ENGLISH

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impulse

2/2017

QUECTEL: ALL-IN-ONE

»Light up your way« by PANASONIC

Customized Antenna & RF Solutions by SINBON

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QUECTEL SC20 is the first generation of Smart modules based on QUALCOMM Snapdragon platform. SC20 is a multi-mode LTE CAT 4 module with built-in Android OS, in SMT package and Industrial temperature range. It delivers speeds of 150Mbit/s downlink and 50Mbit/s uplink data rates and is ideal suited for both, industrial and consumer applications requiring the highest data-rate and high-speed internet access.

ACTIVE COMPONENTS

PASSIVE COMPONENTS

CONNECTORS

CODICO IN-HOUSE

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Editorial

40 YEARS OF CODICO

HAPPY BIRTHDAY CODICO!

40 years ago my father-in-law Heinrich Hawlik first established the foundations of CODICO, when on 7 December 1977 our company was founded by him and Ludwig Waktor in Vienna. The task and mission were then, as they still are today, to distribute customer-related electronic components. Back in 1977 things started with three members of staff and a turnover of 4.5 million Austrian Schillings. Today, CODICO has more than 158 staff members across Europe, and will achieve a turnover of 145 million Euros in 2017.

Together with a winning team, firm roots, and on the right track to growth, we have come a long and very successful way over the last 40 years. Above there's a picture of our team, and every single one of them contributes to the triumphs which we have achieved today.

But the most important contributors over all the years were you, our customers, the people who took an interest in our company. I would like to take this opportunity here and now to offer my warmest thanks to all those who have helped CODICO to become what it is today, for the loyalty you have shown to us, and for the trust you have placed in us.

Sven Krumpel
CEO CODICO

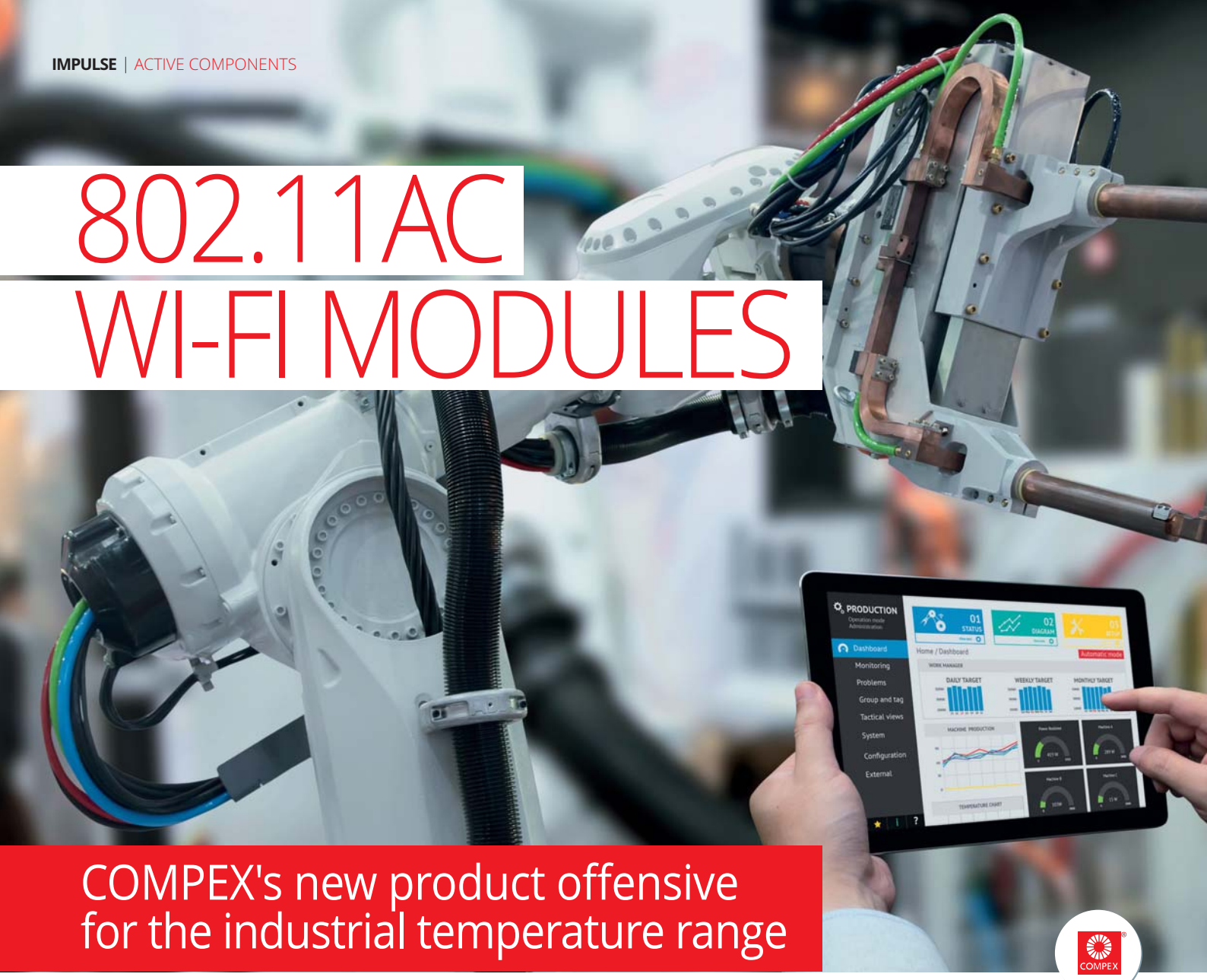
Even as the Managing Director, you always need that feeling of confirmation, that sensation which simply does you good, especially when it comes directly from the customer. And that is why we are particularly pleased to have been honoured, as we celebrate our 40th birthday, by the selection of »Distributor of the Year«. On 14 September 2017, the leading magazine for design engineers and technical management within the German electronics market presented the »Distributor of the Year« awards, and we were proud to achieve third place in the »Embedded: delivery service volume« category.
In addition to this excellent place on the podium, CODICO also attained a total of 15 top-ten places in the most widely differing criteria and categories.

We shall carry this positive achievement with us into the future, into further successful years together with our team, with our customers, with our partners – and with you!

D01

Sven Krumpel

802.11AC WI-FI MODULES



COMPEX's new product offensive for the industrial temperature range

Manufacturers of industrial APs, routers, and hubs are increasingly opting for the Wi-Fi broadband standard 802.11ac. So, it is no surprise that Wi-Fi module specialist COMPEX has consistently enlarged its product portfolio for this standard in recent years. While the first PCIe modules by COMPEX came in oversizes of up to 50.95×50mm, all 11ac PCIe modules are now available in full-size form factor (standard: 50.95×30mm), even for MIMO 4×4 solutions.

COMPEX, founded in 1989, can look back at 14 years of cooperation with Qualcomm, and uses exclusively the latter's Wi-Fi technology in all its modules. Moreover, COMPEX is an official ADC (Authorized Design Center) partner of Qualcomm and, in addition to reference designs, it also offers its customers support in customized hardware and software designs.

COMPEX has long had a reputation in the industry as a specialist for PCIe Wi-Fi modules with an extended (-20°C to +70°C) and industrial temperature range (-40°C to +70°). The latter exclusively builds in components with an industrial temperature range (-40°C to +85°), and the model names feature an »-I« (Industrial) for distinction. The upper limit of 70°C indicated for these modules is due to the fact that the temperature information refers to the ambient area, i.e. outside the shielding. Since the temperature inside the shielding is higher than outside, especially at high data speeds, COMPEX recommends maintaining a safety margin for permanent operation in order to achieve long reliability.

Most 11ac modules are available in both temperature ranges, i.e. in versions with and without »-I«. The two tables provide a general overview of all available 11ac modules. The solutions are divided into single-band and dual-band. The single-band modules (operation in 5GHz) already include 4 new modules: WLE650V5-18A-I, WLE 650V5-25A-I, WLE1216V5-20-I, and WLE1000V5-20. While the first three modules represent the industrial version of the already available WLE 650V5-18A (MU MIMO 2×2), WLE650V5-25A (MU MIMO 2×2), and WLE1216V5-20 (MU MIMO 4×4) modules, the WLE1000V5 is the first single-band 802.11ac version with MU MIMO 3×3.

As a rule, all single-band modules basically distinguish themselves through the antenna configurations available and the resulting data speeds of 867Mbps @ MU MIMO 2x2, 1.3Gbps @ MU MIMO 3×3, and 1.7Gbps @ MU MIMO 4x4. Another distinguishing feature is their output power. Where the WLE650V5-18A family supports a maximum output power of 18dBm @ 5Ghz per chain, the high-power WLE650V5-25A family offers an output power of 25dBm @ 5GHz. The

WLE1216V5-20 family and WLE1000V5-20, on the other hand, support the usual 20dBm @ 5Ghz per chain. What all single-band 5GHz modules have in common is that they support multi-user (MU) mode and also 80MHz+80MHz channel bundling for e.g. 1SS or 2SS (SS = Spatial Stream). Only the WLE1000V5 module does not support channel bundling.

Due to the high bandwidth and the resulting dissipation rate, all single-band modules are available with a heat sink as a standard feature. Nevertheless, COMPEX is open to change requests from its customers. Therefore, these modules can also be delivered with customised heat sinks or even without any.

While the single-band modules specialise in the 802.11ac and 802.11a/n @ 5GHz standards, the dual-band modules also offer 802.11b/g/n @ 2.4 GHz operation. Among these solutions, one module stands out with its design and size of only 1.2×1.2 cm. Though COMPEX previously focused exclusively on modules with a PCIe interface, it has now left this path and also offers a solution with a low-power SDIO 3.0 interface for the first time. The WSD377 module is based on Qualcomm's QCA9377-3 featuring Bluetooth 4.2 in addition to the Wi-Fi functionality. At Qualcomm, this component is listed in the IoT product group, and therefore it is clear that COMPEX intends to expand its existing clientele in the industrial sector to also include IoT. Further IoT modules are on the company's roadmap.

For a comprehensive overview of all available modules and latest datasheets, go to:
http://downloads.codico.com/misc/AEH/COMPEX

Should you have any further questions, please contact

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André Ehlert, +49 89 1301 438 11
andre.ehlert@codico.com

PART NUMBER	WLE600VX	WLE600VX-I	WLE900VX	WLE900VX-I	WSD377
					
Ordering Item Code	WLE600VX 7AA000S	WLE600VX 7BA000S-I	WLE900VX 7AA000S	WLE900VX 7BA000S-I	WSD377 7A0000-TS
Standard	802.11 b/g/n/a/ac	802.11 b/g/n/a/ac	802.11 b/g/n/a/ac	802.11 b/g/n/a/ac	BT 4.2 + 802.11 b/g/n/a/ac
Band	2.4GHz & 5GHz	2.4GHz & 5GHz	2.4GHz & 5GHz	2.4GHz & 5GHz	2.4GHz & 5GHz
MIMO	2x2	2x2	3x3	3x3	MU 1x1
Chipset	QCA9882	QCA9892	QCA9880	QCA9890	QCA9377-3
Interface	PCIe 1.1	PCIe 1.1	PCIe 1.1	PCIe 1.1	Low Power SDIO3.0
Voltage	3.3V	3.3V	3.3V	3.3V	3.3V
Power (Per Chain)	2.4GHz @ 21dBm, 5GHz @ 20dBm	2.4GHz @ 21dBm, 5GHz @ 20dBm	2.4GHz @ 21dBm, 5GHz @ 20dBm	2.4GHz @ 21dBm, 5GHz @ 20dBm	2.4GHz @ 20dBm, 5GHz @ 17dBm
Power Consumption	3.5W (Max)	3.5W (Max)	5W (Max)	5W (Max)	TBD
Receiver Sensitivity	-94dBm @ 6Mbps	-94dBm @ 6Mbps	-94dBm @ 6Mbps	-94dBm @ 6Mbps	-92dBm @ 6Mbps
Antenna Connector	2x U.FL	2x U.FL	3x U.FL	3x U.FL	Pin
Temperature Range	-20°C to 70°C	-40°C to 70°C*	-20°C to 70°C	-40°C to 70°C*	-30°C to 85°C
Dimension (mm)	51 × 30 × 3.2	51 × 30 × 3.2	50.95 × 30 × 3.2	50.95 × 30 × 3.2	12 × 12 × 1.5
RoHS Compliance	yes	yes	yes	yes	yes
Certifications	CE, FCC, IC, TELEC	CE, FCC, IC, TELEC	CE, FCC, IC, TELEC, KC, NCC	CE, FCC, IC, TELEC, KC, NCC	TBD
Reference Design	XB140	XB140	XB140	XB140	Compex Design
Linux Support	ath10k	ath10k	ath10k	ath10k	ath10k
Windows Support	Not Available	Not Available	Not Available	Not Available	10, 8.1, 7, Vista, XP, 2000

**The module can operate up to 90°C. For long term reliability, a 20°C safety margin should be maintained.*

LTE-M VERSUS NB-IOT

COMPARING NEW CELLULAR CONNECTIVITY OPTIONS

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Cellular Advantages for IoT Applications

- Low power consumption
- Greater coverage
- Enhanced security
- Efficient data transfers
- Excellent scalability
- Maximum coverage
- Decreasing costs

Traffic is changing lanes

Across industries and applications, engineers and product designers are increasingly attracted to the bandwidth and ubiquity of cellular networks to provide connectivity for their devices deployed almost anywhere in the world. With as many as 20 billion IoT devices in service by 2020, cellular is poised to move past low-power WAN infrastructures, thanks to several key advantages:

1|Low Power Consumption: Most devices can last up to 10 years in the field using a battery of five watt-hours.

2|Greater Coverage: Cellular networks are nearing almost complete coverage and are suitable for indoor and outdoor deployments.

3|Enhanced Security: DIGI TrustFence provides a tested and fully integrated security framework designed for the industrial IOT. The built-in security of DIGI TrustFence gives you secure connections, authenticated boot, encrypted data storage, secure JTAG, secure software updates, and TLS v1.2 for secure over-the-air data transmissions.

4|Efficient Data Transfer: Enabled by small, intermittent blocks of data.

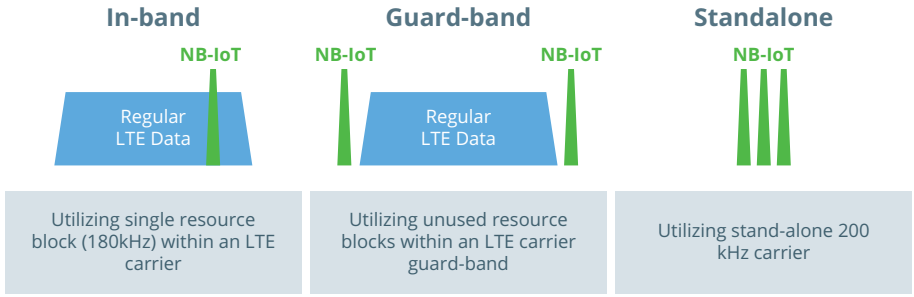
5|Network Availability: As carriers continue to build out their networks to the furthest and remotest areas, there are fewer limits to where you can deploy.

6|Decreasing Costs: Many carriers are rolling out data plans expressly targeting the unique nature of IoT devices, making cellular connectivity a far more affordable option.

But the question arises: what's the right cellular infrastructure to adopt for your IoT devices? In this white paper, we compare Narrowband IoT (sometimes called NB-IoT or NB1) with LTE-M (also known as LTE Cat-M or Cat-M1).

Introducing NB-IOT for Cellular IoT Deployments

NB-IoT is a new mobile data standard that responds to the rapidly expanding market for low power wide area (LPWA) connectivity. It's part of the Release (13) from the 3GPP cellular standards body. Like its LTE-M counterpart (see below), NB-IoT is optimized for lower-bandwidth applications with data rates at or below 250 Kbps. Initial NB-IoT deployments in 2017 and 2018 are primarily in Europe and in parts of Asia. However, since U.S. carriers have already invested heavily in LTE-M infrastructure updates, it is unlikely they will deploy NB-IoT networks in the near future.



However, in those European and Asian regions, the characteristics of NB-IoT make it ideal for applications where devices that sleep most of the time, waking up only periodically to report their readings/data such as sensors on remote equipment. NB-IoT uses a simple architecture based on the single-carrier frequency division multiple access (SC-FDMA) standard and a DSSS modulation scheme that decreases hardware costs and complexity.

NB-IoT supports ultra-long battery life (up to 10 years), extended range (up to 700 percent better than current LTE technology) and better building/obstacle penetration for a wide range of applications and use-cases. For instance, NB-IoT is ideal for remote/sleepy industrial sensors, commercial meters, precision agriculture sensors, and a wide range of smart-city applications.

Note that NB-IoT is not, strictly speaking, an LTE technology. Instead, it branches away from the LTE framework and can be deployed in a number of different ways, such as:

- 180 KHz band within the GSM spectrum
- Within an LTE guard band
- Independent 200KHz frequency band

The Advantages of NB-IoT

1|Optimized for low-power consumption, even while transmitting: Other cellular technologies (such as LTE-M) derive most of their power-saving advantages by sleeping and limiting transmission times and frequencies. NB-IoT excels in its ability to sleep (with support for eDRX) and minimize power consumption during data transmission, primarily due to a simplified data-transmission method and lower data rates, which reduce the need for power-hungry signal processing and improve overall efficiency.

2|Simpler and less-expensive radio design with a single antenna: This characteristic reduces the barrier to entry for new customers and applications that can integrate low-power cellular technology into their solutions.

3|Improved range and clarity: With its reduced data rates and simplified radio design, NB-IoT has stronger link budgets than other cellular technologies. That means greater range/coverage and strong penetration through buildings and other obstacles. That makes NB-IoT ideal for applications using devices deployed in difficult-to-reach places.

Introduction to LTE-M Cellular Technology

LTE-M is another new standard for the LPWA market that's part of Release 13 from the 3GPP. Like NB-IoT, LTE-M is optimized for lower bandwidth applications using devices that sleep and report their data periodically. It supports multi-year battery life with extended ranges and better penetration of buildings and obstacles for devices that are deployed in hard-to-reach places. It is ideal for use-cases including remote/low-density industrial sensors, automated commercial meters for water or gas systems, connected healthcare devices, and even intelligent industrial lighting systems. LTE-M offers two key features that provide exceptional power efficiency Power Savings Mode (PSM) and Extended Discontinuous Reception (eDRX).

PSM

PSM enables the device to notify the cellular network that it's going to sleep and when the network can expect it to wake up. This is achieved using timer values sent by the device. Registration to the network is maintained even when the device is asleep, so the device uses very little battery power. Then, it awakens on schedule to exchange data, or it awakens earlier if important information (e.g., an alarm) must be transmitted immediately. The LTE-M device can remain in this registered sleep state for up to 12 days. Once the device awakens and transmits its data, it must wait for a short period of time to listen for responses from the network (four idle frames), after which it can return to sleep.

eDRX

eDRX improves power efficiency for cellular devices by reducing the »chattiness« between the device and the network. A normal LTE device must be active for a paging cycle every 1.28 seconds. However, an LTE-M device using eDRX is only required to be active for a paging cycle every 10.24 seconds. In other words, a device that is connected to the network (communicating or idle) need only be in an active, power-consuming state for about 10 percent of the vs. non-eDRX devices. eDRX also allows the device to notify the network that it will skip a predetermined number of these 10.24s cycles, extending paging intervals to 40 minutes or more. Both eDRX and PSM save power, but eDRX facilitates reduced power consumption for devices that are awake and connected/idle.

NB-IOT VS LTE-M VS OTHER LTE TECHNOLOGIES

	RELEASE 8 CAT 4	RELEASE 8 CAT 1	RELEASE 13 LTE-M	RELEASE 13 NB-IOT
Downlink speed	150Mbps	10Mbps	384kbps-1Mbps	170-250kbps
Uplink speed	50Mbps	5Mbps	384kbps-1Mbps	50-144kbps
Number of antennas	2	2	1	1
Duplex mode	Full duplex	Full duplex	Full or half duplex	Half duplex
Receive bandwidth	20MHz	20MHz	1.4MHz	200kHz
Transmit power	23dBm	23dBm	20dBm	23dBm
Modem complexity	100%	80%	20%	<15%
Voice	Yes	Yes	Yes	No
Mobility	Full	Full	Limited	Fixed Idle Mode only

LTE-M vs NB-IoT

The Advantages of LTE-M

1|Simpler, less expensive hardware: Devices can connect to LTE networks with simpler modems that only require one antenna, because they are half-duplex and have a narrow bandwidth.

2|Longer Battery Life: Devices can leverage new Power Savings Mode (PSM) and extended discontinuous reception (eDRX) to achieve up to 10 years of battery life.

3|Cheaper Data Plans: LTE-M devices use lower data rates than other LTE devices (typically less than 300Kbps), so they are less network-hungry, enabling carriers to vastly reduce monthly costs of data plans for OEMs.

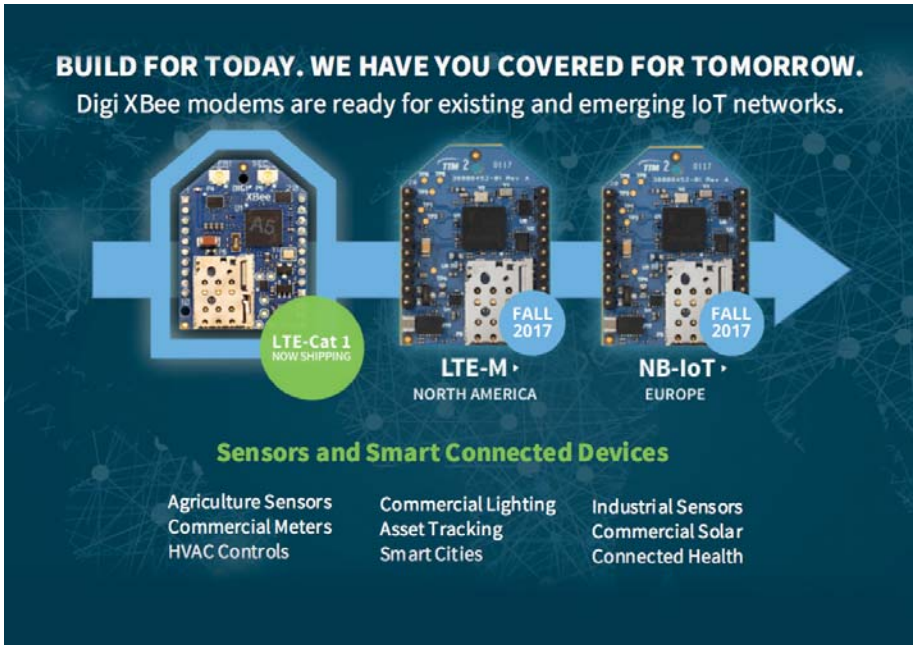
Build for Today

LTE Cat 1 is today's critical cellular technology for low-power, low-bandwidth IoT deployments. However, since it only supports data rates of 10Mbps/5Mbps (down/up), it's not well-suited for higher bandwidth applications that require streaming data or large file transfers. LTE Cat 3 or 4 are better suited for applications requiring higher data rates (150Mbps/50Mbps).

On the other hand, LTE Cat 1 is a great option for LPWA applications that require low-power consumption and transmit smaller amounts of data less frequently. LTE Cat 1 is fully available across North America, so it's ready for immediate deployments. With the DIGI XBee Cellular and its industry-leading sub-10uA Deep Sleep functionality, OEMs can design LPWA devices to work with existing LTE Cat 1 infrastructure today – and, in the future, swap to the ultra-low-power DIGI XBee LTE-M or NB-IoT with little to no hardware or software redesign.

Be Ready for Tomorrow

LTE-M and NB-IoT promise to improve range by 4-7x while further enabling battery life of up to 10 years – all with significantly lower hardware and data plan costs. However, these new networks are still being deployed and availability isn't yet widespread. Carriers are in the early stages of upgrading their infrastructures, with plans for full service availability by the end of 2017 that includes new advanced power management features like PSM and eDRX. Forward-looking OEMs are starting with LPWA implementations that leverage LTE Cat 1 and preparing a seamless transition to LTE-M and/or NB-IoT as those platforms become fully available.



The DIGI XBee line of wireless solutions provides a consistent hardware footprint, standard pin-out connections, and an award-winning software interface across a wide variety of communications protocols. They include ZigBee, 802.15.4, DIGIMesh, Wi-Fi, as well as longer-range proprietary (100+ kilometer) solutions. DIGI XBee devices manufactured more than a decade ago remain hardware- and software- compatible with the latest XBee products, including the new DIGI XBee Cellular LTE Cat 1. DIGI's XBee LTE-M and NB-IoT modems will deliver these new technologies in a fully backward-compatible and future-proof platform.

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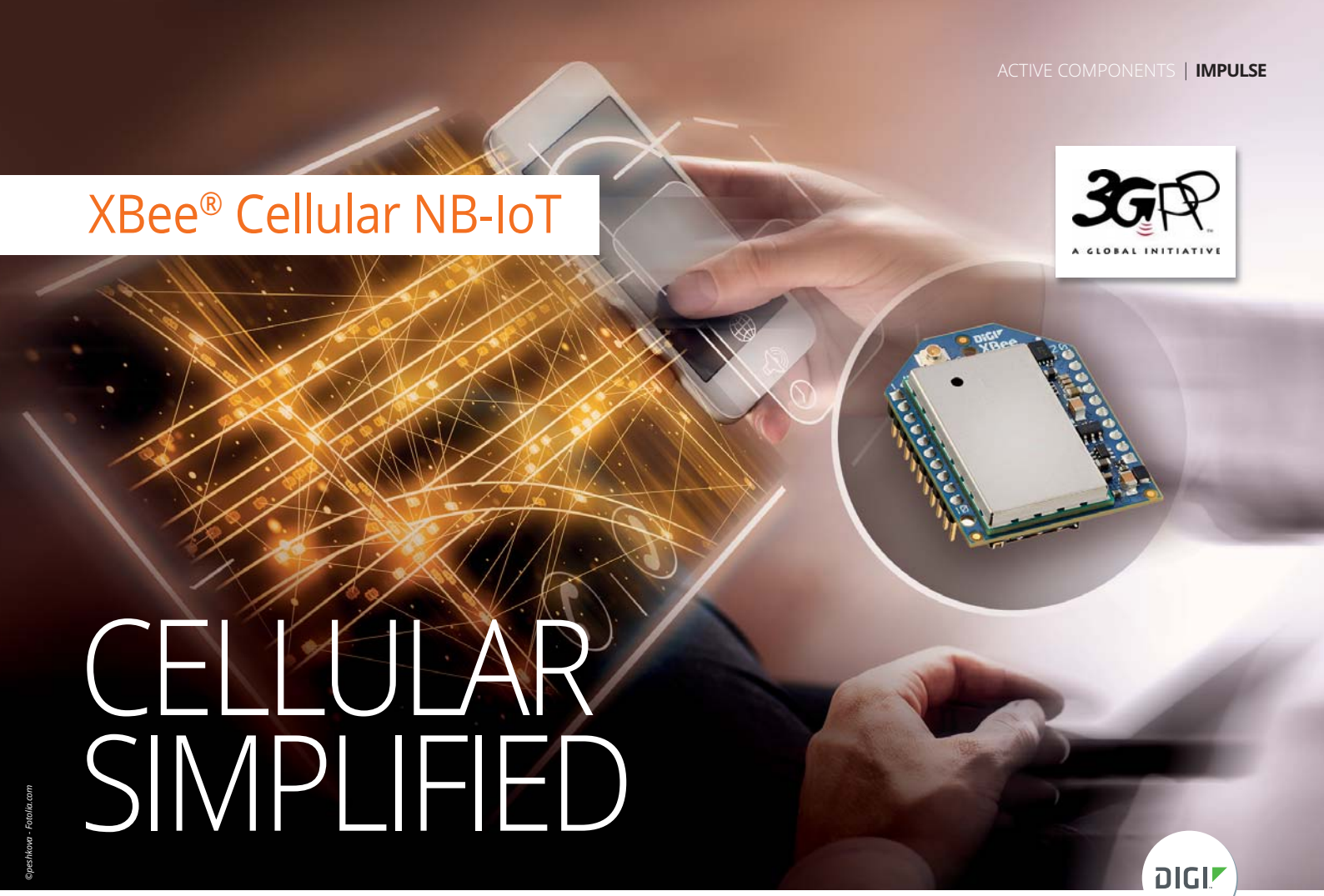
Joachim Strohschenk, +49 89 130143817
joachim.strohschenk@codico.com

XBee® Cellular NB-IoT



CELLULAR SIMPLIFIED

DIGI is excited to bring together the power and flexibility of the DIGI XBee® Ecosystem with the latest 4G cellular technology, combined in the new DIGI XBee Cellular embedded modem.

MDIGI is excited to bring together the power and flexibility of the DIGI XBee® Ecosystem with the latest 4G cellular technology, combined in the new DIGI XBee Cellular embedded modem. This solution enables OEMs to quickly integrate cutting edge 4G cellular technology into their devices and applications without dealing with the painful, time-consuming, expensive carrier end-device certifications. DIGI XBee® Cellular comes fully pre-provisioned and ready to communicate over the cellular network right out of the box.

New and Emerging Standards

The 3GPP (3rd Generation Partnership Project) is a global consortium of various telecommunications associations. In the late 1990s, the 3GPP was organized to establish 3G cellular specifications based on evolved Global System for Mobile Communications (GSM) specifications within the scope of the International Mobile Telecommunications-2000 project of the International Telecommunication Union (ITU).

Since then the scope of 3GPP standards have expanded to cover 4G LTE and evolving standards like LTE Cat 3, LTE Cat 4 and LTE Cat 1. Carriers such as Deutsche Telecom and Vodafone are rapidly rolling out networks in Europe for NB-IoT.

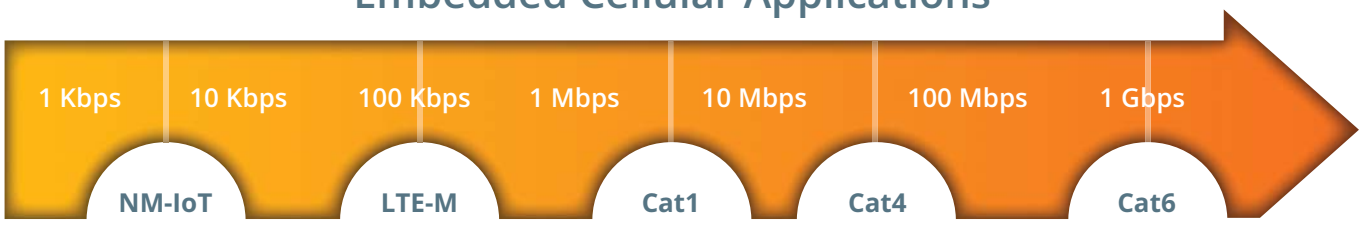
STANDARDS		ALSO KNOWN AS...	BIT RATES (UPLINK)
Broadband	3G	GSM	2Mbps
	4G LTE	GSM/EDGE and UMTS/HSPA	20Mbps
	LTE ADVANCED	Cat 6	300Mbps
Narrowband	LTE CAT 1		5Mbps
	LTE-M	Cat M1 or Cat M	1Mbps
	NB-IoT	Narrowband IoT and NB 1	144Kbps

Example Applications for Narrowband Cellular

These new narrowband standards have made cellular relevant for applications that only need to connect once in a while and send small pakkets of data. The makers of remotely deployed sensors and equipment that operates in far flung places, often running on battery or solar power, now have a cellular connectivity option. DIGI XBee® Cellular simplifies embedded cellular connectivity by reducing or eliminating the time and cost of development and certification to incorporate cellular technology into a wide array of applications.

- **Lighting for streets and parking lots:** Centrally manage and control city-wide networks of street lights.
- **Oil & gas and industrial process controls:** Keep an eye on remote equipment, such as tank levels, temperature, pressure and other sensors.
- **Variable Message Signage (VMS):** Applications ranging from signage to traffic sensors.
- **Environmental monitoring:** Solar panels can report power generation hourly to cloud-based applications.

Embedded Cellular Applications



Sensors & Controllers
Smoke Detectors
HVAC Control
Lighting
Pollution Monitors
Agriculture Monitors

Connected Devices
Patient Monitors
mPERS
Electric Meter
Parking Control

Smart Devices
Enterprise PDA
Asset Trackers
POS Terminals
Telematics

Data Devices
Digital Signage
Retail Kiosk/ATM
Connect. CE Devices
Connect. Healthcare
Telematics

IoT Aggregators
Media Installations
Office Networking
Routers
Network Bridges
In-car Infotainment
Video Surveillance

So, which technology is right for me?

Producers of remotely deployed sensors and devices have had to settle for the compromises, expense, and provisioning/maintenance complexity of traditional RF connectivity for years. Cellular connectivity addresses many of these drawbacks – but still hasn't been cost-feasible for smaller deployments of ten or fewer devices. Today, that's changing. DIGI XBee® Cellular modems simplifies your deployment of embedded cellular connectivity by reducing or eliminating the time and cost of development and certification to incorporate cellular technology into your products. Here are 5 factors to consider when evaluating embedded cellular technology:

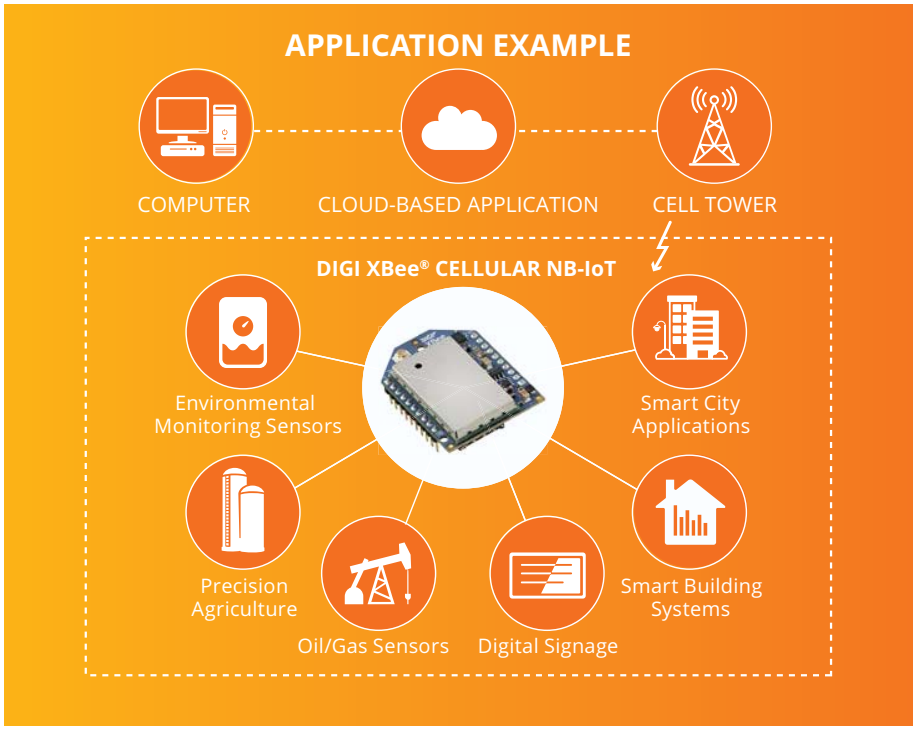
1|The Cost of Data: Chances are, you've considered embedded cellular in the past, but understandably rejected it because of high-cost data plans from carriers. Today, however, with the emergence of LTE Cat 1, LTE-M and NB-IoT, the economics are becoming far more favorable – sometimes in the range of just €2/month (1 MB data plan). For deployments up to ten per location – such as low-power wide-area (LPWA) applications – it can be cheaper to embed cellular connectivity in each device instead of aggregating through a single gateway.

2|Network Coverage: As carriers continue to build out their networks to the most remote areas, there are fewer dead zones to limit your deployments. With DIGI XBee Cellular embedded modems, you can easily develop and quickly deploy smarter, connected devices that are carrier-certified out of the box.

3|Certifications: DIGI XBee® Cellular is carrier end-device-certified, so your device gets to market faster. DIGI eliminates the traditional delays, thousands of dollars in costs, and headaches. DIGI XBee® units are pre-provisioned as well for even faster deployment. Over-the-air (OTA) firmware updates and local or remote configuration give you greater manageability.

4|Long Range, Two-Way Communication: DIGI XBee® Cellular enables secure out-of-band connectivity to devices on third-party sites – without requiring access to those sites' wireless networks. What's more, cellular networks extend your reach far beyond the limitations of unlicensed RF spectrum.

5|Solar-powered and Battery-powered applications: Your device can operate in ultra-low-power modes – including sleep and deep-sleep modes. Wake up and transmit data once a day or once an hour, as needed, to optimize your battery life.



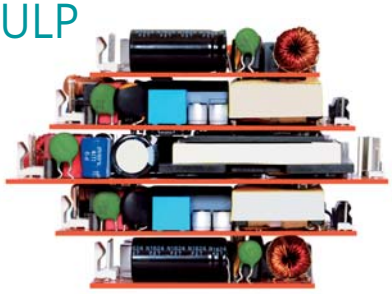
Whatever technology you choose, the interchangeable DIGI XBee footprint enables you to use NB-IoT in one region, LTE-M in another, and LTE Cat 1 in a third. The pin-out is the same, so you just have to design in the connectors and let DIGI do the rest! To learn more about Cellular-Module go to: *https://www.codico.com/en/Products/Cellular-Modules.htm*

A03

Joachim Strohschenk, +49 89 130143817
joachim.strohschenk@codico.com

THE ALL COMPLETE POWER RANGE

ULP



WLC

WLP

EOS Power has attracted a lot of attention in the medical and high-efficiency industrial power supply market in recent years, by releasing many world firsts concerning power densities, footprints and product capabilities.

Their last release was promoted in the Impulse 1/2017 (A03), the outstanding – lowest in class – ULP series of Medical and Industrial, High Efficiency, High Power Density AC/DC power supplies. Those new (M)ULP 40, 180 & 275 Watt series have power densities which reach 30W per cubic inch and measure 0.75 inches (19.05mm) in height only, which makes it best choice for flat devices like displays or medical measuring instruments.

Footprints are available for max. 40W (2×3"), 180W (2×4") and 275W (3×5"). All technical features like stand-by power, leakage-currents, temperature performance, approval standards etc. are up to date and matching or exceeding world-market standards. Stand by power is below 0.5W on all models and makes the entire series compliant to ErP regulations. The low patient leakage current (touch current) does not exceed 100µA meeting BF limits for direct patient contact. All products meet the EN60601-1-2 4th edition EMC amendments.

Truly, the ULP comprises the existing range power supplies at EOS Power. In addition to the already existing (M)WLP and (M)WLC series. The (M)WLP series was EOS first step into the 2×3" footprint, covering 40 to 350W with less than 0.3W standby ensuring compliancy to 2009/125/EC. The (M)WLC for up to 550W completes the entire range now covering 40 up 550W in output power for both, industrial and medical applications for direct patient contact applications, offering a vast range of flexible cooling options.

A04

Andreas Hanausek, +43 1 86305131
andreas.hanausek@codico.com

Author: Kevin Lenz, Field Application Engineer, POWER INTEGRATIONS GmbH

REDUCE THE COSTS BY USING SMART GATE DRIVERS

The SCALE-iDriver™ from POWER INTEGRATIONS is an innovative IGBT gate driver which brings many benefits to a motor drive inverter. This document discusses the feasibility to reduce costs on system level by using this gate driver from POWER INTEGRATIONS™.

Switching off an IGBT with negative voltage by using a unipolar power supply

The idea to work with a unipolar power supply to switch the IGBTs isn't new. The problem so far was that the turn off voltage is 0V and not negative. Many designs failed in the past, because of parasitic turn on due to dV/dt in the system. The typical threshold voltage of an IGBT is around 6V. If a parasitic Voltage between Gate and Emitter occurs in the range of 6V the IGBT can turn on and lead to a system stop.

The SCALE-iDriver™ has an integrated voltage regulator for the turn on voltage. This means the supply voltage can be a unipolar and unregulated 22V-30V supply (Vtot). The SCALE-iDriver™ generates a regulated +15V voltage to turn on the IGBT. The turn off voltage is the difference of the supply voltage and the regulated +15V. Example: Vtot = 22V → Voff = -(22V-15V) = -7V

COST SAVINGS

- Using Simple Transformer (will be available from POWER INTEGRATIONS soon)
- Less Rectifiers for DC/DC needed
- No external voltage regulator needed
- No need of suppressor Diode for Gate Emitter protection (simple diode from Gate to +15V)

Reducing Isolation barriers of sensors with an reinforced isolated Gate driver (acc. to VDE0884-10/17)

Most motor drives use engine speed sensor or current sensors to get a feedback of the motor state. From a cost perspective these signals shouldn't be transferred over an isolation barrier to a Microprocessor which is connected to a high voltage. For cost optimization – and in most cases also technical wise – the best solution is a Microprocessor on SELV level (earth potential) like shown in the picture on the right side. But therefore a reinforced isolated gate driver is needed.

SCALE-iDriver™'s reinforced galvanic isolation is provided by Power Integrations' innovative solid insulator FluxLink™. FluxLink™ is a magneto inductive technology to transfer the PWM command signals from the primary (IN) to secondary side. Thanks to this technology the SCALE-

Clearance and Creepage distance	9.5mm
Comparative Tracking Index (CTI)	600V
Distance Through the Insulation (DTI)	0.4mm
Working Isolation Voltage	1000V

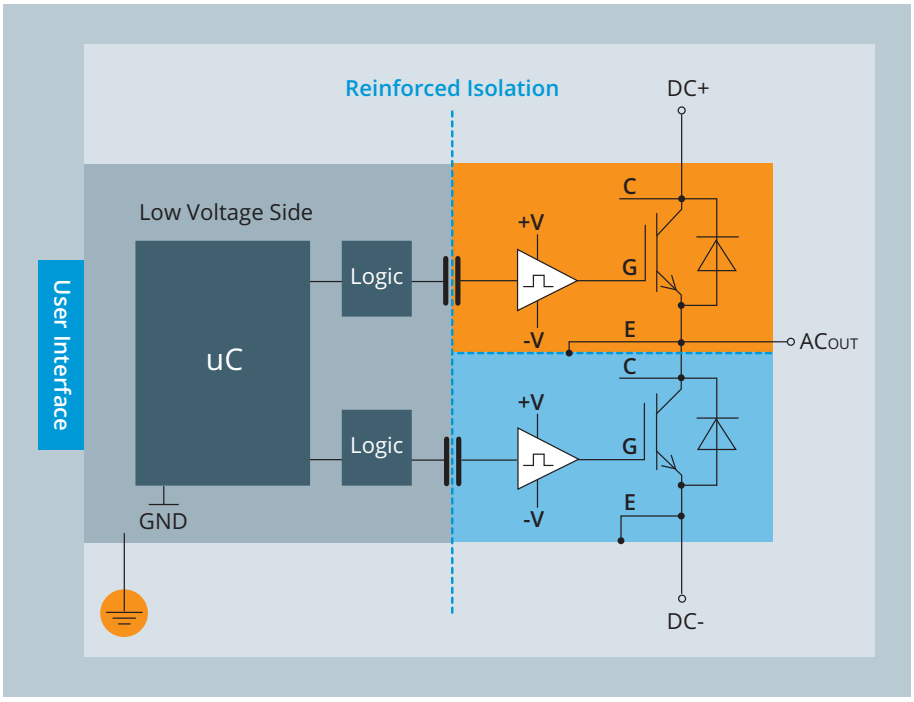
iDriver™ is providing safe isolation between primary side (LDI) and secondary-side also after the secondary side chip (IGD) has blown up due to an IGBT fail.

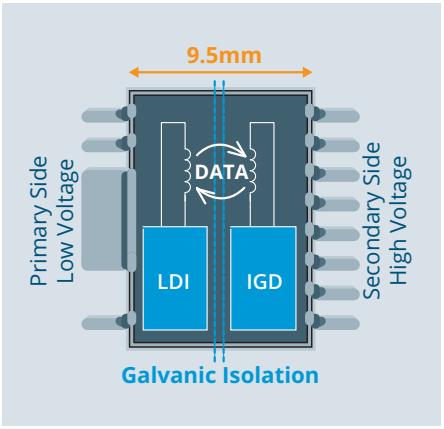
COST SAVINGS

- No further isolation barrier for driver and feedback signals needed
- Less costs for isolation barriers for other sensors
- Reduce qualification and certification efforts
- Higher quality of inverter possible

Less components needed to get the needed peak current value

The SCALE-iDriver™ is available with 2.5A, 5A and 8A output so far. The 8A output is the highest output current for gate drivers available in the market. Until 8A no external booster is needed. This 8A are regulated and available over the full temperature range of -40°C to 125°C ambient temperature. For turn on and turn off current two separate Pins are provided. No external diode for splitting turn on and turn off current is needed. Regarding the internal current regulation over the full temperature range even no external gate resistor is needed.





COST SAVINGS

- No need of external booster up to 8A
- No diode to separate RGon and RGoff needed
- Possibly no gate resistor is needed

Use of smaller IGBT

The SCALE-iDriver™ has an N-Channel-MOSFET output stage which leads to a very low output impedance. The output current can be higher by using the same gate resistors compared to another driver with same current rating. Measurements have shown that this can reduce the turn on (Eon) losses of an IGBT up to 70%. At the same time the turn off losses (Eoff) are still the same. Depending on the switching frequency and the design criteria for selecting the IGBT current this reduce of switching losses can lead to a smaller and so more cost efficient IGBT.

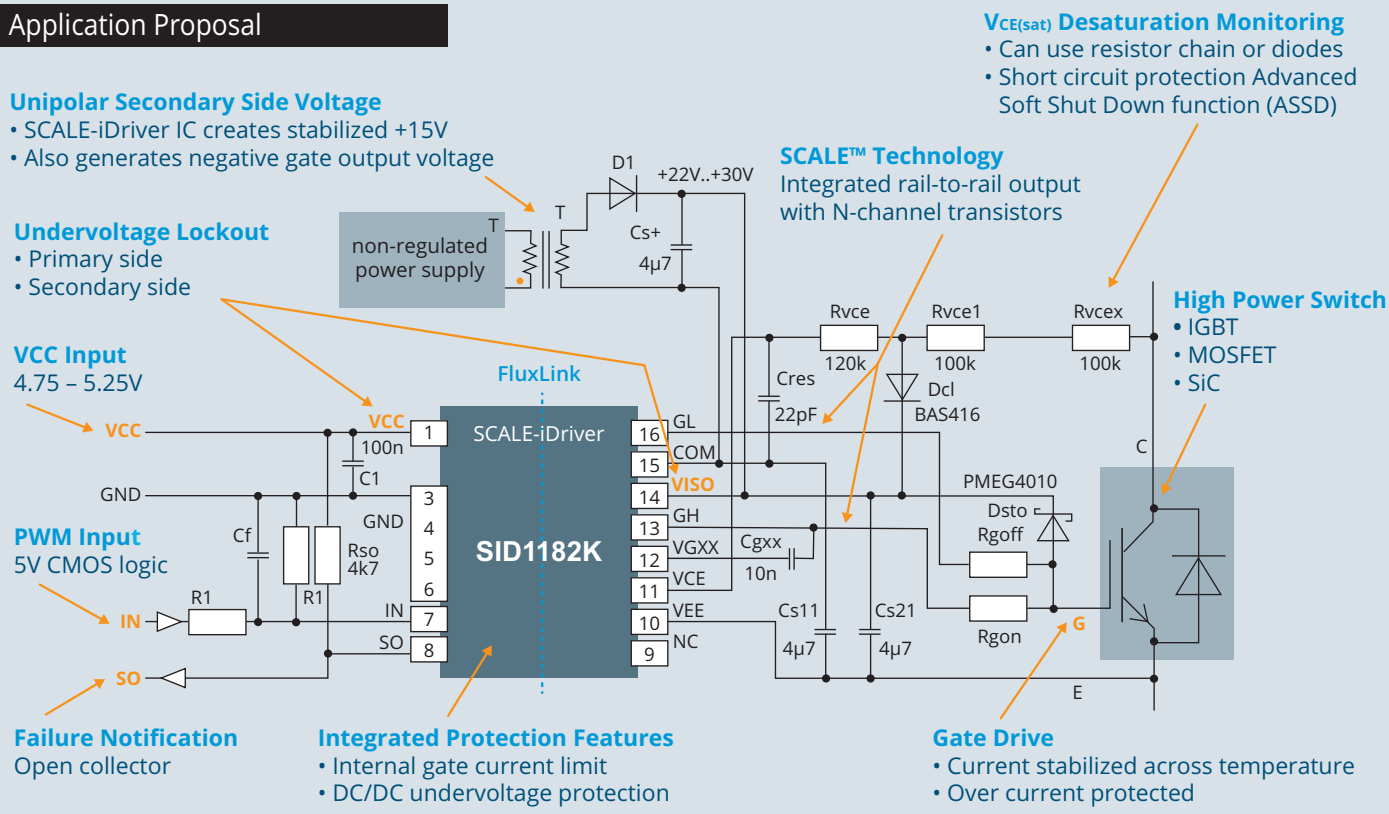
COST SAVINGS

- Use of smaller IGBT

Integrated Overcurrent protection: Less current sensors and electronics needed

Protecting the IGBT against overcurrent is a must have of every motor drive. In most IGBT applications the usage of a gate driver with De-saturation detection (DESAT detection) protects the IGBT against high current that would lead to a destruction of the IGBT. The principle is that an IGBT desaturates at roughly four times of the nominal current. Then the IGBT is getting high impedance and the Collector – Emitter voltage (Vce) will rise up to the DC-link voltage. DESAT detection can detect this voltage and the driver will safely shut off the IGBT. Unfortunately typical DESAT detection can lead to false tripping due to forward recovery - especially in applications with dynamic loads like servo motor drives- after the so-called blanking time.

Application Proposal



Therefore most of the inverter manufacturers designed out the DESAT function and use other solutions like measuring the current with costly current sensors. A current sensor for every phase leg is needed, so three current sensors are required for a three phase inverter. Ideally, design should help to turn off IGBT before reach two times nominal current. This means a lot of engineering effort and also a software adaptation for every different motor drive is needed.

The DESAT detection of the SCALE-iDriver™ provides a response time instead of a blanking time. Short voltage spikes are ignored and the DESAT detection can be used again for overcurrent protection also in servo motors. After a DESAT event is detected, SCALE-iDriver™ will turn off the IGBT with its patented Advanced Soft Shut Down (ASSD) function. This ASSD principle is a closed loop Gate feedback which is working without any additional external components.

The short circuit event will be reported by the SO pin to primary side. By handling the overcurrent with the driver it isn't needed to know the current of each phase. The current of the three phase system could now be measured with the Aron measuring circuit which needs only two current sensors.

COST SAVINGS

- Using resistor chain instead of high voltage diodes
- Less effort for current sensing/signal processing
- Only two current sensors for AC current needed
- No software adaptation for different currents

OTHER BENEFITS OF SCALE-IDRIVER™

- FluxLink™ as transformer based insulation technology
- 5V CMOS input, Open Drain Failure Output
- Under voltage lockout for primary and secondary side
- Operation ambient temperature -40 to 125°C
- Maximum Case Temperature 150°C
- Design ready for 2-layers board
- UL certified (E358471)
- High Switching frequency of 250kHz
- High EMC robustness

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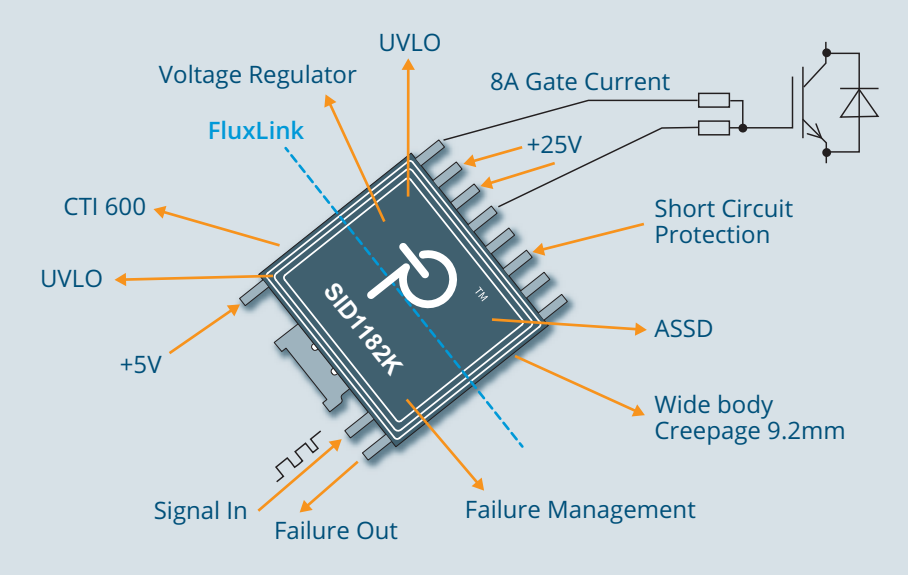
Thomas Berner, +49 89 130143815
thomas.berner@codico.com



ALL-IN-ONE

Full embedded Smart LTE module with Wi-Fi and Bluetooth connectivity, GNSS receiver, Display and Camera interface, Android 6.0 built in.

QUECTEL SC20 is the first generation of Smart modules based on QUALCOMM Snapdragon platform. SC20 is a multi-mode LTE CAT 4 module with built-in Android OS, in SMT package and Industrial temperature range.

It delivers speeds of 150Mbit/s downlink and 50Mbit/s uplink data rates and is ideal suited for both, industrial and consumer applications requiring the highest data-rate and high-speed internet access. SC20 series is backward-compatible with existing EDGE and GSM/GPRS networks, ensuring that it can be connected even in remote areas devoid of 3G or LTE coverage. It also supports short-range wireless communication via IEE 802.11 a/b/g/n and BT4.1 LE dual mode.

SC20 features multiple-input multiple-output (MIMO) technology, a cutting edge antenna technology, capable of transmitting multiple data streams on multiple transmitters to multiple receivers. The antennas at each end of the communications circuit are combined to minimize errors and optimize data speed. In addition to high-speed wireless connectivity, the module includes a multi-constellation and high-sensitivity GPS + GLONASS + BeiDou receiver for positioning.

A rich set of interfaces (such as LCM, Camera, Touch Panel, MIC, SPK, UART, USB, I2C) and abundant drivers (USB drivers for Windows XP, Windows Vista, Windows 7/8/8.1, Linux) extend the applicability of the module to a wide range of M2M applications, such as CPE, wireless POS, smart metering, router, data card, automotive, smart phone, digital signage, alarm panel, security and industry PDA.

In the next months, QUECTEL will expand the Smart module series releasing new products based on more powerful QUALCOMM Snapdragon platforms. New modules will be supported with Octa-Core CPU with higher clock rate, dedicated GPU and more memory, achieving more advanced features like dual displays, dual cameras and able to support more complex software applications.

Complete development kit is available. Please contact us or visit the CODICO Sample Shop.

Features

CPU: MSM8909, Quad core A7, up to 1.1GHz
Memory: 1GB DDR3 + 8GB NAND
LTE: Multi-mode CAT 4, 150/50 Mbps DL/UL
WLAN: 2.4G/5.8G, 802.11a/b/g/n
BT: BT 2.1 + EDR/3.0/4.1 LE
GNSS: GPS, GLONASS, BeiDou/Compass
OS: Android 6.0
LCM: HD (720P, 1280×720), via MIPI_DSI interface
Camera: 8MP via MIPI_CSI interface
Multimedia: Audio and video codec integrated
Dimensions: 40.5×40.5×2.8mm

Evaluation Board

A06

Leonardo Bazzaco, +39 0422 262304
leonard.bazzaco@codico.com

XC6192

Push Button Load Switch

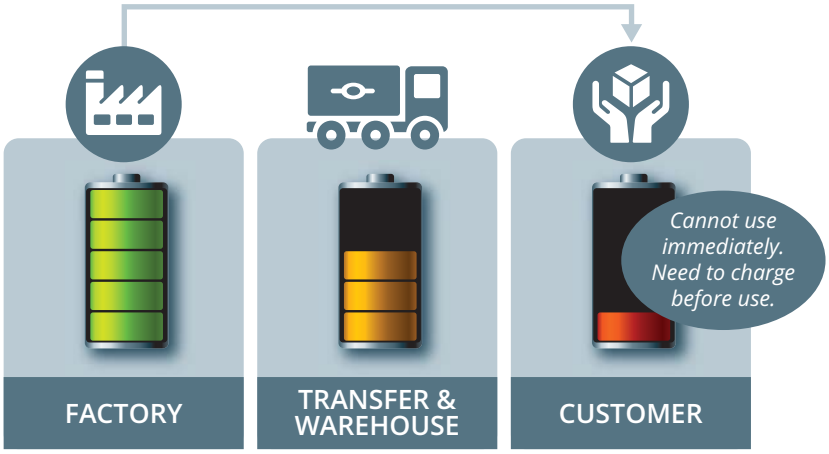


Fig.1: Battery Power Drain during Shipping & Storage

We have all experienced the frustration of having to wait for the battery to charge on our latest wearable gadget before we can use it! You open the box and there is your new smartphone or smartwatch but you have to firstly find the charging cable and wait 30 minutes before you can even start enjoying the new tech! The reason this happens is simple, our new gadget has been sat on a ship and then most likely a shelf for several months before we decided to purchase it and what has happened over those several months is that the battery has slowly drained (Fig.1).

The reason this happens is due to the electronic components on the PCB consuming small amounts of current even though they are in stand-by mode. Each component taken in isolation is not a problem but add them all together and over time these can drain the battery life a lot. Wouldn't it be good if we didn't have to do that! Well, TOREX has a solution with the new XC6192 push button load switch IC which is simple and effective (Fig.2). By adding the XC6192 between the battery and the main power circuit (which could be a LDO or a DCDC) on the board

Those of us old enough to remember will recall that in the not so distant past, new battery powered gadgets had a plastic tab that had to be pulled before you could turn on your device. Not a high-tech solution but it did mean that you could use your gadget immediately as the batteries would be fully charged. Modern lithium batteries can't be used with such mechanical tabs as these batteries tend to be fully enclosed within the product they are powering so there are no openings for a plastic pull tab.

Unfortunately, that also has a down side!

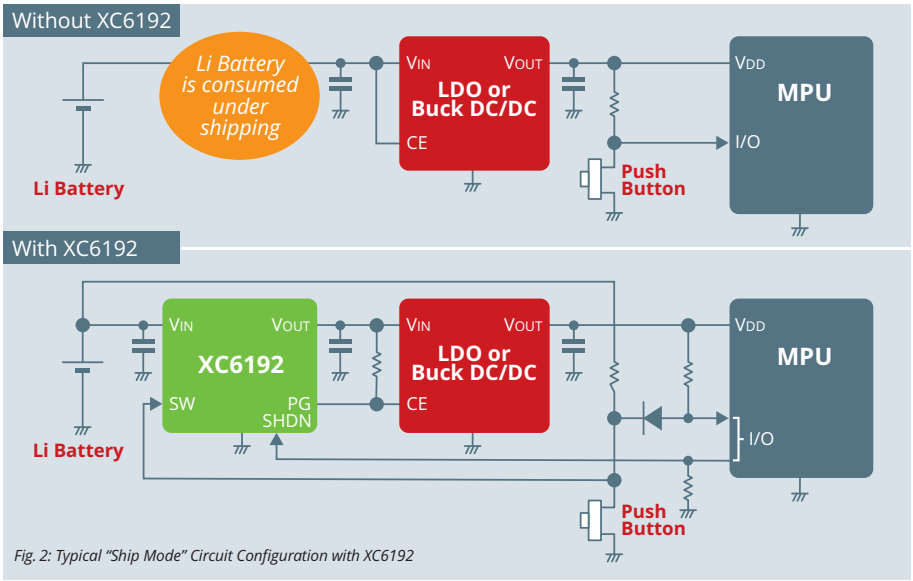


Fig. 2: Typical "Ship Mode" Circuit Configuration with XC6192

or between the battery and the MPU if the MPU is connected directly to the battery without any power circuit, it is possible to completely shut the line from the battery, which in turn stops the battery draining over time. We call this function »Ship Mode« or »Shutdown Mode« and we estimate that over a period of 6 months in storage, the difference in remaining battery life comparing applications with/without the XC6192 is significant (Fig.3).

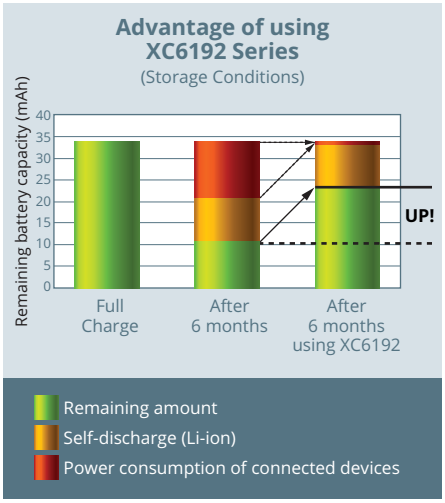


Fig. 3: Battery Life Comparison with/without XC6192

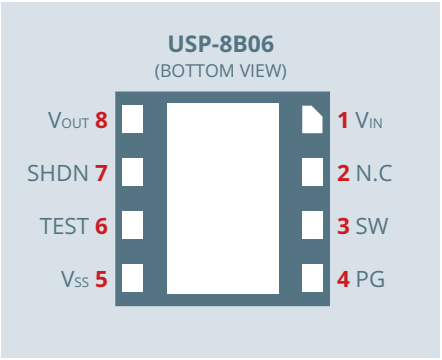


Fig.4: USP-8B06 Package

XC6192 Series (Push Button Load Switch)

The XC6192 series is a push button load switch IC in an ultra-small 2.0×2.0×0.33mm USP-8B06 package (Fig. 4). The IC operates between 2.5V~6.0V and consumes only 0.01uA (typ) in stand-by mode thereby contributing to battery life extension as highlighted in Fig. 3 above.

Both the XC6192A and the XC6192B can be used as both a mains power switch as well as a switch for shipping/storage. For shipping, once the application on which the XC6192 is used has been through final testing following production, the circuit can be put into »Ship Mode« very easily by inputting a single pulse (»H« level) to the XC6192's SHDN pin. After several months of storage, a push button signal turns on the switch and the circuit will start-up with a battery that still has enough charge to allow use straight out of the box! The turn-on delay time can be preset to either 0.5s, 1.0s, 3.0s or 5.0s and it is recommended to set a longer turn-on time for sensitive devices in order to avoid possible mistaken turn-on if set shorter.

However, in most cases 0.5s will be OK. Although the turn-off function with the XC6192A and XC6192B is via a signal to the SHDN pin as explained, with the XC6192A, there is also the option of setting a push button turn-off with a pre-set delay time of either 3s, 5s, 10s, or 15s. This is particularly useful if there is a system freeze on the device and in such cases, a longer turn-off time is recommended to avoid any system errors. The XC6192 series also has a Power Good (PG) pin. There are still many battery-powered industrial applications that continue to use AA & AAA batteries as the main power supply and where these batteries are pre-fitted, such as in smoke detectors, there still needs to be a switch to stop battery drain whilst in storage. Today this tends to be a mechanical switch, usually the pull tab referred to earlier.

However, having such a mechanical switch means that the detectors have to have an opening for the pull tab which can cause issues with possible water damage. The pull tabs have to be manually fitted which is an additional labour cost. The XC6192 can be used to replace such mechanical switches on industrial applications also and will be beneficial for smoke detectors, stand-alone detectors in particular, as a new EU law requires that all smoke detectors that are powered by a primary battery should have the battery fixed internally so that it can't be removed.

The XC6192 can also be used as a main power switch in place of a mechanical switch. When the power is turned off, usually the MPU should perform an operation to turn off the system safely and securely. After such an operation is completed, the MPU can send a H" level signal to the SHDN pin of the XC6192 to turn off the system. In addition, the XC6192A is equipped with an ON/OFF toggle function that means that the power supply line can be switched on/off by inputting a »L« level signal during a pre-determined time to the SW pin.

Need a system reboot solution? The XC6190 push button reboot controller IC can help!

The XC6192A can help to turn-off and re-start a device if the system freezes but if you don't need a power switch function and only need a reboot function for system freeze issues, then the XC6190 is a more suitable IC. The XC6190 is an ultra-low current, push-button reset timer. The XC6190 uses a long timing setup delay to provide the intended system reset, and avoid resets from short push-button closures or key presses. Two versions are available; with the XC6190A the reboot delay time (TDL) can be set as desired by changing the external resistance RT within the range 5s to 20s. The XC6190B has the TDL fixed internally with a choice of two settings. When the TS pin is set to »H« level, the delay time is 12.5s. When the TS pin is set to »L« level, the delay time is 7.5s. Operating voltage is between 1.65V~6.0V and the XC6190 is available in USPN-6 (1.3×1.3×0.4mm) and USPN-6B01 (1.45×1.0× 0.4mm) packages.

A07

Johannes Kornfehl, +43 1 86305149
johannes.kornfehl@codico.com

POE EXPANDING

Ag7200

A low cost SIL 20W DC/DC converter for POE and boost converter applications.

Ag5324

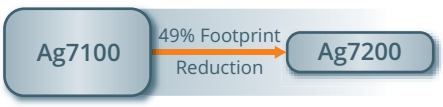
The first Industrial Temperature POE+ module from SILVERTEL.

Ag9924MT

Ultra miniature POE for 24V Industrial temperature applications for up to 12W.

Smaller modules, more power, wide input ranges or higher temperature, whatever the requirement, SILVERTEL keep pushing back the limits.

Following the success of Ag7100 making PSE designs simple, straightforward and convenient, SILVERTEL has expanded its' range of complementary DC/DC boost converters for POE applications with Ag7200. In a very low cost and small footprint SIL package, Ag7200 builds on the success of the Ag7100, providing a nearly 50% footprint reduction for 12W IEEE802.3af applications.



Now offering an input voltage range all the way down to 5V up to 12V, with boost up to 48V or 57V for POE applications, Ag7200 can easily drive an Ag6100 PSE module for single channel POE applications. With approximately 50% smaller footprint than Ag7100, Ag7200 allows far more compact designs and all at lower cost, while still providing IEEE compliant isolation.

Typical application connections using SILVERTEL modules for a fully IEEE compliant solution

Meanwhile, many modern IOT devices and sensors plus industrial or building automation control applications require full industrial temperature range to be specified. As POE continues to penetrate ever more markets and filters into new technologies, it is being used in a broader range of applications than ever before and increasingly at higher power. Industrial control & automation, IP cameras, IP audio, HD audio visual (including HD BaseT) and access control are just some of the more common 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. Many modern applications also demand the capability to operate in more extreme environments, or externally, particularly in IOT sensors and monitoring systems.

With the latest additions to the SILVERTEL module range, POE powering of these becomes straightforward. The Ag5324 is a very exciting new development, being the first ever Industrial Temperature rated (-40 to +85°C) POE+ module released by them. Ag5324 delivers the full POE+ power of 24W continuously at up to 85°C. Ag9924MT meanwhile can provide a full 12W of power all the way up to 85°C with no derating. These two new POE modules are each respectively part of the range of smallest POE 12W IEEE802.3af and POE+ 24W IEEE802.3at PD solutions in the world.

The full Ag9900 series now includes 3V, 5V, 12V and 24V options. Each of these is also available in an over-temperature protected power de-rated (12W @ 24V; 9W @ 12V & 24V; 6W @ 5V and 4.5W @ 3V for 85°C operation) industrial temperature version (Ag9900MT). The full range of Ag9900 and Ag5324 modules are all available in volume now and can be ordered through the CODICO Sample Shop.

A08

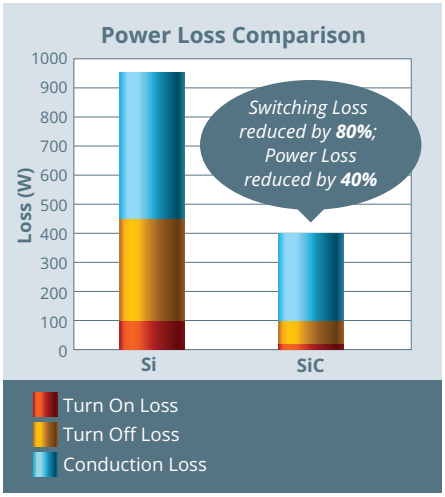
Andreas Hanausek, +43 1 86305 131
andreas.hanausek@codico.com

NEXT GENERATION SILICON CARBIDE Schottky-Diodes

In comparison with silicon Schottky diodes, PANJIT's new silicon carbide (SiC) Schottky diodes have outstandingly good material properties, which mean lower switching losses, higher breakthrough voltage, and better performance at high temperatures. This makes them the ideal choice for customers who need high system efficiency, in particular in solar systems, with power management applications, and in many industrial applications as well.

The new and more stringent energy efficiency regulations, such as Energy Star, 80Plus, or European Efficiency, mean that developers are turning to the use of new converter topologies and more efficient electronic components. This is where high-voltage SiC Schottky rectifiers really come into their own. Their physical properties result in four times better dynamic characteristics, and 15% lower forward voltage than standard silicone Schottky diodes.

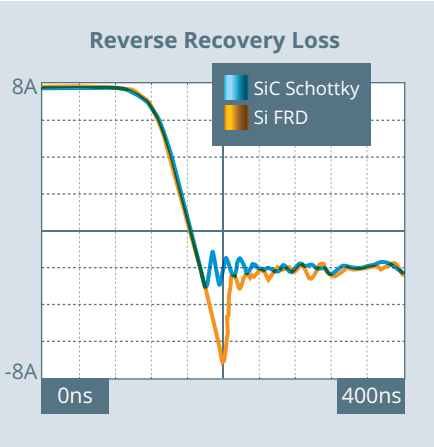
The reduction in switching losses, by 80%, and line losses down by 40%, make for a significant cut in overall loss values, as well as bringing energy consumption down. Energy efficiency is boosted too. The high degree of efficiency makes for smaller heat sinks, and that saves on space and weight.



Interest is growing all round in environmentally friendly and clean energy sources. That means an increase in demand for low-loss power supplies too. Silicon carbide Schottky diodes have low leakage currents even at high temperatures, and that means more stable performance than conventional Si-Schottky diodes. And when it comes to blocking voltage, SiC-SBDs have another advantage. While Si-Schottky diodes are only available up to 200V, SiC Schottky diodes can be provided with 3 to 6 times higher VRRM. A lower reverse recovery time (Trr), high switching rates, and low EMI are other interesting properties. With higher switching frequencies, storage inductors and capacitors are easier to dimension, and smaller too.

The somewhat more complex SiC technology may at the moment still be slightly more expensive than Si semiconductors, but in the sense of cost-of-ownership, the savings potential lies in the application as a whole. And some of the improvements in efficiency, switching performance, and size and weight are really impressive.

Some of the ideal applications are charging stations for electric vehicles, solar power inverters, and server power packs, as well as LED power supplies or general industrial applications such as engine controls.



PANJIT provides a complete family of SiC-Schottky diodes with voltages of 650V and 1200V. Components are available in TO-220AC, TO-252AA, and in TO-263/D²PAK housings, offering the developer the greatest possible flexibility for the choice. Some diodes are also available with AEC-Q101 qualification.

A09

Christian Forthuber, +43 1 86305 158
christian.forthuber@codico.com

Part Number	VRRMMax.	IF	VF@IFTyp.		PD	QC	Package
	V	A	V	µA	W	nC	
SiC02A065T	650	2	1.9	5	68	6	TO-220AC
SiC04A065T	650	4	1.9	6	75	11	
SiC06A065T	650	6	1.9	17	88	12	
SiC08A065T	650	8	1.9	20	100	15.5	
SiC10A065T	650	10	1.9	20	115	18	
SiC05A120T	1200	5	2.4	16	82	14	
SiC10A120T	1200	10	2.3	10	123	38	
SiC02A065NS	650	2	1.9	5	30	6	TO-252AA
SiC04A065NS	650	4	1.9	6	38	11	
SiC06A065NS	650	6	1.9	17	53	12	
SiC08A065NS	650	8	1.9	20	71	15.5	
SiC02A120S	1200	2	2.4	3	70	14	
SiC05A120S	1200	5	2.4	17	93	13	
SiC04A065ND	650	4	1.9	6	75	11	TO-263/D²PAK
SiC06A065ND	650	6	1.9	17	78	12	
SiC08A065ND	650	8	1.9	20	100	15.5	
SiC10A065ND	650	10	1.9	20	93	18	

Miniaturized Modules for IoT-Applications

Intelligently networked smart homes and smart offices require mesh control systems with many low power nodes, actuators and sensors that are »always on«.

To meet these emerging demands, RECOM takes a big leap with complementing its low-power RAC-series with new low-cost converters with EN60335 household certification. These and upcoming RAC-series converters represent a quality-cost proposition, difficult for competition to match. The RAC0x-G series were specially designed to continuously and efficiently power smart building infrastructures and cover power ratings from 1-4W. They accept a broad nominal input voltage range from 100VAC to 240VAC for worldwide use. Standard 5 or 12VDC outputs are suitable to power relays, gateways and building automation nodes. A typical no-load power consumption of only 180mW makes them particularly energy-saving solutions. They operate over a wide temperature range from -25 to +80°C, are over-current and short-circuit protected – and fit into a tiny 33,7×22,2×19,0mm (RAC01/02), 37×24×15mm (RAC03/04) package.

All modules are certified to EN60950 and EN62368 and come with a three-year warranty. EN55022 Class A (RAC-GA) and Class B (RAC-GB) certifications are reached without additional components. The RACxx-GA series is also certified to the EN60335 household norm. These newly developed converters are only a few of many yet to follow in this product family.

A10

Andreas Hanausek, +43 1 86305 131
andreas.hanausek@codico.com

RAC Series: Household Certification for Smart Homes

Supplying sensors from the 4-20mA Loop

As aged as it may be, the venerable analogue 4-20mA loop still represents the undisputed standard in process and control technology – not least due to the relatively simple two-wire technology, which is extremely reliable and easy to install. Supplying digital components from the unused portion of the loop current had become an issue with microprocessors processing raw data and HART (Highway Addressable Remote Transducer) modems ensuring that smart sensors keep sending a variety of data signals on the same loop.

Conventional switching regulator ICs are unsuitable as their high efficiency at full load drops so far at lower loads that they exceed the 4mA threshold. Low quiescent current in sleep mode cannot compensate as this shuts off the main output voltage altogether. Linear regulators are not ideal either; despite their perfectly decent quiescent current levels at around 0.5mA, poor efficiency decreases available power by a factor of around three compared to switching regulators.

RECOM newly developed R420-1.8/PL switching regulators come with a particularly clever solution and a novel topology capable of lowering idle current to around 100µA while still maintaining rated voltage at output. For example, 24VDC and <3.5mA at the input provides 3.3V and 10mA at the output, which is capable of supplying the sensor alongside the microcontroller and HART modem without affecting loop functionality or metering accuracy.

RECOM launches their all new R420 series. The non-isolated switching regulator requires less than 3.5mA input current (logic »0«), when operating and less than 100µA quiescent current. The high performer offers an adjustable output voltage from 1.8-5.0VDC at 10 mA and works from any voltage between 10-36VDC. The low profile SMT (5mm) component is designed to work in industrial environment from -40° up to 105°C and is the perfect companion to power Microprocessors, Data-Loggers and Smart Sensor Applications.

Another benefit is that these switching regulators are programmable for any output voltage between 1.8V and 5V by simple wiring using a resistor, yielding a single component suitable for a variety of tasks in process automation or sensor-controlled, solar-powered systems. The R420-1.8/PL features an open-frame SMD design, operates at temperature range from -40 to +105°C, and operates at an altitude of up to 5,000m. The regulator is permanently protected against short-circuit, and comes with a three-year warranty.

A11

Andreas Hanausek, +43 1 86305 131
andreas.hanausek@codico.com

2×MOPP/250VAC in a SIP7 housing

RECOM has developed a new fully medical-certified DC/DC converter, which is the first in its class to provide 2MOPP with 250VAC working voltage in a SIP7 package.

This compact design offers engineers more freedom to develop their PCB layout, knowing that they will comply with the stringent regulations for medical certifications. It is certainly a challenge to design high performance, space-saving medical devices, while still complying with the latest medical safety and EMC regulations.

The use of pre-certified modules reduces the risk of EMC/safety certification failures and saves time for expensive re-designs. RECOM's new REM1 series complements the existing REM 3W, 6W and 10W medical DC/DC converters by offering a 1W solution in an astonishingly compact SIP7 package.

REM Series: Perfect for Medical Applications

This state-of-the-art converter features reinforced isolation of 5.2kVAC/1 minute and is certified 2MOPP with 250VAC working voltage. Available with 3.3, 5, 12, 15 or 24V inputs and 3.3, 5 or 12V outputs, the REM1 is a versatile solution with up to 85% efficiency and operates in an ambient emperature range from -40 to +90°C.

This converter meets Class B EMC by using a simple external LC filter and is IEC60601-1-2 (4th Ed.) medically EMC certified. It is also fully certified to IEC/EN/ANSI/AAMI 60601, third edition safety standards, with CB report and comes with a 5 year warranty.

A12

Andreas Hanausek, +43 1 86305 131
andreas.hanausek@codico.com

PHOTODIODE TECHNOLOGY

Also suitable for CO_2 gas sensors and temperature measurement!

Since we humans continuously emit heat, it is now possible to build sensors for presence detection using the new photodiode technology by audio and Hall IC specialist AKM. For a better integration into the application, it is important for the output of the sensor to be as simple as possible. Therefore, AKM already integrated signal processing on the module itself. There are currently three sensors available: AK9750, AK9752AE, and AK9753AE.

The AK9750 sensor integrates four IR sensor elements and a signal processing IC on the chip. The IR sensors are based on AKM's own InSb process, which has been used for the Hall effect elements for several years. Since the center points of the four sensors are geometrically distributed, it is possible to detect the movement of the heat source within the whole area covered.

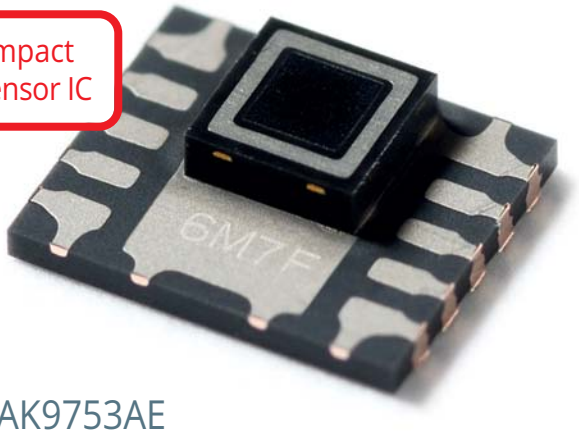
The AK9750 also uses the differential signals between the individual elements for a more precise detection. As a rule, the four sensors slightly vary in their electrical parameters. Yet this poses no problem for the user, since they are factory-calibrated by AKM, and the parameters are stored in the internal EEprom. As a result, further calibration by the user is no longer required.

For perfect presence detection, the module even features an optical filter. The user receives an I2C compatible digital 16-bit signal as output signal. Another advantage is a separate interrupt output to a pin. The chip also features a temperature sensor. The chip can be operated at a voltage of 1.71 to 3.63V with a power consumption of only max.100µA (continuous mode) and max.1µA (power down mode). Since compact dimensions are essential, the chip is available in a 10-pin SON package (4.6×3.8×1.2mm). The AKM sensor can detect presence not only when the objects are moving, but also when they are standing still. This is made possible by directly converting thermal radiation into an electrical signal. Typical applications for the AK9750 sensor can be found in IoT scenarios and as IR sensor in buildings.

Other technologies such as pyroelectric sensors have difficulties delivering a reliable presence detection through glass. This has repeatedly led to limitations in design. Since the AKM sensors work on the basis of a different principle, however, it was possible to develop the AK9752AE version.

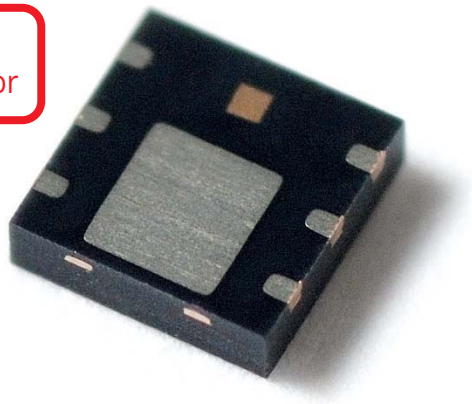
The AK9752 sensor can reliably detect objects through glass, because it can detect infrared radiation with a wavelength of 5µm or less with high sensitivity. This sensor can detect objects at a distance of up to one meter through a glass thickness of 0.7mm or less. The chip integrates the InSb IR sensor elements of AKM and an ana-

One-Chip Ultracompact Passive Infrared Sensor IC

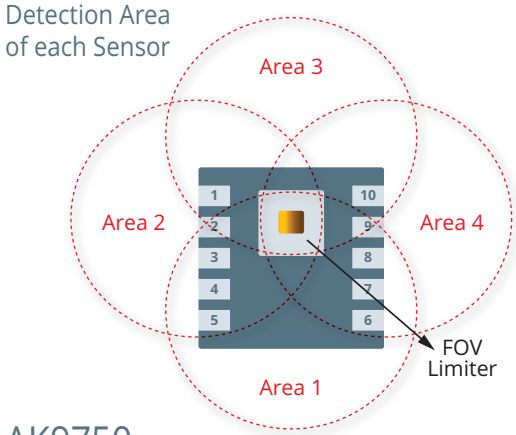


AK9753AE

The World's Smallest Class One-Chip IR Sensor



AK9752AE



AK9750

log front end that converts the current from the IR sensor element into a voltage signal, a temperature sensor to measure the temperature of the element, a 16-bit analog-to-digital converter (ADC), an I2C interface, and an interrupt function.

The chip package is a 6-Pin SON (2.2×2.2mm× 0.6mm), which is even smaller than that of the AK9750. The IC can be operated with a voltage between 1.65V and 1.95V. As far as power consumption is concerned, it has slightly higher values than the AK9750. The interrupt function also available in this sensor is very conducive to an energy-saving operation.

AKM developed the AK9753AE for presence detection with a longer range. Using an external optical lens, the AK9753AE can cover a distance from 2 to 3m. The lens can be built to have only one-tenth of the size of conventional lenses, allowing for an extremely compact design. In addition, the AK9753AE is pin-compatible and function-compatible to the AK9750, so that replacing the AK9750 with the AK9753 can increase the range of the system to up to 3m. This chip is best suited for applications in which security and power conservation are essential.

The optical filter allows wavelengths of 5µm and higher to pass through. The AKM algorithm for presence detection can detect both objects coming directly towards the sensor as well as those just passing by. The detection angle is determined by the lens. There are various options: depending on the lens, it is possible to build a 2D or even a 3D sensor, and detecting human presence is also possible when a person is standing still. This module, too, is factory-calibrated and can be used directly without any additional effort.

Evaluation kits are available for all three sensors. Just ask for one!

A13

Johannes Kornfehl, +43 1 86305 149
johannes.kornfehl@codico.com

CHOOSING THE RIGHT DISPLAY

The display is the showcase of any device, system, operating unit, access control, signage application, etc. In addition, it is often the most expensive component in an application. Therefore, particular attention must be given to the display's features already during the selection process, ideally at the beginning of a project.

A few parameters should certainly be defined as a starting point for these considerations, which lay down the selection criteria and facilitate the decision in favour of a certain type at a later stage. The following describes a few approaches that should help map out a general direction in the multitude of available options, and facilitate the selection.

Which application will the display be used for?

In my opinion, this is the most important consideration, which will essentially help determine and refine all other definitions. It in turn involves numerous questions that one should take into account:

- Where will the device be used?
- What are the light conditions?
- Which ambient conditions can be expected?
- What will the display be showing?
- Which interface is available?
- How long should the service life be?
- Is interactivity desired or necessary?

All these questions often give rise to additional questions, which sometimes mutually influence each other. We shall now look at these different points in detail.

Where will the device be used?

Will the display be used indoors or outdoors? Depending on the installation site, there are different criteria for brightness and contrast, and also for the viewing angle. This already brings us to the question regarding the light conditions. When used indoors, a brightness of approx. 250-350cd/m² will suffice in most cases. Ideally, brightness can be individually adjusted through the LED driver.

When the display will be used outdoors, one should establish whether it should be readable under direct sunlight. If this is really necessary, there are two different methods for achieving this. The first method actually uses the sun. This means that one employs either reflective or transreflective displays, thus using sunlight to achieve a good contrast. This is the best method when the display will be exposed to the sun.

The second method works without the sun. One tries to »outshine« the sun with a strong backlight, thus achieving an acceptable contrast. The brightness required for this purpose is between 600-1200cd/m². An additional measure can be an anti-reflective polariser, which minimizes light reflections and thus also improves contrast. The viewing angle will also depend on the application.

For an operating terminal installed vertically in a switch cabinet, one will use a display with a 12:00 viewing angle, since it can be viewed both from the front and at an angle from slightly above. For a display that will be installed in a desk housing, one will choose a 6:00 viewing angle, since the display will be viewed at an angle from slightly below. Displays with the same viewing angle, i.e. regardless from where one looks at them, are used when the contents must be easily visible from all different directions.

There's just one factor left in this respect - ambient conditions. Which temperatures can be expected? Just imagine the dashboard of a vehicle parked in the sun at 30°C. In most cases, however, the standard operating temperature range of -20°C to +70°C will suffice for most applications.

How high is the humidity? In many cases, one can ignore the humidity factor, since the majority of applications are indoors. There are, however, exceptions: When the display will be used in tropical regions with high air humidity and at high temperatures, it is recommended to examine these parameters carefully so as to ensure its proper function.

What will the display be showing?

One can determine the required resolution depending on the content to be displayed. Make sure not to choose any rare resolutions, since you are running the risk of getting a display from custom-made production batches, for which there is no replacement in case these displays are no longer manufactured. As soon as the number of pixels necessary has been established, one can define the requirements for hardware and software. The size (diagonal measurement) will depend on the space available in the terminal equipment, and on the viewing distance. Of course, the function of the display - pure infoscreen, interactive unit, input terminal... - will also play a role in determining the size. Again, make sure to avoid any exotic sizes. Standard sizes don't disappear from the market quickly, whereas special formats will be easily abandoned by the manufacturer as soon as demand wanes.

In recent years, there has been a change in the display format, largely due to the shift in the consumer market for television sets. The previously popular and widespread 4:3 format in the industry is gradually being replaced by 16:9 and 16:10. It seems as if these so-called wide formats will constitute the bulk of display formats in the future. Therefore, the designer of the user interface should be involved in the selection of the display at an early stage, so as to allow for a smooth integration of the graphical user interface.

Which interface is available?

RGB (TTL) and LVDS interfaces continue to be the most widely used ones. In the case of small screen sizes, one will also find serial interfaces (SPI or I²C) and MCU connections. eDP (embedded Display Port), already heavily propagated a few years ago, has not (yet) gained wide acceptance in industrial applications and is currently found almost exclusively in large panels.

Interestingly enough, there has been increasing demand for panels with an MIPI interface in recent months. MIPI is an interface specification for mobile and mobile-influenced devices, which aims at introducing these into the market as soon as possible with little effort. The problem is that only a few displays with an MIPI interface are available. These come predominantly from the smartphone sector and only have a limited long-term availability, so they are less suitable for industrial applications.

Display life

This term is sometimes used in a misleading manner. One must distinguish between the product's service life – i.e. how long a display will function in accordance with the specifications – and product availability, that is, how long the display will be available on the market or will remain in production. Both issues are important.

The product service life is almost always defined by the service life of the backlight. The value indicated in the datasheet, however, does not mean that the display will show nothing after the defined period expires, but that it will only achieve 50% of the initial brightness. So one must simply compare the desired service life of the end product with this value and then select a suitable display.

Availability is a major consideration for the industry. Since one does not constantly develop new products in short intervals like in the consumer sector (the integration time is significantly longer in the industrial environment), one needs to ensure that the display will remain available on the market for as many years as possible. The rule of thumb is that manufacturers keep displays for industrial applications available for 3 to 5 years.

However, only a few manufacturers will guarantee that in writing. If a device is to remain on the market for a longer period, it will be necessary to take the corresponding precautions. For instance, an intelligent case design can provide for a successor display with altered dimensions to be installed without much effort.

As a rule, however, the manufacturer will at least try to maintain the mechanical dimensions. Should the interface change, it will be easy to convert to the previous one with an additional board.

Is interactivity required/desired?

The touch factor leads to a further multiplication of the selection options. Although more options are available, there are only two technologies being used out there on a large scale: the older resistive touch sensors and the projected capacitative touch sensors. Due to their widespread use in smartphones, the latter have also gained wide acceptance in industrial applications.

Since this topic and the numerous design possibilities would exceed the limits of this article, I wish to refer to IMPULSE 1/2017, in which the article »Make your device unique with PCAP Touch« deals with this issue in greater detail.

By now, you will be asking yourself how it is possible to reconcile all this and manage to adapt the requirements to reality?

Contact us, ask us, and we will try together to find the ideal solution for your application scenario.

A14

Christian Forthuber, +43 1 86305158
christian.forthuber@codico.com

MPQ6541

Monolithic 3-Phase Driver enables compact brushless DC Motor Designs.

With the increasing use of small, brushless, DC motors in everything from consumer goods to industrial and automotive systems, there is a trend to integrate control and driver electronics into the motor body to provide a standalone compact servo motor solution.

As these compact motors typically have diameters of 30mm or less, the challenge is always to physically fit the 3-phase pre-driver stage and 3-phase power stages (normally consisting of six power MOSFETs) into the available space and manage the power dissipation effectively.

The MPQ6541 from Monolithic Power Systems (MPS) is a 3-phase, brushless, DC motor driver stage which offers industry-leading power density in a small 6mm×6mm QFN package. The MPQ6541 can operate from 4.75V to 45V and deliver up to 8A of continuous current per phase (with suitable PCB area and thermal dissipation conditions). The MPQ6541 integrates three half-bridges consisting of six N-channel power MOSFETs along with pre-drivers, gate drive power supplies, and current sense amplifiers. An internal charge pump generates the gate drive supply voltage for the high-side MOSFETs, and a trickle charge circuit maintains a sufficient gate drive voltage to operate at 100% duty cycle. PWM and enable inputs are provided for each phase. Internal safety features include thermal shutdown, under-voltage lockout (UVLO), and over-current protection (OCP) (see Figure 1).

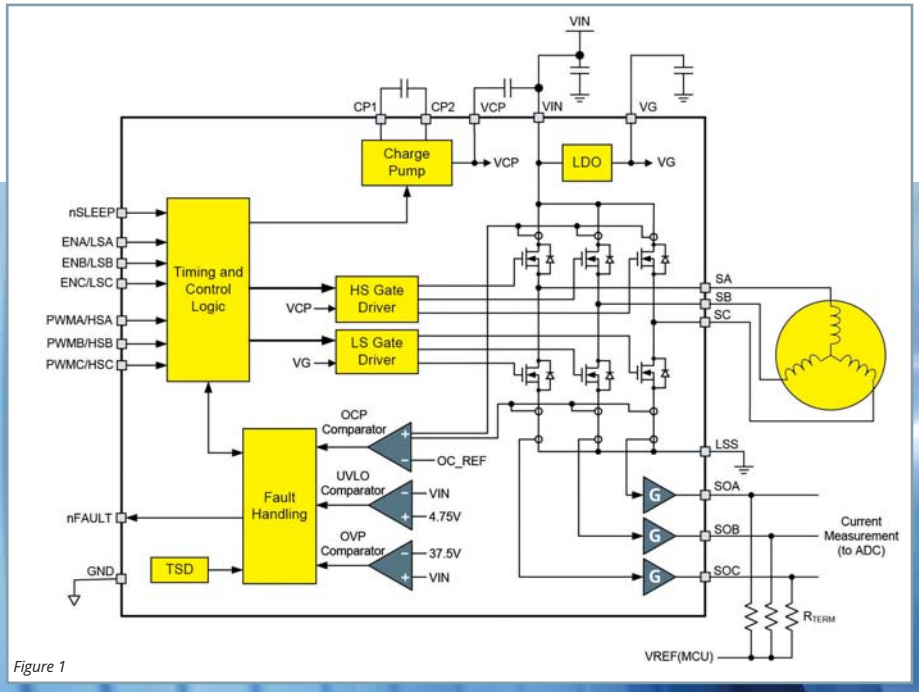
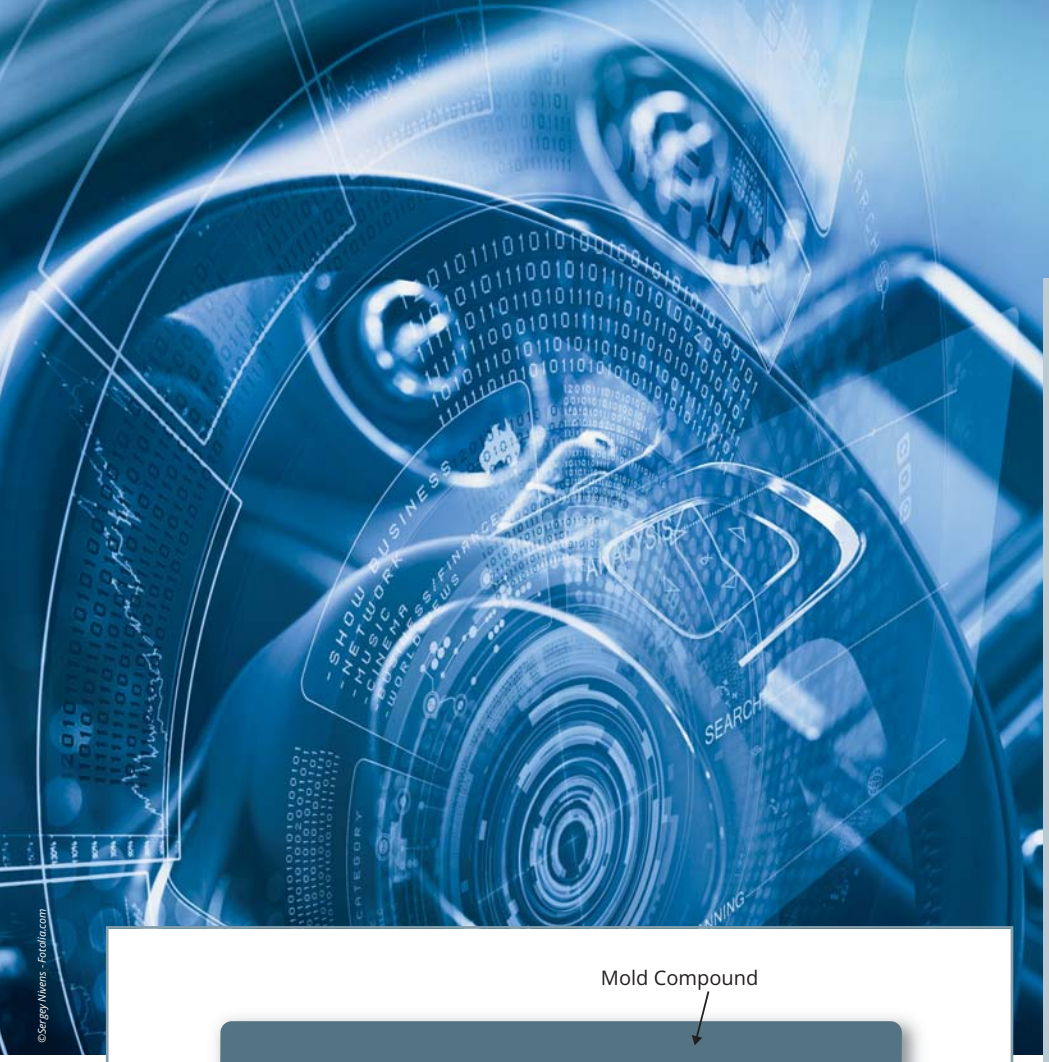


Figure 1



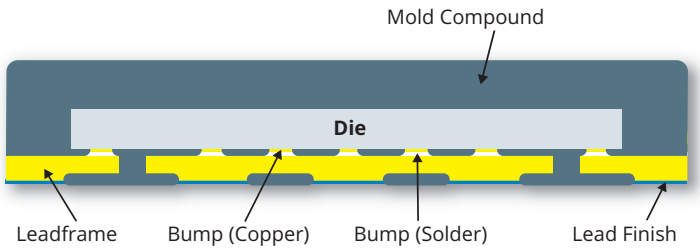


Figure 2

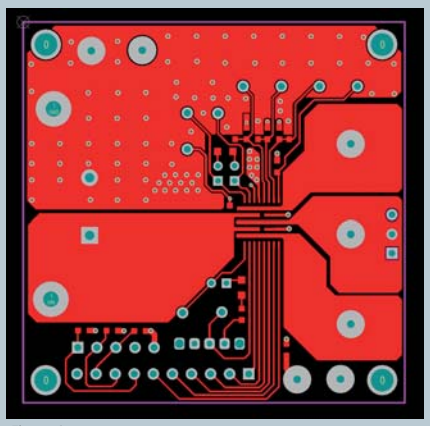


Figure 4

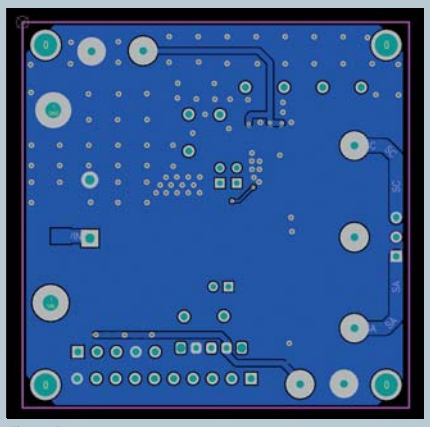


Figure 5

The MPQ6541 is a fully monolithic design and uses MPS's unique flip-chip package technology to dissipate heat via the package lead frame. Long stripe-shaped pads connect directly to the internal high- and low-side 13mΩ MOSFETs, providing the lowest thermal resistance path to the copper of the PCB. Small vias from these pads into the power and ground planes layers of the PCB can further help to draw heat away from the motor driver (see Figure 2 and Figure 3).

Figure 4 and Figure 5 show a two-layer PCB example using 1oz copper on a 5×5cm FR4 board of 1.6mm thickness. Figure 6 shows a thermal image of the MPQ6541 running with a 24V supply, a 20KHz PWM frequency, 75% duty cycle, and 6A peak current. Figure 5 shows a 38°C temperature rise above the ambient.

In a motor with a small diamater where there is less available PCB copper area, the ground plane of the PCB can be designed to make thermal contact with the back plate of the motor's metalic housing for additional heatsinking.

The MPQ6541 is sampling now and is available in a -40°C to +125°C industrial-qualified temperature range. An AEC-Q100 qualified automotive version will also be available later. Evaluation boards are availble now.

A15

Thomas Berner, +49 89 130143815
thomas.berner@codico.com

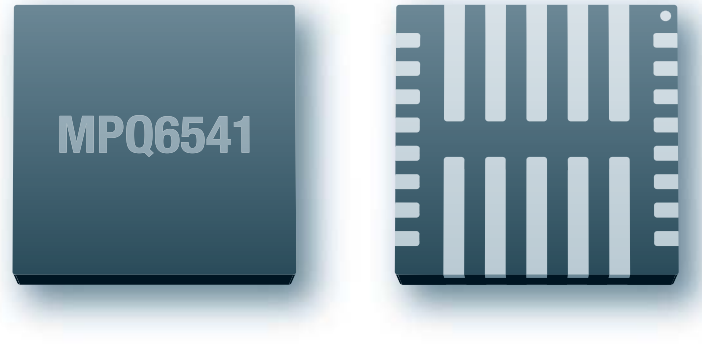


Figure 3

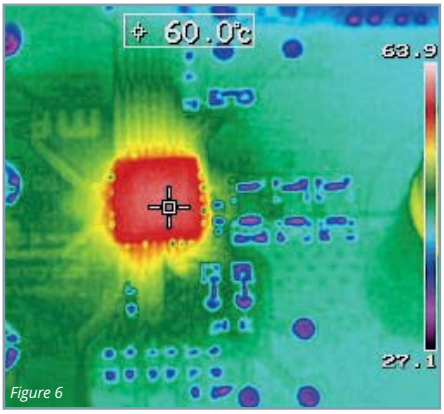


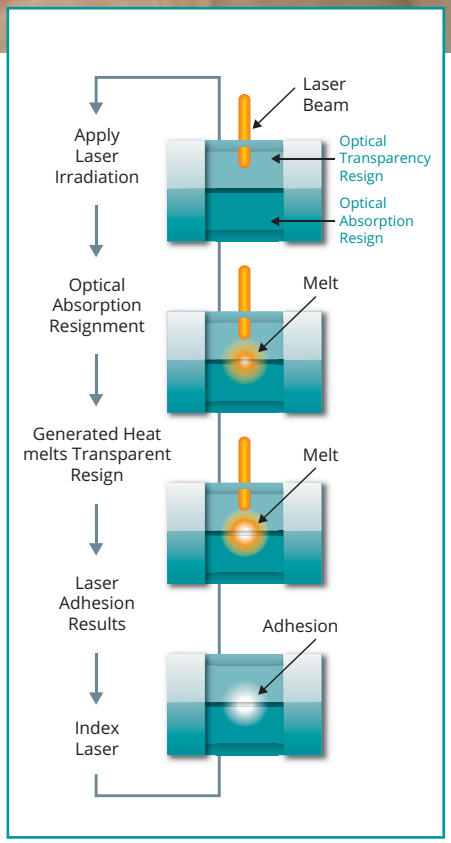
Figure 6

Author: Dipl.-Ing. (FH) Markus Lehmann, Panasonic Automotive & Industrial Systems Europe GmbH

HIGH PERFORMANCE SWITCHES

for the Medical Industry

Laser Welding Process



Medical equipment and devices must be designed with rigorous standards to function in environments where patient safety and product reliability are critical.

Today, there is great demand for innovative, feature-rich, and affordable electronic equipment to be used in diagnostic labs, hospitals, and clinics, as well as for consumer self-care. Engineers are constantly challenged to deploy differentiating leading-edge electronics that demonstrably improve patient care in a cost-effective manner for in-home patient care and portable monitoring and therapeutic devices.

In order to build high-performance products that are durable enough to withstand the challenging environments of most medical applications, design engineers need to consider how each component will operate within each medical device. From tiny sensors to sophisticated measurement systems, electronic products contribute to modern healthcare efforts, and they must be designed and manufactured to meet the special set of requirements for medical electronics products. Key attributes for switches used in medical products include high reliability, miniature size, long cycle life, corrosion resistance against body fluids and the option for customization.

No Contaminants, No Problem. Understanding IP 67

Let's start with a look at the product corrosion resistance against body fluids. It is important to note that medical switches are subject to many hazardous events, such as hospital cleaning solutions, human and environmental surface contaminants, water vapor transmission, electrostatic discharge (ESD), and environmental pressure

differentials. Since ingress of contaminants represents a key failure mode for switches, Light Touch Switches (LTSW) for medical applications increasingly need to meet IP 67 standards for protection against dust and liquid infiltration.

Today's wearable devices and hearing aids nearly always require IP 67 tactile switches too that withstand exposure to sun screen, lotion and water. The long-live cycle provided by IP 67 typically outweighs the tradeoffs in switch feel since the silicone makes the switch feel less crisp.

If you compare two tactile switches with identical push forces, one with and one without the IP 67 membrane, the switch with the membrane will usually feel a bit spongy. Yet it's important to be aware of these tradeoffs when selecting tactile switches with a silicone membrane, especially if you're trying to optimize for switch feel. PANASONIC's IP67 tactile switches are manufactured differently. Rather than bond a silicone membrane under the actuator, the company uses a new patented method laser, which welds a nylon-based thin film over the actuator. This new method has a clear edge over the traditional membrane construction when it comes to switch feel and protection from loads.

LTSW FOR MEDICAL APPLICATIONS
Light Touch Switches provide a unique sharp tactile feel, in a very small package and have a low contact resistance.

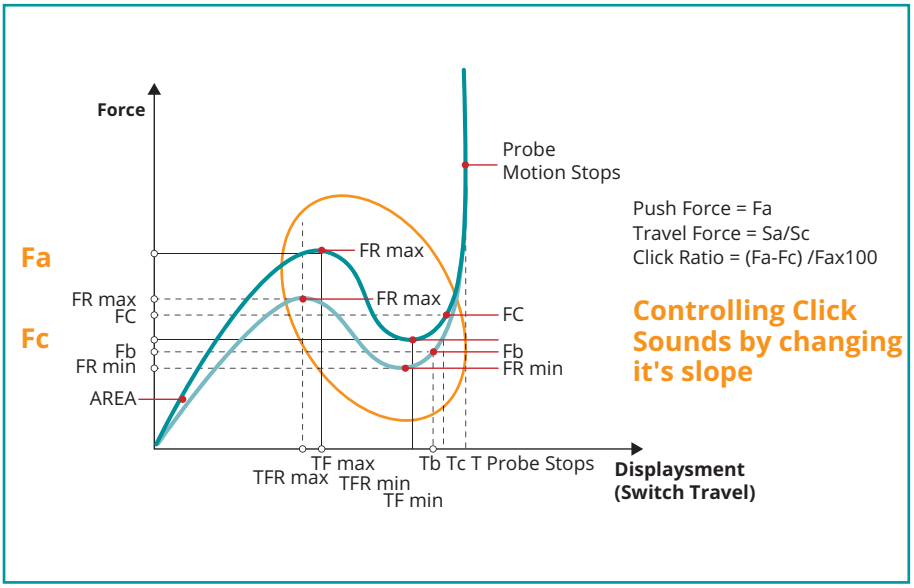
EVPBB (2.6×1.6)	**EVPAK** (3.8×1.9)
	
Top Push Type High operability equipped with an actuator	Side-operational Type Good feel Measure against mechanical peel-off

Improving Tactile Switch Actuation and Life Cycle

Another contributing factor to the longevity of a medical product is quality, and more specifically, how the end user perceives it. For example, for various laparoscopic procedures, surgeons depend on the tactile feedback from their electrosurgery instruments before cutting and sealing tissue. This is further more an extremely important design consideration for insulin pumps, since over time diabetes affects and decreases people's sense of touch due to progressive nerve damage. Switches are being used in transdermal patches to trigger the dispensing of pain killers, antibiotics and other drugs through the skin. Eldery people who have to operate manual drug meters such as those involving lower dosage levels of prescription drugs, require a consistent and reliable tactile feedback experience to minimalize misuse and over dosage. It is essential that the switch operate properly not only to ensure medication is being dispensed, but that the proper dosage is dispensed on schedule.

PANASONIC's Tactile Metal Domes are frequently used to provide the »snap« or tactile feedback and audible sound when a switch is user-actuated and have proven a necessary design. The dome array is part of the switch contact system, which is encased in the switch assembly to provide a solid »snap« or tactile response when the switch is actuated. The design ensures that the moment of tactile response more closely coincides with the moment of contact. The mechanical contact system is extremely reliable in rugged environments and offers a superior tactile response that is consistent from switch-to-switch.

As described in the graph below all tactile switches have actuation force characteristics that can be boiled down into a click ratio that expresses the relationship of the switch's actuation and contact forces. A higher ratio indicates a crisper or snappier switch feel. The travel distance, or deflection, of a pressed switch can also contribute to its overall feel. Metal dome or embossed arrays offer easily integrated low-cost contact systems that still allow for custom contact configurations.



SIDE PUSH SWITCHES FOR MEDICAL APPLICATIONS

EVPAT (3.4×1.7)	**EVPAV** (2.8×2.3)
Good feel Measure against mechanical peel-off Extreme small packaging size	Good feel Measure against mechanical peel-off Extreme small packaging size

The Smaller, the Better – Benefits of Side Push Switches

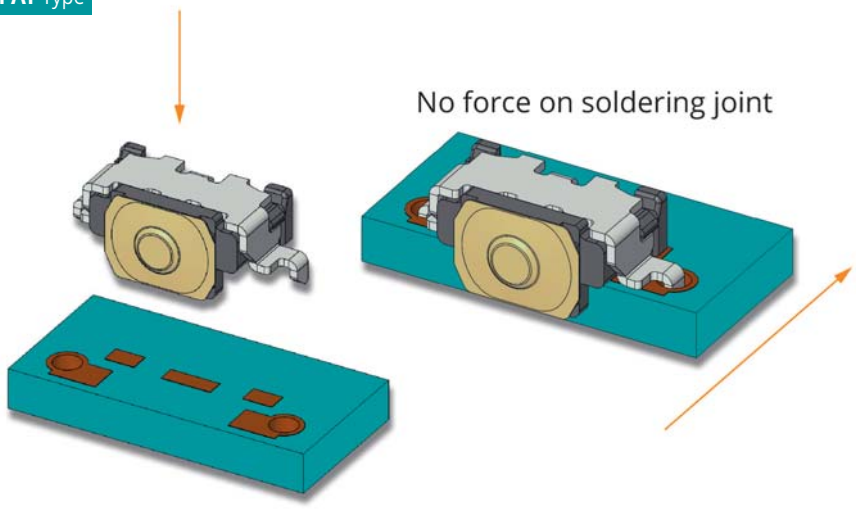
Size is another key factor in medical device design. Take for instance hearing aids – the hearing technology landscape is ever evolving and offers a wide range of products – from traditional hearing aids regulated as medical devices to consumer-technology products (such as personal sound amplification, or PSAPs) and hearing assistive technologies. Hearing devices are more convenient and compatible than ever, with wireless connectivity to smartphones and lithium-ion rechargeable batteries, etc.

All of these functionalities have to take into account that the device has to be as discreet as possible, what is mainly a question of size and that it needs to be operated by a single hand and all of that complicating even out of sight. This as a design question has been successfully answered by PANASONIC's Side Push Switches. Since the height of the switch is first of all not to above the PCB meaning that designers can shrink the product or have additional space to work with.

The mid-mount design also means the PCB provides support for the switch, thereby improving the strength of the mount in relation to the direction in which the switch is pressed. Additionally, being able to mount the switch directly onto a PCB removes the need for a flexible or sub PCB for connecting switch and PCB, thus contributing to cost reductions in end product design.

A product is only as good as the sum of its parts, something especially crucial when it comes to designing safe and accurate medical devices and equipment. By taking these factors into account, design engineers can be sure they're choosing the best switches for their medical applications.

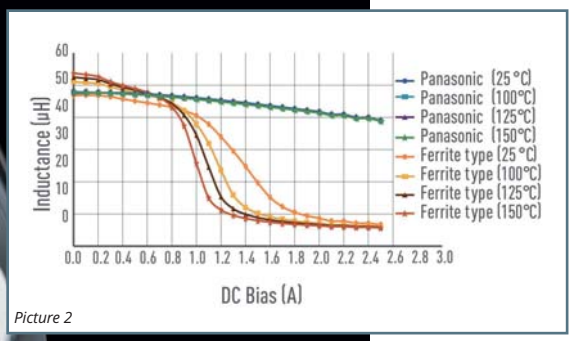
EVPAT Type



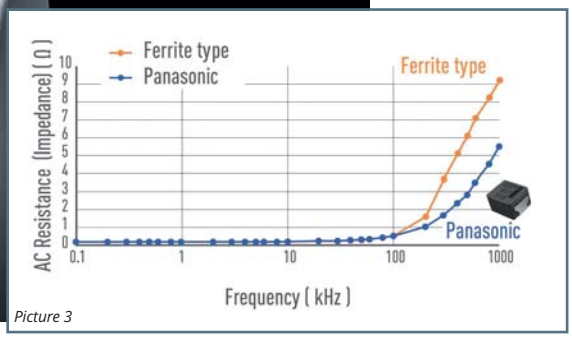
P01

Michael Blaha, +43 1 86305 105
michael.blaha@codico.com

LIGHT UP YOUR WAY!



Picture 2



Picture 3

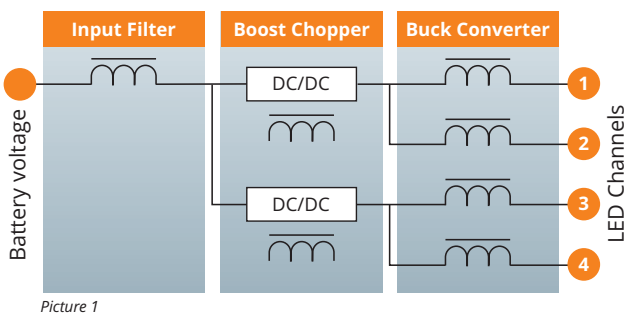
As mentioned before, high efficiency and low losses are the requirements for lighting designs. On the inductor side there is two different kinds of losses occurring: DC and AC losses.

DC losses are mostly due to resistance of the copper wire which benefit of the low DCR of the ETQP series down to 1mΩ. AC losses, on the other hand, are mostly related to frequency dependent core losses. As you can see in Picture 3, by increasing the frequency the core losses are increased as well.

Lighting is one of the most growing applications in the automotive segment. Approximately 30% of all accidents occur at night, that's why it is essential for both seeing and being seen. To improve driving safety, Tier 1 customers are developing innovative adaptive front lighting systems (AFS).

In the latest systems, for example, a total of 25 LEDs can be operated on full power in each headlight. Currently, electronic designers are facing the problem of developing LED driver circuits with low power consumption and finding components working reliably at high frequency (some MHz).

Picture 1 shows the block diagram of such a design, which is mainly based on an input filter followed by boost and buck stages. The filter circuit is designed to absorb noise, allowing the ECU to work properly in its reserved frequency range.



Picture 1

In the boost stage input voltage is transformed to a higher output voltage, in most cases from 12V to 70V. Usually such boost converters are operating in the frequency range of 1-2MHz to improve the efficiency. The buck converters are supplying the LEDs by providing an output voltage of 5V or lower.

To achieve stable boost and buck converter circuits, it's necessary to use power inductors with high current capability and low temperature drift. A drastic drop of the inductance value can lead to a malfunction, which results in instability of the output voltage. Due to its monolithic structure, the ETQP series has soft saturation behavior (Picture 2).

By applying high ripple current the inductance will drop almost linear and there is nearly no deviation of the inductance value at temperatures of up to 160°C.

The PANASONIC's metal composite technology reduces the core losses by almost half compared to the ferrite technology. That way the efficiency and the thermal behavior of the circuit can be improved by reducing the losses. In addition, due to the monolithic structure, eddy current losses can be better controlled or reduced, which improves the power efficiency of the coil itself.

Besides all electrical advantages, with PANASONICs ETQP series miniaturization of the inductor is possible as well. PANASONIC can achieve better electrical behavior in smaller case size compared to competitor ferrite solutions in bigger case size. All these attributes of the PANASONIC metal composite technology are making the component that successful for lighting applications. This allows electronic designers to achieve better thermal behavior, miniaturization and high efficiency in their circuit design.

Order your PANASONIC ETQP series inductor sample in the CODICO Sample Shop now!

P02

Sebastian Gebhart, +43 1 86 305 205
sebastian.gebhart@codico.com

HYBRID-CAPACITOR FOR HIGH TEMPERATURES

Panasonic

Hybrid Capacitors from PANASONIC Automotive & Industrial Systems Europe have established themselves as reliable and versatile solutions in automotive and industrial applications alike. This technology offers low leakage current and long life in combination with low ESR (down to 20mΩ) in miniature case sizes.

The requirements for components regarding temperature and life time are increasing steadily. PANASONIC has developed a new high temperature polymer aluminum electrolytic hybrid capacitor in SMD version, ZE-series, which provides a guaranteed life time of 2.000h at 145°C. This component combines high performance, small costs, low leakage current, long life time and low ESR-values.

If the capacitor is used up to 135°C only, more than double of the ripple current at 4.000h is acceptable (e.g. 2Arms at 35V/270uF/10×10.2mm).

This products are AEC-Q200 certified and versions with vibration proof packages are offered too.

Comments Andreas Lapucha, 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.«*

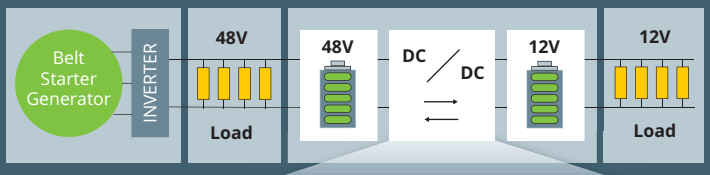
If you want to make use of this benefits too, please visit the CODICO Sample Shop and order your desired samples.

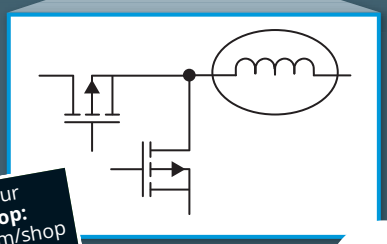
P03

Roland Trimmel, +43 1 86305 144
roland.trimmel@codico.com

VOLTAGE (V)	CAPACITANCE (uF)	DIMENSIONS (mm)	ESR (mΩ@ +20°C/100kHz	RIPPLE CURRENT mAr.m.s.@ +145°C/100kHz	GUARANTEED LIFETIME @+145°C	RIPPLE CURRENT mAr.m.s.@ +135°C/100kHz	GUARANTEED LIFETIME @+135°C
25	220	8×10.2	27	700	2000	1600	4000
25	330	10×10.2	20	900	2000	2000	4000
35	150	8×10.2	27	700	2000	1600	4000
35	270	10×10.2	20	900	2000	2000	4000
50	68	8×10.2	30	600	2000	1250	4000
50	100	10×10.2	28	800	2000	1600	4000
63	33	8×10.2	40	600	2000	1100	4000
63	56	10×10.2	30	800	2000	1400	4000

Storage Choke for the Automotive Segment





SAGAMIs storage choke for bi-directional DC/DC converter 48V/12V.

In the automotive segment 48V has also been established for higher power loads (e.g. AC, heaters, electric steering,...). There are special requirements to battery management system as two separate batteries with 12V and 48V are necessary. For such systems mainly bi-directional DC/DC buck or boost converters are used. In multiphase/multi-ICs operation up to 12 phases are possible and each requires its particular storage choke.

SAGAMIs CVE2622HA series is the perfect solution from the electrical as well as the mechanical point of view. The flat wire design combines the required high current capability and the low DCR in a compact case size. The temperature range of up to 125°C fulfills the requirements of AEC-Q200 grade 1. Equipped with additional mounting pins the vibration resistance is significantly increased.

Recommended items

- CVE2622HA-100M-R – for lower switching frequencies appr. 60kHz-100kHz
- CVE2622HA-6R8M-R – for switching frequency starting from appr. 100kHz

P04

Sebastian Gebhart, +43 1 86 305 205
sebastian.gebhart@codico.com

Ideal for 48V board systems: SAGAMI's new storage choke

RUBYCON: New film capacitor

Ultra-high voltage request can be satisfied by new RUBYCON film capacitor.

RUBYCON has launched an ultra-high voltage metallized polypropylene (MKP) film capacitor that can bare 10,000V~20,000V.

The target applications are X-ray machines, laser machines, particle accelerator, etc. which need very high DC voltage supplied by Cockcroft-Walton generators. Especially when used in X-ray machines, the more the tube-voltage rises the more penetration power of radiation rises up.

An overview of the specification details are shown in the table.

P05

Yasunobu Ikuno, +43 1 86305276
yasunobu.ikuno@codico.com

PRODUCT NAME	MPF SERIES
Category Temperature Range	-40 to +85°C
Rated Voltage (UR)	10,000VDC to 20,000VDC
Capacitance Tolerance	±5% (J), ±10% (K)
Tanδ	0,001 max. bei 1kHz
Capacitance Range	10,000VDC: 10,000pF ~ 33,000pF
	20,000VDC: 4,700pF ~ 15,000pF
Example Size	20,000VDC / 10,000pF 82×28×29mm (B×H×T)

SMD Y1

©Andrzej Thiel - Fotolia.com

To design a SMD-solution, for a primary – secondary coupling in power supplies two Y2-capacitors in series connection had to be used up to now. This means higher component costs on one hand and requires also bigger space on the PCB on the other hand.

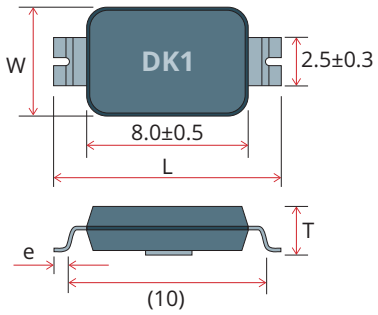
With the new DK1-series MURATA provides a Y1-capacitor in SMD-version for the first time. For this cap the technology of the cearmic disk capacitors was applied to achieve a high withstand voltage that meets IEC60384-14 requirements, despite compact and low profile design. Additionally, to the space saving on the PCB DK1 is best suitable to e.g. realize a particularly low profile LED driver. Another advantages are of course reduced pick and place costs and time.

Main applications for the new DK1-series:

- Y1-capacitor for primary – secondary coupling (C4)
- X1/Y1-capacitor as line filter for switch mode power supplies and AC adaptor (C1, C2, C3)

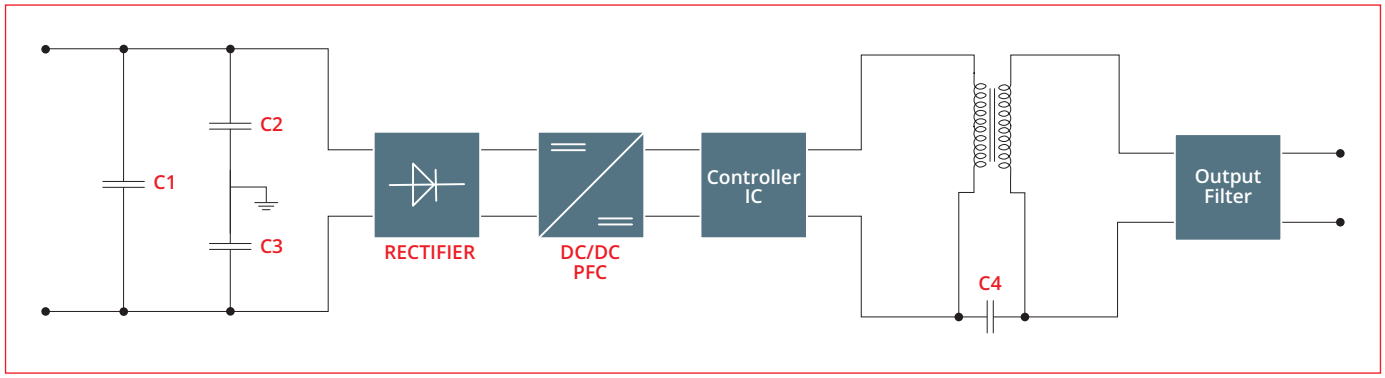
- Size: L11.4×W6.0×T2.5mm
- Rated Voltage: 250Vac (r.m.s.) – 300Vac (r.m.s.)
- Capacitance: 10pF – 1.500pF

DK1 Dimensions



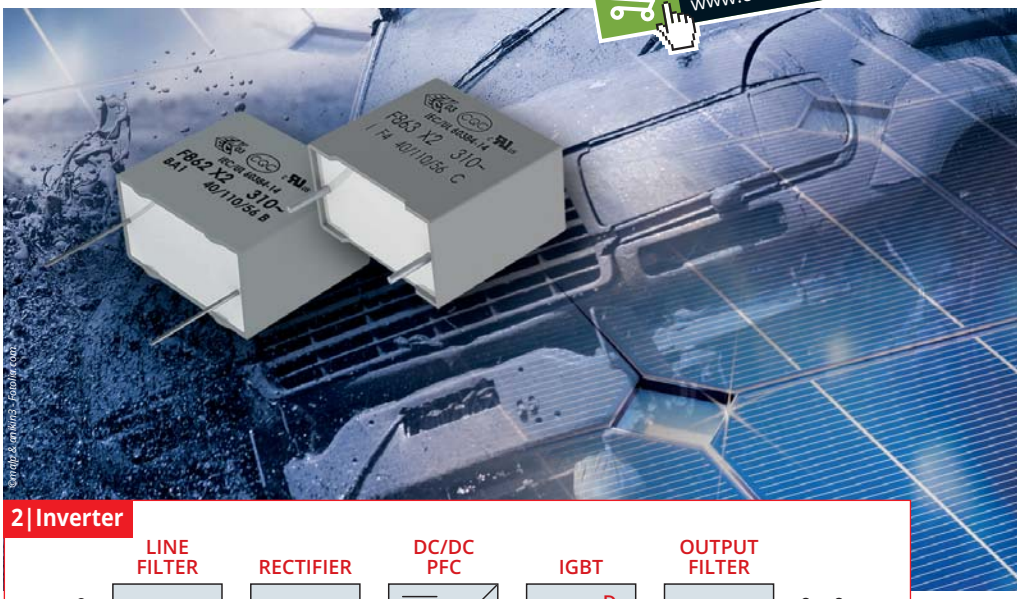
P06

Roland Trimmel, +43 1 86305 144
roland.trimmel@codico.com



LONG-TERM STABLE X2 FILM CAPACITORS

X2-capacitors with rapid considerable capacitance loss can have fatal impacts in various circuits. KEMET provides a remedy with his F862- and F863-series.



For the loss of capacitance there are several reasons like self healing, oxidation, erosion and corrosion. Thanks to a high zinc content in the metallization, conventional X2-capacitors are designed for rapid self-healing, and do not provide the long-term reliability required for specific applications.

A significant amount of the capacitance loss is however caused by an adverse interaction of temperature, humidity and voltage (THB). The higher the humidity the faster the decrease of the capacitance. To counteract, KEMET developed corresponding X2-capacitors. At these caps the rapid loss can be reduced with using optimized materials and a specific production process.

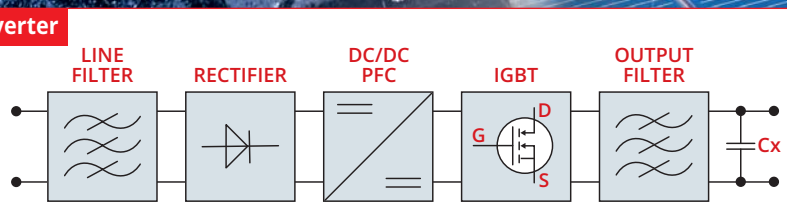
Depending on application a fast decrease of capacitance has different impacts.

1 | Capacitive voltage divider/serial capacitor (C1): In order to supply a corresponding AC-voltage and power to the circuit for a requested time, a high stability of capacitance is required. So, if a X2 capacitor is requested, watch out for following THB-test: 85°C/85% R.H./240VAC (500h or 1000h). This guarantees a long-term stability to avoid an early failure of the power supply.

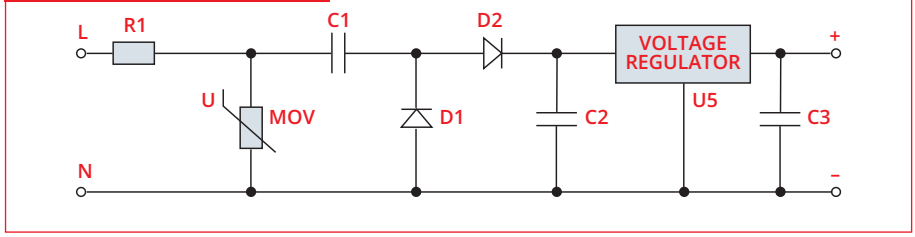
2 | Output filter for inverter or UPS-devices (Cx): A rapid loss of capacitance indicates that the metallization is reduced due to erosion or corrosion. As result tanδ/ESR increases, which means a higher self heating and so a significant lower life time of the capacitor.

The special versions with a high capacitance stability doesn´t show this effect and help to keep the efficiency of the filter. The high stability of the capacitance reduces the deviations of the cut-off frequency and the filtering bandwidth. The portfolio of CODICO provides such special X2-capacitors from KEMET, which meet the mentioned requirements.

2 | Inverter



1 | Capacitive Voltage Divider



F862-series is 1.000hrs at 85°C/85% R.H./240VAC tested. With F863 KEMET introduced a new version of this capacitor, which is tested for 500hrs at same conditions, and represents a miniaturized and cheaper design of F862. So KEMET provides a high performance component in same dimensions like the standard-X2 of R46-series.

- Capacitance range F862: 100nF ... 4,7µF
- Capacitance range F863: 100nF ... 10µF

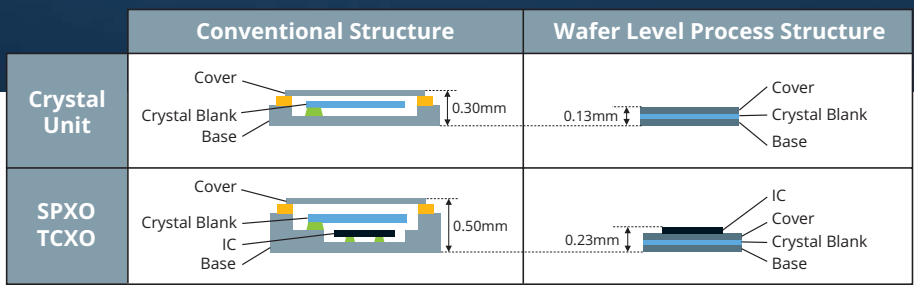
Have we aroused your interest? Just order your desired samples in the CODICO Sample Shop!

P07

Roland Trimmel, +43 1 86305 144
roland.trimmel@codico.com

ARCH.3G

KDS/Daishinku has launched half size new crystal unit »Arch.3G« series to lead SiP (System in Package) solution.



KDS has launched a new »Arch.3G« series which are extremely tiny (1.0×0.8mm size) compared to any other product in the market. Especially the thinness has to be underlined. Today, low profile crystals have a height of 0.30mm. Our new Arch.3G MHz crystal offers only 0.13mm which means less than half.

Due to this thinness Arch.3G series will be suitable for SiP modules or molding inside PCB. Especially IoT (Internet of Thing) is a hot topic now, Arch.3G series will for sure accelerate this trend. Let us introduce some information of Arch.3G. There are two important factors, which are packaging and material.

Crystal products to be produced with wafer level process

1st factor is packaging technology. The new technology witch KDS has adopted in Arch.3G series is the so called WLP (Wafer Level Processing) technology.

Today most of the crystal components are produced by placing the quartz crystal blank into the ceramic package individually. This conventional structures have several difficulties and limits, especially on miniaturization. The smaller the product becomes the more difficult it is to secure margins of a conductive adhesive and mounting position when crystal blanks are mounted in the package.

Also thinner and more fragile the crystal blank becomes with higher miniaturization. Production quantity is related to how fast the machine can pick and place the crystal blank. But if the crystal blank is fragile, the productivity will become very difficult. In order to solve these issues, it was necessary to review the product- and process-designs fundamentally.

Instead of conventional construction, WLP structure can overcome those difficulties. This structure is built from three wafer layers, base layer, crystal blank layer and cover layer. The products are first packaged by those wafers and after packaging, the wafers will be divided to each product. In this technology, margins of blank placing will not be a problem and make the crystal product to realize such tiny and thin size.

Crystal × Crystal × Crystal?

Another important factor is the material itself. Today, base material of crystal products is mainly with ceramic and cover materials are ceramic or metal. But Arch.3G layers are all made out of quartz crystal. This means all materials will be produced by KDS. So there is full flexibility to adopt the product design or the material supply. The difficulty of this technology is in sealing. If the sealing is not perfect, robustness of the product or yield rate in the production become worse. However, KDS has developed its own sealing method »Fine Seal« technology to bring perfect productivity. This Arch.3G series are now tested to apply AEC-Q200 requirements.

Which item is now available?

Arch.3G series are now available in 1.0×0.8mm size with MHz crystal unit, SPXO and TCXO. Also smaller MHz crystal units with 0.8×0.6mm are considered for future development.

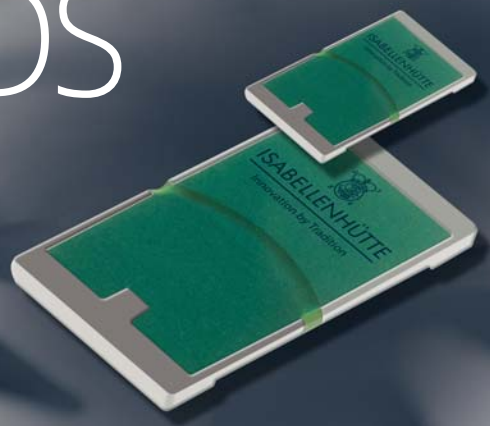
Tell us what you need, from crystal units to MEMS oscillator, KDS can offer you the best product which fits perfectly to your application.

P08

Yasunobu Ikuno, +43 1 86305276
yasunobu.ikuno@codico.com

PRODUCT NAME	DX1008J	DS1008J	DT1008J
Type	Crystal unit	SPXO	TCXO
Package Size	1.0×0.8mm	1.0×0.8mm	1.0×0.8mm
Thickness (typ.)	0.13mm	0.23mm	0.23mm
Frequency	48, 52, 60, 80, 96 MHz	1 to 100 MHz	26, 52 MHz
Temperature Stability	±20ppm	±20ppm	±0.5ppm
Temperature Range	-30 to +85°C	-40 to +85°C	-40 to +85°C
Supply Voltage	–	1.6V to 3.6V	1.6V to 3.6V
Mass Production	From May 2018	From May 2018	From May 2018

TREND TOWARDS LOWER POWER



ISABELLENHÜTTE has developed SMD-mountable precision resistors for medium and lower power requirements, so filling a gap in its product range. The new CMx series meets the demand towards lower power ratings, providing tried and trusted quality features such as long-term stability, low temperature coefficient, and very good load capacity.

Anton Roth, Sales Director Components (VT-BE) ISABELLENHÜTTE, explains the strategy behind the new product series:

»In the automotive sector there is a perceptible trend towards resistors with lower power ratings. The CMx series has been designed with that in mind, and we have now filled a gap in our SMD components range. This approach can be compared to adjusting the product portfolio of an automobile manufacturer. A vehicle brand includes various models which are clearly different from one another in specific respects, such as the size. This means that the individual models suit the individual requirements of the drivers. When it comes to our range of SMD resistors, the power rating, by way of example, is a specific differentiation feature. The tried and trusted VMx and SMx series cover a range from 2W to 5W, while the CMx Series at 1W is aimed at the present market demand, and all with the customary high standard of quality from ISABELLENHÜTTE.«

Keeping ahead of the competition

The new component series is designed for a temperature range from -65°C to 170°C, which makes it ideally suited for applications in the automotive industry. In that sector, CMx resistors can be used, among other things, in monitoring systems for actuators, such as brushless DC motor controls, LED drivers, or general electronic control units (ECU's). In industry, the new component family is well suited for switching power supply units, power modules, or drive control units. In frequency converters, too, for synchronous and asynchronous motors in White Goods such as exhaust hoods, washing machines and dishwashers, or climate control and air-conditioning systems, CMx resistors are well suited for use as current sensors. Over the entire range, the temperature coefficient (Tc) is below 75ppm/K.

ISABELLENHÜTTE can provide the lower temperature coefficients for the complete resistor sector, and the load capacity is guaranteed in comparison even at high contact point temperatures. With resistors from other manufacturers the Tc varies over the performance value range, and the nominal load relates to the ambient temperature. What is determinant in the application, however, is the contact point temperature, which together with the load capacity and stability of the component is the decisive factor. And with long-term stability of lower than 1 percent, users can take best advantage of ISABELLENHÜTTE technology. While competitor products may share some of these features, a contact point temperature of 100°C with ISABELLENHÜTTE resistors is not something other suppliers can readily match. The resistor series is also characterized by high mechanical shock resistance, at some 100g (6ms half-sinus). The components can tolerate vibrations of 20g as well, and high frequencies of between 10 and 2,000 Hertz.

Tried & trusted ISA-Plan® technology, optimized manufacturing process

The basis for the essentially sandwich-type structure of CMx resistors is the tried and trusted ISA-Plan technology. Depending on the requirement for the resistance values, with the ISA-Plan film technique the two materials manganin or zeranin, in the form of etched homogenous films, are mounted, electrically insulated, on a metal substrate of copper, with good thermal conductivity. By using a strongly heat-conductive adhesive, the resistance film of manganin or zeranin is bonded to this carrier material. This adhesive bonding, resistant to high temperature, is optimized with regard to adhesion, insulation, and, above all, low heat resistance (Rthi) between the resistor film and the substrate, which achieves ideal heat dissipation of the component over the side contact connections.
In order to protect the resistor material and the upper layer of copper against environmental influences, the component is subsequently coated with a heat-resistant protective lacquer, providing a secure seal. The side contact connections are provided with a thin layer of tin by means of a galvanic process, and when in use in the customer's application this provides the necessary bond to the PCB. In addition, the component is thermoelectrically adjusted to the metal substrate in such a way that thermal stresses are reduced almost to zero. Thanks to an optimized current density distribution in the structure, hot spots are reduced to a minimum. The good thermal conductivity into the substrate, combined with its high thermal capacity, creates an excellent pulse load capacity.

P09

Srećko Dražić, +43 1 86305 104
srecko.drazic@codico.com

Electromechanical THR RELAY Reflow Solderable

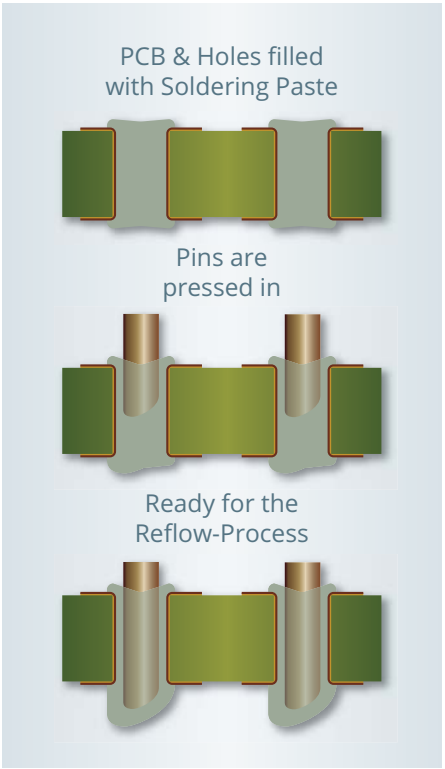
With the GQ series GOODSKY would like to introduce its new innovation which is the technology of »Reflow Solderable Through-Hole« for General Power PCB Relays.

Before the introduction, we will give a little explanation on the difference between SMT and THT component, and the difference of each soldering method.

Currently there are 2 technologies to assemble components to the PCB, which are Surface Mount Technology (SMT) and Through-Hole Technology (THT). The advantages of SMD (Surface Mount Device) components are higher components density, low initial cost of setting up for production, and faster automated assembly. But SMD components have some limitations, as they are not suitable for high power/voltage part, and component level repair is more difficult. Through-Hole components are ideal for products that will undergo mechanical stress, and use in high power applications.

SMD and Through-Hole component require different methods of soldering production process, SMD components uses reflow soldering process where Through-hole components need a wave or hand soldering process. In the eyes of the factory owner, you wish to go through less production steps as possible as this means less capital expenditure and faster production turn rates.

The key reason that a Through-Hole component cannot pass through a reflow soldering process is caused by the process itself, that requires high temperatures to melt the solder paste which takes several minutes of time. In result, the plastic material of Through-Hole relay could melt, and potentially causing a mechanical or electrical malfunction.



Standard THT Relay	*Special THR Relay**
	

**Optional Features: UL Class F Insulation System, Halogen Free, and IEC60335-1 Glow Wire Standard are available.*

Hereby we would like to clarify that most of GOODSKY Through-Hole relays can undergo a reflow soldering process. For most series GOODSKY is able to offer a THR versions with only some extra Cents but much more value added and potential cost saving when the process can be changed.

GOODSKY started this technology with GQ, other series can be added based on customer request for this technology.

Reflow soldering condition

As a minimum, the following parameters shown below shall be specified for reflow temperature profile (According to IEC 60068-2-58: 2015).

Note: we recommend that you confirm your actual solder conditions.

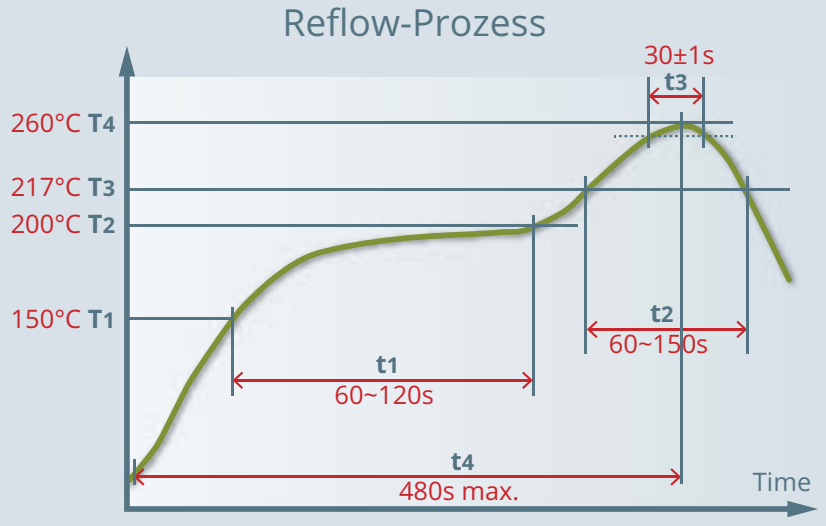
P10

Michael Blaha, +43 1 86305 105
michael.blaha@codico.com

Throughout the years of research in Through-Hole type electromechanical relay, GOODSKY has discovered several supreme standard plastic materials which can sustain the harsh melting temperature of the reflow soldering process.

Now the PCB manufacturers have the choice to go through only one reflow soldering process, as there may be no longer need for the additional wave or hand soldering production process in case the relay would be the limiting component. Also, there is research indicating a lower defect rate with reflow soldering process.

For the THR technology it is necessary to apply the soldering paste to the board. This can be made by a dispenser, screen printing or special parts that will be inserted. Afterwards the all the SMD components will be put on the board and finally the relay and other THR component such as connectors will be inserted into the holes that are filled with the soldering paste.



T1 Minimum preheating temperature
T2 Maximum preheating temperature
T3 Liquidus temperature
T4 Peak temperature

t1 Preheating duration
t2 Time above liquidus temperature
t3 Time above (T4 – 5°C)
t4 Time to T4

SIGNALS

Customized Antenna & RF Solutions

In co-operation with SINBON we are customizing your antenna to offer the smallest size, while maintaining a wide bandwidth to cover a variety of applications in a single antenna. In order to create an optimal RF design for your application, SINBON engineers review detailed technical documentation based on in-house tests made in their own antenna chamber which is approved by ETS-Lindgren.

The antenna performance can be optimized through performance tuning and testing in your device. The product portfolio for antenna & RF solutions includes:

EXTERNAL ANTENNA

Vehicle Antennas

The main focus is on automotive applications where SINBON already provides various designs and specifications for individual OEM/ODM customers worldwide.

Multiple vehicle antenna models including GPS, Glonass, Compass, and AM/FM antennas meet the aftermarket requirements.

Outdoor Antennas

For outdoor solutions CODICO offers windproof antennas for frequencies 700MHz to 6GHz and IP ratings of IP65, 67 and 68 per customer specifications and requirements.

This comprises also magnet mount antennas and a big family of different dipole antennas.

RF Assembly Solutions

Together with long-standing partners CODICO realizes high-quality cable assemblies with micro coax connectors suitable for all industries and applications. The range includes flexible, semi-rigid and hand-formable cable assemblies with a combination of cable and connectors optimized for each market and application.

S01

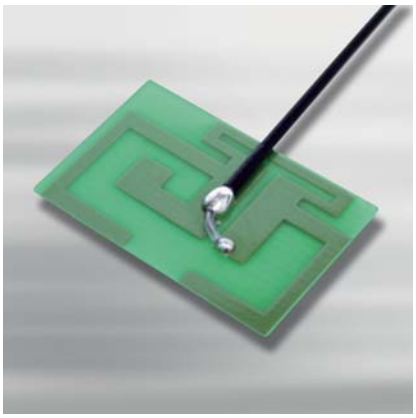
Christian Sichtar, +43 1 86305 134
christian.sichtar@codico.com

INTERNAL ANTENNA

Internal antennas are connected to the PCB either as a cost-efficient SMD component or via a cable and a miniature connector to achieve the optimal antenna performance for your application. Several key antenna types are cable fed antenna, sheet metal, PCB/FPC and plastic carriers.

LTE/3G Antenna

- Internal LTE PCB antenna 704~960MHz, 1710~2170MHz, 2500~2690MHz
- Internal GSM & UMTS & WCDMA PCB antenna
- Available with micro co-axial connector and variable cable length/diameter
- Easy to integrate in device with PCB or flexible PCB antenna



Wi-Fi Antenna

- Designed for 2.4/5.5GHz application (WiFi, Bluetooth, ZigBee, etc.)
- Available with micro co-axial connector and variable cable length/diameter
- Easy to integrate in device with PCB or flexible PCB antenna

GPS Antenna

- SINBON offers performance oriented RF ceramic chip antenna solutions
- Ceramic antenna offer small form factor
- Extreme temperature stability (~2ppm)
- Most common ceramic antennas offer Wi-Fi and GPS solution

NFC Antenna

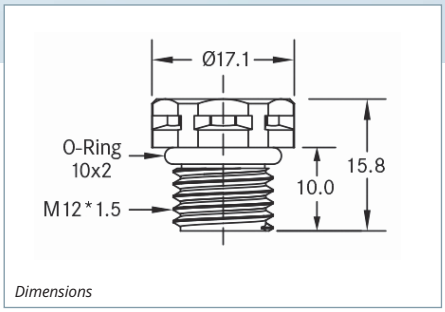
- Material: FPC
- Near field communication antenna
- Frequency: 13.56MHz
- Read distance in to 5cm

LCT Antenna

- Highly accurate pattern resulted from laser onto thermoplastic with primer, which is subsequently plated to form conductive trace
- More variable than LDS process
- Saving cost on pattern

Effectively protects your Outdoor Devices in Harsh Environments

M12 SCREW VENT SERIES



Dimensions

AMPHENOL LTW introduces the Screw Vents M12 of waterproofing screws for industrial applications, providing a solution that reliably guarantees complete enclosure in industrial environments.

The screw vent M12 series strong and flexible plastic is made to withstand extreme changes in pressure while retaining its integrity. The M12's smooth and flat surface design also aids to keep liquids, oils, and moisture away, ensuring its waterproofing feature.

ALTW's screw vent offers a variety of options with numerous performances and characteristics to meet your requirements such as LED lighting, renewable energy, broadband wireless access and security.

S02

Christian Sichtar, +43 1 86305 134
christian.sichtar@codico.com

PART NUMBER		VENT-PS1NGY-N8001 (GRAY) VENT-PS1NBK-N8001 (BLACK)	VENT-PS1NGY-N8002 (GRAY) VENT-PS1NBK-N8002 (BLACK)	VENT-PS1NGY-O8001 (GRAY) VENT-PS1NBK-O8001 (BLACK)	VENT-PS1NGY-O8002 (GRAY) VENT-PS1NBK-O8002 (BLACK)
Assembly Type		Screw M12×1.5	Screw M12×1.5	Screw M12×1.5	Screw M12×1.5
Specification	Environment Temperature	-40°C~+125°C	-40°C~+125°C	-40°C~+125°C	-40°C~+125°C
	Waterproof Rating	IP68 (2M, 60mins), IP69K	IP68 (2M, 60mins)	IP68 (2M, 60mins), IP69K	IP68 (2M, 60mins), IP69K
	Air Permeability	> 1000ml/min @70mbar	> 3000ml/min @70mbar	> 550ml/min @70mbar	> 1000ml/min @70mbar
	Water Entry Pressure	> 60kPa	> 60kPa	> 60kPa	> 60kPa
Material	Housing	PA	PA	PA	PA
	Membrane	ePTFE (Hydrophobic)	ePTFE (Hydrophobic)	ePTFE (Oleophobic)	ePTFE (Oleophobic)
	Sealing	O-ring: Silicone (Blue)	O-ring: Silicone (Red)	O-ring: Silicone (Black)	O-ring: Silicone (Green)
	Housing Color	Gray / Black	Gray / Black	Gray / Black	Gray / Black
Test Standards		Thermal Shock: EIA 364-32, Waterproof: IEC 60529 & ISO 20653, Fungus: GB/T 2423.16			

** Screw nut is optional purchase*

SOURIAU's JMX SERIES

A Connector Dedicated to the Medical Market

Esterline Connection Technologies – SOURIAU has designed a plastic push-pull connector dedicated to the medical market. Features and benefits of the JMX-series are significant and fully designed with the complexities and rigid standards of the medical industry. The reliability of this connector makes it an ideal solution for the abundant diversity of diagnostic devices, patient monitoring, physio & therapy devices, surgical & dental systems constantly being developed and advanced for improved healthcare.

Easy and safe

This series guarantees an easy and safe connection to the equipment. Easy because the JMX only requires two fingers to mate or unmate the system. This operation can be done by nurses, doctors or even the patient, without any special knowledge of connectors required. Safe because of the audible, tactile and visual indicator to ensure a good mating and a correct alignment between the plug and the receptacle. This connector is also capable of 2000 mating cycles and therefore adapted for daily handling and use.

The JMX-series is compliant to UL 1977 and IEC 61984. These certifications are desired as proof of reliability and will make the system design and qualification of the medical equipment go more smoothly. JMX connectors are available in 6 keyways and 9 different color codes to avoid accidental mismating. Additionally, this design allows for blind mating which comes in handy for rear or difficult to access connection ports.

Waterproof and sterilizable

The JMX connector is IP68 rated to protect the equipment from fluid ingress, which is inherent to medical environments where measurement instrumentation are often subjected to constant cleaning or exposure to various fluids. This environmental protection also applies to connectors in an unmated condition which ensures that even when the plug is not engaged with the receptacle, the system electronics will always remain sealed. In addition, JMX connectors can withstand up to 200 cycles of steam autoclave sterilization.

Complimentary Aesthetics

The JMX Plastic Push-Pull is aesthetically and visually appealing to complement and blend with medical and measurement equipment designs. The curves of the coupling ring provide exceptional tactile comfort and the ergonomic design makes handling feel very natural.

Even though this connector series is designed for medical devices, it can also meet the demands of other markets such as instrumentation, lighting or water measurement equipment. Its compact design and environmental sealing characteristic are key features to fulfil those market needs.

S03

Christian Sichtar, +43 1 86305 134
christian.sichtar@codico.com

Securely connected: HIROSE's ER8

High-Speed Board-to-Board Connector - licensed second source for the Samtec Edge Rate® Series.

HIROSE has introduced the ER8 series of connectors to provide a 10+Gbps high-speed connectivity solution for industrial applications. It is a licensed second source for the Samtec Edge Rate® Series. The ER8 range of connectors consists of headers and receptacles that allow a parallel board-to-board connection with stacking heights of 7, 9, 10 and 12mm. Versions are also available for vertical connection. The robust housing incorporates large mating guides on the plug. These allow easy alignment when mating and user friendly insertion of the receptacle.

Key Features

- Number of contacts: 10, 20, 30, 40, 50, 60, 70, 80, 100, 120
- Contact pitch: 0.8mm
- Current rating: 0.5A
- Stacking height: 7-12mm
- Voltage rating: 100V
- Mating cycles: 100

Suitable applications are servo motors/amps, car navigation, medical equipment, broadcasting equipment, POS terminals and industrial machinery.

S04

Julia Reiterer, +43 1 86305 162
julia.reiterer@codico.com

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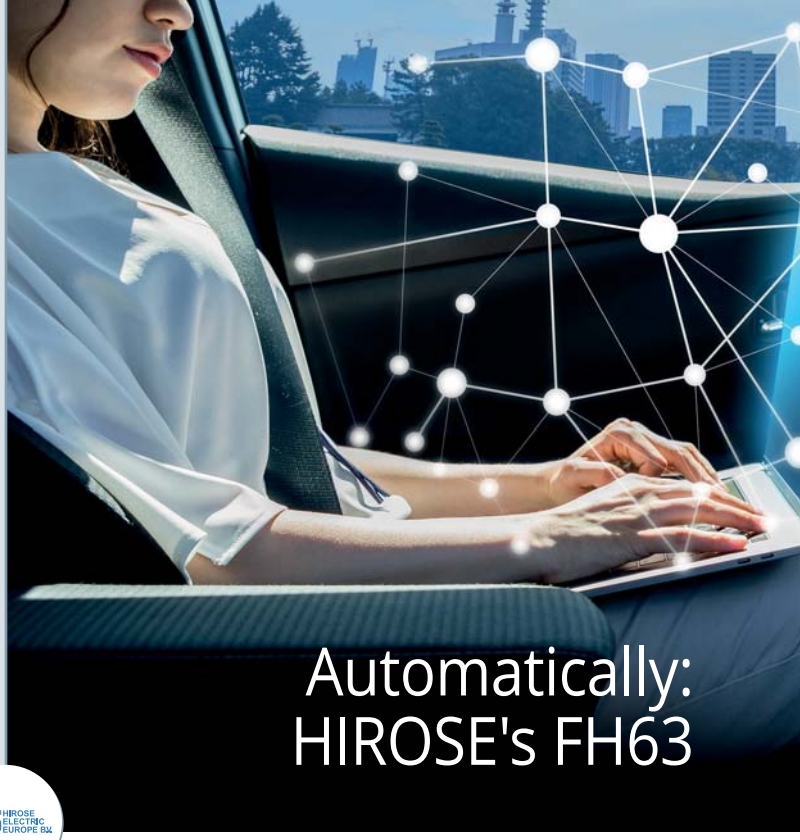
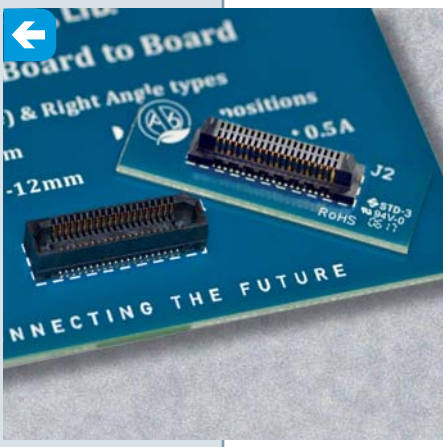


Automatically: HIROSE's FH63



Also for the automotive market: FFC/FPC connector for automated assembly.

HIROSE has introduced the FH63 series range of Flat Flexible Circuit/ Flat Printed Circuit (FFC/FPC) connectors to allow automated insertion of a FFC/FPC, ideal for industrial and automotive applications. The connector series is 105°C heat resistant and meets severe automotive requirements, and supports the signal transmission requirements of Embedded Display Port 1.3, HDMI 1.4a, USB 3.0, and V-by-One HS.

A unique single action lock allows a FFC/FPC to be inserted into the connector without opening the lock lever. This can be done with one hand or by automated machinery to save valuable assembly time and reduce mating failure.

Two-point independent spring beam contacts are utilized to reduce contact failure caused by contamination. The spring allows the contacts to move and wipe dust from the contact path, if any dust remains the second contact point will make the connection. In addition, the spring structure together with wide tapers allows easier insertion of the FFC/FPC.

High retention force is achieved by the robust locking mechanism. This firmly retains the tabbed FFC/FPC into position to secure mating. The correct placement of the FFC/FPC can be visually inspected through small openings in the top surface of the connector. Solder wicking is

LED Lighting: HIROSE's KN27

prevented by a special nickel barrier that is applied to the contacts. Flux is also prevented by wide spaces in the mounting area.

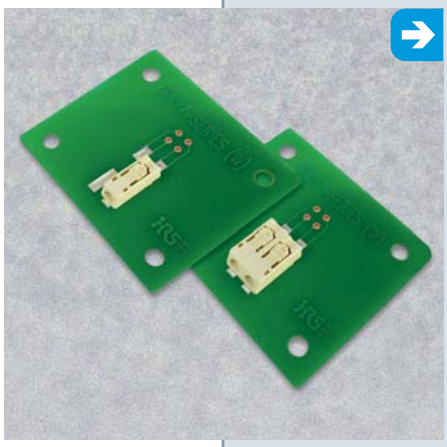
Key Features

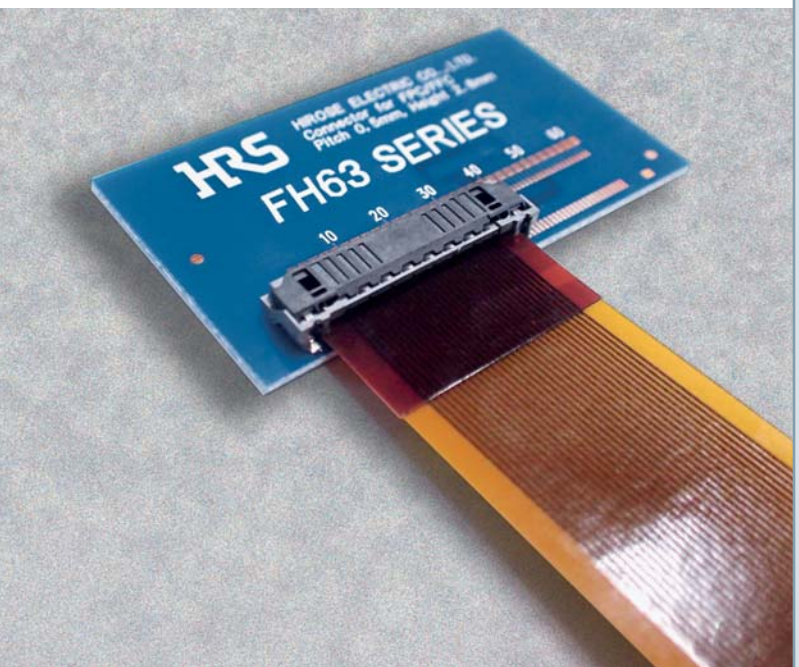
- Number of contacts: 30
- Pitch: 0.5mm
- Current rating: 0.5A
- Voltage rating: AC/DC 50V
- Single action lock

Ideal applications are car navigation systems, vehicle cameras, car infotainment, handheld gaming systems, FA camera, industrial control equipment, servo amplifier, medical devices and others.

S05

Julia Reiterer, +43 1 86305 162
julia.reiterer@codico.com





The KN27 series was developed to replace traditional terminal blocks in LED lighting module applications.

The design eliminates the need to screw down the connection and check for loosened terminal block screws, and offers a more reliable termination that reduces installation variation, time, and cost. The connector series features a rugged 2-point contact design that provides a reliable connection. The connector has an internal guide system that makes cable insertion simple and user-friendly. A push-lever provides for easy cable extraction. The space-saving design features a height of only 4.2mm, 3.9mm width and 11.85mm length (for single contact) all using a standard industry footprint. Although the KN27 series is compact and offers a high current rating up to 9A. It is available with 1 or 2 contacts and accepts 18 to 24AWG.

Key Features

- Number of contacts: 1-2
- Pitch: 0.4mm
- Current rating: 9A
- Voltage rating: AC 600V (1 contact); AC 320V (2 contacts)
- Mating cycles: 5

A wide range of applications are suitable such as LED modules and other small portable devices.

S06

Julia Reiterer, +43 1 86305 162
julia.reiterer@codico.com

PUSH-IN DESIGN TERMINAL BLOCKS

0156/0159: Pluggable PCB Terminal Blocks


0159 with locking lever


0159 THR socket


0156 with screw flange

The series impress with their compact design as well as technical details, which contains the proper solution for almost every application. Special highlights for both series are THR versions, screw flange or locking levers as well as the inter-mate and inter-changeable compatibility with all well-known manufacturers.


0156 THR socket

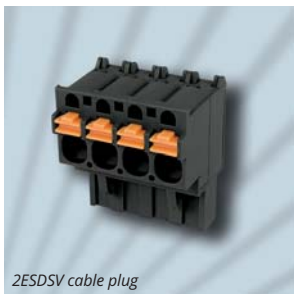
Highlights

- Vertical and parallel plug-in directions to PCB
- Compact double-level plug for high connection density
- Fast wiring due to time saving push-in design
- Type of locking including screw flange, locking lever and snap-in latches
- THR version socket is available with pin length 2.6mm
- Inter-mate and inter-changeable compatibility with all well-known manufacturers

	0156	0159
Pitch [mm]	2.54; 3.50	3.50
Rated Voltage/Current [UL]	150V/5A; 150V/8A	150V/8A
Rated Voltage/Current [IEC]	320V/6A; 320V/10A	250V/8A
Number of Positions	4-44P	4-40P

2ESDSV/2ESDSVM/2ESDSVK: Cable Plugs

DINKLE's 2ESDS* series consists of angled cable plugs with different types of locking options. The speciality of this connection plug is that the push-in buttons are located on the same side as the cable is connected. This series has testing holes on the front side for easy access.


2ESDSV cable plug

Highlights

- Versions with testing holes
- Fast wiring due to time saving push-in design
- Type of locking including screw flange and locking levers
- THR version socket is available with pin length 2.6mm
- Angled cable plug with push-in buttons on the same side as the cable connection

	2ESDSV	2ESDSVM	2ESDSVK
Pitch [mm]	5.08	5.08	5.08
Rated Voltage/Current [UL]	300V/10A	300V/10A	300V/10A
Rated Voltage/Current [IEC]	630V/12A	630V/12A	630V/12A
Wire Cross-Section [AWG]	26~12	26~12	26~12
Type of Locking	–	Screw Flange	Release Tool
Number of Positions	2-24P	2-24P	2-24P

DINKLE's push-in design adopts specially designed spring technology, which allows fast and easy wiring free of tool. The structure is rigid, durable and heads moderate force to release the wire with a screwdriver.

0161/0181: Pluggable PCB Terminal Blocks

0161 with snap-in latches

0161 THR socket

0181 without additional locking

0161 and 0181 series are twin connectors with double push-in connection in 3.50mm and 5.00mm pitch. Twin connectors are a simple way to merge two conductors into one position. Both versions are available with different locking types, e.g. screw flange, locking lever or snap-in latches as well as socket options with shorter pins for reflow soldering.

Highlights

- Compact wire to wire twin connector
- Fast wiring due to time saving push-in design
- Type of locking including screw flange, locking lever and snap-in latches
- THR version socket is available with pin length 2.6mm

	0181	0161
Pitch [mm]	3.50	5.00
Rated Voltage/Current [UL]	300V/8A	300V/15A
Rated Voltage/Current [IEC]	320V/8A	600V/18A
Wire Cross-Section [AWG]	24~16	24~12
Number of Positions	2-24P	2-24P

0177: Front Entry Push-in Design Terminal Blocks

Having the cable entry located on the same level as the push-in buttons, this front entry terminal block series was especially designed for space-critical applications. Special highlight of the 0177-series is the availability in many different pitches up to 10mm to withstand high current and voltage up to 76A/1000V especially for power applications.

0177 in 10mm pitch

0177 in 3.5mm pitch

Highlights

- Double pin on each pole for excellent stability on the PCB
- Fast wiring due to time saving push-in design
- Versions with horizontal and vertical wire entry direction
- Terminal point can be opened without using special tools

	0177
Pitch [mm]	3.50; 5.00; 6.35; 7.50; 10.00
Rated Voltage/Current [UL]	300V/10A ~ 600V/66A
Rated Voltage/Current [IEC]	320V/17.5mm ~ 1000V/76A
Wire Cross-Section [AWG]	26~4
Number of Positions	2-24P

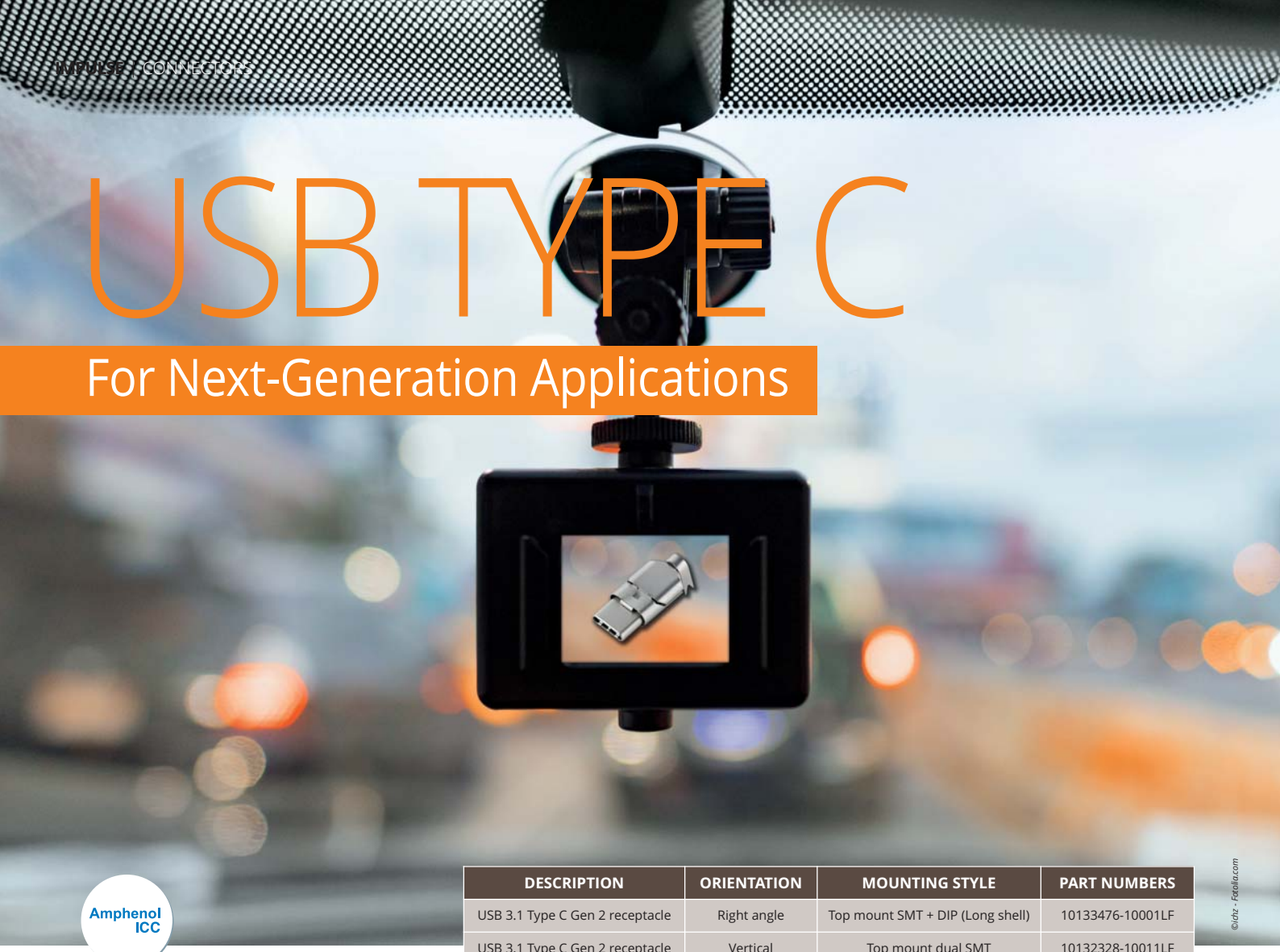
S07

Julia Reiterer, +43 1 86305 162

julia.reiterer@codico.com

USB TYPE C

For Next-Generation Applications



Amphenol ICC

DESCRIPTION	ORIENTATION	MOUNTING STYLE	PART NUMBERS
USB 3.1 Type C Gen 2 receptacle	Right angle	Top mount SMT + DIP (Long shell)	10133476-10001LF
USB 3.1 Type C Gen 2 receptacle	Vertical	Top mount dual SMT	10132328-10011LF
USB 3.1 Type C Gen 2 plug	–	–	10133475-10001LF
USB 3.1 Type C Gen 2 receptacle	Right angle	Top mount dual SMT (Short body)	10137737-10001LF

USB 3.1 Type C Gen 2 is the future of the USB technology providing multifunction single cable solution for Data, Power, Audio and Video.

AMPHENOL ICC's USB 3.1 Type C Gen 2 connectors complies with USCAR standard and are therefore suitable for automotive applications. The reversible feature enables quick and easy connections no matter which way it is inserted.

The connector delivers also better EMI (Electromagnetic Interference) shielding with its robust and small slim form factor design. It supports scalable power delivery up to 100W, performance speed up to 10Gb/s and is ready for next-generation applications.

This product range is suitable for any application – especially in very thin platforms, automotive and industrial & instrumentation markets.

FEATURES	BENEFITS
Supports SuperSpeed communication 10Gb/s	Minimizes user waiting time Ready for next-generation applications
Reversible plug and cable orientation	Ensures quick and easy connections whichever way it is inserted
Robust and small form factor design	Tailored for emerging product designs Suitable for applications in very thin platforms and the industrial & instrumentation market
Better EMI (Electromagnetic Interference) shielding design	Protects against EMI and ESD (Electromagnetic Discharge)

S08

Julia Reiterer, +43 1 86305 162
julia.reiterer@codico.com

PCI EXPRESS® GEN 4 CARD EDGE CONNECTORS

Amphenol ICC

Extend differential signalling to 16Gb/s and 25Gb/s for next-generation systems.

AMPHENOL ICC's PCIe Gen 4 connectors meet industry standard PCIe 4.0 requiring higher speed performance. The optimized series supports backwards mating and is footprint compatible with PCIe 3/2/1.

These 1.00mm pitch vertical card edge connectors enable all generations of PCI Express® signalling in desktop PCs, workstations, and servers. The connector design provides support for 2.5Gb/s (Gen 1), 5.0Gb/s (Gen 2), 8.0Gb/s (Gen 3) and recently upgrade to 16Gb/s (Gen 4), even further to 25Gb/s per differential signal pair.

The base connector family provides x1, x4, x8, or x16 link widths to suit different bandwidth requirements. The basic bandwidth (x1) version supports a single PCI Express® lane and is typically used for I/O cards in desktop PCs.

The x4 and x8 connectors provide 64 and 98 contacts, respectively, for server I/O. The high bandwidth versions (x16 lanes and higher) are used for applications that require even more bandwidth, such as graphics cards in desktop PCs or riser cards in servers. AMPHENOL ICC's expansive range of vertical PCIe Gen4 connectors will include options for surface mount (SMT), through hole solder, press-fit (PF) and straddle mount terminations.

- Backward mating and footprint compatible
- Higher speed performance without altering footprint
- Wide range of positions available
- Optional ridge feature according to customer preference

S09

Julia Reiterer, +43 1 86305 162
julia.reiterer@codico.com

FEATURES	BENEFITS
Surface mount termination type	Different options to meet different application mounting
x1, x4, x8, x16 (36/64/98/164 Pos.) standard links as per PCI-SIG CEM specification	Suitable for different bandwidth requirement
Backward mating and footprint compatible	Meets PCIe Gen 3 requirement, also backward compatible with Gen 1 and Gen 2 specification
Capable to support up to 25Gb/s without altering design	Suitable for next generation system

DESCRIPTION	PERFOMANCE	TERMINATION	POSITION	PART NUMBERS
PCIe Gen 4	16Gb/s	SMT	36, 64, 98, 164	10128241*
PCIe Gen 4	25Gb/s	SMT	36, 64, 98, 164	10141523*

**denotes base part number. Please contact Amphenol ICC for complete part number*

ECO-TRONIC NEWS

Walled Pin Headers for Potting Applications

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SERIES MS 7251	
Potting height	up to 8mm
Useable with	cable sockets
Codings	RAST 2.5 standard
Mechanical	
Positions	3 – 20
Pitch	2.5mm
Operating temperature	-40°C to + 120°C
PCB thickness	1.55 ±0.19mm
Electrical	
Rated voltage	2.5mm pitch: 32V
	5mm pitch: 250V
Rated current	2A / 6A
Comparative tracking index	CTI ≥ 400
Approvals	DIN EN 61984 (IEC 61984)
	UL / ULC E9659
Materials	
Insulating body	PA, glow-wire resistant
	GWT 750°C according to IEC 60335-1
Pin contact	CuZn
Contact surface	Sn
Housing colour	natural

STOCKO CONTACT has extended its successful ECO-TRONIC series with a walled pin header, which is designed especially for potting applications.

During the potting process a liquid sealing compound is applied on a defined area on the PCB to protect all components and their circuits. When the potting compound getting hardened the PCB is secured against moisture, dust, dirt, vibrations and bumps. The sealing of the PCB also guarantees outstanding electric insulation properties and a higher safety in case of an electrical shock.

To protect not only sensitive IC's but also high-rising components like capacitors and varistors the walled pin header from STOCKO accepts potting heights of max. 8mm. The new MS 7251 series can be used in several PCB-applications of domestic appliances and industrial electronics.

S10

Christian Sichtar, +43 1 86305 134
christian.sichtar@codico.com

The newest member in the push-pull connector family from YAMAICHI

Y-CIRC® P: SERIES S

After the successful establishment of the B series on the market, the S series is now available with a hermaphroditic connector.

YAMAICHI Electronics is continuing to develop the push-pull circular connector series Y-Circ® P. Now, in addition to the B series (IP50), there is also an S series (IP50) available with a hermaphroditic connector configuration. The same advantages of the B series are provided and assembly is just as easy and error-free using identical half-shells.

The hermaphroditic connector means that the insulator is divided, with male and female contacts installed in both plug and socket. That makes the connection easy and secure.

All connectors in the S series also have a marking in the form of a blue dot with the YAMAICHI logo. That makes connection and finding the coding particularly easy.

S11

Christian Sichtar, +43 1 86305 134
christian.sichtar@codico.com

Hermaphroditic:
Male and female contacts installed in plug and socket

Assembling:
Just as easy and error-free using identical half-shells

Easy connection:
Marking in the form of a blue dot with the YAMAICHI logo

CODICO PUTS SUSTAINABILITY INTO PRACTICE

For several years now, sustainability has been synonymous with the conservation of resources, and no company could afford having the word missing from its mission statement.

What does sustainability mean for CODICO, and what do we really focus on?

CODICO does not only shoulder responsibility for the company group, but also evaluates its entire setting from this angle. Apart from the fact that we self-evidently meet all official and mandatory requirements, we also commit ourselves to a variety of actions in the area of social and environmental standards, integrity, and conformity. Our sustainability report reveals how we perceive our corporate responsibility today and in the future.

Staff and social surroundings

For instance, we support our staff with flexible working time models and parental part-time work to help them achieve better compatibility between family and work.

Strategic human resources development, opening of career opportunities even for part-time staff, and a responsible approach toward the staff are a good foundation for motivation and a good working relationship. We are also involved in social, cultural, and sports sponsoring and also support the regional economy. We are particularly keen on projects promoting children and youths.

Partners and innovations

At CODICO, we see a close cooperation with suppliers as indispensable for offering quality to our customers at all levels. With several of our suppliers, we maintain an intensive partnership that goes back decades.

Energy-efficient products with low power consumption and a long service life, and »green« applications (e.g. New Energy, Energy harvesting etc.) are particularly emphasized in our publications for our customers.

Environmental protection

We design our processes to be as efficient and energy-saving as possible. We reduce our impact on the environment through worldwide consolidated shipments from our manufacturers, and weekly collective consignments to our customers. As a trading company, we apply environmental protection not only by avoiding any unnecessary waste, but also through active waste separation in the building, collection and return of waste paper, and disposal at our own expense.

Integrity and conformity

To ensure legal conformity, CODICO operates a quality management system according to ISO 9001, which also includes the development and constant updating of a legal register.

Our Code of Business Conduct defines the fundamental principles of our behaviour and serves as guidance for CODICO's management and staff in all their company-related activities.

To find out more about the topic of »Sustainability« at CODICO, visit our homepage at *https://www.codico.com/en/Company/Quality-and-CSR/Quality-Management.htm*

D02

Petra Huynh, +43 1 86305 169
petra.huynh@codico.com

BUSINESS RUN 2017

True to the motto »NEVER CHANGE A WINNING TEAM«, this year CODICO again fielded a total of three teams for the Vienna Business Run.

The 17th Vienna Business Run was held on Thursday, September 7, 2017, around the Ernst-Happel Stadium in Vienna. In glorious weather, almost 30,000 runners proved how fast they were, competing for their companies. And in among them were three highly motivated CODICO teams – »TIME 2 WIN«, »Run, don't fall and finish«, and »Running Turtles« – who, inspired by drummers, set out to master the 4.1 kilometre course at a cracking pace.

And the atmosphere was really euphoric, with all the CODICO teams turning in brilliant results, achieving their targets, and Bernadette Brandstätter even succeeding in going beyond her aims: *»Was I going to achieve my target? Of course I was! I did a lot of running over the weeks leading up to the event, and my aim was to be up there in front … but being the first in the company team was something I hadn't expected.«*

But even that wasn't enough for our ambitious runners. No sooner was this year's run behind them than they were setting their sights on the Business Run 2018.

What did the participants in the Business Run 2017 particularly enjoy?

Viorica Zangger feels that events like the Business Run can be described as a »way of getting away from everyday life«: *»I shall definitely be doing it again. I achieved my personal targets, and that gives me a powerful motivation to keep fit.«*

For Thomas Jell, the social aspect was a good reason to take part in the Business Run 2017: *»As well as the sports aspect, what particularly appealed to me was the "being there", a feeling that was reinforced over and over again by the really excellent atmosphere all the time. It was great that we could put in at least three teams, although we do have some room for improvement there – it should be entirely possible to field four or five teams. It's true I did fall short of my target of 20 minutes, but I'm personally very happy with my time, which was perceptibly better than in previous years. As well as that, you need the right motivation for 2018, and with a bit more training the plan should be entirely achievable.«*

Bernadette Brandstätter is particularly motivated to take part in company events, because they provide the opportunity to get to know her work colleagues better, and to chat about their private lives, and discover new things about them, which allows for a relationship to be formed as friends rather than simply people with whom she works.

Thomas Horvath was particularly enthusiastic thanks to his weeks of preparation enabling him to exceed his target: *»Thanks to the glorious weather, and our very strong team spirit, I managed to achieve a personal best time of 0:20:21.5 hours, and I'm very proud of that.«*

We congratulate the participants for their really excellent results, and we're already looking forward to the Business Run 2018!

D03

Nadja Wimmer, +43 1 86305 356
nadja.wimmer@codico.com

The CODICO TEAM says hello!

Elisabeth Steiter-Bax

Hallo Impulse readers! My name is Elisabeth Streiter-Bax, and it's a great pleasure, after 15 years with CODICO, to have the opportunity of introducing myself again.

I'm one of the »old hands« on the CODICO team. My field of work is sales internal service and administration. It all started back in June 2002, in the department of passive components. After exactly 10 years, I had the opportunity of making an internal change, and now I've been supporting the team in Connection Technology for about five years. I really have a lot of fun being able to work in a small, highly motivated, and professional team. Every day I keep looking forward to the tasks assigned to me.

I find my personal balance in sports. My great passion is swimming. I really get involved with this, and it's always a great thrill to take part in one or the other Masters competitions, regardless of whether it's a free water event, long-distance, or in the pool with the usual short distances. In the past two years, I have also discovered the pleasures of power training, and the lifestyle that goes with it. I have become very involved with healthy eating, and I'm always happy to cook something new for my loved ones at home. At the prompting of some of my friends I have recently also been working on a cookbook, and I'm trying to gather all the recipes I have created and tried out for myself.

I always try to remain true to my life motto, and start every day with positive thoughts, a smile and a laugh.

I would also be very happy to continue helping you with your wishes, ideas, and needs – your satisfaction is my priority. So just give me a call; I'm looking forward to talking to you.

D04

Elisabeth Steiter-Bax, +43 1 86305 135
elisabeth.streiter-bax@codico.com

Ionut Mitru

Since 2 July 2013, the day I started working at CODICO in the warehouse, I've been in a world of constant change and constant growth. You might think »Oh, the warehouse. Yes, I know. Moving stuff from A to B, taking stuff in, taking it into store, packing it.... nothing special there!« If that's what you expect from a warehouse employee, think again. But there's more – a whole lot more!!!

Right from the start I experienced a whole range of different tasks, special customer requirements, and exceptional situations, which indeed I think actually happen in very few warehouses. It's a challenge, and I take a lot of pleasure in dealing with these tasks as precisely and as efficiently as I can. And I haven't mentioned the best part about it: The CODICO-Team!! It's a colourful multicultural mix of characters and personalities, and it's the most friendly and mutually supportive group of people I have ever worked with. I really enjoy getting up in the morning and going off to work.

I am 37 years old, and my name is Ionut Tudorel Mitru (but everybody calls me Jonas). I was born in a town called Slatina, south of Bucharest, and I came to Austria 16 years ago, out of curiosity. Since then I have been constantly meeting new people, discovering wonderful places, customs and traditions which I learned to love and treasure more and more.

I studied for some time at the Institute of Economics at the University of Vienna in Floridsdorf, but then I stopped and tried out several areas of activity. For a while I was working in the catering business, and even worked in a metal processing plant, but I never felt that I found the right place for me until I joined CODICO.

I am a happy husband and proud father of a 5 ½ year old boy named Mathias. I spend my leisure time with my family out enjoying nature, and I enjoy cycling with my son and reading stories to him.

My hobbies are billiards, snooker, football, and, recently I fulfilled myself a childhood's dream: motorcycling.

D05

Ionut Mitru, +43 1 86305 201
ionut.mitru@codico.com

Katalin Bálint

My name is Katalin Bálint and it's a great pleasure to have the chance to introduce myself. Since September 2012 I am a proud member of the CODICO family. As an inside sales employee for active components I act as a connection between worldwide suppliers, CODICO partner companies and customers in Central & Eastern Europe.

I am considered to be a versatile person. This trait can be noticed not just on my personality but also in my work experience. I am an open-minded person, eager for knowledge and challenges. I studied many diverse subjects (music, design, sculpture, landscape architecture, foreign languages, social economy, sociology and social psychology) and during my student life I collected experiences in many different areas through my work as a private home teacher, a market researcher, field analyst in cultural sociology and even working as a lifeguard and pool operator in the US.

Questions like »what you want to be when you grow up« stressed me a bit. I could never define a dream career that I wanted to achieve, I only knew what I was interested in and it was just too diverse to restrict to a certain role.

I will never forget when a friend of mine called me and suggested to apply for the inside sales position at CODICO. I just moved to Vienna, quit job as a market researcher in Budapest and I was excited about new opportunities and challenges. I wasn't really sure if my skills and competences were suitable for the advertised position, but after a while I realised that this job actually was what I was looking for. I always wanted to work in an international atmosphere, to stay in contact with people from all over the world, being part of a big united family, practicing at least 4 but sometimes even 5 different languages a day, doing a work that is lacking routine, where every day and every situation is a new challenge. Here I can make use of everything I learned: social studies, foreign languages and creativity in solving problems.

The main themes of my private life are the following: family, world travel, nature and photography and if it happens to enjoy all of them at once, then that is the best! I am not really a hotel tourist. I like to discover new authentic places, new cultures, new customs and therefore I prefer to stay with inhabitants, to live, to eat and to chat with them and to exchange experiences. Such moments are unforgettable and perfect photo-themes. Travelling for me is like making a documentary film. If there is no opportunity to travel far away, I often go out in the nature either for active refreshment (mountain hiking) or just for relax (lying on the grass). But naturally there I also take my family and my camera with me :-)

CODICO is like a second family for me and I am very glad to be part of this great multicultural team.

D06

Katalin Balint, +43 1 86305 264
katalin.balint@codico.com

Michael Had

Since November 2013 I have been working for CODICO as a sales engineer for passive components. In southern Germany – the so called »Ländle« – I really enjoy handling important Key Account clients. In the automotive sector it is my job in particular, with its new excitements and challenges every day, to co-ordinate the wide variety of projects we handle, and see them through to a successful conclusion. It is a pleasure to discover those modern and futuristic applications to which our design-in makes an important contribution to the overall function. I work in a really great team, in which mutual support is second nature.

The spirit of trust in the co-operation and interaction with our suppliers expands my "global thinking" and the sense of respect among colleagues and business associates enriches my regional work and activity. It's an all-round thing with us.

In the late afternoon my three-year old son can hardly wait to get Daddy away from his business. His sparkling eyes, his radiant curiosity, and uncomplicated approach to life are a true daily inspiration for me. Happiness, friends, family – those are the cornerstones in my private life. Going for walks and extended cycling tours with our friends are an essential part of my life as well. It's often enough simply to be out enjoying the beauties of nature, and getting to know myself all over again.

On adventurous holiday trips to the USA I get a real kick from a spicy BBQ. Whether in Los Angeles, Santa Barbara, or Yosemite, there's always something amazing to discover, and to share in the simple love of life of those sunny Californians. I like to take good photos to record the whole experience, too. Photography is a superb opportunity for me to capture the actual moments which are important in my life, to hold them in time, and then re-create them.

...Oh yes, and where would life be without music?
Getting in the right mood does away with so much stress, and sets the right tone for the day too. The E-guitar and my amplifier are important parts of my life. Concerts with the band together with the gospel choir give a special balance to my lifestyle. And, of course, good food and a nice beer go down very well too. Men cooking together come up with new recipes to try out and enjoy. Barbecue evenings or camping weekends are the perfect way for me to round off the variety.

It's in this spirit that I look forward to more experiences and excitement in the days ahead at CODICO. »Life is beautiful«.

D07

Michael Had, +49 71816695 151
michael.had@codico.com

CODICO GmbH | Zwingenstrasse 6–8 | 2380 Perchtoldsdorf | Austria
Phone: +43 1 86 305–0 | Fax: +43 1 86 305–5000
office@codico.com | www.codico.com