

**06** DAVINCI™ REAL-TIME VIDEO TECHNOLOGY



## INTRO

**'Never waste a good crisis' is a phrase I've heard a lot of late. I confess I don't know who said it first but it very much captures what we've been up to at RS Components over the last few months.**

We've renewed our focus on making sure that our range of electronic components and test equipment is as up to date as we can make it, adding over 5,000 new products per month. At the same time, we've undertaken a thorough and detailed review of our pricing, reducing 165,000 prices since March. Finally, (as I hope you've noticed) we've completely revised our quarterly magazine, giving it a new look and a new name to reflect a completely new style and content.

RS has been the electronic engineer's comparison website since the web existed. Our supplier agnostic approach means that worldwide, engineers like to use our website as you've always used our catalogue: a sourcebook for the technologies, components, industries and tools on the market today.

That's an awesome responsibility for our Product Management team – which we have greatly strengthened with the appointment of a group of specialists with strong semiconductor industry expertise. Working together with the established team, they are ensuring that our range remains fully comprehensive, extending from the latest high performance Texas Instruments DaVinci™ processors to staple 8-bit micros, connectors, passives, test & measurement and tools.

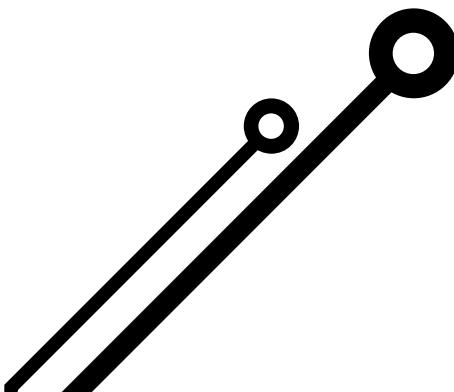
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**06 DAVINCI™ REAL-TIME VIDEO TECHNOLOGY**



**Glenn Jarrett**  
Head of Electronics Marketing



# FF Stop hiding your engineers JJ

We're an engineering-based industry, and I've never understood why it is that so many companies hide the people who do the design from their customers. When you buy legal services, you talk to the lawyers. When you buy accountancy services, you talk to the accountants. When you buy engineering services, you talk to sales and marketing people who may or may not have been engineers once.

I'm not saying that the engineers should be doing the sales people's job. By and large, engineers enjoy designing, and sales people enjoy selling, and the two have different skillsets. But even companies like ours that sell design services can be coy about letting their engineers out in front of a real customer. What are they afraid of? Confidentiality? These issues can be dealt with through appropriate management and training.

**Or is it people skills?** There is this pervasive myth about engineers lacking these skills, which is simply wrong. I confess that the salesman in me cringes when an engineer describes at length some snag we've run into on a project, but the fault there is with me. I was an engineer once, but I've been selling for long enough to fall into the trap of trying to wrap customers in cotton wool and pretend that these things don't happen. I've never known a customer to be actually put off by anything our engineers have said – and in fact their frank input and enthusiasm often injects a note of reality into the dialogue that can be extremely beneficial to the relationship.

Fostering direct interaction enriches the working environment of the engineers too. When I ask our team what they enjoy about meeting customers I get reactions like "it gives us a chance to show off". Quite right. What kind of message does it send to the people whose skills drive our industry, if we tell them, ever so nicely, that they're really not smart enough to get face-to-face with the people who ultimately pay their salary?

## FF What are they afraid of? Confidentiality? JJ

Mike Lloyd is Managing Director of ML Electronics, specialists in innovative electronics designs.

If you've got a strong opinion and would like the opportunity to get on your soapbox, write it up in around 300 words and email it to [etech@rs-components.com](mailto:etech@rs-components.com)

## Improved control and visibility of online procurement from RS

RS Purchasing Manager™ is RS's own eProcurement tool developed for buyers. The system facilitates online purchasing in a controlled and visible way and reduces purchase to pay process costs for medium to large organisations. Using RS Purchasing Manager™ helps buyers to streamline the ordering process throughout creation, approval and invoicing, PM helps companies to manage purchasing costs more effectively.

The new upgraded RS Purchasing Manager™

has expanded capabilities including:

- Improved site control spend management
- New approval options
- Full audit trail from demand to order placement
- Customised field terminology
- Support for customer cost centres, manual order number generation and blanket orders
- Consistent budget allocation and control
- Enhanced reporting options

Over 5,000 customers already use RS Purchasing Manager™ to reduce their procurement process costs. Go to [rswww.com/services](http://rswww.com/services) and find out more.



## New order options now online

Website order options to help you plan requirements.

RS have introduced two new online options to help plan order requirements. Forward orders enables online customers to specify which date you want to receive a complete order on, and Scheduled Orders allows you to set up a schedule of drops for products from a single order. Prices are fixed at the time of placing the order, so you can take advantage of lower prices available at higher quantities, then programme delivery dates that meet your needs.

The new ordering options make it easier for engineers and buyers to plan production schedules and stock requirements, saving costs, with the confidence that RS have their products in stock. Forward and Scheduled Orders are available when placing your order at [rswww.com](http://rswww.com)

## RS achieves Carbon Trust standard

Carbon footprint reduced by 2.5% over three years.

RS UK has been awarded the Carbon Trust standard (CTS) at the highest level. The standard, issued by the Carbon Trust, is an objective benchmark that assesses and accredits an organisation's commitment to tackling climate change. To-date, less than 100 companies in the UK have met the Carbon Trust's

requirements, and even less have achieved level two certification. RS is the first electronics distributor to reach the level two standard.

A significant part of the RS strategy to reduce its carbon emissions was in the replacement of 1,382 light-bulbs with energy efficient lighting.



This has saved over 345.5 tonnes of CO<sub>2</sub> over 3 years, and reduced carbon reduction cost allowances by £4,146 for lighting alone.



The latest introductions into the RS Brand power supplies range gives electronic design engineers a high quality, lower-cost power supply solution for most scenarios they are likely to face. The new range is targeted at applications requiring increased efficiency, low energy consumption requirements, with feature products including new encapsulated, high efficiency, low energy PCB mounted PSUs, and external energy-efficient, switch mode desktop PSUs.

With over 30,000 products in the RS Brand range, engineers and buyers have access to quality components at the lowest prices available. To learn more about how RS Brand products can help reduce your costs, go to [rswww.com/rs](http://rswww.com/rs)

To find out more about how RS energy efficient products can reduce costs in your business, go to [rswww.com](http://rswww.com)



# DaVinci™

## Real-time video surveillance technology

CCTV systems are everywhere – enhancing public safety and security, which can be very important in our daily time. Sometimes the information is monitored by a security guard in a control room – more often it is simply stored for subsequent analysis if an event occurs.

Useful though the footage is to catch perpetrators and bring them to justice, the cost of real-time monitoring means that the opportunity to nip problems in the bud when they happen is often missed.

The availability of low cost, high performance DSP cores, such as Texas Instruments DaVinci™ family, can be used to analyse video footage automatically and in real-time in order to alert a human operator when an event is happening. The proliferation of IP networks and the convergence of many technologies on to them means that it is likely that such a network will be available at most sites and provide the perfect backbone for transmitting video data. This potentially allows the intelligence to be distributed around the network, into the cameras for example, so that only relevant footage is transmitted over the network.

A team at Bristol University, under the leadership of Dr. Naim Dahoun, is investigating techniques for automating the monitoring process using Texas Instruments DaVinci™ DSP platforms. One important aspect of video surveillance is video object classification. It is discussed in the following section.

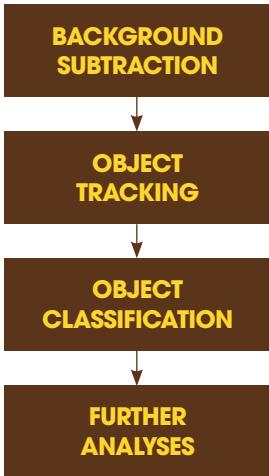
### Video object classification

A key area in automating CCTV monitoring is classifying objects on video footage in real-time. Yu-An Shih, working under the leadership of Dr. Dahoun, has looked at the most appropriate algorithms to use when implementing a real-time video object classification system on a DaVinci™ platform.

Shih identified that an automated video surveillance system would generally go through the sequence of steps shown in Figure 1. The first stage is to identify the moving objects in the image sequences, and eliminate image regions that belong to the background environment, probably using a background model acquired in teach mode. The next step is to track and identify the moving object. Is it a car, a person, or etc.? Finally, further analysis can yield more information, for example about the nature of the activity or the identity of a human.

*Continued page 08 >*





**Figure 1:** The stages of video surveillance

< Continued from page 06

Although this sounds straightforward, there are hidden complexities. Background objects aren't necessarily completely stationary. Repetitive motion, like tree leaves or camera vibrating needs to be allowed for. For instance, on a windy day there can be a lot of random movement in the background. Moreover, some detailed steps are not shown on Figure 1. Shadow detection and removal can also improve the result. Also, background subtraction yields a great number of foreground pixels, which need to be grouped into different regions through connected component labeling.



**Figure 2:** Original image and the result of Mixture of Gaussian algorithm

#### Algorithm selection

Shih noted that the selection of algorithm in one stage is not entirely independent of the others. For example, background subtraction could be improved by a classifier that can detect false foreground regions. On the other hand, if the background subtraction algorithm is very accurate, the later stages can be simplified.

On the hardware side, embedded systems have limited memory, especially internal fast memory. Hence it is usually required to manage the memory usage manually. Another issue is the arithmetic format. The Bristol team is targeting a fixed-point DSP so is avoiding algorithms that required floating-point operations, therefore reducing the cost and power consumption.

Simplicity is also an important issue when choosing an algorithm. A highly complicated algorithm is usually slower, more error prone and more difficult to improve than other simpler algorithms. Therefore, a complex algorithm will not be selected unless it can greatly outperform the others. For background subtraction, Running Gaussian Average (RGA) and Mixture of Gaussian (MoG) are commonly used algorithms. MoG is more accurate, but its memory usage is many times that of RGA. However, the selection will depend on the application. The result of MoG algorithm on a video from PETs Metrics can be seen in Figure 2.

As for shadow detection and removal, methods usually exploit the fact that illumination has larger effect on brightness than chromaticity. While it would require more computation, it is worth doing because it can result in more correct representations of the objects. When considering object classifiers, those that are a little less accurate but faster should be favored over much slower ones. For this

reason, methods such as MLE, Decision Tree, and k-means are often used.

#### Performance

MoG algorithm, shadow detection, and classical connected components analysis were implemented in a previous project based on TI DM642 DSP platform, and a performance of 15 frames per second was achieved. Further optimisation

could be done to achieve a higher frame rate. As for classification part, Shih's goal for the current project is an accuracy rate of 75% with at least ten frames per second. A slower or less accurate system would not be useful in the field, in his view.

#### Getting started

Many of the Texas Instruments DaVinci™ DSP processors are dual-core, consisting of an ARM9 core for graphical user interfaces and a DSP core for intense signal processing. A video processing subsystem (VPSS) is usually included to facilitate video capture and display and to reduce processor load. Thus it is a high performance, low power and low cost platform, ideal for many video applications.

RS offers a range of Texas Instruments Digital Video Evaluation Module (DVEVM), enabling developers to start immediate evaluation of DaVinci™ processors and begin building digital video applications such as IP security cameras as well as digital photo frames, digital signage, video doorbells, and portable digital video products that have yet to be invented. The TMS320DM365 processor, for example offers developers access to H.264 and other video formats in a variety of resolutions including 1080p HD.

The Digital Video Evaluation Module (DVEVM) allows developers to write production-ready application code for the ARM and provides access to the HMJCP coprocessor core using DaVinci™ APIs to begin immediate application development for DaVinci™ digital media processors. The DVEVM is a complete out of box experience. The developer can turn on the board and hook up the included LCD screen. The board will boot MontaVista Linux and run a GUI that can be controlled by the included IR remote. The GUI includes access to three demos and the ability to run five different codec combinations. ●

See the full range of TI devices from RS, including DaVinci™ processors at [rswww.com/ti](http://rswww.com/ti)

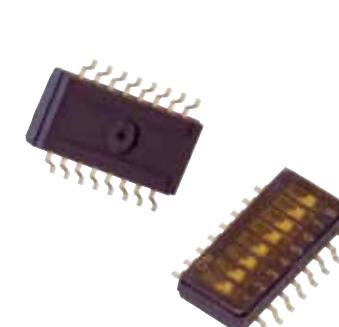


## Omron's A6S-H Surface Mount DIP Switch from RS

Designed for improved solder heat resistance, the A6S-H has a peak solder temperature of 260°C. This range features 1-10 poles, gold-plated twin contacts and slide-type self cleaning mechanism, which ensures high reliability. Supplied on sticks for automatic placement, slide switches are available in washable form with a seal tape.

#### Specifications

Switching Capacity	25mA at 24VDC 10µA(minimum current) at 3.5VDC
Ambient Operating Temperature	-20 to +70°C at 60% max. (with no icing or condensation)
Ambient Operating Humidity	35 to 90% (at 5 to 35°C)
Insulation Resistance	100MΩ min. (at 250VDC)
Contact Resistance	200mΩ max (initial) value
Dielectric Strength	500VAC for 1 min between terminals of the same polarity, and between terminals of different polarity
Vibration Resistance	Malfunction: 10 to 55Hz, 1.5mm double amplitude
Shock Resistance	Malfunction: 300 m/s min
Life Expectancy	Mechanical: 1,000 operations min. Electrical: 1,000 operations min
Operating Force	Flat/raised typ 0.29 N min (30gf)
Weight	0.25g(2 poles), 0.41g (4 poles), 0.58g (6 poles) 0.73g (8 poles), 0.87g (10 poles)



Omron designs operability, user-friendliness and customer benefits into all of its switches. Visit [www.omron-rs.eu](http://www.omron-rs.eu) to view the range

**OMRON**

# LEDS BURNING BRIGHT EFFICIENTLY

**Efficient light where you want it, when you want it – that's the promise of new high power, high efficiency lighting technologies like the Ostar range from Osram Opto Semiconductor. The new range is part of a comprehensive expansion of the RS LED lighting range, which now covers 95% of OSRAM high brightness LED products, a range of complementary LED devices from other manufacturers, as well as LED controllers, drivers and system solutions.**

Image courtesy of Osram Opto Semiconductor.

The controllability and energy efficiency of LEDs is leading to ever widening applications. For example, GRIVEN, of Mantua, Italy, one of the world leaders in entertainment and architectural lighting, is using LED technology for an increasing number of lighting fixtures. "The advent of LEDs in our business has made the development and production of new lighting equipment easier and faster. Benefits include energy savings, reduced maintenance and better long term reliability. We are seeing performance improve rapidly in terms of luminosity and efficiency, and costs coming down, which will help drive the technology into more new market segments", explains Giuseppe Froio, head of product engineering at GRIVEN.

#### OSTAR applications

The OSRAM OSTAR range of SMT LED devices is an excellent example of the rapid innovation that this technology is seeing. Designed for lighting and ultra-miniature pico-projection applications, OSTAR is becoming increasingly popular in a whole range of industrial applications like microscope lighting, flash lamps, traffic lights and projection as well as the more usual room and effect illumination.

Exceptionally compact, the OSRAM OSTAR SMT LED is the light source for any application requiring bright light in a compact space. The devices are offered in a range of colours, and the SMD chips are easily combined with secondary optics. Highly efficient OSTAR devices deliver the maximum light for the minimum energy input. As a result, they also create the minimum of waste heat – reducing thermal management issues and the need for secondary cooling through fans and heatsinks.

**“The advent of LEDs in our business has made the development and production of new lighting equipment easier and faster. Benefits include energy savings, reduced maintenance and better long term reliability...”**

Giuseppe Froio, head of product engineering at GRIVEN.



#### Getting started

Cypress HB LED demonstration boards are an excellent place to start to evaluate the flexibility and capability of LED lighting technology in the context of current and future projects.

RS also offers the ACULED® Gold and Silver Designer Kits, offering a wide range of different LED colours and combinations. Each kit includes a selection of mounted ACULED modules, lenses and different heat sinks as well as the required power supply. Of course we are able to support you across the full breadth of a full LED design, including power supply, drivers, thermal management and optical considerations. [Go to rswww.com/electronics to see more.](http://rswww.com/electronics)

**Find out more at [rswww.com/osram](http://rswww.com/osram)**

**"Somebody should make a low-cost function generator as capable as an Agilent."**



## You mean somebody like Agilent?

The most reliable function/arbitrary waveform generators in the world have always been Agilent. Now, for the first time, you can have that Agilent reliability at a low cost; the new Agilent 33210A function/arbitrary waveform generator. With all the modern LXI compliant I/O, productivity features, and ease-of-use of its older brothers, the 33210A expands your choice of function generators, each scaled perfectly to your needs.

	33210A	33220A	33250A
RS stock no.	667-2591	667-2597	667-2594
Speed	10 MHz	20 MHz	80 MHz
Arb Length	Optional 14-bit, 50 MSa/s, 8 K-point	14-bit, 50 MSa/s, 64 K-point	12-bit, 200 MSa/s, 64 K-point
Waveforms	Sine, square, pulse, ramp, triangle, noise, DC	Sine, square, pulse, ramp, triangle, noise, DC	Sine, square, pulse, ramp, noise, DC, triangle
I/O	GPIB, USB, LAN	GPIB, USB, LAN	GBIB, RS-232

LXI

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[rswww.com/agilent](http://rswww.com/agilent)



Agilent Technologies

## THERMAL MANAGEMENT

As advances in processor power continue and components become ever smaller and more tightly packed into equipment, thermal management continues to be a critical issue for design engineers.

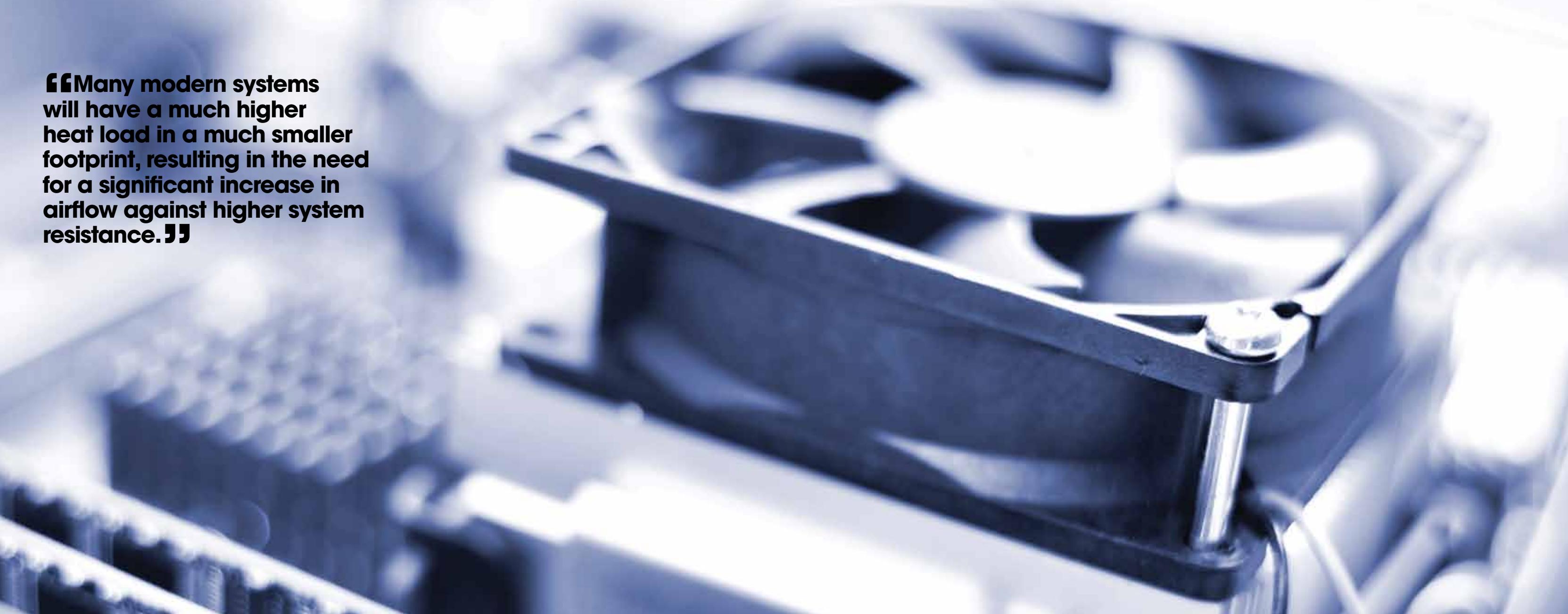
Not only do they need to dissipate heat, but they want to do it as quietly and efficiently as possible.

Fortunately, a stiff breeze of innovation from fan manufacturers is helping to do just that.

For example, the S-Force series fans from ebm-papst embodies revolutionary improvements all key areas of concern.

*Continued page 14 >*

**Many modern systems will have a much higher heat load in a much smaller footprint, resulting in the need for a significant increase in airflow against higher system resistance.**



<Continued from page 13

#### Fan basics

The easiest way to reduce fan noise is to use a large diameter fan to move a large volume of air at low velocity. Fine if size is no object: but the more compact the application, the smaller the fan has to be, and the higher the air velocity and consequently the higher the noise levels. As with most engineering solutions, a compromise is needed. So, what are the options?

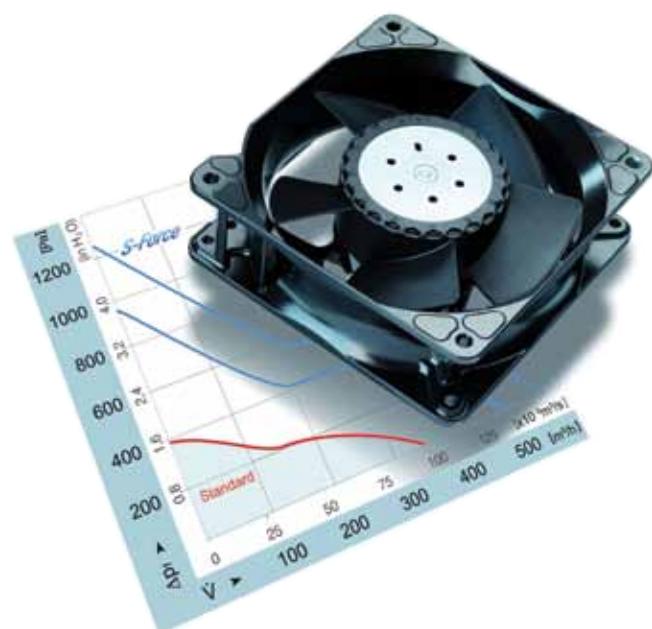
Many modern systems will have a much higher heat load in a much smaller footprint, resulting in the need for a significant increase in airflow against higher system resistance. Until recently, these conflicting characteristics would have been impossible to resolve without a larger fan, but the award winning S-Force range from ebm-papst was designed specifically for this scenario. These ultra-high performance DC compact fans can generate up to 950m<sup>3</sup>/h and overcome pressures of up to 1200 Pascals. Having the same compact dimensions as their standard counterparts, this can only be achieved by rotating the fan at incredible speeds of up to 14,000 rpm. At full load, the tips of the blades are travelling at over 140mph!

The benefit is that you get twice the performance from the same size fan. This gives the potential to reduce the size of current applications or allow for future increases in performance. Since they share the standard dimensions and features of previous fans, converting, upgrading or retrofitting is easy and they are designed to have exactly the same service life.

#### Cabinet cooling

At the other end of the scale, rather than direct cooling of the electronic circuits, sometimes the requirement is to cool a larger cabinet. In this case the approach is very different. Rather than the very directional airflow from an axial fan, this type of application is better suited to a backward curved centrifugal fan which can move a body of air through the plenum of the cabinet. Typically, air is drawn into the eye of the impeller through an aperture and accelerated outward at 90 degrees to the inlet flow. The whole cabinet is in effect pressurised as air passes through and out of the unit, taking the heat with it.

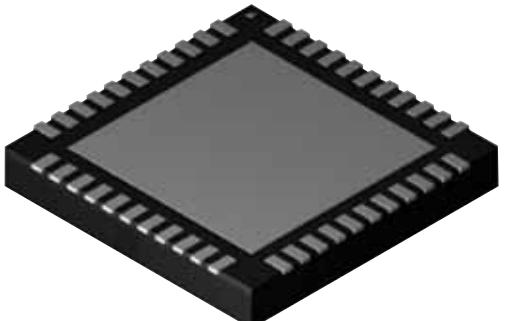
Although the backward curved fan will do this more effectively and quietly than an axial fan, it does require a little bit more attention when designing its installation. To avoid potential noise issues and get optimum performance, there are a few factors to consider. The inlet



aperture is much more efficient when using a specially profiled inlet ring to smoothly guide the air into the impeller. Simply relying on a hole cut in a flat surface will reduce the amount of airflow and increase the noise as turbulent vortices emanate from the sharp lip. Any gap between the aperture and the impeller also affects performance and is equally relevant when using the correctly sized inlet ring, which should sit just inside the impeller.

Mounting is also critical. Without the integral case of a compact axial fan, a frame is required to support the motor from the rear. If this is positioned too close to the rotating impeller further noise issues can arise from what are known as blade passing frequencies. Pressure waves from the impeller can impinge on any adjacent structures and create a low frequency tonal noise which relates directly to the number of blades and rotational speed of the impeller. If you're really unlucky, this can then set off resonant frequencies throughout the application. ●

**See more of the RS range in thermal management devices at [rswww.com/electronics](http://rswww.com/electronics)**



### MICROCHIP NANOWATT XLP™ MCUs

Extreme low power PIC microcontrollers with the worlds lowest Sleep Current.

■ Microchips new nanowatt XLP™ families of PIC microcontrollers offer a new industry benchmark for the lowest sleep current consumption, providing a rich and compatible low-power migration path that includes on-chip peripherals for USB and mTouch™.

With sleep currents down to 20nA, real-time clock currents down to 500nA, and watchdog timer currents down to 400nA, the XLP™ PIC MCUs are ideal for any battery-powered or power-constrained application. Microchip have integrated all three features into their 8-bit and 16-bit XLP™ series, providing more freedom for designers who need products to operate longer while using less battery power.

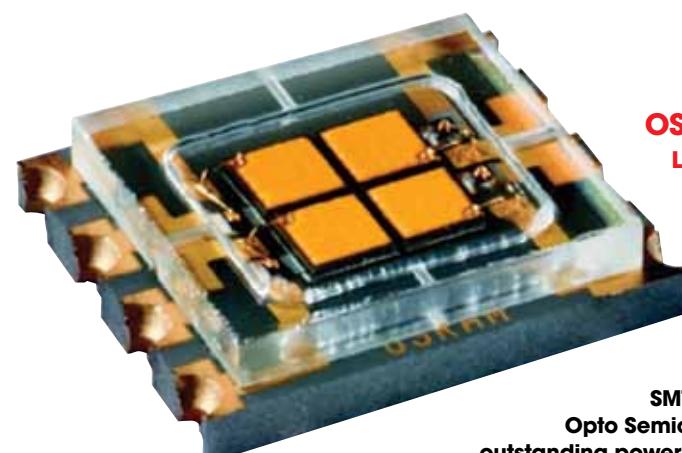
RS Online search term:  
[Microchip low power](#)

### RICHCO PCB SUPPORTS AND SPACERS

Over 80 new lines added to range; all available for next day delivery.

■ New ranges include Self retaining PCB spacers, Edge holding PCB supports and Mini dual-locking posts which snap into place on both the chassis and the board and requires no fixing screws.

RS Online search term:  
[richco pcb processing](#)



### OSRAM OSTAR SMT LED power in a tiny package.

■ Designed for lighting and ultra-miniature pico projection applications, the OSTAR

SMT LED from Osram Opto Semiconductors unites outstanding power efficiency and RGB colour mixing capabilities in a compact surface mountable package.

Thinfilim and ThinGaN chip architecture helps the OSTAR SMT provide provides extremely high luminance and luminous flux, while glass window protection and anti-reflection coating (ARC) on the output window keeps performance high. Available in a variety of colours, the OSTAR SMT LED is ideal for applications requiring the highest possible power density.

RS Online search term: [Osram OSTAR](#)



### PHIHONG SHELF MOUNT POE 8-PORT INJECTOR

125W midspan injector for Power over Ethernet.

■ An 8 Port Gigabit Power over Ethernet midspan for 10/100/1000 Base-T networks, with IEEE 802.3af detection, disconnect and overload protection. Giving Full Power of 125W (15.4W per Port, with no Power management required) and full protection this is the ideal low cost PoE solution.

RS Online search term: [phihong power over ethernet](#)

### TRACOPOWER TEP SERIES OF DC/DC CONVERTERS

Ideal solutions where PCB mounting is not an option.

■ The TEP series from TRACOPOWER provides multiple options for industrial applications. The new TEP-100 series features a metal enclosure which can be fitted to a chassis or heatsink, and an optional chassis mount adaptor greatly simplifies installation.

With the TEP-75 series also available, input voltages across the TEP range from 9~75VDC, with output ranges between 5~48VDC on TEP-100 series products, and a reduced output power of 75W through the TEP-75 series products. The wide input range, combined with reverse input protection make these converters excellent solutions for battery operated systems.

RS Online search term: [Traco TEP](#)

### EBM-PAPST EC TECHNOLOGY BACKWARD CURVED CASSETTE FANS

A more efficient drop in replacement for standard axial fans.

■ A backward curved centrifugal fan has the advantage of developing higher pressure than an axial fan. The disadvantage has been the greater complexity of installation, where certain factors can have a significant impact on both noise and performance; These issues are now a thing of the past because ebm-papst has launched a "plug and play" product which is guaranteed to ensure optimum performance. The EC Cassette Fan range is available in 175mm and 190mm diameter sizes for 24VDC, 48VDC or 230V AC operation. Comprising a high efficiency ebm-papst EC centrifugal fan, inlet nozzle, mounting frame, finger guard and connecting cable, each of the component parts has been perfectly matched to ensure optimum performance.

All you have to do is fix it to your application.

RS Online search term:  
[EBM Papst EC Cassette Fan](#)



### LECROY WAVESURFER® MXS-A SERIES

Engineered for efficient debug, validation and documentation from 200MHz to 1GHz.

■ The new Wavesufer Xs and MXs-A oscilloscopes are designed with speed and responsiveness in mind. This shows up in improved trigger rates for every situation – from capturing waveforms and making measurements, to using FFTs and decoding serial data. With higher sample rates, 10Mpts/CH memory and LabNotebook™, no other product in this class offers such a powerful combination of features and banner specs.

RS Online search term:

[LeCroy wavesufer mxs](#)

### MARL PROFESSIONAL INDICATORS

A stylish new range of metal bodied panel indicator LEDs.

■ The new Marl panel indicator LEDs will operate from any voltage in the range 12-28V with minimal variation in brightness making them ideal for battery powered systems and other applications where input voltage is subject to wide variations. Unlike most LEDs they are insensitive to the

polarity of the incoming power supply, and will work equally well wired either way around. The new LEDs are also highly energy efficient, drawing just 8mA from a 12V supply around 25% less than existing versions.

Available in two sizes, for 8.1mm and 12.7mm panel apertures all versions offer a wide 120 degree viewing angle, and are a plug-in replacement for existing Marl and other LED indicator panels.

RS Online search term: [marl led indicator panels](#)



### SWITCHCRAFT EH SERIES CONNECTORS

A complete line of audio, video, and data connectors built into standard panel-mount XLR housings.

■ Once mounted, connecting your equipment to the back of an EH Series connector is fast and easy. Most connectors are feed through, which means standard cabling is simply plugged into the back of your equipment, then plugged into the back of the EH Series connector. For those EH Series connectors that are not feed through, solder lugs are clearly marked for simple, secure solder connections. All EH Series connectors are available individually bagged with mounting screws.

RS Online search term: [switchcraft eh xlr](#)

# CUTTING POWER BACK TO THE BONE

New ultra-ultra-low-power embedded MCUs allow embedded systems to last a lifetime on one battery.

The success of embedded electronics is opening markets for new products demanding battery standby times measured in decades rather than years or months, including sealed-for-life security and fire-safety equipment such as smoke alarms offering increased convenience and reliability. There are also many opportunities for environmental monitoring and control devices that rely on energy harvested from ambient sources.

New microcontroller families, conceived to operate within unprecedented minuscule power limits, will enable embedded developers to satisfy such demands. Since the majority of embedded products spend 90%-99% of the time powered down, innovative sleep modes are a key feature of such devices.

#### Adding to Proven Techniques

The latest generation ultra-low-power MCU technology from Microchip, called nanoWatt XLP™, adds a new Deep Sleep mode alongside the multiple low-power modes already implemented in Microchip's nanoWatt™ MCUs. In addition, continued support for nanoWatt techniques to reduce dynamic power, such as two-speed startup and clock-switching capability, minimises power consumption throughout the entire duty cycle.

**New Deep-Sleep Mode**  
In Deep Sleep the microcontroller's CPU, integrated Flash and SRAM, and most peripherals are not powered. In devices featuring an on-chip regulator, this, too, is powered down. This achieves the lowest possible current draw without completely removing power from the device. Typical Deep Sleep current for nanoWatt XLP MCUs range from 13nA to 50nA. The PIC24F16KA102 has demonstrated Deep Sleep operating current as low as 20nA.

To avoid interrupting the application, I/O pin states are retained and the 32kHz crystal clock continues to operate. Dedicated Deep-Sleep registers provide storage for up to four bytes of critical application data.

The nanoWatt XLP architecture includes unique peripherals that operate while the MCU is in Deep Sleep mode. These provide valuable extra flexibility to manage the application. The Deep Sleep Real-Time Clock and Calendar (RTCC), for example, allows developers to set a wake-up period from one second to many years. A dedicated Deep Sleep Watchdog Timer (DSWDT), which consumes less power than the regular WDT, allows device wake-up from a time-out alarm. In addition, Deep Sleep Brown-out Reset (DSBOR) prevents

failure if the battery voltage falls or if the battery is changed. An Ultra-Low-Power Wake-Up, external interrupt (INT0) or MCLR signal can also wake the MCU from Deep Sleep mode.

**Maximising Deep Sleep Savings**  
Deep Sleep delivers the greatest advantages in applications that use no peripherals while asleep, demand accurate timekeeping with minimal current draw, or must operate in extreme temperatures. Since power is removed from the core, waking from Deep Sleep causes a device reset rather than resuming from the next instruction, as in the conventional Sleep mode. Hence, there are extra overheads to re-initialise the device after wake up. As a result, Deep Sleep mode is typically best used with sleep times of one second or more.

To calculate whether Deep Sleep or Sleep mode will deliver the greatest power savings when the application is inactive, the total charge consumed in Sleep mode is compared with the total charge in Deep Sleep mode. The Sleep-mode charge is given by  $IPDSLP \times TPD$ , where  $IPDSLP$  is the static current in Sleep mode and  $TPD$  is the time for which the device is to be powered down. The total Deep Sleep charge is expressed as:

$$Q_{DS} = (T_{INIT} \times I_{DD}) + (T_{POR} \times I_{POR}) + (T_{PD}) \times I_{PDDS}$$

Where:

$T_{INIT}$  = Initialisation time to resume full-power operation

$I_{DD}$  = Initialisation current

$T_{POR}$  = Time required for power-on reset

$I_{POR}$  = POR current

$I_{PDDS}$  = Static current in Deep Sleep

The value of TPD when both expressions are equal gives the minimum viable Deep Sleep duration, referred to as the breakeven time (TBE). ◉

#### Getting Started

Recently-introduced nanoWatt XLP™ MCUs including the PIC18F46J50, PIC18F46J11 and PIC24F16KA102 families all feature Deep Sleep Mode. Available development tools include a number of development boards and kits supporting the new device types.

For more information visit  
[www.microchip.com](http://www.microchip.com)

# MOTOR CONTROL - Italian style

**Italy has long been the home of world leading manufacturers of machine tools, production equipment and consumer electrical appliances, and has thus become something of a centre of excellence for electric motor control electronics. We spoke to a number of RS customers in Italy, who proved to have strong views on the new control solutions being offered by the semiconductor industry, and coping with the requirements set by new rules on energy using products.**

## **Higher integration**

For Studioemme of Bologna, specialists in the design and manufacture integrated servo-drives for brushless motors, higher integration is a top priority in its target market of machine tools. Francesco Borghesi, Studioemme R&D designer says, "In our latest product line, we encompassed both power and control circuitry in the same system, installed right on the motor. This allows a significant simplification of the cable routing between the machine and its control board, as it becomes possible to connect all the motors by a single CANopen cable. Higher integration also reduces electromagnetic compatibility problems."

He continued, "The biggest challenges that we had to face were miniaturisation of the system and heat dissipation. To achieve miniaturisation, we modified the power supplies and changed some of the components. For example, low noise current sensors – which are great but bulky – were replaced by smaller sensors, and optical encoders were replaced by absolute magnetic encoders. Our Field Oriented Control algorithm - which we developed in collaboration with the University of Bologna for a previous product family - has not changed, even though in order to take advantage of its full potential, high resolution encoders and low noise current sensors would be needed. For

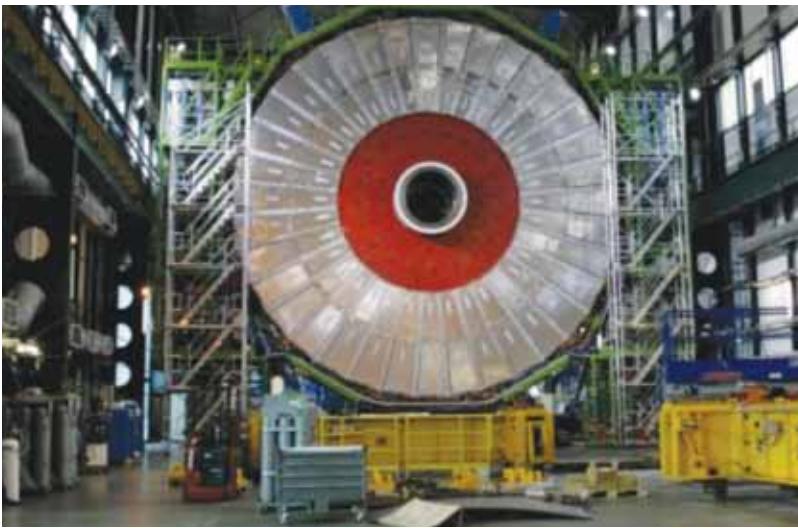
the near future we are planning to complete this family of integrated control systems by adding higher power models".

## **Fighting harmonics**

Among the recent rules impacting motor control systems, are IEC standards which set limits for the harmonics content in the current absorbed from the mains. Selpro (Brescia), suppliers of speed controls based on voltage steps or phase partialisation is strongly focussed on this issue. Their products are used in large HVAC equipment and in industrial refrigeration systems. Fausto Rizzi, a design engineer at Selpro, explains, "We managed

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to meet the IEC standards by updating and refining the use of our technologies. Voltage step systems are intrinsically harmonic-free as they are based

**In our latest product line, we encompassed both power and control circuitry in the same system, installed right on the motor... ☺**

**Francesco Borghesi**  
Studioemme R&D Designer

on autotransformers, which are linear elements and therefore do not generate distortion. Phase partialisation systems, on the contrary, do generate distortion. By taking advantage of the inductive nature and modularity of the load (which consists of several fans) and operating within a certain phase angle, it is possible to cut harmonics within the limit set by the standard for currents from 16 to 75 amps (IEC 61000-3-12). This solution, however, cannot be used for currents up to 16 amps, where a different standard applies with lower limits for harmonics (IEC 61000-3-2). Very soon we will have to face the problem of

energy efficiency, and I think that we will have to use the inverter control technology and adopt DSP-based systems".

Practical targets for lifts Quality-to-price ratio and easy installation are currently the main goals for SMS Sistemi e Microsistemi (Crespellano, Bologna), who design and manufacture control systems for lifts. The company's product offering includes starters, speed controls, devices for taking the car back at the floor level in the event of a power failure, boards for control panels, capstans. "We try to make life easier for installation technicians by providing pre-cabled products", explains Emanuele Castagnini, one of the designers of the company.

"The inverters used for taking the car back to the floor level in the event of power failure are not very sophisticated, as positioning need not be very precise. For these products we are planning to use microcontrollers; we will not need DSPs". The need to reduce power consumption has an impact on this market, too. "Our inverters for normal operation in both electric and hydraulic lifts are the focus of our power optimisation efforts," Castagnini maintains. "In lifts, however, the evaluation of power consumption should be based on the system as a whole, not on a single component". ☺

#### Motor Solutions

Whatever your motor drive and control challenge - RS has products to support your solution. Select from our range of microcontrollers, DSPs, DSCs, encoders, current sensors, MOSFETs, IGBTs etc at [rswww.com/electronics](http://rswww.com/electronics)

IN ASSOCIATION WITH

**elektor**

# Power in the Pocket (1)

## A SIMPLE PWM AMPLIFIER

**Ton Giesberts (Elektor Labs)**

**There are plenty of designs for simple audio power amplifiers. These generally have a class-AB or class-B topology. Here we present a very compact class-D design that can be powered from four AA batteries and because of its relatively high efficiency can elicit quite a few decibels from a loudspeaker.**



The audio power amplifier described in this article is no ordinary analogue amplifier stage, but a 'digital' version that uses pulsedwidth modulation (PWM). In fairness, we will be upfront and state that this amplifier has quite a bit of distortion and so this is absolutely not a hi-fi or high-end amplifier. The circuit is far too simple for that. On the other hand, the circuit does give a unique sound to the music. The digital amplifier has perhaps a 'tube-like sound' quality.

#### PWM amplifier

A PWM amplifier has, in principle, a very high efficiency, because the output is switched at high frequency between the positive and negative power supply voltages (or ground) (see Figure 1). Since the output transistors, are driven, one at a time, either fully on or fully off, the voltage drop across the transistors when

on, and the current through the transistors when off, are minimal. This means that the (heat) losses of the transistors remain small. While the transistor is on, there is a pulse at the output. The width of this pulse is proportional to the amplitude of the original input signal. The width of this pulse is also a measure of the size of the output signal (and by extension the volume level of the amplifier). This can be seen clearly in Figure 1: the places where the positive side of the signal is the largest correspond with the highest (sine) signal levels. This, of course, is also true for the negative half of the signal: the smaller the positive side of the pulse (and therefore the wider the negative side), the smaller ('more negative') the output signal.

The size of the output signal is therefore determined by the ratio between the positive

**Technical specifications**

- 1 W into 8 Ω, 1.7 W into 4 Ω
- Class-D
- Power supply 6 to 9 V (4x AA cell)
- Very compact
- Simple construction without SMDs

and negative pulse. The bigger the difference, the bigger the output signal. And the other way around: as the ratio between positive and negative pulses approaches 50/50, the lower the output signal becomes.

Only a low-pass filter is required to convert the PWM signal back into the (amplified) original signal. This filter removes the high switching frequency from the signal so that only a kind of

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'average' remains, which corresponds exactly to the original signal.

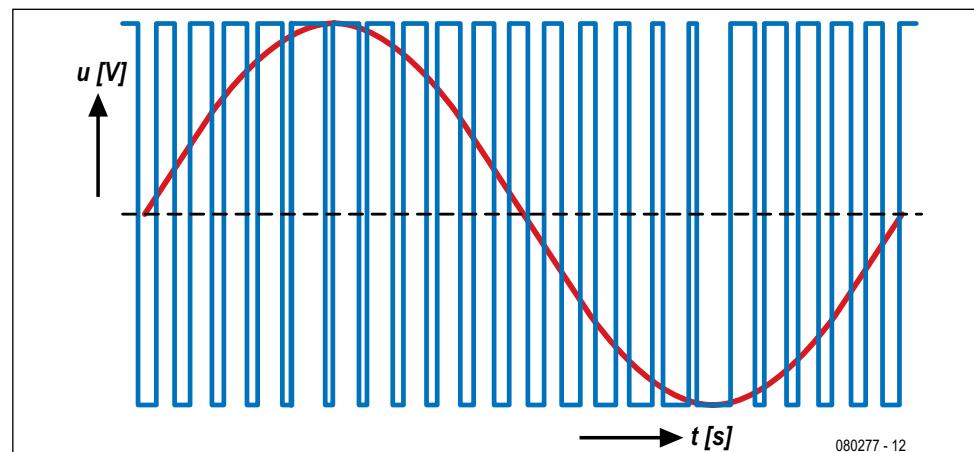
#### The circuit

The circuit (see Figure 2) is a so-called self-oscillating pulsewidth modulator. This is actually an amplifier stage which is oscillating badly. A low-frequency signal affects the oscillation, which results in pulse-width control.

Because the amplifier is powered from a single-ended power supply (6 to 9 V), decoupling capacitors are required at the input and output (C1 and C7). It is mainly the output capacitor that determines the lowest frequency that is passed. The selected value is always a compromise between physical size and bandwidth, just as with analogue amplifiers.

For driving the output stage, a few buffers from the '4000' series logic series are used. The main advantage of this series is their large supply voltage range. Their limited speed is not really a concern here. In order to obtain sufficient gain, two gates are connected in series and the remainder are connected in parallel with the second buffer. This results in a better drive signal for the output stage (necessary because of the high input capacitance of the output stage).

We chose MOSFETs in an I-PAK package (TO-251AA) made by IRF for the output stage. These small transistors can handle more than 4 A (the N-channel MOSFET can cope with more than 7 A). The channel resistance of the N-channel MOSFET is about 0.25 Ω and for



**Figure 1.** The PWM signal corresponding to a sine wave. After filtering of the PWM signal the original signal reappears.

the P-channel MOSFET it is about 0.5 Ω.

Because of these low values of channel resistance, it is important that both transistors do not turn on at the same time (dead time is required). In series with the outputs from the gates are 220 Ω resistors, each in parallel with a Schottky diode. This ensures that the voltage at the gate of one MOSFET is discharged quicker than it is charged at the gate of the other one.

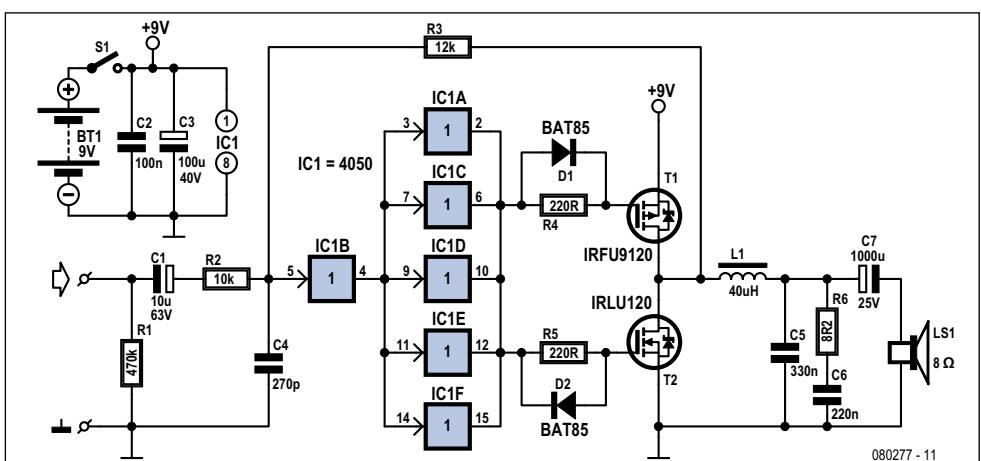
In our prototype we used a reasonably common noise suppression choke for the output inductor in the low-pass filter (L1). This choke is rated for loads up to two amps. But you can also use a smaller choke, such as axial versions for medium-current applications. Just make sure that such a choke will fit on the PCB. We deliberately selected a coil that can

handle more current than strictly necessary (at a load of 4 Ω the peak current is less than 1 A). In order to keep the physical size of coil small, a core is used, but this results in non-linearities which become increasingly larger as the core approaches saturation. So as to operate in a reasonably linear region, a slightly bigger inductor was selected. By using an axial version and mounting it upright, the space required has been kept to a minimum. An air-cored coil would have been the best choice, of course, but that is not an option here because of its physical size.

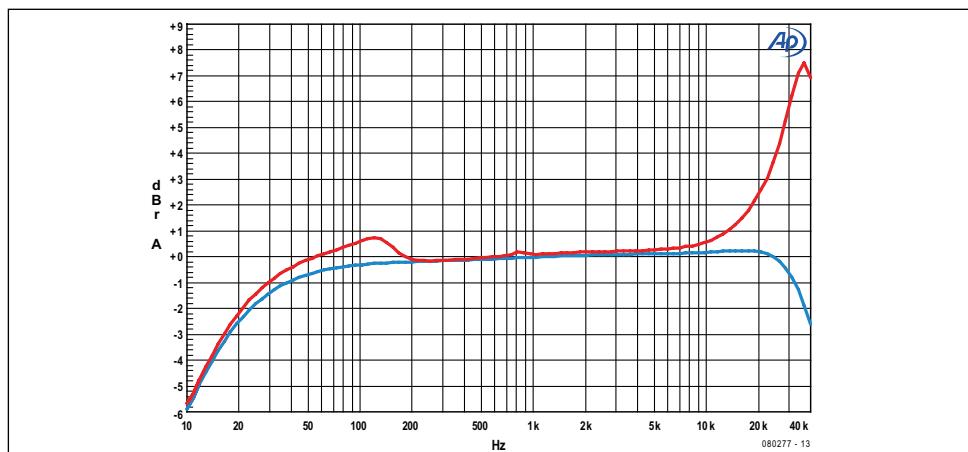
As already mentioned, only a low-pass filter is required to turn the digital signal back into an analogue signal. L1, together with C5 forms a 2nd order low-pass filter (Butterworth) which suppresses frequencies above 40 kHz. This is also necessary to ensure that the circuit does not cause interference to other devices (EMC). The RC network R6/C6 ensures that the filter continues to work properly at higher frequencies.

R1 maintains the input side of C1 at ground level, so that no annoying sounds are generated when the signal source is connected with the circuit already turned on. With the loudspeaker we assume that it is always connected (which is why there is no resistor in parallel with the output terminals).

Loudspeakers are complex loads and are mainly inductive at higher frequencies. The 'gain' of the circuit is determined by the feedback R2/R3. With the values we selected the gain is about one, which, given the power supply voltage and output range, gives sufficient sensitivity. From practical tests it



**Figure 2.** The circuit has very modest dimensions so it will all fit on a compact printed circuit board.



**Figure 3.** The frequency curve depends in the connected load. Here are the curves for an 8Ω resistor (blue) and a loudspeaker (red).

appeared that typical sound cards will probably not supply a sufficient signal to obtain a full output signal from the amplifier. But don't panic: in Part 2 we will describe a board of the same size, which contains a matching preamplifier and extensive tone control.

#### Results

The current consumption in the idle state is at 44 mA clearly too high for battery use, certainly if more than one board is used. This is caused mainly by the relatively high switching frequency of 660 kHz at a power supply voltage of 9 V and the absence of a proper dead-time control (the value of 220 Ω for R4 and R5 is therefore also a compromise).

Fortunately, the frequency reduces at lower power supply voltages (this is because the buffers that are used here become slower at lower supply voltages), which benefits the current consumption. At 6 V (fs is 510 kHz) the current consumption is down to 10 mA and it is possible to use a set of four AA dry cells. At 5 V (fs is 450 kHz) the current consumption is only 6 mA. However, we recommend that you use the circuit with a power supply voltage in the range from 6 to 9 V. The absolute maximum is 9.5 V, which is an overvoltage of a little more than 5%. At this voltage the current consumption has increased to 60 mA. A power supply voltage below 5 V gives an insufficient drive signal (not enough voltage for the gates).

At 9 V the maximum output power into 8 Ω (clipping) is 1 watt. Into 4 Ω the maximum power has not doubled but is about 1.7 watts. Voltage drops across the choke and output capacitor, for example, begin to have a

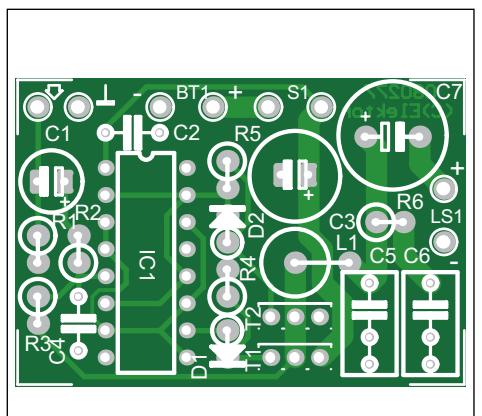
significant effect on the maximum available output voltage.

At 9 V this amplifier, sitting on the desk, produces quite a bit of noise already, even when a small loudspeaker is used. At 1 mW the distortion is less than 0.5%. The bandwidth with an 8 Ω load ranges from 18 Hz to 40 kHz (blue curve in Figure 3). The low corner frequency is determined by C7, the high corner frequency by the low-pass filter (L1/C5). With small loudspeakers this is more than enough because this is often more than what small speaker boxes can reproduce.

As already mentioned the blue test result (Figure 3) shows the amplitude characteristic into a pure 8 Ω load. When a loudspeaker is connected, a small increase (about 1 dB) of output voltage can be observed around the resonance point (red curve). At the corner frequency of the filter (around 40 kHz) a peak of several dBs can occur. This is because the Butterworth filter is no longer terminated correctly. In the figure it may appear that this peak is rather large, but if you have a look at the scale it is obviously not that bad. At 20 kHz the peak is only 2.5 dB. This does no harm in principle, and a lot of people actually appreciate this.

The PCB is very compact. The accompanying pre-amplifier, which is planned for next issue, has the same dimensions so that a complete and very compact mini-amplifier can be realised. We will elaborate on the availability of the PCB in the next instalment (February 2010). ☺

At 9 V the maximum output power into 8 Ω (clipping) is 1 watt. Into 4 Ω the maximum power has not doubled but is about 1.7 watts. Voltage drops across the choke and output capacitor, for example, begin to have a



**Figure 4.** Although 'standard' parts are used the PCB is still very small. The parts are packed quite close together however.

#### Component List

RS stock numbers provided as guidance only. Please see data sheets for full spec.

##### Resistors

R1 = 470kΩ	(151-331)
R2 = 10kΩ	(150-928)
R3 = 12kΩ	(151-151)
R4,R5 = 220Ω	(157-569)
R6 = 8Ω	(385-982)

##### Capacitors

C1 = 10µF 63V, radial, 6mm diam.	(228-6947)
C2 = 100nF ceramic, lead pitch 5mm	(652-9995)
C5 = 330nF, MKT, lead pitch 0.3" (7.5mm)	(483-3999)
C6 = 220nF, MKT lead pitch 0.3" (7.5mm)	(483-3832)
C7 = 1000µF 25V, radial, 10mm diam., lead pitch 0.2" (571-981)	

##### Inductors

L1 = 40µH 2A axial (mount vertically)
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##### Semiconductors

D1,D2 = BAT85 300-978
T1 = IRFU9120NPBF (TO-251AA/I-PAK, International Rectifier) (541-1275)
T2 = IRLU120NPBF (TO-251AA/I-PAK, International Rectifier) (543-1718)
IC1 = 4050

##### Miscellaneous

S1 = 1 make contact, 1A min.
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# Green Power Supplies and the Colour of Money

How high-efficiency power design makes economic sense.

**High-quality** design provides the most suitable route to maximising power-supply efficiency, reliability and power density, delivering a lower cost of ownership when viewed from the system level; as the latest power conversion solutions from Traco Electronic of Switzerland demonstrate.

## Efficiency and More

As the true value of energy becomes increasingly apparent, efficiency is one of the most important buying criteria in major end-user markets. Minimising energy losses in power converters such as AC/DC power supplies or various classes of DC/DC converters therefore influences the saleability of the end product. At the same time, ensuring high efficiency is also important to reduce heat generation, since excessive heat is the enemy of reliability. High heat generation typically forces designers to derate for operation at higher ambient temperatures, and can

complicate thermal management. Conversely, efficient converters that minimise wasted energy can be built within smaller dimensions leading to increased power density, and may also save the need for forced-air cooling.

The design of mains power supplies for general-purpose applications illustrates the effect of converter topology on efficiency, reliability and power density. These typically have a flyback topology, which can save component costs but also brings disadvantages including high peak and RMS currents in the transformer, power semiconductors and capacitors. These high currents lead to high operating temperatures, particularly in extremely compact designs. There maybe no choice but to use a cooling fan to keep the power supply components at a safe operating temperature. This incurs extra cost, introduces a potentially unreliable mechanical component, increases audible noise, and can increase overall size.

## Enhanced Topology

The Traco TOP-100 family employs an enhanced topology to improve efficiency in AC/DC power supplies. Its resonant, pulsed, half-bridge architecture significantly reduces resistive losses in the transformer, choke and semiconductors. Efficiency is further improved by replacing the secondary diodes with FETs of very low on-resistance. By achieving efficiency as high as 92%, TOP-100 power supplies generate up to 50% less heat than competing alternatives. This reduces thermal stress on components and the PCB. As a result the calculated MTBF figures are up to ten-times better than for an ordinary flyback converter under the same load conditions. This also allows greater power density: the TOP-100 family to deliver 100 Watts of output power in the standard 2" x 4" form factor typical of conventional 60-Watt flyback converters.

At the same time, the TOP-100 can be used at higher ambient temperatures without derating or without additional cooling using a fan. In addition to saving cost, audible noise and the potential for fan failure, as well as allowing smaller dimensions, fanless operation also allows designers to use sealed enclosures where desirable.

## Efficiency and Economy

RS supports the full range of efficient, high-quality power conversion solutions from Traco. Among over 200 products including AC/DC power supplies, DC/DC converters and DIN-rail power supplies, the TEX120 fanless, 120W AC/DC power supply has a shockproof, IP67, die-cast aluminium housing and can operate at full-power in environments up to 60°C. DC/DC converter families include the TEP-100, which has a rugged, sealed metal case suitable for chassis mounting, achieves high efficiency and has a wide input voltage range. The TMR-3WI and THB-6 board-mounted power modules for applications including point of load combine

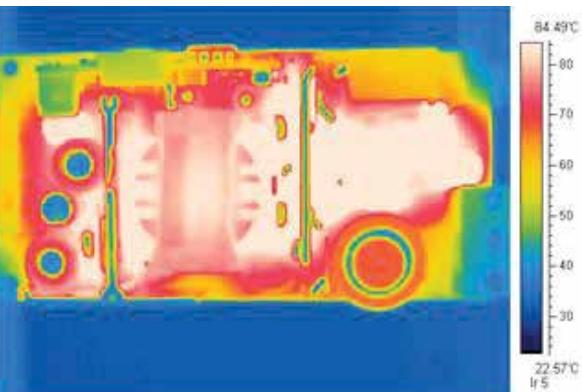
their high efficiency with effective thermal management to achieve high power density, high reliability and minimum derating.

By focusing on high-quality design, achieving high efficiency and low power dissipation, Traco converters deliver a performance edge

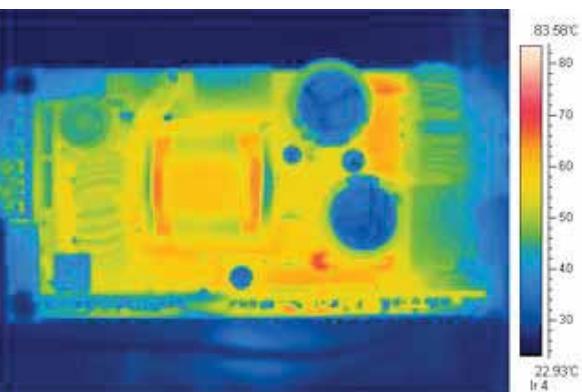
with the potential to reduce the total cost of ownership of the end application. ☺

Find the latest power supplies introductions at [rswww.com/electronics](http://www.rswww.com/electronics)

Thermal images, viewed from top side (both units with 5V/12A load)



60W power supply with flyback topology



TOP-100 power supply



**With no moving parts, capacitive sensing is fundamentally a more reliable technology than mechanical switches and buttons.**



# CAPACITIVE SENSING is on the button

Whether they know it or not, almost anyone who uses consumer electronics these days has experienced capacitive sensing. From MP3 players, washing machines, laptop computers, mobile telephones, capacitive sensing offers the user a satisfyingly modern control experience. To the system designer, they not only offer a whole new world of flexibility in designing the user interface, but are also much more reliable, and allow the electronics to be 'sealed' inside the case impervious to hazards such as hot coffee, sticky fingers and worse.

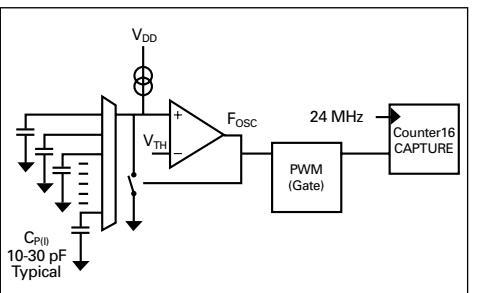
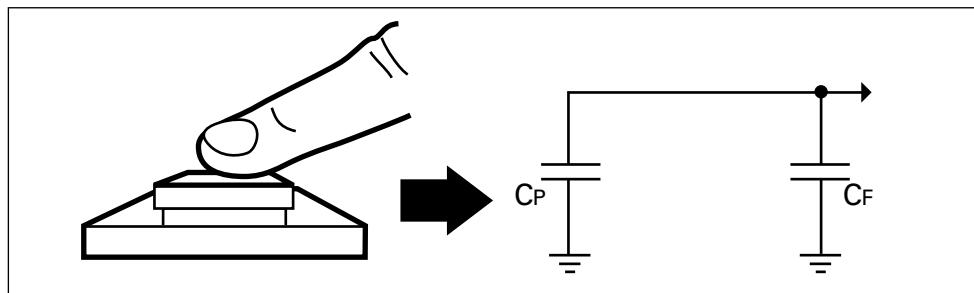
Apple's iPod Touch at the forefront of capacitive sensing technology.

Image courtesy of Apple.



There is a long and proud history of developments pioneered in high end consumer electronics to trickle down through the mass market into professional and industrial systems – and touch controls are no exception. User's expectations of the electronics that they use professionally are calibrated by the devices that they use personally. Moreover, with an installed base of billions of switches, the technology can be regarded as fully mature, and is fully available on the OEM market. RS stocks a full range of development kits and parts from many of the leading vendors including Cypress, Microchip, Analog Devices, ST Microelectronics, Atmel and Omron.

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#### Capacitive sensing benefits

The capacitive sensor consists of a pair of conductors, separated by a dielectric layer. Most of the electric field in this system is concentrated directly between the plates, but some 'fringing fields' spill over into the area outside the plates. Placing a conductor such as a finger in the fringing electric field increases the capacity of the system by the finger capacitance, Cf. The change is just a few femtofarads in a field of picofarad magnitude.

With no moving parts, capacitive sensing is fundamentally a more reliable technology than mechanical switches and buttons. Since the operator doesn't need to touch the sensor directly, it can be sealed away in the instrument case, out of range of dirt and spillages, and impervious to abrasive cleaning agents.

#### Capacitive Sensing principles

To create a sensor, place a copper pad on a piece of FR-4. The shape of this pad is not very important. The designer has the freedom to shape the sensor aesthetically to suit a particular design. However, the area of the pad is very important. The larger the pad, the better the sensitivity and a sensor touch will be more easily detected by the rest of the system. Next, a non-conductive overlay is applied. A variety of materials could be used as long as the dielectric constant of the material is evaluated for functionality. Typically it is best to design a thin touch surface.

The sensor pad has a parasitic capacitance (Cp). When a finger is placed on the pad an additional finger capacitance (Cf) is introduced.

The capacitance introduced by the finger is

known to be very small in the area of 5-15pF. Therefore, we will want to ensure that the capacitance created by our pad is small as well to ensure that a touch is sensed.

There are a variety of techniques employed to measure the change in capacitance. One method is to use a relaxation oscillator (see top right). When a finger is placed on the sensor pad the additional capacitance introduced increases the time constant of the RC network and the capacitor will take longer to charge and discharge. The output from the comparator is used to clock a PWM. The resultant pulses can then be counted.

#### Implementation

Capacitive sensing in its various forms has been used in industrial control for years, to measure liquid levels, humidity, material composition and in proximity sensors. One of the beauties of it as a control technology is the flexibility it offers in the design of the user interface. Almost any non conducting surface can now become a 'control' – giving the user interface panel a sleek, stylish appearance.

Capacitive sensing lends itself well to proximity detection. Products can reside in sleep/hibernation mode until the presence of a hand is detected when it will spring into life. This is at once a cool feature and an energy saving solution.

The capacitive sensor can come in many different forms, sliders, buttons, touchpads, scroll wheels and proximity detectors. Most ranges of capacitative sensors include devices offering 4 to 10 I/O channels – allowing multiple controls to be run from just one device. Normally this is achieved by polling the sensors in turn – a process that takes around 40ms. ☺

#### Getting started

RS offers a full range of capacitative sensing technologies from several different vendors. A great place to start is the £22.75 PSoC® FirstTouch Kit™ from Cypress Semiconductor.

Microchip also offers an excellent kit, that introduces users to Microchip Capacitive Touch Sensing Technology. The PICDEM™ Touch Sense 1 Development Board comes pre-programmed with a demonstration application to ease the user into Capacitive Touch Sensing using all of the board's features.

#### Conclusion

Capacitative touch is a proven technology that is easy to implement and enhances the appearance and the reliability of electronic systems. RS's range of starter kits provide a great opportunity to evaluate an increasingly popular technology, and see how it might enhance your next project.

Go to [rswww.com/electronics](http://www.rs.com/electronics) to find out more

# EuP... Keep Current to Stay Ahead

**Engineers know that targets such as test coverage can be achieved more successfully if tackled from the beginning of the design stage. Rule-makers, also, understand the value of early influence, as the emergence of eco-design legislation such as the European framework covering Energy using Products (EuP) shows.**

The objective of EuP, of course, is not simply to add to design engineers' responsibilities, but to minimise environmental impact while also safeguarding trade and free movement of goods within the EU. Another effect is to provide a foundation for innovative companies to defend their markets against lower-priced competition. Making the most of this opportunity, however, requires designers to keep a careful eye on a moving target.

EuP is not intended to apply to all energy-using products, but to those that have a significant environmental impact, that are sold in significant numbers within the EU, and have clear potential for improvement. In fact, the European Commission is still considering the types of products that may be included

within the EuP framework. Originally 14 product groups were evaluated for inclusion, but this has now more than doubled to 30 categories. Since 2007, products including heating equipment, lighting, battery chargers, power supplies, domestic and commercial appliances, and motor-driven pumps and circulation equipment have become the subject of studies by expert consulting groups.

These are contracted by the EU to identify the most suitable eco-design rules, and the likely benefits in terms of factors such as carbon-dioxide reduction. Recommendations can range from labelling schemes to strict minimum-performance stipulations.





# Environmentally friendly end-of-life disposal: Yes, WEEE can!



**Regulations on disposal of Waste Electrical and Electronic Equipment have been in force for more than two years and, despite the growing mountains of waste, recycling rates in the UK and EU are still low. Here we take a look at what RS is doing, and how we can help our customers keep up with the complex legislation.**

The WEEE Regulations, which came into force on 1st January 2007, aim to encourage the disposal of Waste Electrical & Electronic Equipment (WEEE) in an environmentally friendly way. Associated regulations put on the onus on producers to comply. What this means is that customers can return their goods at end-of-life and the producer is obliged to dispose of them appropriately. The producer pays.

#### **Who is affected?**

Under the WEEE Regulations, companies are defined as "producers" if the equipment they place on the UK market falls within the relevant scope and if they meet one or more of these other criteria: they manufacture or sell own-brand EEE in the UK; they resell others' EEE under their branding; or they import/ (export) EEE into an EU member state.

There is a helpful decision tree provided by the UK Government for those who are unsure whether their equipment falls within scope of the directive. It's also available at [rswww.com/services](http://rswww.com/services)

#### **What RS is doing - commitment to environment and customer service**

As a company, RS is committed to conducting business in an environmentally friendly and sustainable manner. Accordingly, we fully support the objectives of both the WEEE and RoHS Directives and works hard to ensure compliance.

*Continued page 34 >*

**As with our RoHS and REACH initiatives, RS was one of the first companies to implement WEEE, ahead of the legislation being enacted. A key difference is that WEEE isn't a single market directive: it's up to individual member states to set up their own schemes in order to comply with the overall targets the EU sets.**

**Alan Lund, Group Product Compliance Manager, RS Components**



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Alan Lund, RS' group product compliance manager explains, "As with our RoHS and REACH initiatives, RS was one of the first companies to implement WEEE, ahead of the legislation being enacted. A key difference is that WEEE isn't a single market directive: it's up to individual member states to set up their own schemes in order to comply with the overall targets the EU sets."

#### **What customers need to do**

Customers buying other, non-RS or Iso-Tech branded, products can contact the manufacturer to arrange end-of-life disposal. There is an initial list of producers registered under the WEEE regulations at [rswww.com/services](http://rswww.com/services)

If not already registered, customers building RS-supplied components into electrical or electronic goods will need to check whether they should register. As producers, they, too, will need to establish safe, environmentally-friendly disposal arrangements and provide a free-of-charge collection service for their customers. In addition, they will need to mark products that fall inside the scope of the regulation with a crossed wheelie bin and date bar. Both RoHS and WEEE labels are available from the Office Supplies area of the RS Website.

#### **How RS can help**

RS works in partnership with the WeeeCare Compliance Scheme, which is operated by WasteCare. WasteCare has national coverage and will collect, recycle or dispose of, in an environmentally sound way, all the RS obligated WEEE.

#### **Disposing of RS branded products**

To dispose of RS obligated waste, customers have three options for WEEE recovery.

- Small items less than 1kg in weight can be posted direct to the WeeeCare processing centre

- Items up to 20kg can be deposited at any of the 16 trade counters in the UK
- RS obligated waste can be collected from the customer's site, free of charge and with no weight restriction. A request form to arrange collection can be found at [rswww.com/services](http://rswww.com/services)

Collection will be made within 10 days of request.

#### **RS services for customer's own products**

RS' compliance scheme partners offer site collection of other producers' obligated waste and all non-obligated waste. A minimum collection of 300kg applies, and collection is made within 10 days of request.

This is a chargeable service, but it brings real benefits, explained Lund: "What you get is the reassurance that WEEE is being recycled as far as possible; that your waste is not ending up in an illegal landfill in Africa or China. It's peace-of-mind, along with a clear environmental conscience."

#### **The Future of WEEE at RS**

Whilst companies like RS have taken their WEEE obligations seriously, many producers have not been so wholehearted.

Accordingly, the European Commission is proposing to revise the directives on electrical and electronic equipment in order to increase the amount of e-waste that is appropriately treated and reduce the number that go to final disposal. The proposals also aim to reduce administrative burdens.

RS will be watching the developments closely and our WEEE services will be updated in line with whatever changes occur. ☐

**For the latest information visit  
[rswww.com/services](http://rswww.com/services)**

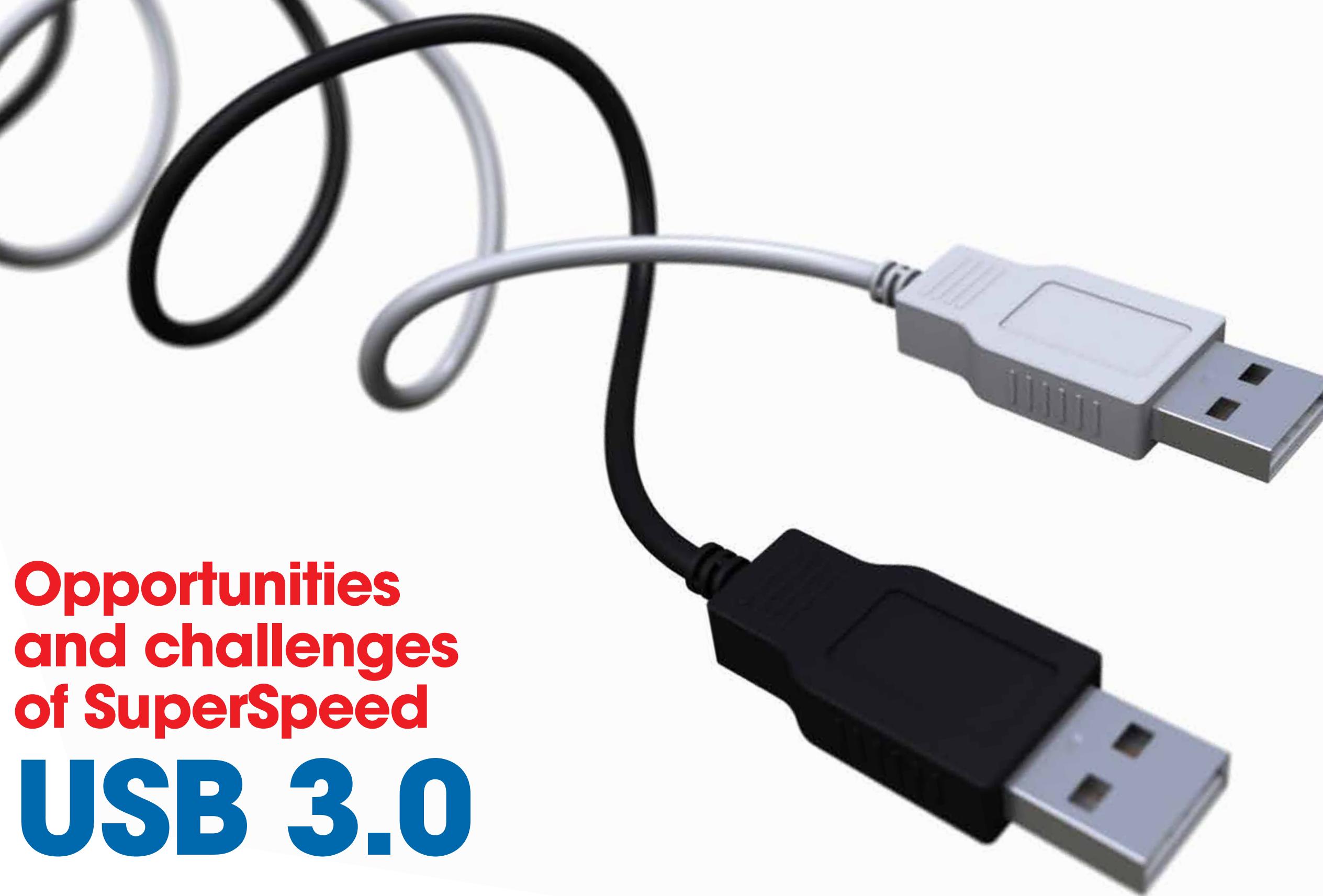
An advertisement for S-Force featuring a large industrial fan unit. The top half shows the fan with the text "S-Force" and "Captive Power!" and a yellow caution tape around it. The bottom half shows a cross-section of the fan's internal blades and motor assembly.

**ebm papst**



# Opportunities and challenges of SuperSpeed USB 3.0

Version 3 of the Universal Serial Bus Interface promises order-of-magnitude faster data transfer and a host of other benefits. That means substantial opportunities for designers. There will be challenges, too, but helpful resources will not be far away.



**USB 3.0** is the latest incarnation of the Universal Serial Bus specification. Offering transfer rates up to 10 times faster than USB 2.0, it retains backward compatibility with previous versions. This is achieved by implementing a fourth transfer mode at 4.8Gbit/s, dubbed SuperSpeed, which should allow real-world transfers up to 400MByte/s.

To gain this improvement in speed, a technology is adopted similar to PCI Express 2.0, in which full-duplex signalling occurs over two differential pairs separated from the non-SuperSpeed differential pair. USB 3.0 cables are thus significantly larger than their predecessors, carrying two wires for power and ground, two wires for USB2-grade non-SuperSpeed data, and four wires for SuperSpeed data – two wires for Transmit and two for Receive. Additionally, there is a shield wire to prevent interference, which would otherwise reduce the data transfer capacity.

Increased data rates do put some constraints on cable assembly lengths; although the specification itself says they can be any length so long as they meet all other requirements. It is estimated that cables 3m or shorter will be able to run at SuperSpeed.

*Continued on page 38 >*

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#### More power, too

As well as this order-of-magnitude speed improvement, bus power specifications have been increased so that a configured device can draw up to 900mA - an 80% increase over USB 2.0. This means that the bus can supply increasingly power-hungry devices, and deliver charging more rapidly to connected portable devices.

What is more, USB3.0 is more power-efficient than previous generations. The specification adds new power management features include support of idle, sleep and suspend states, as well as Link-, Device-, and Function-level power management.

Plus, the minimum device operating voltage is dropped from 4.4V to 4V.

#### A wealth of opportunities

All of this adds up to a wealth of opportunities for designers and OEMs. The most obvious advantages will be in devices where the 480Mbit/s speed limit of USB2.0 has proved most taxing such as external hard drives and flash drives.

Superior data throughput will have major benefits for high resolution webcams and USB video surveillance cameras, and will also enhance the user experience on video display solutions, multi-channel audio interfaces and external media such as Blu-Ray drives.

#### Faster Sync'n'Go

For many, the Holy Grail of Sync'n'Go is for operations to take less than 90s and, with increasing numbers of portable devices using ever-greater densities of flash memory, a vast number of flash based peripherals will

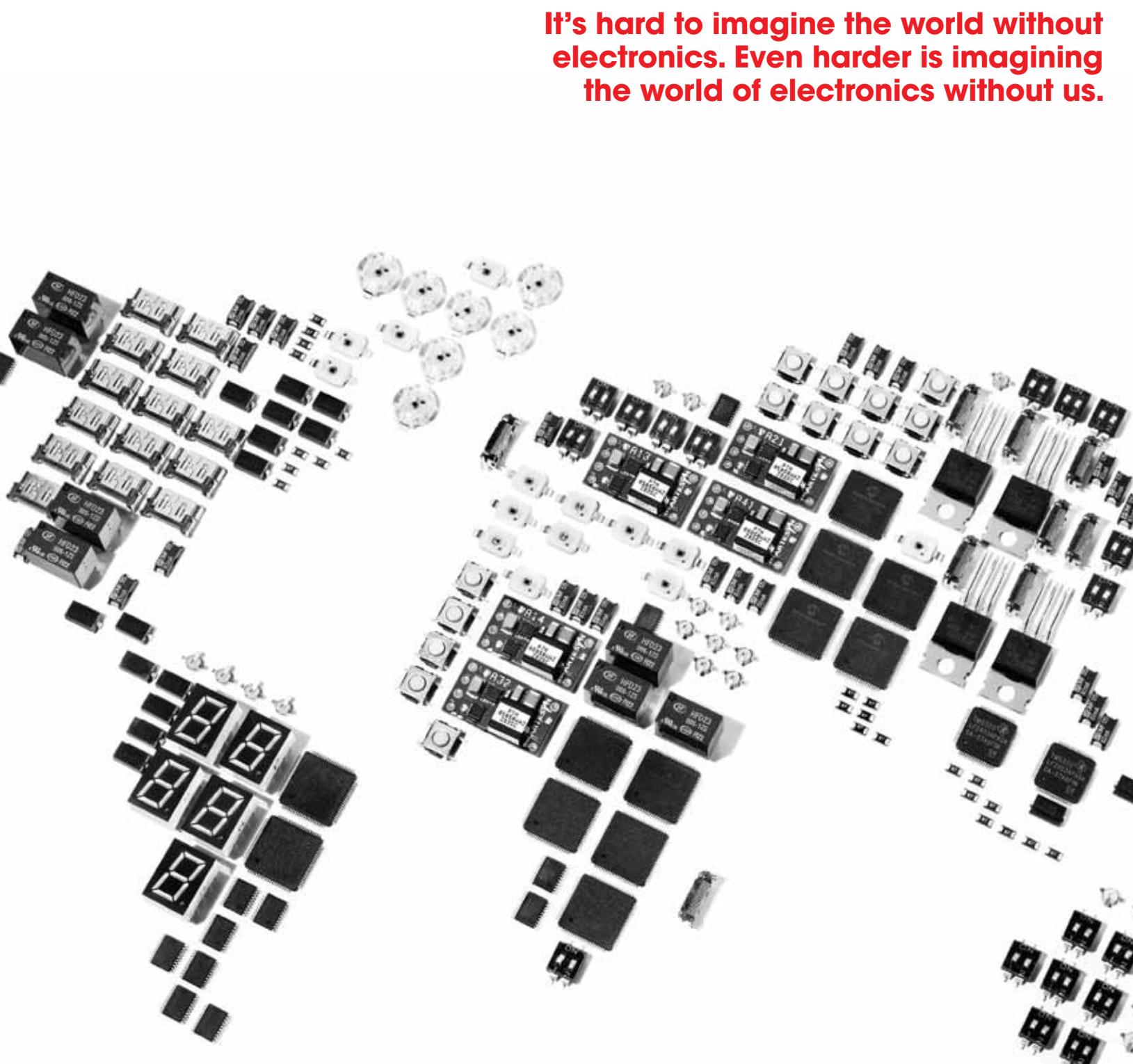
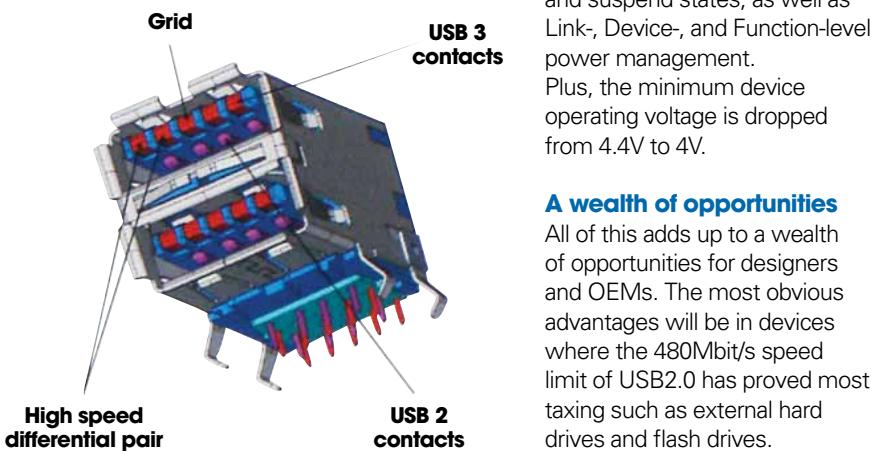
benefit from SuperSpeed USB data rates. From digital video and still cameras, to MP3/4 players, PDAs, phones and even the ubiquitous flash drive; all will synchronise more data, quicker and more efficiently than ever.

Hardware to support these applications is expected to become available later in 2009. IP is currently available for silicon developers and USB 3.0 silicon such as host controllers and hubs are anticipated to be sampling in the latter half of 2009. Already there have been demonstrations of interoperability, for example the first public demonstrations in May 2009 involved vendors as diverse as Fresco Logic, Fujitsu Microelectronics, LucidPort Technology and NEC Electronics Corporation.

As to software, drivers are under development for Microsoft's new Windows 7 operating system but no public releases are planned prior to the October 2009 official release. The Linux kernel will support USB 3.0 with version 2.6.31, scheduled for release around September, whilst Apple is likely to follow suit as the market for SuperSpeed devices takes off.

For developers, a number of tools and resources are already in the pipeline. Texas Instruments, for example, has developed a 5Gbps transceiver test chip, capable of driving and receiving signals over 4m USB 3.0 cables to ensure data integrity. Tektronix has introduced its USB TX module to support all USB measurements using its high-end oscilloscopes. And a number of connector and cabling manufacturers have launched SuperSpeed hardware. 

**RS will provide all the support customers need to take an early advantage in the opportunities offered by USB 3.0. Keep up-to-date with developments at [rswww.com/electronics](http://rswww.com/electronics)**



# WIN

## an iPod Touch with our killer sudoku

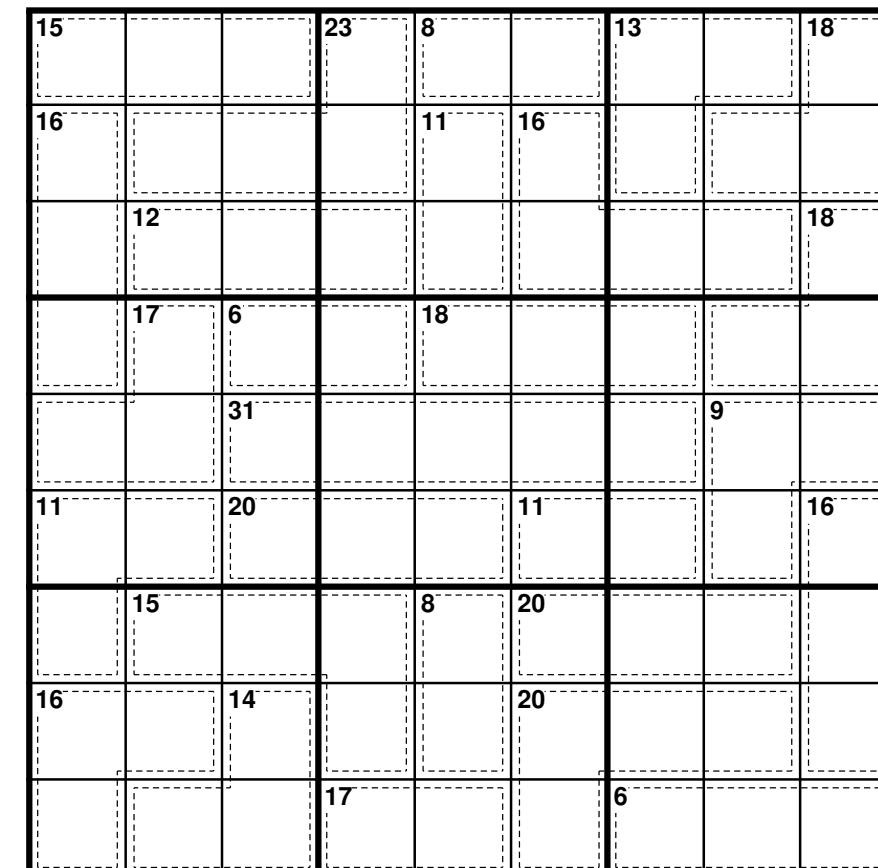
**How to play:**

As with standard sudoku, every row and column and  $3 \times 3$  square must contain the numbers 1 through 9 exactly once.

The grid is composed of shapes with a dotted outline. At the top of each shape is a number, this signifies the sum of the cell. For example; if there is a shape composed of two cells with a '3' in the corner, the total of those cells is '3'. From that you can tell that the values of the cells must be '1' and '2' or '2' and '1'.

It is not permitted to repeat a number in a shape. If you have a sum of 8 across three cells, this cannot be '2', '4', '2' as the '2' is then repeated in the shape.

No numbers are placed in the grid to start with, unlike in normal sudoku; however you can work out every number with no guesswork but applying logic alone to reach the unique solution for each puzzle.



Name: .....  
Job Title: .....  
Ship-To-Number: .....  
Tel: .....  
E-mail: .....

**Send your completed Sudoku to:**

RS Components Ltd, eTech Team, DPN 24, Corby, Northamptonshire, NN17 9RS. All entries must be received by 1st February 2010 and the winner will be notified by the end of February 2010.

**Terms & Conditions:**

This competition is being run by RS Components Ltd. To enter the competition, all information on the entry form must be supplied. Entry is free, no purchase is necessary. It is the responsibility of the entrant to gain permission from his/her employer to enter this competition. The prize is as stated. No cash alternatives are available. The competition is open to all RS Components catalogue recipients, except employees of RS Components or their families. The closing date for entries is 01/02/2010. The date of the draw will be in the month of February 2010. The winner will be selected at random by RS Components and will be notified by 1st March 2010. Responsibility cannot be accepted for lost entries, damaged or delayed in transit to the promoters address. Illegible, altered or incomplete entries will be disqualified. Details of the prize winner can be obtained from the promoter after the date of the draw by sending an SAE to RS Components, eTech Team, DPN 24, Corby, Northamptonshire, NN17 9RS.

Got a brain teaser? Send your suggestions to [etech@rs-components.com](mailto:etech@rs-components.com)

## Who am I?

**1** Born in 1791 in London, England, I studied the magnetic field around a conductor carrying a DC electric current, and established the basis for the electromagnetic field concept in physics. I discovered electromagnetic induction, diamagnetism, and the laws of electrolysis.

**Who am I?**



**2** Born in 1874 in Bologna, Italy, I won the Nobel Prize in Physics in 1909 in recognition of my contributions to the development of wireless telegraphy. In 1901 I sent the first transatlantic radio transmissions.

**Who am I?**



**3** Born in 1901 in Rome, Italy, I am most noted for my work on the development of the first nuclear reactor. I was awarded the Nobel Prize in Physics in 1938 for my work on induced radioactivity.

**Who am I?**



**4** Born in 1857 in Hamburg, Germany, I was the first person to satisfactorily demonstrate the existence of electromagnetic waves by building apparatus to produce and detect VHF or UHF radio waves. I have an SI unit named in my honour.

**Who am I?**



**5** Born in 1856 in Smiljan, Croatia, I am often cited as one of the most important contributors to the birth of commercial electricity. I would have become the world's first billionaire if I'd accepted a contract from Westinghouse in the early 1900's.

**Who am I?**



## General technology fun Quiz

**1** What was the first name for the Internet?

**2** According to the original CD specifications, how many minutes of music does a single CD hold

**3** The most common format for a home video recorder is VHS, what does VHS stand for?

**4** We have 24 hours in a day, 60 minutes in an hour, and 60 seconds in a minute. To what ancient people do we owe this system based on the number 60?

**5** What was the first website to feature a banner ad?

**6** The forerunner of the laser was the maser. What does the "m" in maser stand for?

**7** What did Anton van Leeuwenhoek invent?

**8** The first nuclear reactor was built during WWII, as part of the so-called "Manhattan Project." Where was the first reactor actually built?

**9** Which country generates roughly 80% of its electricity from Nuclear power?

**10** On October 4, 1957, what satellite was launched, becoming the first satellite to officially orbit the Earth?

Each edition we will be featuring an insight into new cutting edge technology from the Fraunhofer Institute. The Fraunhofer Institute is the leading organization of applied research in Europe, undertaking contract research on behalf of industry, the service sector and the government. Commissioned by customers in industry, it provides rapid, economical and immediately applicable solutions to technical and organizational problems.

The global alignment of industry and research has made international collaboration imperative. Furthermore, affiliate Fraunhofer Institutes in Europe, in the USA and Asia ensure contact to the most important current and future economic markets.

At present, the Fraunhofer-Gesellschaft maintains 80 research units, including 57 institutes, at over 40 different locations in Germany. A staff of some 15,000 - predominantly qualified scientists and engineers - work with an annual research budget of 1.4 billion euros.

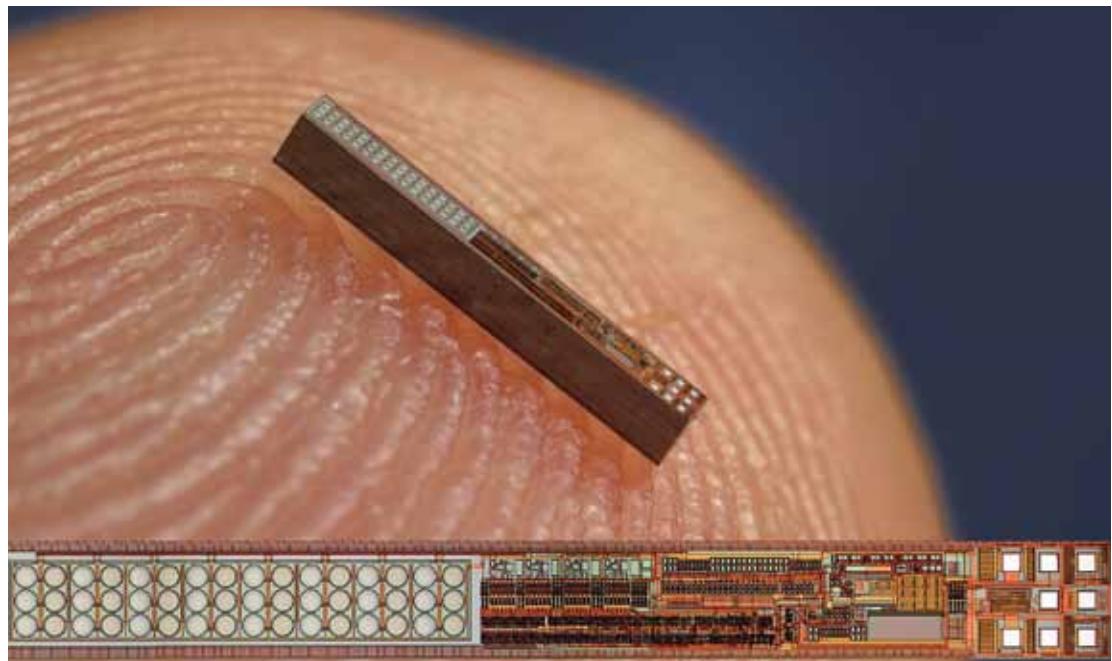
**ARTICLE**

# New sensor positive news for blood-pressure sufferers

**A new sensor will make it easier to carry out long-term blood pressure measurements. The device determines the blood pressure directly in the artery and transmits the data wirelessly to a reader attached to the patient's belt.**

The system was developed by researchers at the Fraunhofer Institute for Microelectronic Circuits and Systems IMS in Duisburg, together with the company Dr. Osypka GmbH and other partners. The first clinical trials are already underway.

In order to find a suitable drug and the correct dosage for



patients with high blood pressure, doctors often have to monitor the patients' blood pressure over a longer period of time - a tedious process. The patient has to wear a blood pressure meter on their body, and a pressure sleeve on their arm regularly inflates itself to

record the latest values - even at night.

The new sensor measures the blood pressure 30 times per second, but without the patient even noticing. It is no more than about a millimeter in

diameter, including its casing. The doctor inserts the tiny helper into the patient's femoral artery in the groin. The data are forwarded via the connected transponder and the external reader to a monitoring station, where the medic analyzes them.