

# focus

Edition 32

## Navigating the new engineering landscape

**4** The evolution of distribution

**18** Why engineering communities are thriving online

**25** From prototype to production: How Avnet Abacus opens doors for startups

**30** Design for manufacture: Spreading knowledge of mass production

**12** Connected Home

Read our interview with **molex**

Focus is the quarterly magazine from Avnet Abacus, featuring in-depth trend and technology reviews, new product spotlights, Avnet community news and interviews with market leaders.

Avnet Abacus is a pan-European distributor committed to supporting customers from design to fulfilment. Avnet Abacus' exceptional linecard features globally recognised manufacturers and an extensive product range that includes interconnect, passive, electromechanical, power supply, energy storage, wireless & sensor products and solutions.

## Features

- The evolution of distribution: How electronics design companies leverage Avnet Abacus' expertise to get to market faster **4**
- Why engineering communities are thriving online **18**
- From prototype to production: How Avnet Abacus opens doors for startups **25**
- Design for manufacture: Spreading knowledge of mass production **30**

## Interview

- An insight into what's coming in the smart home revolution with Bart van Ettinger, VP Connected Devices, Molex **12**

## News

- Avnet Abacus honoured with Senten Manten Gold Award by TDK **36**
- Avnet Abacus receives Sales Achievement Award from Harwin **37**

## Supplier technologies

### Connectors

- Hirose ER8 series high-speed board-to-board connectors **21**
- Samtec Tiger Eye™ high-reliability connector systems **22**
- Aptiv APEX connection system **23**
- Amphenol ICC Minitex MicroSpace™ connector system **23**

### Electromechanical

- Panasonic Electric Works high power relays **9**
- C&K Components switching solutions **10**

### Passive

- Eaton HCM1A series inductors **29**
- KEMET MPLCV series SMD power inductors **29**
- Yageo PU series automotive-grade shunt resistors **35**
- TDK: An innovation driver in leading-edge technologies **35**

### Power

- Murata isolated DC-DC converters for transportation applications **16**

### Sensors and wireless

- Omron compact slot SMD photomicrosensors **15**
- IST AG platinum temperature sensors **16**
- TE Connectivity standard and custom antennas **24**

If you have any comments or questions on the technologies featured in this edition, or wish to speak to one of our technical specialists on power, you can get in touch at [avnet-abacus.eu/ask-an-expert](http://avnet-abacus.eu/ask-an-expert)

**Editor** Jay Miller  
**Design** TMA The Ideas People  
**Print** Image Evolution

Keep up to date with the latest news, product information and technical insights via our social media channels.





**The industry is changing faster than ever before. Electronics play an increasing role in all areas of our lives, while new technologies, market entrants and design challenges are constantly surfacing. So much has changed in the two years that have passed since we last came together at Messe Munich for electronica. This edition of Focus reflects on the industry in 2018, and our role within it.**

At Avnet Abacus we have been adapting to the changing needs of our suppliers and customers – record growth, increased market share and the prestigious supplier awards we have received demonstrate the trust that both our customers and suppliers place in our business and their confidence in our approach.

We enable our customers to overcome the key challenges facing electronics businesses in today's engineering landscape, helping them to:

- get to market faster
- reduce cost at every stage of the product lifecycle
- adopt new, more complex technology

In addition to fulfilment, customers now need the right technical support and expertise at every stage of the design process to get to market faster. The first of our featured articles explores how the role of distribution is changing by looking at the stories of three innovative electronics design companies.

With the rate at which new technologies are emerging, engineers have to find new ways to learn and share knowledge. Online engineering communities such as element14 and Hackster are thriving in 2018, and Georg Steinberger finds out exactly why they are the go-to place for engineers to share and learn.

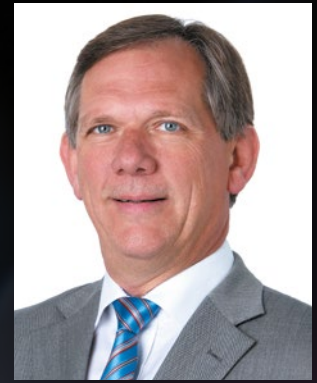
The story of technology startup Hanhaa's Parcelive shipment tracker can be considered an almost unrivalled success. The company took its product to market in less than three years with the help of Avnet Abacus. CEO Azhar Hussain tells his story.

For many new engineering companies building a prototype is easy, but scaling to mass production proves to be a big obstacle. In our final article, Martin Keenan sits down with Dragon Innovation CEO Scott N. Miller to discuss the challenges facing engineers when designing for manufacture.

It is an exciting time for the electronics industry and we feel privileged to be a part of this innovative environment.

If you need help taking your product from prototype to production why not stop by our stand at electronica (C5 101) for coffee and a chat about your design.

Let's explore the possibilities.



Rudy Van Parijs  
President, Avnet Abacus

# focus

# The evolution of distribution

## How electronics design companies leverage Avnet Abacus' expertise to get to market faster

Engineers need more support from distributors than ever before.

With the pace of technological change continually increasing, engineers in organisations large and small are having to design with technology they may not have used before. There are new products and suppliers joining the market constantly.

Engineers often don't have the in-house support and expertise they need to make the right decisions, so they're looking for outside help.

"As a distributor, we've always sat in the middle of customers and suppliers," explains Alan Jermy, VP of Product Marketing at Avnet Abacus.

"However, today it's not only about stocking components and fulfilling orders. It's increasingly about providing customers with the right technical support and giving them access to experts within Avnet Abacus and our suppliers."

Here are just three examples of how Avnet Abacus' expertise has helped customers in ways that reach further than simply meeting a design specification.

### HOW HYPERVSN REDUCED LEAD TIMES BY OVER 50% AND REGAINED CONTROL OF THEIR PRODUCTION SCHEDULE

HYPERVSN is a projector that creates high-resolution holographic visuals which are perceived by the viewer as 3D images floating in mid-air. This innovative product could well drive the next generation of retail displays. But not too long ago, HYPERVSN had a problem.

"Our supply chain wasn't working," explains Alla Demidova, COO of HYPERVSN.

**"The demand for components was huge. It was hard to get the components for the manufacture of the product. A lot of the parts were missing, preventing us starting in due time, which meant delays in delivering the product to market."**

HYPERVSN had previously been allowing their manufacturing partner to handle the supply chain. But they decided to look elsewhere.

Ms Demidova continues, "Avnet Abacus' technical experts were able to offer us alternative components that we didn't know were available. They reduced lead



"Today it's not only about stocking components and fulfilling orders. It's increasingly about providing customers with the right technical support and access to experts."

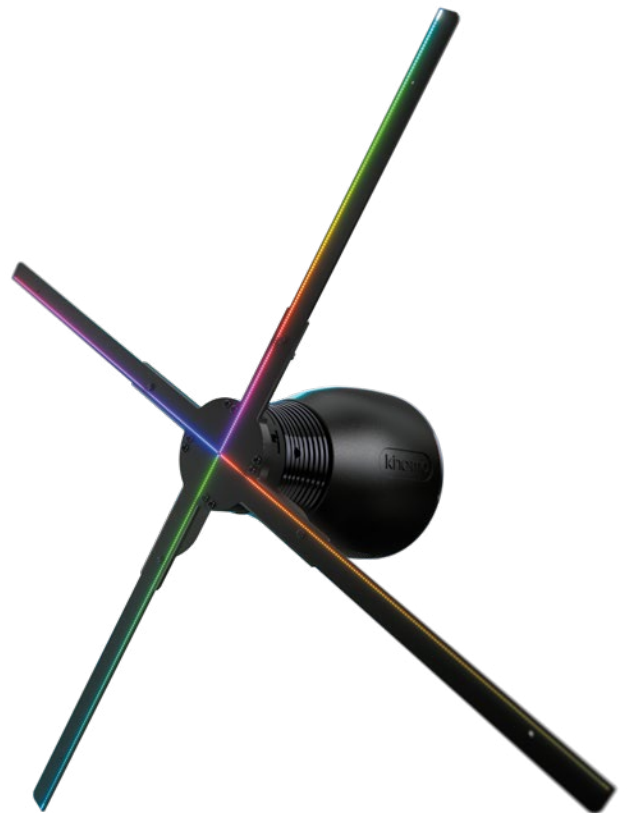
times as much as possible, sometimes from 26 weeks to 12. This allowed us to get the components we needed, to create a more efficient pipeline and take control of our production schedule.

**"Avnet Abacus' high-level expertise really ensured the manufacture of our products in time to deliver them to the market."**

Alan Jermyn adds, "There can be many commercial challenges to consider when selecting the right component. Lead times are a big one. But there can also be certification challenges, supply chain problems and reliability issues.

Your current technology and supply might work for the prototype and low volumes, but when it comes to manufacturing in the thousands, the lack of price and supply chain visibility and technical support can cause headaches, delays and additional costs.

These can all be mitigated up front with the right partner."





## The evolution of distribution

### HOW SMART CITY OVERCAME SUPPLY CHAIN ISSUES AND COMPLIANCE RISKS

Parking Pilot by Smart City Systems was an idea that started among five university friends. One of the co-founders, Christian Schlenk recounts the company's origins:

"We met at university. We had all founded other projects alongside our studies. Then one day, we started to discuss the problem of parking at the university. It really wasn't done very well. So we looked for solutions on the market. But we thought we could do it a better way."

"There were no good sensors for outdoor/on-street parking. We built our first prototype and showed it to some parking providers. The feedback was really good, so we decided to develop it and try to sell it.

"We then started to get connections to parking operators in retail who had problems with long-duration parkers and needed a solution. We got into that field (and others) and it really started from there. We're now into serious production with thousands of sensors being made this year."

As orders and production were increasing, Smart City needed greater technical and commercial support to manage their supply.

Tobias Nakel, Account Manager at Avnet Abacus, explains:

"When we first met Smart City, they were relatively small and at the beginning of their journey with their smart parking system. They had a finished product, and they were receiving more and more orders from their customer.

**"But they were buying the batteries for the sensors from a trading company. And it was becoming a headache!**

"As orders ramped up, the timing of the shipments was becoming a problem. And they had to order by the pallet, which meant they'd need to store the batteries themselves. But you need accreditation to store batteries. There are many strict regulations controlling the handling, storage and shipping of batteries. This was a pain and an expense they could do without.

"The current supplier had been fine for the early design and low-level production, but it couldn't adapt to the company's growth, and added risk to compliance and production schedules.

"Avnet Abacus selected a supplier that could handle regular shipping of the parts. We then set up a supply chain solution to maintain their flow for testing and production so they didn't have to store the batteries themselves.

"We advised them on the additional regulations so they could avoid the risk of contravening battery legislation. And as we purchase in large quantities we could offer the customer a price advantage.

"At startups, the engineers are specialists in their products, so they often don't have experience in areas such as battery storage regulations.

"We help our customers get their product to market and be confident that they're making the right decisions.

**"It's not just selling batteries. It's introductions to the right partners, mitigating risk, complying to regulation, and managing the supply chain to ensure the continued production of the product and delivery to market."**

Alan Jermyn comments, "When you're talking about designing in products like lithium battery packs, there are significant issues that need to be



**“It’s not just selling batteries. It’s introductions to the right partners, mitigating risk, complying to regulation, and managing the supply chain to ensure the continued production of the product and delivery to market.”**

Technology  
review

focus

considered in the handling and shipping of the product. You need to know what you can and cannot do.

“Not only can Avnet Abacus supply the product in a timely manner, handled and packaged appropriately to your manufacturing plant, we can give you advice on how you use that part in manufacture and in the manner it might be shipped. And how spares might be shipped to the customer later. It’s a full service and

full suite of supply chain services – all designed to help you get your idea to market faster.

“Sometimes you might be able to access a component from an online marketplace, but those can come with price volatility, unpredictable deliveries, variable quality, no payment terms, limited technical support, and a lack of appropriate compliance around shipping and handling of things like batteries.

“It can expose your business to a lot of risk.”

### **HOW HANHAA GAINED ACCESS TO THE RIGHT ENGINEERS, TESTING LABS AND COMMERCIAL SUPPORT TO GET THEIR PRODUCT TO MARKET**

Andy Barker, UK Sales Manager for Avnet Abacus, first met IoT Startup Hanhaa at Mobile World Congress in 2015.

Andy says “Hanhaa was presenting their prototype for ParceLive, a device that can track the location and state of parcels anywhere in the world. I was immediately impressed with the idea and the team, so I contacted them to discuss their challenges.

“Having created a successful prototype, developing the actual product was proving more difficult.

“Hanhaa required performance from an antenna that they just couldn’t get from an off-the-shelf solution. Avnet Abacus introduced them to TE Connectivity who offered them access to TE’s world-class engineers and radio labs, to develop the right solution.

“This was a big deal for Hanhaa, as it would be for any small company that might struggle to get on the radar of a global supplier of TE’s scale.

“Beyond the antenna, the battery also needed some attention.

“At the time, they were buying batteries from an online trading platform, but they had concerns when it came to compliance. Avnet Abacus introduced them to VARTA who developed a customised solution and were instrumental in guiding the product through numerous compliance certifications.

As Hanhaa CEO, Azhar Hussain puts it “Avnet really took us from just beyond the kitchen table to getting our product out into the world and into the hands of our customers.”

Alan Jermyn adds “Getting the support you need from suppliers to adopt their technology can be difficult. The largest volume OEMs often take priority. Avnet Abacus can help you gain access by leveraging our scale and business relationships. We tap into our suppliers’ expertise on a daily basis.

“Leveraging our long-standing relationships with suppliers gives you greater immediacy. You can quickly find the people you need to speak to, thus speeding up development, and reducing your time to market.

## The evolution of distribution

**"Getting Avnet Abacus involved early in the design cycle, means you can leverage all of our experience, so you don't run into issues later that cause costly delays and redesigns."**

"In-house at your organisation, it's unlikely you'd have access to the resource we can make available to you. We have a strong team of product and technical specialists, and we also have access to the resource of our suppliers and all their expertise.

**"Getting Avnet Abacus involved early in the design cycle, means you can leverage all of our experience, so you don't run into issues later that cause costly delays and redesigns."**


"We're seeing a faster pace of innovation from both our customers and suppliers than we've ever seen before. And Avnet Abacus and the wider Avnet group have evolved to support that.

"In response to the changing demands on engineers, Avnet Abacus has continued to invest in technical expertise, with field-based technical experts in each technology and region we cover.

"We train our people so they're a trusted source of expertise, offering you a level of support you can't get from speaking to individual suppliers in isolation.

"Only by deeply understanding the capability offered by all of our suppliers can we make sure our customers are selecting and developing the right technology and supplier partners for their specific product.

**"Finding the right information, partners and support is critical to making great decisions and Avnet Abacus is here to guide you, every step of the way."**



**"Leveraging our long-standing relationships with suppliers gives you greater immediacy. You can speak to the people you need to speak to, thus speeding up development, and reducing your time to market."**



## Switching high loads is simpler than ever before with Panasonic Electric Works high power relays

Panasonic  
Electric Works

In recent years there has been an impressive development in the field of PCB technology. Nowadays it is easier for circuits to carry high loads and dissipate the generated heat. In parallel, electromechanical relay technology has been developed dramatically in terms of output density. This means that higher loads can be effectively controlled with the use of smaller footprint relays.

Panasonic Electric Works manufactures high power relays, designed to handle high AC and DC type loads and certified according to the relevant UL and VDE standards. Alongside the superior electrical characteristics Panasonic power relays guarantee a problem-free service life.



### HE-PV SERIES

The Panasonic HE-PV series consists of relays which are able to handle a wide range of AC high loads, starting from 50A (HE-Y5 relay), 90A (HE-Y6) and going up to 120A (HE-Y7). The HE-PV series features a galvanic separation of min. 3mm along with high creepage/clearance distance. This guarantees high insulation resistance, high dielectric strength and protection against surge voltages.

The remarkable low contact resistance (mΩ) ensures extreme low power dissipation. In combination with the coil reduced operating power, the Panasonic high power relays contribute to equipment energy savings.

### FEATURES

- Switching capacity up to 120A/up to 800VAC
- Compact size
- Extreme low coil holding power
- Large contact gap and insulation distance
- 5,000 Vrms insulation/10,000 V surge breakdown
- RoHs/REACH compliant

### APPLICATIONS

- Photovoltaic power
- Energy management
- Industrial electronics

### HE-V RELAY

The HE-V power relay is specifically designed to handle high power DC loads. The 2 Form A relay contacts, connected in series, can handle loads up to 20A at 1,000VDC. The relay benefits from a compact size, while the reduced coil hold voltage contributes to energy savings,

### FEATURES

- 41 x 50 x 39.4mm case size
- Switching capacity up to 20A/1000VDC
- Reduced coil hold voltage contributes to energy savings

### APPLICATIONS

- Photovoltaic power generation systems
- Battery charge and discharge systems
- Inverter control, DC load control, etc.

For more information visit [avnet-abacus.eu/panasonic-electric-works](http://avnet-abacus.eu/panasonic-electric-works)

**Panasonic**

Founded in 1928, C&K is one of the world's most trusted brands of high-quality electromechanical switches. C&K operates in markets that require high levels of performance, quality and cost-effectiveness and the company's unmatched custom design capabilities are recognised globally by design engineers who demand reliable switch performance.

Switches are a key element in any application. They're the components which the user is going to interact with to use the device. However, they are not defined by any standard. While there are standards that apply to switch testing or manufacturing, the definition of the design and associated parameters is a matter for each individual supplier.

C&K has developed a broad switch offering of over 55,000 standard products, meaning more choices of switch constructions to solve application challenges. However, we understand that each application is unique and that customers can require a special design leading to a tailored solution. Our value based product development is in collaboration with customers. We've established different methods to support and assist customers through the selection exercise by using demonstrators, for example, that will help the customers make the right choice for their applications.

The integration of the switch, how it's going to be used and in which environment, are at the heart of designing a new solution that will match the customer's needs. Many parameters including the means of actuation, tolerances, temperature performance and the climate are taken into consideration as they will impact the performance of the switch. C&K understands that and relies on its extensive network of laboratories and its own testing installations to guarantee efficient and robust products and designs, as well as assessing product proposals at an early stage. Our engineers fully understand that when it comes to quality and reliability, every detail counts.

The total cost of ownership which includes, of course, the cost of the components but also the connection costs and assembly costs can be a concern when it comes to developing a custom switch solution. However, at C&K, we benefit from a

wealth of experience in switch design and access to multiple contact technologies uniquely positioning us to be able to not only meet technical parameter requirements, but also cost objectives.

C&K's manufacturing technology allows us to adapt our processes and optimise our tools and machines to meet the needs of all customers and designs. Our fully automated capacity helps us to offer competitive prices in a market where much of the assembly is manual. It also gives our production high levels of repeatability and, therefore, reliability.

Custom switch solutions include a lot of parameters that need to be taken into consideration, apart from the usual specification requirements. Expertise, design experience, innovative manufacturing engineering, attention to customer expectations and cost control are important when developing the right custom switch solution for your application. C&K's dedication to being a customer-first organisation, providing superior support, flexibility and solutions at competitive prices works daily in collaboration with its customers to turn a good product into a great product.



# molex

## The Future of Connectivity **Simply Solved** >



### Connecting the world of tomorrow

Molex is setting standards in connectivity that drive innovation across the globe. From industrial automation, to healthcare and the connected home, Molex has the solution for your IoT application.

Find out more at [avnet-abacus.eu/molex](http://avnet-abacus.eu/molex)

**Visit us at Electronica:  
Hall B3, Booth 131**



# An insight into what's coming in the smart home revolution



## Interview: Bart van Ettinger, VP Connected Devices, Molex

### **What patterns do you see in the international adoption of smart home technologies?**

The adoption of connected-home technologies varies widely throughout the world; both in market penetration and in the ways they are applied. The US and Canada combined represent the largest market so far and it is growing at more than 30 per cent per year. The majority of applications are in security. Homeowners have been buying digital video surveillance systems and sensors to detect fires or water leaks. The Europeans, by contrast, see connected home products as important for reducing energy costs. They are installing sensors and systems that make smarter use of home heating and lighting. Healthcare applications are also becoming popular among a gradually ageing population.

In Asia energy consumption is a concern. But the market is also being driven by a large, innovative telecom industry, which influences the types of system homeowners install. But as technology

improves we will see another pattern emerging: one that will move us on from single-purpose systems that leverage connectivity and cloud intelligence to create homes that truly fit our needs.

Sensors, of course, are the critical ingredient, and more and more are being deployed to detect movement, temperature, cameras, occupancy, to name just a few. ABI Research predicts five billion sensors will be installed in smart homes globally by 2022. So the market seems to be growing healthily.

### **What is the proactive home all about?**

At Molex, we see this as the future of the smart home. There is a tremendous amount of value to be unlocked by enabling the home to proactively engage with occupants' needs without requiring direct interaction.

Right now, many of the devices we call smart need the conscious engagement of the user, such as pressing a button, making a gesture, or touching icons in an app.

For this edition of Focus magazine, we met with Bart van Ettinger, VP Connected Devices at Molex.

Bart van Ettinger joined Molex in 1987 and has held several positions in sales ranging from Sales Engineer, Industry Marketing Manager and Global Account Manager. Bart is now Vice President of Sales, focusing on Molex's Mobile and Connected markets globally.



Even voice-activated technology requires the human occupant to initiate interaction, via a smart speaker.

The way forward lies with combining data from the growing variety of local sensors with the power of Cloud computing to create services that anticipate the occupant's needs.

If we look at the smart home as just one aspect of the fully integrated Internet of Things (IoT), we can easily see the value in combining data from home sensors with information from other sensors outside the home – such as publicly accessible instruments that report on the weather, or air quality, or traffic conditions.

#### **Can you provide an example?**

The proactive home can prepare to help family members with their morning routine, even before they wake. Say traffic is particularly bad on the route one member's calendar says she will be travelling that day. The proactive home can calculate how much earlier

she should wake to make her meeting in time and begin a gentle wake-up cycle knowing her sleep pattern using data from various sensors. It can set the shower to her preferred temperature at the right time and even get coffee ready to speed her on her way.

As the concept takes hold, I have no doubt that creative minds will find many other ways to proactively use complex data from local sensors and the Cloud to make intelligent decisions that save time and energy, and improve quality of life.

#### **What technical challenges must be overcome?**

Interoperability is a major issue. The technology ecosystems in place today tend to compete, rather than cooperate, which can prevent homeowners connecting or using the devices they want to buy in the way they want to use them. We need gateway devices to intelligently translate between protocols, and these are now beginning to emerge.

**“Smaller innovation-led companies and the inventor/maker community will need help to turn a head full of great ideas into real, marketable products.”**

The next step is to ensure seamless integration and so remove barriers to creating product value by using the many overlapping data streams in a home to predict behaviour.

No single organisation can overcome all these challenges alone. We expect companies will collaborate across the entire value chain to create solutions that harvest and use the full extent of the data intelligently.

#### **What are the business challenges for equipment suppliers looking to support these opportunities?**

There are many roles for companies in such a complex ecosystem. Some will focus on a segment, such as the device layer, or the gateway, whereas others will look at the entire ecosystem.

There will be various types and sizes of companies, including equipment suppliers already established in domestic products such as lighting or heating controls. There are also the Internet giants, which have quickly moved in with smart devices like home digital assistants that connect to their own web-service's platforms in the Cloud.

In addition, untold numbers of smaller innovation-led companies and the inventor/maker community will need help to turn a head full of great ideas into real, marketable products.

#### **What is Molex offering developers to help realise the proactive home?**

Molex, traditionally an interconnect company with expertise at the device layer, is transforming its focus to deliver higher-level solutions. We are looking at developing gateways and even ecosystems by acquiring new technologies in sensors, software, and firmware.

As an example, the Molex Transcend Network Connected Lighting system, now with EnOcean energy-harvesting technology, can also capture

sensor data for monitoring real-time energy consumption, air quality, temperature, and more.

Of course, we also have some exciting device-level solutions including Soligie, our advanced substrate for creating robust flexible sensors, and Molex Laser Direct Structuring (LDS) technology for creating antenna patterns on the surface of complex 3D parts to save space and allow greater flexibility in the industrial design.

#### **What further support is available from Molex for companies to realise new products?**

Our partnership with Avnet Abacus goes a long way towards completing this picture. We have worked together to create technical guides to challenges such as antenna selection, which is tricky and highly application dependent. Getting the antenna right can make the difference between success and failure, given the physical and environmental constraints, so we have also collaborated to create antenna sample kits that contain popular devices for home networking.

More generally, the pace of change in the connected home space means that engineers are having to understand and adopt many new, complex technologies and standards. Allied to the necessity to get to market faster and reduce cost at every stage of the product development cycle, these challenges mean our customers need more support than ever before. That's where our distributors can make a difference.

We work closely with Avnet Abacus' technical specialists to ensure that they have a deep knowledge and understanding of our solutions. When a customer doesn't have the prior experience or in-house support, Avnet Abacus' specialists can fill in the gaps.

To learn more, visit [avnet-abacus.eu/molex](http://avnet-abacus.eu/molex)

**molex**



Omron's photomicrosensors are compact optical sensors designed to detect objects or object positions using an optical beam. Transmissive, or slot type photomicrosensors incorporate an emitter and a detector that face each other. When an object is located in the sensing position between the two it intercepts the optical beam of the emitter, reducing the amount of optical energy reaching the detector, which in turn outputs a signal.

In order to tackle complex design considerations such as quality levels, physical characteristics, sensor types and mounting methods, Omron has expanded its range of SMD type photomicrosensors. This range has been developed to allow engineers to mount the components to PCBs faster using reflow soldering, and features a greater choice of slot widths as well as reduced board space requirements.

### EE-SX1329/1321/1330/4320 SERIES NON-AMPLIFIED PHOTOMICROSENSORS

Designed to produce both phototransistor and photo-IC outputs, as well as a phototransistor with dual-channel output, the series feature ultra-compact slot widths (2-3mm) and soldering joints on the components for time and cost savings.

#### FEATURES

- Phototransistor (EE-SX1321, EE-SX1330, EE-SX1340) and photo-IC (EE-SX4320) output types enable diverse applications
- Dual-channel output to detect changes in movement direction (EE-SX1321)
- Ultra-compact 2-3mm slot widths
- High resolutions with a 0.3mm-wide aperture
- Reflow soldering for ease of mounting



SX4320

SX1350

SX1340

### EE-SX1340/3340/4340 SERIES

With slot widths of 4mm, these photomicrosensors feature a high resolution 0.5mm aperture. The EE-SX1340 is available as a phototransistor output type, while two types of photo-IC output are available in the EE-SX3340 and EE-SX4340, Dark ON and Light ON respectively.

#### FEATURES

- 3.5mm height reduction compared with previous 5mm slot SMD types
- SMD type allows for flexible mounting on PCB
- Phototransistor and photo-IC outputs available

### EE-SX1350/3350/4350 SERIES

These series of 5mm slot width SMD type photomicrosensors feature up to a 65% reduced footprint compared to existing terminal type components as well as soldering joints located on the sensors for ease of integration and assembly. Two types of photo-IC output are available in the EE-SX3350 and EE-SX4350, Dark ON and Light ON respectively.

#### FEATURES

- Reduced footprint compared with previous models
- Widely used 5mm SMD terminal type
- Photo-IC and phototransistor outputs available
- Reduced integration time with reflow soldering

Size reduction, ease of mounting and increased slot options make Omron compact slot SMD type photomicrosensors ideal for a diverse range of applications:

#### Office automation

- Copy machines
- Printers
- Image scanners
- Facsimiles
- X-Y plotters
- Computer mouse

#### Household products

- DVD/Blu-ray players
- Microwave ovens
- Air conditioning
- Smart meters
- Fan heaters
- Vacuum cleaners
- Video cameras

#### Other

- Automatic vending machines
- Cameras
- Garage doors
- Slot machines
- Pinball machines
- Game machines

## Platinum temperature sensors from IST AG

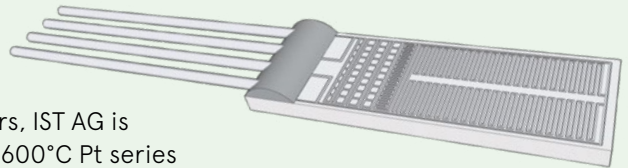
Innovative Sensor Technology IST AG is a leading global manufacturer of physical, chemical and biological sensors. We develop and manufacture temperature sensors, thermal mass flow sensors, humidity sensors and modules, conductivity sensors and biosensors. IST AG sensors are applied in measuring instruments for various applications, including medical, process control, test and measurement or biotechnology. The special thing about IST AG is that we customise sensors in order to fit your individual requirements. That way we can find a sensor solution for nearly every application.



INNOVATIVE SENSOR TECHNOLOGY

The development and production of temperature sensors is a core competence of IST AG. Our thin-film platinum temperature sensors can be operated in a wide temperature range of up to +1000°C with fast response times and accurate results. We offer a broad range of standard temperature sensors with short delivery times. If there are any application-specific needs, we are able to customise our sensors and make them suitable for the according purpose.

In response to the increased demand for high accuracy platinum temperature sensors, IST AG is releasing the new +600°C Pt series for high-precision measurement. The new 4-wire construction on



New +600°C Pt series sensor for high-precision measurement

chip allows measuring in class FO.15 from -200°C up to +600°C and demonstrates significantly less hysteresis compared to the standard platinum sensors. The sensor offers a very stable characteristics curve and excellent long-term stability.

For more information visit [avnet-abacus.eu/ist-ag](http://avnet-abacus.eu/ist-ag)

## Murata isolated DC-DC converters for transportation applications

Murata's rail, transportation and industrial DC-DC converters are designed to provide isolated DC power for applications requiring high reliability in demanding conditions. Utilising the latest in technology development, Murata's DC-DC converters are able to cover a wide range of battery input voltages from 9V to 160V DC in a single module (with input voltage ratios up to 10:1). Specific nominal battery input voltage range converters are also available. Products are suitable for both on-board and trackside rail applications, as well as industrial/manufacturing and farming equipment and the automotive industry.

### CONSTRUCTION

- Baseplate machined from a single block of aluminium
- Thermal interface materials are of the highest quality and thermal conductivity
- Plastic components are made from engineered plastics with temperature ratings >300°C
- Conformal coated with Cytec CE-1171 – which is qualified to meet IPC-CC-830B



INNOVATOR IN ELECTRONICS

## Murata

### FEATURES

- 1/2, 1/4 and 1/16 brick formats
- Input voltage ranges from 9-160V
- Stable no-load operation
- -40°C up to 85°C (ambient) and 110°C (case) operating temperature
- Baseplate and flange package options
- High efficiency - up to 91.5%
- 3.3V, 5V, 12V and 24V output
- Tight line and load regulation
- 3000V RMS input/output isolation

For more information visit [avnet-abacus.eu/murata-power-solutions](http://avnet-abacus.eu/murata-power-solutions)



IRH series



IRQ series



IRS series

# POWER | PROTECT | CONNECT



eMobility /  
Hybrid & Electric  
Vehicles



Railway &  
Harsh Environment



Commercial  
Aerospace &  
Military

Founded in 1949, Bel designs, manufactures and markets a broad array of products that **Power, Protect and Connect** electronic circuits. With over 65 years in the electronics industry, Bel has reliably demonstrated the ability to succeed in a variety of product areas across multiple industries. The company has a strong track record of technical innovation in **Power Conversion, Circuit Protection and Connectivity**, as well as working with the engineering teams of market leaders.

Bel makes products for Transportation, including Railway and Harsh Environment, Commercial Aerospace, Military, Industrial and Hybrid and Electric Vehicles.



**bel**

POWER | PROTECT | CONNECT

For more information visit  
[avnet-abacus.eu/bel-fuse](http://avnet-abacus.eu/bel-fuse)



# Why engineering communities are thriving online



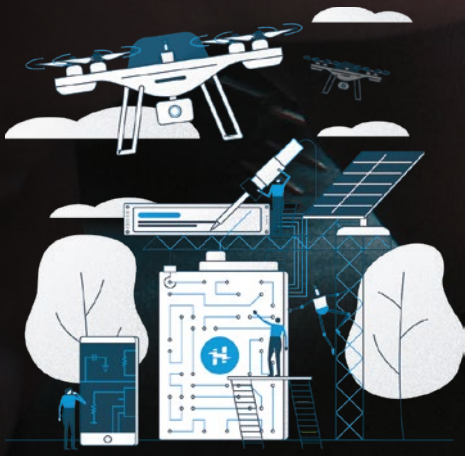
Georg Steinberger  
VP Communications,  
Avnet EMEA

One of the main challenges facing engineers today is understanding new technologies and how to implement them. Recent additions to the Avnet group, element14 and Hackster, seek to address this challenge through a combination of content and community.

When Hackster joined Avnet in November 2016, the community was about 100,000 users strong. Since then, it's grown close to 600,000 users. With 45,000 - 50,000 new members joining every month.

Combined, the element14 and Hackster communities have over 1 million members and are by far the largest hardware community in the world.

These online communities are thriving. And here's why...



Online engineering communities such as Hackster.io are changing the way engineers are learning and sharing knowledge.

**You can learn from your peers**

Within these communities, you can learn about new technologies, talk about them, and have a conversation with other engineers. This can be very difficult in the office sometimes, especially if it's new technology that people haven't used before.

**You can learn by seeing what others have done**

One of the reasons engineers love the community platforms is you can learn by seeing what others have done. You can see the code they've used and you can actually re-use that code.

That's really what makes these communities thrive. Most of the software is open-source. It's opened up the ability to see what people have done, and look at real-life examples.

If you need sample code because you're building a sensor for a car, you can usually find something relevant. You can also find inspiration and reference designs you can use when designing your products.

**You can learn in a way that's easier to digest**

Instead of just reading an app note, element14 offers you access to videos and essential courses. It's the same stuff you'd get in an app note, but in a more engaging way to learn that same technology.

They break things down into manageable chunks. It's not like reading a textbook. They've taken the time to look at the documentation, and pull out what's most valuable and essential to engineers.

They've done the hard work to provide the information in an easily digestible format, so you can read it on the commute, on the train, while at home, etc.

**You can build on the work of others**

Over at Hackster, they've created a substantial reference design and project library for people to come and learn from, get inspired by and replicate the projects they find.

New projects are added to the site on a daily basis. There are currently close to 14,000 open source projects on there. There are over 2,500 home automation projects, 1,000 robotics projects, 400 in security, 400 in wearables, 300 in automotive, and more. Full source code is available to download, along with schematics, and bills of materials.

With each project, you can discover the story of how things were built and why.

**You can get hands-on with workshops**

Community members also come to Hackster for workshops and webinars. The workshops are in-depth, full-day and very technical. You get fully hands-on with the tools. And these aren't hobbyist kits. They're usually enterprise tools.

The Microsoft workshops have sold out every time. For the Xilinx workshop, over 500 attendees registered within two weeks. The workshops are free to attend. You just have to buy the hardware.

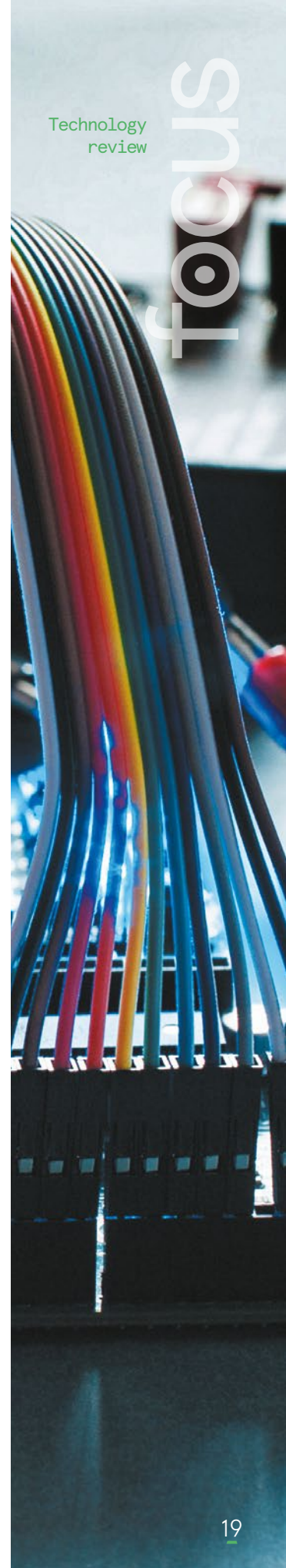
In the recent Internet of Things Virtual Bootcamp, in November 2017, attendees received three full days of lectures and hands-on labs. Day 1 started at the top level with the five elements that make up the IoT - Things, Connectivity, Data, Analytics and Action.

The full agenda contained ten lectures, and nine hands-on labs covering everything from building a basic device, to connecting your device, data basics, taking action, serverless architecture, connecting to the cloud, big data, AI & ML, facial recognition, natural language processing, and building chatbots.

**They're unbiased & technology agnostic**

Why are you here?

Not to get all existential, but this is a question Hackster asks its members in their annual survey. The most popular answers are that it's an unbiased place, it's technology agnostic, and you don't get bombarded with banners.





## Why engineering communities are thriving online

It really is a place to learn, share and develop.

### **47% of members are professional engineers**

The Hackster community has really shifted from a place for hobbyists to a full-blown developer community, and the same is true of element14.

While there is a large proportion of members that are part of the maker community for Arduino etc, almost half are hardware or software engineers working in the industry.

In 2016, Hackster asked their community members how many were “designing, building or programming hardware” for their daily job. The answer was 30% of the community. Fast forward to 2018, and that number is now at 47%.

### **You can use communities to develop your ideas**

If you need to understand new technology to bring an idea to life, these communities can be a great place to start. You can learn about the different technology, see real life use cases, and soundboard your ideas.

And if you want to take your prototype further, programs like ‘Maker to Market’


by Premier Farnell can help smaller companies bring their ideas to life. These small companies often get in touch with Premier Farnell when they’ve got an application they’ve developed, but need to take it further.

Maybe they want to integrate a wireless capability that they don’t currently have, or they maybe have the best design in terms of software, but now they need to go through compliance, and they need to change the form factors on the board.

Unlike a lot of distributors, Premier Farnell also offers the advantage of small quantity ordering, so you can build five or ten units to test your idea, and iterate from there.

The communities of element14 and Hackster, plus the ability to order small quantities from Premier Farnell are just some of the ways the Avnet group has merged and expanded to help engineers meet the challenges they’re facing today.

Combine this with Avnet Abacus’ technical and commercial expertise from design through to production and supply chain, and you have a whole range of tools and resources available to get you to market faster.



In 2016, Hackster asked their community members how many were “designing, building or programming hardware” for their daily job. The answer was 30% of the community. Fast forward to 2018, and that number is now at 47%.



# Light Touch Switches

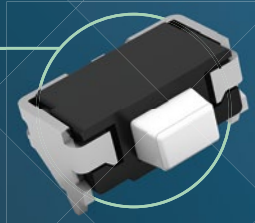
Panasonic

Panasonic Light Touch Switches provide a unique sharp tactile feel, have low contact resistance and minimal bounce sound.



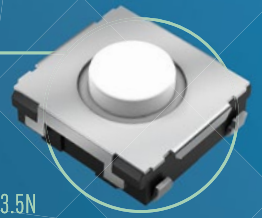
## EVPAK (3.8x1.9) IP-67

- Side-operational type
- Measure against electro static discharge
- With operation force of 1.6N



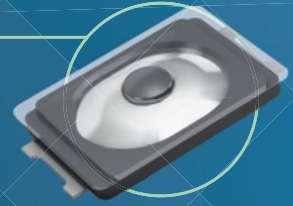
## EVQQ2 (6.5x6.0)

- Adding 4.3 mm in the lineup
- Now: 2.0, 2.5, 3.1, 4.3 mm
- Top push type
- With or without ground terminal
- Wide variety of operation force from 0.5N to 3.5N



## EVPBB (2.6x1.6) IP-67

- Top push type
- High operability equipped with an actuator (push plate)
- Smallest footprint in the market
- Wide variety of operation force with 1.0N, 1.6N, 2.4N



## Touch and Feel the Difference

[www.avnet-abacus.eu/panasonic](http://www.avnet-abacus.eu/panasonic)

AVNET<sup>®</sup> ABACUS

## Hirose ER8 series 0.8mm pitch high-speed, board-to-board connector

Hirose's ER8 series of board-to-board connectors supports high-speed transmission of more than 10+Gbps for industrial applications and is compatible with Samtec's Edge Rate<sup>®</sup> connector strips. The ER8 contacts are optimised for signal integrity performance to ensure reliable high-speed transmission.

The self-aligning connectors have mating/un-mating forces up to six times greater than typical micro pitch connectors. In addition, the ER8 series has an increased contact wipe and insertion depth, making

Hirose

the connectors ideal for applications that require high-mating cycles and resistance to shock and vibration.

The ER8 series is available in parallel (mezzanine type) and right angle versions. The vertical connectors are offered with contacts numbers ranging from 10 to 120, while the right angle version is currently offered with 120 contacts. Featuring low profile stacking heights from 7mm to 12mm, the ER8 meets the size requirements of a wide range of applications. It is a licensed second source for the Samtec Edge Rate<sup>®</sup> series. Edge Rate is a trademark of Samtec, Inc.

ER8 connectors are suitable for servo motors/amps, car navigation, medical equipment, broadcasting equipment, POS terminals and industrial machinery.

For more information visit [avnet-abacus.eu/hirose](http://avnet-abacus.eu/hirose)

**HRS** HIROSE  
ELECTRIC  
EUROPE B.V.

Available in 0.80mm, 1.27mm and 2.00mm pitches, Samtec's Tiger Eye™ interconnect systems are designed for micro rugged, high-reliability, high-cycle applications.

### MULTI-FINGER DESIGN

Tiger Eye™ is a multi-finger, heat-treated, Beryllium Copper (BeCu) contact designed for rugged environments. Most Tiger Eye™ contact systems have three or four redundant points of contact.

The contact mating surface is on the flat, smooth side of each finger. Smooth surfaces allow more mating cycles because they do not stress the plating, providing lower contact resistance and longer plating life.

### BERYLLIUM COPPER

In addition to the multi-finger design, the spring properties of Beryllium Copper make it ideal for high mating cycle applications. Once formed and hardened, BeCu will retain its shape under a wide variety of conditions. BeCu provides a strong combination of mechanical and electrical properties for high-reliability interconnections. For applications where BeCu is not required, Samtec offers Tiger Eye™ LITE which incorporates a three-finger, cost-effective phosphor bronze contact.



### MECHANICAL STRENGTH

The SMT version of the Tiger Eye™ contact has a "micro slot tail". This allows the solder paste on the tail to penetrate the slot, wetting a larger surface area on the lead, providing greater solder joint strength.

It also has been reported that the lead construction can provide a path for organics to escape, reducing the occurrence of voids in the solder. This is of more concern with reflow soldering. Connectors with micro tail slots tend to adhere to the wet solder paste prior to reflow better than flat leads.

### TIGER EYE™ CONTACT SYSTEMS

Tiger Eye™ is available in a variety of connector interfaces, including two-piece board-to-board, discrete wire systems, and IDC cable assemblies.

#### Options include:

#### 1.27MM & 2.00MM PITCH PRODUCTS

The SFM/TFM series is a 1.27mm pitch mated socket and terminal set available in vertical, right-angle and horizontal orientations. Polarised to ensure proper mating, the set is available with optional friction locks to increase unmating force, in a variety of stack heights, and in both through-hole and SMT terminations.

The mated set is one of Samtec's Extended Life Products™, which are capable of 250 to 2,500 mating cycles (with gold-flashed palladium nickel).

Samtec's FFSD series is a 1.27mm pitch Tiger Eye™ IDC cable assembly. It is low profile (0.200"), available with ejector or shrouded headers, as well as polarisation notches and numerous wiring and termination options. IDC assemblies are also available on a 2.00mm pitch.

Tiger Eye™ contact systems are available in rugged discrete wire cable assemblies as well. Most are shrouded, polarised and keyed, with optional metal latches and screw downs. Tiger Eye™ discrete wire systems are available as components or complete assemblies, and with PVC or Teflon® cable, in 28 and 30 AWG.

#### 0.80MM PITCH PRODUCTS

Tiger Eye™ interconnect systems on 0.80mm pitch (SEM/TEM Series) provide reliability and ruggedness in a micro footprint. The mated set is available in 6, 7, and 10mm stack heights. Optional weld tabs and locking clips offer increased retention to the PCB, and a discrete wire system is also available.

## Aptiv APEX connection system

The APEX connection system from Aptiv is the perfect solution for heavy-duty applications, with the highest current rating and ergonomic designs. Aptiv developed the APEX family to ensure reliability in harsh environments, with a high vibration and temperature ratings for both in-line and device applications.

The APEX family comprises the Standard, SensoMate, Mixed and ErgoMate series, with connectors available in 2- to 57-way configurations designed for a range of applications including sensors, in-line, device, lamp and bulkhead systems. The full shroud design protects the interface seal and terminal blade lead-in, making the connectors very durable. Several features have been developed for ease of assembly, including Connector Position Assurance (CPA), Terminal Position Assurance (TPA), smooth well-rounded corners and pre-assembled rear mate seals with retainers. For ergonomic mating design, the ErgoMate™ 24-way version features axial mechanical assist mating. Different sealing solutions are applicable for both simple and more compact packaging.

Aptiv



APEX ErgoMate connector

APEX terminals are designed to have high current carrying capacity by using special copper alloy, with multiple plating options (tin-silver, silver, or gold) and a broad range of configurations (1.2mm, 1.5mm, 2.8mm, 6.35mm, and 9.5mm). The two-piece terminals are constructed with an integrated floating spring made from beryllium copper to resist against stress relaxation.

For more information visit [avnet-abacus.eu/aptiv](http://avnet-abacus.eu/aptiv)

• **A P T I V** •

## Amphenol ICC Minitek MicroSpace™ crimp-to-wire connector system

### A COMPACT, ROBUST AND VERSATILE CONNECTOR SYSTEM

The Minitek MicroSpace™ crimp-to-wire connector platform's unique design meets LV214 -2 specifications and is available in 1.8, 1.5 and 1.27mm pitch versions. Minitek MicroSpace™ connectors are available in single and double row versions, with top and side latch configurations. Designed for simple and secure mating, the system features keying to prevent visual mismatching, Terminal Position Assurance (TPA), primary and secondary contact retention, and Connector Position Assurance (CPA).

### FEATURES

- Design based on existing and proven design controls
- Existing crimp section and automated crimp tooling up to 22AWG
- 4N normal force for vibration and >65N connector locking strength
- Human error-preventing polarisation
- Current rating up to 4A per contact

### BENEFITS

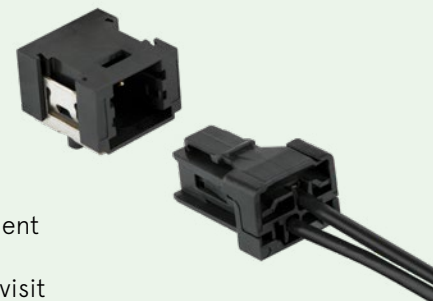
- Suitable for harsh environments
- No specific industrial tools required
- High vibration and locking resistance
- Visual mismatching prevention system
- Meets higher power performance requirements

### APPLICATIONS

- Cameras/sensors
- Cluster navigation
- HVAC
- Lighting
- Power steering
- Audio visual equipment

For more information visit [avnet-abacus.eu/amphenol-icc](http://avnet-abacus.eu/amphenol-icc)

Amphenol ICC



Amphenol  
ICC



## Enhance your wireless designs with TE Connectivity standard and custom antennas

TE Connectivity's (TE) standard and custom antenna solutions are designed to meet the increasing demands of today's connected applications. Available as embedded or multi-element external antennas, these solutions provide high-clarity transmissions in wireless devices in a wide variety of frequencies including, but not limited to: Bluetooth, Wi-Fi, LTE and ZigBee. Manufactured using a range of technologies including two shot moulding, stamped metal, flexible printed circuit (FPC), printed circuit board (PCB) and laser direct structuring (LDS), they allow the greatest design flexibility for your application. TE's in-house development and manufacturing means they control the process and timing from end-to-end and can transition quickly from prototype to mass production – delivering your product fast to increase your speed to market.

### MANUFACTURING TECHNOLOGIES

#### MOULDED INTERCONNECT DEVICE (MID) TECHNOLOGY

TE is one of the leading providers of moulded interconnect device (MID) technology with more than 25 years mass production experience. In its most basic form, MID technology is defined as a process that results in selectively plated plastic parts. MID technology can integrate electrical and mechanical elements into almost any shape of interconnect device allowing entirely new functions to be created while facilitating the miniaturisation of products.

TE utilises two different technologies to manufacture MID antennas:

#### TWO SHOT MOULDING

- Design flexibility for complex 3D geometries
- Ability to integrate multiple functions into one component
- Tightest tolerance for pattern registration to carrier
- Higher yields
- Improved scalability

#### LASER DIRECT STRUCTURING (LDS)

- Ability to produce thin traces
- Flexibility for pattern changes during production
- Simple/fastest/lowest cost tooling



AUTHORIZED DISTRIBUTOR

TE Connectivity, TE and TE connectivity (logo) are trademarks owned or licensed by the TE Connectivity Ltd. family of companies. Other products, logos and company names mentioned herein may be trademarks of their respective owners.

## TE Connectivity



### STAMPED METAL, PRINTED CIRCUIT BOARD AND FLEXIBLE PRINTED CIRCUIT TECHNOLOGY

In addition to MID technology, TE most commonly uses stamped metal, printed circuit board (PCB) and flexible printed circuit (FPC) technology for its antenna products.

#### STAMPED METAL ANTENNAS

- Low cost
- High volume production die
- Integrated contacts
- Rapid prototyping capability

#### PRINTED CIRCUIT BOARD (PCB) AND FLEXIBLE PRINTED CIRCUIT (FPC) ANTENNAS

- Low-cost tooling investment
- Flexibility for pattern changes during production
- Shortest lead-time for tool build
- Patented material and patterns for optimal efficiency and performance

TE antennas comply with the most stringent operating requirements, and have been designed to accommodate the wireless industry's move towards increased complexity and demand for miniaturisation, combined with the need to integrate a multi-radio environment into a single component, making them ideal for a range of applications including:

- Wireless routers
- Smart home systems
- Security and monitoring systems
- Industrial and smart grid products
- IoT and M2M
- Desk and notebook computers
- Mobile phones and other handheld devices
- Medical equipment
- Vehicle tracking and OBD products
- Wearables (smart watches, cameras, etc.)
- Distributed antenna systems (DAS)

For more information visit [avnet-abacus.eu/te-connectivity](http://avnet-abacus.eu/te-connectivity)

# From prototype to production: How Avnet Abacus opens doors for startups

Azhar Hussain

Founder and CEO  
of Hanhaa Ltd



## We were losing parcels

I used to run a company shipping batteries around the world. And parcels were going missing. I wanted to see if I could solve this problem.

I got in touch with a supplier I knew. We used mobile phones initially, as a proof of concept. We changed the software in the phones, and put them in the boxes with the batteries. Now we could see where they were in the world.

## Then we got our first funding

We took the prototype for ParceLive, a live parcel tracker, and presented it at a show called 4 Years from Now (4YFN) in Barcelona, as part of Mobile World Congress. We won first prize in the Internet of Things category, and we got our first seed investment as a consequence of winning that prize.



We started working on version one of our product, a live shipment tracker.

## After a year of development, there were challenges with the build

We didn't have the right developmental tools. There were integration issues, power issues, and more. At the time, we could barely get the device to work for three or four days. The list of issues was too long.

## This is around the time we met Avnet

Andy Barker from Avnet actually found us and came to see us. We told them our pain and they had a cure.

Working with Avnet and ST Microelectronics, we moved the code over to a new processor. At this point there'd been a year's worth of work gone into the product on the platform we were using.

## They helped us migrate in six to seven weeks

We were busy hiring engineers. Meanwhile, Avnet was managing and facilitating the migration, not just with the chip but a whole range of components - modems, sensors, etc.



AUTHORIZED DISTRIBUTOR



## From prototype to production: How Avnet Abacus opens doors for startups

We built in a variety of sensors so not only would we know exactly where a parcel is in the world, we would know the temperature and humidity it's been exposed to, and whether it's been tilted, opened or dropped.

Version 2 of the product was really the first version of what we now use. We had difficulties with the previous technology and had to scrap a lot of it. That was the first path we'd gone down. The second path is essentially the one we're still on, with the product now at version 17.

### **Avnet Abacus introduced us to TE Connectivity**

One thing you need to understand is I don't come from this industry. I didn't really know anybody. Avnet was really my guide. They were making the introductions.

Our work with TE was all about the radio. We wanted a passive radio solution. The challenge was that active sucks up power, while passive has no power and generally a lower performance, but we really wanted a bit of both worlds. We couldn't power it up but we needed it to be finely tuned. Our units can be inside a box, inside a cage, inside a truck, inside a warehouse, anywhere in the world.

### **We got to test our product in a lab that only big companies normally get to use**

We wouldn't have even registered on TE's radar if it wasn't for Avnet Abacus. We were too small. But thanks to Avnet Abacus' introduction, TE opened up their state-of-the-art lab to us, to start tuning our device around the radio frequency.

We currently have the best radio performance in our class at our price point. The design work that went into it is quite nuanced. We had to play with everything - the way the board is laid

out, for example. We had to test it, rearrange it, test it again.

Christian at TE really took us on and made us his thing. He's based in Munich, but he put a call in to their San Francisco lab, a centre of excellence for radio.

### **We got insight that's not on a spec sheet or a design brief**

The thing about radio in general is it's very much an art as much as a science.

We could follow a spec sheet - do this, do that - but TE was able to give us the kind of insight that only comes from years of experience with lots of companies and products.

### **We tapped into this larger brain to make the product better**

There are some things in our design that are there purely because some very smart people looked at it and suggested things.

Avnet Abacus also introduced us to VARTA to help with the battery. Our product was always going to go through a compliance and approvals programme to get as many certifications as possible. This was key for us from the start. But our original, highly customised battery and connector would have added cost to this process.

VARTA's Cell Pac Blox, an innovative semi-customised battery solution, gave us the customisation we needed for our battery, but with extra levels of approvals already included, and minimal NRE costs incurred for its development.

Certifications is one of our big differentiators. You could go to eBay and buy a tracker, but it's not going to fit with aviation regulations, radio regulations, and other regulations, on a global scale. We worked with Panasonic labs. We worked with AirBus labs. We used a lot of first rate labs to get our product compliant.





Technology  
review

focus

**By walking into some of these other big companies with Avnet, we were able to get more done. We got more consideration. More doors were opened**

Rather than filling in various web forms, we landed into these large suppliers with a partner like Avnet.

It gave us a substantial uplift in getting things done.

**It was more than introduction**

Avnet facilitated the whole relationship. It was the whole set-up, including payment.

They supported us with trading terms that allowed us to work with these big suppliers and pay in a way that works for our business.

**Avnet became a crucial interface on both the financial and commercial side**

Normally, large suppliers would want payment up front, and significant minimum orders. They're big companies and they're used to dealing with big companies. But startups are particularly cautious about cash flow.

There needed to be a gear between who we were as a startup and the large suppliers. Avnet was that gear in the middle. They could turn at our speed and their speed.

**Avnet helped set up our supply chain. Now we can go in and order via one online portal**

That then gets pushed out to suppliers and everything gets linked up in our manufacturing facility. We handed over our details to Avnet, so they can get us what we need at the time it's needed, at the cost it's needed, and everything else.

**We went from idea to market in just under 1,000 days**

In May 2017, we received our first 500 trackers ready for customer use. In November 2017, we produced the first batch of a 20,000 unit production run. In December, we were on pilot programs, and by the last quarter of 2017/18, we were running trials with paying customers.

26th April 2018 was day 1,000 since we started Hanhaa. Nothing existed 1,001 days before then. We're now fully operational. We're still rolling stuff out. We recently opened a US distribution centre, and now we're looking to scale.

We're looking to open an office in the US early next year. We have a bunch of customers in America now. We just got our license approved by USPS, making us the first electronic labelling product to work with the USPS network, the largest postal system in the world.



TE Connectivity's state-of-the-art radio labs in San Francisco





Technology  
review

## From prototype to production: How Avnet Abacus opens doors for startups

We work with a large number of logistics companies, tracking all kinds of things as they travel around the globe - medicines, cars, a wide range of electronics, etc.

**This is going to sound like fluff but I genuinely mean this... I'm not sure we could have got here, at the time that we did, at the price that we have, without Avnet**

The story is too complicated - too many bits to share with you. Unless you lived it, it's hard to explain. So many things have happened.

Throughout the process of taking our product to market, we were able to get the components we needed, the price we needed, and the support we needed from Avnet.

We're not a big team. There's only 20 people. And there were 10 of us initially.

**Avnet Abacus has not acted like a big corporation**

They have been great.

Avnet introduced us to the right people at the right time in the right positions. And somehow, it all came together and worked.

Big companies tend to suck at doing sensitive things. They tend not to act with a scalpel but with an axe. They work like an army. They roll on.

**We needed a much more surgical touch, with much more sensitivity. We felt like we got that from Avnet.**

## Guiding small businesses to big success.

# AVNET<sup>®</sup> ABACUS

Avnet Abacus and TE Connectivity helped IOT startup Hanhaa to identify and overcome key design challenges to get its smart parcel-tracking solution to market in less than 3 years.

Find out how we can help you at [www.avnet-abacus.eu/te-startups](http://www.avnet-abacus.eu/te-startups)



Azhar Hussain, CEO & Co-Founder Hanhaa



AUTHORIZED DISTRIBUTOR

**LIGHTING THE WAY FOR TRANSPORTATION**

Light Emitting Diodes (LEDs) are semiconductor devices which provide an efficient and reliable source of light and contain no moving parts, making them ideal in environments with elevated vibration and shock, such as automobiles. Today, advanced LED driver designs are being developed with electronic components that deliver the highest lumens per watt while able to perform at higher ambient temperatures, better energy efficiency, and lower cost of ownership.

Automotive-grade, high power inductors are key to ensuring efficient DC-DC conversion in these systems, delivering low electromagnetic interference (EMI) and higher operating temperature.

Eaton’s HCM1A series inductors are designed to withstand the harsh environmental, electrical and mechanical conditions, able to perform at temperatures from -40°C to +155°C, representing the same inductance roll-off characteristics across the entire temperature range. Tight thermal coupling can ensure effective heat dissipation under high current conditions, while a variety of sizes and higher

inductance values allow automotive designers to operate at higher voltages needed to drive multiple high-power LED arrays for headlights and daytime running lights.

**FEATURES**

- AEC-Q200 Grade 1 compliant
- Higher current capacity up to 40A
- Robustness – Molded construction able to withstand harsh environmental, electrical and mechanical conditions
- Tight thermal coupling – Assures effective heat dissipation under high current conditions
- Higher inductance values (OCL) – Higher inductance more suitable for higher voltage LED drivers



For more information visit [avnet-abacus.eu/eaton](http://avnet-abacus.eu/eaton)



**KEMET MPLCV series SMD power inductors**



With KEMETs acquisition of TOKIN corporation in April 2017, our goal was to fulfil global automotive requirements for under the hood electronics. Whilst TOKIN has been manufacturing for automotive applications for over 40 years, individual automotive OEM’s specifications were the driving force for new product development.

The MPLCV is the first SMD power inductor series that is AEC-Q200 qualified. Case sizes of 7.9x6.7mm and 11.5x10mm are available today with inductance values of 4.7 up to 47µH and rated currents of 2.1 up to 7.1A. The initial series release was made with 6 core values which are very competitive and specified for a 155°C

maximum operating temperature. KEMET’s technical capabilities are linked with the materials used for these components. There has been much progress made to reduce AC losses and increase permeability which has lead to smaller footprints and improved behaviour at higher frequencies. MPLCV series inductors are intended to be used in ECUs as Pi filters or for output inductance in DC-DC converters, making them ideal for LED lighting, air conditioning, power steering and any other power application at or below 48V. More series will be released in 2019 to increase the choice of case sizes, rated current and saturation capabilities.

For more information visit [avnet-abacus.eu/kemet](http://avnet-abacus.eu/kemet)





# Design for manufacture: Spreading knowledge of mass production

**Dragon Innovation specialises in helping hardware companies of all sizes go from prototype to production through a combination of software and human expertise. The company joined Avnet in August 2017 as part of Avnet's expansion to support engineers from idea to production and beyond.**

**Martin Keenan, Technical Director of Avnet Abacus, recently caught up with Dragon Innovation CEO, Scott N. Miller, to discuss the challenges facing engineers when designing for manufacturing.**

Prior to starting Dragon Innovation, Scott N. Miller led the manufacturing team for iRobot's Roomba. During his time at iRobot, Scott moved over to China for four years, where he met his future co-founder, Herman Pang. Together, they built a team of about 55 people across Asia Pacific, where they were building roughly 40,000 Roombas a week.

Throughout this time, Scott had the chance to sit alongside the workers on the line, and really understand what it took to navigate the New Product Introduction phase of launching high volume products.

After 10 years at iRobot, Scott and his co-founder, Herman, started Dragon Innovation.

"We realised it was getting easier and easier to build

a prototype, but it was still insanely hard to figure out how to go from one to many if you haven't done it before," says Scott on the motivation for starting his new firm.

## **THE PROTOTYPING REVOLUTION**

At the time Dragon Innovation started, Scott noticed there were a lot of forces lowering the barrier to innovation for going from the idea to prototype. One was 3D printing, which made it much less expensive to get a fully functioning mechanical model than it was before.

There was also the advent of things like Arduino.

Back in the day, building the Roomba, Scott and his team used to build their own H-Bridges from scratch

Martin Keenan

Technical Director  
at Avnet Abacus



to control the motors. They'd be down at the bare metal, setting the components and doing the firmware. But today with an Arduino, you could be wiggling motors in no time, allowing you to focus at a higher level of problem solving, rather than working on the basic engineering.

These inventions were incredibly empowering. This really started a hardware revolution, with much more people getting into it.

#### **PROTOTYPE TO PRODUCTION: AVOIDING THE COMMON PITFALLS**

Having developed a working prototype, many would-be entrepreneurs were stumbling when it came to moving from the prototype to high volume.

They'd maybe pick a factory that wasn't well suited to them. Or they'd have so many unknown unknowns that they'd get lost along the journey, trying to figure out how much the product was actually going to cost. And whether there was a business model behind it.

How much money does it really take to bring a product from a prototype to the shelves?

What's possible from a design standpoint that's actually manufacturable?

These were questions that Dragon Innovation set out to solve.

For Scott and his team at Roomba, they'd lived those questions, day in, day out, for the past 10 years.

“We realised it was getting easier and easier to build a prototype, but it was still insanely hard to figure out how to go from one to many if you haven’t done it before.”

They knew how to get from a prototype to high volume.

“Designing for Manufacture wasn’t something I learned at school,” Scott says, on reflection. “It was really something I learned on the job, and often the hard way.”

It’s important to understand the consequences of design decisions on downstream manufacturing, to minimise cost and speed up the time to market.

You need to focus on the unknown unknowns, like lead times, and how things will pull together into a schedule without becoming prohibitively expensive.

### THE MANUFACTURING TRIANGLE

When you’re designing for manufacture it is helpful to break down a complex problem into simpler components. The manufacturing triangle: cost, quality and schedule, is a great framework to use.

All companies will think about cost, but with varying lead times, they often don’t think about schedule and they often don’t think about quality until the end.

It can be easy to build in quantities of 1s or 2s, but ideas at this stage aren’t designed to be made at scale. This can be overcome with better tools and education.

So what are the common pitfalls that organisations face when going from one to many?

### SCHEDULE PITFALLS

#### Not Knowing Enough about Regulations and Compliance

You need to know what regulations and certifications your product needs, the process for gaining them, how long it takes, the lead times, and the cost.

If you need regulatory compliance, they all have lead times associated with them as well as costs. They also depend on a certain level of design maturity. If you have to do it again, it can cause delays.

We recommend doing a pre-scan. This is a one-day test to make sure your product has reached a certain threshold, so when you submit for final testing, you have confidence it’s going to pass.

#### Missing the Holiday Sales Cycle

In consumer electronics, the product sales cycle is often driven by the winter holiday season. Many companies make the majority of their revenue for the year in the last month of the year.

If you’ve been hit with some lead time issues, you might need to air ship instead of sea ship, which can impact the cost, which will negatively impact your margins.

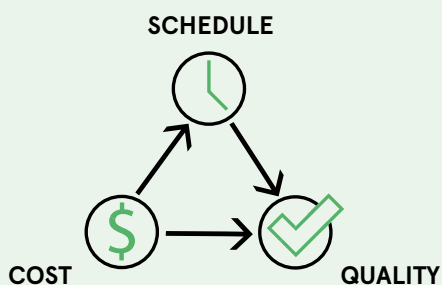
Being late to market can be devastating, as a hardware company in the consumer sector may need to wait another year before the sales opportunity comes back. In this time, they’ll need to cover the financial burn of the team, and are more susceptible to competitive threats after they’ve marketed their product.

#### Underestimating Lead Times

In high volume, as opposed to prototyping quantities, many components have lead-times. For some electrical components (e.g. MLCCs) these can be over a year.

For fabricated parts, such as injection molding tooling, it often takes up to eight weeks to make the tool. If a

### MANUFACTURING TRIANGLE





"Many companies assume they can sum up the Bill of Materials (BOM) cost and arrive at the Cost of Goods Sold. But they also need to account for labour.

What will it cost to pay the workers to put it together?"

company has not factored in these lead times, they will either miss the sales cycles or erode their margins paying for expedited shipping.

#### **COST PITFALLS**

##### **Assuming the product's material costs = the Cost of Goods Sold**

For large items, logistics (i.e. shipping) can also add up, especially if the product needs to be air shipped to meet a schedule.

And it's more than the final assembly labour. It's the injection moulding, the painting, it's looking at the whole product as opposed to just one part of it.

Another point to consider is that the factory has to make a margin. And, there's an overhead to running the factory itself.

And there's scrap - not every unit ends up working.

Then the other side of it is the costs associated with compliance, tooling, stencils, fixtures, etc - all of which can be pretty substantial. So you want to make sure you have all of those factored in.

##### **Forgetting about tooling**

"People tend to forget that to make the parts, you need to make the mould. That will impact cost and schedule - they're expensive and they take time. We've built a lot of those templates into our software tool, Product Planner. We've infused the software with our knowledge, and we incorporate all the elements that people tend to forget."

##### **Running out of money**

This is a big one, and the number one killer of companies.

For hardware companies, cash flow is a lot more complex than for software companies.

First, the company needs to understand their true Cost of Goods Sold (COGS), which is how much they pay for each unit. On top of this, they also need to understand the fixed costs, which includes items such as tooling, stencils, test fixtures, NRE (i.e. engineering services), pre-production samples, safety compliance, etc.

Once these values are known, the hidden killer becomes the payment terms with both the factory and also the customer. By negotiating better terms, it is possible to significantly reduce the working capital requirements. Dragon Innovation's Product Planner and Anvet's financing terms can help solve these problems.

#### **QUALITY PITFALLS**

##### **Ignoring stack-up-analysis**

You need to know your product will be safe for people to use.

If you look at electrical components, they all have a tolerance percentage e.g. resistors can have a +5% range of acceptable tolerance. However, if they're all in a row and they all hit the +5%, then the total number can mount up.

It's important to do a tolerance stack-up analysis. If they all stack up on the low side or the high side, do you get a value that's going to cause a problem?

**If you're making adjustments based off the manufacturing triangle, there are decisions you can make that will help you manage your cash flow more efficiently so you don't run out of money.**

### **Leaving quality to the end**

Many companies leave quality to the very end, rather than designing it into the product from the beginning. As a result, they're left scrambling to fix issues that are identified later in the process, which can be quite costly, especially if tools need to be modified, as long lead-time components need to be ordered, and inventory reworked.

Worse yet, if the product has already shipped and it has taken a while to identify an issue, there could be a high volume of defective product in the field.

### **Failing to consider the time for testing**

Many companies fail to accurately plan their schedules to include comprehensive testing and time to fix issues that occur. There is always some uncertainty as it's never feasible to test every possible failure mode and meet cost and schedule targets. Teams must be comfortable and proficient making correct decisions with limited data. This is easier to do for designs that are simpler and well understood.

If you have to get a lot of tests, it will impact the schedule and costs. You want to minimise the risks to an acceptable level. You can't test for everything and anticipate every way they might use it. But you want to make sure people won't be injured.

### **UNDERSTAND THE IMPACT OF YOUR DECISIONS EARLY**

Dragon Innovation likes people to understand the cost decisions they're making as early as possible. Some of the key insights they provide include break-even reports so you know when you'll start making money. There's also a cash-flow report, so you understand what cash-flow you'll need based on the decisions you're making.

If you're making adjustments based off the manufacturing triangle, there are decisions you can

make that will help you manage your cash flow more efficiently so you don't run out of money.

Hardware startups fail when they run out of money.

Higher quality targets will affect the cost and certifications you'll need and that will in turn affect the schedule. The manufacturing triangle is truly interconnected and a decision on one axis will impact the others.

### **GO INTO THE RFQ PROCESS WELL INFORMED**

You want to deeply understand the prototype, the costs, times and schedule leading up to the Request For Quote process, where you start to select a factory. That way, you'll understand the decisions you've made and the impact - so you're not going into negotiations blind.

At Dragon Innovation, education is really important.

"We want to teach our customers what they need to know so they can grow successful companies," explains CEO, Scott N. Miller.

When you identify problems in the design phase, it's a much less expensive time to fix them. It's at this stage that you want to understand the manufacturing impact of your design decisions.

By designing for manufacture, you can finalise your prototypes, sharpen your estimates and craft your production plans. So you're well informed and ready for the next step of the journey.

And of course, throughout the product development cycle Avnet Abacus can provide product selection advice from our market leading linecard, technical support and tailored supply chain solutions to enable you to get your product to market on time and on budget.

## Yageo PU series automotive-grade shunt resistors

Yageo's PU series shunt resistor is a perfect solution for applications where high precision and high power current sensing components are required. E-beam welding processes have been used to combine the central metal alloy and Copper (Cu) together at the terminations, while the central open-air design is key to achieving excellent heat dissipation.

The PU series features resistance from 0.2 mΩ to 5 mΩ, with high power (10W), high precision (1%), a low temperature coefficient of resistance (TCR 75 ppm/°C), low thermal EMF, excellent heat dissipation and a capability to sense minimal current. It offers high performance, a wide range of sizes (2512, 3921, 5931), and the versatility to fully meet the requirements of customers in different applications. New form factors of sensing hole are available in 8420 and 8518 with max. power rating up to 36W and resistance down to 0.05mΩ.

### FEATURES

- AEC-Q200 qualified
- Low resistance value (down to 0.05mΩ)
- High power (3W - 36W) and high stability



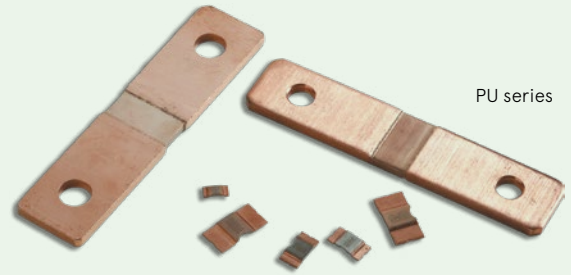
## TDK: An innovation driver in leading-edge technologies

TDK Corporation is a leading electronics company based in Tokyo, Japan. TDK's comprehensive portfolio features passive components such as ceramic, aluminum electrolytic and film capacitors, as well as magnetics, high-frequency, and piezo and protection devices. The product spectrum also includes sensors such as temperature and pressure, magnetic, and MEMS sensors.

### CUSTOMER-ORIENTED INNOVATION

TDK has always been a pioneer in leading-edge technologies, especially in the fields of magnetics and ceramic components. More recently, TDK has greatly expanded its activities into sensor technologies and now features one of the market's broadest portfolios

Yageo



- Withstand high temperature and high humidity
- Excellent heat dissipation
- Low thermal EMF, low TCR

### APPLICATIONS

- Power systems
- Automotive
- Telecom base stations
- Industrial equipment
- Alternative energy

For more information visit  
[avnet-abacus.eu/yageo](http://avnet-abacus.eu/yageo)

**YAGEO**

TDK

of sensors. The company's strong global R&D activities were one of the reasons that Clarivate Analytics selected TDK as one of its Top 100 Global Innovators 2017.

### STRONG PARTNERSHIP WITH AVNET ABACUS

TDK's partnership with Avnet Abacus creates a win-win situation for Avnet Abacus, its customers and TDK.

Avnet Abacus can offer a broad selection of cutting edge TDK, EPCOS, and InvenSense products that are attractive for their customers. With speed to the market a crucial factor, Avnet Abacus's extensive sales and technical teams across Europe support customers who can also benefit from next day delivery of the latest technology.

For more information visit  
[avnet-abacus.eu/tdk](http://avnet-abacus.eu/tdk)

**TDK**



## Avnet Abacus honoured with Senten Manten Gold Award by TDK

Outstanding sales performance, strong leadership and technical excellence are highlighted in annual distribution awards.

This recognition comes as a result of the consistently strong operational and sales performance achieved by Avnet Abacus, with 17.6% sales growth year on year gained across the TDK product range.



Left to right: Marc Reiterer, Dietmar Jaeger, Rudy Van Parijs, Adam Chidley, Peter Miller, Peter Arch, Martin Keenan

The annual awards are based on TDK's annual Senten Manten distributor performance evaluation programme. The Japanese term, Senten Manten, stands for the perfect result, with a maximum of 1000 points available. Distributors are assessed on performance and collaboration with TDK in four categories: business performance, inventory management, contractual terms, and operational excellence. Avnet Abacus was awarded the top score of 830 points across the categories. Rudy Van Parijs, president of Avnet Abacus, commented:

**"This is a great accolade that exemplifies the strength of our long-term engagement with TDK. TDK continues to be a key technology partner working in collaboration with our technical teams to deliver the very best product solutions to customers across Europe."**

Dietmar Jaeger, head of the TDK's distribution business in Europe and Vice President of the Global Sales Distribution, added:

**"We have an excellent relationship with Avnet Abacus on all management levels. This award fully endorses the successful efforts of their teams, which have resulted in high class technical support to customers across our product range."**

# Avnet Abacus receives Sales Achievement Award from Harwin

In recognition of the strong commercial performance that has been attained and the proactivity shown by its staff at all times, Harwin has presented valued distribution partner Avnet Abacus with its annual Sales Excellence Award.

There were numerous factors that influenced Harwin's decision. The primary one was the continued sales growth that Avnet Abacus has brought about in all key European markets, across a broad array of products – covering high reliability connectivity solutions, EMI shielding and PCB hardware. The distributor has managed to realise a 70% year-on-year increase in sales revenue for its Harwin offering, and generated a large number of new design registrations in the last 12 months.

As Gavin Darling, Head of Sales at Harwin, explains:

**“The Avnet Abacus team has exhibited an exemplary understanding of customers’ application challenges and important market trends. Working in tandem with our own field application engineers, they have made a huge positive impact on our sales figures. We greatly appreciate the high quality support that they are able to provide the customer base, and the pivotal role they continue to play in demand planning and fulfilment.”**

**“This is greatly encouraging for us,”** adds Alan Jermyn, VP European Marketing at Avnet Abacus.

**“It is certain to galvanise our sales team and give them the motivation to push even harder to make further inroads into the target markets that have been defined, both geographically and in terms of applications.”**

Members of a collaborative team at Avnet Abacus and Harwin Europe



# Engineers' Insight: the Avnet Abacus blog

## Solving design challenges

Avnet Abacus' technical blog, Engineers' Insight, is designed to help you solve key challenges across the breadth of markets and technologies we serve.

From electronics phenomena such as equivalent series resistance in electrolytic capacitors, to discussions on the best approaches to new wireless technologies, to in-depth design guides for power solutions, this is a blog written for engineers, by engineers.

### Where to read?

[avnet-abacus.eu/engineers-insight](https://avnet-abacus.eu/engineers-insight)