# EP&T

ELECTRONIC PRODUCTS & TECHNOLOGY

MAY 2021

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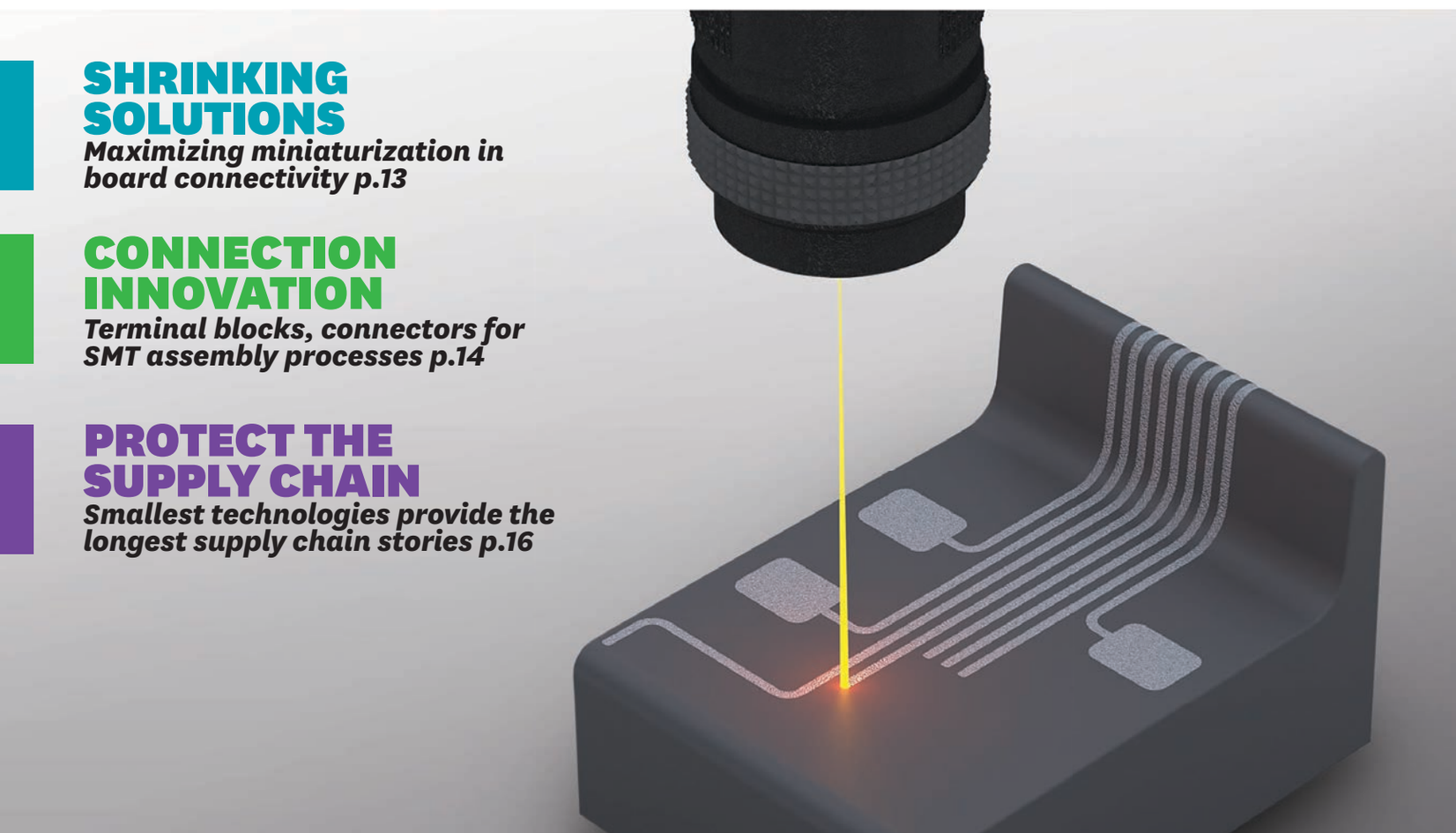

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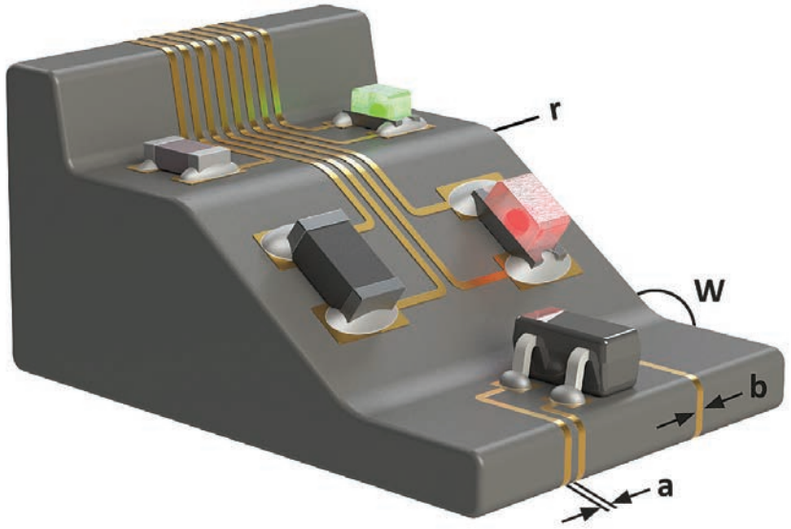


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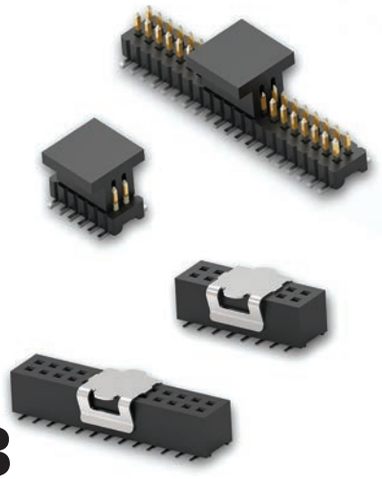

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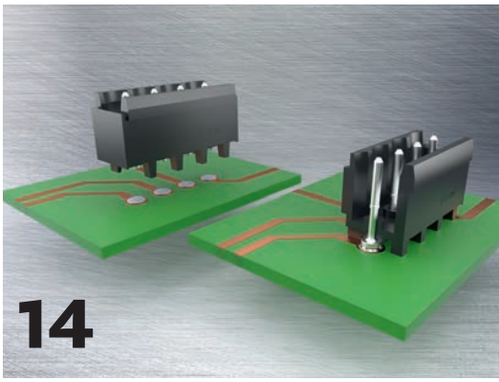

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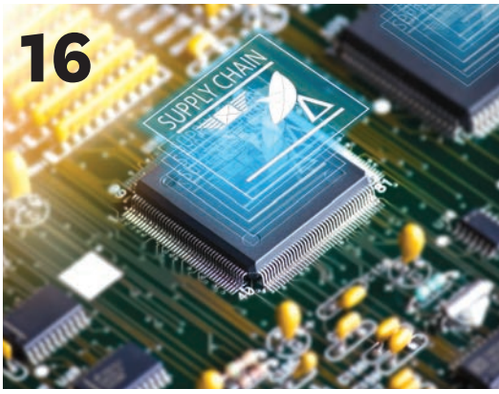


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Cover photo: Harting
Photos (this page, from top): Harting; TE Connectivity; WECO; Omnae

# Semiconductor supplies short circuited

## *Global lack of microchips hampers manufacturing in multiple industries*

For the most part they go unseen, but semiconductors are at the heart of almost every electronic design. And, let's face it, electronics has literally creeped into every nook of our lives these days – thus, when supplies run short, it can halt manufacturing.

It has been estimated that close to 170 different industries are being hit by the ongoing global chip shortage. To a great extent, the lack of semiconductors has been a ticking time bomb, building since late last year due to a few (unrelated) supply-chain disruptions.

When the Covid-19 pandemic caused a precipitous drop in vehicle sales in spring 2020, automakers cut their orders of all parts and materials — as they tend to use a broad selection of components from multiple vendors. Then in the third quarter, when demand for passenger vehicles rebounded, semi makers were already committed to supplying their big customers in consumer electronics and IT.

Tech magnate Elon Musk even waded into the conversation stating his firm has suffered "some of the most difficult supply-chain challenges" ever experienced in the life of Tesla.

### *Booming demand*

Around the world, chip supplies tightened due to booming demand for electronics throughout the pandemic - driving outages at large production facilities. The deepening global chip crunch has spread to makers of smartphones, televisions and home appliances, as companies boost stockpiles of in-demand replacements. The situation has coincided with a period of soaring, unprecedented demand – in January alone, chip sales reached a record USD$40 billion, according to reports.

Companies started actively stockpiling chips, such as Apple in America and Huawei in Asia. From a supply perspective, the world's largest contract manufacturer of semiconductors – Taiwan Semiconductor Manufacturing Co. (or TSMC) recently announced its plans to invest $100 billion over the next three years to expand its manufacturing capacity and support R&D.

> ***"No one knows for sure, but industry forecasts show the global chip shortage looks set to persist for some time yet"***

With other fellow Taiwanese players ramping up production amid the turmoil, and showing improved revenues to boot – US President Joe Biden challenged his home-based foundries to boost domestic production – in hopes of restoring its title as "the world's computer chip leader." It is important to note that semis are not exactly easy to make, either, with advanced parts taking up to six months to produce.

### *Minimize bottlenecks*

US-based component industry association SEMI spoke out in defense of semi makers, releasing a formal retort aimed at the U.S. Department of Commerce.

"Our comments show that just as countless industries depend on semiconductors, semiconductor fabs depend on a complex, global supply chain providing the essential building blocks for semiconductor device manufacturing, from silicon through final test," said Ajit Manocha, SEMI president & CEO.

"Incentives to strengthen the industry must be available to all links within the semiconductor supply chain to minimize potential bottlenecks upstream of chip fabs that could impede the growth of the industry in the United States."

Biden was likely pleased to hear Intel announce a USD$20 billion plan to significantly expand production, including two new plants in Arizona.

No one knows for sure, but industry forecasts show the global chip shortage looks set to persist for some time yet - potentially lasting through 2021 and even into 2022, as industry grapples with increasingly complex market forces. It can take up to two years to get complex semiconductor production factories up and running, and manufacturers are in the process of significantly raising prices for the second time in less than a year.

Until we have seen the end of this pandemic and all the economic twists and turns that come with it, maybe we will look back with some appreciation for the role and vital impact that the semiconductor industry plays in our daily lives? **EP&T**

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**ELECTRONIC PRODUCTS & TECHNOLOGY**
*Canada's information leader for electronic engineers and designers*

**MAY 2021**
Volume 43, Number 3

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*EP&T* is published eight times per year by
**ANNEX BUSINESS MEDIA**
111 Gordon Baker Road,
Suite 400
Toronto, ON M2H 3R1
Tel (416) 442-5600
Fax (416) 510-5134
www.annexweb.com

**SUBSCRIPTION RATES**
Canada – $58.50 one year; $94.00 two years
USA – $134.00 (CAD) per year
International – $183.50 (CAD) per year
Single copy – Canada $15

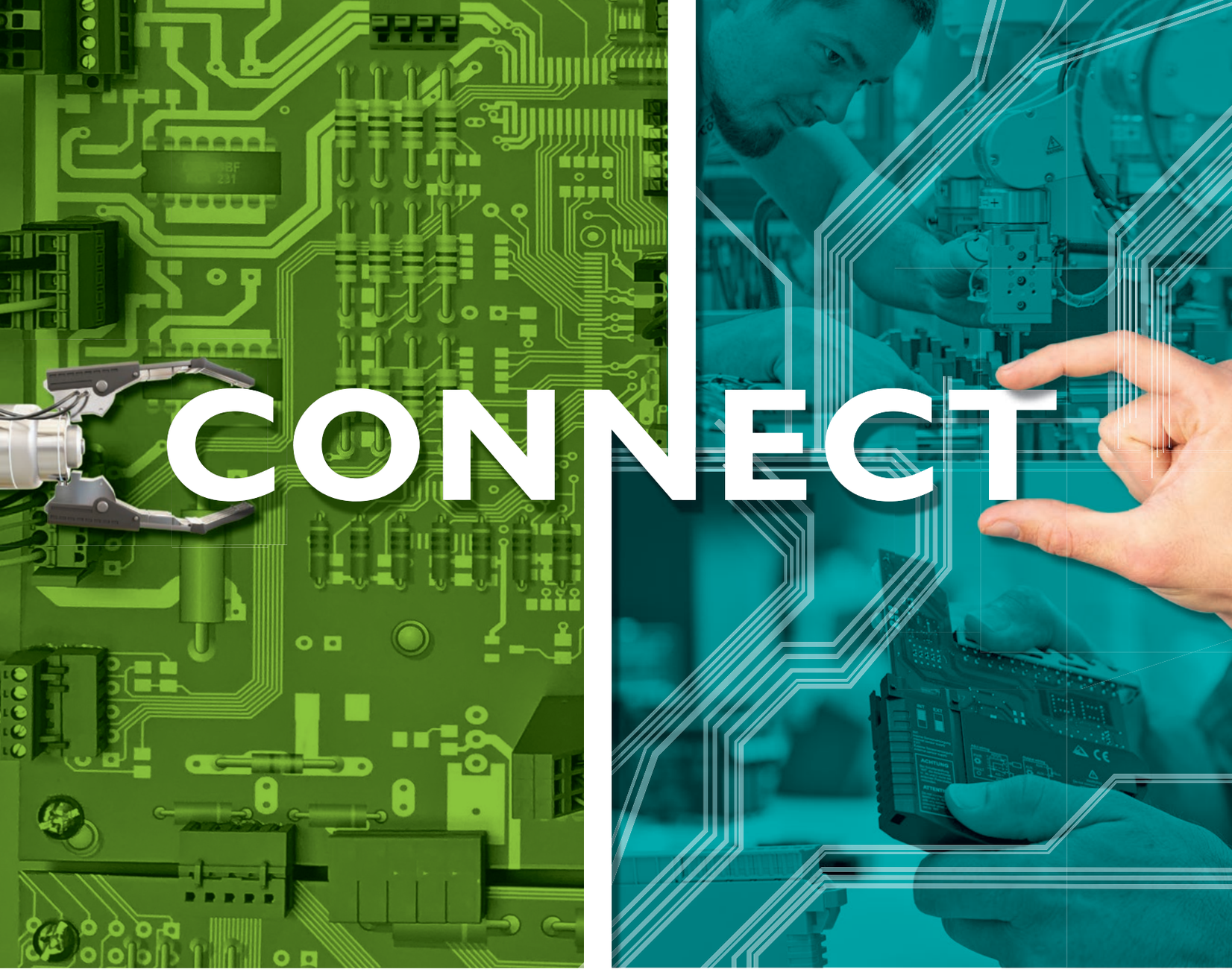
**ISSN 0708-4366** (print)
**ISSN 1923-3701** (digital)

**PUB. MAIL AGREEMENT NO. 40065710**
Return undeliverable Canadian addresses to: EP&T Circulation Department,
111 Gordon Baker Rd. Suite 400,
Toronto, ON M2H 3R1



**PRINTED IN CANADA**

Funded by the Government of Canada | Canada

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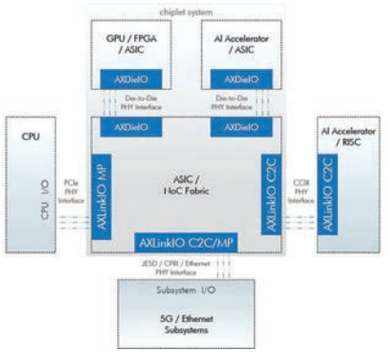
# NEWSWATCH

**IP SOUTIONS**

## ANALOGX ROLLS-OUT INTERFACE IP PLATFORM




*AnalogX serves the chiplet and chip-interconnect market using organic substrate, without any silicon interposer required*

AnalogX, a Toronto-based provider of low power multi-standard connectivity SerDes IP solutions, has released its silicon proven 1-40G 22nm SERDES platform consuming less than 2pJ/bit. The SerDes IP supports 5G radio needs such as JESD204, CPRI and also support PCIe, CXL, CCIX, Ethernet applications. It is designed to pass automotive design rules and suitable for use in low orbit space (LEO) communication applications.

AnalogX serves the chiplet and chip-interconnect market using organic substrate (no silicon interposer required) with 16nm, 12nm, 7 nm, 6nm and now 22nm technology.

"We are excited to work with AnalogX on this latest process offering as we bring Chip-to-Chip and Die-to-Die interface technology main stream along with our HBM PHY and Controller subsystem on leading process nodes," says Mohit Gupta, SVP & GM SoC IP BU, OpenFive. "Our low latency Ethernet and Interlaken controllers further enhances the integrated solution for various applications."

"The use of the AnalogX 22nm PHY with PLDA's PCIe and CXL controllers provides chip architects a power and performance-optimized solution for the most demanding applications," adds Paul Karazuba, vice president of marketing at PLDA.

**SEMICONDUCTORS**

## SEMI AND CAR SIGN MOU

SEMI, the largest global trade association for the design and manufacture of semiconductors, and Center for Automotive Research (CAR), a nonprofit independent automotive/mobility industry think tank, have signed a Memorandum of Understanding (MOU) for joint exploration to advance increased supply chain collaboration between the semiconductor and automotive industries.

Building on the SEMI Smart Mobility initiative, which fosters collaboration across the global automotive electronics supply chain, the MOU lays the foundation to connect microelectronics manufacturing and design stakeholders with the automotive and mobility ecosystems through programs and events that advance both industries.

For SEMI, the collaboration with CAR supports the mission of its Smart Mobility initiative to foster mutually beneficial interactions and broaden transparent dialogue between its global member companies and the automotive ecosystem.

For CAR, as electronic systems are increasingly becoming the critical differentiators in vehicles, having automakers, suppliers, and semiconductor manufacturers work together more closely will add visibility into supply and demand trends. The result is intended to help connect larger cross-sections of the supply chains and minimize the impact and risk of future chip shortages and over-supply.

CENTER FOR AUTOMOTIVE RESEARCH

"This MOU provides vehicle OEMs with access to innovation, the ability to influence technology direction and pace, along with greater visibility into global supply chain developments," said Dave Anderson, president of SEMI Americas.

**11% GROWTH**

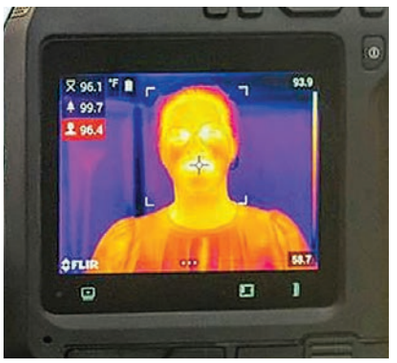
Smartphone camera module shipments will likely continue to spike, thus forecasting 5-billion units in 2021

**AI**

## C2MI, HONEYWELL IMPLEMENT AI-TECH

The MiQro Innovation Collaborative Centre (C2MI), a microelectronics systems research and development center, recently selected Honeywell for its new thermal screening and risk self-assessment process for its Bromont, Quebec-based facility. The goal is to better sustain operations and to help improve the wellbeing of building occupants and visitors.

C2MI is an internationally known microelectronics research centre that requires 24-7 laboratory access for its team and collaborators. The COVID-19 pandemic challenged its standard operations and ability to provide laboratory access while limiting potential virus exposure.




Honeywell worked with C2MI to install a thermal camera solution to screen elevated skin temperatures and risk self-assessment to streamline building access control without the need for human interaction. Using artificial intelligence (AI), the Healthy Building Kiosk thermal sensor monitors for trends and leverages variables such as the outdoor temperature to provide more accurate readings.

"We've worked with C2MI to create a custom solution to improve the efficiency of building access and support a return to more normal operations," says Laura Laltrello, vice president and general manager of North America services, Honeywell Building Technologies. "With the implementation of the new Healthy Building Kiosk at the entrance, C2MI's 24/7 operations are simplified while allowing the security staff to focus on other critical tasks."

**SUPPLY CHAIN**

## SMARTPHONE CAMERA MODULE SHIPMENTS RISE

In response to consumers' growing emphasis on camera performance as a major selling point of smartphones, telephony brands have successively released multi-camera handsets to target this rising demand and seize market shares, in turn driving up the annual shipment volume of smartphone camera modules, according to a recent report by TrendForce.

Despite the pandemic's impact on the smartphone market in 2020, total smartphone camera module shipment underwent a 3% growth year-over-year (YOY) due to the increasing number of camera modules featured per handset – driven by the smartphone brands' competition over camera hardware. TrendForce anticipates smartphone camera module shipments will likely continue to spike, and forecasts an annual shipment volume of 5.07-billion units for 2021 (11% YoY growth).

Photo: AnalogX; C2MI

In addition to increasing the number of camera modules per handset, smartphone brands have also been raising the specifications of their smartphone cameras.

**SENSORS**

## LAYERED MATERIALS GRANT SIGHT TO ELECTRONIC CHIPS

Researchers in Europe have reported an image sensor with an integrated artificial neural network (ANN) capable of learning and classifying images within nanoseconds. The chip is a thousand times faster and uses much less power than conventional vision technologies.

GRAPHENE FLAGSHIP

The image sensor can simultaneously capture and process images, making object recognition many orders of magnitude faster. The device does not consume any electrical power when it is operating, since the photons themselves provide the energy for the electric current. The sensor is complemented by an ANN, a man-made system inspired by our brain. In an ANN, components dubbed 'neurons' are fed data and cooperate to tackle a problem. In this case, recognizing an image.

The researchers at the Vienna University of Technology, supported by the European research project, the Graphene Flagship, devised sensors containing nine pixels – the 'neurons' – placed in a 3x3 array. Every pixel in turn, consists of three photodiodes, which are semiconductor devices that convert light into electrical current, that provide three outputs. Each photodiode links its pixel to the other eight pixels. The current from each photodiode is determined by the intensity of incoming light and the voltage across it. Each neuron sums the individual currents coming from the other eight neurons, and the combined values are then fed into a computer.

The device can classify images after a series of training processes, but it can also recognize a characteristic component or structure of an image from input data, without extra information.

**MEDICAL**

## PRISTINE SURGICAL & NEXOPTIC ENTER AGREEMENT

Pristine Surgical LLC and NexOptic Technology Corp. have entered into an exclusive partnership to deploy NexOptic's artificial intelligence (AI) powered imaging technology in Pristine's single-use endoscopic visualization platform.

NexOptic's proprietary neural networks that powers the firm's All Light Intelligent Imaging Solutions (ALIIS), are machine-learning-enabled and allow for more compact, lighter-weight optics with extreme low-light, anti-glare and data compression performance.

Combined with faster shutter speeds and reduced motion blur on a variety of platforms, the result is always-sharper images with a myriad of downstream processing advantages.

Pristine Surgical's single-use endoscopes use high-performance digital image sensors, advanced high-brightness LEDs and powerful graphics-processing hardware and software to deliver high-definition, high-quality images in a single-use surgical endoscope at reduced cost.

The companies will work together to incorporate NexOptic's Aliis technology into Pristine's single-use endoscopic visualization platform for image optimization.

"Pristine has built the endoscopy platform of the future. By combining our AI expertise with their unique single-use scope design, there's an immediate opportunity to further advance the surgical visualization platform of tomorrow," says Paul McKenzie, CEO of NexOptic Technologies.

**SECURITY**

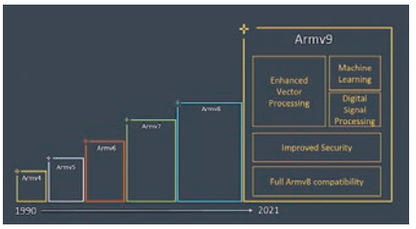
## ARM UNVEILS LATEST AI ARCHITECTURE

Arm, Cambridge UK, recently introduced its Arm v9 architecture in response to the global demand for ubiquitous specialized processing with increasingly capable security and artificial intelligence (AI). Armv9 is the first new Arm architecture in a decade, building on the success of Armv8 which leads the industry in best performance-per-watt everywhere computing.

"As we look toward a future that will be defined by AI, we must lay a foundation of leading-edge compute that will be ready to address the unique challenges to come," says Arm CEO Simon Segars. "Armv9 is the answer. It will be at the forefront of the next 300 billion Arm-based chips driven by the demand for pervasive specialized, secure and powerful processing built on the economics, design freedom and accessibility of general-purpose compute."

**100%**

of the world's shared data will soon be processed on Arm - either at the endpoint, in the data networks or the cloud




The number of Arm-based chips shipped continues to accelerate, with more than 100-billion devices shipped over the last five years. At the current rate, 100% of the world's shared data will soon be processed on Arm; either at the endpoint, in the data networks or the cloud.

Such pervasiveness conveys a responsibility on Arm to deliver more security and performance, along with other new features in Armv9. The new capabilities in Armv9 will accelerate the move from general-purpose to more specialized compute across every application as AI, IoT and 5G gain momentum globally.

**START-UPS**

## SCALEUP ACCELERATORS SERVE ALBERTA INNOVATORS

Alberta Innovates, the crown corporation for the Government of Alberta that promotes innovation in the province, issued a request for proposals (RFP) for the development of business accelerator(s) to vault Alberta's promising start-ups and small and medium technology companies through scale-up and growth faster.

Alberta has a scale-up gap. While half of all start-ups survive over five years, only 0.1 per cent of small firms become mid-sized, and only 2% of mid-sized firms become large.

Alberta Innovates is seeking three or more technology/business accelerators to address the scale-up gap and help Alberta startups and Small to Medium Sized Enterprises (SMEs) to scale and grow and contribute to a thriving innovation ecosystem in Alberta.

"Our goal is to make Alberta a hub for high growth entrepreneurial businesses and recognized as an attractive place for technology investment. We want to help companies scale – not just to become $5-million or $10-million companies – we want to see companies get to $100 million or more," says Laura Kilcrease, CEO, Alberta Innovates.

*Visit **ept.ca** for the latest new products, news and industry events.*

Photo: ARM

# Tech sector emerges within Okanagan

## *Group seeks to establish regional development agency in Kelowna*

**BY SOHAIL KAMAL**

Past history has shown us that support from the public sector can often be a very effective stimulus for growth in the private sector. This is because by directing funding towards local small and medium-sized ventures the government ultimately promotes regional growth and prosperity, which in turn, spreads vibrancy and well-being to the whole region.

Based on that formula, it is great news that the federal government announced it is exploring the possibility of creating a Regional Development Agency (RDA) specifically focused on BC. The province currently gathers funding through Western Economic Diversification Canada (WD), which also covers the three Prairie provinces. When it becomes operational, the BC RDA will be the seventh such federal agency. In January, Minister of Economic Development and Official Languages Mélanie Joly launched a virtual engagement tour on the topic of the RDA.

*A group from the Okanagan is working to garner an RDA office in Kelowna, arguing that it would help one of Canada's fastest-growing regions, play a key role in British Columbia's post-pandemic recovery.*

### *Key role post pandemic*

A group from the Okanagan, BC, an area a four-hour drive from both Vancouver and Calgary, is working to garner an RDA office in Kelowna. They argue that an RDA would help Kelowna, one of Canada's fastest-growing regions, play a key role in British Columbia's (BC) post-pandemic recovery. I recently had the opportunity to connect with Krista Mallory, manager of the Central Okanagan Economic Development Commission, to learn more about the region, why the nation would benefit from having an RDA office in Kelowna, and to share a couple of the region's tech success stories. Mallory says that tech has recently emerged as a significant sector in the region.

"The Central Okanagan region is punching above its weight and poised for growth. All the pieces are in place…a supportive business environment, R&D capabilities and talent pipelines at UBC Okanagan and Okanagan College," Mallory explains.

The federal government's announced in January that it would give $1.9-million to the University of British Columbia's Okanagan campus for a cleantech innovation hub, and it has been a major driver of economic growth. With more than 10,000 students, UBCO is feeding talent pipelines for local companies and adding vibrancy to the region, according to Mallory. The Okanagan also boasts entrepreneurial energy that earned it the distinction of *Most Enterprising Region in Canada* from the Financial Post in 2016.

"Building on this momentum, Kelowna and the Central Okanagan has the potential to drive economic recovery in BC and Canada," Mallory says.

According to Accelerate Okanagan, a business accelerator for tech companies in the start-up or growing phases, the Okanagan has grown 15% year-over-year since 2013 and currently generates an economic impact of more than $2-billion. More than 700 tech companies in the region employ more than 12,000 people. A pair of examples include Bananatag, a Kelowna-based SAAS company specializing in internal communications.

*Krista Mallory, manager of the Central Okanagan Economic Development Commission*

"Bananatag recently merged with a German company, StaffBase, to become the global leader in internal communications," boasts Mallory. Bananatag has also been recognized as one of Canada's top growing companies by Deloitte, The Globe and Mail, and Rocket Builders for their rapid growth, entrepreneurial spirit, and bold innovation.

### *Consider needs of sectors*

In addition, there is QHR Technologies, a 500+ employee Kelowna-based healthcare technology company, wholly owned by Loblaws, that has been experiencing "significant growth in response to Covid-19 driven changes to health care delivery," Mallory says.

"While it is too early to confirm geographical locations for any new BC RDA offices, we recognize the importance of striking a balance between rural communities and urban centres, as well as considering the needs of regions and sectors within the province," says Catherine Mounier-Desrochers, press secretary at the Office of the Minister of Economic Development and Official Languages. The ministry is reportedly considering a hub-and-spoke model for the RDA, with Victoria and Kelowna floated as potential spoke office locations.

The development of the RDA comes as 11 BC innovation-focused groups, including BC Tech Association, SFU Venture Labs, Entrepreneurship at UBC, Accelerate Okanagan, Nanaimo's Innovation Island, Kamloops Innovation Center, and Victoria-based VIATEC, are lobbying the federal government to bring the Ontario-focused Scale-Up platform out west. They hope to secure $31-million in support of rapid growing companies within the province.

Mallory shared one last piece of advice: "Take advantage of networks in your region and work together to grow the local ecosystem. One advantage of growing a business in the Kelowna region is the collaborative nature of the tech ecosystem, [where] companies, government, and academia are working together to grow the region - not competing."

To learn more about the Central Okanagan Economic Development Commission, go to https://www.investkelowna.com **EP&T**

***Sohail Kamal*** *is EP&T's West Coast correspondent. sohail@nextgear.ca*

Photo: Central Okanagan Economic Development Commission

# New US restrictions of substances in products

**BY AURY HATHOUT, ENVIROPASS**

Unlike the European Union, North America tends to let the industry voluntarily reduce hazardous substances in manufactured products. A recent US reform may change this with the legal obligation to restrict certain chemicals.

### *Toxic Substances Control Act (TSCA)*

The Toxic Substances Control Act, also abbreviated as TSCA or TOSCA, is a 45 years old federal law that rules new or existing chemicals in the USA. Its objective is similar to the European Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH) and the Canadian Environmental Protection Act (CEPA) with its domestic and non-domestic substances lists. The Environmental Protection Agency (EPA) oversees the TSCA implementation.

### *The Lautenberg Chemical Safety Act*

Over the years, various civil groups have criticized TSCA for not adequately protecting human health and the environment. As a result, a bipartisan initiative led to an amendment called the 'Frank R. Lautenberg Chemical Safety for the 21st Century Act' or 'TSCA Modernization Act of 2015'. Such reform includes provisions to assess chemical risks and prioritize concrete actions.

### *Persistent, Bioaccumulative, and Toxic (PBT)*

Targeted substances include those that are considered persistent, bioaccumulative, and toxic (PBT). Persistent substances take a very long time before naturally disappearing. Bioaccumulative chemicals tend to concentrate in animal bodies, especially in adipose tissues (fat). Finally, toxic compounds alter some forms of life. As a result, PBT substances combine all three risk factors.

### *Regulated PBT Chemicals in Articles*

At the beginning of 2021, the EPA chemicals evaluation brought to the regulation of five PBT chemicals in products (articles). Here they are, with their possible utilization by the industry:

### *Relation with other Requirements Worldwide*

Like RoHS, the TSCA PBT substances are either prohibited or restricted. Some directly affect the electrical and electronic industry, particularly PIP (3:1) and DecaBDE. DecaBDE is one of the PBDEs already ruled under both EU RoHS and REACH (as a substance of very high concern SVHC). The REACH regulation targets additional BPT substances.

### *Future TSCA PBT Rules*

These listed chemicals are the first five restricted PBT in articles. EPA has extended a 180-day grace period for PIP (3:1). EPA will most likely address additional PBT chemicals which may affect electronic OEMs. **EP&T**

Additional references:

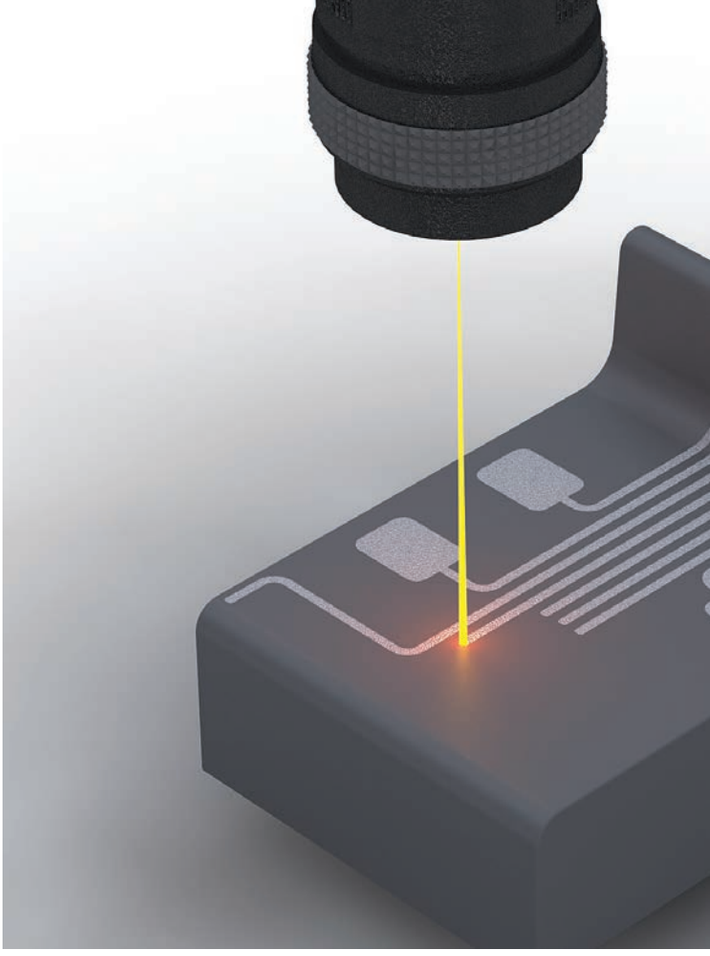
- TSCA PBT: Restriction of 5 Substances in Products
- Persistent, Bioaccumulative, and Toxic (PBT) Chemicals under TSCA Section 6(h)
- Phenol, Isopropylated Phosphate (3:1) (PIP 3:1); Regulation of Persistent, Bioaccumulative, and Toxic Chemicals Under TSCA Section 6(h)
- US TSCA and EU REACH - New Obligations to Manufacturers

***https://www.enviropass.ca/***

# Electronic assemblies without pcbs

## *Laser direct structuring enables the production of electronic assemblies with flexible geometric shapes*

**BY DIRK RETTSCHLAG, PROJECT MANAGER & IE MID, HARTING**



Laser direct structuring (LDS) is a special success story. For almost 20-years, it has been possible to apply electronic conductor paths directly onto plastic parts during series production. LDS enables the production of electronic assemblies with flexible geometric shapes. This process enables electronic products (such as smart phones, sensors or medical devices) to become even smaller and more powerful. Automated manufacturing processes also make this process more economically attractive.

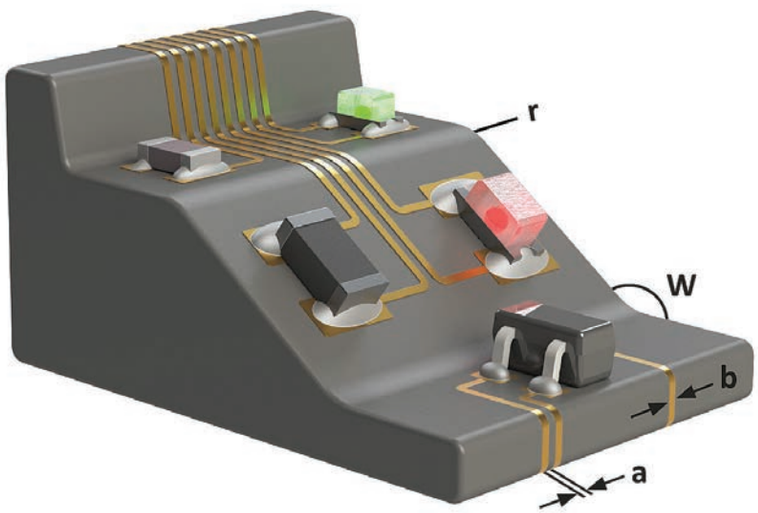
There is less and less space available for electronic assemblies, so solutions are needed which replace conventional printed circuit boards. LDS enables further miniaturization and makes increasingly complex geometric designs possible. This is a stable and reliable process that has established itself in quality-critical sectors such as medical technology or safety-relevant components for the automotive industry.

The LDS process enables three-dimensional assemblies

Direct laser structuring enables 3D-MID (Mechatronic Integrated Devices) assemblies to be produced. When using 3D-MID, electronic components can be fitted directly onto a three-dimensional base body, without circuit boards or connecting cables. The base body is manufactured using an injection moulding process, whereby the thermoplastic material has a non-conductive, inorganic additive.

The additives in the material are "activated" by direct laser structuring so that the plastic material can accommodate the electrical conductor paths. The laser beam writes the areas intended for the conductor paths and creates a micro-rough structure. The released metal particles form the nuclei for the subsequent chemical metallisation. In this way, the electrical conductor paths are applied to the areas marked by the laser. The other areas of the three-dimensional base body remain unchanged. The plastic component can then be assembled in standard SMD processes similar to a conventional pcb. It is also suitable for soldering in a reflow oven.

***Laser Direct Structuring (LDS): The structure of the conductor path is applied using the LDS process. LDS enables electronic assemblies to be made in flexible geometric shapes. Smart phones, hearing aids and smart watches are becoming smaller and more powerful thanks to this process.***




***Dimensioning and positioning: Minimum distances between the conductor paths (a): 50 – 150µm. Minimum width of the conductor paths (b): 50 – 150µm; Radius (r): 0.2mm.***

### *Versatile application of laser technology*

Harting 3D-MID AG is the largest supplier of 3D-MID components outside of Asia. Harting uses high-performance laser systems for the LDS process, with three lasers working in parallel, each offset by 45-degrees. Thanks to an additional axis of rotation, components can be processed by the laser simultaneously from all sides (360-degrees). This technology enables flexible geometric shapes, such as reflector shells or LED lights, to be made. Despite the minimal conductor path thickness of 16 to 20µm, the conductor paths are still suitable for demanding automotive components or for applications with currents up to 10A – for example for heating coils in cameras which are used to prevent the optics from fogging up.

Frequent changes during the electronics development phase or new components with modified dimensions can lead to costly adjustments during conventional pcb production. The laser layout, in contrast, can be adapted very flexibly by using the parameters of the laser's control software. No changes in the injection moulding are required for this.

Photo: Harting

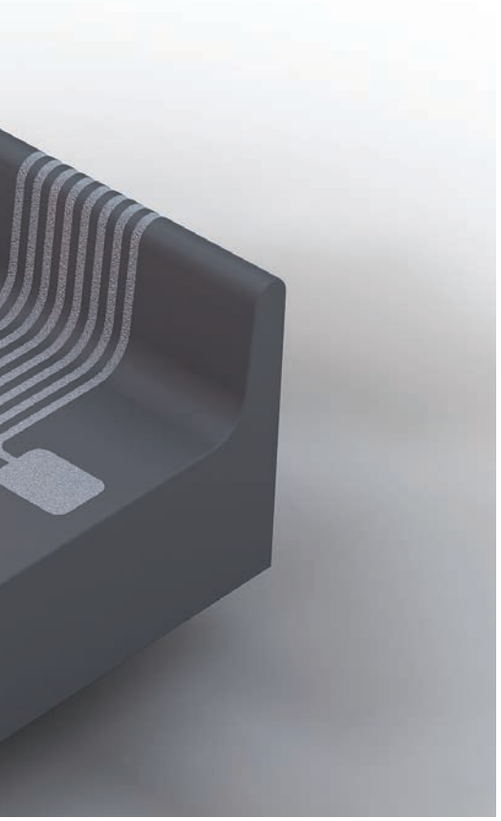


Photo: Harting

The production of prototypes using LDS is also easier compared to conventional processes. Harting can produce the plastic base body using LDS-compatible material and 3D printing. Injection moulding can also be used with inexpensive prototype tools.

### New trends in the LDS process

Several aspects of LDS technology have been improved and further developed over the past few years.

- The working area of the laser has been enlarged from 160 x 160 x 80mm to 200mm x 200mm x 80mm, thus enabling a higher packing density and the processing of even larger components.
- The working speed of the laser can be doubled to 4 m/s by optimising the servo units and mirrors which guide the laser beam, thereby significantly reducing the processing time.
- The improvement of the optics enables the use of a laser with a diameter of 100µm and a laser with a fine focus of 50µm for processing even smaller structures.

Harting is the only 3D-MID manufacturer in the world that has a laser system with three fine focus optics of 50µm. Even smaller conductor path gaps can be achieved thanks to this fine focus laser. Thus, many conductor paths can be created on the same component and a higher packing density can be implemented. This is used for safety technology, among other things, because the closely spaced and intertwined conductors are capable of triggering safety alarms from even the smallest physical interference.

### Advances in materials and economics

Only specially selected thermoplastics are certified for the LDS process; these are available from stock. The process can be further improved with customer-specific adjustments to the plastic material:

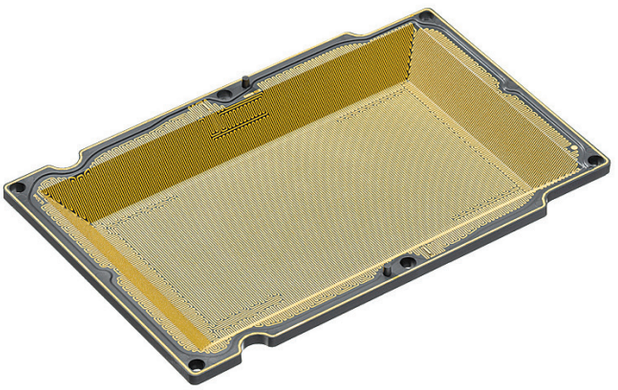
- Harting uses a process which adds LDS additives to non-certified materials to make them MID-compatible.
- Specific RAL or Pantone colours can be achieved with MID plastics by using colour pigments and special LDS additives.
- By selecting suitable additives, special RF characteristics can also be implemented, depending on the frequency range.

To further improve the cost-effectiveness of the manufacturing process, Harting relies on automated robotic systems. The LDS laser system is equipped with a rotary indexing table so that a component can be inserted or removed while another component is still being processed.

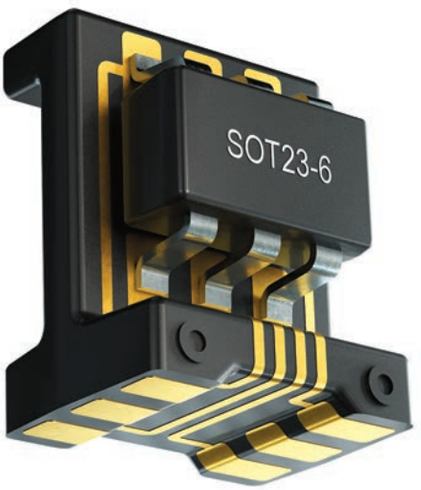
The in-feed and unloading procedures are automated by Harting using robotics. This increases throughput and autonomy, while also enabling integration into automated production processes.

An additional automation step is provided during the injection moulding process. Here, too, a robot takes over the removal of the injection moulded parts. The use of robotics also improves the precise reproducibility of the processes and, thus, overall product quality.

Harting reports increased demand for MID projects and has further expanded the 3D-MID division by investing in machinery and by acquiring a competitor's business. Innovative in-house products are also contributing to further growth. Harting has developed a solution based on 3D-MID technology which replaces flexible pcbs with a component carrier. Instead of using a flex-pcb, the component carrier can be fitted directly with electronic components, thus saving up to two thirds of the cost.



***Security caps for payment terminals: The 3D-MID caps protect the electronics from unauthorized access both mechanically and electronically. A highly precise meandering structure detects every access, no matter how small, and consequently prevents theft.***




***Component carrier: Electronic components – such as LEDs, ICs, photodiodes and sensors – can be attached directly onto the component carrier. The assembled component carriers can then be processed as standard SMD components.***

### 3D-MID technologies

Harting 3D-MID is offering the complete value chain for 3D-MID technologies from a single source, including development/prototyping of customer-specific products, injection moulding, laser direct structuring, metallisation, assembly and connection technology, as well as final inspection.

Its core business is the production of mechatronic components for automobile manufacturing, industry, medical technology and sensor systems. **EP&T**

***Harting** 3D-MID is a business unit of the HARTING Technology Group, headquartered in Espelkamp, Germany.* ***www.harting.com/3D-MID***

***Dirk Rettschlag,** project manager & IE MID, Harting*

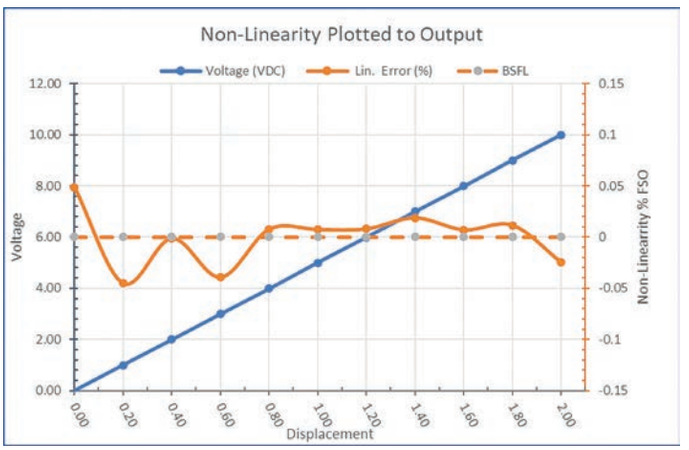
# What is sensor linearity and what does it mean?

## *The more linear the sensor's output, the easier it is to calibrate and to minimize uncertainty in output scaling*

**BY EDWARD E. HERCEG, VICE-PRESIDENT & CHIEF TECHNOLOGY OFFICER, ALLIANCE SENSORS GROUP**

Most analog output sensors have general specifications such as linearity (or non-linearity), repeatability, and resolution, as well as environmental specifications like operating temperature or shock and vibration, and dynamic specifications like response or bandwidth.

All of these specifications represent limits of error or sources of uncertainty related to the sensor's output compared to its input. Many of these terms are fairly easy to understand by their wording alone, but linearity error or non-linearity is not in that category.




### *Definition of linearity error or non-linearity*

Linearity, or more correctly, non-linearity, is a measure of the maximum deviation of the output of any sensor from a specified straight line applied to the plot of the data points of the sensor's analog output versus the input parameter being sensed, which is called the measurand, under constant environmental conditions. The more linear the sensor's output, the easier it is to calibrate and to minimize uncertainty in its output scaling. However, understanding a sensor's non-linearity specification requires understanding the nature of the reference straight line.

### *Reference straight line*

There are several possible reference straight lines that could be utilized to express a sensor's linearity error. The optimum choice based on statistics would be a 'best fit line'. But just what is the criterion for 'best fit'? Both experience and statistics favor a line calculated by the 'method of least squares', whereby the sum of the squares of the deviations from the desired line is mathematically minimized. Such a best fit straight line (BFSL) is broadly used as a basis for a sensor's linearity error or non-linearity, not merely because it is statistically appropriate but also because it has been validated in real world measurements.

### *Impact of other errors*

Because the linearity error applies to the analog output of the sensing system, recognition must be given to other errors that can affect the output besides sensor non-linearity. To fully comprehend what the linearity error specification actually means, there are several pre-conditions that must apply to the measurement process.

First, environmental factors like ambient temperature must be reasonably constant or small changes compared to the linearity error. Next, the repeatability and hysteresis errors in the sensor itself must also be small compared to its linearity error. Third, any non-linearity in the system output caused by ancillary electronics in the measuring system must also be very small compared to a sensor's linearity error. And finally, the resolution of both the sensor and the output reading instrument must be sufficient to react to the small deviations in output caused by linearity error.

### *Why worry about other errors*

Measurement errors cannot simply be added together arithmetically, but are correctly combined by a Root-Sum-Squares (RSS) calculation. So, only if these other errors are small will linearity error be the dominant source of measurement uncertainty. Otherwise, the weighting effect of the other errors can lead to serious uncertainties about the measurement results.

This is also one of the reasons that trying to measure linearity error is more complicated than it might seem. Not only must there be the ability to minimize the effects of ambient factors like temperature and humidity, but it is important to note that sensor linearity error needs to be measured with equipment having at least ten times the desired precision of the linearity error itself, which usually means highly precise equipment normally found only in metrological calibration or national standards laboratories.

### *Specifying linearity error*

The maximum linearity error using a BFSL reference for a unipolar output sensor is usually expressed as a (±) percentage of Full Scale Output or Full Span Output (FSO). For a bipolar output sensor, its maximum linearity error is expressed as a (±) percentage of Full Range Output (FRO), i.e., from (-) FSO to (+) FSO.

### *Example*

To illustrate the effects of linearity error, consider a sensor with a range of 0 to 2 inches, an output of 0 to 10V dc, and its linearity error specified as ±0.25% of FSO. The sensor has a scale factor of 5 Volts per inch and an FSO of 10Vdc, so non-linearity could cause an error of ±25mV in the output, which is equivalent to an error of ±0.005 inches. The user must then decide whether this level of error is tolerable.

This is illustrated by the graph at left, which shows both the sensor's analog output in blue and its point-by-point error from the reference line in orange. Keep in mind that the units of the error are so much smaller than the unit of output that if shown along the blue line they would be indiscernible in terms of resolution.

### To summarize:

- Linearity error is referenced to a Best Fit Straight Line calculated by the least squares method.
- Low sensor linearity error increases measurement precision and facilitates system calibration.
- Errors due to temperature, repeatability, hysteresis, and resolution could affect output linearity.
- Sensor errors do not simply add up but must be combined by a Root-Sum-Squares calculation.
- A sensor's calibration equipment must be a minimum of 10-times better than the measurement precision desired. **EP&T**

***Edward E. Herceg*** *is vice-president and chief technology officer of Alliance Sensors Group, a division of H. G. Schaevitz LLC. http://alliancesensors.com*

Photo: Alliance Sensors Group

# Shrinking solutions in board connectivity

## *Making the most of miniaturization*

**BY JANA NEW, NORTH AMERICA PRODUCT MANAGER, INDUSTRIAL DEVICES, TE CONNECTIVITY**

With Industry 4.0 in full swing, the largest commodity is data. Collecting it. Connecting it. Analyzing and activating it. The Industrial Internet of Things (IIoT) enables every device to be interconnected, opening up a whole new arena of opportunities.

New technologies make data readily available while also automating communication between industrial automation equipment and systems. This allows businesses to leverage data in more meaningful ways, including enabling remote monitoring, using predictive maintenance, and improving overall equipment productivity.

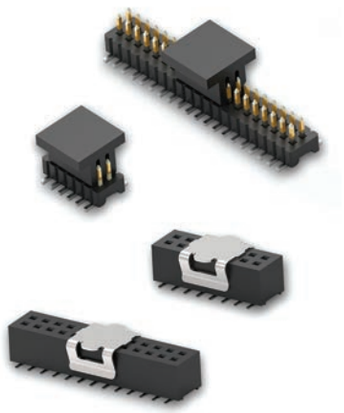
Yet, as interconnected devices become more commonplace in the home and the workplace — from wearable devices to industrial robotics — they have become smaller and smaller. Therefore, as devices shrink, so do the printed circuit boards (pcbs) inside them.

It's official. Smaller, lightweight circuit boards enable tomorrow's technologies and the rise of IIoT.

Industries that are driving the miniaturization include electronics, manufacturing, factory automation, automotive, data communication, and building automation. Yet the industries that will truly drive this technology forward in the coming years include the rise of digital factories, industrial robotics, and intelligent buildings.

### *Solid connections, smaller spaces*

As a global player in sensors and connectivity technology, TE Connectivity is familiar with helping engineer a secure, reliable connection within shrinking space constraints. It offers multiple product families tailored specifically to customer needs.



***AMPMODU interconnect system from TE Connectivity is a comprehensive family of modular signal interconnects for board-to-board, wire-to-board, and wire-to-wire applications.***

The AMPMODU interconnect system from TE Connectivity is a comprehensive family of modular signal interconnects for board-to-board, wire-to-board, and wire-to-wire applications from 1.00mm (0.039") to 3.96mm (0.156") centerlines that are widely used across nearly all industrial applications requiring pcbs.

The newest addition to this product family — the AMPMODU 1mm centerline fine pitch connectors — utilizes a 1.00mm x 1.00mm (0.050" x 0.050") centerline. The smaller centerline is crucial to meeting miniaturization demands. In fact, the AMPMODU 1mm provides a space savings of 85% when compared to standard 2.54mm (0.100") pitch products.

Another product family from TE Connectivity that addresses miniaturized connectivity is its Micro-MaTch wire-to-board and board-to-board connection system. These products provide a proven reliable connection and a unique contact-spring system, which helps prevent fretting corrosion by absorbing movements between male and female contacts.

The spring feature absorbs these movements as part of its design. Think about the life of a contact from the moment its connected — the point is exposed to relative movements, whether caused by vibration or thermal expansion. Even small temperature changes from when the equipment is in use during the day versus the idle factory floor at night can cause movement.

Additionally, plated contacts begin to oxidize as soon as they're exposed to open air, ultimately leading to corrosion and signal discontinuities. TE's contact design creates a gas-tight contact interface, which prevents corrosion without the need for costly gold plating.

With these product families, TE Connectivity can offer the products, configurations and expertise needed to guarantee secure, reliable connections — especially in harsh industrial application environments.

### *Trends in a connected future*

We expect to see a few trends continue into the connected age. One of them being the need for customized and even smaller components. Miniaturization is not a quick fad. OEMs need to ensure they're working with manufacturers that can provide a solution specifically tailored to the application need — all while remaining small and secure.

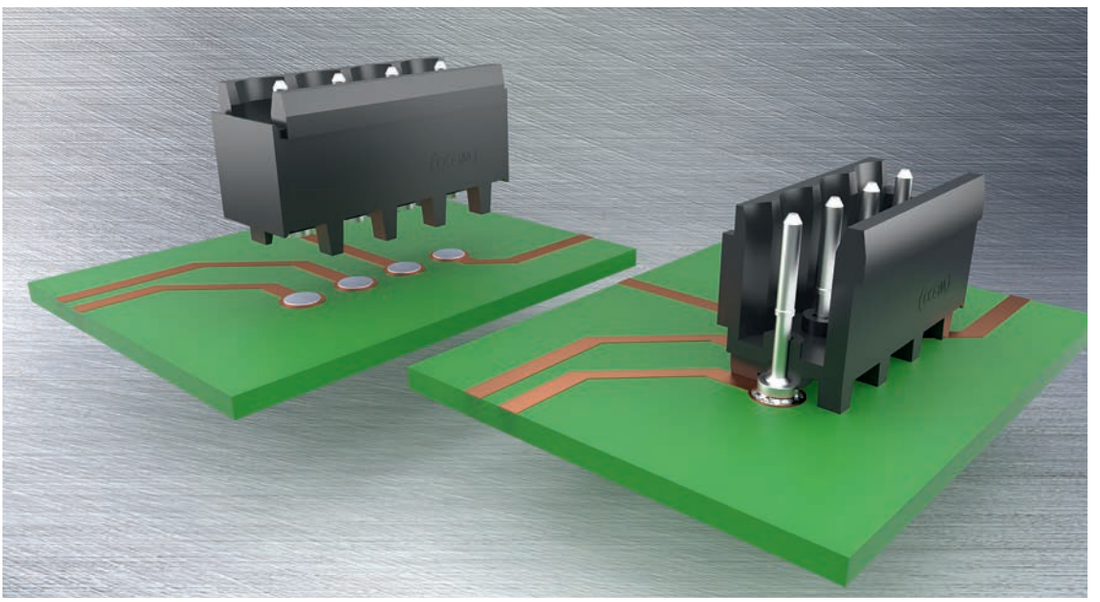
With the potential of IIoT still in its early days, it's clear that while the devices continue to get smaller the opportunities will only continue to grow. **EP&T**

***https://www.te.com/global-en/home.html***

Photo: TE Connectivity

# Need for innovative connection solutions flourishes as control panels shrink in size

*Surface mount terminal blocks, connectors engineered for SMT assembly processes* **BY MARC G VILLENEUVE, P. ENG., DIRECTOR SALES & MARKETING, WECO**



Current technology has changed immensely in the last century and powering electrical controls have evolved exponentially. From the first industrial revolution with steam and water to power electricity and mass production, then to automation and CNC machining, and now to Industry 4.0 and IoT. The need for innovative connection solutions have flourished as control panels have shrunk in size resulting in increased power distribution over a smaller and densely populated printed circuit board (pcb).

As more sensors are used to monitor factory equipment, more signals need to be processed from a single power control board; the requirement for space-saving solutions becomes even more essential. In addition to high performance, the need to maximize pcb real estate is also of paramount importance.

### *Process becomes intricate*

Surface mounted technology (SMT) is not only required to save space for signal connectors with low current, but equally important for power terminal blocks to supply power at a higher current. Soldering larger power terminal blocks and connectors using SMT reflow processes poses several challenges in the manufacturing environment.

Ensuring a sound connection to the host pcb and a high 'peel-off' force for these large surface-mount-devices (SMD), key considerations needed to be addressed: First, one needs to consider the assembly of surface-mount-device (SMD) with varying size and weights. When soldering many components of different sizes to a surface mount board, the process becomes quite intricate. Large components such as magnetic components, and power terminal blocks, require a larger solder pad and a thicker layer of solder paste to ensure an adequate soldering. The requirements for a reliable solder joint require that each pin of an SMD make direct contact with the solder paste covering its respective solder pad.

Solder paste is deposited on the host pcb with a solder stencil and squeegee. The thickness of the solder stencil determines the thickness of the solder deposited. The thicker the solder paste, the more likely the SMD pin will make contact with the solder. During reflow, the surface tension properties of liquid solder cause the capillary action and the solder to wet between the pin and pad. Having components of various sizes requires selectively increasing the solder paste thickness where larger components are placed. This is often a challenge due to time constraints and can be difficult to achieve in a production environment. If the solder paste is too thick, there is a high probability of solder bridging for fine pitch components.

A second consideration is coplanarity, defined as the maximum distance between a surface-mount device (SMD) and its seating plane (the pcb). In essence, it is the physical contact point. When placed on a flat surface, a typical SMD will rest on its three lowest contact points. This defines the seating plane of the SMD.

### *Connecting 'pins' in contact*

The maximum gap between the underside of any pin and the pcb is given a number for non-coplanarity. For large, complex components such as power terminal blocks, the 'package coplanarity' is often higher, meaning there is a greater variance between the seating plane of the terminal block and the pcb.

Dealing with Coefficient of Thermal Expansion – (CTE) is the third key factor that will influence the reliability of the solder joint of a larger power terminal block or larger SMD device. Components of varying size, shape, material and weight all have different CTE and expand at different rates compared to smaller semiconductors.

To achieve proper soldering, all components connecting 'pins' need to be in contact with the solder paste to allow the solder's capillary action to form a proper solder joint. If the measured coplanarity of the pins is too great for the amount of solder deposited, some pins may not make contact with the solder paste. In this situation, the liquid solder simply forms a pool on the pcb pad. It does not wet to bridge the gap between the pin and pad, resulting in an electrical open circuit.

WECO studied these issues and engineered SMarTconn, a portfolio of patented, field-tested,

Photo: WECO

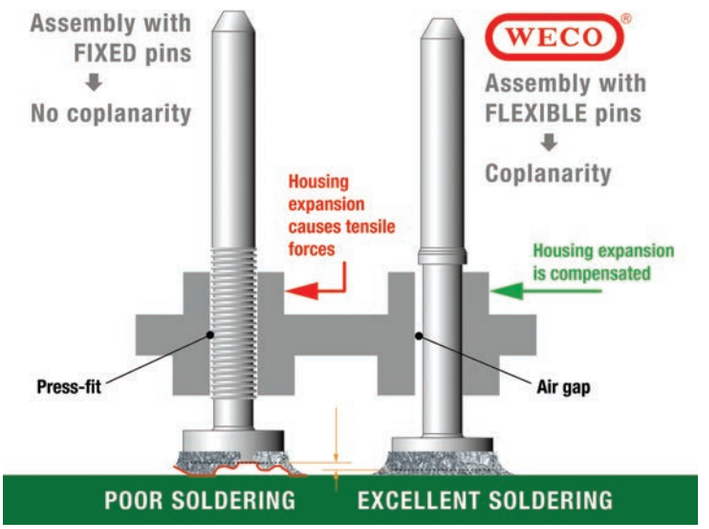



Photo: WECO

***Connectors can be stressed over 50% higher than the torque applied to the screws securing the wires to the housing***

and robust connectors, terminal blocks, pins and anchoring with floating elements (or contacts) specifically designed for advanced SMT processes. The design considered solder paste requirements, coplanarity and varying coefficients of thermal expansion. Each contact is independent and able to 'float' within the terminal body. This principle of a floating elements allows an independent alignment of each contact to the pcb, ensuring coplanarity with the pcb surface, as well as ensuring a proper capillary action of the solder paste to wet and position each contact independently and therefore eliminating the CTE (coefficient of thermal expansion) mismatch during the reflow process.

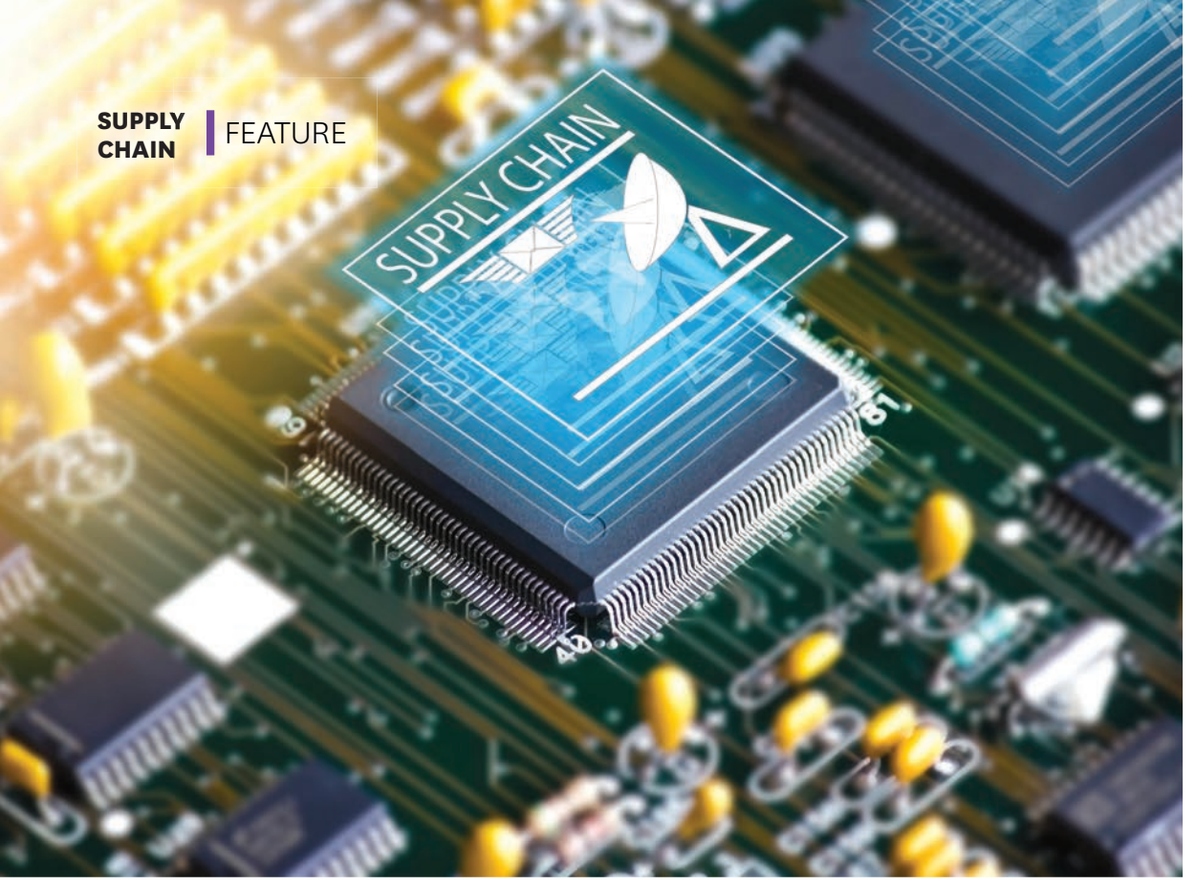
### *Pull-Out-Force*

Test plans were established to calculate and measure the long-term reliability of the soldered connections and the retention of the larger power terminal block to the pcb. The design considers the 'Peel-Off Force', 'Pull-Out-Force' and 'Torque Resistance'. For a Peel-Off test, the connector is pulled vertically (perpendicular to the pcb) and used to simulate the resistance on the 'Z' shape contacts and pcb solder. Recorded values with a 45° bending of the pins with a force of 18N (for a 4 pole - smaller 110-M-SMD series) resulted in no solder joint damage. Pull-Out-Force consist of pulling the complete housing vertically which simulates the resistance of the header to the pull-out-force generated by a mating plug. The header can be stressed to 180N for a 4 pole and to 200N for a 12 pole (smaller 110-M-SMD series) until the housing is separated for the pins with no damage to the pin solder joints. Torque resistance measures the robustness of the interface between the pcb solder pads and connector contacts. Connectors can be stressed over 50% higher than the torque applied to the screws securing the wires in the housings.

The principle of floating elements is also applied to the anchors. Similarly, to the individual contacts, floating anchors are aligned to the larger solder pads by capillary action and kept in place prior to the reflow solder process. Once soldered the terminal block is securely anchored to the pcb. The resulting Peel-Off-Force increases to 65N for the above mentioned smaller 110-M-SMD series connector.

All test values mentioned above are guidelines dependent on the quality of the solder joints, the pcb and process conditions. **EP&T**

*For an educational video on the principle of floating 'elements' or contacts please visit* ***https://www.wecoconnectors.com/en/products/***




# Electronics underpins our lives. It's important we protect the supply chain

*The smallest technologies have the longest supply chain stories* **BY DAN LIONELLO, CHIEF EXECUTIVE OFFICER & CO-FOUNDER OF OMNAE TECHNOLOGIES INC.**

Every minute of every day we're impacted by electronics. It is in what we wear, how we manage our day-to-day and even how we work. Electronics aren't just 'nice to have' luxuries anymore – they're deeply embedded in our lives from the moment we start our day.

The most seemingly simple or smallest technology innovations can often have the most interesting supply chain stories. Digital technologies that help us to organize and better control our supply chains are more important than ever to maintain production quality and minimize disruptions.

Electronics manufacturers work within a uniquely complex supply chain environment which poses many societal, political and economic challenges. Experts agree that, "flexibility and adaptability have become critical attributes for all players in the electronics supply chain. In addition, suppliers, fulfillment centre operators, carriers, retailers, and others increasingly need to speak up." Protecting the integrity of these vital supply chains from top to bottom is imperative to the growth and advancement of electronics and technology innovations.

### *Maintaining supplier relationships for quality control*

Did you know that consumer and industrial businesses lose approximately USD$250 billion each year due to counterfeit parts? Not only does this have serious implications to a company's bottom line, but faulty imitation components can lead to reduced productivity and damaged reputations.

Companies heavily rely on technology tools such as blockchain records to trace components and identify fake parts, but maintaining supplier relationships should be the first step to mitigate the distribution of counterfeits. Not surprisingly, over 80% of electronics executives responded to a recent survey indicating they expect their organizations to reinvent their operations in 2022 with technologies such as IoT, blockchain and robotic process automation.

Supply chain experts agree that technology tools and visibility are vital, as "… enabling holistic, automated data aggregation not just within a factory but, across multiple facilities in a supply chain, unified systems like manufacturing optimization platforms can create a 'digital thread' of data representing a product's supply chain journey, and consequently power collaboration between across many parties through real-time access to the same, actionable information."

Collecting robust data to inform manufacturing leaders about production, inventory and purchases will allow all partners full visibility of the chain to make smarter decisions. Setting the benchmark for quality standards will reduce the risk of counterfeiting through collaboration and transparency. Moving forward, 'bad actors' and vendor vetting technology tools will become even more critical to maintain quality of final outputs and mitigate lost revenues.

### *Protecting the environment and working within regulations*

According to the World Economic Forum, each year over 50-million tons of electronic waste is produced. Of that, only 20% is recycled. Not only does this pose significant dangers to our environment, but it also represents a missed opportunity in raw material value. In fact, the volume of gold in one ton of mobile phones is more than 100 times the amount in one ton of gold ore.

There are plenty of organizations and initiatives that manufacturers can join to support reuse and resale initiatives. These recycling programs help companies regulate their activities under international waste trade laws as well as consumer data privacy requirements. As an alternative, manufacturers can also consider reprocessing and donating working electronics to organizations that can put them to good use including libraries, homeless shelters and local non-profits.

Maintaining visibility of your vendors, and knowing that your partners in the supply chain work within environmental regulations, helps your business do their part in protecting our planet while delivering cutting edge technologies with responsibly sourced components.

### *Adaptations to crises in manufacturing epicentres*

"2020 was a challenging year of broken supply chains, unexpected line downs, missed targets, and logistics headaches. Everything moved slower and cost more in 2020, and a lot of leaders scrambled just to keep up," says Forbes.

As we worked (and still continue to struggle) with managing the

Photo: ©nasakid12 / Adobe Stock

COVID-19 pandemic, electronics manufacturers felt the impacts on business operations earlier than most. As China is a major exporter of electronic components, early factory shutdowns and government-mandated quarantines halted international shipments in the early winter of 2020.

Today, factories are still working with reduced workforces to accommodate social distancing measures and the effects of supply chain shortages and slowdowns are still being addressed. Public health restrictions imposed in the United States and across Europe have only contributed to the exponential increase in supply chain impacts.

Analysing how government leaders responded to increasing infection rates and the variety of tactics used to lock down populations should help supply chain leaders predict and proactively reduce future operational impacts and sourcing efforts.

### *Working through geopolitical turmoil*

From rising tensions between governments, to increasing international tariffs and even part shortages due to changing political leaders, the electronics manufacturing industry has been anxiously trying to prepare for what the future may hold. While some companies have passed tariff costs onto their customers, others are taking a bolder stance and moving manufacturing onshore and out of turbulent areas.

According to experts, "before they begin working with a supplier, many electronics companies must validate the quality and reliability of the supplier's operations and the products they're providing—a process that can take months." As a conservative estimate, setting up manufacturing operations in a new country can take at least two to five years of serious financial planning. Not to mention that the upfront investment needed to move factories won't produce a newer, better or higher quality product than they already manufacture.

### *Overcoming electronics supply chain challenges*

Any of these issues, let alone all of them at once, will have drastic and long-term effects on every supply chain. Once leaders can analyze learnings and data gained throughout the last year, they'll be in an optimal position to take control of the situation and create proactive strategies to get ahead of upcoming trends and issues.

### *Repair is not easy or quick*

"Better connected data tools, which Industry 4.0 technologies supply, help drive the cultural shift in relationships toward transparency by providing an objective, shareable record of what's happening. This added transparency means both sides can quickly agree on the reality of a situation and move on to fixing them," says Forbes.

Protecting the supply chain won't be a quick or easy process, but it's necessary. The more that supply chain partners can collaborate and work together to overcome these challenges as a whole will increase agility, stability and ethical manufacturing practices across the globe. **EP&T**

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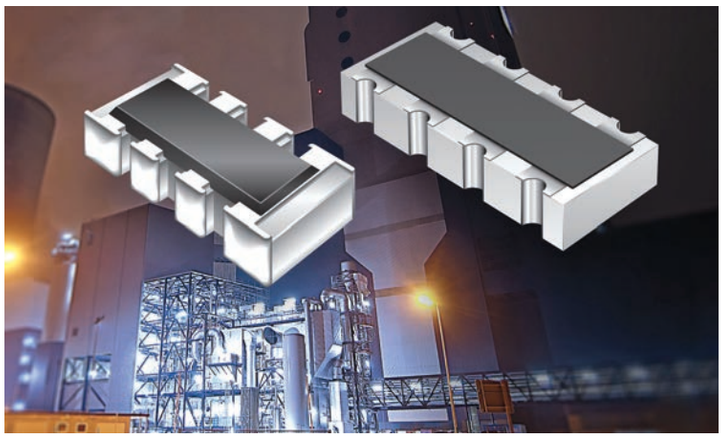
***Dan Lionello*** *is chief executive officer and co-founder of Omnae Technologies Inc., a collaborative cloud-based Supply Chain Management (SCM) platform that empowers businesses to organize their supply chains, simplify their processes, and continuously improve product quality.* ***https://www.omnae.com***



## THICK FILM CHIP RESISTOR ARRAYS ARE AEC-Q200 COMPLIANT

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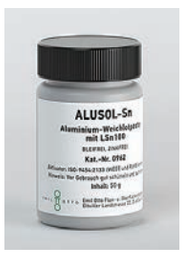
CATxxA-LF, CAYxxA-LF and CAYxxA-AS series AEC-Q200 compliant thick film, surface mount chip resistor array models help increase available board space and reduce costs. Offering long-life protection against many sulfurous environments, devices meet AEC-Q200 standard and anti-sulfur protection requirements based on the ASTM-B-809-95 and EIA-977 (test parameter B) standards making them suitable circuit conditioning solutions for a wide range of applications that must operate in extreme conditions.

**www.bourns.com/products/resistors/chip-resistor-arrays**

## SOLDER PASTES DELIVER SOFT SOLDERING OF ALUMINIUM

**EMIL OTTO**

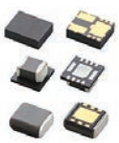



Special solder pastes of Alusol-SN product range are developed for soft soldering and tinning of aluminium and aluminium alloys with pure tin (Sn100) and formulated in such a way, that no separate solder feed is necessary. At a processing temperature of 250°C up to a maximum of 450°C, products produce clean and stable solder joints without further pre- and post-treatment. Product series includes the pastes Alusol-SN and -SN-X. Both pastes must be stirred well before use. The paste is applied with a brush or similar accessory then.

**www.emilotto.de**

## 5A TO 2A DC-DC CONVERTERS ARE ULTRA-SMALL

**MURATA POWER SOLUTIONS**



MYR series of PicoBK Non-Isolated 5A to 2A dc-dc converters integrate a coil and a control IC into a single package. The ultra-small form-factor measures from 2.5 x 2.0 x 1.0mm to 3.1 x 4.7 x 1.3mm depending on model. Units achieve high efficiency, low noise, and high heat dissipation. The environmentally friendly, low power consumption step-down devices are designed for a 2.5V to 5.5V source such as a Li-ion battery to as high as 18V for some models.

**https://www.murata-ps.com**

## MEMS OSCILLATOR ENABLES SINGLE QUALIFICATION IN MANY CONFIGURATIONS

**SITIME**


SiT8008 low-power MEMS oscillator operates at any voltage between 1.62V and 3.63V. With this feature and the additional programmable features such as frequency and drive strength programmability, device provides millions of possible configurations. Industrial and medical applications such as factory automation, seismic sensing, and data acquisition all use many clock sources in a single system. Even if the design uses multiple oscillator configurations, only one component qualification is required, reducing the time burden on valuable engineering resources.

**https://www.sitime.com**

## SMUS SINK FUNCTIONALITY, MEET CHALLENGING APPLICATIONS

**ROHDE & SCHWARZ**


R&S NGU source measure units (SMU) provide two- or four-quadrant architecture, allowing it to function both as a source and a sink to simulate batteries and loads. Built with a special ammeter design, instruments measure current drains from nA to A in one pass. With short recovery times, fast load changes, and high-speed data acquisition, every detail down to 2µs resolution is detected. Product's high accuracy and fast load recovery time, SMU are suitable for challenging applications.

**https://www.rohde-schwarz.com**

## THERMAL IMAGING CAMERA DETECTS -10 TO 400°C TEMPERATURES

**ITM INSTRUMENTS**

Reed Instruments R2160 thermal imaging camera provides a 160 x 120 (19,200 pixels) infrared sensor that can detect temperatures between 14 to 752°F (-10 to 400°C). Unit has the ability to display hot and cold spot temperatures on a 2.8" color LCD and allows a user to choose from 5 different color palettes. Product provides rugged IP65 rated double-molded housing and is drop tested up to 6.5' (2m).

**www.reedinstruments.com/r2160**

## HANDHELD MICROWAVE SPECTRUM ANALYZERS ARE ULTRA-PORTABLE

**SAF TEHNIKA**

Spectrum Compact family of ultra-portable handheld microwave spectrum analyzers supports 6GHz – 20GHz, providing best-in-class price/performance. Product has high sensitivity of -110dBm at 30kHz resolution bandwidth, long battery life of up to 4 hours, and instant-on functionality for quick start-up and operation. Designed in a rugged, ultra-compact form factor, unit measures 135 x 83 x 34 (mm) and weighs 0.57 kg. Unit has a resistive touchscreen for operation with gloves, and high contrast and full display modes for easy readability in bright light environments.

**https://www.saftehnika.com**

## NASA LOW OUTGASSING EPOXY DERIVED FROM SUSTAINABLE INGREDIENTS

**MASTER BOND**

Supreme 70CN two part epoxy adhesive is formulated using a natural, renewable and sustainable ingredient. The moderate viscosity unfilled epoxy is black in color and can be utilized for bonding, sealing, coating and potting. As a toughened system, it resists thermal cycling and is suitable for bonding dissimilar substrates. Product does not compromise performance and features a high tensile strength of over 10,000 psi and a glass transition temperature of 125-130°C. Product bonds well to a wide variety of substrates.

**https://www.masterbond.com/tds/supreme-70cn**

## THERMAL CIRCUIT BREAKER COMES WITH CONTEMPORARY COLOURS

**SCHURTER**

TA36 thermal circuit breaker delivers a modern sculpted rocker switch and bezel, available in several contemporary colors. Device combines gently curved surfaces, providing improved visual indication and a switch feel. A selection of five different markings in black, white or embossed complement the offering. Devices function as an appliance switch and thermal overcurrent protection device. Compact unit offers 1-pole switch with overcurrent protection, and 2-pole switch with 1- or 2-pole overcurrent protection. There are 31 different rated currents, 0.05 A to 20 A.

**www. schurter.com**

## POWER BUFFER MODULES DELIVER EXTRA 380MS HOLD-UP IN AN OPEN FRAME PACKAGE

**TDK-LAMBDA**

ZBM20 series 12V, 15V and 24V 20A rated open-frame buffer modules provide an extended 380ms hold-up time to power supplies preventing data loss during brief power interruptions or allowing equipment to safely shutdown. Energy is stored in electrolytic capacitors, replacing the need for batteries and their associated maintenance and servicing. A remote on/off function can be activated to avoid an unsafe discharge of stored energy. The charge and discharge status can be monitored locally or remotely via a DC OK relay, an LED indicator and photo-coupled signals.

**https://product.tdk.com/en/power/zbm**

## PROGRAMMABLE DC ELECTRONIC LOADS DELIVER WIDE-RANGING REST CAPABILITIES

**TELEDYNE LECROY**

T3EL15030xP programmable dc electronic loads feature four operating modes to provide wide ranging test capabilities. In Constant Current mode, the electronic loads will sink a constant current, regardless of the voltage at the device terminals. Its Constant Voltage mode causes a constant voltage to appear at its terminals. In Constant Resistance mode, the electronic load will behave as a fixed ohm value and will linearly change the current according to the input voltage.

**https://teledynelecroy.com**

## IP69K RATED FANS COME IN AC, DC VERSIONS

**ORION FANS**

IP69K rated fans are available in both ac and dc versions. Designed for applications that must withstand high temperature and high pressure washdown with water and cleaning chemicals, the IP69K rating provides the maximum environmental protection for electronics that are expected to work under the harshest of conditions. Devices are rigorously spray tested with 80°C water every 30 seconds with the spray nozzle being 4-6 inches from the fan. Ac fans are available in 180mm-280mm frame sizes, while dc fans come in 60mm-172mm sizes.

**https://orionfans.com**

## RECEPTACLE SIMPLIFIES KEY SWITCH HOT SWAPPING

**MILL-MAX**

3305-X series of open bottom, low profile, solder mount receptacles are specifically designed to make mechanical key switches hot-swappable. Devices can be soldered into a .060" (1,50mm) minimum mounting hole, with an ultra-thin retention shoulder so plugged-in components sit nearly flush to the board surface. The open bottom design is meant to accommodate varying lead lengths making this a very versatile receptacle. Product series provides three length options of .105" (2,67mm), .130" (3,30mm) and .155" (3,94mm), all with an above-board height of .010" (0,25mm), providing the low profile desired for optimal switch height and functioning.

**www.mill-max.com/PR701**

## VERSATILE 750W DC LABORATORY POWER SUPPLY DELIVERS UP TO 80V OR 50A

**AIM-TTi**

PowerFlex+ QPX750SP 750W single output dc power supply provides voltages between 80V at 9.4A and 12V at 50A with a maximum resolution of 0.1mV. The laboratory unit provides a flexible choice of voltage and current to meet multiple application needs. Unit is housed in a compact 3U half-rack-width case with front ventilation and low noise fan assisted cooling. Front and rear power and sense terminals make it suitable for use either on the bench or in a rack-mount system.

**https://www.aimtti.com**

## OFF-THE-SHELF SINGLE-BOARD COMPUTER IMPROVES PRODUCT TIME TO MARKET

**AVNET**

MaaXBoard Nano single-board computer is designed to accelerate time to market and reduce development costs. Based on NXP's i.MX 8M Nano processor, the production ready dev board is suitable for embedded computing and smart edge IoT applications. Product is enhanced for advanced audio with four microphones and an audio jack. It is FCC, CE and RoHS certified. Product allows the flexibility to design and test concepts, allowing the user to focus on the software side of product development.

**www.avnet.me/maaxboard-nano-npi**

## LOW PROFILE SCHOTTKY RECTIFIERS ARE ENERGY EFFICIENT

**CENTRAL SEMICONDUCTOR**


3A CMDFSHC3-100 and 5A CMDFSHC5-100 100V low profile Schottky rectifiers are energy efficient and packaged in the low profile SMC DFN surface mount case, utilizing a highly reliable passivated silicon die. The space-saving SMC DFN package is 1.25mm in height, 53% lower than the comparable SMC, to support designs requiring low board profiles. Electrical specifications for the energy efficient devices include a low forward voltage (VF) as low as 0.78V at 5A.

**https://www.centralsemi.com**

## HIGH-DEF PIEZOELECTRIC FILM HAPTIC ACTUATOR SERVES NEXT GEN USER INTERFACES

**KEMET**

Piezoelectric polymer film haptic actuator, when embedded directly into a product's surface, acts as haptic skin that provides localized bodily sensations and tactile effects unavailable with other haptic solutions currently in the market. Film actuators enable design engineers to implement advanced haptic solutions with high-performance actuators in a broad spectrum of applications that include remote controls, smart buttons, medical devices, AR/VR, and anything in contact with hands, fingers, head, and lips.

**https://ec.kemet.com/sensors**

## EVALUATION HARDWARE SERVES ADVANCED EVE GRAPHIC CONTROLLERS

**BRIDGETEK**

ME817EV evaluation board assists with the initial development and prototyping of human machine interfaces (HMIs) based on its object-oriented graphic controller ICs. Featuring firm's BT817 embedded video engine (EVE) device, product permits users to experiment with the latest generation of EVE technology and get a comprehensive understanding of the breadth of its capabilities. BT817 supports higher resolutions and large format displays, thus creating more compelling and functionality-rich HMIs, with greater visual clarity and enhanced video playback capabilities.

**https://brtchip.com/eve-4-module**

PANEL BUILDING

## ALLIED ELECTRONICS & SIEMENS TEAM UP

Siemens and Allied Electronics & Automation are teaming up to help panel builders better design simpler, more flexible and space-saving industrial control cabinets. Siemens' SIRIUS modular system, now available from Allied, provides a full range of modular industrial control panel components in seven compact standard sizes, including devices needed to switch, protect, control and monitor motors from size S00 to S12 (45mm to 160mm in width) and power ratings from 4 to 335HP (3 to 250kW).

Key considerations for building control cabinets include wiring time, saving panel space, and whether components meet national regulations and industry codes. Because the panel can contain different-size motor starters, the consistency offered by the manufacturer is important. With SIRIUS, CAx data is available throughout, and users can draw on comprehensive, standard-compliant configuration support to simplify workflows and speed up the electrical engineering process.

"We put a lot of thought into the modularity of our designs," says John Burns, application resource center manager at Siemens. "For example, with the typical comb busbar system you might have four starters side-by-side and starter three goes down. Typically, to replace it you need to do quite a lot of disconnecting. With SIRIUS, we added an easy plug-in module with a backplane that provides touch-safe 3-phase power across the busbar system, making it quick to assemble, easy to design in, and allowing it to carry the same power rating as the comb busbar system."

MANUFACTURING

## TT ELECTRONICS MOVES TO STATE-OF-THE-ART FACILITY

TT Electronics, a global provider of engineered electronics for performance critical applications, is consolidating its North American Sensors and Specialist Components operations and moving into a new, purpose-built facility in Plano TX. The new facility will support administrative, R&D, engineering, and manufacturing functions advancing the company's optoelectronic sensors and resistors business. The phased opening of the site commenced at the end of April, with the current Carrollton TX optoelectronics office and design centre relocating to the Plano TX building. The production of thick film resistors will move from TT sites in Barbados and Corpus Christi TX, to the firm's recently upgraded Bedlington, UK facility. The production of thin film resistors will move the to the new Plano site later this summer.


"Consolidating our operations will improve the ease and speed at which our customers are able to conduct business with us," says Stewart Partridge, VP/GM sensors and specialist components, TT Electronics. "As part of TT's sustainability commitment to develop cleaner energy solutions, I am proud to share that the Plano facility will be 100% Green E renewable."

CONNECTORS

## HEILIND ADDS ROSENBERGER

Heilind Electronics, a distributor of electronic components worldwide, has partnered with Rosenberger North America, a leader in RF and fiber optic connectivity solutions.

The global distribution agreement also authorizes Interstate Connecting Components (ICC), the Mil-aero division of Heilind, to distribute the manufacturer's products in the Americas.

Heilind and ICC will offer Rosenberger's full product portfolio, including RF and coaxial connectors, fiber optic connectors, high-voltage power connectors and alternative energy connectors. Customers will also have the option to customize these solutions to their requirements.

"From cellular technology to space flight, Rosenberger provides our customers with the technology they need to build the most demanding applications," says Alan Clapp, sr. vice president, Heilind. "We look forward to expanding our global RF and fiber optic portfolio with some of the best offerings in the industry."

***Rosenberger is a supplier of RF and fiber optic connectivity solutions***

"Heilind's industry-leading technical sales support will complement our product portfolio and expand Rosenberger's sales presence in several growing markets," says Ryan Spencer, CEO at Rosenberger North America.

Rosenberger's products are used in a variety of markets, including mobile and telecommunications, industrial measurement technology, automotive electronics, medical and industrial electronics, data technology and aerospace.

IOT

## DIGI-KEY SIGNS DISTY DEAL WITH ARKX LABORATORIES

Digi-Key Electronics, has secured a global distribution partnership with ArkX Laboratories to deliver its Advanced Far-field Voice Capture AFE module and development kit for voice-enabled IoT products.

The Advanced Far-field Voice Capture AFE module and development kit outperforms other existing far-field solutions and delivers an enhanced voice experience to consumers by capturing voice commands from three times (3X) the standard distance, around corners, noisy and reflective environments, and without lowering playback volume. Additionally, EveryWord technology provides the ability to identify and suppress speech from TV or other single-point noise sources.

The voice capture module can be used in several IoT applications as a human to machine interface. EveryWord's advanced technology also offers improved performance for Fortune 1000 companies, OEMs, and start-ups who want to bring their voice-enabled smart products and devices to market while mitigating risk, reducing development costs, and accelerating their time-to-market.

Photo: Siemens; TT Electronics; Rosenberger; ArkX Laboratories

# PRODUCT SOURCE GUIDE



## AD INDEX



**TO ADVERTISE** *in an upcoming issue of* **EP&T**, *contact* ***Scott Atkinson****, Publisher, satkinson@ept.ca or (416) 510-5207) or* ***Joanna Malivoire****, Account Manager, jmalivoire@ept.ca or direct 866-868-7089.*

# Fitbit Sense health smartwatch

**BY IFIXIT**

These findings are from iFixit, the open source repair guide. The popular online site teaches people how to fix just about any electronic device, and sells the parts and tools to make it possible. For this teardown, the engineers at iFixit tackle the health smartwatch Fitbit.

Riddled with sensors and health features, the new Fitbit Sense is poised to rival the Apple Watch Series 6 as a health-focused wearable device. But, what happens when the Fitbit gets sick? Well, that's why iFixit engineers decided to open it up and determine how difficult the surgery will be. Pass the scalpel. It's time for a teardown.

Let's get a sense of what this Fitbit brings to the table:

- 1.58 AMOLED screen
- 4 GB internal storage
- A new ECG function as well as a skin temperature sensor, and the standard optical heart rate sensor
- Wi-Fi, NFC, Bluetooth 5.0 and Built-in GPS
- Water resistant up to 50 meters
- Also part of the package are a gyroscope, an altimeter, a 3-axis accelerometer, and an ambient light sensor

Despite the intense opening procedure, we got the Sense that this Fitbit is considerably less complex than any Apple Watch.

As the image (at right) demonstrates, two more brackets tucked up against the sides of the housing keep a few more key components in place: loudspeaker and pressure sensor on one side, and a microphone, vibration motor, and psuedo-button on the other.

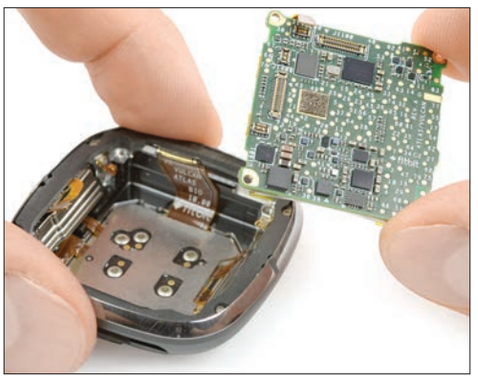
The edge around the display features two separated metal brackets for reading your EDA levels (electrodermal activity) and taking that ECG.

While the opening procedure is far from ideal, most of the critical components in this Fitbit are accessible and replaceable, and disassembly was very straightforward.

Unfortunately, some components are integrated into the sensor board, which is fastened with permanent adhesive.

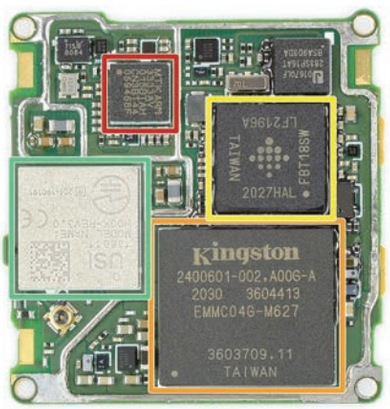
*These findings are from **iFixit,** the open source repair guide. The popular site teaches people how to fix just about any electronic device, and sells the parts and tools to make it possible. Anyone can create a repair manual for a device or edit the existing guides to improve them. iFixit empowers individuals to share their technical knowledge and teach the rest of the world how to fix their stuff.*
***https://canada.ifixit.com***


***Like the Apple Watch, the Fitbit Sense's ingress protection means the very thin gap between the display and the housing of the watch is lined with adhesive.***



***The board doesn't come out alone, though! The battery hitches a ride, lightly adhered to its underside.***

***Two more brackets tucked up against the sides of the housing keep a few more key components in place: loudspeaker and pressure sensor on one side, and a microphone, vibration motor, and psuedo-button on the other.***




***Unlike the resin-encased Apple Watches, this Fitbit wears its silicon on its sleeve, so to speak.***

***The display-first disassembly procedure means screen replacements require only a few steps, but those steps are difficult and can easily damage the display.***

Photo: iFixit

TDK

# Engineered to make life easier!

Tired of spending hours resolving radiated EMI issues? Use a power supply that actually meets Class B, even in a Class II construction (no earth ground).

# CUS-M Series

**High Performance Medical and Industrial AC/DC power supplies with low EMI**

### Features:

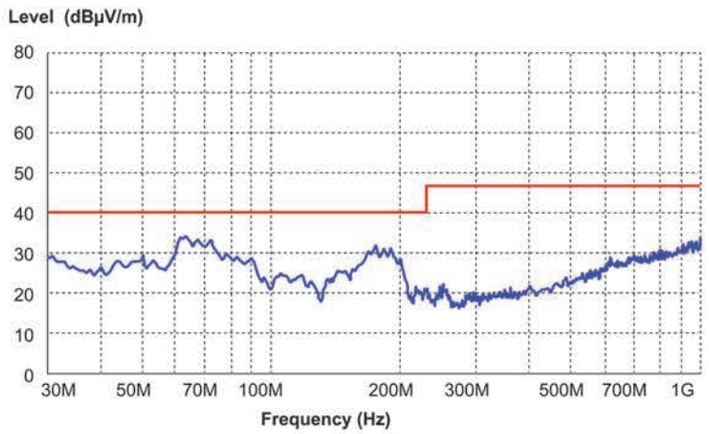
- Industrial and medical safety certifications
- Industry standard footprints
- Efficiencies up to 96%
- 4kVAC isolation and low leakage currents
- Suitable for B and BF rated equipment
- Class B conducted and radiated EMI

### 30-1500 Watt AC/DC Power Supplies

| Model | Watts | Package | Size | Construction |
|---|---|---|---|---|
| CUS30M | 30W | O, E, P* | 2x3" | Class I / II |
| CUS60M | 60W | O, E, P* | 2x3" | Class I / II |
| CUS100ME | 100W | O, E, B | 2x4" | Class I / II |
| CUS150M | 150W | O, E, B, F | 2x4" | Class I / II |
| CUS200M | 200W | O, E | 3x5" | Class I |
| CUS400M | 400W | O, E, B, F | 3x5" | Class I / II |
| CUS600M | 600W | O, E, F | 3x5" | Class I / II |
| CUS1500M | 1500W | E | 5x2.5x10.3" | Class I |

* E = Enclosed, O = open frame, P = pcb mount, F internal fan, B conduction cooling

### EN55032 Class B, QP Limit Class II Construction

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