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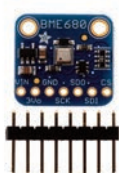
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A dark city skyline at night with various skyscrapers and buildings, some with lights on. The background is a deep blue with some clouds.

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AI-BASED PRECISION MEDICINE MINING OF UK BIOBANK FINDS 13 HUMAN COVID RISK GENES

Data scientists from UK-headquartered AI precision medicine company, PrecisionLife, have used the Company's proprietary AI enabled precision medicine platform to identify 59 repurposing drug candidates that could be used to develop new therapeutic strategies to increase the survival rate of patients who develop sepsis while suffering from severe COVID-19.

The new study on Biorxiv sought to identify genetic risk factors for sepsis especially in the context of COVID-19, and to use these insights to identify existing drugs that might be used to treat life-threatening late-stage disease.

Disease architecture of the sepsis cohort generated by the precisionlife platform. Each circle represents a disease associated SNP genotype, edges represent co-association in patients, and colors represent distinct patient sub-populations or 'communities'.

The new study, released today on Biorxiv sought to identify genetic risk factors for sepsis especially in the context of COVID-19, and to use these insights to identify existing drugs that might be used to treat life-threatening late-stage disease.

"Ours is the first study looking at host genomics and opportunities to treat later stage severe disease where host immune processes take over" said Dr Steve Gardner CEO of PrecisionLife.

Like the initial genomic studies on COVID-19 patient variants that predispose individuals to developing the disease. By providing deeper insights, this study identifies novel approaches and hope for new therapies.

PrecisionLife analysed patient datasets compiled by UK Biobank to identify genes associated with sepsis, which are also found in severe COVID-19 patients. Sepsis is observed in 60 per cent of severe COVID-19 patients and is a life-threatening condition with a mortality rate of approximately 20 per cent.

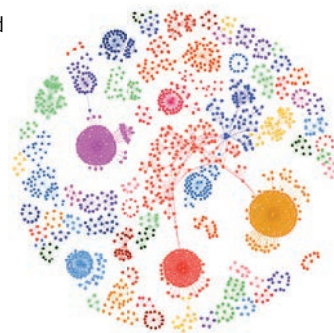
The team identified mutations in 70 sepsis risk genes, 61 per cent of which were also present specifically in severe COVID-19 patients. Several of the disease associated genetic signatures found in both sepsis and severe COVID-19 patients have previously been linked to cancer, immune response, endothelial and vascular inflammation and neuronal signalling.

13 of the sepsis risk genes, which the study shows are also COVID risk genes, are known to be druggable i.e. targeted by active chemical compounds used to treat these other diseases and therefore represent potential drug repurposing opportunities. The study went on to identify 59 compounds and drugs that are known to be active against these 13 targets. These could form the basis for future drug trials and repurposing projects. They could also offer potential as COVID-19 high risk biomarkers.

"Our high-resolution genomic analysis tools have allowed us to develop new insights into two serious and complex diseases for which new therapeutic options are urgently required. We hope that these will lead to better understanding of what drives sepsis in COVID-19 patients and result in new ways to treat seriously ill patients" said Dr Gardner.

PrecisionLife is disclosing its new insights and will be working with international collaborators to investigate therapeutic strategies that may help to reduce the high mortality rates in patients who develop sepsis with or without the context of COVID-19.

As more COVID-19 patient data become available in UK Biobank and other patient data sources, PrecisionLife will be able to analyse the clinical impact of these disease signatures in a larger group of patients.



more than a handful of genetic

UK TECH ENTREPRENEUR DEVELOPS SOLUTIONS TO SUPPORT COVID-19 ECONOMIC RECOVERY

With the country approaching the tenth week of large, and multi industry, social distancing measures as part of the controls around COVID-19, UK businesses are starting, with caution, to explore ways in which adaptations need to be made to ensure a safe movement back to normal working and operating patterns once government recommendations allow it.

Entrepreneur Josh Bunce, founder and CEO of Bristol born inurface Group, has developed a number of solutions which, using a combination of the existing expertise the company has and the utilisation of various technologies, will help support businesses back into operation as well as offer vital reassurance for the public using these services.

While his company took a hit, like many others, due to the knock on impacts of COVID-19, instead of sitting back and waiting for things to return to normal, Bunce and his team began exploring ways they could support UK businesses, using their background and expertise in retail communications solutions and signage, to do this UK based, and with experience and understanding of the UK retail and business industry, the team are able to act

fast with their solutions. This, they hope, will mean they can support businesses to increase their monitoring and safety solutions as quickly as possible in a time where it, like never before, will be essential.

The focus of these services in inurface Groups's mind is twofold. Firstly, in an office environment to keep employees safe and allow them to return to work and secondly in a retail situation where the public will need to be managed and proactively communicated with, to ensure a safe experience for all.

Two primary products are key within the packages developed by Bunce and his team. The first a thermal monitoring camera which, at distance, can remotely read multiple individuals' temperatures accurate, unlike many alternatives on the market, within 0.3 of a degree.

Vitally, unlike other similar systems, the technology will use an integrated cloud based system to share this data in real time with store managers, security teams and even head offices away from the site. This tech will allow businesses to practically, and without disruption, monitor large numbers of people's temperatures in a short period of time and act as necessary to keep areas safe for operation.

This adapted technology, developed by inurface Group owned company ADT (Advanced Display Technology), has been used historically in various way but never before in these settings, and often with less accurate readings or requiring people to be within much closer range of the device.

With adaptation inurface Group team soon realised how this tech could be positively used during this period of economic recovery and have already had multiple conversations with businesses keen to implement the resources Bunce and team can offer.

The second, a digital signage hand sanitiser, combines two technologies to encourage high levels of sanitation at points of entry to stores and offices also allows the same consumer to be targeted with messaging specific to each location and even the real time situation. The screens can be used in a whole range of ways dependant on each unique setting. To regulate crowd flow into a food store for example, to communicate precautions being taken to ease anxiety and offer tailored advice to users through easily positioned monitors.

inurfacemedia.co.uk

WYLD NETWORKS WORKS WITH NHS HIGHLAND AND HIGHLAND HEALTH VENTURES

Wyld Networks has signed an agreement with Highland Health Ventures Ltd (HHVL) to test and deploy its mobile mesh technology into care homes in Scotland to help protect residents, staff and visitors and prevent the spread of COVID-19 or other viruses. HHVL is an independent company with a Collaboration Agreement with NHS Highland for the purpose of developing innovations in healthcare.

The Wyld technology will provide digital access and anonymised social distance monitoring and alerting through a mobile app and a mesh wireless network of connected smartphones and IoT (Internet of Things) devices. Wyld and HHVL have already started the first project for implementation in a care home in Scotland, while the technology may also have broader applications in helping other businesses get back to work.

Statistics from the National Records of Scotland (NRS) show that more than half of the recorded coronavirus deaths in Scotland over recent weeks were in care homes. Data from the Office of National Statistics (ONS) also reports that 12,526 care home residents have died due to Coronavirus in England and Wales during the four months to May.

"Supporting innovation across the healthcare system is more important than ever and will be central to securing transformation and improved care," said Frances Hines, Research, Development and Innovation Manager in NHS Highland. "Creating the conditions for more collaborative approaches to innovation and enabling the adoption of cost-effective new technologies will be key, and we are pleased to be working together with Wyld and HHVL to deliver innovative potential solutions for care homes."

"HHVL h the NHS and with our collaboration agreement with NHS Highland, we are now involved in selected projects which are introducing and deploying technology into healthcare settings," said Dr David Heaney, Director Highland Health Ventures Ltd (HHVL).

For more information visit www.wyldnetworks.com

SGS GAINS OSHA APPROVAL FOR EXPANSION OF ELECTRICAL AND ELECTRONICS TESTING

SGS, the world's leading inspection, verification, testing, and certification company, has gained Occupational Safety and Health Administration (OSHA) recognition for its Electrical & Electronic (E&E) product testing facilities – expanding the scope of its global Nationally Recognized Testing Laboratory (NRTL) network.

The announcement comes as SGS opens a new NRTL testing laboratory in Aix-en-Provence, France.

OSHA aims to ensure safe and healthful working conditions for working men and women by setting and enforcing standards. It requires that all E&E products used in the workplace must be tested and certified to OSHA safety specifications, by a NRTL, before they can be sold on the US market. These standards include those from the American National Standards Institute (ANSI), and the Underwriters Laboratory (UL).

"We are proud that our state-of-the-art testing facilities and services across the globe have gained this additional recognition from OSHA and to have expanded our global network through a new NRTL in France. We've also extended our expertise in electric kitchen appliances and heaters with the addition of gas-fired product testing to our NRTL scope," said John Ciliege, Global Head of NRTL, SGS.

More at www.sgs.com/ee.

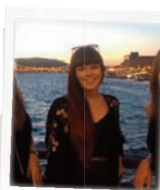
Comment

Hello everyone!

By means of a short introduction, my name is Rachel Tucker and I am taking care of Electronics Magazine while Christian is on furlough because of the current situation.

You will usually find me working on Irish Manufacturing and Factory & Handling Solutions. I hope that I can continue to bring you the same level of quality that you've been used to, and will keep you well informed to when we can welcome Christian back! In the mean time, if you have any questions, news or features to discuss, my email is rtucker@datateam.co.uk

Rachel Tucker – Acting Editor



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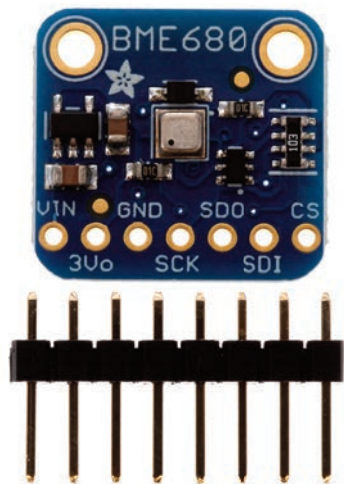
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PROLIFERATION OF IOT DRIVES GREATER DIVERSITY IN SENSORS, MINIATURIZATION AND FUSION



By Robbie Paul, director, IoT Business Development at **Digi-Key Electronics**

With the proliferation of IoT, the need for a greater diversity of sensors has exploded. Digi-Key sells more than 60 million sensors each year, with over 130,000 part numbers available. Temperature sensors are by far the most popular, followed by accelerometers, driven by the popularity of activity tracking IoT devices. Environmental sensors are third, focusing on sensors measuring pressure and humidity.

IoT and autonomous vehicles are driving the demand for sensors, including more sophisticated image sensors. Radar and LiDAR are also moving into the mainstream to support autonomous vehicles and virtual reality applications. For example, next to the camera on the new iPad Pro is a LiDAR scanner for AR, which – provides for greater accuracy in depth perception. LiDAR sensors will continue to rise in popularity, becoming more commonplace in major applications such as phones and autonomous vehicles.

Miniaturization and sensor fusion are two interwoven trends that continue to dominate. Not only making sensors smaller but also integrating multiple sensors into one single, small footprint. For example, temperature, pressure and humidity sensors all combined together in one package and used in compact environmental sensing applications.

Digitization is associated with this as well. Typically, sensors have various analog output types, but by moving to digital outputs, integration is much smoother with other components like microprocessors. Whereas previously we had to convert from analog to digital,

the widespread use of digital sensors is now enabling us to eliminate some components from sensor designs, further contributing to miniaturization.

Artificial intelligence and machine learning are starting to play greater roles in sensor deployment. One example of this is the Google Nest, which sets temperatures based on its surroundings, when people are coming and going, whether it's a weekday or weekend, etc. The Nest device is continually gathering data, analysing it, and sending it to a cloud server to notify the user of its findings.

Not only does deep data analysis contribute to greater convenience for the user, but they also result in significant cost savings. A great example of this is some of the commercial applications for sensors that we've seen in the agriculture industry. Specifically, we're seeing a lot of farmers use moisture sensors to manage their irrigation systems. These sensors arm the farmers with rich data and automatically turn on the irrigation system if they detect the crops need moisture. As sensors continue to progress, we expect that this intelligence and connectivity will be taken to a higher level. For example, tapping into the Weather Channel data, learning it is going to rain tomorrow, and determining not to activate the sensors. We'll also see the fusion trend here – combining temperature, humidity and pressure to give a more complete environmental picture.

The bottom line is we're using sensors today in a very rudimentary way. We take all of the data but don't actively use a majority of it. Predictive maintenance like the commercial agriculture applications

represent the proliferation of sensors and data – and how it can be utilised better. Artificial intelligence and machine learning will also be integral to helping us make data richer and more useful – and that will make all the difference in the world.

At Digi-Key, there are several ways we're responding to these trends, but I will focus on just a few. First, our DK IoT Studio is about bringing together sensors, microcontrollers and connectivity in an easy way to create complete IoT solutions. It simplifies the design process by creating the firmware code in the background so you can program the microcontroller, to send the sensor data to the cloud and ultimately visualise the data on your mobile device.

Digi-Key has also introduced our DK+ initiative, Digi-Key's continued growth as a world-class distributor to provide products, services and solutions for all phases of the technology innovation ecosystem. As part of the DK+ initiative, Digi-Key will continue to work with more specialty sensor manufacturers, providing even more cutting-edge and specialised sensors to customers.

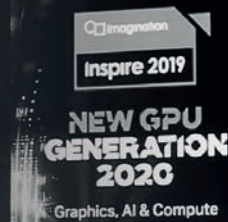
Finally, we're continuing to offer customers some of the most innovative sensor technologies on the market. The Adafruit BME680 breakout board, DFRobot breakout board, and BMI090L shuttle board are a few examples of boards that can be modified and used to create robust IoT systems and products.

IoT continues to drive sensor technology and connectivity for a richer product. It's exciting to see all of the innovation happening in this space. Here at Digi-Key, we look forward to supporting hobbyists, makers and professional engineers as it continues.

Below: Robbie Paul



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THE FUTURE WITH MOUSER

Editor Christian Lynn speaks with Graham Maggs, Director of Marketing EMEA, Mouser



Question 1: Despite the drop in worldwide revenue for semiconductors, it seems as though Mouser had a strong 2019. What helped the distributor challenge the trajectory of the marketplace, to come out successful?

Graham Maggs: Mouser, as an online distributor, differentiates itself to be more than just a shipping service. We focus strongly on the design and development communities in order to empower their innovation. For us to support our customers to innovate, we ensure they have access to the latest products and, in particular, the latest semiconductors. We work closely with our key component suppliers in the lead-up to their new product releases ensuring we have all the product data, supporting documentation, and stock ready to go as soon as the product launches. As a result, from the moment the manufacturer releases a new product our customers can order it and have it in their hands (or even in their devices) within days. Innovation and new product introductions continue to be the lifeblood of our business, which is why we now have over 1.1 million unique manufacturer part numbers available. Added to this are our plethora of support services that engineers are making use of on a daily basis. These include localised customer service, DesignIn, video, articles and ebooks, all of which are accessible online.

Question 2: Moving forward into 2020, business has obviously been affected by Covid-19. How has it affected Mouser's operability as a global distributor? And do you see it having a knock-on effect into the latter half of this year, and maybe

even beyond, into 2021?

GM: Yes, we are no different to everyone else around the world. We have quickly adapted and are prioritising providing our customers with continued world-class service. Our utmost priority is of course people – the safety of our staff and customers is paramount. Due to the fast-changing nature of the outbreak, which is affecting each country differently, we are posting regular updates on our key communication portal during the pandemic, and recommend everyone review our regular updates here:

- For service updates: <https://www.mouser.com/service-alerts>
- For shipment updates: <https://www.mouser.com/covid19-statements/>

This unprecedented global crisis has meant that it is impossible to estimate the effect on the market in the second half of 2020 and especially 2021. However, as Mouser orders stock months in advance, we have a large store of inventory products available to ship immediately. This means we can assure customers that they will find what they need, either by visiting Mouser.com or by calling our local offices.

Overall, 2020 has started well for Mouser with strong business in Q1, however, as logistics in regions and countries are restricted in line with various government decisions and responses, we may see some effect. We are still completely operational and recognise that many engineers are working from home, so we are doing our best to provide consistent service and support for these people. Today we have over 200 staff available to support customers in EMEA in 14 languages, along with regional websites in 17

languages, so we are confident that we will be able to support customers through this difficult time.

Question 3: As this has affected the industry, trends are no doubt going to change, as focus is directed towards what can get the industry back on track. What areas do Mouser see as being the leading areas for investment in distribution, and why?

GM: There is a focus on the medical market presently, such as sourcing components for ventilators and medical equipment, and this is likely to continue throughout 2020 as the global community works to ensure hospitals everywhere have access to vital life-saving technology. Additionally, the continued interest in 5G, AI and EV markets remain strong too. Working with our supplier partners, we have been providing relevant application and solution information to keep our engineering communities up-to-date with product news and the market developments that they need.

The current situation has only served to highlight the importance of evolving business around the online space, social media and our e-commerce model. Mouser continues to develop in line with these trends, whilst simultaneously maintaining our excellent telephone support services and our varied range of Web based tools and content supporting all electronic application segments. In times of trouble ingenuity is even more important, so we will continue to keep engineers innovating!

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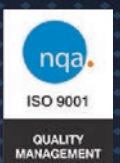
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Deciphering the code – LDRA and the software development lifecycle

Words by Editor, Christian Lynn



With over 40 years in the market, LDRA is a software company, serving customers that are developing safety – and/or security-critical software through software analysis and verification, for high-assurance applications. How this relates to where LDRA stands today is the way that the company is approaching lifecycle management – seeing a software project through its development, and into its process of verification. A big part of this push comes in LDRA's latest collaborations – the company has allied itself with Intland Software and Jira.

TEAMING UP

The partnership with Intland is intended to accelerate workflow for the development of critical software domains within key industries: automotive, medical, aerospace and defence. With Intland's codeBeamer Application Lifecycle Management (ALM), customers can author and develop requirements, as well as providing traceability down into the software quality processes that LDRA involves itself with, helping to identify and eliminate software flaws and vulnerabilities; ensuring complete transparency over the testing process, while augmenting its comprehensiveness, etc. By uniting Intland's lifecycle management with these services, customers can feel secure in their software's development schedule: money and time can be saved, whilst compliance with key regulations and standards is maintained (DO-178B/C, ISO 26262, IEC 62304, and more).

In contrast, Jira offers a more specific

solution in the form of agile development and verification of applications within the embedded sector. Using this, customers will identify key issues within the software and use the integrated LDRA tool suite to track how these issues are resolved over its lifecycle: information attained from this is fed back into the Jira software. This is the predominant difference between Jira and Intland – Intland is requirement focused, whereas Jira hones in on the collaborative development, clarifying who's working on reciprocating what and what is the root cause of any anomalies to begin with.

SETTING THE STANDARDS

However ambitious a collaboration can become, standards and legislation will always ground a project on some level. LDRA is keen to prove that it takes responsibility, particularly in the case of working with other companies like Intland and Jira, for the monitoring of the development cycle, verifying that the software being developed is compliant with relevant regulations and then feeding the results back into the original working environment, ultimately benefitting one's tracking of the overall process. It helps that LDRA participates in the extension of those standards, as technology evolves to force the standard's hand in changing with it: LDRA has recently partaken in the definition of ISO/SAE 21434 and MISRA C: 2012, for example, as their experience in identifying flaws deals them the perfect hand to suggest ways of revising said standards.

This experience comes as a result of the relationship with the customer. What's to stop a customer from questioning

the cost of time and materials that a regulation would impose upon the development schedule of a piece of software? Often, the customer will ask how to efficiently overcome these hurdles. LDRA, by sticking close to the standards, understanding how they're being reviewed, are attempting to aid these customers in achieving their goals more proficiently. Consider a recent example: LDRA worked with General Motors (GM) to define variants in the aforementioned MISRA coding standard, which support GM's overall software development quality initiative, variants that are then passed onto the supplier to ensure complete adherence over the entire course of the software's journey. This marks a general note of attention: understanding the variants and the standard as a whole, so as to initiate the best course of action that will protect the software and its developmental environment, right the way through to its completion.

SETTING A NEW STANDARD

In keeping with this ambition to keep up with current standards, LDRA is supporting the recent revision of the ISO/SAE J3061 automotive cybersecurity standard, being re-fashioned and re-labelled as ISO/SAE J21434. Picking up from where the former left off, the latter is around a year away from final approval, promising more detail that will assist in supporting customers in their search for the best practice of software development and verification within the increasingly connected vehicle. LDRA's part to play in this is its use of the standard to accurately guide automotive OEMs in their prevention of the ongoing impression of anomalies within their software framework: the GM case study was a case in point. All in all, the progression of software development and its relevant legislation, like the latest ISO/SAE standard, demonstrates a desire to shorten the time-to-market lifecycle of a piece of software: LDRA situates itself in the midst of this process, with a hands-on approach that will enable customers to deliver an effective, verified piece of software.

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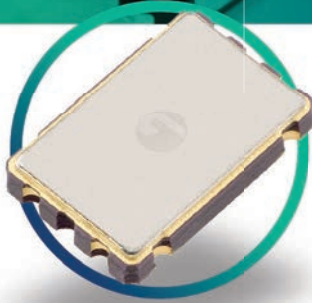
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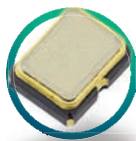
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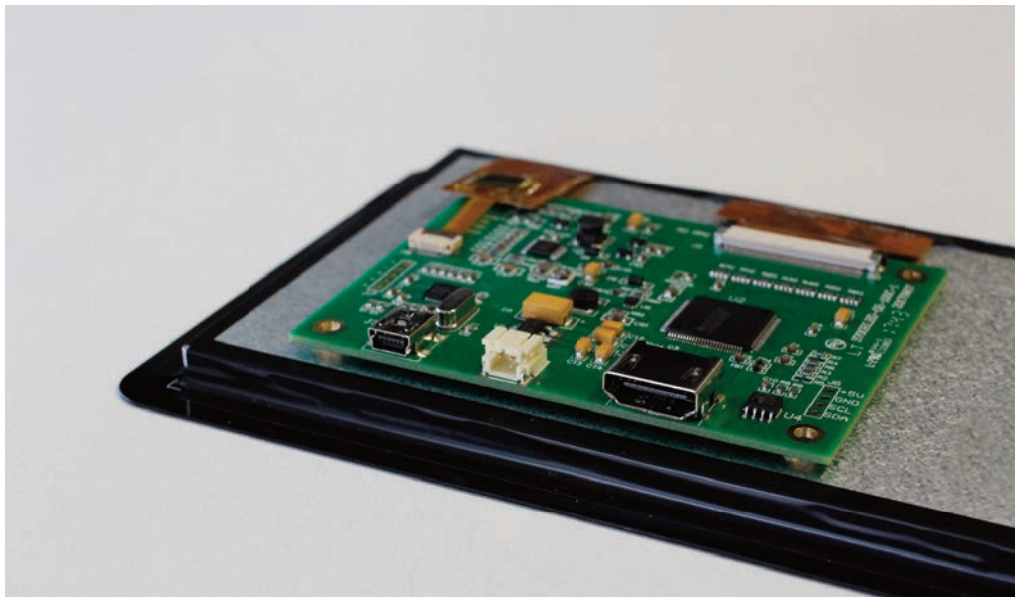
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BRINGING THE DOMESTIC INTO THE INDUSTRIAL

What advantages do HDMI displays offer embedded projects?

By Adilson Jacob, applications and development engineer at Anders



HDMI displays are available in small sizes, such as five or seven inch, which are popular for industrial embedded use cases such as for smart appliances, security devices, ticketing and information systems, medical devices, machine controllers, etc.

ARE HDMI PANELS PLUG AND PLAY?

One advantage of the HDMI interface is that the display can be regarded as a “plug and play” component. In the middle of a development project, one display can be easily swapped for another, to try a different size or a better specification. Plug and play can help teams to start work on the user interface without committing to a hardware platform or waiting until a prototype is ready. That can be very helpful when the time comes to demonstrate a proof of concept, in order to secure a green light from top management.

Anders offers a selection of HDMI displays that provide a Mini-USB port for the purposes of prototyping, connecting the touchscreen to any of the large number of single-board computers that provide a USB connection. Getting a head-start on the user-interface design, while also having the flexibility to make changes, can be a tremendous advantage to the project, particularly when achieving the right look and feel is critical to the overall user experience.

However, HDMI was not created as an embedded user interface. With its roots in the consumer world, it is

relatively expensive due to license fees that can raise the price of the delivered product. The power and board real estate consumed by HDMI interface circuitry also needs to be considered.



ARE HDMI PANELS SUITABLE FOR INDUSTRIAL APPLICATIONS

Despite these apparent drawbacks, embedded projects can take advantage of the fast start, plug-and-play simplicity, as well as the flexibility to make design changes quickly and easily, which HDMI displays can provide. Anders' LVDS to HDMI interface converter can connect an embedded board to an HDMI display, to let user-interface development begin before committing to any particular hardware platform. This can be an effective approach for rapid prototyping.

Later in the project, when the display size and specification are known, the HDMI interface board can be dropped

in favour of a lower-cost, or low-power edembedded RGB or LVDS interface. The option remains: to use the HDMI display in the end product with the interface board, or by integrating the conversion circuitry on the application main board. It's fast and easy, if rather expensive and power hungry.

On the other hand, high-performance evaluation modules, such as the Compulab SOM-iMX8, are suitable for equipment that demands high graphics or image-processing performance, such as medical imaging devices or high-end gaming terminals. In-house tests have shown that these boards offer easy plug-and-play compatibility with a variety of different HDMI displays.

HOW CAN I CONNECT MY CHOSEN DISPLAY?

Various other high-performance display interfaces have strong credentials for emerging embedded use cases. MIPI-DSI is an example, which is being adopted in the automotive industry, as well as AR/VR equipment and wearable electronics. An embedded board with a MIPI-DSI output may require conversion to RGB or LVDS to connect a chosen display. Conversely, some developers may want to connect a MIPI display to a module that has an ordinary RGB or LVDS output.

Small displays that feature high-performance interfaces provide new flexibilities for embedded projects. Anders helps navigate the possible opportunities to ensure the finished product meets the applicable cost, size, and power requirements within the desired time-to-market window.



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P2i signs deal with Samsung to protect selected Galaxy smartphones with its liquid protection Barrier coating

P2i announced partnership agreement with Samsung that will see its Barrier nanocoating technology deployed across several smartphone designs from 2019, extending water and liquid protection to the internal components of selected Samsung Galaxy smartphones. P2i's Barrier will be deployed across other smartphone models in due course. The new agreement builds on an existing relationship between Samsung and P2i, dating back to 2014.

P2i's Barrier is a next-generation waterproofing technology that provides higher levels of liquid protection and enables manufacturers to protect the components, even after water gets into the device.

By using this approach, companies can protect the components on the Printed Circuit Board Assembly (PCBA) in the event of a spill or accidental short immersion into water.

Inkang Song, Vice President, Head of Technology Strategy Group at Mobile Communications, Samsung Electronics said: "Samsung is at the forefront

of smartphone innovation and this not only extends to the performance and the aesthetics, but to ensuring our smartphones are reliable. Water protection is a key part of this, with P2i providing an advanced and trusted nanotechnology solution."

Ady Moores, CEO of P2i said: "P2i is delighted to announce that Barrier is now a part of Samsung's design on selected smartphones. P2i's Barrier increases the reliability of smartphones and other electronic devices by creating a nanoscale electrically insulating plasma coating on the PCBA. This provides liquid protection against corrosion from direct and prolonged exposure to liquids."

Barrier uses a plasma-enhanced chemical vapor deposition (PECVD) process that provides an electrically-insulated coating on the PCBA and critical components in the handset. Coating thickness/protection level can be adapted to suit the needs of the component and the technology uses a non-degrading thin nano film that lasts for the life of the device. The coating allows re-application if a repair is made

or modular component replaced.

It is one of three classes of water protection offerings from P2i which provide up to and exceeding IPX8 liquid protection. The company also offers Splash-proof and Dunkable® coatings to firms seeking to protect electronic equipment from liquid damage.

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Integration of AUTOSAR C++ Coding Guidelines into MISRA C++

By Dr. Frank van den Beuken, **Perforce Software**



It had been announced that two industry standards for coding best practices in C++ — MISRA and AUTOSAR — will integrate into one publication. This comes at a time when use of C++ in embedded design projects continues to grow. In a 2019 survey carried out by Perforce Software, almost 50 per cent of automotive software development professionals said their organisations were using the popular programming language.

C++ is the foundation for many of today's challenging embedded software innovations. The volume of scale and sophistication of embedded software development projects means that creating efficient embedded software for some or many development projects would be very difficult — even impossible — if not for C++.

The reason for C++ being so essential is that it permits direct, deterministic control of hardware, and gives flexibility to the developer. However, this can also bring risks. The main risk is that it is possible to compile code that has undefined behaviour, or code that is not guaranteed to behave in the same way when compiled and run on different target hardware. For instance, automatic memory management and memory allocation within C++ is notoriously easy to get wrong, which can result in memory leaks. These can cause performance problems or may even be exploited by a hacker.

In safety-critical markets — such as automotive, aerospace, and medical

devices — clearly these weaknesses in software can have very serious consequences. This is why coding standards matter, as they give developers guidelines to help improve safety, security, compliance, and ensure the standardisation of design across all contributors. Coding standards also encourage consistent, best practice coding within teams.

For automotive development, the use of a coding standard is already mandated within ISO 26262, though without specifying a particular one. AUTOSAR and MISRA are the two most widely-used and sometime within the near future, the two will be included within one publication: MISRA C++202x. This will bring together the best features of both, which already have a lot in common.

MISRA is a collaboration between manufacturers, component suppliers, and engineering consultancies. The software development standard is used to promote best practices in developing safety and security-related electronic systems and other software-intensive applications. While MISRA is known for the rigour of its coding standards, C++ has continued to evolve since the introduction of MISRA C++ in 2008. This was the main reason for the creation of AUTOSAR C++, which was based on MISRA C++, but applicable to C++14.

AUTOSAR (AUTomotive Open System Architecture) develops standardised open software architectures for automotive electronic control units (ECUs) and is a

With electronics products of all kinds becoming more dependent on software, the growth of C++ will inevitably continue

partnership of over 1800 organisations involved in the automotive industry. In recent years, AUTOSAR has evolved to include its Adaptive Platform standard for connected and autonomous vehicles.

As well as integration with AUTOSAR, new guidance within C++202x will include: move-semantics (which were introduced in C++11 and will be covered by MISRA, which will be applicable to C++17); class-design; and — very likely — RAI too, a popular design pattern that is already promoted by AUTOSAR.

Move-semantics provide a way to refer to and reuse temporary objects so that unnecessary object creation or copying can be avoided. RAI stands for Resource Acquisition Is Initialization. It is a coding pattern to help ensure that when an automated object leaves scope, it will be destroyed and any resources it holds are released, which in turn helps prevent resource leaks.

The MISRA C++ working group is also studying other sources besides the AUTOSAR Guidelines for new guidance. This includes High Integrity C++ Coding Standard from Perforce Software, which is the exclusive static code analysis development partner in AUTOSAR. High Integrity C++ was originally introduced in 2003 to capture C++ in the form of a publicly available standard, and since then has been updated twice. It was the first C++ coding standard to cover concurrency and it can be expected that the new MISRA standard will also provide guidance for correct implementation of concurrency.

Static code analysis helps to enforce efficient coding standards. These tools automate the coding standards compliance process by continually inspecting code in background mode, identifying deviations and alleviating potential additional work for developers. Perforce Software supplies two static code analysers — HelixQAC and Klocwork — both of which are designed to minimise false negatives and positives.

With electronics products of all kinds becoming more dependent on software, the growth of C++ will inevitably continue. Adoption of coding standards and tools that support their implementation will play an increasing role in ensuring performance, standardisation, security and safety, and compliance. This is why the merging of the best of both MISRA and AUTOSAR is good for the electronics industry.

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HMI DESIGNS: THE GOOD, THE BAD & THE UGLY

By Paul Jiao Shouwu, Bridgetek

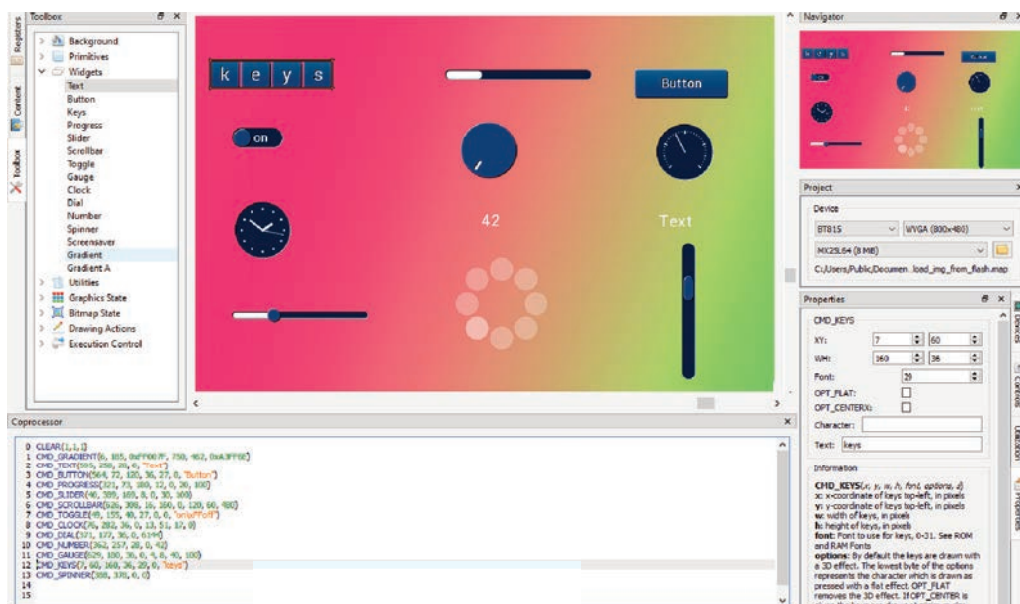


Figure 1: Examples of the many widgets supporting Bridgetek's EVE HMI development platform

The prevalence of human machine interfaces (HMIs) based on touchscreen displays is increasing all the time. As well as being almost obligatory in consumer goods, they are now commonplace in domestic appliances, home automation systems, vending machines and industrial equipment. These HMIs are no longer just another feature – often, they represent the fundamental reason for a product's success.

Plenty of examples exist where touch-enabled HMIs have been the defining attribute allowing certain products to commercially outperform rivals that had the same (or possibly even better) functionality. If the HMI is inherently enjoyable to use, then it will be much better at showcasing the associated product's feature set, and will make it more appealing to customers. Conversely, if it causes user frustration, then this will be detrimental to the market uptake of that product.

A poorly thought-out HMI design may not just impact on product differentiation though; it can potentially have far more serious implications, resulting in the operator's safety being compromised. There are well-documented cases of industrial accidents occurring that stemmed from errors of judgement made because of an inadequately realised HMI. Each icon displayed should therefore be distinct and easy to recognise, thus removing the risk of it being muddled up

with other icons. The data that an operator needs to access must be rendered in such a way that it is quick and straightforward for them to understand. The reaction times required may be very short, so there should be no prospect of something important being accidentally overlooked because it is not in a prominent enough position, or its meaning is ambiguous. Also, pages must be quick to load, with no unwanted latency.

Where the HMI will be located has to be given sufficient consideration. If it is for a public information unit sited outdoors, or incorporated into an electric vehicle's instrumentation cluster, then ambient light variations over the course of the day will need to be dealt with. When being deployed in an industrial context, presence of smoke or steam may also impair visibility. Hence, the size, shape and colouring of buttons, dials and gauges should be bold enough to mitigate low-light conditions.

In harsh application settings, the effect of vibration on the HMI may need factoring in. The clarity of content shown on the screen will require greater augmentation in such situations. In a medical environment (to combat the spread of bacteria) or an industrial processing plant (where there are hazardous chemicals), operators may have to interact with HMIs through thin gloves. In each of these scenarios, thought should be given to the touch

sensing technology employed. For instance, specifying a projected capacitive sensor, with an easy to wipe down protective screen, might be called for. In less challenging circumstances, curbing the bill-of-materials costs may be the priority, making restive touch preferable.

If operators haven't received in-depth training, or the HMI is intended for individuals that will have no previous experience of using it, then the design should clearly reflect this. The regularity with which different operations are executed should be ascertained, and layout optimised accordingly. Likewise, ergonomic aspects must be taken into account – display size; distance from the operator; where their line of sight will aim, etc.

Among the many things to contemplate are – what will be the minimum physical dimensions of a particular button (and will the specified display's size/resolution be ample enough to support this)? Then, where should it be placed in respect to other items on the screen to avoid distraction? Will sliders or dials present more efficient options for certain control functions? The sound output can also be an important aspect of user interaction. Inclusion of animation should not be discounted either, as this can prove invaluable in providing more compelling content.

Modern product development cycles are subject to acute pressures, with huge impetus on exploiting short-lived windows of opportunity. Alongside this, there are usually budgetary concerns – though performance needs to be boosted and feature sets accentuated, the associated costs must still be kept in check. Bridgetek's Embedded Video Engine (EVE) platform transforms all the different HMI elements into an object form. These objects are rendered more rapidly and require far less data storage capacity. Component costs are consequently lowered, as is the board space taken up and the power consumed. EVE makes HMI construction much easier to accomplish, with an ecosystem of related software tools that rely on a simple drag-and-drop approach, and an array of pre-defined widgets. The upshot of all this is engineers don't require any prior coding experience.

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www.brtchip.com

Digital power switching increases versatility and cuts costs

Digital power switching can replace expensive and bulky switch panels and reduce cable lengths in the electrical systems for vessels and vehicles such as agricultural equipment, construction vehicles, boats and industrial machinery. James Cope of Veethree Technologies outlines the advantages of these increasingly popular systems.

Conventional electrical power systems in boats and vehicles can be simplified as well as made more flexible with the adoption of digital power switching systems. Whereas simple switches require individual cabling to each of the devices they control, using a digital switching system over a network such as CAN bus reduces the amount a cabling required while increasing the functions that can be supported. Being programmable, a digital power distribution system can be easily configured for the particular load types, breaker/fuse loads etc required, and for the design and functionality of the display. Data from different systems can be integrated and centralised, ensuring important information is available at a glance.

One such DC digital power switching

module is the VeeConnect from Veethree Technologies. Each of its 12 channels is capable of supplying up to 20 A and is fully configurable, including options such as fuse rating, analogue or digital inputs, and switch type (slider, on/off, burst). A library of predefined icons and switch descriptions is also available.

With IP67 all-round protection, the module can withstand the harshest of environments whether it is being used in marine, utility vehicle or industrial applications. It was developed in conjunction with an aerospace company experienced in handling DC loads on aircraft, where reliability is essential.

When used with Veethree's new T7i 7 inch display, for example, the display can be configured to show any combination of button colours or shape, background design, icons and gauge types. Switches can be easily renamed and configured, including assigning the circuit's trip current, the power on state, and if they are standard, PWM or reversing loads. Switch icons can also easily be assigned and OEMs can go a stage further with fully customised display designs.

Examples of the equipment that can

be controlled in marine applications include lights, alarms, engine fan, depth sounder, bilge pump, blowers, horn and entertainment systems. For off-road vehicles, typical uses might be telematics, digital and analogue sensors, rear view cameras, engine management, winches and GPS speed. As the components are modular, additional equipment can be added as required.

The VeeConnect digital power distribution system replaces expensive and bulky switch panels

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CONSIDERATIONS WHEN SPECIFYING HAND-HELD PLASTIC ENCLOSURES

By Russell Irvine, Hammond Electronics



A hand-held enclosure is just a hand-held enclosure – or is there in fact a lot more to it than that? As with most things, a small plastic enclosure designed to fit in the hand is ostensibly a simple product. However, the more one looks into it, the more options become apparent when considering which particular design to specify.

SIZE

The primary requirement is that the enclosure is large enough to contain the PCB, which despite suggestions from multiple enclosure manufacturers, will invariably be finalised before any attention is paid to the enclosure into which it will be housed. Obviously, for hand-held equipment, there is the further constraint that the finished product must be of an appropriate size and dimensions to be comfortable in use.

STYLING AND APPEARANCE

The most subjective of criteria. Plastic enclosures offer a choice of opaque and translucent material in a variety of colours and shapes. They can also be moulded in a transparent material; styled lids with recesses for membrane keypads and displays are also commonly found. For hand-held devices, ergonomically styling for comfort in use adds another

variable; some designs will also feature soft over-moulds to reduce strain when using the equipment for extended periods of time.

POWER

Many enclosure designs are available with or without an integral battery compartment. A dedicated battery area is typically designed to accept either 2 x AA or a single PP3 9 Volt battery, and both types of connectors will normally be supplied. If an external power source is used, then an end panel fitted with a cord protector and a strain relief bracket can be specified. The new Hammond 1552 family is an ideal example of this option.

END PANELS

Hand-held enclosures will usually be available with one or two end removable end panels. Having decided how many panels are needed, again, inevitably, there are further choices. Plastic or metal, or if the unit is to be used as a remote controller or a bar code reader, then IR transparent plastic panels are available.

ENVIRONMENTAL PROTECTION

Sealing against the ingress of dust and water typically relies on a tongue and groove construction between the mating halves of the enclosure; for higher levels

Plastic enclosures offer a choice of opaque and translucent material in a variety of colours and shapes

of sealing, a compressible gasket will also be used at the interface. The relevant international standard is IEC 60529. Typically, enclosures rated at IP54 are suitable for general purpose use; for installation in environments where dust and water are likely to be present, IP66, 67 or 68 would normally be specified. For completeness, the highest rating under IEC 60529 is IP69K, which gives protection against steam cleaning at high pressure. Obviously, this extreme rating is unlikely to feature high on the list of requirements for a hand-held enclosure.

EMC

Plastic enclosures have one specific weakness: by virtue of the intrinsic properties of the material itself, plastic, unlike metal, offers no EMC attenuation. If EM radiation emitted by the housed electronics or their susceptibility to external fields is a potential problem, the lack of screening could be an issue. Internal coatings in a variety of materials can be applied to the inner surfaces of a plastic enclosure to give different degrees of attenuation dependent on the project requirements. By offering different materials in a range of thicknesses, the most cost-effective and technically competent solution can be provided.

ACCESSORIES

Many designs will have dedicated accessories such as belt clips, which enable the equipment to be conveniently placed out of the way when not immediately required. Other accessories are a wall mounted holder that allows the unit to be stored in a convenient location when not in use, a particular benefit if the equipment is used as a machine controller or scanner used in a specific location.

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ELECTRONICS INDUSTRY AWARDS 2020: WHO WILL WIN BIG?



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Every sector of the component industry is represented in our awards scheme, a true reflection of the innovation and development constantly produced by the electronics market

The entries and nominations are in, and what a varied and innovative collection of products, businesses and individuals they are. This year, we have had more entries than ever before and are thrilled to see new and emerging technologies being included in the list, as well as industry giants showcasing their incredible solutions for a wide range of industry applications. Every sector of the component industry is represented in our awards scheme, a true reflection of the innovation and development constantly produced by the electronics market.

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EXPERT JUDGING PANEL

- Adam Fletcher, Chairman of ecns and IDEA
- John Biggs, ITSA Chairman
- Peter Hannon, ITSA Deputy Chairman and Managing Director of Harting UK
- Svetlana Josifovska, Editor of Electronics World
- Nicholas Hill, Chief Executive Officer of Plextek

- Andy Stubbings, UK Managing Director of Noritake Itron

Following on from the success of last year's judging panel, CIE have decided to include contributory scores from an extended group of industry insiders. Returning to the fold for the 2020 awards is Adam Fletcher, who is chairman of the Electronic Components Supply Network (ecsn), the business association established in 1970 that offers support to all organisations with an interest in electronic components throughout their entire lifecycle. He is also chairman of the International Distribution of Electronics Association (IDEA), and CIE's most valued commentator, writing monthly insights on the trends shaping our industry.

We are also delighted to introduce new members to the Electronics Industry Awards judging panel. We're hugely excited and grateful to announce that ITSA (Interconnect Technology Suppliers Association) chairman and industry heavyweight John Biggs has offered his expertise to help decide the winners. Biggs is joined by his colleague and fellow

market leader Peter Hannon, who is not only the Managing Director of Harting UK, but is also the Deputy Chairman of the ITSA, too. Both men have extensive experience and are well equipped to make informed choices.

Electronics veteran and editor of Electronics World, Svetlana Josifovska, is lending her technical eye to the task of choosing the 2020 winners. Her knowledge will be invaluable to the process and we're thrilled to include her opinion on the latest electronic products and solutions. Chief Executive Officer of Plextek Nicholas Hill has agreed to be one of our illustrious judges this year. His company have produced some incredible innovations over the past 20 years including an immersive virtual reality training simulation for military and air force, an adaptive FPGA-based System on a chip (SoC) Imaging, a tinnitus and hearing loss early warning detection system and a millimetre wave micro-radar system to enable autonomous emergency resupply by unmanned air systems. Our final judge is Andy Stubbings, who is the UK Managing Director of Noritake Itron, the market-leading electronics manufacturer, and is perfectly placed to utilise his extensive know-how and technical expertise to the task of judging.

There are so many ways to get involved and support this one-of-a-kind industry event. To find out more about sponsorship opportunities for the Electronics Industry Awards 2020 please get in contact with Harriet Campbell by emailing hcampbell@datateam.co.uk.

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The revolutionary ZeroCabinet from **PULS Power**, the specialist manufacturer of high reliability DIN-Rail power supplies, meets the growing need for flexible, modular power systems for machine building and process engineering

Decentralisation of system components has proven to be an important factor in modern system planning as it simplifies installation, enables expansion and reformatting of systems, and simplifies maintenance. In addition, conventional control cabinets can be replaced by smaller versions or even removed completely.

The ZeroCabinet from PULS is a new type of power supply that was developed specifically for this environment. A decentralised power supply with protection to class IP54, IP65 or IP67 that is available ex stock, is easy to install and flexible enough to meet the diverse requirements of modular factory automation.

Traditional industrial systems designed with a central IP20 rated power supply will have long cable runs to peripheral devices in the field and will require costly large cross-section cables to minimise losses. It is also common for such a power supply to be over specified to compensate for any potential cable losses. ZeroCabinet is the alternative to a power supply in a centralised control cabinet. It provides an energy efficient, point of load, modular system structure which is simple to expand and maintain.

Two versions of the PULS ZeroCabinet are available both offering either 300W or 500W power output.

The high-power single DC output Basic series ZeroCabinet, which can be connected in parallel to increase total output power or form an N+1 redundant system using integrated high efficiency MOSFET decoupling (Oring).

Decentralisation of system components has proven to be an important factor in modern system planning as it simplifies installation, enables expansion and reformatting of systems, and simplifies maintenance

The eFused series which may be specified with up to 4 current-limited DC outputs and may be configured for NEC Class 2 circuits. This power supply simplifies the implementation of selective power distribution, protection and monitoring directly in the field. The eFused series is a space-saving power

supply system featuring integrated current-limited outputs and is a real alternative to a power supply unit with an external electronic protection module. Special features include staggered output activation, protection of sensitive loads through prioritised outputs and selective shutdown in the event of a fault.

PULS ZeroCabinet power supplies may be used for the decentralised supply of 1-phase or 3-phase systems and machines and feature a no potting Eco-friendly modular design which may be specified with IP54, IP65 or IP67 for reliable protection against ingress of dust and water.

Key features include an LED interface providing system status and immediate diagnosis in the field, output voltage and the current-limited outputs (eFused series) may be monitored and set directly via the LED interface and the push buttons on the front of the device or remotely via IO-Link. Various connector options enable the power supply to be installed flexibly and directly on the machine. DIN-Rail, integrated keyholes or screw mounting with no additional accessories required.

ZeroCabinet is available with input voltage ranges 1-phase 85 – 264V, 1-phase 170 – 264V, 3-phase 320 – 550V, output voltage from 24 – 28VDC, output power 300W or 500W, efficiency > 95 per cent, an operating temperature range from –25 °C to +55 °C without any loss of performance and has dimensions (WxHxD) of 181 x 183 x 57mm.

The potential applications of PULS ZeroCabinet are virtually limitless and include modular applications in the field of conveyor systems, storage technology, robotics, control systems and materials handling.

Marco van der Linden, UK country manager, for PULS comments: “Our new ZeroCabinet decentralised power supply offers designers of industrial systems a cost and space saving alternative to conventional power distribution. ZeroCabinet makes it possible to use shorter and smaller cross-section cables which reduces both the cost of cabling and of its installation. In addition, an all-in-one device can be used instead of several components simplifying system design and reducing inventory.”

For more information on PULS ZeroCabinet visit <https://www.pulspower.com/products/din-rail-power-supplies/ip54-ip65-ip67-power-supplies/>

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WIDELY-ACCESSIBLE WIRELESS CHARGING CAN INCREASE EV ADOPTION

By Patrik Kalbermatten, distribution promotion product management magnetic, Sensor & Actuator at KEMET Corp

As modern cars become more connected and functionally reliant on complex electronic architecture, the vehicle manufacturing industry could finally be preparing to bid farewell to the internal combustion engine (ICE). A growing number of drivers are already eyeing up the possible benefits of purchasing an electric vehicle (EV), but the mainstream adoption of EVs will not only require time but also engineering innovations to eliminate the practical concerns of potential consumers. As part of efforts to change consumer attitudes, passive component manufacturers such as KEMET are working towards the development of improved solutions for EV systems, such as wireless charging.

The advantages of EVs are numerous, such as lower operational costs, excellent safety features and zero direct carbon emissions. However, perhaps because vehicles are such a long-term, high-value purchase, the majority of drivers still feel unsure about investing in a fully electric vehicle. Two of the main reasons for this hesitance are centered around vehicle price and concerns about the range of EVs on a full charge. This so-called 'range anxiety' can be slightly irrational, as a 2011 study showed that although the average driver only travels around 40 miles (64 kilometers) per day, regardless of whether they lived in urban, suburban or rural areas, over 50 per cent of the survey's respondents indicated that they would require a range of 200 miles or above in order for them to consider switching to an EV.

CHARGING POINTS: A WAITING GAME

Understandably, no driver wants to face the prospect of making a longer than usual road trip with an electric car that will not be able to make it to the destination and back on a full battery. As public charging infrastructure is still in its infancy, most EV owners rely on an overnight charge from a basic 1kW Level 1 charger that plugs into a standard wall outlet. However, with a range capacity of over 100 miles, an EV battery could take around 20 hours to obtain a full charge, and for a 250-mile range battery, up to 43 hours of charging may be required. It is thus clear that home charging will not be entirely sufficient for EVs as range continues to be increased.

Increasingly found in urban parking spaces, faster Level 2 chargers bring down the total EV charge time considerably, but for many consumers with ICE vehicles this will not be fast enough to compete with the convenience of quick refueling at a gas station. The highest-powered chargers currently available, Level 3 DC Fast Chargers (DCFC), begin to bridge this competitive gap, but currently they are rarely found at public charging points, and they are also not always compatible with all makes and models of EVs.

IMPROVING ACCESSIBILITY WITH WIRELESS CHARGING

For the majority of consumers to find EVs practical enough to drive with confidence, a mixture of different charging options must be made widely available, including wireless charging. Similar in principle to wireless charging for mobile phones, resonant magnetic induction is used to transfer power from a charging pad on the ground to a receiver positioned on the underside of an EV. Currently, wireless charging can be transferred at rates ranging from 3.3kW to 20kW.

A Wireless Electric Vehicle Charging System (WEVCS) infrastructure can be implemented in urban areas, with transmitters embedded in public parking spots. This would enable EVs to recharge incrementally every time they park, without requiring any intervention from the driver. Additionally, a dynamic WEVCS (D-WEVCS) could be built on areas of public roads such as highways, with a series of embedded charging transmitters that would recharge EVs while they are in motion. Dynamic charging could be most useful for buses and taxis, with charging points placed along dedicated bus lanes, at bus stops or at pickup/drop-off points.

In both a static and dynamic WEVCS, the transmitter takes AC power at 50–60Hz, and after rectification and power factor correction (PFC), the inverter produces an AC output of 80–160kHz to the power transmitter coil. The power generated from the transmitter is then coupled into the receiver coil on the underside of the vehicle, which generates a stable DC power supply to charge the battery, controlled by an electronic battery management system (BMS).

FINE-TUNING WEVCS EFFICIENCY

In any system, reliability and energy efficiency are two of the most important elements for designers to achieve, and the WEVCS is no exception to this rule. The wireless charging infrastructure will be constantly exposed to moisture, extreme temperatures and physical force. The components in both the transmitters and the receivers will need to be rugged enough to withstand these challenges, and thus KEMET offers environmentally-hardened chokes and filters designed expressly for EV charging applications, with new materials developed for smaller components to minimize the size and weight of the receiving equipment mounted on the EV.

Wide bandgap (WBG) power semiconductors are essential in both the transmitter's inverter and the receiver's AC/DC converter to enable safer, more efficient power conversion at the wireless power transfer frequency. A better class of ceramic capacitor with superior capacitance

stability over temperature and voltage is required for these semiconductors to manage very high ripple currents. KEMET's KC-Link multi-layer ceramic capacitors (MLCCs) offer a robust proprietary CoG/NPO base metal electrode (BME) dielectric system that results in very low equivalent series resistance (ESR) with high thermal stability. Moreover, the effective series inductance (ESL) can be minimized as the capacitors are mechanically robust enough to be constructed without a leadframe, also supporting miniaturization efforts further.

In order to maximize the power transfer efficiency, the inductive coupling of the transmitter and receiver coils can be optimized to reduce the need for precision alignment in order for charging to take place, as obstacles may prevent the driver from positioning the vehicle perfectly over the charging pad. Alternatively, research has shown the development of autonomous self-aligning receiver coils can enable consistent charging of up to 5kW at over 90 per cent efficiency.

To aid this optimization, the application of shielding materials to the power transmitter and on-board receiver can help to provide a stronger directional magnetic field, thereby further increasing power transfer efficiency. KEMET has developed high-permeability sintered ferrite tiles that effectively minimize magnetic flux losses and are AEC-Q200 qualified for automotive applications.

With growing demand for EVs, particularly those featuring increased range, there is an urgent need for faster, more convenient charging options in public areas. An easily-accessible wireless charging system is an appealing concept to be added to the EV charging mix, and a dynamic wireless charging system is also possible to charge vehicles as they travel. Making charging widespread, easy and accessible through wireless "top-ups" may help to eliminate range anxiety for consumers and finally make EVs truly competitive against their ICE counterparts.



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What to look for in a 'waterproof' connector

When a customer asks for a 'waterproof' connector, it is often a mystery as to what exactly they require. Unfortunately it is often also a mystery to them!

They just don't know what they want and often end up specifying a totally unsuitable product. In a world where, increasingly, RF, microwave and electronics products generally are used externally, in harsh environments and in situations where fluid ingress is an issue, it is critical that the customer is clear on his requirements and equally, the manufacturer/supplier is an expert in the different methods of ensuring that the integrity of the seals are sufficient to meet the needs of the application.

One area which is often 'forgotten' is the unsuitability of certain materials in certain environments. For example, Intelliconnect have developed, in conjunction with our supply partners products manufactured from materials such as Nickel Aluminium Bronze for salt water applications and special proprietary rubbers for sealing gaskets and O rings.

The following brief case study demonstrates some of the challenges that we first faced when developing our waterproof Pisces range:

Back in 2004 a major international manufacturer of Personal Locator Beacons, approached us and requested that we design for them a range of special TNC connectors. Simple enough, we thought, we can do that!

"Good", said the Customer, but the quantities are quite small, in the hundreds, in fact".

"No problem there, we'll make a one off if you want it!"

"Yes", said the (potential) Customer, "but they need to be waterproof (mated and unmated)".

"OK that's fine, a piece of hermetic glass in the rear end will do the trick!"

"Ah no we've already had a look at those and they're far too expensive, we want something to work to a depth of 10 metres (1 bar) for four hours but we don't want it to cost too much more than a standard connector, oh and because it's a safety related military product, we need it to be highly reliable... and we don't want to pay an NRE charge"

"Umm ok, anything else?" we asked in trepidation.

"Yes, we need product on our dock in eight weeks"

So, we had an interesting problem on our hands. To design, develop, sample, machine, plate assemble and deliver a range of four different connectors with a completely new feature, in the space of eight weeks!

Our design teams in Crossville Tn and Chelmsford, Essex UK, set to work. The connectors themselves were relatively simple bulkhead jacks and right angle cable plugs. The problem, of course, was how to make them waterproof... and that the sockets and the cabled plugs both presented a different set of challenges.

The primary challenges were:

a) Waterproofing the bulkhead jacks so that there was no ingress of water into the beacon when unmated.

b) Waterproofing the plugs so that there was no ingress of water into the cable, either through the face of the connector or the cable crimp area.

c) To ensure that materials were capable of withstanding prolonged exposure to salt water and still maintain a seal.

d) To design the product so that it was manufacturable and cost effective.

e) Above all to prove the integrity of what we designed/made to the highest possible safety levels because this was a potential life or death situation product.

After many late nights, meetings with the Customer, transatlantic teleconferences, trials and tests and a huge amount of advice from specialist vendors, solutions were arrived at.

Like most great idea's it was ultimately a very simple one. Early on in the design process, the use of O rings was mooted as a potential way of internally sealing the connectors but was quickly discarded as being too simplistic and potentially unreliable. The sealing properties of PTFE (Teflon) was looked at, epoxy sealing was investigated, glass was reviewed, some very strange ideas were brainstormed and all were discarded. Were we to fail? No, failure was not an option. Our pride as engineers (not to mention a nice order) was at stake here and we would not be beaten.

But what to do? We had brainstormed until we had very few brains left to storm! "What about that idea of using 'O' rings?"

"Let's look at it again."

...and therein the answer lay. With much help from our O ring vendor, a special material was specified which would conform to sealing and other mechanical requirements, other components were specially designed, FMEAs and design reviews were carried out and now we could finally make prototypes.

Initial prototypes were made (not without some considerable pain) and our Rube Goldberg style test equipment was brought into play. Jacks were tested using air at a pressure of 3 bar for 12 hours (twice the pressure and time that the customer required) with no failures.

The right angle cable plugs proved more difficult. The internal sealing was fine but even with using glue lined heat shrink sleeving there was a small amount of water seepage into the cable after prolonged immersion under pressure. The solution here was to mould a special 'boot' over the connector and cable.

Samples were duly despatched to the Customer and within days the good news came back that they were happy!

Seven weeks and five days after the original enquiry, we were able to deliver the first production quantity with two days to spare.

The Intelliconnect Pisces connector range was born. Since 2005, Intelliconnect has developed a wide range of solutions for Customers waterproofing issues as well as having many 'off the shelf' connectors and cables. Applications range from safety and detection equipment to hearing implants,

Each application has its own challenges and since this time Intelliconnect has developed a special patented sealing system for cable connectors using a special crimp ferrule and developed its test facility to work to a depth of 60m (100psi/7 bar).

All components are sourced in USA or UK and assembly is carried out in Crossville for the North American market and in Corby, UK for the European market.

Products as diverse as Triax, SMA, N Type, Nim Camac, TNC, BNC, MCX and C type have been produced and Intelliconnect have even produced a brand new push on sub-miniature interface. Pisces is now Intelliconnect's fastest growing brand

So the next time somebody asks for a 'waterproof' connector make sure they know what they are asking for. Or alternatively, get them to ask an expert!

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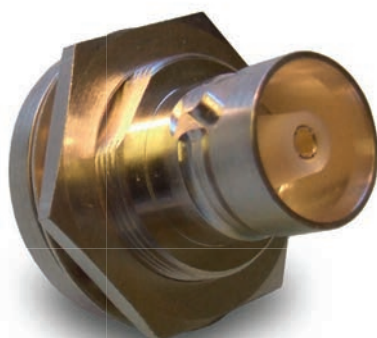
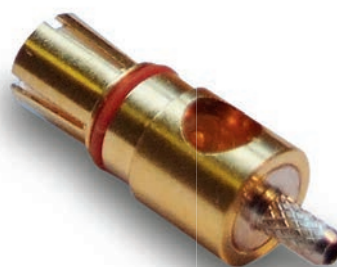
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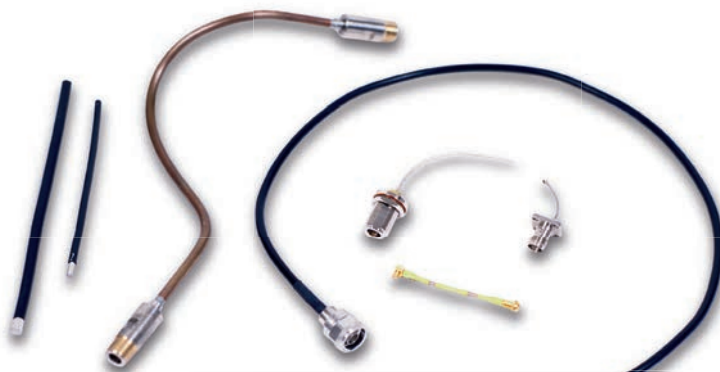
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Microwave Synthesizer offers multioctave frequency coverage and excellent phase noise performance

By Marty Richardson, senior applications engineer, Analog Devices

System frequency and modulation rate requirements continue to escalate with the need for more bandwidth and higher data rates. Low power consumption has become critical as applications once relegated to military and defense enter the commercial sector. These demands come with the caveat that there be no sacrifice of electrical performance or functionality. In order to meet these requirements, including an improved signal-to-noise ratio (SNR), bit error rate (BER), and the high quality of service (QoS) that users are accustomed to, the phase noise of the local oscillator (LO) must improve as well.

The newly released ADF5610 is an integrated phase-locked loop (PLL) and voltage controlled oscillator (VCO) that highlights Analog Devices' efforts to provide a solution that addresses each of these concerns and more.

FREQUENCY COVERAGE

A total of eight octaves are covered by the ADF5610 with the VCO fundamental frequency ranging from 3.65 GHz to 7.3 GHz, which is fed back to the PLL to minimize phase noise. A single-ended output (RFOUT) doubles the fundamental frequency range to provide 7.3 GHz to 14.6 GHz while the differential output simultaneously allows the full operating range of 57 MHz to 14.6 GHz through the use of divide by 1/2/4/8/16/32/64 and 128 settings.

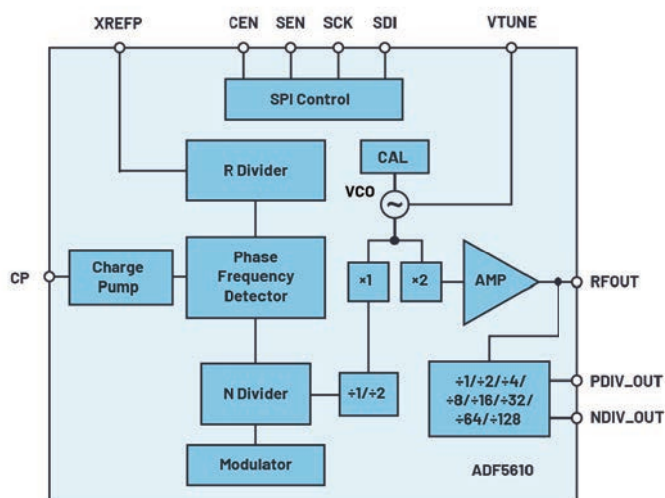


Figure 1. Block diagram of the ADF5610.

The architecture of the ADF5610 VCO allows wideband synthesizer performance while retaining industry-leading phase noise performance with a nominal open-loop phase noise at 10 GHz of -114 dBc/Hz at a 100 kHz offset. An internal state machine allows frequency settling times of under 40 μ s using just a passive loop filter; no need for additional circuitry or lookup tables (LUTs) unless faster settling times are required.

LEADING PLL PERFORMANCE FOR CONVERTER CLOCKS

While the phased-locked loop (PLL) inside of the ADF5610 boasts a modest figure of merit (FOM) of -229 dBc/Hz (-232 dBc/Hz high current mode), when combined with exceptional $1/f$ noise (-129 dBc/Hz) and state-of-the-art VCO phase noise, rms jitter numbers less than 38 fs (1 kHz to 100 MHz integration limit) are possible. This makes the ADF5610 suitable for use in the most demanding converter clock applications. Loop filter resistor values should be kept at a minimum to reduce their thermal noise and a high frequency (100 MHz). An ultralow noise reference source is essential in order to achieve this level of performance.

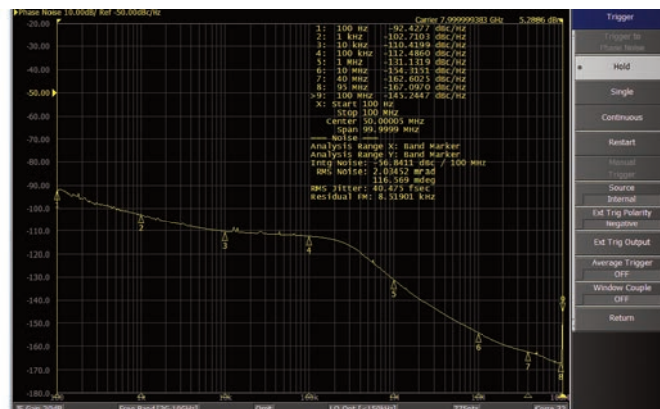


Figure 2. RMS jitter: 8.0 GHz.

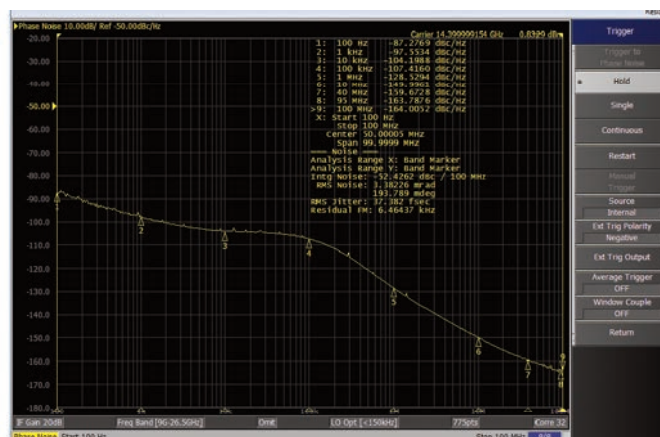


Figure 3. RMS jitter: 14.4 GHz.

COMMUNICATIONS AND INSTRUMENTATION LOS

In addition to its broad frequency coverage, industry-leading phase noise, and exceptionally fast lock times, the ADF5610 has additional features that make it attract most often serve as the local oscillator.

24 bits of fractional resolution are modest, but when paired with the ADF5610's exact frequency mode functionality, frequency generation with 0 Hz error is possible. Using the ADF5610 as the local oscillator allows the active mixer to be driven directly from the RFOUT port due to the nominal 5 dBm of output power, eliminating the need for additional amplification and saving valuable board space. The output power on the differential divider (PDIVOUT/NDIVOUT) is nominally 2 dBm when used single ended, but it can be combined through a low loss balun or hybrid coupler for narrow-band applications to achieve an additional dB or two of output power.

Low power dissipation is essential today and the ADF5610 does its part by sipping less than 700 mW (low current mode with the output divider disabled) to just over a watt under worst-case conditions (high performance mode with the output divider set to divide-by-128). Even in low current mode, the ADF5610's phase noise performance leads in its class, increasing by just 2 dBc/Hz.

The ADF5610 has good spurious performance, with PFD spurious as low as -105 dBc, and in-band unfiltered integer boundary spurs nominally at -45 dBc.

Analog Devices
www.analog.com

SPACE THE EXPANDING FRONTIER

By Roberta Rebora, marketing communications director, **Smiths Interconnect**

The space market is growing and is expected to continue to experience a significant growth over the next years despite the short-term challenges presented by the COVID pandemic. This has been possible because of the diverse range of customers and applications for space-enabled services from commercial telecommunications to institutional surveillance.

Collectively we are 7.7 billion people on this planet with a high percentage using more data every day. We watch and monitor our planet and its environment in greater detail than ever before and are extending the exploration of the far reaches of the universe using more sophisticated long-lasting exploration systems and devices than ever before.

Space covers a wide range of activities from commercial communications satellites, through location-based services to science and exploration initiatives – many of which are extremely high-value projects. Any space-based infrastructure supports a myriad of applications and services – some of which Smiths Interconnect can provide – with the advantage of being a single-source umbrella company that can also provide one-stop shop for critical qualification and testing of products used in space applications.

The industry encompasses not just spacecraft but also the manufacturing of the launchers and the ground equipment. Satellites perform many functions autonomously but need to be operated (supervised and controlled) from the ground and this means that these operational locations require as stringent high-performance reliable component supply networks as anything that is launched into space.

Smiths Interconnect's connectivity solutions have been incorporated into the systems used in highly successful and prestigious space programmes, such as Orion, Solar Parker Probe, and Cosmo SkyMed, just to name a few.

Spacecraft and satellites are certainly among the most fascinating applications of technological advancement due to the extreme conditions in which they operate and certainly due to the longevity of many of these programmes which are set to examine the outer reaches of our Solar System.

For spacecraft which travel into deep space and visit other planets, the journey can take many months or even decades. When they leave the Earth's surface,

they must contend with huge radiation levels, vibration, shock and temperature extremes. This means that manufacturers of the equipment must push technologies and manufacturing capabilities to their limits to ensure that they will not fail during the journey. Failure is simply not an option in space applications, because there is no physical access for maintenance, nor they can be returned to a depot for repair. These harsh environmental conditions require space products and systems to be of exceptional performance, light, rugged, reliable, and durable.

For example, Smiths Interconnect's ruggedised D-sub miniature connectors – designed to withstand the high vibration and extreme temperature fluctuations faced in space – make it possible for Orion's data system to transmit more data than the network used in the Space Shuttle era while also eliminating extraneous signal noise.

Furthermore, they are required not only to meet the primary functions of navigation and communications but to exceed these parameters by offering the safest and most high performing connectivity solutions available on the market. Decades of experience have positioned Smiths Interconnect well – both in designing and delivering active and passive connectivity solutions specifically engineered and optimized to mitigate the effects of heat, shock and vibration and to deliver unparalleled signal integrity, as well as reduced overall system size and weight that are essential in space applications.

Smiths Interconnect's microwave high power waveguide circulators, loads and transitions are used in the data and control transmission systems of the Parker Solar Probe, a NASA robotic spacecraft. Launched in 2018 with the mission of repeatedly probing and making observations of the outer most part of the Sun's atmosphere, the spacecraft has just successfully completed its second close approach to the Sun, the closest any other spacecraft has been before in the history of space exploration.

In within the Cosmo SkyMed Second Generation constellation that is orbiting since December 2019, Smiths Interconnect has provided high performance microstrip circulators embedded into the active antenna Transmitter/Receiver modules, as well as low profile solderless interposers for the core electronics of the satellite. The interposer's reduced size adapts well to



SpaceNXT MWC

extreme space constraints, allowing for a smaller, lighter design of the main equipment and easy installation as well as replacement, options.

The system also included high performance coaxial isolators for the equipment payload, as well as right-angle spring probe connectors for the antenna harnessing connection. These connectors provide streamlined routing of the cable harnessing, therefore, simplifying the antenna's mechanical structure and allowing for a highly efficient plug-in modular approach.

High frequency, reduced footprint, and increased power rating are crucial in SATCOM and 5G broadband applications.

In order to meet the stringent requirements of these market segments Smiths Interconnect has just released its new CTX high frequency wire-bondable chip termination series optimized to combine high frequency and power in a small package.

Using wire bonding techniques, the CTX series allows 5G manufacturers to further reduce the size of their infrastructure in broadband and narrow band applications. This one part can serve in multiple applications thus reducing, both, the customers' bill of material and lowering their cost of ownership.

"We are getting close to the smallest sizes we can go with current thick and thin film ceramic capabilities" says Dave Raymond, product line manager at Smiths Interconnect. "We are embarking on new technologies and materials to further miniaturize components along with combining component functionality into a single device to continue the miniaturization process. New material and processes will be essential in addressing power ratings as miniaturization becomes more prevalent".

Smiths Interconnect will be also releasing a surface mount product in the upcoming months for additional applications for 5G customers.

Roberta Rebora,
marketing
communications director,
Smiths Interconnect



www.smithsinterconnect.com

TOP 10 TIPS TO HELP YOU EFFECTIVELY UTILISE YOUR CONTRACT ELECTRONICS MANUFACTURER



Getting the best solution from your CEM in the 21st century relies on cooperation

For a CEM, building products is an unforgiving environment. A company with their own electronics assembly lines manufacturing boards that go into larger finished products will get things right the vast majority of the time, it's the reaction to rejects that can differ.

A small failure rate of boards built on an in house line may result in an occasional box of rejects being sent back in the direction of the electronics department.

The expectations of a CEM are far greater with tiny failure rates prompting 8D reports and scrutiny of processes to track down the offending loophole. Make a mistake and there is nowhere to hide. The board should, of course, be right.

COOPERATING FROM THE OUTSET

Choose your CEM partner carefully and work with them considering their experience, advice and additional services wherever you can. You need the lowest cost and highest quality so cooperation is imperative from the outset. Your CEM only makes money if they get it right first time and should steer you around assembly issues that could lead to problems.

They can advise the elements of the build that inflate the price, the options they can offer to lower overall costs and optimise yield of the final product.

A CEM has no IP in the finished product and cannot charge a premium because it's the newest, the latest and the

greatest. They are paid by the hour and will have invested in automation to make the magic, routine.

Pennies you have saved in materials from a nifty design trick could easily be lost many times over if it introduces additional assembly time. Budgetary quotations and snippets of advice at an early stage rather than nasty surprises when you've run out of time and options can reap significant rewards.

TOP 10 TIPS:

David Billingham, general manager of SKN Electronics in Birmingham, UK has put together 10 questions you should ask to get the most out of your Contract Electronics Manufacturer:

1. Is it still possible to make minor changes to your design? By doing so you can take full advantage of a CEM's investment in technology and automation. A solder theft pad, a change to SMT or back to through-hole can make a difference.
2. Has your product packaging been considered? The wrong packing method or reliance on the default 'bubble wrap and label' can mean it costs more to pack a board than to assemble it. Rugged, reusable anti-static compartmentalised storage boxes are both environmentally friendly, safe, effective and can have a short ROI.
3. What other additional capabilities and services can your CEM offer to simplify your supply chain? Do they

have in house capabilities such as sheet metalwork, fabrication, painting, coating and toolmaking to consolidate your supplier base?

4. Will your CEM accept free issue components or PCBs to save you handling costs and mean you are absolutely assured of component quality?

5. Do they have modern 3D AOI to inspect millions of joints and placements tirelessly and reliably?

6. Are they geared up for quick changeover between jobs as lengthy downtime can cost more than a production run?

7. Will they offer free labour to build first off assemblies?

8. Are they a true CEM and not an OEM with production time on their hands where you may not be the priority?

9. How does your CEM stand in terms of strength in depth, will a single point of failure in their process stop your order in its tracks or do they have multiple lines and multiple manufacturing sites?

10. Have you asked your CEM to perform functional tests? Your CEM will thank you for being able to ensure the boards really do work which in turn improves your incoming board quality.

Whatever your chosen level of assembly, whether SMT only, full build, or build and test, you must ensure the expectations and responsibility for cost of rectification are clearly laid out from the start. After all, not all faults are assembly errors.

Your CEM will advise the parts of the process where batch size has greatest impact, there could be savings to be had by combining several surface mount batches into one and then spreading the final assembly of the build over a number of months.

Panel sizes are important. Money saved on the bare board price with larger panels can be lost by causing issues with stability through other processes especially on thinner materials. How the boards break out of the master panel needs careful consideration and a well-designed profile will not need rework after breakout. Price negotiation and haggling is normal but advice and guidance is generally free so why not seek it?

SKN Electronics
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COMPLIANCE – REGULATORY RED TAPE, NECESSITY OR OPPORTUNITY TO DIFFERENTIATE?

by Benjamin Khor, ESCATEC's corporate regulatory compliance manager

For many companies, regulatory compliance is just red tape, an expensive overhead that has to be done and, in some cases, worked around. ESCATEC, a multinational EMS provider, takes a different view; by investing in an in-depth understanding of compliance, the company can use this expertise to reduce costs for customers.

Often companies employ in-house experts to understand and manage compliance, supported by external service providers. This specialist knowledge is only known by a few employees which is problematic when someone leaves.

ESCATEC's approach is to just have one in-house expert as a co-ordinator and then make extensive use of a reputable external service provider. This external expert is able to educate a large number of people in the company and along the supply chain on the latest developments through a regular programme that includes frequent webinars, widely disseminating this knowledge and understanding throughout the company and its supply chain.

Compliance covers so many areas from labour to environmental regulations and from corporate governance to specific requirements of specialist product areas. These are the minimum requirements but, by having an in-depth understanding of all aspects of compliance throughout the company, opportunities to save customers' money can be found in many different departments.

By better understanding compliance with customs regulations, ESCATEC's Logistics department found that tax exemptions could be applied to some goods shipped from its Swiss business unit and also from Malaysia where it does much of its contract manufacturing. The savings were passed onto the customer.

ESCATEC as a contract manufacturer was not allowed to sell the surplus components that sometimes remain in stock when a product reaches end of life. Through access to the resources of the external compliance service provider, it discovered that a special license could be obtained to sell surplus stock. This means that ESCATEC's Procurement department has more flexibility in component purchases and can further optimise bulk purchases to achieve even lower costs for customers.



Above: ESCATEC's Suppliers Conference in 2019 in Penang, Malaysia

Below: Benjamin Khor



Compliance stretches throughout the supply chain. Due diligence on compliance by ESCATEC's suppliers is vital; such as ensuring that suppliers significantly minimise any conflict minerals in parts in accordance with the various Conflict Minerals regulations. In addition, supplier compliance is essential to meet regulations such as REACH (Regulation for Registration, Evaluation, Authorisation, and Restriction of Chemicals), ROHS (Restriction of Hazardous Substances), California Proposition 65 and the Consumer Protection Act, all of which can be complex and daunting for suppliers.

ESCATEC reaches out to its hundreds of suppliers to boost their knowledge of compliance requirements via the external service provider's platform, to make their jobs as easy as possible rather than them having to work it out for themselves.

This investment in support by ESCATEC enhances the working relationship between ESCATEC and its suppliers, so they are more prepared to offer better terms of supply that can be passed onto customers. To further support these relationships, ESCATEC hosts its Supplier Conference at its Penang headquarters each year.

ESCATEC's designers ensure that any products designed for customers are compliant not only with existing regulations but also, where known,

pending regulations that will come into force during the lifetime of the product, thus avoiding expensive redesigns. Examples include recyclability for parts used in ships (Regulations (EU) No.1257/2013), the ELV Directive 2000/53/EC automotive requirements for easy recyclability of parts, and the recently announced EU requirement that goods should be designed to be easy to repair.

Since the beginning of the China/US trade war, products made in China have been targeted with import duties. Strong compliance understanding enabled ESCATEC's Export team in Malaysia to rapidly prepare Certificates of Origin to ensure that there was no interruption to shipments or unnecessary tariff costs as the trade war escalated.

In essence, ESCATEC invests in compliance above and beyond the essentials. Having in-depth knowledge enables it to stand out from its competition and helps win business by delivering savings that others would not realise. This commitment to understanding all aspects of compliance also assures customers that ESCATEC truly understands the importance of compliance, giving them greater peace of mind.

ESCATEC
www.escatec.com

SEMICONDUCTOR COUNTERFEITING

The myths and the methods used to uncover the truth

By Ken Greenwood, technical sales manager EMEA, Rochester Electronics



Counterfeits come in many guises. The most basic definition of a Counterfeit is “an imitation intended to be passed off fraudulently or deceptively as genuine, for profit.”

In times of supply shortage, or where component obsolescence limits availability, the prevalence of counterfeit devices often multiplies. As awareness increases, so does sophistication.

We have moved far beyond incorrect manufacturers logos and IC packages with no die inside caught by the simplistic visual inspection testing used by those following AS6081. The Counterfeiters now have very sophisticated operations as the potential gains can be enormous.

Customers whose normal supply routes prove insufficient may assume unauthorised or gray market sources are the only solution; and that “Testing” can eliminate quality risks. Nothing could be further from the truth; but there ARE zero-risk sourcing options available.

WHAT IS A COUNTERFEIT SEMICONDUCTOR?

In the Semiconductor world Counterfeits include:

- Non-Functional or scrap product which is re-marked as good and re-sold.
- Functional yet sub-standard product purchased by the counterfeiter remarked and re-sold as full grade product at an increased price.
- Re-cycled and recovered components re-sold as new.

In all these cases, the process of etching back the original external markings with aggressive chemicals or even mechanical grinders can result in internal bond or substrate damage. Or the chemical residues from the cleaning process, slowly enter and contaminate the device, causing bond-pad or bond-wire failures in-service.

The process of recovering previously used semiconductors from old PCB's can also result in catastrophic heat and/or mechanical damage. Recovery of the IC from the PCB itself is normally the last step of a long scrap trail which includes; a previous working life; and a return-for-recovery route through an uncontrolled storage environment. Exposure to excessive humidity, water, and salt is often routine. This process can produce an authentic used product that has questionable reliability. Authenticity does not automatically mean Reliability.

Identifiable surplus stock and traceability provides no guarantee regarding the storage conditions encountered during the components complete shelf-life.

The consequences of allowing sub-standard product to enter the supply chain may include:

- Reduced production yields



Writer Ken Greenwood of Rochester Electronics

and increased rework.

- Increased in-service failures and reduced reliability.
- Heightened risks and financial liability associated with catastrophic system failure.
- Cost of reputational damage.

WHAT DOES “100% TESTED” REALLY MEAN?

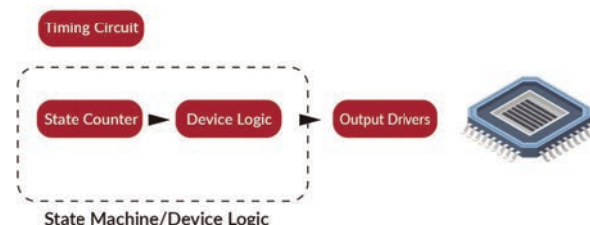
Customers may incorrectly assume “Testing” provides a 100 per cent genuine guarantee. At its most basic, 3rd party testing comprises one or some of the following:

- Paperwork and Visual Inspection: Unlikely to identify the professional counterfeit devices. Traceability documents & certificates are also regularly forged to support the overall deception.
- X-Ray Inspection: Unlikely to identify fraudulently up-screened, well-marked recovered & re-used, or recovered failed-test devices.
- Basic Continuity or Functional Testing: Will not identify the fraudulently upscreened or well-marked recovered & re-used devices.
- Full Functional Testing: The datasheet only provides a subset of the characteristics tested by the Original-Chip-Manufacturer (OCM).

IS FUNCTIONAL TESTING CARRIED OUT OVER THE FULL TEMPERATURE RANGE?

When functionally testing a device, FAULT COVERAGE is critical. Without 100 per cent test fault coverage, the device WILL have residual failures. Residual failures are devices that contain faults, but which PASS the testing used.

Example of Basic Functional Testing: Simple Traffic Controller:



Functional Truth Table												
State Count	North			East			South			West		
	Red	Yellow	Green	Red	Yellow	Green	Red	Yellow	Green	Red	Yellow	Green
1	On	Off	S-ON	Off	Off	On	On	Off	Off	Off	Off	On
2	On	Off	Off	Off	On	Off	On	Off	Off	Off	On	Off
3	Off	Off	On	On	Off	Off	Off	Off	On	On	Off	Off
4	Off	On	Off	On	Off	Off	Off	On	Off	On	Off	Off

If the stuck-at condition above is not tested, then fault coverage is 98.96 per cent. Is this acceptable in your critical application?

Semiconductor test is an intangible process – easy to conceptually understand – difficult to technically implement.

Effective test requires high fault coverage and accurate fault modeling. AS6171 calls out far greater testing for parts bought through Independent Distribution and yet is rarely followed.

The only way to offer a 100 per cent guarantee that a device operates to its specification, is to test it using the original component manufacturer's (OCM) test processes. However, even the most basic MCU test, as carried out by the OCM, comprises many 100,000's of man-hours in development. Third-Party Test Houses cannot hope to replicate these complex test processes, often only partial electrical and/or functional testing is carried out.

The following table referencing standards shows very clearly the only risk-free solution is fully authorised:

Counterfeit Type		Detection Methods											
		Visual & Physical Dimensions	XRF	X-Ray	Marking Permanence or Blacktop	Internal Visual	Basic DC Testing	Datasheet Functional Test at 25C	Datasheet Full Spec Test	Datasheet Test & Qualification	OCM Test	OCM Test & Qualification	
Non-functioning Devices	No Die	Possible	No	Yes	Possible	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
	Wrong Die Re-Marked	Possible	No	Likely	Possible	Likely	Yes	Yes	Yes	Yes	Yes	Yes	
Functions Devices	Failed Real Parts	No	No	No	No	No	Possible	Possible	Possible	Possible	Yes	Yes	
	Refurnished Board Pulls	Possible	Likely	No	No	No	Possible	Possible	Likely	Likely	Yes	Yes	
	Up-Marking	Possible	No	No	Possible	No	No	Possible	Likely	Likely	Yes	Yes	
	Recovered Die	No	No	No	No	Possible	No	Possible	Possible	Likely	Yes	Yes	
	Part Substitution	Possible	No	No	Possible	Possible	No	Possible	Likely	Likely	Yes	Yes	
	Lead-free Re-Marked	Possible	Yes	No	Possible	No	No	No	No	No	Yes	Yes	
	Illegal Copy	Possible	No	No	Possible	Possible	Possible	Possible	Possible	Possible	Yes	Yes	
		AS6081 Visual Inspection					AS6171 Testing				AS6496		
		Independent Distribution					Authorized Distribution					Authorized Distribution	

The ultimate tool in the fight against Counterfeit is AUTHORISATION.

AUTHORISED After-Market Suppliers and Manufacturers (as called out in the US-DoD DFARS), such as Rochester Electronics, provide the only 100 per cent guaranteed and count ors.

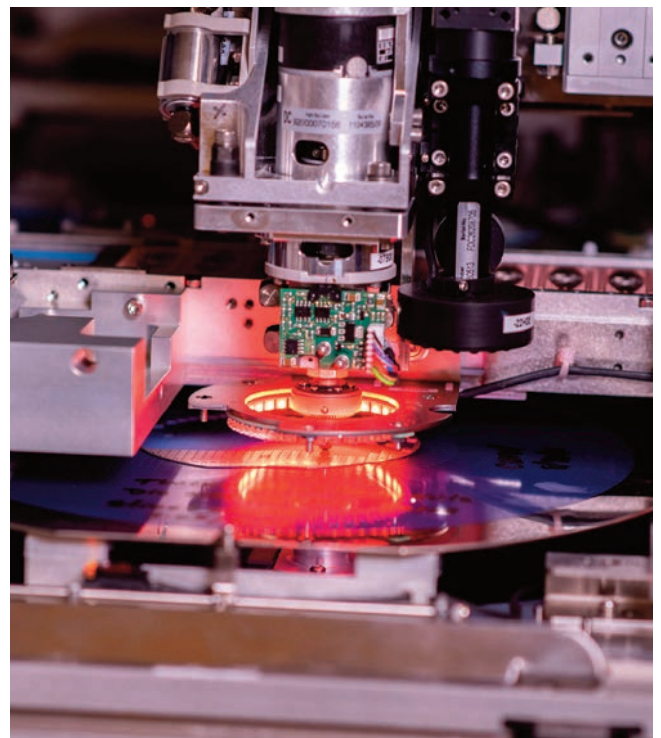
Finished devices stored and supplied by authorised sources are guaranteed to come only from the OCM and to have been stored in-line with the OCM's recommendations. These products offer a 100 per cent conformance guarantee.

As a licensed manufacturer, Rochester Electronics are also able to offer ongoing production of obsolete devices. Built from known-good-die, these products are tested using the OCM test procedures and, in many cases, the original test equipment – **Guaranteed 100 per cent compliant to the original specification.**

Rochester Electronics is authorised by the OCM to mark their products with the original part number and the current date-code. Many of these devices are still in production 20 years after the original discontinuation.

Rochester Electronics

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THE IMPORTANCE OF INSPECTION

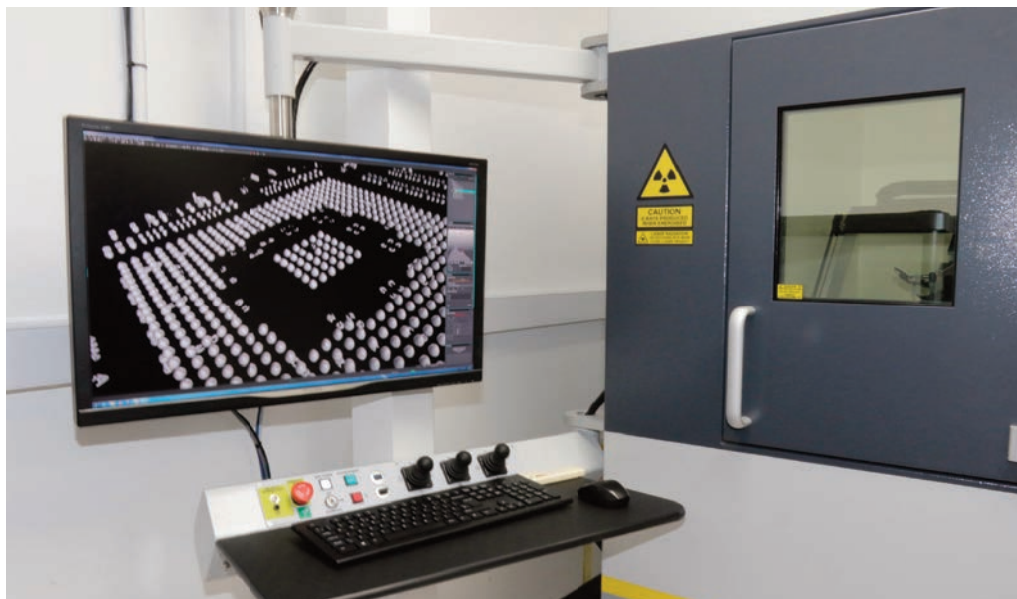


Photo 1: X-Ray inspection

Circuit Solutions (Cambridge) Ltd offers a broad range of electronic manufacturing services to its diverse customer base – from conventional assembly, surface mount assembly, through to full turnkey including box build and test

Their in-depth knowledge and experience along with cutting edge equipment are a good match for their high technology customers with the challenging and complex assemblies.

QUALITY ASSURANCE

Quality of manufacture is key to Circuit Solutions success and in helping to achieve this has been the focus on inspection. Circuit Solutions are proud of their history of quality. Employing their own certified IPC and J-STD trainer, ensures operators are fully trained to the latest industry standards. The approvals achieved are IPC-610 and IPC-620 along with production staff trained to IPC-J-STD-001 and IPC7711/7721 rework and modification. Also, Circuit Solutions is fully compliant with ESD Controls Program to IEC61340-5-2 in all manufacturing areas from goods in through to despatch. These standards supported by a detailed and robust quality management system ensure their ISO 9001-2015 accreditation is maintained.

INSPECTION

Over recent years, inspection has become more challenging with the advancement of more complex circuit designs and miniaturisation of components. Circuit

Solutions carries out inspection on all assemblies at each stage of manufacture as they are fully aware of the importance of 'Right First Time'.

Circuit Solutions have in depth inspection procedures for all stages of manufacture from receipt of components through to despatch of the finished product. These stages are identified as follows:

1. Receipt of Components.
2. Kitting for Production.
3. Surface Mount Assembly.
4. Conventional Assembly.
5. Test.
6. Box Build.

1. RECEIPT OF COMPONENTS

As part of the Goods Received procedure for components, checks are carried out against the purchase orders and includes the description, the part codes, the quantities, and how they are packed. For resistors and capacitors, the values along with tolerances are checked and verified before being placed into stock for use.

2. KITTING FOR PRODUCTION

A 'Works Order Picking List' is generated for each customer job from Circuit Solutions ERP system. Every component on the list is checked as it is 'picked'

from stock, against details which include the part number, format ie reel, strip, tube, etc. The packaging of moisture sensitive components is checked to ensure it has remained airtight and that the 'count-down' label contains the correct information. SMT and PTH jobs are kitted separately and held by stores until required by manufacturing.

3. SURFACE MOUNT ASSEMBLY

The components are loaded onto feeders and then into carts held waiting for the job to go onto the SMT line. At this stage the feeders are checked by quality assurance to verify the correct component is loaded.

After building the first board or panel, the 'first article inspection' process is carried out by quality assurance. This process entails cross checking the original customer BOM with the Circuit Solutions BOM, the Gerber placement files, and the first board or panel assembled. The process can take several hours but ensures that the job will be built correctly, thereby avoiding reworking errors on all the remaining boards.

Any faults found are resolved and corrections made to BOMs and programmes, (this will often involve communication with the customer), **before the OK is given to start the full manufacturing run.**

Once the First Article Inspection is complete, the AOI programme is created and debugged. Where boards contain BGA devices, X-ray inspection is carried out on the first panel to inspect the solder quality on boards that have hidden connections. See photo 1. This will include BGAs, QFNs and specific connectors. If the panel passes for both the AOI and X-ray inspection, the manufacture continues, if not, corrective action is carried out.

The AOI systems will then continue inspecting every component for correct orientation, correct part number, quality of the solder fillet including solder shorts and open circuits. See Photo 2. Boards are taken from the SMT lines and inspected in real time, as they exit the reflow ovens. Any line placement problems are immediately resolved by Circuit Solutions engineering team.

The AOI output file for every board or panel inspected is stored on a dedicated server network, accessible to the rework team via simply scanning the unique bar code on each board. Reworked boards are run through the AOI a second time until they pass. Stored images of each

board tested are kept on file.

4. CONVENTIONAL ASSEMBLY

SMT assembled boards and a PTH kit of parts come together at this stage. The SMT boards are visually inspected by the quality assurance team before any PTH assembly commences. Operators refer to the 'Manufacturing Job Pack' for instructions on which component to fit where on the board. Each job pack is specific to a product type and will accompany the job throughout the entire manufacturing and test process.

Boards are soldered using CSL's two stage selective solder system. The quality of the solder joints are far superior to the older wave solder equipment or hand solder process and allow soldering on all double sided assembly boards with ease.

In general, the PTH component count is far less than the SMT component count and so can be inspected adequately by visual methods using high magnification equipment. Each individual board is manually inspected after soldering.

5. TEST

Many of Circuit Solutions customers require the assembled PCBs to be tested

and then assembled into the final product. Test is normally carried out using a functional test program that includes a dummy unit or test fixture supplied by the customer or built to their specification. This is an important part of the manufacturing cycle as it allows Circuit Solutions to verify that the assembly performs electronically to the customer's specification and is the ultimate verification that all our processes are correct.

6. BOX BUILD

This is the final part of the manufacture process and includes assembling the PCB to any mechanical parts. Final product inspection will include checking the assembly is to the customers drawings, any labels are fitted, serial numbers recorded, scratches or damage, etc and that all the manufacturing inspection sign off's have been completed.

SUMMARY

Circuit Solutions quality objectives includes improving manufacturing quality. Inspection at all stages has had a proven positive impact on these objectives. Improving manufacturing quality is monitored in the production inspection KPI 1st time pass rate. This

KPI includes inspection at the following stages – AOI, Post AOI, PTH and Test. The objective is to achieve the 1st time average pass rate of >98 per cent. As an example for SMT assembly, Circuit Solutions identify all the fault types, analyse and continuously incorporate ongoing preventative actions.

Circuit Solutions

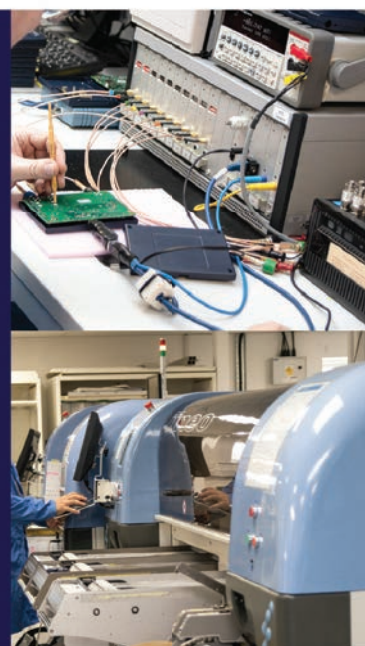
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Photo 2: AOI inspection



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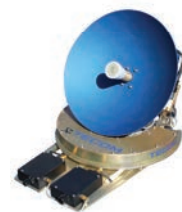
Lattice Semiconductor Corporation (NASDAQ: LSCC), the low power programmable leader, today extended its position as a global provider of FPGA-based embedded vision solutions with the introduction of the Lattice mVision™ solutions stack. The complete solutions stack includes the modular hardware development boards, design software, embedded vision IP portfolio, and reference designs and demos needed to implement sensor bridging, sensor aggregation, and image processing applications.

For more information about the Lattice mVision solutions stack, please visit <http://www.latticesemi.com/mvision>

Smiths Interconnect's KaStream® 5000 MK II antenna system receives Inmarsat Global Xpress approval

Smiths Interconnect, a leading provider of airborne SATCOM terminals and high power transceivers and Inmarsat, the world leader in global, mobile satellite communications, announced that the Smiths Interconnect KaStream® 5000 MK II antenna system has received Inmarsat type approval for use over the Inmarsat Global Xpress network.

The lightweight KaStream® 5000 MK II antenna system is a fully integrated solution that is optimized for use over the Inmarsat Global Xpress Ka-band network and supports both commercial and military modems. It can be used in tail-mount, hatch-mount and roll-on roll-off installations combining the Radio Frequency (RF) electronics, antenna aperture and positioning system in a single Line Replaceable Unit (LRU). This wideband, high-throughput terminal features a 12-inch diameter aperture and weighs less than 25 lbs (~11.4 kg). "Our KaStream® 5000 MK II broadband antenna system is truly unique, in the market, as it offers access to global wideband commercial and military networks. We are very pleased to be partnering with Inmarsat to offer fast, reliable and efficient connectivity on and off the aircraft worldwide," said Ralph DeMarco, Vice President of Business Development and Sales at Smiths Interconnect.



Smiths Interconnect ► + 44 20 8236 2400 ► www.smithsinterconnect.com

New Guideline of FBDi on Product Analyses and 8D-Report

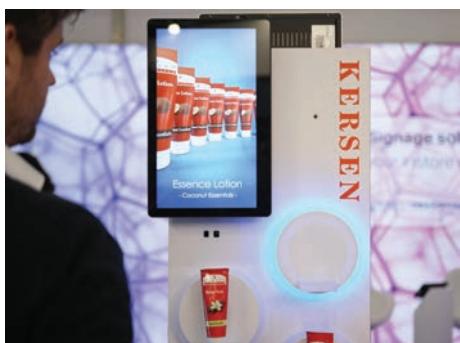


FBDi
► Nassauische Str. 65 A, 10717 Berlin

The FBDi (Fachverband Bauelemente Distribution e.V.) presents a new guideline on the subject of 'Product Analyses and 8D-Report'. The trigger for the development of the guide is that in almost 80% of the complaints about electronic components with requested product analyses or 8D-Reports no fault can be found by the manufacturer. In order to increase quality and throughput speed and to enable realistic assessments, the FBDi Competence Team Quality developed the qualified action guide, which is now available for download in German and English on the FBDi website. (<https://www.fbd.de/wissen-teilen.html>)

► a.falke@fbd.de ► www.fbd.de

Omron vision sensor enhances retail signage



Omron Electronic Components has announced that its Human Vision Sensor forms the heart of a new digital signage accessory aimed at retailers, providing the gender and age of viewers. The Nexosphere X-Eye Gender sensor captures just these specific data points for those standing in front of interactive displays and digital signage, allowing content to be tuned appropriately whilst complying fully with GDPR regulations.

Hubert van Doorne, Business Development Director at Nexosphere, commented, "Retail is continually reinventing itself, and we are helping retailers create new and better experiences digitally. A good and attentive sales assistant will direct customers towards products and promotions relevant to them. With X-Eye we're now able to do the same with digital content."

Omron Electronic Components ► +31 235 681 296 ► <http://components.omron.eu>

Get connected with the Interconnection Specialists

The cable assembly manufacturing service that is offered by Selwyn Electronics continues to grow with increased investment in both our UK and China facilities. This allows us to offer the best possible prices on all of the cable assemblies that we can offer.

The range covers Miniature through to Industrial circular, Ribbon cable, Custom moulded, Waterproof, Coax, Sata (in custom lengths), FFC, Crimp and IDC, and Telecom assemblies, in fact there are very few assemblies that we cannot supply. Just take a look at our website to see the range.

Both facilities are ISO accredited and all assemblies are 100% electronically tested. All orders are controlled from the Selwyn sales office and we can offer a full engineering support service including recommendation of products, drawings, quotations and samples in a short lead time.

Contact us with your requirements and see the benefits of dealing with the Interconnection Specialists.



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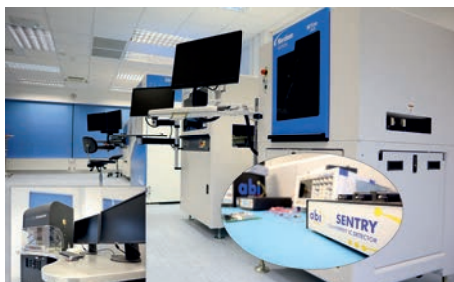


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Nicomatic
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If you can't find the fault, take a closer look

Cupio Services offers a comprehensive X-Ray, optical and acoustic non-destructive analysis service for electronic components and assemblies.

One of the biggest issues in non-destructive inspection is getting a clear visualisation of the area of interest with sufficient resolution to be able to detect the smallest faults. A straight 2D image could mask issues where the correct low angle image can see them easily. Equally CT isn't always the answer as the part in question may be in the middle of a large board. In this circumstance a high resolution reduced angle CT could give you the required images.

Our Nordson Dage Quadra 7 system, with 100nm resolution, full CT and tomosynthesis capability, can image the smallest of structures and our engineers are experienced in the analysis of the images and, if needed, reconstruction into 3D models.

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Medical electronics currently counts as one of the fastest expanding sectors – with growth – creating completely new areas of use and demands for connector systems to match their exact requirements.

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The ever-faster innovation cycle is shaping medical equipment development – therefore suppliers not only need to have a wide range of standard products, but be fast and responsive when only a specific custom solution will solve the problem.

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openings for installation from the inside. Their conical shape allows for easy insertion and reliable sealing of gaps.

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Developing the KDS-DES sealing elements for unassembled cables, CONTA-CLIP has transferred the simple cable entry principle of its KES system to its KDS cable feedthrough system: to insert a cable, the membrane of this, newest sealing element is first pierced at the marked center, whereupon the cable can be pushed through the selected channel. The design based on the proven KES system ensures reliable sealing according to the degree of protection IP64. The KDS-DES variants currently available accommodate up to eight cables, depending on the cable diameter, which can range between 4.5 mm and 10.5 mm. Despite the high packing density, KDS-DES sealing elements are compatible with almost all KDS solutions. Like those, they are pressed into the frame

► www.conta-clip.com

New Round Plastic Enclosures For IoT and Industry 4.0 Electronics



ROLEC has launched technoDISC – a unique round plastic enclosure for industrial electronics. It is based on the firm's successful aluDISC diecast aluminium housings. The new technoDISC cases are UV-stable and sealed to IP 66 (IP 67 optional), making them ideal for Industry 4.0 and IoT applications both indoors and outside. The round design integrates visually when used in applications such as industrial pipework, shipboard equipment, vehicles etc.

These 'go anywhere' enclosures can be fitted to walls, bulkheads, machines – even when closed (protecting the seal and electronics during installation). Clip-on POM (polyoxymethylene) trims cover all the fixing and mounting screws.

New technoDISC's smart design was inspired by the shape of a wristwatch, combining round aesthetics with flat surfaces to enable the mounting of cable glands and controls. The lid is recessed to accommodate a round membrane keypad or product label.

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IDEAL NETWORKS TAKES TEST REPORTING TO THE CLOUD

IDEAL Networks has introduced IDEAL AnyWARE™ Cloud, a new test management system which makes managing, editing and sharing reports easier than ever for installers and technicians using LanTEK® IV cable certifiers.

To make test data management even easier, the secure, cloud-based tool can be accessed, viewed and updated on common web browsers, via PC or tablet. Registration for the free solution can be completed quickly and easily online, and users can select from a choice of nine languages.

Once logged in to the IDEAL AnyWARE Cloud, the intuitive interface provides easy access to data from the LanTEK IV. However, the platform also includes the WalkMe interactive digital help system which provides proactive guidance every step of the way, helping users to complete any key task in the AnyWARE Cloud easily.



IDEAL Networks ► 01925 428 380 ► www.idealnetworks.net



RTI Joins the Autonomous Vehicle Computing Consortium (AVCC) to Help Define an Architecture for Highly Autonomous Vehicles

Real-Time Innovations (RTI) has joined the Autonomous Vehicle Computing Consortium (AVCC). RTI joins leading OEMs, Tier 1 suppliers and semiconductor companies to define the architecture to develop and run highly-autonomous vehicles, and support development phases from research to production.

The amount of technological innovation required to develop highly autonomous vehicles requires the availability of a common architecture that these systems can be based on, regardless of the manufacturer, hardware or software selected. Formed in 2019, the AVCC's primary purpose is to develop a computing platform designed specifically to move today's prototype systems to deployment at scale. RTI automotive experts will work with AVCC members on interface standards, real-time communication and next generation system architecture to advance the state-of-the-art in vehicle design. RTI Connex DDS is built on Data Distribution Service (DDS) standard. Connex Drive is the first software framework that can integrate

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As one of the leading brands in the Electronic and Electromechanical Components market, Würth Electronics are constantly expanding. Over the last year we've integrated IQD Frequency Products into our company, with many of their parts entering the Würth catalogue. We have also recently unveiled our new Wireless Connectivity & Sensors range, increasing our already wide portfolio of products.

As well as being a leading manufacturer, we also supply our parts directly. This, combined with the technical expertise available from our Field Application Engineers and our free sampling service, ensures our place as a service leader in the market.

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Transmille Ltd is a leading manufacturer of calibration equipment, including multi product calibrator's for multimeter's & clamp calibration, electrical test equipment and precision multimeter's for production facilities, service centres & calibration laboratories. Transmille products cover a wide range of accuracy from industrial up to top national laboratories to ensure accuracy and precision at every level.

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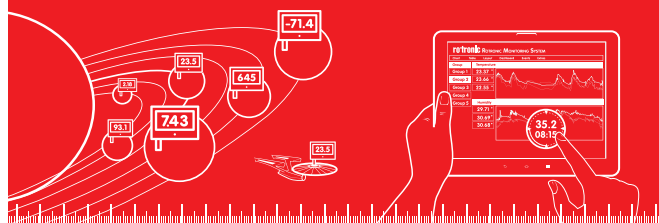


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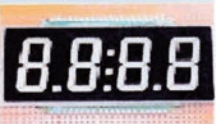



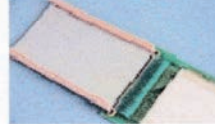

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