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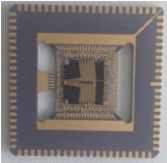

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Next-gen MOST data bus brings Gigabit networking to the car

Christoph Hammerschmidt

AUTOMOTIVE DATA NETWORKING is on the move: Ethernet AVB is conquering more and more domains in today's and, even more so, tomorrow's vehicles - except one: infotainment seems to remain the mainstay of the MOST data bus. The MOST - Media-Oriented Systems Transport - has come somewhat under pressure, but the recent meeting of the industry around the MOST ecosystem proved that the technology is alive and well. Microchip as the company that currently dominates the silicon for the infotainment data bus is even sketching a roadmap for the future, with a 5 Gbit/s broadband in-car networking becoming an option for the next generation of cars.

In his keynote speech, Microchip COO Ganesh Moorthy claimed that the MOST ecosystem is continuing to grow. Currently, 165 car models with about 150 million nodes are utilizing the technology with its characteristic ring architecture. The latest high-profile roll-out of MOST-equipped vehicles, the Audi A3 and the current Mercedes-Benz S-Class, already took place several months ago, but right in time for this year's MOST Forum, Hyundai announced to employ MOST for its new Genesis top-of-the-line model. Like Audi and Daimler, Hyundai plans will use the bandwidth of the current MOST150 generation to enable living-room video quality in automotive (rear seat) infotainment; additional features will be internet access, an interface for Apple's Siri voice control technology and in-car WiFi. According to Moorthy, currently further design wins are in the offing, but he declined to elaborate.

Moorthy also denied that the MOST ecosystem is under pressure from Ethernet AVB. "There is no market share for Ethernet", he said. "All of the infotainment that is deployed in cars today is MOST-based" - a statement that might be somewhat exaggerated, but hits the nail on the head in that in-car Ethernet today indeed is used almost exclusively to either connect cameras to Driver Assistant Systems or to flash data into their respective ECUs at the end of the production line or during maintenance. What Moorthy said is basically that Ethernet AVB and MOST are not competing against each other, at least not head-on, but instead that there are use different cases for both Ethernet AVB and MOST.

In future vehicle generations the MOST bus will not only serve the demand for distributing digital high quality audio and video signals within the vehicles. Instead, it will have to deal with additional tasks and requirements, most-



Microchip COO Ganesh Moorthy steers the MOST bus into a 5 Gbps future.

ly related to even higher video quality (up to 4K video in the next generations of cars) with multi-seat and split-view capability, harmonized communication links and further integration of consumer electronics devices. Most of these wish list items from carmakers will translate into higher bandwidth requirements. The MOST roadmap takes these requirements into account: The next evolution step in the roadmap is now the 'Universal Gigabit Network' (UGN), a technology that supports an impressive range of interfaces and services, including Mipi, PCI and USB. It

Wishlist	MOST 25	MOST 50	MOST 150	UGN
<ul style="list-style-type: none"> robust physical layer more Speed efficient Interfaces : USB, PCIe, MII premium sound Video/Audio synchrony video transmission encoding / decoding compression, isochron Internet protocol (IP) UPnP, Ethernet software : network_stacks, drivers for operating systems test tools cost down 	<p>POF</p> <p>25Mbps</p> <p>I2C, SPI, I2S, MLB,</p> <p>15 Stereo Channels</p> <hr/> <p>Compressed</p> <hr/> <p>MAMAC</p> <p>NetServices Windows + Linux drivers</p> <p>OptoLyzer</p> <p>ROM (OS81060)</p>	<p>UTP</p> <p>50Mbps</p> <p>I2C, SPI, I2S, MLB,</p> <p>30 Stereo Channels</p> <hr/> <p>Compressed video companion</p> <hr/> <p>MAMAC</p> <p>NetServices Windows + Linux drivers</p> <p>SpyNIC, Mocca</p> <p>ROM (OS81092)</p>	<p>POF + Coax</p> <p>150Mbps</p> <p>I2C,SPI,I2S,MLB, TSI, PCI, USB</p> <p>90 Stereo Channels DFI</p> <p>Compressed video companion isochronous</p> <p>MEP</p> <p>NetServices, Windows + Linux drivers</p> <p>SpyNIC, Mocca</p> <p>Coax</p>	<p>PCS + Coax</p> <p>5 Gbps</p> <p>I2C,SPI,I2S,MLB, TSI, PCI, USB, RGB, MIPI, GMII</p> <p>Yes</p> <p>Uncompressed</p> <p>MEP</p> <p>as usual</p> <p>as usual</p> <p>Yes</p>

Evolution into the future: the next generation of the MOST bus will offer unprecedented bandwidth along with a cost-effective coax PHY.

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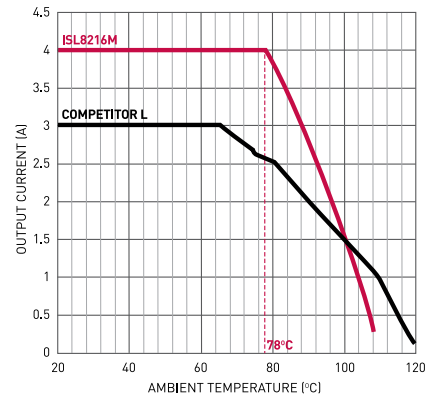
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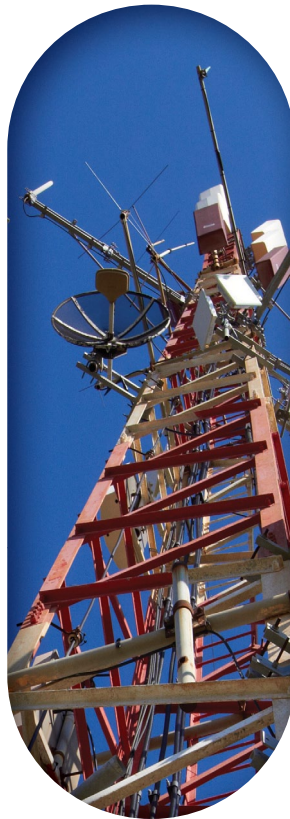
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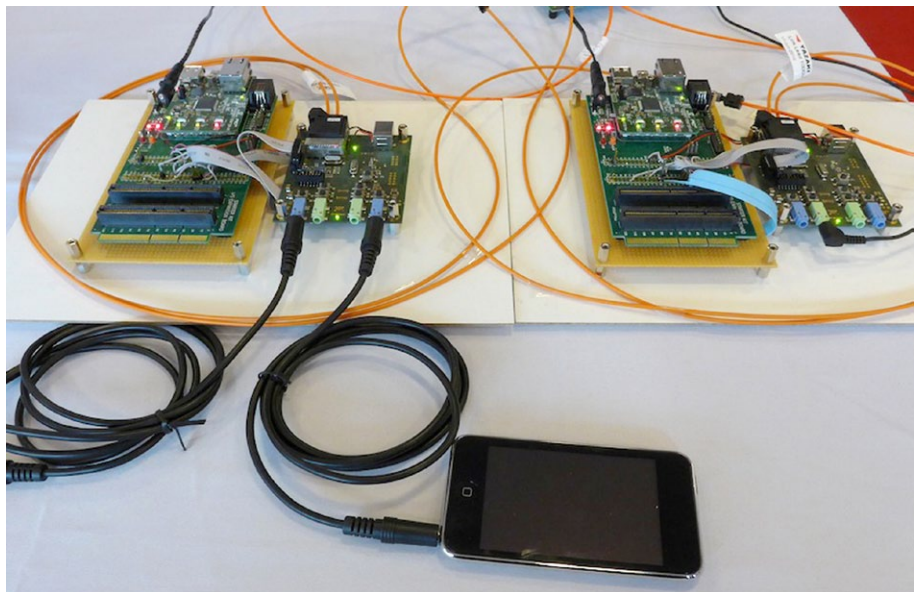
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also promises to further stabilize the dominant position of MOST in the infotainment domain by supporting uncompressed video streaming at a bandwidth of up to 5 Gbps. In contrast to packet-oriented technologies such as Ethernet, video streaming allows for perfect video and audio synchrony and lower latency times.

The latter aspect becomes important where safety-relevant signals are transmitted across the network - for instance cameras that connect to ADAS. At the physical layer, coax cabling will dominate, taking the place of POF and UTP in earlier versions. Coax would open the potential to significant cost reductions, Moorthy said. In addition, it enables power-over-coax schemes which would reduce cabling complexity. Exact data as to the timing for a roll-out were not given. "We have to think ahead of the automotive OEMs next-generation requirements," Moorthy hinted.

It remains unclear to which extent optical technologies will have a place in Microchip's vision of the future. At the meeting, Sumitomo demonstrated an all-glass-fibre physical layer for MOST which would meet automotive requirements and provide the 5 Gbps bandwidth required by the UGN vision - only that according to Moorthy's presentation UGN will no longer provide for glass fibre which triggered some frowning in the POF camp.

Seamless interoperability with consumer electronics devices will be another major concern of the MOST technologists. Already supporting a wide range of standard interface technologies like I2C, SPI, or USB, future MOST bus systems will also



Universal Plug-and-Play does not stop short of the vehicle infotainment, as was demonstrated by the FZI research centre.

connect to MIPI and GMII (Gigabit Media Independent Interface) devices. At a higher protocol level, Universal Plug-and-Play will also be supported.

At the meeting, the FZI research institute from Karlsruhe demonstrated how a smartphone or tablet could be used to access certain vehicle functions - for example, controlling media content transfers from the user to the infotainment system or controlling the HVAC through a customisable user interface. The approach ties the smartphone even closer to the in-car electronics landscape; a discussion on how this can be done without compromising security will become unavoidable.

Report: Europe can shine in global electronic production

By Peter Clarke

CHINA MAY BE THE LEADER in electronic equipment production but rising demand for automotive, industrial and aerospace electronics will see Europe and North America benefit over the next five years, according to Decision Etude Conseil.

Global electronics production, valued at more than €1.410 trillion (about US\$1.96 trillion) in 2012, will show a compound annual growth rate of 3.2 percent over the period to 2017 when the market will reach €1.655 trillion (about US\$2.30 trillion), according to the market analysis firm.

However, while North America, Europe and Japan have lost a large share of equipment manufacturing to China over the last ten years, it is now China's turn to feel the pressure from emerging economies. And with rising demand for high value professional electronics in industrial, automotive and aerospace applications there is an opportunity for North America, Europe and Japan over the next five years.

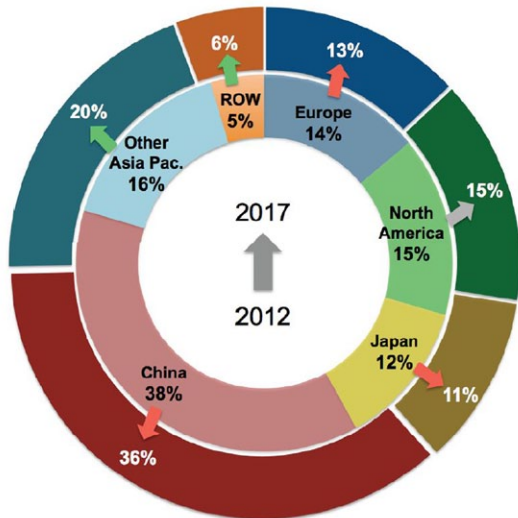
At the end period under study China will still be the largest manufacturer of electronic equipment at 36 percent of global

supply, but will have lost market share, down from 2012.

North America, Europe and Japan have already lost most of the world's computer, communications and consumer electronics production but the situation is now relatively stable, the report suggests. Other sectors such as strategic aerospace and military production, industrial, automotive and medical equipment production is less likely to migrate and it will be China, having emerged as the leading producer, that will come under pressure from other territories such as India, Vietnam and Malaysia.

Indeed at the end of the period under study the annual growth of production of electronic equipment will be higher in all of North America, Europe and Japan, than in China, which will be languishing down at 1.8 percent, Decision predicts.

To see how fortunes can change within a decade consider that in 2002 North America, Europe and Japan still controlled about 66 percent of global electronic equipment production. In



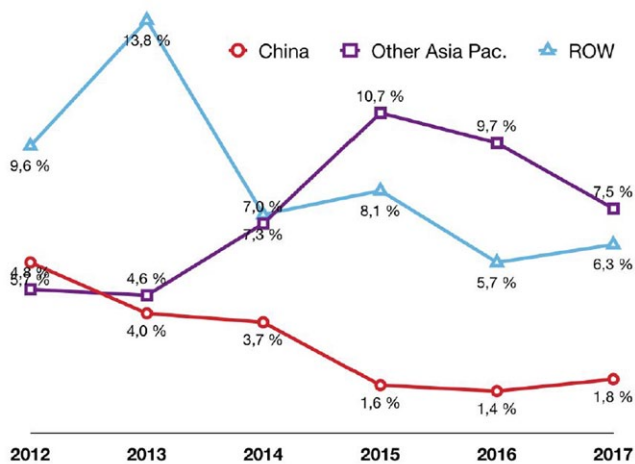
Source: DECISION (March 2014)

Global electronic equipment production by region in 2012 (center) and 2017 (outer). Source: Decision Etudes Conseil.

2012, the three regions were down at 41 percent. But this will only creep down to 39 percent by 2017. China is set to lose 2 percentage points of market share while the Asia-Pacific region excluding China grows to hold one fifth of global production.

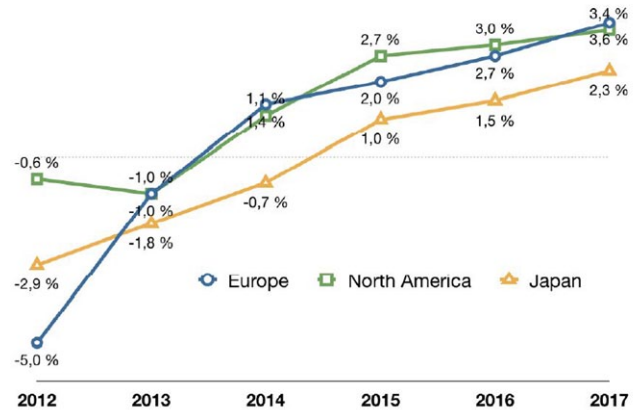
The strong growth will come from the movement of plants from China to adjacent countries to take benefit from lower labour rates starting with low-end mass-market products such as entry-level mobile phones.

Europe and North American can not only retain manufacturing at the higher value, lower volume professional end of the manufacturing spectrum but can also benefit from rising export demand for these industrial, automotive and medical products as spending power increases in the emerging economies of the world, Decision reckons. Decision forecasts CAGRs for Europe and North America of 1.7 and 1.9 percent, respectively.



Source: DECISION (March 2014)

Electronic equipment production growth rates per year in China, Other Asia Pacific and ROW. Source: Decision Etudes Conseil.



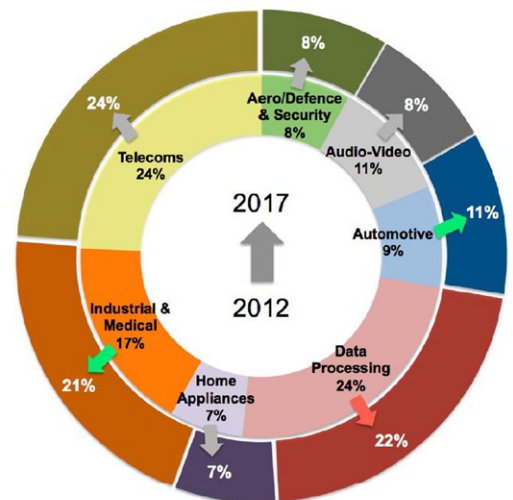
Source: DECISION (March 2014)

Electronic equipment production growth rates per year in Europe, North America and Japan. Source: Decision Etudes Conseil.

The consumer, communication and computing markets represented 66 percent of the production of electronic equipment by value in 2012 and the enormous volumes, measured in billions of units per year will increase, but price erosion will see the value reduce to 61 percent in 2017, according to Decision. The process is exemplified by how personal computer production value had already been overtaken by the combined production of smartphones and tablet computers in 2012.

Professional electronic production, comprising electronic equipment embedded into aircraft, defence and security systems, automotive, trains, ships, medical equipment and so in is expected to increase significantly in value, from €486 billion (about \$670 billion) in 2012 to €656 billion (about \$900 billion) in 2017. This represents growth to 40 percent of worldwide electronic production compared to 34 percent in 2012

The automotive sector will also benefit from the increased use of electronics for energy efficiency and electrification and increased penetration of the automobile into emerging markets.



Source: DECISION (March 2014)

Global electronic equipment production by application sector in 2012 (center) and 2017 (outer). Source: Decision Etudes Conseil.

VTT to spin-off MEMS-based spectrometer startup

By Julien Happich

THE VTT TECHNICAL RESEARCH Centre of Finland has started the development of MEMS-based tunable Fabry-Perot Interferometers (MEMS FPIs) in the 90's but it is only in the past few years that new advances in their fabrication processes truly gave these devices an advantage over competing technologies.

Simply put, Fabry-Perot interferometers consist of two parallel Bragg reflectors whose spacing can be modulated (here in the sub-micrometer range) to tune the transmission peak at selected frequencies of interest.

For most measurement and materials characterisation applications (such as in hyperspectral imaging), the frequencies of interest are known sets of spectral lines associated with the presence of known chemicals, like an optical fingerprint.

Originally, VTT developed these optical measurement technologies and the associated micromechanical Fabry-Perot interferometer components for the purpose of carbon dioxide measurements, but the Finnish lab was joined by several industrial partners during the 2011–2014 FABRY project (Spectroscopic sensor devices based on novel Fabry-Perot interferometers) it coordinated.

Based on the project results, Rikola Ltd manufactures and sells the world's smallest hyperspectral camera (for UAV-based agricultural surveys) while the Irish InnoPharma Labs manufactures Eyemap cameras to speed up the verification of drug ingredients and their distribution in a tablet.

Other partners included Continental Automotive SAS who developed a fuel quality sensor now under trial across various truck OEMs (to detect the optical fingerprint of the fuel and use the information to fine tune the engine management strategy); SICK AG for demanding industrial gas measurements; Ocean Optics for optical spectroscopy and Raman spectroscopy; Murata Electronics for the manufacture of automotive sensors; Okmetic Oyj and VTT Memsfab Ltd acting as the MEMS foundry for the project.

The real breakthrough came from novel fabrication processes, told us Jarkko Antila, a senior scientist at VTT who has been coordinating the project.

In prior research, MEMS parallel mirrors were built through the atomic layer deposition of Al_2O_3 and TiO_2 thin films, stacked in a monolithic manner in a batch process, only spaced apart by a polymeric sacrificial layer. There is no need to assemble separate chips together and because there are no hinges or beams involved, the design is very rugged against vibrations.

Once the sacrificial layer has been removed to create the air gap, applying a voltage from 0 to 5V across the mirrors' respec-

tive circular electrodes suffice to pull down the upper mirror (in effect, a pre-tensioned diaphragm), hence altering the spacing.

The lab has demonstrated tunable MEMS FPI chips for operation in the near infrared and infrared range, with a tuning range of approximately $\pm 10\%$ around selected centre wavelengths, depending on the realization of the mirrors.

The MEMS were only 3mm across, with an optical aperture size of 1.5mm which is large enough to accommodate optical filters in single-point Vis-NIR micro-spectrometers or other miniature hyperspectral imagers.

"You can switch between different target wavelengths in about one millisecond, so you could cover a full spectrum with 500 data points in well under a second", said Antila. "Effectively, you could program the sensor as a humidity sensor, then reconfigure it on the fly to monitor other chemicals" he added.

It is only when you know what your end application will be that you can start to think about optimizing the process platform for devices sensing in various wavelength ranges, you could also choose across various software control scenarios. Another key benefit of VTT's MEMS approach to FPIs is the potentially very low cost for high volume applications and the inherently rugged tuning mechanism and fine selectivity.

As the researcher details in a recent paper, the devices could also be cascaded to increase sensitivity and resolution while reducing the amount of signal post-processing. Multiple devices with different wavelength working ranges could also be combined to search for chemical fingerprints that span across a larger optical bandwidth.

VTT holds most of the new IP and will license it to selected partners seeking to produce high-volume MEMS-based FPIs. The Finnish lab is also launching a spin-off company based on this technology, Spectral Engines Oy.

Antila, who will soon be leaving VTT to manage the startup as its CEO and co-founder, is confident that the newly designed spectral engines will find their way in many more applications.

"The fully assembled MEMS-based FPI prototypes are only the size of a matchbox, a 50X size reduction over

instruments built using competing technologies", he said, "and further component integration is possible if we go for very high volumes as can be found in mobile healthcare applications". The company will be offering USB-ready gas sensors, OEM modules and even a development kit. Initially, the startup will use VTT Memsfab as its foundry partner.



Completed tunable MEMS-based FPI chips measuring 3x3mm.



Mirror structures for a piezo-actuated Fabry-Perot. The optical apertures (round parts are 15.5 mm in diameter)



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UK sees opportunities for quantum sensor and clock developments

By Nick Flaherty

THE UK BELIEVES it has a major advantage in the development of quantum clocks and sensors for navigation. The UK is becoming overly reliant on GNSS and GPS signals for timing, and new sources of accurate timing are being investigated for military applications. These developments in quantum technologies for clocks are also opening up opportunities in sensors using the same technologies.

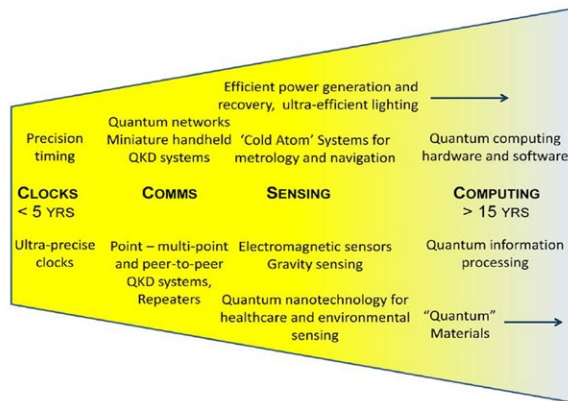
The quantum research can deliver stability and accuracy four orders of magnitude better than other systems, says Stephen Timms, fellow at the UK DSTL which is part of the Ministry of Defence. This will allow tradeoffs for smaller, chip scale devices for defence, space and even consumer applications.

“Whilst the most immediate applications are in the defence field, future quantum navigation technologies could also have significant civilian applications across a wide variety of activities, covering high frequency trading, network synchronisation, robust and ubiquitous navigation, geo-surveying and mineral prospecting,” said Bob Cockshott, Positioning, Navigation and Timing expert at NPL. “With the first applications potentially ready for market in five years, now is the critical time to consider the opportunities provided by quantum.”

The UK government has taken more interest in these opportunities. “Among many promising areas, quantum technologies may bring game-changing advantages to future timing, sensing and navigation capabilities that could support multi-billion pound markets in the UK and globally,” said Rt Hon David Willetts, Universities and Science Minister. “Much of this is at an early stage of development. Scientists need the freedom to explore the most exciting research directions, and we also need to be on the lookout for early commercialisation opportunities.”

The UK provides 7% of the world market (estimated at \$490 billion in 2013) in sensor components and sensor systems says DSTL and growth in the sensors market appears to have been unaffected by the worldwide recession, it is increasing at 8-11% per year.

Researchers have already been able to build wafer level quantum sensors that confine a cloud of ions, confine them and cool them down with a semiconductor laser and diffraction gratings so that the quantum states become entangled. Tiny changes in acceleration can be detected by the entangled ions, providing an accelerometer, gravity detector or highly accurate atomic clock.



The quantum opportunities and timescales (source: DSTL)

step is to use platinum electrodes to further reduce the heating effect of the RF used to contain the ions.

New technologies for ultra high vacuum(UHV) packaging are being developed along with investigating the use of graphene for less noisy electrodes. Prof Mark Fromhold at the University of Nottingham is working on new production techniques for graphene to reduce the power consumption of such devices

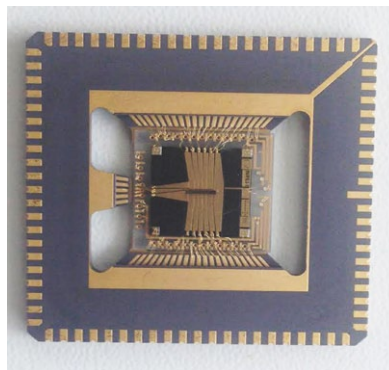
by five orders of magnitude. This comes from creating smoother electrodes than gold or platinum to reduce the power needed to confine the ion cloud.

“It’s a bit like electronics in the valve era, a cold atom sensor is a big, room sized device,” said Prof Fromhold. “Graphene can reduce the power by 100,000 and enable miniaturisation and integration of cold atoms on existing devices.”

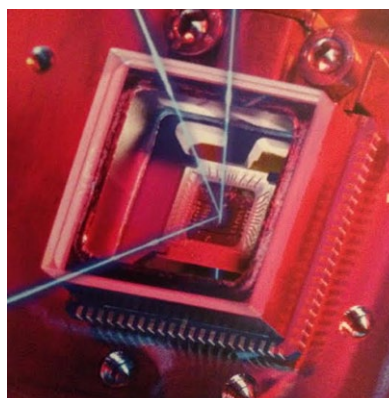
Other researchers at the University of Southampton are developing an ion trap on chip with UHV, using packaging materials such as aluminosilicate ‘gorilla’ glass that is also used for phone and tablet screens.

A team at NPL has been able to capture cold ions using doped silicon wafers with segmented electrode structures. These chips have been mounted in a standard semiconductor package in an ultra high vacuum package with direct laser access for cooling and probing the ions. The next step is to use semiconductor lasers inside the package with the new packaging materials to create clocks with accuracy 2 to 3 orders of magnitude greater than today’s caesium-based atomic clocks, but in a chip package.

The cold ion approach is also being used for a quantum interferometer that acts as an inertial navigation system. Prof Ed Hinds and his team at Imperial College in London are using laser light to track how atoms move in free fall.



A MEMS cold ion chip carrier.



The ion trap chip carrier with laser measurement.

Working with a package supplier in Berlin, the team is building a 1D accelerometer before moving to a 3D version. The researchers predict a commercial chipscale 1D quantum accelerator will be possible in the next three years, with a 3D sensor within five years.

Other researchers at NPL are also using hollow fibres filled with caesium atoms to create miniature atomic clocks. These can provide high accuracy for navigation systems in small, light packages. Such a system could provide 10 days support in the event of a GPS failure.

The precision relates to the rate of "ticking" of the clock which is provided by the natural frequency of the electronic transitions in the atoms used. Higher frequencies allow time to be divided into smaller units while the accuracy of a clock is related to systematic errors in its operation and the degree to which these errors can be successfully corrected. These errors include factors due to atomic collisions, the Zeeman effect of magnetic fields, interaction with black body radiation and the Doppler effect.

Finally, there is a gravitational element to the design, as General Relativity causes a difference in the flow of time. A height

reduction of 1m at "sea level" is approximately equivalent to a 10^{-16} change in frequency, which is now the level of accuracy these devices can achieve. The stability of a clock, its capability to deliver a frequency reference unchanging over the speci-

fied time interval, is a measure of the tendency of a clock's rate to vary, perhaps because of a changing environment. The more accurate and stable the underlying technology, the smaller a clock can be made for a given accuracy and the less dependence there is on the GPS satellite system.

The importance of accurate timing is shown by a team at consultancy Plextek in Cambridge that is working on a scheme to use more accurate timing for groups of unmanned underwater vehicles. By exchanging estimates of position and the time of flight, the accuracy of the position of each UUV can be improved signifi-

cantly. This is complicated by the non-linear time of flight of signal underwater, but helps improve the detection of mines and other underwater threats.

The UK's Technology Strategy Board (TSB) is planning a multimillion pound funding call in September to boost the development of such quantum sensors and clocks.

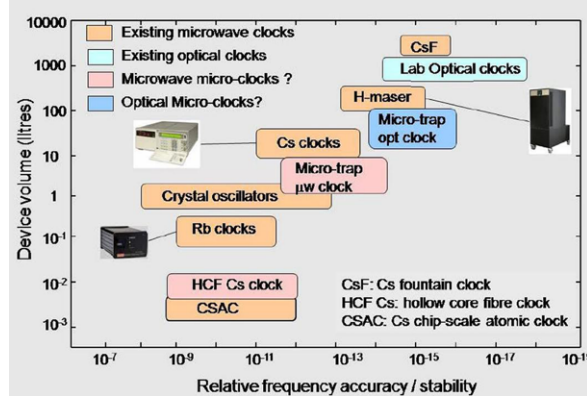


Fig. 4: Types of atomic clocks (source: Prof Patrick Gill, NPL).





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Talking traffic lights, environment-aware vehicles in the UR:BAN project

By Christoph Hammerschmidt

IF TRAFFIC LIGHTS could speak, which language would be used to make sure that vehicles could understand them? An industry consortium of 31 companies, with automotive supplier Continental and aerospace research centre Deutsches Zentrum für Luft- und Raumfahrt (DLR) among them is currently trying to find a solution. The project UR:BAN, designed to develop solutions for safe and efficient urban traffic, provided first insights into demonstration vehicles, simulators, and demo objects at the occasion of the project's half-time event.

The goal of the project is to develop solutions that provide context-sensitive, predictive and individual support to drivers of passenger cars and commercial vehicles in city traffic. Within this context, DLR is working on a specific aspect of car2x communications. The goal is to devise an instruction format that enables traffic lights to communicate with the cars regardless of make, type or manufacturer. For instance, future traffic lights can pass on information to the cars in the environment; the information could be generated by a 'smart guiding pylone' which could be placed by the police in the case of an accident or a construction site. This smart guiding pylone would connect wirelessly to the traffic light to inform them about the traffic obstruction. The traffic light in turn would send the message to the vehicles in the vicinity, alerting them about the situation and thus contributing to prevent accidents and, if applicable, recommending a deviation.

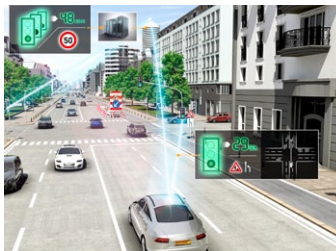
Another data type contains the remaining time of the red or green phase. Drivers can use this information, to reduce or increase their speed accordingly - in future systems, this adjustment could be done automatically.

In complex urban traffic situations, it can be particularly chal-

lenging to recognise hazards and react accordingly.

For this reason, the UR:BAN project covers the aspect of 'cognitive assistance'. In this segment, Continental and others are developing powerful driver assistance systems capable of taking control over lateral and longitudinal movements of the cars. This sub-project contains four functions - driver assistance systems for narrow passages, for passages with contraflow, lane change assist, and situation-aware speed recommendation with haptic feedback. The contraflow traffic assistance system, for instance, determines if the lane ahead of the vehicle is wide enough to allow two vehicles to pass. If the sensors determine that the space is not sufficient it issues a warning sound at the dashboard.

"These functions support an even traffic flow which improves the fuel efficiency and reduces the environmental burden in the dense urban traffic. In addition, they are a contribution to help even unsafe road users to find their way through urban traffic safely", says Stefan Lueke, manager of the subproject. Key for these assistance functions is the reliable identification of other active and passive traffic participants as well as of further relevant objects - which includes the rather complex environment with traffic signs, traffic lights and parking vehicles. Accordingly, these assistance systems are equipped with a rather sophisticated selection of sensors. Four short range radar sensors at the corners of the vehicles, a forward-looking long distance radar sensor and a stereo video camera recognise the surroundings in 360. The situation-aware speed recommendation assist involves a haptic feedback to the driver through the Accelerator Force Feedback Pedal (AFFP) as well as the engine management.



Japan's chip fabs turn to growing lettuce

By Peter Clarke

TWO OF JAPAN'S chip companies have decided to grow lettuce and other vegetables in idle semiconductor clean rooms using specialized lighting to replace sunlight.

The clean room environment is dust-free and germ-free, as it would be for the production of integrated circuits. As a result no pesticide is used and the lettuce stays fresher for longer.

Fujitsu Semiconductor and Toshiba Corp have both started to grow greens and believe the tightly-controlled conditions produce superior plants that can be tuned in terms of trace elements and therefore for taste or for specialized diets to meet health-care needs.

Fujitsu has begun selling low-potassium lettuce, grown in a clean room at its semiconductor plant in Aizu-Wakamatsu, Fukushima Prefecture. Fukushima is the region that experienced a nuclear reactor meltdown on March 11, 2011.

Toshiba has announced a similar initiative and has begun construction of vegetable cleanroom at an idle semiconductor facility in Yokosuka, Kanagawa prefecture.

Toshiba plans to start shipping lettuce, baby leaf greens, spinach, mizuna and other vegetables in the summer

The vegetable facility will be equipped with closed growing systems that integrate lighting with a wavelength optimized for vegetable growth; air-conditioning systems that maintain constant temperature and moisture level and the production management system is based on that used for semiconductor device production. As well as making sales to supermarkets Toshiba expects to offer functional vegetables tuned to be rich in polyphenols and vitamin C, achieved by careful control of the growth environment.

Fujitsu is hoping to post annual revenues of 400 million yen (about \$4 million) from the Kirei Yasai line in the year ending March 2017 while Toshiba is estimating annual sales of about 300 million yen. However, Toshiba is also considering construction of a purpose-built, mega-veggie-fab and creating a business around the sale of equipment and systems for vegetable fabs in its current financial year.



Artist's impression of Toshiba cleanroom vegetable facility. Source: Toshiba.

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Who owns the space above your garden?

By Julien Happich

FOLLOWING THE EUROPEAN COMMISSION'S recent announcement that it would harmonize legislation regarding unmanned drones, EETimes Europe caught up with Yannick Levy, Parrot's Vice President of Corporate Business Development with a close eye on both professional and hobbyist drones.

There have been several lawsuits against hobbyist drone flyers, including a recent one in France where an 18-year-old boy from Nancy filmed a video of his hometown using a GoPro camera mounted onto a small drone.

Nans Thomas was eventually fined 400 Euros for violating the DGAC's sky rules (Direction Générale de l'Aviation Civile) and endangering the lives of others, a fairly light sentence if you consider the maximal sentence could have been one year of imprisonment and a 15,000 Euros fine (violating flying safety rules bear a maximal fine of 75,000 euros but this charge was not taken into account). In the USA, the Federal Aviation Administration (FAA) tried to fine an aerial photographer for "reckless flying", but the court found that the FAA had no authority over small unmanned aircraft when it imposed the first-ever such fine on a drone operator. In fact the FAA has yet to come with dedicated rules for lightweight drones (under 25 kilograms). But in both cases, the general rules that would apply are that recreational drones should stay away from populated areas.

So how are these lawsuits affecting the hobbyist market and what sort of new recommendations Drone manufacturers will put forward to avoid a consumer backlash?

The first promotional AR. Drone Youtube videos posted by French manufacturer Parrot were showing a quadcopter drone remotely piloted via a tablet, hovering over the Parisian cityscape. That makes for an attractive proposition, but wasn't it misleading? We asked Levy.

"The greatest impact that the Nancy case had for the drone industry was a clarification of French law with regards to drones, with numerous media trying to figure out and explain in simple terms what the DGAC regulations meant" said Levy.

"In fact, in its 2012 update of the sky regulations, the DGAC had already anticipated the use of drones for commercial activities, but it was not meant to affect the consumer and hobbyist market when the photos and videos are solely recorded for private purposes", Levy continued.

Some media interpreted the guidelines roughly as: you can't fly over 50m high or further than 100m away from the remote control without any authorisation, and never over a populated area. But only two weeks ago, the DGCA published a new note to clarify the distinction it makes between commercial and hobbyist activities. Hobbyists are now allowed to fly their drones (under 25kg) below the 150m altitude limit, but never over populated areas, neither near airport routes or other specific flying zones as described in aeronautical charts. In effect, this restricts the use of these consumer drones in the confined space of your private home or garden, or in remote places.



"The greatest impact that the Nancy case had for the drone industry was a clarification of French law with regards to drones".

It also implies that users should be made aware of their local aeronautical charts.

"This is why our latest promotional videos only feature groups of friends in wide natural landscapes rather than in a city", emphasized Levy, putting forward Parrot's latest consumer drone announcement, the Bebop featuring a HD video camera and a 300m range, extensible to 2km using the company's Skycontroller pack. "We are also encouraging users to consult the local regulations that apply, and that's why the DGCA is also looking at how to communicate better on the topic".

The notion of "putting the lives of others at risk" is not a specificity of flying drones and didn't require any particular amendments in French law. As for the embarked camera, the issue is whether you use the

recorded media for commercial purpose or not, with consent or not from the people being filmed.

The European Commission issued a statement last month saying it aims to set tough new standards to regulate the operations of civil drones, covering safety, security, privacy, data protection, insurance and liability. In this statement, Vice-President Siim Kallas, Commissioner for mobility and transport, said: "Civil drones can check for damage on road and rail bridges, monitor natural disasters such as flooding and spray crops with pinpoint accuracy. They come in all shapes and sizes. In the future they may even deliver books from your favourite online retailer. But many people, including myself, have concerns about the safety, security and privacy issues relating to these devices."



Parrot's soon to be launched Bebop drone, features HD resolution and a 300m range, extensible to 2km using the company's Skycontroller pack (compatible with Oculus Rift for a first-person view flight immersion).

So, clearly video intrusion is an issue, but it will mostly be considered from a commercial perspective: how will you be allowed or not to commercialize the acquired data, especially as video analytics are increasingly powerful and can extract more data from plain video footage?

On the privacy issue, the European Commission is likely to apply the same rules that already exist for non-airborne cameras. But what if you fly over your garden to have a snapshot of your home? Would it be considered as peeking over your neighbour's fence and would you be putting your neighbour's cat at risk? By the way, would law-enforcement drones be more reliable?

From his discussions with the DGAC, Levy assumes that a little bit of common sense will be necessary to avoid being penalized. "It really depends on your intentions, and the DGAC is not staffed for, nor aiming to interfere with all cases", he said, noting that in the US, the lack of clear regulations doesn't stop vendors of Parrot's drones, lawyers will just figure it out in court.

But among the four drone flying scenarios envisaged by the DGAC for commercial operations, the most restrictive one for out-of-sight operation calls for specific fail-safe mechanisms and crash-safe devices such as parachutes, altitude sensors and more rugged communications including real-time video feedback.

For all commercial activities though, the drone pilot ought to have at least a pilot license for flying ultra-light airplanes or gliders and should prove his/her ability to fly the device reliably in order to be granted a flying permission.

In France, the DGAC recognizes that the current ULM (ultra-light motorized) pilot license requirement is an overkill for most light drones. It is looking at simplifying the delivery of flying permits and drone pilot licenses and in the coming months, it should come up with new amendments, easing up the application process. It is in discussion with large infrastructure providers such as SNCF (French national railways) and EDF (French utility provider) who are considering the use of drones to remotely monitor their infrastructures. This will certainly help define a new framework for companies to do business.

"In terms of reliability, there should also be a clear distinction made between manual operation and GPS-coordinates controlled drones", insisted Levy. "We have just released the Parrot AR.Drone 2.0 GPS Edition that comes with a GPS flight recorder module". The drone's flight can not only be displayed in 3D with accurate GPS localization, but it can also be programmed for a set path of GPS coordinates to fly automatically. A return "button" will guide the drone back to its original take-



Parrot's quadcopter AR.Drone 2.0 GPS edition is capable of GPS-driven return flights.

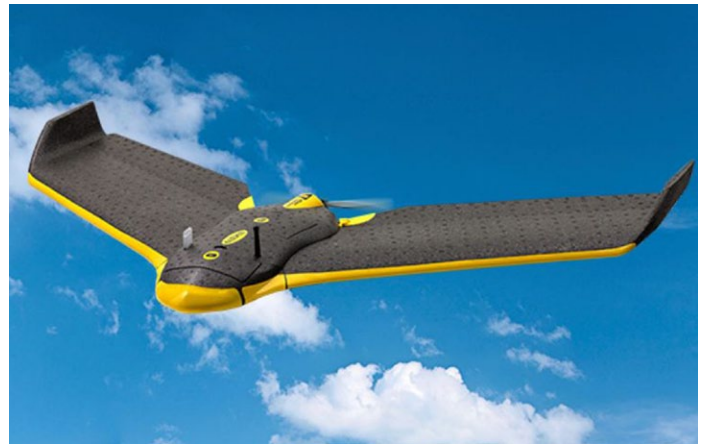


Fig. 3: senseFly's eBee fixed wing drone for 3D mapping and topographic surveys.

off site. "Such a flight is inherently more reliable and stable than when the drone is controlled manually" argued Levy.

GPS-controlled flights are the norm for complex topographic surveys. Parrot's sister company, senseFly Ltd was acquired by the group in 2012, it precisely addresses this commercial market with its eBee variants and professional photogrammetry software. The 3D mapping results are rather stunning.

Are Parrot and their competitors lobbying in Brussels for a new legal framework to take a particular direction?

"We are present at the meetings when Drones are on the agenda" told us Levy, "but merely as observers". Levy reminded us that the new harmonization directives would mostly address heavy commercial drones, and that very light hobbyist drones would still be subject to country-specific laws.

In the last quarter of 2013, the company's drone business unit generated 13,8M€ in revenue, a 23% share of its global sales largely driven by the consumer market.

Parrot is also investing in French startup Delair-Tech - www.delair-tech.com who offers mapping services and drones capable of autonomous flight beyond line of sight in a 230km radius. These are qualified for the DGAC's S4 flight scenario and could typically be used for infrastructure surveillance, crop mapping or environment monitoring. Levy sees the drone activity as pivotal for Parrot's future and potentially the fastest growing one.

Once they'll be buzzing around, how will you make the distinction between an "authorized" drone from a law-enforcement agency or a declared commercial activity and criminal trespassing over your property or the city's landmarks?

"As for being able to recognize "legitimate" law-enforcement drones from video streaming privacy scavengers, only the future will tell if particular procedures and identification marks will be adopted" commented Levy.

Although you are not supposed to take the law into your own hands, there will certainly be cases of trespassing drones being shot down (a slingshot or a stick will do), and such cases could make the legal framework evolve in favour of more privacy protection. But the normal legal route would be to file a complaint and then ask for an inquiry to be made so as to identify the drone and the compromising flight path.

That could prove difficult, unless it is made compulsory for all drones to register a unique identification number and log their GPS data to a centralized cloud database. Again, only the future will tell how the exploding number of drone activities will be supervised and how much space they'll own over your head.

CEO interview: Exar's 'reboot' almost done, says DiNardo

By Peter Clarke

LOUIS DINARDO, CEO OF EXAR CORP. (Fremont, Calif.) since Jan. 3, 2012, says his reboot of the analog and mixed-signal fabless chip company is almost complete. But the company could do better in Europe and plans to do so.

EE Times Europe: Exar has been on steady corporate acquisition program over the last couple of years. Was it a case of consolidate or be consolidated?

Louis DiNardo: The company pursued a lot of strategies between 2005 and 2012 and when I took over as CEO, January 3 2012, we were a relatively small company. There is latency between spending on R&D and return on investment so acquisition is a way to speed that up.

We've been able to pick up assets: Althior in software, Cadeka high performance analog products and talent. And the Stretch acquisition has given us end-to-end video surveillance technology and products. We also picked up some revenue along the way but the Integrated Memory Logic Ltd. (IML) acquisition is much more transformative. It gives us bulk – an additional \$60 million in annual sales – and brings us into the sustainable category at around \$200 million annual sales.

EE Times Europe: How much did you pay for Stretch?

Louis DiNardo: We only paid \$10,000 for the Stretch assets and paid off \$7 million to \$10 million of debts. So the venture capitalists took a hit on this but Stretch had \$12 million in annual sales so that is a good purchase from our point of view.

EE Times Europe: Exar provides high-performance mixed-signal and power chips into such markets as storage, networking, communications infrastructure and industrial. These are not high growth markets. Does Exar need to get into higher growth markets?

Louis DiNardo: Not including IML, about 60 percent of our business is industrial which, in terms of growth, is always going to be GDP plus a little bit. I think we can outperform that, but it is never going to be 20 percent per annum. In networking there has been some uncertainty over standards for data warehousing and customers are waiting for the dust to settle.

Which is why there is great value in the IML acquisition. As we grow up we have to play in the consumer sector one way or

another. IML is a Taiwan-listed company, which makes acquisition more complex, but they have this great position in programmable gamma correction for displays and common-mode voltage IC to drive rows and columns in displays.

The other place they operate is LED lighting where they have a means of using ac to drive the LEDs, which eliminates a second board for ac-dc conversion that is usually present in LED light bulbs. This can take the price of a LED light bulb down from \$1 to 40 to 45 cents.

EE Times Europe: With the Stretch acquisition you also brought in some experienced Silicon Valley executives. Is this a re-invention of the company that moves it towards systems?

Louis DiNardo: The whole process is definitely a reboot of the company. Prior to the acquisition of Stretch early in 2013 I promoted Parviz Ghaffaripour to senior vice president and general manager of the components business and Craig Lytle coming in from Stretch was made senior vice president of systems solutions. Ghaffaripour actually began his electronics



career at Exar in 1984 and spent time in technical and executive management roles at Maxim Integrated Products and National Semiconductor. People who come from great companies bring best practises. I had too many direct reports and now we've got a great team.

EE Times Europe: Application specificity is coming to analog, mixed-signal and power just as it came to digital ICs 20 years ago. Do you agree and, if you do, what are the implications?

Louis DiNardo: Yes. As the semiconductor industry matures things become more specific to the use case. Although some companies still seek out the building-block approach because it can provide volume across multiple applications.

So Linear [Linear Technology Corp.] will dominate the building block business and we need to provide a tailored solution. Power management is a prime example. Why jump in versus Linear, Intersil, On Semi, Maxim, Texas Instruments and China Inc. with 50 to 200 PMIC companies? We've seen a 3A synchronous regulator go from an ASP of \$2 in 2001 to 25 cents today in China. So we provide a module with four channels, output caps and inductors all on a 12mm by 12mm module. This makes use of packaging knowledge to produce a specialized solution we can sell at \$12.

EE Times Europe: You are fabless. Who do you use and what happens if foundry supply comes in to short supply?

Louis DiNardo: Globalfoundries probably has the most mask sets followed by TSMC. We also deal with a Shanghai foundry called Silan [Hangzhou Silan Microelectronics Co. Ltd.]. We are shopping for a good high-voltage foundry.

As to difficulties of supply; I think it is more of an issue for smaller digital companies. For our suppliers on 0.13-, 0.18-, 0.25-micron it hasn't seemed to be a problem. Of course we all go into periods when we're on allocation but those are temporary.

EE Times Europe: You benchmark sales by regions and Germany was responsible for 10 percent of sales in the 2012 financial year. In the same year Europe excluding Germany was just 4 percent and Japan 5 percent. Is Europe excluding Germany falling behind a threshold of relevance?

Louis DiNardo: We have about 13 or 14 percent of our business in Europe. It isn't enough. This is an issue with our profile not with Europe's. My view was that we should put more effort into Germany and UK, Scandinavia but I have had a lot of push-back. I am being told not to overlook France and Italy.

EE Times Europe: What trends do you see across the industry? Do you believe in wearables and the Internet of Things?

Louis DiNardo: IoT is interesting but we do tend to put labels on things that

are hard to define but that are happening already.

What I do see is a proliferation of transducers and sensors of all kinds, in industrial, automotive and consumer. It's more than exponential, if that is possible. A few years ago only one or two companies provided ICs to perform signal conditioning on sensors, Analog Devices and Burr Brown. Now everything is being measured, digitized. That is the most significant trend; sensor conditioning and what you do with the data.

Exar is on the big data side with networking, and at the transducer end. I think we could be on the leading edge of a nice 10 to 15 year run.



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Google's modular phone to bypass wearables

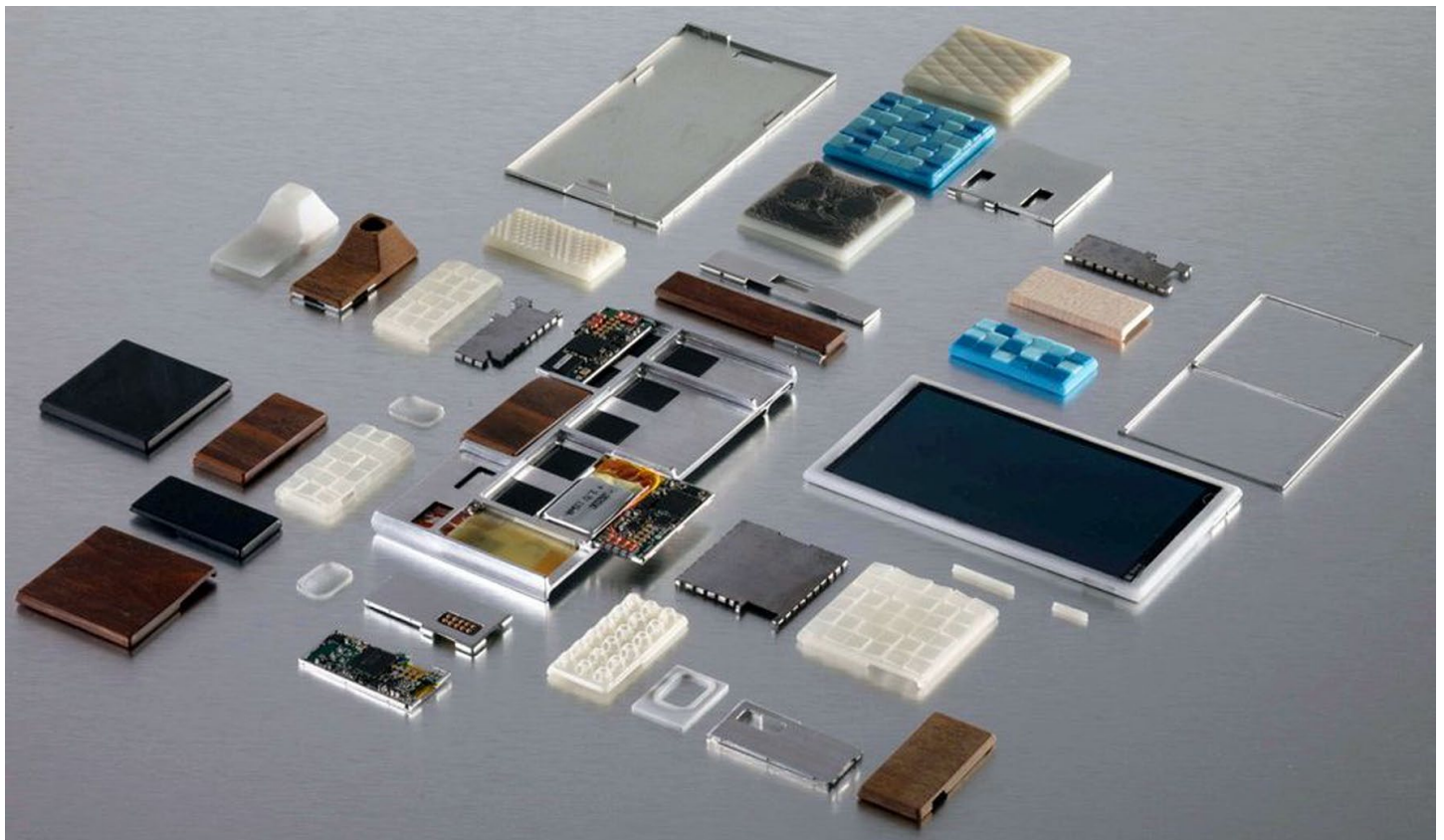
By Julien Happich

GOOGLE'S MODULAR SMARTPHONE "Project Ara", now with Module Developers Kit (MDK) available, is aiming at very large scale hardware developer adoption, in effect, allowing any non-mobile company to design modules that will snap into the smartphone's endoskeleton.

For any semiconductor chip vendor, for any sensor manufacturer, without having to competitively fight their way into new "design wins" with one of the top leading smartphone manufacturers, there will always be room into swappable modules for the Ara modular smartphone.

full spec wearable product, but also a trimmed-down version (no screen, less battery, less processing power) that plugs into the modular smartphone. Users could then decide what's fit for them and how much extra they are willing to pay for yet another battery-operated standalone device.

By publicly adopting the MIPI UniPort-M protocol for its Project Ara Module Developers Kit (MDK), Google is further simplifying the design entry into its modular smartphone. The MIPI UniPort-M interface is a combination of the MIPI UniPro (Unified Protocol) transport layer with the MIPI M-PHY. The interface



In fact, for startups and non-mobile companies, such a modular concept dramatically lowers the barrier to entry into smartphones, since any given module could be produced in any given volume without any binding contract to whoever would produce the connecting endoskeleton.

Depending on the modules they would plug into the backplane, users could decide to turn their phone into a DJ set, or make it more of a portable medical analysis instrument, or just boost the augmented reality or gaming capability of their smartphone with dedicated dual camera and graphics processing modules.

For many manufacturers of wearable devices, the wide adoption of an open-source modular smartphone concept could mean a shift from selling standalone products (often used as smartphone peripherals anyway) to simplified swappable modules performing the same functionalities, but only when needed.

The Ara modular smartphone could certainly kill a fair number of standalone wearable applications, or it could boost differentiation, enticing companies not only to building their original

optimized for short-reach high bandwidth chip-to-chip communications in mobile platforms is conceived as a universally capable channel. It is hailed by the MIPI Alliance as an interface designed to be implemented far beyond smartphones, ready to bridge the smartphone's display and communication capabilities to peripheral applications and wearables (and vice-versa) from many industries, including from the automotive world, the medical world, and from the industrial world.

If Project Ara ever meets Google's target to put modular smartphones in the hands of 5 billion people, with many more pluggable modules to customize them, that will make an awful lot of MIPI UniPort-M interfaces to ship.

A partner of the project, Toshiba sees there a huge ASIC market for MIPI Unipro-compliant bridge ICs. Senior VP & Technology Executive at Toshiba America's System LSI Group, Shardul Kazi presented the company's Ara roadmap during the Google Project Ara Developer Conference held mid-April. Kazi sees Project Ara as an opportunity to expand Toshiba's presence in the mobile market. Since November last year, Toshiba

has been working with Google to develop new IP for the modular smartphone's endoskeleton. This includes a switch IC to be part of the endoskeleton, which would be able to redirect data from any module plugged onto the endoskeleton to any other, and two bridge ASICs which would ensure the conversion from legacy and current data formats of the modular applications to the MIPI UniPro unified interface.

Kazi unveiled the future AP Bridge (application processor), combining CSI/DSI interfaces, a Host Bust Interface, I2C, I2S and GPIOs on one side for modules featuring an application processor, a display, a camera, a microphone or a speaker, a secondary display, with a UniPro layer on the other side.

The GP Bridge, a general purpose bridge IC is aimed at modules such as WiFi, Bluetooth, Modems, GPS, memory cards, SIMs. It combines HSIC (host) and SDIO (master) ports with UART, I2C, I2S, EPM and GPIOs on one side and the Unipro layer on the other side.

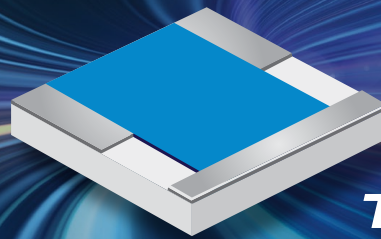
The company expects its first engineering samples by Q4 of 2014, with commercial samples ready early next year for module developers. The idea is to take the complexity of Unipro out of the developers' hand, so they can focus on new applications with the interfaces they are comfortable with.

Toshiba will also push its own reference modules into the market, planning a computational array camera reference module (packing two 5MPix cameras and a pre-processor chip) in a one by two 20x40mm unit, less than 5mm high. The video module could be used to perform all sorts of augmented reality type of applications such as depth mapping, gesture operation, object extraction, refocus. Other reference modules the Japanese company is working on include a close proximity wireless reference design using 560Mps-capable Transfer Jet technology (at up to 3cm), and an activity meter reference module.

The activity meter module is something that would exemplify the modular cannibalization of wearables by Project Ara. Kazi described a one-by-one module packed with an ARM Cortex-M4F processor, Bluetooth Low Energy and multiple axis motion sensors. Of course the unit would fit into the modular smartphone backplane as an add-on, but alternatively, it could also be clipped to a wristband, becoming a wearable peripheral again. Then, the same cost



and optimisation race could happen among module providers as it has been the case for the complete smartphones, with companies competing at module level. This could bring more tier pricing models, ranging from cheap near-empty modules (including customized cosmetic ones, coloured carcasses, mini-aquariums, squishy foam pads etc..), to very densely packed units for more processing power, more radio combinations etc...



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Security and industry 4.0: key assets for European growth

By Julien Happich

SHORTLY AFTER THE PUBLICATION of Infineon's strong Q2 FY14 sales figures with a year-on-year average growth of 14%, CEO Dr Reinhard Ploss accepted to share his insight on what could be the key industry trends to nurture for Europe to grow its chip manufacture.

EETimes Europe: Infineon is the undisputed market leader in power semiconductors, devices that find their way in transport, automotive, industrial equipment and energy infrastructures. You list both Alstom and Siemens as important customers due to their activities in power generation and rail transport infrastructures. So what impact could have the acquisition of Alstom's Energy activities by General Electric and would Infineon rejoice if Siemens came at the top of the negotiations?

Dr Reinhard Ploss: We are a major supplier to all players in these fields, and actually we supply more to Siemens than to Alstom. So we can cope with either scenario, it would not make a big difference to the whole picture for us. Of course, from a European perspective, I understand that France would want to favour Siemens, focusing on maintaining industrial strength in Europe.

EETimes Europe: French's Economy and Industry Minister Arnaud Montebourg has just signed a decree that allows government to block foreign investment at will in key areas including energy, equipment, plants and transportation that are critical for national security and health.

Do you think there should be a European strategy to handle such large-scale and fairly strategic business acquisitions that have vast repercussions on European jobs?

Dr Ploss: I think it is always dangerous to bring in politics into business decisions as it tends to distort the market. If you are too protective and you shield your businesses from competition, then when competition eventually comes, your business dies quicker.

I think that Europe could certainly do more for its industry, not by protecting selected businesses, but with directed public procurement strategies within the European market to grow and strengthen its key industries. Energy is a key challenge for Europe and the EU should strengthen its foothold with new production capabilities.

That's why I like Neelie Kroes' "Airbus of chips" initiative.

Whether Europe could reach 20% of global chip manufacture by 2020 is debatable, but far beyond chip production, she has the vision of strengthening the microelectronics industry as a key enabler for many other industries. If you don't support key enabling technologies, how do you support all the other activities that rely heavily on electronics?



"I think it is always dangerous to bring in politics into business decisions as it tends to distort the market"

EETimes Europe: In this buyout frenzy, could Infineon become a takeover target?

Dr Ploss: It would certainly be gratifying to be a takeover target, Infineon is a very technical company with a very strong market position. But look at the trend of our share price, we have proven to be consistently getting stronger and stronger, we are growth oriented. Now who would reap the benefit of such a takeover?

Thanks to recent investments in 300mm wafer fabs, we are now able to drive down our capex, so it would not make a lot of profitability gain for an acquirer to cut Infineon into pieces. We are in a market leading position on several fronts, and it is unusual for companies to buy leaders, we feel strong and valuable to our share-holders so I see it unlikely to happen.

Of course, should a company or government approach us to make an offer, it would be my duty to look into it and consider it seriously. We would have to put the offer in perspective with how more

valuable we think the company could develop on its own in the future.

On the contrary, because of our strong cash position, we are constantly screening the market for valuable acquisitions to make.

EETimes Europe: Infineon is leading the three-year Euro 55 million "eRamp" project in Dresden, it is also a driver of the Electronic Components and Systems for European Leadership (ECSEL) initiative. Do you plan to open up new fabs in Europe to support these initiatives?

Dr Ploss: I am highly confident that we'll continue to develop our manufacturing base in Europe. We are the only company worldwide to produce power semiconductors on 300-millimeter thin wafers and the cost/performance we achieve will enable us to stay competitive on a global basis.

By investing early on 300mm wafer fabs for power semiconductors Infineon is now realizing a capital expenditure advantage of around 25-30% compared to 200mm technology. Thus

we are now able to cut-back our future investment ratio from 15% to approximately 13% of sales over the cycle. So we harvest the benefit from our long term strategic thinking.

Alongside our 200mm wafer fabs which are fully loaded, our 300mm fabs give us plenty of growth potential and I expect the cost advantage will allow us to grab more share of the market.

The former Qimonda fab in Dresden has been converted for the production of power semiconductors on 300mm wafers and the volume production for our CoolMOS products is just ramping up but with our strong growth in Industrial Power Control and Power Management, we expect this fab to fulfill up to 70% of our growth, the reminder 30% being addressed by our Villach (Austria) 300mm site.

I am confident we'll need all that capacity and we are committed to maintain production in Europe, but as for building new fabs in Europe, ask me in five years' time.

Infineon is the only non-Japanese IGBT supplier to be really engaged in automotive. The demand for hybrid electric cars will grow, and who is able to supply the volumes? Infineon. It is a clear commitment to manufacture in Europe where key automotive manufacturers are based.

EETimes Europe: What are the driving forces for the Automotive market, especially in electromobility?

Dr Ploss: Driver assistance systems are truly a hot topic, they are becoming a must in most high-end cars, and there is a real pull by customers on the lower end of the market. This means a lot of additional electronics, from electric power steering to surround sensors and infotainment.

Government regulations and energy efficiency are other hot topics, and all the combined electronics can be optimized to reduce CO2 emissions, with sensors that determine when driver assistance is most needed.

The big question is: when will the connected car become mainstream? Sensing will become extremely important, combined with real time car-to-car and car-to-infrastructure connectivity to manage autonomous driving schemes. This will call for another hot topic, network security and secure software architectures.

EETimes Europe: Secure chips for smart cards, encryption, trusted platform modules, e-passports, accounted for 12% of your company's global revenues in 2013. Yet there is a trend for more cloud-based mobile payments pushed by Android 4.4 (KitKat) and its Host Card Emulation (HCE), implementing cloud-based secure elements instead of relying on SIMs or the smartphone's crypto-processor.

How would you expect this trend to affect your secure chip business? How could the Internet of Things change the landscape and is it driving growth in this sector?

Dr Ploss: We see HCE as a positive thing to drive more income from our secure solutions. Host card emulation will drive more mobile payments but sooner or later, people will recognize that software is not so simple to maintain at a secure level, just look at the recent SSL hack.

So I think that security will move back to hardware. Many companies are nervous about hackers and high reliability can only be achieved with solid anchors (secure chips). When you lose your data to a hacker, it is never as obvious as when you lose your wallet, and the industry is often playing it down.

But eventually consumers will become more aware of security issues and I think that SIM cards or other secure elements will remain a key part of secure communications and transactions in the area of mobile payment. Infineon is already recog-



“Host card emulation will drive more mobile payments but sooner or later, people will recognize that software is not so simple to maintain at a secure level, just look at the recent SSL hack.”

nized for its high reliability EAL5+ certified security chips, we are the first supplier worldwide of security products and gaining further market shares with our digital security architecture (Integrity Guard) and our Solid Flash technology.

The Internet of Things has many folds so it is difficult to say which aspect will drive security the most. Machine to machine communications for what we call in Germany the Industrial 4.0 revolution could be the main driver, together with autonomous driving and home automation.

Companies all want to protect their communications and their machines against spies and attacks, including smart grids. There are a lot of consumer applications for home automation, take for example the replacement of LED bulbs which can be controlled from your smartphone.

You would think it is not so important to secure the communications for your lighting, but after installation, the majority of users are hesitant to open up their network to the internet. So there will be a need for some sort of firewall. The ageing society in Europe represents a big challenge, but also an opportunity for more remote healthcare and cloud-based activities, possibly with remotely controlled robots checking on the elderly.

In Europe, we have excellent hardware but we need to build the backbone for secure communications to make this happen at all levels. If you have to download software updates to your car, then you want to be sure hackers do not capture your car.

EETimes Europe: In Infineon's strong Q2 FY14 sales figure, the growth of the Industrial Power Control (IPC) segment was quite spectacular at 28% (yoy). What are the particular factors that explain this growth and how do you expect this segment to fare in the coming years?

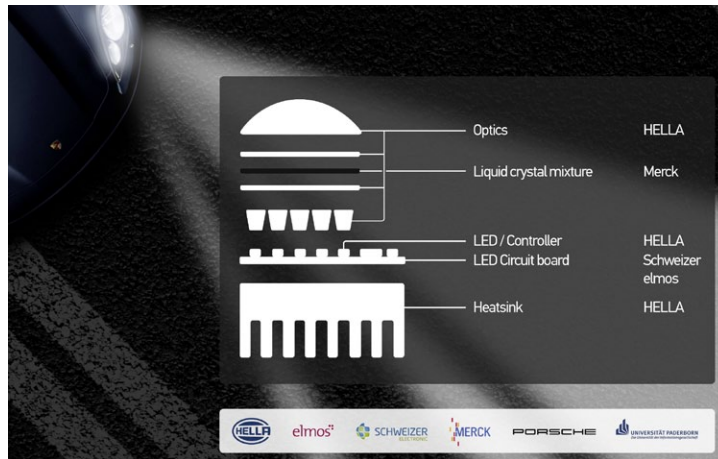
Dr Ploss: This segment follows cyclical ups and downs. Here we are experiencing a recovery out of a market depression since the peaking of renewables in 2011. China is now driving the renewable sector, automation and public transports are also going strong, so we assume this business segment to continue its growth.

R&D project targets fully adaptive automotive lighting

By Christoph Hammerschmidt

A **PERFECT ILLUMINATION** is a major safety factor in road traffic. An R&D project in Germany aims at developing a fully adaptive lighting system for road vehicles. The consortium involved covers the entire value chain - from liquid crystals to semiconductors, PCBs and optical systems.

The goal of the research project with the funny name VoLiFa2020 is to develop a fully adaptive illumination distribution for intelligent, efficient and safe vehicle lighting. Fully adaptive in this context means that the lighting system adapts automatically, continuously and with almost zero delay to the driving situation - if, for instance, another vehicle or even a bicycle appears in the counter traffic, the lighting system will selectively dim the respective sector in the light cone. With its differentiated lighting distribution, the system will help drivers to faster and better identify potentially hazardous situations and thus contribute to overall road traffic safety.



Involved are a number of companies that cover the entire technology chain. Chemical company Merck develops specific liquid crystals custom-designed to control the light beam. Chipmaker Elmos AG is responsible for the semiconductors involved while PCB manufacturer Schweizer Electronic AG devises the customer-specific printed circuit board. Automotive lighting company Hella KGaA holds the responsibility for the development of the optical systems and the integration of the components. The research institute for lighting technology and mechatronics (L-Lab) and carmaker Porsche are devising the overall system specifications, taking into account the subjective perceptual aspects of all traffic participants. The lighting system targets not only passenger cars but also commercial vehicles like trucks and buses. The project is partially funded by the German federal research ministry BMBF with an amount of €2 million over a period of three years.

Open-source projects key to popularize 3D printing

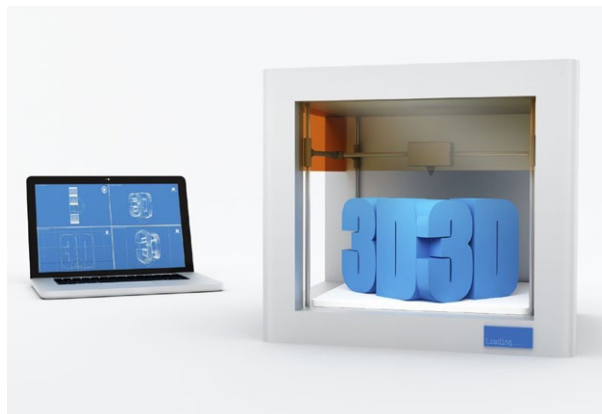
By Julien happich

POWERED BY A GROWING range of industrial applications, 3D printing will become a mainstream production tool in many industries, according to Lux Research. The market research firm estimates that the total 3D printing (3DP) market will nearly quadruple to \$12 billion in 2025, with printers alone representing a \$3.2 billion share, while formulated materials could account for \$2 billion. The remaining \$7 billion could come from the value of parts produced with this technology.

"Consumer uses of 3D printing attract most of the headlines, but industrial uses, from molds and tooling to actual production parts, are quietly having the greatest impact," notes Anthony Vicari, Lux Research Associate and the lead author of the report titled, "How 3D Printing Adds Up: Emerging Materials, Processes, Applications, and Business Models."

"However, the field is still just getting started; advances in processing and printable materials technology are still necessary for future growth," he added.

According to Lux Research analysts, much like conventional "2D" printer makers, 3D printer companies often sell formulated materials at a steep mark-up, from 10 times to 100 times, an economic model which somehow holds back the widespread adoption of 3D printers, confining their use to prototyping rather than volume production. Out of the four printer companies that



dominate the market with a combined 31% share of the pie, namely 3D Systems, Stratasys, EOS and Arcam, only the last one has an open materials supply model, which could eventually break the ties from a Razor/Blade type of business model.

According to Lux Research, as patents on

many key 3D printing technologies will start to expire over the next three years, new crops of lower cost 3D printers will appear, widening the range of capabilities available to end users.

By publicly endorsing 3D Systems' printing services for the customization of its open-source modular phone, will Google push the top companies towards lower material costs?

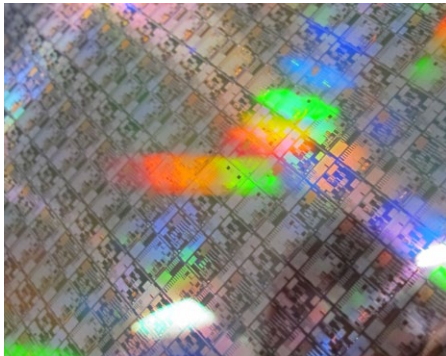
Part of the customization options will certainly include a large open-source library of 3D CAD models of the different module housings, ready for further texturing through open source CAD tools, so consumers can order their parts on a 3D printing-on-demand basis. A fair number of 3D printing companies already offer their services online, but will it take a Google modular smartphone to break the current 3D printing economic model and drive the massive adoption of 3D printing?

Samsung to back adoption of ST's 28nm FD-SOI

By Julien Happich

STMICROELECTRONICS and Samsung Electronics have struck a collaboration deal on the use of ST's 28nm Fully Depleted Silicon-on-Insulator (FD-SOI) technology, allowing customers to source their chips from both ST but also Samsung's state-of-the-art 300mm facilities. This multi-source agreement completes a previous licensing deal with Globalfoundries signed two years ago, further encouraging the mainstream adoption of the process possible. While Globalfoundries is expected to ramp up its volume production by the end of this year, the Samsung 28nm FD-SOI process will be qualified in early 2015 for volume production, the companies said in a joint statement.

"Building upon the existing solid relationship between ST and Samsung within the framework of the International Semiconductor Development Alliance, this agreement further strengthens our cooperation by extending it to 28nm FD-SOI, while expanding the ecosystem and augmenting fab capacity for ST and the entire electronics industry" stated Jean-Marc Chery, STs' Chief Operating Officer. "We foresee further expansion of the 28nm FD-SOI ecosystem, to include the leading EDA and IP suppliers, which will enrich the IP catalog available for 28nm FD-SOI."



Implemented in the ultra-thin region of silicon on top of silicon-on-insulator wafer, FD-SOI technology is the result of a long history of research and development in the French Grenoble technology cluster among ST, CEA-Leti, Soitec, as well as other partners. This planar CMOS process has been demonstrated to offer potential advantages in terms of the range of voltage operation and speed, but lack of second sourcing somehow limited its large-scale adoption.

Some market analysts such as Handel Jones, founder and CEO of International Business Strategies Inc., expect FD-SOI to capture over a quarter of the whole 28nm market by 2017, which he estimates to reach approximately 4,3 million wafers.

This announcement could certainly attract more customers to ST's 28nm FD-SOI process, but is it good news for the revival of European chip manufacture? How many of these new customers will manufacture their chips through ST's fab in Crolles versus far flung fabs from Samsung or Globalfoundries?

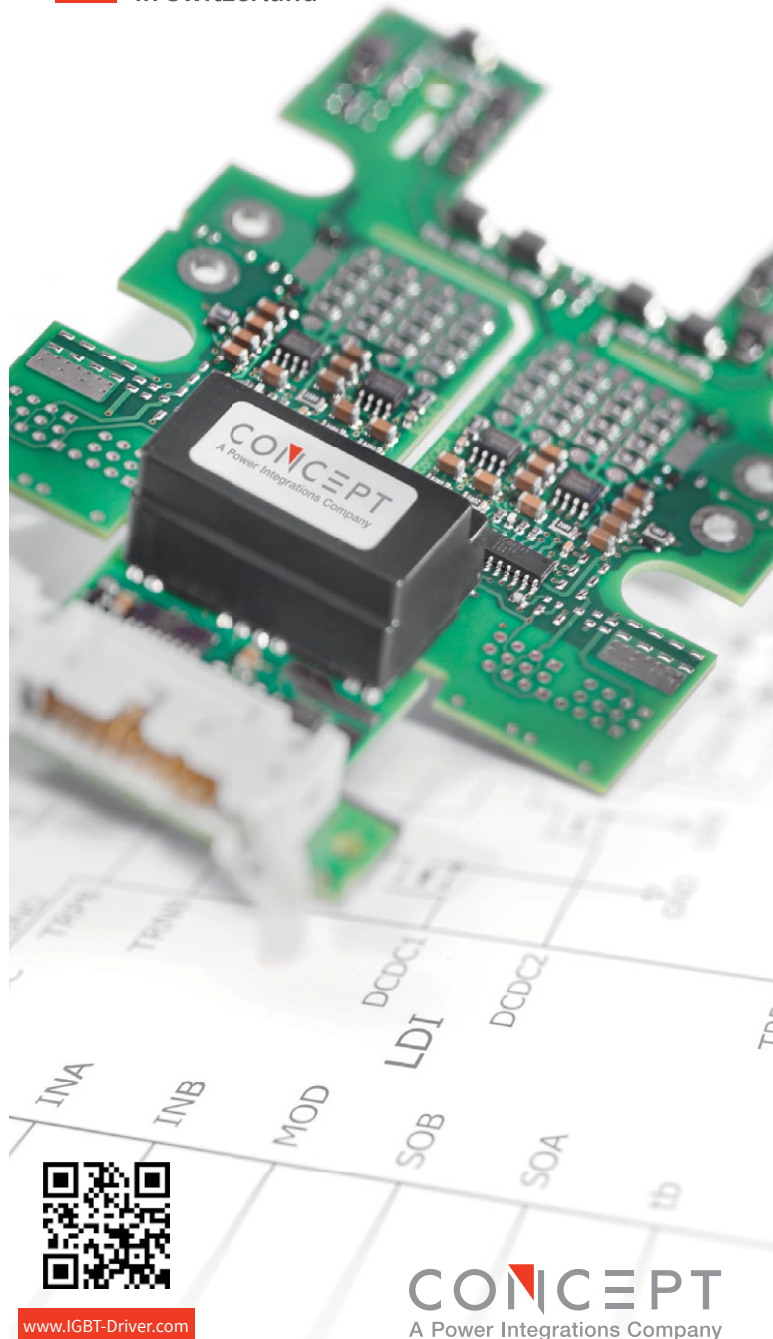
Despite these multi-sourcing agreements, 28nm FD-SOI has yet to take off in volume. Initially, Globalfoundries had announced it would be shipping in large volumes by early 2014, but the market demand has not delivered on its promise. It remains to be seen if Samsung's manufacturing support will entice large volume chip vendors to jump on the 28nm FD-SOI bandwagon and reap the benefits.

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Tactile skin for a flexible robotic touch

By Julien Happich

UNDER ITS FELLOWSHIP for Growth programme, the UK's Engineering and Physical Sciences Research Council (EPSRC) has just granted £1.07 million of funding to support the creation of ultra-flexible tactile skin for robotics and prosthetics. Dr Ravinder S. Dahiya, who joined the University of Glasgow last year as a senior lecturer in electronic and nanoscale engineering, will be leading the four-year research programme.

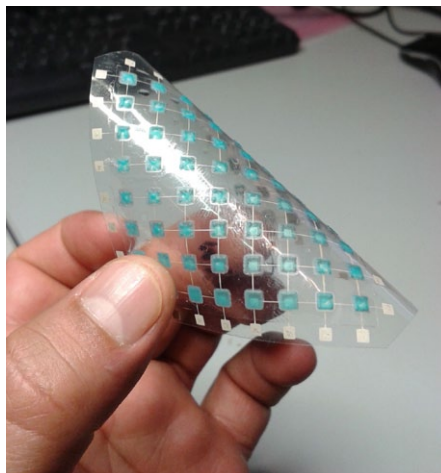
"To date, no robotics scientist has been able to create ultra-flexible tactile skin. Either the sensors have been too big or the electronics not sufficiently flexible", explains Dr Dahiya who wants to get away from discrete and bulky silicon devices. "Often, you see discrete components soldered on flexible PCBs, or hard component islands grafted onto flexible substrates. Some sensors may be flexible, but you need to connect them to electronic processing modules away from the sensing area, hidden in the robot's housing" says Dr Dahiya whose vision is to integrate ultra-thin and flexible silicon-based electronics onto flexible polymers, in effect, forming sheets of distributed electronics along the sensors.

Printed organic electronics is typically seen as a good candidate for low-cost flexible sensing applications, but they have low charge carrier mobility, typically three orders of magnitude lower than that of single crystal silicon. Their short lifetime also makes organic electronics more suitable to low-cost disposable applications. These are real drawbacks if one is to rely on fast transistor switching speed for efficient data processing or communication needs, hence the researcher's focus on using ultra-thin silicon-based devices.

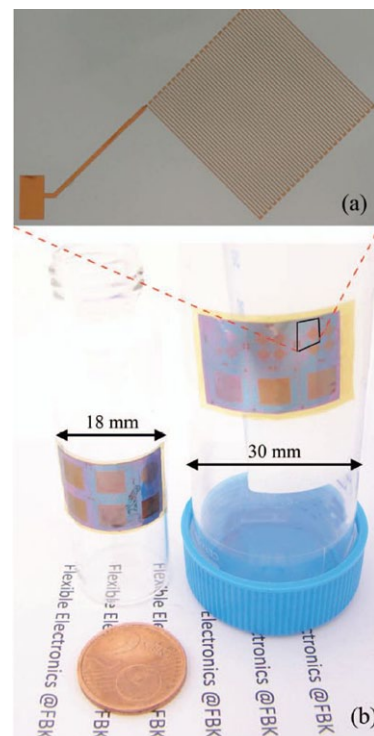
In previous research, Dr Dahiya has developed tactile sensing chips, forming 5x5 arrays of Piezoelectric Oxide Semiconductor Field Effect Transistor (POSFET) pressure and temperature sensors, about 15x15mm in size. Measuring 1x1mm, each POSFET tactile pixel in the arrays were obtained by spin coating piezoelectric polymer films directly onto the gate area of Metal Oxide Semiconductor (MOS) transistors. They were designed to yield human like spatial acuity, each tactile pixel being about 1mm apart.

After proving the sensor concept, Dr Dahiya looked into the formation of ultra-thin flexible silicon circuits. In a 2013 paper titled "Bendable Ultra-Thin Chips on Flexible Foils", his team demonstrated a top-down approach to design 1D (nanowires) and 2D silicon structures to be transferred as ultra-thin circuits onto thin flexible polyimide foils. The so-called flex-chips were designed using regular semiconductor lithography and etching, but then various wafer thinning and structure dig-out tricks were performed in order to peel-off the 15µm thin devices from their original substrate onto a PDMS (Polydimethylsiloxane) film as a carrier before a final print-transfer onto a polyimide foil. This transfer method was successfully applied to ultra-thin flex-chips from 4.5 to 15mm wide and from 8 to 36mm long, mostly featuring passive structures such as metal interconnects. The bending radius achievable without breaking was around 0.5mm, much smaller than what would be typically needed, told us Dr Dahiya.

Of course, this top-down approach gives a lot of control over the Si microstructures, their geometry, their crystallinity



Blue array of touch sensors, based on a matrix of carbon nanotubes screen printed on a flexible foil. The blue colour is due to spacers.



In the top close-up photo, serpentine shaped metal lines make up a passive device on two 15x22mm flex-chips, shown placed on 18mm and 30mm diameter.

and doping levels. But in his newly funded research, Dr Dahiya aims for a much lower cost design methodology. Following a bottom-up approach, he aims to grow vertical silicon nanowires on a gold catalyst, then harvest them and use them in a roll-to-roll dry printing process, very much like a toner of nanowires applied on a "pre-patterned" polymer foil. The key challenge in this bottom-up approach is to be able to precisely align the harvested nanowires onto very well defined patterns to design the final circuits, but Dr Dahiya says he has several self-aligning tricks in mind to make this work as printable networks of distributed sensors. Some of these tricks could include a form of optical or heat exposure of the polymer films to prepare them to receive the nanowire toner, some form of lithographic steps at the device and circuit level maybe, but Dr Dahiya was reluctant to say too much as he is in the process of patenting this new approach.

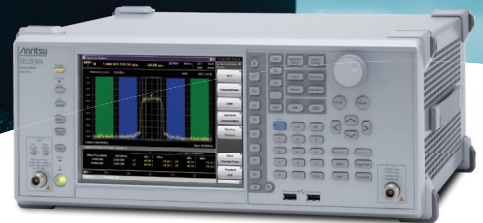
He will be working in collaboration with Professor Duncan Gregory, Chair in Inorganic Materials in the School of Chemistry, on the creation of the silicon nanowires. By developing a printing technique for high-mobility materials such as silicon, he hopes to combine the high-performance of Si electronics at a low cost base. In principle, other types of nanowires could be developed and used for printing electronic circuits, and nanocarbon tubes could also be on the agenda.

Dr Dahiya envisages creating a "tactile" skin that would allow a robot to carry out various tasks ranging from lifting an elderly person or patient out of bed to gauging the right amount of pressure needed to carry a fragile china cup of tea from the kitchen to an elderly person in another room. Sensitivity would be tuned to mimic approximately the human range, from 1 gram to a few hundred grams at finger level, to higher pressures at limb level. Such flexible thin sensors could also find their way into the creation of more touch-sensitive prosthetics.

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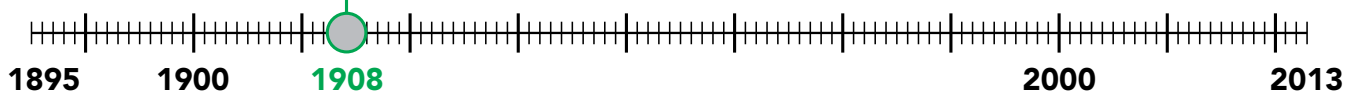
Functions such as Batch Capture Measurement in Anritsu's MS2830A support ultra-high speeds and can greatly benefit mass production.



White paper
Tricks and Tips for using digital IF and sweep spectrum analyzers

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The common battery automatic telephone



Organic photo diodes for flexible sensor applications

By Christoph Hammerschmidt

ENABLING THE DESIGN of cameras with higher sensitivity or test equipment for display panels, organic photodiodes are increasingly regarded as a promising alternative to their silicon-based counterparts. Fraunhofer COMEDD has developed a colour sensor based on organic materials.

Organic photo detectors (OPDs) utilize organic molecules to define the light sensitivity within a specific part of the light spectrum. An example for materials suited for OPDs are certain colour pigments. "These devices have multiple advantages over conventional inorganic components", explained Olaf R. Hild, department manager at Fraunhofer COMEDD in Dresden. Which material suits best however depends on the part of the light spectrum a customer needs for his specific application. Organic materials are only sensitive to light of a certain wavelength, they react only to light of a certain colour. This means that the scientists can control the spectral sensitivity distribution of optical sensors through the selection of the material. Materials available already cover a wide range within the spectrum of visible light. For specific applications in the ultraviolet or near infrared range, the researchers also develop compact microsensors that combine organic semiconductors with silicon technology.

The application spectrum ranges from tiny sensor elements in cameras or in bioanalytics to large-area applications in quality

control - for instance, such devices can be utilized to determine damages to the paintwork in automotive volume production. Other examples are lab-on-chip applications that detect certain DNA sequences which have been marked with fluorescence markers. And yet another application example: In CCD sensors for sophisticated photo cameras, organic photodiodes can increase the sensitivity to light. "They are more sensitive because they can use a larger active area", Hild explains.

In contrast to silicon sensors, OPDs can be implemented as flexible components. To manufacture flexible devices, the structures for the photodiodes are deposited onto polymer film which in turn can be applied to curved or bulged surfaces. In this manner it is possible to create specific shapes for quality assurance applications into which the device under test can be placed. An example is testing car doors for paintwork damages: The entire door is tested quickly in one single step.

This, OPDs are particularly well suited for large-area applications where they offer a significant cost advantage over conventional technologies. It is much more expensive and lavish to coat large curved areas with silicon sensors than with OPDs. Coating such surfaces with OPDs is done in simple processes on relatively cheap materials. Developers can utilise proven manufacturing technologies such as the processes in the production of organic photovoltaics.



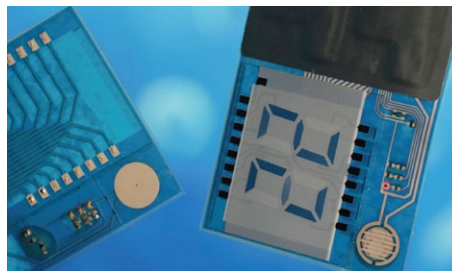
Interactive packaging to display contextual messages

By Julien Happich

IN RETAIL STORES, presentation and packaging design are often key to lure customers into buying products. It is the product's skin on the shelves, and it is only at a quick glance that consumers will evaluate if they want to pick up the product for closer inspection.

Battling for a share of your attention, regular inkjet printing on all sorts of substrates won't just be enough to compete with tomorrow's smart packaging technologies. Some manufacturers are looking at electroluminescent foils for illumination or decorative purposes, others want to integrate film-based displays into the packaging to bring additional information to the customers.

Using flexible or printed electronics, Researchers at Fraunhofer EMFT are now working on the integration of complete electronic systems in foil. The current state-of-the-art technology makes assembling single components and electrical connections on flexible materials possible, but enables only relatively simple applications. At the Interpack trade fair this year, the researchers have demonstrated a flexible temperature measuring system, integrating the sensors, display and flexible batteries into a complete system on foil. Such labels could be used to monitor product freshness and the cold chain during transport and storage. Tie this to an RFID label together with printed memory, and you may be able someday to greet would-be customers with a contextual message (as the product



System-on-foil for measuring and displaying the temperature (© Fraunhofer EMFT).

is lifted from the shelf or as a reader-enabled cart passes by). RFID labels are progressively being adopted at product level, together with shelf-tied tag readers, to give retailers a real-time feedback on the product's presence on the shelves, then in the carts for automated checkout and inventory. So this would be combining visual packaging with customer interaction and inventory

knowledge. Beyond its pure eye catcher functionality, the package could display updated information about the product's content, you could even think of time-based game scenarios and product pricing. In its demonstrator, the research lab claims that no rigid and complicated wiring are necessary, all the system's components are connected to each other via printed interconnects, directly on the same substrate foil. The complete system is thin enough to be easily attached on surfaces of products and packages.

At its technology center for flexible electronics, Fraunhofer EMFT claims to have the capability to deliver high-volume production similar to real manufacturing conditions, using reel-to-reel technology on a number of substrates such as plastic foils, paper or textiles. The researchers are now looking for research and industrial partners to set up a new production line for application-specific mass manufacturing of flexible electronic components and systems.

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To provide customers a low-risk development environment, PIC microcontrollers offer seamless migration within the complete range of products. The 8-bit PIC microcontroller family is pin-compatible within a given pin count as well as code compatible between the architectures. Being able to migrate easily between various PIC MCUs allows flexibility to react to changing design requirements and feature enhancements. When you choose a Microchip solution, you maximize on the options for re-use in future product developments and preserve your investments in hardware, software and tools.

Strength Through Design

In an effort to meet the needs of embedded system designers, silicon manufacturers continue to increase functionality and performance while decreasing the physical size and cost. This provides a significant benefit to both the embedded system designer and end consumer. However, as the demand for sophisticated consumer and embedded products continues to expand, so does the challenge of properly designing such applications.

As semiconductor technology continues to evolve to meet the demand for “smaller, faster and cheaper” solutions, the challenge to provide the key features and attributes needed for the latest embedded design grows. Microchip is committed to implementing technology advances that not only increase the performance and reduce the cost of the microcontroller, but do so without sacrificing key features such as:

- **5V:** As an 8-bit leader, we understand and will continue to support the need for 5V devices.
- **EEPROM:** A key requirement for many embedded designs, cost-effective implementation is critical.
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- **EMC:** Designed to minimize susceptibility to EMI/EMC, providing the most electrically durable solutions in the industry.

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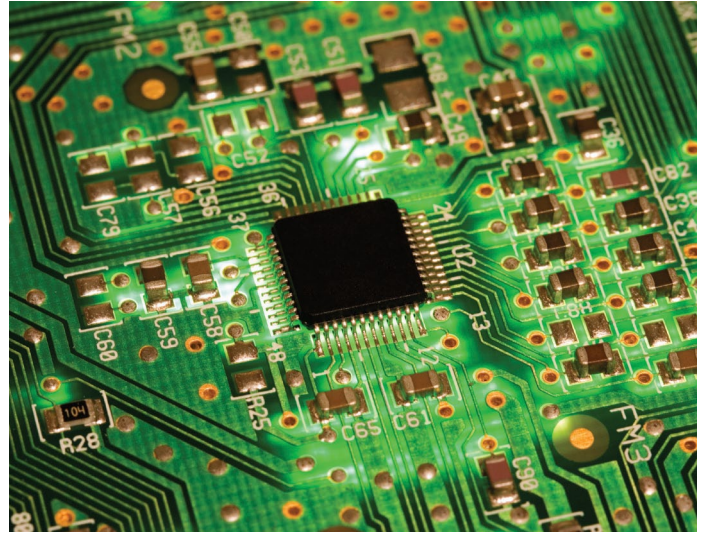
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While MCU core commonality is a trend, there are no “drop in” replacements. The reality of MCU selection is that you are entering into a partnership with your MCU supplier. To ensure success, technology leadership is critical, but it is equally important to work with a partner that is committed to strong business fundamentals such as:

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- Hardware Limit Timer

Faster Time-to-Market

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Intelligent Analog

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- 12b/10b/8b ADC
- 9b/8b/5b DAC
- Zero Cross Detect (ZCD)
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- As small as 8-pin 2 × 3 UQFN and 28-pin 4 × 4 UQFN
- Many other package options available, e.g. 3 × 3 QFN, 5 × 5 UQFN, 0.5 mm z-dimension

Safety Critical Features

- CRC and Memory Scan
- Windowed Watchdog Timer
- Hardware Limit Timer

PIC® MCUs with Core Independent Peripherals

Core Independent Peripherals

PIC microcontrollers with Core Independent Peripherals take 8-bit MCU performance to a new level. With a number of on-board modules designed to increase capability in any control system, these MCUs represent the best value in embedded design. The following Core Independent Peripherals are designed to handle their tasks with no code or supervision from the CPU to maintain operation. As a result, they simplify the implementation of complex control systems and give designers the flexibility to innovate.

- **CLC (Configurable Logic Cell):** Integrated combinational/sequential logic and interconnection/re-routing of digital peripherals
- **COG (Complementary Output Generator):** An extremely configurable waveform generator with programmable rising and falling edge events, precision dead band (5 ns), polarity, auto shut-down and phase control.
- **CWG (Complementary Waveform Generator):** Automated complementary output with control of key parameters such as dead-band and auto-shutdown states.
- **NCO (Numerically Controlled Oscillator):** Precision linear frequency generator with fine step resolution: < 1 Hz up to 500 KHz. Can also be used as a general purpose 20-bit timer/counter.
- **PSMC (Programmable Switch Mode Controller):** 16-bit PWM with dedicated 64 MHz clock source and event triggering. Features automated complementary output with control of key parameters such as phase, dead-band, blanking and auto shut-down states.
- **16-bit PWM:** High resolution 16-bit PWM with edge and center aligned modes for reduced EMI. Can also be used as a general purpose 16-bit timer/counter.
- **SMT (Signal Measurement Timer):** 24-bit precision timer module providing accurate measurement of any digital signal including period, pulse width, frequency, duration and duty cycle. Can also be used as custom digital protocol decoder.
- **HLT (Hardware Limit Timer):** Hardware monitoring timer for missed periodic events and fault detection. Can also be used as a general purpose 8-bit timer/counter with external reset capabilities.



Development Tools

PICkit™ Low Pin Count Development Board (DM164130-9)



- Development board for 8, 14, 20-pin 8-bit PIC MCU
- Populated with PIC16F1829-I/P and ships with PIC18F14K22-I/P (20-pin) MCU
- This board package contains assembled board with area for prototyping circuits and bare board as well
- Software can be rewritten to accommodate new technologies

PIC10F32X Development Board (AC103011)



- Populated with the PIC10F322 6-pin MCU
- Factory programmed with CWG, NCO and CLC demo software
- Prototype area for development purposes
- User's guide and source code available

Featured Core Independent Peripherals Product Families

Superset Device	Pins	Flash/RAM Family Range	Analog (Max)	Timers/PWM (Max)	Comms (Max)	Core Independent Peripherals (Max)	Additional Features
PIC10F322	6	448–896B 64B	8-bit ADC (3)	8-bit (2), PWM (2)	–	CLC (1), CWG, NCO	–
PIC12F1572	8	1.75–3.5 KB 128–256 KB	Comp, 10-bit ADC (4), 5-bit DAC (1)	8-bit (2), 16-bit (4), PWM (3)	EUSART (1)	CWG, 16-bit PWM (3)	–
PIC16F1613	8–14	3.5 KB 256B	Comp (2), 10-bit ADC (8), ZCD	8-bit (4), 16-bit (1), PWM (2)	USB	CWG, SMT (2), HLT (3)	CRC/Scan, WWDT
PIC16F1509	8–14	1.75–14 KB 64–512B	Comp (2), 10-bit ADC (12), 5-bit DAC (1)	8-bit (2), 16-bit (1), PWM (4)	EUSART (1), SPI/I ² C™ (1)	CLC (1), CWG, NCO	–
PIC16F1709	14–20	7–14 KB 256–1 KB	Comp (2), Op amp (2), 10-bit ADC (12), ZCD	8-bit (4), 16-bit (1), PWM (4)	EUSART (1), SPI/I ² C (1)	CLC (3), COG	Peripheral Pin Select
PIC16F1719	28–40	7–28 KB 512–2KB	Comp (2), Op amp (2), 10-bit ADC (28), ZCD	8-bit (4), 16-bit (1), PWM (4)	EUSART (1), SPI/I ² C (1)	CLC (4), COG, NCO	Peripheral Pin Select
PIC16F1789	28–40	3.5–28 KB 256–2 KB	Comp (4), Op amp (2), 10-bit ADC (14), 8-bit DAC (4)	8-bit (4), 16-bit (1), PWM (7)	EUSART (1), SPI/I ² C (1)	PSMC (4)	EEPROM

www.microchip.com/cip

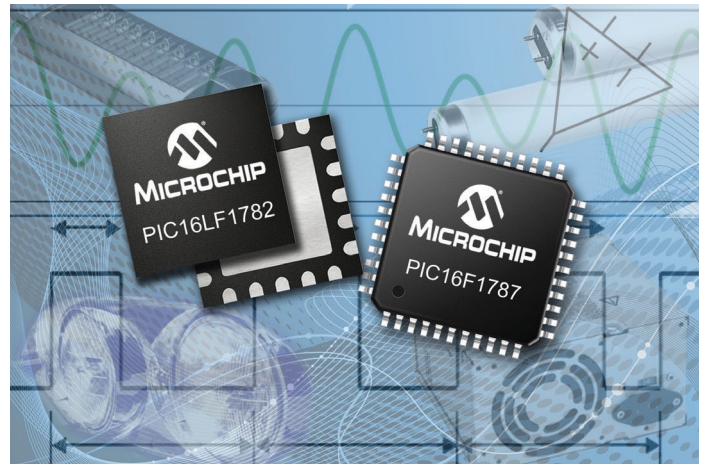
PIC® MCUs with Intelligent Analog

Intelligent Analog

Microchip's Intelligent Analog solutions help you reduce your component count to design smaller, more cost-effective boards. You will benefit from simplified, higher-performance designs and easier procurement of components. In addition, using the MCU's programmable analog interconnects and programmability offers you increased flexibility and analog topology agility.

The following Analog Peripherals have been integrated to simplify your next design:

- **Op Amps:** A basic building block in electronic design. Integrating these basic building blocks into the microcontroller offers increased flexibility and reliability while reducing BOM costs and board space.
- **High Speed Comparators:** Comparators have been available in the PIC MCU lineup for many years. We now offer feature-rich high speed (50 nS) variants to enable faster response and more efficient closed-loop feedback designs.
- **High Current Sink/Source Pins:** High Current Sink/Source pins with the ability to sink/source 50 mA enable direct MOSFET drive from the microcontroller.
- **Conversion (Analog-to-Digital/Digital-to-Analog):** Within the 8-bit portfolio we provide a wide range of resolution and speed grades available to meet most embedded requirements.
- **Zero Cross Detect:** This peripheral is used to detect when an A/C signal crosses ground (0V when referenced to the rest of the system). Common uses include A/C period measurement and TRIAC control applications. It can also be used as part of an algorithm to help determine optimal periods when switching should occur to reduce application EMI.
- **Slope Compensation:** This integrated peripheral performs the slope compensation function for Peak Current Mode power supplies.



Development Tools

F1 PSMC 28-pin Evaluation Board (DM164130-10)



- PSMC development platform using the PIC16F1783
- Break-out headers for application development
- Connect to any F1 motor control add-on
- Prototyping area

PICDEM™ Lab Development Kit (DM163045)



- Development platform for 6 to 20-pin parts
- Works across different architectures
- Includes comprehensive user guide, labs, and application examples
- Support for PICkit 3 and Expansion Headers

Featured Core Independent Peripherals Product Families

Superset Device	Pins	Flash/RAM Family Range	Intelligent Analog (Max)	Timers/PWM (Max)	Comms (Max)	Core Independent Peripherals (Max)	Additional Features
PIC16F527	20	1.5 KB 68B	Comp (2), Op amp (2), 8-bit ADC (8)	8-bit (1)	–	–	EEPROM
PIC16F570	28	3 KB 64B	Comp (2), Op amp (2), 8-bit ADC (8)	8-bit (1)	–	–	EEPROM
PIC16F753	8–14	1.75–3.5 KB 64–128B	Comp (2), Op amp (2), 10-bit ADC (8), 9-bit DAC (1), Slope Comp	8-bit (3), 16-bit (1), PWM (1)	–	–	HV Shunt, High-current I/O
PIC16F1709	25–20	3.5–14 KB 256–1 KB	Comp (2), Op amp (2), 10-bit ADC (12), ZCD	8-bit (4), 16-bit (1), PWM (4)	EUSART (1), SPI/I ² C™ (1)	CLC (3), COG	Peripheral Pin Select
PIC16F1719	28–40	7–28 KB 512–2 KB	Comp (2), Op amp (2), 10-bit ADC (28), ZCD	8-bit (4), 16-bit (1), PWM (4)	EUSART (1), SPI/I ² C (1)	CLC (4), COG, NCO	Peripheral Pin Select
PIC16F1789	28–40	3.5–28 KB 256–2 KB	Comp (4), Op amp (2), 12-bit ADC (14), 8-bit DAC (4)	8-bit (4), 16-bit (1), PWM (7)	EUSART (1), SPI/I ² C (1)	PSMC (4)	EEPROM

Safety-Critical Features

Summary

Engineers are commonly faced with the challenge of complying with safety standards or the need to add a fail-safe operation in their design, while keeping cost and complexity to a minimum. Additionally, Microchip offers a family of 8-bit MCUs which integrates fault-detecting hardware features to assist you in developing your safety-critical applications. This high level of integration makes these MCUs suitable for many applications like home appliances, industrial machinery, RPM indicators and power supplies.

The Window Watchdog Timer (WWDT), Cyclic Redundancy Check with Memory Scan (CRC/SCAN) and Hardware Limit Timer (HLT) help ease implementation of safety standards or fail-safe features. In addition, the higher-memory products include additional peripherals to support control and power management applications. By eliminating code overhead and external components, these features help reduce design complexity and save costs, while also enabling faster time-to-market.

Highlights

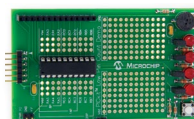
- **Cyclic Redundancy Check with Memory Scan (CRC/SCAN):** Automatically calculates CRC checksum of Program/DataEE memory for non-volatile memory integrity. Additionally provides a general purpose 16-bit CRC for use with memory and communications data. Monitoring is done in hardware with no interruption to the CPU, reducing overall code.
- **Windowed Watchdog Timer (WWDT):** System supervisory circuit that generates a reset when software timing anomalies are detected within a configurable critical window. Gives engineers the flexibility and ease to add monitoring to design.
- **24-bit Signal Measurement Timer (SMT):** Performs high-resolution measurements of any digital signal in hardware, resulting in more precise and accurate measurements. This can be used as a standard timer, ideal for speed control, range finding and RPM indicators.
- **Hardware Limit Timer (HLT):** General purpose 8-bit timer/counter with hardware monitoring capabilities for missed periodic events and fault detection of external hardware.



- **Zero Cross Detect (ZCD):** Detects high-voltage AC signals at the lowest crossing. Simplifies TRIAC and switching control, eliminating the need for additional components.
- **Complementary Waveform Generator (CWG):** Provides non-overlapping complementary waveforms for various inputs including Comparators and PWM, while offering enhanced features like deadband control, auto shutdown, auto reset, phase control, blanking control.
- **Capture Compare and PWM (CCP):** Includes a 10-bit PWM which can be utilized to implement a variety of motor control and lighting applications.

Development Tools

PICkit™ Low Pin Count Development Board (DM164130-9)



- Development board for 8, 14, 20-pin 8-bit PIC MCU
- Populated with PIC16F1829-I/P and ships with PIC18F14K22-I/P (20-pin) MCU
- This board package contains assembled board with area for prototyping circuits and bare board as well
- Software can be rewritten to accommodate new technologies

Featured 8-bit MCUs with Safety-Critical Features

Device	Program Memory (Kbytes)	Data SRAM (bytes)	I/O Pins	8/16-bit Timers	Comparators	10-bit ADC (ch)	Zero Cross Detector	CCP/10-bit PWM	CWG	CLC	SMT/HLT	Angular Timer	Window Watchdog Timer	CRC + Memory Scan	Math Accelerator	PPS	EUSART	I ² C™/SPI
PIC12(L)F1612	3.5	256	6	4/1	1	4	1	2/0	1	0	2/1	0	✓	✓	0	-	0	0
PIC16(L)F1613	3.5	256	12	4/1	2	8	1	2/0	1	0	2/1	0	✓	✓	0	-	0	0

www.microchip.com/8-bit

PIC® Microcontrollers with XLP Technology

eXtreme Low Power (XLP) Technology

- Sleep currents down to 9 nA
- Active Mode currents down to 30 $\mu\text{A}/\text{MHz}$
- Execution Efficiency with more than 80% PIC MCU single cycle instructions
- Execute code smarter, sleep longer, maximize battery life
- Wake-up sources including RTC, WDT, BOR, Interrupts, Reset or POR

Low Power Peripheral Integration

Many of today's low power products need advanced peripherals. Microchip offers low power devices with peripherals like USB, LCD and mTouch capacitive sensing. This eliminates the need for additional parts in the application, which saves cost, current and complexity.

Low Power Reliability

In addition to peripherals, products with XLP have system supervisory circuits specially designed for battery powered products.

- Watchdog Timer down to 200 nA, provides protection against system failure
- Real-Time Clock/Calendar down to 400 nA, provides precise timekeeping
- Brown-out Reset down to 45 nA, protects as batteries are depleted or changed

Battery Life Estimator

The XLP Battery Life Estimator is a free software utility to aid you in developing eXtreme Low Power applications with Microchip's PIC MCUs featuring XLP technology.

- Profile your application Run and Sleep time (duty cycle)
 - Select operating temperature and operating voltage
 - Pre-loaded with most common battery specifications
- www.microchip.com/BLE



Run from a Single Battery

The MCP1623/4 and MCP1640 Synchronous Boost Regulators enable single-cell battery applications, ideal for small, portable and lightweight applications.

- Power any PIC MCU down to 0.35V
- Provides 2–5.5V fixed/stable output voltage

Development Tools

XLP 8-bit Development Board (DM240313)



- Supports PIC16 and PIC18 devices
- LCD and buttons
- Flexible power options
- Expansion connector
- Current measurement points

Featured XLP Product Families

Superset Device	Pins	Flash (KB)	Sleep (nA)	Active ($\mu\text{A}/\text{MHz}$)	Special Features
PIC16F727	20–44	3.4–14	20	55	–
PIC16F1509	20	7–14	25	30	CLC, CWG, NCO
PIC16F1613	8–14	3.5	50	32	Safety critical and core independent peripherals
PIC16F1709	14–20	3.5–14	50	32	Intelligent analog and core independent peripherals
PIC16F1719	28–40	7–28	50	32	Intelligent analog and core independent peripherals
PIC16F1789	28–40	3.5–28	50	32	Intelligent analog and core independent peripherals
PIC16F1829	8–20	3.5–14	20	55	–
PIC18F1947	28–64	7–28	60	55	LCD
PIC18F46K20	28–40	8–64	50	138	–
PIC18F87K22	20–80	8–128	9	197	–

All numbers are typical values, sleep numbers refer to the lowest power Sleep mode available on each family.

PIC® Microcontrollers with mTouch™ Technology

Touch Sensing

Touch sensing has become an alternative to traditional push-buttons and switches providing:

- Lower cost of manufacturing and assembly
- Elegant and stylish designs
- Increased reliability with fewer moving parts
- Proximity-sensitive human interfaces

Microchip's mTouch Sensing Solutions allow you to integrate touch sensing with application code in a single microcontroller, reducing total system cost. Microchip offers a broad portfolio of low-power, low-cost and flexible solutions for keys/sliders and touch screen controllers. Get to market faster using our easy GUI-based tools, free source code and low-cost development tools.

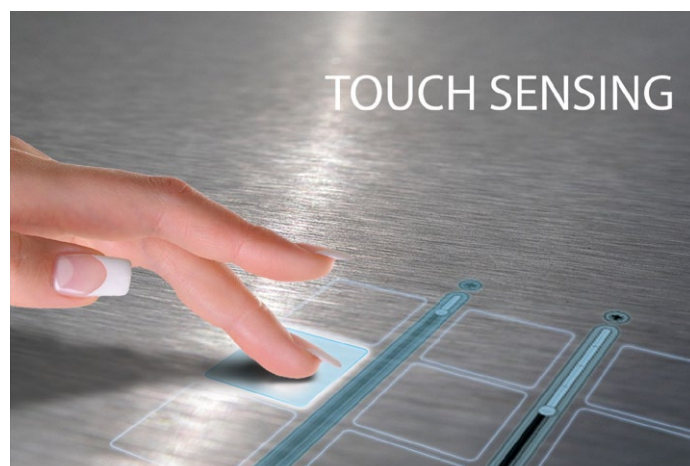
Keys, Sliders, Wheels and Proximity Detection

- Industry's lowest-power touch sense solutions
 - Capacitive sensing in less than 5 μA
 - Proximity sensing down to less than 1 μA
- No external components
- Works through plastic, glass and metal surfaces
- Waterproof designs for all weather conditions
- High noise robustness
- Integrated peripherals such as USB, segmented and graphical LCD modules for true human interface system-on-a-chip
- Free software library simplifies implementation and source code puts you in control

Capacitive Voltage Divider (CVD)

CVD is a charge/voltage based technique to measure relative capacitance on a pin using only the ADC.

- Software implementation
- 8, 16, and 32-bit support
- Proximity sensing support
- Low temperature dependence
- Low V_{DD} Dependence
- Minimal hardware requirements
- Low-frequency noise rejection
- Metal over cap compatible



Hardware CVD

Hardware CVD (HCVD) has been implemented on some of our new devices providing automated capacitive touch sampling, thereby reducing code size and decreasing CPU usage.

Development Tools

Enhanced mTouch™ Capacitive Evaluation Kit (DM183026-2)



- Features PIC16F, PIC18F, PIC24F and PIC32F
- Includes 8 buttons, matrix and sliders daughter boards
- GUI for easy configuration and real time data monitoring

Metal Over Cap Accessory Kit (AC183026)



- For use with the DM183026-2
- 1 daughter board featuring stainless steel cover
- 1 daughter board featuring a plastic cover

Featured HCVD Product Families

Device	Pins	Flash/RAM	HCVD	Voltage (V)	Additional Features
PIC12LF1552	8	3.5 KB 256B	✓	1.8–3.6	10-bit ADC (4), SPI/I ² C™
PIC16LF1554	14	7 KB 256B	✓	1.8–3.6	10-bit ADC (11), EUSART, SPI/I ² C
PIC16LF1559	20	14 KB 512B	✓	1.8–3.6	10-bit ADC (17), EUSART, SPI/I ² C

Software CVD available on all PIC MCUs with ADC

www.microchip.com/mtouch

PIC® Microcontrollers with LCD

Segmented Displays

Segmented displays are used in a wide variety of applications, ranging from meters to portable medical devices to thermostats to exercise equipment. PIC MCUs with integrated LCD drivers can directly drive segmented displays with letters, numbers, characters and icons. The main features of Microchip's LCD portfolio include:

- Flexible LCD segments
 - 28 pins: up to 72 segments
 - 44 pins: up to 116 segments
 - 64 pins: up to 184 segments
 - 80 pins: up to 192 segments
 - 100 pins: up to 480 segments
- Variable clock inputs
- Integrated voltage bias generation
- Direct drive for both 3V and 5V powered displays
- Software contrast control for boosting or dimming for different temperature or lighting conditions
- Drive LCD while conserving power in Sleep mode
- Integrated real time clock and calendar for displaying time and date information
- mTouch capacitive touch sensing capability
- Crystal-free USB 2.0 options





Direct Drive for Segmented Displays

The LCD PIC microcontrollers support direct LCD panel drive capability with no external components needed, lowering total system cost. They have integrated voltage bias generation which allows the MCU to generate the different voltage levels that are required to drive the LCD segment pins and provide good contrast for the display. The LCD MCUs support a range of fixed and variable bias options as well as variable clock inputs, giving you the flexibility to work with many different glass vendors.

Contrast Control

Software contrast control is a key feature using firmware to either boost or dim the contrast of the display. Boost the contrast up to V_{DD} or beyond if you are using one of the MCUs with an integrated charge pump. Software contrast control allows you to vary the contrast on the LCD to account for different operating conditions such as temperature, lighting and humidity. Also, software contrast control can be invaluable for portable applications. As the battery level starts to drop, the firmware can apply a boost to the contrast helping extend the battery life while still producing a crisp image on the display.

Featured LCD Product Families

Superset Device	Pins	Flash (KB)	Max Segments	Voltage (V)	Additional Features
 PIC16LF1907	28-40	3.5-14	116	1.8-3.6	10-bit ADC, EUSART
 PIC16(L)F1947	28-64	7-28	184	1.8-5.5	10-bit ADC, EEPROM, I ² C™, SPI, Comparators
 PIC18F87K90	64-80	32-128	192	1.8-5.5	10-bit ADC, EEPROM, I ² C, SPI, RTCC, Comparators, ECCP
 PIC18F97J94	64-100	32-128	480	2-3.6	Crystal-free USB, V _{BAT} , 12-bit ADC, ECCP, EUSART, I ² C, SPI, Comparators



Development Tools

PICDEM™ LCD 2 Demo Board (DM163030)

- Illustrates and supports the main features of Microchip's 28-, 40-, 64- and 80-pin LCD PIC microcontrollers
- LCD glass with icons, numbers, alphanumeric and starburst display
- Separate Processor Plug-in Modules (PIMs) are available to evaluate all of the LCD products
- Booster capability for contrast control and dimming

LCD Explorer Development Board (DM240314)

- Supports PIC24 and PIC18 LCD PIC MCUs with XLP technology
- Current measurement terminals, mTouch sensing solutions and expansion connector
- Eight common LCD glass types
- Supports 1/3 biasing
- CTMU switch to showcase touch sensing
- Four switches implemented for software demonstration
- Power the board using 9V power supply, USB connector, two AAA batteries or connector for V_{BAT} current measurement

PIC18F97J94 PIM Demo Board (MA180034)

- Features 100-pin PIC18F97J94 for evaluation of all 100-, 80- and 64-pin PIC18F97J94 LCD/USB/General Purpose MCUs
- Plugs into LCD Explorer Board (DM240314) for additional functionality
- Contains code examples

PIC® Microcontrollers with Integrated USB

USB

USB communication is growing in popularity for remote upgrades, downloading data and other portable serial communication applications. Microchip's USB PIC MCUs bring the benefits of full-speed USB to a broad range of embedded designs that can operate in various environments and locations, enabling easy access to other USB devices such as printers, handheld devices or PCs.

Full-Speed USB 2.0 (Device)

Microchip offers USB solutions capable of full-speed USB operation with the PIC16 and PIC18 family of devices. If USB On-The-Go is a requirement we have solutions in our 16 and 32 bit families.

Crystal-Free USB

USB communication requires 48 MHz with 0.25% accuracy over temperature. This is typically done with an external crystal and an internal USB. We have recently implemented technologies that allow a crystal-free implementation with the following benefits:

- Lower BOM cost
- Tiny PCB footprint
- Simplified design
- More robust solution

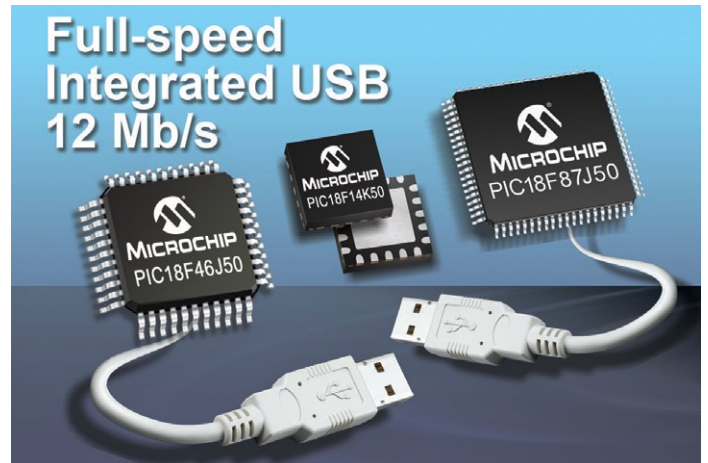
Free USB Software

Microchip has software to support USB on 8, 16 and 32-bit MCUs. This software is royalty-free source code and also includes sample projects. The 8-bit family supports USB device mode with full-speed operation. Additional software support includes full C and RTOS development environments. Included within this USB Framework Library is Microchip's USB Framework Configuration Tool.

- Generates configuration files with just a few clicks
- Royalty-free source code
- Firmware projects and USB drivers for the PC

Add USB to any PIC® MCU with EUSART

The MCP2200 is a stand-alone USB to EUSART serial converter that enables full-speed USB connectivity in applications containing a EUSART interface. The MCP2200 has 256 bytes of EEPROM and eight general purpose I/O. It offers a simple plug-and-play solution, allowing USB connectivity with very little design effort.



Development Tools

Low Pin Count USB Development Kit (DV164139-2/DM164127-2)



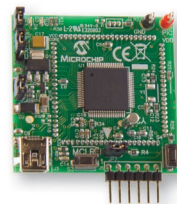
- Development platform for 14 and 20-pin USB MCUs
- For evaluation of PIC16F145X and PIC18F14K50/13K50 20-pin USB MCUs
- Contains hardware, software and code examples
- Self-directed course and lab materials

PICDEM™ Full-Speed USB Demo Kit (DM163025-1)



- Evaluation platform for PIC18F2X/4XK50 family of USB MCUs
- Full speed USB 2.0 device without the need for an external crystal
- Populated with the PIC18F45K50

PIC18F87J94 PIM Demo Board (MA180033)



- Features 80-pin PIC18F87J94 MCU for evaluation of all 80- and 64-pin PIC18F97J94 USB/LCD/General Purpose MCUs
- Can be used with PIC18 Explorer Board (DM183032) for additional functionality
- Contains code examples

Featured Crystal-Free Product Families

Superset Device	Pins	Flash (KB)	Voltage (V)	Crystal-Free	Additional Features
 PIC16(L)F1459	14–20	14	1.8–5.5	✓	CWG, 10-bit ADC, DAC, I ² C™, SPI, EUSART
 PIC18(L)F45K50	28–44	16–32	1.8–5.5	✓	10-bit ADC, Comparators, ECCP, EUSART, SPI, I ² C
 PIC18F97J94	64–100	32–128	2–3.6	✓	V _{BAT} , 12-bit ADC, LCD, ECCP, EUSART, I ² C, SPI, Comparators

www.microchip.com/usb

PIC® Microcontrollers with Ethernet

Embedded Ethernet

Microchip addresses the growing demand for embedded Ethernet products with the ENC624J600, ENC424J600 and ENC28J60 as standalone Ethernet controllers, and the PIC18F97J60 family, which are IEEE 802.3™ compliant and fully compatible with 10/100/1000Base-T networks. Microchip's Ethernet solution also includes a free and robust TCP/IP stack optimized for PIC microcontroller and dsPIC® digital signal controller families (www.microchip.com/tcpip).

Development Tools

PICDEM.net™ 2 Development Board (DM163024)



- Supports ENC28J60 and PIC18F97J60 devices
- Can be developed as web server

PICtail™ Ethernet Daughter Board (AC164121)



- Can be plugged to any of the PIC18 demonstration boards
- Populated with ENC28J60
- Interfaces to RJ-45 female connector

Featured Ethernet Product Families

Superset Device	Pins	MCU + Ethernet	Integrated MAC + PHY	Interface	Hardware Security	Pre-programmed MAC	Additional Features
PIC18F97J90	64–100	✓	✓ (10 Base-T)	–	–	–	IEEE 802.3™ compliant, Auto-negotiation, Configurable buffer
ENC28J60	28	–	✓ (10 Base-T)	SPI	–	–	
ENC624J600	44–64	–	✓ (10/100 Base-T)	SPI/Parallel	✓	✓	

www.microchip.com/ethernet

PIC® Microcontrollers with CAN & LIN

Controller Area Network (CAN)

Microchip offers a complete line of 8-, 16- and 32-bit MCUs to meet the needs of high-performance embedded applications using the CAN bus. On-chip peripherals include A/D converters, comparators, motor control PWMs, USART (RS485, RS232, LIN) and Master I²C/SPI.

Microchip's Enhanced CAN Module

- Supports CAN 1.2, CAN 2.0A and CAN 2.0B protocols
- DeviceNet data bytes filter support
- Standard and extended data frames
- 0–8 bytes data length
- Three modes of operation:
 - Mode 0: Legacy mode
 - Mode 1: Enhanced Legacy mode with DeviceNet support
 - Mode 2: FIFO mode with DeviceNet support
- Six buffers programmable as Rx/Tx buffers

Local Interconnect Network (LIN)

Microchip offers a LIN compatible USART on a wide variety of microcontrollers. We have recently taken our LIN offering to a new level by offering microcontrollers with integrated LIN transceivers.

Featured CAN and LIN Product Families

Superset Device	Pins	Flash (KB)	CAN Tx Buffers	CAN Rx Buffers	LIN Tx Rx	Voltage (V)	Additional Features
PIC18F4685	28–44	16–96	3	2	–	2–5.5	LIN USART
PIC18F66K80	28–64	32–64	3	2	–	1.8–5.5	LIN USART
PIC16F1829LIN	14	8K	–	–	Integrated	2.3–5.5	LIN USART

www.microchip.com/can
www.microchip.com/lin

Support

Microchip is committed to supporting its customers in developing products faster and more efficiently. We maintain a worldwide network of field applications engineers and technical support ready to provide product and system assistance. In addition, the following service areas are available at www.microchip.com:

- **Support** link provides a way to get questions answered fast: <http://support.microchip.com>
- **Sample** link offers evaluation samples of any Microchip device: <http://sample.microchip.com>
- **Forum** link provides access to knowledge base and peer help: <http://forum.microchip.com>
- **Buy** link provides locations of Microchip Sales Channel Partners: www.microchip.com/sales

Sales Office Listing

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Atlanta
Tel: 678-957-9614

Austin
Tel: 512-257-3370

Boston
Tel: 774-760-0087

Chandler
Tel: 480-792-7200

Chicago
Tel: 630-285-0071

Cleveland
Tel: 216-447-0464

Dallas
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Fine prints and gigabits of data: on paper

By Julien Happich

PRINTED ELECTRONICS is about reaching the most cost effective way to integrate and mass produce electronic components and systems into very thin flexible substrates.

Often, the idea is to get away from process-intensive hard-silicon designs and adopt well established printing processes such as inkjet or roll-to-roll to apply electronics onto plastic foils or even paper, ready for innovative smart packaging applications.

A lot of printed or flexible electronic components such as sensors, displays, some logic blocks and passive components, or conductors have been demonstrated in research, some are even being commercialized. But for more complex system designs, or simply for cheap and flexible data storage, memory is still a challenge.

A PhD student from the Institute of Photonics and Optoelectronics & Department of Electrical Engineering at the National Taiwan University, Der-Hsien Lien is proposing to convert paper into a truly dual memory medium.

According to his research, a single sheet of paper could combine printed text or graphics as for any conventional reading paper, together with embedded printed electronics memory for more information storage than would normally fit even in very fine prints.

Currently a visiting student at UC Berkeley, Der-Hsien Lien uses inkjet printing to stack a specially formulated insulator material including TiO_2 nanoparticles, between two electrodes, namely silver and a carbon layer. The so-called Resistive Random Access Memory (RRAM) bit obtained for each stack is operated by changing the resistances of the insulator material.

Applying a voltage across the memory dots, one can turn the resistive states on and off for "0" and "1" binary values.

These resistive states and the switching voltage window can be tuned to a few volts based on the insulator material's thickness. With individual dots being tested for endurance, the memory's retention property was proven at temperatures up to 150°C and with mechanical flexures at a bending radius of 10mm.

So how many bits of memory this printing process could yield on a A4 sheet of paper?

At the current printing resolution he is using, with a dot size of circa $50\mu\text{m}$ and a pitch resolution of $25\mu\text{m}$, Der-Hsien Lien estimates that one bit occupies a square of about $100\mu\text{m}$ on each side. That would translate in 10^4 bits/ cm^2 . With that density, a fully printed A4 sheet of paper could hold 6.237×10^6 bits.

With state-of-the art printing resolutions such as super fine inkjet (SIJ) technology and providing that the required specialized inks would be compatible, one could achieve a dot resolution of $1\mu\text{m}$ and nearly the same pitch width, says Der-Hsien.

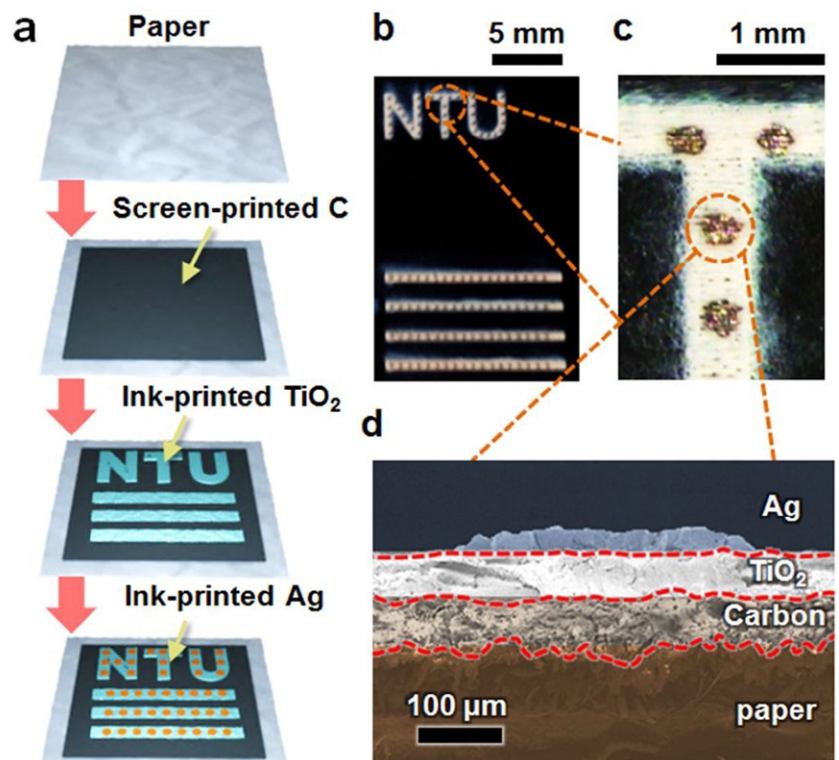
This could increase the density by roughly 2500 times, yield up to several Gbits per sheet of A4 paper or tens of Mbits per square centimeter.

Based on materials and process manufacturing costs, the PhD student figures out that a paper-based RRAM would cost

about 0.0003 cent/bit, versus 3 cent/bit for a fully printed RFID tag (1-bit) fabricated on PET substrate, or versus a 96-bit credit-card-sized ID paper tag at around 0.021 cent/bit.

In future research, Der-Hsien envisages connecting arrays of dots with cross-bar electrodes. Such a memory architecture would allow the researcher to stack memory layers into 3D arrays to further increase density.

Other activities of the lab include the development of memory drivers to design a complete all-printed memory solution. This sort of printed paper memory would combine very well with other printable devices, for example to be integrated with RFID for ticketing.



Fabrication and geometry of paper RRAM: (a) Schematic diagram of the fabrication process for the resistive paper memory device. (b) A close-up photograph showing fine prints and arrays of memory dots. (c) A zoom-in optical image from b. (d) A cross-sectional scanning electron microscopy image of the paper-based memory.

But Der-Hsien also thinks that single dots of memory could well be used as arrays of individually pigmented dots to be read like QR codes. By combining the pigments (dark and light) and their resistive states (high and low), the stored information on such codes could be doubled and secured, he explained EE Times Europe.

A specially designed reader would have to be designed to access the memory dots. Safe and secure disposal of the memory is as simple as shredding or recycling a stripe of paper.

Several patents are pending in Taiwan and several others will be applied for in the US too.

This research will be one of the key highlights of the 2014 Symposia on VLSI Technology and Circuits to take place in Hawaii, June 9-12.

Saving costs with sensors: what secrets do fluid colors tell us?

By Kevin Jensen

SMALLER, FASTER, INTELLIGENT. When looking at the development process of Embedded Color Measurement Systems it is essential to know what the side-parameters are and what one wants to measure. Inline measurement or handheld solution? Color sensors enable multiple ways to uncover the secrets behind various fluid-, oil- or ink-based in various applications. The most important factor however remains: an intelligent measurement concept and system setup.

The secret behind each measurement is to know how to achieve accurate values without drift effects. Color perception is based on three major variables: the Object, the observer and the light. White light is seemingly colorless, but in fact includes all colors of the visible spectrum. As soon as a white beam of light reaches an object only specific values of color is reflected and/or blocked. Only the color perceived will remain. Still, color can be perceived differently, when the main variables or conditions change. While unraveling the secrets of color, these aspects often are obstacles for a technological project. Therefore it is important to evaluate the overall measurement setup before deciding the general technological approach.

Shifting the variables can be beneficial, if these are performed intentional. For example the statistical method of regression analysis allows various application-specific options. This evaluation methods allows to estimate the relationship between variables and draws conclusions based on color or spectral variations. Therefore it is possible to analyze an object or fluid that is outwardly clear or colorless via hyper-spectral procedures. But what can one really detect with True Color XYZ with human eye perception) or Multi-Spectral Sensors (Spectral evaluation)?

For example the German company MAZeT GmbH provides unique sensors with patented JENCOLOR interference filter technology. This special technology allows the sensors to measure at highest

accuracy, without having color drift effects like common absorption filter based sensors. MAZeT's JENCOLOR sensors are long-term stable, temperature resistant and cost-efficient.

More than meets the eye

Glucose, pH or chemicals are examples of the most common measurements in bio analytics, quality management, food processing or the medical industry. This article will demonstrate some sample applications, measurement values and accuracies. For example glucose measurements with color sensors can be performed via the pyranose oxidase method. A test setup based on transmittance and indirect determination utilizing ABTS as a redox indicator for the visual spectral range has been used to perform measurements.

This method allows to measure the fraction of the incident light at a specified wavelength that passes through a sample. Colorless samples have been measured via fluorescence method. This method enables colorless chemical compounds to react with chemicals at certain wavelengths allowing various analysis options. The usage of ABTS as an indicator causes that the measured substances react to a green color range. The glucose test setup was further used to perform glucose measurements of soft drinks. Results ranging from 95+ mg/l for a Coke-like brand and Sprite-like brand, 50+ mg/l for Ice Tea and nearly 40 mg/l for Fruko, a regional soft drink from Turkey – see figure 1.

Even handheld transmission devices are possible. In this case it is common to perform zero-measurements of a sample and add an indicator to a fluid to allow accurate determination options of the sample composition. This kind of method is not solely useful for glucose or pH values, but allow allows various chemical compositions such as: Chlorine, copper, nitrite, phosphate and many others.

Accuracy values for absorption measurements with a pH indicator range from an error array of less than 0.1. If the results of absorption measurements are not accurate enough the results can be improved via the florescence method. Within the test setup it was possible to measure Roda-

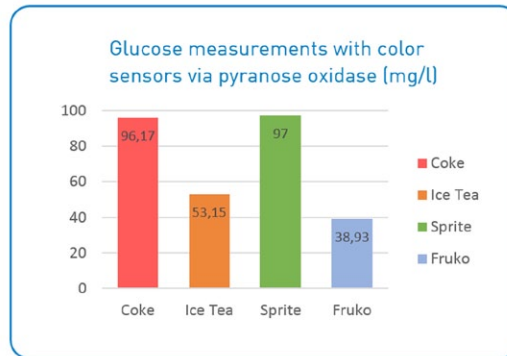


Fig. 1: Soft drink glucose measurements with color sensor.

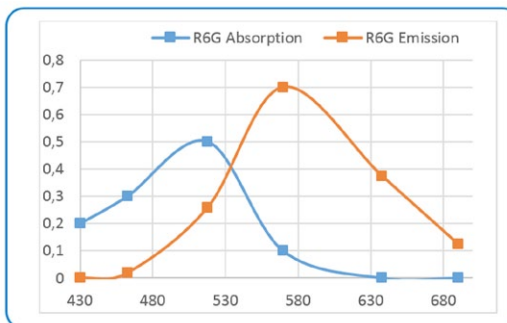


Fig. 2: Quasi-spectrum of Rodamin 6G (Absorption- and emission-based).

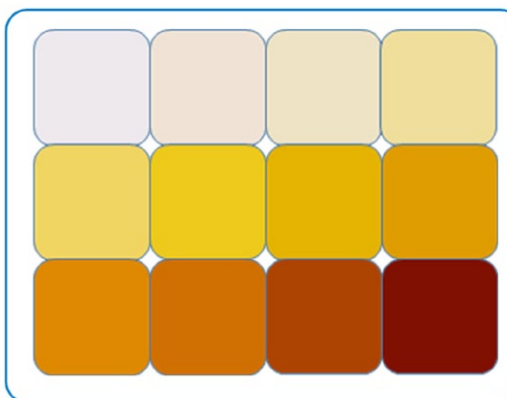


Fig. 3: Illustration of common petroleum based color charts.

Kevin Jensen is Sales Engineer for North America, Canada & Europe at MAZeT – www.mazet.de – He can be reached at kevin.jensen@mazet.de

min 6G – see figure 2 - and Coumarin 1 at an accuracy of 10⁻⁶ Mol/l. At a thickness of 200 µm Toluidin Blue could be detected at a concentration of 10 µMolar.

The importance of color differences in mineral oils and fuels

The international industry strongly regulates fuels or petroleum products via many standards. Color values of fuel or petroleum are used as an indicator for many applications: such as taxation or usage domain regulations. Examples of color scales in this field are the ASTM D1500, Pt-Co or Gardner color scales. They show a progression of color ranging from soft yellow-whitish to dark orange-brown – see figure 3. The standard ASTM D 6045 describes the tristimulus color measurement method ranging from Saybolt to ASTM colors, which color range similar to figure 3. The Saybolt Color scale is used for grading light colored petroleum products including aviation fuels, kerosine, naphthas, white mineral oils or hydrocarbon. Whereas the ASTM color scale is used for darker colored petroleum products. It is a challenging task to measure the difference between Saybolt samples, since the color differences are often hardly visible by the human eye.

Looking at a clever designed test setup it is possible to even detect the finest peaks or color differences. Beyond the measurement setup it is possible to improve the results of liquid measurements or other fluid based applications by means of mathematical algorithms. Therefore spectral data can be used to improve the accuracy and implement complex simulation and detection methods. For example the method of particle swarm optimization combined with the characteristics of JENCOLOR interference filter sensors from MAZeT. The result of this kind of optimization procedures is to achieve accuracies that are able to distinguish between seemingly equal colored liquids. The following image shows measurements that represent the chromaticity coordinates of multiple measured fluid samples in the Saybolt range within the CIE Color Space. The range values are defined by the standard and show how accurate a color detection system needs to be, to meet the given standard – see figure 4.

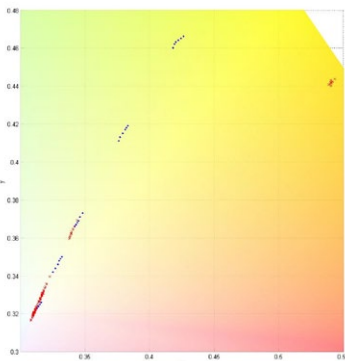


Fig. 4: Tristimulus analysis of Saybolt samples.

Cost saving potential of multi-spectral sensors in the printing industry

Other applications can be found in the printing industry. This field has strong requirements regarding color consistency and standards. An error during the printing process, where the corporate colors change during an inline-process can cost a lot of money. What is supposed to happen? Should the production be stopped or continued? Every misprint is a dollar lost. A special measurement setup for absolute print colors can improve this situation, whereas the in-line color change can be actively measured and referred to the values of a spectrometer. The special JENCOLOR filter technology of MAZeT's sensors allows long-term stable measurements over years without the need of constant recalibration, like known from a spectrometer. An

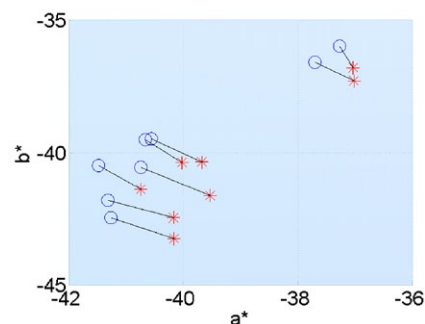


Fig. 5: Cyan print color sample after optimization at a value of $\Delta E_{00} = 0.25$

advantage of multi-spectral sensors is the greater accuracy and the possibility to use spectral approximation methods. If the printing colors are known, the results can be improved via calibration of the specific colors. Therefore it is possible to achieve absolute accuracies of $\Delta E_{00} < 1$ independent of the standard observer and standard light source.

Utilizing a multi-spectral sensor and multi-channel transimpedance amplifier at flexible amplification levels the further measurements took place. A set of Avian Ceram Basic Series was used for target calibration. The goal was it to improve the



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


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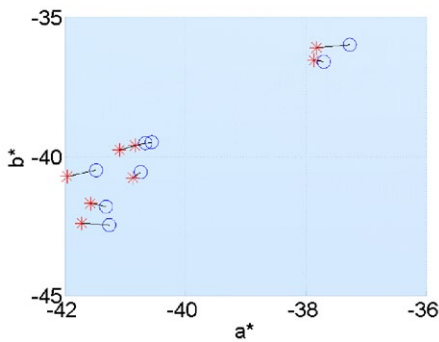


Fig. 6: Cyan print color sample prior to optimization at a value of $\Delta E_{00} = 1.47$

Cyan. The initial values without optimization have been $\Delta E_{00} = 1.47$ – see figures 5 & 6.

Looking at multiple color measurement methods in various fields of applications, it is clear that there are multiple ways to provide accurate and reliable analysis options for many solutions. The long-term stability, high accuracy, and compact size of MAZeT's patented JENCOLOR interference filter technology allows utilization in mobile devices or tight environments.

The most important fact is to know what kind of detector needs to be utilized within the test setup and how the measurement shall be performed. Accuracies and output values

overall accuracy of print color detection based on the specific application setup. A white LED was chosen as standard light source. Via regression equation for spectral approximation it is possible to achieve average accuracies of $\Delta E_{00} = 0.25$ for

in form of color coordinates or the spectral fingerprint define the application-specific outcome of the results and analysis methods. Choosing the right method (like emission, remission or transmission) is essential for an accurate evaluation of different substances or elements. For example fluids react differently than solid objects, reflection or fluorescence require an altered measurement approach.

Furthermore all measurements confirmed the fact that color detection cannot be set equivalent to common physical variables such as voltage, pressure or density. Since the main variables of color change upon the arrangement of the observer, the object and light - it is essential to optimize and calibrate color measurement tasks to the specific application. Defined reference points or targets need to be set to compare the specific ΔE_{00} of chromaticity coordinates within particular color spaces – see figure 7. All measurements demonstrated an accuracy increase through usage of intelligent optimization processes or algorithms.

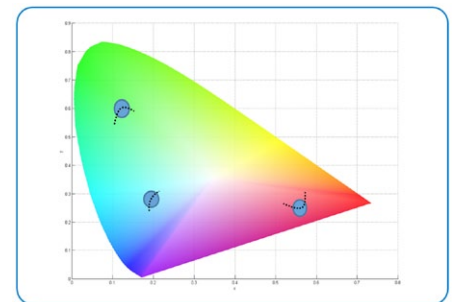


Fig. 7: Samples measurements and targets in the CIE1931 color space.

Polarised light measures rotation angle

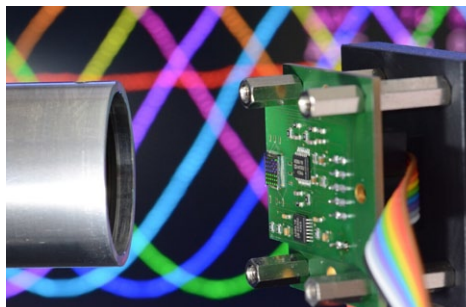
By Christoph Hammerschmidt

ROTATION ANGLE SENSORS help users determining the position of a moving body relative to an axis. Such sensors are used in thousands of applications in mechatronics, machine building, aviation and the automotive industry. A new type of rotation angle sensor combines high accuracy with flexible handling plus high adaptability to individual measurement tasks.

In factories, conveyor belts transport production goods from one process station to the next one. For the handover from one conveyor to the next one to work it is necessary that the conveyors belts are positioned very exactly at a certain point. To determine the exact relative position of these belts, a rotation angle sensor is required. Also in automotive design, rotational angle sensors are indispensable - for instance in closed loop control systems that control the rotational speed of the drive shaft.

Currently there are basically two types of rotation angle sensors available at the market: magnetic and optical sensors. Magnetic sensors offer very high robustness and resilience even in dirty environments. However, they are less accurate than optical sensors which in turn require a very exact installation. For this reason, optical sensors typically are difficult to handle and are not overly versatile.

A new rotation angle sensor type, developed by the Fraunhofer Institute for Integrated Circuits (IIS), combines the strengths of both techniques. While it is an optical measurement system, it applies different functional principles than available products:



The Fraunhofer researchers utilised the polarisation effect of light to measure the angle, explains section manager Norbert Weber. The researchers attached a polarising film to the object under test (e.g. a shaft) and directed a light beam to it. Only light that oscillates in a certain direction passes the film; if the shaft rotates, the polarisation vector rotates with it. This effect can be used for rotational direction indication.

The reader module, implemented as an integrated circuit, is placed within the light beam that passes through the polariser. The surface of the chip bears a matrix of micro structures shaped as a grid. If the polarised light hits the grid the amount of light diffraction allows a conclusion to the angular position of the shaft. These grids - at least three are required - are attached to the sensor within the normal CMOS production process, at no significant additional effort. "Depending on the measurement task, we can add more grids to adapt the sensor to specific customer requirements or to increase measurement accuracy", Weber says.

With this design, the Fraunhofer researchers do not reach the exactness of optical sensors to 100%, but this array is much more robust and can be positioned flexibly. "The sensor does not even need to be placed exactly within the optical axis", Weber explains. "All that counts is that it is hit by the light beam". Even imbalances of the shaft do not affect measurement accuracy as long as the sensor is within the beam.

Presence detection sensor overrides LED lighting controls

Harvard Engineering has launched a new device called a SensorNode that enables presence detection for the company's LeafNut monitoring and control system for outdoor and street lighting. The SensorNode automatically overrides any scheduled dimming profiles on the system, returning the lights to full power for a specified period of time. The device operates via connection with an external presence detection unit. Following recent concerns



about turning lights off at night, the SensorNode allows local authorities to save energy through scheduled dimming, and maintain the safety of residents with increased light levels when required. LeafNut has been installed by over 100 local authorities across the world and is helping to save up to £46 per street light per year in energy costs, and up to 100kg of carbon per street light per year.

Harvard Engineering
www.harvardeng.com

32 analog inputs and 20-Bit A/D at 1MHz over USB

Data Translation's DT9844 USB data acquisition module comes with 32 analog inputs, a 1 MHz A/D converter and 20-bit A/D resolution. Even at the maximum overall sampling rate



of 640 kHz, the new module maintains system accuracy and minimizes noise and crosstalk. In addition to the 32SE or 16DI analog inputs, the new module also features 32 digital I/O channels and five counter/timers. The high accuracy of the new module is achieved by a wide analog bandwidth of the input subsystem, a high-speed multiplexer and a powerful A/D converter. The $\pm 500V$ tri-sectional galvanic isolation between the analog inputs, the digital I/O channels and the USB interface ensures ultra-accurate measurements. All analog channels can be run simultaneously and synchronously with the digital I/O channels. The digital outputs can also be used for synchronizing external devices.

Data Translation
www.datatranslation.eu

Ambient light, color and proximity sensing

The ams TMD3782 digital sensor is optimized for use in mobile devices, the 3.9x2.4x1.4mm module combines ambient light, color and proximity sensing. The sensor operates behind dark glass to drive intelligent display adaption for color and brightness. The TMD3782 on-chip filters minimize the effects of ultra-violet and IR light to improve the overall accuracy of light and color sensing.

ams
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Data analytics for raw internet-enabled industrial data

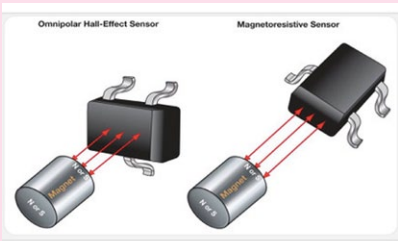
An integrated data collection and analytics appliance, Proficy Historian IPC from GE Intelligent Platforms uses the raw data of internet-connected industrial machines to bring out actionable information. The IPC platform enables numerous data collection tags on a rugged form factor small enough to install with machine controls in harsh environments. Proficy Historian's patented compression algorithms enable greater volumes of data to be stored on the IPC's hard drive than competitive data historians, without sacrificing the data's integrity, claims the manufacturer. The solution integrates a set of proven products— the PACSystems RXi XP, the latest of GE Intelligent Platforms high performance IPCs, and Proficy Historian 5.5 – into a purpose-built unit. The appliance has capacity for 100 to 5000 data collection points on a single compact device but multiple IPCs can be connected to expand that capacity via a wide area network (WAN).



GE
www.ge.com

Magneto-resistive sensors require nanoamps to replace reed switches

Honeywell Sensors and Control, a division of Honeywell International Inc. (Morristown, New Jersey), has introduced a family of ICs comprising what it claims is the lowest power



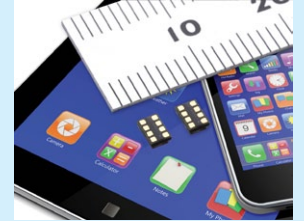
and highest sensitivity anisotropic magneto-resistive sensors. The sensors provide a binary output - engaged or not engaged - and can replace reed switches in numerous applications and with

current draw in the range 300- to 400-nanoamps the sensors are suitable for battery-operated equipment, the company claimed. The Nanopower family includes two components both housed in a SOT-23 package. The SM351LT has a sensitivity of 7 gauss and 11 gauss maximum with a typical current draw of 360nA. The SM353LT is sensitive to 14 gauss and has a maximum operational tolerance of 20 gauss with a lower typical current draw of 310nA. Potential applications are vast include counting, metering and flow sensing, anti-tamper switches, door and window closed sensors and position sensing in industrial equipment. Omnipolarity allows the sensor to be activated by either a north or south pole while the push-pull CMOS output does not require external resistors. The sensitivity of the sensors means that they can be sited further away from a magnet than would be the case with a Hall Effect sensor and can be used with ferrite magnets, not requiring stronger rare-earth enriched magnetics, said James McKenna, product director for sensors in Europe. The devices work from a voltage supply of 1.65V to 5.5V and across a temperature range of -40 to 85 degrees C. The devices are smaller and more durable and reliable than reed switches, at the same sensitivity and essentially the same cost.

Honeywell Sensors and Control
www.honeywell.com

Combined proximity and illuminance sensor simplifies HMI design

Presented as the smallest combined proximity and illuminance sensor, the surface-mount LT-1PA01 device measures 3.05x2.10x1.10 mm and integrates both an optical proximity sensor and an illuminance sensor. The proximity sensor uses a photoreceptor to measure the distance to an object based on the amount of returned light. Another photoreceptor is used to detect the level of ambient brightness. Such sensors are widely used in smartphones to darken the screen when the phone is near the user's face during a call or to increase the brightness of the screen's backlight when used outdoor. The device has an extremely low power profile, consuming only 80 μ A during proximity sensing. Illuminance sensing angle is ± 45 degrees at 50% and sensing distance is up to 70 mm with grey card. Operating voltage is +3.3 VDC. Communication with the host processor is via I2C serial communications.



Murata Europe
www.murata.eu

PCIe DAQ cards offer high resolution

Swiss company Elsys Instruments, maker of custom and standard fast, high-precision data acquisition systems, has expanded its family of LAN controlled transient recorders with a cost-effective series of high resolution PCIe data acquisition cards. TPCE-LE PCIe data acquisition waveform digitising products are suitable where the acquisition of high speed, high resolution and high precision waveform data is required.



Features include advanced trigger modes, continuous data acquisition mode, single ended and differential inputs, digital input lines and ICP coupling for powering piezo sensors. They enable the development of scalable systems that can be expanded to meet growing data acquisition needs. TranAX-LE operating and analysis software comes with each board, as well as a LabVIEW Instrument driver, C++/C# and IVI scope class driver. As with Elsys' existing TPCX and TPCE platforms, the TPCE-LE modules can be housed in any existing TraNET system:

- 1 TraNET FE transient recorders that hold four to 32 single-ended channels or two to 16 differential channels;
- 2 TraNET EPC industrial computer frame with 16 slots for a total of 64 channels;
- 3 TraNET PPC ruggedized portable computer system with six slots for a total of 24 channels.

All Elsys recorders feature input channels with the ability to be individually triggered. For example, four full trigger circuits are available on a four-channel recorder to obtain logic triggering such as "AND" and "OR". Synchronisation can be established with many associated channels. Advanced trigger modes include slew rate, pulse width, pulse pause, period, missing event, window-in and window-out as well as the usual edge pos/neg triggering with trigger hysteresis values set by the user.

Elsys
www.elsys-instruments.com

Sonar drives gesture recognition startup

Startup Chirp Microsystems Inc. (Albany, Calif.) was founded late in 2013 to commercialize research into the use of a piezoelectric ultrasound transducer array to capture depth



information and gesture recognition. The company is led by co-founder and CEO Michelle Meng-Hsuing Kiung, a former executive with the Micron Technology Inc. (Boise, Idaho) imaging group, now Aptina Imaging Inc. The company claims on its website that the use

of sound waves to locate moving objects is more energy efficient than trying to recognize them from an image sensor. The company compares a camera consuming 1W to record video while the Chirp transducer consumes 400-microwatts to perform 3D range finding. The micro-machined ultrasound transducer and its companion ASIC work by driving an array of silicon membranes in the MEMS device to emit an ultrasonic wave from the device and then uses the membranes in a microphone mode – to detect the return signal. The use of time-of-flight information from the array of sensors allows calculation of the distance and direction and the build-up a 3D depth map in front of the sensor.

Chirp Microsystems Inc.

www.chirpmicro.com

More ears for the NSA: GSM monitoring receiver

The latest member of Pentek's Cobalt family, Model 52663 is a full spectrum GSM channelizer 3U VPX module running a highly-optimized IP core for the Xilinx Virtex-6 FPGA.



The unit is fit for mobile monitoring systems that must capture some or all of the 1100 uplink and downlink signals in both upper and lower GSM bands. This full global system for mobile communications spectrum monitoring targets homeland security, government and military applications. Designed for GSM

phone signal interception, Model 52663 accepts four analog inputs from an external analog RF tuner, such as the Pentek Model 8111, where the GSM RF bands are down converted to an IF frequency. These IF signals are then digitized by four A/D converters and routed to four channelizer banks, which perform digital downconversion of all GSM channels to baseband. Two of the banks handle 175 channels for the lower GSM transmit/receive bands and two banks handle 375 channels for the upper bands. The DDC channels within each bank are equally spaced at 200 kHz. Each DDC output is re-sampled to a 4x symbol rate of 1.08333 MHz to simplify symbol recovery. Every four DC outputs are combined into a frequency-division "superchannel" that allows transmission of all 1100 channels across the PCIe Gen 2 x8 interface.

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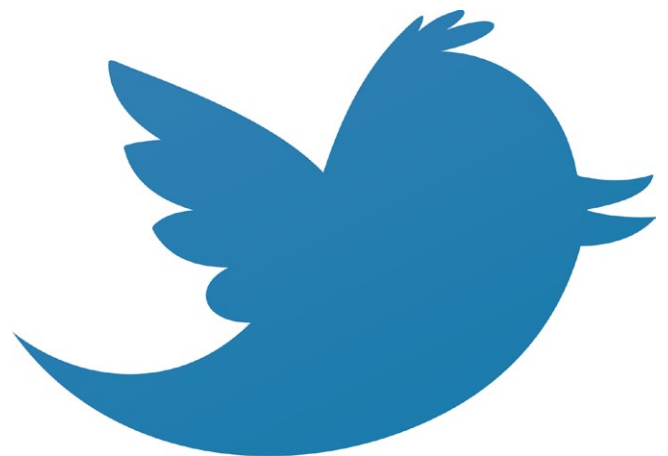
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How to guarantee safe air transportation of lithium batteries

By Benno Diemer

ON BOARD AN AEROPLANE, on the ground at an airport or inside a train, the consequences of an explosion or uncontrolled fire can be devastating. As a dense and combustible source of energy, a lithium battery would be capable of causing a blaze if it were misused, and its protection and safety circuits were disabled or faulty.

An electrical fire caused by a battery cannot be doused with the small amounts of water available on board an aircraft, and requires specialist fire extinguishers. The potential for damage and loss of life if a battery catches fire on board an aircraft is evident.

In fact, lithium batteries have been implicated in a small number of fires on board aeroplanes in the years up to 2013. This has resulted in a re-drawing of the regulations governing the transportation of lithium batteries on aircraft, which now require compliance with stricter instructions on the handling, preparation, packaging and labelling of lithium cells and batteries carried on-board aircraft. (Similar regulations apply to other modes of transport, such as rail, road and sea transport.)

But this raises a number of questions for OEMs which transport lithium batteries as discrete parts, or equipment containing lithium batteries:

How can OEMs ensure that they are in compliance with the many, complex regulations governing the airborne transportation of lithium batteries?

And is compliance on its own sufficient to guarantee safe transportation?

The function of the air transport regulations

The latest version of the Lithium Battery Guidance Document from IATA (the International Air Transport Association, the trade association for the world's airlines) is based on the provisions of two separate regulations:

The 2013-2014 edition of the ICAO (International Civil Aviation Organization) Technical Instruction for the Safe Transport of Dangerous Goods by Air

The 55th edition of the IATA Dangerous Goods Regulations (DGR)

The rules reflect the known behaviour of lithium cells and batteries. The relevant failure mode for batteries in transportation (and therefore not in use) is normally a short circuit: this can cause a dangerous over-current event, resulting in over-heating which escalates until a cell or battery explodes and/or catches fire.

One cause of short circuits is the ingress of dust or other particles inside a cell during the production process, impairing the separator layer between the anode and cathode. Reputable,

brand-name cell manufacturers and battery manufacturers make and use known-good cells that keep the levels of contaminants to extremely low, safe levels.

As of 1 January 2013, the DGR classification criteria for lithium batteries stipulate that cells and batteries must be manufactured under a quality management programme. Such a programme will provide for the production of high-quality cells posing an extremely low risk of dangerous internal contamination.

A battery containing high-quality cells is still theoretically at risk of a short circuit caused by the making of an electrical connection between the positive and negative terminals on the case of the battery; or, in the case of a battery embedded in equipment, its accidental activation. This risk underlies most of the provisions with which OEMs must be concerned.

Broadly, the regulations call for batteries to be packaged in such a way that insulation between the battery's terminals is maintained from the battery's production site to its final destination (in the case of discrete battery packs). This includes providing protection against the risk of contact with conductive materials in the same packaging that could lead to a short circuit. In the case of equipment containing an embedded battery, the packaging must prevent accidental activation, for instance by insulating the battery's terminals from the terminals on the equipment side.

In detail, the regulations require a discrete battery to be packed in a container, such as a blister pack, which completely encloses it, so that it cannot be directly handled in transit. This pack must then be contained in a strong and robust outer packaging which minimises the risk of accidental damage, and of the inner package shifting under the influence of shock or vibration

Equipment containing a lithium battery pack must be packed in strong and robust packaging that prevents damage to and movement of the battery (unless the equipment itself achieves this end).

The battery, or equipment containing a battery, must be handled in production by operators trained in the requirements of the DGR, who can ensure that each unit is packed in accordance with the provisions of the DGR.

The packaging and packing process employed must be tested to verify that it satisfies the requirements of the DGR. The outer package must be labelled clearly to show that the package contains lithium batteries, that it must be handled with care (see Figure 1), that the contents are flammable, that special measures must be taken if the package is damaged, and providing a telephone number to call for information about the package (see Figure 2).

Implementing these rules ensures that the battery leaves the factory inactive, and remains so throughout its journey. Even



Fig. 1: approved label styles for lithium metal (primary) and lithium-ion batteries

Benno Diemer is Risk Prevention Manager at VARTA Microbattery - www.varta-microbattery.com

though it will be (in the case of a lithium primary battery) fully charged, these rules ensure there is a minimal risk of any discharge occurring, except the normal, minuscule and safe levels of leakage current.

This is a broad description of the function of the regulations. The detail of the regulations themselves runs to many hundreds of pages. Numerous variations in the requirements for packaging, handling and labelling apply, depending on the type, weight, size and capacity of the battery, the end equipment it is to be carried in (if applicable) and the shipping method. In addition, exceptions apply to low-capacity batteries (<100Wh batteries or <20Wh cells), and to low quantities of batteries, such as prototypes used in pre-production development or testing programmes.

So how can an OEM operate with confidence that it is complying with all the relevant regulations, and that it is able to guarantee the safety of its equipment in transit?

Clearly these questions are of the highest importance to commercial manufacturers: the cost of liability in the event of proven negligence, and the risk to a manufacturer's brand, are incalculable. However small the risk, it must be eliminated.

Proven transportation techniques

Fortunately, experience is on the manufacturer's side. General industry experience shows that implementation of the IATA and ICAO regulations has achieved its aim: the number of safety incidents reported in the air or on the ground attributable to lithium batteries since the current rules were put in place has fallen dramatically.

The particular experience of reputable battery manufacturers such as VARTA Microbattery is also helpful. The company itself continually ships batteries by air and by other modes of transport, and so has great experience of the procedures for complying with the DGR. OEM customers can draw on this experience: VARTA Microbattery, for instance, is often asked by customers to provide advice on whether new packaging complies with the DGR.

Beyond these general points, however, there are two general practices that OEMs should follow in order to ensure they comply with the DGR, and eliminate their liability to the risk of unsafe transportation of lithium batteries.

Take a keen interest in your cell and battery supplier's products, quality procedures and quality standards. As described above, defective cell-production processes can give rise to a risk of short circuits.

A reputable battery pack manufacturer will also ensure that the pack is protected by a multi-level protection scheme, which will include software-controlled over-current, over-temperature, over-voltage and under-voltage shut-down mechanisms, as well as an active and a passive fuse for hardware over-current shut-down protection. These mechanisms guarantee the safe operation of the battery in transit, even if it is activated. (The packaging design will normally prevent activation.)

It is clear, however, that a risk arises from the use by consumers of replacement 'counterfeit' batteries not supplied by the original manufacturer. These cheap batteries mimic the form factor of the original, but often lack adequate fail-safe protection mechanisms to ensure safe transportation and operation.

The DGR applies to batteries carried on-board by passengers as well as to cargo shipped by manufacturers. It is an interesting challenge for airlines to devise a method to enforce compliance with the DGR by their own passengers.

This risk, of course, does not apply to OEMs transporting batteries in their own equipment. Battery manufacturers can, however, implement authentication technology which renders consumers' use of counterfeit batteries impossible.

Give responsibility for DGR compliance to one person at your company, and give them the power to fulfil their responsibility.

The rules governing the transportation of dangerous goods are long, complex and highly detailed. It is not sensible to expect a product, marketing or production manager to know the rules governing the transportation of the equipment they design or manufacture. DGR compliance is a specialised responsibility in its own right.

No reputable manufacturer will wish to flout the rules. And in fact one of the most common ways in which manufacturers inadvertently fail to comply with the DGR is when they fail to realise that the product they are shipping even contains dangerous goods!

So the first responsibility of the staff member in charge of DGR compliance is to perform an audit of the equipment that the company ships. Any product that contains a lithium cell or lithium battery – no matter how small – must be subject to the company's DGR compliance programme, even if implementation of the programme reveals it to be exempt from some requirements of the DGR.

In short, the regulations for the transportation of lithium batteries are well designed, and proven to be successful in practice. The three steps required to guarantee safe carriage of lithium batteries are easy to list: use only reputable lithium cell and lithium battery brands; appoint a single staff member with overall responsibility for compliance with the DGR; comply with the DGR, and require your compliance to be verified at executive level in the company.

While it is harder to implement these steps than to describe them, a battery supplier such as VARTA Microbattery can help by providing guidance, advice and documentation. OEMs need not be alone in their efforts to comply with the DGR.



Fig. 2: UL and other internationally-recognised standards provide for the verification of a lithium-ion battery's quality

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Low cost isoSPI coupling circuitry for high voltage high capacity battery systems

By Jon Munson

THE ISOSPI FEATURE built into the LTC6804 battery stack monitor, when combined with an LTC6820 isoSPI communications interface, enables safe and robust information transfer across a high voltage barrier. isoSPI is particularly useful in energy storage systems that produce hundreds of volts via series-connected cells, which require full dielectric isolation to minimize hazards to personnel.

In a typical isoSPI application - see figure - pulse transformers provide the dielectric isolation and reject common-mode interference that can be impressed on the wiring. The isoSPI function operates with readily available and inexpensive Ethernet LAN magnetics, which typically include a common-mode-choke section to improve common-mode line noise, along with the usual 100Ω line termination resistors and common-mode decoupling capacitors.

Ordinary signal transformers, including Ethernet and gate-driver types, are wound with enameled wire that can have pin-hole sized insulation defects, which expose the copper to the atmosphere, inherently limiting the inter-winding bias that for which such transformers are certified. Such units are tested in production with high potential (called hi-pot screening) to identify gross insulation problems, typically with 1.5kV. This is established as a safe design margin for long-term bias of 60V, since the tiny corrosion sites tend to require more than 60V to form conductive paths between windings.

Problem: high voltage = high cost

For battery-stack voltages in the 400V range, good design practice is to specify transformers with reinforced (double) insulation and hi-pot testing to 3750V or higher. Such transformers are difficult to find as small parts due to the creepage (surface distance) and clearance (air spacing) dimensions required, and they are relatively expensive. isoSPI is applied in battery systems up to 1kV, which requires transformers with hi-pot testing to 5kV for conservative design margin. At this level, isolation components can become bulky, costly, and compromise pulse fidelity.

Solution: divide and conquer

One alternative to using reinforced transformers is to separate the bias requirement from the magnetics by moving the extra insulation to coupling capacitors instead. While capacitors alone could provide a seemingly complete isolation option, they offer neither common-mode rejection nor the shock-resistant isolation characteristics that transformers offer, so an L-C approach is actually optimal. In this way capacitors charge to the nominal DC bias and leave the transformer to handle transients, for which even ordinary units are well suited.

The coupling capacitors are biased by high value resistors, generally tied to the transformer center-tap connection, as shown in figure 2. As a bonus, if the DC current of the biasing resistors is monitored, then any dielectric breakdown becomes

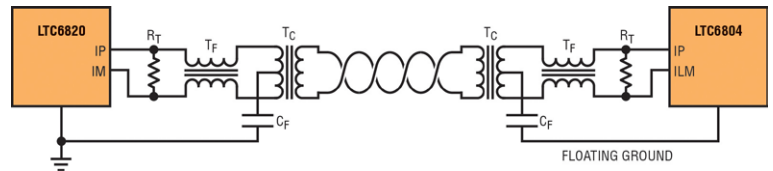


Fig. 1: Generalized isoSPI point-to-point link.

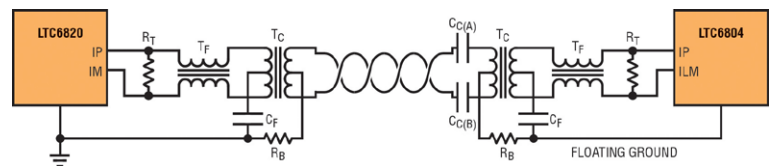


Fig. 2: AC-coupled isoSPI point-to-point link for increased voltages.

a detectable fault. The resistance is chosen to be a high value, like 10MΩ, so that fault currents are within the fine wire rating of the transformers and the shock hazard to personnel is minimal.

Eliminating the high voltage requirement from the transformer magnetic design enables a number of relatively low cost options. One is to simply use appropriately approved Ethernet transformers. Another is to use other off-the-shelf low profile magnetics to reduce component height and part mass (reducing solder fatigue issues). These can be installed via surface-mount automated assembly

methods like any other part, reducing production costs. A good candidate with these features is the discrete common-mode-choke (CMC), a transformer structure that is ordinarily used as a filtering element. Such parts are available up to 100μH and carry approvals for use with automotive systems, making them desirable for isoSPI configurations as well.

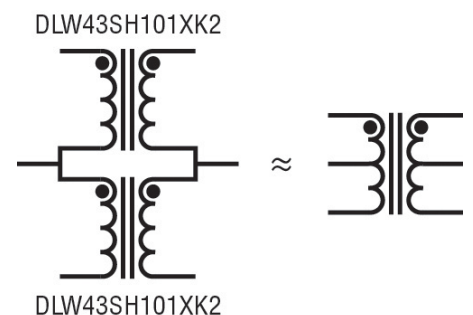


Fig. 3: Using two common-mode-chokes as a center-tapped isoSPI transformer.

Suitable CMCs are inexpensive. They can be quickly and easily produced as a machine-wound wire pair on a chip-sized ferrite form. Although isoSPI designs require somewhat higher inductance to effectively pass the longer pulse waveforms, adequate inductance can be achieved by using two of the chokes with windings in series to produce 200μH. This has the additional benefit of forming virtual center-tap connections, which are useful for common-mode biasing and decoupling functions.

Figure 3 shows an equivalent transformer model realized with two CMCs. The chokes indicated have an 1812 SMT footprint and bifilar windings (wires paired in construction), so primary and secondary are intimately matched—minimizing the leakage inductance and thus preserving high frequency performance.

Jon Munson is Applications Engineer at Linear Technology Corp. - www.linear.com

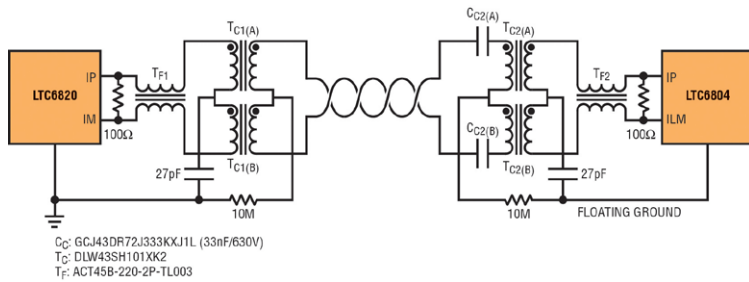


Fig. 4: Complete high voltage isoSPI point-to-point link.

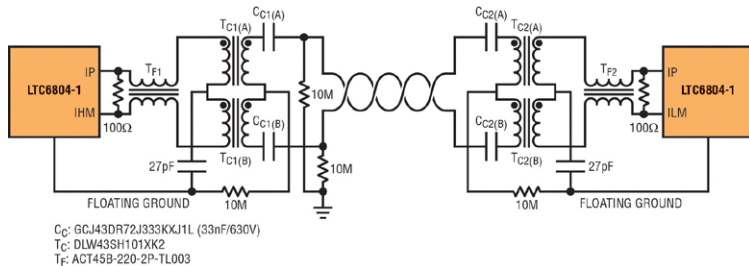


Fig. 5: High voltage daisy-chain isoSPI link with isolated wiring.

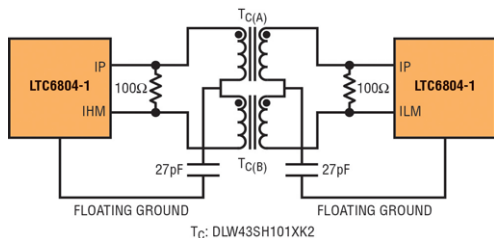


Fig. 6: Daisy-chain isoSPI link for same-board interconnections.

Types with physically separated windings have poor pulse fidelity due to excessive leakage inductance. The units shown have a 50V DC continuous rating.

Complete the picture

Figure 4 shows the complete circuit when using the L-C solution with CMCs as the transformers. Since the usual isoSPI application includes beneficial CMC filtering sections (integrated in the case of standard LAN parts), this circuit includes a recommended discrete part to retain that function. The coupling capacitors are high quality 10nF–33nF parts with an 1812 footprint (630V or 1kV rating). Here, we assume that the LTC6820 is operating at chassis ground potential, so that biasing of the twisted pair is at a safe level.

In situations where both ends of the pair are at floating potentials, as in links between daisy-chained LTC6804-1 modules, then capacitors can be used at both ends of the link and the

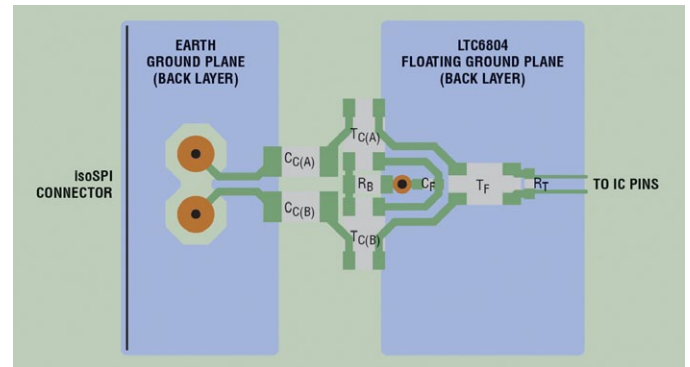


Fig. 7: Suggested printed-circuit layout for high voltage performance at an isoSPI interface.

pair itself can be biased to “earth” potential with high value resistors to each line as shown in Figure 5. Since the capacitors are in series in this situation, at least 22nF is recommended (33nF/630V type shown).

Links between daisy-chained LTC6804-1s on the same board do not need any capacitor couplings since the potential is ordinarily < 50V, usually requiring only a single transformer section as well (see figure 6) since the noise ingress without a cable is far smaller.

High voltage layout

The printed circuit layout should include wide isolation spacing across the main dielectric barrier, namely, the capacitors. Figure 7 shows a placement example that provides good high voltage performance, with the blue regions representing frame ground (left side, with twisted-pair connector) and IC common (right side).

Note that the transformers must withstand HV transient potentials, so clearance is maintained there as well by using a 1206 size-biasing resistor. The HF decoupling capacitor and impedance termination resistor can be small parts (0602 size depicted).

Another good practice to avoid leakage current across the HV barrier is to suppress soldermask in the area of the HV components (parts over the “gap” between grounds). This facilitates effective rinsing of flux residue under the parts, and avoids moisture retention in the porous soldermask layer.

Special considerations for an isoSPI bus

The previous circuits apply to point-to-point isoSPI links, but one of the important cases for providing a high voltage solution is the bus-connected addressable LTC6804-2 with the twisted-

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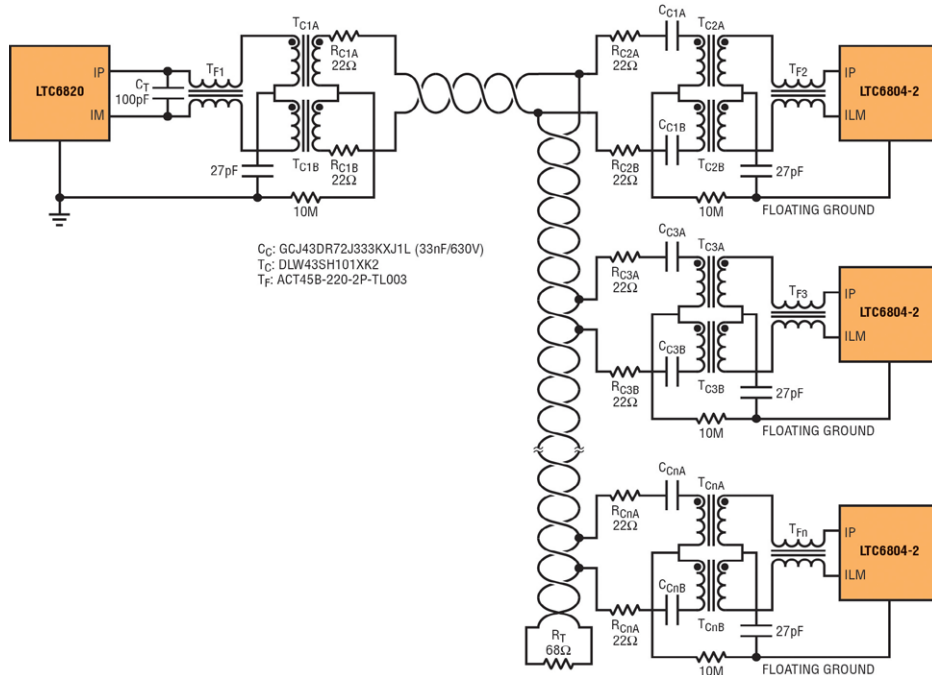


Fig. 8: Complete high voltage isoSPI bus with echo control.

any of the LTC6804-2s). 22Ω coupling resistors (RC) are used for all bus connections to decouple stray capacitive loading.

These are shown in the circuit of figure 8, which again assumes the LTC6820 is operating at a safe “earth” potential. The modified waveforms are band-limited to control distortion from reflections, so the received pulses at the IC pins appear more rounded as in figure 9, but the isoSPI pulse discriminator circuit works fine with this filtered shaping and supports a full sixteen address bus. Depending on actual losses encountered in a given system, it may be necessary to lower the pulse-detection thresholds for optimal operation (configure thresholds to be 40%–50% of the differential signal peak). Note that for networks of five or less addresses, the reflections are generally not a significant problem, so standard resistive end-terminations can be retained (namely 100Ω at the CTERM and RTERM positions of Figure 8, with the RCs omitted).

pair link passing through each “tap” connection, as shown in figure 8. The bus application places a high voltage requirement on every transformer since the same twisted-pair potential must interface with any voltage on the floating cell-stack.

The use of the CMC and AC-coupling capacitors for added insulation is the same as previously described, but we suggest slightly different coupling circuitry to damp the multitude of reflections and provide a consistent wave shape for communicating devices irrespective of their physical position in the network. There are three differences:

The LTC6820 termination is changed to a 100pF capacitor (CT).

Far-end termination is only applied to the live bus (RT) and set to 68Ω (no termination at

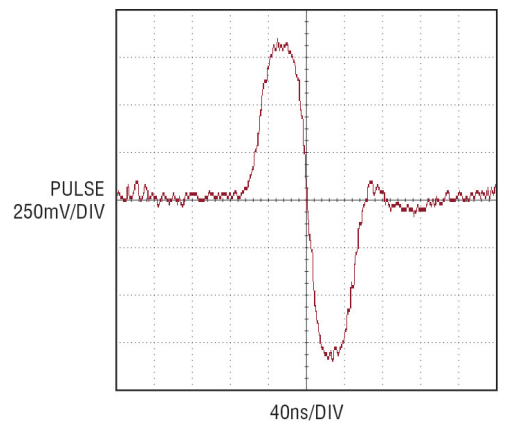


Fig. 9: Modified pulse shaping for echo control in isoSPI bus applications.

Dual carbon battery charges 20x faster than lithium-ion batteries

By Paul Buckley

JAPANESE START-UP POWER JAPAN PLUS has launched a new battery technology that claims to offer a more sustainable, safer, longer-lasting and cost-effective battery technology with an energy density comparable to a lithium ion battery.

The Ryden dual carbon battery makes use of novel chemistry that sees both the anode and the cathode made of carbon. Made of naturally grown organic cotton, the company’s Carbon Complex is claimed to offer novel properties not seen in other carbon materials. By controlling the size of the carbon crystals during production, Power Japan Plus can engineer the Carbon Complex for a variety of high performance applications.

The Ryden battery is said to balance a breadth of consumer demands previously unattainable by single battery chemistry, including performance, cost, reliability, safety and sustainability. Energy dense the Ryden battery claims to charge 20 times faster than lithium ion batteries and is also more powerful than other advanced batteries, operating above four volts.

The new battery is capable of slotting directly into existing manufacturing processes, requiring no change to existing man-

ufacturing lines. Even more, the battery allows for consolidation of the supply @chain, with only one active material - carbon. Additionally, the manufacture of the Ryden battery would not be subject to supply disruption or price spikes from rare metals, rare earth or heavy metals. Rated for more than 3,000 charge/discharge cycles, the battery eliminates the unstable active material used in other high performance batteries, greatly reducing fire and explosion hazard. Even more, the battery experiences minimal thermal change during operation, eliminating the threat of a thermal runaway. It can be 100 percent charged and discharged with no damage to the battery.

The company is testing the battery with its organic Carbon Complex material, working towards a production with all organic carbon in the future. Power Japan Plus will begin benchmark production of 18650 Ryden cells later in 2014 at its facility in Okinawa, Japan. The facility will allow the company to meet demand for specialty energy storage markets such as medical devices and satellites. For larger demand industries, such as electric vehicles, Power Japan Plus will operate under a licensing business model.



Battery electrode material mystery is visualized for first time

By Paul Buckley

A MIT-LED TEAM of researchers has produced the first detailed visualization - down to the level of individual atoms - of exactly how sodium manganese dioxide, a promising electrode used in rechargeable batteries, behaves during charging and discharging. The visualization discovery helps to elucidate an exotic molecular state that may help a greater understanding of superconductivity. The findings are reported in the journal Nature Materials, in a paper by MIT researcher Xin Li, professors Young Lee and Gerbrand Ceder, also of MIT, and 12 others.

The phenomenon the team investigated - known as the cooperative Jahn-Teller effect - "is a basic piece of physics that has been well-known historically", explained Ceder, the R.P. Simmons Professor of Materials Science and Engineering. The effect

describes how the positions of atoms in certain compounds can be slightly distorted, changing the materials electrical and magnetic properties.

It is associated with a lot of interesting phenomena, said Ceder and enables a better understanding that could be useful both in advancing our knowledge of physics and in potential applications, from improved batteries to new kinds of electronics.

While the Jahn-Teller phenomenon is well-known, Ceder says it is a bit unusual to see it in battery compounds such as the sodium manganese dioxide now under investigation as a possible lower-cost substitute for the lithium-based electrodes in lithium-ion batteries.

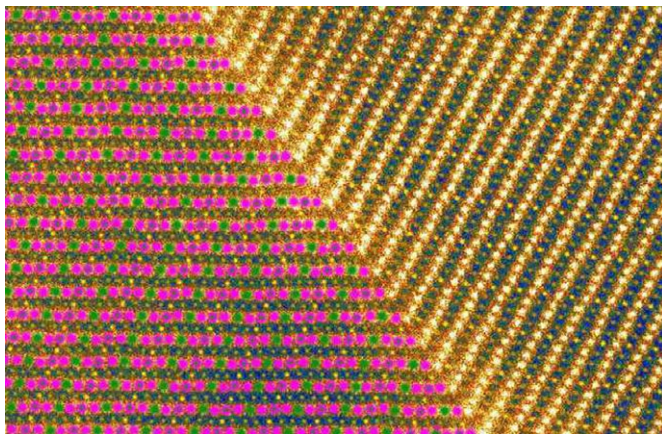
Such rechargeable batteries work when an electrical current pulls ions out of an electrode during charging, then returns them to the electrode as the battery is used. The arrangement of atoms within the material is very ordered, and normally the ordering is driven by fairly standard physics, explained Ceder. But in this material, the order is completely driven by the Jahn-Teller effect.

Understanding how that difference affects charging and discharging could be important in guiding teams around the world who are seeking to improve the performance of such batteries.

The team combined density functional theory with technologies including electron diffraction; synchrotron X-ray diffraction; neutron diffraction; and aberration-corrected atomic-resolution scanning microscopy for direct visualization. Using these methods, the researchers showed that the material produces a 'superstructure' governed by the Jahn-Teller effect; at low temperatures, it produces a kind of 'magnetic stripe sandwich', with alternating stripes of ferrimagnetic and antiferromagnetic atomic chains.

This is fundamental work, said Li, to determine any intrinsic capacity limits to sodium manganese dioxide - such as how much charge it can hold, or how many times it can go through the charge-discharge cycle without degradation.

The ultimate goal is to find out how [to] make a higher-capacity sodium-ion battery electrode. In addition to possible battery applications, the work led to the finding that sodium manganese dioxide forms bands of magnetic domains at temperatures of 60 kelvins or less. The finding, Li said, may be important to the emerging field of spin electronics, where the spin states of electrons, rather than their electrical charges, carry and store information.



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Fiber supercapacitor aims to power wearable devices

Paul Buckley

SCIENTISTS AT NANYANG Technological University (NTU) in Singapore, Tsinghua University in China, and Case Western Reserve University in the USA claim to have developed a fiber supercapacitor that can be woven into clothing and power wearable medical monitors and communications.

The device packs an interconnected network of graphene and carbon nanotubes so tightly that it stores energy comparable to some thin-film lithium batteries.

The product's developers believe the device's volumetric energy density is the highest reported for carbon-based microscale supercapacitors to date - 6.3 microwatt hours per cubic millimeter.

The device also maintains the advantage of charging and releasing energy much faster than a battery. The fiber-structured hybrid materials offer accessible surface areas and are highly conductive.

The researchers have developed a way to continuously produce the flexible fiber, enabling them to scale up production for a variety of uses. To date, they've made 50-meter long fibers, and see no limits on length.

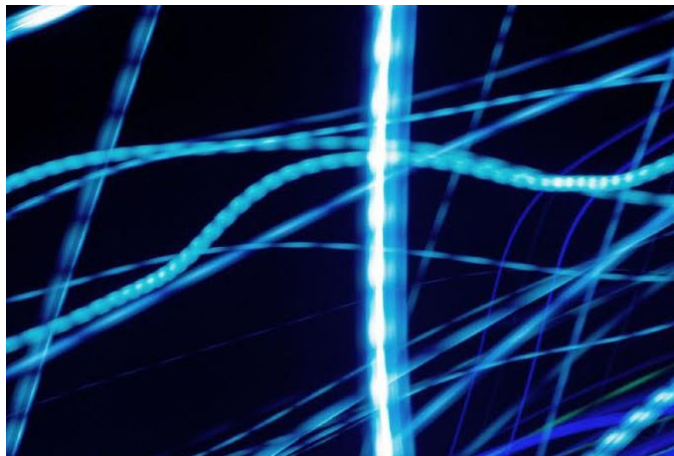
The scientists envision the fiber supercapacitor could be woven into clothing to power medical devices for people at home, or communications devices for soldiers in the field. The fiber could also be used as a space-saving power source and serve as 'energy-carrying wires' in medical implants.

Yuan Chen, a professor of chemical engineering at NTU led the new study, working with Dingshan Yu, Kunli Goh, Hong Wang, Li Wei and Wenchao Jiang at NTU; Qiang Zhang at Tsinghua; and Liming Dai at Case Western Reserve. The scientists report their research in *Nature Nanotechnology*.

Dai, a professor of macromolecular science and engineering at Case Western Reserve and a co-author of the paper, explained that most supercapacitors have high power density but low energy density, which means they can charge quickly and give a boost of power, but don't last long. Conversely, batteries have high energy density and low power density, which means they can last a long time, but do not deliver a large amount of energy quickly.

By mass, supercapacitors might have comparable energy storage, or energy density, to batteries. But because they require large amounts of accessible surface area to store energy, they have always lagged badly in energy density by volume.

The fiber is produced from a solution containing acid-oxidized single-wall nanotubes, graphene oxide and ethylenediamine, which promotes synthesis and dopes graphene with nitrogen, is pumped through a flexible narrow reinforced tube called a capillary column and heated in an oven for six hours.



Sheets of graphene, one to a few atoms thick, and aligned, single-walled carbon nanotubes self-assemble into an interconnected porous network that run the length of the fiber.

The arrangement provides huge amounts of accessible surface area - 396 square meters per gram of hybrid fiber - for the transport and storage of charges.

But the materials are tightly packed in the capillary column and remain so as they are pumped out, resulting in the high volumetric energy density.

The process using multiple capillary columns will enable the engineers to make fibers continuously and maintain consistent quality, Chen said.

The researchers have made fibers as long as 50 meters and found they remain flexible with high capacity of 300 Farad per cubic centimeter. In testing, they found that three pairs of fibers arranged in series tripled the voltage while keeping the charging/discharging time the same.

Three pairs of fibers in parallel tripled the output current and tripled the charging/discharging time, compared to a single fiber operated at the same current density.

When they integrate multiple pairs of fibers between two electrodes, the ability to store electricity, called capacitance, increased linearly according to the number of fibers used.

Using a polyvinyl alcohol / phosphoric acid gel as an electrolyte, a solid-state micro-supercapacitor made from a pair of fibers offered a volumetric density of 6.3 microwatt hours per cubic millimeter, which is comparable to that of a 4-volt-500-microampere-hour thin film lithium battery.

The fiber supercapacitor demonstrated ultrahigh energy-density value, while maintaining the high power density and cycle stability.

"We have tested the fiber device for 10,000 charge/discharge cycles, and the device retains about 93 percent of its original performance," Yu said, "while conventional rechargeable batteries have a lifetime of less than 1000 cycles."

The team also tested the device for flexible energy storage. The device was subjected to constant mechanical stress and its performance was evaluated. "The fiber supercapacitor continues to work without performance loss, even after bending hundreds of times," Yu said.

"Because they remain flexible and structurally consistent over their length, the fibers can also be woven into a crossing pattern into clothing for wearable devices in smart textiles," said Chen.

"The team is also interested in testing these fibers for multi-functional applications, including batteries, solar cells, biofuel cells, and sensors for flexible and wearable optoelectronic systems," Dai said.

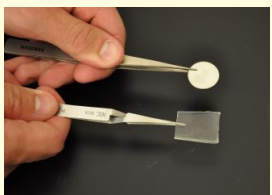
Electronic load handles 6 kW for battery testing

The EL97xx series of electronic loads available now from Intepro Systems, suppliers of power component and power system automated test equipment (ATE), offers users a simple means to test or characterise individual battery cells or multi-cell stacks. Models are available with power ratings from 150 to 6,000W for use as simple front panel controlled bench test or repair instruments, to components in complex, automated test and burn-in systems. Applications include repair of power supplies and equipment, through to testing batteries used for high reliability UPS and data-protection systems. Comprehensive battery testing can identify individual faulty cells allowing battery stacks to be rebuilt, reducing waste and recycling while improving reliability. Battery manufacturers can use the Intepro EL97xx series of electronic loads to characterise the performance of new designs, establish life expectancy and for production test. Automated testing provides repeatability and offers storage of test data for quality control, analysis and traceability. Test results may be fully interrogated and exported as spreadsheets or word documents into a SQL database. All Intepro EL97xx electronic loads are supplied with free software to simplify set-up and testing of batteries. Dynamic burn-in and discharge tests with user control of waveform may be performed with all test parameters available for user setting; live data is shown on a virtual control panel and a clear "capacity plot" is displayed. The user can add additional markers by using the icons on the tool bar to set a visual indicator to show the expected performance range. As well as being a standalone instrument the EL97xx electronic load is also designed for integration into larger automated test systems and may be controlled by Interpro's open-source PowerStar software suite.

Intepro
www.inteproate.com

Silicon dioxide nanotubes help batteries last 3x longer

Researchers at the University of California, Riverside Bourns College of Engineering have used a material found in surgical tubing to develop a way to make lithium-ion batteries that last three times longer between charges compared to the current industry standard. The team created silicon dioxide (SiO₂) nanotube anodes for



lithium-ion batteries and found they had more than three times as much energy storage capacity as the carbon-based anodes currently being used. The discovery has implications for industries including electronics and electric vehicles, which are always trying to squeeze longer discharges out of batteries. "We are taking the same material used in kids' toys and medical devices and even fast food and using it to create next generation battery materials," said Zachary Favors, the lead author of a just-published paper on the research. The paper, which was entitled 'Stable Cycling of SiO₂ Nanotubes as High-Performance Anodes for Lithium-Ion Batteries' was published online in the journal Nature Scientific Reports, was co-authored by Cengiz S. Ozkan, a mechanical engineering professor, Mirimah Ozkan, an electrical engineering professor, and several of their current and former graduate students: Wei Wang, Hamed Hosseinni Bay, Aaron George and Favors. The team focused on silicon dioxide because it is an abundant compound, environmentally friendly, non-toxic, and found in many other products. Silicon dioxide has previously been used as an anode material in lithium ion batteries, but the ability to synthesize the material into uniform exotic nanostructures with high energy density and long cycle life has been limited. The key finding was that the silicon dioxide nanotubes are stable in batteries which leads to longer lifespans. SiO₂ nanotube anodes were cycled 100 times without any loss in energy storage capability and the authors are confident that they could be cycled hundreds more times. The researchers are focusing on methods to scale up production.

Bourns College of Engineering
www.engr.ucr.edu

PICO

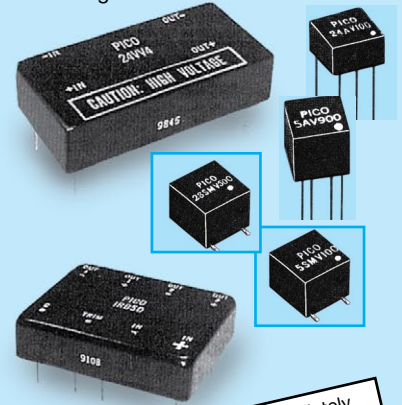
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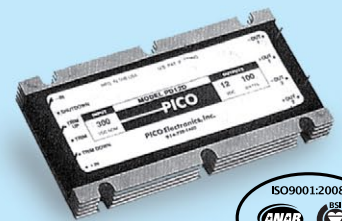


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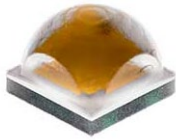
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England
Ginsbury Electronics Ltd.
 E-mail: rbennett@ginsbury.co.uk
 Phone: 0044 1634 298900
 Fax: 0044 1634 290904

Single-die LED achieves efficacy of 200 Lumens per Watt at 350mA

Cree has introduced what the company claims is the first commercially available single-die LED to achieve breakthrough efficacy of up to 200 lumens per watt at 350 mA. The Cree XLamp XP-L LED delivers up to 1226 lumens in a 3.45x3.45mm package and claims to enable an immediate performance increase of 50 percent or more as a drop-in upgrade for lighting designs based on Cree's market-leading XLamp XP-G LEDs. As the brightest member of the industry's only family of high-density class discrete LEDs, the XP-L LED also claims the industry's highest optical control factor (OCF). XP-L's high OCF will enable lighting manufacturers to improve the performance of existing lighting designs in the XP footprint, reduce the size and cost of new designs and create innovative new solutions to address applications ranging from lamps to stadium lighting. Characterized and binned at 1050 mA, 85°C, the XP-L LED is available in up to 90 CRI and color temperatures ranging from 2700 K to 8300 K. As a 'successor' product to the XLamp XM-L2, lighting manufacturers seeking ENERGY STAR qualification can use 3,000 hours of LM-80 data, potentially saving up to four months in the approval process. Product samples are available now and production quantities are available with standard lead times.

Cree, Inc.
www.cree.com

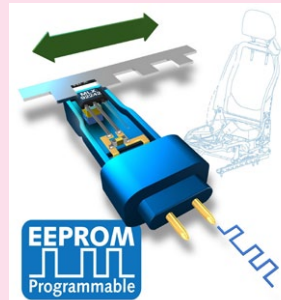


Hall effect switch does away with mechanical adjustments

The MLX92242 from Melexis is a highly integrated Hall effect switch/latch IC designed for automotive applications, such as seatbelt latch detectors, seat position sensors or window lifters. Its non-volatile memory enables car manufacturers to carry out end-of-line (EOL) programming, allowing cancellation of all mechanical tolerances within the application. Programmable memory is used to enable the various tolerances that need defining for a specific application to be set and if necessary readjusted, before finally being

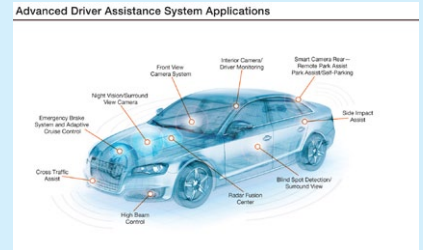
locked. The range and resolution of programmable magnetic thresholds and thermal sensitivity coefficients allows the sensor working in conjunction with a magnet to easily implement a ferrous metal proximity sensing system. Since its temperature compensation characteristics can be programmed, the MLX92242 can be used with all kind of magnets - including low cost ferrite materials. The resulting cost-effective and very small ferrous proximity switch handily serves many limit position, proximity detection and encoding applications. Another differentiator of the MLX92242 is that it supports 2-wire rather than a 3-wire implementation, only needing use of the VDD and GND pins, but still providing all the necessary diagnostic capacity to respond if malfunction conditions occur. The advantage of this is that less wiring/cable harnessing is needed, allowing deployment into confined spaces.

Melexis
www.melexis.com



Triple alliance has platform for camera-based ADAS

Vision-based driver assistance systems are increasingly connected to steering and braking systems of cars. Developers and system integrators for this reason are demanding turnkey platforms that meet the tough requirements of automotive ruggedness and reliability as well as applicable functional safety standards, in particular ISO 26262. Chipmaker



Freemake, Green Hill Software and Neusoft have devised such a platform. By providing a combined hardware and software solution for automotive-related image processing systems, the trio enables developers to significantly streamline the development of complex algorithms and porting these algorithms to the respective target hardware. The solution to be provided by the alliance utilises the Apex Image Processing IP (ICP) from CogniVue which is sold through Freescale. Neusoft - despite its name a Chinese company - contributes ADAS image processing software which automatically adapts to the underlying silicon; Green Hill adds its safety-certified Integrity operating system along with its MULTI tool chain. The result is a holistic, ready-to-use image processing solution custom-made for ADAS applications such as pedestrian recognition, traffic sign recognition or collision avoidance.

Current probes boost accuracy in harsh electrical environments

Wide-band screened CWT Mini Rogowski current probes from Power Electronic Measurements (PEM) use an electrostatic screening strategy that enhances performance and accuracy in the presence of large electrostatic interference signals. Its shielding technique, using a low sensitivity coil and low-noise signal-conditioning circuitry, gives the wide-band screened CWT Mini probe improved immunity to local dV/dt transients while maintaining small size, flexibility, and 3dB bandwidth of up to 30 MHz for a 100 mm coil. The probes feature a coil 4.5 mm thick with 5 kV insulation voltage, and can handle maximum current slope of 70 kA/μsec. The enhanced accuracy of a screened probe is required for applications such as measuring complex current waveforms in equipment such as UPS circuits, switched-mode power supplies and Variable-Speed Drive (VSD) inverters where high power density leads to high field strengths, or where the high speeds and high blocking voltages of silicon-carbide (SiC) devices call for higher probe bandwidth and better common-mode immunity. The CWT Mini probes eliminate the extra bulk and bandwidth restrictions imposed by conventional screening techniques, while delivering the known advantages of a Rogowski coil. These include zero insertion impedance, freedom from flying leads, isolated measurement, high peak-current rating, and the ability to measure small AC currents in the presence of large DC current.

Power Electronic Measurements (PEM)
www.pemuk.com



32-bit Arduino platform targets IoT and wearables

Arduino and Atmel joined forces to release the Arduino Zero development board, a 32-bit extension of the platform established by Arduino UNO. The Zero board is powered by



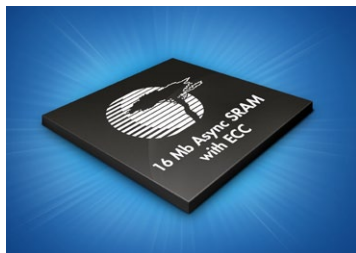
Atmel's SAMD21 MCU, which features a 32-bit ARM Cortex M0+ core. The SAMD21 MCU comes with 256kb of flash and 32kb SRAM in a TQFP package. Compatible with a 3.3V Shield that conforms to the Arduino R3 Layout, develop-

ment with the Arduino Zero using the Arduino programming language is fully supported through a custom developed software library, integrated in the Arduino development environment. The Arduino Zero board also features flexible peripherals and Atmel's Embedded Debugger (EDBG), which provides a full debug interface on the SAMD21 without the need for additional hardware, significantly increasing the ease-of-use for software debugging. EDBG also supports a virtual COM port that can be used for device programming and traditional Arduino boot loader functionality.

Arduino
www.arduino.cc

Asynchronous SRAM features on-chip error-correcting code

SRAM maker Cypress Semiconductor is sampling a 16 Mb fast asynchronous SRAM with error-correcting code (ECC). The on-chip ECC feature enables the new SRAMs to provide



the highest levels of data reliability, without the need for additional error correction chips, yielding the lowest-available soft error rates. The devices ensure data reliability in a wide variety of industrial, military, communication, data processing, medical,

consumer and automotive applications. Soft errors caused by background radiation can corrupt memory content, resulting in a loss of critical data. A hardware ECC block in Cypress's new asynchronous SRAMs performs all error correction functions inline, without user intervention, delivering lowest Soft Error Rate (SER) performance. The 16 Mb Fast Asynchronous SRAM achieves a 10-nsec access time and is pin-compatible with current Asynchronous SRAMs, enabling customers to boost system reliability while retaining board layout. Cypress has also introduced a new Fast SRAM with PowerSnooze family that combines the 10-nsec access times of Fast SRAMs with low standby power comparable to that of the MoBL family. PowerSnooze is an additional power-saving Deep Sleep mode that achieves 12 μ A (typical) deep-sleep current for a 16 Mb SRAM. The 16 Mb Fast SRAM with PowerSnooze also offers on-chip ECC. The 16-Mbit Asynchronous SRAMs are offered in industry standard x8, x16 and x32 configurations. The devices operate at multiple voltages (1.8V, 3V, and 5V) over -40 to +85C (Industrial) and -40 to +125C (Automotive-E) temperature ranges.

Cypress
www.cypress.com

LED driver offers enhanced functionality for front and rear light

With LED headlights becoming more and more the standard lighting technology even in the compact and subcompact vehicles class, automotive OEMs and suppliers are focusing on

cost effectiveness and versatility for the LED drivers. Now Texas Instruments introduced the automotive industry's first two-channel switching LED driver for front lights and the only linear LED driver with

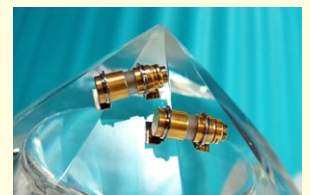


single short LED detection for rear lights. Plus, TI's new chips offer multiple dimming options. Unlike other LED drivers in the market, the TPS92630-Q1 and TPS92602-Q1 feature both high-side current sense dimming and pulse width modulation (PWM) dimming capabilities, as well as full diagnostic and thermal management, which helps designers create flexible lighting systems that meet many countries' differing traffic regulations. Key features and benefits of the TPS92630-Q1 for automotive rear lights include single LED short detection and full diagnostic capabilities. This gives designers flexibility to meet different countries' traffic regulations. The multi-chip fault bus connection supports up to 15 IC connections on one bus and supports easy control logic without an extra microcontroller, which saves valuable board space and cost, compared to previous generations. Thermal current fold-back with programmable threshold prevents LED flickering in thermal shut down situations.

Texas Instruments
www.ti.com

Non-magnetic sapphire trimmer cap aimed at MRI

Voltronics has added to its range of non-magnetic trimmer (variable) capacitors; the company claims to have the widest range of such products for Magnetic Resonance Imaging available. V9000 series is the company's smallest, high voltage trimmer capacitor. The V9000 Sapphire trimmer capacitor is sub-miniature at just 0.64 in. (16.3 mm) (at minimum capacitance) in length, but offers the highest working voltage rating (2 kV) for its size - whilst delivering a capacitance range of 1 to 12pF. Sapphire is ideal for precision trimmer capacitors as its dielectric constant is extremely stable, measuring below 0.0003 up to 10 GHz, and is chemically inert; totally moisture resistant and mechanically strong. These trimmers have a high Q (3000 min at 100 MHz); DC working voltage of 2000V and DC withstand of 3000V. They are also compatible with SAC 305 reflow processing. The V9000 Series is designed for the MRI industry where its size, power, capacitance range and affordability make it the preferred choice for the next generation of coils. Due to the severe non-magnetism requirements this industry requires it employs only materials that exhibit no measurable magnetism - commercial brass and plating materials are not acceptable. Strict traceability and testing regimes ensure this essential parameter.



Voltronics
www.knowlescapacitors.com

Embedded video engine addresses human machine interfaces

The VM800P series Arduino-compatible development platform from FTDI Chip offers engineers everything they need to implement more effective human machine interfaces (HMIs),



including not only display, audio and touch elements, but data processing aspects too.

The boards can be programmed via the Arduino IDE (using a pre-programmed Arduino-compatible bootloader)

with over 50 EVE sample applications provided, categorised into basic, intermediate and advanced levels. These include straight forward gauges and keyboards through to white goods/industrial controls. With comprehensive support for various Arduino libraries provided, every VM800P incorporates an FTDI Chip FT800 EVE graphic controller IC and its FT232R USB interface IC, as well as an ATMEGA328P 8-bit RISC-based microcontroller (running at 16MHz). Also featured are a touch-enabled display LCD panel, a backlight LED driver and an audio power amplifier along with a micro speaker. A choice of 3.5-inch, 4.3-inch and 5.0-inch display formats is available, replete with precision fitted bezels that help to ensure continued operation even in uncompromising industrial application settings. All VM800P units have a USB serial port for firmware upload and application communication, a battery-backed real time clock (RTC) for carrying out system timing and a micro-SD socket which is complemented by a 4GByte SD card containing the pre-loaded sample applications.

FTDI
www.ftdichip.com

Infinion shrinks power modules for HEVs, EVs

Having gathered experience with e-car projects such as BMW's i3, Infineon has developed a new HybridPack power module for automotive inverters. The HybridPack Drive complements



the company's HybridPack and HybridPack 2 product family with improvements in terms of cost and space. Infineon's highest priority in the development of power components is rising the switching speed for better energy efficiency, explained Carlos Castro-Serrato, Head of

Application Engineering, Electric Drive Train. The HybridPack Drive module is equipped with faster-switching transistors, which translates into a 30% smaller form factor compared to the HybridPack 2 at the same performance. Small package size is particularly important for hybrid electric vehicles, since in this category the existing conventional engine occupies most of the space under the hood. The module, which contains 24 IGBTs and 24 diodes, can handle between 50 and 100kW. While earlier HybridPack modules are equipped with screw-mounted power connections, the new module has multi-function tabs that allow faster installation - an aspect relevant for volume production. The stray inductance has been reduced from 14nH to 10nH.

Infinion
www.infineon.com

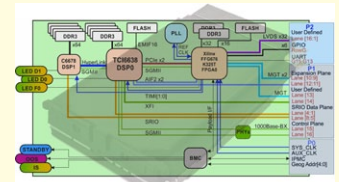
Host Card Emulation goes white-label

Shortly after its acquisition of Metaforic, INSIDE Secure is to accelerate the adoption of mobile-based payments with the launch of a white-label Android application for Host Card Emulation (HCE). Dubbed the MatrixHCE, the application enables mobile payment application providers to accelerate time to market by using a pre-validated HCE payment functionality. Introduced on Android 4.4 (KitKat), Host Card Emulation (HCE) allows for contactless payments (and other services including loyalty programs, building access and transit passes) to be made directly between the consumers' bank mobile application and the retailers point-of-sale, using NFC technology. It allows sensitive data used to facilitate transactions to be stored on, and accessed from, cloud servers rather than a mobile device and without the use of a hardware secure element. HCE therefore enables widespread deployment of mobile payments, which have previously been restricted by the limited deployment of hardware secure elements in mobile devices. MatrixHCE supports the HCE payment standards announced by major payment brands such as Mastercard and VISA, in preparation for the global commercial rollout later this year. It benefits from the software obfuscation and whitebox encryption security technologies developed by Metaforic. These have successfully undergone extensive penetration tests at external security labs. MatrixHCE also embeds secure networking communication technologies to protect the exchanges between the cloud server and the mobile application, thereby further protecting banking and payment data.

INSIDE Secure
www.insidesecond.com

TI/Xilinx silicon provides DSP/programmable capabilities in rugged VPX module

CommAgility's VPX-D16A4 is a rugged high performance DSP and FPGA based card in the compact VITA 65, 3U OpenVPX form factor. The module is intended for applications such as software defined radio (SDR) (including LTE, Remote Radio Head (RRH), WiMax and Cloud RAN), imaging or radar, and is suited to military or other harsh field deployment environments. The VPX-D16A4 is CommAgility's first board in the rugged VPX form factor, and is available as either conduction-cooled or air-cooled versions. For flexibility in interfacing, it supports SRIO, Ethernet, CPRI and Multi-Gigabit Transceiver (MGT) to the backplane plus links to RF or analogue I/O. The board is based around a Texas Instruments (TI) TCI6638K2K KeyStone-based System-on-Chip (SoC) and a TI TMS320C6678 SoC, which between them contain sixteen C66x DSP cores and four ARM Cortex-A15 cores, as well as baseband and networking accelerators. The two SoCs are closely coupled with TI's HyperLink bus as well as Gigabit Ethernet. Each device has its own 2 Gbytes DDR3 memory bank and a 20 Gbaud SRIO link to the VPX backplane. For additional I/O or co-processing, the main DSP is connected via PCI Express and the AIF2 CPRI interface to a Xilinx Kintex-7 K325T FPGA



For additional I/O or co-processing, the main DSP is connected via PCI Express and the AIF2 CPRI interface to a Xilinx Kintex-7 K325T FPGA

CommAgility
www.commagility.com

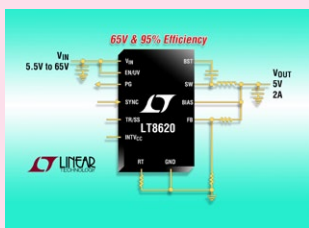
EEsof adds radar and EW modelling and verification

Agilent Technologies' EEsof EDA W1905 radar model library has been enhanced to simulate moving 3-D radar scenarios as well as phased-array adaptive beamforming. The new modelling capability saves design verification cost and accelerates deployment for radar system engineers. It also reduces dependence on expensive field testing and dedicated hardware emulators by realistically rendering radar and electronic warfare environments economically throughout the R&D process, using commercial design software and test equipment. The W1905 radar model library is available as a simulation option to SystemVue, Agilent's platform for electronic system-level design. The enhancements add inertial modelling "layers" above the baseband radar signal processing references. They account for the 3-D positions, velocities, rotations and beamforming directions of each transmitter, receiver and target, allowing modellers to create and script meaningful airborne, shipborne and multi-static scenarios or environments. Together with models for dynamically steerable antenna arrays and adaptive digital beamforming, the effectiveness of radar architectures and counter-measures can be quickly assessed, while also accounting for clutter, jammers, interference and RF analog limitations.

Agilent Technologies
www.agilent.com

Step-down switcher offers very high efficiency, handles cold-crank

The LT8620 from Linear Technology is a 2A, 65V input capable synchronous step-down switching regulator. Synchronous rectification delivers efficiency as high as 95% while



Burst Mode operation keeps quiescent current under 2.5µA in no-load standby conditions. The chip's 3.4V to 65V input voltage range makes it ideal for automotive (single and dual battery) and industrial applications. Its internal high

efficiency switches deliver up to 2A of continuous output current to voltages as low as 0.97V. The LT8620's ultralow quiescent current makes it well suited for applications such as automotive "always-on" systems, which need to extend operating battery life. The LT8620's unique design maintains a minimum dropout voltage of only 250mV at 1A under all conditions, enabling it to excel in scenarios such as automotive cold-crank. The device's fast minimum on-time of only 30ns enables 2MHz constant frequency switching from a 16V input to a 1.5V output, enabling designers to optimize efficiency while avoiding critical noise-sensitive frequency bands. The LT8620's 24-lead 3x5mm QFN or thermally enhanced MSOP-16E package and a high switching frequency keeps external inductors and capacitors small, providing a compact, thermally efficient footprint.

Linear Technology
www.linear.com

Micro coaxial cable assemblies deliver enhanced signal integrity

High Speed Interconnects (HSI), a full service cable extrusion and coaxial assembly manufacturer, announces increasing capabilities to solve custom, small form factor interconnect challenges. As engineers face the competing pressures of less board-space combined with the need for transfer speeds at microwave spectrum data rates, HSI has been ramping up their R&D efforts to provide the answer to both pressures. Both the coaxial construction, which includes the proprietary dielectric of the company's micro coaxial solutions are extruded in-house to tight specifications, providing exacting performance up to 10 GHz, with micro-coaxial connector terminations down to 0.3 mm pitch, and fine wire, direct-to-board terminations down to 0.175 mm. The fine wire direct-to-board method provides unrivalled footprint dimensions and can be ruggedized with HSI's proprietary strain relief process. And custom wired-to-board does not infer higher cost, in fact it can be lower than using exotic, hard to find, small footprint connectors. The company's certifications are extensive, and include AS9100 revision C, ISO9001, IPC 610/620, ITAR Registration, and multiple MIL Specification compliances. HSI is factory-certified in North America to properly terminate to Hirose, IPEX, and JAE micro coaxial connectors.



High Speed Interconnects (HSI)
www.highspeedint.com

200°C automotive grade silicon capacitors come in die size

3D silicon passive components integrator IPDiA has developed a new range of capacitors called ATSC dedicated to 'under the hood' applications. The ATSC range meets the demand of automotive sensor manufacturers who are looking for long life components with performance preserved when exposed to harsh conditions. The devices feature an operating temperature range of -55°C to +200 °C and enable a size reduction by a factor of 10 compared with traditional technologies. These SiCaps are available in 0202, 0505 and 0605 case sizes with respectively 1nF, 47nF and 100nF capacitance. They yield an electrical breakdown voltage of 30V and very low leakage current (<0.5 nA at the working voltage and room temperature). They also show low loss factors (equivalent series resistance ESR <100 mW and equivalent series inductance ESL <250 pH). The ATSC capacitors have been developed with a rated voltage of 16V, in order to meet automotive voltage rating requirements, specified at a minimum value of 14V, and have been qualified according to the Automotive Electronics Council requirements AEC-Q100.



IPDiA
www.ipdia.com

LED-driver ICs deliver accurate output power to 12 W

Power Integrations has introduced a IC family of isolated LED drivers which delivers up to 12 W of accurately controlled output power, reduces component count and results in simpler, smaller, more reliable LED lighting designs. LYTSwitch-2 LED-driver ICs use primary-side control, resulting in cost-effective, single-sided PCBs with low component counts. In addition, driver isolation allows the LEDs to be affixed directly to a metal heat sink, avoiding the added expense of an electrically isolating enclosure that is often required for non-isolated drivers. Accurate constant-current (CC) output tolerance across temperature (better than +/-5% at both low-line and high-line voltages) reduces the need to over-design systems in order to meet requirements such as the U.S. ENERGY STAR minimum-lumens-delivered specification. Designs using LYTSwitch-2 ICs are also highly efficient – up to 90% in typical applications. LYTSwitch-2 ICs protect the LED load from surges in line voltage, increasing bulb lifetime in regions where the mains voltage is subject to frequent peaks. The constant-current and constant-voltage (CC/CV) control function maintains a constant voltage on the output of the driver during no-load operation, preventing damage to the output filter or shutting down the driver when being tested or installed with no LED string connected.

Power Integrations
www.powerint.com

Digital-lighting microcontroller uses discrete state-machine controllers

The STLUX development environment, consisting of demonstration boards, a graphical configurator, software libraries, and compiler, provides everything needed to start designing high-performance LED lighting with STLUX385A, the



first in a new family of lighting controllers featuring a new digital control technique from STMicroelectronics. The STLUX development environment is demonstrated with a plug-and-play demonstration board

featuring all STLUX385A functionalities and a context for programming PWM waveforms using the six on-chip SMED (State Machines Event Driven) digital controllers. The SMED is an advanced hardware-configurable state machine where state advancement is automatically triggered by internal or external events thereby ensuring faster response than a conventional interrupt-driven microprocessor. STLUX385A supports smart-grid connectivity and DALI communication for remote control, enabling use in energy-efficient lighting throughout smart cities. The STLUX385A includes six SMEDs with 10ns reaction time, four analogue comparators with internally-generated and external references, an analogue-to-digital Converter (ADC) with an 8-channel sequencer, native DALI, built-in memory including 32 kBytes program Flash, serial and I²C communication channels, and an integrated low-power STM8 microcontroller.

STLUX
www.stlux.org

At your digital radios!

In this month's reader offer, CML Microcircuits is giving away two complete evaluation kits for its newly launched CMX983 analogue front end, a chip that bridges the gap between a digital radio's RF section and the DSP/FPGA. Specifically designed to meet the needs of a Software Defined Radio (SDR), the CMX983 performs critical DSP-intensive functions, provides dual-channel analogue-to-digital and digital-to-analogue conversion. It includes two RF fractional-N synthesisers and embeds a host of auxiliary ADCs and DACs for use within the radio system. Included in each package are five highly configurable CMX983 ICs, supporting numerous sample rates and filtering characteristics. A software support package is also included in this offer. For evaluation of the Fractional-N synthesisers, the EV9830 evaluation kit includes a 900MHz VCO fitted with connections to synthesiser 1 and a 2.1GHz VCO fitted with connections to synthesiser 2. Test pads are also provided for connection to an external VCO. An instrumentation interface with single-ended signal connections to differential baseband I/Q connections on the CMX983 is provided to allow easy connection of proprietary test equipment. The board also incorporates all of the necessary power supply regulation facilities for operation from a dual +/-6V supply.



CML Microcircuits
www.cmlmicro.com

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

More HDD memory for a 24/7 surveillance society

The MD03ACA-V series of high-capacity hard disk drive (HDD) unveiled by Toshiba Electronics Europe is a purpose-built line of 3.5-inch HDDs addressing the video surveillance market with capacities up to 4TB. The SATA drives spin at 7200rpm and support the industry-standard 512n sector lengths as well as RV compensation that maintains performance under multiple HDD configuration - making the MD03ACA-V series well suited for around-the-clock 24/7 video surveillance storage. The robust design of the MD03ACA-V series provides storage to various video recorders including surveillance digital video recorders (SDVR), surveillance network video recorders (SNVR) and Hybrid SDVR, delivering 24/7 operation with a mean time to failure (MTTF) of 1 million hours. The higher memory capacity supports higher resolution data streams, addresses the need for longer surveillance video retention periods, multi-streaming capabilities, wider temperature resistance and uninterrupted write applications.



Toshiba Electronics
www.storage.toshiba.eu

1 kW power supply in a 1U high module

Excelsys Technologies' XSolo family of 1U high, ultra-compact single output power supplies is available in two package types, outputting 504W convection cooled in an open-frame



U-channel form-factor and up to 1008W in an enclosed fan-cooled chassis. Both models carry a 5 year warranty. The XSolo platform offers system integrators a features including; variable fan speed, 12V/300 mA isolated bias

supply, remote ON/OFF, output voltage control and parallel operation for higher power applications. Nominal output voltages are 24V and 48V with wide adjustment ranges and user defined set-points. Maximum dimensions are 1U x 238 mm x 128 mm. The XSolo range has dual safety agency certification; EN60950 for industrial applications and EN60601-1 2nd and 3rd Edition for medical applications, fully meeting the stringent creepage and clearance requirements, 4 kVAC isolation and <300 μ A leakage current. The XSolo is also compliant with the semiconductor manufacturing standard SEMI F47, fully meeting the voltage dips and interruption requirements, and with all relevant EMC emission and immunity standards. Optional features available include I2C digital control and OR-ing Diodes for N+1 redundancy.

Excelsys

www.excelsys.com

ARM code development package adds runtime analysis

Fully integrated with IAR Embedded Workbench for ARM, C-RUN is an add-on product that provides developers with accessibility to powerful code analysis. The C-RUN runtime analysis



product is available as an add-on to the IAR Embedded Workbench for ARM development toolchain. Integrated with the toolchain, C-RUN offers each developer access to runtime analysis. C-RUN is a new product from IAR Systems that performs runtime

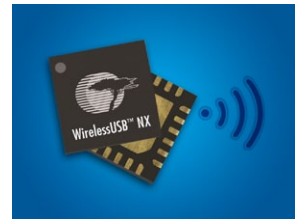
analysis by monitoring application execution directly within IAR Embedded Workbench. Tight integration with the toolchain supports the full cycle of implementation, testing and debugging. C-RUN for ARM has several features such as bounds checking to ensure accesses to arrays and other objects are within boundaries, different overflow and arithmetic checks, as well as a comprehensive heap checker. Flexible settings enable developers to customise analysis functionality according to specific needs. C-RUN is developed by IAR Systems and introduces code analysis as an early, natural part of the development cycle, the company says, adding that runtime analysis that is both powerful and easy to use is not something that has been readily available to embedded developers. IAR Embedded Workbench for ARM is a high-performance C/C++ compiler and debugger toolchain that incorporates a compiler, an assembler, a linker and a debugger into one complete integrated development environment. C-RUN is an add-on product to version 7.20 of IAR Embedded Workbench for ARM.

IAR Systems

www.iar.com

Wireless USB transceiver aims supports 3-year battery life

Cypress Semiconductor says that its ultra-low-power 2.4-GHz WirelessUSB NX transceiver enables three-year battery life for wireless human interface devices, while supporting data rates of up to 2 Mbps, and allowing integration with Cypress's touch sensing technology. The fourth-generation 2.4-GHz WirelessUSB radio-on-a-chip enables three years of battery life for wireless mice, keyboards, trackpads, remote controls and other Human Interface Devices



(HIDs). End users demand long battery life for wireless HIDs, making a low power consumption radio a must. WirelessUSB NX operates at 900 nA in sleep mode where HID's spend most of their time, and it offers active current of 12 mA in transmit mode and 15 mA in receive mode. As with other Cypress WirelessUSB families, the NX radio offers superior performance in the presence of common 2.4-GHz interference from sources such as WiFi, Bluetooth, cordless phones and microwaves. WirelessUSB NX is complemented by Cypress's highly integrated enCoRe VI microcontroller, PSoC 4 system-on-chip devices and complete trackpad modules for touch interfaces, offering manufacturers a single source of supply and support. WirelessUSB NX offers compatibility with common RF devices that are currently designed into wireless HID's. Compatibility with these solutions enables customers to reuse existing firmware to reduce development time. The Received Signal Strength Indicator feature on WirelessUSB NX supports a 5-bit reading for signal strength and a 4-bit reading for noise strength.

Cypress

www.cypress.com

Plug and play solar generator offers iPod sound

The world's first plug and play electric solar generator has been developed by Solihull & Telford-based AceOn Battery Solar Technology. The generator claims to enable the user to access free electricity on the go and can accommodate up to four plugs with an iPod sound system.

As well as powering low energy home lighting and electronic devices – such as TVs, stereos, games consoles, laptops, phones, hair dryers, power tools



- the SolarSDS stand-alone energy source is ideal where remote sourced electricity is required and where there is no, or an unreliable, grid network etc. AceOn is in the process of setting up distribution deals around the world and Technical Consultant Neil Turner said: "We envisage that most of our sales will be in Africa, basically where the grid is poor. However we see big opportunities in the middle east due to the vast number of campers who visit the desert weekly as well as servicing our home market in the UK & Europe."

SolarSDS

www.solarsds.com

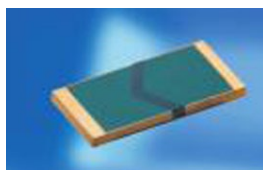
Wide format LCD module features high-brightness LED backlight

NLT Technologies (NLT), together with its sales and marketing channels in Europe, Renesas Electronics Europe GmbH, has introduced 15.6 inch wide WXGA amorphous-silicon thin-film-transistor (TFT) liquid crystal display (LCD) modules that are equipped with long-life white LED backlight units. The wide format TFT LCD module, which is ideal for use in outdoor applications such as boating equipment or construction devices and for use in industrial display applications, are equipped with long-life white LED backlight units that achieve high luminance and also contribute to lower maintenance costs for equipment and reduced environmental impact. The 15.6 inch module has a luminance of 1100cd/m² and high contrast ratio of 900:1 resulting in excellent viewability even in high ambient light environments. The displays are ideal for display applications in outdoor environments. The long-life, 70,000 hours, LED backlight is used in the new 15.6 inch module. This results in easy, low cost maintenance for these displays. Adoption of the white LED backlight also results in lower environmental impact since the backlights consume limited power and are mercury free. The operating temperature ranges from -20 to +70 degrees C.

NLT Technologies (NLT)
www.nlt-technologies.co.jp

Gold-plated bondable resistors optimize heat dissipation

Isabellenhütte has introduced the PMH-D and PLU precision performance foil resistors which are produced by using the Isa-Plan process which creates a temperature-resistant bonded



combination of substrate and resistant foil that ensures optimal dissipation of heat. The Isa-Plan process uses pressure bonding to combine three layers of manganin foil, copper substrate with an adhesive to provide

good thermal conductivity. A small increase in the temperature of the component has a positive effect on stability and long-term drift. Both resistors are well suited to applications in the automotive sector in which there are requirements in terms of high temperature and load. The devices meet the international AEC-Q200 specifications. The PMH-D and PLU can also be used in industrial applications such as frequency converters and power modules with DCB ceramic substrates. The PMH-D (6.7x3.4x0.7mm) and the PLU (10.4x6.4x0.6mm) are designed for hybrid mounting with bonding technology. The bonding pads and the back side of the component are plated with a 0.1 µm layer of gold which makes soldering and mounting with conductive adhesive viable. The resistors are designed to handle a constant load of up to 5 W at 150°C and a constant current of up to 50 A (PMH-D / size 2512) and 70 A (PLU / size 3924). The PMH-D is currently available as a 2-mOhm resistor and the PLU as a 1-mOhm resistor. Both resistors are designed as four-wire measurement resistors (Kelvin connection).

Isabellenhütte
www.isabellenhuette.de

Integrated IoT wireless controller features low power

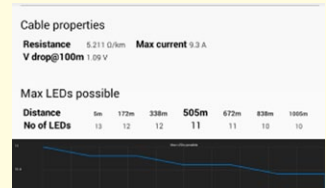
A fully integrated wireless controller suitable for remote, battery powered sensor systems, which can offer current consumption as low as 32 µA is available from LPRS. The low cost, high security easyRadio Integrated Controller (eRIC) offers designers seven power saving modes of operation to ensure maximum battery life of remote sensors. The eRIC transceiver power saving modes provide control of the duty cycle of the receiver so that the 'ON' time can be set to 12.5%, 6.25%, 3.1%, 1.56%, 0.78%, 0.39% & 0.2% with corresponding levels of power saving from its "always on" current of 16 mA. The transmitter may then be independently set to the same duty cycle as the receiver or longer as required for transfer of data. Up to 250 Byte data-packets are supported throughout all operating modes and up to 500 Kbs over air data rates are available. Measuring 20x15x5mm, the LPRS eRIC module is now available with operating frequencies for world markets and provides secure over-air transmission with the availability of an AES 128 bit data encryption option. Many other advanced features are available as standard including; received signal strength indicator (RSSI), carrier detect and group ID. The advanced design of this transceiver uses system-on-chip (SOC) technology removing the need for an external processor.



Low Power Radio
www.lprs.co.uk

App calculates voltage drop between LED drivers and fixtures

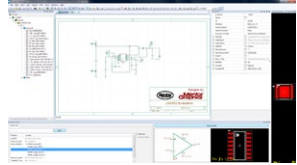
Integrated System Technologies (IST) Ltd is launching the company's first ever app for Android mobile phones and tablets which is capable of calculating the voltage drop between an LED lighting fixture and an LED driver. The Dr Voltz app can be used to calculate the voltage drop depending on the length of cable which links the LED lighting fixture and an LED driver, as well as a number of other critical installation factors. Dr Voltz aims to simplify calculating the voltage drop for either constant voltage or constant current LED applications and assists in planning cable runs, cable specifications and LED system parameters to avoid potential onsite LED installation issues. By downloading the free app from Google Play and entering a series of data values into the Standard Calculator, including the cable diameter, fixture voltage, distance from the fixture to the LED driver and the forward current of the LEDs, the app calculates a voltage drop value for a specific cable length. In addition, the user is also provided with a value at which the driver voltage should be set, in addition to a simple graph demonstrating voltage drop along the length of the cable. Dr Voltz provides quick, accurate voltage drop calculations and an automatic warning when the LED forward current exceeds the rated cable forward current.



Integrated System Technologies (IST) Ltd
www.istl.com

Cloud links desktop design to distributor database

Mentor Graphics has developed a cloud transformation engine that converts component information from a distributor's database directly into a design in its PADS PCB schematic tool.



The technology is being used for its collaboration with Digi-Key on the Designer Schematic tool where it has rejected the open source/free to use model for EDA tools that has been pushed by companies such

as RS Components with its DesignSpark tool. "We are happy to be providing one of the most cost effective professional tools on the market. The Designer Schematic tool is scheduled to launch early this summer, at an unprecedented sub-\$300 price point, pulling in data automatically to avoid data entry errors as well as easy, error-free access to Design Service Providers and PCB Fabrication and Manufacturing Services.

Digi-Key

www.digikey.com

RS Components and Allied Electronics ready to ship Red Pitaya

RS Components (RS) and Allied Electronics (Allied), the trading brands of electronics distributor Electrocomponents plc, are now ready to take general orders for Red Pitaya, a single-



board, open instrumentation and control platform that replaces many expensive laboratory and field instruments at a fraction of the price. Customers across the globe who previously registered their interest on the Red Pitaya website, and who have been

eagerly awaiting availability of the product, were given the opportunity to place a priority order with RS and Allied, which guarantees them delivery of a Red Pitaya board from the first limited production run in May 2014.

RS Components

www.rs-online.com

X-REL Semiconductor signs for UK and Russian distribution

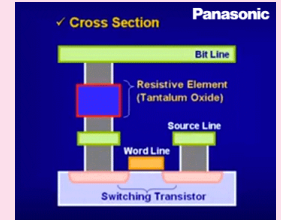
A manufacturer of high-reliability / high-temperature integrated circuits operating from -60°C to $+230^{\circ}\text{C}$, X-REL Semiconductor has signed a distribution agreement with UK-based Charcroft Electronics. A manufacturer of high-reliability / high-temperature integrated circuits operating from -60°C to $+230^{\circ}\text{C}$, X-REL Semiconductor has signed a distribution agreement with UK-based Charcroft Electronics. X-REL Semiconductor also announces the signing of a distribution agreement with IC Quest, a high-reliability electronic components supplier, located in Vyborg Russia, and dedicated to military, aerospace, and high-temperature industrial applications. Charcroft and IC Quest already have in-depth knowledge of the special customer environments and requirements for applications which are subject to high-temperature, vibration and shock and this fits perfectly with X-REL customers.

X-REL Semiconductor

www.x-relsemi.com

Mouser to ship Panasonic's latest ReRAM-based MCUs

Mouser Electronics is now shipping the MN101L 8-bit Microcontrollers from Panasonic, the first microcontrollers with internal Resistive RAM (ReRAM). Resistive RAM is a new non-volatile embedded memory that offers five times the write performance of Flash or EEPROM memory without the need for an erase cycle. This has the benefit of offering high-speed non-volatile writing and longer operational times in battery powered devices.



The Panasonic MN101L 8-bit MCUs have a total of 64 KBytes of ReRAM. 62 KBytes is used in the program memory area and is used similar to conventional Flash memory. ReRAM requires a write voltage of only 1.8V.

Mouser Electronics

www.mouser.com

VIS Systems to distribute Perpetuum in Poland

Perpetuum has signed an exclusive agreement with VIS Systems for the distribution of its remote condition monitoring services and systems within Poland. "We have been looking for the right partners which can broaden Perpetuum's presence in key European markets," shared Steve Turley, CEO of Perpetuum. "VIS Systems meets this with their maintenance expertise and local Polish footprint." VIS Systems is an expert in Poland in design and engineering, asset management and maintenance optimisation in the railway market, and the addition of Perpetuum's services and products will ensure that it remains a progressive force in the development of the massive potential in Poland. VIS Systems will manage the needs of local Polish clients with the support of Perpetuum for technical services and products.

Perpetuum

www.perpetuum.com

Plessey sign up Alcom for Benelux distribution deal

Plessey Semiconductors has entered into a distribution agreement with Alcom Electronics B.V, an electronics distributor headquartered in the Netherlands, to expand the European network with coverage in the Benelux market for its GaN-on-Si LED products. Marcel den Bak, Managing Director of Alcom,



said: "The innovative Plessey LED solution fits very well within Alcom's market approach. We are offering the newest technology in the respective markets we are active in, making sure that our customers can be more competitive in their end applications. Plessey, being an early adaptor of GaN-on-Si LED technology, will bring Alcom and its customers an extremely competitive, high quality light source.

Plessey Semiconductors

www.plesseysemiconductors.com

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LAST WORD

How chip makers can regain control of their value chain

By Chanan Greenberg

IDC REPORTS THAT the average selling price of a smartphone decreased to £205 in 2013, down from £236 in 2012, and it is expected to drop to about £157 by 2017. They may not want to pay for enhancements but consumers expect more powerful devices every year.

As a result, OEMs demand even lower prices for better performance, leading to tension between providing faster chips and the failure of margins or revenues to reflect return on the necessary investment. The problem for semiconductor manufacturers is that the performance gains of Moore's Law are not keeping up with the economics. The cost of materials and R&D continue to rise.

On the other hand nervous chip makers would rather have the revenue with poor margin than risk having nothing at all. The result is that most semiconductor manufacturers leave £29.7 million on the table for every £590 million in sales.

A common scenario is that a customer says it will buy a million chips at 42p per chip. The chip maker agrees to this discount up front but by the end of the year, the customer has still only purchased 100,000 chips yet received the discount. Had the deal been negotiated for the actual volume, the cost per chip would have been 89p.

The key is not to let price be lower than it needs to be. By connecting price concessions to what OEMs are actually consuming rather than unmet volume, chip makers can better control revenue erosion. Chip makers should consider the following best practices when seeking to align concessions with consumption by using rebates or step pricing.

Changes will be required

To begin with there needs to be a mindset shift at the executive level.

Chanan Greenberg is senior director, strategic markets, at Model N - www.modeln.com

Company execs need to decide that they can decelerate revenue erosion and deliberately connect price to real volume consumption and not mythical price pressures. The CEO must be 100 per cent on board. The chip maker also needs real-time insight into data sets across channels that allows for clear understanding of what their partners and

customers are doing for the top line. The biggest objection is often that companies don't have the tools and processes in place to manage rebates and step pricing.

This transition impacts sales, sales operations, order management and finance, which need to negotiate and structure deals in a new manner.

The chip maker may need to realign sales compensation to stop sales people from being indifferent to how the deal is done. For instance, those sales people that move customers to a rebate or step pricing deal may receive their standard commission plus 2%.

Be Selective where you start

It's wise to avoid starting with the really big parts of the business. Instead start with new business. Any new deal valued at less than £297,000 per year could automatically be put on step pricing.

Agreements with contract manufacturers are also primed for transformation. Pricing abuse can run rampant among contract manufacturers who may tell the chip maker they are building for one end customer that gets better pricing, when they are actually building for another. Rebates enable chip makers to mask the end customer pricing away from the middlemen so that they cannot play the system. Chip makers that have tested rebates and step pricing strategies to stem revenue erosion have seen an average five percent yield improvement on deals. It's hard to argue against the arithmetic because, at the end of the day, semiconductor manufacturers cannot continue bearing the brunt of dropping prices.



De l'innovation à l'application



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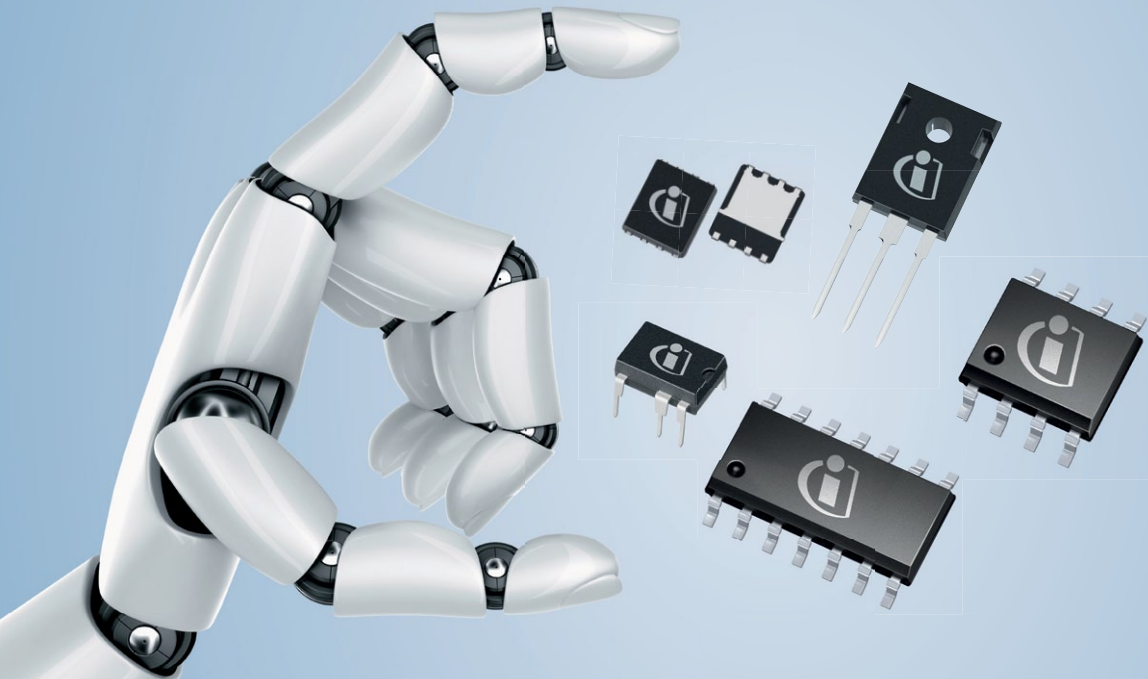
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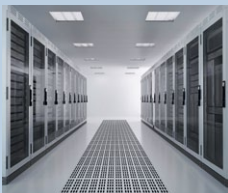
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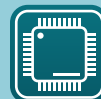
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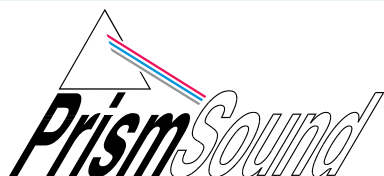
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FFT Detectors	40	2	40	2
Scripted FFT Detectors	✓	✗	✓	✗
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Channel Status I/O	✓	Simple CS only	✗	✗
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Monitor Outputs On BNC, Headphones, and Inbuilt Loudspeaker	✓	✓	✓	✓
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