ECN®

SERVING THE ELECTRONIC DESIGN COMMUNITY SINCE 1956

Advantage Business Media

APR/15

ecnmag.com

The 2015 ECN IMPACT Award Finalists

WhiteBoard: The International Space Station

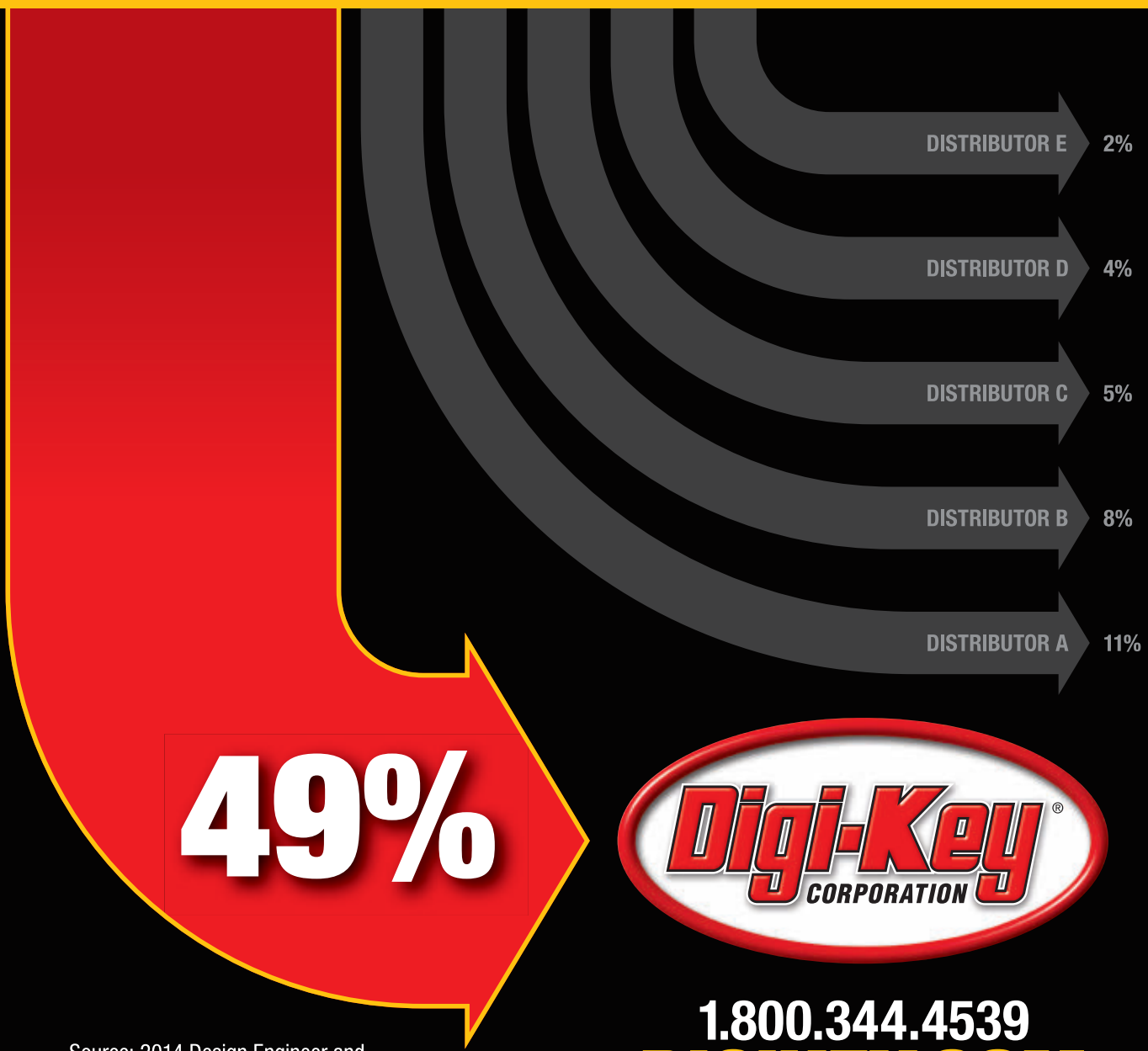
Components of risk: counterfeit electronic parts

Smart Cities:

How M2M will affect major urban areas

Vol. 59 No. 4

Best of Class for Broadest Overall Product Selection



Source: 2014 Design Engineer and Supplier Interface Study, Hearst Business Media Electronics Group

Digi-Key® CORPORATION

1.800.344.4539

DIGIKEY.COM

1,000,000+ PRODUCTS IN STOCK | 650+ INDUSTRY-LEADING SUPPLIERS | 100% AUTHORIZED DISTRIBUTOR

ecia MEMBER ecsn member CEDA

Higher frequency signals, meet True*form* signal integrity.

Higher frequency Keysight 33600A Series waveform generators with True*form* technology deliver unparalleled signal fidelity. Choose from four models to accelerate even your most complex tasks.

33600A Series Waveform Generators
1 GSa/s sampling rate and up to 120 MHz bandwidth
Arbs with sequencing and optional 64 MSa memory
1 ps jitter, 200 times better than DDS generators
5x lower harmonic distortion than DDS generators
Compatible with Keysight BenchVue software

TESTEQUITY

View the 33600A Series library of measurement briefs, videos, and more.
www.testequity.com/Keysight_Function
Buy from an Authorized Distributor 800 732 3457

KEYSIGHT TECHNOLOGIES
Unlocking Measurement Insights

EDITOR'S VIEW

KASEY PANETTA | EDITOR
kasey.panetta@advantagemedia.com

Announcing
the finalists

In this issue of ECN, we're introducing the finalists for our second annual ECN IMPACT Awards. This competition seeks to honor the best and most innovative in the design engineering world. We believe that companies who are doing great work in the industry deserve to be rewarded for their hard work, whether they are implementing an educational program or designing a unique sensor.

I particularly like that every company (big or small) has an equal opportunity to be judged by our distinguished panel of industry experts.

Last year, we honored 20 companies for their outstanding contribution to 13 different areas of the industry. We also honored three services and offered four awards for our special recognition categories including Education Innovation, Green Technology, and Market Disrupter.

This year, we decided to expand the categories to include a few more product categories, services, and special recognition opportunities. The finalists, which were judged to be some of the top competitors, are featured on page 10.

The winners of this awards program will be announced at a ceremony at the Mirage, Las Vegas on May 13, 2015 in conjunction with EDS 2015, a premier electronics distribution event put on by the Electronic Components Industry Association (ECIA) and Electronics Representative Association International (ERA).

Last year's awards show, hosted in the lovely Cosmopolitan of Las Vegas Hotel and Casino, was quite the event and a great place to catch up with a diverse range of companies and the ECN editors. The 27 winners were announced by our editorial team.

This year's event is shaping up to be even better, and with an exciting new location and even more winners, might just top last year's. The editorial dream team, including Editorial Director David Mantey, Digital Editor Jason Lomberg, and yours truly will all be in attendance and announcing winners this year, so that's generally worth the price of admission.

I would like to thank all of the companies who participated in the awards program this year as we saw some great products and services. Good luck to all who entered and I hope to see you next month at EDS.

Until next issue,

Kasey Panetta

The Smart Choice for Small Spaces

Coilcraft is the brand engineers trust most when specifying tiny inductors for wearable technology

Boost the performance and battery life of your wearable products with these tiny RF and power inductors from Coilcraft:

- Wirewound chip inductors as small as 0201 size for wireless communications
- Shielded power inductors as thin as 0.71 mm for power management
- Coupled inductors as small as 2.2 x 1.45 mm for LED display drivers

Get started by using our suite of web tools to quickly locate the perfect parts for your design. Compare and analyze multiple inductors based on your actual operating conditions, and then order free evaluation samples with just a click.

Learn why we're the biggest name in ultra-miniature inductors. Visit us at **www.coilcraft.com.**

Coilcraft®

WWW.COILCRAFT.COM

coilcraftdirect.com
No min order. Next day delivery.

TABLE OF CONTENTS

ECN
www.ECNmag.com

General Manager
Nick Pinto
nick.pinto@advantagemedia.com
973-920-7745

Editorial Director
David Mantey
david.mantey@advantagemedia.com

Editor
Kasey Panetta
kasey.panetta@advantagemedia.com

Digital Editor
Jason Lomberg
jason.lomberg@advantagemedia.com

Technical Contributor
Joshua Israelsohn
ECNjoshua@jas-technicalmedia.com

Regional Vice President of Sales, Midwest
Mike Francesconi
mike.francesconi@advantagemedia.com
973-920-7742

Regional Vice President of Sales, East
Glen Sundin
glen.sundin@advantagemedia.com
973-920-7038

CEO
Jim Lonergan

COO/CFO
Terry Freeburg

Chief Content Officer
Beth Campbell

List Rentals
Infogroup Targeting Solutions
Senior Account Manager, Bart Piccirillo,
402-836-6283; bart.piccirillo@infogroup.com
Senior Account Manager, Michael Costantino
402-863-6266;
michael.costantino@infogroup.com

Reprints
YGS Group, Brad Hairhoger
800-501-9571 x128 or
brad.hairhoger@theygsgroup.com

For subscription related matters please contact: ABM@omeda.com. Or phone them at: 847-559-7560, or fax requests to: 847-291-4816

Advantage Business Media
100 Enterprise Drive, Suite 600,
Box 912, Rockaway, NJ 07866-0912

BPA WORLDWIDE

PRINTED WITH SOY INK

Rethink the Possibilities

• Custom devices • Bare die for space constrained solutions • Customer-specific screening

Latest Innovations from Central™

- **Low Capacitance TVS**
  Ultra low capacitance TVS
- **Low Profile MOSFETs**
  Lowest profile MOSFETs (0.32mm)
- **HyperFast Rectifiers**
  Fastest rectifiers ideal for PFC

Discretes do Matter™

Diodes Rectifiers	Bipolar Transistors	MOSFETs JFETs	Protection Devices	Thyristors	MDMs

Challenges welcome

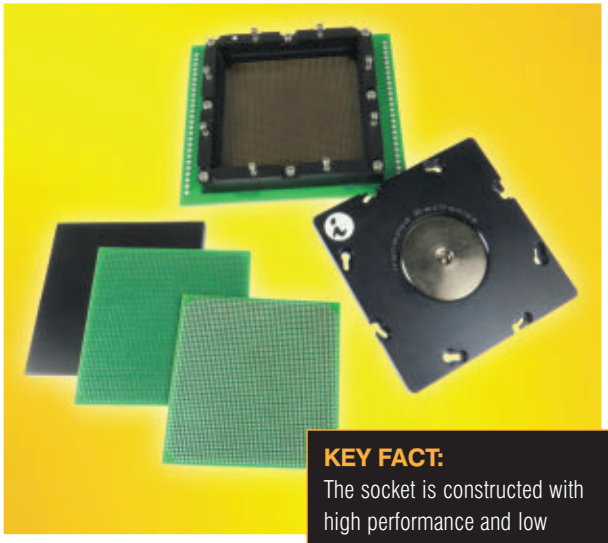
Just Ask

Call today 631.435.1110
or email:
inquiry@centralsemi.com

Central™ Semiconductor Corp.

www.centralsemi.com/ind1

145 Adams Avenue
Hauppauge, New York 11788 USA



KEY FACT:
The socket is constructed with high performance and low inductance elastomer contactor.

BGA socket designed for 1 mm pitch

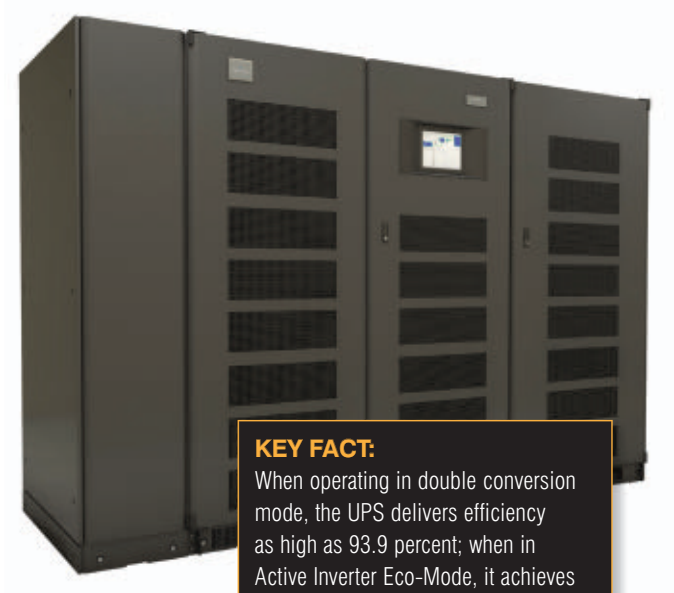
Ironwood Electronics has recently introduced a new high performance BGA socket for 1 mm pitch, 2577 pin BGA ICs. The SG-BGA-6422 socket is designed for IC size - 52.5x52.5 mm package size and operates at bandwidths up to 27 GHz with less than 1 dB of insertion loss. The sockets are designed to dissipate up to several watts without extra heat sinking and can handle up to 100 watts with custom heat sink. The contact resistance is typically 20 milliohms per pin. The socket connects all pins with 27 GHz bandwidth on all connections. The socket is mounted on the target PCB with no soldering, and uses industry's smallest footprint.

For more information, visit www.ironwoodelectronics.com.

UPS system extends native 575 to 600 V capabilities to power applications

Emerson Network Power introduced the Liebert NXL 400kVA, 575 V to 600 V on-line, maximum protection Uninterruptible Power Supply (UPS) system. The new system extends native 575 V to 600 V capabilities to power applications that require a high degree of resiliency. This UL listed UPS is now available in the U.S. and Canada to meet the needs of 575 V to 600 V applications. This UPS expands the 575 V to 600 V applications in the Liebert NXL product family from 250 kVA to 1,100 kVA. For data centers that need to quickly scale to meet spiking power demands, the new system enables a faster, easier and cost-effective deployment by using optimized internal transformers.

For more information,
visit www.emersonnetworkpower.com.



KEY FACT:
When operating in double conversion mode, the UPS delivers efficiency as high as 93.9 percent; when in Active Inverter Eco-Mode, it achieves efficiencies up to 97.6 percent.

F-35B can't fit full weapons load because of design flaw

By Jason Lomberg, Digital Editor, @JasonECNMag
The hits just keep on coming for the Joint Strike Fighter, the problematic 5th-gen personification of "requirements creep." The latest blow — the most flawed version of a thoroughly flawed program can't fit all its weapons because of a design flaw.

Engineering Update #100: The world's first 3D-printed jet engine

➤ ***The world's first 3D-printed jet engine***
Researchers from Australia's Monash University have created what they describe as the world's first 3D-printed jet engines.

➤ ***Glasses that prevent facial recognition***
AVG has created a prototype of glasses that they claim will make it impossible for facial recognition technology to figure out who you are.

➤ ***Google's Titan Drones to take flight***
At Mobile World Congress, Sundar Puchai, senior VP at Google, discussed how Google is working on three big programs that hope to connect some of the 4 billion people currently without Internet access. Titan, the drone company Google acquired in April 2014, will be conducting its first test flight later this year.

4 Billion
People on the planet without Internet access

5 STEM toys you must buy for your kid

By Kasey Panetta, Editor, @kcpanetta
Sometimes you have to buckle down and do the dirty work and other times you get to assemble toys at work. A large part of the STEM conversation centers around when and where kids develop an interest in science, technology, engineering and math (STEM). This often leads to discussions about toys and how they can affect the skill sets that children develop, which in turn can affect careers. But how fun can a toy be if it's supposed to be a learning experience? I decided to test out a few toys that sounded intriguing and picked my five favorites to feature here.

TWEET
Jason Lomberg @JasonECNMag
Our fabulous, stupendous, wonderful, marvelous 100th episode of the Engineering Update! http://bit.ly/1DPOw2N @ecnonline

$17,000
Cost of the most expensive Apple Watch

TWEET
Kasey Panetta @kcpanetta
Love love love these behind the scenes videos from our 75th #Engineering Update http://www.ecnmag.com/videos/2014/09/engineering-update-behind-scenes-writing-script-and-video-production …
#toofunny @ecnonline

Introducing the Finalists

The second annual ECN IMPACT Awards seek to honor design engineering excellence across the industry. These finalists recognize the top products, services, and companies across 26 categories. The companies listed here have all succeeded in creating a product or service that could be game-changing for the industry.

The 2015 Finalists for the ECN Impact Awards:

PRODUCTS

Analog & Mixed Signal ICs
ClariPhy
Ethertronics, Inc.
Inphi Corporation
Linear Technology
MACOM
Maxim Integrated
ON Semiconductor
SiTime Corporation
Texas Instruments Incorporated

Antennas
Ethertronics, Inc.
Fractal Antenna Systems

Boards Modules and Embedded Systems
Advanced Micro Devices
Bluegiga Technologies
Data Translation, Inc.
Keysight Technologies
Laird
MEN Micro Inc.
Rambus
Spansion
Texas Instruments

Cooling and Thermal Management
Jaro Thermal
Keysight Technologies
Vortec

Digital/Logic ICs
Altera Corporation
Microchip Technology Inc.
Quantenna

Electromechanical/Mechanical Devices
BEI Kimco Magnetics
CUI Inc
EAO Corporation
HARTING Inc. of North America
New Scale Technologies
SCHURTER Inc.
Southco, Inc.

Enclosures
OKW Enclosures, Inc.
Rittal Corporation

Microwave & RF
ams
Digi International Inc.
Empower RF Systems, Inc.
Ethertronics, Inc.
MPI Corporation
Oscium
Peregrine Semiconductor
SAF Tehnika JSC
Silicon Labs
Thin Film Electronics ASA (Thinfilm)
W. L. Gore & Associates, Inc.

Optoelectronics
EarthLCD
Osram Opto Semiconductors
TE Connectivity
Texas Instruments Incorporated
Wavelength Electronics, Inc.

Oscillators
API Technologies
Pletronics, Inc.

Passive Components & Discrete Semiconductors
AVX Corporation
Bourns, Inc.
Efficient Power Conversion Corporation (EPC)
GaN Systems
KEMET Electronics
Littelfuse, Inc.
Peregrine Semiconductor
Vishay Intertechnology, Inc.
Vishay Precision Group

Power Sources and Conditioning Devices
Carling Technologies
CUI Inc
Intersil Corporation
Linear Technology
Maxwell Technologies
MORNSUN GUANGZHOU SCIENCE 7 TECHNOLOGY
Murata Power Solutions
Power Integrations
SL Power Electronics
Texas Instruments
XP Power

ECN iMPACT Awards

To RSVP to the event visit www.ecnawards.com.

RF Amplifiers
API Technologies
Freescale Semiconductor Inc

Sensors
ams
BIMBA MANUFACTURING CO.
California Eastern Laboratories
Cognex Corporation
Freescale Semiconductor
Honeywell Sensing and Control
Infineon Technologies
Leddartech
LMI Technologies Inc.
New Vision Display, Inc.
ON Semiconductor
Qualtré, Inc.
QuickLogic Corporation
Silicon Labs

Software Design
Altera Corporation
Altium
California Eastern Laboratories
Cognex Corporation
Mouser Electronics
OriginLab Corporation
SYSPRO Espresso

Solid State Lighting
Larson Electronics LLC
Texas Instruments

Test & Measurement
3E Public Relations
Anritsu Company
Cascade Microtech, Inc.
Electrocube, Inc.
Freescale Semiconductor Inc
Keysight Technologies, Inc.
Mentor Graphics Mechanical Analysis Division
Oscium
Parasoft Corporation
Rigol Technologies, Inc.
Signal Hound
Tektronix
Teledyne LeCroy
Texas Instruments Incorporated
Uson LP
ZES ZIMMER

Tools Kits and Reference Designs
Freescale Semiconductor
Harwin Inc
Texas Instruments

Wireless Charging
Texas Instruments

SERVICE CATEGORIES

Contract Manufacturer Innovation
Novati Technologies
Sparton Corporation

Distributor Innovation
Digi-Key Corporation
Mouser Electronics
Newark element14

Rapid Prototyping
California Eastern Laboratories
Osram Opto Semiconductors

SPECIAL RECOGNITION

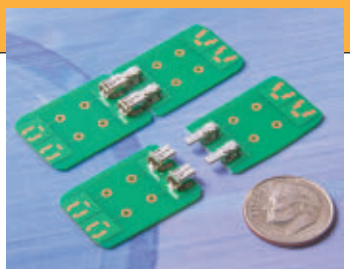
Education Innovation
Greater Than One
Mouser Electronics

Market Disrupter
California Eastern Laboratories
Ethertronics, Inc.
Keysight Technologies, Inc.
MagnaCom
MPI Corporation
Novati Technologies
Peregrine Semiconductor
QuickLogic Corporation
Silicon Space Technology
Tektronix
VIPA Controls America

Material Technology Innovation
API Technologies
Isola Group
Novati Technologies
Peregrine Semiconductor

Social Corporate Responsibility
Acopian Power Supplies

NEW PRODUCTS



LED connection ideal for high density applications

The new LEK Series connectors recently introduced by JST Corporation provide a space saving and low profile connection for LED lighting and reliable contact construction for high density applications. Any misalignment between the horizontal connections between the PCBs is absorbed by the LEK plug and receptacle. Features include:

- The spring contact in the receptacle is designed with a hook that provides a secure locking system.
- The connectors are especially suited to high density LED devices that may be subjected to harsh handling or vibration.
- Rated at 3A (AC/DC), the PCB SMT mounted plug and receptacle contacts are available in side entry configuration.
- The LEK Series has an operating temperature of -55 degree C to +85 degree C including temperature rise when applying an electrical current. The PCB mounted contacts are made of tin plated copper alloy.
- Headers are molded of RoHS compliant 94V-0 PBT material and feature insertion guides for easy and secure mating.

For more information, please visit www.jst.com.

Accelerometer ensures reliable operation from -55°C to +163°C

Measurement Specialties has released the Model 7132AHT, a high-temperature, miniature accelerometer with exceptional linearity across dynamic ranges from ±50 g to ±2000 g. The unit's stable temperature response ensures reliable operation over an extended temperature range of -55°C to +163°C, making this triaxial IEPE accelerometer useful in high temperature, high frequency, shock and vibration testing. In addition to its specific uses in automotive testing and laboratory environments, the product is designed for many general purpose data acquisition applications. Features include:

- Miniature, high temperature, triaxial IEPE accelerometer.
- Wide temperature range from -55°C to +163°C.
- Flat frequency response across a wide bandwidth up to 10 kHz.
- Stable piezo-ceramic crystals in annular shear mode for long term operation.
- Rugged, titanium housing is hermetically-sealed.

For more information, visit **www.meas-spec.com.**

Gigabit Ethernet switch includes a 29 GBit/s switch matrix

MEN Micro Inc. recently released the G101, a managed 3U flexible multiport Gigabit Ethernet switch, with a 29 GBit/s switch matrix, implemented as a CompactPCI Serial board. Specifically designed for rugged mobile communication in harsh environments, the new Ethernet switch conforms to the EN 50155 railway standard. The high bandwidth of the 29 GBit Switch matrix, robust design and wide operating temperature of -40°C to +85°C make MEN Micro's new G101 ideally suited for railway applications. Features include:

- Managed 3U rugged Gigabit Ethernet switch.
- CompactPCI Serial design.
- 29 Gbit/s carrier grade switch matrix.
- Up to 25 Gigabit Ethernet ports; all on rear I/O or 3 on front and 22 on rear.
- Wide -40°C to +85°C operating temperature.
- EN 50155 compliant; rugged construction for reliable operation in harsh environments.

For more information, **www.menmicro.com.**

THINK™

HIGH PERFORMANCE BATTERY HOLDERS

• For AA, AAA, 1/2AA and CR123A cylindrical batteries • Coil Spring and Polarized contacts assure low contact resistance and proper continuity for circuit protection • Available in Thru Hole Mount (THM) or Surface Mount (SMT) configurations • THM versions use nickel-plated stainless steel contacts • SMT versions feature gold-plated stainless steel contacts • Durable, rugged High Temperature Nylon housing • Quick & easy battery installation/replacement • Retains battery securely • Optional Covers are available for additional retention, if required • Ideal for low profile, space saving PCB applications • Suitable for Industrial and Consumer product applications

IT'S WHAT'S ON THE INSIDE THAT COUNTS

KEYSTONE®
ELECTRONICS CORP.

VISIT US AT BOOTH 139 EDS 2015

www.keyelco.com • (718) 956-8900 • (800) 221-5510

Smart Cities:
How M2M will affect major urban areas

By **Janine Mooney,** Editor-In-Chief, WDD

By 2050, the United Nations projects 67 percent of the global population will live in cities. The rapid urban growth will require cities to become more sustainable, safer, and even interactive. In many places, the only way to handle this population influx will be to develop hyper-connected smart cities, which are not without challenges. Development of these cities requires the right environment, smart solutions must take into consideration the needs and wants of city dwellers, and smart services need to be implemented and used effectively.

Continuous advancements in current technologies will aid in the transformation of our existing cities into smart cities. Specifically, advancements in machine-to-machine (M2M) communications, the Internet of Things (IoT) and wireless sensor networks (WSNs) will play a large role in assisting the smart city to prosper. M2M communications will enable multiple applications and services, allowing the smart city to become a successful reality. Public and private organizations can use M2M technology to obtain key information, allowing them to gain better insight into the needs and wants of their community.

Smartphones to deliver information

Jesse Berst, Chairman of the Smart Cities Council, believes that smartphones will allow residents to stay in touch with smart city councils and organizations to receive and relay vital information.

"It's important to realize that today's smartphones are both a delivery platform and a sensing platform," says Berst. "They are a terrific way to stay in closer touch with stakeholders by delivering information and services right to their phones and for accepting their answers and queries. Likewise, they are a great way to gather information."

This delivery and sensing platform is already in use in some locations worldwide. "In New Zealand, citizens have volunteered the use of their smartphones to gather information about weather, air quality, and water quality by using the on-board sensors and/or the camera," says Berst. "In Boston, citizens keep the 'Bump' application active as they drive around. When the phone's accelerometer records a big-enough bump, it automatically shoots a note, including the location, to the city. The city checks that location against its database of known issues like speed bumps and then sends out a pothole repair crew if needed. Finally, several council member companies can mine the information from M2M networks to glean insights that are timelier and more accurate than old-fashioned surveys. IBM, a founding member of the Smart Cities Council, and BehaviorMatrix can both 'listen' to social media plus M2M data feeds and, using analytics, tell a city how its citizens are feeling about various issues, which approaches are favored, which issues are top of mind, etc."

Putting the information to good use

With all of this great data being obtained through the use M2M communications, how can smart cities effectively use the information to better their community? Berst says smart technologies offer significant improvements in virtually every aspect of urban life. Some examples of this include:

- Smart traffic – reducing congestion by 20 to 30 percent
- Smart water – increasing water availability by 20 to 40 percent
- Smart buildings – decrease energy usage by 10 to 30 percent
- Smart policing – decrease crime by 20 to 30 percent
- Smart payments – save money (often millions per year), reduce fraud and get money to beneficiaries more quickly.

"These are not theoretical maximums, but improvements we are seeing routinely," Berst says. "What's more, many smart solutions—smart parking, smart street lights, Open Data—can significantly increase city revenues, decrease costs, or both."

Terje Lassen, Systems Engineer, Wireless Connectivity Solutions at Texas Instruments (TI) says that a lot of companies are actually already investing in this

Simplify Your M2M Connectivity

With MeshWorks™ By CEL

Armed With The ScriptNinja™
A Powerful Mesh Scripting Tool

ECN iMPACT 2015 Finalist Awards

- Market Disrupter
- Software Design
- Sensors

Finally, a Complete Node-to-Cloud M2M Solution That's *Fast & Easy* to Implement

The MeshWorks™ platform is an incredibly easy to implement turnkey wireless solution which connects sensors and control peripherals to the cloud via localized mesh networking coupled with cellular or Ethernet backhaul.

MeshWorks™ Benefits

- Achieve cost, size and power targets via localized Personal Area Networking (PAN)
- Leverage powerful and robust self-healing network capability using an industry-proven 802.15.4 stack
- Python-based, GUI-driven software suite makes it exceptionally easy for novices to program wireless PAN
- Get up & running with cloud-connected sensor prototypes in mere hours vs. months
- Out-of-the-box cloud access with complete portal tools and customizable dashboards
- Implement state-of-the-art monitoring and control, including RTLS

CEL MeshConnect™
Empowering Wireless Connectivity

To Learn More Visit:
www.cel.com/MWECN

space. He has seen the data being used for multiple applications as well, including: sensors for smarter waste collection, parking sensors to show availability of parking, traffic sensors to route traffic more efficiently, public transportation information, smart metering (water, gas, electric, heat), air quality monitoring, and medical applications such as a "virtual doctor," capable of house calls, in large cities.

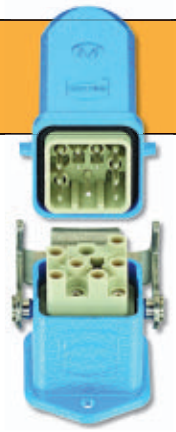
Major application: Power management

It is very clear that the information gathered using M2M communications is hugely valuable to smart city councils and organizations, and will likely contribute to its successes. One application that we see as a major benefit to all smart cities of the future is that of power management (aka smart metering or smart buildings).

Philip Gilchrist, Vice President and CTO of Data Communications at TE Connectivity believes cities can efficiently monitor and manage power usage in cities by utilizing M2M communications. "The most effective way to save energy is not to use it when we don't have to. M2M technology is the most viable way to govern power usage based on instantaneous need 24/7. Milliseconds count. Public and private organizations should define at a minimum the way M2M devices talk and cooperate with one another. Anything short of a connected web of adaptive M2M devices is a missed opportunity. We humans tend to be poor managers of power. We are slow to respond to changes in physical context and too limited a sensor to determine small changes in light, heat, and environmental conditions. We also can't be everywhere at every minute of the day," says Gilchrist.

Continuous growth

Thanks to the innovations in M2M technology, smart city councils and organizations are able to effectively communicate and better their cities today and in the future. These advances will continue evolving year over year, as they have been. Once cities are properly equipped with accurate and real-time information, organizations can continuously develop ways to improve infrastructure, plan for the future, keep their community safe, and overall make more intelligent decisions. ECN



Connector portfolio designed for explosion proof applications

HARTING has launched the Han® Ex industrial connector portfolio for explosion proof applications with a series of five size 3A sets, each comprised of a hood, housing and high pin count insert.

Features include:

- This first Han® Ex rollout is for use exclusively in intrinsically safe circuits of categories “ia”, “ib” and “ic” of explosion protection method “Ex i”, and is suitable for Zones 0, 1 and 2 for gas and Zones 20, 21 and 22 for dust.
- The “Ex i” protection method assures intrinsically safe electrical circuitry that is limited for maximum voltage, current, capacity and inductance.
- The Han® Ex housing’s blue color indicates that an intrinsically safe circuit is present.
- HARTING’s Han® Ex sets are available with 4, 7, 8 or 12 contacts.
- There are three variants with crimp termination and two with HARTING’s proprietary Han-Quick Lock® termination technology.

For more information, visit **www.harting-USA.com.**

Programmable power supplies offer output up to 600 W

Saelig Company, Inc. has introduced the BENCH range of economical programmable power supplies - compact, remote-controllable, single-output DC power supplies with available power output up to 600 W. The range includes voltages from 20 V to 1,000 V output, and 1.5 A to 30 A current to a maximum of 600 W. The embedded 12-bit D/A and A/D converters provide very accurate control and reporting of both voltage and current. The BENCH’s front panel LCD simultaneously shows voltage and current readings, as well as complete power supply status information, and it facilitates easy setup and adjustment. BENCH supplies feature low ripple and noise output and are CE, UL and CSA compliant to IEC 60950 Ed 3. Features include:

- Convenient digital rotary knobs provide manual voltage and current adjustment, and standard rear ports allow for very fast remote control changes via USB2.0 or analog control.
- The USB input is SCPI-compliant, with LabView drivers available for simple incorporation into complex test set-ups.
- Integral Digital Remote Sense (no additional wires are required) make BENCH 600W Programmable Power Supplies an ideal solution for bench and ATE applications.
- Voltage and current measurements can be transmitted to the controlling PC for logging.
- Over-voltage, over-current, and over-power protection capabilities are provided to avoid damage to a connected unit under test, while thermal protection features protect the supply itself.

For more information, visit www.saelig.com.

The cost of increased access

Next-generation module card interface: Designed for smaller, lighter and thinner computing devices

By **Brian Long,** field application engineer, TE Connectivity Ltd.

In today's society, across the entire globe, consumers and businesses alike are demanding increased access to the connected world. This demand is all but independent of where people are or what they are doing. This insatiable demand requires newer and smaller devices with faster connection speeds to allow people this access without significant effort. Needless to say, designing and developing devices with these characteristics have posed unique challenges on original equipment manufacturers (OEMs) and component manufacturers.

The industry leaders have been at the forefront of this development with interconnect solutions designed to help OEMs meet such challenges. Examples of such interconnect solutions include the module card, and the expansion card, which are used to add any number of features such as Wi-Fi, WWAN, Bluetooth, GPS, and Solid State Storage Drives (SSDs) in devices such as PCs, laptops, tablets, and gaming devices.

Within the PCI-SIG industry standards group, there has been a natural progression from the previous generation of PCI Express Mini Card connectors with the M.2 (Next-Generation Form Factor, or NGFF) connector. To support the key attributes around OEM device development, the M.2 connector was designed taking speed and space savings into consideration.

Accelerating speed

The M.2 connector was built for fast speeds targeting the need to meet the latest industry specifications like PCI Express 3.0, USB 3.0, and SATA 3.0. The high-speed capability of the M.2 connector comes from its optimized contact designs on both the upper and lower portions of the connector. The signal travels from the printed circuit board (PCB) connection point (Point A in Figures 1, 2) to the module card connection point (Point B in Figures 1, 2) and vice versa.

The PCI Express (PCIe) Mini Card connector features stamped contacts, which have large metal sections (red oval in Figure 1) which are used to retain the contacts within the housing. Since these large sections are not on the direct path from A to B (or B to A), they can be referred to as a signal stub. This signal stub increases capacitance in this area and generates noise coupling, reducing the contact performance at higher frequencies.

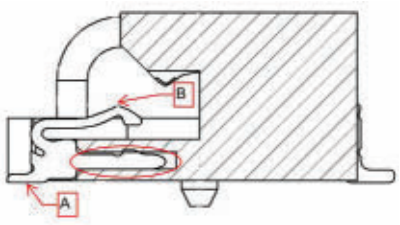


Figure 1 – PCI Express Mini Card Lower Contact (All images courtesy of TE Connectivity)

The M.2 connector contacts (shown in Figure 2) have stamped and formed contacts, which eliminate the large signal stub. This very direct signal path allows for much better capacitance across the signal trace and improves performance.

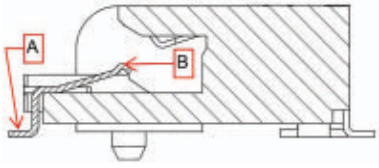


Figure 2 – M.2 Connector 3.2H Lower Contact

Looking at differential insertion loss plots as a comparison, the PCIe Mini Card Connector crosses the -2dB point around 6.75GHz (shown in Figure 3), while the M.2 connector maintains under -2dB loss all the way through 12GHz (Figure 4), leaving room to support performance beyond the latest specs of PCIe 3.0, USB 3.0, and SATA 3.0.

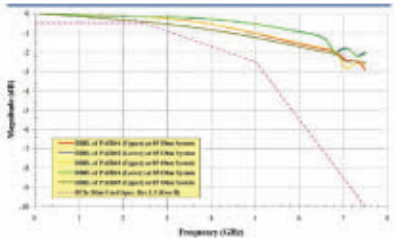


Figure 3 – Differential Insertion Loss of PCI Express Mini Card Connector at 85 Ω

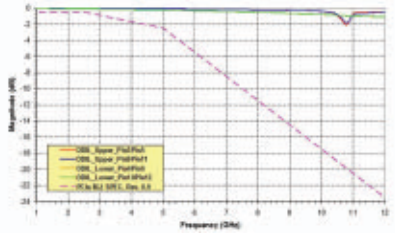


Figure 4 – Differential Insertion Loss of M.2 Connector 2.25H at 85 Ω

Saving space

The M.2 connector is also built for saving space. From the smaller 0.5 mm pitch, compared to 0. 8 mm pitch for the PCIe Mini Card Connector, the M.2 connector helps to save over 20 percent of PCB real estate. The height of

Tadiran batteries make your devices run for their lives...

PROVEN

40

YEAR

OPERATING

LIFE*

And keep them running until 2055.

The battery of the future is here today. Tadiran bobbin-type lithium thionyl chloride ($LiSOCL_2$) batteries feature an annual self-discharge rate of just 0.7% per year: so energy efficient that they allow low power consuming wireless devices to operate for up to 40 years on a single battery. No one else even comes close. Tadiran lithium batteries also feature the highest capacity, highest energy density, and widest temperature range of any lithium cell, plus a glass-to-metal hermetic seal for added ruggedness and reliability in extreme environments.

For a battery that lasts as long as your device, run with Tadiran.

TADIRAN BATTERIES

Tadiran Batteries
2001 Marcus Ave.
Suite 125E
Lake Success,
NY 11042
1-800-537-1368
516-621-4980

www.tadiranbat.com

* Tadiran LiSOCL2 batteries feature the lowest annual self-discharge rate of any competitive battery, less than 1% per year, enabling these batteries to operate over 40 years depending on device operating usage. However, this is not an expressed or implied warranty, as each application differs in terms of annual energy consumption and/or operating environment.

the connector is also reduced from less than 4 mm down to as low as 2.25 mm for single-sided module cards. For double-sided module cards, the M.2 connector is as low as 3.2 mm, which is still a reduction of 2 percent over that of the PCIe Mini Card.

Connector Dimensions	Stack Height (z)	Card Centerline to PCB	Length (x)	Width (y)	Volume (xyz)
Mini Card	4.0	2.1	9.09	29.9	1087
M.2 (NGFF)	2.35	1.08	8.7	21.9	426
Savings	1.75	1.02	0.39	8	661

Table 1 – Mini Card Connector versus M.2 Connector

Improvements over the PCIe Mini Card Connector
One aspect of the current M.2 connector design is the three-step, angled insertion process. This process (shown in Figure 5) allows for two improvements over the PCIe Mini Card connector. The first improvement is the bonus PCB real estate near the module card screw down. Having the module card seated at a 25° angle allows for taller components near this screw down area and greater design flexibility and potential space savings for the OEM. If the module card were to be seated parallel to the mother board, taller components could interfere with the insertion path.

The second improvement is the module card insertion process for the operators. As the insertion process is manual, having the operator's hand higher off the motherboard reduces the chances for potential damage to the components on the motherboard.

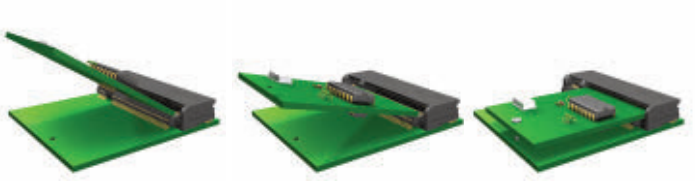
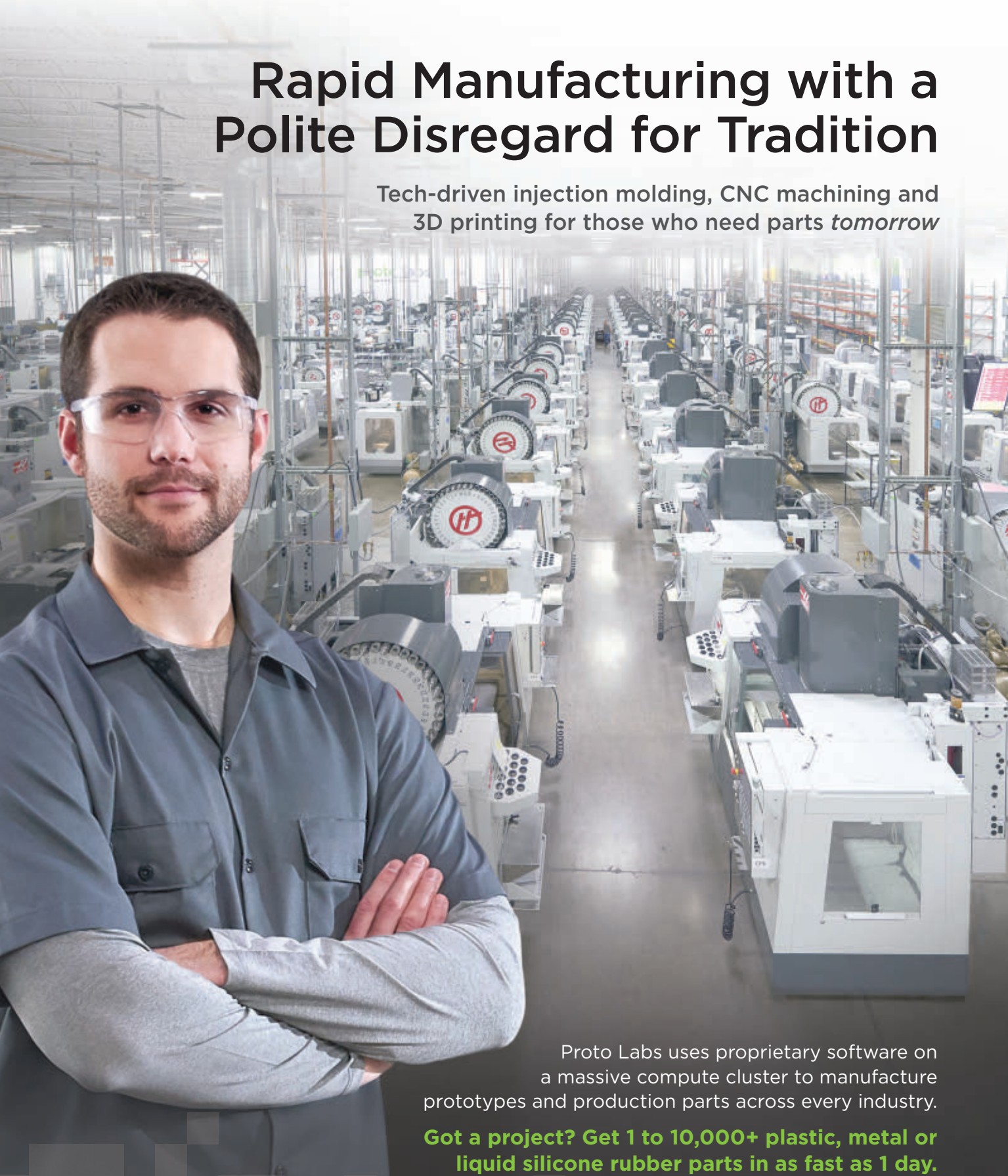


Figure 5 – The M.2 Connector's Three-Step Insertion Process

The performance benefits of the M.2 connector are already measureable, even with the connector being the "tires of the car" to the module card being the "engine." As the module card market designed for the M.2 connector platform is in its infancy, the true performance limits of the connector may not be fully known. As the module card market continues to develop and grow, the performance of the M.2 connector is expected to separate itself further from the PCIe Mini Card Connector platform.

Rapid Manufacturing with a Polite Disregard for Tradition

Tech-driven injection molding, CNC machining and 3D printing for those who need parts *tomorrow*



Proto Labs uses proprietary software on a massive compute cluster to manufacture prototypes and production parts across every industry.

Got a project? Get 1 to 10,000+ plastic, metal or liquid silicone rubber parts in as fast as 1 day.

Request your free Torus design aid at **go.protolabs.com/EC5GB**

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

proto labs®
Real Parts. Really Fast.™

The demands of mobile devices

Fostering an ecosystem of interface specifications for smartphones and other connected devices

By **Rick Wietfeldt,** Editorial Advisory Board Member, Chairman of the MIPI Alliance Technical Steering Group and Senior Director, Technology at Qualcomm

Our smartphones have become indispensible and the value we attach to these devices will continue to grow along with steadily advancing device capabilities. New designs coming to market showcase increasingly sophisticated components: ever-faster 4G/LTE and Wi-Fi modems, higher resolution cameras, 4K ultra-HD displays, high-definition audio, and a plethora of sensors enabling mobile health, smart home, and other compelling applications.

The components share a common feature: they are integrated into a device as peripherals that interface to the application processor. The interfaces themselves, designed and crafted as carefully as the parts they interconnect, are provided in large part by the MIPI® Alliance, an international organization that specializes in this intricate work.

MIPI Alliance exists to develop interface specifications that enable components to interconnect and interoperate within the complex, demanding mobile device operating environment. The organization addresses interface needs for the entire mobile device, including the modems, antenna, various other peripherals, and application processor. Formed in 2003, MIPI Alliance has released more than 45 interface specifications, bringing interoperability to device components to yield design and cost efficiencies that standardization provides. Most smartphones on the market today employ many MIPI Alliance interfaces.

MIPI Alliance, an independent group, works closely with other groups to enable other industries to use its specifications. As mobile connectivity increasingly finds its way into other markets, from PC to automobile products and to the burgeoning Internet of Things (IoT), MIPI specifications are gaining additional influence and helping drive growth in these ecosystems. In the PC industry, for example, the JEDEC® Solid State Technology Association, USB Implementers Forum, and PCI SIG® have all leveraged MIPI technologies to deploy their protocols in mobile devices.

State-of-the-art interfaces meet emerging market needs

MIPI Alliance's new sensor specification addresses the needs of sensors in smartphones by advancing traditional I2C and SPI interfaces for use in the mobile context. Designers can use the interface to streamline and scale sensor integration for all types of mobile products and help drive the IoT.

Evolving technology is yielding higher resolution cameras and displays and specifications are helping facilitate these exciting features for end users. One interface, for example, can support 4K resolution to enable brilliant, realistic color rendering for the most demanding high-definition imagery.

Global roaming on 4G/LTE devices is a fundamental need that the organization is helping address with its MIPI RF Front-End interface. This interface, pervasive in the market, offers a common method for controlling power amplifiers, antennas, and other front-end devices. The latest release improves interface characteristics for smartphones that use complex, multiradio systems and will help 3G/4G-based products operate in multiple frequency bands.

A holistic and comprehensive interface framework

MIPI Alliance interfaces are offered within a framework of specifications that serve four device interface categories: multimedia, chip-to-chip, control/data, and debug. These specifications offered across these categories enable engineers to interconnect a complete inventory of mobile device components.

Multimedia interfaces are the most popular; these support cameras, displays, audio codecs, microphones, speakers, and storage as well as FM radio, NFC, Bluetooth and GPS.

Chip-to-chip interfaces are also widely used. These high-speed interfaces provide interprocess communications (IPC) between a 4G/LTE or Wi-Fi modem and the application processor.

Control/data interfaces are used for lower-speed components including batteries, sensors, and RFFE devices.

Debug/trace interfaces are used for debugging increasingly complex embedded systems at gigabit speeds. For example, MIPI specifications can facilitate debugging via USB 3.0 and can be used to debug devices already in the field.

Interface options serve component and architectural needs

The specifications are made available as individual interfaces. Companies can adopt whichever ones they prefer to differentiate their designs or support particular technology requirements or architectures.

For example, MIPI Alliance offers three physical layer (PHY) interfaces (MIPI C-PHY℠, MIPI D-PHY℠, and MIPI M-PHY™) to support a variety of device protocols and configurations. A classic smartphone could use MIPI D-PHY for camera and display applications, for example, while a manufacturer may choose MIPI C-PHY because it lowers the interface signaling rate relative to MIPI D-PHY. Google has adopted MIPI M-PHY, combined with the MIPI UniPro℠ transport layer in the MIPI UniPort-M interface, to serve the modular needs of its Project Ara smartphone platform. MIPI M-PHY also enables PC protocols, mentioned earlier, to operate in mobile terminals.

3 Fundamentals: high performance, low power, low EMI

The specifications address the mobile industry's very special needs for high performance, low power, and low electromagnetic interference (EMI) interfaces.

High performance interfaces are needed to support a full range of performance demands in a device. These include the high data throughput that 4K displays and high-resolution cameras require and the high data speeds that 4G/LTE and 802.11ac Wi-Fi technologies must deliver.

Low-power operation is always required. MIPI Alliance interfaces use low-power signaling in both active and idle states. This minimizes interface power consumption and helps preserve battery life, enabling users to enjoy extended hours of feature-rich operation.

Low EMI helps minimize interference created by the many interfaces on the many radios present in a device. MIPI specifications deliver low EMI by employing slew rate control and low voltage swings. The techniques enable multiple radios to coexist in devices and also prevent interference from impacting displays and other features.

Looking to the future

The group has a heritage of providing device interfaces the mobile industry needs and will continue this support as technologies continue to evolve. While anticipating new smartphone trends, it is also focused on the broader device market. Today's ultra-low-tier mobile devices are likely to take on more sophisticated capabilities in the coming years and MIPI Alliance will support this evolution.

As increasingly more devices in the "mobile influenced" sphere incorporate smartphone capabilities, components in these devices will need the attributes MIPI Alliance specifications can facilitate. Alliance interfaces are already used for multimedia display and camera applications in cars, for example. The organization also expects its technologies will have important roles to play in wearables, augmented reality, healthcare and the IoT.

Hermetically sealed SMD tantalum capacitors for harsh environment applications

By Jan Petrzilek, Ph.D., AVX Czech Republic

Components designed for use in harsh environment applications must exhibit three primary features: mechanical robustness capable of surviving shocks and vibrations, hermetic sealing capable of protecting against chemical exposure, and long-term reliability despite operating under extreme conditions. Tantalum capacitors exhibit all three features and are widely employed in harsh environment applications due to their stability, reliability, and volumetric efficiency. Since the anode and dielectric materials are always the same — tantalum and tantalum pentoxide, based upon the cathode material — several types of capacitors can be distinguished.

One such category is formed by tantalum capacitors with a liquid electrolyte. In this case, the dielectric is in contact with a liquid with ionic conductivity, e.g., diluted sulfuric acid. Such capacitors are popular in applications that require high energies and high energy densities, and, until recently, were the only tantalum capacitors capable of high voltage (100V+) ratings. Tantalum capacitors with liquid electrolyte are typically hermetically sealed, and their robust mechanical construction makes them particularly suitable for harsh environment applications. Their other major advantages are: high capacitance recovery (since most of the dielectric is contacted even if the anode is large), high temperature capabilities (200°C), surge robustness, and self-healing capabilities. With regard to the latter, since the liquid electrolyte serves as a source of oxygen, it oxidizes potentially damaged spots of dielectric, effectively repairing them. However, this same feature is also responsible for deterioration mechanisms, as crystals grow under voltage, and especially at voltages that are close to the breakdown voltage of the electrolyte. Crystals of dielectric are responsible for DCL increase, especially at elevated temperatures, and DCL induces electrolysis of the electrolyte and produces hydrogen, which can cause mechanical damage to the capacitor case. So, the prevailing failure mode is electrolyte leakage and a drop in capacitance. The other drawback of this type of capacitor comes from the limited conductivity of the electrolyte, as capacitance drops with increased frequency, as well as with decreasing temperature.

Figure 1: AVX's TWD DCUltraMax Series wet electrolytic tantalum capacitors (50mF/6.3V). (Photos courtesy of AVX).

Another such category is tantalum capacitors with solid electrolytes, which use electronically conductive materials — manganese dioxide or intrinsically conductive polymers — to contact the dielectric. Manganese dioxide as a cathode material exhibits high mechanical, thermal, and electrical stability, as well as self-healing capabilities. If hermetically sealed, tantalum capacitors with manganese dioxide, which are usually SMD, can withstand operating temperatures as high as 230°C. The drawbacks for this type of capacitor include: a potentially dangerous failure mode, since tantalum can vigorously react with manganese dioxide when ignited, which can lead to burning; a relatively high resistivity of the cathode, which results in higher ESR; and a maximum rated voltage of 63 V since, as the 2009 Passive Components Conference made clear, greater thickness of the dielectric fails to further increase breakdown voltage.

Figure 2: AVX's TAJ Series SMD solid tantalum chip capacitors

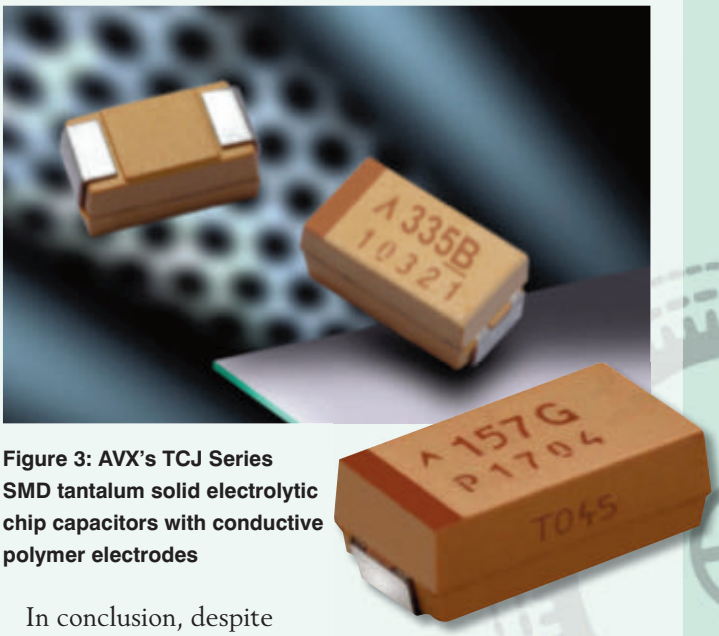


Figure 3: AVX's TCJ Series SMD tantalum solid electrolytic chip capacitors with conductive polymer electrodes

Another category of tantalum capacitors with solid electrolyte, developed more recently than those with liquid electrolyte or manganese dioxide cathodes, employs conductive polymer cathode materials, most frequently Polypyrrole or PEDT. These capacitors negate the drawbacks of solid manganese dioxide cathodes, as polymers do not have enough oxygen in their molecules to support tantalum burning, and their higher conductivity enables ESR reduction. Polymer tantalum capacitors also exhibit self-healing capabilities and are largely available as SMD devices. Special prepolymerized conductive polymers can even increase BDV and lower DCL, which has enabled the development of tantalum polymer capacitors rated up to 125 V. Major drawbacks of conductive polymer cathode capacitors are primarily associated with the material's chemical instability. Polymers are prone to oxidative degradation at elevated temperatures, and such processes are accelerated in the presence of oxygen, which limits their temperature ratings to 85 to 125°C. High levels of humidity can also induce chemical degradation in these types of capacitors, which results in increased ESR and a drop in capacitance. Additionally, both types of tantalum capacitors with solid electrolytes — manganese dioxide and conductive polymers — routinely experience capacitance recovery issues, as the dielectric is not 100 percent contacted, which can lead to reversible capacitance changes with humidity, especially in the case of conductive polymers.

In conclusion, despite their various limitations, most liquid and solid electrolytic tantalum capacitors exhibit the long lifetimes and mechanical robustness required to survive the shocks, vibrations, and, if they are hermetically sealed, chemical exposures that are common hazards in harsh environment applications.

JOSHUA ISRAELSOHN | DIRECTOR JAS TECHNICAL MEDIA

Components of risk: counterfeit electronic parts

The electronics industry benefits from innovative leaps and incremental developments from an impressive number of engineering disciplines. No matter if a technological problem centers on process, device, or circuit design; thermal or mechanical engineering; material science or package development the industry has or acquires the talent and tools to solve it. It is fortunate indeed, therefore, that so many of the challenges that engineers face in developing and producing new products are technological in nature.

Counterfeit electronic components, however, pose threats that extend beyond matters of technology. Counterfeiting is attractive to opportunists and organized criminals alike. Counterfeit parts pose safety, security, and economic risks to end users and to the companies that own the rights to genuine parts.

Due to the international scope of the electronics supply chain, tracking and shuttering offshore counterfeiters is nearly impossible. Without commitments from national governments, overseas component-counterfeiting operations are relatively safe from the law enforcement organizations of original device manufacturer (ODM) and end-market countries.

US DHS seizure statistics, shown in figure 1, indicate that China is by far the largest source of counterfeit goods that arrive in the United States. The Semiconductor Industry Association (SIA) estimates that counterfeiting costs US semiconductor manufacturers $7.5 billion per year in lost revenue and robs the labor market of 11,000 jobs, according to testimony before the U.S. Senate Committee on Armed Services during the committee's investigation into counterfeit electronic parts in the Department of Defense (DOD) supply chain.

According to Committee Chair Sen. Carl Levin (MI), when the Armed Services Committee began its investigation into counterfeit electronic parts during the spring of 2011, the Chinese Ambassador to the United States rebuffed their request to visit China to gain an understanding of the electronic counterfeiting industry. A message from the Chinese embassy was sent saying, "if the results of the [Senate] investigation were not positive, it could be 'damaging to the US-China relationship.'"

In lieu of any means to stop counterfeiting at the source, the best near term strategy is to detect fraudulent components before their installation, despite the fact that counterfeit parts can enter the supply chain at any point. Although parties from the various interested sectors agree in concept, a lack of common vocabulary, definitions, and understanding of the problem's scope can hamper convergence of understanding and recommended methods for resolution. For example, as recently as last May, the Federal Register included some 14 pages summarizing various, sometimes contradictory, comments on a proposed rule for the Defense Federal Acquisition Regulation Supplement (DFARS): Detection and Avoidance of Counterfeit Electronic Parts.

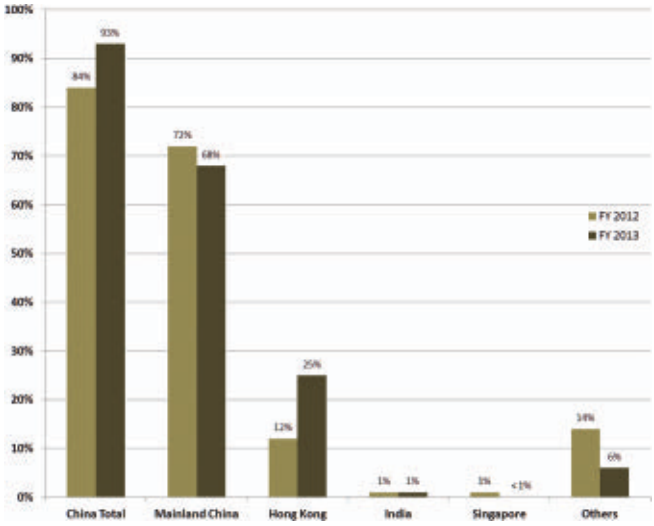


Figure 1: Seizure statistics for fiscal years 2012 and 2013 by country of origin. (Graphic courtesy JAS Technical Media; data source: Office of International Trade, US Customs and Border Protection, US Department of Homeland Security)

With more than 30 international, regional, national, industry, and sector organizations promulgating standards, most at least approach agreement as to what constitutes a counterfeit part at least if they limit the scope of commodities to technology-based products and not, say, fashion accessories. Detail differences can be problematic because contractual obligations to detect and isolate fraudulent parts derive from a mutually agreed definition of what constitutes a counterfeit part. That said, the broad definition offered by the US Department of Commerce Office of Technology Evaluation is representative and useful in the general case: "A counterfeit part

- is an unauthorized copy;
- does not conform to original OCM design, model, [or] performance standards;
- is not produced by the OCM [or by its authorized contractors];
- is an off-specification, defective, or used OCM product sold as "new" or working; or
- has incorrect of false markings [or] documentation."

That definitions such as this one include so many clauses is indicative of how many ways there are to counterfeit a part. These include recycling aged or nonfunctional parts, remarking new or recycled components, selling overproduced ICs outside of the authorized supply chain, or selling out-of-spec components. They also include

Targeted Application Focus > > > > > > >

Focused Supplier of Electronic Components to a Broad Range of Industries

MPD
MEMORY PROTECTION DEVICES, INC.

Battery Holders & Coin Cell Contacts

For primary & stand-by power and CMOS memory back-up

MPD offers a wide diversity of popular sizes, styles, terminations, options and accessories. The fact is, our website features the industry's largest array of battery holders, including extensive medical and military types.

Key Features:
- Engineered designs assure optimum battery tightness
- Low contact resistance
- Accepts NiCd, Carbon Zinc, and Alkaline batteries
- Molded of flammability rated high impact resistant plastic
- Broad temperature service range
- Molded-in contacts for PC board wave soldering
- 6" UL-CSA rated wire
- Male/Female 9V snap fastener terminals

Coin Cell Battery Retainers

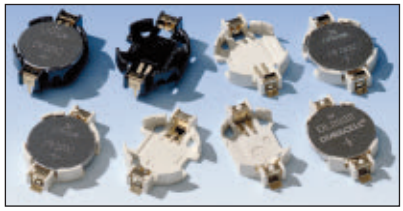
Memory Protection Devices, Inc. Now offers a very large selection of coin cell battery retainers. Newly release is a coin cell retainer for ML414 batteries, part number BK-414. Designed to meet the rigorous demands of portable equipment and featuring ultra light weight with exceptional strength. Other sizes range from 4.8 mm to 30 mm diameters and in heights from 1.2 mm to 5.8 mm.

- Thru hole or surface mounting
- Available on tape and reel
- Accepts most common sizes of alkaline or lithium cells
- Low cost
- Dual beam contacts
- Ultra light weight, low profile
- Phos-Bronze with nickel plating
- No tool necessary to change battery

www.battery-contacts.com

Coin Cell Holders

For handheld and portable devices



Key Features:
- Bright gold-plated contacts (over base metal) – particularly effective in outdoor or humid environs
- Resists tarnish or corrosion
- Unique design keeps coin-cell firmly secured, with dual beams for assured contact
- Gold's low resistance (30 M O max.) helps extend battery life
- Break-resistant, lightweight LCP plastic body resists high temperatures
- Lead-free reflow process, compatible to over 300°C
- Pick and place compatible
- Shock and vibration resistant
- Available for CR-2032 and other size coin-cell batteries
- Thru-pin and surface mounting
- Available tape and reel
- Requires no tool for battery removal coin-cell battery holders

www.batteryholders.com

Auto Plugs, Sockets, Auto Plug-in Cords

Low cost, high quality

Auto Plugs (14 versatile designs)

MPD's auto lighter plug accepts a standard 3AG fuse and is supplied with a 250 volt 3 amp type. An optional 3mm red LED (when lit) assures that the unit is receiving power. The plug unscrews for easy soldering.

Power Cord Assemblies
For foreign & domestic autos/sockets. Molded DC plug – 2.1* x 5.5mm, straight or right angle. 2A thru 10A. Straight wire or coil cords in many gauges. Custom assemblies, too. *2.5 optional.

Sockets
Plastic or rugged metal case. Screw lock or insert lock mounting types. Porcelain or Bakelite insulators. Mounting panels and dust covers available.

www.12v-parts.com

MPD Memory Protection Devices, Inc. • 200 Broad Hollow Rd., Farmingdale, NY 11735 • 631-249-0001 • Fax: 631-249-0002

JOSHUA ISRAELSOHN | DIRECTOR JAS TECHNICAL MEDIA

parts cloned by pirated IP or by reverse engineering, ICs reproduced with tampered designs (which can implement hardware-based security breaches), or components sold with forged documentation.

A common, relatively low-tech method of counterfeiting consists of remarking parts. Counterfeiters can remark parts to appear as higher-grade versions of the same product—for example, marking commercial-grade parts as industrial-grade. They can also re-mark one part to masquerade as a different, more-valuable component with the same package and pin count. Examination of a part's markings is a quick and easy way to detect this type of counterfeiting.

You can use acetone to test the permanence of a part's markings but a milder solvent that MIL-STD-883 method 2015.13 specifies is a 3:1 mixture of mineral spirits to alcohol. Legitimate markings will not dissolve or smudge when you apply this mixture.

Beyond testing its permanence, check the placement, clarity, and content of a part's markings. For example, most manufacturers don't allow markings of any kind within mould features such as indents. Check the indents and other molded features to see if they match those of a known good part. When in doubt, photograph a suspected part and consult the ODM.

Component distributor AERI suggests several other quick checks during visual inspection of incoming parts. Look for misspellings on manufacturers' labels. Verify that the date code on the package label and the parts agree. If you suspect alterations in a part's markings, confirm with the ODM that the date and lot codes agree with their records. Check that the packaging conforms to part-specific requirements, such as for ESD or humidity protection. AERI CEO Robb Hammond has penned an article, available at bit.ly/18huvt8 that includes numerous photographs depicting parts counterfeit using methods detectable by means of visual inspection.

Beyond external visual inspection, tests to confirm parts as counterfeit or genuine vary according either to the part's form-factor, such as for example BGA or leaded SMT, or its electronic-function. When in doubt, look to your part supplier or the ODM for support: They want to rid the supply chain of counterfeit parts as much as you do.

For further reading, an excellent information resource is Henry Livingston's blog, available at http://bit.ly/1EHSlva. Although Livingston's focus is largely on this issue as it affects the defense and aerospace sectors, there are a good number of articles and reports in the Literature section that engender broad interest.

Acknowledgement

The author thanks Aimee Kalnoskas for sharing her insights on this topic.

Touch. Discover. Solve.

Oscilloscopes redefined.

We've improved on the proven. The new Keysight 3000T oscilloscope is the next-generation of the InfiniiVision X-Series. With its zone touch triggering, you can trigger on any signal in just two steps. So you can isolate a signal in seconds—much faster than with any competing scope. The 3000T is also a 6-in-1 instrument. Along with your oscilloscope, you can get an MSO, WaveGen function generator, protocol analyzer, DVM and counter. Get in touch with the future of scopes. Take the Trigger Challenge today.

Models	Keysight 3000T X-Series*	Leading Competitor**
Bandwidth	100 MHz-1 GHz	100 MHz-1 GHz
Update Rate	Uncompromised 1M wfms/s	Up to 280K wfms/s
Touch Screen	8.5-inch Capacitive	No
Zone Touch Triggering	Yes	No
Sample Rate	5 GSa/s	2.5 GSa/s (>= 500 MHz) 5 GSa/s (1 GHz)

microlease

Take the Trigger Challenge at:
www.microlease.com/Keysight/scope
Buy from an Authorized Distributor 866 436 0887

KEYSIGHT TECHNOLOGIES
Unlocking Measurement Insights

* Refer to Keysight document 5992-0140EN for product specs, and 5989-7885EN for update rate measurements.
** Competitive oscilloscopes are from Tektronix publication 48W-30020-3

Agilent's Electronic Measurement Group is now **Keysight Technologies.**

MODERATED BY KASEY PANETTA
EDITOR

Q: What type of smart energy technology will make the biggest impact in the future?

Tom Griffiths, Marketing Manager, Sensor Driven Lighting, ams AG's Emerging Sensor Solutions group

While there are a number of specific technology elements that will enjoy continued leaps forward on both the micro- or macro-scale, ranging from more intelligent power management IC's to breakthroughs in HVAC systems, the highest impact smart energy technology will more overarching. The winner will be sensor-driven predictive systems solutions. As we contemplate the scope of what we really mean by "Internet of Things", we quickly point to the cloud, big-data aggregation, and near-universal connectivity. Rounding that out will be a separate internet of connected awareness that will feed that aggregation. As that cloud "connects the dots" with regard to individual or group behaviors, we'll quickly find that the IoT is able to fairly accurately predict how most individuals will interact with the spaces they occupy. We expect that for most of our built spaces, our lighting will serve as the IoT sensor hub to deliver the sensor-driven data that will create this mass "awareness" (lights are ubiquitous, have power, and a great view of the occupied space). The sensor-driven data that will flow from those IoT connected smart lighting systems will determine a new normal, where most people enjoy X amount of light and Y amount of heat when they wake up, and only spend Z amount of time, on average, in spaces such as A, B and C. As the data becomes more personalized, the information will tell us that if the someone takes a right turn out of the bedroom, they'll be out of the space for the rest of the day and heading off to work, where the systems have learned they need 20 percent less light than most of their officemates. These "cognitive" systems will start from more optimized default assumptions (thanks to big data) and rapidly learn the preferences of the individual users.

Brett Burger, Senior Product Marketing Manager, Smart Grid Systems at NI

When looking for the most impactful energy technology there is a plethora from which to select. Software startups, research institutions, billion dollar global corporations and one-person engineering shops are all doing great work to help solve the energy problems we face today. Because of this, we have a variety of solar generation technologies, huge wind-turbines that are getting more efficient, automated demand response to lower peak energy, new energy storage technology, various communication protocols, smarter meters, software to serve information from mountains of data…and the list goes on. All of these technologies will continue to play a big role in the future of energy, but the technology that will make the biggest impact in the future is the Industrial Internet of Things (IIoT) technology that will help bring them all together for the grid operators. The grid is not going to be redesigned around a single new technology. That would be expensive and reduce innovation. The most impactful solution will be a nimble and flexible network of measurement, processing and communication nodes throughout the grid; an updated "nervous system" for the next generation smart grid. Microgrids are a good, scaled down example of IIoT technology as they often incorporate multiple energy technologies such as distributed renewables, storage and a fueled generator. This mix of dynamic generation with storage requires more data and faster control to operate than the standard hub/spoke generation model. Connecting these technologies, which are likely not all from the same company, is where the IIoT comes in with an overarching solution to merge measurements, control and connectivity. By bringing new technologies and grid operators together, the IIoT will help improve grid operation while continuing to foster new innovation from scientists and engineers with domain expertise.

Randall Restle, Director, Applications Engineering, Digi-Key Corporation

Gallium nitride (GaN) power transistors driven by intelligent drivers and controllers will have a big impact on energy reduction and improved energy efficiency. This is because GaN transistors have very low RDSON which give them best-in-class current densities. Due in part to surface mode conduction, these devices have very large current carrying capability enabling them to drive large loads from very small electronic packages. But carrying current is only part of the story. The load is the other. Delivering only the current the load needs, and not more, means there is less waste and energy loss in the load itself. Stepper motors that are stationary and without disturbance from the load need no energy at all to hold their position. Overdriving these motors when it's not needed is energy lost in the motor and the load connected to it. It is easily felt by placing your hand on the powered stepper motor. Adapting to the load is the job of the driver or controller or sometimes both when they are integrated into a chip. Sensing load characteristics and adjusting drive strength on the fly means only delivering the energy the load requires. Drives that do not make these dynamic adjustments result in loads that make more noise due to mechanical vibration and oscillation, get unnecessarily hot, and otherwise wear faster than is necessary. Addressing this, in turn, means higher efficiency, higher performance, and faster end-products – more output from less input. Two suppliers offering these technologies through Digi-Key are Efficient Power Conversion (EPC) (eGaN devices) and Trinamic (smart drivers).

DO YOU CONSIDER YOURSELF AN EXPERT IN LEDS? WOULD YOU LIKE TO CONTRIBUTE TO THE BRAINSTORM?

What's the next big thing in LEDs?

Email Editor Kasey Panetta at kasey.panetta@advantagemedia.com by May 1 and your answer might be featured in the magazine.

Industrial LED light bar designed for harsh environments

Binder is proud to announce the release of its new Industrial LED light bar. The IP69K rated lights are ideal for diverse automation and industrial machinery. The LED lights are designed to provide energy efficient illumination while defying harsh work environments and are able to withstand high pressure washdowns and exposure to liquids
such as oils and coolants. Features include:

- Three standard bar length: 9.8, 14 and 16.25 inches.
- Alternative solutions for engineers that are looking for an adaptable light fixture.
- Rated 24V per lamp and 5.7 watts for the smaller LED bar, the LEDs produces a neutral white light color at 4,000 K with a lifespan of 50,000 hours.

For more information, visit **www.binder-usa.com.**

Digital printing designed for metal enclosures

OKW's metal enclosures division METCASE is pioneering the use of digital printing for front panels, rack cases and instrument housings – saving customers time and money. METCASE's new state of the art digital technology means legends, logos and complex photo quality graphics can be printed on front panels and enclosures quickly and easily. METCASE can print in full color CMYK up to 1,800 x 1,800 dpi on painted or anodized metal surfaces (and plastics) with all different kinds of textures. Features include:

- Hard UV ink provides excellent scratch resistance and the surfaces lacquered for added protection.
- Digital printing is significantly faster than traditional silk screen printing and more cost effective because there are no expensive tooling costs.
- The process also enables different iterations to be easily created so it's simpler to add barcodes, QR codes, or sequential numbering.
- Printing is carried out on a large A2 flatbed area so multiple panels or cases can be printed at once, speeding up the process still further.

For more information, **visit www.metcaseusa.com.**

Advertisers Index

ECN® (ISSN #1523-3081,USPS #172-060), (GST Reg. #844559765) is a registered trademark of and published monthly except semi-monthly in June (13 times per year) by Advantage Business Media, 100 Enterprise Drive, Suite 600, Box 912, Rockaway, NJ 07866-0912.
Periodicals Mail postage paid at Rockaway, NJ 07866 and at additional mailing offices. POSTMASTER: Send return address changes to ECN, P.O. Box 3574, Northbrook, IL 60065. Publications Mail Agreement No. 41336030. Return undeliverable Canadian addresses to: Imex/Pitney Bowes, P.O. Box 1632, Windsor Ontario N9A 7C9.
Subscription Inquiries/Change of Address: contact: Omeda Customer Service, PO Box 3574, Northbrook, IL 60065-3574, 847-559-7560, Fax: 847-291-4816, email: abecn@omeda.com. Change of address notices should include old as well as new address. If possible attach address label from recent issue. Allow 8 to 10 weeks for address change to become effective. Subscriptions are free to qualified individuals. Subscription rates per year are $93 for U.S.A., $112 for Canada, $175 for Mexico & foreign air delivery, single copy $8 for U.S.A., $12 for other locations, prepaid in U.S.A. funds drawn on a U.S.A. branch bank.
Notice to Subscribers: We permit reputable companies to send announcements of their products or services to our subscribers. Requests for this privilege are examined with great care to be sure they will be of interest to our readers. If you prefer not to receive such mailings and want your name in our files only for receiving the magazine, please write us, enclosing your current address mailing label. Please address your request to Customer Service, P.O. Box 3574, Northbrook, IL 60065-3574.
Printed in USA: Advantage Business Media does not assume and hereby disclaims any liability to any person for any loss or damage caused by errors or omissions in the material contained herein, regardless of whether such errors result from negligence, accident or any other cause whatsoever. The editors make every reasonable effort to verify the information published, but Advantage Business Media assumes no responsibility for the validity of any manufacturers' claims or statements in items reported.

Entry Deadline Approaching

Advantage Business Media

$75,000 IN PRIZES TO BE AWARDED

YOUNG MIND AWARDS

Submissions for the Inaugural Awards Are Due May 31st!

Advantage Business Media's Young Mind Awards will recognize inspired designs in science, technology, engineering, and math from the next generation of entrepreneurs, innovators, scientists, and engineers.

The awards are open to all Middle School, High School, and Undergraduate students, giving these future innovators the opportunity to demonstrate their passion and showcase their ability to tackle real-world challenges as they pursue their dreams in STEM.

A panel of distinguished industry professionals will review all submissions based on the core principles of creativity, comprehensiveness, clarity of expression, and demonstration.

Students can submit a project in one of five innovation categories:

- Research and Development
- Electronic Design
- Medical Device Design
- Electromechanical/Mechanical
- Wireless Design

Join us in saluting the efforts and achievements of our future innovators.

For more information and to enter, visit www.youngmindawards.com.
All submissions are due by May 31, 2015.

Evergreen Sponsor:

ALLIED ELECTRONICS

Official Conference Partner:

IMS
Connecting Minds. Exchanging Ideas.

International Space Station

By Kasey Panetta, Editor

The **International Space Station (ISS)** changed the world of space forever after its launch in 2000. Not only has it served as an international project that allows countries to set aside politics for science, it is also a one-of-a-kind research facility. You can Spot the Station by visiting www.spotthestation.nasa.gov and keep updated on the ISS via Twitter @Space_station.

Oct. 31 2000
Launch of Expedition 1

March 2001
Expedition 2 Launch

April 2001
The robotics system called Canadarm2 is launched

April 28 2001
First space tourist Dennis Tito arrives

June 2002
Expedition 4: Flight engineers break 196 day U.S. Space Endurance Record

April 2003
Expedition 7
First two-person station crew

Feb 2003
Space Ship Columbia is lost with the STS-107 Crew on board

August 2005
Sergei Krikalev beats record of time spent in space: 803 days

Specs:

- Module Length: **167.3 feet**
- Truss Length: **357.5 feet**
- Solar Array Length: **239.4 feet**
- Mass: **924,739 pounds**
- Habitable Volume: **13,696 cubic feet**
- Pressurized Volume: **32,333 cubic feet**
- Power Generation: **8 solar arrays** = **84 kilowatts**
- Lines of Computer Code: approximately **2.3 million**

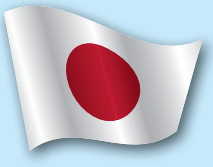
The ISS has served as a space port for:

- **100** Russian launches
- **37** Space Shuttle launches
- **1** test flight and **3** operational flights by SpaceX's Dragon

- **1** test flight and **2** operational flights by Orbital Science's Cygnus
- **4** Japanese HTVs
- **5** European ATVs

Principal partners:

esa
European Space Agency



Anybody home?:

- **184** space walks
- Days in orbit: **5956** days **8** hours **57** minutes
- Cumulative crew time: **5243** days **4** hours **53** mins
- Orbits @ **268** mph

Sept 2006
The Station receives its second set of solar arrays

Feb 2010
The ESA-built observatory modular dubbed the Cupola arrives

Nov. 2 2010
10th anniversary of continuous occupation

June 2011
ISS now consists of 11 modules

May 2014
Expedition 40

Source: NASA www.nasa.gov designed by Larry Corby

Welcome to our Satellite Office

With hundreds of space missions under our belt, Coilcraft CPS is well positioned for all your aerospace applications

Space is no place for commercial-grade components. That's why leading aerospace companies rely on Coilcraft CPS for proven RF and power magnetics featuring:

- Custom termination plating including Sn/Pb and Gold
- Extended temperature ranges (-55°C to +300°C)
- Vibration testing to 80 G / shock testing to 1000 G
- Low outgassing to NASA specifications

We also offer comprehensive product testing and validation services in accordance with established industry standards, as well as custom screening to your electrical and physical specifications.

Learn more about how our deep space experience can help your design take flight. Call or visit **coilcraft-cps.com** today!

Coilcraft CPS
CRITICAL PRODUCTS & SERVICES

* Coilcraft CPS parts are available with or without ITAR compliance.

800.981.0363 847.639.6400 www.coilcraft-cps.com


Who will drive
the future of the
transportation industry?
You and NI will. From passenger vehicles to rail systems, the transportation industry is struggling to deal with increased electronic complexity, higher demands on safety, and accelerated time-to-market requirements. See how NI helps simplify rapid control prototyping, in-vehicle data logging, and a variety of other critical applications at ni.com.
NATIONAL INSTRUMENTS
©2014 National Instruments. All rights reserved. National Instruments, NI, and ni.com are trademarks of National Instruments.
Other product and company names listed are trademarks or trade names of their respective companies. 18586