Mushrooms recover gold from mobile scrap

Design Focus: Power Design

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China's quest for 'MIPS in wearable'
Let's be blunt: Not many serious players in the electronics industry today are sanguine about the survival chances for MIPS processors in a global mobile market where in the last decade - almost single-handedly - ARM has built its formidable ecosystem.

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By Julien Happich

**GOLD, SILVER, COPPER** and many other valuable metals (including rare earth metals) are commonly used in the manufacture of consumer electronics for getting the signal from one chip to another (gold wire-bonds, copper traces on printed circuits boards) or to improve contact reliability (gold or silver electrodeposition on connectors), only to end-up into huge piles of electronic waste.

The e-waste issue is not new, and before it became on the European legislation agenda, it used to be that unscrupulous “recyclers” would ship discarded electronic devices to third world countries where very basic and hazardous metal recovery techniques would be used. This often includes burning and melting the metals from cables (toxic fumes including dioxins), or separating gold from burnt PCB ashes using toxic cyanides solutions that then contaminate nearby rivers. In Europe and the US, several companies have industrialised the recovery of precious metals from e-waste, first crushing the devices and PCB boards, then using various separation methods (magnets to take out the steel, Eddy currents to separate non-ferrous metals from plastic) before smelting again or using toxic chemistries (often sulphuric acid or cyanide solutions) to dissolve the metal particulates and recover them through chemical reactions. The processes are similar, only better managed at industrial scale, but they are still energy intensive and environmentally debatable.

Reportedly, such industrialised processes can yield up to 300 grams of gold per ton of discarded mobile phones, and between 2 and 2.5 kilos of silver. By far, the most abundant metal in e-waste is copper, making up between 10 and 15% of a mobile phone’s weight.

Searching for non toxic e-waste processing alternatives VTT Technical Research Centre of Finland has developed a biological filter made of mushroom mycelium mats that could recover of as much as 80% of the gold in electronic scrap. The researchers are also looking at ways to extract copper from circuit board waste by floating the crushed and sieved material rather than indiscriminate melting.

In VTT experiments, cell phones were crushed and the particles sieved and separated magnetically and by eddy current into circuit board fractions. Further crushing, sieving and flotation (a separation method that separates hydrophobic particles from hydrophilic particles by blowing air into the sludge) resulted in a fraction with high concentration of valuable metals for solution extraction experiments. The researchers say their flotation technique raised the copper content of circuit board fraction from 25% to 45%, while gold content increased by a factor of 1.5.

“Because it is difficult to remove the components from the circuit boards, the first step in most recycling processes is to crush everything into particulates and that’s how we start too”, explained Jarno Mäkinen, Research Scientist at VTT Technical Research Centre of Finland.

“But then, using non-toxic water-based solutions, we have managed to engineer mycelium-based biomass that acts as a biosorbsent specifically targeted at gold complexes”.

Using biosorbents such as fungal and algae biomass, the Finnish lab demonstrated that more than 80% of the gold in the solution adhered to the biomass, compared with only 10 to 20% of gold recovery when using most commonly used harmful chemical preparations. Different filament structures can be formed, for example, into biological filters, which could make that specially engineered biomass useful to recycle precious metals on an industrial scale.

Mäkinen didn’t want to say more about the biomass engineering tricks used to make the biosorbsents more effective for gold or other precious metals. But in principle, the idea would be to engineer various biosorbsents targeted at different metals (including rare earth metals) and to cascade the e-waste recycling process through different metal absorption steps. At the end of each step, the collected biomass is burnt or chemically processed to recover the metal complexes inside.

“We have been most successful with gold so far, but we’ll be working to recover other rare metals too”, commented Olli Salmi, Research Professor at VTT, adding that the processes relied on organic chemistry and ionic liquids to dissolve the gold particulates and form complexes.

In other VTT experiments, the researchers were able to recover more than 90% of the metal solution dissolved from a circuit board with the help of functional ionic liquid.

These results stem from the European “Value from Waste” project of the research consortium AERTO (Associated European Research and Technology Organizations), initiated two years ago. The Finnish lab developed both biological and mechanical pre-treatment methods for a more efficient and more sustainable recovery of precious metals from electronic waste. Its findings could enable the metal refining industry to use cleaner electronic waste in larger amounts.

VTT participated in joint technology R&D with the following six European research institutes: Fraunhofer ICT and Umistic (Germany), CEA (France), TNO (the Netherlands), SINTEF (Norway), Tecnalia (Spain) and SP (Sweden). The project was co-ordinated by SINTEF from Norway.
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Quantum dot solar concentrator opens energy harvesting window

By Paul Buckley

QUANTUM DOT RESEARCHERS have demonstrated that a house window may be capable of doubling as a solar panel. Researchers at the Los Alamos National Laboratory in collaboration with scientists from University of Milano-Bicocca (UNIMIB), Italy have shown that the superior light-emitting properties of quantum dots can be applied in solar energy by helping to harvest sunlight more efficiently.

“The key accomplishment is the demonstration of large-area luminescent solar concentrators that use a new generation of specially engineered quantum dots,” said lead researcher Victor Klimov of the Center for Advanced Solar Photophysics (CASP) at Los Alamos.

The emission color of quantum dots can be tuned by simply varying their dimensions. Color tunability is combined with high emission efficiencies approaching 100 percent. The properties have become the basis of a new technology – quantum dot displays – employed, for example, in the newest generation of the Kindle Fire e-reader.

A luminescent solar concentrator (LSC) is a photon management device, representing a slab of transparent material that contains highly efficient emitters such as dye molecules or quantum dots. Sunlight absorbed in the slab is re-radiated at longer wavelengths and guided towards the slab edge equipped with a solar cell.

Klimov said: “The LSC serves as a light-harvesting antenna which concentrates solar radiation collected from a large area onto a much smaller solar cell, and this increases its power output.”

“LSCs are especially attractive because in addition to gains in efficiency, they can enable new interesting concepts such as photovoltaic windows that can transform house facades into large-area energy generation units,” explained Sergio Brovelli, who worked at Los Alamos until 2012 and is now a faculty member at UNIMIB.

Because of highly efficient, color-tunable emission and solution processability, quantum dots are attractive materials for use in inexpensive, large-area LSCs. One challenge, however, is an overlap between emission and absorption bands in the dots, which leads to significant light losses due to the dots re-absorbing some of the light they produce.

To overcome the problem the Los Alamos and UNIMIB researchers have developed LSCs based on quantum dots with artificially induced large separation between emission and absorption bands (called a large Stokes shift).

The ‘Stokes-shift’ engineered quantum dots represent cadmium selenide/cadmium sulfide (CdSe/CdS) structures in which light absorption is dominated by an ultra-thick outer shell of CdS, while emission occurs from the inner core of a narrower-gap CdSe. The separation of light absorption and light-emission functions between the two different parts of the nanostructure results in a large spectral shift of emission with respect to absorption, which reduces losses to re-absorption.

To implement the concept, Los Alamos researchers created a series of thick-shell (so-called ‘giant’) CdSe/CdS quantum dots, which were incorporated by their Italian partners into large slabs (sized in tens of centimeters) of polymethylmethacrylate (PMMA). While being large by quantum dot standards, the active particles are tiny being about hundred angstroms across.

“A key to the success of this project was the use of a modified industrial method of cell-casting, we developed at UNIMIB Materials Science Department,” explained Francesco Meinardi, professor of Physics at UNIMIB.

Spectroscopic measurements indicated virtually no losses to re-absorption on distances of tens of centimeters. Further, tests using simulated solar radiation demonstrated high photon harvesting efficiencies of approximately 10% per absorbed photon achievable in nearly transparent samples, perfectly suited for utilization as photovoltaic windows.

Despite their high transparency, the fabricated structures showed significant enhancement of solar flux with the concentration factor of more than four. The results indicate that “Stokes-shift-engineered” quantum dots represent a promising materials platform that may enable the creation of solution processable large-area LSCs with independently tunable emission and absorption spectra.

The research paper entitled ‘Large-area luminescent solar concentrators based on ‘Stokes-shift-engineered’ nanocrystals in a mass-polymerized PMMA matrix’ is published online in Nature Photonics.
Google safeguards future wearable IP with smart lens patents

By Julien Happich

ON THE 15TH OF APRIL, US-based Google fans were granted the privilege to exchange $1500 for a “pair” of Google Glass. But the search engine giant would not want to miss on future miniaturization opportunities. Last month, the Patent Bolt website revealed the company’s patent application for contact lenses with an integrated camera system, controlled by the wearer through unique blinking patterns.

The patent is wide encompassing, describing a multi-sensor contact lens computer system that may work with many future wearable devices and other consumer electronics. While a number of companies and research centres work on smart lenses with integrated health monitoring sensors, displays or optical to electrical stimuli conversion concepts (via external video capture and processing for visual interpretation), Google bets on yet to come integration breakthroughs with a rather open-ended patent application to safeguard as much wearable IP as possible.

The components are certainly not ready for building a thin-film camera to be embedded within a contact lens, nor the specific actuators or sensors that would interpret blinking patterns and process it locally, but the on-going research in flexible electronics and printable circuits promises that someday, it may be possible to combine all the relevant building blocks for such a smart device. Trying to bulk itself up, the patent somehow states the obvious, that the building blocks would be positioned in visually non-obstructive areas of the lens (around the pupil).

The camera component would be aligned so as to track and generate image data corresponding to the gaze of the wearer, following any shift in gaze. Then the patent extends on what could be done with such a lens-mounted camera, from merely detecting light (what looks more like current state-of-the-art printed flexible electronics), to identifying colours or performing plain face recognition or any other video processing task. The sensors that would be integrated on such smart lenses could be just anything the company would see fit, including energy harvesters.

Google may not have the IP to build the actual sensing blocks, but if this patent was ever granted, it would somehow prevent any company with the suitable technologies to strike a deal with competing smart lens developers, or at least it would shrink their marketable options. I suppose that’s ok to have Google as a licensee, except if the company’s patented smart lenses are only a strategy to give more life to its current Google Glass while preventing agile startups and research lab spin-offs from coming up with better alternatives.

Holst Centre and Imec shrink wearable health patch

By Julien Happich

RELYING ON SYSTEM in package (SiP) technology from industry partner Shinko Electric Industries, Holst Centre and imec have built a flexible health patch demonstrator whose electronic module measures only 17.4x17.4mm and weighs just 10g, only half the weight of alternative solutions. The patch logs real-time electrocardiogram (ECG), tissue-contact impedance and accelerometer information to accurately monitor physical activity.

Following the trend in wearable activity monitors and fitness electronic devices that compute the calories you burn, the research centers have packed a 1-lead ECG, a tissue-contact impedance sensor and a 3D accelerometer.

All the sensor data is processed and analyzed locally through proprietary calibrated algorithms before relevant information is transmitted via a Bluetooth Smart link to a smartphone or another connected unit. All this is done on a minimal energy budget.

The demonstrator was run on a rechargeable 15mAh battery from partner Solicone, told us Chris Van Hoof, program director for wearable healthcare at imec. The algorithms used to process the sensor data locally are able to recognize the type of activity, he explained, which minimizes wireless data transfers and power consumption.

“When we processed the data from all sensors locally only to send relevant activity information, then the patch operated two days in a row without recharge. But if we had all the sensors streaming raw data over Bluetooth, the same battery only lasted two hours” Van Hoof clarified.

“If you only send knowledge to the application running on the smartphone, then you make huge power savings”, he concluded. The electronic module is integrated into a flexible and stretchable patch designed by Holst Centre, combining system in foil technology with stretchable, integrated electrodes to create a lightweight patch that can be worn comfortably on the chest for extended periods. Ideally, the patch would be integrated into a skin-breathable fabric or into clothing.

The patch was developed in the framework of imec’s and Holst Centre’s joint Human++ program. Both research centers are prospecting for partners interested in industrializing the concept.
Custom processor tool wins $2.8m backing

By Nick Flaherty

CZECH EDA TOOL developer Codasip has raised $2.8m in its first public offering to expand its customizable processor technology.

The Codasip Framework Studio tool and IP blocks allow processors to be easily developed with custom instruction sets for embedded system-on-chip applications. The investment will be used to further develop the technology that enables its application specific integrated processors (ASIP) to be programmed using the same standard flows as existing processors. This is key to eliminating the traditional complexity associated with ASIP designs and transition ASIP usage from a niche into mainstream design, says the company, competing directly with configurable processor cores such as ARC from Synopsys and the Tensilica cores from Cadence Design Systems.

Funding is being led by Credo Ventures, a venture capital firm based in the Czech Republic, and includes additional funds from multiple private investors.

The rapid growth of mobile devices, the internet of things (IoT) and personalized medicine is driving demand for extremely low power processors that perform very specialized tasks. ASIP’s address this need by optimizing the processor instruction set to the needs of the application, improving performance by orders of magnitude over traditional processing techniques.

“Codasip is changing how ASIPs are designed today and we are happy to help the company expand to new markets,” said Vladislav Jez, Partner at Credo Ventures. “After being specialized products for many years, some form of ASIP now exists in every semiconductor-based product,” said Karel Masarik, CEO of Codasip.

“Codasip’s uncompromising vision to deliver the performance that ASIP’s offer, while utilizing industry standard design, development, and programming flows, means we are perfectly positioned to take advantage of this rapidly growing opportunity. Additionally, our Codix extensible processor IP and subsystems mean that even companies that have never dealt with this technology can benefit with minimal effort.”

Codasip recently released version 2.0 of the Codasip Studio ASIP platform, further extending its technology leadership in the market. This new funding will be used to accelerate the existing product roadmap for EDA tools, as well as expanding the range of Codix IP cores that it will bring to market.

In addition to expanding R&D activities the funding will be used to enable international expansion. Codasip has recently expanded its business development and sales presence in the US, and Europe, and will be expanding to other regions during the remainder of 2014.

Formed in 2006 and headquartered in Brno, Czech Republic, Codasip currently has offices in the US and Europe. Its Advisory Board is headed by technology commentator and investor Esther Dyson and its Investment Committee Chairman is Eduard Mika, a prominent technology entrepreneur in Central Europe.

ARM backs Open Sensor Platform

By Peter Clarke

ARM HOLDINGS PLC (Cambridge, England) has offered its support of the Open Sensor Platform (OSP) for sensor hub applications, developed by startup Sensor Platforms Inc. (San Jose, Calif.). Sensor Platforms is the developer of the FreeMotion Library of software for sensor fusion functions.

The OSP is a framework for sensor data acquisition, communication, and interpretation, compatible with any CPU architecture or real-time operating system, according to documentation on Sensor Platforms website. OSP encourages developers to focus on creating low-level applications for sensors rather than reinventing the wheel on the sensor interface.

The OSP is processor architecture agnostic but was written with the ARM architecture in mind, according to Sensor Platforms. Technical documentation states: “The first sample of OSP implementation is an Android KitKat-compliant sensor hub providing always-on sensor data up to the Android hardware abstraction layer (HAL) on the application processor. However the framework is simple and flexible enough to be extended to more use cases. OSP developers will also be able to seamlessly take advantage of higher-level sensor interpretation such as that available through Sensor Platforms’ own FreeMotion Libraries that provide robust sensor fusion always-on context awareness and pedestrian dead reckoning.”

“As an open source platform for sensor fusion fundamentals, OSP will enable a community of developers to accelerate new functionality for ongoing innovation in sensor hubs across applications. As a result, we should see devices and applications that are more aware of their user and their environment, making technology more useful for all,” said Charlene Marini, vice president of marketing for embedded business at ARM, in a statement issued by Sensor Platforms.

OSP will be open sourced under Apache License, version 2.0, and will actively manage and incorporate community contributions. The initial source code release, supporting documentation, and forum support will be available at GitHub.com on or before May 12.
Measurement Speed Boosts Production

In 1908 Anritsu produced the common-battery automatic telephone, leading to the commercial development and mass production of public telephones. Since then, the company has continued to be a key player in ensuring the reliability and quality of communications technology and infrastructure. Today, Anritsu’s MS2830A spectrum analyzer features best-in-class measurement speed, significantly increasing production and saving time and money.

**Batch Capture Measurement**

Functions such as Batch Capture Measurement in Anritsu’s MS2830A support ultra-high speeds and can greatly benefit mass production.
ECSEL Germany launched with automotive touch

By Christoph Hammerschmidt

AS A PART OF the European Commission initiative to increase Europe’s share of the global semiconductor production, the German part of the Electronic Components and Systems for European Leadership (ECSEL) has been launched. In a kick-off event in Munich, Infineon CEO Reinhard Ploss along with a selection of industry and technology managers as well as politicians sketched an image of economic progress through innovation at the semiconductor and application level.

ECSEL is a joint undertaking in public-private partnership of the EU member states and the industry, aiming at defending and improving Europe’s leadership position with regards to electronic components and systems. The undertaking stands for a holistic approach and embraces the segments of micro and nanoelectronics (ENIAC); Embedded and Cyber-physical systems (ARTEMIS); and Smart Systems Integration (EPoSS).

“ECSEL is a real opportunity for the European Union and for Germany”, said Ploss. The Infineon top manager pointed out that the project is most relevant to strengthen the EU’s industrial core. “It is not only about production - it is about technological competence”, he said.

The German “chapter” of the EU-wide ECSEL activities embraces, among others, companies such as Airbus, Bosch, Carl Zeiss SMT, Continental, Daimler, Infineon, NXP Germany and Siemens as well as the universities of Braunschweig and Erlangen and research institutions like Fraunhofer Group for Microelectronics. “This is not a private party,” Ploss said. “Instead, it is open to every company and institution to join and share its expertise.”

Within the context of ECSEL at the European level, the German contribution will emphasize R&D activities in the fields of nanoelectronics for critical and real-time application systems, complex Embedded Systems and Cyber-Physical Systems (CPS). The group regards system integration technologies as a key competitive factor. Instead of focusing on a specific part of the value chain such as design or production, it intends to pursue a holistic approach and drive innovation along the entire value chain.

Khalil Rouhana, Director Components and Systems at the Directorate General for Communications Networks, Content & Technology (DG Connect) of the European Commission, highlighted the need for action. “We know that the EU is not doing well in all parts of the technology value chain”, he said, adding that investment in significant parts of technology has decreased. Nevertheless, the EU’s economy is strong in other specific segments, namely automotive, components, and embedded systems - in the latter segment, the EU stands for 30% of the world’s value production. Five global technology megatrends – Big Data; Cloud Computing; Smart Connected Objects and IoT; Broadband and Wireless Connectivity; and Autonomous Systems - translate into three areas of business opportunities for the European countries: These are the High-growth “Smart X” (IoT) markets; selected vertical markets (automotive, energy and security) as well as the continuous growth of mobile and wireless markets. To reverse the declining market share of Europe’s electronics components production, the EU should attract investments to Europe. ECSEL’s task in this context is addressing both demand and supply, he said. “This is very important. The production follows the markets value chain”, he emphasized. The importance of this challenge reflects the size of the funding: ECSEL will have an overall budget of about €5 billion for the timeframe.
from 2014 to 2020. Of this budgeted, €1.17 bn will come from the EU and the same amount from the local governments of the member states. The remaining €2.34 billion will be contributed by the industry. As of today, 17 member states have already committed to join the initiative.

Christoph Grote, Managing Director of carmaker BMW's Research and Technology group, went into more details describing the challenges electromobility as one of the technology fields in question is facing today. “Why is this a long-distance race rather than a sprint?” he asked rhetorically. The answer is that electromobility requires high amounts of basic research; the infrastructure has to undergo massive changes and motors are still way too expensive. “Today’s electric motors are efficient, but not affordable”, he said; more R&D efforts have to be made. “The same holds true for power electronics” he added. For the connected car, another field of activity for ECSEL, the industry needs “reliable, affordable driver assistance systems” and “new technologies for the vehicles to communicate in the Internet of Things”. Also for autonomous driving, another challenge the automotive industry is currently working to master, highly reliable and exact sensors have to be developed that are much more affordable than today’s counterparts. These sensors will feature in-sensor data pre-processing and intrinsic communications capabilities. To meet the high requirements with regards to functional safety, the industry also needs a certified tool chain.

But this is not the end of the industry’s wish list: cloud connectivity as an essential part of vehicle architectures requires the creation of a joint platform. The feature of this platform list underscores the size of the challenge: based on low-latency 5G network technology, this platform will guarantee QoS for M2M communications.

At the same time, it will provide a geo-reference for mobile sensors. And this is still not enough: software needs to be developed capable of conducting real-time traffic flow analysis, and the standards have to be created to enable all these parts to collaborate and to work in the desired way. “All these systems must have some sort of master plan”, Grote stated. “Otherwise we will run into a bits-and-pieces problem”.

A wise bet on Android’s host card emulation

By Julien Happich

BY ACQUIRING ENCRYPTION-related software company Metaforic, Inside Secure adds key technologies to its secure microcontrollers IP portfolio to push for more cloud-based mobile payments security using Host Card Emulation (HCE).

Introduced on Android 4.4 (KitKat) and publicly supported by Visa and MasterCard, Host Card Emulation (HCE) relies on a secured cloud-based transaction to allow contactless payments and services through any NFC-enabled mobile device. The mobile application connects the consumer’s bank to the retailer’s point of sale using NFC, whilst all the sensitive user and banking data is stored and accessed from the bank’s secure cloud servers where the transaction takes place.

By emulating a smart card, HCE bluntly takes telecom operators and smart card vendors out of the equation since banks no longer have to retribute them for hosting some of the secure services on the SIM card or an embedded secure element inside the mobile phone. Instead, they implement cloud-based secure elements so the payment processing app is not just running on its own (on a vulnerable mobile platform).

This may well put an end to the long battle between Telcos, mobile mobile manufacturers and banks for the NFC transaction pie. Both Visa and MasterCard have announced tools and support applications for banks to adopt HCE as an alternative to renting memory space on the SIM. Of course for the transaction to take place, an internet connection is required, but rather than requiring an always-on connection, digital tokens could be issued at times of connection by the banks’ secure cloud, only valid for short intervals of time. MasterCard who has already been proving HCE on small scale trials with Capital One and Banco Sabadell, plans to unveil its secure remote payment specifications by mid-2014. Closing the deal, Inside Secure paid USD 11.6 million in cash and could pay an additional USD 4.5 million in 2015 subject to completion of certain 2014 business milestones. The company already offers hardware-based and software-based encryption solutions but it is acquiring some very interesting software developments from Metaforic, crucial to secure Host Card Emulation (HCE)-based mobile payments.

Founded in 2006, Metaforic took the gold award at last year’s American Technology Awards in the Cyber Security category for its self-defending software immune system dubbed Metaforic Core. The Metaforic software analyzes code transparently as it runs, with thousands of so-called antibody agents distributed throughout the code to check the program and each other. While impacting computing performance by less than 1%, Metaforic antibodies are said to be resistant to detection and automated removal techniques, and if any change is made to the executable, multiple antibodies detect the change and respond.

Another interesting product now in Inside Secure’s portfolio is Metaforic’s code concealer, which enables software developers to hide sensitive data such as encryption keys in software and to obfuscate sensitive code. In short, code disassembly and dissemination are used to make the software more difficult to understand and to reverse-engineer. This code concealment approach can be hardened with the software immunization described above. The acquisition will not only expand Inside Secure’s IP licensing revenues, it brings in Metaforic’s know-how and customer base in the mobile and payment industries. Over the last two years, Inside Secure was licensing Metaforic’s technology for its content protection (DRM) solutions.

Chief Executive Officer of Inside Secure, Remy de Tonnac is a firm believer of HCE-based, cloud-based mobile payment solutions which he expects to become mainstream since they have been endorsed by Visa and MasterCard. “The Metaforic acquisition is superbly aligned with Inside Secure’s strategy. It will uniquely position Inside Secure as the only company able to provide security solutions for enterprise secure access, digital entertainment and financial services markets, the three key market drivers for mobile security” Tonnac said in a statement.
Teardown reveals PrimeSense in Google’s Tango

By Peter Clarke

A DECONSTRUCTION BY iFixit of Google’s Project Tango depth-sensing prototype Android phone has revealed the presence of the PS1200 ‘Capri’ 3D sensor data processor from PrimeSense Ltd. (Tel Aviv, Israel). The teardown also reveals two Myriad 1 vision processors from Movidius Ltd. (Dublin, Ireland) and a Snapdragon 800-series MSM8974 application processor.

Although PrimeSense was not mentioned as one of the original collaborators in Project Tango, the startup was the developer of the Kinect 3D depth sensing system used with Microsoft Xbox 360. PrimeSense was acquired by Apple for about $345 million late in 2013.

The Project Tango prototype from Google has been created in partnership with OmniVision Technologies Inc. (Santa Clara, Calif.), inertial MEMS sensor provider Bosch; Movidius Ltd. (Dublin, Ireland) the vendor of the Myriad 1 vision processor; and Paracosm (Gainsville, Florida), vendor of software that converts 3D scans into computer models.

The Capri PS1200 SoC works with an infrared illuminator that sends modulated IR light out and then an off-the-shelf CMOS image sensor to read the coded light back from the scene. The PS1200 then processes the coded IR patterns to produce a depth-image of the scene.

A Dragon Fruit for test and measurement:

Red Pitaya comes to Europe

By Christoph Hammerschmidt

FANS OF ARDUINO, Raspberry Pi or Cubieboard will like this: Startup company Red Pitaya transfers the open approach of these single-board computers to the Test and Measurement arena. The company now sets its foot on European soil. As the first step, it signed an exclusive distribution agreement with RS Components.

Since its inception in mid-2013, Red Pitaya has developed an ecosystem of devices and software designed to support an open approach to measurement tasks of all kinds. The ambition is high: The platform available for less than $500 could seriously compete against multiple expensive laboratory instruments - plus, its open approach fosters the development of innovative applications for segments where hitherto no custom offering exists in the market.

The entire Red Pitaya ecosystem is centred on a single board, reconfigurable, open instrument platform not much bigger than a credit card. The processing power is provided by a Xilinx Zynq SoC which combines an ARM Cortex-A9 microcontroller with the flexibility of an FPGA. The board offers a total of six analogue I/O ports of which two are suited for RF signals.

16 general-purpose I/Os, an Ethernet port and a Micro SD slot ensure connectivity and expandability. In terms of software, a cloud marketplace named Bazaar offers a set of open-source measurement applications including an oscilloscope, a spectrum analyser and an arbitrary waveform generator. Measurement results can be displayed on a PC or tablet computer running a web browser. A repository of corresponding open-source code and tools enables designers to share and collaborate in developing applications.

The software is based in the GNU/Linux operating system; the environment supports a variety of software interfaces and languages including C/C++, scripting languages and HTML-based web interfaces. First commercial products can be expected later this year, RS Components says.
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Jungheinrich, a leading European forklift manufacturer, needed to reduce their motor control size and cost while maintaining power output levels. Thermal Clad insulated metal substrates (IMS®) allowed their engineers to replace high profile thru-hole FETs, capacitors, and bus bars with fewer low profile, surface mount components. This sleek design reduced package size by over 50%, all without sacrificing a single watt of power. Thermal Clad's unique dielectric coating dissipates heat more efficiently than FR-4 or other PCBs – ideal for high watt-density applications such as motor control.

Automated assembly lowers manufacturing costs.

Cooling with Thermal Clad IMS eliminates the need for heat sinks, clips, fans and other discrete components that increase package size and require costly manual assembly. Now, using surface mount technology, Jungheinrich was able to automate much of the assembly process thus reducing cycle times and long-term manufacturing costs.

“"We needed to reduce our processing cost, it was too labor intensive. With Thermal Clad we were able to automate, dissipate the heat better, and reduce our size by at least 50%.””

Stephan Taube
Electronic Development Engineer of Jungheinrich Forklifts

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Focusing on energy efficiency

CamSemi is making a name for itself as a manufacturer of chips for energy efficient mains adaptors, mobile phone chargers and solid state LED lighting drivers. CamSemi CEO, David Baillie, talks to Hanns Windele of Mentor Graphics

Hanns Windele: Revenue growth in the semiconductor business has been averaging in double-digits for two decades, but has recently scaled back to single-digit growth. How do you expect to grow CamSemi under this new climate?

David Baillie: One of our key achievements is that, while in 2012 the semiconductor market was down 4 or 5 per cent, with 2013 up by a similar amount, we were the fastest growing semiconductor company in the Sunday Times Hiscox Tech Track 100, growing by at least 50 per cent per year. We have done that by targeting markets that are growing dramatically faster than the industry is.

HW: And your primary markets are networking and telecoms?

DB: That’s where we started. As a start-up business the big challenge was to get people to take the risk of working with us. We identified the home networking market – DSL modem, hub, router – and what we found was that traditional power adaptors in that sector were inefficient. We saw how we could take something that was 50 per cent efficient to 85 per cent and achieve a three-fold improvement in terms of reduced energy waste. We felt that if we could demonstrate that to people, they almost would have no choice but to try our product. Energy consumption has become a major concern from an ecological image perspective. Sometimes we measure our growth in chips or in dollars, or at other times in the number of power stations the world hasn’t had to build because of what we do. These are all meaningful metrics.

HW: What advice would you give to EDA companies on our future challenges?

DB: The challenge is much less at chip level and more to do with how the chip interacts with the system. Today we have no means of modeling how a layout might work. So today you might have a situation where you turn a transistor through 90 degrees and everything dramatically changes, probably because the transistor is sitting on a lead-frame that is effectively an aerial. If there was an efficient cost-time way of effectively simulating these sorts of problems we would be able to get out of trial-by-experience.

HW: Will you be looking into different markets from those you serve today?

DB: Yes. Our first market in the networking space was about crossing the chasm of bringing in the first partner customer. Our second market, the mobile consumer space, was about driving growth. But the next huge opportunity is the solid state LED lighting market. Although the handset market is massive – 2 billion units per year – what fascinates us from a power conversion point of view is LED lighting.
Incandescent lights sold 12 billion units per year at their peak. LEDs have the potential to be bigger than any other market that’s existed in power conversion.

**HW:** How will you select markets you want to work with over the next decade?

**DB:** The interesting thing about the battery charging and solid state lighting markets is that they share a common key application requirement – constant current drive. That is one of the things we try to do. We are a relatively small organisation and so we have to be careful about focus and leveraging what we’ve already mastered.

**HW:** Do you see chargers becoming more intelligent?

**DB:** We’re now looking at a situation where the power supply and the consumer product start talking to each other. The supply will identify the optimal charge profile with the result that the user will have to wait less time for a full charge.

**HW:** What changes do you see happening in the next decade?

**DB:** We will see a situation where the switch is no longer physically wired to the light. It will no longer be constrained by being bolted to the wall. It may not even be on the wall in the future. But there will be a convergence in the Internet of Everything, where all appliances and controlling devices will be interconnected.

**HW:** One way to rise in the eco-system is to provide more complex solutions. Do you see a point when you’ll provide complete solutions in intelligent lighting?

**DB:** We don’t want to compete with our customers. We have considered whether there would be a bigger dollar return on shipping a bigger proportion of the solution. Could we go from chips to subsystems? We have always declined to do so, because our margins would go down.

**HW:** Is there one change in the market that would make your life easier?

**DB:** One thing that could transform market growth for us is a stronger approach to mandating energy efficiency at government level. Clearly incandescent light bulbs are being phased out, but that doesn’t apply to halogens, which are only marginally more efficient. And yet there is an LED alternative that is ten-times more efficient.

**HW:** What changes do you see happening in the semiconductor industry?

**DB:** There is increasing divergence in the semiconductor industry between companies chasing the ‘bleeding edge’ (sub-20nm) and companies like CamSemi, which simply cannot afford to play in that space. Every product we ship is based on a technology that is 20 years old and well proven.

We want to be involved in areas where we can leverage the historical manufacturing infrastructure that has been left behind by the bleeding edge.
4K OLED: the last status symbol before TV obsolescence?

By Julien Happich

ULTRA HIGH DEFINITION also known as 4K (boasting 3840×2160 pixels at either 60 or 120 frames per second) was in pretty much every announcement at the NAB Show which took place last month in Las Vegas.

The content exists or can be “digitally upgraded”, the displays are ready, but are consumers ready to fork out for a 4K upgrade yet?

Even if LCD or OLED TVs grow larger, flatter and thinner, my impression is that cloud-based services and video compression will eventually kill wall-mounted TVs as a concept.

In fact, the move to 4K could be seen as a desperate attempt by the TV industry to reverse the global market trend: two consecutive years of decline since the 2011 peak of 255 million units shipped worldwide.

“4K is a very important strategy for most brands, but particularly those targeting the high-end TV market,” observed Paul Gagnon, director of global TV research for NPD DisplaySearch.

But overall TV shipments fell 3 percent in 2013 (7% in 2012) and even newer LCD TVs declined 1 percent as early as 2012 (CRT and plasma TVs being the hardest hit technologies). But NPD DisplaySearch expects the number of UHD TVs to reach 62 million in 2017.

The research firm sees OLED and 4K TVs as growth drivers, it expects curved TVs display shipments to reach nearly 800,000 units in 2014 and to exceed six million units by the end of 2017, boosted by OLED TVs.

But the novelty of OLED and curved TVs will wear off too and even the higher selling prices and higher profit margins of such TVs will certainly fail to compensate for the overall market shrink.

What probably makes it harder to attract television buyers, especially in saturated markets such as Europe and the USA, is that consumers spend more time on their smartphones and other internet-connected devices, with online content and games at their fingertips wherever they are.

Ultra high definition cinema @ home

Splashing tens of thousands of dollars only to be stuck in a room watching the same mediocre content (with a better resolution I admit) that you could access from any mobile device does not make much sense unless you are after a status symbol. Even as a very wealthy photographer or video maker, you would think twice before spending that sort of money only to lose flexibility. Portable projectors are also moving into the wide-screen space, again with unbeatable portability and projection size.

On the bright side for high-end TV makers, China will be the new Eldorado for 4K TVs, with Chinese brands accounting for 84 percent of global 4K TV shipments which totalled 1.6 million units in 2013 according to NPD DisplaySearch. Pricing war is then likely to reduce the high-margin benefit of making such large display units.

4K TV broadcasting ends-up on smartphones

Ultra High Definition also known as 4K (boasting twice the horizontal and vertical resolution of the 1080p HDTV format) was a hot topic both for content creators, broadcasters and display manufacturers.

Even going beyond 4K, at NAB, Japanese public broadcaster NHK demonstrated over-the-air transmission of 8K content (so-called Super Hi-Vision featuring 7680x4320 pixels) in a single 6 MHz UHF TV channel. In February, the company had announced an 8K sensor that could shoot video at 120 frames per second, it has developed an 8K-capable video camera weighing under 2 kg.

For the efficient delivery of heavy Ultra HD content boasting 3840×2160 pixels at either 60 or 120 frames per second, you must not only be able to acquire and process video at that sort of resolution and frame rate, but you must also be able to encode and decode it efficiently to enable data streaming. High Efficiency Video Coding (HEVC) is the name of the game. H.265 / HEVC is said to double the data compression ratio compared to H.264/MPEG-4 AVC for the same level of video quality. It can support 8K UHD and resolutions up to 8192x4320.

At NAB, MaxLinear and STMicroelectronics announced a reference design for Ultra HD set-top boxes and gateways, for satellite pay-TV operators. The reference design supports multiple decode, multi-channel personal video recorders (PVR),
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video-on-demand (VOD) and multiple transcoding for streaming to second-screen clients. It combines MaxLinear's MxL5xx family of satellite Full-Spectrum Capture receivers and ST's pin-compatible STiH312 “Cannes” and STiH412 “Monaco” set-top box SoC decoders.

Altera was keen to announce that its H.265 Enhanced Motion Estimation Engine, paired with server software from video delivery infrastructure provider Harmonic could enable 4Kp60 real-time performance, cutting on rack space and CPU processing power.

Barco Silex also demonstrated 4K Video over IP, combining its JPEG2000 compression IP cores and transport stream solutions with Xilinx’ SMPTE 2022 cores on a single Kintex-7 device to deliver encoded content compliant with the VSF (Video Services Forum) for maximum interoperability.

Earlier this year at CES, French company Kalray was demonstrating a low power Ultra HD HEVC encoder running on its MPPA-256 Manycore processor (256 cores on a single chip), streaming DivX HEVC UltraHD video to a set top box (with live encoding and decoding) while drawing under 50W of power. The company sees a big market opportunity to improve the energy efficiency of cloud infrastructures used by content providers to encode, decode or transcode multi-format and premium videos for multi-screen devices such as tablets and smartphones.

DivX HEVC is part of an end-to-end solution helping to accelerate the adoption of the next-generation compression standard across the entire video distribution system. It includes MainConcept encoding SDKs for professional content creators, the DivX Video Service with studio approved DivX DRM for protected content delivery across multi-screen devices, and popular DivX consumer software tools for PC-based content creation and playback. In addition, DivX HEVC is integrated into the DivX Certification program that allow IC and OEM customers to quickly bring to market mobile and consumer electronics products that enable consistently high-quality DivX HEVC video playback.

Solutions are also cropping up to stream Ultra HD content from a smartphone to a larger display such as a 4K-capable TV stuck on a wall. For instance, Toshiba Electronics’ TC358840 Ultra HD HDMI to MIPI CSI-2 converter chipset supports 4K video resolution. The chipset converts an Ultra HD HDMI video stream to a dual CSI-2 video interface on an application processor, effectively converting the smartphone into a 4K gateway for home TV.

The HDPay ICs rolled out by TransSwitch supports both HDMI (High-Definition Multimedia Interface) and DisplayPort standards, eliminating the need for active converter cables and enabling consumers to port 4K content from their notebook PCs, tablets and smartphones to Ultra HD televisions (for those who can afford them).
**Li-Fi reaches 1Gbps: lighting the path to a new internet model**

By Paul Buckley

HARALD HAAS AND his team are claiming another breakthrough in Li-Fi technology by demonstrating that up to 1.1 Gbps can be transmitted using light waves from micro LEDs over a distance of 10 metres using less than 0.5 W power.

Haas is a Professor at the University of Edinburgh and Chief Science Officer (CSO) and co-founder of pureLiFi. The demonstration equates only to five percent of the power of a typical 10 W LED light bulb but proves the point that lights can be dimmed down while high data rates and coverage are maintained. Moreover, the distance at which 1 Gbps can be achieved with a single colour LED is 10 times larger than what has been reported previously.

The work was undertaken as part of the EPSRC funded Ultra Parallel-Visible Light Communications (UP-VLC) programme grant, in collaboration with partners from the Institute of Photonics at the University of Strathclyde, the University of Glasgow and the University of Oxford.

The latest discovery follows the successful demonstration by pureLiFi of the world’s first commercial Li-Fi product, Li-1st, during March at MWC 2014 and CeBIT 2014, pureLiFi added a second production run of the Li-1st during March 2014 to meet the high demand from industry customers worldwide. This new production run is being shipped in April.

“Li-Fi is revolutionising wireless communications and showing that Li-Fi can be the enabler of the emerging Internet of Everything. By transmitting data at speeds above 1 Gbps and record distances of 10 metres at a fraction of the power of typical LED bulbs, we continue to make the technological leaps and bounds that make Li-Fi a technology that could transform the way we use the internet in the near future,” explained Professor Harald Haas, CSO and co-founder of pureLiFi.

**Printoo: modular printed electronics made Arduino-compatible**

By Julien Happich

A SPIN-OUT FROM YDreams, ynvisible was founded in 2010 with the goal to bring more interactivity to everyday objects and surfaces, mostly through the use of flexible and printed electronics including the company’s fully transparent electrochromic display. The paper-thin display, which only becomes visible when activated can easily be integrated with different background graphics.

Currently, the company is raising funds through the crowd-funding platform KickStarter for the first production batch of its Printoo Arduino-compatible printed electronics design platform. With more than three weeks to go, Ynvisible has already collected more than its initial $20,000 pledge which would support the production of roughly 500 kits featuring between 10 to 12 modules.

Running Arduino software, the first Printoo packs include novel printed modules including LED light strips from VTT lab, 1.5V printed batteries from Blue Spark and Enfucell, 0.350mm thin organic photodetectors from ISORG, printed polymer solar cells from Mekoprint, and Ynvisible’s own transparent printed displays running from 1.5V. Also included are modules like Bluetooth LE, DC motor control, flexible LED matrixes, and a variety of sensors. The Printoo core is powered by the Atmel ATMega328 microcontroller. A list of components can be found at www.printoo.pt

“Flexible and printed electronics components are often only available from labs and research institutes, and by building an Arduino-compatible platform capable of connecting different flexible modules, we’re giving designers a chance to try out these novel printed electronic technologies” explains Manuel Câmara, New Products Manager at Ynvisible.

“With Printoo, we bring printed electronics to the masses. The Arduino user base is also more accepting, and by making Printoo an open-source project, we encourage more people to experiment with these relatively new technologies while they are still maturing”, Câmara added.

“Our R&D engineers are taking printed electronics out of research and development laboratories into the mainstream” says Ynvisible’s CEO Inês Henriques in a presentation video on KickStarter.

Among the various project examples shown on the promotional video, I must admit the very basic “girlfriend communicator” made me giggle.

The company hopes to bring more modules as the platform develops, for example to include flexible memory, printed OLEDs, printed temperature sensors or image sensors. It is open to talk with all companies in the field of flexible electronics.

Modularity means connectors. There are also quite a few discrete components mounted on flexible foils too.

“In order to make Printoo modular and easy to experiment with, we’ve made the compromise to rely on 2.54mm pitch standard connectors for the different modules, so they are not as small as they could be if only using printed electronics. But of course, once they have proven a concept, designers can opt for better printed integration at manufacturing level” told us Câmara.

Since Europe is driving the research in printed electronics, the Printoo kits will most likely be manufactured in Europe, so as to stay close to the companies involved, hinted Câmara.
Amazon’s smartphone: a consumers tracking tool in disguise

By Julien Happich

THE WALL STREET JOURNAL’S report last week that e-commerce giant Amazon is planning to enter the smartphone market with its own handset planned for June is stirring a lot of debate regarding the company’s pricing model in what looks like a saturated and well served market.

According to the report, a smartphone with four front-facing cameras or sensors has been demonstrated to developers in Seattle and San Francisco over the last few weeks, with the capability to track the user’s gaze, augmented reality features together with a glasses-free 3D-viewing experience. The auto-stereoscopic 3D screen would serve the on-screen effects based on the user’s head position (as detected by the front-facing sensors). You could certainly extrapolate that back-facing stereoscopic cameras would capture the real world in 3D to support the augmented reality features and match the user’s gaze with the real-world items attracting the consumer’s attention.

Once identified in the real world, these items could be searched and matched in Amazon’s online database to come up with price-competitive offers. In retail stores equipped with Bluetooth Smart beacons, the geolocalized offers pushed to the consumer’s smartphone could even be used by Amazon to fine-tune its contextual counter-offers.

Sure the smartphone market is already dominated by a handful of players, all trying to leverage their hardware to scrutinize and influence consumers’ spending habits. Google’s Android OS gives the search engine giant a helping hand on personalized advertising across the majority of smartphones, including the company’s Nexus series.

Last year, HTC and Facebook have released a “low-cost” social-network dedicated smartphone that turns the unit into a full-featured Facebook engine, ready to deliver targeted advertising. The “First” as it is called, is said to deliver an immersive Facebook experience with better integrated notifications.

If provided at a very attractive cost, Amazon’s smartphone could just be another self-serving tool, a consumer tracking device purposely built to give the merchant a competitive edge in-store as well as online. It may come fully loaded with Amazon’s apps and useful shortcuts to the company’s retail services.

Even if Amazon was not directly making profit from selling this new hardware, the user-generated data collected and analysed by such a proprietary tool could well compensate the design effort. Especially so if the new augmented reality feature means that 3D items from Amazon’s online catalogue can pop-up in front of the users’ eyes, right in place of the real thing and at a better price. A real-time price-war could take place wherever you shop.

If the practice ever became mainstream, would physical shops retaliate with special “no augmented reality” policies?

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China’s quest for ‘MIPS in wearable’

By Junko Yoshida

LET’S BE BLUNT: Not many serious players in the electronics industry today are sanguine about the survival chances for MIPS processors in a global mobile market where in the last decade - almost single-handedly - ARM has built its formidable ecosystem.

Against that backdrop, the industry can’t help but ooze with pessimism as it regards Ingenic Semiconductor, a Beijing-based supplier of its own MIPS-based mobile SoCs.

Armed with a home-grown MIPS CPU core, the Chinese fabless company, founded in 2005, flew under the radar until 2010, when it first burst into the then emerging tablet scene and went public in China. Despite initial success in e-books and tablets, Ingenic ended up abandoning the tablet marketing in late 2012. Ingenic today is betting its life on the yet-to-be defined smartwatch market.

As company founder and CEO Qiang Liu acknowledged in a recent conversation with EE Times, “Ingenic performed not well during the past several years... Profit decreased from $10 million three years ago to around $4 million last year.”

Ingenic, back against the wall, last year rolled out a new platform for wearable devices and Internet of Things, called the Ingenic Newton Platform. At the platform’s core sits Ingenic’s 1 GHz MIPS-based JZ4775 CPU (a single-core MIPS CPU running at 1.0 GHz, manufactured by using a 65 nm process technology). Newton features flexible mobile connectivity options and various MEMS and bio sensors.

Ingenic’s all-out attack on the wearable/IoT market won’t end there. Ingenic is grooming a new SOC, JZ4785, complete with its own MIPS version of big.LITTLE architecture. The new SoC, enabled with low-power voice recognition baked in, is expected out of the foundry by the end of May. It’s designed for smartwatches, camera glasses, and other IoT devices, Liu told us.

In short, Liu and his team have not given up the impossible dream: MIPS in wearable devices, if not handsets and tablets. “The total 240 employees at Ingenic still insist on our belief to provide another computing platform other than ARM,” said Liu.

Rise and fall

To call the rise and fall of Ingenic typical of the hundreds of boom-and-bust China fabless ventures is premature and misguided. Ingenic, more accurately, is an underdog story about a non-“me too” apps processor

In a broader context, Ingenic could be a bellwether for the industry and the investment community blame him for clinging to MIPS. “They say my decision to stay with MIPS is emotional.”

Liu, however, is adamant that Ingenic’s choice of MIPS is a “business decision.” MIPS is what Ingenic teams know and how the company believes it can differentiate itself and its products from others. “We are doing MIPS because we want to stay original,” Liu told EE Times in Beijing.

Significantly, Ingenic is unlike most China fabless companies, which design mobile apps processors by cobbling together various IP blocks licensed from elsewhere. Ingenic’s team was working on MIPS CPU designs well before the company purchased licenses for MIPS architecture instruction sets in 2009.

Liu noted, “We have a MIPS architecture license, we design our own processor cores and multimedia elements that go into SoCs on our own.” As for 3D graphics, Ingenic licensed it from Vivante, and more recently PowerVR from Imagination.

Meet Qiang Liu

Liu is by no means a typical boastful Chinese CEO. Calm and quiet, he talks earnestly, listens to others intently, and makes no predictions about what he doesn’t know. In a recent meeting at Ingenic’s Beijing headquarters, Liu said a lot of people in the industry and the investment community blame him for clinging to MIPS. “They say my decision to stay with MIPS is emotional.”

MIPS is a “business decision”

In April 2012, Linley Gwennap, principal analyst at The Linley Group, wrote a piece entitled “Stranger in an ARM World,” discussing the Ingenic-designed MIPS CPU for the JZ4770 mobile processor:

Ingenic designed its own CPU, called XBurst. Implementing the MIPS32 (release 2) instruction set, this CPU uses a simple scalar design. In 65nm LP, it operates at 1.0GHz (1.2GHz at overvoltage). The single-core JZ4770 should have performance similar to that of single-core Cortex-A5 processors running at the same speed.

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What killed MIPS in mobile

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In addition to low cost, Ingenic designed the JZ4770 for low power as well. At 1.0GHz, the XBurst CPU uses 90mW. The entire processor consumes less than 300mW, according to the company. These figures should help mobile designers use smaller, lighter, and less expensive batteries.

In the same 2012 article, Gwennap was hopeful for Ingenic, citing “millions of dollars savings Ingenic made, compared with the cost of an ARM architecture license.” Gwennap was optimistic about MIPS in the Android market, noting “most Android apps are architecture-neutral and run on any instruction set.”

In the last couple of years, Ingenic has seemingly made the right moves to get MIPS accepted in the Android world. Ingenic snagged support for MIPS from Google on Android 4.1 in 2012. It also developed a binary translator for MIPS and opened it to Imagination Technologies.

But in the end, Gwennap’s cautious 2012 analysis was prescient about MIPS’s demise in the tablet market. Gwennap wrote, “One drawback of this processor for tablet use is its lack of compatibility with some Android apps. The MIPS architecture provides some technical advantages, but end users may not care about that if they can’t run their favorite apps.”

When approached by EE Times for follow-up this week, Gwennap said, “The large number of apps available on ARM makes it difficult for any other architecture to succeed in smartphones or tablets...

“Consider that Intel has made little headway in mobile despite spending years optimizing its binary translator and also investing heavily in getting the leading apps ported natively to x86. The MIPS camp is well behind Intel in this type of investment.”

Onto wearable devices
Since the company’s single-core JZ4770 launched in 2011, Ingenic has continued to develop its XBurst-based JZ47XX series SoCs.

The Ingenic-designed XBurst CPU adopts a pipeline engine that can emit instructions with very little power, according to the company. Liu explained that the JZ47XX series has penetrated into e-dictionary, PMP, e-book, tablet, and wearable devices quickly. Since its inception of the series in 2007, Ingenic has shipped more than 30 million units.

Although Ingenic still holds some market share in the educational tablet market, the company has switched gears since 2012, setting its sights on the emerging market of wearable devices with Newton, a platform for the Internet of Things.

Industry analysts believe that despite Ingenic’s withdrawal from the tablet segment, there’s plenty of opportunity to pursue wearables.

Analysts’ views
The Linley Group’s Gwennap told us, “Smart watches are still very new, and it’s not clear how they will develop... One likely scenario is that most apps will run on the smartphone while driving content to the watch via Bluetooth.” Under such a scenario, “the watch needs to run only a small amount of software, so compatibility with ARM becomes much less important.

“For this type of watch, the processor must be simple and inexpensive, so Ingenic’s technology should be applicable.”

IHS’s Sideco agrees. “This relatively green field provides an opening for MIPS-based suppliers to break in,” he notes. “The smart watch market... doesn’t have the same entrenched designs as the tablet market does (given that the latter is based on a lot of smartphone designs).”

The Ingenic Newton platform comes with flexible mobile connectivity including WiFi (802.11 a/b/g/n at 2.4/5 GHz) and Bluetooth 4.0 + EDR (including Bluetooth LE support), with support for NFC and FM. It also features various MEMS and bio-sensors; 3-axis gyroscope; accelerometer and magnetometer; and pressure, humidity, temperature, and bio-signal detection and processing. The small board, 3.2 mm thick, measures 21.6 by 38.4 mm.

Imagination Technology’s Alexandru Voica recently blogged about Ingenic Newton:

Ingenic Newton achieves very impressive power consumption figures under typical workloads: standby power is a measly 4mW, generic computing tasks (think MP3 playback) take up to 100mW on average while peak power consumption is around 260mW. This means that Ingenic-powered smartwatches can last for 30+ hours on a single charge.

Switching from Freescale to Ingenic
In China, where both system OEMs and consumers are eager for the emerging smartwatch market, the Ingenic Newton platform is gaining traction.

Beyond Geak Watch and Z Watch, ToMoon Technology, a leading smartwatch vendor, has joined the Newton party. In fact, ToMoon recently switched its hardware platform from Freescale to Ingenic, after the company sold its first batch of smartwatches over the Internet.

When this reporter visited Ingenic, a team of ToMoon engineers could be seen, closeted in a conference room with Ingenic’s engineering staff.

Ingenic’s foray into the IoT market goes beyond Newton. A new SOC, designated JZ4785, is in the hopper and expected back from the foundry in May.

Ingenic’s new IoT platform and its new SoC will be instrumental if Ingenic survives. But the future for Ingenic and MIPS technology will require a big idea and long-term thinking.

In that regard, Liu is hopeful for a much tighter collaboration with Imagination. But even more imperative is a clear commitment by industry forces -- other than Ingenic itself -- to a computing platform other than ARM.
What exactly is DC power integrity?

By Benjamin Jordan

WHEN I FIRST learned to design digital electronics and layout a PCB, I was taught to put all the 74-series chips and the microprocessor in neat rows, and the rule of thumb was to add a single 0.1µF ceramic capacitor for decoupling to each device, and sometimes adding an additional 1µF tantalum or electrolytic for the micros in parallel. I never worried too much about getting power to each device - using a 20 or 30 mil trace was enough for a chip that never drew more than 100mA, along with the classic interdigitated +5V/GND “grid”. Of course, power electronic designs are a whole different ball game. And I always took a lot more time, care and planning with power supply and amplifier designs - making sure to use proper (star) grounding and keeping high-current loops as tight as possible.

Some of this was more than 20 years ago now, and of course there has been a lot of development in the decoupling and power network topic since then. More elaborate and carefully placed decoupling schemes have to be designed for each new silicon process node, each new chip package generation and for each new PCB design as they become more densely packed with parts than ever. It’s getting difficult to find room for all the “rule of thumb” decoupling caps! And with BGA packaged devices down to 0.4mm pitch, that meanwhile draw several amps of current during use, it’s getting really difficult to plan and design a good power network on the PCB. Whether we like it or not, Power Integrity is a challenge that all PCB designers and engineers have to address.

Power Integrity is talked about a lot these days. But a lot of the talk is really on the signal integrity side - I call it AC power integrity, which is really about the impedances of the power network at high frequencies. This deals with how the decoupling is designed as well as return paths for high-speed signals. While it is non-trivial, I don’t want to simply regurgitate this already very commonly discussed topic. I want to get down to DC... why? Well, it just seems to me that learning to walk before trying to run is a good idea. So let’s talk DC Power Integrity.

At face value, it seems to be a simple enough topic - you just need to make sure there’s enough copper to get the necessary current to each device on the board. But that’s just at face value. When you start to work with fine-pitch device packages, manufacturing constraints and power requirements of said devices are almost completely at odds. Not only is it difficult to get the current needed to all the power pins, but you are also working with multiple supply voltages. This means that unless you want a high-layer-count PCB, you are going to have to get power to your devices through various split planes, and that’s just where the trouble begins.

But before I go too far down into the rabbit hole of designing the power distribution networks, how can you tell if you even have a power integrity problem? Power Integrity issues are sneaky little blighters. Like cockroaches that rapidly scamper into the crevices when the light turns on - the moment you try looking for these issues is the moment they can’t easily be reproduced. But you may have a power integrity issue if any of the following symptoms occur to your assemblies:

- The CPU is resetting unexpectedly, or when a high-utilization thread enters execution.
- Memory devices keep failing content retention / corruption tests.
- Analogue front-end circuits are randomly inaccurate or out of design specs.
- CPU or FPGA devices fail catastrophically.
- FPGA configurations are corrupted during power up.
- PCB Vias go open-circuit after a period of use cycles or maybe even at first power on.
- Production PCBs suffer blistering in the common locations.
- PCBs suffer delamination in common locations.
- Trace or polygon neckdowns are fusing.
- Discoloration of laminate or solder mask material in some regions of the PGB.

These symptoms fall into two broad categories of DC Power Integrity problems. For example, items 1 through 5 are the more sinister misbehaviours caused by transient voltage drops across the board. Sometimes they can be fixed with better decoupling but when talking DC, really more copper will improve the design. Items 6 through 10 are more serious power integrity issues where current density regularly exceeds the safe limits for temperature rise and the board is suffering from localized heating, or copper is outright fusing.

There are some useful tools for avoiding these sorts of problems before prototype; for example the IPC-2152 conductor sizing charts. I would say it’s a must that every design begins with these charts as the basis for power network design rules for the PCB layout. However, there are designs that now approach a part density that make it necessary to design “on the edge” and work with means and duty cycles to make sure the board doesn’t fail.

So, DC Power Integrity is the concern over making sure that each device in the design gets the power it needs, without suffering the problems mentioned, all while ensuring a reliable power network on the PCB.

Benjamin Jordan is Sr. Manager for Content Marketing Strategy at Altium - www.altium.com
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SiC power devices gain traction among electric vehicles manufacturers

By Dr. Thomas Barbieri

AS THE MARKET DEMAND for electric vehicles continues to increase – driven in part by government regulations on fuel efficiency, escalating fuel costs and an overall trend toward “greener” transportation options – a growing number of automotive manufacturers are incorporating the latest power electronic technology in their designs to improve overall performance, increase efficiency, and reduce cost, weight and complexity.

Hybrid electric vehicles (HEVs), plug-in hybrid electrical vehicles (PHEVs) and battery electrical vehicles (BEVs) all contain several critical systems that stand to benefit from wide bandgap power devices; these devices have the potential to enhance both the energy efficiency and performance of electric vehicles, which could enable early adopters to achieve a significant market advantage over their competitors.

As one of the leading wide bandgap semiconductor materials, silicon carbide (SiC) offers a number of proven performance advantages over conventional silicon technology, including higher voltage blocking capability, faster switching speed, lower on-state and switching losses, higher thermal conductivity, and higher surge resistance. These characteristics provide the platform for advanced power electronics subsystems that are at the heart of electric vehicle drivetrains, power converters and charging systems.

In a typical electric drivetrain vehicle, sophisticated power electronics are employed to manage the flow of energy between energy storage devices (batteries) and motor drive inverters. Improving the efficiency of these power electronics systems, which currently depend on conventional silicon power devices with limited voltage and power ratings, is critical for improving overall electric vehicle efficiency and reliability. By using the performance advantages of SiC power devices, electric drivetrains can achieve increased efficiency, higher power levels and power density, and reduced cooling system requirements. These system-level benefits yield increased vehicle performance, driving range per charge and decreased energy and/or fuel cost.

The significant performance enhancement that SiC can provide in an electric vehicle application can be shown by replacing the conventional silicon PIN diode with SiC Schottky diodes in both the high voltage DC/DC boost converter circuit of the traction drive system and also in the onboard battery charging system. Note that these applications require high voltage devices (> 300V) with ultrafast switching speed. Conventionally, silicon PIN diodes are used since high voltage silicon Schottky diodes are not available. However, these bipolar silicon PIN diodes have poor reverse recovery characteristics, which reduce achievable switching frequency and efficiency. In comparison, the zero reverse recovery characteristic of the unipolar SiC Schottky devices virtually eliminates diode switching losses and permits increased switching frequencies, making the overall power management system much more efficient.

Another critical area for enhancing EV performance is also in the design of the vehicle’s charging system. Plug-in vehicle owners want rapid charging from readily accessible electrical outlets and hybrid owners desire reliable and long-lasting battery charging systems. The key to both of these performance enhancements is the design of power electronic systems that feature high efficiency power conversion, high operating temperature capability and high charging current and power.

A significant increase in system efficiency can be achieved by replacing the silicon PIN diode with a SiC Schottky diode in the buck-boost converter of a 6.6kW charging system. In a recent study by Global Power Electronics, this drop-in replacement of SiC diodes for silicon diodes in an IGBT-switched power module increased the system efficiency by approximately 2 percent (for a maximum observed conversion efficiency of 96.4 percent), compared to the system employing all silicon devices.

Cree’s 600V and 1200V SiC Schottky diodes have already been implemented in several EV charger designs, and the diode portfolio has recently been expanded to include packaged devices and bare die in voltage ratings ranging up to 1700V. Cree SiC Schottky diodes feature a proprietary internal design with a Merged PIN Structure (MPS), providing extreme surge resistance against the most intense fault events. As seen in figure 4, a 10A, 1200V Schottky diode with the MPS structure exhibits surge resistance greater than 700A at 25°C under a

Reduced Losses Using SiC JBS Diode

Fig. 1: EV charging systems benefit from the improved efficiency and thermal characteristics of Cree’s SiC Schottky diodes.

Dr. Thomas Barbieri is product marketing engineer at Cree, Inc – www.cree.com
10-microsecond pulse. This high surge capability will contribute to increased reliability in the systems that incorporate SiC components. For example, the susceptibility of the boost converter to damage from high inrush current would be greatly reduced if the silicon PiN boost diode were to be replaced with a SiC Schottky diode.

Another advantage realized by substituting SiC Schottky diodes is that, unlike silicon devices which experience significant switching performance degradation with a rise in temperature, the switching characteristics of SiC Schottky diodes are virtually unchanged at elevated temperatures. Consequently, as the operating temperature of the charger or inverter increases, the switching efficiency of silicon diodes decreases, but the switching efficiency of SiC diodes remains unchanged. SiC as a material also has inherently higher thermal conductivity, meaning that smaller heatsinks are required, and in many cases, secondary cooling technologies such as fans can be eliminated from the design. Since vehicle charging systems are subject to high operating and ambient temperatures, this makes SiC devices a better choice.

Finally, SiC power devices are capable of much higher power density than silicon devices. This feature includes the potential to save significant space and weight by reducing component count, size, and circuit complexity, and improving the thermal management of the overall system, as noted above. Ultimately, these performance improvements, in combination with the space and weight reduction in the power electronics systems, enable automotive designers to provide better efficiency, eliminate auxiliary cooling systems, and deliver increased battery range for their electric vehicles.

By reducing circuit complexity and thermal management requirements and enabling higher power density and more efficient operation, SiC power has the potential to drive the performance of electric vehicle systems to new levels.
SOLAR POWER IS green and abundantly “free,” but often times it can be less than reliable. Varying temperature effects that shift the solar panel’s optimal power delivery point, in addition to device aging, partial shading, the sun going down, animal waste, etc. can all impede a panel’s performance. Due to these reliability and variability concerns, nearly all solar-powered devices feature rechargeable batteries for backup power purposes. Once just lead-acid based, these batteries have now expanded to include Lithium-based chemistries too. The goal of the solar-based recharging system is to extract as much of the solar power as possible to charge the batteries quickly, as well as maintaining their state of charge. Furthermore, drain on the solar power as possible to charge the batteries quickly, as well as maintaining their state of charge. Furthermore, drain on the battery when the panel is lightly, or not illuminated, is important and should be minimized whenever possible.

Clearly, solar powered applications are on the rise. Solar panels of various sizes now power a variety of innovative applications from crosswalk marker lights to trash compactors to marine buoy lights. Some batteries used in solar powered applications are a type of deep cycle battery capable of surviving prolonged, repeated charge cycles, in addition to deep discharges. These type of batteries are commonly found in “off grid” (i.e., disconnected from the electric utility company) renewable energy systems such as solar or wind power generation. System up time is paramount for off-grid installations due to proximity access difficulties.

Solar panel basics

For a given amount of light energy and operating conditions, a solar panel has a certain output voltage at which peak output power is produced. Figure 1 shows the characteristics of a 72 cell panel at a panel temperature of 60ºC. The blue line shows the I-V curve of the panel using a simple load box to accomplish the sweep. For this particular case of conditions, the maximum power point is at 32v and the panel can deliver 140W. Once the panel temperature is allowed to vary, which it certainly will in a real world setting, the maximum power point can vary between 28V on a hot day to 44V on a cold winter’s day.

Many simpler solar charging systems set the panel voltage operating point to a fixed level. In the case of this particular panel, these simpler systems would set the operating point of the panel to be 32V in order to extract the most power at a given temperature, 60ºC in this case. However, when the panel temperature changes, significant power is wasted because the panel is no longer operated at its true maximum power point. Upwards of 20% to 30% of the available power can be wasted in these cases.

To make matters worse, most panels are required, by safety standards set in place, to have bypass diodes built into the solar cell array. The reason for this has to do with what occurs when only portions of the panel are shaded from sunlight, while other areas get full sun. When this occurs, the solar cells that are shaded become reverse biased but still have high currents flowing through them because the other illuminated cells are providing the current. High temperatures in the shaded cells can occur and this can pose a fire hazard. To help lower the risk of fire, manufacturers place bypass diodes throughout the panel. Figure 2 shows how bypass diodes can be placed in the 72 cell panel.

With bypass diodes in the panel, complex power versus voltage characteristics can occur when partial shading is present. Figure 3 shows such a scenario where two local power maxima are present, one at 21V and the other at 37V. If the above 32V simple power point method were used, 79.4W of power would be available compared to 90.1W available at the true maximum power point of 21V. This represents a significant loss of 13.5% in this case. Clearly, a system that can operate and track the true maximum power point would be a superior approach.

Design challenges

Typical solar panel efficiencies range from about 5% to 15% Combined with the fact that larger (i.e., more powerful) panels cost more, solar powered designs must maximize efficiency to minimize total system cost.

To effectively harvest energy from the sun in a solar based product, the design must manage a widely varying input while also finding a way to operate the solar panel at or near its maximum power point. Furthermore, the design must safely charge the battery chemistry of choice used in the product.

Fig. 1: With no partial shading, a simpler power curve exist for a given solar panel

Fig. 2: 3 bypass diodes placed in a 72 cell solar panel for safety considerations

By Steve Knoth and Albert Wu

Steve Knoth and Albert Wu are Senior Product Marketing Engineer and Design Manager respectively, for the Power Products Group at Linear Technology Corporation – www.linear.com
There are also other design problems encountered with solar charging systems. For any given solar-powered system, firmware development and debug can take a huge amount of time.

A more complex buck-boost topology is needed if the panel’s optimal power delivery point can be below, equal to, or above the battery voltage (this is a very common scenario). A buck-boost topology allows true isolation in both directions (when compared to a step-down or “buck” topology only, if the panel is dark it might drain the battery through the body diode of the NMOS through the inductor). Proper voltage termination is needed to protect the battery. Finally, since the panel is not a reliable source of power, in-situ charging of the battery (where the charger feeds the battery, and a load is connected to battery) is needed—the battery is the power source but also acts as a “buffer” in this case.

What is maximum power point tracking (MPPT) and why is it needed?

Maximum Power Point Tracking is a technique that helps extract the highest amount of power from the panel under all operating conditions. Some of these non-ideal operating conditions include:

- Panel is partially shaded (leaves, bird droppings, shadows, snow, etc)
- Panel’s temperature variation
- Panel’s ageing

For example, in off-grid solar panel systems, failure of the power system is costly. Customers want to extract the most power they can from the panel. Further, they want to maximize the time interval needed between maintenance visits to the solar installation.

Fig. 4: LT8490 typical application circuit

Fig. 3: With Partial Shading, More Complex Power Curves Exist for a Solar Panel

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True active MPPT will seek out the optimum operating point under all conditions. This results in less overall system cost because the smallest panel or smallest battery can be used, reducing the need to over design the system. True MPPT will find the best peak power point and reject false local maximum common in partially shaded panels (note: partial shading power patterns are determined by the number and arrangement of bypass diodes inside the panel).

A simple IC solution
An IC charging solution that solves the problems outlined above needs to possess many, if not all, of the following attributes:

- Minimal software and firmware development time
- Flexible buck/boost topology
- Active MPPT algorithm
- Simple, autonomous operation (no µP needed)
- Termination algorithms for various battery chemistries
- In-situ charging - to power a load while the battery is being charged
- Wide input voltage range to accommodate various power sources
- Wide output voltage range to address multiple battery stacks
- High output/charging current
- Small, low profile solution footprints
- Advanced packaging for improved thermal performance and space efficiency
- Cost-effective solution

Typical convoluted competing solar battery charging systems consist of a DC-DC switching battery charger, a microprocessor plus several ICs and discrete components in an attempt to replicate maximum power point control / tracking functionality.

An alternative solution could be a solar module; however these are costly, not simple to design in (require software, firmware, etc.) and tend to lock on to false solar panel maxima and therefore do not operate as efficiently as possible. Fortunately, a simpler solution is at hand, thanks to Linear Technology’s LT8490 buck-boost solar powered battery charging controller.

An efficient solar-powered solution
Linear Technology has developed a simple, innovative high performance and space efficient solution that solves the problems outlined above. This is the LT8490, a synchronous buck-boost solar powered battery charging controller.

The LT8490 is a synchronous buck-boost battery charging controller for lead acid and Lithium batteries, featuring automatic maximum power point tracking and temperature compensation. The device operates from input voltages above, below or equal to the regulated battery float voltage. The LT8490’s full-featured battery charger offers many selectable constant-current constant-voltage (CC-CV) charging profiles, making it ideal for charging a variety of Lithium or lead acid chemistry types, including sealed lead acid, gel cells and flooded cells.

All charge termination algorithms are provided on chip, eliminating the need for software or firmware development, thus reducing design cycle time.

The LT8490 operates over a wide 6V to 80V input voltage range and can produce a 1.3V to 80V battery float voltage output using a single inductor with 4-switch synchronous rectification. The device is capable of charging currents as high as 10A depending on the choice of external FETs. The LT8490’s MPPT circuit enables a sweep of the full operating range of a solar panel, finding the true maximum power point, even in the presence of local maxima points caused by partial shading of the panel. Once the true maximum power point is found, the LT8490 will operate at that point while using a dithering technique to quickly track changes in the local maximum power point. With this methodology, the LT8490 fully utilizes the power generated by a solar panel even in non-ideal operating environments.

A global MPPT sweep is shown in Figure 5. The yellow trace shows the panel output voltage. The LT8490 commands the panel voltage to go to the open circuit level then subsequently commands the panel to ramp down linearly to the minimum level. The red trace shows the panel current as the panel voltage changes. The current is measured by the LT8490 and the power is calculated inside the IC. Once the sweep is completed, the panel voltage is returned to the point at which maximum power was measured.

The dithering technique is used to track smaller changes in the maximum power point between global sweeps. This is shown in Figure 6. About midway through the scope shot, a change to the power point is applied to the panel to simulate a cloud moving in the sky thus changing the amount of sunlight striking the panel.

The LT8490 continually moves the panel voltage a small amount above and then below the current MPPT point to check if a better operating point exists. If it finds one, it properly tracks to the new point and repeats the process. In this way, the LT8490 is able to track changes without having to do a global sweep too often.

The LT8490 performs automatic temperature compensation of the battery charge voltage by sensing an external thermistor on the battery. The STATUS and FAULT pins can be used to drive LED indicator lamps. Charging current limits can be adjusted by changing as few as 1 or 2 resistors, and a charging time scale can be selected with the appropriate resistor divider.

Other features of the device include: input and charge current limit pins, a 3.3V regulated LDO output, status pins and a synchronizable fixed switching frequency from 100kHz to 400kHz. The LT8490 is available in a 0.75mm high 64-pin 7x11mm QFN package and is guaranteed for operation from -40°C to +125°C.
Power management: are you doing enough?

By Rob Morris

When the power supply to critical equipment fails, companies are at risk of losing out. In a retail environment, this can result in tills breaking down and lost customer orders; in manufacturing, power outages can mean downtime, wasted man-hours and failure to deliver on time. We all know how annoying a power cut at home can be, but in a business environment this frustration is magnified many times over with damage incurred to reputation, customer satisfaction and to the bottom line.

However, the fact is that, while potentially catastrophic, blackouts and power outages are relatively rare events. In fact, they are only one small, but very visible, part of a wider power problem. Poor quality power events such as spikes, surges and electrical noise often unnoticed and, worryingly, can be more damaging to a business in the long term. Power disturbances have the ability to erode electrical components, scramble computer systems and cause sudden failures in critical equipment. But what exactly is poor quality power and what can be done to prevent it?

What is poor quality power?

In simple terms, poor quality power is any irregular variation in the voltage magnitude of a power source or in an electrical circuit. This can include things like surges, spikes, transients, electrical noise, electrical pollution and brownouts. It can be caused by many different factors – both internally and externally. A lightning strike, for example, can have a current as high as 100,000 Amps, which can cause irreparable damage to internal circuits. Lightning strikes increase the ground voltage, inducing electromagnetic fields, which subsequently cause surges in voltage and current in the power supply.

Equipment inside buildings can also create pollution within a circuit, sending potentially damaging spikes and transients to other equipment. For example, lifts in office buildings or flash-freezers in restaurants can send massive spikes around the circuit when being turned on and off.

Most businesses are alive to the problem of power outages and blackouts and often take action to prevent them from damaging their business, installing uninterruptible power supplies (UPS) which provide backup power in the event of failure. However, UPS do not always safeguard against poor quality power and therefore don’t offer full protection against power problems, despite what many business owners believe.

All of these disturbances, from the problems in the power supply coming from the grid to the pollution introduced by electrical equipment, can cause serious problems for a business, both immediately and in the long-term. These power quality problems can be defined by the 3 D’s:

The three D’s

- **Destruction** occurs when a disturbance is so significant that it causes a component to fail instantly. This sort of problem is easily identifiable by the charred remains of the part.
- Low amplitude disturbances affect semiconductors within electronic equipment by causing degradation of the material over time. When power disturbances exceed the low voltage tolerance of a semiconductor junction, the material erodes over time, eventually causing the failure of the component.
- Some power disturbances can mimic genuine signals, causing disruption. Disruption can also be a result of a secondary fault created when surge diverters shunt excessive voltages to ground. This sort of problem is difficult to identify and is often diagnosed as a software bug.

The best guard against the 3D’s is to use a combination of components in one overall power conditioning system, providing full overall protection from poor quality power.

The optimal combination will include the following components:

- Surge diverter to shunt any high voltages away from sensitive equipment.
- Low-impedance isolation transformer to protect against the common-mode caused by a surge diverter. This is the biggest problem modern computers face and is the one which leads to lockups and data losses.
- Noise filter to remove any low amplitude disturbances that pass through the surge diverter. Low amplitude noise can affect the operation of digital systems by causing the circuit to misinterpret the noise as a signal.
- Voltage regulator to remove any dips or swells.
- Frequency regulator for occasions when the frequency is not stable. This is especially problematic in electricity in developing countries or from generators.
- Uninterruptible power supply to provide backup power in the event of a power outage.
- Ground loop control technology prevents the formation of current loops when a circuit has more than one ground.

Rob Morris is UK Country Manager at Powervar – www.powervar.com
Significant ROI, fewer service calls
Planmeca, the American manufacturer of dental imaging equipment, found a 60% reduction in service calls after it integrated Powervar’s power conditioning equipment into its dental imaging units.

Previously, the company’s customers were experiencing repeated equipment failures. Understandably, this was frustrating for staff and patients alike. The problem actually lay in the other equipment in the dental surgeries. Large compressors and vacuum systems created noise pollution in the power supply that caused slow degradation of components in the imaging units. Eventually, these components would fail, causing equipment failure.

Planmeca initially thought their existing power management solutions were enough to protect their equipment. They had included UPS systems in their dental imaging units but this proved insufficient to protect their high-tech devices from poor quality power. The result, a high number of hardware failures, was costing Planmeca 6% of the total cost of the product through service calls. Integrating power conditioning solutions in their imaging equipment reduced this by 70%. In real terms, this equated to a return-on-investment of US$7,650,000 over the 1,200 units installed per year.

This example shows that existing power management solutions might not always be enough to protect sensitive and critical equipment. The best power conditioning solution will provide all the benefits of individual power management components, without any of the negative consequences. It can save users and manufacturers time and money by ensuring equipment receives clean, continuous power.

Surge protection against 10,000A on an 8/20 µS waveform
Bourns has added the Model 1840 surge protective device (SPD) for signal and data line applications, a heavy-duty, multi-stage protector designed to safeguard sensitive electronic circuits and components from damaging surge voltages and currents. The new model features extremely fast response and low clamping voltages. The Bourns Model 1840 supports working voltages of 5, 12 and 24 volts, and may be used directly with RS-232, RS-422, RS-423 and RS-485 standard EIA interfaces as well as with 4-20 mA and 50 mA instrumentation loops. Bourns’ solid-state, third stage protection device works by intercepting the leading edge of a surge within a sub-nanosecond response time. Within micro-seconds thereafter, a primary stage, three-electrode common-chambered Gas Discharge Tube (GDT) activates and crowbars the majority of the surge energy to ground. The new model also utilizes Bourns’ TBU High-Speed Protector (HSP) technology as a key second stage.

Bourns
www.bourns.com

Smallest conduction cooled power supply focuses on LED lighting
SL Power Electronics has introduced a single output, conduction cooled, wide temperature range LED power supply that provides 130 watts of energy efficient power at 90 percent efficiency in an ultra-compact 3 x 5 x 1.3 inch package. The LB130 is a single output power supply that is ideal for high intensity entertainment applications such as stage lighting and theatre control systems due to the ability to operate efficiently in extreme temperature conditions and tight spaces. The LB130 is designed to operate from -40°C to 70°C providing optimum thermal performance. Delivering 130 watts at 70°C ambient, the LB130 power supply is the smallest in the industry featuring conduction cooling that eliminates space and associated costs needed for fans. Meeting EN55015 standard for Electro Magnetic Compatibility (EMC) immunity and Class B Conducted EMI, the LB130 does not require an external Electromagnetic Interference (EMI) module. In addition, the power supply can turn on at -40°C, eliminating the need for a costly heating element.

SL Power Electronics
www.slpower.com
Battery sensor integrates MCU, CAN and analogue front-end

Freescale has an AEC-Q100 (automotive) qualified intelligent battery sensor that combines three measurement channels, a 16/32-bit MCU, and a CAN protocol module in a single package. Designed to support both conventional and emerging battery chemistries for automotive and industrial applications, the MM9Z1J638 battery sensor measures key battery parameters for monitoring state of health (SOH), state of charge (SOC) and state of function (SOF) for early failure prediction. A flexible four-cell front end architecture supports conventional 12V lead acid batteries as well as emerging battery applications, such as 14V stacked cell Li-Ion, high voltage junction boxes, and 24V truck batteries. Integrating a 16/32 bit S12Z microcontroller with 128K Flash, 8K RAM and 4K EEPROM together with a CAN protocol module, LIN interface and a three-channel analogue measurement front end, the MM9Z1J638 battery sensor combines analogue, processor and communication functions in a single package to help lower total bill of materials and accommodate advanced battery monitoring algorithms. The analogue front end includes a two-channel, 16-bit sigma delta (ΣΔ) analogue-to-digital converter (ADC) for simultaneous measurement of battery voltage and current, as well as a third 16-bit ΣΔ ADC for temperature monitoring using the integrated sensor and redundant measurement plausibility checks to support functional safety.

Freescale
www.freescale.com

Synchronous forward MOSFET driver needs no signal transformer

LT8311 is a high efficiency secondary-side MOSFET driver that operates without the need for primary control in an isolated synchronous forward converter. The LT8311’s preactive mode eliminates the need for a signal transformer for primary to secondary-side communication by sensing signals on the secondary side to control synchronous rectification. This mode reduces component count and solution size. The device operates over a 3.7V to 30V input voltage range and is used with a primary-side IC, such as the LT3752/-1. The complete forward converter can operate with input voltages ranging from 6.5V up to 400V+ making it ideal for a wide range of applications including hybrid/electric vehicle automotive requirements. It combines a 10 mA opto-driver and a feedback loop error amplifier to enable output voltage feedback from the secondary to the primary side. The entire system provides fixed frequency peak current mode control that has excellent line/load regulation and fast transient response. Additional features include a 1.5% reference voltage, a power-good monitor and programmable soft-start of the output voltage. The IC comes in a TSSOP-20 package with several pins removed for high peak-voltage spacing, in E- and I-grade (-40°C to 125°C junction temperature), H grade (-40°C to 150°C) and MP grade (-55°C to 150°C).

Linear Technology
www.linear.com

DC-DC converter boasts internal compensation

Maxim Integrated has posted information on a device that it believes to be the only available 60V, 1.7A, internal FET, synchronous buck converter in its class. MAX17505 is a high-efficiency, high-voltage, synchronously rectified step-down converter with dual integrated MOSFETs that operates over a 4.5V to 60V input. It delivers up to 1.7A and 0.9V to 90% VIN output voltage. Built-in compensation across the output voltage range eliminates the need for external components. The feedback (FB) regulation accuracy over -40°C to +125°C is ±1.1%. The device is available in a compact (4 x 4mm) TQFN lead(Pb)-free package with an exposed pad. Simulation models are available. The device features a peak-current-mode control architecture with a MODE feature that can be used to operate the device in pulse-width modulation (PWM), pulse-frequency modulation (PFM), or discontinuous-conduction mode (DCM) control schemes. PWM operation provides constant frequency operation at all loads, and is useful in applications sensitive to switching frequency. PFM operation enables negative inductor current and additionally skips pulses at light loads for high efficiency. DCM features constant frequency operation down to lighter loads than PFM mode, by not skipping pulses but only disabling negative inductor current at light loads. DCM operation offers efficiency performance that lies between PWM and PFM modes. The low-resistance, on-chip MOSFETs ensure high efficiency at full load and simplify the layout.

Maxim Integrated
www.maximintegrated.com

DC-DC regulators offer 15 A output with 0.1% line regulation

Exar has extended its PowerBlox switching regulators with the XR76108, XR76112 and XR76115, synchronous step down regulators delivering point-of-load (POL) supplies of 8A, 12A and 15A, respectively. The XR761xx family is designed to achieve excellent transient response and output accuracy, of 0.25% load and 0.1% line regulation, using Exar’s proprietary emulated current mode Constant On-Time (COT) control loop. These devices deliver core voltage rails for ASICs, FPGAs, DSPs and Network Processors in communications, networking and industrial markets. Input voltage range is 4.5V to 22V for an adjustable output voltage from 0.6V to 18V. With its 0.1% line regulation across the entire input voltage range and 1% output accuracy over full temperature range, XR761xx provides increased headroom. The emulated current mode COT control scheme has the fast transient response of conventional COT control loops without any of the compromises. Exar’s COT control loop enables operation with ceramic output capacitors, eliminating loop compensation, which simplifies system design and reduces overall component count. The XR761xx offers a suite of supervisory and protection features for proper sequencing, safe operation under abnormal operating conditions and light load operation. The control loop also maintains constant operating frequency. A selectable power saving mode allows the user to operate in discontinuous mode (DCM) at light current loads, significantly increasing the converter efficiency. The XR76108 and XR76112 come in 30-pin 5x5mm QFN packages. The XR76115 is in a 30-pin 6x6mm QFN.

Exar
www.exar.com
Silicon interposers for efficient 3D integration

By Stéphane Bellenger

THE COMMON POINT with articles relating progress in the electronic components world is the search for form factor reduction and high performance. Since the 90s, designers have been working on 3D integration (Multi-Chip Package, stacked die, System in Package) which brings highly efficient solutions to achieve these goals. Several products have been developed, in particular the interposers.

The interposer can be assimilated to a packaging platform serving as a high density substrate with a redistribution layer and offering, unlike traditional packages, the reduced pitch capabilities required by advanced IC technology nodes.

In other words, the interposer plays the role of a space transformer from the IC to the applicative module. It also allows usually incompatible technologies to be mixed on the same platform, therefore leading to heterogeneous integration (System in Package on interposer). Combined with Through Silicon Vias (TSV), it opens the doors to an optimized form factor world (system volume, weight and footprint) with improved performance (higher transmission speed, lower power consumption and RF parasitic reduction).

From an applicative point of view, interposers were first imagined to be used as a pure packaging platform dedicated to dies with large I/O number (high density BGA). They have evolved towards 3D structures to meet the demands of CCD imager, mobile phone and consumer applications. Now, an additional range of applications can be reached with the so-called 2.5D interposers. This new approach offers an economic model perfectly adapted to related portable products, implantable medical devices, avionics and defense. IPDiA, leading manufacturer of passive components, has developed a range of silicon interposers which, when combined with Integrated Passive Devices (IPD) and Through Silicon Vias (TSV), offer an evolutionary solution to these market segments.

Several types of material can be considered as interposer substrate, each offering intrinsic properties that need to be seriously considered prior to any other considerations. Silicon is one, and is chosen for the following reasons: first, silicon is a stable base substrate that presents a very small CTE (coefficient of thermal expansion) mismatch with attached external ICs. Since the active parts are in fact often made of silicon themselves, the thermo-mechanical stresses encountered during processing and lifetime application are minimized, thereby increasing the reliability. Silicon therefore offers a very good trade-off between thermal conductivity and thickness. It is also perfectly adapted to via or micro-via technology (including via last technology) and provides wider possibilities in terms of pitch, via diameter and via density. Lastly, it enables passive devices to be integrated (IPD technology) and is compatible with ICs and MEMS. Main dimensional as well as thermal and thermo-mechanical characteristics for different types of substrate are summarized in the tables 1 and 2.

The different structures

The interposers can be divided into three families. The three structures show the common key advantages of enabling external integration of active dies without their packaging, as well as integration (externally or internally) of passive devices - see figure 1.

2D silicon interposer:
This two vertical stage structure is an intermediate solution in terms of footprint. Due to the connections from the sides of the interposer to the final module, space saving is not totally
optimized. However, combined with a wide range of integrated passive devices (high-density trench capacitors, MIM capacitors, resistors, high-Q inductors) and external active dies, this may represent a very good compromise for cost-driven applications such as in the mobile market.

2.5D silicon interposer:
This is also a two vertical stage structure. The difference comes from the copper vias which, combined with IPDs, provide a higher level of integration together with system performance improvements. This structure also allows external component integration on the top and on bottom - see figure 2.

3D interposer:
In this case, the structure is a multistage integration and all layers are active. Although the 3D structure could be interesting in terms of miniaturization, it still shows too many drawbacks in terms of design flow, testing, cost, stress impact and thermal issues and will not be addressed in this article.

Brief overview of Through Silicon Via technology
The use of Through Silicon Vias has a tremendous positive impact on new 3D packaging architectures. TSVs enable higher density and shorter connection lengths compared with wire bonded solutions and are perfectly fitted to face the increasing demand for faster signals and lower power use. IPDiA is providing TSVs for interposers with or without IPDs.

In the past years, IPDiA and its main technological partner CEA-Leti have worked on TSV process optimization to bring it to the right level of maturity and cost for markets where high added-value products are needed (medical devices, aerospace, professional electronics and telecom infrastructures).

Of the three TSV process options (via first, via middle and via last), IPDiA endorsed the via last approach, in which vias are formed after the die has been manufactured. This choice is mainly driven by co-integrating TSV with IPDiA PICS technology (Passive Integration Connecting Substrate). Moreover, this solution brings the potential of making TSV on pre-existing CMOS wafer or on a 2.5D IPD interposer developed by IPDiA.
**Application examples**

The application examples given below come as a conclusion of this article and illustrate perfectly the benefits of the different types of interposer in three specific areas (implantable medical devices, vision care devices and aerospace).

**2D silicon interposer with IPD for implantable medical devices**

In this first example, major improvements have been brought by IPDiA 2D interposer with Integrated Passive Devices to a medical sensor module including RF communication. The module is to be used in an implantable defibrillation system. The main concerns of the customer are miniaturization (size and weight impacts), stability and reliability. As described in the introduction of this article, the silicon not only serves as a redistribution layer but also allows the integration of passive components within the substrate. It enables a great size reduction (35% area saving, figure 4) and a decrease of the total system weight.

Additionally, the PICS technology used for integration of the passive components results in very stable high capacitor integration. Finally, IPDiA offers a complete service with its stable flip-chip technology and the silicon-silicon compatibility between the substrate and the active dies meets the customer’s demand in terms of reliability.

**2D silicon interposers with IPD for vision care devices**

The final application of this second example is linked to the medical field, more precisely to preventive treatment for vision care. The first essential advantage IPDiA has brought forward is miniaturization of the final device in x, y and z axes. But IPDiA has also shown its ability to adapt its technology to the customer’s product environment and has developed a module with four 2D silicon interposers including IPD and active components, the complete system being mounted on a 100 µm thick flexible organic substrate.

**2.5D silicon interposer with IPD for aerospace**

The third example implies integrated passive devices with TSV 2.5D interposer combined with a 3D packaging technology, suitable for motor control in aerospace domain. This time, miniaturization and decrease of the total weight of the device is optimized thanks to the combination of IPD, TSV and 3D packing. Reliability is once again achieved by the silicon-silicon compatibility. IPDiA finalizes the complete module by using a stack die technology on the 2.5D interposer - see figure 5.

**USB driver software reduces power usage**

FTDI Chip has updated its USB driver portfolio to include a selective suspend feature. The revised drivers have passed Microsoft certification and are available to download free of charge from the FTDI Chip website. Following the launch of lower powered versions of its X-Chip series, the company has now followed this up with enhanced power management in the accompanying driver technology. Supporting many popular Windows environments (with WHQL pass for this feature being achieved in relation to Windows 7, 8, 8.1, Server 2008), the innovative selective suspend feature now incorporated into the FTDI Chip drivers means that the USB host can either enable or suspend a port/peripheral as needed via software control - resulting in far greater flexibility for design engineers when implementing their systems as well as a marked reduction in the overall power consumption. This new capability can be employed for controlling USB ports that are configured together as part of a hub structure, so that it is possible to access particular peripherals or conversely power them down when they are not required to be active. Among the applications where this could prove to be an operational advantage are card readers and biometric scanners on laptop PCs, as well as potential opportunities being envisaged in building automation, environmental monitoring and industrial control systems.

**Connector system targets**

**LED-backlit LCD panels**

Molex’ IllumiMate 1.00 and 1.25 mm pitch wire-to-board connector system provides design flexibility with multiple mating and voltage configurations. IllumiMate 1.00 and 1.25 mm pitch wire-to-board connector system offers display, flat-panel LED television and PC monitor manufacturers more mating styles, voltage ratings, circuit sizes and locking types than any similar connector system, Molex asserts. By providing a single system, the IllumiMate family allows set makers to design various models around a single connector type and PCB footprint pattern. The IllumiMate 1.00 mm saves about 50% of space compared to IllumiMate 1.25 mm and offers lower voltage options to help reduce power consumption. Both the 1.00 and 1.25 mm product families have different options in areas such as voltage, circuit sizes and wire gauge and share several key features including: - Positive and friction locks for secure latching and space savings with an anti wire-tangling feature and middle friction lock with window for visible mating assurance. - Polarity guide ribs that protect the pins while preventing improper mating and side-to-side movement. The 1.00 mm pitch version has guide ribs located on the housing ends, while the 1.25 mm pitch version has them towards the middle.

**Molex**

www.molex.com

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**Fig. 4:** Comparison of module area between standard SMD technology (left) and IPDiA technology PICS (right).

**Fig. 5:** 2.5D interposer with PICS IPD and external active dies.
Multicoax connector takes multiport testing from DC to 18GHz

Huber+Suhner’s MXP series is designed for the high speed digital testing market, the MXP18 version has been introduced to meet the need for multiport testing interconnectivity between DC to 18GHz. It comes as a 1x8 ganged version which breaks out to female SMA connectors. The MXP18 multicoax connector provides outstanding electrical and mechanical performance and is designed to save valuable board space while keeping the distance between the connector and the device under test to an absolute minimum. As the MXP18 is fully mechanically compatible with the MXP40 (40Gbps) multicoax solution, users can stay with the MXP.

Huber+Suhner
www.hubersuhner.co.uk

Piezo switch certified for use in hazardous environment

The PSE EX 16 family of piezo switches from Schurter has been extended to include the PSE EX 19 and PSE EX 22 mounting diameter, both approved for use in potentially explosive atmospheres containing air and gases. Further application areas also include industrial sectors such as mills, where solids are found in smallest form as dust, which may be prone to self-ignition. The PSE EX family is certified according to ATEX and IECEx regulations. The approval marking is Ex II 2 GD (according ATEX regulations), Ex ib IIC T6 ... T5 Gb and Ex ib IIIC T85 °C ... T100 °C Db (according IEC regulations) for gases and dust. The temperature class was extended from T4 to T5 and T6. Therefore the permissible power dissipation of the PSE EX was limited accordingly so that the piezo switch is intrinsically safe according to EN60079-11. In addition, the flammability group was increased from IIB to IIC, respectively IIIC (gas, dust). This extension will allow the use of the PSE EX in atmosphere with further type of gases, combustible dust, ignitable fibers and flyings. The PSE EX standard models are available with mounting diameters of 16, 19 and 22 mm with pin connectors and housing colors in red, green or natural aluminum.

Schurter
www.schurter.com

Prototyping 3D Circuitry

Extension of the interconnect pattern into the third dimension adds new potential. The LPKF ProtoLaser 3D for laser direct structuring (LDS) gives engineers an outstanding flexible and economical access to 3D prototypes. Discover for yourself a new dimension: lpkf.com/protolaser3D
Hard wired floating point changes FPGA

By Nick Flaherty

ALTERA HAS DEVELOPED a way to add single precision floating point processing to its FPGAs with minimal overhead, opening up a wide set of new high performance computing applications.

Previously floating point DSP designs such as radar or pattern matching had to be converted to fixed point, taking up the DSP blocks and up to 700 logic elements per block. By adding a layer of hardened multipliers and adders to the existing DSP blocks in the architecture, and tweaking the interconnect, designs can be implemented direct from the C output of tools such as OpenCL and Simulink directly in the DSP blocks without additional logic usage, says Altera architect Martin Langhammer. This also allows FPGAs to be used to run more high performance computing algorithms that currently use GPU arrays.

The IEEE 754-compliant hardened blocks are shipping in 20nm Arria 10 FPGAs but the software to use them will not be available for a few more months. The blocks deliver 1.5TFLOPS of processing the Arria devices, and will provide over 10TFLOPS in the next generation Stratix 10 devices. This comes from process improvements to 14nm, larger devices and architectural changes, he says.

“I had to find a way to do it for close to free for it to work, so the floating point multiplier is overlaid on the 27 x 27 fixed point multipliers,” said Langhamer. “The adder is more complex as it’s a separate structure – I had to design it to target the technology library, the maximum frequency and the routing that were available in the DSP block as well as the block aspect ratio. The adder not only had to fit into the spare space in the block but as routing is more expensive than the logic I had to find a way to reuse all that wiring for the floating point adder.”

“In this way we were able to get floating point on the DSP block – it’s cheap enough to put on every device and doesn’t affect the fixed point power or performance,” he said. “This opens up a new market for people that want to do floating point.”

The other element is the design of the floating point units to support large matrix operations. “We designed hardware recursive structures for the vector mode that greatly reduces the latency to seamlessly combine thousands of operators, reusing the existing fixed point routing,” he said. The structures are self-timed and self-aligned, with timing adjustment registers that avoid problems with data dependencies but minimize the latency for large vector calculations.

“The two big innovations are that we got floating point on cost effectively and the new vector structures that allow us to put together all the blocks however you want,” he said.

The integration of hardened floating-point DSP blocks in Altera FPGAs and SoCs can reduce development time by upwards of 12 months. Designers can translate their DSP designs directly into floating-point hardware, rather than converting their designs to fixed point. As a result, timing closure and verification times are cut, which will benefit the move to the larger Stratix 10 devices, says Langhammer.

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Measuring angular position and velocity

By Jakub Szymczak

RESOLVERS USE THE MAGNETIC coupling between primary and secondary windings to measure the precise angular position of a rotating element. Used in industrial motor controls, servos, robotics, power train units in hybrid- and full-electric vehicles, and many other applications, resolvers can withstand severe conditions, making them the perfect choice for military systems in harsh environments.

Standard resolvers have a primary winding on the rotor and two secondary windings on the stator. Variable reluctance resolvers have all windings on the stator, but the saliency (exposed poles) of the rotor causes a sinusoidal variation in the secondary with the angular position. Figure 1 shows classical and variable reluctance resolvers.

When the primary winding is excited with a sinusoid (Equation 1), a signal is induced in the secondary windings. The amount of coupling is a function of the position of the rotor relative to that of the stator, and an attenuation factor known as the resolver transformation ratio. Because the secondary windings are displaced mechanically by 90°, the two output sinusoidal signals are phase shifted by 90°. The relationships between the resolver input and output voltages are shown by the sine signal (Equation 2) and cosine signal (Equation 3).

\[ R_1 - R_2 = E_0 \sin \omega t \quad (1) \]
\[ S_3 - S_1 = T \times E_0 \sin \omega t \times \sin \theta \quad (2) \]
\[ S_2 - S_4 = T \times E_0 \sin \omega t \times \cos \theta \quad (3) \]

where: \( \theta \) is the shaft angle, \( \omega \) is the excitation signal frequency, \( E_0 \) is the excitation signal amplitude, and \( T \) is the resolver transformation ratio.

Resolver-to-Digital converter

The primary winding is excited with a sinusoidal reference. Two differential output signals, sine and cosine, are electromagnetically induced on the secondary windings. A resolver-to-digital converter (RDC) decodes the angular position and rotation speed of the motor shaft.

A majority of RDCs use a Type-II tracking loop to calculate position and velocity. Type-II loops use a second-order filter to ensure that steady-state errors are zero for stationary or constant velocity input signals. The RDC simultaneously samples both input signals to provide digitized data to the tracking loop. An example of an RDC that uses this type of loop is ADI's AD2S1210 complete 10-bit to 16-bit tracking converter, whose on-chip programmable sinusoidal oscillator provides the excitation signal for the primary winding.

Fig. 1: Classical resolver vs. variable reluctance resolver.

Typical resolvers require a low-impedance 3-V rms to 7-V rms signal to drive the primary winding. Operating on a 5-V supply, the RDC typically delivers a 7.2-V p-p differential signal on the excitation outputs. This signal does not have sufficient amplitude and drive capability to meet the resolver’s input specifications. In addition, resolvers attenuate signals by up to 5×, so the resolver output amplitude does not meet the RDC’s input amplitude requirements.

A differential amplifier boosts the signal to the primary and improves signal-to-noise ratio. The output sine and cosine signals can then be attenuated with resistor dividers or a low-pass filter. Figure 2 shows a typical resolver-to-digital converter interface including amplifier and filter.

Error sources

The system accuracy is determined by the RDC, resolver, excitation buffer, input circuitry, and cabling. The most common sources of system error are amplitude mismatch, signal phase shift, offsets, and acceleration.

Amplitude mismatch is the difference in peak-to-peak amplitudes of the sine and cosine signals at 0° and 180° for cosine, 90° and 270° for sine. Mismatch can be introduced by variation in the resolver windings, or by the gain between the resolver and the RDC’s sine and cosine inputs.

The amplitude mismatch error oscillates at twice the rate of rotation, with a maximum of \( \delta/2 \) at odd integer multiples of 45°, and no error at 0°, 90°, 180°, and 270°. With a 12-bit RDC, 0.3% amplitude mismatch will result in approximately 1 LSB of error.

The RDC accepts differential sine and cosine signals from the resolver. The resolver removes any dc component from the carrier, so a VREF/2 dc bias must be added to ensure that the resolver output signals are in the correct operating range for the RDC. Any dc offset between SIN and SINLO inputs or COS and COSLO inputs will introduce additional system error.

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The error introduced by the common-mode offset is worse in the quadrants where the sine and cosine signals are in anti-phase to each other, which occurs from 90° to 180° and 270° to 360°.

Another source of error is differential phase shift between the resolver’s sine and cosine signals. Some differential phase shift will be present on all resolvers as a result of coupling. A small residual voltage or quadrature voltage indicates a small differential phase shift. Additional phase shift can be introduced if the sine and cosine signal lines have unequal cable lengths or drive different loads.

Most resolvers also introduce phase shift between the excitation signal and the sine and cosine signals. This error can be minimized by choosing a resolver with a small residual voltage, ensuring that sine and cosine signals are handled identically, and by removing the reference phase shift.

Under static conditions, phase shift between the excitation reference and the signal lines will not affect the converter’s accuracy, but moving resolvers generate speed voltages due to the reactive components of the rotor impedance and the signals of interest. Speed voltages are in quadrature to the signal of interest. Their maximum amplitude is

$$V_{\text{speed}} = \frac{\text{Motor Speed}}{\text{Excitation Frequency}}$$

In practical resolvers, rotor windings include both reactive and resistive components. The resistive component produces a nonzero phase shift in the reference excitation that is present when the rotor is both moving and static. Together with the speed voltages, the nonzero phase shift of the excitation produces a tracking error.

To compensate for the phase error between the resolver reference excitation and sine/cosine signals, the AD2S1210 uses the internally filtered sine and cosine signals to synthesize an internal reference signal in phase with the reference frequency carrier. Generated by determining the zero crossing of either the sine or cosine (whichever is larger, to improve phase accuracy) and evaluating the phase of the resolver reference excitation, it reduces the phase shift between the reference and sine/cosine inputs to less than 10°, and operates for phase shifts of ±44°. Figure 3 shows a block diagram of the synthetic reference.

The advantage of Type-II tracking loops over Type-I loops is that no positional error occurs at constant velocity. Even in a perfectly balanced system, however, acceleration will create an error term. The amount of error due to acceleration is determined by the control-loop response. Figure 4 shows the loop response for the AD2S1210.

**Excitation buffer**

A buffer is typically required to drive the resolver’s low impedance inputs. The high-current driver shown in Figure 6 uses the AD8397 high-current dual op amp with rail-to-rail outputs to amplify and level shift the reference oscillator output, optimizing the interface to the resolver. The AD8397 achieves low distortion, high output current, and wide dynamic range, making it ideal for use with resolvers. With 310-mA current capability for 32-Ω loads, it can deliver the required power to a resolver without the use of the conventional push-pull stage, simplifying the driver circuit and reducing power consumption. A duplicate circuit provides a fully differential signal to drive the primary winding.

The output amplitude is set by the amplifier gain, R2/R1, and the common-mode voltage is set by R3 and R4. Capacitor C1 and resistor R2 form a low-pass filter to minimize noise on the EXC and (EXC) outputs. The capacitor should be chosen to minimize phase shift of the carrier. The total phase shift between the excitation output and the sine and cosine inputs should not exceed the phase-lock range of the RDC. The capacitor is
optional, as classical resolvers filter out high-frequency components exceptionally well. When combined with the AD2S1210 resolver-to-digital converter, resolvers can create a high-precision, robust control system for position and velocity measurements in motor-control applications. To achieve the best overall performance, buffer circuits are required to amplify the excitation signals and provide the drive strength required by the resolver. To complete the system, a basic input circuit can provide signal conditioning. As is the case with all mixed-signal mechatronic signal chains, care must be taken to design an accurate system that considers all error sources. With its variable resolution, reference generation, and on-chip diagnostics, the AD2S1210 provides an ideal RDC solution for resolver applications. It is available in industrial and automotive grades.

Video processing system supports multi-band TV/IR imaging

RFEL has announced the Rapid Product Development System (RPDS) for its HALO video processing solution. The plug and play platform enables customers to input video, try out RFEL’s video processing algorithms and immediately see the quality of the video improvement on a monitor. Designers can then select which of the various HALO form factors is most suitable for their project. In addition to real-time high definition video enhancement, HALO can also handle the camera control interface for Pan Tilt Zoom (PTz) making it an all-in-one solution for CCTV control and image processing. State-of-the-art video processing solutions include digital stabilisation, adaptive contrast enhancement, multi-band fusion and lens distortion correction. HALO enables video analytics directly at the source. Its real-time video processing blocks condition the incoming stream and rectify many of the common shortfalls of existing video systems, including poor raw sensor imagery under very challenging lighting or atmospheric conditions. For example, a camera mounted on a moving vehicle, aircraft or even on the top of a pole will suffer from shake and vibration that makes it challenging for machine automated video processing and very tiring for a human operator to watch. HALO is available as ruggedly-housed sub-system measuring 137x105x80mm, as a PCI Express-based XMC form factor board, or as a 90x75mm System-on-Module board, equipped with an all-digital high-density connector to implement directly into sensor housings.

RFEL

www.rfel.com
Development kit enables advanced driver assistance systems

Texas Instruments’ Vision Software Development Kit (SDK) gives developers a framework, comprehensive set of hardware device drivers and a useful set of development tools for more efficient implementations of advanced driver assistance systems (ADAS) on TI’s heterogeneous architecture. The TI Vision SDK, based on TI’s SYS/BIOS RTOS, enables multiple algorithms to run concurrently on numerous heterogeneous cores and eases integration of new functionality into a system. Debug and instrumentation features allow algorithm developers to benchmark and profile their algorithms in a system context. TI is also making libraries available for both its Embedded Vision Engine (EVE) and digital signal processor (DSP) on the TDA2x System-on-Chip (SoC). The libraries include more than 200 optimised functions for both EVE and DSP libraries, providing building blocks to jump-start development. The EVE and DSP libraries are available for low-to-mid and high-level vision processing. The TDA2x, incorporating Vision AccelerationPac, combines an optimal mix of high performance, vision analytics, video, graphics and general purpose processing cores in a low-power envelope.

TI
www.ti.com

Remote power drivers improve LED lighting system flexibility

LumaStream has expanded the company’s Trinity range of remote power drivers for LED lighting, adding an analog model with as many control zones as power channels to give lighting designers and system integrators ultimate design flexibility. Lighting applications where 0-10 V controls are most common, but where only small numbers of LED fixtures are grouped together on one switch, can now have the same variety of lighting configurations as a digital, low-voltage system at the lower analog system price point. LumaStream claims to be the only company to offer a holistic approach to low-voltage power distribution for LED lighting. The Trinity 3-in-1 platform combines digital power conversion, constant current drivers, and superior dimming control into one cohesive, intelligent LED power supply. Trinity remote drivers can power and control up to 24 LED luminaires up to 200 ft. away using only thin-gauge speaker wire. Onboard drivers are often regraded as the number one source of failure in LED fixtures. LumaStream eliminates that failure point, combines power and control onto one wire, and provides both analog and digital control protocols. The Trinity Analog model is ideally suited for hospitality and medical office applications where standard analog control switches and dimmers are used and where individual rooms or spaces may have only one or two LED fixtures that need to be powered or dimmed at once. Both markets, hospitality and healthcare, are experiencing growth in 2014, leading in new construction numbers.

LumaStream
www.lumastream.com

20-nm FPGAs meet interconnect needs with fine-pitch copper bump technology

Altera and TSMC have announced that they are to use TSMC’s fine-pitch copper bump-based packaging technology for Altera’s 20 nm Arria 10 FPGAs and SoCs. Altera is the first company to adopt this technology in commercial production to deliver improved quality, reliability and performance. “TSMC has provided a very advanced and robust integrated package solution for our Arria 10 devices, the highest-density monolithic 20 nm FPGA die in the industry,” said Bill Mazotti, vice president of worldwide operations and engineering at Altera, adding that it, “... helps us address the packaging challenges at the 20 nm node.” TSMC’s flip chip BGA package technology provides Arria 10 devices with better quality and reliability than standard copper bumping solutions through the use of fine-pitch copper bumps. The technology is able to accommodate very high bump counts as required by high-performance FPGA products. It also provides excellent bump joint fatigue life, improved performance in electro-migration current and low stress on the ELK (Extra Low-K) layers, all highly critical features for products employing advanced silicon technologies.

Altera
www.altera.com

Medical DC-DC converter takes 4:1 input range

Murata Power Solutions’s NCM6 series of isolated 6-W single and dual output DC/DC converters accept an ultra-wide 4:1 input range, in three nominal input voltage ranges of either 5 VDC input (4.5 – 9 VDC 2:1 range), 12 VDC (9 – 36 VDC 4:1 range) or 48 VDC (18 – 75 VDC 4:1 range). Each nominal input voltage variant offers seven output voltage models. Four of these are single output versions with +3.3, +5, +12 or +15 VDC output. Three dual output models provide +5, +12 or +15 VDC output options. Recognition of certification to international safety standards UL60950 for IT equipment and 3rd edition medical safety standard UL60601 for 2 MOOP is pending. The DC/DC converters are encapsulated in order to achieve high levels of thermal performance and are housed in a standard package measuring 20.0x32.0x10.75 mm. The operating temperature range is from – 40 to +85 degrees C and the device is protected against damage due to excess operating temperatures. An input undervoltage lockout feature protects the output should the input voltage fall below specified limits. Input to output isolation is 5200 VDC.

Murata Europe
www.murata.eu
Display Stream Compression standard boosts display interfaces to 8K

The Video Electronics Standards Association (VESA), working in liaison with the MIPI Alliance, has unveiled the Display Stream Compression (DSC) Standard, version 1.0. Developed as an industry-wide compression standard for video interfaces, offering visually lossless performance and low latency, the DSC has been adopted into VESAs embedded DisplayPort (eDP) v1.4 and into MIPI Display Serial Interface (DSI) Specification v1.2, which are used for embedded display interfaces within mobile systems, including smartphones, tablets and laptops. Increasing display resolution and higher refresh rates present challenges for small-display mobile devices and laptops, as well as large external displays. As display resolutions increase, the interface payload capacity must increase either with more power-consuming bandwidth, video data compression, or both. Displays going beyond 4K resolutions will push the video data rate beyond the current limits of the interface standards. For example, standard 1080p displays require a video data rate of 3.5 gigabits/sec; 4K displays at 60Hz require 14 Gb/s; and future 8K displays will require over 50 Gb/s.

On-going development of DisplayPort standards, which includes 8K resolution support, foresaw the need for compression because of inherent limits in the existing display interface cables. VESAs DSC standard version 1.0 enables up to 66 percent data rate reduction, extending battery life in mobile systems and laptops, while simplifying the electrical interface requirements for future 4K and 8K displays. The standard enables a single codec for system chips that have multiple interfaces. The VESA DSC Task Group, in collaboration with the MIPI Alliance Display Working Group, co-defined requirements for a high quality compression specification that meets the needs of todays varied display usage, which includes a wide range of image types from still graphics and text overlaps, to photography and video.

Video Electronics Standards Association (VESA)

www.vesa.org

Artesyn opens ATCA management framework to third parties to slash integration time

Artesyn Embedded Technologies has developed a new software framework for its ATCA systems that can cut develop time by 40 percent by allowing third party applications. The System Services Framework (SSF) is a complete system management suite for Artesyn ATCA systems that is also open to third party application. It allows users or applications to configure and monitor the hardware and software elements of a single ATCA shelf or across multiple shelves. A graphical user interface provides a quick and easy view of system configuration, events and alarms as well as providing a means of configuring switches or payload blades and managing system access. Artesyn’s SSF also provides XML and command line interfaces so user applications have access to the system parameters and controls. The SSF can be enhanced with Artesyn and 3rd party add-on software modules. For example, Artesyn’s ViewCheck provides in-service and out-of-service diagnostics of ATCA blades and other system elements. Another add-in, Artesyn’s FlowPilot, provides a complete packet load balancing solution. “By using Artesyn’s System Services Framework and its add-in software modules, our customers can focus on their value-add application. We estimate it can save customers up to 40 percent time-to-market versus writing or porting their own system management software”, said Jim Darroch, director of software marketing, Artesyn Embedded Technologies, which was formerly Emerson Network Power’s Embedded Computing & Power business. “Artesyn SSF provides the tools necessary to speed the development process and brings a whole new level of ease-of-operation to ATCA systems.”

Artesyn Embedded Technologies

www.artesyn.com
Next-generation wireless prototyping platform

National Instruments has announced an integrated software defined radio solution for rapidly prototyping high-performance, multichannel wireless communication systems. The NI USRP RIO platform is built on the LabVIEW RIO architecture and combines a high-performance 2 x 2 multiple input, multiple output (MIMO) RF transceiver capable of transmitting and receiving signals from 50 MHz to 6 GHz with an open LabVIEW programmable FPGA architecture. Wireless engineers can use this technology to rapidly prototype real-time wireless communications systems and test them under real-world conditions. They can also prototype more capable wireless algorithms and systems faster and reduce time to results using the only complete platform to take full advantage of a graphical system design approach. The USRP RIO family delivers high-performance, real-time processing capability with the Xilinx Kintex-7 Series FPGA, low latency with the PCI Express connection to a host computer and small size (1U half wide, 19 inch rack mountable). USRP RIO is ideal for a wide range of application areas including 5G wireless communications research, active and passive radar development and exploration, communications intelligence, connected smart devices and more. The USRP™ (Universal Software Radio Peripheral) is already a popular platform for research spanning industry and academia as it empowers researchers to rapidly iterate on designs via programmable software. For example, a recent Lund University announcement highlights a 5G research application focusing on massive MIMO — a technology being considered for 5G communication.

National Instruments
www.ni.com

Piezoelectric drop-on-demand printheads target advanced manufacturing

Inkjet technology developer Xaar has released a range of piezoelectric drop-on-demand printheads designed specifically for advanced manufacturing applications. The Xaar 1002 AMP is capable of very small drop fluid deposition on an industrial scale, able to consistently jet droplets as small as 1 pL for the production of fine features, patterns and coatings. The combination of highly accurate, very small drops and high reliability enables the industrialisation of advanced manufacturing processes in sectors such as display, PCB, semiconductors and photovoltaics. The 1000 optimised geometry nozzles ensure accurate jetting and consistent drop volume across the printhead, even with fluids that have a high solids content, including metallic particulates. The company’s TF Technology ensures a uniform temperature across the whole printhead for consistent drop formation and repeatable fluid deposition. Drop size and formation can be optimised for variable drop volumes within a single pattern to control coating thickness and avoid potential optical effects such as banding and Mura. If required, multiple Xaar 1002 AMP printheads can be configured into large jetting arrays.

Xaar
www.xaar.com

CAN-WiFi-gateway leverages smartphones for data visualization

With IPEhub2 and the IPEmotion App, Ipetronik enables users to visualize CAN data on a smartphone or tablet using a WiFi connection. IPEhub2 acts as CAN-WiFi-Gateway and transfers CAN bus data (from the company’s CAN modules or the vehicle CAN bus) using WiFi. Two CAN bus data streams are converted to encrypted WiFi data and wirelessly transferred to a tablet or smartphone running the IPEmotion App according to WiFi Standard 802.11 a/b/g/n. IPEmotion 2014 features an IPEmotion App export, so custom IPEmotion configurations can be used in the Android application conveniently. Data visualization type and extent (curve, bargraph, alphanumeric, LED) are to be set individually via IPEmotion App. Parallel to wireless data transfer, traffic data are stored on the FIFO of the SD card included in IPEhub2. Customers can choose between SSID (Service Set Identifier) and WPA2- (WiFi Protected Access 2) encryptions; WPS- (WiFi Protected Setup) function is supported for initial setup. The IPEhub2 module uses a gold-anodized aluminum enclosure measuring 106x43x62mm, it is protected to IP54 and can operate in the -40 to +85°C temperature range. It runs from a 9vDC to 36 VDC voltage supply, drawing 4.0 watts typically. Two multi color status LEDs indicate operating states of WiFi (signal strength) and data storage (memory usage). IPEhub2 also supports Access Point functionality with DHCP server and a CAN2 terminating resistor that can be connected via software.

Ipetronik
www.ipetronik.com
Regulator shuts down to 3.5 µA quiescent current

LTC3624 is a high efficiency, 17V input capable synchronous buck regulator that delivers up to 2A of continuous output current to outputs as low as 0.6V. Synchronous rectification delivers efficiencies as high as 95% while Burst Mode operation requires only 3.5µA of no load quiescent current. The LTC3624 switches at a fixed 1MHz frequency, whereas the LTC3624-2 switches at 2.25MHz. Their constant frequency, current-mode architecture minimises switching noise while offering very fast line and load transient response. The LTC3624/-2 operate from an input voltage range of 2.7V to 17V, making it ideal for single cell or multi-cell Li-Ion stack inputs as well as 12V intermediate bus-powered systems. The combination of its 3x3mm DFN package, high switching frequency and tiny, low cost capacitors and inductors ensures a highly compact solution footprint. The LTC3624/-2’s 60ns minimum on-time enables it to step-down 16V inputs to 2.5V with a 2.25 MHz switching frequency (LTC3624-2) without pulse skipping, minimising the size of external components thus offering a very compact, high efficiency 2A step-down solution. Its 3.5µA quiescent current suits it for always-on applications demanding maximum battery run time. For applications requiring the lowest possible noise, the LTC3624/-2 can be configured to run in pulse-skipping or forced continuous mode, reducing noise and potential RF interference. Additional features include a power good voltage monitor, internal compensation and thermal protection. The LTC3624EDD and LTC3624EDD-2 are available in a 3x3 mm DFN-8 package, priced at $2.95 (1,000). Industrial grade versions, the LTC3624IDD and the LTC3624IDD-2 are guaranteed to operate over the -40°C to 125°C operating junction temperature range, priced at $3.25.

Linear Technology
www.linear.com/product/LTC3624

GUI development editor enables better GUIs

Altia is a user interface development software company that provides tools for the creation of graphical user interfaces for embedded devices, with users in automotive, medical, industrial, fitness, and home appliance industries. The latest release, Altia Design 11.1, is the centerpiece of Altia’s user interface development tool suite. With the new features rolled into Altia Design 11.1, users are equipped to develop better GUIs than ever before – with exciting new content. Altia offers a GUI editor and graphics code generator that enable development teams to build completely custom user interface models with graphics created from scratch or imported from industry-standard design programs such as Adobe Photoshop. The Altia GUI can be connected to a variety of simulation tools or C code to create a complex, user-driven model which can be shared with users and management teams for testing and validation prior to production. Once approved, Altia’s code generator automatically generates pure C source code that is optimised to take full advantage of the resources of the selected production hardware. New features in Altia Design 11.1 help users deliver extremely high quality GUIs. The Validator gives users the capability to perform real-time validation of their GUI design against general guidelines or even design rules specific to their selected embedded target. Users can now look “under the hood” while their GUI runs within Altia Design to review and trap animation activity with the new Debugger. With Altia Design 11.1, users also can import and control eye-catching 3D mesh files and animations from 3D authoring tools such as Maya and 3DS Max with the all new 3D Scene Object. The new Multi-Plot Object offers cool and custom complex plotting, strip-charting and data logging capabilities for advanced applications.

Altia
www.altia.com

Android digital signage integrates BLE iBeacons

Noxel has integrated iBeacons and Android in a unique and powerful digital signage system. The Noxel Xtream A700 player includes an embedded iBeacon, a Bluetooth Low Energy (BLE) module that can be used by retailers and brand marketers for indoor positioning and location-specific push messaging to smartphones. The A700 claims to be the most powerful Android-based digital signage player on the market, with a Quad Core ARM-A9 processor, embedded 3D Mali 400 GPU, built-in WiFi and available expansion storage. Fast computing and embedded graphics processing ensure digital signage content creators can drive networked screens with HD quality video and smooth motion graphics messages. The A700 is the latest player running on top of Noxel’s Xtream cloud digital signage content management system. The company’s browser-based Software as a Service platform removes the complexity from digital signage operations, allowing users to simply select from a range of Android players, create a Noxel user account and activate the signage service. “Putting an iBeacon on what’s probably the most powerful Android digital signage player available and then managing that in the cloud is what I think sophisticated network operators are now looking for,” said Farbod Sadeghian, CEO of Noxel. “Using Android gives our customers a very cost-effective, stable and rapidly evolving platform" added Sadeghian.” Integrating BLE means the messaging delivered on Xtream-powered screens can also be targeted down to the shopper smartphones and also provide intelligence on consumer behavior." Noxel has in-house creative and technical teams to develop mobile applications that can use iBeacons for advertising and location mapping.

Noxel
www.noxelxtream.com
USB data acquisition at 750kHz/channel across 6 analog inputs

With the DT9816 series Data Translation offers a range of low-cost USB data acquisition modules for simultaneous sampling of up to six analog signals. Unlike comparable measurement instruments in the same price range, these modules feature separate 16-bit A/D converters per input channel instead of multiplexed inputs. This eliminates phase shifts and allows simultaneous, synchronous measurements on multiple inputs. The series provides different models, from the proven DT9816-S with a sampling rate of up to 750 kHz per channel, to the DT9816 with 6 x 50 kHz and the DT9816-A with 6 x 150 kHz. The compact modules run entirely on USB power so that no external power supply is needed. This makes them suitable for portable measurement and test applications. Screw terminals on the module allow easy signal connections. In addition to the six analog inputs, all models of the series also provide 16 digital inputs and outputs. A counter/timer supports frequency measurements, rate generation and other operations. The modules ship with the QuickDAQ measurement software, offering a complete ready-to-measure data acquisition solution. The supplied software package comprises 32/64 bit drivers for the standard Windows operating systems as well as a comprehensive range of software tools, such as interfaces for LabVIEW, MATLAB and .NET.

Data Translation
www.datatranslation.eu

Texas Instruments bets on iBeacons with reference designs

Texas Instruments has announced its support for iBeacon technology across its Bluetooth low energy portfolio including the company’s Bluetooth Smart SoCs. SimpleLink CC2541 and CC2543 wireless microcontrollers (MCUs), its Bluetooth dual mode SimpleLink CC2564 solution, and the BLE6450 automotive connectivity device. TI is also launching a new location app, with iBeacon technology for its CC2541-based SimpleLink SensorTag development kit, as well as a new low cost, small form-factor broadcaster reference design based on the CC2543. The CC2543 is a low-cost version of CC2541 optimized for beacons and broadcast applications. The app allows engineers to upload a floor plan and “place” SensorTags to easily set up an indoor positioning system. The app provides feedback on how near users are the SensorTags and can launch a user-specified URL when they are in the immediate vicinity of a SensorTag. Additionally, existing SensorTags can be updated with the latest SensorTag App through an over-the-air upgrade to be compatible with iBeacon technology. TI is also introducing a coin cell-sized, low cost and low-power broadcaster reference design that enables fast volume production of devices with iBeacon technology based on the SimpleLink CC2543. The SensorTag reference design is FCC-certified and includes Gerbers, schematics, layout, and BOM.

Texas Instruments
www.ti.com

Debugging tool supports safety-oriented Linux version

The Trace32 debugging tool from vendor Lauterbach GmbH is now available for ElinOS, an embedded Linux product from Sysgo. ElinOS runs under Sysgo’s safety and security optimized operating System PikeOS as a ‘personality’. PikeOS developers were already able to use Trace32. The PikeOS awareness provides access to PikeOS resources such as partitions, processes and threads. Because PikeOS is also a virtualization platform, it is important to be able to debug any application, whatever partition or type of partition (called personality in the PikeOS terminology) this application belongs to. The new version of Lauterbach’s Kernel awareness now provides now the possibility to debug any thread of ELinOS, used as PikeOS Linux personality, and in SMP mode if needed. The first implementation has been achieved on Freescale’s i.MX6 series platform. Further platforms will be available soon, affirms Lauterbach. Performance analysis on PikeOS tasks and Linux processes can be performed, showing when and which task was running, how much time each task consumed and how often it was pre-empted. To comply with the full MMU support of PikeOS, Trace32 also includes full MMU support, so the user is able to debug several tasks in different PikeOS partitions concurrently.

Lauterbach GmbH
www.lauterbach.com

From 70 kHz to 145 GHz in a single sweep

With its new VectorStar ME7838D broadband network analyzer, RF test expert Anritsu offers industry-best frequency coverage of 70 kHz to 145 GHz in a single sweep using a coaxial test port. Applications are on-wafer device characterization for 77 GHz automotive radar devices, E-band wireless communication, and emerging applications above 110 GHz. The VectorStar ME7838D conducts a single sweep on a device over multiple RF, microwave, and millimeter wave (mm-wave) waveguide bands, allowing engineers to more accurately characterize integrated circuits and other RF building blocks. Due to the instrument’s ability to perform sweeps from rather low frequencies in the kHz range to 145 GHz, engineers can create more accurate models and subsequently have fewer design turns when devices are subsequently used in applications. The key enabler for broadband operation to 145 GHz is the MA25300A Non-Linear Transmission Line (NLTL) module. The module, also new in Anritsu’s catalogue, extends the frequency range of previous NLTL modules and is compatible with the basic VectorStar ME7838 system. Thus, all versions of the ME7838 series can be upgraded to ME7838D 145 GHz performance. At the opportunity of the ME7838D roll-out, Anritsu also introduced a novel 0.8 mm test port connector for use with the VectorStar ME7838D broadband system. The connector creates new opportunities for advanced network analysis and system design above 110 GHz.

Anritsu
www.anritsu.com

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Anritsu
www.anritsu.com
Module supports both ANT and Bluetooth

Dynastream Innovation’s N548 module is aimed at Internet-of-things applications. Based on Nordic Semiconductor’s nRF51422 SoC; this 2.4 GHz solution is small, future proof and features concurrent support for both ANT and Bluetooth low energy. The N548 is sized for wearable, home and industrial trends in a 14.0 x 9.8 x 2.0 mm LGA (Land Grid Array) package. Its makers say that it is a combination of technologies not previously available, taking ultra low power wireless to a new level of connectivity, and that, “ANT is always focused on simplifying issues for developers and this module offers all of the latest ANT and ANT+ advantages in a turnkey hardware solution.” Designed for manufacturing simplicity, the N548 ANT SoC Module is fully integrated with PCB antenna, 32 kHz crystal time base, DC-DC converter, and 24 GPIOs with six analogue inputs, allowing developers the freedom to focus on their specific applications. It is pre-certified with FCC/IC/CE/JP/AU/NZ designations and Bluetooth qualification. Use it in simple sensors as well as cost-focused applications. The N548 highlights the advantages of the ANT protocol, including its strong position in Android smart phones, while enabling a bridge connection between available ANT+ devices and the iOS platform. Users now rely on ANT to manage multiple sensors in crowded race environments, simple and complex interchanging and pairing of devices, and transferring data from multiple sensors to multiple displays simultaneously. Ultra long battery life and ANT’s efficient, low overhead management of flexible topologies also make ANT the ideal solution for active RFID, smart beacons, asset tags, audience response systems and home automation.

Dynastream Innovations
www.io-components.com

Eight-channel, 8-bit single slot PCIe Gen2 digitiser delivers 1 Gsample/s

Agilent Technologies’ eight-channel version of its U5309A 8-bit single-slot PCIe Gen2 digitiser, that can operate directly in a PC card slot, has on-board processing, and provides new levels of channel density and minimum footprint at this level of performance. Until now, Agilent says, users requiring an eight-channel data acquisition system had to order a three-slot cPCI chassis, including two digitiser modules and an interface card to a computer. Today they can select the single-slot, eight-channel U5309A PCIe digitiser, which has multiple advantages in cost, reliability and performance—as well as the tremendous size reduction into a single slot card. The installation is as simple as a direct plug into the computer PCIe slot, immediately providing eight channels of simultaneous acquisition. The eight channels at 1 Gsample/sec version increases the offering of the U5309A product recently launched with its two-channel version. Channels can be interleaved to reach a 2 Gsample/sec sampling rate. Applications will also benefit from the high data throughput provided by the Gen2 eight-lane PCIe bus and the possibility to implement real-time signal processing algorithms into the on-board FPGA. Custom processing for the PCIe digitiser family (U5309A and U5303A) is created using the U5340A FPGA development kit.

Agilent Technologies
www.agilent.com

On Semi launches industrial image sensor family

On Semi has introduced its Python family of CMOS image sensors, which provides global shuttering, 4.8-micron pixel size and is aimed at industrial applications. The first three devices come with resolutions of 300k, 500k and 1.3-megapixels and are intended to address the needs of machine vision, inspection and motion monitoring, as well as security and surveillance applications including intelligent transportation systems. On Semi has patent coverage for in-pixel correlated double sampling, offered in the Python range, which the company claims results in CCD-like performance. The Python pixel combines a read noise of less than 9 e-, with 7.7 V/lux sensitivity and frame rates as high as 850fps (VGA format). A configurable sequencer also allows on-the-fly updates to the sensor configuration. The sensors operate across the -40°C to +85°C industrial temperature range. Specifications for the Python 300, 500 and 1300 CMOS image sensors. Source: On Semi. Resolutions of VGA, SVGA and SXGA are offered by the first three sensors with higher resolutions planned for release. All are pin-to-pin compatible with one-another and with the existing VITA1300 image sensor.

On Semi
www.onsemi.com

Single-phase electricity meter SoC integrates four 24-bit ADCs

The ZON M3 (MAX71315) single-phase electricity meter SoC announced by Maxim Integrated Products integrates four 24-bit ADCs for 4-channel data collection and ±0.1% measurement accuracy over 5000:1 dynamic range. A 32-bit metrology compute engine (CE) ensures high-accuracy processing of all collected data. Its two touch-switch inputs eliminate mechanical switches and improve user experience, and its infrared (IR) communications interface eliminates the typical extra IR receiver module. The chip also includes multiple interfaces (SPI, I2C, and 4 USART) for design versatility, a real-time clock (RTC) with temperature compensation and a digital temperature sensor for highly accurate temperature compensation. Delivered in a 100-pin LQFP package, it comes with ample Flash and RAM memory for long-term service.

Maxim Integrated
www.maximintegrated.com
DALI dimmable LED power supplies can be customised

Power supply solutions provider Stadium Power is now offering a wide range of DALI LED power supplies, LED drivers and controllers to enable customers to tailor LED lighting systems to individual requirements. LED power supply product ranges include the LDP and LDM IP65/IP67 constant current power supplies with outputs from 25 to 100 W, the DLD-C070 IP67, DIP16 packaged with up to 1400 mA output and the DALI compatible models DIM01H adjustable dual output up to 1000 mA and IP65 rated and the MLD6-C070 wide input range, up to 1400 mA output for synchronized control multi-channel lighting systems. The DRD-S1 digital rotary dimmer has a single control for ON/OFF and adjustment of brightness. It can serve as a master controller and power supply for 2 slave controllers. Automatic synchronization makes it possible to change the control location without disturbing lighting effects and it is capable of individually controlling 1 - 64 individual addresses or working in Broadcast mode. The DRD-M1-A multipledimmer has a rotary control and keypad also features a green LED locator light, 1 - 6 Individual DALI addresses can be controlled independently.

Stadium Power
www.stadiumpower.co.uk

Low power GPS modules target wearables

CSR and OriginGPS aim to accelerate the adoption of wearable devices with small form factor and low power GNSS modules; the modules, which have integrated antennas, reduce typical size by 70% and offer uprated performance, making them ideal for wearable devices. CSR and OriginGPS (Israel) have announced high-performance GNSS modules using CSR’s SiRFstarIV and SiRFstarV product lines. The new modules are 70% smaller than current solutions and deliver a 30% reduction in Time To First Fix (TTFF), making them ideal for health and fitness trackers, sports watches, medical devices, wearable action cameras, and digital still cameras. All modules, including the newly released 7x7mm Multi Spider (ORG4572) solution, integrate the LNA, SAW filter, TCXO, RTC crystal and RF shield. The OriginGPS modules offer unparalleled sensitivity resulting in shorter autonomous and aided TTFF, better navigation stability, and higher accuracy in harsh environmental conditions. In real-life testing of the module in camera applications, TTFF performance improves by over 30% compared to other solutions. The module also delivers TTFF results in less than one minute over 90% of the time (Cold Starts). In addition to its small footprint, the GNSS module’s ultra-fast geo-tagging capability improves the consumer experience.

CSR
www.csr.com

Anritsu gives away a handheld spectrum analyzer

This month, Anritsu is giving away a complete MS2711E spectrum analyzer unit for EETimes Europe's readers to win. Worth 5419 Euros, the handheld instrument fits the bill for spectrum monitoring, broadcast proofing, interference analysis, RF and microwave measurements, or Wi-Fi and wireless network measurements. The unit operates in the 9kHz to 3GHz frequency band. It boasts a dynamic range greater than 85 dB in 100Hz resolution bandwidth, with a phase noise of -90 dBc/Hz max at 10kHz offset at 1GHz. Measurements include occupied bandwidth, channel power, ACPR, C/I. The interference analyser will give you a spectrogram, signal strength, RSSI, signal ID and interference mapping. Frequency accuracy is under ±1.5ppm, below ±50ppb with the GPS Option 0031. Other features include value tracking (normal, max hold, min hold, average) and the various detection modes (peak, negative, sample, quasi-peak, and true RMS). Equipped with a touchscreen keyboard, the instrument can store 2000 traces internally before transferring the data to a PC via a USB connection. It can run three hours on one battery charge.

Check the reader offer online at www.electronics-eetimes.com

3D camera assists robots on production line

The Ensenso stereo 3D camera from IDS allows robots to handle the most complex requirements, such as bin picking. The Ensenso camera integrates two global shutter CMOS sensors with WVGA resolution together with an infrared pattern projector. It projects a random pattern of dots onto the object to be captured, allowing structures that are not visible or only faintly visible on the surface to be enhanced or highlighted. The object is then captured by the two image sensors in accordance with the stereo vision principle and its 3D coordinates are reconstructed or calculated for each and every pixel using geometric relations based on the triangulation principle. This means that, even if parts with a relatively monotone surface are placed in the bin, a virtually seamless and detailed 3D image of the entire surface can be generated without additional technical effort. The camera is designed for working distances of 260 mm to 1,400 mm and for variable picture fields. The available focal lengths of 3.6 to 16 mm can cover a wide range of distances and sizes. The camera module comes with a USB connection and will soon also be available with a GigE connection, it fits in a 150x45x45mm enclosure.

IDS Imaging Development Systems
www.ids-imaging.de
ARM-based kit enables Apple-compatible accessories

Silicon Labs has a 32-bit hardware and firmware development kit designed to accelerate the design of Made for iPod/iPhone/iPad (MFI) accessories and help product manufacturers get to market quickly. Based around the company’s ARM Cortex-M3-based SiM3U microcontroller (MCU), the MFI-SiM3U1XX-DK development kit supports the all-digital Lightning connector and protocol stack. The development kit targets a wide range of accessories for iOS devices including entertainment accessories, device-powered dongles, game controllers and docking stations. Silicon Labs designed the MFI-SiM3U1XX-DK kit as a turnkey solution to help developers simplify their Lightning-based accessory development projects and speed time to market while meeting the MFI program requirements. The kit provides a cost-effective and comprehensive solution for accessory developers and includes hardware development board, firmware libraries and an example iOS App, which supports Appcessory-style communication between the iOS device and development board. The SiM3U MCU features fully-specified analogue peripherals, an integrated capacitive touch sense controller, an internal 5V regulator and crystal-less USB support, which eliminates the need for discrete crystal oscillators and reduces component count, BOM and board space.

Silicon Labs
www.silabs.com/mcu

Integrity RTOS extended to multicore ARM Cortex-A9 processors

Green Hills Software now offers its INTEGRITY-178 tuMP real-time operating system (RTOS) for ARM-based processors. Green Hills Software partner Richland Technologies has announced an Open Standard Reconfigurable and Certifiable Computing Architecture (ORCCA) avionics computer based on an ARM multicore processor and INTEGRITY-178 tuMP. The INTEGRITY-178 tuMP (time-variant unified multiprocessing) RTOS is intended for safety-critical and security-critical systems that are based on modern multicore processors. INTEGRITY-178 tuMP significantly improves the flexibility in how the ARM processor cores can be used. The tuMP architecture is referred to as “unified” in that a common OS controls the scheduling of all cores and the overall communications between applications. It retains all AMP and SMP scheduling capabilities while resolving their significant limitations. The introduction of tuMP for ARM-based processors follows the successful introduction in 2011 of INTEGRITY-178 tuMP for Freescale’s family of QorIQ multicore processors. The tuMP implementation is an update to Green Hills Software’s INTEGRITY-178 single-core product; INTEGRITY-178 tuMP for ARM also supports the ARINC-653 (Part 1 supplement 3 and Part 2 supplement 2) interfaces and operating system capabilities necessary to be aligned with the Future Airborne Capability Environment (FACE™) V2.0 Technical Standard. For systems requiring compliance to RTCA/DO-178B/C, Green Hills Software provides Level A certification evidence for INTEGRITY-178 tuMP.

Green Hills Software
www.ghs.com

Companion FPGA packs 85K LUTs in 10x10mm package

The ECP5 FPGA Family launched by Lattice Semiconductor was specifically designed to focus on key fast growing and high-volume markets such as small-cells, microservers, broadband access, or industrial video. As a companion chip bringing the much needed design flexibility to ASICs and ASSPs, the IC comes in various options offering from 25 to 85K look-up tables (LUTs) at a cost 40% lower than alternatives according to the manufacturer, while delivering twice the functional density of competing solutions. The devices are specifically designed to closely match a number of applications, with improvements on the DSP block and support for very low cost and low power SERDES links. The ECP5 FPGAs provide the flexible connectivity required in outdoor small-cells, at extremely low-cost. They can also enable a smart SFP (small form-factor pluggable) transceiver solution for broadband access equipment, including integrated operation and maintenance. Outside of communications, ECP5 devices offer low cost, low power PCI Express side-band connectivity for microservers. For industrial video cameras, ECP5 FPGAs can implement the entire image processing functionality in a device that consumes under 2W. Enhancements leading to 30% lower total power than other FPGA solutions include stand-by mode operation of the individual blocks including SERDES, dynamic IO bank controllers and reduced operating voltage.

Lattice Semiconductor
www.latticesemi.com

Automotive-qualified motor controller combines small size and high current

Microchip has developed an automotive-qualified motor driver IC that combines cost-effectiveness with a very small footprint. The MCP8063 comes in a small 8-pin, 4x4mm DFN package. Microchip claims that this is the world’s first motor driver to combine a this size with a 1.5A peak phase current for the 180° sinusoidal drive of a variety of three-phase brushless DC motor and fan applications. The high degree of integration reduces PCB area and the high sinusoidal-drive performance provides high efficiency, low mechanical vibration and, as a consequence, low acoustic noise and silent operation. The device also includes safety features such as thermal shutdown, over-current limiting and lock-up protection. Additionally, it supports the sensor-less driving of BLDC motors, which eliminates the cost and space of a Hall sensor. The MCP8063 motor driver works stand-alone or in conjunction with Microchip’s portfolio of PIC microcontrollers and dsPIC digital signal controllers. This offers a high degree of flexibility for everything from simple voltage control to closed-loop motor speed control using high-performance algorithms, such as sinusoidal sensorless drive. Development with the MCP8063 motor driver is facilitated by the 12V 3-phase BLDC sensorless Fan Controller Demo Kit ADM00575.

Microchip Technology
www.microchip.com
4x4 MIMO device testing capability for chipset and device makers

Anite claims to be the first to offer chipset and device manufacturers the ability to verify their 4x4 downlink (DL) MIMO designs and products, accelerating the development of LTE and LTE-Advanced devices. The milestone was achieved in close collaboration with a leading device manufacturer using the company’s Development Toolset for early stage testing. MIMO is a key feature in LTE-Advanced, Advanced MIMO antenna configurations where both the base station and the device are equipped with multiple transmit/receive antennas are leading to an increased need for device testing prior to market launch. 4x4 DL MIMO capable devices require greater antenna separation/isolation and are therefore used in devices with larger form factors such as phablets, laptops with inbuilt modems and set-top boxes, as well as in various automotive applications. Anite’s capability to test 4x4 DL MIMO follows its earlier success in demonstrating Carrier Aggregation of two component carriers of 20 MHz each, resulting in Category 6/7 downlink data rates of 300 Mbps. ‘Complex antenna configurations such as 4x4 DL MIMO require advanced testing capability. Anite’s leading product roadmap and its collaborative engagement with key industry partners enable device manufacturers to accelerate their designs of LTE and LTE-Advanced products’, says Paul Beaver Products Director at Anite.

Anite www.anite.com

Flush-mountable infrared LED delivers remote control functionality

Osram Opto Semiconductors has introduced the company’s first flush-mountable infrared LED which enables remote control functionality to be incorporated in a lower profile than ever before. The T-shaped SFH 4140 Midled protrudes 0.6 mm above and below the board thereby offering remote control functions in a small space. The compact side-looking T-shaped Midled offers high radiant intensity and protrudes fractions of millimeters from the board. An infrared transmitter can therefore now be integrated in extra-thin smartphones or tablet computers. For the first time, Osram Opto Semiconductors has succeeded in sinking a surface-mountable infrared LED in a pc board. The LED is the T-Midled SFH 4140. The T-shaped transmitter takes up 4.6 mm² of board space and emits a focused beam to the side. The beam angle of +/-25 degrees is created by an integrated reflector – a real plus point in terms of space requirements. The SFH 4140 produces an impressive 50 milliwatts per steradian (mW/sr) as its typical radiant intensity from 100 mA so it achieves the ranges needed for remote control functions. The wavelength of 940 nanometers is also perfect for meeting the requirements of this application. This component is Osram Opto Semiconductors’ contribution to the trend of turning smartphones and tablet computers into universal remote controls. If the device is equipped with the appropriate infrared transmitter diode then the diode can be controlled with a suitable app.

Osram Opto Semiconductors www.osram-os.com

10 to 20W DIN Rail DC-DC converters are under 26mm thin

CUI’s latest family of compact DIN rail DC-DC converters is housed in a slim 76x31.5x25.8mm DIN-Rail package with all electrical connections easily accessible via screw terminals. The family’s 47 modules, across three series PYB10-DIN, PYB15-DIN, and PYB20-DIN have an output range of 10 to 20W with input ranges of 9 to 36 Vdc or 18 to 75 Vdc for battery-driven applications. The devices operate reliably in the -40 to +85°C temperature range. The PYB family is available in single output (3.3, 5, 12, 15, or 24 Vdc), dual output (±5, ±12, or ±15 Vdc), and in 15 and 20 W versions, triple output (3.3/±12, 3.3/±15, 5/±12, or 5/±15) models. Outputs are fully regulated to within ±0.5% for overall line input conditions and ±1.0% for all load conditions. Input to output isolation of 1,500 Vdc is provided across the range of models. The PYB series delivers efficiencies reaching 91%. Single output 15 W and 20 W models offer an output trim that allows ±10% nominal output adjustment. All parts include a remote on/off feature. Protections include continuous short circuit, over current and over voltage. The PYB series meets CISPR22/EN55022 Class B standards with limited external components. An optional heat sink is also offered on most models for improved thermal performance.

CUI www.cui.com

CO₂ sensor module offers maintenance-free long-term stability

The sensor module EE893 from E+E Elektronik allows accurate and long-term stable CO₂ measurements in demanding OEM applications. Thanks to its small size and low power consumption, the EE893 can be used in both hard-wired sensors and battery operated devices such as wireless transmitters, hand-held devices and data loggers. Environmental influences. Aging effects are compensated automatically. The multiple point CO₂ and temperature adjustment ensures high accuracy over the entire temperature working range. Measurement intervals can be set individually according to the requirements of the application. The device offers a measuring range of 0 to 10,000 ppm; the readouts are provided across a digital E2 interface.

E+E Elektronik www.eplus.com
Mouser and ADI sponsor 12th annual NASA Tech Briefs design contest

Together with Analog Devices Inc, Mouser Electronics is sponsoring the 12th annual NASA Tech Briefs magazine “Create the Future” Design Contest, a challenge to engineers and students worldwide to create the next great thing. The grand prize winner will receive global recognition and a cash prize of $20,000 for an innovative product that benefits society and the economy. Previous contests have produced more than 9,000 design ideas from engineers, educators and students in more than 100 countries. Entries are being accepted now through July 1, 2014. The “Create the Future” Design Contest has been responsible for bringing attention to product designs that increase the quality of life, improve the efficiency and quality of healthcare and help to reduce dependence on non-renewable energy sources.

**Mouser Electronic**
www.mouser.com

Osram's PrevaLED and Optotronic ranges at Farnell element14

The light engines are launched with and without integrated driver technology providing a versatile range of current and voltage windows, lighting control and system level efficiency and warranty. The Osram PrevaLED range is available in a variety of luminous flux and offers four shades of white from warm white to cool white, in form factors from strips to round and square modules meeting Zhaga standards for lighting.

**Farnell element14**
www.premierfarnell.com

Free-board programme adds Atmel 8- and 32-bit MCU kits

Distributor Future Electronics has added three of the latest development boards for Atmel microcontrollers to its FTM Board Club website, making them available free to qualified members. One of the new boards supports the ATmega168, an 8-bit AVR microcontroller. The other two are for users of the SAM D21 or SAM R21 families of ARM Cortex™-M0+ microcontrollers. The AT-MEGA168-XMINI is a flexible for users of the ATmega168 MCU, providing an on-board debugger, a large prototyping area with connections to all the MCU’s pins, and a footprint for an optional Arduino shield connector. The board is automatically detected by the Atmel Studio development environment on power-up. The ATSAMD21-XPRO and ATSAMR21-XPRO boards provide a feature-rich hardware environment for developers working with ARM Cortex-M0+ based MCUs. The boards may be easily extended with Atmel I/O1 Xplained Pro, OLED1 Xplained Pro, QT1 Xplained Pro, and PROTO1 Xplained Pro extension boards, enabling designers to quickly build a realistic application environment in which to experiment with the capabilities of the microcontroller. Both boards include a debugger, and are powered over USB. The new boards are available to members of the FTM Board Club at www.my-boardclub.com.

**Future Electronics**
www.FutureElectronics.com

Anglia signs with DEM Manufacturing

Anglia Components has been appointed a UK and Ireland distributor for Roxburgh, Deltron Enclosures and Deltron Connectors, three brands manufactured by DEM Manufacturing, one of the UK’s best known manufacturers of EMC filters, connectors and enclosures. All three brands are being supported by an extensive stock profile held at Anglia’s UK warehouse, and available online for same day shipment through Anglia Live. Anglia will be supporting Deltron Enclosures standard range of general aluminium die cast enclosures, IP rated enclosures; IP65 enclosures, IP66 enclosures, IP67 enclosures and IP68 enclosures, and industrial and heavy duty options suitable for harsh environments. It will also offer Deltron Connectors DIN and XLR plugs and sockets, phono and jack plugs, 4mm banana plugs, crocodile clips and a variety of electrical connectors suitable for instrumentation and speaker applications. Roxburgh industrial filters and general EMC filters, including IEC inlet filters, will also be supported with stock.

**Anglia**
www.anglia.com

Rochester Electronics re-introduces Intel’s 8XC196 family

Rochester Electronics is a fully-authorized continuing source for the Intel 8XC196 Family of microcontrollers. Introduced in 1982 as the Intel MCS-96 Family, these MCUs are most commonly used in motor control, modem, printer and pattern recognition applications within embedded systems. In 2007, Intel discontinued this family of microcontrollers, at which point Rochester Electronics acquired the intellectual property of these devices to continue helping Intel’s customer base for this specific family. Through its Extension-of-Life programs, Rochester Electronics currently offers this family in a variety of packages, temperature ranges and speeds, including military versions for the 80C196KB, 87C196KC and KD.

**Rochester Electronics**
www.rocelec.com

RFMW Ltd to distribute Aviacomm’s transceivers

RFMW Ltd and Aviacomm announced a distribution agreement that covers customers in North America, Europe and South East Asia. RFMW will distribute Aviacomm’s portfolio of smart transceivers including the ARF1020, ARF2010 and ARF3010. These direct conversion RF transceivers can operate on any frequency band between 50 MHz and 2,800 MHz without restrictions of band-limited ports, enabling more efficient and scalable RF front-end designs. Aviacomm products are low power, high performance, RFIC transceivers that address a variety of radio protocols and architectures, including TVWS, 4G/LTE, 3G, 2G, Cognitive Radios, Software Defined Radios, and other specialty wireless communication devices.

**RFMW Ltd**
www.rfmw.com
A whiter shade of pale

By Paul Buckley

Scientists from Penn State in partnership with Soraa Inc., believe that some LED bulbs whites are not ‘whiter than white’ and that with the switch away from incandescent and fluorescent lighting, different degrees of whites may all look the same.

Kevin W. Houser, professor of architectural engineering, Penn State, led the research team which asked 39 participants to observe various combinations of light sources and white objects to see how the light source affected perceptions of white. The results are reported in a recent issue of Leukos, the journal of the Illuminating Engineering Society.

For years, companies have been adding whiteners to laundry detergent, paints, plastics, paper and fabrics to make whites look ‘whiter than white’. “Retailers have long been concerned with the color-rendering qualities of their lighting, but less aware how light sources render white,” said Houser.

Not long ago, the only practical choices for home, office or commercial lighting were incandescent or fluorescent bulbs. More recently, compact fluorescent bulbs, which use less energy than incandescent bulbs, became popular, but compact fluorescents are not always accepted by consumers because of poor color rendition, lack of dimmability, slow warm-up to full output and because they contain mercury.

The most recent popular entry into home or commercial lighting are light-emitting diode (LED) bulbs, which are often even more energy-saving than compact fluorescents. While some LED bulbs will make colors pop, the vast majority do not showcase or differentiate the appearance of white products, according to Houser, because all white light is not the same.

Different light sources contain different combinations of the wavelengths of light. A broad variety of wavelengths will create light that appears white to the human eye, but different mixtures of wavelengths will affect how colors are rendered. When it comes to seeing the color white, the light source is very important because of how product manufacturers make white products appear white using whiteners.

Whiteners contain fluorescent materials that glow under violet and ultraviolet light. Sunlight, fluorescent light and incandescent light all produce some light in the violet and ultraviolet range. The whiteners used in consumer products work under those conditions, resulting in a bright white perception.

However, most current LED bulbs use blue LEDs to excite a phosphor that then glows white, but produces no violet or ultraviolet light. The participants completed three tests - selection, forced choice and sorting - using five different light sources - a blue-pumped LED, filtered halogen lamp and three violet-pumped LEDs with differing levels of violet emissions.

In the sorting experiment, the researchers placed six calibrated whiteness cards of varying whiteness on a table in a booth enclosed on three sides. They asked participants to arrange the cards in order of whiteness under each of the five light sources.

Under the halogen light and violet-pumped LED lights with 7 and 11 percent violet emission, the order was correct. Two of the cards were flipped under violet-pumped LEDs with only three percent violet emissions.

“With the LED with only blue pumping the phosphors, the order became random," said Houser. “People simply couldn’t tell the difference between the cards under the blue-pumped LED, which is notable because blue-pumped LEDs are by far the most common type for general lighting.”

In the forced choice test, two nominally identical cards were placed in each of two booths containing different light sources. Participants were asked to choose the card that was whiter under all of the permutations of each of the five light sources.

“The light sources with higher violet component permitted the best discrimination between the targets,” said Houser.

In the selection test, researchers asked the participants to look at a reference card in one booth and rank the cards in a second booth as either as white or whiter than the reference card. Again the blue-pumped LEDs did not fare well. The researchers noted that “engineering of an LED source’s spectrum is necessary for an accurate rendering of whiteness.”
USB 5V 2.5A Output, 42V Input Synchronous Buck with Cable Drop Compensation

The LT8697 is a compact, high efficiency, high speed synchronous monolithic step-down switching regulator designed to power 5V USB applications. A precise output voltage and programmable cable drop compensation maintain accurate 5V regulation at the USB socket connected to the end of a long cable. Forced continuous operation allows the LT8697 to sink current, further enhancing accurate 5V regulation during load transient.

Non-chopper-stabilized versus chopper-stabilized bipolar latching Hall-effect sensors

Honeywell Sensing and Control has developed a high sensitivity and fast response bipolar latching sensor by using a quad Hall element without chopper stabilization. This new design offers high sensitivity, repeatability, and fast response time, that all contribute to an efficient BLDC motor design. This paper shows the results of a low gauss latch competitive evaluation performed by Honeywell, between Honeywell’s non-chopper-stabilized SS460S bipolar latching Hall-effect sensor and five chopper-stabilized competitor.

Selecting the Best Inductor for Your DC-DC Converter

The use of DC-DC converters is increasing. As electronic systems become more miniaturized, mobile, complicated, and popular, the power requirements become more varied. Proper inductor selection requires a good understanding of inductor performance and of how desired in-circuit performance relates to the information available in supplier data sheets. This paper discusses the key performance ratings engineers need to understand and evaluate when specifying power inductors for dc-dc conversion circuits.

Integrated Analog and Digital Power Supply for Remote Sensors

Industrial encoders, optical sensors or laser modules are supplied via long lines with 24 V. This can vary +/-50% and have glitches/noise. In high-precision sensors analog circuits supply voltages have to be as glitch-free as possible and working with microcontrollers on different supply voltages or drivers switching >100 mA. A DC/DC converter hybrid architecture provides an optimum solution to the supply needs of the analog and digital parts of sensors.

Supplying DC input power for HEV testing

Hybrid electric vehicle (HEV) and electric vehicle (EV) test starts with a reliable and stable DC voltage in the range of a few kW to many tens of kW. High-power batteries, fast chargers, DC/DC converters, and battery electronic control units all require many kW of power during test at various voltage and current combinations. At these high power levels, protecting the device under test (DUT) is also very important.

Proper use of Field Analyzers at Lower Frequencies

Most RF field probes are designed to measure only the root mean square (RMS) of a continuous wave (CW) electric field over a broad range of frequencies and amplitudes. This is not the case for the AR Field Analyzer. The AR Field Analyzer contains an embedded web-page that has the ability to measure CW and Modulated electric field or power density in the time domain using an oscilloscope-type display.
Switch Mode Power Supplies
Bringing Energy Efficiency to the Next Level

Within SMPS applications high efficiency targets are required across the entire load range starting at 20% or even at 10% load. Infineon offers a broad portfolio, providing innovative solutions for high performance systems.

- High Voltage Power MOSFETs (CoolMOS™)
- Low Voltage Power MOSFETs (OptiMOST™)
- SiC Schottky Diodes (thinQ!™)
- Driver ICs (EiceDRIVER™)
- Si Power Diodes (Rapid 1 and Rapid 2)
- Analog Controller ICs (CoolSET™, ICE-family)
- Microcontroller (XMC)

Your requirements:
- Reaching highest efficiency
- System miniaturization

Our offer:
- Full system solution enabling highest efficiency
- Space optimized designs with innovative packages

Learn more about our offering for your system: www.infineon.com/smps

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