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CHRISTMAS GIFT GUIDE

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Season's greetings

Stuck for Christmas ideas? We've got it covered

By now you should have done your Christmas shopping, but chances are there are a least a few last-minute gifts to sort. A recent survey by shopping channel QVC revealed that the vast majority of people dedicate a single day to their Christmas shop, and spend an average of £400 on gifts.

Assuming that you're not among the 4 percent who admitted they don't buy any presents at all, our gift guide on page 78 should provide plenty of inspiration whatever your budget. Everyone loves to receive a gadget and another survey - this one carried out by Barclays - showed that tablets will be one of the most popular gifts this year.

And it's no wonder: prices are still tumbling while quality is ever increasing. We reviewed Tesco's latest Hudl 2 in the last issue and on page 48 we take a look at Amazon's new Fire HD 6, a tablet that costs little more than its basic Kindle eReader. It's great if you want a small screen and have a tight budget but for those with more money, Apple's iPad Air 2 (page 38) once more raises the bar for premium tablets. If you're treating yourself, then check out our group tests of keyboards and mice on pages 88 and 96. Even if you're not an avid gamer, these high-quality peripherals are a great investment.

As it's the end of another year, we look forward to the technology you can expect to see in 2015 on page 68. Homes will get smarter as will wearable tech. One of the most interesting areas is 3D printing. It's looking more and more likely that home 3D printers will become affordable, making it possible to print a new smartphone case or even a part to repair a broken appliance. But while these 'cheap' printers will print in just one colour, online services will let you print more complex items, and allow you to personalise goods before you buy.

Finally, don't miss our guide on page 112, which explains how to make a virtual reality viewer for your smartphone. Costing less than a pint of beer, this cardboard contraption will let you use the many free virtual reality apps available for both Android and iOS. ☒

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AMD reveals high-end 'Carrizo' APU, its first fully HSA-compliant chip

AMD unveils Carrizo, the company's successor to its Kaveri enthusiast integrated processor

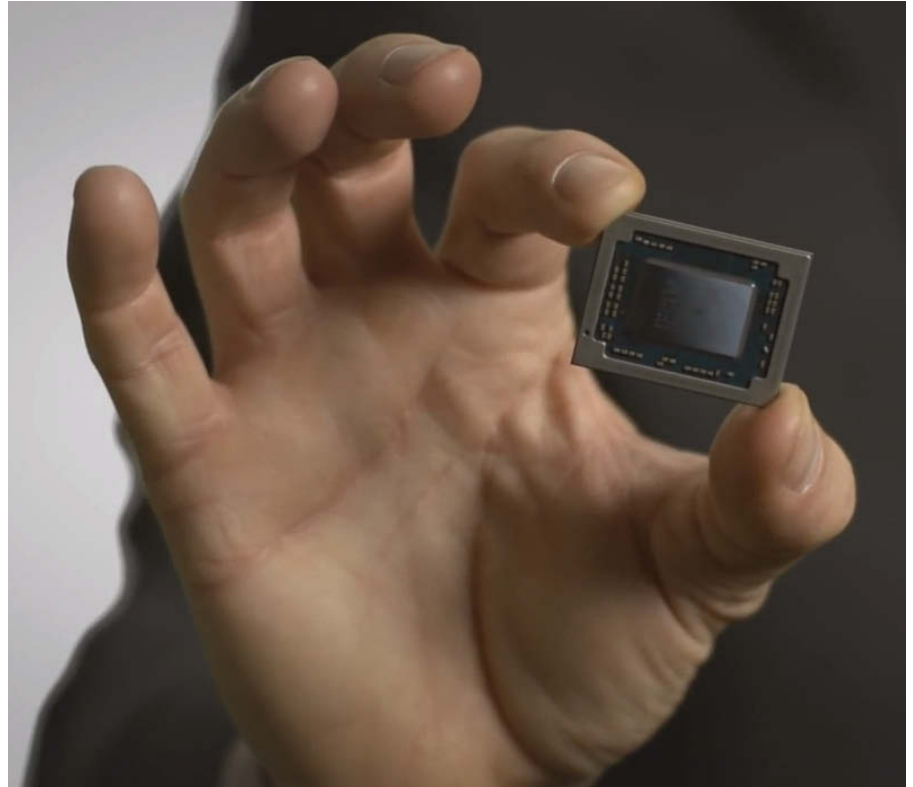
With AMD's processors still stuck on an aging 28nm manufacturing process, it needs some innovation to catch up to Intel - and the company thinks it has the elements to do so with 'Carrizo', a high-end integrated chip that the company will debut in 2015.

AMD has revealed that Carrizo and a derivative, Carrizo-L, will debut sometime in 2015. The company disclosed the new additions at an event in Singapore, adding that it will reveal more details - presumably speeds and price - in the first half of 2015.

Carrizo will be fully HSA 1.0 compliant, which means it will deliver on the Heterogenous Systems Architecture that AMD has talked about for some time. With HSA, the GPU can also be tapped to perform compute functions, which the company claims will deliver far more performance than the speed increases from moving to finer CPU manufacturing technologies alone. Intel, of course, is moving to its second-generation 14nm processor technology with upcoming chips such as the Core M.

In June 2014, AMD launched 'Kaveri', a family of what it called its first enthusiast-class APUs. Kaveri's CPU cores are based on AMD's 'Steamroller' microarchitecture, while its GPU cores use the same architecture as AMD's Hawaii-class discrete graphics processors (dubbed Graphics Core Next). The 'Carrizo' processor will integrate the new x86 CPU core codenamed 'Excavator' with next-generation AMD Radeon graphics, while the Carrizo-L derivative will use the Puma+ core and AMD Radeon R-Series GCN GPUs for mainstream configurations, AMD said.

AMD is trying everything it can to diminish the fundamental advantages Intel's manufacturing technology brings. Its latest efforts include Mantle, a write-



to-the-metal API that allows game makers to eke out performance advantages with AMD-specific instructions. Capcom was the latest developer to use Mantle, and Samsung also said it would take advantage of AMD's FreeSync technology and build a range of 4K monitors using it.

The chip maker also announced that it would commit to slashing the power used by its chips by 25 times by 2020. Earlier this week, Intel reorganised its processor groups by combining its mobile and desktop design teams, signalling a vaguely similar commitment.

"We continue to innovate and build upon our existing IP to deliver great products for our customers," enthused John Byrne, senior vice president and general manager, Computing and Graphics business group, AMD, in a statement.

"AMD's commitment to graphics and computer performance, as expressed by our goal to improve APU energy efficiency 25x by 2020, combines with the latest industry standards and fresh innovation to drive the design of the 2015 AMD Mobile APU family. We are excited about the experiences these new APUs will bring and look forward to sharing more details in the first half of next year," he continued.

So why does this matter so much? AMD needs every edge to get itself back in the race with Intel, and it's been aggressively exploiting what it can. The question is whether the new Excavator cores will offer performance that can compete with what Intel has to offer, as well as a profit margin that will keep it in the game.



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Lenovo's acquisition of Motorola finalised

CHRIS
MARTIN



Purchase of Motorola means that Lenovo is now the third largest smartphone maker in the world

Lenovo recently announced the completion of its purchase of Motorola Mobility from Google. The acquisition of the Motorola brand and its portfolio of innovative smartphones such as Moto X, Moto G and Moto E, as well as the future Motorola product roadmap, positions Lenovo as the world's third largest maker of smartphones. It will operate Motorola as a subsidiary.

Lenovo's chairman and CEO, Yang Yuanqing, was enthusiastic about the deal. "Today, we achieved a historic milestone for Lenovo and for Motorola - and together we are ready to compete, grow and win in the global smartphone market."

Liu Jun, Lenovo executive vice president and president of Lenovo's Mobile Business Group, has been appointed chairman of the Motorola management board. Rick Osterloh, a Motorola veteran, will remain president and chief operating officer of Motorola.

Read our analysis on page 23.



From LEFT TO RIGHT: Liu Jun, Yang Yuanqing and Rick Osterloh celebrate the acquisition

Microsoft halts production of Windows 7 consumer PCs

End of an era as Microsoft stops selling Windows 7 licenses to PC manufacturers

Microsoft has stopped selling Windows 7 licenses to PC makers (OEMs in industry parlance), per Microsoft's lifecycle fact sheet. It's now all about Windows 8.1, at least for the consumer market.

Computers with Windows 7 Professional will continue to be produced for businesses, as well as anyone else willing to pay a premium for the deluxe model of Windows 7. However, OEMs will no longer have access to Windows 7 Home Basic, Home Premium or Ultimate licenses.

Microsoft has not yet set a date for the end of Windows 7 Professional and it's unlikely we'll see any changes in that position before the release of Windows 10. Businesses with managed



IT departments have little interest in Windows 8 and are waiting for Windows 10, Patrick Moorhead, principal analyst at Moor Insights & Strategy, told us.

As for the computers sold on the high street, Moorhead revealed that the OEMs he's spoken to aren't worried about the end of Windows 7. "They are shipping a clear majority of their consumer PCs with Windows 8 already," he said.

OEMs may not be able to get new Windows 7 licenses, but for the time being you'll still be able to buy a PC with the operating system preinstalled. How long that will last depends on how many Windows 7 PCs retailers are willing to keep in stock.

Even if it does get harder to find a Windows 7 computer don't despair. With the holiday season approaching, it's likely retailers and OEMs will have a few deals planned for PCs loaded with Windows 7.

NETFLIX

Netflix arrives on YouView

After a flurry of rumours, Netflix is now accessible from YouView boxes. However, it's just BT and Humax boxes that get the film- and TV streaming service. TalkTalk and Huawei box owners will have to wait until early in 2015.

If you're a TalkTalk customer and would like to get it first, register your interest at talktalk.co.uk/netflix. Netflix offers content including *Breaking Bad*, *Orange is the New Black*, *Marco Polo* and *House of Cards*.

MORE: tinyurl.com/pj7zbg6



Offline viewing comes to Blinkbox

Blinkbox has announced a much wanted download feature for its users of the iPad app. The news means that at long last, users can download movies and TV shows for offline viewing - anywhere and without the need for a data connection. Blinkbox Movies users need only update the app to gain the ability.

Once the app is up to date, users can download any purchased or rented TV shows or films with the arrow icon. However, you still can't make purchases through the app so this must be done online in a web browser.

Blinkbox also confirmed to *PC Advisor* that the download feature will arrive for Android users very soon.

MORE: tinyurl.com/mfgon7r

4G to get faster with Freeview spectrum

Ofcom has started work on making new spectrum available for 4G

Regulator Ofcom has outlined its plans to make Freeview TV spectrum available for 4G mobile broadband. 4G is still a relatively new technology in the mobile world, but with millions of people already using it, the existing infrastructure faces congestion. The move to use the 700MHz spectrum for 4G instead of TV will make mobile broadband better in terms of performance and cheaper in cost.

Ofcom said it believes the benefits will substantially outweigh the costs. Although it won't happen for a long time, few existing 4G-enabled smartphones and tablets support the 700MHz band. "Enabling the 700MHz band to be used for mobile data will allow mobile networks to provide better performance at a lower cost, which will bring considerable benefits to citizens and consumers," an Ofcom spokesman explained.

There is, however, a bit of a wait involved as Ofcom plans to make the spectrum available for 4G use by the start of 2022. It will be implemented sooner if possible and work will begin immediately.



Given the timeframe, there is major work to be done and the services which currently use the 700MHz - including digital terrestrial television and wireless communication for theatrical, musical and sporting events - will have to be moved to other frequencies.

Ofcom ensure there will be no compromising the existing benefits and no significant disruption. Experts are likening it to opening an additional lane on busy motorway.

"Viewers will not need to take any action as a result of this change until around 2019. For the vast majority of TV viewers the only impact of this decision will be that they need to retune their televisions," Ofcom's spokesman advised.

Office goes free for iOS and Android

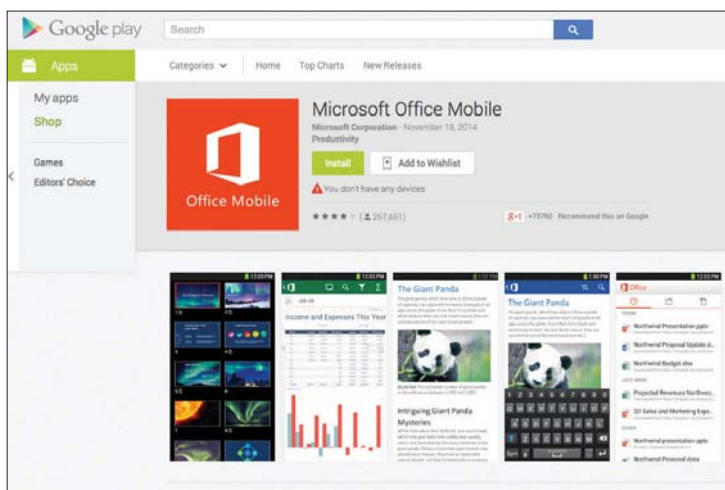
Microsoft makes its productivity suite available for free on mobile

Office is now free to download and use if you have an iPhone, iPad or Android device.

Previously, users required an Office 365 subscription to edit documents and store them in the cloud. Microsoft has also split the suite into separate Word, Excel and PowerPoint apps for iPhone.

"With Office on nearly every device, it's incredibly important to us that customers have a consistent experience and the ability to do more - anywhere and everywhere. So, starting today, people can create and edit Office content on iPhones, iPads, and soon, Android tablets using Office apps without an Office 365 subscription," Microsoft announced.

Office 365 subscribers will continue to get the advantages of extra functionality in the form of advanced editing and collaboration, as well as unlimited OneDrive storage. Describing the decision to give away Office for free, Microsoft's head of Office marketing Michael Atalla said: "It's not a total strategic shift, as much of an extension of the



existing strategy." Moving the user's experience of its free online web apps to mobile.

The move comes alongside the addition of Dropbox integration across Office desktop, mobile, and the web. Microsoft has called it a 'strategic partnership'. "In our mobile-first and cloud-first world, people need easier ways to create, share and collaborate regardless of their device or platform," explained Microsoft CEO, Satya Nadella.

Read our analysis on page 20.

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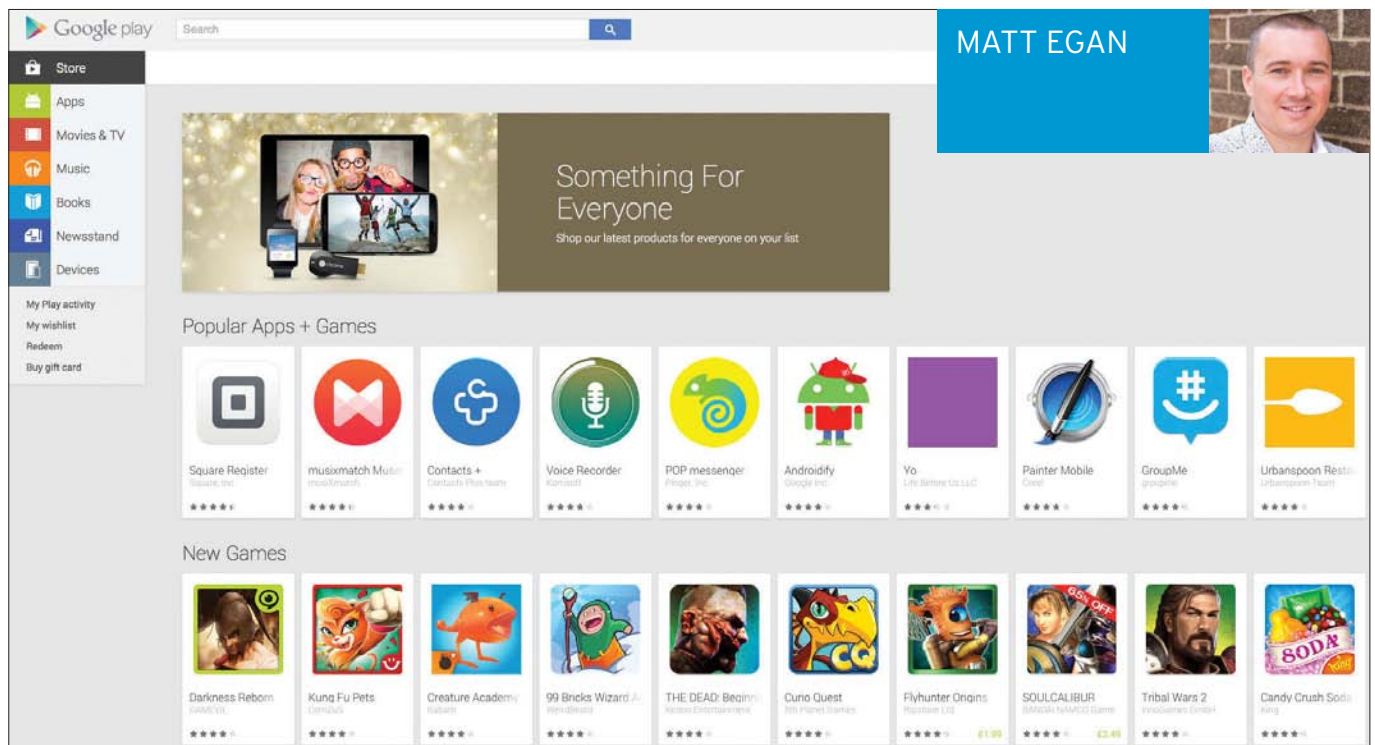
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Apps, Android and the big opportunity for everyone

Apps remain important, and there is an opportunity for everyone in the Android app world

Like many rich-content publishers, *PC Advisor* and our publisher IDG rushed to launch apps when the iPhone kicked off the mobile revolution. Recreating websites was initially popular with both audience and, yes, advertisers. This made sense when the mobile web experience wasn't great, and building a consistent mobile audience was difficult. Readers liked to an app to which they could turn every time they picked up their smartphone, and sponsors liked ownership of that audience.

That initial 'got to have an app' excitement is long gone. There is simply no point in a smartphone app where the web experience is adequate. And the way people, in particular millennials, source information has changed massively. These days we surf the web and social media to discover tidbits of info and interest wherever they lie on the web. Only rarely do we head for a bookmarked site, making the website-replacement app an out-of-date oddity.

I am prepared to pay for an app that tells me how late is my train, and on what platform it will arrive. But I'll use the web to find things to read on the train. Which is not to say that apps are not important. They are.

It's just that to be relevant an app has to offer something more than a recreation of the web experience.

Again this is reflected in my professional experience. We've actually killed off the website-replacement apps for *PC Advisor*, *Macworld UK* and the rest. But we've never had more readers for our bespoke digital magazines, delivered via apps. *iPad & iPhone User*, *Android Advisor*. People are prepared to pay for these titles, because they offer something more than a web-browsing experience. They are a curated experience.

A designed and calibrated product, intended to entertain and inform in a format that suits the device on which they are consumer, rather than an efficient means of satisfying a requirement to know.

The Android opportunity

This is important because there is a big app opportunity opening up, as digital natives grow up and start to spend more. And that opportunity is mainly in the Android world.

Getting together Android and iOS user numbers is always tricky. Putting together as many stats as I can, I'd guess that the current numbers for UK mobile market share

are, basically, Android with 58 percent, iOS 31 percent and Windows Phone 10 percent. (That leaves a single percent for mistakes and oddities.) The details don't really matter – suffice to say that Android is the biggest.

Piecing together data from disparate sources, in the 12 months to June 2014 around \$5bn was spent in the Google Play store. During the same period around \$10bn was spent in the iOS store. Android has more than twice as many users, globally. But more than twice as much is spent on iOS devices.

Traditionally this has been because iPhone- and iPad users have more cash to spend. But this is changing as people who grew up using cheaper Android phones get older and wealthier, as Android users come on stream in the developing world, and as Android phones match and beat the iPhone in terms of quality, value and functionality.

It also used to be said that iOS had a better UI, which made it easier to spend. But that is no longer true. App developers go for the lowest hanging fruit. In the past that has been the iPhone, which made some of these issues self-perpetuating. But as time goes by the opportunity for everyone is changing from the iOS- to the Android world. ☒

CHRIS MARTIN



Don't buy your gadgets at launch

If you're willing to wait a little while, you'll be able to save a few pounds and pick up a bargain

A while ago I explained why you shouldn't get a smartphone on a contract, so this is a sort of part two articles in which I plead with you not to buy gadgets as soon as they are released.

Things move fast in the technology world, especially when it comes to smartphones and tablets which are refreshed with new models/generations as quickly as every six months. The constant race and competition to produce something better is a good thing and creates a lot of hype for the next big thing – particularly flagships handsets such as the next iPhone and Galaxy S.

For most consumers who are into tech, there's a strong desire to have the latest piece of kit as soon as it's available. That's why we provide in-depth details whenever a new device is launched. Whether that desire simply fulfils a warm satisfactory feeling or bragging rights at the pub, it's pretty normal. I love a good bargain and getting the best

value for money possible, so if you're not like me then this column might not persuade you, but there are serious savings to be made if you can have a little patience.

There's a lot of hype around devices when they launch, but with the fast-moving technology world, as soon as they've arrived, we're immediately thinking about what's next. One trend I've noticed is that the price of gadgets, particularly smartphones, drops very quickly after the release date has passed – sometimes within a few weeks, so I'm not talking about waiting until it's an outdated model.

You can pick up some good bundles or freebies if you preorder a device sometimes, but it's rare. If you can hang on a while, you'll get a still very new device at a really good price (rhyme unintended).

For example, the LG G3 (which is still number one in our smartphone chart on page 132) launched at around £500 and

has been dropping in price ever since. It's still a top-notch device and we're still a good few months away from it being replaced by a new model, but you can pick it up for as little as £319.

The Samsung Galaxy S5 is another example – a big name handset that has fallen from £579 to £399 since its launch.

Exceptions to the rule

I've noticed this trend in smartphones and tablets mainly, and it's worth it for other tech products too, though, there are exceptions.

Apple products do not drop in price until a new model is released, so you're not going to save any dosh by holding onto your existing device for a little longer. However, if you do buy on launch day at a physical store you've got to brave one of the infamous queues.

Others that will hold price include Google's Nexus devices, at least, if you buy them from the Play Store. 

ASHLEIGH
ALLSOPP
(MACWORLD UK)



Apple's 2014: a reflection

A look back over the year to see how the tech giant fared

As we rapidly approach the end of 2014, it's only natural that we begin to reminisce about the year behind us before looking ahead to 2015. I've been taking a look back at some of the Apple-related columns I've written this year, to see whether Apple met expectations and to discover how my opinion about the company has changed.

Keynote sorrow follows keynote joy

In June, I wrote about the WWDC 2014 keynote, which I absolutely loved, not least because 2014 has been a fantastic year for Apple's software with iOS 8 and OS X Yosemite opening up their doors to developers. But the keynote was also funny, and it was the first time I'd really seen Apple's executives oozing confidence and excitement since we lost the legendary Steve Jobs. I wrote that I was already eagerly awaiting Apple's next keynote, dad jokes included, and I genuinely felt like my faith in the company had been restored after a slow and rocky few years.

Apple's September keynote, where it unveiled the iPhone 6 and iPhone 6 Plus, as well as the Apple Watch, didn't stand out as a funny or entertaining one – Apple let the products take centre stage and, while I thought it was a wise move because the products were pretty darn awesome, a part of me missed the jokes.

I also felt that Apple was losing that confidence I'd seen before, particularly when CEO Tim Cook conducted two interviews directly after the event that felt like the company's way of justifying some of its actions to the doubters.

Then came Apple's October special event, during which it unveiled the iPad Air 2, iPad mini 3, Mac mini and the Retina 5K iMac. I'm sad to say that it bored me so much I almost nodded off during the first half an hour. The dad jokes came back in full force, but they were overdone, far too long and not actually relevant. It was among the most cringe-worthy things I've ever witnessed.

What happened Apple, what happened?

iPhone 6

In July, after suggesting that Apple needs to pick up the pace of innovation, I wrote about what I thought Apple should do to help the iPhone 6 leapfrog its rivals.

I reiterated my point from my column in March that Apple needed to give the iPhone a bigger screen, and it did, of course. (In fact, I think it took things a bit too far with the iPhone 6 Plus' 5.5in display).

I also said Apple needs to give the iPhone a better display, which it did, kind of (Retina HD on the iPhone 6 is a bit of a strange term if you ask me, but I'll accept it for the 401ppi iPhone 6 Plus). But it's not the 534ppi Quad HD screen I was hoping for – Apple's still

behind its rivals there then. The iPhone 6 also got a better camera – at least a bit. It's still 8Mp with 1.5 micron pixels, but it has improvements when it comes to focusing and image stabilisation.

However, I also said that Apple needed to add a microSD slot to the iPhone 6 (I knew it wouldn't but I still think it should), as well as front-facing speakers and a knock-out feature that we didn't see coming. Nope, none of those. The iPhone 6 and 6 Plus are really, really good smartphones, but they don't match the competition when it comes to specs and features, and they certainly don't leapfrog them.

At the beginning of the year, particularly after WWDC 2014, I thought 2014 was going to be Apple's year. And while I think some of the products it has launched are fantastic, particularly the iPhone 6, the 5K iMac and (finally) an update to the Mac mini, I fear that Apple missed the boat with the Apple Watch. Plus, despite my love of the iPhone 6, I still feel like Apple is slipping behind in the smartphone race.

So, here's what I'm hoping for from Apple in 2015: a successful launch of the Apple Watch that doesn't leave us all waiting until the middle of the year; an update to the Apple TV (come on Apple); a new smartphone that isn't an iPhone 6s and a new iPad that'll shake up the market (iPad Pro, perhaps?). ☒

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The handbag theory

Why the iPhone 6 Plus hasn't got a size problem

I got in trouble with a colleague recently after making what I thought was an innocuous remark on the subject of iPhone sizes. The iPhone 6 Plus was so big, I thought, that it must be aimed at women. Because they've got handbags.

Perhaps - as another colleague used to say whenever a joke was met with stunned silence - that isn't a fashionable point of view; and you're always on thin ice when drawing generalisations about half of the world's population. But Apple's massive new smartphones signal a switch in strategy so radical that I can't help coming up with theories, and asking questions.

Why does five-and-a-half inches make sense now, when four was the ideal for so long? (Behave.) What made Apple suddenly decide to ditch the habits of seven gloriously successful iPhone generations and balloon upwards into the world of phablets? Will Apple keep making 4in handsets? Have the company's fans evolved into slab-handed troglodytes in the space of a year?

The thing about smartphones, more than any of the computing devices that came before them, is that they are inextricably linked to your person. (The coming wearables revolution, of course, will take things further in that direction.) Your smartphone holds an intimate place in your life, which is why relatively minor malfunctions, glitches and slowdowns can be so profoundly upsetting.

And because it spends so much of the day in your hand, a smartphone's physical dimensions are vastly important. Changing a smartphone's dimensions is like resizing your wedding ring. Millimetres matter.

Which makes me curious about Apple's latest bet-the-company moment, its decision to go big or go home (or, to put it another way, its concession to user demand and Android pressure): the long-predicted but somehow still surprising launch of the big iPhone 6 and the bigger iPhone 6 Plus. Surely Apple realises that anyone who is used to an iPhone 4- or 5-series iPhone is going to find these devices grossly oversized and murderously unfamiliar? Indeed, after spending a little time with the 6 Plus and a lot of time with the 6, I'll come out and say it: I greatly prefer the 5s.

Well, there are some issues to overcome. But I think Apple's strategy with the iPhone 6 series makes sense, when you consider the segments of its target audience.

For a start, you've got the hardcore: the Apple devotees who upgrade each portable device on a yearly basis, and who will give the new iPhones a try based on loyalty alone. They're safe; and while some will never grow to love the larger form factor, many will spend enough time with the devices to recalibrate their expectations. The hardest part about switching to a drastically different device is the early days, and loyalty will get many of this group through that period.

DAVID PRICE
(MACWORLD UK)



In any case, those hardcore users who do switch back to a smaller model are unlikely to go for Android or Windows, because the iPhone 6 series handsets are still well-made products - the concern is with the size of the phones, not their quality.

Then you've got the people who upgraded last year, and have iPhone 5s or 5c handsets, but in general upgrade less regularly. I wouldn't expect them to upgrade this year, but I wouldn't have expected them to do that anyway. The standard for a lot of users is a biennial upgrade, and some even upgrade every three years. Apple will work to get them next year - and I expect it to do this with a new range of 4in devices.

Because this could be Apple's thinking from now on. If the company gets into a cycle of upgrading its large phones every other year and the 4in phones in between, it'll start to sync with users' upgrade cycles. In the case of slower upgraders, it could even speed them up a little.

And then you've got the lost souls: the people who abandoned the iOS ecosystem some years ago, or never tried it at all. This is a big market: Android users often boast of the size of the platform's user base, all of them potential Apple customers. By offering something different, something that Android users often talk about as one of the advantages of their platform, Apple is giving itself the best possible chance of making the case for switching.

(And by targeting them with its latest and costliest products, by the way, it's ensuring that any customers it does skim off will be from the premium end of the Android market: the ones who are more likely to spend money on apps and future upgrades. They're the customers that Apple wants.)

For these users, needless to say, Apple doesn't need to worry about unfamiliarity. They aren't used to iPhones of a particular size, because they're not used to iPhones at all. And some will be familiar with larger phones anyway.

I could be wrong in all this, of course. Maybe Apple's days of 4in phones are behind it - although I think that would be a mistake. And maybe it really did expect iPhone 5s owners to leap at the chance to switch to a 5.5in phablet. But my theory is that Tim Cook planned this year's iPhone refresh with a different market in mind. And that the reason so many of us don't love the latest products the way we expected to is because, well, they're aimed at someone else. ☒



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The folly of Apple's 16GB devices

By keeping 16GB iPhones and iPads, Apple is handicapping what could be the majority of iOS devices

Recently, I was installing iOS 8 for my dad via iTunes on his Mac. He, like many others, hadn't installed the iOS update - in his case because he didn't want to delete 5.6GB of content from his 16GB iPad. I knew that the solution was to install via iTunes as that's exactly what I'd had to do for my 16GB iPhone.

I've written in the past about how 16GB, though limited, is still workable thanks to iCloud storage and the fact that you don't have to carry everything on your phone all the time; I've also written about how to pare down what you have on your phone so you can manage with that restricted capacity.

But there is a major problem with 16GB, and it became apparent when iOS 8 launched: if you want to install it, you need more disk space available than anyone would logically have spare if they have a 16GB device. And don't even get me started on the situation facing people with 8GB iPhones.

I believe this space requirement is the reason why uptake has been slower for iOS 8 this time round. That plus the fact that many have never even plugged their iPad or iPhone into their Mac or PC because, in the past, Apple has made it so easy to update over the air - they don't realise there's another way.

Even if you have a 16GB iPhone you won't have 16GB available for all your music, photos and apps. The practical free storage capacity is less than the advertised figure. A 16GB iPhone or iPad, for example, gives you around 12.2GB of free space to play with. That's equivalent to around 3,000 songs, 15 hours of video, eight Hollywood movies or 400 apps/games - or some combination of all those. Realistically, you will have to delete something like half your content in order to make space for that iOS 8 download.

If Apple is going to continue to launch software that needs 5.8GB spare capacity to allow for its installation, then the company needs to make 32GB the entry-level iPhone and iPad. We asked Apple why it had removed the 32GB from the line-up for the new iPhone and iPad models and were told that 16GB was the most popular size. But people are not opting for 16GB of storage - they're opting for the price tag.

People will always flock to the cheapest option. But it isn't just those who are strapped for cash who end up with 16GB iPhones and iPads. The 16GB is the phone that business users are lumbered with because when their company gets them an iPhone it buys the cheapest option on offer.

If you are buying phones for a large number of staff, it undoubtedly makes sense to save £100 per handset - a saving of £1,000 for 10 people. That's all very well until IT has to cope with installation problems. And then what happens next time? Expect companies to switch to cheaper Android phones with removable storage.

Apple has made a mistake in preserving the 16GB version - and even more of a mistake with the 8GB iPhone 5c. In its greed to get people to spend a bit more for the midrange version, Apple has handicapped what it says is the most popular price point. I can understand why (to encourage people to pay a little more to get a whole lot more storage), and I can see that Apple justifies it by saying people now get more storage for less than before (64GB where once they would have got 32GB). But the iOS 8 update shows that 16GB is not enough. Apple needs to discontinue its 16GB iPad and iPhone models. ☒

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How Apple could exploit a forever-free iCloud

While Google and Microsoft are using large amounts of free cloud storage to sell inexpensive laptops, Apple has stood above the fray. But there's no reason why it can't join in. [Gregg Keizer](#) explains

Google recently announced that all Chromebooks purchased before the end of 2014 would be eligible for a free 1TB allowance to Google Drive for two years. Although the search giant described the promotion as "a bonus for the holiday season," the deal didn't originate with a Scrooge-style epiphany but from a business sensibility. Several Microsoft computer-making partners, notably HP, have taken to bundling free cloud storage.

HP includes either OneDrive storage space or both that and a free subscription to Office 365 Personal with its low-end Stream line of laptops. The Stream Notebook 11, for example, includes a one-year 1TB OneDrive

as well as a one-year subscription to Office 365 Personal, a single-machine license to the suite. The Stream Notebook 14, meanwhile, comes with a two-year 100GB OneDrive offer.

Ultra-cheap Windows-based notebooks have taken a bite out of Chromebooks' share of the low-end market, according to Stephen Baker of the NPD Group. Citing statistics from NPD's retail data, he revealed that Chromebooks' share of US entry-level retail sales had dropped to under 20 percent in 2014 from the high 20s in 2013, as similarly-priced Windows laptops have gained momentum. This is largely because Microsoft is now subsidising the operating system, reducing OEMs' cost for Windows to zero

or near zero. To stay competitive, Google temporarily upped the usual 100GB Google Drive offer to 1TB.

Apple, however, has not played the cloud storage card, and there are good technical reasons why it hasn't. First, unlike Chromebooks, HP's Stream line and other minimalist laptops, Apple's MacBook Air and MacBook Pro laptops come with relatively spacious on-device storage. While the typical Chromebook or HP Stream packs just 32GB of flash-based local storage - necessitating Google Drive or OneDrive - even the entry-level Air and Pro come with 128GB, or four times as much.

Currently, Apple gives customers a measly 5GB of free iCloud storage, used not only by Macs but also by iPhones and iPads, then charges for more than that. Even with price cuts this year, Apple's costs are out of line with the market, and its free allowance is a third of Google's and Microsoft's.

The free Google Drive and OneDrive offers, and also the latter's unlimited space (via an Office 365 Personal subscription) only exacerbate the disparity.

There's nothing preventing Apple from giving away iCloud storage space: the company has more money in its coffers than





it knows what to do with. If it wanted to, Apple could join the promotional space race to sell more Macs, which are on the rise, and iPads, which are not. But there's another reason why it would be a smart move.

Just as it did in 2013 when it gave away OS X upgrades and the iWork productivity suite, Apple could bundle a significant chunk of iCloud storage space with new hardware purchases to keep existing customers in its fold even as it encourages them to upgrade their hardware with new notebooks or tablets.

That may be part of Google's and Microsoft's strategy as well - Microsoft's especially - although their bundles smack more of old-fashioned market share skirmishing, each hoping to outdo the other in the entry-level space.

Because of its personal computer pricing, Apple competes with no-one other than itself. As Baker said two weeks ago, the race to the bottom by Google with Chromebooks and Microsoft with cheap Windows knock-offs has "decimated" the over-\$300 Windows notebook segment in the US, with sales down 10 percent in the last weeks of October 2014 compared to the same period in 2013.

The inclusion of, say, 100GB or 200GB of free iCloud storage, would not in itself tip more than a handful of potential buyers from a much-less-expensive Chrome operating system or Windows personal computer to a line that starts at £749 and climbs to double that and more. It might, however, be enough to nudge the already-in-Apple pool to buy a new Mac or iPad sooner than they might otherwise.

That's because consumers who already own an Apple device, whether iOS or OS X, are by committed, even if only tenuously, to iCloud. If Apple used the same mechanism for an iCloud enhancement as it used for iWork, the boosted allowance would be available to all the buyer's iOS and OS X devices.

(In 2013, Apple gave away the iWork iOS apps to any customer who bought a new iPhone or iPad after 9 September; the Mac versions of the same applications were included free with any Mac bought after 21 October. In both instances, the apps were tied to a customer's Apple ID, letting them download the free-of-charge apps to any other iOS or OS X device associated with the same credentials.)

Add the offer to new iPad purchases - perhaps limiting it to only the larger-sized iPad Air 2 - and Apple would give people who already own a Mac or iPhone or even an earlier tablet another reason to buy, juicing sales of the now-declining iPad.

The disparity between the pricing of the least-expensive iPad Air 2 and the least-expensive MacBook Air or MacBook Pro might require a two-tier iCloud offer: 100GB for a new tablet, 200GB for a new notebook. That, in turn, could be spun to advantage by making the deals additive. Buy a new MacBook Air, get 200GB; buy a new iPad Air 2, get 100GB more, for a total of 300GB.

Halo effect

It would also amplify the 'halo' effect on the iPhone, easily Apple's most-owned device in its current triad of iPhone/iPad/Mac. Boosting iCloud storage space - invaluable for storing the photographs that make up the largest portion of the content iPhone owners generate - could be another way to entice iPhone owners, most of whom do not own a Mac or iPad, to add to their Apple-made device inventory, just as Apple hopes its iOS-OS X Continuity feature set will do.

Such a plan might not only encourage multiple purchases, albeit over time, but would also differentiate Apple's cloud storage deal from the get-a-terabyte-right-off-the-bat of its rivals by reminding customers that few need that much storage now but many will down the road. Purchase

enough Apple hardware and you'll get to that terabyte about the time you really require it.

Unlike the Google and Microsoft offers, which expire after two years - at which point the stuff stored in the cloud still remains accessible - Apple could give away iCloud storage in perpetuity, just as it has iWork. That would be simpler to manage, since the company would not have to track expirations and then try and convince customers to pay. And the forever-free angle would both separate iCloud from other consumer-oriented storage services and mesh with an Apple already-stated strategy.

"Free is good," said Apple executive Craig Federighi in 2013 when trumpeting the free upgrade to OS X Mavericks.

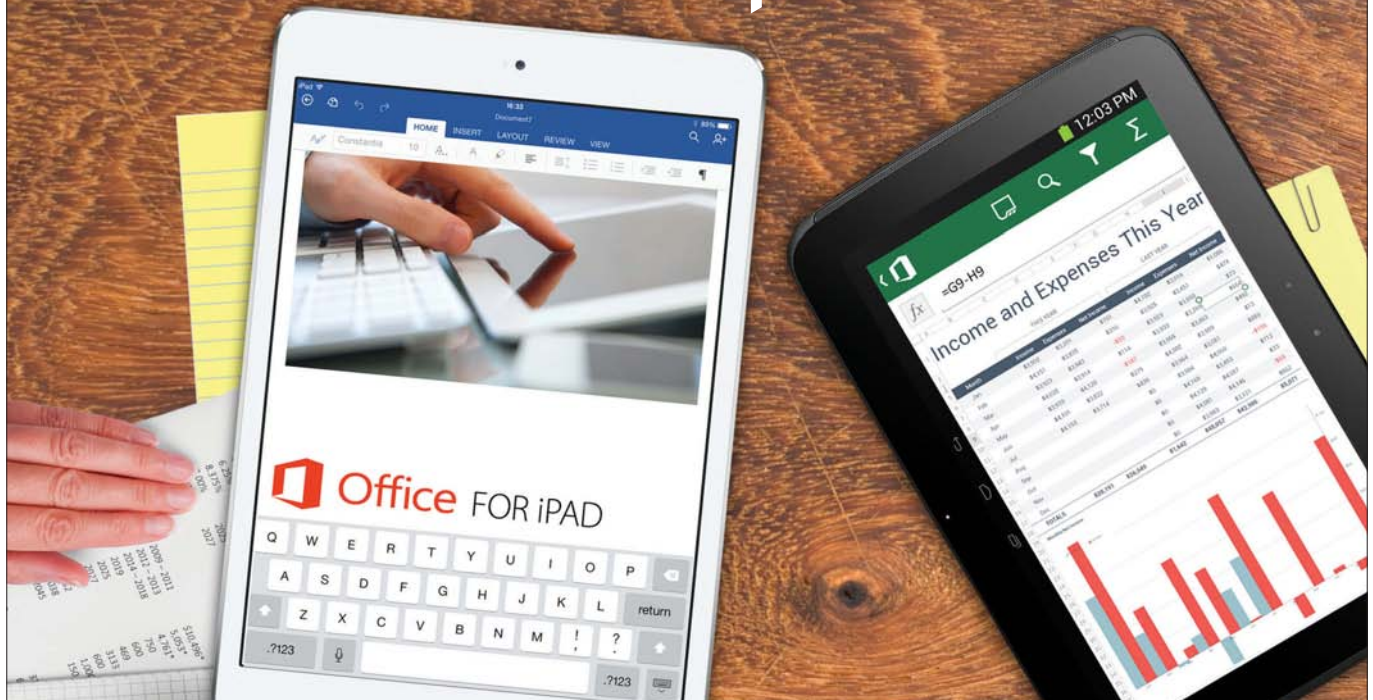
Google has claimed that its 1TB storage offer is worth "almost \$240," a phrase that found its way into most reports of the deal. Apple would never say that, although others might make the calculations for them (by the way, 200GB of iCloud storage now costs £2.99 per month). While giving away stuff to sell stuff is a linchpin of Apple's long-time strategy - think Apple Genius support, think its history of bundling first-party apps with its operating systems - it doesn't tend to put a dollar value on what it bundles.

Instead, Apple likes to present its giveaways differently, not as giveaways per se, certainly not as reactive moves required by market exigencies, but as a customer benefit because they add to the overall value of its ecosystem.

"We think that iWork is a really key advantage for our customers' productivity," CEO Tim Cook said in 2013 as he explained why Apple did the free apps-for-iOS deal. "We think that all iOS devices are made even better if they have these apps. And almost all of customers want these apps."

Substitute 'free iCloud' for 'iWork' and 'these apps' in Cook's comments, and there's the rationale for an iCloud-for-life freebie. 

Why free Office for iPad makes Windows PC more important



Office is now free for all iOS and Android users. [Matt Egan](#) explains why this move makes sense

The Office suite of productivity apps has long been a cash cow for Microsoft. As the gold-standard for software that helps you to get things done, Office is used in a huge number of businesses- and educational establishments. And it's not cheap software. Whether you buy an Office 365 subscription or buy the licence outright Office is an investment businesses feel is worth making. Furthermore, it isn't just a Windows product. Office for Mac is one of Microsoft's biggest earners and - until recently - you could buy Office for iPad, iPhone and Android phone and tablet.

While anyone could download and install the apps, you could only create new documents if you had a paid subscription to Office. Not now. Microsoft has made Office free for iOS and Android (read our news story on page 8). This means you can install and use Office on your iPhone, iPad or Android phone and tablet. And you can use it to create, open and edit Office documents, so why has Microsoft done this?

The idea of getting an expensive product such as Office for free is an exciting one, but it isn't that big a decision for Microsoft. The truth is that the mobile and tablet

versions of Office aren't worth a great deal. Microsoft generates only 13 percent of its Office revenues from consumers. Just the tiniest fraction of that revenue comes from iPad, iPhone and Android apps. And that's revenue it has to share with Apple and Google, remember.

Of course app-using tablets and smartphones are relatively new, when compared with Microsoft's core Office business. So you could argue that this is a potential growth market. But I would posit that it is very unlikely that many people use iPads as their principal computer. More likely people have access to a PC- or laptop (or Mac) and do most of their productivity work on that. Being able to open- and edit documents on a touchscreen device is a nice extra, but it doesn't replace the need for a proper computer. There may be some maniacs who run their business lives exclusively from an iPad, but that group of users is the sum total of customers Microsoft is about to lose. I'm sure it can afford it.

Microsoft is more than willing to pay that price. And that is because giving away for free Office will hurt Google Docs and other free third-party office suites

that proliferate in the mobile and tablet space. It will also shore up support for Microsoft's core Office userbase.

The BYOD phenomenon means that most businesses, schools and colleges are stuffed full of people who use Office in their professional lives, and smartphones and tablets at leisure. These worlds collide and people are used to opening and tweaking documents on their personal mobile devices. Being able to do so - for free - using a native Office app is another reason for business users to stay with Office from Microsoft.

Being able to use Office on such devices means the suite remains the go-to tool (rather than Google), and iPads, Androids and the rest are now additional kit. Microsoft is betting that - in a weird way - making Office a free tool for touchscreen devices makes it more useful as a full-blown product for PC and laptop. And that in turn shores up the idea of the Windows PC as the hub of the working world.

At the very least, it makes Office seem a more compelling choice in the face of increased opposition from Google and the rest. And that makes giving up a tiny amount of revenue a smart choice. ☒

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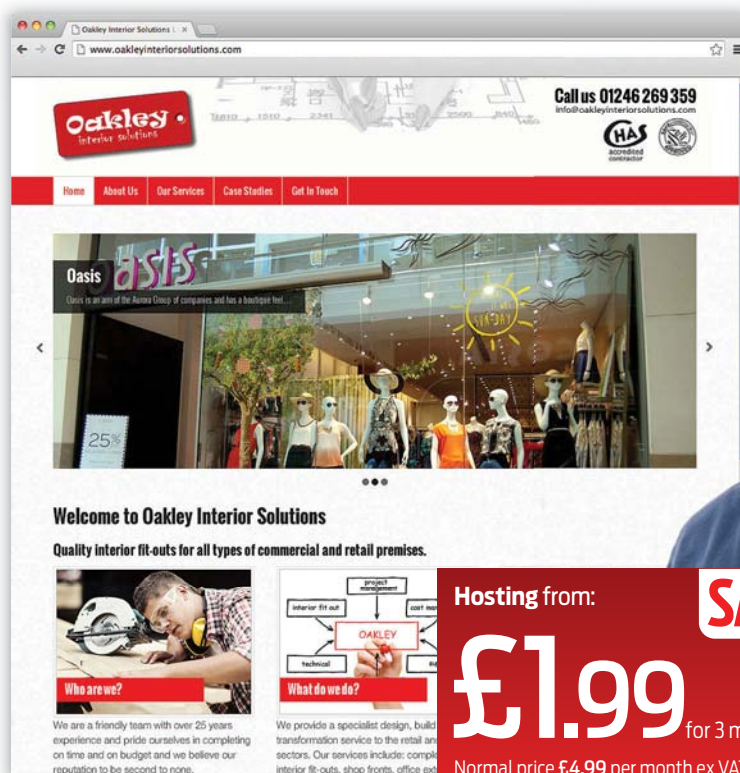
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Chipmakers give IoT a push with power-efficient components

A new generation of components promises to improve battery life, reports Mikael Ricknås

Low battery consumption will be a key to success for Internet of Things (IoT) products, and chipmakers are working on more frugal processors and microcontrollers to make that happen.

Improved energy efficiency was a common theme at the recent Electronica conference in Munich, where next-generation IoT chipsets were plentiful. Energy efficiency "is very important indeed, because in many cases you are talking about devices that run on batteries and the battery life has an effect on how affordable and practical it will be to deploy them," explained Matt Hatton, director at Machina Research.

Atmel was at the conference to launch its SAM L21 microcontroller family, which the company claims consumes one-third the power of comparable products in the market today. Limited numbers of the product will be available from February 2015, for use in consumer, industrial and portable medical products.

Toshiba, meanwhile, is going after smartwatches, bracelets, glasses and rings, as well as activity monitors with its TZ1021MBG processor. The chip has been designed so devices can be as small, lightweight and power-efficient as possible. The Japanese giant did not, however,

reveal how much power it will consume. Mass production is expected to begin in the first quarter of 2015.

Most existing wearables suffer from bad battery life, so any improvement in that regard would be a step in the right direction.

The Atmel and Toshiba products both use technology from ARM, highlighting how the UK-based company has managed to build on its smartphone success and establish a beachhead in the market for IoT devices.

IoT represents a potentially huge market. According to market research company Gartner, there will be 4.9 billion 'things', such as appliances and sensors, connected to the internet in 2015.

For chip manufacturers, getting into the market isn't just about product development. Making it easy for developers of applications and hardware to use their products is equally important. Just as apps have played a huge role in the popularity of smartphones, they are needed for the IoT market to take off.

For example, semiconductor maker Freescale has started a beta program to help jump-start the development of IoT products. It will offer developers Thread software and a beta development kit. Thread is an IP-based mesh networking protocol used for connecting devices in the home. According to

Freescale, early adopters can start product planning and development now, and begin delivering products later in 2015.

Competing vendor Renesas Electronics has developed a processor board based on ARM's recently-launched mbed IoT device platform, which aims to speed up the development of embedded systems.

Chip manufacturers are working to expand partnership programs in an effort to build an ecosystem around their components. Broadcom recently said it had signed up more than 40 new companies, including module manufacturers, independent design houses and original device manufacturers, to its program.

The increasing availability of customised chipsets is a sign that the much-hyped IoT sector is becoming more mature. But the launch of apps with IoT connectivity is also important for the development of the market. For example, SAP this week launched three products for maintenance, logistics and manufacturing.

"Verticalisation is something that's applicable across the board," Hatton said. "Lots of companies are looking at how to make IoT more appropriate for smaller organisations with particular needs, rather than thinking about generic offerings." ☒

What you should know about Lenovo's Motorola acquisition



Lenovo has bought Motorola but, [Agam Shah](#) says, no products are being discontinued and the phone maker's Android strategy remains intact

China's Lenovo finally has the global smartphone presence it wants, after it finalised the purchase of Motorola Mobility from Google for \$2.91 billion (see our news story on page 7).

Motorola's offerings in mature markets will complement the Chinese company's growing smartphone presence in developing countries. Lenovo hopes to unseat the likes of Apple and Samsung, and has an ambitious goal of shipping 100 million devices, including PCs, tablets and smartphones, by the end of March 2015. Lenovo and its Motorola subsidiary will continue to distinguish their individual brands – the former will target its products at emerging markets and Motorola at mature ones. Both brands are available in some countries, such as India, and there are no plans to change that.

Indeed, retaining brands is important to expand market presence until a long-term product strategy is devised, explained Liu Jun, president of Lenovo's Mobile Business Group. That could disappoint customers waiting for Lenovo brands such as Vibe to reach the US. But availability and support of Lenovo and Motorola products will be easier with the merger of its distribution channels.

Motorola's Android strategy won't change

Motorola's Moto X, G and E smartphones are attractive because of their prices and the bloatware-free versions of Android that receive quick OS upgrades. Stock versions of Android were available thanks to Motorola being a part of Google and that won't change with Lenovo.

"By going with stock Android, we're giving customers the ability to choose," said Rick Osterloh, president of Motorola Mobility. "It's closely tied to the Motorola identity."

That's also good news for existing Moto smartphone owners and Motorola has said it would upgrade its newer smartphones to Android 5.0, codenamed Lollipop, by the start of 2015. Google's Nexus 6, built by Motorola, is also built on stock Android. The recent Droid Turbo has some bloatware, but uses a stock Android base.

Motorola's research and development resources will merge with Lenovo's, which could result in more feature-rich handsets under multiple brands. The smartphone maker added 21Mp cameras to its recent Nexus 6 and Droid Turbo smartphones, so it's possible Lenovo may put those features in its high-end Vibe smartphones. Motorola has also developed algorithms to adjust smartphone behaviour based on background sounds, locations and user behaviour, which Lenovo could bring to its smartphones.

Product security

The US government views some Chinese companies as security threats, but Lenovo has assured Motorola customers that user data will remain secure. The tech giant went through a stringent regulatory approval process in many countries before



the acquisition was approved. Moreover, the company is transparent in its business activities, and has a solid track record of selling tablets and PCs worldwide, Lenovo executives said.

While Motorola's acquisition will help expand Lenovo's global smartphone presence, it doesn't seem to immediately benefit the PC and tablet lines. Lenovo has done little to bring its smartphones closer to its popular tablets and PCs, and having a Motorola smartphone and ThinkPad PC will still feel like owning products from two different companies. Unlike Apple, Lenovo does not have app stores or a cohesive set of services customised for its mobile devices and PCs. Lenovo's focus remains on hardware, as opposed to software and services, and that won't change in the short-term. 

How Samsung, BlackBerry and Apple are fighting to win enterprise users



Tech giants battle it out in the fight to win enterprise users. **Mikael Ricknäs** reveals all

Samsung's deal with BlackBerry and Apple's efforts to make it easier to configure and deploy massive numbers of iPhones highlight how the smartphone makers are battling for supremacy among enterprise users.

As the smartphone market becomes saturated in the US and Europe, enterprise users will be big winners. To continue to grow, manufacturers are courting CIOs more aggressively by making products more secure and easier to manage.

"The big benefit we are seeing is that costs are coming down for managing these devices," explained Leif-Olof Wallin, research vice president at Gartner.

Samsung has been trying to replicate its consumer success in the enterprise arena, but has so far struggled to make much headway. The company is hoping to change that by joining forces with BlackBerry to integrate BES (BlackBerry Enterprise Server) 12 with Galaxy smartphones and tablets. The devices will still be protected using Samsung's Knox technology, but BlackBerry will add its network infrastructure and management capabilities, the company revealed in a recent announcement.

On paper, the deal plays to their respective strengths; Samsung is better at developing smartphones people want to buy,

while BlackBerry is still the gold standard for mobile security and management. But they still have to prove the integrated solution is as secure BlackBerry's existing products.

"Just because you take something that's proven and certified doesn't mean the new platform is as secure," Wallin said.

It's important for both companies for the partnership to succeed. For BlackBerry, the deal comes just over a year after John Chen took over as CEO, with the goal of saving the struggling vendor by turning it into a more software-centric company with products for Android and iOS, as well as its own OSes.

Samsung, on the other hand, needs enterprise revenue to help make up for less-than-stellar smartphone sales. During the third quarter, Samsung smartphone market share dropped by over 10 percentage points year-over-year.

BES12 is expected to start shipping on Samsung's Galaxy devices early in 2015. As part of the partnership, Samsung will resell BES12 to joint customers and BlackBerry will offer Knox support as part of the Gold category of BES12 subscriptions. Pricing will be announced upon availability, according to BlackBerry.

But even if the partnership looks like a step in the right direction, success is far from certain as Apple continues to accelerate to

compete in the enterprise market on multiple fronts. The company's partnership with IBM is a statement of intent, showing that it is going after enterprises more actively.

This week, Apple expanded its DEP (Device Enrollment Program) to 25 other countries and regions, as well as to authorised resellers and carriers. Previously it has been available only in the US, which has been joined by the UK, Australia, Canada, France, Germany and Japan.

The programme eases the initial setup of iPhones, iPads and Macs by automating mobile device management enrolment, letting the IT department configure the devices without touching them. To further simplify the process, some Setup Assistant screens can be skipped so employees can start using their devices right out of the box, Apple explained.

For Apple, the increased number of countries is a step in the right direction, but DEP needs to be expanded further to let enterprises buy compatible devices from more sources than just Apple, authorised resellers or carriers, according to Wallin.

The growing competition for enterprise dollars isn't likely to cool off anytime soon, as Apple gets ready to deliver the first apps as a result of its partnership with IBM, and Samsung and BlackBerry get to work. [\[X\]](#)

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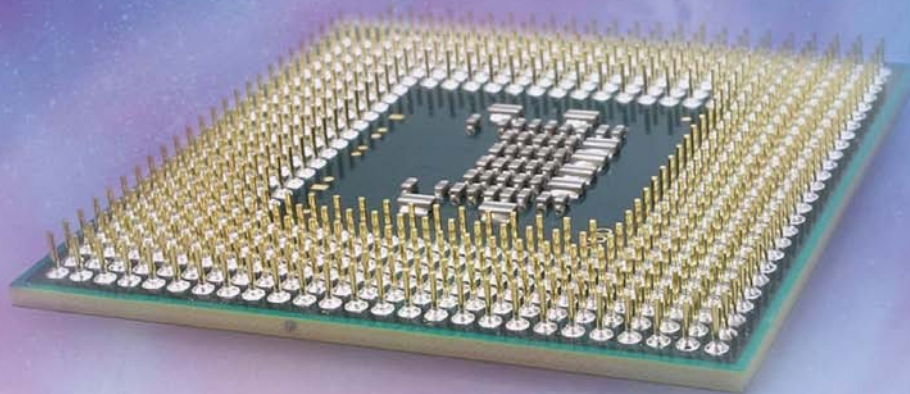


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The Network Innovation

As Moore's Law approaches 50, Intel battling to keep up



Intel is facing challenges keeping up with Moore's Law, writes [Agam Shah](#)

With advances in chip technology, it's becoming increasingly difficult for Intel to keep up with Moore's Law, but the company's CEO says that remains the key baseline when it comes to adding performance and functionality to its processors. "Our job at Intel is to make sure it lives on as long as possible," Brian Krzanich explained during a keynote at the Intel investor meeting in Santa Clara, California, recently.

Next year marks the fiftieth anniversary of Moore's Law, and the chipmaker is planning to mark the event. The law is based on an observation by Gordon Moore, who cofounded Intel in 1968, that the number of transistors that can be placed on silicon will double every two years, making it possible to improve chip performance and add new functionality. The company has used Moore's Law, which was offered in a 1965 paper, as a baseline to pack more transistors on to processors, and reduce their size and cost.

But with chips shrinking to the atomic level, engineers and scientists have declared that Moore's Law has reached its final stages. Intel at the investor conference said it has packed more performance and power savings into its latest chips, while achieving cost savings in line with Moore's Law, though production and design issues caused it to veer off the path.

The company usually releases new chips every year and implements new

manufacturing processes every two years. But the company has had trouble making chips using the 14nm process, which is the most advanced in the industry. It took Intel two-and-a-half years to get the full benefits of the 14nm process.

The first chips based on this process shipped in 2014, but yields are just starting to reach Intel's projected expectations, compared to the previous 22nm process, said Bill Holt, executive vice president and general manager of Intel's Technology and Manufacturing Group.

Production of the first 14nm chips codenamed Broadwell is in a "healthy range," though hasn't yet recovered after initial lapses, Holt explained, adding that yields will reach 22nm levels in early 2015.

"Our 22nm technology is the highest yielding technology we've ever had. The bar that we're trying to catch up to there is very high," he revealed. "That's essential, because if you're going to get cost reduction [you] have to match those other parameters of your previous generation."

But yields are still not normal for Intel, which is known for its timely execution. Problems with Broadwell production have led to delays in the release of laptops and tablets. The first Broadwell-based tablets and hybrids have just started appearing and will used in mainstream laptops early 2015.

Intel is also trying to move on from its initial struggles with 14nm and is looking

forward. The company brushed Broadwell aside at the recent Intel Developer Forum and promoted its next-generation architecture called Skylake, which will also be made using the 14nm process, with features for wire-free computing and better graphics.

Market needs have defined Intel's manufacturing priorities. With the PC market weakening, the chipmaker is churning out more mobile processors in which power consumption remains a priority over performance. That has changed the way Intel has built processors, with the company adopting a system-on-chip approach where a number of processing and wireless modules are integrated in one chipset.

Krzanich said Intel still wants cutting-edge transistors, but depending on priorities, Moore's Law could be achieved using multiple paths. Balance needs to be found in cost, performance and power consumption.

The company is approaching Moore's Law from the economics related to cost-per-transistor, which would come down with scaling. With the 22nm process, Intel adopted a new chip design in which it started stacking transistors on top of each other. That was enhanced with 14nm technology, in which chip sizes were made even smaller.

Intel was slightly below the trend line on cost reduction with 14nm process compared to previous manufacturing processes when taking Moore's Law into account, Holt said. In terms of chip design, Intel scaled down the

transistor fin pitch, and reduced the scale of the interconnect, so all the building blocks on processors fit together in a cohesive way. But it could not achieve aggressive scaling with the gate pitch or SRAM memory cells.

But as Moore's Law detractors have argued, etching an increasing number of features on smaller processors will get even more challenging. They could be

vulnerable to a wider range of defects, and a lot more of attention to detail is required when designing and making chips.

Intel is looking to implement new technologies such as EUV (extreme ultraviolet) lithography, which will help produce chips at smaller geometries. It is also shifting to 450mm wafers, so it's less expensive to make chips. Intel is also

researching processor materials that could possibly replace silicon.

The 14nm process will be succeeded by 10- and 7nm processes. Holt didn't say when the first chips based on those processes would be released, but Moore's Law will be applicable. "We are quite confident we can continue to deliver on the promises of Moore's Law," he enthused. 

Breaking up is hard to do, but HP won't look back

The split will be "the biggest separation that's ever been done," says HP's CEO. [James Niccolai](#) reports

Breaking up HP is "totally the right thing to do for this company," CEO Meg Whitman said recently, after the company reported declines in revenue and profit for its most recent quarter. "We're going to make more progress as separate companies than as two companies together," she told financial analysts during a recent conference call. But it's a monumental task - "the biggest separation that's ever been done," according to Whitman.

And it's not a typical break-up, where a company spins off a small part of its business. Each of the new HPs will be a behemoth in its own right, with about \$57 billion in revenue.

HP announced in late 2014 that it will divide itself in two by the end of 2015. One company, HP Inc, will sell its printers and PCs, while the other, Hewlett-Packard Enterprise, will sell its data center products and services. Around 400 to 500 executives will manage the split, Whitman said Tuesday, while the other 275,000 employees try to get on with running the company. "We've got deadlines every month on decisions that have to be made and operations that have to be changed," she explained.

HP has 786 legal entities around the world, and each needs to be "rationalised" and studied for the legal and tax ramifications of the breakup.

Still, she insisted it's the right course. By splitting in two, the rationale goes, each company will be more focused on the products it builds and the customers it serves. And it gives HP a chance to review "every line item" and reshape the new companies almost from scratch.

Whitman has faced a huge task trying to turn HP around, after several big missteps by her predecessors. She was opposed to a breakup in the past, saying in 2013 that "we are better and stronger together". She didn't say why her thinking has changed, but HP's results have improved little since that time.

The company recently reported a 2 percent drop in revenue, to \$28.4bn, its



MEG WHITMAN

twelfth quarterly decline in 13 quarters. Profits were also down, by 6 percent, even though HP has cut 45,000 jobs to reduce its costs. Excluding some one-time items, its earnings climbed 5 percent to \$1.06 per share, in line with its forecast.

The company's huge PC division continued its growth spree, with sales up 4 percent. But that division has benefitted from businesses that were slow to upgrade from Windows XP, and most of those upgrades are now complete.

Its printer, server and storage divisions all reported declining sales, with networking the only other bright spot.

HP increased its spending on research and development by 10 percent this year, Whitman said, and it's been innovating on several fronts. Its Sprout PC broke new ground in 3D printing and touch computing,

and it's designing a whole new type of computer architecture called the Machine.

But it's unclear when those and other initiatives, such as its low-power Moonshot servers, will pay off. At one time, Whitman predicted a return to growth for HP in 2014, but that hasn't happened, and she has said it probably won't happen in 2015, either.

So HP is starting the fiscal year with its work cut out for it - even without the distraction of breaking up the company. Customers and employees are, however, "excited" about the split, according to Whitman, but big structural changes rarely lead to increased sales in the short-term - just ask Dell. "I have a lot of confidence that we'll deliver in fiscal year 2015, which is critical," Whitman said. "The most important thing we can do to get these two companies off on their own is to deliver this year." 

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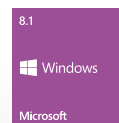


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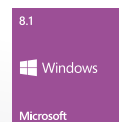


Scan G30i Value System Gaming PC

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The 3XS Performance GT is an affordably-priced gaming rig that includes a dual-core Intel Pentium G3258, which we overclock up to 4.4GHz for improved performance. Also included is a 2GB NVIDIA GeForce GTX 760 graphics card, 8GB of 2133MHz Corsair DDR3, a Z97 motherboard and 1TB hard disk.

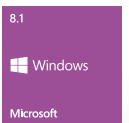


Scan 3XS Gamer 20i Gaming PC

- Intel® Core™ i7 4790 processor
- 8GB Corsair DDR3 2133MHz memory
- 4GB NVIDIA GeForce GTX 970 SC ACX
- 1TB Seagate HDD
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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-K motherboard along with a 1TB hard disk.



3XS Graphite LG156 Gaming Laptop

- Intel® Core™ i5 4210M processor
- 8GB Corsair DDR3 1600MHz memory
- 2GB NVIDIA GeForce GTX 860M
- 15.6in 1,920 x 1,080 screen
- 500GB WD 7200rpm hard drive
- Windows 8.1

£826 Inc VAT

The LG156 is 15.6" mid-range gaming laptop that includes a NVIDIA GeForce GTX 860M graphics card. The LG156 has won multiple awards in the press for its performance and value for money. The LG156 is ready for next-day delivery and has a 2 Year Warranty.

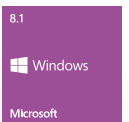


3XS Graphite LG1720 Gaming Laptop

- Intel® Core™ i7 4710HQ processor
- 8GB Corsair DDR3 1600MHz memory
- 3GB NVIDIA GeForce GTX 970M
- 17.3in 1,920 x 1,080 screen
- 500GB WD 7200rpm hard drive
- Windows 8.1

£1055 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.



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Nokia N1

Tablet

Although Microsoft bought its handset business, Nokia is back with an Android Lollipop tablet in the N1. At 7.9in, it's an iPad mini rival and looks similar too with the aluminium design. It has a 64-bit Intel Atom processor and the firm's own Z Launcher.

\$249 (UK price TBC)
n1.nokia.com/en



>> Microsoft Band

Fitness tracker

With a not very inventive name, the Microsoft Band is the software giant's highly anticipated foray into wearable tech. It can help with productivity by displaying email, calendar and message notifications but is primarily a fitness tracker including heart rate, UV and skin temperature sensors. Microsoft has included support for iOS and Android on top of Windows.

\$199 (UK price TBC)
microsoft.com/en-gb

CHRIS
MARTIN

Microsoft Lumia 535 *Smartphone*

The Lumia 535 is Microsoft's first Windows Phone handset since dropping the Nokia branding. The budget smartphone now has the firm's own name on it and the usual selection of bright colours. A 5in qHD screen and 5Mp front- and rear-facing cameras headline the spec sheet.

Around £100 inc VAT
microsoft.com/en-gb



HP Omen *Laptop*

This sleek gaming laptop has a custom chrome hinge and blue-coated tips to echo the racing look of titanium exhaust pipes. Under the hood is an Intel Core i7 processor, up to 16GB of RAM, dual-SSD drives and an nVidia GeForce GTX 860M graphics card.

£1,299 inc VAT
hp.com/uk



Arcam Solo ^

Soundbar

The Arcam Solo is an all singing, all dancing soundbar with 100W of power through six drivers. It comes with four HDMI inputs and supports 4K pass-through via the single HDMI output. The firm touts it as the best Bluetooth speaker on the market with AptX support and private listening feature.

£800 inc VAT
arcam.co.uk



Samsung Galaxy A3 <<

Smartphone

There's a growing trend of selfie smartphones and Samsung's effort is the Galaxy A3, which forms part of a new line-up of devices along with the larger A5. Design and specs are pretty standard but the 5Mp front-facing and 13Mp rear-facing cameras are the key selling points.

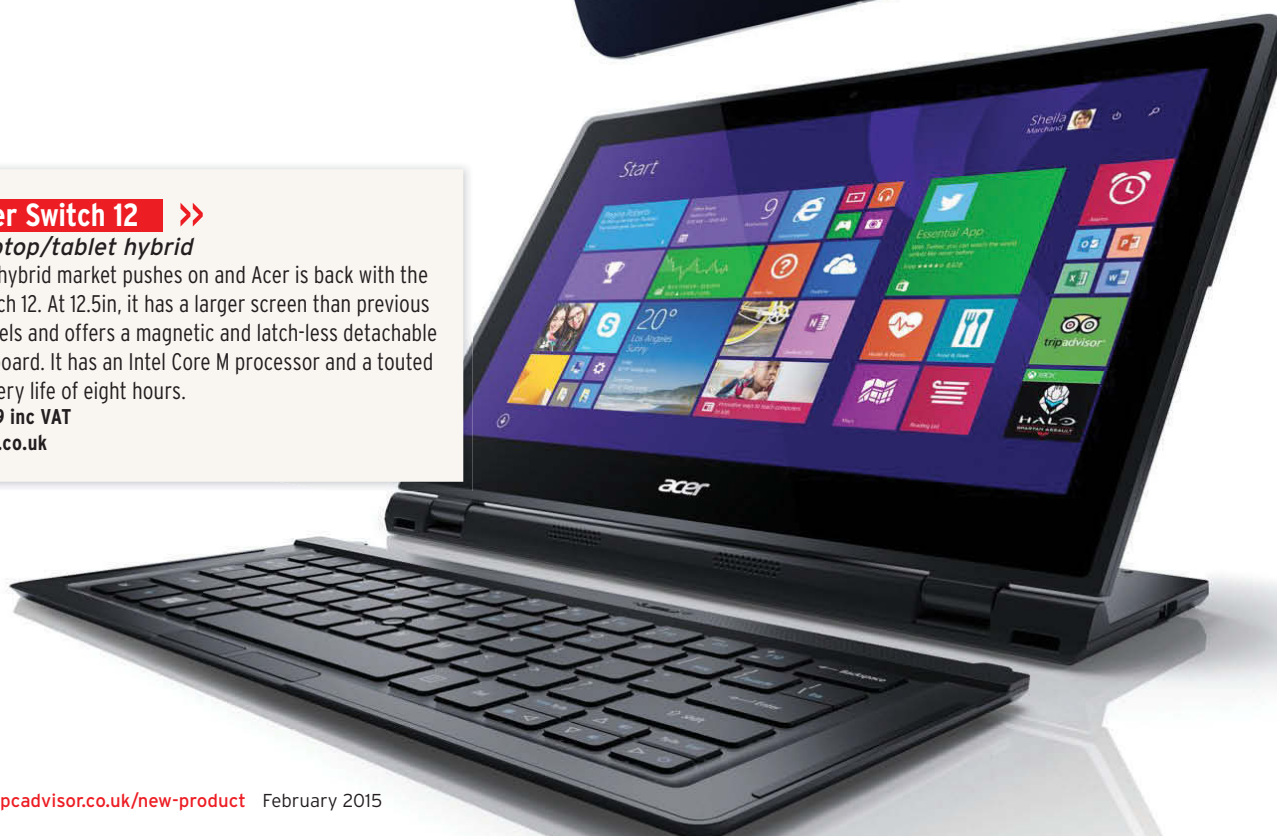
£TBC
samsung.com/uk

Acer Switch 12 >>

Laptop/tablet hybrid

The hybrid market pushes on and Acer is back with the Switch 12. At 12.5in, it has a larger screen than previous models and offers a magnetic and latch-less detachable keyboard. It has an Intel Core M processor and a touted battery life of eight hours.

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acer.co.uk



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Pure Voca <<

Bluetooth speaker

Pure is well-known for its radios but has decided to branch out into the busy Bluetooth speaker market with the Voca, which features dual-passive radiators. The device is rechargeable and able to offer up to 10 hours battery life and hands-free calling when connected to a smartphone.

£99 inc VAT

pure.com



Jawbone Up3 >>

Fitness tracker

Jawbone's latest tracker aims to be the most powerful tracker in the smallest possible design. It has a raft of new sensors including ambient temperature and a tri-axis accelerometer. Along with a heart rate monitor, it can automatically track your sleep and activity to a greater level.

£150 inc VAT

jawbone.com

Amazon Fire TV Stick >

HDMI dongle

Amazon is taking on the Chromecast and Roku Streaming Stick with its inexpensive Fire TV Stick - an HDMI dongle version of its media streamer. It comes with a remote control and services such as Amazon Prime Instant Video, Netflix and Spotify. Specs include 8GB of storage and a dual-core processor.

\$39 (UK price TBC)

amazon.co.uk





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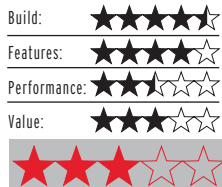
■ hp.com/uk

Read more

■ tinyurl.com/jvLn7ky

Specification

10.1in (1920x1200) gloss multi-touch IPS display; 1.6GHz Intel Atom Z3795; Windows 8.1 Pro (64-bit); 4GB RAM; 128GB eMMC; Intel HD graphics; 802.11a/b/g/n; 2x2 MIMO; Bluetooth 4.0; microSDXC card slot; 2.1Mp front and 8Mp rear camera with LED flash; stereo speakers; 30Wh lithium polymer battery; HP dock port; 261x177x9.6mm; 661g



ULTRAPORTABLE LAPTOP

HP ElitePad 1000 G2

A Windows tablet aimed at business users, the ElitePad is HP's answer to the iPad. It has a 10.1in widescreen touch display, effectively the size of the standard iPad Air.

HP doesn't get off to a great start in promoting this Windows tablet, pitching it as 'one of the thinnest tablets in the industry at 9.2mm', which would have been true if its only competition had been the original iPad of 2010. Excepting some Google-based slabs, few tablets are as thick as ElitePad's actual 9.6mm.

Powering the ElitePad 1000 is a new Intel low-power Atom processor, a quad-core 64-bit Z3795 chip running at 1.59GHz. The 4GB of system memory is low-power DDR3 RAM, clocked at a lowly 1067MHz, the fastest that the Atom can use. Storage options are 64- or 128GB.

It's worth noting that the flash drive inside is not the high-performance SSD found in standard PCs and laptops, but the low-speed eMMC type fitted in smartphones.

The aluminium case encircles the tablet. Its 16:10 aspect ratio display is a useful compromise between the 4:3 iPad and the widescreen 16:9 displays of most Android tablets and Windows laptops. The ElitePad is designed mainly for landscape mode: the Windows logo is at the bottom of one long edge, and a plastic trim piece on the top at the back gives radio access to the wireless aerials for Wi-Fi, Bluetooth and 3G modems.

Under Windows 8.1, general tasks were cumbersome to complete using the touchscreen alone. The relatively high screen resolution means buttons and controls in the traditional Windows desktop are tricky to finger-tap accurately. A stylus, the Executive Tablet Pen G2, gives more precise pointing but is not without its trials. Tapping the screen to launch a program, for example, often earned no response. The general lag in the interface and intermittent tap feedback sometimes made it difficult to know if a tap had registered correctly.

The tested ElitePad 1000 came with a useful set of accessories. A desktop dock can support the tablet on the desk at a slanted angle like



a laptop, and adds extra connectivity - four USB 2.0 ports and audio minijack on the sides, and ethernet, HDMI and VGA ports on the rear.

Used with the HP Bluetooth wireless keyboard and mouse of your choice, you can get a passable version of a working laptop setup. There are no USB ports on the tablet itself, just a slot for an microSDXC card and a proprietary multi-pin dock. A dongle in the box connects to that dock port for a makeshift USB 2.0 connection.

Finally, there's a battery case available, which fits around the tablet (and requires screws to hold together). This also includes two USB 2.0, HDMI and full-size SD card slots, and adds 21Wh of lithium-ion power to the tablet's own 31Wh internal battery.

Lab tests

In single-core mode the ElitePad scored 1026 points on the cross-platform Geekbench 3 benchmark; multi-core moved this only up to 3310 points. This is just ahead of a fast Google Android smartphone such as the Motorola Moto X (998/2975 points) but a long way behind the best ARM mobile chips, such as that in the iPad Air 2, which scores around 1815 and 4505 points.

In PCMark 7, the ElitePad returned 2535 points, a low score in laptop terms. PCMark 8 results of 1266 points in the Home scenario, and 1555 points in Work also suggest it is slow in PC terms. A £349 Toshiba Satellite laptop

recently scored 1883 and 2240 points in the same test.

This tablet may not be aimed at home users, but we tried playing Stalker: Call of Pripjat to get an idea of graphics performance. It could just play the game at a very low frame rate - an average of 10fps at a modest 1280x720 resolution and Medium detail settings. For games entertainment, Intel's new silicon is not up to the job.

Display quality was more satisfactory, if only able to reproduce 70 percent sRGB gamut and 53 percent Adobe RGB. Contrast ratio in a chequerboard test was around 650:1. Colour accuracy measured particularly well.

Battery life was tested with our standard looped video rundown. The ElitePad lasted eight hours, 42 minutes. Standby time was poor though. Adding the 431g battery case to the tablet is said to extend total running time to 20 hours. Our calculations suggest a total runtime closer to 14.5 hours. That's not a bad figure, although the tablet assembly alone is a weighty 1.1kg, not including the dock or keyboard.

Verdict

If you need Windows programs and a totable tablet with almost usable battery life, the ElitePad does the job. As a first-choice device that can serve in a laptop role too, it's underpowered and will have you yearning for the power of even a budget laptop. **✗ Andrew Harrison**

£2,827 inc VAT

Contact

■ twinhead.com.tw

Read more

■ tinyurl.com/Lkjo2em

Specifications

13.3in (1024x768) semi-gloss; daylight-readable, touch-sensitive (resistive) TN display; 2GHz Intel Core i7-3667U (3.2GHz Turbo), Intel HD Graphics 4000; Windows 7 Pro; 16GB DDR3; 128GB SATA SSD; DVD drive; 802.11b/g/n cellular (LTE); 3x USB 2.0; 1x USB 3.0; 1x gigabit ethernet; 1x VGA, 1x RS232, 86Wh li-ion; 200x294x56mm; 3.6kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



RUGGED LAPTOP

Twinhead International Durabook R8300

Several companies produce rugged laptops but many are categorised as just 'business rugged' or 'semi-rugged', the aim being to provide users with peace of mind even if they don't work in a hazardous environment. The Durabook R8300, on the other hand, is described as a fully rugged laptop, and competes with models in the Panasonic Toughbook and Getac ranges. It's intended for use by anyone who needs to use a PC outdoors, possibly in the rain and where there's every chance of it being dropped.

Like most fully rugged laptops, some aspects of the R8300 seem basic or dated compared with business and personal laptops. The screen is a classic example, with its 4:3 aspect ratio. However, the Durabook is unlikely to be used for watching movies on a windswept building site, and the squarer screen is better suited for viewing business and engineering documents.

Likewise, the XGA (1024x768) resolution is low but, given the modest size of the screen, the pixel density of 96ppi is the same as that of most budget laptops.

Viewing angles, though, were disappointingly restricted, and the colour gamut was a very low 55 percent sRGB - noticeable in its poor rendering of image colour. Reading from the screen was also hampered by a pitiful contrast ratio of just 100:1 in our chequerboard test.

Our benchmarks mostly confirmed that processor, memory and SSD are what you'd expect of a modern budget-to-midrange laptop.

The Durabook R8300 scored 4197 on PCMark 7, while PCMark 8 returned 2625 (Home) and 3247 (Work). This suggests it's capable of running most normal Windows programs, at around the same speed as a £500 laptop.

Gamers might like the mil-spec looks but you're unlikely to play games on this notebook. Nonetheless we tested its graphics capability with the relatively easy Stalker: Call of Pripyat game benchmark. Played at native resolution and Medium detail, this gave an average frame rate of 35fps.

SSD storage showed relatively poor throughput. In benchmarks, the 128GB SanDisk SSD mustered

just 270MB/s sequential reads and 197MB/s writes. While the R8300 takes a SATA 3 drive, its results look more like it's connected to a SATA 2.

For the price the speed results might sound disappointing although it's sufficient for typical applications and would exceed the spec of any rugged-laptop competition still using a hard disk.

Where the Durabook R8300 really shines is in its self-protection credentials. It looks the part, the styling being more reminiscent of a toolbox than a laptop, but it goes more than skin deep.

The magnesium alloy casing is far more durable than plastic. The textured finish, coupled with a carrying handle, reduces the likelihood of it being dropped, even with cold and wet hands. Even so, it should survive a tumble from normal carrying height, being tested and certified against the US military standard that specifies drops from 1.22m on to plywood over concrete on to all 26 of its faces, edges and corners as well as levels of vibration, thermal shock, altitude and more.

It also achieved an IP65 rating on the IEC 60529 waterproofing standard. This means it will survive jets of water from any direction, making it immune from even the heaviest rain.

With no external vents for dirt or water to enter, air cooling relies on a small aperture in the top left corner of the top deck, just beyond

the keyboard. From this a noisy buzzing fan was clearly audible as it intermittently revved up and down during any normal use.

In our tests, the daylight-readable screen registered a brightness of 588cd/m² - far better than indoor laptops. The keyboard has a red backlight for use in the dark, and widely separated keys allow it to be used while wearing gloves.

The same can't be said of the small touchpad, which fails with a gloved hand even if the resistive touchscreen does work with gloves. Given the cost and performance hit of a touchscreen capability and its questionable value on a laptop, we'd have preferred a touchpad that could work with gloves instead.

In our tests, battery life was a respectable six hours, five minutes, playing a looped MPEG video over 11n wireless. If you want a full day's use, you'll need to recharge or carry a spare battery.

Verdict

This is an expensive portable PC. If you're used to buying standard laptops, the spec will sound pedestrian for the price. It's the inevitable cost of protection from rough handling, though. The good news is that you'd have to be particularly careless or clumsy to destroy it and you could shave several hundred pounds off the price by opting for a more basic variant with less RAM.  **Mike Bedford**



From £399 inc VAT

Contact

■ apple.com/uk

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■ tinyurl.com/Ly2k5av

System information

9.7in (2048x1536) LED-backlit widescreen; multi-touch display with IPS technology; fingerprint-resistant oleophobic coating; fully laminated display; anti-reflective coating; A8X chip with 64-bit architecture; M8 motion coprocessor; 8Mp iSight camera; 1080p HD video recording; 1.2Mp FaceTime camera; Wi-Fi (802.11a/b/g/n/ac); dual channel (2.4GHz and 5GHz); HT80 with MIMO; Bluetooth 4.0; AirPlay Mirroring; 240x169.5x6.1mm; 437g

Build: ★★★★★

Features: ★★★★★

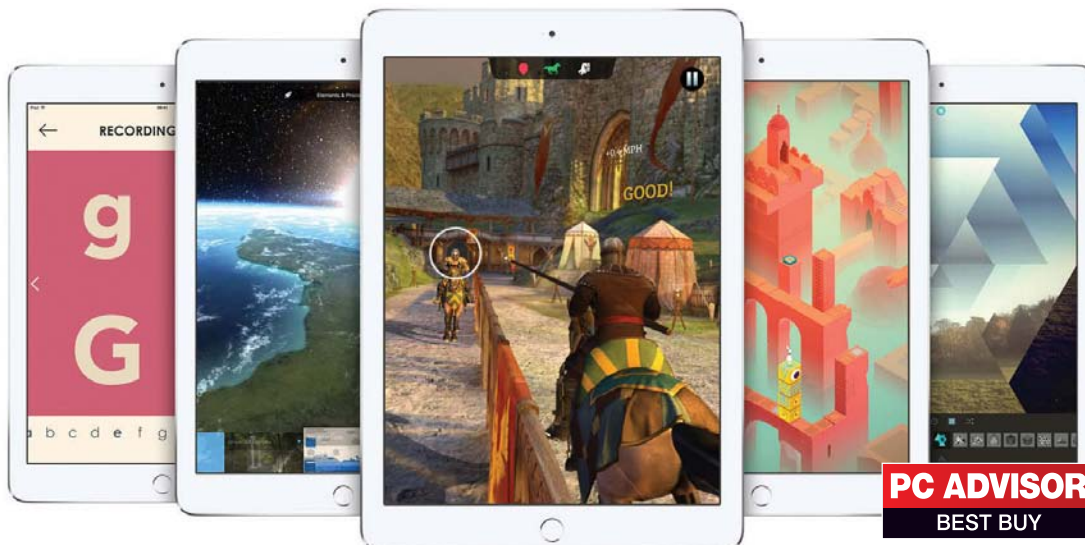
Performance: ★★★★★

Value: ★★★★★



TABLET

Apple iPad Air 2



Apple's iPad Air 2 has launched and, unlike its more cautious little brother, the iPad Mini 3 (see page 40), it's replete with enhancements and new features.

In a year of near-everyday use, the original iPad Air hasn't struck us as too fat or too heavy, but Apple has nevertheless sliced 6 percent off its weight and nearly 19 percent off its depth. It's now just 6.1mm thick (down from 7.5mm) and weighs 437g (for the Wi-Fi version) or 444g (with 3G) - that's down from 469g/478g.

The Air 2 is crazy-slim. And we mean that not entirely in a positive sense; shaving further millimetres off an already whisper-light chassis seems like an extravagance, and was presumably achieved at some cost - to battery size, and potentially to physical robustness.

In our tests, it stood up to heavy use, though, it feels more fragile than its predecessor. And a little flexing showed there is more give than on the original iPad Air.

Aside from being slimmer, the physical design is very similar to its predecessor. The back edges are rounded, and there's a brushed-metal effect across the back panel. The front edge has a sharp chamfer and a mirror finish, and looks smart.

The headphone socket and power-off button remain on the top of the device, the volume buttons are still on the upper right (though, they're fractionally further apart, and therefore a touch easier to tell apart with a blind finger) and the SIM tray is still in roughly the same spot at the lower-right.

The microphone holes have, however, moved - they're either side of the rear camera aperture. Another change is that the speaker grille along the bottom is now a single row of larger holes rather than a double row of smaller ones. These are stereo speakers, as far as we can tell, but audio quality remains a weak point and the mute/orientation lock switch has gone.

The device comes with iOS 8.1 preinstalled. It's a highly optimised, user-friendly system that beginners find easy to grasp but offers a deep feature set for power users.

In use, we found it faster than the original iPad Air. Flipping from screen to screen, for example, and within apps is near-instantaneous.

Display

In many respects, the Air 2 has the same screen as its predecessor. The 9.7in display has a resolution of 2048x1536 and a pixel density of 264 pixels per inch (ppi). That's the standard iPad Retina pixel density, and is very sharp to look at.

There are, however, a couple of differences from last season's display. One is in terms of the iPad's overall design. By compressing everything into a smaller form, Apple took out what it calls the "air gaps" between different elements of the screen. However accurate a description that is, it has translated into a screen that is firmer to the touch, and has (unlike the device as a whole) less flex. (One of our few dislikes when reviewing the first iPad Air was the way the display yielded

to a finger tap a tiny but appreciable amount. That's gone now.)

The second is the addition of an anti-reflective coating. Initially, we were sceptical, but this is great, darkening and minimising the distracting reflections that appear when using an iPad under electronic lighting.

Finally, the screen appears to be more responsive to the touch. It's possible that the compressed design means that the touch-responsive elements are simply closer to the surface of the glass than before, creating the illusion that your fingers are touching and moving the visual elements displayed. Or this could be the effect of the new, more powerful processor and its superb graphical muscle. Either way, it's a pleasure to use.

The Air 2 comes with a new chip - the A8X. It offers a 64-bit desktop-class architecture and three billion transistors. Thanks to this chip, the iPad is 40 percent faster than its predecessor. Even more impressive is the graphical side of things: Apple claims that users will see two-and-a-half times the graphics performance. That's great news for gamers, and video- and photo-editing apps will also benefit from the enhanced graphics performance.

The third in the Air's triptych of enhancements (after the slimmed-down body and pumped-up chip) is the rear-facing camera, which has been boosted from 5- to 8Mp.

Your experience is likely to vary depending on the shooting conditions, and there will be areas

where the Air 2 demonstrates its superiority – particularly close-up detail under studio lighting, and low-light conditions – but don't expect a quantum leap forward.

More appealing than the increase of megapixel rating, however, may be the new camera features that have been added. The Air 2 gets slow-mo and time-lapse video modes, as well as burst mode and a timer. And panoramas: the original Air had these, but they now go all the way up to 43Mp.

Apple has also improved the FaceTime camera – it's now HD and lets in 81 percent more light. Perfect for use in low light.

Less important than the big three improvements is the addition of Apple's fingerprint scanner to the iPad line for the first time. (It also makes an appearance in the iPad mini 3.) Touch ID on the iPad is as straightforward and fast to use as it is on the iPhone. You can use it to unlock the device, to unlock various apps, and to verify purchases on the App Store. There are, of course, checks and balances – the first time you unlock the iPad after a power-down, you'll need to input the passcode; ditto the first time you verify a purchase after setting up Touch ID. You can also use Touch ID for online shopping, as long as those sites and/or apps have Apple Pay implemented.

Apple appears to have concluded that people are unlikely to take their iPad shopping in the real world, so the most famous aspect of Apple Pay and Touch ID – the one where you touch your device on a sensor in a shop to pay for goods, as seen in the iPhone 6 and Apple Watch – has been disabled on the iPad Air 2.

As we touched on earlier, the Air 2 gets a stereo speaker setup, like the iPad mini line-up before it. (At least, we're pretty sure it does – there's still some debate about this, and Apple's own specs only call them speakers.) About time, some audiophiles might say: yet the truth is that it might as well still be mono.

The speaker grilles are right next to each other, on the same

edge of the device. (The lower edge, either side of the Lightning port.) It's therefore almost impossible to create a situation in which the two sound sources can be heard separately. If you pop the iPad on its side and watch a movie with amazing sound design, prepare for disappointment: both speakers will be on the left (or the right) of the screen, and their output will be mashed together.

To provide good stereo sound, the iPad needs to have speakers on opposite sides. Of course, this would involve compromises in design, and it's possible that Apple doesn't think of the iPad as a serious audio device; and those who want stronger audio can invest in a wireless speaker or some decent headphones.

Moving away from the mono/stereo issue, the Air 2 produces sound that isn't bad, though, it isn't great either. It can manage quite a decent volume without quality degrading, but while you get a nice solid snap out of snare drums and similar, bass isn't much to write home about. It's a 'thin' sound, too – not something you'd call warm.

Battery life

There's a smaller capacity battery inside the Air 2 – 27.3Wh compared to 32.4Wh in the original Air – although Apple specifies the same overall battery life of 10 hours of web surfing, video playback or music listening. We tried a more stressful test than browsing, using looped gameplay from GFXBench to play the T-Rex sequence, 30 times over. This gave an estimated total runtime of three hours, 53 minutes. For reference, we tried the same test on a year-old first-generation iPad Air. Both tablets were running the same build of the current latest iOS 8.1 software. Here the original Air posted an estimated total runtime of four hours, six minutes.

But it's vital to also look at the performance of both products. Over the length of the test, the first Air could play at an average framerate of 22.9fps. Meanwhile, the Air 2 played at more than twice

that speed, recording 48.3fps. This one test comes close to validating Apple's claims for two-and-a-half times the graphics performance.

The new iPad Air 2 also offers better Wi-Fi connectivity than the previous generation, thanks to the inclusion of the latest 802.11ac technology. Another new area of connectivity is the addition of a removable SIM for the UK and US markets. This is designed to be as "flexible as possible," according to Apple. It will, however, only work in the latest iPads. There will be no NFC in the iPads, though.

As it did with the iPhone 6 line-up, Apple has dropped the 32GB capacity option from the iPad Air 2 line-up. The tech giant told us that this was a strategy to bring the higher capacities down to a lower price point making it more affordable in that category.

When we asked why it had kept the 16GB model on (rather than replacing that with the 32GB model), Apple told us that 16GB has always been popular (due to the lower price we are sure). Unfortunately, it seems likely those people with 16GB devices are also the ones who've failed to install iOS 8.1. You will be able to buy a 32GB iPad Air, however.

Verdict

We're a tiny bit concerned about how much physical punishment this slender creature will stand up to, but if you're throwing your iPad around the place (or deliberately bending it), then you should probably expect to come unstuck anyway. Other than that, this is a lovely update of an already lovely device, with an improved camera, a considerably faster processor, a slimmer, more portable body and Touch ID. We might not recommend that owners of the first iPad Air upgrade – by the time the speed gains of the A8X are showing up in apps, we'll be thinking about the iPad Air 3 – but if you're on an iPad 4 or earlier, new to the world of iPads or just have a lot of cash to spare, jump in.  **David Price**



From £319 inc VAT

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System information

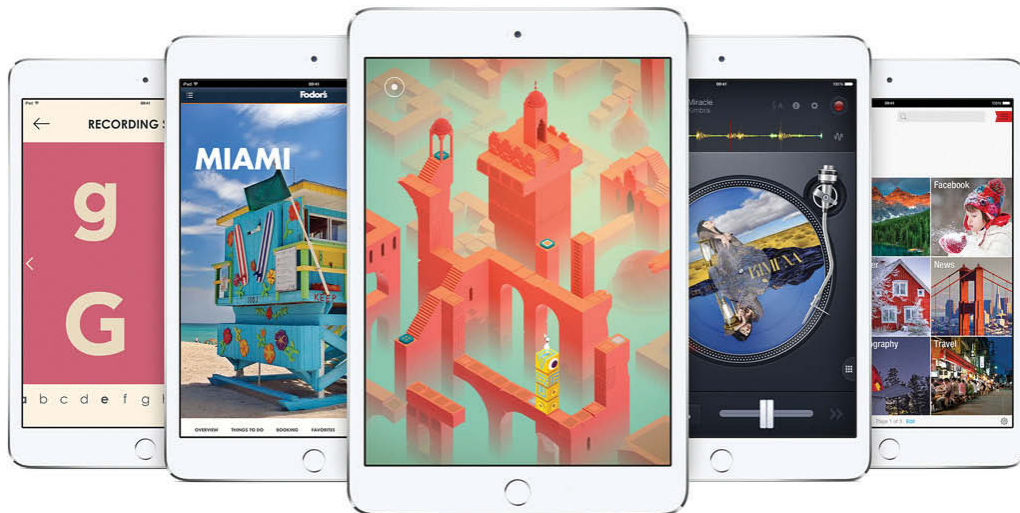
7.9in (2048x1536, 326ppi)
LED-backlit Multi-Touch display with IPS technology; fingerprint-resistant oleophobic coating; A7 chip with 64-bit architecture; M7 motion coprocessor; 5Mp iSight camera; 1080p video recording; 1.2Mp camera; Touch ID; Wi-Fi (802.11a/b/g/n); dual channel (2.4GHz and 5GHz) and MIMO; Bluetooth 4.0; FaceTime; AirPlay Mirroring; iOS 8.1; 200x134.7x7.5mm; 331g

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



TABLET

Apple iPad Mini 3



As well as launching a new iPad Air (see page 38), Apple has also released an update to its line-up of smaller tablets, the mini 3.

The first thing you'll notice is that it's deceptively similar to the mini 2. In fact, as we look at later, the only real difference between the two is the introduction of the Touch ID fingerprint sensor and the option to buy a tablet with gold casing in addition to silver and slate grey.

The iPad mini 3 is gorgeous. It has a brushed aluminium chassis, available in the aforementioned new gold, as well as silver and slate grey hues. The addition of a gold model didn't come as a huge surprise, as it brings the iPad range in line with the iPhone. The gold option was first introduced with the 5s, and is an option for the iPhone 6 and 6 Plus, too. Apple told us that gold is a popular colour choice.

The bevelled edges surrounding the glass front of the iPad mini 3 add to the overall premium finish, and look great paired with the Home button's new Touch ID fingerprint sensor, which has a matching metal ring around it.

Aside from the gold option and the Touch ID, Apple's tablet looks the same as its predecessor. It didn't get the same treatment as the Air 2, which is slimmer and lighter than the model that came before it. It is 7.5mm thin (for comparison, the Air 2 is just 6.1mm), and weighs 331g for the Wi-Fi only model or 341g for the Wi-Fi + cellular model.

During our testing, we didn't feel that this tablet should be thinner, though, we found it a bit heavy when holding it in one hand for more than 10 minutes, particularly with Apple's Smart Cover attached. The original mini was lighter than the mini 2 and 3, so we'd like to see Apple shave off a few grams with the next version.

Oddly, the iPad Air 2 (which has a larger 9.7in display rather than the 7.9in screen found here) feels more comfortable to hold, despite being around 100g heavier. This is to do with the difference in the way the device is held.

Touch ID

As we touched on the start of this review, Apple has added Touch ID to the iPad mini 3. During our tests we found it easy to set up, simple to use and it worked flawlessly.

It can be a huge time-saver, as you don't need to enter your passcode every time you want to unlock your device. It can also be used to unlock various apps and to make purchases in the iTunes Store, App Store and iBooks Store.

You'll also be able to use it to do your online shopping, as long as those online stores have Apple Pay implemented. It won't work in actual brick and mortar stores, though, as Apple believes people are unlikely to take their tablet shopping in the real world.

Apple hasn't made any changes to the 7.9in Retina display. It retains the same resolution: 2048x1536 at 326 pixels per inch (ppi). That's better than the Air 2, which has the

same resolution but offers 264ppi due to the bigger screen.

The mini 3 uses the same processor as its predecessor - the A7. It seems Apple has focused its attention on the Air 2 this time round, which comes with a very powerful A8X chip.

Last year, we were surprised that the only difference between the mini 2 and the original Air was their size. Now there will be more reason to buy a larger iPad, which is good news for Apple as it makes more money from that model. It is, however, a disappointment for lovers of the smaller form factor.

Not that the A7 chip is a slouch. It's a very fast, 64-bit processor. The mini 3 also features the M7 motion co-processor, which helps save power by taking on the task of measuring motion using the built-in accelerometer, gyroscope and compass. Both the A7 and M7 are found in the iPhone 5s.

We carried out a series of benchmark tests on the mini 3 to find out the difference between it and the mini 2 when it comes to speed and performance. We also looked at how it compares to the brilliant iPad Air 2.

In our Geekbench 3.0 performance test, we found that the mini 3 (running iOS 8.1) scored 1376 in the single-core test and 2483 in the multi-core test, which is almost identical to the mini 2's scores of 1374 and 2484. It is, however, a lot better than the original mini running iOS 8.1, which scored a significantly lower 260 (single) and 494 (multi).

The iPad Air 2, on the other hand, is incredibly powerful judging by our benchmark tests, scoring 1818 in the single-core test and a whopping 4520 in the multi-core trial.

As for graphics, the mini 3 is good, though, it isn't in the same league as the Air 2. It scored 8.9fps in the Manhattan onscreen test in GFXBench, which is identical to that of its predecessor but way behind the 24.6fps of the Air 2. The T-Rex test results were more impressive, at 22.7fps for the mini 2 and 3 and an incredible 52fps for the Air 2.

When it comes to SunSpider, the JavaScript browser test, the mini 3 scored a speedy 449ms, just like its predecessor. The Air 2 scored a staggering 287ms and the original mini was painfully slow at 1503ms.

As we talked about earlier, the mini 3 is virtually identical to its predecessor. This means that unlike the Air 2, it doesn't come with 802.11ac, which is a real shame. Instead, it has dual-band 802.11n Wi-Fi and MIMO, with download speeds that can reach up to 300Mb/s. If you opt for the Wi-Fi + cellular model of the iPad mini 3, you'll also get 4G LTE capabilities.

Aside from that, though, the tablet comes with Bluetooth 4.0 and GPS, and uses Apple's Lightning connector to charge.

The mini 3 does, however, get the new Apple SIM, a removable SIM for the UK and US markets. This SIM is designed to be as "flexible as possible" according to Apple. At present, EE is the only company that's signed up to the scheme in the UK.

As it did with its iPhone 6 line-up, the 32GB capacity option has been dropped. Apple told us that this was a strategy to bring the higher capacities down to a lower price point. When asked why it had kept

the 16GB model on, rather than replacing that with the 32GB model, Apple revealed that 16GB has always been popular (due to the lower price we are sure). Unfortunately, we think it's likely that all those people with 16GB devices are the ones who've failed to install iOS 8 because they don't have enough space left on their device.

If you want a 32GB device you'll need to buy a mini 2, as the mini 3 is available only in capacities of 16-, 32- and 128GB.

Cameras

Like so much else on this device, the cameras haven't been upgraded, so it has the same rear-facing 5Mp iSight camera with f/2.4 aperture. HDR is supported and with iOS 8 you get the option to take high-resolution Panorama shots (up to 43Mp) and the ability to capture time-lapse videos. Video capabilities of the rear-facing camera are 1080p HD at 30fps. The front-facing FaceTime snapper is 1.2Mp, and is capable of capturing 720p video. Although its cameras haven't been updated, it still takes decent shots.

The entry-level 16GB model is available for £319, rising to £419 if you add cellular connectivity. That's just £80 less than the iPad Air 2, though, despite the significantly less impressive specs.

As mention above, there isn't a 32GB iPad mini 3, instead you jump straight to 64GB for £399 (£499 for cellular). The top-of-the-range 128GB iPad mini 3 costs £479 (£579 for the cellular version).

With so little difference between the price of the iPad mini 3 and the Air 2, and with the former having so few changes aside from Touch ID, we would strongly advise you to consider whether the Air 2 is a better option for you.



The alternative is, of course, to opt for the iPad mini 2, which is still available to buy from Apple in 16- and 32GB models for £239 and £279 respectively. We think the 32GB mini 2 is a much better deal. Plus, it's well worth checking the Apple Refurbished store (tinyurl.com/6kp9bqv) to find out whether you can save even more money by buying a refurbished model (which are as good as new anyway).

Verdict

The iPad mini 3 is by no means a bad tablet. In fact, it's a great one, but it's a bit of a rotten deal. We'd find it difficult to recommend buying one when the mini 2 is available for £80 less and is almost exactly the same, and the hugely more powerful and impressive Air 2 is just £80 more. The only reason to buy a mini 3 over the other options is if you're set on a 7.9in screen, are desperate for a gold model and you think you can't live without the Touch ID. If that's you, then you won't be disappointed, but a new processor and some other upgrades would have been appreciated.  **Ashleigh Allsopp**



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Contact

■ samsung.com/uk

Read more

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Specification

Android 4.4.4 KitKat OS, 5.7in Super AMOLED display (1440x2560), 515 ppi, 2.7GHz quad-core, Qualcomm Snapdragon 805 CPU, Adreno 420 GPU, 3GB RAM, 32GB internal storage, 16Mp rear camera, 3.7Mp front camera, video recording up to 4K, Bluetooth 4.1 LE, Wi-Fi 802.11a/b/g/n/ac, NFC, infrared, fingerprint scanner, heart rate monitor, UV sensor, A-GPS, 4G LTE (Cat 6), micro-SIM, 11.9Wh (3220mAh) battery, 79x154x8.7mm, 175g

Build: ★★★★★☆

Features: ★★★★★★

Performance: ★★★★★☆

Value: ★★★★★☆

★★★★★☆☆

PHABLET

Samsung Galaxy Note 4

Like the Galaxy Note 3 (tinyurl.com/qakoLzy), the Note 4 has a 5.7in screen, a faux leather textured back that we're still not overly keen on, and similar dimensions and weight. One slight difference is the metal frame, which has none of the tacky stitching of the Note 3. It provides decent grip, but the rear cover is yet again extremely thin plastic.

The handset is 8.5mm thick (8.67mm by our measurement), so we'd class it as a phablet. It won't fit into your front pocket easily and is best used with two hands, although there are features to help out. It's also tall, so reaching for the physical and touch-sensitive buttons below the screen feels uncomfortable. The back button is particularly hard to reach one-handed.

It's available in Charcoal Black, Frost White, Blossom Pink and Bronze Gold. It also comes with the S Pen, which is what puts the 'Note' in the name.

The Quad HD Super AMOLED screen is stunning. The 1440x2560 resolution gives an incredible sense of depth. Not only is it beautifully crisp, but it has excellent viewing angles from any direction and bags of brightness.

The super-speedy 2.7GHz quad-core processor also has 3GB RAM and Adreno 420 graphics. We found it extremely smooth and snappy when launching and switching apps.

We expected impressive results from this powerful smartphone and for the most part we got them. The Note 4 is the first to break the 3000 barrier in GeekBench 3, although it couldn't outpace the similarly-sized iPhone 6 Plus (tinyurl.com/o9rx9un) for graphics.

There's a fingerprint scanner beneath the home button, and a heart rate monitor on the back that can measure your blood oxygen saturation level and even stress level. It isn't as effective as Apple's Touch ID, though.

Interestingly, the Note 4 also has a UV sensor, which Samsung says is the first to be found in a mobile device. It's part of the S Health system, and sits on the back of the phone. You simply point it at the sun and take a reading

The 16Mp rear-facing camera has autofocus and smart optical image stabilisation. HDR offers a live preview, so you can see what your image will look like before capturing it. And you can record 4K video.

A decent 3.7Mp front camera has an aperture of f1.9. There's also a fun Wide Selfie mode, so you can capture more of the environment around you. The size of the Note 4 means taking photographs is not an easy task, though.

Samsung has added lots useful

features to take advantage of the large screen.

Multi Window, for

example, lets you use two apps at once in a split screen view. A window can also be viewed as a pop-up screen that can be moved around.

The S Pen can now emulate various pen and writing types, including a fountain pen or calligraphy pen, thanks to its 2048 levels of pressure sensitivity. We found it useful as a replacement for a finger as an input device - it's accurate and avoids the screen getting grubby.

We all want our smartphone to last as long as possible between charges, and although the Note 4 has a large 3220mAh battery, it didn't blow us away. Realistically, it will last a day and have a bit of charge left, though, not enough to make it through a second, so you'll have to charge it every night. However, it does fast-charge 50 percent of the battery in just 30 minutes and an Ultra Power Saving mode can make that last few percent stretch as far as possible, avoiding cut-off.

Verdict

This phone is a bit of a handful and expensive but Note lovers will be just as enamoured with this one. It is a great device with plenty of power and features as long as you're aware that you're buying a huge phone and will get the most out of what it offers. Otherwise a smaller and cheaper handset is probably a better choice.  **Chris Martin**



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Specification

Android 4.4.4 KitKat; 5.2in (1080x1920) Triluminos display; 2.5GHz quad-core Qualcomm Snapdragon 801 CPU; Adreno 330 GPU; 3GB RAM; 16GB internal storage; microSD slot (up to 128GB); 20.7Mp rear camera AF with LED flash; 2.2Mp front camera; video recording at up to 2160p; Wi-Fi up to 11ac; Bluetooth 4; NFC; 4G LTE Cat 4; nano-SIM; 3100mAh battery; dust and waterproof (IP68); 72x146x7.3mm; 152g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



SMARTPHONE

Sony Xperia Z3

It doesn't feel like long ago when we saw the original Xperia Z, but we're already on the fourth generation of Sony's flagship device - the Z3.

Its styling is similar to that of previous models, with the square shape, side-mounted buttons and rounded sides. The device continues the combination of glass and aluminium, although a new element to the design is the introduction of nylon corners (where it is likely to land in a drop), so in theory you don't make a huge dent in the metal.

Sony continues to offer a dust- and waterproof design, so all the ports, apart from the headphone jack, are located under protective flaps. The phone is also IP68-rated, which is slightly higher on the dust side of things and can be submerged in 1.5m of water for up to 30 minutes.

The new Xperia Z3 is 7.3mm thick and weighs 152g. However, at 72x146mm it's still a big phone. The new completely rounded edges do make a big difference in terms of how it feels in the hand.

Things are largely the same on the hardware front too, so Xperia Z2 (tinyurl.com/nxb5swv) owners have little reason to upgrade.

Despite the LG G3 (tinyurl.com/Lkspk7y) with its Quad HD screen, Sony has stuck to a Full HD resolution (and the 5.2in size), claiming that the higher resolution isn't noticeable or worth sacrificing battery life. Sony does offer its impressive display technology including Triluminos and X-Reality (intuitive contrast enhancement) and the display has bags of brightness, so is a good performer outdoors. However, we can't escape the fact it's the same as before, so it's one reason for Z2 owners to not bother upgrading.

Something else that hasn't changed is the Qualcomm Snapdragon 801 processor. It is clocked higher at 2.5GHz compared to 2.3GHz, although we're not sure this was necessary, and there's still a healthy 3GB of RAM.

It's no surprise that the Z3 benchmark scores were almost identical to those of the Z2. The former scored 2805 in Geekbench 3 compared to the latter's 2796. In general use this phone is once again very nippy.

Despite the higher-clocked chip, and the fact the battery has slightly lower capacity at 3100mAh, Sony claims longer battery life of two days in normal use or even more with Stamina mode switched on. We found battery life to be exceptionally good and this is one of the best smartphones money can buy in this area. It could perhaps have been even better without clocking the processor higher.

On the storage front, there is 16GB only. Luckily, the microSD card slot can take cards twice the capacity at up to 128GB.

As you would expect from a top-end smartphone, there is support for 4G networks but when compared to some other flagships, it's missing features such as an IR blaster, fingerprint scanner and wireless charging.

New features

The first of these is for the gamers out there who own or plan to buy a PS4. The Remote Play feature that allows PS4 games to be played on the Vita is available to the Xperia Z3. This works over Wi-Fi in use with the DualShock 4 controller and an optional GCM10 Game Control Mount. Technically it will work if you're not connected to the same network as the PS4, but Sony will not advertise this as the experience may be unplayable.

Next, is the addition of high-res audio (LPCM, FLAC, ALAC and DSD) - making it the first smartphone to support DSD playback. Sony says you will need a pair of headphones that support the feature such as the MDR-1A range, but we've had no problems with a pair of B&W P5s.

Sony has stuck with the same 20.7Mp camera with its own Exmor RS sensor that's found in previous Xperia Z devices. This isn't a problem, though, as it's one of the best inside a smartphone.

The firm hasn't left the camera without any updates though, as the Xperia Z3 has a new 25mm wide-angle lens so you'll get more into the picture, and introduced an ISO of 12800, the highest available on any smartphone, so you will get better results in low light.



By default, it shoots at 8Mp with an aspect ratio of 16:9, but you can ramp things up to the full 20.7Mp if you're happy with 4:3. You'll need to switch to manual mode to tweak the settings and a happy medium is the 15.5Mp option in 16:9.

In manual mode, you can record video at up to 1080p and 60fps but the phone can record in 4K so open the '4K video' app for this.

Moving on to software and there is little change as the Xperia Z3 has Android 4.4.4 KitKat out-of-the-box. According to Sony, those wanting to upgrade to Lollipop will be able to do so in early 2015.

The user interface remains in essence untouched with a clean, simple and stylish look and feel.

Verdict

The Sony Xperia Z3 is undoubtedly a decent and desirable smartphone, but Z2 owners will have little reason to upgrade unless PS4 Remote Play or high-res audio are must-haves. In terms of the wider market, the Z3 is up there with the best and a solid choice even if it doesn't have the amount of bells and whistles others do. Chris Martin

£365 inc VAT**Contact**■ sonymobile.com**Read more**■ tinyurl.com/o6pvrer**Specifications**

4.6in (1280x720) display;
2.5GHz Quad-Core
Qualcomm Snapdragon
801 CPU; Adreno 330 GPU;
2GB RAM; 16GB internal
storage; microSD slot (up
to 128GB); 20.7Mp rear
camera AF with LED flash;
2.2Mp front camera; video
recording at up to 2160p;
Wi-Fi up to 11ac;
Bluetooth 4; NFC; 4G LTE
Cat 4; Nano-SIM;
2600mAh battery; dust
and waterproof (IP68);
65x127x8.6mm; 129g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**SMARTPHONE****Sony Xperia Z3 Compact**

Flagship smartphones almost always come in a cheaper mini version and the Xperia Z3 Compact is exactly that for the Xperia Z3 (opposite).

Like the full-size phone, it's slimmer and lighter than its predecessor at 8.6mm and 127g. That's not a massive amount but it's a step in the right direction, and that's perfectly thin and light for a mid-size smartphone. As with almost any smartphone, the Z3 Compact comes in black and white, as well as green and orange.

Waterproof design is becoming synonymous with Sony and the Z3 Compact has a high rating of IP68, meaning it's fully dust-proof and can be plunged into water up to 1.5m deep. This does mean slightly annoying flaps cover all the ports, with the exception of the headphone port, but that's the price you pay.

Once again, build quality feels top-notch with Sony's combination of glass and aluminium. An addition to the design are nylon corner pieces (where it's more likely to land) to avoid damaging the metal if you drop the device.

Although the phone is exactly the same size as before, Sony has managed to increase the screen size from 4.3- to 4.6in thanks to smaller bezels around the edge. The resolution remains at 720p, so the bigger display does mean a drop in pixel density to 319ppi, but this isn't really a big deal.

The screen is crisp, bright and the most important thing for us is the amount of real estate on offer. The display is almost as big as the iPhone 6's (tinyurl.com/Lnkvjkk), which is a much larger device. It's also responsive and has optional glove and double-tap to wake options. The 'smart backlight control' will keep the screen on as long as you're looking at it.

Much of the device's hardware is the same as the full-size Xperia Z3, which is something most mini versions don't achieve. Inside is a Qualcomm Snapdragon 801 quad-core processor clocked at 2.5GHz. It does have less RAM at 2GB, but this is nothing to worry about. Storage remains at 16GB and there's the usual microSD card slot for adding more memory (up to 128GB) if you should wish to do so.

**PC ADVISOR**
GOLD

The phone benchmarked well and unsurprisingly similar to the Z3, although better in graphics tests because of the lower resolution. The GFXBench results match and outpace the impressive iPhone 6 Plus (tinyurl.com/o9rx9un), which scored 41fps and 18fps respectively.

Sony touts a two-day battery life for the Z3 Compact, which is the same as the flagship model. The battery itself is larger at 2600mAh compared to 2300mAh of the Z1 Compact but the processor is clocked higher. Stamina mode remains a staple feature helping users get better battery life by switching off functions like Wi-Fi when the screen is off. In our tests battery life was fantastic, lasting up to three days between charges. If left alone, the device will drop only a few percent each day.

Compared to some handsets on the market, namely Samsung phones, the Z3 Compact appears lacking in additional features. Yes, it has 11ac Wi-Fi, Bluetooth 4.0 and NFC but nothing along the lines of an IR blaster, fingerprint scanner or wireless charging.

Instead, Sony is aiming the Z3 range at music fans with support for high-res audio, including a first for smartphones: playback of DSD files. Sony says this will apply if you have a compatible pair of headphones but we've experienced no problems with regular pairs.

There's no scrimping when it comes to photography, so the Z3 Compact has the same 20.7Mp rear camera with Exmor RS sensor as its big brother. It also has a new 25mm wide-angle lens and a super-high ISO of 12800 for improved shooting in low light. By default, it takes photos at 8Mp, but in manual mode you can switch up to 15.5Mp (16:9) and 20.7Mp (4:3) if you like.

The Compact can now shoot video in 4K and there's an improved Steady Shot with Intelligent Active Mode for keeping content smoother. At the front is a decent 2.2Mp camera with Exmor R sensor.

There's one big new feature on the software front and it will appeal to gamers. The device supports PS4 Remote Play meaning you can play full-blown PS4 games on the smartphone over a Wi-Fi connection using a DualShock 4 controller.

Other than this, the software remains familiar, so if you're not into gaming or high-res audio it's pretty much the same old story. The Z3 Compact comes with Android 4.4.4 KitKat and Sony's usual style tweaks.

Verdict

The Xperia Z3 compact is great little smartphone offering pretty much everything available on the full-size Z3. At £349, this is not only the best mini smartphone you can buy, it's one of the best smartphones around. **Chris Martin**

£350 inc VAT

Contact

■ htc.com/uk

Read more

■ tinyurl.com/nvmmbuf

Specification

2.3GHz Qualcomm; Snapdragon 801; 2GB RAM; 16GB storage (plus microSD support up to 128GB); Android 4.4.4 KitKat; HTC Sense 6 with BlinkFeed; 5.2in full-HD (1920x1080, 423ppi) screen; 13Mp front- and rear cameras, both with dual-LED flash; IPX7 splashproof (waterproof up to 1m); NFC; Bluetooth 4.0 with aptX; dual-band 802.11n Wi-Fi; GPS; 4G LTE; front-facing BoomSound speakers; 2400mAh battery; 152x74x8.5mm; 154g

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



SMARTPHONE

HTC Desire Eye

The HTC Desire Eye is the latest in a growing craze of super-selfie smartphones, offering twin 13Mp cameras, both with dual-LED flashes. But how does it fare beyond the vanity stakes?

It might not be as much of a looker as the HTC One M8 (tinyurl.com/ngbwxy9), but this round-edged slab of soft-touch plastic is easy on the eye for a mid-range smartphone. It's available in two-tone blue or white with a red trim.

Extremely thin bezels have allowed HTC to squeeze a 5.2in screen into a chassis just 152mm long and 74mm wide. Combine this with a featherlight 154g weight and the Desire Eye is comfortable to use in a single hand.

Given the twin 13Mp cameras, the Desire Eye is unbelievably thin at 8.5mm. This has been made possible by adopting a central position for the front camera, and top-left corner for the rear. This also makes for less awkward-looking selfies than are seen from phones that demand you hold them in an unnatural position and peer up at the top-right corner of the screen.

That 5.2in screen is a full-HD (1920x1080) panel, with a pixel density of 423ppi. Text and images are very clear, and are displayed with natural colours. Viewing angles are excellent, too. We did find the display a little dull out of the box, though, so ramped up the brightness in the settings.

SIM and microSD slots are found behind doors on the device's left edge, which is a giveaway to its IPX7 protection – it's waterproof up to 1m. With no removable rear panel the Desire Eye's battery cannot be replaced, but this does mean the phone feels very sturdy and won't creak or bend under pressure.

On the top is a headphone jack, while a Micro-USB charging port is tucked away at the bottom. On the Eye's right side is a volume rocker, power switch and dedicated camera shutter button.

The Desire Eye is very responsive and we experienced no lag when browsing the web, flipping through home screens or launching apps. We weren't expecting to be quite so blown away by its performance in our synthetic benchmarks, though.



In Geekbench 3 its 2.3GHz Qualcomm Snapdragon 801 chip, 2GB of RAM and Adreno 330 graphics powered the HTC Desire Eye to a single-core score of 983 points, and a multi-core score of 3009 points. That means it's faster than the HTC One M8 and Samsung Galaxy S5 (tinyurl.com/nhdz6od), and in the multi-core component it even beat the iPhone 6 Plus (tinyurl.com/o9rx9un). Only the Samsung Galaxy Note 4 (see page 42) is faster.

In terms of storage the Desire Eye has what is fast becoming the standard for mid- and high-end Android smartphones: 16GB built in, plus microSD support up to 128GB. You can also take advantage of cloud storage using Google Drive and other third-party apps.

Cameras

The cameras are the key selling point for the Desire Eye. Not only is there a 13Mp f/2.0 camera with a dual-LED flash found at the rear, there's also one at the front, but with a slightly wider f/2.2 22mm lens. This selfie camera is just like any smartphone's primary camera, with support for HDR, slow-motion video, face detection that tracks up to four people in the frame, on-the-fly application of filters, live make-up (adjusted via a slider), manual settings and a timer.

Once you've taken your high-resolution selfie, it will automatically flip around, offering you the view from other people's point of view rather than that which you see in

the mirror. You can flip it back if you prefer, as well as rotate, crop and straighten the image, and even doodle on top. Tweakable effects options include face fusion (allowing you to fuse your face with that of a friend, celebrity or animal), skin smoothing, lighting and face contour (you can quickly lose 10 pounds). Also here you can apply a different filter, and you can add a photo frame, although most of those available are pretty cheesy.

The image quality is perfectly acceptable for a smartphone, with true-to-life colours and little noise.

One thing we really didn't like is the auto-playing slideshow in the Gallery. If you have the sound turned on, it will also play some naff background music, refusing to remember that you have instantly switched this off every time you've ever opened the Gallery.

The HTC Desire Eye runs Android 4.4.4 KitKat out of the box, but HTC says it will be ready to upgrade to Android Lollipop as soon as it is opened. This shouldn't have too much of an effect on performance, but it may improve battery life.

HTC overlays its Sense 6 interface, which includes the BlinkFeed widget. In essence, this is an aggregator for news articles you might like, social media updates, calendar appointments and more.

Verdict

We are thoroughly impressed with the Desire Eye. It's fast, it has a nice screen, sounds great, and it makes you look pretty. Marie Brewis

£189 inc VAT**Contact**■ nokia.com/gb-en**Read more**■ tinyurl.com/p7vtt4t**Specifications**

4.7in (1280x720, 316ppi, 16:9) ClearBlack OLED display; Windows Phone 8.1; 1.2GHz Qualcomm Snapdragon 400 quad-core CPU; 1GB RAM; 8GB internal storage (plus microSD support up to 128GB and 15GB free cloud storage); 802.11b/g/n Wi-Fi; Bluetooth 4; GPS; 4G; NFC; Qi wireless charging; 5Mp wide-angle front camera; 6.7Mp PureView rear camera; nano-SIM; Micro-USB; 3.5mm headphone jack; 2220mAh removable battery; 68.5x8.9x134.7mm; 134g

Build: ★★★★★☆

Features: ★★★★★☆

Performance: ★★★★★☆

Value: ★★★★★☆

**SMARTPHONE****Nokia Lumia 735**

Nokia's Lumia 735 might not be the ultimate selfie phone - that accolade goes to the more recently announced Android-powered HTC Desire Eye (see opposite) and its 13Mp front-facing camera - but with a 5Mp wide-angle front camera and dedicated Lumia Selfie app, it is the best selfie phone for Windows Phone users. And with the recent Windows Phone 8.1 update, Microsoft can expect an increasing number of those.

We have always loved the design of Windows Phone, with its brightly coloured tiled interface offering information updated in real-time, and a simple side-swipe opening a single alphabetical app list that makes finding whatever you're looking for a cinch. But apps and features have long held back Windows Phone.

With 320,000 apps at the last count, the Windows Phone Store still can't hold a candle to Google Play or Apple's App Store, but for most of the tasks you want to complete you'll find apps, and many of the big-name brands are now covered.

Our sample arrived in a bright orange polycarbonate plastic case that's so glossy it just feels shiny. It's also available in white, grey and bright green.

It doesn't look like it, but this case is removable, allowing access to the nano-SIM and microSD slots, plus an also-removable battery inside. You'll soon be able to buy replacement covers for the Lumia 735, meaning you can switch from grey or white to orange or green, depending on which side of bed you got out of. However, with the Qi wireless charging tech built into the case, these will likely be more expensive than standard shells.

Given the removable shell, it's understandable that the screen isn't quite edge to edge, allowing the orange plastic to extend to the front where it looks great against the jet black screen. This panel is ever so slightly raised, too, making the Lumia 735 easier to pry apart but spoiling the smooth finish.

Thanks to slim bezels, Nokia has managed to squeeze a 4.7in screen into a chassis just 68.5mm wide and 8.9mm thick. Despite that shiny finish, it's easy to hold and use one-

**PC ADVISOR**
RECOMMENDED

handed, and even if you should drop it the Lumia 735 feels pretty sturdy, with no flexing or rattling evident under pressure.

The Nokia's display might be 'only' an HD panel (1280x720 pixels), but its 316ppi density is very good for a sub-£200 smartphone and not far off the 326ppi of the high-end iPhone 6. There is some evidence of graininess, particularly when you closely inspect the live tiles, but it will be sharp enough for most people's tastes.

The Lumia 735's 1.2GHz Qualcomm Snapdragon 400 processor and 1GB of RAM would be mildly disappointing in a mid-range Android smartphone, but in our experience the Nokia is plenty fast enough for most users. Although it might not be the best phone for gaming, there is no sign of lag when switching between apps or media, and web browsing is fast.

The one benchmark we could run is SunSpider, in which the Lumia 735 scored 1217ms. This puts it slightly ahead of the £50 more expensive Android-powered HTC Desire 610 (tinyurl.com/ov443j5) with which it shares the same processor and RAM combination.

In common with that HTC Desire 610, you get just 8GB of internal storage with the Lumia 735, but pleasingly there's support for microSD cards up to 128GB in capacity. And because this is a Windows Phone, you also get 15GB of free cloud storage via OneDrive.

Given the £189 price, we're impressed to see Qi wireless charging, 4G LTE and NFC on the Nokia Lumia 735's spec sheet. The wireless tops out at 802.11n.

The Lumia 735 has a 6.7Mp-rated rear camera with Zeiss optics,

autofocus and a single-LED flash. Nokia lists a 4x digital zoom, 1/3.4in sensor, f/1.9 aperture, 26mm focal length and a minimum focus range of 10cm. This camera also shoots full-HD (1080p) video at 30fps.

The main star of the show is the 5Mp front-facing 'selfie' camera with f/2.4 aperture. Its wide-angle lens also makes it good for 'groufies'. Five megapixels is pretty high for a front camera - the highest on a Windows Phone anyway, if now mirrored by several Androids. Not only is it good for selfies, it's also good for video chat. And while at 5Mp it isn't crystal-clear, who wants to post a crystal-clear image of their face - blemishes and all - to the web?

The Lumia Selfie will save an image only when it meets your approval. You can change the aspect ratio to suit your desired sharing medium and rotate the image before doing so. You then swipe left and right to choose a filter, and long-press to compare it to the original.

Next up are options to enhance the photo, and these work incredibly well. Among the enhancements is the ability to enlarge your eyes and make them stand out better, alter the toning, soften the image, make your face slimmer, add a smile and whiten your teeth.

We're amazed to see Qi wireless charging built into the Lumia 735, but while a charger is supplied in the box, it's a standard USB- rather than wireless device.

Verdict

The Lumia 735 is an ideal smartphone for selfies. At just £189, we can picture many a teenage girl - and boy - adding this great-value Windows Phone to their Christmas list.  **Marie Brewis**

£79 inc VAT

Contact

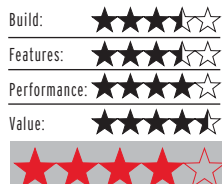
■ amazon.co.uk

Read more

■ tinyurl.com/nwf38sd

Specification

6in (1280x800)
touchscreen tablet; quad-core 1.5GHz processor; 1GB RAM; 802.11n Wi-Fi (2.4GHz only); Bluetooth 4.0 LE; Rear 2Mp camera, front VGA camera; 8- or 16GB internal storage; 169x103x10.7mm; 290g



EREADER

Amazon Fire HD 6

Amazon's Kindle eReaders have long had 6in screens, and now there's a 6in Fire tablet to match. If you like the form factor of a Kindle eReader, but want a fully fledged tablet with a proper web browser, email, Skype and apps, Amazon can now oblige with the Fire HD 6. Notice that Amazon has dropped the 'Kindle' from the name with its latest tablet range, possibly to help differentiate them from plain eReaders.

What's important to note is that this isn't simply a Kindle with a colour LCD screen. We were surprised by how chunky and heavy the HD 6 was compared to the new Kindle (see opposite).

Because of its large bezels, the tablet is larger than many smartphones with 6in screens (phablets, we like to call them). It's also thick at 11mm, and seems unnecessarily heavy at almost 300g.

The extra 100g of weight makes the HD 6 considerably less comfortable to hold in one hand when reading a book, and will make it a two-handed tablet for some people. It's only a millimetre or so thicker, which you're unlikely to notice if upgrading from an existing Kindle eReader, but you will definitely feel the extra width - there's 16mm more plastic to get your hand around, and it does make a difference. The angled edges - in keeping with all recent Fire tablets - don't exactly help with comfort either.

Since there are no page-turn buttons, it isn't really possible to swipe or tap to go to the next page of a book one-handed.

The headphone socket, Micro-USB port and sleep/wake button are on the top edge, along with the microphone, and volume controls are on the left. A single speaker sits at the bottom on the rear,

The bezels may be thinner than the original Kindle Fire tablet, which already looked dated when it launched, but the 6in screen still looks as if it could be bigger. The 1280x800 resolution is decent considering the sub-£80 price, though, and the fact that it's more than 250ppi makes everything look nice and sharp. Amazon doesn't state the technology used, but contrast is acceptable.



Disappointingly, there's no ambient light sensor, so you'll find yourself having to tap, swipe down to display the control centre, tap on brightness and adjust it for different environments or times of the day.

Something new is that you don't have to have a black Fire HD 6. Now there's a choice of five colours including Citron and Magenta.

Hardware and performance

As usual, there's no expandable storage so you're limited to the 8- or 16GB of internal storage in the two models Amazon offers. We were sent the 8GB version for review, which had a total of just 5GB available for apps, photos, videos and other personal files. Even with Amazon's well thought-out cloud storage system, which means that pretty much all your content can be made available via Wi-Fi, there will still be files - music, videos and apps - that you'll want to keep on the device, and 5GB just isn't enough.

That pushes the price to £99 for the 16GB version, and it's an extra £10 (as ever) if you don't want the lock-screen adverts.

Getting back to the hardware, it's good to see front and rear cameras (even if they're basic VGA and 2Mp affairs). If you're buying the HD 6 for a child, they will appreciate them, even though their quality is awful.

The quad-core processor runs at "up to 1.5GHz", according to Amazon, and there's 1GB of RAM.

No-one is going to choose the HD 6 based on benchmark scores, but it managed 1366 in the multi-core section of Geekbench 3, and 776 for single-core. In SunSpider, it completed the web browsing test in a decent 674ms, and this translated to real-world use. The HD 6 loads web pages extremely quickly.

Wi-Fi is as basic as the cameras, but the lack of dual-band support will be inconsequential to virtually all HD 6 owners. You get Bluetooth Low Energy but no GPS.

Amazon recently added FreeTime to its tablet range, and this feature makes the HD 6 a particularly good choice for kids. You can create up to four password-protected child profiles (in addition to two adult profiles), and limit the content each child can access.

One of the best features of FreeTime is that you can set different time limits for apps/games and books. The idea is that you can allow longer (or even unlimited) reading but restrict playing time.

There are a surprising number of updates in the latest version of Fire OS too. The HD 6 runs 'Sangria' or version 4.1.1. It's based on Android KitKat, and you can side-load Android apps by allowing installation from unknown sources.

There's a new weather app, and the email, contacts and calendar apps have been improved. Email, for example, works much like Mail on an iPhone or iPad.

Notifications now appear on the lock screen, and there are behind-the-scenes updates which help to make apps load quicker.

A handy addition is backup and restore, which goes beyond merely storing your content in the cloud and saves device settings, Wi-Fi configuration and bookmarks. This all makes it a lot easier to get going with a new Fire tablet if yours gets lost or damaged.

Verdict

It isn't perfect, but the HD 6 is good value. Performance is above the level you'd expect at this price, as is the screen's quality. **Jim Martin**

£59 inc VAT**Contact**■ amazon.co.uk**Read more**■ tinyurl.com/n2bo9j2**Specifications**

6in EInk Pearl (600x800) screen, 16 levels of greyscale; 4GB internal memory; Wi-Fi; 1-month battery life; experimental web browser; Micro-USB charging; 169x119x10.2mm; 190g

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

**EREADER****Amazon Kindle (seventh generation)**

Once upon a time, Amazon's Kindle eReader with a touchscreen would set you back £109. But now, the new seventh generation model is basically the same as the older Kindle Touch yet costs around half the price.

Apart from the fact that it's black rather than graphite in colour, and has similar bevelled rear edges to Amazon's current tablet range, the new Kindle is really no different to the 2011 Kindle Touch. It has the same 4GB of memory (twice that of the outgoing non-touch Kindle), which is enough for thousands of books.

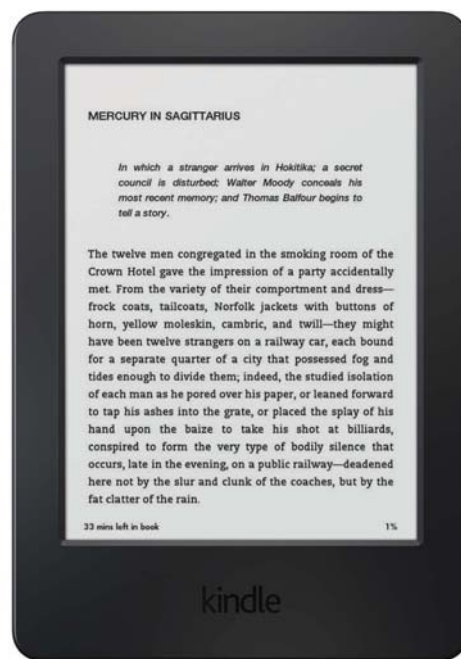
It has the same 6in screen with the same 800x600 resolution, equating to 167 pixels per inch (ppi). That's low by today's standards but on a 16-level greyscale EInk screen, it doesn't need to be much higher. Sure, characters are sharper on the 212ppi Paperwhite (and even crisper on the brand-new 300ppi Voyage) but it isn't going to prevent you enjoying a good novel.

What's changed is an even faster processor, which speeds up page turns. They're fast enough now that you don't really notice the page refreshing – it's certainly a world away from those early EInk screens that would take a second or so to refresh the image.

The touchscreen element is as responsive as you'd expect from a modern tablet, and you can use gestures such as swiping to 'unlock' the Kindle (necessary to remove the lock-screen adverts unless you've paid the extra £10 to obliterate them), and scrolling through menus or web pages.

Anyone thinking of upgrading from a non-touchscreen Kindle will appreciate just how easy it is to type in search queries when looking for a new book in the Kindle store – or simply searching the on-device library. The same goes for typing in Wi-Fi passwords and making notes. You can tap away as fast as you like, and the Kindle will keep up.

It's a shame that Amazon hasn't managed to make the bezels at the sides any thinner, as it would make it easier to hold the Kindle in one hand. In fact, it's odd that this new model is a few millimetres bigger in all dimensions than the



old non-touchscreen model. That's the opposite of improvement in our book. And at 190g, it's also 20g heavier. It's still light enough to hold for long periods, but it's disappointing nonetheless.

In terms of software features, don't expect any difference from your current Kindle – if you've kept it up to date that is. Amazon has been adding features on a regular basis, and a particularly useful one is FreeTime. This works in a similar way to Amazon's Fire tablets. You choose which books each child can read (there's no limit based on age rating), and the child can earn badges when they hit their reading targets for one or more days. You can set the daily reading goal, such as 30 minutes, so the whole experience is customisable. FreeTime also blocks off the web browser, Wikipedia lookup and also stops them from buying books from the store.

One recently added feature is Kindle Unlimited, which costs £8 per month. It's akin to Netflix – you subscribe on a monthly basis and get access to a vast catalogue of books while your subscription is active. As well as ebooks, the subscription includes audiobooks. The problem is that this Kindle doesn't have a speaker or a headphone socket, so you'll need another device such as a tablet to benefit from the audiobooks.

The battery will last for weeks if you read for short periods each day, making it much better than a tablet if you only want to read books, and charges in roughly four hours from a laptop or PC's USB port.

Amazon has designed new leather and PU cases for the Kindle, so you can add a splash of colour. There's the same garish yellow and magenta options as for the new Fire HD 6 and 7 tablets, plus red and purple (and black if you don't want colour). Both versions turn on the Kindle when you open them – a handy feature. The black leather will cost you a hefty £35 while the coloured PU versions are (a still hefty) £25.

Verdict

Aside from the loss of audio functions, you're getting a Kindle Touch for just £59. That's not bad, but don't forget there's no charger in the box. There's more competition these days, though, so if you want a eReader with a lit screen, you can buy the new Nook SimpleTouch GlowLight for just £30 more. And if you're willing to buy second-hand, ebay is full of Kindle Paperwhites which sell for between £60 and £80. Don't forget, too, that the new Fire HD 6 has the same reading features as the new Kindle, and costs just £20 more. If you can live with reading on an LCD screen, then it's a great deal. **Jim Martin**

GRAPHICS CARDS

AMD Radeon R9 290X GPU vs nVidia GTX 780 Ti vs nVidia GTX 970

AMD
£240 inc VAT
Contact
■ amd.com/en-gb

Performance: ★★★★★☆
Value: ★★★★★☆



nVidia GTX 780 Ti
£300 inc VAT
Contact
■ nvidia.co.uk

Performance: ★★★★★☆
Value: ★★★★★☆



nVidia GTX 970
£276 inc VAT
Contact
■ nvidia.co.uk

Performance: ★★★★★☆
Value: ★★★★★☆



Read more
■ tinyurl.com/nvgj8eb

Chip giant nVidia made a splash recently with its double-launch of the 'Maxwell' GTX 970 and GTX 980 graphics cards. While the 980's price will put off all but the most dedicated of gamers, the GTX 970 commands a price at around the £300 mark, making it a viable purchase for those who really love their graphics. However, it has some pretty stiff competition, and the GTX 780 Ti and AMD's Radeon R9 290X both have similar prices.

The Radeon R9 290X, coming as it does from nVidia's hot rival, AMD, is unsurprising as a rival. However, the presence of the GTX 780 Ti is rather more unexpected, since this is a product from nVidia's previous generation, Kepler, and is effectively the GPU that the GTX 970 might be looking to replace. Supplies of GTX 780 Ti cards are already starting to thin out, and we suspect this GPU won't be available in a few months time. But while it is, it's worth comparing it with the newer technology to see if, on this occasion, old is indeed better.

The first surprising aspect of these two cards is that they're both manufactured using the same 0.28nm process. Traditionally, a smaller manufacturing process has been used for each new generation of chips. That allows the GPUs to be smaller, and means they generate less heat, and so can be run at higher speeds.

Maxwell vs Kepler

So how does the GTX 970's Maxwell architecture compare to that of the Kepler-equipped 780 Ti? Well, the older Kepler GPUs came with a carefully designed system that



NVIDIA GTX 780 TI

revolved around the SMX (Streaming Multiprocessor neXt generation) unit. Maxwell, though, will be built up from SMMs (Streaming Multiprocessor Maxwell). These are considerably smaller, so the newer architecture is far more efficient at manipulating data. There's more control over individual areas, and bottlenecks should be reduced. There's also a lot less sharing between different aspects of the architecture, and the high-performance L1 and L2 memory caches have also been enhanced. The L2 cache, in particular, has gone up from 512KB to 2MB.

Not that the newer arrangement is without its problems, though, and that reduced size does mean that each SMM has a lot less on board than the SMXes. A single SMX contains 192 shader cores, while the newer SMMs have just 128. The texture units have been reduced to eight a time on the SMM, from 16 in the case of the older SMXes. Added to that is the fact that the 780 Ti has 15 SMXes enabled, as opposed to the 13 of the GTX 970. So not only do the 780 Ti's SMXes have more of everything, but there are a greater

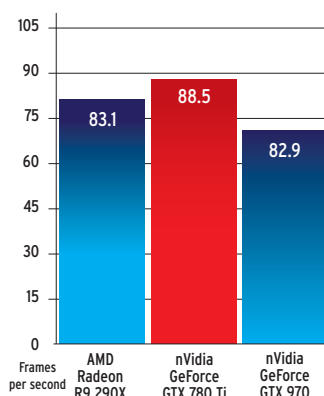
quantity of them. That all adds up, and while the 970 has just 1664 shader cores and 104 texture units, the 780 Ti can boast 2880 shader cores and 240 texture units. These are very significant differences.

The 970 does use its reduced size to allow for higher clock speeds, and the standard version's Boost core clock speed of 1178MHz is some 250MHz higher than the default figure of the 780 Ti. Even so, more texture units might be more important. When it comes to traditional texture fill rates, for instance, the 780 Ti's higher number of texture units seem decisive, giving it a fill rate of 222.7GT/s. The 970, in contrast, limps to a rather pathetic 122.5GT/s.

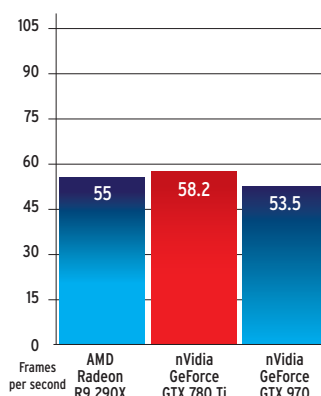
It doesn't get any better for the memory, either. The 970 has 4GB of GDDR5, which gives it a small advantage over the 3GB 780 Ti. However, while both GPUs have the same 1.75GHz memory clock, the 780 Ti's 384-bit memory bus has been reduced to 256-bit on the 970. On paper, then, the 970 doesn't fare well on traditional memory bandwidth calculations, producing a bandwidth figure of 224GB/s, rather than the 336GB/s of the 780 Ti.

However, it's important to stress that many of these advantages

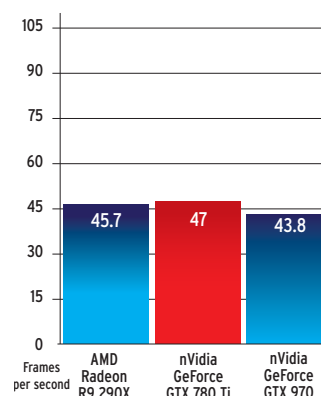
Crysis 3 (1900x1200)



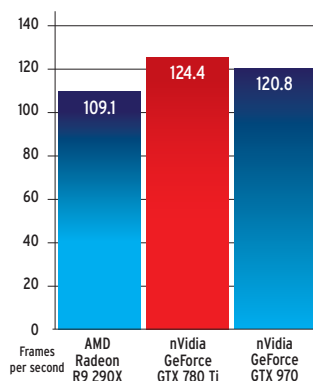
Crysis 3 (2560x1600)



Crysis 3 (3840x2160)



Bioshock Infinite Rage (1920x1080)

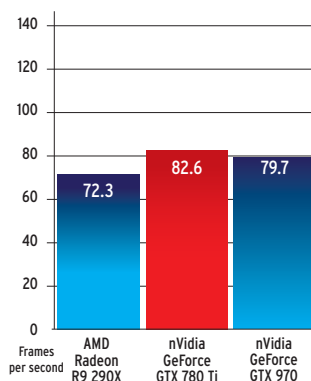


are on paper rather than in reality. Traditional calculations can't take into account the greater organisation and flexibility of the Maxwell architecture. Nor can they make allowances for Maxwell's Third Generation Delta Color Compression. This interesting concept uses compression to allow the memory bus to work with more data without creating bottlenecks. So while the 256-bit memory bus may be vastly inferior to the 780 Ti's 384-bit version on paper, the reality may see the two come rather closer together.

AMD Radeon R9 290X

So where does the R9 290X come into this? After all, this product is likely to be still around and competing long after the 780 Ti disappears from the shelves. Well, on paper, it comes in somewhere between the 970 and the 780 Ti. The standard 290X offers 2816 shader cores - similar to the 780 Ti's 2880, and a huge distance clear of the 970's 1664 shader cores. The 290X also has rather more texture units compared to the 970's - 176, against the 104 of the Maxwell GPU. The 970 retains a lead in terms of

Bioshock Infinite Rage (1920x1080)

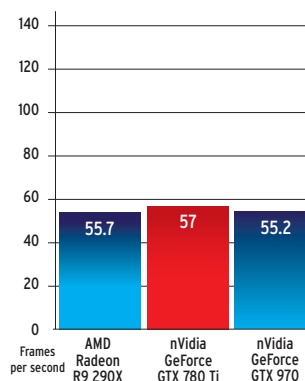


core clock speeds - 1178MHz rather than the 290X's 1GHz - but it's the 290X that wins out on overall texture fill rates, touting a figure of 176GT/s over the 970's 122.5GT/s.

It's little better on traditional memory bandwidth, despite the 970's effective 7GHz memory clock speed being some 2GHz higher than the 290X's 5GHz. The 290X does match the new Maxwell GPU on GDDR5 memory though, offering an identical 4GB complement. And the 290X's massive 512-bit memory bus is twice the size of the 970's, culminating in a bandwidth rate of 320GB/s for the 290X rather than the paltry 224GB/s of the 970. As with the 780 Ti, though, these figures don't reflect the high efficiency of the Maxwell GPUs, so we'll have to look at the games tests to determine how they compare in a real world situation.

Maxwell's real charm comes in its low power consumption. These days, it's about conserving energy, and the 970 puts out an astonishingly small amount of wattage given its capabilities. The GPUs come with a TDP (Thermal

Bioshock Infinite Rage (1920x1080)

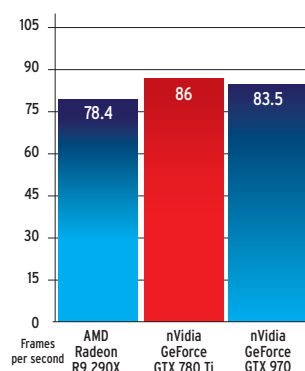


Design Power) figure, that estimates how much power your system will need to handle when using one of these products. The GTX 970's TDP of 145W compares very favourably with the 170W quoted for the much older and significantly slower GTX 760. The 780 Ti hits a rather steep 250W in comparison, while the R9 290X gets up to 300W. In reality, the difference isn't quite as large, although we did frequently see a gap of 89W under load between the R9 290X and the 970. The latter was also rather lower than the 780 Ti, this time seeing a difference of 74W. This is remarkable given the technology, and is proof that Maxwell extracts performance at a fraction of the power.

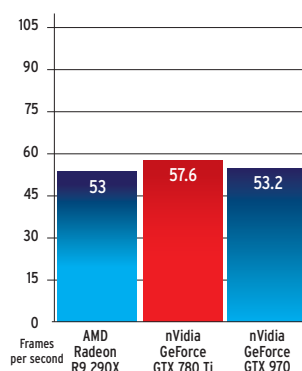
Crysis 3

The 780 Ti leads all the way, although its advantage seems the best at the lowest resolution of 1900x1200, leading here by 5.4fps. By the time we get up to 3840x2160, the gap over the rest has fallen to just 1.3fps. The 290X is the best of the other two, albeit not by much. It leads the 970 by a mere 0.2fps at the lowest resolution,

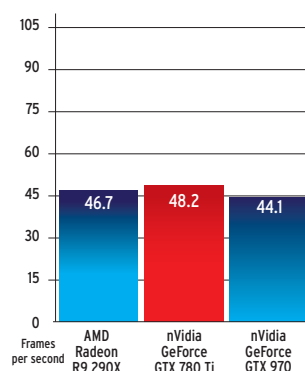
Battlefield 4 (1900x1200)



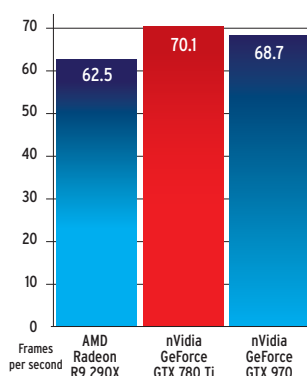
Battlefield 4 (2560x1440)



Battlefield 4 (3840x2160)



Thief (1920x1080)

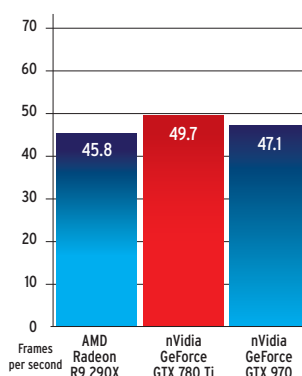


although that lead does go up to 1.9fps as the resolution goes up.

Bioshock Infinite Rage

As a percentage, the 780 Ti is much closer to the competition in this game, eking out a lead of 3.6fps at 1920x1080, and seeing this fall to just 1.3fps at 3840x2160. This time, though, it's its stablemate, the Maxwell-powered 970, that hits hardest, working up a 10.7fps lead at the lowest resolution. The AMD almost closes the gap at 2560x1440 to 7.4fps, and actually overtakes its rival at 3840x2160, leading it by 0.5fps. Overall, though, the 970 is better than the AMD here.

Thief (2560x1440)



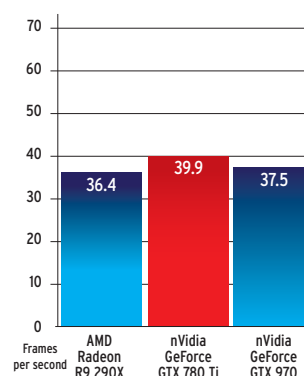
Battlefield 4

The results are very similar in this game, with the 780 Ti holding small but consistent leads throughout, starting at 2.5fps at 1900x1200, and ending in 1.5fps at 3840x2160. Once more, the 970 beats the AMD at the lower resolutions, leading it by 5.1fps and 0.2fps at 1900x1200 and 2560x1440, before dropping 2.6fps behind at 3840x2160.

Thief

This is probably the game where the 970 is closest to the Kepler-powered 780 Ti. The latter leads by just 1.4fps at 1920x1080, but has extended this to 2.4fps by the time

Thief (2560x1440)



it reaches 3840x2160. The AMD is again behind, although only at 1920x1080 is the gap significant - 6.2fps. The lead drops to 1.3fps at 2560x1440, and becomes a mere 1.1fps at 3840x2160.

Verdict

There's very little wrong with the nVidia's GTX 780 Ti. Kepler may be older technology, but cards with the 780 Ti are still powerful. At the time of the 970's launch in October, the 780 Ti was still rather expensive, but prices have come down. Failing this, the 970 is a very good product, despite its slightly lowly on-paper specifications. Robin Morris

	AMD RADEON R9 290X £240 to £300 inc VAT ★★★★☆	NVIDIA GEFORCE GTX 780 TI £300 to £390 inc VAT ★★★★☆	NVIDIA GEFORCE GTX 970 £276 to £3200 inc VAT ★★★★☆
Memory	4GB	3GB	4GB
Chip	Hawaii	GK110 (Kepler)	GM204 (Maxwell)
Transistor count	6.2 billion	7.1 billion	5.2 billion
Manufacturing process	28nm	28nm	28nm
Standard core clock	Standard Boost to 1GHz	875MHz (boost to 928MHz)	1050MHz (boost to 1178MHz)
Standard memory clock (DDR effective)	1.25GHz (5GHz)	1.75GHz (7GHz)	1.75GHz (7GHz)
Memory bus	512-bit	384-bit	256-bit
Compute units or streaming multiprocessors	All 32 CUs enabled	15 SMXes enabled	13 SMMs enabled
Stream processors	2816	2880	1664
Texture units	176	240	104
ROPs	64	48	64
FP64	1/8	1/24 FP32	1/32 FP32
Texture fillrate	76GT/s	222.7GT/s	122.5GT/s
TDP	Around 300W	250W	145W



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£999 inc VAT

Contact

■ optoma.co.uk

Read more

■ tinyurl.com/ndk2wr5

Specification

Single-chip DLP; 1920x1080 pixels; 2x HDMI, component and composite video, VGA, RS232c, 12V trigger; vertical lens shift, Eco mode; PureEngine picture processor; 2200 ANSI lumen specified brightness; 50,000:1 specified dynamic contrast ratio; 5000-hour lamp life; 1000-hour/6-month lamp warranty; 29dB Eco operating noise; 1.39 - 2.09:1 throw ratio; compatible with Optoma ZF2100 Active Shutter 3D system; 270W Bright mode, 230W Eco mode quoted power consumption; 286x266x124mm; 3.8kg

Build: ★★★★★☆

Features: ★★★★★☆

Performance: ★★★★★★

Value: ★★★★★★



PROJECTOR

Optoma HD50

The Optoma HD50 is a full-HD (1920x1080 resolution) single-chip DLP projector aimed at the home-cinema and high-end gaming market. It offers greater contrast and higher brightness than its predecessor, the HD30 (tinyurl.com/p7k5nwc), along with a number of image processing and operational refinements. It is, not to put too fine a point on it, a bit of a belter.

The snowy white HD50 is conveniently small, just 286mm wide and 124mm high. It's also light at 3.8kg. This makes it easy to pack away should you not want a permanent ceiling or shelf mount.

The lens is offset, and there's a forward-facing exhaust that expels a lot of hot air. Heavy venting is employed to help keep the projector's lamp cool, but even in its quieter Eco mode it still runs at a relatively loud 29dB. There's no onboard sound system (unusual for a sub-£1,000 model).

Connectivity

Connections comprise two HDMI inputs, supporting CEC control and MHL for smartphones, component and composite video inputs and VGA. Also available are a 12V trigger, RS232 and 3D sync port.

The HD50 is 2D from the box, but can be used with Optoma's optional ZF2100 Active Shutter 3D system, which is a £90 extra. It ships with a matching, backlit remote control.

Installation is straightforward. There's a manual 1.5x zoom lens and vertical lens shift, to help align the image with whatever screen you're using, be it specialised fabric



PC ADVISOR
RECOMMENDED

or white wall. Once positioned and focused, you can opt for any of the well-judged display presets; or if you prefer, dig deeper into the various calibration tools, including a full RGB colour management system.

Room-wise, you'll need just over 2m to cast an image 120in across. If you have more space available, and a pretty big wall or screen, you'll be able to go even larger.

At 2200 ANSI lumen the HD50 is bright enough to function with low-level lighting, but looks its best in full black-out conditions.

Its 1080p images were consistently sharp, and while black levels weren't absolutely Stygian (you'll need to pay twice as much for that), contrast is high. There was no sense that blacks were greying out.

It's possible to boost black level depth by using a Dynamic Black mode, which adjusts the lamp output dynamically, based on image content. Unfortunately, this also causes the projector's cooling fan to speed up audibly from its Eco default. This can be

distracting, depending on how close you sit to the projector.

Lamp life

The lamp itself has a quoted working life of 5000 hours so you shouldn't need to contemplate changing it anytime soon. Optoma's warranty for the bulb is 1000 hours or six months, whichever event is first.

Colour fidelity is terrific, with deep reds and vibrant blues. The neon-lit street scenes in the *Total Recall* reboot on Blu-ray looked sensational.

The image-processing suite responsible has been dubbed PureEngine by Optoma. There's an UltraDetail mode designed to eke every ounce of detail from hi-def sources; and PureMotion image interpolation, which doesn't improve motion resolution per se, but imparts that smooth panning high framerate look so beloved of Peter Jackson. Our advice is keep this Low to avoid image artefacts.

Single-chip DLP projectors have long suffered with a rainbow fringing effect with high-contrast material, created by the system's spinning colour wheel. That's been all but eliminated here. Images are refreshingly clean.

Verdict

The Optoma HD50 comprehensively over delivers on its upper budget price tag. HD images are exceptionally detailed, making this an ideal partner for a set-top box, Blu-ray player or next-gen games console. Operating noise is our chief remaining complaint. Overall usability is high. Consequently, the HD50 is the sub-£1k 1080p projector to beat right now. **Steve May**



£900 inc VAT**Contact**■ philips.co.uk**Read more**■ tinyurl.com/k3d3sym**Specifications**

55in LCD TV; 1920x1080 pixels; Freeview HD, satellite tuner; 10W stereo audio system; 4x HDMI, SCART, component (YPbPr)/composite; stereo phono audio input; digital optical audio output, 3.5mm headphone jack; 10/100 ethernet, CI card slot; 2.4GHz 802.11n Wi-Fi built-in/Wi-Fi Direct; Ambilight 2-sided with Hue compatibility; Active Shutter 3D; 53W quoted EU Energy power consumption; 1231x715x54mm (without stand); 19.9kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**55IN LCD TV****Philips 55PFS6609**

Philips latest 6-Series screens are as pretty as a picture. With their ultra-narrow grey bezel and snowy white back panel, they immediately stand out from the crowd. Add a neat swivelling stand and, of course, Philips' integrated Ambilight mood lighting, and you have a flat panel proposition distinctly different from cookie-cutter rivals.

Although Philips televisions have a reputation for being inscrutable, the brand appears to have reined in its loopy picture processing predilections considerably with this 55-incher. Now you really don't need to tweak overmuch to get a picture commensurate with the cosmetics.

If you need something a tad smaller, this 55in 6-series model is also available as the 48in 48PFS6609 and the 40in 40PF6609, priced at £750 and £600 respectively.

Connectivity errs on the generous side, with four HDMI ports, SCART, component video with stereo phono audio, ethernet and two USB sockets.

While the TV will timeshift to an external USB HDD, you can also use a USB stick to provide simple Pause functionality. A 4GB or larger USB thumbdrive is required to do this. There's also a digital optical audio out, and both Freeview HD and satellite tuners.

The brand's Smart TV platform remains somewhat middling. Key attractions include Netflix, Blinkbox, BBC News and Sport, iPlayer, Spotify, YouTube, Viewster, Facebook, Skype and Twitter.

Unusually there's also a Cloud TV tab that opens up a host of limited interest IPTV services from across Europe. The main Freeview TV guide is disappointingly dull, lacking a live TV window or audio.

Multimedia playback support is fine, however, with all key codecs and containers playable across the network and from USB. We had no trouble unspooling a wide assortment of MKV, MOV, MP4, AVI, WMV, AAC, M4A, FLAC, WAV, MP3 and WMA files.

Performance

High-definition image quality was impressive, once we'd undertaken some modest manipulation. Our



suggestion would be to turn sharpness down to 1 and choose the Standard image preset for the best black-level performance.

If you have calibration gear and want to dig deeper, selecting the ISF Day or Night modes opens up additional calibration options. Most users though should be content to explore the various presets, which include the usual mixture of movie, game and dynamic shop modes.

Motion handling, rated at 400Hz, is good but not outstanding, typically retaining around 900 lines of subjective motion resolution. Anything other than the Minimum setting for Philips HD Natural Motion processing brings unwanted smudgy motion artefacts.

Philips TVs typically punch above their weight when it comes to audio, and the 55PFS6609 is no exception. The 2x 10W sound system sounded surprisingly full-bodied, which may or may not be down to the madly named Ambi-Woox processing.

The set's Active Shutter 3D system is also rather good. While there is still some minor crosstalk evident, general stereographic imagery holds up well, displaying a good sense of depth, although some brightness is lost. Two pairs of glasses are supplied with the set.

If you've not seen Ambilight of late, it's worth noting that this latest

iteration is wonderfully effective. Presented here in two-sided format, it comprises LED lights running left and right of the screen in stereo formation. The general idea is that they pick up on colours within any broadcast image and create an ever-changing light show around the TV.

Of course, it's a little more sophisticated than that. You can alter the vividness of the light show, opt for a natural static lighting effect, or compensate for different wall colourings.

Owners of Philips Smart lighting Hue system can also integrate Ambilight into that as well. We partnered a couple of Hue Bloom uplighters and Hue lamps to our Ambilight screen and created a kaleidoscopic room of pulsating vibrant colours – great for a hyper immersive gaming experience, perhaps less so for casual TV watching.

Verdict

Overall, this 6 Series Philips TV has much going for it. Both sound and vision are a cut above the norm, and while it wouldn't be our top choice if connected Smart functionality was top priority, or we wanted a screen specifically optimized for sports, it's made significantly more desirable by the moody magic of Ambilight. **Steve May**

SMARTWATCH

VTech Kidizoom Smart Watch vs Leapfrog LeapBand

VTech
£40 inc VAT
 Contact
 ■ vtech.co.uk

Ease: ★★★★★
 Features: ★★★★★
 Performance: ★★★★★
 Value: ★★★★★



Leapfrog
£30 inc VAT
 Contact
 ■ leapfrog.com/en-gb

Ease: ★★★★★
 Features: ★★★★★
 Performance: ★★★★★
 Value: ★★★★★



Read more
 ■ tinyurl.com/qcnjbhe

Motorola, Sony and Samsung have all released smartwatches, but there's a growing market of devices for children. Two companies, Leapfrog and VTech, have both launched watches aimed at the younger market. Here we put them through their paces.

The VTech Kidizoom Smart Watch (pictured right) is a watch that offers a bunch of fun multimedia functions, such as the camera (still and video) and a hilarious voice recorder. It's aimed at keeping children entertained.

The device's three games aren't very engaging but playing with the camera and voice recorder are fun and should keep children entertained. There are about 50 different watch faces (analogue and digital), many of which are hideous to adults but fun for kids. It's a shame VTech didn't build a time-telling game, though, as this would have been perfect.

The Leapfrog LeapBand (below) is aimed at keeping kids fit by encouraging active play, plus healthy eating habits. It sets a series of fun physical challenges - walking,

running, jumping and dancing - that the wearer tries to complete to earn credits to spend on their virtual pet: feeding, cleaning, grooming and clothing the pet as they earn more points. Activity is measured with the built-in accelerometer, just like you'd find in the iPhone or activity trackers.

Both are well-made and comfortable wristbands with a watch function combined with other features, and around the same size - chunky. The LeapBand is slightly larger, and we prefer the looks of the Smart Watch, which is slightly less ungainly.

While LeapBand rewards kids for jumping around and keeping fit, the VTech sends kids off taking photos and videos and then manipulating them with special effects.

Both feature a stopwatch (which kids love), although the Smart Watch goes further with an Alarm and countdown Timer. Each is fun but different in their features, so a child could even have one for fitness fun and the other for more entertainment. Neither band's games are particularly great. The Smart Watch has three, but the camera and voice recorder offer more fun; the LeapBand has more games, plus the fun fitness challenges.

Neither is waterproof, so keep them away from bath time!

The LeapBand is available in more colours (green, blue, orange and pink) compared to the three versions of the Kidizoom (white, blue and pink). It's also £10 cheaper, and we've seen it on sale for as little as £22. We couldn't find the Smart Watch for much under the £40 RRP,



VTech KIDIZOOM SMART WATCH

although the pink model was around £32 at a few online stores. Strangely the white version was often more expensive than the blue or pink.

We liked both the Kidizoom and the LeapBand so it's really up to parents to decide which features work best for them. The LeapBand is great for encouraging healthy activity while the Kidizoom is best for entertaining kids with its camera and microphone.

Verdict

So which is best: Kidizoom or LeapBand? The VTech Kidizoom Smart Watch and Leapfrog LeapBand are both quality wearable wristbands for kids, but there the similarities end. They are different in features. The VTech is aimed at multimedia entertainment, while the worthier LeapBand goes for child fitness and activity. As such it's difficult to say which is best for you. Both are a lot of fun. The healthier LeapBand is cheaper but lacks the camera and microphone of the cooler Smart Watch - which is entertaining but not much more, and is let down a little by the overly simple games. ☒ **Simon Jary**



LEAPFROG LEAPBAND

£349 inc VAT**Contact**■ fujifilm.eu/uk**Read more**■ tinyurl.com/qevr9qL**Specifications**

512GB solid-state drive;
2.5in SATA Revision 3
(6Gb/s); 7mm form factor;
19nm MLC NAND flash; 53g

SOLID-STATE DRIVE**Fujifilm HQ-PC Series 512GB**

The Fujifilm company is best-known for its photography products, stretching back in its long history to its position as a supplier of photographic film. More recently it has diversified into electronic hardware and media, such as Fujifilm FinePix digital cameras and flash memory. Now it's selling solid-state drives for PCs and laptops.

Two models of SSD are available, the Fujifilm HQ-PC Series reviewed here, and a higher-specification range named Fujifilm HQ-Pro Series. Both ranges include models with capacities of 128-, 256- and 512GB, with the Pro also adding an extra 60GB option.

Both drives resemble closely the Toshiba Q Series SSD (tinyurl.com/pne2gvr) from the outside, built around the same slim 7mm dot-speckled aluminium case, with a large name sticker applied in the centre of the top side.

The drive uses 19nm MLC NAND stock, we're told, although as with Toshiba SSDs there's little other information available about the technical specification.

Performance

We tested the 512GB capacity HQ-PC Series drive. In the simple ATTO Disk Benchmark test, the Fujifilm SSD easily surpassed the 500MB/s mark, hitting maximums of around 552MB/s reads and 520MB/s writes.

In CrystalDiskMark we had the first clue that this was not quite identical to a Toshiba Q Series Pro, as while the 32-queue depth 4kB

random read was the same at 373MB/s - or 95,488 IOPS - the Fujifilm showed conspicuously faster write performance. The Toshiba measured 251MB/s, while the Fujifilm measured 342MB/s. In single 4kB threads, the Fujifilm provided 26- and 120MB/s reads and writes; the Toshiba 23- and 78MB/s.

In fact, testing a sample of the Fujifilm HQ-Pro we could see that in this test this latter drive is more like the Toshiba Q Series Pro that we tested earlier this year.

Looking at IOPS results again, AS SSD benchmark returned results for the Fujifilm HQ-PC that coincided closely with the Toshiba Q Series Pro. Both drives reached similar scores (999 and 1000 points); and best-case IOPS were 91,767 (Fujifilm) and 91,913 (Toshiba) for 64-thread 4kB random reads.

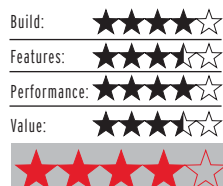
In terms of 4kB random writes (QD=32), the drives measured at 58,447 and 58,044 IOPS respectively; almost identical.

We are tempted to conclude that the Fujifilm is the same as Toshiba Q Series in terms of components, with a slight tweak in the firmware that could result in the more favourable write performance in CDM's higher queue-depth random write test.

In the AS SSD benchmark test, both drives measured effectively identical in all sub-tests.

Verdict

The Fujifilm HQ-PC Series 512GB is a fast SSD, following the solid design of the Toshiba THNSN SSD upon which it appears to be based. With quality assured, it can come down to price to choose which model to buy.  **Andrew Harrison**



AS SSD Benchmark 1.7.4739.38088

FileEditViewToolsLanguageHelp

X: Fujifilm Fujifilm HQ-PC S SCSI Disk Device

Fujifilm Fujifilm HQ-PC JUGA iaStorA - OK 1024 K - OK 476.94 GB	Read:	Write:
☒ Seq	486.32 MB/s	465.91 MB/s
☒ 4K	20.21 MB/s	74.02 MB/s
☒ 4K-64Thrd	358.47 MB/s	228.31 MB/s
☒ Acc.time	0.126 ms	0.063 ms
Score:	427	349
	999	

Abort

PERFORMANCE SCORES:
Fujifilm HQ-PC Series 512GB

AS SSD Benchmark 1.7.4739.38088

File Edit View Tools Language Help

X: TOSHIBA THNSNJ512GCST SCSI Disk D

TOSHIBA JTRA iaStorA - OK 1024 K - OK 476.94 GB	Read:	Write:
☒ Seq	476.81 MB/s	466.31 MB/s
☒ 4K	20.04 MB/s	77.32 MB/s
☒ 4K-64Thrd	359.03 MB/s	226.73 MB/s
☒ Acc.time	0.123 ms	0.039 ms
Score:	427	351
	1000	

PERFORMANCE SCORES:
Toshiba Q Series Pro

Abort

£120 inc VAT**Contact**■ devolo.com/uk**Read more**■ tinyurl.com/qe6macw**Specifications**

Ethernet 10/100/1000Mb/s;
powerline
200/500/600/1200Mb/s;
Powerline OFDM,
4096/1024/256/64-QAM,
QPSK, BPSK; Powerline
2880; security 128-bit AES;
standards: IEEE 802.3,
IEEE 802.3u, IEEE 802.3ab,
IEEE 802.3x, IEEE 802.3az,
IEEE 802.1p, Auto MDI/X

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**POWERLINE ADAPTOR****Devolo dLAN 1200+**

Today's homes require an ever-increasing number of network connections: from smart TVs, Sky+ and Virgin Tivo set-top box PVRs or Apple TV, PC or laptops, games consoles and even smart thermostats. All of these reach their full potential when connected to a decent home internet connection.

Simply plug one adaptor into a power socket by your internet router or modem (and link with an ethernet cable), and the other in a power socket in the room where you require another ethernet connection. The signal is carried over your home's internal wiring.

We've tested many powerline adaptors, and we're lucky now to be in a period of technological advance for the products. Where once the top speed was 200Mb/s most powerlines work at claimed speeds of 500Mb/s. And now we have our first 1200Mb/s Powerline adaptor, the Devolo dLAN 1200+, specially built for Gigabit transmission speeds.

Unfortunately, such speed claims are inaccurate. They are the theoretical maximum speeds of the chips used within the adaptors. In actual live tests the speeds are much slower, but a 500Mb/s powerline will be faster than a 200Mb/s adaptor, and the new 1200Mb/s adaptor tested here is faster still. The most you can really hope for with such adaptors is around 100Mb/s, but that's enough to massively speed up your home network if you're used to slow Wi-Fi speeds.

Devolo Powerline adaptors have been favourites of ours for a while. They are well made and often offer extra features you won't find in other makes. With its dLAN 650 adaptors, the company used its Range+ technology that uses not just the Live and Neutral wires in your home's electrical wiring, but the Earth wire, too.

The new dLAN 1200+ Powerline takes this a step further. It operates using what Devolo calls diversity. Not only can both possible paths (live- and earth-neutral) of data transmission be used, but only 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.

In addition, it uses the MIMO (Multiple Input Multiple Output) principle. The lines between live-and earth-neutral are used simultaneously for data transmission, which makes it possible to double bandwidth. In effect there are two 600 series adaptors working simultaneously in each 1200 series adaptor.

This is made possible by the new QCA 7500 chipset, which offers enhanced processing power compared to the previous model. Again, increased stability and range are the advantages.

Devolo engineers also claim to have lowered the power consumption in this latest Powerline range. When in use, the dLAN 1200+ uses a maximum of 4.2W, and if the connected terminal device is switched off, the adaptor automatically goes into standby mode, using just 0.7 watts.

The dLAN 1200+ is equipped with a gigabit ethernet connection and a gigabit ethernet cable. The Starter Kit, including base and second adaptor unit plus cables, costs £120. Additional adaptors can be bought for £65.

We test every Powerline adaptor under common conditions to get a fair comparison on speeds. This means 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.

We compared the Devolo 1200+ to two other fast powerline adaptors: Devolo's own dLAN 650 (tinyurl.com/nc8muo3) and TrendNet's Powerline 500AV2

(tinyurl.com/n96tkeL), our fastest-rated powerline to date. The 1200+ lived up to its technical chops, beating both formidable rivals.

In our fastest-possible test, where the two adaptors are placed next to each other, the 1200+ reached 357Mb/s. While this is a lot lower than the bold 1200Mb/s claim, it is much faster - nearly twice so - than its closest rival's 186Mb/s result. The TrendNet scored 137Mb/s in this test.

In our real-world tests, the second adaptor is placed in a room two floors down from the base unit and modem/router - in a Victorian terraced house. The 1200+ again romped home, scoring an average speed of 126Mb/s. Our previous fastest in this set up had been 88Mb/s.

The adaptor has an integrated electrical socket and mains filter, which means you don't use up a valuable electrical power socket in each room it is installed.

For security, especially in shared living environments, users can activate the 128-bit AES encryption at the push of a button to avoid any unauthorised access to the network.

You can use the Devolo Cockpit software on Mac, Windows or Linux (and there's the obligatory app) to configure and manage encryption - but the system will work straight out of the box just by plugging it into a socket and connecting to your router/modem.

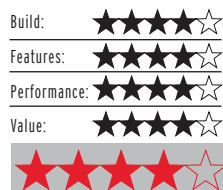
Verdict

The dLAN 1200+ is the fastest powerline adaptor we've tested, and its integrated electrical power socket is a real bonus, although we'd love it to feature additional Wi-Fi and an other ethernet port on the second unit.  **Simon Jary**



£49 inc VAT**Contact**■ mobilefun.co.uk**Read more**■ tinyurl.com/offxqhp**Specifications**

3W LED; 3W speaker;
AC110-240V; Bluetooth 4.0
(15m range without
obstructions); E27 Edison
screw fitting (B22
bayonet adaptor included
in the box); 50x126mm;
two-year warranty

**BLUETOOTH SPEAKER****Olixar Light Beats Bluetooth Speaker Bulb**

Olixar's Bluetooth Speaker Bulb might sound like a gimmick, but it's actually really cool, taking mood lighting to a new level - and a fantastic idea for a gift.

The beauty of pairing light bulb and speaker is that, provided the light is turned on, the speaker is fired up and ready to go. There's no fiddling with buttons, and no need to charge the speaker or plug it into a wall outlet. You just grab your phone or tablet, connect to the Olixar Speaker Bulb over Bluetooth 4.0, and are instantly ready to blare out music, podcasts and audiobooks from the ceiling.

This high up, central position is ideal for rocking out audio without obstruction. Not that this 3W speaker is especially loud, but loud enough - about the right level to create a nice atmosphere and fill the room without annoying those in the flat or room upstairs.

One down side to pairing light bulb and speaker is that with no way to separate the two the

speaker is good only as long as is the bulb. That said, Olixar offers a two-year warranty and LED lasts much longer than a traditional incandescent bulb in any case - around 10,000 hours. There are other benefits to LED lighting, too, such as reduced energy consumption and less heat generated. The £49 tag on the Light Beats Bluetooth Speaker Bulb is therefore much better value than it might appear.

The 3W LED is said to kick out enough light to rival a 50W bulb, but its end cap (visible only when the light is on) meant the 46W bulb we replaced did a better job of lighting our room. We can live with that, given its additional functionality, but if you prefer brighter lighting you may find the Olixar more usefully paired with a lamp - especially considering that when used with the supplied bayonet adaptor this otherwise

**PC ADVISOR**
RECOMMENDED

cool-looking white plastic and gold speaker bulb is rather long.

The Bluetooth connection is functional over 15m without obstructions. We found the output would break up a little when we took our paired phone into the next room and shut the door, but when used in the same room we couldn't fault it.

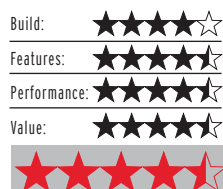
Sound comes from the flower-patterned opening on the underside. The audio is clear and without distortion, and seemed to struggle with only the bassiest tracks.

Verdict

The Olixar Light Beats Bluetooth Speaker Bulb is such a cool idea, really useful and a fantastic gift for that person who has everything.  **Marie Brewis**

£135 inc VAT**Contact**■ swann.com/uk**Read more**■ tinyurl.com/p4xbaog**Specifications**

IP security camera;
1280x720-pixel resolution;
30fps; 802.11 b/g/n Wi-Fi;
infrared LEDs for night
vision up to 5m; microSD
slot; Micro HDMI out;
68x85x130mm; 131g

**IP SECURITY CAMERA****Swann ADS-456 SwannCloud HD**

Swann has a reputation for devising effective surveillance systems that won't break the bank and its latest solo security camera, the ADS-456 SwannCloud HD is an inexpensive model that still aims to give user satisfaction.

An upgrade on the ADS-450 (tinyurl.com/n5p8xtw), the ADS-456 weighs 131g and fits in the palm of your hand. It comes with a small stand that doubles as a mountable bracket - complete with screws and plugs - should you want to fix it to the wall, ceiling or furniture.

The useful feature of this camera is its Wi-Fi connectivity, although you will need to be within reach of a power socket as it still requires mains power. You can also connect more securely by ethernet.

Establishing a Wi-Fi connection can be through WPS, pressing the WPS button on the back to link to your router. A flashing blue light on the camera signals confirmation. Once connected, you can then download the SwannCloud app to

your Android or iOS device to start watching live streaming.

You can also access the same information via the SwannCloud website. A built-in microphone on the front of the camera provides live sound, while a circle of infrared LEDs enable night vision up to 5m. The camera sensor captures video footage in basic HD, 720p at framerates up to 30fps. A microSD card slot can be used to grab snapshots on the fly.

Picture quality is good - bright and sharp with strong contrasts in the daylight and clear IR outlines at night even in pitch-black conditions.

You can preset 10-second video captures for motion detection (there's a Passive Infra-Red motion sensor on the front), intrusion detection (which angle an object enters the frame), camera tampering and face recognition. Alerts can automatically be triggered and all the footage can be stored on the SwannCloud for later viewing. If you have an existing alarm system, this

**PC ADVISOR**
RECOMMENDED

can also be directly linked to the back of the camera.

Swann has also released the companion ADS-446 model, which has all the same features plus the ability to pan up to 350 degrees horizontally and tilt 100 degrees vertically - all remotely controlled and costing about an extra £20.

Verdict

Swann is on to a winner here with an affordable Wi-Fi HD camera that has multiple record settings as well as live monitoring via your mobile device.  **Martyn Clayden**

\$39 (£23)

Contact

■ minitool.com

Read more

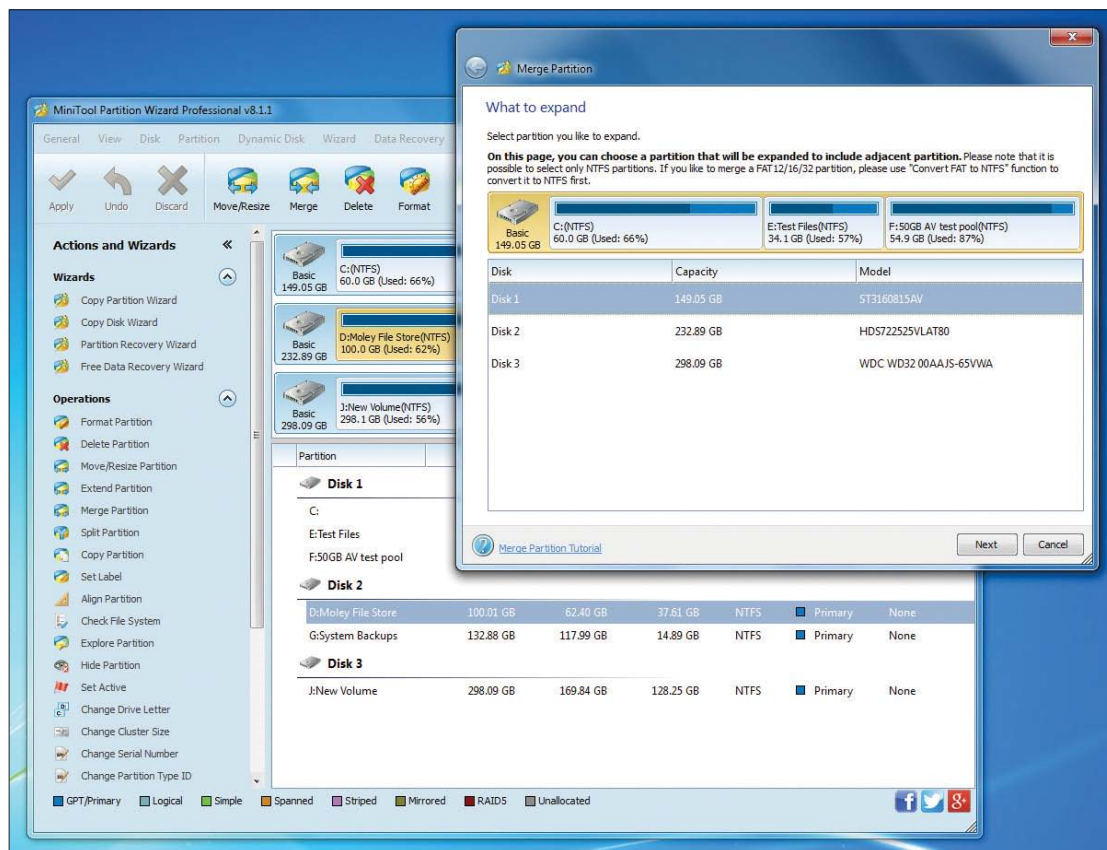
■ tinyurl.com/mwoLq4p

Specification

Windows 2000/XP/
Vista/7/8

OPTIMISATION SOFTWARE

MiniTool Partition Wizard Professional 8.1.1



Ease of use: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



There's quite a bit of choice when it comes to partitioning tools for the Windows PC, but one we hadn't come across until now is MiniTools Partition Wizard Professional, now in version 8.1.1. That's Wizard in the sense of somebody who can work magic, rather than a step-by-step, single-task Windows tool.

The main working window in the program looks much like those in the better known applications, from the likes of Acronis or Paragon. There's a menu bar along the top, a toolbox down the left-hand side and the rest of the screen showing details of the drives the software has found on your system, with indications of capacity, current use and drive stats.

The screen is clean and tidy, although most of the actual work is done through a series of wizards - this time we do mean the step-by-step single-task Windows tools.

All the basic functions are covered, like moving and resizing partitions, but there's also split and merge partitions, and you can copy a partition to a different drive - useful when migrating to a new device. You can extend a partition to take up free space in a single step, too.

MiniTools Partition Wizard supports Windows Dynamic disks and can convert from dynamic to basic types without data loss. You can also explore a partition, although this is just to check you're working on the right one. It shows a folder and file tree, but you can't perform operations at this level.

Functions such as merge and split used to be a rarity in partition managers, but they're both here and worked well to restructure a hard drive. We would have expected to be able to select the drive to work on before invoking the Merge Wizard, but the software takes no notice of what's selected in the main screen, displays all valid drives and automatically selects drive 1. So you have to be on your guard to select the desired drive in the wizard.

Extras include an integrated run of CHKDSK to check the filing system, a disk surface scan and a secure disk wipe, including quick wipes and US Department of Defense 3- and 7-pass overwriting modes.

To give an idea of performance, a surface scan of a 100GB partition took 31 minutes, 22 seconds, while a realignment to align the partition

with disk sector boundaries and improve disk access times, took two minutes, 10 seconds. Splitting the partition in two (75/25) took 43 seconds and merging the partitions together again took 26 seconds. These are all very fair times, given the amount of processing involved and the 250GB SATA drive used for the test.

Like most partition managers, Partition Wizard uses a pending queue, so the operations you set up are all enacted in one go, when you finally give it the go-ahead. This speeds the setup of multiple tasks and provides an extra level of security, as tasks can be reviewed before final application.

The software will also create a bootable CD, so you can get at all the functions of Partition Wizard even when Windows won't start.

Verdict

MiniTool Partition Wizard Professional 8.8.1 should be up with the main names in partition management. It offers easy control of all the essential partition tasks you might need to undertake on your drives. **Simon Williams**

£60 inc VAT**Contact**■ pandasecurity.com/uk

Read more

■ tinyurl.com/qz5wtnL**Specifications**

Windows XP/Vista/7/8;
Intel Pentium 300MHz;
1GB memory; 275MB drive
space; Mac OS X 10.6; Intel
Core 2 Duo; 200MB drive
space; Android 2.2 or later

Ease of use: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



ANTIVIRUS SOFTWARE

Panda Global Protection 2015



Panda is one of the long-standing Internet Security (IS) providers and its Global Protection 2015 product offers cover for up to five devices, including those running OS X and Android, as well as Windows.

The interface has been revamped, with Windows 8.1-style tiles on a burgundy background. Each of the major elements of the software – scan, firewall, tune-up, parental control, application control and Wi-Fi monitor – has a tile and they're joined by multi-device protection, account status and support. There's a secondary panel of controls, reached rather like sliding between apps on an iOS or Android device.

Some of the elements in the suite are a bit basic. The PC tune-up module only deletes unwanted files and calls up the Windows defragmenter, while online backup gives you just 2GB on Mozy, to share between your five devices.

The Wi-Fi monitor is useful if you want to check for wireless intruders, but will only work from another PC connected wirelessly. If you have it running on a machine with a cabled connection to a wireless router, it doesn't see the wireless devices in the same workgroup.

Parental control is simple enough to implement, as Panda provides a wide variety of categories to check.

The Mac and Android offerings are more limited than the Windows one, but still promise significant protection. AntiVirus for Mac handles both Mac and Windows malware (when running Windows applications under emulation) and performs set or real-time scans. You can also scan linked iOS devices from the Mac version.

Panda Mobile Security is the Android product and includes anti-virus, a privacy auditor, anti-theft – locate lock and wipe, but no photo facility – and a useful task killer, when you need more room on your phone or tablet. When we tested the scan rate of AV scanners, we use a test basket of 50GB 'known-clean' files, as we don't want the scan interrupted.

Panda Global Protection 2015 found 30 files it didn't like and promptly quarantined them. They were all examples of the Conduit A adware search engine. The odd thing is, no other IS suite, including Panda's own 2013 and 2014 offerings, have queried these files before. We suspect it's a reclassification of Conduit A as

malware by Panda. The 50GB scan took 24 minutes, three seconds to examine 274,486 files, a scan rate of 190.2 files/s. This is up with the fastest products we've reviewed.

Panda was one of the first companies to claim much of its AV work was done in the cloud, giving it a very light footprint. Our tests didn't show it to be particularly light, with a 35 percent increase in copy time when there was a system scan running in the background.

AV-Test (av-test.org) last rated Panda Cloud Anti-Virus Free, which uses the same AV agent as all the Panda range, at 17.0/18.0, a very good score.

It dropped 0.5 under Performance, with an average slowdown of just one second in the range of tasks performed with it installed, and again 0.5 points on Usability, due to a false detection and a couple of false blockages during the test period. It scored 100 percent on malware detection.

Verdict

Panda Global Protection 2015 is a good option, if you need to protect a range of different devices from Windows PCs to Macs and Android machines. **Simon Williams**

£80 inc VAT

Contact

■ mcafee.com/uk

Read more

■ tinyurl.com/nq2hbvc

Specification

Windows Vista SP1/7/8/8.1;

Mac OS X 10.7; Android

2.3; iOS 5

Ease of use: ★★★★★☆

Features: ★★★★★☆

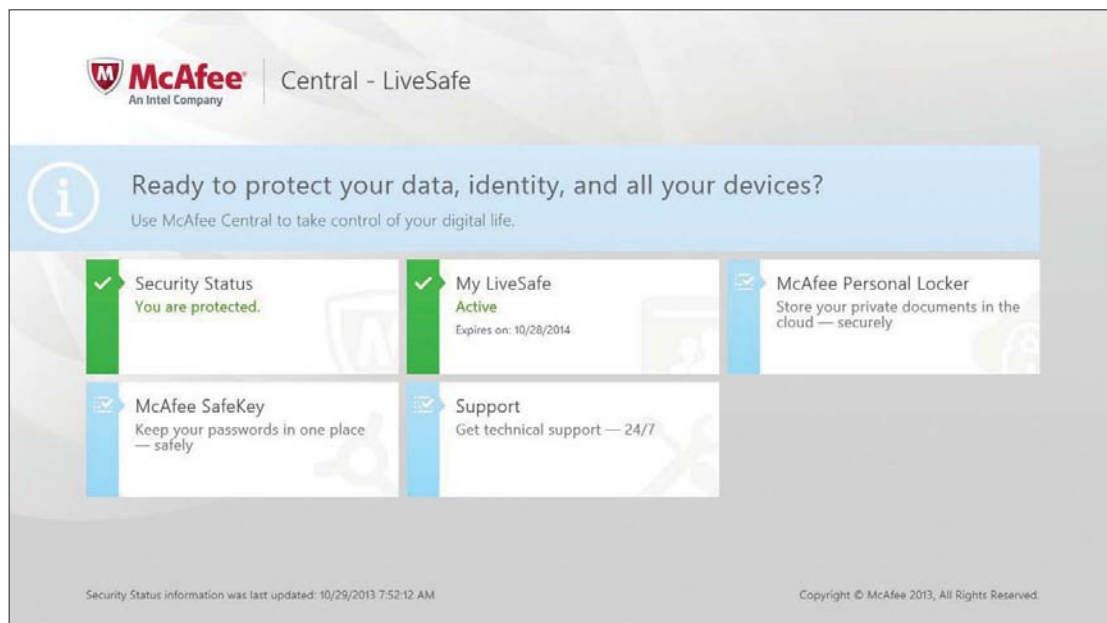
Performance: ★★★★★☆

Value: ★★★★★☆



ANTIVIRUS SOFTWARE

McAfee LiveSafe 2015



McAfee LiveSafe, the top level in Intel Security's internet security range, has a particular feature that may make it uniquely attractive - it covers as many devices as you can throw it at, as long as they're all yours.

The security software may be primarily Windows PC-based, but there are apps for OS X, Android and iOS offering various levels of protection and you can install them in any combination that suits.

The control screen in LiveSafe Internet Security, which is pretty much McAfee Internet Security 2015, is an uninspiring, mainly text-based affair, with large tiles for four main functions, including Your Subscription, and smaller ones for Data Protection, PC and Home Network Tools, and Parental Controls.

We wonder at these choices - will the average customer really be more interested in his/her subscription status (which only changes once a year) than vulnerability testing or parental control?

Internet security tools

McAfee LiveSafe Internet Security comprises AV and anti-spyware, web and email protection - including a two-way firewall - and comprehensive, encrypted password management via SafeKey and Personal Locker. This keeps a small number - 1GB across all your devices - of sensitive documents safe,

online. There's a web browser guard and transaction protection, too.

There are a few things missing that some other vendors include in their IS suites, the most obvious being any form of backup, local or online. McAfee Total Protection 2015 includes 5GB of online storage from Mozy, but this hasn't been carried through to LiveSafe. The only mainstream backup is from the Android app to your PC. There's little in the tune-up area, either, except a vulnerability scanner which looks for out-of-date applications and drivers.

The Mac version is a shadow of the PC one, although the Mac OS is generally screwed down tighter against malware. It includes LiveSafe and SafeKey, which, in itself, is more than iOS devices get. There, there's just SafeKey and Personal Locker, where you can tap into that 1GB of Cloud storage.

Android app

The Android App includes McAfee Mobile Security, which handles backup to PC, warns of dodgy websites and can take photos and wipe data remotely, as part of an anti-theft regime. There's also SafeKey and Personal Locker.

When we ran tests on LiveSafe Internet Security, it took one hour, 30 minutes to scan our 50GB test basket and looked at 17,995 files, giving a scan rate of 3.33 files/s.

This is the slowest we've measured, although the McAfee

scan is said to include rootkits, which some others don't.

Repeating the scan checked the same number of files, so there's no noticeable fingerprinting.

The software doesn't seem to put much of a resource hit on a PC, reducing the time for a 1GB file copy by just 3 percent. This is reflected in the results from the German test site, AV-Test (av-test.org). In its most recent group test of Windows 7 packages, McAfee Internet Security, the malware engine inside LiveSafe, too, scored a perfect 18/18.

It didn't slow the AV-Test machines at all during their more wide-reaching usage tests and in the Protection category the software was 100 percent effective against its malware collection, and 99 percent effective on zero-day attacks. Under Usability it gave no false detections, warnings or blockages at any time during testing. It's one of the best set of results the site has posted.

Verdict

If you run a couple of home Windows PCs, a Mac, a tablet and a smartphone, or a similar combination, McAfee LiveSafe 2015 is an economical way of protecting them all and providing anti-theft facilities on the mobile devices. While the feature set of the IS component of the package may lack back-up and PC tune-up, the power of its AV protection can't be denied. **Simon Williams**

£69 inc VAT**Contact**■ nero.com/eng**Read more**■ tinyurl.com/Lf7e54o**Specifications**

Windows XP SP3 32-bit/
Vista SP2/7 SP1/8/8.1; 1GB
RAM; 5GB drive space;
2GHz processor

Ease of use: ★★★★★☆

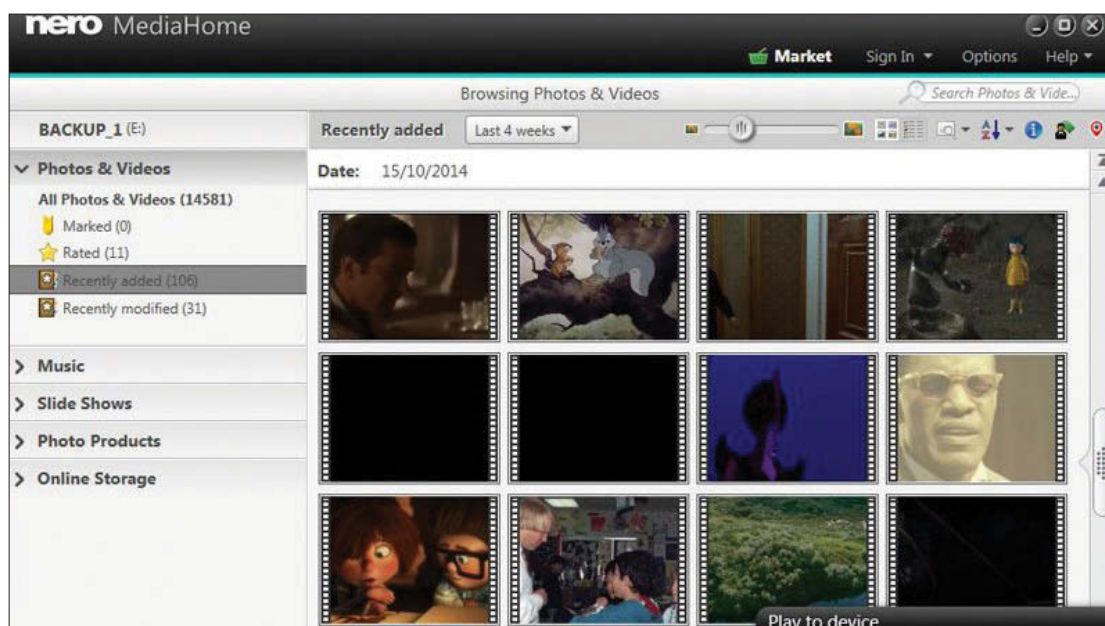
Features: ★★★★★☆

Performance: ★★★★★☆

Value: ★★★★★☆



MEDIA MANAGEMENT SOFTWARE

Nero 2015 Platinum

The Nero software package started as Nero Burning ROM, a CD/DVD-burning program, but 2015 Platinum now covers nearly all the media bases, through a multitude of interrelated applications.

These are divided into four main areas on Nero 2015 Platinum's annoyingly non-windowed launcher screen. Nero MediaHome, Nero Media Browser and a Blu-ray player sit under Manage and Play; Nero Video, Nero Recode and Creative Content live under Edit and Convert; Nero Burning ROM and Nero Express sit under Rip and Burn; and Nero BackItUp and Nero Rescue Agent, unsurprisingly, are headlined Backup and Rescue.

Nero BackItUp and Creative Content aren't included on the Nero 2015 Platinum DVD and have to be downloaded separately, along with other optional extras, such as Nero WaveEditor.

The backup product is fully automated and can either use the 5GB of online storage supplied with

the suite, or your own local storage. It handles files only, though, not drive/system backup.

Backing up music and especially videos is almost bound to require more than 5GB, of course, and £5.49 per month rents unlimited storage.

Nero has always been good at following trends, and as CDs and DVDs have given way to other forms of storage, the company has steered its way toward media management and streaming. Nero 2015 Platinum continues this move by covering mobile devices and many of the new features are aimed at Android and iOS users.

There are five new applications in this edition of the software: BackItUp, AirBurn, MediaHome Receiver, MediaHome WiFi Sync and Nero Manuals. The last of these displays manuals for the Windows programs on an Android or iOS device, although it would be good to have them on the PC, too - they're only via your browser.

BackItUp can be used to back up your entire phone or tablet to a memory card, a Windows PC via Wi-Fi or again to that 5GB of online storage.

Backups can include phone settings and messages, if you select them. AirBurn helps you compile media from your mobile device and burn it to optical disc via Nero Burning ROM, as a one-click task.

MediaHome Receiver links your device to your PC for playing music,

slide shows or videos from the library on your PC. MediaHome Wi-Fi Sync syncs selected media between PC and Android device - iOS users still need to use iTunes.

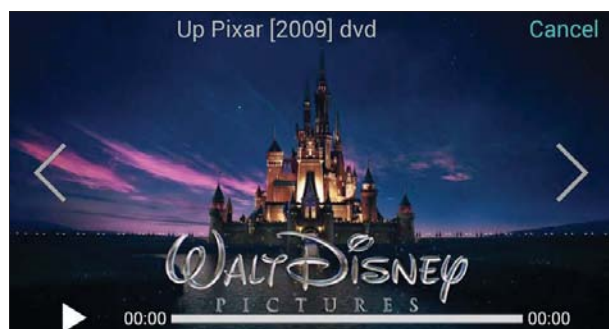
Nero MediaHome can also stream from your PC, via your wireless router to any DLNA device that can latch into the network. This includes smart TVs and media receivers.

The application indexes all your photos, music and videos, and enables you to match faces in photos and display your media on a timeline or in other categories. You can add folders for it to watch, although it's harder to get it to disregard ones it has picked for itself.

The main PC applications in Nero 2015 Platinum generally benefit only from minor tweaks. New facilities such as being able to change disc formats on the fly while authoring a video and the addition of extra, professional-grade fonts improve the Nero Video offering. You can tag photos and videos with name and place info, to help with indexing and selection in Nero MediaHome.

Verdict

Nero 2015 Platinum continues to be a good all-round media manager, with an emphasis on disc burning and now on media steaming to fixed and mobile devices around the house. The application tries hard to make this as simple to achieve as possible, and often succeeds.  **Simon Williams**



£29 inc VAT**Contact**■ wbie.com**Read more**■ tinyurl.com/nc9sd5x**Specification**

Windows Vista/7/8 (64-bit); Intel core i5-750, 2.67GHz, AMD Phenom II X4 965, 3.4GHz; 4GB RAM; nVidia GeForce GTX 560, AMD Radeon HD 6950; DirectX 11; broadband internet connection; 25GB drive space

GAME

Middle Earth: Shadow of Mordor

While it was one of the major triple-A releases of 2014, no-one quite knew what to expect from Middle Earth: Shadow Of Mordor. Some camps were hailing it as the best action game of the year, while others rolled their eyes at the prospect of another tired retread of a familiar franchise.

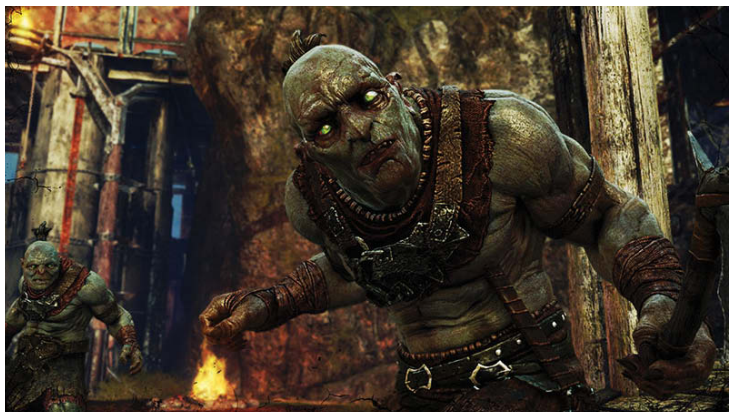
However, unlike previous LOTR games, instead of forcing us to play as a bunch of D-list background characters while the real adventure happens off-screen, Shadow Of Mordor instead serves as a prequel, taking place during the slightly nebulous period in between *The Hobbit* and the start of *The Fellowship Of The Ring*.

It stars an original character, a Ranger by the name of Talion. Possessed by an ancient Wraith after he and his family are murdered by the minions of Sauron, they set out to wreak joint vengeance on those responsible.

The textures are all exquisitely rendered, the animations are smooth, and the amount of detail is just astonishing, especially on the battle-scarred Orcs (see above).

If you're looking for story, though, you might leave a little unsatisfied. The backstory draws heavily on chunks of Tolkien lore that haven't yet been put to film, and can get confusing for casual fans. The actual plot is also paper-thin; it's the basic revenge quest that's been done countless times, and with only 20 story missions to play out, it doesn't have time to get particularly deep.

The place the writing really shines is the Orcs. The incidental dialogue gives them real personality, arguably much more than the main characters; they'll bicker and boast among themselves, along with spreading Chinese whispers about your terrifying abilities, which helps



to make you feel like a legendary badass. They also spend an absurd amount of time loudly discussing what they'll do to you if you try anything on them, which makes it especially entertaining when you drop three storeys to stab them.

And it has to be said that doing so is immensely satisfying – stealth kills are brutal and violent. However, they're also astonishingly easy. You can run even in stealth mode and it's only marginally slower than sprinting, meaning you'll probably spend most of the game running around doubled over. It's a useful feature, but it removes a lot of the challenge of stealth sections, and means you can sneak up on pretty much any enemy without trying.

On top of that, the Orc AI is staggeringly stupid. They're not supposed to be the brightest creatures, granted, but when you can go through a single-file patrol by creeping up and methodically neck-stabbing each one in sequence, it gets a little ridiculous. The time it takes for them to spot you is also huge – you've usually got a good 10- to 20 seconds to silence the poor schmuck who's seen you before he's even twigged you're a threat. Difficulty issues aside, though, the stealth elements are a lot of fun and well-implemented.

One place it doesn't quite work, however, is the free-running. The predominantly empty, ruined landscapes of Mordor means that a lot of the parkour movement mechanics are underutilised. Interactive environmental elements, however, are more appropriate: grog barrels can be poisoned to discreetly eliminate a camp, fires can be exploded and caged beasts can be

loosed to terrorise their captors, allowing for multiple inventive ways to complete objectives.

There's a slight issue with balance, wherein the early fights have a tendency to overwhelm you with sheer numbers and the later ones are rendered relatively simple through your accrued upgrades, but overall the combat is fun.

The upgrade system is nicely tailored for an action-adventure title. Rather than the oft-tedious routine of looting chests for upgrades and spending hours comparing miniscule stat differences, you have a perk tree for major skills, upgradeable attributes such as max health and arrow capacity, and various rune slots on your sword, bow and dagger, which provide different modifiers and effects, and can be swapped out depending on your own particular playstyle. A cool aspect of this is that the runes are dropped by defeated Orc captains, with higher-ranking chiefs dropping more powerful runes.

Finding these weaknesses is coincidentally where the unique gameplay mechanic of Shadow of Mordor comes into focus, and where the real fun lies. The armies of the Dark Lord have a hierarchical power structure; a small number of warchiefs at the top, with a few dozen lower captains underneath them. By interrogating the Orcs in the know, you can find out detailed information about a captain's strengths and weaknesses.

Verdict

Middle Earth: Shadow of Mordor is far from flawless, but it's still the best *Lord of The Rings* game we've played.  **Adam Shepherd**



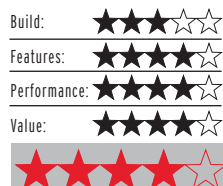
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Contact

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Specifications

1200x600dpi print resolution; 1200x2400dpi scanner; 300x300dpi fax; 20/18ppm rated speed for mono/colour; 1x USB interface; 802.11n Wi-Fi; 150-sheet input tray; 188x480x290mm; 9.5kg



A3 COLOUR INKJET PRINTER

Brother MFC-J4420DW

Most A3 printers are bulky and expensive, aimed at professional designers and photographers who need high-quality page proofs for their work. Yet home and small business users can make good use of them too, perhaps for printing posters to stick on the kids' bedroom wall, or to advertise a business and products.

Brother's MFC-J4420DW is a good option here, as it provides a versatile A4 multifunction inkjet printer that is also capable of occasional A3 printing. Priced at a competitive £99, this four-in-one device includes a 1200x600dpi printer, a 2400x1200dpi scanner and copier, and a fax machine, too. Another model, the J4120DW, doesn't include a fax, but it's only about £10 cheaper, so the fax doesn't make a major difference to the overall price.

Other features include two-sided printing and a 20-sheet automatic document feeder. There's a USB port for connecting to your PC, and Wi-Fi for network connectivity, plus support for Apple's AirPrint for printing from iOS devices, as well as Google Cloud Print. Brother also provides a Print&Scan app for both iOS and Android devices that lets you scan documents direct to your mobile devices. The only omission here is an Ethernet interface for wired networks; you'd need to pay another £40 for the JF4620DW model to get hold of that option.

The J4420DW is neatly designed, measuring just 188mm high, 480mm wide and 265mm deep. In effect, it's a standard A4 printer, with the 150-sheet paper tray in the base of the device taking paper no bigger than A4. However, you can print on A3 by using the paper feed slot in the back of the printer. Sheets can be fed in only one at a time so it's only suitable for occasional use, but it's still handy to have the option. Our only criticism here is that the main paper tray feels flimsy, and had to be pushed in firmly after refilling so as to avoid paper jams.

Brother quotes speeds of 20 pages per minute (ppm) for mono printing and 18ppm for colour. Our tests didn't quite match that. We got 17ppm for mono Word documents and 13ppm for PDF files with text and colour graphics; but that's still good performance for a printer costing around £100, and the J4420DW is certainly fast enough for most home users and small businesses.

Print quality is good. Our text documents displayed very smooth text outlines; it's not quite laser-quality, but perfectly fine for printing business letters or school reports. Colour graphics were also good, and the J4420DW is well suited for business graphics and charts. Photos printed on plain paper were less impressive, with rather dull colours and slight banding on larger images. Glossy photo paper gave

better results, with brighter colours and a print time of just 40 seconds for a 6x4in postcard.

The A3 option was speedy too - 50 seconds for an A3 poster with text headlines and graphics.

The J4420DW uses just four standard inks - cyan, magenta, yellow and black - so it can't match the subtle tonal gradations of more expensive printers using five or more inks, but it's perfectly good for occasional A3 documents for school work or your office.

Colour printing also turns out to be quite affordable. Brother's high-yield colour cartridges cost £20.39 each direct from Brother and last for 1200 A4 pages, which works out at a competitive 5p per page. The high-yield black cartridge also lasts for 1200 pages, but costs £31.19, which works out at 2.6p per page. That's not exorbitant, but it's at the higher end of the average range for mono printing, so it will be worth shopping around to see if you can pick up a better deal online.

Verdict

The J4420DW's flimsy paper tray is a potential weak spot, so this printer isn't ideal for a busy office that needs to print hundreds of pages every month. But it's a versatile and affordable option for home users and small businesses with light printing needs, and who want to print A3 documents every now and then.  **Cliff Joseph**



£107 ex VAT
£129 inc VAT

Contact

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Specification

Print resolution 4800x600dpi; quoted print speed 28ppm; actual print speed 22.7ppm; USB 2.0; 802.11b/g/n; 10/100 ethernet; NFC; Google Cloud; 250-sheet input tray; 128MB memory; auto duplex; toner cost £46; print life 3000 pages; one-year warranty; 368x335x202mm; 7.4kg

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



MONO LASER PRINTER

Samsung Xpress M2835DW

The humble mono laser forms the printing backbone of many a modern business, churning out document after document after document. They may not be the best for graphical extravaganzas, but when it comes to low-cost quality text, nothing can beat them. Samsung continues to set the pace, and its M2835DW offers a wealth of features for a modest price tag.

The cream/charcoal colour scheme is sober and business-like. It's the traditionally blocky laser printer design, but rounded edges and a relatively modest footprint help the M2835DW to melt into the background. It's relatively quiet and will happily buzz away on your desk, and doesn't have to be concealed behind a sound-reducing screen or rubber plant.

Controls

There's no display, and the main buttons besides the power switch handle the Eco mode and WPS setup. The latter is a hint at the advanced connectivity, and the M2835DW can be hooked up to both wireless (802.11b/g/n) and wired (Ethernet 10/100) networks. It can also hook up to mobile devices, and the handy NFC feature allows you to connect just by tapping the device on the printer.

This brilliantly convenient approach is given even greater potency by the help features.

Smartphones, for instance, can take you straight through clear trouble-shooting tutorials, bringing a rare level of user friendliness to laser printing. It comes as no surprise that Google Cloud support is seamlessly integrated. The company has clearly worked hard on ease of use, and the fruits of its labour will be relished by all M2835DW users.

The impressive printer drivers let you alter the favourites list, select which options get most prominence, and import/export presets as FUP files, so you can easily harmonise settings across a batch of printers. Graphical previews let you quickly see the difference between one option and another, and you can make use of watermarks, overlays and other features.

Eco mode

There is even a boost for Eco mode, with a results simulator estimating the percentage saving of any print jobs. No other company's drivers let you go into such detail – do you take out some bold text, for instance, or make a font one size smaller, to save on resources? In truth, most users will just hit the print button and have done with it. But if you care about the environment or your costs, this brilliant printer lets you delve deep to see exactly how to make practical savings. Other excellent software is available, including network management utilities.

The M2835DW is a printer of some substance. It comes with a sizable 250-sheet tray – which will jut out slightly at the back if used with A4 paper – and page feeding is flawless. The multipurpose tray is a nice touch, effortlessly handling envelopes, labels and other tricky pieces. There is support for PCL5e/6 and Samsung's own SPL language, and the 12,000 monthly duty cycle is good for this price. 128MB of memory is a good chunk to be processing data with.

But what of the printing? Well, the text is immaculate. Even in the standard mode, characters are crisply defined, with beautiful lining and no smudging. The real-world print speed of 22.7ppm is good for the price – even the £210 Lexmark CS410dn is only marginally faster.

Our Samsung time was taken using a 10-page bundle from scratch. Once the M2835DW has started to print, it does indeed hit the 28ppm quoted rate. It drops to 14.9ppm using auto-duplex, but that's still more than fast enough for everyday printing, making default double-sided printing a genuine option.

Graphics

It isn't quite as faultless with graphics. It's pretty good at handling different shades, but less so at rendering. The speed is good for a mono laser, though, with an astonishing figure of 16.7ppm (even including the warm-up). As a means of quickly running off mono presentations for reference purposes, it's a great option.

Even without the Eco mode, the M2835DW is rated for 3000 pages on the higher capacity toner. That works out at 1.5p per page, which is fairly normal for a £200+ laser, but very nicely priced for a model costing little more than £100.

Verdict

We tried to find fault with this printer, we really did, but there was nothing doing. Print quality is strong, the design is generally fantastic, and all of the features work exactly how they should. When a laser is this effective and this thoughtfully put together, it seems churlish not to give it our highest accolade.  **Robin Morris**



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Specifications

1200x600dpi print resolution; 1200x1200dpi scanner; 300x300dpi fax; 18/10ppm rated speed for mono/colour; 1x USB interface; 1x ethernet; 802.11n Wi-Fi; 225-sheet input tray; 35-sheet document feeder; 462x388x224mm; 8kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



A4 COLOUR INKJET PRINTER

HP OfficeJet Pro 6830

In many ways, the HP OfficeJet Pro 6830 is a conventional multifunction printer, aimed at home workers and small businesses. However, it is unique in one respect: it's the first printer that HP has launched in the UK that can be used in conjunction with the company's new 'Instant Ink' subscription scheme.

Priced at just £108, the 6830 is certainly good value for money. The device incorporates a 1200x600dpi A4 colour printer, a 1200x1200dpi scanner and photocopier, and a fax machine. It includes USB, Wi-Fi and ethernet connectivity, and supports Apple's AirPrint for printing to iOS devices, as well as HP's own ePrint app for Android devices.

It also offers two-sided printing, along with a 35-page document feeder. While it has just a single paper tray, with a capacity of 225 sheets of A4 paper, that should be perfectly adequate for the small business users that the OfficeJet Pro 6830 is aimed at.

Output

HP quotes speeds of 18 pages per minute for mono printing with the OfficeJet Pro 6830, and 10ppm for colour. Our test documents actually produced speeds of 14ppm for simple mono text, and 6ppm for documents that contained text and graphics, but those speeds are respectable enough for a printer in this price range.

Print quality is very good too, with sharp, smooth text that comes close to laser quality. Photo printing on ordinary plain paper was a bit dull, but using more expensive



glossy paper produced much better results, so the OfficeJet Pro 6830 can certainly be used to produce marketing brochures or occasional product photos if required.

But, of course, a low purchase price is often accompanied by high costs for replacement ink cartridges. If you buy one of HP's value packs you can get a complete set of high-yield colour cartridges – cyan, magenta and yellow for this printer – that will print 825 pages for £37. That works out at 4.5p per page for colour printing, which is actually very reasonable.

Oddly, though, the OfficeJet Pro 6830 isn't quite so competitive at simple mono printing. The high-yield black cartridge supports 1,000 pages and costs £23, which comes to 2.3p per page. That's by no means exorbitant, but it is still a little higher than we'd like to be shelling out for a business printer that is going to be used on a daily basis.

There is, however, a third option for the OfficeJet Pro 6830 in the form of HP's new Instant Ink subscription scheme. This allows you

to pay a flat fee that covers a specific number of pages each month: £1.99 for 50 pages, £3.49 for 100 pages, and £7.99 for 300 pages.

The OfficeJet Pro 6830 monitors its own ink levels and automatically orders replacement cartridges when they are required, while the cost of the cartridges is covered by your monthly subscription

fee. According to HP, this is considerably less expensive than paying for replacement cartridges as you normally would. The catch here is that the cost per page is the same, regardless of whether you're printing mono or colour. The £1.99 subscription therefore works out at 4p per page – which is very good for colour, but poor for mono. The £3.49 subscription works out at 3.5p per page, while the £7.99 subscription drops it to 2.6p per page. The subscription schemes therefore represent good value for colour printing, but poor value for simple mono documents.

If you don't print the full number of pages in one month, then you can carry some pages over to the next month. There is, however, a sting in the tail here. If you go over your monthly page limit, you could end up paying even higher fees, depending on the number of excess pages and the particular Instant Ink subscription fee you signed up for.

Verdict

Any attempt to reduce the cost of running a printer is obviously welcome, but think carefully about your printing requirements before signing up for the Instant Ink service. If you have light printing needs, you may well be better off simply buying replacement cartridges, just as you would for any other printer. In that case, the OfficeJet Pro 6830 is good value for people who regularly need high-quality colour printing for brochures and other marketing documents, but less competitive on routine mono printing for letters and other text-heavy documents.  **Cliff Joseph**





PREDICTIONS

FOR

2015

What will the tech landscape look like in the coming year? It certainly won't be dull, that's for sure. Our experts reveal what to look out for over the next 12 months

The traditional way to start a feature such as this is to reminisce about *Tomorrow's World's* more outlandish claims and bemoan the lack of hoverboards and flying cars in our present circumstances. But reader: in 2015 we will already be living in the future. Take a mental step back even five years, and the world in which we are currently living will look like *Star Trek*. And we're not talking paunches, bad acting and wigs.

Smartphones have become catch-all, portable computers and communications devices. They are a portable TV, video calling device and games console, costing from less than £100. And for good measure in 2015 we will increasingly access our smartphones not from their shiny touchscreens, but via wearable gadgets. The tyranny of having to pull a phone from your pocket is over as smartwatches, bands and headsets come into vogue.

Wearables are set to proliferate, offering not only easier access to existing connected

devices, but quantifying our movements and assessing our health. This in turn speaks to three further trends: cloud storage, 3D printing and the Internet of Things. The idea of the smart home has been kicking around for decades, but as gas suppliers catch on to the power- and money-saving opportunities offered by heating homes only as they need it, smart thermostats are becoming the norm.

Meanwhile, the way we entertain ourselves has changed fundamentally. Few would even watch a retread of *Tomorrow's World* these days, because a multitude of TV-streaming services allows us to view only what we want, when we want to. We don't need to store all of that content - it lives in the cloud, accessible from anywhere we can get online. And if the thing we want right now is physical, pretty soon we will be able to manufacture it in our own home. 3D printing is about to get serious, which is good news for fans of the *Star Trek* replicator.

Put any display in front of a child and they will reach out to control it via touch. And if

that display doesn't connect to the internet, the child will consider it broken. Every device is becoming a smart device. And that is trend that will continue in only one direction.

Expect to be able to control multiple aspects of every home from any connected device, and all in the next year or so. And the number of touchpoints via which we can access these controls will continue to grow. In time every display in your home will be a connected touchscreen display - and that time is coming quickly. This is no longer science fiction, it's necessary and mundane fact.

In this feature we throw forward just one year, to the end of 2015. We asked our experts to look closely at smartwatches and smartphones, laptops and Windows, the Internet of Things, and 3D printers. All the developments we predict are incremental, but they take us somewhere that even just a few years ago would have seemed amazingly futuristic. The future is here: it's in the following pages.

SMARTWATCHES

Perhaps one of the biggest things to happen to the smartwatch category in 2015 will be the launch of the Apple Watch in the spring. At this point, all smartwatch makers will need to up their game. While the Apple Watch iOS 8-based platform isn't any better than is Android Wear, and alone will unlikely be enough to persuade users of either platform to jump ship, it does have a few lessons to teach rival smartwatch makers in 2015.

Previously, most smartwatches worth their salt have been based on the Android Wear operating system and are of little use to the huge number of iPhone owners out there, in the same way that the first Tizen-based Gear smartwatches were unappealing to anyone other than Samsung owners. But with decent smartwatches available for both user bases, the smartwatch category will finally begin to appeal to the masses.

According to Futuresource, which polled 8000 consumers in the USA, UK, France and Germany in May and October 2014, in five months it has seen a 125 percent increase in interest in smartwatches, and 50 percent in fitness trackers. Perhaps not surprisingly, it's largely iPhone users who have brought about this change: whereas 6 percent were interested in smartwatches in May, by October 17 percent had their interest piqued by wearable tech.

In 2015 we expect to see smartwatch improvements on five fronts: design, usability, health- and fitness tracking, battery life and price.

It's important for manufacturers to remember that a watch is as much a fashion statement as it is a piece of useful



APPLE WATCH

technology. Whereas most Android Wear smartwatches can't be customised beyond selecting a different watch face or strap, the Apple Watch is available in two sizes - for men and women - and three collections: Apple Watch, Apple Watch Sport and Apple Watch Edition. We expect to see Android Wear smartwatch makers follow suit with designs that appeal to all types of users.

We're also starting to see more round-face smartwatches in the style of traditional wristwatches. The Motorola Moto 360 (pictured below) and LG G Watch R are great examples; expect to see more round, less-techy-looking designs in 2015.

Apple's Watch has a digital crown, which means the smartwatch isn't operated entirely via touch - not always practical on a small screen. Some Android Wear smartwatches have similar features. The digital crown might not become the standard, but you can guarantee smartwatch makers will take steps to improve navigation and ease of use in 2015, perhaps with improved gestures.

In terms of the tech itself, health- and fitness will remain key, narrowing the gap between smartwatch and fitness band. With more practical designs, we could eventually see fitness bands replaced altogether. In 2015 we think we'll see more in the way of always-on health- and fitness tracking - rather than a pedometer or heart-rate sensor that fires up when you activate it, these things will be ticking along quietly in the background, building up a more true-to-life picture of your health and daily activity.

The more you use these devices to work out, the more they need to be able to resist wear and tear. Expect more rugged, water- or at least rain- and sweatproof watches in 2015.

Improvements to battery life will be key, since we simply aren't accustomed to charging our watches overnight. Nor do we expect their batteries to run down in a matter of days. We want watches that are smart, but also that we can treat just like a traditional watch.

Expect Qi wireless charging support to feature heavily in smartwatches in 2015. It's bad enough that we have to take off our watch to charge it; worse that we have to tether it to a USB port to do so.

Pricing has previously been off-putting for some wannabee smartwatch owners. The LG G Watch is one of the more affordable examples at £159, but for most smartwatches you're looking at around £180 to £200 - or significantly more, as we expect will be the case with the Apple Watch. In 2015 we wouldn't be at all surprised to find budget smartwatches appearing from companies such as Huawei, ZTE and other smartphone makers known for their great-value devices.

At the other end of the scale are people who like to spend a lot of money on their watches. Rumour has it the gold Apple Watch will cost a whopping £3,000. **Marie Brewis**



MOTO 360

SMARTPHONES

It's been another big year for smartphones, which have yet again been one of the most popular gadget sectors. Major handsets have been launched by Apple, Samsung, LG, Sony, HTC, Google and a raft of smaller rivals. Although smartphones have, to an extent, hit a bit of a ceiling in terms of innovation and new technology we're hoping for some interesting and useful breakthroughs next year.

Screen sizes have been increasing on average, with even Apple launching the massive 5.5in iPhone 6 Plus, but we saw little in the way of bendy or flexible screens. The LG G Flex (top right) was too big and more of a concept phone than a recommendable product while the Galaxy Note Edge (right) was the most interesting, with its curved section on the side able to display different content to the main part.



IPHONE 6 PLUS



SAMSUNG GALAXY NOTE EDGE

In 2015 we're hoping to see (but probably won't) the next generation of the flexible screen in smartphones where the device itself is malleable rather than simply having a display fixed in a set arc. A phone you can properly fold or roll up would be cool and possible indestructible. The tech should also mean improvements in the wearable market where a curved and flexible screen makes so much sense.

An area we've seen almost no development in is battery life and it's something we all want improvements in. The smartphone remains most consumers' primary piece of daily tech and we desperately want to get back to the days of only charging a handset once a week or even less often.

Charging time will almost certainly be reduced, but that's a smaller victory. Whether smartphone battery life improves by the battery packs themselves or more efficient



LG G FLEX

components or a combination of the two, we should see a noticeable difference compared to this year's devices. A new type of memory is touting battery life of multiple weeks.

Modular smartphones will make their debut next year and that's an exciting, if not proven, concept. Google's Project Ara is tipped to arrive as early as January. The idea is that you buy a phone but you can chop and change different parts of it as and when you please. It has the potential to completely turn the smartphone market on its head.

A modular smartphone is made up of building blocks, so you will be able to upgrade individual components just like you can with a desktop PC. If you fancy a new processor, more storage or a better camera, then just slide that module out and insert your new one. This concept is being developed by Phonebloks (pictured below)

Last and in a way least, we could well be seeing fewer smartphones come to market than currently. Manufacturers such as HTC have already gone this way and the big player that is Samsung has announced it is going to cut the number of devices it produces by up to a third. **Chris Martin**



PHONEBLOKS

TABLETS

Despite the rise of phablets, larger screens will still be going strong in 2015. In the UK, tablets have been outselling laptops since the end of 2012 and in 2015, more tablets will be sold than PCs and laptops combined, according to data from analyst firm IDC.

It's not too surprising if you think about it. Although most of us still use a desktop PC or laptop for work, we're more likely to pick up a tablet or smartphone for anything that isn't work related, which is a lot of things.

But while tablets are great for web browsing, shopping, gaming, emails and lots more, they're increasingly allowing us to get some 'real' work done. Documents, spreadsheets and presentations can all be created and edited on a tablet, but there's still a long way to go before tablets are the go-to productivity device. They will also let you access corporate networks via a VPN. You can even print from a tablet given the right printer, so it's only with specialised systems aren't optimised for a touchscreen that you'll have to resort to a PC.

Their flexibility is why tablets are replacing laptops for a lot of people. When an old laptop or PC breaks or becomes too slow, we're more likely to buy a tablet than replace it with the latest equivalent.

Being always on, lightweight and with far better battery life than the majority of



MICROSOFT SURFACE PRO 3

laptops, tablets make more sense these days, especially as they're also cheaper than even a bargain basement laptop.

Will we see more tablets like the Surface Pro 3 (pictured above), though? Microsoft says it's the first tablet that can replace your laptop, but Windows 8 doesn't fare well against Android or iOS when used as a tablet. This is why software is arguably more important than hardware.

And speaking of hardware, we're not expecting any major technology changes in tablets over the next 12 months. Battery technology is still relatively stagnant, which means that apart from a rapid charging system on some Android tablets (which means they can charge to around a third or half within around 30 minutes), we'll continue to see around 10- to 12 hours of use from the best tablets.

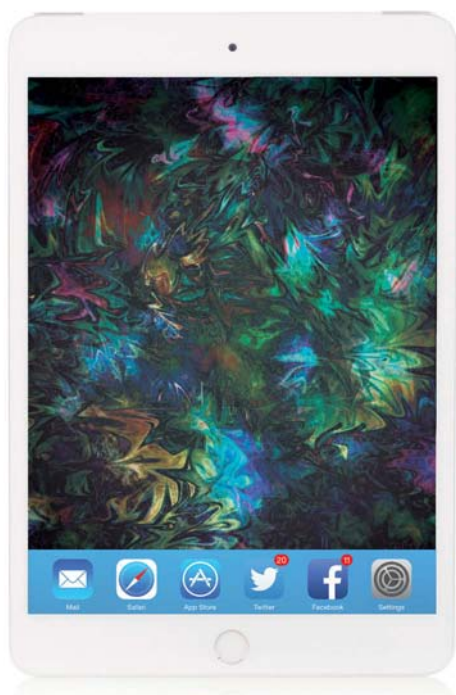
Display technology will also stand pretty still, with resolutions possibly creeping up slightly - some manufacturers will race to be the first to have a 4K 10in screen - but it's highly unlikely there will be anything

revolutionary. If you're waiting for a roll-up tablet, it's not going to happen in 2015.

The best we might see is a curved screen as we've already seen on a couple of smartphones, such as LG's G Flex (pictured on page 71) or the curved edge on Samsung's Galaxy Note Edge. Currently, the technology used to make screens touch-sensitive isn't flexible, but a bigger issue is that neither are the other components such as the battery.

All the other components will get performance bumps: Wi-Fi will begin to standardise on 802.11ac, Bluetooth to 4.1, and cameras will have ever more megapixels, even if their sensor sizes remain the same.

As ever, Apple will launch new versions of the iPad towards the end of 2015. That's relatively uninteresting, but what could be big news is the rumoured iPad 'Pro' (see below). An iPad version of the Surface Pro 3 with a laptop-size screen and the ability to run more than one app onscreen at a time could be a game changer. It might be enough to persuade execs to ditch their Windows Ultrabooks. **Jim Martin**



FROM LEFT TO RIGHT: Mock-up of rumoured iPad Pro, iPad Air 2, iPad Mini

LAPTOPS



The laptop PC industry, like many, is risk adverse and so prefers to copy what it sees as a financially successful idea rather than innovate for itself. So in the mass market of consumer laptops, which notwithstanding Google's efforts with Chromebooks is still mostly self-selecting as Windows laptops, we will continue to see notebook computers that are low-cost and lower-quality copies of the Apple MacBook Pro (pictured top right).

Apple has striven for outstanding battery life, ease of use and freedom from anti-user add-ons such as sponsored bloatware. And with Intel's advances in developing low-power x86 chips for Apple Macs, the typical Windows laptop now has a runtime longer than two- or three hours. In 2015, expect to see the average Windows laptop run for as long as six hours.

Ease of use took a dramatic backwards leap from a preceding low start point with Windows 8, but Microsoft's urgent need to remedy this means that Windows 10 in 2015 should at least let people find their way, with the face-losing reinvention of the Start Menu. But increased pressure from other platforms and other ways to compute on the move means that sales figures for the few remaining Microsoft-aligned laptop makers will dwindle further, so you may see even

more unwanted software on your laptop as manufacturers try to break even.

Expect to find - beside the usual McAfee/Norton, Microsoft Office trials, Dropbox, eBay and Amazon desktop decorations - animated wallpaper sponsored by local fast-food restaurants. (Who knows, further discounts might even be offered to laptop buyers who agree to a copromotion with McDonalds that requires an 'I'm lovin' Windows' logo to cover their laptop lid.)

Ultrabook used to be Intel's synonym for 'MacBook Air with Windows', until the chipmaker cooked up a scheme with its software partner to create the Ultrabook Touch. Unfortunately, neither company got the memo that said consumers don't want touchscreen laptops because they're overpriced for the average user's budget. Nor

did they get the results from usability labs that detailed how the Windows desktop spectacularly fails as a touch-controlled computing interface.

Touchscreen laptops will fade further from view, and Windows laptop buyers will continue to prioritise cheapness. Those touchy few that do leak out will continue 2014's design trend, using the lowest-grade TFT available, with image quality so poor it will be of primary benefit to people whose touch experience is heightened by their knowledge of braille.

Meanwhile, 2015 will see Apple introduce its first ARM-powered laptops, building on its currently surprising position as the



only computer company that can design a decently fast 64-bit RISC processor. And one that doesn't require an actual fusion drive to power it.

With the Apple A8X chip in 2014's iPad Air 2 now faster than Intel's attempts at making its battery-efficient CPU line, the MacBook maker will push home its advantage and make fanless laptops that go beyond the MacBook Air's current 12-hour lifespan. The Mac operating system, OS X, will mutate again back to its RISCy roots, leaving users and developers to work out what software will still work on their Macs. Again.

Competing with Microsoft in the consumer category labelled 'barrel's bottom', Google Chromebooks will receive a marketing overhaul, now in good faith renamed as Telescreens. Users who remain unaware of the chilling effects of having their every keystroke and facial expression recorded will continue to take delight that at least they don't have to worry about backups.

In all seriousness, though, we're likely to see more Chromebooks launched and cheaper Windows laptops will benefit from the Intel Core M series of low-power chips, with performance to match. The biggest news for laptop users in 2015, then is Windows 10. **Andrew Harrison**



ACER ASPIRE

HP CHROMEBOOK

WINDOWS

We don't need to gaze into our crystal ball to find out what's going to happen in the Windows universe in the coming year. Microsoft has laid bare its plans for Windows 10 - oddly skipping over version 9 - which involve listening to user feedback from an open beta program.

Anyone can download and try early versions of the operating system, but these are currently aimed more at business users, which Microsoft needs to woo after the miniscule uptake of Windows 8.

Consumer features for Windows 10 are largely still unknown, but Microsoft has already said that the Consumer Preview will be available early in 2015. It also declared at the unveiling of Windows 10 that it will be: "One platform for all devices." This means that although the interface will look different, the underlying operating system will be the same for Window Phones, tablets, laptops, PCs and even the Xbox One console.

There will also be one unified store from which to buy games, apps, music, videos and more. Quite how this will work in practice -

especially for apps - remains to be seen, but if you can buy an app on one device and have it available on all your Windows kit, then that has to be a good thing and a potential reason to invest in a Windows ecosystem.

Windows Phone itself will get an interim update which should be rolled out to smartphones early in 2015, bringing Cortana to older Windows Phone 8 handsets, which are lacking Microsoft's digital assistant. Windows Phone 8.1 Update will also let users create folders on the home screen, introduce a kind of guest mode (in addition to Kids Mode) where you can allow friends to access certain apps, and new 'accessory apps', which provide notifications from your phone on a compatible wearable device, such as an activity tracker. Interestingly, there will also be a VPN designed for making it safer for anyone to use public Wi-Fi hotspots.

It's possible that later on in 2015, to tie in with the public release of Windows 10, we'll see an announcement or even a launch of Windows Phone 10. If Microsoft also wants users to see Windows as one platform, it

needs to bring the version numbers in line with each other as quickly as possible, and ensure that it doesn't cut existing owners off as it did with the change from Windows Phone 7 to Windows Phone 8.

That would be a disaster as Windows Phone has finally established itself as a credible third option alongside Android and iOS, but is struggling to increase its market share. This in turn is putting off developers, which creates a catch-22 scenario where the lack of apps (or quality apps) is putting off users from switching to Windows Phone.

Microsoft is pulling out all the stops to get developers on board, but it's hard to see Windows Phone gaining on Android or iOS during 2015.

With Windows 10 putting a firm focus back on the keyboard and mouse when running on a PC or laptop, we should also see a bigger separation between PCs and tablets. There's still a rather awkward push towards so-called 2-in-1 devices, which try to be both a laptop and tablet, but generally offer the worst of both worlds. **Jim Martin**



3D PRINTERS

Twice as many 3D printers will be sold in 2015 as in 2014, and 2016 will see twice as many again. Does this mean we'll all have 3D printers in our study, workshop or kitchen? Probably not, but the customisation made available by the technology will impact your life in a lot of interesting ways.

The massive growth in 3D printers that analyst firm IDC predicts isn't in the home, although a \$249 consumer printer - the New Matter MOD-6 - will go on sale in 2015. Post-hype, it's clear that there's a place for 3D printers in the homes and studios of hobbyists and semi-professionals - as there is for other tools for artists, designers and developers from Arduinos and Raspberry Pis to lathes and easels. Sales here will likely be due to prices coming down and current owners upgrading to better models: with buyers being creative types and tinkerers not your average punter.

Where the growth is really going to happen is in commercial manufacturing - for example, HP's first 3D printer, the Multi Jet Fusion 3D printer (pictured right) is aimed at design firms and will cost over £100,000 when it ships in 2016. This is an area where 3D printing - or additive manufacturing to give its formal, boring title - is so well established that as a concept it hasn't been exciting for a few years now. Here it's new developments such as affordable multi-material printing that are going to get product, furniture, fashion

and technology designers exciting - and we'll all reap the rewards of their efforts.

In January 2014, Stratasys launched the world's first multi-material, full-colour 3D printers, the snappily titled Objet500 Connex3 Color Multi-material 3D Printer (shown below) at a wince-inducing price of £200,000. Next year, we expect to see much cheaper printers that can print multi-coloured objects - though they're unlikely the drop down low enough for most of us to afford.

Where this will affect us is that we'll start to see more customised objects being sold at a reasonable price. Everything from clothes and accessories to homewares and toothbrushes can be customised to our

tastes - think of how you can customise almost any aspect of NIKEiD shoes and apply that to everything else in your life that you'd like to be yours. Multi-material printing - especially when one of those materials is electrically conductive - means that 3D printing can be applied to anything you can think of, and a few things you'd probably rather not think about (such as 3D-printed sex toys, which are apparently a thing).

One area where you hope you personally won't see the benefits of 3D printing is in medicine. Over the past couple of years we've seen some truly wonderful prototypes: prosthetic eyes that cost £100 to make rather than £3,000 (and take a hour rather than weeks of hand-painting), precise casts for broken bones made of a mesh that still lets you scratch and even 3D printed skin for burns victims.

In 2015, we expect at least some of these to become available through private medical companies and perhaps even the NHS. Driving this is because they offer better results than current techniques but - as with the prosthetic eyes - replacing the hand-made with the printed means that medical items that have to be customised for each user are significantly cheaper. And with budget pressures across the NHS, this is likely to be welcomed.

So the 3D printer won't be the HD television, tablet, laptop streaming box, dishwasher or microwave - ubiquitous devices that most of us have in our homes. But when we want something more customised than the mass-produced but less expensive than the hand-made, 3D printing will be there for us. **Neil Bennett**



HP MULTI JET FUSION



STRATASYS OBJET500 CONNEX3 COLOR MULTI-MATERIAL 3D PRINTER

INTERNET OF THINGS

The Internet of Things, or IoT as geeks like to refer to it, sounds mysterious but is in fact very easy to understand. Previously, only computers and networking equipment had a connection to the internet, but these days so many devices have the capacity to be online - including everyday 'things' you're your heating thermostat - that an Internet of Things is being created.

It isn't only devices with an IP address which count as a 'thing'. Any uniquely identifiable computing device is part of the Internet of Things, so it includes Bluetooth gadgets such as activity trackers.

Of course, it isn't only wearable devices we're talking about: smart electricity meters and other new tech comes

under the IoT umbrella and things are about to hot up during 2015.

You've probably noticed the many adverts for smart thermostats such as Hive (pictured far right) on TV, on public transport and in newspapers. They let you control your heating from anywhere you've got an internet connection so you can turn it on if you're heading home from holiday early, or turn it off if you forgot

when you left the house. Thanks to deals with energy suppliers where you can get one free, smart thermostats are set to become hugely popular in 2015.

Smart meters are already rolling out, but many more will be installed in 2015. A government initiative aims to have all UK homes and businesses kitted out with one by 2020. Smart meters will remove the need

for you - or the man from the supplier - to read your gas and electricity meters so they can bill you for how much you've used. Smart meters will be read remotely, so the days of an estimated bill will finally be over.

Another benefit is you'll be able to see more easily how much energy your appliances are using, and what it's costing you, hopefully

helping you to save money.

Home monitoring also extends to safety and security, and 2015 will see the launch of easy to install and use cameras and sensors. These could include smoke and carbon monoxide alarms (such as the Nest Protect, above), as well as security systems that are smarter than your existing burglar alarm.

We're sure we'll also see affordable smart entry systems that let you and other



'authorised' people into your home. The current lock-and-key system works fine until you lose your keys or you want to let visitors in before you arrive home. Prototypes exist right now, but as with the other smart systems here, some people are worried they could be hacked into and misused.

Another example is location tracking. We'll see more and more smart devices which can help you keep track of your stuff. Small, low-cost tags could even be embedded into suitcases, clothing or attached to practically anything of value, and be trackable online.

The challenges for manufacturers include increasing battery life from months or years to decades, which will also involve using processors, communications devices and sensors that use much less power than they do now. BT will start rolling out a Internet of Things network using ultra-narrowband, which is suited to sending small amounts of data over great distances. **Jim Martin**



NEST PROTECT

SMART HOME

Your home is set to become smart, whether you like it or not. And you'll probably like it. Smart heating, and smart home automation in general, is going to be huge in the UK over the coming year.

On the one hand you have tech-savvy, affluent consumers with smartphones and in-home Wi-Fi. And on the other? A nation that is short of cash and power. So much so that those in the know say it will take only one bad winter to lead to power outages and astronomical rises to already high gas prices. Home automation is not only a cool way of using tech, it could be a critical way of reducing the amount of cash we spend on utilities. More importantly, it could be the short-term answer to the problem of keeping the lights on, and reducing the amount of fossil fuel we produce. Or at least helping with this issues, if only in a small way.

If I could make a prediction in this area, it is that within two winters we will all be comfortable with the idea of being incentivised to switch off electrical devices during the peak hours



of the evening rush hour. This would require power companies to supply homes with smartplugs, controlled by the consumer but monitored by the provider. A bit Big Brother, perhaps, but a small price to pay in return for - say - £1 a day. It would make no difference at all to your food if your fridge and freezer were switched off from 5- to 6pm every night. The temperature will change by a degree or two at most. But that is the point of each day at which the grid is under maximum pressure, and at which we might expect to start seeing power cuts. Of course, we would have to ensure that the power companies weren't leaching personal data, but I am more than happy to share with the world when my fridge is on and when it is off. (If not when I am in and when I am out.)

So settle in and get comfy. Invest in smart-home tech if you like the idea, but don't be surprised if it is 'gifted' to you by your gas or electricity provider. It will make your life better, and it might just save you money. But it will also become necessary in order to keep the home fires burning. **Matt Egan**

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Christmas gift guide

Ashleigh Allsopp presents a gift guide that will guarantee a perfect Christmas

Christmas is rapidly approaching, and that means the gift-buying season is upon us. We know how difficult it can be to find the perfect gift for everyone, so here we've rounded up the best tech we've seen throughout the year with enough present ideas to suit every budget.

There are plenty of new accessories and peripherals to choose from, whether you're looking for something fun, something practical, something fashionable or something to keep your tech safe. We've got cases, battery packs, storage devices, speakers, headphones, quirky gadgets and more in our Christmas Gift Guide 2014, so read on to get some gift inspiration.



Photography by Dominik Tomaszewski



Under £30



Shoulderpod S1

£24

shoulderpod.com

The Shoulderpod S1 helps keen photographers make the best use of their smartphone as a camera. This accessory can mount to a tripod, nestle in your hand in a 'filmmaker grip' or break down into a stationary travel stand. You can slip it into your bag or hang it from a belt strap, too.

Ted Baker AW14 collection for iPhone 6

£24.95

proporta.co.uk

For a fashion-savvy friend, Ted Baker's AW14 cases make perfect presents. The cases feature the brand's latest prints, and sport the Ted Baker London plaque. They're made with a soft-feel-finish polycarbonate, and give free access to all ports, buttons and controls.



Tryble Headphone Earmuffs

£19.99

firebox.com

Designed for those cold, wintery days, the Tryble Headphone Earmuffs will keep your ears nice and toasty while allowing you to listen to music from a smartphone or tablet. They look good, sound good (as good as you'd expect for £19.99) and are practical, too.

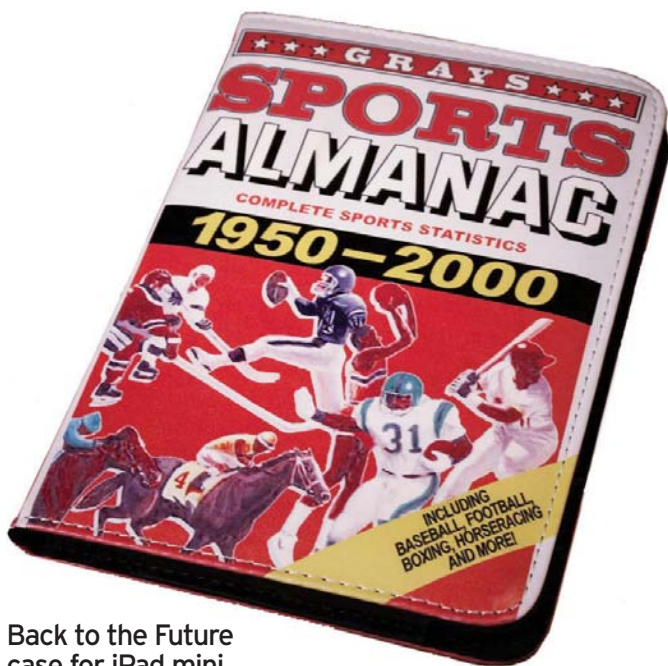


Boom Box Touch

£24.99

firebox.com

Here's a speaker that fits into the sub-£30 category, and it's a clever one too. The Boom Box Touch speaker doesn't use cables or Bluetooth pairing - place your smartphone or MP3 player on top of the speaker and press play. It's small, portable and can last for up to 10 hours of continuous playtime. Then, charge it using the Micro-USB cable.



Back to the Future case for iPad mini

£17.99

firebox.com

Back to the Future fans will love this brilliant iPad mini case inspired by the Grays Sports Almanac that Old Biff gives to Young Biff in the movie as a ploy to become a millionaire by betting on sporting events that had yet to happen. There's a bigger version for owners of Apple's iPad 2 or later, too.

3 in 1 Powerbank, Torch and Hand Warmer

£19.99

iwantoneofthose.com

Here's an example of practicality at its prime: the 3 in 1 Powerbank, Torch and Hand Warmer. If you know someone who loves camping, festivals and other outdoor activities, then here's a cheap and very cheerful gift for them. Its name is self-explanatory: it can fully recharge an iPhone, provide four to five hours of hand-warming heat and up to 50 hours of light thanks to the LED torch.



Cardboard iPhone projector

£15

firebox.com

This simple, nifty gadget makes the perfect Christmas gift for a Secret Santa at just £15. The cardboard smartphone projector does just what it says on the tin, allowing you to project what's on your phone via the cardboard housing (complete with retro styling) and an 8x glass lens.



£30 to £50



Misfit Flash

£49.99

misfitwearables.com

Ideal for friends or family with a keen interest in fitness, the Misfit Flash is a waterproof fitness and sleep monitor that tracks steps, calories, distance and sleep, as well as cycling and swimming, and encourages you to reach your daily goals. Made of soft-touch plastic and available in seven colours, including Frost, Onyx and Fuchsia, it connects via Bluetooth to your Android or iOS device using a dedicated app that's simple to use and wonderfully designed.

SuperTooth D4

£49

supertooth.net

This cool wireless speaker from SuperTooth is designed to look like a megaphone. With a handle at the top, it's been crafted with portability in mind, connecting to any Bluetooth-enabled device. SuperTooth says it'll last for up to 12 hours on one charge. The speaker is available in five colours, so you can choose from orange, black, white, blue or grey.

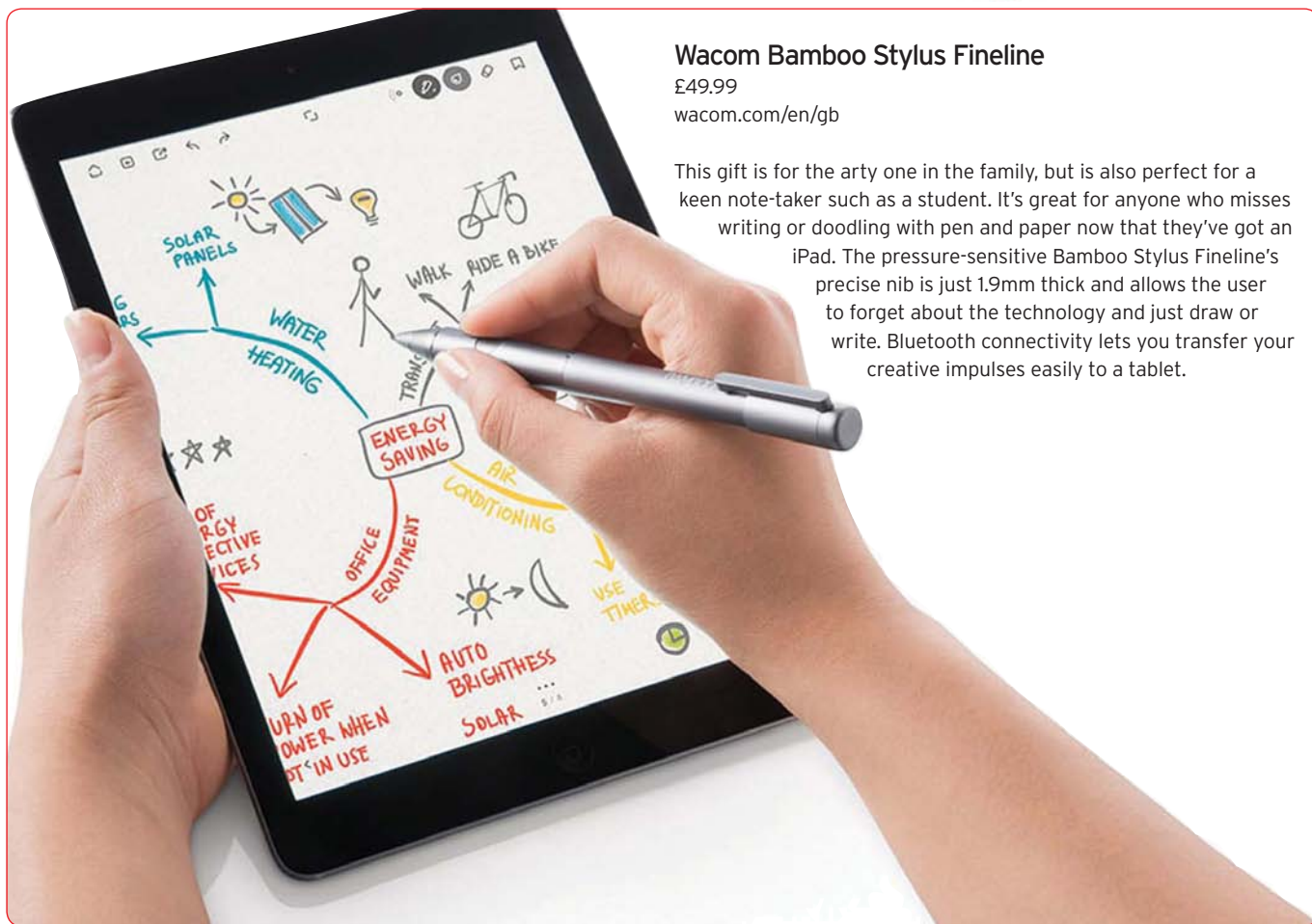


Wacom Bamboo Stylus Fintline

£49.99

wacom.com/en/gb

This gift is for the arty one in the family, but is also perfect for a keen note-taker such as a student. It's great for anyone who misses writing or doodling with pen and paper now that they've got an iPad. The pressure-sensitive Bamboo Stylus Fintline's precise nib is just 1.9mm thick and allows the user to forget about the technology and just draw or write. Bluetooth connectivity lets you transfer your creative impulses easily to a tablet.



G-Paws Pet GPS Tracker

£49.99

firebox.com

This device is for pet owners curious about what their beloved pet gets up to on its adventures. Attach the small G-Paws Pet GPS Tracker to your pet's collar and send them off. When they return, plug the tracker into your computer via USB and you can view their pet's travels on Google Maps.

**SurfacePad for iPad mini**

£42

twelvesouth.com

We love the SurfacePad. It's available for iPhone, iPad Air and iPad mini. Made with smooth, genuine leather and lined with microfibre, it covers the front and back of Apple's tablet and also acts as a stand. It's slim too, adding minimal bulk to the iPad. There are three colour choices: Pop Red, Mod White and Jet Black.

**Mophie Juice Pack Universal Reserve Lightning**

£39.95

amazon.co.uk

Handy for anyone who constantly finds themselves running out of power on their iPhone, the Mophie Power Reserve Lightning is a small but powerful charger that has an integrated Lightning cable and built-in USB connector to ensure that you're never without the juice you need to give your iPhone a battery boost. It's available in red, black or white, so you can match the colour to the recipient.

**Personalised wooden iPhone cover**

£39

sophiavictoriajoy.com

Here's a brilliant gift for a close friend or family member. It's an iPhone case that you can personalise with up to nine words that mean something special to that person, like their name, your name, the date you met, a memorable experience you shared, and so on. Custom-made from bamboo to fit the iPhone 4, 4s, 5 or 5s, a laser-engraving technique ensures a perfect finish.

£50 to £100

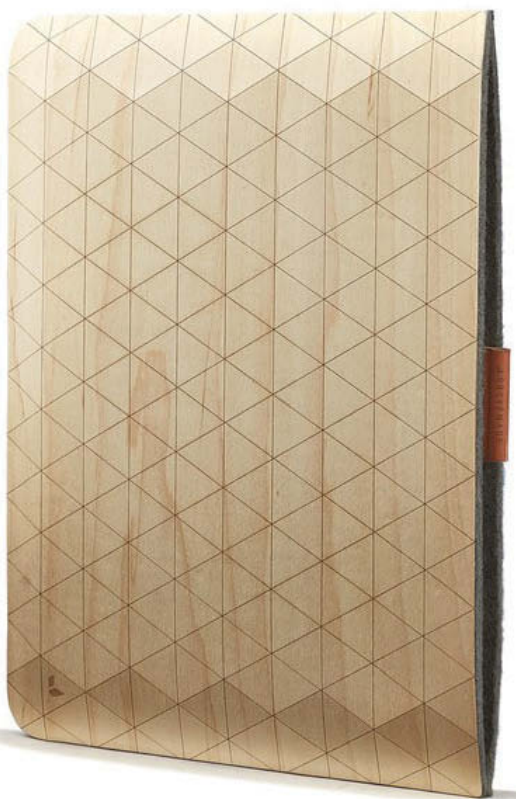


Braven 705

£89.99

braven.eu

The colourful Braven 705 speaker is small but stands out from the crowd. It's available in eight colours, including pink, blue and grey, and is water-resistant, which makes it perfect for use outdoors on holiday or during a picnic. You can also make hands-free calls using the built-in speakerphone, and give your smartphone or tablet a battery boost using this nifty little gadget.



Grovmade Maple Sleeve for iPad Air

£62

grovmade.com

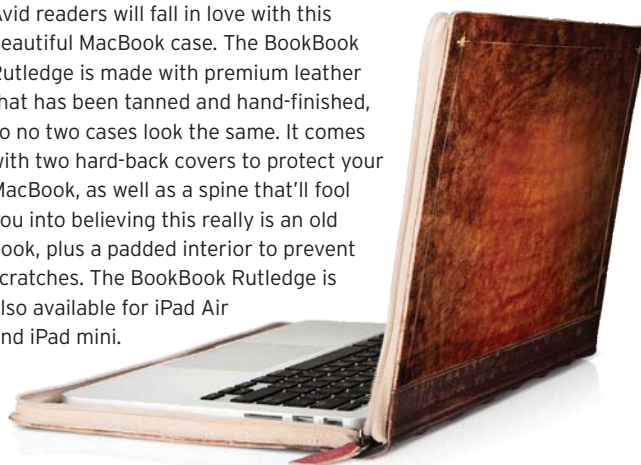
Grovmade's Sleeve, available in contoured maple or black walnut veneer, has a premium wool lining and a strap for smoothly removing the MacBook Air. Grovmade also makes the Sleeve for MacBook Air and iPad mini (all generations) too. It'll make a gorgeous gift for a loved one, as it's completely handcrafted and oozes style.

BookBook Rutledge for MacBook Air/MacBook Pro

£90

amazon.co.uk

Avid readers will fall in love with this beautiful MacBook case. The BookBook Rutledge is made with premium leather that has been tanned and hand-finished, so no two cases look the same. It comes with two hard-back covers to protect your MacBook, as well as a spine that'll fool you into believing this really is an old book, plus a padded interior to prevent scratches. The BookBook Rutledge is also available for iPad Air and iPad mini.



Proporta Stephenson Satchel

£89

proporta.co.uk

Proporta's stylish satchel comes with a removable tablet compartment that doubles as a case. There are even adhesive pads that allow you to attach a Bluetooth keyboard for typing while out and about. The Satchel has been designed to allow you to charge the iPad without removing it from the case, thanks to small openings through which cables can pass. The Satchel, which comes in navy or brown, has a main compartment large enough to fit a 13- or 15in laptop, plus other personal belongings.



Sphero Ollie

£79.99

gosphero.com

A big brother to the Sphero 2.0 robotic ball, the Sphero Ollie is a robot that can be controlled using your smartphone or tablet and a dedicated app. With a new, tubular design, it can spin, drift and flip, and is impressively fast at up to 14mph. You can change the colour of the tyres and hubcaps too, with green, orange, pink and blue options.



B&O Play Form 2i

£60

beoplay.com

The RRP for these B&O headphones is £109, though we've spotted them for much less on Very.com and Iwantoneofthose.com, so we've decided to squeeze them into the £50 to £100 category. The Play Form 2i is a modern update to the company's trendsetting headphones that debuted in the 80s and has won a place in New York's Museum of Modern Art. Now sporting a microphone, in-line remote, better sound and improved comfort, the B&O headphones are super-portable, weighing just 90g, and are available in black, white, red, blue, green, grey and additional limited edition styles.



Pebble Smartwatch

£99

firebox.com

The Pebble Smartwatch would make a fantastic gift for gadget-lovers. It can be used to see notifications including messages, emails and social media interactions, and there are lots of other apps to add more functionality in the dedicated Pebble app store. Choose from black, grey, orange, red and white options.

Mighty Power Wallet

£79

firebox.com

Here's a clever idea for you: the Mighty Power Wallet is a fully functional wallet with a built-in battery that can charge a smartphone up to 1.5 times. It's made from Italian Saffiano Leather and comes with both Micro-USB and Lightning cable adaptors, so you can charge most smartphones and tablets. It's not much bigger than an ordinary wallet (though it is heavier), so it can be slipped into a pocket ready for a night out.



More than £100

Jarre AeroSKull HD

£399

selfridges.com

The AeroSkull HD speaker is not going to appeal to everyone, and with a price tag of £399 it'll be a gift for someone particularly special, but for those looking for a speaker that'll be a talking point at parties and will fit in with a wacky interior design style, then this could be just it. It comes in 11 different colours including black, red, blue, green, silver (all in chrome) and matt black. An iPhone plugs straight into the Lightning connector on the top of the speaker, so there's no need for cables.



Mophie Space Pack

From £130

johnlewis.com

The Mophie Space Pack is an amazing product that'll benefit anyone with an iPhone 5 or 5s. It's the world's first battery case that comes complete with built-in storage. The Space Pack is available in 16- and 32GB models in black or white. If you know someone with a 16GB iPhone who has been complaining about running out of space, here's the gift for them. You'll be able to add up to an extra 16,000 photos, 14 hours of video and 9,000 songs. What's more, the Space Pack could double the battery life of an iPhone. Cool, right?



Parrot Jumping Sumo

£139.99

amazon.co.uk

Here's a brilliant gift for kids and big kids alike. The smartphone or tablet-controlled Parrot Jumping Sumo is great fun - but be warned that when you're not driving the robot it can be pretty frightening when it jumps up to 80cm when you're least expecting it. It even has a camera built into the front of the device to let you stream and record footage straight to your Android, iOS or Windows Phone device. There are three (very cool) colour schemes available to choose from, and various apps available to download to help you get more out of this awesome Christmas gift.

Ted Baker Audio Fastnet

£199.99

tedbaker.com

This fun and stylish product from Ted Baker Audio may look a bit like a camera, but it's a folding Bluetooth wireless speaker with integrated microphone. Available in black and brown, the speaker can be folded up to protect it from knocks, and that foldable portion doubles as a stand for use while listening. There's a built-in rechargeable li-ion battery that Ted Baker says will last for six hours between charges.



Braven BRV-Bank

£119.99

amazon.co.uk

If you're looking for something that'll charge your smartphone but you don't need it to be able to cook food as well, the Braven BRV-Bank is probably more suitable. It's still ideal for an outdoorsy person, though, as it's rugged and IPX5 water-resistant. And as it's Bluetooth-enabled, it can be remotely controlled, with the Remote Battery Monitor app allowing power levels to be checked. You can turn on or off one or both of its USB ports for power conservation, and activate Bear mode or SOS. In Bear mode, the BRV-Bank will send out an alert if the connected device is moved, and in SOS mode, it will send out a distress signal using the in-built USB torch.



BioLite CampStove

£150

amazon.co.uk

The BioLite CampStove is no ordinary camping accessory. In addition to cooking your evening meal, this extraordinary piece of kit charges your smartphone and tablet or other portable electronics gear. You can burn twigs, pine cones and other biomass in it to keep your smartphone or tablet charged and cook up the fuel you need to keep yourself energised, too.

B&O H6 Limited Edition headphones

£329

amazon.co.uk

These over-ear headphones are super-stylish, made with real leather and anodised aluminium for a lightweight feel and comfort for those who like to listen for prolonged periods of time. There's a three-button inline remote complete with a microphone, and the ability to daisy-chain with other compatible headphones to share music. The Limited Edition B&O H6 headphones are available in three stunning designs: Blue Stone, Graphite Brush and Bronzed Hazel. 







GAMING MICE

Love gaming but find your mouse is more of a hindrance than a help? **Adam Sheperd** and **Hayden Dingman** reveal the best mice to enhance your gaming experience

Why are you suffering in silence with that hunk of plastic you call a mouse? You love games, so don't settle for a tool designed for applications no more demanding than a web browser. Stepping up to a purpose-designed mouse can reduce stress on your body and make you more productive if you take advantage of its extra buttons and programmability.

Whether you're blowing chunks out of opponents or demolishing those TPS reports, it's essential that you have the right mouse under your hand. Gaming mice in particular have a seemingly endless variety of options to choose between, all offering different benefits. So how do you choose the right one for you and your needs?

A lot of it comes down to personal choice – how it feels in your hand, and whether you find the positioning of the buttons

comfortable. Incidentally, lefties should take note; these are all exclusively right-handed mice, and the Razer DeathAdder is the only model with a southpaw alternative, so you might want to consider that before splashing out. (There's also the Razer Taipan, too, but at £70 it was too pricey for inclusion here.)

However, aside from sheer ergonomics, there are other factors to consider. Many mice offer adjustable on-the-fly DPI settings, allowing you to change your mouse's sensitivity at the touch of a button.

Three buttons? Most high-end devices come with anywhere from five to 10 programmable buttons (which you can assign to specific functions such as sprinting, crouching or reloading), while an MMO-style mouse might cram 20 or more onto its chassis. These can give you a leg up on the competition, when used correctly.

Many also offer various backlighting options to make them more attractive to look at. Occasionally a mouse comes with removable weights, allowing you to make the mouse heavier or lighter until you've found your 'perfect' weight.

Wired mice versus wireless is another consideration you might have, but our view is that wired is best. The breadth of choice is much bigger if you opt for a mouse with wire, and you don't have to faff around with replacing batteries. Some gamers also say they can notice a lag with some wireless mice.

Whatever you're after, whether you're a twitch-gaming fanatic looking for the perfect precision headshots or a MOBA gamer trying to maximise your DPS, there's a mouse that'll suit your needs, and after using one, you'll never go back.

Cooler Master CM Storm Alcor

£25 inc VAT

eu.coolermaster.com/uk



The Cooler Master CM Storm Alcor is, to all intents and purposes, identical to the Razer DeathAdder (opposite). The design is the same (bar the tiniest of differences to the left- and right-button shape), and the two-side buttons are in exactly the same place.

However, there are some fairly key differences. First, the Alcor is available for under £30, which is great value. Furthermore, it has on-the-fly dots per inch (dpi) switching up to 4000dpi, a feature crucially missing from the Razer DeathAdder. The dpi settings come in four levels, with the CM Storm logo on the palm section changing colour to indicate the current state. We could argue that it would be better placed in a more visible location, but this is a quibble at best.

Admittedly, we couldn't find any support software for customising dpi levels or macros, something every other mouse we tested was able to provide. The quality is also a little disappointing – it's solid enough, but doesn't feel particularly different to a bog-standard desktop mouse. The semi-gloss finish also has a tendency to get a little sweaty during extended sessions, which didn't happen with any of the others.

The lack of flashy presentation might turn some of the more hardcore gamers off from the Alcor and the lack of macro and remapping options could prove too restrictive, but at such a ridiculously low price it's the perfect choice for those taking their first steps into PC gaming. **AS**

CORSAIR M65 RGB



Corsair M65 RGB

£60 inc VAT

corsair.com/en-gb



PC ADVISOR
BEST BUY

The Corsair M65 RGB mouse is, appropriately enough, a sleek, dangerous-looking thing of beauty, a mix of contours and sharp angles. The matte surface is non-slip for fast, precise movements, it has a braided cable, and it feels pleasantly solid. It's also part of Corsair's RGB range, meaning it has three separate lighting sections that can be customized with 16.8 million colours in a variety of ripple, wave and chase effects.

While design and aesthetic appeal are clearly a key focus of this mouse, it by no means skimps on the features. The 8200dpi sensor is the best we tested, and it comes with on-the-fly switching via two buttons below the scroll wheel, although the colour-changing indicator is less convenient

than the Kone's voiceover system. It also features a 'sniper switch', so you can drop your DPI down at a moment's notice to nail that perfect pin-point headshot. The two-side buttons are well-placed in thumbs-reach and the M65 feels reasonably comfortable in the hand, aside from a lack of support for your little finger. For the more particular gamer, Corsair's mouse also offers three 'tuning zones' to tweak the center of gravity to your individual satisfaction.

The configuration software covers all their peripherals, so applying customised lighting patterns between devices is a snap. The lighting management software itself can be somewhat confusing, but the options for creating patterns and effects are almost infinite, so it's a good trade. The software also includes macro functionality, so you can bind specific custom macros to any button you wish, as well as additional commands such as multimedia control.

The Corsair M65 RGB is ideal for those gamers who want their battle stations to look as awesome as humanly possible. However, it's also one of the best-equipped mice we tested, and would be equally at home in the hands of a tech-spec purist. **AS**

Logitech G402 Hyperion Fury

£37 inc VAT

logitech.com/en-gb



PC ADVISOR
RECOMMENDED

The G402 Hyperion Fury is part of the gaming range from Logitech, which has a substantial pedigree when it comes to PC peripherals in general. While it's not known for producing gaming gear, the level of experience and expertise it can bring to the table, or in this case, desk, is undeniably fearsome, including a 'fusion engine' built for 420 inches per second of tracking.

The mouse is definitely one of the most user-friendly we've tested – it fits ergonomically into the hand, and we barely had to move our thumb to reach the two side buttons. Counting these, the Hyperion Fury has eight programmable buttons, including a sniper switch and four-level on-the-fly dpi switching. The buttons for shifting the dpi up and down, however, are located just in front of the thumb switches and are a somewhat uncomfortable finger-stretch away.

The dpi levels are adjustable, and are indicated by three LEDs above the sniper switch. Again, the Roccat Kone has this beat in terms of sheer convenience, but it's a perfectly functional indication method. Along with the dpi LEDs, the Logitech 'G' logo is the only section that includes backlighting. It's a shame the G402 doesn't include more than

COOLERMASTER CM STORM ALCOR





this somewhat desultory twinkle, but we can forgive it on the strength of its design.

The visual design of this mouse is weirdly pretty; matte-black with gloss detailing and smooth, arresting contours. It's minimalist chic that's cool without being overly flashy. It's also very well-constructed, as could be expected from a company such as Logitech. The body feels solid and well put-together, and it's lightweight while still maintaining enough heft so as not to appear cheap and flimsy. It's just a shame that it's gone with a rubber rather than braided cable.

Logitech's configuration software is basic and lacks some of the bells and whistles found on offerings from the likes of Razer and Corsair. However, it's incredibly intuitive and easy for less experienced users to get to grips with, while still offering full single and multi-key macro functionality. It also includes some rather cool usage statistics and analysis to help assess your performance.

Adjustable dpi, high-speed tracking and a dedicated sniper switch make this a great mouse for FPS gamers, but the G402 Hyperion Fury has got a solid design and layout that render it a pretty sensible choice for fans of other genres as well. Even better, it's not overly expensive. **AS**

Mionix NAOS 7000

£52 inc VAT
mionix.net



PC ADVISOR
RECOMMENDED

Mionix's NAOS 7000 is a whale of a mouse. It's more than an inch wider than several of the mice in this round-up. That's a lot of plastic, but a lot of plastic put in service

of your hand's comfort. And comfort is what Mionix excels at. The NAOS 7000 is in essence the same mouse as the older NAOS 8200, except Mionix outfitted the new one with an optical sensor where the other one has a laser. The only change you might notice is that the sensitivity now tops out at 7000- instead of 8200cpi (counts per inch), but that's plenty for most people's needs.

Mionix has quietly crafted some stellar software for its back end. Installation isn't mandatory, but it's encouraged. Its features include a surface analyser, customisable lift-off distance, cpi adjustments, scroll speed adjustments, and the ability to change the colours of the LEDs illuminating its logo and mouse wheel with practically any colour imaginable.

One of the NAOS 7000's best features is the internal memory that enables you to bring your mouse to a friend's place, plug it into their computer, and retain all your custom macros and key bindings. Some would argue that cloud storage has rendered local memory an unnecessary expense for storing



this purpose, but I find it so much more convenient than waiting for a download.

The NAOS 7000 is closer to perfect than most of the mice reviewed here, but it's still not perfect. Scrolling is stepped, but it nonetheless feels a bit mushier than we prefer. In fact, its scrollwheel is one of the weakest in this lot, and it has an unpleasant tendency to rotate one or two steps when all we intended was to click the wheel.

We also couldn't find a way to hold the mouse with my three fingers arranged comfortably on its top. When things get tense, or in certain games where the mouse wheel is important. We like to keep the index finger on the left-mouse button, the ring finger on the right, and the middle finger - you guessed it - on the middle button.

The sloped/ridged shape of the NAOS 7000 renders this impossible. We had to either scrunch our little finger up close to our other fingers or stretch it awkwardly to the side, neither of which is ideal.

Apart from those reservations, the NAOS 7000 is spectacularly comfortable, with a



matte finish that feels luxurious and velvety. This gaming mouse is a solid investment for anyone who needs to operate a computer for hours on end. You just can't go wrong with the NAOS 7000. **HD**

Razer DeathAdder

£48 inc VAT
razerzone.com/gb-en



The Razer DeathAdder is as close as the company gets to an entry-level peripheral, listed on its site with an RRP of £64 (it's much cheaper from Amazon). The DeathAdder has two additional side buttons to supplement the usual three, and their placement feels convenient and natural. However, the mouse itself isn't as ergonomic as some of the models we've tested, which is a shame.

While it boasts 6400dpi optical sensor, the second-highest in our test, the DeathAdder lacks the on-the-fly switching capability found

in others, which can be a pain when switching between genres. It's also without a dedicated 'sniper switch', a specific button that when held keeps the dpi at a preset level for precision aiming, making it a less than ideal choice for FPS enthusiasts.

The Razer Synapse 2.0 software suite, which the Razer peripherals use for configuration and macro creation, is very user-friendly - it's a doddle to set up long keystroke sequences that can then be assigned to a single mouse click. You can also share your macros across devices, should you also have a Razer keyboard or gamepad.

The design is basic but functional plastic, with an understated matte-black finish and rubber sidegrips for stability. The cable is braided rather than rubber, which we like as it looks more professional and seems sturdier than traditional plastic. The lighting is pretty simplistic, with only the scroll wheel and Razer logo lighting up, and while backlighting isn't nearly as important for mice as it is for keyboards, this feels a little lazy.

For the amount being charged, we can't help thinking that the Razer DeathAdder is surprisingly lacking in features. With no on-the-fly dpi switching and only two additional buttons, unless you're dead-set on using the Synapse 2.0 macro software you're better off elsewhere. **AS**

Razer Naga 2014 Expert MMO

£64 inc VAT

razerzone.com/gb-en



The button-heavy 'MMO mouse' has become a rarity, having fallen out of favour almost as much as the MMORPG itself. No other class of game can take advantage of as many button



ROCCAT KONE NAVAL STORM PURE

commands or macros as an MMO, so a mouse studded with 15- or 20 buttons just isn't in demand. But they haven't disappeared. Razer, for one, refreshed its MMO mouse, the Naga 2014 Edition, which looks like a mouse with a numeric pad glued to its side.

The Naga has 19 buttons in all: left-, right-, and middle-click, two buttons accessed by tilting the scrollwheel left and right (a new feature in this year's model), two buttons adjacent to the scrollwheel, and 12 buttons arranged telephone-style beneath your thumb.

Razer has widened the Naga's right side, making the device a bit more comfortable to grip. The 12 thumb buttons have been upgraded with mechanical switches for faster response times, and rearranged into a more concave pattern that in theory lets you tell

which button you're pressing without looking. But after days of use, we still found myself making mistakes in the heat of battle. Twelve buttons is a lot to put under one finger, and my thumb is just not sensitive enough to tell the difference between them without a second or two of thought.

The Naga is pleasant enough to use in any use scenario. It's comfortable and lightweight, and has enough buttons to make anyone happy. On the flip side, it's overkill for most people. But you might not be 'most people'. If you're still playing a ton of MMOs, or love to have applications bound to all those buttons, I'd say the Naga is in the top three MMO-style devices on the market. **HD**



RAZER NAGA 2014 EXPERT MMO

Roccat Kone Naval Storm Pure

£57 inc VAT

roccat.org



The Roccat Kone Naval Storm Pure is built for the most finicky of gamers who like to tweak every last detail of their settings. Both the angle snapping (which adjusts the input to keep horizontal and vertical lines straight) and the lift-off distance (the height the mouse can be raised to before it stops registering input) can be adjusted, as well as virtually every conceivable aspect of the dpi.

Beware, though, as the configuration suite for the Roccat Kone is insanely complicated. While it's comprehensive, trying to pack in all that data means that the mass of numbers will be very intimidating for novice users, and there's a high risk of confusion.

On top of that, rather than the software provided by Razer and Corsair, the drivers for


TESORO SHRIKE

different Roccat devices come as separate programs, and the lack of integration can get very annoying when trying to sync settings and macros between the two.

The mouse also features seven programmable buttons, including two below the pleasing chunky Titan scroll wheel. These buttons are used for switching instantly between five adjustable dpi settings up to 5000, with a little announcement to tell you which dpi you're on - helpful for when you're in the middle of a firefight and don't have time to check.

Sadly, the side buttons aren't nearly as intuitively placed as others we've seen; in fact, the Kone as a whole feels a little uncomfortable during intense FPS sessions.

The build quality, however, is superb (if visually uninspiring). It's plastic but it's high-quality plastic, and it feels like a decent piece of kit, with a braided cable and 16.8 million-colour LED logo to boot.

One interesting feature is the Roccat EasyShift[+] technology built into its devices. In essence works in the same way as Shift on a keyboard; hold it down, press a button and you can access a second preassigned function, letting you increase your potential mouse functions to 16. It's an elegant solution for those that find themselves running short on available buttons.

If you want absolute control over every possible aspect of your mouse, this will suit you down to the ground. For undemanding

gamers who just want a few more buttons and some above-average design, however, it's probably not the best option. **AS**

SteelSeries Rival

£40 inc VAT

steelseries.com



The SteelSeries Rival is about as bare-bones as a gaming mouse can be - only six buttons and a scrollwheel. And yet we found ourselves returning to the Rival as our daily driver even though we had our pick of several high-priced, feature-packed alternatives. The Rival is a workhorse. It's comfortable and powerful, and because it doesn't scream 'gamer mouse' we can use it in public without attracting unwanted attention. Just as there are times when the Razer Naga's panoply of buttons is just the ticket, so there are occasions when a simple and unadorned tool is all that's required.

We're not saying the Rival is simplistic. Its optical sensor tracks from 50- to 6500 counts per inch (cpi), and it comes with a programmable cpi-switch button that lets you swap between two sensitivity levels on the fly. And as with all SteelSeries products, the Rival comes with a host of adjustable settings via the downloadable SteelSeries Engine 3 client software. Polling rate, dpi, buttons, mouse acceleration, and angle snapping can all be adjusted within this app. The front and rear LEDs illuminating the manufacturer's logo can also be adjusted independently (or turned off). Sorry, lefties, but the Rival is a right-handed mouse. Its elongated oval shape renders it best suited to palm-grip users. Claw- and fingertip grippers might be able to use the Rival, but the thumb buttons are placed so far forward they're difficult to hit unless you palm the whole mouse. The Rival is extremely comfortable to use with a palm grip, even if it was a little narrow for my large hands. The rubberized grip on either side is soft and tactile, and allows you to lift and adjust the mouse with minimal effort.

The Rival is a solid (if stripped-down) mouse on the lower end of the price spectrum. If you need a good mouse that can double as a competent gaming peripheral, the Rival is a solid option. **HD**

Tesoro Shrike

£35 inc VAT

tesorotec.com



The Tesoro Shrike is an interesting little number; it's not technically lacking in


STEELSERIES RIVAL

any area, but it somehow feels a bit underwhelming. It has eight programmable buttons, all of which are within easy reach, a braided cable and pleasing brushed aluminium look, and it's fairly easy to use. Not as much as some, but it's far from awkward. The rubber side-grips are also comfortable, and excellent at preventing slippage. On the other hand, there's no getting away from the definite cheapness of the plastic body – this doesn't feel like a particularly well-built model.

Additionally, while it's got a five-level dpi cycle (up to 5600dpi), there's no clear indication of which setting you're currently on, which makes for some rather tedious guesswork. The cycle system also frequently leads to overshooting your desired dpi and having to go round again.

The macro and button-mapping software, while functional, is pretty basic, and not especially pretty to look at. The manufacturers also claim full-colour LED illumination, but you'd be hard-pressed to tell, as it's restricted to a tiny area beneath the scroll wheel.

One area where the Shrike does shine is the manual weight system. Included with the mouse is a set of four weights totalling 35g, which can be slotted in various combinations into a pop-out section on the underside. This allows players to customise exactly how heavy they want their mouse to feel during play, and is a rather nice feature.

While it's not the best on this list, the comparatively cheap price tag of around £35 is enough to make up for the Tesoro Shrike's superficial flaws, making it a very solid mouse for those looking to upgrade to a dedicated gaming peripheral. **AS**

Zowie Gear EC1 EVO CL

£50 inc VAT
zowiegear.com



We've used a Zowie mouse (the AM model, to be specific) as our everyday mouse for more than a year. We love it because it's a plug-and-play device: there's no need to install manufacturer-specific software on my machine. It has an incredible sensor, a very low lift-off distance, and absolutely zero frills. That's perfect for what we need.

The Zowie EC1 Evo CL is similar in many ways. The company's optical sensors are some of the most accurate and responsive we've ever seen, and the 1.5mm lift-off distance is right in the sweet spot for us. Most devices on the market run a little (or a lot) higher than 1.5mm, especially as a default – devices by SteelSeries and Razer will allow you to set a similar lift-off distance, but only after you install their software.



ZOWIE GEAR EC1 EVO CL

Like the SteelSeries Rival and the AM model we use, the EC1 Evo is a bare-bones model with just five buttons: left-, right-, and middle-click, plus two on the thumb. That's what we like: a mouse that moves my cursor around the screen so reflexively we barely have to guide it.

The shape is clearly ideal for palm grippers, with a broad and elongated base, but I had a fine time using the mouse as a claw gripper. The thumb buttons are enormous and placed far enough back that you can hit them no matter what grip you're contorted into. As with other Zowie products, the EC1 Evo CL has a CPI switch on its bottom its bottom. This one can switch between settings of 450-, 1150-, and 2300cpi, with the settings identified by the shade projected through its translucent scrollwheel: red, purple, and blue, respectively.

Unfortunately, there's no way to turn that light off. Love to run your mouse at 1150dpi? Prepare to have a blinding pinkish-purple light in your peripheral vision as long as you use this mouse. There's also no way to program the thumb buttons to do anything useful unless you're running software. That's fine in a game, where you can map buttons in the options menu, but it's not so great in standard usage. If you're using a web browser, for instance, you can use those buttons to navigate forward and back through your browsing history. But that behaviour is preprogrammed inside the application – you can't change it to act any other way. The EC1 version of the EC Evo CL was designed with feedback from professional Quake player Anton 'Cooler' Singov.

The big change that resulted from his feedback: The mouse wheel is stepped at 24 intervals instead of 16. As it says on Zowie's website, "Zowie Gear have made this choice together with Cooler because Quake gamers tend not to use the scrollwheel to change

weapons compared to other games." The end result is a mouse wheel with a lot less friction than what I'm used to, and I'm not a huge fan.

Finally, the matte black coating on the top of the mouse is a fingerprint magnet. We still found ugly oil marks all over the top of the EC1 when we let go of it. We're talking very minor aesthetic issues here, but they're worth noting. We love Zowie's mice. They're fantastic, they're responsive, and the sensors are works of technical wizardry. The EC1 Evo CL is one of the best gaming mice in this roundup, but there's room for improvement. This company was built on the strength of its sensors, but it has much to learn in terms of vanity features and atypical user needs. **HD**

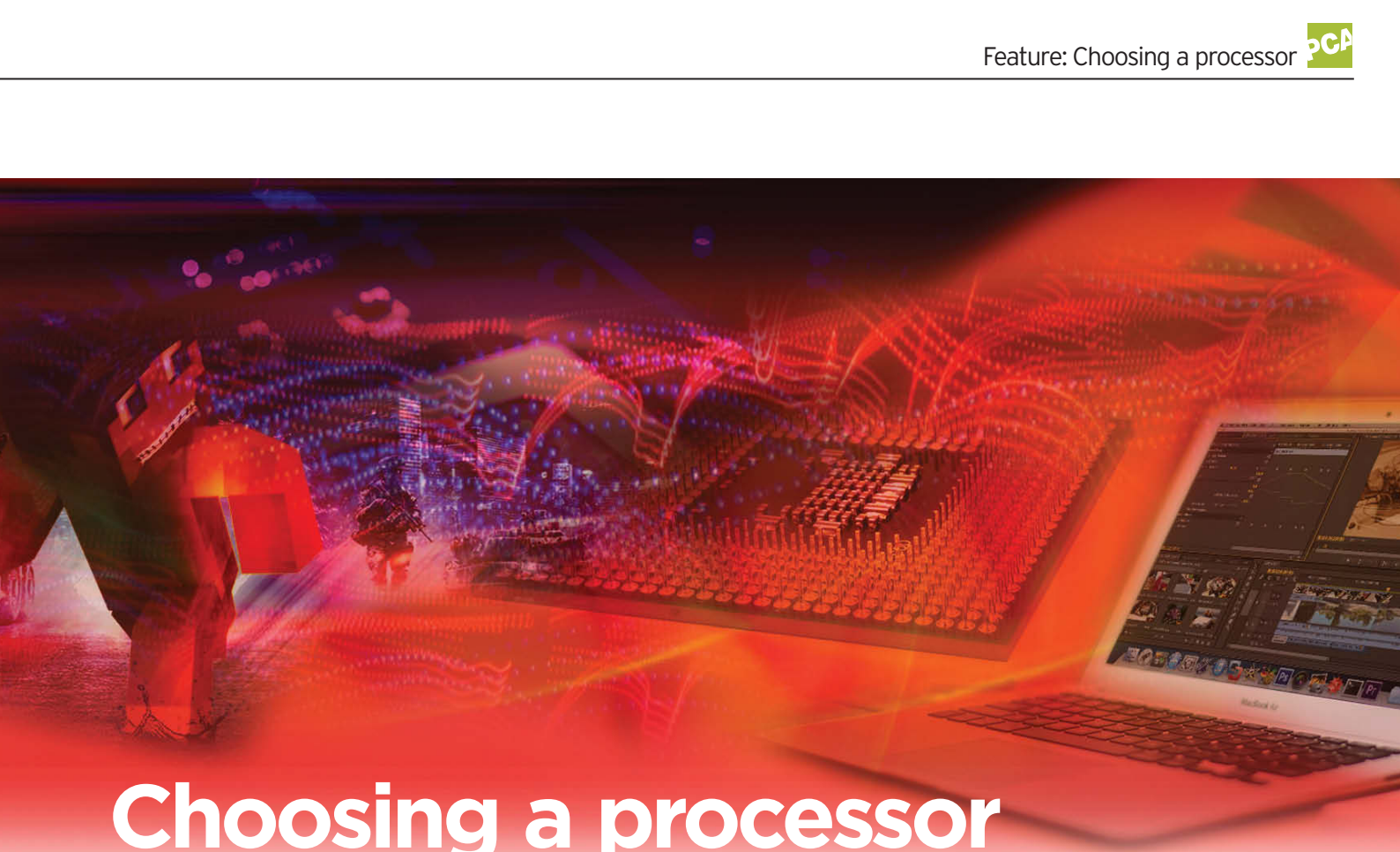
Conclusion

Gaming mice are not only a personal choice but also one that will be based on the type of game you like to play.

Fussy gamers that like to micromanage every aspect of their hardware's configuration will be delighted with the Roccat Kone, but more low-maintenance players will probably find the amount of adjustable options to be overkill. For those that don't need all the bells and whistles, the Cooler Master Alcor is an excellent choice that offers dots per inch switching and well-placed additional buttons without stretching your wallet.

For a shade over £50, the Mionix NAOS 7000 is an ultra-comfortable choice for those who plan on protracted gaming sessions, or want to use this as their main mouse all day, every day.

Although at the top end of our price range for this test, the £60 Corsair M65 RGB is well worth the extra for some gamers. It has on-the-fly dpi switching, a decent number of additional buttons and plenty of macro support. And to cap it all off, it looks the absolute business.



Choosing a processor

How powerful does a CPU need to be for editing video and playing games? **Jim Martin** explains everything you need to know to buy the right computer with the right processor, memory and hard drive

It's a question we get often asked: "What processor do I need for games and video editing?" Here we explain the basics, so you're better equipped to spend your cash more wisely.

PC games

Many people mistakenly think that they need the fastest possible processor to play games. This isn't true. In fact, the brunt of the load is borne by your PC's graphics card, as this is the component that's responsible for rendering each frame of the game and delivering it to the screen. It's a processor in its own right, most often referred to as the GPU (graphics processing unit).

Aside from supporting the latest graphical features (which isn't strictly necessary to play most games) what you need from a graphics card is enough processing power to play your chosen game at the highest resolution of your monitor – usually 1920x1080 pixels.

You also want to be able to see the game at its best, which means turning all the graphics options to their highest level, and then for the card to be able to render a minimum of 25- to 30 frames per second for smooth game play.

In all of this, the main processor – the CPU – doesn't have as much to do. It looks after other aspects of the game, such as the artificial intelligence of characters and physics calculations. However, you don't need the latest Core i7 for this.

It's worth spending as much as you can on the best graphics card rather than a fast CPU if you have the choice. Ideally, though, you want a well-balanced system with no 'weak' components, which means a good helping of RAM and a fast hard drive – preferably an SSD.

To properly answer the question, the best processor for games is a relatively inexpensive one that leaves room in your budget for a fast graphics card. Our recommendation would be the Intel Pentium G3258 Anniversary Edition, which has an unlocked multiplier and is built for overclocking. You can find it for under £50.

For just under £80, try AMD's FX-6300 Black Edition. This is a six-core, multiplier unlocked chip which is also great value.

If money is no object, then go for the Intel Core i5 4690K. It's around £175, and is very overclockable. Beyond this, you're not going to notice much benefit for gaming, and it really is a case of diminishing returns: a Core i7 is overkill for gaming.

Video editing

When you're editing video, the processor is much more important than the graphics card. Video is very processor (and memory) intensive, especially if you want to edit HD or even 4K video. Here, it pays to get the fastest processor you can afford, with the most cores, and you'll certainly notice the benefit of a fast Core i7. You should also

buy as much memory as you can afford and should consider 8GB a minimum, but you can never have too much.

If you're editing standard definition video, requirements are much lighter, and even (modern) budget laptops should be able to handle a few tracks of video and audio.

Check whether your chosen video-editing software supports multiple cores, as otherwise three cores of a quad-core processor could be left idle when exporting or rendering your timeline.

You might also want to choose your graphics card based on your chosen software, or vice versa, since some editors can use the power of a GPU to accelerate rendering and playback. Adobe Premiere Pro, for example, works best with certain nVidia graphics cards that support Cuda.

Our pick right now for a good-value video-editing CPU would be the same Core i5 we've already mentioned. At £175, the Core i5 4690K should be powerful enough for most casual users. For enthusiasts, it might be worth going for a six-core i7, such as the i7 5820K but the quad-core i7 4790K, running at 4.4GHz, is still plenty powerful at under £260.

Naturally, if you already have a motherboard and are looking to upgrade, you'll be limited to those CPUs that have a compatible socket type. Don't, however, assume all Core i7 processors have the same socket: they don't. ☒

GAMING KEYBOARDS

Get the edge in first-person shooters and other games.

Adam Shepherd tests five of the best keyboards for gamers

For some PC gamers, having the right keyboard attached to your computer can be almost as important as the hardware inside it. However, for the uninitiated, it can be hard to see what all the fuss is about. Is there really any difference between fancy gaming keyboards and a basic £10 keyboard from Microsoft or Logitech?

In a word, yes. Different keyboards have different features, of course, but all gaming keyboards come with a battery of extra options and features, and have the potential to improve your gaming experience dramatically.

One of the principal differences is the keys themselves, and whether the keyboard is mechanical or membrane-based. The latter use a layer of conductive plastic underneath the keys which forms an electrical contact when pressed. Mechanical keyboards on the other hand use physical switches underneath each key, which are actuated when pressed.

Mechanical keyboards are generally more crisp and responsive and keyboards using the high-quality Cherry MX mechanical switches are a firm favourite of PC gamers, allowing for faster, more precise keystrokes. The principal downside of mechanical keyboards is their more expensive and bulky nature versus membrane models.

Of course, how a keyboard feels is only part of its appeal; you want it to look good as well. Many gaming keyboards now come

equipped with backlighting, allowing you to see what your typing even in the dark, as well as often enabling you to program specific colours or patterns for aesthetic appeal.

Layout is also an important aspect of gaming keyboards. Many games rely on lightning-fast reflexes, and a split-second can mean the difference between glorious success and humiliating, abject failure. For this reason, gaming keyboard layouts are optimised for maximum efficiency, with ergonomic layouts, programmable keys and numerous shortcuts meaning that everything you need is always right where you need it.

Part of this is macro keys: programmable buttons to which you can assign long, complicated strings of keystrokes. This enables you to execute complex commands and manoeuvres with a single button press, saving time and effort and letting you focus on your gaming strategy. You can even create multiple profiles with separate macros, allowing you to tailor your macro sets to specific games.

Many additional factors can influence a gaming keyboard's appeal - the design and build quality, the convenience of its configuration software, additional multimedia keys and so on. You may find that if you're only an occasional gamer, you're perfectly happy with the most basic of peripherals. But for those of us that consider gaming a serious hobby, upgrading to a dedicated keyboard will change the way you play.







**COOLERMASTER CM
STORM QUICKFIRE TK**

Cooler Master CM Storm Quickfire TK

£85 inc VAT
eu.coolermaster.com/uk



When we took it out of the box, the first thing we noticed about the Cooler Master CM Storm Quickfire TK was its tiny size. It's the smallest keyboard we tested by a considerable margin, but it felt a bit wrong. For a while, we couldn't put our finger on the reason, until we realised that in order to save space, Cooler Master has combined the right-hand numberpad with the arrow and command keys to the left.

On paper, this seems like a great idea: a lot of those buttons are fairly redundant, and there's a substantial amount of wasted space in that area. However, muscle memory plays a huge part in keyboard operations, both in terms of gaming and when just generally typing, and by smashing those two sections together and shortening the form factor, our muscle memory was thrown off in a pretty major way. After spending some time with it, we were able to (mostly) get used to the smaller dimensions, but it's initially counter-intuitive and uncomfortable.

We can't understate how small it is, though. You'd have to struggle not to fit this on to even the smallest of desks, and it's extremely portable. The braided cable is also detachable for even more flexibility, and connects via mini-USB enabling you to swap it out for a longer or shorter wire as needed.

Like the Excalibur, it's basic in terms of design, opting for the basic matte-black square shape. The plastic material of the body feels a little low-quality, but the keys themselves are nice, and the inbuilt steel plate gives it a fantastic rigidity, albeit at the expense of a slightly disproportionate weight. It's unassuming, but for some reason, we found it more attractive than the similar looking Excalibur.

One feature it is unfortunately lacking in is macros. We couldn't find any configuration software, so if you want to rebind any keys or assign any long macro combinations, you're out of luck with this particular keyboard. This also means that there's no lighting customisation. While it is backlit, the Quickfire TK only has one colour option (depending on which switch type you opt for), with three lighting modes (including lighting the most common gaming keys) and five brightness settings. It's also got a brace of media controls, once again assigned to the function keys. It's not the most impressive set-up in the world, but it's at a decent basic level.

The keys used in the Quickfire are Cherry MX switches, available in red, blue or brown. We used the red switches as also seen on the Corsair K70 RGB, and the action isn't as crisp as we'd like. It's also not as noisy as Corsair's keys, but both of these are very minor quibbles. One bonus it does have is a tool for detaching the keys included in the packaging, allowing you to take them out for cleaning or maintenance.

This keyboard is perfect for gamers that have to juggle their hobby with work or education, as it won't dominate your desktop real-estate and is uber-portable. On the other hand, the lack of modification options and macro support is a little irritating for those of us that like to tweak our settings. Overall,

though, this is a great all-rounder for both fast, responsive gaming, and for acting as a typing workhorse.

Corsair K70 RGB

£140 inc VAT
corsair.com/en-gb



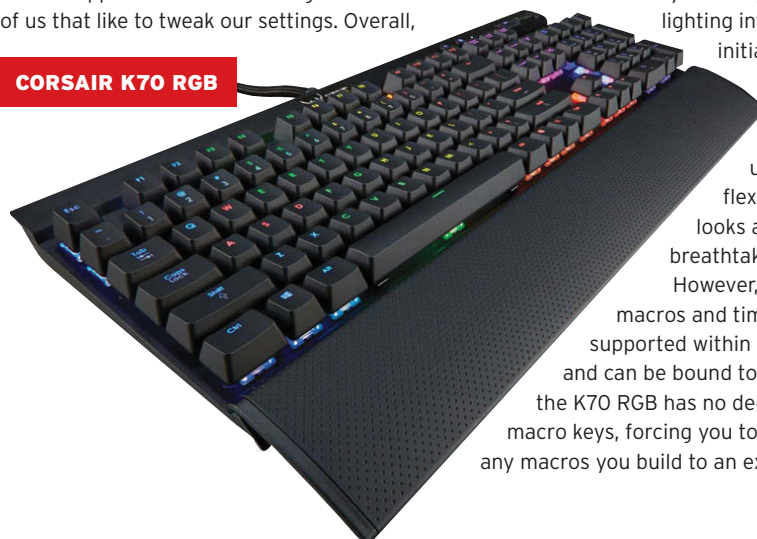
**PC ADVISOR
BEST BUY**

We'll say this for the Corsair K70 RGB keyboard: it's a beautiful piece of kit. Constructed from aircraft-grade brushed aluminium, it's both light and sturdy, on top of looking fantastic. The design itself is simple, square and a little dull, but we can live with that. It also comes prepackaged with a detachable soft-touch wrist rest.

It looks even better switched on, too. The chief selling point of this model is the backlighting, boasting 16.8 million colours per key and virtually limitless combinations. Corsair's cross-device software allows you to build an endless variety of pulse, ripple and wave effects in vibrant rainbow colours, as well as colour-coding specific keys, such as movement controls in green, skill keys in blue and combat buttons in red. You can also assign timers to the lighting, such as having your spell keys change colour when they're ready to use. The lighting interface is a

initially confusing, but makes up for it with sheer unbridled flexibility, and looks absolutely breathtaking in action. However, although macros and timers are supported within the software and can be bound to any button, the K70 RGB has no dedicated macro keys, forcing you to reassign any macros you build to an existing key.

CORSAIR K70 RGB



**RAZER ANANSI**

The key switches themselves are Cherry MX models, and the red versions that we used are nice and responsive. There's not a huge amount of physical feedback and they're pretty clacky (although not as loud as the Roccat Ryos), but whether that's a plus or a minus is entirely down to personal taste. For the record, we're fans.

Rather than assigning music and video controls to the function keys as most other keyboards do, Corsair has opted to give them special little buttons. There's also a special volume roller, for instant and precise audio control. It's a small detail, but for some reason, we're absolutely in love with it.

One thing we don't like is the two USB ports required to run the keyboard. In this case we can understand why it's necessary, given the intensiveness of the backlighting, but it's still a little awkward. The braided cable is also unexpectedly chunky, which is odd.

While it's not as densely packed with hardware features as some of the other models on this list, in terms of purely aesthetic value it's the clear winner by an absolute mile. If you desperately need macro keys it's probably not ideal.

Razer Anansi
£86 inc VAT
razerzone.com/gb-en



Razer is well known in the gaming world for its peripherals, and a Razer keyboard is the first choice for many. The Anansi is one of Razer's cheaper models, but remains fairly packed with features.

The Anansi uses 'Hyperresponse' keys, as opposed to the Cherry MX switches used in every other keyboard we've tested here. The difference is definitely noticeable. The action just doesn't feel as nice as the others on this list. It's not necessarily a deal

breaker, but it is a great illustration of why so many people swear by Cherry keys.

The Anansi also has a gaming mode that disables the Windows and Alt keys, and multicolour backlighting that can be customised for specific colours or cycles, adding an extra dimension to the standard lighting seen in most keyboards. Visually, it's uninspiring; the plain matte-black surface and gloss edging is pretty run-of-the-mill, and is unlikely to get anyone fired up. It's at least fairly attractively shaped though, with rounded edges rather than square corners.

Razer bills this keyboard as being 'designed for MMO gamers', and nowhere is this more apparent than when it comes to the amount of additional keys. As well as assigning multimedia actions to the function keys and including five programmable macro keys to the left of the keyboard, it also features a whopping seven thumb modifier keys below the space bar that can be assigned to macros, multimedia functions or modifiers such as Ctrl-Shift. While a higher number of keys is theoretically good to have (just in case), having seven on top of the macro keys just seems unnecessary.

However, the Anansi does handle macros beautifully, and the Razer Synapse 2.0 software suite is unquestionably this

keyboards biggest selling point. Dealing with macro construction and assignment, as well as lighting, configuration and key-mapping, the software is able to transfer macros and settings between multiple profiles and Razer devices, making it an incredibly efficient tool.

One thing that does let the Anansi down is its cable. Although it's braided, it requires two USB ports, which eats input space, particularly if you're using a laptop. We can't quite work out why it needs that much connectivity, but we do know that having to shuffle devices around to free up two adjoining ports is a little annoying.

The Anansi isn't a bad keyboard, and it does lots of things well, but gamers with more specialised tastes are likely to be unsatisfied. A great keyboard for heavy macro users, but FPS fans should look elsewhere.

Roccat Ryos MK
Advanced Mechanical
£90 inc VAT
roccat.org



It's painfully evident that Roccat's strength lies in its range of mice after using the Ryos

ROCCAT RYOS MK
ADVANCED MECHANICAL





TESORO EXCILIBUR G7NL

MK. For starters, there is no backlighting. This is disappointment particularly as certain small elements of the keyboard are lit, leading us to question why the rest of it wasn't. There is a fully illuminated version of the Ryos MK, but it's £120.

The keyboard is huge, largely due to the built-in wrist rest. While it's ergonomically comfortable, it increases the size of an already-bulky device - you'll need a lot of desktop space for this. It also feels hollow and flimsy, a side-effect of which is that the sound of the Cherry MX black switches is amplified by the echoey body to old-school typewriter levels of clackiness. The overall build quality is average and the plastic feels fairly cheap. The lack of a braided cable also makes the price seem a tad high.

A common feature of gaming keyboards is having multimedia controls bound to the function keys. For gaming, there's the standard set of multiple profiles and the ability to switch between them. It also has a column of five macro keys on the left of the keyboard and thumb modifiers below the spacebar, similar to the Anansi. However, the Ryos has three thumb keys rather than seven, which we feel is a more sensible amount.

Should you feel that this is insufficient, Roccat's EasyShift[+] technology allows you to assign a second function to every key, accessed by holding down what would otherwise be the Caps Lock button. However, with over 100 programmable keys already available, we can't conceive of any situation that would necessitate almost doubling your keyboard's functions.

Unfortunately, the macro and configuration interface is less comprehensive than some we've seen, and is less intuitive - programming macros is something of an ordeal. It's also separate to the Roccat mouse drivers, so if you've got multiple devices it's not easy to share settings between them. We also couldn't find any option for changing the resolution of the software, which appeared

as ridiculously tiny on our monitor, forcing us to squint at the settings.

The Roccat Ryos MK is a decent keyboard, provided you don't mind the lack of backlighting and the prospect sounding like a 1950s typist. However, there are better options out there, so unless you particularly need the option to have around 200 key bindings, look elsewhere.

Tesoro Excilibur G7NL

£65 inc VAT

tesorotec.com



The Tesoro Excilibur is not a pretty-looking keyboard. It's chunky and square, with the most basic matte-black design possible. It features no fancy aesthetic flourishes, no extraneous wrist rests and no lighting gimmicks - this is 100 percent functionality.

If you're looking for something that's going to make your setup look high-end and impressive, this is not it. To the untrained eye, the plastic body and rubber cable make this look like something you could buy in Maplin for under a tenner. The font used is also ugly, in that obnoxiously self-conscious sci-fi sort of way. The build quality is better than one would expect from looking at it, though; the plastic is good-quality, and it's solid and weighty without being overly brick-like.

While it doesn't use Cherry MX switches, the Kailh models used instead come in similar blue, brown and red variations. We tested the blue keyswitches and we have to admit, they've got beautiful action. They're a lovely balance between resistances, with more feedback than the Cherry red switches, but not as much as the black. They also appeal to our soft spot for sharply clacky keys.

As with most others, the Excilibur's media controls occupy function key slots and there's key shortcuts for switching between

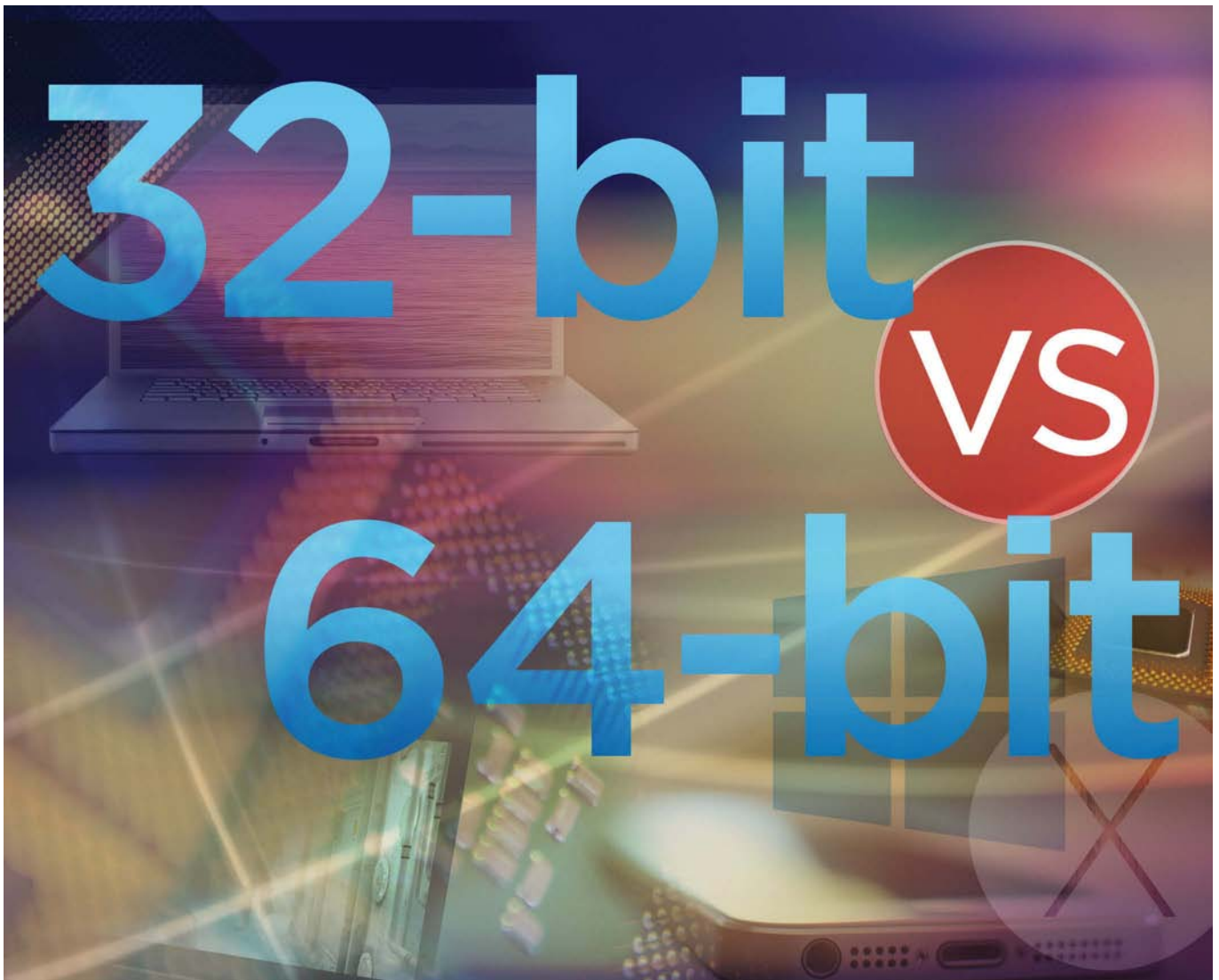
the five available profiles, all of which is fairly unremarkable. However, like the Corsair, the Excilibur features macro support without having dedicated macro keys, which could get frustrating if you're someone that relies on heavy macro use while gaming.

The macro software is simplistic, and it doesn't look especially flashy, but it does its job well enough, and we've no complaints. You can also rebind various keys, should you so wish. The configuration software handles the keyboard backlighting as well, which is rudimentary but serviceable. There's no option for setting up cycles or patterns, but there's various colours available, and you can switch between various levels of brightness and configuration, including a 'breathing' effect and specifically lighting individual sections such as the WASD keys for gaming.

This keyboard is about as middle-of-the-road as they come; it's not going to win any beauty contests, but it's not an eyesore. It's not dripping with features, but it does what it needs to. And while it's not going to cost you pocket change, it's not going to break the bank. It's unlikely to wow anyone, and dedicated keyboard enthusiasts might resent the features it lacks, but unless you've got specific requirements in mind, the Tesoro Excilibur should suit you just fine.

Conclusion

Gaming peripherals are a lot like art - while there are some features that are good and bad, a lot of it is down to personal taste. For those that rely on macros for gaming, such as fans of the MMO and RTS genres, the Razer Anansi is a solid option that you'll feel right at home with. For those seeking portability, the Cooler Master Quickfire is perfect for taking to LAN tournaments and the like. However, for our money, the Corsair K70 RGB is a perfect blend of gaming functionality and everyday convenience, all wrapped up in a package that's dripping with visual flair. ☒



What's the difference between 32-bit and 64-bit, x86 and x64. [Jim Martin](#) explains the jargon

P PCs, laptops, Macs, Windows and OS X – everything is 64-bit these days. Even some smartphones are 64-bit. The main reason for the switch from 32-bit is to get past the limit on the amount of memory a 32-bit processor can access.

Memory

A 32-bit chip can access a maximum of 4GB of memory, which just isn't enough these days. It might be fine for basic tasks, but if you want to run multiple programs, have 35

tabs open in various web browsers or open 30 high-resolution photos for editing at once, 4GB really isn't going to cut it. And don't forget that 32-bit Windows can access only around 3.2GB even if 4GB is installed.

PCs and laptops and their operating systems are all 64-bit these days. 64-bit versions of Windows 8 can access 8TB of RAM (tinyurl.com/mgahyk4), while server versions can access 128TB.

However, you'll struggle to afford such enormous amounts of memory, let alone

install it into today's motherboards, which typically top out at 32GB over four slots.

x86 vs x64

This somewhat misleading term is the equivalent of 32-bit vs 64-bit. x86 (or x86 architecture) has long been a common way to refer to the family of processors ending in

86, Intel's most successful line of chips. The first was the 8086, and many people will remember the 286, 386 and 486 processors in early PCs from the mid-1980s to 90s.

All are 32-bit, which is why x86 has become interchangeable with 32-bit.

Likewise, x64 has become interchangeable with 64-bit (and is even used by Microsoft), but doesn't make sense as there aren't lots of processors with numbers ending in 64. Instead, it is merely shorthand for 64-bit.

Software and compatibility

Memory isn't the only reason to have a 64-bit computer. 64-bit processors can deal with data in 64-bit chunks, which is more efficient than moving it around in 32-bit words.

If your PC is running 64-bit Windows, you'll probably find a Program Files (x86) folder on your hard drive. This stores 32-bit applications, while the other 'Program Files' folder contains all the 64-bit apps you've installed. 64-bit systems can run 32-bit apps, as they're backwards compatible. It doesn't work the other way around, though. ☒

Windows edition

Windows 8.1 Pro

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[Get more features with a new edition of Windows](#)

System

Processor: Intel(R) Core(TM) i5-2410M CPU @ 2.30GHz 2.30 GHz

Installed memory (RAM): 6.00 GB

System type: 64-bit Operating System, x64-based processor

Pen and Touch: No Pen or Touch Input is available for this Display

Computer name, domain, and workgroup settings

Computer name: Jim-Lenovo-PCA

Full computer name: Jim-Lenovo-PCA.IDG

Computer description:

Domain: IDG.DOMAIN.com

View BASIC INFORMATION about your system



PORTABLE POWER

If you're going to be away from mains power for a few days or your phone or tablet simply won't last a full working day, a power bank can be invaluable. Able to keep your USB-powered mobile devices going as long as you do, these portable chargers let you top up your battery wherever you are, ensuring that you always stay connected.

Power banks come in all shapes, weights and capacities, from the emergency credit-card-sized Onaji Pawa that offers a quick boost to keep you going until you get home, to the ultra-high-capacity 22400mAh power bank from EC Tech, which might charge your phone 10 times – ideal if you're going camping or have several devices to charge. Then there are those able to recharge their own battery using solar power, which could mean you never need charge your devices

using mains power again. That could save you a few quid on the electricity bill.

Choosing a power bank

Several factors are important when choosing a power bank. One is portability: some of the devices we review over the following pages are small and light enough to slip into a pocket; others you'll notice their presence even when slung in a bag. Pay particular attention to their weight and avoid bulky designs.

Another factor is capacity. It's important to note that a power bank will not deliver its full advertised capacity to your device – some of this energy is lost through heat generated and voltage conversion. If a power bank manufacturer doesn't expressly state otherwise, expect to achieve around 70 percent efficiency. A 10000mAh power

bank might therefore deliver 7000mAh of power. Check the specification of your phone or tablet's battery to estimate how many full charges you can expect from this.

Charging and recharging

The input rating is key when it comes to recharging the power bank – the higher is this figure the more quickly it will charge. Some power banks support a feature known as passthrough charging, but expect to pay more for this luxury. This allows them to function as a USB hub of sorts, meaning you can simultaneously charge both the power bank itself and your mobile devices, and ensures the power bank is always topped up and ready to go when you need it.

Don't expect to get a USB charger in the box – you can use that which was supplied with your phone or tablet. Do note, however,



Photography by Dominik Tomaszewski

Phone makers are at last taking steps to improve battery life, but keeping your smartphone going as long as you do remains a difficult task. **Marie Brewis** rounds up the best power banks for charging your phone, tablet and other USB-powered devices while you're away from the mains

With additional reviews from **Mike Bedford**, **Simon Jary** and **Adam Shepherd**

that a power bank with a 2A input will not recharge its own battery any faster than one with a 1A input when used with an underspecified USB charger. The reverse is also true when it comes to charging your devices - a phone that supports only a 1A input won't charge faster from a 2A output.

The output rating refers to how quickly a power bank will charge your devices. In most cases you'll find 1A and 2A outputs, the former intended for smartphones and the latter for tablets. You can use either output to charge any USB device - it will draw only the power it needs. However, you might find some tablets - usually iPads - will refuse to charge from lower-specified outputs.

If a power bank has several outputs then the maximum total output capacity is key. For example, the LimeFuel Blast L180X Pro has four 2.4A outputs, but delivers

only 4.2A total output. With four USB devices attached you will find that each charges much more slowly.

Additional features

Some power banks also support auto-on and -off functionality. This allows them to begin charging your device as soon as you plug it in, and switch off when it's done, meaning no power is unnecessarily wasted.

In most cases you'll find a series of LEDs used to denote how much capacity remains. This is fine with smaller-capacity power banks, but with larger-capacity models you'll find the massive jump in capacity between each LED leaves the system rather meaningless. Look out for power banks with LCD displays that are able to tell you the exact capacity remaining, so you'll never get caught short.

A very common feature in power banks is a built-in LED flashlight. This could come in useful on camping trips, for example, but keep in mind that unless the device is reasonably portable and has an ergonomic design you're unlikely to use it as a torch. EC Tech's 6000- and 18000mAh power banks are perhaps the best examples here: the smaller-capacity device looks and feels just like a flashlight; the latter is big, heavy and rectangular, making it a bizarre device to use as a torch.

The ideal power bank carefully balances useful capacity with portability, value, fast charging/recharging, multiple outputs and high-end features such as passthrough charging and LCD displays. The closest we've found in this regard is the Zendure A2, but several of the devices we review here are well worth a second look.

BIOLITE CAMPSTOVE



£139 inc VAT • biolitestove.com • tinyurl.com/Lkrgdx9

The BioLite CampStove is a portable charger with a difference. As well as being a camping stove, it can generate power from burning biomass, so you can charge your phone from burning twigs.

To get maximum heat from this source of fuel, fan-assistance is necessary. The BioLite's fan is powered from an internal battery, which should be charged before you leave home; a built-in generator serves to keep it topped up, and generates more electricity than is required - the excess is available, via a USB port, for charging electronic equipment.

No-one is going to buy the CampStove just to charge their phone, so we were keen to see how good it is at cooking. We were able to boil 500ml of water in four minutes, which is comparable to similarly sized gas burners.

Even if the CampStove's battery is fully charged before use, when you first light a fire the energy used by the fan will be greater than that generated. As such, excess energy isn't available initially for charging external devices. We found it was ready to charge after three minutes. With a Samsung Galaxy Ace attached we measured a current of 300mA at 5V. It took three hours 20 minutes to charge the phone from flat.



EC TECHNOLOGY 6000MAH



£11 inc VAT • iectechnology.com • tinyurl.com/muks7vg

We've seen a lot of power banks with torches built-in, but none quite so well done as this EC Technology power bank. Not only does this thing look like a flashlight, its 1W LED is also usefully bright.

But that's not the most useful thing about this device. With 6000mAh of capacity (of which you should expect to receive at least 4200mAh), it can keep your phone - or tablet, thanks to the fast-charging 2.1A output - going for just as long as you do.

It's extremely good value, too, at just £11. That's twice the amount of power you get from the Power Mini 3000, and all for an extra quid.

Sure, this EC Tech device isn't quite so pocketable as the Power Mini, some 174mm long, but it weighs just 147g and you really won't notice its presence in a handbag or rucksack.

We like the EC Technology power bank's design. A cylindrical tube of aluminium with a matte texture, it's easy to grip and feels reassuringly tough. Plus two chrome rings, one at either end, remind us of a magic wand. Cool.

Our only criticism is that there's no way to tell how much power remains, which means you could get caught short.

For refilling the power bank there's a 1A Micro-USB port. This is pretty standard, although we've seen better - and worse. It does mean that it will take twice as long to charge as it will to drain.

EC Tech doesn't include support for features such as passthrough charging and

auto-on/-off - but at this price you really have no right to expect it.



EC TECHNOLOGY 18000MAH



£31 inc VAT • iectechnology.com • tinyurl.com/pzufvbo

Portable chargers are great for keeping all your USB-connected devices going for as long as you do, and this 18000mAh External Battery Pack from EC Technology is more stylish than most in its 12mm ultra-slim matte-aluminium chassis.

It's also a lot heavier than many of its rivals at 540g, and portable only in the sense that you might throw it into a travel bag. Pocket this power bank and it will pull down your trousers.

Our review sample is a sleek black slab, and the External Battery Pack also comes in stylish pink, silver and green. On top is EC Technology's logo, and below you'll find legends for each of the ports - all lie on the device's right side. Also here is a four-LED status light that doubles as a torch, although at 122mm wide this External Battery Pack is the oddest-shaped torch we've ever held.

The problem with using an LED system to denote the remaining capacity is that each light represents a huge amount of battery capacity - 4500mAh in this case.

Around 70 percent of the 18000mAh capacity will make it to your devices, so you can expect around 12600mAh. That would fill an iPhone 5s (1570mAh battery) eight times. At just £31, that's fantastic value.

With 1A and 2.1A outputs available, fast charging is available. A 1.2A input means this unit will fill up slower than its 22400mAh brother, however.



EC TECHNOLOGY 22400MAH



£36 inc VAT • iectechnology.com • tinyurl.com/LhgftLj

PC ADVISOR
RECOMMENDED

Of all the power banks we've seen, this 22400mAh portable USB charger from EC Technology has the highest capacity. It can charge an iPhone 5s 10 times away from the mains. And we can't believe such a huge amount of portable power is on offer at such a low price.

You might be wondering why, if an iPhone 5s battery is rated at 1570mAh, and this power bank offers 22400mAh, you can charge your iPhone 5s 'only' 10 times. As with all such devices, some power is lost through the transfer of energy and heat generated - in the case of the EC Tech, around 30 percent. We'll do the maths for you: that leaves 15680mAh for charging your USB-powered gadgets.

Since the time of our original review the EC Tech has been updated to include a third USB output, with one each now rated at 1A, 2A and 2.4A. That means fast charging for all your devices.

With such a large amount of portable power on offer, it's also pleasing to see the Micro-USB input rated at 2A. Using a 2A charger the power bank can be charged up in 14- to 15 hours, but it'll take 27- to 29 hours using a 1A USB charger. You can use whichever USB charger was supplied with your phone or tablet.

It's not as good-looking as some of its rivals, but this power bank has a certain charm. Supplied to us in black with a red trim, the plastic chassis has rounded edges and corners, and feels pretty tough. It's also available in white, blue and white, and red and orange.

Four LEDs are used to show the remaining capacity, but each represents a huge 5600mAh.

FREEPLAY TUF**£34 inc VAT** • freeplayenergy.com • tinyurl.com/nwh9nyy

Hand-cranked electronics is a technology that has been widely adopted, with varying degrees of success, since Trevor Baylis invented the wind-up radio and founded Freeplay Energy.

The company's product line now includes a wind-up charger for mobile phones but, for just £15 more, you can buy the TUF, which adds an AM/FM/SW radio, a torch and a solar panel.

While the TUF has an internal battery, used to power the radio and torch, it can't be used to charge external electronic gear. Instead, you must crank the TUF's rotary handle. Freeplay says that a minute of winding will give two to three minutes of talk time.

We found that cranking at two turns per second generated a charging current of 500mA at 5V, which is comparable to what you'd achieve when charging from a PC's USB port.

Given that you probably wouldn't want to crank at this rate for too long, it would be appropriate to consider this as a device for charging a phone only in emergencies.

This is a device designed to provide emergency power only when you need it. Given that being able to see in the dark and listen to radio broadcasts also have useful safety connotations, the Freeplay TUF is a good all-round package.

**INTOCIRCUIT POWER MINI****£10 inc VAT** • hisgadget.com • tinyurl.com/kwone54**PC ADVISOR**
RECOMMENDED

Power banks come in two varieties.

On the one hand you have high-capacity power banks such as the EC Technology 22400mAh (previous page). That's great if you're going away for a few days, but for daily use it's OTT.

On the other hand are the smaller 2000- to 3000mAh capacity power banks that will recharge your phone only once, but are cheaper and compact and light enough to slip into a pocket or bag and you won't notice their presence. Olixar's PC810 (page 107) and Veho's Pebble Smartstick+ (page 109) are two such examples, but this Intocircuit Power Mini is a better one.

While the Veho Pebble Smartstick+ is pricey at £39, this Intocircuit costs just £10. And while the 2000mAh Olixar won't fully charge your smartphone, with its 3000mAh capacity this one will.

It's also easier to slip into a pocket than either of those two devices. It's a lipstick-style charger, just 128x80x28mm and 118g. It's less bulky than the rectangular Olixar, and not as long as the Veho.

Our sample has a matt gunmetal grey aluminium case with rounded corners, a chrome-effect power button and a three-LED system that shows how much power remains. A LED torch is built in.

If you need a truly portable power bank for daily top ups, you won't find a better deal than this. Cheap, well built, easily pocketable and with enough capacity to fill most smartphones once, the only drawback is in remembering to recharge the power bank itself after each use.

**INTOCIRCUIT POWER CASTLE****£22 inc VAT** • hisgadget.com • tinyurl.com/nqrpvac**PC ADVISOR**
RECOMMENDED

One of our biggest gripes with the majority of affordable power banks is that they use a four-LED system to denote how much capacity remains. That's fine for the lower-capacity varieties, but when you've got a lot of power to hand the large jump between each LED makes it difficult to work out where you are.

Intocircuit's Power Castle is one of the few power banks we've seen to offer an LCD display, enabling you to see exactly how much power remains.

Also unusual at this price is auto-on/-off and passthrough charging. Your device will be charged before the power bank rather than simultaneously, but this is still a more practical solution.

Priced in line with the Lumsing 10400mAh (page 106) and TP-Link (page 109), this Intocircuit bank offers a tad more power for your devices - 11200mAh. You should expect at least 7800mAh to be available for charging your phone or tablet - or both, with dual 1A- and fast-charging 2.1A outputs mirroring those rivals.

It will take longer to refill its own battery with its 1A Micro-USB input, but if you can live with that you may find the LCD display makes this Intocircuit Power Castle the better deal power bank.

Its brushed-aluminium-alloy shell is aesthetically pleasing, and is a comfortable fit in the hand. The Power Castle feels sturdy, plus Intocircuit supplies a soft carry case in the box. It's heavier than the competition, but not so much that you will notice the added weight.

**LIMEFUEL BLAST L180X PRO****\$99 (£62)** • limefuel.com • tinyurl.com/owmgsq6

LimeFuel's Blast might be more expensive than its rivals (available in the UK via LimeFuel's online shop), but it ticks several boxes that others don't and shows the way forward for power bank tech.

It has not one or two but four 2.4A fast-charging USB outputs, and it supports passthrough charging, which means it can function as a four-port USB hub that'll always be powered up and ready to go when you need to take it on road. With a 18000mAh capacity, such a device could otherwise take between 11- and 18 hours to fill up. If you're in a rush, that's not much use.

That said, even with four 2.4A USB outputs the maximum total output is 4.2A. Devices will charge faster when fewer are connected.

There's a two-in-one Micro-USB and Lightning cable supplied in the box, but ours broke after the third use.

Another plus point is the LimeFuel's ability to save power by automatically turning itself on and off when you don't have a device connected.

Overcharge protection prevents damage when used as a USB hub.

Build quality is very decent. The Blast feels tough and durable, and comes with a 12-month warranty.

The LimeFuel is a matt black slab with rounded corners and a smudgeproof coating, measuring 79x24x124mm and weighing 369g. We expected it to be both larger and heavier, given the capacity, but while it'll fit in a pocket a bag might be better.



LIMEFUEL RUGGED L150XR



\$84 (£52) • limefuel.com • tinyurl.com/ngn7kbm

LimeFuel's Rugged L150XR (available in the UK via its online shop) is the ideal gadget for outdoors enthusiasts, allowing them to keep their communications and GPS devices going in the toughest terrains.

I'd barely got the L150XR out of its box before my partner swooped: "That's cool. I want that." And I do get the Rugged's appeal, especially to someone who spends much of their holidays waist-deep in snow in Glen Clova, or crashing down the Brecon Beacons on a mountain bike. It's IP66-certified, which means it's water-, dirt- and shock-resistant. Plus it looks tough, with a grippy rubber protective casing with a flap to conceal the charging ports.

When you're in the middle of nowhere, having a means of communication should you get into trouble is vital. Many will also carry a portable GPS device. A smartphone is useful only so long as its battery holds out, and the further you move away from civilisation the more quickly its power will drain as it searches for a signal. With many of today's high-end smartphones waterproof and increasingly durable, it makes sense to pair them with a rugged power bank such as this.

A Velcro strap with a carabiner clip is supplied, enabling you to secure the LimeFuel to a rucksack. There's also the same two-in-one Micro-USB and Lightning flat slimline cable that you get with the LimeFuel Blast L180X Pro (page 105). And it supports the same high-end features as that device, such as passthrough charging and auto-on/-off.



LUMSING 8000MAH



£24 inc VAT • lumsing.com • tinyurl.com/n7e36ra

With the current craze in gold smartphones and tablets, we were keen to see Lumsing's gold power bank. It's a darker shade than Apple's gold, but this USB charger is pretty bling – and good value, too, if not as good as the other Lumsing in this group.

For £24 you get 8000mAh of portable power, from which you can realistically expect at least 5500mAh. That's three full charges for your golden iPhone 6.

It's not just gold iPhones this Lumsing (also available in black, blue and pink) is keen to keep powered on either. With a 2.1A output it will charge any USB-powered device, be that a smartphone, a tablet, a Bluetooth speaker, an MP3 player or a camera.

The 1.5A Micro-USB input is also decent, allowing you to recharge the power bank faster than you would many of its rivals.

Few power banks can be described as stylish, but the brushed aluminium chassis and slim, pocketable dimensions of this Lumsing impress – it's just 10mm thick, and much easier to handle than other brick-like chargers we've reviewed. In the pocket it simply feels as though you're carrying a second smartphone.

A Micro-USB cable is supplied in the box. Its coiled cable is too fancy for our liking, but you can always supply your own.

Our one gripe with this device is the LED system it uses to show how much capacity remains. Most high-capacity power banks use four LEDs; some of the smaller pocketable USB chargers use three; this 8000mAh power bank has only two.



LUMSING 10400MAH



£21 inc VAT • lumsing.com • tinyurl.com/mgo3926

Lumsing's power bank was our top pick for festival-goers and campers last summer, allowing them to charge their smartphone, tablet, camera and any other 5V USB-powered device wherever they were. But it's a device that's useful all year round.

It's a 159g, 138x59x20mm harmonica-style device, about the same height as our Samsung Galaxy S4, but a little chunkier and about two thirds of its width. You probably won't want to carry it in your pocket, but the Lumsing will be an easy fit in your bag or even left in your tent. At just £21 you won't need to guard it with your life, and a soft case is supplied to protect it from accidental damage.

The power bank is available in shiny black, champagne gold or white, with a brushed-metal-effect band on the top and a silver plastic edge. It looks and feels good for its low price.

Inside is a Grade A Samsung lithium-ion cell specified at 10400mAh, which should be good for 500 charges. If you're away from the mains for a few days, that's a lot of useful portable power.

The Lumsing has two USB outputs, so you can charge two devices simultaneously. The first output is specified at 1A, while the second 2.1A output offers a faster charge. A power button is found to the right of these outputs, along with four blue LEDs to show the Lumsing power bank's remaining charge. When it's empty, you can quickly recharge the power bank via its 1.5A Micro-USB input.



MIPOW POWER CUBE 8000L



£84 inc VAT • mipow.co.uk • tinyurl.com/Lj5bwq8

MiPow's Power Cube 8000L might look pretty cool and feature a built-in Lightning connector for charging your iPad, iPhone or iPod on the go, but it's an incredibly expensive power bank that does little to justify its price.

You can't deny the MiPow Power Cube 8000L looks good, with an anodised aluminium alloy chassis mixed with soft grey rubber. A soft carry case is supplied in the box to keep it safe on the road.

The grey underside doesn't sit flush with this case, with a gap running along the MiPow's edge that you can fit a thumbnail into, but this doesn't detract from the Power Cube's sturdy feel.

We like the built-in Lightning connector, too, which is certified by Apple; not so much the grey button sticking out of the MiPow's side that must be used to access it, though.

Those flaws aside, this looks like an expensive power bank. And it is. At £84 the 8000L is four times the price of some of the power banks we've seen, and it does little to justify this.

There's no support for high-end features such as auto-on/-off and passthrough charging. There's no LCD screen. There's no LED flashlight. And we can't even say the Power Cube is

particularly light or compact for its capacity – 92x92x17mm and 220g, this

8000mAh bank is heavier than some higher-capacity models such as the Lumsing (left).

On the plus side this power bank is fast to charge both itself and any attached phone or tablet.



OLIXAR ENCHARGE PC810**£16 inc VAT** • mobilefun.co.uk • tinyurl.com/pyf22kp

The enCharge Power Bank from Olixar is an ideal portable phone charger not only for overnight trips, but also to give your device that extra bit of power to help it last all day.

At just 75x33x24mm and 58g, this tiny power bank can be thrown into a bag or pocket and you won't even notice it's there. A small black box with a soft-touch casing and rounded corners, the enCharge also features a built-in torch and four LEDs to show you how much capacity remains.

It's functional-looking rather than stylish, and its appearance isn't as cool as that of the Pebble Smartstick+ (page 109), nor does it hold as much power as that 3000mAh portable charger. But it costs less than half the price, is able to more quickly charge both itself and other devices, and is unlikely to scratch as easily. The enCharge feels reasonably sturdy, and we could hear nothing rattling inside.

A short Micro-USB cable is provided, allowing you to both charge the device and your phone, although if you're using an iPhone or a mobile phone with another proprietary connector you'll need to provide your own USB cable.

A 2000mAh capacity allows the enCharge to provide some smartphones with a single charge, and it's 1A output is ideal for such devices. Exactly how much the Olixar will charge your device will depend on the capacity of its own battery. It isn't so well suited to charging a tablet; for this you'll want a higher capacity and a faster output.

**OLIXAR ENCHARGE KP-8000****£49 inc VAT** • mobilefun.co.uk • tinyurl.com/ojh69x

Even at £49 this is an expensive solution for charging your phone or tablet on the go. But four built-in solar panels make the KP-8000 a pretty cool solution, and one that can keep you up and running as long as you like.



Supplied in a green foldable case, the enCharge is big and heavy. Folded it measures 179x105x39mm, but expanded for solar charging it's a huge 550mm long. And given the 8000mAh of juice inside, the battery is very bulky, weighing in at 490g. Of course, this isn't the type of device you carry with you; the enCharge is much better left outside to bathe in the sun.

Its 1.5A output translates to rapid charging for a smartphone, although there are better options for tablets. You may even find your tablet will refuse to charge – as is the case with our iPad mini 2.

For charging itself the Olixar's maximum input is 1A, whether over USB- or solar power. We laid the device on our sunny 7th-floor roof terrace. After six hours the battery was half full, and it took a further six hours to completely charge the enCharge from the mains.

It's a shame that there's no LCD display to show you how quickly it is charging via solar power, or tell you how much power is left.

It's worth noting that how fast the enCharge refills its battery today will differ from tomorrow: it doesn't have to be sunny to charge a solar panel, but solar charging is more efficient in bright sunshine.

OMAKER S-X5 10000MAH**£18 inc VAT** • tinyurl.com/kgwzbvq • tinyurl.com/LLgscwo

Omaker is a new name to us, but parent company DoReMi Mall has been trading in car chargers, Lightning cables and power banks on Amazon for six years. Its S-X5 10000mAh Power Bank is a twin-output USB charger, with both ports supporting fast charging at 2.1A.

Its closest rival is perhaps the Lumsing 10400mAh (page 106), which by comparison offers only one 2.1A output, with its second rated at 1A. That power bank is arguably more stylish, but the Omaker's second fast-charging port, built-in 1W torch and slightly cheaper price may make it the better deal for you.

The two power banks are very similar in size, with this Omaker S-X5 ever so slightly larger and considerably heavier. Whereas the Lumsing has a sleek gloss casing with silver painted plastic edging, this Omaker is a matt white candy bar-style device that's easier to grip and feels sturdier, but lacks that premium feel. Functionality is more important than style, of course, and here the S-X5 wins out.

We also like the fact the Omaker automatically turns on when you plug in a device to charge. And, more importantly, it turns itself off when you're done, so it won't waste power.

As with most other power banks, four LEDs are used to denote how much capacity remains. With a 10000mAh capacity you can reasonably expect between around 6500- and 7000mAh to be available to your phone or tablet.



One small gripe is with the supplied Micro-USB cable. The plastic casing came away when we pulled it out the bank.

ONAJI PAWA**£19 inc VAT** • onaji.co.uk • tinyurl.com/mvcpp7w

Power banks can be bulky, while battery cases can make a once slim-design smartphone a bit of a fatty. The Onaji Pawa Card takes the chunkiness out of battery chargers. It's credit-card-sized in width and length, but understandably thicker. Annoyingly, it wouldn't fit into the credit-card holder built into our phone case.



It's a very neat design, though, with connectors for Micro-USB, Lightning and Apple 30-pin dock built into the card, so you needn't carry around separate cables.

You're not going to get bags of reserve power out of this slim card, but its 500mAh battery will give you enough charge to get you home or to a friendly power source.

Onaji claims it will give your phone up to a 30 percent charge – enough for most emergencies. Our iPhone 5s tests got close to that (around 25 percent), which isn't going to give you another full day on your smartphone but will allow you to go that little bit extra.

However, we were unable to charge our Motorola Moto G or an iPhone 4 using the Pawa Card, and the fact that a Samsung S4 charged fine suggests the problem was not with a faulty connector.

There's also a little torch in case your emergency comes with the lights out. It's not very powerful but it might come in useful one day.

At £19 the Onaji is far from expensive, but it's not as good value as some of the power banks in this group. If you want something you can slip in your pocket look to the higher-capacity and cheaper Intocircuit Power Mini (page 105).

PHONESUIT FLEX XT



£49 inc VAT • phonesuit.com • tinyurl.com/o77eftq

The Phonesuit Flex XT differs from most power banks in that it has a built-in connector for either Lightning or Micro-USB. Whichever device you choose will be restricted to charging only phones and tablets with that connection, although it does make for a neat solution that means you needn't carry around a cable.

In this sense it's something of a cross between a power bank and a battery case; while the former works with any device and the latter only a specific device, this Phonesuit charger works with only Lightning devices or only Micro-USB devices. It's also less bulky than a battery case, and you hook it up to your phone only when required.

The Flex XT is an updated version of the Phonesuit Flex, with a longer connector that should mean you won't have to remove your device from its case to charge it.

The Phonesuit Flex XT offers a 2600mAh charge, and four LED lights show you how much power remains. Phonesuit claims this will give you an extra 150 percent charge on an iPhone 5.

Phonesuit describes the aluminium Flex Charger as 'thumb-sized'. That's a pretty fat thumb, but it's certainly equal to the length of an adult man's thumb, and smaller than most battery packs.

It weighs 79g and, while you wouldn't want it on your person all the time, it's perfect for slipping into your bag when travelling. You won't notice it's there until you get that low battery warning.



At £49, though, it's expensive, and the PNY PowerPack (right) offers the same features at a much more appealing price.

PNY POWERPACK 2200MAH



£17/£26 inc VAT • pny.com • tinyurl.com/q3uv92L

PNY's PowerPack offers the same concept as the Phonesuit Flex XT (left). It's a Lightning- or Micro-USB-specific charger for your phone or tablet, except it's much cheaper at just £17 (Micro-USB) or £26 (Lightning).



On the down side it holds slightly less power than the Phonesuit - 2200mAh versus 2600mAh - but not so much that you would notice the impact.

PNY has a full range of ultraportable PowerPacks for just about any mobile device out there. Each is slightly larger and heavier than a cigarette lighter, but at 60g will hardly be noticed in a briefcase, handbag or even a jacket pocket.

The PowerPack DCL2200 (Lightning) and DCM2200 (Micro-USB) are handy battery packs for smartphone users, saving you the hassle of carrying around a separate charging cable. Both have a charge capacity of 2200mAh that should give most smartphones a full recharge, saving you from that dreaded battery life warning that can ruin your day.

Each unit's LED indicator uses four lights to display the Power Pack's battery level status. And both come with a Micro-USB cable to charge the Power Pack.

PNY also sells the affordable PowerPack T2600 (£11)/T5200 (£19)/T7800 (£29)/T10400 (£39) with a Universal USB output for the widest range of devices. All you need to do is plug a Micro-USB or Lightning cable into the battery pack.

POWERMONKEY EXTREME 12V



£120 inc VAT • powertraveller.com • tinyurl.com/mhwwf3z

Powertraveller's powermonkey extreme comprises two main components: a battery pack and a solar panel. Its 33.3Wh lithium-polymer battery isn't too far short of the iPad's 32.4Wh battery. There are 5V- (for USB devices) and 12V (for DSLRs) outputs. Several connector tips are included, and we were able to charge a Samsung Galaxy Ace in 2.5 hours.

The battery pack can be charged from the mains whenever you have access, and a dual-voltage charger is provided.

Alternatively, when you're truly cut off from civilisation, it can be charged via the solar panel.

This is hinged and folds up for carrying.

The solar panel includes maximum power point tracking (MPPT) technology to optimise charge even under lower output conditions.

Powertraveller says in optimal conditions it'll charge its own battery pack from flat in 18- to 22 hours. Expect charging times to be longer in the UK - at midday on a sunny day with 20 percent cloud cover we achieved a charging rate of 3- to 4 percent per hour, as indicated on the battery pack's LCD status panel.

The battery pack and the solar panel are bigger than most phones, and significantly larger and heavier. Rubber grips mean you're less likely to drop the kit when you've got cold or wet hands, while an IP67 rating means it's waterproof to 1m for 30 minutes.



RAVPOWER RP-PB13 DELUXE



£22 inc VAT • ravpower.com • tinyurl.com/mwc4qo2

High-capacity power banks aren't always big and heavy, and the RavPower RP-PB13 Deluxe does a good job of packing a decent capacity and keeping down size and weight.

The RavPower is interesting in that it weighs only 10g more than the Intocircuit Power Castle (page 105), yet it packs an extra charge for your smartphone with 14000mAh capacity.

It costs the same price, too: £22. That's fantastic value for a device that could charge, say, the iPhone 6 five times.

It is slightly longer and wider than the Power Castle, though, and we must admit to preferring the Intocircuit's brushed-aluminium-alloy design - particularly with its built-in LCD screen - to this black-and-silver-painted plastic power bank. RavPower uses the common four-LED system - here seen in a blue light strip - to denote how much capacity remains. With each LED representing 25 percent, or 3500mAh, it's difficult to know exactly how much charge is left.

Neither does the RavPower support advanced features such as passthrough charging and auto-on/-off - although, to be fair, we're still surprised to find the Power Castle does. To begin charging your device you must press the button on top of the power bank. A double-press activates the LED flashlight.

The RavPower has a 1.5A input, which means it will refill its battery faster than the 1A Power Castle. Like that device, it has dual 1A and fast-charging 2A USB outputs for powering your phone or tablet.



TP-LINK TL-PB10400**£23 inc VAT** • uk.tp-link.com • tinyurl.com/nt2mL5k**PC ADVISOR**
RECOMMENDED

TP-Link is well-known for producing quality tech at affordable prices, and its 10400mAh Power Bank is no different. It's perfect for keeping your smartphone and tablet going on the move.

The TP-Link's closest competitor is the slightly cheaper Lumsing 10400mAh (page 106). Both feature a 10400mAh capacity and two USB outputs – one rated at 1A for smartphones and the other 2.1A for fast-charging tablets and phones. You can plug a phone into this second output, of course – it will draw only the power it requires – but some tablets may not like the 1A output. Typically iPads.

All power banks lose some of their power through voltage conversion and heat, but with both the TP-Link and the Lumsing you should expect around 7000mAh. That might charge an iPhone 6's 1810mAh battery about four times, but the higher-capacity 2915mAh iPhone 6 Plus just two and a half times.

TP-Link's power bank has some advantages over the Lumsing, though. Importantly, it has a 2A Micro-USB input. This means you can refill its battery in just seven hours.

It also has a built-in LED flashlight, and it's better than the Lumsing at showing you how much power remains. The TP-Link's fourth LED will blink when it gets down to 10 percent remaining.

The TP-Link is short and squat, a chunky rectangular device made from glossy white plastic and with blue end caps. It looks nice and feels reasonably sturdy, weighing approximately 240g.

**TYLT ENERGI 5K+****£64 inc VAT** • tylt.com • tinyurl.com/oo6tq94

Today's busy lifestyle with its multiple mobile devices has made portable chargers a crucial travel accessory for many people, keeping our smartphones and tablets charged on the go. In order to keep your various electronics juiced, Tylt has released the stylish Energi 5K+.

The Energi 5K+ is nice to look at – as far as these devices can be – and there's a choice of red, blue or grey highlights. The rest of the casing has a semi-gloss finish.

At just over 160g, the Energi 5K+ isn't too heavy. It's light enough to pocket without dragging down your trousers, and its 70x142mm dimensions put it at around the same size as a 5in smartphone, albeit twice as thick.

Technically, the Energi 5K+ is also very sleek; it comes with captive Micro-USB and Lightning charger cables that wrap around the device to clip neatly into the body. There's also a full-size USB output for charging a third device, a Micro-USB input for recharging the Tylt battery itself and a power button/LED indicator to indicate the remaining charge level.

The capacity of this battery pack is, however, a fairly major stumbling block. The 5200mAh rating may be higher in capacity than the average smartphone, but it's paltry when compared with some of its competitors in this group – especially given the very high price of £64.

The Energi 5K+ will refill its own battery in around six- or seven hours. That's a long time, considering the small capacity.

**VEHO PEBBLE SMARTSTICK+****£39 inc VAT** • mobilefun.co.uk • tinyurl.com/muv9vfg

Veho's Ayrton Senna-inspired Pebble Smartstick+ is possibly one of the coolest-looking portable phone chargers we've seen.

The Smartstick+ is a 3000mAh power bank that'll provide a full charge for any smartphone, and potentially two for those with smaller-capacity batteries. Not that you have any way of knowing how much charge remains. It won't charge either itself or your device in a hurry, however, with just a 0.5A input and output.

This isn't a problem with smartphones, and you can simply leave the Pebble plugged in until the job is done. But it's worth noting that some tablets will refuse to charge (such as our iPad mini 2) or will take an incredibly long time to do so (such as our Google Nexus 7).

At £39 the Pebble Smartstick+ is more expensive and carries less juice than some portable chargers we've seen. But it's far more easily pocketable and portable at just 84g, and it looks pretty cool.

The Smartstick+ is a smooth, metal stick with rounded edges and F1 driver Ayrton Senna's signature emblazoned on the side. It's supplied with both a carry case and a carabiner clip, so it's up to you whether you shove it in a bag or attach it to your key ring.

The Pebble's charging port is hidden below an end cap, which screws into place to prevent you losing it – at least until your phone is being charged, with nothing then tethering the cap.

It's supplied with a short USB cable and three interchangeable connectors: Micro-USB, Mini-USB and a 30-pin Apple connector. If you have another type of smartphone that uses a proprietary connection you must provide your own cable.

**ZENDURE A2****£33 inc VAT** • zendure.com • tinyurl.com/owyp5bo**PC ADVISOR**
BEST BUY

There are 24 power banks in this group, and every one has 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. The Zendure A2 changes everything.

Compact, lighter than you might expect and reassuringly durable, this 6000mAh power bank will deliver around 4800mAh to your mobile devices (Zendure claims its A2 has a market-leading 80 percent efficiency rate). That's plenty to fully charge a smartphone at least once, probably twice.

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

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

It also supports passthrough charging, ensuring that both phone and power bank are full up and ready to go whenever you are. Plus the A2 will hold 95 percent of its charge for up to six months.

Auto-on/-off means you just plug in your phone to begin charging, and when it's done the A2 won't waste any power.



Conclusion

Zendure's A2 is our favourite power bank in this round-up. At £33 it's affordable, and its 6000mAh capacity is sufficient for at least two full smartphone charges (potentially three, depending on your phone). It's lightweight, extremely durable, offers fast charging and comes with useful features such as auto-on/-off and passthrough charging.

The Zendure won't appeal to everyone, though. And which power bank you choose really depends on your personal needs.

If you want the ultimate-capacity power bank for extended trips, EC Technology's 22400mAh power bank offers unrivalled value (and capacity) at £36. It's big and heavy, though. You won't want to carry this one in your pocket.

If that trip involves some extreme outdoor pursuits then a rugged, waterproof bank such as LimeFuel's L150XR is ideal. It's a little pricey, though, and you'll have to order it from the US.

If you need something ultraportable that will slip unnoticed into a pocket, there are really just three options here: Olixar's enCharge PC810, Veho's Pebble Smartstick+ and Intocircuit's Power Mini. The latter gets our vote for doing the best job of balancing

useful capacity and price. Although the Veho looks the coolest, it's overpriced and slow to charge, while the Olixar couldn't fully charge our smartphone. PNY's PowerPack is also worth a look, removing the need to carry a cable.

For something in the middle, offering useful capacity and reasonably portable, we like TP-Link's TL-PB10400 and Lumsing's 10400mAh Power Bank. The Lumsing is arguably better-looking, but the TP-Link refills its own battery faster, has a built-in torch, and it has a slightly better system for showing you how much power remains than most that use LEDs. Even better is that of the Intocircuit Power Castle, though, which is among few power banks in this round-up to feature an LCD display. It offers staggering value.

Finally, for those with an eye on the environment (and their electricity bills) are the Olixar enCharge KP-8000 and Powertraveller powermonkey extreme 12V; Freeplay's Tuf wind-up radio also features a solar panel. While Powertraveller's example is technically better, Olixar's bank offers amazing value - just £49 as we went to press. You might never have to pay to charge your gadgets again. ☒

	Price	Star rating	Capacity	Input	
BIOLITE CAMPSTOVE	£139 inc VAT	★★★★★☆☆	N/A	Biomass/gas	
EC TECHNOLOGY 6000MAH	£11 inc VAT	★★★★★☆☆	6000mAh	1A Micro-USB	
EC TECHNOLOGY 18000MAH	£31 inc VAT	★★★★★☆☆	18000mAh	1.2A Micro-USB	
EC TECHNOLOGY 22400MAH PC ADVISOR RECOMMENDED	£36 inc VAT	★★★★★☆☆	22400mAh	2A Micro-USB	
FREEPLAY TUF	£34 inc VAT	★★★★★☆☆	600mAh	Mini-USB, hand crank, solar	
INTOCIRCUIT POWER MINI PC ADVISOR RECOMMENDED	£10 inc VAT	★★★★★☆☆	3000mAh	1A Micro-USB	
INTOCIRCUIT POWER CASTLE PC ADVISOR RECOMMENDED	£22 inc VAT	★★★★★☆☆	11200mAh	1A Micro-USB	
LIMEFUEL BLAST L180X PRO	\$99 (£62)	★★★★★☆☆	18000mAh	2A Micro-USB	
LIMEFUEL RUGGED L150XR	\$84 (£52)	★★★★★☆☆	15000mAh	2A Micro-USB	
LUMSING 8000MAH	£24 inc VAT	★★★★★☆☆	8000mAh	1.5A Micro-USB	
LUMSING 10400MAH	£21 inc VAT	★★★★★☆☆	10400mAh	1.5A Micro-USB	
MIPOWER POWER CUBE 8000L	£84 inc VAT	★★★★☆☆☆☆	8000mAh	2.1A Micro-USB	
OLIXAR ENCHARGE PC810	£16 inc VAT	★★★★★☆☆	2000mAh	1A Micro-USB	
OLIXAR ENCHARGE KP-8000	£49 inc VAT	★★★★★☆☆	8000mAh	1A Micro-USB, solar	
OMAKER S-X5 10000MAH	£18 inc VAT	★★★★★☆☆	10000mAh	1A Micro-USB	
ONAJI PAWA	£19 inc VAT	★★★★★☆☆	500mAh	0.5A Micro-USB	
PHONESUIT FLEX XT	£49 inc VAT	★★★★★☆☆	2600mAh	1A Micro-USB	
PNY POWERPACK 2200MAH	£17 inc VAT	★★★★★☆☆	2200mAh	1A Micro-USB	
POWERMONKEY EXTREME 12V	£120 inc VAT	★★★★★☆☆	9000mAh	2.5A Micro-USB, solar	
RAVPOWER RP-PB13 DELUXE	£22 inc VAT	★★★★★☆☆	14000mAh	1.5A Micro-USB	
TP-LINK TL-PB10400 PC ADVISOR RECOMMENDED	£23 inc VAT	★★★★★☆☆	10400mAh	2A Micro-USB	
TYLT ENERGI 5K+	£64 inc VAT	★★★★☆☆☆☆	5200mAh	1A Micro-USB	
VEHO PEBBLE SMARTSTICK+	£39 inc VAT	★★★★★☆☆	3000mAh	0.5A Micro-USB	
ZENDURE A2 PC ADVISOR BEST BUY	£33 inc VAT	★★★★★☆☆	6000mAh	1.5A Micro-USB	



	Output(s)	Extra features	Dimensions	Weight
	0.3A USB	Camping stove	110x210x125mm	935g
	2.1A USB	Torch	174x22x22mm	147g
	1x 1A USB, 1x 2.1A USB	Torch	169x120x120mm	703g
	1x 2.4A USB, 1x 2A USB, 1x 1A USB	Torch	160x80x2.3mm	462g
	0.5A USB	Solar panel, wind-up radio, LCD display, torch	145x60x60mm	300g
	1A USB	Carry case, torch	128x80x28mm	118g
	1x 1A USB, 1x 2.1A USB	Carry case, LCD display, torch, auto-on/-off, passthrough charging	110x71x22mm	280g
	4x 2.4A USB (4.2A total output)	Auto-on/-off, passthrough charging, torch	79x24x124mm	369g
	2x 2.4A USB (4.2A total output)	IP66 rugged, waterproof design, auto-on/-off, passthrough charging	83x27x141mm	375g
	2.1A USB	'Fancy' coiled USB- to Micro-USB cable supplied	130x71x10mm	168g
	1x 1A USB, 1x 2.1A USB	Carry case	138x59x20mm	159g
	2.1A USB, 1x Lightning	Built-in Lightning connector, carry case	92x92x17mm	220g
	1A USB	Torch	75x33x24mm	58g
	1.5A USB	Solar panel, torch	179x105x39mm (folded), 179x550x15mm (open)	490g
	2x 2.1A USB	Torch, auto-on/-off	159x23x63mm	290g
	1x Lightning, 1x Apple 30-pin dock, 1x Micro-USB	Built-in Lightning, Micro-USB and 30-pin dock connectors, torch	92x58x4.9mm	18g
	1x Lightning	Built-in Lightning/Micro-USB connector, auto-on/-off	73x21x21mm	79g
	1A Micro-USB (£17) or Lightning (£26)	Built-in Micro-USB or Lightning connector	71x21x32mm	59g
	1A USB, 12V	12V output, solar panel, rugged, waterproof design, interchangeable connectors, carry case, LCD display	155x60x28mm (battery unit), 170x91x18mm (solar unit)	456g
	1x 1A USB, 1x 2A USB	Carry case, torch, interchangeable connectors	123x80x20mm	290g
	1x 1A USB, 1x 2A USB	Carry case, torch	89x44x44mm	241g
	1x Lightning, 1x Micro-USB	Built-in Micro-USB and Lightning connectors	14x70x142mm	127g
	0.5A USB	Interchangeable adaptors for Micro-USB, Lightning and 30-pin dock, carry case, key ring	21x114x21mm	84g
	2.1A USB	Carry case, auto-on/-off, passthrough charging, rugged design	93x48x23mm	137g



Make your own Oculus Rift for £2.50



With the help of the Google Cardboard project, you can turn your Android phone into a virtual reality headset. Jim Martin explains how

Google Cardboard is a project that uses a couple of magnets, lenses and a piece of cardboard to turn your Android smartphone (as long as it's running Android 4.1 or later) into a virtual reality headset like the Oculus Rift or Samsung Galaxy Gear VR.

And here's the best part: you can buy a Cardboard kit for less than a pint of beer. Google's own kit is the best quality, as far as Cardboard can be, but you can't buy it. The good news is that there are plenty of knock-offs, some of which even come with an elastic head strap. I bought a basic kit from Deal Extreme (tinyurl.com/okhf8v7), which cost just £2.50 including delivery.

After a couple of weeks, the kit duly arrived. There are no instructions, so for the benefit of anyone wanting to try this at home, here's how to put it together.



START Check you've got everything. There should be three pieces of cardboard, two lenses, two magnets and two Velcro pads. All you need to add is an Android phone with a screen no bigger than 6in. I'm using a Nexus 5.



2 This is the annoying bit. The cardboard has been pre-cut, but the unwanted material has not been removed. You'll need to carefully press out the cutouts without ripping or bending the card. That shouldn't be too difficult, though: it's pretty sturdy.



3 Place the two supplied lenses in the large circular holes (it doesn't matter which way around they go), then fold the cardboard around the front and back to keep them in place. You can use a bit of tape or glue to secure them if necessary.



4 Fold the main piece into shape starting with the section shown in our photo. The circle should face inward, and is used to hold the magnets. Again, you can use glue or tape if you like, but it's not necessary.



5 Now fold this component around the piece with the lenses, with the centre hole facing the front. The small divider piece slots in here to make sure each of your eyes see only the images intended for them.



6 Create an easily opened yet secure compartment for your phone by using the two Velcro pads to fasten the flap to the top of the headset.

7 Next you need to download the Cardboard app from Google Play. It's a large app - 74.63MB - so make sure you both have room on your phone and that you're connected to Wi-Fi.



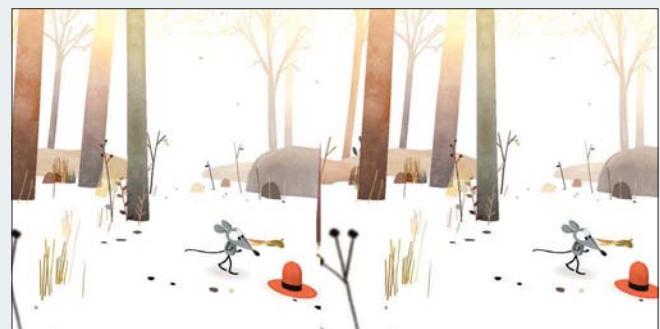
8 Place your phone inside the Google Cardboard headset so that the camera can be seen through the cutout. It looks as though it won't fit because the divider is in the way, but the Velcro should give you enough wiggle room.



9 Turn your head left and right to choose a demo within the Cardboard app, and pull down and release the outer magnet in order to make a selection. To exit, simply turn the device to portrait mode. Demos include the brilliant Windy Day 'game' (shown here) which kids (and adults alike) will love - Moto X owners will recognise this as it comes preinstalled. It's better with Google Cardboard of course.

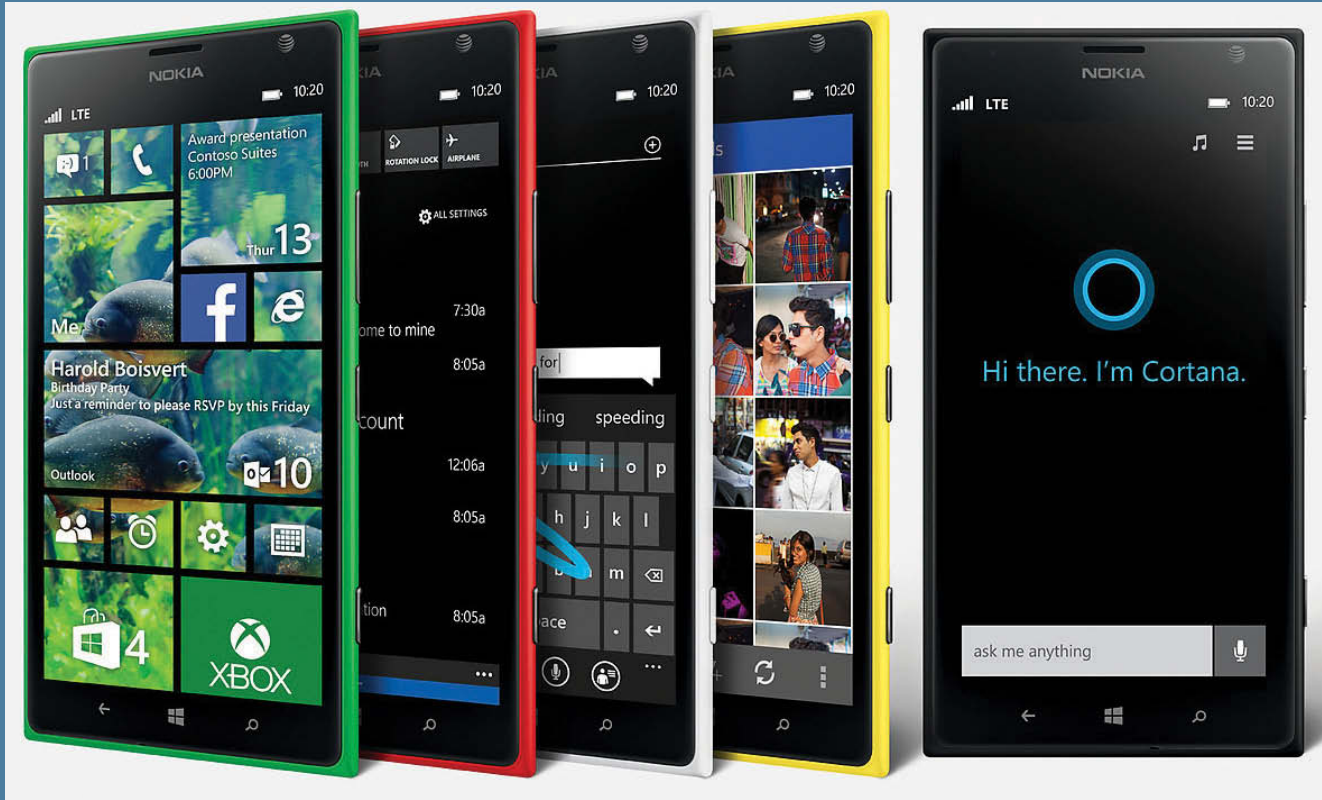
You can also take a virtual tour of the Palace of Versailles, and see what Google Street View is like in virtual 3D (only on the limited route Paris, unfortunately). The other gem here is the YouTube app, which gives you a giant cinema-like screen and the ability to search for videos using the microphone; select it by looking at it and pulling down and releasing the magnet.

Cardboard isn't the only app you can use, as there are a few others to try in the Play Store including Tuscany Drive where you can actually move around, VR Cinema for Cardboard (this plays any MP4 video in a split-screen view), Orbulus for Cardboard VR and Dive City Rollercoaster.



Plus, you can fire up the Chrome web browser and go to g.co/chromevr to see some of Google's in-browser VR experiments which work with Cardboard.

Not all apps work on all phones, but if you have a Nexus 4 or 5 or Galaxy S4 or S5 you should be fine. We also tested the main Cardboard app with an LG G3 and that worked too. ☑



Back up and restore a Windows Phone



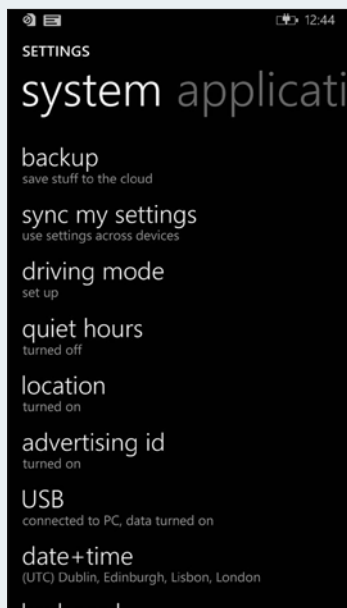
Jim Martin shows how to ensure you have a current backup of your Windows Phone, and how to restore that backup to a new smartphone

A feature that's been added to Windows Phone is the ability to back up your settings, wallpaper, home screen arrangement, text messages, photos and videos, passwords, notes, and more. This means that it's very easy to get everything back exactly the way it was before disaster struck, or simply when you upgrade to a new Windows Phone. Here's how to make a backup of your handset and how to restore this to a new device.

We're using Windows Phone 8.1 here, but all phones running 8 onwards should be largely the same.

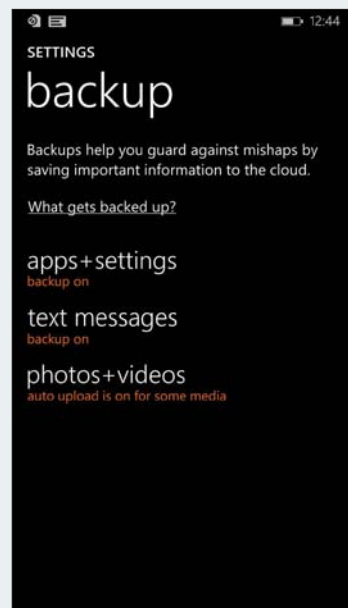
START

On your Windows Phone, go to Settings, then scroll down to 'backup'.

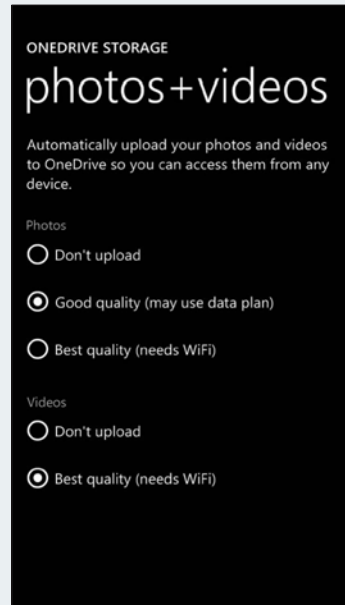


2

In backup you'll find three different sections: apps + settings, text messages, and photos + videos. Under each is displayed their status, such as 'backup on' or 'backup off'. Tap each to set your preference, though, we recommend turning on backup for everything.



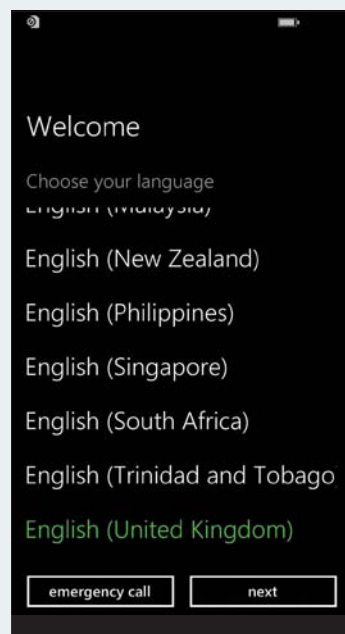
3 Under photos + video, there are options to back up images at 'good quality' which will use your data plan (or Wi-Fi if you're connected). However, it's best to choose Best quality (needs WiFi). For videos, that's your only choice.



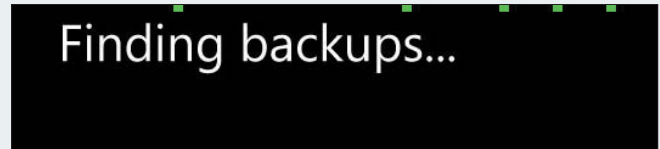
4 To manually create a backup, tap on apps + settings (under settings, backup), then 'back up now'.



5 When you first turn on a new device, you'll need to choose your language, accept the terms of use, connect to Wi-Fi, select WiFi Sense options, general phone settings, and the time and region. Only then will you be asked to sign in to your Microsoft account.



6 During the sign-in process, you should see 'Finding backups...' at the top of the screen. A list will be shown for you to choose from. The date is displayed so you know which is the most recent. If you're not sure which phone the backup was from, you might have to search online for the make and model number.



Restore phone

Do you want to restore data from a previous phone or start with a clean slate?

Windows Phone
NOKIA RM-994_eu_euro1_1129
Oct 13, 2014

Windows Phone
NOKIA RM-1045_1003
Jul 22, 2014

don't restore
Start afresh with your phone

7 Tap the backup you want to restore and tap next. The restore process will begin, and you should see a message saying that your apps will be downloaded in the background. If there are any you need to use straightaway, you can download them manually from the Windows Store. ☒



Block nuisance calls



Cold callers have always been a nuisance, but now you can use technology to banish them. Jim Martin explains how to eliminate unwanted calls

The only reason I still have a landline is because it's one of BT requirements for broadband. I'd happily unplug it if it weren't for the fact that my parents insist on using it instead of calling my mobile. The rest of the calls to the number are largely unwanted calls from companies trying to sell PPI or want me to claim compensation for injuries I never sustained. Here are the best ways to prevent such calls.



Telephone Preference Service

More than 17 million domestic phone numbers have been registered with the TPS, yet in my experience, the government scheme seems to have done little to reduce the number of nuisance calls. Telemarketing firms are supposed to avoid calling any numbers listed on the TPS database. You can register your number by going to www.tpsonline.org.uk, but that's merely the first step. Many companies either ignore the rules, or because they are calling from outside the UK the regulations don't apply to them.

Caller ID

As long as you have a compatible phone, you can ask your provider whether it's possible to display the number of the person calling. BT currently charges £1.75 per month for Caller Display, so you can see the number of the person calling, but it's included for free if you pay for your line rental for 12 months up front. Virgin charges £2.25, but TalkTalk and Sky both offer it for free.

If a number is in your phone's address book, then the name appears on the display instead of the number. On the BT handset I was using until recently, international calls were flagged up as just that, and since we don't have any overseas relations, it's easy to avoid answering calls from anyone you don't know.

Call blockers

The main issue with nuisance calls is that even if you know it's one, it's still a pain having to listen to the phone ringing at all; likewise if you have to get up and walk over to find out who's calling.

It may be possible for your phone provider to block specific numbers, but that will typically cost money, usually a few pounds a month. BT calls this Choose to Refuse, but it has other 'calling features' too, which include blocking all withheld UK numbers. BT lists its unwanted call services at tinyurl.com/6mrvnoL.

This is where call blockers come in. Call blockers are boxes which you plug in-line with your existing landline.



CPR 1200

I tried the CPR 1200 call blocker from Amazon. It costs £40, which might sound expensive, but if nuisance calls really bother you, then it could be well worth it for the peace and quiet it can bring.

The box comes with 200 known nuisance numbers already programmed in and barred, but you can add a new number whenever you like simply by pressing

the button on top after you answer a call and discover that it's an unwanted nuisance or cold caller. This works only if the number calling is visible via caller ID, though – indeed, you need caller ID for the box to work at all.

The CPR 1200 also lets you block international calls, withheld or private numbers, and entire area codes. Everything is done using your phone's keypad, and it comes with a quick-reference sticker so you don't have to memorise which combinations to press. Since the box is powered from the phone line, it doesn't need a mains adaptor, making it convenient and easy to install.

It can even handle two phone lines and two phone handsets.



BT BT8500

An alternative to a separate box is a new phone with call-blocking features built in. BT's BT8500 costs £35 for existing BT customers, or £50 if you want a second wireless handset. For non-BT customers, it's £60 and £80.

The main handset includes buttons for controlling the built-in answerphone, and the phone synchs its address book with other handsets (there are twin, triple and quad handset packs). When someone calls,

the BT8500 answers it and asks the caller to state their name. Only then will it ring and alert you. You'll then hear a message telling you who's calling and you can choose whether to accept the call only once, always, send it to the answerphone or always block it.

Friends and family will automatically get through as long as they are using a number in your address book. That's the only slight frustration with the BT8500 – it's laborious to enter lots of names and numbers via the numberpad. There's no way to import an address book from an existing phone (or smartphone). However, you can just wait until people call and add their numbers that way.

Like the CPR 1200, it lets you block calls by type so you can tell it to block all international and withheld numbers, and all numbers with a certain area code. It goes a bit further by letting you also block all mobile numbers and payphones, apart from those in your address book.

Another nice feature of the BT8500 is Do Not Disturb, which mutes the ringer and LEDs. You can tag certain people as VIPs in the address book, so their calls still get through. ☒

Connect to a router to change its settings



Need to change some settings in your wireless router? If you can't access 192.168.1.1 – or your router's IP address – Jim Martin shows how to get connected

These days, it's much easier to set up a new broadband router. They all come with Wi-Fi enabled and secured. Typically you'll find the Wi-Fi password on a label stuck to the router, and it may even show the user name and password and default IP address. It's trickier for older routers, especially if someone has changed the IP address, password or you've simply forgotten the details.

If you can't access your router via Wi-Fi, connect an ethernet cable between your router and your PC. We're using Windows 8 here, but the process is similar for Windows 7 and Vista.



1 Bring up a command prompt by typing 'command' in the Start menu search box (or Windows 8 Start screen) and choosing Command Prompt.

2 Type `ipconfig` and press Enter. You will see a list of the network adaptors in your computer. Look through the

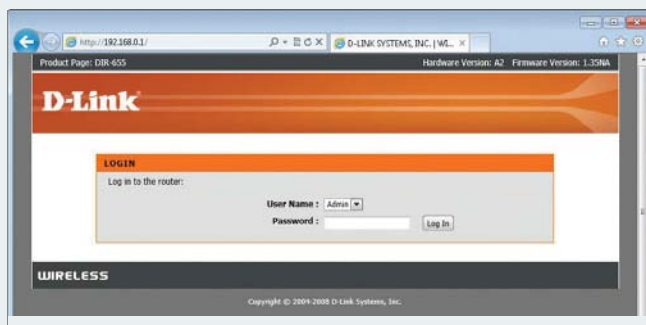
```

Command Prompt

Wireless LAN adapter Local Area Connection* 2:
    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : 
Wireless LAN adapter Wi-Fi:
    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : 
Ethernet adapter Ethernet:
    Connection-specific DNS Suffix  . : IDG.DOMAIN.com
    Link-local IPv6 Address . . . . . : fe80::5849:bd4d:24db:c6b6%3
    IPv4 Address. . . . . : 192.168.3.70
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.0.1
Tunnel adapter isatap.IDG.DOMAIN.com:
    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : IDG.DOMAIN.com
C:\Users\Martin>
  
```

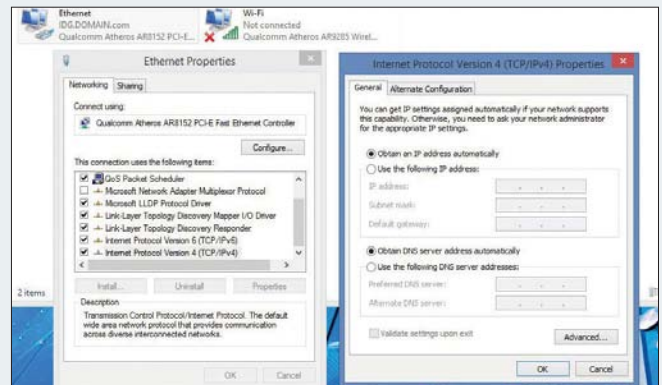
information to find the number next to Default gateway. This is the IP address of your router.

3 Open a web browser and type this number – in this case 192.168.0.1 – into the address bar, then press Enter. (Don't



add `http://` before the IP address. You should now see the login screen for your router.

4 If you don't see the login screen, it could be because the gateway IP address has been manually entered under your network adaptor settings. To check, open Control Panel and search for 'network'. Click on View Network Connections under Network



and Sharing Center. Right-click on the Ethernet adaptor and choose Properties. Then scroll down the list to find Internet Protocol Version 4. Click on it and then click the Properties button. Make sure Obtain an IP address automatically is selected, and also Obtain DNS server address automatically.

Repeat steps 2 and 3 to see if this has fixed the problem.

5 If you've forgotten your router's username and password, you'll need to reset it to factory settings. This is usually achieved by pressing a button or inserting a paper clip or pin into a reset hole. Check your manual to find out how long to hold the button for in order to reset it. The router will need to be connected to the mains and turned on in order for this to work, of course.

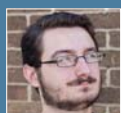
After resetting your router you can follow the earlier steps to connect to the router's management interface.

6 If your reason for accessing your router's settings was to configure a Wi-Fi network, you can now do so. It's worth changing the Wi-Fi network name to something memorable, but it's most important to set a password. If possible, choose WPA2 security rather than WEP. While you're at it, change the default router password to prevent anyone else accessing your router's settings. Stick a label on the router so you won't forget the IP address, Wi-Fi password and router username and password.

Check also for other software such as parental control applications, which may prevent you from accessing certain websites – a router's settings interface is just a website. There could also be settings within your web browser which are causing a problem, so try a different browser to eliminate this as an issue. ☒



Ground yourself before touching a CPU



With delicate electrical components such as RAM, graphics cards and CPUs, caution and delicate handling are always watchwords. CPUs in particular can

easily get fried by errant static electricity. However, avoiding this potentially expensive disaster is a simple matter of grounding yourself before handling any components. Adam Shepherd reveals how

START

The first thing to remember when dealing with electrical safety is preparation.

You can help ensure the security of your components by making sure you store them in anti-static bags (pictured right) to negate any static electricity they may encounter.



2

Another key tip is to avoid wool like the plague. We've all seen the childhood trick of rubbing a balloon on your jumper and then sticking it to stuff, and that's made possible by static electricity coming off your woollen jumper. A good habit to get into is ensuring that you're always making any PC modifications on non-carpeted floor, with shoes on and no jumper. This should ensure that you're carrying as little static as possible.

3

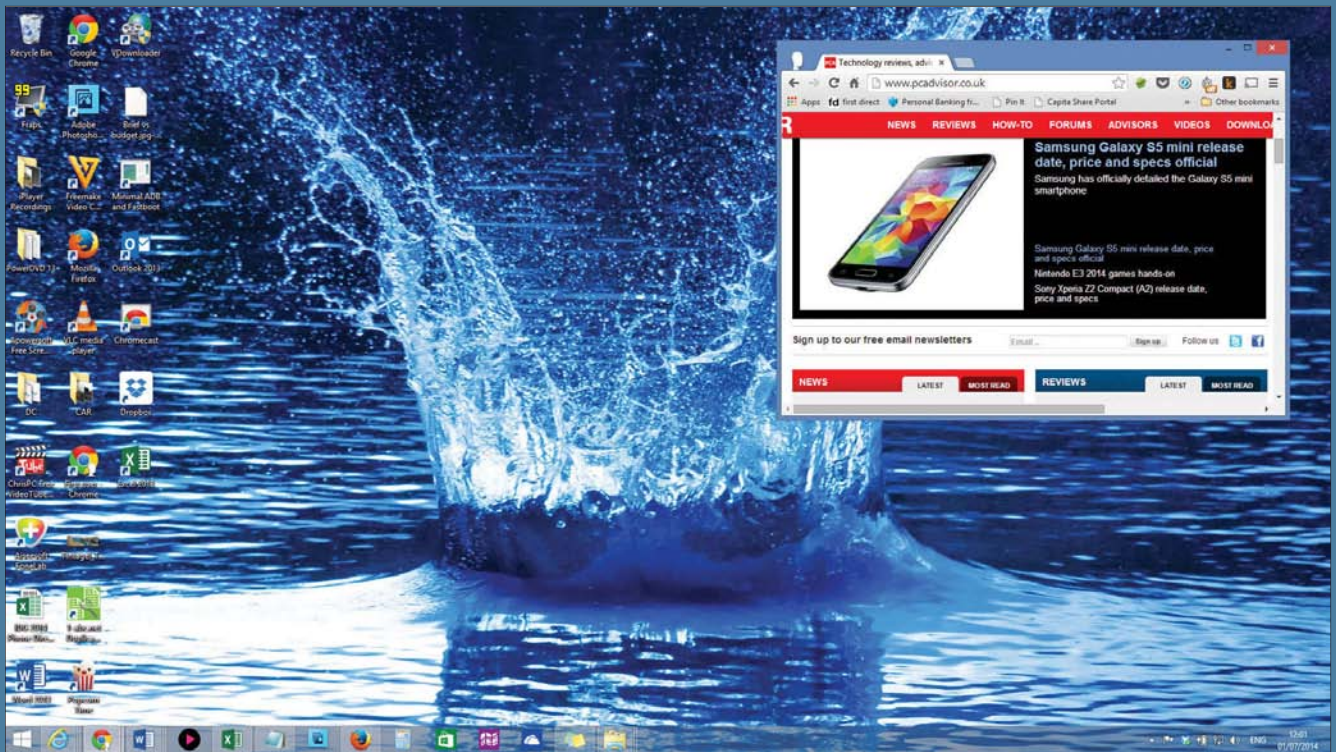
Sometimes, however, a little static electricity is unavoidable. This is easy to circumvent, however; you can buy anti-static wristband from Amazon for as little as £1. These small accessories will feature a wristband with a wire and crocodile clip (pictured above



right). This clip is then attached to a grounded source, such as a radiator or any plugged-in electrical product with a metal ground pin, which prevents the build-up of any static electricity. If you want to be extra sure, place your hand on a metal object such as your PC case every so often to dissipate any excess.

4 Finally, when handling CPUs, make sure to hold only the edge. Avoiding touching the exposed pins, circuitry or metal top will help ensure the health of your components. ☒

Get out of full-screen mode in Windows 8



To say Windows 8 hasn't been a popular operating system is an understatement, but it's mainly because the new interface

is so confusing for long-time Windows users. One of the problems is getting stuck in full-screen mode. Jim Martin explains how to escape

Exit full-screen mode and go to the desktop

It's important to understand whether you're using Windows 8's Modern Interface, or the traditional desktop as this will determine whether you can, or how you can, exit full-screen mode.

If you press the Start button on a Windows 8 computer, this brings up the new Windows 8 Start screen by default. It's like a start menu that covers the whole screen.

Most people don't realise there is a link to the desktop from this start screen, but it's usually at the bottom-left corner. It's an icon that should have your current wallpaper, so it should be obvious even if the Desktop label isn't.



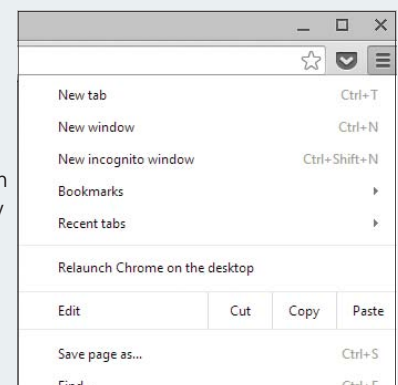
If you don't have a tile to take you to the desktop, simply type Desktop on the Start screen. A list of results will appear and the top hit should be Desktop.

Google Chrome

Google Chrome, according to some people, randomly switches to full-screen mode. This can mean a few different things, but for many, it's because their touchpad is set to put an app in full-screen mode when you swipe down from the top. This can be frustrating if you're merely trying to move the cursor. You may be able to disable touchpad gestures in the mouse settings within Windows Control Panel, but if not, you might have to adjust the way you use the touchpad on your laptop to avoid swiping down from the top of it. Instead avoid the top edge completely. When Chrome is running on the traditional Windows desktop, but has 'gone full-screen' it hides all the controls and makes the web page fill the entire screen.

Another issue with Chrome is where it runs in 'Windows 8' mode. This means it's running as a Modern UI app, and will fill the whole screen. In this

mode, you can minimise the browser and see a Chrome OS-like desktop as you would on a Chromebook. The way to exit this mode is to click on the Chrome icon to display the web browser, then click on the three bars at the top right to show the settings menu. Now click 'Relaunch Chrome on the desktop'. ☒



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Auslogics BoostSpeed 7

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Online registration required: Follow the links during installation before 11 March 2015.

System requirements

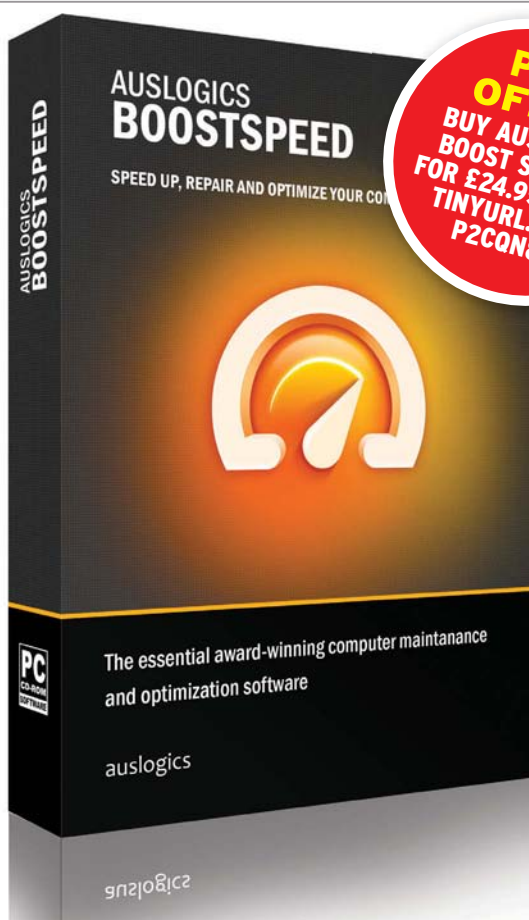
Windows XP/Vista/7/8/8.1; 512MB RAM; 60MB drive space; 1024x700 screen resolution

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 and privacy protection.

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.

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.

In addition, Auslogics has made numerous other enhancements to the suite, most of them intended to improve usability and help novice users better understand the benefits each feature may provide. ☒



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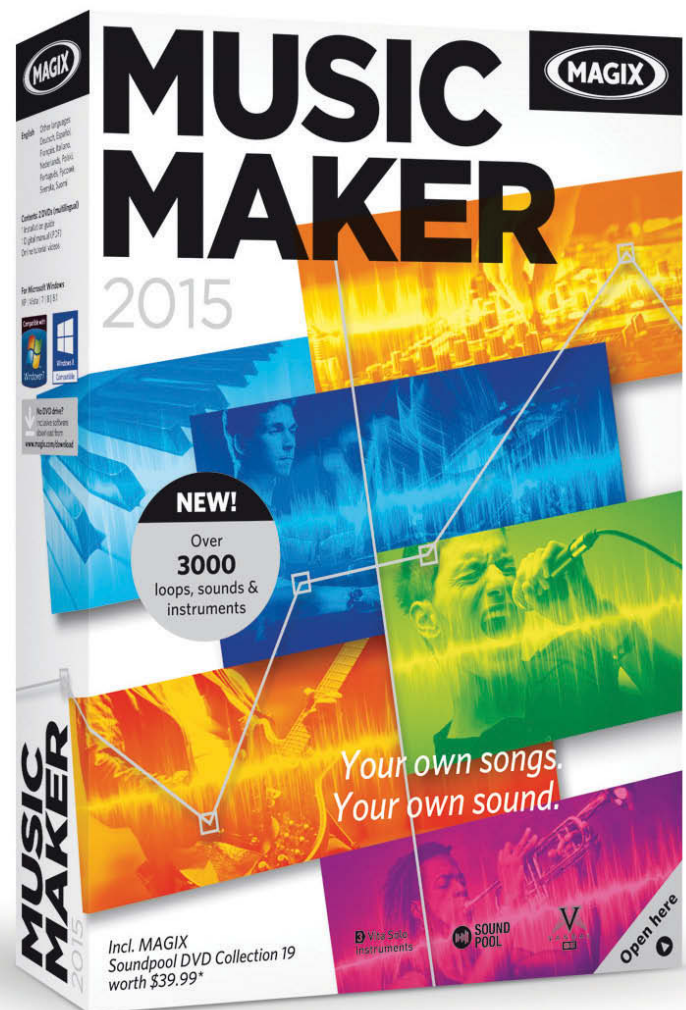
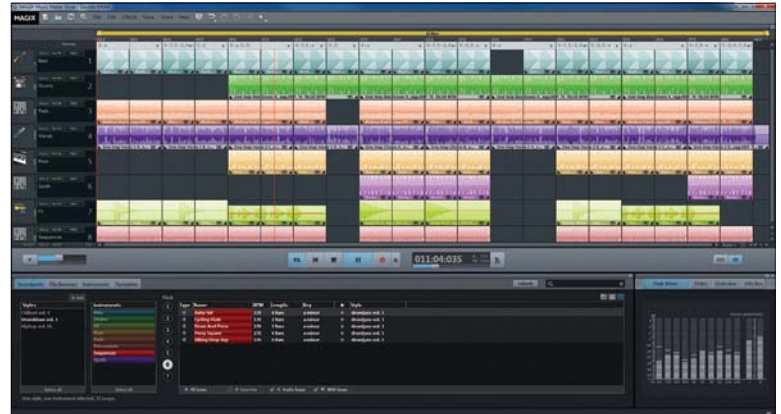
Online registration required: Follow the links during installation before 11 March 2015.

System requirements

Windows XP/Vista/7/8;
2GB RAM; 7.5GB drive
space; 2GHz processor

MAGIX Music Maker series has a wealth of features and thousands of loops and samples to satisfy every level of musical creativity.

MAGIX has completely redesigned its intuitive music software with new innovations, including a virtual synthesizer and drum machine, and Vita Sampler. Easy-to-understand features, thousands of loops and samples, high-quality virtual instruments and a massive range of effects make it possible for both beginners and more advanced users to easily create impressive songs. Thanks to the user-friendly interface and practical guides, even beginners can have fun making music with no previous experience at all. 



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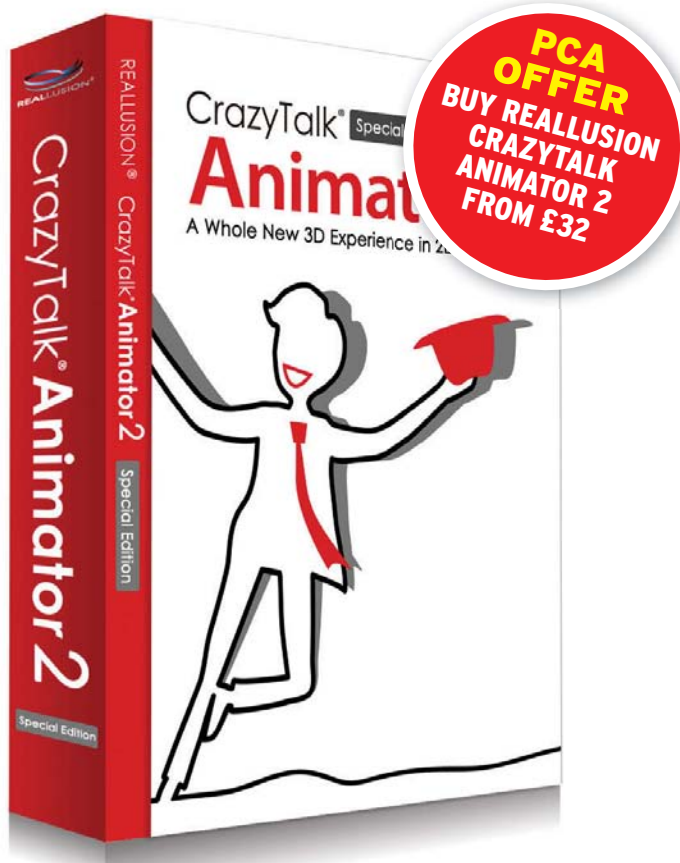
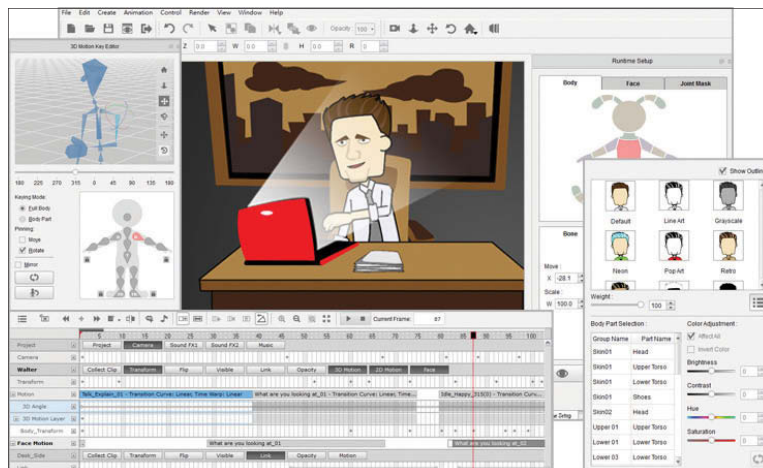
Online registration

required: follow the links during installation before 11 March 2015.

System requirements

Windows XP/Vista/7/8 (32- and 64-bit); 5GB drive space; 512MB RAM; dual-core processor

CrazyTalk Animator is a revolutionary animation suite that has all the necessary tools to create professional-level animation. It offers an exciting new approach to traditional 2D animation, with innovative new tools that allow users to apply 3D motions to 2D characters. Powerful new features have opened possibilities for freely editing 2D motions and viewing them from any angle with a single click. In addition to HumanIK motion editing and seamless mix-and-match character customisation, CrazyTalk Animator also offers creative and fun visual render styles that can dictate or enhance the mood of any scene. Powerful features such as body motion puppet and auto lip-sync further reinforce its position as the most creative tool for 2D character animation. It's designed for everyone from cartoon and movie creators to artists, illustrators, web designers, and educators. ☒



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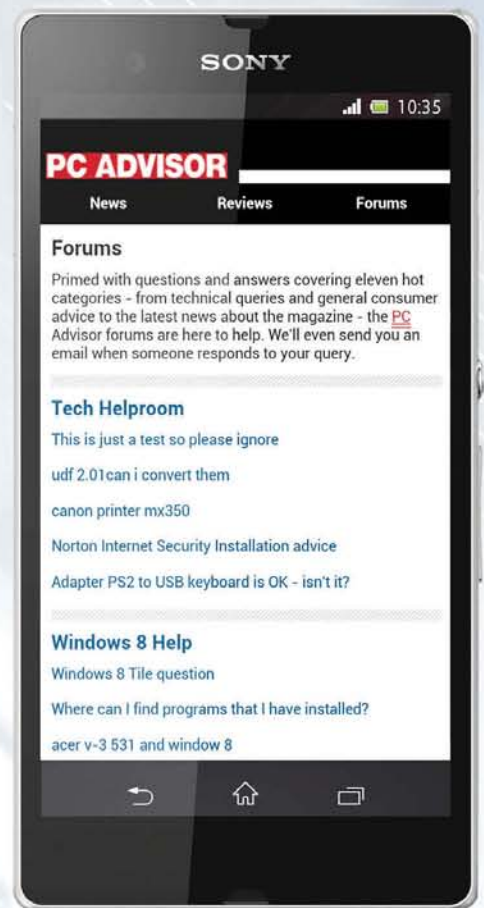
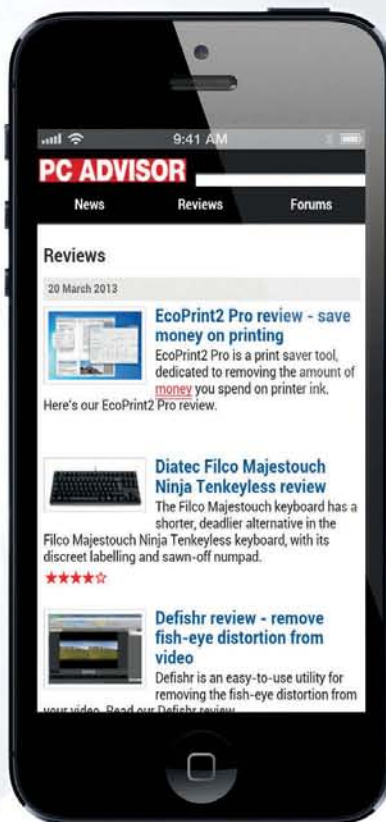
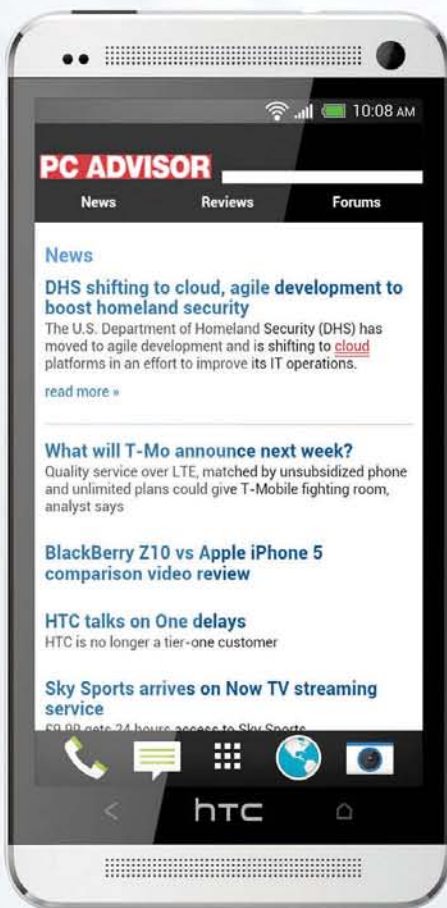
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Blu-ray drives



Wireless routers



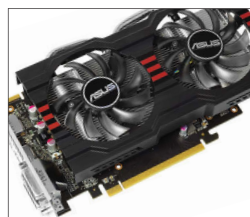
Printers



Projectors



Solid-state drives



Graphics cards



Flat-panel displays

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Prices

Laptops

Laptops up to £500
£501 to £1,000
£1,001 and over

Printers

Printers under £150
£151 and over

Graphics cards

Graphics cards under £150
£151 and over

Flat-panels

Flat-panels under £200
£201 and over

Prices listed are those quoted by the distributor or manufacturer and include VAT. They are intended only as a guide and you may see products on sale for less or more than our quoted price.

If you're interested in purchasing one of the products reviewed here then please contact the manufacturer or supplier directly, mentioning both *PC Advisor* and the issue in which you saw the product. If it won't supply the product as reviewed, contact us at jim_martin@idg.co.uk.

Manufacturers are under no obligation to feature reviewed products on their websites. *PC Advisor's* recommendations are for guidance only. The publisher takes no responsibility for purchasers' decisions.

Star ratings and Gold, Recommended and Best Buy badges are awarded at the time of the original review and given in relation to the market competition at that time.

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Ultraportable laptops	    				
	1	2	3	4	5
	Apple MacBook Pro 13in Retina	Apple MacBook Air 13in	HP Spectre 13-3010ea	Toshiba Kira-101	MSI GS60 2PE Ghost Pro
Price	£1,399 inc VAT	£849 inc VAT	£999 inc VAT	£1299 inc VAT	£1,317 inc VAT
Website	Apple.com/uk	Apple.com/uk	Hp.com/uk	Toshiba.co.uk	Uk.msi.com
Launch date	July 14	Apr 14	Sep 14	Aug 14	Oct 14
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	2.8GHz Intel Core i5	1.4GHz Intel Core i5	1.6GHz Intel Core i5-4200U	1.8GHz Intel Core i7-4500U	2.4GHz Intel Core i7-4700HQ
RAM	8GB DDR3L	4GB DDR3L	8GB DDR3	8GB DDR3	8GB DDR3
Storage	512GB SSD	128GB SSD	256GB SSD	256GB SSD	2x 128GB SSD, 1TB HDD
Screen size	13.3in glossy (anti-glare)	13.3in glossy (anti-glare)	13.3in glossy	13.3in glossy	15.6in matt
Screen resolution	2560x1600	1440x900	1920x1080	2560x1440	1920x1080
Graphics	Intel Iris Graphics	Intel HD Graphics 5000	Intel HD Graphics 4400	Intel HD Graphics 4400	nVidia GeForce GTX 870M
Video memory	N/A	N/A	N/A	N/A	3GB
Wireless	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11b/g/n/ac	802.11a/b/g/n/ac
Ethernet	Optional	Optional	None	None	None (mini)
Bluetooth	✓	✓	✓	✓	✓
USB	2x USB 3.0	2x USB 3.0	2x USB 3.0	3x USB 3.0	3x USB 3.0
FireWire	x	x	x	x	x
Thunderbolt	2x	✓	x	x	x
DisplayPort	x	✓	✓	x	✓ (mini)
HDMI	✓	x	✓	✓	✓
DVI	x	x	x	x	x
VGA	x	x	x	x	x
eSATA	x	x	x	x	x
Media card slot	✓	✓	✓	✓	✓
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	FaceTime HD webcam	HD webcam, multitouch trackpad, backlit keyboard	1080p webcam	720p webcam	720p webcam
Operating system	Mac OS X 10.10 Yosemite	Mac OS X 10.10 Yosemite	Windows 8.1 64-bit	Windows 8.1 Pro 64-bit	Windows 8.1 64-bit
Bundled software	iLife 11	iLife 11	None	None	None
Fear (Max detail)	Not tested	Not tested	31fps in Stalker (720p)	17fps (1080p)	45fps Batman: Arkham City
Battery	71.8Wh lithium-polymer	54Wh lithium-polymer	51Wh lithium-ion	52Wh lithium-polymer	52Wh lithium-polymer
Battery life	9 hrs 55 mins	12 hrs 57 mins	7 hrs 30 mins	7 hrs 10 mins	1 hr 59 mins
PC Mark 7 score	Not tested	4602	5006	5100	5655
Dimensions	314x219x18mm	325x227x4-17.5mm	324x220x15mm	316x207x19.8mm	390x266x19mm
Weight	1.57kg	1.35kg	1.52kg	1.26kg	1.9kg
Warranty	1 year return-to-base	1-year return-to-base	2 year return-to-base	2-year onsite	2-year onsite
FULL REVIEW	TINYURL.COM/PNTUMPW	TINYURL.COM/KNXWZ3	TINYURL.COM/N4CJQL9	TINYURL.COM/QHP9F9T	TINYURL.COM/JVJBU39

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Sub-£500 laptops	1	2	3	4	5
	Dell Chromebook 11	Lenovo B50-30	HP Chromebook 14	Asus X102BA	Toshiba CB30-102
Price	£239 inc VAT	£200 inc VAT	£259 inc VAT	£280 inc VAT	£230 inc VAT
Website	Dell.co.uk	Lenovo.com	Hp.com/uk	Asus.com/uk	Toshiba.co.uk
Launch date	Dec 14	Dec 14	Dec 14	May 14	Jun 14
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	1.4GHz Intel Celeron 2955U	2.16GHz Intel Celeron N2830	1.4GHz Intel Celeron 2955U	1GHz AMD A4-1200	1.4GHz Intel Celeron 2955U
RAM	4GB DDR3	4GB DDR3	4GB DDR3	4GB DDR3L	2GB DDR3
Storage	16GB SSD	320GB HDD	16GB SSD	500GB HDD	16GB SSD
Screen size	11.6in glossy	15.6in matt	14in glossy	10.1in glossy touchscreen	13.3in glossy
Screen resolution	1366x768	1366x768	1366x768	1366x768	1366x768
Graphics	Intel HD Graphics	Intel HD Graphics	Intel HD Graphics	AMD Radeon HD 8180	Intel HD Graphics
Video memory	N/A	N/A	N/A	N/A	N/A
Wireless	802.11a/b/g/n	802.11b/g/n	802.11a/b/g/n	802.11b/g/n	802.11a/g/n
Ethernet	Gigabit	Gigabit	Gigabit	10/100	Gigabit
Bluetooth	✓	✓	✓	✓	✓
USB	2x USB 3.0	1x USB 3.0, 2x USB 2.0	2x USB 3.0, 1x USB 2.0	1x USB 3.0, 2x 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	x	✓	x	✓	✓
DVI	x	x	x	x	x
VGA	x	✓	x	✓	x
eSATA	x	x	x	x	x
Media card slot	✓	✓	✓	✓	✓
Audio	Headphone minijack	Headphone jack, mic	Headphone minijack	Headphone jack, mic	Headphone jack, mic
Optical drive	None	N/A	None	None	None
Extras	Webcam	Webcam	Webcam	Webcam	Webcam
Operating system	Google Chrome OS	Windows 8.1 with Bing	Google Chrome OS	Windows 8 64-bit	Google Chrome OS
Bundled software	None	None	None	MS Office Home & Student	None
Battery	Lithium	45Wh lithium	Lithium	33Wh lithium-ion	Lithium-polymer
Battery life	7 hrs 17 mins	4 hrs 51 mins	7 hrs 50 mins	4 hrs 20 mins	7 hrs 25 mins
PC Mark 7 score	N/A	1663	N/A	1100	N/A
Stalker (Low/High)	N/A	N/A	N/A	N/A	N/A
Dimensions	295x201x24mm	380x260x26.5-32.5mm	345x239x20.5mm	266x185x29mm	454x268x56mm
Weight	1.3kg	2.2kg	1.7kg	1.1kg	1.5kg
Warranty	1-year depot	1-year return-to-base	1-year return-to-base	1-year return-to-base	1-year return-to-base
FULL REVIEW	TINYURL.COM/M3D3QJ4	TINYURL.COM/OQ94SKB	TINYURL.COM/PPS4F9G	TINYURL.COM/PLAUQCG	TINYURL.COM/LQEBYPA

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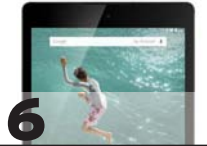
£501-£1,000 laptops	1	2	3	4	5
	Scan 3XS Graphite LG156	Dell Inspiron 17-7737	Chillblast Defiant 2 Mini	HP Pavilion TouchSmart 15	Chillblast Helium
Price	£899 inc VAT	£800 inc VAT	£899 inc VAT	£530 inc VAT	£899 inc VAT
Website	3xs.scan.co.uk	Dell.co.uk	Chillblast.com	Hp.com/uk	Chillblast.com
Launch date	Jul 14	Jul 14	Jul 14	May 14	Jul 14
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	2.5GHz Intel Core i7-4710MQ	2GHz Intel Core i7-4510U	2.5GHz Intel Core i7-4710MQ	1.6GHz Intel Core i5-4200U	1.8GHz Intel Core i7-4500U
RAM	8GB DDR3	16GB DDR3	8GB DDR3	8GB DDR3	16GB DDR3
Storage	1TB SSHD	500GB HDD + 8GB NAND	1TB SSHD	750GB HDD	500GB HDD + 120GB SSD
Screen size	15.6in matt	17.3in glossy	13.3in non-reflective	15.6in glossy touchscreen	14in
Screen resolution	1920x1080	1920x1080	1920x1080	1366x768	1600x900
Graphics	GTX 860M/Intel HD 4600	GT 750M/Intel HD 4400	GTX 860M/Intel HD 4600	GT 740M/Intel HD 4400	Intel HD Graphics 4400
Video memory	2GB	2GB	2GB	N/A	N/A
Wireless	802.11a/b/g/n/ac	802.11a/b/g/n	802.11a/b/g/n	802.11b/g/n	802.11b/g/n
Ethernet	Gigabit	Gigabit	Gigabit	10/100	Gigabit
Bluetooth	✓	✓	✓	✓	✓
USB	3x USB 3.0, 1x USB 2.0	4x USB 3.0	2x USB 3.0	2x 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	✓	✓	✓	✓	✓
eSATA	✓ (shared USB 3.0)	x	x	x	x
Media card slot	✓	✓	✓	✓	✓
Audio	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic
Optical drive	N/A	N/A	N/A	8x DVD ± RW	N/A
Extras	1080p webcam	720p webcam	1080p webcam	Webcam	720p webcam
Operating system	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8 64-bit	Windows 8.1 64-bit
Bundled software	None	None	None	None	None
Stalker (720p/1080p)	178/102fps	104/63fps	180/100fps	60fps (720)	29fps (720p)
Battery	77Wh lithium-ion	58Wh lithium-ion	62.2Wh lithium-ion	41Wh lithium-ion	44.6Wh lithium-ion
Battery life	4 hours	5 hrs	5 hrs 33 mins	5 hrs 45 mins	5 hrs 20 mins
PCMark 7 score	4846	4260	4456	2860	5100
Dimensions	374x250x43mm	412x269x28mm	330x227x32mm	386x258x25mm	337x236x21mm
Weight	2.7kg	3.3kg	2.1kg	2.6kg	2.1kg
Warranty	2-year return-to-base	1-year NBD	2-year collect-and-return	1-year return-to-base	1-year return-to-base
FULL REVIEW	TINYURL.COM/MYTG9X5	TINYURL.COM/N6828JG	TINYURL.COM/NNDFZRR	TINYURL.COM/L2JAXH7	TINYURL.COM/P7U28WQ

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	£1,001+ laptops 1 PC ADVISOR BEST BUY  2 PC ADVISOR RECOMMENDED  3  4  5 				
	Aorus X7 v2	Chillblast Helix	MSI GE70 2PE Apache Pro	Schenker XMG P304	Dell XPS 15
Price	£1,729 inc VAT	£1,250 inc VAT	£1,126 inc VAT	£1,100 inc VAT	£1,449 inc VAT
Website	Aorus.com	Chillblast.com	UK.msi.com	Mysn.co.uk	Dell.co.uk
Launch date	Sep 14	Sep 14	Sep 14	Jul 14	Sep 14
Build rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Features rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Performance rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Value rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Processor	2.4GHz Intel Core i7-4860HQ	2.5GHz Intel Core i7-4710HQ	2.5GHz Intel Core i7-4710HQ	2.2GHz Intel Core i7-4702MQ	2.3GHz Intel Core i7-4712HQ
RAM	16GB DDR3	4GB DDR3	16GB DDR3	8GB DDR3	16GB DDR3
Storage	1TB HDD, 3x 128GB SSD	1TB HDD, 120GB SSD	1TB HDD, 2x 128GB SSD	250GB SSD	512GB SSD
Screen size	17.3in matt	17.3in matt	17.3in matt	13.3in matt	15.6in gloss
Screen resolution	1920x1080	1920x1080	1920x1080	1920x1080	3200x1800
Graphics	2x nVidia GeForce GTX 860M	nVidia GeForce GTX 870M	nVidia GeForce GTX 860M	nVidia GeForce GTX 860M	nVidia GeForce GT 750M
Video memory	8GB	2GB	2GB	2GB	2GB
Wireless	802.11a/b/g/n/ac	802.11b/g/n/ac	802.11b/g/n/ac	802.11b/g/n/ac	802.11b/g/n/ac
Ethernet	Gigabit	Gigabit	Gigabit	Gigabit	*
Bluetooth	✓	✓	✓	✓	✓
USB	3x USB 3.0, 2x USB 2.0	4x USB 3.0	2x USB 3.0, 2x USB 2.0	3x USB 3.0, 1x USB 2.0	3x USB 3.0, 1x USB 2.0
FireWire	*	*	*	*	*
Thunderbolt	*	*	*	*	*
DisplayPort	✓	✓	*	*	✓
HDMI	✓	✓	✓	✓	✓
DVI	*	*	*	*	*
VGA	✓	*	✓	*	✓
eSATA	*	*	*	✓	*
Media card slot	✓	✓	✓	✓	✓
Audio	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic
Optical drive	N/A	N/A	N/A	None	N/A
Extras	HD webcam	HD webcam	HD webcam	720p webcam	720p webcam
Operating system	Windows 8.1 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
Stalker (720p/1080p)	189 /157fps in Tomb Raider	142fps in Batman (1080p)	120fps in Batman (1080p)	115fps (1080p)	68fps (1080)
Battery	74.7Wh lithium-polymer	60Wh lithium-ion	49Wh lithium-ion	62Wh lithium-ion	91Wh lithium-ion
Battery life	1 hr 48 mins	3 hrs 45 mins	2 hrs	5 hrs 5 mins	5 hrs
PCMark7 score	6304	5710	6241	5500	5833
Dimensions	425x303x24.5mm	419x287x21.8mm	418x269x39mm	374x250x37mm	372x254x18mm
Weight	3.24kg	2.66kg	3kg	2kg	2kg
Warranty	2-year return-to-base	2-year collect-and-return	2-year return-to-base	2-year collect-and-return	1-year next day in-home
FULL REVIEW	TINYURL.COM/KLUXLGE	TINYURL.COM/Q8U7CUP	TINYURL.COM/PU5L5GK	TINYURL.COM/Q4JWVSM	TINYURL.COM/N9GRT4U

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Tablets					
	1 PC ADVISOR GOLD	2 PC ADVISOR GOLD	3 PC ADVISOR RECOMMENDED	4 PC ADVISOR RECOMMENDED	5 PC ADVISOR RECOMMENDED
	Google Nexus 7 (2013)	Apple iPad Air 2	Samsung Galaxy Tab S 8.4	Apple iPad mini 2	Apple iPad Air
Price	£199 inc VAT	£399 inc VAT	£319 inc VAT	£239 inc VAT	£319 inc VAT
Website	Play.google.com	Apple.com/uk	Samsung.com/uk	Apple.com/uk	Apple.com/uk
Launch date	Jul 13	Oct 14	Aug 14	Oct 13	Oct 13
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Platform	Android 4.3 Jelly Bean	Apple iOS 8.1	Android 4.4.2 KitKat	Apple iOS 8.1	Apple iOS 8.1
Screen size/resolution	7in/1280x800	9.7in/2048x1536	8.4in/2560x1600	7.9in/2048x1536	9.7in/2048x1536
Storage/media card slot	16GB/none	16GB/none	16GB/32GB	16GB/none	16GB/none
Connectivity	802.11b/g/n, Bluetooth 4	802.11a/b/g/n/ac, Bluetooth 4	802.11a/b/g/n/ac, Bluetooth 4	802.11a/b/g/n, Bluetooth 4	802.11a/b/g/n, Bluetooth 4
Processor	1.5GHz Snapdragon S4 Pro	Apple A8X	Exynos 5	Apple A7	Apple A7
RAM	2GB	1GB	3GB	3GB	1GB
Claimed battery life	9 hrs	10 hrs	12 hrs	Not specified	10 hrs
Cameras (front/rear)	1.2/5Mp	1.28Mp	2.1/8Mp	1.2/85Mp	1.2/5Mp
Dimensions	114x200x8.7mm	240x169.5x6.1mm	126x213x6.6mm	200x134.7x7.5mm	169x240x7.5mm
Weight	299g	437g	294g	331g	469g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/QYUDY5C	TINYURL.COM/QEYQXYM	TINYURL.COM/KL6G9FJ	TINYURL.COM/MZDXBGQ	TINYURL.COM/LSB84EE

Tablets					
	6 PC ADVISOR RECOMMENDED	7 PC ADVISOR RECOMMENDED	8 PC ADVISOR RECOMMENDED	9 PC ADVISOR RECOMMENDED	10 PC ADVISOR RECOMMENDED
	Google Nexus 9	Samsung Galaxy Tab S 10.5	Sony Xperia Z2 Tablet	Tesco Hudl 2	Google Nexus 10 by Samsung
Price	£300 inc VAT	£399 inc VAT	£399 inc VAT	£132 inc VAT	£319 inc VAT
Website	Play.google.com	Samsung.com/uk	Sony.co.uk	Tesco.com	Play.google.com
Launch date	Nov 14	Aug 14	Apr 14	Oct 14	Nov 12
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Platform	Android 5.0 Lollipop	Android 4.4.2 KitKat	Android 4.4.2 KitKat	Android 4.4 KitKat	Android 4.4 KitKat
Screen size/resolution	8.9in/2048x1536	10.5in/2560x1600	10.1in/1920x1200	8.3in/1920x1200	10.1in/2560x1600
Storage/media card slot	16GB/32GB	16GB/32GB	16GB/none	16GB/microSD	16GB/none
Connectivity	802.11b/g/n/ac, Bluetooth 4.1	802.11b/g/n/ac, Bluetooth 4	802.11b/g/n/ac, Bluetooth 4	802.11a/b/g/n, Bluetooth 4	802.11b/g/n, Bluetooth 4, NFC
Processor	2.3GHz nVidia Tegra K1	Exynos 5420	2.3GHz Snapdragon 801	1.8GHz Intel Atom	1.7GHz Cortex A-15
RAM	2GB	3GB	3GB	2GB	2GB
Claimed battery life	Not specified	Not specified	Not specified	8 hrs	9 hrs
Cameras (front/rear)	1.6/8Mp	2.1/8Mp	2.2/8.1Mp	1.2/5Mp	1.9/5Mp
Dimensions	228x153x7.95mm	247x177x6.6mm	266x172x6.4mm	128x224x9mm	178x264x8.9mm
Weight	425g	465g	439g	401g	603g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/NQ6K77Y	TINYURL.COM/OESDFZQ	TINYURL.COM/M8BZZUN	TINYURL.COM/NE5W9U9	TINYURL.COM/ARL2KDG

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Smartphones	1	2	3	4	5
	LG G3	Sony Xperia Z3 Compact	LG G2	HTC One (M8)	Samsung Galaxy Note 4
Price	£499 inc VAT	£365 inc VAT	£279 inc VAT	£550 inc VAT	£599 inc VAT
Website	Lg.com/uk	Sonymobile.com	Lg.com/uk	Htc.com/uk	Samsung.com/uk
Launch date	Jun 14	Nov 14	Sep 13	Apr 14	Nov 14
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Platform	Android 4.4.2 KitKat	Android 4.4 KitKat	Android 4.2 Jelly Bean	Android 4.4 KitKat	Android 4.4.4 KitKat
Processor	2.5GHz Snapdragon 801	2.5GHz Qualcomm	2.26GHz Snapdragon 800	2.3GHz Snapdragon 801	2.7GHz Qualcomm
Storage/media card slot	16GB/none	16GB/microSD	16GB/none	16GB/microSD	32GB/none
Screen size/resolution	5.2in/1440x2560	4.6in/1280x720	5.2in/1920x1080	5in/1920x1080	5.7in/2560x1440
Screen type	Capacitive multitouch	Capacitive multitouch	Capacitive multitouch	Capacitive multitouch	Capacitive multitouch
Connectivity	4G, HSPA+, Bluetooth, Wi-Fi	4G, HSPA+, Bluetooth, Wi-Fi	4G, HSPA+, Bluetooth, Wi-Fi	Bluetooth, NFC, Wi-Fi ac	4G, NFC, Bluetooth, Wi-Fi
Claimed battery life	Not specified	Not specified	Not specified	Not specified	Not specified
Cameras (front/rear)	13Mp, 1080p video	20.7Mp, 1080p video	13Mp, 1080p video	5Mp, 1080p video	8Mp, 1080p video
GPS	A-GPS	A-GPS	A-GPS	A-GPS, Glonass	A-GPS
Dimensions, weight	75x146x8.9mm, 149g	127x64.9x8.6mm, 129g	71x139x9.4mm, 143g	146.4x70.6x9.4mm, 160g	79x154x8.7mm, 175g
Warranty	1 year	1 year	1 year	2 years	Not specified
FULL REVIEW	TINYURL.COM/MQ8DHUU	TINYURL.COM/O6PVRER	TINYURL.COM/PAFK4SZ	TINYURL.COM/NGBWXY9	TINYURL.COM/MRVQCKG

Smartphones	6	7	8	9	10
	Huawei Honor 6	Google Nexus 5	Sony Xperia Z3	OnePlus One	HTC Desire Eye
Price	£249 inc VAT	£299 inc VAT	£539 inc VAT	£229 inc VAT	£350 inc VAT
Website	Huawei.com/uk	Play.google.com	Sonymobile.com	Oneplus.net/uk	Htc.com/uk
Launch date	Nov 14	Oct 13	Nov 14	Jul 14	Nov 14
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Platform	Android 4.4 KitKat	Android 4.4 KitKat	Android 4.4.4 KitKat	CyanogenMod 11S	Android 4.4.4 KitKat
Processor	1.7GHz Cortex-A15	2.3GHz Snapdragon 800	2.5GHz Qualcomm	2.5GHz Qualcomm	2.3GHz Qualcomm
Storage/media card slot	16GB/32GB	16GB/none	16GB/microSD	16GB/none	16GB/microSD
Screen size/resolution	5in/1920x1080	4.95in/1920x1080	5.2in/1920x1080	5.5in/1920x1080	5.2in/1920x1080
Screen type	Capacitive multitouch	Capacitive multitouch	Capacitive multitouch	Capacitive multitouch	Capacitive multitouch
Connectivity	4G, NFC, Bluetooth, Wi-Fi	HSPA+, Bluetooth, Wi-Fi ac	4G, NFC, Bluetooth, Wi-Fi	4G, NFC, Bluetooth, Wi-Fi	4G, NFC, Bluetooth, Wi-Fi
Claimed battery life	Not specified	17 hrs/300 hrs	Not specified	Not specified	Not specified
Cameras (front/rear)	13Mp, 1080p video	8Mp, 1080p video	20.7Mp, 1080p video	13Mp, 720p video	13Mp, 1080p video
GPS	A-GPS	A-GPS	A-GPS	Glonass	A-GPS
Dimensions, weight	70x140x7.5mm, 130g	69x138x8.9mm, 130g	72x146x7.3mm, 152g	152.9x75.9x8.9mm, 162g	152x74x8.5mm, 154g
Warranty	1 year	1 year	1 year	Not specified	2 years
FULL REVIEW	TINYURL.COM/OYBQJVA	TINYURL.COM/PAFK4SZ	TINYURL.COM/K5S4KXD	TINYURL.COM/KYW977U	TINYURL.COM/NVMMBVF

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Gaming PCs	 1 	 2	 3	 4 	 5
	Chillblast Fusion Probe	Chillblast Fusion Ranger	Gladiator Firestorm OC	CyberPower Infinity Perseus XT	Computer Planet GX 760
Price	£1,299 inc VAT	£1,249 inc VAT	£695 inc VAT	£1,499 inc VAT	£983 inc VAT
Website	Chillblast.com	Chillblast.com	Gladiatorpc.co.uk	Cyberpowersystem.co.uk	Computerplanet.co.uk
Launch date	Feb 14	Jul 14	Mar 14	Feb 14	Mar 14
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	3.4GHz Intel Core i5-4670K (OC 4.4GHz)	3.4GHz Intel Core i5-4670K (OC 4.2GHz)	3.4GHz Intel Core i5-4670K (OC 4.2GHz)	3.4GHz Intel Core i5-4670K (OC 4.4GHz)	3.4GHz Intel Core i5-4670K
CPU cooler	Corsair H55 Liquid Cooler	Corsair H60 Liquid Cooler	Be Quiet Dark Rock 3	Cooler Master Seldon 120mm	Corsair H60 Hydro
Memory	16GB DDR3	16GB DDR3	8GB DDR3	16GB DDR3	8GB DDR3
Storage	120GB SSD + 2TB HDD	120GB SSD + 2TB HDD	2TB HDD	256GB SSD + 2TB HDD	120GB SSD + 2TB HDD
Power supply	750W Corsair	750W Corsair	500W Corsair	750W Corsair	450W Corsair
Motherboard	Gigabyte GA-Z87N-Wi-Fi	Asus Maximus VII Ranger	MSI Z87M Gaming	Gigabyte GA-Z87-HD3	Gigabyte GA-Z87N-Wi-Fi
Operating system	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit
Screen	23.6in Iiyama X2377HDS	None supplied	None supplied	23in AOC i2367fh	None supplied
Graphics	Palit Jetstream GeForce GTX 780, 3GB VRAM	PowerColor AMD Radeon R9 290 OC, 4GB VRAM	MSI nVidia GeForce GTX 750 Ti Gaming, 2GB VRAM	Powercolor AMD R9 290, 4GB VRAM	Zotac GeForce GTX 760, 2GB VRAM
Sound	Onboard	Onboard	Onboard	Onboard	Onboard
Connectivity	Gigabit ethernet, 802.11n	Gigabit ethernet	Low-lag ethernet	Gigabit ethernet	2x gigabit ethernet, 802.11n
Ports	6x USB 3.0, 4x USB 2.0	6x USB 3.0, 2x USB 2.0, 2x DVI, HDMI, DP	8x USB 3.0, 4x USB 2.0, 2x eSATA	6x USB 3.0, 4x USB 2.0	6x USB 3.0, 2x USB 2.0
Optical drive	DVD±RW (Blu-ray optional)	24x DVD±RW	24x DVD±RW	DVD±RW, BD-ROM	None supplied
Case	Aerocool Dead Silence Gaming Cube	Corsair Graphite 230T	Aerocool Dead Silence Cube Window Red	Cooler Master Dominator 690 III	Fractal Design Node 304
Keyboard & mouse	Gigabyte M6800 mouse, Force K3 keyboard	None	None	Gigabyte M6900 mouse, Force K3 keyboard	None
Other	Optional family pack	None	None	None	None
PC Mark 7 score	6965	6852	5124	6731	5508
Alien vs Predator score (720p/1080p)	169/93fps	173/97	103/54fps	172/96fps	103/54fps
Final Fantasy XIV (720p/1080p)	218/96fps	N/A	N/A	167/87fps	N/A
Sniper Elite V2 (Low/High/Ultra)	308/187/49fps	321/164/42	194/81.6/18.6fps	352/155/39fps	261/119/29fps
Power Consumption	52/407W	67W/386W	70W/166W	68/484W	53W/271W
Warranty	2-year collect-and-return	2-year collect-and-return	4-year return-to-base	3-year RTB (2 years parts, 3 years labour)	3-year return-to-base
FULL REVIEW	TINYURL.COM/OWQ24QQ	TINYURL.COM/MEGK909	TINYURL.COM/PKDV2NG	TINYURL.COM/NKWN7V4	TINYURL.COM/MJZKS7G

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Mini PCs	 1 PC ADVISOR BEST BUY	 2 PC ADVISOR RECOMMENDED	 3	 4	 5
	Yoyotech Warbird RS4.0	Chillblast Fusion Xcalibur	Mesh Elite Mini Gaming OC	Dino PC Microraptor GTX 770	Quiet PC Serenity Nano
Price	£999 inc VAT	£849 inc VAT	£1,499 inc VAT	£999 inc VAT	£1,238 inc VAT
Website	yoyotech.co.uk	chillblast.com	meshcomputers.com	dinopc.com	quietpc.co.uk
Launch date	Mar 14	Mar 14	Mar 14	Mar 14	Mar 14
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	3.4GHz Intel Core i5-4670K	3.2GHz Intel Core i5-4570	3.5GHz Intel Core i7-4770K (4.3GHz OC)	3.4GHz Intel Core i5-4670K (4.3GHz OC)	3.4GHz Intel Core i5-4670K (3.8GHz OC)
CPU cooler	Noctua L9i low-profile cooler	Scythe Shuriken low-profile cooler	Corsair Hydro Series H60 liquid cooler	Corsair Hydro Series H80 liquid cooler	Noctua L9i low-profile cooler
RAM	8GB DDR3 1600MHz	8GB DDR3 1600MHz	16GB DDR3 2133MHz	16GB DDR3 1600MHz	16GB DDR3 1600MHz
Storage	128GB SSD, 2TB HDD	120GB SSD, 1TB HDD	240GB SSD, 2TB HDD	128GB SSD, 1TB HDD	120GB SSD, 2TB HDD
Power supply	Seasonic Evo 520W Bronze-rated	450W Silverstone SFX	750W Cooler Master GX RS-750	600W Corsair Builder Series CX600	FSP Aurum 750W modular PSU
Motherboard	Asus Z87I-Pro	Asus H81I-PLUS	MSI Z87I Gaming AC	Gigabyte GA-Z87N-WIFI	Gigabyte H87N-WIFI
Operating system	Windows 8.1	Windows 8.1/7 Home Premium	Windows 8.1	Windows 8.1	Windows 8.1
Graphics	Asus GTX 770 (2GB)	EVGA GTX 760 (2GB)	AMD Radeon R9 290X (4GB)	Zotac nVidia GeForce GTX 770 (2GB)	Palit GTX 770 Jetstream (2GB)
Networking	Gigabit ethernet, 802.11n Wi-Fi	Gigabit ethernet, 802.11n Wi-Fi	Gigabit ethernet, 802.11n Wi-Fi	2x gigabit ethernet, 802.11n Wi-Fi	Gigabit ethernet, 802.11n Wi-Fi
USB ports	6x USB 3.0, 4x USB 2.0	4x USB 3.0, 4x USB 2.0	6x USB 3.0, 2x USB 2.0	6x USB 3.0, 3x USB 2.0	5x USB 3.0, 4x USB 2.0
Other ports	3x DVI (2x DVI-I), 2x HDMI, 2x DisplayPort	2x DVI, HDMI, DisplayPort	3x DVI, 2x HDMI, 2x DisplayPort, eSATA	1x DVI, 2x HDMI, 1x PS/2	2x DVI, HDMI, DisplayPort
Optical drive	Pioneer BDR-S07XLT Blu-ray writer	Optional	External Blu-ray drive	LiteOn iHAS122 DVD writer	Optional
Case	Cooler Master Elite 130	Silverstone RVZ01	Fractal Design Node 304	Cooler Master Elite 130	Cooler Master Elite 130
Keyboard & mouse	None	Logitech MK520	None	None	None
PCMark 8 score	6403	6334	6678	6861	6403
Alien vs Predator score (720p/1080p)	127/68	104/56	186/104	121/65	127/68
Sniper V2 Elite score (Low/High/Ultra)	303/161/40	263/124/31	387/169/43	313/150/38	303/161/40
Games score (Final Fantasy XIV)	200/76	155/63	183/94	220/81	200/76
Power consumption (idle/max)	49/330W	39/278W	54/548W	71/384W	49/330W
Warranty	3-year Silver (1-year parts, 3-year labour)	2-year collect-and-return (5-year labour)	3-year collect-and-return (2-year parts, 3-year labour)	3-year return-to-base (1-year parts, 3-year labour)	2-year collect-and-return
FULL REVIEW	TINYURL.COM/MQ8POPOQ	TINYURL.COM/NFQ6EGO	TINYURL.COM/PWCACV2	TINYURL.COM/MXMJ6QT	TINYURL.COM/O4QDHTY

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All-in-one PCs	1 	2 	3 	4 	5 
	Dell XPS 2720	Apple iMac 27in (Late 2012)	Medion Akoya P2002	Chillblast Fusion AIO Ultima	MSI Wind Top AE2712G
Price	£1,749 inc VAT	£1,699 inc VAT	£449 inc VAT	£1,199 inc VAT	£1,199 inc VAT
Website	Dell.co.uk	Apple.com/uk	Medion.com/gb	Chillblast.com	Uk.msi.com
Launch date	Sep 13	Sep 13	Sep 13	Sep 13	Sep 13
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	3.1GHz Intel Core i7-4770S	3.2GHz Intel Core i5-3470	3.3GHz Intel Core i3-3220	3.1GHz Intel Core i7-3770S	2.9GHz Intel Core i5-3470S
RAM	16GB DDR3	8GB DDR3	4GB DDR3	16GB DDR3	4GB DDR3
Storage	2TB HDD + 32GB SSD	1TB HDD	1TB HDD	1TB HDD + 120GB SSD	1TB HDD
Screen	27in IPS touchscreen	27in IPS	23.6in TN	21.5in IPS touchscreen	27in TN touchscreen
Screen resolution	2560x1440	2560x1440	1920x1080	1920x1080	1920x1080
Graphics card	nVidia GeForce GT 750M	nVidia GeForce GTX 675MX	Intel HD Graphics 2500	Intel HD Graphics 4000	nVidia GeForce GT 630M
Video memory	2GB	1GB	N/A	N/A	2GB
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	✓	✓	✗	✓	✓
USB	6x USB 3.0	4x USB 3.0	2x USB 3.0, 4x USB 2.0	4x USB 3.0, 2x USB 2.0	2x USB 3.0, 4x USB 2.0
FireWire	✗	✗	✗	✗	✗
Thunderbolt	✓	✓	✗	✗	✗
HDMI	✓	✗	✓	✓	✓
Media card slot	✓	✓	✓	✓	✓
Optical drive	Blu-ray combo drive	None	DVD drive	Blu-ray combo drive	Blu-ray combo drive
Other	2.1Mp webcam, wireless keyboard and mouse, dual digital microphone array	1.3Mp webcam, wireless keyboard and mouse	Wireless keyboard and mouse, CyberLink software, Kaspersky Internet Security	Webcam, Microsoft Wireless Desktop 3000	2Mp webcam, DVB-T TV tuner, wireless keyboard and mouse, CyberLink software
Operating system	Windows 8	Mac OS X 10.9 Mavericks	Windows 8	Windows 8	Windows 8
Power consumption (idle/max)	54/84/220W	53/84/243W	34/42/92W	32/40/119W	44/53/110W
Sniper V2 Elite (Low/High/Ultra)	6/25/94fps	12/54/197fps	5/5/16fps	5/7/28fps	5/6/17fps
PCMark 7 score	6091	4141	3298	5195	3138
Dimensions	492x664x72mm	650x203x516mm	580x196x430-460mm	338x541x61mm	672x483x66mm
Weight	16kg	9.5kg	10.3kg	9kg	13kg
Warranty	1-year next-day in-home	1-year return-to-base	1-year return-to-base	2-year collect-and-return	2-year collect-and-return
FULL REVIEW	TINYURL.COM/KWZ4KLL	TINYURL.COM/A95Q9VY	TINYURL.COM/MEVSJ9D	TINYURL.COM/LQ4U8FW	TINYURL.COM/MUGFKQ7

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Business PCs					
	Aria Gladiator Logic N200-3220M	Chillblast Fusion Opal	Wired2Fire Business Accelerate	Dino PC Synergy 4430	Eclipse Precision A856F85
Price	£509 inc VAT	£549 inc VAT	£689 inc VAT	£569 inc VAT	£519 inc VAT
Website	Aria.co.uk	Chillblast.com	Wired2fire.co.uk	Dinopc.com	Eclipsecomputers.com
Launch date	Aug 13	Aug 13	Aug 13	Aug 13	Aug 13
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	3.3GHz Intel Core i3-3220 (dual-core)	3.2GHz Intel Core i5-4570 (quad-core)	3.4GHz Intel Core i5-4670 (quad-core)	3GHz Intel Core i5-4430 (quad-core)	3.6GHz AMD Trinity A8-5600K (quad-core)
RAM	8GB DDR3	8GB DDR3	8GB DDR3	8GB DDR3	8GB DDR3
Storage	500GB HDD + 80GB SSD	1TB HDD	120GB SSD	1TB HDD	1TB HDD
Motherboard	Gigabyte GA-B75M-D3H	Asus B85M-G	ASRock B85M-HDS	Gigabyte GA-H87M-HD3	Asus F2A85-M LE
CPU cooler	Arctic Cooling Alpine 11 GT Quiet	Standard Intel cooler	Standard Intel cooler	Standard Intel cooler	Standard AMD cooler
Power supply	Corsair 430W	CiT 500W	Xigmatek 400W	CiT 500W	Alpine 600W
Screen	21.5in AOC E2260SWDA	23.6in Iiyama X2377	2x 21.5in AOC E2260SWDA	23in Iiyama XB2380HS-B1	23in AOC i2369Vm
Screen resolution	1920x1080	1920x1080	1920x1080	1920x1080	1920x1080
Graphics	Intel HD Graphics 2500	Intel HD Graphics 4600	Intel HD Graphics 4600	Intel HD Graphics 4600	Integrated
Video memory	N/A	N/A	N/A	N/A	N/A
USB	2x USB 3.0, 4x USB 2.0	3x USB 3.0, 6x USB 2.0	2x USB 3.0, 8x USB 2.0	4x USB 3.0, 4x USB 2.0	4x USB 3.0, 4x USB 2.0
Sound	Onboard	Onboard	Onboard	Onboard	Onboard
Speakers	Not specified	Not specified	Not specified	Not specified	Not specified
Case	Cooler Master N200	CiT Fortress	In-Win Em040	CiT Templar	K2 Gamer
Keyboard	Microsoft Desktop 400 keyboard and mouse (wired)	Cherry J82-16001 keyboard, M-5450 mouse (wired)	Gigabyte K6800 keyboard, M6800 mouse (wired)	Logitech K120 keyboard, B110 mouse (wired)	Microsoft Optical Desktop 800 (wired)
Optical drive	24x DVD±RW	24x DVD±RW	DVD±RW	Samsung DVD±RW	Samsung DVD±RW
Operating system	Windows 7 Home Premium 64-bit	Windows 8 Professional	Windows 7 Professional 64-bit	Windows 7 Home Premium 64-bit	Windows 8 Professional
Bundled software	None	None	None	None	None
PCMark 7 overall score	3524	4257	5667	3458	2349
PCMark 7 Productivity score	4056	2685	5929	2529	1883
PCMark 7 Computational score	3321	21490	13651	9377	3899
Power consumption (idle/max)	27/69W	47/124W	37/135W	37/115W	34/145W
Warranty	1-year return-to-base, phone support	2-year collect-and-return, phone support	2-year return-to-base, phone support	3-year return-to-base, phone support	1-year return-to-base, phone support
FULL REVIEW	TINYURL.COM/OSW55A8	TINYURL.COM/KGGE98T	TINYURL.COM/PCSKWVS	TINYURL.COM/PF8LUXD	TINYURL.COM/MQFWJ3R

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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-oc-iv>

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Family PCs					
	1	2	3	4	5
	Chillblast Fusion Commando	Wired2Fire Diablo Reactor	Mesh Elite 4670-PCA	Dino PC Raging Lizard V2	Arbico Family i3 4185
Price	£799 inc VAT	£668 inc VAT	£799 inc VAT	£780 inc VAT	£675 inc VAT
Website	Chillblast.com	Wired2fire.co.uk	Meshcomputers.com	Dinopc.com	Arbico.co.uk
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	3.4GHz Intel Core i5-4670	3.5GHz Intel Core i5-4690	3.4GHz Intel Core i3-4130
RAM	16GB DDR3	8GB DDR3 1600MHz	16GB DDR3 1600MHz	8GB DDR3 1600MHz	8GB DDR3 1600MHz
Storage	1TB HDD + 120GB SSD	1TB HDD	2TB HDD + 120GB SSD	1TB HDD + 128GB SSD	1TB HDD + 120GB SSD
Motherboard	Asus B85M-G	Asus B85M-G	MSI B85M-E45	Gigabyte H97M-D3H	MSI B85M-E45
CPU cooler	Arctic Cooling Freezer 7 Pro	Standard Intel Cooler	Standard Intel Cooler	Standard Intel Cooler	Arctic Cooling Freezer 7 Pro
Power supply	600W CiT	500W FSP	500W FSP	500W CIT	650W Arctic Red
Screen	23in Iiyama X2377	24in AOC E2495Sh	24in Iiyama E2483HS-B1	24in Iiyama E2483HS-B1	23.6in AOC E2470SWHE
Screen resolution	1920x1080	1920x1080 pixels	1920x1080 pixels	1920x1080 pixels	1920x1080 pixels
Graphics	Zotac nVidia GeForce GTX 650 Ti	AMD Radeon R7 265	nVidia GeForce GTX 750 Ti	nVidia GeForce GTX 750 Ti	MSI AMD Radeon R7 250
Video memory	N/A	2GB	2GB	2GB	2GB
Connectivity	802.11b/g/n, gigabit ethernet	Gigabit ethernet	Gigabit ethernet	Gigabit ethernet, 802.11b/g/n	Gigabit ethernet
USB	3x USB 3.0, 6x USB 2.0	3x USB 3.0, 6x USB 2.0, 2x HDMI, 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	2x USB 3.0, 6x USB 2.0, HDMI, VGA, DVI-D
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	Fractal Design Core 1000 USB3	CIT Templar
Keyboard	Logitech MK260	Octigen Wireless combo	Logitech MK270 (wireless combo)	Gigabyte KM6150 (wired combo)	Logitech MK120
Optical drive	LG BD-ROM/DVD±RW	LiteOn DVD RW	24x DVD RW	None	Samsung DVD RW
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	Ahead Nero, CyberLink PowerDVD
Sniper V2 Elite score (Low/High/Ultra)	147/59/14fps	240/76/18fps	195/68/16fps	196/83/20fps	62/22/5fps
Alien vs Predator score (720p/1080p)	52/27fps	83/44fps	71/37fps	102/53fps	22/11fps
PCMark 7 score	6177	3938	7304	6431	4800
Warranty	2-year collect-and-return	2-year return-to-base	3-years labour (2-year parts, 3-months free C&R)	3-year labour (2-year parts)	2-year return-to-base
FULL REVIEW	TINYURL.COM/KF6G3T7	TINYURL.COM/OA8UKDP	TINYURL.COM/OZCSHYU	TINYURL.COM/PFA55F7	TINYURL.COM/NU7FSGB

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Sub-£150 printers	    				
	1	2	3	4	5
	Samsung Xpress M2070W	Canon Pixma MG5550	Samsung Xpress M2022W	Canon Pixma MX535	Brother MFC-J870DW
Price	£100 inc VAT	£60 inc VAT	£70 inc VAT	£70 inc VAT	£137 inc VAT
Website	Samsung.com/uk	Canon.co.uk	Samsung.com/uk	Canon.co.uk	Brother.co.uk
Launch date	Mar 14	Apr 14	Aug 14	Jul 14	Jul 14
Overall rating	★★★★★	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Technology	Mono laser	Colour inkjet	Mono laser	Colour inkjet	Colour inkjet
Max print resolution	1200x1200	4800x1200dpi	1200x1200dpi	4800x1200dpi	6000x1200dpi
Actual print speed	B=17.1ppm	B=11.8ppm C=8.7ppm	B=18ppm	B=9.7ppm C=3.8ppm	B=18ppm C=11ppm
Scan/fax facilities	1200x1200 scans	1200x2400 scans	None	1200x2400 scans/fax	1200x2400 scans
Supported interfaces	USB 2.0, 802.11b/g/n, NFC	USB 2.0, 802.11b/g/n	USB 2.0, 802.11b/g/n	USB 2.0, 802.11b/g/n, AirPrint	USB 2.0, 802.11b/g/n, NFC
Cost per page	B=3.8p	B=2.4p C=4.8p	B=5p	B=2.7p C=4.8p	B=3.9p C=2.5p
Media card/auto duplex	x x	x ✓	x x	x ✓	✓ ✓
Input capacity	150 sheets	100 sheets	150 sheets	100 sheets + 30-sheet ADF	150 sheets + 20 ADF
Dimensions	406x360x253mm	455x369x148mm	332x215x178mm	458x385x200mm	410x374x180mm
Weight	7.4kg	6.3kg	4kg	8.5kg	9.5kg
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/OYZKJKE	TINYURL.COM/LKWLJDE	TINYURL.COM/NFJHDOR	TINYURL.COM/N9LXVNZ	TINYURL.COM/M52V29R

£151+ printers	    				
	1	2	3	4	5
	Canon i-Sensys MF6180dw	Brother HL-L9200CDWT	HP OfficeJet Pro X551dw	Kyocera Ecosys P6030cdn	Lexmark CS410dn
Price	£260 inc VAT	£550 inc VAT	£360 inc VAT	£546 inc VAT	£195 inc VAT
Website	Canon.co.uk	Brother.co.uk	Hp.com/uk	Kyoceradocumentsolutions.co.uk	Lexmark.co.uk
Launch date	May 14	Aug 14	Aug 13	Jul 14	Jul 14
Overall rating	★★★★★	★★★★★	★★★★★	★★★★☆	★★★★☆
Technology	Mono laser	Colour laser	Colour inkjet	Colour laser	Colour laser
Max print resolution	1200x600dpi	2400x600dpi	2400x2400	9600x600dpi	1200x1200dpi
Actual print speed	B=24ppm	B=30ppm C=30ppm	B=42.9ppm C=15.8ppm	B=27ppm C=27ppm	B=23.1ppm C=13.6ppm
Scan/fax facilities	600dpi scanner, 33.6Kbps fax	None	None	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	USB 2.0, ethernet
Cost per page	B=1.5p	B=1p C=5.9p	B=1p C=4.3p	B=1.2p C=1.7p	B=1.8p C=9.5p
Media card/auto duplex	x ✓	x ✓	x ✓	x ✓	x ✓
Input capacity	250 + 50 sheet + 50 ADF	750 sheets + 50 sheet	500 + 50 sheet	500 sheets + 150 (2150 max)	250 + 1 sheets
Dimensions	390x473x431mm	410x495x445mm	517x399x414mm	345x518x480mm	291x442x407mm
Weight	19.1kg	28.3kg	17.1kg	29.5kg	20.5kg
Warranty	1 year	1 year	1 year	2 years	1 year
FULL REVIEW	TINYURL.COM/LE9WA5N	TINYURL.COM/PT52MH6	TINYURL.COM/CZ05P65	TINYURL.COM/N4MCLYF	TINYURL.COM/MJG33UL

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Blu-ray drives					
	1	2	3 	4	5
	Pioneer BDR-209EBK Retail	Pioneer BDR-209DBK OEM	LG LN48919	LG BP40NS20	Lite-On IHES112-115
Price	£59 inc VAT	£54 inc VAT	£60 inc VAT	£90 inc VAT	£54 inc VAT
Website	Pioneer.eu/uk	Pioneer.eu/uk	Uk.lge.com	Uk.lge.com	Liteonit.eu
Launch date	Nov 13	Nov 13	May 12	Jan 13	Oct 12
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Blu-ray speeds	16x -R, 14x -R DL, 2x -RE, 12x -ROM	16x -R, 14x -R DL, 2x -RE, 12x -ROM	16x -R, 12x -R DL, 12x -RE, 12x -ROM	6x -R, 6x -R DL, 2x -RE, 6x -ROM	12x -ROM
DVD speeds	16x ±R, 8x ±R DL, 6x -RW, 8x +RW, 16x -ROM	16x ±R, 8x ±R DL, 6x -RW, 8x +RW, 16x -ROM	16x ±R, 8x ±R DL, 6x -RW, 8x +RW, 12x -RAM, 16x -ROM	8x ±R, 6x ±R DL, 6x -RW, 8x +RW, 5x -RAM, 8x -ROM	8x ±R, 8x ±R DL, 6x -RW, 8x +RW, 8x -ROM
Max storage	128GB	50GB	50GB	100GB	8.5GB
Interface type	SATA (internal)	SATA (internal)	SATA (internal)	USB 2.0 (external)	SATA (internal)
Label technology	None	None	LightScribe	None	None
Software	ArcSoft TotalMedia Extreme	None	CyberLink Blu-ray Suite	PowerDVD, PowerProducer	None
Dimensions	148x180x42mm	148x180x42mm	146x170x41mm	160x153x22mm	158x145x22mm
Weight	740g	740g	749g	380g	700g
Warranty	1 year	1 year	1 year	1 year	2 years
FULL REVIEW	TINYURL.COM/LD47X7K	TINYURL.COM/LD47X7K	TINYURL.COM/8YTUJEF	TINYURL.COM/BS8UAFF	TINYURL.COM/8SYECMW

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	£170 inc VAT	£110 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	x	x	x	x	x
Manufacturer's rating	1300/450Mb/s	1300/600Mb/s	1300/600Mb/s	1300/450Mb/s	1300/600Mb/s
WPS	x	✓	✓	✓	✓
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/Q2NR8Q	TINYURL.COM/OZ5G7KG	TINYURL.COM/KKJMPCE	TINYURL.COM/K4ZATKV

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NAS drives	1	2	3	4	5
	Synology DS413j	Qnap HS-210	Qnap TS-421	Synology DS1813+	Asustor AS-604T
Price	£260 inc VAT (diskless)	£240 inc VAT (diskless)	£366 inc VAT (diskless)	£760 inc VAT (diskless)	£435 inc VAT (diskless)
Website	Synology.com	Qnap.com	Qnap.com	Synology.com	Asustor.com
Launch date	Oct 13	Oct 14	Mar 14	Jan 14	May 14
Overall rating	★★★★☆	★★★★★	★★★★☆	★★★★☆	★★★★☆
Drive bays	4	2	4	8	4
Processor	1.6GHz Marvell mv6282	1.6GHz Marvell single-core	2GHz Marvell single-core ARM	2.13GHz Intel Atom D2700 dc	2.13GHz Intel Atom
Memory	512MB DDR3	512MB DDR3	1GB DDR3	2GB DDR3	1GB DDR3
Remote access	✓	✓	✓	✓	✓
eSATA	✗	✗	✓	✓	✓
USB port	2x USB 2.0	2x USB 3.0, 2x USB 2.0	2x USB 3.0, 2x USB 2.0	2x USB 3.0, 4x USB 2.0	2x USB 3.0, 4x USB 2.0
Raid options	0/1/5/6/10/JBOD	0/1/JBOD	0/1/5/6/10/JBOD	0/1/5/6/10/JBOD	0/1/5/6/10/JBOD
Software	DSM 4.1	HD Station	Backup Station	DSM 4.3	Asustor utilities, App Central
Dimensions	184x168x230mm	302x220x41mm	177x180x235mm	175x340x233mm	230x170x185mm
Weight	2kg	1.5kg	3kg	5.2kg	3.5kg
Warranty	2 years	2 years	2 years	3 years	2 years
FULL REVIEW	TINYURL.COM/PL8XM8S	TINYURL.COM/OEXRYNY	TINYURL.COM/MCYWUB8	TINYURL.COM/PWO4M6J	TINYURL.COM/NX5Q08M

USB drives	1	2	3	4	5
	G-Technology Professional	WD My Passport Pro 4TB	LaCie Little Big Disk	G-Technology Thunderbolt	Toshiba Stor.E Basics
Price	£250 inc VAT	£350 inc VAT	£760 inc VAT	£599 inc VAT	£80 inc VAT
Website	G-technology.com	Wdc.com/en	Lacie.com/uk	G-technology.com	Toshiba.co.uk
Launch date	Sep 13	Aug 14	Feb 14	Aug 12	Nov 13
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★★	★★★★☆
Capacity tested	4TB	4- to 8TB	1TB	8TB	2TB
Capacity range	2TB to 4TB	2- to 4TB	512GB to 2TB	4TB to 8TB	320GB to 2TB
Disk size	3.5in	2.5in	2.5in	3.5in	2.5in
Spin speed	7200rpm	7200rpm	5400rpm	7200rpm	5400rpm
Transfer speed	N/A	230MB/s	635MB/s	329MB/s	94MB/s (USB 3.0)
Encryption	None	None	None	None	None
Other interfaces	FireWire 800	None	None	None	None
Software	None	None	LaCie Backup Assistant	None	None
Dimensions	235x130x46mm	88x143x44mm	40x140x85mm	235x130x85mm	119x79x21mm
Weight	1.35kg	700g	650g	2.3kg	215g
Warranty	3 years	3 years	1 year	3 years	1 year
FULL REVIEW	TINYURL.COM/NV7F32F	TINYURL.COM/QAQGEUG	TINYURL.COM//KRCL3VZ	TINYURL.COM/CXEF6MH	TINYURL.COM/LBHC8EL

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SSDs					
	1	2	3	4	5
	Crucial M550	OCZ Vector 150	Crucial M500	Samsung 840 EVO	Seagate 600 SSD
Price	£334 inc VAT	£131 inc VAT	£169 inc VAT	£320 inc VAT	£202 inc VAT
Website	Crucial.com/uk	Ocz.com	Crucial.com/uk	Samsung.com/uk	Seagate.com/gb
Launch date	May 14	May 14	Aug 13	Nov 13	May 14
Overall rating	★★★★★	★★★★☆	★★★★★	★★★★★	★★★★☆
Capacity tested	1TB	240GB	480GB	750GB	480GB
Price per GB	33p	55p	35p	43p	43p
Memory cache	1GB LP DDR2	512MB	512MB DDR3	1GB LPDDR2	N/A
Controller	Marvell 88SS9189	Indilinx Barefoot 3 M00	Marvell 88SS9187	Samsung MEX (3-core ARM)	Link A Media Device
Encryption	AES 256-bit	AES 256-bit	AES 256-bit	AES 256-bit	None
Flash	Micron 20nm MLC NAND	Toshiba 19nm MLC	Micron 20nm MLC NAND	Samsung 19nm Toggle NAND	Toshiba 19nm MLC
Firmware updated via	Bootable CD	OCZ Toolbox, bootable	ISO boot disc	SSD Magician for Windows	Seagate Firmware, bootable
ATTO peak sequential	R: 563MB/s; W: 514MB/s	R: 557MB/s; W: 534MB/s	R: 539MB/s; W: 433MB/s	R: 554MB/s; W: 537MB/s	R: 555MB/s; W: 474MB/s
CDM peak IOPS	100 / 91.7	92.9 / 94.7	89.8k (read)	104K (read)	96.8 / 88.6
CDM 4kB rnd	30/99	25/97	N/A	N/A	28/78
Warranty	3 years	5 years or 91TB writes	3 years	5 years	3 years
FULL REVIEW	TINYURL.COM/MSWD98Z	TINYURL.COM/KBED2W6	TINYURL.COM/M2NCSMJ	TINYURL.COM/L5EDQOY	TINYURL.COM/N58RB8G

Projectors					
	1	2	3	4	5
	BenQ W1300	Optoma W316	InFocus IN126STa	NEC M352WS	Optoma ML1500
Price	£767 inc VAT	£463 inc VAT	£540 inc VAT	£778 inc VAT	£650 inc VAT
Website	Benq.co.uk	Optoma.co.uk	Infocus.com	Nec-display-solutions.com	Optoma.co.uk
Launch date	Jun 14	Jul 14	Sep 14	Jul 14	Jul 14
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Projection technology	DLP	DLP	DLP	DLP	DLP
Resolution (pixels)	1920x1080	1280x800	1280x800	1280x800	1280x800
Brightness, Contrast	2000, 10,000:1	3400, 15,000:1	3300, 15,000:1	3500, 10,000:1	1500, 15000:1
Image size	300in	300in	300in	150in	100in
Supported aspect ratios	16:9 native	16:10, 16:9, 4:3	16:10, 16:9, 4:3	16:10	16:10, 16:9, 4:3
Noise levels (dB)	33 (30 eco)	29db	32db (30 eco)	33 (39 bright mode)	30db
Connections	VGA, 2x HDMI, USB, 3D	VGA, HDMI, Mini-USB, 3D	2x VGA, HDMI, USB, ethernet	2x VGA, 2x HDMI, USB	HDMI, 2x USB-A, SD
Lamp/lamp life	240W/6000 hrs	190W/10000 hrs	278W/3500 hrs	278W/8000 hrs	LED/20,000 hrs
Dimensions	330x257x128mm	315x223x102mm	292x220x108mm	368x268x97mm	270x170x48mm
Weight	3.4kg	2.5kg	3.7kg	3.6kg	1.4kg
Warranty	3 years	2 years	1 year	3 years	2 years
FULL REVIEW	TINYURL.COM/K4FA89Q	TINYURL.COM/OCWTHGW	TINYURL.COM/NHH3QPB	TINYURL.COM/Q6J2N6W	TINYURL.COM/QBFRYR7

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Sub-£150 graphics cards	1	2	3	4	5
	MSI Radeon R9 270	MSI R7 260X OC	Sapphire Radeon R7 265	Gigabyte GTX 750 Ti WindForce	XFX Radeon R7 240
Price	£123 inc VAT	£87 inc VAT	£110 inc VAT	£115 inc VAT	£45 inc VAT
Website	Uk.msi.com	Uk.msi.com	Sapphiretech.com	Uk.gigabyte.com	Xfxforce.com
Launch date	Jul 14	May 14	Sep 14	Aug 14	Jul 14
Overall rating	★★★★★	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Graphics processor	AMD Radeon R9 270	AMD Radeon R7 260X	AMD Radeon R7 265	nVidia GeForce GTX 750 Ti	AMD Radeon R7 240
Installed RAM	2GB GDDR5	2GB GDDR5	2GB GDDR5	2GB GDDR5	2GB GDDR3
Memory interface	256-bit	128-bit	256-bit	128-bit	128bit
Core clock/Boost	900MHz/975MHz	1175MHz/none	900MHz/925MHz	1033MHz/1111MHz	750MHz/780MHz
Memory clock/Effective	1.4GHz/5.6GHz	1625MHz/6.5GHz	1.4GHz/5.6GHz	1.35GHz/5.4GHz	400MHz/1.6GHz
Stream processors	1280	896	Varies	640	320
Texture units	80	56	64	40	20
Power connectors	1x 6-pin	1x 6-pin	1x 6-pin	N/A	N/A
DirectX	11.2	11.1	11	11.2	11.2
Digital interface	2x DVI, HDMI, DP	2x DVI, HDMI, MiniDisplayPort	2x DVI, 1x HDMI, 1x DP	2x DVI, 2x HDMI	1x DVI, 1x HDMI
Warranty	3 years	3 years	2 years	3 years	2 years
FULL REVIEW	TINYURL.COM/MCE7353	TINYURL.COM/OZ6WUYT	TINYURL.COM/LV69BEM	TINYURL.COM/Q7K4ESV	TINYURL.COM/LPYCHJB

£151+ graphics cards	1	2	3	4	5
	Gigabyte GeForce GTX 770 2GB	Sapphire Radeon R9 280X	XFX Radeon R9 290X	MSI Radeon R9 270X	MSI Radeon R9 295 X2
Price	£200 inc VAT	£226 inc VAT	£300 inc VAT	£150 inc VAT	£700 inc VAT
Website	Uk.gigabyte.com	Sapphiretech.com	Xfxforce.com	Uk.msi.com	Uk.msi.com
Launch date	Aug 13	Mar 14	Apr 14	Dec 13	May 14
Overall rating	★★★★★	★★★★★	★★★★★	★★★★☆	★★★★★
Graphics processor	nVidia GeForce GTX 770	AMD Radeon R9 280X	AMD Radeon R9 290X	AMD Radeon R9 270X	AMD Radeon R9 295 X2
Installed RAM	2GB GDDR5	3GB GDDR5	4GB GDDR5	2GB GDDR5	8GB GDDR5
Memory interface	256-bit	384-bit	512-bit	256-bit	2x 512-bit
Core clock/boost	950MHz/1020MHz	950MHz/1070MHz	1GHz/1GHz	1030MHz/1120MHz	1018MHz/N/A
Memory clock/Effective	1.5GHz/6GHz	1.55GHz/6.2GHz	1.25GHz/5GHz	1.4GHz/5.6GHz	1.25GHz/5GHz
Stream processors	1536	2048	2816	1280	2x 2816
Texture units	128	128	176	80	2x 176
Power connectors	1x 6-pin, 1x 8-pin	2x 8-pin	8-pin, 6-pin	2x 6-pin	2x 8-pin
DirectX	11	11	11	11	11
Digital interface	2x DVI, HDMI, DisplayPort	DVI, HDMI, 2x Mini-DisplayPort	2x DVI, HDMI, DisplayPort	2x DVI, HDMI, DisplayPort	DVI, 4x Mini-DP
Warranty	3 years	2 years	3 years	2 years	3 years
FULL REVIEW	TINYURL.COM/OAG6277	TINYURL.COM/OWVAP37	TINYURL.COM/NPET8ER	TINYURL.COM/OYA2DFJ	TINYURL.COM/POTAOGZ

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Sub-£200 flat-panel displays					
	1 	2 	3	4	5
	AOC i2369V	Philips 234E5QHAW	NEC MultiSync E243Wmi	BenQ EW2740L	BenQ GL2450
Price	£130 inc VAT	£130 inc VAT	£185 inc VAT	£178 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 pixels	1920x1080 pixels	1920x1080 pixels	1920x1080 pixels	1920x1080 pixels
Pixel density	96ppi	96ppi	93ppi	82ppi	92ppi
Brightness	220cd/m ²	187cd/m ²	250cd/m ²	300cd/m ²	261cd/m ²
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	TINYURL.COM/OOEFYPR	TINYURL.COM/KLYLW4V	TINYURL.COM/KNCGVOU	TINYURL.COM/OO6EC5L	TINYURL.COM/OOUPFUE

£201+ flat-panel displays					
	1	2	3	4	5
	AOC Q2963P	LG 34UM95	Dell UltraSharp 32 Ultra	BenQ PG2401PT	ViewSonic VP2772
Price	£287 inc VAT	£851 inc VAT	£1,478 inc VAT	£855 inc VAT	£550 inc VAT
Website	Aoc-europe.com/en	Lg.com/uk	Dell.co.uk	Benq.co.uk	Viewsoniceurope.com/uk
Launch date	Mar 14	Dec 14	Jun 14	Oct 14	Jun 14
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Screen size	29in	34in 21:9	31.5in	24.1in	27in
Panel type	AH-IPS	IPS matt	IGZO	IPS	AH-IPS
Native resolution	2560x1080 (96ppi)	3440x1440	3840x2160 pixels	1920x1200 pixels	2560x1440 pixels
Pixel density	96ppi	110ppi	140ppi	94ppi	109ppi
Brightness	240cd/m ²	320cd/m ²	350cd/m ²	317cd/m ²	350cd/m ²
Static contrast ratio	530:1	1000:1	550:1	540:1	560:1
Response time	5ms	5ms	8ms	5ms	6ms
Ports	HDMI, DVI, DP, VGA	HDMI, DP, Thunderbolt, USB 3.0	HDMI, DP, Mini-DP, 4x USB 3.0	DVI, DP, HDMI, VGA, 3x USB 3.0	HDMI, DVI, Mini-DP, 4x USB 3.0
Dimensions	714x214x388mm	830x83x380mm	750x214x483-572mm	543x254x555mm	643x348x470mm
Weight	6.9kg	6.7kg	9.2kg	7kg	8.5kg
Warranty	3 years	2 years	3 years	1 year	3 years
FULL REVIEW	TINYURL.COM/NXDAGMK	TINYURL.COM/QYKH6UM	TINYURL.COM/O4CTO3S	TINYURL.COM/PMV5L5V	TINYURL.COM/LLQRWTX

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Takeaway tech

You know a market is commodified when (a) supermarkets start selling own-brand items and (b) prices drop to next to nothing. As it was in the smartphone and tablets market, so it is in the wonderful world of wearables. Yes, no-one knows how popular smartwatches and -glasses are set to be, but wristband activity trackers abound and the consumer tech industry is determined that we will all be wearing our computers soon enough.

And the commoditisation is already taken care of. Because just as the super cheap Tesco Hudl told us that tablets had become an everyday purchase, so now we see the Aldi Activity Tracker. It's a wristband from the budget supermarket that tracks your exercise and it costs just £29. Wearables are now impulse purchases to be made when getting the weekly shop, it seems.

This is interesting on several fronts. For one thing it suggests that we are all paying a premium for activity trackers. Indeed, I recently had to replace my Jawbone Up24 (pictured) after it stopped working, and I was pleasantly surprised at how amenable was Jawbone to replacing it no questions asked. Pleasantly surprised, that is, until it occurred to me that the device I purchased for £125 was so easily replaceable for the manufacturer. It probably costs pence to make and ship.

And if Aldi is knocking out activity-tracking wristbands for £29, it won't be long until they are available for free.

What your wristband says about you

This is not least because - like Tesco with the Hudl tablet - the benefits to manufacturers of wristbands reach beyond the profit they make from selling them. The Hudl is basically an extension of the Club Card, giving Tesco an insight into the viewing and surfing habits of customers about

whom they already know a lot. I would posit that Jawbone's long-term profitability is based more on the massive amounts of user data it generates than on its ability to sell wristbands.

Which is why a recent survey from PriceWaterhouseCoopers makes for interesting reading. One of the survey questions asked the 1,000 respondents how excited they'd be about wearables from various brands. While Apple unsurprisingly came out on top, the bottom of the list is much more interesting.

Apparently, 18 percent of respondents said they were somewhat or very interested in wearable technology from McDonald's. The survey also found that 27 percent of respondents were interested in a Starbucks wearable, and 26 percent were interested in wearable tech from Coca-Cola. This has been widely mocked, in so far as it has been reported at all. But the bean counters are on to something here.

Imagine the benefits to McDonalds or Starbucks of giving away activity tracker wristbands with meals. It would be great PR: earn more unhealthy food and drink by exercising more. The fast-food vendor as fitness trainer. And it would be an incredible way of generating data about customers, and enticing them back into the store. Perhaps a Starbucks or McDonalds wristband would buzz when a certain amount of steps was achieved, and then use GPS to point customers to the nearest 'restaurant' in order to consume the treat they'd earned.

Trust me, it will happen. Free and cheap gadgets as a mean of generating loyalty and user data is already an accepted business model. And the more personal the device the better the data. So free wearables from your favourite brands is the next step on from loyalty cards. Coming soon to a fast-food joint near you. ☒

“ It would be great PR: earn more unhealthy food and drink by exercising more. The fast-food vendor as fitness trainer. And it would be an incredible way of generating data about customers ”





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