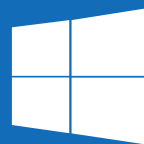


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Six issues	£24.99	£19.99
Europe (12 issues)	£100	£100
Rest of world (12 issues)	£125	£125

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PC Advisor is published by IDG UK  
IDG UK, 101 Euston Road, London NW1 2RA. Tel: 020 7756 2800  
Printer: Wyndeham Press Group Ltd 01621 877 777  
Distribution: Seymour Distribution Ltd 020 7429 4000

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JIM  
MARTIN



# Stay connected

## Why boosting your home's Wi-Fi is easier than ever

**W**elcome to another packed issue of *PC Advisor*. It's an age-old problem, but poor Wi-Fi coverage and stuttering, buffering video should be a thing of the past if you invest in one of the routers and powerline kits we've tested this month.

Combining a modern 802.11ac router with Powerline adaptors allows you to connect to the internet - and other devices connected to the network in your home - from anywhere, even in the shed at the bottom of your garden.

It's not just your choice of router that's important, but where you install it and how you configure it. We explain on page 96 to 99 how to ensure you get the best coverage and speed from your kit, including Powerline adaptors. These are becoming ever more popular as they let you connect computers, Sky boxes and many other devices to your router, even if they're in the most remote room in your house.

Some kits have built-in Wi-Fi and these are what you need if there's a dead spot that your router's wireless signal can't reach. This is because Powerline - or HomePlug - kits use your home's mains wiring as network cables, and the adaptors can take the signal and broadcast a strong Wi-Fi hotspot at any power outlet connected to the same electricity meter. Better still, prices have come down and speeds gone up, so it's a great time to buy.

Something else that's age-old is the debate over whether PCs or consoles provide the best gaming experience. Naturally, we're firmly in the PC camp and this month we've tested out the latest graphics cards (page 56) that offer a huge speed boost over most current setups and have enough power to play games at 4K resolution: something no current games console can manage.

Talking of high-end kit, we've got our hands on the first Chromebook Pixel to be sold in the UK (see page 28). It's a beautiful piece of kit, but the price will be hard to swallow for most. That's because you can buy a great Windows laptop for hundreds less - the new Acer V3 is the perfect example and you'll find out why on page 27.

It would seem that most PC and laptop makers were caught on the hop with the launch of Windows 10 back in July, which is why you'll still find new models arriving with Windows 8.1 out of the box. You can upgrade them for free to Windows 10, of course, and we explain how on page 100. This will also help anyone who's tired of waiting for their existing machine to download and install Windows 10 automatically.

**ISSUE 245 ON SALE 14 OCTOBER 2015**

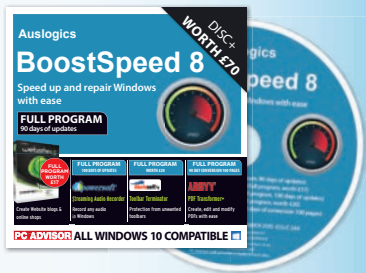


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# Intel aims first 6th-gen Skylake CPUs at gamers and enthusiasts

Intel reveals further details of its upcoming Skylake range of processors

At Gamescom in Germany, Intel unveiled two new 14nm desktop Skylake CPUs aimed at PC enthusiasts and gamers. Expectations are running high for the new chip, which is a 'tock' in Intel's processor roadmap. For years, Intel has worked on a 'tick, tock' cadence for CPUs. Ticks are used to introduce new process changes and bring fairly conservative improvements, while the follow-on tocks are expected to bring a performance boost.

The two Skylake CPUs include the 4GHz Core i7-6700K and the Core i5-6600K. Both are quad-core, desktop chips, with the key differentiator being support for Intel's virtual CPU Hyper-Threading technology.

While unattributed reports earlier this year had performance differences between the sixth-generation Skylake and the fifth-generation Haswell wildly high, Intel officials say to expect 10 percent over 2014's fastest Haswell CPU, 20 percent over the fastest Haswell from two years ago, and up to 30 percent over the fastest third-generation Ivy Bridge chip. Graphics performance differences between the new Intel HD 530 and previous chips would be from 20- to 40 percent.

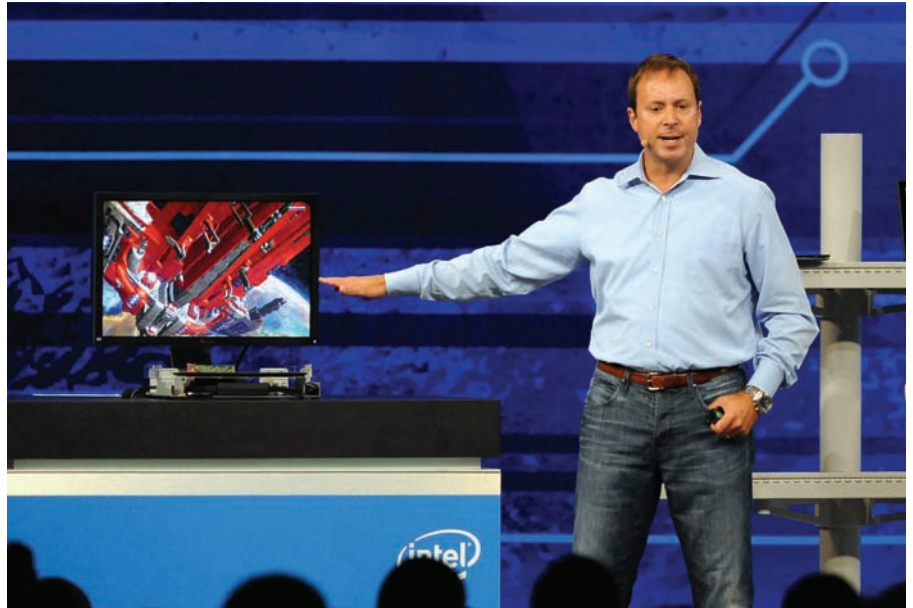
After the too-little, too-late launch of the desktop fifth-generation Broadwell CPU in June, many see Intel's Skylake as the true replacement for its Haswell series of CPUs.

## Time for a new socket

Skylake desktop CPUs use a newer LGA1151 socket that is incompatible with older LGA150 sockets. That means systems using the new processor will require different motherboards, though that may not be a bad thing for those into moving forward.

Along with the new CPUs, Intel is also unveiling the much-needed 100-series chipset that includes key improvements to all PCs. The previous 9-series chipsets were often handicapped by a lack of internal bandwidth within the chipset itself.

If you think of a computer as a small city with congested roads, mainstream PCs have been clogged for years when a lot of hardware is installed. Getting data



to multiple USB 3.0 drives, SATA drives, eSATA and hard drives would easily overtax a PC's available bandwidth. For example, eSATA as implemented in the Z97 and other 9-series chipsets was limited to 10Gb/s transfer speeds by design. That has been a nonstarter for high-end drives, which easily exceeded that bandwidth. With the additional bandwidth on Z170, SATA Express can be now hit 16Gb/s connections speeds, making it more appealing.

The new Z170 chipset doubles the internal bandwidth by going from a x4 PCIe 2.0 connection to a x4 PCIe 3.0 connection, and also now offering up to 20 PCIe Gen 3 lanes in the chipset itself. The top-end Z97 chipset, for example, offered 8 PCI Gen 2 lanes.

Although there's no direct need for the new chipset to implement USB 3.1, many new motherboards for the Skylake chips have all featured USB 3.1 and USB-C connectors.

## DDR4 for everyone

The most noticeable change on Skylake systems will be the use of DDR4 memory. This was first introduced on PCs with Intel's ultra-high end Haswell-E CPUs in 2014, where the high cost of the newer RAM would be more acceptable. With the price difference

between DDR4 and DDR3 now smaller, Intel feels safer introducing the newer and faster RAM to more mainstream platforms.

DDR4's claims to fame are higher density and higher speeds, while using less power. So far, that's proving to be true. Haswell CPUs never saw density beyond 32GB because desktop memory modules never exceeded 8GB. With Skylake and the 16GB modules, you'll be able to build or buy a system with double the previous maximum amount. The memory bandwidth of DDR4 is also greatly improved, with modules pushing DDR/3200 and into the DDR/3666 range already.

## What about the rest of us?

With Skylake now in the hands of gamers and die-hard enthusiasts, when will laptops and mainstream PCs get Intel's new processor?

Its launch shouldn't be like the dribs and drabs of Intel's first 14nm Broadwell chip, which suffered delay after delay. Skylake in laptops are expected to hit sometime this quarter. Sources have previously told PC Advisor to expect the new chip in the autumn. Intel officials declined to confirm that report, but all chatter points to a much more rapid introduction than Broadwell.



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CHRIS  
MARTIN



# Struggling Lenovo to cut 3,200 jobs, streamline handset business

Lenovo lays off 3,200 employees as it trims down its smartphone portfolio

Lenovo is laying off 3,200 employees and trimming down its smartphone portfolio in response to a slowdown in its PC and handset sales. The Chinese company faced a particularly tough market environment during the second quarter, according to its CEO Yang Yuanqing. Demand is down for PCs and tablets, and competition in China's smartphone market is cutting into sales.

The tech giant reported second quarter earnings that failed to meet its expectations. Net profit declined 51 percent year on year to reach \$105 million, while revenue increased by just 3 percent from a year ago, to reach \$10.7 billion.

In response, Lenovo has announced cost-cutting measures that will reduce its employee strength of 60,000 by 5 percent. It is also restructuring its mobile business group, to pave the way for a simpler product portfolio with fewer smartphone models.

The layoffs will help reduce expenses by about \$1.35bn per year. The Chinese company will also pay a price to streamline its handset business, and will incur \$600m in restructuring costs.

Lenovo is the world's largest PC maker, but it has expanded into the smartphone and enterprise hardware market to increase its revenue. This led the tech giant to acquire smartphone maker Motorola Mobility and IBM's x86 server business last year.

However, it is taking time for Lenovo to integrate these acquisitions into its overall business. Motorola, for instance, is still reporting a loss and cutting into the company's earnings.

"We do not make these moves lightly," Lenovo's CEO said in a letter to employees that the company later released. "But we must ensure our long-term success."



## AMD launches small, yet insanely powerful Radeon R9 Nano

Video card uses high-bandwidth memory and AMD's powerful Fiji GPU

AMD's computing and graphics division may have plummeted last quarter, but those results were riding on the shoulders of Radeon R200-series video cards, which are nearly two years old. The Radeon crew is gearing up for a more bountiful future with the recent release of its powerful Fury X and Fury graphics cards, built with cutting-edge high-bandwidth memory and AMD's most powerful processor yet - Fiji.

During AMD's recent earnings call, CEO Lisa Su (pictured) let slip a more concrete launch window for the most intriguing member of the Fiji line-up: the Radeon R9 Nano. "Fury just launched actually this week and we will be launching Nano in the August timeframe," Su said, while answering a question about the supply of Fiji-powered

graphics cards. Previously, the R9 Nano was only confirmed for "this summer".

The R9 Nano will take advantage of HBM's integration directly on the Fiji die to shrink the overall length of the card down to crazy small proportions. The Nano is six inches long, and unlike the Fury X, doesn't require an integrated closed-loop liquid cooling solution to stay frosty, which makes you wonder how much punch it will have. Don't worry. The Fury X's GPU packs a whopping 4096 stream processors, while the air-cooled Fury rocks a cut-down version with 3584. AMD hasn't confirmed the R9 Nano's exact specs yet, CEO Su has said that the six-inch card will offer "significantly more performance than the Radeon R9 290X," AMD's previous-generation flagship.





# Four weeks after its launch, Windows 10 is already on 75 million PCs and tablets

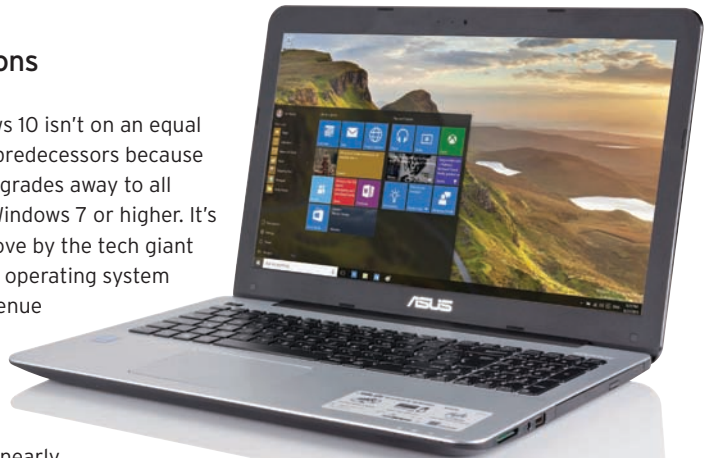
Microsoft's free Windows 10 upgrade offer is having the desired effect, as uptake outpaces earlier versions

Microsoft is well on the way to achieving its goals with Windows 10, as the company boasts of more than 75 million installs in four weeks. The statistic was revealed by Yusuf Mehdi, Microsoft's corporate vice president of marketing for Windows on Devices. He noted that more than 90,000 unique PC and tablet models have seen the upgrade, including some PCs manufactured eight years ago.

The adoption rate is nearly twice that of Windows 8, which sold 40 million licenses after about a month. Microsoft had previously claimed that early Windows 8 adoption was roughly in line with Windows 7. The take-up of Microsoft's new operating system has also blown past Vista (20 million licenses in a month) and XP (17 million licenses after one month).

Of course, Windows 10 isn't on an equal playing field with its predecessors because Microsoft is giving upgrades away to all consumers running Windows 7 or higher. It's an unprecedented move by the tech giant as it tries to push the operating system as a service, with revenue coming from built-in ad-supported and premium services.

On that note, Microsoft hasn't said nearly as much about the extent to which people are using services such as Cortana and the new Edge browser. But Mehdi did offer one encouraging sign. So far, the average Windows 10 device has downloaded six times more Windows Store apps compared to Windows 8. Getting users to try those



modern apps is a major part of its 'Universal Apps' strategy, which allows developers to easily port software to Windows phones, Xbox consoles, and eventually HoloLens.

Microsoft still has a lot to prove and a long way to go. The company has set a goal of getting Windows 10 on to a billion devices within three years, and with more than half of the world's 1.5 billion PC users still running Windows 7, it's too early to roll out the 'Mission Accomplished' banner. Still, it has at least proven that people aren't so apathetic toward its operating system that they'll turn down a free upgrade.

Of course, Windows 10 isn't on an equal playing field with its predecessors because Microsoft is giving upgrades away to all consumers running Windows 7 or higher

## Giffgaff adds 4G at no extra cost

Good news for provider's users who will get 4G connectivity for free

Virtual mobile network Giffgaff has upgraded its tariffs to 4G broadband at no extra cost for its customers. Although the company has offered the faster download and upload speeds of 4G LTE on its network for a while, customers have had to pay extra for the privilege. It has also changed the range of 'goodybags' on offer.

The firm has started making 4G available to pay as you go customers too, though it

will take until mid-October to complete the process. The Gigabags tariff for tablets will also be upgraded to 4G for free.

"We've had some helpful feedback from our members about 4G and sprucing up our offer. As a result we are upgrading our service to include 4G data as standard. There's no change to prices so if you're 4G ready you can use it at no extra cost," said Giffgaff in an email.

There are now seven goodybags to choose from rather than nine - all of which will come with 4G data and tethering. They range from £5 to £20, with the most expensive getting you 'Always On' data. Some goodybags have been upgraded in data allowance and minutes.

Always On data might sound odd as you probably leave your data connection on all the time. With Giffgaff, however, it means that the first 6GB of data will be 4G and then access to unlimited data at a restricted speed from 8am until midnight.

"We have chosen a speed of 256 kilobits per second that allows members to still use regular data services whilst reducing demand on the network."

Note: If you don't have a 4G-enabled phone, you simply buy one of the new goodybags and carry on as normal. You will simply carry on using 3G. ☒

### 4G goodybags

Internet increased to 2GB	Internet increased to 4GB Minutes increased to 1000	Internet increased to 6GB Minutes increased to 2000
<b>£12 goodybag</b>	<b>£15 goodybag</b>	<b>£18 goodybag</b>
<ul style="list-style-type: none"> <li>500 UK minutes</li> <li>Unlimited UK texts</li> <li>4GB UK data</li> <li>Free to giffgaff numbers</li> </ul>	<ul style="list-style-type: none"> <li>500 UK minutes</li> <li>Unlimited UK texts</li> <li>6GB UK data</li> <li>Free to giffgaff numbers</li> </ul>	<ul style="list-style-type: none"> <li>1000 UK minutes</li> <li>Unlimited UK texts</li> <li>6GB UK data</li> <li>Free to giffgaff numbers</li> </ul>

### 3G goodybags

Available for existing members until Mar 2016	Ends on 1st Sept 2015	Available for existing members until Jan 2016
<b>£12 goodybag</b>	<b>£15 goodybag</b>	<b>£20 goodybag</b>
<ul style="list-style-type: none"> <li>500 UK minutes</li> <li>Unlimited UK texts</li> <li>3 GB UK data</li> <li>Free to giffgaff numbers</li> </ul>	<ul style="list-style-type: none"> <li>500 UK minutes</li> <li>Unlimited UK texts</li> <li>5 GB UK data</li> <li>Free to giffgaff numbers</li> </ul>	<ul style="list-style-type: none"> <li>2000 UK minutes</li> <li>Unlimited UK texts</li> <li>Unlimited UK data</li> <li>Free to giffgaff numbers</li> </ul>



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# Why Microsoft Edge browser's lack of add-ons is a deal breaker



**Lack of support for web browser extensions is an Achilles heel that needs to be addressed soon**

**M**icrosoft's new Edge browser, which is built into Windows 10, has a lot to offer, including the ability to annotate web pages and work with Cortana - the Windows version of Apple's Siri voice assistant. It also loads pages very quickly. However, there's at least one thing missing, and it's going to keep me from using the browser, at least for now.

Unlike every other major browser, Edge doesn't support extensions, or small, browser add-on apps that perform a range of useful tasks, including some important security-related functions, such as storing passwords and blocking phishing sites.

If you've been following Windows 10, you may have heard about Edge's lack of support for extensions. What is surprising, though, is that we're nearly a month past Windows 10's release date, and Microsoft is still not saying when it will make the Edge browser whole. I checked with the company recently and received the following response:

"Because part of the customer promise of Microsoft Edge is a personal experience, we are bringing support for extensions to Microsoft Edge in a future update. Developers who build extensions for other modern browsers using common web technologies such as JavaScript and HTML, will work with Microsoft Edge with little or no code changes."

Translation: Edge extension support will be ready when it's ready. Microsoft will eventually push a Windows 10 update to

users that includes a fix, and the problem will likely become a nonissue.

Until then, there's a host of things you cannot do with Edge. So for now, I'm mostly using Mozilla's Firefox, in part because it supports tons of valuable extensions and add-ons. Add-ons make Firefox a better browser for Windows 10 than Edge... for now.

Firefox extensions I use frequently include LastPass, a password manager that saves me the trouble of remembering dozens of passwords; Privacy Badger, which stops sites from tracking me; an ad blocker that reduces the numbers of ads I see; a Facebook button that lets me share pages with a click; and an extension that lets me chose when to load and when to block Adobe's Flash. None of these add-ons currently work with Edge, so the new browser is more trouble than it is worth, at least for me.

If you use Norton Antivirus, you'll see this message after launching Edge: "Norton extensions protect you from phishing and other risky sites. Click Next to change your default browser to a supported browser, so that you are protected while you surf the web."

There's another issue that may further delay Edge extension support. Microsoft's statement makes it sound as though developers won't have to work very hard to make their extensions play well with Edge after it gets add-on support, but that's not true, according to Peter Eckersley, a developer with the Electronic Frontier

Foundation (EFF), a privacy-focused consumer advocacy group.

The foundation developed the previously mentioned Privacy Badger browser extension. In theory, Eckersley and his colleagues should be able to plug it into Edge without much fuss. "Unfortunately, we've rarely found matters to be so simple - the APIs tend to change a lot between versions of each browser, as well as being very different between them, and it's a constant struggle to implement privacy or security functionality with them," Eckersley said via email.

In other words, EFF expects to have to spend some time working with Edge, and it's likely that other popular extensions could also be delayed.

The situation isn't shocking, but it is unfortunate - and annoying. Every time Microsoft rolls out a new version of Windows, untold numbers of loose ends and glitches are introduced. I suspect that Edge will turn out to be a more than worthy successor to Internet Explorer, and it may even give Chrome and Firefox a run for their money. Until this huge extension gap is plugged, however, it's difficult to use Edge as an everyday browser. ☒

**BILL SNYDER**







It's time to put Flash out of our misery once and for all. And, thanks to Google, it may finally happen

**S**ome programs – cough Windows, cough – are full of security bugs, but they're so popular that we can't get rid of them. That is why Adobe Flash continues to be widely used. But it could be that the end is near, at last for the bug-ridden multimedia platform.

Flash, of course, though widely used is also vehemently hated in some quarters. Steve Jobs famously trashed it twice. First, in 2008, he said that Flash for desktops and notebooks "performs too slow to be useful" on the iPhone, and the mobile version "is not capable of being used with the web". Then, far more famously, in 2010, he declared that Flash wasn't good enough for iPhones and he wouldn't have it in his devices.

He was far from the only hater, but it didn't do any good. Today, you can run Flash on iOS using third-party programs such as the Puffin Web browser to get your Flash fix.

It's no secret that when it comes to security, Flash leaks like a sieve. And while that cliché is appropriate, it doesn't capture the magnitude of the problem. We're all techies here; let's look at some hard numbers. Colleague Michael Horowitz counted up Flash's bugs through mid-May for 2015. Take a guess how many he found. Give up? He discovered 78.

And has a chagrined Adobe done much better since then? Not on your life. Since then, 86 more bugs have been found. That's 164 all together, which means a bug was being discovered every day-and-a-half, on average, or one bug every day for the five-day business week. That's got to be some

kind of record, though not one that anyone will want to match anytime soon.

If you're an Adobe Flash programmer, this is all great news; you've got excellent job security as long as advertisers and websites continue to use Flash. If you're anyone else, there's nothing great about it.

### Flash's days numbered

You might find that hard to believe if you have any idea how much it is still being used. When I browse the internet with Google Chrome, I block Adobe Flash content automatically, so instead of Flash content, I see grey boxes. And I see them everywhere. There are few sites I visit that don't have Flash-based ads. According to Ad Age, which should know, 84 percent of banner ads are still built from Flash.

People are also still playing Flash games. Jerome Segura, senior security researcher at Malwarebytes Labs, says that developers are still using it. "There are people in the gaming industry who are still very attached to Flash," he says.

And while YouTube dropped Flash for HTML5-based video in January 2015, many other video sites still use it. Last, but oh I how wish this were least, some websites' user interfaces are still written in Flash.


First, Mozilla began blocking all versions of Flash Player from running automatically in Firefox in mid-July. Then Facebook admitted in an SEC 10-Q that Flash vulnerabilities are affecting its "ability to generate Payments revenue." This prompted fed-up Facebook chief security officer Alex Stamos to tweet,

"It is time for Adobe to announce the end-of-life date for Flash and to ask the browsers to set killbits on the same day."

Then, on 27 August the grumbling about Flash got serious. Google announced in its AdWords Google+ page that: "Chrome will begin pausing many Flash ads by default to improve performance for users. This change is scheduled to start rolling out on September 1, 2015."

That means all those splashy video Flash ads will stop in their tracks. That's no way to impress the punters. Google will automatically translate some of these ads into HTML5 video. But some ads won't convert. The only way you can tell beforehand is to test the ads with Google's Swiffy extension. If your ads don't come over – well, Google suggests you get cracking in creating HTML5 ads.

This move is going to be the real Flash killer. Google AdWords accounts for about two out of three ads seen on the web. If vendors can't reach their customers with Flash ads, they're going to abandon it.

Flash is finally coming to the end of the road. Adobe has no-one to blame but itself for this. Flash is almost 20 years old, and still a month doesn't go by without a serious security problem. That's why I seriously doubt it will live to see its 21st birthday. 

STEVEN J  
VAUGHAN-  
NICHOLS



# Consumers win as Android vendors struggle



The future for phone makers is uncertain as the battle over cheaper phones intensifies, says [Mikael Ricknäs](#)

**S**taff cuts at Lenovo and HTC, a failed patch from Google, and Samsung's latest flagship smartphones all highlight just how tricky selling Android smartphones has become.

Apple's stranglehold on the market for the most expensive handsets have left most vendors in the Android camp scrambling to make a living off of cheaper devices with lower margins.

Recent data from market research company IDC illustrates how Android is losing ground in the £500+ segment. Just 8 percent of smartphones sold during the second quarter of this year was in this category, down from 11 percent in the same period in 2014, according to Francisco Jeronimo, research director at IDC. At the same time, 82 percent of iPhones fell into this category, up from 60 percent last year.

Samsung is still convinced it can make a mark in this segment of the market. Adding to its portfolio of high-end smartphones, the company launched the Galaxy Note 5 and Galaxy S6 edge+ at an event in New York on Thursday. Although the new products are very impressive, selling the tens of million units Samsung needs to make them a hit won't be easy. To an even larger extent than before, great products are no longer a guarantee for market success.

"There is a general apathy towards new smartphones. Consumers just aren't as

excited about the next big thing anymore. As far as they are concerned products have reached a level of maturity that's good enough," argued Ben Wood, chief of research at CCS Insight.

## Grim picture

The cuts announced by HTC and Lenovo highlight just how ruthless the smartphone market has become. While HTC's struggles have been intensifying for a couple of years, Lenovo, helped by its acquisition of Motorola Mobility, seemed to be on the right track. But the second quarter painted a grim picture of its fortunes. While the overall market grew by just over 15 percent year-on-year, both Lenovo and Motorola shipped 32 percent fewer units, according to Strategy Analytics. The two have struggled with the transition from 3G to 4G smartphones in China and the US, it said. For example, Motorola didn't launch an LTE version of the second-generation Moto G in the US. The company finally released a proper upgrade of the device in July along with new Moto X models.

While the Moto G is the company's budget king, the new Moto X Pure (also known as the Style) is Motorola's take on what an Android-based high-end smartphone should cost and look like in 2015.

The Moto X family is a perfect illustration of how the smartphone market has changed due to increasing competition. When

Motorola launched the original model about two years ago, the 16GB version started at £350, and last year the price for the second generation had dropped to £420. The Moto X Style will go on sale in September, priced from £359.

So what's an Android smartphone vendor to do? Motorola is hoping the lower price of the new Moto X will help convince consumers to pick its flagship over Samsung's and Apple's much more expensive offerings.

HTC, which is laying off 15 percent of its staff, is hoping to survive by expanding beyond smartphones. For its part, Lenovo said on Thursday it would cut 3,200 jobs and restructure its mobile business, with the aim of creating leaner and meaner company. To keep up, it will update its smartphones and add new models every six months, Lenovo said.

If all this wasn't bad enough, manufacturers now have to take security vulnerabilities in Android seriously. Thanks to the operating system's success, hackers looking to steal data or defraud users have increasingly targeted smartphones.

Google will play a key role, but vendors have to get intimately involved to ensure their products are safe. Samsung and LG have said they are planning to push out patches monthly, and other vendors will have to follow in their footsteps sooner rather than later. This change

will come with increased costs as well as the risk of alienating users if a patch fails or doesn't arrive soon enough. Highlighting how complicated this all is, Google had to release another patch to fix the Stagefright vulnerability after a security firm said the first one included a flaw. (See how to remove the from your Android handset on page 108.)

So if there is light at the end of the tunnel for the Android vendors, it's hard to find.

There are exceptions: Huawei Technologies and Xiaomi, for example, can celebrate their second quarters, which were boosted by aggressively priced products that attract smartphone buyers in China. Huawei is also expanding rapidly across other parts of Asia, Europe and North America. In addition, smartphone sales are still growing, which is more than can be said for PCs and tablets.

If there is a winner in all this doom and gloom it's consumers all over the world.

Just a couple of years ago, smartphones for below £100 were bordering on unusable. That's no longer the case. At the same time, mid-range devices are becoming increasingly competent and high-end phones are reaching new engineering heights, even though improvements over previous generations are smaller than they used to be. But nothing lasts forever; if vendors start going out of business competition will decrease and that's never a good thing. ☒

# Seven reasons why modular smartphones are such a nightmare to develop

Challenges include the fact there are no guarantees users will want one, reports [Mikael Ricknäs](#)

**A**nyone who thinks modular smartphones are a cool concept was dispirited when Google postponed tests of its Project Ara until next year. Developing such devices is, however, particularly challenging, because of issues with size, performance and price.

Here we look at the top seven reasons why it's so difficult to develop smartphones that let users swap out the processor, camera and storage options.

## Architecture

The biggest technical challenge to building a modular smartphone is the underlying architecture, the structural frame and data backbone of the device, which makes it possible for all the modules to communicate with each other. It has to be so efficient that the overall performance doesn't take a hit, yet still be cheap and frugal with power consumption.

## Durability

The Project Ara team recently posted and then retracted a Twitter message that a prototype had failed a drop test. But it's clear that keeping the modules in place is a challenge. In another message that wasn't retracted, the team said that it's developing a new and better solution. It also remains to be seen how the modules and connectors will be able to handle the wear-and-tear of long-term daily use.

## Form factor

While modular design gives users more flexibility, it also comes with several drawbacks. Smartphones, for example, have become more svelte thanks to tighter integration between components, so the addition of chassis that needs to be sturdy adds to the overall size and weight.



Vendors have to find the best possible balance between durability and size, which won't be easy. However, the size won't be a dealbreaker. Recent flagship smartphones from the likes of LG Electronics, Motorola Mobility and HTC aren't very light or small for their respective screen sizes, and they still leave little to be desired.

## Battery life

The communication between the modules uses more power than in a traditional smartphone. What the eventual power tax will be remains to be seen. It's one of the things that Google's Project Ara team is working to improve.

## Testing

The testing part of the development process is more complicated and time-consuming for modular phones. Instead of having to ensure that one hardware configuration works, vendors have to make sure that all permutations work equally well.

## Price

A more complicated development process and less product integration will have an effect on pricing, as well. The Project Ara FAQ states that it's much too early to tell what phones will cost, but the bill-of-materials cost of a basic, entry-level Ara device is in the £50 to £100 range. The smartphone market has become very price competitive, so if modular smartphones are to succeed, the extra cost for manufacturing them has to be as small as possible.

## Do consumers want one?

Spending money on developing modular smartphones is at the end of the day very brave since there are no guarantees they will succeed technically or commercially. There will always be tech enthusiasts who will buy them. But those customers aren't enough to make them financially viable in the long term, and convincing the large group of consumers who simply want a smartphone that just works will be very challenging. ☒





# SNAPDRAGON 820 CHIP GETS TECHNOLOGY TO SECURE ANDROID PHONES

Processor is boon for the next generation of high-end Google phones, reports [Mikael Ricknäs](#)

**Q**ualcomm is promising to improve security and privacy on high-end smartphones with Snapdragon Smart Protect, which uses on-device machine learning to detect zero-day malware.

The popularity of smartphones has started to catch the imagination of hackers, resulting in the need for better protection. Qualcomm's latest contribution is Snapdragon Smart Protect, which the company announced in August.

The anti-malware technology looks at what's going on in the smartphone and

Asaf Ashkenazi, senior director of security product management at Qualcomm.

The first processor to get Smart Protect is the Snapdragon 820, which will show up in high-end smartphones during the first half of next year. The technology will also be used in future processors for cheaper devices.

Smart Protect works only with Android, and is powered by one of the key new features in the Snapdragon 820, the Zeroth platform, which Qualcomm describes as the company's first cognitive computing engine. The additional power consumed is

all phones powered by the processor will make use of the functionality. Qualcomm provides the APIs and a reference user interface, but smartphone manufacturers will have to build the final UI themselves.

Getting the user interface right is almost as important as the technology itself, because the protection might be compromised if users don't understand the warnings it presents. The number of false positives, which is when security software thinks something is a threat when it isn't, will also decide how successful Smart Protect is.

Qualcomm is also working with mobile security providers, including, AVG, Avast and Lookout, to make Smart Protect capabilities available within their apps.

It would be naive to think that Qualcomm's Snapdragon Smart Protect will be able to detect all threats directed at smartphones. After all, technologies that should be able to detect zero-day vulnerabilities have been around for a long time in networks, and hackers are still wreaking havoc.

However, the combination of signature-based security software, technologies such as Qualcomm's Smart Protect and vendors working harder to plug vulnerabilities should help at least make life a little more difficult for the bad guys. ☒

The anti-malware technology looks at what's going on in the smartphone and warns about what it thinks is abnormal behaviour to protect users, such as an app sending an SMS

warns about what it thinks is abnormal behaviour to protect users. At its most basic, that could be an app that takes a photo even though the display is off, or a program sending an SMS without any user interaction.

"We can look at many different aspects of what applications are doing; what resources they request, what system calls they make, and then look at a sequence of events and decide if something is malicious," explained

tiny, Ashkenazi argued: "It's so low we have trouble measuring it."

The anti-malware technology also makes use of ARM's TrustZone platform, which allows for apps to run separately from the operating system. This hardware-based layer makes it more difficult for hackers to access the features protected by TrustZone.

However, just because the Snapdragon 820 has Smart Protect built-in doesn't mean



# Chipsets lay groundwork for gigabit speeds to more homes

Technology will make it easier for operators to upgrade their broadband networks, says [Mikael Ricknäs](#)

**C**hipset vendors such as Broadcom and STMicroelectronics (STM) have launched products that'll make it possible to offer gigabit speeds over fibre, as well as over copper and cable networks.

Broadband operators are already offering gigabit speeds over fibre, but the development of new technologies will help make super fast broadband networks more common during the next couple of years.

STM recently announced that its DOCSIS 3.1 chipset, code-named Barcelona, which goes into home cable modems and gateways. It will enable higher speeds at a larger scale and more cost-effectively, which could help convince cable companies to roll out faster networks. It's difficult to predict what speeds users will end up getting, but the maximum capacity is 10Gb/s downstream and 1Gb/s upstream.

Barcelona, or STiD325, is currently available in small numbers to some of STM's larger customers, according to the company, which didn't say when the first products based on it would arrive. However,

in July, Comcast revealed that it would at least start testing DOCSIS 3.1 during the fourth quarter. Company CEO Brian Roberts said the technology "will be a quantum leap forward" during its second-quarter earnings conference call.

## Reference design


Competing chipmaker Broadcom also announced a gateway reference design, which it said will make it easier for cable operators to roll out fiber to users' homes without having to upgrade their existing infrastructure. Chipmakers release reference designs to show how their components can be used and in the process make it easier to develop products based on them.

Both ST and Broadcom demonstrated their products at the CableLabs Summer Conference in Keystone, Colorado.

At the same time, work is progressing on a technology called G.fast, which will allow telecom operators to offer gigabit speeds or at least several hundred megabit per second over copper networks. To lower the bar

for rolling out that technology, chipmaker Skypio Technologies recently announced reference designs for supporting G.fast modems inside an SFP (small form-factor pluggable) module.

The growing momentum around G.fast was highlighted recently when Qualcomm acquired Ikanos Communications, which has been a key figure in the development of the technology. In Europe, BT, Telekom Austria and Swisscom are all testing G.fast. The latter two plan to launch commercial services next year. BT has said it will launch its services either next year or in 2017. Ikanos has also tested the technology with operators in Japan and Korea.

G.fast and DOCSIS 3.1 use a mixture of copper or coaxial cable and fiber to connect users. Fibre is used as far as possible, and the other two cable types take over for the last bit to the subscriber. Ultimately, it doesn't matter what cables are used, as long as the performance doesn't disappoint, and it seems G.fast and DOCSIS 3.1 can deliver speeds that meet expectations. 



# Ericsson's next-gen LTE targets faster mobile networks and IoT

Company demonstrated some of the upgrades at CTIA Super Mobility. By Mikael Ricknäs reports

**E**ricsson is working on LTE with faster upload speeds, as well as using unlicensed spectrum to speed up downloads and customising the technology for Internet of Things applications. The Swedish telecom equipment vendor is showed off some of the developments at the CTIA Super Mobility conference in Las Vegas.

Although 5G was one of the hottest topics at CTIA, LTE still has lots mileage left – after all, the first two letters stand for Long Term. And it's a lot easier to upgrade an existing network than roll out a new one.

One of the more contentious upgrades is using unlicensed spectrum for LTE. Detractors fear it will affect Wi-Fi performance, which uses the same frequencies. To prevent that from happening, a number of methods are being developed to make LTE play well alongside Wi-Fi. At CTIA, Ericsson demonstrated LTE-U (Unlicensed) Fair Sharing, which continually monitors the radio environment to determine the overall average channel availability.

The company also showed LTE at speeds up to 600Mb/s with the help of carrier

aggregation and better signal encoding. Carrier aggregation, which is part of LTE-Advanced, allows networks to devote more resources to some users by treating two or more channels in the same or different frequency bands as if they were

bigger images and videos to social networks, so higher upload speeds will be welcomed.

However, future LTE networks are also being developed to work better with the Internet of Things. A new version called LTE Category 0 is much slower than current

**One of the more contentious upgrades is using unlicensed spectrum for LTE. Detractors fear it will affect Wi-Fi performance, which uses the same frequencies**

one. However, because of the amount of spectrum needed, not all operators will be able to offer 600Mb/s. The work that's been done to increase bandwidths has focused on faster download speeds. Using some of the same technologies, attention is now being turned to speedier uploads, as well. Using carrier aggregation on the uplink along with improved encoding allows the bandwidth to be increased from 75- to 150Mb/s.

Users are becoming more dependent on cloud-based storage, and are also uploading

networks, but that's fine since most Internet of Things apps don't need lots of bandwidth. The upside is that the cost of devices drops and battery lives can be extended to 10 years, and more.

To show what's possible, Ericsson teamed up with chipmaker Sequans to demonstrate a prototype network and device.

All the LTE upgrades are part of Ericsson's Networks Software 16A and 16B. They will be used on indoor and outdoor base stations and become available next year. ☒



# Intel preps wireless power laptop tech for 2016

Wireless charging and WiGig could mean computing without wires, says [Martyn Williams](#)

**A** wireless charging system that packs enough power to replenish a laptop battery should hit the market in 2016, helping realise the long-held dream of a cable-free desk, according to Intel. The chipmaker is developing a system that can handle up to 20W of power – about four times the amount available from the wireless charging mats already available for some smartphones.

At the IFA trade show in Berlin, the company demonstrated a wireless charging unit that can be attached to the underside of a desk and send power to devices sitting on the desk. It charged two smartphones simultaneously and, with them moved out of the charging zone, a convertible PC.

The charging station sends energy through up to 5cm of desk to an area about 20cm in diameter. It wasn't very difficult to find the spot, although sometimes devices needed a slight nudge to begin charging. But then, it is still a prototype.

Intel said it is working with equipment makers on the technology and expects to see a series of announcements through 2016.

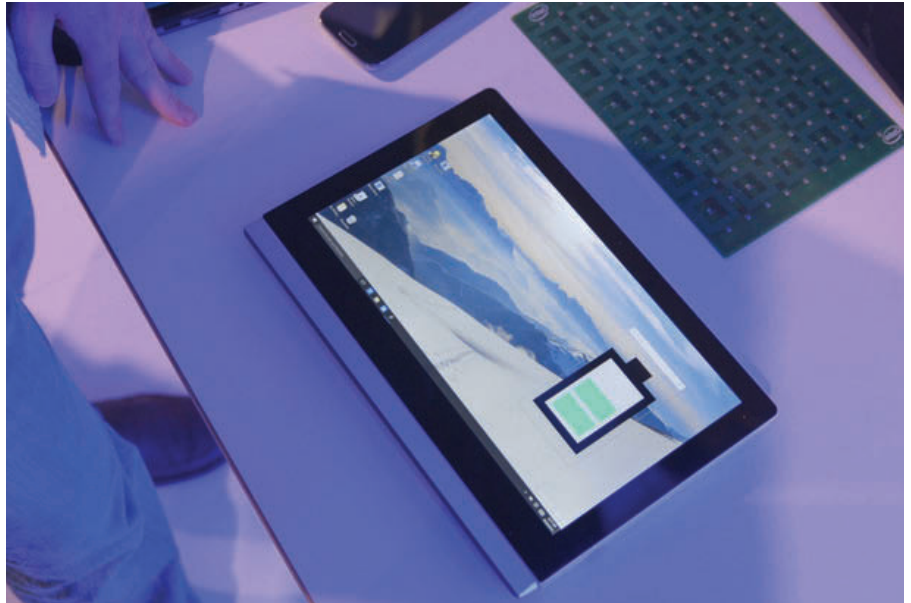
## Competing technologies

A lack of compatibility between competing technologies has dogged the rollout of wireless charging technology in smartphones, but the industry is coming together around two competing standards.

The Intel device is based on a magnetic resonance system that is the result of a merger between two former competitors, the Alliance for Wireless Power and the Power Matters Alliance. Their competitor remains the Qi alliance.

Wireless charging was demonstrated alongside another wireless technology: WiGig. The wireless gigabit standard is currently supported by devices from HP and Dell and provides a gigabit-speed wireless data link between computer and hub. Peripherals such as monitors, hard disks and keyboards are connected to the hub and the link to the PC is maintained over the air.

The WiGig link remained strong over about 5m during the demonstration, so people will have a small degree of mobility inside a home or office.



PHOTOGRAPHY BY ADAM MURRAY

Intel hopes that a combination of the two systems will help realise the long held goal of a truly wireless desk, but cables are probably never going to completely disappear. After all, for most people, the paperless office is still not a reality. ☒

The Intel device is based on a magnetic resonance system that is the result of a merger of the Alliance for Wireless Power and the Power Matters Alliance

## Crafting PCs the Scan way: Specification. Service. Satisfaction.

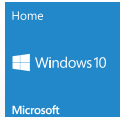


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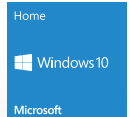


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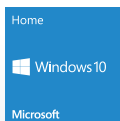


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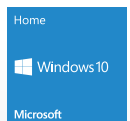


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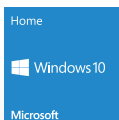


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**£999** Inc VAT

The 3XS Gamer 20i is a super-fast gaming PC thanks to its combination of quad-core Intel Core i7 4790 CPU running at 3.6GHz with added Hyper-Threading plus a 4GB NVIDIA GeForce GTX 970 graphics card. These components are installed in an Asus Z97-P motherboard along with a 1TB hard disk.

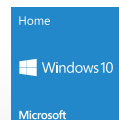


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- 3 Year Premium Warranty

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This high-end gaming system includes a water-cooled Intel Core i7 6700K CPU overclocked up to 4.6GHz plus a 4GB NVIDIA GeForce GTX 980 graphics card, 8GB of 3000MHz Corsair Vengeance LPX DDR4 plus a 256GB PCI-E SSD for lightning quick gaming loading and a 2TB hard disk.

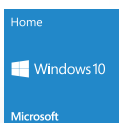


### 3XS Graphite LG157 Gaming Laptop

- Intel® Core™ i7 4720HQ processor
- 8GB Corsair DDR3 1600MHz memory
- 2GB NVIDIA GeForce GTX 960M
- 15.6in 1,920 x 1,080 screen
- 1TB SATA 6Gb/sec hard drive
- Windows 10

**£869** Inc VAT

The LG157 is a 15.6" mid-range gaming laptop that includes a NVIDIA GeForce GTX 960M graphics card plus an Intel Core i7 4720HQ CPU, up to 16GB of RAM and multiple hard disks and SSDs. The LG157 is ready for next-day delivery and is protected by a 2 Year Premium Warranty.

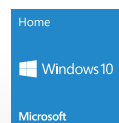


### 3XS Graphite LG1720 Gaming Laptop

- Intel® Core™ i7 4720HQ processor
- 8GB Corsair DDR3 1600MHz memory
- 3GB NVIDIA GeForce GTX 970M
- 17.3in 1,920 x 1,080 screen
- 1TB SATA 6Gb/sec hard drive
- Windows 10

**£1075** Inc VAT

The LG1720 is a 17.3" high-end gaming laptop that includes a choice of powerful NVIDIA GeForce GTX 970M or 980M graphics card, ensuring silky smooth frame rates in all games. The LG1720 is ready for next-day delivery and has a 2 Year Warranty.



## Scan Computers recommends Windows.

### 3XS Custom Series

Our 3XS Custom Series is a range of computers designed to offer the best performance for a variety of applications, with a particular focus on games. We build Custom Series PCs to order, so we can configure and tailor make an individual PC just the way you want it. We can also overclock the processor, so you get a faster PC without a substantial increase in price. All 3XS Custom Series PCs are covered by a three year warranty as standard with the first year on-site.



Scan 3XS Overclocked



Built by award winning 3XS team



3 Year Warranty

# 3XS SYSTEMS



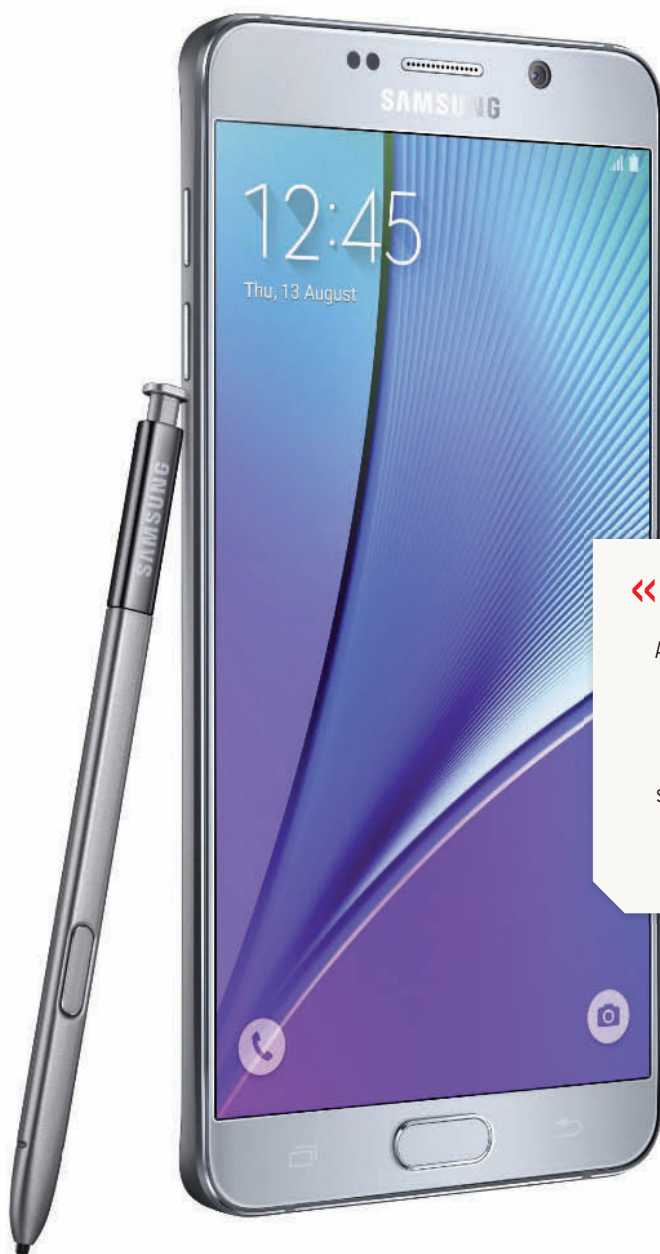
More new products online:  
[tinyurl.com/gadgetsPCA](http://tinyurl.com/gadgetsPCA)

### Samsung Galaxy S6 Edge+

#### Smartphone >>

Samsung has expanded its S6 range with an even larger version of its curved screen phone. The Galaxy S6 Edge+ is a 5.7in version of the regular model and now has 4GB of RAM, although the 128GB storage capacity has been dropped as well as the IR blaster.

£749 inc VAT  
[samsung.com/uk](http://samsung.com/uk)



### << Samsung Galaxy Note 5

#### Phablet

Although the S6 Edge+ is a new phablet from Samsung, the Note range is still around. However, there are currently no plans to release the Note 5 the UK. That's a shame because it's got S6-like style and build, a Quad HD 5.7in screen, fingerprint scanner and 4GB of RAM.

ETBC  
[samsung.com/uk](http://samsung.com/uk)

CHRIS  
MARTIN**Alienware X51 R3** >>**Gaming PC**

If you thought desktops were dead, check out the new X51 R3 from Alienware. It might look the same on the outside, but inside is new custom liquid cooling and support for the Alienware Graphics Amplifier. Core specs include an Intel sixth-generation Core i5K or i7K processor, an nVidia GTX 960 graphics card and new M.2 PCIe SSDs.

**From £1,029 inc VAT**  
[alienware.com](http://alienware.com)

**Sky Now TV Box****Media streamer**

Sky is back with a second-generation media streamer, which is once again powered by Roku. The new Sky Now TV Box includes an ethernet port instead of just Wi-Fi and a processor that's five times faster. It also has a new interface, making it easier to find content. Users can take advantage of the new Sky Sports Month Pass, which costs £31.99.

**£14 inc VAT**  
[sky.com](http://sky.com)







### << **LG Music Flow HS8** *Soundbar*

If you're a fan of tessellation, then this new soundbar will be the perfect companion for your curved TV. Not just for looks, LG says the shape also expands the sweet spot for listening. The HS8 features a 360W 4.1 system and includes Wi-Fi for multi-room audio and support for Google Cast.

**£699 inc VAT**  
[lg.co.uk](http://lg.co.uk)

### **Dell Chromebook** >>

#### *Chromebook*

The new laptop is described by Dell as a professional Chromebook. The device comes in a slim design and has an Intel fifth-generation Core i5 processor, 8GB RAM and up to 12 hours battery life. The 13in screen features a Full HD resolution, an IPS panel and a Gorilla Glass front.

**\$399 US (UK price TBC)**  
[dell.co.uk](http://dell.co.uk)



### **Sony SmartBand 2** >>

#### *Fitness tracker*

Sony has announced a new version of its SmartBand. It comes with support for Android and iOS, and is rated IP68 waterproof, so you can take it almost anywhere. A key new feature is a heart rate sensor, and users will get notifications via a combination of vibrations and LEDs.

**€199 (UK price TBC)**  
[sonymobile.com](http://sonymobile.com)



**Honor Band >>*****Fitness tracker***

The new brand backed by Huawei has announced a new fitness tracker, which is yet to be named. We've simply called it the band, but the name will be chosen via a competition. It comes with a 1.06in circular screen, IP68 waterproof certification, three-day battery life and a G-sensor.

**£59 inc VAT**  
[hihonor.com](http://hihonor.com)

**<< Epson EcoTank 2500*****Printer***

A printer may be one of the least glamorous tech products, but we still need them. If you're fed up of buying new cartridges, the EcoTank range lasts a whopping two years for the average user. The 2500 model includes the firm's Micro Piezo technology, a 1200dpi scanner and Wi-Fi connectivity.

**£229 inc VAT**  
[epson.co.uk](http://epson.co.uk)

**AKG N60 NC >>*****Headphones***

These lightweight 150g headphones will be perfect for travellers with the NC in the model name standing for noise-cancelling. AKG touts 30 hours of battery life, so you won't run out of power even on the longest flights. The foldable design is made up of leather, aluminium and memory foam for style and comfort.

**£229 inc VAT**  
[uk.akg.com](http://uk.akg.com)





**£999** inc VAT

**Contact**

■ [msi.com](http://msi.com)

**Specifications**

15.6in (1920x1080, 141ppi)  
IPS matt anti-glare display;  
Windows 8.1; 2.6GHz Intel  
Core i7-4720HQ (3.6GHz  
Turbo) 4C, 8T; nVidia  
GeForce GTX 960M (2GB  
GDDR5) + Intel HD Graphics  
4600; 8GB 1600MHz DDR3  
RAM; 128GB M.2 SATA SSD +  
1TB 7200rpm SATA HDD;  
gigabit ethernet; 802.11ac,  
1x1 MIMO; Bluetooth 4.0;  
tray-load DVD±RW drive;  
3x USB 3.0, 1x USB 2.0; Mini  
DisplayPort 1.2, HDMI 1.4;  
Kensington Lock Slot; SDXC  
card slot; stereo speakers  
(Dynaudio); webcam and  
mic; UK tiled keyboard  
with numberpad; two-  
button multi-touch  
trackpad, 103x61mm;  
50Wh lithium-ion, non-  
removable battery;  
387x258x27.8mm; 2355g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



## GAMING LAPTOP

### MSI GE62 2QD Apache Pro

The MSI GE62 2QD gaming laptop hides its frame well, since the bare specification of just under 2.4kg and 28mm thick doesn't sound especially portable. Pick it up though, and this 15in notebook seems thinner, lighter - certainly than the traditional portable gaming laptop.

Construction is mostly metal, a veneer of brushed aluminium on the lid and top deck, and an underside cast from magnesium-lithium alloy. It's all finished in black, with a natty red stripe along the front.

Not unusually, there's no removable battery nor access trapdoors, although MSI has found room to incorporate a DVD drive.

Powering the machine is nVidia's recent mobile processor, the GTX 960M from the middle of the pack, backed with a Haswell-generation Intel Core i7 quad-core CPU. There's 8GB memory on one card, and while a second slot is available MSI doesn't want you inside to fill it, since a tamper sticker warns of voiding the warranty. There's an SDXC card slot and old USB 2.0 port alongside the DVD tray on the right, and three USB 3.0, Mini DisplayPort, HDMI, audio and network ports to the left.



A rainbow of colours shines from beneath the keyboard, not so much through but around the keys. You can customise colours to taste. A medium-sized touchpad has a brushed-metal effect, accurate, and with two real buttons below.

## Performance

MSI rightly ensures image quality is top-notch, fitting an anti-glare IPS display, set at a sensible resolution of 1920x1080. This measured with nigh-on full sRGB coverage (98 percent) and a great contrast ratio up to 790:1 at full brightness.

Colour accuracy was good too, average Delta E of just 0.92.

The 4720HQ quad-core processor has been popular in gaming laptops, and here propelled the MSI to 10,896 points in Geekbench 3 (3085 points single-core) - decent numbers but around 13 percent below the XMG A505,

for instance, with the same chip but faster memory.

PCMark 8 scored the MSI with a decent 2895 points (Home), rising to 3328 points in Accelerated mode.

The nVidia graphics may not be top-spec but the GTX 960M is capable of allowing maximum detail at native full-HD resolution. Batman played at 56fps even at highest Extreme setting, while Tomb Raider averaged 51fps at Ultra detail, falling to 33fps at peak Ultimate settings.

Only our Metro: Last Light torture test (1080p, Very High with all effects) proved too challenging with 16fps, but at High setting, the GE62 was back in its stride with 57fps.

Despite efficient Intel/nVidia silicon and switchable graphics, runtime from the 50Wh battery was under three hours (two hours 58 minutes) in the looped streaming-video test.

## Verdict

Sensibly powered for great games action, while remaining portable and comfortable to use, the GE62 is only compromised by tricky upgrade potential and disappointing battery life. It has a great display and respectable keyboard for gaming, and crucially plays games at high detail without distress. **Andrew Harrison**



**£1,000** inc VAT

**Contact**

■ [toshiba.co.uk](http://toshiba.co.uk)

**Specifications**

13.3in (1920x1080, 166ppi)  
IPS matt anti-glare display;  
Windows 8.1; 2.4GHz Intel  
Core i7-5500U (3GHz  
Turbo) 2C, 4T; Intel HD  
Graphics 5500; 8GB  
1600MHz DDR3; 256GB  
mSATA SSD (Toshiba  
THNSNJ256GMCU); 802.11ac  
2x2; Bluetooth 4.0; 3x USB  
3.0; HDMI 1.4; SDXC card  
slot; stereo speakers;  
0.9Mp webcam; dual mics;  
3.5 mm headset jack; UK  
tiled keyboard with two-  
stage backlight; buttonless  
multi-touch trackpad,  
104x59mm; 51Wh lithium-  
ion polymer battery, non-  
removable; 45W mains  
charger with IEC C5 inlet;  
315x206x18mm; 1083g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



**LAPTOP**

## Toshiba Kira-10D

You can find ultraportables cheaper than the £1,000 Kira-10D, but Toshiba has invested in quality components for this small notebook to provide a more premium product.

Its 13.3in display is a high-grade IPS type, which gives superb image quality, and its full-HD resolution in this size means a higher 166ppi pixel density for sharper text and graphics. The case is magnesium alloy bottom to top, thinner and not as solid-feeling as an aluminium unibody MacBook Air but lighter overall, under 1.1kg. It's smaller too, just 315mm wide with a thinner gloss black bezel around the screen.

The Air allusion is continued by the very shape of the Kira-10D, subtly wedge-shaped with the same sculpted taper toward the front.

The smaller keyboard has stunted rectangular keys, but is easy to type on thanks to good consistent action across the board, with decent travel. The buttonless trackpad was functional enough, though we'd expect less stickiness, more precision at this price.

The port count is low, typical for the size category, but all three USB sockets are 3.0, while HDMI 1.4 means you can drive 2560x1600 screens without issue.

Flash-inventor Toshiba includes a good SSD here, 256GB and mSATA, which ensures a responsive



overall feel in a useful capacity. And wireless is up-to-date, two-stream 11ac Wi-Fi.

As with other recent offerings from Toshiba, the company banks on earnings from sponsors when you alight upon preinstalled links and programs from the likes of McAfee, Amazon, Skype, Spotify, eBay, Booking.com and Skyscanner. Windows built-in unzipping utility is replaced by WinZip, for which you are asked to pay.

### Performance

Driven by an Intel Core i7-5500U at 2.4GHz, the Kira-10D has good processing reserves, more than you'd expect of an ultrabook. When pushed its single fan would rev, but mostly remained quiet.

In our tests, PCMark 8 gave the laptop 3051 points in Home accelerated mode, which is an impressive result. Geekbench 3 revealed more of the same - 3104 points for just one

Turbo-boosted core, rising to 6348 points in quad-core mode with Hyper Threading.

Thanks to one of Intel's better integrated efforts, HD Graphics 5500, this little laptop has entertainment value, too. While Batman: Arkham City at native 1920x1080 was beyond it (22fps, Medium), winding down to 720p revealed an average of 43fps, if dipping to 23fps minimum. Worse, Tomb Raider at 1080p allowed only 18fps, though at 720p and Normal detail expect a more playable 34fps.

The Toshiba Kira-10D's display quality is first-class, an excellent 800:1 contrast ratio and 100 percent sRGB coverage. Its colour accuracy of just 0.61 Delta E was outstanding, too. One deficit is backlight control though, low-rent PWM to reduce brightness, revealing flicker to sensitive eyes.

Despite the low weight the Toshiba packs a healthy 51Wh polymer battery, which was able to keep running nearly 11 hours (10 hours 59 minutes) in our wireless-streaming test.

### Verdict

The Toshiba Kira-10D is a well-balanced premium ultraportable, carrying off a great display, good magnesium build quality and a fast Core i7 processor. It's thin, very light to suit anyone needing a more satisfactory Windows ultraportable. **Andrew Harrison**





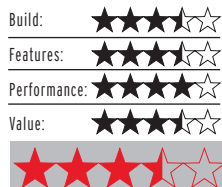
£722 inc VAT

Contact

■ [chillblast.com](http://chillblast.com)

Specifications

13.3in (1920x1080, 166ppi)  
AAS matt anti-glare, PWM  
backlight display; 2.2GHz  
Intel Core i5-5200U (2.7GHz  
Turbo) 2C, 4T; Intel HD  
Graphics 5000; 8GB  
1600MHz DDR3 RAM; 250GB  
mSATA SSD (Samsung 850  
EVO); gigabit ethernet;  
802.11ac, 1x1 MIMO (Intel  
Dual Band Wireless-AC  
3160); Bluetooth 4.0; 1x USB  
3.0, 1x USB 2.0; HDMI; SDXC;  
stereo speakers; 0.9Mp  
webcam with single mic;  
3.5mm headset jack; UK  
tiled keyboard; buttonless  
multitouch, 105x64mm;  
45Wh lithium-ion, non-  
removable battery; 45W  
mains charger with IEC C5  
inlet; 324x217x19.1mm; 1374g



LAPTOP

# Chillblast Helios i5



This laptop from Chillblast starts at a tuppence short of £700, with a similar specification and an attempt at duplicating the all-metal casework. The Helios i5 is a 13.3in ultraportable weighing under 1.4kg, measuring 19mm thick, and packing the latest Broadwell Intel processor, plus full-HD display. This has IPS-like technology for improved image over cheapest TN types.

Chillblast uses the Topstar U731 laptop and makes it available in the

UK with 2.2GHz Intel Core i5-5200U for £699; or with 2.4GHz Core i7-5500U for an extra £99. The chassis is similar to that of Apple's MacBook Air, sides that taper toward the front to give the illusion of a wedge. There are two USB ports, but only one USB 3.0, even if the left port is erroneously labelled 'SS' for SuperSpeed. The DC power inlet is too close, so you may have trouble inserting thumb drives. There's an upside-down HDMI and an SDXC card slot, along with a rarity in ultrabooks - built-in ethernet. This has a hinged flap that flops down, even when not required.

With lid closed, the Chillblast Helios i5's top and bottom are plain, in unfinished aluminium, and while there are no defects in manufacture it feels flimsier than we would like. Chillblast has stuck a thick plastic logo in one corner.

The keyboard works satisfactorily but we had trouble with the trackpad, a budget component with poor sensitivity - it would take several taps to register a click, for example, and steering was not particularly precise. You can select 250- or 500GB mSATA

SSD, a Samsung 850 EVO, while Wi-Fi supports 11ac networks with a single-stream adaptor from Intel.

## Performance

With the help of up-to-date Core i5, the Helios i5 didn't want for speed - 2652 points in Geekbench 3, rising to 5269 in multi-core mode. PCMark 8 Home scored the laptop with 2812 points, about right for a midrange ultraportable. Gaming was less certain, just 27fps at the low setting of 720p/Low in Batman.

The AAS display is a budget attempt at IPS, here able to cover 97 percent sRGB and 670:1 contrast ratio. Colour accuracy was disappointing, Delta E average 3.12.

Battery life was good though, at nine hours 46 minutes in the wireless video-streaming test.

## Verdict

The Chillblast Helios i5 trumps the MacBook Air in screen resolution and image quality, but it's let down by cheaper-feeling build. If you can live with these issues along with the operating system, you can save over £100 on the real thing. Andrew Harrison



**£579** inc VAT**Contact**■ [acer.co.uk](http://acer.co.uk)**Specifications**

15.6in (1920x1080, 141ppi)  
 AH-IPS matt anti-glare;  
 2.2GHz Intel Core i5-5200U  
 2C, 4T; Windows 8.1; nVidia  
 GeForce GTX 940M with  
 2GB DDR3 + Intel HD  
 Graphics 5000; 8GB  
 (1600MHz DDR3 RAM; 1TB  
 5400rpm HDD with 8GB  
 flash; gigabit ethernet;  
 802.11ac; Bluetooth 4.0;  
 tray-load DVD±RW with  
 M-Disc; 2x USB 3.0, 1x USB  
 2.0; HDMI, VGA D-Sub;  
 Kensington Lock Slot; SD  
 card slot; stereo speakers;  
 0.9Mp webcam and single  
 mic; 3.5mm headset jack;  
 UK tiled; buttonless  
 multi-touch trackpad,  
 106x78mm; 37Wh lithium-  
 ion, non-removable  
 battery; 381x259x24-  
 28.5mm; 2212g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**LAPTOP****Acer Aspire V3-574G-1Z1**

The Aspire V3-574G is a 15in all-rounder of a laptop, featuring styling touches and specification that raise it well above the cheapest budget machines.

The metal lid back has an unusual reeded effect that's similar to carbon fibre and not unattractive. The top deck is brushed aluminium veneer, inset with a large, high-quality trackpad that responds accurately to finger movements. An extra numberpad to the right of the keyboard is standard fare, while the keyboard itself is well-made - flat Scrabble tiles with a good firm action for solid typing.

An IPS screen, especially on a circa-£500 laptop, should be cause for celebration, and while this is a major improvement on low-grade TN types, the example here is a budget version with limitations. The full-HD resolution (1920x1080) across 15.6in gives a pixel density of 141ppi, making clearer type and sharper images than the plethora of 1366x768 screens, which are much more common. Its contrast ratio of around 550:1 isn't bad, but colour gamut is restricted by its 6-bit nature to just 65 percent

sRGB, where IPS screens typically cover 90-plus percent. That said, subjective impressions suggest this is a decent display.

**The metal lid back has an unusual reeded effect that's similar to carbon fibre and not unattractive. The top deck is brushed aluminium veneer**

**Performance**

For storage, our sample had a 1TB hybrid disk/solid-state drive, although Toshiba's limited 8GB flash gives only basic read-cache benefits. So while booting may be slightly quicker than disk-only, don't expect silky SSD performance throughout.

The internal battery is small at 37Wh, and non-removable. Small keeps weight down to a luggable 2.2kg, and the fifth-generation Core series processor means reasonable battery life, five hours 20 minutes in the video rundown test.

Clocked at 2.2GHz, the Intel Core i5-5200U is a good choice, allowing a Geekbench 3

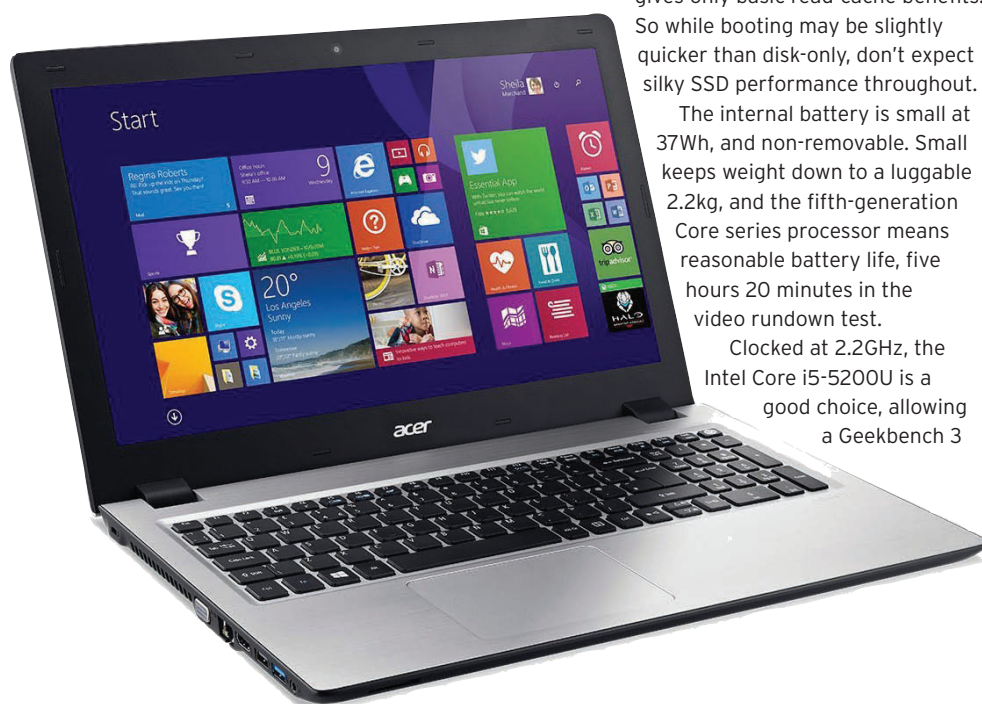
score of 5221 points with the help of Hyperthreading and 2619 points, single-core Turbo Boosted to 2.7GHz. PCMark 8 rated the V3 with 2250

points (Home), rising to 2899 points with OpenCL acceleration. That's less than we'd expect given nVidia graphics, although the GTX 940M is a basic integrated solution little faster than Intel's. Another version of this Aspire features Intel Iris graphics, which may be faster, given the limited 29fps average we saw from Batman: Arkham City at native screen resolution and Medium detail.

Dropping to 1280x720 however let the Acer average 46fps, even at High detail. Tomb Raider 2013 fans can expect 38fps at the latter resolution and detail, or even 39fps at 1080p and Normal detail.

**Verdict**

For under £600, the Aspire V3 is easy to recommend. It's a commendable balance of virtues from the IPS screen, to the precise trackpad and highly regarded CPU. The graphics allow fluid gameplay up to 720p, while the five-hour battery life may even get you through half a day's use away from the mains. **Andrew Harrison**



£799 inc VAT

Contact

■ google.co.uk

Specifications

12.85in (2560x1700, 239ppi) high resolution IPS; Broadwell U Intel Core i5; Intel Core i7 Intel HD Graphics 5500 (Integrated); 8GB LPDDR3 RAM; 32GB SSD; 1TB Google Drive cloud storage; 72Wh lithium-ion battery; dual-band Wi-Fi; 802.11a/b/g/n/ac compatible; Bluetooth; 2x USB Type C; 2x USB 3.0; SD card slot; 4K display out, with optional HDMI or DisplayPort adaptor; 60W charging; integrated 720p HD camera; backlit Chrome keyboard; multi-touch, clickable glass trackpad; built-in stereo speakers; 297.7x224.55x15.3mm; 1.5kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



LAPTOP

## Google Chromebook Pixel (2015)

Two years on from its first iteration, Google has updated the Chromebook Pixel, making an already impressive, best-in-class laptop an even more tempting machine. The price is still high, but if Chromebooks are your thing then this is as good as it gets.

In terms of design, the Pixel has changed very little from its predecessor. It still bears the industrial, chunky, square edged styling that we found initially so appealing, and that remains true today. When so many PCs seem to be trying to rebuild MacBook Airs and Pros, the more brutal form of the Pixel stands out as something to savour. That's not to suggest that this is in any way a great lump of a machine. In the hand or resting on your lap, it feels compact and solid, and is comfortable to use. At 1.5kg, it might not be as svelte as the new MacBook, but it isn't a heavy device to carry around in your bag.

Chromebooks have never been overburdened with ports, as ChromeOS isn't interested in doing much with them, but the Pixel has a useful collection of slots. Two USB 3.0 ports and a headphone jack adorn one side, while the other makes room for an SD card reader. The real interesting apertures though, are the two USB type-C ports that flank the machine, and are used for power charging or attaching any number of peripherals. We're beginning to see a few machines arrive with this new style of port and it definitely feels like the way to go for laptops.

We've grown accustomed to finding great keyboards and trackpads on inexpensive Chromebooks, but the Pixel packs the best of the lot. The shallow, island-style layout is wonderfully easy to use for extended periods, proving responsive and accurate. The backlight also makes typing after the sun goes down just as pleasant. There are a few changes to the normal arrangements, as Chromebooks feature internet navigation buttons along the top and a search button where the Caps Lock normally lives, but they make sense on this machine and OS. A glass trackpad is a step up from the normal plastic versions found



on cheaper models, and again it's excellent. Multi-finger gestures execute instantly, while general navigation is smooth and precise.

### Display

The real star of the show is the gorgeous IPS 2560x1700 resolution HD display. It's bright, colourful, clear, and bears an unusual 3:2 aspect ratio, which Google deems more appropriate for using the web. The taller nature of the screen does mean you see more of a web page's content before needing to scroll down, although if you watch a lot of movies on your laptop, then there is a trade-off here against the widescreen displays often found on other PCs. One added bonus is that the display is also a touchscreen. This might seem a little overkill for a device like a Chromebook, but it's a useful feature when traversing the web with its widespread, tappable options. The pinch-to-zoom feature also works very smartly, expanding pages with no hint of hesitation.

Video calling is a natural fit with an internet obsessed device, and the Pixel takes care of business in style thanks to a 720p webcam with blue glass and a wide aperture. Why the blue glass? To be honest we're not entirely sure what difference it makes, but images are sharp and well defined. Callers also reported audio was solid, which is down to the twin microphones on the device.

The 2015 Pixel is lightning fast. Web pages load rapidly, navigation is swift, and even with multiple tabs open you don't really sense any kind of slowdown. Streaming HD

video from YouTube is no problem, 4K variants proved smooth and consistent, and the stereo speakers are surprisingly loud and articulate.

Much of this will be down to the 2.2GHz Intel Core i5 CPU and 8GB of RAM that are at the heart of the machine. It's a potent combination when paired with the lightweight operating system. This speed arrives with a few caveats, though. While ChromeOS has come a long way in the few short years it's been around, it does still boil down to being a supercharged browser. Yes, you can run a number of useful applications offline now, such as Google Docs, and also a small number of Android apps, but when you're looking to spend around £800 on a machine you're going to want a little more.

If you create or edit multimedia content, then the Pixel is going to feel limited. Photo-editing is available through some apps, but if you want Photoshop you're out of luck. The same goes for iTunes. Don't get us wrong, this is a capable machine for a lot of everyday tasks, but you need to understand what you're paying for up front.

The bare bones nature of ChromeOS is beneficial when it comes to battery life though, and in our looped video test the Chromebook Pixel (2015) held out for just over nine hours.

### Verdict

The Chromebook Pixel (2015) is a beguiling device that is a genuine pleasure to use. Do we want one? Unquestionably. Will we be buying one? Hmmmm. Martyn Casserly



**£125** inc VAT**Contact**■ [vodafone.co.uk](http://vodafone.co.uk)**Specifications**

5.5in full HD (1920x1080) IPS display; Android Lollipop 5.0.2; octa-core Qualcomm Snapdragon 615 chipset; Adreno 405 GPU; 13Mp rear and 5Mp front facing camera; 3000mAh non-removable battery; 2GB RAM; 16GB storage, microSD up to 128GB; Wi-Fi 802.11b/g/n; Bluetooth 4.0; NFC; GPS; 159g; 154x77x9mm

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**SMARTPHONE****Vodafone Smart Ultra 6**

Vodafone markets the Smart Ultra 6 as a budget 4G phone, though this isn't evident by the design of the handset. Similar in looks to the smaller Smart Prime 6, it's available in both grey and silver, with curved edges that make it comfortable to hold in the hand.

The 5.5in IPS multi-touch display is housed within a 154x77mm housing, which gives the device a 70 percent screen-to-body ratio. It has a Full HD resolution (1920x1080), which equates to around 401ppi. The result is a display that offers great viewing angles, vibrant colours and crisp and clear text.

When it comes to storage, Vodafone offers a single 16GB model. This may not seem much, but many other similarly-priced budget smartphones offer just 8GB of storage. It's worth noting that the handset has a microSD card slot, which can boost the storage by up to 128GB. There's also 2GB of RAM, double the amount provided by many other budget smartphones.

Inside, the Smart Ultra 6 has an octa-core Qualcomm Snapdragon 615 chipset, which is comprised of four 1.5GHz Cortex-A53 cores, as well as four 1GHz Cortex-A53 cores. This is a jump up from the Smart Prime 6's quad-core Qualcomm Snapdragon 410 chipset and not what we'd expect to find in a sub-£150 phone.

The Adreno 405 GPU means that this phone is fine for casual gaming, but may not give the best experience for the latest processor-hungry 3D games. Nevertheless, we didn't encounter any issues with visible lag when using the phone during our testing - this may also have something to do with the upgraded Snapdragon 615 chipset.

One of the Smart Ultra 6's biggest selling points is 4G connectivity. Along with this, the handset has Wi-Fi 802.11 b/g/n, Bluetooth 4.0, NFC, GPS and FM

radio. It can also be used as a Wi-Fi hotspot, enabling you to access 4G speeds on a Wi-Fi-only device.

**Camera**

The 13Mp rear-facing camera has a maximum resolution of 4128x3096. In our tests, photos had decent levels of exposure and detail, and the noise issue that was present with the Smart Prime 6 wasn't a problem here.

It also supports full 1920x1080p HD video at 30fps, though due to the lack of any digital or optical image stabilisation, the videos we recorded were shaky when played back - even when we were conscious of not shaking the handset.

The stock camera app offers several different shooting modes, including panorama, multi-exposure, HDR, interval capture, smile detection and a fully manual mode. Most of these are self-explanatory and do what's said on the tin, though we noticed when using the HDR mode that photos looked washed out compared to an identical image taken in auto mode.

While not as impressive as the rear shooter, in our tests the front-facing 5Mp camera took much crisper images than we were expecting. It also offers 720p video.

One point we want to make is that the camera is extremely responsive - more so than some premium handsets we've used in the past. It really is a point-and-shoot experience, as the camera app opens almost instantly and as soon as you tap the shutter, the photo is taken and saved. That's down to the octa-core Qualcomm Snapdragon 615 chipset and makes the Smart Ultra 6 perfect for capturing those unplanned moments. Great stuff from such a cheap phone.



Vodafone has been careful not to fill the Smart Ultra 6 with bloatware. As a result, there's only a handful of branded apps and one single branded discovery widget. Apart from that, it's a rather vanilla implementation of 32-bit Android Lollipop 5.0.2.

This almost Nexus-like user experience is a real plus point for us, keeping things easy and simple. You'll quickly get to grips with the operating system even if you've never used Android before.

Vodafone has decided on touch sensitive buttons below the screen. This makes them a little harder to reach but also frees up real estate on the display for other content so it's swings and roundabouts.

**Verdict**

The Vodafone Smart Ultra 6 is one of the best budget smartphones we've seen. It won't run the latest 3D mobile games but for everyday use, it's a great device. **✉ Lewis Painter**

	<b>GEEKBENCH 3</b>	<b>GFXBENCH T-REX</b>	<b>GFXBENCH MANHATTAN</b>	<b>SUNSPIDER*</b>
<b>Vodafone Smart Ultra 6</b>	2469	14fps	5.7fps	1545ms
<b>Vodafone Smart Prime 6</b>	1401	9.4fps	3.8fps	1301ms
<b>Motorola Moto E 4G</b>	1463	13fps	6fps	1301ms

\* lower is better

**£159** inc VAT**Contact**■ [motorola.co.uk](http://motorola.co.uk)**Specifications**

5in, 720p HD (1280x720, 294ppi) Corning Gorilla Glass 3; Android Lollipop 5.1.1; Qualcomm Snapdragon 410 (MSM8916) processor with 1.4GHz quad-core CPU; Adreno 306 with 400MHz GPU; 1GB, 2GB (Available on 16GB model only); 8- or 16GB, removable storage supports up to 32GB microSD card; 2470mAh, mixed usage up to 24 hours; IPX7; GSM/GPRS/EDGE, UMTS/HSPA+, 4G LTE; 13Mp rear camera; 5Mp front camera; Bluetooth 4.0; Wi-Fi 802.11 b/g/n; GPS, AGPS, GLONASS, BeiDou; accelerometer, ambient light sensor, proximity, sensor hub; 142.1x72.4x6.1-11.6mm; 155g

Build: ★★★★★☆

Features: ★★★★★★

Performance: ★★★★★★

Value: ★★★★★☆

**SMARTPHONE****Motorola Moto G (third generation)**

The Moto G series of phones from Motorola has become a little confusing, with this being the third generation even though there are four different versions. Nevertheless, this is 2015's model and Motorola is under more pressure than ever to produce the best budget phone with fresh competition from the likes of the EE Harrier Mini and Vodafone Smart Ultra 6 (see page 29).

**Design and build**

Once again, the Motorola's budget handset looks pretty similar even to the original, but understandably closer to the style of the 2014 model. This Moto G is a good-looking phone, especially for the budget end of the market. It is a little thicker and heavier, though, at 11.6mm and 157g.

It has a metal strip that houses the rear camera and the iconic dimpled logo. The front slots are flush, though unfortunately Motorola has removed the stereo speakers. The recessed slots also provide a place for dirt to collect.

There's a new texture to the rear cover and the shape looks similar to the Moto X, but the Moto G is, of course, made of plastic. Shell colours include Black, Navy, Cabernet, Golden Yellow, Lime, Cherry, Blue, Turquoise, Raspberry and Chalk. There are also Flip Shells.

This phone comes with an IPX7 rating for waterproofing, which proved to be spot on in our tests, so you won't have to worry if you knock over your drink or drop the Moto G down the toilet. The rating means the phone will survive being submerged in up to 1m of water for up to 30 minutes. It's a feature you won't find on other budget phones.

In our dunk test, we did find that some water seeped underneath the cover, but the rubber seals stopped this from getting where it should be - we recommend removing the cover and drying everything if you do submerge the phone.

A major new feature in this area is that the Moto G 2015 is available to order via the Moto Maker ([tinyurl.com/qcool42](http://tinyurl.com/qcool42)). This means you can

customise the phone with different front colours, rear covers, accent colours, engraving and storage capacities.

The new Moto G feels nice in the hand and gives the impression of being more premium than previous generations. It certainly feels like a mid-range device rather than a budget offering.

**Hardware**

The screen of the Moto G remains at 5in and although we had our fingers crossed, the resolution hasn't been bumped to Full HD (1920x1080). Instead, it remains at 720p, so the Vodafone Ultra 6 outclasses it here with Full HD at a lower price. Although the screen is 720p, it's still good quality and it provides decent brightness and colour reproduction.

As you might expect, the processor has also been upgraded. This time there's a Qualcomm Snapdragon 410 chip (1.4GHz quad-core), which is also found in the new Moto E 4G. That's a little disappointing on the face of it, but performance is nice and smooth regardless of this and the fact



You should note that the benchmark results are from the model with 2GB of RAM, so we can't comment on the performance of the lesser model. In the past, we've heard of users having issues with Moto G's with 1GB of RAM, so it's probably worth spending the extra on the 2GB model.

**It comes with an IPX7 rating for waterproofing, which proved to be spot on in our tests, so you won't have to worry if you knock over your drink**

that our benchmark results don't make for impressive reading (see opposite). It beats the previous model but is outdone by the cheaper Moto E in three tests - as does the Vodafone Smart Ultra 6.

The amount of memory in this Moto G has been doubled to 2GB of RAM but you'll only get that if you buy the 16GB model - the 8GB model has 1GB of RAM. There's still a microSD card slot that can take cards up to 32GB in size.

**Camera**

Upgrades continue with a new 13Mp camera, up from 8Mp, which is impressive for a budget smartphone. In fact, it's the same camera from the Google Nexus 6 (which Motorola makes), with improvements such as a new lens and an IR filter. There's a dual-LED flash too, and video can be shot at up to 1080p or 720p for slow motion.

The front camera has also been increased in terms of resolution,





**CAMERA TEST: HDR ON****CAMERA TEST: MACRO**

from 2- to 5Mp with a wide-angle lens making it able to offer much higher quality selfies.

As usual, the default setting for the main camera is 16:9, which means you'll get 9.7Mp, so switching to 4:3 will make use of the full complement of pixels. Another default is no touch to focus, which is a little annoying, but you can switch it off if you find it a little tricky to use. We found the camera takes photos quickly and their quality of is generally excellent. Video is also good, but is nothing overly special. You can see a couple of our test photos above.

There are no major frills when it comes to connectivity - there's

supposedly even faster than the Galaxy S6. The firm claims 24 hours of mixed use from the Moto G.

Even without a large battery (which is non-removable despite the rear cover coming off), we found battery life to be excellent. In our benchmark test, the Moto G managed six hours, 29 minutes with a score of 2596. That's not far off the Samsung Galaxy S6, which lasted for six hours, 53 minutes.

### Software

There's not a great deal to say about software as Motorola is sticking to offering a very stock Android and the Moto G comes preloaded with version 5.1.1 Lollipop.

These include Moto Assist, Moto Display and Moto Actions, which are now bundled into one app simple named Moto. You can also make sure the phone stays quiet when you're in bed or automatically change settings based on your location.

Actions let you add gestures, so you could, for example, 'double karate chop' to launch the torch or twist to open the camera app. The display will show you notifications when the phone detects movement and you can select which apps are allowed and how much of the notification is shown.

Apart from Migrate, which helps you move content from a previous phone, the Moto G is a stock Android meaning you have a nice blank canvas with which to customise.

## Actions let you add gestures, so you could, for example, 'double karate chop' to launch the torch or twist to open the camera app

still no NFC which is a shame but the Moto G 2015 does have that all-important 4G LTE support.

The battery comes in at 2470mAh, though Motorola hasn't mentioned the TurboCharge feature found on the new Moto X, which is

We're seeing more and more Android manufacturers going with a vanilla user experience and we like it. It's not a completely Nexus-like software setup though, as Motorola does add some of its own apps. That's not a bad thing though.

### Verdict

With various upgrades, including a waterproof design, great cameras and stock Android, the new Moto G 2015 is a great phone. It's worth opting for the model with 16GB of storage and 2GB of RAM and when you customise the device with Moto Maker, the price is a not so attractive £209. The Vodafone Smart Ultra 6 is worth a look at just £125 with its Full HD display. **✉ Chris Martin**

	GEEKBENCH 3	GFXBENCH T-REX	GFXBENCH MANHATTAN	SUNSPIDER*
Motorola Moto G (third generation)	1628	10fps	4fps	1344ms
Motorola Moto G (second generation) 4G	1182	11fps	4fps	19681ms
Motorola Moto E 4G	1463	13fps	6fps	1301ms
Vodafone Smart Ultra 6	1469	14fps	5.7fps	1545ms

\* lower is better

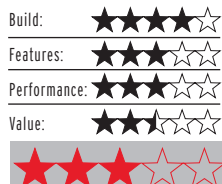
**£209** inc VAT

**Contact**

■ [lg.com/uk](http://lg.com/uk)

#### Specifications

5in (1280x720) IPS LCD capacitive touchscreen; 16 million colours; Android Lollipop 5.0 (Lollipop); Qualcomm MSM8916 Snapdragon 410 processor; quad-core 1.2/1.3GHz Cortex-A53; microSD up to 128GB; 8GB RAM; 8Mp rear-facing camera 3264x2448 pixels, autofocus, LED flash; 5Mp front camera; Wi-Fi 802.11 a/b/g/n, dual-band, Wi-Fi Direct, DLNA, hotspot; Bluetooth 4.1; A2DP, LE; apt-X; Li-ion 2540mAh battery; 139.7x69.8x10.2mm; 136g



## SMARTPHONE

### LG G4c

The LG G4c is a cut-down version of the excellent G4. It is a smaller, more affordable phone, with a 5in display and a quad-core chip. Priced £209, it's not cheap, but it sits nicely in the middle ranks of modern Android Lollipop phones.

It revels in minimalist chic, with a nicely curved design that makes it look sleek and expensive. The removable diamond-patterned back helps here, with LG branding stamped clearly and stylishly. It also feels robust and built to last, and that diamond patterning reduces the impact of scratches.

At 136g, the G4c is lighter, smaller and cheaper than the G4, and measuring 139.7x69.8x10.2mm, it's slim without being super-slim, and feels good in the hand. The volume controls and home button are on the back, which take getting used, but they are responsive and we grew to like this touch.

Overall there is not a lot of wow factor, but as it's the cheaper version of the G4 this is not the purpose of this particular model. It is good enough in this respect.

#### Display

According to LG, you are closer from finger to display than on other phones. We're not sure why that's a benefit, but hey: we'll mention it anyway. In use, the screen feels perfectly responsive. Indeed, the display's quality is good - bright and

clear. It is not as great as that found on the LG G4, but then no smartphone's display is.

It's a 5in IPS LCD capacitive touchscreen, with 16M colours. Packed into those five inches are 720x1280 pixels, which makes for a middle-of-the-road 294ppi pixel density.

Onboard is 8GB of storage, which is not enough these days, though there's a microSD card slot, which accepts cards up to 128GB.

#### Performance

You get a quad-core Cortex-A53 chip, clocked at 1.3GHz. This is paired with a single gigabyte of RAM. So far so standard for a mid-range, mid-2015 phone.

Connectivity is standard too, so there were no problems there. You get Wi-Fi 802.11 a/b/g/n, dual-band, Wi-Fi Direct, DLNA, hotspot. The G4c uses Bluetooth 4.1, A2DP, LE, apt-X, and there is GPS, and NFC.

In general use, the G4c isn't as powerful as the G4. Of course, it costs a lot less, but £209 is still not cheap. Plus, we found it was sluggish when moving between apps, which is frustrating.

This is borne out by poor synthetic benchmark performance. In the Geekbench 3 test, we



recorded a mediocre average score of 1450. GPU performance was similarly disappointing, with the GFXBench Manhattan off-screen test turning in a paltry score of 1.7fps.

#### Battery life and camera

On a brighter note, the G4c's battery is better than most. We found it could last a whole day with heavy use. (And we mean heavy use. This reviewer was home all day with their five-month-old daughter. Your phone gets some action.)

On the front of the G4c is a 5Mp camera for selfies, while around the back is an 8Mp snapper. We found this to be very middle of the road in our tests. Nothing stood out, though it's reasonable considering its price. One nice touch is the function that makes you able to flip between front and back camera with just a swipe.

#### Verdict

Overall we are disappointed with the LG G4c. It is neither cheap enough to be truly budget, nor good enough to stand out in a crowded middle of the Android phone market. Battery life is great, but its performance poor. There are much better phones out there for less, so unless you want an LG device, it's worth looking elsewhere. ✉ **Sorcha Egan**





**£125** inc VAT**Contact**

amazon.co.uk

**Specifications**

6in (1280x800, 252ppi)  
touchscreen; quad-core  
1.5GHz processor; 1GB RAM;  
Wi-Fi 802.11n; Bluetooth 4.0;  
2Mp rear-facing camera;  
VGA front-facing camera;  
8- or 16GB storage;  
169x103x10.7mm; 290g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**TABLET****Amazon Fire HD Kids Edition**

When we first saw the Fire HD 6 back in October 2014, we said it made a good kids' tablet. This was partly down to the smaller size - a 6in screen - and the low price of £79, but also because the Freetime app meant you could restrict the apps, books and games that children could access and the amount of time they could use the tablet each day.

Since then, Amazon has put together a subscription package, which sees the app renamed Fire for Kids and gives them access to a wide selection of books, games, educational apps and videos as long as your subscription is valid.

What the new Fire HD Kids Edition does is to bundle a Fire HD 6, a tough bumper case - in pink or blue - and a year's subscription to Fire for Kids for £119. Plus, you get the peace of mind of a two-year warranty which covers accidental damage. As the box proclaims, "If they break it, we'll replace it."

This makes the Fire HD Kids Edition arguably the best kids' tablet around. Or certainly one of the best. There are cheaper options in the form of LeapFrog and Vtech's ranges, and even Tesco's Hudl 2 now costs £99 (or £114 if you buy the official bumper as well).

The snag with Amazon's tablet is that the £119 price is for the 8GB model, which has around 5.5GB of usable storage. That's nowhere near enough, as you can't add extra capacity via microSD cards. If you opt for the 16GB version (essential if you're going to buy a Fire HD Kids Edition) then you'll pay £139.

The Fire for Kids subscription lets you create up to four child profiles on the tablet. Although you enter their birth date, the content isn't tailored to be age-appropriate like it is on a LeapFrog tablet.

Instead, each child sees the same selection which Amazon says is appropriate for kids from three to 10. That means each child will have to pick and choose what they want to read, watch or play from the selection available.

It's relatively impressive, too. Games include plenty of Disney titles and there's also some Toca Boca and Sago favourites along with lots of other independent apps and games. Some of the latest titles were



missing - Toca City for one - but this is down to Toca Boca rather than Amazon. It's also good that there are no in-app purchases in any of the apps and games.

The book selection isn't as good. Our seven-year old tester asked us to search for *Horrid Henry*, *Famous Five*, or books by Daisy Meadows and Holly Webb. None were found. There was an overwhelming number of books about cartoon characters including Sponge Bob and Shrek, and little of substance.

There's a reasonable variety of videos including *Peppa Pig*, *Ben and Holly*, *Kipper*, and some classics that parents might remember: *Cities of Gold*. Blockbuster films are conspicuous by their absence, but it was nice to see *The Gruffalo* and *Room on a Broom*.

Surprisingly, there's no facility to download any of these to watch offline for car journeys or holidays, so unless you have Wi-Fi, you have no videos. If there's a game, app or book not available in Fire For Kids unlimited, you can go back to a parent profile and get it from the Amazon store, then make it available in a certain child's profile.

Within the Fire for Kids app there's a child-friendly camera app and a universal search, which offers results for books, games, apps and videos in one list. There's also a Characters section, so kids can see content available per character, though this doesn't always work

well: tap on the Gruffalo and you'll see an app but not the video.

**Performance**


Children will be perfectly happy with the screen resolution and quality. It could be brighter, though. The mono speaker is just about loud enough and the cameras adequate for the odd snap and video clip.

Performance is generally okay by today's standards. We said it was "well above the level you'd expect at this price" a year ago, but other tablets have caught up and the price is much higher with the Kids Edition.

However, when the storage is nearly full there are regular slow-downs and a distinct lack of responsiveness. This is rarely an issue when playing a game, watching a video or reading a book, though: it's mainly when navigating menus or returning to the home screen.

Battery life is pretty good at roughly seven hours, but it's putting it in flight mode if you know it's not going to be used for a few days to prevent the battery draining.

**Verdict**

With no expandable storage, we'd advise against buying the 8GB Fire HD Kids Edition. This puts the price up to £139. If that's too much, you could buy the standard 16GB Fire HD 6 for £99. However when you factor in the bumper case, warranty and Fire for Kids subscription, £139 isn't bad value.  **Jim Martin**

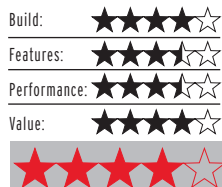
£59 inc VAT

Contact

■ tronsmart.com

Specifications

Android 4.4 KitKat TV box with custom UI; 1.5GHz Mstar MS09180D1R (Cortex A9); 1GB DDR3 RAM; 8GB flash storage; 801.11b/g/n; 10/100 ethernet; 2x USB 2.0; 1x USB 3.0; microSD slot; supports 4K streaming and HDMI recording; remote control; HDMI cable; 12V/2A external power adaptor; 148x148x26mm; 297g



ANDROID TV BOX

# Tronsmart Pavo M9

Tronsmart's Pavo M9 is an Android TV box that plugs into your TV via HDMI and turns it into an Android computer. It supports up to 4K streaming (depending on your TV), as well as HDMI-in recording.

This is the second Tronsmart Android TV box we've reviewed, having previously seen the Tronsmart Draco HW80. At £59 this one is not only cheaper, but there are several reasons why we prefer it.

For starters, the plastic Pavo M9 is surprisingly better-looking than the metal Draco HW80. A sleek black box with rounded corners, this smaller Tronsmart Android TV box omits the ugly antenna seen poking out of the Draco's rear. From the front all you see is a power button and the remote sensor, at the side sit three USB ports (2x USB 2.0, 1x USB 3.0) and a microSD card slot, and everything else is tucked away at the rear.

Despite the external power brick (note that you'll need a UK adaptor), it sits nicely under the TV, and silent running means it won't raise any eyebrows in the living room.

The supplied remote control is also better-looking and significantly easier to use than that supplied with the Draco, but even so you'll want to add a mouse (a wired mouse).

There is an app you can download to your phone or tablet that lets you use it as a controller, but both must be connected to the same Wi-Fi network in order to pair, and we found that after closing the app it wasn't able to pick up the Pavo M9 without a restart.

You'll get away without needing a keyboard, thanks to the onscreen keyboard, but not using a mouse with this TV box really does incur more pain than it's worth.

Setup, the second time around, was a cinch. On our first attempt we unwittingly made life difficult for ourselves having hooked up the Tronsmart to an old projector sat at ceiling-level that refused to adjust its display size over HDMI.

Although there is an option in the Display settings of the TV box itself to reduce the display size (you can independently adjust top-, bottom-, left- and right edges - that's better than the Draco, which lets you alter only the overall



size), we couldn't see this because it was on the ceiling rather than the wall. The fact we couldn't see the top of the screen made it impossible to use the remote control as a mouse, and it was equally impossible to use a wired mouse in mid-air.

On top of that we had tethered the Tronsmart to our phone's internet connection, which meant we couldn't connect both phone and TV box to the same Wi-Fi network to make use of the remote control app. Talk about making life more difficult than it needed to be.

The second time around we connected the Tronsmart to an HDMI TV with a single cable, connected to the home Wi-Fi network and logged into our Google account. That was it.

## Software

Once up and running the Pavo M9 is very different to the Draco HW80. Whereas the latter has a standard Android KitKat interface, and looks very much like a large-screen tablet but without the touchscreen, the new Pavo M9 has a custom user interface, also based on KitKat.

Finding our way around the various menus did take a little bit of getting used to, especially getting our heads around the two settings menus, but we liked the fact it made the Tronsmart seem more like a home-entertainment device and a proper Android TV than a glorified tablet. OTA updates are available for the Pavo M9, too.

One of the menu options opens an app tray, which is the closest thing you'll get to standard Android. You'll also find menus for the browser, games (none are preinstalled, but you will see several shortcuts to download apps from

Google Play), video, music, an app manager, settings, media centre, HDMI (for recording from the HDMI input) and Google Play.

Thanks to full integration with Google Play, we had no problems installing TV favourites such as iPlayer, Netflix and TVCatchup. We also installed our usual benchmarking apps, which ran fine with the exception of GFXBench - it doesn't tend to play nicely with lower-spec hardware.

And, unsurprisingly, that is what you get for your £59. Inside is a 1.5GHz Mstar MS09180D1R (Cortex A9) processor with Mali450 graphics, 1GB of DDR3 RAM and 8GB of flash storage. If you need more storage you can make use of the microSD card slot, plug in a hard drive via USB, or access cloud- or networked storage.

The Tronsmart's performance results were nothing to shout home about, yet it performed adequately when connected to the TV. There was more lag when launching apps and menus than we might find in KitKat on other devices, yet it was no slower in this regard than any of the smart TVs we've tried.

In Geekbench 3.0 we recorded 336 points in the single-core component and 1071 points multi-core. SunSpider clocked the Tronsmart at 1941ms, and in AnTuTu it posted a score of 19067 points.

## Verdict

For the money the Tronsmart Pavo M9 is a perfectly adequate device that plugs into your TV to allow the downloading of apps, recording over HDMI and up to 4K streaming. Performance isn't out of this world but it's a useful device for turning a dumb TV smart. **✗ Marie Brewis**

**£100** inc VAT**Contact**■ [silicondust.com](http://silicondust.com)**Specifications**

2x DVB/DVB-T2 tuners;  
10/100 ethernet; 5V/11A  
power adaptor; ethernet  
cable; DLNA compatible;  
92x93x28mm

Build: ★★★★★☆

Features: ★★★★★★

Performance: ★★★★★☆

Value: ★★★★★☆

**FREEVIEW TV TUNER****SiliconDust HDHomeRun Connect**

Until recently receiving Freeview HD on your choice of any computer or mobile device was not possible, with Elgato abandoning the opportunity to update its DVB-T Netstream product. A solution now finally exists for the DVB-T2 service though. Step up the SiliconDust HDHomeRun Connect. It's a network TV adaptor with two separate tuners, allowing two programmes to be watched or recorded at once.

The device just needs an aerial feed, such as from your usual wall socket, and a wired ethernet connection to your router. If your home has enough family members with divergent tastes to make two stations too few for comfort, you can add another device, with a second HDHomeRun Connect box able to expand available station coverage to four. But beware that with HD stations especially, you may find some network congestion that causes small glitches to deny smooth playback.

The SiliconDust hardware is a small plastic box, with three connectors on the back panel - a female TV aerial socket, 10/100 ethernet port and DC power inlet. Supplied in the box is a 5V mains adaptor and short length of ethernet cable. Build quality is satisfactory, not as streamlined in appearance as the Elgato Netstream, but for a product that will probably be stowed out of sight after first setup there is no need for designer styling.

SiliconDust supplies its own software for Windows, OS X and Linux operating systems, as well as a mobile app for Google Android. The HDHomeRun View application is sufficient to watch live Freeview and Freeview HD broadcasting, although there is no provision for recording or even pausing live TV.

To do so, you'll need the help of some additional software. Windows users that still have Windows Media Center available can use WMC to watch and record TV on their PC. For Mac users, Elgato EyeTV 3 is the answer, available to buy separately from Elgato's hardware devices for £59.95, while the companion EyeTV mobile app is on the App Store at £3.99.

For iOS and Android users there is the InstaTV Pro app, free to



download and costing £8.99 for the required in-app purchase to support HDHomeRun.

There are also several free and open-source media-centre solutions for Linux and other platforms, such as MythTV and Kodi.

**Performance**

We tried the HDHomeRun Connect first on a Mac, downloading the HDHomeRun Utilities software package from SiliconDust website as instructed. As with its Windows version, this package comprises the core HDHomeRun VIEW application, to view live TV; and terminal script that checks current firmware, and downloads and install any updates it finds online. In our case, the firmware was updated from 20150505 to 20150605. The process initially failed in OS X, likely due to our third-party installed network filter, but then successfully concluded almost instantly when we tried with Windows.

Using the View software, you can easily switch between available stations, with a vertical strip appearing down the right side of the screen. Thumbnail images are embedded that help you quickly identify each station visually.

To check on recording capability, we used Elgato EyeTV 3.6.8 software, launching the application's Setup Wizard to first find and communicate with the Connect device on the network. After a quick channel scan through the available digital TV broadcast multiplexes, we found over 100 stations on nine multiplexes - including the long-awaited Freeview HD stations.

At our location receiving from the Crystal Palace transmitter, we were seeing six multiplexes broadcasting using the original DVB-T standard; and a further three using the newer DVB-T2 system,

totalling 12 HD channels, including the BBC's HD stations, ITV HD and Channel 4 HD. These are transmitted as MPEG-4 AVC video with 1080i/25 resolution, and audio is AAC 16-bit/48kHz, with bitrate at 128kb/s for regular stereo broadcasts.

In use the SiliconDust unit performed very well, letting us view or record stations with excellent image and sound quality. There is a slight pause whenever changing channels, around one second, although many modern TVs are also far from instant in this respect.

For standard-definition broadcasts, the streamed video and audio were faultless, although for HD stations we did sometimes experience occasional glitches, such as small stutters followed momentarily by a flutter of tiny MPEG block artefacts.

When it came to recording, the Elgato EyeTV software could record on-demand or by schedule, using the standard DVB electronic programme guide (EPG) to populate up to two weeks of listed schedules.

Note that while free-to-air television broadcasts are protected from any form of DRM or encryption by law, the BBC did push for digital copy restrictions to be imposed on the new DVB-T2 service for Freeview HD. This was approved by OFCOM in 2009, and thus when recordings are made by a PVR system, the hardware manufacturer is impelled to encrypt the recording on to hard disk, to prevent it being played on any another device.

**Verdict**

SiliconDust's HDHomeRun Connect fills is a digital TV tuner for terrestrial Freeview HD services, and one that is platform agnostic. At the price and given its versatility, this solution must be recommended highly.  **Andrew Harrison**



**£159** inc VAT**Contact**

■ nest.com

**Specifications**

IP camera; 1920x1080 resolution; built-in speaker and microphone; 8x 850nm infrared LEDs with IR cut filter; 802.11n dual-band Wi-Fi; 114x73x73mm; 203g; Wi-Fi connection, web browser or iOS 8 or Android 4 or later

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**SMART WEBCAM****Nest Cam**

Home security cameras are nothing new. Even internet-connected cameras are old hat. What is relatively new are cameras that literally anyone can set up with zero technical knowledge. The latest breed, including the Nest Cam, send you notifications when motion is detected and let you watch the live video stream on your phone so you can check what's happening when you're away from home.

The camera is exceptionally well made. Even the packaging makes you feel as if you've spent your £159 wisely, as the tape which holds the long USB cable has easy-open tabs.

It has a metal body and a big magnetic base which lets you mount it on a tall fridge/freezer, say, without having to reach for your toolbox. The stand tilts and swivels so you can adjust the angle to get exactly the image you need. The 130-degree lens means it works even in smaller rooms.

Plus, the 1080p resolution gives great detail - there's also the option to zoom in using the 'Enhance' setting in the app. This is just digital zoom, but it's a nice feature to have if you want to have a closer look at someone's face, for example.

The camera has eight front-mounted infrared LEDs that give impressive night vision. Instead of a spotlight-like beam which focuses only on a narrow area, it manages to light up a wide area, so you can see what's happening in just about every corner of the room.

There's also a status LED, which can be configured in the app to be turned off to make the camera a bit stealthier. Flashing lights are conspicuous and mean your Nest Cam may be stolen in a burglary.

Bluetooth and Wi-Fi are built in, and both 2.4- and 5GHz are supported, although not 802.11ac. One extra feature is a built-in speaker. Along with the microphone, it means you can use the Nest Cam a bit like a PA system: if there's an intruder you can shout at them to get out, or you could tell your dog to get off the sofa.

Setting up the camera is extremely easy - especially if you already have a Nest Learning Thermostat or Nest Protect. Even if you don't it's a simple case of

downloading the app (Android and iOS), creating an account and entering your Wi-Fi password.

**Software**

We love the hardware. Our gripes all concern software. First, there's the flaky iOS app. We tested the Nest Cam on an iPhone 6 Plus running iOS 8.4. Prior to installing the Nest Cam, the app was fine, but the camera part freezes and sometimes causes the app to quit.

Next on our list is the fact that you can do little more than watch the live feed unless you subscribe to Nest Aware for £8 per month for a 10-day history, or £24 for 30 days. You will get notifications of movement or unusual sounds, and if you have one or more Nest Protects, your Nest Cam will turn on and record the scene in the event of an alarm without a subscription.

But, only subscribers get to rewind time and save clips. You get a 90-day trial if you buy a Nest Cam before 29 September, otherwise it's just a 10-day trial to see what you're missing. As well as getting a list of motion or sound events, you have full access to the continuous recording for the past 10- or 30 days, depending on the subscription.

This is means you can check what happened in the minutes before or after something happened. The iOS app has a poor interface when it comes to navigating through recordings, though. Yes, you can tap the History button to see a list of events, but it's far from obvious what the playback controls do when you're on the live screen. Even on the website, the timeline is hard to get to grips with.

If you don't want your Nest Cam recording continuously you can set periods when it's turned off, or you can make it automatically turn off when you set your Nest thermostat to home. Then it will turn on when you set it to Away.

Yet another gripe is that you'll only get one alert every 30 minutes. This is something Nest needs to address and offer a frequency option in the app, or web interface. No-one wants to be bombarded by notifications of motion, but you'd rather this than miss an alert when there's a problem.




If you trigger an alert by walking past the camera on your way out of the house, say, and an intruder breaks in 20 minutes later, you won't know about it. You'll be able to see the event in your Nest history (if you subscribe) but this means you have to check the app constantly.

**Motion detection**

So far, we've talked about motion detection in only a general sense. Nest claims more advanced algorithms are used if you subscribe to Nest Aware, so you could point the camera at a window and it would only trigger an alert if something significant happened, but won't alert you if leaves are blowing in the wind. If you decide not to subscribe, you won't be able to specify areas within the frame to monitor for motion, excluding areas you don't want to monitor. What's great about the custom zones is that there are eight adjustable points: you can click and drag to form the precise shape you want, allowing you to avoid areas that you don't want to monitor without creating lots of zones.

Once done, you'll get more informative alerts, such as 'motion detected in Zone 1'. However, there's no way to adjust the sensitivity of detection. This is a major problem since what we would consider motion worth recording was sometimes ignored by the camera. With no ability to adjust sensitivity, you're reliant on Nest's algorithms to alert you and mark the event on the timeline.

**Verdict**

The Nest Cam is a well-made piece of kit that delivers great video, even in the dark.  **Jim Martin**

**£470** inc VAT**Contact**■ [synology.com](http://synology.com)**Specifications**

1.4GHz Annapurna Labs Alpine AI-314 quad-core ARM processor; Synology DSM 5.2 operating system; 2GB DDR3 RAM; 2x USB 3.0; 2x eSATA; 2x 80mm cooling fans; 1x PSU fan; 157x248x233mm

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**NAS DRIVE**

## Synology DS1515

After the most basic single- and two-bay network-attached storage drives, the four-bay NAS becomes a popular choice. This introduces the chance to combine three or more disks into a RAID array that can provide better performance and maintain true redundancy if a disk should fail, all without losing any data.

Synology does offer four-bay devices such as the DS414 and DS415+, but unusually also has five-bay NAS drives in its extensive range – usually aimed at more data-hungry applications demanded by businesses and home power users. The DS1515+ is the latest such five-bay NAS from Synology, derived from the original DS1010+ launched in 2010, and now sporting a quad-core Intel Atom processor running at 2.4GHz.

### Features

What we have here though is the DS1515+ 'lite', based on the same chassis but with a lower-spec ARM processor and a little trimming to the ports arrangement.

Instead of the usual low-powered Intel x86 processor, noted for quite usable file-serving speed in pre-built NAS devices, the ARM processor is an even cheaper option for the manufacturer to install, helping to cut the final retail price; and there's also the potential for savings in your pocket, with reduced electricity costs from the more frugal processor architecture.

The chip in use here is relatively unusual, a quad-core CPU clocked at 1.4GHz from newcomer Annapurna Labs of Israel. Little is known about the company, other than it was bought by Amazon earlier this year.

The Annapurna Labs Alpine AI-314 processor is something of a mystery although it reveals itself internally as based on the 32-bit ARMv7 rev 4, as commonly found in mobile devices such as Google Android smartphones.

The chip also includes a hardware encryption engine, which means you could select the encrypted-volume option in the DSM software without incurring the massive slowdown that software crypto otherwise creates when activated. A floating-point unit



(FPU) is also available to keep up overall speed.

For system memory, the DS1515 has 2GB DDR3 RAM fixed, where the DS1515+ can be upgraded to a total of 6GB. The DS1515 has four gigabit ethernet ports and two eSATA ports, in common with plus version, but only two rather than four USB 3.0 ports.

Both machines have the capability to be docked with up to two additional bare five-bay chassis – the first 15 in the product name indicates a total of 15 disks can be run from the core NAS system; the second 15 shows the year of release: 2015.

The second key component of the NAS drive is its software, and here we find the usual DSM operating system, now in its version 5.2. We have explored its manifold features and ease-of-use before in preceding Synology NAS reviews – suffice to say this remains a strong reason to consider a Synology network drive.

### Performance

The Alpine processor showed it had plenty of real-world power in a straightforward sequential speed test, up to the gigabit-LAN limit for both reads and writes.

We set up the Synology DS1515 with four 2TB WD Red hard disks, configured in the default SHR array – Synology Hybrid RAID, which here behaves like a traditional RAID 5 array.

In Windows and connected via SMB, the ATTO Disk Benchmark test showed sequential transfers up to 119MB/s, for all data from around 32kB to 8MB. With four threads available its 4kB read/write results were an impressive 18.6- and 25.6MB/s respectively.


CrystalDiskMark 3.0 rated sequential reads and writes at 110MB/s, while 4kB random reads and writes reached 10MB/s; not a bad result for a single thread. Expanding to a queue depth of 32 threads, transfers now reached an even healthier 55MB/s reads and 44MB/s writes.

For Mac users, we tried both AFP and SMB connections. By default, most Mac users will find themselves using the Apple Filing Protocol, although our experience has shown that with network drives it can be beneficial to force a connection over Microsoft's Server Message Block, especially when many small-file transfers will be in play.

In the case of Synology's DiskStation Manager operating system, this is not an issue, though – both protocols scored well here, with AFP sequential transfers up to 110MB/s (106MB/s SMB) while 4kB random read/write results were in essence the same at around 12MB/s (random 4kB read) and 6.5MB/s (random 4kB write).

Power consumption was relatively low, reaching 30W with the system in use with its four WD disks, and falling to 18W when the NAS was idle and the disks had spun down.

### Verdict

At £470, the Synology DS1515 is around £70 cheaper than the DS1515+. Both NAS drives feature impeccable build quality and arguably the best NAS operating system in the market. The more affordable DS1515 takes an unknown ARM processor but our tests suggest its up to the job of powering the NAS through fast file-serving duties, and should a little more economical to run, too.  **Andrew Harrison**

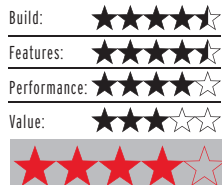
**£329** inc VAT

**Contact**

■ [bowers-wilkins.co.uk](http://bowers-wilkins.co.uk)

**Specifications**

Bluetooth 3.0 (with aptX support); rechargeable battery via Micro-USB; nylon damped diaphragm; CCAW coil; changeable ear cushions; detachable cable; 3.5mm stereo mini jack (CTIA 4-pole); 2x 40mm (1.6in) full-range drivers; 10Hz to 20kHz frequency range; 22 ohms impedance; <0.4% (1kHz/10mW) distortion; 108dB/V at 1kHz sensitivity; 50mW max input; minijack cable included; 223g



**BLUETOOTH HEADPHONES**

## Bowers & Wilkins P5 Wireless

Bowers & Wilkins knows a thing or two about making top-quality speakers. The respected British company has already made a successful foray into the world of consumer tech with its headphones and AirPlay speakers. It has even launched a Bluetooth wireless speaker: the T7.

But it has held back from launching any wireless headphones until it was sure its discerning – and loyal – customers would be happy, not just with sound quality but also reliability. Clearly the firm thinks it has cracked this heady mix though, as the P5 Wireless is B&W's first pair of Bluetooth headphones.

The P5 Wireless costs £329, which is £80 more than the P5 Series 2 at £249. That's the premium for going wireless. B&W touts the fact that they are "platform agnostic" since they'll work with both Android and iOS devices – and practically any other phone, tablet, laptop or PC with Bluetooth.

It's worth noting that corded headphones will work with an even broader range of audio gear, including your hi-fi, TV, and more.

Do you even need a pair of cordless headphones? Having never owned a pair, we were sceptical of the benefits. However, after just a few days the lack of a cable had a surprisingly freeing effect.

We didn't need to remove our usual ear buds when walking away from a laptop, nor worry about snagging cords on bags or clothing while commuting. There's also the advantage of never having to unravel a bird's nest of wires as many of us do each morning with wired headphones. You just switch on and go.

### Design

Even if you own a pair of P5s, you'd struggle to initially tell if there are any differences between the P5 Series 2 and the new P5 Wireless. Beyond the absence of a cable, that is. That's pretty obvious.

They have the same leather and polished metal design, and even use the same drivers. In fact it's only when you examine the new pair more closely that you notice the subtle introduction of buttons on the central band on the right-hand ear

piece. Plus the fact that the cans are very slightly thicker than the Series 2's – 2mm if you thrive on stats – to compensate for this and the extra Bluetooth electronics and batteries.

Given all that, it's impressive that the P5 Wireless weighs only 28g more at 223g. They're not the lightest wireless headphones you can buy, but when you hear them, you'll forgive the weight immediately.

Those buttons let you adjust volume, pause and play tracks and even answer phone calls. A pair of built-in mics means background noise can be isolated and suppressed and the recipient of our test phone call reported decent enough quality.

Hold down the play/pause button and you can call up Siri on an iPhone, just as with many other headphones.

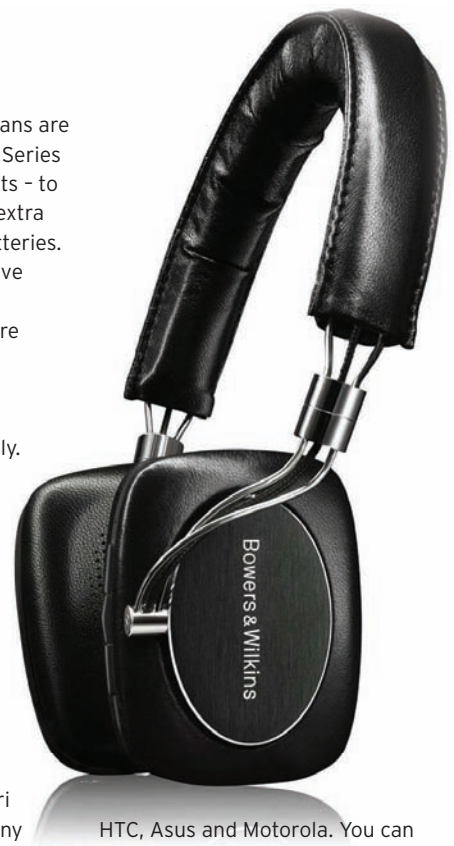
The batteries last 17 hours when used at 75 percent volume, but we expect this is a conservative claim by B&W. You can still connect a cable (included in the box) using the same clever recessed port you'll find on the P5 Series 2 so you can use these cordless headphones as a traditional wired pair if you do happen to get caught short. It's unlikely you will, since the P5 Wireless charges via Micro-USB, meaning you can even charge them on the move with a handy USB battery pack.

The headband is adjustable and should fit most people, and the grip on your ears is tight enough to ensure they won't fall off. If you wear glasses, you might notice the clamping effect more than those who don't, but it's worth pointing out that this is not a pair of headphones for going running.

No. These are audiophile headphones. Some enthusiasts will naturally scoff at this, but we would challenge them to have a listen to the P5 Wireless before writing them off.

### Audio quality

Thanks to support for aptX, streaming quality from any phone that supports the standard is very impressive. Such phones include models from Samsung,



HTC, Asus and Motorola. You can find a full list on the aptX website at [tinyurl.com/ojfrdvq](http://tinyurl.com/ojfrdvq).

Apple doesn't support aptX, preferring to use its own implementation of Bluetooth audio. It may be lossy unlike aptX, but it sounds pretty darned good to me.

In fact, my – admittedly non-audiophile – ears can't hear any noticeable difference between the P5 Series 2 and the P5 wireless when using an iPhone 6 Plus with some tracks stored in lossless AAC format. Their sound quality is essentially identical.

As mentioned before, the new cans have the same 40mm drivers, which are also in the over-ear B&W P7 headphones. They deliver a balanced, well-defined soundstage with enough bass to satisfy without being overpowering. Similarly, the top-end is crisp without being harsh. Whatever style of music you prefer, the P5 Wireless should be able to put a smile on your face.

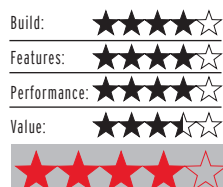
### Verdict

We said in our Series 2 review that some might find the £249 price a little hard to swallow, and it's harder still to stump up £80 more for the removal of a cable. Yet, if you are specifically after wireless headphones, these are one of the best pairs we've tested. **Jim Martin**



**£249** inc VAT**Contact**■ [en-uk.sennheiser.com](http://en-uk.sennheiser.com)**Specifications**

16Hz to 20kHz frequency range; 18 ohms impedance; 110dB at 1kHz sensitivity; NFC; Bluetooth 4.0; aptX; touchpad controls; 1.2m cable with in-line control; soft carry case; compatible with iOS and Android

**BLUETOOTH HEADPHONES****Sennheiser Urbanite XL Wireless**

With the Urbanite range of wireless headphones, Sennheiser is keen to reach into the cooler street-style audience so far monopolised by Beats. Hence the name and the solid, fashionable looks of this set of excellent Bluetooth headphones.

As you might be able to work out, the Urbanite XL Wireless headphones are the same as the regular wired model, but with added Bluetooth capability. This does mean the price is higher and you'll need to pay an extra £50 for it at £249, which is steep but not uncommon.

**Design**

Sennheiser's headphones come in just one colour - black. It's a shame that there aren't the usual options such as Sand, Olive, Denim and Nation (red and white), though.

They are circumaural, more commonly known as over-ear, meaning they completely surround your ear rather than sitting on them. If you're looking for on-ear and wireless, look to the Momentum range from Sennheiser. The wide headband is mostly covered in fabric with white stitching. The underside is a soft rubber, which feels slightly odd to the touch, but is comfortable.

Designed to be durable, most of the body is plastic (apart from the stainless steel hinges), which makes it feel cheaper than its rivals. However, this does mean that they are more suited to being thrown around a little. The headband, for example, can be bent and twisted a long way without breaking.

As with most over-ear headphones, these are large but not unreasonably heavy. The soft foam on the cups is comfortable, though there's little air flow, so you're ears do get hot after a while. This combination of things means we can't recommend the Urbanite XL Wireless for long listening sessions.

A trick these headphones have up their sleeve - and you wouldn't know it - is that you can control your music playback easily. The outside of the headband on the righthand side is touch-sensitive, so you can adjust volume, pause, play and skip tracks, and so on. Plus, there's a built-in mic, so you can have a phone call wirelessly, using the touchpad to answer a call.



Although these headphones are wireless, they also come with a 1.2m cable with in-line controls. This is easily plugged in if, for example, you want to use them on a flight or the battery runs out meaning Bluetooth is unavailable. A soft carry case is included and the headphones fold up, so they aren't so huge when you want to put them away.

**Audio quality**

Over the years, we've tested many shockingly bad Bluetooth audio products and we expected a pair of headphones called Urbanite to concentrate on style and features rather than sound quality. We were, however, impressed with these, which were less thumpy than the wireless Beats Studio pair they're up against.

These Sennheiser's use aptX technology, which a lot of smartphones support (although the iPhone doesn't). Furthermore, the headphones have built-in NFC, making it even easier to pair them with a smartphone or other NFC-enabled device.

Using the headphones wirelessly will give you up to 25 hours of use. They charge over Micro-USB and a cable is included in the box.

Overall, the sound of the Urbanite XL Wireless headphones is very good. The drivers are powerful enough, yet the tuning is well balanced and we found the

experience easy to get on with. We thought headphones called Urbanite might be at the Beats end of the headphone scale with unnecessarily loud bass. Sennheiser promises 'Massive bass', but it's nicely balanced, while remaining pretty tight and punchy. If you like your sound bassy these are a good choice. If you like a super-bassy sound, then Beats Studio might suit you better, although we prefer the clarity of the Sennheiser Urbanite XL Wireless headphones.

The mid-range is present and clear, and we always found vocals coming across nicely. The top end gets a little swamped at times, which is a shame, but is still bright where it manages to burst through. This means the Urbanite XL Wireless headphones are more suited to music genres such as rock and dance than classical.

**Verdict**

If you can afford the price, the Sennheiser Urbanite XL Wireless headphones provide great sound over Bluetooth, offering punchy bass without going over the top. There are handy features such as NFC, a smart touchpad for controls and a microphone for calls. Some might find the build is a little on the plastic side, and these headphones are pretty bulky - but that's the street style that Sennheiser is aiming for. **Chris Martin**

**£149** inc VAT**Contact**■ [rha-audio.com/uk](http://rha-audio.com/uk)**Specifications**

Dynamic driver (model 770.1); 16Hz to 40KHz; 16 ohm impedance; 100db sensitivity; 1.35m cable; multicore OFC Connections 3.5mm, gold plated; 41g

**IN-EAR HEADPHONES****RHA T10i**

The T10is from RHA are in-ear headphones with what the manufacturer describes as customisable sound, as well as mouldable ear hooks. They have three changeable tuning filters that can adjust the sound to bass, reference or treble. The full kit includes a three-button remote control with 360-degree mic for call and track control. Premium earphones, the RHA T10i offer full noise isolation, and are made from injection-moulded steel, with what RHA calls an oxygen-free copper cable.

**Price**

You can purchase these from RHA-Audio for £149. Flip across to Amazon and at the time of writing you could get a minor discount at £139. A Google Shopping search found the RHA T10i available for a lot less, if you are prepared to buy from a less well-known store.

**Design**

The metal shell and weight makes the RHA T10i look and feel like the higher end earphones they are. The copper cable and metal connection are more secure and robust than other wires we have used, which is reassuring.

In the ears, the RHA T10i are comfortable, especially when you



play around with the 10 sets of silicone earbud options - there are five options, two pairs for each size. As the RHA T10i sit nicely in the

are punchy with the bass filter, without overpowering the music. We think you'll have to like bass sounds to enjoy these earphones,

Build: ★★★★★  
 Features: ★★★★★  
 Performance: ★★★★★  
 Value: ★★★★★



**The RHAs come with a three-year guarantee, which is a big deal when you are shelling out this much money for a pair of headphones**

ear - and stays there even while exercising - the sound isolation is excellent. We're not sure if this is down to the earbud or the headphones themselves, but we were impressed nonetheless.

The mouldable wire fits around the back of the ear, which is a novel element. You will need to adjust the wire each time you wear the earphones, though. There is an on-cable controller, but it's compatible only with a iOS devices, not Android, which is annoying - make it compatible with the most popular platform, RHA. There is a three-year guarantee too, which is a big deal when you are shelling out this much for a pair of headphones.

**Audio quality**

Listening to podcasts using our LG G4 smartphone, the sound was crystal clear. You get very good clarity on spoken word content. Music-wise, deep bass tracks

as there is more emphasis on this than the treble. Volume is standard - we personally wanted it to be a bit louder, but we'll always want too much and this is probably a safe level, taking into consideration the phone setting rather than the earphones.

Overall the RHA T10i offer reasonable audio quality for the price. It's not outstanding, but it is pretty good.

**Verdict**

So, taking into consideration all of the above, are they worth buying? In a word, yes. For build quality alone in this price range they stand out. Features and audio quality are of a sufficiently good quality, and it helps that it comes with a three-year guarantee. The T10is aren't for the pure audiophile, but are a great step up for the music lover who wants a better quality of headphones. **Sorcha Egan**

**£500** inc VAT**Contact**■ [orbitsound.com](http://orbitsound.com)**Specifications**

Bluetooth 2.1 with aptX;  
Toslink optical digital input;  
3.5mm minijack aux input;  
USB port for firmware  
updates; Soundbar: 1.95kg,  
750x65x74mm; Subwoofer:  
7.9kg; remote control,  
optical cable and analogue  
cable included in box

**SOUNDBAR AND WIRELESS WOOFER****Orbitsound A70 airSound Bar**

Orbitsound may not be as familiar as the biggest names in speakers and soundbars, but this is no reason to discount it. We've long appreciated the British company's focus on sound quality over frills, but the new A70 airSound Bar adds those as well in a great package.

The last Orbitsound speaker we reviewed was the SB60 airSound Base: a large 'soundbase' that sits under your TV and incorporates a subwoofer rather than being a thin bar which can be mounted on the wall or sit in front of your screen.

The A70 airSound follows the more traditional bar-plus-separate-sub formula, but retains the signature side-firing speakers which create the immersive sound we've come to know and love from Orbitsound products.

**Design**

The speaker bar measures 750x65x74mm, so it's slim enough to mount unobtrusively beneath your TV on the wall, or place in front of it on a TV bench. The enclosure is wooden, and the piano black paint is hand polished to a glossy finish. It's longer, lighter and slimmer than previous Orbitsound soundbars, such as the M12, we've reviewed.

Inside are five speakers, three forming an array at the front and two at the sides. What's interesting is that Orbitsound has paired a traditional analogue crossover with a digital amplifier for the front speakers. This produces a warm, yet crisply defined sound - we'll get to sound quality below.

The side-firing 'airSound' speakers are driven digitally and combined with the subwoofer give a 300W total output. The side speakers play an out-of-phase stereo signal, which helps to give the impression of sound all around you, rather than coming from a particular spot.

The 6.25in sub communicates with the bar wirelessly, requiring only a power cable. It's a pretty compact unit, but weighs a reassuringly hefty 8kg.

On the back of the soundbar, you'll find a just a pair of inputs: Toslink optical, analogue 3.5mm minijack and a USB port which is for firmware updates, or just charging



your phone. The port is recessed, so it's possible that dongles could be added in the future for extra functions.

There's no HDMI, but you shouldn't need one as long as your TV has an optical output and can reroute the audio from its HDMI inputs to the optical output. Most can. An optical cable is included, and makes setup simple.

If you want to play music from your phone, the A70 also has built-in Bluetooth and supports apt-X for better quality streaming - if you have a phone that's compatible, of course. If you're using an iPhone, you'll have to live with

Unlike the SB60 with its single blue LED, the A70 has a much more informative display. On the left is a touch-sensitive strip of light-up controls for power, input selection and volume. There's also NFC, so you can touch your Android phone and have it pair with soundbar.

On the right is a second display showing volume level. The same dotted scale lets you see how much bass or treble addition or reduction you've applied. You can also see which input is selected, if there's a problem with the subwoofer's Bluetooth connection and when a Bluetooth audio device is connected. If we're being picky, both displays could be brighter (there's no way to adjust brightness), but it's better to be dimmer and not too bright.

You get the same updated remote that now comes with the SB60. It's a simple remote, which has mute, input, bass, treble and volume buttons. The A70 can also learn from your TV remote, so you can use that to control the soundbar's volume. It works with Sony, LG and Samsung TVs, but not Panasonic. You could alternatively try using the volume button on another compatible remote control,

such as your DVD player, Hi-Fi amp, Sky or Freeview box.

The A70 is designed to enhance your TV's audio, providing clearer dialogue as well as much better bass. It does this with ease. If this is your first soundbar, you'll wonder why you lived with poor-quality sound from your TV for so long.

The front-mounted tweeters are perfect for voices, and mean you can hear dialogue more clearly even if there's ambient music in the programme or film. And that incidental music sounds so much better than any flat-screen TV thanks mainly to the power of the subwoofer which delivers tight, focused bass. It's not the most powerful around, but it's more than enough to handle music and effects in movies and TV shows.

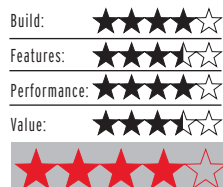
The side-firing tweeters give the impression of surround sound and really widen the soundstage, but when playing music via Bluetooth, it's not so pronounced.

Via Bluetooth, the A70 again handles most things pretty well. You can play pop, jazz, classical and most other styles and be very happy with the volume and quality the soundbar can deliver.

It's not so hot when it comes to rock or metal tracks where the lack of mid-range power makes guitars sound somewhat muted and flat. It must be said that we tested primarily with an iPhone which, as we've said, doesn't support aptX.

**Verdict**

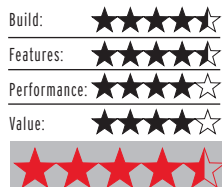
The A70 is well built, looks good, is easy to install and - on the whole - sounds great, especially considering its slim dimensions. It's not the cheapest soundbar you can buy, but its ability to work as a wireless Bluetooth speaker is handy, and most people will be happy with the sound quality on offer. **Jim Martin**





**£99** inc VAT**Contact**■ [ultimateears.com/en-gb](http://ultimateears.com/en-gb)**Specifications**

360-degree audio; range of colours and designs; iOS and Android app available; Bluetooth and 3.5mm jack input; 9-hour battery life; 135x40mm; 330g

**BLUETOOTH SPEAKER****UE Roll**

Ultimate Ears has launched the latest edition to its family, the UE Roll. It's a sub-£100 Bluetooth speaker that should withstand almost anything that you can throw at it, partly thanks to a plastic coated acoustic skin, which provides the speaker with water, dust and stain resistance. It also comes with a 'marine grade' bungee cord at the back of the speaker, which enables you to attach it to almost anything, from hanging it on a tree in a park to attaching it to the handlebars of your bike.

**Design**

The circular, dome shaped design helps to aid the audio projection of the UE Roll, while also making it extremely versatile. It measures 40mm in height, has a diameter of 135mm and weighs 330g.

The speaker is available in a variety of different patterns and colours, six in total. These vary from the standard UE colours including blue and red, black and red, and purple and yellow.

It's not a delicate speaker either - its rugged design includes a plastic coated acoustic skin that provides waterproofing to the speaker - an IPX7 waterproof rating to be precise, which means the UE Roll can (in theory) be submerged in up to 1m of water for up to 30 minutes.

With regards to connectivity, the UE Roll doesn't disappoint. As well as offering both Bluetooth and a 3.5mm jack input, UE has created the UE Roll app specifically for the speaker, which is available for both iOS and Android. The app acts as an intermediary between your mobile device and the speaker, allowing you to remotely turn the speaker off (and back on again), as well as connect an additional UE Roll for double the volume, or for a truly stereo speaker experience.

The app is also where you can update the UE Roll's on-board software. It's a great mindset for UE to have, and is one we haven't seen from many (if any) other Bluetooth speaker manufacturers. It makes you feel a bit better about buying a speaker because you know that it'll continue to improve over time!

As mentioned now, the UE Roll supports Bluetooth connectivity


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with a 20m range, but that may vary depending on usage and other factors. However, that's not the only impressive feature of the UE Roll's Bluetooth connectivity, as it can simultaneously connect to two devices. So if a friend wants to take over they can connect to the UE Roll, while you're still playing music. Then, once they're ready, all you need to do is pause the music on your phone and let them play from their phone - it's that simple.

**Audio quality**

Now you know all about the UE Roll, let's move on to what really matters - the audio quality. Though the UE Roll isn't very big, it features one 2in driver and two 0.75in tweeters which, together, produces a room-filling level of audio. Its dome-like design also aids with audio projection, as when the speaker is on a flat surface, you experience an even level of audio from any angle.

There isn't as much bass as the Boom, though over the period of time we've tested it, the levels of bass has improved. However, it still has a great mid-range that produces warm and clear vocals, and is at its best playing acoustic-style songs.

With many sub-£100 Bluetooth speakers, the audio deteriorates as the volume increases, usually ending up with horribly distorted audio at maximum volume. We're glad to say that the UE Roll doesn't suffer from this issue, and delivers crisp, clear

audio even at the device's maximum volume. It's loud for a small speaker too, as we were able to hear it clearly from the floor below.

The UE Roll is advertised as having a nine-hour battery life, though we're sure we've used it for longer periods without needing to charge its battery. It's worth noting that UE recommends a five-and-a-half hour charge time from 0- to 100 percent, so it's not the fastest charging Bluetooth speaker.

One cool feature of the UE Roll is that it can be remotely turned on and off via its smartphone app. It also displays its battery level on the status bar of the iPhone, as well as in the app, so you're always aware of the battery level of the device.

But what if you're on Android? You can still check the battery levels via the app, or you can try something different. If you press the '+' and '-' buttons on the speaker at the same time, you'll get a natural-sounding voice letting you know what percentage the battery is currently at. It's nice to hear such a natural-sounding voice on a Bluetooth speaker, as many manufacturers seem to opt for a poorly pronounced voiceover, with some being completely inaudible.

**Verdict**

Overall, we love the UE Roll. From its design to the audio quality, it's an ideal companion for those who enjoy the outdoors. **Lewis Painter**

**£52** inc VAT**Contact**■ [inateck.com](http://inateck.com)**Specifications**

Bluetooth 4.0/AUX speaker;  
2x 5W drivers; IPX5-rated  
waterproof protection;  
built-in 1800mAh  
rechargeable battery (up  
to 15 hours life); carry  
case; hand strap, 1.2m  
Micro-USB and AUX  
cables provided;  
162.8x62.8x28.6mm; 250g

Build: ★★★★★  
Features: ★★★★★  
Performance: ★★★★★  
Value: ★★★★★

**BLUETOOTH SPEAKER****Inateck MercuryBox BP2101**

Priced £52, the Inateck MercuryBox BP2101 is twice the price of many of the budget speakers we review, but significantly cheaper than many of the better known brands with comparable performance. So, even at a touch over £50, it offers very good value for money.

The speaker comes in an elegant black case, internally covered with velvet fabric, which gives you a hint as to the quality of the product inside. However, we don't judge a book from its cover. So let's take a closer look at the MercuryBox.

Its rectangular aluminium housing is sleek and essential at a time when minimalism is in vogue, and Inateck gains points for the design. The speaker's upper end is rubberised and has a soft-touch texture. On this side are buttons for turning on and off the device, playing/pausing music, answering calls over Bluetooth, changing the volume or skipping a track.

If you don't want to use the Bluetooth facility, you can opt for the AUX mode, which allows you to connect your phone, tablet or laptop with the speaker though the included 3.5mm audio cable.

The MercuryBox is also IPX5-rated, meaning its splash resistant. This makes it ideal for use in the bathroom – just don't submerge it in water.

In terms of battery life, Inateck claims the built-in 1800mAh rechargeable lithium-ion battery can offer up to 15 hours of playtime. Your results will, of course, vary,



depending on audio volume and other factors. When the speaker's battery is running low on power, the buttons will turn red. You can then charge Inateck MercuryBox using the included Micro-USB charging cable.


Another nice characteristic is how easily portable this speaker is. It's a small device (162.8x62.8x28.6mm) and lightweight at just 250g.

**Audio quality**

Given its dimensions, we were surprised by just how loud the MercuryBox could go. For such a small speaker, its room-filling sound is impressive and beats that of larger, heavier speakers.

Vocals are loud and clear, and highs are well reproduced. There's no unnatural metallic sound or noise distortion, even at maximum volume. Its powerful dual 5W drivers deliver a loud and rich sound, and they perform well with different types of music, from rock music to jazz. The bass won't shake the room, but it is still good with a pleasant presence of warmth. However, we did find that the speaker doesn't have any stereo separation, which is a shame.

**Verdict**

Inateck's MercuryBox BP2101 Bluetooth Speaker is a decent budget speaker, both sophisticated and attractive in design. We were sceptical about its performance, but the Inateck impresses with a rich, deep sound. Even at maximum volume, we didn't hear any sound distortion.  **Roberta Alidori**





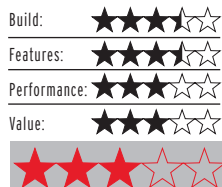
£92 inc VAT

Contact

■ [steelseries.com](http://steelseries.com)

#### Specifications

Engine 3 software; USB 3.0 (cable supplied); 3x IR sensor; 80x366x55mm; 318g



## EYE-TRACKING DEVICE

# SteelSeries Sentry



Eye-tracking technology has been around for a number of years but we've not seen it in many consumer products. SteelSeries has partnered with Tobii Technology to produce an eye-tracker for gaming.

This slightly odd-looking bar sits below your monitor (or laptop screen). It uses three infrared micro-projectors to scan your eyes 50 times per second, so it knows where you are looking at all times.

This lets you analyse your performance after a gaming session, and gives you the ability to look around in a game without moving your mouse. It's therefore great for Twitch and YouTube streamers, as it allows viewers to see exactly where they are looking while they play.

It's somewhat understandable that new technology like this comes at a price, as there's no comparable product out there. The SteelSeries Sentry will cost you £92, so it's more than most gaming peripherals, such as controllers or headsets.

We can't argue too much with this, but at the same time we can hardly brand it as good value for money. It's a luxury purchase.

## Hardware and performance

To get started, you'll need to download the Engine 3 software ([steelseries.com/engine](http://steelseries.com/engine)) and go through the settings. This didn't take us long, though, and we were soon up and running. You'll also need to stick a magnetic plate to your monitor and use the supplied cable.

Once the Sentry is working, you'll notice that the infrared sensors glow red. We found this a little off-putting at first, though we soon got used to it. You can set up the Sentry for

different players and it works just as well if you wear glasses.

You can use the tracker to analyse your gaming, which is handy. It offers real-time details, such as time since last look at mini map, time spent since last region look, average time spent looking in each region, and a match summary table. As a casual gamer we found this intriguing, but the novelty soon wore off and these options are really aimed at enthusiasts.

What's far more exciting is what the Sentry can do when you're playing. We tested it with Assassin's Creed: Rogue. In a third-person game such as this, you can look around by changing where you look on your screen. The further you move your gaze to the edge of the display, the faster the camera pans.

You would normally do this with your mouse, and the ability to do so with eye-tracking is so futuristic it feels a little odd for a while. We soon got used to it, though, and it freed up our mouse for other elements of the game. The idea works well in a slow-paced game such as AC: Rogue, but we're not so sure about a fast and furious first-person shooter, though you can still use your mouse as normal if you feel the need.

Like Samsung's Smart Stay option on its smartphones, the Sentry knows when you are and are not looking on the screen. This means that if you look away for whatever reason, perhaps someone kindly brings you a cup of tea or walks into the room, the game will automatically pause when you do and resume when you look back. We did experience the odd bug, though. For example, while playing Assassin's

Creed: Rogue, the Sentry would keep pausing the game and opening the menu, even though we were still looking at the screen.

However, apart from a small bug that need ironing out, the tracker works well. Indeed, it's the kind of new technology that makes you smile and think wow. You'll want to show it off to your mates, for sure.

Although we love what the Sentry can do, the fact that it's such new technology is apparent when you look at the list of games it supports. This is very small, with Assassin's Creed: Rogue, DOTA 2 and StarCraft 2 the main three titles. The latter two are the only ones to support the live gaze overlay for streamers, which is a shame, and that's all they do. We thought we would be able to move the map around instead of using the mouse. Other lesser known titles include Hunter: Primal and Son of Nor. So all in all, that's not many games for the price you're paying.

The Engine 3 software also makes it seem as though you can add other titles easily. This, unfortunately, isn't the case. For example, we tried to add Heroes of Newerth, and while it did appear in the library, the eye-tracker didn't work. SteelSeries needs to be clearer about which games are supported and what the device does in each title as this varies.

## Verdict

The SteelSeries Sentry is an impressive piece of kit. However, the device is expensive and there aren't enough games that support it. We hope the situation improves soon. **Chris Martin**



**£99** inc VAT**Contact**■ [philips.co.uk](http://philips.co.uk)**Specifications**

5 cleaning modes; wireless charging; 1 brush head included; charging carry case

**SMART TOOTHBRUSH****Philips Sonicare DiamondClean**

These days, every regular electrical device and appliance is getting Wi-Fi connectivity and therefore offering 'smart' features (see our MiPow PlayBulb Color review on page 51). Toothbrushes haven't yet got to this stage, but many offer clever tech features and not just to help you clean that pesky plaque.

The Sonicare DiamondClean is the top of the range electric toothbrush from Philips and has a price tag of £99.

**Design**

Our review model was black, which looks incredibly stylish with its matt finish compared to the traditional white electric toothbrush. There is a white if you prefer or pink if you feel that way inclined. As with any electric toothbrush, you'll need to buy replacement brush heads as you'll get only one in the box.

As well as the stylish design, the Sonicare DiamondClean feels every bit a premium product, with the included hard case, glass, and the way the modes and battery indicator light up.

While smart toothbrushes will typically come with an app, they're not really necessary as they contain a timer to make sure you brush for the recommended two minutes.

This isn't always practical, so the Sonicare DiamondClean does

away with this and simply switches off automatically after the two minutes are up - it will even give you a notification of sorts every 30 seconds by very briefly pausing the vibration so you clean evenly.

Not all the brushing modes last two minutes, but you'll probably use the regular clean mode the most. Your other options are gum care, polish, white and sensitive. To find the one you want, keep pressing the power button to cycle through them. If you haven't used an electric toothbrush before you can put it into a mode that gradually increases the strength of the vibration to help you get used to it.

Of course, Philips says that the device will help keep your teeth cleaner, whiter and ensure you're gums are healthy. We can't test things such as the claim of up to seven times plaque removal but the results after a two-minute regular clean. You can feel the difference compared to a manual toothbrush.

The clever automatically timed modes, up to 31,000 brush strokes per minute and the introduction setting are just the start of the smart features available here. What is particularly neat is how you charge the Sonicare DiamondClean. The toothbrush features wireless

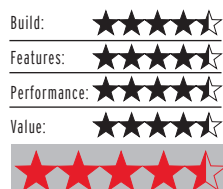
charging, so doesn't need to sit in a dock properly or anything. You simply place it in the supplied glass, which then sits on a base that you plug into the wall. This means you don't even need to think about charging it and you can pick up and use the glass easily while the charging base stays put.

If you do take the Sonicare DiamondClean away from home, it will last around three weeks on a full charge. The hard carry case will keep it protected and has space for a couple of brush heads. Plus, you can charge the toothbrush while it's in the case because it has a USB port. You plug it into a laptop, smartphone charger or any other USB port to keep it topped up. We'd prefer it if the connection on the case was Micro-USB rather than the older Type B, but this isn't the end of the world and a cable is supplied.

**Verdict**

The Philips Sonicare DiamondClean is a stylish electric toothbrush with some handy smart features including automatic timing so you don't need an awkward app, five cleaning modes and wireless charging. At £100 so there's little to fault here. ☒ **Chris Martin**

**The DiamondClean feels every bit a premium product, with the included hard case, glass, and the way the modes and battery indicator light up**



**£33** inc VAT**Contact**■ [choetech.com](http://choetech.com)**Specifications**

15,600mAh power bank; 1x Qualcomm Quick-Charge 2.0-certified 5V 2.4A (12W)/9V 1.7A (15.3W)/12V 1.3A (15.6W) USB output; 1x 5V 1A (5W) USB output; 1x Qualcomm Quick Charge 2.0 5V 2.1A (5.5W)/9V 1.5A (13.5W) Micro-USB input; 1x 5V 2.1A (5.5W) Lightning input; 4-LED status system; no auto-on/off; no passthrough charging; no LED torch; no carry case; 147x78x16mm; 356g

Build: ★★★★★  
 Features: ★★★★★  
 Performance: ★★★★★  
 Value: ★★★★★

**POWER BANK****Choetech Portable Power Bank B611Q**

Opposite, we review the MiPow Power Tube 3000, which includes Bluetooth connectivity so you can pair it with an app and monitor the remaining capacity and device temperature – a hot topic, thanks to a recent EE Power Bar fire-safety scare.

Here we have the Choetech Portable Power Bank, the first power bank we've seen to include support for Qualcomm Quick Charge 2.0 – and not only for charging your devices but also for refilling its own battery, which means you could refill this high-capacity bank in just 7.5 hours.

If you have a phone or tablet that supports Quick Charge, you'll know just how welcome a feature it is. Qualcomm Quick Charge 2.0 is able to reduce charging time by up to 75 percent, and in the case of our own Samsung Galaxy S6 we can obtain a 40 percent charge in just 30 minutes. Having tried it, we wouldn't buy a phone without it.

With our phones now an essential part of our daily lives, and hardware getting more powerful with every new release, battery life is an issue; the ability to get enough charge for several hours' use in literally a few minutes is an absolute lifesaver. Incorporating that functionality into a portable power bank is genius.

**Design**

We say portable, but the Choetech – for all the great tech that lies inside – is a bit of a brick. It's a shiny brick, thanks to its glossy black coating, but this does little to hide its size and actually makes it feel a little cheap. (And cheap it isn't, at £33 from Amazon UK – at least not when compared to many rival power banks of this capacity.) The Choetech measures 147x78x16mm, and weighs a hefty 356g.

To be fair, the Choetech does provide 15,600mAh of power for charging up a connected phone and/or tablet. Most power banks, unless the manufacturer specifically states otherwise, hover around 65- to 70 percent efficiency. This means not all of that 15,600mAh of power will make its way to your devices; instead, you should expect something closer to 10,500mAh. That's still plenty of juice, mind, and



would fill our Samsung Galaxy S6 four times, or a smaller-capacity iPhone battery something like five- to six times.

**Connections**

If you have a phone or tablet that doesn't support Quick Charge, you'll note there are two outputs and two inputs on this Choetech power bank. Input 1 is a 5V 2.1A (5.5W)/9V 1.5A (13.5W) Micro-USB port that supports Quick Charge; to refill the bank just pair it with the charger that came with your Quick Charge-compatible device. Input 2 is a Lightning port, making refills easier for iPhone users who are unlikely to have a Micro-USB cable to hand (although one is supplied in the box). This operates at the slower speed of 5V 2.1A or 5.5W.

When it comes to charging up your phone or tablet, those with Quick Charge-compatible devices should use output 2, which is instantly recognisable by its blue connection. This is a 5V 2.4A (12W)/9V 1.7A (15.3W)/12V 1.3A (15.6W) output. The other output, output 1, is a 5V 1A (5W) connection for charging an iPhone or non-Quick Charge-compatible Android phone.

That's it for the ports and connections, and the only other hardware control you'll find is a power button on top of the Choetech Portable Power Bank. Beside this are four LEDs with the legends 25-, 50-, 75- and 100 percent to show how much power remains. The power button is used to see the capacity status at a glance, and also to begin




charging, since the Choetech doesn't support auto-on.

Another feature it doesn't support is passthrough charging, which is the ability to power both the power bank and a connected device at once. We're happy to ignore this gripe, however, given that charging time is greatly reduced for both phone and power bank via Quick Charge.

Also missing is a soft carry case and an LED torch, two things commonly provided with the vast majority of power banks. But you know what we're going to say: who cares – it supports Quick Charge.

In all honesty, though, were it not for the inclusion of Quick Charge support and the ability to refill the device via either Micro-USB or Lightning, the Choetech would be a very standard, albeit high-capacity power bank. If your phone doesn't support Quick Charge, or the Lightning input is of no use to you, we would advise you to look elsewhere. (See our best power banks chart on page 145.)

**Verdict**

We can't say enough just how pleased we are with the inclusion of Quick Charge 2.0 support in this power bank, and if speed is important to you then no doubt you'll feel the same. iPhone users will also appreciate the Lightning input, although the Quick Charge functionality will be of no use to them. In other respects there is nothing standout here, so if you won't benefit from Quick Charge or Lightning you should look elsewhere.  **Marie Brewis**

**£34** inc VAT**Contact**■ [mipow.com](http://mipow.com)**Specifications**

3000mAh power bank; certified for iPhone 5/5c/5s/6/6 Plus, iPod touch 5th-gen and iPod nano 7th-gen; 1x 5W (5V, 1A) USB; 1x 5W (5V, 1A) Lightning connection; 3-LED status system; JuiceSync companion app; no torch; no passthrough charging; no auto-on/off; 25x25x105mm; 85g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**POWER BANK****MiPow Power Tube 3000**

Well, we really thought we'd seen it all with power banks, but the MiPow Power Tube 3000 has something entirely new: built-in Bluetooth.

This enables it to pair with MiPow's free JuiceSync app on your iPad or iPhone and allow you to monitor the remaining battery capacity and power bank's temperature. You can also set an 'Away Alert', which will warn you if you accidentally leave behind the power bank.

**Heat monitor**

The ability to monitor the power bank's temperature will be a nice touch for those concerned by power-bank safety in the wake of claims that certain EE Power Bar models can be a fire hazard.

By default, the alert is set to trigger at 55°C; when we first plugged in the MiPow to our iPad it recorded 25°C and within a few minutes rose to 29°C. The hottest it became during our testing when discharging was 42°C.

With a 3000mAh capacity, of which you'll likely see not much more than 2000mAh (some is lost through heat generated and voltage conversion), you can expect one full charge for your iPhone or iPod and potentially a little bit more, depending on your model and its battery capacity.

As with many power banks the MiPow uses a three-LED system to show you how much power remains. Through the companion app you can see the exact battery



percentage, but to be fair you're only ever going to get one full charge out of this power bank. How handy this will prove to be is debatable. You can set the app to warn you when the remaining

Apple certified Lightning connector. Also under the cap is a full-size USB connection, which allows the MiPow to refill its own battery at 5W, either by plugging it into a USB port on your computer or directly

## The ability to monitor the power bank's temperature will be a nice touch for those concerned by power-bank safety

capacity gets down to 30-, 20- or 10 percent remaining.

At this pocketable size and with only a 5W output, the MiPow isn't really designed for iPad, certified by Apple as 'Made for iPod' and 'Made for iPhone'. It did work with our second-generation iPad mini (sometimes iPads can be fussy with slower outputs), although you shouldn't expect a full charge. Indeed, in our tests with the screen on so we could monitor the app our battery capacity went up only a few percent. To begin charging you plug it in and press the power button. It's not possible to simultaneously charge your iPad or iPhone and the Power Tube - not only would the design make doing so difficult, but the lack of passthrough charging makes it impossible.


The MiPow Power Tube is exactly what it sounds like: a compact tube with a rubberised coating that comes in black, grey, blue or red. It has an end cap that is tethered to the Power Tube via a built-in

into a USB wall charger. That's not especially fast, but at this capacity it's not too much of a problem.

The MiPow Power Tube feels very well made and we wouldn't worry too much about slinging it in a bag (or it's small enough to go in a pocket). But MiPow does supply a soft carry case in the box.

Note that if your device does not have a Lightning connection the MiPow Power Tube is not for you - there is no way to connect your own cable to charge an Android device or an older iPad or iPhone.

**Verdict**

MiPow's Power Tube is an appealing power bank for iPad and iPhone users. Even at its lower price, the 3000 is expensive when you consider that most power banks at this capacity cost around £10. However, the built-in Lightning connection means you won't need to carry additional cables, and the ability to monitor the temperature through an app will sway many users.  **Marie Brewis**





£11 inc VAT

## Contact

■ xiaomi-mi.co.uk

## Specifications

10,000mAh lithium-ion power bank; 1x 10W (5V, 2A) Micro-USB input (charges in 5.5 hours with 10W adaptor); 1x 10.5W (5V, 2.1A) USB output; passthrough charging; auto-on; flat white USB- to Micro-USB cable provided; nine layers of protection; no LED torch; no carry case (silicon protection cases are available); 91x60.4x22mm; 207g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



## POWER BANK

## Xiaomi 10,000mAh Power Bank

When we first took the Xiaomi power bank out of its box, we were confused. As is standard with Xiaomi products, all the writing on the box and in the supplied quick setup guide was in Chinese. We thought we were getting a 10,000mAh power bank, yet this thing is closer in size to the 6,000mAh Zendure A2 (see opposite).

And, indeed, the specs mentioned something about 6250mAh. But we hadn't been duped. Unlike many other power bank manufacturers we've encountered, Xiaomi is completely transparent with the fact that the entire 10,000mAh capacity will not be available to power your phone or tablet. Most power banks will lose between 30- and 35 percent of their battery capacity through heat generated and voltage conversion, so we wouldn't expect to get any more than 7000mAh from a 10,000mAh bank.

We think Xiaomi has been somewhat over-cautious with this 6250mAh rating in any case. The hardware inside has been optimised for increased efficiency and durability, which Xiaomi claims is up to 93 percent. We saw two full charges for our Samsung Galaxy S6 (2550mAh battery), and were still able to get a Ulefone BeTouch (also 2550mAh battery) to 75 percent.

This isn't the only thing Xiaomi has taken extra care over in designing its Xiaomi power bank. The fact that it has managed to


**PC ADVISOR**  
 RECOMMENDED

squeeze so much power into such a compact 91x60x22mm design (725Wh/L) means this is the first 10,000mAh power bank we've seen that we'd happily slip into a pocket rather than a bag. No power bank makes a better compromise between portability and capacity.

We can't fault the design and build quality either, and if it weren't for the Micro-USB- rather than Lightning input and supplied flat white cable, the Xiaomi would look right at home in an Apple factory.

Available in silver, gold or rose anodised aluminium alloy, the Xiaomi power bank is CNC-milled with what the company claims is MacBook Pro-standard surface processing. This elegantly curved chassis features a sweatproof and anti-corrosion surface and although no carry case is provided (we've found silicone cases available to buy on Amazon for £5.79), you're unlikely to need one - the Xiaomi power bank is shatterproof and resistant to collision.

The safeguards extends to the Texas Instruments/MPS-designed circuitry inside, and the smart-control chips feature nine layers of protection, covering everything from temperature resistance and short-circuit protection to input- and output overvoltage. The indented power button at one end can also act as a reset button when required, for the power bank itself will

automatically begin charging when you attach a phone or tablet.

With a single USB output you'll be able to charge your phone or tablet, rather than both at once, but this helps to keep down size. Plus we like the fact the Xiaomi supports passthrough charging, which means you can charge both it and an attached device at once.

With a 10W Micro-USB input, using a similarly specified mains adaptor you should be able to refill the Xiaomi in roughly 5.5 hours. The USB output is also well specified, fast at 10.5W and offering automatic power adjustment to suit the attached device.

In terms of value, the Xiaomi power bank is unbeatable, and you'll pay twice the price for most 10,000mAh power banks. Xiaomi power banks are available to buy in the UK, for example through Amazon for £14.66, though Geekbuying offers a much cheaper deal at £11.56 with free shipping.

## Verdict

Perfectly balancing portability with capacity, the Xiaomi power bank's feature list and specification is also much bigger than you'd expect. Brilliantly designed, the Xiaomi 10,000mAh Power Bank offers extraordinary value. It's a strong rival to the Zendure A2, although the Zendure will prove easier to get hold of in the UK. Marie Brewis



**£25** inc VAT**Contact**■ [zendure.com](http://zendure.com)**Specifications**

6400mAh (3.7V, 22.2Wh)  
lithium-ion rugged power  
bank; 80 percent  
efficiency; 1x 2.1A USB  
output; 1x 1.5A Micro-USB  
input; recharges in 4  
hours; passthrough  
charging; auto-on and -off;  
93x48x23mm; 137g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**POWER BANK****Zendure A2**

We originally reviewed the first-generation A2 power bank last October, but Zendure has now updated its A-series. The second-generation models feature higher capacities (previously 6000mAh you now get 6400mAh) but are just as dinky, and all but the A2 also offer smarter power management. It's also dropped its prices, and the Zendure A2 now costs just £25 from Amazon UK, offering excellent value.

We've reviewed plenty of power banks over the past year, and without exception every one has had a catch. If they're high in capacity, then they're big and heavy; if they're portable then they have insufficient capacity to fully charge your phone or tablet - or they take hours to charge over a meagre 0.5A output; and if they support fancy features such as passthrough charging, then they're expensive.

For a long time, the closest thing we had to a happy medium was the Lumsing 10,400mAh Power Bank. At £22, it's great value, it's stylish, it offers fast charging and it's reasonably portable, although you still wouldn't carry this brick in your pocket, and it takes a while to recharge. The Zendure A2 changes everything.

Compact, lighter than you might expect and reassuringly durable, this 6400mAh power bank will deliver around 5120mAh to your mobile devices (some energy will naturally be lost through heat generated and voltage conversion, although Zendure claims its A2 has a very good 80 percent efficiency rate). That's plenty to fully charge a smartphone at least once, and in most cases two or possibly three times.

Although it has just the one USB output it's rated at 2.1A, which translates to 10.5W and fast charging for compatible devices. The A2's Micro-USB input is also nicely specified at 1.5A (7.5W), meaning you could recharge this power bank in just four hours.

Higher-capacity power banks in Zendure's range feature two USB outputs and, as we mentioned earlier, smarter power management of those outputs. (All are available

via Amazon UK.) But we think that £25 A2 hits the sweet spot between price, capacity and portability. Zendure supplies a soft carry pouch in the box, but you could realistically slip this power bank into a pocket.

The A2 is well equipped for a life on the road, too. Built from crushproof PC/ABS composite material with dual-injection moulding and a shock-absorbing central belt, this silver block is not only tough but it looks cool. Maybe not as cool-looking as a McLaren Spider, but definitely tougher.

In common with the vastly more expensive LimeFuel Blast L180X Pro, this Zendure A2 supports passthrough charging. It's an incredibly useful feature, allowing you to simultaneously charge both smartphone and power bank via a single power point, ensuring that both are full up and ready to go whenever you are.

If your phone tends to give up mid-afternoon, just whip out the Zendure A2 and you can double or even triple its life. Even if your battery gives up the ghost less frequently, the A2 will hold 95 percent of its charge for up to six months.

Also like the LimeFuel, the Zendure supports auto-on. This means you won't have to fiddle around with buttons to get your


device charging. Just plug it in and charging begins. Simple.

There is a single button on the Zendure A2, although this is used only to check the remaining battery capacity. As with all other power banks the A2 uses a four-LED system, but with its 6400mAh capacity each represents a much smaller 1600mAh, making it easier to work out just how much remains.

Zendure supplies a flat Micro-USB cable in the box; if your device uses a proprietary connector you'll need to provide your own cable.

The power to pound ratio isn't as high as it is with power banks such as the aforementioned Lumsing or the EC Technology 22400mAh High Capacity Power Bank, but we think features such as passthrough charging, auto-on and its durable, portable design make this Zendure the better deal.

**Verdict**

Zendure's A2 is one of the best power banks we've seen, mixing great value, build and portability with useful capacity. It has tough competition from the Xiaomi 10,000mAh Power Bank (opposite), but with a newly upgraded capacity, lower price point and easier availability in the UK, the A2 scoops the crown for best power bank available to buy in the UK today.  **Marie Brewis**

**PC ADVISOR**  
GOLD

**£47** inc VAT

**Contact**

■ [zendure.com](http://zendure.com)

**Specifications**

16,000mAh lithium-ion battery; 1.5A Micro-USB input; 2x 2.1A (10.5W) USB outputs; 2.1A (10.5W) maximum total output; passthrough charging; auto-on; 127x73x24mm; 320g; 12-month warranty

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



**POWER BANK**

## Zendure A5

Zendure's A5 power bank is the PC Advisor Gold award-winning Zendure A2 (page 49), but bigger and better - and now even more so in its second-generation. The A2 hits the perfect middle ground, but if you're going on a longer trip or have both a smartphone and tablet to charge you may find this the power bank better suited to your needs.

Zendure has now released its second-generation A-series, and this A5 features a higher capacity (16,000mAh vs 15,000mAh), smarter power management and a slightly lower price - £47 from Amazon UK.

For an extra £22, you get everything the A2 offers but with 2.5 times the capacity - with 80 percent efficiency that's roughly 12,800mAh usable, and enough to last you several days away from the mains - plus an additional USB output.

Whereas before you'd get one 5W- and one 10.5W USB output, in its second-generation both the A5's outputs are rated at 10.5W. The total output is still 2.1A (10.5W), which means with two devices you'll get slower charging (around 5W), but with two 10.5W outputs on offer you don't need to worry about which one you use to plug in your tablet.

Also new here is Zen+ power-management technology. Rather than a straight 5W/5W split between the two USB outputs, the Zendure can recognise the devices attached and supply an optimum amount of power for charging them.

The main trade-offs are in the Zendure A5's larger, heavier (but still portable) design, and in its price. However, it's worth pointing out that while this power bank is more than twice the price of, for example, the £22 similar-capacity RP-PB13 Deluxe from RavPower, several features add to its worth.

With the Zendure A5, you'll benefit from passthrough charging (allowing you to use the A5 as a USB hub, simultaneously charging both it and your devices), auto-on (removing the need to fiddle around with buttons, you just plug it in and go) and a rugged design built from crushproof PC/ABS composite material with dual-injection moulding and a shock-absorbing central belt.

Zendure also claims that 95 percent of the battery's capacity



will remain after six months, which means you could potentially chuck this power bank in the glove box and forget about it until you need it.

At this price and capacity, and with these features, the A5's closest rival is perhaps the LimeFuel Rugged L150XR, which costs \$84 (around £52), but you'll need to factor in shipping costs from the US (you'll get free UK delivery with the Zendure). While that power bank offers two 12W outputs (which are able to simultaneously operate at full-pelt), can charge itself slightly faster with a 2A (rather than the 1.5A here) input, and is waterproof, this cheaper Zendure is significantly smaller and lighter, and it looks just as cool and feels just as tough. And hey, speed isn't everything.

This probably isn't a device you'll carry in your pocket, at 320g and 127x73x24mm (that's the same size and weight as the first-gen A5, by the way), but Zendure supplies the device with a soft carry case. This isn't cushioned, yet the A5 is tough enough that it doesn't need protecting - the case merely keeps together both power bank and the also supplied flat Micro-USB cable,

and in that sense it's very handy. As with most other power banks a four-LED system is used to show how much power remains. It's easy enough to understand, although the 4000mAh jump between each LED means it isn't the most accurate of systems. Using a 1.5A/7.5W charger you can expect to fill this bank in 11 hours, but allow extra time with a phone and/or tablet connected.

Unlike most other power banks we've reviewed there's no LED torch, although we can't say that we miss having one.

### Verdict

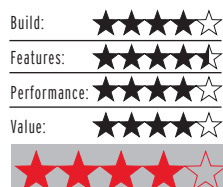
Zendure's A2 is a brilliant power bank, winner of our Gold award and currently at number one in our best power banks chart. With an extra USB output, smarter power management and larger capacity, this should be a better device, although we'd rather those additions didn't entail the loss of fast charging (with two devices connected) and the extra weight and bulk. Still a very good deal, even at £47, this is the Zendure for those with multiple devices to charge or longer journeys to take. **Marie Brewis**

**For an extra £22, you get everything the A2 offers but with 2.5 times the capacity - with 80 percent efficiency that's roughly 12,800mAh usable**



**£54** inc VAT**Contact**■ [mipow.com](http://mipow.com)**Specifications**

3W LED; 3W Bluetooth speaker; 100- to 240V/50- to 60Hz; Bluetooth 4.0 and Bluetooth Smart; 135Hz to 15KHz frequency response; pairs with MiPow PlayBulb X app for iOS or Android

**SMART LIGHT BULB****MiPow PlayBulb Color**

Smart light bulbs that connect to an app on your phone or tablet, and can change colour to help you create a desired atmosphere, are nothing new, but those that also serve up audio are so much cooler.

We've previously tested the Olixar Light Beats Bluetooth Speaker Bulb, and were impressed with its ability to blast out music from our ceiling (a great position for directing audio to all corners of the room without obstruction), but that smart bulb is a one-trick pony. Not only can the MiPow PlayBulb Color play audio, but it can rotate through a preconfigured colour scheme to match the beat and by altering the ambient light enhance the atmosphere.

Olixar's alternative is significantly cheaper than the PlayBulb, available from MobileFun for £29, whereas the MiPow has an RRP of £79. That's if you get it direct from MiPow: we received our sample from GearBest, where it has a usual selling price of £54.

Even at £34 the MiPow PlayBulb could be considered expensive when viewed merely as a light bulb - once the bulb has gone, the whole thing will need to go in the bin, since it's not possible to replace the bulb. However, bear in mind that LEDs last much longer than traditional incandescent bulbs, and they have other benefits, such as reduced energy consumption and less heat generated. You could potentially end up saving money. And besides, it's not just any old light bulb.

When we first took the PlayBulb out the box, we were surprised by its size, and it's quite a bit larger than the Olixar. The PlayBulb Color would make a traditional light bulb cower in comparison. It's a huge device, but it has to be in order to squeeze in all the electricals and audio hardware.

The MiPow fitted easily inside our lamp, though, and the larger surface area and fact it may very well extrude from smaller lamp shades means the colours it emits are more effective at changing the lighting within the room. Aside from the speaker grille around its middle, it looks like a standard (if oversized) LED light.



The PlayBulb has a standard screw fitting, so if you have Bayonet fittings in your home you'll need to pick up an adaptor (or buy a new lamp).

Our first impressions of the PlayBulb Color are good. It takes a few seconds to start up when you flick the switch, but it's all good thereafter. Its Bluetooth connection seems to be much stronger than that of the Olixar, and no matter where in the house we took our paired Samsung Galaxy S6 the audio didn't break up. The audio is loud, and the quality is good, with the MiPow seemingly more adept than the Olixar at handling whatever type of track we decided to chuck at it.

One thing we did notice was that having downloaded the PlayBulb X companion app (free for Android and iOS, and without which the MiPow is a standard white LED light) and paired it to the PlayBulb Color, we were able to change the lighting but not play music. In order for this to be possible we had to go into our phone's Bluetooth settings and ensure the PlayBulb was paired for media audio. After that, controlling the PlayBulb Color was a cinch.

On the app's first tab is Light Control. Colours are selected from a colour wheel, and there's a slider below for controlling the saturation. Tap the Effects button to access cool controls such as Rainbow and Pulse, or you can turn on the ability to change the LED colour by shaking your phone.

The second tab is for the Music Player, although you can also play music directly from Google Play

Music or another app once the PlayBulb is paired for media audio.

Other settings within the app let you configure scenes, and set a timer for the light to either come on or go off.

A plus point is the ability to pair multiple devices to the PlayBulb Color, meaning that in a home with multiple family members everyone can have a go at playing with the MiPow. (And they did.) However, this also means that anyone can take it upon themselves to turn off your music when it isn't to their taste, or turn on the lights in the middle of the night.

**Verdict**

Our first impressions of the MiPow PlayBulb Color are strong. Not only is it a cool gadget, but the MiPow is a great talking piece when friends come over, and it'll prove useful for parties. **Marie Brewis**



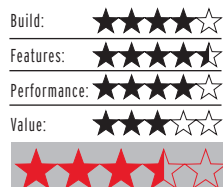
**Camera**  
**£169** inc VAT  
**Home alarm**  
**£249** inc VAT

**Contact**

■ [getmyfox.com/uk](http://getmyfox.com/uk)

**Specifications**

720p HD camera;  
 130-degree wide angle  
 lens; night vision; motion  
 detection; two-way audio;  
 battery back up; 110db  
 siren; Intellitag proactive  
 break-in detection;  
 Personalised fob key and  
 panic button; automatic  
 deactivation of alarm  
 system upon your return



HOME SECURITY SYSTEM

## MyFox Home Alarm and Security Camera



Smart devices are all the rage, and you can pick up anything from a smart bulb, such as the MiPow PlayBulb Color (page 51), to a smart kettle or smart washing machine. MyFox claims to have produced the “world’s first proactive smart home security system”.

### Design

Visually, MyFox’s Home Alarm and Security Camera look gorgeous. The aluminium and white plastic design is sleek and understated, and will blend into your home environment.

The home alarm is a pretty large, circular unit with built-in LEDs around the rim and two speakers on the bottom for its incredibly loud 110db siren. It has to be plugged in for a constant supply of power, but in the case of a power outage or a burglar switching off the plug, the alarm has a battery backup that’ll keep it ringing for long enough to deter any intruders.

The design of the camera is more impressive, primarily because of two simple design features. The first of these is its privacy mode, which uses a mechanical shutter to cover the security camera when you want privacy in your own home. Some people aren’t comfortable with the idea that a camera is recording them in their living room 24/7, so the option to quickly close the camera shutter via the MyFox Security iOS or Android app is a better option than physically having to turn the camera away.

Secondly, the security camera uses magnets with its dock. MyFox has designed both the security camera and home alarm to be attached to walls and brackets for a more secure system. If, however, you’re unable to secure it to a wall, MyFox provides a curved dock for the circular security camera

that uses magnets to allow for finite control over the angle of the camera. It’s such a simple feature to have, but one that means it stands out from the competition.

### Setup

According to MyFox, the whole system will take 10 minutes to set up from your smartphone. In testing, however, it took us closer to half an hour. For starters, we typed ‘MyFox’ into the App Store and downloaded what appeared to be the right app. Unfortunately, it wasn’t. In fact, it was only when ‘United Kingdom’ wasn’t an option during the sign up phase that we realised we were dealing with the wrong app. Admittedly that’s more our fault than MyFox’s, so we’ll move on.

We decided to set up the security camera first, as the home alarm comprises the alarm, key fob and Intellitag, all which require individual setups and would (probably) take longer to do. Setup was done via the MyFox Security app, but instead of connecting to the camera’s own Wi-Fi network for setup (the norm for many smart devices), it took a slightly different approach.

We had to manually input our Wi-Fi network details as there was no option to scan for local Wi-Fi networks. The app then transferred this information to the camera via a QR code, which was displayed onscreen. Unfortunately, our setup was unsuccessful and we had to reset the camera and start again – the app didn’t tell us what the problem was. We thought that it was an issue with the QR code being read incorrectly, so we decided to try again.

After going through the same process again, and again, and

again, we started to get a little frustrated. We couldn’t understand why it wouldn’t connect to our Wi-Fi network when it was in range and had an active connection to the internet. It was then that it dawned on us that the camera may not be compatible with a 5GHz Wi-Fi connection, so we tried connecting to our 2.4GHz network and it worked first time. It would have saved a lot of time and hassle if MyFox had specified this.

Thankfully, the setup process for the Home alarm and all its accessories was a much more pleasant and straightforward experience. We went through and added each individual accessory via the MyFox Security app with no real issues. It took around 10- to 15 minutes in total. The only downside to the setup process was that there was no real explanation as to what each button did on the key fob, which meant that we activated the insanely loud 110db siren by accidentally pressing the panic button.

### Camera

The security camera has a full 720p HD camera, with night-vision capabilities and a 130-degree wide angle lens. When we originally saw that it was only 720p HD, our expectations were lowered with regards to image quality, but that was a mistake. Upon accessing the live camera feed via the MyFox Security app, the image quality was clear and crisp, and looked closer to a 1080p feed than a 720p one. You’re able to pick out small details, which is a crucial feature for a security camera.

Even when the camera switches from standard- to night-vision mode, the quality is still there. Looking at security cameras we’ve

used in the past, using night vision decreases the overall quality of the video feed by some degree, making it grainy and generally less impressive than its standard offering. However, in our tests, the MyFox Security Camera produced a level of clarity comparable to its standard daytime video feed.

The camera also has a two-way intercom system, which allows you to communicate with family members in the same room as the camera. While it's a nice feature to have, we don't see the point - we can't imagine any kind of situation where we'd want to talk to an intruder rather than trigger the 110db siren.

Like the home alarm, the MyFox Security Camera must be plugged into a power supply, so you'll need to think about its positioning with regards to the nearest plug socket. That said, the supplied cable is longer than your average Micro-USB cable, so it shouldn't be too much of an issue. If there's a power cut or if an intruder tampers with the camera, it has a backup lithium-ion battery that'll kick in and keep it recording for up to an hour. You're also be notified whenever the camera is unplugged and running on battery power, so you can access the live feed and make sure everything is okay.

The camera also features motion detection and will send a notification to your smartphone whenever motion is observed. From here, you can access the video feed and verify whether it's a false alarm or if there is an intruder. If it is the latter, you can remotely activate the alarm. There's also a mode where the alarm will automatically be triggered whenever motion is detected on-camera, though if you own a pet, you may decide against using this feature.

Using the MyFox Security app, you can easily identify periods where movement was detected, thanks to purple blocks displayed on the timeline below the live camera feed. Drag the timeline back to where motion was detected, and you can easily review earlier footage. This is made possible because whenever the security camera isn't in privacy mode, it's recording - but don't worry about your phone's storage, as the video footage is stored in the cloud.



Unfortunately, you'll need to pay to use this service. You're given a two-week free trial of MyFox's premium service, which offers seven-day video storage in the cloud. After that, you'll have to shell out £7.99 a month for the service, or £3.99 per month to get an overview of the day's events. Considering you have to pay £169 for the camera and £249 for the alarm system, the least we would expect is a free cloud storage service.

### Home alarm system

The heart of the home alarm system is the 110db siren. We accidentally set it off at 4:30am on a Sunday morning, and believe us when we say that everybody in the house was awake within seconds. In fact, being in the same room as the alarm for 10- to 15 seconds left us with a headache, which is both impressive and worrying.

Next, we have the MyFox fob, which you can carry around with you on your key ring. When setting it up, you'll have to input the name of the person using it. With this information, you can access the MyFox app and see who's at home at any given time.

The key fob has four buttons, including a panic button for emergency situations. Pressing this will trigger the 110db siren, and also send a text, email and notification to every member of your family that's signed up to the MyFox Security app. It's a great accessory to have and will bring peace of mind and a sense of security for many people. You can easily enable the security system at the press of a


button when leaving home, and carrying the fob on your person will also automatically deactivates the home security system upon your return, making accidental alarm triggering a thing of the past.

The final part of the system is the Intellitag. Place it on any window or door frame in your house and add it in-app. The device uses on-board sensors and an algorithm to analyse the different vibration patterns it detects, and can detect a potential break in before it happens.

The Intellitag is able to tell the difference between standard events such as opening or closing a door, and possible threats, including an intruder using a drill or hammer. When it detects a potential break-in, the Intellitag will trigger the siren and send a notification to your smartphone alerting you to the current situation. With all this said, we still thought that we'd get a false alarm or two if we put the Intellitag on our front door, but it's been there for a few weeks now, and we've not had a false alarm.

Like the siren, the Intellitag has technology built-in that will detect any potential tampering, namely with communication jamming, and set off the alarm before the connection is lost.

### Verdict

The MyFox Home Alarm and Security Camera is the best-looking system we've seen. It provides you with a holistic, smart home security system that you can continue to add to over time. It's just a shame you have to pay for cloud storage  **Lewis Painter**



**£1,299** inc VAT**Contact**■ [dji.com](http://dji.com)**Specifications**

Flight time: 23 minutes;  
 charging time: 55 minutes;  
 Spare battery cost: £105;  
 2000m claimed range;  
 Camera resolution: 4K (up to 4096x2160 pixels, 30fps, 60Mb/s); stills resolution 12Mp; Photo functions: single shot, burst shooting 3/5/7 shots; auto exposure bracketing (AEB) 3/5 frames, bracketed frames at 0.7EV bias; 1.28kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**QUADCOPTER****DJI Phantom 3 Professional**

It may look the same as before, but DJI says it has rebuilt the Phantom 3 from the ground up to make aerial imaging as simple as smartphone photography. It doesn't stop there, either, with the company claiming that this is the best consumer quadcopter that has ever existed, and offers the ultimate flying experience.

Bold claims indeed, considering the increasing competition in the world of drones. So, let's get the bad news out of the way first.

The Phantom 3 does have a raft of new features, but it does not have auto-follow, cannot orbit an object and won't fold up and fit into your backpack. Nor can you throw it into a lake and watch it

burst out of the water and into the air like a certain other drone you may have seen on YouTube.

There's good news, too, though. The Phantom 3 is a real product that you can actually buy, and it's manufactured by the most popular quadcopter maker in the world. This is important because it means several things. First, you can get spares easily. Secondly, the SDK means developers can build new apps for the Phantom 3 which in turn means there will almost certainly be features such as auto-follow and orbit mode in the not-too-distant future.

There are two models available - Advanced and Professional. We tested the Professional version, which you can buy from FirstPersonView, though much of this review applies to the £899 Advanced version, too.

**Camera**

The most obvious upgrade is the camera. The Professional version gets a 4K camera with a 94-degree field of view. It has a larger sensor with more dynamic range as before and it's mounted on a three-axis gimbal as you'd expect. For the uninitiated, this means it delivers amazingly stable video as if the camera were mounted on a tripod in the sky. And if you're gentle with the controls, you should never see the propellers in the footage.

If you opt for a Phantom 3 Advanced, you'll get a 1080p

camera, though it's not the same as the Phantom 2's. It has a 94-degree FOV like the Professional and shoots 1080p up to 60fps. The sensor is also different and DJI says it offers less noise and better clarity.

Both cameras can also shoot 12Mp still photos in JPEG and DNG RAW, just as with the Phantom 2.

**Controller**

The way you control the camera has been improved over the Phantom 2 since you can now do a lot more from the transmitter. You can change aperture, take photos, rotate the gimbal and more without taking your hands off the controller.

Lightbridge is built into the Phantom and controller, so you get a 720p image from 1.6km away, as long as there are no obstructions. The transmitter has been redesigned and features a flip-up clamp which will take phones and tablets with up to 10in screens. That means you can use your iPhone 5s or your iPad Air.

Cleverly, you now plug your device into the controller's USB port so there's no need to connect to the Phantom's Wi-Fi, and there's one less wireless connection to worry about.

**Flight and app**

DJI says that the motors have been upgraded so they accelerate and decelerate more quickly. It's hard to notice much difference between this and the Phantom 2, but unlike some cheaper quadcopters, the Phantom



3 instils confidence in the way it flies. It's ultra-stable in the air, even in reasonably windy conditions. It's specified to remain stable even in 25mph gusts.

If you're flying low to the ground, new ultrasonic and 'visual' sensors (from the Inspire 1) enable the P3 to hover just inches off the floor. This means you can fly it indoors without needing a GPS signal. We wouldn't be confident to do this in small spaces, though, as it's not an obstacle avoidance system. The sensors do make it more reliable when taking off and landing, and the app has buttons for auto take-off and landing if you don't fancy using the sticks to do it manually.

The P3 uses the same Pilot app as the Inspire 1 and it defaults to beginner mode. This limits altitude to 30m and sets up a geofence to prevent you from flying the drone too far away from your position.

There's the same return-to-home function as before. The quad always knows how far it is from the controller and how much power is needed to get back, so will automatically initiate the return process when the battery runs down to the critical point. It will also automatically land when it hits 10 percent remaining - preferable to cutting out mid-air when the battery is completely depleted (you may have seen another YouTube video covering that eventuality).

Battery life is claimed to be 23 minutes with the new battery, but we found it was a few minutes less than that. It could be that you'll get the full 23 if there's no wind at all, but more than likely you'll want to order a spare battery. As it's a different voltage, you can't use any batteries from the Phantom 2.

The app's interface is simpler than the interface you get with the Inspire 1. It still gives you plenty of control, though. You can pick between various resolutions and frame rates, as well as white balance, shutter speed, ISO and more. For 4K, it will shoot at 24-, 25- and 30fps at the usual 16:9 3840x2160 resolution. But it can also record 4096x2160 if you prefer.

For higher framerates up to 60fps, there's also a choice of 1080p and 720p. Talking of 720p, the app lets you stream footage at this resolution straight to YouTube. Since the Phantom records video but not



audio, you can add a soundtrack via your mobile device's microphone - ideal for commentary of what the audience is seeing. The quality isn't a patch on the excellent 4K footage, but it's pretty good. The narrower 94-degree lens means there's much less image distortion than on the Phantom 2 Vision+ but it's not completely absent. Most people are unlikely to notice it, though.

Although the Phantom 3 Professional can record at bitrates of up to 60Mb/s don't expect the level of quality you'd get from a CSC such as the Panasonic GH4. 4K footage is good, though, and certainly the best we've seen from any consumer drone.

Via the app you can view videos stored on the quad's microSD card and download short clips to use in the Director part of the app. Here you can quickly edit videos (highlights are chosen automatically)

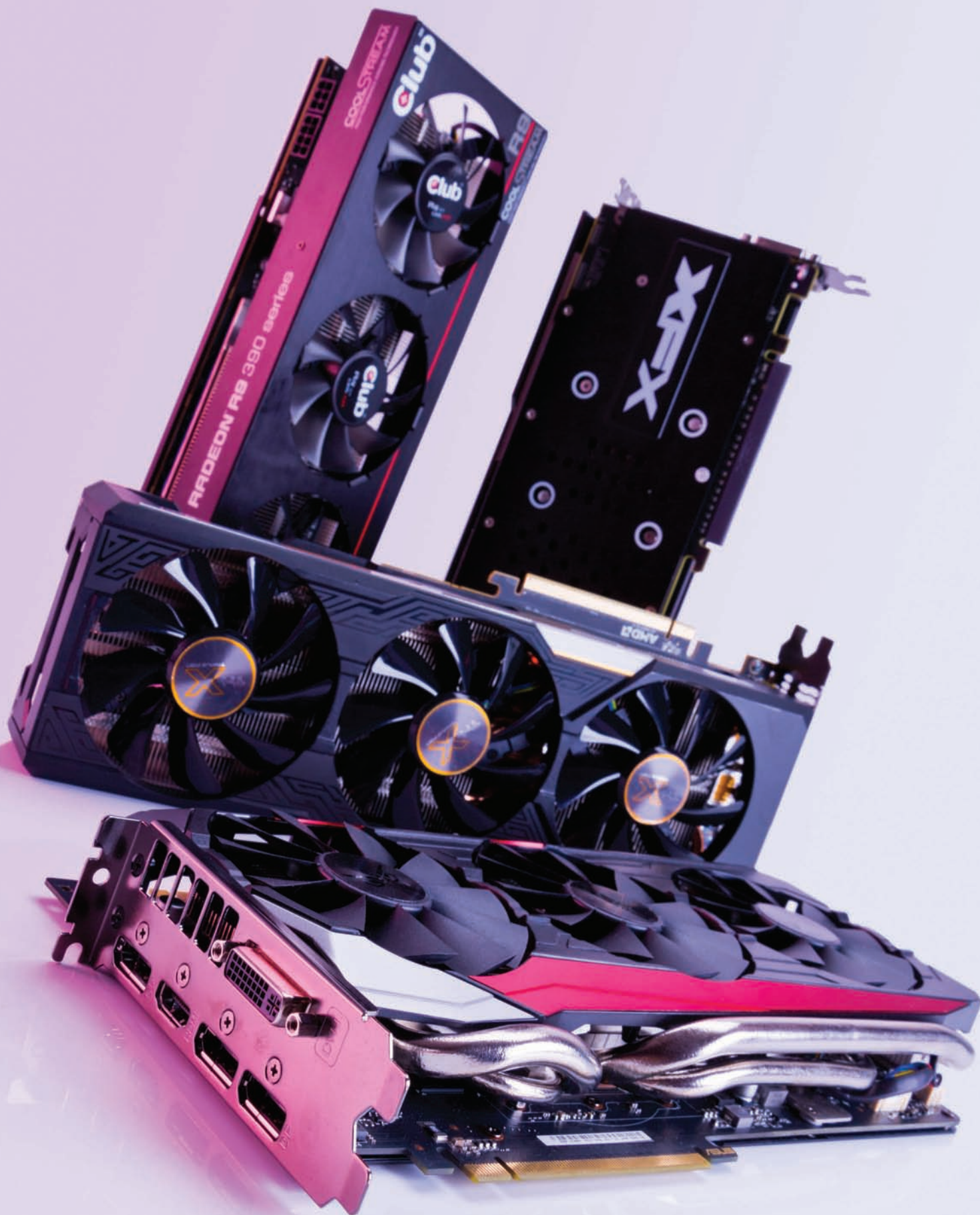
and music is automatically added. You can then upload them to YouTube, Facebook and Instagram. For serious video work, you'll want to copy the original files off the card and import them into a 4K video editor such as Final Cut or Adobe Premiere, of course.

### Verdict

DJI has delivered on its bold claims: the Phantom 3 is by far the best consumer quadcopter we've seen. It's stable and produces stunning video footage. Its range goes beyond what most consumers will need and the only extra requirement out of the box is a compatible iOS or Android device to use with the controller. The Professional model is fairly expensive at over £1,000 online, but those who don't need 4K can save (and still be happy) with the Advanced model for under £800. **✉ Jim Martin**







Photography by Dominik Tomaszewski



# HIGH-END GRAPHICS CARDS

If you want high-end performance, **Paul Monckton** looks at six of the best graphics cards money can buy

**W**hatever your budget, there's a bewildering array of options when it comes to graphics cards. Multiple variations on a theme from each vendor, coupled with impenetrable acronyms and an unpronounceable product names can make choosing one a daunting task. But, stick to a few guidelines and the whole process becomes a lot easier.

Here we look at high-performance enthusiast cards for gamers willing to spend on a graphics card anything, with prices ranging from around £290 to as much as many users might consider spending on a PC. Budget then, will be your first constraint.

Coming in at the bottom of our enthusiast price range, we have the GeForce GTX 970 from nVidia and AMD's slightly newer Radeon R9 390 GPUs, priced at around the £290 mark. We don't have any of the older, but still current GTX 970 products featuring in the group test this time around, but you can check our previous reviews for more details of those at [pcadvisor.co.uk](http://pcadvisor.co.uk). Either of these GPU types will provide smooth gameplay, with high quality graphics settings at reasonably high resolutions. You may even get away with some 4K gaming, although we wouldn't recommend aiming for a 4K gaming rig at this level.

Increasing your expected outlay by between £70 and £120 will get you a Radeon R9 390X or an nVidia GTX 980. In this price bracket, we would definitely recommend

the nVidia card. It is rather more expensive than the AMD-based cards, but we feel the performance boost of an R9 390X over the standard R9 390 often isn't enough to justify the price premium. Thankfully R9 390Xs are often discounted as a result, so you may still find a good deal.

Spending over £500 will get you an nVidia GTX 980 Ti, a very different beast from the standard GTX 980, an AMD Radeon R9 Fury or its more powerful liquid-cooled sibling the Radeon R9 Fury X. Many gamers won't need a card with this level of performance, but high-quality gaming at 4K resolution, 3D, Virtual Reality, high refresh-rate displays and multi-monitor setups can all demand a huge amount of processing power, and in those situations these high-end cards are there to provide the grunt. Don't worry, there are plenty of excuses you can use to justify your expensive purchase.

Where it gets more complicated is that not all graphics cards based on a particular GPU are created equal. Individual manufacturers will modify the reference designs in a variety of ways, adding features and boosting performance along the way.

Most graphics cards can be overclocked to some extent, and the amount of overclocking available can be greatly increased through the use of upgraded components and powerful custom cooling systems. The better-designed graphics cards

will come from the factory pre-overclocked to take advantage of the improved hardware, and this is why we start to see differences in performance between graphics cards using the same GPU types. Sometimes speed boosts are negligible, but on occasion a more radical redesign can achieve larger speed boosts, taking the graphics card into the same territory as non-overclocked cards from the next tier above. Factory overclocked cards can often therefore deliver excellent value for money.

Most graphics card vendors have a naming system they use for each type of GPU, which describes the additional features of the boards. For example, MSI refers to its current dual-fan heat pipe cooler as TwinFrozr V. An efficient cooler will allow the underlying components to run faster without overheating, giving you increased frame rates. But it's also important to consider the noise output from the fans. The best examples will remain quiet and even turn off altogether until required, meaning your gaming PC and be just as useful for listening to classical music as it is for first-person shooters.

The choice between AMD- or nVidia-based graphics cards can be tricky, but if you have a good idea of which games you want to play, you will notice that many of them are optimised better for one vendor's GPUs than the other. This may be enough to sway your decision.



## ASUS GEFORCE GTX 980Ti STRIX GAMING

**£639** inc VAT • [asus.com/uk](http://asus.com/uk)

Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★☆
Overall	★★★★★

**PC ADVISOR**  
BEST BUY

Based on nVidia's GeForce GTX 980 Ti GPU, the Asus Strix GTX 980 Ti is one of the fastest graphics cards available. Despite the '980' denomination, a GeForce GTX 980Ti bears closer resemblance to nVidia's current flagship, the Titan X, than it does to a standard GTX 980. The Titan X is admittedly faster, but also includes features such as 12GB of RAM, which far exceeds the requirements of today's entertainment software. It's also prohibitively expensive for most.

By taking the Titan X Maxwell G200 architecture, trimming down the number of cores by a little less than 10 per cent, and then halving the amount of available memory to a still-spacious 6GB, nVidia has produced a graphics card close in performance to the Titan X, yet with a price point nearer to the standard GTX 980. The 980 Ti also retains the same memory and core clock speeds as the Titan X.

However, this level of performance is just a starting point for the Asus GTX 980 Ti Strix OC, which makes many significant improvements over Titan reference design.

Compare the Asus Strix design to a standard board and you'll immediately notice the size difference. The Asus card is bigger, taller and heavier and also comes fitted with three fans and a seriously beefy dual 10mm heat pipes. Asus calls this design Direct CU III and boasts 30 percent cooler operation, while operating three times quieter than the reference model. This is achieved using a new patented 'triple-wing blade OdB' fan design.

The card is constructed using Asus's new automated process, which removes all human involvement from the production line. Asus claims this has improved manufacturing tolerances, which should lead to more efficient and consistent overclocking from board to board. Holding the board in our hands we can certainly say that it looks and feels like a premium product, both in terms of its styling and it's excellent build quality, you're also treated to a pulsating light display from the illuminated Strix logo on the side of the board. Two 8-pin PCI-Express power connectors are required, each, which cause an LED to glow white when connected. If the correct power connections are not made, you get a red LED instead.

### Performance

Of course, none of these modifications are of any value unless they provide performance to match, and here the Strix GTX 980 Ti doesn't

disappoint. Flip the Asus card into its high-performance OC mode and it increases base and boost clocks from 1000- and 1075MHz, to 1216- and 1317MHz respectively. That's a performance boost of around 22 percent. Even in its default 'Gaming' mode, it runs around 20 percent faster than the reference design. It's 7200MHz memory clock also outruns the competition, albeit by a lesser percentage.

As you might expect, this level of performance results in some very impressive frame rates. Gaming at 4K resolution is a tall order for most single-card setups, but the Asus Strix GTX 980 Ti has a jolly good stab at it. Alien Isolation, for example, runs with a convincing average frame rate of 71fps with ultra quality settings on our test rig. Zotac's GeForce GTX 980 Ti Amp! Edition also turned in an average frame rate above 60fps, but the extra headroom afforded by the Asus card gives you more flexibility with quality settings and fewer frames below that threshold speed.

The most demanding 3DMark Fire Strike Ultra test recorded a score of 4591 points, more than 500 points clear of the Zotac card. You won't be able to play everything at 4K, though this card will let you play at higher resolutions and at higher quality settings than just about anything short of a GeForce TITAN X. Even those without Ultra High Definition displays can benefit from the increased performance of this card as it will provide the increased framerates necessary to drive 144Hz gaming monitors with high quality settings, while standard monitors can benefit from nVidia's Dynamic Super Resolution technology to scale down 4K frames to lower resolutions, resulting in improved image quality.

Despite its blistering speed, the Asus card remains very quiet. Even under torture the conditions, the fans never exceeded 47 percent of their maximum speed while holding the GPU temperature at a maximum 80°C.

Even better, the cooling fans won't spin at all until the core temperature reaches the mid sixties Celsius, rendering the card completely silent. Asus claims that even some games such as League of Legends and Starcraft can be run with only passive cooling, giving you that rare combination of a powerful gaming PC which is also quiet.

Being a high-end enthusiast product, the board also comes with software to help you fine-tune the performance. Using Asus GPU Tweak II, you can select from three preconfigured performance



modes or create your own profile. Here you can adjust clocks and fan speeds as you wish. The software also comes with a one-year licence for XSplit Gamecaster, which allows you to record and stream your gaming sessions while applying annotations and overlays. It also lets you adjust your clock speeds on the fly without leaving your game.

**VERDICT:** Despite the high asking price, the GTX 980Ti Strix Gaming offers considerable value for money to those who can afford it. It may cost over £100 more than many other cards based on the same GPU, but its tangible performance benefits and superb build quality make it obvious where that extra money is going.



## CLUB 3D RADEON R9 390 royalQueen

**£289** inc VAT • club-3d.com

Build	★★★★☆
Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★☆

**PC ADVISOR**  
RECOMMENDED

For performance on a budget, it's hard to beat the Radeon R9 390. Launched as AMD's answer to the phenomenally popular nVidia GeForce GTX 970, it's a serious challenger that offers excellent bang for the buck, as well as double the amount of RAM.

You'll do better to avoid 4K gaming, but you should be able to play all the latest games at 1920x1080 and above with decent quality settings. Pushing the previous GPU harder does come at a cost - power consumption and temperatures can tend to run rather high.

This example from Club 3D, the Radeon R9 390 royalQueen, has been pre-overclocked from the standard core speed of 1000MHz to a why-did-they-even-bother level of 1010MHz, while the memory speed has been left at the standard 1500MHz. The card is cooled by a large heat sink, fitted with three fans.

### Performance

As the least expensive card in our group test, the Club 3D offers understandably lower performance when compared to cards costing more than double the price. That's not to say it's a poor performer, far from it. It's just up against much tougher competition here. For the asking price of £289, we think you're getting a great deal of performance close to the price/performance sweet spot. Our test often recorded average frame rates in excess of 60fps at 2560x1440 and, yes, occasionally at 4K, proving the Radeon R9 390 royalQueen to be a very capable card at his price point.

However, despite its relatively modest (in this group test) gaming performance, the Club 3D proved to be one of the loudest. Under FurMark stress testing, the three fans became progressively louder

with each degree rise in temperature. The cooling was effective, keeping temperatures below 70°C, but this certainly isn't a card you would select if you're hoping for a quiet setup. This is mostly due to the inherently power-hungry nature of the Radeon R9 390, which is in essence a tweaked and overclocked version of an older technology pushed harder to gain extra speed. It may seem counter-intuitive, but most of the powerful cards run much more quietly than this one. The cooler is also unusually deep, causing the card to be a little wider than normal and limiting access within the PC case.

If you fancy something a little faster, the most obvious potential upgrade to consider would be the Radeon R9 390X. Club 3D makes a royalQueen version of this too, but with a price premium of around £100, the extra performance you would gain is negligible.

If you already own a PC with AMD graphics, then a Radeon R9 390 can make a particularly cost-effective upgrade, as Radeon graphics cards can often work in tandem with previous GPU versions in a CrossFireX multi-card setup. So, if you already own a reasonably recent AMD graphics card and a compatible PC, there's a good chance you'll be able to leave it right where it is and simply plug in the royalQueen alongside it for a big boost in performance.

**VERDICT:** Noise issues aside, the Club 3D Radeon R9 390 royalQueen makes a great choice for a first enthusiast-level system. It also serves at a convenient drop-in performance boost when teamed up with an existing AMD card, even from the previous generation. Give, the low price, it probably makes more sense to buy one of these than to step up to a Radeon R9 390X.





## MSI GTX 980 GAMING 4G

**£404 inc VAT • [uk.msi.com](http://uk.msi.com)**

Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

Based on nVidia's high-performance GeForce GTX 980 GPU, this enthusiast card from MSI offers a sizeable cost saving over a GTX 980 Ti, while still delivering plenty of performance for all but the most demanding of gamers. If you like your quality settings cranked right up, then this card may be exactly what you need.

The GPU has nVidia's Maxwell architecture launched just under a year ago when both the GTX 980 and the more cost-conscious GTX 970 were both unveiled. While the GTX 970 has been a runaway hit, the GTX 980 offers quite a sizable speed boost for around £100 more. There are almost too many GTX 980-based cards available, MSI alone lists no fewer than six different versions, but the Gaming 4G is the fastest of that range. In the default 'Gaming' mode, the core runs at 1190MHz, with a boost speed of 1291MHz. Selecting 'OC' mode increases these speeds to 1216- and 1317MHz, while a silent mode reduces them to the reference clock speeds of 1127- and 1216MHz.

With this card, MSI has further built upon the reference specification by deploying upgraded electrical components, which MSI claims will offer double or even triple the lifetime of standard versions, though it should be noted that other vendors also make similar claims. The most obvious upgrade, however, is external and comes in the form of MSI's Twin Frozr V cooling system, with its pair of independently variable fans and large heat pipe cooler. Two 8-pin PCI-Express connectors are required to power the card.

MSI's bundled gaming app lets you select from different performance profiles according to your needs. The app also provides monitoring functions and on-screen overlays, so you can check your card's performance in real time, while an LED control function allows the card's illuminated logo to perform tricks in the form of a selection of flashing or pulsing effects.

Also supplied is a separate fan control app, which gives you more precise control over the card's two cooling fans. Interestingly, these fans can be controlled independently of each other and when left in auto mode will spin up and down individually as required. This app lets you override the automatic settings as you wish in order to balance cooling and noise. Much like with the Asus Strix card, the

TwinFrozr cooler is efficient enough to allow the fans to stop entirely until the GPU temperatures reach Celsius temperatures above the mid sixties. This card runs very quietly indeed, which is unusual for a high-performance model.

The third and most complex app is MSI Afterburner, an overclocking tool designed to give you full control over the operation of your graphics card while monitoring its performance. You can also download a companion app for your Android or iOS device, to control your graphics card without having to leave your current game. MSI Afterburner also works on graphics cards from other vendors, but full control over voltage adjustments is reserved just for MSI customers.

Falling in the middle of the price range of our group test, the MSI GTX 980 Gaming 4G offers a very noticeable performance boost over the less expensive cards at 1920x1080 resolution, although this gap can narrow once you try to push resolutions much higher as the less expensive AMD Radeon R9 380 and 390X cards have twice as much RAM, enabling them to work with more detailed textures required at higher resolutions. This effect varies from game-to-game, though.

Unfortunately, in a quick test of the card's OC mode showed no appreciable increase in the 3DMark score, with increases and occasional decreases in sub-scores falling well within the margins of experimental error.

This Gaming 4G card is a really good example of a GeForce GTX 980. It doesn't cost much more than a standard model, but offers many improvements not only in performance but also in cooling, quiet operation and software support. Power consumption is also kept low, enabling compatibility with less powerful system PSUs, especially if you're considering a multi-card configuration.

**VERDICT:** The MSI GTX 980 Gaming 4G is an excellent graphics card for those who want to run games at the highest quality settings, but who don't want, or can't afford a 4K setup. The factory overclock, control applications and Twin Frozr V cooler allow for full control over performance, consumption and noise output.



## SAPPHIRE TRI-X FURY OC

**£534 inc VAT** • [sapphiretech.com](http://sapphiretech.com)

Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

One step down from AMD's liquid-cooled flagship, the Radeon R9 Fury X, comes the standard R9 Fury and it's this GPU we find in Sapphire's Tri-X Fury OC graphics card.

The Radeon R9 Fury has 4GB of AMD's new High Bandwidth Memory (HBM), which uses vertically stacked memory chips to deliver a huge 512GB/s of bandwidth while making space and power savings into the bargain. HBM offers 60 percent more bandwidth than GDDR5, and according to AMD this makes up for the fact that the chips offer only 4GB of RAM where other solutions offer 6-, 8- or even 12GB.

At the same time as removing the liquid-cooler from the R9 Fury X, AMD has reduced the number of processor cores from 4096 to 3584 and the corresponding texture units from 256 to 224.

With the external liquid-cooling system of the full-strength version of the R9 Fury X gone, this version of the R9 Fury from Sapphire's substitutes in a Tri-X triple-fan heat pipe cooler capable of running passively at low loads for silent operation. This results in a far larger board than the R9 Fury X version but, provided your case has the space for it, it's much more straightforward to install. The R Fury does away with DVI ports, and this allows half of the card's two-slot thickness to serve as an air vent at the rear of the PC.

The component design of the card has enabled Sapphire to implement a small factory overclock from the standard 1000MHz core up to 1040MHz. There's also an identical-looking version of the card available, which operates at the standard 1000MHz. Of course, the factory overclock is just a starting point, and the card comes bundled with Sapphire's 'TriXX' overclocking and monitoring application. It provides the usual control over clock speeds and voltages along with the ability to save log files and provide user feedback.

### Performance

As you would expect, the Sapphire Tri-X Fury OC easily outperforms card based on AMD's lesser R9 390 and R9 390X processors, however, MSI's factory overclocked GTX 980 Gaming 4G comes very

close in many tests despite costing over than £100 less. On exception is in Grand Theft Auto 5, where the Tri-X Fury OC's 4K performance is considerably better. AMD is touting the Fury series of cards as ideal for 4K and VR use and our test results would back this up, although for truly smooth ultra-quality 4K you would still need a dual-card setup to run more challenging titles.

The Sapphire Tri-X Fury is a very quiet-running card. Keeping the fans switched off until required enabled it to run silently until higher temperatures are reached. In our stress tests, fan noise remained unobtrusive until the card reached around 78°C where it started to become louder as it worked harder to keep temperatures down. Despite being a hugely powerful card, it's much quieter in operation than many less powerful ones, notably the Club 3D Radeon R9 390 royalQueen.

The card jostled for superiority with MSI's overclocked GeForce GTX 980 in our tests and is available at a similar price if you shop around, although it can't match either of the GTX 980 Ti-based card which admittedly cost rather more. The best card for you will vary depending on how your favorite games are optimised and whether you want to use GPU-specific features such as Freesync or multi-card setups. We've also yet to see how the cards will stack up when running future games written to the DirectX 12 API.

Unlike the R9 390 chips, the R9 Fury is different enough to be incompatible with the former GPUs and can't therefore be combined with them in a multi-card setup, so you'll have to start again from scratch if you're hoping to upgrade from a previous AMD GPU. Of course, the R9 Fury offers a lot more power to start with and is less likely to need doubling up.

**VERDICT:** The Sapphire Tri-X Fury OC is a well-designed card, with a quiet and efficient cooling system enabling silent operation when games aren't being played. It's a big improvement over an R9 390X but not up to the performance level of an nVidia GeForce GTX 980 Ti. However, it's also considerably less expensive and the full potential of AMD's latest technology is possibly yet to be realised.



## XFX RADEON R9 390X DOUBLE DISSIPATION CORE EDITION

**£309** inc VAT • [xfxfire.com/en-gb](http://xfxfire.com/en-gb)

Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

AMD's Radeon R9 390X is a higher-performance take on the Radeon R9 390 designed to go up against nVidia's GeForce GTX 980. XFX's Radeon R9 390X Double Dissipation Core Edition embellishes the reference design with furnishes the GPU with the twin fan heat pipe cooler which gives the card its name.

With the Radeon R9 390X, AMD aims to cater to the needs of high resolution gaming above 1080p resolutions. This means that smooth playback should be achievable at 2560x1440 and above.

Unlike many graphics cards featuring sophisticated third-party coolers, the XFX card runs at the stock core clock speed of 1050MHz, making it the only card in our group test that hasn't been factory overclocked. This should be kept in mind when viewing the performance figures as we haven't attempted to overclock the card manually. This is a slightly faster clock speed than a standard Radeon R9 390 and the performance is further increased by increasing the number of stream processors from 2560 to 2816, although the memory performance remains unchanged.

### Performance

Therefore, this R9 390X-based XFX card does outperform the R9 390 royalQueen from Club 3D, but only by a very small amount. In our tests, the gap is often only a few frames per second. For example, we see the R9 390 product achieving an average of 182.11fps from Alien Isolation at 720p Ultra, while the R9 390X of the XFX card improves this to only 190.63.

Also, the XFX model runs considerably quieter and, at the time of writing, can be found for only £21 more, making it a pretty good deal in our books. The XFX Radeon R9 390X Double Dissipation Core Edition is undoubtedly the better card and in the end it's not just about raw frame rates.

On the other hand, stepping up to the MSI GTX 980 Gaming 4G would gain you only a little more speed, but cost you an additional £100. If the XFX R9 390X card had been pitted against a standard GeForce GTX 980 it would have been a closer fight, with the AMD card occasionally coming out on top, but the overclocked cores MSI board help it to hold onto its lead.

The Radeon R9 390X comes as standard with a huge 8GB of RAM as compared to 4GB on the nVidia GeForce GTX980. There aren't many games which can take advantage of this currently, but there's still potential for the AMD card to make some gains with future titles. The XFX card lacks the finesse and application support of some of the competition but we feel it mounts a successful challenge to the GTX 980.

**VERDICT:** The XFX Radeon R9 390X isn't always a good value for money option when compared to a standard R9 390, but find this card at the right price and it's one of the better examples thanks to its Double Dissipation cooler, although it's still noisier and slower than the more expensive GPUs. Steer clear of 4K resolution and this card will serve you well.





## ZOTAC GEFORCE GTX 980 Ti Amp! Edition

**£532** inc VAT • [zotac.com/uk](http://zotac.com/uk)

Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

Zotac's GeForce GTX 980 Ti Amp! Edition is a factory-overclocked card based on nVidia's superb GeForce Ti GPU. This card uses Zotac's 'IceStorm' cooler, which has a trio of 90mm fans to help keep temperatures down and noise output low.

The GeForce GTX 980 Ti is a cut-down version of nVidia's flagship GPU, the Titan X, which retains most of the performance of the latter, while shedding half of its 12GB RAM and 256 of its processor cores, bringing the total down to 2816. Current games have difficulty filling 6GB of RAM, so halving the memory translates into a pure cost saving for the customer.

By treating the standard core and memory clocks to a moderate speed bump from 1000MHz (base), 1075MHz (boost) to 1051- and 1140MHz respectively, Zotac has given you a head start on unlocking the full potential of the board via DIY overclocking. We tested the card at this speed as it's the minimum performance you're guaranteed to get, but you'd be unlucky not to be able to achieve a little better than this through further tweaking.

To boost performance further, you can use Zotac's supplied Firestorm overclocking application. It offers control over the usual parameters, such as clock speeds, though we found it a little less user-friendly than its competitors, due to its baffling design. Issues include unexplained icons, some of which seem to do nothing when pressed. We would recommend ditching it for a third-party utility were it not for the Quick Boost button, which instantly overclocks the base core speed to 1101MHz and the boost speed to 1190MHz.

In our tests, the Zotac GeForce GTX 980 Amp! Edition performs well, as you would expect given the £532 price tag, and it leaves most of the competition behind. The Zotac card achieves an average frame rate comfortably over 60fps in 4K with Ultra settings when playing Alien isolation and is therefore an excellent choice for gamers looking to venture into Ultra High Definition setups. It also ran quietly under stress testing, though not as quietly as the Asus Strix GTX 980 Ti or the Sapphire Tri-X Fury.

However, even in its fastest modes, the Zotac card is comprehensively outclassed by the Asus Strix GTX 980 Ti, which performs almost as though it had a different class of GPU altogether. There is, however, a large price difference and we feel the Zotac card will offer more than enough performance for the majority of gamers.

There's every chance you'll be able to achieve much faster performance out of the Zotac GTX 980 Ti Amp! Edition by using the Firestorm application, but if you'd rather spend a your money than your time, you can opt for the Zotac GTX 980 Ti Amp! Extreme edition, which is pre-overclocked even higher than the Asus GTX 980 Ti Strix OC at roughly the same price.

Not to be sniffed at is the card's five-year warranty, which is two years longer than the best of the competition.

**VERDICT:** The Zotac GTX 980 performs well and comes at a reasonable price. It's not as impressive as the Asus Strix GTX 980 Ti, but buying the Zotac model will net you a large cost saving that can't be ignored.



## Conclusion

All of the graphics cards reviewed here offer good value for money, regardless of where they fit in the price range. With DirectX 12 games just around the corner, it's hard to predict how the current crop of graphics cards will perform, but if you need to buy a card now, there are plenty of great options.

At £288, the obvious budget choice is Club 3D's Radeon R9 390 royalQueen. It's noisy and a little power hungry, but it delivers good performance for the money, raising the question whether it's worth spending any more on the higher-performing Radeon R9 390 X.

In the middle of the price range there are more options and fewer clear winners. Although, you tend to get what you pay for, the MSI GTX 980 Gaming 4G has a lot to offer, including very quiet operation and a good selection of utility software.

If money is no object, the Asus Strix GTX 980 Ti comes out streets ahead of the competition. With a huge factory overclock, superb build quality and excellent application support it's in a class of its own. Despite being by far the fastest card on offer here, it's capable of operating completely silently when not running games.

	<b>ASUS</b> <b>£639 inc VAT (£532 ex. VAT)</b> ★★★★★ <b>PC ADVISOR</b> BEST BUY	<b>CLUB 3D</b> <b>£288 inc VAT (£240 ex. VAT)</b> ★★★★★ <b>PC ADVISOR</b> RECOMMENDED	<b>MSI</b> <b>£404 inc VAT (£336 ex. VAT)</b> ★★★★★	
Model name	Strix GTX 980 Ti	Radeon R9 390 royalQueen	GTX 980 Gaming 4G	
Memory	GDDR5 6GB	GDDR5 8GB	GDDR5 4GB	
Chip	nVidia GeForce GTX 980 Ti	AMD Radeon R9 390	nVidia GeForce GTX 980	
GPU	Maxwell G200	Grenada Pro	Maxwell G204	
Manufacturing process	28nm	128nm	28nm	
Max core clock	OC mode: 1216MHz (base); 1317MHz (boost). Gaming mode (default): 1190MHz (base); 1291MHz (boost)	1010MHz	1216MHz (base) 1317MHz (boost)	
Standard memory clock (DDR effective)	7200MHz	6000MHz	7010MHz	
Memory bus	384-bit	512-bit	256-bit	
Stream processors	2816	2560	2048	
Texture units	172	160	128	
ROPs	96	64	64	
3D API support	DirectX 12, OpenGL 4.5	DirectX 12, OpenGL 4.4, Vulkan, Mantle	DirectX 12, OpenGL 4.4	
Outputs	3x DisplayPort 1.2, 1x HDMI 2.0, 1x DVI-D	1x DisplayPort 1.2, 1x HDMI 1.4, 2x DVI-D	3x DisplayPort 1.2, 1x HDMI 2.0, 1x DVI-D	
Cooling system	DirectCU III 3 fans + heatpipes	CoolStream 3 fans + heatpipes	Twin Frozr	
Power connectors	2x 8-pin PCIe	1x 8-pin, 1x 6-pin PCIe	2x 8-pin PCIe	
Power consumption (2D desktop/full load)	74-/372W	75-/362W	74-/293W	
Warranty	3 years	2 years	3 years	
FRAMERATES				
Alien Isolation (4K Ultra)	71.03	47.6	50.28	
Alien Isolation (720p Ultra)	333.97	182.11	161.74	
Bioshock Infinite (4K Ultra)	40.74	14.46	32.48	
Bioshock Infinite (720p Ultra)	34.94	15.68	33.95	
Thief (4K Ultra)	37.7	24.9	27.4	
Thief (1080p Ultra)	60.2	56.1	57.7	

## How we test

To test the graphics cards in this group test, we built a high-performance PC. It was designed to eliminate any CPU bottlenecks that may slow down the performance of the fastest graphics cards. Testing is carried out under Windows 10 Pro 64-bit, with a disk image that is restored before testing, to ensure that all cards are using the same Windows configuration. We use the latest graphics drivers available to ensure we have the latest optimisations in place.

Graphics benchmarks will change as new games become available and older ones fall out of use, but for now we use Alien Isolation, Bioshock Infinite and Thief. Each of these is run at a variety of resolutions and quality settings, picked as appropriate for the category of graphics card under test. (We don't attempt to test low-end cards at 4K for example).

We also measure the total power consumption of the PC while idling at the desktop, and with the graphics card fully loaded by running FurMark. Testing is carried out using an AOC U2868PQU monitor, which allows for display resolutions up to and including 4K UHD at 3840x2160 pixels. Our test PC's specification is as follows:

**Motherboard:** Asus X99-A


**Processor:** Eight-core Intel Core i7-5960X overclocked to 4.2GHz

**CPU cooler:** Corsair H100i GTX

**Power supply:** Corsair RM1000

**Memory:** 16GB Kingston HyperX Predator DDR4

**Storage:** Crucial CT500MX

Our thanks go to Asus, Corsair, Crucial, Intel and Kingston for supplying the components. 

<b>SAPPHIRE</b> £450 inc VAT (£375 ex. VAT) ★★★★★	<b>XFX</b> £309 inc VAT (£257 ex. VAT) ★★★★★	<b>ZOTAC</b> £532 inc VAT (£443 ex. VAT) ★★★★★
<b>Tri-X Fury OC Version</b>	<b>Radeon R9 390X Double Dissipation Core Edition</b>	<b>GeForce GTX 980 Ti Amp! Edition</b>
HBM 4GB	GDDR5 8GB	GDDR5 6GB
AMD Radeon R9 Fury	AMD Radeon R9 390X	nVidia GeForce GTX 980 Ti
Fiji Pro	Grenada XT	Maxwell G200
28nm	28nm	28nm
1040MHz	1050MHz	11051MHz (base), 1140MHz (boost)
1000MHz effective	6000MHz	7010MHz
4096-bit	512-bit	512-bit
3584	2816	2816
224	176	172
64	64	96
DirectX 12, OpenGL 4.4, Vulkan, Mantle	DirectX 12, OpenGL 4.4, Vulkan, Mantle	DirectX 12, OpenGL 4.4
3x DisplayPort, 1x HDMI	1x DisplayPort 1.2, 1x HDMI 1.4a, 2x DVI	3x DisplayPort 1.2, 1x HDMI 2.0, 1x DVI-D
Tri-X	DD Fansink (twin fans + heat pipes)	IceStorm (triple fans = heat pipes)
2x 8-pin PCIe	1x 8-pin, 1x 6-pin PCIe	1x 8-pin, 1x 6-pin PCIe
76-/440W	80-/356W	74-/357W
2 years	2 years	5 years
56.41	48.86	63.72
202.65	190.63	303.58
13.69	14.11	35.73
15.41	15.76	38.49
26.6	27.8	35.4
55.6	56.1	63.1



# DSL ROUTERS



Photography by Dominik Tomaszewski

**Orestis Bastounis** puts seven of the latest 802.11ac-compatible routers through their paces

**O**ut of all the tech kit in your home, you probably pay little attention to your router. But the humble router is arguably the most important piece of computer equipment. Hidden inside that unassuming plastic box, a combination of hardware and software sorts and delivers every last piece of data that flies around your home network as fast as possible.

Your router handles everything you do online, from browsing the web to streaming music and playing online games. Plus, it has to deal with more devices than ever before: phones, tablets, PCs, thermostats, cameras, audio systems, set-top boxes, games consoles, printers, network storage devices: the list is almost endless.

But what makes a good router? Most devices connect via Wi-Fi, so you'll want a router that's capable of delivering strong wireless signal, right to the borders of your property. The 802.11ac wireless standard is the latest and blisteringly fast, but relatively few phones and other devices support it and have to make do with 802.11n over either 2.4GHz or (faster) 5GHz channels.

The number of internal or external antennas in a router affects the number of wireless streams it's capable of handling, and therefore its corresponding performance. For 802.11ac, each stream can handle 433Mbit/s of data, and the most common triple-stream 3x3 models are capable of 1300Mbit/s, although real-world speeds never come close to this theoretical figure. You also need a 'client device' that supports that speed. The vast majority of laptops have 2x2 Wi-Fi, but even at the slower speeds, 802.11ac is far better than its predecessors.

Routers do more than wireless networking though. Their built-in software gives you complete control over your network, with features like quality-of-service (QoS), which is used to manage the bandwidth each computer is allocated, plus parental controls, useful to prevent the kids from using Facebook when it's homework time for example.

With USB ports now commonly found on routers, you can turn your router into a NAS simply by attaching a USB disk. Some models even let you specify which users can access

certain folders on the disk, and some even provide a download manager for torrents and other files. Some routers let you use the USB port for a 3G/4G dongle for backup in case your broadband connection goes down.

Routers generally fit into two categories – those with and without integrated modems. If you subscribe to Virgin Media's cable service, you'll have to connect your router to the Virgin SuperHub, but with any other provider, such as BT, Sky or TalkTalk, your broadband service will be delivered over copper wire, via either ADSL or VDSL fibre. In that case you want a router with a built-in modem (as opposed to a 'cable' router) as this will allow you to ditch the router your ISP gave you.

It's this latter type we're focusing on here, with seven 802.11ac routers with integrated DSL modems on test. You don't strictly need 802.11ac support, but it makes no sense to save a few quid and buy an 802.11n router since opting for 802.11ac now means your purchase is much more future-proof. Many more phones and other wireless devices are starting to come with 802.11ac Wi-Fi support.



## ASUS DSL-AC68U

**£139** inc VAT • [asus.co.uk](http://asus.co.uk)

Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

**PC ADVISOR**  
RECOMMENDED

Asus sells a number of 802.11ac routers, each offering a slightly different set of features. The DSL-AC68U is the company's 3x3 MIMO (Multiple Input Multiple Output) model, which supports speeds up to 1300Mbit/s over 802.11ac and has a built-in VDSL/ADSL2+ modem. It looks identical to Asus' RT-AC68U - a black box with a 'chequerboard' cover and three giant antennas protruding from the top.

The router supports 600Mbit/s 802.11n speeds thanks to Broadcom's TurboQAM feature, but it's unlikely you'll see the benefits, since without a TurboQAM-compliant adaptor in your client PC, of which there are very few on the market, you'll be limited to the usual 450Mbit/s. There's a single USB 3.0 port for external storage or printer connections, while inside is a dual-core processor.

The true killer feature is the Asus WRT onboard software, which makes the DSL-AC68U stand out from its competitors. It's fast and responsive, easy to use and full of useful features, some of which aren't offered by any other router.

For starters, Asus has struck the right balance of usability and advanced features. The front page greets you with a clear overview of the status of your network, allowing you to quickly see which devices are connected: your WAN IP, wireless networks, and so on. A notification system in the upper-right corner indicates when a firmware update is available, or reminds

you to change the default login password, with a clickable link that takes you to the right setting to adjust it.

The rest of the router settings are then easy to find via a clearly labelled menu on the left, and if you need to adjust more advanced settings, a set of tabs at the top keep these hidden away. If you need more help, a link to the full manual is provided at the bottom of every page.

It's also worth mentioning the Download Master software, which works when USB storage is attached. It means you can leave the router to download torrent files without leaving your PC switched on.

The DSL-AC68U performed well in our tests, almost hitting average speeds of 600Mbit/s at short range over 802.11ac. Its 802.11n performance is also good, especially over 5GHz at long distance. That said, it didn't top our performance charts. The AVM Fritz!Box 3490 and TP-Link Archer VR900 both performed slightly faster at both short range and longer distance, although you're unlikely to be disappointed by the wireless performance of the DSL-AC68U, as it's still very fast.

**VERDICT:** The Asus DSL-AC68U is a great modem router, with excellent software and decent performance.



## AVM FRITZ!BOX 3490

**£135** inc VAT • [en.avm.de](http://en.avm.de)

Build	★★★★☆
Features	★★★★★
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★★

**PC ADVISOR**  
BEST BUY

The Fritz!Box 3490 sits right in the middle of AVM's product line-up, as a triple-stream 3x3 MIMO router, with a built-in ADSL/VDSL modem. It lacks the digital telephony features of the more expensive 7490 model, but pretty much everything else is the same.

The router comes in a red and silver chassis that sits horizontally, with the antennas hidden underneath fins on the top, which give a streamlined look to the router. We can't think of any other bright red networking product, and it's an unmistakable design for AVM, as every Fritz!Box looks almost identical.

The 3490 has two USB 3.0 ports, a single phone socket and four ethernet ports. By default, these are set to power-saving mode, and run only at speeds of 100Mbit/s rather than gigabit, a setting that you'll have to change in the software.

AVM was one of the first companies to treat its software as an integral part of the product rather than an afterthought, as was once the case with the majority of networking hardware. Other router manufacturers have now caught up and put considerably more effort into their software design, however, AVM's Fritz! OS software is still impressive compared with much of the competition.

The overall software design is excellent. The router setup process is straightforward and logical, and there are some nifty extra features. For example, the router scans for nearby wireless networks,

so you can choose a channel that is less congested. Although it doesn't cater for the absolute least technical users possible, as the TalkTalk Super Router and BT Home Hub do, we think the 3490 is still intuitive to set up.

With previous AVM Fritz!Box routers, we've found that wireless performance has slightly let them down. This isn't the case with the 3490 though, which delivers blisteringly quick wireless speeds. Breaking 600Mbit/s average speeds over short-range 802.11ac and 130Mbit/s over 802.11n propels it to second place in the overall performance charts.

AVM has also put considerable effort into reducing the power consumption of the 3490. The options for low-power ethernet and wireless modes are in addition to the generally low overall power consumption we measured – just 4.8W. This is under half the amount used by the other routers we've tested in this group test, and a potentially important consideration for a device that most people will leave running all the time.

**VERDICT:** Put it all together and the AVM Fritz!Box 3490 is a very strong offering. Great performance, great software, a good range of features and plenty of room for expansion with external storage. A winning combination.





## BT HOME HUB 5

**£45** inc VAT for existing customers (Free, new contract) • [shop.bt.com](http://shop.bt.com)

**£129** inc VAT for non-BT customers • [shop.bt.com](http://shop.bt.com)

Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

BT has stuck with the same design as the Home Hub 4. The only cosmetic change is a blue stripe across the front of the router instead of a black one. All the routers buttons, lights and ports are located in exactly same position. BT Infinity customers can get their hands on a Home Hub for free when upgrading to an Infinity package or when they renew their contract. Alternatively, the router can be purchased from BT for a one-off £45 fee, which is very cheap if you're an existing customer - otherwise it's £129.

Setting up the Home Hub 5 is easy. If you've got an older model, you simply swap the routers around and use the new wireless SSID and password assigned to the router. Otherwise it's a quick four-stage setup, which you carry out in your browser. This allows you to set up things such as parental controls, which are enabled for everyone, so don't use them.

On the face of it there's no major reason to upgrade to the Home Hub 5, but it does have a number of internal upgrades, which might make it worth your while. For starters, the four ethernet ports on the back of the Hub 5 are now all gigabit. This is good news for anyone who plugs multiple devices into their existing router. BT's device is also a consolidated VDSL modem and router, which in simple terms negates the need for a Home Hub router and a separate Openreach network box for fibre-optic broadband. It means

you only need one device instead of two - saving space, plug sockets and power. You plug the router straight into the wall socket; however, this isn't made clear in the booklet, which is sent out with the Home Hub 5 or available from BT's website.

Upgrading to this router doesn't mean that your internet speeds will get any better. We didn't see any difference in our tests using speedtest.net with Infinity 2 in ping and upload, though we recorded a small boost in download - only a few Mbit/s though.

Like its predecessor, the Home Hub 5 has dual-band (2.4- and 5GHz) Wi-Fi, but also offers the latest 802.11ac technology and 3x3 MIMO. Smart wireless means the device will choose which channel to use automatically (ideally one that isn't being used by nearby routers), although you can go into the settings and manually choose this if you wish. It managed this during our tests and the web user interface is easy to use if you fancy tweaking the Hub's settings.

We found performance over 11ac to be decent, but not as good as the competition in this group test. While close range speeds were good on both 2.4- and 5GHz, the Home Hub 5 dropped off more than others when the distance was increased to 10- and 20m.

**VERDICT:** The Home Hub 5 is the cheapest 11ac router we've seen and it comes with performance to match its value and good features.



## LINKSYS XAC1900

**£179** inc VAT • [linksys.com/gb](http://linksys.com/gb)

Ease of use	★★★★☆
Features	★★★★☆
Performance	★★★★★
Value	★★★☆☆
Overall	★★★★☆

The XAC1900 takes a unique approach to the integration of its DSL modem, as it's built into the power supply rather than on the router itself. This could be useful for hiding cable clutter, but it also makes life easier for Linksys, which can churn out the same chassis for various router models, either with or without the DSL modem.

This modem is, however, ADSL2+ only, so it won't support faster fibre connections. This is a shame because the XAC1900 is otherwise a good router. It supports 600Mbit/s speeds over 802.11n and 1300Mbit/s over 5GHz 802.11ac, with dual SSIDs.

The main unit sits horizontally, with a Linksys logo that glows white when the router is powered on. There's a USB 3.0 and a USB 2.0 port at the rear along with three short and stubby external antennas. When testing, we noticed that no matter how securely we tightened the antennas, they always seemed to work loose.

Although Linksys isn't the only router company to offer remote access, it's integrated particularly closely to the XAC1900. Called Linksys Smart Wi-Fi, anything you can do locally can be performed remotely as well. Importantly, this option can be turned off if you'd rather not open a hole in your router's security. If you're still worried about your privacy, Linksys partly reassures customers via its web page that none of your router settings are stored on its servers, except for the login and password.

When it comes to the software, Linksys has paid special attention to a clean, crisp layout, with a widget-based UI system. The front page shows at-a-glance information about your network - the number of connected clients, external storage, and so on. The QoS (Quality of Service) setting is also easy to use, with a drag-and-drop interface to prioritise connected clients.

The XAC1900's performance was superb during our tests, and we recorded some impressive results. It managed the highest short-range performance in this group test - 650Mbit/s over 802.11ac at 3m and over 150Mbit/s over 2.4GHz 802.11n. These are potentially record-breaking results from a 3x3 MIMO router. Ranged performance and 5GHz 802.11n results were also very good.

The lack of VDSL support lets down the XAC1900, but it's otherwise an excellent product, although at £179 it's also rather expensive. When 802.11ac routers first went on sale, some were as much as £200, but prices have come down since. It seems that Linksys hasn't realised this and it's charging a fair amount more for its DSL router than its competitors do for theirs.

**VERDICT:** We'd think carefully before buying the Linksys XAC1900. It's a great performer, and the software is really good, but it lacks VDSL support yet still costs more than other routers.



## NETGEAR D6400 AC1600 WI-FI VDSL/ADSL

**£124** inc VAT • [netgear.co.uk](http://netgear.co.uk)

Build	★★★★★
Features	★★★★☆
Performance	★★★★☆
Value	★★★★★
Overall	★★★★☆

Netgear has two distinct router lines. Its 'Nighthawk' series of premium cable routers are the more powerful, with giant external antennas, and one model, the R7500, offering 4x4 MIMO quad-stream 802.11ac for the fastest possible speeds. The D6400 is part of a more down-to-earth line-up though, with internal antennas, a slightly cut-down specification and a considerably lower price.

The front of the device has a plastic covering that's so reflective it's almost a mirror, and it attracts fingerprints as easily as the average glass smartphone screen. At the bottom there's a bright purple band, which serves no purpose whatsoever, other than complimenting the black design. The edges are sharply angled and the rear of the chassis is covered in triangular holes (usefully doubling up as air vents).

There's another minor addition. Most DSL routers lack a fifth ethernet port for WAN connections, which you might require if you switch provider and need to use an external modem. Netgear has thought of that and usefully provides both a WAN port and a standard RJ11 DSL connector.

The D6400 is slightly more affordable than a lot of DSL routers, but in cutting the costs, a few features have been cut as well. The two USB ports on the side and rear are only USB 2.0 rather than 3.0, and although the D6400 offers full 3x3 MIMO 802.11ac for speeds up

to 1300Mbit/s, it only supports 300Mbit/s over 802.11n. Otherwise, it has 128MB of memory, a dual-core processor and 128MB of RAM.

Netgear's Genie software works well, with a sparse-looking interface, but all the usual features are there. The main page gives you an overview of the status of the wireless network, DSL connection, parental controls, attached USB storage and a network overview. The ReadyShare software makes it pretty simple to set up a shared folder on attached drive.

When it came to testing, we expected to see 802.11n results from the D6400 that came out slightly worse than other models. Performance at 2.4GHz was nothing special - at short range it didn't even reach 100Mbit/s, but it fared better with 5GHz 802.11n. Its performance was nowhere near the bottom of the pack, with some excellent speeds at range. It didn't do too well with 802.11ac though, with some middling speeds at short range, although its results at 20m distance look better. None of these results are terrible though, and as we stated earlier, 802.11ac speeds still trump older standards.

**VERDICT:** With both reasonable performance and pricing, the D6400 isn't a router for speed freaks who expect to be transferring hundreds of gigabytes of files across to a NAS wirelessly on a regular basis, but it works well as an entry-level 802.11ac DSL router.





## TALKTALK SUPER ROUTER

**£125** inc VAT • [talktalk.co.uk](http://talktalk.co.uk)

Ease of use	★★★★★
Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆
Overall	★★★☆☆

As a DSL router that comes as part of TalkTalk's fibre broadband package, the new 802.11ac Super Router is a substantial upgrade over its 802.11n-only predecessor. It's manufactured by Chinese electronics giant Huawei and is a reengineering of that company's HG633 model, loaded with custom software aimed at making the setup process as straightforward as possible.

The Super Router is the second 802.11ac router from TalkTalk, with the HG635 model preceding it. One major difference between the two is that TalkTalk has decided to revert from gigabit ethernet ports back to 100Mbit/s fast ethernet with this model. Although a USB 3.0 port is included at the rear, we'd be happy for TalkTalk to have ditched this feature and stuck with faster ethernet speeds.

But generally, ISPs are more concerned about ease of use than blistering performance or advanced features, and this is especially evident with the Super Router. Everything about it is designed to make connecting to the internet as straightforward as possible. The manual goes into lengthy detail about how to connect your phone line to the router, with plenty of diagrams to show which leads plug into the ports on the back, how to install telephone splitters, and so on. In this respect, TalkTalk has done a great job with the software, as it holds the user's hand at every point in the process and is unlikely to scare less technically minded users.

Aside from the slower ethernet ports, there's also a reasonable feature set on offer. Along with its VDSL modem, it offers 802.11n over both 2.4- and 5GHz and 3x3 MIMO 802.11ac.

Due to the focus on simplicity, the Super Router only outputs a single wireless SSID, which can be either set to automatically detect what its connected clients are capable of, or manually forced to use a certain wireless standard. This makes a lot of sense. A single SSID can be much simpler to manage, but more technically advanced users are certain to prefer the additional flexibility of dual wireless networks as a way to ensure you connect at certain speeds.

In order to test TalkTalk's router, we directly connected both our test machines via wireless to overcome the limitation of the ethernet ports. From our results we found the Super Router performs well at range, but that it languishes behind Linksys, AVM and TP-Link over both 802.11n and 802.11ac. TalkTalk does claim its router is an improvement over BT's Home Hub 5 though, and we did see a slight improvement from our results.

**VERDICT:** The question is, if we subscribed to TalkTalk, would we recommend ditching the old Super Router and replacing it? We'd say no. It's really not worth upgrading your router and you'd be better off hanging on to your existing device.



## TP-LINK ARCHER VR900

**£139** inc VAT • [uk.tp-link.com](http://uk.tp-link.com)

Ease of use	★★★★☆
Features	★★★★☆
Performance	★★★★★
Value	★★★★☆
Overall	★★★★★

TP-Link's first generation of 802.11ac wireless routers was great value for money. They lacked many bells and whistles though, offering a very basic cut-down interface, with few extras to speak of. Since then, the firm has changed direction, and its routers have improved enormously, with much better software and more features. They're no longer the no-frills offering they once were, but unfortunately, they're not as cheap as they used to be either. That's understandable, since TP-Link has squeezed a lot of hardware into it. It's the company's first VDSL router, and 3x3 MIMO 802.11ac support, as well as twin USB ports.

The VR900's appearance is an upgrade over previous models. It's a big white box with a solid silver stand that runs down the sides. Three enormous external antennas are provided, but despite these sticking out from the back, the router generally shouldn't look out of place if it's placed in a central location in your home.

The software has seen a similar upgrade from TP-Link's older models. Basic routers used to offer no more than a few static pages with a list of settings, but now the company has tried to go further, with software that is both intuitive and functional. Now, as with other routers, the front page gives you a good overview of the status of your network, showing the status of your LAN, DSL connection and so on.

There's no major reason for complaint, although in our opinion it lacks the polish of Asus' or AVM's efforts. It sounds like a small thing, but with those routers, clickable links take you to various parts of the interface, and there are a few unique features that turn out to be useful, which the Archer VR900 doesn't offer.

But if pure wireless performance is all you care about, then you'll be interested to hear that this is one of the fastest routers we tested. Short-range 802.11n and 802.11ac results trumped all its competitors except the Linksys XAC1900, with good results even at range. We were very surprised to see speeds of over 470Mbit/s at 20m distance, and this is no fluke. Over 2.4GHz 802.11n, we measured speeds over 110Mbit/s, an outstanding result. Other routers struggle to meet these speeds even at short range.

Our only questionable result from the VR900 is its power consumption. Given that routers are usually left on 24 hours a day, 12.3W is a high figure. For comparison, a basic desktop PC at idle can use around 45W, so leaving the VR900 turned on for 24 hours is equivalent to a desktop PC being left on for around six hours.

**VERDICT:** With decent software and excellent performance, we wouldn't hesitate to recommend the Archer VR900. TP-Link has come a long way in a short time.

## Conclusion

A good wireless router should offer excellent wireless performance, software that's easy to use and plenty of advanced features. These days, it's also useful to support some form of expandability via USB ports. The majority of the routers here do well on all three counts, so it's been a close finish between them.

We think the Asus WRT software in the DSL-AC68U is best we've ever used, but that router's wireless performance didn't match the usual standard we expect from Asus. Some of the firm's high-end cable routers are lightning quick, but although the DSL-AC68U does well, it's not as fast as some of the other routers, making it a strong runner-up, but not a winner.

When it comes to performance though, the TP-Link Archer VR900 steals the show. We weren't expecting any of the routers to do well at long range, but at 20m, the VR900 managed better speeds than BT's Home Hub 5 and Netgear's D6400 could at just 3m. Very impressive, but we think the software falls just slightly short. While TP-Link has included just about all the features you might want, there are times when it lacks a certain amount of polish, omitting a few details or bits of information that you find on other routers. So again, a great product but perhaps not the very best.

Also in this category is the Hub 5, which makes a lot of sense for BT customers as a

free or cheap upgrade, but if you're looking for the best speeds, it gets outclassed here.

While the Linksys XAC1900 deserves an honourable mention, as it ticks the right boxes for performance at 802.11n and 802.11ac speeds, the AVM Fritz!Box 3490 is our favourite router in this line-up. Its performance is nearly as good as the Archer VR900, with some superb results over both 802.11n and 802.11ac, but its software is far superior. With two USB 3.0 ports as well as a reasonable price, which is worth mentioning since AVM's routers have had a reputation for being pricey, this is an incredibly strong offering, and possibly the best Fritz!Box router AVM has ever made.

	<b>ASUS</b> <b>£139 inc VAT (£115 ex VAT)</b>  <b>PC ADVISOR</b> <b>RECOMMENDED</b>	<b>AVM</b> <b>£135 inc VAT (£112 ex VAT)</b>  <b>PC ADVISOR</b> <b>BEST BUY</b>	<b>BT</b> <b>From £45 inc VAT (£37 ex VAT)</b> 
Model name	<b>DSL-AC68U</b>	<b>Fritz!Box 3490</b>	<b>Home Hub 5</b>
Wireless standards	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n/ac
Antenna configuration	3x3 MIMO	3x3 MIMO	3x3 MIMO
IPv6 support	Yes	Yes	Yes
Modem	ADSL 2+/VDSL	ADSL 2+/VDSL	ADSL 2+/VDSL
Ethernet	4x gigabit ethernet	4x gigabit ethernet	4x gigabit ethernet
USB	1x USB 3.0	2x USB 3.0	1x USB 2.0
Internal/external antennas	External	Internal	Internal
Dimensions	220x83.3x160mm	245x55x175mm	236x31x116mm
Weight	640g	458g	290g
<b>PERFORMANCE</b>			
802.11n 2.4GHz (3m)	114Mbit/s	136.9Mbit/s	97.2Mbit/s
802.11n 2.4GHz (10m)	94.6Mbit/s	103.9Mbit/s	75.4Mbit/s
802.11n 2.4GHz (20m)	77.7Mbit/s	86.5Mbit/s	40.5Mbit/s
802.11n 5GHz (3m)	337.3Mbit/s	N/A	310.9Mbit/s
802.11n 5GHz (10m)	325.8Mbit/s	N/A	219.1Mbit/s
802.11n 5GHz (20m)	275.6Mbit/s	N/A	218.4Mbit/s
802.11ac 5GHz (3m)	565.3Mbit/s	610.3Mbit/s	437.8Mbit/s
802.11ac 5GHz (10m)	491.2Mbit/s	473.6Mbit/s	254.7Mbit/s
802.11ac 5GHz (20m)	366.2Mbit/s	462.7Mbit/s	186.7Mbit/s
Idle power use	11.8W	4.8W	7.3W





## How we test

We test each router using the WiFiPerf application, which measures network speeds between two computers without the possibility of a storage device creating bottleneck and slowing down the transfer. We connect one computer to the router wirelessly and another via an ethernet cable to work out the just how quick each router can perform.

We use a 2013 Retina MacBook Pro because it has a 3x3 MIMO wireless adaptor, and is therefore capable of using each router's full speed. By measuring 802.11n

performance at 2.4GHz and 5GHz, as well as 802.11ac at 5GHz (the only frequency at which it operates), we measure speeds with unobstructed line of sight at 3-, 10- and 20m and make the routers perform for a full two minutes at each distance.

Note that two of the models on test lack the option to specify the 5GHz channel when using 802.11n. Instead they choose between 2.4- and 5GHz automatically based on the client, and our 802.11ac laptop meant there was no way to obtain 5GHz 802.11n results from those routers. ☒

LINKSYS £179 inc VAT (£149 ex VAT) ★★★★★	NETGEAR £124 inc VAT (£103 ex VAT) ★★★★★	TALKTALK £125 inc VAT (£104 ex VAT) ★★★★★	TP-LINK £139 inc VAT (£115 ex VAT) ★★★★★
<b>XAC1900</b>	<b>D6400</b>	<b>Super Router</b>	<b>Archer VR900</b>
802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n/ac
3x3 MIMO	3x3 MIMO	3x3 MIMO	3x3 MIMO
Yes	Yes	Yes	Yes
ADSL 2+	ADSL 2+/VDSL	ADSL 2+/VDSL	ADSL 2+/VDSL
5x gigabit ethernet	5x gigabit ethernet	4x fast ethernet	4x gigabit ethernet
1x USB 3.0, 1x USB 2.0	2x USB 2	1x USB 3.0	1x USB 3.0, 1x USB 2.0
External	Internal	Internal	External
256x35x186mm	306x76x258mm	120x190x60mm	245x90x181mm
540g	1.1kg	N/S	720g
156.9Mbit/s	99.6Mbit/s	117.6Mbit/s	146.7Mbit/s
108.5Mbit/s	91.5Mbit/s	87.8Mbit/s	128.3Mbit/s
101.6Mbit/s	89.8Mbit/s	77.9Mbit/s	111Mbit/s
337.1Mbit/s	308Mbit/s	312.4Mbit/s	N/A
297.7Mbit/s	290Mbit/s	210.2Mbit/s	N/A
289.9Mbit/s	248Mbit/s	203.5Mbit/s	N/A
651.8Mbit/s	464Mbit/s	514.2Mbit/s	622.7Mbit/s
453.1Mbit/s	416.4Mbit/s	374.5Mbit/s	525.4Mbit/s
433.5Mbit/s	386.2Mbit/s	203.2Mbit/s	474Mbit/s
10.1W	8.3W	5.2W	12.3W

# POWERLINE ADAPTORS

**Simon Jary** ranks and reviews the best powerline adaptors available in the UK right now

**F**ed up with slow Wi-Fi round your home? Bored to death of waiting for HD TV to stream from iPlayer or Sky? Love action-packed computer games or need a fast internet connection to your shed, sorry home office? Sounds like you need to give your home network a boost.

Most of us position our internet router/modem in a different room to our entertainment devices - smart TV, Sky+, Tivo, Apple TV, games console, and so on. Increasingly, these gadgets require a fast internet connection for optimal use, and your home's wireless signal often just doesn't make the grade.

You could try a Wi-Fi extender or repeater, but these are hit-and-miss, and only push an already weak signal around your home, rather than genuinely boosting speeds. There is, however, something much faster than Wi-Fi, and that's a wired connection using an ethernet cable, just like the one that connects your router to your PC. You lose a lot less data to the limitations of Wi-Fi, which drops strength the further away you are from the wireless router, hates going through walls, and is

affected by interference from all sorts of other devices and structures.

Stringing ethernet cables round the house is impractical though, so the best solution is tidy, simple to install and inexpensive: Powerline (sometimes known as HomePlug). The technology is incredibly simple to set up and uses your home's power cables instead of ethernet cables.

## Getting started

Before you begin, you'll need to make sure that you have at least two Powerline adaptors. Luckily, most starter kits come with everything you need: a couple of adaptors and at least one ethernet cable.

Playing with electrical sockets isn't normally recommended, but Powerline is child's play for adults to set up - even if you think you know nothing about technology. First, plug one Powerline adaptor into a power socket near your router, then connect it via ethernet to the router. Next, take the other Powerline adaptor and plug that into a power socket in another room - next to your TV, for example. You can then connect this second adaptor to your

television using another ethernet cable. Bingo, your television - or Sky+, Tivo, laptop or whatever - is now wired to your router, and so should enjoy much faster download speeds than via Wi-Fi. It will also set up a basic computer network if you want to share files around the house.

## Speed myths

All Powerline adaptors come with hugely inflated speed claims. You should ignore these because the actual speeds that we've tested are plenty fast enough for most home networks.

Every Powerline maker claims that their adaptors can carry data at speeds of 200Mb/s at the entry level to 500-, 600- and 1200Mb/s for the fastest. These are the theoretical maximum speeds of the chips used within the adaptors.

As the whole point of Powerline is to speed up your home network, we've tested a bunch of the 500-, 600- and 1200Mb/s adaptors. The 600- and 1200Mb/s devices for the most part include faster processors and more sophisticated technologies, such as MIMO (Multiple Input Multiple Output), where



the lines between live-neutral and earth-neutral are used simultaneously for data transmission, which makes it possible to double the bandwidth.

In the real world, you won't get 500Mb/s from a 500Mb/s Powerline adaptor. In fact, you'll be lucky to get 100Mb/s for a multitude of reasons, including the age of your power cables, distance between adaptors, 'electrical noise', mains fluctuations, interference from other devices such as phone chargers.

Don't worry, though. A speed of around 50- to 60Mb/s should be enough to allow for acceptable TV streaming. Check out our real-world speed scores on pages 91 to 93 to compare the adaptors tested here, though remember that you may get faster or slower speeds in your own home.

### Ethernet speed

Another important factor is the speed of the ethernet connection. Many of the 200- and 500Mb/s Powerline adaptors have one or more 10/100 ethernet ports. If this is the case, the maximum speed you'll get is 100Mb/s, because the ethernet connection maxes at that rate. For faster speeds look

for a Powerline adaptor that has ports using the gigabit ethernet standard, which has a theoretical maximum speed of 1000Mb/s.

It won't make any difference unless your computer and router are gigabit ethernet too, but if they are, then you're better sticking with the fastest version. You can use gigabit with slower systems, as they are backwards compatible. You just won't see any speed benefit. If you use 10/100 ethernet with a gigabit system, you'll be pegged back to the slower protocol.

It's also worth remembering that your Powerline setup will only ever be as fast as your broadband speed when downloading files, movies or catch-up TV.

### Powerline Wi-Fi hotspots

Some Powerline adaptors have extra Wi-Fi functionality. They use the same internet supply you get from your wireless router, but create a brand-new hotspot, so you don't lose signal strength through distance from the router. (You will lose some signal strength via Powerline, but in our tests, it improved around-the-house Wi-Fi signal strength by as much as four times.)

Some Powerline adaptors include a passthrough power socket, so you don't lose that power source for other devices. This allows you to slot another device's plug into the Powerline adaptor. It's also claimed that using the passthrough socket shields the signal strength from other limiting electrical noise. It does make the adaptors a bit chunkier, but saving the power socket is a real benefit.

How many ethernet ports do you need in the second room? My home setup requires at least two, and preferably three. The Samsung smart TV needs one for iPlayer, YouTube and Amazon Prime Video, while the Sky+ box needs one for catch-up TV. And sometimes I might want the fastest possible downloads on my laptop. My smart thermostat would also like to be on the ground floor, too, and that has an ethernet gateway.

Most Powerline adaptors come with one ethernet port, which is fine if you just need one or are happy to swap out the cables for the device you need at any one time. Alternatively, you can add an ethernet switch (about £20) that can link that one port to four or more.



## TP-LINK AV 500 PASSTHROUGH POWERLINE WI-FI KIT (TL-WPA4230P)

**£88** inc VAT • [uk.tp-link.com](http://uk.tp-link.com)

## TP-LINK AV 500 POWERLINE ADAPTOR WITH AC PASSTHROUGH STARTER KIT (TL-PA451KIT)

**£54** inc VAT • [uk.tp-link.com](http://uk.tp-link.com)

## TP-LINK 300MB/S AV500 WI-FI POWERLINE EXTENDER STARTER KIT (TL-WPA4220KIT)

**£69** inc VAT • [uk.tp-link.com](http://uk.tp-link.com)

## TP-LINK AV500 POWERLINE WI-FI KIT (TL-WPA4226KIT)

**£79** inc VAT • [uk.tp-link.com](http://uk.tp-link.com)

### TP-Link AV 500 Passthrough Powerline Wi-Fi Kit (TL-WPA4230P)

Features	★★★★★
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★★

### AV 500 Powerline Adaptor with AC Passthrough Starter Kit (TL-PA451KIT)

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★★

### TP-Link 300Mb/s AV500 Wi-Fi Powerline Extender Starter Kit (TL-WPA4220KIT)

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★★

### TP-Link AV 500 Powerline Wi-Fi Kit (TL-WPA4226KIT)

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★★

TP-Link sells four 500Mb/s-rated Powerline adaptors, though they need to be differentiated to stop buyers' confusion. Please excuse the product codes, but it's the only way to stop you from buying the wrong kit, and all Powerline kit product names sound alike anyway.

All the sets reviewed here are starter kits and include the minimum requirements for getting started: two adaptors and two ethernet cables. That's really all you need. You can buy single adaptors if you want to connect more rooms to your home network.

Let's start with our favourite, the £88 AV500 Passthrough Powerline Wi-Fi Kit (TL-WPA4230P KIT), which features all the bells and whistles you could want from a non-gigabit Powerline setup.

This is a speedy Powerline system that can also add a Wi-Fi hotspot to that second room. It also features an integrated passthrough power socket, which means an additional device can be plugged into the adaptor as though it were a normal wall socket, so in effect it doesn't use up a valuable power socket.

Just to make things even more confusing the TL-WPA4230P KIT is actually two separate adaptors boxed as a starter kit. The base unit, which you plug into your internet router, is the white/grey TL-PA4020P, with two ethernet ports. The second adaptor,

**All the sets reviewed here include the minimum requirements for getting started: two adaptors and two ethernet cables**

which sits near your TV, Sky box, and so on, is the black-edged TL-WPA4230P, with three ethernet ports and the Wi-Fi hotspot.

We appreciate the number of ethernet ports, as a rising number of home-entertainment systems are lost without an internet

### TP-LINK AV PASSTHROUGH POWERLINE WI-FI KIT



### TP-LINK AV 500 POWERLINE ADAPTOR WITH AC PASSHROUGH STARTER KIT



**TP-LINK 300MB/S AV500 WI-FI POWERLINE EXTENDER STARTER KIT****TP-LINK AV500 POWERLINE WI-FI KIT**

connection these days. Most Powerline adaptors feature just the one ethernet port, and while you can make do with just the one socket, and even swap it out to match your network needs, or add an ethernet switch as a multi-port hub to split the data feed, having three ports is a real bonus for those of us with multiple internet-demanding devices.

While the 65Mb/s score in our tough real-world tests isn't the fastest, it proved more than acceptable for streaming TV and so forth. The Wi-Fi hotspot it creates was excellent, coming in only fractionally slower than the wired test at 54Mb/s.

Our one gripe is that the ethernet ports are located at the bottom of the unit, which makes it neater but troublesome if your power sockets are very low to the floor. If you have low sockets, we'd recommend the similar (but more expensive) Devolo 500AV Wireless+, which has its ports at the top of the unit.

TP-Link's AV500 Powerline adaptor with AC Pass Through Starter Kit (TL-PA451KIT) also features passthrough sockets but lacks Wi-Fi, and has just the one ethernet port on each adaptor, though it's much cheaper at just £54 (we've seen it for under £40 online, too). It was also marginally faster (at 68Mb/s) than the 4230P, though not noticeably so, and the difference could have been caused by environmental factors on test day. This is a decent starter kit if you don't want lose power sockets when setting up a Powerline network, but aren't bothered by adding a new wireless connection in the second room.

Finally, TP-Link offers two versions of what it calls the 300Mb/s AV500Wi-Fi Powerline extender - the 300Mb/s refers to the theoretical maximum speed of the Wi-Fi; otherwise it's a normal 500Mb/s Powerline. And again in a cruel act of product confusion there are two versions.

Both the £69 300Mb/s AV500 Wi-Fi Powerline Extender Starter Kit (TL-WPA4220KIT) and the £79 AV500 Powerline Wi-Fi Kit

**While you can make do with just the one ethernet port, having three is a bonus anyone with multiple internet-demanding devices**

(TL-WPA4226KIT) contain a TL-WPA4220 - the 500Mb/s Powerline adaptor with Wi-Fi hotspot and two ethernet ports.

The other adaptor with the cheaper TL-WPA4220KIT is the TL-PA4010 base unit, with one ethernet port. While more ports is better, you may be all right with just the one if the base adaptor sits near your modem/router, as this is generally not where you have multiple devices demanding internet access.

**We think the extra £10 is money well spent - not just for the extra port on the base unit, but for the passthrough socket**

The base adaptor with the £10 more expensive TL-WPA4226KIT is the TL-PA4020P, which has two ethernet ports and a passthrough socket. We think the extra £10 is money well spent - not just for the extra port on the base unit, but the passthrough socket that will help you save a power socket. Remember though, that the second adaptor doesn't have the passthrough. As expected actual speeds were pretty much the same as the other TP-Link 500Mb/s kits, at 68Mb/s. The wireless speed was again great at 57Mb/s.

So TP-Link's 500Mb/s Powerline offerings all hit decent speeds and are really only different in their number of ethernet ports, Wi-Fi functions, and passthrough sockets.

**VERDICT:** Our favourite of the 500Mb/s TP-Link Powerline starter kits is the TL-WPA4230P KIT, because it has multiple ethernet ports, Wi-Fi, and passthrough. It's the more expensive of the starter kits on offer from TP-Link, but we think that the extra £20 is worth it if you have multiple devices that you want to hook up to your network, and both adaptors have passthrough, too.

The cheapest TP-Link Powerline adaptor is the TL-WPA4220KIT, which has just one ethernet port per adaptor and no passthrough or Wi-Fi. In the middle, you have the TL-PA451KIT, which has just the one socket per adaptor and no Wi-Fi, but does have passthrough on both adaptors, so if you need just the one ethernet port, then this will save you money and still do the job.

## TP-LINK AV1200 GIGABIT PASSTHROUGH POWERLINE STARTER KIT (TL-PA8010P KIT)

**£79** inc VAT • [uk.tp-link.com](http://uk.tp-link.com)

## TP-LINK AV1200 3-PORT GB PASSTHROUGH POWERLINE STARTER KIT (TL-PA8030P KIT)

**£88** inc VAT • [uk.tp-link.com](http://uk.tp-link.com)

The TP-Link AV1200 Gigabit Passthrough Powerline Adaptor Starter Kit uses the latest 1200Mb/s Powerline chips to make it one of the fastest we've tested. We test TP-Link's varied range of 500Mb/s Powerline starter kits elsewhere in this group test (page 78), but this model is faster because it comes with the latest Powerline processor and gigabit ethernet ports, and uses MIMO technology. Multi-input Multi-output (MIMO) allows the adaptors to use all three wires of your home electrics, including the live, neutral and earth to create multiple data paths, so that you benefit from faster data throughput and more stable connections.

Two versions are available. The TL-PA8010P KIT costs £79 and offers just one gigabit ethernet port per adaptor, while the £88 TL-PA8030P KIT is exactly the same, except that each adaptor has three gigabit ethernet ports. Both come with two adaptors and two ethernet cables.

Set up is a breeze and you don't have to install any software or configure your settings. In our tough two-floor Powerline test, the TP-Link AV1200 managed just over 100Mb/s, which is only slightly slower than the other two gigabit Powerlines we have tested: the uglier but cheaper Solwise SmartLink 1200AV2 (107Mb/s) and larger but more costly Devolo 1200 (126Mb/s), for example.

The AV1200 Powerline Starter Kit is subtle in white, but larger than many adaptors as it has a passthrough power socket on the front, which is helpful as it means you don't give up a valuable socket. The ethernet port is located on top of the adaptor, which is handy if your power sockets are close to the floorline.

### TP-Link AV1200 Gigabit Passthrough Powerline Adaptor Starter Kit (TL-PA8010P KIT)

Features	★★★★☆
Performance	★★★★★
Value	★★★★☆
Overall	★★★★★

### TP-Link AV1200 3-port GB Passthrough Powerline Starter Kit (TL-PA8030P KIT)

Features	★★★★☆
Performance	★★★★★
Value	★★★★☆
Overall	★★★★★

The best value option is the TL-PA8030P KIT. Although it's slightly more expensive, it has three gigabit ethernet ports, which you may well find is handier if you have multiple smart devices that demand fast internet connections.

**The AV1200 Powerline Starter Kit is subtle in white, but larger than many adaptors as it has a passthrough power socket on the front**

Neither model offers Wi-Fi, which keeps the price down, but does limit functionality if you fancy having faster wireless in your chosen second room, as well as extra wired connections.

**VERDICT:** The TP-Link AV1200 Gigabit Passthrough Powerline Adaptor Starter Kit matches its rival gigabit Powerline adaptor sets in our real-world speed tests. We prefer the slightly more expensive TL-PA8030P, as it offers three gigabit ethernet ports, compared to the TL-PA8010P's single-port adaptors.

Neither version, however, includes functionality to add a new Wi-Fi hotspot in your house, as some other Powerline adaptors do. That said, if your Wi-Fi signal is acceptable you can live without a new hotspot, and the TL-PA8030P especially represents great Powerline value.

### TP-LINK AV1200GB PASSTHROUGH POWERLINE KIT



### TP-LINK AV1200GB PASSTHROUGH POWERLINE KIT (WITH THREE GIGABIT ETHERNET PORTS)





**NETGEAR POWERLINE 500 (XAVB5221)****£29** inc VAT • [netgear.co.uk](http://netgear.co.uk)**NETGEAR POWERLINE 1200 (PL1200)****£69** inc VAT • [netgear.co.uk](http://netgear.co.uk)**NETGEAR PLP1200****£79** inc VAT • [netgear.co.uk](http://netgear.co.uk)

Netgear's Powerline 500 (XAVB5221) is one of the smallest and cheapest starter sets of 500Mb/s Powerline adaptors that we've tested. If you want a no-thrills Powerline setup at the lowest cost, then you should seriously consider this starter kit of two adaptors and two ethernet cables. Compare it with the equally small and low-price offerings from Zyxel and D-Link.

Priced at just £29 this set includes two 500Mb/s Powerline adaptors. Each has just the one (10/100) ethernet port, and there's no added Wi-Fi hotspot functionality, so this is a bare bones system, though that's all many people need from a Powerline setup.

The adaptors don't feature passthrough sockets, so you will lose a wall socket in both of the rooms you connect with your Powerline home network. This does keep down the size of the adaptors, though.

The minimal size of the Netgear Powerline 500 adaptors will delight householders who balk at the bulk of many more sophisticated Powerlines. Some of the adaptors reviewed here are pretty chunky, while these are about half the size of the Devolo dLan 1200+ or similar Solwise SmartLink PL1200AV2 or TP-Link AV1200 starter Powerline sets.

As with all adaptors you won't actually get the claimed 500Mb/s speeds, as this is just the theoretical maximum. However, these adaptors should still greatly boost your home network to a performance level that will transform your download speeds for catch-up TV, online gaming, and the like. The Powerline 500 scored a little-below-average results in our speed tests. Our real-world speed score for these adaptors was 61Mb/s - miles below the claimed 500Mb/s, but enough to greatly improve on your home network if you rely on standard Wi-Fi. This speed is acceptable for a 500Mb/s adaptor, but not as fast as some models can reach.

Performance will be at the heart of your starter kit buying decision. None of the kits tested here performed badly, but if you want blazing performance, consider upgrading to the latest 1200Mb/s gigabit Powerlines that will near-double the speeds reached here.

**Netgear Powerline 500 (XAVB5221)**

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★☆

**Netgear Powerline 1200 (PL1200)**

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★☆

**Netgear Powerline PLP1200**

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★☆

**VERDICT:** While it lacks certain handy functions, such as the ability to add a new Wi-Fi hotspot, as well as features (more than one ethernet port per adaptor, for instance, and a passthrough socket) the Netgear Powerline 500 is inexpensive, simple to set up, and performs adequately for most home uses. If you want faster speeds and all the bells and whistles look elsewhere, but we rate this starter kit as great value.

**Netgear Powerline PL1200/PLP1200**

The Netgear Powerline 1200 and PLP1200 are one of the new breed of gigabit Powerlines. There are two models of Powerline 1200.

The PL1200 is a pretty basic system, with just one gigabit ethernet

**NETGEAR POWERLINE 500****NETGEAR PLP1200**

port per adaptor – you get two adaptors, along with two ethernet cables. The PLP1200 comes with the same extras, but also has a passthrough socket on the front of each adaptor. This adds about a tenner on to the price, and makes the adaptors taller too, however, for the extra money we'd recommend the PLP1200, as we think you'll appreciate the socket-saving feature.

## In our real-world tests, both the Netgear Powerline 1200 adaptors performed well, racing past the 500Mb/s-rated adaptors

But both lack features that you may desire – for example, that solitary gigabit ethernet port. If you have multiple devices, such as a smart TV, Tivo, Sky+ or games console, that one port is not going to connect everything to your network. You can, of course, swap out the ethernet cable to the particular device you need at the time, but this can be a pain. Alternatively, you can invest an extra £20 or so on an extra multi-port ethernet switch. Other Powerline devices offer two or even three ethernet ports on that second-room adaptor, which you may want to consider instead. If you just need the one, then this is not a limitation that will bother you. Neither of the two Netgear Powerline 1200 models has a wireless capacity.

In our real-world tests, both the Netgear Powerline 1200 adaptors performed well, racing past the 500Mb/s-rated adaptors and just about level with the other 1200Mb/s Powerlines. Our average real-world speed score for these latest adaptors was 105Mb/s – a long way below the claimed 1200Mb/s, but enough to greatly improve on your home network if you rely on standard Wi-Fi. The Netgear adaptors reached 102Mb/s. You may get even faster speeds. It all depends on your home set up, electrical wiring, and whatever else you have plugged in. Battery chargers and microwaves, for example, will ruin your Powerline speeds when switched on.

Netgear admits that top speeds will be well below the stated megabits per second rating, and the adaptors have a traffic light LEDs that tell you about link rate. The lowest is Red, which Netgear calls 'Good' at under 50Mb/s. Amber ('Better') scores between 50- to 80Mb/s. And Green ('Best') has a link rate above 80Mb/s.

**VERDICT:** Powerline adaptors are brilliant for making fast and simple home networks, and the Netgear Powerline 1200 models passed our speed and set up tests with ease. Of the two models, we think paying extra for the PLP1200 with passthrough sockets is worth the additional expense compared to the cheaper PL1200. Sadly both are rather limited by their no-frills features, though: one ethernet port per adaptor and lack of wireless mean these are relatively basic, but will still make a huge difference to your home network and PC/entertainment download speeds.

### DEVOLO dLAN 650 TRIPLE+ (dLAN 650+)

**£99** inc VAT • [devolo.com/uk](http://devolo.com/uk)

### DEVOLO dLAN 650+ (dLAN 650+)

**£79** inc VAT • [devolo.com/uk](http://devolo.com/uk)

### DEVOLO dLAN 500AV WIRELESS+ (dLAN 500AV Wireless+)

**£129** inc VAT • [devolo.com/uk](http://devolo.com/uk)

### DEVOLO dLAN 500AV WI-FI STARTER KIT (dLAN 500 Wi-Fi)

**£79** inc VAT • [devolo.com/uk](http://devolo.com/uk)

Devolo has a wide range of Powerline adaptors, with a number rated at 500- or 600Mb/s, and a couple at the latest 1200Mb/s standard. Its dLAN 650+ and dLAN 650 triple+ use the faster Powerline chips that push theoretical maximum speeds to 600Mb/s. They also employ a new technology that uses all three physical lines of the mains circuit for data transmission, rather than the two used by all other Powerline adaptors. Using Range+ technology, the adaptors couple the signal on to the earth wire, as well as the standard live and neutral wires used by all Powerline systems. The 650+ and 650 triple+ then determine which two of the three lines will provide the best data transmission rate.

We remain fans of Devolo's older 500Mb/s dLAN 500AV Wireless+, which we liked not only for its speeds and Wi-Fi but its three ethernet ports (10/100) and passthrough power sockets. At

#### Devolo dLAN 650 triple+

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★☆

#### Devolo dLAN 650+

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★☆

#### Devolo dLAN 500AV Wireless+ Starter Kit (dLAN 500AV Wireless+)

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★☆

#### Devolo dLAN 500 Wi-Fi Starter Kit (dLAN 500 Wi-Fi)

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★☆

£129 though, it's expensive for a 500Mb/s Powerline starter kit. We did find it online for £110, so it's worth hunting around. Extra single adaptors cost about £75.

The £99 dLAN 650 triple+ also comes with three ethernet ports, and these are of the faster gigabit variety. The multitude of ports means this adaptor will be especially useful if you want to hard wire more than one ethernet-enabled device such as a television, games console, or Sky+ box. There's less need for the base adaptor, which connects to your internet router, but at the business end of your network (maybe your living room or home office), the more the merrier unless you want to wire up just one device.

If you can live without the new Wi-Fi hotspot, then the dLAN 650 triple+ offers better value than the dLAN 500AV Wireless+. The £79 dLAN 650+, on the other hand, has just the one gigabit

**DEVOLO dLAN 650 TRIPLE+**

ethernet port. Other than the number of ethernet ports on the second adaptor, the 650+ and 650 triple+ are the same.

The passthrough socket on the front of the adaptors means you don't lose a power socket in either room, and may even improve performance over adaptors that lack such a feature. An integrated mains filter further optimises data transmission by eliminating interference on the network.

Most other Powerline adaptors use one or other of the Live or Neutral wires in the home's power lines. The Range+ goes one further, and checks out the earth wire too, to see if using that is faster. This potential use of this wire is where Devolo gets the extra '50' from in its 650 names. It's a bit cheeky, but if the performance is better, then is warranted.

The Devolo dLAN 650 triple+ we tested scored a speed of 69Mb/s - not a lot faster than the 500Mb/s adaptors but fast enough. Neither the dLAN 650+ nor 650 triple+ feature Wi-Fi, which is featured on the Devolo dLAN 500AV Wireless+. Despite the speed gains of the 650 models, we still prefer the Devolo dLAN 500AV Wireless+ for its added Wi-Fi functionality, which reached 59Mb/s in wired and 47Mb/s wireless in our tests.

Devolvo also sells a smaller set of 500Mb/s adaptors that lack the passthrough sockets but are much less obtrusive. As its name suggests, the dLAN 500 Wi-Fi Starter Kit can create a new wireless hotspot in the second room. In our real-world speed tests, it scored a rather low 47Mb/s, with 34Mb/s using its Wi-Fi signal - still faster than our house Wi-Fi but slower than others on test here.

**DEVOLO dLAN 650+****DEVOLO dLAN 500AV WIRELESS+**

In a bid to break the mystique of home networking, Devolo markets this starter kit as a 'cure' for weak Wi-Fi, and it's true that the new wireless hotspot will boost your smartphone browsing and downloading. But the real benefit of Powerline is the wired connection, and we think that the low speed score we achieved makes this product less of a cure and more of a sticking plaster. Of course, it's just as likely that your home will see faster results, as every home is different, but at £79 this set is overpriced in comparison to some of the other starter kits reviewed here. BT's similar Mini Wi-Fi Home Hotspot 500 kit, for example, looks better value, while for the same price you could pick up a TP-Link AV500 Powerline Wi-Fi Kit with a passthrough socket. The other Devolo 500/600Mb/s products are easier to recommend.

**VERDICT:** While we think the dLAN 500 Wi-Fi Starter Kit is overpriced, the Devolo dLAN 650+ and 650 triple+ are fine examples of the 600Mb/s Powerline chips, and offer fast speeds much faster than a home's standard wireless signals. The use of gigabit ethernet, plus the clever Range+ technology make these adaptors mean they're not massively faster than the older adaptors but they are an improvement. We love the three gigabit ethernet ports on the Devolo dLAN 650 triple+.

The lack of Wi-Fi on the 650 adaptors is, however, a disappointment, and you might prefer the slightly slower but Wi-Fi-packing Devolo dLAN 500AV Wireless+ Starter Kit, although that now looks very expensive compared to the much faster 1200Mb/s-rated Powerlines, including Devolo's own.

**DEVOLO dLAN 500AV WI-FI STARTER KIT**



## DEVOLO dLAN 1200+ WI-FI AC STARTER KIT (dLan 1200+ Wi-Fi ac)

**£159** inc VAT • [devolo.com/uk](http://devolo.com/uk)

## DEVOLO dLAN 1200+ STARTER KIT (dLan 1200+)

**£119** inc VAT • [devolo.com/uk](http://devolo.com/uk)

Devolo has a huge range of Powerlines, including the diminutive dLan 500 Wi-Fi, feature-packed 500AV Wireless+, and mid-range 650+ models. This 1200 model is its fastest, and the priciest we've tested here. The Devolo 1200+ is available in two versions: the dLAN 1200+ Starter Kit (itself not cheap at £119) and the dLAN 1200+ Wi-Fi ac Starter Kit (a whopping £159).

As the name suggests, the 1200+ Wi-Fi AC Starter Kit includes Wi-Fi functionality that creates a new, fast Wi-Fi hotspot in the second room, away from your router. It also has two gigabit ethernet ports on the second unit. The more basic, but same-speed, 1200+ Starter Kit lacks the Wi-Fi and has just the one gigabit ethernet socket on each adaptor.

Devolo does make a couple of adaptors with three ethernet ports (the £99 Devolo dLAN 650 triple+, and £129 Devolo dLAN 500AV Wireless+), but we were a little disappointed that its new flagship model has just the two. That's our only real complaint, though.

The new dLan 1200+ Powerline takes its 650+ Range+ technology one step further. The new generation of range+ adaptors operate using what Devolo calls diversity. Not only can both possible paths (live-neutral and earth-neutral) of data transmission be used, but just the path currently providing the best results is used. In milliseconds, the Powerline chip determines which line provides the best results and routes the data through this path - significantly improving stability and a longer range.

All these speed enhancements would be useless if the adaptors used older, slower 10/100 ethernet connections and cables, which would (and do for many 500Mb/s adaptors) limit the speed to 100Mb/s. In our real-world tests, the second adaptor is placed in a room two floors down from the base unit and modem/router. The

**The 1200+ Wi-Fi AC Starter Kit includes Wi-Fi functionality that quickly and easily creates a new, fast Wi-Fi hotspot**



**DEVOLO dLAN 1200+ WI-FI AC STARTER KIT**

### Devolo dLan 1200+ Wi-Fi ac Starter Kit (dLan 1200+ Wi-Fi ac)

Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

### dLan 1200+ Starter Kit (dLan 1200+)

Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

1200+ again romped home, scoring an average speed of 126Mb/s. We later tested the Solwise 1200AV2 adaptors, which are very similar but smaller and cheaper, although not as good looking and with the ports on the bottom of the adaptor rather than the top. Its speed results were very marginally faster than the Devolo, but there's really nothing in it.

The top-end dLAN 1200+ Wi-Fi ac model comes with the latest wireless standard, 802.11ac, which can deliver significantly improved speeds over previous Wi-Fi standards thanks to greater bandwidth and higher amplitude. It creates a new Wi-Fi hotspot in the room where you put the second adaptor, so should remove the usual Wi-Fi degradation caused by distance, walls, and so on. The great thing is that you don't need to have an 'ac' router - or indeed a wireless router at all - as the Powerline adaptor provides the ac access point. So if your router is simply wired and not wireless, the 1200+ Wi-Fi will bestow your house with fast Wi-Fi. Again the 1200 Wi-Fi didn't disappoint, reaching 117Mb/s in our tests. The previous fastest Wi-Fi we'd got from a Powerline adaptor was 68Mb/s.

Each adaptor has an integrated electrical socket and mains filter, which means that you don't use up a valuable electrical power socket in each room it is installed.

**VERDICT:** The dLan 1200+ is one of the fastest Powerline adaptors we've tested to date. It might not reach the dizzying speeds that Devolo claims, but that's true of all Powerline adaptors out there. Its integrated passthrough power socket is a real bonus, and the model with Wi-Fi and two gigabit ethernet ports on the second unit pretty much has it all.

If you think your home Wi-Fi is fast enough and you don't need more than one ethernet port, then you'll save £40. If you want more than two ports another option is to get the basic one-port unit and invest £20 in a four-port gigabit ethernet switch. We're fans of the Devolo range but do find it pricy compared to other in this group test.



**DEVOLO dLAN 1200+ STARTER KIT**

## SOLWISE SMARTLINK 1200AV2 HOMEPLUG ADAPTOR (PL-1200AV2-PIGGY)

**£86 inc VAT • solwise.co.uk**

### Solwise Smartlink 1200AV2 HomePlug Adaptor (PL-1200AV2-PIGGY)

Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

The Solwise SmartLink 1200AV2 HomePlug Adaptor (also named the PL-1200AV2-PIGGY) is a gigabit-rated Powerline adaptor that's up there with the fastest in the category. It uses the latest QCA 7500 chipset (which offers enhanced processing power) and employs MIMO and gigabit ethernet ports, so should be close to the Devolo 1200 AV2 in terms of performance. These plugs are able to transmit on any two of three plug pairs: live, neutral and earth.

We test every Powerline adaptor under common conditions to get a fair comparison on speeds. This does mean that our speed tests might not duplicate what you get, but you can be confident that what we find is faster should be faster in your home, too. In our real-world tests, the second adaptor is placed in a room two floors down from the base unit and modem/router. We think this will mimic an average UK home to give you a fair comparison. We tested the Solwise 1200AV2 at exactly the same time as the Devolo dLAN 1200+.

The two 1200 Powerline adaptors scored a lot faster than the average 65Mb/s we saw with 500Mb/s Powerlines. The Solwise PL1200AV2 bolted through our 1GB file transfer test in just 77 seconds, registering 107Mb/s. (Although in an earlier test the Devolo hit a super 126Mb/s, in this face off it reached 105Mb/s. Powerline tests are exceedingly difficult to replicate the same test conditions on different days.)

The 1200AV2 has two gigabit ethernet ports and a handy passthrough socket (just like the Devolo). The benefit of this is that

neither adaptor uses up a valuable power socket on the wall. Plus, two ethernet ports are better than one if you need to connect more than one device to your network.

Again both Solwise and Devolo are very similar. There's a wireless version of the Devolo, which can create a new, fast Wi-Fi hotspot in the second room, but this costs £159 for the two adaptors; £119 for the non-wireless version. The Solwise 1200AV2 is priced at £43 per adaptor, so £86 for the required two, so is much cheaper than the Devolo 1200+.

**The AV1200 Powerline Starter Kit is subtle in white, but larger than many adaptors as it has a passthrough power socket on the front**

If you have the spare change, you will almost certainly prefer the looks of the Devolo. While the Solwise is smaller - and cheaper - it's no looker and resembles a plug-in air freshener. If you can hide it, it's one of our favourites.

Another difference is that the Devolo parks its ports on the top of the adaptor, which is better if your power sockets are close to the floor or skirting boards. Like TP-Link, the Solwise packs its ports at the bottom of the adaptor, which can be neater, as long as your sockets are positioned higher up the wall.

**VERDICT:** The Solwise SmartLink PL1200AV2 Passthrough PIGGY HomePlug might have an over-long name but it is one of the fastest Powerline adaptors we've tested. In a straight fight with its nearest competitor, the better-looking but bigger Devolo 1200+, it aced the speed tests by a whisker. It features two gigabit ethernet ports and a passthrough socket just like the Devolo, but is a third cheaper. There's no Wi-Fi model, but pound for pound it's hard to fault this super-speedy Powerline adaptor.

### SOLWISE SMARTLINK 1200AV2 HOMEPLUG



**BT WI-FI HOME HOTSPOT 500 KIT****£89** inc VAT • [bt.com](http://bt.com)**BT MINI WI-FI HOME HOTSPOT 500 KIT****£55** inc VAT • [bt.com](http://bt.com)

The BT Wi-Fi Home Hotspot 500 Kit is a well-made, fully featured 500Mb/s Wi-Fi Powerline set of adaptors that performed well in our real-world speed tests. It stands out from other Powerlines with its striking black design. There are two versions: one Mini Wi-Fi Home Hotspot kit, and the other main set that includes a handy passthrough power socket, but might be rather too big and black for most living rooms. The latter can create a new Wi-Fi hotspot in the room, offering much faster Wi-Fi for your laptop or tablet.

The BT Wi-Fi Home Hotspot 500 is about as fully featured as 500Mb/s Powerline adaptor kits go. It offers both fast downloading over ethernet and speedy Wi-Fi. It has two 10/100 ethernet ports on the second adaptor, so you can connect more than one device via ethernet. Take a look at the back of your Sky+ box or TV, and you'll soon see why having at least two ports is a real benefit. Like most 500Mb/s Powerline adaptors, because it uses 10/100 ethernet ports, its maximum speed is pegged back to 100Mb/s. If you want to hit faster speeds, you need to go for a Powerline product that boasts gigabit ethernet ports.

The larger BT Wi-Fi Home Hotspot 500 has a useful passthrough power socket on the base unit. Most routers find themselves near computers, printers, hard drives and other gadgets – all of which demand a power source – so keeping one socket working is a real help. It would have been even more useful if both adaptors offered this, however – as you get with the Devolo, Solwise and TP-Link

Remember that you might get faster speeds, as Powerline performance is seriously affected by environmental factors

**BT WI-FI HOME HOTSPOT 500 KIT****BT Wi-Fi Home Hotspot 500 Kit**

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★☆

**BT Mini Wi-Fi Home Hotspot Kit**

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★☆

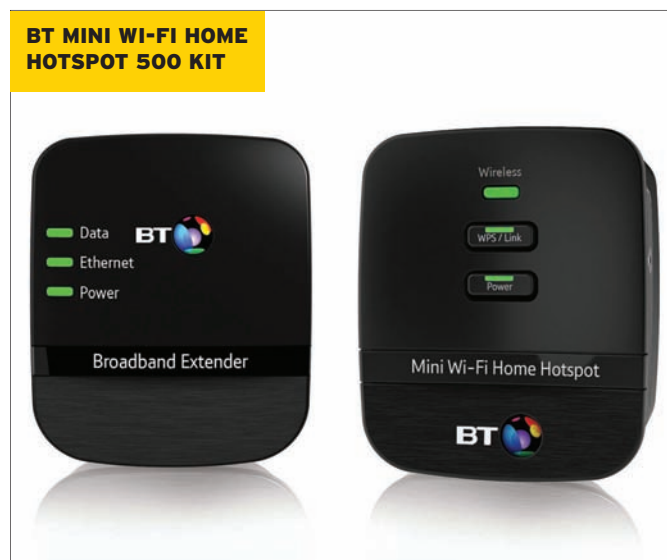
Adaptors. The smaller BT Mini Home Hotspot 500 Kit is much more discrete, although still a not-too-home-friendly black – but lacks the passthrough socket.

The one thing we weren't particularly keen on is the design. The adaptors look great in very cool black with plenty of helpful indicator lights showing you what's going on, but we're not sure that the big black bulk of the larger unit will be welcomed in many living rooms.

We recorded speeds up to 66Mb/s using Powerline and ethernet, in our real-world tests. This was the about average for the speeds we got in our comparison of 500Mb/s Powerline products, and is sufficient for most users, and we streamed HD TV with few pauses. Remember that you might get faster speeds, as Powerline performance is seriously affected by environmental factors such as distance, network traffic, noise on electrical wires, building material and construction, quality of electrical installation and other adverse conditions.

Using the Hotspot 500's Wi-Fi function we created a new hotspot downstairs and achieved an average speed of 54Mb/s – compared to the 16Mb/s we could get through the home's standard Wi-Fi. It took just over two minutes to pass a 1GB file using the Powerline Wi-Fi, compared to over eight minutes using the normal Wi-Fi. That, again, was the one of the fastest in all our 500Mb/s Powerline Wi-Fi speed tests.

**VERDICT:** The BT Wi-Fi Home Hotspot 500 Kit performs well, offering fast Powerline speeds over ethernet and Wi-Fi in our tests. There are faster 1200Mb/s-rated Powerline kits out there, but this is average for the 500Mb/s-rated adaptor charts. It's simple to install, is up and running in minutes, and both models offer two (non-gigabit) ethernet ports. Our only problem with it is its bulk and obtrusive black design, which may not appeal in your living room. The smaller BT Mini Home Hotspot 500 Kit is much smaller but still black. It is good value at £55, though.

**BT MINI WI-FI HOME HOTSPOT 500 KIT**



**TRENDNET POWERLINE 500 AV2 ADAPTOR KIT (TPL-408E2K)****£51** inc VAT • trendnet.com**TRENDNET POWERLINE 500 WIRELESS KIT (TPL-410APK)****£69** inc VAT • trendnet.com

Trendnet has a couple of models of speedy 500Mb/s-rated Powerline kits: the Powerline AV2 Adaptor Kit (TPL-408E2K), and the Powerline 500 Wireless Kit (TPL-410APK), which adds a Wi-Fi hotspot to the second room.

Despite being rated at 500Mb/s the TPL-408E2K has gigabit ethernet ports for the fastest speeds. While you won't reach the possible speeds of gigabit, at least you'll know that you're not limited by slower 10/100 ethernet ports used on most other Powerline adaptors.

You can get away with a Powerline adaptor that has just the one ethernet port but it's often more convenient to have more on the second-room adaptor. You can, of course, add a multi-port ethernet switch (from about £20) if you want to extend to more than one device. The TPL-408E2K comes with the two standard adaptors – each of which has just the one ethernet port. The TPL-410APK, however, has not just the extra Wi-Fi hotspot but two ethernet ports on the second-room adaptor. Sadly, the Wireless TPL-410APK has the slower 10/100 ethernet ports, and we were less impressed with its straight-line speed, although the Wi-Fi function makes up for this.

The adaptors don't feature a lot of extras. There's no passthrough socket, for example, so you will lose a power socket in each room you have these installed. Don't be tempted to connect Powerline adaptors into an extension block though, as you will lose data speed compared to a straight wall connection.

We were pretty blown away by the speeds we got from the TPL-408E. The Trendnet AV2 was faster than most of its completion, averaging a speed of 71Mb/s using Powerline and ethernet. If you want the fastest speeds you need to make the jump to the pricier gigabit adaptor.

**Don't be tempted to connect Powerline adaptors into an extension block though, as you will lose data speed**

**TRENDNET POWERLINE 500 AV2 ADAPTOR KIT****Trendnet Powerline 500 AV2 Adaptor Kit (TPL-408E2K)**

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★☆

**Trendnet Powerline 500 Wireless Kit (TPL-410APK)**

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★☆

Using the Wi-Fi of the Wireless Access Point, we again got the best results we've seen from a Powerline device, with a 68Mb/s average – almost as fast as using the Ethernet cable!

We tested the Wi-Fi-ready TPL-410APK at a different date, so the environment may have changed, and at 50Mb/s it didn't perform as well as the 408E. But this speed should still be adequate for catch-up TV downloading.

There is a way to get the best of both worlds. Buy the single TPL-408E adaptor (as opposed to the two-adaptor TPL-408E2K kit) for £35, and then add the single Wireless Access Point (TPL-410AP for £41 – making a total of £76. It's well worth considering if you want a faster Wi-Fi signal away from your wireless router – say for browsing the internet in the lounge or kitchen – as well as the faster 408E gigabit ethernet adaptor.

**VERDICT:** The Trendnet Powerline 500Mb/s kits feature some of the fastest 500Mb/s Powerline adaptors we've tested so far, and the Wireless Access Point option adds super-fast Wi-Fi for good measure. Of course, we like the speed, which is the whole point of Powerline, but we were also impressed that the standard adaptor had gigabit ethernet, although more than one port per adaptor would have been nice. It might be basic in its single port and lack of passthrough socket, and it's a shame that the wireless adaptor kit – which does have two ports – is limited by the use of 10/100 ethernet, but you simply can't argue with the impressive speed scores and we've seen the Wireless Starter Kit sell online for under £50, so is incredibly good value.

**TRENDNET POWERLINE 500 WIRELESS KIT**

## TRENDNET POWERLINE 1200 AV2 ADAPTOR KIT (TPL-420E2K)

**£79** inc VAT • [trendnet.com](http://trendnet.com)

The Trendnet Powerline 1200 AV2 Adaptor Kit (TPL-420E2K) is one of the fastest Powerlines we've tested to date. And it's inexpensive for one of the latest gigabit Powerlines. These adaptors are small too, so they won't make your front room look like a tech toy room. As a starter kit, you get two adaptors and two ethernet cables.

Unfortunately, these adaptors lack features that you may desire. For example, they have just the one gigabit ethernet port. If you have multiple devices, such as a smart TV, Tivo or games console, that one port is not going to connect everything to your network unless you add an ethernet switch as a hub to split the data feed.

Set up, as with all Powerlines, is a breeze. Plug one adaptor into a wall power socket near your modem/router, and connect with the supplied ethernet cable. Next, plug the second adaptor in to a socket near the TV or whatever device you want to hook up to your network, and connect via ethernet.

Some other Powerline adaptors offer a wireless function that creates a new Wi-Fi hotspot in that second (or third or fourth) room. This is especially useful if you suffer a degraded wireless signal in different parts of the house. The Trendnet Powerline 1200 AV2 doesn't have this capacity, which partly explains the cheaper price tag. If you're happy with your home Wi-Fi speed for smartphone or laptop use, then this shouldn't be a concern.

The Trendnet Powerline 1200 AV2 also doesn't have a passthrough socket as some other models do, so you will in

### Trendnet Powerline 1200 AV2 Adaptor Kit (TPL-420E2K)

Features	★★★★☆
Performance	★★★★★
Value	★★★★☆
Overall	★★★★☆



effect lose a power socket in each of the rooms you install into. And you certainly shouldn't cut corners by just connecting them into a power extension block, as this will reduce data speed.

**If you have multiple devices, such as a smart TV, or games console, that one port is not going to connect everything to your network**

It scored excellently in our speed tests, easily surpassing 500Mb/s-rated adaptors and just shading ahead of other 1200Mb/s Powerlines. Both adaptors reached 110Mb/s – certainly one of the fastest you can get. You may well get even faster speeds. It all depends on your home set up, electrical wiring, and whatever else you have plugged into the circuit.

**VERDICT:** Powerlines create fast home networks with the minimum of fuss, and the Trendnet Powerline 1200 AV2 Adaptor Kit is one of the fastest we've tested. It is rather limited by its no-frills features, though: one ethernet port per adaptor, lack of wireless, and no passthrough socket on either adaptor. But if you want just the basics at top speeds, then you will love this Powerline kit.

## ZYXEL 500MB/S MINI POWERLINE HD POWERLINE ADAPTOR (PLA4201)

**£34** inc VAT • [zyxel.com/uk](http://zyxel.com/uk)

The Zyxel 500Mb/s Mini Powerline (PLA4201) is a set of two adaptors – the minimum you need to create a home Powerline network – rated at 500Mb/s speed. The two adaptors in the kit are white and some of the smallest we've had on test.

There's only one 10/100 ethernet port on each Zyxel adaptor, so if you need to connect a smart TV and a set-top box at the same time, or want to connect your laptop via ethernet while watching iPlayer, this could be limiting. It's likely, however, that you'll only need one connection at one time, so you can switch the ethernet cable to whichever device you need. You could also add an ethernet switch for about £20, and split the data feed to multiple devices.

There are other Powerline products that have a wireless function in that they can create a new Wi-Fi hotspot in other rooms of the

**You'll be lucky to get 100Mb/s from a 500Mb/s Powerline, but this is fast enough for most needs, such as watching catch-up TV**

### Zyxel 500Mb/s Mini Powerline HD Adaptor (PLA4201)

Features	★★★★☆
Performance	★★★★☆
Value	★★★★★
Overall	★★★★☆



house. This Zyxel device doesn't offer this, which is understandable given the price – one of the cheapest we've seen.

Setup is so easy that it's amazing, as is the case with most Powerline products. You'll have a home network up and running in a matter of minutes. It's this fact about Powerline that really strikes you when you maybe expected creating a home network to be a technological minefield. This really is a walk in the park.

You'll be lucky to get 100Mb/s from a 500Mb/s Powerline, but don't fret as this is fast enough for most needs, such as watching catch-up TV or downloading large files. And rest assured, it's much, much faster than standard home Wi-Fi.

In our real-world tests, we got speeds up to 68Mb/s using Powerline and ethernet – all that's sufficient for streaming television, for instance.

For the price and at these speeds if you don't need to boost your home Wi-Fi or use more than one ethernet port in the second room at the same time the Zyxel HD Powerline is a bargain.

**VERDICT:** The Zyxel HD Powerline Adaptor 500Mb/s is a great-value set of Powerline adaptors that performed well in our real-world tests.

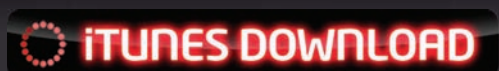
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## PC ADVISOR





## D-LINK POWERLINE AV 500 HD MINI STARTER KIT (DHP-509AV)

**£30** inc VAT • [dlink.com/uk](http://dlink.com/uk)

## D-LINK POWERLINE AV2 1000 HD GIGABIT STARTER KIT (DHP-601AV)

**£40** inc VAT • [dlink.com/uk](http://dlink.com/uk)

D-Link's latest Powerline adaptor starter kits are the Powerline AV 500 HD Mini Starter Kit (DHP-509AV) and Powerline AV2 1000 HD Gigabit Starter Kit (DHP-601AV). Both include the required minimum two adaptors plus ethernet cables.

All manufacturers claim rated speeds at 500Mb/s and above for their Powerline adaptors, but, as explained previously, this isn't anything but the adaptor chip's theoretical maximum speed. Real-world speeds for Powerlines are mostly under 100Mb/s. As even streaming HD TV is acceptable at 50- to 60Mb/s this isn't much of a problem, but for the fastest home network you should aim for at least a 600Mb/s Powerline with gigabit ethernet.

The Powerline AV2 1000 HD Gigabit Starter Kit is much the faster of the two, as its chip allows for a theoretical 600Mb/s, compared to the AV 500 HD Mini's 500Mb/s - itself no slouch, although in our real-world tests the 500 HD was below average. The AV2 Powerline also has faster gigabit ethernet ports, which removes the 100Mb/s speed limit you get with slower 10/100 ethernet ports.

So the specs are impressive, but we were blown away by the actual performance of the AV2 1000 HD Gigabit. In our tough, real-world speed tests (hooking up a network between the router on the second floor of a Victorian house to the living room on the

The specs are impressive, but we were blown away by the actual performance of the D-Link AV2 1000 HD Gigabit

### D-Link Powerline AV 500 HD Mini Starter Kit (DHP-509AV)

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★☆

### D-Link Powerline AV2 1000 HD Gigabit Starter Kit (DHP-601AV)

Features	★★★★☆
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

ground floor) the AV 500 HD Mini produced just-about acceptable speed scores of between 50- to 55Mb/s, but the AV2 1000 HD scored terrifically - beating even our benchmark 1200Mb/s Powerline set up, with a score of 116Mb/s.

Both sets of D-Link Powerlines are basic. There's no wireless function to add a new Wi-Fi hotspot in the second room (as some Powerlines boast) and there's no passthrough power socket on the adaptors either, so they will use up your wall sockets - don't plug them into a power extender as this will slow them down.

Basic isn't bad. It may be all you require: one ethernet port near your PC or TV for faster download times. If you don't have a load of power sockets, then you should consider Powerline adaptors with integrated passthrough sockets. D-Link is planning passthrough versions of both products, but they weren't available at the time of going to press.

One advantage of no passthrough is the size of the adaptors. The AV 500 HD Mini (as the name suggests) are tiny - maybe the smallest Powerline adaptors we've seen. The AV2 1000 HD adaptors are larger, but still discreet.

**VERDICT:** Both the D-Link AV 500 HD Mini and AV2 1000 HD Powerline adaptors are well built, and discreet - you'll hardly notice them. The AV 500 adaptors were a little slow in our tests, but just about acceptable for most needs - and they are tiny. The AV2 1000 HD adaptors are a bit larger but were blazingly fast when tested, even beating a 1200Mb/s set of Powerline adaptors. You don't get extra Wi-Fi or passthrough power sockets, but at these prices the D-Link Powerline Adaptors are great value and will certainly speed up your home network.

### D-LINK POWERLINE AV 500 HD MINI STARTER



### D-LINK POWERLINE AV2 1000 HD GIGABIT STARTER KIT



## 1200Mb/s

	<b>TP-LINK</b> £88 inc VAT (£ 73 ex VAT) ★★★★★	<b>TP-LINK</b> £79 inc VAT (£65 ex VAT) ★★★★★	<b>DEVOLO</b> £119 inc VAT (£99 ex VAT) ★★★★★	<b>DEVOLO</b> £159 inc VAT (£132 ex VAT) ★★★★★
Model name	AV1200 3-port Gigabit Passthrough Powerline Starter Kit	AV1200 Gigabit Passthrough Powerline Starter Kit	dLan 1200+ Starter Kit	dLan 1200+ Wi-Fi ac Starter Kit
Model number	TL-PA8030P	TL-PA8010P	dLan 1200+	dLan 1200+ Wi-Fi ac
Rated speed	1200Mb/s	1200Mb/s	1200Mb/s	1200Mb/s
Tested speed	102Mb/s	102Mb/s	126Mb/s	126Mb/s
Number of adaptors in kit	2	2	2	2
Ethernet speed	Gigabit	Gigabit	Gigabit	Gigabit
Ethernet ports: base adaptor	3	1	1	1
Ethernet ports: second adaptor	3	1	1	2
Wi-Fi	No	No	No	Yes
Passthrough socket: base adaptor	Yes	Yes	Yes	Yes
Passthrough socket: second adaptor	Yes	Yes	Yes	Yes

## 1200Mb/s

	<b>SOLWISE</b> £86 inc VAT (£ 71 ex VAT) ★★★★★	<b>NETGEAR</b> £69 inc VAT (£57 ex VAT) ★★★★★	<b>NETGEAR</b> £79 inc VAT (£65 ex VAT) ★★★★★	<b>TRENDNET</b> £79 inc VAT (£65 ex VAT) ★★★★★
Model name	Solwise 1200AV Smart Link HomePlug AV	Powerline 1200	Powerline PLP1200	Powerline 1200 AV2 Adaptor Kit
Model number	PL-1200AV2-PIGGY	PL1200	PL1200	TPL-420E2K
Rated speed	1200Mb/s	1200Mb/s	1200Mb/s	1200Mb/s
Tested speed	107Mb/s	105Mb/s	105Mb/s	117Mb/s
Number of adaptors in kit	2	2	2	2
Ethernet speed	Gigabit	Gigabit	Gigabit	Gigabit
Ethernet ports: base adaptor	2	1	1	1
Ethernet ports: second adaptor	2	1	1	1
Wi-Fi	No	No	No	No
Passthrough socket: base adaptor	Yes	No	Yes	No
Passthrough socket: second adaptor	Yes	No	Yes	No

## 500- and 600Mb/s

	<b>TP-LINK</b> £88 inc VAT (£73 ex VAT) ★★★★★	<b>TP-LINK</b> £79 inc VAT (£65 ex VAT) ★★★★★	<b>TP-LINK</b> £69 inc VAT (£57 ex VAT) ★★★★★	<b>TP-LINK</b> £54 inc VAT (£45 ex VAT) ★★★★★	
Model name	AV500 Passthrough Powerline Wi-Fi Kit	AV500 Powerline Wi-Fi Kit	300Mb/s AV500 Wi-Fi Powerline Extender Starter Kit	AV500 Powerline Adaptor with AC Passthrough Starter Kit	
Model number	TL-WPA423OP KIT	TL-WPA4226KIT	TL-WAP4220KIT	TL-PA451KIT	
Rated speed	500Mb/s	500Mb/s	500Mb/s	500Mb/s	
Tested speed	65Mb/s	68Mb/s	68Mb/s	68Mb/s	
Number of adaptors in kit	2	2	2	2	
Ethernet speed	10/100	10/100	10/100	10/100	
Ethernet ports: base adaptor	2	2	1	1	
Ethernet ports: second adaptor	3	2	2	1	
Wi-Fi	Yes	Yes	Yes	No	
Passthrough socket: base adaptor	Yes	Yes	No	Yes	
Passthrough socket: second adaptor	Yes	No	No	Yes	

## 500- and 600Mb/s

	<b>NETGEAR</b> £29 inc VAT (£24 ex VAT) ★★★★★	<b>BT</b> £89 inc VAT (£ 74 ex VAT) ★★★★★	<b>BT</b> £55 inc VAT (£46 ex VAT) ★★★★★	<b>TRENDNET</b> £51 inc VAT (£42 ex VAT) ★★★★★	
Model name	Powerline 500	Wi-Fi Home Hotspot 500 Kit	Mini Wi-Fi Home Hotspot 500 Kit	Powerline 500 AV2 Adaptor Kit	
Model number	XAVB5221	N/A	N/A	TPL-408E2K	
Rated speed	500Mb/s	500Mb/s	500Mb/s	500Mb/s	
Tested speed	61Mb/s	66Mb/s	66Mb/s	71Mb/s	
Number of adaptors in kit	2	2	2	2	
Ethernet speed	10/100	10/100	10/100	10/100	
Ethernet ports: base adaptor	1	1	1	1	
Ethernet ports: second adaptor	1	2	2	1	
Wi-Fi	No	Yes	Yes	No	
Passthrough socket: base adaptor	No	Yes	No	No	
Passthrough socket: second adaptor	No	No	No	No	



DEVOLO £79 inc VAT (£65 ex VAT) ★★★★☆	DEVOLO £129 inc VAT (£107 ex VAT) ★★★★☆	DEVOLO £79 inc VAT (£65 ex VAT) ★★★★☆	DEVOLO £99 inc VAT (£82 ex VAT) ★★★★☆
dLAN 500 Wi-Fi Starter Kit	dLAN 500 AV Wireless+ Starter Kit	dLAN 650+	dLAN 650 triple+
dLAN 500 Wi-Fi	dLAN 500 AV Wireless+	dLAN650+	dLAN650 triple+
500Mb/s	500Mb/s	600Mb/s	600Mb/s
46Mb/s	59Mb/s	69Mb/s	69Mb/s
2	2	2	2
10/100	10/100	Gigabit	Gigabit
1	2	1	3
1	3	1	3
Yes	Yes	No	No
No	Yes	Yes	Yes
No	Yes	Yes	Yes
TRENDNET £69 inc VAT (£57 ex VAT) ★★★★☆	ZYXEL £34 inc VAT (£28 ex VAT) ★★★★☆	D-LINK £40 inc VAT (£33 ex VAT) ★★★★☆	D-LINK £30 inc VAT (£25 ex VAT) ★★★★☆
Powerline 500 Wireless Kit	500Mb/s Mini Powerline	Powerline AV2 1000 HD Gigabit Starter Kit	Powerline AV 500 HD Starter Kit
TPL-410APK	PLA4201	DHP-601AV	DHP-509AV
500Mb/s	500Mb/s	600Mb/s	500Mb/s
71Mb/s	68Mb/s	116Mb/s	60Mb/s
2	2	2	2
10/100	10/100	Gigabit	10/100
1	1	1	1
2	1	1	1
Yes	No	No	No
No	No	No	No
No	No	No	No



## Conclusion

Powerline is a wonderfully easy to set up, inexpensive way of super-charging your home network. For most people's needs a 500Mb/s Powerline system will be sufficient, but you can usually go faster for more money with a 600- or 1200Mb/s system.

If you also want to boost Wi-Fi around your house buy an adaptor that can create a

hotspot. These can often be 'cloned', so that they use the same name and password as your normal home Wi-Fi. If not, they create a new wireless network in the second room.

Also consider the number of ethernet ports you need. One is fine, but if you need more, you'll either have to add an ethernet switch or buy adaptors with multiple ports.

Go for gigabit ethernet if your PC or router use that standard too; otherwise speeds will be limited to 100Mb/s. Plus, consider adaptors with a passthrough socket if you want to preserve the number of power outlets in both rooms. Then it's just a matter of plugging the adaptors in, and your new Powerline home network is ready for action.

## How we test

We test using real-world situations, transferring a 1GB file multiple times between computers to test the average speed of a home network. Speeds will vary wildly between different buildings, and that's to do with the age of the home's wiring, and other environmental issues.

All the Powerlines tested here were given a tough test of creating a network in the same house. The router and base Powerline adaptor were on the second floor of a Victorian house, while the second adaptor was placed in the ground floor living room, filled with the usual smart TV, Sky+, hi-fi,

lamps, and so on to recreate an average home. If your house was built more recently, you may achieve faster speeds than we did, but we use this house to get consistent speeds for a proper Powerline comparison.

Many Powerline reviews use the manufacturer's own speed-testing app to gauge performance, but that's not going to give you a realistic idea of how fast one Powerline adaptor compares to another. Only *PC Advisor* tests give you real-world Powerline testing.

The megabits per second (Mb/s) speed - shown in Powerline apps such as Devolo

Cockpit - is the 'physical data rate' (gross data rate). It's the amount of 'zeros and ones' that is transmitted in a certain time.

If you transmit a 1GB file, you also transport overhead (address data, error correction, and so on). So the amount of user data (net data rate) is, depending on the user software and protocol, about 50 percent of physical data rate.

Please note that our scores will be different from the speeds you'll get because so much depends on the home environment, though you can use our scores to compare each of the adaptors tested here. ☒

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# Improve your Wi-Fi speed and range

Matt Egan explains how to improve your Wi-Fi if its slow speed is driving you round the bend

Everyone needs faster, stronger Wi-Fi. You rely on your broadband connection for more than ever before. These days we don't just surf the web from a single PC in one place - we stream music, radio and movies around multiple connected devices, around the home and in the garden. In this article, we explain why you may need to upgrade your Wi-Fi equipment. We also show you how to boost your Wi-Fi signal using your existing kit, and simple ways to make your broadband faster, more stable, go further, and be more secure.

## Wi-Fi standards

Your wireless broadband will work only as fast as the slowest part of the chain - the signal you receive down the line depends on the quality of the line and the service you pay for. Beyond upgrading or moving house, the things you can control are your router and your laptop, PC or tablet.

If you're buying a new laptop, make sure it supports 802.11n or even 802.11ac wireless. The 802.11n standard has various options, with headline speeds up to 600Mb/s, while 802.11ac boasts headline figures up to 1.3Gb/s. But few routers are able to take advantage of this at this stage, but you might find your ISP-provided router supports 802.11ac if you got it recently. Enthusiasts should get a router that supports the latest standard, but 802.11n is a good start.

Wireless networking equipment adheres to various standards, which are created by the Institute of Electrical and Electronic Engineers (IEEE) to ensure interoperability between kit from different manufacturers. Excluding the obsolete ones, the standards that relate to Wi-Fi are 802.11g, 802.11n and 802.11ac.

The latter is brand-new and, although you can buy 'ac' equipment, it's unlikely that your whole setup will be able to take advantage of its speeds. Each standard specifies the headline speed, measured in megabits per second (Mb/s). The headline figures aren't representative of what you'll see in practice, but they do allow comparisons to be made.

Remember that if you decide to upgrade your equipment, both the wireless router and your computer must adhere to the same standard. For example, if your laptop supports only 802.11g, upgrading to an 802.11n router won't boost performance, although it might increase the range. In this scenario, you'd also need an 802.11n USB adaptor for your laptop.

802.11g has a headline speed of 54Mb/s. This standard has largely been phased out in favour of 802.11n, but you may still be using 802.11g if your computer is more than a couple of years old. That's why we suggest upgrading to an 802.11n laptop if your Wi-Fi is being broadcast from an 802.11n router (which it almost certainly is). Check both router and computers - both sides of the bargain will work only at the speed of the slowest link in the chain.

## Remove obstructions, improve range

The real-world speed you'll get from equipment adhering to a particular Wi-Fi standard is about half the headline figure at best. What's more, it reduces with distance, and with the number of walls and floors between the router and PC. For example, while 802.11g offers 54Mb/s, you'll achieve only 25-30Mb/s when your PC is next to the router, and much less the further away it is placed. At

the limit of the equipment's range, just before the connection is lost, the actual speed may well be less than 1Mb/s.

Placing your router in a spot that is close to the phone connection is important, as distance from the exchange means a loss of signal. But the further you are from the router itself, the worse will be the signal you receive. It's not uncommon to find that your Wi-Fi network doesn't reach every corner of the house, especially if some of the internal walls are brick or block construction. Extending the range can be carried out in several ways, some of which won't cost you a penny.

First, coverage will be improved if you are able to position your wireless router as close to the centre of the building as possible. Remember that it doesn't have to be positioned by the telephone company's master socket; you could also plug a router into any extension socket. (Note, though that you might end up with slower broadband speeds if you do this.)

If the router was previously hardwired to a desktop PC (or other gadgets) without Wi-Fi capabilities, and the wireless router's new home is somewhere else, bear in mind that you will need to get a wireless adaptor or powerline network adaptors to reconnect to the web those devices.

Another option is to increase the range of your wireless router. Some models have removable antennae, in which case you could buy high-gain antennas to replace the standard versions.

Alternatively, you can try mounting your router higher up, rather than have it languishing on the floor or behind the sofa. If all else fails, you might have to buy a wireless range extender and position it to cover a different part of the house from the wireless router. These units operate by retransmitting the signal.

Of course, distance and obstructions such as walls aren't the only things that will reduce wireless speeds. Another culprit is interference from wireless equipment that uses the same channel.

## Radio bands

Two radio bands are used for wireless internet: 2.4- and 5GHz. 802.11g equipment will operate only on 2.4GHz, while 802.11ac supports only 5GHz; 802.11n permits operation in both bands, and many equipment manufacturers let you choose which frequency to use. Before you make a choice over 2.4- and 5GHz, it pays to understand the pros and cons of each.

The 2.4GHz band has just 13 channels, nine of which are overlapping, while 5GHz has many more. You stand a much greater chance of avoiding interference from other users in the 5GHz band. This, in turn, will make your connection more stable and faster. This is particularly important if you want to use channel bonding to achieve the highest speed 802.11n offers.

As the name suggests, channel bonding uses two 20MHz channels to create a 40MHz channel, theoretically doubling the speed. The problem is that using 40MHz channels reduces the number of non-overlapping channels to just two. In turn, this means that interference with your neighbours' Wi-Fi equipment is much more likely, leading to poor transfer speeds and the possibility of the connection dropping out altogether. For this reason all 802.11n routers ship with channel bonding disabled by default. Unless you live in a remote area, using 40MHz bands on 2.4GHz is not recommended.

The extra number of channels in the 5GHz band means that using 40MHz channels is much more of a practical proposition, but some experts are suggesting that before too long the 5GHz band will be as congested as 2.4GHz. 802.11ac, meanwhile, also allows 80- and 160MHz channels.

Rarely does something offer a win-win solution, though, and 5GHz is no exception. A 5GHz signal's range is generally less than that of a 2.4GHz signal, and this is noticeable if it has to pass



through floors and walls - concrete is an especially tricky obstacle. Some manufacturers of 802.11n equipment allow the use of both bands simultaneously, carrying part of the data stream across 2.4GHz and part across 5GHz. This increases the speed beyond that which is available using either band alone.

## Find free channels

As we've said, there are 13 channels available on the 2.4GHz band. Many of these channels overlap, which means equipment using channel 2 would interfere with equipment on channel 3, for example. There are only four channels that do not overlap - 1, 5, 9 and 13 - so many people choose one of these.

By default, many wireless routers are set to automatically select a channel automatically; others allow you to specify the channel. If you're having problems with your Wi-Fi, suffering from poor speed or occasional dropouts, it may pay to change channels.

Rather than adopting a trial-and-error approach, you should check which channels are in wide use in your neighbourhood. Identifying the free channels is easy with Xirrus Wi-Fi Inspector, a free utility from [xirrus.com/free-tools](http://xirrus.com/free-tools).

If you have a router capable of using the 5GHz spectrum, it's likely that you're one of few people in your area to use it. However, if your neighbour has also invested in gear that operates at 5GHz and is using channel bonding, you may still experience problems with interference. Fortunately, inSSIDer can show usage in the 5GHz band, too.

## Configure security

Wireless routers have built-in security features to prevent anyone accessing your Wi-Fi network without your permission. On older routers this feature tends to be turned off by default. Failure to turn on security means that someone can access the internet via your wireless network, which could slow down your use of the network and, more importantly, if you've shared files or folder on your PCs, your documents could be accessible by anyone. Similarly, anyone could illegally download media, and you would be held responsible.

Details of how to enable security in your wireless router varies from one manufacturer to another, but the principles are the same for all. First, turn on Wi-Fi Protected Access (WPA), which encrypts your data prior to its transmission across the network and decrypts it on receipt. You should then specify a password that must be entered into any equipment hoping to connect to your wireless network. Note that most equipment will store this password; if you have to enter the password only once then it's worth using a strong password. Check the user manual to find out how to change your wireless router's security settings. ☒



# Improve the wireless signal in your home

Simon Jary's tips and gadgets will help boost the wireless signal in your home

All of us know a house's weak or dead Wi-Fi spots, and it's frustrating when these are where you need a strong Wi-Fi signal most. Wi-Fi black spots are most often caused by distance from the wireless router (wireless signals weaken with range), thick stone walls, and interference. Here's some tips and tricks and inexpensive gadgets that will help improve your wireless signal.

## Update your wireless router

If your house suffers from weak Wi-Fi, we first recommend that you think about upgrading your wireless router. The oldest to newest Wi-Fi standard are: 802.11b, g, n and ac. If you have an older wireless 'b' or 'g' router, you should consider replacing it with a newer wireless 'n' or 'ac' device that offers longer ranges and faster connection speeds. Try asking your ISP to send you an updated wireless router - BT, for example, has released the Home Hub 5. If you've been a customer for a while it should help

you out, but watch out if it asks you to sign up for a longer term, unless you're happy with its service. Though these newer routers may not significantly increase the range of your wireless network, you should at least get better speeds at longer distances. (See our routers group test on page 66.) You won't get the maximum range and performance from the newer wireless router unless your computers, smartphone or tablets also use the same Wi-Fi standard. An old laptop is unlikely to boast 'ac' or 'n' Wi-Fi, so check the specs to see which wireless standard it is using.

Rather than buy a new laptop or desktop PC or Mac, you can get a wireless adaptor - from as little as £25 - that plugs into a USB port. You can also add a new wireless adaptor inside a desktop PC's case or via a PC Card slot; but good luck trying that with a Mac.

What about your smartphone? Apple's iPhone 6 and Samsung Galaxy S4 and S5, for example, are equipped up to 802.11ac, while the iPhone 4 and 5, Galaxy S, S2 and S3 are compatible up to 802.11n.



**BT HOME HUB 5**

### Create a new Powerline home network

We also recommend considering Powerline adaptors (see left), which create a fast home network using the electrical wiring in your house. This means you can take your internet around your house without losing much performance.

Simply plug one adaptor into a power socket near your router and connect it to the router using an ethernet cable (usually supplied with the adaptor). Then plug the second adaptor into a power socket in a faraway room. You can then attach this to your smart TV, Sky+ box, games console, laptop, and so on, via another ethernet cable. This means that you can do without Wi-Fi for more demanding tasks such as streaming HD TV shows or moves from catch-up TV services.

Powerline adaptors act as if they're directly plugged into your router - even if they're on the other side of the house. You need at least two adaptors, and the best way to buy these are as part of a starter kit. The best adaptors can also create a new Wi-Fi hotspot right there in the second, third or fourth room. These create not merely boosted signals - as you get with a Wi-Fi extender - but close-to-fully performing new Wi-Fi hotspots. They cost more but are much more versatile and provide faster speeds than mere extenders.

Read our powerline adaptors group test on page 76.

### Wi-Fi extenders

A new wireless router or Powerline Adaptor set with built-in wireless are best but can cost more than a simple Wi-Fi Extender. The best Powerlines, with wireless functionality, we tested cost from around £50 to £150. Wi-Fi extenders such as TP-Link's TL-WA860RE are priced around £35. They catch a wireless signal and then rebroadcast it, helping to strengthen the signal from a router on a different floor of a house or on the opposite side of a building. It should be noted that they can also drag down your network's performance.

A repeater uses half its internal antennae to receive a wireless signal and the other half to transmit a new signal - in effect, halving the potential speed of the device's network connection. This shouldn't be that noticeable for light web browsing, email, and so on, but can be felt when streaming video or moving files around the network. That's why we prefer Powerline for more demanding tasks.

Wi-Fi extenders share the bandwidth with the router. Wi-Fi speeds are slower because it's sharing the data between the router and the extender, whereas the Powerline simply acts as a single device (not sharing the bandwidth) and so you get stronger signals. The extender

needs to be placed in a central location, not too far away from the main router. If you put the repeater at the far edge of your main network hoping to strengthen the signal you will reduce the speed of your connection to the rest of the network and to the internet. Remember that the extender is just boosting the signal. If it's placed in a weak Wi-Fi spot, then it will merely push around that weak signal. Place it in an area with better Wi-Fi and the signal it pushes out will be stronger, too.

The ideal location for a range extender is halfway between your main router and the intended wireless devices - in an open corridor or spacious room rather than a crowded space. It should also be away from interfering devices such as Bluetooth gadgets.

### 2.4- or 5GHz wireless

Wi-Fi can work over one of two spectrum bands: 2.4GHz or 5GHz. The trade-offs between these have to do with interference, range and speed. Manufacturers claim that 2.4GHz routers or extenders can reach up to 300Mb/s speeds, while 5GHz devices have a theoretical maximum of 450Mb/s. Dual-band devices are therefore sometimes rated as 750Mb/s. Remember that these claimed speeds are theoretical maximums, and you won't be getting anywhere near these speeds, but you can achieve perfectly acceptable wireless performance using such devices.

Each band has its limitations, though. For example, 2.4GHz devices face a battle for the available space, and so cause interference between each other. It is also divided into overlapping channels. The more overlap, the greater the interference among networks located closely together. Switching to 5GHz alleviates the channel problem because so many more channels are available - and without any overlap - in the 5GHz band.

However, 2.4GHz does have one big advantage over 5GHz: range. The shorter wavelengths used in the 5GHz band can't penetrate as well through objects such as walls, ceilings, desks, and, yes, people. The more interference, the less speed and range; the greater range you want, the less speed you can have; the greater speed you want, the more you have to mitigate interference and work closer to an access point.

A dual-band (2.4- and 5GHz) Wi-Fi extender, such as the TP-Link AC750, should offer the best of both worlds. The same goes for Powerline adaptors. The latest Devolo dLAN 1200+ Wi-Fi Starter Kit, for example, uses 'ac' and 2.4- and 5GHz bands. ☑



# Get Windows 10 upgrade icon if it's missing

Martyn Casserly shows how to force the Windows 10 update and get it to install on your PC or laptop

Windows 10 is here and Microsoft has made it easy to reserve your upgrade copy of its newest operating system by adding an icon in your notification area (it's a small white Windows logo). But if you can't see this option, you might need to do a little tinkering to ensure that you'll be able to get your free copy easily when the big day comes. Here's how to check you're running the right version of Windows, and what to do if the icon just won't appear.

## Check your version

While Microsoft said that Windows 10 is a free upgrade to existing Windows customers, it's actually a little more complicated than that - only select versions of the operating system are eligible for the free offer. If you're running Windows 8, Vista, XP or Enterprise versions, then the upgrade icon won't appear as you don't qualify for Windows 10. Of course, you can upgrade Windows 7 and 8 to the necessary versions for free using Windows Update on your PC. If you're not running an official copy of Windows, then it doesn't matter which version you have, as the system will know and stop you upgrading. Naturally, we realise that our readers are far too honest and splendid to dabble in such forms of piracy, but just thought we'd mention it in the spirit of completeness.

## Turn on Windows Updates

You might not see the icon if you have Windows Updates turned off. To remedy this on Windows 7, click on the Start button, type in update, then select Windows Updates. Now you can click Check for Updates, and Install Updates if any are found.

For Windows 8.1 users, you'll need to go to the Windows Store, open the Settings bar on the right side of the screen by either swiping in or moving the mouse pointer there, select App Updates, then ensure that Automatically update my apps is turned on.

## Check tool

If all of the above is proving futile, then there is another route left open. Some Windows fans on the Microsoft Support Forums

have created a script file that can fix the most common problems that block the upgrade icon from appearing. This isn't an official Microsoft solution, and therefore must be attempted at your own risk, but from the research we've done it certainly seems a legitimate bit of code that is there simply to help people. It's available to download from [tinyurl.com/q8e9aut](http://tinyurl.com/q8e9aut).

Once you have the `wind10fix_full.zip` file on your hard drive (it only takes a few seconds to download as it's tiny), you can extract it, then right-click on the file to bring up the contextual menu. Select Run as Administrator, then Run the program. Read the instructions on the screen and after a couple of warnings you'll be presented with a menu. Selecting the first option will run a system update to make sure everything is up to date. Then you can work your way through the other options until you see the icon appear.

## Reserve a copy of Windows 10

Once the mystery of the missing icon is resolved you need to click on the newly arrived Windows logo, then follow the simple instructions to reserve your free copy of Windows 10.

## Windows Update

Assuming you've done all of the above and Windows 10 still isn't downloading in Windows Update, try the following:

- Make sure Windows Update is set to get updates automatically
- In File Explorer, go to `C:\Windows\SoftwareDistribution\Download` and delete everything in it. This removes downloaded updates, and one of these could be corrupt or be causing another problem stopping Windows 10 from downloading
- Press Win-R to bring up the Run box. In it, type **cmd**. A command prompt window will appear
- Type **wuauclt.exe /updatenow** and press Enter. This forces Windows Update into action
- Check in Windows Update and you should see that it's downloading Windows 10 ☑



# Remove your location from Instagram

Ashleigh Allsopp reveals how to keep your whereabouts private on social media

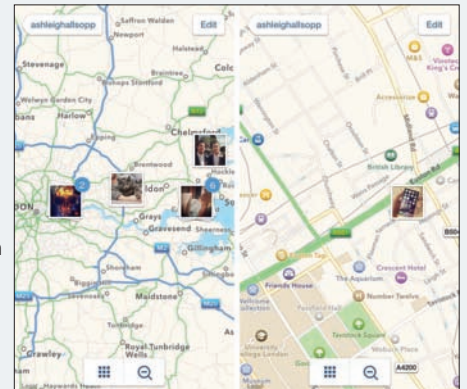
Formula One star Jenson Button and his wife Jessica Michibata found themselves in the headlines recently when it emerged that the pair were robbed while on holiday in a Villa in St Tropez. Thieves made off with hundreds of thousands of pounds worth of items, including Jessica's £250,000 engagement ring.

Since the news came to light, reports have suggested that their use of Instagram could be partly to blame for the break-in. Before the theft Jessica had posted a photo of herself sunbathing, with the ring clearly visible. The image had a location attached to it that anyone could see, potentially giving away where the couple were staying and therefore leading the thieves straight to them.

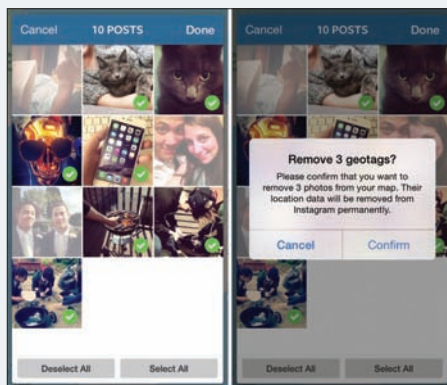
This left us thinking. We are guilty of showing off new and expensive purchases on Instagram and other social channels, and have never considered the thought that details of that item's location are being shared with potential burglars nearby.

If location tagging is something that concerns you, then you can follow these steps to remove location details from your Instagram and take images off your photo map, and prevent new pictures from appearing there in the future.

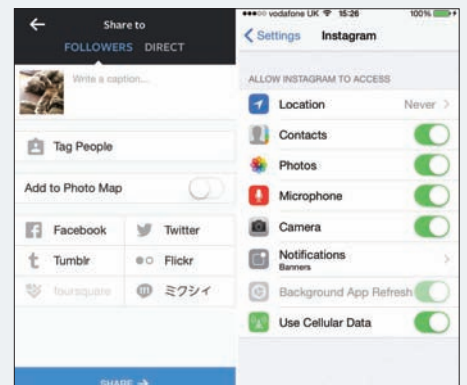
**START** You can find out whether your photos have a location attached to them by going to your profile and tapping the Map icon. You'll be taken to the Map page, where you'll see stacks of photos situated in the locations they're tagged to. Zoom in and it'll become clear that these photos can pinpoint your exact location. I can see photos I uploaded from my current address and the office, as well as places I've travelled to on holidays or work trips.



**2** To remove images from your photo map, tap edit in the top-right corner of the screen, then tap on the group of photos you'd like to remove and tap edit again. You'll see all of the photos in that group. If you want to remove them all from the map, tap deselect all, or you can tap individual photos to deselect them. Then tap Done and Confirm and they'll be removed from your photo map.



**3** To prevent photos from being added to your photo map in the future when you post new photos to Instagram, simply make sure that the Add to Photo Map slide is white - if it is blue that means you're adding location information to the photo. Better still, you can go to your smartphone's settings or the app's settings and disable location features for that app. ☒





# facebook

## Hide your phone number on Facebook

Roberta Alidori reveals how to hide your phone number on Facebook and why you should do so

Have you added your phone number to your Facebook account? If the answer is yes, did you know that anyone can find out information about you simply by typing your phone number into Google? They don't even need to know it's your phone number - they can just enter a string of digits and the results returned will be your data on a plate.

When you first create an account, or when you upload pictures or videos from your phone, Facebook will prompt you to add your phone number. Your phone number can also be used for extra security to prevent others from entering your account.

However, if you don't customise your privacy settings, anyone can type your number into Facebook and then collect information about you that might seem harmless, such as your profile picture, name, job title and location. However, when this is combined with other snippets, it can be used to build up a picture of you.

You don't have to provide your phone number at all, but if that advice comes too late, and you've already submitted your number, don't worry. There are still steps you can take to protect your data on Facebook.

Privacy settings and tools			
Who can see my stuff?	Who can see your future posts?	Friends of friends	Modification
	Check all the post you are tagged		Use the Activity Log
	Do you want to limit the audience of the post that you shared with friends of friends or with the public?		Limit your past posts
Who can contact me?	Who can send you friend requests?	All	Modification
	What you want to filter messages in your inbox?	Basic filters	Modification
Who can find me?	Who can find you using the e-mail address you provided?	All	Modification
	Who can find you using the phone number you provided?	All	Modification
	Want others search engines make reference to your diary?	Yup	Modification

**START** Log into your Facebook account and click on the down arrow that appears at the top right of the page on the blue bar. Scroll down to and select the Settings option. Next, click the Privacy menu from the lefthand pane.

Privacy settings and tools			
Who can see my stuff?	Who can see your future posts?	Friends of friends	Modification
	Check all the post you are tagged		Use the Activity Log
	Do you want to limit the audience of the post that you shared with friends of friends or with the public?		Limit your past posts
Who can contact me?	Who can send you friend requests?	All	Modification
	What you want to filter messages in your inbox?	Basic filters	Modification
Who can find me?	Who can find you using the e-mail address you provided?	All	Modification
	Who can find you using the phone number you provided?	All	Modification
	Want others search engines make reference to your diary?		Close
<p>Note:</p> <ul style="list-style-type: none"> <li>If this setting is on, the other search engines is easier to defer to your timeline in search results.</li> <li>If you disable this setting, you may need a bit of time before the search engines stop to show the link to your diary among the search results.</li> </ul> <p><input checked="" type="checkbox"/> Allow other search engines to defer to your diary</p>			

**2** In the 'Who can find me' section, select 'Who can find you using the phone number you provided?' There are two options. One lets you choose who can find your mobile number, while the other refers to whether search engines are allowed to link to your Timeline.

Privacy settings and tools			
Who can see my stuff?	Who can see your future posts?	Friends of friends	Modification
	Check all the post you are tagged		Use the Activity Log
	Do you want to limit the audience of the post that you shared with friends of friends or with the public?		Limit your past posts
Who can contact me?	Who can send you friend requests?	All	Modification
	What you want to filter messages in your inbox?	Basic filters	Modification
Who can find me?	Who can find you using the e-mail address you provided?	All	Modification
	Who can find you using the phone number you provided?	All	Modification
	Want others search engines make reference to your diary?		Close
<p>Note:</p> <ul style="list-style-type: none"> <li>If this setting is on, the other search engines is easier to defer to your timeline in search results.</li> <li>If you disable this setting, you may need a bit of time before the search engines stop to show the link to your diary among the search results.</li> </ul> <p><input checked="" type="checkbox"/> Allow other search engines to defer to your diary</p>			

**3** To hide your phone number on Facebook, disable 'Allow other search engines to defer to your Timeline', then validate your choice by clicking on 'Confirm'. ☒



# Turn off notifications in Facebook Messenger

If you're fed up with Facebook's Messenger alerts, Matt Egan reveals how to turn them off

Facebook Messenger is the somewhat useful, if at least partially controversial, messaging app from Facebook. It is a means of text messaging groups and individuals with whom you have a Facebook contact. A free messenger app that doesn't rely on you knowing someone's phone number, it is at best a useful rival to WhatsApp.

At best. At worst, it is both a privacy threat and a irritation. A privacy threat because you are forced into installing a new app. It's also an irritant because any of your Facebook 'friends' can message you, and by default you will get a notification somewhat akin to receiving an SMS. This how to is for those times when you don't want to leave a Facebook Messenger conversation, but you do want to mute the notifications. You want to retain your sanity without burning a contact.

## Turn off notification alerts on the online Messenger app

- Open the Messenger app
  - Tap the menu button and select Settings
  - Use the checkbox next to Notifications to turn notifications on or off
- To turn off notifications for just a single conversation:**

- View the conversation
- Tap the menu button and select Mute conversation
- Select On, Off or Off for 1 hour

## Turn off notification alerts on the Android Messenger app

- Open the Messenger app
  - Tap Notifications, and use the toggle to turn notifications On or Off
  - Select whether you'd like to Turn off for 1 hour or Turn off until 8am
- To turn off notifications for a single conversation:**

- Press and hold a conversation

- Tap Mute notifications
- Select For 1 hour, Until 8:00 AM or Until I turn it back on

## Turn off notification alerts on the iPhone Messenger app

- Open the Messenger app
- Tap Settings
- Tap Notifications, then choose whether you'd like to Turn off for 1 hour or Turn off until 8am

### To turn off notifications for a single conversation:

- Swipe left on a conversation and tap Mute
- Select For 1 hour, Until 8:00 AM or Until I turn it back on

## Turn off notification alerts on the iPad Messenger app

- Open the Messenger app and tap Settings
- Tap Notifications, then choose whether you'd like to Turn off for 1 hour or Turn off until 8am


### To turn off notifications for a single conversation:

- Swipe left on a conversation and tap Mute
- Select For 1 hour, Until 8:00 AM or Until I turn it back on

## Turn off notification alerts on the Windows Phone Messenger app

- Open the Messenger app
- Tap the menu button (three dots) and select settings
- Tap notifications and select whether you'd like to turn off for 1 hour or turn off until 8am

### To turn off notifications for a single conversation:

- Press and hold a conversation and tap Mute
- Select mute, mute for 1 hour or mute until 8am 



# Get WhatsApp on your phone, tablet or PC

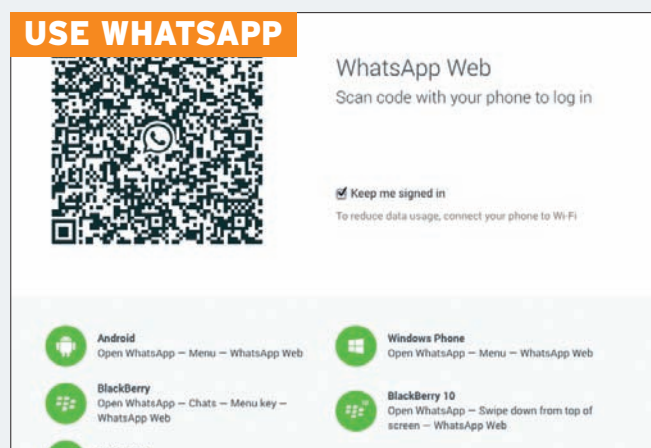
It's now possible to access your WhatsApp account on all your devices. Marie Brewis explains how

WhatsApp is now available on the web via the Chrome browser and in a tablet app, meaning it's possible to simultaneously access your account on your phone, tablet, laptop and PC without a hack.

It works with Android, BlackBerry, Nokia and Windows phones, and iOS users. You must also be using the Google Chrome web browser, and make sure you are running the latest version of WhatsApp (in Android, launch the Google Play Store, tap the three lines icon at the top left, choose My apps and check whether an update is available).

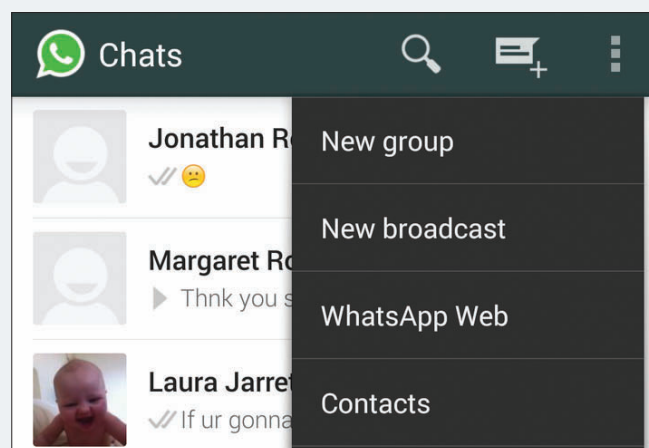
Though WhatsApp originally claimed that WhatsApp web wouldn't be available for iPhone or iPad users due to restrictions in its iOS system, the company has quietly added support for the service. If you head over to the official WhatsApp web page, you'll notice that 'iPhone' has been added, though the company has yet to officially announce support.

The update seems to be rolling out gradually, and iOS users can see whether it's been activated for their accounts by accessing the Settings menu. Once accessed, you should see a 'WhatsApp Web' menu - if not, sit tight and check again in a few hours.



**START**

On your computer or tablet, launch the Chrome browser and head to [web.whatsapp.com](http://web.whatsapp.com). A QR code will pop up onscreen on your PC. If you're using a tablet, you will need to request the desktop site in Chrome's settings.

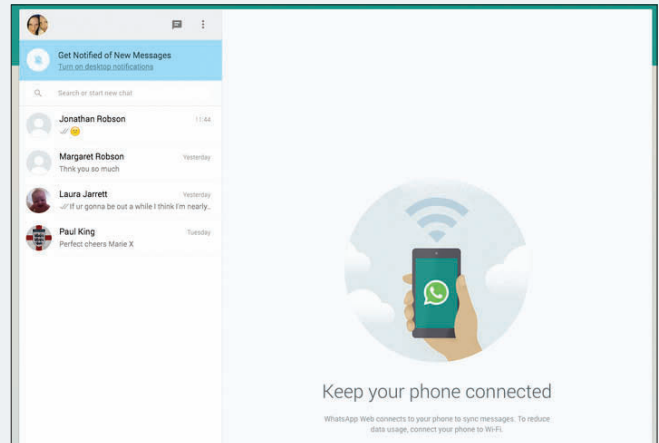
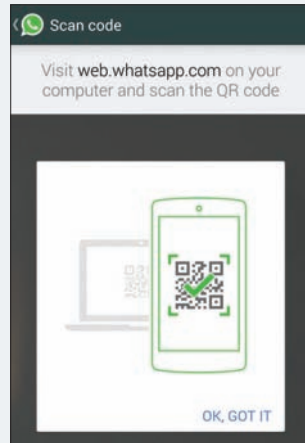


**2**

Launch WhatsApp on your phone and access the settings menu (click the three dots at the top right to access more options on an Android device), then choose WhatsApp Web.

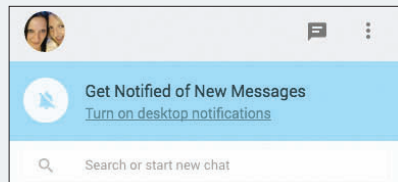


**3** A QR reader will then open on your phone; point this at your PC screen to read the code and be automatically logged into WhatsApp on the web.

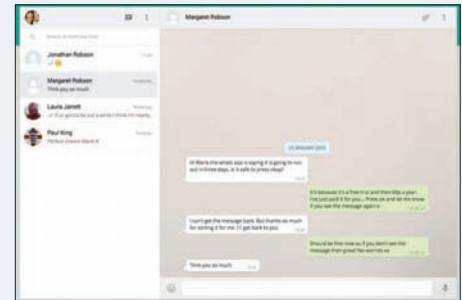


**4** The interface will be familiar to WhatsApp phone users, but you should note that desktop notifications are supported, which you may want to switch off in the settings menu. As on the phone, tapping the three-dot icon brings up more options. Select Notifications and then deselect Desktop Alerts and Sounds.

**5** Starting a conversation is different on the desktop. As on the phone, you can click the new message icon to select one of your contacts, but in WhatsApp on the web the search function lets you start new conversations as well as filter existing chats.

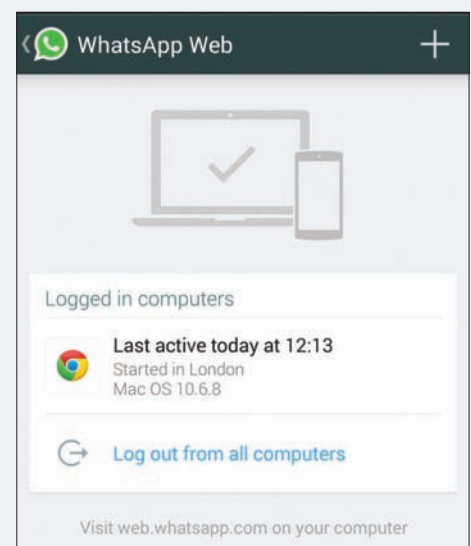


**6** Within a conversation, the interface matches that of the phone, with emoticon and mic icons sitting either side of the bottom text-entry field, and a paperclip icon at the top to attach files. Beside this is a more options icon that allows you to view contact info. And as on the phone you get the single-, twin- and blue-tick system to show whether messages have been sent, delivered and read.



**7** Once your phone and computer are connected, you are able to manage your logged in computers from your phone via Options > WhatsApp on the web menu. From here you can log out from all your computers, or you can use the options menu in WhatsApp on the web to log out from the system you're currently using. WhatsApp will by default keep you logged in unless you specify otherwise, but having logged out you'll need to go through the QR code process again the next time you want to log into WhatsApp on that machine.

Messages between phone and browser are instantly synched, so users on limited mobile data contracts should be wary of increased data usage. It's a good idea to switch on your Wi-Fi if you're a heavy WhatsApp user. ☒





# Block a number on an Android smartphone

Martyn Casserly reveals how to block unwanted calls using the built-in features on an Android phone

Nuisance calls are one of the modern evils of the world. Whether it's sales, marketing or just people you don't like, having your phone ring at all hours only to find these interlopers interrupting your day is no fun at all. Of course, if you're in the UK, you can sign up to the Telephone Preference Service ([tpsonline.org.uk](http://tpsonline.org.uk)), which does its best to stop unwanted calls, but some of the more persistent offenders often manage to sneak through. In this how to we'll take a look at the options open to you, and hopefully return your life to the peaceful, robot-salespersonless way it was meant to be.

As the layout of Android varies on different handsets we've separated the methods out by manufacturer, though many of the same principles apply on most platforms. So if you don't see your particular model listed, try using the other solutions provided. There are some phones that don't allow the feature directly, and in those cases you can use third-party solutions, a couple of which we've also included in our guide.

## Samsung

The Korean manufacturer uses a system called the Auto-Reject list to block calls on Samsung phones. To access this start by tapping on the Phone icon on your home screen. Now select the number you want to block and when its details appear tap the More option in the top righthand corner of the screen. You'll see the option Add to Auto-Reject List appear. Tap this and now whenever this particular number rings your phone will bat it away.

## LG

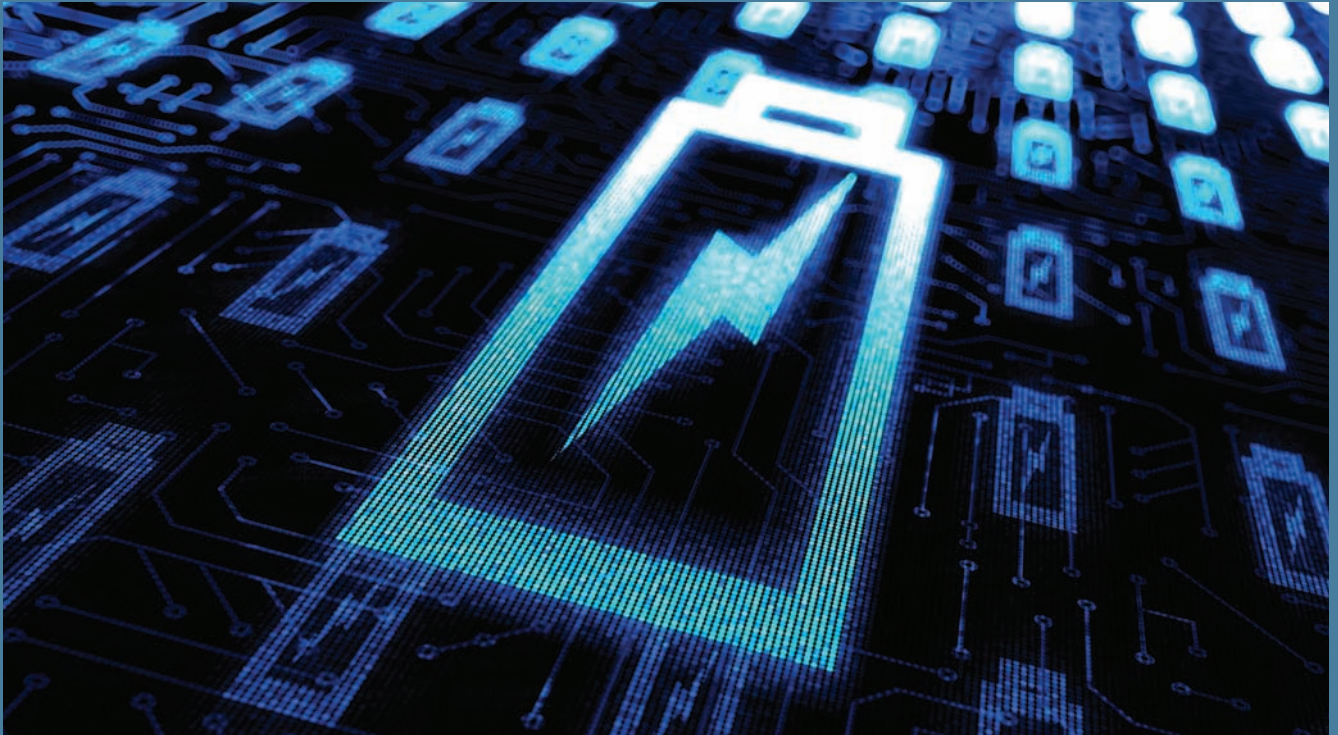
In a similar fashion, you can create a Call Reject list on LG handsets. To do so, tap the Phone icon on the home screen, then tap the three dots in the top right corner. You'll see a menu appear and from this select Call Settings > Call reject > Reject calls from. Next, tap the Plus icon and you can add the numbers of those who have been bothering you. You can also select any number from your Call Logs or Contact list.

## HTC

HTC make things very easy with its quick method of blocking numbers. On the Home screen, tap the Phone icon, then swipe in from the right and you'll see your call history appear. Long press on the offending number and another menu appears, this time with an option to 'Block contact', tap OK, and you won't be receiving any calls or messages from them any more.

## Third-party solutions

Thankfully, when you can't block callers from your phone's OS, you can still turn to third-party solutions. If you use antivirus software on your phone, such as Avast ([avast.com](http://avast.com)), then you'll find the feature often included in the service. Otherwise you can download dedicated apps such as Truecaller ([truecaller.com](http://truecaller.com)) or Mr Number ([mrnumber.com](http://mrnumber.com)), which provide the same kind of solutions as those on the phones listed above. ☒



# Extend the lifespan of your phone's battery

Simon Jary reveals how to extend the life of your smartphone's battery with his top tips

Batteries are one of tech's most boring subjects, that is until your phone, tablet or laptop dies. While most of us live in fear of a fading phone battery when we're out and about, we don't worry too much about their eventual lifespan, but there are ways to keep your battery in tip-top shape for a long and fruitful life.

## Don't charge battery from zero to 100 percent

The rule with Lithium-ion batteries is to keep them 50 percent or more most of the time. When it drops below this, top it up a little if you can. A little a few times a day seems to be the optimum to aim for. Try not to charge it all the way to 100 percent. It won't be fatal to your battery if you do a full recharge – most of us are forced to do this every now and again in emergencies – but constantly doing a full recharge will shorten the battery's lifespan. So a good range to aim for when charging a Lithium-ion battery is from about 40- to 80 percent in one go. Try not to let it drop below 20 percent.

## Full battery charge

Experts recommend that you do a full zero- to 100 percent battery recharge once a month only. This recalibrates the battery.

## Overnight charge

Most modern smartphones are clever enough to stop charging when full, so there isn't a great risk in leaving your phone charging overnight. But some experts recommend you remove the phone from a case if charging for a long time, as a case could lead to overheating, which Lithium-ion batteries do not like.

## Fast battery charging

Many Android phones have a feature that allows for fast charging. Samsung even calls its technology "ultra fast charging". Motorola

boasts about its Droid Turbo, which promises an eight-hour charge in just 15 minutes. HTC's Rapid Charger 2.0 charges devices such as the One M8, One E8 and Desire Eye 40 percent faster. These phones have special code, located in a chip known as the Power Management IC (PMIC), which communicates with the charger you are using and requests that it send power at a higher voltage.

Apple's iPhone 6 doesn't feature fast charging, but its Qualcomm PMIC is smart enough to recognise when you use a higher-amp charger (like the one you get with the iPad), and that's a good thing because fast charging will heat up that Lithium-ion battery and cause it increased wear and tear.

So, if you can, switch off fast charging on your Android phone.

## Charger

Where possible use the charger that came with your phone, as it will have the correct rating. If you must use a third-party charger make sure that it's approved by your phone's manufacturer. Cheap alternatives from Amazon or eBay may harm your phone, and there have been several reported cases of cheap chargers actually catching fire.

## Storing battery tips

Don't leave a Li-ion battery lying around too long at zero percent. Try to leave it at around 40- to 50 percent. These batteries drain at about five- to 10 percent a month when not in use. If you let the battery discharge completely and leave it uncharged for a long period of time, it may eventually become incapable of holding a charge at all. It's unlikely you'll leave your smartphone lying in a drawer for very long, but some people do leave their laptop, battery packs or spare batteries unused for long periods of time. So try to keep them all at least half charged. ☒





# Protect Android phone from Stagefright

Marie Brewis reveals how to stay safe and avoid the Stagefright Android MMS virus

Android security has hit the headlines recently following a report from cybersecurity firm Zimperium that suggests Android phones can be infected with a picture message, allowing hackers to take complete control of a phone. Before you panic, here's how to avoid the Stagefright Android MMS virus.

We should note that although there is a patch for the flaw, known as Stagefright and to which some 950 million devices are said to be vulnerable, the various flavours of Android in use and the need for both mobile operators and phone manufacturers to be involved in any software updates makes it impossible for Google to automatically roll out a patch to all Android users. Those using older handsets will likely never get the patch.

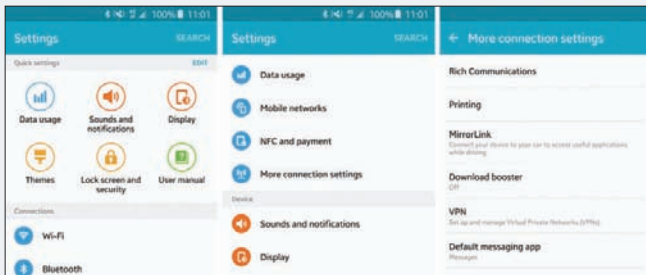
Traditionally, Android malware comes through the installation of dodgy apps outside of the protected walls of Google Play. However, it's also possible to attach malware to a multimedia message, which will download to your phone once you view the message.

A simple solution, you might think, would be to keep your wits about you and not to open and immediately delete, any suspicious-looking messages. But that's not always so easy; Hangouts, which is the default messaging app for many Android users, by default automatically processes incoming media messages without your input. Other messaging apps may also be set to auto-retrieve multimedia messages by default, and you should check this is not the case with whichever app you use.

An easy way to check whether your device is vulnerable to Stagefright is to download the free Stagefright Detector app from the Google Play store at [tinyurl.com/q6L97by](http://tinyurl.com/q6L97by). When launched, it will scan your phone and let you know whether you're at risk. If you are, follow the steps below to protect your phone from the Stagefright MMS virus.

Security firm 360 Security also advises taking steps to protect your phone from Stagefright while it's locked. It says to open the Settings app, then choose Notifications under My Device. Depending on your device, select 'When Locked' or 'Notifications on Lock Screen', then click 'Hide Sensitive Content'. This will stop the bug from being executed when your phone is locked.

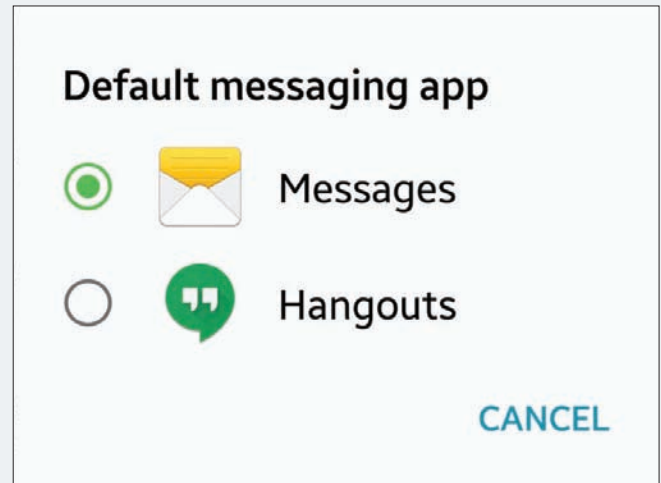
## CHANGE THE DEFAULT MESSAGING APP IN ANDROID



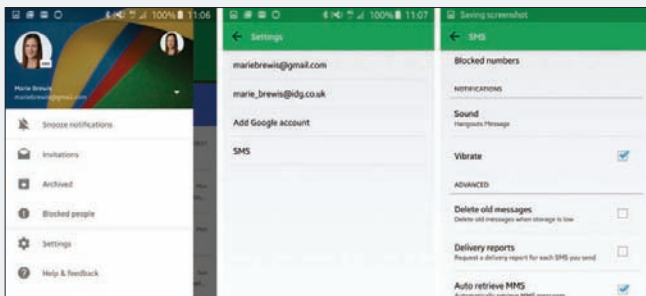
**START** There are two ways to access the option to change your default messaging app in Android. The first method is to open the Settings app on your phone, then select More under Wireless & networks, and finally tap on Default SMS app.

(This looks a little different on our Samsung Galaxy S6, on which we open the Settings menu, choose More connection settings under Connections, then select Default messaging app.)

The second way to access this option is through Hangouts. Open the app and tap the three vertical lines icon at the top left of the screen to access the options, choose Settings > SMS > SMS enabled.



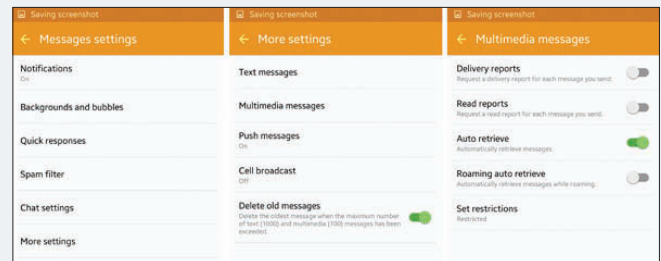
**2** If Hangouts is selected as the default messaging app instead, choose Messaging, Messages or any other option you see here. If you don't see an option other than Hangouts, go to Step 3.



**3** If you don't have an alternative messaging app on your phone you can either download one from Google Play, or you can turn off Hangouts' ability to automatically retrieve multimedia messages.

If you go with the first option, note that you may need to set it as the phone's default messaging app within the app's own settings menu before you see an option to select it within Settings > More > Default SMS app.

If you go with the second option, open Hangouts, tap the three vertical lines at the top left of the screen, then choose Settings > SMS. Scroll down the page to the Advanced section and deselect the box to Auto retrieve MMS.



**4** It's not just Hangouts that will auto-retrieve multimedia messages by default. The Messages app on our Samsung Galaxy S6 also auto-retrieves MMS messages by default. To turn this off, open Messages and select More > Settings > More Settings > Multimedia messages, and disable the option to Auto retrieve.

In vanilla versions of Android where Hangouts is not the default messaging app, you should open the Messaging app and select the three dots icon to access Settings > Multimedia MMS Messages, then ensure the option to auto retrieve is disabled. ☒





# Remove a virus from a PC or laptop

Matt Egan explains how to delete a virus, spyware or other malware from a computer

If your PC or laptop is running slow, or strange windows keep popping up as you browse Windows, your computer may well have been infected by a virus, spyware or one of the myriad other types of malware that proliferate on the web. In this how to, we reveal how to remove malware from a PC or laptop, and clean up your system after infection by a virus or spyware. We'll start, however, by giving you some quick and basic advice on prevention.

## Prevention

Check now: do you have on your PC internet security software that includes up-to-date firewall, antivirus and antispyware? That is the very least you need in your security arsenal. The easiest way to get such security on your PC is to purchase an internet security suite.

Incidentally, if you do have up-to-date security software and you still think you are infected, simply running a scan is a good first step, but it is unlikely to solve the problem. Once installed any malware worth its salt will be able to disable your antivirus. (Security software to a greater or lesser degree prevents infection,

but if your security software has already failed, it is unlikely to be able to solve the problem alone. Remember, no antivirus application can detect 100 percent of the millions of malware types and variants, particularly given the fact that literally thousands of new threats spring up each day.)

Similarly, returning to an older System Restore point might help, but the chances are the malware will be ahead of this trick. So let's assume you've been infected. Follow the steps below to sort things out. Carry them out in order and it is likely you won't need Step 4.

## START Enter Safe Mode

First, disconnect your PC or laptop from the internet. Do so by unplugging any wired connections, and switching off Wi-Fi on your laptop. Now we're going to boot into Windows' Safe Mode. This is a version of the OS that runs without many of the programs and processes required by full Windows. It will let you use your PC without doing any more damage, and it should help you to find out what the problem is. Malware won't run in Safe Mode.



To boot into Safe Mode in Windows 7, Vista or XP, first shut down your PC. Next, turn on your computer and, as soon as you see anything on the screen, repeatedly press the F8 key. You'll now see the Advanced Boot Options menu. Select Safe Mode with Networking and press Enter.

Windows 8 and 10 are a little different. PCs using these operating systems start up quickly, so there's not enough time to press F8. At the Windows login screen, choose restart and hold down the Shift key. You will see several options to troubleshoot your system from which you can select to boot in Safe Mode.

Of course, most people who need Safe Mode will already have a problem with their PC. If you are already logged in and can see only a black screen, hit Ctrl, Alt, Del to bring up the selection screen, and choose logout, restart. Then hold down the Shift key and you will be taken to the window via which you can choose Safe Mode.

## 2 Delete temporary files

This step isn't critical, but it can help. Deleting temp files will speed up virus scanning, free disk space and may even delete malware. Select Start, All Programs (or just Programs), Accessories, System Tools, Disk Cleanup. Choose to delete temporary files.

## 3 Download and run Malwarebytes

As discussed above, you need to use a different malware scanner to that which you have installed, since your current antivirus software hasn't detected the malware. So now we're going to use an on-demand scanner, which searches for malware infections only when you manually open the program and run a scan. The benefit here is that you can run an on-demand scanner alongside the real-time security software we discussed at the outset.

We're going to use the Malwarebytes Anti-Malware free on-demand scanner ([malwarebytes.org](http://malwarebytes.org)). To get started, reconnect to the web so you can download, install and update the program; but disconnect from the internet before you start scanning. To be entirely safe the best process is to download Malwarebytes on another computer, save it to a USB flash drive, and take the flash drive to the infected computer.

After downloading Malwarebytes, run the setup file and follow the wizard to install the program. Once installed, it will check for updates and launch the app itself. If you get a message about the database being outdated, select Yes to download the updates and then click OK when prompted that they have been successfully installed.

Once the program opens, keep the default scan option ('Perform quick scan') selected and click the Scan button. Though it offers a full-scan option, Malwarebytes recommends that you perform the quick scan first, as that scan usually finds all of the infections anyway. Depending on your computer, the quick scan can take anywhere from five- to 20 minutes, whereas the full scan might take 30- to 60 minutes or more. While the software is scanning, you can see how many files or objects the software has already scanned, and how many of those files it has identified either as being malware or as being infected by malware.

If Malwarebytes automatically disappears after it begins scanning and won't reopen, then you probably have a rootkit or other deep infection that automatically kills scanners to prevent them from removing it. Though you can try some tricks to get around this malicious technique, you might be better off reinstalling Windows after backing up your files (as discussed later), in view of the time and effort you may have to expend to beat the malware.

If the quick scan doesn't find any infections, it will show you a text file containing the scan results. If you still think that your system may have acquired some malware, consider running a full scan with Malwarebytes and trying the other scanners mentioned earlier. If it does find infections, it'll bring up a dialog box warning you of the

discovery. To see what suspect files it has detected, click the Scan Results button in the lower right. It selects to remove the ones that are known to be dangerous. If you want to remove other detected items, choose them as well, then click the Remove Selected button in the lower left to get rid of the specified infections.

After removing the infections, Malwarebytes will open a text file listing the scan and removal results; skim through these results to confirm that the antivirus program successfully removed each item. The program may also prompt you to restart your PC in order to complete the removal process, which you should do.

If your problems persist after you've run the scan and it has found and removed unwanted files, consider running a full scan with Malwarebytes and the other scanners mentioned earlier. If the malware appears to be gone, run a full scan with your real-time antivirus program to confirm that result. Then go to Step 5.

## 4 Use a virus removal device

This step requires you to shell out some cash. But it will be worth it if Malwarebytes hasn't solved your problem. Sometimes simply going online to download software - even security software - opens up your PC or laptop to more pain. So using a bootable USB stick with preinstalled security software is a good way of scanning and cleaning your PC without going online. To create one you just have to download and install a security software package to a USB disk. (If you are reading this story and you don't have a virus problem, this wouldn't be a terrible idea.) The trouble is that unless you are the network admin for an office, you are unlikely to have such a disk to hand.

FixMeStick is an easy to use 'plug and play' antivirus USB stick. It's ideal in this scenario: perfect for anyone wanting a no-fuss antivirus solution for multiple devices, without having to venture online to download and install software. It isn't cheap, though. It costs £45 per stick, but the device can at least be used on up to three PCs or Macs per year. If you find yourself regularly rescuing PCs and laptops for friends and family, it may be worth a punt.

In essence, it's a self-bootable USB device that operates in its own clean environment, identifying viruses and malware such as spyware, Trojans, ransomware, and so on. It includes security software from Sophos, Kaspersky and Vipre. Plug it in and start scanning for viruses and malware. What it finds it can clean.

## 5 After the event

Your PC should now be free of malware. But that may not free you from the after effects of the infection. You may find, for instance, that your web browser defaults to a weird search engine and has a home page you didn't choose. You can solve this by following the steps in our 'How to remove unwanted web browser toolbars' piece - go to [tinyurl.com/pycy2w3](http://tinyurl.com/pycy2w3).

More importantly, you should change all your passwords and login details for anything that contains sensitive information. Remember that this includes email and social media accounts. ☒



LETITIA  
AUSTIN



ONLINE  
REGISTRATION  
REQUIRED

## Auslogics BoostSpeed 8

FULL PROGRAM (90 DAYS' WORTH OF UPDATES) AVAILABLE ONLY ON THE DISC+

### Installation details

Go to My Computer, right-click the DVD icon and open the disc. Select Files 244/Auslogics BoostSpeed 8 and open the install file.

### Online registration required:

Follow the instructions within the program before 10 November 2015.

### System requirements

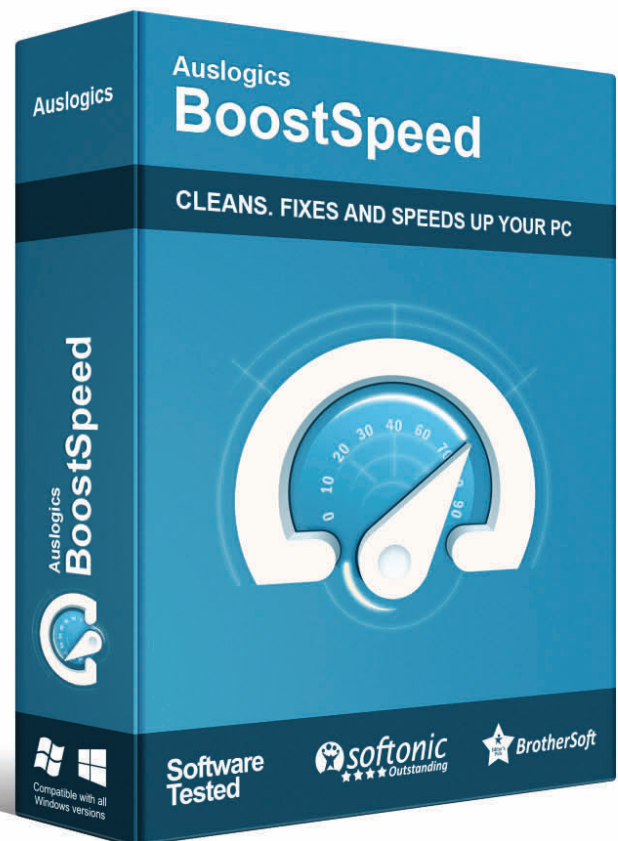
Windows XP/Vista/7/8/8.1/10 (32- or 64-bit); 512MB RAM; 60MB drive space; 1024x700 screen resolution

BoostSpeed is an immensely popular system utility suite that offers a wide selection of computer optimisation and maintenance tools for users of any PC experience level. It provides one-click cleanup and repair functionality, and offers 19 separate tools covering most computer tune-up needs, such as Registry cleanup and defrag, disk defrag, startup management, internet optimisation, privacy protection and recovery of accidentally deleted files.

New features include Action Center, which offers PC improvement recommendations based on each system's current status. This includes Windows features that can be enabled for improved security, as well as additional applications that can be installed to cover essential system needs, such as antivirus software, data backup tools and similar. The Action Center tips help the user protect their data, prevent virus infections and avoid other potential problems, which can be especially helpful for novice users who have little experience in dealing with these issues.

The Privacy Protection section has been enhanced with added functionality, improved clarity in subcategory breakdown and better hints. Users can now review the kind of sensitive information that may be revealed, see a detailed list of items detected and control what portions get erased.

The Live Speedup section (formerly LiveProtect) has been expanded with three new tools added: Auto Defragmentation, Disk Priority Management and Desktop Protection. Along with the existing memory and CPU optimisation tools, these new features provide real-time performance enhancement, making the software even more effective for everyday use.



Visit our website for more software special offers: [pcadvisor.co.uk/special-offers](http://pcadvisor.co.uk/special-offers)

**ONLINE  
REGISTRATION  
REQUIRED**

# Incomedia WebSite X5 Compact 10

FULL PROGRAM AVAILABLE ONLY ON DISC+

## Installation details

Go to My Computer. Right-click the DVD icon, and open the disc. Select Files 244/ Incomedia WebSite X5 Compact 10 and open the install file.

## System requirements

Windows XP/Vista/7/8/10;  
1GB RAM; 1024x768  
screen resolution;  
internet connection

WebSite X5 Compact 10 will help turn your website dreams into reality. With 500 professional-quality templates, you're sure to find the perfect option for whatever project you have in mind. The software offers a unique way of creating website pages: just drag-and-drop text, images, videos, sound and FlashTM animations into the various pages to create an interesting, eye-catching project. You have everything at your fingertips: text editor, photo editor, functions for creating FlashTM Galleries, support for importing videos from YouTube, and more. In addition, you can complete your project with a blog that can be customised and updated as required, new posts can be published regularly.



## Online registration

**required:** Go to [tinyurl.com/pojhbc5](http://tinyurl.com/pojhbc5) and register. You'll receive an email asking you to validate the account. Return to [tinyurl.com/pojhbc5](http://tinyurl.com/pojhbc5) to obtain Licence Key. Download WebSite X5 Compact 10. Insert the Licence Key to activate it. Follow the instructions within the program before 10 November 2015

**ONLINE  
REGISTRATION  
REQUIRED**

# ABBYY PDF Transformer+

FULL PROGRAM (90-DAY CONVERSION OF 100 PAGES) AVAILABLE ONLY ON DISC+

## Installation details

Go to My Computer, right-click the DVD icon and open the disc. Select Files 244/ABBYY PDF Transformer + and click the Windows install button on the cover-disc interface.

## Online registration

**required:** Follow the instructions within the program before 10 November 2015.

## System requirements

Windows Server  
2003/2008 R2/2008/  
2012/XP/Vista/7/8/8.1/10;  
1GHz processor

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# Abelssoft Toolbar Terminator

FULL PROGRAM AVAILABLE ONLY ON THE DISC+

ONLINE  
REGISTRATION  
REQUIRED

## Installation details

Go to My Computer, right-click the DVD icon and open the disc. Select Files 244\Abelssoft Toolbar Terminator and open the install file.

## Online registration

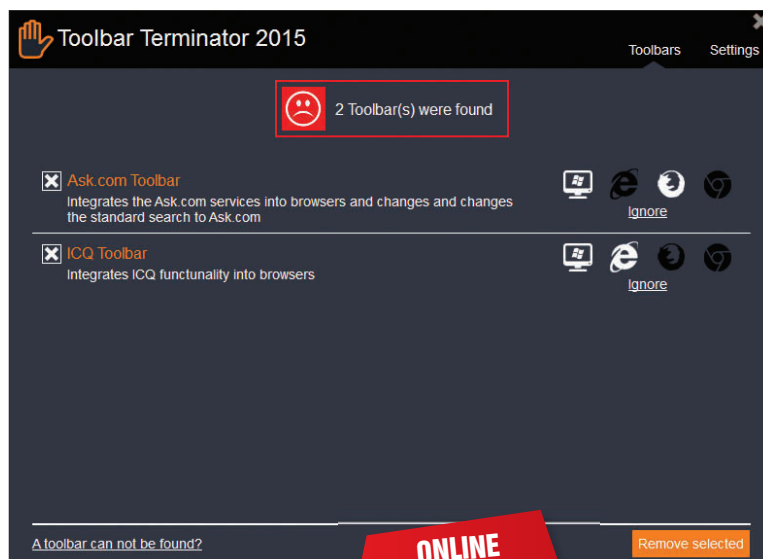
**required:** Follow the instructions within the program before 10 November 2015.

## System requirements

Windows XP/Vista/7/8/10/Server; 512MB RAM; 50MB drive space

Toolbars that take over your web browser can get into your system when installing many free software applications today. They change your browser's start settings, take control about features and install malware. Most won't let you uninstall them properly. Instead, they integrate themselves into your system.

Toolbar Terminator has been developed to remove toolbars and throw them out of your system. The software can also remove unwanted applications that those toolbars have installed on your PC.



ONLINE  
REGISTRATION  
REQUIRED

# Apowersoft Streaming Audio Recorder

FULL PROGRAM (100 DAYS OF UPDATES) AVAILABLE ONLY ON THE DISC+

## Installation details

Go to My Computer. Right-click the DVD icon, and open the disc. Select Files 244\Apowersoft Streaming Audio Recorder and open the install file. Enter pcadvisor@apowersoft.com when prompted and type in: 10298534910155975410.

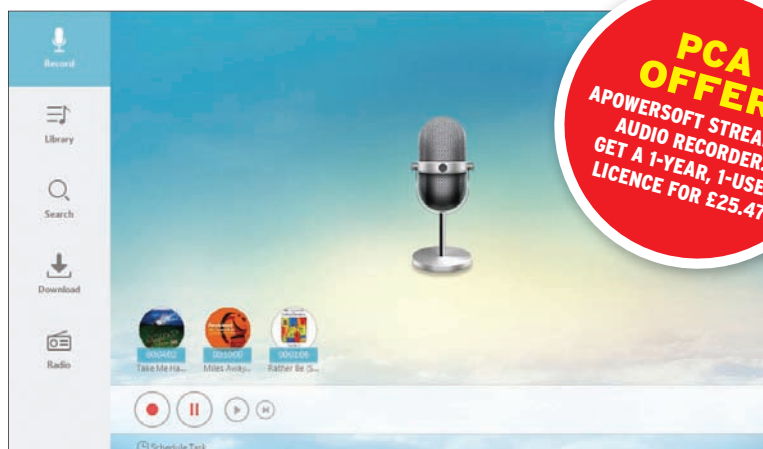
## Online registration

**required:** Follow the instructions within the program before 10 November 2015.

Apowersoft Streaming Audio Recorder is a comprehensive program that lets you record any audio source from a computer's sound card and microphone.

Within this program, you can record streaming music from music sites, including Spotify, Jango, MySpace, and so on, plus record internet radio stations such as Sirius Radio and BBC Radio.

If you're recording music, the track's info will be identified automatically. Its built-in ID3 tag editor can help you edit the detailed information of the recorded file such as title, artist, album, year, genre, and even artwork.



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OFFER  
APOWERSOFT STREAMING  
AUDIO RECORDER.  
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## System requirements

WindowXP/Vista/7/8/8.1/10; 1GHz processor; 512MB RAM

## DISC INSTRUCTIONS

Place disc in drive. Open the file 'Click here to begin.pdf' for extra information.

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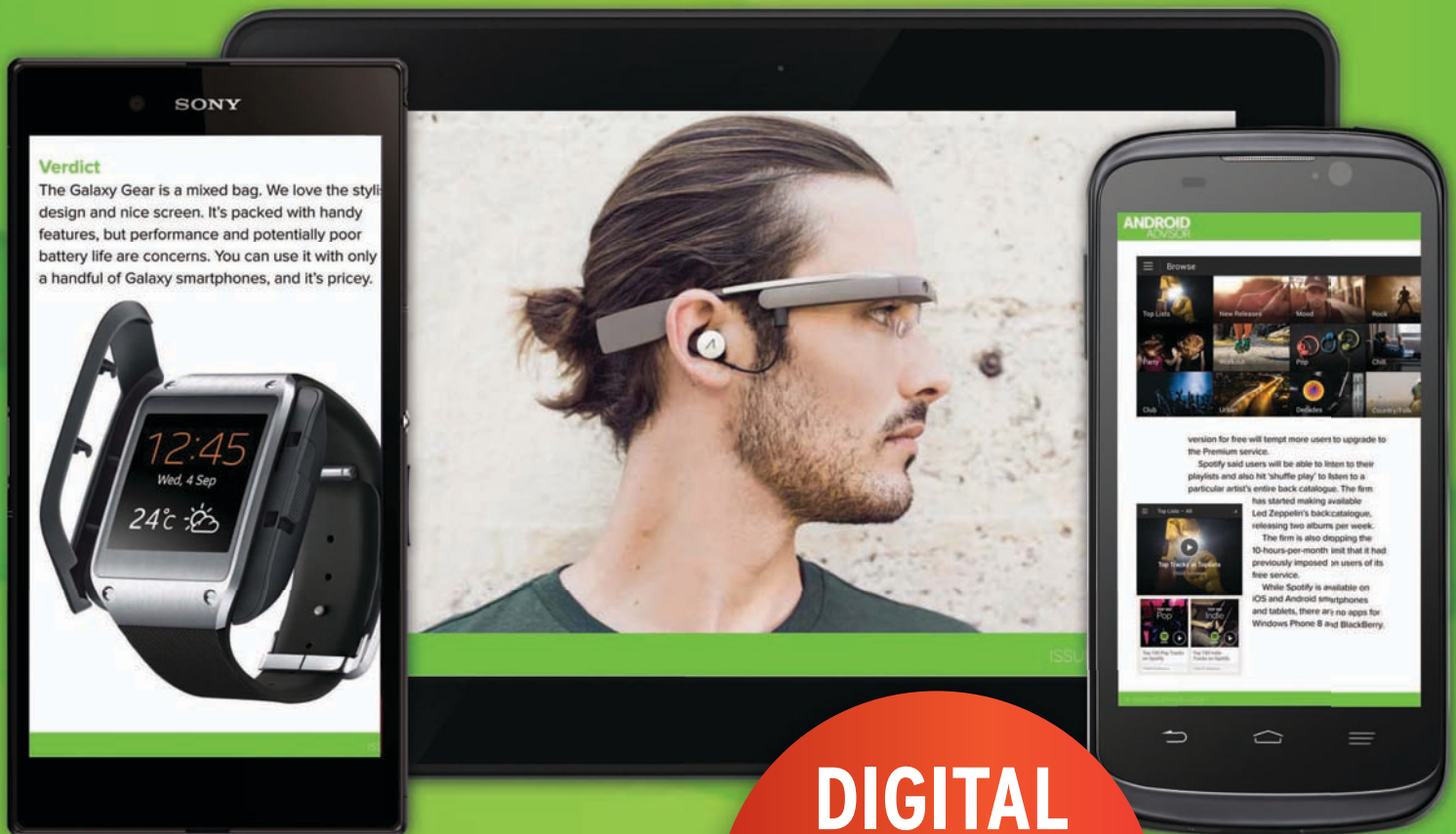
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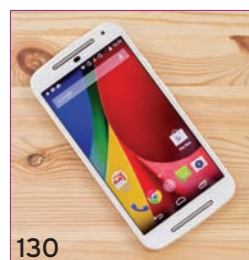
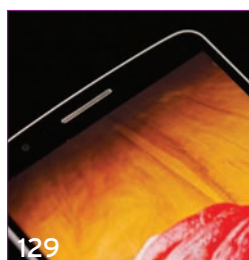
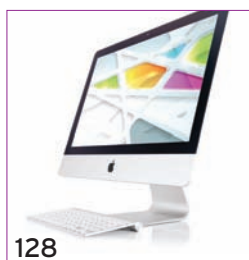
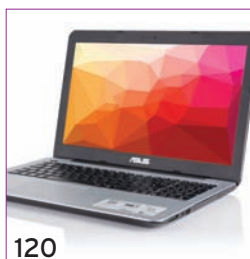
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Best laptops	    				
	1 PC ADVISOR BEST BUY	2 PC ADVISOR RECOMMENDED	3	4	5
	Aorus X7 v2	Alienware 13	Apple MacBook Pro Retina 15in	HP EliteBook Folio 1040 G1	Apple MacBook Pro Retina 13in
Price	£1,720 inc VAT	£1,100 inc VAT	£1,599 inc VAT	£2,116 inc VAT	£999 inc VAT
Website	Aorus.com	Alienware.co.uk	Apple.com/uk	Hp.com/uk	Apple.com/uk
Launch date	Sep 14	May 15	June 15	Jan 15	June 15
Build rating	★★★★☆	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	2.4GHz Intel Core i7-4860HQ	2.4GHz Intel Core i7-5500U	2.2GHz Intel Core i7	2.1GHz Intel Core i5-4600U	2.7GHz dual-core Intel Core i5
RAM	16GB DDR3	8GB (2x 4GB) DDR3	16GB DDR3L	8GB DDR3L	8GB LPDDR3
Storage	1TB HDD, 3x 128GB SSD	256GB SSD	256GB SSD	256GB SSD	128GB SSD
Screen size	17.3in matt	13.3in matt	15.4in matt	14in matt	13.3in matt
Screen resolution	1920x1080	1920x1080	2880x1800	1920x1080	2560x1600
Graphics	2x nVidia GeForce GTX 860M	nVidia GeForce GTX 860M	Intel Iris Pro Graphics	Intel HD Graphics 4400	Intel Iris Graphics 6100
Video memory	8GB	2GB	N/A	N/A	N/A
Wireless	802.11a/b/g/n/ac	802.11ac	802.11a/b/g/n/ac	802.11a/b/g/ac	802.11a/b/g/n/ac
Ethernet	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit
Bluetooth	✓	✓	✓	✓	✓
USB	3x USB 3.0, 2x USB 2.0	3x USB 3.0	2x USB 3.0	2x USB 3.0	2x USB 3.0
FireWire	x	x	x	x	x
Thunderbolt	x	x	✓	x	x
DisplayPort	✓	✓	x	✓	x
HDMI	✓	✓	✓	x	✓
DVI	x	x	x	x	x
VGA	✓	x	x	x	x
eSATA	x	x	x	x	x
Media card slot	✓	x	✓	✓	✓
Audio	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic
Optical drive	N/A	N/A	N/A	N/A	N/A
Extras	HD webcam	2Mp webcam	720p FaceTime	0.9Mp webcam	720p FaceTime
Operating system	Windows 8.1 64-bit	Windows 8.1	OS X Yosemite	Windows 7 Professional	OS X Yosemite
Bundled software	None	None	None	None	None
Gaming scores	189/157fps in Tomb Raider	89/64fps in Tomb Raider	Not tested	49/33fps in Tomb Raider	Not tested
Battery	74.7Wh lithium-polymer	52Wh lithium-polymer	74.9Wh lithium-ion	42Wh lithium-polymer	74.9Wh lithium-ion
Battery life	1 hr 48 mins	10 hrs 20 mins	8 hrs 58 mins	5 hrs 41 mins	17 hrs 5 mins
PCMark7 score	6304	5429	Not tested	4783	Not tested
Dimensions	425x303x24.5mm	328x235x26.7mm	358.9x247.1x18mm	338x232x17.3mm	314x219x18mm
Weight	3.2kg	2kg	2kg	1.6kg	1.6kg
Warranty	2-year return-to-base	1-year collect-and-return	1-year return-to-base	2-year return-to-base	1-year return-to-base
FULL REVIEW	<a href="http://tinyurl.com/kluxlge">TINYURL.COM/KLUXLGE</a>	<a href="http://tinyurl.com/08vxagl">TINYURL.COM/08VXAGL</a>	<a href="http://tinyurl.com/06u4ncr">TINYURL.COM/06U4NCR</a>	<a href="http://tinyurl.com/owv2frr">TINYURL.COM/OWV2FRR</a>	<a href="http://tinyurl.com/ng98ld4">TINYURL.COM/NG98LD4</a>

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Best budget laptops	1	2	3	4	5
	Asus X555LA-XX290H	Toshiba Chromebook 2	Dell Vostro 15	Toshiba Satellite CL10-B-100	Acer Chromebook 13
Price	£300 inc VAT	£269 inc VAT	£442 inc VAT	£200 inc VAT	£219 inc VAT
Website	Asus.com/uk	Toshiba.co.uk	Dell.co.uk	Toshiba.co.uk	Acer.co.uk
Launch date	Jul 15	Jan 15	Jul 15	Jul 15	Sep 14
Build rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Features rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Performance rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Value rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Processor	1.9GHz Intel Core i3-4030U	Intel Celeron	2.2GHz Intel Core i5-5200U	100	2.1GHz nVidia Tegra K1
RAM	4GB DDR3	4GB DDR3	4GB DDR3	2GB DDR3	4GB DDR3
Storage	1TB HDD	16GB SSD	500GB SSD	32GB eMMC	32GB SSD
Screen size	15.6in glossy	13.3in IPS	15.3in matt	11.6in glossy	13.3in
Screen resolution	1366x768	1920x1080	1366x768	1366x768	1920x1080
Graphics	Intel HD Graphics 4400	Intel HD Graphics	Intel HD Graphics 5000	Intel HD Graphics	nVidia Kepler
Video memory	N/A	N/A	N/A	N/A	N/A
Wireless	802.11b/g/n	802.11a/b/g/n/ac	802.11b/g/n/ac	802.11b/g/n	802.11a/b/g/n/ac
Ethernet	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit
Bluetooth	✓	✓	✓	✓	✓
USB	1x USB 3.0, 2x USB 2.0	1x USB 3.0, 1x USB 2.0	1x USB 3.0, 2x USB 2.0	1x USB 3.0, 1x USB 2.0	2x USB 3.0
FireWire	x	x	x	x	x
Thunderbolt	x	x	x	x	x
DisplayPort	x	x	x	x	x
HDMI	✓	✓	✓	✓	✓
DVI	x	x	x	x	x
VGA	✓	x	x	x	x
eSATA	x	x	x	x	x
Media card slot	x	✓	✓	x	✓
Audio	Headphone minijack	Headphone minijack	Headphone minijack	Headphone minijack	Headphone minijack
Optical drive	DVD writer	None	None	None	None
Extras	Kensington lock slot, webcam	Webcam	Kensington lock slot, webcam	Kensington lock slot, webcam	Webcam
Operating system	Windows 8.1	Google Chrome OS	Windows 8.1	Windows 8.1 with Bing	Google Chrome OS
Bundled software	None	None	None	None	None
Battery	37Wh Lithium-ion	Not stated	40Wh Lithium-polymer	26Wh Lithium-ion	Not stated
Battery life	5 hrs 17 mins	9 hrs	5 hrs 17 mins	6 hrs	9 hrs 20 mins
PCMark 8 Home score	1985	Not tested	2296	Not tested	Not tested
Batman (Low/High)	30fps/Not tested	Not tested	29fps/Not tested	Not tested	Not tested
Dimensions	381x257x26.3mm	320x214x19.3mm	1378x259x24.5mm	315x216x20.3mm	18x327x227.5mm
Weight	2.1kg	1.4kg	2.4kg	1.1kg	1.5kg
Warranty	1-year return-to-base	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/OMYZQJ3	TINYURL.COM/OP9NQAY	TINYURL.COM/NDAX6WT	TINYURL.COM/QQC4PUO	TINYURL.COM/Q2YT5AD

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Best ultraportable laptops	    				
	1	2	3	4	5
	Apple MacBook Pro Retina 13in	HP EliteBook Folio 1040 G1	Apple MacBook Air 13in	Dell XPS 13 9343	Microsoft Surface Pro 3
Price	£999 inc VAT	£2,116 inc VAT	£849 inc VAT	£1,099 inc VAT	£639 inc VAT
Website	Apple.com/uk	Hp.com/uk	Apple.com/uk	Dell.co.uk	Microsoft.com/en-gb
Launch date	June 15	Jan 15	April 14	Mar 15	Oct 14
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	2.7GHz Intel Core i5	2.1GHz Intel Core i5-4600U	1.6GHz Intel Core i5	2.4GHz Intel Core i7-5500U	Intel Haswell Core i3
RAM	8GB LPDDR3	8GB DDR3L	4GB LPDDR3	8GB DDR3	4GB DDR3
Storage	128GB SSD	256GB SSD	128GB SSD	256GB SSD	64GB SSD
Screen size	13.3in matt	14in matt	13.3in glossy	13.3in IPS	12in ClearType
Screen resolution	2560x1600	1920x1080	1440x900	3200x2000	2160x1440
Graphics	Intel Iris Graphics 6100	Intel HD Graphics 4400	Intel HD Graphics 6000	Intel HD Graphics 5500	Intel HD Graphics 4400
Video memory	N/A	N/A	N/A	N/A	N/A
Wireless	802.11a/b/g/n/ac	802.11a/b/g/ac	802.11a/b/g/n/ac	802.11ac	802.11a/b/g/n/ac
Ethernet	Gigabit	Gigabit	None	Gigabit	None
Bluetooth	✓	✓	✓	✓	✓
USB	2x USB 3.0	2x USB 3.0	2x USB 3.0	2x USB 3.0	1x USB 3.0
FireWire	x	x	✓	x	x
Thunderbolt	x	x	✓	x	x
DisplayPort	x	✓	x	x	✓
HDMI	✓	x	x	x	x
DVI	x	x	x	x	x
VGA	x	x	x	x	x
eSATA	x	x	x	x	x
Media card slot	✓	✓	✓	✓	x
Audio	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack	Headphone jack, mic
Optical drive	N/A	N/A	N/A	N/A	N/A
Extras	720p FaceTime	0.9Mp webcam	720p FaceTime	720p webcam	5Mp webcam
Operating system	OS X Yosemite	Windows 7 Professional	OS X Yosemite	Windows 8.1 64-bit	Windows 8.1 Pro
Bundled software	None	None	None	Microsoft Office 2013 Trial	None
Gaming scores	Not tested	49/33fps in Tomb Raider	Not tested	40fps Batman: Arkham City	Not tested
Battery	74.9Wh lithium-ion	42Wh lithium-polymer	38Wh lithium-ion	52Wh lithium-polymer	8000mAh lithium-ion
Battery life	17 hrs 5 mins	5 hrs 41 mins	12 hrs 49 mins	6 hrs 12 mins	9 hrs
PCMark 7 score	Not tested	4783	Not tested	Not tested	Not tested
Dimensions	314x219x18mm	338x232x17.3mm	300x192x17mm	304x200x15mm	292x201.3x9.1mm
Weight	1.6kg	1.6kg	1.4kg	1.3kg	0.8kg
Warranty	1-year return-to-base	2-year return-to-base	1-year return-to-base	1-year next business day	1-year return-to-base
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	Toshiba Chromebook 2	Acer Chromebook 13	Dell Chromebook 11	HP Chromebook 14	Acer C720p Chromebook
Price	£269 inc VAT	£219 inc VAT	£239 inc VAT	£259 inc VAT	£249 inc VAT
Website	Toshiba.co.uk	Acer.co.uk	Dell.co.uk	Hp.com/uk	Uk.asus.com
Launch date	Jan 15	Sep 14	Dec 14	Sep 14	Jan 14
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	Intel Celeron	2.1GHz nVidia Tegra K1	1.4GHz Intel Celeron 2955U	1.4GHz Intel Celeron 2955U	1.4GHz Intel Celeron 2955U
RAM	4GB DDR3	4GB DDR3	4GB DDR3	4GB DDR3	2GB DDR3
Storage	16GB SSD	32GB SSD	16GB SSD	16GB SSD	16GB SSD
Screen size	13.3in IPS	13.3in	11.6in glossy	14in glossy	11.6in glossy
Screen resolution	1920x1080	1920x1080	1366x768	1366x768	1366x768
Graphics	Intel HD graphics	nVidia Kepler	Intel HD Graphics	Intel HD graphics	Intel HD graphics
Video memory	N/A	N/A	N/A	N/A	N/A
Wireless	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n	802.11a/b/g/n	802.11a/b/g/n
Ethernet	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit
Bluetooth	✓	✓	✓	✓	✓
USB	1x USB 3.0, 1x USB 2.0	2x USB 3.0	2x USB 3.0	2x USB 3.0, 1x USB 2.0	1x USB 3.0, 1x USB 2.0
FireWire	x	x	x	x	x
Thunderbolt	x	x	x	x	x
DisplayPort	x	x	x	x	x
HDMI	✓	✓	✓	✓	✓
DVI	x	x	x	x	x
VGA	x	x	x	x	x
eSATA	x	x	x	x	x
Media card slot	✓	✓	✓	✓	✓
Audio	Headphone minijack	Headphone minijack	Headphone minijack	Headphone minijack	Headphone minijack
Optical drive	None	None	None	None	None
Extras	Webcam	Webcam	Webcam	Webcam	Webcam
Operating system	Google Chrome OS	Google Chrome OS	Google Chrome OS	Google Chrome OS	Google Chrome OS
Bundled software	None	None	None	None	None
Battery life	9 hrs	9 hrs 20 mins	7 hrs 17 mins	7 hrs 50 mins	6 hrs 7 mins
SunSpider score	Not tested	660ms	465ms	470ms	502ms
Peacekeeper score	Not tested	Not tested	2468	2478	2453
Browsermark score	Not tested	Not tested	3732	3643	3698
Dimensions	320x214x19.3mm	18x327x227.5mm	295x201x24mm	20.5x345x239mm	19.1x288x204mm
Weight	1.4kg	1.5kg	1.3kg	1.7kg	1.4kg
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/OP9NQAY	TINYURL.COM/Q2YT5AD	TINYURL.COM/M3D3QJ4	TINYURL.COM/OCU7FTY	TINYURL.COM/O9KFZMA

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	1 <b>PC ADVISOR</b> BEST BUY	2 <b>PC ADVISOR</b> RECOMMENDED	3 <b>PC ADVISOR</b> BEST BUY	4	5
	Aorus X7 v2	Alienware 13	MSI GS60 2QD-470UK	Gigabyte P37X	Aorus X7 Pro
Price	£1,720 inc VAT	£1,100 inc VAT	£1,299 inc VAT	£1,750 inc VAT	£2,100 inc VAT
Website	Aorus.com	Alienware.co.uk	UK.msi.com	Uk.gigabyte.com	Aorus.com
Launch date	Sep 14	May 15	May 15	May 15	Jan 15
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	2.4GHz Intel Core i7-4860HQ	2.4GHz Intel Core i7-5500U	2.6GHz Intel Core i7-4720HQ	2.6GHz Intel Core i7-4720HQ	2.4GHz Intel Core i7-4860HQ
RAM	16GB DDR3	8GB (2x 4GB) DDR3	16GB (2x 8GB) DDR3	16GB DDR3	16GB DDR3
Storage	1TB HDD, 3x 128GB SSD	256GB SSD	1TB HDD, 128GB SSD	2x 128GB SSD, 1TB HDD	2x 256GB SSD
Screen size	17.3in matt	13.3in matt	15.6in matt	17.3in matt	17.3in matt
Screen resolution	1920x1080	1920x1080	1920x1080	1920x1080	1920x1080
Graphics	2x nVidia GeForce GTX 860M	nVidia GeForce GTX 860M	nVidia GeForce GTX 965M	nVidia GeForce GTX 980M	2x nVidia GTX 870M
Video memory	8GB	2GB	3GB	8GB	6GB
Wireless	802.11a/b/g/n/ac	802.11ac	802.11ac	802.11ac	802.11a/b/g/n/ac
Ethernet	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit
Bluetooth	✓	✓	✓	✓	✓
USB	3x USB 3.0, 2x USB 2.0	3x USB 3.0	3x USB 3.0	2x USB 3.0, 2x USB 2.0	3x USB 3.0, 2x USB 2.0
FireWire	x	x	x	x	x
Thunderbolt	x	x	x	x	x
DisplayPort	✓	✓	x	✓	✓
HDMI	✓	✓	x	✓	✓
DVI	x	x	x	x	x
VGA	✓	x	x	✓	✓
eSATA	x	x	x	x	x
Media card slot	✓	x	✓	✓	✓
Audio	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic
Optical drive	N/A	N/A	N/A	N/A	N/A
Extras	HD webcam	2Mp webcam	2.1Mp webcam	0.9Mp webcam	HD webcam
Operating system	Windows 8.1 64-bit	Windows 8.1	Windows 8.1	Windows 8.1	Windows 8.1 64-bit
Bundled software	None	None	None	None	None
Gaming scores	189/157fps in Tomb Raider	89/64fps in Tomb Raider	123/82fps in Tomb Raider	221/153fps in Tomb Raider	221/170fps in Tomb Raider
Battery	74.7Wh lithium-polymer	52Wh lithium-polymer	48Wh lithium-ion	78Wh lithium-polymer	74.7Wh lithium-polymer
Battery life	1 hr 48 mins	10 hrs 20 mins	2 hrs 49 mins	4 hrs 2 mins	1 hr 48 mins
PCMark 7 score	6304	5429	6241	6305	6474
Dimensions	425x303x24.5mm	328x235x26.7mm	389x265x20.3mm	415x286x23.2mm	425x303x24.5mm
Weight	3.2kg	2kg	2kg	2.9kg	3.2kg
Warranty	2-year return-to-base	1-year collect-and-return	2-year return-to-base	2 years	2-year return-to-base
FULL REVIEW	<a href="http://tinyurl.com/kluxlge">TINYURL.COM/KLUXLGE</a>	<a href="http://tinyurl.com/08vxagl">TINYURL.COM/08VXAGL</a>	<a href="http://tinyurl.com/06q3jdd">TINYURL.COM/06Q3JDD</a>	<a href="http://tinyurl.com/ndpc6p6">TINYURL.COM/NDPC6P6</a>	<a href="http://tinyurl.com/ozvq6jq">TINYURL.COM/OZVQ6JQ</a>

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Best family PCs	1	2	3	4	5
	Chillblast Fusion Commando	Wired2Fire Diablo Reactor	Chillblast Fusion Pharoah	Mesh Elite 4670-PCA	Dino PC Raging Lizard V2
Price	£799 inc VAT	£668 inc VAT	£799 inc VAT	£799 inc VAT	£780 inc VAT
Website	Chillblast.com	Wired2fire.co.uk	Chillblast.com	Meshcomputers.com	Dinopc.com
Launch date	Jul 13	May 14	May 14	May 14	May 14
Build rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Features rating	★★★★☆	★★★★☆	★★★★★	★★★★☆	★★★★☆
Performance rating	★★★★☆	★★★★☆	★★★★★	★★★★☆	★★★★☆
Value rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	3.2GHz Intel Core i5-4570	3.4GHz Intel Core i5-4670	3.5GHz Intel Core i5-4690	3.4GHz Intel Core i5-4670	3.5GHz Intel Core i5-4690
RAM	16GB DDR3	8GB DDR3 1600MHz	16GB DDR3 1600MHz	16GB DDR3 1600MHz	8GB DDR3 1600MHz
Storage	1TB HDD + 120GB SSD	1TB HDD	1TB HDD + 120GB SSD	2TB HDD + 120GB SSD	1TB HDD + 128GB SSD
Motherboard	Asus B85M-G	Asus B85M-G	Asus B85M-G	MSI B85M-E45	Gigabyte H97M-D3H
CPU cooler	Arctic Cooling Freezer 7 Pro	Standard Intel Cooler	Standard Intel Cooler	Standard Intel Cooler	Standard Intel Cooler
Power supply	600W CiT	500W FSP	500W FSP	500W FSP	500W CiT
Screen	23in Iiyama X2377	24in AOC E2495Sh	23in Asus VS239HV	24in Iiyama E2483HS-B1	24in Iiyama E2483HS-B1
Screen resolution	1920x1080	1920x1080	1920x1080	1920x1080	1920x1080
Graphics	Zotac nVidia GeForce GTX 650 Ti	AMD Radeon R7 265	AMD Radeon R7 265	nVidia GeForce GTX 750 Ti	nVidia GeForce GTX 750 Ti
Video memory	N/A	2GB	2GB	2GB	2GB
Connectivity	802.11b/g/n, gigabit ethernet	Gigabit ethernet	Gigabit ethernet	Gigabit ethernet	Gigabit ethernet, 802.11b/g/n
USB	3x USB 3.0, 6x USB 2.0	3x USB 3.0, 6x USB 2.0, 2x HDMI, VGA	3x USB 3.0, 6x USB 2.0, 2x DVI, 2x HDMI, DP, VGA	4x USB 3.0, 8x USB 2.0, HDMI, VGA, DVI-D, DVI, DP	5x USB 3.0, 3x USB 2.0, 2x HDMI (1x e-Mini), VGA, 2x DVI
Media card slot	None	None	None	None	None
Sound	Onboard	Onboard	Onboard	Onboard	Onboard
Speakers	2x Logitech LS220	None	None	None	None
Case	Cooler Master Force 500	Zalman Z3 Plus	Zalman Z3 Plus	Zalman Z3 Plus	Fractal Design Core 1000 USB3
Keyboard	Logitech MK260	Octigen wireless combo	Logitech MK270 (wireless combo)	Logitech MK270 (wireless combo)	Gigabyte KM6150 (wired combo)
Optical drive	LG BD-ROM/DVD±RW	LiteOn DVD±RW	LiteOn BD-ROM/DVD±RW	24x DVD±RW	None
Operating system	Windows 8 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit
Bundled software	None	None	None	None	None
Sniper V2 Elite score (Low/High/Ultra)	147/59/14fps	240/76/18fps	240/76/18fps	195/68/16fps	196/83/20fps
Alien vs Predator score (720p/1080p)	52/27fps	83/44fps	83/44fps	71/37fps	102/53fps
PCMark 7 score	6177	3938	5953	7304	6431
Warranty	2-year collect-and-return	2-year return-to-base	5-year labour, 2-year collect-and-return	3-years labour (2-year parts, 3-months free C&R)	3-year labour (2-year parts)
FULL REVIEW	TINYURL.COM/KF6G3T7	TINYURL.COM/OA8UKDP	TINYURL.COM/K2KF83U	TINYURL.COM/OZCSHYU	TINYURL.COM/PFA55F7

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\*\* Chillblast won more awards in the leading IT press publications PC Pro, PC Advisor and Computer Shopper combined than any other retailer 2010-2013

\*\*\* World's fastest PC as tested by PC Pro Magazine <http://www.pcpro.co.uk/reviews/desktops/371152/chillblast-fusion-photo-ac-iv>  
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Best gaming PCs	    				
	1	2	3	4	5
	Eclipse SuperNova i5r285oc	Dino PC Dark Spark GTX 960	Cyberpower Infinity Achilles	Chillblast Fusion Mantis	Yoyotech Warbird Gam3r
Price	£999 inc VAT	£999 inc VAT	£999 inc VAT	£749 inc VAT	£999 inc VAT
Website	Eclipsecomputers.com	Dinopc.com	Cyberpowersystem.co.uk	Chillblast.com	Yoyotech.co.uk
Launch date	Mar 15	Mar 15	Mar 15	Mar 15	April 15
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	3.5GHz Intel Core i5-4690K (OC 4.4GHz)	3.5GHz Intel i5-4670K (OC 4.6GHz)	3.5GHz Intel Core i5-4690K	3.5GHz Intel Core i5-4690K (OC 4.2GHz)	3.5GHz Intel Core i5 4690K (4.2GHz OC)
CPU cooler	Zalman CNPS11X Extreme	Be Quiet Pure Rock BK009	Cooler Master Seidon 120mm RL-S12M-FLNN-S1	Corsair H55 Water Cooler	SilentiumPC Fera 2 Heatpipe Cooler
Memory	16GB HyperX Savage	8GB DDR3	8GB DDR3	8GB DDR3	8GB DDR3
Storage	2TB HDD + 250GB SSD	1TB HDD + 120GB SSD	1TB HDD + 120GB SSD	1TB SSHD	2TB HDD + 240GB SSD
Power supply	550W XFX Core Edition	450W Corsair	600W Cooler Master	600W Corsair	600W Aerocool Integrator
Motherboard	Asus Z97-K	Gigabyte Z97X-Gaming 3	Gigabyte H81M-S2H	Gigabyte Z97-HD3	MSI Z97M-G43
Operating system	Windows 8.1	Windows 8.1	Windows 8.1	Windows 8.1 64-bit	Windows 8.1
Screen	26in HKC 2615	24in Iiyama GE2488HS-B1	24in AOC E2470SWDA	None supplied	23.6in AOC I2476VWM
Graphics	XFX AMD Radeon R9 285 DD Edition	Palit nVidia GeForce GTX 690	MSI nVidia GeForce GTX 970	MSI GeForce GTX 960	MSI nVidia GTX970 4GB
Sound	Onboard	Onboard	Onboard	Onboard	Onboard
Connectivity	Gigabit ethernet	Gigabit ethernet	Gigabit ethernet	Gigabit ethernet	Gigabit ethernet
Ports	6x USB 3.0, 4x USB 2.0	6x USB 3.0, 4x USB 2.0, 2x PS/2, D-Sub, DVI-D, 6x SATA	6x USB 3.0, 3x USB 2.0, 2x DVI, HDMI, DP	6x USB 3.0, 2x USB 2.0, 2x DVI, HDMI, DP, PS/2	6x USB 3.0, 2x USB 2.0
Optical drive	Samsung DVD±RW	None	None	None	DVD±RW
Case	XFX Type 1 Bravo	NZXT Source 340	NZXT Source 340 Black	NZXT Source 340	CIT Kube Case
Keyboard & mouse	Cooler Master Storm Devastator Set	Corsair	Cooler Master Devastator Keyboard and Mouse	None	Gamdias Ares Keyboard and Mouse
Other	None	Corsair Raptor Bundle	None	Chillblast Family Software pack (optional)	None
PCMark 7 score	7931	7090	5945	5823	6244
Alien vs Predator score (720p/1080p)	111.4/59.8fps	103.4/54.7	167.8/89fps	104.2/55.2fps	1169.2/89.6fps
Final Fantasy XIV (Maximum)	91fps	86fps	120fps	86fps	137fps
Sniper Elite V2 (Low/Medium/Ultra)	292.1/106.8/26.5fps	285.6/123.6/28.9fps	281.1/192.9/48.1fps	289.3/123.8/29fps	429.4/204.3/49.1fps
Power Consumption	76/432W	77/310W	48/261W	50/277W	72/369W
Warranty	3-year return-to-base	3-year PromoCare	2-year parts, 3-year return-to-base, 30-day C&R	5-year labour (2-year collect-and-return)	1-year RTB (3-year labour only), 90-day C&R
FULL REVIEW	<a href="http://tinyurl.com/k5ajlbo">TINYURL.COM/K5AJLBO</a>	<a href="http://tinyurl.com/mvbk6kx">TINYURL.COM/MVBK6KX</a>	<a href="http://tinyurl.com/kkkrrxad">TINYURL.COM/KKKRRXAD</a>	<a href="http://tinyurl.com/l5h9zdr">TINYURL.COM/L5H9ZDR</a>	<a href="http://tinyurl.com/nwzzzbm">TINYURL.COM/NWZZZBM</a>

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All-in-one PCs	1  <b>PC ADVISOR</b> RECOMMENDED	2 	3 	4 	5 
	Apple iMac with 5K display	Acer Aspire AZ3-615	Chillblast Volante A10	Asus Eee Top	HP Envy Beats 23-n001na
Price	£1,999 inc VAT	£799 inc VAT	£1,299 inc VAT	£799 inc VAT	£900 inc VAT
Website	Apple.com/uk	Acer.co.uk	Chillblast.com	Asus.com/uk	Hp.com/uk
Launch date	Dec 14	Dec 14	Dec 14	Dec 14	Dec 14
Build rating	★★★★★	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Features rating	★★★★★	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Performance rating	★★★★☆	★★★★☆	★★★★★	★★★★☆	★★★★☆
Value rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Overall rating	★★★★★	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Processor	3.9GHz Intel Core i5-4690	2.7GHz Intel Core i5-4460T	4GHz Intel Core i7-4790S	2.6GHz Intel Core i5-4200U	3.2GHz Intel Core i7-4785T
RAM	8GB DDR3	8GB DDR3	16GB DDR3	6GB DDR3	8GB DDR3
Storage	1TB Fusion Drive	1TB HDD	1TB SSD	1TB HDD	1TB HDD
Screen	27in	23in touchscreen	24in	23in touchscreen	23in touchscreen
Screen resolution	5120x2880	1920x1080	1920x1080	1920x1080	1920x1080
Graphics card	AMD Radeon M9 M290X	nVidia GeForce GT 840M	nVidia GeForce GT 750M	Intel HD Graphics 4400	Intel HD Graphics 4600
Video memory	2GB	2GB	2GB	N/A	N/A
Wireless	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n
Ethernet	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit
Bluetooth	x	x	x	x	x
USB	4x USB 3.0	2x USB 3.0, 3x USB 2.0	4x USB 3.0, 2x USB 2.0	3x USB 3.0, 3x USB 2.0	2x USB 3.0, 4x USB 2.0
FireWire	x	x	x	x	x
Thunderbolt	✓	x	x	x	x
HDMI	x	x	✓	✓	✓
Media card slot	✓	✓	✓	✓	✓
Optical drive	None	DVD Writer	Blu-Ray Combo	DVD Writer	DVD Writer
Other	Final Cut Pro X, Logic Pro X, Aperture	1Mp webcam, wireless keyboard and mouse	Logitech MK520 wireless keyboard and mouse	2Mp webcam, Freeview TV, wireless keyboard and mouse	Wireless keyboard and mouse, Beats Audio stereo speaker system (8x 12W)
Operating system	OS X Yosemite	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit
Power consumption (idle/max)	46/215W	46/91W	35/177W	33/69W	43/81W
Sniper V2 Elite (Low/High/Ultra)	Not tested	47.7/18.7/5.1fps	91.5/41.2/10.5fps	31.4/7.8/5fps	27.7/7.4/5fps
PCMark 8 Home score	Not tested	2906	3776	2828	2702
Dimensions	650x203x516mm	540x489x579mm	585x200x450mm	571x359x50-214mm	563x143x413mm
Weight	9.54kg	8.8kg	14.6kg	9kg	8.4kg
Warranty	1-year return-to-base	Not stated	5-year labour (2-year collect-and-return)	1-year return-to-base	1-year limited parts, labour, and pickup-and-return service
FULL REVIEW	TINYURL.COM/NWJUJSF	TINYURL.COM/QEY8FOE	TINYURL.COM/LO8A5MC	TINYURL.COM/PRPHC7L	TINYURL.COM/O6M4BCN

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Best smartphones	    				
	1	2	3	4	5
	Samsung Galaxy S6	Sony Xperia Z3 Compact	LG G4	LG G3	HTC One M9
Price	£349 inc VAT	£349 inc VAT	£500 inc VAT	£479 inc VAT	£579 inc VAT
Website	Samsung.com/uk	Sony.co.uk	Lg.com/uk	Lg.com/uk	HTC.com/uk
Launch date	Apr 15	Sep 14	May 15	May 14	Mar 15
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
OS (out of box)	Android 5.0 Lollipop	Android 4.4 KitKat	Android 5.1 Lollipop	Android 4.4 KitKat	Android 5.0 Lollipop
Processor	2.1GHz Exynos 7420	2.5GHz Snapdragon 801	Snapdragon 808 six-core	2.5GHz Snapdragon 801	Snapdragon 810 octa-core
RAM	3GB	2GB	3GB	2GB/3GB	3GB
Storage	32/64GB	16GB	32GB	16GB/32GB	32GB
MicroSD support	No	Up to 128GB	Up to 128GB	No	Up to 128GB
Graphics	Mali-T760 GPU	Adreno 330	Adreno 418	Adreno 330	Adreno 430
Screen size	5.1in	4.6in	4.5in	5.5in	5in
Screen resolution	1440x2560	720x1280	1440x2560	1440x2560	1080x1920
Pixel density	577ppi	319ppi	538ppi	534ppi	441ppi
Screen technology	Super AMOLED	IPS	IPS	IPS	IPS
Front camera	5Mp	2.2Mp	8Mp	2Mp	4Mp (UltraPixel)
Rear camera	16Mp, LED flash	20.7Mp, LED flash	16Mp	13Mp, LED flash	20Mp
Video recording	4K	4K	4K	4K	4K
Cellular connectivity	4G	4G	4G	4G	4G
SIM type	Nano-SIM	Nano-SIM	Micro-SIM	Micro-SIM	Nano-SIM
Dual-SIM as standard	No	No	No	No	No
Wi-Fi	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band
Bluetooth	Bluetooth 4.1	Bluetooth 4.0	Bluetooth 4.1	Bluetooth 4.0 (aptX)	Bluetooth 4.1 (aptX)
GPS	GPS, Glonass	A-GPS, Glonass	A-GPS, Glonass	A-GPS, Glonass	GPS, Glonass
NFC	Yes	Yes	Yes	Yes	Yes
USB OTG	Yes	Yes	Yes	Yes	Yes
Extra features	Heart-rate sensor, fingerprint scanner	Waterproof, PS4 Remote Play	24-bit/192kHz audio, rear key	24-bit/192kHz audio, rear key	BoomSound speakers
Geekbench 3.0 (single)	1347	Not tested	Not tested	Not tested	1160
Geekbench 3.0 (multi)	4438	2800	3513	2465	3378
SunSpider	1048ms	944ms	715ms	959ms	867ms
GFXBench: T-Rex	30fps	41fps	25fps	20fps	50fps
GFXBench: Manhattan	14fps	26fps	9fps	Not tested	24fps
Battery	2550mAh, non-removable	2600mAh, non-removable	3000mAh removable	3000mAh, removable, Qi	2840mAh, non-removable
Dimensions	143.4x70.5x6.8mm	64.9x127x8.6mm	64.9x127x8.6mm	75x146x8.9mm	70x145x9.7mm
Weight	138g	129g	155g	149g	157g
Warranty	1 year	2 years	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/PC2KOYQ	TINYURL.COM/NBBUY82	TINYURL.COM/NBBUY82	TINYURL.COM/OA76T73	TINYURL.COM/PUS2XEJ

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Best budget smartphones	1	2	3	4	5
	Vodafone Smart Ultra 6	Motorola Moto E 4G 2015	Vodafone Smart Prime 6	EE Harrier Mini	Motorola Moto G 3G 2014
Price	£125 inc VAT	£109 inc VAT	£79 inc VAT	£99 inc VAT	£140 inc VAT
Website	Vodafone.co.uk	Motorola.co.uk	Vodafone.co.uk	EE.co.uk	Motorola.co.uk
Launch date	Jul 15	Feb 15	June 15	June 15	Sep 14
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
OS (out of box)	Android 5.0.2 Lollipop	Android 5.0 Lollipop	Android 5.0.2 Lollipop	Android 5.0 Lollipop	Android 4.4 KitKat
Processor	2.5GHz Snapdragon 615	1.2GHz Snapdragon 410	1.2GHz Snapdragon 410	1.2GHz	1.2GHz Snapdragon 400
RAM	2GB	1GB	1GB	1GB	1GB
Storage	16GB	8GB	8GB	8GB	8GB
MicroSD support	Up to 128GB	Up to 32GB	Up to 64GB	Not stated	Up to 32GB
Graphics	Adreno 405	Adreno 306	Adreno 306	Not stated	Adreno 305
Screen size	5.5in	4.5in	5in	4.7in	5in
Screen resolution	1920x1080	540x960	720x1280	720x1280	720x1280
Pixel density	401ppi	245ppi	294ppi	312ppi	294ppi
Screen technology	IPS	IPS	IPS	IPS	IPS
Front camera	5Mp	0.3Mp	2Mp	2Mp	2Mp
Rear camera	13Mp	5Mp	8Mp	8Mp, LED flash	8Mp, LED flash
Video recording	1080p	720p	1080p	720p	720p
Cellular connectivity	4G	4G	4G	4G	3G
SIM type	Nano-SIM	Micro-SIM	Micro-SIM	Micro-SIM	Micro-SIM
Dual-SIM as standard	No	No	No	No	Yes
Wi-Fi	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n
Bluetooth	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0
GPS	GPS, A-GPS	GPS, A-GPS, Glonass	A-GPS	A-GPS, Glonass	A-GPS, Glonass
NFC	Yes	No	No	No	No
USB OTG	No	No	Yes	Yes	Yes
Extra features	FM radio	Double-twist launches camera, lockscreen alerts	FM radio	Wi-Fi calling	Stereo speakers
Geekbench 3.0 (single)	649	464	464	Not tested	340
Geekbench 3.0 (multi)	2469	1463	1401	1549	1144
SunSpider	1545ms	1301ms	1301ms	1880ms	1526ms
GFXBench: T-Rex	14fps	13fps	9.4fps	10fps	11fps
GFXBench: Manhattan	5.7fps	6fps	3.8fps	4fps	4fps
Battery	3000mAh, non-removable	2390mAh, non-removable	N/S, non-removable	2000mAh, non-removable	2390mAh, non-removable
Dimensions	154x77x9mm	66.8x5.2-12.3x129.9mm	141.65x71.89x9mm	138x67.9x9.5mm	71x142x11mm
Weight	159g	145g	155g	124g	155g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/Q7Q9NXR	TINYURL.COM/Q7Q9NXR	TINYURL.COM/Q5DSNHE	TINYURL.COM/PXTROH4	TINYURL.COM/OAE6AH5

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Best phablets	    				
	1	2	3	4	5
	Samsung Galaxy Note 4	LG G4	LG G3	OnePlus One	Google Nexus 6
Price	£599 inc VAT	£500 inc VAT	£479 inc VAT	£229 inc VAT	£499 inc VAT
Website	Samsung.com/uk	Lg.com/uk	Lg.com/uk	Oneplus.net	Play.google.com
Launch date	Sep 14	May 15	May 14	Jul 14	Oct 14
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
OS (out of box)	Android 4.4 KitKat	Android 5.1 Lollipop	Android 4.4 KitKat	Cyanogen 11S (Android 4.4)	Android 5.0 Lollipop
Processor	2.7GHz Snapdragon 805	1.82GHz Snapdragon 808	2.5GHz Snapdragon 801	2.5GHz Snapdragon 801	2.7GHz Snapdragon 805
RAM	3GB	3GB	2GB/3GB	3GB	3GB
Storage	32GB	32GB	16GB/32GB	16GB/64GB	32GB/64GB
MicroSD support	Up to 128GB	Up to 128GB	No	No	No
Graphics	Adreno 420	Adreno 418	Adreno 330	Adreno 330	Adreno 420
Screen size	5.7in	5.5in	5.5in	5.5in	5.96in
Screen resolution	1440x2560	1440x2560	1440x2560	1920x1080	1440x2560
Pixel density	515ppi	538ppi	534ppi	401ppi	493ppi
Screen technology	Super AMOLED	IPS	IPS	IPS	IPS
Front camera	3.7Mp	8Mp	2Mp	5Mp	2Mp
Rear camera	16Mp, LED flash	16Mp, LED flash	13Mp, LED flash	13Mp, LED flash	13Mp, LED flash
Video recording	4K	4K	4K	4K	4K
Cellular connectivity	4G	4G	4G	4G	4G
SIM type	Micro-SIM	Micro-SIM	Micro-SIM	Micro-SIM	Nano-SIM
Dual-SIM as standard	No	No	No	No	No
Wi-Fi	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band
Bluetooth	Bluetooth 4.1	Bluetooth 4.0	Bluetooth 4.0 (aptX)	Bluetooth 4.0	Bluetooth 4.1
GPS	GPS, Glonass	A-GPS, Glonass	A-GPS, Glonass	GPS, Glonass	GPS, Glonass
NFC	Yes	Yes	Yes	Yes	Yes
USB OTG	Yes	Yes	Yes	Yes	Yes
Extra features	Fingerprint, UV, heart-rate sensors, S Pen stylus	24bit/192kHz audio, rear key, IR blaster	24bit/192kHz audio, rear key	None	None
Geekbench 3.0 (single)	Not tested	Not tested	Not tested	969	Not tested
Geekbench 3.0 (multi)	3272	3513	2465	2570	3304
SunSpider	1367ms	715ms	959ms	877ms	791ms
GFXBench: T-Rex	27fps	25fps	20fps	29fps	27fps
GFXBench: Manhattan	11fps	9fps	Not tested	Not tested	12fps
Battery	3220mAh, removable	3000mAh, removable, Qi	3000mAh, removable, Qi	3100mAh, non-removable	3220mAh, non-removable, Qi
Dimensions	78.6x153.5x8.5mm	76x149x6.3-9.8mm	75x146x8.9mm	75.9x152.9x8.9mm	82x159x10.4mm
Weight	176g	155g	149g	162g	183g
Warranty	2 years	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/PNHJCZ4	TINYURL.COM/QDQU48T	TINYURL.COM/OA76T73	TINYURL.COM/PK3S5CP	TINYURL.COM/NLZ4UD9

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	Best 7- & 8in tablets				
	1	2	3	4	5
	Google Nexus 7	Samsung Galaxy Tab S 8.4	Sony Xperia Z3 Tablet Compact	Apple iPad mini 2	Google Nexus 9
Price	£199 inc VAT	£319 inc VAT	£299 inc VAT	£239 inc VAT	£319 inc VAT
Website	Play.google.com	Samsung.com/uk	Sony.co.uk	Apple.com/uk	Play.google.com
Launch date	Aug 13	Aug 14	Sep 14	Oct 13	Oct 14
Build rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Features rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Performance rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Value rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
OS (out of box)	Android 4.3 Jelly Bean	Android 4.4 KitKat	Android 4.4 KitKat	iOS 8.2	Android 5.0 Lollipop
Processor	1.5GHz Snapdragon S4 Pro	Exynos 5420, octa-core	2.5GHz Snapdragon 801	Apple A7, Apple M7	2.3GHz nVidia Tegra K1
RAM	2GB	3GB	3GB	1GB	2GB
Storage	16GB/32GB	16GB/32GB	16GB/32GB	16GB/32GB	16GB/32GB
MicroSD support	No	Up to 128GB	Up to 128GB	No	No
Graphics	Adreno 320	ARM Mali-T628 MP6	Adreno 330	Apple A7	192-core Kepler
Screen size	7in	8.4in	8in	7.9in	8.9in
Screen resolution	1920x1200	2560x1440	1920x1200	2048x1536	2048x1536
Pixel density	323ppi	359ppi	283ppi	326ppi	287ppi
Screen technology	IPS	Super AMOLED	IPS	IPS	IPS
Front camera	1.2Mp	2.1Mp	2.2Mp	1.2Mp	1.6Mp
Rear camera	5Mp	8Mp, LED flash	8.1Mp	5Mp	8Mp, LED flash
Video recording	1080p	1080p	1080p	1080p	1080p
Cellular connectivity	4G version available	4G version available	4G version available	4G version available	4G version available
Wi-Fi	802.11b/g/n, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n, dual-band	802.11a/b/g/n/ac, dual-band
Bluetooth	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.1
GPS	GPS, Glonass	GPS, Glonass	A-GPS, Glonass	A-GPS, Glonass	GPS, Glonass
NFC	Yes	No	Yes	No	Yes
USB OTG	Yes	Yes	Yes	No	Yes
Fingerprint scanner	No	Yes	No	No	No
Waterproof	No	No	Yes	No	No
Extra features	None	Stereo speakers	PS4 Remote Play, stereo speakers	None	BoomSound speakers
Geekbench 3.0 (single)	Not tested	Not tested	Not tested	Not tested	1904
Geekbench 3.0 (multi)	Not tested	2765	2708	Not tested	3352
SunSpider	1136ms	1089ms	1017ms	397ms	955ms
GFXBench: T-Rex	Not tested	14fps	28fps	Not tested	48fps
GFXBench: Manhattan	Not tested	3fps	11fps	Not tested	22fps
Battery	3950mAh, non-removable, Qi	4900mAh, non-removable	4500mAh, non-removable	6470mAh, non-removable	6700mAh, non-removable
Dimensions	200x114x8.65mm	126x213x6.6mm	213x124x6.4mm	134.7x7.5x200mm	153.7x228.3x8mm
Weight	299g	294g	270g	331g	425g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/PUJDJBY	TINYURL.COM/OUEM64Z	TINYURL.COM/NJ6VHEO	TINYURL.COM/PCJPB5L	TINYURL.COM/NQ6K77Y

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Best 9- & 10in tablets	 1 <b>PC ADVISOR</b> GOLD	 2 <b>PC ADVISOR</b> RECOMMENDED	 3 <b>PC ADVISOR</b> RECOMMENDED	 4 <b>PC ADVISOR</b> RECOMMENDED	 5 <b>PC ADVISOR</b> RECOMMENDED
	Apple iPad Air 2	Samsung Galaxy Tab S 10.5	Sony Xperia Z2 Tablet	Apple iPad Air	Google Nexus 10
Price	£399 inc VAT	£399 inc VAT	£369 inc VAT	£319 inc VAT	£389 inc VAT
Website	Apple.com/uk	Samsung.com/uk	Sony.co.uk	Apple.com/uk	Play.google.com
Launch date	Oct 14	Aug 14	Mar 14	Oct 13	Oct 12
Build rating	★★★★★	★★★★☆	★★★★☆	★★★★☆	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
OS (out of box)	iOS 8.2	Android 4.4 KitKat	Android 4.4 KitKat	iOS 8.2	Android 4.2 Jelly Bean
Processor	Apple A8X, Apple M8	Exynos 5420, octa-core	2.3GHz Snapdragon 801	Apple A7, Apple M7	1.7GHz Exynos 5250
RAM	2GB	3GB	3GB	1GB	2GB
Storage	16GB/64GB/128GB	16GB/32GB	16GB	16GB/32GB	16GB/32GB
MicroSD support	No	Up to 128GB	Up to 64GB	No	No
Graphics	Apple A8X	ARM Mali-T628 MP6	Adreno 330	Apple A7	ARM Mali T604
Screen size	9.7in	10.5in	10.1in	9.7in	10.1in
Screen resolution	2048x1536	2560x1600	1920x1200	2048x1536	2560x1600
Pixel density	264ppi	288ppi	224ppi	264ppi	300ppi
Screen technology	IPS	Super AMOLED	IPS	IPS	IPS
Front camera	1.2Mp	2.1Mp	2.2Mp	1.2Mp	1.9Mp
Rear camera	8Mp	8Mp, LED flash	8.1Mp	5Mp	5Mp, LED flash
Video recording	1080p	1080p	1080p	1080p	1080p
Cellular connectivity	4G version available	4G version available	4G version available	4G version available	No
Wi-Fi	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n, dual-band	802.11b/g/n, dual-band
Bluetooth	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0
GPS	A-GPS, Glonass	GPS, Glonass	GPS, Glonass	A-GPS, Glonass	GPS, Glonass
NFC	Yes (for Apple Pay)	No	Yes	No	Yes
USB OTG	No	Yes	Yes	No	Yes
Fingerprint scanner	Yes	Yes	No	No	No
Waterproof	No	No	Yes	No	No
Extra features	None	Stereo speakers	PlayStation certified	None	None
Geekbench 3.0 (single)	1816	Not tested	967	1487	Not tested
Geekbench 3.0 (multi)	4523	2769	2719	2703	Not tested
SunSpider	Not tested	1079ms	1099ms	400ms	1329ms
GFXBench: T-Rex	48fps	14fps	27fps	23fps	Not tested
GFXBench: Manhattan	Not tested	3fps	Not tested	Not tested	Not tested
Battery	7340mAh, non-removable	7900mAh, non-removable	6000mAh, non-removable	8600mAh, non-removable	9000mAh, non-removable
Dimensions	240x169.5x6.1mm	247x177x6.6mm	266x172x6.4mm	240x169x7.5mm	264x178x8.9mm
Weight	437g	465g	439g	469g	603g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	<a href="http://tinyurl.com/plqxwsz">TINYURL.COM/PLQXWSZ</a>	<a href="http://tinyurl.com/oesdfzq">TINYURL.COM/OESDFZQ</a>	<a href="http://tinyurl.com/m8bzun">TINYURL.COM/M8BZZUN</a>	<a href="http://tinyurl.com/nvoo6h">TINYURL.COM/NVOO6H</a>	<a href="http://tinyurl.com/puag9rn">TINYURL.COM/PUAG9RN</a>









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
Best smartwatches	1	2	3	4	5
	LG G Watch R	Motorola Moto 360	Sony Smartwatch 3	LG Watch Urbane	Asus ZenWatch
Price	£195 inc VAT	£199 inc VAT	£189 inc VAT	£259 inc VAT	£199 inc VAT
Website	Lg.com/uk	Motorola.co.uk	Sony.co.uk	Lg.com/uk	Uk.asus.com
Launch date	Nov 14	Oct 14	Sep 14	Jul 15	Jan 15
Overall rating	★★★★★	★★★★★	★★★★☆	★★★★☆	★★★★☆
Operating system	Android Wear	Android Wear	Android Wear	Android Wear	Android Wear
Compatibility	Android	Android	Android	Android	Android
Display	1.3in 320x320 P-OLED	1.56in 290x320 LCD	1.6in 320x320 LCD	1.3in 320x320 P-OLED	1.6in 320x320 AMOLED
Processor	1.2GHz Snapdrgon 400	TI OMAP 3	1.2GHz ARM V7	1.2GHz Snapdragon 400	1.2GHz Snapdragon 400
RAM	512MB	512MB	512MB	512MB	512MB
Storage	4GB	4GB	4GB	4GB	4GB
Waterproof	Yes	Yes	Yes	Yes	Yes
Battery	410mAh	320mAh	420mAh	410mAh	1.4Wh
Dimensions	46.4x53.6x9.7mm	46x11.5mm	36x51x10mm	46x52x10.9mm	51x39.9x7.9-9.4mm
Weight	62g	49g (leather band model)	45g	67g	75g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/QATY8FT	TINYURL.COM/O9C69K6	TINYURL.COM/OQVZ3PN	TINYURL.COM/Q3VK7ES	TINYURL.COM/NN7GA7W

Best smartwatches	6	7	8	9	10
	Apple Watch	Pebble Steel	LG G Watch	Sony Smartwatch 2	Samsung Gear 2 Neo
Price	£299 inc VAT	£179 inc VAT	£159 inc VAT	£125 inc VAT	£169 inc VAT
Website	Apple.com/uk	Getpebble.com	Lg.com/uk	Sony.co.uk	Samsung.com/uk
Launch date	Apr 15	Sep 14	Jul 14	Jun 13	Apr 14
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Operating system	watchOS	Proprietary	Android Wear	Proprietary	Tizen
Compatibility	iOS	iOS, Android	Android	Android	Samsung phones
Display	1.32in 340x312 Ion-X Glass	1.26in 144x168 E-Paper	1.65in 280x280 IPS	1.6in 220x176 LCD	1.6in 320x320 Super AMOLED
Processor	Apple S1	Not specified	1.2GHz Snapdragon 400	Not specified	Dual-core
RAM	512MB	512MB	512MB	Not specified	512MB
Storage	8GB	Not specified	4GB	Not specified	4GB
Waterproof	Yes	Yes	Yes	Yes	Yes
Battery	Not specified	130mAh	400mAh	Not specified	300mAh
Dimensions	38.6x33.3x10.5mm	46x34x10.5mm	37.9x46.5x9.95mm	42x41x9mm	58.8x37.9x10mm
Weight	72g	156g	63g	123g	55g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/OUTH9XK	TINYURL.COM/PPBXV7J	TINYURL.COM/Q84WL6L	TINYURL.COM/P4X7AZM	TINYURL.COM/Q68FS5U

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Best activity trackers					
	1 	2	3	4 	5 
	Fitbit Charge HR	Fitbit Surge	Fitbit One	Microsoft Band	Fitbit Charge
Price	£119 inc VAT	£199 inc VAT	£79 inc VAT	£169 inc VAT	£99 inc VAT
Website	Fitbit.com/uk	Fitbit.com/uk	Fitbit.com/uk	Microsoft.com/en-gb	Fitbit.com/uk
Launch date	Jan 15	Jan 15	Jan 14	May 15	Nov 14
Overall rating	★★★★★	★★★★★	★★★★★	★★★★☆	★★★★★
Compatibility	iOS, Android, Windows	iOS, Android, Windows	iOS, Android	iOS, Android, Windows	iOS, Android, Windows
Display	OLED	Touchscreen	OLED	TFT	OLED
Pedometer	Yes	Yes	Yes	Yes	Yes
Heart-rate monitor	Yes	Yes	No	Yes	No
Sleep tracking	Yes	Yes	Yes	Yes	Yes
Alarm	Yes	Yes	Yes	Yes	Yes
Third-party app syncing	Yes	Yes	Yes	Yes	Yes
Call notifications	Yes	Yes	No	Yes	Yes
Waterproof	Yes	Yes	No	Yes	Yes
Battery life	5+ days	5 days	10-14 days	2 days	7-10 days
Dimensions, weight	21.1mm, 26g	34mm, 51g	35.5x28x9.65mm, 8g	11x33mm, 60g	21.1mm, 24g
FULL REVIEW	<a href="http://tinyurl.com/pckv4su">TINYURL.COM/PCKV4SU</a>	<a href="http://tinyurl.com/o83dr47">TINYURL.COM/O83DR47</a>	<a href="http://tinyurl.com/pt2tc6f">TINYURL.COM/PT2TC6F</a>	<a href="http://tinyurl.com/lhmq2ac">TINYURL.COM/LHMQ2AC</a>	<a href="http://tinyurl.com/pfmq9kh">TINYURL.COM/PFMQ9KH</a>






Best activity trackers					
	6	7 	8	9 	10
	Basis Peak	Xiaomi Mi Band	Jawbone Up 2	Jawbone Up Move	Jawbone Up24
Price	£169 inc VAT	£29 inc VAT	£89 inc VAT	£39 inc VAT	£99 inc VAT
Website	En-gb.mybasis.com	Mobilefun.co.uk	Jawbone.com	Jawbone.com	Jawbone.com
Launch date	Apr 15	Feb 15	June 15	Nov 14	Mar 14
Overall rating	★★★★☆	★★★★★	★★★★★	★★★★★	★★★★★
Compatibility	iOS, Android	iOS, Android	iOS, Android	iOS, Android	iOS, Android
Display	E-Ink	No	No	No	No
Pedometer	Yes	Yes	Yes	Yes	Yes
Heart-rate monitor	Yes	No	No	No	No
Sleep tracking	Yes	Yes	Yes	Yes	Yes
Alarm	No	Yes	Yes	No	Yes
Third-party app syncing	No	No	Yes	Yes	Yes
Call notifications	Yes	Yes	No	No	No
Waterproof	Yes	Yes	Splashproof	Splashproof	Splashproof
Battery life	4 days	30 days	7 days	Six months, non-rechargeable	7 days
Dimensions, weight	33x43x10mm, 51g	157-205mm, 13g	220x11.5x3-8.5mm, 25g	27.6x27.6x9.8mm, 6.8g	S: 19g, M: 22g, L: 23g
FULL REVIEW	<a href="http://tinyurl.com/lhmq2ac">TINYURL.COM/LHMQ2AC</a>	<a href="http://tinyurl.com/qz3yvcr">TINYURL.COM/QZ3YVCR</a>	<a href="http://tinyurl.com/pht98zk">TINYURL.COM/PHT98ZK</a>	<a href="http://tinyurl.com/pfxqfne">TINYURL.COM/PFXQFNE</a>	<a href="http://tinyurl.com/nd8ymb8">TINYURL.COM/ND8YMB8</a>






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Best budget printers	    				
	1	2	3	4	5
	HP OfficeJet 3830	Samsung Xpress M2022W	Brother HL-1110	Canon Pixma MX535	Canon i-Sensys LBP6230dw
Price	£60 inc VAT	£179 inc VAT	£59 inc VAT	£70 inc VAT	£91 inc VAT
Website	Hp.com/uk	Samsung.com/uk	Brother.co.uk	Canon.co.uk	Canon.co.uk
Launch date	Jun 15	Jul 14	Feb 14	Jul 14	Mar 15
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Technology	Colour inkjet	Mono laser	Mono laser	Colour inkjet	Mono laser
Max print resolution	1200x1200dpi	1200x1200dpi	600x600dpi	4800x1200dpi	1200x1200dpi
Actual print speed	B=11ppm C=4ppm	B=20ppm	B=16.4ppm	B=9.7ppm C=3.8ppm	B=22.2ppm
Scan/fax facilities	None	1200x1200 scans	None	1200x2400 scans/fax	None
Supported interfaces	USB 2.0, 802.11b/g/n, AirPrint	USB 2.0, 802.11b/g/n	USB 2.0	USB 2.0, 802.11b/g/n, AirPrint	USB 2.0, 802.11b/g/n
Cost per page	B=6p C=7p	B=2p	B=2.7p	B=2.7p C=4.8p	B=2p
Media card/auto duplex	x✓	xx	xx	x✓	x✓
Input capacity	60 sheets	150 sheets	150 sheets	100 sheets + 30-sheet ADF	250 sheets
Dimensions	222x454x362mm	332x215x178mm	340x238x189mm	458x385x200mm	379x293x243mm
Weight	5.8kg	4kg	4.5kg	8.5kg	7kg
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/PJ4K9D7	TINYURL.COM/PQ9JUDN	TINYURL.COM/OQE9LGJ	TINYURL.COM/N9LXV7	TINYURL.COM/KZW8VU3

Best printers	    				
	1	2	3	4	5
	Canon Pixma MG7550	Samsung Xpress M2835DW	Canon i-Sensys MF6180dw	Epson WorkForce Pro	Brother HL-L9200CDWT
Price	£130 inc VAT	£143 inc VAT	£320 inc VAT	£200 inc VAT	£548 inc VAT
Website	Canon.co.uk	Samsung.com/uk	Canon.co.uk	Epson.co.uk	Brother.co.uk
Launch date	Jul 15	Oct 14	May 14	May 15	Aug 14
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Technology	Colour inkjet	Mono laser	Mono laser	Colour inkjet	Colour laser
Max print resolution	9600x2400dpi	4800x600dpi	1200x600dpi	4800x1200dpi	2400x600dpi
Actual print speed	B=14.3ppm	B=22.7ppm	B=24ppm	B=18.9ppm	B=30ppm C=30ppm
Scan/fax facilities	2400x4800dpi scanner	None	600dpi scanner, 33.6Kb/s fax	None	None
Supported interfaces	USB 2.0, ethernet, 802.11b/g/n	USB 2.0, ethernet, 802.11b/g/n	USB 2.0, ethernet, 802.11b/g/n	USB 2.0, ethernet, 802.11b/g/n	USB 2.0, ethernet, 802.11b/g/n
Cost per page	B=2.4p C=8.1p	B=1.5p	B=1.5p	B=1.1p	B=1p C=5.9p
Media card/auto duplex	x✓	x✓	x✓	x✓	x✓
Input capacity	125 sheets	250 sheets	250 + 50 sheet + 50 ADF	250 + 80 sheet	750 sheets + 50 sheet
Dimensions	435x370x148mm	368x335x202mm	390x473x431mm	346x442x284mm	410x495x445mm
Weight	7.9kg	7.4kg	19.1kg	11.4kg	28.3kg
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/PZ3SVH7	TINYURL.COM/QECOF7V	TINYURL.COM/LE9WA5N	TINYURL.COM/OC7FUJ3	TINYURL.COM/PT52MH6

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Best wireless routers	    				
	1	2	3	4	5
	Apple AirPort Extreme	Netgear Nighthawk R7000	D-Link DIR 880L	TP-Link Archer C7	Asus RT-AC68U AC1900
Price	£169 inc VAT	£150 inc VAT	£108 inc VAT	£90 inc VAT	£160 inc VAT
Website	Apple.com/uk	Netgear.co.uk	Dlink.com	Tp-link.com	Uk.asus.com
Launch date	Jan 14	Sep 14	Sep 14	Jan 14	Jan 14
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Standards supported	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n/ac
Frequency modes	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz (concurrent)
Antennas	6x internal	3x external	3x external	3x external, 3x internal	3x external, 3x internal
Built-in modem	×	×	×	×	×
Manufacturer's rating	1300/450Mb/s	1300/600Mb/s	1300/600Mb/s	1300/450Mb/s	1300/600Mb/s
WPS	×	✓	✓	✓	✓
Ports	Gigabit WAN, 3x gigabit LAN, USB	Gigabit WAN, 1x USB 3.0, 1x USB 2.0	Gigabit WAN, 1x USB 3.0, 1x USB 2.0	Gigabit WAN, 4x gigabit LAN, 2x USB 2.0	Gigabit WAN, 4x gigabit LAN, 2x USB 2.0
Average power use	8W	9W	10W	N/A	N/A
Max speed (11n/11ac)	171/572Mb/s	171/592Mb/s	171/625Mb/s	110/505Mb/s	98/610Mb/s
Dimensions, weight	98x168x98mm, 945g	285x186x45mm, 750g	247x190x47mm, 745g	32.5x243x160mm, 508g	160x83x220mm, 640g
Warranty	1 year	N/S	N/S	3 years	2 years
FULL REVIEW	TINYURL.COM/MFDLLSC	TINYURL.COM/Q2NRQ8Q	TINYURL.COM/OZ5G7KG	TINYURL.COM/KKJMPCE	TINYURL.COM/K4ZATKV

Best powerline adaptors	    				
	1	2	3	4	5
	Solwise SmartLink 1200AV2	TrendNet Powerline 500 AV2	TP-Link AV1200	Devolto dLAN 1200+	Devolto dLAN 500AV
Price	£43 inc VAT	£41 inc VAT	£88 inc VAT	£119 inc VAT	£129 inc VAT
Website	Solwise.com	Trendnet.com	Uk.tp-link.com	Devolto.com/uk	Devolto.com/uk
Launch date	Nov 14	Mar 14	May 15	Sep 14	Nov 13
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
No of adaptors in kit	1 (2 required)	2	2	2	2
Max throughput	1200Mb/s	600Mb/s	1200Mb/s	1200Mb/s	500Mb/s
Near test result	410Mb/s	146Mb/s	500Mb/s	357Mb/s	96Mb/s
Far test result	107Mb/s	71Mb/s	200Mb/s	126Mb/s	47Mb/s
Ethernet ports	2x gigabit	1x gigabit	1x gigabit	1x gigabit	3x gigabit
Passthrough socket	Yes	No	Yes	Yes	Yes
Wireless hotspot	No	No	No	No	Yes
Encryption	128-bit	128-bit	128-bit	128-bit	128-bit
Dimensions	62x122x41mm	55x87x58mm	230x190x100mm	130x66x42mm	152x76x40mm
Weight	Not specified	90g	898g	Not specified	Not specified
Warranty	2 years	3 years	1 year	3 years	3 years
FULL REVIEW	TINYURL.COM/NZ4EJW8	TINYURL.COM/QYEPJQ7	TINYURL.COM/NVONCWT	TINYURL.COM/Q4EO04M	TINYURL.COM/OVNPPQ7

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Best NAS drives	1	2	3	4	5
	Qnap TS-421	Synology DS115j	Qnap HS-210	WD My Cloud EX2100	Synology DS414j
Price	£320 inc VAT (diskless)	£83 inc VAT (diskless)	£190 inc VAT (diskless)	£205 inc VAT (diskless)	£270 inc VAT (diskless)
Website	Qnap.com	Synology.com	Qnap.com	Wd.com	Synology.com
Launch date	Mar 14	Feb 15	Dec 14	May 15	Jan 15
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Drive bays	4	1	2	2	4
Processor	2GHz Marvell single-core	800MHz Marvell Armada 370	1.6GHz Marvell single-core	1.3 GHz Marvel Armada 385	1.2GHz Mindspeed Concerto
Memory	1GB DDR3	256MB DDR3	512MB DDR3	1GB DDR3	512MB DDR3
Remote access	✓	✓	✓	✓	✓
eSATA	2x	x	x	x	1x
USB port	2x USB 3.0, 2x USB 2.0	2x USB 2.0	2x USB 3.0, 2x USB 2.0	2x USB 3.0	1x USB 3.0, 1x USB 2.0
Raid options	0/1/5/6/10/JBOD	None	0/1/JBOD	00/1/JBOD	0/1/5/6/10/JBOD
Software	Backup Station	DSM 5.1	HD Station	My Cloud	DSM 5.0
Dimensions	177x180x235mm	71x161x224mm	302x220x41mm	216x109x148mm	184x168x230mm
Weight	3kg	700g	1.5kg	3.5kg	2.2kg
Warranty	2 years	1 year	2 years	3 years	3 years
FULL REVIEW	TINYURL.COM/MCYWUB8	TINYURL.COM/MNEYVVK	TINYURL.COM/OEXRYNY	TINYURL.COM/M643BSG	TINYURL.COM/M643BSG

Best external hard drives	1	2	3	4	5
	Transcend StoreJet 25M3	WD My Passport Ultra Metal	Toshiba Canvio Basics	Seagate Seven mm	iStorage diskAshur Pro
Price	£70 inc VAT	£90 inc VAT	£76 inc VAT	£99 inc VAT	£269 inc VAT
Website	Uk.transcend-info.com	Wdc.com/en	Toshiba.co.uk	Seagate.com/gb/en	Istorage-uk.com
Launch date	Feb 15	Feb 15	Feb 15	Feb 15	Feb 15
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Capacity tested	2TB	2TB	2TB	500GB	1TB
Capacity range	500GB, 1TB, 2TB	1TB, 2TB	500GB, 1TB, 2TB	500GB	500GB, 1TB, 1.5TB, 2TB
Disk size	2.5in	2.5in	2.5in	2.5in	2.5in
Spin speed	5400rpm	N/A	5400rpm	5400rpm	5400rpm
Transfer speed	135MB/s	114MB/s	117MB/s	49MB/s	115MB/s
Encryption	256-bit AES	256-bit AES	256-bit AES	N/A	256bit AES-XTS
Other interfaces	USB 3.0	USB 3.0	USB 3.0	USB 3.0	USB 3.0
Software	Transcend Elite	WD Drive Utilities	None	Seagate Dashboard	Security utilities
Dimensions	130x82x19mm	110x80x19mm	111x79x21mm	123x82x7mm	120x85x20mm
Weight	234g	241g	207g	178g	200g
Warranty	3 years	3 years	2 years	2 years	2 years
FULL REVIEW	TINYURL.COM/M72D3EP	TINYURL.COM/L2B7V3B	TINYURL.COM/JWHHACB	TINYURL.COM/O6KZFDM	TINYURL.COM/MZOBZ6J

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Best SSDs	    				
	1	2	3	4	5
	OCZ Arc 100	Samsung 850 Pro	SanDisk Extreme Pro	Crucial MX200	Kingston HyperX Savage
Price	£69 inc VAT	£365 inc VAT	£172 inc VAT	£301 inc VAT	£185 inc VAT
Website	Ocz.com	Samsung.com/uk	Sandisk.co.uk	Uk.crucial.com	Kingston.com/en
Launch date	Jul 15	Jul 15	Jul 15	Jul 15	Jul 15
Overall rating	★★★★★	★★★★★	★★★★★	★★★★☆	★★★★☆
Capacity tested	240GB	1TB	480GB	1TB	480GB
Price per GB	28.8p	36.5p	35.8p	30.1p	38.5p
Memory cache	512MB DDR3	1GB LPDDR2	1GB	1GB DDR3	256MB
Controller	Indilinx Barefoot 3 M10	Samsung MCX	Marvell 88SS9187	Marvell 88SS9189	Phison PS3110 S10
Encryption	AES 256-bit	AES 256-bit	AES 256-bit	AES 256-bit	Unknown
Flash	Toshiba 19nm MLC	Samsung 40nm V-AND MLC	SanDisk 19nm MLC	Micron 16nm MLC	Toshiba 19nm A19 MLC
Firmware updated via	OCZ SSD Guru	Samsung SSD Magician	SanDisk SSD Dashboard	Crucial Storage Executive	None
ATTO peak sequential	489-/447MB/s	564-/534MB/s	556-/525MB/s	533-/514MB/s	564-/543MB/s
CDM peak IOPS	79.2-/90.3MB/s	103.2-/93.7MB/s	102.7/91.4MB/s	26.1/90.1MB/s	91.6-/94.8MB/s
CDM 4kB rnd	27-/127MB/s	36-/89MB/s	32-/88MB/s	29-/131MB/s	26-59MB/s
Warranty	3 years	10 years	10 years	3 years	3 years
FULL REVIEW	TINYURL.COM/QZQLYY4	TINYURL.COM/OVHDALD	TINYURL.COM/NMSJU25	TINYURL.COM/P3YX2KE	TINYURL.COM/ON54VUC

Best projectors	    				
	1	2	3	4	5
	ViewSonic PLED-W800	BenQ W1300	Optoma W316	InFocus IN126STa	NEC M352WS
Price	£512 inc VAT	£730 inc VAT	£458 inc VAT	£525 inc VAT	£778 inc VAT
Website	Viewsoniceurope.com/uk	Benq.co.uk	Optoma.co.uk	Infocus.com	Nec-display-solutions.com
Launch date	Feb 15	Jun 14	Jul 14	Sep 14	Jul 14
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Projection technology	DLP	DLP	DLP	DLP	DLP
Resolution (pixels)	1280x800	1920x1080	1280x800	1280x800	1280x800
Brightness, Contrast	800, 120,000:1	2000, 10,000:1	3400, 15,000:1	3300, 15,000:1	3500, 10,000:1
Image size	100in	300in	300in	300in	150in
Supported aspect ratios	16:10 native	16:9 native	16:10, 16:9, 4:3	16:10, 16:9, 4:3	16:10
Noise levels (dB)	34 (32 eco)	33 (30 eco)	29db	32db (30 eco)	33 (39 bright mode)
Connections	VGA, HDMI, USB	VGA, 2x HDMI, USB, 3D	VGA, HDMI, Mini-USB, 3D	2x VGA, HDMI, USB, ethernet	2x VGA, 2x HDMI, USB
Lamp/lamp life	90W/30000 hrs	240W/6000 hrs	190W/10000 hrs	278W/3500 hrs	278W/8000 hrs
Dimensions	175x52x138mm	330x257x128mm	315x223x102mm	292x220x108mm	368x268x97mm
Weight	0.83kg	3.4kg	2.5kg	3.7kg	3.6kg
Warranty	3 years	3 years	2 years	1 year	3 years
FULL REVIEW	TINYURL.COM/K83X8LA	TINYURL.COM/K4FA89Q	TINYURL.COM/OCWTHGW	TINYURL.COM/NHH3QPB	TINYURL.COM/Q6J2N6W






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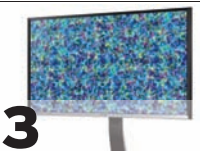


Best budget graphics cards	1	2	3	4	5
	Sapphire Radeon R7 250X	MSI R7 260X OC	EVGA GeForce GTX 750	Asus GeForce GT 740 OC	MSI GeForce GT 730
Price	£65 inc VAT	£91 inc VAT	£90 inc VAT	£65 inc VAT	£48 inc VAT
Website	Sapphiretech.com	Uk.msi.com	Eu.evga.com	Asus.com/uk	Uk.msi.com
Launch date	Feb 15	May 14	Mar 14	Feb 15	Aug 14
Overall rating	★★★★★	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Graphics processor	AMD Radeon R7 250X	AMD Radeon R7 260X	nVidia GeForce GTX 750	nVidia GeForce GT 740	nVidia GeForce GT730
Installed RAM	1GB GDDR5	2GB GDDR5	1GB GDDR5	1GB GDDR5	2GB GDDR3
Memory interface	128-bit	128-bit	128-bit	128-bit	128-bit
Core clock	950MHz	1175MHz	1294MHz	1033MHz	780MHz
Memory clock/Effective	1125/4500MHz	1625MHz/6.5GHz	1253/5012MHz	1.25/5GHz	900/1800MHzHz
Stream processors	640	896	512	384	320
Texture units	40	56	32	32	20
Power connectors	1x 6-pin	1x 6-pin	None	1x 6-pin	1x 6-pin
DirectX	12	11.1	Unknown	Unknown	Unknown
Digital interface	1x DVI, HDMI, DisplayPort	2x DVI, HDMI, Mini-DP	1x DVI, HDMI, DisplayPort	1x DVI, HDMI, VGA	1x DVI, HDMI, VGA
Warranty	2 years	3 years	3 years	3 years	2 years
FULL REVIEW	TINYURL.COM/OLJ83SQ	TINYURL.COM/OZ6WUYT	TINYURL.COM/PB3F6EN	TINYURL.COM/PAH5VMJ	TINYURL.COM/P8J4C2R

Best graphics cards	1	2	3	4	5
	Gigabyte GeForce GTX 770 2GB	HIS Radeon R9 280X	Zotac Geforce GTX 960	XFX Radeon R9 290X	MSI Radeon R9 295 X2
Price	£200 inc VAT	£246 inc VAT	£285 inc VAT	£280 inc VAT	£680 inc VAT
Website	Uk.gigabyte.com	Hisdigital.com	Zotac.com	Xfxforce.com	Uk.msi.com
Launch date	Aug 13	Nov 13	Mar 15	Apr 14	May 14
Overall rating	★★★★★	★★★★★	★★★★☆	★★★★★	★★★★☆
Graphics processor	nVidia GeForce GTX 770	AMD Radeon R9 280X	nVidia GeForce GTX 960	AMD Radeon R9 290X	AMD Radeon R9 295 X2
Installed RAM	2GB GDDR5	3GB GDDR5	2GB GDDR5	4GB GDDR5	8GB GDDR5
Memory interface	256-bit	384-bit	128-bit	512-bit	2x 512-bit
Core clock/boost	950/1020MHz	850MHz/1GHz	1266/1329MHz	1/1GHz	1018MHz/N/A
Memory clock/Effective	1.5GHz/6GHz	1.5GHz/6GHz	1752MHz/7.1GHz	1.25GHz/5GHz	1.25GHz/5GHz
Stream processors	1536	2048	1024	2816	2x 2816
Texture units	128	128	64	176	2x 176
Power connectors	1x 6-pin, 1x 8-pin	2x 8-pin	1x 6-pin	8-pin, 6-pin	2x 8-pin
DirectX	11	11	12	11	11
Digital interface	2x DVI, HDMI, DisplayPort	DVI, HDMI, 2x Mini-DisplayPort	DVI, HDMI, 3x DisplayPort	2x DVI, HDMI, DisplayPort	DVI, 4x Mini-DP
Warranty	3 years	2 years	5 years	3 years	3 years
FULL REVIEW	TINYURL.COM/OAG6277	TINYURL.COM/PR503GT	TINYURL.COM/MWBC036	TINYURL.COM/NPET8ER	TINYURL.COM/POTAOGZ

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Best budget flat-panel displays	1	2	3	4	5
					
	<b>AOC i2369V</b>	<b>Philips 234E5QHAW</b>	<b>NEC MultiSync E243WMI</b>	<b>BenQ EW2740L</b>	<b>BenQ GL2450</b>
Price	£130 inc VAT	£130 inc VAT	£194 inc VAT	£175 inc VAT	£108 inc VAT
Website	Aoc-europe.com/en	Philips.co.uk	Nec-display-solutions.com	Benq.co.uk	Benq.co.uk
Launch date	Jul 14	Jul 14	Jun 14	Aug 14	Jul 14
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Screen size	23in	23in	23.8in	27in	24in
Panel type	IPS matt	IPS matt	IPS matt	VA semi-matt	TN matt
Native resolution	1920x1080	1920x1080	1920x1080	1920x1080	1920x1080
Pixel density	96ppi	96ppi	93ppi	82ppi	92ppi
Brightness	220cd/m <sup>2</sup>	187cd/m <sup>2</sup>	250cd/m <sup>2</sup>	300cd/m <sup>2</sup>	261cd/m <sup>2</sup>
Static contrast ratio	630:1	210:1	650:1	280:1	610:1
Response time	6ms	5ms	6ms	4ms	5ms
Ports	HDMI, HDMI/MHL, DP, VGA	2x HDMI (QHAB) or 1x HDMI (QDAB), VGA	DP, DVI-D, VGA	2x HDMI, VGA	DVI-D, VGA
Dimensions	531x204x398mm	532x213x414mm	558x214x380-490mm	623x191x451mm	579x179x436mm
Weight	3.75kg	3.5kg	6.3kg	4.2kg	4.1kg
Warranty	3 years	2 years	3 years	2 years	2 years
FULL REVIEW	<a href="http://tinyurl.com/ooefypr">TINYURL.COM/OOEFYPR</a>	<a href="http://tinyurl.com/kllylw4v">TINYURL.COM/KLYLW4V</a>	<a href="http://tinyurl.com/kncgvoU">TINYURL.COM/KNCGVOU</a>	<a href="http://tinyurl.com/oo6ec5L">TINYURL.COM/OO6EC5L</a>	<a href="http://tinyurl.com/oo0pfue">TINYURL.COM/OO0PFUE</a>

Best flat-panel displays	1	2	3	4	5
					
	<b>BenQ BL3201PT</b>	<b>Philips BDM4065UC</b>	<b>Samsung UD970</b>	<b>Acer S277HK</b>	<b>ViewSonic VP2780-4K</b>
Price	£699 inc VAT	£600 inc VAT	£1,400 inc VAT	£499 inc VAT	£699 inc VAT
Website	Benq.co.uk	Philips.co.uk	Samsung.com/uk	Acer.co.uk	Viewsoniceurope.com/uk
Launch date	Jul 15	Jul 15	Jul 15	Jul 15	Jul 15
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Screen size	32in	40in	31.5in	27in	27in
Panel type	IPS	VA	PLS	IPS	IPS
Native resolution	3840x2160	3840x2160	3840x2160	3840x2160	3840x2160
Pixel density	157ppi	110ppi	140ppi	163ppi	163ppi
Brightness	350cd/m <sup>2</sup>	120cd/m <sup>2</sup>	350cd/m <sup>2</sup>	300cd/m <sup>2</sup>	350cd/m <sup>2</sup>
Static contrast ratio	1000:1	5000:1	1000:1	530:1	1000:1
Response time	4ms	8.5ms	8ms	4ms	5ms
Ports	DVI-DL, HDMI, DP, mDP	HDMI, DP, mDP, VGA	HDMI, DVI, 4x USB 3.0	DVI, HDMI, DP, mDP, 4x USB 3.0	HDMI, DP, 4x USB 3.0
Dimensions	490.2x740.3x213.4mm	904x512x88mm	728x427x62mm	614x406x113mm	642.7x469.7x347.8mm
Weight	12.5kg	8.5kg	10.3kg	4.9kg	11.7kg
Warranty	3 years	2 years	Not stated	Not stated	3 years
FULL REVIEW	<a href="http://tinyurl.com/npa62QL">TINYURL.COM/NPA62QL</a>	<a href="http://tinyurl.com/q2w3vzy">TINYURL.COM/Q2W3VZY</a>	<a href="http://tinyurl.com/obwbbyn">TINYURL.COM/OBWBBYN</a>	<a href="http://tinyurl.com/ntv4evd">TINYURL.COM/NTV4EVD</a>	<a href="http://tinyurl.com/o69cmtb">TINYURL.COM/O69CMTB</a>

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## Best e-book readers








	Amazon Kindle Voyage	Amazon Kindle (7th gen)	Amazon Kindle Paperwhite	Nook GlowLight	Kobo Aura H2O
Price	£169 inc VAT	£59 inc VAT	£109 inc VAT	£89 inc VAT	£139 inc VAT
Website	Amazon.co.uk	Amazon.co.uk	Amazon.co.uk	Nook.com/gb	Kobo.com
Launch date	Oct 14	Sep 14	Sep 13	Oct 13	Sep 14
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Screen size	6in touchscreen	6in touchscreen	6in touchscreen	6in touchscreen	6.8in touchscreen
Screen technology	E Ink	E Ink	E Ink	E Ink	E Ink
Screen resolution	1440x1080	600x800	768x1024	758x1024	1430x1080
Built-in light	Yes	No	Yes	Yes	Yes
Storage	4GB	4GB	2GB	4GB	4GB, microSD up to 32GB
Book store	Amazon Kindle	Amazon Kindle	Amazon Kindle	Nook	Kobo
Cellular connectivity	Optional extra	No	Optional extra	No	No
Battery life	Six weeks	Four weeks	Eight weeks	Eight weeks	Two months
Dimensions	162x115x7.6mm	169x119x10.2mm	117x169x9.1mm	127x166x10.7mm	179x129x9.7mm
Weight	180g	191g	206g	175g	233g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/NXAAU3Q	TINYURL.COM/NSFORJE	TINYURL.COM/PREZPRK	TINYURL.COM/OZ5WMPO	TINYURL.COM/MJVR4M9





## Best media streamers



	Roku Streaming Stick	Roku 3	Google Chromecast	Apple TV	Amazon Fire TV
Price	£49 inc VAT	£99 inc VAT	£30 inc VAT	£59 inc VAT	£79 inc VAT
Website	Roku.com	Roku.com	Play.google.com	Apple.com/uk	Amazon.co.uk
Launch date	Mar 14	Mar 13	Mar 14	Mar 12	Oct 14
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Type	Dongle	Set-top box	Dongle	Set-top box	Set-top box
Ports	HDMI, Micro-USB	HDMI, USB, ethernet	HDMI, Micro-USB	HDMI, ethernet, Micro-USB	HDMI, USB, ethernet
Processor	600MHz single-core	900MHz single-core	Single-core	Apple A5 single-core	1.7GHz Qualcomm quad-core
RAM	512MB	512MB	512MB	512MB	2GB
Graphics	Not specified	Not specified	Not specified	Not specified	Adreno 320
Storage	None	512MB plus microSD slot	None	8GB (not user-accessible)	8GB
Voice search	No	Yes	No	No	Yes
Remote control	Yes	Yes	No	Yes	Yes
Dimensions	78.7x27.9x12.7mm	89x89x25mm	72x35x12mm	98x98x23mm	115x115x17.5mm
Weight	18g	170g	34g	270g	281g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/OAP9QF9	TINYURL.COM/PT7MGUL	TINYURL.COM/QBGTC52	TINYURL.COM/OLCJRC3	TINYURL.COM/P4RE7WP





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Best games consoles	1	2	3	4	5
					
	Sony PlayStation 4	Microsoft Xbox One	Nintendo Wii U Premium	Sony PlayStation 3 Super Slim	Microsoft Xbox 360
Price	£349 inc VAT	£349 inc VAT	£249 inc VAT	£249 inc VAT	£199 inc VAT
Website	Playstation.com	Xbox.com	Nintendo.co.uk	Playstation .com	Xbox.com
Launch date	Nov 13	Nov 13	Nov 12	Sep 12	Dec 05
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	Octa-core AMD x86	1.75GHz octa-core AMD x86	IBM Power multicore CPU	IBM CPU	IBM Xenon CPU
Graphics	1.84TFlops AMD Radeon GPU	1.31TFlops AMD Radeon GPU	AMD Radeon GPU	256MB nVidia RSX	512MB ATI Xenos
RAM	8GB GDDR5	8GB DDR3	Not specified	Not specified	512MB GDDR3
Storage	500GB	500GB	32GB, plus SD card support	500GB	500GB
Optical drive	Blu-ray, DVD, game discs	Blu-ray, DVD, game discs	Wii U, Wii discs only	Blu-ray, DVD, game discs	DVD, game discs
Ports	2x USB 3.0, AUX, HDMI	USB 3.0, HDMI	4x USB 2.0, HDMI	2x USB 2.0, HDMI	5x USB, HDMI
Connectivity	Ethernet, 802.11b/g/n, Bluetooth	Ethernet, 802.11b/g/n	802.11b/g/n	Ethernet, 802.11b/g/n, Bluetooth	Ethernet, 802.11b/g/n
Other	1 controller	1 controller, 4K, Kinect option	1 controller	1 controller	1 controller
Dimensions	275x53x305mm	333x274x79mm	46x269x171mm	290x230x60mm	269x75x264mm
Weight	2.8kg	3.2kg	1.6kg	2.1kg	2.9kg
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	<a href="http://tinyurl.com/NBFLQK2">TINYURL.COM/NBFLQK2</a>	<a href="http://tinyurl.com/M6J4KHS">TINYURL.COM/M6J4KHS</a>	<a href="http://tinyurl.com/6J49LHL">TINYURL.COM/6J49LHL</a>	<a href="http://tinyurl.com/QDJP560">TINYURL.COM/QDJP560</a>	<a href="http://tinyurl.com/PFP9CCK">TINYURL.COM/PFP9CCK</a>

Best budget portable speakers	1	2	3	4	5
					
	Denon Envaya Mini	UE Roll	Lumsing B9	i-box Twist	Lava BrightSounds
Price	£99 inc VAT	£99 inc VAT	£23 inc VAT	£41 inc VAT	£39 inc VAT
Website	Denon.com	Ultimateears.com	Lumsing.com	lboxstyle.com	Lavaaccessories.co.uk
Launch date	Jan 15	Jul 15	Aug 14	Nov 12	Dec 14
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Speaker(s)	Not specified	Not specified	Not specified	2x 3W	1x 5W
Bluetooth	Bluetooth 4.0	Bluetooth	Bluetooth 3.0 + EDR	Bluetooth 2.1	Not specified
Handsfree calls	Yes	No	Yes	Yes	Yes
NFC	Yes	Yes	Yes	No	No
Frequency response	Not specified	108Hz to 20kHz	20Hz to 20kHz	Not specified	Not specified
Impedance	Not specified	Not specified	4 ohms	Not specified	Not specified
Extra features	IPX4 splashproof	IPX7 splashproof	MicroSD slot, lanyard	None	IPX4 splashproof, LED lamp
Claimed battery life	10 hours	9 hours	25 hours	5 hours	8 hours
Dimensions	209x54x51mmmm	134x39x40mm	177x50x70mm	246x59x56mm	190x95x103mm
Weight	558g	330g	300g	380g	821g
Warranty	1 year	2 years	1 year	5 years	1 year
FULL REVIEW	<a href="http://tinyurl.com/QDRNP3P">TINYURL.COM/QDRNP3P</a>	<a href="http://tinyurl.com/O7T7ZUU">TINYURL.COM/O7T7ZUU</a>	<a href="http://tinyurl.com/P623MK8">TINYURL.COM/P623MK8</a>	<a href="http://tinyurl.com/LET9RDF">TINYURL.COM/LET9RDF</a>	<a href="http://tinyurl.com/KOM2ZT3">TINYURL.COM/KOM2ZT3</a>

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Best budget headphones					
	1 <b>PC ADVISOR</b> RECOMMENDED	2 <b>PC ADVISOR</b> RECOMMENDED	3 <b>PC ADVISOR</b> RECOMMENDED	4 <b>PC ADVISOR</b> RECOMMENDED	5
	RHA MA450i	Sennheiser HD 429	Rock Jaw Alpha Genus	AKG K77	Creative Sound Blaster Jam
Price	£39 inc VAT	£45 inc VAT	£41 inc VAT	£25 inc VAT	£39 inc VAT
Website	Rha-audio.com/uk	En-uk.sennheiser.com	Rockjawaudio.com	Uk.akg.com	Uk.creative.com
Launch date	Nov 14	Jan 11	Jun 14	May 08	May 15
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Type	In-ear	Circumaural over-ear	In-ear	Circumaural over-ear	Circumaural over-ear
Frequency response	16Hz to 22kHz	18Hz to 22kHz	20Hz to 20kHz	18Hz to 20.5kHz	20Hz to 20kHz
Nominal impedance	16 ohms	32 ohms	16 ohms	32 ohms	Not specified
Sensitivity	103dB	110dB	108dB	112dB	Not specified
In-line remote	Yes (3 button)	No	No	No	No
Mic	Yes	No	No	No	Yes
Extra grommets	Yes	N/A	Yes, and filters	N/A	N/A
Carry case	Yes	No	Yes	No	No
Cable length	1.5m (braided)	3m	1.2m (twisted)	2.5m	N/A
Weight	14g	218g	11g	190g	109g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/P7W7RVL	TINYURL.COM/ND8TD8O	TINYURL.COM/NNYUFBF	TINYURL.COM/PA8FOX4	TINYURL.COM/NLD8ZS2

Best headphones					
	1 <b>PC ADVISOR</b> BEST BUY	2	3 <b>PC ADVISOR</b> RECOMMENDED	4	5 <b>PC ADVISOR</b> RECOMMENDED
	Denon AH-D600	Audio-Technica ATH-WS99	Bose QC20	Denon AH-W150	Bowers & Wilkins P3
Price	£229 inc VAT	£79 inc VAT	£259 inc VAT	£59 inc VAT	£169 inc VAT
Website	Denon.co.uk	Eu.audio-technica.com/en	Bose.co.uk	Denon.co.uk	Bowers-wilkins.co.uk
Launch date	Aug 2012	Jun 15	Jun 13	Aug 12	Jun 12
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Type	Circumaural over-ear	Over-ear	In-ear	Over-ear wireless buds	On-ear, foldable
Frequency response	8Hz to 25kHz	8Hz to 25kHz	20-21kHz	5Hz to 25kHz	10Hz to 20kHz
Nominal impedance	37 ohms	37 ohms	32 ohms	16 ohms	34 ohms
Sensitivity	120dB	120dB	105dB	102dB	111dB
In-line remote	Yes	Yes	Yes	Yes	Yes
Mic	No	Yes	Yes	Yes	Yes
Extra grommets	N/A	N/A	Yes	Yes	N/A
Carry case	Yes	No	Yes	Yes	Yes
Cable length	3m	0.8m	1.3m	N/A	1.2m
Weight	250g	250g	44g	23g	132g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/NBCFJW6	TINYURL.COM/QDRCCAT	TINYURL.COM/OEAGFOF	TINYURL.COM/O2CJV3R	TINYURL.COM/PZ07PON

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Best power banks					
	1 <b>PC ADVISOR</b> GOLD	2 <b>PC ADVISOR</b> RECOMMENDED	3 <b>PC ADVISOR</b> RECOMMENDED	4 <b>PC ADVISOR</b> RECOMMENDED	5 <b>PC ADVISOR</b> RECOMMENDED
	Zendure A2 (2nd gen)	Xiaomi 10,000mAh	iHarbot Power Bank MS024	Anker Astro Mini	Intocircuit Power Castle
Price	£25 inc VAT	£11 inc VAT	£7.50 inc VAT	£13 inc VAT	£22 inc VAT
Website	Zendure.com	mi.com/en	Amazon.co.uk	lanker.com	Hisgadget.com
Launch date	Aug 15	May 15	Jun 15	Apr 13	Mar 13
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Capacity	6400mAh	10,000mAh	5000mAh	3200mAh	11200mAh
Input	1x 7.5W Micro-USB	1x 10W Micro-USB	1x 10.5W Micro-USB	1x 4W Micro-USB	1x 5W Micro-USB
Outputs	1x 10.5W USB	1x 10.5W USB	1x 10W USB	1x 5W USB	1x 10.5W USB, 1x 5W USB
Auto-on/-off	Yes	Yes	Auto-on	No	Auto-on
Passthrough charging	Yes	Yes	Yes	No	Yes
Status indicator	4 LEDs	4 LEDs	4 LEDs	No	LCD screen
LED flashlight	No	No	No	No	Yes
Carry case	Yes	No	No	Yes	Yes
Dimensions	93x48x23mm	91x60.4x22mm	118x11.6x63mm	92x23x23mm	110x71x22mm
Weight	137g	207g	150g	80g	280g
Warranty	1 year	1 year	18 months	18 months	1 year
FULL REVIEW	TINYURL.COM/NGCNO5F	TINYURL.COM/NFQZOCB	TINYURL.COM/PVO2LEC	TINYURL.COM/PZHUHJO	TINYURL.COM/P5M9NKE

Best desktop chargers					
	1 <b>PC ADVISOR</b> RECOMMENDED	2 <b>PC ADVISOR</b> RECOMMENDED	3 <b>PC ADVISOR</b> RECOMMENDED	4 <b>PC ADVISOR</b> RECOMMENDED	5 <b>PC ADVISOR</b> RECOMMENDED
	iClever USB Travel Charger	Zendure Turbo Charger	Olixar Smart IC Charger	Inateck USB Charger	Lumsing 5-Port Charger
Price	£20 inc VAT	£25 inc VAT	£34 inc VAT	£15 inc VAT	£8 inc VAT
Website	Hisgadget.com	Zendure.com	Mobilefun.co.uk	Inateck.com	Lumsing.com
Launch date	Oct 14	May 14	Feb 15	Feb 14	Apr 14
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Max output	50W	40W	50W	35W	30W
Outputs:					
USB 1	12W USB	12W USB	12.5W USB	10.5W USB	10W USB
USB 2	12W USB	12W USB	12.5W USB	10.5W USB	10W USB
USB 3	12W USB	12W USB	12.5W USB	5W USB	10W USB
USB 4	12W USB	12W USB	12.5W USB	5W USB	5W USB
USB 5	12W USB	12W USB	12.5W USB	5W USB	5W USB
USB 6	12W USB	N/A	12.5W USB	N/A	N/A
Colours available	Black	Black, white	White	Black	Black
Dimensions	100x69x27mm	97x60x27mm	100x69x26mm	100x55x20mm	136x68x30mm
Weight	180g	166g	189g	340g	422g
Warranty	1 year	1 year	2 years	1 year	1 year
FULL REVIEW	TINYURL.COM/MPA4DWC	TINYURL.COM/NKYNJ7P	TINYURL.COM/OCZXK93	TINYURL.COM/KBXUHDF	TINYURL.COM/LK22OGY

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# Attack of the clones

I recently wrote an article extolling the virtues of what I believe to be the 10 best iOS games. This was lots of fun, but I was slightly saddened to notice that three of my top four are not iOS originals: they were all developed for PC, then ported across to mobile when they made it big.

With respect to PC gamers, that's not how this was supposed to work. With low barriers to entry for developers and a vast, affluent user base, the iOS App Store was supposed to be a brave new world of innovation for the games industry: one that would leave PCs and the big consoles trailing in its wake. Yet even an iOS gaming evangelist like myself has to acknowledge that the best games on the iPad and iPhone at present are ports from other platforms.

I promise I didn't plan it this way, but it's striking too that the two highest-placed iOS originals on my list - Threes and Monument Valley, at numbers five and three respectively - were made by software teams who have discussed publicly the problems of developing for the App Store, or at any rate for mobile in general.

Pricing for a market that has decided that £2.49 is really quite a lot for a game (what's that, £4.60 for a pint? Yes please, I'll have six) and competing with freemium. Getting users to rate your games, and persuading them not to crash your rating when you have the audacity to release extra levels as an in-app purchase. And putting your heart and soul into a game only to see it cloned by a bunch of chancers within weeks of launch. The cloners are winning. And if we don't stop them, games such as Threes and Monument Valley will increasingly be the exception on the App Store.

Apple, it's not too late to embrace the dream once again. And this is the perfect opportunity to differentiate yourself from Android. Just as Twitter belatedly responded to grass-roots activism with a 'report abuse' function, the App Store needs a similar crowdsourced approach to taking down the app cloners, and give the talented devs - the ones who are coming up with great ideas - the opportunity to flourish.

I think that every game (every app, in fact) should have a 'report clone' button on its App Store entry. You spot a clone, you press the button. (There could be an optional field to enter the name of the original game, too, if you want to speed up the investigation process.) If enough people accuse an app of cloning another, Apple's team investigates - and if the accusation is well-founded, the cloners would be given the choice of removing the offending app from the store, or keeping it there but from then on diverting a proportion of their revenue to the originator.

Sure, it's going to be messy at first. And open to abuse, but so is the app-rating system, and Apple happily keeps that. Let's say that you need to be logged into an account to report a clone. For every clone you spot, your secret clone-spotting credibility algorithm gets a tweak upward. And for each accusation that leads nowhere, your algorithm goes down. People would still game the system, I'm sure, but they would see diminishing returns.

Best of all, it would create one extra headache for cloners, and might even send a bit of cash the way of deserving creative types who we really, really don't want to give up on this whole App Store thing. ☒

“The best games on the iPad and iPhone at present are ports from other platforms”







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