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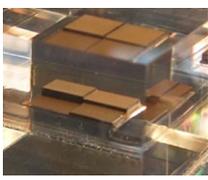
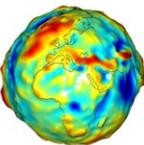
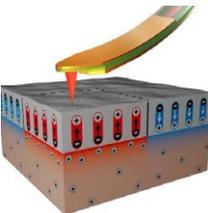
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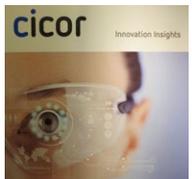
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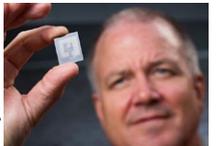
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Unlocking Measurement Insights

# Who gains the most from ARM's new IP?

By Junko Yoshida

**A** suite of new IP — ranging from ARM Cortex A72 processor to cache coherent interconnect and new Mali T880 GPU — announced by ARM Tuesday (Feb. 3) has exposed some of the leading processing-core company's hopes and dreams for mobile phones in 2016.

Next year's mobiles, as envisioned by ARM, will go beyond mere phones to become "primary computing platforms," said Ian Ferguson, vice president, segment marketing at ARM.

The 2016 mobile phones will be able to see, hear and understand users much better, through a new set of interfaces (going beyond voice, including gestures).

The growing CPU and GPU processing power enabled by ARM's new IP cores also suggests that the next-generation phone will be up to the task of "creating content," instead of just consuming it, Ferguson added.

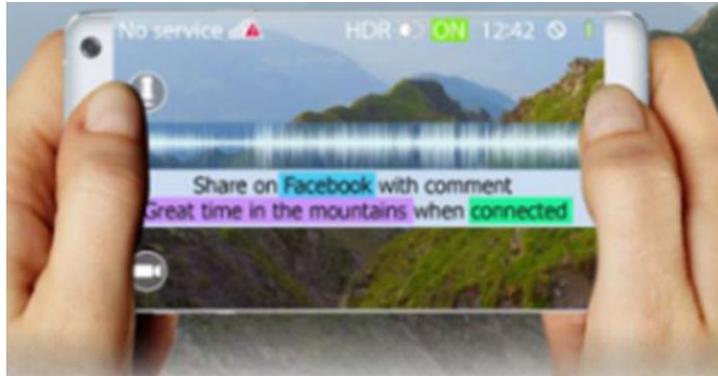
Sensor data will be captured, processed and analyzed more locally, instead of being sent to the cloud, according to ARM. Phones will cease to be just a "conduit," said Ferguson.

But really, who will gain most from ARM's new IP?

The answer is China. Most striking in ARM's announcement is the undeniable rising power of Asian fablesses, foundries and consumers that ARM is poised to serve.

Among "more than ten partners" to whom ARM has reportedly licensed the new Cortex-A72 processor, ARM mentioned only three companies by name. They are: MediaTek, HiSilicon and Rockchip. While MediaTek is a Taiwan behemoth, both HiSilicon — a chip division of Huawei — and Rockchip are leading apps processor companies based in China.

I'm sure Apple, Samsung and Qualcomm all have plans to leverage ARM's new IP, but their primary focus is more on developing their own custom CPU architecture. While these leading apps processor companies wage a full-blown battle for high-end apps-processor dominance, each seeking for its own slight edge, ARM has become the BFF of leading Asian chip powerhouses. ARM's new IP helps them beef up their applica-



Concept for anything, anywhere, anytime phone (Source: ARM).

tions processors.

Taiwan Semiconductor Manufacturing Co. (TSMC) also comes out as a big winner. ARM's new physical IP suite is optimized for the TSMC 16nm FinFET+ process. Announcements on support for other foundries will probably come later, Ferguson indicated during a conference call. Chip companies interested in

enabling "All-Day Compute Devices" using ARM's new cores in 2016 mobile phones are likely to resort to TSMC's 16nm FinFET process, but not others.

Asian consumers are also playing an important role in deciding the desired features and functions in 2016 mobile phones. Unlike the United States, where many consumers who have had PCs for decades and still depend on PCs for Internet access, the mobile phone is the platform for a majority of Chinese Internet users.

A Chinese government report issued Tuesday counted 649 million internet users by the end of 2014, with 557 million of those using handsets to go online.

## Reuters reported:

While growth is slowing, China's total internet population still rose by 31 million in 2014, said the report by the China Internet Network Information Center (CNNIC). Growth in mobile internet users was faster, at 57 million.

Against that backdrop, the old U.S. PCs vs tablets debate seems almost silly. China is already the world's largest smartphone market and its population has already gone mobile.

ARM's Ferguson went a step further. While the personal computer might linger in the Western market, tablets will be the first "impacted" by the rise of more powerful mobile phones, he predicted. "We are already seeing the slowdown of the tablet market." PCs, in the longer run, will be next. "Many CIOs and enterprises are clearly looking for mobile devices, armed with security features and the ability to separate personal content from corporate/business content," he said.

Junko Yoshida is Chief International Correspondent at EETimes

# Sigfox raises 100 million Euros to globalize IoT

By Julien Happich

**I**oT network provider Sigfox has successfully raised 100 million euros to expand the deployment of its very low power, long range IoT network infrastructure across the globe. The French company who is already offering nationwide coverage in France, Spain, The Netherlands and the UK, will use the funds to extend its IoT communication infrastructure across Europe, ensure global coverage across the USA and venture in Asia and South America thanks partnering telecom operators such as Telefónica, SK Telecom et NTT Docomo Ventures. Other partners include Elliott Management Corporation and industrial partners GDF SUEZ, Air Liquide and Eutelsat, joining as capital investors.

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# Development Tools Map the Connected Future

Without them, the roadmap for every embedded system design would be a rocky one indeed.

By Barry Manz for Mouser Electronics

As if the design of embedded systems isn't difficult enough, several trends are making it even more challenging. In the high-performance sector, designers must work with complex devices such as FPGAs and quad-core CPUs, and the "small form factor" segment now encompasses subsystems whose end products must fit into an end product the size of a watch. And virtually all must have on-board communications capability from Bluetooth, Zigbee, and Wi-Fi, to Ethernet. It's safe to say that without comprehensive evaluation boards and software development kits few embedded systems today could be designed at all. Fortunately, device manufacturers understand this, as well the fact that the quality of their support tools can make or break a product.

It's hard not to marvel at what today's high-performance embedded systems can achieve on a single 3U or 6U card. A typical single-board computer or DSP board for example can have one or more FPGAs, a quad-core CPU, high-speed, high-resolution, broadband ADCs and DACs, perhaps a discrete graphics engine, and truly enormous amounts of I/O.

At the other end of the spectrum are comprehensive devices like Broadcom's WICED Sense Bluetooth Smart Sensor development kit based on the company's BCM20737S SoC for creating secure embedded wireless networking applications. It has six MEMS Sensors for gyroscope, accelerometer, compass, pressure sensor, humidity, and temperature, a WICED sense tag, USB to MicroUSB cable, links to download sample applications, and development software. The tag's firmware can be updated from a smartphone, tablet or PC. The company says it can "reduce" the design time for Bluetooth app development from months to minutes.



Figure 1 – This smartphone app comes with Broadcom's WICED Sense Bluetooth Smart Sensor development kit.

## The RF Enigma

The embedded community has also just been tasked with connecting every possible person, place, or thing and has, begrudgingly, faced the fact that RF and microwave (i.e., wireless) technology can no longer be considered an outlier. Rather, it's become a standard requirement, requiring attention to a domain that this community has long considered anathema. That's not surprising, as the world of "fields and waves" shares little or nothing with its digital counterpart and thus requires different areas of expertise, and can significantly increase the complexity of any device in which it must be incorporated. That said, without it many embedded systems would be islands with no connection to the outside world, so RF and microwave technology is begrudgingly accepted as an annoying but necessary evil.

Fortunately for the consumer embedded community, wireless-enabled embedded products are small-signal devices. That is, their receive and transmit electronics are small and don't need to deliver high levels of RF output power that would increase size, burden the batteries of portable host devices, and drive up cost. Entire radios on a chip simplifies matters, but nevertheless require attention to the vagaries of RF design. The need to embrace not just MIMO but MU-MIMO, frequencies up to 60 GHz, and higher-order modulation schemes like OFDM haven't helped. Nor has the device-and manufacturer-specific nature of hardware development platforms and the enormous programming time (often using multiple tools) required to make the system "work".

Microchip Technology's PIC32 for Bluetooth Starter Kit (Figure 2) is a well-thought-out development platform that uses the PIC32MX270F256D MCU. Among other things, you get a Bluetooth radio, pushbuttons, Cree multi-color and single-color LEDs, an accelerometer, temperature sensor, onboard debugging, along with Android app, demo code and a serial port profile stack.

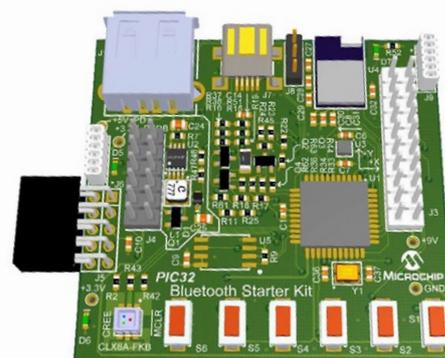


Figure 2 – Microchip's Bluetooth development platform has the essential tools – including software.

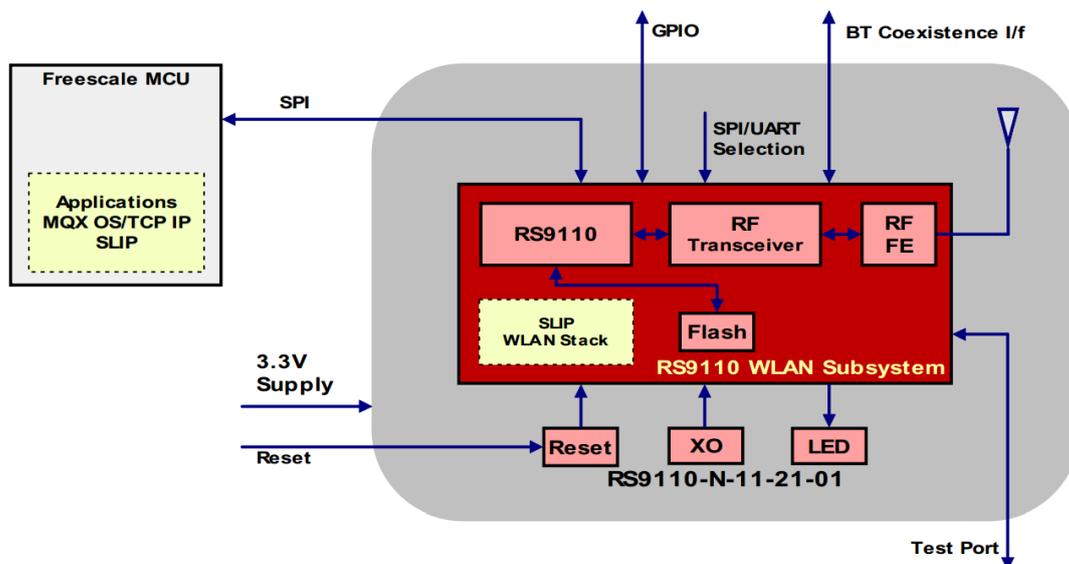


Figure 3 – Freescale’s Wi-Fi Tower Development Module employs Redpine Signal’s 802.11n solution, whose reference design is certified for FCC/IC/CE

Freescale Semiconductor’s TWR-WIFI-RS2101MI Wi-Fi Tower Module (Figure 3) allows 802.11bgn Wi-Fi connectivity to embedded designs, and is a low-cost evaluation, demonstration and development board that features a solution from Redpine Signals, based on Redpine’s 802.11n chipset (RS9110). The board (module) has ultra-low power operation with power save modes, includes uART and SPI interfaces, networking stack in embedded firmware to make a fully self-contained 802.11n WLAN solution for a variety of applications; and over-the-air firmware updates. The RS2101 was developed to make it usable by designers with little or no Wi-Fi or RF expertise while also removing the requirement for testing and certification.

### Tired of Hearing About IoT? Get Used to It

The Internet of Things umbrella term may already have worn out its welcome, but it’s not going away, and in fact has just begun to emerge as something well beyond its former, far less comprehensive predecessor, called “convergence”. Intel, which

projects that by 2020, more than 200 billion devices will be connected to each other and the cloud, puts it bluntly: “By 2020 any end-point appliance without integrated gateway functionality (the ability to connect to a source and catalog data over a network) will be largely useless.”

To that end, the company has amassed gateway development platforms (Figure 4) for energy and industrial, transportation, and developers in general that incorporate a bewildering array of capabilities. It includes its Quark-branded SoCs designed for applications ranging from industrial systems to wearable devices, Wind River software tools, broad security resources, support for more or less every known wired or wireless communications protocol, and a huge number of other features. Other companies are following suit.

### Summary

Embedded system design today is not for the faint of heart, and in some sectors new challenges posed by connecting everything to the Internet (and the cloud) are about to make it even more “interesting”. From the perspective of high-performance computing, defense, and other applications, embedded systems benefit from standardized form factors and internal and external communication standards that have evolved over decades, but their design is still enormously challenging.

By comparison, the emerging world of ubiquitous connectivity is the “Wild West”, driven in some cases by applications that haven’t yet been explored and are thus not yet “deployed”, the mandatory requirement to incorporate state-of-the-art communications technology in tiny form factors (each one unique), and a slate of new requirements that will challenge designers for a very long time. The good news is that the demand for connectivity has created an entirely new market from the bottom to the top of the food chain, from discrete devices to SoCs, and complete systems.

For further information visit the Application & Technology section of mouser.com.

Figure 4 – Intel gateway platform is based on its Quark SoCs covers applications from large industrial systems to wearables.



# TSVs to split more chips: re-integration is the focus

By Julien Happich

**D**uring the third European 3D TSV summit organized by SEMI in Grenoble's Minatec center, all of the speakers seemed to agree on one thing: in many fields including the consumer market, 2.5D integration (through the use of interposers) is going to remain cost-competitive for a while with real 3D vertical integration.

And this could lead to major shifts in the electronics manufacturing landscape. Barnett Silver, Senior Vice President & Principal at semiconductor consulting firm ATREG gave us his insight on the packaging and IC manufacturing markets. The total costs for process and fab development has risen dramatically from one node to the next over the last decade, he notes, and only a handful of foundries will have the cash to stay in the race beyond the 14nm node, namely TSMC, Samsung and Intel.

That makes OEMs and fabless companies overly reliant on very few foundry options, as rather captive customers. Hence the necessity for large OEMs to vertically re-integrate their strategic silicon supply chain.

Silvers sees an inflection point coming over the next three years, when cash-rich OEMs such as Apple, Google or Amazon could invest more and more into foundries and IC packaging facilities to secure their supply chain, have better access to advanced nodes and reduce the risk of silicon allocation.

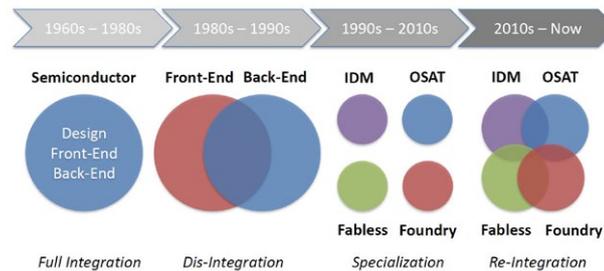
Sitting at the negotiation table of many foundries and IDMs acquisitions/mergers, Silver said he had witnessed such large OEMs making bids (although unsuccessfully so far).

One way to counter TSMC's unabated foundry market dominance would be for OEMs (Original Equipment Manufacturers) to acquire both OSATS (Outsourced Semiconductor Assembly and Test Services) and foundry shares and develop alternative manufacturing models, with varying levels of capital engagement, operating responsibility and ownership.

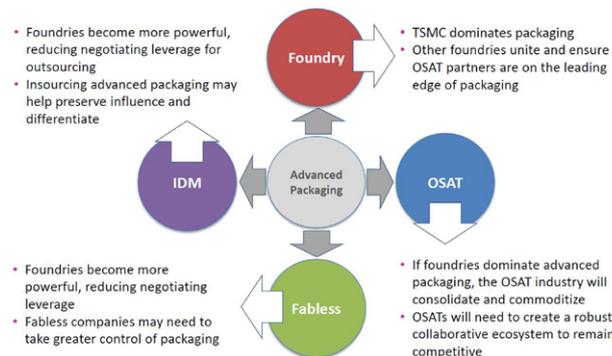
Such hybrid semiconductor manufacturing models, as Silver calls them, could include "Equity for Capacity", where a semiconductor firm or OEM would invest in a fab to have a stake in the overall success of the fab (including guaranteed access to capacity), or more Cooperative (co-op) models, whereby a fab is co-owned and operated among multiple semiconductor firms (ensuring a proportional access to overall capacity while sharing the running expenses).

"In this picture, packaging is essential, yet largely overlooked", Silver notes, so he sees a convergence of OSATS and foundry services.

Later we learned from Yole Développement that already in 2014, around 19% of overall semiconductor IC wafers were manufactured with packaging features (bumping, RDL, TSV, etc...) processed at the wafer-scale (with still a feature size gap between Silicon device and PCB processing for OSATS to play a role).



Chip integration going full circle: source ATREG.



Advanced packaging will remain a clear differentiator and will drive re-integration: source ATREG.

"I expect more Mergers & Acquisitions with foundries, OSATs and IDMs all fighting for the USD 51 billion chip assembly & test market. As the packaging gets more advanced, often at wafer-level, there will be re-integration and convergence between the front-end and the back-end", Silver concluded.

While much progress has been made on TSVs, their resolution, depth, aspect ratio, they are still cost prohibitive for all but high-end applications including server memory or high performance computing.

Although 2015 is regarded as the year of the 3D TSV (with several high bandwidth memories ramping up in volume), much of the debate at this year's European 3D TSV summit was about when such full 3D architectures

would compete in consumer applications, cost-wise, with 2.5D interposers. This uncertainty is an opportunity for OSATs to extend their offerings and fight off the foundries' pretensions to do it all.

According to E. Jan Vardaman, President of semiconductor packaging consulting company TechSearch International Inc., although TSVs are largely used in sensors and MEMS, the yield issues but also the thermal challenges for stacking memory and logic together still make 3D TSV unattractive for consumer applications (something to which would later agree Qualcomm Technologies' Senior Program Manager, Mustafa Badaroglu).

Vardaman sees monolithic integration of logic and memory happening in 2018 at the earliest, while the price pressure on smartphones would make it difficult to adopt 3D TSVs for logic-on-logic stacking before 2019.

"Die stacking is happening and AMD is doing it", said Bryan Black, Senior Fellow at AMD as he reviewed today's 2.5D and 3D packaging solutions, "but why is it happening now?" questioned Black, claiming that AMD had figured out yield issues about ten years ago and is about to use TSVs across all of its product portfolio.

Cost is the first reason, especially when making large dies at advanced nodes becomes cost prohibitive because of decreasing yields. "Silicon integration is running out of gas", Black says, arguing that the next process node may not necessarily come out cheaper overall.

His analysis is that even though Moore's law will give us more transistors at each new node, they will not be the right transistors, because process scaling will stop supporting diverse functionalities on a single die such as fast logic, low power logic, analog, and cache.

Hence, logically, engineers will want to break large single dies into specialized components to maximize the value of new and existing process nodes, only to be re-integrated through

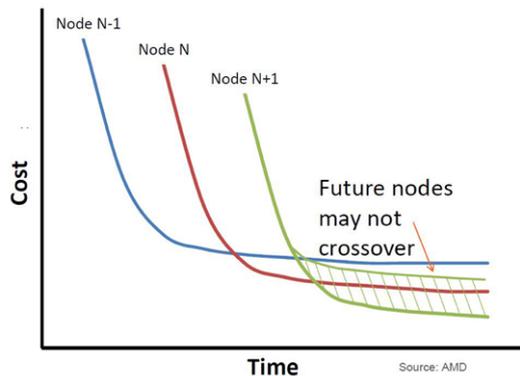
2.5D and 3D stacks. In his view, IC integration will never move away from interposers, but on the contrary, silicon interposers will be the SoCs sockets of the future, hosting multi-sourced 3D components whose functionalities can scale at their own pace.

As the cost of stacked dies will reduce, OEMs will be able to leverage die-sharing instead of soft IP licensing, buying the best dies on the market and assembling them to craft their own SoCs. To do the integration themselves, large OEMs would want to invest in the OSATs or the foundries doing the packaging.

During a coffee break, Black accepted to share more of his thoughts with EETimes Europe.

“In the server space, who knows better than Google or Facebook what they need?” he said. “These guys don’t want to be tied to AMD or Intel’s hardware offerings, but they are not going either to out-innovate semiconductor firms, they just need to add their own innovation”.

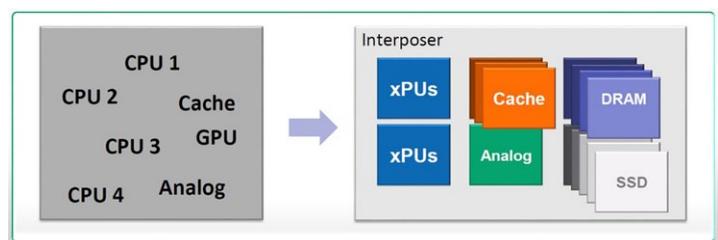
“So ideally, they would want an IC with a blank socket in it to do their own things”, commented Black, admitting he had had such discussions with Google engineers.



The uncertainty of transistor costs according to AMD.

This die-level IP sharing vision where large OEMs would buy guaranteed tested dies from different vendors and manage their own 2.5D interposer socket, in some cases even adding their own ASIC into the mix, is very much in line with the vertical re-integration scenario envisaged by ATREG.

“It is an interesting time for a business model change”, concluded Black, hinting at the fact that silicon vendors may want to focus on selling more discrete dies of proven IP instead of large do-it-all integrated dies falling short of OEMs’ expectations.



Silicon interposers will be the SoCs sockets of the future: source AMD.

## Flexible OLED displays target volume production in 2015

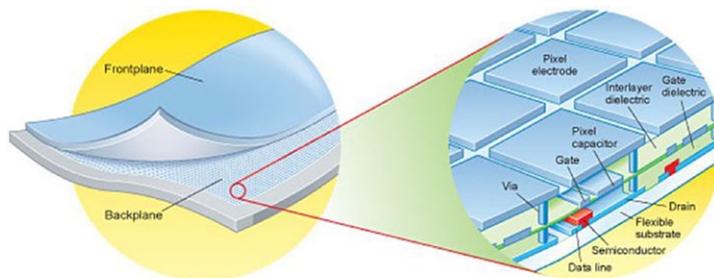
By Paul Buckley

**P**lastic electronics specialist, Plastic Logic, which has been at the forefront of the development of truly flexible electronics technology, will split the technology development and manufacturing parts of the business. The separate elements will move forward as independent companies.

The newly formed FlexEnable will be a Cambridge-based company comprising of three IP partnership offerings. FabEnable is intended to allow fabs to be built or upgraded to make flexible electronics. ProductEnable is targeted at those looking to create flexible electronics, while MaterialsEnable will help developers to assess and qualify materials for flexible electronics including a graphene based display. FlexEnable is focusing on ensuring that flexible displays will be in volume production by the end of 2015. The technology will enable products to be made on substrates as thin as 25µm which can withstand a transistor bend radius of 0.25mm that will allow the creation of flexible and rollable displays.

Plastic Logic’s manufacturing plant in Dresden, Germany, which develops, manufactures and sells a range of flexible, electrophoretic displays (EPD), will operate independently under the name Plastic Logic Germany.

“FlexEnable has been created from Plastic Logic’s people and its technology assets in Cambridge, UK,” explained Indro Mukerjee, Plastic Logic’s Chairman. “Based on Plastic Logic’s full technology and patent portfolio. FlexEnable will independently provide expertise, technology and products to system



builders, device makers and product companies to enable innovative, volume products.”

“I believe that the full potential of plastic electronics is now emerging as transformational

developments in flexible transistor performance and bold, new concepts drive more and more applications,” said Mukerjee. “This, combined with the proven manufacturability and scalability of our transistor technology platform, makes this a defining moment for the industry”.

According to Mukerjee the capability has reached the point where it is possible to be able to manufacture arrays with millions of perfect flexible transistors across areas of any size and shape and in high volumes. The Plastic Logic flexible transistor platform has now been industrially proven to be able to form active backplanes for LCD, OLED, EPD and other display media and has been successfully broadened to be able to enable solutions for sensors and integrated systems on fully-flexible, plastic.

Being able to create flexible electronics on plastic will enable the technology to provide transformational benefits for product shape, weight, and durability and enables a path to low-cost solutions for high volumes which is perfectly suited to match the requirements of markets for wearables, new mobile devices and distributed, flexible sensors for IoT applications.

FlexEnable’s process is low temperature (<100°C) which opens up a host of manufacturing and cost benefits.

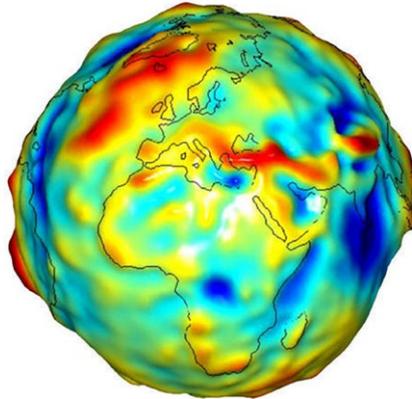
## Satellite project measures gravity, predicts deluges

By Christoph Hammerschmidt

The advance warning time for deluges will be extended significantly if a research project from a group of institutes led by the University of Bern (Switzerland) succeeds. The scientists plan to deduce deluge warnings from earth gravity anomalies. Likewise, droughts can be predicted with more accuracy.

The European Gravity Service for Improved Emergency Management (EGSIEM) project aims at improving the methods to predict deluges. "In view of the climate change, the frequency of extreme weather conditions is increasing significantly", says Adrian Jäggi from the Astronomical Institute of the University of Bern. "For this reason it is becoming increasingly important to have reliable and relevant data at one's disposal to take appropriate measures to save life, infrastructure and property in time."

But how can a satellite capture, and even predict the probability of a deluge? The measurement principles utilized by the Bern researchers are anything but self-explanatory and straightforward. First, to predict an inundation, it is important to know the saturation of the subsoil with water. Ironically, the subsoil can be monitored best from space. The GRACE (Gravity Recovery and Climate Experiment) satellite system, launched already in 2002, enables users to analyze terrestrial mass changes. The distribution of masses (for instance, water) directly influences the terrestrial field of gravity. This, in turn, affects the satellite orbit.



In the case that water is gathering in a certain region, the mass of this region increases, and the satellite orbit is changing. Though the deviation is only marginal - the orbit changes by the thickness of a hair - it can be measured: Within the GRACE system, two identical satellites follow each other in a correlated polar orbit; they continuously measure their mutual distance by means of microwaves. If the leading satellite approaches a region with increased gravity, it experiences a slight acceleration. Measuring this effect allows highly accurate conclusions as to the earth gravity. This enables the scientists to predict the regions where natural and artificial reservoirs are filled and at which speed.

Within the EGSIEM project, the institute for terrestrial measurements (IfE) at the University of Leipzig assumes the task of analysing the GRACE sensor data. In this context, a team of researchers led by Prof. Jakob Flury will develop sensor data deviation models that will enable modelling the earth's field of gravity at even higher accuracy.

The system will also enable the prediction of droughts. However, predicting droughts is less time-critical since aridities announce themselves over weeks.

Members of the EGSIEM consortium are, besides the University of Bern and the IfE, the University of Luxembourg, the Deutsches GeoForschungsZentrum (GFZ) in Potsdam (Germany), Géode & Cie (Toulouse, France) and the technical University of Graz (Austria).

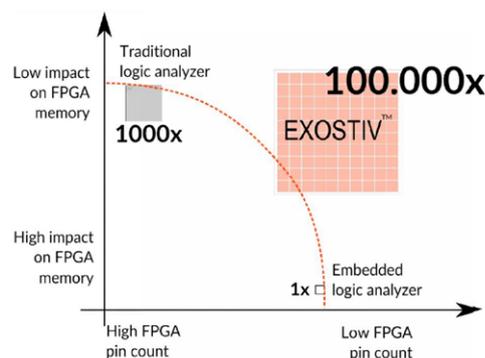
## Yugo Systems externalizes FPGA debug with hardware

By Julien Happich

For the last 10 years, Belgium company Byte Paradigm has operated as a design centre for high-end FPGA-based systems as well as a provider of test and debug solutions for electronic systems. Under the new company trade name, Yugo Systems, the company is about to expand its offering for FPGA debug and verification. And together with its new launch, Yugo Systems is announcing a unique FPGA debug solution, Exostiv, claimed to deliver up to 200.000 times more observability at speed of operation than traditional embedded instrumentation solutions.

We caught up with Frédéric Leens, Byte Paradigm's CEO to learn more about this new venture.

"For a number of years, we have been actively designing with FPGAs and helping our customers debug their systems, and we suffered the same frustration that FPGA designers typically experience with the limited tools provided by FPGA vendors",



**Exostiv vs. traditional and embedded LA solutions. The numbers show the relative observability provided by each solution.**

said Leens.

"Back in 2011, we started to investigate about a new hardware-based debug tools that could improve a designer's access to FPGA's internals. Although we had heard about Tabula doing interesting developments then, our research was geared towards improving the visibility of off-the-shelf FPGAs".

"Typically, designers would want to see as much as possible of their design in operation, in realtime, but today's embedded debug tools and

built-in test are too light, only supporting a few kBytes' worth of information at a time", continues Leens.

With Exostiv, the company doesn't require designers to put aside the FPGA's internal memory for embedded debug and built-in test. Instead it externalizes the analysis through fast access points (configured in-system as dedicated IP) capable

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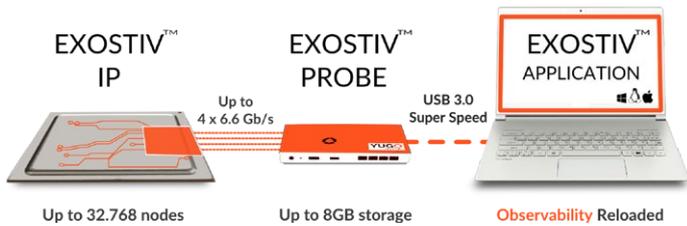
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## Exostiv's data flow.

of feeding the data of more than 32,000 nodes over the FPGA multi-gigabit transceivers. Transferred through up to four 6.6Gb/s lanes to an external memory up to 8GByte, the data can then be further analysed using the company's MYRIAD Waveform Viewer, designed to handle Terabytes of information.

In a whitepaper titled "FPGA verification tools need an

upgrade", Leens lists the debug limitations (economical or physical) that today's FPGA designers have to face, also highlighting the fact that in high-end FPGAs, the logic resources are increasing much faster than the amount of memory, making it unrealistic to rely on the FPGAs' memory alone to extract info and look into the logic.

Although the new debug solution was developed in-house based on the company's own expertise of commercially available FPGAs, Leens would welcome some form of partnership with FPGA vendors, whereby some of Yugo Systems' IP could find its way as hardened blocks to further boost design observability.

For now, Exostiv is proposed in beta to specific key customers and will be fully available during the second quarter of 2015. Yugo Systems will reveal more details about features and pricing during the first quarter of 2015.

## FeFET to extend Moore's law

By R. Colin Johnson

**U**niversal memory replacing DRAM, SRAM, flash and nearly every transistor in a computer may result from their successful fabrication of a ferroelectric gate over germanium channel material, according to researchers at the University of Texas (Austin).

Their successful ferroelectric gate stack holds the hope of extending Moore's Law beyond the end of the International Technology Roadmap for Semiconductors (ITRS) circa 2028.

"We have not yet built a complete ferroelectric field-effect transistor -- or FeFET -- but we have proven that our detailed simulations on the supercomputer at the Texas Advanced Computing Center can be realized in the lab," professor Alexander Demkov told EE Times.

"What we have done is build the complete gate stack and gotten the material and fabrication techniques right -- our next step will be to fabricate the germanium channel to complete the FeFET."

FeFETs are desirable because they can be scaled beyond

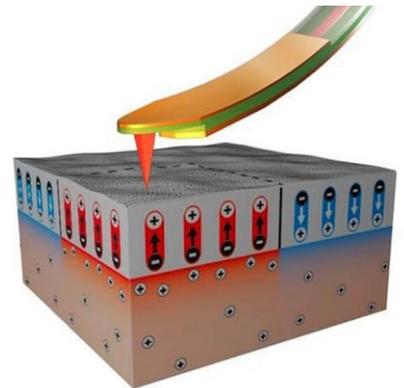
the end of the silicon roadmap, as predicted by ITRS, using a faster semiconductor for the channels -- either germanium (Ge) or gallium arsenide (GaAs), all built on standard silicon CMOS wafers. With a computer built completely from FeFETs, everything in it would remember its state when you turn it off, making it instant-on, and right where you left it when you hit the off button.

"We have not experimented with memory architectures for our FeFET, but believe that it could serve as a universal memory since it is faster than DRAM and denser than flash," Demkov told us.

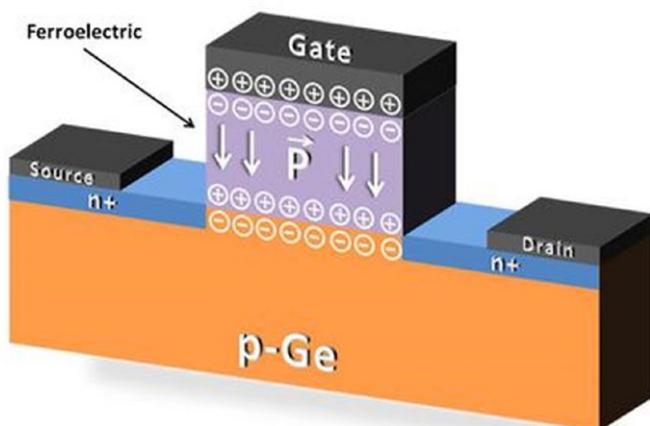
Demkov collaborated with the University of Texas (UT) doctoral candidate, Patrick Ponath, on the project, as well as with researcher in other departments, as well as with Arizona State University and the Oak Ridge National Laboratory. Currently Demkov has colleagues at the University of Texas working on a chemical deposition technique to etch the germanium channels to complete the FeFET project.

"We don't have the facilities to easily fabricate germanium or gallium arsenide channels for our FeFET, but we hope that an industrial partner will step forward to help us when it is time to commercialize this new process technology," Demkov told us.

The most difficult part of creating the process involved growing the barium titanate (BaTiO<sub>3</sub>) gate in a 3-D orientation using molecular beam epitaxy so that its dipoles could be switched vertically. Their success was verified using piezoelectric-force and microwave-impedance microscopy. Other applications include ultra-high density memories, super efficient photovoltaic cells and faster nonvolatile reconfigurable logic.



The measurement set-up using negative-biased conductive scanning probe to sense switching in ferroelectric layer. (Source: University of Texas)



The ferroelectric material pictured on a germanium channel above a silicon substrate retains its polarization indefinitely making any computers built from FeFETs instant-on. (Source: University of Texas)

# French startup expands 3D to the room

By Julien Happich

**K**ickstarter project Immersis from French startup Catopsys is promising to turn any room into a fully immersive 3D interactive environment.

The company has its roots in academia when in 2003, Dr. Laurent Sarry (a professor at the University of Auvergne) and IUT du Puy-en-Velay demonstrated the feasibility of undistorted projection across non-planar surfaces, through the use of computational anamorphosis and a specially designed projector.

More research was carried out under the CATOP-SYS (CATadiOptric Projection SYStems for virtual and mixed reality) collaborative project, which yielded a first patent for a panoramic projection device (published in 2009).

From then on, several prototypes were developed under this project, one with a 180° screen and direct projection, the other with a dome and 360° projection (from two video projectors).

From first proof of concept in academia to Catopsys officially becoming a company in 2013, it took over eight years of research and development to fine tune the software building blocks necessary for realtime computational anamorphosis applied to panoramic 3D projection.

In effect, the anamorphic projection process consists in taking any panoramic content (from video games, 3D applications or any other panoramic photo formats such as Google's Photosphere format) and distort its perspective based on the projector's position and the actual 3D mapping (at pixel-level) of the room in which the projection is to be viewed.

Most other 3D immersive solutions available today rely on one projector for each side of a dedicated room (typically an immersive display such as a dome or a cubic room which all add up to the costs).

This is why room-level 3D immersion is mostly used for industrial applications and sometimes for entertainment. Cheaper consumer alternatives include regular projectors fitted with a fisheye lens for panoramic projection, but inevitably, the resulting image is distorted.

"This 3D-based anamorphosis is nothing trivial", told us Daniel Duhautbout, President and Co-Founder of the company. "To my knowledge, apart from fisheyes-fitted projectors which



3D panoramic view across 180°, corrected at room level.

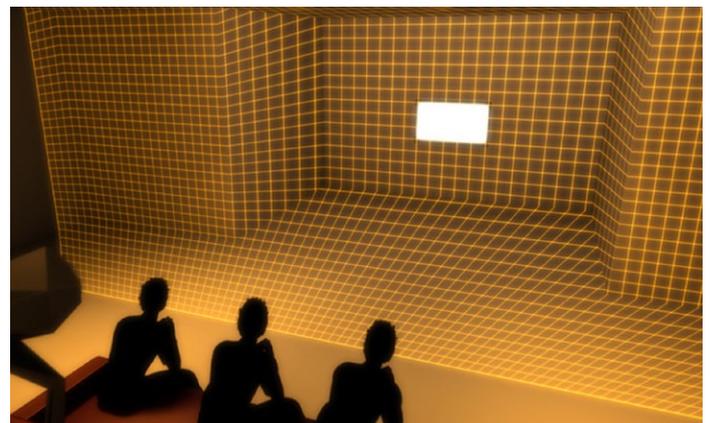
give a poor rendering, there isn't on the market any equivalent solution to what we are offering with Immersis".

"The major differentiation is in our software, since we take a 3D model of the room as the basis to deform the image and map it to the shape of the room, based on the projector's position", Duhautbout added, "and we hold the patents for that".

"The nearest approaches you could think of, are Microsoft's research projects RoomAlive and IllumiRoom, but so far, these are conceptual projects only. Then, you could consider Oculus Rift as our nearest competitor in the low-cost 3D immersion arena. But wearing these virtual reality goggles provides a very different experience, after 20mn, you get motion sickness."

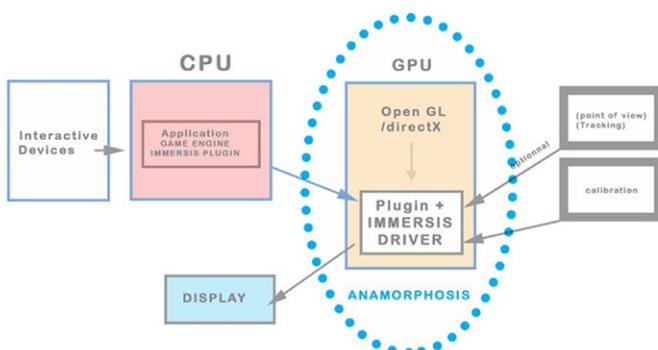
"With Catopsys' solution, you can share the 3D immersion with others, it is a more natural feeling".

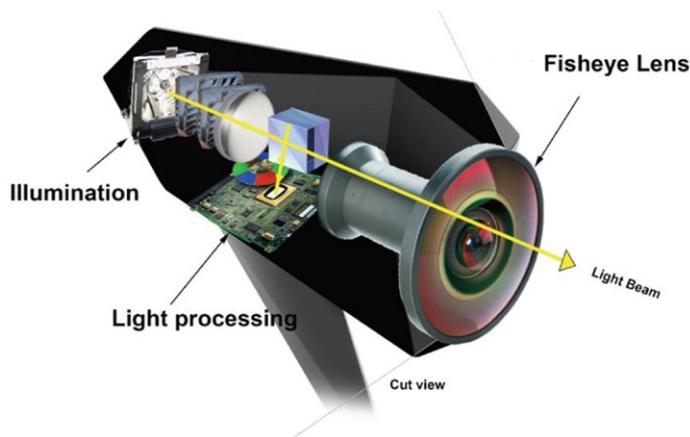
Before the launch of the Immersis Kickstarter campaign mostly aimed at gamers, Catopsys was increasing its business by developing fully immersive stereovision solutions for entertainment companies or for industrial CAD environments (including user tracking goggles to constantly update the projection's distortions based on the viewer's position. But the solution required a lengthy calibration and positioning process, done by dedicated field engineers.



Mapping the room before anamorphosis is performed at pixel-level. Source Catopsys.

## IMMERSIS ARCHITECTURE With 3D engine PLUGIN





### Inside Catopsys' projector.

So what made Catopsys go after the consumer market now? "It is a combination of factors", admits Duhautbout, "lately we've seen more and more panoramic formats appear, Google certainly initiated the trend with Street Views, then the Photosphere.

But it is really the acquisition of Oculus Rift by Facebook beginning of 2014 that sent a clear message. The market understood that virtual reality is panoramic, not a flat perspective". "From there, we have seen more and more panoramic cameras on the market, such as Giroptic's 360Cam, so we are betting on consumers to develop more panoramic content, and they will want an adequate projector to view this content".

Initially, Immersis will still require the user to perform some calibration, by providing a 3D model of the projection space. Although this can be done through Immersis' configuration tool

by describing the dimensions of the room or by importing a 3D model (.obj, .fbx, collada or other standard formats created by software like Maya, 3DS Max, Blender or Sketchup), this explains why the projector is mostly addressed at the rather geeky gamers' community accustomed to tweak their hardware and software to optimise their gaming experience.

Through a dedicated driver, Immersis also relies on the gamers' powerful GPUs to perform the anamorphosis computations.

But on the company's roadmap is automated 3D acquisition of the projection space (through structured lighting or other 3D scanning techniques), and automated calibration.

To make the projector more self-reliant, and because the anamorphosis are very compute-intensive, it would make sense to have a dedicated ASIC. This would also be one way to expand the company's business beyond its own proprietary projector solutions.

"We are open to any cooperation with suitable industrial partners for the manufacture of realtime anamorphosis chips" admitted Duhautbout, mentioning NVidia as a serious contender.

Another way to serve a larger market may be through licensing the anamorphosis software to video projector makers, since the hardware at this stage is not the most difficult part.

As for today's \$2500 price tag, Duhautbout finds it attractive compared to today's alternatives which would require a dome or a dedicated projection room setup by professionals. He also justifies the premium by the fact that the projector hardware is not only highly integrated, but offers a realistic 3D immersion that no other video projector on the market would offer.

## Atomic level LEDs open up flexible electronics opportunities

By Paul Buckley

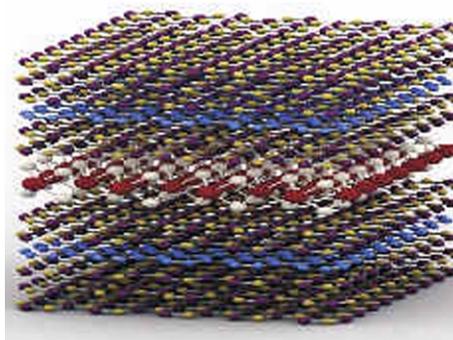
**R**esearchers at the University of Manchester and University of Sheffield have demonstrated that 2D 'designer materials' can be produced to create flexible, see-through and more efficient electronic devices.

The team, led by Nobel Laureate Sir Kostya Novoselov, has created LEDs which were engineered on an atomic level and has published the research findings in the scientific journal Nature Materials.

The research shows that graphene and related 2D materials could be utilized to create light emitting devices for the next-generation of mobile phones, tablets and televisions to make them incredibly thin, flexible, durable and even semi-transparent.

The LED device was constructed by combining different 2D crystals and emits light from across its whole surface. Being so thin, at only 10-40 atoms thick, these new components can form the basis for the first generation of semi-transparent smart devices.

By building heterostructures – stacked layers of various 2D materials – to create bespoke functionality and introducing quantum wells to control the movement of electrons, new possibilities for graphene based optoelectronics have now been realized.



Freddie Withers, Royal Academy of Engineering Research Fellow at The University of Manchester, who led the production of the devices, said: "As our new type of LED's only consist of a few atomic layers of 2D materials they are flexible and transparent. We envisage a new generation of optoelectronic devices to stem from this work, from simple transparent lighting and lasers and to more complex applications."

Sir Kostya Novoselov said: "By preparing the heterostructures on elastic and transparent substrates, we show that they can provide the basis for flexible and semi-transparent electronics".

"The range of functionalities for the demonstrated heterostructures is expected to grow further on increasing the number of available 2D crystals and improving their electronic quality."

Prof Alexander Tartakovskii, from The University of Sheffield added: "The novel LED structures are robust and show no significant change in performance over many weeks of measurements".

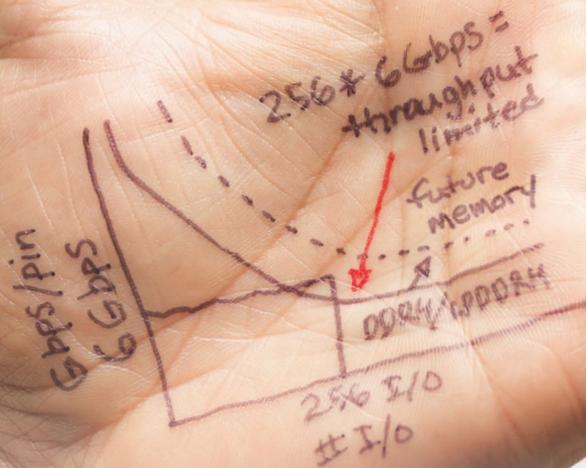
"Despite the early days in the raw materials manufacture, the quantum efficiency (photons emitted per electron injected) is already comparable to organic LEDs."

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## Man with a big imagination

CEO of Imagination Technologies Sir Hossein Yassaie sits at the helm of one of Britain's best technology successes. Here, the man who helped to develop the graphics for the iPhone discusses how, in the area of IP technology, it's best to make haste slowly...

**Hanns Windele:** You have gone on record as saying that one of the keys to success is identifying future opportunities. How do you go about doing this?

**Sir Hossein Yassaie:** It's actually quite a formal process for us, perhaps more formal than many would realise for an IP company. We basically do three things. First we look at the trends in technology, and by that I don't just mean what's going on in the semiconductor technology. I mean what's going on in technologies we care about such as graphics, video and audio – also software. The second thing we do is to understand the changes – what I call the 'direction of travel' – in the food chain in our industry. If you look six years down the line, you can't say the world will look exactly the same, because it won't. The third thing is really all about the consumer trends. What people don't appreciate is that you can do a lot of consumer analysis through the Internet these days. You can reach thousands of people and ask them questions about what they care about. A few years ago we were trying to work out whether customers cared about streaming content versus having it on the device. And so you say: "if you could do something like this... would this be of interest to you? and why?" All these analyses form the basis of a long-term plan. And then the rest of it is actually more of a short-term proposition, looking at visible markets and using data to validate the shorter-term horizon.

**Hanns Windele:** How much of a role does the spreadsheet play in all this?

**Sir Hossein Yassaie:** I hate spreadsheets. In my previous company people would justify anything with a spreadsheet. They'd say: "it's a big market, let's aim to get 10 per cent of it." It's easy to do that and you can justify anything. I think where the spreadsheet can be useful is to validate your long-term plans once you've done the trend analysis. You get a numerical back-up, which tells you how to work through things.

**Hanns Windele:** when it comes to M&As, are we dealing with simply inserting your technology into another company's way of doing things?

**Sir Hossein Yassaie:** Once we have understood the overall road map of where things are heading, if we then feel that we have to be in a certain market, then we will look for disruptions. In 1993-4 I decided to go into graphics because I saw graphics technology was going to move from the PC into portable devices. I could see that it was all going to be about footprint and a different memory system, meaning you'd have to execute what you are doing very efficiently. That's what led to our mobile, low-power, efficient architecture. You can identify those disruptions and address them yourself, or acquire someone who knows how to do it, or you can invest in start-ups. We have investment in about 10 companies in one form or another as part of our overall plans.

**Hanns Windele:** What is the balance at Imagination between organic growth in-house and looking outside for solutions?

**Sir Hossein Yassaie:** We are very much in-house driven. If you



*"Making a positive difference in a large enough scale is the thing that drives me.."*

look at our underlying technologies, the graphics and video were entirely homegrown. Before we acquired MIPS Technologies we even developed our own processor as a way to scale up what we were doing. In terms of connectivity we acquired Enigma, a company recognised for its know-how in signal processing as applied to broadcast and wireless. That was an expertise we didn't have. That company used to be a leading consultancy, but when we acquired it we said: "no more consultancy; the focus is now going to be on creating a generic solution for connectivity". That's how the Enigma RPU (radio processing unit) came about.

**Hanns Windele:** Will Imagination concentrate in future on growth through in-house development or further acquisition?

**Sir Hossein Yassaie:** We've done a certain amount of acquisition apart from MIPS. There was Enigma of course, and then in 2010 we acquired Caustic Graphics, which is in the ray-tracing technology area. And there are other more recent ones, which are small to medium-size. But, I think strategically we have already

**HANNS WINDELE is Vice President, Europe and India at Mentor Graphics. [www.mentor.com](http://www.mentor.com)  
FOR FURTHER DETAILS about Imagination technologies visit [www.imgtec.com](http://www.imgtec.com)**

done most of the things that we need for today. We've covered the processor, connectivity and multimedia technologies, which we see as the three key elements. I think the focus of the business now is to fully exploit what we have and also bring these three technologies together and to leverage them as platforms too. A bigger focus now is to provide enhanced financial performance. That's the plan.

**Hanns Windele:** How much was the acquisition of MIPS a game-changer?

**Sir Hossein Yassaie:** When the MIPS opportunity came up, I saw the opportunity to speed up what we were doing. MIPS brought in a strong customer base despite the fact that it wasn't making as much investment as it should have. The other important thing about MIPS was that we got a very clear commitment from Google to support Android, and its historical Linux ecosystem was quite strong. It also doubled up our engineering capability. In the IP business you have to do the licensing first before the volume ramps up. I think the big issue with MIPS was that it needed certainty about the future. Over the past few years we have come to realise that there are a lot of engineers out there who really love MIPS and so from the technological point of view it is highly respected. We dealt with the issues of uncertainty and investment and what we announced last year – that we had 50 or so licenses – represents a dramatic change in customer commitment, and we are seeing that momentum continuing. As to the royalties: we are being conservative. They might go down and they might be flat before they pick-up. That's just a time-line statement.

## QUICKFIRE QUESTIONS

### What are your favourite leisure activities?

Hiking and walking in the middle of nowhere – places like the Lake District or the Yorkshire Dales.

### What are your hobbies?

Like everyone else I have a great interest in music, but also walking and some sports and I'm a keen follower of current affairs.

### What (non-business) book are you inspired by?

I enjoyed 'The Kite Runner' and 'A Thousand Splendid Suns' by Khaled Hosseini.

If you could take up a senior role outside technology business where would that be?

I would probably be an academic teaching the next generation.

### If you ended up in prison, who would you share your cell with?

I think I'd settle for being in a prison cell on my own, reading books and listening to music. My favourite band is Queen. So I'd hope to have their albums with me.

### What is the one gadget you couldn't live without?

My Apple iPhone 6.

### If you had more time how would you spend it?

I would spend it with my family, my two daughters and my wife, definitely.



**Hanns Windele:** what is the main factor that leads to the success of an IP company?

**Sir Hossein Yassaie:** The IP business is only perceived to be successful after the event. There are many IP companies that don't succeed and I can give you a long list. To succeed in the IP business you must have patience and you must believe in whatever it is you are trying to achieve. If you're just trying to secure short-term revenue contributions it won't work. But if you have a long-term view then it might. I have noticed some EDA companies are getting into IP in one form or another, but when you look at Imagination, when you talk about IP it's not just about developing the core, it's more about developing the ecosystem around the IP than the IP itself.

**Hanns Windele:** Imagination is rich in technology, but looking at your stock price I see you've not exactly been rewarded for that, have you?

**Sir Hossein Yassaie:** I think the reality is that markets, particularly these days, are short-term and care only about limited horizons. It's difficult for a CEO of an IP company to produce short-term responses to financial requirements. We have to take a strategic view based on the three key areas of processor, connectivity and multimedia. That does require huge investment. If I concentrated on just one of these the share price would perhaps, in the short-term, be higher. But as a CEO you must also look forward in time to say three years from now and create higher and more sustainable shareholder value in the longer range.

**Hanns Windele:** Do you think that Imagination is vulnerable to being taken over?

**Sir Hossein Yassaie:** We have multiple major customers who value our independence. These are people who are long-term supporters who have an understanding of where we are heading. This gives me the confidence to believe that we can carry on as we are and execute the plan.

**Hanns Windele:** This column is called Iconic Insights – is there anything you've learnt from your icons or want to impart to those who might follow your guidance?

**Sir Hossein Yassaie:** I don't really know what the notion of iconic means, but if you are asking me what I care about, then the real driving motivation is that I want to make a difference. When you get to a certain age and you look back it's nice to be able to say, "I did that". I certainly have enjoyed what I'm doing. Making a positive difference in a large enough scale is the thing that drives me and to do that I don't think that you can take a short-term view of things. You have to have a vision. You have to have planning and you have to be prepared to be knocked down. When you've been knocked down you have to be able to get back up again and continue on your path.

## Fuel cells in trucks: silent power instead of idling motors

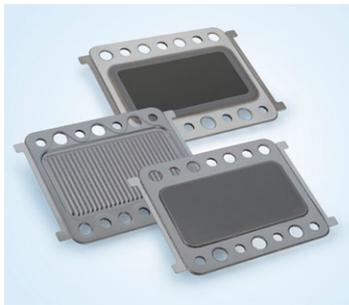
By Christoph Hammerschmidt

**R**esearchers of the Jülich research centre are developing a new type of fuel cells. Running on diesel fuel, it will be robust enough to serve as auxiliary power supply in large trucks. The research also represents a new type of collaboration between German and Austrian entities.

With a power consumption of several kilowatts, large trucks consume as much electric energy as a multi-flat house. To supply HVAC, refrigeration plant, auxiliary heating or the driver's coffee machine the vehicles often let their engines idle on motorway stations or overnight. Electric generators based on fuel cell, so called Auxiliary Power Units (APUs) could help saving energy and avoid noise and harmful exhaust fumes.

High-temperature fuel cells with solid electrolyte (Solid Oxide Fuel Cell or SOFC) could be commercially interesting, since they do not need platinum. By means of a reformer interposed between fuel tank and fuel cell, SOFCs can turn usual diesel fuel into electricity. Full-ceramics cell types are already quite mature, but they suffer from a critical drawback - their brittleness prevents their usage vehicles; they simply do not survive vibrations and shocks in their location in the vehicle floor for a very long time.

Metal-based versions as devised by scientists from the Jülich research centre along with Austrian companies AVL List GmbH, Plansee SE and the Vienna technical university perform much better; in addition they offer the perspective to lower production cost. Currently these cells however have another weakness: Already after several hundred hours of operation,



their performance is declining significantly. "The reason for the excessive ageing effect lies in the micro structure of the electrodes, which is not yet optimal", says Dr. Martin Bram from the Jülich Institute for Energy and Climate Research. "Other factors are the interplay of the electrode material with impurities of the process gases as well as inter-diffusion and oxidation process at the boundary surfaces."

In the Christian Doppler lab (CD Lab), the scientists will explore these mechanisms in detail and develop solutions that prevent premature ageing. The anode-based high-temperature Solid Oxide Fuel Cell developed at the institute is already a success story, it currently is passing a long-term test run with already more than 60.000 operating hours. The new variant, the Metal Supported Cell (MSC-SOFC) to be developed is not even required to run that long - about 12.000 operating hours would be sufficient. In the long run, these fuel cells could also serve as APU during driving - they could provide additional electricity for hybrid vehicle functionality.

The research is conducted at the new Christian Doppler Lab in the Jülich research centre. And this is the other innovation in this story: Those who are familiar with the CD Lab network know that this is an Austrian institution, with their application-oriented research approach to some extent comparable to Germany's Fraunhofer institutes. The CD Lab in Jülich, inaugurated these days, is the only the second one established at a German research institute.

## Driver assistance becomes predictive

By Christoph Hammerschmidt

**A** 360 degree surround sensing system today creates a virtual image of a car's environment, enabling the electronic systems to keep the vehicle in the selected lane and to hit the brake if an obstacle emerges. Now Honda has added a predictive element - their Intelligent Adaptive Cruise Control (i-ACC) system can tell if a fellow car driver has the intention to cut in.

Has Honda the proverbial crystal ball? No - the i-ACC uses camera and radar to sense the position of other vehicles on the road. The system runs an algorithm that can determine the likelihood of vehicles in adjacent lanes cutting-in. For this purpose it evaluates the relation between the vehicles in the surroundings and how they change. According to Honda, the predictable time horizon is about 2 seconds. And of course the outcome of the computation is not a 100% sure prediction, it is more like a guess, albeit a rather good one.

The system has been devised by European and Japanese developers and is based on real-world research of typical European driving styles. It will make its debut this year on the new

European CR-V, building upon the traditional Adaptive Cruise Control (ACC) system.

Traditional ACC systems keep a preselected longitudinal velocity, which is only reduced for maintaining a safe distance to a car in front. However, if a vehicle cuts in from a neighbouring lane, the traditional ACC system reacts later thus requiring stronger braking.

The new i-ACC system is able to compute the likelihood of a cut-in before it occurs, and is therefore designed to react more smoothly so as not to startle the driver, who might not yet be aware of the imminent cut-in. In this case the system applies just a mild brake initially, with an icon appearing on the driver display, informing the driver why a slow-down occurs. It then proceeds to apply a stronger brake to adapt the velocity to keep a safe distance. i-ACC recognises the side of the road one is driving on whether in the UK or on the continent and automatically detects which neighbouring vehicle is the most critical to be aware of at any given moment.





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# Are you worth insuring? Wearables to decide

By Julien Happich

**A**t Cicor's first Innovation Insights Symposium held in Zurich last week, the focus was very much on smart wearables for health monitoring.

According to recent market figures from Soreon Research, the smart wearables market for healthcare alone could grow from USD 2 billion today to over USD 40 billion by 2020, that is at a vertiginous 65% compounded annual growth rate.

In these figures are included not only the wearable devices (from sensor-laden bracelets to shoe-soles or hearing aids) but also the software and associated services. And listening to the panel of speakers present during the event, big data is where the true value is.

According to Christian Stammel, Founder and CEO of business accelerator company Wearable Technologies AG, the hardware is going to be commoditized so much that over the next 10 years, it could probably represent only 20% of the actual wearable value, while the other 80% would be in the data analysis.

"Four to three years ago, big retailers were not adapting to wearables. But now they are creating corners dedicated to wearable electronics", Stammel noted.

"A few years ago, network providers were the clear winners, but wearables are only useful if they are used in an intelligent environment, and now brands like Staples are adapting different IoT devices under one platform. Automotive makers are also looking at wearables because the car is the nearest intelligent platform".

Stammel expects the most common and useful sensors of first generation healthcare and fitness wearables to end up converging into one central and cheap unobtrusive unit, such as a belt buckle or something not even to be noticed or displayed as a fashion statement. Instead, all the differentiation would be performed in software, deriving different services and applications based on behaviour pattern recognition.

In the medical industry, big data can help you cut costs, if you use it for disease prevention and for outbound patients or to reduce your insurance premiums. Niclas Grandqvist, Director of the Polar Electro Group, briefly mentioned ongoing collaborative work with US insurance companies who push Polar's fitness-tracking devices to their customers. "We collect the data and analyze it for the insurance companies", he said, not sure whether this would lead to discriminatory insurance premiums.

In fact, so-called corporate-wellness programs have already been reported in the press, enticing employees to exercise more and benefit from a healthier lifestyle. In return, the employer distributes less sick days and pays lower insurance premiums. But



such a pervasive health monitoring program could go against your own understanding of wellbeing, as an individual, should you not want to behave within the "healthy standards" set by the company or the state looking after your health.

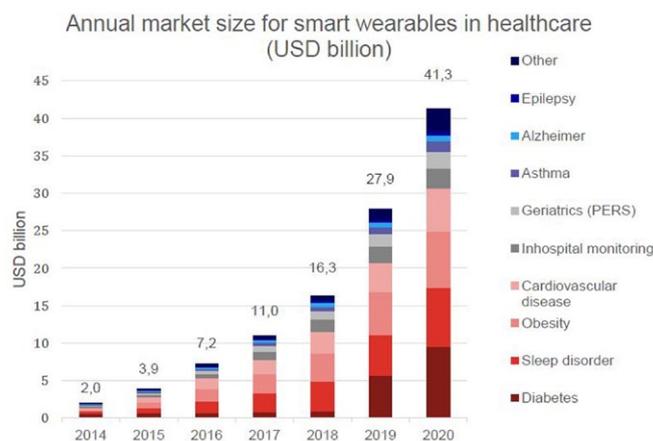
Unhealthy behaviour (who should set the limits for this?) could turn your data into lower pay, higher taxes or even less or no insurance reimbursements (for damaging the workforce instrument that is your body).

But even if there was a rational recipe for all of us to live healthily for as long as possible, should it necessarily be enforced for the greater "common good" through financial incentives? (read cutting national health expenses).

One important barrier to overcome for these scenarios to happen in Europe is data privacy, lamented some of the speakers. Only political changes and legal reforms could enable big

data to truly yield its full Orwellian potential. In the meantime, it is possible to integrate privacy-by-design features into wearables, so the data does not become too personal yet remaining accessible for big data analysis schemes, one example being MIT's Open Personal Data Store concept. For now, when using a service, it is still not clear to whom belongs the collected data, commented Dr. Stefan Rüping, Head of the Data Mining group at the Fraunhofer Institute IAIS. "People don't think too much about that, but this can have many legal implications".

Without a heavy clamp down on "unhealthy behaviour" or making fitness trackers compulsory by law, another barrier to mass adoption is cost, of course. And more than medical regulatory issues, the question of reimbursement is critical, highlighted Dr Milo Puhan, Professor of Epidemiology and Public Health and Director of the Epidemiology, Biostatistics and Prevention Institute at the University of Zurich. Should the health



Source: (c) Soreon Research

insurances pay for the devices or should they be part of a free public service? In any case, if the devices are not reimbursed in one way or another, most patients won't want to pay for it, unless they understand that their life depends on it.

It is difficult to convince people to wear health monitoring devices long term only for predictive analysis, even if this is to decrease their risk of having a heart attack or diabetes in the next ten years (by influencing their behaviour). "During all these years when nothing happens, you still have to pay for the back office, interpret the data and eventually coach the individuals, but is this really affordable?" Questioned Puhan. That is why today, only the high-risk patients are monitored (typically those who already had a first heart accident or who feel immediately at risk).

For now, what truly makes the difference between a smart wearable's success and failure is its level of usefulness, the actual value perceived by the wearer, not only by whoever runs the data analysis. For instance, Hocoma AG's CEO Dr. Gery Colombo related his experience with the launch of Valedo for the treatment of low back pain.

While many wearable devices are seen as gadgets, Valedo is an easy sell for those who seek medical help, claims Colombo. The kit includes two motion sensors that monitor the wearer's posture as he/she follow therapeutic gaming instructions on



Hocoma's Valedo therapeutic gaming platform ensure the right compliance with low back pain exercises.

a tablet or a smartphone. The minute rehabilitation movements are easier to perform thanks to the avatar's feedback in real time, and the sessions just feel like playing a game, hence a better compliance with the recommended exercises.

"Eight out of ten people will be affected by back pain at some point during their lives", highlighted Colombo, citing this health issue as the number one cause of disability worldwide (\$200 billion in lost wages and productivity), and one of the most expensive ones to treat.

"We got very good reviews, because we truly bring a solution to low back pain problems, and it is not just fun but also medically proven and certified".

For Colombo too, in the medical sector, the biggest issue is the prescription habits and reimbursement.

"Patients are used to do what the doctors tell them" he said. "If the doctors prescribe them even the most expensive treatments, if the insurances reimburse them, then the patients will go for that. They always favour the treatments that they know will be reimbursed".

"In sports, people pay out of their own pocket, but in health, people expect someone to pay for them, either the healthcare or the insurance", Colombo concluded.

## Bosch bets on synergies between electromobility and connectivity

By Christoph Hammerschmidt

One of the major roadblocks for electromobility is the fragmented charging landscape: For long-distance rides, e-car drivers not only have to stop and recharge their batteries rather often. What makes things worse: To get the electric refill for the battery, drivers must utilise many different payment systems. Bosch Software Innovations (BSI), a subsidiary of Robert Bosch Group, now is developing a smartphone app that allows drivers to plug in to any charging station regardless of the payment system or electricity provider.

With the move, BSI extends its strategy to facilitate electric driving not only at the car level but likewise at the infrastructure level. In this context, payment systems - or apps that span multiple payment systems - play a major role. As recently as December 2014, Daimler introduced its Charge & Pay system enables owners of its electric B-series vehicles to charge almost wherever they want (at least in Germany). To our knowledge, this app has been developed by Bosch and highlights the direction in which the Swabian traditional all-hard-ware company plans to develop.

At the CAR Symposium this week in Duisburg (Germany), Bosch CEO Volkmar Denner outlined the mobility landscape of the future, as seen from Bosch's perspective. In a nutshell, Denner explained that connectivity and electromobility are two

building blocks for individual mobility that are very complementary. "The best electric car is the networked electric vehicle", Denner said.

Electric mobility does not start at all-electric vehicles; in Bosch's universe hybrid drivetrains of all types play an important role. By 2025, about 15 percent of all new vehicles built anywhere in the world will have at least some kind of hybrid



drive, Denner predicted. For Europe, this figure will be even higher; Denner expects that one in three new cars will be powered at least in part electrically. A key to lowering the price level for electric vehicles is the battery price. Denner who also assumes the tasks for research and advanced development at the automotive supplier expects that by 2020 the batteries will offer twice the capacity at half the price, compared with today.

In the booming SUV market segment, hybrid drive will be standard by 2020, Denner predicted. This trend is driven by the exacerbated CO2 regulations from the European Commission. The hybridisation will lead to new developments in the area of diesel and gasoline engines that are more fuel efficient, clean and powerful than ever. "Through electrification we will see that the best time for internal combustion engines has yet to come", Denner said.

# Rear axle becomes steerable... by wire

By Christoph Hammerschmidt

**W**ith an innovative approach to automotive kinematics, ZF Friedrichshafen emphasises its commitment to electronic technologies in automotive segments hitherto defined exclusively by mechanic parameters. The company that recently took over mechatronic systems supplier TRW Automotive now introduces a steerable rear axle design in which decisive elements are controlled by software.

Until now, steerable rear axles were too expensive, too complicated or too fuel-inefficient to implement. Such systems which assist the steering of the front axle for better driving behaviour have been on the agenda of OEMs throughout the automotive industry - and due to their high price and complexity they were restricted to a few high-end vehicles. Now ZF says it has a system ready for volume production. ZF's AKC system, which facilitates steering movements of the rear axle by modifying the toe angle, demonstrates its advantages as a standard active rear axle steering in Porsche's 911 Turbo and 911 GT3 models.

Track adjustment is an important task when developing the suspension. The aim is to promote optimum vehicle handling because the toe angle on the chassis is responsible, among other things, for directional stability when braking and for the steering precision perceived by the driver. Suspension components such as toe links and control arms ensure that the track setting defined during chassis development on a volume production vehicle is maintained precisely.

As soon as the track for a vehicle is defined, it cannot be varied anymore - and right at this point ZF steps in with its latest development. The company's developers developed a length-adjustable toe link, which lies at the centre of the active system: Electromechanical actuators can vary the toe angle while the vehicle is moving; control software integrated into the vehicle electronics issues the commands.

One advantage: a steering movement is produced by modifying the track angle. This is actually small (about three degrees) compared with the front axle, but steering intervention at the rear axle has a greater impact. Interacting with the steering angle of the front wheels, the result is a distinctly noticeable and positive impact on vehicle handling. Depending on requirements and available installation space, the AKC system, which operates energy-efficiently according to the power-on-demand principle, is available in two variants: with an actuator in the centre of the rear axle, also called a "central actuator" system, or with one actuator per rear wheel as is the case in Porsche's 911 Turbo and 911 GT models.

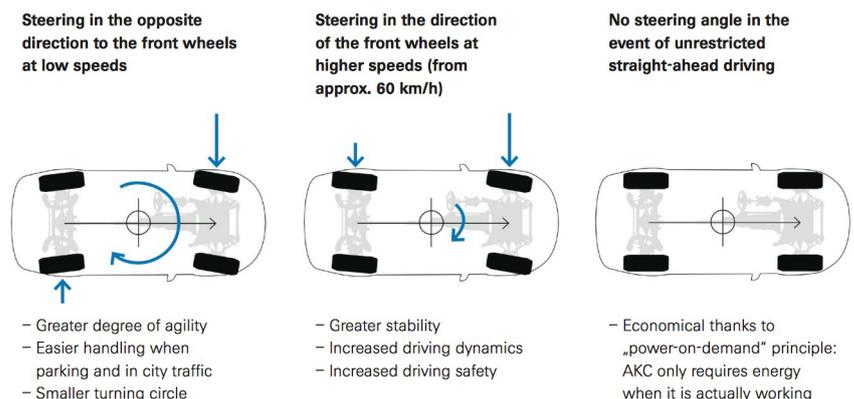
The technology offers benefits in many driving situations, claims ZF. "If you are driving slowly through narrow streets, it steers contrary to the front wheels' steering angle and generates a higher yaw rate of the vehicle, explains Peter



Holdmann, head of development at ZF's Chassis Technology division.

"The turning circle is then reduced by up to 10 percent, thus making passenger cars easier to manoeuvre." At higher speeds - more than 60 km/h (37 mph) - the system steers the rear wheels in the same direction as the front wheels, thus improving directional stability and driving dynamics.

Steering assistance with AKC is created by electromechanical actuators which are not mechanically connected to the steering wheel. It is therefore a pure 'by-wire' system. This has the advantage that AKC can be integrated into the active control network of the particular passenger car. Then it assists the functions provided by other active systems - such as in combination with ESP. If AKC and the antilock braking system are interconnected, stabilizing interventions of the brakes and rear axle improve the vehicle's handling during deceleration. Thus the system enhances safety and driving dynamics at the same time. When braking on surfaces with varying grip, the stopping distance is reduced.



# Eco-friendly electronics that self-degrade and vanish

By Amy Norcross

**R**esearchers at Scandinavian research organization SINTEF have made progress in developing components that dissolve in water. They are made of a combination of magnesium, silicon, or silicon with a magnesium additive; are water-soluble; and disappear after a few hours.

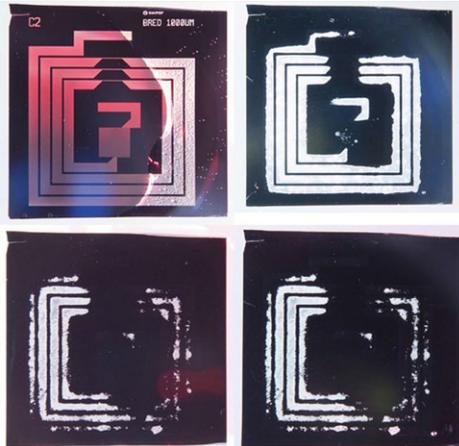
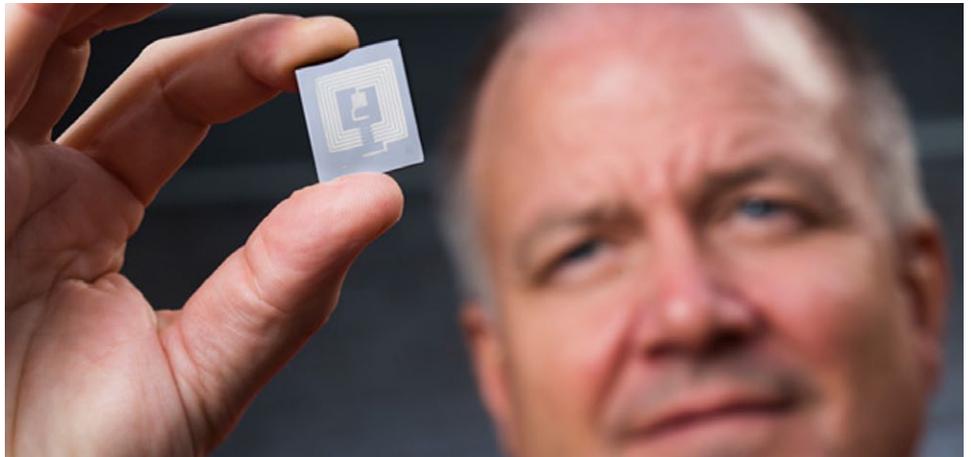
One of the obstacles to creating a final working product is the need for a coating that can protect the circuits. When external fluids reach the inside of the packaging, the circuits will begin to degrade. The job for which the circuit is designed must be complete before that step occurs. SINTEF researchers gave an example, a circuit package designed to be used in seawater and fitted with sensors for measuring oil spills. The film must be made so that it remains in place for the weeks during which the measurements are being taken.

"It's important to make it clear that we're not manufacturing a final product, but a demo that can show that an electronic component can be made with properties that make it degradable," says Karsten Husby, a research scientist in SINTEF's Information and Communication Technology (ICT) division. "Our project is now in its second year, but we'll need a partner active in the industry and more funding in the years ahead if we're to meet our objectives. There's no doubt that eco-friendly electronics is a field which will come into its own, also here in Norway. And we've made it our mission to reach our goals."

Researchers in the United States have been working on biocompatible electronic devices that can be implanted in the body for various uses — pain management, for example, or to combat infection — and then dissolve over time.

"We make no secret of the fact that we are putting our faith in the research results coming out of the USA," Husby adds. "The Americans have made amazing contributions both in relation to medical applications, and towards resolving the issue of waste. We are far from this, but we want to try to find alternative approaches to the same problem."

Along similar lines, other researchers have created what they call the world's first "biological" drone built with biodegradable material that, should the drone crash, will start breaking down upon impact, leaving no evidence of its existence. A team of 15 Stanford University, Brown University, and



Printed on a silicon wafer, the components contain extremely thin circuits — only a few nanometres thick — that are designed to transfer energy. Source: Werner Juvik, SINTEF



The bio-drone's chassis, made of mycelium, the vegetative part of a fungus, was modelled and 3D-designed by a team of students for the 2014 iGEM design contest and produced by Ecovative Design. Source: iGEM.org

Spelman College students developed the drone in collaboration with New York-based biomaterials company Ecovative Design for the iGEM (International Genetically Engineered Machine competition) 2014 Giant Jamboree, held Oct 30 to Nov 3 in Boston.

An unmanned aerial vehicle made entirely of biological materials would be able to fly in sensitive areas, for numerous purposes, and leave no trace of its existence in the event of a crash. "No one would know if you'd spilled some sugar water or if there'd been an aircraft there," Lynn Rothschild, lead scientist at NASA's Ames Research Center and an adviser for the student team that created the drone, told New Scientist.

In a recent Tech Times article, author Jim Algar says, "Drones have been used to explore and observe remote locations, some for scientific purposes and some for military operations, but the crash of a science drone could contaminate a sensitive environment, while that of a military drone could give away the fact someone's been spying."

"The greatest part of the biological prototype drone," Algar adds, "consists of a plant-root-like material known as mycelium, part of a fungus, often grown for use as a sustainable, lightweight material for wine packaging or in surfboard cores."

Other materials used in the drone's construction included a protective covering for the fungal body — comprising sticky cellulose "leather" sheets grown by bacteria in the lab — proteins cloned from the saliva of paper-wasps, and silver nanoparticle ink for printing the circuits. Nonbiological components of the drone were the controls and propellers borrowed from a standard quadcopter, as well as a standard battery. The team plans to eventually be able to make all parts of the drone, including the sensors, biodegradable.

## Best single-board computers under \$200: the readers strike back

By Cabe Atwell

**S**ingle-board computers (SBCs) are quickly becoming a staple in the maker world as the go-to development board. Professional engineers may use SBCs for prototyping as well as hobby tinkering. So exactly what is an SBC and why do so many makers use it in their projects?

A single-board computer is just that — a complete computer built on a single board. They can be fairly large like Nvidia's Jetson TK1 or incredibly small like the iMX233-OLinuXino-Nano and are popular development tools that for the most part, are incredibly cheap.

Makers and engineers often use SBCs as an affordable alternative over notebooks and desktops to design everything from home automation to robotics or just about anything that can be imagined. Let's take a look at some of the SBCs for under \$200 that have been suggested by EE Times' readers. Pete220 is one such reader and his alternatives include the ZedBoard's MicroZed development board.

### The MicroZed ZedBoard

The MicroZed ZedBoard is based on the Xilinx Zynq-7020, which packs two ARM Cortex-A9 cores, 1GB of DDR3 RAM and 128MB of QSPI flash storage along with a microSD card interface. The board also features 100 user I/O headers, which are inactive in stand-alone mode but, when plugged into a carrier card, automatically conforms to what the card's programming. ZedBoard's MicroZed SBC is one of the higher priced

boards topping out at \$199 but it is rich in features.



ZedBoard's MicroZed development board features Xilinx Zynq-7020 SoC that packs 2 Cortex-A9 processors. (Source: ZedBoard)

### Intel's MinnowBoard Max

Another SBC Pete220 suggested for the under \$200 price mark comes



Intel's MinnowBoard Max features the company's Atom processor in single or dual core flavors. (Source: MinnowBoard.org)

in the form of Intel's MinnowBoard Max. This board is actually a collaboration between Intel and CircuitCo (manufacturer) and comes in two flavors — a single core for \$99 and a dual core for \$139. The higher priced version features Intel's Atom E3825 (clocked @ 1.33GHz) APU. While the board is designed for anything from hobbyist projects to embedded applications (due in part to the many ports), it can also be used for file servers and network applications as the board comes with a PCI-E port, Gigabyte Ethernet and SATA support.

### Intel's D2500HN Atom D2500 mini-ITX

The final SBC suggested by Pete220 is the Atom micro-ITX. While he wasn't specific on which model, I'm going with Intel's D2500HN Atom D2500.



Intel's D2500HN Atom D2500 mini-ITX features just about everything a full-size desktop would have, only in a much smaller package. (Source: Intel)

This board has it all — an Intel Atom dual-core processor (clocked @ a modest 1.8GHz), two SO-DIMM slots for up to 4 GB of DDR3 memory and a mini PCI-E slot.

It's also packed with an array of connection options that include 8 USB 2.0 ports (4 internal/external), VGA port and a PS2 port for a keyboard or mouse. Like most desktop motherboards, it also features connections for external speakers or headphones powered by Intel's HD audio. The cost for Intel's D2500HN hovers around \$90, which isn't bad for this feature-packed SBC.

### EMAC's iPac-9X25

While it may not look 'flashy' like some of the others mentioned in this list, EMAC's iPac-9X25 has a massive amount of headers for digital applications. Suggested by rossi007,



It isn't pretty but EMAC's iPac-9X25 is certainly no slouch as it packs Atmel's AT91SAM9X25 processor along with a massive amount of GPIO connectors. Source: EMAC Inc)

EMAC's SBC features Atmel's AT91SAM9X25 microcontroller (clocked @ 400MHz), 16Mb of serial flash, 128Mb of DDR2 memory and 4 GB eMMC.

What sets this board apart from the other is its massive amount of digital I/O headers- 20 GPIO SAM9X25, 16 SPI Expander Based Digital I/O lines, and 8 x High Drive Digital

Outputs. It also sports 2 10/100 BaseT Ethernet with RJ45 ports along with 1 USB 2.0 High-Speed (Host Port), 1 USB 2.0 Full-Speed (Host Port) and 1x USB 2.0 High-Speed (Device Port). While this board is a great development platform, it's one of the higher priced SBCs running around \$199.

### The BeagleBoard-xM

BeagleBoard makes some of the more popular SBCs on the market and even their older boards are still standing strong in the maker community.



The BeagleBoard-xM is powered by ARM's AM37x 1GHz processor but has no NAND storage, so the OS has to be stored separately on a microSD card. (Source: BeagleBoard.org)

Suggested by Sanjib.A, the BeagleBoard-xM is actually a modified version of the original SBC and features a faster ARM Cortex-A8 CPU (clocked @ 1GHz), 512Mb of LPDDR memory and a 4 GB microSD card pre-loaded with The Angstrom Distribution for embedded devices. It comes packed with a host of ports, including 4 USB 2.0 ports, Ethernet, stereo in/out jacks and S-video. While every feature makes this a decent SBC, it truly shines with its ability to pump out an HD resolution of 1400 X 1050 using the onboard DVI-D port. It can also run many Linux flavors, including Android, Fedora and Ubuntu along with a host of others. Not bad for a board that costs around \$150.

### Intel's NUC Kit DN2820FYKH

While it may look like an HTPC or a streaming device like the Roku, it's actually Intel's NUC Kit DN2820FYKH.

This one is suggested by me (Cabe) and actually houses the



Intel's NUC Kit  
DN2820FYKH  
(Source: Intel)

company's Haswell-based SBC, which features a Celeron 2820 dual-core processor, 1 GB DDR3L RAM and support for a 2.5-inch SSD or HDD. It also sports 1 USB 3.0 port, 2 USB 2.0 ports and an HDMI 1.4a port. While it is true that the NUC can be used as an HTPC, Cloud storage device or even a desktop PC as it runs Windows 8.1, however there are hacks that allow users to run Fedora for software or app development. Intel's NUC Kit costs in the neighborhood of \$130, which isn't bad considering it's a stand-alone PC and an app-developing platform.

### WandBoard's WBQUAD

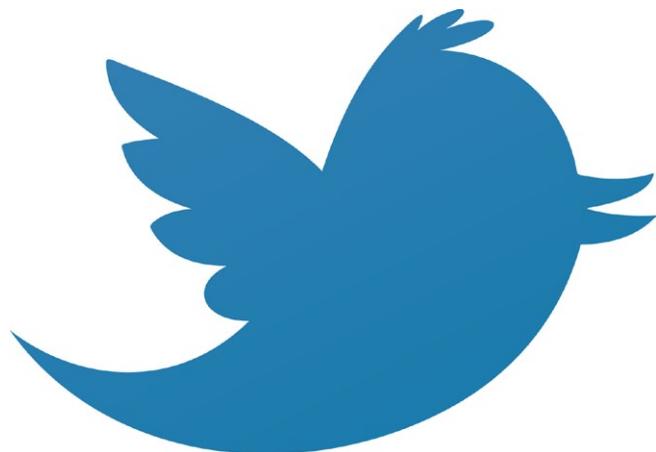
Another SBC I would like to suggest is WandBoard's WBQUAD (or WandBoard Quad), which may be small in stature but it packs some serious hardware, including Freescale's i.MX6 quad-core CPU (ARM Cortex-A9 clocked @ 1GHz). Besides the slick processor, the board also features an integrated Vivante GC2000 GPU, 2 GB of DDR3 RAM and 2 microSD slots. It also has a SATA connector, HDMI and USB ports in much the same

# Follow-us on



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# Follow-us on



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WandBoard's WBQUAD may not look like much but it packs a Freescale i.MX6 quad-core processor. (Source: WandBoard.org)

in fashion as other popular boards. If that wasn't enough, there is also optical S/PDIF, a camera interface as well as an expansion header and Gigabyte LAN. Users also have the option of running their favorite Linux-based flavors, including Android, Ubuntu and Fedora. For \$129, what's not to like?

### Odroid-XU3

The last three entries on this list haven't been suggested but deserve to be in it anyway, with the first being the Odroid-XU3, which is based on Samsung's Exynos5422.



Odroid's Odroid-XU3 is based on Samsung's Exynos5422, which packs four Cortex-A15 and four Cortex-A7 CPUs. (Source: Hardkernel.)

The interesting thing about the SoC is that it features four Cortex-A15 cores along with four Cortex-A7 cores. Only one quad-core set is engaged depending on the app requirements and thereby helps to reduce energy requirements. The board goes all out with the visual technology as well thanks to the onboard Mali-T628 MP6 GPU, which astonishingly enough is capable of pumping out 4K UHD (Ultra-High Definition) resolutions! The XU3 also sports a USB 3.0 and 4 USB 2.0 ports along with HDMI 1.4a and DisplayPort 1.1 ports. Obviously, this is one of the more expensive SBCs (@ \$179) but you do get what you pay for.

### Raspberry Pi 2

What list would be complete without the Raspberry Pi? The RPi Foundation recently released the Raspberry Pi 2, which is superior to the original in just about every way but costs the



The Raspberry Pi 2. (Source: Raspberry Pi)

same (\$35). The upgraded SBC features an ARM Cortex-A7 quad-core CPU (clocked @ 900MHz), which provides about 6-times more performance over the original as well as the B+. It also has twice the amount of RAM as the original, with 1 GB of LPDDR2 RAM.

What's truly different from the other boards is that it can run the typical Linux flavored OSes such as Ubuntu but it can also run a modified version of Windows 10! However, the best part is

that Microsoft's newest operating system will be free to Raspberry Pi makers!

### Intel's Edison

The final entry on this list comes from Intel with their second revision of the Edison. The SoC for the Edison contains two



Intel's Edison may be small but it packs hardware that's nothing to sneeze at, including two Atom Silvermont cores and one Quark core. (Source: Intel)

Atom Silvermont cores (clocked @ 500MHz) along with a single Quark core (clocked @ 100MHz), which is basically used to run the Linux-based Viper OS. The SBC also features 1 GB of RAM and 4 GB of eMMC flash for storage along with a 70-pin dense connector for USB, GPIO and UARTs. Intel designed the board for use with wearable devices but what makes this board interesting is that it's compatible with the Arduino Breakout Kit, which means it can take advantage of the company's many shields. Not bad for a board that costs a mere \$50.

### GizmoSphere's Gizmo 2

As an extra-added bonus for the list of sub \$200 SBCs, take a look at GizmoSphere's Gizmo 2, which features enough power to run high-end applications, including mainstream videogames.



GizmoSphere's Gizmo 2 has enough horsepower to run high-end applications and even graphic-intensive videogames. (Source: GizmoSphere.org)

By all intents and purposes, this board is a development kit—meaning it has a wide range of interfaces for connecting add-on devices, including GPIO, ADC/DAC and SPI connections.

It's clear that the inclusion of a heatsink with a fan means it's packing some power, which it is as the Gizmo 2 is powered by an AMD GX-210HA dual-core SoC (clocked @ 1GHz), which also sports AMD's Radeon HD 8210E GPU and 1Gb of DDR3 RAM.

The 4-inch X 4-inch board is also equipped with two USB 3.0 ports, two USB 2.0 ports, mSATA, microSD slot and HDMI port. The \$199 price tag for the Gizmo 2 is justifiable given the amount of technology that's packed on the SBC.

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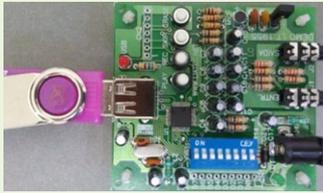
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### RecPen board records sounds directly to a USB drive

Brazilian chip manufacturer Liatec has created the RecPen board around its LT-1955 IC, the main component responsible for capture and reproduction of audio signals after storage



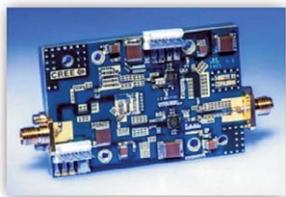
on a pen drive. RecPen was designed as a development board for hobbyists and students willing to record sounds directly to a USB memory stick, without the need of any external devices.

The board can reproduce and record any type of sound in Wav format, using either the on-board microphone input to capture sounds or even using any other audio source through the auxiliary audio jack. Because the board records and stores the audio signal directly to an external flash memory drive, storage capacity depends only and exclusively on the pen drive capacity, ordered in 256 different files regardless of individual size. The board also features a signal indicator for the end of the file, in order to alert the microcontroller that the audio that was being reproduced has reached its end. It also has a signal that identifies the presence or not of a USB memory stick. The kit can be used in professional applications such as elevators, telephone centrals, train and subway stations or other audio applications relying on pre-recorded messages, allowing for greater message capacity and simpler file manipulation or exchange.

**Liatec**  
[www.liatec.net](http://www.liatec.net)

### Doherty PA reference design for small cell applications

To address the needs of small cell designers, Cree, Inc., has introduced the CDPA35045 asymmetric Doherty power amplifier (PA) reference design for the 3.5 to 3.7 GHz band. This band is



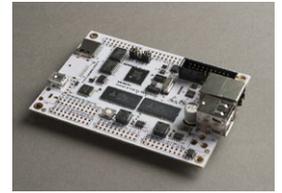
an additional spectrum space intended to complement small cell technology by providing increased wireless system capacity for both licensed wireless carrier services and unlicensed public use, such as WiFi. Providing 10-W average

output power and excellent predistortion (DPD) correctness, this proven Doherty PA design utilizes Cree's 30-W CGH-V27030S and 15-W CGHV27015S GaN HEMT devices, which can operate with either 50 V or 28 V drain supplies and enable enhanced design flexibility for telecommunications, wideband tactical radio, and radar applications spanning low frequencies to 6 GHz. The CDPA35045 was evaluated by engineers at Xilinx in a 3.5 GHz test radio platform that implemented Xilinx® CFR and DPD SmartCORE™ IP on a Xilinx ZC706 evaluation board featuring the company's Zynq® 7Z045 All Programmable System-on-Chip (APSoC) as the processing engine. The evaluation proved that this combination of Xilinx Zynq APSoC devices and Cree® GaN devices results in highly efficient, low cost, and low power products that enable full flexibility of control processing and the radio signal.

**Cree, Inc.**  
[www.cree.com](http://www.cree.com)

### Development board hosts Renesas ARM Cortex-A9 core MCU

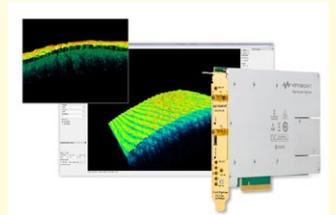
Distributor Rutronik has Vekatech's VK-RZ/A1H development board which carries the RZ/A1H embedded microprocessor from Renesas, an ARM Cortex-A9-based MCU. The embedded microprocessor RZ/A1H runs at up to 400MHz clock speed; integrates up to 10MB of on-chip RAM, and has an OpenVG compatible graphics accelerator, dual LCD-drivers and camera inputs. The internal SRAM can hold two layers of WXGA size images making external SRAM redundant. Using serial QSPI-flashes enables compact HW-designs with low pin count ICs. The VK-RZ/A1H board is equipped with the 10 MB-version of the RZ/A1H in the BGA256 package. The processor has 2x32 MB SDRAM and 2x8 MB QSPI-flash next to it. Debugging can be performed via standard J-TAG connector. An additional USB function interface, provided by a RL78/G1C connectivity microcontroller, is connected to the RZ/A1H's UART. The Board Support Package includes U-Boot, Linux-GCC, FreeRTOS and CycloneTCP, both compiled for EWARM from IAR and can be downloaded from Vekatech's website ([www.vekatech.com](http://www.vekatech.com)). An SD-Card boot-loader allows for easy loading and running of applications from the internal SRAM, SDRAM or serial flash.



**Rutronik**  
[www.rutronik.com](http://www.rutronik.com)

### Keysight applies 12-bit high-speed PCIe card to Optical Coherence Tomography

Keysight Technologies's U5303A high-speed data acquisition 12-bit PCIe card, resulting from a collaboration with YellowSys, a provider of IP processing firmware and software, is now available with an option dedicated to optical coherence tomography (OCT) technology. The Keysight data acquisition solution uses signal resampling which provides on-board enhancement of range analysis and offers a stable ADC signal sampling cadence. The solution focuses on clock stability while acquiring the signal in order to avoid sampling cadence changes. This adverse effect on signal acquisition typically occurs when an external k-clock is used. Signal processing is done in real time directly on the data acquisition card, significantly reducing the processing load on the host computer. The solution was designed using Keysight's U5340A FPGA development kit, allowing portability of the OCT signal processing IP to other Keysight data acquisition cards, including future releases. There is no need for internal circuitry dedicated to OCT, and the easy migration of the processing IP is a key to future OCT technology developments. "OCT technology is evolving at a fast pace and we strongly believe in supporting developers to push the limits in real-time imaging and quality," said Didier Lavanchy, operations manager of Keysight's high-speed digitizers division. "Partnering with YellowSys enables us to meet the application demands using our FPGA development kit."



**Keysight**  
[www.keysight.com](http://www.keysight.com)

## 40x31mm USB 3.0 board-level camera delivers 1288x964 resolution at 30 FPS

Point Grey's Chameleon 3 is a new family of USB3 Vision board-level cameras that combines the ease-of-use of USB 3.0, the small size and flexibility of board-level, and the most



popular CCD and CMOS image sensors into an affordable package. Available in a lightweight 44x35x19.5mm metal case or as a 40x31mm board stack, the Chameleon3

is well-suited to a wide range of space-constrained applications. The board-level version offers configuration flexibility and can be equipped with either a C/CS-mount lens holder or a smaller S-mount (M12) lens holder. Other standard features include an on-camera frame buffer for image retransmission, opto-isolated GPIO with locking connection, and a hassle-free 3-year warranty. The first Chameleon3 CM3-U3-13S2 models are based on color and monochrome versions of the popular Sony ICX445, a 1/3" global shutter CCD sensor capable of 1288 x 964 image resolution at 30 FPS. The EXview HAD CCD sensor technology offers excellent imaging performance with high quantum efficiency and NIR sensitivity, in a cost-effective 1/3" optical format. Additional Chameleon3 models will be released throughout 2015, including the 1.3 megapixel On Semi Python 1300 global shutter CMOS, and the 2.8 megapixel Sony ICX818 global shutter CCD.

**Point Grey Research**

[www.ptgrey.com](http://www.ptgrey.com)

## Optimized HMI board is only 59x39mm

With the launch of its GraphLight board, French manufacturer Clairitec addresses the growing market demand for display with a resolution up to VGA (640x480 pixels). This new HMI board version benefits from the SpiderGraph board technology while being optimized for a resolution up to VGA.

By removing the hardware components non-mandatory for a display in low resolution, replacing the microprocessor and optimizing the electronic architecture, the new GraphLight board offers two



main advantages: a significant cost decrease compared to the original board while slashing its footprint by a factor of two. Equipped with serial connections RS232, CAN or USB, the 59x39mm GraphLight enables engineers to develop and integrate fully customizable touch and graphic interfaces in less than four weeks directly from an existing business application. The GraphLight board will also be integrated into the plug & play and EMC certified graphic display module designed by Clairitec, more particularly the 4.3" WQVGA and 3.5" QVGA versions.

**Clairitec**

[www.clairitec.com](http://www.clairitec.com)

## FPGA-based I/O expansion and bridging starter kit

Presented as the most affordable product of its type available, Lattice Semiconductors's Programmable kit enables easy and quick evaluation of MachXO3L FPGAs. The kit



includes pre-loaded reference designs, design tools, USB connector and other components necessary to thoroughly evaluate MachXO3L devices. The MachXO3L Starter Kit is a platform for evaluating and designing with the company's low cost family of MachXO3L instant-on, non-volatile FPGAs. Product devel-

opers can now immediately deploy programmable bridging and I/O expansion with high I/O density at the lowest cost per I/O that Lattice offers. The MachXO3L family is Lattice's small form factor FPGA family for essential bridging and I/O expansion functions. The new MachXO3L Starter Kit enables designers to evaluate and demonstrate LED drive, SPI, I<sup>2</sup>C, CMOS I/O, programming via JTAG or I<sup>2</sup>C, dual-boot operation using SPI Flash and other capabilities. The kit consists of reference designs pre-loaded onto a LCMXO3L-6900C-5BG256C device for demonstration and easy bring-up of the embedded I<sup>2</sup>C and SPI controllers as well as the oscillator and programmable I/O used for LED drive. The kit also includes a USB connector for power and programming, LEDs, prototyping area and an expansion header landing for SPI, I<sup>2</sup>C and JTAG supported by 3.3V and 1.2V supply rails.

**Lattice**

[www.latticesemi.com](http://www.latticesemi.com)

## Signal processing VPX module with PCIe interface

This high performance DSP and FPGA board for harsh environments from CommAgility, the VPX-D16A4-PCIE is a rugged card in the compact VITA 65, 3U OpenVPX form factor, with a high speed Gen2 PCI Express (PCIe) interface.

Use it in applications such as electronic warfare (EW), software radio, imaging or radar that require very high signal processing performance in the robust VPX form factor for deployment in



harsh environments. It is well suited to implementations where it interfaces with other boards based around Intel processors. The VPX-D16A4-PCIE complements CommAgility's existing VPX-D16A4, which provides similar functionality, but is aimed primarily at wireless applications. The main difference between the two modules is that the VPX-D16A4-PCIE includes a 10 Gbaud 2x PCIe interface to the VPX backplane for each of the two on-board Texas Instruments (TI) System-on-Chip (SoC) devices, instead of the VPX-D16A4's 20Gbaud RapidIO links. The new board is based around a TI TCI6638K2K KeyStone-based 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 large 2 Gbytes DDR3 memory bank. The VPX-D16A4-PCIE is available as either conduction cooled or air cooled versions.

**CommAgility**

[www.commagility.com](http://www.commagility.com)

# RF car key could make vehicles 'cool' according to NXP

By Junko Yoshida

**T**he car key is seemingly destined to become the most visible object differentiating one car brand from another, thus cementing the bond between carmakers and car owners. At least, that's the expectation of car OEMs — and NXP Semiconductors is banking on it.

The Dutch chip supplier, known for its prominence in the keyless entry and immobilization IC market, unveiled a new smart-car access chip integrating passive keyless entry, a RF transmitter for remote control, and an immobilizer in one package. The latest chip, dubbed NCF29A1, has been sampled by Tier Ones and car OEMs, said Lars Reger, vice president of strategy, new business, and R&D for the automotive business unit at NXP. "You'll be able to see cool cars fitted with innovative keys in 2015."

The NCF29A1, which comes with a variety of upgraded features, including an ultra-low-power programmable microcontroller core, allows car OEMs to make car keys sexier than the remote key fobs that have become ubiquitous and boring. Reger described his potential "cool car."

When a driver with the new improved key in pocket, briefcase, or Maxwell Smart shoe-heel approaches his car, the car picks up the key's unique vibe from a range of five to ten meters. The car responds by hitting the welcome lights. (The car shines "orange" lights for its primary driver and "pink" lights for the driver with a second key.)

Once the driver touches the door handle equipped with capacitive touch sensors, the car awakes and unlocks the door. Once inside a car, the driver simply pushes for ignition and liftoff.

According to NXP, myriad features reside in the NCF29A1. These include the superior sensitivity of the low-frequency front-end, in which low quiescent current enables best-in-class battery lifetime. Distance bonding restricts the activation range for safety-critical remote control functions. It is the combination of transponder, UHF Transmitter, and RISC Controller on the same chip that enables new safety and security features. It accommodates a wide range of regional

sub-1GHz frequencies from 310 MHz to 447 MHz (868/915 MHz upon request). It allows multi-channel RF transmitter operation for robust operation and key localization (within 5 cm) with a 3D LF interface.

The highly integrated chip allows the lowest external component count, thus enabling further cost reduction for Tier Ones and OEMs, the company said. It also comes with "peer-reviewed AES security" that helps prevent key cloning and vehicle theft, it added.

Because the new chip is lower power (claiming 40% longer battery life) and 70% smaller, it allows OEMs options for new key designs, said Reger. "Carmakers can design, for example, their branded smartphone cases integrated with passive key entry chips or smartwatches that can also serve as a car key."



Often, when a car is tucked out of sight in the garage, the key serves as a new status symbol, said Reger. A driver, for instance, might show off his ownership of a luxury EV by casually plunking down a visibly branded car key on the table in a pub, he explained. "For car OEMs, car keys are becoming a new differentiator," he added. They provide "emotional manipulation" of the consumer experience.

## Supply chain

NXP designs smart car entry architecture - in both software and hardware - not only for keys, but also for in-car units that respond to smart car keys. "So, if we ever have any supply problems with our passive key entry chip solutions, that could literally force car OEMs to stop assembly lines," said Reger. "Fortunately, we've established a solid supply chain, and we've never had any serious allocation problems before."

As an automotive chip supplier, "what's important isn't just whether your chips meet all the stringent automotive quality requirements. A supply chain that won't get interrupted is equally important" to gain the OEMs' trust.

Citing the Strategy Analytics report of the third quarter of 2014, NXP described that the share of complex, semiconductor-intensive entry systems (passive keyless entry) is constantly growing.

Junko Yoshida is Chief International Correspondent at EETimes

# IoT data model fills a gap

By Michael Koster

**T**he IPSO Alliance is making freely available a data model for creating interoperable smart objects geared for systems and software that are part of the Internet of Things.

Technology for the Internet of Things is rapidly being developed and deployed using low-power physical networks such as 802.15.4 (Zigbee and Thread), low-power Wi-Fi, and Bluetooth Smart.

The Internet Protocol (IP) layer has been extended to low-power and constrained devices through 6LoWPAN, and through IP networking layers which are being developed for Zigbee and Bluetooth Smart. High level transport protocols and application layer support over IP are now available using several communication standards such as HTTP, CoAP, MQTT, and XMPP.

These standards enable reuse of network technology by providing common connectivity and IP protocol compatibility. What they don't provide is end-to-end interoperability between the devices themselves and the application software that manages and uses the devices. The result is vertically integrated systems that don't allow easy third-party integration of devices and applications from different vendors. A level of interoperability is achieved only at the expense of tight vendor integration with specific partners. We need a common data model that can be used to enable diverse applications to communicate with diverse devices over diverse transport and application protocols.

The IPSO Smart Objects for IoT aims to fill the gap with a consistent and reusable data model for use between devices and application software. This data model defines a set of data types and API structures that can be used across device types to enable them to interoperate with diverse application software components.

To accomplish this, IPSO Smart Objects use Web-based design patterns and M2M standards to define a template for standard software objects. These Smart Objects represent the physical objects and building blocks which make up the IoT. Smart Objects use well known data types, web content formats like JSON, and Web style URL addressing. Standard URL templates and data formats enable the reuse of both device software and Web application software libraries across a wide range of IoT device types and applications.

IPSO Smart Objects work with low-power devices on constrained networks, while supporting advanced IoT protocol features such as asynchronous notification and resource discovery, and thus are easily implemented using IETF CoAP. However, the Smart Objects data model is compatible with any protocol that supports URL addressing, and a small set of data types and content formats. Thus Smart Objects may be used with HTTP, MQTT, XMPP, SMS, and other base protocols as well as CoAP.

Using IPSO Smart Objects makes it easier to bridge between different protocols. This enables the selection of optimum protocols and interfaces for different layers of the system. For example, CoAP or MQTT could be used to connect low-power devices to local networks. HTTP or XMPP could be used between gateways, Web services, and application software to support existing libraries and public APIs.

A recently published "Smart Objects Starter Pack" is freely available on the Web site of the IPSO Alliance. It defines a set of 18 common IoT data objects such as temperature sensors, humidity sensors, 3-axis accelerometers, actuators, light controllers, and load controllers. In addition, it is easy to define new Smart Objects as needed to represent new and advanced device capabilities. These objects can be combined into more sophisticated devices with multiple capabilities, such as home appliances and smart city multi-sensors.

Michael Koster works in IoT R&D at ARM, focused on application level interoperability and Internet standards. He is co-chair of the IPSO Smart Objects working group and works on IETF draft standards for IoT.



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# In-store networks: how consumer-grade smartphones run more risks than rewards

By Simon Longhurst

**T**he UK's end-of-year holiday sales season sees masses of shoppers flocking to retailers' physical and online stores. Now encompassing US imports like Black Friday and Cyber Monday, retailers are having to address a rapidly rising number of logistical nightmares associated with the expanded shopping rush. This in turn is placing increasing pressure on retailers to optimize their in-store network strategies.

In an industry like retail where competition is fierce and a mere second's delay in service can lose sales, retailer communication tool selection strategies are under the microscope. Some retailers have been known to settle with deploying consumer-grade smartphones, but this is actually exposing them to serious security and customer service risks.

A key concern that illustrates the challenges associated with allowing the use of consumer-grade devices by in-store employees is that, while the holiday shopping season is now over, many stores are having to deal with aftermath of returns. The Wall Street Journal reports that consumers are now returning about \$60 billion worth of merchandise during the whole holiday season – about 20 percent of a year's total.

From a customer service perspective, dealing with a flood of returns and exchanges means that front line sales staff need to be equipped with the tools to deal with all customer enquiries and have inventory information at their fingertips more so than over normal sales periods. This is where the popularity of the BYOD trend or providing consumer-grade smartphones may hinder retailers, and if staff are not equipped with appropriate tools, they will take matters into their own hands wherever possible.

However, while the use of consumer-grade smartphones may at first glance appear to provide efficiency gains, it is not right for all business sectors. Retailing is a sector where this trend is not appropriate – especially for their in-store networks.

For retailers willing to let employees select or bring their own devices, the IT department has to deal with a range of systems, products and platforms. While sales staff may find increased satisfaction, IT teams may find maintaining and integrating these devices is a complicated, if not impossible, task. Unsurprisingly, security is one of the top concerns when it comes to using mobile devices to access sensitive company data. Consumer smartphones are designed to access and share data in the cloud, increasing the potential for data to be duplicated and moved between applications.

Additionally, problems like insufficient battery life – a common issue with consumer smartphones – can lead to costly and potentially dangerous delays due to missed communications. For retail staff, a constant connection to retail business systems, as well as to each other, is crucial. This is something that consumer smartphones just can't provide. Similarly, consumer devices lack the durability required in a fast-paced retail environment. Impact and dropped devices can easily damage devices not equipped to cope.



Guaranteed voice quality is another issue that must be addressed across in-store network strategies. Retailers can be very large sites, with storerooms, elevators, basements and stairwells. With heavy returns loads, for example, staff will be traversing the premises more than usual, and it's essential that within these areas, 'dead zones' or decreased voice communication quality aren't encountered.

Retailers also require a communication solution that interoperates with their call control platforms, Wi-Fi networks and business-specific applications that drive workflow. Consumer smartphones can provide the seamless interoperability required to maintain continuous and uninterrupted communication throughout the workplace.

Retailers can combat these challenges through the implementation of purpose-built mobile devices. These devices offer the benefits of a more mobile sales floor staff, but alleviate specific fundamental shortfalls of smartphones.

Security concerns are eliminated because purpose-built devices only operate over the confines of a retail store's Wi-Fi network, preventing costs from spiraling due to loss, theft or extra security measures. Purpose-built devices remove the challenge of loss of battery life with the ability to swap batteries at the beginning of a shift, with continued battery life through to the end of a shift. They also negate the need for further precautions for durability as they are built to withstand challenging environments and can withstand multiple drops even onto concrete floors.

Furthermore, high voice quality is guaranteed across the entire in-store network, including areas such as basements where smartphone network providers may not reach. And, purpose-built smartphones can integrate with the call control platform and in-store Wi-Fi network so the communication devices act like any other telephone or computer within the store. Furthermore, purpose-built devices can support business-specific applications like inventory control, alarms and alerts all within the store's network.

In-store network implementation for retailers certainly requires innovations that can assist in establishing competitive advantage and maintaining a profitable operation, especially over peak sales periods and the resulting logistical issues. However, allowing sales staff to bring their own devices does not fulfil this requirement, and instead, brings to retailers a host of avoidable security concerns. Furthermore, front line sales staff require instant access to pricing, offers and stock information at their fingertips, allowing them to remain on the shop floor. This enables them to serve customers faster and better.

Retailers require purpose-built mobile handsets which are specifically designed with retailers in-store networks in mind for optimum security, and provide efficiencies allowing both staff and networks to work smarter, not harder. Only then can they tackle customer service and logistical challenges, without worrying about security issues, no matter what changes to the peaks and troughs the industry experiences.

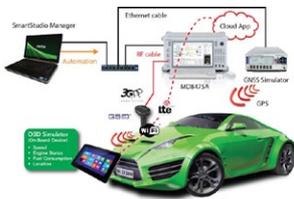
Simon Longhurst is Global Alliances Manager at Spectralink – [www.spectralink.com](http://www.spectralink.com)

## Car's diagnostics M2M communication runs on LTE network simulator

At the upcoming Mobile World Congress 2015 (Barcelona, 2-5 March), Anritsu will be showcasing a cloud-based connected car system for fleet tracking, developed by the University of Hertfordshire in the UK with the help of network simulation technology from Anritsu. The connected car demonstration will show a car's diagnostics system connecting to the cloud via a simulated LTE network environment provided by Anritsu's mobile network simulator, the MD8475A. An application in the cloud enables a fleet manager on any internet-connected device to view the location and operating parameters of any vehicle in the fleet in real time. The MD8475A enables the university's development team to test, from their Hertfordshire laboratory and with a single instrument, how the system's in-car LTE modem would perform in mobile networks all across the world, and operating according to all major worldwide standards.

**Anritsu**

[www.anritsu.com](http://www.anritsu.com)



## Industrial cellular router provides broadband wireless connectivity

From Siemens, this integrated LTE modem includes rollback to 2G and 3G networks for reliability; it has dual SIM card slots for service provider redundancy and automatic failover; and is a rugged design for demanding environments such as Utilities, Transportation and Oil & Gas. Siemens' Ruggedcom RX1400 is a multiprotocol intelligent node which combines Ethernet switching, routing and firewall



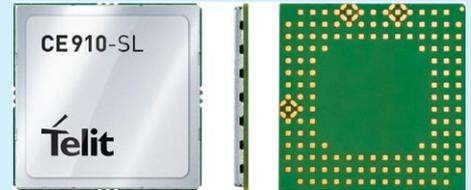
functionality with various WAN connectivity options. The device is IP40 rated, does not use fans for cooling, operates continuously within a -40°C to +85°C temperature range and comes with a rugged metal housing that supports DIN rail, panel, or rack mounting. The Ruggedcom RX1400 provides a high level of immunity to electromagnetic interference, heavy electrical surges, extreme temperature and humidity for reliable operation in harsh environments. The integrated GNSS (GPS/GLONASS) functionality allows the device to report its location as necessary for asset tracking purposes in large scale deployments. The Ruggedcom RX1400 is designed to support primary communications over commercial LTE networks and use LTE's enhanced capabilities for QoS (Quality of Service) management. For reliability purposes the device is able to rollback to 2G and 3G wireless connectivity. The cellular router is equipped with a Dual SIM card slot which enables automatic failover in case of interruption in the communication. The device can also be used with two optional small form factor pluggable fibre optic transceivers (SFPs), to establish wireline communication in areas where fibre is available.

**Siemens**

[www.siemens.com](http://www.siemens.com)

## Telit Introduces CDMA Modules for the energy market

Telit Wireless Solution has launched the CE910-SL cellular module specifically for applications in areas where CDMA450 coverage exists as a commercial mobile network operation or where it can be licensed to be developed as a private network by utilities, emergency response organizations, and other similar government and private groups. The CE910-SL is a single-band 450MHz CDMA 1xRTT wireless module in a compact LGA form factor, pin-to-pin compatible with the xE910 family, allowing for easy integration of different 2G to 3G wireless technologies into the same design. The CE910-SL enables reliable and secure CDMA cellular connectivity in up to 153.6kbps full-duplex data rates. Applications such as smart metering, telemetry, ATMs, POS terminals, and security are the product's top markets. Additional features such as UART/USB interfaces and integrated TCP/IP and UDP/IP stacks provide extended functionality, adding value to the customer application without adding cost.

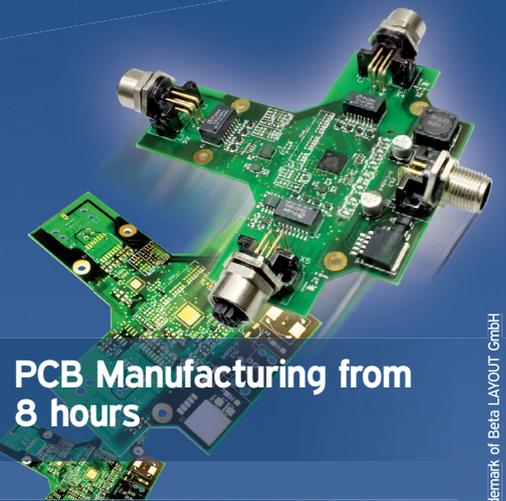


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# MEMS step up for 3D motion tracking

By Per Slycke

**M**icroelectromechanical systems (MEMS) are all around us. They can be found in our step counters and our phones. But these inertial motion sensing applications do not really exploit the true potential of the technology, which is capable of detecting changes in orientation as small as 0.01 degrees. However, we are now seeing the emergence of a new generation of 3D motion capture systems that are opening up exciting new dimensions in both consumer applications and scientific and industrial research.

Inertial motion sensors were first developed during the Second World War to help stabilize the V-2 rockets. The technology was further refined for the guidance of intercontinental ballistic missiles. Since the late 1980s, mechanical gyros and accelerometers have been replaced progressively by solid state MEMS technology that has enabled the sensors to become ever smaller and lighter. They are found in a host of applications, from triggering the operation of air bags in cars, stabilising aircraft in flight and helping to eliminate motion-shake on hand held video cameras.

In recent years, we have started to see these MEMS sensors being used to accurately measure human motion in 3D, with potential applications in entertainment, sports, ergonomics, biomechanical engineering, injury rehabilitation, and many others. One of the benefits of this MEMS based motion capture technology is that it tracks motion in 3D with no external reference such as GPS tracking or using cameras. This means the technology can be deployed outside of the lab or studio, which is especially helpful for industrial and consumer applications.

## What are MEMS sensors?

MEMS are miniature electromechanical systems, able to convert mechanical movements such as rotation and acceleration into electrical signals. The sensors can detect motion in three dimensions, both 3D rotational movement as well as 3D linear movement, therefore sometimes referred to as "6D".

A particular advantage of MEMS sensors is that they are solid state silicon devices. So as long as they are not physically damaged they will operate for long periods of time with almost no degradation in performance. Calibration is of course a very important challenge in designing motion capture systems, and achieving effective autocalibration using advanced "sensor fusion" software algorithms has been an important breakthrough in the design of 3D motion tracking systems. In effect, the system only requires calibration at the factory assembly stage.

Another major advantage of the technology is the size. The unobtrusive nature of the devices means they can be easily integrated into clothing or connected to devices to measure both human and robot motion. The trend of increasing integration and decreasing size is set to continue, opening up even more possibi-



ties for this technology. When these highly integrated MEMS motion sensor systems hit certain levels of accuracy they enable exciting new functionalities. For example, applications like tracking 3D human motion in real-time, rather than simple step counting, the utility of which is increasingly being disputed.

## MEMS for unmanned flight

MEMS sensors are being used to stabilise moving objects, in the way that the technology was originally developed for. Area-I, a company

specialising in advanced aircraft, has used Xsens MEMS based technology in the development of its unmanned aircraft. The aircraft have a limited payload requiring both an accurate and lightweight navigation system. Highly accurate MEMS sensor systems that provide attitude and navigation data are ideal in this situation.

## MEMS in healthcare

In healthcare and rehabilitation, MEMS sensors can be used to tackle one of the most common medical complaints: lower back pain. As people become increasingly sedentary, spending more time in front of a computer and in cars, lower back pain has become a big problem. At any one time, 40% of the population is suffering from lower back pain but almost everyone (85-90%) of people will experience this pain at some point in their lives.

The solution to this is often a series of exercises to be repeated at home but in many cases, the patients don't complete the treatment. This is down to several reasons. At home, patients don't have the expertise of their doctors so can't be certain they are doing the exercises correctly, or if they are working at all. In addition, the exercises are boring and repetitive, putting some patients off. To help patients complete their treatment, Hocoma, a global medical technology company, developed Valedo. The Valedo system uses highly accurate wearable motion trackers to track the movement of the wearer. This is combined with a state of the art gaming experience, giving them the motivation to continue their exercises. The software also provides real time feedback, whether it's in a clinic or in a home. Hocoma uses low power, high performance MEMS based motion trackers to power the Valedo system, making it suitable for a mass market.

The sensors are comprised of a 3D gyroscope, 3D accelerometer and 3D magnetometer which detect a full 360 degree range of movements to within one degree. Weighing only 18 grams and with a battery life of six hours, the sensors are applied to the chest bone and pelvis to measure the movements of the upper body and pelvis.

Valedo tracks 17 unique movements within 45 therapeutic exercises to help users reach their therapeutic goals. The movement performance algorithms monitor accuracy, smoothness and precision, ensuring patients are moving correctly. This is all incorporated into a serious gaming experience. The user's movements control a robot through different landscapes, with the challenge of making the movements are precise and smooth as possible. Hocoma's Valedo system is enabled by a MEMS motion tracking system.

Per Slycke is CTO and General Manager at Xsens – [www.xsens.com](http://www.xsens.com)

## MVN Biomech

Xsens' new MVN Biomech system uses MEMS technology to make motion capture accessible for research and industry. The system tracks human motion in 3D and caters to a variety of applications including ergonomics, human machine interaction, biomechanical analysis, rehabilitation, wearables development and sports science. The hardware is combined with MVN Studio Biomech software which adds to the accuracy of the system, as well as visualising 3D human motion in real time. One of the key benefits of this system is that it is lightweight and portable, fitting into an average sized backpack.

The simplicity of set up makes it suitable for non lab-based applications, such as reducing injury on a factory production line where RSI is a risk. It can also be used to optimise the movement of athletes to improve performance.

Daniel Dinu of the National Institute of Sport in France, said of the new system, "The evaluation of an athlete's performance is one of the main issues for coaching and biomechanical analysis in sports. The MVN Biomech system with its wearable, lightweight sensors allows me to conduct my basketball, shot-put and tennis research anywhere, without constraining athlete's activities. It provides fast visualisation of motion patterns and feedback, without any need for post-processing, and delivers accurate and proven data."

## MEMS in the future

The number of applications for MEMS technology is rising. Having started in the military, MEMS sensors are now used in a wide variety of consumer electronics, medical and, industrial applications. In the future, it is likely we will see MEMS technology used more and more in the consumer market, for example in novel single-function wearables next to broad consumer applications like smartphones. The much wider use of autonomous systems, like robotics and drones that rely on a great degree of autonomy and intelligence will be powered by MEMS motion tracking systems that need to deliver accurate data under all circumstances. These robots will take over many mundane tasks from humans (for example, vacuum cleaning) but will also enable new exciting possibilities such as remote telepresence.

MEMS sensors are already energy efficient but I anticipate that the efficiency is set to increase enough to make use of energy harvesting possible. Energy harvesting would allow MEMS sensors to operate fully autonomously without a power source like a battery, opening up options for battery-less operation in future applications.

And of course, MEMS sensors will become even smaller, lighter and fully integrated. Eventually, we will see a full motion tracker on a chip. This could be realised within 5 years, or even sooner as consumer demand can cause jumps in progress.

# Fraunhofer develops MEMS optical grating for medium infrared

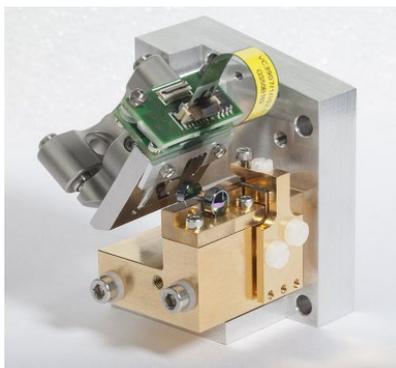
By Peter Clarke

The Fraunhofer Institute for Photonic Microsystems IPMS is developing a scanning grating spectrometer that operates in the medium infrared range from 3-microns to 12 microns wavelength. Many chemical substances that are significant for security monitoring have characteristic absorption lines in this region

Therefore the motivation for the research is to create a compact mobile sensor that can quickly detect and quantify these materials.

Fraunhofer is working with 17 other companies in the MIRIFISENS project to help achieve this. The project began in September 2012 and runs for 42 months. The total budget is €12.6 million (about \$14.6 million), of which the European taxpayer will provide €8.6 million (about \$10 million).

At the core of the MIRIFISENS project – Mid Infrared Innovative Lasers for Improved Sensing of Hazardous Substances – is a miniaturized quantum cascade laser (QCL), which is being developed by researchers of the Fraunhofer Institute for Applied Solid State Physics IAF in Freiburg. The QCL covers a large range of the wavelengths that are important for the spectroscopic fingerprint in the medium infrared range. To set the light of the QCL to the defined



QCL module with integrated MEMS diffraction grating. Source Fraunhofer IAF.

wavelengths, scientists at Fraunhofer IPMS developed a highly reflective diffraction grating acts as the quantum cascade laser's variable frequency external resonator. It allows for the tuning of laser wavelengths with a frequency of 1000 Hz, with a variable frequency range of up to 20 percent of the central wavelength.

"Electrostatically-driven MEMS grating mirrors are much more compact than galvanometer scanners, make almost no sound and allow for very high scanning frequencies due to their low weight. In combination with miniaturized laser sources, they are ideal for integration into mobile handy sensor systems, simple measurements on location and for integration into industrial measurement technology at production and processing facilities," said Fraunhofer IPMS' project manager Jan Grahmann.

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## ST leads European research project on next-generation optical MEMS

By Graham Prophet

**S**TMicroelectronics has disclosed that it is to take a lead role in Lab4MEMS II, an extension that builds on the continuing success of the existing Lab4MEMS project, announced in April 2013.

Lab4MEMS II focuses on Micro-Opto-Electro-Mechanical Systems (MOEMS) that merge MEMS with Micro-optics to sense or manipulate optical signals using integrated mechanical, optical, and electrical systems, while the original project maintains its emphasis on developing a pilot line for next-generation MEMS devices augmented with such advanced technologies as piezoelectric or magnetic materials and 3D packaging. Like its sister project, Lab4MEMS II is being launched by the European Nanoelectronics Initiative Advisory Council (ENIAC) Joint Undertaking (JU), a public-private partnership in nanoelectronics. Lab4MEMS II is a €26 million project with 20 industrial, academic, and research partners spread across nine European countries. Building on the established foundation and successes of the first Lab4MEMS project, the extension features ST as the coordinating partner, offering its complete range of manufacturing, technical, and organisational resources to Europe's efforts to secure leadership in high-potential MOEMS.

The Lab4MEMS II project focuses on designing, fabricating, and testing a variety of devices that include optical switches, arrays of micro-mirrors, optical cross-connects, lasers, and micro lenses using micro-optics and standard micromachining technologies to miniaturise and build advanced optical systems. MOEMS is seen as a platform for future valuable commercial products, such as optical switches, micro-mirror devices and dynamic displays, bi-stable devices, and optical shutters useful in micro-projectors, laser micro-scanners, new-generation Human Machine Interfaces, and micro-spectrometers. One goal



of the project is to optimise the production of dual single-axis mirrors as well as to research the possibilities for the development of the dual-axis single mirror.

Lab4MEMS II is a Key Enabling Technology (KET) Pilot-Line project contracted by the ENIAC JU to develop technologies and application areas with substantial societal impact.

The Pilot Line for Lab4MEMS II will expand ST's operational 200 mm-wafer manufacturing facility in Agrate Brianza for higher volumes, while adding optical technologies to the mix. It would increase the know-how on those strategic enabling technologies while combining scientific skills and the ability to design and manufacture a wide range of smart micro- and nano-systems on silicon. The project will evaluate the potential benefits and impact of a future move to 300mm wafers.

The ENIAC JU is a public-private partnership involving ENIAC member states, the European Union, and the Association for European Nanoelectronics Activities (AENEAS). It is currently contributing some €1.8 billion towards the costs of numerous R&D projects, which it selects through a competitive process assessing responses to its Calls for Proposals. The Lab4MEMS II project, coordinated by ST, was selected for funding in Fall 2013 and work began in November 2014.

In addition to ST, partners in the Lab4MEMS II project are: the Politecnico di Torino and di Milano; Consorzio Nazionale Interuniversitario per la Nanoelettronica; CNR-IMM MDM; Commissariat AI Energie Atomique Et Aux Energies Alternatives; ARKEMA SA; University of Malta; Okmetic Oyj; MURATA Electronics; VTT Memsfab Ltd; Teknologian tutkimuskeskus VTT; Aalto University; KLA-Tencor ICOS; University POLITEHNICA of Bucharest - CSSNT; Instytut Technologii Elektronowej; Warsaw; Stiftelsen SINTEF; Polewall AS; and Besi Austria GmbH.

## Maxim exits consumer MEMS, touch sensors

By Peter Clarke

**M**axim Integrated Products Inc. has decided to get out of consumer MEMS and consumer touch sensor markets and focus its sensor business on the automotive sensor. Meanwhile Maxim is making moves into wearable equipment, mainly with the provision of power management ICs.

Tunc Doluca, CEO of Maxim (San Jose, Calif.) announced the move during a conference call to discuss the company's financial results for the second quarter of its fiscal 2015 financial year. The company made net loss of \$71.7 million on revenues of \$566.8 million in the quarter. The loss was due to special items that consisted primarily of \$138 million in charges related to impairment of goodwill and other assets related to the MEMS business, \$28 million in charges related to restructuring activities, including the closing of a wafer fab in San Jose, and \$23 million in charges related to acquisitions.

The quarterly sales were down 2 percent from the \$580 million revenue recorded in the prior quarter, and a 9 percent decrease year over year.

"We are on track to achieve our previously announced cost reduction plans, which will enable us to reduce spending while we focus investment in our growth businesses. We also decided to stop investment in Consumer MEMS and Touch technology," said Doluca in a statement.

The company expected to achieve revenues of between \$565 million to \$605 million in the next quarter.

In the conference call Doluca said: "So even though we're stopping investment in consumer MEMS, we really are taking those resources and going to apply them to automotive. And that business, we can continue to grow, because the superior performance of our products are valued by their customers."

Doluca said that stopping investment in touch technology however would have some impact on the automotive side of the business. "The investment in bio and environmental sensors are pretty much independent of this, so those go forward, where we can add value in mobile with those types of sensors," Doluca said.

# OmniVision replaces VCM with MEMS autofocus

By Peter Clarke

**C**MOS image sensor vendor OmniVision Technologies Inc. (Santa Clara, Calif.) has used a MEMS-based autofocus system from Wavelens SA (Grenoble, France) for autofocus, which it reckons is superior to the “dated” voice coil motor (VCM).

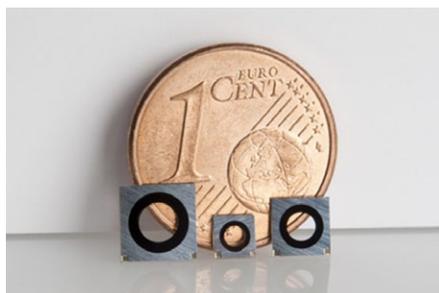
The VCM is used in many image sensors today but OmniVision has coupled its 23.8-megapixel OV23850 sensor with a MEMS from Wavelens to produce a high-speed autofocus and bring digital still camera functionality to high-end smartphones.

The OV23850 is capable of recording quad high definition (QHD) video at 30 fps in HDR mode to enable ‘always on’ HDR preview mode for a resolution size popular with flagship smartphone displays. Additionally, the sensors support 720p HD video at 120 fps and 1080p HD video at 90 fps, allowing for crisp slow motion video recording.

Wavelens has developed three optical MEMS with different optical apertures and dimensions to cater from a few megapixels to more than 20 megapixels.

Wavelens’ optical MEMS consists of an optical membrane released onto an optical oil-filled cavity, with MEMS actuators embedded at the membrane periphery. As an operating principle,

when the MEMS are actuated, the optical oil flows through the membrane center-modifying the membrane’s curvature and introducing a focal length variation.



This smart combination of the flexible membrane and the optical oil makes possible an efficient and powerful variable focus component.

Since the MEMS actuators are embedded at the membrane periphery, Wavelens technology is very competitive in terms of compactness (ratio between MEMS outline and optical aperture).

Thanks to the optical oil, the voltage required is typically below 10V, because of the low force needed to change the membrane curvature, and the power efficiency is very high. The optical power variation required for Autofocus application (at least 10 diopters) can easily be achieved for a wide range of optical MEMS aperture.

Wavelens optical MEMS has a functional thickness less than 100-microns.

“With our partnership with OmniVision, we are able to fully leverage the high-speed focus and low-power consumption that our MEMS-based autofocus technology offers,” said Sebastien Bolis, CEO at Wavelens, in a statement.

## Aiming at smartphones, poLight readies for mass production

By Julien Happich

**H**eadquartered in Horten, Norwegian startup poLight AS has raised NOK 146m (USD19M) in a private placement of shares, to fuel the deployment of its piezo-MEMS auto-focus lens technology, TLens.

“The funds will take us all the way into the global market” told us poLight’s newly appointed CEO Øyvind Isaksen, “helping us step up our manufacturing capacity and expand our organization with the opening of extra offices to get nearer our customers”.

Currently, the company is working with several potential customers and is ramping up manufacturing capacity in a cooperation with ST Microelectronics as a manufacturing partner, with volume production planned for the second half of 2015.

Assembled at wafer level, each 2.9x2.9mm TLens consists of a very thin piezo-actuator layer on top of a thin glass membrane that deforms a soft polymer sandwiched with a thicker layer of glass. By applying varying voltages (up to 30V), the piezo actuator forces the thin glass membrane to bend, deforming the polymer underneath it and varying the optical focus.

The TLens is claimed to be ten times faster than today’s widely used VCM (Voice Coil Motor) lenses, while drawing 20 times less power. These features make them very attractive as a replacement for bulkier VCM assemblies, also enabling fast consecutive multi-focus shots to implement full-focus photos in

software.

Although TLens currently rely on ST’s fab capacity, the company owns the full process IP and could easily second source its capacity.

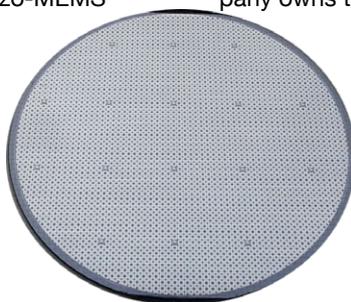
“We see a huge expansion of the market for autofocus lenses”, said Isaksen, “Autofocus used to be reserved to back-facing cameras, now you also find it on front-facing smartphone cameras and across multiple cameras for stereo-imaging, all these represent new opportunities for poLight” he added.

The company has also developed a proof-of-concept for image stabilization, again with a very low power consumption, no inertia and no wobbling compared to multiple VCM assemblies.

Next step for poLight will be to become a public listed company. “We will probably do a pre-IPO by late 2015 or mid-2016 when we are in the market and are starting to generate revenue, an IPO could follow 12 months later”, said Isaksen.

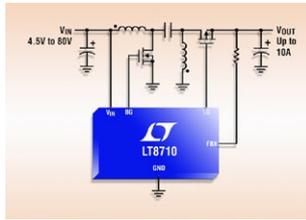
One could establish a parallel with Wavelens, a French startup with similar performance claims for another MEMS-based lens technology using an oil-filled cavity instead of a polymer for the optical path variation.

“The real competition now is VCMs, so there will be plenty of room for a couple of competitors” admitted Isaksen.



## 80V Synchronous SEPIC/Inverting/Boost Controller IC with 3 Regulation Loops

In today's modern electronic systems, the need for power conversion circuits that can do more than simply convert one voltage to another is growing. Some systems require a constant



current output, or a constant voltage output, others may require the current to flow from input to output or output to input. All of these requirements are in addition to the normal requirements of high conversion efficiency and high operating voltage ranges.

LT8710 is a synchronous SEPIC/inverting/boost controller IC with 3 regulation loops which can operate from an input voltage up to 80V. When configured as a SEPIC or boost converter, the output voltage can be set from 1.3V to 80V. When the LT8710 is used in an inverting converter, the output voltage can be set from -0.1V to -80V.

**Linear Technology**

[www.linear.com](http://www.linear.com)

## Gallium-nitride-on-silicon white LEDs deliver more light

Toshiba's latest high-luminous-efficacy white LEDs output luminous flux surpassing 160 lm. This series of high power LEDs is suitable for use in residential, commercial and industrial lighting applications.

The TL1L4 series offers significantly better performance than the preceding TL1L3 series. The TL1L4 series achieves high luminous flux that surpasses 160 lm at room temperature operation. Under conditions of  $T_a = 85^\circ\text{C}$ , operating current can be driven to 1A and luminous flux is more than 60% greater than that offered by the preceding TL1L3 series. This contributes to improved luminous efficacy and lower power consumption for LED applications. Available in nine colour variations from 2700K to 6500K, the TL1L4 series is built with gallium nitride-on-silicon (GaN-on-Si) wafer technology to create LEDs optimised for both output and energy efficiency. The devices are housed in a 3.5 x 3.5 mm lens package and rated to support an absolute maximum forward current of 1.5A max at  $T_a < 55^\circ\text{C}$  and  $T_j < 150^\circ\text{C}$ . Hot binning tests for electrical and optical characteristics are conducted at  $85^\circ\text{C}$  and  $I_F = 350\text{mA}$  that simulate real-life operating conditions.



**Toshiba Electronics Europe**

[www.toshiba.semicon-storage.com](http://www.toshiba.semicon-storage.com)

## Safety-critical code verification extended in C++ static-analysis tool

PRQA has added functionality in its latest releases of QA-C and QA-C++, including Dataflow, Graphical and Command Line Interfaces, support for Modern C++ features and improved coverage for MISRA C++ and HIC++

Specific upgrades include; Dataflow analysis, enhanced Graphical and Command Line Interfaces, support for the latest Modern C++ language features, and an improved level of coverage for compliance with the MISRA C++ and High Integrity C++ (HIC++) coding standards.

The Dataflow engine in both QA-C++ and QA-C can now perform pointer alias modelling on class and structure pointer members. The internal representation of class/structure members has been changed to a form which can be processed more efficiently by the SMT Solver, boosting the speed, depth and accuracy of the analysis. This has also improved analysis of pointer arithmetic and allows full pointer alias modelling of the first level of indirection.

Additional enhancements to the cross-platform architecture and updated Graphical and Command Line Interfaces include better integration to IDEs (MS Visual Studio and Eclipse), improved third party component integration to expand the list of supported software languages, plus IPv6 and multi-language support.

QA-C++ is a tool for the growing number of development teams that are transitioning to Modern C++ (C++'11 and C++'14). The tool already provides coverage of key new constructs such as rvalue references, variadic templates, user defined literals, the noexcept operator, and many more. The recent addition of extern template, default arguments and extension to this, means that QA-C++ now supports more than 60% of recently added language features.

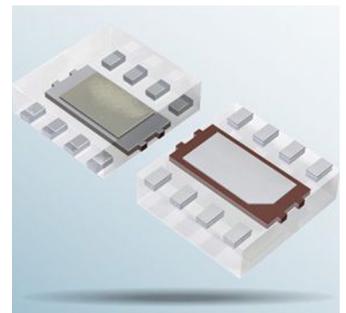
In the latest version of QA-C++ there are also improvements in the support for both MISRA C++ and HIC++ compliance modules, and the level of coverage of the statically enforceable rules has now reached 92% and 87% respectively.

**PRQA**

[www.programmingresearch.com](http://www.programmingresearch.com)

## Color sensor provides highest infrared cutoff characteristics

ROHM has developed a color sensor for display-equipped devices such as smartphones and tablets capable of detecting the color temperature, brightness, and RGB components of ambient light. The BH1745NUC uses original infrared removal technology and computing methods to achieve what the company claims is the industry's highest infrared cutoff characteristics, reducing the effects of infrared rays by more than 10x compared with conventional products. The device enables compatibility with dark



(low permeability) optical windows – unlike conventional color sensors that cannot provide accurate detection due to the effects of infrared interference when dark windows are used. In recent years a greater number of smartphones, tablets, and other display-equipped devices have begun to integrate color sensors in order to analyze the RGB components of ambient light for display image adjustment or perform LED backlight dimming based on the surrounding brightness levels. Conventional color sensors require a transparent optical window in order to accurately detect visible (i.e. RGB) light. The design trend in many smartphones and portable devices is to adopt dark optical windows, which although are more stylish make it difficult to precisely detect colors, since less visible light gets through and the light that does permeate gets mixed in with IR rays.

**ROHM**

[www.rohm.com](http://www.rohm.com)

## Dimmable LED lighting driver design covers wide power range

Fairchild has introduced the FL7734 Phase-Cut Dimmable Single-Stage LED Driver, an integrated LED controller solution for low-cost, and reliable LED lighting solutions from 5 W to 30 W. The FL7734 enables designers to achieve light quality designs with high dimmer compatibility while integrating full power factor correction (PFC) circuitry to meet power factor (PF) and total harmonic distortion (THD) requirements. The FL7734 solution uses Fairchild's active dimmer driving technology to eliminate visible flicker or shimmer symptoms and deliver more than 90% dimmer compatibility with a variety of leading edge, trailing edge and digital dimmers from a wide range of manufacturers. The solution fully meets NEMA SSL 7A-2013 and ENERGY STAR standards and provides a programmable dimming curve and input current management flexibility. The FL7734 is a Flyback (or Buck-Boost) Pulse-Width Modulator (PWM) controller that uses an advanced Primary-Side Regulation (PSR) technique, which minimizes the external components required for implementation and therefore lowers BOM. To meet stringent LED brightness control requirements, the FL7734 uses Fairchild's innovative TRUCCURRENT PSR technology for tight constant current (CC) variation with a tolerance of less than  $\pm 1\%$  in the wide line voltage range. The FL7734 can be used in a wide variety of lamps including GU10, candle lights, A19 and PAR30/38 bulbs, down and flat lights, and indoor and outdoor lights. Both solutions deliver a precise CC control with better than 1% variation across the entire universal line input operating range.

Fairchild  
[www.fairchild.com](http://www.fairchild.com)

## Silicon-Carbide MOSFET range extended at 1200V ratings

ST's SCT20N120 silicon-carbide power MOSFETs will, the company asserts, bring advanced efficiency and reliability to a broader range of energy-conscious applications such as inverters for electric/hybrid vehicles, solar or wind power generation, high-efficiency drives, power supplies, and smart-grid equipment. The 1200V SCT20N120 extends the family, with on-resistance (RDS(ON))

better than 290 m $\Omega$  up to the 200°C maximum operating junction temperature. Switching performance is also consistent over temperature thanks to highly stable turn-off energy (E<sub>off</sub>) and gate charge (Q<sub>g</sub>). The resulting low conduction and switching losses, combined with ultra-low leakage current, simplify thermal management and maximise reliability. In addition to their lower energy losses, ST's silicon-carbide MOSFETs permit switching frequencies up to three times higher than similar-rated silicon IGBTs allow. This enables designers to specify smaller external components and save size, weight, and bill-of-materials costs. The SCT20N120's high-temperature capability helps to simplify cooling-system design in applications such as power modules for electric vehicles. SCT20N120 comes in ST's proprietary HiP247 package with enhanced thermal efficiency.

ST  
[www.st.com](http://www.st.com)

## Sensirion refines flow sensing dedicated to medical device sector

Integrated sensor specialists Sensirion has continued its development of devices targeting specific end-markets with a click-in design for disposable infusion flow sensing in medical applica-

tions. This release represents a re-design of the company's LD20-2000T disposable liquid flow sensor. With the goal of separating the core sensing element from other complex electronics, Sensirion has developed a two-piece, click-in design that radically improves the cost-efficiency of the solution while retaining high performance liquid flow measurement on a minimum footprint. With the reduction of the disposable part to a bare minimum, Sensirion's flow measurement solution is suitable for medical applications such as infusion pumps and catheters. In these applications, flow rates and monitoring of failure modes are essential to patient safety and the quality of the therapy. The click-in connection between the disposable sensor element and reusable part offers a quick and easy solution for communication and mechanical integration of the sensor. The click-in design illustrates the strength of Sensirion's technology in providing small, cost-effective sensing solutions that offer high performance at low flow rates, typical of medical applications.

Sensirion  
[www.sensirion.com](http://www.sensirion.com)



## AEC-Q100-rated, automotive grade flash storage

SanDisk has introduced a range of robust, automotive grade NAND flash solutions designed for next-generation 'connected cars' and automotive infotainment systems. The responsiveness and capacity of flash storage technology offers the potential for car manufacturers to continue to push the boundaries of the "connected car application experience", SanDisk says. The SanDisk Automotive portfolio of storage solutions includes an automotive grade SanDisk SD card and iNAND embedded flash drive (EFD), which are available to automotive manufacturers in capacities up to 64 GB. Using proprietary flash storage architectures, these solutions are applicable to data-intensive automotive infotainment and connected car applications, enabling maps to load fast, improving touch-screen responsiveness, and reducing potential interference from driving on uneven or rough roadways. These Automotive storage solutions are built to meet the reliability, endurance, quality and temperature demands of the automotive market, and are AEC-Q100 certified. The company points to its vertical integration and quality control, from flash memory wafer manufacturing to product assembly, test and analysis, to customer implementation. SanDisk adds that it is working closely with leading automotive chipset vendors to optimise the new automotive grade storage solutions for use with the latest application processors.

SanDisk  
[www.sandisk.com](http://www.sandisk.com)



## Interface device connects 5 CAN buses to one USB channel

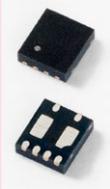
The Memorator Pro 5xHS from Swedish vendor Kvaser AB eases the work of test engineers in automotive and industrial environments: The data concentrator connects multiple CAN buses to a data logger or similar downstream device through a single USB channel. What's more, it synchronises the data transmitted and received across all five CAN buses - and it also synchronises with other Kvaser interfaces that are connected to the same PC. The Memorator has a 26 pin HD DSUB that connects to a splitter with five 9 pin DSUBs, and one USB connector that links to any USB port on a host computer. Only one USB port needs to be allocated when monitoring multiple CAN buses, reducing the need for an external hub in many applications. A special feature of the 5-channel Memorator Professional is its ability to run user scripts. Like other Kvaser's products such the Eagle interface and data logger, the Memorator Pro 5xHS's script functionality allows users to develop customised applications written in the Kvaser t programming language. Examples of such applications are CAN protocol converters and gateways as well as CAN logging functionality. Application-specific scripts for this device will also be available from Kvaser's network of technical associates, who contribute their respective domain expertise.

**Kvaser AB**  
[www.kvaser.com](http://www.kvaser.com)

## Low capacitance TVS diode arrays support fast-charging peripherals

Littelfuse, Inc., has introduced the SP1255P Series Low Capacitance ESD Protection TVS Diode Arrays (SPA Diodes), which are designed to provide superior ESD protection for current-intensive applications, such as fast-charging peripherals or PoweredUSB. The SP1255P Series integrates three channels of ultra-low capacitance steering diodes with a low voltage TVS diode to provide maximum ESD protection of the USB data and ID pins per the IEC 61000-4-2 standard. With a dynamic resistance of 0.3 $\Omega$ , they provide clamping voltages up to 23 percent lower than similar silicon solutions. A high surge current protection device with a working voltage of 12 V is allocated for Vbus protection; this device protects against lightning level fast transients of up to 100 A on the USB Vbus line. Typical applications for the SP1255P Series include ESD protection for smartphones, tablets, and other portable electronics. The SP1255P Series arrays offer low dynamic resistance of 0.3 $\Omega$  provides clamping voltages up to 23 percent lower than similar silicon solutions to offer superior protection for current-intensive applications such as fast-charging peripherals. The small form factor  $\mu$ DFN-6 package (1.8x2.0x0.55 mm) simplifies the PCB layout by allowing the traces to run directly underneath the device without the need for stub traces that can cause signal degradation. Automotive-grade quality (AEC-Q101 qualified) ensures maximum reliability in the harshest environments.

**Littelfuse, Inc.**  
[littelfuse.com](http://littelfuse.com)



## USB human interface design platform, provided as IP

Polish IP Core provider and SoC design house Digital Core Design has assembled its USB HID Design Platform, a complete and integrated solution which targets almost all aspects of USB based Human Interface Devices. DCD is offering its product for Internet of Things (IoT) projects which the company says will benefit from its software stack with an ultra-low power DP8051 8-bit CPU. Digital Core Design's USB HID Design Platform is a complete and integrated solution created to assist the USB-based Human Interface Devices design process. Mice, keyboards, tablets, and also hundreds of other devices, depend on a stable USB connection. A true programmable embedded system-on-chip integrating configurable analogue and digital peripheral functions, remains one of the biggest challenges engineers face, DCD asserts.

**Digital Core Design**  
<http://dcd.pl/ipcore/93/hid-platform/>



## 230°C silicon power MOSFETs feature integrated drivers

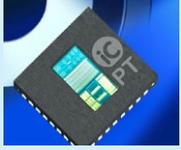
X-REL Semiconductor (France), fabless semiconductor specialist maker of devices rated for long-term operation at high temperatures, has added the XTR20410 and XTR20810 high-temperature families of N-channel Power MOSFET with integrated driver circuitry. These product families are intended for power conversion applications in highly demanding markets including aerospace, industrial, hybrid and electric vehicles, transportation, geothermal and oil and gas. The XTR20410 and XTR20810 product families consist of power N-channel MOSFETs and integrated drivers tailored for use in extreme reliability and high temperature applications, such as DC/DC converters, motor control and power switching. Matching network optimisation between a driver and a power transistor is, says X-Rel, a difficult and time-consuming task: these devices provide users with a turn-key solution that already matches power transistor and driver inside a single piece of silicon. XTR20410 parts may be used as high-side (40V max), low-side, or low-side switch with negative offset (-30V max) on the output stage (source connected to a negative voltage), while receiving a control input signal referred to GND. XTR20810 parts are intended to be used as low-side switches, and are able to sustain transient overshoot voltages up to 100V. Devices in the XTR20x10 families are able to reliably operate from -60°C to well above +230°C (5 years at +230°C). All X-REL Semiconductor products can be used in applications running at lower temperatures (e.g. from 100°C to 200°C) where extended lifetime is expected or where failing is not an option. For example, the expected lifetime of X-REL Semiconductor parts in an application operating at T<sub>j</sub>=150°C is over 35 years. Parts from XTR20410 and XTR20810 families can be packaged in both niche and large-scale markets in high-reliability compact hermetic or plastic packages, as well as bare dice.

**X-REL Semiconductor**  
[www.x-relsemi.com](http://www.x-relsemi.com)



## Blue light encoder sensor chip sharpens resolution

iC-Haus has released sensor chips for optical position encoders with photodiodes designed to operate with blue light. The shorter wavelength and penetration of blue-light photons improve the resolution, signal amplitude, harmonic distortion, and jitter performance of incremental and absolute encoders.



That is because blue light causes less diffraction at the same slot width compared to higher wavelengths, thus resulting in sharper imaging. Modern semiconductor processes provide small, shallow structures which can take advantage of the shorter penetration of blue light to improve efficiency. What's more, smaller

structures allow an interlaced photodiode layout which produces sine and cosine encoder signals with lower offset. In addition, a high fill-factor for the photosensitive areas is achieved by an equivalent geometrical transformation. iC-Haus has optimized the new incremental scanners in its high resolution iC-PT H-Series especially for blue light, under the Encoder blue trademark. Delivered in a flat 5x5mm<sup>2</sup> optoQFN package, the chip requires a minimal scanning area of only 1.9x3.1mm to generate 10,000 pulses per revolution using a code disc of only 26mm in diameter.

**iC-Haus**

[www.ichaus.com/encoder-blue](http://www.ichaus.com/encoder-blue)

## Digital controllers for high-current PoL converters

ZMDI (Dresden, Germany) has introduced its ZSPM1505/ZSPM1506 digital controller for powering high-current devices in sectors such as enterprise networking and storage equipment. ZSPM1505 and ZSPM1506 are single-phase true-digital power controllers for powering auxiliary power rails for field programmable gate arrays



(FPGAs) in enterprise networking and storage applications. Many high performance FPGAs require a third power supply commonly referred to as the auxiliary rail (AUX). The AUX rail is often used to power internal clocks, phase-lock loops, peripheral input/output devices and transceivers in FPGA applications. These are critical rails that require tight tolerances and low jitter and ripple on the output volt-

ages. ZSPM1505 and ZSPM1506 are pre-configured to provide a simple solution for high-performance, digitally controlled power supplies with one of ZMDI's integrated MOSFET power stage DrMOS products: the ZSPM9000, ZSPM9010, ZSPM9015 or ZSPM9060.

**ZMDI**

[www.zmdi.com](http://www.zmdi.com)

## Passive harmonic filters clean 200-240VAC power lines

A line of power-quality-improvement products from Schaffner, under the name ECOSine, has been augmented with further passive harmonic filters, for applications in the voltage range of 200V to 240VAC. These filters, FN 3416LV (50 Hz) and FN 3418LV (60 Hz), extend the application range of the ECOSine Economy



Line down to 200 V to 240 VAC and offer a cost-effective solution for harmonics mitigation particularly suitable for applications requiring superior THDi performance and with limited available space. Both new series are intended to be used for harmonic mitigation of three-phase installations with diode or thyristor bridge interfaces, enabling to achieve a target THDi of under 7% in presence of a DC-link inductor. Both rectifier peak current and RMS input current are reduced and the grid current is restored

to its sinusoidal shape. Lower electrical losses and improved power factor allow an enhanced and more efficient utilisation of electrical system capacity. The filter concept allows for a quick installation and commissioning without the need of thorough system analysis and the involvement of specialists.

**Schaffner**

[www.mycosine.com](http://www.mycosine.com)

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## Off-line switcher ICs meet 2016 European and US efficiency rules

The LinkSwitch-4 Switcher ICs from Power Integrations meet the latest efficiency directives, employing adaptive base and emitter switched drive technology that enables safe use of



low-cost bipolar junction transistor switches. LinkSwitch-4 is a family of CV/CC primary-side regulated (PSR) switcher ICs that use an adaptive base and emitter switched drive scheme for bipolar junction transistor switches (BJTs) that substantially

improves power conversion efficiency and eliminates reliability concerns due to secondary breakdown. The devices target chargers and adapters required to meet stringent new efficiency rules from the US Department of Energy (DoE) and European Code of Conduct (CoC), both of which are scheduled to come into force in January 2016. The new DoE rules, known as DoE-6, require efficiency compliance measurements to be taken at the end of the charger USB cable; LinkSwitch-4 exceeds the requirements while using a low-complexity Schottky diode secondary, even for high-current 1.5A and 2A smartphone chargers. The ICs incorporate a multimode PWM/PFM controller with a quasi-resonant switching strategy to maximise the efficiency, meet less-than-30 mW no-load limits and at the same time maintain fast transient response. An operating frequency of up to 65 kHz enables transformer size to be minimised

### Power Integrations

<http://ac-dc.power.com>

## IP builds NVM memory at mid-density

Synopsys' DesignWare medium density NVM IP family reduces die cost by up to 25%: an alternative to embedded flash memory, NVM IP eliminates need for extra masks or processing steps for analogue ICs. Reprogrammable DesignWare Medium Density NVM IP delivers flash-like functionality without additional masks or processing steps, reducing die cost by up to 25%. It can provide up to 64 kBytes of on-chip memory with more than 5x the density of lower bit count NVM solutions. The IP enables microcontroller integration with on-chip reprogrammable NVM in 180nm 5V CMOS and BCD processes, where embedded flash capabilities are unavailable, and can be equipped with integrated Error Checking and Correction (ECC) functionality for additional system reliability. Synopsys positions the memory as an alternative to EEPROM or flash memory when integrating microcontrollers in analogue IC designs for smart sensors, power management and touchscreen controller applications. The DesignWare Medium Density NVM IP products bring flash functionality to 5V CMOS and BCD process technologies, where embedded reprogrammable NVM is needed. Error checking and correction functionality provides additional system reliability and reduces implementation efforts. The NVM IP offers 40 nsec access time, providing fast read times and real time computing. Validated through rigorous characterisation, qualification and reliability testing in Synopsys labs, the NVM IP supports temperature ranges from -40°C to 125°C with 10 years of data retention.

### Synopsys

[www.synopsys.com](http://www.synopsys.com)

## 512 kByte STM32F3 extends mixed-signal MCU family

STMicroelectronics has extended its STM32F3 microcontroller series for applications that require high performance and innovative features at affordable cost. The new devices add larger memory densities up to 512 kByte Flash and 80 kB SRAM, as well as richer peripherals for high-speed control and off-chip storage. The STM32F3 series is ST's entry point to its ARM Cortex-M4 microcontroller portfolio. The M4 core with DSP and floating-point unit, running up to 72 MHz, executes deterministic routines such as motor-control loops up to 43% faster with the unique ST "Routine Booster" based on core-coupled memory (CCM-SRAM). Positioned in the performance spectrum immediately above ST's STM32F1 Cortex-M3 series, STM32F3 devices are part of the STM32 portfolio that comprises more than 600 devices offering extensive hardware and software commonalities, easy-to-use design tools, and development ecosystem. With up to 512 kByte Flash memory in the STM32F303 and STM32F302 devices, the F3 series can support more sophisticated applications. New features include extra SPI and I<sup>2</sup>C communication interfaces, and a Flexible Memory Controller (FMC) with 36 MHz access on 8/16bit bus for various off-chip storage and LCD modules. There are also up to three 144 MHz 16-bit motor-control timers for multi-motor products found in home appliances, power tools, and industrial equipment.

### STMicroelectronics

[www.st.com](http://www.st.com)

STM32F3 series  
Mixed-Signal ARM Cortex-M4



512 Kbytes Flash  
80 Kbytes SRAM



## Sealed piezo switch with tactile symbols

PSE HI (high impact) switches can be delivered with raised symbols, letters and numbers in addition to various colours, or legend inscriptions. The switch surface is made of anodised aluminium, which can be pre-formed with raised symbols to withstand long-term wear and give good user haptics. A variety of standard legends and/or raised symbols is offered to indicate function. The laser etched legends or pre-formed raised symbols provide long-term protection against wear. Raised symbols can be numbers, as well as characters from the Braille alphabet. These flexible design options make it possible to offer a wide variety of standard or custom options to meet individual design requirements. PSE HI piezo switches have an ingress protection class rating of IP67. The hermetic seal makes the switches suitable for use in areas that must be regularly cleaned or disinfected. The switches have a robust metal housing, suited for use in harsh environments where there exists the potential for vandalism. Impact resistance according to DIN EN 50102 is IK06. The switch is rated 0.1A @ 42 VAC/60 VDC. The piezo switching element offers a long service life of more than 20 million switching cycles. Typical applications include pedestrian crossing walks, elevators, truck lifts, material-handling equipment, safety equipment, ticketing terminals, service stations, food service equipment and processing plants.



### Schurter

[www.schurter.ch](http://www.schurter.ch)

## AC power analysis and oscilloscope display, in a single instrument

Keysight Technologies has introduced a power analyser with touch-operated oscilloscope waveform display functions; engineers will no longer need two separate instruments to characterise power waveforms. There will be two basic versions, for



single-phase and 3-phase power analysis. Combining accurate power measurements and touch-driven oscilloscope waveform viewing capability in a single instrument, the IntegraVision power analyser is intended for engineers who are designing and testing electronic power conversion systems to access dynamic views of current, voltage and power. Keysight contends that although some available power analysers offer good measurement accuracy, they

are cumbersome to use and lack the ability to characterise power consumption under dynamic conditions. Engineers have needed a power analyser to make accurate measurements and an oscilloscope to visualize repetitive and single-shot events such as turn-on and occurrences of transients. The IntegraVision power analyser has isolated inputs rated up to 1,000 Vrms (Cat II). The instruments offer external sensor inputs and 2A(RMS) and 50 A(RMS) direct current inputs, standard on all channels. The external sensor input supports current probes and transducers up to 10V full scale. Eliminating a separate oscilloscope in the measurement setup decreases test complexity and reduces configuration time, Keysight says; its IntegraVision power analysers are designed to quickly and interactively measure AC and DC power consumption, power conversion efficiency, operational response to stimulus, and common AC power parameters such as frequency, phase and harmonics – all with 0.05% basic accuracy and 16-bit resolution. The power analyser enables engineers to characterise power consumption under highly dynamic conditions with 5 Msamples/sec digitising rate and 2 MHz bandwidth.

**Keysight Technologies**  
[www.keysight.com](http://www.keysight.com)

## Cell-balancing IC facilitates energy recuperation application design

The BD14000EFV-C from ROHM Semiconductor is a cell-balancing chip that helps reducing the size of electric double layer capacitors (EDLCs) in energy regeneration applications in hybrid electric vehicles and industrial equipment. The device also



improves stability of such circuits as well as the operating life for EDLCs. The chip integrates over 20 discrete components required for EDLC cell balancing on a single chip, reducing mounting area by 38% over conventional solutions while eliminating component variations, making it easier to configure compact, high reliability EDLC systems with up to six cells. Multiple ICs can be connected in series to enable simultaneous control of even more cells. The cell balancing voltage can be set between 2.4V and 3.1V, ensuring support for a variety of EDLCs. Flag output is also built in, along with an over-current detection voltage function with adjustable detection voltage setting based on the cell balancing voltage. The chips is qualified for automotive use according to AEC-Q100. Compared to other storage devices, EDLC offers faster charge/discharge performance, longer life, and greater safety while minimizing environmental impact, making it the solution of choice for a variety of applications including automotive and industrial systems.

When connecting multiple EDLCs in series to support higher voltages, the voltage applied to each EDLC cell may vary, which can adversely affect the lifetime and shorten the amount of time they can be safely used. Up to now cell balancing operation has been achieved through discrete configurations, making it necessary to address a number of issues such as board space and design load in order to minimize fluctuations while maintaining reliable cell balancing operation.

**ROHM Semiconductor**  
[www.rohm.com/eu](http://www.rohm.com/eu)

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## Power MOSFET drivers in smaller, thermally efficient packages

Microchip's MCP14A005X and MCP14A015X are designed to allow fast transitions with large capacitive loads; the SOT-23 and 2 x 2 mm DFN packages are among the smallest available



for MOSFET drivers. They offer reduced power loss in the controller and conduction loss in the power MOSFET. MCP14A005X and MCP14A015X feature a new driver architecture for high-speed operation, the first in the MCP14A product line. The small packaging enables higher power densities and smaller solutions, while the design targets fast transitions and short delay times. Additionally, these MOSFET drivers include low input threshold voltages that are compatible with low voltage MCUs and controllers, while still maintaining strong noise immunity and hysteresis. The drivers' low input threshold is compatible with various Microchip PIC microcontrollers (MCUs) and dsPIC Digital Signal Controllers (DSCs), even when operating at lower voltages, as low as 2.0V; the MOSFET driver boosts the output signals to 18V, reducing power loss in the controller and minimising conduction loss in the power MOSFET. The threshold levels balance the need for noise immunity with the ability to function with a wider variety of controller products, including Microchip's devices.

**Microchip**

[www.microchip.com](http://www.microchip.com)

## Thermopile array sensor identifies movement, direction and multiple objects

Panasonic Automotive & Industrial Systems has introduced what it believes to be the first surface mount thermopile array sensor. Grid-EYE features 64 thermopile elements in an 8x8 grid format that detect absolute temperatures by infrared radiation. Grid-EYE is able to measure actual temperature and temperature gradients, providing thermal images. It is possible to detect multiple persons, identify positions and direction of movement, almost independent of ambient light conditions without disturbing privacy as with conventional cameras. Cost-effective and compact solutions for contactless temperature measurement across the entire specified area can be configured with very accurate results. A built-in silicon lens provides a viewing angle of 60°. Measurement values can be read out via I<sup>2</sup>C interface in 1 or 10 frames per second. An interrupt signal output delivers a quick response to time-critical events or additional energy saving capabilities in stand-by mode, offering a high degree of flexibility. Measuring 11.6 x 4.3 x 8.0mm, Grid-EYE arrays have an operating voltage of 3.3V or 5V and a typical current consumption of 4.5 mA (normal mode); 0.8 mA (stand-by mode); and 0.2 mA (sleep mode). Object temperature range is 0 to 80°C for the high gain amplification version and -20 to 100°C with low gain. Overall Temperature accuracy is ±2.5°C with an NETD (Noise Equivalent Temperature Difference) of ±0.5°C, depending on P/N. Compared to single element thermopile sensors and pyro-electric detectors, Grid-EYE sensors offer extended possibilities for detecting persons and objects, enabling advanced applications that include digital signage; security; lighting control; kiosks/atms; medical imaging; automatic doors, and people counting.



**Panasonic**

<http://eu.industrial.panasonic.com>

## Connector system feeds high currents to PCBs

The Super Sabre power connector system is capable of delivering 34.0A per blade in a 7.50-mm pitch connector, fabricated with materials that have a withstand temperature of up to +125°C



Molex designed the connector system for high-current applications where flexible wire-to-wire and wire-to-board configurations are required. Super Sabre power connectors are suited to automotive and commercial vehicle applications as well as the appliance, medical, datacom and industrial control industries. Utilising proven and reliable Sabre Connector multi-beam technology, the Super Sabre Connector System helps solve these issues, providing 34.0A current per blade and withstanding +125°C operating temperatures."

For 10 to 12 AWG wires, the Connector System accommodates both wire-to-wire and wire-to-board configurations and is compatible with lead-free wave soldering and reflow soldering processes. Silver-plated, high-conductivity alloy terminals are used to minimise fretting corrosion concerns. The flat-blade terminal design with four independent points of electrical contact offers redundant, secondary current paths for long-term performance and reliability. In addition, terminal design provides a more reliable electrical connection than other terminal styles. The terminals are fully-isolated on both mating sides to ensure complete protection against damage or shorting. Positive latch and Terminal Position Assurance (TPA) features prevent terminal backout.

**Molex**

[www.molex.com](http://www.molex.com)

## Faceless oscilloscope connects via WiFi

As the first digital storage oscilloscope geared towards tablet computers labels Belgian reseller Velleman NV its WFS210 oscilloscope. The 2-channel instrument takes the fact into account that some tablet computers do not have any cable interfaces: For data exchange with the backend computer it utilises a WiFi connection. The WFS210 offers two vertical signal channels, full auto setup function, signal markers, a hold function, and DVM functionality. The suitable x1/x10 probe has to be ordered separately. Input sensitivity can be selected in 12 steps between 5mV/div and 20V/div; the integrated signal ADC has a resolution of 8 bit. The signal bandwidth is 10 MHz for each one of the two channels. It also offers a sample rate of 2 x 10 Msps and a sample buffer of 4K per channel. Battery-powered, lightweight and compact (180 g, 100 x 100 x 35 mm), the WS210 fits into any briefcase and serves for quick measurements. The signal is displayed either via a tablet or a PC. Downloadable apps for iOS, Android 4.0 and PCs are available.



**Velleman NV**

[www.velleman.eu](http://www.velleman.eu)

## Audio PA for in-car systems with 'light' hybrid electrics

The 4-channel power amp IC, TCB001HQ, has been designed to offer enhanced noise tolerance and to limit the effect of interference generated by in-car mobile phone use. Stopped vehicles fitted with engine idling reduction technology can suffer significant drops in battery output voltage, which can adversely affect the sound quality and clarity of in-car entertainment systems. By reducing the minimum operating voltage from 8V to 6V, this power amplifier offers more stable operation, prevents loss of sound and reduces noise disturbance. With mobile phone interference protection, the TCB001HQ improves the in-car listening experience. The TCB001HQ also offers a newly developed filter circuit and reinforced protection circuits, including thermal overvoltage, output to VCC, output to GND and output to output protection, to ensure increased reliability. Built in mute and standby functions help to maintain battery charge.



**Toshiba Electronics Europe**  
[www.toshiba.semicon-storage.com](http://www.toshiba.semicon-storage.com)

## PC-based scopes use USB 3.0, add 512 Msample memory depth option

PicoScope 3000D Series oscilloscopes have up to 200 MHz bandwidth, two or four analogue channels plus 16 digital channels on the mixed-signal (MSO) models, and deep memories from 64 to 512 mega-samples. The scopes offer a maximum real-time sampling rate of 1 Gsample/sec and feature a USB 3.0 interface; they also host a built-in arbitrary waveform generator (AWG). Deep memory enables long timebases with the fastest sampling rates; for example, at 1 Gsample/sec sampling rate you can capture a 500 msec waveform—that's half a billion samples, Pico points out—while hardware acceleration keeps the display updating smoothly. The 512 Msample buffer memory can be segmented, enabling acquisition of up to 10 000 individual waveform segments of 50 000 samples, with less than 1 µsec re-arm time between each segment. Memory segmentation is beneficial when analysing waveform bursts or serial data packets that include long gaps. The PicoScope can be set to trigger on each packet and skip the gaps that are of no interest. This function allows users to acquire, for instance, CAN data packets over several minutes and then analyse the packet content at a later point in time. The oscilloscopes are multi-function include a spectrum analyser and arbitrary waveform generator (AWG), and advanced functions as standard, such as serial bus decoding, mask limit testing, maths channels and filtering. Advanced triggers include pulse width, interval, window, window pulse width, level dropout, window dropout, runt pulse, variable hysteresis, and logic.



**Pico Technology**  
[www.picotech.com](http://www.picotech.com)

## Bluetooth, WiFi for in-car use combined in one module

Addressing the rising demand for systems that integrate smartphones into the infotainment system in vehicles, Alps has developed a module that combines Bluetooth and WiFi functionality in one product, the UGZZF series. Increasing smartphone functionality has given rise to new services making use of cloud-based data, a trend creating spillover effects for the automotive electronics market. Car navigation, display audio and other automotive systems incorporate Bluetooth communication functionality for such features as hands-free calls and music playback using a smartphone or similar device. In recent years, however, wireless LAN is increasingly being added to enable high-speed communication with cloud networks via LTE-capable smartphones. Additionally, systems which use Bluetooth, as modules that also contain an antenna, must have Bluetooth SIG certification, as well as any certification specified by radio legislation in each country. This necessitates spending an enormous amount of time and effort on examination and testing. Furthermore, many car audio and other automotive systems have CPUs with low processing capability, feeding demand for modules with integrated Bluetooth protocol stack and wireless LAN driver. The antenna-integrated UGZZF Series Bluetooth/Wireless LAN module is ALPS' answer to this set of needs. By incorporating the Bluetooth protocol stack into the module, ALPS takes responsibility for obtaining for the module both Bluetooth certification and certification required by regional radio legislation. The module is also equipped with a wireless LAN driver, enabling Wi-Fi connections without burdening the host CPU. The module meets the requirements of a wide range of customers and also helps to reduce the antenna and system design and testing, software development and certification workload of equipment manufacturers.

**ALPS**  
[www.alps.com](http://www.alps.com)

## Mass flow sensors make gas boilers more efficient

Energy efficiency is a pivotal issue for many users today. With a series of new mass flow sensors, Sensirion helps developers of gas-operated boilers to better control their energy consumption. Sensirion's new calibrated and temperature-compensated sensors and sensor solutions ensure precise and reliable measurement of the air mass to a combustion chamber, enabling higher boiler efficiency and a higher increase in the modulation ration which in turn leads to higher boiler lifetime.



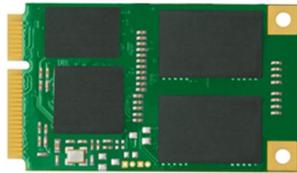
Thanks to compact size and flexible modification options, the mass flow sensors can be installed in almost any boiler. In addition, the sensors guarantee a wide dynamic control range, the elimination of zero-point drift, high repeatability and accuracy as well as the option of certified intrinsic safety. The performance of these sensors is based on Sensirion's proprietary CMOSens Technology, in which the sensor component and the evaluation circuit are integrated on a single CMOS microchip. In conjunction with a specially developed sensor packaging, the result is a more cost-effective system with significantly higher precision and repeatability, representing a quantum leap in mass flow and differential pressure measurement, promises Sensirion.

**Sensirion**  
[www.sensirion.com](http://www.sensirion.com)

## DDR4 modules, SSDs for automotive and industrial markets

At the upcoming Embedded World, Swissbit AG will showcase memories and storage solutions designed for automotive, industrial and data communications applications. Among the highlights are Solid-State Disks (SSDs) with ultra fast I/O as well as Swissbit's first DDR4 DRAM module which offers significantly higher data rates without any negative effect on energy consumption. The latest generation of SSDs with SATA-III features an I/O bandwidth of 6 GBit/s. With its X60 series, Swissbit widens its SSD portfolio and increases the data throughput to 525 MByte/s with a random access I/O performance up to 75.000 IOPS. The series leverages Swissbit's proprietary hardware and firmware functionality to address demanding embedded storage applications which require high performance, reliability and resilience over their entire service life. The X-60 products are available at capacities from 16 to 480 GByte and in standard form factors. Another innovation, Swissbit's first DDR4 ECC SODIMM, the company serves the need to current embedded SBC boards. On top of higher I/O bandwidth, the module offer an optimised data bus termination, dynamic bus inversion and CRC protection of the instruction and data buses. With its DDR4 offerings, namely the 8GByte ECC SODIMM Swissbit targets industrial applications in the first place. With the extension of its PS-100u security series, Swissbit aims at highly integrated secure data storage applications. .

**Swissbit**  
[www.swissbit.com](http://www.swissbit.com)



SSDs with SATA-III features an I/O bandwidth of 6 GBit/s. With its X60 series, Swissbit widens its SSD portfolio and increases the data throughput to 525 MByte/s with a random access I/O performance up to 75.000 IOPS. The series leverages Swissbit's proprietary hardware and firmware functionality to address demanding embedded storage applications which require high performance, reliability and resilience over their entire service life. The X-60 products are available at capacities from 16 to 480 GByte and in standard form factors. Another innovation, Swissbit's first DDR4 ECC SODIMM, the company serves the need to current embedded SBC boards. On top of higher I/O bandwidth, the module offer an optimised data bus termination, dynamic bus inversion and CRC protection of the instruction and data buses. With its DDR4 offerings, namely the 8GByte ECC SODIMM Swissbit targets industrial applications in the first place. With the extension of its PS-100u security series, Swissbit aims at highly integrated secure data storage applications. .

## Sensor-integrated smart lighting manager enables IoT-connected daylight harvesting

ams AG has introduced the AS721x Autonomous Daylighting Manager which the company claims is the industry's first integrated chip-scale Internet of Things (IoT)-connected smart lighting manager. The new class of sensor-integrated smart lighting manager solutions delivers cost-effective, IoT-connected, integrated control capabilities to luminaire, light engine and replacement lamp manufacturers. Photopic sensors built with nano-optic filters integrated into the AS721x series are designed to help lighting manufacturers address the growing challenges of energy-saving lighting mandates, including daylighting controls. The challenges are more cost-effectively met by bringing the controls, connectivity, such as Bluetooth, and high-granularity sensing into the luminaires themselves. The AS721x family is ams' first platform technology of integrated sensor solutions that provide system-level sensing and control capabilities, reducing system costs and shortening time-to-market. The AS721x Autonomous Daylighting Manager senses the ambient daylight and enables the delivery of constant lux levels in the space by managing subtle adjustments as the amount of outside light varies. Integrating a sensor-based manager into each luminaire optimizes the overall responsiveness and efficiency of the lighting system. This also delivers accurate lumen maintenance over time and temperature variations.

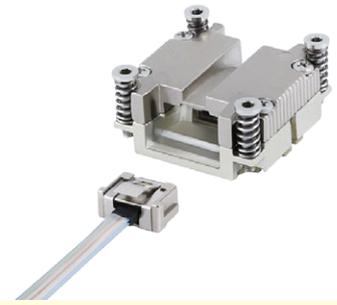
**ams AG**  
[www.ams.com](http://www.ams.com)

## Optical on-board-transceiver carries up to 300 Gbit/s data

FCI's Leap On-Board-Transceiver (OBT) system is a one inch square, (2.5 x 2.5 cm) board mounted optical module that features 12-transmit and 12-receive channels, each working at 25 Gb/s over distances up to 100m with a total of 300 Gb/s throughput. The OBT is designed to be placed near a host ASIC which results in shorter copper board traces, better signal integrity and lower power consumption. The transceiver is connected to the board via an FCI proprietary surface mount electrical BGA/LGA socket. Optical connectivity to-and-from the OBT is realised by using a high-density ribbon fibre assembly connecting to the front panel with an optical connector system such as the MPO or MXC connector and adaptor. A standard MT ferrule is used on the transceiver side. This next generation of product has been engineered with the latest 850 nm VCSEL and PIN array technology operating at 25 Gb/s along with the latest 25 Gb/s laser driver and TIA chip set. The design is optimised for low power consumption resulting in a total typical power consumption of 2.7W without CDR and 5.4W with CDR.

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**FCI**  
[www.fci.com](http://www.fci.com)

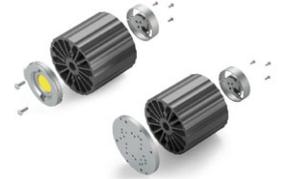


## Active heat sink for LEDs integrates low-noise fan motor

The service life of LEDs directly depends on their heat dissipation concept. Drastic temperature fluctuations will considerably shorten it, and overstepping the permitted chip temperature has a direct impact on the light yield.

The use of extruded aluminium heat sinks for free convection already serves as an effective LED heat dissipation concept today. Fischer Elektronik is now specifically expanding its comprehensive product portfolio for weight-sensitive applications with an active LED heat dissipation concept under the article number LA LED 68. The base is made from a thermotechnically optimised aluminium hollow-chamber profile. Zhaga-conform LED modules can be directly bolted to the front of this by way of additional threads. There is also the option of fastening various LED modules from different manufacturers, as well as their holder systems, to the pre-threaded mounting plate with the help of an adapter screwed into the base section. A special low-noise fan motor in a round design is integrated in and fastened to the back of the base section. The motor has a double slide bearing and is designed for the special requirements of LED applications where noise and lifetimes are concerned. Custom mechanical processing, cover panels with ventilation slits, customised designs and surface coatings are also all available.

**Fischer Elektronik**  
[www.fischerelektronik.de](http://www.fischerelektronik.de)



## TTI to represent Knowles brand Syfer Technology

Already supported by TTI Inc. in Europe and Asia this move sees the brand available worldwide from this leading authorized distributor of interconnect, passive, electromechanical and discrete components. With a history traceable back to Erie



Electronics in the 1960s, Syfer is a global leader in Capacitor products, EMI filters and EMC solutions. The company was later acquired by the Dover Corporation and is now part of The Knowles Corporation, a recent spin-off from Dover. The brand is a constituent

part of Knowles along with DLI, Novacap and Voltronics. The company has lead the industry over the years with leading technical advances like FlexiCap and ProtectiCap and have developed a successful Capacitor and EMI filter product line.

TTI Inc.

[www.ttiinc.com](http://www.ttiinc.com)

## Conductive paint spreads inventivity

Distributor RS Components is expanding its offering with products from Bare Conductive; Electric Paint and the company's Arduino-based Touch Board. The products are aimed at the complete range of potential customers, from hobbyists to professional engineers, and including the 'maker' sector. Bare Conductive says that one reason it has partnered with RS is for the access that the distributor has to each of those constituencies. Electric Paint is a carbon-based paint or ink that comes either in a direct-dispense tube or pen ; or in pots for brushing or screening. The product is electrically conductive (in both liquid and dried states), non-toxic, solvent-free, and water-soluble.



RS Components

<http://uk.rs-online.com>

## Element14 releases Raspberry Pi 2 Model B with more processing power, memory

Priced at €31.15, the successor to the four million unit selling Raspberry Pi is six times faster than its predecessor and now boasts 1GB of RAM to run bigger and more powerful projects. The Raspberry Pi 2



marks a major modification for the credit card-sized computer, with a new Broadcom BCM2836 ARMv7 Quad Core Processor powered Single Board Computer running at 900MHz with 1GB of RAM. For

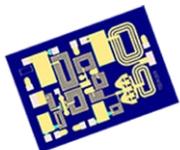
a superior user experience the new Raspberry Pi 2 boots up in less than half the time of its predecessor. All previous Raspberry Pi projects are compatible with the new Raspberry Pi 2 Model B, and the expanded GPIO pins, advanced power management and connectivity, make it possible to connect up to four USB devices, including some powered devices such as hard drives. The 40-pin GPIO enables multiple sensors, connectors and expansion boards to be added, with the first 26 pins identical to the Model A and B board.

element14

[www.element14.com](http://www.element14.com)

## RFMW to distribute Qorvo's 2-6GHz GaN driver amplifier

RFMW, Ltd. announces design and sales support for a 2 - 6GHz GaN driver amplifier from Qorvo, the new company name for the merger of TriQuint and RFMD. The TGA2597 provides a



saturated output power of 31.5dBm with over 31% PAE. Small signal gain of the TGA2597 is greater than 24dB with large signal gain over 13.5dB. Qorvo offers the TGA2597 for radar, EW and communication applications requiring low current (40mA) from a 25V supply. Offered as DIE, a packaged version is

available from Qorvo as the TGA2597-SM.

RFMW

[www.rfmw.com](http://www.rfmw.com)

## Digi-Key to host FIRST Robotics Challenge kick-off

Electronic distributor Digi-Key sponsored a regional kick-off event for high school students planning to participate in the FIRST (For Inspiration and Recognition of Science and Technology) Robotics' 2015 Global Challenge. In conjunction with a global unveiling of the contest hosted by Inventor Dean Kamen, Digi-Key invited several regional high schools to its headquarters last Saturday for a presentation by one of Digi-Keys executive vice presidents and to receive their kit for this years challenge. With growing interest around the world in innovation and engineering, over 75,000 high school students, comprising nearly 3,000 teams, have signed up to participate in this years FIRST Robotics challenge.



Digi-Key Corporation

[www.digikey.com](http://www.digikey.com)

## SPST and SP4T switches for impedance-matching and aperture-tuning

Richardson RFPD now offers full design support for two new tuning control switches from Peregrine Semiconductor Corporation, the PE613010 and PE613050. Based on Peregrine's UltraCMOS

technology, a patented variation of silicon-on-insulator (SOI) technology on a sapphire substrate, these tuning control switches support a wide variety of tuning circuit topologies, with emphasis on impedance-matching and aperture-tuning applications. Both of the new switches feature low on-resistance (1.2 and 1.6 Ohm respectively) and insertion loss (0.20 dB @ 900 MHz and 0.40 dB @ 1900 MHz for the PE613010) across key cellular frequency bands from 100 to 3000 MHz.



Richardson RFPD

[www.richardsonrfpd.com](http://www.richardsonrfpd.com)

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## LAST WORD

# The automation obituaries

By Jonathan Wilkins

**W**hat will humans soon have in common with horses? Obsolescence in the work place, if a video on YouTube by CGP Grey is anything to believe.

The fifteen minute video, entitled Humans need not apply has received 3.5 million views since August 2014 and puts forward the case that advances in technology are inevitably going to make people in all runs of working life - unskilled, skilled, professional and creative - obsolete.

This is a pretty damning vision of a dystopian future that even H. G. Wells would be proud of. It's also incredibly unlikely to happen in the mass way the video suggests. Although there is no factual evidence for technological unemployment, CGP Grey is correct in the statement that we are living in a period of rapid technological advancements. This also brings with it the frustrating situation where a lot of perfectly functional products become obsolete relatively quickly.

In the world of industrial automation, one reason for products becoming obsolete is changing legislation. A recent example is the Ecodesign Directive, which sets mandatory efficiency requirements for electrical products. This way, industrial automation parts that fail to meet environmental standards are gradually phased out.

From January 1, 2015, in accordance with the second phase of the Ecodesign Directive, motors rated from 7.5 to 375kW will either have to be replaced with IE3 efficiency level models, or meet the previous IE2 level and be fitted with a variable speed drive (VSD). This means that motors that fail to meet IE3 standards at this moment in time must be retrofitted with an appropriate VSD or face the bin of obsolescence.

Another reason why products become obsolete is functionality. More universally (pun to follow), the common USB (universal serial bus) cable will soon become obsolete with the introduction of the Type-C connector. This new connector will negate the infamous three turn technique many of us have become so accustomed to when trying to plug in

Jonathan Wilkins is marketing manager of European Automation - [www.euautomation.com](http://www.euautomation.com)

the cable. The new Type-C is reversible and equipped with USB 3.1 specifications, which means a more powerful and faster delivery system.

More common in businesses with embedded systems is the use of specific industrial portable memory. As well as being safer than USBs, which are the most common way of transferring viruses, specific industrial memory is bespoke and so will never become obsolete. Finally, another scenario in which industrial automation parts go out of date is when the original equipment manufacturer stops producing them for one reason or another. In 1986, GE Fanuc Automation Corporation was jointly established in the US by the two giants - General Electric and FANUC. This company was successful in supplying automation solutions until 2009 when the two firms agreed to dissolve the joint venture.

Needless to say, since this split, GE Fanuc products such as HMIs, displays, pendants and controllers have become obsolete. That's not to say that you can't still buy their branded automation products – no, no.

Whilst GE Fanuc parts are no longer being manufactured, some of their products out there in the manufacturing ether are in perfect condition. At European Automation, we specialise in tracking down parts like these and supplying them to our customers. Obsolete doesn't have to mean useless, often it just means no longer in production.

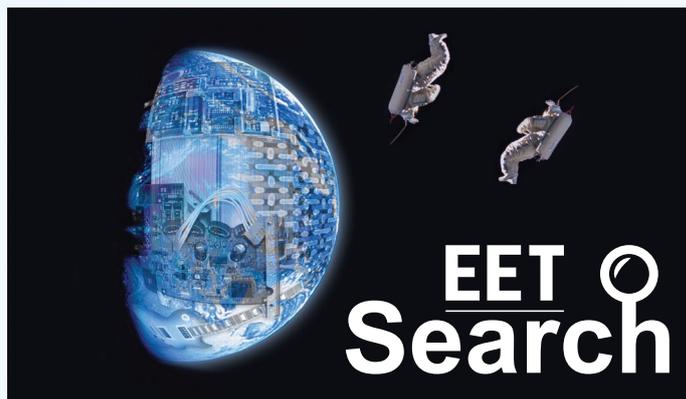
With this in mind I'll return to the video cited in the opening of this article. Granted, horses did pretty much lose their jobs with the evolution of machines. However, when some automation products become obsolete, there is often still a great demand for them. Sometimes these parts become our best sellers, which proves companies still use them for years after production is halted.

By replacing an older motor or PLC when it breaks down, companies can reduce purchasing time and costs, not to mention minimise expensive downtime. If you're still using obsolete automation parts on your production line – and we bet you are - it might be worth giving us a call before you decide to swap to a shiny and costly new one.

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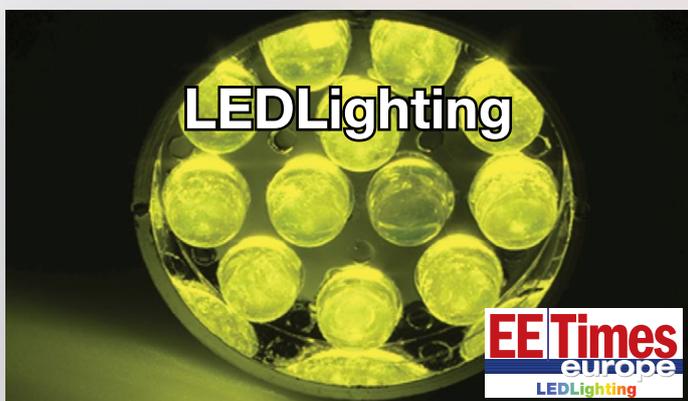
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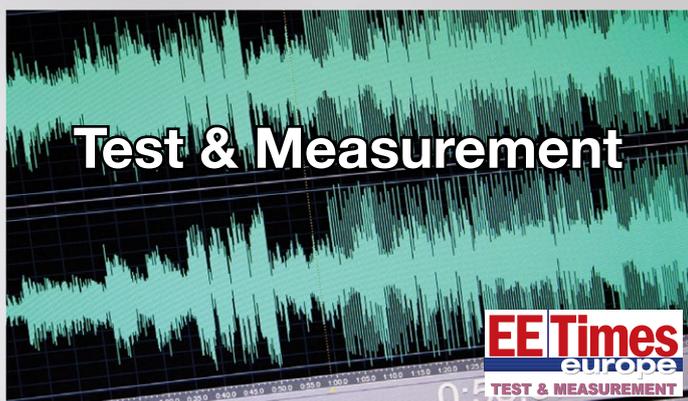
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