Military EMBEDDED SYSTEMS

September 2014
Volume 10 | Number 6
MIL-EMBEDDED.COM

SPECIAL REPORT: NEXT-GEN SHIPBOARD ELECTRONICS

P 30

2014 RESOURCE GUIDE

P 52

P 26

Military market one of opportunity for embedded COTS suppliers
Q&A with Eric Sivertson, Executive Vice President of ATD Business Unit, Kontron

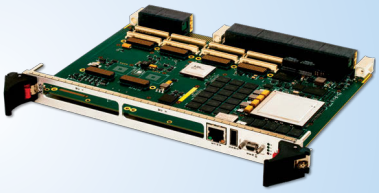
U.S. military market outlook

P 10

Module and System-Level Solutions from X-ES

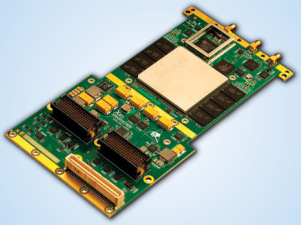
Intel® and Freescale™ Single Board Computers

XPedite7570
4th Gen Intel® Core™ i7-based 3U VPX SBC with XMC/PMC



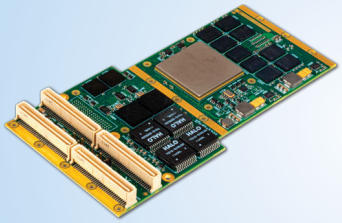
XCalibur1840
Freescale QorIQ T4240-based 6U VPX SBC with dual XMC/PMC

High-Performance FPGA and I/O Modules



XPedite2400
Xilinx Virtex-7 FPGA-based XMC with high-throughput DAC

Secure Ethernet Switches and IP Routers



XPedite5205
Secure Gigabit Ethernet router XMC utilizing Cisco™ IOS®

XChange3018
3U VPX 10 Gigabit Ethernet managed switch and router

High-Capacity Power Supplies

XPm2220
3U VPX 300W power supply with EMI filtering for MIL-STD-704 & 1275

Rugged, SWaP-Optimized, COTS-Based Systems

XPand4200
Sub-½ ATR, 6x 3U VPX slot system with removable SSDs

XPand6200
SFF 2x 3U VPX system with removable SSD and integrated power supply

XPand6000
SFF Intel® Core™ i7 or Freescale QorIQ-based system with XMC/PMC

X-ES

Extreme Engineering Solutions
608.833.1155 www.xes-inc.com

Designed, manufactured, and supported in the USA

Annapolis Micro Systems

The FPGA Systems Performance Leader

WILDSTAR OpenVPX Ecosystem

FPGA Processing Boards
1 to 3
Altera Stratix V or
Xilinx Virtex 6 or 7
FPGAs per Slot

Input/Output Modules Include:
Quad 130 MSps thru Quad 550 MSps A/D
1.5 GSps thru 5.0 GSps A/D
Quad 600 MSps D/A
Dual 1.5 GSps thru 4.0 GSps D/A

1 to 40 Gbit Ethernet
SDR to FDR Infiniband

Open VPX Storage
Up to 8 TBytes Per Slot
4 - 8 GBytes Per Second

GEOINT, Ground Stations, SDR, Radar, Sigint, COMINT, ELINT, DSP, Network Analysis, Encryption, Image Processing, Pattern Matching, Oil & Gas Exploration, Financial and Genomic Algorithms,

Open VPX Switch
1 to 40 Gbit Ethernet
SDR to FDR Infiniband

Chassis
4, 6 or 12 Slot
Up to 14G

Annapolis Micro Systems

High Performance Signal and Data Processing in Scalable COTS FPGA Computing Fabric

190 Admiral Cochrane Drive, Suite 130, Annapolis, Maryland USA 21401
wfinfo@annapmicro.com USA (410) 841-2514 www.annapmicro.com

www.mil-embedded.com

Military EMBEDDED SYSTEMS

ON THE COVER:

Top photo: The U.S. Navy's Littoral Combat Ship Freedom variant leverages open architectures in its shipboard electronics. Photo courtesy of Lockheed Martin.

Bottom photo: The F-35 Joint Strike Fighter program will continue to produce aircraft despite a flat military market. This photo of an F-35A Lightning II completed the first in-flight missile launch of an AIM-120 on June 5, 2013, over the Point Mugu Sea test range in California. Photo courtesy of U.S. Air Force.

September 2014 | Volume 10 | Number 6

COLUMNS

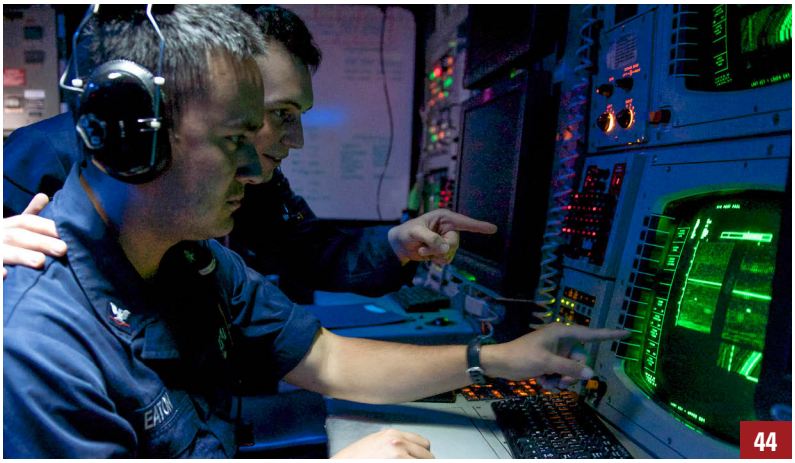
DEPARTMENTS

RESOURCE GUIDE

BONUS INTERVIEW

SPECIAL REPORT | Shipboard electronics

MIL TECH TRENDS | Rugged computing trends for the warfighter



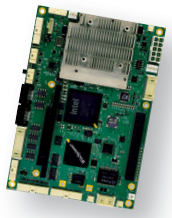
INDUSTRY SPOTLIGHT | Managing obsolescence

Published by: OpenSystems media®

ISSN: Print 1557-3222

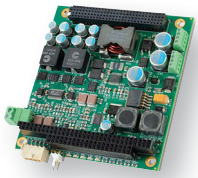
@military_cots

www.linkedin.com/groups/Military-Embedded-Systems-1864255



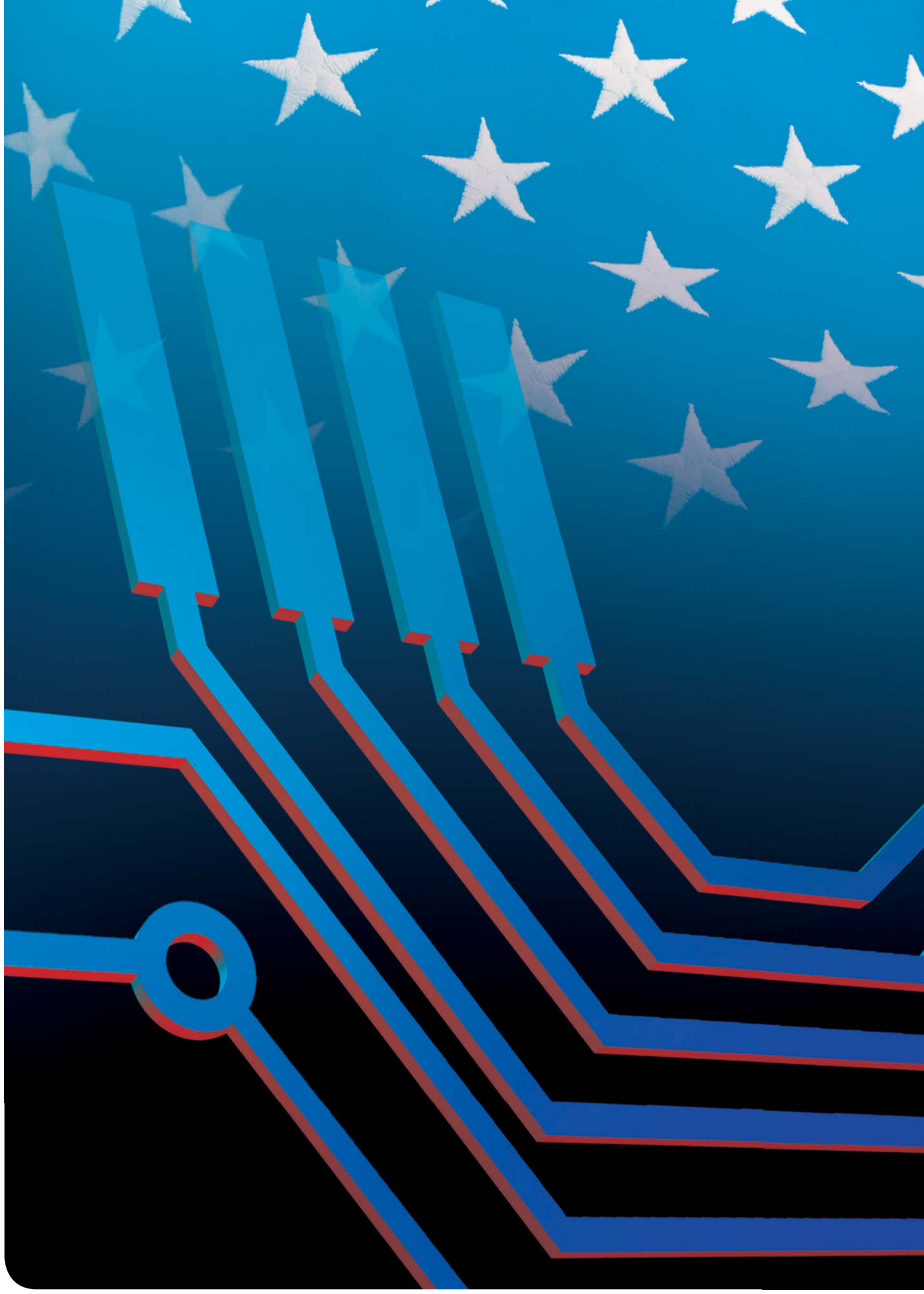
EPIC Single Board Computers
Rugged, Small Form Factor
Fanless -40° to +85°C Operation

Small Form Factor Computers
Intel® Atom™ E3800 and i.MX6 CPUs
Fanless -40° to +85°C Operation



Industrial DC/DC Power Solutions
Renewable Energy, UPS, and PoE
Fanless -40° to +85°C Operation

Single Board Computers
COM Express Solutions
Power Supplies
I/O Modules
Panel PCs



Freedom From Support Delays and Long Lead-times

When your project is on the line, you can't afford to waste time and money on poor technical support or out-of-stock products. Call WinSystems and you'll speak directly with an Applications Engineer in our Arlington, Texas facility. Engineers are ready to guide you through product selection, customization, troubleshooting, and the manufacturing life cycle. Our robust inventory allows most products to ship in 1-2 business days so development can start quickly.

Let us put over three decades of embedded computer experience, integrity, and service to work for you.

715 Stadium Drive | Arlington, Texas 76011
Phone: 817-274-7553 | Fax: 817-548-1358
info@winsystems.com

Call 817-274-7553 or visit www.winsystems.com.
Ask about our product evaluation!

WinSystems®
An Employee-Owned Company

ADVERTISER INFORMATION

Page	Advertiser/Ad Title
24	**ACCES I/O Products, Inc.** – USB embedded I/O solutions – Rugged, industrial strength USB
19	**Acromag** – The complete package
3	**Annapolis Micro Systems, Inc.** – WILDSTAR OpenVPX ecosystem
13	**Astronics** – Freedom 2 choose
7	**Ballard Technology** – Portable avionics databus interfaces
51	**beneq** – Keeping displays performing, regardless of the conditions
43	**Crane Aerospace & Electronics** – Get the best – FAST!
18	**Creative Electronic Systems** – Safety-critical solutions from CES
37	**D-TA Systems** – Ultra-wideband spectral survey and long-duration data recording
29	**Data Device Corporation** – Your solution provider for connectivity, power, control
46	**Elma Electronic** – Elma's J-Series platforms – Performance computing of EPIC proportions
17	**Excalibur Systems, Inc.** – Dragon – it's not a myth
119	**GE Intelligent Platforms, Inc.** – Delivering on your promises takes more than the latest technology
9	**HARTING** – We have your solution. DIN 41 612 connectors
117	**IBI Systems, Inc.** – Full line of rugged systems
117	**IMS Engineering Products** – We weren't the first to engineer an easy-to-assemble, snap together system...We simply did it better
11	**Interface Concept** – Intel Core i7, VPX FPGA boards
43	**Kimdu Corporation** – Protocol converters
96	**Kontron** – Executive speakout: Kontron's strategy to excel in the market
35	**LCR Embedded Systems** – Rugged systems engineered for your application
23	**Omnetics Connector Corp.** – High density connectors
33	**Orbit Power Group and Orbit Electronics Group** – Building the world's most powerful VME-VPX resource
25	**Parvus Corporation** – Qualified to perform
120	**Pentek, Inc.** – Got tough software radio design challenges? Unleash the new Virtex-7 Onyx boards!
42	**Phoenix International** – Rugged deployable RAID data storage
14	**Proto Labs** – Building bright ideas
50	**SynQor** – VPX military DC-DC power supplies
15	**Technologic Systems** – Superior embedded solutions
47	**WDL Systems** – The power inside tomorrow's technology
5	**WinSystems, Inc.** – Freedom from support delays and long lead-times
2	**X-ES** – Module and system-level solutions from X-ES

Military EMBEDDED SYSTEMS

OpenSystems media

MES Editorial/Production Staff

John McHale, Group Editorial Director
jmchale@opensystemsmedia.com
Lisa Daigle, Assistant Managing Editor
ldaigle@opensystemsmedia.com
Amanda Harvey, Assistant Editor
aharvey@opensystemsmedia.com
Sally Cole, Senior Editor
scole@opensystemsmedia.com
Steph Sweet, Creative Director
ssweet@opensystemsmedia.com
Konrad Witte, Senior Web Developer
kwitte@opensystemsmedia.com

Sales Group

Tom Varcie, Sales Manager
tvarcie@opensystemsmedia.com
(586) 415-6500
Rebecca Barker, Strategic Account Manager
rbarker@opensystemsmedia.com
(281) 724-8021
Eric Henry, Strategic Account Manager
ehenry@opensystemsmedia.com
(541) 760-5361
Kathleen Wackowski
Strategic Account Manager
kwackowski@opensystemsmedia.com
(978) 888-7367

Asia-Pacific Sales
Elvi Lee, Account Manager
elvi@aceforum.com.tw

Regional Sales Managers
Barbara Quinlan, Southwest
bquinlan@opensystemsmedia.com
(480) 236-8818
Denis Seger, Southern California
dseger@opensystemsmedia.com
(760) 518-5222
Sydele Starr, Northern California
sstarr@opensystemsmedia.com
(775) 299-4148

Europe Sales
James Rhoades-Brown
james.rhoadesbrown@husonmedia.com

Reprints and PDFs

republish@opensystemsmedia.com

OpenSystems Media Editorial/Creative Staff

Embedded Computing Design | Military Embedded Systems | DSP-FPGA.com | Industrial Embedded Systems | PC/104 and small form factors | PICMG Systems & Technology | VITA Technologies

John McHale, Group Editorial Director
Military Embedded Systems
PC/104 and Small Form Factors
PICMG Systems & Technology
VITA Technologies
Lisa Daigle, Assistant Managing Editor
Military Embedded Systems
PC/104 and Small Form Factors
Amanda Harvey, Assistant Editor
Military Embedded Systems
VITA Technologies
Sally Cole, Senior Editor
Military Embedded Systems
Jerry Gipper, Editorial Director
VITA Technologies
jgipper@opensystemsmedia.com
Curt Schwaderer, Editorial Director
Embedded Computing Design
cschwaderer@opensystemsmedia.com
Christine Long, DIY Brand Manager
clong@opensystemsmedia.com
Joy Gilmore, Assistant Webcast Manager
jgilmore@opensystemsmedia.com
Joe Pavlat, Editorial Director
PICMG Systems & Technology
jpavlat@opensystemsmedia.com
Rich Nass, Embedded Computing Brand Director
Embedded Computing Design
rnass@opensystemsmedia.com
Monique DeVoe, Managing Editor
Embedded Computing Design, DSP-FPGA.com
mdevoe@opensystemsmedia.com
Brandon Lewis, Assistant Managing Editor
PICMG Systems & Technology
Embedded Computing Design
Industrial Embedded Systems
blewis@opensystemsmedia.com
Rory Dear, Technical Contributor
Embedded Computing Design
rdear@opensystemsmedia.com
Konrad Witte, Senior Web Developer
Steph Sweet, Creative Director
David Diomede, Creative Services Director
Joann Toth, Senior Designer
Jake Rojas, Graphic Designer

Corporate — opensystemsmedia.com

Patrick Hopper, Publisher
phopper@opensystemsmedia.com
Rosemary Kristoff, President
rkristoff@opensystemsmedia.com
John McHale, Executive Vice President
jmchale@opensystemsmedia.com
Rich Nass, Executive Vice President
jmchale@opensystemsmedia.com
Christine Long, Vice President Online Business
clong@opensystemsmedia.com
Wayne Kristoff, CTO
Emily Verhoeks, Financial Assistant
Headquarters – ARIZONA:
16626 E. Avenue of the Fountains, Ste. 201
Fountain Hills, AZ 85268
Tel: (480) 967-5581
MICHIGAN:
30233 Jefferson
St. Clair Shores, MI 48082
Tel: (586) 415-6500

Subscriptions — opensystemsmedia.com/subscriptions

subscriptions@opensystemsmedia.com

The industry's most trusted and widely used USB interfaces

Portable Avionics Databus Interfaces

A reliable USB interface from Astronics Ballard Technology does it all – databus test, analysis and simulation. Use it in the lab or in the field – it's fully powered by a single USB port. Simply connect it to any available laptop, desktop or tablet PC and it's ready to go. Add our CoPilot® interactive software for a complete easy-to-use solution.

NEW models with multiple protocols mean the best is now even better!

Visit our website or call 425-339-0281 to learn more.

www.ballardtech.com/USB

- MIL-STD-1553, EBR 1553
- ARINC 429, 708, 717
- Serial, Discrete

Get the best solution – all the protocols and channels you need in a single device

Ballard TECHNOLOGY

AS9100/ISO 9001 Registered

ASTRONICS CORPORATION

Defense electronics and 3D printing

By John McHale, Editorial Director

Additive manufacturing, better known as 3D printing, has made its way into the military embedded computing realm as suppliers are using the technology to speed up their production and reduce development costs. They can save thousands of dollars by printing heat sinks, connectors, components, and even printed circuit boards. 3D printing can save tremendous amounts of time, but the defense industry is not known for being quick to change. The Department of Defense (DoD) is notorious for kicking tires on new technology for years before deploying it in mission-critical applications – and only after rigorous testing. However, with 3D printing they seem to be doing more than kicking the tires.

"Everybody is looking at it," says Wayne Plucker, Industry Manager at Frost & Sullivan in San Antonio, Texas. "The Air Force is looking at it as a way to cost-effectively maintain parts for legacy aircraft fleets. The Navy is doing a lot of 3D printing, or additive manufacturing, largely in metal sorts of things such as replacing classic metal brackets. For example, if they need an unusual complex shape or something like that they will use a 3D printer to create a part, which only requires minimal machining."

Commercial off-the-shelf (COTS) embedded computing companies are already creating boards via 3D printing. "In the defense industry 3D vendors – like us – printing our own PWB [printed wire board] to prototype will save thousands of dollars per board type per project and potentially putting financial pressure on many of the smaller prototype PWB manufacturers," says Doug Patterson, Vice President of Military and Aerospace Business at Aitech in Chatsworth, Calif. This is only one of the disruptive elements to the industry.

"We have [a 3D printer] and it's been a true enabler for us," says Eric Sivertson, Executive Vice President, ATD Business Unit, Kontron in Poway, Calif. "However, the technology has not gotten to a point where a sellable 3D printed product could be developed with it for the defense segment. We do use 3D printing in the COTS development process to save cost and get to market faster. 3D printing will happen faster on the commercial side since it doesn't have the same rigorous specifications to drive through and it has significant time to market pressures."

"Embedded computing companies are printing boards and connectors, but what will stop the end user from printing out their own boards and chips and cutting out the middle man?"

What about those rigorous specifications? 3D printing is wonderful, but how do you guarantee military specifications if 3D-printed parts are created on a ship at sea or in a P-8A aircraft and don't go through the same steps as other military components are required to do?

It depends on the application and the risk of the mission, Patterson says. "As unmanned robotic ships take a more active role in everyday life, the need for many of the parts standards are not needed since a human life is not in jeopardy – especially in space when a failed robotic ship just drifts away or burns up the in atmosphere, hurting no one. In manned systems, the maker of the replacement part takes on the responsibility (and public shame) if the failure leads to them."

"For certification of parts it is really about the process," Plucker says. "What they've done is certify the processes and certify people at a company who validate the process. If the process is followed the part will be conformal. In the military that is reasonably easy to do. To their credit all the military services are doing a reasonably good job of figuring how they can validate a 3D part as a conformal part. This is pretty much the opposite of the FAA, who is being dragged kicking and screaming into 3D printing. At the FAA there is an abundance of concern about safety being adversely affected by any new type of manufacturing process."

Embedded computing companies are printing boards and connectors, but what will stop the end user – whether it is the military or the auto industry – from printing out their own boards and chips and cutting out the middle man?

"I doubt it will happen, unless complex processing, FPGA, and memory electronic components can be 3D printed in commercially-viable production with nanometer line widths too," Patterson says. "Then there's the legal IP right issues that would need to be worked out of who owns what rights to manufacture proprietary replacement parts, etc."

Despite some of the procedural hurdles, the DoD and the defense industry are embracing 3D printing, although at a slower pace than commercial markets. The defense market was "built around procedures and testing for mass production," Sivertson says. "A product produced through the 3D printing process does not meet any set of standards. Each part produced is unique and not always considered an exact copy such as a mass produced part with guaranteed consistency throughout. It will require a DoD program or two to come in and develop a few standards to say 3D parts built this way are sufficient to military requirements and standards."

HARTING®

Pushing Performance

We have your solution
DIN 41 612 connectors

Time-tested and still evolving

- With 40 years of development, HARTING's market leading connectors offer solutions for today.
- Reduced size with one third length versions, mixed contact types with hybrid connectors.
- Rugged shell housings address the most demanding applications.
- Specially loaded variants deliver solutions customized to your need.

www.HARTING-usa.com

People | Power | Partnership

U.S. military market is a sustainment market

By John McHale, Editorial Director

U.S. Department of Defense (DoD) budget cuts and sequestration combined with a shrinking U.S. military footprint abroad have created an uncertain marketplace, leaving many to wonder where the business opportunities will be. However, market analysts and distributors of electronic components don't see it so much as a shrinking market, but rather one that is evolving and shifting toward sustainment.

The P-8A Poseidon is one of the U.S. military's most successful new aircraft platforms. In this photo U.S. Navy Lt. Clayton Hunt and Lt. j.g. Nicholas Horton pilot a P-8A Poseidon at sea during a mission to assist in the search for Malaysia Airlines Flight 370. U.S. Navy photo by Petty Officer 2nd Class Eric A. Pastor.

"Overall spending is down because there is a smaller force and fewer platforms, but there are pockets of growth in signal processing for data exploitation and dissemination, helping analysts utilize all the data they are collecting from full motion video, etc.," says Brad Curran, Industry Analyst at Frost & Sullivan (www.frost.com).

"Demand for electronics in the military is relevant to budget activity," says Bryan Brady, Vice President/Director of Vertical Markets at Avnet (www.avnet.com). "We've assessed the President's FY 2015 budget request and our bottom line conclusion is that dollar for dollar electronic component demand is increasing, while funding for personnel and infrastructure is decreasing. There are fewer new programs and existing programs are stretched out longer. However, those existing programs have design activity for sustainment purposes and upgrades to their electronics. We still see robust activity in this area. We also see design cycles shortening and more effort in our defense customer base to leverage products already designed in the marketplace."

Sustainment and modifications are typically green lights to suppliers of commercial off-the-shelf (COTS) hardware and software as most upgrades want to leverage open architectures and open standards.

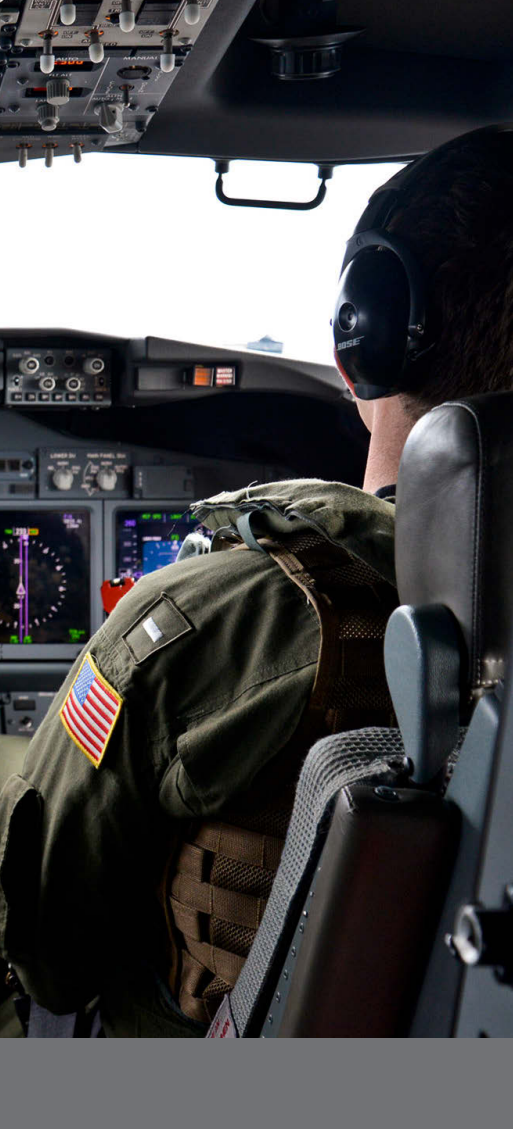
This "is absolutely an opportunity for COTS suppliers," Curran says. "Proprietary is not what the government wants anymore. They want mature commercial stuff with open standards that can be easily integrated and refreshed when new stuff comes along. They also want price competition."

To get that price they are letting more contracts. "Instead of giving a huge contract to one or two companies the military is dividing contracts among 20 or 25 companies with more of them IDIQ so there isn't a single point of failure," Curran says. "This forces companies to perform better, forces more competition so the government gets the best price and service. The government is definitely spreading out the wealth."

"How hard a company is hit by the budget cuts depended on which program they are involved with," Brady says. "One quote I remember summed up this situation best: 'When boots withdraw, the eyes will remain.' In other words, funding for intelligence, surveillance, and reconnaissance [ISR] technology should be steady even as the U.S. military draws back its global footprint."

Radar and electronic warfare

Nothing is more important to keeping an eye on potential adversaries than radar and electronic warfare technology. "Radar is still hot because airborne surveillance and reconnaissance for manned and unmanned aircraft is still really important for military missions as



well as for border security and counter narcotics applications," Curran says. "Current events are also driving this need as China and Russia become more belligerent through Cold War-type confrontations. Improved missile defense is crucial for the U.S. and its allies such Saudi Arabia, United Arab Emirates, South Korea, and Japan.

"The other thing driving radar is the push for smaller form factor designs for fighters and UASs [unmanned aerial systems]," Curran notes. "To get radars on UASs there is still a lot of work to do to extend the range, improve accuracy, and lower power consumption. Everything in radar points to opportunities for embedded suppliers, but they still have to solve traditional problems, such as removing heat and cooling these high-performance signal processing systems."

For radar/lidar there were 79 awards in 2013 totaling $4 billion with Raytheon leading the way, Curran says. "So far in this calendar year there have been 41 awards totaling $2 billion. This year is skewed with Lockheed Martin winning the $914 million Space Fence contract in June. The big money for radar is still in missile defense, which is proliferating. Secondly, funding for F-35 radar and upgrades to radars for other fighter jets – that cannot afford the F-35 radar – will be steady." Total electronic warfare contracts in 2013 hit 64 at about $2.5 billion led by Northrop Grumman, who was very closely followed by Raytheon, he adds.

Radio and networking technology

COTS and open standards are also driving factors in military communications and networking applications. "The DoD is looking to leverage the use of commercial technology such as cloud computing, social media, and commercial mobile devices," Curran says. "Companies that have those products will see a bump.

"The Army and Marine Corps are also shrinking, with only three quarters of the number of troops they had last year, which means the gear needs to be multi-functional," he continues. "Commercial networking and communications technology is making that happen with the increased smartphone demonstrations for the warfighter and things like tactical app stores based on the iPhone model. They need devices that can do multiple things."

For networking technology there were 246 awards in 2013 totaling about $17.6 billion for enterprise and tactical applications, Curran says. "General Dynamics was the leading provider. Tactical networks totaled 96 contracts for $20.8 billion in 2013. Harris was the leading company in tactical and enterprise applications. Harris is the leader in radio technology as well thanks to their whole family of Falcon radios. I'd say Harris has a lot of momentum going right now. For airborne radio applications Rockwell Collins is the leader while ViaSat is the front-runner for data link technology," Curran adds.

Unmanned aircraft

The unmanned aircraft market has also become one of sustainment. "The build out of big programs of record in military unmanned aircraft has slowed," says

Ron Stearns, Research Director at G2 Solutions (www.g2globalsolutions.com). "Major DoD programs of record are nearing the end of their production runs such as the Air Force RQ-4 variants and the MQ-9. The MQ-1C will likely see the end of its run in 2015. This has been expected as the industry is becoming one geared toward sustainment and upgrades. DoD opportunities are now flowing back to the traditional primes and away from smaller niche UAS suppliers. It is a gradual shift to traditional acquisition and away from joint urgent operational needs [JUONS], services, and quick reaction capability [QRC]. So if you look at the DoD UAS market strictly with regard to program-of-record procurement and RDT&E, then yes it's falling. However, if you look at it from an Operations & Maintenance [O&M], services, non-programs-of-record, and special access programs perspective it looks pretty steady."

From a procurement and RDT&E standpoint the military unmanned systems market is stable at $2.5-3 billion a year through 2019, Stearn continues. "The FY 2015 budget request had fallen slightly but that did not show the O&M dollars, which would likely add about another billion on to that. Then you could add in services contracts – like Boeing Insitu has with their aircraft contracts – which is at least a couple hundred million dollars a year.

"So if I add up all program of record spending for RDT&E within FY 2015 it comes to about $17.8 billion," he says. "Funding for new platforms such as the Unmanned Carrier-Launched Surveillance and Strike [UCLASS] is programmed, although changes in system requirements could shift progress to the right. The big question mark is the uncertainty as to whether the Long Range Strike program's Next Generation Bomber will have an unmanned or optionally-manned component. If that decision is made in favor of unmanned capability it would add about $12 billion to the total spending through 2019, some of which would be directly attributable to UAS platforms. This is the type of large defense program that really moves the needle for the defense electronics industry."

UCLASS will be another big needle mover for the U.S. military UAS fleet. "UCLASS is currently the largest new-build DoD UAS competition," Stearn says. "Northrop Grumman, The Boeing Company, Lockheed Martin, and General Atomics-ASI are competing for it and is worth about $2.9 billion (2012-2019) as an acquisition piece with RDT&E funding included. Consistent messaging as of late indicates a Navy desire for UCLASS to perform surveillance first and strike second. It is perhaps the most visible of programs in a competition phase. It was originally scheduled to reach an initial-operational capability [IOC] by 2020, but it is now looking more like 2022. If the concept of operations proceeds as envisioned UCLASS could add unprecedented situational awareness capability to the carrier battle group."

UAS commercial market opportunities

UAS defense suppliers are also keeping an eye on the burgeoning commercial market for unmanned aircraft. "The FAA's notice of proposed rule making on unmanned aircraft is still on target to be posted or handed down late calendar or third quarter of this year," Stearn says. That will start an 18-month clock of revisions and comments and "by 2016 or 2017 we should see commercial access for small UAVs in specific airspace and controller-radius paradigms become a reality, catering first and foremost to forestry, agriculture, oil & gas, and electrical infrastructure, where I believe there is demand for this technology.

"Companies who will have the biggest head start in this market will be defense avionics and electronics suppliers who have been there and done that with this technology," he continues. "However, it is a very different operating space for them, akin to a purely commercial electronics company trying to sell in the military procurement realm. I see the commercial unmanned systems market being a more speculative venture for defense suppliers as they will have to use internal R&D dollars to create solutions that match commercial form factors. There is also no guarantee like what they'd get with a DoD program of record. There is no Office of Naval Research or Special Operations Command to incubate commercially configured sensors or electronics. Looking from the outside I can understand the difficulty business managers would have selling this opportunity up the food chain in their organizations. It would require taking some risk that could hurt them if the reward does not materialize during an anticipated timeframe."

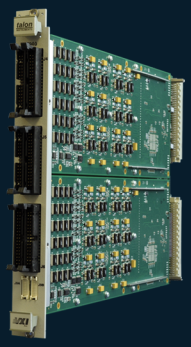
"[Unmanned technology] has enormous marketplace potential and we think that the traditional defense companies will take advantage of this," Avnet's Brady says. "Some unmanned aircraft military applications such as persistent stare will be applicable to commercial uses for combating forest fires and search and rescue operations. However, the cost of these will have to be reduced before this transition becomes commonplace."

Manned aircraft and avionics

Sustainment means fewer new manned aircraft programs, but also means potential opportunities for avionics upgrades to aging aircraft platforms being forced to extend their operational life. "The overall U.S. military aircraft market and subsequently the avionics market is a bit flat," says Wayne Plucker, Industry Manager at Frost & Sullivan. "The DoD is finishing a number of new aircraft builds and there is not a lot in the pipeline. [Despite the] sparse marketplace there will always be opportunities with modifications and we will see a continuing series of modifications and upgrades for the next several years. As the number of new aircraft programs dwindle, current fleets will still need to be sustained through avionics and other mission-related upgrades." For avionics box and avionics solution providers it will be steady business, he says. "I think the solution providers that will thrive here are Rockwell Collins and Honeywell with Thales as a distant third – depending on where the aircraft is flying. The real growth in the avionics world will be with new boxes and integrating new mission hardware, in other words making sensors better and making weapons control better.

"We are seeing more of a push toward procuring COTS equipment for modifications and new designs," Plucker continues. "Integrators want things that have already been engineered and are

ASTRONICS
TEST SYSTEMS



Freedom™ *2* Choose

Our collaborative approach to integration takes advantage of today's advanced technology and software to produce a test system that is customized for your specific mission.

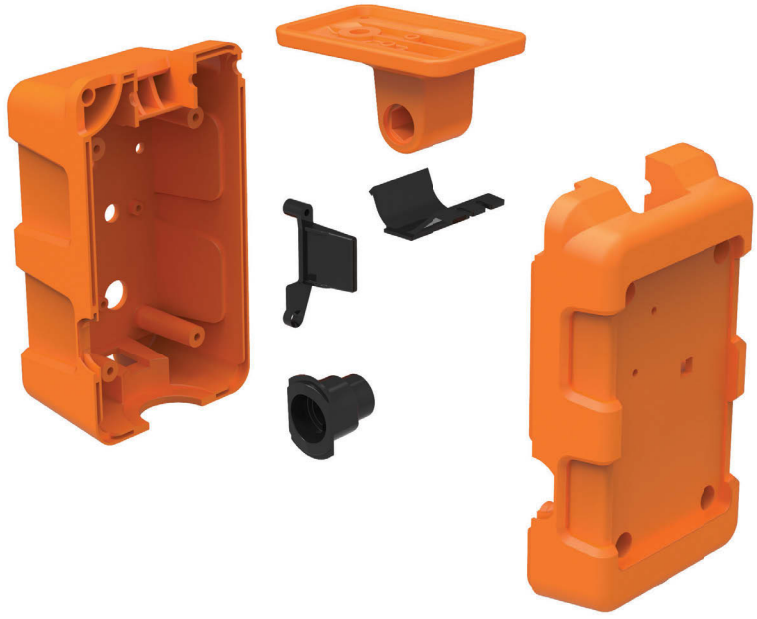
Astronics Test Systems, Your Integrator of Choice When Failure Is Not An Option

Instruments | Systems | Software | Support

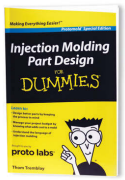
www.AstronicsTestSystems.com

Building Bright Ideas

At Proto Labs, we accelerate innovation by turning brilliant concepts into real parts in days.



Proto Labs serves as a catalyst for product designers and engineers when high-quality prototype parts are needed fast. Just upload a 3D CAD model for an interactive quote within hours. When ready, our molding, machining and additive services can produce 1 to 10,000+ plastic, metal and liquid silicone rubber parts in as quick as a day. That means you can fail fast, iterate faster (and more often), and confidently launch your product to market before competitors.



Injection Molding Part Design for Dummies
Request your free book at
go.protolabs.com/MY4B

Major Credit Cards Accepted | ISO 9001:2008 Certified | ITAR Registered

proto labs®
Real Parts. Really Fast.™

proven, that they can procure quickly. They also want open architecture products that can interface into an old architecture. I don't see a strong demand for new flight management software and new basic flight hardware, but there is a need to thoroughly integrate mission stuff and continuing upgrades of mission technology that includes items such as data links, red force/blue force tracking, and other things connected to mission profiles."

The F-35 and P-8A

"Two big ticket fixed wing aircraft programs – the F-35 Joint Strike Fighter (JSF) and the P-8A Poseidon – are still on track for more aircraft production. The P-8A [a replacement for the P-3 Maritime and Patrol aircraft] is coming along ok," Plucker says. "I had expected some issues, but it seemed to perform well during the search for the missing Malaysian Airlines flight, staying on station for long periods to conduct high-level searches. The program looks like it is on track to hit its production number of 34 aircraft.

"In terms of production, the F-35 has dropped from its projected number of 120 down to about 80 aircraft between now and 2018," Plucker adds. "Lockheed Martin is hoping for higher numbers, but that is where I think the U.S. is headed with the F-35."

"The jury is still out with respect to the F-35. I like to think we've been good at understanding the aircraft's role in future engagement and that those costs will turn out to have been good investments," says Michel Merluzeau, Managing Partner of G2 Global Solutions. "To precisely forecast what U.S. military and NATO will face in the future is the refection of recent wars against enemies with limited capabilities. They feel it's a poor return on investment based on the adversaries faced in recent Middle East wars. The F-35 was not created for those battles. Regarding F-35 development challenges, it was a complicated process trying to get an aircraft to do things that have never been done before. We will not be able to get a full verdict on the F-35 until it performs in combat."

Vetronics

"The vetronics [vehicle electronics] market is worse than flat," Frost's Plucker says. "I see it having -3.5 CAGR over five years, which is flat to less than flat. Part of the problem is the same with avionics: there are no new platforms coming around. Production has essentially shut down with the last of the Strykers being built. There will be modifications and integration of mission systems hardware, etc. to existing vehicles, especially with vehicles returning from Middle East conflicts. When we bring back the junk from Afghanistan we will have to do some rethinking because a lot of those vehicles do not have a path forward. We will need to improve the architectures and remove the Band-Aid boxes that have been applied to many of them while they were in the field – to make them more of a system and less patchwork. I don't see this happening within the next five years. I don't think we have the taste for it or the planning for it. We still haven't figured out what kind of war we want to fight next." **MES**

FPGA or GPU? – The evolution continues

By Charlotte Adams

A GE Intelligent Platforms perspective on embedded military electronics trends

Designers of high performance embedded computing (HPEC) systems for the military and aerospace market have some options when choosing the primary processor for signal- and image-processing applications. Designers can cast field programmable gate arrays (FPGAs) or graphics processing units (GPUs) in the starring role.

In the past the military was wedded to FPGAs mostly because there was no middle ground between FPGAs and cost-prohibitive application-specific integrated circuits (ASICs). Program managers thought nothing of building a complete electronic warfare (EW) system with FPGAs.

Two developments, however, are changing this picture: First, GPUs have emerged that are nearing parity with FPGAs in both performance and power consumption. Second, the military itself has changed, with budgetary necessity driving officials to demand size, weight, and power (SWaP) tradeoffs. As a result, GPUs are becoming more popular and may eventually overshadow FPGAs, as the latter alternative takes on a more subordinate role.

FPGAs vs. GPUs

FPGAs have certain advantages. To begin with, these chips are hardware implementations of algorithms, and hardware is always faster than software. FPGAs are also more deterministic; their latencies are still an order of magnitude less than that of GPUs – hundreds of nanoseconds vs. single-digit microseconds. (GPU users compensate by accommodating the worst-possible timing case in their particular applications.)

GPUs historically have been power hogs, which is problematic in battery-dependent scenarios, but the latest GPU products have reduced that liability. NVIDIA's Tegra K1 GPU/CPU board, for example, burns less than 10 W. GE Intelligent Platforms, taking notice of this improvement, has announced an agreement with NVIDIA to add Tegra K1-based products to its stable of GPU offerings (see Figure 1).

Unlike FPGAs, GPUs run software, and executing an algorithm in software takes time. Instructions have to be fetched and cued up, math operations have to be performed, and results have to be sent to memory. GPUs also have their own advantages. On the hardware side, GPUs' massively parallel construction enables them to run a software algorithm much faster than a conventional processor could. GPUs also run their software very close to the hardware, enhancing speed and controllability.

Unlike FPGAs, GPUs excel in floating-point operations. GPU cores are native hardware floating-point processors. A 384-core GPU can run 384 floating-point math operations every clock cycle. This capacity makes GPUs a natural fit for floating-point-intensive signal- and image-processing applications.

In fact, many newer signal-processing algorithms are aimed at GPUs. Moreover, GPUs are designed with very fast memory, and new direct memory access (DMA) techniques allow high-volume sensor data to be streamed to the GPU without consuming GPU clock cycles.

GPUs also offer good backward compatibility. If an algorithm changes, the new software can run on older chips. FPGAs are more problematic on this count: It's no small matter to upgrade the algorithm on an FPGA or to move an algorithm to a newer FPGA. GPUs, furthermore, are supported with a wide array of open development tools and free math function libraries.

GPUs are increasingly found in radar processing, for example, where flexibility is valuable. Radar has numerous

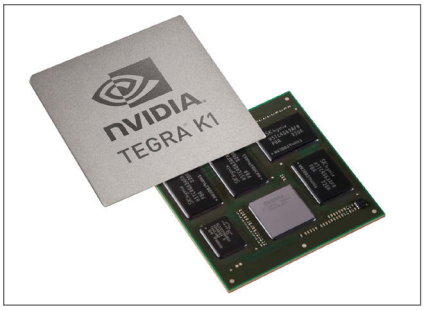


Figure 1 | GE Intelligent Platforms is NVIDIA's preferred provider of products based on the new Tegra K1 to serve users in the military/aerospace market.

modes, some of which pilots want to run simultaneously. GPUs are right for this application, as they can run multiple processing pipelines at the same time. While FPGA manufacturers offer the ability to synthesize a small number of algorithm "images" on the same chip, the algorithms can't be run simultaneously. It takes a second or so – an eternity in EW – to switch between them.

Is collaboration the key?

The long-term trend in embedded military-signal and image-processing applications seems to be the adoption of the GPU as the primary processing engine, with the FPGA in a supporting role as the data pipe between the antenna and the GPU. Central processing units (CPUs) would play a management role, interpreting the results of the GPU and sending the "answer" to the user.

Such a combined system would play to the strengths of each type of processor while maximizing system efficiency. The FPGA would forward incoming sensor data at high speeds, while the GPU would handle the heavy algorithmic work. Then the CPU would step in to winnow out false positives from the GPU's output. Since the FPGA would have fewer responsibilities, it could be smaller and less difficult to design and therefore cheaper and faster to field.

defense.ge-ip.com

DRAGON

it's not a myth.

- Rugged PC/104 enclosure
- Data acquisition
- Monitoring • Recording
- MIL-STD-1553/1760
- AS5652 (MMSI) • H009
- ARINC-429/575 • ARINC-708
- CANBus • A/D • D/A
- Serial • Discrete
- User configurable
- COTS • Expandable
- Extreme environments
- Accepts third party cards

EXCALIBUR SYSTEMS

www.mil-1553.com

CAMELOT MACC LANC

Leveraging COTS to lower the cost, risk of safety-certifiable avionics hardware

By Gregory Sikkens
An industry perspective from Curtiss-Wright Defense Solutions

In today's cost-constrained, competitive environment, aircraft system designers are increasingly pushing down new requirements to integrators, encouraging them to invest in hardware development. Today, the FAA demands that electronics suppliers for commercial aviation, and increasingly for military aircraft, certify their system solutions to strict safety certification standards. New approaches for the design and verification of commercial off-the-shelf (COTS) modules can reduce the cost of safety-certifiable aircraft electronics.

For airborne applications, such as those aboard rotor-wing platforms or intended for unmanned aerial vehicle (UAV) ground stations, system designers are increasingly confronted with requirements for DO-178 (for software) and DO-254 (for hardware), the FAA's key safety certification standards. The DO-254/DO-178 certification process requires the costly and time-consuming creation of detailed sets of "data artifacts" to prove that the proper design and production processes have been followed.

Typically, electronics designed to meet the safety-certification requirements have been custom designs. In many cases, however, COTS modules can significantly reduce a system developer's schedule, budget, and program risk. COTS benefits can also include significant technology upgrades and mitigation of obsolescence challenges. There is demand for rugged COTS modules that specifically target the needs of commercial and military aviation platforms. These safety-certifiable COTS modules will come complete with data artifact packages required for DO-254-level certifiability, including plans, requirements, design, integration, test, verification, and validation of the specific modules.

By providing select standard modules with comprehensive packages of design-certification process artifacts and certification evidence, COTS hardware vendors can ensure that their products are safety-certifiable and can be successfully used in a system that must achieve DO-178/DO-254 certification. This approach can help system designers to begin their application development sooner and much more cost-effectively.

"In many cases COTS modules can significantly reduce a system developer's schedule, budget, and program risk. "

About safety-certification standards

Pre-existing data artifact packages help reduce costs and development time by eliminating the complex and demanding documentation process that a user must otherwise undertake in order to provide proof of design assurance during the module's design life cycle. On the software side, the DO-178B standard establishes guidelines for avionics software and defines software life-cycle management, criticality-level details, and software-component testing to ensure a high level of software reliability. In many applications, the data artifacts to support DO-178B/C will be available from the hardware vendor, while others may be supplied by a third-party software vendor.

For the module itself, an important determinant for the system designer will be which DO-254 Design Assurance Level (DAL) the hardware will need to meet. DO-254 defines five different DAL levels – A, B, C, D, and E – each related to the severity of effects resulting from potential failure. It's estimated that over half of all avionics systems fit into the DO-254 DAL C/D/E categories. In the event of failure, hardware that meets DAL "E," the lowest level, will have no effect on the aircraft's operational capability or pilot workload. DAL "D" is for hardware that would cause only a minor failure condition for the aircraft. In the middle, failure of hardware intended for DAL "C" usage would result in a major failure condition for the aircraft, and typically involve serious injuries. As the levels go higher, and the potential consequences of system failure increase, the amount and complexity of the data artifacts required for certification also increases. A DAL "B" hardware failure is defined as one that could cause a hazardous/severe-major failure condition for the aircraft, and could involve some loss of life. The highest and most intensive level of the DO-254 standard, DAL "A," is for hardware whose failure would result in a catastrophic failure condition for the aircraft and would likely result in total loss of life for all aboard.

As an example of the new approach for designing and verifying COTS modules, Curtiss-Wright has recently launched an initiative to design standard COTS subsystem modules with safety certification in mind – such as single-board computers and graphics modules – for use in military and commercial aerospace applications. Starting with the new VPX3-150 3U VPX SBC and VPX3-718 3U VPX graphic cards, Curtiss-Wright's approach resulted in DO-254 DAL C and DO-178C DAL C certifiable products with design artifact packages developed from the ground up, rather than reverse-engineered afterward.

Gregory Sikkens
Product Marketing Manager, Graphics, ARM SBC, and Safety Certifiable
Curtiss-Wright Defense Solutions
www.cwcdefense.com

DEFENSE TECH WIRE

NEWS | TRENDS | DOD SPENDS | CONTRACTS | TECHNOLOGY UPDATES

By Amanda Harvey, Assistant Editor

NEWS

NATO AWACS fleet to get avionics facelift

Boeing won a contract from NATO worth about $250 million to integrate digital avionics and flight decks on 13 of the alliance's Airborne Warning and Control System (AWACS) aircraft, which are based on the Boeing 707 commercial airplane. The upgrades will allow compliance with current and future air traffic control and navigation requirements, enabling the aircraft to have broader access to airspace worldwide. The upgrade will also enable cost savings in personnel because the flight deck crew will be reduced from four to three. It also solves the challenge of finding out-of-production avionics for the AWACS fleet by using readily available commercial off-the-shelf (COTS) digital avionics. The modifications will begin in 2016 with a completion date of 2018.

Figure 1 | Boeing has been awarded a $250 million contract to upgrade the digital flight deck (pictured) on NATO's fleet of AWACS aircraft. Photo courtesy of Boeing.

Raytheon developing laser weapon technology for Marine Corps ground vehicles

Raytheon won an $11 million contract to develop a laser weapon for use on Marine Corps ground vehicles to defeat low-flying threats such as enemy unmanned aircraft. The work will be done under the Ground Based Air Defense (GBAD) Directed Energy On-the-Move Future Naval Capabilities program – an Office of the Naval Research program. The program calls for a field demonstration of a Humvee-mounted short-range laser weapon system that has a minimum power output of 25 kW and that meets the Marine Corps' size, weight, and power (SWaP) requirements. Raytheon engineers will leverage the company's planar waveguide (PWG) technology to enable high-energy lasers. Using a single PWG, the size and shape of a 12-inch ruler, the lasers generate sufficient power to effectively engage small aircraft.

General Dynamics Electric Boat's North Dakota attack submarine completes maiden voyage

The 11th Virginia-class advanced nuclear-powered attack submarine, the North Dakota, returned to the General Dynamics Electric Boat shipyard after successfully completing its first voyage in open seas. The alpha sea trials included various propulsion-plant and submarine operations, such as submerging for the first time and high-speed runs on and below the surface to demonstrate that the North Dakota's propulsion plant is fully mission-capable.

Virginia-class submarines are capable of speeds in excess of 25 knots and can dive to a depth greater than 800 feet, while carrying Mark 48 advanced capability torpedoes and Tomahawk land-attack missiles. Electric Boat and Newport News Shipbuilding have delivered 10 Virginia-class submarines to the U.S. Navy, and are currently constructing eight others.

Orion spacecraft recovery tested by joint industry government team

Lockheed Martin, NASA, and U.S. Navy personnel participated in a simulated ocean recovery of an Orion spacecraft test article to practice recovery techniques for retrieving the crew module after it splashes down following its first test flight in December 2014. During the test, Navy dive teams retrieved and positioned the Orion test article on the USS Anchorage via a Lockheed Martin-built recovery cradle, recovery winch, and sea anchor. The data gathered during this phase of testing will help enable a safe and efficient recovery of the crew module and collection of flight test data after splashdown. The uncrewed test flight will give engineers data about systems critical to crew safety to validate designs of the spacecraft before it starts carrying humans to new destinations in deep space.

Figure 2 | Navy dive teams retrieved the Orion spacecraft test article during a recent simulated ocean recovery. Photo courtesy of NASA.

Navy, Northrop Grumman demonstrate integrated manned and unmanned flight operations at sea

Northrop Grumman engineers and U.S. Navy personnel conducted a demonstration of manned, unmanned aircraft teaming during a series of cooperative flights from the aircraft carrier USS Theodore Roosevelt (CVN 71), using an X-47B Unmanned Combat Air System (UCAS) and an F/A-18 Hornet. This demonstration marked the first time manned and unmanned carrier aircraft have operated together in the same carrier controlled landing pattern. It took place in the Eastern Atlantic and collected data that will help reduce risks associated with integrating unmanned aircraft with conventional manned carrier operations.

During the flights, the X-47B flew in the landing pattern with the F/A-18 Hornet at approach speeds of as fast as 120 miles per hour, at a pattern altitude of as high as 1,200 feet.

Figure 3 | The X-47B Unmanned Combat Air System, operating alongside an F/A-18 Hornet, demonstrated two successful launch and recovery sequences from the USS Theodore Roosevelt. Photo courtesy of Northrop Grumman.

Arleigh Burke-class destroyers to get upgraded bridge, navigation systems

Northrop Grumman won contracts from the U.S. Navy, General Dynamics Bath Iron Works, and Huntington Ingalls Industries to deliver integrated bridge and navigation systems and steering gear systems to upgrade Arleigh Burke-class guided missile destroyers (DDGs). The systems to be installed include navigation software, radar systems, ship control software, network interface boxes, chart servers, flat panel displays, global positioning systems (GPS), and ship control display systems. The contracts also cover engineering services. Deliveries will start in 2015 with a planned completed date of 2021.

Logos Technologies chosen to develop gunfire, explosion recognition system for U.S. Army

The U.S. Army Research Library (ARL) has awarded Logos Technologies a $9.7 million contract to further develop and deploy the Optical Gunfire, Rockets and Explosive Flash Detection (OGRE) system that will locate explosive detonations and hostile gunfire. The OGRE system uses high-speed cameras to capture the signature of a detonation or a fired weapon and provide source coordinates to troops on the ground.

OGRE is paired with an existing acoustic sensor; the combined unit – called Serenity – works in combination with full-motion video and wide-area surveillance sensors to locate and identify the locations of hostile fire. The Serenity system will be integrated with Logos Technologies' aerostat-based Kestrel sensor system, enabling operators to not only see attacks as they happen, but also access DVR-like forensic playback when necessary. Serenity will detect flash events such as rocket and mortar launches and explosive detonations, making it uniquely suited to protect forward-deployed bases.

Curtiss-Wright's enhanced rugged LCD touchscreens for airborne surveillance platforms launched at ALEA

Curtiss-Wright Corporation announced at the Airborne Law Enforcement Association (ALEA) show an enhanced and improved family of rugged touchscreen LCD displays designed for use onboard airborne surveillance platforms. The AVDU3000 is a 12.1" LCD display and the larger AVDU3600 is a 14.1" LCD display. Both displays feature control and video handling capabilities designed for airborne law enforcement applications such as patrol, surveillance, and search and rescue. These user-configurable touchscreen displays enable flight crewmembers to control the aircraft's video recorders and switches without having to divert their eyes from the screen.

Figure 4 | The AVDU3000 (12.1") and AVDU3600 (14.1") LCD displays are designed for use in patrol, surveillance, and search and rescue operations. Photo courtesy of Curtiss-Wright.

Is open delaying the future of cognitive computing?

By Dr. Ian Dunn, Mercury Systems

Open systems have the intended and unintended consequence of delaying innovation in computing. While industry players agree to standardize and build complex systems that eventually become useful products, this process can be lengthier than a single organization working alone. On the other hand, open systems drive the economic reality behind Moore's Law; without the economic reality of open systems, it is probable that Moore's Law would not be very valuable. Open systems are what unleash it.

By roughly 2040, assuming Moore's Law continues unabated, the ability to purchase the capacity of a human brain for about $1,000 will be a reality. That's an astounding concept. Will it shed tears? Will it be happy? The 2013 movie "Her" was essentially based on this precept. As is typically the case, science fiction may be predicting the not-too-distant future. Because of this movie, it is more than likely that there are kids somewhere thinking about the future in these terms. The reality is that we don't have very far to go; 2040 is not all that far off. There has been an enormous amount of innovation since Moore's Law was introduced in 1965, in what is really an extremely short period of time in the context of human and technological development.

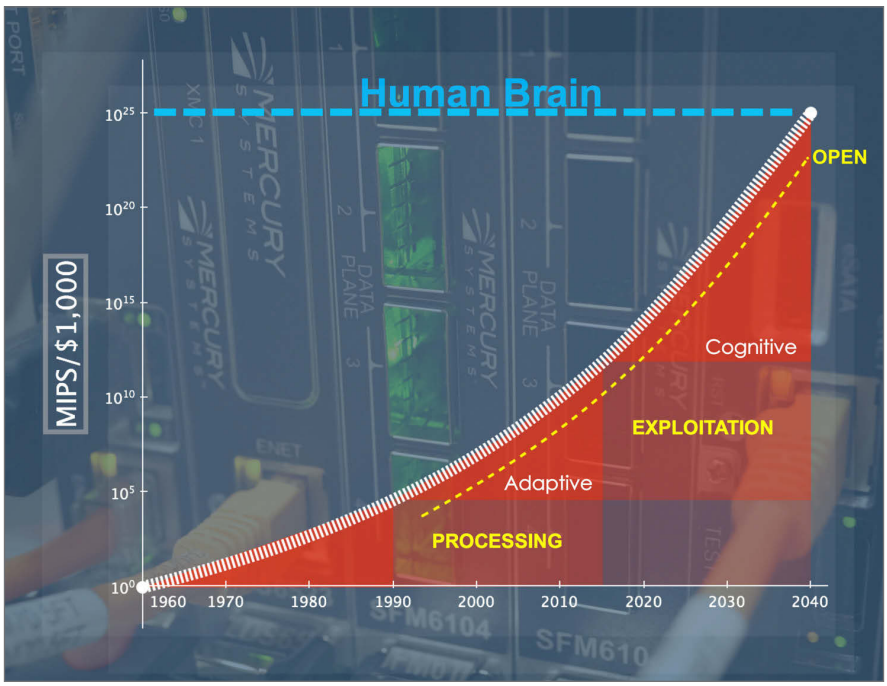


Figure 1 | The demonstrable evolution of Moore's Law can be divided into three distinct stages of computing: processing, exploitation, and open. The shaded areas of the diagram represent the point at which these three stages have an economic value.

In my opinion, the demonstrable evolution of Moore's Law can be divided into three distinct stages of computing – processing, exploitation, and open – as shown in Figure 1. The shaded areas in the diagram represent the commoditization of those stages, the point where they have economic value.

Early in the first stage, there was no economic value because processing was very advanced and was completed primarily in the world's laboratories. By about 1990, however, with the advent of desktop computing, basic processing was commoditized and thereby spawned a wide range of applications like email, spreadsheets, Gantt charts, and other tools. We are now seeing the commoditization of the second stage – exploitation. Exploitation, in this case, means individuals and companies that research, collect, evaluate, and analyze information and sell it to governments and businesses. This information, commonly known as Big Data, is used for a wide range of applications from fraud prevention and medical research to political canvassing and marketing. One very public example of this type of exploitation is the leak of classified documents by Edward Snowden in 2013.

The advances in processing and exploitation have led to two distinct phases of application development – adaptive and cognitive. The commoditization of processing in the embedded and non-embedded markets resulted in wide-range adaptive systems, which can adjust in real-time to changing parameters. A representative example is traffic lights: Historically, traffic lights operated on fixed timers programmed by officials who used traffic pattern studies to determine optimal timing. As traffic patterns shifted over time, however, bottlenecks sprang up. In an adaptive system, a computer tracks traffic in real-time and determines the timing of the lights to keep traffic moving optimally. Other adaptive systems could include doors that open when someone comes near them or robots that adapt to changes in their environment. What we are going to see next, where exploitation and cognitive application development meet, is the commoditization of cognitive systems. An early example

"There has been an enormous amount of innovation since Moore's Law was introduced in 1965, in what is an extremely short period of time in the context of human and technological development. "

of this was IBM's "Watson" question-answering computing system that competed on the quiz show "Jeopardy."

The interesting thing about open systems, the third stage of computing, is that in the last 20 years in the embedded market, open systems has always lagged behind the frontier of innovation by as much as five years or more. Watson competed with the other game show participants in 2011 and won. Will it take five or 10 years before the same thing is done with an Android phone with an open architecture? Five years is a realistic time frame, given what is known about the way open systems are created.

Again: Open is slower when it comes to innovation. From an economic perspective, what would happen to this curve if open didn't exist? Would the curve flatten, be nonexistent, or have an entirely different price characteristic than is what is represented?

In order to fully capitalize on open systems, the embedded industry must focus on two areas. The first is the difference between market expansion, and time and control of the solution. We know that when any company opts to embrace open systems, it is pioneering it, participating in its development, or using it. Regardless of how a company is involved, the company relinquishes control over the time and cost of the return on the investment in the open architecture. In theory, the corporation benefits from market expansion and performance efficiencies.

As a community, our industry must do a better job of organizing to manage this tradeoff. This is particularly important to cognitive computing, which not only is the next frontier of complexity for our industry, but also is essential for much of what our industry hopes to accomplish. So what is considered essential? It is not the ability to predict consumers' shopping habits and trends. Rather, it is helping to find a cure for cancer, Alzheimer's, and other diseases. It is improving the human factor in war to minimize casualties. These are examples of the essential capabilities that cognitive systems may provide in the future.

There has been some improvement in time management. Unlike in the past, today we are driving standards development rather than just allowing a standard to unfold as an engineering activity. However, in order to deliver essential capabilities in a reasonable timeframe, our industry must focus on speed of adoption and devise a better way of managing the existing tradeoff.

Every day there are groundbreaking technologies – as predicted by Moore's Law – that create tremendous innovation. Unfortunately, there are not enough adopters. Again, we experience the dichotomy between open systems and speed of adoption of the power predicted by Moore's Law. There is a real concern that the current lag time in innovation associated with open systems may expand. Our nation's security industry provides a real example of this possibility. The F-35 Joint Strike Fighter, for example, requires complex open systems, which are increasingly difficult to assemble and in many cases, cost more money.

The second area of focus is open innovation. While "open innovation" is a widely used and diluted term, there is a narrower interpretation that makes sense. Open innovation is not really about innovation; instead, it is about access to talent a company on its own may not otherwise be able to afford to employ directly. In essence, any professional in our industry is qualified to work for any company, yet the economics of the industry don't make that possibility practical or affordable. Vertical integration of this sort simply can't exist from a financial perspective.

The only viable alternative to vertical integration and collaboration among the best and brightest minds of the industry lies in standards communities like VITA and others. The challenge, unfortunately, is that the industry has devolved to the point of having one or two proprietary pioneers, as seen in the case of the Watson computer. Years after the introduction of a technology, an open community may be established to focus on and solve a particular problem related to these proprietary technologies. This time lag, and the threat of a potential open system with the demonstration of a proprietary system, makes innovating difficult at best.

What is needed is innovation in the way the industry manages supply chains and collaboration. The standards community must take the lead and pioneer changes and improvements in this area. If our industry would focus on developing ways to manage supply chains and ways to create virtual communities where innovation thrives, we can achieve the Moore capabilities that customers want, maintain more control, and improve the overall return on investment.

At present, cognitive systems are the most important target zone for this community. We have more computing power right now than our customers and our marketplace can adopt. We have more speed and more switching capabilities than we can use. Some may argue that there is not enough I/O as is sometimes needed. However, even when I/O is charted against Moore's Law, the industry is vastly outstripping the capabilities of physical systems in many ways.

The question remains: What is going to happen with all that computing power? It's going to be put into cognitive capability. Systems will become much more adaptive than they are today. Hopefully that will help extend human life, reduce or eliminate disease, improve human factors in wars, increase productivity levels, and provide opportunities for better socialization and interaction for all of us. **MES**

Dr. Ian Dunn *is currently the VP and General Manager of the Embedded Products Group, part of Mercury Systems' Commercial Electronics business unit. He is responsible for embedded product development across the entire sensor-processing chain. Previously, Dr. Dunn was VP and General Manager of Mercury's Microwave and Digital Solutions Group and prior to that was the company's CTO responsible for technology strategy and R&D projects. Dr. Dunn joined Mercury Computer Systems in 2000 as a systems engineer upon completing a Ph.D. at Johns Hopkins University in Electrical Engineering. As a doctoral student at Johns Hopkins, Dr. Dunn consulted for Disney Imagineering and Northrop Grumman on distributed automation and various high-performance computing projects. He has 20 years of experience designing and programming parallel computers for real-time signal processing applications and has authored numerous papers and a book on designing signal-processing applications for high-performance computer architectures. Please direct any questions to info@mrcy.com.*

Mercury Systems
866-627-6951 • www.mrcy.com

QUALIFIED TO PERFORM

Effective tactical Communications on the Move (COTM) depends on proven, secure Mobile Ad Hoc Network (MANET) routing technologies. With Parvus' DuraMAR 5915, tactical radios and satcom gear now interface with a MIL-STD qualified, SWaP-optimized mobile router/switch subsystem. This integrates Cisco Systems IOS management, information assurance, and mobile IP routing capabilities.

Photo courtesy of DefenseImagery.mil

cisco Technology

NON-ITAR

Parvus DuraMAR 5915 Router

- Rugged Cisco IOS Secure Mobile Router
- Integrated Gigabit Ethernet Switch
- Data, Video and Voice Support
- Qualified to MIL-STD-810G, 461F
- Size, Weight & Power (SWaP) Optimized

cwcdefense.com
800.483.3152
ds@curtisswright.com

CURTISS-WRIGHT

Military market one of opportunity for embedded COTS suppliers

Q&A with Eric Sivertson, Executive Vice President of ATD Business Unit, Kontron

INTERVIEW

Department of Defense (DoD) budget cuts and sequestration have slowed military sales up and down the supply chain, giving many up and down the defense supply chain cause to worry. Meanwhile in the defense electronics community some such as Eric Sivertson, Executive Vice President of ATD Business Unit, Kontron in San Diego, see the current economic environment as one of opportunity for suppliers of commercial off-the-shelf (COTS) embedded computing technology – especially in areas such as unmanned systems and cyber security. In this Q&A with Sivertson he tells Military Embedded Systems where he sees the defense electronics market heading, where the best bets for growth are, and how embedded COTS suppliers like Kontron can help manage obsolescence challenges and enable reduced size, weight, and power (SWaP) in military electronic systems.

MIL-EMBEDDED: ***Please provide a brief description of Kontron in North America and its role within Kontron globally – by listing markets, key technological areas, number of employees, etc.***

SIVERTSON: I run Kontron's Avionics, Transportation, and Defense (ATD) business unit, which covers all Kontron products used in commercial avionics, transportation (rail, auto, etc.), and defense applications. The unit was previously called Military, Avionics, and Rail or MAR, but we changed it to ATD to more accurately represent our broadened transportation scope. ATD has a global focus, while leveraging the Kontron America footprint of 200 plus employees.

A large portion of our business is in the defense segment with enhanced commercial off-the-shelf (COTS) computing platforms based on open standards such as CompactPCI, COM Express, VPX, VME, etc. We sell into the global defense market, with a heavy focus on the U.S. and Europe.

Aside from defense, Kontron ATD's avionics side focuses predominantly on in-flight entertainment (IFE), where we provide both servers and cabin wireless access points (CWAPs) to major airline carriers around the world. On the transportation side our focus is on rail applications but we also have content on other forms of transport such as farm vehicles and long haul trucks.

MIL-EMBEDDED: ***Defense budget cuts and sequestration forced a change in procurement philosophy at the Department of Defense (DoD), with the government shifting research and development costs more onto the suppliers. As one general put it, "We don't want power points anymore, we want something we can use right now." How does this environment affect the embedded COTS market? Does it create cause for concern or is it an environment of opportunity?***

SIVERTSON: It's an environment of opportunity. I think it's a great time to be in this market. The market is really moving toward COTS suppliers in terms of procurement. After Sept. 11, defense spending went up and then peaked globally in 2008. While we will not see those rates again anytime soon, all this infrastructure was built to work under that peak. That fact combined with current events – just turn on the news shows, the need for defense products is still high. DoD program managers are asking what can I get off the shelf to give me the protection I need now? They can't afford to wait for costly development cycles to field equipment to keep pace with commercial technology. This drives them to COTS now more than ever.

For example, commanders want their warfighters to have the same capabilities on the battlefield that they get from their cell phones. The only way to do that is to piggy back off of commercial technology. Embedded computers are the heart of all of these systems and companies like Kontron are the perfect COTS partners for these customers. While we won't see the massive growth of past, this trend promises a solid market.

MIL-EMBEDDED: ***It has been two decades since then-U.S. Defense Secretary William Perry issued his famous memo that required the use of COTS products wherever and whenever possible. The term COTS has taken on many meanings for different people. How do you define the role of COTS in the defense procurement culture today?***

SIVERTSON: I think there is a small segment of defense market that will always do custom things, but the larger portion is riding on commercial technology because it doesn't have a choice. COTS isn't even a bad word anymore. It's even gone the other way as the commercial world actually is using a lot more military specification requirements to develop rugged mobile devices and you will see many luxury automobiles of today have the same technology as military aircraft cockpits of only a few years back.

Today mobile and the Internet of Things (IoT) drives technology development. Military COTS procurement has become a matter of taking this commercial technology and figuring out how to make it work in a rugged, secure package. Companies that can deliver that mix on a trusted foundation will succeed in today's defense electronics environment. The DoD wants COTS, but COTS with a strong pedigree of trust.

MIL-EMBEDDED: ***It is often said that military budget cuts drive commonality, creating a need for more flexibility and reuse of equipment across multiple platforms to save costs. How does embedded COTS computing technology enable commonality in military systems designs?***

SIVERTSON: The trend I've seen in my career was a push toward open standards. For decades defense customers were locked into customized solutions produced by only one vendor. Today they want open standards and open platforms to drive competition and get the best price. If one vendor is not meeting their particular requirements they know there is a competitive solution available that will still work with their system. This need for commonality is driving the industry toward open platforms with hardware and software such as Android and Linux implementations. Regarding open standards for embedded hardware Kontron plays strongly with their offerings of VITA and PICMG standards-based products such as VPX and COM Express.

MIL-EMBEDDED: ***If you were to name three growth areas in the military embedded market what would they be and why?***

SIVERTSON: Modernization efforts are a strong, steady market for embedded computing suppliers in the defense community – especially as the DoD continues to pass the development costs on the front end to defense contractors. Some amount of that modernization is taking place with form, fit, and function upgrades to leverage new capabilities in legacy tanks, ships, and aircraft. It is a huge investment and represents what I call the base market for defense technology. This solid base won't go away and has moved a lot toward embedded COTS technology as the DoD can't afford to spend a lot of money on upfront development costs but still needs the latest technology innovations.

A significant growth area is unmanned systems, particularly in unmanned ground vehicles (UGVs). These robots will be huge cost savers in the long run for the military, especially in personnel. I read an article that the U.S. Army will have up to 10 robots for every soldier by 2020. A huge chunk of the federal budget is spent on personnel. The amount spent on military weapons is small compared to personnel, as it has to cover lifetime pensions, medical benefits, etc. If you could replace every third soldier with a couple robots, you could really drop the federal budget footprint for the military. The success of unmanned aircraft in the military only bodes well for UGVs and other unmanned platforms. We have products in unmanned naval and ground applications and are absolutely looking at the potential of unmanned systems in the commercial market, as well.

Another area that is growing is cyber security. Trust is a foundational technology requirement for this. It is needed for everything around the defense space – a trusted supply chain, trusted data, trusted devices, etc. One element of such trust can be enabled in hardware solutions through continuous health monitoring in embedded computer boards. We offer trusted computing modules with built-in health monitoring and are investigating other technologies to bring into this sector of the market.

MIL-EMBEDDED: ***Disruptive technology is an often-used phrase to mark turning points in the high tech sectors. What are two or three disruptive technologies that have changed or will change the face of military embedded computing?***

SIVERTSON: I think the iPhone has greatly impacted the military world. Military leaders want to know why they can't have the same commercial technology for the battlespace that everyday consumers have at home. The DoD is already exploring and evaluating smart phone capability for use by the warfighter. The trick will be securing it to NSA level standards and in rugged packages for use in battlefield environments.

Unmanned vehicles have been a disruptive technology for the military with the entire unmanned market space promising to be truly disruptive when the technology reaches the commercial markets.

A third would be the speed of electronic connection through the Internet. The government gave us the Internet through DARPA – then called ARPA. The Internet was created as a protective tool during the nuclear era and now has turned around to be one of the biggest threats to the whole planet. Look at all the cyber attacks happening, such as Edward Snowden's release of classified information. The cyber security realm is tied to this pervasiveness of the Internet.

MIL-EMBEDDED: ***Many on the embedded supplier side say the biggest challenge their engineers face is balancing power vs. performance requirements – putting as much performance as possible in small form factors at low power. Are you seeing the same trend? How do you deal with***

the thermal management challenges in small form factors?

SIVERTSON: We've seen SWaP becoming a big issue in the market – for the industrial space, communications space, etc. Each Kontron business unit is dealing with this problem. Moore's law is still alive and well, so the race for performance in smaller packages is leading to some real challenges here. When you put a lot of stuff in a small space it is hard to get the heat out. We also need to deal with how to get heat out without air or fans. Conduction cooling in a rugged environment is a real challenge as electronics get smaller.

Wearables also represent a thermal management challenge. They require good conduction cooling rather than liquid cooling. It needs to be fanless to prevent the insides from being exposed to dust and environmental conditions while performing ever-greater tasks. This is also putting a real strain on power technologies like rechargeable batteries.

One trend that will enable more efficient management of SWaP is the use of 3D transistors. Working with companies such as Intel as they go to a 14-nanometer silicon process with 3D transistors enables an increase in processor speed at lower power – all critical to meeting the SWaP challenge.

MIL-EMBEDDED: ***Which of these standards will play the greatest role in military designs in the future and why: VPX, VME, CompactPCI, COM Express, or PC/104?***

SIVERTSON: 3U VPX is trending right now. The xTCA form factor peaked about five years ago when there was a massive push to use it in lots of places. We're seeing 3U VPX being the highest performer right now for military applications. COM Express has become a heavy lifter for many middle performance level applications and SMARC is taking off for small form factor solutions, such as wearables and disposables. Finally, there is still plenty of VME, CompactPCI, and PC/104 being used in legacy systems, too.

MILITARY COTS PROCUREMENT HAS BECOME A MATTER OF TAKING COMMERCIAL TECHNOLOGY AND FIGURING OUT HOW TO MAKE IT WORK IN A RUGGED, SECURE PACKAGE. THE DOD WANTS COTS, BUT COTS WITH A STRONG PEDIGREE OF TRUST.

MIL-EMBEDDED: ***System integrators and prime contractors still say the biggest problem they have with COTS technology is obsolescence. Will that ever change? How does Kontron combat this problem?***

SIVERTSON: It's only going to get worse because commercial parts – such as processors from Intel – are driving the performance curve with new introduction life cycles now on the order of only six to eight months. For the military the best they can hope for leveraging many commercially targeted devices is 24-36 months peak market window. At Kontron we use long-term supply agreements as part of many contracts with our customers. We insure beyond the normal part life cycle by figuring out the quantities necessary for long-term support well past the manufacturer's expected end-of-life (EOL) date and offer this as a service to our customers. They can purchase this at any time up until EOL. We buy enough product and put it in protective storage, keeping it on the shelf long past the life of the silicon, enabling as much as a 20-year life cycle on our end products if a customer so chooses to purchase this service.

On the other end you need to maintain a good relationship with the commercial part supplier. A good example is the one we have with Intel. As one of their premier partners, we have great insight to their roadmap. Knowing which products are best targeted to the defense customer needs and when their products are going EOL enables clear visibility and reduces risk to the main supply chain. This is a huge benefit to working with a COTS vendor such as ourselves.

MIL-EMBEDDED: ***How does the military market look outside the U.S. in Europe, Asia, etc.? Do the defense procurement strategies in these regions mirror that of the U.S. or are there programs or applications that are unique to one region or another?***

SIVERTSON: EMEA (Europe, Middle-East, and Africa), especially Europe, is strong right now. Once again all you have to do is look at the news. Current events are going to dictate more defense modernization for allied nations in these regions. It is very similar to the U.S. market regarding the need for modernizing aging platforms. There is also a similar demand for better cyber security and more unmanned systems. EMEA is almost a microcosm of what happens in the U.S.

My sense of the defense market in APEC (Asia Pacific Economic Cooperation) is that there will be opportunities for embedded technology. Japan has a growing need for more defense capability to counter China and North Korea and I still see some strong activity in Australia and New Zealand.

MIL-EMBEDDED: ***Kontron has grown quite a bit over the last five to 10 years through internal development and mergers and acquisitions. What technology capability would you like to add to your military embedded portfolio that you currently do not have?***

SIVERTSON: I'd like to see us expand our expertise in software integration. Today we are strong in hardware-based technology. We have all the open form factors and all the BIOS and board support technology necessary. Now we are getting more

involved in what I consider to be the service architecture side of things, being able to provide middleware that takes away the integration pain from our customers, very similar to what happened in the enterprise space a decade or so ago.

For discrete hardware and software components, connectivity that is now more and more demanded is mostly via middleware and as a result customers are buying solutions as a system rather than trying to completely roll their own. Therefore they are not worried as much about the underlying piping mechanisms as much as they are worried about a solid [operating system] OS-agnostic, open, easily interfaced set of functions to rapidly build their applications upon. This relieves them of the non-value added lower level mechanics headaches and launch pains. There is more and more demand for middleware targeted for embedded. Kontron is investing more in developing and offering this to our customers.

MIL-EMBEDDED: ***Five years from now where do you see Kontron's role in the military supplier world – as a hardware supplier, system supplier, or a full systems provider?***

SIVERTSON: Yes and yes and yes. Kontron has a wide reach in the hardware space and understanding how to do things – from avionics to defense systems to medical devices to parking meters. That broad a base of hardware development is hard to do. You would never go to a venture capital firm wanting to build a company to compete with Kontron. There is too much evolutionary knowledge wrapped up inside the company. Going forward we will leverage a lot more of middleware technology in the commercial IoT space and perform a lot more integration for our customers, enabling them to get to market faster and be more competitive.

In today's defense market the primes more and more will add value, gluing technology together to get fire control, missile defense, and other applications to run. Kontron will never be a defense prime contractor, but we will be doing more system integration to function as a single point of contact for these primes. We will be a one-stop shop and partner for the primes to take the pain out and enable them to focus on where they add value. **MES**

Eric Sivertson *is Executive Vice President of Kontron's Avionics, Transportation & Defense (ATD) Business Unit. He is an experienced entrepreneur, executive, engineer, and innovator with more than 25 years working in multiple companies, from startups to top tier global defense contractors. His focus is on technologies to enhance trust and security in embedded systems, wireless connectivity, and high performance and reconfigurable computing. He earned his electrical engineering degree from Virginia Tech.*

Kontron • 888-294-4558 • www.kontron.com

Next-gen shipboard electronics enhance data sharing and automation

By Sally Cole, Senior Editor

New design trends for shipboard electronics, such as those onboard the U.S. Navy's Littoral Combat Ship, focus on enabling enhanced data sharing capabilities and automation, along with a heavy emphasis on being prepared for electronic warfare.

The U.S. Navy's Littoral Combat Ship Freedom variant leverages open architectures in its shipboard electronics. Photo courtesy of Lockheed Martin.

Reducing noise, size, weight, and power demands, as well as improving ruggedization all continue to be key design considerations for shipboard electronics. New requirements are centering on the need to combat electronic warfare on the digital frontier, as well as embracing open architectures and open source systems to enable automation and enhance data sharing in both older platforms and new ones like the Littoral Combat Ship (LCS).

"The U.S. Navy's lack of the number of ships to deal with all it's asked to do is really driving onboard systems development," says John Chehansky, director of business development for GE Intelligent Platforms (www.ge-ip.com) in Charlottesville, Va. "It's easy to forget that the Navy is much more than a military force; it plays watch-keeper, humanitarian, antipiracy, and antiterrorism roles, in addition to being deployed to conflict zones."

New ships are also prohibitively expensive, so the Navy is focusing primarily on ways to improve the capabilities of its existing fleet.

"The Navy has built up a mass of legacy systems on each ship," Chehansky notes. "Historically, for example, deploying a new sensor onboard meant a new communications pipeline dedicated to that sensor." This resulted in far too many computers and communications pathways onboard.

A good indication of the Navy's future goals can be found within the description of the Office of Naval Research's Integrated Topsides (InTop) program, which as Chehansky points out, includes keywords such as "integrated," "multifunctional," "modular," "scalable," "open architecture," and "software-defined functionality."

The InTop program aims "to bring sensors for radar and infrared [IR], which today are used in individual functionalities, together via high-speed digital communications," Chehansky says. "This would address another Navy problem – struggling to bring all of its data together to provide meaningful information."

Data sharing, open source, and the cloud

One of the Navy's top goals is to move away from "stovepiped" networks, which includes PCs and electronics, not just Ethernet cables and how the network is wired together.

"This is based on a desire to be able to improve data sharing across networks to get a better sense of the big picture by pulling together data from several areas that haven't

necessarily been combined in the past, which, in turn, is driving data consolidation and tying into cloud architectures to an extent to support it," explains Isaac Porche, senior engineer for RAND Corp. in Santa Monica, Calif. (www.rand.org).

The term "cloud" tends to be interpreted as consolidating servers, but it can also mean using a distributed cloud to share data. "Using a distributed cloud just needs to be done in a way that makes sense in terms of interoperability and, of course, it must be secure. It definitely opens a new can of worms about how to share data at different classification levels easily, while avoiding data spillage," Porche explains.

There's also a big push toward open source options, particularly "in the cloud with OpenStack, because license fees are killing everyone," says Porche. "But open source is easier said than done.

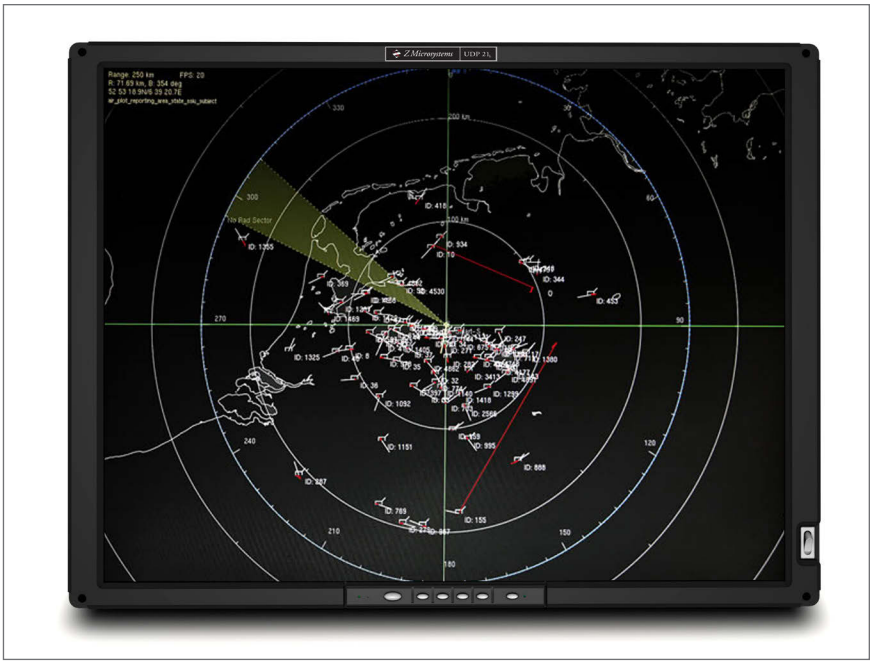


Figure 1 | The Orion 21L Universal Display Platform (UDP) from Z Microsystems is designed for airborne and intelligence, surveillance, and reconnaissance (ISR) applications. It supports picture-in-picture viewing, quad-view (optional), dual-view, and other user-adjustable viewing settings.

The desire is there, and we're beginning to see it in the database world. In the past you paid your Oracle database license fees, but now open source database concepts are looking more attractive."

This is an area "the weapons systems folks will be watching closely, because they won't want to sit on an IP network with latencies," Porche adds. "While consolidation is intended to reduce costs, the tradeoff with security is still being debated, so it can only be taken as far as issues with performance and security assurances will allow. There are performance and security requirements that can't ever be weakened."

The military, in general, "is a big proponent of open source because it provides improved flexibility, but it also brings security concerns along with it," concurs Bob Kopas, vice president of military programs for Z Microsystems in San Diego (www.zmicro.com). "Any software that goes into Navy systems must be certified and, as you begin to use open source code, it becomes more difficult to guarantee security."

So a new focus is to find ways to "secure the data separately with all of the proper permissions and security differences within the same store, so one person with the right credentials can pull the data to develop a bigger picture with it and improve efficiency," Porche says.

Overall, embedded computing is also "playing a huge role in making it easier for crews to make more sense of the vast amounts of data available to them," Chehansky notes.

In terms of embedded systems, "we're seeing a continued realization about the value of ruggedization for longevity of systems," Kopas says. "The driving factor for servers is still processing power, which is being driven by the commercial market. Demand is also increasing for storage capability and video ingestion/manipulation capabilities."

Ruggedization continues to be a key design trend, with strong interest in higher-resolution 4k display panels, which is the leading technology in the commercial market, according to Kopas (see Figure 1).

"We're also seeing increasing interest in real-time enhanced video built into displays, because operating in maritime environments often involves visual degradations such as fog and haze, and even dust in the waters like those in the Persian Gulf," he adds.

The Littoral Combat Ship and open architectures

Engineers at Lockheed Martin in Bethesda, Md. (www.lockheedmartin.com) leveraged open architectures and more efficient data sharing in the electronic systems onboard the LCS Freedom variant, a stealthy surface combatant designed to be a flexible and upgradable asset for the U.S. Navy's fleet. This technology enables each LCS to be "manned with a 50-sailor crew, which is about a quarter of the crewmembers on similarly sized ships," says Joe North, vice president of Littoral Ships and Systems for Lockheed Martin. The LCS encompasses three key mission packages: Antisubmarine Warfare, Mine Countermeasures, and Surface Warfare. (For more on the mission packages, see sidebar on page 33.)

The LCS Freedom variant relies on open architecture to enable rapid and cost-effective technology insertion and spiral development capability, according to Lockheed Martin. LCSs are networked to share tactical information with other naval aircraft, ships, submarines, and joint and coalition units to provide the right people with the information they need quickly and efficiently.

The ship's COMBATSS-21 software system is combined with a "Total Ship Computing Environment" to provide hardware and software interfaces for quick integration of new capabilities such as weapons, sensors, and communication links. COMBATSS-21 provides the backbone of the self-defense suite, integrating radar, electro-optical/infrared cameras, gunfire control system, countermeasures, and short-range air missiles, according to Lockheed Martin.

Automation is another key part of LCS design, largely intended to support the ship's minimally manned crew. "This includes an advanced combat management system, remote vehicles to keep crewmembers out of mine fields, a ship system health monitoring capability,

Electronic warfare: jamming on the digital frontier

One very real concern fleets face at sea today is on the digital frontier in the form of electronic warfare – the use of electronics signals to deny or deceive sensors and radars, aka jamming or spoofing. Adversaries are exploiting today's rampant use of radio frequency (RF) technologies to improve their offensive and defensive systems, including short-range tactical communications, long-range command and control networks, networked defense systems, and RF seekers.

The U.S. military is concerned about this issue and is actively seeking solutions – especially after "the Army discovered the hard way in Iraq that putting jammers on vehicles interfered with communications for Blue Forces," points out Isaac Porche, senior engineer for RAND Corp. in Santa Monica, Calif. (www.rand.org).

The basic concept behind electronic warfare is to control energy use and also to have the ability to remove your adversary's ability to use it, according to the U.S. Office of Naval Research. An ideal system would enable sailors and marines to exchange spectrum and threat information between platforms to enable better-informed decisions during situations in which time and accuracy are crucial.

The U.S. Navy is "working to improve command and control electronics' situational awareness capabilities in terms of the network and wireless portions of the network, focusing on any emissions within the electromagnetic spectrum," Porche says.

One of several ongoing efforts to address this issue is the Electronic Warfare Battle Management for Surface Defense program, sponsored by the U.S. Office of Naval Research, to help sailors and marines coordinate electronic countermeasure responses to inbound threats faster than is currently possible by simply using the traditional method of voice communications.

The goal of the program is to enable personnel located both onboard ships and in aircraft to share adversary sensor and radar threat information digitally using available communication networks. Naval forces can then coordinate countermeasures onboard and remotely with the help of automation software, bringing speed and precision to a process that typically occurs via radio communications.

Another effort, led by the U.S. Defense Advanced Research Projects Agency (DARPA), actively seeks system approaches for active and passive electronic warfare techniques to counter advanced networked and agile systems using technologies such as distributed systems, coherent systems, disposable systems providing asymmetrical capabilities, and close-in remote sensing coupled with advanced jamming and spoofing.

In particular, DARPA's Microsystems Technology Office is seeking technologies to provide the U.S. military fundamental asymmetries to address these new capabilities, including concepts involving physical and network solutions, distributed systems, as well as the exploitation of precise spectral, time, and position information.

Sidebar Figure 1 | A Navy MH-60S Sea Hawk helicopter flies over four Helicopter Sea Combat Squadron ships in the Pacific Ocean during RIMPAC Exercise 2014. Photo credit: U.S. Navy/Mass Communication Specialist 2nd Class Amanda R. Gray.

LCS Freedom's mission package specifications

Antisubmarine warfare

The Antisubmarine Warfare mission package includes a MH-60 Romeo helicopter with forward-looking infrared (FLIR) radar, laser rangefinder/designator, inverse synthetic aperture (ISAR), airborne low-frequency sonar (ALFS), sonobuoys, and MK54 lightweight hybrid torpedoes. It is also equipped with vertical takeoff/unmanned aerial vehicle (VTUAV), ASW escort module with towed variable depth sonar (VDS) active source, a multi-function towed array (MFTA) acoustic receiver, and continuous active sonar processing and system control. For countermeasures, it has a torpedo defense module with an MFTA with acoustic intercept (ACI) and lightweight tow (LWT).

Mine countermeasures

The Mine Countermeasures mission package includes a MH-60 Sierra helicopter, VTUAV, remote multi-mission vehicles (RMMVs), AN/AQS-20A mine hunting sonars, airborne laser mine detection system (ALMDS), airborne mine neutralization system (AMNS), organic airborne and surface influence sweep (OASIS), unmanned surface vehicle (USV), unmanned surface sweep system (US3), coastal battlefield reconnaissance and analysis (COBRA), and surface mine countermeasures unmanned undersea vehicle (SMCM UUV).

Surface warfare

The Surface Warfare mission package includes a MH-60 Romeo helicopter with eight Hellfire missiles, a 50-caliber machine gun, and a 7.62 mm machine gun, VTUAV, two 30-mm gun modules that use the MK 46 MOD (X) gun weapon system with MK 44 MOD 2 30-mm automatic cannon, surface-to-surface missile module, and a maritime security module.

Source: Lockheed Martin.

and laser-based fluid monitoring and machinery control systems," North says. "Using advanced automation, the LCS can accommodate current and future technological advances."

Three examples of the automation technologies found in the ship include its plant automation, ship system, and fluid monitoring systems.

"It's exciting to see how much automation is helping the crew," North says. "On a ship's bridge, for example, normally 10 or more sailors monitor the consoles that track all of the ship's systems on traditional Navy ships. On LCS, you have one or two sailors monitoring and controlling all of the ship's complex systems from a single location." **MES**

Rugged handheld evolve to meet warfighter needs

By Amanda Harvey, Assistant Editor

Designers of rugged handheld computers and tablets for the military market are upgrading designs to meet the changing needs of warfighters on the frontline.

The Toughpad FZ-E1 is Panasonic's MIL-STD-810G-tested, fully rugged 5" handheld tablet.

Warfighters are in constant need of computing gear that shortens and improves the efficiency of decision cycles, costs less to procure, and is lightweight so soldiers and Marines are not burdened with more unnecessary weight in their packs. They want state-of-the-art devices like iPhones, Samsung tablets, and lightweight laptops like their friends and family in civilian life have back home.

While warfighters – just like students, business travelers, and computer gamers – want extended battery life, lower power, and more resistive touchscreens, they also have unique needs for more flexibility driven by battlefield applications.

"One thing our military customers are asking from us is options," says Sean Hall, national sales manager, Army, Panasonic System Communications Company of North America in Newark, N.J. "The days of one-size-fits-all mobile computers are over. Today, service members need to have the flexibility to select the ideal tool for the job, not make what they have meet their needs." For example, a service member doing flight line maintenance may require a lightweight, handheld mobile computer with sunlight readability, while another service member may need a laptop with a larger screen and a full keyboard, he continues. But one thing remains constant: both will need rugged durability, high performance, and long battery life.

"The basic needs in the industry are fluid at this point in time, thus the requirements follow suit," agrees Jim Shaw, vice president of engineering, Crystal Group in Hiawatha, Iowa. "Some of our clients want extensive mapping capabilities with route planning and a system that is capable of running high-compute power applications like Falcon View and Blue Force Tracker (FBCB2)." Yet, they have other clients who are more interested in unmanned aerial vehicle/unmanned ground vehicle (UAV/UGV) control interfaces, he adds, who are "not as concerned about size and battery life but want enough screen surface area and resolution to monitor and control multiple autonomous vehicles at any one time.

"Our focus has turned from making everything within the system to customizing the best industry has to offer and creating sufficient I/O to satisfy the needs of multiple

WHILE WARFIGHTERS WANT EXTENDED BATTERY LIFE, LOWER POWER, AND MORE RESISTIVE TOUCHSCREENS, THEY ALSO HAVE UNIQUE NEEDS FOR MORE FLEXIBILITY DRIVEN BY BATTLEFIELD APPLICATIONS.

mission profiles in a single kit architecture," Shaw continues. The TAC-V2 I/O and power distribution module is a system that enables the user to build the capability of the compute or communications package by snapping the modules together. The capability of the system is structured around a USB 3.0 backbone that provides video links, power management, RS232, video-out, and communications data interface (see Figure 1).

Commercial origins of rugged mobile computing

The commercial sector has played a large part in the design of handheld devices for the military, with users wanting their rugged systems to be similar to the consumer electronics they use in their personal lives. "Our customers' expectations of features are driven by consumer-grade smartphones and tablets," confirms Steve Motter, vice president of business development for Industrial Electronic Engineers, Inc. (IEE) in Van Nuys, Calif. "The customers are very used to iPhone-style gesturing (pinch and swipe for zooming and moving windows or images, respectively), and being able to accomplish that with low power and gloved-hand operation while still supporting all of the EMI [electromagnetic

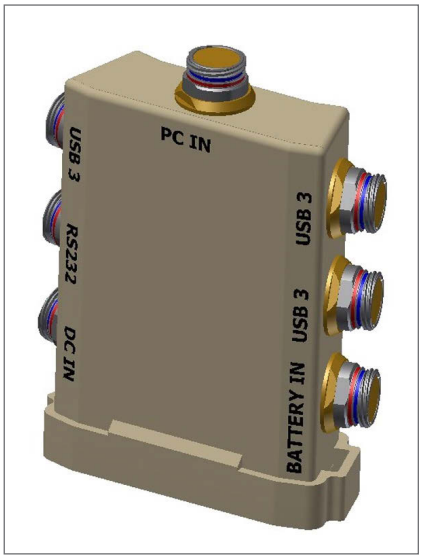


Figure 1 | The TAC-V2 I/O and power distribution module measures approximately 3" x 4" x 1.25" and weighs approximately 0.6 lbs.

interference] requirements is key," he adds.

In addition to consumer technology, enhanced display technology is also being researched and used. These include OLED (organic light-emitting diode) and flexible displays, as well as resurgence in the use of transflective displays, which use ambient light to reflect the image on the screen. "That's one of the techniques that we're using to achieve sunlight readability of displays. And that technology continues to evolve to higher-density, higher-resolution displays," Motter says. "IEE continues to track the technology related to OLED displays and the flexible displays, and we're monitoring and testing from the point of view of temperature performance and long life performance and supply."

Rugged computers and tablets are expected to work in all types of weather conditions and times of day. Motter says displays have to be sunlight readable but also legible in adjustable lighting all the way down to low light, including night vision goggle compatibility. "The trends are to try to accommodate all of that in extremely low power, which is very challenging in terms of that implementation," he adds.

Features such as these enhanced display capabilities enable the most functionality out of the rugged mobile computing systems. Warfighters need reliable equipment that will not fail even in the harshest of conditions. "Mobile computers must work how, when, and where their users do, without compromise. This includes using them in direct sunlight, in the elements, with gloves on,

Data-At-Rest Recorder from Macrolink now includes NSA Type 1 certified encryptor for unattended operation

Engineers at Macrolink, a BE Aerospace Company, in Anaheim, Calif., achieved National Security Agency (NSA) embedment approval for the company's full-mil airborne-qualified Data-At-Rest (DAR) Recorder targeted for unattended operation on unmanned platforms.

This process is moving faster than previously thought as Macrolink's announcement and NSA certification story shows. The following is an exclusive to *Military Embedded Systems.*

"Government and Military data storage and recording applications must address the expanding need for strong encryption to protect sensitive data," says Jim Grace, director of business development at Macrolink. "Deployed systems are now dominated by rugged solid state drives (SSDs) that have replaced spinning media. Sensitive data can be minimally protected with encryption built into SSDs. Applications demanding stronger encryption schemes need to be encrypted based on the sensitivity of data to be protected by the FIPS-140-2 standards, while more sensitive data needs to be protected to the IASRD Type I standard, which can protect data at levels to Top Secret.

"It is a well known fact that only NSA Type I certification provides the approval for DAR systems that demand protection for Secret And Below (SAB) or Top Secret And Below (TSAB) data classifications," Grace says. "It should also be further noted that complications arise in applications involving unmanned platforms [in the air, at sea, or on the ground]. For these unique deployments, the DAR system needs to be embedment approved by the NSA for unattended operation. To achieve this approval level the platform also needs to be reviewed and approved by the NSA to ensure a properly secured feed to storage subsystem.

"The certification process for a system of this type can be quite long and requires a 'program-of-record' sponsor," Grace continues. "Until this year, such a system has been unavailable. Now Macrolink would like to correct the perception that this capability is not available to industry, as Macrolink has completed development and a program of record has deployed, at Low Rate Initial Production (LRIP), a product for the unattended operational need. This product, packaged within a ¾ ATR enclosure, meets full military requirements for flight certification and features as much as 10 TB or more of SSD storage (subject to capacity of available drives)."

Macrolink's TSAB system is available today for adaption into applications performing in unattended environments, according to Grace. The stored, encrypted DAR on the removable flash storage array (FSA) is trusted and essentially unclassified. The removable FSA can be quickly replaced, reducing mission downtime. Macrolink provides ground stations that enable the removed FSA data to be downloaded and/or decrypted as required. The deployed system also features a Cryptographic Ignition Key (CIK) qualified for use on government-sponsored platforms.

For more information on the Macrolink solution, contact Jim Grace at 714-777-8800 (Ex 307).

Ultra-Wideband Spectral Survey & Long-Duration Data Recording

Spectrum Processing for ELINT

RFvision-2

- 500 MHz – 18 GHz tuning range (expandable to 40 GHz)
- 500 MHz stare bandwidth
- Fast scanning & low phase-noise
- 15 dB noise figure, 31 dB gain
- 12-bit data converters
- FPGA based DDC (up to 500 MHz operating BW)
- I & Q data on two 10 gigabit optical networks
- Real-time long duration recording @ 1.6 Gbytes/s rate
- SigInspector™ 2 GUI for convenient control & failsafe operation
- File support for Midas Platinum Blue, MATLAB,… for post analysis
- Optional IF Output

No User Development Required

Download **RFvision-2 Ultra-Wideband Spectrum Processing System** presentation and **SIGINT Simplified** brochure directly from home page:

www.d-ta.com sales@d-ta.com 1-877-382-3222

D-TA SYSTEMS INC.
A Sensor Interface and Processing Company

or for long periods of time without stopping to recharge," Hall says. See lead-in image for Panasonic's 5-inch Toughpad FZ-E1 rugged handheld tablet.

Panasonic engineers are developing a rain-sensing feature that permits handlers to continue to use the touchscreen in the rain without the raindrops activating the screen. They are also adding more hot-swap functionality into their rugged systems, which enable users to swap out depleted batteries for fresh ones without powering down the device, according to Hall.

Managing SWaP

Size, weight, and power (SWaP) limitations for small handheld devices continue to be one of the toughest challenges for rugged mobile computer manufacturers to overcome. Though SWaP restrictions apply to technology in all types of military applications, the challenges are greater in mobile handheld systems due to their small size and typical lack of active cooling.

"With processors that use less power and create less heat, we can create mobile computers in smaller and smaller form factors," Hall says. For soldiers on the move, smaller, less bulky devices are more convenient, while fanless mobile systems present significant advantages through their greater mean time between failure (MTBF) and more stealth operation.

On the processing side, IEE targets processors in the portable market that are in the 2-10 W range for the portable applications and embedded handheld devices. "That's one of the areas where we're able to bring higher performance in within the SWaP objective. The other is by taking advantage of SOMs [systems on module] and SoCs [systems-on-a-chip] where there is more embedded silicon-level peripherals that do graphics acceleration, communication acceleration, and encoding/decoding," Motter says. To maintain low power consumption and lower heat generation in mobile systems, IEE relies on ARM processors or x86 multi-core Atom processors in their devices (see Figure 2).

Military mobility market continues to evolve

Rugged handheld computing for the warfighter remains a huge market, with new trends appearing continuously. Even firms known more for their mail-order home computers such as Dell in Round Rock, Texas, are leveraging their commercial designs in rugged form factors for military and government use.

Dell engineers released their Latitude 14 Rugged Extreme notebook and the Latitude 12 Rugged Extreme convertible notebook for defense and law enforcement users earlier this year (see Figure 3). The products are built with resistant ultra-polymers and magnesium alloy. Data is protected from the elements with sealed doors and compression gaskets while enabling performance at high temperatures with fourth-generation QuadCool thermal management.

Based on feedback from their users they added: a direct-view outdoor-readable display for reducing glare and reflectivity with less reliance on backlighting, resulting in longer battery life; a resistive multi-touch on the Latitude 12 Rugged Extreme for recognizing intuitive gestures while wearing thick gloves; a rugged "flip-hinge" convertible display with the Latitude 12 Rugged Extreme; and as much as 16 GB of memory and as much as 512 GB of solid-state storage. The laptops have a battery life up to 8.5 hours and up to 14 hours, respectively; have fourth-generation Intel Core processors; and come with a dedicated GPS. **MES**

Figure 2 | IEE's 3.5" handheld SWAP-C CDU is a low power, sunlight readable display that leverages high performance ARM processing and thin-client architecture.

For more information on rugged handheld and wearable technologies for the warfighter, see the rugged computing company listing on page 39.

Figure 3 | The Latitude Rugged Extreme 12/14 notebooks from Dell are for defense and law enforcement applications in extreme environments.

Rugged Computing Listing

Access I/O
www.accesio.com

Acromag
www.acromag.com

Adlink Technology
www.adlinktech.com

Aitech
www.rugged.com

Amrel Computer Division
http://computers.amrel.com

Annapolis Micro Systems
www.annapmicro.com

Arbor Technology Corp.
www.arbor.com.tw/

Argon Corp.
www.argoncorp.com

Augmentix
www.augmentix.com

Axiomtek
us.axiomtek.com

BittWare
www.bittware.com

Black Diamond Advanced Technology
www.bdatech.com

Broadax Systems, Inc.
www.bsicomputer.com

Connect Tech
www.connecttech.com

Corvalent
www.corvalent.com

Crystal Group
www.crystalrugged.com

Cyberchron Rugged Systems
www.cyberchron.com

Curtiss-Wright Defense Solutions
www.cwcdefense.com

DAP Technologies
www.daptech.com

Dell
www.dell.com

Diamond Systems Corp.
www.diamondsystems.com

Digital Systems Engineering
www.digitalsys.com

DRS Tactical Systems
www.drs-ts.com

Ecrin
www.ecrin.com

Elma Electronic
www.elma.com

Eurotech Zypad
www.zypad.com

EVOC Group
www.evoc.com

Extreme Engineering Solutions (X-ES)
www.xes-inc.com

Galleon Embedded Computing
www.galleonembedded.com

GammaTech Computer Corp.
www.gammatechusa.com

General Dynamics Canada
www.gdcanada.com

General Dynamics C4 Systems
www.gdc4s.com

GE Intelligent Platforms
www.ge-ip.com

General Micro Systems
www.gms4sbc.com

Getac
www.getac.com

Glacier Computer
www.glaciercomputer.com

Hartmann Electronic
www.hartmann-electronic.com

IBI Systems
www.ibi-systems.com

IEE
www.ieeinc.com

Industrial Computers
www.eindustrialcomputer.com

I.M. Systems
www.imsystems.com

Kontron
www.kontron.com

MaxVision
www.maxvision.com

MEN Micro
www.menmicro.com

Mercury Computer Systems
www.mrcy.com

Motorola Solutions
www.motorolasolutions.com/XU-EN/Product+Lines/Psion

New Embedded Technology
www.newembedded.com

NextComputing
www.nextcomputing.com

Octagon Systems
www.octagonsystems.com

Panasonic Corporation of North America
www.panasonic.com/toughbook

Parker Hannifin Corp.
www.parker.com

Pentek
www.pentek.com

Quantum3D
www.quantum3d.com

RTD Embedded Technologies
www.rtd.com

Rugged Notebooks
www.ruggednotebooks.com

SANBlaze Technology
www.sanblaze.com

Sealevel Systems
www.sealevel.com

Secure Communication Systems
www.securecomm.com

SIE Computing Solutions
www.sie-cs.com

Small PC
www.smallpc.com

Stealth Computer
www.stealth.com

Systel USA
www.systelusa.com

Technology Advancement Group (TAG)
www.tag.com

Themis Computer Inc.
www.themis.com

Trenton Systems
www.trentonsystems.com

Tracewell Systems
www.tracewellsystems.com

Trimble Navigation
www.trimble.com

VarTech Systems
www.vartechsystems.com

Versalogic
www.versalogic.com

VIA Technologies
www.via.com.tw

VT Miltope
www.mymiltope.com

WinSystems
www.winsystems.com

Z Microsystems
www.zmicro.com

The cutting edge of thermal management

By Brian Hoden

The biggest challenge for system integrators today is thermal management. With access to the latest-generation processors, GPUs, and switch fabrics, system integrators must find creative ways to remove the heat created by this vast computing power. These thermal challenges call for innovative thermal solutions to maximize the performance for computing-intensive applications.

Soldiers from the 9th Regional Commando Battalion, Iraqi Special Operations Forces, use military vehicles as they tear through the desert sand to enter a village suspected of housing criminal elements during training in Al Anbar province. Photo Credit: Sgt. Brandon Pomrenke.

Cooling 6U-sized rugged electronics cards in a system has historically been achieved using conduction-cooled cards mounted in a convection-cooled, forced-air-cooled (fan or supplied), or base-plate-cooled chassis. Using this approach in military thermal environments of 55 °C and as hot as 71 °C can limit the amount of card heat that can be removed and therefore limits computer-processing capability. The cards need to be housed in a chassis to protect them from the outside environment such as EMI, blowing sand, blowing rain, humidity, salt, and fog. When vibration requirements reach or exceed 0.1G2/Hz (over 10 to 2,000 Hz) and 40 Gs of shock, cards that are loaded into a standard card-cage rack are no longer an option. With computer processing requirements increasing and size, weight, and power (SWaP) decreasing, the heat loads on processors and GPUs are exceeding 50 W, with individual cards exceeding 100 W.

Military board- and system-level solutions

To manage these heat loads on individual cards and maintain VITA spacing requirements, convection-cooled chassis usually cannot meet the requirements of rugged military thermal environments. Forced-air-cooled and cold-plate-cooled chassis struggle to cool these 100 W+ cards. For example, a multiprocessing card with two quad-core Intel Core i7 processors that is capable of more than 260 GFLOPS peak has a typical and maximum power draw of 144 W and 192 W, respectively. When used in these traditional chassis, the processors have to be scaled back, which means that the system is either unable to run at its full potential or the cooling temperature needs to be reduced.

Other solutions that can be used are liquid-cooled, spray-cooled, and air-flow-through (AFT) cards. Managing liquids that are pumped through a chassis is usually expensive for the platform system integrator, but this type of cooling can meet the current military environments if sized correctly. Draft ANSI/VITA 48.3 standard – Mechanical Specifications for Microcomputers Using REDI (ruggedized enhanced design implementation) Liquid Cooling – provides some guidance on how this may be accomplished. Another approach is VITA 48.5 (AFT): This standard provides for a rugged method to mount

the electronics cards into a chassis using wedge locks as well as a seal to protect the cards from the outside environments. It also provides a more direct path for the heat to be removed from the card and processor (see Figure 1 Side View) compared to conduction-cooled cards.

While this technology has been around for many years, now that there is a standard it enables a commercial off-the-shelf (COTS) approach for the military industry. VITA 48.7 (Air Flow-By), currently in the ratification process, is a configuration where the electronic card is sealed inside an external-finned heat sink. Cooling is provided by flowing air over the outside of the heat sink, which has the advantage of cooling both sides of the card components. This configuration is used in a standard card-cage rack and uses seals that are located in the backplane. Since this is a rack-mounted card, the vibration and shock levels are on the order of half when compared to VITA 48.5 and other conduction-cooled card chassis. Both of these air flow technologies have their place in military platforms and should be evaluated before selecting a system solution. An example of a

WITH COMPUTER PROCESSING REQUIREMENTS INCREASING AND SWAP DECREASING, THE HEAT LOADS ON PROCESSORS AND GPUS ARE EXCEEDING 50 W, WITH INDIVIDUAL CARDS EXCEEDING 100 W.

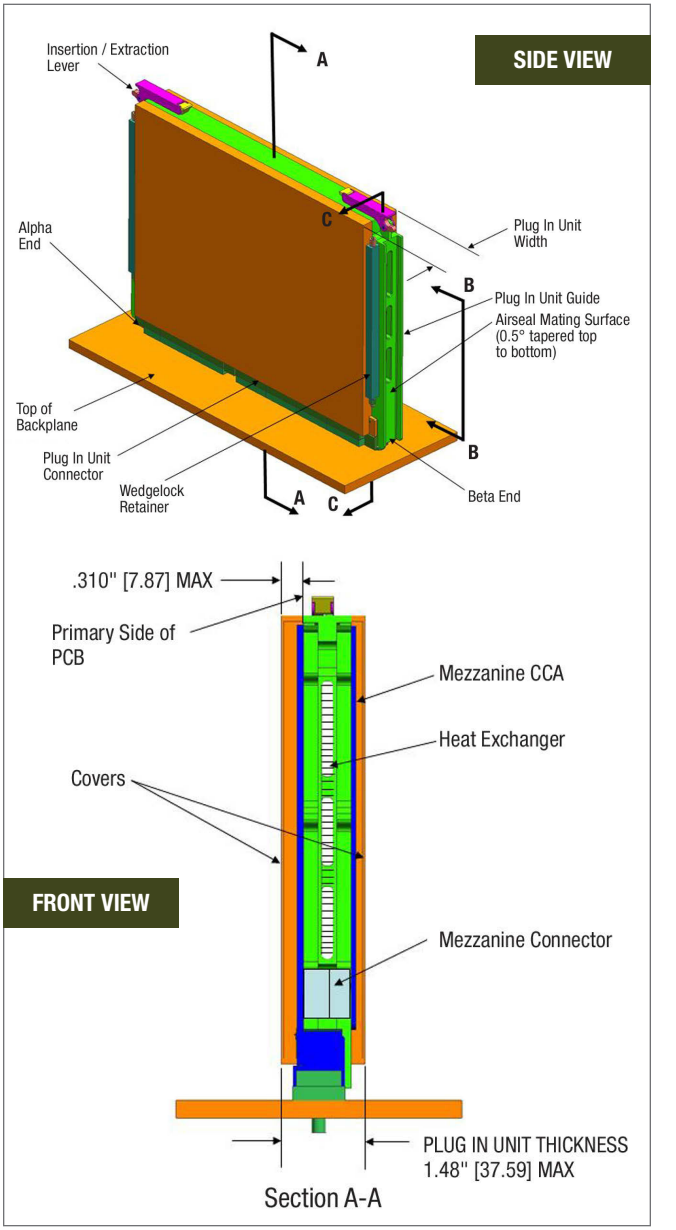


Figure 1 | VITA 48.5 card configuration (taken from standard).

VITA 48.5 system is GE Intelligent Platforms' CRS 48.5 high performance embedded computing (HPEC) rugged system (shown in Figure 2) which contains four DSP280 cards, each featuring two Intel Core i7 processors, a switch card, a power-supply card, an EMI filter card, along with two spare slots; it all draws 1,200 W. The size and weight is similar to a 1 ATR long chassis.

VITA 48.5 board and system-level design considerations

When designing a VITA 48.5 card, the air flow and pressure drop is left to the designer. A system integrator, of course, wants low pressure drop and low flow, so the challenge is to balance this desire in the heat-exchanger design. For cards that have 150 W of power draw, a target goal of 10 cfm flow and 0.7 in. H_2O at 55 °C ambient (20 cfm and 1.5 in H_2O at 71 °C) is achievable with this standard. Figure 3 shows how a designer might report performance of a card at one ambient temperature. This approach helps the system integrator size the system inlets and air routing because fans/blowers are selected using pressure-flow rate curves.

The VITA standard allows for either a 1.17" or 1.48" thick board assembly. The 1.48" thickness is needed when using mezzanine cards, which are attached to the opposite side of the heat exchanger as shown in Figure 1 (Front View). This setup is an excellent method of cooling a mezzanine card, since both thermal rails and card hot spots can be heat-sunk

Figure 2 | GE Intelligent Platforms' VITA 48.5 COTS Rugged System.

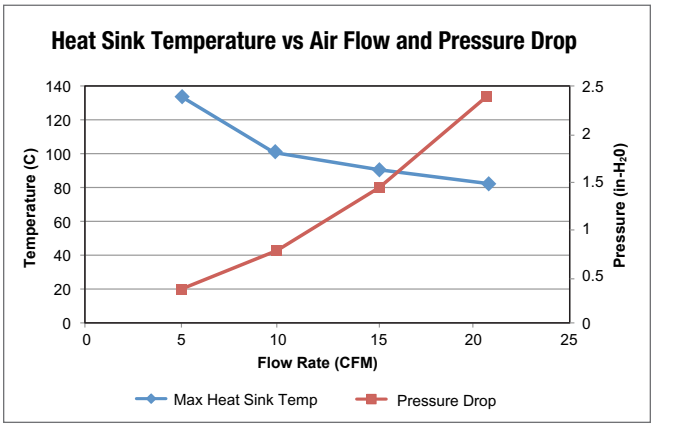


Figure 3 | VITA 48.5 performance curve.

to the heat exchanger. If mezzanine cards are needed, this method reduces the air flow cross section in the metal work and increases the pressure drop when using standard 10 mm connectors. To increase the flow, a nonstandard connector is needed. Commercial connectors are available for a Switched Mezzanine Card (XMC) with an 18 mm board-to-board spacing and 15 mm for PCI Mezzanine Card (PMC), which helps, but this approach may not be optimum for a 1.48"-thick assembly that has a 25 mm board-to-board height. One method to get the 25 mm spacing is to use standard connectors on the boards and then use an interposer board or bridge connector. When designing with mezzanine cards, data is needed similar to Figure 3 for implementing in a chassis.

When designing a VITA 48.5 chassis, one option is to use the 1 ATR form factor. This form factor can replace older systems already on platforms, but the air flow is more restrictive in this orientation since the width of the chassis is defined by the ARINC 404 standard and does not provide enough wall space for a high-flow/low-restriction manifold. The routing of air from the front to rear can add an additional 10 percent pressure drop due to these narrow side walls and openings. A better approach is to apply the air inlet in the same direction as the

card heat sinks using a header or manifold; the number of cards is then limited if trying to meet a 1 ATR form factor.

Balancing the flow rate through cards can be achieved by strategic placement and/or using orifices to route air through each card heat exchanger. This arrangement allows for maximizing card air flow while minimizing pressure drop. A good example of this is an integrated power-supply filter that occupies a slot in the chassis but has 70 percent less heat load than a graphics card. The amount of air flow can be reduced from 10 cfm to 3 cfm and more air flow can be routed to the graphics card. Ultimately, properly sized integrated military vaneaxial fans or external cabin air is needed for maximum performance.

Rugged military systems need rugged board solutions, and the cooling method has a big impact on the type of solution that can be used. Understanding how these system solutions work and the pros and cons of each is key to a successful platform that can work today and in the future. **MES**

Brian Hoden *is Principal Mechanical Engineer, Embedded Engineering at GE Intelligent Platforms. He has more than 25 years of experience in military computer system designs, military laser system designs, telecommunication laser product manufacturing, and nuclear shipping container designs. Brian has also worked for Sandia National Laboratories, LATA, and Emcore, and holds a BSME degree from the University of New Mexico.*

GE Intelligent Platforms, Inc.
800-433-2682 • www.ge-ip.com

Eradicating device obsolescence

By George Karalias

Device obsolescence is the status of a part when it is no longer available. The problem of obsolescence is very prevalent in microelectronics technology as the life cycles for microelectronic parts are often in conflict with equipment life cycles. In addition, microelectronics technology has a long history of obsolescence issues. Obsolescence extends beyond electronic parts to other materials like textiles and mechanical parts. In addition, obsolescence can also appear in software, specifications, standards, processes, and packaging technologies.

Sonar Technician 2nd class Anthony Summa, left, from New Hartford, Conn., answers radar questions from Sonar Technician Matthew Eaton, from Tampa Bay, Fla., aboard the Arleigh-Burke class guided-missile destroyer USS John S. McCain (DDG 56) in the South China Sea. U.S. Navy photo by Mass Communication Specialist Seaman Alonzo M. Archer.

Over the past several decades, technology has advanced rapidly, causing components to have shorter procurement life spans. Driven by the consumer product sector, new and better components are being introduced more frequently, rendering older components obsolete. Quickly examining the dynamic shifts in the semiconductor market from the 1980s to today, it is easy to see why semiconductor obsolescence is a growing problem for many original equipment manufacturers (OEMs).

Semiconductor market in the 1980s:

- Packaging was standard across many companies
- Parts were often dual-sourced
- Digital was almost all 5 volt operation
- Department of Defense (DoD) was a significant share of the market (military has longer product life cycles)

Semiconductor market in the 1990s:

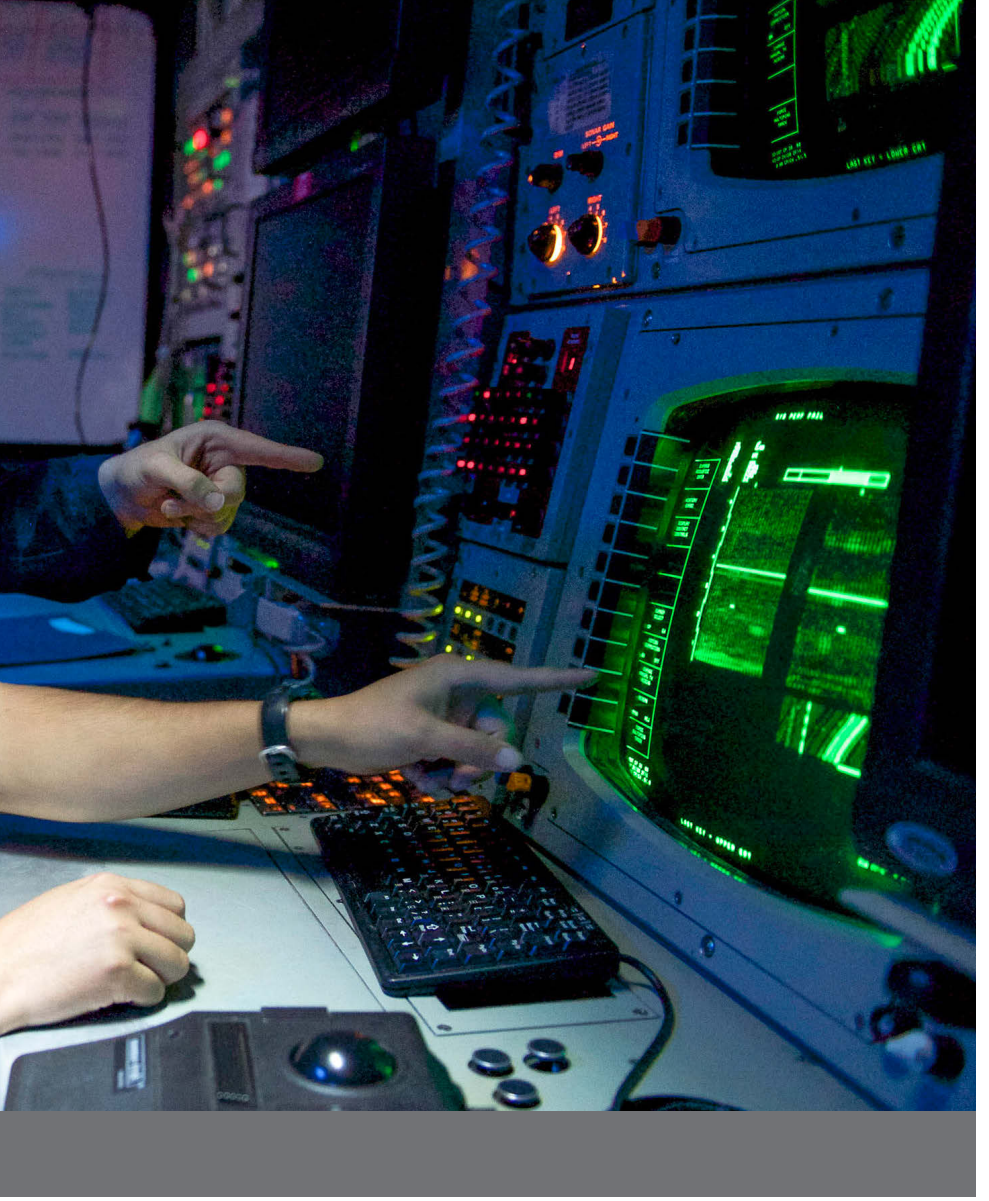
- Fabless operations rose to prominence
- Parts rarely dual-sourced
- DoD insignificant technology driver
- Digital technologies vary in voltage
- Packaging differentiation expands and goes offshore
- Consumer products drive volume

Semiconductor market in the 2000s:

- Huge crash of semiconductor market in 2001
- Public company stock punished for inventory build-up post-crash of 2001
- All high-end digital devices in unique packages including flip-chip
- DoD drops to single-digit percent of market
- Portables are biggest market

Semiconductor market today:

- DoD less than one percent of the semiconductor market
- Average consumer life cycle 2-5 years maximum
- All digital products are unique, silicon through packaging
- Process technology development driven primarily by portable markets (low voltage, reduced temperature range, consumer life cycle)



Today, obsolescence at the largest foundries is occurring with .35-µm technology and accelerating as to when that obsolescence happens. Acceleration of obsolescence is happening because consumers thirst for the latest gadgets, and consumer silicon drives volumes at leading-edge foundries. The leading consumer products push the leading processes for the best-cost basis as one of the main goals. Those .35-µm designs going through obsolescence are only 10-15 years old from when they were first prototyped and after less than 10 years in production. There are many systems out there that need longer than 10 years for product and/or where the cost of requalification is huge. Smaller foundries continue to offer process nodes long after the big volume foundries have left the market. The traditional life cycle of electronic parts includes several phases: development, introduction, growth, maturity, and finally decline (phase-out and discontinuance), which can lead to device obsolescence (see Figure 1).

For example, Figure 2 displays the possible impact of obsolescence in the design process of a sonar system. This figure shows that already 70 percent of the commercial off-the-shelf (COTS)

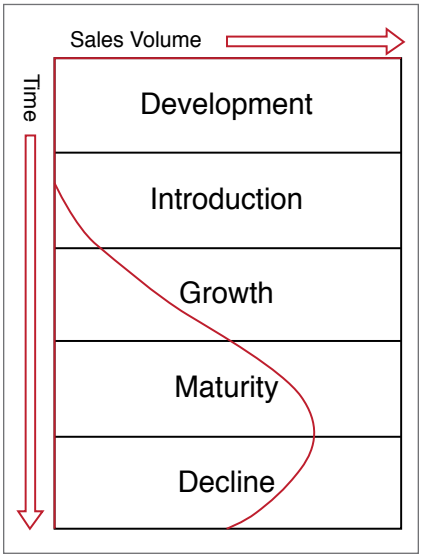


Figure 1 | The traditional life cycle of electronic parts.

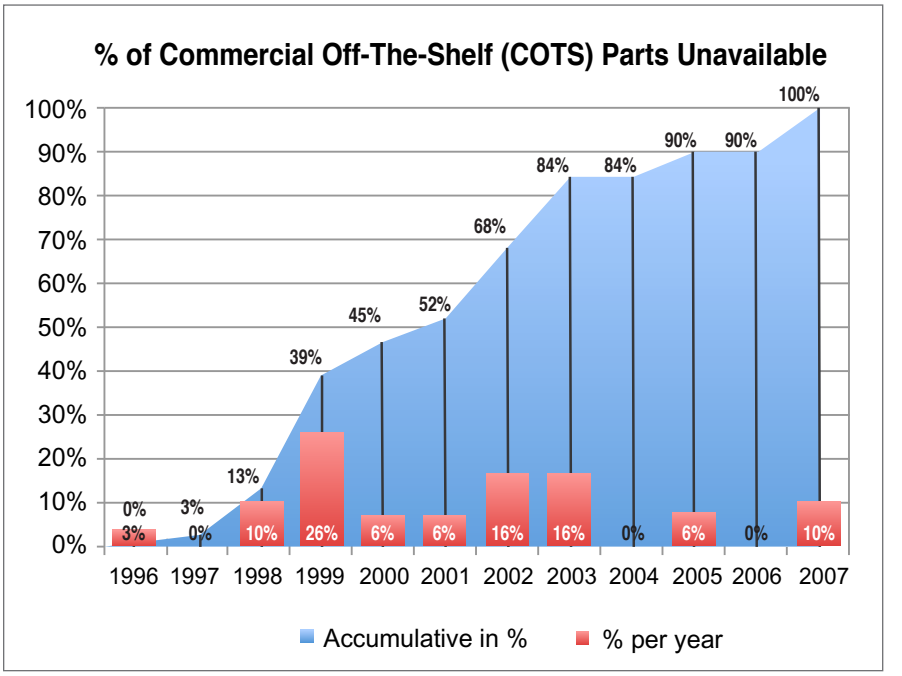


Figure 2 | Percentage of commercial off-the-shelf (COTS) parts that are out of production (unprocurable) versus the first 10 years of a surface ship sonar system's life cycle. (Courtesy of NAVSURFWARCENDIV Crane.)

parts in this system have reached end of life (EOL) and are obsolete before the first system is installed. While technological advances continue to fuel product development, engineering decisions regarding when and how a new part will be used and the associated risks involved with a new part and technology differentiate the winning from the losing products.

Obsolescence management

Unfortunately, the discontinuing of semiconductor devices is inevitable. Every product and technology has a life cycle; it is only a matter of time before a semiconductor device is discontinued by the manufacturer to make way for the next-generation part. Once a manufacturer discontinues a product and an EOL announcement is made, customers typically have six to 12 months to decide whether they want to place a last-time buy, or find an alternative solution for its system. OEMs need to strategically plan for EOL events in order to mitigate device obsolescence scenarios.

A semiconductor EOL announcement can create a costly inconvenience for customers, as it can be difficult to accurately forecast last-time buy requirements or absorb the additional inventory and storage costs associated with last-time buys. Customers supporting applications with long-term service requirements such as government, military and aerospace, and other OEMs can find themselves servicing and maintaining a product in the field for years without the support of an original semiconductor manufacturer. Depending on the length of the OEM's production and maintenance schedules, customers may be forced to project more than a decade out into the future to estimate the procurement requirements of the obsolete semiconductor device.

Inaccurate estimations can create costly problems for the OEM. If the OEM does not procure enough devices, supply diminishes faster than expected and the OEM must quickly find an alternative source so as to not shut down production or to discontinue maintenance and repair services. Purchasing too many devices affects the bottom line, as the last-time buy costs are coupled with the semiconductor storage costs.

EOL planning important

It is not enough for a customer to react to an EOL notification, as by that time a new source of semiconductor devices already needs to be identified and qualified as an authorized source for authentic and reliable parts. A plan should be implemented, perhaps as early as at the time a semiconductor is designed into the end equipment, in order to find a suitable new source for the critical semiconductor part. It is important for customers to have a proactive mindset for the EOL announcement of critical semiconductor components to ensure continuous manufacturing with traceable, high-quality semiconductors.

By implementing an EOL plan, OEMs will have sufficient time to investigate the alternatives to making a last-time buy

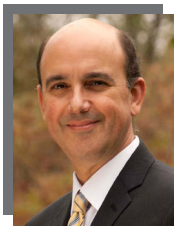
or dealing on the potentially dangerous gray market where counterfeits and substandard devices are more common. Alternative solutions include finding a drop-in replacement, partnering with an authorized continuing manufacturer, or redesigning the system.

A drop-in replacement part matches the original semiconductor device and provides a "pin-for-pin" alternative to the obsolete device. If supplied by an authorized source, this solution enables a customer to bypass many of the obstacles that the other options below carry. A "pin-for-pin" replacement is not easily found, and may require some recertifications and requalifications for mission-critical applications.

If a drop-in replacement cannot be procured from the original manufacturer, one option is to redesign the system to eliminate the part and use a different device in its place. A redesign can be costly, however, not only from engineering personnel hours and the purchasing of new devices, but also from production downtime as the new system goes through the retesting and requalification processes. For many customers, a redesign may not be a feasible option due to the higher costs and increased lead time associated with system certification.

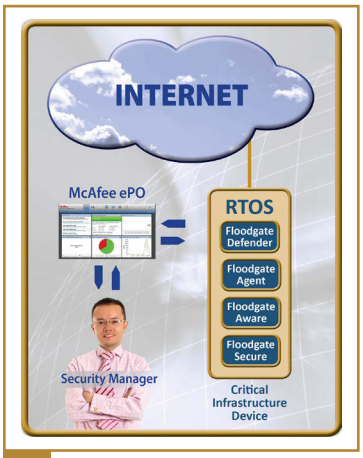
A more suitable solution for many companies is to partner with a contractually-licensed continuing manufacturer that can provide a continuous supply of qualified parts. These authorized manufacturers engage with the original semiconductor manufacturer to acquire the remaining inventory, including packaged devices, finished devices, die, selected intellectual property, tooling, test programs, and test equipment, thus extending the life of the semiconductor series. This transfer of technology assures there is no interruption of authorized, certified, and traceable devices in the supply chain. By engaging with an approved continuing manufacturer, a new semiconductor life cycle is created, subsequently eliminating device obsolescence.

The most effective way to mitigate the risks and costs of obsolescence is to accommodate rapid component changes by changing product designs and production processes quickly, easily, and inexpensively at all levels. However, this is not always feasible. Planning ahead for inevitable EOL events can ensure a continued supply of vital semiconductor devices without downtime. OEMs already faced with finding a replacement for an obsolete part can engage with companies that are authorized by original semiconductor manufacturers to build legacy parts using the suppliers' original die. **MES**



George Karalias *is the Director of Marketing and Communications for Rochester Electronics and has worked with the company for more than 10 years. His experience in the high tech and computer industries started in 1983 when he graduated from Boston College.*

Rochester Electronics
978-462-9332 • www.rocelec.com



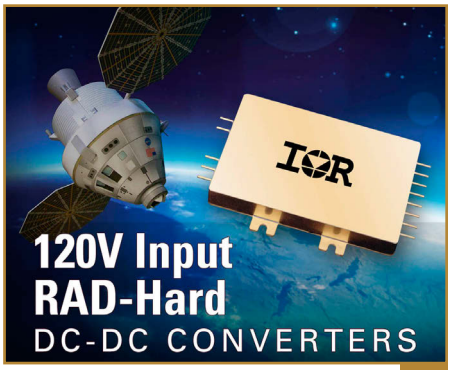
Protection from Internet threats

Icon Labs' Floodgate Defender security software for real-time operating systems (RTOS) delivers protection from Internet-based threats by controlling what packets the embedded device processes and by preventing unwanted packets from being processed. Unlike encryption and authentication, which may only protect the device from a hacker trying to connect, the Icon Labs product can prevent the hacker from even attempting to connect. Its filtering engine is capable of blocking denial of service attacks, packet floods, port scans, or other Internet-based threats.

The tool is a complete embedded firewall that provides static (rules-based) filtering, Stateful Packet Inspection (SPI), and threshold-based filtering. Along with McAfee's ePolicy Orchestrator (ePO) platform, the software creates a security solution for managing and protecting Department of Defense (DoD) operational assets, industrial control, the Internet of Things (IoT), and Smart Grid. The Floodgate products provide a solution to aid in compliance with regulatory guidelines and mandates; gather and report command, device, and event status information for audit requirements; and protect control units and endpoint devices from cyber risks. The solution also achieved "McAfee Compatible" status and along with Icon Labs' other software products is available through McAfee's Security Innovation Alliance (SIA).

Icon Labs • www.iconlabs.com • www.mil-embedded.com/p372359

40 W rad-hard 120V DC-DC converters



The M3G120 series of 40 W radiation-hardened (rad-hard) 120V input DC-DC converters from International Rectifier (IR) are designed for a range of analog and digital satellite power systems. The converters are targeted at satellite systems requiring long mission life (15 years or more), such as NASA's Orion Multi-Purpose Crew Vehicle (MPCV) programs and space stations. The M3G120 series is based on IR's M3G legacy series, which has been used in the space industry since 1998.

The DC-DC converters are lightweight – less than 110g included in a 3.5" x 2.5" x 0.475" package (including I/O pins and mounting tabs). The converters are available in single and dual output configurations, and feature standard single output voltages of 3.3, 5, 12, 15, and 28V and dual output voltages of ±5V, ±12V, and ±15V. Features of the M3G120 series include: 95V to 140V DC input; integrated EMI filter; input under-voltage protection; input/output and on/off control via converter's inhibit pin; single event effect (SEE) (Heavy Ions) with rated LET greater than 83 MeV-cm²/mg; synchronization; total ionizing dose (TID) of over 200 krad (Si); and as much as 160V input transients. The converters are also Class K hybrid MIL-PRF-38534 qualified.

International Rectifier (IR) • www.irf.com • www.mil-embedded.com/p372360

Digital radio test platform for Viking Series radios

The 3920B Digital Radio Test Set from Aeroflex features a 2.7 GHz radio frequency (RF) range for automated test and alignment of EF Johnson Viking Series radios. The company's Automated Test and Alignment procedure removes the need for user interaction with automated test and alignment of EF Johnson radios. The new test capabilities focus on the Viking VP600 Series, which come in three model variants: no keypad; limited keypad; or full keypad, and are IP67-rated, meet MIL standard 810 G specs, include a top display and Dual Shield design, feature 2.5 W of audio, and include a backlit keypad and display.

The Aeroflex product has low-phase noise RF signal generator (SSB phase noise of -110 dBc/Hz at 10 kHz offset); full spectrum analyzer and tracking generator with displayed average noise level of -140 dBm; and sensitive receiver for accurate measurements. The test system ensures tests and alignment to manufacturer-recommended specifications and to industry standards, ensuring proper interoperability and a uniform standard of performance within the radio's network technology.

Aeroflex • www.aeroflex.com • www.mil-embedded.com/p372361

All-in-one AC/DC modules

The sMV-28-500 from Astrodyne Power Supplies functions as an all-in-one AC/DC module that has been integrated into an Alternative Energy Storage and Distribution System (AESaDS) – which is a portable hybrid voltaic/battery power system used for power storage on the battlefield. Instead of fossil fuels, the AESaDS leverages alternative energy sources such as solar to provide reliable power to warfighters, reducing the need for excess fuel resupply in remote locations.

Each stackable 1,600-watt rechargeable battery and solar array provides 300 W of continuous electricity, and any excess energy is collected and stored in high-density batteries for later use when an alternative energy source is unavailable. The AESaDS provides AC/DC power to charge computing, communications, and targeting devices. Three of the sMV-28-500 modules are fed by a 3ϕ AC input and produce 1500 W of 28Vdc from paralleled modules. AESaDS underwent continuous power testing during the development phase of ambient temperatures as high as 116 °F, and provided 85 percent of the rated energy even under the extreme temperature. AESaDS is also transportable so can be deployed rapidly in heavy shock and vibration environments.

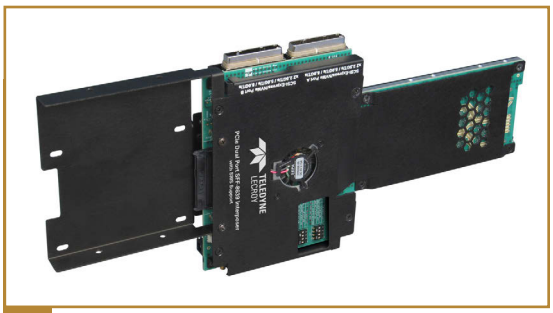
Astrodyne Power Supplies • www.astrodyne.com • www.mil-embedded.com/p372362

Mobile battery management system

The Power Scavenger battery charge management concept from Lincad is designed to meet the mobile tactical battery charging requirements of warfighters in the field. It weighs less than 750 g and measures 275 mm x 75 mm x 60 mm. Originally configured as a solar charge management device, it has been expanded to enable polarity independent connection to any DC source. It can recharge Lincad's Lithium Ion Power System (LIPS) suite of batteries from any DC source from 11 V to 50 V, which is achieved through integral latching and power connection terminals. Recharge of other in-service batteries, such as the BB250, is possible via configurable battery interface adapters (BIA); third party batteries can also be recharged from a fully charged LIPS battery if alternative power sources are unavailable.

In addition, active thermal management is engaged to maintain optimal function even in severe environments. The Power Scavenger also features a USB A connector for recharging other mobile devices and can be configured to emulate a current- and voltage-limited DC power supply for user-specific requirements. An adaptable communications interface for protocols such as DQ and SM Bus have also been incorporated into the design of the Power Scavenger.

Lincad • www.lincad.co.uk • www.mil-embedded.com/p372363



PCI Express dual port interposer card

Responding to increased demands for more PCI Express (PCIe) based analysis products Teledyne LeCroy engineers developed the SFF-8639 dual port interposer card for analysis of dual ported solid state drives (SSDs). When used with Summit Protocol Analyzers it enables PCIe bus traffic between a host backplane and dual port SSD device to be monitored, captured, and recorded for protocol analysis. The product supports lane widths of x2 per port, PCIe host interfaces such as NVM Express (NMVe) and SCSI Express (SOP/PQI), and protocols at data rates from 2.5 GTps as fast as 8 GTps.

The card supports SSD monitoring for each individual A or B port and also when both ports are active at the same time, as in a dual port mode configuration test setup. The dual port interposer provides connectivity and monitoring capability for dual ported SSDs targeted at enterprise storage equipment that use the SFF-8639 connector. The Teledyne LeCroy solution can be used with 2 1/2" or 3" drives. The drive is then inserted into a drive tray on the interposer that supports an electrical and mechanical connection to an SFF-8639 connector. The interposer taps all PCIe protocol traffic between the host backplane and the storage device and records it on two PCIe protocol analyzers with each port data time synchronized, where protocol issues and performance metrics can be further analyzed and debugged. The interposer enables accurate simultaneous monitoring of both data port paths during interoperability test and system development.

Teledyne LeCroy • www.teledynelecroy.com • www.mil-embedded.com/p372364

SynQor®

Advancing The Power Curve®

VPX

Military DC-DC Power Supplies

VITA 62 Compliant

High Efficiency

Field Proven

VPX

- VITA 62 Compliant
- High efficiency: 90% at full load
- 3U: 500W total output power
- 6U: 1000W and 800W total output power
- Active current share through backplane
- MIL-STD-461F, MIL-STD-704, and MIL-STD-810G Compliant
- Qualified to the most stringent VITA-47 levels

Made in the United States of America.

1-978-849-0600 www.SynQor.com

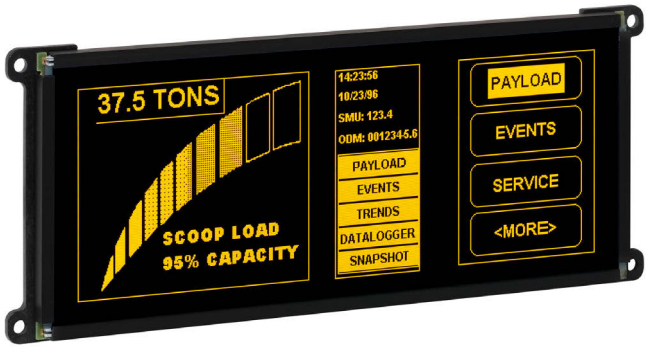
Keeping displays performing, regardless of the conditions

LUMINEQ®
POWERED BY beneq

MIL EMBEDDED: ***What are your customers looking for in terms of technical capabilities in display applications?***

Wide temperature range

One of the key requirements for military grade displays is a wide temperature range. Lumineq displays are frequently used for equipment that is used outdoor in the arctic winter cold and desert heat. All TFEL displays we deliver have an inherently wide operating range, e.g. from -25 °C to +65 °C, but special designs can achieve extreme conditions, ranging from -60 °C to +105 °C. The image quality is virtually unchanged over the entire temperature range, with instant pixel response and no motion blur even at the extreme colds.



Rugged design

Displays and the equipment they are embedded into need to be tough enough not to fail in harsh environments. They also need to be durable enough to function flawlessly in the heat of battle. Our displays are commonly used in harsh and demanding environments in heavy industry and military. A TFEL display consists of an emissive glass panel – a totally solid-state structure – pixel drive electronics and power supply, all built into a compact and lightweight, but rugged, package. TFEL displays have excellent shock resistance and are widely used in portable devices where shock and vibration or rough handling cannot be avoided.

Image quality

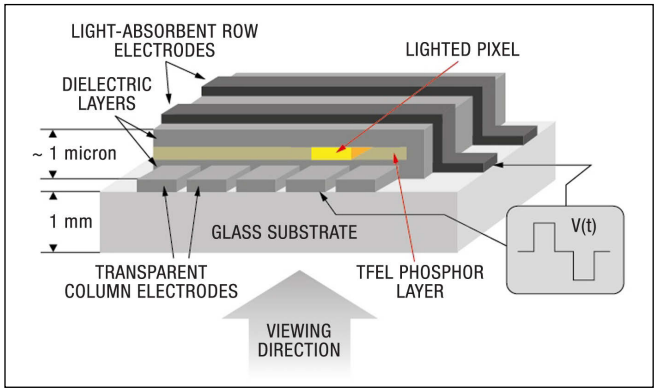
Needless to say, what you see is critical. The ability of a display to precisely convert the impulses it is fed into visual information that is clear and precise is of paramount importance. Lumineq TFEL displays incorporate a light absorbing thin film layer that virtually eliminates light reflections from the environment. This layer also absorbs all stray light from lit pixels, removing blooming and haloing around adjacent pixels. The result is inherently higher contrast and outstanding character crispness in all lighting conditions. The structure also eliminates the need for contrast enhancing filters.

Long-term availability

Today's technical development cycles shorten the time a certain product or model is available on the market. To remedy this, and to make products available for a longer time, Lumineq establishes lifetime programs that make it easy for customers to focus on their products. We can help build a stellar product and keep it in production longer. Lumineq Displays secures long-term commitments from component suppliers prior to design and production, and by close cooperation with suppliers we can ensure long-term availability of products and components.

The technology behind

Lumineq TFEL (thin film electroluminescent) displays are based on 30 years of proven manufacturing experience and 3 million display deliveries worldwide. The TFEL glass panel (see schematic below), the heart of the assembly, consists of a luminescent phosphor layer sandwiched between dielectric layers and a matrix of row and column electrodes. The circuit board, which contains the drive and control electronics, is connected to the back of the glass panel. A pixel on the display is lit by applying voltage to the row and column electrodes, causing the intersection area to emit light.



4 unique advantages of TFEL displays:

- Widest temperature range available: -60 °C to +105 °C
- Rugged and reliable
- Crystal clear, no motion blur
- 10+ year product lifecycle

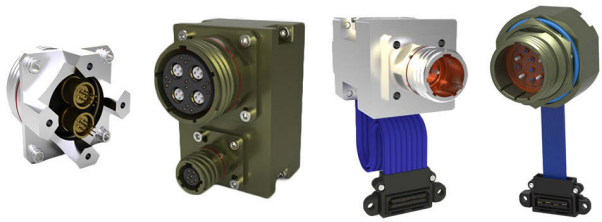
Joe Pimenoff *is Marketing Manager, Lumineq Displays, Beneq Products Oy. Contact him at joe.pimenoff@beneq.com.*

Lumineq Displays
+358 9 7599 530 • www.lumineq.com

RESOURCE GUIDE PROFILE INDEX

Amphenol® Aerospace

http://www.amphenol-aerospace.com/Fiber-Optic/ctf-media-converter-family



CTF (Copper to Fiber) Media Converters

Amphenol Aerospace is one of the world leaders in both high speed copper and fiber optics for rugged environments, offering the next generation of military/aerospace products by combining our legacy high speed copper technology with our innovative fiber optic product lines. Amphenol offers solutions from gigabit Ethernet to 10Gbps XAUI, as well as active optical cables, data conversion and more. Fiber optic termini on the I/O connector allow the user to run much higher speeds along long cable runs without concern for EMI. These also reduce the cable assembly weight by eliminating the shielding required for high speed copper assemblies. High speed copper integration "in the box" allows for easy installation and maintainability to the board. It also allows for smaller routing options resulting in smaller enclosures. All of Amphenol Aerospace's CTF Media Converters are designed for the most severe environments and meet MIL-STD-810 requirements. *However, the greatest advantage of using Amphenol Aerospace Media Converters is the affordability and knowing that Amphenol is in your corner!*

FEATURES

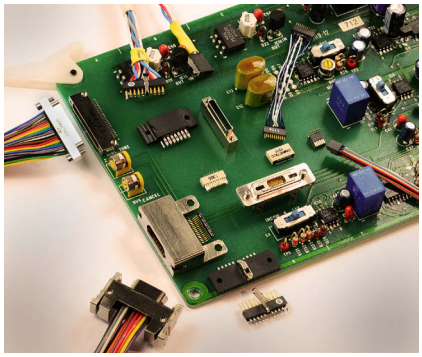
- No need for internal subsystem fiber harnesses, interconnect, or transceivers
- Utilizes copper transceivers and existing interconnect (backplane, harnessing, faceplate) for system fiber connection
- Media conversion at the connector reduces system complexity and cost
- APH Epoxy staking protects delicate fiber components for environment and assembly process
  - *Rugged – meets MIL-STD-810 environmental performance*
  - *Uses industry standard M29504, ARINC 801, or MT38999 Fiber Optic Interface*
  - *Optical fiber link distances up to 10km*
  - *Maximum optical channel bit error rate less than 10x10-9*
  - *Flexible design configurations to meet space constraints*
  - *Operational power input IAW MIL-STD-704*
  - *Natural Convection Cooling (no fan required)*
  - *Operational Temperature -40°C to +85°C*
  - *"In the box" copper interfaces can be PC Tail, Flexible Circuit Assembly, and more!*

Amphenol Aerospace | 800-678-0141

Contact: cservice@amphenol-aao.com • **Twitter:** https://twitter.com/AmphenolAAO
Facebook: https://www.facebook.com/pages/Amphenol-Aerospace/306480391950
LinkedIn: https://www.linkedin.com/company/amphenol-aerospace

OMNETICS CONNECTOR CORPORATION

www.omnetics.com



High-Reliabilty Board Mounted Interconnects

Omnetics Connector Corp is a design and manufacturer of high-performance, Nano and Micro miniature interconnects featuring light weight, high-density, high-reliability, rugged connectors. In addition to high performance, high-reliability Mil-Spec standard connectors, we design application specific connectors with interconnecting cables designed for systems in military, aerospace, and other high-reliability complex applications. Connectors built to military specifications and AS9100/ISO9001 standards to meet customer requirements. Worldwide representation and distribution is available on our standard and COTS products as well as engineering services to adjust designs to meet unique form, fit and function requirements. Equipment using Omnetics connectors include those used in Space, Mil-Aero equipment, geospatial systems, surveillance, robotics, and computer systems.

www.omnetics.com

FEATURES

- MIL-DTL-83513 & MIL-DTL-32139
- Rugged Micro & Nano connectors
- Micro & Nano mounting systems
- High Density Interconnects
- Low Profile
- SMT/Thru-Hole
- Polarized connectors
- High Speed
- Easy Board Edge connections
- Embedded-Systems compatible
- Pick & Place packaging
- Hybrid connector options
- Application specific designs available

Omnetics Connector Corp. | +1-763-572-0656

Contact: sales@omnetics.com
Twitter: https://twitter.com/Omnetics
LinkedIn: https://www.linkedin.com/company/omnetics-connector-corporation

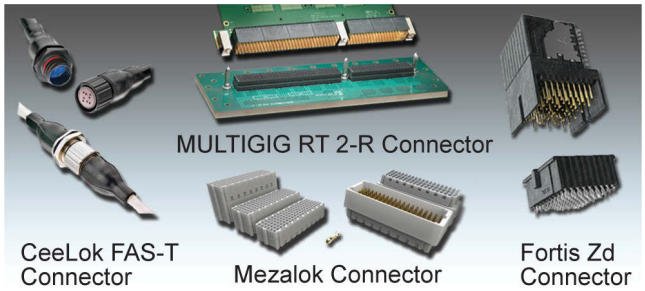
Avionics Technology: Connectors

mil-embedded.com/p9911581

TE connectivity AEROSPACE, DEFENSE & MARINE

1-800-522-6752

TheFutureUnleashed.com



Meet the Next Generation

Designed to perform in the most extreme environments, these compact, lightweight and high-speed interconnect solutions from TE Connectivity support increasing bandwidth requirements and withstand increasing shock and vibration conditions of emerging military, aerospace and marine applications.

CeeLok FAS-T Connector
- 10 Gb/s
- Small form factor – Shell size 8
- Field terminable
- 360° EMI protection

Mezalok Connector
- 5 Ghz+
- 500 mating cycles
- 4-point contact redundancy
- Available in 60, 114 and 320 positions and stack heights options 10, 12, 15 and 18 mm

Fortis Zd Connector
- 10 Gb/s+
- 4-point contact redundancy
- Ruggedized for harsh environments

MULTIGIG RT 2-R Connector
- Quad-redundant contact system
- Rugged survivability – High level shock and vibration beyond VITA 47
- "Pinless" Interface tested to 10,000 mating/unmating cycles

TE Connectivity | TheFutureUnleashed.com

Avionics Technology: Databus

mil-embedded.com/p9919567

SEALEVEL®

www.sealevel.com

1553 IP Cores

MIL-STD-1553 IP cores are the smart alternative to traditional 1553 ICs. This field-proven technology is software compatible with legacy applications, but at a fraction of the cost and board space of discrete ICs. A smaller footprint and ability to include multiple channels in a single FPGA also result in increased reliability (MTBF). Easy to integrate and test, Sealevel's MIL-STD 1553 IP cores are the perfect fit for your next military, avionics or space application.

Choose between various configurations and interfaces ranging from the basic 1553 front end, designed for simple applications where no CPU is controlling the system, to the most complex implementations interfacing with a local bus. Full third-party validation testing guarantees compliance to the MIL-STD-1553 specification, and IP cores from Sealevel are compatible with any clock frequency and 1553 transceiver.

Available software tools allow testing behavior in the lab, reducing design risks, costs, and time. Since FPGAs can be reprogrammed, upgrade and configuration of the IP core, even in the field, is simple. Sealevel IP cores will work with FPGAs from any manufacturer, eliminating obsolescence and other supply chain problems.

FEATURES

- Suitable for any MIL-STD-1553 BC, RT or MT implementation
- Software compatible with existing legacy 1553 applications
- Available with simple local bus or 33/66 MHz PCI back-end interface
- Provided with full verification environment
- 3rd party RT validation tested
- Small FPGA area utilization

Download the white paper today and learn more about MIL-STD-1553 IP cores, board level products, and simulation tools at www.sealevel.com.

Sealevel Systems, Inc. | 864-843-4343

Contact: sales@sealevel.com
LinkedIn: www.linkedin.com/company/sealevel-systems-inc
Twitter: https://twitter.com/sealevelsystems

COMPUTING SOLUTIONS

www.sie-cs.com

716 Series Conduction Cooled ATR Enclosures

716 Series offers a wide range of COTS solutions from a rugged precision machined design. Engineered for strength, light weight, and maximum cooling in a conduction-cooled environment, the 716 Series incorporates a unique frame and configurable conducting walls that allow the ATR to be tailored to meet a wide range of thermal requirements.

FEATURES

- Precision machined construction
- Available in 3U or 6U card formats
- Rugged deployment
- Expansive range of ARINC sizes
- Modular power supply
- AC or DC filtered inputs
- High altitude fan offering
- System performance monitoring
- Multiple bus architectures
- Cold start heaters
- Configurable I/O panel

SIE Computing Solutions, Inc. | 508-588-6110

Contact: info@sie-cs.com
Twitter: @SIE_CS
LinkedIn: www.linkedin.com/company/900478?trk=tyah

COMPUTING SOLUTIONS

www.sie-cs.com

717 Series Air-Over Conduction Cooled ATR Enclosures

The 717 Series is available in standard ARINC sizes that include 1/2 ATR Short to 1-1/2 ATR Long and any custom form factor. From bus standards to application-specific custom designs, the 717 Series provides an expansive offering of ATRs for platforms such as the VME, VME64x, VXS, VPX and CPCI architectures. Designed specifically for rugged deployment and to direct air over the thermal conducting walls, its cooling can be configured to meet application requirements by either drawing air through the walls and out a rear exhaust plenum or forcing air down the walls and directing it away from the equipment. When configured for unpressurized environments, the 717 Series can be configured with a high-altitude cooling scheme to permit ultimate performance at altitudes up to 50,000 feet. The 717 Series can be configured with optional avionics trays for isolation from shock and vibration environments common to airborne, vetronics and shipboard applications. For applications where stringent weight requirements are an issue, SIE Computing Solutions offers a lightweight composite solution.

FEATURES

- Dip-brazed construction
- Expansive range of ARINC sizes
- Modular power supply – AC or DC filtered inputs
- Cold start heaters & high altitude fan offering
- Configurable I/O panel

TECHNICAL SPECS:

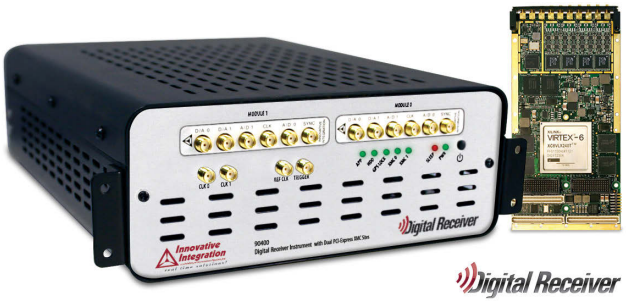
- Storage Temp (-40°C to +85°C MIL-STD-810F)
- EMC (MIL-STD-461D)
- Input Power (28VDC, 115VAC/400Hz. 1Ø, 115VAC/400Hz. 3Ø-MIL-STD-704A thru 704E, MIL-STD-1275A)
- Wiring (Low Toxicity – MIL-C-24643)
- Vibration (15 to 2,000Hz At 0.1g2/ Hz. (RMS~12g) MIL-STD-810F Method 514.5) & Shock (20g for 11ms MIL-STD-810F Method 516.5)

SIE Computing Solutions, Inc. | 508-588-6110

Contact: info@sie-cs.com
Twitter: @SIE_CS
LinkedIn: www.linkedin.com/company/900478?trk=tyah

Innovative Integration
a subsidiary of Interconnect Systems, Inc.
... real time solutions!

www.innovative-dsp.com



Digital Receiver

Digital Transceiver Instrument

Digital Transceiver is a turnkey solution providing integrated digital down-conversion (DDC), digital up-conversion (DUC), FFT, spectrum monitoring, and digital beamforming functions. The solution consists of three parts: An FPGA-based analog digitizer module (Table A) and a PC-based host controller (Table B) plus an optional firmware development kit (Table C) to allow customization.

The digitizer module (Table A) is provided with the software examples and API, pre-compiled firmware bit image, and the manual. The module is installed onto an XMC-PCIe adapter for use within a conventional PC or Innovative's Andale Data Recorders or the module may be natively installed within an Innovative ePC or VPXI-ePC embedded computer to create a miniature, self-contained instrument. Regardless, the application software may be used to capture and analyze the data immediately – a turnkey solution.

A development kit is available to support creation of advanced custom firmware by logic developers (Table C). Netlist versions of the IP cores used to build the Digital Receiver are provided, so developers can integrate with their own custom cores to create an enhanced receiver design.

Existing Innovative XMC module owners need only purchase the software/firmware listed in (Table D) to achieve full Digital Receiver functionality.

Innovative Integration | 805-578-4260 **Contact:** sales@innovative-dsp.com

octasic

www.octasic.com

OCTBTS 3000

Octasic's **OCTBTS** family of base station platforms allow OEMs to easily add LTE, UMTS, GSM as well as military-standard waveform coverage capability to platforms such as UAVs, man-pack radios, and vehicles. The OCTBTS family is designed for minimum SWaP, and includes form factors as small as 70 mm X 75 mm in the case of the miniature, single sector OCTBTS 3000 platform – about the size of a post-it note. Other models are available with 2 or 3 radio sectors. All models support MIMO operation and can switch from one air interface to another in a matter of seconds – just by reloading the software. For power-sensitive applications, OCTBTS 3000 is designed with a low-power ARM application processor, and optimized for passive cooling. The OCTBTS 3000 is a field-proven and reliable radio platform used by numerous military and government OEMs in North America and Europe.

FEATURES

- 400 MHz to 6 GHz Frequency Agility
- Multi-standard LTE and 3G/2G solution
- Expandable SDR platform for custom waveforms
- Miniature form factor
- Long range 2 X 2 MIMO radio

Octasic Inc. | +1 514-282-8858 **Contact:** sales@octasic.com

PENTEK

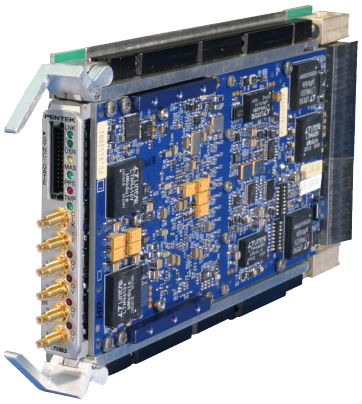
Setting the Standard for Digital Signal Processing

http://pentek.com/go/mesrg52663

GSM Receiver for Government, Military and Homeland Security Systems

The Model 52663 accepts four analog inputs from an external analog RF tuner, such as the Pentek Model 8111, where the GSM RF bands are downconverted to an IF frequency. These IF signals are then digitized by four A/D converters and routed to four channelizer banks, which perform digital downconversion of all GSM channels to baseband. Two of the banks handle 175 channels for the lower GSM transmit/receive bands and two more banks handle 375 channels for the upper bands. The DDC channels within each bank are equally spaced at 200 kHz.

Each DDC output is resampled to a 4x symbol rate of 1.08333 MHz to simplify symbol recovery. Every four DDC outputs are combined into a frequency-division "super-channel" that allows transmission of all 1100 channels across the PCIe Gen. 2 x4 interface. The GSM channelizer IP core is supported with factory-installed FPGA functions including packet formation, time stamping, four DMA controllers, gating and triggering.



FEATURES

- Complete GSM channelizer with analog IF interface
- Four 180 MHz 16-bit A/Ds
- Two banks of 375 DDCs for upper GSM band
- Two banks of 175 DDCs for lower GSM band
- Sample clock synchronization to an external system reference
- LVPECL clock/sync bus for multiboard synchronization
- PCI Express Gen. 2 x4 interface
- 3U OpenVPX form factor provides a compact, rugged platform
- Also available in XMC, PCIe, AMC, 3U and 6U cPCI form factors

Pentek | 201-818-5900

Contact: info@pentek.com

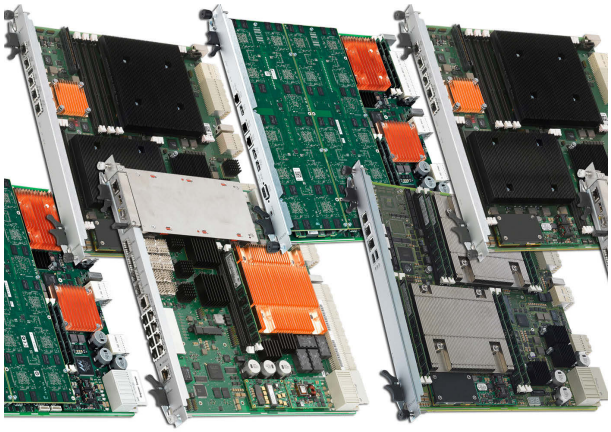
COTS Collection: Boards, Carriers, Mezzanines, ICs: AdvancedTCA (ATCA) mil-embedded.com/p9919625

ARTESYN™
EMBEDDED TECHNOLOGIES

www.artesyn.com/computing

ATCA® Blades

In addition to integrated, application-ready systems, Artesyn offers a rich selection of payload blades featuring various processor architectures to suit the dense computing and integrated network needs of military and aerospace applications. Artesyn closely follows the Intel® Embedded Roadmap for ATCA server blades, offering an optimized balance of performance, memory, I/O, and interfaces. Our broad portfolio of packet processing blades, based on Cavium OCTEON or Intel Xeon processors, are ideal for accelerating applications such as packet gateways, deep packet inspection, and network security. Artesyn has also developed a range of DSP-based ATCA blades that offer a very high density of IP voice and video transcoding for applications such as media resource function, session border controllers, and media gateways, and mobile video optimization.



FEATURES

- Designed and tested for challenging environments
- Tested and verified in Artesyn's Centellis™ series systems to simplify configuration and integration
- Wide range of processor architecture options including Intel Xeon, Cavium OCTEON, and DSPs from TI or Octasic
- Long life embedded processors support long life military programs

Artesyn Embedded Technologies | +1 (888) 412-7832

Contact: computingsales@artesyn.com
linkedin.com/company/artesyn
twitter.com/artesynembedded

COTS Collection: Boards, Carriers, Mezzanines, ICs: AdvancedTCA (ATCA)

mil-embedded.com/p9919626

ARTESYN™
EMBEDDED TECHNOLOGIES

www.artesyn.com/computing

Centellis™ ATCA® Systems

AdvancedTCA is an open standard bladed architecture that supports leading-edge packet and data processors while providing a degree of ruggedness in a compact and power-efficient bladed architecture.

ATCA is already engaged in various military & aerospace applications including shipboard communications and data center consolidation, naval tactical combat systems refresh, airborne reconnaissance, theater command centers, mobile TOCs, ground and airborne battle management systems, net-centric converged solutions for voice, video, and data, and C4ISR. All these programs require dense computing processor blades communicating over a 10G/40G integrated network.

Artesyn has the largest installed base of ATCA systems and blades and a long history of providing computing solutions to prime contractors and system integrators. Our ATCA systems in shock-isolated racks have operated flawlessly under afloat shock testing (Class A barge testing) and hour-long vibration testing with shock events increasing in intensity to the maximum -15G.

FEATURES

- Application-ready configurations shorten time-to-market
- Strong ecosystem of off-the-shelf or custom blades allows the platform to be easily configured for a range of applications & upgraded as new technologies become available
- Power & cooling up to 600 Watts per blade slot accommodates today's technology with headroom for higher powered processors in the future
- Integrated redundant switching of up to 40G to all slots in the backplane
- Long life embedded processors and switching architectures support long life military programs

Artesyn Embedded Technologies | +1 (888) 412-7832

Contact: computingsales@artesyn.com
linkedin.com/company/artesyn
twitter.com/artesynembedded

COTS Collection: Boards, Carriers, Mezzanines, ICs: CompactPCI

mil-embedded.com/p9918714

North Atlantic Industries
Accelerate Your Time-to-Mission

http://www.naii.com/3U-cPCI-ARM-Cortex-A9-75ARM1/P275

3U cPCI Single Board Computer (SBC) – 75ARM1

Made in the USA
Certified Small Business

The 75ARM1 is a modular 3U cPCI ARM Cortex™-A9 based SBC that can be configured with up to three NAI intelligent I/O and communications function modules. Choose from more than 40 intelligent I/O, communications, or Ethernet switch functions for the highest packaging density and greatest flexibility of any SBC in the industry. Developed specifically for rugged mil-aero applications via NAI's Custom-On-Standard Architecture™ (COSA™), the 75ARM1 offers a COTS solution that accelerates deployment of SWaP-optimized systems in air, land and sea applications. The 75ARM1 3U cPCI SBC delivers more intelligence and versatility in a smaller footprint, in less time, and with little or no NRE.

FEATURES

- ARM Cortex-A9 dual core 800MHz processor
- 512 MB DDR3 SDRAM
- Up to 32 GB SATA II NAND Flash (256 GB expansion option in slot #3)
- < 5 W MB power dissipation
- Up to 3 independent intelligent I/O function modules supported
- System controller (SysCon) or peripheral option
- Independent x1 SerDes interface to each function module slot
- Wind River® Linux, VxWorks® and Xilinx® PetaLinux OS support
- Continuous background Built-in-Test (BIT)
- Intelligent I/O library support included
- Operating temp: 0°C to +70°C or rugged -40°C to +85°C

North Atlantic Industries, Inc. | 631-567-1100

Contact: www.naii.com

ALPHI TECHNOLOGY CORPORATION

www.AlphiTech.com

PCIe-Mini-AD8200

The PCIe-Mini-AD8200 with 1X Lane PCI Express Mini card and a simultaneously sampled A/D, offers a mix of up to 8 single-ended or 4 differential analog input channels. All channels feature programmable gain 1 or 2 and can be programmed to handle analog input with a single-ended or differential configuration.

The 16-bit A/D converters can provide a global acquisition and conversion time of ≤5µsec per sample per channel. The board offers a programmable digital filter with ±5 V range and the –3 dB frequency is typically 15 kHz. In the ±10 V range the –3 dB frequency is typically 23 kHz.

Alphi Technology offers a variety of PCI Express Mini cards: PCIe-Mini-DA16, PCIe-Mini-1553, PCIe-Mini-ARINC429, PCIe-Mini-CAN, PCIe-Mini-DIO and more.

FEATURES

- 8 channels 16-bit A/D converter simultaneously sampled
- Fast throughput rate: 200 KSps for all 8 channels
- 8 channels SE or 4 pseudo differentials
- Single-ended or 4 differential channels
- True bipolar analog input ranges: ±10 V, ±5 V – selection applies to all channels
- Analog input clamp protection
- 1MΩ analog input impedance
- Programmable 2nd order anti-alias analog filter
- Over-sampling capability with digital filter
- PCI Express compliant

ALPHI Technology Corporation | 480-838-2428 **Contact:** sales@AlphiTech.com

ALPHI TECHNOLOGY CORPORATION

www.AlphiTech.com

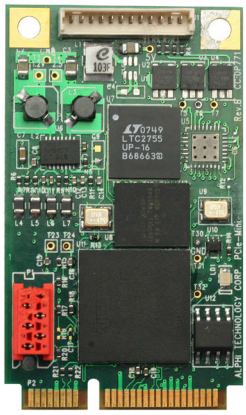
PCIe-Mini-DA4 – 4 Ch 16-bit D/A Software Programmable 2 µSecond DACs

The PCIe-Mini-DA4 is a PCI Express Mini board with a total of 4 voltage outputs D/A. Each output is followed by a buffer able to provide +/-30 mA.

Special function code allows global updates of all channels or by a group at a time. Standard ping-pong output registers for each channel or optional data RAM allows waveform generation with minimum processor involvement.

An internal register sets the sampling rate of the internal sampling rate generator. The card operates in one of 3 modes:

- *State machine providing automatic update and load on sampling clock*
- *Manual load with update on sampling clock*
- *Manual load and update*



FEATURES

- 16-bit D/A converter
- Settling time 2 µsec, 0-5V range
- 500 KSPS throughput
- Six Programmable Output Ranges per channel
- Up to 30 mA Output Drive requires +/-12V External Power Supply
- Unipolar: 0V to 5V, 0V to 10V
- Bipolar Mode: ±5V, ±10V, ±2.5V, -2.5V to 7.5V, ±10 mA continuous, ±30 mA max
- Multiple output spans available
- Temperature monitoring function
- Simultaneous or single update of D/A converter outputs
- Power-On Reset to 0V
- Two stage buffers
- Global output buffer with internal or external triggering

ALPHI Technology Corporation | 480-838-2428 **Contact**: sales@AlphiTech.com

Annapolis Micro Systems

www.annapmicro.com

Dual 4.0 GSps DAC

The Annapolis Micro Systems Dual Channel 4.0 GSps D/A I/O Card provides one or two 12-bit digital output streams at up to 4.0 GSps. The board has one or two MAX 19693 for 4.0 GSps, MAX 19692 for 2.3 GSps, or MAX 5859 for 1.5 GSps.

The Dual Channel DAC board has five SMA front connectors: two single-ended DAC outputs, a high-precision trigger input with Fs precision, and a universal single- or double-ended 50 ohm clock input. It has excellent gain flatness in the first 3 Nyquist Zones, ultra-low skew and jitter saw-based clock distributions, and main board PCLK sourcing capability.

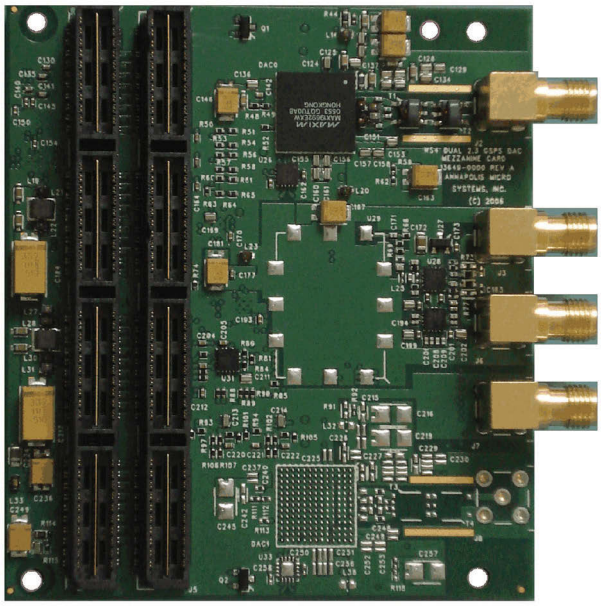
In concert with the WILDSTAR 4 or WILDSTAR 5 FPGA processing main boards, this mezzanine board supplies user-configurable real-time A to D conversion and digital output. Up to two A/D or D/A and up to two serial I/O cards can reside on each WILDSTAR 4 or WILDSTAR 5 VME/VXS or IBM Blade main board, or up to one A/D or D/A and up to one serial I/O card on each PCI-X or PCI Express main board.

Our boards run on many different operating systems. We support our board products with a standardized set of drivers, APIs, and VHDL simulation models. VHDL source is provided for the interfaces to A/Ds, D/As, DRAM/SRAM, LAD bus, I/O bus, and PPC Flash. CoreFire™ users will have the usual CoreFire Board Support Package.

The combination of our COTS hardware and our CoreFire FPGA Application Development tool allows our customers to make massive improvements in processing speed, while achieving significant savings in size, weight, power, person-hours, dollars, and calendar time to deployment.

Annapolis Micro Systems, Inc. is a world leader in high-performance COTS FPGA-based processing for radar, sonar, SIGINT, ELINT, Digital Signal Processing, FFTs, communications, software radio, encryption, image processing, prototyping, text processing, and other processing intensive applications.

Annapolis is famous for the high quality of our products and for our unparalleled dedication to ensuring that the customer's applications succeed. We offer training and exceptional special application development support, as well as more conventional customer support.



FEATURES

- One or two 12-bit Analog to Digital Converters: MAX 19693 for 4.0 GSps, MAX 19692 for 2.3 GSps, or MAX 5859 for 1.5 GSps
- Five SMA front panel connectors: two single-ended DAC outputs, one high-precision trigger input with Fs precision
- One universal single- or double-ended 50 ohm clock input
- High-precision trigger input manufacturing options – 1.65 V LVPECL, 2.5 V LVPECL, 3.3 V LVPECL
- I/O card plugs onto WILDSTAR 4 or 5 VME/VXS/PCI-X/PCI Express/ IBM Blade main boards
- JTAG, ChipScope, and Serial Port access
- Full CoreFire Board Support Package for fast, easy application development
- VHDL model, including source code for board-level interfaces
- Proactive thermal management system
- Industrial temperature range
- Includes one-year hardware warranty, software updates, and customer support
- **Designed and manufactured in the USA**

Annapolis Micro Systems, Inc. | 410-841-2514 **Contact**: wfinfo@annapmicro.com

Annapolis Micro Systems

www.annapmicro.com

Four Channel Clock Synchronization Board

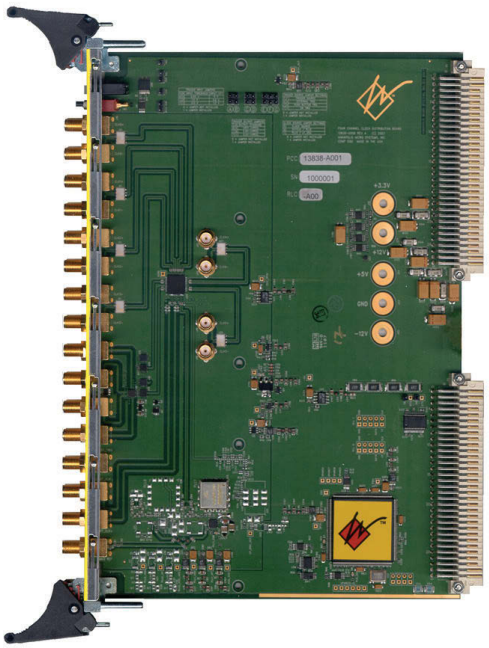
The **Four Channel Clock Distribution Board** distributes a common clock and synchronized control signal triggers to multiple cards in the system. This 6U VME64x/VXS board provides four high-speed, ultra-low jitter, ultra-low skew differential bulkhead mounted clock outputs, two ultra-low skew differential vertical SMA on-board clock outputs, and four ultra-low skew and clock synchronized single-ended bulkhead mounted control signal triggers.

A jumper set at board installation time or via optional P2 Serial Port determines which one of the two installed clock sources is active. Manufacturing options for Clock Source 0 are Single Ended or Differential External Clock, a PLL ranging from 700 MHz to 3 GHz with an On-Board Reference Oscillator, or a PLL ranging from 700 MHz to 3 GHz with a 10 MHz External Reference. Manufacturing options for Clock Source 1 are a PLL ranging from 700 MHz to 3 GHz with an On-board Reference Oscillator, a PLL ranging from 700 MHz to 3 GHz with a 10 MHz External Reference or an On-Board Low Frequency Oscillator ranging up to 800 MHz.

The four control trigger outputs can originate from a high-precision external source via front panel SMA, from a manual pushbutton on the front panel, or from software via an optional Backplane P2 Connector Serial Port. These trigger outputs are synchronized to the distributed clock to provide precise output timing relationships.

Annapolis Micro Systems is a world leader in high-performance, COTS FPGA-based boards and processing for RADAR, SONAR, SIGINT, ELINT, DSP, FFTs, communications, Software-Defined Radio, encryption, image processing, prototyping, text processing, and other processing intensive applications.

Annapolis is famous for the high quality of our products and for our unparalleled dedication to ensuring that the customer's applications succeed. We offer training and exceptional special application development support, as well as more conventional support.



FEATURES

- Four Synchronized Differential Front Panel Clock Outputs up to 3 GHz with Typical Skew of 5 ps
- Ultra-low Clock Jitter and Phase Noise – 275 Fs with 1,280 MHz PLL and external 10 MHz Reference
- On-board PLLs Manufacturing Options provide Fixed Frequencies of 700 MHz to 3 GHz, Locked to Internal or External Reference
- On-board Low Frequency Oscillator provides Fixed Frequencies up to approximately 800 MHz
- Four Synchronized Trigger Outputs, always Synchronized with the Output Clock, with Typical Skew of 5 ps
- Jumper Selectable Trigger Output Levels of 3.3 V PECL, 2.5 V PECL, or 1.65 V PECL
- Source Trigger from Front Panel SMA, Pushbutton, or Optional P2 Serial Port
- Cascade boards to provide up to 16 sets of outputs
- Compatible with standard VME64x and VXS 6U backplanes
- Universal clock input supports wide range of signal options, including signal generator sine wave
- Differential clock input permits multiple standards including: LVDS, 3.3 V PECL, 2.5 V PECL, and 1.65 V PECL
- Clock and Trigger Outputs Compatible with all Annapolis Micro Systems, Inc. WILDSTAR™ 2 PRO I/O Cards and WILDSTAR™ 4/5 Mezzanine Cards

Annapolis Micro Systems, Inc. | 410-841-2514

Contact: wfinfo@annapmicro.com

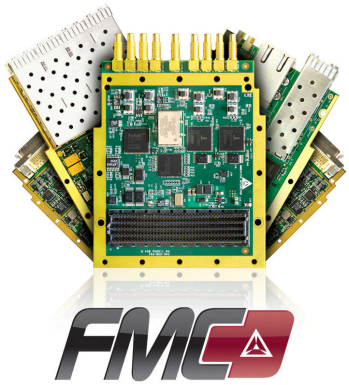
COTS Collection: Boards, Carriers, Mezzanines, ICs: FMC

mil-embedded.com/p9918257

Innovative Integration
a subsidiary of Interconnect Systems, Inc.
... real time solutions!

www.innovative-dsp.com

FMC Family



Innovative Integration's **FMC Family** offers a wide range of dense, high-performance I/O solutions in VITA57 form-factor.

The FMC standard requires only the core I/O transceiver circuitry that connects directly to the FPGA on the carrier card. The resulting efficiencies translate to substantial benefits.

The FMC modules deliver a wide range of solutions: High Speed digitizing Signal Generation for wireless Transceiver Pulse Generation, Medical Imaging, Precision Recording/Playback, RADAR, LTE WiMAX Physical Layer, Wireless Receiver and Transmitter, Remote Radio Head receiver, OBSAI and CPRI interface, Serial FPDP and SRIO fiber optic ports.

FEATURES

- High speed digitizing and signal generation FMC I/O modules
- **FMC-1000** Module with 2x 1000 MSPS 14-bit A/D, 2x 1000 MSPS 16-bit DAC with PLL and Timing Controls
- **FMC-500** Module with 2x 500 MSPS 16-bit A/D, 2x 1230 MSPS 16-bit or 1x 1GSPS DAC with PLL and Timing Controls
- **FMC-310** Module with 4x 310 MSPS 16-bit A/D with PLL and Timing Controls
- **FMC-250 FMC** Module with 2x 250 MSPS 16-bit A/D, 2x 500 MSPS 16-bit or 1x 1GSPS DAC with PLL and Timing Controls
- **FMC-SFP+ FMC** Module with Four SFP+ Ports

Innovative Integration | 805-578-4260

Contact: sales@innovative-dsp.com

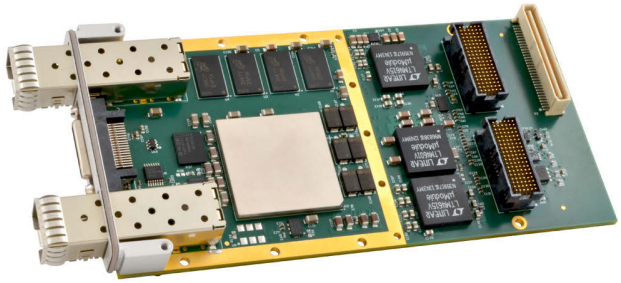
COTS Collection: Boards, Carriers, Mezzanines, ICs: FPGA

mil-embedded.com/p9918190

Acromag®
THE LEADER IN INDUSTRIAL I/O

www.acromag.com/fpgas

XMC-7K User-Configurable Kintex®-7 FPGA Module



Acromag's XMC-7K modules feature a high-performance user-configurable Xilinx© Kintex®-7 FPGA enhanced with high-speed memory and a high-throughput serial interface. The result is a powerful and flexible I/O processor module that is capable of executing custom instruction sets and algorithms.

Two versions of the XMC-7K are available, both with rear high-speed serial bus interface I/O. The XMC-7K SERIAL provides front I/O with dual SFP+ ports and a VHDCR connector, while the XMC-7K AXM provides additional I/O processing support via a separate AXM mezzanine card.

The logic-optimized FPGA is well-suited for a broad range of applications, such as: hardware simulation, communications, in-circuit diagnostics, military servers, and signal intelligence.

FEATURES

- Two versions: high-speed serial I/O or AXM I/O support
- Reconfigurable Xilinx© Kintex®-7 FPGA with 325k or 410k logic cells
- Quad DDR3 SDRAM, 124Mb x 64-bit
- 32M x 16-bit parallel flash memory for MicroBlaze™ FPGA program code storage
- 8-lane high-speed serial bus interface for PCIe Gen 2

Acromag | 248-295-7088

Contact: solutions@acromag.com
Become a fan: www.facebook.com/acromaginc
Follow us: www.twitter.com/acromag

Annapolis Micro Systems

www.annapmicro.com

2.0 GSps 10-bit A/D

The Annapolis Single Channel 2.0 GSps A/D I/O Card provides one 2.0 GHz A/D input with a resolution of 10 bits. The board has one e2v AT84AS004 that is fed by an onboard analog input circuit, which converts the single-ended 50-ohm SMA input into differential signals for the ADC. There is a universal single-ended 50-ohm SMA clock input and a high-precision trigger input allowing multiple A/D I/O cards to be synchronized together. Synchronization of A/D I/O cards can be facilitated by the Annapolis 4 or 8 Channel Clock Distribution Boards.

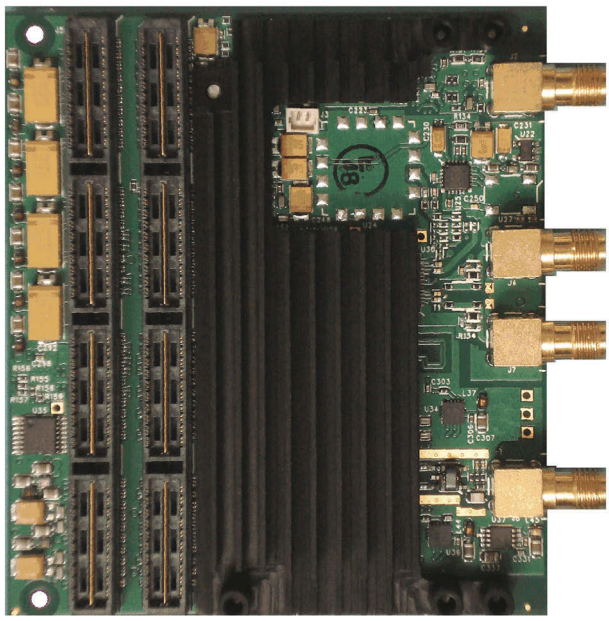
In concert with the WILDSTAR 4 or WILDSTAR 5 FPGA processing main boards, this mezzanine board supplies user-configurable real-time continuous sustained processing of the full data stream. Up to two A/D and up to two Serial I/O cards can reside on each WILDSTAR 4 or WILDSTAR 5 VME/VXS or IBM Blade main board, or up to one A/D and up to one Serial I/O card on each PCI-X or PCI Express main board.

Our boards run on many different operating systems. We support our board products with a standardized set of drivers, APIs, and VHDL simulation models. VHDL source is provided for the interfaces to A/Ds, D/As, DRAM/SRAM, LAD bus, I/O bus, and PPC Flash. CoreFire™ users will have the usual CoreFire Board Support Package.

The combination of our COTS hardware and our CoreFire FPGA Application Development tool allows our customers to make massive improvements in processing speed while achieving significant savings in size, weight, power, person-hours, dollars, and calendar time to deployment.

Annapolis Micro Systems, Inc. is a world leader in high-performance COTS FPGA-based processing for radar, sonar, SIGINT, ELINT, Digital Signal Processing, FFTs, communications, software radio, encryption, image processing, prototyping, text processing, and other processing intensive applications.

Annapolis is famous for the high quality of our products and for our unparalleled dedication to ensuring that the customer's applications succeed.



FEATURES

- One e2v AT84AS004 (2.0 GHz, 10-bit) A/D
- Four SMA front panel connectors: one 50-ohm analog input, one single-ended 50-ohm clock input, or differential 1.65 V LVPECL clock input
- One high-precision trigger input with Fs precision; high-precision trigger input – 1.65 V LVPECL, 2.5 V LVPECL, 3.3 V LVPECL
- Analog input bandwidth is 100 KHz-3.0 GHz
- I/O card plugs onto WILDSTAR 4 or 5 VME/VXS/PCI-X/PCI Express/ IBM Blade main boards
- JTAG, ChipScope, and Serial Port access
- Full CoreFire Board Support Package for fast, easy application development
- VHDL model, including source code for board-level interfaces
- Proactive thermal management system
- Includes one-year hardware warranty, software updates, and customer support
- We offer training and exceptional special application development support, as well as more conventional customer support
- **Designed and manufactured in the USA**

Annapolis Micro Systems, Inc. | 410-841-2514 **Contact**: wfinfo@annapmicro.com

Annapolis Micro Systems

www.annapmicro.com

WILDSTAR 5 for IBM Blade

Perfect Blend of Processors and Xilinx Virtex-5 FPGAs. Eleventh Annapolis Generation.

Direct Seamless Connections – No data reduction between: external sensors and FPGAs, FPGAs and processors over IB or 10 Gb Ethernet backplane, FPGAs and standard output modules.

Ultimate Modularity – From zero to six Virtex-5 processing FPGA/memory modules, and two Virtex-5 I/O FPGAs. Accepts one or two standard Annapolis WILDSTAR 4/5 I/O mezzanines: Quad 130 MSps through Quad 500 MSps A/D, 1.5 GSps through 2.2 GSps A/D, Quad 600 MSps DAC, InfiniBand, 10 Gb Ethernet, SFPDP.

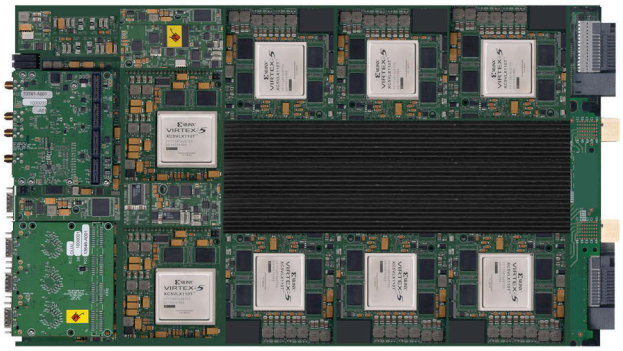
Fully Integrated into the IBM Blade Management System – Abundant power and cooling for maximum performance.

Annapolis Micro Systems, Inc. is a world leader in high-performance COTS FPGA-based processing for radar, sonar, SIGINT, ELINT, Digital Signal Processing, FFTs, communications, software radio, encryption, image processing, prototyping, text processing, and other processing intensive applications. We support our board products with a standardized set of drivers, APIs, and VHDL simulation models.

Develop your application very quickly with our CoreFire™ FPGA Application Builder, which transforms the FPGA development process, making it possible for theoreticians to easily build and test their algorithms on the real hardware that will be used in the field. CoreFire, based on dataflow, automatically generates distributed control fabric between cores. Our extensive IP and board support libraries contain more than 1,000 cores, including floating point and the world's fastest FFT. A graphical user interface for design entry supports hardware-in-the-loop debugging, and provides proven, reusable, high-performance IP modules.

WILDSTAR 5 for IBM Blade, with its associated I/O cards, provides extremely high overall throughput and processing performance. The combination of our COTS hardware and CoreFire allows our customers to make massive improvements in processing speed, while achieving significant savings in size, weight, power, person-hours, dollars, and calendar time to deployment.

Achieve world-class performance; WILDSTAR solutions outperform the competition.



FEATURES

- From two to eight Virtex-5 FPGA processing elements – LX110T, LX220T, LX330T, FX100T, FX130T, or FX200T; six are pluggable with power module and memory
- Up to 10.7 GB DDR2 DRAM per WILDSTAR 5 for IBM Blade Board
- 144 x 144 crossbar; 3.2 Gb per line; two external PPC 440s – 1 per each I/O FPGA
- Full CoreFire Board Support Package for fast, easy application development
- VHDL model, including source code for hardware interfaces and ChipScope access
- Available in both commercial and industrial temperature grades
- Proactive thermal management system – board-level current measurement and FPGA temperature monitor, accessible through host API
- Includes one-year hardware warranty, software updates, and customer support
- Blade management controller; USB, RS-485, Ethernet, KVM, 16 RIO, Switch to 1 GbE over backplane
- Save time and effort; reduce risk with COTS boards and software
- We offer training and exceptional special application development support, as well as more conventional support
- Famous for the high quality of our products and our unparalleled dedication to ensuring that the customer's applications succeed

Annapolis Micro Systems, Inc. | 410-841-2514 **Contact**: wfinfo@annapmicro.com

Annapolis Micro Systems

www.annapmicro.com

WILDSTAR 6 for AMCs

Annapolis Micro Systems, Inc. is a world leader in high-performance, COTS FPGA-based processing for radar, sonar, SIGINT, ELINT, DSP, FFTs, communications, Software-Defined Radio, encryption, image processing, prototyping, text processing, and other processing-intensive applications. Our fourteenth generation WILDSTAR 6 for AMC uses Xilinx's newest Virtex-6 FPGAs for state-of-the-art performance. It accepts one FMC I/O Card. Our boards work on a number of operating systems, including Windows, Linux, Solaris, IRIX, ALTIX, and VxWorks. We support our board products with a standardized set of drivers, APIs, and VHDL simulation models.

Develop your application very quickly with our CoreFire™ FPGA Application Builder, which transforms the FPGA development process, making it possible for theoreticians to easily build and test their algorithms on the real hardware that will be used in the field. CoreFire, based on dataflow, automatically generates distributed control fabric between cores.

Our extensive IP and board support libraries contain more than 1000 cores, including floating point and the world's fastest FFT. CoreFire uses a graphical user interface for design entry, supports hardware-in-the-loop debugging, and also provides proven, reusable, high-performance IP modules. WILDSTAR 6 for AMC, with its associated I/O Cards, provides extremely high overall throughput and processing performance. The combination of our COTS hardware and CoreFire allows our customers to make massive improvements in processing speed, while achieving significant savings in size, weight, power, person-hours, dollars, and calendar time to deployment.

Annapolis is famous for the high quality of our products and for our unparalleled dedication to ensuring that the customers' applications succeed. We offer training and exceptional special application development support, as well as more conventional support.

Save time and effort and reduce risk with our COTS boards and software. Achieve world-class performance – WILD solutions outperform the competition.

FEATURES

- One Xilinx Virtex-6 FPGA I/O Processing Elements – LX240T, LX365T, LX550T, SX315T or SX475T
- On board Host Freescale P1020 or P2020 PowerPC
- Up to 2.5 GBytes DDR2 DRAM in 5 memory banks or
- Up to 80 MB DDRII or QDRII DRAM in 5 memory banks
- Programmable FLASH to store FPGA image
- 4X PCI Express Bus Gen 2 between PPC and FPGA
- Supports VITA 57 FMC I/O Cards
- Full CoreFire Board Support Package for fast, easy application development
- VHDL model, including source code for hardware interfaces and ChipScope access
- Available in both commercial and industrial temperature grades
- Proactive Thermal Management System – current, voltage, and temperature monitoring sensors via Host API
- Includes one year hardware warranty, software updates, and customer support. Training available.

Annapolis is famous for the high quality of our products and for our unparalleled dedication to ensuring that the customer's applications succeed. We offer training and exceptional special application development support, as well as more conventional support.

Save time and effort and reduce risk with COTS boards and software. Achieve world-class performance – WILD solutions outperform the competition.

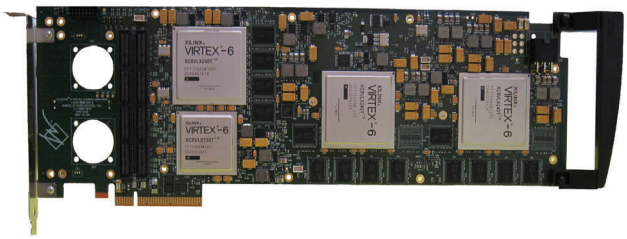
Annapolis Micro Systems, Inc. | 410-841-2514

Contact: wfinfo@annapmicro.com

Annapolis Micro Systems

www.annapmicro.com

WILDSTAR 6 PCIe



Annapolis Micro Systems, Inc. is a world leader in high-performance, COTS FPGA-based processing for radar, sonar, SIGINT, ELINT, DSP, FFTs, communications, Software-Defined Radio, encryption, image processing, prototyping, text processing, and other processing-intensive applications. Our fifteenth-generation WILDSTAR 6 for PCI Express uses Xilinx's newest Virtex-6 FPGAs for state-of-the-art performance. It accepts one or two I/O mezzanine cards, including Single 1.5 GHz 8 Bit ADC, Quad 250 MHz 12 Bit ADC, Single 2.5 GHz 8 Bit ADC, Quad 130 MHz 16 Bit ADC, Dual 2.3/1.5 GSps 12 Bit DAC, Quad 600 MSps 16 Bit DAC, Universal 3Gbit Serial I/O (RocketIO, 10 Gb Ethernet, InfiniBand), and Tri XFP (OC 192, 10G Fibre Channel, 10 Gb Ethernet). Our boards work on a number of operating systems, including Windows, Linux, Solaris, IRIX, ALTIX, and VxWorks. We support our board products with a standardized set of drivers, APIs, and VHDL simulation models.

Develop your application very quickly with our CoreFire™ FPGA Application Builder, which transforms the FPGA development process, making it possible for theoreticians to easily build and test their algorithms on the real hardware that will be used in the field. CoreFire, based on dataflow, automatically generates distributed control fabric between cores.

Our extensive IP and board support libraries contain more than 1,000 cores, including floating point and the world's fastest FFT. CoreFire uses a graphical user interface for design entry, supports hardware-in-the-loop debugging, and also provides proven, reusable, high-performance IP modules. WILDSTAR 6 for PCI Express, with its associated I/O cards, provides extremely high overall throughput and processing performance. The combination of our COTS hardware and CoreFire allows our customers to make massive improvements in processing speed, while achieving significant savings in size, weight, power, person-hours, dollars, and calendar time-to-deployment.

Annapolis is famous for the high quality of our products and for our unparalleled dedication to ensuring that the customer's applications succeed. We offer training and exceptional special application development support, as well as more conventional support.

Save time and effort and reduce risk with COTS boards and software. Achieve world-class performance – WILD solutions outperform the competition.

FEATURES

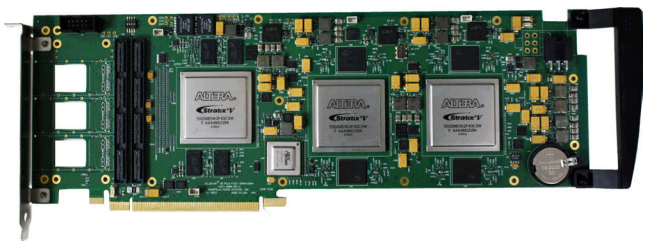
- Up to three Xilinx Virtex-6 FPGA I/O processing elements – LX240T, LX365T, LX550T, SX315T, or SX475T
- Up to 8 GBytes DDR2 DRAM or DDR3 DRAM in 14 memory banks per WILDSTAR 6 for PCI Express board or up to 480 MBytes DDRII+/QDRII DRAM in 15 memory banks
- Programmable FLASH for each FPGA to store FPGA images
- 8X PCI Express Bus Gen 1 or Gen 2
- Supports PCI Express standard external power connector
- High-speed DMA Multi-Channel PCI controller
- Full CoreFire Board Support Package for fast, easy application development
- VHDL model, including source code for hardware interfaces and ChipScope access
- Available in both commercial and industrial temperature grades
- Proactive Thermal Management System – Board Level current measurement and FPGA temperature monitor, accessible through Host API
- Includes one year hardware warranty, software updates, and customer support
- Training available

Annapolis Micro Systems, Inc. | 410-841-2514 **Contact**: wfinfo@annapmicro.com

Annapolis Micro Systems

www.annapmicro.com

WILDSTAR A5 for PCI Express



Supports up to Three 56G FDR InfiniBand, Three 40Gb Ethernet, or Twelve 10Gb Ethernet Connections.

WILDSTAR A5 for PCI Express uses Altera's newest Stratix V FPGAs for state-of-the-art performance. This is the first of a series of Altera Based FPGA Processing Boards from Annapolis.

Annapolis Micro Systems, Inc. is a world leader in high-performance, COTS FPGA-based processing for radar, sonar, SIGINT, ELINT, DSP, FFTs, communications, Software-Defined Radio, encryption, image processing, prototyping, text processing, and other processing intensive applications. It accepts one or two I/O mezzanine cards, including Single 1.5 GHz 8 Bit ADC, Quad 250 MHz 12 Bit ADC, Single 2.5 GHz 8 Bit ADC, Quad 130 MHz 16 Bit ADC, Dual 2.3/1.5 GSps 12 Bit DAC, Quad 600 MSps 16 Bit DAC, Universal 3Gbit Serial I/O (RocketIO, 10 Gb Ethernet, InfiniBand), and Tri XFP (OC 192, 10G Fibre Channel, 10 Gb Ethernet). Our boards work on a number of operating systems, including Windows and Linux. We support our board products with a standardized set of drivers, APIs and VHDL simulation models.

Develop your application very quickly with our CoreFire™ FPGA Application Builder, which transforms the FPGA development process, making it possible for theoreticians to easily build and test their algorithms on the real hardware that will be used in the field. CoreFire, based on dataflow, automatically generates distributed control fabric between cores.

Our extensive IP and board support libraries contain more than 1,000 cores, including floating point and the world's fastest FFT. CoreFire uses a graphical user interface for design entry, supports hardware-in-the-loop debugging, and provides proven, reusable, high-performance IP modules. WILDSTAR A5 for PCI Express, with its associated I/O Cards, provides extremely high overall throughput and processing performance. The combination of our COTS hardware and CoreFire allows our customers to make massive improvements in processing speed, while achieving significant savings in size, weight, power, person-hours, dollars, and calendar time to deployment.

FEATURES

- Supports up to Three 56G FDR InfiniBand, Three 40Gb Ethernet, or Twelve 10Gb Ethernet Connections
- Up to Three Altera Stratix V FPGA Processing Elements – GSD4, GSD5, GSD6, GSD8, GXA3, GXA4, GXA5, GXA7, GXA9, GXAB
- Up to 4 GBytes DDR3 DRAM in 2 Memory Banks and Up to 192 MBytes QDRII + SRAM in 12 Memory Banks per WILDSTAR A5 for PCI Express Board
- Programmable FLASH for each FPGA to Store FPGA Images
- 16X PCI Express Bus Gen 1, Gen 2, or Gen 3 to Host PC through On Board PCIe Switch
- Supports PCI Express Standard External Power Connector
- Multi Channel High Speed DMA
- Full CoreFire Board Support Package for fast, easy application development
- VHDL model, including source code for hardware interfaces and ChipScope Access
- Available in both commercial and industrial temperature grades
- Proactive Thermal Management System – Board Level current measurement and FPGA temperature monitor, accessible through Host API
- Includes one year hardware warranty, software updates, and customer support
- Training available

Annapolis is famous for the high quality of our products and for our unparalleled dedication to ensuring that the customer's applications succeed. We offer training and exceptional special application development support, as well as more conventional support.

Save time and effort and reduce risk with COTS boards and software. Achieve world-class performance – WILD solutions outperform the competition.

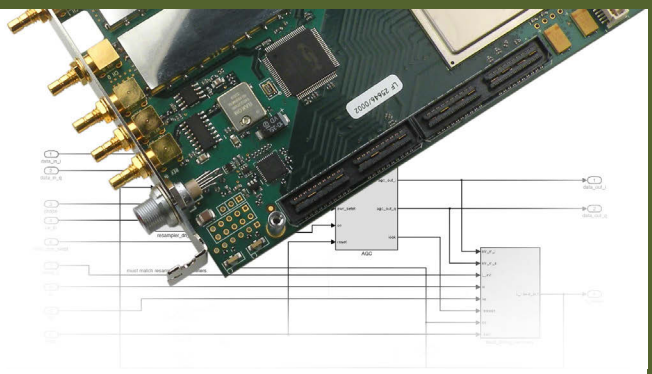
Annapolis Micro Systems, Inc. | 410-841-2514

Contact: wfinfo@annapmicro.com

edt
a HEICO company

www.edt.com/drx16.html

Dual IF digitizer | 16-bit ADCs | Custom FPGA-based DSP designs



The **DRX16 dual IF digitizer with 16-bit ADCs** has two identical ports with independently programmable sample clocks. Included EDT firmware and software provide basic signal capture and spectral display. Custom FPGA-based DSP design, development, and integration services are available.

The board has a configurable Xilinx Virtex-6 LX FPGA and two identical ports for signals from 2 to 300 MHz. Each port has a sample clock that is independently programmable from 10 to 130 MHz.

Output is digitized by the ADCs and captured in the FPGA, which can perform DSP functions or route data to the main board. The main board provides DMA, as well as additional memory and programmable FPGA resources.

FEATURES

- Mezzanine board (pairs with an EDT PCIe main board, which adds DMA, programmable FPGA resources, and memory)
- Digitizes two IF signals via two identical ports, each with its own independently programmable sample clock (10 to 130 MHz)
- **FPGA:** One programmable Xilinx Virtex-6 (XC6VLX240T)
- **ADCs:** Two 16-bit (one per port)
- **Sample clock I/O:** Programmable as input or output
- **Time base:** 10 MHz TCXO or reference input, available via reference output
- **Time code:** 1 pps or IRIG-B input
- **DSP:** Custom FPGA-based design + integration services available

EDT | 503-690-1234 | 800-435-4320

Contact: info@edt.com
www.edt.com

Innovative Integration
a subsidiary of Interconnect Systems, Inc.
... real time solutions!

www.innovative-dsp.com/products.php?product=Mini-K7

mini-K7

The **Mini-K7** is a user-customizable, turnkey embedded instrument that includes a full Windows/Linux PC and supports a wide assortment of ultimate-performance FMC modules. With its modular I/O, scalable performance, and easy to use PC architecture, the Mini-K7 reduces time-to-market while providing the performance you need.

Distributed Data Acquisition – Put the Mini-K7 at the data source and reduce system errors and complexity. Optional GPS or IEEE1588-synchronized timing, triggering and sample control is available for remote I/O. Limitless expansion via multiple nodes. Up to 4 SSD for data logging.

Uniquely Customizable – Dual FMC sites for IO, user-programmable FPGA for IO interfaces, triggering and timing control, USB ports.

Remote or Local Operation – Continuous data streaming up to 3200 MB/s to SSD or Gb/s Ethernet. Optional, stand- alone, autonomous operation with GPS-synchronized sampling.

Rugged – SSD boot drive support in a compact, rugged footprint that is ready for embedded operation.

8-26V DC-Only Operation – Perfect for portable or automotive data loggers or waveform generators.

FEATURES

- Combines an industry-standard COM Express CPU module with a single FMC I/O module in an extremely compact, stand alone design
- Programmable Kintex 7 325/410 and Spartan 6 FPGAs
- Small form factor: 4" H x 7" W x 10" D
- Conduction cooled design: Fins or cold-plate
- Stand-alone operation: Able to operate headless, booting from SSD Windows, Linux OS support. RTOS availability.
- Dual VITA 57 FMC IO module site. Add anything from RF receivers to industrial control modules.
- IO site (VITA 42.3) delivers >3000MB/s to CPU memory**
- Integrated timing and triggering support for IO includes GPS, IEEE1588 or IRIG-disciplined clock
- Supports Innovative and third-party FMC modules for private data channels, triggering and timing features
- USB 3.0 x2/2.0 x2, Gb Ehernet, SATA x4, DisplayPort, Touch Screen
- Up to 2 SSD (2.5 in)
- AC or DC operation

Innovative Integration | 805-578-4260

Contact: sales@innovative-dsp.com

Red Rapids

www.redrapids.com

SigFPGA

The SigFPGA product family provides the ideal platform to rapidly field application specific signal acquisition and generation functions minus the expense of custom hardware development. All of the products share a common FPGA processing architecture and code base with a variety of analog-to-digital and digital-to-analog converter options.

A wide selection of sample rates and support for AC or DC coupled analog connections allow the product to address a broad range of applications (radar, communications, geolocation, recorder/playback). The AC coupled configuration supports direct IF sampling (bandpass sampling) beyond the first Nyquist zone. The DC coupled option allows operating frequencies to approach zero without attenuation.

The SigFPGA product family is available in multiple form factors for seamless integration into an embedded chassis or traditional server/desktop environment. The embedded solution also conforms to the VITA conduction cooled XMC (CCXMC) specification. The CCXMC product can plug into any compliant host platform with no modification to the conduction frame.

FEATURES

- Available in XMC, CCXMC, and PCIe form factors
- Model 372 dual channel transceiver (16-bit, 250 MHz ADC/DAC)
- Model 376 dual channel receiver (12-bit, 1.6 GHz ADC)
- Model 377 quad channel receiver (16-bit, 250 MHz ADC)
- Model 378 octal channel receiver (16-bit, 125 MHz ADC)
- On-board fixed or programmable frequency synthesizer
- Support for external clock, reference, GPIO, and trigger
- Three Xilinx Kintex-7 FPGA size options available
- Two banks of high-speed QDR II+ SRAM
- Multiple on-board temperature and current monitors
- PCI Express (PCIe) x8 Gen 2 host bus interface
- FPGA core library includes scatter-gather DMA controller
- Windows, Linux, and VxWorks drivers & API
- Reference design with VHDL and C source code

Red Rapids | 972-671-9570

Contact: sales@redrapids.com

ACCES I/O PRODUCTS, INC.

www.accesio.com

USB-104-HUB – Rugged, Industrial Grade, 4-Port USB Hub

This small industrial/military grade hub features extended temperature operation (-40°C to +85°C), high-retention USB connectors, and an industrial steel enclosure for shock and vibration mitigation. The OEM version (board only) is PC/104 sized and can easily be installed in new or existing PC/104-based systems as well. The USB-104-HUB now makes it easy to add additional USB-based I/O to your embedded system or to connect peripherals such as external hard drives, keyboards, GPS, wireless, and more. Real-world markets include Industrial Automation, Embedded OEM, Laboratory, Kiosk, Transportation/Automotive, and Military/Government.

This versatile four-port hub can be bus powered or self powered. You may choose from three power input connectors: DC power input jack, screw terminals, or 3.5" drive power connector (Berg). Mounting provisions include DIN rail, 3.5" front panel drive bay mounting, and various panel mounting plates.

FEATURES

- Rugged, industrialized, four-port USB hub
- High-speed USB 2.0 device, USB 3.0, and 1.1 compatible
- Extended temperature operation (-40°C to +85°C)
- Data transfer rates up to 480 Mbps
- Supports bus-powered and self-powered modes
- Three power input connectors (power jack, screw terminals, or 3.5" drive Berg power connector)
- LED status indicators for power and overcurrent fault conditions for each downstream port
- USB/104 form factor for OEM embedded applications
- OEM version (board only) features PC/104 module size and mounting
- Includes micro-fit embedded USB header connectors in parallel with all standard USB connectors
- Industrial grade USB connectors feature high-retention design
- Small (4" x 4" x 1"), low profile, steel enclosure
- 3.5" front panel drive bay mounting provision

ACCES I/O Products, Inc. | 858-550-9559
10623 Roselle Street • San Diego, CA 92121

Contact: contactus@accesio.com
Follow us on Twitter: http://twitter.com/accesio
LinkedIn: www.linkedin.com/company/acces-i-o-products-inc.

Connect Tech Inc.

Embedded Computing Experts

www.connecttech.com/VXG001-OSM/

COM Express + GPU Embedded System

The COM Express + GPU Embedded System from Connect Tech combines the latest generation x86 processors with high-end Graphics Processing Units (GPUs) all into a ruggedized small form factor embedded system. Choose from 4th Generation Intel® Core™ i7 or i5 (Haswell) x86 processor options and from either the AMD Radeon E6760 GPU, ideal for driving multiple displays, or NVIDIA Ge-Force GT 745M GPU for applications that require access to CUDA cores and the ability to process complex mathematics in parallel with the on-board x86 CPU.

This embedded system exposes all of the latest generation interconnect including: Gigabit Ethernet, USB 3.0 and 2.0, DisplayPort++, VGA, LVDS, SATA III, GPIO, I2C, mSATA, miniPCIe, PCIe/104 and SD Card Expansion. This Embedded System uses all-locking ruggedized positive latching connectors and eases the challenge of cooling multiple processors with the use of our Unified Thermal Extraction Baseplate, which can be mounted directly into an enclosure or chassis for further thermal dissipation.

FEATURES

- Combines High-End GPUs with Latest Generation x86 Processors in a ruggedized small form factor
- Choose from AMD Radeon E6750 or NVIDIA GeForce GT-745M
- GPUs can be targeted for 4 independent display outputs OR for a headless GPU processing system utilizing CUDA cores
- All thermal extraction points from COM Express and GPU are brought out to a single unified plane

Connect Tech Inc. | 519-836-1291 | 800-426-8979

www.connecttech.com • sales@connecttech.com
Twitter: twitter.com/connecttechinc
Facebook: facebook.com/connecttechinc

Tech Source

An EIZO Group Company

www.techsource.com

Condor Series – Graphics, Video and GPGPU solutions

The Condor product line by Tech Source provides a complete range of high performance rugged graphics, imaging and video capture boards, H.264 encoders and recorders and GPGPU processors. The product line also supports a wide range of input and output resolutions and formats such as HD-SDI (SMPTE 292), STANAG, DVI, RS-170, RS-343 and VGA. Our XMC and 3U VPX boards support VPX, VME and cPCI platforms with Windows, Linux and VxWorks. Flexible designs allow the product to meet specific customer requirements with minimal cost impact.

Tech Source has engineered advanced video and graphics solutions for 27 years serving key Mil-Aero markets including Avionics, Naval, UAV and Vetronics to systems integrators and OEMs around the globe. With engineering and manufacturing near Orlando, FL, all products meet ISO-9001 standards and comply fully with ITAR. Vital partners including AMD, NVIDIA, and CoreAVI help support our efforts.

FEATURES

- Latest choice of AMD E8860 or E6760 GPU processors
- Option to remove GPU for frame capture only applications
- GPGPU: NVIDIA CUDA support on certain models or OpenCL
- High performance video input and/or graphics output
- H.264 hardware encoding with Main, Baseline or High profiles
- HD-SDI support on certain models for input and output

Tech Source Inc. | 800-330-8301

Contact: embeddedgraphics@techsource.com
www.techsource.com

http://www.aim-online.com/

AXC1553-x

The AXC1553 is a member of AIM's new family of PCI Express based XMC-Mezzanine (ANSI/VITA 42.3) modules targeted to embedded MIL-STD-1553A/B applications. The AXC1553 full function version concurrently acts as Bus Controller, Multiple Remote Terminals (31) and Chronological/Mailbox Bus Monitor. Versions with reduced functionality (Single Function or Simulator Only) are available as well as extended temperature range variants. All AXC1553 cards have the capability to handle eight General Purpose Discrete I/O (GPIO) signals and also offer Trigger-I/O. With the provided onboard flash memory the components boot up autonomously after power up.

Therefore the AXC1553 cards are well prepared for MIL-STD-1760D and other embedded applications requiring fast and autonomous boot up to operational mode.

FEATURES

- Concurrent BC, MRT (31) & Chronological/Mailbox Bus Monitor
- Full Error Injection/Detection (AS4112)
- Complex Triggering, Data Capture/Filtering & 100% Bus Recording
- Physical Bus Replay
- IRIG-B Time Encoder/Decoder
- Onboard Bus Network and variable Output Amplitude
- Full function, Single function & Simulator only versions available
- Driver Software included: WindowsXP/XPembedded/Vista/7/8 and Linux and for embedded VME systems (e.g. VxWorks)
- Drivers for other embedded applications are available on request
- Optional Databus Test & Analysis Software & RT Production Test Plan

AIM-USA | 267-982-2600

Contact: salesusa@aim-online.com

cwcdefense.com

Parvus DuraNET 20-10 Rugged 20-Port Gigabit Ethernet Switch System

The Parvus® DuraNET® 20-10 rugged Commercial Off the Shelf (COTS) Gigabit Ethernet switch subsystem from Curtiss-Wright is optimized for Size, Weight, Power and Cost (SwaP-C) sensitive embedded military and civilian computer network systems applications. Featuring advanced Layer 2 networking features with 20 ports of non-blocking wire-speed 10/100/1000Mbps connectivity, an integrated management processor and extremely low power consumption, the DuraNET 20-10 enables reliable local area network (LAN) switching across extended operating temperature ranges (-40 to +71C) and extreme shock/vibration conditions for technology refresh and new platforms, including mobile, tactical, aerospace, and ground vehicle applications.

FEATURES

- 20-Port 10/100/1000Mbps Gigabit ethernet switch subsystem in Size, Weight & Power (SWaP) optimized chassis: approx. 4 lbs. weight, < 3" height, < 20W max power for 20 ports of GigE
- Layer 2 switch management: 10/100/1000Mbps Gigabit ethernet connectivity, IPv4/IPv6 multicast, VLAN, QoS/CoS traffic prioritization, multiple/rapid spanning tree, link aggregation, IEEE-1588 precision timing protocol
- Layer 3 IPv4/IPv6 unicast static routing support for IP routing to attached WAN/radio ports
- SNMPv3, HTTP server, web GUI, RS-232 console CLI, port monitoring, RMON, Syslog, Network Access Server (NAS), 802.1X authentication, IGMP snooping, Access Control Lists (ACLs), Zeroization, Built-in-Test (BIT) diagnostics
- Designed to meet harsh MIL-STD-810G & DO-160G conditions

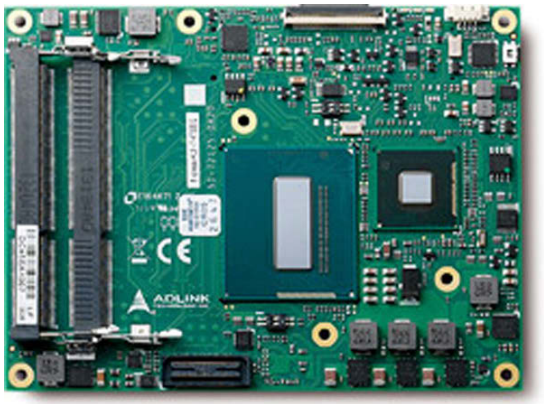
Curtiss-Wright Defense Solutions | 800-483-3152

Contact: ds@curtisswright.com

ADLINK TECHNOLOGY INC.

www.adlinktech.com

Express-HLE Processor with ECC memory



ADLINK's **Express-HLE** is a COM Express® COM.0 R2.1 Type 6 module supporting the 64-bit 4th generation Intel® Core™ i7/i5/3 processor with CPU, memory controller and graphics processor on the same chip. Based on the latest Mobile Intel® QM87 Express chipset, the Express-HLE is specifically designed for customers who need high-level processing and graphics performance in a long product life solution.

The Express-HLE supports Intel® Hyper-Threading Technology (up to 4 cores, 8 threads) and DDR3 dual-channel memory at 1333/1600 MHz to provide excellent overall performance, with ECC memory also supported. Intel® Flexible Display Interface and Direct Media Interface provide high speed connectivity to the Intel® QM77 Express chipset.

FEATURES

- 4th generation Intel® i7/i5/i3 processor with Mobile Intel® QM87 Express chipset
- Dual channel with ECC 1600/1333 MHz DDR3L memory up to 16GB in dual SODIMM socket
- Three DDI ports support three independent displays
- Seven PCIe x1, one PCIe x16
- GbE, four SATA 6 Gb/s, four USB 3.0 and four USB 2.0
- Supports Smart Embedded Management Agent (SEMA) functions

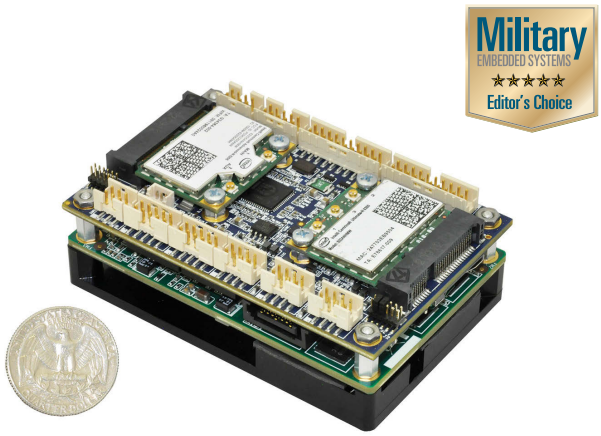
ADLINK Technology, Inc. | 408-360-0200

Contact: info@adlinktech.com
LinkedIn: www.linkedin.com/company/adlink-technology
Facebook: www.facebook.com/ADLINKTECH

Connect Tech Inc.
Embedded Computing Experts

www.connecttech.com

COM Express® Type 10 Mini Carrier Board



The **CCG010** features rugged, locking connectors and supports extended temperature ranges of -40°C to +85°C. This device offers ultimate durability with high performance processing, while fitting the needs of a constrained Size, Weight, and Power (SWaP) environment.

The CCG010, which supports the latest generation of low-powered CPUs from Intel and others, is module agnostic supporting a wide range of module vendors. It is 84mm x 55mm and weighs only 49 grams. It has two mini PCIe, mSATA, SATA, two x GbE, six USB, LVDS, DisplayPort/HDMI/DVI/VGA, HD Audio, 2 x RS-232/422/485. Both sockets have PCIe and USB signaling and one socket can be configured as mSATA. It has one DisplayPort++ (DDI) interface and can also be used for HDMI, DVI, or VGA. The device has one LVDS interface (18-bit, 3 data pairs), two Gigabit (10/100/1000) Ethernet ports, one from COM Express, and one from the on-board Intel 825741 PHY/controller.

FEATURES

- Extremely small size, 84mm x 55mm
- All ruggedized latching connectors
- 2 x mini PCIe, mSATA, SATA, 2 x GBE, 6 x USB, LVDS, DisplayPort/HDMI/DVI/VGA, HD Audio, 2 x RS-232/422/485
- Support for the latest generation of low powered CPU's
- Extended Temperature Range

Connect Tech Inc. | 519-836-1291 | 800-426-8979

www.connecttech.com • sales@connecttech.com
Twitter: twitter.com/connecttechinc
Facebook: facebook.com/connecttechinc

Technologic Systems

www.embeddedARM.com

TS-4900 Computer-on-Module

The TS-4900 is a high performance TS-SOCKET Computer on Module based on the Freescale i.MX6 CPU which implements the ARM® Cortex™-A9 architecture clocked at 1 GHz (Single or Quad Core) and paired with 1 or 2 GB of DDR3 RAM. Several industry standard interfaces and connections such as Gigabit Ethernet, WiFi and Bluetooth, USB, SATA II, PCI Express, and more make the TS-4900 a great fit for nearly any embedded systems application. A wide variety of software platforms are available including Linux and QNX (with Android and Windows support) for flexibility in matching your embedded system requirements.

TS-SOCKET Computer-on-Module Standard

TS-SOCKET is an embedded computer standard that defines both a form factor and a connection pin-out and is based on two 100-pin low-profile connectors, allowing secure connection between a Computer-on-Module and a carrier board. TS-SOCKET Computer-on-Module feature CPU, RAM, NAND Flash, SD Card socket, Ethernet MAC/PHY and requires a single 5 V power source. Peripherals can include USB host and device, I2C, CAN, GPIO, external bus, video, touchscreen, audio, SPI, and UART. All parts are soldered-on and no moving parts are used, ensuring embedded ruggedness and reliability.

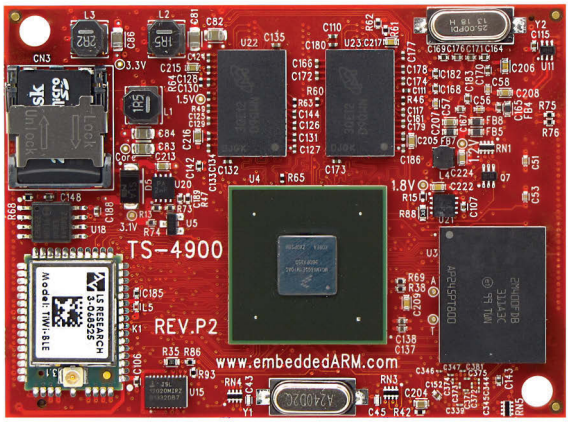
TS-SOCKET Specs:

- *75 mm x 55 mm (credit card sized)*
- *Dual 100-pin connectors*
- *Secure connection with mounting holes*
- *Common pin-out interface*
- *Low profile with 6 mm spacing*

A TS-SOCKET carrier board can be any piece of hardware, supplied by the customer or Technologic Systems, that interfaces with a Computer-on-Module through the dual TS-SOCKET standard connectors.

JUMP-START YOUR EMBEDDED SYSTEM DESIGN

The TS-SOCKET Computer-on-Modules securely connect to your custom carrier board, enabling drastically reduced design time and complexity. Start your embedded system design around one of our TS-SOCKET Computer-on-Modules to reduce your overall project risk and accelerate time-to-market.



Pricing starts at: $134 (Qty 1) or $99 (Qty 100)

TS-4900 FEATURES

- 1 GHz Single or Quad Core Cortex A9 ARM CPU
- 1 GB DDR3 RAM (Standard on Single Core)
- 2 GB DDR3 RAM (Standard on Quad Core)
- Bluetooth 4.0+EDR and WiFi 802.11BGN onboard radios
- Gigabit Ethernet
- USB Ports
- 2GB SLC eMMC flash storage
- microSD card socket
- SATA II port
- PCI Express Bus
- 4x COM (TTL), 1x RS-485 (Transceiver Required)
- Up to 70x DIO, 2x I2C, 1x I2S, 1x SPI, 2x CAN
- Industrial temperature range (-40°C to 85°C)
- Temperature compensated RTC
- Linux Kernel 3.10
- QNX Neutrino RTOS
- Android (Contact Us)
- Windows (Contact Us)
- Yocto, Debian, and Ubuntu distribution support
- Linux GUI development using QT, GTK, DirectFB, and more

TS-SOCKET BENEFITS

- Simplifies custom embedded systems
- Rapid design process gets products to market faster
- Several COTS carrier boards for evaluation and development
- Design your own carrier board or use our design services
- Computer-on-Module are interchangeable for future upgrades

OTHER TS-SOCKET CPUs

- **TS-4200:** Atmel ARM9 with super low power
- **TS-4600:** 450MHz at extremely low cost
- **TS-4710:** 1GHz ARM9 w/Video & DoubleStore™ SD Cards
- **TS-4712:** like TS-4710 + 2nd Ethernet
- **TS-4720:** like TS-4712 + eMMC Flash
- **TS-4800:** FreeScale iMX515 with video and 800MHz CPU

Technologic Systems | 480-837-5200

Contact: info@embeddedARM.com
https://twitter.com/ts_embedded • www.linkedin.com/company/technologic-systems
https://plus.google.com/+Embeddedarm-TS • www.facebook.com/embeddedARM

WinSystems®
An Employee-Owned Company

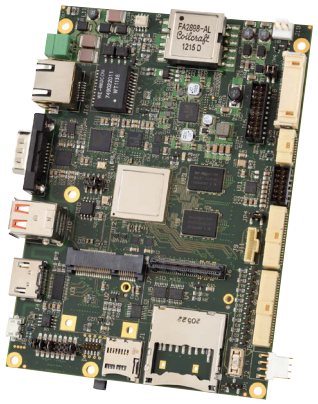
www.WinSystems.com

SBC35-C398Q – Industrial ARM® SBC with Real-Time Linux

Designed for industrial applications and long-term availability, WinSystems' **SBC35-C398Q** SBC features a quad-core ARM processor with options for expansion and customization. The combination of processing power and industrial I/O provides a flexible solution for a number of applications including security, industrial control, medical, transportation and MIL/COTS. This low-power design operates from -40° to +85°C without a fan or heatsink for improved reliability.

Kick- start development with our SD Cards, available preloaded with our newly released real-time Linux distribution or Android™. Our factory engineers offer technical support from pre-sales through production.

The IO60 connector supports I2C, SPI, TTL-UART, and PWM signals, allowing stackable module expansion. When coupled with the MiniPCIe socket, the SBC35-C398Q is one of the most expandable ARM single board computers currently on the market.



FEATURES

- Freescale® i.MX 6™ Quad-core ARM® Cortex™-A9 Processors
- Fanless -40° to +85°C operational temperature
- Powered by PoE or +10-50VDC Input
- 10/100/1000 Ethernet with IEEE-1588™
- USB 2.0 and USB On-The-Go Ports
- FlexCAN and RS-232/422/485 Serial Ports
- 24 GPIO tolerant up to 30VDC
- Mini-PCIe and IO60 (I2C, SPI, TTL, and PWM) expansion
- 10 year availability

WinSystems, Inc. | 817-274-7553

Contact: Info@WinSystems.com
Website: http://www.winsystems.com/SBC35-C398Q.cfm

WinSystems®
An Employee-Owned Company

www.WinSystems.com

Industrial SBC35-CC405 Small Form Factor Computers

The **SBC35-CC405** series of small form factor computers utilize the Intel® Atom™ E3800 family of processors in a standard 3.5-inch SBC format. The COM Express based solution includes two Gigabit Ethernet controllers with IEEE® 1588 time-stamping, two serial channels, USB 3.0, and +10 to +50V DC input.

Engineered for rugged applications, the low-profile thermal solution creates a sturdy base that protects the PCB assembly, provides convenient mounting, and enables fanless extended temperature operation.

Linux, Windows®, and other x86 operating systems can be booted from the CFast, mSATA, SATA, or USB interfaces, providing flexible data storage options. WinSystems provides drivers for Linux and Windows 7/8 as well as pre-configured embedded operating systems.

FEATURES

- Multi-Core Intel® Atom™ E3800 Processors
- Up to two independent displays (VGA, LVDS, DisplayPort)
- Two Ethernet Controllers with IEEE1588 time stamping
- Two RS-232/422/485 Serial ports
- Bus Expansion (Two MiniPCIe and IO60)
- Four USB ports (1xUSB 3.0 and 3xUSB 2.0)
- Bootable SATA, CFast, and mSATA
- Wide range +10 to +50V DC input
- Fanless -40° to +85°C operational temperature

WinSystems, Inc. | 817-274-7553

Contact: Info@WinSystems.com
Website: http://www.winsystems.com/SBC35-CC405-3845.cfm

Acromag
THE LEADER IN INDUSTRIAL I/O

www.acromag.com/comexpress

COM Express® Embedded Computing Solutions

Acromag's line of COM Express products provides an integrated solution for more extreme small form factor processing. Each module is designed to withstand the shock and vibration of harsh environments. Add advanced conduction cooling heat management technologies and extended temperature support for a reliable performance no matter where the mission takes you.

The modular solution minimizes costs and development time going from prototype to production. Fit for your defense and industrial applications, this rugged small form factor computing system is ready to deploy in your more extreme operations.

FEATURES

- COM Express® CPU, featuring Intel® Core™ i7/i5 processor and up to 16GB of removable memory
- Type 6 carrier card with Samtec SEARAY™ high-density connector
- Production front panels with MIL-DTL-38999 connectors
- Expansion via PMC/XMC/Mini PCIe modules
- Advanced thermal management via heat spreaders and conduction-cooled rails
- Made in the USA

Acromag | 248-295-7088

Contact: solutions@acromag.com
Become a fan: www.facebook.com/acromaginc
Follow us: www.twitter.com/acromag

ADL Embedded Solutions™
Embedded. Works Anywhere.™

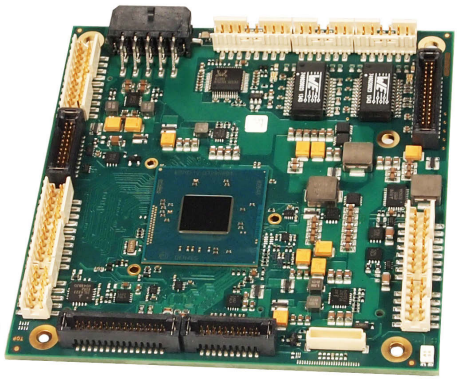
www.adl-usa.com

NEW ADLE3800PC – Intel® E3800 Series PCIe/104 SBC

The ADLE3800PC is based on Intel's first System-on-Chip (SoC) E3800 Atom product family which is built using Intel's 22nm 3D Tri-gate process. It offers vastly superior compute performance and energy efficiency including Intel's 7th generation graphics engine for stunning graphics performance. Improved power management capabilities result in standby power measured in milliwatts with days of standby time.

Potential Applications Include:

- *Military & Defense Rugged SFF*
- *Rugged Mobile Computing*
- *Portable Medical Devices*
- *Mobile Autonomous Systems for Civil, Commercial and Defense Applications Including:*
  - *Unmanned Ground Vehicles*
  - *Robotic Subs*
  - *Unmanned Avionics*
  - *Unmanned Buoys and Other Surface Vehicles*



FEATURES

- Intel® E3800 Series SoC Processors, DC/Quad
- Junction Temperature Rated at -40C to +110C
- Up to 8 GB DDR3L-1333, 1.35V SoDIMM204 Socket
- Type 2 Downward-Stacking PCIe/104 V2.01 with 2x Gen2 PCIe x1 Lanes
- 4x USB 2.0, 1x USB 3.0, 2x Serial COM
- 2x SATA 3 Gb/s, 2x GLAN Ethernet
- PCI Express Mini Card 1.2 Socket, Compatible with Mini PCIe or mSATA Modules

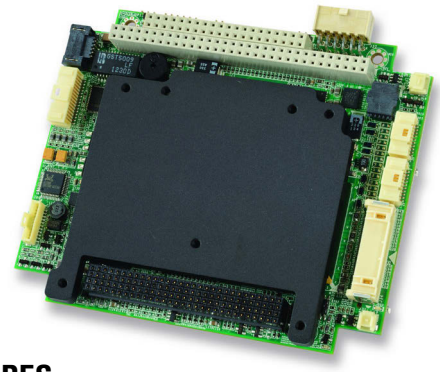
ADL Embedded Solutions Inc. | 858-490-0597

Contact: sales@adl-usa.com

WinSystems®
An Employee-Owned Company

www.WinSystems.com

PPM-C393 – Industrial Intel® Atom™ PC/104-*Plus* SBC



WinSystems' **PPM-C393** industrial single board computers feature highly integrated functionality with PC/104-*Plus* expansion, providing a flexible and cost-effective solution for demanding applications. The industry standard PC/104 form factor provides access to data acquisition, communications, power supplies, and other modules available from WinSystems and suppliers worldwide.

The low power PPM-C393's -40°C to +85°C operation benefits applications such as security, Mil/COTS, medical, transportation, data acquisition, and communications. The small and rugged PC/104 form factor is proven reliable in these industries.

Kick-start development with our Industrial CompactFlash cards available preloaded with Linux, Windows® Embedded Standard 2009, and Windows® Embedded 7. Our factory engineers offer technical support from pre-sales through production.

FEATURES

- Low power Intel® Atom™ N455 CPU
- -40° to +85°C operational temperature
- Four serial ports (two RS-232, two RS-232/422/485)
- Eight USB 2.0 ports with polyfuse protection
- Intel® Gigabit Ethernet controller
- Bus expansion PC/104 and PC/104-*Plus*
- Simultaneous LVDS and VGA video support
- Bootable CompactFlash and SATA 2.0 support
- Runs x86 operating systems including Linux and Windows®

WinSystems, Inc. | 817-274-7553

Contact: Info@WinSystems.com
Website: http://www.winsystems.com/PPM-C393-S.cfm

ACCES I/O PRODUCTS, INC.

www.accesio.com/PCIe-IDIO-24

PCIe-IDIO-24 Isolated PCI Express Digital I/O Card

The PCIe-IDIO-24 was designed for high-voltage protection in industrial control and monitoring applications. This product features 24 optically isolated digital inputs and 24 solid state FET relay outputs. The card is an x1 PCI Express device which can be used in any available PCI Express slot. Optocouplers on the card are rated for 2,500V isolation and help protect systems in industrial environments against high voltages or currents caused by line surges or ground loops. The solid state outputs are capable of switching from 5-34DC at 2A continuous.

The PCIe-IDIO-24 offers change of state detection (COS) on all inputs (including TTL lines), which can generate an interrupt whenever one or more of the digital inputs changes state. This eliminates the need for constant polling and reduces processor overhead. A digital change of state can be configured to detect rising, falling, or both edges.

Applications include factory automation, energy management, industrial ON/OFF control, security systems, manufacturing test, and process monitoring.

FEATURES

- 24 optically isolated, non-polarized digital inputs
- Polarity insensitive AC/DC inputs accept up to 31 VDC or AC RMS
- Software configurable filters on inputs for electrically noisy environments
- Can detect input state change and assert interrupt
- 24 optically isolated fully protected FET high-side switch outputs
- Outputs capable of switching from 5-34 VDC at 2A
- Optocouplers rated for 2.5kV isolation
- Four optically isolated output groups and two optically isolated input groups
- 8 non-isolated TTL/CMOS I/O lines
- 12-channel I/O, and input or output only versions available

ACCES I/O Products, Inc. | 858-550-9559
10623 Roselle Street • San Diego, CA 92121

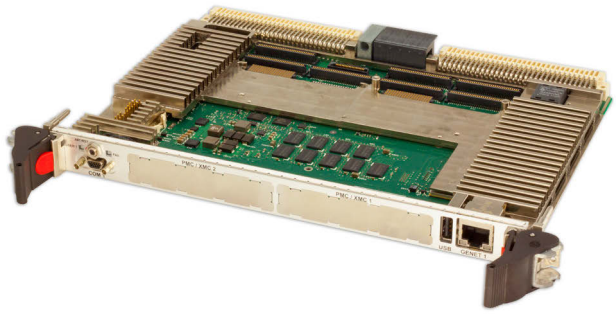
Contact: contactus@accesio.com
Follow us on Twitter: http://twitter.com/accesio
LinkedIn: www.linkedin.com/company/acces-i-o-products-inc.

ARTESYN™
EMBEDDED TECHNOLOGIES

www.artesyn.com/computing

MVME8100

Artesyn's **MVME8100** is a high performance 6U VME/VXS SBC featuring the Freescale QorIQ P5020 processor with up to 8GB DDR3-1333MHz ECC memory, 512K NVRAM, and 8GB eMMC NAND Flash. It offers expanded I/O and memory features with PCIe and SRIO fabric connectivity and multiple USB, Serial and Ethernet ports. The MVME8100 is offered in commercial and fully rugged variants for extreme environments with extended shock, vibration, temperatures and conduction cooling. It is designed for a range of high end industrial control such as SPE and photo lithography and C4ISR, including radar/sonar. It will provide technology insertion to prolong current programs while providing more computing performance and data throughput. Supported operating systems include Linux, Wind River VxWorks, and Green Hills INTEGRITY.



FEATURES

- VME/VXS SBC with Freescale QorIQ P5020 1.8/2.0GHz
- Up to 8GB DDR3-1333MHz ECC Memory, 512KB NVRAM, embedded NAND Flash (8GB eMMC)
- 2 PMC/XMC sites
- Optional mounting kit to support 2.5" SATA SSD
- 2x4 PCIe or 2x4 SRIO connectivity to VXS backplane P0
- Up to 3 USB 2.0 ports, 5 Ethernet ports, 5 Serial ports, 4 GPIO
- Extended temperature and conduction cooled variants
- Conformal coating available

Artesyn Embedded Technologies | +1 (888) 412-7832

Contact: computingsales@artesyn.com
linkedin.com/company/artesyn
twitter.com/artesynembedded

Acromag®
THE LEADER IN INDUSTRIAL I/O

www.acromag.com/vpxcarriers

VPX Carrier Cards for XMC/PMC Modules

Acromag's new family of VPX mezzanine carrier cards provides a simple and cost-effective solution for interfacing XMC and PMC modules to a VPX computer system. The carrier card routes power and bus signals to a plug-in mezzanine module through the VPX card slot connector (3U) or OpenVPX™ data plane (6U). Industrial I/O and configurable FPGA modules from Acromag or other vendors are supported.

These carriers are ideal for high-performance industrial, defense, scientific research, and telephony systems requiring high-speed I/O expansion.

FEATURES

- 3U and 6U form factors
- Interfaces up to two PMC or XMC modules
- PCIe x8 Gen 2 interface
- Air-cooled and conduction-cooled versions
- REDI also available for 3U form factors

Acromag | 248-295-7088

Contact: solutions@acromag.com
Become a fan: www.facebook.com/acromaginc
Follow us: www.twitter.com/acromag

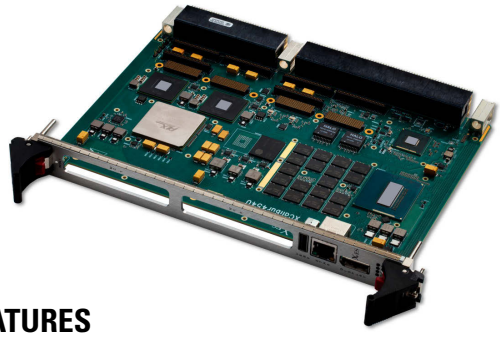
COTS Collection: Boards, Carriers, Mezzanines, ICs: VITA 46 VPX

mil-embedded.com/p9918992

X-ES

xes-inc.com

XCalibur4540 | 4th Gen Intel Core i7 6U VPX Module



The XCalibur4540 is a high-performance, 6U OpenVPX™, multi-processing, single board computer that is ideal for ruggedized systems requiring high-bandwidth processing and low power consumption. With a 4th generation Intel® Core™ i7 Haswell processor, four 10 Gigabit Ethernet ports on the data plane, and a configurable x16 Gen3-capable PCI Express expansion plane interface, the XCalibur4540 delivers enhanced performance and efficiency for today's embedded computing applications.

The XCalibur4540 provides up to 16 GB of DDR3L-1600 ECC SDRAM in two channels, two PrPMC/XMC slots, and up to 64 GB of SATA NAND flash. The XCalibur4540 also supports five Gigabit Ethernet ports, two graphics ports, three SATA ports, three USB 2.0 ports, and two RS-232/422/485 serial ports out the front panel and/or backplane.

FEATURES

- Supports 4th generation Intel® Core™ i7 processors
- Compatible with multiple OpenVPX™ (VITA 65) profiles
- Ruggedized Enhanced Design Implementation (REDI) per VITA 48
- Conduction or air cooling
- Supports two PrPMC/XMC modules
- Up to 16 GB of DDR3L-1600 ECC SDRAM in two channels
- Up to 64 GB of onboard SATA NAND flash
- Four 10 Gigabit Ethernet ports and five Gigabit Ethernet ports
- Four x4, two x8, or one x16 Gen3-capable PCI Express ports from switch to backplane
- Two graphics ports, three SATA 3.0 Gb/s ports, and three USB 2.0 ports
- Two RS-232/422/485 serial ports
- Wind River VxWorks BSP, Linux BSP, Microsoft Windows drivers

Extreme Engineering Solutions (X-ES) | 608-833-1155

Contact: sales@xes-inc.com
twitter.com/XES_INC • facebook.com/XES.INC

COTS Collection: Boards, Carriers, Mezzanines, ICs: VITA 48 VPX-REDI

mil-embedded.com/p9918717

ADLINK TECHNOLOGY INC.

www.adlinktech.com

VPX6000 Series Rugged 6U VPX Processor Blade

ADLINK's **VPX6000** is a dual-CPU 4th generation Intel® Core™ i7 processor 6U VPX blade (0.85" pitch) with Mobile Intel® QM87 Express chipset in a rugged, conduction-cooled, VPX REDI (VITA 48) form factor. The VPX6000 features two CPU sub-systems, each with up to 16GB DDR3-1600 dual channel ECC memory soldered onboard and 32GB SLC SATA onboard soldered solid state drive. Rear I/O per node includes 2x 10GbE, 2x 1000BASE-BX and 2x 1000BASE-T, 2x PCIe x1, HD audio (Line-in, Line-out), 3x SATA 6 Gb/s, 2x USB 3.0, 2x USB 2.0, 8x GPIO, HDMI, DVI and RS-232/422.

A VPX-R6000 Rear Transition Module (RTM) is available to access rear I/O signals from the VPX6000, and a tBP-VPX6000 Test Backplane supporting three payload slots is available for users to validate VPX6000 functionality. The VPX6000 Series is rugged, conduction-cooled with conformal coating, making it ideal for mission-critical applications such as military and aerospace platfoms.

FEATURES

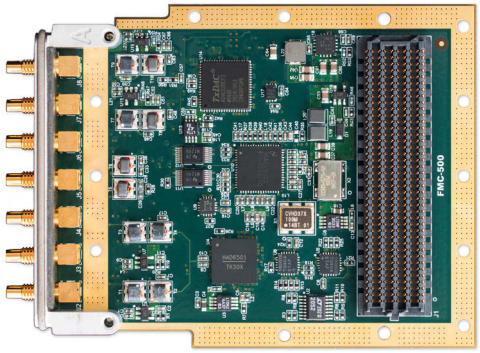
- Dual quad-core 4th generation Intel® Core™ i7 processor with ECC
- Dual channel DDR3L ECC memory soldered, 16GB per node
- Supports three independent displays
- Supports storage upgrade via mezzanine card
- Supports remote management
- Conduction-cooled and air-cooled versions available

ADLINK Technology, Inc. | 408-360-0200

Contact: info@adlinktech.com
LinkedIn: www.linkedin.com/company/adlink-technology
Facebook: www.facebook.com/ADLINKTECH

Innovative Integration
a subsidiary of Interconnect Systems, Inc.
... real time solutions!

www.innovative-dsp.com



FMC-500

The FMC-500 is a high speed digitizing and signal generation FMC I/O module featuring two, 500MSPS A/D channels and two 1230 MSPS D/A channels supported by ultra-low jitter sample clock and triggering features.

The FMC-500 features the new Hitite dual channel, 16-bit 500 MSPS A/D device plus an Analog Devices dual-channel 1230 MSPS DAC device. Analog IO may be either AC or DC coupled. Receiver IF frequencies of up to 500 MHz are supported due to the wide bandwidth performance of the analog front-end. The sample clock may be sourced from either a low-jitter PLL or external input. Multiple cards can be synchronized for sampling to address MIMO applications.

Download Data Sheets & Pricing Now!

FEATURES

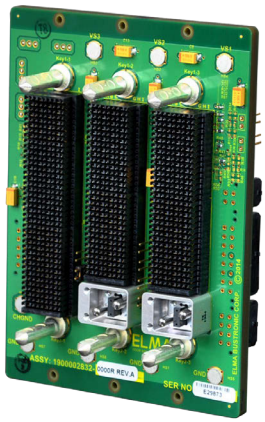
- Two A/D Inputs 500 MSPS, 16-bit AC or DC coupled
- Two D/A Outputs 1230 MSPS, 16-bit D/A
- 11.5W typical (AC-coupled inputs)
- Conduction Cooling per VITA 20 subset
- Environmental ratings for -40° to 85°C 9g RMS sine, 0.1g2/Hz random vibration

Innovative Integration | 805-578-4260

Contact: sales@innovative-dsp.com

ELMA
Your Solution Partner

www.elma.com



3U VPX Optical Backplane

Elma's Bustronic brand of OpenVPX backplanes are designed to meet VITA 65 and VITA 46. This 3U 3-slot VPX backplane has two slots dedicated to backplane optical I/O. Each of the optical slots has its own dedicated Fat Pipe connection to slot 1.

Contact Elma for complete details.

http://www.elma.com/en/products/backplanes/vita-backplanes/product-pages/3U-OpenVPX-3-slot-BKP3-CEN03-15-6-X-n-Detail

FEATURES

- Compliant to VITA 65 and VITA 46
- Standard with the High Speed MultiGig™ connector (VITA 60 and VITA 63 connectors upon request)
- Preliminary VITA 66.4 optical module accepts MT (MPO) fiber ferrules
- Provides built-in ESD ground protection in every slot
- Accepts MultiGig™ compatible cables with available accessories
- Available optical ferrules currently support 12 or 24 discrete fibers or equivalent fiber ribbons
- Data Planes support 6.25 GBaud per lane or 25 GBaud per Fat Pipe

Elma Electronic Inc. | 510-656-3400

Contact: sales@elma.com
LinkedIn: linkedin.com/company/elma-electronic
Twitter: twitter.com/elma_electronic

Annapolis Micro Systems

www.annapmicro.com

WILD OpenVPX Four Slot Mesh Chassis

Annapolis enters the OpenVPX market with WILDSTAR 6 Xilinx Virtex-6 and WILDSTAR A5 Altera Stratix 5 FPGA Processing Boards, an 8 TB per slot WILD Storage Solution, a WILD Switch, a Four Slot and a Twelve Slot Chassis.

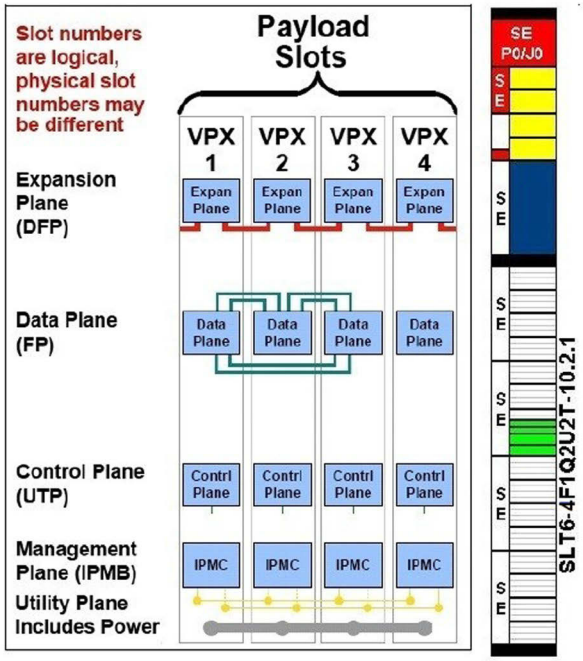
The Four Slot Mesh Chassis has a particularly powerful Backplane Configuration, as shown in the diagram.

The chassis could, for example, be filled with two of the 8 TB WILD Storage Cards, one WILDSTAR A5 Stratix V FPGA Processing Board, and a Single Board Computer.

Annapolis Micro Systems, Inc. is a world leader in high-performance, COTS FPGA-based processing for radar, sonar, SIGINT, ELINT, DSP, FFTs, communications, Software-Defined Radio, encryption, image processing, prototyping, text processing, and other processing intensive applications. Annapolis provides I/O mezzanine cards, including Single 1.5 GHz 8 Bit ADC, Quad 250 MHz 12 Bit ADC, Single 2.5 GHz 8 Bit ADC, Quad 130 MHz 16 Bit ADC, Dual 2.3/1.5 GSps 12 Bit DAC, Quad 600 MSps 16 Bit DAC, Universal 3Gbit Serial I/O (RocketIO, 10 Gb Ethernet, InfiniBand), and Tri XFP (OS 192, 10G Fibre Channel, 10 Gb Ethernet). Our boards work on a number of operating systems, including Windows and Linux. We support our board products with a standardized set of drivers, APIs and VHDL simulation models.

Develop your application very quickly with our CoreFire™ FPGA Application Builder, which transforms the FPGA development process, making it possible for theoreticians to easily build and test their algorithms on the real hardware that will be used in the field. CoreFire, based on dataflow, automatically generates distributed control fabric between cores.

Our extensive IP and board support libraries contain more than 1,000 cores, including floating point and the world's fastest FFT. CoreFire uses a graphical user interface for design entry, supports hardware-in-the-loop debugging, and provides proven, reusable, high-performance IP modules. WILDSTAR A5 for OpenVPX, with its associated I/O Cards, provides extremely high overall throughput and processing performance. The combination of our COTS hardware and CoreFire allows our customers to make massive improvements in processing speed, while achieving significant savings in size, weight, power, person-hours, dollars, and calendar time to deployment.



FEATURES

- 4U High 19" Rack Mount Chassis with Front Mounted Horizontal OpenVPX Card Cage with Four Slots
- 4 Slot OpenVPX High Speed Mesh Backplane with Rear Transition Module Support
- 10+GBps on Data Plane for 10GBase-KR Ethernet, 40GBase-KR4 Ethernet, 10GBase-KX4 XAUI or SDR, DDR and QDR 4x InfiniBand
- 8x PCIe Gen 1, 2 or 3 on Expansion Plane
- 1000Base-X on Control Plane
- Large Power Supply
- Chassis Management, including Voltage, Temperature and Fan Monitoring and Control and a Front of Chassis Display Panel
- High Performance Convection Cooling with Replaceable and Cleanable Fan Tray and Filter
- Front Panel Power Switch, System Rest Switch and Maskable Reset Switch, all with Safety Covers
- Electromagnetic Shielding
- Includes one year hardware warranty

Annapolis is famous for the high quality of our products and for our unparalleled dedication to ensuring that the customer's applications succeed. We offer training and exceptional special application development support, as well as more conventional support.

Save time and effort and reduce risk with COTS boards and software. Achieve world-class performance – WILD solutions outperform the competition.

Annapolis Micro Systems, Inc. | 410-841-2514

Contact: wfinfo@annapmicro.com

Annapolis Micro Systems

www.annapmicro.com

WILD OpenVPX Twelve Plus 3 Slot Switched Chassis

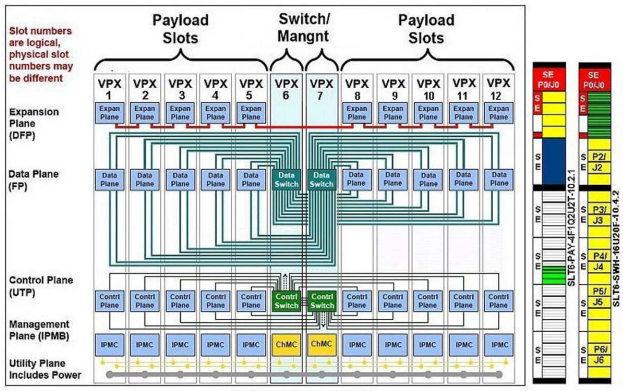
Annapolis enters the OpenVPX market with WILDSTAR 6 Xilinx Virtex-6 and WILDSTAR A5 Altera Stratix 5 FPGA Processing Boards, an 8 TB per slot WILD Storage Solution, a WILD Switch, a Four Slot and a Twelve Plus Three Slot Chassis.

With Ten Payload Slots and Two Switch Slots, and an option for Three VME/VPX Slots, the **Twelve OpenVPX Plus 3 Chassis** has a particularly powerful Backplane Configuration, as shown in the diagram.

Annapolis Micro Systems, Inc. is a world leader in high-performance, COTS FPGA-based processing for radar, sonar, SIGINT, ELINT, DSP, FFTs, communications, Software-Defined Radio, encryption, image processing, prototyping, text processing, and other processing intensive applications. Annapolis provides I/O mezzanine cards, including Single 1.5 GHz 8 Bit ADC, Quad 250 MHz 12 Bit ADC, Single 2.5 GHz 8 Bit ADC, Quad 130 MHz 16 Bit ADC, Dual 2.3/1.5 GSps 12 Bit DAC, Quad 600 MSps 16 Bit DAC, Universal 3Gbit Serial I/O (RocketIO, 10 Gb Ethernet, InfiniBand), and Tri XFP (OC 192, 10G Fibre Channel, 10 Gb Ethernet). Our boards work on a number of operating systems, including Windows and Linux. We support our board products with a standardized set of drivers, APIs and VHDL simulation models.

Develop your application very quickly with our CoreFire™ FPGA Application Builder, which transforms the FPGA development process, making it possible for theoreticians to easily build and test their algorithms on the real hardware that will be used in the field. CoreFire, based on dataflow, automatically generates distributed control fabric between cores.

Our extensive IP and board support libraries contain more than 1,000 cores, including floating point and the world's fastest FFT. CoreFire uses a graphical user interface for design entry, supports hardware-in-the-loop debugging, and provides proven, reusable, high-performance IP modules. WILDSTAR A5 for OpenVPX, with its associated I/O Cards, provides extremely high overall throughput and processing performance. The combination of our COTS hardware and CoreFire allows our customers to make massive improvements in processing speed, while achieving significant savings in size, weight, power, person-hours, dollars, and calendar time to deployment.



BKP6-CEN12-11.2.XXX

FEATURES

- 19" Rack Mount Chassis with Front Mounted OpenVPX Card Cage
- Primary Twelve Slot 6U OpenVPX High Speed Switched Backplane with Rear Transition Module Support
- 10+GBps on Data Plane for 10GBase-KR Ethernet, 40GBase-KR4 Ethernet, 10GBase-KX4 XAUI or SDR, DDR and QDR 4x InfiniBand
- 8x PCIe Gen 1, 2 or 3 on Expansion Plane
- 1000Base-X on Control Plane
- Secondary Three Slot VME/VPX Backplane for Power Only Payload Cards
- Very Large Power Supply
- Chassis Management, including Voltage, Temperature and Fan Monitoring and Control and a Front of Chassis Display Panel
- High Performance Convection Cooling with Replaceable and Cleanable Fan Tray and Filter
- Front Panel Power Switch, System Rest Switch and Maskable Reset Switch, all with Safety Covers
- Electromagnetic Shielding
- Includes one year hardware warranty

Annapolis is famous for the high quality of our products and for our unparalleled dedication to ensuring that the customer's applications succeed. We offer training and exceptional special application development support, as well as more conventional support.

Save time and effort and reduce risk with COTS boards and software. Achieve world-class performance – WILD solutions outperform the competition.

Annapolis Micro Systems, Inc. | 410-841-2514

Contact: wfinfo@annapmicro.com

Annapolis Micro Systems

www.annapmicro.com

WILD OpenVPX Storage Board

Annapolis leads the OpenVPX market with the 8 Terabyte per slot WILD Storage Solution with 4GBps Write and 8GBps Read Bandwidth. The Storage Board has a Hot Swappable Canister containing up to 16 Pluggable 1.8" SSD SATA 3.x Drives, with 2, 4 or 8 Terabytes per Board.

Annapolis Micro Systems, Inc. is a world leader in high-performance, COTS FPGA-based processing for radar, sonar, SIGINT, ELINT, DSP, FFTs, communications, Software-Defined Radio, encryption, image processing, prototyping, text processing, and other processing intensive applications. Annapolis provides I/O mezzanine cards, including Single 1.5 GHz 8 Bit ADC, Quad 250 MHz 12 Bit ADC, Single 2.5 GHz 8 Bit ADC, Quad 130 MHz 16 Bit ADC, Dual 2.3/1.5 GSps 12 Bit DAC, Quad 600 MSps 16 Bit DAC, Universal 3Gbit Serial I/O (RocketIO, 10 Gb Ethernet, InfiniBand), and Tri XFP (OC 192, 10G Fibre Channel, 10 Gb Ethernet). Our boards work on a number of operating systems, including Windows and Linux. We support our board products with a standardized set of drivers, APIs and VHDL simulation models.

Develop your application very quickly with our CoreFire™ FPGA Application Builder, which transforms the FPGA development process, making it possible for theoreticians to easily build and test their algorithms on the real hardware that will be used in the field. CoreFire, based on dataflow, automatically generates distributed control fabric between cores.

Our extensive IP and board support libraries contain more than 1,000 cores, including floating point and the world's fastest FFT. CoreFire uses a graphical user interface for design entry, supports hardware-in-the-loop debugging, and provides proven, reusable, high-performance IP modules. WILDSTAR A5 for OpenVPX, with its associated I/O Cards, provides extremely high overall throughput and processing performance. The combination of our COTS hardware and CoreFire allows our customers to make massive improvements in processing speed, while achieving significant savings in size, weight, power, person-hours, dollars, and calendar time to deployment.

FEATURES

- 4 GBps Write and 8 GBps Read Bandwidth
- Up to 40Gb Ethernet or QDR InfiniBand on each of Four Fat Pipes on P1 for a total of 20GBps on P1
- PCI Express 8x Gen 1, Gen 2 or Gen 3 on P2 and P5 of the OpenVPX Backplane
- 2, 4 or 8 Terabytes per OpenVPX Slot
- Hot Swappable Canister
- Up to 16 Pluggable 1.8" SSD SATA 3.x
- API for Command and Control of the Storage Process
- Includes one year hardware warranty

Annapolis is famous for the high quality of our products and for our unparalleled dedication to ensuring that the customer's applications succeed. We offer training and exceptional special application development support, as well as more conventional support.

Save time and effort and reduce risk with COTS boards and software. Achieve world-class performance – WILD solutions outperform the competition.

Annapolis Micro Systems, Inc. | 410-841-2514 **Contact**: wfinfo@annapmicro.com

Annapolis Micro Systems

www.annapmicro.com

WILD OpenVPX Switch Board

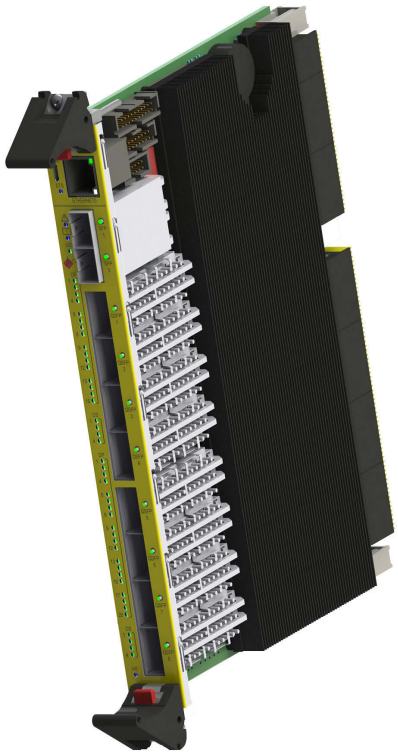
Annapolis leads the OpenVPX market with the **WILD 6U OpenVPX** (VITA 65.0 Compliant) **Switch Board**, with up to 4 Tbps non-blocking switching capacity with up to 8 switch partitions.

Supports OpenVPX Switch Profiles: SLT6-SWH-20U19F-12.4.1: 20 Control Plane and 19 Data Plane Backplane Ports; SLT6-SWH 16U20F-12.4.2: 16 Control Plane and 20 Data Plane Backplane Ports; SLT6-SWH-24F-12.4.3: = 24 Data Plane Backplane Ports

Annapolis Micro Systems, Inc. is a world leader in high-performance, COTS FPGA-based processing for radar, sonar, SIGINT, ELINT, DSP, FFTs, communications, Software-Defined Radio, encryption, image processing, prototyping, text processing, and other processing intensive applications. Annapolis provides I/O mezzanine cards, including Single 1.5 GHz 8 Bit ADC, Quad 250 MHz 12 Bit ADC, Single 2.5 GHz 8 Bit ADC, Quad 130 MHz 16 Bit ADC, Dual 2.3/1.5 GSps 12 Bit DAC, Quad 600 MSps 16 Bit DAC, Universal 3Gbit Serial I/O (RocketIO, 10 Gb Ethernet, InfiniBand), and Tri XFP (OC 192, 10G Fibre Channel, 10 Gb Ethernet). Our boards work on a number of operating systems, including Windows and Linux. We support our board products with a standardized set of drivers, APIs and VHDL simulation models.

Develop your application very quickly with our CoreFire™ FPGA Application Builder, which transforms the FPGA development process, making it possible for theoreticians to easily build and test their algorithms on the real hardware that will be used in the field. CoreFire, based on dataflow, automatically generates distributed control fabric between cores.

Our extensive IP and board support libraries contain more than 1,000 cores, including floating point and the world's fastest FFT. CoreFire uses a graphical user interface for design entry, supports hardware-in-the-loop debugging, and provides proven, reusable, high-performance IP modules. WILDSTAR A5 for OpenVPX, with its associated I/O Cards, provides extremely high overall throughput and processing performance. The combination of our COTS hardware and CoreFire allows our customers to make massive improvements in processing speed, while achieving significant savings in size, weight, power, person-hours, dollars, and calendar time to deployment.



FEATURES

- 6U OpenVPX Board
- Up to 4Tbps Non-Blocking Switching Capacity with up to 8 Switch Partitions
- Multiprotocol Switch – SDR/DDR/QDR/FDR InfiniBand and 1/10/20/40 Gb Ethernet
- Each Backplane and Front Panel Port can be Configured for either InfiniBand or Ethernet
- Front Panel: Up to 8 QSFP+, Up to 2 SFP+, RJ45 Management Port, USB USART, LED Status
- Supports OpenVPX Switch Profiles
- InfiniBand and IP Routing
- Ethernet Gateways
- ChMc Management Plane Support
- Includes one year hardware warranty

Annapolis is famous for the high quality of our products and for our unparalleled dedication to ensuring that the customer's applications succeed. We offer training and exceptional special application development support, as well as more conventional support.

Save time and effort and reduce risk with COTS boards and software. Achieve world-class performance – WILD solutions outperform the competition.

Annapolis Micro Systems, Inc. | 410-841-2514

Contact: wfinfo@annapmicro.com

Annapolis Micro Systems

www.annapmicro.com

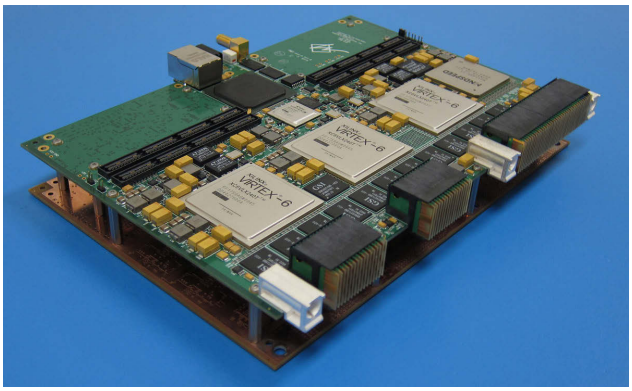
WILDSTAR 6 for OpenVPX

Annapolis Micro Systems is a world leader in high-performance, COTS FPGA-based processing for radar, sonar, SIGINT, ELINT, DSP, FFTs, communications, Software-Defined Radio, encryption, image processing, prototyping, text processing, and other processing intensive applications. Our 14th-generation WILDSTAR 6 for OpenVPX uses Xilinx's newest Virtex-6 FPGAs for state-of-the-art performance. It accepts one or two I/O mezzanine cards in one VPX slot or up to four in a double wide VPX slot, including Single 1.5 GHz 8 Bit ADC, Quad 250 MHz 12 Bit ADC, Single 2.5 GHz 8 Bit ADC, Quad 130 MHz 16 Bit ADC, Dual 2.3/1.5 GSps 12 Bit DAC, Quad 600 MSps 16 Bit DAC, Universal 3Gbit Serial I/O (Rocket I/O, 10 Gb Ethernet, InfiniBand), and Tri XFP (OC 192, 10G Fibre Channel, 10 Gb Ethernet). Our boards work on a number of operating systems, including Windows, Linux, Solaris, IRIX, ALTIX, and VxWorks. We support our board products with a standardized set of drivers, APIs, and VHDL simulation models.

Develop your application very quickly with our CoreFire™ FPGA Application Builder, which transforms the FPGA development process, making it possible for theoreticians to easily build and test their algorithms on the real hardware that will be used in the field. CoreFire, based on dataflow, automatically generates distributed control fabric between cores.

Our extensive IP and board support libraries contain more than 1,000 cores, including floating point and the world's fastest FFT. CoreFire uses a graphical user interface for design entry, supports hardware-in-the-loop debugging, and provides proven, reusable, high-performance IP modules. WILDSTAR 6 for OpenVPX, with its associated I/O cards, provides extremely high overall throughput and processing performance. The combination of our COTS hardware and CoreFire allows our customers to make massive improvements in processing speed, while achieving significant savings in size, weight, power, person-hours, dollars, and calendar time to deployment.

Annapolis is famous for the high quality of our products and for our unparalleled dedication to ensuring that the customer's applications succeed. We offer training and exceptional special application development support, as well as more conventional support.



FEATURES

- Up to three Virtex-6 FPGA processing elements – XC6LX240T, XC6LX365T, XC6LX550T, XC6SX315, or XC6SX475
- Up to 7 GB DDR2 DRAM in 14 banks or up to 448 MB DDRII or QDRII SRAM
- OpenVPX backplane
- 80 x 80 crossbar connecting FPGAs and VPX backplane
- 1 GHz 460EX PowerPC onboard host
- 4X PCIe controller
- Programmable Flash to store FPGA images and for PCI controller
- Full CoreFire Board Support Package for fast, easy application development
- VHDL model, including source code for hardware interfaces and ChipScope Access
- Host software: Windows, Linux, VxWorks, etc.
- Available in both commercial and industrial temperature grades
- Proactive Thermal Management System – Board level current measurement and FPGA temperature monitor, accessible through host API
- Save time and effort and reduce risk with COTS boards and software; achieve world-class performance – WILD solutions outperform the competition
- Includes one-year hardware warranty, software updates, and customer support; training available

Annapolis Micro Systems, Inc. | 410-841-2514 **Contact**: wfinfo@annapmicro.com

Annapolis Micro Systems

www.annapmicro.com

WILDSTAR A5 for OpenVPX

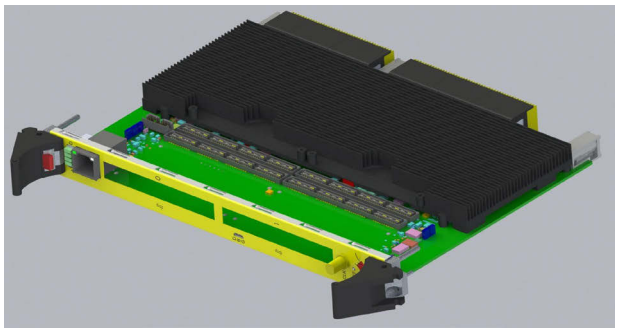
Supports up to Twenty-four 14G InfiniBand, Six 40Gb Ethernet, or Twenty-four 10G Ethernet Connections.

WILDSTAR A5 for OpenVPX uses Altera's newest Stratix V FPGAs for state-of-the-art performance. This is one of a series of Altera Based FPGA Processing Boards from Annapolis.

Annapolis Micro Systems, Inc. is a world leader in high-performance, COTS FPGA-based processing for radar, sonar, SIGINT, ELINT, DSP, FFTs, communications, Software-Defined Radio, encryption, image processing, prototyping, text processing, and other processing intensive applications. It accepts up to four I/O mezzanine cards, including Single 1.5 GHz 8 Bit ADC, Quad 250 MHz 12 Bit ADC, Single 2.5 GHz 8 Bit ADC, Quad 130 MHz 16 Bit ADC, Dual 2.3/1.5 GSps 12 Bit DAC, Quad 600 MSps 16 Bit DAC, Universal 3Gbit Serial I/O (RocketIO, 10 Gb Ethernet, InfiniBand), and Tri XFP (OC 192, 10G Fibre Channel, 10 Gb Ethernet). Our boards work on a number of operating systems, including Windows and Linux. We support our board products with a standardized set of drivers, APIs and VHDL simulation models.

Develop your application very quickly with our CoreFire™ FPGA Application Builder, which transforms the FPGA development process, making it possible for theoreticians to easily build and test their algorithms on the real hardware that will be used in the field. CoreFire, based on dataflow, automatically generates distributed control fabric between cores.

Our extensive IP and board support libraries contain more than 1,000 cores, including floating point and the world's fastest FFT. CoreFire uses a graphical user interface for design entry, supports hardware-in-the-loop debugging, and provides proven, reusable, high-performance IP modules. WILDSTAR A5 for OpenVPX, with its associated I/O Cards, provides extremely high overall throughput and processing performance. The combination of our COTS hardware and CoreFire allows our customers to make massive improvements in processing speed, while achieving significant savings in size, weight, power, person-hours, dollars, and calendar time to deployment.



FEATURES

- Supports up to Twenty-four 14G InfiniBand, Six 40Gb Ethernet, or Twenty-four 10G Ethernet Connections
- Up to Three Altera Stratix V FPGS Processing Elements – GSD4, GSD5, GSD6, GSD8, GXA3, GXA4, GXA5, GXA7, GXA9, GXAB
- Up to 8 GBytes DDR3 DRAM in 4 Memory Banks and Up to 80 MBytes QDRII + SRAM in 5 Memory Banks per WILDSTAR A5 for OpenVPX Board
- Programmable FLASH for each FPGA to Store FPGA Images
- APM86290 PowerPC on Board Host
- PCI Express Bus Gen 1, Gen 2, or Gen 3 to P2 Expansion Plane through On Board PCIe Switch
- Full CoreFire Board Support Package for fast, easy application development
- VHDL model, including source code for hardware interfaces and ChipScope Access
- Available in both commercial and industrial temperature grades
- Proactive Thermal Management System – Board Level current measurement and FPGA temperature monitor, accessible through Host API
- Includes one year hardware warranty, software updates, and customer support
- Training available

Annapolis is famous for the high quality of our products and for our unparalleled dedication to ensuring that the customer's applications succeed. We offer training and exceptional special application development support, as well as more conventional support.

Save time and effort and reduce risk with COTS boards and software. Achieve world-class performance – WILD solutions outperform the competition.

Annapolis Micro Systems, Inc. | 410-841-2514

Contact: wfinfo@annapmicro.com

COTS Collection: Boards, Carriers, Mezzanines, ICs: VMEbus/VME64

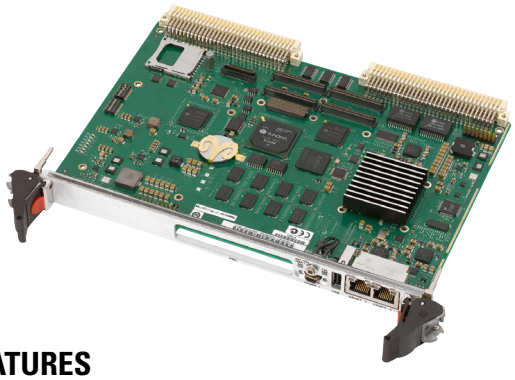
mil-embedded.com/p9917298

ARTESYN™
EMBEDDED TECHNOLOGIES

www.artesyn.com/computing

MVME2500

Artesyn's **MVME2500** series makes a perfect migration path for older generation MVME3100, MVME4100, MVME5100 and MVME5110. On-board memory includes up to 2GB DDR3 memory and 512KB non-volatile MRAM. The MVME2502 variant has 8GB soldered eMMC solid state memory for additional rugged, non-volatile storage. Connectivity includes Gigabit Ethernet, USB 2, serial ports, SATA port and either one or two PMC/XMC sites with the MVME2500 and MVME2502 respectively. A hard drive mounting kit is available for Serial ATA or solid state hard drives. Extended temperature, rugged variants and conformal coating are available. The MVME2500 series is ideal for automation, medical, and military applications such as railway control, semiconductor processing, test and measurement, image processing, and radar/sonar.



FEATURES

- VME SBC with Freescale QorIQ P2010 or P2020 processor
- Processor delivers an impressive performance-to-power ratio with single- or dual-core frequencies up to 1.2 GHz at less than 8W
- Up to 2GB DDR3 and 512KB non-volatile MRAM
- Connectivity includes Gigabit Ethernet, USB 2, serial, SATA
- Single PMC/XMC site on MVME2500 variant
- MVME2502 variant has 8GB soldered eMMC and two PMC/XMC sites
- Conformal coating available
- Optional rear transition module
- Optional hard drive mounting kit

Artesyn Embedded Technologies | +1 (888) 412-7832

Contact: computingsales@artesyn.com
linkedin.com/company/artesyn
twitter.com/artesynembedded

COTS Collection: Boards, Carriers, Mezzanines, ICs: XMC

mil-embedded.com/p9918255

Innovative Integration
a subsidiary of Interconnect Systems, Inc.
... real time solutions!

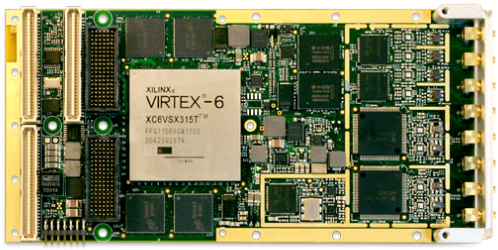
http://www.innovative-dsp.com

X6-1000M

PMC/XMC Module with Two 1 GSPS 12-bit A/Ds, Two 1 GSPS 16-bit DACs, Virtex 6 FPGA, 4 GB Memory and PCI/PCIe

The X6-1000M integrates high-speed digitizing and signal generation with signal processing on a PMC/XMC IO module for demanding DSP applications. The tight coupling of the digitizing to the Virtex6 FPGA core realizes architectures for SDR, RADAR, and LIDAR front end sensor digitizing and processing. The PCI Express system interface sustains transfer rates over 2 GB/s for data recording and integration as part of a high performance realtime system.

Download data sheets and pricing now!



RoHS 2002/95/EC Compliant

X6 1000m

FEATURES

- Two 1 GSPS, 12-bit A/D channels
- Two 1 GSPS, 16-bit DAC channels
- +/-0.5V, AC or DC -Coupled, 50 ohm, SSMC inputs and outputs
- Xilinx Virtex-6 SX315T/SX475T or LX240T
- 4 Banks of 1GB DRAM (4 GB total)
- Ultra-low jitter programmable clock
- Arbitrary Waveform Generation Memory
- Gen2 x8 PCI Express providing 2 GB/s sustained transfer rates
- PCI 32-bit, 66 MHz with P4 to Host card
- PMC/XMC Module (75x150 mm)
- Conduction Cooling per VITA 20
- Ruggedization Levels for Wide Temperature Operation
- Adapters for VPX, Compact PCI, desktop PCI and cabled PCI Express system

Innovative Integration | 805-578-4260

Contact: sales@innovative-dsp.com

VECTOR ELECTRONICS & TECHNOLOGY, INC.

www.vectorelect.com

VECTORPAK™ "Slimline" CHASSIS – ITAR REGISTERED

19" rackmount, rugged aluminum construction with left to right airflow. Fans installed on left/right for maximum cooling of 6U x 160mm front cards and 6U x 80mm rear transition cards. 1U, 2U, 3U, 4U and 5U (2-10 backplane slots), IEEE 1101.1, .10 & .11 compliant.

Plug-in, hot-swap power supplies or embedded ATX:

- 200W plug-in power supply will provide 5V@25A; 3.3V@35A; +12V@8.0A and -12V@1.5A, AC/DC or DC/DC
- 250W high output plug-in power supply will provide 5V@40A; 3.3V@40A; +12V@5.5A and -12V@2.0A, AC/DC or DC/DC
- 300W embedded ATX-type power supply will provide 5V@30A; 3.3V@20A; +12V@16A and -12V@0.8A

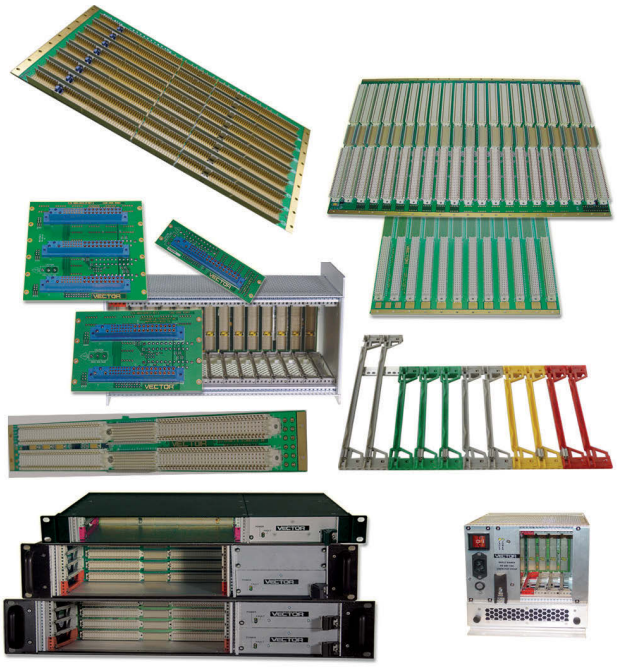
Backplane options:

- cPCI 64-bit/66MHz PICMG 2.0, Rev 3
- cPCI H110
- VME64x with EBG (Electronic Bus-Grant)

Our units are made at our U.S. facility, and we offer short lead times and custom configurations upon request.

Many color options are available.

Please call us at 1-800-423-5659 or e-mail us at inquire@vectorelect.com.



FEATURES

› CompactPCI or VMEbus

› 1U, 2U, 3U, 4U and 5U 19" rackmount

› Push-pull fans for maximum airflow

› Dual-redundant hot-swappable power supplies

› Wide choice of factory colors

Vector Electronics & Technology, Inc. | 800-423-5659 **Contact:** inquire@vectorelect.com

Mass Storage: Data recorder (system)

mil-embedded.com/p9914814

Innovative Integration
a subsidiary of Interconnect Systems, Inc.
... real time solutions!

http://www.innovative-dsp.com/products.php?product=Andale

Andale Luggable

Andale (pronounced on' duh lay) is a powerful data logging system which directly controls an NTFS disk subsystem to support gap-free storage or playback of analog or digital signals acquired using the Innovative X-series XMC modules. The included logging software moves data in real-time between the analog or digital I/O peripherals on any Innovative XMC module to/from dedicated SATA drives with minimal intervention from application software or Windows.

Dedicated PCI Express SATA3 RAID controllers interface to conventional hard/SSD drives supporting data flow rates up to 2600 MB/s, sustained.

Download Data Sheets & Pricing Now!

FEATURES

- Turnkey, High-Speed Data Acquisition + Storage
- Runs Windows7/i7 CPU in ATX enclosure with integrated cooling
- Up to 48 TB Hard Disk Array
- Expandable storage via external JBOD
- 2600 MB/s sustained performance from analog or digital I/O module to standard NTFS disk files
- Supports all Innovative X3, X5 &X6 IO module features including triggering and timing features.
- Wideband (500 MHz) logging/playback
- Autonomous or Network-controlled operation via named pipe

Innovative Integration | 805-578-4260

Contact: sales@innovative-dsp.com

Mass Storage: Solid State Disk (SSD)

mil-embedded.com/p9918759

Amphenol® Aerospace

http://www.amphenol-aerospace.com/Micro-Miniature/r-sata

R-SATA Connectors

With today's Mil-Aero & Defense subcontractors moving towards COTS solutions while maintaining the harsh environment reliability and survivability required by our military customers, Amphenol's (Rugged) R-SATA style connector is perfectly suited as the primary internal storage interconnect for desktop and mobile PCs, connecting the system to peripherals such as hard drives, solid state drives, optical drives, and removable magnetic media drives. The R-SATA supports SATA 3.0 protocol, delivering 6.25 Gb/s data rates & beyond. Amphenol's R-SATA connector utilizes a Micro-Hyperboloid contact with proven performance. The Micro-Hyperboloid contact system offers low insertion and extraction forces, high durability counts and is resistant to shock, vibration and fretting corrosion.

FEATURES

- Ruggedized SATA style
- Supports SATA 3.0 protocol (6.25 Gb/s) & beyond
- Rugged Micro-Hyperboloid contacts
- Low insertion/extraction force
- 20K mating cycles
- Resistant to shock, vibration & fretting corrosion
- 7 pin SATA & Combo 22 pin R-SATA contact arrangements (two differential pairs, 3 ground)
- Foot print compatible with 3M SATA Connectors

APPLICATION FLEXIBILITY

- Four body styles for the 7 pin arrangement
- Seven body styles for the Combo 22 pin arrangement

Amphenol Aerospace | 800-678-0141

Contact: cservice@amphenol-aao.com • **Twitter:** https://twitter.com/AmphenolAAO
Facebook: https://www.facebook.com/pages/Amphenol-Aerospace/306480391950
LinkedIn: https://www.linkedin.com/company/amphenol-aerospace

Apacer

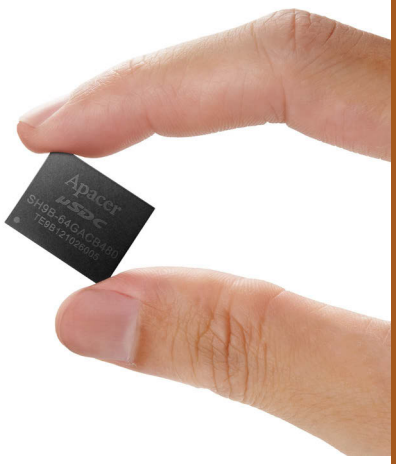
Access the best

http://us.apacer.com

UrKey Technology / µSDC / Boot Protect – SFD 25AP

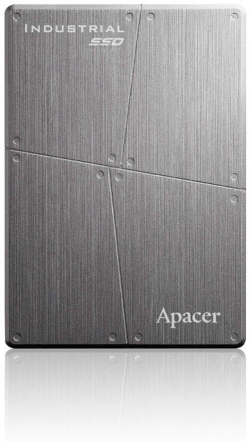
UrKey Technology:

Apacer's exclusive CoreSecurity Technology for SSD core data security is tailored for customers' system design and use. The newly launched UrKey Technology can trigger, enable or remove the three major special security instructions of CoreSecurity through its USB-based 2-way dongle. These include **CoreEraser**, **CoreDestroyer** and **CoreProtector**, which deliver quick erase, full erase and security protection that will facilitate data security and increase storage reliability. The UrKey technology acts as the key to computer security. Once inserted in the preset USB slot, it will easily activate any CoreSecurity function and quickly ensures security protection.



µSDC:

The **µSDC-M** Plus innovatively adopts with BGA156 packaging technology, which integrates the controller/flash and related components into one single chip. The unique design reduces its size to 16x20x1.4mm, which is as small as a one dollar coin. Meanwhile, the adoption of SATA 3 6Gb/s interface allows a maximum capacity of 64GB. The µSDC-M Plus also conforms to JEDEC MO-276 specification, which significantly streamlines the main configuration, so as to make the customer-end products lighter in the era of light and thin devices. In addition, its characteristics such as wide temperature (-40°C ~+85°C) and Surface-Mount Technology (SMT) provide the most stable storage installation for observation and photography even in high altitude.



Boot Protect – SFD 25AP:

Apacer's exclusive CoreProtector Technology for SSD data security protection is upgraded – once again: Besides **Data Protect, Write Protect** and **Device Protect, Boot Protect** is added to consolidate perfect management of information security. Boot Protect requires users to enter Access Code for access identification before entering the OS environment. The management mechanism and control with multiple partition and multiple users allows each computer to achieve security control via different Access Code, achieving perfect management of data security.

Apacer Memory America, Inc. | 408-518-8699

Contact: ssdsales@apacerus.com

Mass Storage: Solid State Disk (SSD)

mil-embedded.com/p9915446

PHOENIX INTERNATIONAL

www.phenxint.com

RPC24 Rugged RAID Storage Array

Phoenix International's RPC24 is a high performance Fibre/SAS/iSCSI Host, SAS/SATA 3 Solid State/Hard Disk Drive RAID subsystem that delivers a level of operational environmental capability not previously available in COTS Data Storage Systems.

The RPC24 features two 12 drive removable magazines housed in a rugged 2U panel height chassis providing 16Gb FC, 12Gb SAS or 10GigE iSCSI host interfaces to high performance 6/12Gb SAS and/or SATA HDDs or SSDs.

Incorporating aluminium and steel in its rugged construction, the RPC24 weighs only 51 lbs with a full complement of 24 SSDs, is less than 20" deep and has been tested and certified to military specifications MIL-STD-810G and MIL-STD-461E.

FEATURES

- Single or Dual Active Redundant RAID Controllers
- MIL-STD-810G and 461E Certified
- Two each 12 Drive (24 drives total) Removable Magazines
- Solid State or Hard Disk Drives
- Magazines are Enclosed and Electrically Isolated
- Sustained Read/Write Data Rates over 5000MB/sec
- Battery Free Cache Backup
- Operational Altitude to 45,000 ft
- Operational Temperature -20 to 70 C
- 40 to 440Hz, 90/240 VAC Input Operation
- Management GUI and Failover Software
- AES 256 Encryption
- **Made in USA**

Phoenix International | 714-283-4800

Contact: info@phenxint.com

Mass Storage: Solid State Disk (SSD)

mil-embedded.com/p9915286

PHOENIX INTERNATIONAL

www.phenxint.com

VP1-250X VPX Solid State Data Storage Module

The VP1-250X Serial Attached SCSI (SAS)/Serial ATA (SATA) based VPX blade delivers high capacity, high performance data storage for military, aerospace and industrial applications requiring rugged, secure and durable mass data storage.

The VP1-250X is a 3U VPX storage module and is available in air cooled and conduction cooled configurations. It integrates MLC, eMLC and SLC NAND SSDs and can be direct connected as a SAS/SATA Drive or via the PCIe interface. When used with supporting media, the VP1-250X supports the purge input to destroy media or the Zeroize that will erase the media.

The Phoenix VP1-250X's outstanding performance and versatility are enabled by Phoenix International's state-of-the-art technology, which provides high transfer and I/O rates, endurance and data integrity.

FEATURES

- Conduction, REDI Conduction (pictured) or Air Cooled
- Supports SATA, SAS and PCI Express interfaces
- Up to 80,000 Feet Operational Altitude
- Operational Temperature from -40° to +85° C
- Can be Configured to work from Fat Pipe A or B from the VPX bus
- Integrated SLC, eMLC or MLC NAND SSDs
- Meets Military and IRIG 106-07 Declassification Standards
- Optional AES 256 Encrption
- Advanced NAND Flash Management for Enhanced Reliability and Durability
- **Made in USA**

Phoenix International | 714-283-4800

Contact: info@phenxint.com

www.ToughSSD.com

Proteus 2 and Galatea 2

TCS Space & Component Technology specializes in the best performing, highest quality ruggedized solid state drives for the most demanding environments. With a 100% focus on the military, aerospace and industrial markets, TCS can customize the performance and functionality of the drive to meet each customer application. All TCS SSDs are built in the USA at AS9100 or QML certified facilities to ensure high reliability.

Proteus 2 provides high performance and maximized capacity in an industry standard 2.5" form factor. The ruggedness, quality and performance that military and industrial customers have come to expect from TCS is now available with even higher performance and capacity. Proteus 2 SSDs support the SATA revision 3.0 interface standard at up to 6.0Gb/s. Proteus 2 SSDs take full advantage of this improvement and deliver sustained reads up to 550MB/s and sustained writes up to 500MB/s. A robust interface is ensured by integrated hardware support for on-the-fly, per sector error detection and correction. The resulting Bit Error Rate is less than one in 10^{14}.

Galatea 2 also provides high performance in an industry standard 2.5" form factor. Galatea 2 goes further, improving encryption to AES-256 and adding user key management and TCG Opal compliance for complete data security protection. Secure erase functionality features seven different agency-approved enhanced erase methods. Erasure can be initiated by either software command or hardware signal. Galatea 2 SSDs support the SATA revision 3.0 interface standard at up to 6.0Gb/s.

FEATURES

- Rugged Solid State Drives for the Military, Aerospace and Industrial Markets
- Milled Aluminum alloy case and rigid printed circuit board mounted by 8 screws for high levels of shock and vibration resistance verified by Mil-STD-810 testing
- Underfilled BGA controller, memory buffer and NAND flash
- Available in Industrial temperature SLC NAND flash for high data retention and write endurance over a wide temperature range
- Also available in Industrial grade MLC Flash providing you with a trade-off between cost and reliability
- 500 MB/s sustained bandwidth
- Capacities: 64 GB / 128 GB / 256 GB / 512 GB capacity (SLC)
- Capacities: 128 GB / 256 GB / 512 GB / 1 TB capacity (MLC & eMLC)
- Available in Standard and Military Secure Erase versions
- Additional options available (conformal coat, extended burn-in, gel fill)

Additional Galatea 2 Features:

- Power holdup
- AES-256 Encryption
- TCG Opal compliance

TeleCommunication Systems, Inc. | 800-307-9488

Contact: sctsales@telecomsys.com
Twitter: twitter.com/TeleComSys

Mass Storage: Solid State Disk (SSD)

mil-embedded.com/p9919589

RENICE®

Factory Headquarters: // Address: Room 1101, B2 Block, Kexing Science Park,
NamShan High-Tech Park, 518057, ShenZhen, China
Email: sales@renice-tech.com Tel: 0086-755-83258725

www.renice-tech.com

Renice H1 Compact Flash Card and S8 SD Memory Card SSDs

The Military Storage Solution Provider

Utilizing the standard Compact Flash form factor, the Renice H1 CF Card Series provides rugged and reliable memory for a wide range of demanding applications. The H1 is designed based on military & industrial standards to support wide operating temps, includes overvoltage protection and power fail safety functions. Renice provides long term supply with a controlled BOM, which makes the H1 series fit for harsh environment, mission critical applications.

For the smaller form factor the new Renice S8 SD Card is a small non-volatile memory card in a standard SD 3.0 (UHS-I) form factor. The S8 Series provides high capacity data storage. It delivers a number of enhanced product features such as wide operation temp, power failure protection, secure erase, AES 128/256 encryption to ensure data security which has become a primary requirement in embedded, industrial, military, avionic and automotive applications.

FEATURES

- High Reliability
- Secure Erase
- Wide Temperature
- Customization
- Fixed BOM with Long Term Supply
- All Standard SSD Form Factors Supported

Renice Technology – USA
866-276-1466 | 408-385-2045

Contact: sales@renice-usa.com • **Facebook:** http://www.renice.co/en/index.html#sthash.3kmYBE7P
LinkedIn: https://www.linkedin.com/company/renice-technology-co-.-ltd
Twitter: https://twitter.com/solidstatetech/status/179901676013109248

Obsolescence/DMSMS: End-of-life/Aftermarket supplier

mil-embedded.com/p9914933

Artisan® Technology Group

www.artisantg.com

Extending the life cycle of legacy and critical systems

Artisan Technology Group provides hardware and end-of-life support for legacy COTS platforms, extending the life cycle of critical Automated Test Stations and Equipment (ATS/ATE). We specialize in stocking and acquiring discontinued COTS equipment for military and industrial platforms.

Control Your Chain of Custody

Artisan Technology Group purchases export restricted assets benefiting businesses with a single trusted buyer and the security that retired assets are handled in full compliance with all US government regulations. Artisan Technology Group is ITAR compliant and is registered with the US Department of State DDTC.

FEATURES

- Over 65,000 OEM COTS modules in stock
- We provide hardware support to extend the lifetime of critical systems
- We stock an extensive inventory of certified used equipment
- We offer guarantees, warranties, and repair services

For more information visit our website at www.artisantg.com

Artisan Technology Group | 888-88-SOURCE

Contact: sales@artisantg.com

X-ES

xes-inc.com

XPand4200 | ½ ATR Forced-Air-Cooled Chassis for Conduction-Cooled Modules

The **XPand4200 Series** redefines the limits of power, performance, and functionality in a sub-½ ATR chassis. This forced-air-cooled, fully ruggedized chassis is designed to meet the rigorous standards of MIL-STD-810 F/G while integrating the latest power-saving and performance-enhancing technology. The heat from the internal conduction-cooled modules is conducted to sidewall heat exchangers, where it is dissipated to the ambient environment by forced-air cooling. In today's avionics and ruggedized environments, size really does matter, and the XPand4200 Series sets a new standard for sub-½ ATR computing.

FEATURES

- ½ ATR forced-air-cooled chassis for conduction-cooled modules
- Forced-air-cooled sidewall heat exchangers
- Extremely lightweight design
- Supports increased cooling through external cold plate
- Physical dimensions of 5.88 in. (W), 6.9 in. (H), 13.2 in. (L) with Removable Memory Bay (RMB)
- Chassis footprint: 4.88 in. (W), 8.3 in. (L)
- Six slots support conduction-cooled 3U VPX, 3U CompactPCI, or power supply modules
- 3U VPX and cPCI backplanes available
- Configurable front panel I/O connectors
- Removable memory bay supports up to two SSD modules (optional)
- Select from an extensive lineup of X-ES designed and manufactured SBC, FPGA, and I/O modules
- Integration services with third-party modules available
- Power supply options of up to 300 W
- MIL-STD-461 EMI filtering
- Environmentally sealed
- Internal holdup of up to 60 ms at 200 W

Extreme Engineering Solutions (X-ES) | 608-833-1155

Contact: sales@xes-inc.com
twitter.com/XES_INC • facebook.com/XES.INC

Dawn VME Products®

www.dawnvme.com

DEV-4200 VPX 3U DC-3 Development System

Dawn's DC-3 VPX Development System for 3U boards represents the latest in state-of-the-art technology. It provides a capability of configuring up to an 8-slot system that supports any mix of 3U convection or conduction cooled boards and 3U transition modules on .8" or 1.0" centers along with an advanced capability to support high current demands and corresponding high cooling requirements. Backplane profiles and topologies are or will be available to test any board configuration.

Power supply choices support 12H and 5VH-based systems. Optional "VEN" power systems available for cost savings if desired. Cooling is delivered equally at each slot with up to 700 LFM across the boards with no dead spots. Chassis side panels are removable for side board access and probing. Airflow through the board area provides adequate cooling for even high power boards.

FEATURES

- 8 slots of VPX on 1" pitch with or without TM connectors
- Connectors may be partially populated for cost savings
- Legacy wedgelock or VITA 48.2-style card guides available as an option
- Dawn's RuSH System Health Monitor and Controller with LCD display
- 8-slot, 3U x 160mm, 1101.10-compatible front card cage
- 8-slot, 3U x 80mm, 1101.11-compatible Rear Transition Module card cage

Dawn VME Products | 510-657-4444

Contact: sales@dawnvme.com

Packaging/Mechanical Chassis: Heatsink/Cooling

mil-embedded.com/p9918757

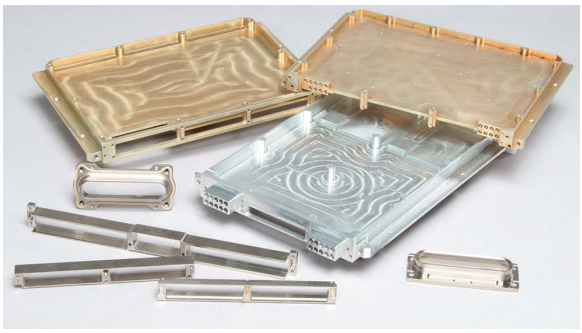
Amphenol® Aerospace

http://www.amphenol-aerospace.com/Board-Level-Rectangular/custom-metal

Custom Metal Machining

Amphenol has extensive heat sink and metal machining manufacturing capabilities. Our engineering team designs, not only the custom board level connectors, but the assembly that it resides in, whether it be a heat sink, interface plate or even an enclosure. We design to fit your board or work from CAD models, assemblies, or step files. There are many benefits of Amphenol's design and manufacture of custom metal machining such as our familiarity with major industry and military specifications.

This manufacturing and design excellence provides customers with the assurance that their custom or standard Amphenol rectangular connector will mate to their heat sink design.



FEATURES

- Provide manufacturing studies on prototype models, CAD models or drawing packages (Consult Amphenol about acceptable CAD formats)
- Rapid prototyping in-house
- Manufacture interface plates and other accessories; Design-in and install pins, studs and threaded inserts
- Provide extensive knowledge in geometric dimensioning and tolerancing techniques that can assist in optimizing your design to enhance manufacturability from the initial design phase (DFM)
- Provide ease of design for a variety of heat sink configurations and heat sink materials
- Design flexibility for contact cavities for RF, digital I/O, high speed, fiber optic, power and low voltage data signal contacts

Amphenol Aerospace | 800-678-0141

Contact: cservice@amphenol-aao.com • **Twitter:** https://twitter.com/AmphenolAAO
Facebook: https://www.facebook.com/pages/Amphenol-Aerospace/306480391950
LinkedIn: https://www.linkedin.com/company/amphenol-aerospace

Packaging/Mechanical Chassis: Rugged chassis

mil-embedded.com/p9910608

Dawn VME Products®

www.dawnvme.com

CCE-3VX4 Conduction Cooled Enclosure for 3U Modules

Dawn's 3U form factor conduction cooled chassis for cold plate deployment is designed for all rugged environments: airborne, land and sea.

Conduction cooled base coupled, via short and efficient thermal path, provides for optimum cooling. Maximum power dissipation depends on cold plate.

RuSH enhanced 3U conduction cooled power supply monitors system-critical performance parameters including voltage, current, and temperature. The RuSH monitor is interfaced into the OpenVPX IPMB (I^2C) management plane, providing communication link-up with system cards.

Key guards provide protection against incorrect card insertion for each slot by customer selection of unique (0, 45, 90, 270, 315 degree) key rotations.

FEATURES

- 4 slots of 3U VPX on 1" pitch (OpenVPX Ready)
- Integrated power supply
- RuSH enhanced power supply actively monitors:
  - Voltage on each power rail
  - Current on each power rail
  - Temperature (humidity – optional)
- FFM-overlay backplane interconnection for quick-turn customization of data plane connection fabric
- Rigid front panel interface eliminates wiring challenges
- Backplane overlays enable PMC/XMC to I/O customization

Dawn VME Products | 510-657-4444

Contact: sales@dawnvme.com

American Avionic Technologies Corporation
A B/E AEROSPACE COMPANY

www.aatcorp.com

6U & 3U VITA Power Solutions

Power Supply Solutions for Rugged Military & Airborne Applications

American Avionic Technologies Corporation (AATC) engineers, designs and manufactures custom electronic assemblies, power conversion products, and components for systems, sub-systems and test equipment in military and commercial aircraft, surface ship and military ground vehicle applications. AATC constantly reinforces its "Best Value" supplier status by managing the customer's needs through engineering, manufacturing, testing services, reduced lead times and 100% on time delivery.

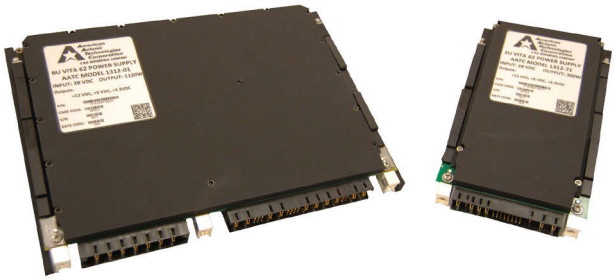
Products

Combined engineering, design, manufacturing, assembly and test experience to serve a wide range of markets including military/ defense, commercial aerospace, military ground vehicles, radar, and industrial equipment.

- *Ruggedized Computing VME/VPX*
- *Power Supplies/Systems*
- *Power Distribution*

VITA 62 6U 1120W

VITA 62 3U 300W



SOLUTIONS

› VITA 62.0 & VITA 48.5 form factors
- 6U – Up to 1350 W (20W/in3)
- 3U – Up to 550 W (25W/in3)

› Conduction or Forced Air Cooled
- -40° C to +90° C

› Designed to NAVSO-P-3641A Derating

› Inputs
- MIL-STD-704 28 VDC, 115 VAC 1ph, 3 ph, 60 – 400Hz
- DO-160 Aircraft 115 VAC 1 ph, 3 ph, Wild Frequency 350 – 800 Hz
- MIL-STD-1275 Ground Mobile 28 VDC, 15 to 33 VDC
- MIL-STD-1399 Shipboard 115 VAC 60Hz

› EMI
- MIL-STD-461
- DO-160

› Environment
- MIL-STD-810
- MIL-S-901
- DO-160

› Communications / Management / Control
- I2C Monitoring and Control
- Protection – Overcurrent, Overvoltage, Overtemp
- Input UV lockout, Inrush Current Limiting
- Remote Sense
- Discretes – Sys Reset, Power Fail, Input Power Fail, PS Enable

› Parallelability

› Active Power Factor Correction

› Power Density
- Delivering 20 - 25 Watts/in3

› Output Configurations
- Single, Dual, Triple, or Quad Outputs
- 3.3V, 5V, 12V, 15V, 28V, 48V Outputs
- 100 – 1300 Watts total output power
- Flexible/Scalable Output Options

American Avionic Technologies Corporation | 631-924-8200 **Contact:** Sales @aatcorp.com

What is your company's strategy to excel in this market?

kontron

Eric Sivertson, Executive Vice President of ATD Business Unit, Kontron

Kontron's dedicated Avionics, Transportation & Defense (ATD) Business Unit is a global organization focused on key high growth Embedded Computing Technology (ECT) vertically integrated sub-segment solutions. We leverage Kontron's extensive broad-base ECT product portfolio of single board computers based on open standards (such as VME, VPX, COMe, cPCI, SMARC) to meet key needs of the Aerospace & Defense (A&D) community's stringent requirements. Additionally, Kontron spends more on R&D than most companies in the ECT space with over 40% of its work force dedicated to R&D. Couple this with our very close relationship with the computing industry's leading silicon providers (e.g. Intel, AMD, Freescale) and you get cutting edge commercial technology targeted to the demands of the embedded computing environment.

Given the reduced spending trend within the Defense community, especially the US DoD budget, A&D contractors are becoming ever more dependent on COTS products. Kontron's ATD Business Unit specializes in COTS products and platforms built to accepted industry open standards, rugged packaging, safety critical and redundant systems, secure systems, extended temperature range products, extended life warranties and long term supply guarantees. Additionally, our global production facilities are keenly adapted to support the high mix, lower volume requirements of the A&D industrial base. With a full US based engineering, development, and program management team supporting our US production facilities that are certified to the most stringent of quality standards and certifications (including FAA manufacturing authority and repair facilities) we have the best of both worlds – a global technology leader exposed to all key commercial technology trends and issues with complete design, manufacturing, service & support facilities local to many of our large US A&D customers.

Besides our strong offering of base technologies, we also have several specific targeted platforms for the A&D community. These platforms encompass not only the base computing technology but also include built in SW and HW features to enable rapid out of the box development for quickest path to deployment. We work very hard to take the integration pains out of developing ECT system solutions by enabling basic features and supporting key Operating Systems and middleware out of the box. With the key support features in both SW & HW built in, this enables our A&D customers to focus on their applications and not waste precious time configuring and bringing up the base platform.

Kontron | www.kontron.com

Rugged Computer Systems: Mass storage

mil-embedded.com/p9918747

RED ROCK® TECHNOLOGIES

www.redrocktech.com

PMC and XMC SSD Modules

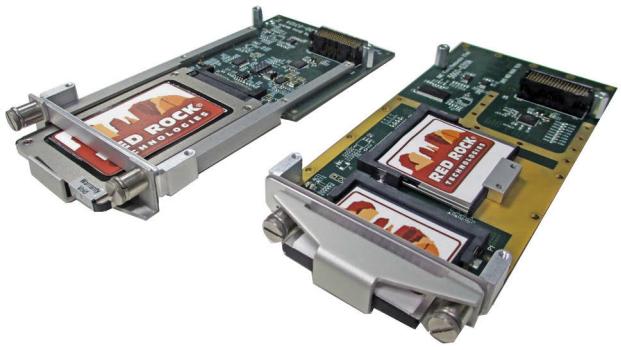
Add storage to your SBC. Red Rock Technologies provides a wide range of PMC and XMC SSD module options designed for extreme temperature, shock, and vibration environments.

Fixed and removable SSD options are available with 1.8" SATA SSDs, CFast™ or Compact Flash. Removable SSDs are secured with a rugged retainer clip.

For applications requiring frequent insertion/removal of SSDs, the PMC Compact Flash and XMC CFast™ modules are rated for 10,000 insertion/removal cycles.

For applications requiring fast data transfers and higher capacities, the PMC/XMC 1.8" SATA SSD modules provide capacities currently up to 800GB and read/write speeds up to 500MB/S.

For applications requiring 2 drives, the PMC Compact flash and the XMC CFast™ modules provide support for 2 Compact Flash or 2 CFast™ drives.



FEATURES

- Air or conduction cooled
- Uses COTS 1.8" SATA SSDs, CFast™, or Compact Flash
- MLC up to 800GB or SLC up to 240GB
- Fixed and removable drives
- Discrete controlled secure erase options
- -40° to +85° C operational temperature
- Windows, Linux, and VxWorks (5.x, 6.X) driver support

Red Rock Technologies, Inc. | 1-800-808-7837

Contact: info@redrocktech.com
www.redrocktech.com

MERITEC®
Innovative Interconnect Solutions

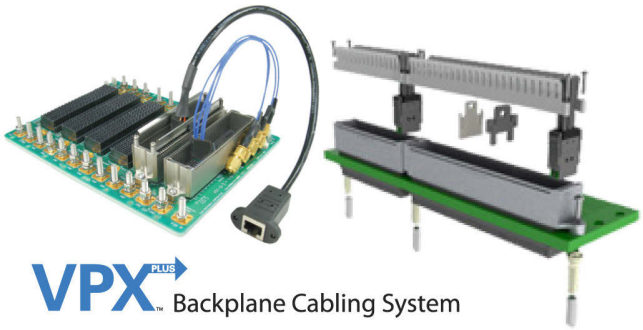
www.meritec.com

VPX PLUS™ Design | Test | Deploy

Meritec's VPX PLUS™ is today's most versatile VPX MULTIGIG RT compatible cabling system, allowing users to access and expand upon the traditional VPX backplane. When bringing out VITA 46 and Open VPX I/O, developers can utilize SATA, SAS, Serial Rapid I/O, InfiniBand, Ethernet, Meritec's HERCULES™ and other MIL-38999 connectors. Meritec's VPX Plus System, along with its I/O capabilities, is designed for full bandwidth testing and can be adapted for deployment.

The standard VPX cabling terminology applies to Meritec's VPX Plus cabling system. Fat pipes, thin pipes, ultra-thin pipes are all available in multiple lengths as COTS products, and thanks to Meritec's unique stacking of wafers, any number of wafers can be stacked to achieve final result, thus creating a wide variety of development options.

Your link to The Xtreme High-Speed Xperts –
http://www.meritec.com/flipbooks/vpx_plus/index.html#4



VPX PLUS™ Backplane Cabling System

FEATURES

- The Meritec VPX-Plus is a cost effective and flexible alternative to expensive rear transition modules.
- VPX-Plus has less electrical losses than both backplane and rear transition modules circuitry.
- Provides a connection method allowing backplane circuit rerouting with small electrical losses and low investment.
- Adds Functionality & Flexibility to any System
- 6U and 3U housing kits allow you to maintain complete control from test to deployment.
- Deployment rails, supplied with capped screws, enhance the ruggedness & security of the system when deployed into real world environments
- COTS and standard pricing
- Made In The USA

Visit us at Booth 219 MilCom14
October 6-8 – Baltimore

Meritec | 888-MERITEC (637-4832)

Contact: Hercules@meritec.com
Facebook: www.facebook.com/pages/Meritec/142140812492429
Linkedin: www.linkedin.com/company/meritec-inc

MERITEC®
Innovative Interconnect Solutions

www.meritec.com

HERCULES® >10Gbs Ruggedized COTS High-Density Interconnect System

Meritec's Hercules Interconnect System embedded in the rugged MIL-DTL-38999L Series III circular shell provides both a rugged and high-bandwidth interconnect system suitable for Mil/Aero/Marine and harsh environment commercial applications not previously accommodated by Industry standard interconnects. The rapid emergence of high-speed switched serial fabric backplanes in the rugged embedded computer market has created a need for a connector system capable of supporting serial I/O at full bandwidth between platforms. New backplane architectures are supporting link speeds in excess of 5 Gbs. The desire of system developers to implement these speeds and to operate independent boxes or platforms at full system bandwidth requires a new generation of high bandwidth (>10 Gbs) ruggedized I/O connectors. The new VITA 76.0 (Draft) Standard is based on the HERCULES Interconnect System, that will support these bandwidth (>10 Gbs) requirements while also meeting the necessary density and pin counts emerging in ruggedized systems.

Follow the link for interactive flip book and technical data –
http://www.meritec.com/flipbooks/hercules/index.html#1

FEATURES

- Up to 145 total contacts with 44 differential pairs in a #23 circular shell
- Rugged light-weight aluminum MIL-38999 Series III Size 9, 13, 17 & 23 threaded-coupling circular shells.
- Shell plating: CAD & Ni PTFE plating materials are available
- Keying: "N" (standard) "A", "B", "C", "D"
- Available as Plug-Cable Assemblies & Jam-Nut or Flange Mount Receptacles for Solder Tail, Press-Fit or Pigtail
- Jacket types available LSZH, PVC, FEP & Halar Expando
- Cable types available in 24, 26, 28, 30 AWG, high bandwidth, Custom lengths built to order
- Supports data rates in excess of 10 Gbs & differential-pair signaling w/low-skew pairs & shielding for EMI/RFI protection
- Compatible with the following protocols: SAS/USB/PCIexpress/Serial I/O/ Ethernet/SATA as well as InfiniBand
- Matched impedance design of 100 Ohm
- Fully electrically tested interconnect systems
- Made In The USA

Visit us at Booth 219 MilCom14
October 6-8 – Baltimore

Meritec | 888-MERITEC (637-4832)

Contact: Hercules@meritec.com
Facebook: www.facebook.com/pages/Meritec/142140812492429
Linkedin: www.linkedin.com/company/meritec-inc

Rugged Computer Systems: Mass storage

mil-embedded.com/p9911759

RED ROCK® TECHNOLOGIES

www.redrocktech.com

VPX Drive Modules

Add disk storage to your VPX system.

Red Rock Technologies provides a wide range of VPX SSD module options designed for extreme temperature, shock, and vibration environments. Fixed drive options are available with 2.5" SATA SSDs or CFast™.

For applications requiring frequent insertion/removal of drives, the VPX SATA Carrier with Removable Module provides SSD housed in a case that has connectors rated for 100,000 insertion/removal cycles. The module can be easily removed from the VPX carrier board for secure storage.

For applications requiring 2 drives, the VPX SATA CFast™ module provides 2 SATA interfaces to 2 CFast™ drives; 2 fixed or 1 fixed and one removable.

Red Rock Technologies specializes in providing custom solutions per customer requirements.

FEATURES

- Air or conduction cooled
- Fixed and removable drives
- SATA or PCIe(Gen2 x1)
- OpenVPX MOD3-STO-1U-16.5.1-3 for SATA
- OpenVPX MOD3-PER-1U-16.3.3-2 for PCIe
- VITA 46, 47, 48, 65 compliant
- Uses 2.5" SATA drives and/or CFast™
- Discrete controlled military secure erase options
- RTM available

Red Rock Technologies, Inc. | 1-800-808-7837

Contact: info@redrocktech.com
www.redrocktech.com

Rugged Computer Systems: Mass storage

mil-embedded.com/p9919584

WINCHESTERSYSTEMS®
Purpose-Built Storage

www.winsys.com/federal

FlashDisk RF Series COTS-Rugged RAID Storage Systems

Winchester Systems FlashDisk RF-Series COTS-Rugged RAID systems are designed to store and protect data in harsh C5ISR; tolerating levels of dust, moisture, shock and vibration not possible with standard commercial units. Major U.S. DOD programs currently depend on Winchester Systems COTS-Rugged products to be easy to deploy in theater and data centers alike.

FlashDisk RF systems feature "Hybrid" Flash capability – seamlessly combining Flash SSD performance with economical magnetic disk drives – and support up to 16 host ports, and 360 disk/SSD drives.

Modular controllers, power supplies and fans are redundant and hot swappable, making COTS-Rugged FlashDisk RF-Series systems ideal for deployable video surveillance, mobile ground stations, and multi-application mission-planning and analysis systems.

FEATURES

- Single/Dual-controller ruggedized RAID storage
- Designed to meet MIL-STD-810E, MIL-STD-833E, NEBS Level 3
- Tested to withstand 200G shock with 1U mounting tray
- Three form-factors available: 2U (twelve 3.5" or twenty-four 2.5" drives) and 3U (sixteen 3.5" drives)
- Hybrid Flash: intelligently use both HDDs and SSDs
- Sustained data rates up to 5,200 MB/sec and 1.4 Million IOPS
- Multi-level RAID data protection
- All rack-mount enclosures only 22 inches deep
- Available in multiple rack-height (U) and host-interconnect configurations
- All units less than 79 lbs. (fully loaded)
- Power: 530W peak; 345-367W typical draw
- Temperatures: 0° to 40° C operating; -40° to 60° C non-operating

Winchester Systems Inc. | 800-325-3700

Contact: marketing@winsys.com

WINCHESTERSYSTEMS®
Purpose-Built Storage

www.winsys.com/federal

FlashDisk RR2P Ultra-Rugged Removable Canister RAID System

Winchester Systems FlashDisk RR2P is a rugged, lightweight, removable-canister RAID-protected storage system used worldwide in airborne, shipboard, and ground-vehicle deployments. Two secure, easily removable 10-disk canisters enable rapid data transfer and transport, and fast data-gathering aircraft/vehicle turnaround.

In typical SIGINT, IMINT, and MOVINT applications, post-mission canisters containing critical data and/or imagery are easily removed and plugged into a ground-station RR2P system. Fresh canisters are immediately loaded into the mobile unit for rapid redeployment.

For added protection, FlashDisk RR2P also supports Canister Mirroring: writing the same information simultaneously to drives in both canisters to preserve crucial data in case one canister is misplaced or damaged during a mission.

FEATURES

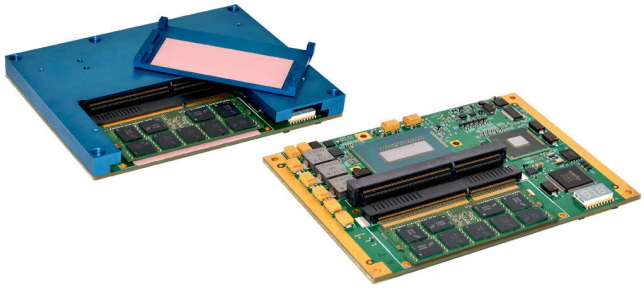
- Field-proven, ultra-rugged removable canister RAID storage system
- Designed to meet MIL-STD-810F, MIL-STD-901D, MIL-STD-461E, MIL-STD-1686A
- Two removable canisters, each holding ten 2.5" SFF disks or SSDs
- Embedded management GUI with performance monitoring tool
- Optional Canister Mirroring – duplicating incoming data
- Lightweight, rugged milled-aluminum design: 44 lbs. fully loaded with 20 SSDs (48 lbs. with 20 HDDs)
- Canister connectors rated for 10,000 insertion cycles
- Four 8Gb Fibre Channel interfaces
- Dimensions: 3.5" (2U) high x 17" wide x 22" deep
- Power input: 100-240 VAC, 47-63 Hz; 10-36 VDC
- Power consumption: 550 Watts peak, 350 Watts operating
- Temperatures: 0° to 40° C operating; -40° to 60° C non-operating

Winchester Systems Inc. | 800-325-3700

Contact: marketing@winsys.com

Acromag®
THE LEADER IN INDUSTRIAL I/O

www.acromag.com/xcom6400



XCOM-6400 Rugged COM Express® Type 6 Module

Acromag's XCOM-6400 COM Express modules provide a high-performance processor in a COTS package that is small, light, and very power-efficient. A variety of models are available with your choice of Intel 4th generation Core i7 or i5 CPU for enhanced graphics, security, and power management capabilities.

Setting a new standard for rugged small form factor processing, each unit is designed to withstand the shock and vibration of extreme industrial and defense applications. Combined with conduction-cooling rails, an extra rigid circuit board, and extended temperature support, the XCOM-6400 provides unparalleled performance.

FEATURES

- Intel®4th Gen (Haswell) multi-core i7/i5 processor
- Intel 8-Series QM87 PCH chipset
- Up to 16GB of high-speed DDR3L removable memory with SODIMM lock-down mechanism
- Advanced heat management technologies: heat spreader plates and optional conduction-cooled frame or fan for extreme temperatures
- Up to -40 to 85°C extended operating range
- Made in the USA

Acromag | 248-295-7088

Contact: solutions@acromag.com
Become a fan: www.facebook.com/acromaginc
Follow us: www.twitter.com/acromag

Amphenol® Aerospace

http://www.amphenol-aerospace.com/Micro-Miniature/2m-micro-miniature.html

2M Micro-Miniature Connectors

Amphenol's 2M Micro-Miniature Series is designed for interconnect applications requiring high performance and reduced size and weight. This smaller, high density, lightweight connector far exceeds the competition in quality and performance. The 2M Series is a superior and versatile connector designed and tested to Mil-Spec standards, comparable to MIL-DTL-38999.

The 2M Series comes in four standard coupling options: Dual-Start ACME Thread, Bayonet, Push-Pull, and Tri-Start Thread. Contact termination styles include Crimp, PC Tail, and Solder Cup; with others available upon request. These micro-miniature connectors have many customized solutions available including shell modifications, contact technology, and more. We customize to fit your application.

FEATURES

- 71% weight savings compared to MIL-DTL-38999
- 52% smaller than MIL-DTL-38999
- Up to 60% more contact density than MIL-DTL-38999
- Broad family with many styles and options
- Designed for high reliability aerospace/defense/C4I applications
- Rugged – For use in harshest environments
- 2M High Speed Solutions: Copper and fiber, USB, Ethernet, Teflon inserts
- 2M Dualok offered in 2M801 Series for high vibration applications
- Filter and hermetic options available in all series
- Braided and overmolded cable solutions
- Full range of 2M accessories available
- RoHS compliant platings available

Amphenol Aerospace | 800-678-0141

Contact: cservice@amphenol-aao.com • **Twitter:** https://twitter.com/AmphenolAAO
Facebook: https://www.facebook.com/pages/Amphenol-Aerospace/306480391950
LinkedIn: https://www.linkedin.com/company/amphenol-aerospace

CREATIVE ELECTRONIC SYSTEMS

http://www.ces.ch

Safety Critical Mission Computer

CES' Mission Computer is a fully configurable (sub)system based on CES' Rugged COTS building blocks. Easily adaptable to your requirements, it covers a wide range of airborne or ground based applications. CES' Mission Computer is a flight proven, cost-efficient and stable solution benefiting from 30+ years of experience.

Built with safety critical design constraints, CES' Mission Computer has reached up to the highest Design Assurance Level (see DO-178 and/or DO-254). It is, therefore, the right choice when it comes to mission and safety critical solutions for the C4ISR market. With a long track of record, CES' Mission Computer has been integrated in various applications such as:

- *UAV Payload Systems*
- *ISR Subsystems*
- *Tactical Mission Computers*
- *Command & Control Computers*
- *Ground Station Subsystems*

FEATURES

- **CES' COTS portfolio:** SBCs, PMCs/XMCs, FPGAs, Carriers, Avionic Interfaces, Network Interfaces, Graphic & Video Interfaces, Storage Devices
- **Pre-qualified Solution:** DO-160, DO-178, DO-254, MIL-STD 810, MIL-STD 704, MIL-STD 461
- **Long term Obsolescence Management**
- **Multiple OSs:** VxWorks©, Integrity©, Linux©

CES – Creative Electronic Systems | +41.22.884.51.00

Contact: ces@ces.ch

www.crystalrugged.com/products/embedded.aspx

RE0412 Carbon Fiber Embedded Computer

The RE0412 has been designed and developed to support airborne and ground mobile applications where significant processing power is required while still being lightweight and rugged.

The system is designed around a DC power solution with an Intel mini-ITX board form factor using an air-over-components cooling approach. The system can accept a single PCIe X4 card in a X16 slot and up to two hard drives and 16GB RAM. The RE0412 is exceptionally rugged, powerful, and lightweight.

FEATURES

- Ultra-light carbon fiber chassis provides exceptional ruggedness
- Unit weighs up to 4.25 lbs.
- Extended temperature range -40C to +55C
- Intel mini-ITX motherboard, LGA1155 socket, Lan, 2XUSB 3.0, 2XUSB 2.0, DVI-I, eSATA, HDMI, Audio, PCIe(X4 in X16 slot) provides exceptional performance in small package
- Air cooled design limits weight
- Two (2) 204 pin DDR-3 SDRAM sockets support 1066 MHz and 1333 MHz SO-DIMMs of 2GB to 8GB size i.e. up to 16GB capacity non-ECC memory
- Intel H61 express chipset controller hub provides traffic management between memory, CPU, and I/O
- Integrated graphics support within processor incorporates latest graphics technology
- HDMI, DVI-I video options provide broad video support
- Supports one (1) or two (2) 2.5" SATA hard drives (weight based on single drive)
- One PCIe X4 electrical in a X16 slot via riser card supports LP expansion card
- Power LED, power switch, and circular connector provide easy access and operation

Crystal Group, Inc. | 800-378-1636

Contact: rfq@crystalrugged.com
Twitter: http://twitter.com/CrystalGroup • **LinkedIn:** www.linkedin.com/company/crystal-group
Facebook: www.facebook.com/pages/Crystal-Group/

http://defense.ge-ip.com/products/crs-48-5/p3736

CRS 48.5 High Performance Embedded Computing Air Flow Through Rugged Subsystem

The CRS 48.5 is a High Performance Embedded Computing (HPEC) Rugged Subsystem. A complete, integrated, tested, ready-to-run subsystem, it uses the most advanced VITA 48.5 compliant air-flow through-cooling to allow the integration of up to eight quad core Intel® Core™ i7 processing nodes, dissipating up to 1,200 watts. This makes it capable of satisfying the most demanding rugged embedded computing requirements such as ISR and electronic warfare (EW) in the harshest, most challenging environments.

The CRS 48.5 ATR features GE's DSP280 multiprocessor with two quad core Intel Core i7 processors, capable of more than 260 gigaflops, delivering main memory bandwidth of up to 21GBytes/sec per CPU node. It can also take advantage of the even more powerful DSP281 multiprocessor for a total peak performance in excess of 2.4 teraflops. It includes the GBX460 fully managed 10 Gigabit Ethernet switch as the data plane.

FEATURES

- Ruggedized VITA 48.5 ATR subsystem
- Designed for data-intensive applications
- Up to 4 multiprocessor boards (32 cores):
  - Two quad core i7-2715QE BGA @ 2.1GHz
  - 8 or 16GBytes DDR3 SDRAM per CPU
  - 8 or 16GBytes NAND Flash Disk per CPU
- Communication via 10GigE switch
- Up to four Fiber 10Gigabit Base-SR ports
- Up to 8 TB solid state drive memory
- Performance of up to 2.46 TFLOPS
- Various power options: 28 VDC, 115 VAC or high voltage DC

To speak with a GE Intelligent Platforms representative, please call 1-800-433-2682 or International: Country Code + 1 (780) 401-7700.

GE Intelligent Platforms, Inc.
http://defense.ge-ip.com/

Contact: http://defense.ge-ip.com/contact • **Twitter:** https://twitter.com/GEMilAero
YouTube: www.youtube.com/user/GEIPTV • **Blog:** http://defense.ge-ip.com/blog/
LinkedIn: www.linkedin.com/groups?gid=5097734&trk=my_groups-b-grp-v

GET Engineering

http://www.getntds.com

MIL NTDS over Ethernet

GET Engineering's Full MIL NTDS over Ethernet solutions are now available. Qualified to Military Specification MIL-S-901D, Grade A Class 1 for Shipboard operation, this system is currently deployed on US NAVY warships. Featured here is our two channel, bulkhead mount NTDS Parallel (Type A/B/C/H) and Serial (Type D/E) unit.

Our MIL-STD-1397 NTDS Over Ethernet Systems transform NTDS data to standard Ethernet protocol, effectively turning your NTDS ports into an Ethernet aware device that meets stringent NTDS latency specifications. Any NTDS device can now be accessed through a standard 802.3 Gigabit Ethernet port. GET solutions integrate legacy tactical data processors and peripheral equipment into the new Net-Centric Open Architecture standard.

Client software conforms to the standard GET Engineering driver protocol. The user configures the system and transacts data though the TCP/IP connection using GET's Common User Interface (CUI) for ease of application development and porting. Multi-node connectivity through the Ethernet interface is supported.

FEATURES

- **NTDS Parallel and Serial Interface** – MIL-STD-1397C Type A/B/C/H Serial Type D/E
- **Ethernet** – 1000/100/10BASE-T
- **Form Factor** – Bulkhead Mount
- **Power Requirements** – 90-260 VAC 200mA 47-63 Hz
- **NTDS I/O Connectors** – M28840P1/P2, UBJ26-2(BNC)

CERTIFICATIONS

- **Shock** – MIL-S901D Grade A Class 1 Type A Lightweight
- **Vibration** – MIL-STD-167-1A Type 1 4-24Hz
- **Humidity** – MIL-STD-810G-507I
- **EMI** – MIL-STD-461F CE/CF-101, CS 114-116
- **Drip** – MIL-STD-810G506.5/III, 15°
- **Ship Motion** – DOD-STD-1399, 301A, Pitch/Roll +30° to 30°

***GET* Engineering Corp. | 619-443-8295**

Contact: sales@getntds.com

LCR™ EMBEDDED SYSTEMS, INC.

www.lcrembeddedsystems.com

RPCS-001

The **RPCS-001** is a highly portable rugged computing system contained in a hardened shock proof enclosure. It is ideal for remote monitoring and control applications that need to be frequently moved, field deployed test applications, portable training assets used in harsh environments, and command and control applications that need to be rapidly field deployed. The embedded computer uses an Intel Core i7 with 8 GB of memory. The I/O, including 6 GbE along with 4 USB and a display port, is easily accessible via the internal face plate. The system supports both removable and internal drives. The internal expansion slots allow additional I/O features and rapid customization. The unit is powered by either 110V AC, 28V DC or an external battery. The rugged outer case is water-tight, crush-proof, and dust proof and is small enough to meet FAA requirements for carry on items.

FEATURES

- **Processor:** Intel Core i7 (2.53 GHz dual Core) with 8GbE Memory
- **I/O:** (2x) GbE NIC Controllers; (4x) GbE Hub Ports; (4x) USB 2.0 Ports
- **Expand Slots:** (1) PCIe x 1; (2) Mini PCIe; (1) PCI 32-bit/22 MHz
- **Drives:** (2) Internal 2.5 SATA Bays; (1) Internal CD Card Type I/II
- **Power:** 100-240 VAC 50/60HZ; 28V Nominal DC (9-34VDC), Mil-2590 Battery
- **Dimensions:** 22" (w) x 13.81" (h) x 9" (d)
- **Shock:** MIL-810F method (516.5)
- **Vibration:** Operating 5 to 10Hz .5g

***LCR Embedded Systems** is leader in standard and custom chassis, backplanes and integrated systems. We serve the aerospace defense and rugged industrial market. To learn more about **LCR Embedded Systems** and our products, go to www.lcrembeddedsystems.com contact us at (800) 747-5972 or sales@lcrembedded.com.*

LCR Embedded Systems, Inc. | 800-747-5972

Contact: sales@lcrembedded.com

MPL
High-Tech • Made in Switzerland
www.mpl.ch

Rugged Embedded Computers up to 3rd Gen. i7 Core

The **PIP Family** is a powerful, highly integrated, robust and fanless rugged embedded Computer, based on Intel's Mobile Technology, all out of the Embedded2 Roadmap for longtime availability. The Systems represent a unique solution for today's demanding defense requirements and are available with basically unlimited options. They are designed to operate under extreme and normal conditions without the need of fans. The MPL solutions are designed and produced in Switzerland and come with a long-term availability guarantee.

Outstanding is the extreme low power consumption. The systems have a complete set of standard PC features as well as industrial features like wide DC input power, reverse polarity protection, etc. Additional GPS, WLAN, CAN, Sound, and UPS modules are available.

FEATURES

- Wide CPU selection up to i7 Core
- Soldered CPU and chipset
- Soldered ECCRAM
- Up to 5 x Gigabit Ethernet
- Up to 7 USB (3.0 & 2.0)
- Up to 4 serial ports (RS232/485)
- Internal & external PCIe expansion
- Internal PMC/XMC expansion
- Fanless operation
- Optional -40°C up to 85°C
- Long term availability (+7 years)
- Optional Bonding & Coating

MPL AG | +41 56 483 34 34

Contact: info@mpl.ch

North Atlantic Industries
Accelerate Your Time-to-Mission
http://www.naii.com/Sensor-Interface-Unit-SIU33/P266

Sensor Interface Unit – SIU33

Built on NAI's Custom-On-Standard Architecture™ (COSA™), the SIU33 Sensor Interface Unit is a highly configurable rugged system supporting a multitude of mil-aero applications that require high-density I/O, communications, Ethernet switching and processing. The SIU33 system uses up to three NAI 3U cPCI boards to deliver off-the-shelf solutions that accelerate deployment of SWaP-optimized systems in air, land and sea applications – with little or no NRE. Eliminate man-months of integration with a configured, field-proven SIU33 system from NAI.

- 40+ modules to choose from
- Fast boot capability
- Reduced SWaP
- COTS/NDI
- Sense & response system

Made in the USA
Certified Small Business

FEATURES

- 3 x 3U cPCI Slots – configure with up to 9 I/O and communications function modules
- SBC-less, stand-alone operation supported via Ethernet connection to your mission computer
- Processor options: Freescale PowerPC QorIQ® P2041, Intel® Core™ i7, Intel® Atom™ or ARM Cortex-A9
- MIL-STD-461F, MIL-STD-1275 & 704A
- Customer configurable I/O, communications and processing
- Wind River® Linux, VxWorks®, Xilinx® PetaLinux and Windows® Embedded Standard 7 OS Support
- VICTORY interface services (Contact factory)
- Continuous background Built-in-Test (BIT)
- Operating temp: -40°C to +71°C conduction cooled
- 28 VDC input

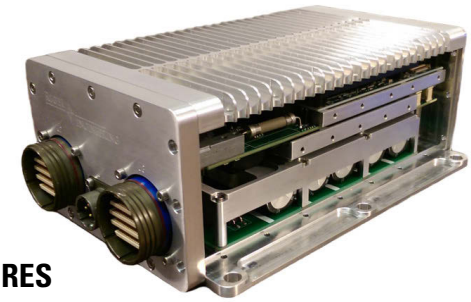
North Atlantic Industries, Inc. | 631-567-1100

Contact: www.naii.com

RIGEL ENGINEERING

www.rigel-eng.com

Altair Rugged Small Form Factor System – AA6000



Rigel Engineering's Altair family of rugged scalable small form factor processor systems are loaded with open standard I/O interfaces and utilizes the latest high performance and low-power embedded processors. The small rugged enclosure has a footprint of only 9.181" x 5.3" x 3.525" and weighs 7lbs fully loaded, which makes it ideal for use in size constrained and rugged environments.

The AA6000 provides access to a wide range of I/O through two MIL-DTL-38999 connectors. The I/O is expanded from Rigel Engineering's CB2603 COM Express carrier card via built-in native I/O and module support through the following mezzanine expansion sites. 1 COM Express, 1 PMC/XMC, and 2 MiniPCIe. The 38999 connectors are routed to the processing elements via the GB1300 interface card that is easily customizable to meet the system I/O pinout requirements. This also provides a cleaner, more rugged design with no custom internal cable harness.

FEATURES

- Flexible, Rugged conduction-cooled design
- Data rates up to 10Gb/s through MIL-DTL-38999 connectors
- System configurable 50ms+ hold-up (optional)
- +28V MIL-STD-704F 150W power supply
- COM Express Type 6 Basic module carrier – CB2603
- Scalable processor modules; ATOM to i-7 Quad core
- Mezzanine Expansion sites for custom processor and I/O configuration
  - *XMC (8-lane)/PMC (PCI-X 133MHz) conduction-cooled mezzanine site*
  - *Two MiniPCIe sockets (Half-Mini and/or Full-Mini Card)*
- Dual 32/64GB embedded SATA Drive (SSD)
- Four RS-232 ports and four configurable RS-232/422/285 ports
- Gigabit Ethernet, 12 GPIO pins, 2 SATA ports, 4 USB 3.0 ports, VGA & DVI display
- Operating temperature: -40C to +71C. Internal temperature sensor built-in

Rigel Engineering | 321-473-6999 x1002

Contact: sales@rigel-eng.com

WinSystems®

An Employee-Owned Company

www.WinSystems.com

PPC65-15T – IP65-rated Industrial Panel PCs

WinSystems' **PPC65-15T** Panel PC provides a complete computing system with a front panel that meets IP65 certification for ingress against dust and water. The PPC65-15T is optimized for environments such as industrial control, medical, transportation, and food processing which often expose systems to liquids and dust particulates.

The PPC65-15T is also available with a 10 inch display. The default configuration includes two RS-232/422/485 serial ports and four USB with options for a third RS-232 port, and line-out audio.

Kick-start development with our preinstalled operating systems and support from our factory based engineers. Windows® 7 and Linux distributions are available on a 2.5" solid state drive. Industrial CompactFlash cards are also available preloaded with Linux, or Windows® Embedded.

FEATURES

- 15-inch IP65-compliant fanless touch Panel PC
- Dual-Core 1.86GHz Intel® Atom™ D2550 processor
- Two Gigabit Ethernet ports with EtherCAT support
- Wide input power range from +9.6V to 28V DC
- Four USB 2.0 ports (default configuration)
- Two RS-232/422/485 (default configuration)
- Removable HDD/SDD tray and CompactFlash Socket
- Runs Linux, WES2009, WES7, and Windows® 7
- Less than two inches deep

WinSystems, Inc. | 817-274-7553

Contact: Info@WinSystems.com
Website: http://www.winsystems.com/PPC65-15T.cfm

THEMIS

http://www.themis.com/HD

RES-XR4 High Density (HD) Server

Data Center and function consolidation, virtualization, and big data analytics drive a demand for increased computing density in a smaller, lighter footprint with reduced space, energy, and cost requirements. Suited for computing environments where server Size, Weight, and Power (SWAP) is important, Themis RES-XR4 High Density Servers deliver high performance, double compute density, enable a 50% rack space savings, and reduce system weight by nearly 50%.

Featuring four chassis slots and enhanced reliability features, the 2U RES-XR4-HD system chassis houses stand-alone, hot-pluggable processor, storage, Mellanox-based high-speed switch, and system management module options. Designed with leading edge components that include Intel® Xeon® E5-2600 V2 Series processors and Supermicro motherboards, RES-XR4-HD servers provide maximum system configuration flexibility and system expansion options. Customers can combine different module types to define system functionality and meet their specific computing and storage requirements.

Processor modules support up to three 56 Gb/sec Infiniband (IB) or 40 Gb Ethernet ports to provide industry leading I/O bandwidth. A FDR option supports 56 Gb/sec IB or 40 Gb/sec Ethernet via a QSFP connector. Alternatively a QDR option supports 40 Gb/sec IB or 10 Gb/sec Ethernet. Each processor module also has a PCIe expansion slot that supports two additional FDR or QDR ports.

Designed with enhanced reliability features for virtualization, ISR, Big Data Analytics, radar processing, image processing, and large Hadoop cluster applications, Themis RES-XR4 HD systems can be used in a multitude of military, industrial, or rugged commercial applications that require high-compute density and low latency access to large-data storage. RES-XR4 HD servers can be mounted in standard commercial racks or mobile rugged transit cases, and incorporate thermal and kinetic management design capabilities for shock, vibration, and extended temperature.

FEATURES

- Maximum system configuration and expansion flexibility with processor, storage, Mellanox-based high-speed switch, and system management module options
- Intel® E5-2600 V2 series Xeon processors with up to twelve cores and up to 512 GB total system memory
- Height: 2RU or 3.5 inches (88.9 mm)
- Width: 17.06 inches (433.3 mm)
- Depth: 20 inches (508 mm)
- Weight (typical): 40 pounds*
- Operating temperature: 0°C – 55°C
- Extended temperature: -15°C – 55°C **
- Operating shock: 3 axis, 35G, 25ms
- Operating vibration: 4.76 Grms, 5Hz to 2000Hz (SSD)
- Operating Humidity: 8% to 90% non-condensing
- MIL-STD-810F and MIL-STD 461
- Multiple power supply options

* Themis designs all products to meet or exceed listed data sheet specifications. System weight is configuration dependent.

** Extended temperature range is dependent on system configuration/components and application thermal profile.

Themis products keep mission-critical applications available in the most demanding environments. The Themis product line currently includes:

- VME and VPX Board Level Computers
- Tactical Systems
  - VITA-74 Small Form Factor Computers (NanoATR, NanoPAK, NanoSWITCH), 3U VPX Systems, and 3U VPX Board Level
- RES Servers
  - Intel-based Rack Mountable, RES-mini Small Form Factor Servers, NVIDIA GPGPU High Performance Computers (HPCs), and High Density Servers and Storage Servers
- Storage Appliances
- Custom configurations of products listed above

Themis Computer | 510-252-0870

Contact: www.themis.com/headquartersandsales
Facebook: www.facebook.com/Themis.Computer
LinkedIn: www.linkedin.com/company/17952 • **Twitter:** https://twitter.com/Themis_Computer

Embedded Solutions™
Embedded. Works Anywhere.™

www.adl-usa.com

ADLMES-8200 – High-Ingress Protection (IP) Modular Enclosure Systems

The **ADLMES-8200** is a highly innovative embedded enclosure design. Its highly configurable modularity makes it possible to expand or reduce a system without replacing the entire enclosure. Side wall modules may be added or removed as system requirements evolve. Three standard profiles provide quick turn inventory availability. A broad portfolio of PC/104 SBC Options Ranging from low-power Intel® Atom™ to high performance 4th Generation Intel Core i7 Processors are available.

Potential Applications Include:

- *Rugged Industrial Applications*
- *Communications Applications*
- *Mobile Routers and Other Network Appliances*
- *Military and Defense – Rugged SFF*
- *Railway Train Control*
- *Transportation*
- *Imaging Applications*

FEATURES

- Modular Sidewall Design Supports Variable PC/104 Stack Heights (2 - 6 Cards) or Expanded 3.5" SBC Intelligent Systems
- High and Low IP (Ingress Protection) Systems Possible via High IP, Modular Chassis Design Coupled with Full Custom, Quick-Turn I/O Panels
- Broad Portfolio of PC/104 SBC Options Ranging from Low-Power Intel® E3800 Atom™ to High Performance 4th Generation Intel Core i7 Processors
- Fully Supported by ADL Embedded Solutions' Team of Solidworks Engineers for Model and or Design Support
- Options for MIL-STD 810, MIL-STD 461, and MIL-STD 704/1275

ADL Embedded Solutions Inc. | 858-490-0597 **Contact**: sales@adl-usa.com

E-CASTS

Safety certification and unmanned aircraft

Presented by Esterel, LDRA, RTI

The U.S. Federal Aviation Administration (FAA) is beginning to open the national airspace to unmanned aerial systems (UASs). The UAS commercial market is expected to someday dwarf what is already a multi-billion military marketplace for UAS technology. However, before that happens rules and regulations need to be defined and met to ensure unmanned aircraft can operate safely in the same airspace with passenger jets. Unmanned military platforms to date have not been required to meet safety certification standards such as DO-178B & C, but will need to before they can enter the national airspace unaccompanied. This webcast of industry experts will discuss the challenges with meeting safety standards such as DO-178B & C in unmanned aircraft and solutions for navigating safety certification effectively.

GO TO E-CAST:
ECAST.OPENSYSTEMSMEDIA.COM/485

Managing SWaP in ISR systems

Presented by Advanced Cooling Technologies, Curtiss-Wright, GE Intelligent Platforms, TE Connectivity

Even in today's budget-constrained environment the Department of Defense (DoD) is still funding intelligence, surveillance, and reconnaissance (ISR) missions from payloads in unmanned aerial vehicles (UAVs) to radar and maritime surveillance. All of these applications are driven by requirements for more and more signal processing performance and reduced size, weight, and power (SWaP). Innovation in these systems is happening at the embedded electronics level where designers are overcoming thermal and power dissipation challenges in small system footprints through unique solutions and open architectures. This e-cast of industry experts will discuss the reduced SWaP challenges in ISR systems and more.

GO TO E-CAST:
ECAST.OPENSYSTEMSMEDIA.COM/482

freescale™

http://www.freescale.com/RFmilitary

MMRF1306H RF Power LDMOS Transistors

The industry's most advanced RF power technologies and broadest RF portfolio – now enabled for superior performance in military & defense applications. These 1250 watt high ruggedness LDMOS RF Transistors are qualified for use in high VSWR CW or pulse applications such as radar and high power radio communications. The unmatched input and output designs allow wide frequency utilization up to 600 MHz. High ruggedness capability of 65:1 VSWR allows use in extreme mismatch conditions. Used individually or paralleled together for multi kilowatt applications, such as klystron upgrades in radar installations.

For more information on Freescale RF military devices and to download our product brochure visit our website at
www.freescale.com/RFmilitary

FEATURES

- Highest Power LDMOS RF Power Transistor – 1250 watts CW capability
- High Ruggedness device designed for VSWR applications up to 65:1
- Up to 600 MHz operation
- High Drain Efficiency, 74% typical
- High Gain, 24 dB typical

For more information:
http://www.freescale.com/MMRF1306H

Freescale Semiconductor | 480-413-5362

Contact: gavin.smith@freescale.com
Twitter: www.twitter.com/RFleonard

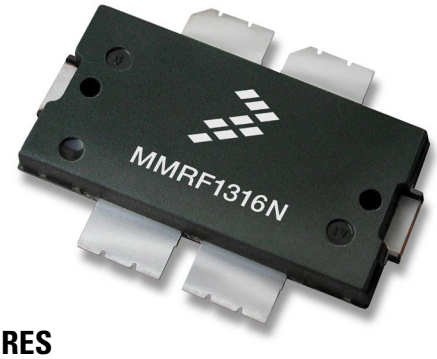
freescale™

http://www.freescale.com/RFmilitary

MMRF1316N RF Power LDMOS Transistors

The industry's most advanced RF power technologies and broadest RF portfolio – now enabled for superior performance in military & defense applications. This high ruggedness device is ideal for use in high VSWR military, aerospace and defense, radar and radio communications applications. It is an unmatched input and output design allowing wide frequency range utilization, between 1.8 and 600 MHz. High ruggedness capability of 65:1 VSWR at all phase angles allows use in extreme mismatch conditions. Industry leading plastic packaging technology enables low thermal resistance.

For more information on Freescale RF military devices and to download a product brochure visit our website at
www.freescale.com/RFmilitary



FEATURES

- Wide Operating Frequency Range, 1.8-600 MHz
- Extreme Ruggedness
- Unmatched Input and Output Allowing Wide Frequency Range Utilization
- Integrated Stability Enhancements
- Low Thermal Resistance
- Integrated ESD Protection Circuitry
- Cost effective plastic packaging

For more information:
http://www.freescale.com/MMRF1316N

Freescale Semiconductor | 480-413-5362

Contact: gavin.smith@freescale.com
Twitter: www.twitter.com/RFleonard

Software/Middleware: Ada

mil-embedded.com/p9915469

AdaCore
The GNAT Pro Company
www.adacore.com

GNAT Pro 7.1

GNAT Pro is a robust and flexible Ada development environment, with complete support for all versions of the language standard including Ada 2012. It comprises a full Ada compiler, an Integrated Development Environment, a comprehensive tool suite including a visual debugger, and a set of libraries and bindings. **GNAT Pro** offers a range of mixed language solutions supporting Ada, C, and C++ within a common environment.

GNAT Pro is available on the widest range of platforms of any Ada technology, with both native implementations and cross compilers to embedded targets. **GNAT Pro** is distributed with complete source code, and is backed by frontline support service from the product developers themselves – the world's largest and most experienced team of Ada experts.

GNAT PRO

FEATURES

- Support for large-scale mission-critical systems
- Support for safety-critical and high-security applications
- Support for multi-language development
- GNAT Programming Studio and Eclipse-based GNATbench IDEs
- Support for major embedded platforms including VxWorks, ELinOS, PikeOS, LynxOS, and Android; and Bare Board configurations (ARM, PPC, Leon)
- Excellent code quality

AdaCore Technologies | 877-787-4628

Contact: info@adacore.com
Twitter: @AdaCoreCompany
Linkedin: linkedin.com/company/adacore

Software/Middleware: Static analysis tools

mil-embedded.com/p9915447

AdaCore
The GNAT Pro Company
www.adacore.com

CodePeer 2.3

CodePeer is a source code analyzer that detects run-time and logic errors in Ada programs. Serving as an efficient and accurate code reviewer, **CodePeer** identifies constructs that are likely to lead to runtime errors such as buffer overflows, and it flags legal but suspect code typical of logic errors. Going well beyond the capabilities of typical static analysis tools, **CodePeer** also produces a detailed analysis of each subprogram, including pre- and postconditions.

CodePeer finds errors by analyzing every possible input and path through the program. The tool can be employed early in the development cycle to identify defects when they are least costly to repair, and it can also be used retrospectively on existing code to help detect latent vulnerabilities.

An extended demo of the latest CodePeer release, V2.3, will be be accessible online on Thursday, October 16. For more information please visit **www.adacore.com/codepeer-2-3-demo/**.

CODE PEER

FEATURES

- Expedites code review and makes human review more productive
- Works on partially complete programs
- Analyzes programs for a wide range of flaws including use of uninitialized data, pointer misuse, buffer overflow, and numeric overflow
- Identifies not only where a failure could occur, but also where the faulty values originate
- Automatically generates both human-readable and machine-readable component specifications
- Exploits multi-core CPUs for efficiency and allows performance tuning

AdaCore Technologies | 877-787-4628

Contact: info@adacore.com
Twitter: @AdaCoreCompany
Linkedin: linkedin.com/company/adacore

Annapolis Micro Systems

www.annapmicro.com

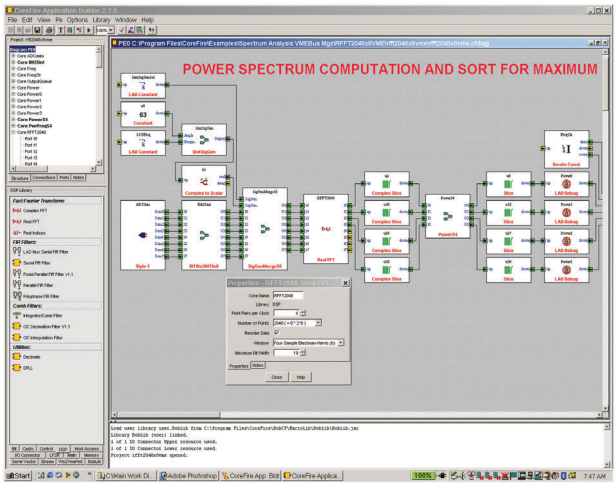
CoreFire

Develop your application very quickly and easily with our **CoreFire™ FPGA Application Builder**, which transforms the FPGA development process, making it possible for theoreticians to easily and quickly build and test their algorithms on the real hardware that will be used in the field.

Use CoreFire's graphical interface to drag and drop library elements onto the design window. Modify your input and output types, numbers of bits, and other core variables by changing module parameters with pull-down menus. The modules automatically provide correct timing and clock control. Insert debug modules to report actual hardware values for hardware-in-the-loop debugging. Hit the Build button to check for errors and as-built core sizes and to build an encrypted EDIF file. Use the Xilinx ISE tool to place and route each FPGA design. Modify and use the jar file or the C program created by the CoreFire Build to load your new file into your WILDSTAR and I/O card hardware. Use the CoreFire Debugger to view and modify register and memory contents in the FPGA and to step through the dataflow of your design running in the real physical hardware.

Our extensive IP and board support libraries contain more than 1,000 proven, reusable, high-performance cores, including FIR and CIC filters, a channelizer, and the world's fastest FFT. We support conversion between data types: bit, signed and unsigned integers, single precision floating point, integer and floating point complex, and arrays. A few of the newly added array cores include array composition and decomposition; slice, parallelize, serialize, repack, split, merge, reorder, rotate, and concatenate transformations; matrix math, sliding windows, and convolutions.

The combination of our COTS hardware and CoreFire enables our customers to make massive improvements in processing speed while achieving significant savings in size, weight, power, person-hours, dollars, and calendar time to deployment.



FEATURES

- Dataflow-based – automatically generates intermodule control fabric
- Drag-and-drop graphical interface
- Work at high conceptual level – concentrate on solving algorithmic problems
- Hardware-in-the-loop debugging
- More than 1,000 modules incorporate years of application experience
- Reduce risk with COTS boards and software
- Save time to market
- Save development dollars
- Easily port completed applications to new technology chips and boards
- Training and custom application development available
- Achieve world-class performance; WILD solutions outperform the competition
- Annual node locked or networked license; includes customer support and updates

Annapolis Micro Systems, Inc. | 410-841-2514 **Contact**: wfinfo@annapmicro.com

LYNX SOFTWARE TECHNOLOGIES

www.lynx.com

LynxSecure • LynxOS 7.0 • LynxOS-178

LynxSECURE

LynxOS® 7.0

LynxOS®-178

RTOS and Secure Virtualization Software from Lynx Software Technologies

LynxSecure

LynxSecure provides one of the most flexible secure virtualization solutions for use in Intel® architecture based embedded and computer systems, including the new 4th generation Intel® Core™ i7 and Core™ i5 processors. LynxSecure is based on separation kernel technology and was designed from the ground up with security as a key design goal. Adding virtualization to the separation kernel allows for multiple different guest Operating Systems (OSs), both real-time and general purpose, to run in secure domains on a single embedded system. LynxSecure 5.2 is the latest version of this established product and adds a new feature that offers real-time detection of stealthy advanced persistent threats such as rootkits.

LynxOS 7.0

LynxOS 7.0 is a deterministic, hard real-time operating system that provides POSIX-conformant APIs in a small-footprint embedded kernel. LynxOS provides symmetric multi-processing support to fully take advantage of multi-core/multi-threaded processors. LynxOS 7.0 contains new security functionality designed for M2M devices. LynxOS 7.0 supports the most popular reference targets in the Intel and PowerPC architectures, including the new 4th generation Intel® Core™ i7 and Core™ i5 processors.

LynxOS-178

LynxOS-178 is a safety-critical COTS RTOS that fully satisfies the objectives of the FAA DO-178B level A specification and meets requirements for Integrated Modular Avionics developers. LynxOS-178 delivers the security and real-time responsiveness needed for safety-critical systems and provides a low-risk path to DO-178B certification for developers to meet the technical requirements in the production of software for airborne systems.

FEATURES

LynxSecure

- LynxSecure runs fully virtualized guest OSs such as Windows®, Solaris, Linux®, Android, and Chromium OS, requiring no changes to the guest OS
- LynxSecure offers the ability to run guest OSs that have Symmetric Multi-processing (SMP) capabilities
- Designed to maintain the highest levels of military security offering a MILS architectural approach

LynxOS 7.0

- LynxOS 7.0 provides the ability for developers to embed military-grade security directly into their devices
- LynxOS contains networking support for long haul networks with TCP/IPV4, IPV6, 2G/3G/4G cellular and WiMax communication stacks. It also supports the short-haul networks common with M2M applications such as 802.11 WiFi, ZigBee wireless mesh and Bluetooth
- LynxOS is a true fully preemptive hard real-time OS with a POSIX application interface

LynxOS-178

- LynxOS-178 provides full POSIX conformance, enabling developers to take advantage of the time-to-market and investment-protection benefits of open standards-based development
- Supported standards include ARINC 653 as well as support for the Future Airborne Capability Environment (FACE) standard currently under development
- LynxOS-178 is the only time- and space-partitioned RTOS that has been awarded the FAA Reusable Software Component (RSC) for DO-178B certifications

www.lynx.com | 800-255-5969

Contact: inside@lynx.com
LinkedIn: linkedin.com/company/lynxsoftwaretechnologies • **Twitter:** @LynxSoftware
Facebook: www.facebook.com/lynxsoftwaretechnologies

Quantum® LeaPs
innovating embedded systems

www.state-machine.com

QP active object (actor) frameworks

What is it?
QP™ is a family of lightweight, open source software frameworks for building responsive and modular real-time embedded applications as systems of cooperating, event-driven active objects (actors). The QP™ family consists of QP/C, QP/C++, and QP-nano frameworks, which are all strictly quality controlled, superbly documented, and commercially licensable.

Why active objects?
Active objects (actors) are encapsulated state machines that run in their own thread of execution and process events asynchronously using an event-driven receive loop. They inherently support and automatically enforce the best practices of concurrent programming, such as: keeping the thread's data local and bound to the thread itself, asynchronous inter-thread communication without blocking, and using state machines. In contrast, raw RTOS-based threading lets you do anything and offers no help or automation for the best practices.

Where does it run?
All QP™ frameworks can run on bare-metal MCUs, completely replacing a traditional RTOS. Ports and ready-to-use examples are provided for all major CPUs, such as ARM Cortex-M, ARM7/9, MSP430, RX, R8C, AVR32, AVRMega, PIC24/dsPIC, PIC32, C28x, C55x, as well as Arduino and mbed. QP/C and QP/C++ can also work with a traditional OS/RTOS, such as: POSIX (Linux, QNX), Windows, VxWorks, ThreadX, embOS, and uC/OS-II.

How does it handle behavior?
The behavior of active objects is specified in QP™ by means of hierarchical state machines (UML statecharts). The frameworks support manual coding of UML state machines in C or C++ as well as fully automatic code generation by means of the free graphical QM™ modeling tool.

Who is using it?
The QP™ frameworks are used in millions of products worldwide in medical, aerospace, robotics, consumer electronics, telecommunications, industrial automation, transportation, and many more. The QP™ frameworks and the QM™ modeling tool received over 33,000 downloads last year.

Welcome to the 21st century!

FEATURES

- World's smallest active object (actor) frameworks for embedded microcontrollers.
- Safer RTOS alternative based on modern, extensible, and highly responsive event-driven architecture.
- Thread-safe execution of state machine objects (actors) with zero-copy event passing, direct event posting, and publish-subscribe event delivery.
- Highly maintainable and traceable mapping of UML hierarchical state machines to C or C++.
- Free, QM modeling tool for drawing UML statecharts and automatic code generation based on QP.
- Compliant with MISRA-C:2004 (QP/C and QP-nano) and MISRA-C++:2008 (QP/C++).
- Book "Practical UML Statecharts in C/C, 2nd Ed." with detailed design study of the QP framework.
- Ready-to-use QP Development Kits (QDKs).
- Application notes, articles, user manuals, and blog.
- Free support forum.
- Moderated and strictly quality-controlled open source distribution.
- Closed-source licensing option with commercial support and accountability for the licensed intellectual property.

Quantum Leaps, LLC | +1-919-360-5668

Contact: info@state-machine.com
LinkedIn: https://www.linkedin.com/company/quantum-leaps
SourceForge: https://sourceforge.net/projects/qpc/

WIND RIVER

www.windriver.com/solutions/aerospace-defense

Wind River® VxWorks® with Aerospace Profile

Powering over 1.5 billion embedded devices, VxWorks® is the world's most widely deployed real-time operating system (RTOS). For over 25 years VxWorks has been the operating environment of choice for aerospace and defense companies who trust VxWorks for its rock-solid determinism, reliability, and its rich ecosystem of complementary third-party hardware and software technologies.

VxWorks 7, the revolutionary new release of the RTOS, combines a modular, future-proof architecture with the scalability, security, safety, and connectivity customers need to harness the opportunities created by the Internet of Things (IoT). Aerospace Profile for VxWorks is a collection of middleware developed to help aerospace and defense manufacturers – from military and civilian aircraft to spacecraft and unmanned surveillance vehicles – bring robust, differentiated systems to market faster, while reducing risks and development costs.

BENEFITS

- **Faster time-to-market:** VxWorks 7 with Aerospace Profile delivers a complete operating environment that minimizes the time required to create a scalable operating system foundation for a differentiated product offering designed to meet high safety and security requirements.

- **Lower development costs and risks:** VxWorks supports a large ecosystem of complementary third-party hardware and software technologies that enable customers to differentiate their products with cutting-edge capabilities, and also accelerate time-to-deployment and cut costs by deploying out-of-the-box integrated and validated solutions.

- **The operating environment for today and tomorrow:** The expandable, upgradable architecture of VxWorks 7 separates the core kernel from middleware, applications, and other packages, enabling updates, upgrades, and new feature additions to be accomplished faster and with minimal retesting of the entire system.

FEATURES

Aerospace Profile for VxWorks enhances the VxWorks 7 Core Platform with the following additional capabilities that boost safety, security, connectivity, manageability, user interface, and graphics:

› Safety
- Time and Space Partitioning enables the consolidation of multiple applications with different levels of criticality on the same hardware platform

› Security
- Wind River SSL Secure Sockets Layer protocol
- Wind River SSH Secure Shell protocol
- Wind River Cryptography Libraries
- Wind River IPsec and IKE Internet Protocol Security suite and Internet Key Exchange
- Wind River Wireless Security

› Connectivity
- Wind River SocketCAN

› Device Manageability
- Wind River Web Services: HTTP, XML, and GSOAP
- WebCLI
- Wind River SNMP Simple Network Management Protocol
- Wind River Web Server
- MIBway for Wind River Web Server
- MCE
- cURL

› User Interface and Graphics
- OpenVG software-driven vector graphics stack
- OpenGL ES 2D and 3D graphics stack with graphics processing unit (GPU) support
- Tilcon user interface (UI) designer tool with graphical user interface (GUI) builder and software renderer

Wind River Aerospace & Defense
800-545-9463

Contact: marketing@windriver.com • **Facebook:** https://www.facebook.com/WindRiverSystems?sk=wall
Twitter: https://twitter.com/WindRiver • **LinkedIn:** https://www.linkedin.com/company/wind-river
Blog Network: http://blogs.windriver.com/ • **YouTube:** https://www.youtube.com/user/windriverchannel

www.signatec.com

Signatec IF Recording & Playback Systems

High speed IF recording and playback solutions for gap-free real-time performance for RADAR, SIGINT, wireless communications, medical imaging, and test & measurement data acquisition applications.

Signatec systems can continuously record signal data at up to 2.8 GB/s sustained through the PC to drive storage without any break in the analog record. Programmable FPGAs allow users to implement their own custom developed in-line DSP, or use provided routines for DDC, FFT, and FIR filtering.

Downconverter receivers allow wideband signal coverage from 100 kHz to 20 GHz featuring a single RF input and 3 software selectable IF bandwidths, from 10 MHz to 100 MHz. The carrier center frequencies can be tuned from 50 MHz to 20 GHz, using direct digitization below 50 MHz.

FEATURES

- **Turnkey Integrated System with Software**
  - 14-bit Sustained Record and Playback
  - Up to 2.8 GB/s Gap-Free Data Recording
  - Inline FPGA Programs - DDC, FFT, FIR Filter, or User Code
  - Monitor Signals While Recording
  - Large Channel Counts with Synchronized Sampling
- **Analog Signal Real-Time Digitizers, PCIe x8:**
  - 14-bit, 400 MS/s, 400 MHz BW, 2 CH
  - 8-bit, 1.5/3.0 GS/s, 2 GHz BW, 4 CH
- **Analog Signal Arbitrary Waveform Generation, PCIe x8:**
  - 14-bit, 1.2 GS/s for 2 CH or 600 MS/s for 4 CH, 590 MHz BW
  - 8-bit,1.2 GS/s for 4 CH, 590 MHz BW

DynamicSignals LLC | 800-567-4243

Contact: sales@signatec.com

Test and Measurement: PXI

mil-embedded.com/p9913158

www.aviftech.com/pxi-c429

PXI-C429

Four, Eight, 16, or 32 Channel
ARINC 429 Test & Simulation
PXI Module

The PXI-C429 module is a member of AIT's family of ARINC 429 test and simulation modules. This module is a 3U PXI Hybrid Slot compatible instrument that is designed to enable monitoring, analysis, simulation, and testing of ARINC 429 data channels. The PXI-C429 module supports up to 32 fully programmable (as inputs or outputs) ARINC 429 channels. The PXI-C429 provides full error injection and detection capabilities.

FEATURES

- Four, Eight, 16, or 32 Software Programmable Tx/Rx Channels
- Programmable High/Low Speed Operation
- All Tx/Rx Channels can operate concurrently
- PXI Interrupts, Star Trigger, and PXI Clock
- Full Error Injection & Detection
- Rate-oriented Label Transmission
- Label Selective Trigger for Capture/Filtering
- IRIG-B Time Code Encoder/Decoder
- Real-Time Recording & Post Analysis of Multiple Channels
- Application Interface supporting C/C++, C# and VB.NET Development
- Device Driver Support: Windows, Linux, VxWorks, and other operating systems
- High-level, intuitive LabVIEW Instrument Driver provided
- Flight Simulyzer GUI Analyzer Software

Avionics Interface Technologies | 402-763-9644

Contact: sales@aviftech.com
www.aviftech.com

Avionics Interface Technologies

www.aviftech.com/pxie-c664

PXIe-C664

ARINC 664 Part 7 Test & Simulation PXI Express Module

AIT's PXIe-664 Test & Simulation module provides a PXI Express interface module capable of supporting the simulation of multiple ARINC 664 End Systems within a single slot and capable of recording and replaying ARINC 664/Ethernet network data streams.

The module supports both the conventional 10/100 Mbit/s ARINC 664 Part 7 Ethernet interfaces as well as the next generation 1 Gbit/s Ethernet interface. The module also provides support for IRIG-B time synchronization allowing the correlation of data timestamps across multiple modules and system chassis.

FEATURES

- Supports IEEE 802.3 10/100/1000 Mbit/s Full-Duplex Ethernet links
- Utilizes SFPs to support both copper and optical interfaces
- PXI Express module
- Simulates multiple ARINC 664 End Systems, including VL traffic shaping and input VL redundancy management
- Standard Ethernet operations simultaneous to ARINC 664 operations
- Supports up to 128 Output VLs and 512 Input VLs
- Supports up to 1024 Sampling & Queuing output message ports and up to 4096 input Sampling & Queuing message ports
- Upper layer protocol handling (ARINC 653, UDP, IP) managed onboard
- Provides DMA for high data rate applications
- Time-stamping of all received messages with 8 nS resolution
- IRIG-B interface for correlated timestamps across modules and systems
- Optional "promiscuous" mode allows capture of all network traffic for protocol analysis and data logging applications
- Windows XP/7/8, Linux, and LabVIEW Real Time Drivers & APIs provided (other OS support on request)
- Easy setup and configuration using AIT's XML based ARINC 664 End System configuration tools

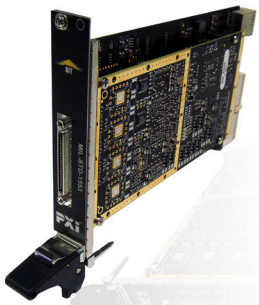
Avionics Interface Technologies | 402-763-9644

Contact: sales@aviftech.com
www.aviftech.com

Avionics Interface Technologies

www.aviftech.com/pxi-c1553

PXI-C1553



One, Two, or Four Dual Redundant Interfaces
MIL-STD-1553A/B Test & Simulation
PXI 3U Module

The PXI-C1553 module is a member of AIT's family of MIL-STD-1553A/B test and simulation modules. This module is a 3U PXI Hybrid Slot compatible instrument designed to support testing, simulations, monitoring, and analysis of MIL-STD-1553 A/B databuses. The PXI-C1553 module is capable of simultaneously simulating a MIL-STD-1553 Bus Controller (BC), up to 31 Remote Terminals (RT), and a Chronological Bus Monitor (BM) on each channel. Single, dual, and quad channel options are available. The PXI-C1553 provides full error injection and detection capabilities in support of AS4112/AS4111 testing.

FEATURES

- Dual redundant, one, two, or four MIL-STD-1553 bus interfaces
- Concurrent Bus Controller, 31 Remote Terminals, & Bus Monitor operation
- Full error injection and detection
- Data capture filtering, 100% bus recording, and physical bus replay
- FPGA-based hardware architecture
- PXI trigger generation on 1553 bus events
- Initiate data simulation (BC) and data capture (BM) on PXI triggers
- Onboard time-tag clock synchronization to external IRIG or PXI system clock
- Variable output voltage signal and software selectable bus coupling modes
- Ten high voltage (up to 30V) programmable DIO lines
- Flight Simulyzer GUI Bus Analyzer Software

Avionics Interface Technologies | 402-763-9644

Contact: sales@aviftech.com
www.aviftech.com

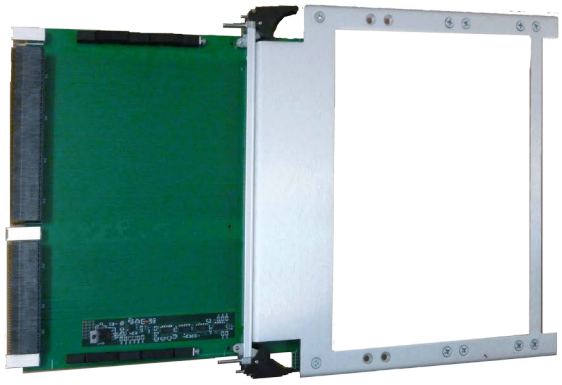
AZ-COM

www.az-com.com

VPX 6U Power Extender

AZ-COM's VPX 6U Power Extender is a must-have tool for developing and testing VPX cards. On-board MCU monitors voltages and current consumption of the Device Under Test (DUT). Extender activates Alarms and/or disconnects DUT when out of range current consumption is detected. This allows to identify potential future problems with DUTs. Built-in display and USB port provide easy configuration and monitoring of Extender using Mouse or via PC application.

In 1998 AZ-COM introduced Single-slot backplane as a low-cost solution for replacing worn top connectors in cPCI Extenders. The same concept is used to protect top connectors of the VPX Extenders. Mounting options allow installation in Air-Cooled or Conduction-Cooled chassis and testing of Air-Cooled or Conduction-Cooled VPX cards. 3U version is available with optional VIPER connectors.



FEATURES

- Voltage and current monitoring.
- Easy maintenance with replaceable top connectors
- Air-cooled and Conduction-cooled chassis support
- Control and monitoring via Hardware and Software
- Frame extension guides, stabilizes and secures DUT
- 3U version available with optional VIPER connectors

AZ-COM Inc | 925-254-5400 • 1-877-962-9266 (1-877-MY AZCOM) **Contact:** sales@az-com.com

Unmanned Systems Technology: Navigation systems/GPS
mil-embedded.com/p9918751

VECTORNAV
Embedded Navigation Solutions

www.vectornav.com

VN-300 Dual Antenna GPS-Aided Inertial Navigation System

The **VN-300** is the world's smallest and lightest high-performance Dual Antenna GPS-Aided Inertial Navigation System (GPS/INS). Incorporating the latest solid-state MEMS sensor technology, the VN-300 combines 3-axis accelerometers, gyros, magnetometers, a barometric pressure sensor, two GPS receivers, as well as a low-power micro-processor into a rugged aluminum enclosure about the size of a matchbox.

Building on the architecture of the VN-100 IMU/AHRS and VN-200 GPS/INS, the VN-300 enables a wider range of applications through the incorporation of GPS compass techniques, which provide for accurate, GPS-based heading determination in static conditions. It is ideal for applications that require a highly accurate position, velocity and attitude solution under both static and dynamic operating conditions, especially in environments with unreliable magnetic heading.

FEATURES

- Built-in Extended Kalman Filter running at 400 Hz with IMU outputs up to 1 kHz
- Coupled position, velocity, & attitude estimates
- Operates as a "True INS Filter" that does not force any requirements on alignment of the sensor to the velocity direction of a platform or specify the orientation of the sensor for initial alignment
- Real-time gyro & accelerometer bias compensation
- Raw pseudorange, Doppler, & carrier phase outputs
- Dynamic accuracy better than 0.3° in heading, 0.1° in pitch & roll
- Static accuracy better than 0.3° in heading, 0.5° in pitch & roll
- Individually calibrated for bias, scale factor, misalignment, and temperature over full operating range (-40°C to +85°C)
- Compact and lightweight rugged aluminum package (45 x 44 x 11 mm; 30 g)

VectorNav Technologies | 512-772-3615

Contact: sales@vectornav.com
LinkedIn: VectorNav Technologies

ELMA

Your Solution Partner

www.elma.com

F-Series PCIe/104 Platform

Elma Electronic Inc. now offers the compact F-Series PCIe/104 Platform, a fanless, rugged mission computing platform that combines an innovative, highly configurable structure with Intel's 4th generation Quad or Dual Core processor.

Using custom I/O panels, expandable sidewall modules and a host of application specific PC104e I/O expansion cards, the F-Series Platform can be easily modified to take on additional I/O including video compression and frame grabbers, ARINC and 1553 cards, Ethernet and Ethernet switching plus FPGA and GPGPU processing.

The new F-Series Platform takes full advantage of Intel's cutting edge processor and all its capabilities, including the 8-series QM87 PCH chipset, making the system useful where multi-core processor performance is needed in space constrained, rugged or extended temperature environments.

FEATURES

- Highly configurable structure with Intel's 4th generation Quad or Dual Core processor
- Modular Mission Computer from Elma Easily Provides Custom I/O
- Multi-core processing combines with flexible configurations

The F-Series PCIe/104 Platform's base board configuration supports:

- Intel's 4th generation Quad or Dual Core processor
- Up to 8 GB DDR3
- Type 1 Bottom-Stacking PCIe/104 with Gen2 PCIe x1 Lanes and Gen3 PEG x16
- SATA with RAID capability
- 2x Gigabit Ethernet ports; 2x RS232 COM ports
- 13x USB 2.0 total2x USB 3.0, backward USB 2.0 compatible
- Onboard audio and video for , three independent displays
- Discrete 16-bit GPIO Port; PCI Express Mini Card 1.2 Socket

Elma Electronic Inc. | 510-656-3400

Contact: sales@elma.com
LinkedIn: linkedin.com/company/elma-electronic
Twitter: twitter.com/elma_electronic

SENSORAY

embedded electronics

http://www.sensoray.com/products/2453LP.htm

Model 2453 | IP Video Server

Sensoray introduces Model 2453 IP video server that compresses and decompresses audio and NTSC/PAL video and sends the resulting streams over Ethernet. It can simultaneously produce two output streams, from one input, with independent resolutions, frame rates, and bit rates. The 2453 will also decode compressed streams and converts them to analog audio and video. It provides a number of advanced features including de-interlacing with motion artifact removal, real-time text overlay, and image rotation and mirroring.

Video can be output as an elementary stream or multiplexed. A variety of stream formats are supported, including MPEG-4 and H.264 elementary streams, MP4 and MPEG-2 transport stream containers, and MJPEG. The transport stream uses AAC audio and H.264 or MPEG-4 ASP video. Overlay generators can position up to 160 characters of text anywhere in the video frame. A unique text string can be defined for each overlay generator. Text variables such as time, date, and frame count are automatically updated on every video frame. The built-in web server allows device configuration and control, user management, and live stream previewing on any web browser.

FEATURES

- Two independent output streams from one video input
- H.264 HP @ L3, MPEG-4 ASP, MJPEG video compression
- Supports MPEG-TS, H.264 VES, MJPEG over HTTP
- Streams via HTTP, RTP, RTSP, UDP
- G.711 or AAC-LC audio
- Includes RS-232/422/485 port and two GPIOs

Options include SD-card storage and USB output, see our website for details.

Sensoray Co., Inc. | 503-684-8055

Contact: sales@sensoray.com
LinkedIn: www.linkedin.com/company/sensoray
Twitter: twitter.com/Sensoray

CHARITY

The Marine Corps-Law Enforcement Foundation (MC-LEF)

THE MARINE CORPS-LAW ENFORCEMENT FOUNDATION

Each month in this section the editorial staff of *Military Embedded Systems* will highlight a different charity that benefits military veterans and their families. We are honored to cover the technology that protects those who protect us every day and to back that up, our parent company – OpenSystems Media – will make a donation to each charity we showcase on this page. This month we focus on the Marine Corps-Law Enforcement Foundation (MC-LEF), whose motto is "On behalf of the children we serve." MC-LEF is an IRS 501(c) 3 organization that delivers financial assistance for education to children of fallen U.S. Marines and federal law enforcement personnel.

According to the website, www.mclef.org, the charity subsists of only one part-time employee and a network of donors and volunteers who "believe that the brave men and women who protect our country and our communities deserve to have their families protected as well."

Founded in 1995 by former Marines and law enforcement personnel, the charity has awarded more than $63 million in scholarships to more than 3,500 eligible children to date. MC-LEF is currently using its donations to provide a $30,000 higher education scholarship account for every child who has lost a parent serving in the U.S. Marine Corps or as federal law enforcement personnel.

MC-LEF is expanding to provide financial support and medical equipment to severely wounded Marines and also provide financial and medical support for physically or mentally disabled children of active duty Marines.

For upcoming charity events, visit www.mclef.org/events.asp.

To donate to this cause, visit www.mclef.org/contributions.asp.

E-CAST

Safety certification and unmanned aircraft

Presented by Esterel Technologies, LDRA, RTI

The U.S. Federal Aviation Administration (FAA) is beginning to open the national airspace to unmanned aerial systems (UASs). The UAS commercial market is expected to someday dwarf what is already a multi-billion dollar military marketplace for UAS technology. However, before that happens rules and regulations need to be defined and met to ensure unmanned aircraft can operate safely in the same airspace with passenger jets. Unmanned military platforms to date have not been required to meet safety certification standards such as DO-178B & C, but will need to before they can enter the national airspace unaccompanied. This webcast of industry experts will discuss the challenges with meeting safety standards such as DO-178B & C in unmanned aircraft and solutions for navigating safety certification effectively.

Register for the e-cast:
http://ecast.opensystemsmedia.com/485

View upcoming e-casts:
http://opensystemsmedia.com/events/e-cast/schedule

WHITE PAPER

StarVX – A generic scalable computer architecture

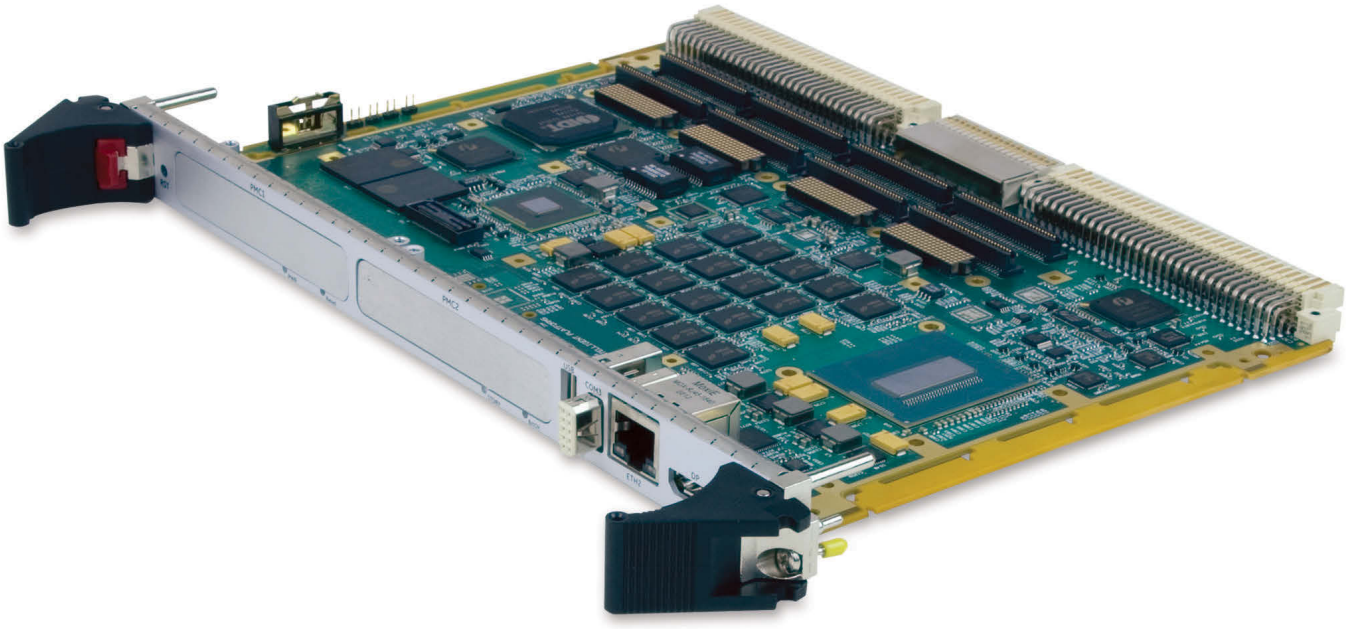
By Kontron

Kontron's StarVX is a high performance embedded computer (HPEC) system that brings supercomputing I/O bandwidth and performance, previously only achieved in IT datacenters, to the harsh military environment. The 3U VPX-based Kontron StarVX enables military systems developers to drastically reduce the process from design to field deployment of radar, sonar, autonomous vehicles, and other 3D reconstruction-based systems. The StarVX allows multiple computer profiles and skins, and its open standards extend the flexibility and scalability to add other products that are necessary for the application or take advantage of upgrading to the latest CPU technology. It provides a competitive advantage that enables designers to quickly develop proof of concept prototypes so they can demonstrate their application.

Read the white paper: http://mil-embedded.com/white-papers/white-scalable-computer-architecture/

More white papers:
http://whitepapers.opensystemsmedia.com/

GE
Intelligent Platforms



Delivering on your promises takes more than the latest technology

GE has announced a range of single board computers that take advantage of the latest 4th Generation Intel® Core™ i7 processors. More processing power. More 3D graphics capability. More I/O flexibility. But all within the same power envelope as before for optimum SWaP.

It's not just about the processor technology, though, or about perhaps the industry's broadest range of supporting technologies. It's about the company behind the technology. It's about working with a company with the resource, talent and commitment to help customers bring in programs on time and on budget – and a company with a multi-decade track record of helping customers achieve the lowest lifetime cost of ownership.

That company is GE.

defense.ge-ip.com

imagination at work

Got Tough Software Radio Design Challenges?

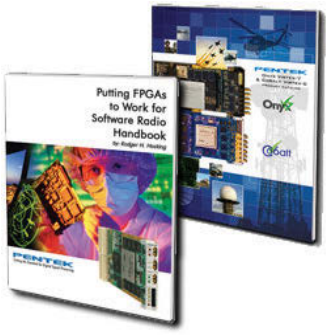
Unleash The New Virtex-7 Onyx Boards!

Pentek's Onyx® Virtex-7 FPGA boards deliver unprecedented levels of performance in wideband communications, SIGINT, radar and beamforming. These high-speed, multichannel modules include:

- A/D sampling rates from 10 MHz to 3.6 GHz
- D/A sampling rates up to 1.25 GHz
- Multi-bandwidth DUCs & DDCs
- Gen3 PCIe with peak speeds to 8 GB/sec
- 4 GB SDRAM for capture & delay
- Intelligent chaining DMA engines
- Multichannel, multiboard synchronization
- ReadyFlow® Board Support Libraries
- GateFlow® FPGA Design Kit & Installed IP
- GateXpress® FPGA - PCIe configuration manager
- OpenVPX, AMC, XMC, PCIe, cPCI, rugged, conduction cooled
- Pre-configured development system for PCIe
- Complete documentation & lifetime support

With more than twice the resources of previous Virtex generations plus advanced power reduction techniques, the Virtex-7 family delivers the industry's most advanced FPGA technology.

Call 201-818-5900 or go to www.pentek.com/go/vitaonyx for your FREE online *Putting FPGAs to Work in Software Radio Handbook* and Onyx product catalog.



NOW AVAILABLE!
RF Slot Downconverters

Onyx

PENTEK
Setting the Standard for Digital Signal Processing

Pentek, Inc., One Park Way, Upper Saddle River, NJ 07458 • Phone: 201.818.5900 • Fax: 201.818.5904 • e-mail:info@pentek.com • www.pentek.com