Choosing the Right Connector for Harsh Environments in Industrial, Transport and Mining Applications
Coaxial Connectors
The SMA connector is designed for a frequency range of DC to 18 GHz at 50 Ω impedance. With its threaded-type coupling mechanism, it is perfect for securing your connection in intensive vibration environments.

For further information, please visit: www.we-online.com/coax
Connectors are an essential part of any design, whether that is handling analog signals, digital data or power. In his article on page 20, Mouser’s technical marketing manager, Mark Patrick, examines the environmental factors that can cause connector failure, the different kinds of connector that can survive tough conditions (including the relevant IP ratings), and how you can choose the right connectors for your application – without wasting space and cost by over-specifying.

For more information contact TRX Electronics, authorised Mouser independent representative in South Africa, +27 12 997 0509, info@trxe.com.

Interconnection, switches, relays, cables & keypads ......................................................... 20

Mouser Electronics offers advice on choosing connectors for applications in harsh environments, and TE Connectivity puts the spotlight on lighting designs.
The unseen role of component distributors

Things are tough out there. That’s the general consensus when I speak to people in the electronics industry (usually off the record). There is no getting away from the fact that there are worrying signs for the industry, and the engineering/manufacturing sector in general, from top to bottom. By the bottom (no pun intended) I mean the foundational level, where the country’s educational and social policies are letting down our youth, our economy and our future egrogeniously. At the top of the pile (again, no pun intended) we have the policy-makers: I have to hope that for the most part they have the best intentions, but with our news headlines increasingly dominated by revelations of corruption and state capture, it’s hard to summon any faith that they do.

Before I continue, I want to thank the people who volunteered their frank insights for the article in this issue about the local electronics manufacturing supply chain. I must also state categorically that none of the comments or opinions expressed in this column are attributable to, or necessarily shared by, any of those individuals – they are mine alone, but were inspired and informed by those discussions.

South African electronics manufacturers often butt heads with the distributors who supply them with components, mostly when those components are not delivered on time and in full. In our previous issue, we explored that, and some of the other issues faced by said manufacturers, including how they had been affected by load shedding this year. There are two sides (at least) to every story, so for this issue we gave the distributors a chance to have their say, and I hope readers on all sides of the debate will find the article on page 4 informative as part of a broader, constructive discussion.

In my experience, engineers – whether by nature or by training – are a versatile bunch. You can find rehabilitated engineers in jobs spanning the technical and managerial hierarchy and in sectors from entertainment to banking, and everywhere in between – even, occasionally, in publishing.

And then there are the FAEs (field application engineers). Often disparaged by those in the business of actually manufacturing electronic products as nothing more than glorified salespeople or order-takers, their work mostly happens behind the scenes. But let us not forget that these are people with very valuable and rare skill sets, and they play an essential role in bridging the engineering world where things are designed and made, and the business world where big decisions are taken and money changes hands. Yes, their involvement is self-serving in the sense that they are incentivised to get their suppliers’ products designed into their customers’ products, but name one person who doesn’t work to make money.

As we head into winter and dig our long-sleeve clothes out from the back of the cupboard, at least I have one less worry on my mind: public enterprises minister Pravin Gordhan has assured the nation that Eskom has no intentions of implementing load shedding this winter. . . or it will only be a maximum of 26 days of Stage 1. . . or maybe something else entirely. He can’t quite be sure because generating power for more than 50 million people is, like, really hard and stuff, and is not widely believed to be achievable through well wishes or magic tricks. But he is “hopeful that there will be no load-shedding going forward. That’s if our plans are successful.” Mmmm, we’ll see.

It’s not clear why Gordhan and Eskom have waited until now to snap their fingers and make all that load shedding silliness go away, but hey, let’s not look a gift horse in the mouth. Abracadabra! Our government has pulled off a pre-election miracle!

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South Africa

- The CSIR (Council for Scientific and Industrial Research) – which will turn 75 in 2020 – has plotted a new strategic direction built around the vision of accelerating socioeconomic prosperity in South Africa by building on industrial development opportunities, to ultimately create a more balanced focus on scientific and industrial development. The strategy focuses on nine synergistic clusters and enabling initiatives which span several industries and rely on collaboration with a host of public and private sector stakeholders, funding partners, industry associations, higher education institutions and innovation partners.

- The minister of science and technology, Mmamoloko Kubayi-Ngubane, has welcomed the approval by Cabinet of the new white paper on science, technology and innovation (STI), which identifies the Fourth Industrial Revolution as a key focus and purports to place STI at the centre of South Africa’s development agenda. Reviews of the national system of innovation by the department of science and technology have revealed that the system is not inclusive – for example, the number of women (particularly black women) in research, science, technology and innovation is very low – so government’s agenda will also place a strong emphasis on social concerns.

- ExecuKit has relocated to new business premises at Unit 804, Micro Industrial Park, Strijdompark. The company’s landline number is set to change, but managing director Renita Fleischer can still be reached on her mobile number of +27 82 744 9660.

- Otto Marketing has relocated from its long-time home in Strijdompark to Unit 6, Anglo Industrial Park, 319 Waltloo Road, Waltloo, Pretoria. Its landline number has changed to +27 12 803 7373.

Overseas

Business

- Analog Devices announced financial results for its first quarter of fiscal 2019, which ended 2 February. Compared to the same quarter last year, revenue decreased by 2% to reach $1,54 billion, while diluted earnings per share (EPS) were 22% higher at $0,95. For the second quarter of this year, the company is forecasting revenue of about $1,50 billion and EPS in the region of $0,94.

Companies

- Qorvo has entered into a definitive agreement to acquire Active-Semi International, a private fabless supplier of programmable analog power solutions. Active-Semi will become part of Qorvo’s Infrastructure and Defence Products (IDP) group. Active-Semi’s technologies are positioned to intersect multiple long-term secular trends in 5G, industrial, data centre, automotive and smart home by addressing the increased demand for efficient power solutions.

- ON Semiconductor has agreed to acquire Quantenna Communications, a Wi-Fi chip and software vendor, for approximately $1,07 billion. The acquisition is another step towards strengthening ON’s presence in low-power connectivity for the industrial and automotive markets.

Industry

- The Semiconductor Industry Association (SIA) announced worldwide sales of semiconductors reached $32,9 billion for the month of February 2019, a decrease of 7,3% from the January 2019 total of $35,5 billion and 10,6% less than the February 2018 total of $36,8 billion. Regionally, sales decreased both month-to-month and year-to-year across all regional markets: Europe (-2,3% total of $35,5 billion and 10,6% less than the February 2018 total of $36,8 billion. Regionally, sales decreased both month-to-month and year-to-year across all regional markets: Europe (-2,3% month-to-month/ -3,0% year-to-year), Asia Pacific/All Other (-5,1%/-7,2%), Japan (-5,3% / -5,9%), China (-7,8%/-8,5%), and the Americas (-12,9%/-22,9%).

EVENTS

Local Southern African Manufacturing Expo
21 – 23 May 2019
Expo Centre, NASREC, Johannesburg
The Local Manufacturing Expo will showcase South Africa’s manufacturing capabilities across a wide variety of industry sectors, positioning leading local industries to thousands of potential national and international investors.
Register at www.localmanufacturingexpo.co.za

Design Automation Conference (DAC) 2019
2 – 6 June 2019
Las Vegas, USA
Devoted to the design and automation of electronic systems (EDA), embedded systems and software (ESS), and intellectual property (IP).
Register at www.dac.com

International Microwave Symposium
2 – 7 June 2019
Massachusetts, USA
Annual gathering of RF, microwave and millimetre-wave researchers, technologists, and practitioners from academia and industry.
Register at www.ims-ieee.org

SEMICON West
9 – 11 July 2019
California, USA
Connects the entire extended supply chain, from materials, equipment, design, manufacturing, system integration and demand channels, to new verticals and adjacencies such as flexible hybrid electronics, MEMS and sensors, and more.
Register at www.semiconwest.org

PCB West
9 – 12 September 2019
California, USA
For 28 years PCB West has trained designers, engineers, fabricators and, lately, assemblers on making printed circuit boards for every product or use imaginable – from high-reliability military/aerospace to cutting-edge IoT and wearables.
Register at www.pcbwest.com

SMTA International
22 – 26 September 2019
Illinois, USA
Conference and exhibition covering SMT manufacturing equipment and technologies, featuring high-quality technical information and networking opportunities.
Register at www.smta.org/smtai/

European Microwave Week
29 September – 4 October 2019
Paris, France
Bringing industry and academia together and covering microwave ICs and technology, wireless technology and radar, this event includes three conferences and a trade and technology exhibition featuring leading players from across the globe.
Register at www.eumweek.com
Is the supply chain broken?

The world’s insatiable demand for electronic goods has created a monster: a supply chain that spans the globe and relies on the entirety of our collective knowledge and experience in the pursuit of industry.

From the mining of base resources to the almost inconceivable precision required to make cutting-edge semiconductors, the Fourth Industrial Revolution requires that we hone every tool in the electronics manufacturing process to perfection.

Given all the stages and complexities of keeping that supply chain going, it is a minor miracle that the whole machine keeps turning at all. The demands of this process do mean, however, that it’s not always smooth sailing, and the production and supply of components can be impacted by many factors, and has a range of knock-on effects.

One of the worst offenders in recent years has been MLCCs (multi-layer chip capacitors), predominantly due to their ubiquitous and rapidly growing use in the design of smartphones and automotive electronics.

According to Diel Met Systems’ production manager, Brandon Weavind, there has been an improvement in MLCC lead times of late, although some common capacitance values still remain problematic.

“It must be noted that, although the lead times have improved, the cost associated is still relatively high,” he explains. “The supply/cost of MLCCs and similar components has forced us to move to smaller footprints – affecting both our old and new products.”

This issue is exacerbated by the fact that South African manufacturers get the short end of the stick when it comes to component allocations, in Weavind’s view. “With all my MLCC orders being ‘on allocation’ from local distributors, we were forced to look globally for stock to keep our production running. I noted that while EMEA and American regions also had limited supply, the Asia-Pacific regions seemed largely unaffected,” he elaborates.

Planning and forecasting would seem to be the most obvious solutions to these problems, but how easy is it to do so accurately and reliably? “It’s not difficult doing accurate forecasting for production assemblies, but it is very expensive,” answers Weavind. “Due to the high variability in supply of all electronic components, we are forced to maintain high levels of ‘buffer’ stock. We have experienced some unexpected delays in starting new designs/assemblies due to component supply, which forced us to source from outside South Africa.

“Some component distributors are better than others, but I generally receive regular feedback regarding delays and changes in pricing. I feel that a lot of distributors’ primary focus is on active components as this is where their bigger margins are, and hence they are always willing to push component manufacturers on pricing and availability. However, the supply of passive components has been ‘you get it when you get it’ – it would be nice to see the same drive from distributors when it comes to passive components.”

Forecast, forecast, and forecast again

According to Gary de Klerk, director at local component distributor NuVision Electronics, lead times on most components, MLCCs included, are now coming back to a situation of normality. He says that while there are still some particular components that are in high demand, the situation is now vastly better than it was in 2018, and the general allocation experienced in the market last year has recovered a lot quicker than most experts were forecasting.

Speaking to the perception among local electronics manufacturers that South Africa gets the short end of the stick when it comes to allocations, he asserts that this is not the case. “What has to be remembered is that most large OEMs and distributors have an active forecast system in place with their key suppliers;” he elaborates. “This allows the suppliers to have inventory available within a reasonable lead time, or a manufacturing plan for sourcing the necessary raw materials, etc.

“The problem for local customers is that they end up in the back of the queue as they have had no forecast in place, and thus the supplier has no choice but to offer the full lead time to build from scratch. We actively encourage our customers to provide us with some form of forecast, so that we can get this into the manufacturing plans of our suppliers. Without a forecast, any new orders will suffer the full component lead time.”

Delving deeper into the real-world realities behind component lead times, de Klerk advises that customers need to place orders within the stated lead times of the product, as given by the suppliers. “If a product has a 12 week lead time, you cannot expect to place an order today, for delivery in two weeks’ time. Working on a just-in-time basis plays straight into the hands of the larger global catalogue distributors like Digi-Key, Mouser, RS Components and the likes.

“These global distributors thrive on customers that cannot work on a long-visibility forecast and need components on a very short lead time. They rightfully charge a premium for having the product available from stock, as they carry the risk of having the stock available on the shelf. This generally drives up the BOM (bill of materials) cost of the customer but does help for the just-in-time build.”

As is the case with all business endeavours, money talks, and electronics manufacturers don’t want to have to pay more than they have to for their components. “Typically, we as distributors are beholden to the contracts we have with our suppliers,” says de Klerk. “Many of these contracts will have a clause in them, allowing for the supplier to increase prices for a given reason (such as raw material price increases) at short notice.

“As a distributor, we are generally price takers and not price makers. Sadly, when things happen outside of our control, we have very little choice but to pass these cost increases onto our end customer. If there had been a firm forecast in place, these are generally not affected by a change in pricing as the raw material had already been procured.”

De Klerk says NuVision handles such instances on a case-by-case basis and immediately alerts the customer when its supplier plans a price increase. Sometimes NuVision has the opportunity to buy stock at the old price, before the pending increase, while at other times it is simply advised the price has been increased and there is no negotiation.

His advice to customers to mitigate component supply issues is to “forecast, forecast and forecast again. Nothing beats lead times and pricing better than having an accurate forecast and manufacturing plan in place, that we can share with our suppliers. We also offer the option for a customer to request us to...
hold buffer stock, by mutual agreement, with a condition that the customer will utilise this buffer stock within a six month period:"

**Clear communication forges strong relationships**

Product development manager at Electrocomp, Andrew Dixon, says there has been some improvement in MLCC supply, but expects they will continue to cause issues for some years to come: "From reliable sources, on our last trip in Europe, we saw that the manufacturers making MLCCs cannot keep up with the current demand from the global market. A major cause is the automotive and mobile markets – it is not so much that more cars are sold but the fact that cars and phones now have about 10 times the number of MLCCs than before."

He acknowledges that component allocations are a sticking point for local manufacturers, and says there is little that distributors can do to mitigate this. "You must remember that the SA market is a very small portion of the global market and we would most likely be in the back of the row in most cases. We have good relationships with our suppliers and in all cases we go the extra mile to make sure to keep the supply chain going to our customers," he assures.

"All components have real lead times attached to them, and planning from a lot of customers is not good," Dixon continues. "We decided years ago to counter this by putting stock on the shelf; but this is the real world and if forecasting and planning were better from customers' side it would assist in solving big delays.

"Currency rate of exchange (ROE) is a big issue and this too is not something in the hands of distributors. We would on all our quotes to customers on non-stock items quote subject to ROE variation. We can work with our customers on a few principles, like buying forward cover, and we would give our customers the option that they prefer to work with."

Dixon's best advice to local manufacturers is to have healthy relationships with their suppliers and keep the communication channels clear: "If the communication is open and clear about lead times, handling of parts through the shipping and clearing process, the rates at time of quote and the time of costing, duties and most other issues will be eliminated. The reality is that lead times are currently much longer and planning from all should be better. Getting stock on very short lead times will certainly get more difficult going forward."

**A butterfly flaps its wings**

Specialist RF supplier, RF Design, is not affected by the MLCC shortage to as great an extent since it applies more to commercial parts, and sales director Andrew Hutton says none of its customers are on component allocations. On the bigger issue of how distributors and their customers can work together to streamline component supply, he points out that there are many facets but believes strongly that it should start with better planning.

"The way we operate is we supply a quote upfront, which specifies delivery times so that our customers can plan accordingly. Unfortunately some companies don't plan adequately, so it ends up in a situation where, for example, they plan on a 16 week lead time when in fact we indicated at the outset that the part was much longer" he clarifies.

Cost adds another complication into the mix, and the temptation for companies to gamble on exchange rates can be a double-edged sword. "We quote on the basis that we can fix prices for up to a period of one year, as this is what the banks will provide in forward cover on foreign currency. On the other hand we can say that we won't fix it, but then the customer is making their own risk versus reward gamble – if the exchange rate improves by the time the parts are delivered it's a bonus, but if it goes down they lose. Companies that export are somewhat protected from these fluctuations since what they lose on the swings they generally gain on the roundabouts," explains Hutton.

The ability to shop and buy components online has been disruptive in the electronics industry, and not necessarily in a good way. Hutton says that buyers will often see a price from an online distributor and take issue with the fact that the local distributor is quoting more, without realising that there is a cost associated with guaranteeing the actual landed cost of the part. The alternative is to order everything immediately, put it on the shelf when it arrives and use when needed, but nobody wants money sitting on the shelf rather than in their bank account.

Echoing what many in the industry see as being the real crux of the tug-of-war between component distributors and electronics manufacturers, Hutton broaches the fact that the hard work done by FAEs (field applications engineers) in assisting with the design of products is undervalued.

"Component distributors are much more than just delivery guys. In some cases we might spend many hours, over a period of years, working with a company on a product's design, and there is obviously a business cost associated with that. When contract manufacturers source components, they can sometimes ignore the effort it costs the entire supply chain in the long run," says Hutton.

He further points out that the complex global nature of the electronics supply chain can result in the 'Butterfly Effect' – the well-known idea that if a butterfly flaps its wings in one part of the world, a hurricane is caused in another. By way of illustrating this, a component manufacturer might oftentimes notify a distributor that delivery of a part is being delayed right at the last moment, and that in turn might have been caused by a shortage of materials at their own supplier, or a monsoon knocking out a production facility on the other side of the world.

**Bridging the buyer's knowledge gap**

In the experience of Renita Fleischer, a 30-year veteran of the South African electronics industry and managing director of component procurement and kitting provider ExecuKit, the industry is not exactly flush with highly experienced and knowledgeable internal salespeople and buyers. She therefore sees it as imperative that staff who are put into these roles are proactively trained and empowered.

"I've been in their shoes so I know what it takes to achieve a sufficient level of knowledge, and just as importantly confidence. When I started in this industry at Omnigo on 16 April 1984, I was just out of school and knew nothing. Whatever I know today I was trained to do, primarily by my boss at the time – Rieël Schönfeld – who took me under his wing and mentored me. But that process takes time, and you also need to be interested rather than just in it for earning a salary."

It might seem obvious to an electronic engineer that a 0,25 W resistor cannot handle the load that a 0,5 W resistor can, but to a layperson those are just numbers and letters. Fleischer therefore focuses on training ExecuKit's buyers by starting with the difference between a resistor and a capacitor, or between a transistor and a diode, using a sample board that shows the different packages and so on.

"Training a buyer can take a few months, but it is worth it to see how they get better and better, gaining the confidence to make the right decisions and giving me the confidence that I can trust them to do a good job. I have known some of these buyers for 10 or 15 years, and I'm glad I put in the work to train them in return for the reward of seeing how they've grown," Fleischer concludes.

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- Andrew Hutton, RF Design, +27 21 555 8400, andrew@rfdesign.co.za, www.rfdesign.co.za.
**Win an AVR-IoT WG development board**

Dataweek readers are being offered the opportunity to win a Microchip Technology AVR-IoT WG development board (AC164160) to make it easy to deploy IoT devices to Google Cloud IoT Core’s artificial intelligence and machine learning infrastructure.

The board combines a powerful 8-bit ATmega4808 MCU, an ATECC608A CryptoAuthentication secure element IC and the fully certified ATWINC1510 Wi-Fi network controller to provide a simple and effective way to connect embedded applications.

The AVR-IoT WG development board gives developers the ability to add Google Cloud connectivity to new and existing projects with a single click, using a free online portal at www.AVR-IoT.com. Once connected, developers can use Microchip’s rapid development tools, MPLAB Code Configurator (MCC) and Atmel START, to develop and debug in the cloud.

The board combines smart, connected and secure devices to enable designers to quickly connect IoT designs to the cloud. It is compatible with more than 450 MikroElektronika Click boards that expand sensors and actuator options.

**4IRSA launches digital economy summit**

The launch of South Africa’s first ‘digital economy’ summit, endorsed by Cabinet, was announced at the Wits Tshimologong Digital Innovation Hub by the minister of telecommunications, Stella Ndabeni-Abrahams, who delivered the keynote address.

The summit is due to take place at the end of June 2019.

“As we unpack the critical components of 4IR (the Fourth Industrial Revolution), it is important that people are placed at the centre of the conversation. As government, this is woven into all our 4IR interventions, and as such, we have been deliberate in seeking collaborative efforts that build a capable 4IR army. In the same breath, we must ensure that we create and own solutions that respond to our unique requirements as a country. Lastly, it is imperative that all sectors find expression in the 4IR conversation,” said Ndabeni-Abrahams.

Wits University is a founding partner of 4IRSA, a partnership that aims to stimulate and facilitate an inclusive national dialogue to shape as well as in responding to the 4IR conversation, “said Ndabeni-Abrahams.

Wits University is a founding partner of 4IRSA, a partnership that aims to stimulate and facilitate an inclusive national dialogue to shape as well as in responding to the 4IR conversation, “said Ndabeni-Abrahams.

The 4IRSA partnership was founded by the Universities of the Witwatersrand, Johannesburg, and Fort Hare, with Deloitte Africa joining as a facilitation and knowledge partner and the Department of Telecommunications and Postal Services as the public sector partner. As the initiative grows, it will include more participation from government, labour, business, civil society and researchers.

“The 4IRSA partnership is really important because it is a spontaneous and growing alliance between enthusiastic and concerned partners in industry, academia and government, together with social actors and citizens, who are committed to working together to develop a coherent, inclusive national response to the Fourth Industrial Revolution in South Africa,” said Professor Brian Armstrong, who is the secretary to 4IRSA and professor of digital business at the Wits Business School.

On show at the launch were some of the technologies associated with 4IR, such as a 3D printer printing the 4IRSA logo, a robot crane made from drone recycled material, and a hydroponic garden. The launch took place at Johannesburg’s Tshimologong Precinct. Run by Wits University, Tshimologong, which means ‘new beginnings’ in Setswana, is an incubation hub for digital entrepreneurs, the commercialisation of research, and the development of high-level digital skills for students, working professionals and unemployed youth.

The universities of Johannesburg and Fort Hare are also focusing research attention on 4IR, with a number of different projects and courses. Professor Tshilidzi Marwala, vice-chancellor and principal of the University of Johannesburg, said: “Industry 4.0, as the 4IR is also known, is changing the world of work, because artificially intelligent machines now perform tasks that were traditionally performed by human beings.

“The consequence of this change is that the world of work is shrinking. Economic inequality will also increase, which will result in social instability. This will in turn undermine democracy. Our staff and our students have a critical role to play in shaping as well as in responding to the significant and sweeping changes to the current order and the way we work.”

For more information visit www.4irsa.org
Local manufacturing key to economic growth

The manufacturing sector in southern Africa is primed to take a more active role in supplying goods to the continent and internationally.

Characterised by a pioneering, diehard attitude, this sector has a solid reputation of developing products that can readily compete with the best the international market has to offer.

Eric Bruggeman, CEO at the South African Capital Equipment Export Council (SACEEC), says that in the majority of cases there is simply no reason for the African market to source products outside the continent. “The innovation and quality of locally produced goods is exemplary and we believe that this message needs to be conveyed to those people responsible for the procurement of goods within organisations. By partnering with Specialised Exhibitions Montgomery, we are providing a showcase for local manufacturers at an inaugural event."

The Local Southern African Manufacturing Expo (LME), which is endorsed by the Premier of Gauteng, David Makhura, will be held at the Expo Centre, Nasrec from 21 to 23 May 2019. The event, which will also include free-to-attend seminars hosted by SAIMechE, has attracted a wealth of local manufacturing intellectual property and expertise.

The expo will also play host to an AREI (Association of Representatives for the Electronics Industry) pavilion and the Skills Development Zone hosted by the Artisan Training Institute (ATI). AREI represents the interests of the electronics industry in South Africa and aims to contribute to the creation of an environment which encourages a dynamic growth of the electronics manufacturing industry, at both component and system level, in South Africa.

The Artisan Training Institute (ATI) will use the Skills Development Zone to display its technical skills in an interactive workshop setting. ATI is making a substantial difference in the technical training environment as it drives quality training throughout its operations.

The organisers have signed an agreement with the Mandela Mining Precinct wherein the Southern African Institute of Mining and Metallurgy (SAIMM) will host the SA Mining Supply Chain Conference and Workshop alongside the Local Southern African Manufacturing Expo on 22 and 23 May.

“We are very excited about the potential of the Expo to ignite business ties between our local manufacturing sector and industry captains from Africa and abroad. It’s time for local manufacturers to share their offerings with the market. This event will present the exhibitors with a captive target audience and allow industry procurement specialists to source high-quality locally-manufactured products,” says Charlene Hefer, portfolio director for Specialised Exhibitions Montgomery.

Some of the electronics-specific products taking centre stage will be Würth Elektronik’s new quartz items and oscillators, and Battery Experts’ variety of lithium ion batteries;

To visit the Local Southern African Manufacturing Expo 2019 or to find out more information about the exhibition visit the website at www.localmanufacturingexpo.co.za.

Social media platforms on Facebook, Twitter #LME2019, Instagram and LinkedIn can also be used.

For more information contact Natasha Heiberg, Specialised Exhibitions, info@localmanufacturingexpo.co.za

Local Southern African Manufacturing Expo

21 - 23 MAY 2019
EXPO CENTRE, NASREC,
JOHANNESBURG, SOUTH AFRICA
9am - 5pm Daily

A Showcase of Southern Africa’s Manufacturing Capabilities

Reasons to visit

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Network
Thousands of your industry peers will be there

Experience
Live demos of global standard products

Visit our Skills Development Zone

Register online for FREE ENTRY!
www.localmanufacturingexpo.co.za

Contact us 076 135 6549
info@localmanufacturingexpo.co.za

#LME2019
Driven from its office in Cape Town, the TIH is not a physical space but rather a think tank of young intellectuals, mentored by senior professional engineers, and embracing the possibilities that exist when technology is harnessed to improve lives and promote progressive development in transport.

Smart technology and the road user can no longer be separate concepts, according to a statement from SANRAL. “The road user harnesses smart technology on their devices, in their vehicles, in their offices and homes. It therefore stands to reason that this technology should be integrated into the travel experience during our everyday commutes. This is ultimately where the world is headed and South Africa should be no different.”

The new innovation hub is a platform for graduate engineers to showcase some of the pilot projects that are in development, including the use of a robotic flagger at road construction sites, intelligent road studs to provide additional guidance to the road user, and the planned use of 3D road markings. Other projects include video analytics for vehicle inspection and pedestrian detection, drones for engineering applications, floating car data, road sensors, electric and automated vehicles, alternative materials (nanotechnologies) and augmented/virtual reality.

“I cannot overstate the importance and relevance of credible research in the work we do,” stated Kobus van der Walt, who heads up the TIH. “A clear and direct strategy is needed to ensure economic growth in our industry and our research can be used to inform this strategy.

“We furthermore want to create solutions that directly speak to the needs of the road user. For too long engineers have created transport solutions which they think will serve the needs of the public at large. Our approach is to stay engaged with road users at all levels, and through research and partnerships, we aim to create an engaging environment where the road user has a vested interest in getting the best use out of our national road network.”

While advancement in road user technology seems predominantly geared at motorists, it is important to note that in South Africa, pedestrians make up a massive proportion of road users. Therein lies a major driver of road safety through the use of technology.

Engineers with post-graduate studies in research topics relevant to transportation technology advancements, such as automated pedestrian detection and drone applications, play a major role in how technology can be applied in saving lives.

For more information visit www.nra.co.za

Appointments

Farnell element14 has appointed Theresia Hartslief, who has extensive industry experience, to be its sales representative in South Africa. Theresa can be contacted at +27 83 412 5918 or thartslief@farnell.com
Hisense grows SA plant investment

Chinese electronics manufacturer Hisense has injected a further R72 million into its refrigeration and television production lines at its Atlantis factory in the Western Cape, in a move that signals the company’s intent to gear up for the growth of the fast moving consumer goods sector on the African continent.

Referring to the investment as an ‘important achievement,’ Trade and Industry minister Rob Davies said the investment is proof that South Africa remains an attractive investment destination across all sectors, including advanced manufacturing.

“Everyone who is involved with this kind of a project needs to be extremely proud of what has been achieved here because this is an important investment, which has injected R72 million into the economy and created 150 quality manufacturing job opportunities. Moreover, this investment brings Hisense’s total investment in this Atlantis plant to R440 million, which is a significant investment,” said Davies.

Davies was informed that the plant has been rated as the best performing Hisense plant in the world outside China. “This means that the plant is performing better than others based in North America and the European Union member countries. This is something we need to be proud of as a country and I congratulate Hisense South Africa for that accolade. This is part of our pitch as a country for manufacturing investment that if you come and invest in South Africa, you will have a good experience.”

President of Hisense Middle East-Africa Holdings, Jerry Liu, said the new manufacturing lines would not only create 150 new job opportunities but high-level skills development will be at the forefront of the company’s skills development programme.

“As we expand our presence in southern Africa, Hisense remains committed to providing solutions that will enable growth and sustain economic development. Hisense is keen to support government localisation programmes by partnering with South African manufacturers and logistics networks to consolidate an integrated domestic supply chain,” said Liu.

Clearing the Static
with Greg Barron,
Actum Group
director

Topic 2:
Combat ESD by staying grounded

In our previous column we discussed how an electrostatic discharge (ESD) can cause irreparable damage to sensitive electronic components and devices. One of the primary causes of static charge generation is people: we are constantly moving around and interacting with objects around us, building up static.

Grounding systems are used to ensure that components, personnel and any other conductors are kept at the same relative electrical potential to prevent ESD events. Here are the key elements that form part of an effective grounding system:

Workstation grounding
• ESD common grounding point: an electrical junction where all ESD grounds are connected to via grounding cords.
• Work surface bench mats: dissipative bench mats with a resistivity of 1 x 10⁹ Ω or less. The mat must be grounded.
• Static dissipative floor or floor mat: to avoid static build-up when walking, consider ESD floor mats, vinyl, epoxy or paint in the ESD protected area.
• Grounding testers: ensure to test your workstation before, during and consistently after the installation of your ESD grounding system.

Personnel grounding
• Wrist straps: a conductive elastic band or metallic, expendable strap comprised of a conductive inner surface.
• Heel/foot grounders or ESD shoes: frequently used where the technician needs more freedom of movement. Conductive shoes or foot grounders should be worn on both feet.
• Clothing and gloves: static dissipative clothing and gloves prevent dangerous static fields from interacting with components and causing damage.
• Chairs: when personnel sit or stand up, static generates. To prevent this, ESD chairs with a resistance to ground of less than 1 x 10¹⁰ Ω is recommended.

For more information contact Altico Static Control Solutions on +27 11 608 3001 or email sales@actum.co.za to discuss your static control requirements.

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Continued success for Zetech’s stencils division

Best known for supplying SMT (surface mount technology) equipment and consumables for printed circuit board assembly for 33 years, Zetech is enjoying success with its more recently established stencils division.

This is based primarily on the strength of its acquisition, in 2017, of the exclusive DEK/ASM franchise for laser-cut manufacturing stencils and frames for southern Africa.

“Zetech took it upon itself to actively promote DEK’s VectorGuard stencil system as it is the most advanced stencil foil technology available today globally,” says Zetech’s managing director, Inna Orlianski. “The best educated guess on the size of the stencil market in EMEA is 400 000 units per year. All ASM franchises and VectorGuard licencees (38 companies in EMEA) manufacture 42 000 VectorGuard stencils per year, representing 11% of the market which comprises around 100 stencil manufacturers in EMEA.”

Zetech’s laser-cut stencils facility is located at its premises in Edenvale, Gauteng, and includes the T8 laser system, stencil CAD computers and inspection facilities. It can manufacture stencils in a variety of thicknesses, cut on the following frame sizes: 23” x 23”, 23” x 29” and 29” x 29”. Quality verification is identical to that of DEK stencils worldwide, and the company boasts a fast turnaround time.

Zetech is able to produce various DEK stencil types, including: stainless steel; fine-grain (ideal for fine-pitch applications and a cost-effective alternative to nickel stencils); laser-cut nickel whose surface qualities deliver especially even and detailed paste deposits; multilevel, ideal for ensuring the right area ratio for each component; electroformed, which are built layer-by-layer for outstanding printing properties; and 3D electroformed stencils for very special cases – with cavities or for chip-on-board applications. For applications and processes that pose special requirements, Zetech specialists are available to provide further assistance.

The company also offers standard as well as high-tension VectorGuard frames. The frame system allows assembly specialists to use a single frame to accommodate multiple stencil foils for different products. Foils are loaded into the frame using air pressure, then VectorGuard’s unique tensioning system engages to hold the foil securely in place.

“Customers that use our stencils and have changed from mesh and other stencil types to VectorGuard are happy with the Zetech/DEK stencils with regards to price and superior quality,” says Orlianski. By way of demonstrating this, she offers the following customer recommendations received by Zetech:

<table>
<thead>
<tr>
<th>Customer Description</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronics manufacturer in Johannesburg</td>
<td>Just thought we can give some feedback on the quality of the stencils we get from you, we are so happy that we can get quality stencils locally done at a reasonable price. So far we ran over 20 000 boards with your stencils and all our technicians are very happy with the quality. As a company a good stencil plays a big role in the manufacturing process, therefore we put much emphasis on the quality of the stencil. Please keep up the good work!!</td>
</tr>
<tr>
<td>Consumer electronics manufacturer in the Western Cape</td>
<td>We ordered unframed foil stencils for low-volume development work that required Nano Coating. Very good, uniform release on the solder paste and no detectable residue left on stencil.</td>
</tr>
<tr>
<td>Manufacturer in Midrand</td>
<td>100% happy with the performance of the VectorGuard stencils received so far. Appreciate the liaising.</td>
</tr>
<tr>
<td>Manufacturer in Sandton</td>
<td>Very happy with the result. No problem with the service, and good communication.</td>
</tr>
</tbody>
</table>

For more information contact Zetech’s stencils division, +27 11 609 1244, stencils@zetech.co.za, www.zetech.co.za

ASM DEK VectorGuard Stencils are the most advanced Stencil Foil technology available today globally

Zetech provides customers inside South Africa with the following manufacturing capabilities:

- Local manufacture of stencils in a variety of thicknesses.
- We supply VG stencils cut on the following frame sizes: 23” x 23”, 23” x 29”, 29” x 29”
- Access to standardised DEK CAD design rules if required. Other reduction options are available as per your manufacturing requirements.
- VectorGuard product portfolio.
- Stencils available in other formats (including foils).
- Quality verification identical to that of DEK stencils worldwide.
- Fast turnaround.
- Backup via worldwide DEK Stencil Network.
- Supply chain of Multilevel and Nano Ultra stencils from DEK Europe.

Speak to us and make the change today
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DesignSpark surpasses 750 000 members

RS Components’ DesignSpark online engineering community has grown to more than 750 000 members.

Launched in 2010, DesignSpark provides design engineers and students around the globe with free tools, resources and content to help them to remove barriers, save time and turn their ideas into reality.

“We would like to say a huge thank you to every single member of the DesignSpark community,” said Mike Bray, vice president of DesignSpark. “There is a great feeling of togetherness within the community and it is great to see how engineers are able to support each other to achieve amazing things with the help of our tools and resources.

“Since day one, the aim of RS has been to give something back to the electronics industry through DesignSpark by providing free professional tools and resources for engineers around the world. We are proud to see the sustained rapid growth of DesignSpark and are committed to further enhancing our platform for the growing user base.”

During the nine years since it launched, RS has continued to improve the functionality and range of resources available through the DesignSpark ecosystem. This has resulted in a large increase in new members, with more than 35% of DesignSpark’s current membership having joined over the past two years.

Registering on DesignSpark is completely free of charge, with all members gaining instant access to the following tools:
- DesignSpark PCB, a professional-grade schematic capture and PCB design software package;
- DesignSpark Mechanical, an advanced 3D CAD tool based on direct modelling techniques;
- DesignSpark Electrical, a fully specified electrical CAD package for the design of control panel, machinery and electrical systems;
- PCB Part Library, a huge library of schematic symbols and PCB footprints, which are compatible for all leading PCB software packages, including Altium, Zuken, Mentor Graphics, Cadence, Target, Pulsonix, Eagle and DesignSpark PCB;
- 3D Model Library, containing thousands of 3D models available to use in CAD designs;
- DesignSpark Toolbox App, an Android and iOS app for engineers, including 27 calculations tools, comparison tables, news, projects and more;
- Zerynth Studio middleware for IoT, which enables the most popular 32-bit microcontrollers to be programmed in Python or C/Python and connect to the top cloud platforms;
- Obsolescence Manager, a tool enabling engineers and purchasing professionals to monitor and review the lifecycle status of products within a bill of materials and select alternatives.

In addition to free tools and resources, DesignSpark provides a platform for members to share their projects and opinions, and connect with other engineers and students.

To find out more, or to join DesignSpark, visit www.designspark.com.

For more information contact RS Components, +27 11 691 9300, sales.za@rs-components.com.

Python programming comes to Nordic’s multiprotocol SoCs

Nordic Semiconductor announced that Zerynth, a New York-based Internet of Things (IoT) software developer, has extended the availability of its ‘Zerynth IoT middleware’ to Nordic’s nRF52840 Bluetooth 5/Bluetooth Low Energy (Bluetooth LE) system-on-chip (SoC). The middleware was previously available for the nRF52832 SoC.

Zerynth comprises a set of software development tools that accelerate IoT product design by simplifying firmware programming of 32-bit microprocessors – such as the nRF52840 SoC’s 64 MHz Arm Cortex device – using Python, or ‘hybrid’ C/Python, which is useful for low-level coding for time-critical tasks while retaining Python’s flexibility and readability for non time-critical tasks.

The product also supports secure connection to leading cloud services and eases hardware integration with sensors, actuators and industrial protocols. Design and development are further simplified by the availability of a growing list of open-source libraries available on GitHub.

The software tools comprise ‘Zerynth Virtual Machine’ and ‘Zerynth Studio’. Zerynth Virtual Machine is a multithreaded, stack-based virtual machine built on top of a real-time operating system (RTOS). The virtual machine is independent of the hardware, allowing code reuse on a wide range of 32-bit microcontrollers. When running on the Nordic nRF52840 SoC, the virtual machine uses just 60 to 80 KB of the chip’s 1 MB Flash allocation and 3 to 5 KB of its 256 KB RAM allocation.

Zerynth Studio is a free-to-download integrated development environment (IDE) and toolchain for developing Python or hybrid C/Python applications. The IDE includes a compiler, debugger and an advanced code editor, alongside tutorials and example projects for rapid learning.

Zerynth Virtual Machine has been developed with the aim of bringing the high-level programming language, Python, to the embedded world with support for multithread and cross-board compatibility. The virtual machine supports most high-level features of Python including modules, classes, multithreading, callback, timers and exceptions. In addition, the virtual machine enables the use of custom hardware-related features like interrupts, pulse width modulation (PWM) and digital I/O.

A free licence to access the Zerynth Virtual Machine is granted once the developer creates a Zerynth account. The virtual machine is then installed on the nRF52840 SoC, enabling the developer to start programming using Zerynth Studio. The Nordic SoC’s over-the-air device firmware update (OTA-DFU) feature ensures the embedded virtual machine can be regularly updated. The supported cloud services – for example, Amazon Web Services, Google Cloud Platform and IBM Cloud – enable the developer to view their data using either the Zerynth app or a third-party IoT dashboard.

For more information contact Andrew Hutton, RF Design, +27 21 555 8400, andrew@rfdesign.co.za.
Defend Your IP, Brand and Revenue Stream

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Secure your design at www.microchip.com/Secure
Würth extends design tool’s functionality

Würth Elektronik eiSos has extended its free online design tool, REDEXPERT. The simulation software is a highly precise option for AC loss calculation in switch mode power supplies, and now supports calculations for a whole range of other components.

LEDs for horticultural applications, wireless modules, photodiodes and foil capacitors are among the product groups now included in the simulation tool. The properties of the components can be predicted under different operating conditions using stored data. A special feature of REDEXPERT is that the calculations are made on the basis of real, measured laboratory data.

The software relieves developers from having to do much of the mathematical calculating and simulating work involved with qualifying components. Taking DC foil capacitors as an example, all the graphs required for a powerful design analysis are available – based on measured data of the change in capacitance, impedance and ESR versus frequency.

The newly integrated ‘Horticulator’ enables the design of individual lighting recipes for the use of horticulture LEDs. Starting with information on the number of LEDs used, the input current and the input connection temperature, the full spectra, photosynthetic photon flux (PPF) and wavelength colour ratios can be calculated, among others.

The photodiodes and phototransistors from Würth Elektronik eiSos are now covered in REDEXPERT and are represented by curves of the viewing angle, spectral sensitivity, irradiance and emitter-collector. A useful tool for the development of wireless solutions – the ‘Range Estimator’ – allows distance ranges to be calculated as a function of a given data rate and link budget.

For more information contact
Jason Page, Würth Elektronik eiSos, +27 71 259 9381, jason.page@we-online.com.

Espressif jumpstarts ESP32 development

Espressif Systems has introduced two tools to assist developers using its ESP32 microcontroller platform in simplifying and speeding up their designs.

As developers know, building production-ready firmware is not an easy task. Along with the basic functionality of the product, one also needs to consider building smartphone applications and integrating cloud platforms. ESP-Jumpstart is a new reference guide which aims to help developers convert their ideas into actual products in the least possible amount of time. It provides users with a complete guide for product development.

ESP-Jumpstart is based on Espressif’s IoT development framework, ESP-IDF, and discusses all the necessary steps and best practices for product development in a simple, well-structured way. The development framework includes the following chapters:

- Driver APIs for ESP32
- Wi-Fi connection
- Network configuration
- Remote control (cloud)
- Over-the-air (OTA) firmware updates
- Manufacturing
- Security considerations
- ESP-Jumpstart allows users to easily modify the code in the application layer and adjust it to their own product and the peripheral drivers they want to use. This can significantly reduce the time usually required to convert a simple idea into an actual product that is ready for mass production.

ESP32 now also supports Dialogflow, a conversational interface from Google which enables IoT developers to embed natural-language processing in their devices. This Google service runs on the Google Cloud Platform, allowing users to build engaging voice- and text-based conversational interfaces for their products, powered by artificial intelligence (AI).

Dialogflow offers a user-friendly and intuitive natural-language processing (NLP) method that incorporates Google’s machine-learning expertise and products such as Google Cloud Speech-to-Text. Dialogflow is the most widely-used tool for building Actions, Skills, bots and apps, featuring reduced complexity, pay-as-you-go pricing and customised wake words. There are no certification hassles since users are not integrating their products with Alexa or Google Assistant, but rather using Dialogflow to build their own conversational platforms for their own products.

Unlike voice assistants, Dialogflow lets users configure every step of the conversation in any given project. For example, a Dialogflow agent for a laundry project will provide information only about the configurable parameters of the laundry (e.g. status, temperature, wash cycle etc.).

Espressif’s Voice-Assistant SDK (ESP-VA-SDK) provides an implementation of Google’s Dialogflow for the ESP32 microcontroller. Additionally, the same SDK works with Google’s Voice Assistant (GVA) and Amazon’s Alexa Voice Service.

Espressif’s SDK contains prebuilt libraries for Alexa, GVA and Dialogflow along with resources for such utility components as the audio pipeline and connection manager.

For more information contact iCorp Technologies, +27 11 781 2029, enquiries@icorptechonologies.co.za
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Taking control the easy way

As a wireless supplier, Otto Wireless Solutions is very often drawn into assisting clients when it comes to integrating our routers into final products.

There are a few common questions we get asked, which has prompted us to include some non-wireless products in our portfolio, specifically for those occasions when customers are looking for a one-stop shop.

A common question we get asked is: “How do I use a router to switch 220 V devices on and off?”

The answer to this is surprisingly simple. Firstly, most routers on their own would not be able to deliver this sort of solution. There are a few products which incorporate a router as well as analog switching capabilities in the way of relays, but those products tend to be rather niche, and generally carry a heavy price-tag.

There is a simpler, less expensive way to accomplish this with a generic approach. When you combine any one of our industrial Wlink routers with a relay controller, it’s a whole new ball game, and one which everyone can play.

Let’s begin by giving you the basic specifications of the relay controller we selected, so you can get an idea of the sort of end-devices it can switch.

The relay controller module has an RS-232 interface and includes eight relays, each designed to function independently, packaged in a plastic enclosure, with a total weight of approximately 250 g. The relay module is powered at 12 V d.c./1.5 A. This relay module is used to switch any connected devices on and off. When used in conjunction with a Wlink router, this relay can be used to switch devices remotely.

This is achieved by simply enabling the TCP/IP protocol on the router and downloading a TCP/IP application on your mobile device. Alternatively, a virtual interface, for example Putty, can be used on a computer connected to the router if remote operation is not desired.

Each relay switch has a power capacity of 250 V a.c./10 A or 30 V d.c./10 A. The relay module can be mounted on a wall using DIN-rail clips if desired, or one can simply use the wall-mount screw sockets and mount the router to a wall or a sidewall of an enclosure. Each relay is represented by 1 bit, and the 8 bits are then converted to a hexadecimal value. A relay would then be assigned two unique hex commands – one would be used to open the relay and the other would close it.

There are two ways of connecting the relay to the router accomplishing the switching on and off functionality. The first method, as shown in Figure 1, will require the user to download a TCP/IP application on their smartphone and set up a TCP/IP tunnel on the router. This method is reliant on the stability of the network provider in use. The advantage of this method is that you can operate the relays remotely.

An alternative way of connecting the relay module to the router would be as in Figure 2. This is a more localised connection. This connection will require the user to install a virtual terminal (e.g. Putty) on the computer. It is recommended that the user creates hexadecimal scripts as in Figure 3, to aid in recording and documenting the commands for ease of reference.

Taking control is a lot simpler than one would have imagined. This solution could be your answer to a useful application such as switching lights, generators, pumps, gates and more on and off, or it can even be scaled up to a bigger application like control of motors and other industrial machines. If you would like to know more about these products, or require further details about the configuration and setup, contact Otto Wireless Solutions as per below.

For more information contact Siphiwe Mashinini, Otto Wireless Solutions, +27 11 791 1033, siphiwe@otto.co.za
Tips for resolving common battery faults

Forbatt SA not only provides high-quality batteries but advises on maintaining batteries and prolonging their lifespan. The following is a quick guide for how to spot and resolve common battery faults that one might encounter while using batteries in UPS and/or telecommunications applications.

Reduced run time or backup time
When one or more batteries are below capacity it will result in reduced run time or backup time, which is a sign that maintenance is required. The best way to resolve this will be to discharge all the batteries to 10.5 V, then fully charge and discharge again, and then repeat these steps two more times. A battery that cannot recover to its full capacity needs to be replaced.

Zero voltage or no current
Incorrect usage of the battery is most likely to cause short circuits. The good news is that short circuits can be detected and resolved by cutting open the battery to check if there are any cells that may have short-circuited. If there are two or more cells that have short-circuited, then this may have been caused through human error (incorrect usage). If there is only one cell that has short-circuited, and the cell cross-bridge is melted, this may also have been caused by human error. If the cast-on strap or cross-bridge has any irregular cracks, it is defective.

Very low voltage or zero voltage
Very low to zero voltage may be a sign that the battery might contain foreign material. To verify this, the battery needs to be cut open to see if there is any foreign material inside it that may have caused damage to the cells. Take note of the following points when inspecting the cells:
1. Is the top cover of the battery cracked?
2. Are there any traces of holes and repairs on the battery container?
3. Has the top cover been re-sealed?

Knowledge is power – make the right choices to prolong your batteries.

For more information contact Forbatt SA,
+27 11 469 3598, sales@forbatt.co

Altium Designer 19, the latest version of the company’s flagship PCB design software, introduces new features aimed at making the design of complex, high-quality projects easier, faster and more accurate, from concept to production.

Altium Designer 18 introduced a modern graphical user interface, multi-board functionality and a redesigned bill of materials (BOM) management system, all built on 64-bit architecture. Altium Designer 19 expands on these features with technologies that simplify the design process and further unify the schematic, layout, and post-design processes.

New capabilities that accurately model high-density interconnect structures, give designers confidence when manufacturing cutting-edge high-density boards. An enhanced PCB materials library allows designers to create accurate impedance profiles for routing and manufacturing. The optimised component panel and part search allow parts to be found and placed in the design even if they are not already in the library, with the automated acquisition of supply chain as well as CAD data.

For more information contact EDA Technologies,
+27 12 665 0375, sales@edatech.co.za.
**BLE module gets major speed boost**

The Wireless Connectivity and Sensors division at Würth Elektronik eiSos has rolled out firmware version 3.4.0 of its Proteus I Bluetooth module. The most important improvement is the more than twofold increase in UART (universal asynchronous receiver transmitter) baud rate, with the maximum data throughput going from 36 Kbps to 80 Kbps.

The newly introduced UART flow control guarantees that no data packets get lost on the UART. This, and extensive possibilities for firmware individualisation, are further improvements on the product. With firmware version 3.4.0, the data throughput of 80 Kbps can be achieved with a single BLE (Bluetooth Low Energy) packet per connection interval, and is therefore compatible with all BLE 4.2 devices on the market.

Manufacturers that make their products Bluetooth-enabled using the Proteus I module can now also completely determine how it appears to the communication partner. This starts with its appearance, i.e. the device name and icon displayed to the user in the list of possible Bluetooth connections. A profile can also be added with the Device Information Service (DIS) to make more of the device's information available with wireless technology, for example the name of the device manufacturer or the serial number.

The Proteus II 2.4 GHz BLE wireless module, with dimensions of 11 x 8 x 1.8 mm, has a feature that is actually no longer intended in the Bluetooth Low Energy standard (Bluetooth Smart): the serial port profile (SPP) for emulating a serial cable connection. Data transmission is enabled with the AMBER SPP-like profile, which is based on the optional Bluetooth 4.2 data length extension feature and increases the data throughput.

Firms can make this BLE profile their own by assigning their own UUID, for example to register the profile with the Bluetooth Special Interest Group (SIG). Würth Elektronik eiSos also offers customers individualisation of the firmware, while guaranteeing adherence with the relevant guidelines in the wireless domain.

For more information contact Jason Page, Würth Elektronik eiSos, +27 71 259 9381, jason.page@we-online.com.

**RF mixers with high linearity and isolation**

Marki Microwave has added new models to its range of high-linearity, high-isolation mixers, optimised for a variety of applications.

For S-, C- and X-band applications, the MT3L-0113H is a lower-IF variant of the MT3H-0113H triple-balanced MMIC mixer. Greater than +30 dBm IIP3 can be achieved when paired with the ADM series of square-wave generating LO driver amplifiers. RF and LO cover 1.5 to 13 GHz, and the IF is 0.25 to 5 GHz.

With port isolations greater than 40 dB and spur suppression over 60 dBc, this latest entry to the T3 product family is ideal for high-performance radar, radio and test applications. The MT3L-0113H is available as a bare die or connectorised module, and the company can also be contacted for surface-mount QFN availability.

The MM1-0832LSM/HSM double-balanced GaAs MMIC mixers are best suited for X- through Ka-bands, with full coverage for satcom and 28 GHz 5G applications. RF is a wide 8 to 32 GHz, LO is 8 to 30 GHz, and IF spans DC to 12 GHz.

The high-linearity MM1-0832HSM provides +22 dBm IIP3 with an LO of +18 dBm, while the MM1-0832LSM offers a low drive option requiring just +8 dBm LO. Both versions feature enhanced spurious suppression and port-to-port isolations to support demanding frequency plans. They are available in surface-mount QFN and connectorised evaluation modules.

For more information contact Andrew Hutton, RF Design, +27 21 555 8400, andrew@rfdesign.co.za.

**SSDs for industrial computing**

Innodisk has packaged Toshiba’s next-generation 3D NAND Flash technology into an industrial-grade solid state drive (SSD) designed to tackle the tough conditions seen in many embedded environments and to handle the challenges of edge computing.

The devices use industrial-grade 3D TLC NAND Flash with a rated program/erase cycle number of 3000, to ensure lasting endurance as required by many embedded applications. The firmware is also optimised for industrial use and the SSDs strictly avoid SLC caching to avoid performance drops and increased write amplification, which lower program/erase cycle numbers through excessive data transfers within the SSD.

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The series includes two models – 3TE7 and 3TG6-P – with the former being DRAM-less and the latter using an external DRAM chip and a Marvell controller. The modules can incorporate AES encryption for data security and end-to-end data path protection to ensure error correction at every point of data transfer.

The modules can also be fitted with Innodisk’s trio of power stabilising technologies – iCell, iPower Guard and iData Guard – to further strengthen data integrity in areas susceptible to power fluctuations.

For more information contact Vepac Electronics, +27 11 454 8053, sales@vepac.co.za.
Secure NB-IoT platform

Gemalto is offering highly efficient IoT connectivity with the launch of its Cinterion Narrowband IoT (NB-IoT) wireless module platform. The new solution builds on the success of Gemalto’s NB-IoT product in China, delivering power efficient future 5G connectivity to APAC and Europe.

A combination of several optional security features ensures trust in the comprehensive IoT ecosystem. The solution is ideal for the growing mass of industrial solutions that require extreme efficiency, expanded coverage and long life such as utility meters and smart city solutions.

The IoT is accelerating at dizzying speed, with China leading the way and the European market following with more than 415 million connections expected in the next five years. The majority of these connections are emerging in the industrial IoT (IIoT) sector where highly efficient, Low Power Wide Area Network (LPWAN) technologies such as NB-IoT are driving massive expansion. A recent report by Custom Market Insights predicts the NB-IoT market will grow at a compound annual growth rate of 90% between now and 2025. As the number of connections continues to rise, so do cyberattacks, making digital security an urgent concern.

Leveraging Gemalto’s strong capability in securely managing billions of digital credentials, the Cinterion NB-IoT platform will offer an integrated eSIM in selected platform products. Gemalto eSIMs authenticate IoT devices, encrypt data and securely manage connections to cellular networks. Soldered to the IoT module, eSIMs reduce the size and cost of solutions while strengthening security and reliability. Pre-installed certificates simplify secure on-boarding to cloud services by authenticating leading cloud platform providers.

The new Gemalto Cinterion ENS22 NB-IoT wireless module gives developers a single mode NB-IoT connectivity solution designed to meet the highest standards and requirements of the European and APAC regions. Its power management system boosts energy performance to extend battery life for up to 10 years.

The module is ideal for stationary IoT applications that send data only at intermittent intervals. Gemalto’s evolution strategy enables forward migration within Cinterion product families while allowing a single device design for any technology standard or geographical area where it is used.

To better manage devices in the field over long life cycles, the module enables incremental firmware updates over-the-air (FOTA), a mandatory feature for cost savings and device lifecycle management. These updates allow revision of only the portion of code that needs updating. This significantly reduces transmission time, power draw and throughput, which are all essential in preserving the investment in NB-IoT technology.

For more information contact Renaldo Fibiger, Altron Arrow, +27 11 923 9600, rfbibiger@arrow.altech.co.za

Passive intermodulation analyser

Passive intermodulation (PIM) is one of the main causes of faults in modern networks. PIM can significantly reduce the network quality with regard to range and data transmission. PIM is caused by a number of factors, some of which include inadequate installation, poor component quality, or site-specific elements.

The Rosenberger portable and multifunctional, broadband PIM Site Analyzer is an alternative way to perform accurate, stressed PIM tests on site. By detecting and eliminating interferences, higher data rates, shorter response times and increased network quality can be realised.

The instrument consists of a single master unit with band-specific and interchangeable filter units. No calibration is required when interchanging filters on site. It offers easy plug-and-play setup and covers a frequency range of 700 to 2700 MHz. Its continuous wave (CW) signal simulates real operating conditions of the base station (in conformity with IEC 62037-1). The analyser upholds accuracy of down to 0,3 m for PIM Distance to Fault (DTF) measurement.

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Choosing the right connector for harsh environments

By Mark Patrick, technical marketing manager, Mouser Electronics.

In any system, what is the weakest link? If you're designing for any kind of harsh environment, it may well be the humble connector. That holds true for any application that needs rugged components, whether it's industrial, mining, transportation, or anything else. In safety-critical systems, any failure can be serious – and potentially fatal.

Connectors are an essential part of any design, whether that is handling analog signals, digital data or power. In many systems, there will be multiple sensors and actuators that must be connected, as well as several sub-systems.

In this article, we'll look at the environmental factors that can cause connector failure, the different kinds of connector that can survive tough conditions (including the relevant IP ratings), and how you can choose the right connectors for your application – without wasting space and cost by over-specifying.

Protecting against dust and moisture

One of the most likely causes of connector failure is the ingress of moisture or contaminants, such as dust or dirt. Water can get into connectors from the weather, or from cleaning with a hosepipe or other source of flowing water. Cleaning can also introduce chemicals or surfactants, which can corrode electrical conductors, thus at the very least decreasing their ability to carry current, and possibly causing failures.

Moisture can also result from condensation in humid environments, particularly when a device is moved from a cold to a warm environment. Inevitably, water and electricity don't play nice together – and the result can be damaging short circuits.

Dirt or dust that finds its way into a connector can build up over time to form an insulating layer, which can mean there is a poor quality connection made by a connector. The dust or dirt can also cause overheating.

Ingress protection, or IP, is described by the IEC’s IP standard, IEC 60529, which has become widely used today. This standard uses a two-digit number to show a device’s protection against solid objects (first digit) and liquids (second digit), as shown in Table 1.

For example, IP67 means a device is fully dust-tight and protected against temporary immersion in water. Such protection is achieved with heavy-duty seals and grommets, as well as being flame- and chemical-resistant.

Metal construction can also ensure a mechanically robust connector. Thinner metallic optical connectors (Figure 1) use a metallic body that can handle high temperatures up to 150°C.

In addition to dust and moisture, extremes in temperature can be damaging to connectors – such as the high temperatures experienced in many industrial processes, or in mining, where high ambient temperatures underground contribute to extremes experienced by connectors. Frequent cycling of temperatures from low to high, which is likely to occur in many applications, also causes problems.

In sub-zero temperatures, there is also the issue of ice to deal with. As water freezes, it expands, which can result in large forces, possibly damaging connectors and cables. The extra weight of ice can also put strain on connectors. When specifying connectors, look for an extended temperature range. For example, for fibre-optic cables, Molex’s LC2 metallic optical connectors (Figure 1) use a metal body that can withstand high temperatures up to 150°C.

Connectors can also suffer physical damage, whether that is from an impact or from the effect of vibration – which can cause mechanical failure or damage to electrical connections. All-metal bodies can provide the strength to withstand impacts, while thermoplastic shells will resist corrosion, as well as being flame- and chemical-resistant.

Metal construction can also ensure a connector provides sufficient protection against electrostatic discharge (ESD) and electromagnetic interference (EMI). Another area of mechanical design to consider is strain relief, which ensures any forces applied to the

<table>
<thead>
<tr>
<th>1st digit</th>
<th>Protection against solid objects</th>
<th>2nd digit</th>
<th>Protection against solids</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Not protected</td>
<td>0</td>
<td>Not protected</td>
</tr>
<tr>
<td>1</td>
<td>Protected against objects &gt;50 mm</td>
<td>1</td>
<td>Protected against drips</td>
</tr>
<tr>
<td>2</td>
<td>Protected against objects &gt;12.5 mm</td>
<td>2</td>
<td>Protected against drips if the housing is bent at an angle of 15°</td>
</tr>
<tr>
<td>3</td>
<td>Protected against objects &gt;2.5 mm</td>
<td>3</td>
<td>Protected against spray water</td>
</tr>
<tr>
<td>4</td>
<td>Protected against objects &gt;1.0 mm</td>
<td>4</td>
<td>Protected against splash water</td>
</tr>
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<td>5</td>
<td>Dust protected</td>
<td>4 K</td>
<td>Protected against splash water at increased pressure</td>
</tr>
<tr>
<td>6</td>
<td>Dust-tight</td>
<td>5</td>
<td>Protected against jet water</td>
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<td></td>
<td></td>
<td>6</td>
<td>Protected against strong jet water</td>
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<tr>
<td></td>
<td></td>
<td>6 K</td>
<td>Protected against strong jet water at increased pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>Protected against the effects of temporary submersion in water</td>
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<tr>
<td></td>
<td></td>
<td>8</td>
<td>Protected against the effects of permanent submersion in water</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9 K</td>
<td>Protected against water during high pressure/steam cleaning</td>
</tr>
</tbody>
</table>
cable or exterior of the connector cannot be passed on to the electrical connection – many connectors provide strain relief as standard.

Suitably rugged connectors will provide the ability to handle vibration, which is defined by standards such as MIL-STD-202. For example, the CeeLok FAS-T Gigabit Ethernet connectors from TE Connectivity (Figure 2) can cope with high degrees of vibration, as well as being IP67-rated and having an operating temperature range of -65°C to +175°C.

**Picking the right connector**

When choosing a connector, it goes without saying that the first step is to understand the target application and the likely environmental conditions. Plan for the worst case, so you know your connector can withstand whatever is thrown at it.

Once you know what you're aiming for, any necessary approvals, such as IP67, should be checked on the connector's datasheet, which will also state the operational temperature range. Also consider any other standards that are required, for example in South Africa, the South African Bureau of Standards (SABS) has developed multiple standards that relate to connectors.

Look for connectors with a secure locking mechanism that can withstand vibration, and that provides confirmation that it is engaged, with an audible noise or tactile response. There are many types of locking method, so make sure you pick one that is appropriate – including planning for how often it will be disconnected and connected in its lifetime. Secondary locks, commonly referred to as wedgelocks, will ensure that contacts are held firmly together.

Picking components that have been tested following a relevant standard, such as MIL-STD-202, is important, to ensure they provide the required robustness over their full lifetime. The standards-based tests use techniques such as ‘highly accelerated life tests’ (HALT) to accurately simulate real-world conditions, and thus ensure product reliability.

On the other hand, do make sure you don't go too far. The temptation is to over-specify your connectors, but this can mean unneeded costs and space wasted by bulky parts. You may be tempted by the connector with the highest IP rating, when a lower rating is sufficient and cheaper. Similarly, a plastic connector may well be preferable to a more expensive metal connector.

**Conclusion**

While connectors are sometimes left to last in a system design, they are essential components, and you need to get their selection right. When all the possible permutations are considered, there is a huge range of options, and your best option may well be talking to a distributor who can provide expert technical advice.

For more information contact TRX Electronics, authorised Mouser independent representative in South Africa, +27 12 997 0509, info@txe.com

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Actum Electronics
A niche distributor of industrial & electronic products.
ERNI hands over D-Sub production

ERNI has discontinued its D-Sub connector portfolio and partnered with Provertha, which will now be manufacturing and selling the D-Sub product portfolio into key markets.

Rudolf Hausladen, group CEO of ERNI International AG, is optimistic about the new partnership. According to a recent article published on ERNI’s website he said: “We are very pleased to have gained Provertha as a professional partner with comprehensive expertise who will manufacture and supply ERNI D-Sub products in the usual high quality. This will allow customers to continue their projects and use ERNI resources that become available for other product lines.”

Provertha has been manufacturing D-Sub connectors for over 25 years, and will continue to develop and expand the D-Sub connector range.

Actum Electronics, a division of the Actum Group, is the exclusive distributor of ERNI products in South Africa. According to Greg Barron, Actum Group director, the Provertha ownership of D-Sub will not impact local customers: “We would like to assure our customers that Actum Electronics will continue to supply D-Sub connectors locally through our own partnership with Provertha. We will uphold the same level of quality and dedicated customer service when supplying this product as before,” says Barron.

About the D-Sub range

The D-Sub/TMC series consists of interface connectors suitable for almost any application. This series offers 9- to 50-pole connectors, five different pin counts and various termination types, which makes it highly flexible and economic. It is available in male and female genders with different termination types, both straight and right angled. This new generation is fully RoHS-compliant.

For more information contact TRX Electronics, +27 12 997 0509, info@trxe.com

Hirose Electric and the Harting Technology Group have entered into an agreement to jointly develop new standardised products and market a connection technology system for single-pair Ethernet (SPE).

The partnership was announced in 2016 when the companies jointly launched the ‘ix Industrial’ interface. This collaboration is now expanding to achieve an end-to-end infrastructure which consists of a component portfolio including connectors, sockets, cables and cable sets. Both companies are striving to successfully position the technology in standards committees.

Hirose and Harting are working closely with the standards committee for single-pair cabling and the components required on the device side, as well as the necessary transmission standards such as IEEE802.3 BASE-T1. It is expected that a complete infrastructure for the Industrial Internet of Things (IIoT) based on Ethernet can be founded on this base.

Hirose and Harting collaborate over single-pair Ethernet

Hirose president Kazunori Ishii (third from left) and Harting CEO Philip Harting (second from left) explained their cooperation at this year’s Hannover Fair.

For more information contact Nelina Brand, Otto Marketing, +27 12 803 7373, nelina@ottomarketing.co.za; Errol Mann, Harting SA, +27 11 575 0017, za@harting.com
Connectors for harsh vibrations and shocks

These compact cable-to-board connectors feature a robust construction for prolonged operational lifespan, thanks to their glass-reinforced polyphenylene sulfide (PPS) enclosures, with a 100 MΩ minimum insulation resistance ensuring continued signal integrity.

They have a double-row contact arrangement with a 2 mm pitch – enabling mating of their through-board PCB male connectors to the corresponding female crimp connectors – with an array of different wire sizes (from #22 AWG to #28 AWG) being accommodated.

Each tin-plated copper alloy male contact has a current rating of 3,3 A (3,0 A when all contacts are electrically loaded simultaneously) and a maximum contact resistance of 25 mΩ. When mated, the single-piece female contacts each have three surfaces touching the corresponding male pin. This means that reliable interconnection is maintained, even when placed in the most uncompromising of application settings and under extremely challenging working conditions.

A rapid mate-before-lock retention system has been developed to increase mated connector holding force and assist with vibration resilience. The female connector is fitted with rubber retainers, and locking pins are supplied loose. These pins are pushed into the rear of the mated female connector, and subsequently expand the rubber retainers to grip onto the male connector.

There are shrouded contacts on both the male and female connector elements to prevent damage, while polarised housings safeguard against the possibility of mismating. The female crimp contacts are available on reels (for high-volume automated production) or loose (for prototyping purposes), with a hand crimp tool offered for low-volume.

An operational temperature range of -55°C to +125°C is covered and a 50 mating cycle lifespan supported. These components are aimed at factory automation and processing machinery, industrial drives, robotics, test/monitoring instrumentation, handheld test equipment and industrial automation controls.

For more information contact Quatraine Domoney, Avnet South Africa, +27 11 319 8600, quatraine.domoney@avnet.eu

Floating board-to-board connectors

Molex launched the SlimStack 0,40 mm floating board-to-board connectors, designed to save space and allow for design flexibility. These new connectors are one of the smallest of their kind in the market, and are designed for automotive, industrial and consumer applications that require a large floating range and high-speed transmission.

The connectors feature a low-halogen housing material, a ±0,50 mm floating range that eases misalignment worries by facilitating automatic assembly, a soft floating force, temperature support up to 125°C, and a high-speed transmission rate of 6 Gbps.

For more information contact Trx Electronics, +27 12 997 0509, info@trx-e.com

www.dataweek.co.za
The making of low-PIM coaxial cable assemblies

With the growing number of distributed antenna systems (DAS) and small cell installations, low passive intermodulation distortion (PIM) interconnect and components have gained popularity.

Modern complex multi-carrier communication systems such as these are now incredibly wideband and support a plethora of wireless standards, such as Wi-Fi, cellular, military, government, public safety and emergency bands. And there is only an expanding number of sub-6 GHz wireless standards and technologies, including Internet-of-Things (IoT) devices, new 5G-NR sub-6 GHz services, TV white space (TVWS) devices, and more.

Many of these standards cover frequencies that, if mixed by passive means, would cause distortion in any of the other bands. The greater the bandwidth of a system, the more potential for PIM distortions to cause reduced throughput, loss of service, and even system failures.

Hence, low-PIM coaxial cable assemblies comprised of both low-PIM cable and low-PIM connectors are being employed more often as jumpers and interconnects between wireless system components. The value of low-PIM cable assemblies is that they are tested, and hopefully certified, for low-PIM operation. If installed correctly in a system that is also otherwise designed for low-PIM performance, these interconnects shouldn’t add any significant PIM and mitigate the distortion that would normally be contributed by cables with a higher PIM rating.

The construction of a low-PIM cable assembly typically involves three main parts: the two end connectors and the coaxial cable itself. Each of the end connectors – commonly DIN 7/16, 4.3-10, Type N and 4.1/9.5 for communication system applications – should be low-PIM rated and include hardware to attach to the coaxial cable that also facilitates a low-PIM installation.

As any additional connections could lead to an increased level in system PIM, connectors should be chosen that eliminate the need for adaptors at either end. This may require male-to-male or male-to-female connectors, or a different connector type and gender on each end. Cable assemblies with different connector types are commonly known as between-series, where cable assemblies with the same connector type are known as in-series. Moreover, right-angle adaptors are often used in confined and difficult installation situations. However, using low-PIM and right-angle connectors for the cable assembly could lead to better PIM performance than relying on additional right-angle adaptors.

The coaxial cable should also be low-PIM rated, and also satisfy building code requirements. For building codes, UL910 ratings for plenum coaxial cables meet most building code requirements. Often low-PIM coaxial cables are made of solid inner and outer conductors, as solid conductors tend to perform better in low-PIM applications than braided.

As solid conductors are less flexible, it is also common to have corrugated outer conductors to enable some flexibility and to ease installation. A solid outer conductor also provides better shielding than braided conductors, which could be useful in installations with a dense number of services and connections and nearby transmitters.

Lastly, the assembly of the complete cable needs to be done in a way that ensures low-PIM operation, and testing is also necessary to ensure that any manufacturing defects in any of the components or assembly process don’t produce a failing unit. Having the PIM performance listed on the cable can make installation much easier when evaluating the overall system’s PIM performance, especially during troubleshooting.

For more information contact Andrew Hutton, RF Design, +27 21 555 8400, andrew@rfdesign.co.za.

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Miniature RF coax connectors

Mobile communication networks today demand highly stable and fast network infrastructures. Passive intermodulation (PIM) in a network can cause serious interference and significantly degrade the network quality.

Rosenberger’s new NEX10 RF coax connector system has been designed to meet the existing and future demands of small cell and upcoming 5G networks. The connectors’ excellent RL performance (up to 20 GHz) and high screening efficiency guarantees their electrical performance.

The NEX10 interface offers very low PIM performance in a miniature and robust design, which makes it ideal for applications requiring PIM stability in a compact size. Target applications include small cells, low-power base stations, distributed antenna systems (DAS), in-building architecture and MIMO (multiple-in, multiple-out). The separation of the electrical contact from the mechanical reference yields a low PIM and high RL performance regardless of the coupling mechanism or applied torque.

The increasing number of jumper connections per site has also generated a high demand for a multi-coax connector that enables multiple connections across various applications. NEX10 provides 4 or 5 interfaces within one connector and on the same form factor as a 7-16 connector. For very narrow applications, a push-pull version is available.

For more information contact Actum Electronics, +27 11 608 3001, sales@actum.co.za.
Connectors 101 for lighting designers

While pronouncements of the death of incandescent lights are premature, their future is dimming as new technologies offer high efficiencies and lower energy consumption. Solid-state lighting technology, in particular, is quickly entering the lighting mainstream.

While pronouncements of the death of incandescent lights are premature, their future is dimming as new technologies offer high efficiencies and lower energy consumption. Solid-state lighting technology, in particular, is quickly entering the lighting mainstream.

Arguably the most prominent and nearest-term solid-state lighting source suitable for general lighting is the ubiquitous LED, albeit a high-power version. Already the favoured technology in such applications as signage, jumbo displays and emergency lighting, these high-intensity LEDs are also finding use in interior accent and architectural lighting. At some time not too far off, LEDs will replace household incandescent lighting as the technology matures, costs decline, and energy-efficiency mandates are implemented.

Making new lighting technologies more affordable and thereby enabling new applications falls into two main categories:

- *Semiconductor processing:* This category includes issues of both materials and fabrication. While outside the scope of this article, it must be mentioned as a key driver of commercial viability of solid-state lighting technology. As manufacturers solve fundamental materials problems, improve yields, and move to volume production, costs will decline.

- *Packaging:* Packaging the light source for its final application is the area that is directly affected by the lighting designer, and can significantly affect long-term reliability, cost and usability. Where an incandescent light and its fixture are relatively simple embodiments of the well-known Edison socket, LEDs present a whole set of different and more challenging issues.

Since these LEDs are essentially point sources of light, new thermal, optical and packaging/integration considerations come into play. High power densities make thermal management a critical part of the fixture design process. Some level of electronics drive circuitry is required to provide the required constant-current source. With few exceptions, LEDs cannot be plugged directly into a normal AC line voltage source.

**Connectors and solid-state lighting**

Our concern here is with connector technology and the ways it can help (or hinder) making lighting more affordable and easier to apply and use. Connectors remain a critical part, but have too often been left to the end of the development cycle. This lack of foresight can result in fewer choices and higher costs (including cost of materials, cost of assembly, and cost of upkeep).

Integrating connector selection into early design phases opens options, gives more choice, and often lowers costs.

Not only is it important to consider connectors early in the design to gain the widest array of options, it’s equally important to understand some of the basics of connector technology to allow informed decisions about various options and trade-offs.

For example, TE Connectivity offers low-profile, surface-mount, two-position connectors designed for use in PCB-based LED strings, lighting controls, and other applications that can benefit from an easy poke-in wire termination to the PCB. The connector speeds assembly and routine maintenance of lighting systems through an application-specific design.

**Connector basics**

For our purposes, the basic connector consists of a housing and contacts used to create a separable electromechanical interface. The interface can be used for wire-to-wire, board-to-board, and wire-to-device/board connections. From a practical perspective, a connector is a system in which all the elements combine to make the connector work in its intended application. As shown in Figure 1, these physical elements can be segregated into:

- Housing design and material.
- Contact design and material.
- Contact plating system.

A detailed discussion of these elements is beyond the scope of this article, but the following are the most important factors to consider in lighting designs.

**Environmental concerns**

The environmental protection provided by the housing can encompass preventing contaminants (both solid and liquid) from getting into the connector interface and also preventing inadvertent physical contact with the electrical contacts. To prevent interface contamination, various sealing techniques are used. In sealed connectors the housing, in conjunction with various sealing devices, serves to prevent contaminants from entering into the contact area.

Electrical connector housing sealing levels typically adhere to the well-recognised IP levels (Figure 2, page 26). EN 60529 outlines an international classification system for the sealing effectiveness against both objects (tools, dust, fingers) and moisture. This classification system uses the letters IP (for ingress protection) followed by two digits. The first digit refers to protection from physical objects; the second digit deals with moisture. Most unsealed connector systems, therefore, have an inherent IP20 rating.

Preventing physical contact with the electrical contacts is also a key function performed by the housing, and is particularly important in higher-voltage applications. At a minimum, having some housing protection prevents or at least minimises potential handling damage to the contacts themselves that may occur during assembly or installation of the end product.

When dealing with elevated voltages (usually above 48 V), most safety standards require design features to prevent accidental physical contact with the electrical contact. In this case, contacts...
are recessed to some extent and often shrouded as a mechanical barrier to contact. Most standards around the globe use a ‘standard’ probe to confirm the housing design is adequate to prevent access.

Lastly, the housing must be robust enough to handle the end application’s environmental conditions. It is important to understand and establish what these are early in the selection process. If outdoor use is anticipated, then it is natural to specify a housing with a UV exposure rating.

If a connector is expected to be used in an abusive environment where it is subject to mechanical shock and impacts (such as what would be used in a concert or stage setting), then perhaps a heavily impact-modified polymer housing would be used, or perhaps even a connector with a protective metal shell.

High- or low-temperature applications require particular housing materials and determine whether thermoset or thermoplastic materials need to be used. If active latching is required, the designer must specify a polymer material that allows latch flexibility while still meeting other mechanical and electrical requirements.

Even chemical exposure needs to be considered; for example, if the connector is to be used in gasoline pump applications, you need to make sure the housing material can withstand continued exposure to volatile hydrocarbons without becoming brittle or fracturing.

**Connector ratings**

In selecting the best connector for an application, basic electrical, mechanical and environmental performance requirements must be identified and considered to optimise the selection.

Electrically, the connector must be compatible with the current levels and voltages of the application. Certainly, the basic continuous voltage and current needs to be considered but, in addition, transient and surge conditions that may occur over the life of the product need to be identified.

Mechanical considerations can cover a broad range of features. As with all electronics, the trend is toward miniaturisation, so connectors require tighter contact pitches to pack more contacts in a smaller area. As a result, the physical size of the connector relative to the application needs to be considered in selecting the connector.

Mating direction and wire dress similarly need to be considered relative to their intended application in the system. How the connectors are held together after mating can also impact the selection process since some connectors rely on active mechanical latches, others utilise small detent bumps, and some have nothing other than friction to hold them together.

Beyond obvious form factor issues, the connector must also be evaluated for the degree to which it can withstand mechanical abuse, such as vibration, shock and the like.

Environmentally, the connector must withstand both application temperature ranges and processing temperatures (such as those experienced during reflow soldering of surface-mount connectors). The application environment will define additional needs, such as sealing, the ability to withstand solvents or salt spray, high altitudes, or other extremes. In outdoor applications, UV exposure capability is critical to reliable, long-term connector performance.

While typically not seen in lighting applications, shielding in a noisy electromagnetic environment may also be necessary. In some instances, both shielded and unshielded versions of the same connector are offered by connector suppliers.

The connector must be designed specifically to terminate the cable’s shield since it is practically impossible to convert a non-shielded connector design to a shielded one. The key to a reliable, effective shield is to provide a 360° termination that maintains a low-impedance path from the cable through the connector to ground.

**Thermal considerations**

Signal applications typically do not require thermal management. Power applications do.

Power contacts have a current rating that indicates the maximum current that the contact can carry continuously. This rating is usually based on a 30°C temperature rise on the contact and is based on measurements of a single contact. When multiple power contacts are used in a housing, the allowable current is derated to allow suitable heat dissipation. It is important therefore for the end user to consult the connector’s product specification to determine the suitable current derating factor when evaluating a connector system.

In high-intensity LED applications, the LEDs themselves generate enough heat to require careful consideration to thermal management – typically this is accomplished by a heatsink and sometimes forced air cooling. The challenge of integrating thermal management into a system is an excellent example of why it is important to consider interconnections early in the design process. This often poses unique system packaging challenges since most of the new high-intensity LEDs are small and are often packaged as surface-mount devices (SMD).

Integrating the connector system in amongst the LEDs, circuit boards, optics and thermal devices is often quite challenging if left to the end of the design process. Evaluation of the interconnect earlier on in the design process provides for a more tightly integrated, optimised solution that can make assembly and, if needed, repair much more efficient.

Beyond the normal electromechanical aspects, new interconnections must also address the special needs of solid-state lighting. These include higher operating temperatures and the ability to provide housings in specific colours so the connector blends into the visible parts of the lighting designer’s fixture.

Furthermore, for lighting applications it is often very desirable to use circuit board-mounted connectors with softened edges to minimise shadowing and the possibility of partially occluding the light output of the low-profile surface-mount LEDs.

**The next step in connectors**

So now that we’ve defined the key elements of a connector, let’s expand the definition a bit.

From an application standpoint, it is well known that LEDs perform better when operating at lower temperatures. As mentioned earlier, current LED lighting design methodology usually incorporates one or more LEDs
onto a circuit board, usually metal clad for thermal reasons.

This assembly is then integrated into the fixture by a lighting fixture designer. Throwing out conventional logic that mandates a circuit board in the system, one could combine a heatsink into the electromechanical design of the connector to create a thermoelectric connector that mates directly to the LED.

An example is the high-intensity LED holder (shown in Figure 3) that TE Connectivity designed for use with a high-intensity LED. The holder combines a small footprint and low profile with a snap-together contact system for both direct electrical and thermal connections directly to the LED. Without the need for solder, thermal adhesives, or metal-clad printed circuit boards, application is simple, cost-effective and expands mounting options beyond the planar constraints of circuit boards.

As an added benefit, replacement of a faulty LED or changing colours is equally straightforward since all it entails is removing the retention clip, removing the LED, and replacing it with a new one. The basic holder kit includes a contact carrier and an LED retention clip used to secure the LED to the carrier. The module-to-cable interface is a standard two-position TE Connectivity Mini CT post and receptacle connection that facilitates plug-and-play operation.

**A note on standards and approvals**

Naturally, any connector must meet agency requirements for any region of the world in which it is used. Regulatory agencies like UL and CSA in North America and IEC, TUV, and VDE in Europe have requirements to provide for safe application of a product.

Selecting components that have already gone through the approval process speeds design and simplifies approval of the final product. Given the global nature of the lighting market, the designer must confirm that components meet all regional or local requirements. Being cognizant of the connector agency requirements, as well as those needed by the end application, is critical to the successful selection and integration of the appropriate connector system.

**Conclusion**

Selecting the best connector for a lighting application is a matter of matching application requirements to available connectors, with proper consideration given to performance and costs. It can't be stressed enough the wisdom of giving connector selection the same thought and consideration as you give thermal, optical and electrical issues at the early design stage. Indeed, the right connector can address these issues.

We haven't mentioned cost. The acquisition cost of the connector is one thing; the applied cost is quite another. Newer generations of application-specific connectors for lighting can reduce engineering costs, manufacturing costs, warranty costs and maintenance costs. But one key to realising these savings is to understand connector basics and to integrate connector selection into the overall design process.

These new solid-state lighting systems with their inherent longevity demand equally robust connector systems while the LEDs, thermal solution, optics and packaging comprise a considerable part of the overall cost of the lighting system. The connector is usually a small part of the overall cost and is often specified without adequate consideration and balancing of cost versus performance.

It makes little sense to scrimp on the one component that your entire fixture relies on for power. Without a reliable and appropriate connector system, the lighting fixture, however well designed and aesthetically pleasing it is, becomes a dull, static (and unlit) non-functional objet d’art.

 Spend some time and consideration selecting the appropriate, proven connector system for the application, even if it costs a little more. It will pay dividends in the long run.

For more information contact Quatraine Domoney, Avnet South Africa, +27 11 319 8600, quatraine.domoney@avnet.eu.

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**Samtec débuts compact mPOWER connector series**

Samtec’s new mPOWER connectors offer enhanced space savings and design flexibility. This 2,00 mm pitch system (UMPT/UMPS) can pass 21 A per blade while freeing up the board for other components or minimising package size. mPOWER can be used as a standalone high-power solution, or alongside one of Samtec’s high-speed connector systems for a two-piece power and signal/ground solution. Compatible Samtec high-speed systems include: AcceleRate HD, Edge Rate, SEARAY, SEARAY 0,80 mm, LP Array, Q Strip, Q2, Tiger Eye and more.

With stack heights from 5 mm to 12 mm (up to 20 mm in development), mPOWER can be easily added to new or existing architectures. Further design flexibility is available with a choice of 2, 3, 4 and 5 power blades (up to 10 blades in development). Matte tin or 10 µ” gold plating are standard, with optional 30 µ” gold plating to meet specific regulations. Additionally, the power blades have two-stage mating and can be selectively loaded to achieve any specific creepage and clearance requirements. Optional weld tabs provide increased stability on the board.

A variety of other options are in development for mPOWER connectors, including a right-angle version with 2 to 10 position counts, and a socket cable assembly to mate with both the vertical and right-angle terminal. The cable assembly will include latching for more rugged applications. Also in development is a 30 A system for even greater power in a small footprint.

For more information contact Quatraine Domoney, Avnet South Africa, +27 11 319 8600, quatraine.domoney@avnet.eu

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**Plastic accessories for insulated assembly**

Würth Elektronik eiSos is supplementing its range of SMT spacers with plastic accessories for thermally and electrically insulative assembly, with the introduction of the new WA-SCAP spacer cap.

M3 Nylon 66 Phillips screws are also available, in lengths from 4 to 10 mm for insulated assembly. The operating temperature extends from -30 to +85°C. The WA-SCRW screw series is available in flammability classes UL94 V-2 and UL94 V-0.

The assembly hardware is available from stock in bulk packs of 1000 pieces.

For more information contact Jason Page, Würth Elektronik eiSos, +27 71 259 9381, jason.page@we-online.com.
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Open-frame power supplies

XP Power’s new EPL150 is a range of high-density, low-profile, open-frame AC-DC power supplies aimed at cost-sensitive industrial, ITE and healthcare applications.

The EPL150 series produces 100 W output with convection cooling and 150 W with as little as 10 cfm airflow. The product has a 101,6 x 50,8 mm footprint and its low profile of 25,1 mm makes it ideal for space-constrained applications. Its high power density is enabled by high efficiency – up to 95% typical at 150 W with better than 85% achieved down to 10% load. No-load losses are less than 0.5 W, giving reduced running costs and compliance with the latest environmental goals and legislation.

The parts are approved for use in Class I or Class II (earth free) applications for extended flexibility. They feature comprehensive safety agency approvals including IEC60950-1-1 for ITE, IEC62368-1 for ITE and IEC/ES60601-1 for medical. Medical approvals are for two means of patient protection (2 x MOPP) from input to output and one means of patient protection (1 x MOPP) from both input to earth and output to earth, suitable for BF applied-part applications. Patient leakage current is less than 50 µA and isolation test voltage is 4 kV a.c. input to output and 1.5 kV a.c. from input to earth and output to earth.

Low-noise outputs available are 12, 15, 18, 24, 28, 36 and 48 V, with a useful additional 12 V fan supply provided, rated at 0.5 A. Input range is 80 – 264 V a.c. and maximum operating altitude is 5000 m, making the parts suitable for worldwide use. Full power is available to +50°C with derating to +70°C ambient temperature, with comprehensive protection included for over-voltage, overload and short circuits.

The EPL150 series will find applications in many industries including automation and process control, broadcast, ITE, oil and gas, and medical.

For more information contact Vepac Electronics, +27 11 454 8053, sales@vepac.co.za

Hi-Rel DC-DC converters

Gaia Converter has extended its platform of DC-DC converters with ultra-wide input voltage, with the new Hi-Rel MGDD-80 series targeting military and airborne applications.

The devices 9-60 V input voltage range (80 V transient) is ideal to comply with Mil-Std-1275, 704 or DO-160 standards without an additional front-end protection device. This performance is achieved thanks to proprietary switching techniques while also keeping efficiency over 90%.

With two outputs (for parallel, serial or symmetrical operation) of 5 V, 12 V, 15 V and 24 V, they can cover a wide variety of needs, such as single 5 to 48 V output, ± 15 V or 2 x 24 V outputs, for example. Packaged in a 5.08 x 4.06 cm housing, they have a wide temperature range of -55°C to +105°C and are potted to suit rugged military and airborne environmental conditions.

The units are fully featured and protected, with zero to full-load regulation, trim, on/off capability, adjustable UVLO, soft start, embedded EMI filter, as well as over-current and over-temperature protection. They can also be synchronised, and do not use any optocoupler.

For more information contact Tobie Muller, Accutronics, +27 11 782 8728, tmuller@accutronics.co.za.

SiC is used in solar panel array boost converter to provide input voltage for battery charger and/or power grid inverter.

It minimises size and weight while increasing ruggedness for lower installation and maintenance.

The SiC advantage - it is 99.5% more efficient, enables up to 3 times smaller size and 10 times lighter.
5G beam steering antenna

The KSF410.A from Taoglas is a 28 GHz 5G millimetre-wave beam steering antenna with a sixteen-element linear phased array. It delivers a gain of up to 17 dBi and has a wide 3 dB beamwidth for wide angular coverage in azimuth, with most of the energy focused within 45° of the main beam.

The antenna employs beam steering/forming at the RF level using RF phase and amplitude shifters, or beam forming networks. Antennas in the array are grouped in groups of four, each group with an IC phase shifter, LNA and power amplifier (PA), allowing a field of view (FoV) of ±45°.

The KSF410.A uses a Ka-band 5G chipset that supports four Tx/Rx radiating elements, includes all requisite beam steering controls for 5-bit phase and gain control, and operates in half-duplex fashion to enable a single antenna to support both Tx and Rx operation. The provided SPI interface allows direct access to the chipset to control the device configuration.

The antenna has up to 2 GHz impedance bandwidth, which gives upwards of 2 Gbps data rates – well suited for fixed and mobile broadband capacity-hungry next-generation networks. It also features higher than 20 dB cross polarisation rejection, making it less susceptible to interference from undesired signals.

The antenna can be directly connected using standard 2.92 mm and SMPM connectors. It is ideal for use at user equipment for client-side integration or inside a Ka-band 5G access point. Their application can be for indoor and outdoor wireless coverage for mobile or fixed broadband access in 5G routers and/or access points. There is also an option to use a coaxial-to-waveguide adaptor in conjunction with ultra-low-loss, pre-connectorised cables.

For more information contact Andrew Hutton, RF Design, +27 21 555 8400, andrew@rfdesign.co.za.

Inductor learning kit

Co-developed by Würth Elektronik eiSos and Texas Instruments, the TI-PMLK Buck Würth Elektronik Edition is a learning kit to autonomously study the impact of magnetics in a power supply using a buck board with adjustable operating conditions and a free experiment book.

The learning kit can be used by engineering students and electrical engineers to study and understand the impact of magnetics on a buck power supply. “Most universities don’t have the resources to provide specific courses in the area of power management, especially those that address the challenges associated with design and optimisation of the magnetics in a power supply, which is a key component in any electronic system,” said Alexander Gerfer, CTO at Würth Elektronik eiSos.

“The TI-PMLK Würth Elektronik Edition has been developed in collaboration with Professor Nicola Femia, from the University of Salerno, Italy, who has been teaching power board design for the past 25 years. This learning kit is accessible for autonomous learning to most students and engineers, and includes a mix of theoretical learning and hands-on training using real-world application scenarios.”

The hardware has been designed to allow adjustable operating conditions such as switching frequency, EMI input filter, and ambient temperature control. Over-voltage, over-current and polarity reversal protection by eFuse protect the board from potential damage.

A free experiment book with structured labs completes the learning kit. This editable PDF experiments book allows for easy data entry and sharing of results. It can be downloaded at www.we-online.com/pmlk.

For more information contact Jason Page, Würth Elektronik eiSos, +27 71 259 9381, jason.page@we-online.com.
With its newly designed vacuum test fixtures, Ingun has simplified mass testing of a small number of PCB (printed circuit board) versions. The vacuum test fixture combines intuitive handling and a robust, easy-to-maintain design.

The innovative ADP slide enables quick, easy, tool-free access to the probe plate. The slide automatically locks into place upon the first contacting stroke. An updated housing slide enables quick, easy access to the inner housing assisted by gas pressure springs. The housing slide is locked into place quickly and easily using a tool (Torx screwdriver T20).

The modularly designed housing features a removable base plate and rear panel. With the help of an additional frame, the housing can be heightened. The grip handles ensure comfortable transportation. The 6 mm thick moving plate with ESD-conductive surface and a 10 mm thick probe plate made from deflection resistant FR4/6 mm offer customisation possibilities and a long lifespan.

For more information contact Electronic Industry Supplies, +27 11 726 6758, hreispty@iafrica.com

L3 Narda-MITEQ released a new cost-effective phase-locked oscillator with an extended frequency range. The 2LPL series comes in a 51 x 51 x 15 mm housing, has an operating temperature from -40°C to +80°C, and weighs less than 100 grams.

The device operates at a single frequency from 10 MHz to 15 GHz (and 19 GHz in extended bands), with the option of doubling frequency by using an external multiplier. It boasts low phase noise and enhanced spurious performance, and has a built-in reference cleanup as a standard feature.

The 2LPL operates from either an external reference or internal TCXO, with stability as tight as 500 ppb. Flexible internal DC regulators allow operation from +6.5 V to +28 V d.c. Its construction promotes excellent RF and reliability performance, and meets MIL-STD-202 requirements for shock, vibration, humidity and altitude.

For more information contact Tobie Muller, Accutronics, +27 11 782 8728, tmuller@accutronics.co.za

Infinion Technologies’ Power PROFET BTS50010-1TAE is a smart high-side switch designed to drive currents up to 40 A d.c. in 12 V systems. With an $\text{R}_{\text{DS(ON)}}$ down to 1.0 mΩ, the device is packaged in a D2PAK (PG-T0263-7).

The device's energy robustness and inrush current capability up to 250 A supports the requirements of motorcycle and scooter engine starters. It also addresses automotive, industrial and consumer applications such as lawnmowers or chainsaws, as well as any load with harsh switching demands.

The BTS50010-1TAE can be used to replace mechanical relays, and obviates the need for a suppressor diode, external short circuit protection or components for load current measurement such as shunt/PTC resistors.

For more information contact Dirk Venter, Altron Arrow, +27 11 923 9600, dventer@arrow.altech.co.za

For more information contact Electronic Industry Supplies, +27 11 726 6758, hreispty@iafrica.com
The CMD273P3 from Custom MMIC is a low-loss, broadband, positive control MMIC DPDT (double-pole double-throw) transfer switch that operates from DC to 12 GHz (covering the L, S, C and X bands). It has an insertion loss of 1.7 dB and an isolation of over 42 dB at 6 GHz, and a control voltage of 0/+5 V. The switch can handle a P1dB of up to 25 dBm and has a switching speed of 12 ns. It is available in a RoHS compliant, 3 x 3 mm surface mount package and can be certified for space applications.

**RF Design**, +27 21 555 8400.

Analog Devices’ ADMV1013 and ADMV1014 are a paired microwave up- and down-converter, respectively. They operate over a very wide frequency range with 50 Ω matching from 24 GHz up to 44 GHz, facilitating ease of design and reducing the costs of building a single platform that can cover all 5G mm-wave frequency bands. The chipset is capable of flat 1 GHz RF instantaneous bandwidth supporting all broadband services as well as other ultra-wideband transceiver applications. Each chip is highly integrated, comprising I (in-phase) and Q (quadrature-phase) mixers with on-chip programmable quadrature phase-shifter configurable for direct conversion to/from baseband (operable from DC to 6 GHz) or to an IF (operable from 800 MHz to 6 GHz).

**Altron Arrow**, +27 11 923 9600.

Texas Instruments introduced new isolated gate drivers that provide high levels of monitoring and protection for high-voltage systems. The UCC21710-Q1, UCC21732-Q1 and UCC21750 target designs in traction inverters, onboard chargers, solar inverters and motor drives. The devices offer integrated sensing features for IGBTs and SiC MOSFETs to simplify designs and enable greater system reliability in applications operating up to 1.5 kV_{	ext{RMS}}. With integrated components, the devices provide fast detection time to protect against over-current events while ensuring safe system shutdown. Utilising capacitive isolation technology, they maximise insulation barrier lifetimes while providing high reinforced isolation ratings, fast data speeds and high-density packaging.

**Avnet South Africa**, +27 11 319 8600.

A new chipset from STMicroelectronics lets users quickly build reliable and space-efficient Powered Devices (PDs) to take advantage of the latest IEEE 802.3bt Power-over-Ethernet (PoE) specification. The PM8804 and PM8805 provide the PoE converter circuitry for PDs up to Class 8, which defines a usable power budget of 71 Watts. The chipset targets next-generation connectivity equipment including 5G small cells, WLAN access points, switches and routers, in addition to smart building and smart office applications such as IP cameras, access control systems, display panels, lighting, curtain or shutter controllers, video call systems, IP phones and tabletop consoles.

**EBV Electrolink**, +27 21 402 1940.

Renesas Electronics introduced two touch-free user interface (UI) solutions to simplify the design of 2D and 3D control-based applications. Based on the company’s capacitive sensor microcontrollers (MCUs), the new solutions support the development of UIs that allows users to operate home appliances, as well as industrial and office automation equipment without touching the devices. Available in three different sizes based on the application, the touch-free UI solutions have passed class B testing for the IEC 61000 4-3 level 3 and 4-6 level 3 noise immunity standards, and can achieve stable operation.

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