New-Tech Magazine Europe

March 2016

Intelligent Systems

DDragonBoard™ 410c

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More Information

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dragonboard410c

DragonBoard 410c supports Android 5.1 and Linux based on Ubuntu at launch and also support windows10 IoT and offers advanced processing power, WLAN, Bluetooth, and GPS, all packed into a board the size of a credit card. It is designed to support feature-rich functionality, including multimedia, with the Qualcomm® Adreno™ 306 GPU, integrated ISP with up to 13 MP camera support, and 1080p HD video playback and capture with H.264 (AVC).

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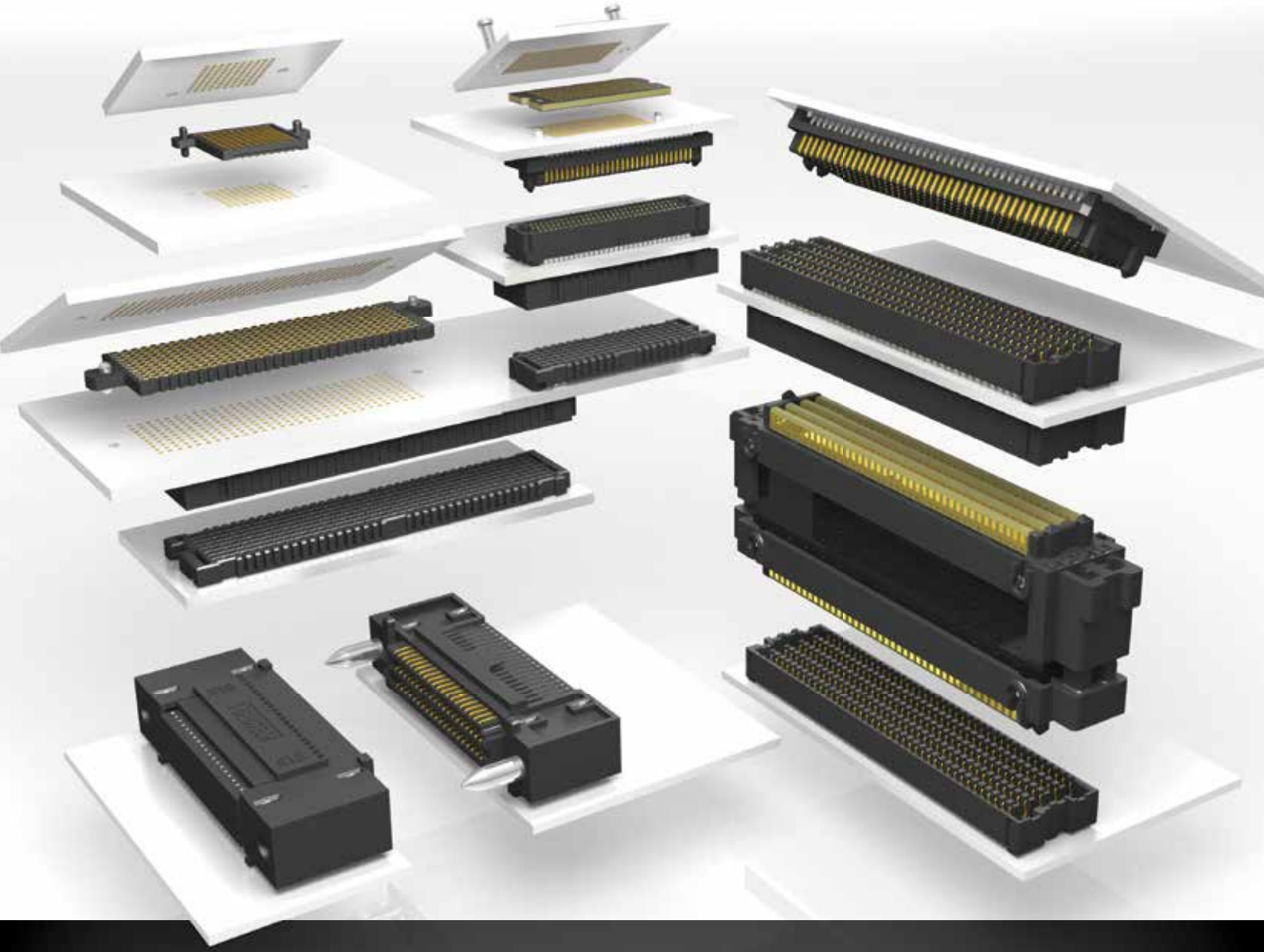

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[i] See datasheet for suggested application circuit.
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New-Tech Europe

Read To Lead

March 2016

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About New-Tech Magazines Group

'New-Tech Magazines' A world leader in publishing high-tech and electronics, producing top quality publications read by tens of thousands professionals from all over the world especially from Europe, innovative electronics, IoT, microwave, homeland security, aerospace, automotive and technological industries.

Our specialized target audiences prefer New-Tech Europe because they know that our publications are a reliable source of the latest information in their respective fields. Our multidimensional editorials, news items, interviews and feature articles provide them with a full, well-rounded picture of the markets in which they operate - an essential asset for every technological leader striving to stay ahead, make the right decisions, and generate the next global innovation.

Moreover, as an attractive platform for advertisers from around the world, New-Tech Europe has become a hub for bustling international commercial activity. Here, through ads and other promotional materials, Israeli readers obtain crucial information about developers and manufacturers worldwide, finding the tools, instruments, systems and components they need to facilitate their innovative endeavors.

Targeting the needs of both the global and european industries and global advertisers, New-Tech Magazines Group constantly expands and upgrades its services. Over the years, the company has been able to formulate a remarkably effective, multi-medium mix of offerings, combining magazine publications with useful online activities, newsletters and special events and exhibitions.

Contents

Flying demo highlights commercial potential of drones in Wales

Government and industry representatives have gathered at Wales's Snowdonia Aerospace Centre to watch Unmanned Aircraft Systems (UAS) take on a series of innovative missions.

The week-long event, hosted by QinetiQ in partnership with the Welsh Government and Snowdonia Aerospace LLP, demonstrated how drones flown from the airfield can help to tackle environmental issues and other commercial challenges.

in managing the threat to the Welsh coast from erosion and flooding.

Unmanned Aircraft Systems (UAS) take on a series of innovative missions

Coastal scenario: erosion and flooding

A Bramor rTK drone, with a wingspan of 2.3m, flew from the airfield and out over the Welsh coast to collect data on the area's vulnerability to erosion and flooding. A high-definition camera took a series of pictures that can be layered to provide a 3D model of the area's topography. The 3D model can be filled with 'virtual water' to indicate which areas would be submerged in the event of a flood.

Around 60 per cent of the Welsh population lives in coastal areas, with an estimated 84,731 properties at risk from tidal flooding. Around 2,000 properties will be at risk from coastal erosion over the next 100 years if there is no active management.

The exercise demonstrated how drones could help to spot the warning signs early, enabling better preparedness and timelier response.

Guests learned how similar missions could be used to monitor flora and fauna in sensitive natural habitats.

Maritime scenario: fisheries protection

A 2.3m Bramor C4Eye drone, equipped with a small video camera, was launched from the airfield and flew out over Cardigan Bay, where it approached a Welsh Government fisheries patrol vessel to collect data on its position.

The activity showed how authorities can investigate vessels for signs of illegal fishing. Authorities can act on the information immediately to prevent further offences, or use it as evidence to pursue prosecutions at a later date.

Welsh Government Economy Minister Edwina Hart said: "Wales is well placed to take advantage of the growing interest and use of drones for a wide range of civilian uses. These trials illustrate the benefits that can be realised and highlight the facilities and expertise available in Wales. We have two unique centres in Wales – at Llanbedr and Aberporth – that have benefited from significant infrastructure investment and are in pole position to maximise these emerging opportunities and attract investment as the technology develops."

Optomec 3D Printing Systems Used in Mass Production of Consumer Electronics

Optomec, a leading global supplier of production-grade additive manufacturing systems for 3D printed metals and 3D printed electronics, today announced its Aerosol Jet technology is being used by LITE-ON Mobile Mechanical SBG (LITE-ON) for high-volume production of electronic devices. LITE-ON, a global contract manufacturer, has pioneered a 3D Direct Printing (3DP) solution that enables 3D antenna patterns and other functional electronics to be integrated into virtually any mechanical structure or cover – maximizing design flexibility, ensuring optimal placement and performance, and allowing slimmer product designs.

"With the flexibility provided by Aerosol Jet technology, our 3DP systems can print sensors, antennas, and other functional electronics onto plastic components and covers as well as metal die-cast insert-molded polymer frames and even onto glass panels and ceramic materials," said Henrik Johansson, Senior Manager, Technology Development Antennas, at LITE-ON. "We see Aerosol Jet as a strategic component of our 3DP solution, which has enabled us to expand into new markets."

LITE-ON first purchased Aerosol Jet technology to develop prototypes for its OEM customers, which include world leading communication device, personal care and

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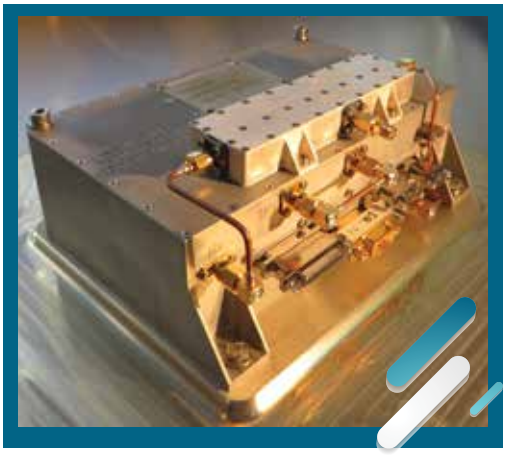
automotive brands. The digitally-driven Aerosol Jet based 3DP process provides full design flexibility, with quick iteration and minimum lead-time for last-minute changes. After successfully implementing Aerosol Jet in prototype environments, LITE-ON expanded its usage and has now deployed multiple production machines in Guangzhou, China, operating 24×7 printing conformal electronics onto millions of consumer devices. Since the 3DP process requires no plating or special resins, logistics are simplified and production costs are lowered.

The open architecture of the Aerosol Jet hardware allows configurations to be optimized for specific production needs. The implementation at LITE-ON leverages a series of Aerosol Jet print modules spread across multiple 5-axis motion platforms, configured to handle common smartphone and tablet form factors. Each machine is able to print a wide range of common electronics materials, at a rate of millions of units per year, enabling next generation applications in consumer electronics, automotive, aerospace, and smart IoT devices. Click herefor video.

"LITE-ON has been an incredible strategic customer for Optomec. Their dedication and commitment was critical to proving the viability of Aerosol Jet technology in a real world 24/7 production setting," said Mr. Dave Ramahi, Optomec President and CEO. "With its unique and in-depth process knowledge in Aerosol Jet printing, Optomec is pleased to recognize LITE-ON as a "Center of Excellence" for High Volume Production of 3D Printed Electronics."

APC provides power for ExoMars launch

APC HiRel has worked with British technology company QinetiQ to supply power supply modules for the ExoMars Trace Gas Orbiter launched.



The Lander, a test bed for technologies being used in future space programmes, features VPT SV Series hybrid isolated power supplies and filters, specified for their high reliability and ability to withstand the mission's radiation levels and harsh operating environment.

VPT Dc-Dc power supplies were supplied for the UHF transceiver for the Lander and will also be fitted to the Rover for the 2018 mission.

It was critical that both power supplies and filters met Class K, the top level of screening and test for hybrids, frequently used for space missions to ensure the very highest level of reliability.

Class K typically requires parts to be "burned in" for up to 160 hours at elevated temperatures, exposure to shock and vibration tests, and require pre-cap inspections.

Most importantly under the DLA (Defence Logistics Agency) approved radiation plan, MIL PRF 38534 Appendix G, characterization and testing is performed at the critical semiconductor component piece-part level (radiation lot acceptance testing) from traceable semiconductor lots. This marks a fresh alternative from traditional suppliers where radiation testing has to be carried out after assembly.

VPT SV Series power supply modules are one of the first to supply product with DLA radiation component testing, making them more cost and time efficient.

The ExoMars programme is a collaboration between the European and Russian Space Agencies. The Orbiter was launched this morning from Kazakhstan on a seven-month mission to monitor temperatures and trace gases on the red planet.

One of its primary goals is to discover the existence and sources of methane on the planet, providing further information about whether life has ever existed on Mars. The Orbiter measures 3.5m by 2m by 2m and has 17.5m of solar arrays. The launch mass for the Proton-M/Breeze-M launch vehicle totals 4332kg (including fuel and the Schiaparelli launch vehicle).

A second Rover mission will follow in 2018, also using VPT SV Series Dc-Dc power supply modules.

Latest News

STMicroelectronics Showcased Latest Innovative Internet-of-Things Enabling Solutions at IoT Asia 2016

STMicroelectronics, a global semiconductor leader serving customers across the spectrum of electronics applications, demonstrated its latest innovative solutions for the Internet of Things (IoT) and a smarter world at IoT Asia, Singapore Expo, March 30-31, 2016.

With the rapid proliferation of Connected Things, estimated to reach 8.6 billion in 20201, the IoT is widely ac-cepted as a key to building a future with infinite possibilities. ST has been a pioneer in enabling the IoT and its technologies have been making everything smarter, fuelling the first wave of augmented things - Smart Things, Smart Driving, and Smart Cities, among them. ST is found everywhere that semiconductors are making life better, delivering the hardware, software, and tools that are necessary to drive this Smart-Things revolution. With its broad and comprehensive portfolio, the Company remains the undisputed leader in providing all the functionality and ecosystem needed to build Smart Things and IoT applications: processing (secure, ultra-low-power, high-performance, and economical microcontrollers); sensing; connectivity; power and energy management; and analog. At IoT Asia, a key industry platform for governments, industry, and technology leaders to foster closer partnerships in the area of IoT, ST will highlight its IoT experience by featuring a rich portfolio of solutions that are leading the transition of the city to a Smart City (and of workplaces and factories to smart workplaces and smart factories).

A key highlight of the ST booth will be the next-generation Smart Building demonstration illustrating a variety of solutions developed using a comprehensive array of ST technologies. The demo features a number of STM32 Nucleo development boards and STM32 Nucleo expansion boards equipped with different sensors, communications features, motor drivers, security, and power devices. ST will also showcase its STM32 Open Development Environment that combines modular hardware with comprehensive software offering a fast and affordable way to prototype and develop Smart Things and IoT applications with state-of-the-art ST components. Simplified and accelerated product development and reduced time-to-market is possible thanks to ST's platform-ready solutions and ecosystem. The Company's broad portfolio enables Smart Living by improving the quality of life by making everything smarter. During the Smart Cities Track on March 31, Franck Martins, Senior Microcontroller Marketing & Business Development Manager for STMicroelectronics' Asia Pacific Region presented case studies on ST solutions powering IoT applications and how these represent some of the best-in-class technologies for Smart City developments.

Littelfuse Completes Acquisition of TE Connectivity Circuit Protection Business

Littelfuse, Inc., today announced it successfully completed its acquisition of the circuit protection business of TE Connectivity Ltd. for $350 million in cash. The circuit protection business has a leading position in polymer-based resettable circuit protection devices, with a strong global presence in the automotive, battery, industrial, communications and mobile computing markets. The acquired business has operations in Menlo Park, California and manufacturing facilities in Tsukuba, Japan and Shanghai and Kunshan, China.

Littelfuse will continue to produce and sell PolySwitch® devices, 2Pro® devices, PolyZen® devices and other circuit protection products that are part of the acquisition.

"This is an exciting day for Littelfuse," said Gordon Hunter, CEO of Littelfuse. "With this acquisition, we have strengthened our core circuit protection business - both with new products and new markets. We believe our expanded product portfolio and manufacturing capabilities provide excellent growth opportunities for the future."

Latest News

Samsung presents a new concept of safety on two wheels Smart Windshield

Samsung Italy and Yamaha have announced their collaboration to add a smartphone-connected display to the windshield of a motorcycle. The Smart Windshield concept will display notifications like calls and texts on a head-up display on the screen, with the software designed to be hands-free. This is being undertaken as nearly 25 percent of motorcycle accidents in Italy involve smartphones.

smartphone-connected for Yamaha motorcycle

The windshield pairs up with the smartphone wirelessly and shows call or SMS notifications, incoming emails, messages and more and this aims at reducing distractions to the rider.

The screen is transparent and located low on the windshield so it doesn't obscure the rider's vision. It connects through wi-fi and has a dedicated app to relay information. This will also show directions to the user with the help of GPS.

Samsung is developing this technology as part of its global Launching People communication project and Yamaha has offered its Tricity scooter as the test vehicle. While it's still a concept, Samsung is hopeful that the concept could be the future of safer motorcycle riding.

Dyson developing an electric car, according to government documents

Dyson is developing an electric car at its headquarters in Wiltshire with help from public money, according to government documents.

The company, which makes a range of products that utilise the sort of highly efficient motors needed for an electric car such as vacuum cleaners, hand dryers and bladeless fans, last year refused to rule out rumours it was building one.

Sir James Dyson at Dyson's Malmesbury headquarters. Photograph: Adrian Sherratt/Rex

But on Wednesday, the government appeared to have accidentally disclosed Dyson is working on one, along with other big companies outside of the automotive industry, such as Apple. "The government is funding Dyson to develop a new battery electric vehicle at their headquarters in Malmesbury, Wiltshire. This will secure £174m of investment in the area, creating over 500 jobs, mostly in engineering," said the National Infrastructure Delivery Plan, published on Wednesday.

When Dyson CEO, Max Conze, was asked last year if the company was working on an electric car, he said: "We are ruling nothing out. Like our friends in Cupertino [Apple] we are also unhealthily obsessive when it comes to taking apart our products to make them better."

Dyson recently reported profits up 20% in 2015, driven by strong growth in China, and said it plans to invest £1bn in battery technology over the next five years. Last October, Dyson bought solid-state battery company, Sakti3, for $90m, which founder Sir James Dyson said had "developed a breakthrough in battery technology." Asked if the company was, as the government suggested, developing an electric car, a Dyson spokesman said: "We never comment on products that are in development."

The Guardian has also contacted the Office for Low Emissions Vehicles, which encourages the roll-out of electric vehicles as a way to cut air pollution and lower carbon emissions, and is awaiting details on the exact level of funding.

Hitachi and Honda Successfully Develop Prototype of Portable Breath-based Alcohol Detection Device for Vehicle Smart Keys

Tokyo, Hitachi, Ltd. and Honda Motor Co., Ltd.'s subsidiary Honda R&D Co., Ltd. (Honda) announced they have successfully developed a prototype of a portable alcohol detector that is tamper-resistant as it can distinguish human breath from alternative gases and that can be integrated into smart key. This device is capable of distinctively detecting the saturated water vapor from human breath and accurately measuring alcohol level within 3 seconds once a driver exhales breath onto the device. Hitachi and Honda jointly collaborated on this technology development in an effort to create the ideal alcohol detector.

They also developed a system that can show the alcohol level measured by the detector on the vehicle's display panel. It can become an ignition interlock to stop a vehicle starting its engine when it detects a driver under the influence of alcohol.

The effort to prevent or stop drunk driving is global and is an on-going focus of progress in safe driving technology. In Japan, transportation operators are required to use an alcohol detector to test whether professional drivers are under the influence of alcohol before they begin their shifts. Meanwhile, in the U.S., the National Highway Traffic Safety Administration (NHTSA) has launched and directed the development of ignition interlock technology that connects alcohol detectors to a vehicle's engine.

In addition, the Hitachi/Honda device can confirm that the applied gas is human exhaled breath and can detect the level of alcohol at the same time, an enhancement over currently available devices.

Analog Devices' Gabriele Manganaro Elevated to IEEE Fellow

Gabriele Manganaro, an Analog Devices, Inc. engineering director, has been named an IEEE (Institute of Electrical and Electronics Engineers) Fellow for his leadership in the design of high speed converters. Elevation to an IEEE Fellow involves a rigorous evaluation procedure and less than 0.1% of IEEE voting members are selected annually for this prestigious honor.

Manganaro, who holds a Dr.Eng. and a Ph.D. degree in Electronics from the University of Catania, Italy, has been engineering director for high speed converters at Analog Devices since 2010. His career in data converter design spans more than 20 years.

"Gabriele has been a highly visible part of the industry's data converter community for many years, and he was able to contribute to the efforts of ADI's high speed converter group immediately when he joined us more than five years ago," said Dave Robertson, product line director, High Speed Converter Group. "The IEEE award recognizes the breadth and depth of Gabriele's impact over the course of his career. Analog Devices actively supports our engineers' engagement in the IEEE and other organizations to foster technical exchange across the industry."

Gabriele Manganaro, an Analog Devices, Inc. engineering director

Manganaro holds 13 U.S. patents, with more pending. He has been the recipient of numerous scientific awards, including the 1995 CEU Award from the Rutherford Appleton Laboratory (UK), the 1999 IEEE Circuits and Systems Outstanding Young Award, and the 2007 IEEE European Solid-State Circuits Conference Best Paper Award. Manganaro has authored/co-authored 60 papers and three books, including "Advanced Data Converters," published by Cambridge University Press in 2011. He was associate editor, then deputy editor in chief, and finally editor in chief for IEEE Trans. On Circuits and Systems – Part I.

Manganaro served on the technical sub-committee for data converters of the ISSCC for seven consecutive years. He is a Fellow of the IET (since 2009), a member of Sigma Xi, and a member of the Board of Governors for the IEEE Circuits and Systems Society.

Latest News

Sensirion and Digi-Key Electronics announce worldwide distribution agreement

Sensirion and Digi-Key are pleased to announce a worldwide distribution agreement. Digi-Key is now franchised to sell the wide range of sensors developed with Sensirion's patented CMOSens® Technology, which enables the sensor component to be combined with the signal processing circuitry on a tiny CMOS silicon chip. The resulting sensor chips enable precise and reliable sensing of relative humidity, temperature, or mass flow, attaining the highest performance combined with cost effectiveness. Sensirion's many years of experience, hard-won expertise and strong innovative drive have made it the pioneer in sensors. Sensirion products available from Digi-Key Electronics include Sensrion's SHTxx and STSxx digital relative humidity and temperature sensors, LG01 flow switch and bubble detectors for liquids, SDPx series of high-performance differential pressure sensors and SFMx series of gas flow meters. All Sensirion product families have a variety of plug-and-play evaluation kits that support data logging capabilities.

„We are very excited to partner globally with Digi-Key to leverage their exceptional reputation with the engineering community and strong marketing presence. Digi-Key will provide Sensirion customers more options for service and support from design, to prototype and into production. Digi-Key is an integral part of Sensirion growth strategy and we look forward to strengthening the partnership and growing our mutual sales." says David Kenneth, General Manager, North America, Sensirion.

"We are grateful for the opportunity to distribute Sensirion's innovative and comprehensive sensor solutions to design engineers worldwide. Our customers will benefit from the experience and knowledge that Sensirion offers in many different application markets including IoT, automotive, industrial, medical, and more. Our partnership will allow engineers to get their designs and products to market faster." says Tom Busher, Vice President, Global I P & E, Digi-Key.

New 3D printer unlocks 'mind-blowing' possibilities with electronics manufacturing

Installation of a highly advanced 3D printer for electronics at Lawrence Livermore National Laboratory has opened the door for creating miniature circuits on surfaces and substances that could never be used before.

The Optomec Aerosol Jet 500 system, which became operational in January, is capable of printing circuits with a broad range of nanomaterials, allowing engineers to manufacture conductors, semiconductors and microcircuits with an intricacy and flexibility not possible with the Lab's previous technology.

Gabriele Manganaro, an Analog Devices, Inc. engineering director

Perhaps equally important, the 260 square-foot Optomec system can potentially replace an entire 2,700 square-foot electronics prototyping facility, which required a high volume of hazardous chemicals to operate.

Previously, the smallest components created in the facility were limited to 50-100 microns. The Optomec machine can print at 10 microns and also is not limited to copper or metallic inks. It's capable of utilizing a number of conductive and nonmetallic materials, even proteins, and printing on surfaces such as glass, plastic or kapton, a thin heat-resistant polymer. It also can print at any angle in three dimensions, meaning engineers can experiment with 3D-printed antennas, flexible circuits, components for robots and pressure and medical sensors.

"When we use it, we can print at different angles and conform it the way we want," said Dale Kurita, a senior electronics technologist. "There's just unlimited capabilities in the future. This opens up a whole new door for people to look at electronics differently."

Electronics technologist Julian Larregui, who is figuring out how to use the software, said he was amazed by the printer's potential.

Huawei Among World's Top 100 Most Valuable Brands in 2016 According to Brand Finance

Brand Finance's selection criterion for its "Global Top 100 Most Valuable Brands" include a brand strength index (BSI), brand loyalty and marketing investments. The international enterprises on this list boast outstanding comprehensive capabilities. For Huawei, its brand value incorporates both hard power and soft power. Its continued appearance on global brand rankings shows that Huawei has successfully established global awareness of its brand. Huawei is now the mobile phone company with the third largest share of the smartphone market and the first Chinese mobile phone company having achieved annual sales of more than 100 million units.

With this recent selection, Huawei is once again ranked among the world's top 100 renowned brands, after being inclued in the Interbrand "Best Global Brands" for both 2014 and 2015, as well as being selected by BrandZ for its "Global Top 100 Most Valuable Brands" in 2015.

In 2014, Huawei became the first Chinese company to be chosen for the Interbrand "Best Global Brands", when it was ranked in 94th place. In October 2015, Huawei was again ranked among the Interbrand "Best Global Brands", this time rose to 88th place. Huawei was also chosen by BrandZ in 2015 for its "Global Top 100 Most Valuable Brands," ranked 16th among science and technology brands. BrandZ valued the Huawei brand at over US$15.3 billion in 2015, while Brand Finance put the number at more than US$19.7 billion, up 70% from the year before to rank Huawei eighth in terms of growth rate.

At present, Huawei has deployed its products and solutions in more than 170 countries and regions. It also has 16 research institutes in the United States, India, Sweden, Russia, China and other places. In the rapidly changing and growing field of science and technology, Huawei already has world-class innovation and R&D capabilities, and remains committed to innovation and R&D in many scientific and technological fields.

In recent years, Huawei has seen strong growth in its overseas businesses, and its consumer business now ranks third in terms of smartphone global market share. In 2015, Huawei had global smartphone sales of 108 million units, up 44% YoY, with annual revenue over US$20 billion, up nearly 70% YoY. Demand for the flagship Mate 8 just after launch was much stronger than anticipated, and Huawei's other high-end products also have shown remarkably strong brand power. In a 2015 brand research report by IPSOS, Huawei received a Net Promoter Score of 47, ranking third in the world. This means that users of Huawei mobile phones report a positive product experience, which in turn reflects the significant improvement that Huawei has made in its user experience.

No More Power Barriers with Panasonic Assist Robots

Panasonic released a video featuring its assist robots, which support the everyday lives of workers and the elderly. The company has applied the advanced control and sensor technologies that it has developed to create a robot equipped with motors that assist human body mechanics. These robots are safe to use and offer peace of mind. This video highlights the latest developments in Panasonic's assist robots.

Assist Robots for Industrial Use

Power assist suits for industrial use have been developed by Activelink Co., Ltd., one of Panasonic's in-house venture companies.

"Our mission is to help realize a Power Barrier-less Society by offering a helping hand during manual labor and at other worksites" said Hiromichi Fujimoto, President of Activelink Co., Ltd. "We are proposing robotics to help at these worksites, because there will always be a certain level of work that must be done by people, and these power assist suits can help reduce the physical strain during such work."

AWN-03

The AWN-03 was especially developed to provide lower back support. It automatically senses the user's motion when lifting and holding heavy objects, and sends a signal to the motors to rotate the gears. It also raises the user's upper body while pushing on their thighs, and as a result reduces stress on the user's lower back by 15kg.

Latest News

AT&T's LG G5 Smartphone and LG Watch Urbane 2nd Edition LTE Available

AT&T is offering you an early opportunity to purchase one of the premier smartphones of the year and get another one for free. you will be able to pre-order the LG G5 as well as the LG Watch™ Urbane 2nd Edition LTE, the only Android Wear device with NumberSync, at www.att.com and AT&T stores.

AT&T customers can also take advantage of two exciting offers for these devices:

You can buy the LG G5 and get a second G5 free when adding a second line and buying both on AT&T Next.1 Similar to other BOGO offers, this offer is available to new and existing customers. The first phone can be a new line or an upgrade, but the second upgrade must be a new line purchased on AT&T Next 24.

The LG Watch Urbane 2nd Edition LTE is available for $99.99 on a two-year agreement when you buy a LG G5 on AT&T Next. Here's how the BOGO offer works: Available to new and existing customers, Both phones must be purchased on AT&T Next, our popular installment plan, as follows:

The first phone can be a new line or an upgrade.

The second phone must be a new line and purchased on AT&T Next 24.

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"We are excited to offer the latest LG devices along with hot deals and unique experiences such as DIRECTV and NumberSync," said Jeff Bradley, senior vice president, Device Marketing and Developer Services, AT&T. "We're the first carrier to bring NumberSync to the Android Wear platform on the LG Watch Urbane 2nd Edition LTE, which helps you stay connected with the same mobile number that your friends, family, and coworkers recognize. This is another example of how we're adding value through innovative solutions."

Her Majesty The Queen Experiences Samsung Digital Classroom

Samsung Digital Classroom in London, United Kingdom, recently received a visit from some highly prestigious guests. Her Majesty The Queen and HRH The Prince of Wales marked the 40th anniversary of The Prince's Trust by visiting one of the charity's Centres in Kennington, South London. The visit saw the Royal dignitaries hear from young people about how The Trust has helped them find employment or get into education and training. This included a visit to the Centre's Samsung Digital Classroom to see how the technology is making an impact on the interactivity of their lessons.

In the last four decades The Prince's Trust has given over 825,000 disadvantaged young people the skills and confidence to find a job. Three in four young people who receive help from The Prince's Trust move into work, training or education.

Samsung has been a supporter of The Prince's Trust since 2012 through The Prince's Trust & Samsung Celebrate Success Awards and has been introducing Digital Classrooms into its Centres. Each Digital Classroom, equipped with an interactive whiteboard, Galaxy tablets, PCs and digital cameras, creates an enhanced interactive learning environment and gives young people an opportunity to pick up vital digital skills. The Samsung Digital Classroom at the Kennington Centre opened its doors in March 2014. Aleyne Johnson, Head of Government Relations and Citizenship, Samsung UK said: "We are honoured to have received a visit to one of our digital classrooms from Her Majesty The Queen and HRH The Prince of Wales. Samsung shares the desire of The Prince's Trust to enhance the lives of young people. The classroom at The Prince's Trust is part of our wider Digital Classrooms programme, now in its third year. We have been working hard to establish Digital Classrooms at schools across the UK, providing them with access to Samsung's technology, but also teacher training and connectivity, with the aim of making lessons more enjoyable and engaging."

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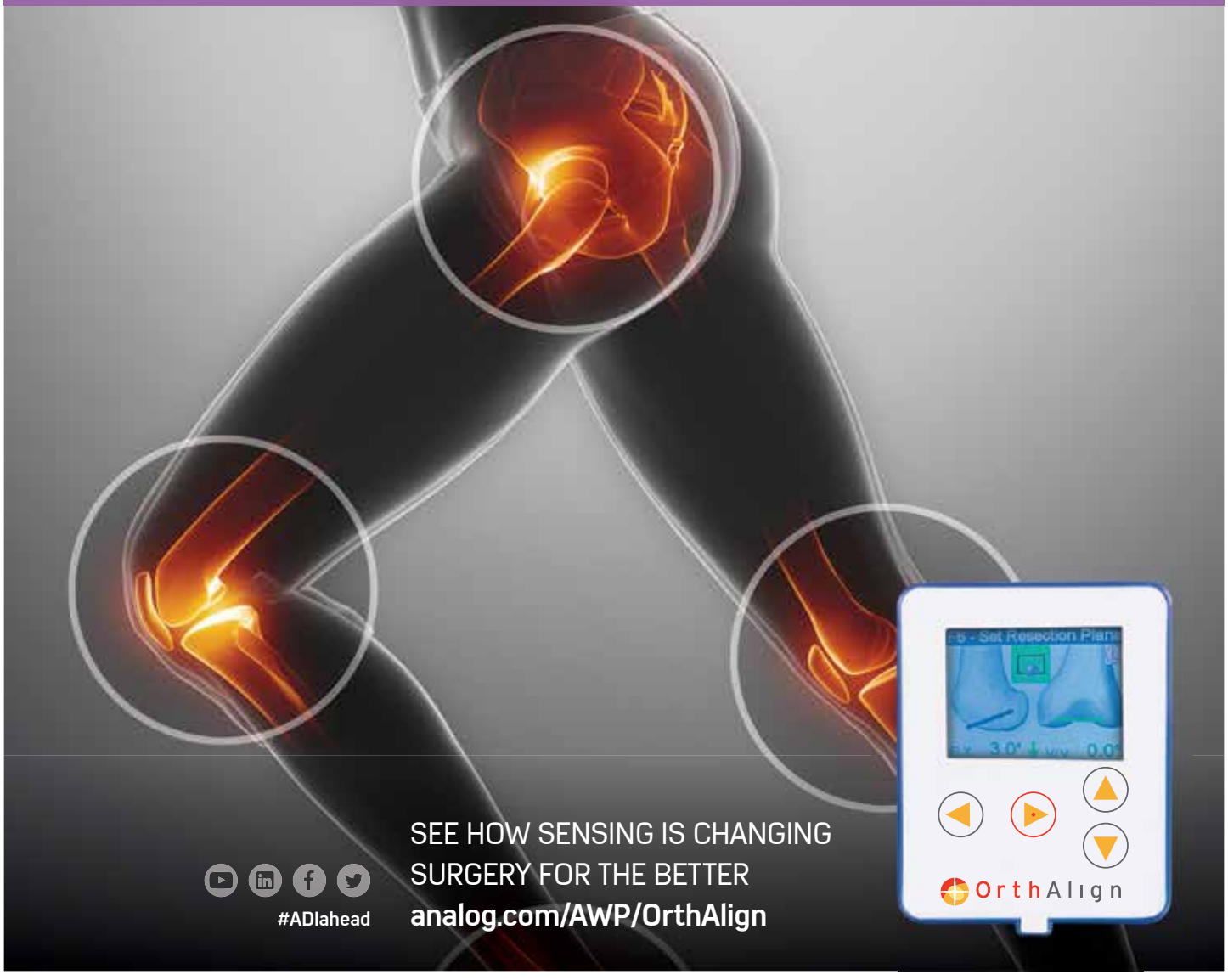

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Op Amp Input Over-Voltage Protection: Clamping vs. Integrated

› Daniel Burton, Analog Devices Inc.

High-precision op amps enable system designers to create circuits that condition signals (amplify, filter, buffer, etc.) while maintaining the precision of the original signal. When information is contained in very small variations of the signal, it is critical that op amps in the signal path perform their operation while contributing very little DC and AC error. The performance of the total system depends on maximizing the precision and accuracy of the original signal throughout the path.

In some applications, a situation may occur in which the inputs of the op amp get driven by voltages outside the level of the supply voltages — called an over-voltage condition. For example, if an op amp is configured to run with its positive supply at +15V and its negative supply at -15V, any time an input pin goes more than one diode drop beyond those supply rails (say, ±15.7V), the op amp's internal ESD-protection diodes can be forward biased and start conducting current. Excessive input current over long periods of time (or even short periods of time if the current is high enough) can damage the op amp. This damage can result in a shift in the electrical specification parameters beyond the datasheet guaranteed limits; it can even cause a permanent failure of the op amp. When system designers are faced with this possible situation, they often add over-voltage protection (OVP) circuits at the inputs to the amplifier. The challenge then is to add OVP circuitry without adding errors (loss of system precision).

How Over-Voltage Conditions Occur

Over-voltage conditions can be caused by a number of different situations. Consider a system where a remote sensor is located in the field (for example, measuring fluid flow in a refinery) and sending its signal through a cable to data-acquisition electronics which reside at a different physical location. The first stage in the data-acquisition electronics signal path can often be an op amp configured as a buffer or a gain amplifier. The input to that op amp is exposed to the outside world and therefore can be subjected to any over-voltage incidents like a short circuit from a damaged cable or incorrectly connecting the cable to the data-acquisition electronics.

Similarly, a situation that can cause an over-voltage condition is when an input signal that is usually within the input voltage range of the amplifier suddenly receives an external stimulus

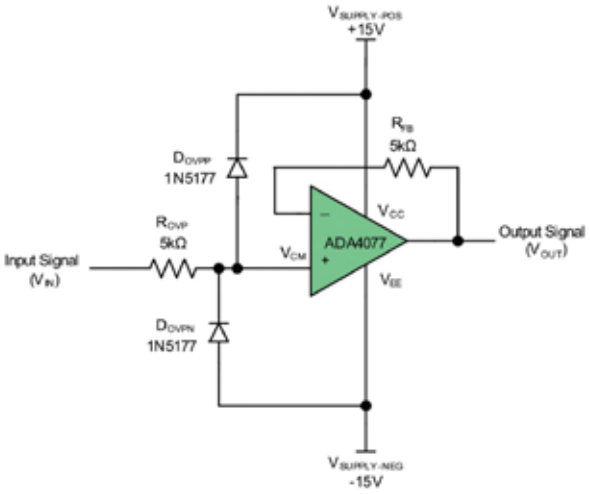

Figure 1: Classic clamping circuit for over-voltage protection

which causes a transient spike that exceeds the op amp supply voltages.

A third scenario that can result in an input over-voltage condition comes from the power-on sequence of the op amp and other components in the signal path. For example, if the signal source (e.g., a sensor) gets powered up before the op amp does, the output of the source can start to output a voltage that will then be applied to the input of the op amp even though the op amp supply pins have no power yet (they are essentially at ground). This will create an over-voltage situation and likely force excessive current through the input of the op amp to ground (the unpowered supply pins).

Clamping: A Classic Over-Voltage Protection Technique

A very popular way to add OVP is shown in Figure 1. When the amplitude of the input signal (VIN) exceeds one of the supply voltages plus the forward voltage of a diode, the diode (DOVPPor DOVPN) will forward bias and send the current to the supply rails rather than into the op amp inputs, where the excess current could damage the op amp. In this application, we are using an ADA4077, an extremely high-precision and low input-offset op amp with a maximum power supply range of 30V (or ±15V). The clamping diodes are 1N5177 Schottky diodes because they have a forward voltage of approximately 0.4V, which is less than the forward voltage of the op amp's input electro-static discharge (ESD) protection diodes; thus the clamping diodes will start conducting current before the ESD diodes do. The over-voltage protection resistor ROVP limits the forward current through the clamping diodes to keep them under their maximum current rating, preventing them from being damaged by excessive current. The resistor RFB in the feedback loop is there because any input bias current on the non-inverting input can cause an input voltage error across ROVP; adding RFB will null out the error by generating a similar voltage on the inverting input.

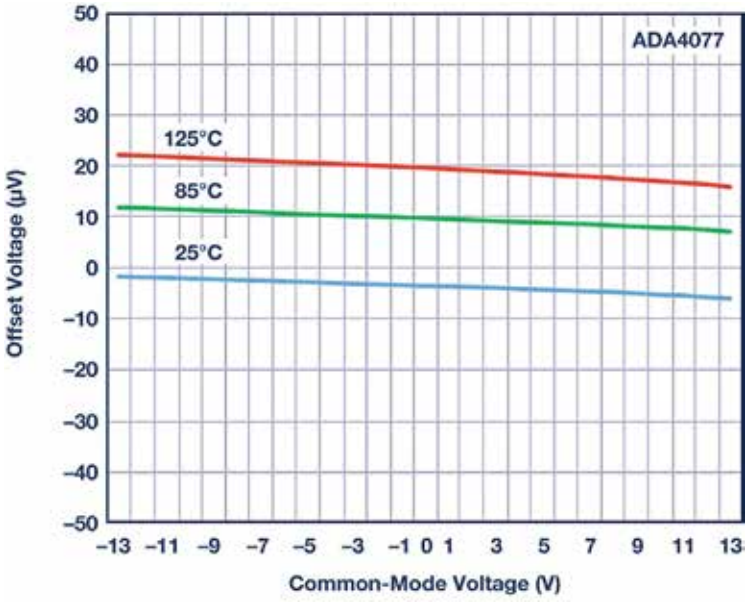

Figure 2: Input offset voltage vs. input voltage for ADA4077

The Trade-off of a Diode Clamping Circuit: Reduced Precision

Although the classic circuit in Figure 1does protect the op amp inputs, it contributes a significant amount of error to the signal path. High-precision amps generally have low input offset voltages (VOS) in the microvolts range. For example, the maximum VOS for an ADA4077 is 35µV over the full operating temperature range of -40°C to 125°C. Adding the external diodes and an overvoltage resistor

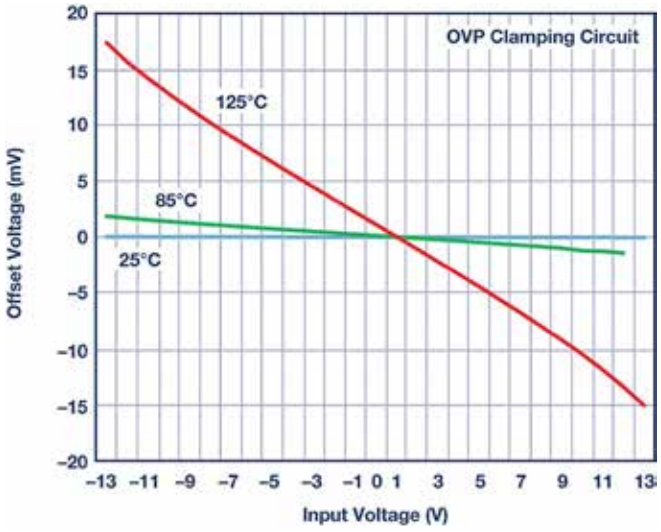

Figure 3: Input offset voltage vs. input voltage for OVP clamping circuit added to ADA4077

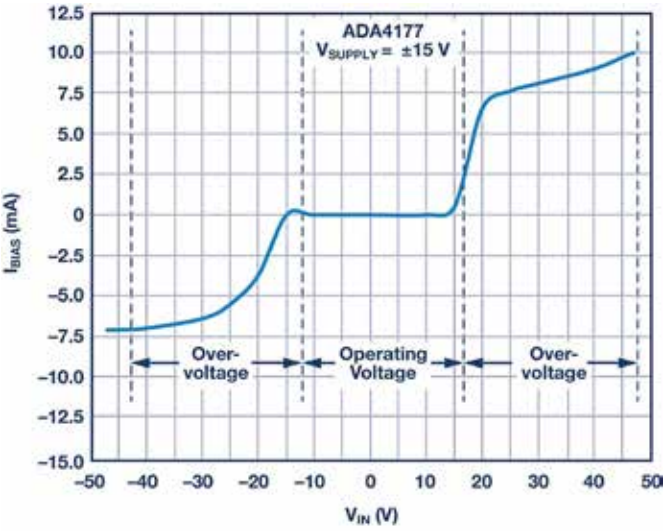

Figure 4: ADA4177 Input bias current is restricted as over-voltage increases

contributes an input offset error that can be many times greater than the low offset inherent to the op amp.

Reverse-biased diodes exhibit a reverse leakage current which flows from the cathode through the anode to the supply. When the input signal voltage (VIN) is between the supply rails, the diodes DOVPNand DOVPN have a reverse voltage on them. With VIN at ground (the middle of the input voltage range), the reverse current though DOVPN is approximately equal to the reverse leakage current through DOVPP. However, when VCM moves above or below ground, a larger reverse current flows through one diode than the other. For example, when VCM is at the top of the op amp's input voltage range (which is 2V from the positive supply or +13V in this circuit), diode DOVPN will have a reverse voltage of 28V across it. According to the 1N5177 diode datasheet, this can cause a reverse leakage current of close to 100 nA. As reverse-leakage current flows from the input signal (VIN) through ROVP, it will create a voltage drop across ROVP which looks to the signal path exactly like an increased input offset voltage.

Of additional concern is that diode reverse leakage current increases exponentially with an increase in temperature — causing an increase in the offset-voltage penalty of the clamping OVP circuit. As a baseline of comparison for op amp precision with no external over-voltage circuitry, Figure 2 shows the measured offset voltage of the ADA4077 over an input voltage range from -13V to +13V. The measurements were performed at three temperatures: 25°C, 85°C, and 125°C. Note that at 25°C, the VOS of the ADA4077 used in this test reached only 6 microvolts; even at 125°C, the VOS is only approximately 20µV. When we add the external clamping OVP circuit to the same ADA4007 device and apply the input at VIN, we see the results shown in Figure 3. At room temperature, the VOS jumps to 30 microvolts — five times the signal path error of the ADA4077 alone. At 125°C, VOS goes to over 15 millivolts — an increase 750 times the 20 µV of the ADA4077! The precision is gone.

The 5kΩ resistor does a great job protecting the clamping diodes (and therefore the op amp) during an over-voltage condition, but it adds quite a bit of offset error — reducing precision — during normal operation when the diodes are leaking current across it (not to mention loss of precision from the Johnson noise of the resistor). What we would like is a "dynamic" input resistance that has low resistance during operation within the specified input voltage range, but high resistance during over-voltage conditions.

An Integrated Solution Provides the Answer

The ADA4177 is a high-precision, low-offset op amp which includes integrated over-voltage protection. The integrated ESD diodes act as overvoltage clamps to protect the part. Depletion-mode FETs are in series at each input before the ESD diodes. They provide the dynamic resistance which increases when the input voltage (VCM) exceeds the supply voltages. As input voltage

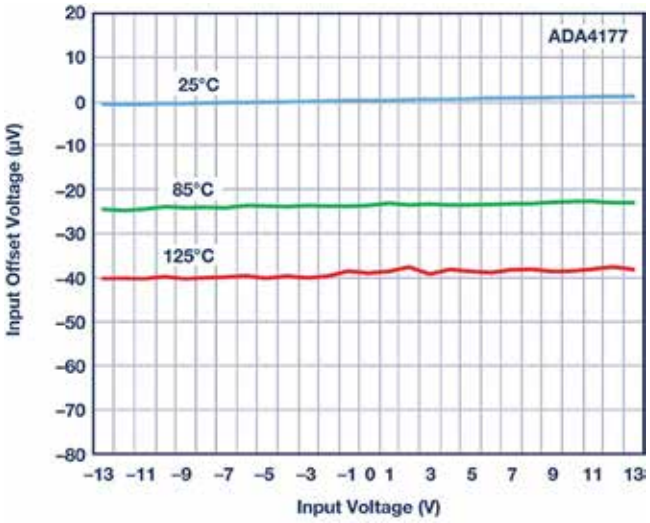

Figure 5: Input offset voltage vs. input voltage for ADA4177 with its integrated OVP

Over-voltage protction method	25°C	85°C	125°C
ADA4177	143 dB	145 dB	142 dB
ADA4077 + Clamping OVP	113 dB	78 dB	58 dB

Table 1: CMRR Comparison of ADA4177 to Discrete OVP with Clamping Diodes

increases, the drain-to-source resistance (RDSON) of an internal FET increases, thus restricting the current flow exponentially with the increased voltage (Figure 4). Because the ADA4177 uses depletion mode FETs on the inputs and not a series protection resistor, the op amp doesn't suffer the offset-voltage penalty across the resistor that the clamping OVP circuit does.

The ADA4177 can withstand voltages on its inputs up to 32 Volts beyond the supply voltage. It limits overvoltage current to a typical 10-12 mA, protecting the op amp without the use of any external components. As shown in Figure 5, even at 125°C, this tested unit is showing an offset voltage of only 40 microvolts. That's less than 3% of the error that the clamping circuit showed at that temperature! Precision is maintained.

What This Means to System Performance

When analyzing the effect of varying input voltage on the precision of the signal path, a system designer will consider the amplifier's common mode rejection ratio (CMRR). This is a measure of how much of the common-mode input voltage is rejected from showing up on the output (or how little gets through). Since op amps are often configured to provide gain between the input and the output, we normalize the CMRR specification by referring to change in the input offset voltage (the change in output divided by the amplifier closed-loop gain). The common mode rejection ratio is a positive value expressed in dB and is calculated by the following formula:

$CMRR = 20 \log (\Delta VCM / \Delta VOS)$

From this ratio, we see it is clearly desirable to keep the VOS as small as possible. The ADA4177 is specified to have a guaranteed minimum CMRR limit of 125 dB over full operating temperature. Using the test results from the units measured in this experiment, we can calculate and compare the CMRR of the clamping circuit and the ADA4177. Table 1 shows the extreme loss of precision when using the classic clamping diode circuit and the excellent CMRR of the ADA4177 with its integrated FET over-voltage protection.

For more information on designing high-precision amplifier circuits with over-voltage protection, see:

Robust Amplifiers Provide Integrated Overvoltage Protection by Eric Modica and Michael Arkin, Analog Dialogue Volume 46, February 2012:http://www.analog.com/library/analogDialogue/archives/46-02/ovp.html

Video (ADA4177): Op Amp with OVP and EMI Provides Robustness and Precision:http://bcove.me/dmuw92a5

Video: ADA4096-2 Input Over-Voltage Protection Amplifier: http://bcove.me/bdj41ehl

For more information on the ADA4177 and ADA4077, see the product pages and datasheets here: ADA4177 and ADA4077

Design of a Synthetic Aperture Radar (SAR) Simulator Using High-Frequency Software

› National, Kfir Aberman, Professor & Yoav Chachamovitz, Student

A synthetic aperture radar (SAR), is a type of radar used to create two- and three-dimensional representations of an object. SAR uses the motion of the radar antenna over a targeted region to provide finer spatial resolution than is possible with conventional beam-scanning radars. The signal processing uses magnitude and phase of the received signals over successive pulses from elements of a synthetic aperture. The SAR is similar to a phased array radar, but contrary to the large number of parallel antenna elements used in a phased array, SAR uses one antenna in time-multiplex.

Students at the Technion – Israel Institute of Technology SAMPL Lab built an efficient, easy-to-use SAR simulator that could be connected to MATLAB for signal processing, thereby significantly speeding up design time. The SAMPL Lab design focused on sub-Nyquist sampling of the received signal and full reconstruction of the image.

The Design Project

The students, supervised by Kfir Aberman and Prof. Yonina Eldar, created an SAR simulator (Figure 1) that could handle many targets on the surface and perform very quickly. They then used MATLAB to calculate the object shapes.

The students used high-frequency design software, as shown in Figures 2, 3, and 4, for this SAR simulator research project. The software gave the students a simple yet accurate look at the architecture and design phases of the SAR simulator.

It was necessary to include several key capabilities within the SAR simulator to ensure the project's success. It had to contain a signal generator, an RF transmitter, an antenna, an RF receiver moving target detector (MTD), and links to third-party tools such as MATLAB (Figure 5) and LabVIEW.

NI AWR Design Environment provided a solution for including these specifications without being too complex for the students to use successfully. By using the graphical architecture of the software, they were able to build independent blocks that were suitable for specific tasks. In addition, the software provides many built-in blocks that the students

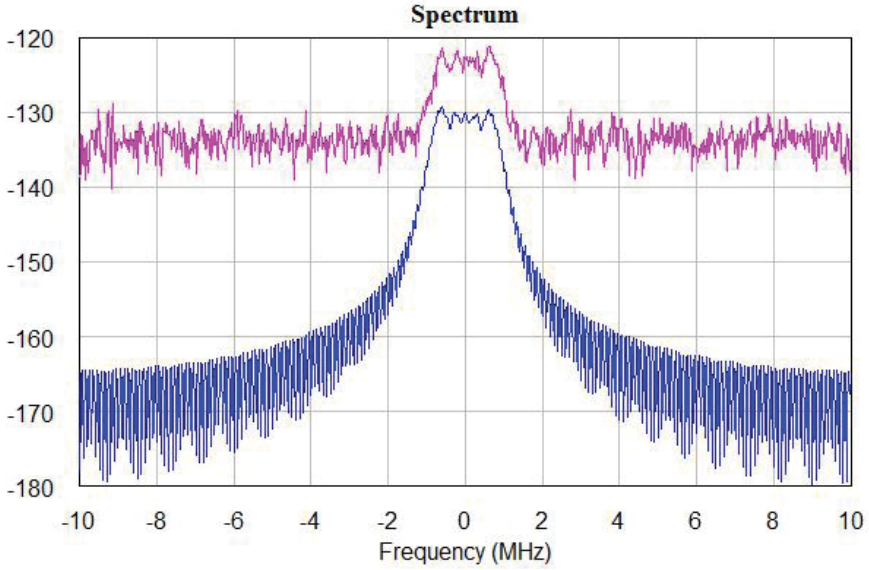

Figure 1. Amplitude presentation of multiple targets with additive white Gaussian Noise

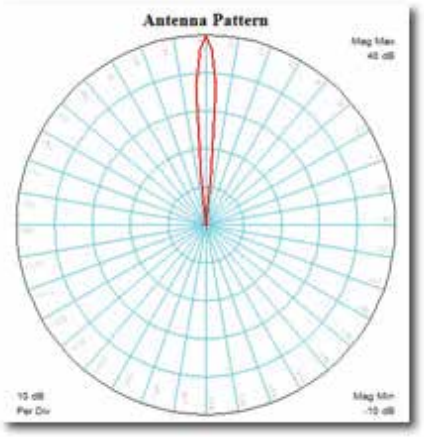

Figure 2. The antenna radiation pattern shown in AXIEM EM simulator

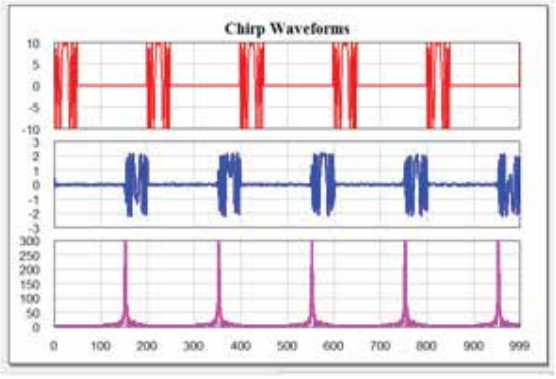

Figure 3. Transmitted signal waveform chirp with a set pulse repetition Interval shown in red. Signals returning back from the targets are shown in blue. The pink waveform shows the returning signals after the match filtering process

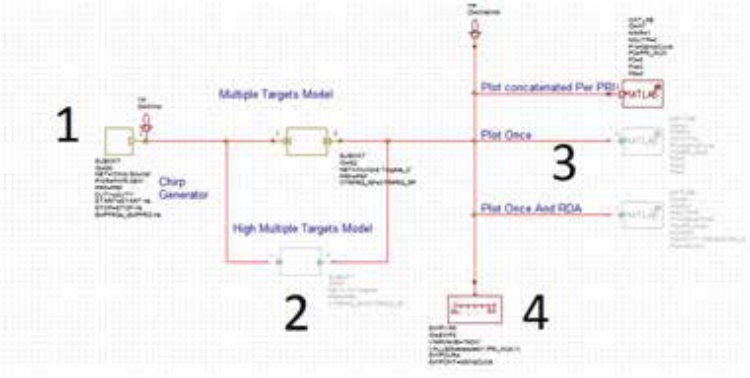

Figure 4. Top view of the hierarchical design in VSS, including chirp generator, target models, control blocks, and MATLAB blocks for co-simulation and signal processing

were able to use in this project.

A small influence on latency was noticed when simulating a large number of targets. This was an important discovery because within this project there was a need to perform calculations on many targets in order to build a picture of the object shapes.

Conclusion

Students at the Technion – Israel Institute of Technology SAMPL Lab built an efficient, easy-to-use SAR simulator that could be connected to MATLAB for signal processing, thereby significantly speeding up design time. The simulator could handle many targets on the surface and perform very quickly. Because the SAR had to contain several RF parts such as a signal generator, an RF transmitter, an antenna, an RF receiver moving target detector (MTD), the students used high-frequency design software, which enabled them to successfully complete their design project.

RISK ASSESSMENT OF NANOMATERIALS

› Dr. Mieke Van Bavel, Imec

On January 28, 2016, the 14 partners of the European NanoStreeM project gathered at imec for the project's kick-off meeting. Together, they will build an inventory of all the nanomaterials that are used in today's and future semiconductor manufacturing processes. The consortium will evaluate methodologies for risk assessment to protect human health and the environment. Imec's Dimiter Prodanov, coordinator of the NanoStreeM project, talks about nanomaterials in semiconductor manufacturing and the precautionary approach to risk assessment and risk management.

Nanomaterials in the semiconductor fab

As Moore's Law proceeds and transistor dimensions continue to shrink, a variety of novel nanostructured materials enter the semiconductor fab. Most of these materials have poorly understood hazardous properties. And this has become a shared concern of the semiconductor industry. Dimiter Prodanov: "Understanding how these materials affect human health, other biological systems and the environment is a relatively new area of scientific study. 50 how can we safely handle these materials? Which nanomaterials are being used and will be used in the future, and what is their potential danger? What is the risk for exposure by the fab workers? And how can the risks be assessed and managed? That will be the focus area of the Nano5treeM project. "The project, coordinated by imec, gathers 14 partners from 3 different worlds (R&D, industry and academia), active in various aspects of materials and semiconductor research and processing industry and academia), active in various aspects of materials and semiconductor research and processing.

To be clear, the project will not deal with the risks of nanomaterials in consumer products. Dimiter Prodanov: "In fact, there are two approaches to nanotechnology. One is the bottom-up approach, where researchers or industry synthetize nanoparticles with special properties and introduce them in consumer products such as bicycles, paints, coatings, medicines or cosmetics. This will not be the focus of the project. NanoStreeM will deal with a second approach, the top-down

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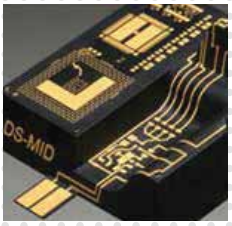

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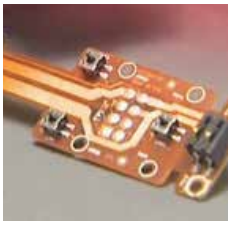

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approach to nanotechnology, where bulk materials are further processed to create nanoscale entities. In this approach, all the nanoscale objects are contained within packages, and nanomaterials are only used or released during certain steps of the processing. There is no concern for consumer exposure. But the fab worker can be exposed to nanomaterials during e.g. the maintenance of his equipment, or nanomaterials can be released into the environment."

Identifying the hotspots of risk

The project builds on the earlier activities of a working group that was part of the ESIA community, the European Semiconductor Industry Association. This working group consisted of representatives from imec, STMicroelectronics, CEA, Fraunhofer and Intel. Its focus was on establishing best practices for CMP processing. CMP or chemical mechanical polishing uses nanoparticle abrasives for polishing, leading to waste slurries that can enter the environment. The use of nanomaterials in CMP slurries is now well documented, but there are other scenarios where nanomaterials may be used or generated. Dimiter Prodanov: "For example, different types of carbon-containing materials, such as graphene and carbon-nanotubes, start to enter the fab. There is growing evidence that unbounded carbon nanotubes -in the form of nanoparticles ¬are health hazards. Experimental studies have pointed out that carbon nanotubes, when inhaled, can lead to sustained inflammation. In a semiconductor fab where nanoparticles are handled in containment, exposure to unbounded carbon nanotubes is not very likely. But there are situations where some exposure in not
unthinkable, such as the opening of a deposition reactor during maintenance. Part of the project's mission will therefore be to map the trajectory of the various nanomaterials within a typical European facility and identify the hotspots of risk, where worker exposure is possible."

Precautionary principle

As the eco-and human toxicological properties of most of the engineered nanomaterials are largely unknown to the sector, most of the semiconductor fabs adopt the precautionary principle. Dimiter Prodanov: "As long as we don't completely understand what is going on, we apply the precautionary principle when handling these materials: we assume that an unknown material has certain hazardous properties, and we take all the necessary precautions for handling this material safely. Later on, when there will be more experience and more scientific information on the material's properties, we can lower the precautions or make them more focused."

The properties of nanomaterials cannot simply be derived from their bulk counterparts. Dimiter Prodanov: "Materials at the nanoscale behave different from bulk materials due to quantum physics phenomena. Nanoparticles have a very large surface area compared to bulk material with an identical mass. And this increases significantly their catalytic activities. Also, the charge and surface energy distributions can be different. And this may change their chemical reactivity and lead to toxicological properties. For example, some materials can catalyze the formation of reactive oxygen species, which are pro-inflammatory in the body."

Risk-banding tools

The precautionary principle is implemented by the use of so-called risk-banding tools, an approach that is also being followed at imec. Dimiter Prodanov: "At imec, the approach

Fig 1: Nanoparticles in solution

starts with grouping different nanomaterials into categories. We have 3 categories of supposed increasing hazard, and we have 3 categories of increasing likely hood of exposure. That makes a matrix of 9 categories, and all steps in a process can be categorized in this way. For each of the categories, we prescribe different safety measures. For example, when we know that there is a nanomaterial, but exposure is unlikely, the measure can be limited to post signing and labeling.

For another category, we will prescribe the use of directed ventilation, or ,when needed, the use of a full breathing apparatus.

As part of the NanoStreeM project, we will compare the various risk banding approaches that are being used within the industry. We will share best practices and make recommendations for improvement." Imec, besides coordinating the project, will share experience in this risk assessment, and will participate in the mapping exercise for future materials.

Outcome of the project

The European Union has taken concerted efforts to understand and promote nanotechnology, but also to address public concerns. Dimiter Prodanov: "With this Horizon 2020 project, we answered a call which was opened last year for support action in the area of ICT, and which aims

to look into the use and characterization of nanomaterials. By comparing various approaches to risk assessment and sharing

Fig 2: (Middle, left) Dimiter Prodanov, project coordinator, and (middle, right) Alain Pardon, Safety, Environmental & Health Manager atimec, at the kick-off meeting of the NanoStreeM project on January 28, 2016, at Imec

good practices, the NanoStreeM project will contribute to improve the awareness and safety of the workers in semiconductor fabs, and minimize the impact on the environment. We will come up with recommendations concerning the use of nanomaterials in semiconductor processing. We will also set up comprehensive training and communication efforts." But the project will also enable the semiconductor industry to share and benchmark its

approach with other sectors that face similar challenges, such as the pharmaceutical industry, the paint industry etc. Dimiter Prodanov: "The semiconductor industry is an advanced industry that is well aware of its duties and responsibilities. We have a very safety aware culture, resulting in a very tight process control. And this is an attitude that can be transferred to other industries as well. "

The NanoStreeM project (Nanomaterials: strategies for safety assessments in advanced integrated circuits manufacturing) receives funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement n° 688794.

Imec collaborates in many projects (EU, ESA and IWT) on which we work in close collaboration with industrial and academic partners. On our website, you can view the projects that are currently running. You can browse this information by research domain. And on April 30, 2076,

imec participates in Europe Day (Dutch website), where we will put some of our European projects in the spotlight.

Power Control for LED Lighting

› European Editors - Publitek Marketing Communications

Smart lighting is one of the keys to the smart home. Radio and network control can be used to alter the level of lighting either by direct control from the user, employing a dedicated remote control or with the help of a smartphone app, or automatically based on time of day. However, LED power control for lighting requires special consideration. Circuitry developed for traditional dimming control does not work well with the requirements of solid-state lighting.

Most dimmers installed in homes are based on a phase-cut circuit. The advantage of this type of circuit is that it is very simple to design and is robust. The circuit works by simply cutting the supply to the bulb for a portion of the AC cycle, reducing the overall voltage supplied to the filament. This, in turn reduces the filament's light output. Because of the comparatively long time that it takes for the filament to heat up and cool down, this switching is not noticeable to the user except possibly at the very lowest settings of the dimmer.

However, with LEDs, which have much shorter response times, the low switching frequency of the main supply means that attempting to use a similar strategy to control the light output will result in significant flickering. As a result, LEDs require specialized power supply circuits that can deliver a more consistent voltage and current output to provide power that minimizes flicker without compromising efficiency.

Although it is possible to manipulate light levels from LEDs by altering the current supplied to them, this results in a drop in power efficiency at lower current levels. A power LED provides its best efficiency at the highest rated current. So, dimming behavior is still best obtained using pulse-width modulation (PWM) techniques, turning the LED on and off at higher frequencies than would be supported by traditional mains-based dimmer circuits.

In a PWM-based power converter, a reference signal fed back to the controller is used to determine whether the transistor that feeds power to the load should be on or off. The reference is compared to a periodic signal created by a ramp generator. While the reference signal is higher than the ramp, the transistor is switched on. When the reference signal falls below the ramp, the transistor is switched off. The

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integrated current delivered therefore follows the profile of the reference signal. Various techniques can be used to control the reference signal and therefore manipulate the power output. For smart-home use, power converters can integrate additional inputs that tune the reference signal based on the preferred dimming level.

The power converters for LEDs may also be designed to handle different supply types. For example, a simple retrofit bulb that includes the LED ballast, dimming control and RF interface to a smart-home network, will generally work with a 50 Hz/60 Hz mains supply. However, the power converters for bulbs that are designed to go into low-voltage strips and buses will need to be able to handle DC supply inputs instead.

Inrush current is an important consideration in LED lighting design. The power supply to the LED presents a capacitive load to the mains supply, which leads to the potential for a high current to be drawn for a short period when the LED is switched on as the capacitors around the supply charge. Because this current can be much higher than the steady-state current, it can lead to overload problems when a large number of lamps attached to one mains circuit are activated. Limiting inrush current at startup provides a design that has greater compatibility with home electrical circuits.

Power-factor correction (PFC) is a further consideration in terms of mains compatibility. The switched-mode techniques needed for efficient LED dimming should not be allowed to drive additional harmonics onto the electricity supply.

The need for efficient power delivery and support for PFC has led to the introduction of parts such as the Fairchild FL7701. The Fairchild FL7701 has been designed to work with both AC and DC supplies, using the ripple

voltage transmitted to its low-voltage VCC pin from the high-voltage supply as a means of detection. The ripple on the VCC rail is used using a sigma-delta modulation scheme to provide a reference signal to the PWM switching circuitry. When a DC input is applied, the lack of ripple on the VCC rail results in a reference signal suitable for DC-mode power conversion without PFC.

To support remote control, the FL7701 has an analog input pin that can support 0 V to 10 V dimming control by using a resistive divider. This signal is fed into the digital controller and used to determine the output of a digital-to-analog converter that provides the reference signal to the PWM control circuitry. A microcontroller can be used to generate the input signal to the LED ballast, potentially receiving its commands from an RF interface.

The FL7701 employs a soft-start function to limit inrush current, applying a delay to the internal voltage reference signal used by the PWM circuitry so that it rises

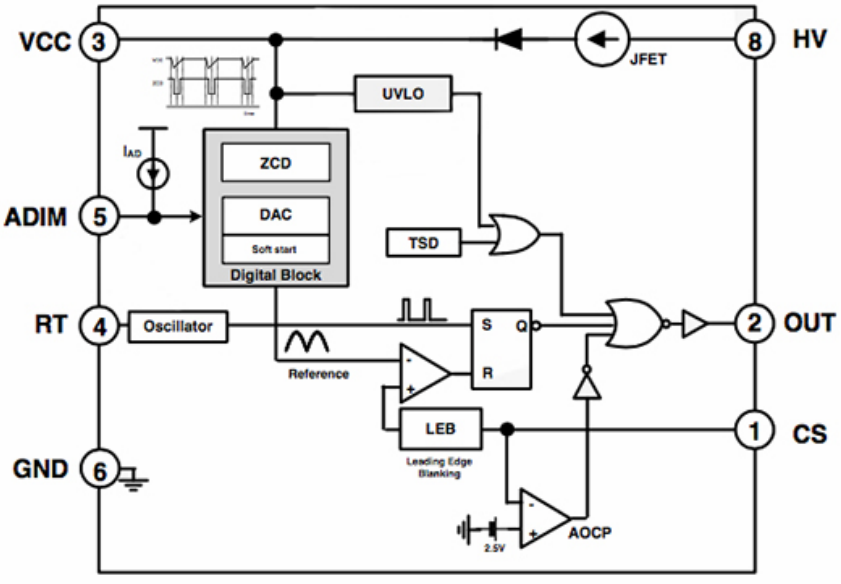


Figure 1: Block diagram of the FL7701

slowly from initial startup. A similar soft-start feature is available on the SSL4101T Greenchip III+ from NXP. On this device, the soft-start period is determined through selection of an external resistor and capacitor.

Able to work with conventional triac dimming techniques, and so support systems that need to handle a mixture of lighting sources, the SSL4101T was designed to provide high efficiency at all power levels; using a variety of PWM control techniques to suit the conversion to the desired output light level. The device moves from quasi-resonant operation at high power levels to quasi-resonant operation with valley skipping through to reduced-frequency operation at low power-output levels, reducing the current supplied to the LED to avoid generating audible noise from the ballast's transformer.

In quasi-resonant mode, the next converter stroke is started after demagnetization of the transformer that should be provided as part of the front-end circuitry to the SSL4101T. This helps to minimize losses, as the converter only switches on when the voltage across the external MOSFET is at its minimum. To reduce the frequency of operation at lower loads, the quasi-resonant operation changes to discontinuous mode operation with valley skipping in which the switching frequency is limited for EMI reasons, typically to around 125 kHz. Again, the external MOSFET is only switched on when the voltage across the MOSFET is at its minimum.

At very low-power and standby levels, the frequency, which can be reduced

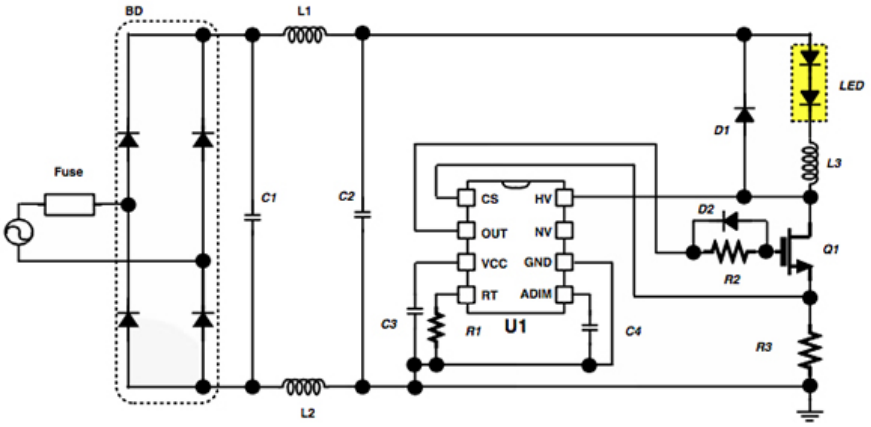


Figure 2: The FL7701 in a typical application

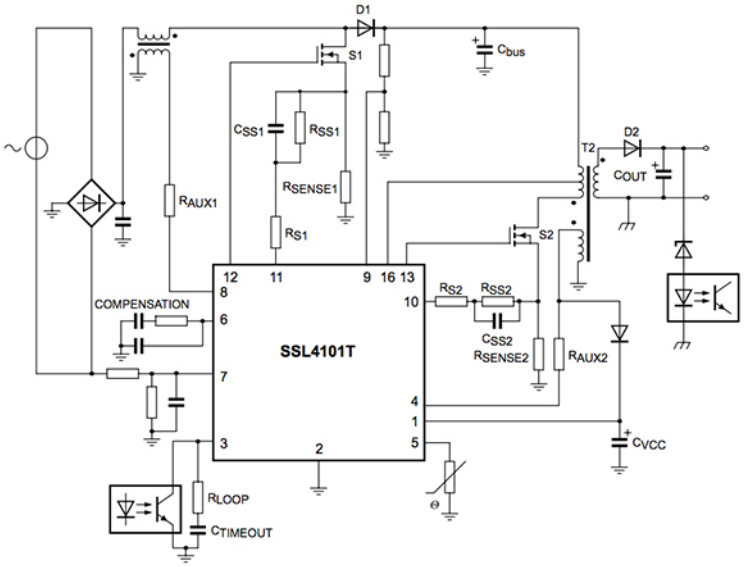


Figure 3: Block diagram of the SSL4101

to almost zero, is controlled down by a voltage-controlled oscillator (VCO). During frequency reduction mode, the primary peak current is kept at a minimal level of 25 percent of the maximum. In frequency reduction mode the PFC controller is switched off as the harmonics generated will be minimal. To prevent oscillation around the PFC-operation point, the device supports approximately 50 mV of hysteresis on the control pin.

The ability of the SSL4101T to support very-low input power in standby mode eliminates the need for an additional housekeeping power supply to power the lighting controllers or dimmers.

Although design for LED smart lighting involves more complex power conversion than dimming control for incandescent lamps, integrated devices such as the FL7701 and SSL4101T can ease the design burden and achieve high efficiency.

Internet of Things: How Will They Be Built?

› Paul McLellan, Cadence

Internet of Things (IoT) is not really a market, it is a catchall term for devices that connect to the internet, sometimes via our smartphones. The whole IoT ecosystem has a cloud backend and networking to get the data there and back, but I don't consider that part of the IoT market, that is part of infrastructure. And smartphones are part of mobile.

A typical IoT device contains some sort of computing element, some sort of networking, and one or more sensors. It is battery powered and those batteries have to last a long time. For example, at DesignCon I attended a teardown of a fitness monitor that can last six months on a single coin cell. Other applications, such as sensors out in fields for agricultural applications, might need to have power consumption low enough to last the lifetime of the product (perhaps the time from planting to harvest of the crop). Plus you've probably heard about power scavenging devices. In Mike Muller's keynote at ARM Techcon he talked about a blood glucose monitor that was powered by removing the cap, generating 400 uJ of energy, enough to perform the measurement. Other experimental devices are powered by ambient heat.

It remains to be seen which IoT devices really take off in interesting volumes. Today we have:

- Fitness monitors like FitBit
- Watches like Pebble and the Apple Watch
- Thermostats like Nest
- Cameras like GoPro
- Radio-controlled drones, mostly for recreational use (I don't think we count a Predator as being an IoT device)

One of the drivers of IoT is video. As video has gotten cheap enough to add to everything, it is becoming ubiquitous, not just in obvious places like GoPro cameras, but for security and to give drones inspection capability. The key interfaces are likely to be MIPI for sensor interfaces, especially the new I3C standard. This not only supersedes the I2C standard but is public domain, unlike I2C which was owned by Philips Semiconductors, now NXP (and the new standard is pronounced eye-three-see whereas the old one was pronounced eye-squared-see).

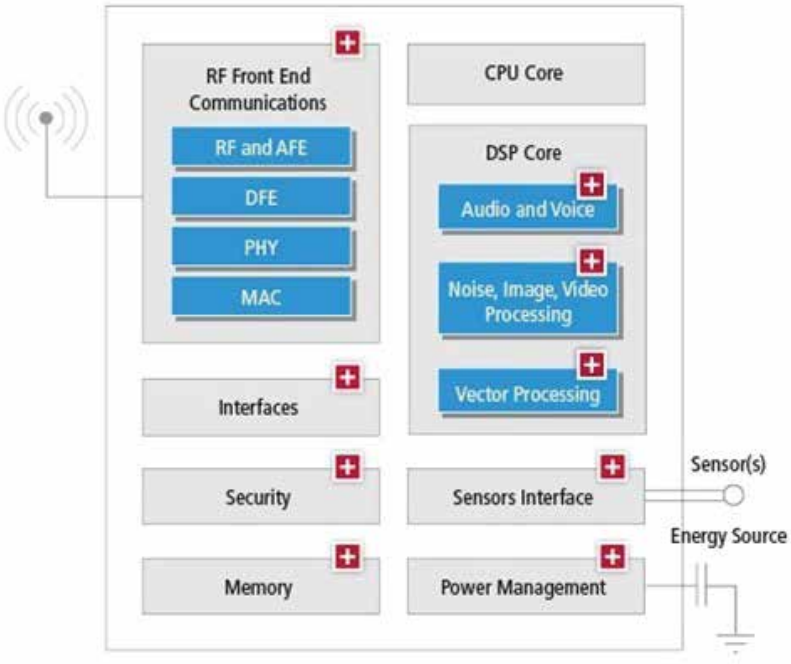
The other really important interface is CSI, the Camera Standard Interface, actually MIPI's CSI-2 and

CSI-3. This allows an image sensor to be connected to the application processor. There is also a Display Standard Interface, DSI, although this will probably be less important since only a few IoT devices are likely to have true displays.

I believe that most IoT devices are not going to contain dedicated SoCs, by which I mean an SoC designed just for that one IoT device. I haven't seen all the teardowns but I think only the Apple Watch has its own SoC of the devices I listed above. The other devices all contain general-purpose SoCs with a microcontroller and on-board memory, and perhaps wireless interfaces such as Bluetooth. For example, the fitness monitor torn down at DesignCon contained an Ambiq Apollo MCU with 512KB RAM, along with a Dialog Semiconductor Bluetooth chip. The key point is that neither of these components were created specially for this fitness monitor. There are two problems with designing a dedicated SoC, money and time. An SoC is an expensive thing to design, but in the early stage of a market the important thing is to get to market and see what the customer wants and then iterate. "Throw mud against the wall and see what sticks," as the saying goes. Of course if high-volume markets appear, then it may well make sense to design a dedicated SoC. Although the up-front costs are high, the unit costs are very low.

I think that the big challenge in IoT is going to be security. The problem is that encryption is a power hog. It is hard to have the extreme battery life that everyone wants at the same time as having secure communication that cannot be hacked. It is notable, I think, that the weak link that led to Target having all those credit cards stolen was nothing to do with their financial systems but was a controller in their air-conditioning system. There are plenty of stories of being able to inject malicious code into a Fitbit through the Bluetooth link. Of course having your Fitbit hacked is probably not that big of a deal but you probably don't want someone taking over your thermostat or your refrigerator.

Power for things like encryption can be reduced by building either custom hardware or a specialized cryptographic co-processor. For some IoT devices this will probably be enough. They spend most of their time dormant and only need to power up occasionally to check their sensors and, perhaps, send and receive data up into the cloud.



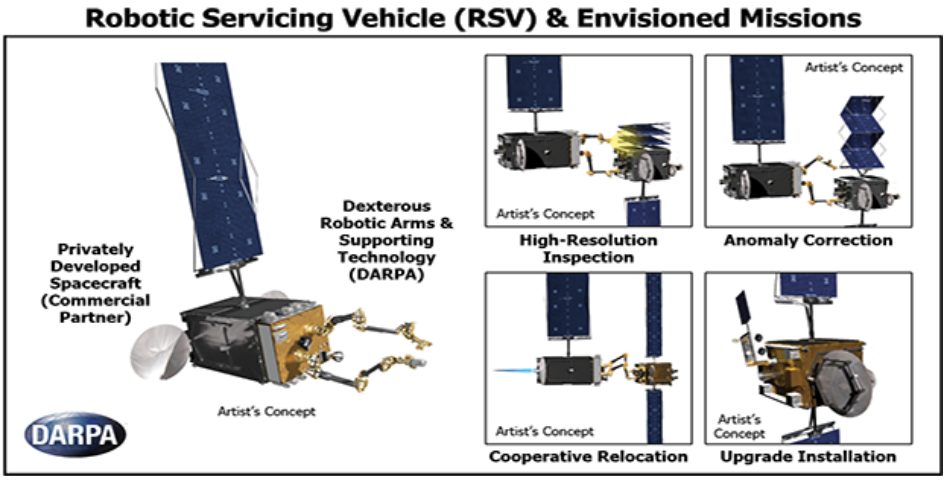
Program Aims to Facilitate Robotic Servicing of Geosynchronous Satellites

DARPA

Servicing vehicle jointly developed with a commercial partner would leverage DARPA's successes in space robotics and accelerate revolutionary capabilities for working with satellites currently beyond reach Servicing vehicle jointly developed with a commercial partner would leverage DARPA's successes in space robotics and accelerate revolutionary capabilities for working with satellites currently beyond reach Hundreds of military, government and commercial satellites reside today in geosynchronous Earth orbit (GEO) some 22,000 miles (36,000 kilometers) above the Earth—a perch ideal for providing communications, meteorology and national security services, but one so remote as to preclude inspection and diagnosis of malfunctioning components, much less upgrades or repairs. Even fully functional satellites sometimes find their working lives cut short simply because they carry obsolete payloads—a frustrating situation for owners of assets worth hundreds of millions of dollars. With no prospects for assistance once in orbit, satellites destined for GEO today are loaded with backup systems and as much fuel as can be accommodated, adding to their complexity, weight and cost. But what if help was just a service call away?

DARPA's new Robotic Servicing of Geosynchronous Satellites (RSGS) program intends to answer that question by developing technologies that would enable cooperative inspection and servicing in GEO and demonstrating those technologies on orbit within the next five years. Under the RSGS vision, a DARPA-developed modular toolkit, including hardware and software, would be joined to a privately developed spacecraft to create a commercially owned and operated robotic servicing vehicle (RSV) that could make house calls in space. DARPA would contribute the robotics technology, expertise, and a Government-provided launch. The commercial partner would contribute the satellite to carry the robotic payload, integration of the payload onto it, and the mission operations center and staff. If successful, the joint effort could radically lower the risk and cost of operating in GEO.

"The ability to safely and cooperatively service satellites in GEO would vastly expand public and private opportunities in space. It could enable entirely new spacecraft designs and operations, including on-orbit



assembly and maintenance, which could dramatically lower construction and deployment costs while extending satellite utility, resilience and reliability," said RSGS program manager Gordon Roesler. "Commercial and government space operators have sought this capability for decades. By investing together, we can achieve a capability that would be extremely challenging to do individually."

To formalize that collaboration, DARPA aims to establish a public-private partnership through which the Agency would develop and provide technical capabilities for transition to a commercial space robotics enterprise that would make cooperative robotic servicing available to both military and commercial GEO satellite owners on a fee-for-service basis. DARPA seeks to engage a commercial partner with a strategic interest in this capability, and an interest in providing services to the Defense Department (DoD).

By executing the RSGS program, DARPA seeks to:

Demonstrate in or near GEO that a robotic servicing vehicle can perform safe, reliable, useful and efficient operations, with the flexibility to adapt to a variety of on-orbit missions and conditions

Demonstrate satellite servicing mission operations on operational GEO satellites in collaboration with commercial and U.S. Government spacecraft operators

Support the development of a servicer spacecraft with sufficient propellant and payload robustness to enable dozens of missions over several years

After a successful on-orbit demonstration of the robotic servicing vehicle, U.S. Government and commercial satellite operators would have ready access to diverse capabilities including high-resolution inspection; correction of some mission-ending mechanical anomalies, such as solar array and antenna deployment malfunctions; assistance with relocation and other orbital maneuvers; and installation of attachable payloads, enabling upgrades to existing assets. Satellite operators would be able to purchase these services on request to the robotic servicing vehicle operator.

A critical component of the RSV would be the robotic arm developed by DARPA known as FREND. Constructed to enable automated, cooperative connection to satellites that are not designed for docking, the FREND arm has multiple joints enabling dexterous movement and can carry and switch among multiple generic and mission-specific tools. DARPA will augment the arm by adding advanced algorithms for machine vision and supervised autonomous robotic operations. Also new will be onboard mission-planning software and a variety of sensors designed to provide reliable, high-fidelity spatial orientation information, essential for safely guiding the spacecraft with its robotic systems on orbit.

"In addition to these technical advances, a key goal of the RSGS program is to establish best practices and voluntary standards for space servicing operations," said Brad Tousley, director of DARPA's Tactical Technology Office, which oversees RSGS. "Government and industry need to work together to set safety standards as well as to take advantage of the servicer's new capabilities."

DARPA plans to kick off the public-private partnership via a Program Solicitation in the near future. Shortly thereafter, DARPA will host a Proposers Day to provide potential partners with further technical and programmatic details about the RSGS program. The date of issue of the Solicitation and the date and location of the Proposers Day have yet to be determined. Both will appear on the Federal Business Opportunities website (www.fbo.gov).

Activating surfaces with flexible displays

flexenabl

The rise of plastic and flexible displays will be accompanied by a shift from glass substrates to plastic substrates'* according to industry experts. Flexible displays bring a new degree of design freedom for product designers and we've been working with partners to develop the industrial process that will make them a mainstream technology.

We've already explained how the automotive and aerospace industries could benefit from lighter, flexible displays, and in this blog we look at a few more applications of this exciting technology.

Wearables

Bracelet made from a plastic LCD can wrap around your wristUtility was a major concern for first gen wearables, and form factor constraints also meant users weren't experiencing the full potential of what wearables could truly offer. With flexible displays more creative design options can be delivered, providing better functionality for users. We recently showcased an organic liquid crystal display (OLCD) curved into a smart watch form factor(left) proving what is possible with flexible electronics.

Wearables are not confined to the wrist alone; flexible displays can be also integrated into clothes, shoes and accessories making surfaces come to live.

Mobile devicesFlexible screens will be folded out from mobile to tablet size

Whether you want a large screen for playing games or watching videos, or a foldable screen for convenience, flexible displays can offer larger viewing area while not compromising user comfort.

Not everything is about size and flexibility. Breakability is a big issue for mobile screens, and plastic displays will offer a shatterproof solution.

Digital signage

Large digital displays will benefit from flexible OLCDs Long gone are the days where you'd see someone up a very tall ladder pasting the newest oversized poster onto billboards across town; large area digital signs have been installed across major cities, and these LCD panels offer high performance and high durability, while removing the need to replace them on a regular basis. However, imagine if the panels were thinner, lightweight, unbreakable but still on a par with existing LCD image quality? With additional benefit of

flexibility, advertisers would no longer be constrained to flat mounts but be able to use a plethora of surfaces.

Household goods

Flexible screens and sensors will become ubiquitous in IoT productsWith the proliferation of the Internet of Things, more electronic goods are being fitted with end user displays – whether that be for functionality or merely aesthetic pleasure. Anything from your dishwasher to your coffee machine and blender can benefit from a colourful, plastic display that can be wrapped around its surface and interacted with.

Bringing flexible displays to the mass market

At FlexEnable, we've developed the technology that can make all of the above examples possible. Our flexible electronics platform can be used for the manufacture of glass-free, flexible displays and sensors. It uses a low temperature production process which ultimately means lower cost per unit while demonstrating better electrical performance than conventional TFT technology.

Reflection-removing camera

› Larry Hardesty, MIT

In recent years, computer scientists have been investigating a range of techniques for removing reflections from digital photographs shot through glass. Some have tried to use variability in focal distance or the polarization of light; others, like those at MIT, have exploited the fact that a pane of glass produces not one but two reflections, slightly offset from each other.

At the Institute of Electrical and Electronics Engineers' International Conference on Acoustics, Speech, and Signal Processing this week, members of the MIT Media Lab's Camera Culture Group will present a fundamentally different approach to image separation. Their system fires light into a scene and gauges the differences between the arrival times of light reflected by nearby objects — such as panes of glass — and more distant objects.

In earlier projects, the Camera Culture Group has measured the arrival times of reflected light by using an ultrafast sensor called a streak camera. But the new system uses a cheap, off-the-shelf depth sensor of the type found in video game systems.

At first glance, such commercial devices would appear to be too slow to make the fine discriminations that reflection removal requires. But the MIT researchers get around that limitation with clever signal processing. Consequently, the work could also have implications for noninvasive imaging technologies such as ultrasound and terahertz imaging.

"You physically cannot make a camera that picks out multiple reflections," says Ayush Bhandari, a PhD student in the MIT Media Lab and first author on the new paper. "That would mean that you take time slices so fast that [the camera] actually starts to operate at the speed of light, which is technically impossible. So what's the trick? We use the Fourier transform."

The Fourier transform, which is ubiquitous in signal processing, is a method for decomposing a signal into its constituent frequencies. If fluctuations in the intensity of the light striking a sensor, or in the voltage of an audio signal, can be represented as an erratic up-and-down squiggle, the Fourier transform redescribes them as the sum of multiple, very regular squiggles, or pure frequencies.

Phased out

Each frequency in a Fourier decomposition is characterized by two properties. One is its amplitude, or how high the crests of its waves are. This describes how much it contributes to the composite signal.

The other property is phase, which describes the offset of the wave's troughs and crests. Two nearby frequencies may be superimposed,

for instance, so that their first crests are aligned; alternatively, they might align so that the first crest of one corresponds with a trough of the other. With multiple frequencies, differences in phase alignment can yield very different composite signals.

If two light signals — one reflected from a nearby object such as a window and one from a more distant object — arrive at a light sensor at slightly different times, their Fourier decompositions will have different phases. So measuring phase provides a de facto method for measuring the signals' time of arrival.

There's one problem: A conventional light sensor can't measure phase. It only measures intensity, or the energy of the light particles striking it. And in other settings, such as terahertz imaging, measuring phase as well as intensity can dramatically increase costs.

So Bhandari and his colleagues — his advisor, Ramesh Raskar, the NEC Career Development Associate Professor of Media Arts and Sciences; Aurélien Bourquard, a postdoc in MIT's Research Laboratory of Electronics; and Shahram Izadi of Microsoft Research — instead made a few targeted measurements that allowed them to reconstruct phase information.

In collaboration with Microsoft Research, the researchers developed a special camera that emits light only of specific frequencies and gauges the intensity of the reflections. That information, coupled with knowledge of the number of different reflectors positioned between the camera and the scene of interest, enables the researchers' algorithms to deduce the phase of the returning light and separate out signals from different depths.

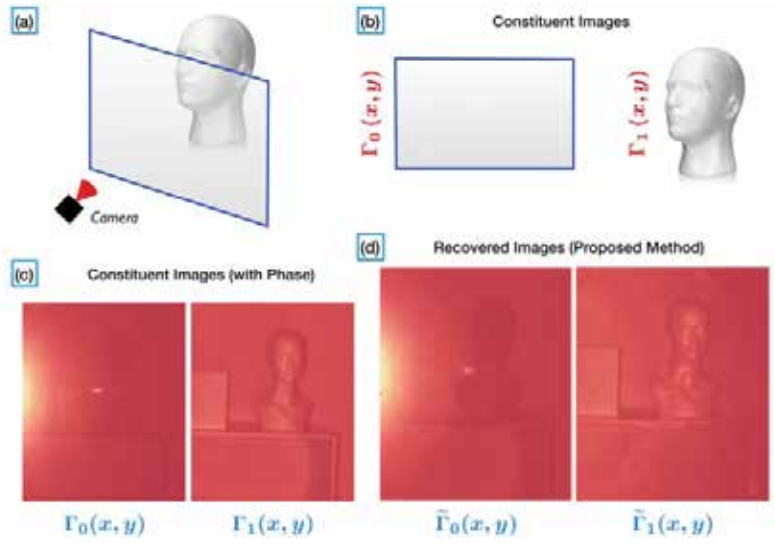
Reasonable assumptions

The algorithms adapt a technique from X-ray crystallography known as phase retrieval, which earned its inventors the Nobel Prize in chemistry in 1985. "We can also exploit the fact that there should be some continuity in the intensity values in 2-D," says Bourquard. "If your planes, for instance, are a glass window and a scene behind it, both these planes should exhibit some spatial continuity. Typically, the intensity values will not vary too fast on every separate plane. So essentially, what this phase retrieval does is use some techniques of frequency estimation, coupled with the assumption that local intensity variations within every single plane are moderate relative to the average intensity difference between these planes."

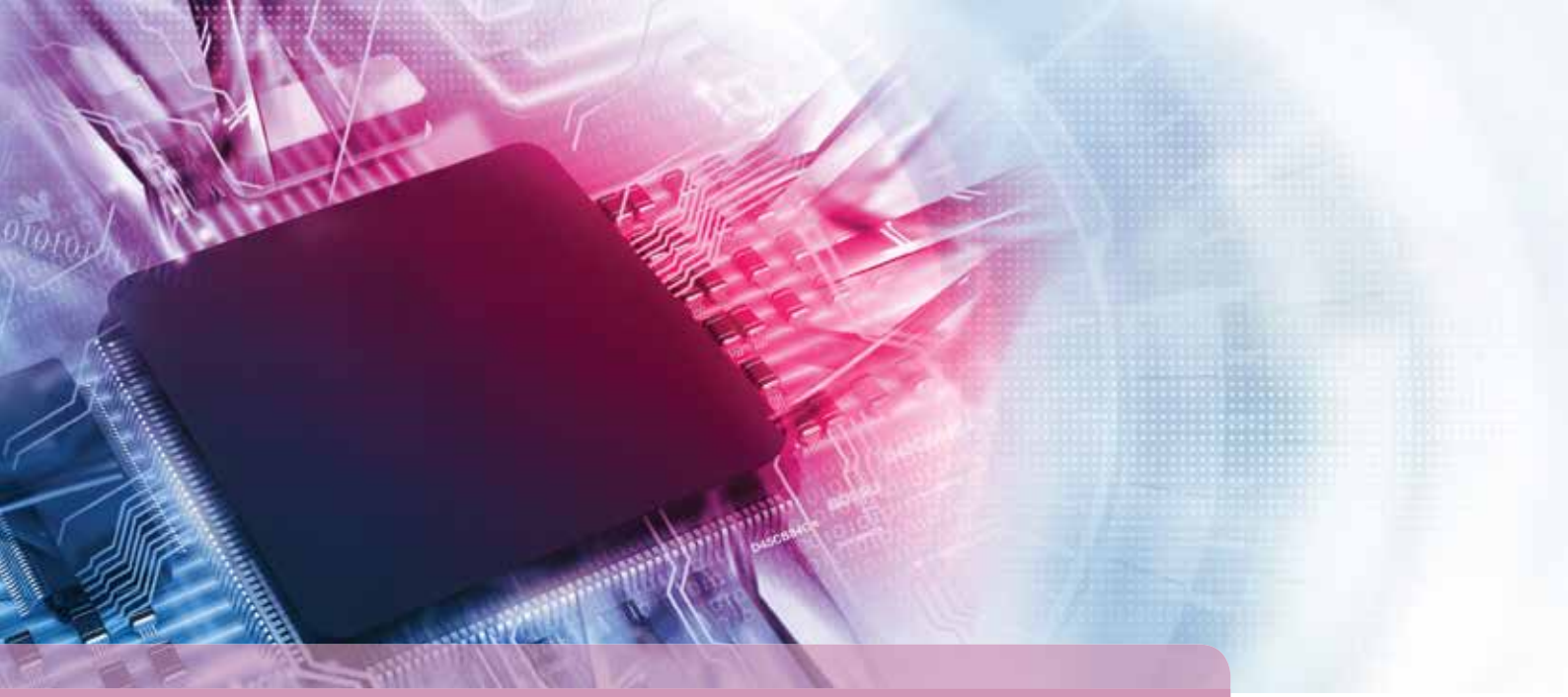
In theory, the number of light frequencies the camera needs to emit is a function of the number of reflectors. If there is just one pane of glass between the camera and the scene of interest, the technique should require only two frequencies. If there are two panes of glass, the technique should require four frequencies.

But in practice, the light frequencies emitted by the camera are not pure, so additional measurements are required to filter out noise. In their experiments, the researchers swept through 45 frequencies to enable almost perfectly faithful image separation. That takes a full minute of exposure time, but it should be possible to make do with fewer measurements. "The interesting thing is that we have a camera that can sample in time, which was previously not used as machinery to separate imaging phenomena," Bhandari says.

"What is remarkable about this work is the mixture of advanced mathematical concepts, such as sampling theory and phase retrieval, with real engineering achievements," says Laurent Daudet, a professor of physics at Paris Diderot University. "I particularly enjoyed the final experiment, where the authors used a modified consumer product — the Microsoft Kinect One camera — to produce the untangled images. For this challenging problem, everyone would think that you'd need expensive, research-grade, bulky lab equipment. This is a very elegant and inspiring line of work."



MIT - Reflection Removal



Powering IGBT Gate Drives with DC-DC converters

› Paul Lee, Murata Power Solutions UK.

IGBTs can now be found in high power devices with effective gate capacitances measured in hundreds of nanofarads. Although this capacitance has simply to be charged and discharged to turn the IGBT on and off, the circulating current to do so causes significant power dissipation in voltage drops in the gate driver circuit and within the IGBT.

At high power, inverters or converters typically use 'bridge' configurations to generate line-frequency AC or to provide bi-directional PWM drive to motors, transformers or other loads. Bridge circuits include IGBTs whose emitters are switching nodes at high voltage and high frequency so the gate drive PWM signal and associated drive power rails, which use the emitter as a reference, have to be 'floating' with respect to system ground, so called 'high side' drives. Additional requirements are that the drive circuit should be immune to the high 'dV/dt' of the switch node and have a very low coupling capacitance. An emerging trend is to use a DC-DC converter to provide optimum power rails for these 'floating' drive circuits using an IGBT.

An initial consideration is to set the on and off-state gate voltages. For example, a typical IGBT is the FZ400R12KE4 from Infineon. It has a minimum turn-on threshold of 5.2 Vat 25 Celsius, in practice to ensure full saturation and rated collector current of 400 A, at least 10 V must be applied. The part has a maximum gate voltage of ± 20 V so +15 V is a good value with some margin. Higher values produce unnecessary dissipation in the gate drive circuit. For the off-state, 0 V on the gate can be adequate. However, a negative voltage typically between -5 and -10 V enables rapid switching controlled by a gate resistor. A consideration also is that any emitter inductance between the IGBT and the driver reference, (point x in Figure 1), causes an opposing gate-emitter voltage when the IGBT is turning off. While the inductance may be small, just 5 nH would produce 5 V at a di/dt of 1000 A/µs which is not unusual. 5 nH is just a few millimetres of wired connection (the FZ400R12KE4 has a stray package inductance of 16 nH). An appropriate negative drive ensures that the gate-emitter off-voltage is always zero or less.

A negative gate drive also helps to overcome the effect of collector-gate 'Miller' capacitance on device turn-off which works to inject current into the gate drive circuit. When an IGBT is driven off, the collector-gate voltage rises and current flows through

TEST SOCKETS

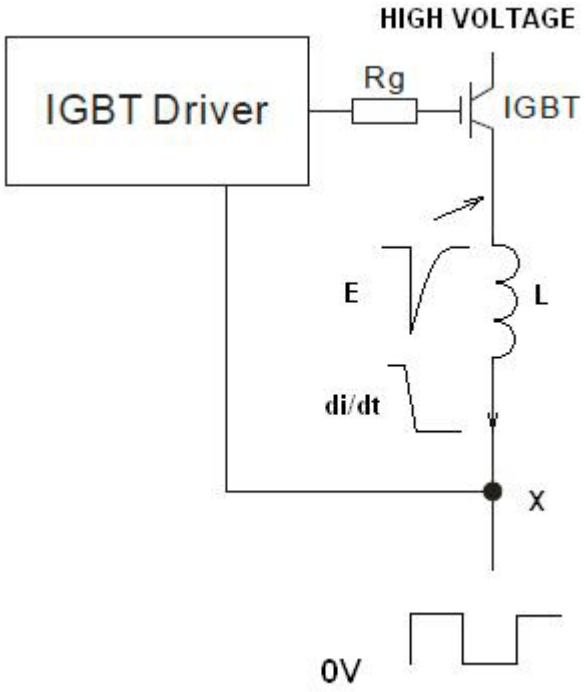


Figure 1. On switch-off with stray inductance L, negative di/dt produces a negative voltage on the emitter, opposing the turn-off voltage.

the Miller capacitance of value Cm. dV_{ce}/dt into the gate emitter capacitance Cge and through the gate resistor to the driver circuit, see Figure 2. The resulting voltage V_{ge} on the gate can be sufficient to turn the IGBT on again with possible shoot-through and damage. Driving the gate to a negative voltage mitigates this effect. A DC-DC converter with +15/-9V outputs conveniently provides the optimum voltages for the gate driver.

The gate of an IGBT must be charged and discharged through Rg in each switching cycle. If the IGBT data sheet provides a gate charge curve then the relationship is:

$P = Qg . F . Vs$

Where P is gate drive power, Qg is data sheet charge for a chosen gate voltage swing, positive to negative, of value Vs.

If the data sheet does not provide a charge curve but just a Qg value at specific gate voltages, the value of Qg at other gate voltage swings can be approximated by multiplying by the ratio of the actual versus data sheet voltage swings. For example the FZ400R12KE4 has a Qg value of 3.7 µC with ±15 V gate voltage swing (30 V total). For a swing of +15/-9 V (24 V total) gate charge approximates to:

$Qg = 3.7e^{-6} . 24/30 \approx 3$ µC

At 10 kHz this requires gate drive power of:

$Pg = 3e^{-6} .10e^{3} . 24 \approx 0.72$ W

With derating and allowing for other incidental losses, a 2 W DC-DC converter would be suitable.

In our example, with 24 V total gate voltage swing, the charge and discharge energy must be the same in each cycle, so the average charge and discharge current must be the same, at 30 mA given by Pg/Vs. The peak current Ipk, required to charge and discharge the gate is a function of Vs, gate resistance of the IGBT Rint and external resistance Rg.

$Ipk = V s/(Rint + Rg)$

The FZ400R12KE4 has Rint = 1.9 ohms so with a typical external resistor of 2 ohms and a swing of 24 V, a peak current of over 6 A results. This peak current must be supplied by 'bulk' capacitors on the driver supply rails as the DC-DC converter is unlikely to have sufficient value of output capacitors to supply this current without significant 'droop'. Of course the gate driver itself must be

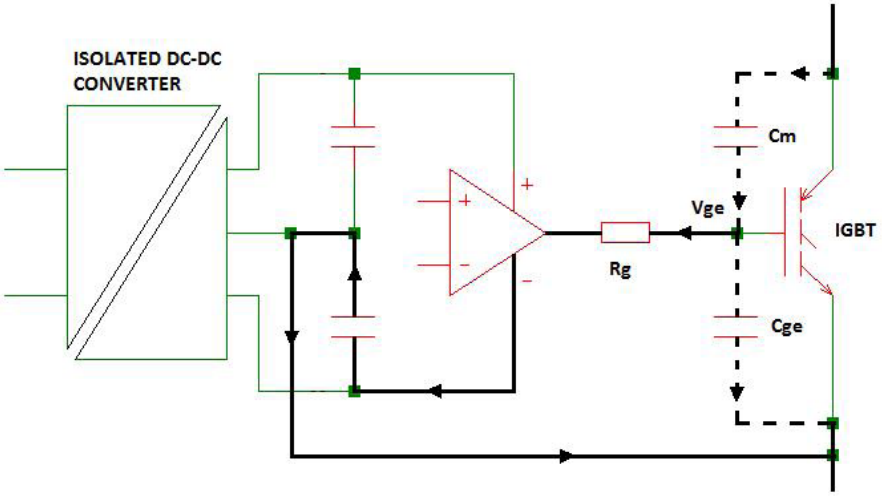


Figure 2. Current through 'Miller' capacitance Cm works to turn on the IGBT.

rated for these peak current values as must the gate resistors.

For our example, total gate drive energy E per cycle is given by:

$E = Qg. V s = 72 \mu J$

The bulk capacitors on the +15 and -9 V rails supply this energy in proportion to their voltages so the +15 V rail supplies 45 µJ. If we assume that the bulk capacitor on the +15 V rail should not drop more than say 0.5 V each cycle then we can calculate minimum capacitance C by equating the energy supplied with the difference between the capacitor energies at its start and finish voltages, that is;

$45 \mu J = ½ C (Vinit^2 – Vfinal^2)$

$C = (45e^{-6} . 2)/(15^2 – 14.5^2) \approx 6.1 \mu F$

Although the -9 V rail supplies about a third of the energy, it requires the same capacitor value for 0.5 V drop as this is a larger percentage of the initial value.

DC-DC converter considerations

The absolute values of gate drive voltages are not very critical as long as they are above the minimum, comfortably below breakdown levels and dissipation is acceptable. The DC-DC converters supplying the drive power therefore may be unregulated types if the input to the DC-DCs is nominally constant. Unlike most applications for DC-DCs however, the load is quite constant when the IGBT is switching at any duty cycle. Alternatively the load is close to zero when the IGBT is not switching. Simple DC-DCs often need a minimum load otherwise their output voltages can dramatically increase, possibly up to the gate breakdown level. This high voltage is stored on the positive bulk capacitor so that when the IGBT starts to switch, it could see a gate

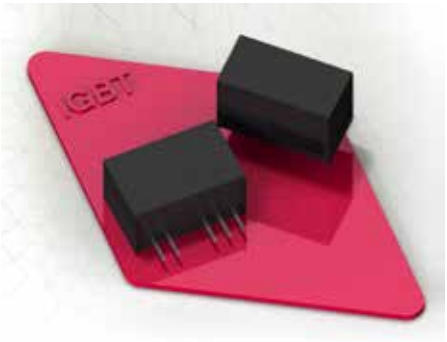


Figure 3. Typical 2 W IGBT driver DC-DC converter from Murata Power Solutions the MGJ2

overvoltage until the level drops under normal load. A DC-DC should be chosen therefore that has clamped output voltages or zero minimum load requirements.

IGBTs should not be actively driven by PWM signals until the drive circuit voltage rails are at correct values. However, as gate drive DC-DCs are powered up or down, a transient condition might exist where IGBTs could be driven on, even with the PWM signal inactive, leading to shoot-through and damage. The DC-DC should therefore be well behaved with short and monotonic rise and fall times. A primary referenced on-off control can enable sequencing of power-up of the DC-DCs in a bridge reducing the risk of shoot-through.

DC-DCs for 'high side' IGBT drives see the switched 'DC-link' voltage across their barrier. This voltage can be kilovolts with very fast switching edges from 10 kV/µs upwards. Latest GaN devices may switch at 100 kV/µs or more. This high 'dV/dt' causes displacement current through the capacitance of the DC-DC isolation barrier of value:

$I = C. dV/dt$

So for just 20 pF and 10 kV/µs, 200 mA is induced. This current finds an indeterminate return route through the controller circuitry back to the bridge causing voltage spikes across connection resistances and inductances potentially disrupting operation of the controller and the DC-DC converter itself. Low coupling capacitance is therefore desirable, ideally less than 15 pF.

When the IGBT driver is powered by an isolated DC-DC converter, the barrier in the converter will be expected to withstand the switched voltage applied to the IGBTs which may be kilovolts at tens of kHz. Because the voltage is switched, the barrier will degrade over time faster than with just DC by electrochemical and partial discharge effects in the barrier material. The DC-DC converter must therefore have robust insulation and generous creepage and clearance distances. If the converter barrier also forms part of a safety isolation system, the relevant agency regulations apply for the level of isolation required (basic, supplementary, reinforced), operating voltage, pollution degree, overvoltage category and altitude.

It is advisable to place the IGBT driver and its DC-DC converter as close as possible to the IGBT to minimise noise pick up and volt drops. This places the components in a potentially high temperature environment where reliability and lifetime reduces. DC-DC converters should be chosen with appropriate ratings and without internal components that suffer significantly with temperature such as electrolytic capacitors and opto-couplers. Data sheet MTTF values will typically be quoted at 25 or 40 Celsius and should be extrapolated for actual operating temperatures.

Solving the Wireless Bandwidth Crunch with 60GHz Millimeter-Wave Technologies

› Peju Chiang, SiBEAM, Inc.

Millimeter wave technologies can provide the solution to the bandwidth crunch created by a growing number of Internet connected devices attempting to move ever-larger volumes of multimedia content across existing wired and wireless media. Operating at the unlicensed 60GHz frequency spectrum, a new breed of devices with integrated multi-gigabit transceivers are already delivering more bandwidth than those currently using the overcrowded 2.4GHz and 5GHz unlicensed bands. With multi-gigabit throughput, these devices are already delivering better services than the few hundreds of Mb/s available from today's most advanced wireless products.

Many applications are expected to benefit from 60GHz millimeter-wave solutions. These include adding new capacity to the traditional Wi-Fi networks in your home and between office buildings for wireless data access and video streaming. And the same technologies are also demonstrating great promise as a wireless replacement for mechanical connectors in consumer electronics and mobile devices. These short-range wireless connectors enable sleeker, more robust products by eliminating bulky conventional connectors while purging the susceptibility to damages caused by exposure to water, humidity, dust, and other contaminants.

Manufacturers are already beginning to migrate to millimeter-wave-based technologies. But risk factors must be considered for adoption, both in terms of selecting the right emerging standards, and choosing the right technology partner to assist in their implementation. This article provides a concise overview of the technologies, applications, and implementation challenges facing manufacturers as they attempt to design products which will satisfy the needs of a bandwidth-hungry world.

60GHz: The Next Frontier

Wi-Fi and Bluetooth wireless technologies, which made the mobile data revolution possible, have become victims of their own success. Originally intended to operate in the unlicensed 2.4GHz band, Wi-Fi's widespread acceptance quickly forced the Wi-Fi Alliance to define its operation for a series of channels located in the next globally available unlicensed band located at 5 GHz. Thanks to steady improvements in efficient 5GHz wireless protocols and radio architectures, Wi-Fi has been

able to keep pace with the growing demand for bandwidth from laptops, tablets and other mobile devices.

IoT: the Game Changer

Excitement is growing as smart devices from DTVs to coffee makers, to refrigerators will now be connecting to the Internet. As the number of wirelessly connected devices continues to skyrocket, the growing demand they create for both access and capacity will quickly outstrip what's available on the existing wireless spectrum. The problem is being compounded as wireless carriers offload increasing amounts of their multimedia traffic—their slices of the licensed cellular spectrum—to the 'free' spectrum available in the Wi-Fi bands.

As a result, both of today's commonly-used ISM bands are rapidly approaching overload. Technical improvements under development can mitigate the problem, but cannot ultimately solve congestion issues, especially in apartments, offices, public spaces and other areas with high user density.

The logical solution to the growing congestion is the adoption of technologies and products capable of operating in the 60GHz (millimeter wave) region where the regulators such as FCC have designated a wide band of spectrum for unlicensed use by industries. With more than 7GHz of spectrum, broken down into four 1.8GHz channels, this new airspace provides 20X more bandwidth than its 5GHz counterpart.

Wireless Connectors: Not an Oxymoron

60GHz millimeter wave also gives device designers an innovative solution to the annoying problems caused by mechanical connectors. When used with low power RF with the appropriate antenna, a millimeter-wave data interface can serve as a so-called 'wireless connector' which, at close proximity, provides more robust connectivity and can replace today's mechanical connector solutions. In fact, SiBEAM has introduced a wireless connector solution that has demonstrated transfer rates of up to 12Gbp/s (full duplex). Known as Snap technology, it is intended as a replacement for most conventional data and video connectors, including all variations of USB 2.0, USB 3.0, HDMI, and DisplayPort.

Wireless connectors are especially valuable in mobile devices such as smartphones, tablets and cameras because they eliminate mechanical connectors, one of most failure-prone components in those products. Besides creating an entry point for the pocket lint, sweat and other common contaminants, most mechanical connectors have a tendency to wear out or shear off from their PCB mounts well before a product's batteries or electronic components have a chance to fail. Eliminating mechanical connectors allows designers to "life-proof" their products against water, dust, dirt, moisture and the occasional spilled coffee.

More, using wireless connectors allows designers to create sleek, stylish products which would not be possible if they had to compromise their industrial designs by sacrificing precious space to mechanical connectors. In fact, mechanical

connectors have already become a stumbling block in the design process as manufacturers struggle to meet the demand for ever-thinner tablets, mobile phones and other electronic devices. Even today, connectors can take up as much as half the height of a CE device.

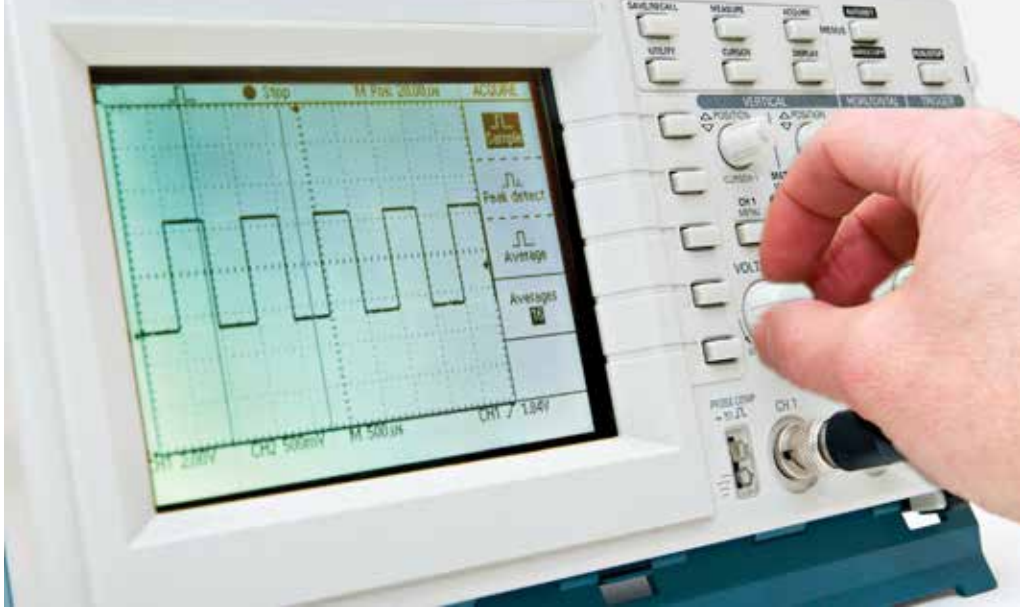
Close proximity wireless connectors also help to eliminate EMI problems. Often, mechanical connectors are the largest source of unwanted radio 'noise', and at Gigabit speeds, suppressing connector-induced EMI becomes a major system level challenge. This adds to both the overall system design effort and the unit cost of each device.

So, wireless connector solutions such as SiBEAM's Snap technology help designers to develop sleeker, more functional mobile electronic products which are better able to survive the real-world conditions.

Applications & Markets

Millimeter-wave radio's unique propagation characteristics include:

- RF signals behave much more like light than conventional radio waves at millimeter-wave frequencies.



Because of this, early implementations in the band were limited to line-of-sight applications. However, recent innovative techniques such as adaptive beam-forming and beam-steering have been implemented to provide a robust non line-of-sight communication.

• 60GHz signals are attenuated by oxygen, a phenomenon that can severely limit range. This problem must be overcome in order to deliver the wireless experience consumers expect, a task which requires system-level knowledge as well as radio and antenna design know-how.

• Unlike 2.4 & 5GHz signals, 60GHz RF cannot penetrate most walls. This makes 60GHz technologies suitable for consumer experience that is contained in the same room.

At first glance, these issues might seem to limit the utility of the millimeter-wave band, but properly defined applications deliver unique advantages to both users and manufacturers. These applications fall into three general categories, defined primarily by the distances they must span.

Gigabit Wireless Connectors

Wireless connectors, aka Close Proximity Data Links, provide high-bandwidth I/O in consumer electronics and computers at distances up to 10mm. One promising implementation of millimeter-wave interfaces is already available with SiBEAM's wireless Snap technology. Its high data throughput makes it ideal for creating wireless docking solutions or device-to-device synch connections. Boasting a 12 Gb/s aggregate throughput, Snap can completely replace the USB, HDMI, or DisplayPort connectors for data and video transfers. Snap is complementary to wireless power charging technologies, and when combined, Snapallows designers to create device form factors which are truly connector-free (Figure 2).

Indoor Wireless Connections

Millimeter-wave technology can also be used to enhance today's Wi-Fi networks by adding much-needed wireless capacity. In fact, one of the most active standards efforts for these applications is IEEE 802.11ad, formerly Wireless Gigabit – or "WiGig" for short. The standard defines a new physical layer for 802.11 networks in the 60GHz spectrum and is poised to become the next-generation Wi-Fi to alleviate the anticipated congestion in current 2.4GHz and 5.0GHz spectra.

The current 802.11ad specification includes an enhanced version of the standard 802.11 Media Access Control (MAC) layer to support data rates of up to 7Gbits/s. With a complete standard in place and early-market products already available, 802.11ad certification programs are now being implemented by the Wi-Fi Alliance.

While the up and coming 802.11ad standard can carry video streams over IP-based packet protocol, products based on the 60GHz WirelessHD standard have been shipping for almost a decade. Created to stream video content between HD audio/video devices such as HDTVs, DVRs, PCs, mobile and other consumer electronics, products supporting the WirelessHD standard provides the same 1080p60 Full HD video and multi-channel audio experience at near zero latency expected from cables. WirelessHD technology's high capacity and low latency is well suited for uncompromised wireless video entertainment and highly interactive experiences such as wireless gaming and virtual reality applications. WirelessHD enables a "cable like" HDMI experience without the wires and utilizes the 7GHz channel to support data rates of up to 28 Gb/s while carrying both 2D and 3D formats as well as 4K video streams.

The first wave of WiHD-enabled laptops, smartphones, DTVs, video projectors and VR headsets have been well-received, thanks to the ease-of-use and performance they offer. For example, the LeTV's MAX1

smartphone has garnered accolades and popularity in China, largely due to its integrated WiHD interface which lets users wirelessly beam games, movies or other video content playing on the MAX1 over to a video projector, LCD screen or other HD display. Users with non-WiHD-capable equipment can also enjoy the easy set-up and convenient operation afforded by a wireless connection with a WiHD-to-HDMI adapter, currently available from several manufacturers.

Both 802.11ad and WiHD compensate for the 60GHz band's line-of-sight propagation characteristics through the use of beam forming and beam steering between the transmitter and receiver ICs. Network processors along with RF IC integrated with phased array antennas increase the signal's effective radiated power and allows the wireless system to select the best available Tx/Rx path. In the case of WiHD, this technique has enabled products to support point-to-point, non-line-of-sight (NLOS) connections at distances of up to 10 meters.

While created to support different protocols and applications, WiHD and 802.11ad products are expected to peacefully co-exist in the same home, and even the same room (Figure 4).

Gigabit Wireless Outdoor Links

Millimeter-wave technologies will also play an important role in future backhaul infrastructure applications that include next-generation 5G mobile broadband infrastructure, fixed access backhaul extension, and point-to point on-campus links where the 60GHz channel's wireless capacity and highly optimized RF link make it an ideal 'wireless fibre' to replace today's fibre-based backhaul applications.

At present, there are several approaches vying for market acceptance but most systems are currently based on some implementation of the IEEE 802.11ad standard currently being developed. In addition to the in-room applications mentioned earlier, this amendment to the existing 802.11 standard includes the support of long-reach links (up to 500 meters) in the 60GHz millimeter wave spectrum.

Implementation Strategies

Implementing 60GHz millimeter wave technology does have its challenges but there are practical strategies which help. Perhaps the best advice is to choose CMOS RF ICs on which to base your system. Previously, most RFIC makers have relied on exotic, high cost processes such as Gallium-Arsenide (GaAs) or silicon-germanium (SiGe) which allow only limited integration and cost-reductions. Now, however, millimeter-wave devices using commodity-grade deep submicron CMOS processes are available. Such CMOS RFICs are helping to bring the cost of millimeter-wave products to cost points suitable for the consumer electronics market.

If a suitable commercially available solution is available, it is frequently the best choice, especially for early-entry products. Existing RFICs can reduce both time-to-market and development costs, allowing you to devote your resources to adding features which will help differentiate your product.

But there are considerations before you commit to a particular off-the-shelf chip/chipset:

- The application affects the type of 60GHz technology you should choose. Is it wireless video within the room? Or gigabits of data across a campus? Or is it the need to transfer a lot of data across short distances extremely quickly?
- Are you providing an end-to-end (closed) system or does the product have to comply to an industry standard?
- Is your product battery operated or will AC power be available? Trade-offs between link throughput, distance travelled, antenna design, and component selection will depend on the power available and operating time.
- What industrial design constraints

will your product have? Any wireless design requires careful placement of the RF circuit within the system. 60GHz adds additional challenges due to the properties of short millimeter waves. In small form factors such as smartphones, heat dissipation and thermal management will add complexity as well.

- Budget. Depending on throughput, distance, form factor, and placement, different wireless components and system level implementation will impact the final cost.

Conclusion

With the 2.4GHz and 5GHz ISM bands approaching capacity saturation, the unlicensed portion of the millimeter-wave band offers a much-needed piece of open spectrum where wireless devices can enjoy new dimensions in capacity and access. Standards are already in place to define both indoor Wi-Fi service and outdoor long-haul links for point-to-point links as well as "last block" mobile access. Millimeter-wave technologies also show promise for use as ultra-short-range "wireless connectors" which eliminate the durability, EMI and industrial design issues associated with traditional mechanical connectors.

Advanced CMOS technologies are making it possible to unlock the potential of all these applications of the unlicensed 60GHz frequency spectrum in an economical manner. SiBEAM is one of the few companies in the world that has mass-produced millimeter-wave ICs in high-volume CMOS fabs on multiple process nodes for over a decade. Part of the company's success can be attributed to its proven closed-loop design for production process where the device's production test vectors are created using inputs from collected data from the CMOS processes used. During production tests, the results produced by these highly-accurate test vectors are then used as feedback by designers to fine-tune the design for optimal yield and performance. The methodology can be migrated between process nodes at different manufacturing foundries. SiBEAM provides support through every phase of design, manufacturing, test and deployment including: RF design, thermal management planning; ackaging and implementation; compliance testing, FCC Part 15B and Part 15C.

About The Writer:

Peiju Chiang is product marketing manager for SiBEAM, Inc., overseeing the company's 60 GHz wireless solutions. Mr. Chiang's responsibilities include overall business strategy and product management of semiconductor products which feature leading standards such as IEEE 802.11ad and WirelessHD®. During his time at SiBEAM, he has been instrumental in driving the adoption of WirelessHD® technology in mobile and consumer electronics markets.

Mr. Chiang is a seasoned professional with over twelve years of experience in the wireless semiconductor industry. Prior to joining SiBEAM, Mr. Chiang held various product marketing and system engineering positions at Silicon Image and Realtek Semiconductors.

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RFID And Wireless Power transfer simulation From Tag to system

› Marc Rütschlin, CST AG

This article discusses the design and modeling of both low frequency (LF) and high frequency (HF) RFID devices using CST® STUDIO SUITE®. This can be done at the level of the individual tag, but also for the entire system, including the reader, the tagged object and its surroundings. Analyzing the entire system with simulation allows the suitability of the chosen RFID system for the application to be investigated, and can reveal unforeseen interactions that can be hard to identify with measurement alone.

Overview

Radio frequency identification (RFID) makes it possible to catalogue, label and track items quickly in demanding environments. At the heart of all RFID systems is the tag – an inductive coil or antenna usually connected to a small microchip. When interrogated by an RFID reader, this chip generates a unique data string which allows the tag to be identified and, if necessary, can provide additional information to the reader.

Most RFID tags in common use are passive, which means that they don't carry any power source. Instead, the power to run the tag is supplied by the interrogating reader through a near-fi eld or far-field coupling to the reader. This means that RFID can be very sensitive to other objects in the environment. Interference and shielding effects can both affect the performance of tags, and they need to be taken into account when considering an RFID system. Full-wave EM simulation can capture the behavior of RFID devices in great detail, making it possible to investigate how a tag will behave without constructing a prototype.

Tag simulation

For the purposes of simulation, RFID systems can be divided broadly into two groups: low frequency (frequencies up to tens of megahertz) and high frequency (hundreds of megahertz or greater). LF RFID tags are very much smaller than the wavelength of the reader field. They act as an inductive coil, and couple only through the magnetic field. Common applications of LF RFID are animal tagging, industrial process control and smart card ticketing. These applications do not typically require high data rates, but do need to be very robust.

Since they are electrically small, LF

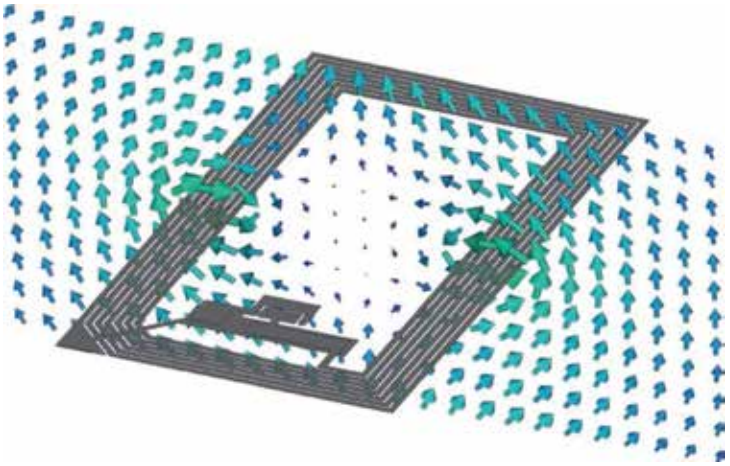

Figure 1: H-field (left) and surface current density (right) for a typical LF RFID tag.

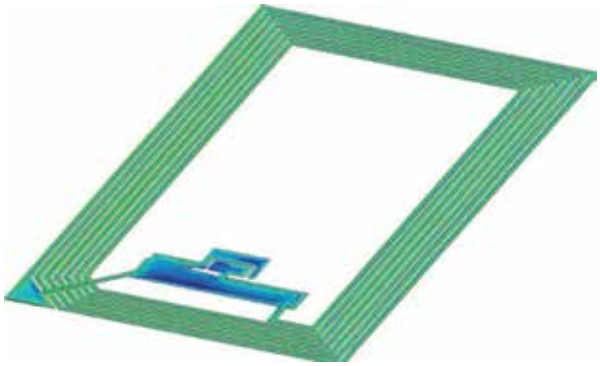

Figure 2: A high-frequency RFID tag (top) and its farfi eld pattern at its

RFID tags are best simulated using the frequency domain solver in CST STUDIO SUITE. For these tags, simulation can be used to calculate the H-field and surface currents induced in the coil (Figure 1), and to extract an equivalent circuit for the tag.

HF RFID systems on the other hand offer higher data rates and longer ranges, making them suitable for applications such as inventory tracking and electronic toll collection. In HF RFID tags, the coil acts as a normal antenna, usually tightly folded to reduce its area. This means that the impedance matching in HF RFID tags needs to be carefully optimized to allow the small antenna to operate efficiently.

HF RFID tags can be simulated using the time domain solver or the frequency domain solver, depending on the antenna geometry and model size (including the environment). Useful results when dealing with HF RFID tags include their S-parameters and their farfields (Figure 2). The farfields can be used to identify the best position and orientation for the RFID tags relative to the reader and, using the built-in "Calculate RFID Read Distance" macro in CST STUDIO SUITE, the readable range of the tag can be calculated over the range of possible angles (Figure 3) given the output power and sensitivity of the reader antenna.

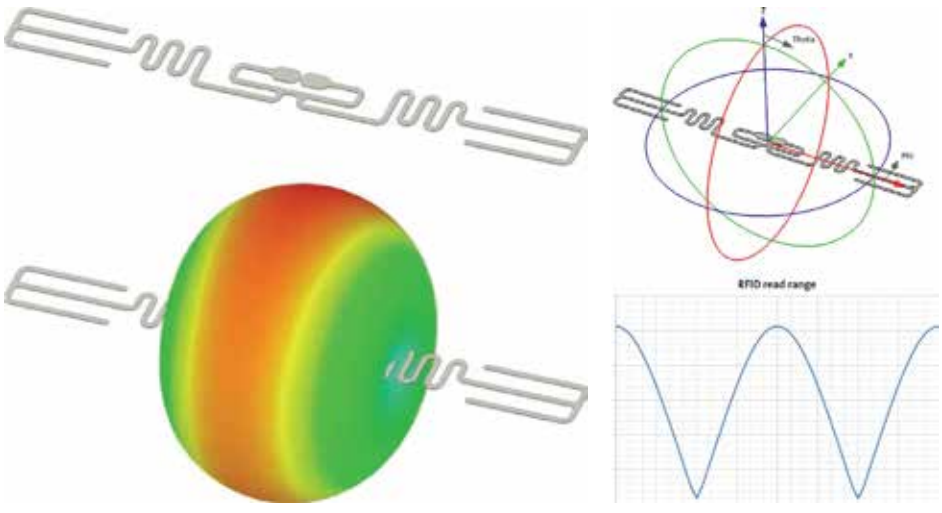

Figure 3: The read range of the RFID tag in Figure 2.

Most RFID tags include an integrated circuit, which contains the data associated with that tag. The chip itself will have a characteristic inductance and capacitance which will affect the tuning of the antenna, and may also include a matching circuit to improve antenna efficiency. To allow these to be taken into account by the simulation, CST STUDIO SUITE also includes a schematic circuit simulation tool which is integrated into the 3D design environment. The 3D model can be treated as a block and included in a circuit simulation or, using true transient-circuit co-simulation, the chip can be inserted into the 3D model as a SPICE or IBIS fi le. A simulation involving the complex chip impedance is shown in Figure 5.

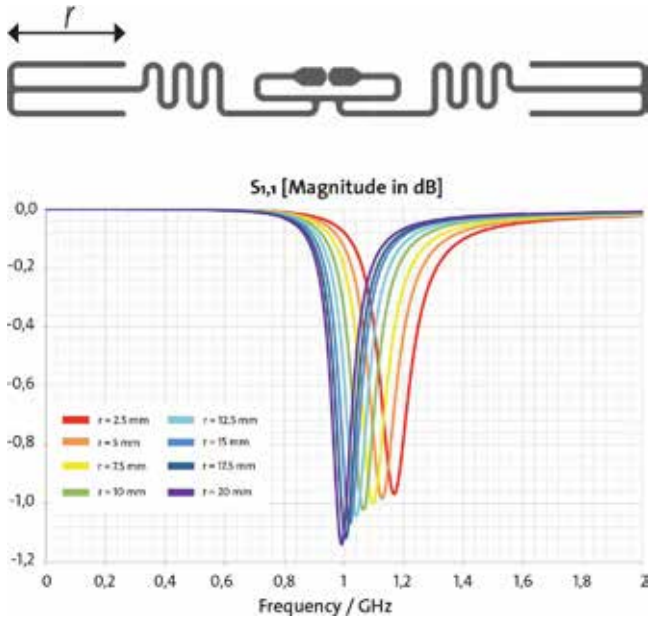

Figure 4: (top) A parameterized antenna model. (bottom) The S-parameters from a parameter sweep over the arm length r, not taking complex chip impedance into account.

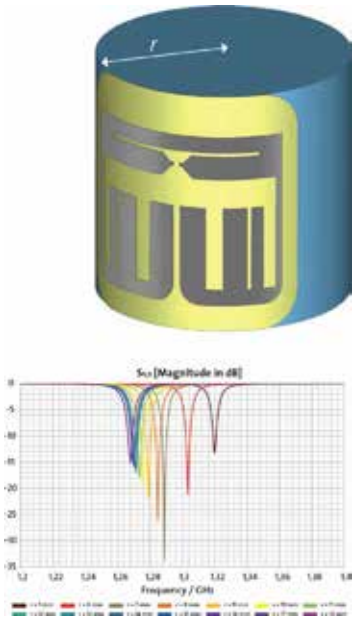

Figure 5: (top) A bent RFID tag model. (bottom) The S-parameters from a parameter sweep over the radius of curvature, taking into account the complex chip impedance.

To improve the efficiency of a tag, these matching circuits can be tuned using the built-in optimizers in CST STUDIO SUITE. These find the set of parameters for the circuit elements which best fi t a given goal - for example, it can find the component values that minimize the S1,1 of the antenna-chip combination at the desired resonant frequency.

Optimization is not limited to circuit elements, however. The dimensions of the 3D antenna model and its material properties can also be parameterized and optimized (Figure 4) in order to improve its performance. When dealing with very compact RFID tags, this approach has the advantage that it can reduce the number of additional circuit elements which have to be added to the tag during construction. For example, a parameter sweep or an optimization over the substrate thickness can be used to adjust the capacitance and inductance of the antenna and improve its effi ciency without adding an additional matching circuit. Alternatively, a parameter sweep can be used to investigate how well a design performs when manufacturing tolerances and deformations are taken into effect (Figure 5).

Tag and Reader Simulation

The tag is only half of the RFID system. The reader also needs to be carefully designed to allow efficient, reliable scanning. Because RFID readers can be very sensitive to the distance, position and angle of the tag, it is often useful to be able to calculate the system's behavior for numerous different positions and orientations quickly. With CST STUDIO SUITE, the tag and the reader can be modeled together in the same simulation. The tag's coordinates can be easily parameterized, and a parameter sweep offers a straightforward way to analyze the effect of misalignment on the tag.

Figure 6 shows how different alignment problems affect the behavior of an RFID-based NFC system. These planar coils turn out to be very sensitive to small changes in the position of the tag relative to the reader, but are more resilient to angular changes. Moving the tag by 10 mm either perpendicular or parallel to reader causes the output power to drop almost to 0mW, but the effect of rotating the tag on the reader is relatively small.

Improving the efficiency of the link between the reader and the tag requires a multi-port matching circuit optimization. The chips used in RFID tags often have frequency-dependent impedance profiles with both real and imaginary parts, which means that a

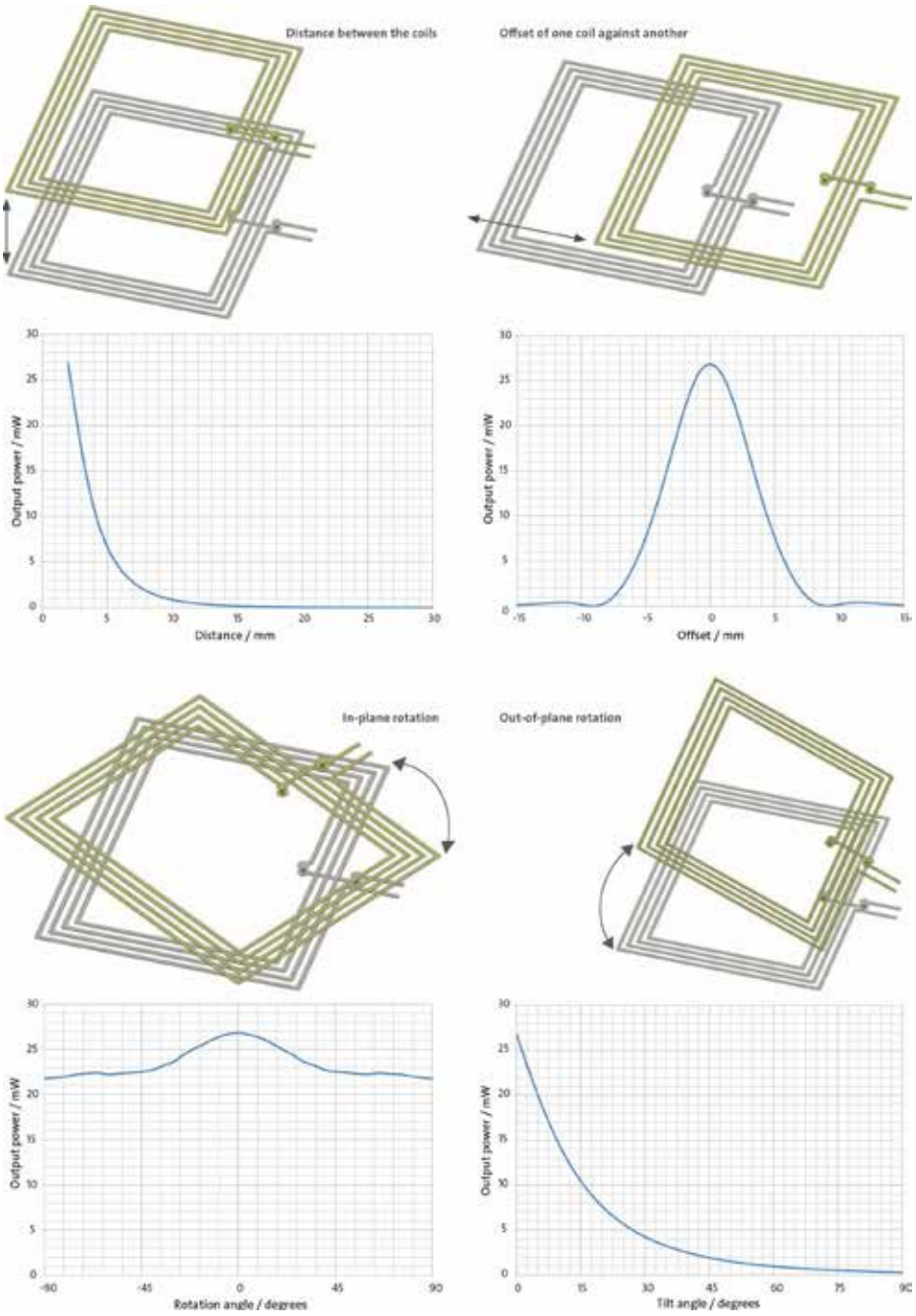

Figure 6: The eff ect of diff erent possible alignment problems in a 13.56 MHz RFID-based near-fi eld communication (NFC) system.

broadband optimization is required. In addition, matching the coils at a single position will cause as many problems as it solves – strong mismatches will occur when the antennas are moved. Together, these two factors make effective matching difficult.

For this, the OptenniLab tool is ideal. Optenni Lab shares a close two-way link with CST STUDIO SUITE, allowing simulation results and circuit models to be shared between the two products. The matching circuits can then be optimized to get a good match across a wider range of frequencies, and the effect of the optimized circuits can be included directly in a new 3D simulation.

The inclusion of circuit simulation tools means that the analysis can be more detailed than a simple S-parameter calculation. The electronic components of the chip and reader can be combined with a 3D model of the system (Figure 7), and using the AC Task, a realistic data transmission can be simulated. This will take into account distortions to the signal caused by modulation and demodulation, refl ection within the system, and unwanted parasitic eff ects such as interference from other tags.

Full system simulation

It is not enough for an RFID tag to work in isolation. Any practical RFID application also needs to take into account the effect of the environment, including detuning, shielding, and coupling between tags. These effects can have many different possible sources, including other tags, metal structures, nearby people and animals, and the tagged object itself. Simulation is the only way to calculate these complex effects before the prototyping phase begins.

Figure 8 shows one example: sixteen pill boxes marked with RFID tags, all located in close proximity. These tags are interrogated by a reader located some distance away. Figure 9 shows the S-parameters for one tag on each row, ordered from those nearest to the antenna to those furthest away. The simulation reveals that the RFID tag in the first row, which is closest to the antenna, are actually more

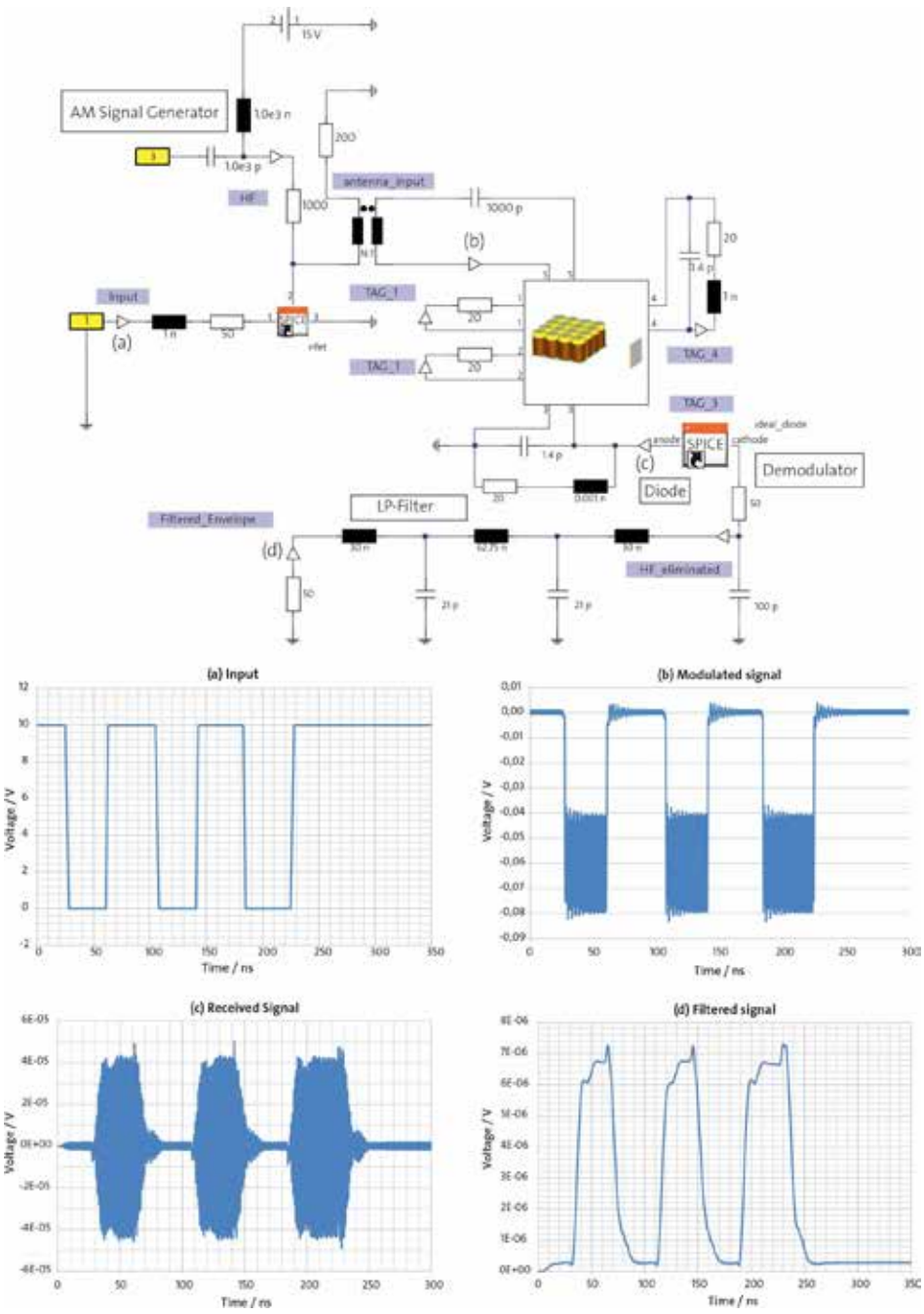

Figure 7: Schematic view of a full tag-and-reader simulation, showing the time-domain signals at various points throughout the system. The 3D model is the large block on the center-right.
Full sYstEM siMulAtion

weakly coupled than the RFID tags located in the center of the pallet, due to constructive interference. This effect would be extremely difficult to calculate without carrying out a fullwave simulation.

Another situation where a full simulation is useful is shown in Figure 10. Here, the RFID tag is embedded in a complex metal environment, consisting of several spools of a cable contained in a crate reinforced by a metal cage. All this metal will shield the RFID tag, which means that it may only be readable in certain directions – or worse still, not at all.

A full-wave simulation of the system can calculate the farfi eld of the RFID tag (Figure 11) in order to fi nd the transmission peaks and nulls, to allow the engineer to decide where the best location for the reader antenna is. When compared to Figure 2, it is evident that the environment has altered the tag's farfi eld drastically.

The time domain solver in CST STUDIO SUITE supports GPU computing, which can dramatically speed up the simulation of large or complex models. This makes it possible for big sections of the environment to be simulated and, especially when combined with distributed computing (DC) for solving systems with multiple tags, can be a very useful extension to the simulation tool.

Conclusion

Traditional RFID design methods can be complemented by EM simulation in order to better understand the behavior of the device. Parameterization and optimization means that multiple design variations can be investigated as part of a what-if analysis, and the antennas can be tuned and matched for better efficiency. The whole system can also be simulated, including the reader, multiple tags, and the device's surroundings, allowing engineers to examine how the system will behave in a realistic environment. These environmental effects can be very hard to detect without using simulation.

Author Marc Rütschlin, Market Development Manager for Microwave and RF Applications, CST AG

Figure 8: A pallet containing multiple RFID-tagged pill boxes (left), close to a reader (right).

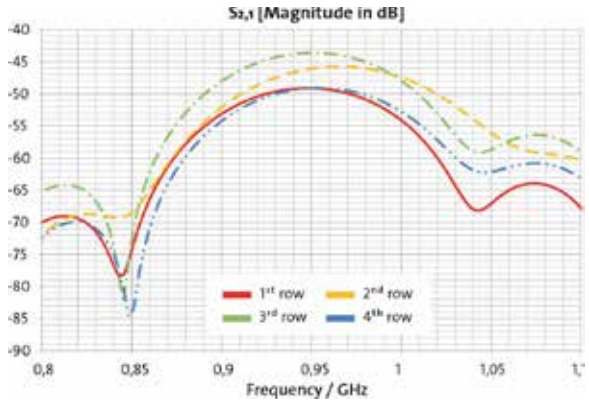

Figure 9: S-parameters calculated for one RFID tag on each row.

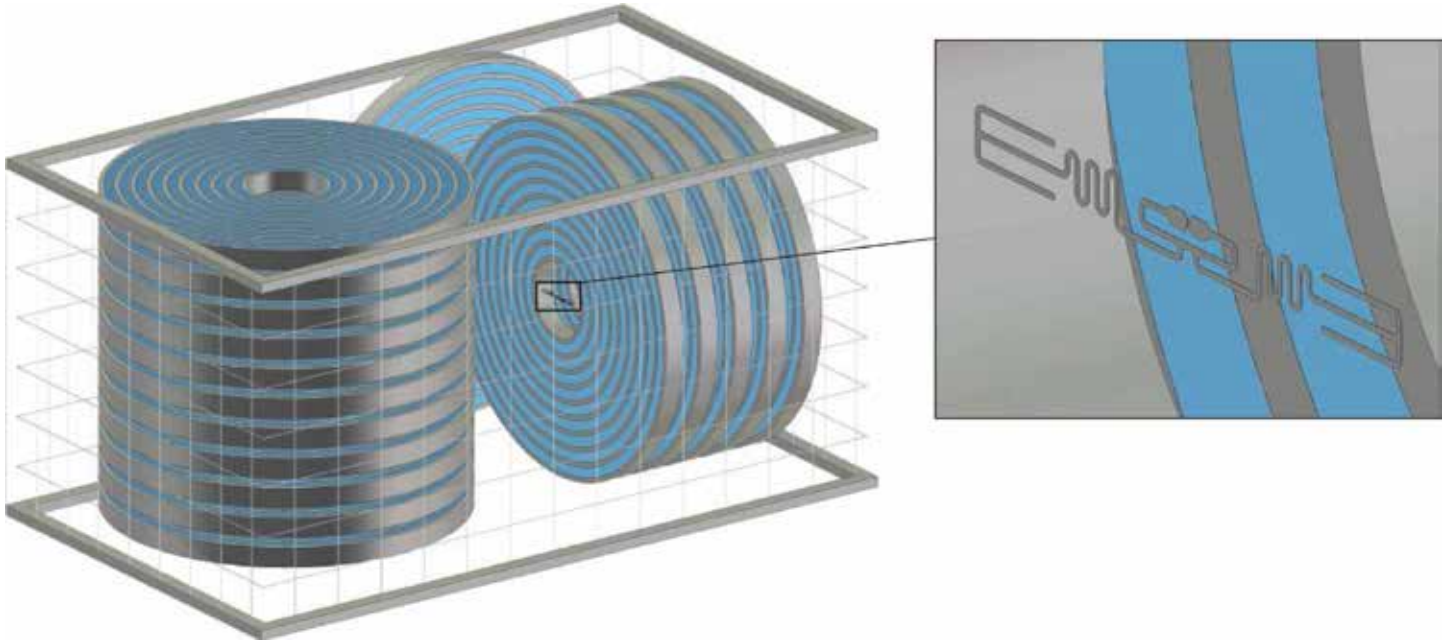

Figure 10: A RFID tag on a spool of cable in a reinforced crate.

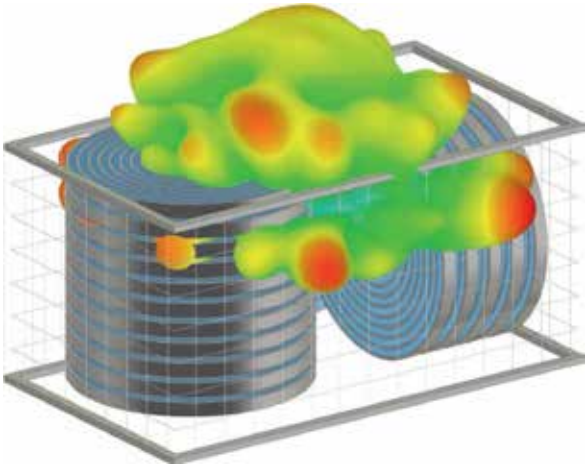

Figure 11: The farfi eld of the RFID tag in situ. Red areas indicate transmission peaks.

New Test Adapters Improve Your PDN Measurements

› PICO TEST

This article discusses measurement of small resistances, such as those encountered during PDN measurement, using the OMICRON Lab Bode 100, Keysight E5061B, and the Picotest J2102A common mode transformer.

The resistor being measured is a 250uOhm 1% resistor manufactured by Stackpole. The datasheet is not clear about how the device measurement is performed, though the resistor element is specified to be within 1% or 2.5uOhms.

Both the OMICRON Lab Bode 100 and the Agilent E5061B are capable displaying impedance in the 2-port measurement. They support the OPEN, SHORT and LOAD calibration in the 2-port series and shunt measurements for improved accuracy. A common mode transformer is necessary for all measurements where the ground braid resistance is significant, as shown in Figure 2, unless the VNA has a differential or semi-floating 50Ω input. The Keysight E5061B is unique in that its low frequency gain-phase ports have semi-floating inputs and do not need the transformer. The higher frequency Port 1/2 inputs, as well as the Bode 100 and most other VNAs for that matter, do require the transformer in order to make the 2-port shunt measurement. The J2102A gets well above 100MHz, which is sufficient for general PDN use. Above that frequency the transformer is not really impactful.

By way of example, the simulation result of the 2mOhm case is shown in Figure 3, while sample measurements of 1 and 2 mOhm parts are shown in Figures 4 and 5, with and without the J2102A common mode transformer inserted. In order to quantify the significance, the approximate error is the parallel ground braid resistance divided by the DUT. For instance, a 5% error would occur at a DUT value of 1Ω as the parallel ground resistance is 50mΩ or 5% of 1Ω.

Moving on to our 250uOhm measurement, a DC measurement is made using precision, low noise 6.5 Digit DMM, as a point of reference.

Figure 5 A DC measurement is made using precision, low noise 6.5 Digit DMMs (Picotest M3500A) to obtain a second measurement for correlation. The power supply does not have current programming, which is the reason the current is set to an odd number. The two channels of the

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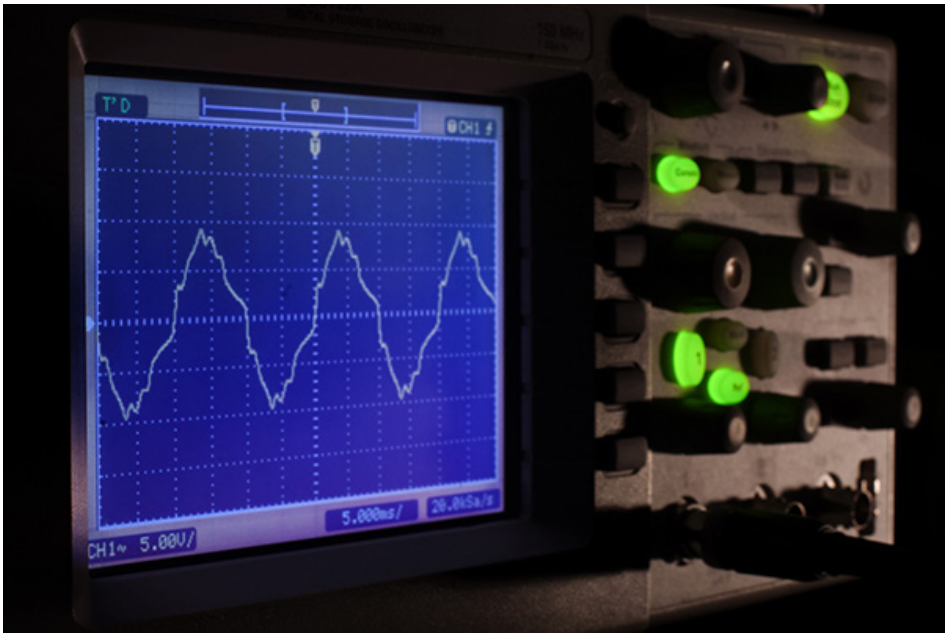

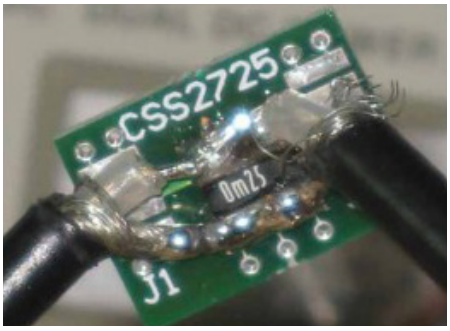

Figure 1, A 250uOhm current sense resistor is mounted with RG58 coax soldered directly to the resistor for measurement

power supply are connected in parallel and both are in current limit for this measurement.

Figure 5 A DC measurement is made using precision, low noise 6.5 Digit DMMs (Picotest M3500A) to obtain a second measurement for correlation. The power supply does not have current programming, which is the reason the current is set to an odd number. The two channels of the power supply are connected in parallel and both are in current limit for this measurement.

The calculated DC resistance value is:

341uV/1.4184A=240uOhms

The noise floor of the measurement using the J2102A common mode transformer and a preamplifier is shown in Figure 6 below. Such a sample test is important and recommended as it confirms the validity and limits of the test setup.

The DMM measured value reflects an error of 4% from the specified value. The measurement error includes the error of the two DC meters and the 1 Ohm calibration resistor. The expected error in the measurement due to the 1 Ohm calibration is:

The measurement of the 250uOhm resistor is near perfect. Of course there are other errors, including the tolerance of the calibration resistor, the calibration of the two DMM's and the gain accuracy of the VNA. There is also a cable shield resistance error,

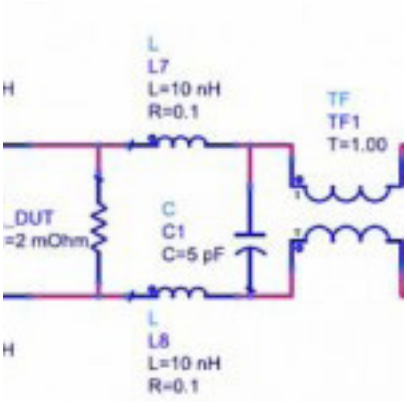

Figure 2 Schematic of the 2-Port impedance measurement including cable resistance, a 2mOhm DUT and the common mode transformer

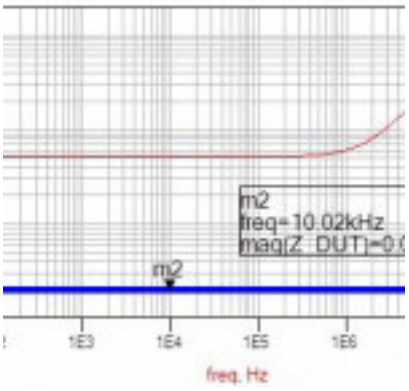

Figure 3 Simulation results of the 2-port shunt thru impedance measurement including cable resistance and 2mΩ DUT with and without the common mode transformer

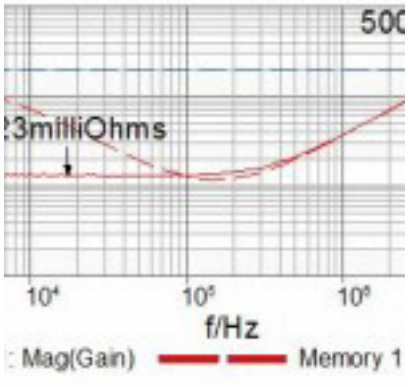

Figure 4 Impedance measurement of the 1mΩ resistor with and without the J2102A common mode coaxial transformer using the OMICRON Lab Bode 100.

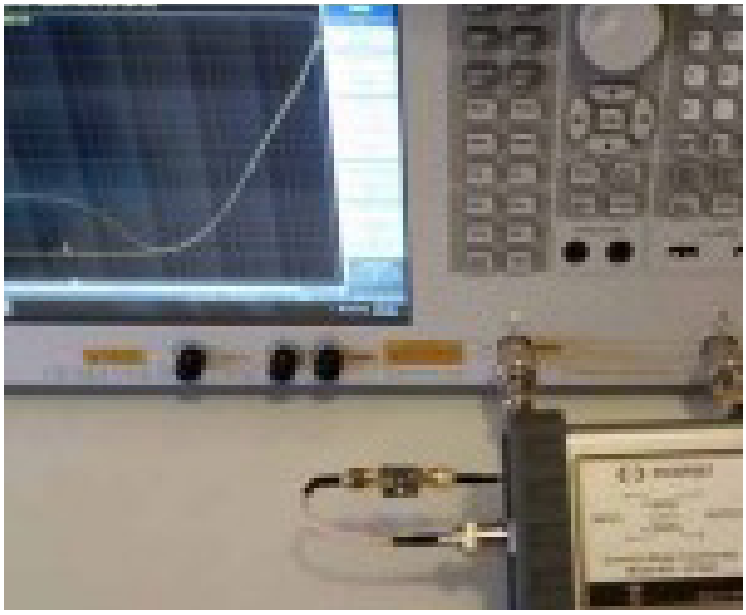

Figure 5 Impedance measurement of the 2mΩ resistor, using Port 1 and Port 2, with and without the common mode coaxial transformer on the Keysight E5061B. The unique GP ports don't require the transformer, but are limited to 30MHz

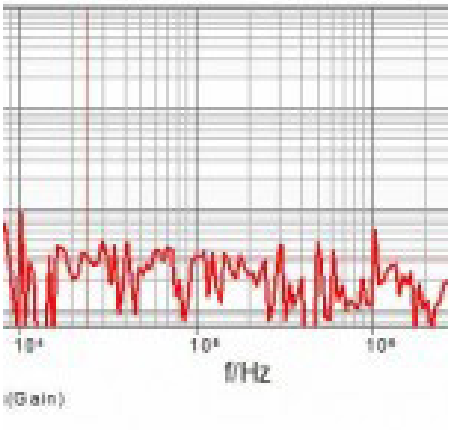

Figure 6 - Noise floor in Ohms on the Bode 100 using the J2102A and the J2180A preamplifier included

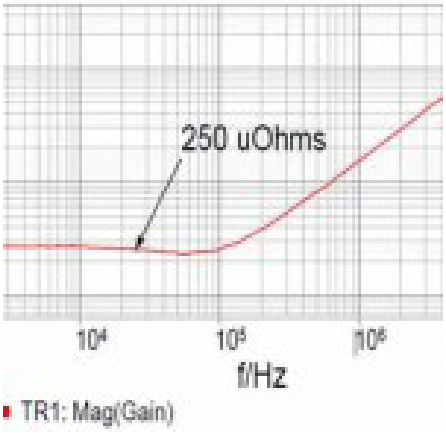

Figure 4, The Bode 100 measurement of the 250uOhm resistor shown in Figure 1. The measured resistance and ESL are shown

Frequency	Trace 1
83.140 kHz	

Figure 5 A DC measurement is made using precision, low noise 6.5 Digit DMMs (Picotest M3500A) to obtain a second measurement for correlation. The power supply does not have current programming, which is the reason the current is set to an odd number. The two channels of the power supply are connected in parallel and both are in current limit for this measurement.

so the longer the cables the bigger the error.

The result would be considered to be excellent even if the result were further from the nominal, in order to account for these additional tolerances. It is clear that the Picotest J2102A common mode transformer and a preamp are indispensable when it comes to getting the most accuracy during PDN measurement.

NIKE DEBUTS WAVE OF INNOVATION WITH ADAPTIVE LACING AND NIKE+ APP

This afternoon Mark Parker, President & CEO, NIKE, Inc., took the stage in New York City to unveil an unprecedented breadth of innovation that includes: Nike Air VaporMax, the latest expression of a global icon; Nike Anti-Clog Traction, a mud-beating polymer; Nike HyperAdapt 1.0, which introduces the future of sport-informed adaptive lacing; and the new Nike+ app, a personalized service for athletes, and more. These products represent Nike's unrelenting drive to not only exceed expectations but also inspire all athletes by manifesting the unimaginable.

The Nike HyperAdapt 1.0 is the payoff of significant research into digital, electrical and mechanical engineering. Powered by an underfoot-lacing mechanism, the shoe proposes a groundbreaking solution to individual idiosyncrasies in lacing and fit preferences. That means the undue pressure caused by tight tying and slippage resulting from loose laces are relics of the past. Precise, consistent, personalized lockdown can now be manually adjusted on the go.

Tinker Hatfield and Tiffany Beers, Senior Innovator, NIKE, Inc., led the project. Together with Parker, they envision a future where the product changes as the wearer changes, thus serving the needs of athletes instantaneously. This shoe is just the tip of that adaptive iceberg - one step closer to facilitating complete synchronicity between body and athletic footwear.

THESE PRODUCTS REPRESENT NIKE'S UNRELENTING DRIVE TO NOT ONLY EXCEED EXPECTATIONS BUT ALSO INSPIRE ALL ATHLETES BY MANIFESTING THE UNIMAGINABLE.

The Nike HyperAdapt 1.0 is also just one of Nike's significant statements inaugurating the "Era of Personalized Performance" introduced by Parker.

Nike HyperAdapt 1.0

The new Nike+, which provides an all-access pass to athletic potential, similarly characterizes this period.

"We are surrounded by technology and data, but for athletes to truly achieve their potential they require something richer and more meaningful. They don't need a dashboard; they need a relationship," Parker says.

Connecting Nike's wealth of sport knowledge with its footwear and apparel offerings, Nike+ translates the "plus" to "personal," providing members with customized guidance, support and a host of tailored resources that unlock the best of Nike.

Dynamic coaching and training programs help improve a full gamut of activity — a runner's times, a weightlifter's strength and a yogi's flexibility. In person, Nike+ Run Club and Nike+ Training Club sessions bring communities of athletes together for shared inspiration and motivation, whether in intimate neighborhood sessions or at international marathons.

This engagement also applies to new athletes. Nike's suite of digital products welcomes them with starter programs as well as shoe and product suggestions. As such, Nike+ realizes a universal truth in sport: Community is a potent motivator.

"We have the most personal solutions to today's most common challenges," asserts Parker. "We know athletes better than anyone else. Today, for the first time, all athletes can benefit from that expertise."

Antenova announces two flexible antennas: Bentoni and Asper for positioning applications with GNSS and 2.4-2.5GHz

Antenova Ltd, manufacturer of antennas and RF antenna modules for M2M and the Internet of Things, is adding two new positioning antennas, Bentoni and Asper, to its range of flexible FPC antennas.

Bentoni is a positioning antenna for all of the global public satellite constellations: GPS, GLONASS, Beidou and GALILEO. It is designed to be used in trackers, portable devices, network components, drones and wearable electronics.

Asper is a dual antenna with two separate antenna systems in a single form factor. It combines a 1559 – 1609 MHz antenna with a 2.4 – 2.5 GHz antenna in the same part for positioning applications with wireless connectivity as well. This antenna is suitable for sports cameras, trackers, dash cams, portable devices, network devices and wearable electronics.

Both antennas offer high performance and maintain good isolation in situ within a device.

Bentoni and Asper are the latest flexible FPC antennas in Antenova's flexiiANT product range. They are supplied with an I-PEX MHF connector and a 1.13 mm RF cable in a choice of three lengths. They can be folded to save space in operation within a device.

Antenova's antenna design team aims to create antennas that a product designer can integrate with the other circuits in a design in a convenient way, rather than designing a product to fit around the antenna. The aim of these antenna designs is plug and play simplicity – they are self-adhesive mounted so that they can easily be fixed inside an electronic device.

Bentoni antenna and Asper antennas are available to order now..

Infineon Security and RF Components support Samsung Galaxy S7 and Galaxy A smartphone series

Where smartphone manufacturers differentiate their offers in a highly competitive market through either security or performance, Samsung chooses both. The world market leader builds its new Samsung Galaxy S7 and Galaxy A devices with security and RF (radio frequency) components from Infineon Technologies AG (FSE: IFX / OTCQX: IFNNY).

Smartphone owners benefit from low noise amplifiers (LNA) to antenna tuners and RF switches enhancing the data rate and reducing power consumption. At the same time, embedded Secure Element (eSE) chips protect security-critical functionalities of the mobile device. They enable secured transfer of sensitive payment credentials for contactless payment, convenient biometric authentication of the user and new applications such as mobile ticketing.

The Samsung Galaxy S7 is Samsung's latest premium smartphone introduced at Mobile World Congress 2016. The Galaxy A devices were already launched in December 2015 and are being rolled out worldwide.

Trailblazer for mobile payment

Embedded Secure Elements are becoming a mainstream security solution for NFC (Near Field Communication) applications. According to IHS estimates the number of smartphones shipped with embedded NFC secure Elements is projected to increase from 427 million today to 1,620 million in 2020 (NFC Report 2015). Consumers' ease-of-use and trust in secured mobile services is expected to significantly increase the acceptance of mobile payment.

Follow the Snyder family

Smartphones and wearables are part of our everyday lives. On the occasion of the Mobile World Congress, Infineon has followed a day in the life of the fictitious Snyder family – also visiting Barcelona. During the day, the family's smart helpers are repeatedly put to use. It is in this way the reader also discovers the contribution Infineon makes with its products in the areas of security, high frequency, sensors, power management and mobile infrastructure. With this, we make life easier, safer and greener. Find out more at www.infineon.com/mobile-solutions and at www.infineon.com/mwc

Cobham shifts focus to new generation satcom at BVE 2016

Cobham SATCOM is showing its new series of Portable Manual Deploy Fly-Away VSAT antennas on service provider partner Europsat's stand (D:31) at the BVE 2016 exhibition in

London this week. The EXPLORER 3075 series comes in two variants; a KA-SAT version for EutelSat NewsSpotter and the latest model configured specifically for operation on the new Inmarsat Global Xpress (GX) Ka-band network.

EXPLORER 3075 antennas are built from a firm carbon fibre composite, which ensures high performance, while being extremely portable. All antennas in the series use the same 0.75m 4-piece reflector and materials, delivering a precise blend of lightweight design with strength and durability, ideally suited to the mobile nature of outside newsgathering and broadcasting.

While providing unmatched radio performance and service reliability on Inmarsat's global and mobile GX satellite service, the new EXPLORER 3075GX variant also offers the flexibility to switch to the established KA-SAT based NewsSpotter service when using an optional 'field conversion kit'. The possibility for easy switching from Inmarsat GX to NewsSpotter provides flexibility for newsgathering teams to ensure they can access the best available service. Switching using the conversion kit is straightforward; the user simply changes the antenna feed chain using a 'bicycle style' quick release mechanism, meaning no tools or expertise are required. Within minutes, EXPLORER 3075GX can be transmitting on the alternative satellite, ensuring availability of a high bandwidth link to the studio and the Internet.

EXPLORER 3075GX delivers reliable, high quality live streaming/ broadcasting in addition to remote videoconferencing and Internet cloud services including voice, radio, data and fax. The terminal has an embedded WLAN Access Point and four LAN interfaces, allowing for multiple wireless and wired connections.

"Like Eutelsat NewsSpotter, the Global Xpress satellite network will become a key resource for outside broadcasting and with EXPLORER 3075GX we have developed a sophisticated antenna system that ensures users can make the most of the high bandwidth Inmarsat's new service offers," explains Henrik Noerrelykke, Vice President, Land Mobile Business Development, Cobham SATCOM.

"Because EXPLORER 3075GX shares the same platform as the EXPLORER 3075 with a ViaSat eTRIA configured for the KA-SAT NewsSpotter service, we can offer users a new kind of flexibility that allows them to choose the best available service whilst on location, ensuring their ability to broadcast regardless of environment or service status," adds Noerrelykke.

The EXPLORER 3075GX weighs approx. 22 kg and is transported in two rugged hard cases. Each case is airline checkable and is easy to carry. The EXPLORER 3075 for KA-SAT weighs approx. 11kg and comes in a single airline checkable rugged hard case.

RF transistor delivers >50% efficiency at 150W DVB-T for ultra wideband asymmetrical Doherty applications

Ampleon today announced the launch of the BLF888E RF power transistor designed for DVB-T UHF asymmetrical wideband Doherty amplifier applications. Fabricated in a SOT539 package using a sixth generation high voltage LDMOS process, the BLF888E has greater than 50% power efficiency, this being typically up to 10% more efficient compared to previous devices. With its high efficiency rating, the device helps reduce the energy consumption profile of the end-application. The average DVB-T power output is 150 Watt, representing typically a 25% increase in output power of previous devices making it one of the highest power levels available from a single transistor for such broadcast applications.

Also, the characteristics of the BLF888E provide a typical 120 MHz bandwidth per sub-band compared to the industry norm of 40 – 50 MHz narrow bands for similar applications.

To aid development of asymmetrical wideband Doherty amplifiers for UHF DVB-T applications a set of three evaluation boards are available on request that cater for the 470 – 590 MHz, 580 – 690 MHz and 650 – 790 MHz sub-bands. The amplifiers have a 1:1.5 main/peak power ratio and are driven from a 50 VDC supply.

Thijs Tullemans, Senior Director Marketing BU Multi-Market, Ampleon comments, "With the introduction of the BLF888E we demonstrate our thought leadership in the RF Power Broadcast market by crossing the 50% mark and taking efficiency to the next level. Along with the BLF888E, our application specialists have also developed three evaluation boards that cover the entire UHF band (470-800MHz). These help enable our customers to shorten the

time-to-market for their UHF TV power amplifiers."

Rohde & Schwarz presents multistandard test solution for RF and audio tests on Bluetooth® modules

The modules used in Internet of Things (IoT) applications often combine Bluetooth® with other wireless interface technologies. The R&S CMW500 wideband radio communication tester is the only test platform on the market to offer a one-instrument solution for testing all cellular and non-cellular standards and Bluetooth. Rohde & Schwarzhas now expanded it leading test platform to include Bluetooth audio tests for manufacturers of Bluetooth headsets and audio car kits.

Today, Bluetooth modules are used in mobile, automotive, smart home and other IoT applications. Accordingly, manufacturers and integration specialists have higher testing requirements. Rohde & Schwarz helps them to optimize test performance, minimize test times and thus save considerable costs. The R&S CMW500 wideband radio communication tester is the only testing solution that combines all 38 RF signaling tests defined by the Bluetooth SIG together with other cellular technologies such as LTE, LTE-Advanced and WCDMA as well as non-cellular technologies such as WLAN and GNSS. The Bluetooth Special Interest Group (SIG) has qualified the solution for RF measurements.

RF signaling tests and fast spectrum measurements

Developers can use the R&S CMW500 to perform extensive tests on their Bluetooth products and optimize their design before taking it to a Bluetooth Qualification Test Facility. The test platform offers unparalleld flexibility since the parametric test concept allows developers to set all the parameters themselves. Thanks to the easy-to-use R&S CMWrun sequencer software tool, they can also use the compact solution to perform automated prequalification tests for Bluetooth Basic Rate, Enhanced Data Rate and Bluetooth Low Energy in line with Bluetooth core specifications for versions 1.2, 2.0, 2.1, 3.0+HS, 4.0, 4.1, 4.2.

The extremely fast R&S CMW500 greatly benefits developers, e.g. when performing the complex spectrum measurements that are part of the Bluetooth qualification tests. The R&S CMW500 delivers the first test results in less than one second, which simplifies optimization tasks. The solution is also ideal for general integration and coexistence tests, for example, to check whether WLAN and Bluetooth transmitters in certain frequency bands interfere with each other.

New R&S CMW-KS602 option for Bluetooth audio tests

Those who do not have their hands free when using a computer or driving rely on Bluetooth headsets and Bluetooth hands-free car kits to make telephone calls. Manufacturers of headsets or hands-free car kits can now ensure the quality of their products by using the R&S CMW500 to test the audio properties of their products as well as to perform RF signaling tests. The Rohde & Schwarz test platform can be used in the development phase to optimize products and in production to verify audio characteristics.

When establishing the Bluetooth connection, the flexible R&S CMW500 can operate as master or slave. It supports the hands-free audio gateway mode, authentication when pairing Bluetooth devices with headsets, etc. and the volume control function on the microphones and headsets. it supports various voice codecs, including CVSD and mSBC.

R&S CMW platform: the right solution for all M2M/IoT requirements

For users who only perform Bluetooth® and WLAN non-cellular integrations tasks, the R&S CMW270 wireless connectivity tester offers a cost-effective solution. The R&S CMW270 was also qualified by the Bluetooth SIG for RF measurements. The R&S CMW290 functional tester supports all common cellular and non-cellular mobile communications standards. Wireless module integrators require extensive functional tests for hardware and applications. The R&S CMW290 offers all essential measurements and an excellent price/performance ratio.

Rohde & Schwarz will demonstrate its R&S CMW platform for Bluetooth tests at booth C40, hall 6 at Mobile World Congress in Barcelona. The new R&S CMW-KS602 option for Bluetooth audio tests will be available fromRohde & Schwarz in March 2016.

ON Semiconductor & RFMicron Unveil Multifaceted IoT Sensor Platform Supporting Battery-Free Operation

Compact, highly integrated solution utilizes multiple connectivity modules to provide accurate "sense data" onto any cloud platform

IoT Platform Development Kit

ON Semiconductor (Nasdaq: ON),driving energy efficiency innovations, teamed with RFMicron, and developed a game-changing 'plug-and-play' development tool to speed the deployment of wireless passive sensor solutions onto any Internet of Things (IoT) cloud platform. The IoT Platform Development Kit, SENSORRFGEVK, brings together a series of performance-optimized computing and connectivity modules to facilitate quick and effective deployment of battery-free wireless sensing technology and IoT hardware in locations where power and space constraints are of particular concern. This streamlined and flexible solution takes the approach of moving much of the system's intelligence away from where the sensors are situated, and placing it on the cloud.

Each IoT Platform Development Kit incorporates ON Semiconductor's battery-free wireless sensor tags, which use RFMicron's Magnus® S2 Sensor IC, and can perform temperature, moisture, pressure, or proximity sensing functions. The platform also features a UHF RFID reader module with 32 decibels-milliwatt (dBm) power rating and an 860 megahertz (MHz) to 960 MHz frequency range. Localized data processing is performed by the ARM® Cortex-A8 based AM335x system-on-chip (SoC). The platform has the capacity to transfer captured data either wirelessly (via WLAN, Zigbee, Z-Wave, UHF Gen 2, etc.) or using wireline infrastructure (via KNX, CAN, SPI, Ethernet. etc.). This development kit complements ON Semiconductor's existing wireless sensor evaluation kit, SPS1M-EVK, which provides a set of tools test our sensor capabilities.

"This IoT Platform Development Kit opens up greater opportunities for IoT-based data-acquisition/monitoring enabling the implementation of wireless sensors quickly and effectively into many applications. Using it, the data from multiple sensors can rapidly be accessed, analyzed and used on multiple backend networks," states Gary Straker, Vice President and General Manager of Protection and Signal Division at ON Semiconductor. "As a result of this platform, wireless sensing technology can now be deployed into application scenarios where a mains supply is simply not available or where replacing batteries would be too difficult and costly to undertake. This ground-breaking product will markedly broaden the scope of IoT deployment and this development kit offers a tool that makes evaluating the technology simple for multiple application use cases. Through this wireless sensing technology we will be able to connect what was previously un-connectable."

The platform also possesses an intuitive touch-enabled user interface, plus LEDs, headers and switches designed to enhance its configurability and expand its operational potential. The sophisticated accompanying software allows the platform to fit seamless into any supported network, serving as a dedicated node. Built-in application firmware will assist engineers in implementing more effective IoT-based data-acquisition/monitoring systems irrespective of their experience level.

The combination of all the functions above in a single self-contained board creates an integration tool IoT platforms can use to easily evaluate wireless sensing technology in their

ecosystems.

ON Semiconductor Showcases its Advances in IoT Technology at Embedded World 2016

ON Semiconductor (Nasdaq: ON), driving energy efficiency innovations, will be exhibiting highlights from its expansive range of solutions relating to the Internet of Things (IoT) at the Embedded World conference (held in Nuremberg Messe between 23rd and 25th February). Visitors may experience interactive and informative demos at the company's booth (5.178).

ON Semiconductor will demonstrate the new NB3H63143G small form factor, low power, low cost one-time programmable (OTP) clock generator, a member of the OmniClock family of devices that support any output frequency from 8 kHz to 200 MHz in addition to offering a rich feature set and utmost operational flexibility. OmniClock generators have three single-ended clock outputs (LVCMOS/LVTTL), two of which can be combined into a differential output (LVPECL/LVDS/HCSL/CML), allowing designers to replace multiple crystals and/or oscillators, reducing overall system cost. The devices are available in a 3x3mm QFN 16 package which integrates three individual output enable (OE) pins as well as three individual output voltage (VDDO) pins and a smaller 2x2mm DFN 8 package for applications with little available board space.

"The OmniClock family offers the most features and flexibility of any programmable clock devices available in the market today," said Prescott Sakai, director of ON Semiconductor's timing products business unit. "They enable customers to meet their system's low power requirements while at the same time substantially simplifying board design and the overall system bill-of-materials."

During Embedded World, one demonstration will present the NB3H63143G OmniClock generator providing a 19.2 MHz clock to the AR1820HS 18 megapixel image sensor, a 48 MHz clock to the AP1302 imaging co-processor, and a 19.2 MHz clock to a USB controller. Another demonstration will show how the OmniClock generator can change the output frequency and the spread spectrum modulation on the output frequency in real-time.

Introduced in order to facilitate greater use of video in IoT systems, the MatrixCam™ video development kit (VDK) will also be on display. The compact, low power, 1080p camera solution is capable of streaming video over Wi-Fi or Ethernet connections. It supports smart operation, with wake-up initiated via either Bluetooth Low Energy (BLE) or motion detection through its built-in PIR sensor.

To support the connectivity that will be vital to next generation applications like IoT, ON Semiconductor will also be displaying its latest wireless devices. TheNCS36510 is highly integrated system-on-chip (SoC) for the implementation of secure wireless networks with the minimum of external components. It incorporates a 2.4 GHz IEEE 802.15.4-2006 compliant transceiver, a 32-bit ARM® Cortex®-M3 microprocessor, a true random number generator, plus RAM and Flash memory resources. The AX5043 narrowband, ultra-low power RF transceiver supports frequency-shift keying (FSK) and amplitude-shift keying (ASK) modulation. It delivers 16 decibels-milliwatt (dBm) of output power and -136 dBm sensitivity at 100 bits per second (bps) FSK.

Other demonstrations will include smart passive sensors, Sigfox™ functionality, BLDC motor control and touch level sensing.

"There are many possibilities for IoT and so far the industry has just started to fully explore them," explains Ryan Cameron, vice president, industrial and timing products at ON Semiconductor. "By offering a wealth of hardware for IoT implementation, including microcontrollers, RF transceivers, camera systems and clock generators, we are enabling design engineers to take their ideas on IoT systems from the concept phase and make them a reality."

AMD Achieves High-End Embedded Performance Leadership with New R-Series Processors

AMD (NASDAQ:AMD) today announced new AMD Embedded R-Series SOC processors that establish performance leadership across a targeted range of embedded application market requirements for digital signage, retail signage, medical imaging, electronic gaming, media storage and communications and networking. Designed for demanding embedded needs, the processors incorporate the newest AMD 64-bit x86 CPU core ("Excavator"), plus third-generation Graphics Core Next GPU architecture, and state-of-the-art power management for reduced energy consumption. Combined, these AMD innovations and technologies provide industry-leading graphics performance and key embedded features for next-generation designs. 157022_carrizo_PRO_frontvie

The single-chip system-on-chip (SOC) architecture enables simplified, small form factor board and system designs from AMD customers and a number of third party development platform providers, while providing astounding graphics and multimedia performance, including capability for hardware-accelerated decode of 4K video playback. With a robust suite of peripheral support and interface options, high-end AMD Radeon graphics, designed for the industry's first Heterogeneous Systems Architecture (HSA) 1.0 certification, and support for the latest DDR4 memory, the new AMD R-Series SOC addresses the needs of a wide range of markets and customers.

"AMD continues its push into x86 embedded platforms and that's paying off with an increasing number of customers and applications," said Jim McGregor, principal analyst, TIRIAS Research. "There is a need for immersive graphics, high-quality visualization, and parallel computing in an increasing number of embedded applications. Across these fronts, the AMD Embedded R-Series SOC is a very compelling solution."

"With so much momentum around immersive experiences, especially for visual and parallel computing, the embedded industry needs a high-performance, low-power and efficient architecture with superior graphics and compute capabilities," said Scott Aylor, corporate vice president and general manager, AMD Embedded Solutions. "Our new AMD Embedded R-Series SOC is a strong match for these needs in a variety of industries including digital signage, retail signage, medical imaging, electronic gaming machines, media storage, and communications and networking. The platform offers a strong value proposition for this next generation of high-performance, low-power embedded designs."

Industry-Leading Graphics

With the latest generation AMD Radeon graphics as well as the latest multimedia technology integrated on-chip, the AMD Embedded R-Series SOC provides enhanced GPU performance and support for High Efficiency Video Coding (HEVC) for full 4K decode and DirectX 12. The new AMD Embedded R-Series SOCs offer 22 percent improved GPU performance when compared to the 2nd Generation AMD Embedded R-Series APU and a 58 percent advantage against the Intel Broadwell Core i7 when running graphics-intensive benchmarks . Specifications for the integrated AMD Radeon graphics include:

- Up to eight compute units and two rendering blocks
- GPU clock speeds up to 800MHz resulting in 819 GFLOPS
- DirectX 12 support

Fully HSA Enabled

Customers in several industries such as machine learning, medical imaging and digital signage often need to execute compute intensive, parallel processing algorithms. HSA is a standardized platform design that unlocks the performance and power efficiency of the GPU as a parallel compute engine. It allows developers to more easily and efficiently apply the hardware resources in today's SoCs, enabling applications to run faster and at lower power across a range of computing platforms. The AMD Embedded R-Series platform incorporates a full HSA implementation which balances the performance between the CPU and GPU. Leveraging the heterogeneous Unified Memory Architecture (hUMA) allows for reduced latencies and maximizes memory access to both the CPU and GPU to increase performance.

IAR Systems supports Ambiq Micro's Apollo MCUs targeted for wearables and IoT

IAR Systems® announces that the latest version of the complete embedded development toolchain IAR Embedded Workbench® for

ARM® supports the Apollo family of ARM Cortex®-M4F microcontrollers from the semiconductor company Ambiq Micro.

Since the start in 1983, IAR Systems has been building and expanding a strong network of partners. The company is the hub of a powerful partner ecosystem, including all leading semiconductor vendors worldwide. Thanks to this, the complete C/C++ compiler and debugger toolchain IAR Embedded Workbench supports more microcontrollers in more architectures than any other tool on the market. All available ARM cores from all major vendors, in total more than 4,000 devices, are supported by IAR Embedded Workbench, and IAR Systems continually adds support for new devices.

The Apollo family of microcontrollers from Ambiq Micro offers leading power numbers in both active modes and sleep modes. These power savings combined with a high-performance processing engine make the Apollo MCUs a good choice for battery-powered devices including wearable electronics, activity and fitness monitors, and wireless sensors.

“We are really pleased that our Apollo MCUs are supported by IAR Systems’ complete development tools,” says Mike Salas, Vice President of Marketing and Strategy, Ambiq Micro. “The combination of the ultra-low power performance of the Apollo MCUs and the high-quality development toolchain IAR Embedded Workbench for ARM will help developers worldwide to bring new innovative products to life.”

IAR Embedded Workbench is a powerful development toolchain that incorporates a compiler, an assembler, a linker and a debugger into one completely integrated development environment. The toolchain provides extensive debugging and profiling possibilities such as complex code and data breakpoints, runtime stack analysis, call stack visualization, code coverage analysis and integrated monitoring of power consumption. For complete code control, IAR Systems also offers integrated add-on tools for static analysis and runtime analysis. More details about IAR Embedded Workbench for ARM and trial versions are available at www.iar.com/iar-embedded-workbench/arm/.

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congatec introduces Server-on-Modules with new Intel® Xeon®/Core™ processors

congatec AG, a leading technology company for embedded computer modules, single board computers (SBCs) and embedded design and manufacturing (EDM) services, has expanded its COM Express Basic portfolio with new server-class embedded modules. The new Server-on-Modules are equipped with 6th generation Intel® Xeon® and Intel® Core™ i3 / i5 / i7 processors (codenamed Skylake). The DDR4 memory of the conga-TS170 modules provides up to twice as much system memory performance for data-intensive applications while consuming 20 percent less energy and requiring only half the footprint of DDR3 RAM that is expected to become legacy in future applications. In addition, the modules offer faster processor speeds, a 60 percent accelerated system bus and an enlarged Intel® Smart Cache (up to 8 MB) as well as the PCIe Gen 3.0 support for all PCIe Lanes and the new Intel® HD Graphics P530. Overall, users can expect to benefit from enhanced system performance and packing density with lower space and energy requirements.

The new modules have been developed for the server-class of embedded designs that operate within a thermal power envelope of 25-45W TDP and require custom I/O and IoT interfaces. The new conga-TS170 modules equipped with Intel Core processors are suitable for applications including test and measurement equipment, back-end systems in medical imaging, high-performance industrial workload stations as well as intelligent vending machines.

The Intel® Xeon® module variants additionally provide ECC memory protection, which extends their usage to data critical server and gateway applications. Applications can be found in industrial IoT and cloud servers with big data analytics, carrier-grade edge node servers as well as connected Industry 4.0 automation servers that host multiple virtual machines or media servers with multiple stream real-time video transcoding.

In addition, the new conga-TS170 modules offer powerful tools to manage distributed IoT, M2M and Industry 4.0 applications. Thanks to Intel® vPro technology and congatec’s board management controller with watchdog timer and power loss control, the modules are fully equipped for remote monitoring, management and maintenance tasks, right down to out-of-band management.

For cost-sensitive applications

that do not necessarily require complex out-of-band management or virtualization, modules based on the Intel® Core™ i3 processor and the Mobile Intel® HM170 chipset are also available.

The feature set in detail

The new conga-TS170 modules are equipped with the latest 6th generation 14nm Xeon® v5 and Intel® Core™ processors. They feature a TDP of 25-45W, up to 8MB smart cache and super-fast 2133 DDR4 memory up to 32 GB, implemented as ECC memory for safety-critical applications in the Intel® Xeon variants. For energy-efficient 24/7 operation, the new modules support disconnected standby in place of the legacy S3 mode. With disconnected standby, switching from energy-saving sleep mode to full performance takes less than half a second; as a result, systems can go into sleep mode more frequently without affecting usability and responsiveness.

The integrated 9th generation Intel® HD Graphics 530 supports DirectX 12 for faster Windows 10 based 3D graphics on up to 3 independent 4K (3840 x 1260) displays via HDMI 1.4, DVI or DisplayPort 1.2. For legacy applications, a dual-channel LVDS output and optional VGA are available. Thanks to hardware support for the decoding as well as the encoding of HEVC, VP8, VP9 and VDENC, it is now possible to stream HD video energy-efficiently in both directions.

In addition to PCI Express Gen 3.0 Graphics (PEG), the choice of available I/O interfaces includes 8x PCI Express Gen 3.0 lanes, 4x USB 3.0, 8x USB 2.0, LPC and I²C. SSD, HDD and BluRay mass storage can be connected via 4x SATA 3.0, including RAID 0, 1, 5, 10 support. All major Linux and Microsoft Windows operating systems are supported, including Windows 10. A comprehensive set of add-ons for easier design-in – such as cooling solutions, carrier boards and starter kits – rounds out the offering.

STMicroelectronics Releases Your Creativity in Showcase of Solutions around STM32, Secure Microcontrollers, and Near Field Communication

Free hands-on workshops and technical seminars at Embedded World in Nuremberg, Germany (Hall 4A-138, Feb 23-25 2016) and on YouTube

At Embedded World 2016 in Nuremberg, Germany, STMicroelectronics will present a broad range of solutions for embedded designs across the full range of applications, including industrial, medical, consumer, and automotive. The comprehensive showcase will include demos, technical seminars, and hands-on workshops, hosted by experts who can help attendees release their creativity with ST's latest embedded technologies, products, and tools. Videos, produced during the event, will be available from February 24, 2016 at www.youtube.com/stonlinemedia/EW2016

ST invites Embedded World 2016 attendees to participate in on-booth technical conferences or go into more depth on products and tools during practical workshops running throughout the exhibition. ST will give away hundreds of valuable and easy-to-use development boards and other prizes, including BB-8™ by Sphero, an app-enabled Droid™ powered by the STM32F3 ARM® Cortex®-M4 microcontroller, during various activities.

Among the demonstrations planned for Embedded World attendees are:

The newest members of the STM32 ARM Cortex-M MCU family, including new 14-pin STM32L0 devices, smaller derivatives of the STM32L4, and extensions of the STM32F4 and STM32F7 series;

A member of the LoRa® Alliance, ST will demonstrate the LoRa technology1 on STM32 MCUs and distribute LoRa combo packs (STM32L0 Nucleo + SX1276MB1LAS shield from Semtech) to interested attendees;

Application solutions around the STM32 including connectivity, graphics, motor control, ARM mbed™ OS, Apple HomeKit™, and more;

The STM32 Open Development Environment, which provides a flexible, easy, and affordable way to develop innovative devices and applications;

The full NFC portfolio, including tags, dynamic tags, readers, and transceivers;

A new security module for securing connected devices;

Solutions that include wireless charging, new innovative sensors, wireless connectivity, MEMS microphones, and micro-power analog, to complement embedded designs;

Flightsense™ sensor family for ranging, user detection, and gesture control;

Embedded solutions for automotive applications that include the first Power Architecture™ MCU with ISO CAN FD (Flexible Data Rate)

and the SPC5Studio microcontroller development environment demonstrated on the smallest ASIL-D microcontroller device (SPC57);
Teseo III single-chip standalone positioning ICs capable of receiving signals from multiple Global Navigation Satellite Systems.
Embedded World 2016 attendees are welcomed to visit STMicroelectronics in Hall 4A-138 to release their creativity.
Tune in for ST's Embedded World videos, recorded live from the show, available from Feb 24, 2016 at www.youtube.com/stonlinemedia/EW2016

Renesas Synergy™ Platform with World-Leading Tools from IAR Systems Accelerates Development of Innovative IoT and Embedded Products

Thanks to Integration of IAR Embedded Workbench within the Renesas Synergy™ Platform, Customers Gain Shortened Time to Market and Lowered Up-Front Investment
UPPSALA, Sweden / TOKYO, Japan, February 23, 2016 — IAR Systems®, the world's leading provider of embedded development tools, and Renesas Electronics Corporation (TSE:6723), a premier supplier of advanced semiconductor solutions, are proud to announce that the world's most widely used development toolchain IAR Embedded Workbench® is now integrated within the Renesas Synergy™ Platform as "EWARM-RS". The platform is being showcased at embedded world 2016, February 23-25, Nuremberg, Germany, in IAR Systems' booths 4-216 and 4-102, as well as in Renesas' booth 01-350 and 4-173.
"Platform solutions are the way to go for the IoT and future embedded applications as they enable simplified development and quick return on investment. The Synergy Platform has a unique position in providing these values," says Stefan Skarin, CEO, IAR Systems. "The embedded market is ready for a change, and as vendors we have to reach beyond our traditional product offerings by creating strong strategic alliances and provide high-quality, all-inclusive solutions that accelerate development of new innovative products. I am personally committed to make this journey towards the future of embedded development a true success."
The Synergy Platform provides developers with immediate access to a complete embedded platform comprised of best-in-class RTOS and software, scalable ARM® Cortex®-M based microcontrollers (MCUs), broad solutions, and now all the powerful features of the industry-leading development toolchain IAR Embedded Workbench. Developers gain access to all these elements with a simple click-through licensing on the Synergy Gallery website. Since everything has been preintegrated, tested, and qualified by Renesas as warranted in the Synergy Software Package (SSP), developers save months of work.
"Over the past two and a half decades, Renesas and IAR Systems have shared experience and knowledge to ensure optimized performance and quality for our mutual customers. Now we are entering an era of platform focus, and we are excited to have IAR Systems on board with the Synergy Platform," says Ali Sebt, President, Renesas Electronics America, and SVP, Renesas Electronics Corporation. "IAR Systems is well-known for high-quality tools and expert competence in the embedded market. Thanks to our close cooperation around the Synergy Platform, we are able to offer a complete, qualified solution that enables developers to deliver innovative products to the market fast with a negligible up-front investment. For the price of just one Synergy MCU, or one million Synergy MCUs, developers gain immediate access to the entire platform which now includes IAR Embedded Workbench."
The Synergy Platform includes a special edition of IAR Embedded Workbench only available within the platform. IAR Embedded Workbench is complete C/C++ compiler and debugger toolchain that offers sophisticated code optimization technology in a feature-rich IDE. Included is also the static analysis tool C-STAT and the runtime analysis tool C-RUN. Synergy Platform customers are entitled to on-going IAR Embedded Workbench maintenance and technical support through Renesas, and there is no limit to the number of development seats within a given company holding a valid click-through license from the Synergy

Gallery. The first beta version of the integrated tools was launched in June 2015 and has been tested by Renesas' customers since October 2015. The full release of EWARM-RS is planned for June 2016. Find more information and try the Renesas Synergy Platform at www.renesassynergy.com.

Mentor Graphics Optimizes Tools and Flows to Help Designers Succeed With Samsung Foundry's 10nm FinFET Process

Mentor Graphics Corporation (NASDAQ: MENT) announced that, in collaboration with Samsung Electronics, it is delivering a wide range of design, verification and test tools and flows optimized for Samsung Foundry's 10nm FinFET process. The announcement includes the Calibre® physical verification suite, Mentor® Analog FastSPICE™ (AFS™) platform, Olympus-SoC™ digital design platform and Tessent® test product suite. These tools have been optimized and certified so that system-on-chip (SoC) designers can quickly adopt Samsung Foundry's advanced 10nm process with greater confidence in first-pass success.

The interplay between design styles and manufacturing processes becomes even more critical at 10nm, so Design for Manufacturability (DFM) tools play a critical role in the verification flow. Samsung Foundry has certified the Calibre YieldEnhancer product —and specifically its SmartFill and ECO/Timing-Aware Fill capabilities — to help designers make multiple design changes and still comply with manufacturing planarity requirements and tape-out schedules. To help designers identify and fix potential lithography-related issues, Samsung supports the use of the Calibre LFD™ tool, which is based on Mentor's production-deployed solutions for process-window modeling, mask synthesis, optical proximity correction (OPC) and resolution enhancement (RET). As design teams address multiple DFM elements simultaneously, they can use the Samsung DFM scoring and analysis solution built on the Calibre YieldAnalyzer tool to streamline the process of making tradeoff decisions. Finally, for fast feedback from manufacturing results to customer design processes, Samsung supports yield detractor pattern identification and repair using the Calibre Pattern Matching solution.

For physical verification, the Calibre nmDRC™ platform is now certified for 10nm, and remains the ecosystem's touchstone sign-off solution for Samsung R&D, IP validation, and fabless customer design tape-outs. This release marks the culmination of years of collaboration in manufacturing process development for triple patterning and quadruple patterning with Calibre Multi-Patterning technology.

Samsung Foundry has also certified the Calibre xACT™ product to deliver detailed accuracy and high throughput for parasitic extraction at 10nm. The Calibre xACT tool uses an integrated field solver to calculate parasitics around the complex, three-dimensional FinFET structures. It optimizes performance through a highly scalable parallel processing approach.

Other certifications help SoC designers complete circuit verification, physical implementation and IC test. For example, the AFS platform is certified in Samsung's 10nm process device models and design kits. Mutual customers rely on AFS to deliver nanometer SPICE accuracy faster than traditional SPICE simulators for verifying analog, RF, mixed-signal, memory, and custom digital circuits.

The Olympus-SoC place and route platform is also certified for use at 10nm, with a comprehensive colored design methodology covering floorplanning, placement, extraction, routing and chip finishing requirements. To address the particular challenges of FinFET manufacturing, the platform supports M1 triple patterning, color shifting, non-uniform tracks, mask- and width-dependent spacing rules, and other new capabilities. Active deployment is underway at multiple mutual customers.

For test, Mentor and Samsung have collaborated to make the Tessent test product suite deliver higher test quality for new cell-internal structures at 10nm, as well as higher test pattern compression to control the cost of testing larger 10nm designs. The companies are also leveraging production test diagnosis to quickly identify and eliminate design-specific and cell-internal yield limiting features during design ramp-up.

"Our collaboration with Samsung Foundry goes beyond helping bring this advanced process to joint customers," stated Joe Sawicki, Vice President and General Manager of Mentor Graphics Design-to-Silicon Division. "The joint solution spans design verification, manufacturing,

and test to provide a high-integrity bridge between fabless companies and the Samsung foundry."

Infineon enables new high-performance FPGA development platform

Infineon Technologies AG (FSE: IFX / OTCQX: IFNNY) today announced that its Digital Point-of-Load (PoL) DC-DC regulators with full PMBus capabilities are featured in the Kintex® UltraScale™ development board. A key driver for the design flexibility of the board is the superior PMBus connectivity of the IR3806x family. Configurations can be stored in internal memory. In addition, PMBus commands allow run-time control, fault status and telemetry.

Tremendous flexibility

The on-chip programmable SupIRBuck™ regulator provides tremendous flexibility for FPGA-based design. Thus, it easily adapts to rapidly changing design requirements. The IR3806x SupIRBuck voltage regulator features integrated PWM controller and MOSFETs in a single package. It delivers 90 percent more efficiency for all rails including all losses and less than sub 10 mV peak-to-peak ripple from 3 to 35 A in a tiny footprint. The regulator allows system power management on a high level and is extremely robust.

Despite being compact, the IR3806x family delivers a fully integrated PoL regulator with advanced power management programmability, margining, sequencing, and telemetry across multiple rails via full PMBus 1.2 compatibility. The board includes all functions for an embedded processing system. This enables designers to easily design and verify applications.

The Xilinx Bit Error Test (BERT) demonstrates error losses through rigorous code testing. It uses worst case bit patterns across serial transceiver/receivers. The IR38060 delivers precise power performance: zero bit error test results show no contribution to jitter noise across the pattern.

Infineon will show the Xilinx Kintex UltraScale board in its booth #1917 at the APEC March 20-24, 2016 in Long Beach, California. Further information is available at: www.infineon.com/Xilinx.

Imec Presents Compact Lens-Free Digital Microscope

At the SPIE Photonics West 2016, imec will demonstrate a lens-free microscope for large field-of-view live imaging at micrometer resolution. Imec's on-chip lens-free microscope can be integrated into life sciences and biotech tools, targeting multiple applications such as label-free cell monitoring, automated cell culturing, or automated high-throughput microscopy.

Compared to conventional optical microscopes, lens-free digital microscopy removes the need for expensive and bulky optical lens components to acquire and visualize microscopy images. In a lens-free digital microscope, images are captured on a CMOS image sensor, and digitally reconstructed using software. Imec's lens-free microscope features a comparable micrometer-scale accuracy as traditional optical microscopes. While being much smaller and less expensive, imec's microscope captures a larger field-of-view in one shot, enabling shorter sample processing times. The lens-free microscope paves the way to new applications with living cells and tissues.

"This microscope will enable an abundance of applications, where traditional microscopes are just not applicable," stated Andy Lambrechts, program manager of integrated vision solutions at imec. "Recently, we demonstrated its ability to be integrated into a bio-incubator in stem-cell research for cell culture monitoring, and for cardio-toxicity testing, where the microscope monitored contractions of cardiac tissue in response to drugs. With impressive results our team has branched out even further and is exploring its ability measure fabrication tolerances and stress in our in-house developed neural probe chips, and for defect inspection of thin-film displays."

"Imec's lens free imaging solution is now available as a full, ready-to-use demo kit evaluation system including a light source, image sensor, control and read-out electronics and a software interface," stated Jerome Baron, business development manager of integrated vision systems at imec. "Companies can use it to try out their own applications, supported by our engineers to fine-tune the hardware and software and customize the systems toward their exact application requirements."

Imec will demonstrate its lens-free microscope at SPIE Photonics West exhibition (booth 4144).

Molex Expands its Medical Business with Innovative New Capabilities Company will highlight growing product portfolio at MD&M West

Molex, LLC will bring its deep expertise and wide range of solutions for the medical industry to MD&M West, February 9 – 11, booth 1746. Through its ongoing investment in research and development, as well as its strategic acquisitions and partnerships, Molex has built an extensive portfolio of solutions that medical original equipment manufacturers (OEMs) can integrate into their groundbreaking healthcare devices in diagnostic, therapeutic and patient monitoring applications. Molex remains committed to designing and manufacturing solutions that move the medical industry forward, while containing costs and keeping patient care and safety at the top of the list.

"Today's life-saving healthcare devices feature increasingly sophisticated capabilities that require equally sophisticated electronics to reliably and cost-effectively transmit data, signals, images and power," said Anthony Kalaijakis, strategic medical marketing manager, Molex. "Because of its long history as a technology leader, Molex is uniquely qualified to meet this increased demand for innovative, feature-rich and affordable medical electronic equipment. We're very excited to continue our work in the medical industry, helping to enhance the performance and functionality of medical devices for our customers worldwide."

Recently, Molex expanded its reach in the medical field with two key acquisitions: ProTek Medical Ltd., a contract engineering design and manufacturing firm that specializes in supplying custom solutions for medical device manufacturers in the global medical industry and certain assets of Soligie, Inc., a developer of flexible printed electronic solutions used in several industries, including medical applications such as diagnostics, EKG leads, surgical equipment/devices and wearable sensors. Other acquisitions that have contributed to the company's expansion of its medical business include Polymicro Technologies™, Temp-Flex® Specialty Wire and Cable, Affinity Medical Technologies and FCT Electronics Group.

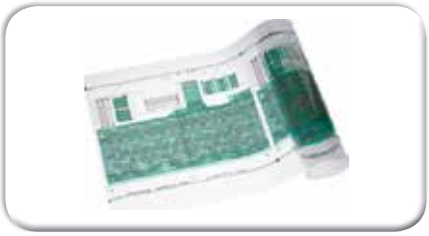
Molex experts will be available throughout the show to discuss the company's cutting edge technology and showcase its wide array of solutions including:

Medical Cables: Unique custom medical products including cable assemblies, custom connectors, encapsulated electronics, bulkhead connectors and ECG cables and leadwire assemblies.

Optical Cables and Connectors: Advanced optical solutions including connectors and adapters, optoelectronics, optical assemblies, backplanes, optical circuitry and integrated systems.

Printed Circuit Solutions: Molex offers clean sheet mechanical and electrical design, development and test support, including modeling and empirical testing. Its engineering teams work with customers to ensure a design that meets their needs. Solutions include membrane, capacitive and resistive switches, and copper flex with LEDs, as well as components and interconnects that can be fabricated on flexible substrates such as plastic, paper and foil.

For more information about medical solutions from Molex, please visit www.molex.com/industry/medical.html..



Eternal 5D data storage could record the history of humankind

Scientists at the University of Southampton have made a major step forward in the development of digital data storage that is capable of surviving for billions of years.

Using nanostructured glass, scientists from the University's Optoelectronics Research Centre (ORC) have developed the recording and retrieval processes of five dimensional (5D) digital data by femtosecond laser writing.

The storage allows unprecedented properties including 360 TB/disc data capacity, thermal stability up to 1,000°C and virtually unlimited lifetime at room temperature

(13.8 billion years at 190°C) opening a new era of eternal data archiving. As a very stable and safe form of portable memory, the technology could be highly useful for organisations with big archives, such as national archives, museums and libraries, to preserve their information and records.

The technology was first experimentally demonstrated in 2013 when a 300 kb digital copy of a text file was successfully recorded in 5D.

Now, major documents from human history such as Universal Declaration of Human Rights (UDHR), Newton's Opticks, Magna Carta and Kings James Bible, have been saved as digital copies that could survive the human race. A copy of the UDHR encoded to 5D data storage was recently presented to UNESCO by the ORC at the International Year of Light (IYL) closing ceremony in Mexico.

5D UDHR

Universal Declaration of Human Rights recorded into 5D optical data

The documents were recorded using ultrafast laser, producing extremely short and intense pulses of light. The file is written in three layers of nanostructured dots separated by five micrometres (one millionth of a metre).

The self-assembled nanostructures change the way light travels through glass, modifying polarisation of light that can then be read by combination of optical microscope and a polariser, similar to that found in Polaroid sunglasses.

Coined as the 'Superman memory crystal', as the glass memory has been compared to the "memory crystals" used in the Superman films, the data is recorded via self-assembled nanostructures created in fused quartz. The information encoding is realised in five dimensions: the size and orientation in addition to the three dimensional position of these nanostructures.

Professor Peter Kazansky, from the ORC, says: "It is thrilling to think that we have created the technology to preserve documents and information and store it in space for future generations. This technology can secure the last evidence of our civilisation: all we've learnt will not be forgotten."

The researchers will present their research at the photonics industry's renowned SPIE—The International Society for Optical Engineering Conference in San Francisco, USA this week. The invited paper, '5D Data Storage by Ultrafast Laser Writing in Glass' will be presented on Wednesday 17 February.

The team are now looking for industry partners to further develop and commercialise this ground-breaking new technology.

Silicon chip with integrated laser: Light from a nanowire Nanolaser for information technology

Physicists at the Technical University of Munich (TUM) have developed a nanolaser, a thousand times thinner than a human hair. Thanks to an ingenious process, the nanowire lasers grow right on a silicon chip, making it possible to produce high-performance photonic components cost-effectively. This will pave the way for fast and efficient data processing with light in the future.

Ever smaller, ever faster, ever cheaper – since the start of the computer age the performance of processors has doubled on average every 18 months. 50 years ago already, Intel co-founder Gordon E. Moore prognosticated this astonishing growth in performance. And Moore's law seems to hold true to this day.

But the miniaturization of electronics is now reaching its physical limits. "Today already, transistors are merely a few nanometers in size. Further reductions are horrendously expensive," says Professor Jonathan Finley, Director of the Walter Schottky Institute at TUM. "Improving performance is achievable only by replacing electrons with photons, i.e. particles of light."

Photonics – the silver bullet of miniaturization

Data transmission and processing with light has the potential of breaking the barriers of current electronics. In fact, the first silicon-based photonics chips already exist. However, the sources of light for the transmission of data must be attached to the silicon in complicated and elaborate manufacturing processes. Researchers around the world are thus searching for alternative approaches.

Scientists at the TU Munich have now succeeded in this endeavor: Dr. Gregor Koblmüller at the Department of Semiconductor Quantum-Nanosystems has, in collaboration with Jonathan Finley,

developed a process to deposit nanolasers directly onto silicon chips. A patent for the technology is pending.

Growing a III-V semiconductor onto silicon requires tenacious experimentation. “The two materials have different lattice parameters and different coefficients of thermal expansion. This leads to strain,” explains Koblmüller. “For example, conventional planar growth of gallium arsenide onto a silicon surface results therefore in a large number of defects.”

The TUM team solved this problem in an ingenious way: By depositing nanowires that are freestanding on silicon their footprints are merely a few square nanometers. The scientists could thus preclude the emerging of defects in the GaAs material.

Atom by atom to a nanowire

But how do you turn a nanowire into a vertical-cavity laser? To generate coherent light, photons must be reflected at the top and bottom ends of the wire, thereby amplifying the light until it reaches the desired threshold for lasing.

To fulfil these conditions, the researchers had to develop a simple, yet sophisticated solution: “The interface between gallium arsenide and silicon does not reflect light sufficiently. We thus built in an additional mirror – a 200 nanometer thick silicon oxide layer that we evaporated onto the silicon,” explains Benedikt Mayer, doctoral candidate in the team led by Koblmüller and Finley. “Tiny holes can then be etched into the mirror layer. Using epitaxy, the semiconductor nanowires can then be grown atom for atom out of these holes.”

Only once the wires protrude beyond the mirror surface they may grow laterally – until the semiconductor is thick enough to allow photons to jet back and forth to allow stimulated emission and lasing. “This process is very elegant because it allows us to position the nanowire lasers directly also onto waveguides in the silicon chip,” says Koblmüller.

The Qt Company introduces Qt 5.6 enabling stable long-term development of advanced applications across desktop, mobile and embedded platforms

Long-Term Supported release adds cross-platform High-DPI functionality, extends to full Windows 10 support, Windows host development for embedded Linux and improved leverage of the Yocto Project

The Qt Company today announced that Qt 5.6, the latest version of its cross-platform application and user interface (UI) development framework, is available for download. Qt enables the rapid creation of high-performance, efficient and beautiful applications that run natively on multiple platform screens, whether desktop, mobile or embedded. Qt 5.6 delivers a significant level of new functionality that will assist both application development and device creation. This includes cross-platform full support for Windows 10, High-DPI capabilities, and fully leveraging the Yocto Project for embedded software stack builds. Qt 5.6 is a Long-Term Support (LTS) release, which means that users can develop with it secure in the knowledge that the version will receive continued support.

Long-Term Support

Being an LTS release, Qt 5.6 provides a solid basis for software projects for years to come. It will receive patch releases containing bug fixes and security updates for at

least three years, even after later Qt versions are released. After this time additional extended support can be purchased, if required.

With the LTS, a lot of effort has been put into improving the Qt APIs all-around. For instance, Qt 5.6 introduces improvements to C++11 support, Qt Multimedia, OpenGL ES 3 compatibility and the Chromium-based browser engine, Qt WebEngine, has been updated to a new version, adding support for Pepper plugins (PPAPI) such as Flash.

Application Development

Qt 5.6 enables developers to create applications with one technology in order to reach all the screens of the end users, supporting all major desktop and mobile operating systems including Windows, Linux, OS X, Android, iOS and now, with Qt 5.6, Windows 10 devices.

Qt 5.6 introduces full support for Windows 10 so that applications built with Qt can run on all Windows 10 desktop PCs, tablets and phones, and, of course, be distributed through the Windows Store. With Qt's cross-platform features, users can take existing Qt-based applications to the new Microsoft platforms and distribute them through Windows Store. In most cases, the migration is just a matter of recompiling the application against the new version of Qt.

Another exciting feature introduced with Qt 5.6 is a completely new cross-platform High-DPI support. This allows even older Qt applications to be easily made to automatically scale from standard resolution displays to high pixel density displays. Qt can automatically adjust font sizes, window elements, icons and other graphics based on the pixel density.

Qt 5.6 also sees the introduction of a Start-up offering that enables small companies (with annual revenues of $100,000 or less) to harness the full power of Qt for Application Development in their products on preferential terms. Visit www.qt.io/start-up-plan for more details.

Device Creation

As the Internet of Things and other embedded applications increasingly demand smooth, high performance UIs and seamless integration with each other and the Cloud, Qt is being widely adopted as the development framework of choice. Qt 5.6 adds the ability to develop embedded Linux devices using a Windows host computer and also integrates seamlessly with the Yocto Project. This means that developers can easily pull in the full Qt offering to their own Yocto-based software stacks or customize Qt's Yocto-compliant software stack to meet their production needs.

Qt 5.6 also introduces a new version of the Qt Virtual Keyboard, now supporting handwriting recognition, integrating with Nuance T9 Write and adding traditional Chinese as one of the many built-in languages.

To learn more and to download Qt 5.6, please visit: www.qt.io/qt5-6

Amphenol Industrial Adds Gray ZnNi Plating

Amphenol Industrial Products Group has enhanced its standard shell plating from Olive Drab Cadmium to Gray Zinc over Electroless Nickel (Gray ZnNi) to be used in the harshest environments. Initially designed for use in marine applications, this plating is now used in military and industrial applications or where RoHS-compliant plating is required.

Compatible with market standard plating options, Gray ZnNi is non-magnetic so it can be used safely in magnetic environments in conjunction with a connector shell that is also non-magnetic. It has an operating temperature range of -65°C to 200°C.

Mark Cunningham, General Manager, Amphenol Industrial said, "Standard cadmium plating can only sustain 96 hours of salt spray and is not RoHS-compliant. Electroless nickel and zinc cobalt can only reach 48 and 96 hours. But, our new Gray ZnNi is rated for 500 hours of salt spray and is RoHS-compliant."

Technical Specifications

RoHS-compliant

500 hour salt spray rating (OD Cad is only 96 hrs)

Compatible with market standard plating options

Non-magnetic

Operating temperature range of -65°C to 200°C

Our AC Threaded, PT, and GT product lines are currently available in Gray ZnNi plating through our distribution partners Mouser Electronics and PEI-Genesis.

Expanded range of Pro-Power cables in full-reel and cut-to-length for industrial and outdoor use

New industrial cables from Pro-Power for high reliability and durability, including tri-rated, silicone, rubber, steel wound armoured, welding cable, LSZH(low smoke zero halogen)

element14 has expanded its range of cable and wire, cable accessories, marking and labeling from Pro-Power for use in design, education, manufacturing, repair and maintenance. A comprehensive selection of over 5,300 of the latest products include equipment wire, data transmission cables, industrial and automation cables, coaxial cables and cable accessories are available at http://au.element14.com/pro-power where customers can review and select cables in full reel or cut-to-length options.

Highly versatile and flexible, the new range of Pro-Power Tri Rated cables was designed for use in the wiring of electrical cabinets, switch control, relay and instrument panels, and small electrical devices. Available in over 100 colours and sizes, this flexible (Class 5) high temperature, flame-retardant single core and single insulated cable comes with heat resistant PVC sheathing, and can be used in numerous applications globally as it meets three separate standards; British Standards, Underwriters Laboratories(UL) and Canadian Standards Association (CSA).

Marc Grange, Global Head of Product Operations, element14 said, “We have put together the most popular cables needed for electronics design and production including Tri Rated and LSZH cables. These products offer high quality and value, and deliver long-lasting reliability to meet the high procurement standards of our customers. ”

In addition, a wide range of Pro-Power Coaxial cables are available; these are suited for transmission of radio frequency signals including television aerial connection, transmission of CCTV images and broadband signals.

The Pro-Power range of Twinflex PVC Battery Cable with 1mm thickness insulation and 1mm thickness sheath, are ideal for indoor and outdoor use, in dry as well as wet locations, on motorised vehicles, or battery powered equipment such as forklift trucks and conveyors.

Molex Debuts Nano-Pitch I/O™ 80-Circuit Interconnect at DesignCon 2016 System offers highest port density and speed in the smallest available package

System offers highest port density and speed in the smallest available package

At DesignCon 2016, Molex, LLC introduced the Nano-Pitch I/O™ 80-Circuit Interconnect System, which offers the highest port density (number of high-speed differential lanes) and speed (25 Gbps per lane) in the smallest package available. A multi-protocol pinout concept enables compatibility with all known SAS, SATA and PCIe protocols and provides enhanced signal integrity in an extremely compact form factor. The connector is ideal for SAS and PCI Express applications, including storage-to-controller, server-to-server, server-to-switch, switch-to-switch, and mobile/enterprise.

“With an industry-leading port density, multi-protocol application support, and enhanced signal integrity, the Nano-Pitch I/O 80-Circuit Interconnect System is redefining PCIe and SAS solutions within the storage industry,” said Joe Dambach, product manager, Molex.

The system’s flexible pinout concept (continuous Ground-Signal-Signal-Ground) optimizes it for high-speed applications and maximizes the number of high-speed lanes within the lengths provided. Eight lanes (80 circuit) are available, per industry standard.

The system’s small form factor (5mm × 23mm × 9mm) and a 12mm mated connector-to-cable assembly height for right angle cable exit) allow it to service mobile devices through enterprise applications. Staggered, reliable and constant dual-row contact configuration delivers hot pluggability (the ability to add components without shutting down the system). Also, the connector provides optimal routing for high-speed trace connections while reducing the need for PCB real estate.

Storage systems applications for the Nano-Pitch I/O 80-Circuit Interconnect System include data center and enterprise storage systems, storage racks, JBODs, storage controllers, HBA servers, and RAIDS. Telecommunications/networking applications for the connector include hubs, servers, switches, and routers.

For more information about the Nano-Pitch I/O™ Interconnect System from Molex, please visitwww.molex.com/link/nanopitchio.html.

Build SFP28 Modules for Data Centers and Radio Access with Industry's First Transceiver IC in Mass Production

Keep heat away from lasers using Maxim Integrated's transceiver chip and TO-can optics.

Enables low-cost optics: Reduced module BOM through the use of TO-can based opticsMUNICH, Germany – March 16, 2016 – Manufacturers of SFP28 modules for data center and radio fronthaul applications can now use TO-cans enabled by the industry's first transceiver IC, which is shipping now from Maxim Integrated Products, Inc.(NASDAQ: MXIM).

Maxim's SFP28 transceiver allows module manufacturers to avoid a driver inside the transmit optical subassembly (TOSA). This keeps heat away from the sensitive laser, simplifies production, and improves yield. Maxim's SFP28 transceiver also includes advanced digital eye tuning capabilities that enable use of low-cost TO-can based optics. The SFP28 module can simply be designed in the same way as an SFP+ module using TO optics, one transceiver IC, and one controller IC.

SFP28 optical modules for data centers and radio fronthaul applications need to offer cost competitive performance relative to the incumbent SFP+ module, while still having low power and a wide operating temperature range. Optimized specifically for these requirements, Maxim's 28.1Gbps low-power transceiver IC has a CDR and laser driver in the transmit path, and a high sensitivity limiting amp and CDR in the receive path.

Maxim will demonstrate its industry-leading SFP28 transceiver and other optical ICs at OFC 2016, March 22-24, in Hall A, Booth 1272,http://bit.ly/OFC2016.

Key Advantages

Accelerates time to market: Digital eye tuning at the output reduces design spins

Reduces production costs: Reusing TO-can-based 10Gbps manufacturing flow improves yield

Commentary

"Maxim's SFP28 transceiver builds on our proven 100Gbps technology and gives the industry what it needs to move to higher bandwidth interconnect," said Andrew Sharratt, Director of Business Management at Maxim Integrated. "Shipping now to customers who are already in mass production, Maxim's SFP28 IC enables cost effective upgrades to enterprise, hyperscale data center, and radio access networks."

"Demand for SFP28 modules will experience strong growth over the next five years, as the market moves from 10Gbps per lane to 25Gbps," said Dale Murray, Principal Analyst at LightCounting Market Research. "With its new transceiver IC, Maxim is poised to support this move by simplifying module design and lowering costs."

Availability

Available immediately

Specified over the -40-degree Celsius to +100-degree Celsius temperature range

For more information about Maxim's broad portfolio of optical ICs, contact your local Maxim sales representativehttp://bit.ly/SalesOffices

Analog Devices' Low Dropout Regulators Enable Cleaner and Faster Communications

announced two series of low dropout regulators (LDOs) offering ultra-low noise performance that eliminate unwanted system noise and improve receiver, transmitter, and audio quality. Target applications for the ADP176x and ADP715x LDOs include wireless base stations, wired communications, industrial instrumentation, high-end audio equipment, and medical devices. The new LDOs enable cleaner power rails, faster transient response, and higher power supply rejection ratio (PSRR) in noise-sensitive precision analog and RF applications, particularly when higher data rates are involved.

View product pages, download data sheets, order samples and evaluation boards:
http://www.analog.com/ADP1763 and http://www.analog.com/ADP7159

Learn about Analog Devices' linear regulator product portfolio:
http://www.analog.com/en/products/power-management/linear-regulators.html

Connect with engineers and ADI product experts on EngineerZone®, an online technical support community: https://ez.analog.com/community/power

Higher data rates in many applications are driving the need for cleaner power rails to run sensitive semiconductor devices. The issues intensify as speeds increase and geometries drop from 65nm to 28nm and beyond. The ADP176x and ADP715x LDOs support a growing set of noise-sensitive applications including RF transceivers, voltage-controlled oscillators, phase-locked-loop synthesizers, clocks, and high-speed A/D and D/A converters. The new LDOs also reduce PCB size and cost by eliminating the need for additional passive components including extra external filters and bypass capacitors.

The ADP176x and ADP715x LDOs offer excellent noise and PSRR performance. The ADP176x series delivers up to 3A of output current and operates across an output voltage range of 0.5V to 1.5V. This combination of lower voltage output operation addresses the high-current core rail requirements in many emerging applications. The ADP715x series supports an output range of 1.2V to 3.3V and delivers industry leading noise performance of 1.6 µVrms from 10 Hz to 100 kHz while expanding the LDO output current range for this ultra-low sub-2 µVrms (100 Hz to 100 kHz) up to 2A maximum. This combination of ultra-low noise and higher PSRR performance set new benchmarks for higher LDO power levels.

Microchip Announces Two New Digitally Enhanced Power Analog Controllers Designed for Next-Generation LED Lighting Applications

Microchip Technology Inc. (NASDAQ: MCHP), a leading provider of microcontroller, mixed-signal, analog and Flash-IP solutions, today announced two new digitally enhanced power analog controllers designed for LED lighting applications. The MCP19116 and MCP19117 increase accuracy for LED lighting and allow users to carefully control LED light output levels without sacrificing color or light quality for reliable long-life applications.

Efficiency and longevity have consistently been drivers in LED adoption. However, light quality remains one of the most important system considerations. Color, brightness, and controllability are the key to a successful lighting product. By combining the power and performance of an analog-based controller with the flexibility of a digital interface, the MCP19116/7 is an intelligent pulse width modulation (PWM) controller with a fully integrated PIC® MCU core that can deliver cost savings while still providing the highest standards in reliability, efficiency, and light quality. The digital interface also allows for communication and configuration, allowing a subsystem to report status or be remotely controlled. This functionality is necessary for adding lighting to many applications, especially high-reliability automotive and remotely accessible internet of things (IoT) devices.

"The MCP19116/7 is designed to create excellent LED lighting applications, and can do so better than any other LED drive IC on the market," said Keith Pazul, senior manager of Microchip's Analog Power and Interface Division. "Many companies claim they have tight current regulation accuracy in their controllers, when in reality they ignore various sources of error from other components in the system. These devices are highly accurate across all operating conditions and adjustable on the fly using the integrated PIC MCU core. This is truly a best-in-class solution."

The LED lighting industry continues to grow in market share and reach. A report from Big Market Research from 2015 indicated strong market growth for LED lighting, anticipating the industry to grow 45 percent per year through 2020. The market is also expected to reach over $63 billion in 2020. These predictions are consistent throughout industry analysts.

"LED is here to stay," echoed Pazul. "Microchip has made a diverse investment in technologies to control and drive future generations of LED lighting products. We are proud to be a premier supplier of lighting solutions to a wide variety of applications and end markets."

For more information about the MCP19116 and MCP19117, download the data sheet at: www.microchip.com/MCP19117-032216b.

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INTEGRATING DESIGN WITH FLEXIBILITY

Minitek® Pwr 3.0/4.2mm
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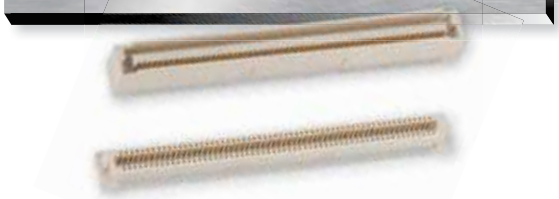
Gen 4 Mezzanine Connector



USB 3.1 Type C
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