

ENGLISH

C O D I C O [®]

impulse ^{1/2017}



QUALCOMM: **Powerful!**

Coupling Transformers by ELYTONE

Ix Industrial™: Compact Future Ethernet Interface

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IPQ40x8 and IPQ40x9: For several product generations, QUALCOMM has been developing WiFi SoC (system-on-chip) components, which also integrate a network and an application processor in addition to the radio function. These components were previously based on an MIPS CPU with either a 24Kc or a 74Kc architecture. With the IPQ4018/19/28/29 family, QUALCOMM is taking a completely new approach, offering SoC solutions featuring a Cortex-A7 CPU for the first time.

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CODICO Seminars

Towards the end of September 2016, CODICO organized jointly with our supplier ISABELLENHÜTTE seminars on the topic of shunt resistors in Poland and the Czech Republic.

In a series of one-day sessions, Thomas Otto (Head of Product Management) and Deniz Vartan (Distributions Manager) presented our customers (applications specialists, developers, and others) with the history, the profound know-how, and the broad product range from ISABELLENHÜTTE.

The history of ISABELLENHÜTTE extends back over a hundred years, with the first documented mention even dating from the year 1482. The breakthrough came in 1889, with the development of the base material MANGANIN®. Since then, ISABELLENHÜTTE has been market leader in the field of resistor alloys and thermal alloys, and therefore your perfect partner in the sector of shunt resistors.



Sven Krumpel
CEO CODICO



ISABELLENHÜTTE and CODICO will also be holding seminars in your area in the future. We would welcome your interest and applications at:

P01

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Editorial

We feel honoured!

Our regular readers know that I can rarely hold back my pride when writing the Impulse introduction. In recent months, there have been plenty of moments that triggered this uplifting feeling inside me. CODICO received five awards, five distinctions from important suppliers who felt that our collaboration is worth honouring.

We can perceive supplier-relationship management as a purely theoretical term. You will find numerous publications dealing with strategies, processes, and measurability. Of course, we have our own, defined processes as well.

But the theory cannot describe the joy and pride we feel when presented with an award. This theory neglects – and even mostly forgets or ignores – the emotional element. Receiving a distinction is a confirmation that you did something right, that you stood out, and that a relationship is working well.

My particular thanks go to the five suppliers who have honoured us with awards in recent months: QUALCOMM presented CODICO with an award for best distributor performance in demand creation, and for attracting new customers and projects. At the electronica 2016, CODICO received the »Distributor excellence Award for outstanding Performance in Automotive Business Europe« from RUBYCON. PANASONIC presented us with an award in the »Demand Creation« category, COSEL Co. Ltd. for »Continuous Growth«, and ISABELLENHÜTTE found us worthy of the distinction »Best Distributor of the Year« for the second year in a row. For more on these awards, go to page 36.

I promise to continue to work on improving our supplier-relationship management: With theoretical approaches, practical implementation, and with plenty of emotion!

D01

▼ Sven Krumpel



IPQ40x8 & IPQ40x9

POWERFUL!

The new 802.11ac SoC components by QUALCOMM for routers, gateways, and access points.



For several product generations, QUALCOMM has been developing WiFi SoC (system-on-chip) components, which also integrate a network and an application processor in addition to the radio function. These components were previously based on an MIPS CPU with either a 24Kc or a 74Kc architecture.

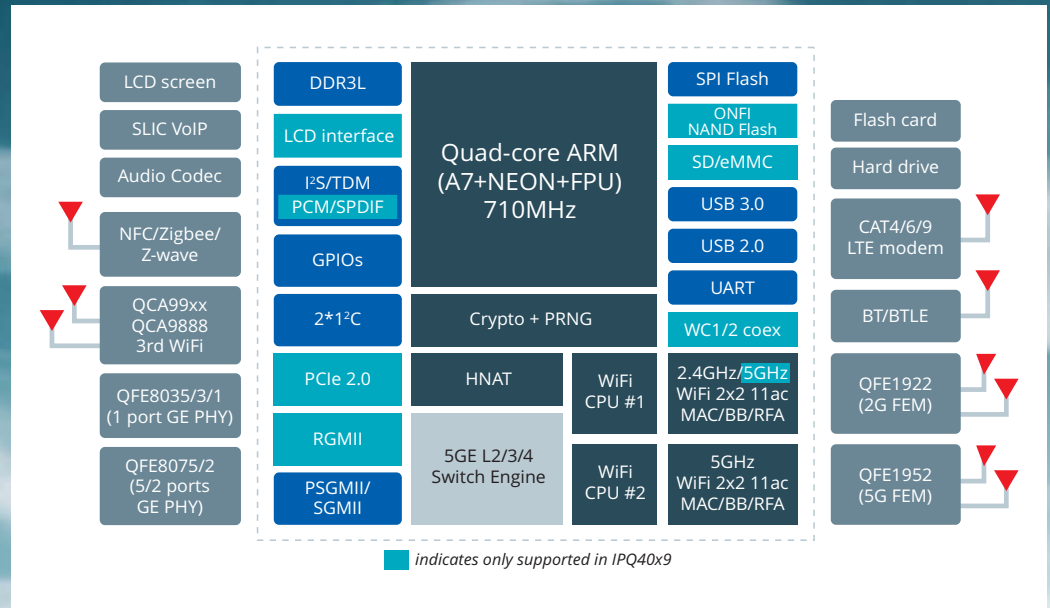
With the IPQ4018/19/28/29 component family, QUALCOMM is taking a completely new approach, offering SoC solutions featuring a Cortex-A7 CPU for the first time. The developers opted for 4 processor cores from the outset, and each core comes with a floating point unit, a NEON data engine, 32KB I-cache, and 32KB D-cache. In addition, all 4 cores have access to a shared

256KB L2 cache. Considering that each core can be clocked at 710MHz (or 716.8 MHz in the case of IPQ40x9), one quickly realizes that these are really powerful devices allowing for the integration of highly complex applications.

In practice, 2 cores are often assigned to network protocols, and 2 to the application. For those who believe that two cores are too much for the network, it should be pointed out that each component supports dual band and real dual concurrency (DBDC) for the 802.11ac@5GHz and 802.11n@2,4GHz standards, i.e. both frequencies can be served simultaneously, which always requires that two WiFi radios (MAC and PHY) are integrated in parallel. An additional feature of

these devices is that they support the MIMO 2x2 antenna configuration for 11n, and the MU-MIMO 2x2 for 11ac. The latter has a modulation of 256 QAM, a 5/6 coding rate, and a maximum bandwidth of 80MHz, reaching a raw data rate of 866.7Mbps. For 802.11n, the device supports a raw data rate of 300Mbps for 802.11n at a maximum bandwidth of 40MHz.

In addition, the 11n radio in the IPQ40x9 can also be configured as 11ac, so that it can operate two 11ac radios with MU-MIMO 2x2 in dual concurrency. Both components also feature a PCIe interface, allowing for a third radio to be added. In the IPQ40x8, the additional radio (just as in IPQ40x9) can be connected via USB2.0 and USB3.0. In general, several additional interfaces are available. One should particularly emphasize the 5-port gigabit Ethernet switch and the 16-bit



■ indicates only supported in IPQ40x9



DDR3L interface with a speed of up to 672MHz. The two components IPQ4018 and IPQ4019 are also available in an enterprise version as IPQ4028 and IPQ4029. The IPQ4029 is the only component of the family that also supports the extended temperature range of -40°C to +110°C (case).

Our module partner 8DEVICES has already announced that it will be launching a module based on IPQ4018 in the course of this year. 8DEVICES is already testing the first engineering samples.

Finally, it should be pointed out that the entire component family supports the new WiFi SON (Self-Organizing Network) by QUALCOMM. WiFi SON allows for several network processes for routers, gateways, and access points to be automated, such as, for instance, self-configuring, self-managing, self-healing and self-defending: www.QUALCOMM.com/products/features/wi-fi-son

Should you have any questions, please contact:

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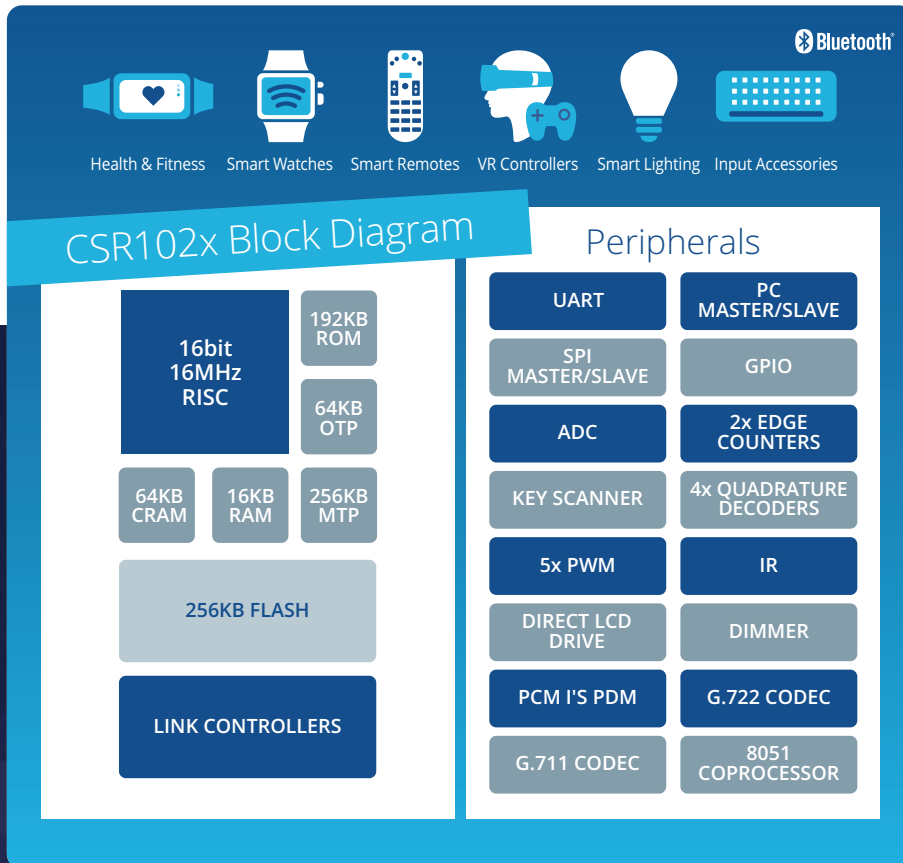
PART NUMBER	CPU	DDR SUPPORT	FLASH SUPPORT	INTERFACES	STANDARDS	CHANNEL OPERATION	PACKAGE
IPQ4018 C-Temp, case 0°C to 110°C	Quad-A7 @ 710MHz 32 KB I-Cache & 32 KB D-Cache 256 KB L2 Cache (shared)	JEDEC standard DDR3L SDRAM Up to 256 MB Supports 16bit DDR interface 533MHz clock rate 1066MHz data rate	SPI NOR & NAND	PSGMII, USB3.0, USB2.0, I2C, I2S, SPI, UART, GPIO, JTAG, 5-port GE switch	802.11n (MIMO 2x2) & 802.11ac (MU-MIMO 2x2)	20, 40MHz @ 2.4GHz 20, 40, 80 MHz @ 5GHz	180pin 14*14mm DR-QFN
IPQ4019 C-Temp, case 0°C to 110°C	Quad-A7 @ 716.8MHz 32 KB I-Cache & 32 KB D-Cache 256 KB L2 Cache (shared)	JEDEC standard DDR3L SDRAM Up to 1GB Supports 16bit DDR interface 672MHz clock rate 1344MHz data rate	SPI NOR & NAND	RGMII, PSGMII, USB3.0, USB2.0, PCIe 2.0, I2C, SPI, I2S, PCM/SPDIF, UART, GPIO, 5-port GE switch, SD/eMMC card reader, LCD controller, JTAG	802.11n (MIMO 2x2) & 802.11ac (MU-MIMO 2x2) or 2 x 802.11ac (MU-MIMO 2x2)	20, 40MHz @ 2.4GHz 20, 40, 80MHz @ 5GHz	583ball 18*18mm BGA
IPQ4028 Enterprise C-Temp, case 0°C to 110°C	Quad-A7 @ 710MHz 32 KB I-Cache & 32 KB D-Cache 256 KB L2 Cache (shared)	JEDEC standard DDR3L SDRAM Up to 256 MB Supports 16bit DDR interface 533MHz clock rate 1066MHz data rate	SPI NOR & NAND	PSGMII, USB3.0, USB2.0, I2C, I2S, SPI, UART, GPIO, JTAG, 5-port GE switch	802.11n (MIMO 2x2) & 802.11ac (MU-MIMO 2x2)	20, 40MHz @ 2.4GHz 20, 40, 80MHz @ 5GHz 5, 10, 20, 40MHz @ 4.9GHz	180pin 14*14mm DR-QFN
IPQ4029 Enterprise C-Temp, case 0°C to 110°C I-Temp, case -40°C to 110°C	Quad-A7 @ 716.8MHz 32 KB I-Cache & 32 KB D-Cache 256 KB L2 Cache (shared)	JEDEC standard DDR3L SDRAM Up to 1GB Supports 16bit DDR interface 672MHz clock rate 1344MHz data rate	SPI NOR & NAND	RGMII, PSGMII, USB3.0, USB2.0, PCIe 2.0, I2C, SPI, I2S, PCM/SPDIF, UART, GPIO, 5-port GE switch, SD/eMMC card reader, LCD controller, JTAG	802.11n (MIMO 2x2) & 802.11ac (MU-MIMO 2x2) or 2 x 802.11ac (MU-MIMO 2x2)	20, 40MHz @ 2.4GHz 20, 40, 80MHz @ 5GHz 5, 10, 20, 40MHz @ 4.9GHz	583ball 18*18mm BGA

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SMALL, EFFICIENT & VERY LOW POWER

CSR102X, a new Bluetooth® Smart 4.2 System-on-Chip (SoC) family specifically designed to help engineers meet the needs of today's "always-on" world. The CSR102x family is optimized for specific applications in the Internet of Things (IoT), including wireless remote controls, simple smart watches, home automation solutions and beacons, where balancing performance, battery life and cost is critical.





A comprehensive software development kit enables developers to get ahead with example applications such as Bluetooth Smart profiles and smartphone apps, all in source code. A secure, over-the-air update (OTAU) capability enables flash-based product family members to be reliably updated while in service.

Other features that have been added to address target use cases includes high quality voice command capabilities with ultra-low power, for remote controls with always-on voice and CSRmesh™ support for home automation manufacturers looking to create whole home systems.

Much of the Low Power capabilities of the CSR120X family can be rewarded to the efficient 16-bit RISC controller being used and also to the Hardware Link Controller, which let the chip stay in sleep much longer periods than conventional solutions and thus saving power.

There are development kits available today, both for general IoT applications, as well as for more specific use cases like a Smart Remote Control Development Board and a Smart Watch Development Board. For more information and ordering these please contact us.

Balancing power, features and cost, optimized for specific use cases and target applications, is not easy but the new CSR102x family of SoCs brings extensive and flexible I/O capabilities designed to simplify integration and eliminate expensive interface components.



Features

MCU: 16-bit 16MHz RISC embedded CPU

Bluetooth: Version Bluetooth v4.2 compliant with optional features

Memory: 192KB ROM; 80KB RAM; 64KB OTP 256KB integrated flash (CSR1024/CSR1025)

Bluetooth TX/RX: up to +4dBm max RF transmit power -92dBm receiver sensitivity; No external power amplifier or TX/RX switch required

Interfaces: I2C, UART, SPI/Q-SPI, PDM, I2S, 15/33/37 GPIOs 4x quadrature decoders, 2x time stamping blocks, 5x PWM blocks, key matrix scanner, LCD glass drive 10-bit ADC, G.722 and G.711 audio codec

Current Consumption: Total system current during active TX/RX: <5mA (at 3V, +0dBm)

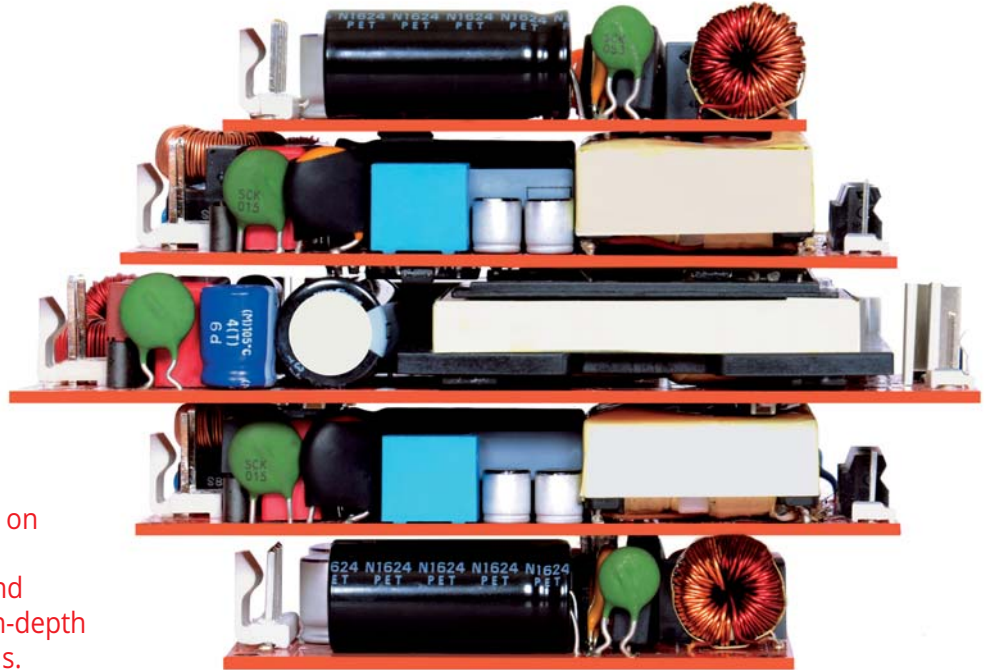
Operating Voltage: 0.9V to 3.6V (CSR1020/CSR1021)
1.4V to 3.6V (CSR1024/CSR1025)

Operating Temperature: -30°C to +85°C

A02

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SPECS	CSR1020	CSR1021	CSR1024	CSR1025
Memory	OTP	OTP	256KB Flash	256KB Flash
Analog I/O	1	2	1	2
General Purpose I/Os	15	37	15	33
PWM (LED)	5	5	5	5
Package Type (mm)	QFN 5x5x0.65	QFN 8x8x0.65	LGA 5x5x0.75	LGA 8x8x0.75
Pitch	0.5	0.5	0.5	0.5



EOS Power India Pvt. stays on track and focusses consequently on their three core competencies: Miniaturisation, high flexibility and adaption to customer requests, in-depth know-how in medical applications.

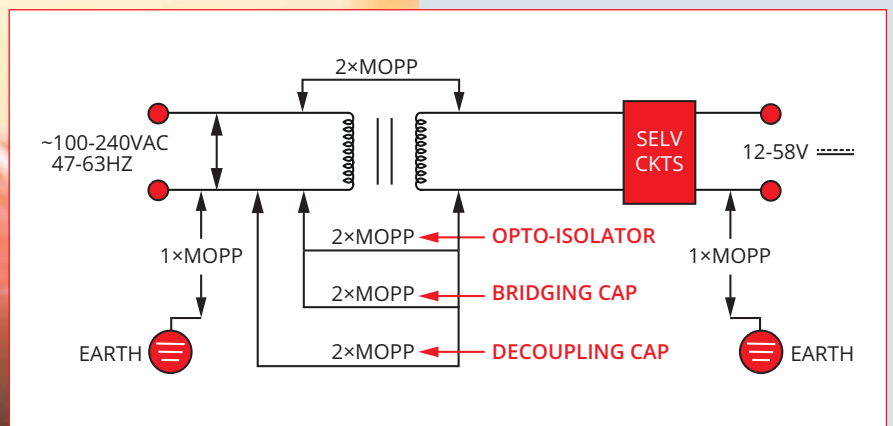
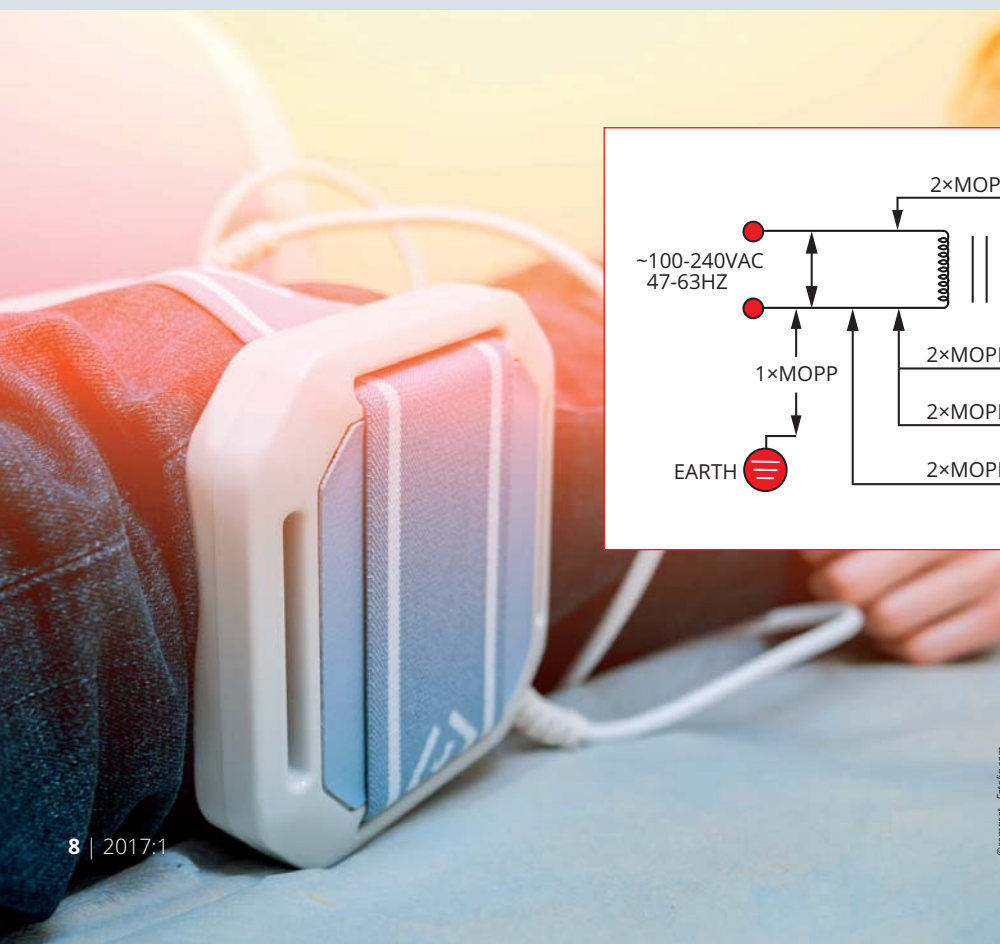


FLAT AS A PANCAKE

After their latest release, the WLP series, the Indian manufacturer just introduced their ULP series to the power world. ULP as in »ultra-low profile« only measures 0.75" (19.05mm) in height and is available on all three standard footprints (2x3"@40W, 2x4"@180, 3x5"@275W).

The series literally is the next logical step after the recently introduced WLP series (1" i.e. 25.4mm in height on 75/120W@2x3", 225W@2x4", 350W@3x5"footprints). The entire family is available in Safety Class I and II and is perfectly suitable for industrial and medical applications.

Due to its isolation grade of 2xMOPP (Means of Patient Protection) between primary and secondary side as well as 1xMOPP between primary and Earth as much as SELV-Circuit and Earth, the device is the perfect fit for literally any portable device or homecare equipment with direct patient contact (BF-body floating). Customers increasingly demand long term availability especially in the medical industry as much as long time warranty.



EOS can comply with both desires by offering an optional seven year warranty (»-EX«) for very versatile product offering.

A03

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FOCUS ON

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The ever shrinking world of POE from SILVERTEL

Introducing Ag9924 & Ag5324 – the latest modules in the Ag9900M and Ag5300 series!

These two series of modules are respectively the smallest POE 12W IEEE802.3af and POE+ 24W IEEE802.3at PD solutions in the world. As POE becomes ever more widely adopted, it is being used in a broader range of applications than ever before. Industrial control & automation, IP cameras, IP audio, HD audio visual (including HD BaseT) and access control are all areas where POE usage has been dramatically increasing. However, there are a number of these types of applications that require 24V as opposed to the more standard 12V or 5V typically used by devices deriving power from POE.

With POE being an inherently safe technology from a voltage distribution point of view (typically at 48V – so well below the SELV limits), it is clear that this has additional benefits when used in IOT, audio visual applications and household devices. With no mains voltages present, and no mains wiring needed, device or product installations are both inherently safe, simple and relatively low cost to carry out, with simple CAT5/6 cabling all that is required. When looked at in relation to the new IEC/EN60335 and IEC/EN62368 standards (successor of the currently valid IEC/EN60950), POE power distribution at a nominal

48V is extremely advantageous cost wise and respectively in terms of ease of design for safety and meeting the requirements of these new standards. With all SILVERTEL's modules rigorously designed to include 1.5kV impulse isolation to meet IEEE and safety regulations you can be assured that your product will be able to pass the requirements of the new standards.

The tiny, ultra-miniature Ag9900M series POE PD module is truly the smallest POE module and POE solution in the world. The addition of a 24V option means the advantages of this new technology are now available to every possible POE application and designer. Significantly smaller in footprint than is possible using discrete component design, (and 40% smaller even than the Ag9800M series) yet capable of delivering up to 12W of power, while rated for up to 9W at 85°C, it packs an incredible performance into the smallest of spaces.

Similarly for Ag5324, with the only other 24V POE+ module (Ag5100) available from SILVERTEL being around 35% more expensive and 100% bigger footprint, the new module clearly provides significant advantages. Following the Ag9900M



Ag5100

35%
SMALLER

Ag5300

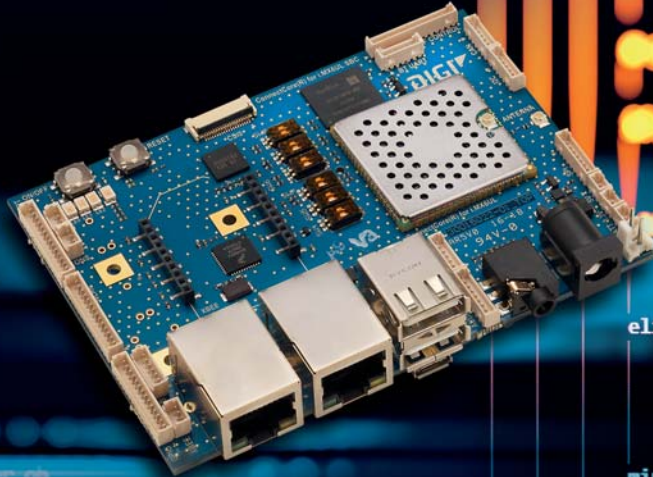
SILVERTEL focusses on their core competencies miniaturisation and cost optimization.

The full Ag9900 series now includes 3.3V, 5V, 12V and 24V options. Each of these is also available in an over-temperature protected power de-rated (9W @ 12V & 24V; 6W @ 5V and 4.5W @ 3.3V for 85°C operation) industrial temperature version. The so called Ag9900MT modules, as well as the Ag5324 are available from April 2017 onwards for sampling.

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FOR DEVELOPERS



Accelerate Product Development with Single Board Computers!

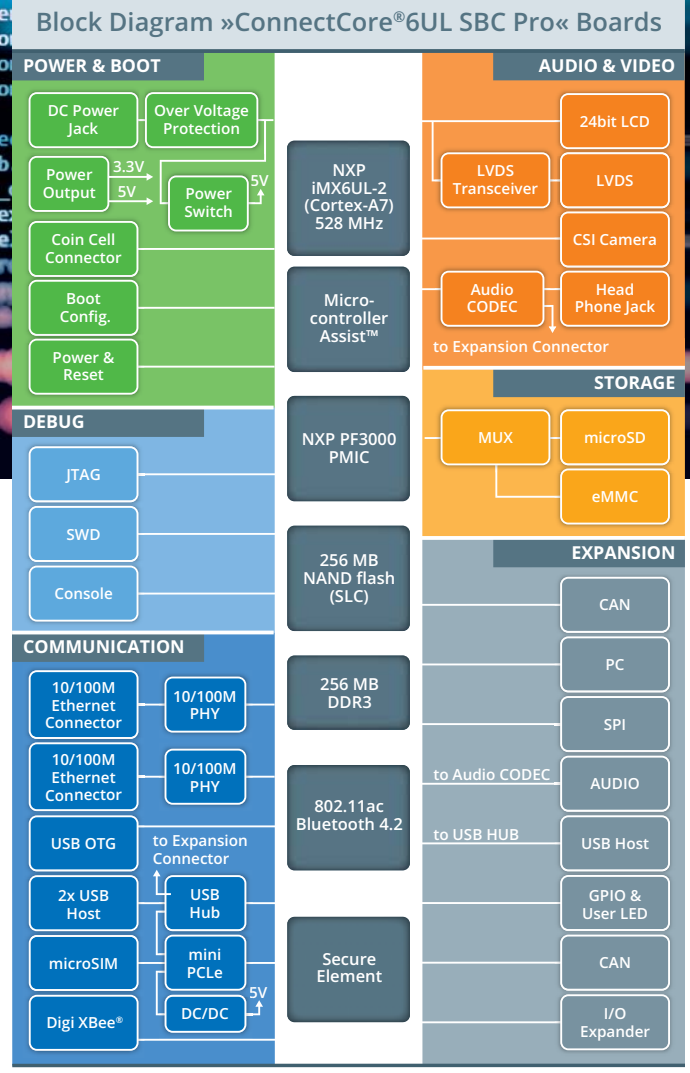
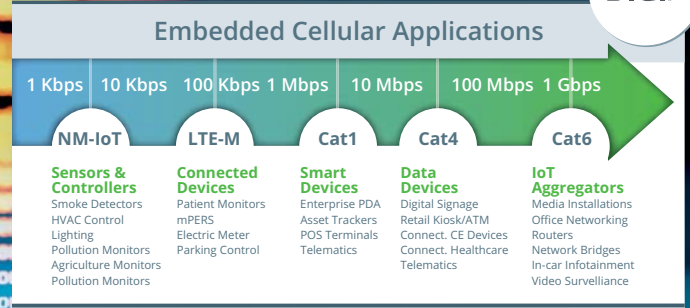
DIGI ConnectCore® 6UL SBC Pro delivers a complete off-the-shelf Single Board Computer (SBC) built on the NXP i.MX6UL low-power, high-performance, ultra-efficient processor family featuring a single ARM® Cortex®-A7 core, which operates at 528MHz. This SBC is a proven way to fast track development of smart, connected products without the need for having advanced microprocessor expertise in-house.

SBCs are well-suited for rapid prototyping and then quickly transitioning into production with a fully featured product, requiring little to no hardware development effort. The standard form factor of the ConnectCore® 6UL SBC Pro makes it an ideal solution for connected applications demanding professional reliability and flexibility in connected healthcare, transportation, energy, utility, agriculture, building automation and industrial markets.

Focus on your core competency

The SBC is built on the ConnectCore® 6UL SOM with a low-power NXP i.MX6UL application processor, 256MB flash, 256MB RAM, dual 10/100Mbit Ethernet, pre-certified dual-band 802.11ac wireless LAN, Bluetooth 4.2 connectivity, NFC tag capabilities, and a complete set of available peripherals.

DIGI tests, integrates and maintains complete Yocto Project Linux BSP and software support for the ConnectCore® 6UL module and SBC platform. This includes software components such as the DIGI TrustFence™ Device Security Framework, wireless connectivity stacks, and drivers for relevant



industry leading cellular modems. We also offer optional services, including antenna design/selection guidance, cellular integration support, certification assistance, or custom design services, to get you to market faster and smarter.

A05

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RADAR SENSORS

Radar sensors emit electromagnetic waves and operate on the basis of different physical principles, such as Doppler, FSK (frequency shift keying) Doppler, and FMCW (frequency modulated continuous wave).

The Doppler sensor uses a transmitter antenna to emit microwaves at a specific frequency and a receiver antenna to receive the waves reflected from the moving object. As a result of the Doppler effect, the movement of the reflecting object causes the frequency of the reflected wave to change, and this is evaluated in the sensor.

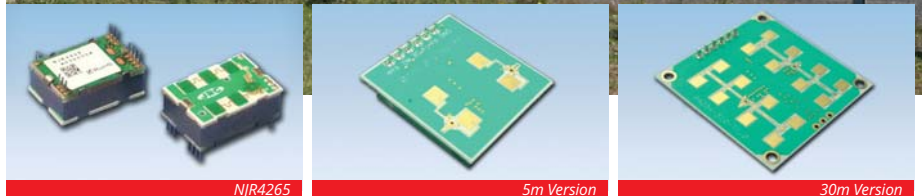
FSK Doppler uses two different frequencies for the emitted wave, which are emitted alternately at a pre-defined time interval. Here, too, the Doppler frequency is proportional to the speed of the moving object. The two different frequencies generate two different Doppler frequencies characterized by a phase shift. This phase shift can be used to assess the distance to the moving object. If the object is not moving, it is not possible to determine the distance.

In the case of FMCW, microwaves are emitted using a linearly modulated frequency. Here, the reflected wave shows a time delay. This delay is proportional to the distance and can thus be evaluated in the sensor.

In summary, this allows for the following measurements: Using the Doppler principle, it is possible to measure a moving object and its speed over a large area. FSK Doppler helps determine the distance and speed of a moving object. A stationary object, however, is not »visible« to such a sensor. FMCW makes it possible to measure stationary objects and their distance. Previously, only modules which functioned according to one of the above principles were available in the market. Today's modules sometimes feature several modes.



JRC



NJR has been developing radar sensors for many years and is well-known for its wide range of sensors. For instance, the NJR4265 module, which functions solely as a Doppler and can thus only detect motion. This module works in the 24GHz band, and both the antenna and the MCU are integrated in the module. The module features an UART interface for communication. It was designed for the detection of objects moving slowly and at a close distance to the sensor, such as, for instance, pedestrians. In the case of NJR4265, close distance means around 10m. Typical applications include surveillance modules for the detection of persons, e.g. in a warehouse, but also as special modules for presence detection in beverage dispensing units or other devices, and for light control in building automation systems.

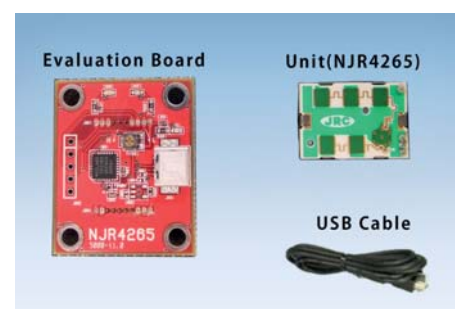
If distance measurement is required, NJR will also offer a module with FSK Doppler and FMCW mode. Possible applications can be found in traffic infrastructure (such as electronic toll systems, parking space management systems) and in safety and security (such as collision detection, area monitoring). For these applications, NJR offers the NJR4234, which works both in FSK Doppler mode and in FMCW mode.

In the first development stage, it will be able to measure the distance of a moving object. In this module, both antenna and microcontroller are on board. A serial interface is available for the connection to the application. This is used for the transfer of the parameters to the module, and of information from the module to the host.

Depending on the required detection range, two versions will be available, one for 5m and one for 30m. NJR will first launch the module for 30m on the market. This module will be available in a 38x38mm size and will be just 4.2mm thin.

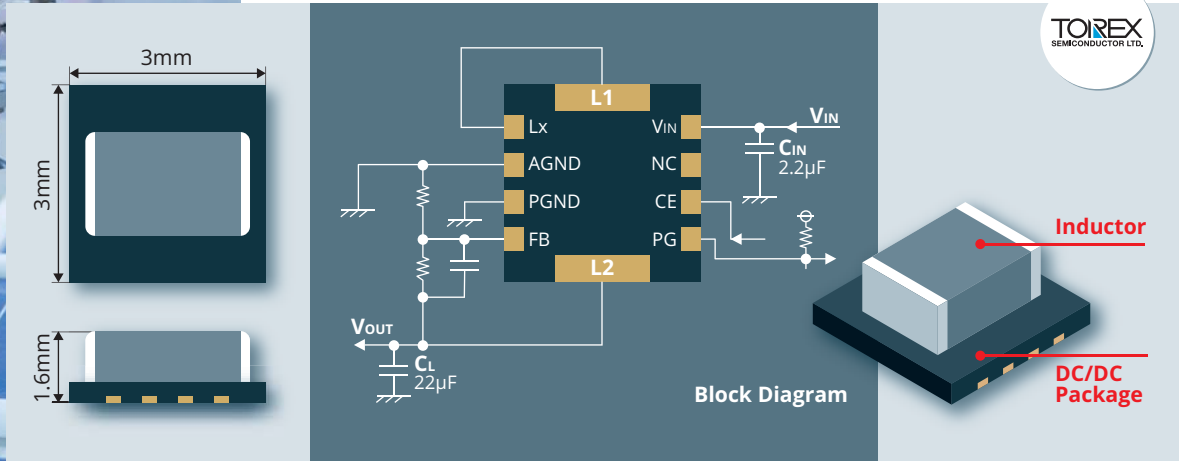
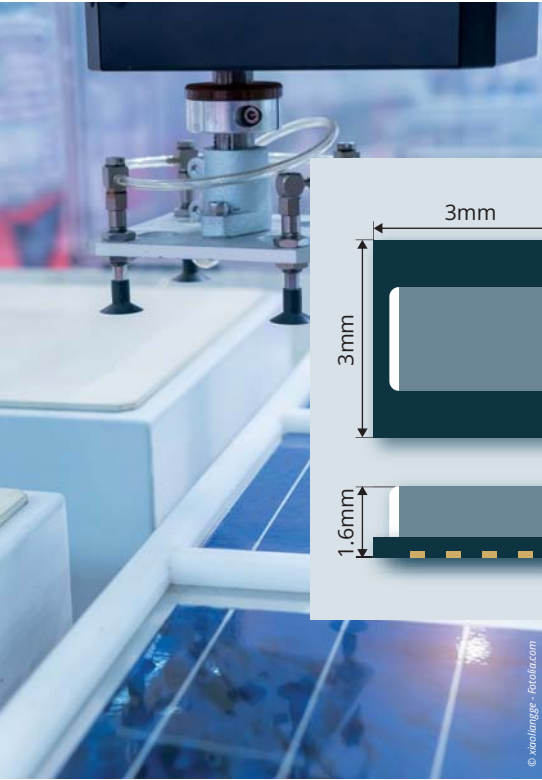
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18V MICRO DC/DC

XCL225/26 Series: 18V, 500mA Synchronous Step-Down Micro DC/DC Converter



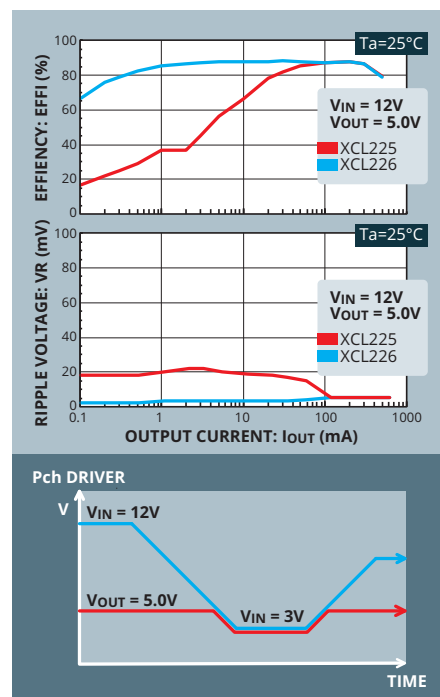
In addition, this new Micro DC/DC features low quiescent current (12 μ A) and ultra-low output ripple voltage. The XCL225/26 includes Over Cur-

rent and Short-circuit protection, adjustable soft start and a power good output. The operating ambient temperature range is -40°C~+105°C.

With an operating temperature range of up to +105°C and a quiescent current of only 12 μ A, this new 18V, 500mA buck Micro DC/DC from TOREX is a welcome addition to the ever expanding range of ultra-small Micro DC/DCs from TOREX!

The XCL225/26 series is a 1.2MHz synchronous step-down Micro DC/DC converter with integrated inductor in an ultra-small 3.0x3.0x1.6mm DFN3030-10B package. Integration of the inductor simplifies the board layout and minimizes any unwanted radiated noise. A stable and efficient power supply circuit can be configured by simply adding only two ceramic capacitors externally thereby contributing to PCB space saving and the shortening of development time.

With a P-Ch High Side Switch to ensure low voltage operation and 100% max duty ratio, the XCL225/26 can operate from 3.0~18.0V and deliver loads up to 500mA making it an ideal replacement for inefficient linear regulators used in many industrial applications. Output voltage is set externally within a range of 1.0~15.0V and the new XCL225/26 is designed for very high efficiencies at low output loads.



Many traditional mid-voltage DC/DC converters use an N-Ch MOSFET for the High Side switch. Whilst an N-Ch FET is excellent for High Speed Switching it normally needs a special bootstrap circuit to drive it. A bootstrap circuit has the advantage of being simple and low cost, but it also has limitations. The duty-cycle and on time is limited by the requirement to refresh the charge in the bootstrap capacitor, which means the maximum duty ratio can never be 100% and this has implications when the input voltage goes below V_{OUT} .

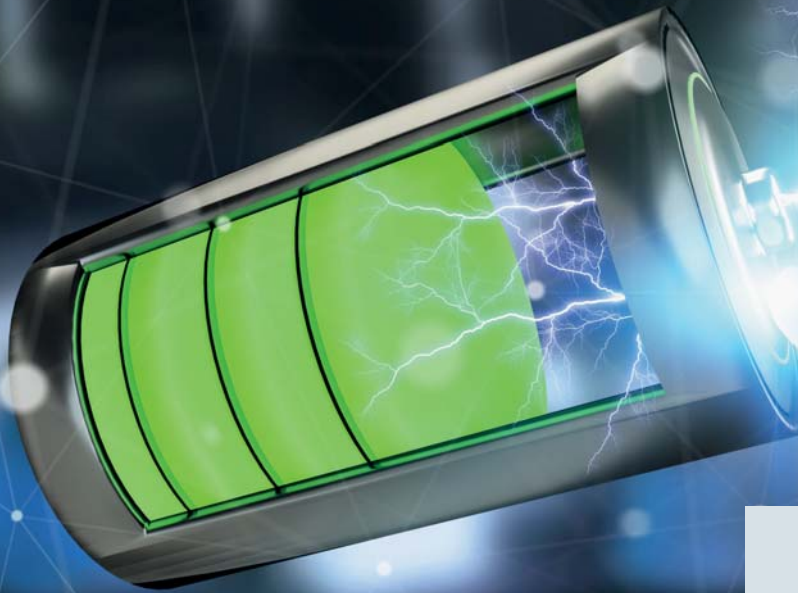
The XCL225/26 uses a P-Ch MOSFET for the High Side Switch that does not need a bootstrap circuit, so the maximum duty ratio can be 100%. This means that the output remains stable even when the input drops beneath V_{OUT} .

The XCL225/26 output follows the input when it goes below V_{OUT} and this can be important when the V_{IN} source has a high impedance (i.e. due to a long cable).

A07

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BATTERY POWER

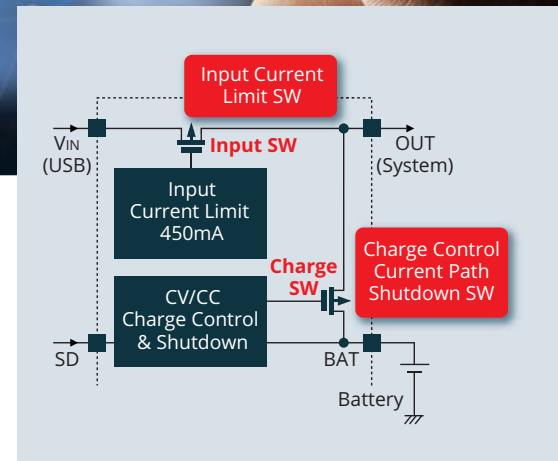


Li-Ion/Li-Polymer Battery Charger IC with Temperature Monitoring, Current Path & Storage Mode Shutdown Function.

The XC6806 is a linear Li-Ion/Li-Po battery charger with a 450mA Input Current Limit and integrated Current Path to maintain and prioritise the system load during the charging cycle. The XC6806 operates within a range of 4.5~6.0V. The charge current level can be set externally between 10mA~380mA and the charge voltage is set internally within a range of 3.5~4.45V.

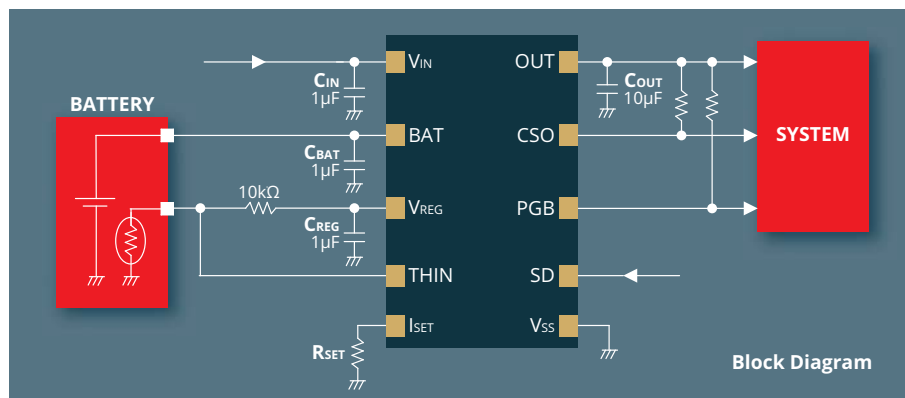
The XC6806 also includes a novel Storage Mode Shutdown function to help conserve battery life whilst the end product is in transit to the shops. After production, the time from shipment of

finished goods to them being sold and used by the end customer may be a few months or more, depending on the supply route from factory to warehouse and to retail outlet. During this time, to avoid the battery discharging, the Li-ion/Li-Po cell should ideally be disconnected from the system. This is not always possible with traditional Charging ICs, but the XC6806 includes an additional Charge Switch to allow the user to cut-off the connection between V_{BAT} and the System. The connection is cut using the integral diode of the Charge SW. A toggle signal to the SD pin enables the Shutdown mode operation when there



is no V_{IN} and once enabled, the consumption current from the BAT pin is only $0.1\mu A$. This function allows the device to be operated with full battery immediately after purchase even if it has been in storage for extended periods of time.

The input current limit also makes the XC6806 ideal for USB charging or applications that use smaller AC/DC adaptors. The temperature monitoring function meets JEITA standards and by controlling the charge voltage and charge current as appropriate for the temperature, the battery can be charged safely. Additional protective functions include a safety timer, UVLO, thermal control, and reverse current protection. A charging circuit can be designed with minimal external components. The XC6806 is available in the small USP-10B or LGA-10B01 package.



A08

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MAKE YOUR DEVICE UNIQUE

PCAP touch technology has gained a foothold in industrial applications. With the exception of resistive touch displays, other touch technologies such as surface acoustic wave (SAW), surface capacitive (CAP) or infrared (IR) have been pushed out of the market and are only rarely used in new projects. In the course of time, PCAP (projected capacitive touch) has passed through smartphone and tablet use, and the associated habituation this brings with it, to eventually establish itself in industrial applications.



This technology presents a series of advantages. An essential aspect is the structure of the display-touch system. The latter allows for a high degree of customization to meet the customer's requirements.

In most cases, the front of PCAP touch screens is made of glass, and can also be customized individually. A wide range of options is available, from standard cover lenses made of simple soda lime glass, to toughened glass and printed versions. Especially the printing option can be used to apply a unique design to a device. Many possibilities are available – from a simple black frame to multi-colour printing with embedded logo or a type designation, almost everything is feasible.

It is also possible to vary the size of the front glass, which needs not be limited to the dimensions of the display. This allows for the production of complete fronts made of glass, with the display

occupying only a small part of the surface. Glass thickness is another issue. Industrial applications sometimes prescribe safety standards that require a minimum break resistance (IK rating). This also has an impact on the thickness of the glass used and requires the use of a touch controller that is suitable for such a thickness.

In addition, devices must be water-resistant in environments in which liquids are used. In such cases, touch sensor and display are well protected behind a sealed glass front. Another area of application is medical technology. Such displays are easy to clean, and allow for the use of at times aggressive detergents without hesitation. Other technologies make this difficult or even impossible to achieve.

It is therefore easy to reach protection class IP67 on the front of the device by gluing the glass to the front plate.

Glass is largely resistant to scratches and abrasion, though this does not necessarily apply to glasses with surface treatment, such as anti-glare or anti-reflective coating. The anti-glare effect is achieved by etching the surface, creating a slightly mat surface that guarantees a glare-free image. The display's anti-reflective property is obtained by applying a coating that improves translucency, thus reducing reflections on the surface. Such displays are prone to damage, for instance in access terminals, where keys can easily scratch the surface. But there are remedies for this as well.

In the case of frequently used touch sensors, it is sometimes recommended to use an anti-fingerprint coating to avoid ugly fingerprints. A nano-coating is usually applied, which both protects and keeps the surface clean.

The final step consists in applying the touch surface onto the display. The two possible options

WISECHIP widens the product range with TOLED



OLEDs have been proving their worth for a long time in the consumer sector with their use in smartphones, and there's no stopping this technology when it comes to TV sets. But, what about industry? Here too, slowly but surely, OLEDs are developing from niche product to a much broader range of uses.

The properties of Organic Light Emitting Displays provide new opportunities, too. At the electronica 2016, WISECHIP was proud to present another transparent OLED. Back in August 2016 the company launched a round TOLED with 1.07" diameter and a resolution of 160x136 pixels, and now they've come up with a larger variant. The new TOLED has a diagonal of 4.1", and is configured as a multicolour segment display. The transparent OLED technology can be used, for example, as an HUD (Head-Up Display) for driver information.

For the automotive market, OLEDs offer advantages such as a 180° viewing angle without colour displacements, an operational temperature range from -40°C to +105°C, a high light density of 1500cd/m², and a rapid response time. All this gives the driver a very easily readable information source, whether in bright daylight or darkest night – and that means more safety. The display can also be integrated directly into the windscreen, which makes the overall design easier.

The very high level of transparency of 65% makes the display of interest for other applications too. Near-to-eye systems, as well as use in augmented reality technologies, are possibilities. Also conceivable are optical projection systems, monitoring systems worn on the human body, or displays built into helmets. In combination with another development, the flexible OLED with a minimum bend radius of 40mm, there are a lot more possible applications on the horizon. And as far as the automotive sector is concerned, other ideas include interior lighting, dashboard functions, and much more besides.

A09

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A10

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Author: Allen Y Chen

for Cars

LED DRIVER MOD

LED lighting is one of the fastest growing segments in automotive electronics, but it is not without its own unique challenges. This article describes several major constraints facing today's lighting designers and explores how these can be addressed by MPS's new MPM6010-AEC1 automotive LED module.

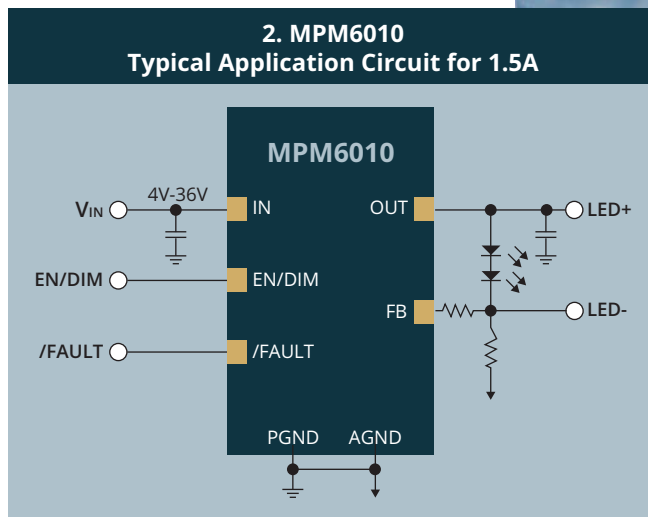
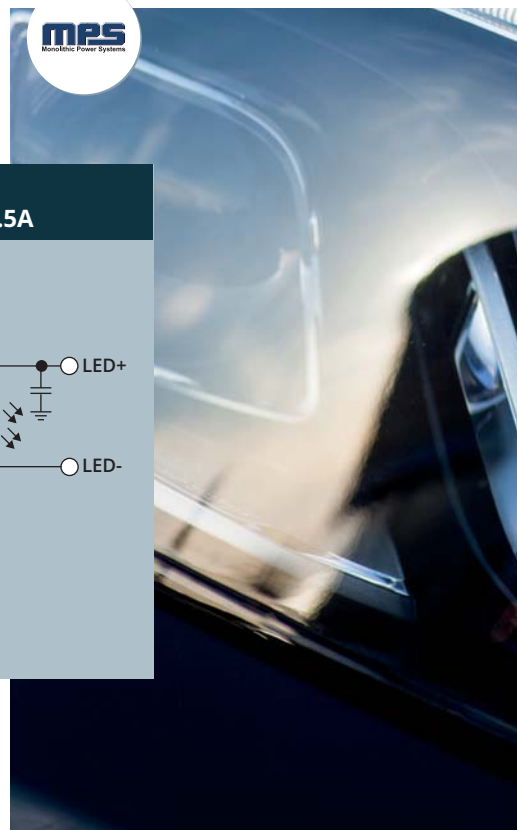
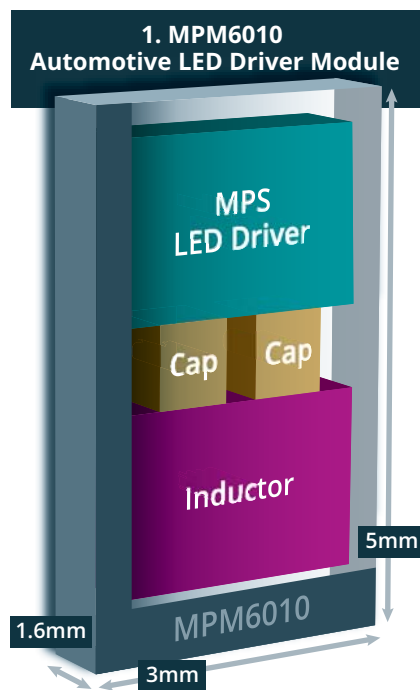
One of the biggest trends in automotive electronics has been the widespread proliferation of lighting LEDs, as their intrinsic benefits of longevity, small size, and low power consumption are perfectly harmonious with the needs of today's eco-conscious vehicles. LEDs today are found by the dozens in and around cars. On the inside, they can be found in accent and mood lighting, tell-tales, and digital screen backlights. On the outside, they're a great fit for everything from turning and position indicators to fog and daytime running lights. In the coming years, LEDs are expected to take over high-power headlamps, which, even as of a few years ago, were still mainly halogen- or Xenon-based.

Today's automotive lighting engineers face a litany of technical challenges when implementing ever smaller and more exotic LED solutions, among which are the need for high reliability, robustness against electromagnetic interference (EMI), and thermal management.

High reliability is the universal ethos in automotive engineering and is especially important in exterior lighting, which may be depended upon for indicating a vehicle's status (turning, stopping, alerting, etc.). A good general rule for maximizing reliability is to minimize the number of components on a board: fewer components usually leads to fewer potential points of failure, less material handling, less complicated layout, and a design that's easier to debug and bring to market. Furthermore, as LED systems shrink, the associated electronics used to drive these must follow suit. A common method to achieve smaller board designs is to increase the operational frequency of their switching drivers, thereby reducing the size of their associated inductors and capacitors. However, moving to higher switching frequencies can increase radiated emissions catastrophically;

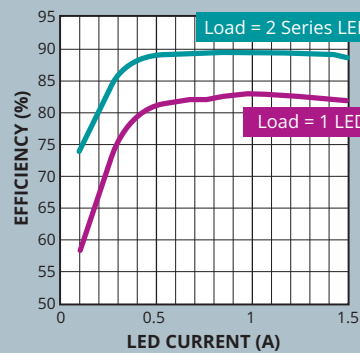
EMI has a squared relationship to switching frequency, meaning a doubling of switching frequency increases the EMI four-fold. To counteract this, designers must rigorously tune their schematics and layouts to choose low-loss components and minimize the sensitive pathways, or loops, that see the highest transient current activity. These can include the switches, energy-shuttling inductors, and decoupling capacitors. Another method of reducing EMI is simply to add metal shielding, but this is often prohibitively expensive in the price-sensitive lighting market. Lastly, while LEDs inherently require far less power versus their halogen or incandescent counterparts, thermal management is a big concern as it is directly related to LED life expectancy. LEDs are famous for promising hundreds of thousands of operational hours, but this can be greatly reduced when they're subjected to excessive high junction temperatures and further exacerbated by the often harsh climates that vehicles must survive in.

MPS had these key concerns in mind when they developed the new MPM6010-AEC1, the industry's

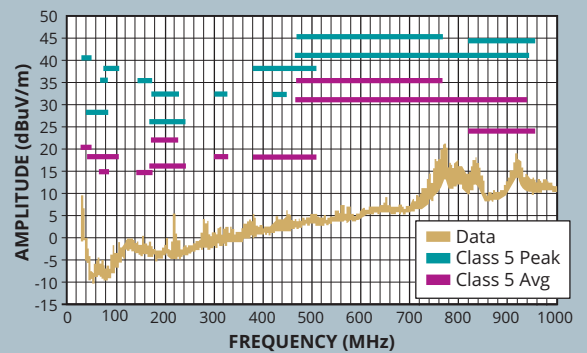


ULES

3. Efficiency vs. LED Current Operating at 2.2MHz, 12V Input



4. CISPR25 Class 5 Average Radiated Emissions Vertical, 30MHz - 1GHz



most advanced automotive LED driver module. This 36V, 1.5A, LED module integrates a synchronous step-down LED driver with an automotive-grade inductor and decoupling capacitors (Fig.1), targeting up to 15W interior and exterior lighting applications. The MPM6010's compact 3x5mm form factor drastically simplifies and shrinks board layout—as shown in Figure 2, with as few as four external components it is possible to achieve a full LED driver solution with this module.

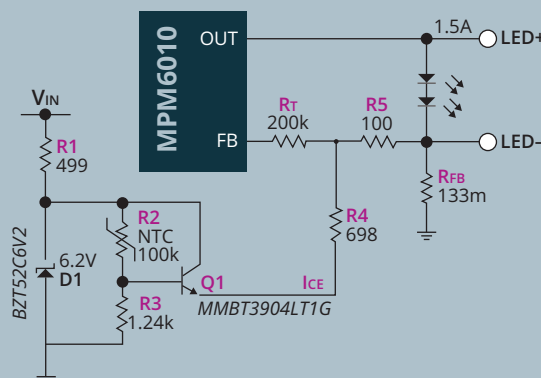
The MPM6010-AEC1 utilizes the same great proprietary low RDS(ON) process technology made popular in MPS's DC/DC converter solutions, delivering over 90% efficiency at 2.2MHz and contributing to cooler-running LED systems. Figure 2 shows the efficiency measured in a real-world application of 1 and 2-series connected LEDs driven at 2.2MHz. This LED driver module helps improve system reliability by slashing the sheer number of components needed: as illustrated in Figure 3, a single MPM6010 module takes the place of 4-6 separate board-level components of a comparable discrete driver. Furthermore, the inductor's inside was separately qualified under

AEC-Q200 passive component qualification guidelines before the entire module was qualified under AEC-Q100 guidelines. With the MPM6010, EMI is optimized, as the critical loops with the highest current transients are localized within the module package itself, passing CISPR25 Class 5, a standard automotive EMC requirement, becomes more straightforward.

Lastly, the MPM6010-AEC1 supports LED thermal management by employing thermal foldback techniques using either its PWM dimming input (EN/DIM) or the LED current regulation feedback pin (FB). Figure 5 shows one such implementation of the latter: when the temperature tracked by the external thermistor reaches its critical threshold, the current delivered to the LEDs is throttled back. This circuit, coupled with built-in safety features such as thermal shutdown and open/short LED detection, helps to maintain the LEDs within a safe operating margin that can better ensure a long lifespan.

The MPM6010 is qualified to AEC-Q100 Grade 1 standard and is offered in 3x5x1.6mm QFN packaging with optional wettable flanks to assist with automated optical inspection. Automotive suppliers face stringent performance and size goals in designing LED lighting systems, and the market trends suggest that these will only get tougher over time. Advanced integrated driver modules like the MPM6010 can help fulfill aggressive product requirements of high reliability, EMI compliance, controlled thermals and more, making it easier to reach those system goals and paving the way for a new generation of ever-more sophisticated illumination and signaling systems.

5. MPM6010 Thermal Foldback Circuit



A11

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Security

Narrowband IoT (NB-IoT) is a new way of communicating with smart devices that require small amounts of data, small power consumption, in hard to reach places. NB-IoT is a Low Power Wide Area Network (LPWAN) radio technology standard that has been developed to enable a wide range of devices and services to be connected using cellular telecommunications bands.

NB-IoT-TECHNO

NB-IoT focuses specifically on indoor coverage, low cost, low device complexity, long battery life, and high density of connected devices in a single cell. A new physical layer has been designed to meet the above demanding requirements and battery life of more than 10 years can be supported for a wide range use cases. Initial cost of the NB-IoT modules is expected to be comparable to GSM/GPRS modules.

NB-IoT can co-exist with 2G, 3G, and 4G mobile networks acquiring advantages of using an existing and running network. Mobile operators will just need to perform a software update of their networks in order to allow first NB-IoT communications. It also benefits from all the security and privacy features of the mobile networks, such as support for user identity confidentiality, entity authentication, data integrity, and mobile equipment identification.

With the help of mobile operators, end customers are already testing first devices with NB-IoT support in the field. Extended update of the networks is planned for mid of 2017.

Connect...

5626514515
23231646548
78456494245

21561545314
56265145155
23231646548
78456494245
23611684843
97654297569

DATA

Waiting For Command...



QUECTEL's first NB-IoT module is available!

LOGY IS HERE!

QUECTEL BC95 module, one of the first cellular module compliant to the 3GPP Release 13 is now available and it will provide the basic platform for the terminal suppliers' NB-IoT deployment.

BC95 module is based on Hisilicon Boudica chipset and is single mode LTE Category NB1 and single band. It's available in 3 frequency bands configurations: 850Mhz (B5), 900Mhz (B8), 800Mhz (B20). Dual band B8/B20 version will be available during the course of the year.

Both B8 and B20 will become standard and widely deployed bands across Europe but 800MHz

will be predominately used in metering segment due to the lower frequency, hence best penetration.

The BC95 module is also compatible with 2G module M95, 3G modules UG95/UG96 and 4G modules EG91 which allows easy migration from existing GPRS application to NB-IoT as well as full scalability between different cellular technologies with a common footprint on the pcb. It features ultra-low power consumption, offering global connectivity with over 10 years' battery life for low data rate IoT applications.

The low profile, the small size of 19.9×23.6×2.2mm and the easy LCC package allows BC95 to be easily embedded into IoT applications which are every day smaller and smaller.

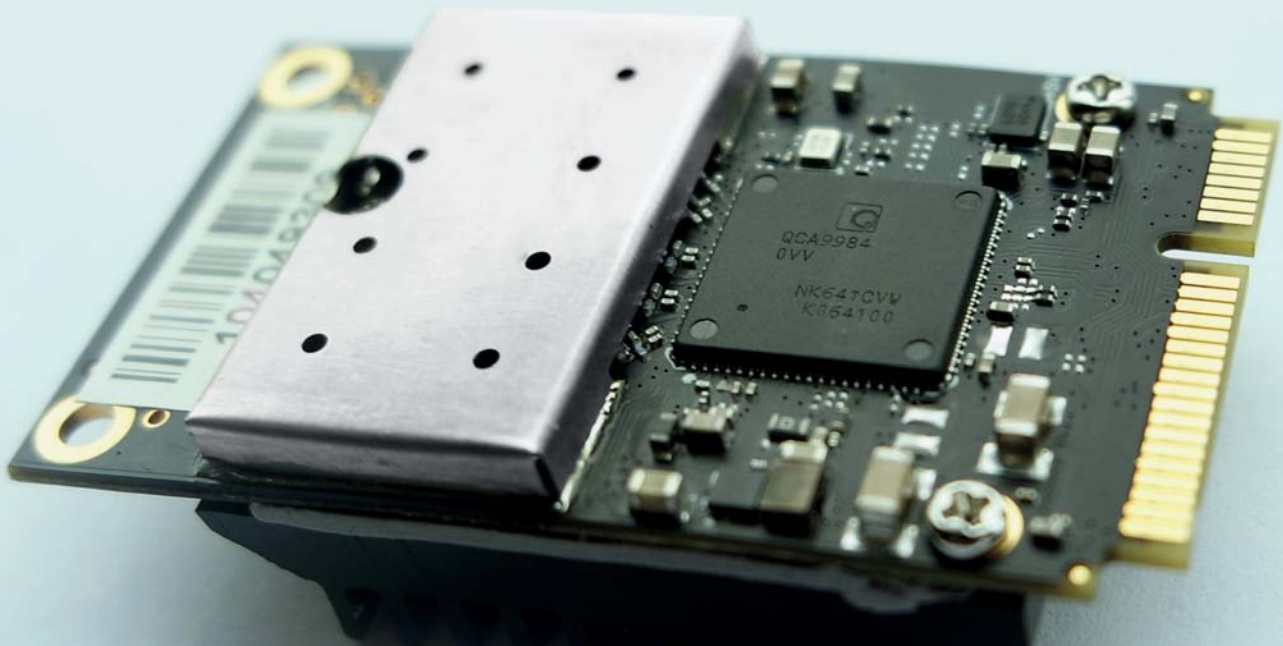
Due to compact form factor, ultra-low power consumption and extended temperature range, BC95 is the best choice for a wide range of M2M applications, such as smart metering, smart city, security and asset tracking, white goods, agricultural and environmental monitoring, etc. it is able to provide a complete range of SMS and data transmission services to meet client-side demands.

A12

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Features

- Size: 19.9×23.6×2.2mm
- Industrial temperature range: -40°C + 85°C
- Supply voltage : 3.1~4.2V Typical: 3.8V
- Interfaces: 2x UART, ADC, Antenna, SIM
- NB-IoT protocols
- FOTA support
- Output power: 23dBm
- Power sensitivity: -135dBm
- Power consumption: Sleep < 10uA, Idle < 6mA



HOW ABOUT A LITTLE MORE?

WLE1216V5-20: The new 802.11ac module from COMPEX supports a gross data rate of 1733Mbps.

Established in 1989, COMPEX specializes in the development and production of PCIe Wi-Fi modules. Since 2003, COMPEX has focused exclusively on WiFi technologies from QUALCOMM, i.e. all the modules on offer are based on the latter's WiFi chipsets.

The latest PCIe module WLE1216V5-20 was developed for High Bandwidth Enterprise Wireless Access Points, so it's no wonder that the QUALCOMM flagship, the QCA9984 module, is the one that's used. With an MU MIMO 4x4 configuration and 11ac Wave2 support, the module supports either up to four spatial streams (4SS) with an 80MHz bandwidth, or two spatial streams (2SS) with a channel bonding of 80MHz+80MHz. In both cases, with a maximum modulation (256

PART NUMBER	WLE1216V5-20
Ordering Item Code	WLE1216V5-20 7A00001.01
Standard	802.11 n/a/ac
Band	5 GHz
MIMO	MU MIMO 4x4 (80 MHz+80 MHz)
Chipset	QCA9984
Interface	PCIe 2.0
Voltage	5V
Power (Per Chain)	5GHz @ 23dBm
Power Consumption	8.5W (max)
Receiver Sensitivity	-94dBm @ 6Mbps
Antenna Connector	4 x U.FL
Temperature Range	-20°C to 70°C
Dimension (mm)	50.8x29.85x12 (HxWxD)
RoHS Compliance	yes
Certifications	Not Available
Reference Design	Complex Design
Linux Support	ath10k
Windows Support	TBD

QAM, 8 bits per symbol) and a minimum coding rate of 5/6, a gross data rate over all four antennas of 1733Mbps is achieved. In addition to the 11ac, the standards IEEE 802.11d, e, h, i, j, k, r, u, v time stamp and w are also supported.

A particular feature with WiFi modules from COMPEX is the fact that all of them are on offer at least in the extended temperature range from -20° to +70°C, and that goes for the WLE1216V5-20 too. And the cooling element allows for operation in the open air without active cooling.

More modules and information about WLE 1216V5-20: <http://downloads.codico.com/misc/AEH/COMPEX>



A13

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DOES YOUR CAR TALK TO THE POWER GRID?



Power Line Communication (PLC) is a communication method in which power supply and data transfer take place at the same time on one cable strand. PLC also comes up in connection with terms such as »Industry 4.0«, »Internet of Things« and »Smart Home«.

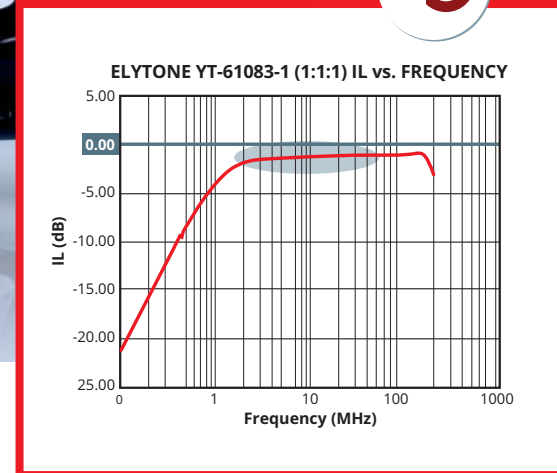
As well as the buzzwords, there is another subject of conversation going around at present in the automobile industry which may be less known but not less interesting.

This involves the interaction between electric vehicles (EV), plug-in hybrids (PHEV), and the charging stations, known as the electric vehicle supply equipment (EVSE). Since 2014, ISO/IEC 15118-5 (preliminary standard DIN SPEC 70121) has set the regulatory framework for the intelligent AC and DC charging of EVs. According to these standards, HomePlug Green PHY™(HPGP) is schedu-

led as the standard for the PLC data transfer during plug-in charging. Charging EVs requires very power, and at peak times this can cause particular challenges to the grid utilization. That is why it is necessary to exchange information with the network operator. Besides other information, the required charging time, the actual charging status and possible roaming information will be transferred. CODICO's product range offers two special solutions of these coupling transformers by ELYTONE.

Between EV and EVSE the transmission is achieved by a YT-61083-1 in each unit. For further communication between EVSE and grid load sensor/smart grid gateway, the YT-61082-1 of ELYTONE is your choice.

As the charging stations are handled as a »consumer« product, there are particular standards which should be considered. The item YT-61082-1 meets the requirements of IEC 60950-1 to secure the safety of the user. Besides overvoltage class



3 (insulation voltage: 4kV@250Vrms) the transformer can also be used under conditions with a pollution degree up to category 2.

When communicating by Control Pilot, operation takes place on the same electrical potential. This imposes lesser demands on the YT-61083-1. An excellent insertion loss behavior in the operating frequency range from 2MHz to 30MHz is a must. (see diagram)

Additional both items are certified according to AEC-Q200 Grade 1.

Visit us at our CODICO Sample Shop, where both PLC transformers and other Power Line components are easy to find!

P02

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ITEM NUMBER	YT-61082-1	YT61083-1
Ratio (Tx:Line:Rx)	1:4:5	1:1:1
Isolationvoltage	4kV	500V
Dimensions (WxDxH)	11x13.5x8	
PCB Mounting	SMD	
Operating Temperature	-40°C to +125°C	
Application	EVSE	EV/PHEV
AEC-Q200 Grade 1	certified	
Additional Standards	IEC 60950-1	

MEMS SHINE THE LIGHT ON NEW APPLICATIONS

New KDS MEMS oscillators will be replacing solution for precise XO market

KDS offers new MEMS series, called Elite Platform MEMS oscillators. Elite platform products are revolutionary MEMS platform for ultra-accurate and low-jitter TCMO* and VCMO** with using new SiTimes technology DualMEMS™ and TurboCompensation™.

The Elite has 3 important factors:

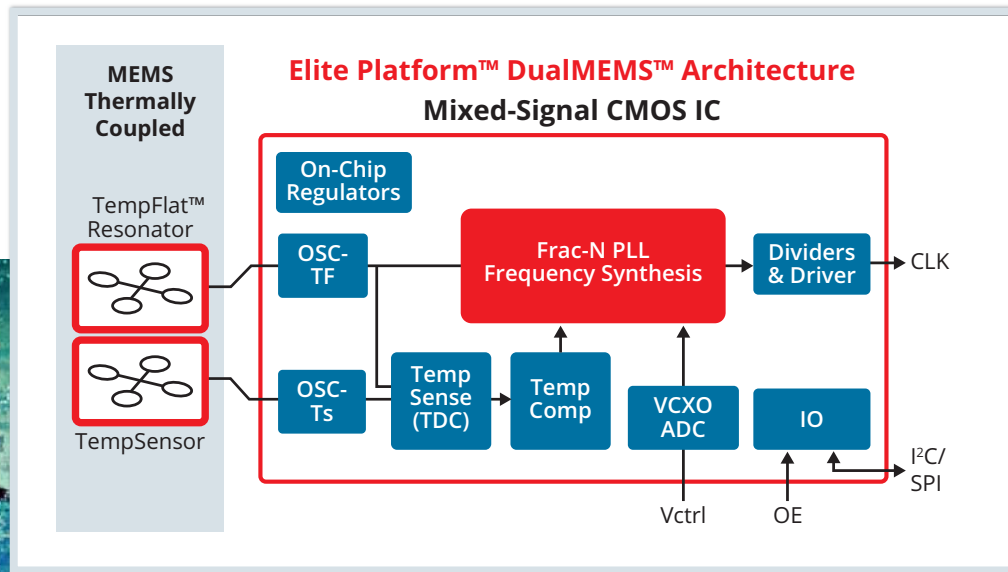
- TempFlat MEMS™ resonator are very robust against vibrations or shocks compared to quartz crystal resonators.
- DualMEMS™ technology offers better and faster temperature compensation.
- The low noise PLL circuit IC resists any power supply noise and gives a 0.23ps low phase jitter.

The products is available with following four options:

- Precision Super-TCMO* for wireless
- Super-TCMO* for automotive and industrial GNSS
- Ultra-low jitter differential oscillators for Ethernet
- High temp, high reliability differential VCMO**

1. Precision Super-TCMO* MO5356/MO5357

KDS Precision Super-TCMO* reaches ± 0.1 ppm which fulfills Stratum3 compliance used in small cell, IEEE1588 clocks or Synchronized Ethernet. In those kind of applications mainly OCXOs are used these days. This type of oscillator requires high power consumption (around 1W). The oven to keep the appropriate temperature for the SC



cut crystal blank it needs bigger package sizes (9.0x6.0mm) as well. Against those disadvantage of OCXOs, the Precision Super-TCMO* needs lower power consumption (70% less) and smaller package size (6.0x4.9mm).

2. Super-TCMO* MO5155/MO5156/MO5157

This ±0.5ppm TCMO* is suitable for industrial and automotive GNSS application. Today those markets mainly require quartz TCXOs reaching a temperature stability of ±0.5ppm in the range of

-40°C to 105°C. Robustness might be one of the key point which is given by the AEC-Q100 appliance. They resist mechanical impacts to maintain the operation and also keep the required specification.

But what about the effect of airflow or sudden temperature ramp up and voltage change? For such kind of small effects, all quartz TCXOs will have a small frequency jump. This is caused by the structure of every TCXO where the quartz crystal blank is separated from the temperature

compensation IC. But MEMS are very strong in that area and extremely robust. The resonators are pasted directly on the IC which minimizes the impact caused by effects like variation of temperature, vibrations and voltages.

Only the size will be a bit bigger considering today's TCXO market. Right now 2.5x2.0mm size is the major one and next future is 2.0x1.6mm size. But why not to try them in your application? You will understand the accuracy of this Super-TCMO*.

	1. MO5356/MO5357	2. MO5155/MO5156/MO5157	3. MO9365/MO9366/MO9367	4. MO3372/MO3373
PACKAGE SIZE	SOIC- 8 6,0x4,9mm	SOIC- 8 6,0x4,9mm	QFN 3,2x2,5mm QFN 7,0x5,2mm	QFN 3,2x2,5mm QFN 7,0x5,2mm
FREQUENCY	MO5356: 1~60MHz MO5357: 60~220MHz	MO5154: 10Freq für GNSS MO5156: 1~60MHz MO5157: 60~220MHz	MO9365: 32 Std.-Frequenz MO9366: 1~60MHz MO9367: 60~220MHz	MO3372: 1~60MHz MO3373: 60~220MHz
TEMPERATURE STABILITY	±0,1ppm ~ ±0,25ppm	±0,5ppm ~ ±2,5ppm	±10ppm ~ ±50ppm	±10ppm ~ ±50ppm
TEMPERATURE RANGE	-20°C ~ +70°C -40°C ~ +85°C -40°C ~ +105°C	-20°C ~ +70°C -40°C ~ +85°C -40°C ~ +105°C	-20°C ~ +70°C -40°C ~ +85°C -40°C ~ +105°C	-20°C ~ +70°C -40°C ~ +85°C -40°C ~ +105°C
OUTPUT TYPE	LVC MOS, Clipped Sine	LVC MOS, Clipped Sine	LVPEC, LVDS, HC SL	LVPEC, LVDS, HC SL
JITTER			Max. 0.1ps	
SAMPLES AVAILABLE	From 1H 2017	From 1H 2017	Already available	Already available

3. Ultra-low jitter differential oscillators MO9365/MO9366/MO9367

This Ultra-low jitter differential oscillators are targeting high speed data communications that requires 0.1ps to 0.3ps jitter. There are no doubts that all quartz crystal owes perfect jitter performance, but MEMS have now reached same or even better jitter performance.

Especially at higher frequencies like over 100MHz MEMS give advantages. In such frequency range usually SAW resonator are used as actual solution. But compared to unstable frequency tolerance or low jitter performance of SAW solutions, this Ultra-low jitter differential oscillators offers a more accurate solution.

4. High temp, high reliability differential VC MO** MO3372/MO3373

This high temperature, high reliability differential VC MO** targets wireless repeater, CMTS (Cable Modem Termination Systems) and broadcast systems. It has a good performance for audio or industrial application.

As we announced recently, MEMS oscillators are quite new in the timing device market. As the performance of MEMS oscillators improved year by year they are your solution now. We recommend to consider and test this technology in your future designs. Tell us what you need! From crystal units to MEMS oscillator we can offer you the best product which fits perfectly to your application.

P03

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* TCMO: Temperature Controlled MEMS Oscillator
** VC MO: Voltage Controlled MEMS Oscillator



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HIGH PERFORMANCE

RUBYCON Hybridcaps PHV-Series

PANASONIC Hybridcaps ZK-Series



Features

- Higher cv-value
- Low leakage current
- Safe in case of failure
- Lower ESR
- Stable behaviour vs. temperature & frequency
- Higher ripple current in small case sizes
- Long lifetime

More and more engineers are utilizing the features of hybrid capacitors in their applications. Hybrid caps combine the advantages of both, electrolytic and polymer capacitors, in compact dimensions.

RUBYCON has launched a 135°C version with high ripple current capability and a guaranteed life time of 4.000hrs. This new series »PHV« additionally provides an even higher ripple current capability at 125°C, which is market-leading. Special materials used bring RUBYCON's hybrid caps further advantages in ESR behaviour at specific low temperatures. A high temperature withstanding of up to 150°C for 300hrs is also provided.

Especially due to the ripple current performance this capacitor is targeting automotive powertrain applications. As well for ABS/ESP applications and boost recuperation systems »PHV« is interesting. RUBYCON recommends polymer hybrid version also for all kind of pumps, engine & indoor fans and actuators/motor drives (EPS, wiper, window lifter,...).

From PANASONIC there is a new 125°C series »ZK« available which provides higher capacitances and a higher ripple current capability in same case sizes compared to conventional series. The achieved capacitance values per case size are market-leading. Guaranteed life time is 4.000hrs.

Comments Mustafa Khan, European Product Manager for Polymer Capacitors at PANASONIC: *»Our new hybrid capacitors are ideal for a broad spectrum of applications including input/output filtering in power converters and voltage regulators, power and battery decoupling and clock circuitry. Their endurance and low ESR makes them ideal for use in automotive applications, servers, base*

stations and industrial PCs. Yet they are small enough for wireless and IoT designs.«

Our table shows some specification examples.

P04

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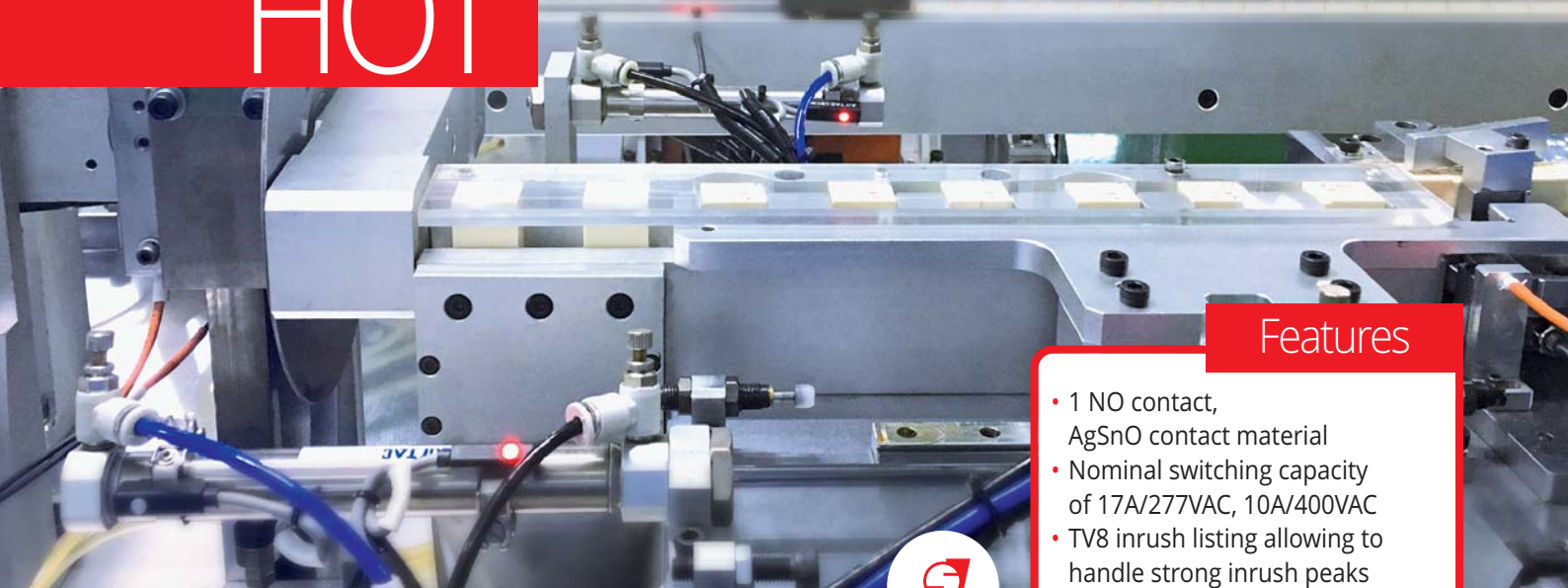
RUBYCON Hybridcaps PHV-Series

VOLTAGE (V)	CAPACITANCE (uF)	DIMENSIONS (mm)	ESR (mOhm max @20°C/100kHz)	ESR (mOhm max @-40°C/100kHz)	RIPPLE CURRENT (mArms@135°C/100kHz)	RIPPLE CURRENT (mArms@125°C/100kHz)
25	220	8x10.5	22	33	1600	2900
25	330	10x10.5	20	30	2000	3600
35	150	8x10.5	22	33	1600	2900
35	270	10x10.5	20	30	2000	3600

PANASONIC Hybridcaps ZK-Series

SERIES	VOLTAGE (V)	CAPACITANCE (uF)	DIMENSIONS (mm)	ESR (mOhm max @20°C/100kHz)	RIPPLE CURRENT (mArms@125°C/100kHz)
ZK	25	47	5x5.8	80	660
ZC	25	33	5x5.8	80	550
ZK	25	150	6.3x7.7	30	1680
ZC	25	100	6.3x7.7	30	1400
ZK	25	470	10x10.2	20	2800
ZC	25	330	10x10.2	20	2000
ZK	35	56	6.3x5.8	60	1080
ZC	35	47	6.3x5.8	60	900
ZK	35	180	8x10.2	27	1920
ZC	35	150	8x10.2	27	1600
ZK	35	330	10x10.2	20	2800
ZC	35	270	10x10.2	20	2000

SOME LIKE IT HOT



Features

- 1 NO contact, AgSnO contact material
- Nominal switching capacity of 17A/277VAC, 10A/400VAC
- TV8 inrush listing allowing to handle strong inrush peaks
- Class F coil system
- Coil voltage from 5Vdc to 48Vdc with 360mW coil sensitivity
- Ambient temperature up to 105°C
- Standard IEC 60335-1 glow wire test at end product
- Dimensions of 21×16×21.8mm (L×W×H)
- VDE, cULus

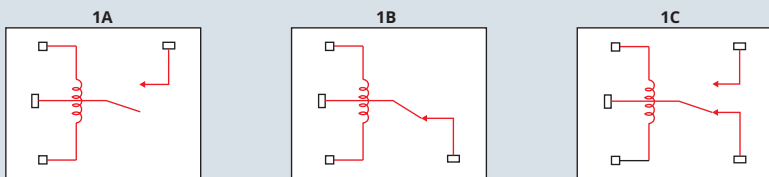
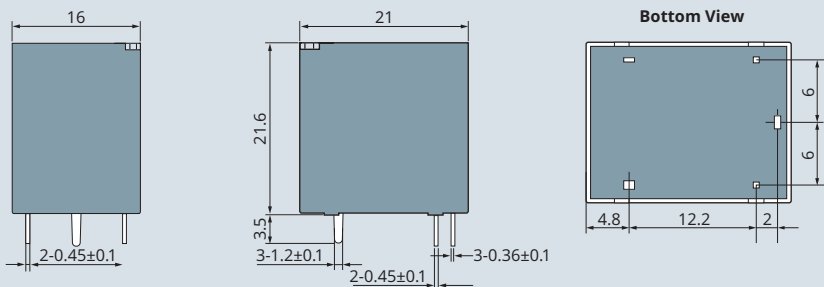


The miniature power SRG power relay of SANYOU is among the strongest relays of the so called Sugar Cube Relay class.

It offers a 17A rating with 100k operations at an ambient temperature of 85°C and 10A with 210k operations at 105°C ambient. The coil consumption is only 360mW. The product is compliant with IEC60335-1 offering a GWIF 850°C/GWIT 775°C and CTI ≥250V.

It is produced on a fully automated line which is located in the SANYOU headquarter in Dong-guang. A new cULus listing of 17A/277VAC at 105°C for general & resistive use for 100.000 operations are in the pipeline.

SANYOU SRG Dimensions & Wiring Diagram



Unless otherwise specified: If dimension <1mm, tolerance: 0.2mm; If dimension <1~5mm, tolerance: 0.3mm; If dimension >5mm, tolerance: 0.4mm; Note: 1. Extended terminal dimensions before soldering; 2. Tolerance of P.C.B. layout: 0.1mm

Typical applications are heating elements used in appliances as used in ovens and stoves, and motor controls in building management as used in door opening applications.

P05

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THERMAL MANAGEMENT SOLUTION **SOFT-PGS**

200µm thickness guarantees thermal stability up to 400°C with thermal conductivity up to 400W/mK

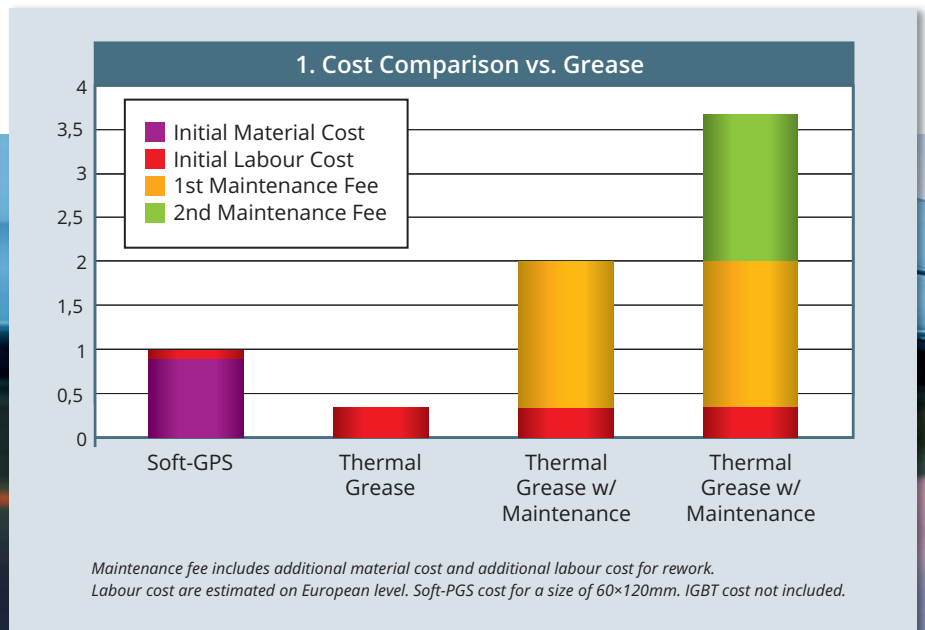
PANASONIC has launched a highly-compressible Thermal Interface Material (TIM). This is used to reduce contact thermal resistance between rough surfaces in extremely thin spaces. Soft-PGS enhances the thermal coupling between heat producing devices (heat sources) and heat dissipation devices (the heat sinks).

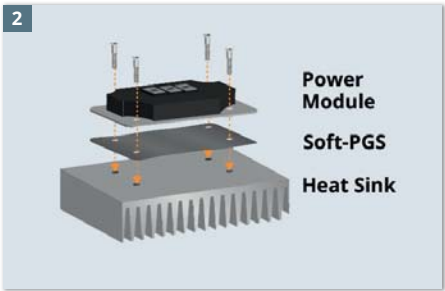
Thermal Interface Material (TIM) is a key component in the majority of power electronic systems. Heat generated by semiconductors has to be transferred to a heat sink and ultimately dissipated. Soft-PGS is a 200µm thick pyrolytic graphi-

te sheet designed as a thermal interface material for IGBT modules. As Soft-PGS can be compressed by 40% it is an excellent method for dramatically reducing thermal resistance between a heat sink and an IGBT module. The 200µm thick Soft-PGS sheet is easy to install and has far lower labour and installation costs than thermal grease or phase change material. After one single service maintenance Soft-PGS cost is already lower than thermal grease as shown in figure 1.

Soft-PGS guarantees a thermo stability of up to 400°C and high reliability against intense heat cycles (-55°C to +150°C). Its thermal conductivity is guaranteed at 400W/mK in X-Y direction and at 30W/mK in Z direction.

PANASONIC offers a wide range of standard sheets for different IGBT modules from various suppliers. The IGBT module compatible Soft-PGS Search Tool will help you in finding the fitting





solution: <https://industrial.PANASONIC.com/www/soft-pgs-cross>

Comments Simone Saile, Product Manager, Thermal Solutions & Ceramic Devices at PANASONIC: *»As the volume of the heat sink reduces and local power densities increase, there are greater demands on the thermal interface connecting power electronic components to the heat sink. A paste-like TIM-layer is never of homogenous thickness; also, most paste-like thermal solutions degrade over time. Compared to thermal grease and PCM, Soft-PGS fits uneven surfaces far better as well as offering superior workability, reliability and thermo stability.«* (figure 3)

3. Comparison with grease (ref.) / Pump-out test Heat cycle (-40 <->100°C)

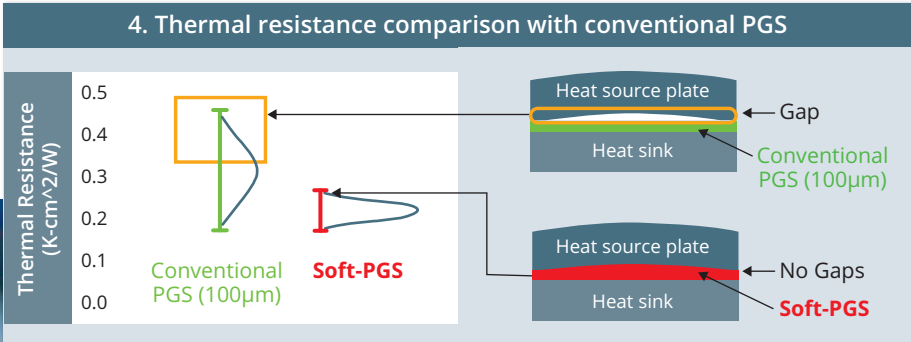
Material	Initial	120 times	Deterioration (Thermal resistance)
Grease			Significantly deteriorated
Soft-PGS			Slightly deteriorated

Characteristics

- Thickness: 200µm
- Thermal resistance: 0.2°C x cm²/W (600kPa)
- Excellent compressibility of 40% (600kPa)
- Thermal conductivity X-Y: 400W/mK / Z: 30W/mK
- High reliability: Thermo stability guarantee of up to 400°C and high reliability against intense heat cycles (-55°C ~ 150°C)

Recommended Applications

- For cooling/heat transfer of electronic devices that generates heat, such as power module.
- Inverters and converters
 - Car-mounted camera, motor control unit, automotive LED, luminous source of laser HUD, medical equipment
 - Base station, Server

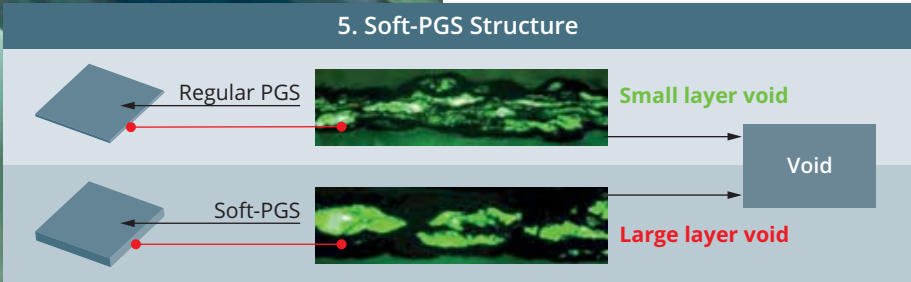


Structure

Soft-PGS is a further development of standard PGS which we already introduced in our Impulse 2016:1. High compressibility property helps to reduce contact thermal resistance due to better fitting to uneven surface compared with regular PGS (figure 4). As shown in figure 5 a unique sintering process creates the large layer void in the Soft-PGS that makes higher compressibility possible.

P06

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GQ

Miniature Power Relay with 12A and reinforced insulation at smallest dimensions

The GQ miniature power relay from GOODSKY offers a 5A and 10A rating for ambient temperatures up to 105°C. The very small housing gives a space consumption on the PC Board of only 180mm².

The relay is UL and VDE listed and provides also a TV5 rating. AgSnO + Indium contacts secure excellent performance in case of inrush currents. The coil consumption is only 200mW with nominal voltages starting from 3VDC up to 60VDC. The minimum creepage distance is 8mm

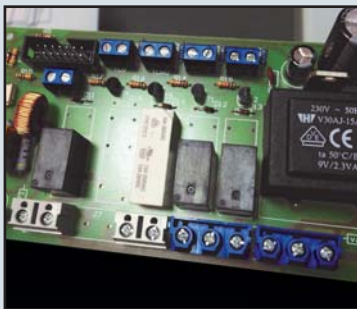
and the minimum clearance distances 5.5mm. With a solid insulation of 2mm and the possibility of a version for glow wire test this relay allows a very universal use in a multiple of applications and industries.

GQ Features

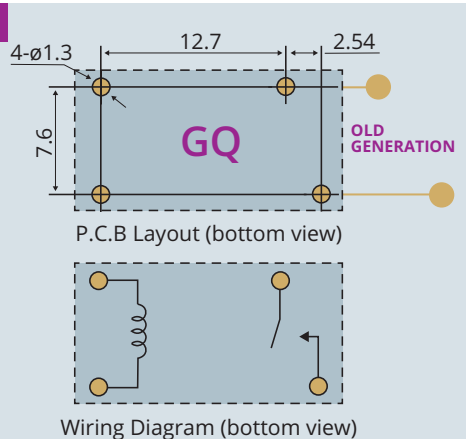
- 1 NO contact, AgSnO + Indium contact material
- 5A standard version
- High performance version with 10A/277VAC respectively 10A/30VDC contact rating and TV5 inrush listing allows to handle strong inrush peaks
- Class F coil system
- Coil voltage from 3Vdc to 60Vdc with 200mW coil sensitivity
- Reinforced insulation acc. to IEC 60335-1
- Ambient temperature up to 105°C
- Version that meets IEC 60335-1 glow wire test at end product optional
- Halogen free series available also in combination with glow wire feature
- Compact dimensions of only 18.2x10.0x14.9mm (LxWxH)
- VDE, cULus, TÜV
- NEW: Reflow soldering version on request

New VDE listing of 12A/277VAC at 105°C for 100.000 operations and 16A/125VAC cos phi 0,75 at 85°C for 50.000 operations.

GOODSKY GQ pinning comparison

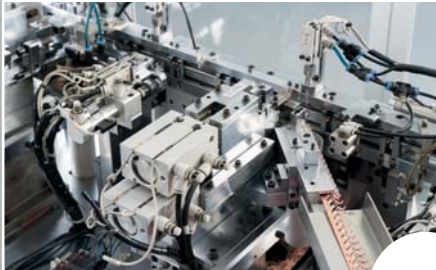


Example of a control board using a double layout





Fully automated production line



GOODSKY's GQ



Applications

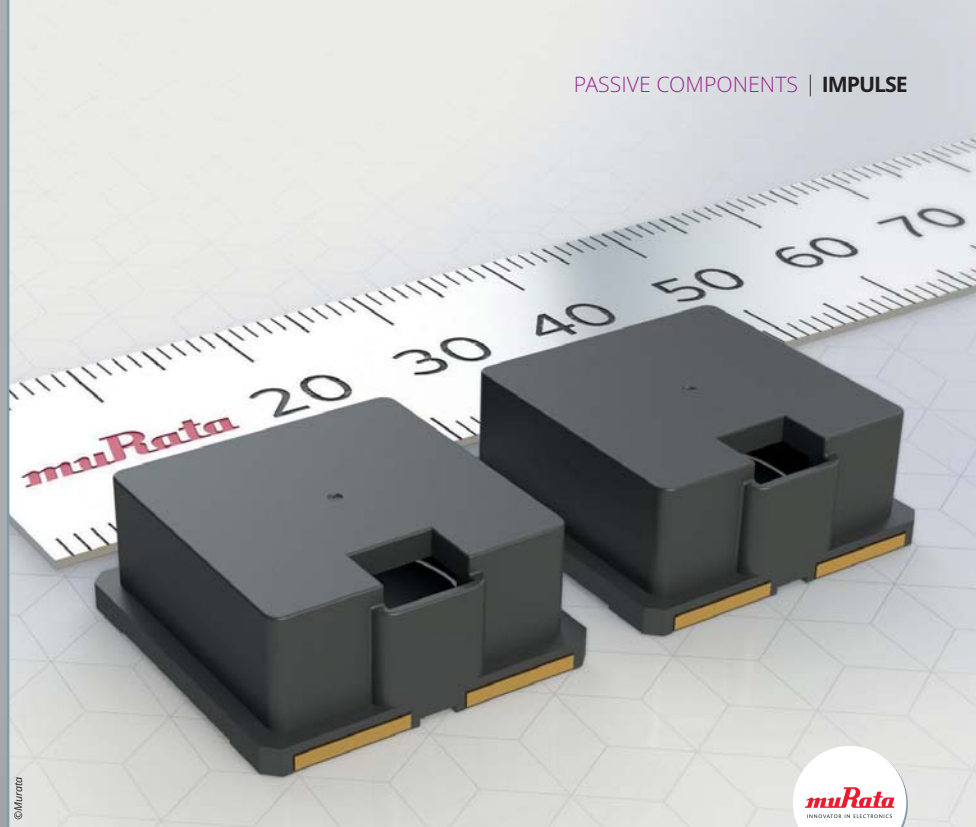
- Heating controls: mixer, burner control, control of high efficiency pump
- Building management: blind controls
- Time delay & control relays
- Measuring & testing equipment
- Light controls

The relay is produced on a fully automated production line. As a special feature the relay is fully automated adjusted. This production module is a unique technology developed by the GOODSKY engineering team and provides a very homogeneous electrical performance of the GQ.

With above features the GQ would be able to replace old generation products if a NO contact is sufficient. In a first step this can be realized with a double layout. In a second step a redesign of the board can save 35% of board space. Our picture show this technology advantage.

P07

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©Murata



New piezo sounder for the automotive & industrial market!

MURATA has introduced the world's loudest surface mount piezo-electric sounder. Facing the market's need for the highest level of reliability, the sounder allows reflow mounting as an effective countermeasure against irregular mounting and abnormal sound.

Meeting this challenge, MURATA applied its unique material technology and high-level manufacturing processes to produce a surface mount piezoelectric sounder. As a result we now can offer to you a new sounder that yields higher sound pressure level with an increase of 10 to 12dB. It is expected that these louder, more reliable sounders can be used in applications like instrument cluster, control panel, power slide doors, power tailgates, and parking assist systems and some more.

Dubbed the PKMCS1818E20A0-R1 the sounder has typically 100dB at 100mm (input signal: +12Vo-p, 2.0kHz, square wave) of sound pressure level and measures a diminutive 18x18x8mm. Its wide operational temperature range of -40 to 105°C enables the sounder to work under demanding and tough conditions.

The simple structure of the sounder does not use any magnet or coil. This reduces the impact of electromagnetic noise on surrounding circuits and contributes to an extremely light weight. It consumes less than a tenth of the power consumed by comparable electromagnetic components. For manufacturing speed and efficiency, the sounders are available in taped reel packaging.

P08

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Small & High-Speed



Features

- Number of contacts: 19, 41 (others upon request)
- Pitch: 0.2mm
- Top contact
- Current rating: 0.2A
- Voltage rating: AC/DC 30V
- RoHS compliant
- Halogen Free



HIROSE has introduced the FH53 series, a range of Flat Printed Circuit (FPC) connectors for small portable electronic devices that require high-speed transmission.

The connector series offers excellent impedance characteristics, and delivers high-density transmission required to support Embedded DisplayPort version 1.3 and MIPI D-PHY version 1.1 standards. The dimensions are compact with a short mounted depth of 3.2mm, a height of only 0.65mm and a fine pitch of 0.2mm pitch to minimize the required mounting area, saving valuable board space.

Two multi-functional metal fittings are incorporated into the connector housing to support correct tabbed FPC insertion/withdrawal and to hold the FPC in place temporarily before the locking operation. A firm and tactile click confirms correct locking of the FPC has been achieved. When locked the metal fittings close to hold the FPC tabs firmly in place to ensure high retention of the FPC.

The unique contact design features a sharp protrusion in the bottom section that presses up into the FPC stiffener to increase the retention force to 9.9N in the horizontal direction. In addition, each contact and metal fitting support the actuator axle during rotation to hold the actuator securely in place.

Solder wicking from the surface mount termination area to the contact points are prevented by a nickel barrier. Clearances are provided at the sides of the contacts/metal fittings and the housing to prevent flux penetration.

Ideal applications are portable electronics that require high-speed transmission, including cameras & video recorders, portable music players, handheld gaming systems, point of sale devices, medical devices and others.

S01

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ix Industrial™

The ix Industrial™ arose from a collaboration between HIROSE and HARTING. It offers a broad technological basis for a new standard in the area of the familiar RJ45.

As a response to the challenging and increasing demand for global digitalisation, both partners – HIROSE and HARTING – recently agreed to combine their strengths. The result of this joint effort is the ix Industrial™ – a new miniaturised Ethernet interface for high-speed data rates. The two partners have jointly standardised the ix Industrial™ mating face in compliance with IEC/PAS 61076-3-124. Meeting this standard provides for future technologies and applications in IoT (Internet of Things) and others. The mass production is planned to start in June 2017.

Miniaturisation with a more robust construction

The mission of the ix Industrial™ is clear: a better high-speed performance in industrial data traffic. It is smaller, more robust and powerful in comparison with the RJ45. Due to this small robust design, it makes fast ethernet available in a number of different industrial applications.



A compact future Ethernet Interface



With a 70% size reduction compared to a conventional RJ45, the ix Industrial™ connector provides more connections using less space on the PCB, space that can be utilized more efficiently.

The ix Industrial™ is ideal for the continuous miniaturisation of applications especially in the Industrial communication network, such as PLCs, controllers, motion and drives, robotics, FA cameras. The socket has 5 THR (Through-hole reflow) shielding contacts for maximum retention on the PCB. The robust structure of the ix Industrial™ ensures stability in harsh environments.

With performance to Category 6A, the ix Industrial™ interface is configured for 1/10Gbit/s Ethernet and is therefore future-proof. High current load capacity accommodates the PoE (Power-over-Ethernet) applications of today and tomorrow. The combination of high-speed data transmission and power in one interface, provides ideal solutions for space saving requirements.

S02

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A miniature

Features

- Contact positions: 2, 3, 4, 6
- Contact pitch: 1.2mm
- Current rating: 3.0A
(2 contact version:
28AWG cable)
- Voltage rating: AC/DC 100V
- Mating cycles: 10
- Cable size: AWG 28 - 30

HIROSE has introduced the DF58 series to deliver a space-saving, low profile, wire-to-board connectivity solution for miniature applications.



The connector range consists of crimp sockets and headers in a single row. The mated height profile is minimised to 1.0mm and the depth to 4.97mm to reduce the space needed on the board.

Although the connector is miniature in size the power rating is not comprised. A high current rating capability of 3A (using the 2 contact version with 28AWG cable) can be achieved to support power supply applications.

Secure connection is guaranteed with the ViSe (Vertical-insertion Swing-extraction) double-locking mechanism. The crimp socket is mated to the header in a vertical direction; however it is guided in at an angle to engage with the positive lock. This ensures high retention force in the upper direction and prevents the cables from easily being disconnected. The friction lock prevents incomplete locking and floating after mating.

Highly reliable 2-point clipping contacts are utilised to stabilize contact resistance and reduce temperature rise. Furthermore, a long effective mating length of 0.29mm is achieved even though the low profile mated height is low at only 1.0mm.

A wide range of applications are suitable such as wearable devices, service robots, drones, medical devices, point-of-sale equipment, digital cameras and many other small portable devices.

S03

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Y-CIRC-P



The BETTER push-pull connector



MADE IN GERMANY

In 2014, the renowned manufacturer of connectors, YAMAICHI, introduced the Y-Circ-P series as an interesting alternative to the existing products. Since then, Y-Circ-P has successfully established itself on the market, not least of all due to many advantages and further developments. Experience has shown that customers especially appreciate the following features.

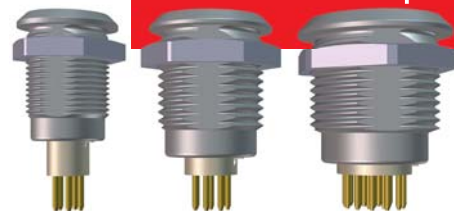
100% Made-In-Germany

The Y-Circ-P connector is an optimized circular connector made of metal with push-pull locking which is developed in Germany and is qualified and produced for the European market. The vertical integration ensures the highest product quality, short delivery times and quick implementation of individual customer requirements. The product portfolio includes suitable accessories as well as customer-specific cable assemblies.

Shorter, Lighter, Cheaper

The Y-Circ-P is up to 20% shorter than comparable circular connectors available on the market. This allows for the use of shorter accessory sockets and thus saving space in the customer application. Thanks to its optimized length, Y-Circ-P is lighter and less susceptible to vibrations. Its design (material savings) and process advantages (logistics) provide significant price benefit.

Identical installation depth



Technical improvements

The optimized collet half shell system offers a better strain relief as well as a force decoupling from the collets to the insulating body. Assembly is made simpler and faster thanks to the use of identical half-shells. Due to the length adjustment, accessory sockets of various sizes can be installed on the same circuit board without requiring additional effort.

Best quality

The Y-Circ-P is made of high quality materials such as chrome-plated brass, peek, gold-plated contacts, etc. and can be plugged in existing systems.

Saving space



Whether you are looking for connectors or customer-specific cable assemblies, we look forward to your inquiry!

S04

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POWERING - FUTURE OF TECHNOLOGY

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Amphenol



BarGuide® Connectors

BarGuide® connectors provide a high current power interconnection with quick connect/disconnect function for space constrained board-to-board, board-to-busbar, and busbar-to-busbar power distribution applications.

- Large surface contact area ensures small voltage loss, minimum heat generation & low insertion/extraction forces
- Current carrying capacity from 65Amps to 140Amps
- Press-fit tails for mounting on both circuit boards & busbars
- Vertical design for parallel/mezzanine applications

SheerPwr™ Circular Connector

SheerPwr™ Circular is a high-current, low-resistance interface designed for connecting busbars to circuit boards. It uses a robust and compliant power contact assembled in a circular orientation. The result is a power socket, designed to mate with traditional machined pins, which provides repeated low resistance, high mis-alignment and high current carrying capabilities.

- Redundant contact points for improved reliability and lower resistance
- Low profile socket - regardless of current carrying capacity
- Provides a minimum of 4.0mm of gatherability, increases with pin diameter

Barklip® I/O Connectors

The Barklip® I/O connector provides a convenient method of distributing up to 200 Amps between busbars, cables and circuit boards. It features 14 fully independent cantilevered beams, providing a true compliant spring to adjust for variations in bus bar alignment and surface finish. The ultrasonic welding connection between the wire and contact increases efficiency and reliability for current transition.

The cable connects with system rack bar, a 3.0mm thick copper bar, to achieve a direct plug-gable connection to an un-insulated busbar. This connection generates very low energy loss, with a maximum resistance of only 0.2mΩ per port.

PwrMAX® Power Connectors

The PwrMAX® connector family offers a compact means for connecting up to 100A DC power in modern system architecture requiring high density and high current. Configurations include coplanar, backplane, mezzanine and orthogonal.

- 100A per contact
- Blind-mating
- GCS® plating provides low resistance
- Press-fit and solder tail termination
- 10 points of contact for long term reliability

eHPCE™ Enhanced High Power Card Edge Connector

eHPCE™ connector offers a 15% increase in power density with the same footprint as classic HPCE®. The all-new power contact design offers lower contact resistance and higher current carrying capacity compared to classic HPCE® connectors. eHPCE™ connectors are designed to extend the life of power supplies using card edge output power connectors.

- Same mating footprint as classic HPCE®
- Enhanced housing design
- GCS® plated contacts deliver lower resistance without the high cost of gold
- Maximum operating temperature increased to 105°C
- Low-halogen housing material

S05

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X-LOK SERIES

Outdoor Connector for Blind Mating from AMPHENOL-LTW

Amphenol

Field Installable Version

AMPHENOL-LTW extends its X-Lok series with a crimp version for field installation. The push lock mechanism provides you the best blind mating practice for a quick and easy connection. It achieves IP68 waterproof protection to prevent your devices from the damage of water ingress. To meet the high industrial standard, the X-Lok field installable adopts UL94V-0 & UL-f1 rated thermoplastic materials against damages from the flammability and UV exposure.

Hybrid Contact Layouts

A further extension of the X-Lok series are hybrid layouts, combining data and power transmission in a single connector. The 11 new layouts are available for the B-, C- and D-size with up to 18 contacts. They are compliant with UL1977 to offer you the safe and stable performance in data and power transmission.



The X-Lok series includes a large variety of different connector sizes and pin configurations, serving as the right solution for your various outdoor interconnections (LED lighting, renewable

Features

- Current rating up to 20A
- Voltage rating up to 300VAC/DC
- Durability 1.000 cycles
- IP68 (1m/24h) in mated & unmated condition
- Push-Lock mechanism with audible feedback
- Accommodates a wide range of wire and cable outer diameters
- UV resistant accord. to UL746c, f1

energy, IP CCTV & security, industrial automation, vehicles, marine,...). Customization and individual cable assembly requests are welcome.

S06

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FICX

Cable connection with IP68 Rating!

Amphenol

AMPHENOL LTW introduces cable joiner, FICX series, for installers to make the cable interconnections simple and reliable in field.

Designed with screw type terminal block, the FICX series provides a cost-saving wiring system, ensuring error-proof and time reduction.

Met IP68 waterproof protection and exposed to 720 hours for UV resistance test, the FICX series is fit for either indoor or outdoor wet locations, enhancing your installation quality. With wide range of connectors: in-line and T-shaped cable joiner, the FICX series is available to accommodate various cable OD and wire sizes as your quick-connecting solutions.

A wide range of applications are suitable such as LED lighting, renewable energy, marine electronics, industrial automation, IP CCTV & security, outdoor wireless and vehicles.

S07

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Features

- 1.00mm pitch
- Different stacking heights from 4.15mm to 7.00mm
- Configurations from 9-69 positions (right angle from 31 positions)
- Data transmission up to 5Gbps
- Focuses on Industrial & Instrumentation and Automotive & Infotainment

CONAN®

The well-known mezzanine board-to-board connector system CONAN® from Amphenol-FCI is now available in right angle configurations.

This connector family enhances secure mating with an audible «click» and assures the ease of use. It is especially ideal for industrial applications and harsh environments.

Amphenol
FCI

S08

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New right angle configurations: 1.00mm!

COSEL, ISABELLENHÜTTE, PANASONIC, RUBYCON & QUALCOMM: Five key suppliers honor CODICO



Fltr.: Michael Froemel (CODICO), Bill Casby (QUALCOMM)

Bill Casby, Senior Director Global Channel Sales at QUALCOMM, presented CODICO with an *»award for best distributor performance in demand creation and attracting new customers«* and projects for QCA and QTIL (formerly CSR) products, and, in addition, for above-average growth. CODICO's Sales Manager Michael Froemel, who received the award on behalf of the company, made the following comment: *»The award presented by QUALCOMM delivers another proof that the investments made in market development during the last five years have paid off. QUALCOMM is thus acknowledging our efforts in the areas of smart building, IoT, and automotive. This distinction is a great honor for us!«*

During electronica 2016, CODICO was presented by RUBYCON with the *»Distributor excellence Award for outstanding Performance in Automotive Business Europe«*. RUBYCON is thus honoring the exceptional new demand and the numerous projects that CODICO has developed and implemented with RUBYCON. Osamu Yokozawa (Managing Director Sales & Marketing at RUBYCON) was particularly delighted over an especially successful

Fltr.: Osamu Yokozawa (RUBYCON), Sven Krumpel (CODICO)



Fltr.: Thomas Jell (CODICO), Maximilian Jakob (PANASONIC)

year, new opportunities, and the expected increase in sales. One reason for this success is definitely the reliability and high quality of RUBYCON's products. But the know-how, several years of experience, and the close cooperation between RUBYCON, customers, and CODICO have played an at least equally decisive role in this.

Maximilian Jakob, Sales Director, Product Marketing Department at PANASONIC, was very pleased to present CODICO with the award in the *»Demand Creation«* category. As he explained, *»CODICO is a company that constantly looks into the future, adapts new technologies and adds new markets. The company is very successful in identifying new market opportunities for us, and this is why I am very pleased to honor this achievement.«* CODICO is keen on cooperation with dynamic & innovative partners. PANASONIC is considered an excellent example of such a provider. Regarding the partnership with PANASONIC, Thomas Jell, Executive Sales Manager for Passive Components at CODICO, particularly appreciates the open exchange between the companies. *»We feel honored to be presented with this award and we are very thankful to PANASONIC.«*

Fltr.: Masato Tanikawa (Cosel), Sven Krumpel (CODICO)



CODICO Team with CEO ISABELLENHÜTTE

Masato Tanikawa, President & CEO COSEL Co. Ltd., and Yuichi Nakagawa, Managing Director of COSEL Europe GmbH, were very happy to present CODICO with an award for *»5+ years of continuous growth in Europe«*. CODICO has been working together with COSEL for more than 15 years, and is proud to have such a high-quality, innovative partner at its side. The fact that we have received an award for five years of continuous growth confirms us in our decision to focus on very long-term partnerships in a dynamic market.

At the 2017 European Distribution Meeting, CODICO's German manufacturer ISABELLENHÜTTE presented the company with the annual *»Best Distributor of the Year«* award. CODICO has received this award twice in a row. This result reflects the close and successful cooperation between ISABELLENHÜTTE and CODICO. The criteria for the choice of the best distributor were not based only on sales but also on activities in the area of marketing and distribution, such as brand awareness, promotion of new products, and customer-specific projects. For Dr. Felix Heusler (Managing Director) and Anton Roth (Sales Manager Components), this award represents a recognition for the economic success, and also for the proactive and strategic approach of CODICO. For CODICO, this distinction is a great honor and, at the same time, an incentive to continue meeting the requirements of its customers in a demanding market.

CODICO wishes to thank them for the awards and the recognition that these represent!

D02

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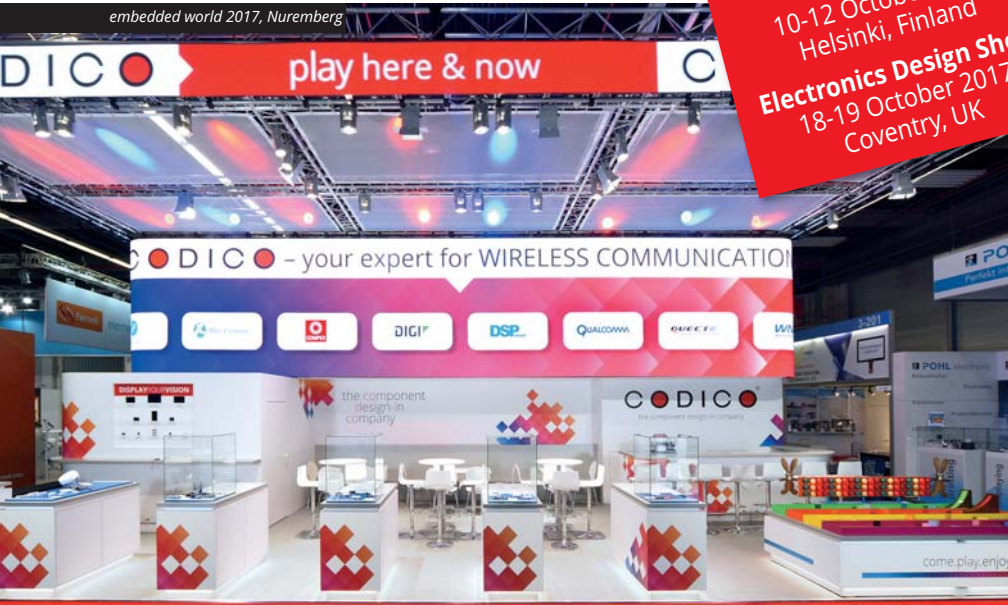
electronica 2016, Munich

MEET CODICO LIVE

In 2016/17 CODICO once again featured at a large number of trade fairs, welcoming existing and potential clients at the CODICO booth. At the electronica 2016, and again at the embedded world 2017, CODICO was there to impress: offering technical advice to our guests on our stand, as well as a warm and genuine welcome. But there were trade fairs in Sweden too, and the Czech Republic, and in England, and our regional sales teams were there every time.

Trade fairs are always excellent opportunities for visitors to the event to find out more about the very latest in technical innovations, as well as CODICO's own Design-In offer. Our marketing and product experts are there to give you advice, both in theory and practice, right on the spot. And perhaps CODICO might soon be coming to an event near you as well. 2017 has a lot of exciting things to offer. You can meet CODICO, for example, at:

embedded world 2017, Nuremberg



Elkom 2017
10-12 October 2017
Helsinki, Finland

Electronics Design Show
18-19 October 2017
Coventry, UK



Amper 2017, Brno, Czech Republic



Electronics Design Show 2016, Coventry, UK



Elektronik 2017, Gothenburg, Sweden

Current events can always be found at:
www.codico.com/en/Fairdates.htm

D03

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The CODICO TEAM says hello!



Matteo Dadati



Dear Impulse reader, it is my turn to introduce myself! My name is Matteo Dadati and I am 43 years old. I joined CODICO at the end of 2013. I started as Field Sales Engineer covering sales and promotion of Passive Components in Italy. Since January 2016, I became the Regional Sales Manager for Italy and France in Passive Components Group.

Actually, my history with CODICO started a bit earlier than 2013. I met with CODICO Passive team already in 2008 when I was working for one of their suppliers, a Japanese company. My function was to support the design activity of CODICO sales team for Austrian and German customers. Thanks to this opportunity, I could meet many of my actual colleagues and I got to know a bit about this company, its history and values. When I decided to leave my previous company, I was so lucky that CODICO was looking for someone to establish a sales network for Passive Components in Italy.

CODICO is a multinational and multicultural company. We have contacts with colleagues, customers and suppliers coming from all over the world. I meet wonderful people and share great experiences. To meet different cultures, different life experiences and different point of view is something very important to extend my horizon and to grow as a person.

What I also like at CODICO is that we focus on the design activity. We try to find the best solutions based on customer requirements. This gives us the possibility to study and to learn a lot about different applications and different solutions and we can provide an added value to our customers. This is something not really common nowadays in our life and I am really happy to find it at CODICO.

I am located in Italy, in a small town called San Donato Milanese, near Milano. I have the luxury to work in the same town where I live and this means a lot for me. I can balance my day between work and private life and even I travel quite often to visit my customers, I can also be close to my kids and spend time with them. My son, Lorenzo, is 13 years old and my daughter, Beatrice, is 9 years old. Nowadays they are my main interest and I spend most of my free time with them. We like to go to cinema, visit museums, eat Japanese food and, of course, eat pizza. We like to travel and discover new places but also to have relaxing holidays at seaside.

Out of this, I love to read books and practice sports like running, soccer, tennis and ski. Few years ago, I had the chance to approach also Golf and I found it a very interesting activity. Golf requires a lot of patience and very high concentration level. I could not believe it before, but I must say that I like this sport very much. It brings you in beautiful places and you can spend one full day open air walking and chatting with friends. In some cases, I could say that Golf is a good training for my job as well.

Three and a half years already passed from my first day at CODICO. It has been an exciting period of my life, full of challenges, hard work and a lot of fun. I look forward to face new challenges and to support the design activity of our customers. I hope to meet you soon and discuss about your new projects!

D04

▶ Matteo Dadati, +39 0236752945, matteo.dadati@codico.com



Brian Yule

I joined CODICO just over three years ago as a Technical Field Sales Engineer in the Active Components group, supporting UK and Ireland alongside my colleague Steve Price. Although stuck out on an increasingly remote and independent island (I wrote this piece as Article 50 was triggered), it is always refreshing to visit CODICO HQ in Perchtoldsdorf for a warm Austrian welcome, a few days of product training and multi-cultural office banter, followed by relaxed evenings socialising over a glass or two of »Weissbier« or fine wine (it keeps Europe in my veins!)

I started my career in the diverse and exciting world of electronics after graduating way back in 1987, mostly involved in some form of technical support position, enjoying pan European travel. By late 2013 I was delighted to accept a position with CODICO to support the UK territory, but now adding a commercial role alongside my technical responsibilities.

I live in a small town called Tetbury, based in the Cotswolds, not far from Bath and Bristol. It's a peaceful countryside setting, ideal for exploring the great outdoors. Outside of work I have many activities, most of which are juggled alongside my growing family of two young children with my lovely wife Vikki. We spend much quality time together, mostly at weekends trying to exhaust the children with plenty of fresh air and exercise. I usually feel the need to fill my lungs and stretch my legs a few times a week, running and cycling are my exercise staples. I try to participate in a couple of half-marathons a year and also enjoy the occasional hike, windsurfing, skiing/snowboarding and round of golf (just to unwind).

I'm really a frustrated musician. I have played trumpet since childhood (to the detriment of a peaceful family home), enjoying many exciting moments from youth orchestras to semi-pro European tours, in all forms of musical genres including classical, jazz, Latin, big-band, brass-band, blues, funk, reggae, pop, etc... you name it, they all need a trumpet! Out of all my musical interests, I would say it's jazz that runs through my veins (alongside »Weissbier!«). I play in a couple of bands performing at clubs, pubs and festivals and occasional recording session. It's great to be on stage, but as I am often reminded... »don't to give up the day job, Brian!«

My drive for a happy life is to have a great work-life balance. I'm still working on this, although I do find my focus on the autonomous responsibilities I enjoy with CODICO is somewhat energised by my passion for family fun, music and exercise.

D05

▶ Brian Yule, +44 7787550898, brian.yule@codico.com



Regina Macho

I joined the CODICO team in 2011 as an assistant to the Management, where I was able to actively support our management in various ways. The diversity of tasks and the contact to company members of all groups continues to be particularly exciting in my current activity.

Since graduating from the commercial college in Mödling, I always worked as assistant to the management, a position that also allowed me to gather experience in other industries (tax consulting and real estate) for a few years.

My greatest challenge began in 2013, when my daughter Linda was born, and she has been keeping me on my toes ever since. She is like a tiny tornado that turned life upside down, and she puts me in a state of proud amazement every single day. Since 2015, I have been working part time on mornings from Monday to Thursday in Personnel/Human Resources, where I primarily support our Austrian employees in connection with salary accounting, billing, various reports, contracts, time management and many other matters affecting the staff. I am very happy to be entrusted with this responsible task, which gives me the opportunity to acquire new knowledge every day and to outgrow myself.

I dedicate all my free time to my family. Sports are my favourite pastime, though I do not always manage to find the time. Whether riding the bike, doing garden work, walking in the woods, skiing or travelling to the sea: the main thing is to be outdoors in nature (especially when the sun is shining). My greatest passion is dancing, which I followed actively for some time until I had to pause because of my daughter's birth. And yet, I don't manage to stand still when good music is playing. I can best relax when playing the guitar, which I somehow taught myself a bit, but I can also recover and recharge by reading a good book or watching a movie.

D06 Regina Macho, +43 1 86305-106, regina.macho@codico.com



Benjamin Einfalt

My name is Benjamin Einfalt, and I've been with CODICO for just nine years now. My colleagues and I in the IT department are responsible for our technical infrastructure. It's an area with a lot to cover, and it ranges from simply switching on a screen (that's not a joke, either; in my nine years with CODICO I've actually had to do that) to setting up my colleagues' mobile phones, and on to installing really complex server systems and looking after them. It's a big job, and that's what makes the work challenging and interesting, because every day can always bring new surprises.

My private life has its surprises too, because with two boys aged six and three there are also always new challenges to deal with. And in about a month there will be a daughter too. That's why I try to get some sports activity in as often as I can, and to give myself a good workout I go to the fitness center two or three times a week.

D07 Benjamin Einfalt, +43 1 86305 116, benjamin.einfalt@codico.com



SUCCESS STORY:

A year of the CODICIO Sample Shop

Our CODICIO Sample Shop has been online for a whole year! A year in which we have given our customers and everybody else interested the opportunity, with the help of a selection tool, to find online the right sample to develop their particular project. And a year in which we have had some incredibly positive feedback and a huge number of project enquiries.

4,000 items waiting for you

In February 2016 CODICO started out with 127 items, but that number very soon shot up. Today the Sample Shop has more than 4,000 items, and every one is a winner! There are already 26 suppliers with products represented in the Shop. A lot of them are in the powerline communications sector and the capacitor and relay market, and those are just a few of the areas of application available.

In addition to the advantage of free delivery, other highlights of the Shop are its user-friendliness, its design, the fast delivery of the products, and, of course, the selection possibilities which select exactly the right sample for you.

LOOK

»An added bonus is that you can always find the right person to talk to, and that means the real specialists, people with the expert know-how to deal with every enquiry«, says Sven Krumpel, CEO CODICO, talking about the new modern online presence.

Try it for yourself. The right sample or demo board is waiting for you at www.codico.com/shop. We wish you a successful online shopping experience!

D08 Miriam Kaitan-Aichberger, +43 1 86305 129 miriam.kaitan-aichberger@codico.com



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