

ENGLISH

C O D I C O [®]

impulse ^{1/2019}



QUALCOMM: Build
a Smart Speaker!

SAGAMI is filtering your Class D Applications
Fast, Faster, PUSH-IN Design by DINKLE

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Smart Speakers, or Speakers enabled to receive voice commands and act on those, are a very hot topic in the Audio market today and most companies in the Audio industry have some form of Smart Speaker in their product portfolios. But with the new CSRA68105 from QUALCOMM CSR you can build your own »Smart Bluetooth® Speaker«!

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»And the Quality Award goes to...«

Delivery reliability, service orientation, cooperation, flexibility, sustainability and logistics performance - these are the central criteria for the evaluation of our suppliers.

We regard the regular evaluation of our suppliers as a proven means of determining special services simply and meaningful. CODICO is once again awarding the Quality Award to the best of over 150 suppliers this year.

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Congratulations and many thanks to our suppliers for their outstanding performance and trustful cooperation!

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Sven Krumpel
CEO CODICO



Quality Award

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Editorial

OUT OF THE BOX

Dear readers,

CODICO is expanding! We are growing, and the challenges for our logistics centre are also increasing; we need more space, and a significantly higher level of automation. Yet the purpose of our enlargements (see more on page 52) is not only to create additional space. We did, however, provide for sufficient new space - in our enlarged office and logistics areas, and in our new recreational park.

To continue our success into the future, we also intend to look into new working methods, and to examine the way we deal with the breathtaking pace of the world of work, the constant time pressure, the permanent multitasking, and the resulting loss of motivation and a superficiality in our society. CODICO thus puts a significant amount of effort in finding out how the company can think out of the box. How to create an environment that fosters creativity, gives our staff enough space for development, the space we require to find creative technical solutions for our customers.

Our expansion attempts to incorporate the latest findings in neuroscience, and to provide an answer to the question »How do I create the best conditions to allow the human brain to work in the most efficient way possible.« The new space provides social areas and workbenches to allow joint work in groups and to encourage informal communication. We are implementing a Corporate Farming Project: we will be cultivating fruits and vegetables, and we will build a recreational park with sports and fitness facilities for our employees and their families.

The objective of our internal and external »renovation« - to be completed by late 2020 - is to promote open-mindedness and alternative thinking. We see our growth not only as an opportunity to expand from a business point of view, but also as a chance to think out of the box and to encourage boldness and individuality.

D02

▶ Sven Krumpel



SMART SPEAKER

Build a »Smart« Bluetooth Speaker with CSRA68105!



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Smart Speakers, or Speakers enabled to receive voice commands and act on those, are a very hot topic in the Audio market today and most companies in the Audio industry have some form of Smart Speaker in their product portfolios.

One of the design challenges companies meet when designing a Smart speaker is that the platforms used are many times quite complex and require an Operating System to be

run and because of that also requires more power. QUALCOMM do have these platforms, and more to come when it comes to the High End of the Smart Speakers, but here we will talk about the lower end of the scale, where a design is less complex and can therefore use smaller more self contained SoC device running a Real Time Operating System (RTOS).

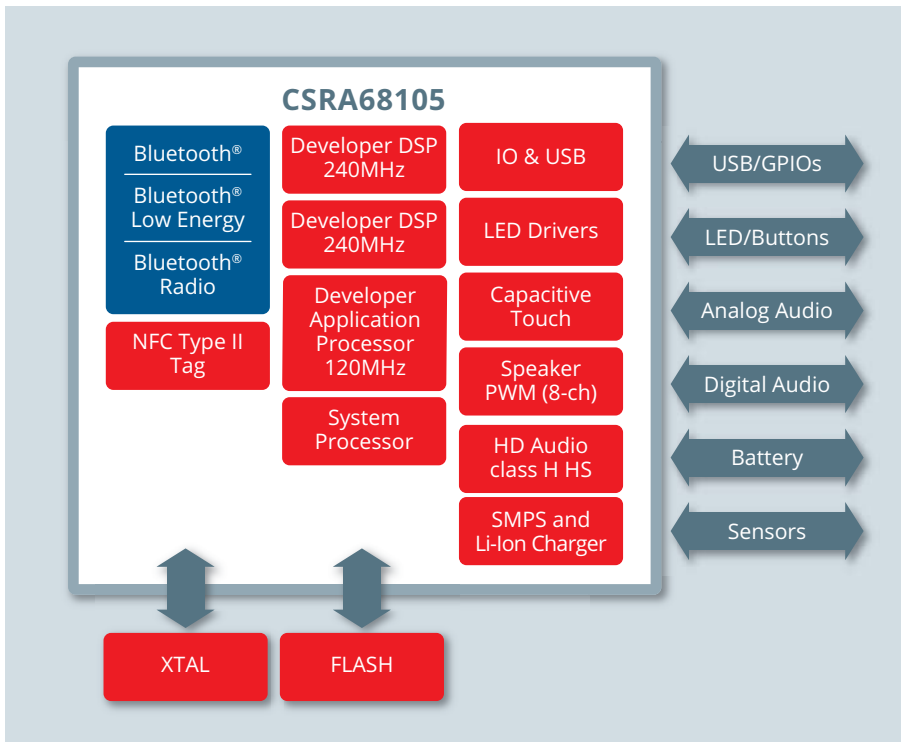


For RTOS-based speakers QUALCOMM can support voice enablement using the CSRA68105 SoC – a high-performance, single-chip Bluetooth® audio SoC, designed for premium wireless speaker and headphone applications. This highly integrated SoC is engineered to include a comprehensive selection of connectivity, system processing, audio processing and power management

resources. Generally the challenge for designing a Smart Speaker, and even more so a portable Smart Speaker, is battery life and power consumption.

In the case of CSRA68105 QUALCOMM have set their sights on minimal power consumption and hence uses the connection to the mobile phone for enabling the connectivity needed for the Smart functionality. The CSRA68105 has enough RAM memory to catch the phrase after a keyword and forward that in the stream for a cloud based (or even terminal based) voice service application to act on the information. What this gives you as a developer and/or end customer is a product with a very streamlined power consumption and still the Smart functionality requested by most people looking to buy a Bluetooth® enabled Speaker today.

There are several companies offering Voice Services today, both for resolving voice commands



of digital signal processor (DSP) processing power and advanced features on a single-chip RTOS platform. Dual 240MHz QUALCOMM® Kalimba™ audio DSPs, and QUALCOMM® Kymera™ audio framework offer more DSP processing power to eliminate the need for external audio processing previously required to support premium features such as far-field voice processing and advanced musical effects and reduces eBOM.



CSRA68105 Devboard

A more comprehensive listing of features and specifications.

and many also have their own look up services, control system interfaces etc. and with the open framework of the development system you as a developer can choose to work with the partner of choice that suits your particular needs.

The technical features embedded in the CSRA 68100 support OEMs in the development of products with superior audio quality, voice control, far-field echo cancellation, sensor processing and audio post processing, raising the bar in terms

Features

- **Powerful quad-core processor architecture**
- Dedicated 120MHz 32-bit processor application subsystem
- Dual-core 240MHz Kalimba™ DSP Audio subsystem
- DSPs support downloadable capabilities from RAM/QSPI and pre-installed library functions from ROM
- Further system processor with embedded Bluetooth protocol stack
- Embedded ROM + RAM and external QSPI Flash
- **Variety of high definition audio interfaces**
- 2-ch 24-bit 109dBA line outputs
- 2-ch 24-bit 100dBA line inputs
- 2-ch 24-bit 96dBA class-H ground referenced headphone driver
- 8-ch 108dBA PWM speaker outputs
- 4× 384kHz 24-bit I2S
- 4× 96kHz 24-bit SPDIF interfaces
- **Integrated Bluetooth® 5 and NFC tag radios**
- **Dual-mode Bluetooth® BR/EDR and Bluetooth® Low Energy**
- **Pin-to-Pin compatible with CSRA68100**
- **Advanced power management with integrated SMPS & Li-Ion battery charger with USB type-C charger support**
- **Rich array of interfaces including LED drivers and capacitive touch**

SPECIFICATIONS

- **CPU**
- CPU Clock Speed: 2× 120MHz
- CPU Cores: System firmware processor, Dedicated customer application processor
- **DSP**
- DSP Technology: 2× QUALCOMM® Kalimba™ DSP, QUALCOMM® Kymera™ DSP Framework
- DSP Clock Speed: 2× 240 MHz
- **Bluetooth**
- Bluetooth Version: Bluetooth® 5.0
- Class Support: Class 2, Class 1
- **NFC**
- Integrated NFC Radio: NFC type II, Peer-to-peer listener mode, Tag mode
- **General Audio**
- Audio Technology: QUALCOMM® Broadcast Audio Technology, QUALCOMM® aptX™ audio technology
- QUALCOMM® aptX™ playback support: aptX Classic, aptX HD, QUALCOMM® eXtension program
- Digital Microphone Input: Up to 8 digital mics
- Audio Inputs: 2× high-quality line level ADCs, 2× low power ADC, 4× 24-bit I2S up to 192kHz with programmable MCLK, 4× 24-bit SPDIF up to 192kHz
- Audio Outputs: 2× high-quality line level DAC outputs, 2× low power Class-H headphone drivers, 4× 24-bit I2S up to 192kHz, 4× 24-bit SPDIF up to 192kHz, 8-ch PWM audio outputs
- **Charging**
- Maximum Current: Up to 1.8 A
- **Battery**
- Battery Type: Li-ion battery
- **Memory**
- Flash: Flexible QSPI Flash (external) programmable platform
- **Interface**
- Supported Interfaces: USB device and host, SDIO v3.0 host, I2C, SPI, UART
- **Input/Output**
- Summary: 2× audio line in, 2× audio line out, 2× microphone in, 2× headphone out, 4× I2S, PCM in/out, 4× SPDIF in/out, 8× audio PWM out, UART, USB, I2C/SPI, 13× XI
- ADC: 2-ch 100dBA 24-bit ADC with microphone pre-amp, 8-96kHz sample rates
- General Purpose IOs: 63
- DAC: 2-ch 109dBA 24-bit DAC, 8-192kHz sample rates

A01

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Author: Miriam Leunissen, EOS

CUSTOMISATION ON A SOUND BASIS

CODICO and two international medium-sized firms demonstrate how modified standard power supply solutions in medical technology can work!



At first, it seemed that the prisma VENT50 ventilator by Löwenstein Medical Technology was heading for a quick open-frame power supply solution.

On offer was a small power supply measuring just 2×4×1 inches, with a 28W output per cubic inch, convection cooling up to 112.5W, and 225W with forced ventilation. In addition, a dual input fuse, a standby power consumption less than 0.5W, and an MTBF of over 3.3 million hours. The efficiency factor of up to 94 percent was okay, the temperature shut-off and start guarantee for as low as -40°C were in line with the specifications. According to the CB report, all output voltages from 12V to 58V were approved.

All this came in a medical class II design for devices with direct body contact, and it conformed to the demands of the development department at Löwenstein for their new series of high-quality

»made in Hamburg« ventilators, more precisely than any other open frame power supply unit available in the market. Moreover, according to the unanimous opinion of all project managers, the device performed to datasheet specifications during intensive pre-tests.

Yet the »power supply for prisma VENT50« project was far from being a slam dunk. »As so often the case in medical technology, the devil is in the detail«, recalls Wolfram Heinrich, who has been part of the prisma VENT development team for many years and the Electronic New Device Division project manager since 2014, thus also in charge of sampling for the Prisma VENT ventilator series at Löwenstein. The main topics were connecti-

ons, EMC, and the load profile. »This time again, it proved indispensable to implement a multitude of adjustments. Therefore, we were very glad to have CODICO as distribution partner and EOS Power as manufacturer of the said power supplies on board again during the development of this new generation of our prisma VENT ventilators.«

What followed was by no means a walk in the park: as a result of the new medical classification and the sensors used by Löwenstein, which are built in the latest generation of breathing masks, the standard prescribes that the connection between the patient and the device must be considered conductive. Therefore, the otherwise insulated section now had to meet BF, 2×MOPP, and protection class II requirements. The fact the new EOS (M)WLP225 series to be used in this case had been approved – just as all other EOS series – according to the relevant EMC standards EN 60601, 3rd and 4th edition provided a solid basis.

»Of course, we also very much welcomed the fact that, in addition to the approval background and the compact size, the price of the EOS open frame power supplies was also very reasonable«, says Heinrich. »Because ultimately, all these series of ventilators we are talking about are price-sensitive home ventilation devices, for which price and quality must be brought into balance.« But this was not the sole criterion for our decision. As with the simpler predecessor model prisma VENT30/40, and in the case of the VENTlogig LS ventilation device, which are both already equipped with the older EOS MWLT 150 power supply unit, the Löwenstein team deliberately opted again for an EOS Power open frame power supply from CODICO.



Make or Buy

Already at that time, the crucial »make or buy« question was almost reluctantly decided in favour of »make«. For a short while, the developer team of the respiratory device was overwhelmed by the feeling that they were trying to square the circle, because all the usual, affordable off-the-rack standard units were out of the question.

This is a feeling many developers in medical technology are all too familiar with. *»Today, there are only a few power supply unit makers who offer the class II medical technology standard as an open frame standard device; at the time, there was practically none. Our device, however, had to remain affordable for the end customer - and still be small, lightweight, and safe«,* as Heinrich remembers the situation eight years ago, when his Hamburg branch still operated under the name »Weinmann«.

In its MWLT version, the WLT150 by EOS was one of the few power supply units at the time that already had a class II certification; since the 3rd edition of the EN60601, it is available with upgraded specs and also features 2xY2 capacitors for 2xMOPP. It was recommended by Austrian distributor CODICO, with whom Löwenstein had already successfully cooperated for several years in the area of displays and components. Those in charge jointly decided to give it a try with a clever modification of the WLT150, if possible without affecting the certification-related parameters. *»In the times that followed, our people and the European sales agents of EOS could have just as well set up office at Löwenstein in Hamburg, still Weinmann at the time«,* says Manfred Schulz, FSE Active Components at CODICO, summing up the intense cooperation between the three medium-sized firms.

Issue number one: the connections. EOS Power often supplies its customers with special connectors from its factory in Mumbai. Depending on the requirements, the user can choose between screw and plug-in type terminals at the output. A special output connector was chosen for the Löwenstein power module. As a result, the device manufacturer can work with the same cable harness in all its devices. In addition, the positioning holes and the cross section of the mounting and the circuit board for the ventilation device were individually adjusted in several small steps. In addition to the connections, seemingly trivial things



Manfred Schulz (CODICO) with Wolfram Heinrich (Löwenstein)

had already been modified according to the customer's specifications in an earlier stage of the cooperation – including the heat shrink tube, for fire protection reasons.

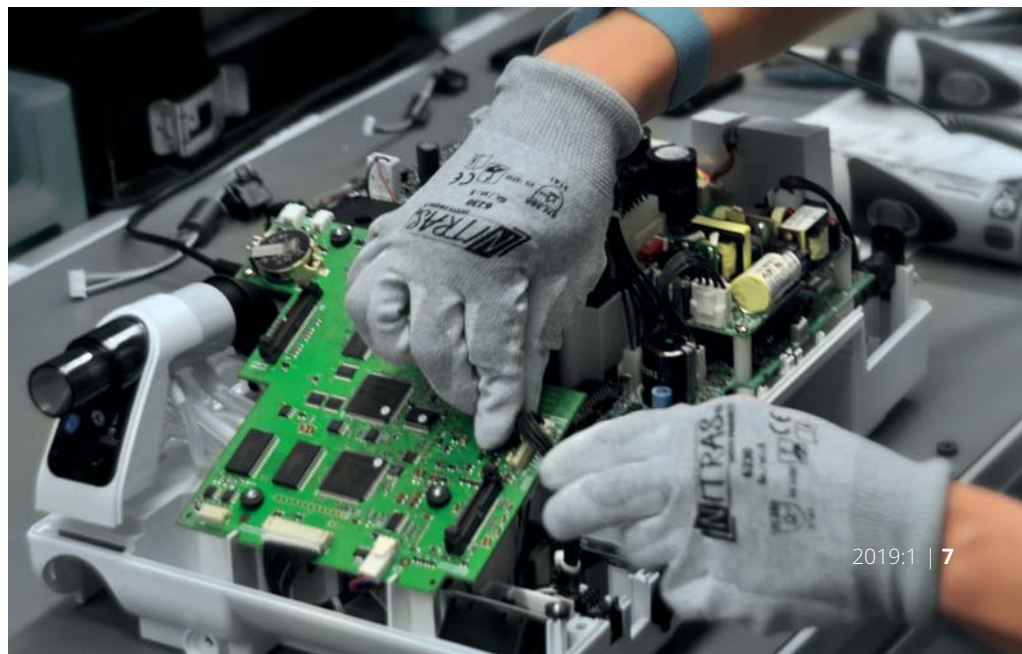
Issue number two: goods receipt, workflow, and traceability. Since 2016, in the areas of goods receipt, production, quality assurance, and batch control, Löwenstein has been working with special barcode labels required on the components in triplicate at the production in Hamburg. These labels, including the barcode and the peel-off sticker, are already affixed and registered at the manufacturer in Mumbai. Measures were also taken with the support of CODICO in India to meet customer-specific ESD packaging requirements. In the unlikely event of a necessary recall, e.g. in case of a higher failure rate, the product

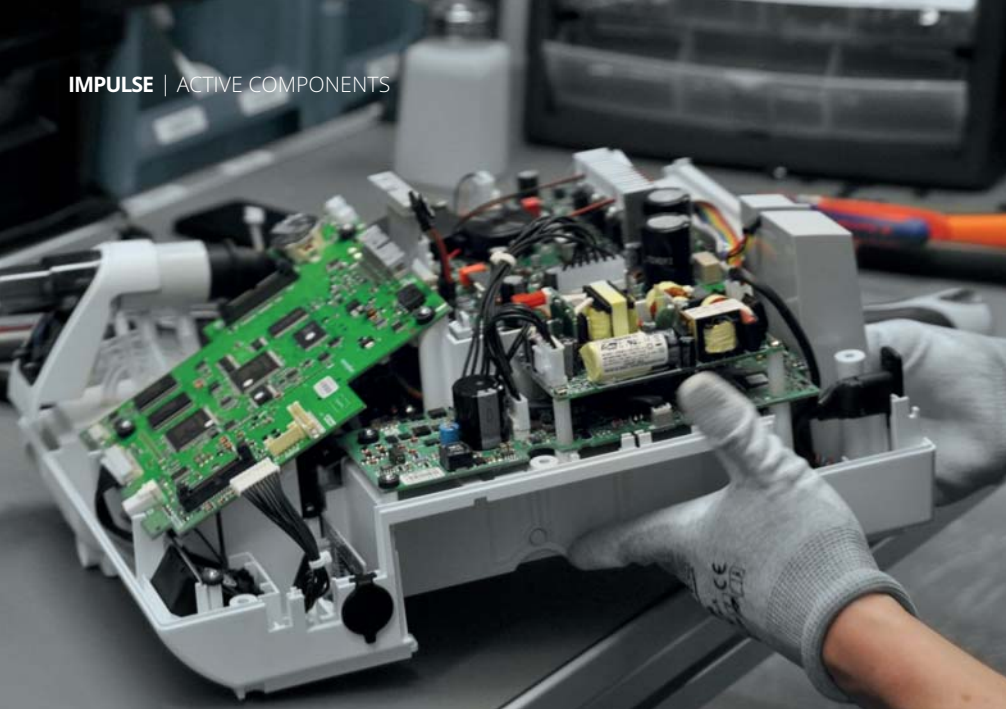
can be traced seamlessly from the end customer back to the pre-supplier, including all component suppliers involved.

More than just new connectors

From a technical point of view, changes did not merely include the usual standard modifications from the connector to the output voltage, but also involved in-depth profile adjustments. When it became evident that the ordinary voltage and load profiles of the Löwenstein devices did not exactly meet the standard profiles of the EOS devices, components were added and modified at several points following intensive joint test series in Hamburg and Mumbai.

For instance, Ventilic LS was fitted with an NTC for temperature monitoring and ventilator





control as requested by the customer, due to ventilation phases with very high outputs. In addition, different MOSFETS that can cope with particularly high voltages were used in the PFC stage in the Ventilagic LS. Subsequently, the 2xY2 capacitors were also adjusted to improve the load profiles and EMC performance. This close development cooperation only worked because a prototype of each modified ventilation device was sent to EOS Power in India for measurements. The renewed EMC measurements (incl. surge and burst) were also carried out in parallel both in Germany and India.

As a whole, however, all the modifications in the MWLP225 did ultimately result in the need for additional certification for the modified MWLP225, because critical components and safety-related barriers had been altered. Sanjay Pusalkar, Head of Engineering at EOS Power: *»When the separation between patient and current flow changes, or when optocouplers and parts in charge of monitoring control are modified, re-certification becomes obligatory.«* According to the



Löwenstein team, however, the required re-certification following the replacement of components was done quickly and without any difficulties. At around 5,000 dollars, the costs were significantly lower than the costs for a new certification of a power module, which can easily reach more than double that amount.

Behind-the-scenes process integration

»The integration of processes behind the scenes also suits us«, stresses Wolfram Heinrich of Löwenstein. In addition to the modifications on the part of the manufacturer, CODICO operates a seamless serial-number tracking and customer-specific packaging labelling system, and the producers in India perform additional DoC tests. These are documented accordingly. As a result, an additional quality requirement of Löwenstein was efficiently solved in the cooperation group.

For the best possible implementation of innovations, EOS Power and CODICO supported his company with its documentation obligations to an extent that goes beyond usual market practice, as Löwenstein Project Manager Heinrich emphasizes. According to Heinrich, EOS provided almost 40 datasheets of capacitors and other components. Circuit diagrams as well. *»This is really an extraordinary service and support«,* Heinrich assures. He believes the reason lies in the *»similar corporate culture and customer focus«* of the three partners. This is what helped their collaboration succeed even in time of difficulties, and despite the large distances.

The group takes an equally open approach to addressing problems in the early stages of develop-

ment and production. As a result, they managed to overcome quite a few challenges together, ranging from strange noises coming from the device after a long standby, to overheating capacitors. Since the handling of critical components is a key part of risk analysis within the meaning of EN60601, assembly versions and second-, third-, and fourth-source components pose major challenges for all medical technology manufacturers. Therefore, customer-specific adjustments would be almost impossible without an open approach to the parts list.

Ideal conditions for high mix/low volume

Another advantage was the fact that all EOS power supplies are manufactured centrally at EOS Power in Mumbai. The manufacturing installations are intentionally flexible and geared to a high mix and a wide variety of modifications, so that volumes of just a few thousand identical components each year can be produced there cost-efficiently. These high-mix/low-volume *»pick-and-place«* systems can handle different types of circuit boards and components. For instance, the designs have different connectors to cope with the compact size of the power supplies; the facilities ensure a reliable positioning of large components and the mounting of resistors and tiny capacitors – as well as the exact placement of a wide range of SMT components down to fine-pitch parts such as ICs, QFN packages and BGAs.

The manufacturing site has received numerous quality and manufacturing awards from reputable bodies like Dun & Bradstreet, Frost & Sullivan or Elcina. The manufacturer Löwenstein Medical Technology (still Weinmann at the time) also audited the EOS production in India years ago and approved it following a few supplementary agreements.

The successful cooperation between the three international companies is currently entering its third round. The product is still top secret, but this much can be revealed: CODICO visited Löwenstein more than a dozen times during the last two years, and the responsible product manager of EOS flew over to Europe equally often.

For further questions, please contact:

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POWER MANAGEMENT

Solutions for small FPGAs & MCUs!



TOREX
SEMICONDUCTOR LTD.

Realizing Power Sequencing and High-Speed Transient Response without a PMIC!

Small Field-Programmable Gate Arrays (FPGAs) are extremely common today in digital designs and many FPGA applications usually require multiple voltage rails to power them.

Core voltage is normally 1.2V or 1.0V. DDR memory needs typically 1.5V or 1.8V and I/Os need 2.8V or 3.3V (refer to Figure 1 below).

Using a PMIC is today the most standard solution for providing the power to the multiple rails required by small FPGAs. However, using a PMIC also has its own problems including how to make effective sequencing, probable unstable operation and EMI issues caused by long wiring from the PMIC to the FPGA as well as the influence of a common GND and finally, there are thermal considerations to be considered with a PMIC solution due to the concentration of heat in one place.

Power Sequencing

In addition to the specific power rails listed above, the different voltages must be powered on and perhaps more importantly, but often overlooked, powered off, in the correct order to maintain system stability. This is known as »power sequencing« and for start-up will usually begin with the Core voltage and, depending on the FPGA, will end with the I/O voltage. For power off the order is usually the opposite so I/O off first and Core

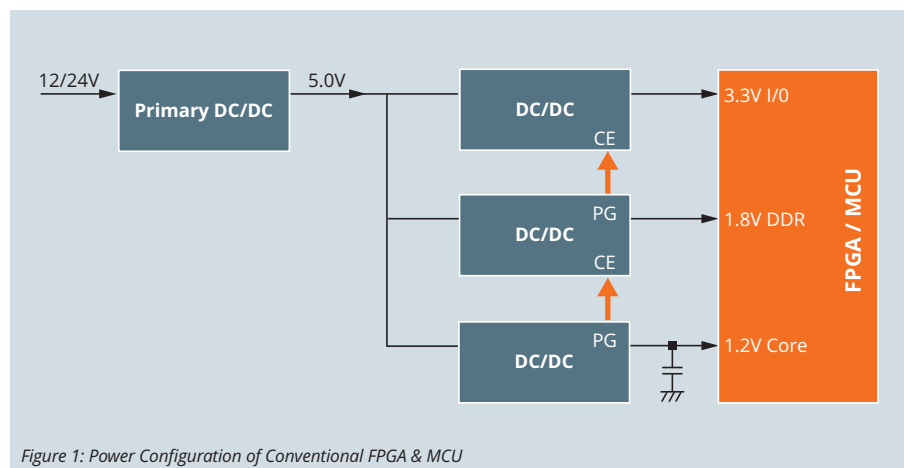


Figure 1: Power Configuration of Conventional FPGA & MCU

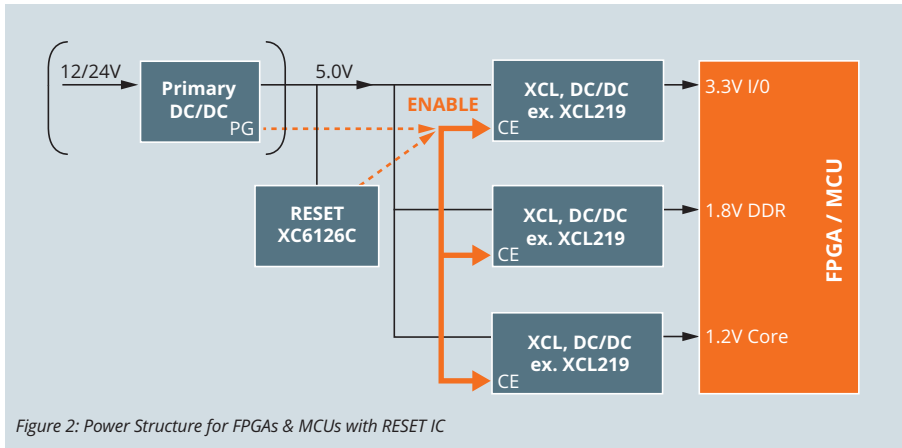


Figure 2: Power Structure for FPGAs & MCUs with RESET IC

voltage off last. Seems simple enough but there are pitfalls if it isn't done properly and to do on/off sequencing properly usually means adding a large and expensive capacitor on the Core voltage rail to make sure that it stays on until all the other rails are powered off in the right order during power down.

Typical Power Sequencing Requirements

As mentioned, to have a secure shutdown sequence (power off), the 1.2V Core voltage should be maintained until all the other rails are off, so a large (>2,000µF) and expensive Capacitor is necessary for the Core rail. When the 5V rail is off, the UVLO of each secondary DC/DC operates and cuts off their outputs but the large capacitor of the Core rail is used to keep its voltage until all other rails are powered down.

Because of the large capacitor, it is also difficult to control the rise-up time of the Core rail to

make the power on sequence and therefore it is quite common to have a Power Good (PG) output which is used to provide an Enable signal to next DC/DC in the sequence and so on (as shown in Figure 1).

TOREX has a solution, however, that will enable the sequencing to be done without a PMIC and without the need for a large and expensive Capacitor on the Core voltage rail. Read on!

Point of Load (POL) method with TOREX Micro DC/DCs (integrated Coil) & Hi-SAT COT DC/DCs

POL with TOREX's XCL Micro DC/DCs and/or Hi-SAT COT solutions realizes a very stable operation, fast transient response, good dispersion of heat and lower EMI thereby solving all the issues normally associated with powering FPGAs and power sequencing. The advantage of using individual ICs rather than a PMIC is that each IC can be located closer to each pin on the FPGA (POL).

The power sequence of start-up and shutdown of the 3 rails is important as already highlighted and it can actually be realized by a simple RC delay for the CE pins of each DC/DC (Figure 6 & 7).

A RESET IC (TOREX XC6126C) that monitors the V_{IN} voltage is recommended for the ENABLE signal driving RC. Without the RESET IC, the sequence may be unreliable, or the V_{IN} start-up waveform may be limited. Please note that if the primary side DC/DC has PG (Power Good) as shown in Figure 2, the ENABLE signal can be driven by the PG signal. In addition, it should also be noted that if the voltage from the output of the primary side DC/DC is 3.3V a line switch (such as the TOREX XC8107) should be used instead of a Micro DC/DC or DC/DC.

TOREX Power ICs suitable for use with small FPGAs & MCUs

For stable FPGA and MCU operation, it is important that each DC/DC is positioned at the Point of Load (POL) as that reduces impedance between the DC/DC and the FPGA or MCU. It is equally important to separate each heat source and to layout the PCB to reduce EMI and to avoid interference between each power supply. The XCL Micro DC/DC series with integrated coil is ideal for FPGA power supply use because they have low EMI, good thermal characteristics, are simple to design with and are very small (Figure 3 & 4).

In addition, the core voltage (which is normally 1.2V or lower) requires high accuracy and fast transient response so here TOREX DC/DC &

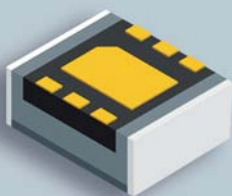


Figure 3: Pocket Style Micro DC/DC with integrated Inductor for I_{OUTS} up to 1A

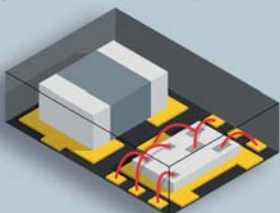


Figure 4: Multiple Style Micro DC/DC with integrated Inductor for $I_{OUTS} > 1A$

Hi-SAT COT Buck DC/DC vs PWM/PFM Buck DC/DC

$V_{IN} = 3.6V, V_{OUT} = 1.8V, TRISE = TFALL = 2\mu s, TA = 25^{\circ}C,$
 Hi-SAT COT Buck DC/DC: $C_{IN} = C_L = 10\mu F$ (ceramic)
 PWM/PFM Buck DC/DC: $C_{IN} = 4.7\mu F$ (ceramic), $C_L = 10\mu F$ (ceramic)

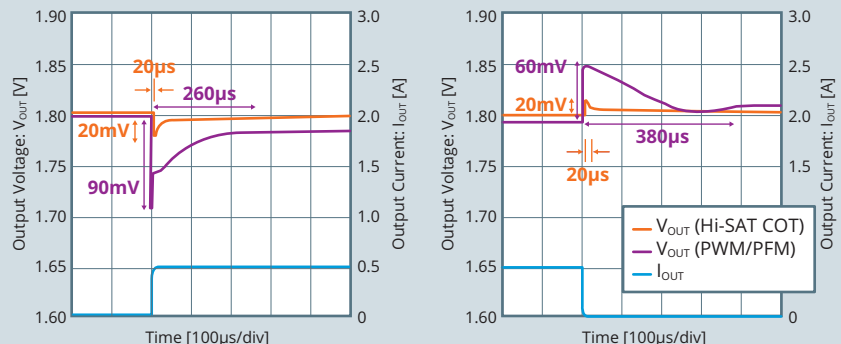


Figure 5: Load Transient Performance Comparison between Hi-SAT COT & Standard DC/DC

Micro DC/DC solutions that support Hi-SAT COT control (Fig.5) such as the XC9257 or XCL219 (1A) and the XC9260 or XCL213 (1.5A) are suitable.

TOREX Solutions for small FPGAs & MCUs ($V_{IN}=5.0V$ & $V_{IN}=3.3V$)

With a 5.0V input, a 4.0V CMOS output RESET IC such as the TOREX XC6126C40A7R-G is recommended to make the ENABLE signal whereas with a 3.3V input, a 2.4V solution is suitable, XC6126C24A7R-G. If the ENABLE is connected directly to V_{IN} without a RESET IC, V_{IN} must rise-up faster than the RC delays and the shutdown sequence will not be realised because each power IC will turn off when the V_{IN} reaches the IC's UV-

Power Sequencing & High-Speed Transient Response without PMIC!

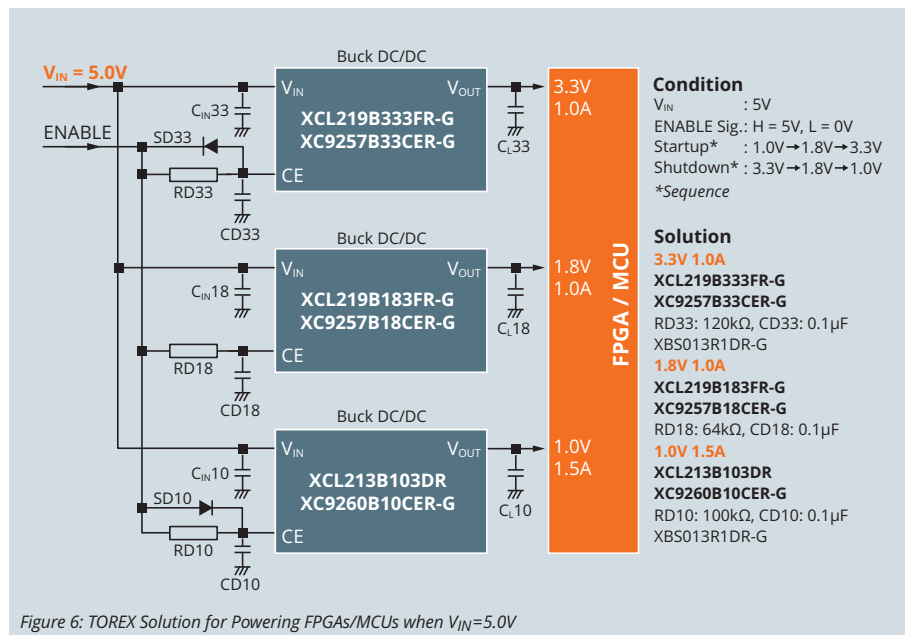


Figure 6: TOREX Solution for Powering FPGAs/MCUs when $V_{IN}=5.0V$

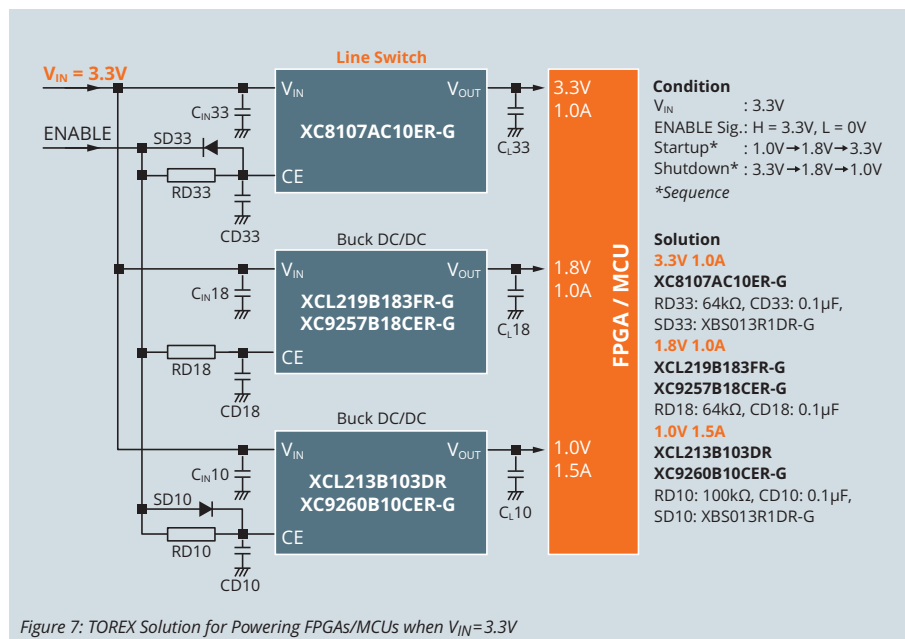


Figure 7: TOREX Solution for Powering FPGAs/MCUs when $V_{IN}=3.3V$

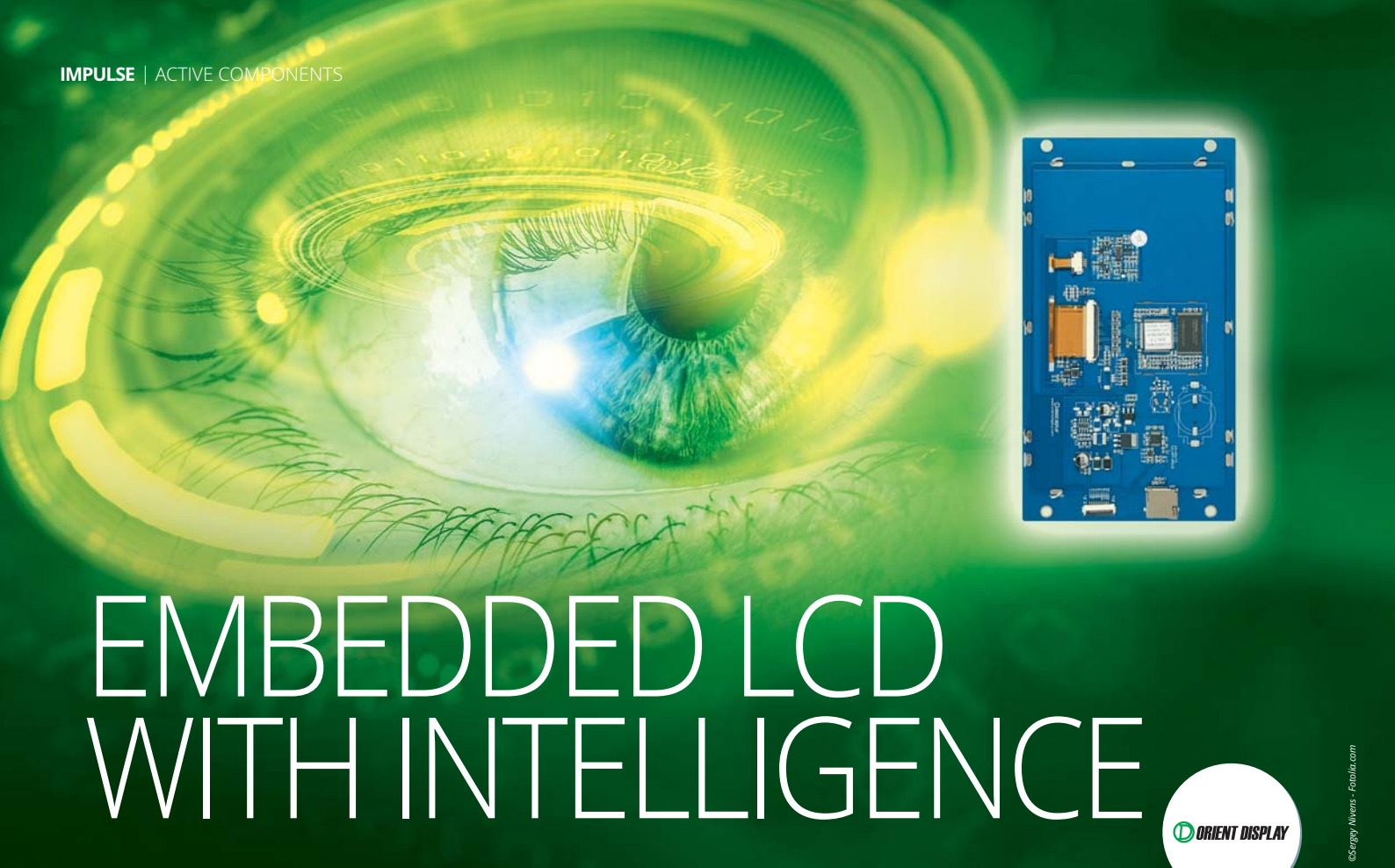
LO voltage. If the primary DC/DC for 12/24V input has a PG pin, please use it for the ENABLE signal.

In both cases ($V_{IN}=3.3V$ & $V_{IN}=5.0V$), the power sequence can be realised using just a RC delay for each CE pin without the need for a dedicated PMIC, multiple RESET ICs or the large capacitor on the Core voltage rail highlighted earlier. A simpler solution with the added benefits of lower EMI and better thermal performance!

Samples and/or evaluation boards for all the TOREX products mentioned in this feature can be requested via CODICO. The evaluation boards are made to the customer's specific requirements. Test data is provided with each board. In addition, TOREX can also provide solutions for the Primary step-down DC/DC from 12V/24V so please ask your local CODICO contact for details.

A03

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EMBEDDED LCD WITH INTELLIGENCE



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Nowadays, it is inconceivable to have any applications without colour displays. Although a monochrome variant would often fulfil the purpose as well, in most cases the colour variant is given preference, simply as a demonstration of modern concept and approach. Monochrome displays are easy to handle, because they require a lower data volume than a colour display.

But it is not always the case with an application that a CPU is available with sufficient capacity to provide a colour display with a higher resolution. If it is intended that a display should be located at a considerable distance from a computer, then consideration also needs to be given as to how to control the display. Not having a suitable computer on the spot, in other words directly at the display, means having long connecting lines, and that in turn can cause problems with data transfer.

How to tackle the challenge?

ORIENT DISPLAY offers a possible answer here, and one that is easy to use – the Embedded LCD. The solution consists of a hardware part and software part. The hardware is made up of the display itself and an embedded micro-processor, including the peripherals, with the PCB located on the rear of the display. The software part is the development environment known as OGUS (Orient Graphic Utility Software). This is where the project files are generated, and

then loaded into the Embedded LCD hardware.

What advantages does this solution provide?

- The integrated embedded CPU allows for rapid reaction times, and has low current consumption.
- The graphic development environment allows for fast & flexible working, and is easy to use.
- The UART interface can be easily integrated into existing systems.
- Products can be developed quickly and swiftly brought onto the market.
- The system provides high reliability & stability.

What hardware is available at present?

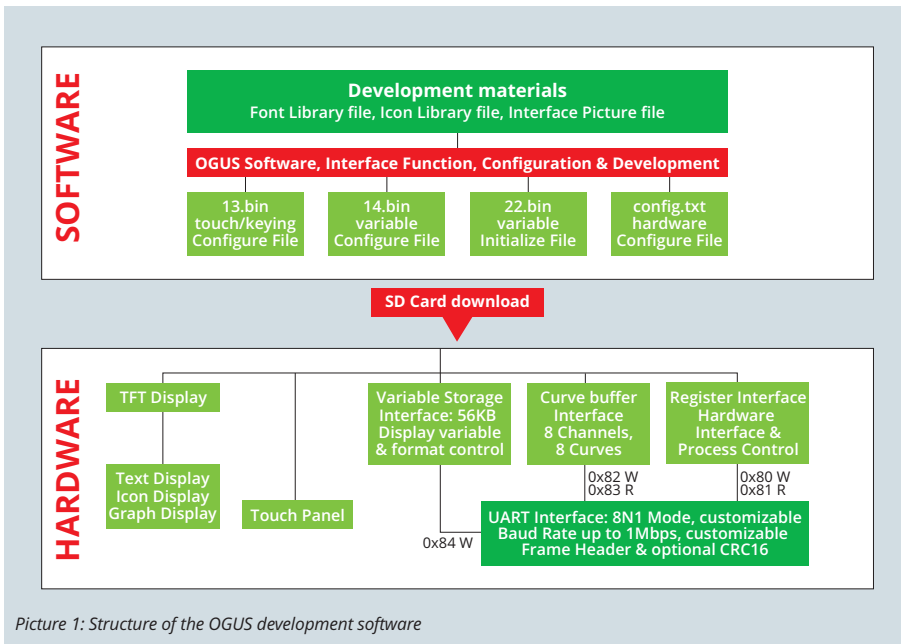
The AGN Series at the moment consists of three display sizes – 3.5" with a resolution of 320×240 pixels, 4.3" with 480×272 pixels, and 7.0" with 800×480 pixels. The displays have a UART interface, by means of which the commands are sent to the displays. This supports 65,536 colours,

with brightness adjustable in 64 steps. The memory for the firmware is provided by an SD card. And, of course, the series has an operating temperature range suitable for industrial uses, from -20°C to +70°C. Interactivity is achieved by way of a resistive touchpanel.

When getting started, help is provided by a set consisting of embedded LCD, AC/DC adapter, USB/UART adapter board, mini-USB cable and FFC (Flexible Flat Cable), which is available for the individual sizes. The display is connected to a PC by way of the USB adapter board. This means that commands are sent to the panel, and, in the opposite direction, data is received from there. Communication from and to the host takes place in real time.

What about the software?

OGUS is a graphic development environment, which makes working with Embedded LCD's considerably easier. With the aid of the software, touch functions and display activities are defined and the configuration and the user interface programmed. After completion, the project files are adopted into the Embedded LCD by way of SD card. This method also makes series production easier, and also simplifies updates which may be necessary. The structure of the OGUS development software is represented in Picture 1.

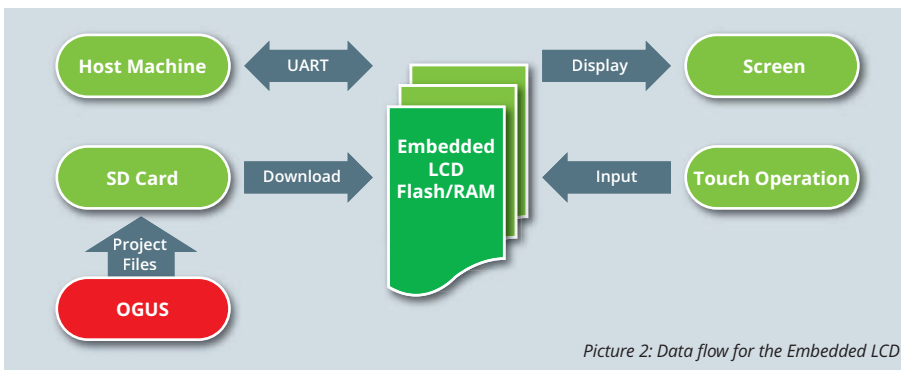


Picture 1: Structure of the OGUS development software

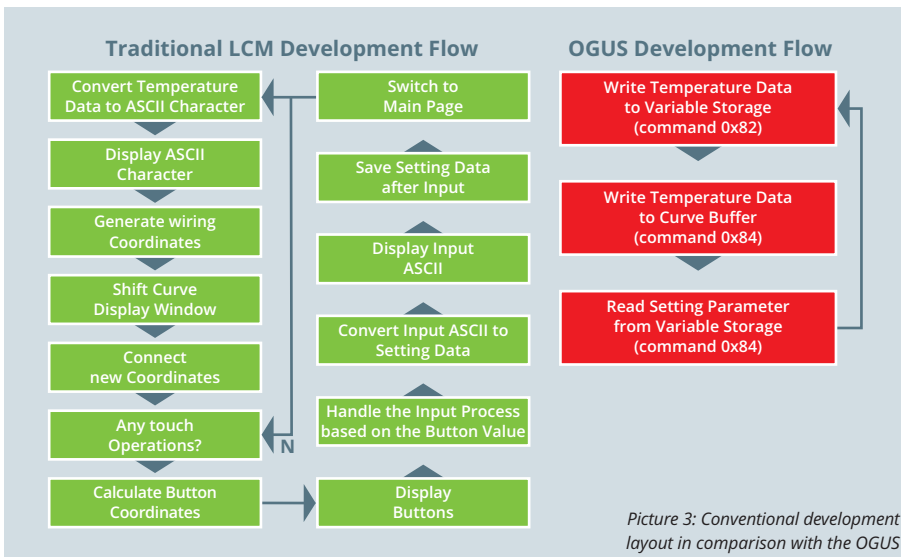
Aids such as font libraries, icon libraries, and pictures are combined, and from these the configuration files generated. Everything is stored on an SD card and transferred to the Embedded LCD. There the data is copied into the Flash or RAM and implemented. Picture 2 shows the data flow for the Embedded LCD.

What are the benefits?

By contrast with conventional LCDs (without embedded controllers) to which the data that is to be displayed is transferred directly from the host with specific timings, Embedded LCDs work on the principle of direct variable processing. All operations are carried out by comparison with pre-



Picture 2: Data flow for the Embedded LCD



Picture 3: Conventional development layout in comparison with the OGUS

SOFTWARE

- Each picture is broken down into a number of control elements, and the user can extend the configuration file simply by adding an element.
- There are a large number of control elements to choose from, such as data input, touch input, audio reproduction, etc.
- Readily available are 56k RAM, 8 memory channels for data curves, and fast processing of the variables in maximal 80ms.
- There are 256-byte configuration registers for the hardware control. These can be written & read via the interface.
- Each page can contain up to 128 display control elements and any desired number of touch elements.
- Functions such as Real Time Clock (RTC), backlight control, and capacitive touch panel, are easy to integrate.
- User-defined databanks are supported.
- Mathematical functions (MAC, CRC, etc.) can be implemented. Data storage, serial communications, and protocol processing (such as Modbus) are no problem either.

defined variables. This makes work during the development considerably easier.

Let's assume we want to produce a thermostat which displays a temperature in real time, and by touch input switches to another page on which parameters can be input. Picture 3 shows the conventional development layout in comparison with the OGUS. It can clearly be seen that the process can be designed to be substantially simpler.

So to sum it up: Even small controllers can be fitted with a colour display, and without losing any capacity for the tasks they are actually intended to do. This means that the application or the device can be provided with a display of much higher quality. Decentralised display units are easy to set up with embedded displays. Thanks to operation via a serial interface, long connection lines with the use of RS232 or RS422 are no problems at all. And that means the scope of application for higher quality LCDs is widened as well.

A04

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PASSIVE FILTER DESIGN

Buck Regulators for Ultra-low Noise Applications



Switched-mode power supply (SMPS) has the advantage of high efficiency compared to traditional Low-dropout (LDO) regulators. Due to its switching nature, a SMPS emits noise at its switching frequency and its harmonics.

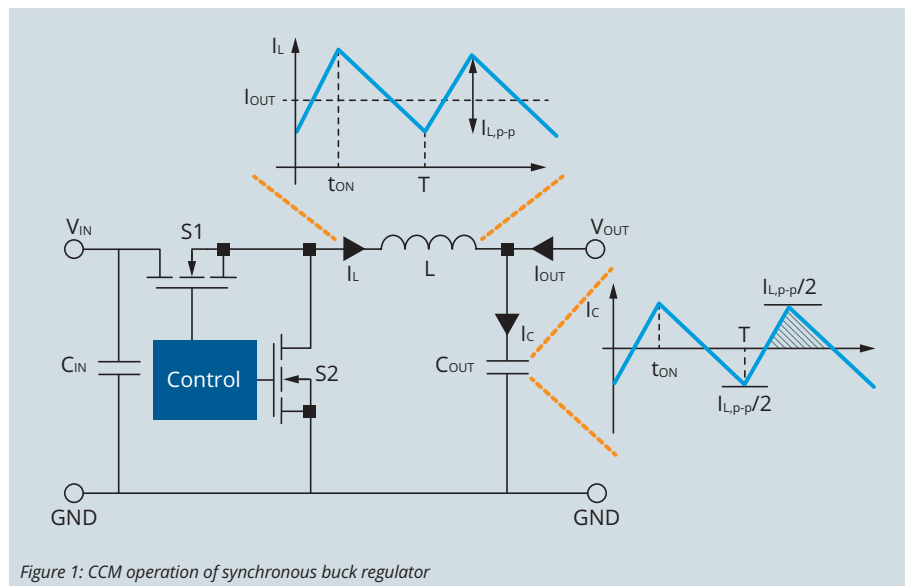


Figure 1: CCM operation of synchronous buck regulator

This article illustrates the procedure of designing filtering to achieve ultra-low output voltage noise of SMPS regulators. Single stage capacitive filter is commonly used for DC/DC converter applications. Low-ESR ceramic capacitors are utilized to meet output voltage ripple specifications. The single stage capacitive filter is sufficient for applications that requires no less than 1-2mV output voltage ripple. For applications such as RF ADC and DAC applications where it is necessary to meet less than 1mV ripple, a second stage LC filter should be used to effectively suppress the switching noise.

Single Stage Filter Design

A synchronous buck converter consists of an input capacitor C_{IN} , two switches $S1$ and $S2$ with their body diodes, an energy storage power inductor L , and output capacitors, C_{OUT} . The input source provides energy to the power inductor L and the load when $S1$ is turned on and $S2$ is turned off. During this period, the inductor current rises. The energy stored in the inductor is transferred to the output capacitor and load when $S2$ is on and $S1$ is off, causing the inductor current to drop. The switching behavior of the buck regulator causes the output voltage to fluctuate. The output capacitors C_{OUT} is placed at the output to smooth the output voltage under steady state. The output capacitor reduces the output voltage ripple by providing a low impedance path for the high-frequency voltage components to return to ground.

In the subsequent development, it is assumed the buck converter operates under continuous conduction mode (CCM) for output voltage ripple minimization. The inductance of L is designed

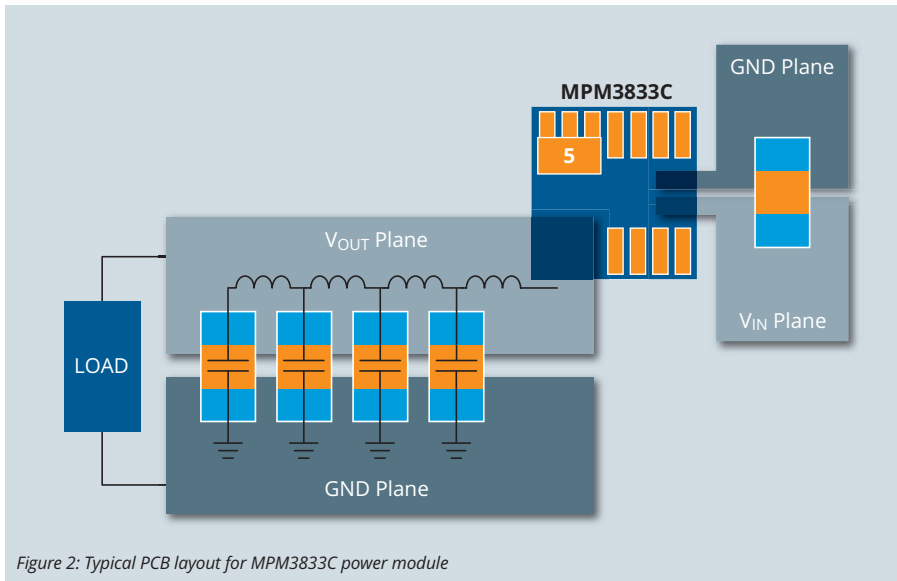


Figure 2: Typical PCB layout for MPM3833C power module

the power converter design is shown in Figure 2. In the PCB layout of MPM3833C, wide copper plane is used for the output power path to minimize power losses. The output capacitors are placed along the output current path. As shown in the figure, as more capacitors are placed on the output plane, the distance from the additional capacitor to the output pin of the power module increases. Consequently, more parasitic inductance is involved in the output capacitor that is further away from the power module.

Adding more output capacitance become less and less effective and eventually, the shunt loop is dominant by parasitic inductance. To demonstrate the impact of loop parasitic inductance, an MPM3833C with various output capacitors are simulated using Simplis. It is assumed that each additional output capacitor introduces an additional 0.5nH parasitic inductance to the bypassing loop. Figure 3 illustrate the output ripple of the power module with one 22µF capacitor. The bypassing capacitor effectively reduces the output ripple to around 3mV at 5V input, 1.2V output, and 2A load.

To further reduce the output voltage ripple, 1 additional 22µF output capacitors is place at the output. Since the new capacitor has to be placed further away from the power module, the parasitic inductance involved with the new capacitors is 1nH. The simulated output voltage ripple is shown in Figure 4A where the output voltage ripple is reduced to 2mV. Compared to the waveform shown in Figure 3, where one 22µF output capacitor effectively brings down the output voltage ripple to 3mV, the additional one 22µF capacitor is less effective. Figure 4B shows the output voltage ripple with one more 22µF capacitor (total of 4×22µF). The last 22µF capacitor involves 1.5nH parasitic inductance in its bypass-

to meet inductor current ripple requirement. The minimum inductance of L is determined as:

$$1 \quad L_{Min} = \frac{(V_{IN} - V_{OUT})D}{I_{L,p-p}f_{sw}}$$

Where V_{IN} and V_{OUT} represent the input and output voltage, respectively, $D = \frac{V_{OUT}}{V_{IN}}$ represents the duty ratio, $I_{L,p-p}$ is the peak-to-peak current ripple of the inductor, and f_{sw} represents the switching frequency of the converter. Typically, the peak-to-peak inductor current ripple is selected as 20-40% of the output DC current.

The output capacitance is selected to ensure that the output ripple is below the specified peak-to-peak value. For a single stage capacitive filter, a minimum output voltage ripple of 1mV to 2mV can be achieved. Under steady state, the net electric charge delivered to the capacitor is zero within one switching period. The capacitor charge of the shaded area in Figure 1 is calculated as:

$$2 \quad \Delta Q_C = \frac{T}{4} \frac{I_{L,p-p}}{2}$$

Where T is the period of one switching cycle. By definition, the capacitor charge in a given period is also can also be expressed as:

$$3 \quad \Delta Q_C = C\Delta V_C$$

Equating equations (2) and (3), the minimum capacitance to achieve the required output peak-to-peak voltage ripple, $V_{(OUT,p-p)}$ is determined as:

$$4 \quad C_{Min} = \frac{I_{L,p-p}}{8f_{sw}\Delta V_{C,p-p}}$$

Ideally, the noise shunt capability can be increased by paralleling more output capacitors. In practical, the output capacitors are laterally placed on a PCB. Adding more output capacitors on a PCB would introduce additional parasitic inductance and AC resistance to the shunt path and thus reduce the effectiveness of bypassing the switching noise.

A typical PCB layout of a MPS power module which integrates optimized inductors to simplify

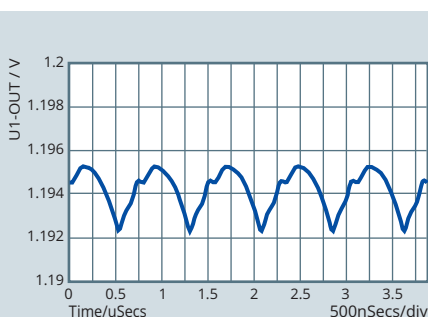


Figure 3: Output voltage ripple of MPM3833C with one 22µF output capacitor

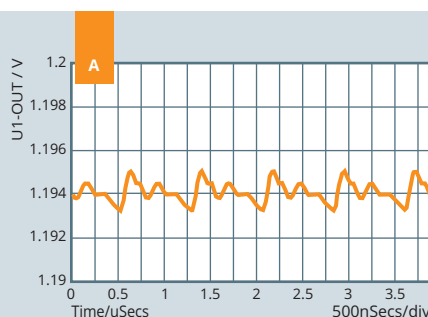


Figure 4: Output voltage ripple of MPM3833C with (A) 4×22µF output capacitors and (B) 5×22µF output capacitors

sing loop. As shown in the figure, the output ripple reduction achieved by the additional 22uF capacitor is less than 5% compared to the case where 3x22uF is used.

As demonstrated in Figure 3 and 4, the parasitic inductance introduced by the PCB copper/trace will become dominant as more output capacitors are placed on the PCB. Eventually, the benefit of adding more capacitors will be negated by the additional parasitic inductance added in the loop.

Second stage filter design

Typically, the shunt output capacitor can effectively reduce the output voltage ripple to 1mV. Beyond this point, a second stage output filter is required to achieve smaller output voltage ripple (sub 1mV voltage ripple can be achieved). Figure 5 illustrates a second stage LC filter which is cascaded to the first stage output capacitors. The second stage filter consist of one filter inductor and its series resistor DCR, a bypassing capacitor branch, and a damping branch. The LC filter works by creating a high impedance to the output. The filtering inductor L_f is resistive at the intended high frequency range and dissipates the noise energy in the form of heat. The inductor combines with additional shunt capacitors to form a low-pass LC filter network.

The second stage filter is very effective on reducing the output voltage noise when properly designed. It is crucial to size the component of the second stage LC filter for the intended frequency band. The first step of the design procedure involves choosing the first stage output capacitor such based on Equation (4). 5mV to 10mV output voltage ripple is typical for the first stage design. Usually a 10-22uF capacitor is sufficient. The capacitor C_{OUT} of the first stage has to be smaller than the bypassing capacitor C_1 of the second stage to ensure system stability.

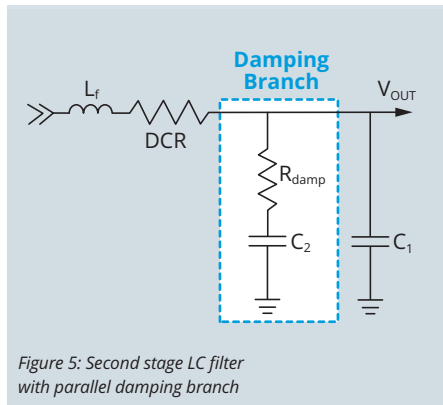


Figure 5: Second stage LC filter with parallel damping branch

Once the first stage capacitor C_{OUT} is determined and the specified output voltage ripple (at given frequency) is given, the required attenuation of the second stage LC filter can be determined as:

$$A_{0,dB} = 20 \log \frac{V_{0,p-p}}{V_{1,p-p}}$$

Where $V_{1,p-p}$ represents peak to peak voltage ripple at the output capacitor and $V_{0,p-p}$ represents the peak to peak of the output voltage (after the second stage filter).

Using phasor analysis, the amplitude of the gain of the LC filter is determined as

$$|H(f)| = \frac{1}{\sqrt{[1-(2\pi f)^2 L_f C_1]^2 + (\omega R_{DC} C_1)^2}}$$

Note that the impedance of the damping branch which consists a large series resistor is much larger than the bypassing branch at switching frequency. Thus the filter shown in Figure 5 is approximated as a second order RLC filter. The cut-off frequency of the filter is determined as

$$f_0 = \frac{1}{2\pi \sqrt{L_f C_1}}$$

Typically, an inductor with 0.22uH to 1uH inductance can be selected to achieve the required output ripple. The inductor should be selected to have minimal DCR as the serious resistance increases power dissipation and reduces the output voltage regulation. It should be noted that as the DC current increases, the core material of the inductor becomes saturated which reduces the inductance of the inductor. Care should be taken to ensure that the inductance is high enough at the rated DC current.

Once the filtering inductor is selected, its DCR can be extracted from the datasheet. The second stage LC filter which is a second order filter provides 40db per decade roll-off after the cutoff fre-

quency. The attenuation at given frequency can be estimated as

$$A(f) = -40 \log \left(\frac{f}{f_0} \right) \text{ dB}$$

Using the attenuation calculated in equation (5), the required cut-off frequency is determined as:

$$f_0 = \frac{f}{10^{-\frac{A_0}{40}}}$$

Subsequently, the required bypassing capacitance C_1 is determined as:

$$C_1 = \frac{1}{4\pi^2 f_0^2 L_f}$$

Ceramic capacitors should be used as the bypassing capacitor for the low ESR and ESL. It should be noted that the capacitance of ceramic capacitors experience significant de-rating at DC bias voltage. Figure 6 illustrates the DC de-rating curve of a ceramic capacitor which is rated at 6.3V. As shown in the figure, at the full rated DC bias voltage, the capacitance drops to 20% of the nominal value. The bypassing capacitor should be selected at the nominal DC bias voltage to factor in the de-rating.

Damping

The second stage LC filter may introduce resonance peaking if not properly damped. The resonance between the filtering inductor and bypassing capacitor may amplify the output ripple and create undesired ringing at load transient. Fig. 7 shows the output voltage of an underdamped converter system with the second stage LC filter. Initially, the system operates under steady state. At $t=200\mu\text{s}$, a load transient from 1A to 2A is initiated which causes the output voltage to ring. Figure 7B illustrate the output voltage and current under load transient of a overdamped second stage filter. To avoid undesired ringing at load transient, the second stage LC filter resonance must be properly damped. In most designs, the second stage filter will be placed outside of the control loop to avoid control stability issue. Consequently, the damping has to be achieved by passive components (additional damping resistors).

The filtering inductor usually include a parasitic DC resistance in series with the inductor. This DCR provides damping to the network. However, to provide enough damping for a series RLC circuit, the series resistance has to satisfy $R_{DC} > 2\sqrt{\frac{L_f}{C_1}}$. In most cases, the DCR alone can-

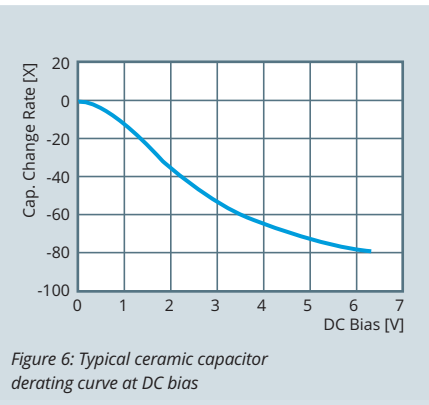


Figure 6: Typical ceramic capacitor derating curve at DC bias

not provide sufficient damping. To this end, a RC damping network is inserted in parallel with the bypassing capacitors to damp the resonant circuit along with the series DCR resistor.

Design example

The EVREF0102A is the analog power module developed for ZCU1275 Zynq UltraScale+RFSoc Characterization Kit. The EVREF0102 analog power module provides ultra-low noise power supply for the high speed data converters on the ZCU1275 development kit.

The EVREF0102A employs five high efficiency step-down switched-mode power modules with integrated inductors. MPM3833C is a 6V, 3A, ultra-small step down power module and MPM3683-7 is a 16V, 8A power module. Both power modules feature integrated protection functions including OCP, OVP, UVP, and OTP. Compared to the traditional LDO solution, EVREF0102A can achieve up to 80% efficiency improvement.

The EVREF0102A analog power module also achieves ultra-low noise level to meet the specifications of Xilinx high-speed data converter by leveraging the forced continuous conduction mode (CCM) operation and implementing post passive filters. CLC passive filters are utilized for the two most sensitive ADC and DAC rails and capacitive filters are utilized for the rest of power rails.

The design procedure is illustrated on the ADC/AVCC rail where MPM3833C power module is employed to power the rail. The MPM3833C integrates a 1uH power inductor, the current

Figure 9: EVREF0102 Ultra-low noise power supply module



ripple of the inductor at 5V input and 0.925V output is determined as 0.63A by applying equation (1). Subsequently, the first stage output capacitor is selected based on equation (4) as 22uF to provide 3mV voltage ripple to the second stage filter.

The required gain of the second stage LC filter is determined by equation (5) as -30dB to achieve 120uV output voltage ripple at the switching frequency. Considering the size and current rating availability, a 0.24uH chip inductor is selected with sufficient current rating. The ADC and DAC rails require ultra-low noise across the frequency range up to 15MHz. To provide attenuation with enough margin, the cut-off frequency of the second stage filter is selected as 25kHz.

Finally, the filtering capacitors are selected as 150uF. This design is conservative to provide enough margin. The cut-off frequency is selected to compensate the high-frequency gain increase

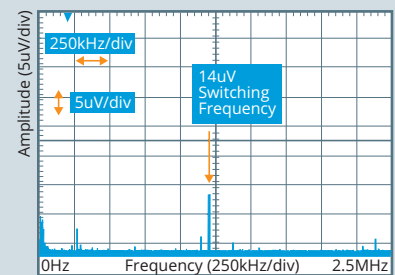


Figure 8: Output noise measurement of the ADC/AVCC rail of EVREF0102

due to the parasitic inductive impedance involved in the filter loop increases at high-frequency (up to 15MHz). A SP-Cap with 100mOhm ESR is selected as the damping capacitor. Since the series resistor of the SP-Cap is high enough for damping, there is no need to external resistor. The FFT results of the output noise measurement of the EVREF0102A is shown in Figure 8. As shown in the figure, the peak noise at switching frequency is reduced to 14uV.

Conclusion

The design procedure of an output filter is outlined in this article for a buck regulator to achieve ultra-low output voltage noise. A single stage output capacitor filter is capable of reducing the output voltage ripple to up to 2mV. A second stage LC filter is added to effectively reduce the output voltage ripple to less than 1mV.

The design of the second LC filter involves selecting of the filtering inductor, the bypassing capacitor, and the damping branch. A design example is given for the power rail of high-speed ADC converter on Xilinx ZCU 1275 kit. The optimized filter effectively removes the output voltage ripple to satisfy the ultra-low noise requirement of on the ADC/DAC rails.

A05

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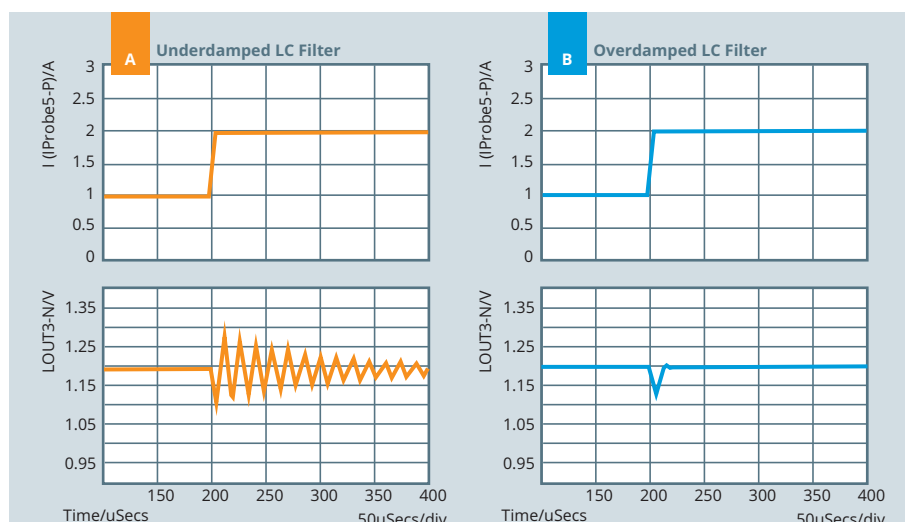


Figure 7: Step response of (A) underdamped LC filter and (B) overdamped LC filter

Author: Adnaan Lokhandwala, Power Integrations

NO NEUTRAL POWER SUPPLIES?

<75 μ A Standby Solution Enables 2-Wire Wall Switch for Smart Home & Lighting!

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Lighting control products such as smart wall-switches, occupancy sensors and dimmers play an important role in increasing the energy efficiency in residential and commercial buildings. Besides enabling user convenience, they can reduce or eliminate the reliance on occupants to turn lights off by doing so automatically with integrated timers or vacancy detection.

Newer products now incorporate wireless connectivity, sensors for motion and voice detection etc. and are becoming essential components of the smart home eco-system. With the integration of electronics, these products need power even when the switch is off and the amount of power required continues to increase as more features are added. On the other hand, they are also required to consume less power, specifically their current draw to meet regulations and system performance requirements.

Traditional mechanical on/off light switches have Line-only wiring and do not require a neutral wire for functional operation; hence, this wire is not available today at the light switch box in most retrofit installations. Many smart in-wall products today however require a neutral return wire to power itself which make them incompatible unless the home or building is rewired. No-neutral products are typically powered by »leaking«

current through the load when they are off. However, high current consumption during off mode can lead to flicker often known as ghosting when used with LED lamps. In some cases, the Earth wire is present at the switch box and is used for power, but current draw must be limited to 500 μ A to comply with UL773A.

In order to meet the above requirements and at the same time generate the maximum possible power for the smart switch, the offline power supply must be carefully designed to consume very low current from the mains and deliver excellent light-load efficiency. In this article, we will explain some of the challenges and key care about when designing smart wall-switches compatible with no-neutral wiring. An elegant solution will then be discussed which enables 2-wire products for upgrading mechanical wall-switches into smart controls without changing electricity wiring.

Powering a Smart Switch

Now let's look closer at a common no-neutral wire application, a smart wall-switch powering a lamp. The AC/DC power supply is tasked with generating the bias voltage rails for the electronics (sensors, wireless communication, MCU etc.) and the drive power for the main power switch which is shown as a relay in Figure 1. When the switch is off, (i.e. relay open), the switch current (I_{OFF}) leaks through the lamp. High current consumption in this mode can lead to flicker or ghosting effects, caused by energy accumulation in the lamp initiating intermittent start-up and brief light activation. The occurrence of this issue also depends on the power rating and driver stage in the lamp, with lower power LED and CFL lamps most susceptible to this issue. Reducing I_{OFF} to the lowest possible level is required to increase compatibility with various lamps. Adding an impedance across the lamp to bypass I_{OFF} and mask this issue has been proposed by some vendors, but is not a practical solution for consumers.

When the switch is on (i.e. relay closed), the AC/DC power supply input is essentially shorted by the low voltage drop across the relay. Hence,

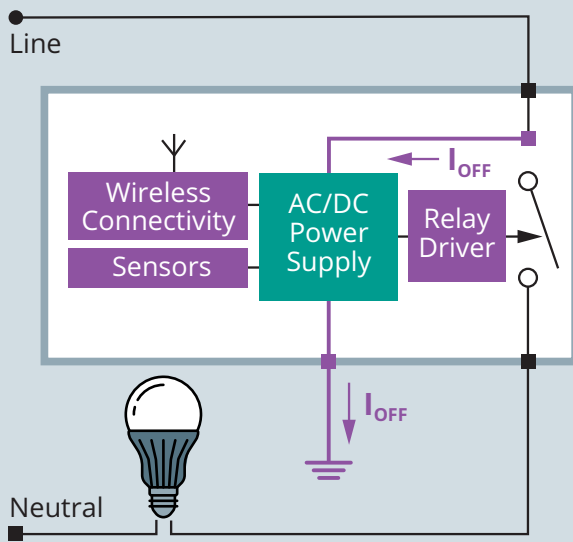


Figure 1: No Neutral wire smart wall-switch simplified block diagram

as demonstrated in DER-623. With the BLE controller enabled (15-20mW average load), LNK3202 excellent light-load efficiency helps with limiting the input current draw to <math><300\mu\text{A}</math> at 230VAC input.

A series regulator is used in this design as the auxiliary power source for the switch when the relay is closed. While there are several ways to implement this regulator, low power dissipation and good thermal performance were used as key design considerations as it carries the full lamp current. Seamless transition between the switch on and off modes is shown in Figure 3. The regulator output (pink) is only enabled when the switch is on to power the relay and linear regulator for the 3.3V bias rail (turquoise). The first two waveforms (green and blue) are the outputs of the LNK3202 flyback converter which are active only while the switch is off and drop-off when the relay closes.

Summary

The ever-rising need for improved energy efficiency, consumer convenience & security continue to drive the smart home and building evolution. Many homes have light switch wiring that is incompatible with smart products today and require electrical rewiring, which increases installation costs and discourages adoption. The simplicity of LinkSwitch-TN2 and its ultra-low current draw enables 2-wire smart in-wall products which are compatible with no Neutral wall-switch wiring.

A06

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an auxiliary power source is required to keep the switch smart once the lamp is on. Ideally, this source must be enabled only when the lamp is on and not impact the current consumption of the switch in off mode. If a TRIAC is used as the main power switch, the voltage drop generated by inserting a firing angle delay from zero crossing can be used to derive this auxiliary power.

components and maintaining excellent light-load efficiency to help power more with a lower current draw.

In DER-622, LinkSwitch-TN2 LNK3202 is utilized in a non-isolated flyback topology with simply half-wave input rectification to reduce solution cost. The power supply provides two outputs, a

12V rail to drive a relay and a 3.8V rail for the BLE controller. Figure 2 shows the power supply input current consumption across AC input while in standby.

The standby current consumption can be reduced further by implementing a full-bridge input rectifier

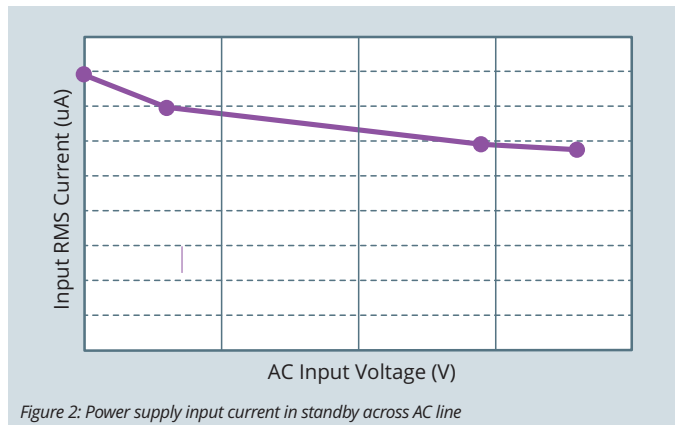


Figure 2: Power supply input current in standby across AC line

Line only Wireless Wall-Switch

POWER INTEGRATIONS reference design DER-622 addresses these challenges and illustrates a Bluetooth® low energy (BLE) smart switch compatible with no-neutral wiring and low power LED lamps. The design is implemented with LinkSwitch™-TN2 LNK3202 which enables <math><75\mu\text{A}</math> current consumption from the mains in standby.

LinkSwitch-TN2 devices enhance system reliability by incorporating numerous safety features including input and output over-voltage protection, over-temperature, and output short-circuit protection along with a rugged 725V power MOSFET. The device employs simple ON/OFF control thereby requiring no external loop compensation

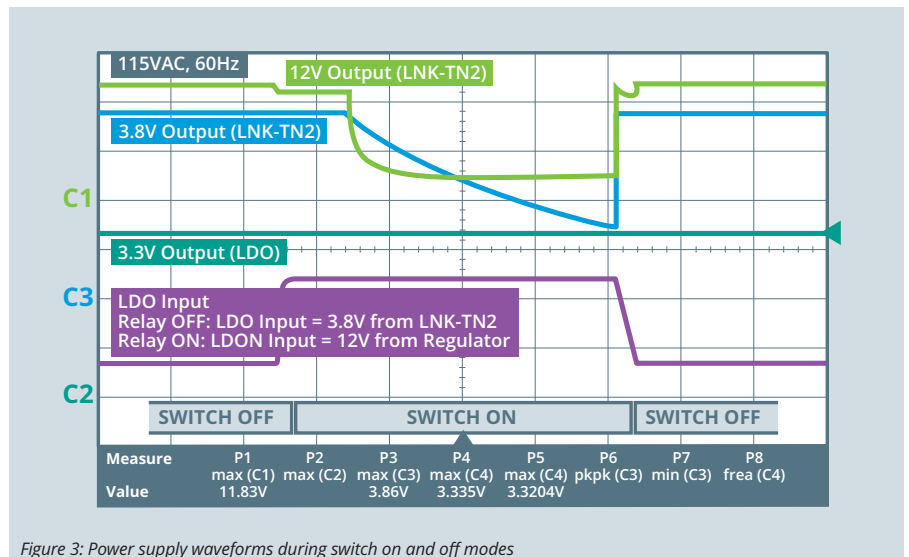


Figure 3: Power supply waveforms during switch on and off modes



HAPPY ANNIVERSARY MG SERIES



The COSEL MG Series has been available for almost ten years now. Just in time for its anniversary, COSEL completes the comprehensive series of established and reliable on board DC/DC modules with further models.

The MG series as we know it, comprises two footprints with 1×1" (15W) and 1×2" (30W) fully shielded, meaning six not five sided shielding, in COSEL terms making the module a true Faraday cage. The industry standard footprint makes the DCDC converter the perfect drop in replacement for countless applications in industrial and – even more important – EMC sensitive applications, which is literally any application, nowadays. With ten years warranty, the product is not only well established but also truly reliable.

MG products are available with 4-1 input voltage range, single (S) and bipolar (W) output voltages plus remote on/off functionality for maximum flexibility.

COSEL has now tuned up the power with both footprints. The 1×1" comes peppered with 40W

and the 1×2" with 80W. The 80W power DCDCs have never been available on an industrial footprint of this size before. The market for Front-end DCDCs with power ratings of 50W and more has been covered by brick modules, yet. That was the standard! With the industrial footprints now digging off market share from brick modules there is at least a – smaller – alternative.

Both power ratings work above 90% efficiency and cover a very large input voltage range from 4.5 up to 76Vdc. There is single and bipolar output versions available allowing customers to use the module as a boost module, too. Other than that, not a whole lot has changed. From its outer appearance, it is simply not possible to distinguish between the »old« and the »new« version, just that the »new« ones have more than doubled their performance.

Last, but not least, the first expansion of the product range in 2017 needs mentioning. At the time, COSEL has added a wide range of Single Inline Modules with 1.5, 3, 6 and 10 Watts in two footprints SIP6 and SIP8. The difference to other market players with the MG low power variants is not only that the entire series comes with bipolar and single outputs.

It is worth mentioning that also the SIP modules come with regulated outputs, making a 2-1 input voltage range possible in a form factor that was destined for unregulated and commoditized products before.

One particular highlight is the MGXS series, a high grade spin off, that offers 10-1 input voltage range, i.e. 6-60Vdc for power ratings of 1.5 (SIP6) and 6W (SIP8) package as mentioned above. Needless to say: There is also a dual variant named MGXW following the nomenclature as explained above.

The true alternative to the »COSEL yellow pages«!

The MG series along with other, new and established, products is now available on COSEL's Product Selector App, developed to operate across all mobile devices and computers – even without internet connection. The COSEL Product Selector App is straightforward in use and in just a few clicks the user is able to rapidly locate a selection of products suitable for his application. The app also includes simple calculators and all product specifications in a basic format as well as datasheets. It makes the well known »COSEL yellow pages« (the legacy catalogue) redundant.

»This app has been designed to assist everyone at all levels, making it a quick, simple and easy process for selecting a power supply. The ability to use it offline as well as store favorites and send datasheets is particularly helpful when multiple solutions are available for the same specification and solutions based on specs entered ensure that the right solution is offered, thus optimizing costs.« Said Nick Theodoris, COSEL Europe Sales Director. *»COSEL is extremely proud to be the first to market with such a tool, demonstrating the company's dedication to meeting the needs of today's electronics engineers«.*

To reduce the size of the app on users' terminals, only datasheets are built into the application. However, links to supporting documentation e.g. instruction manuals are included under »Features« and are accessible when online.

To guarantee that users always have the latest, updated COSEL products information, when online, the COSEL Product Selector App automatically checks for the latest stored data, offering an option to refresh the application or to stay with current version. Here again, the application has been optimized for speed and refreshing stored data is done in just a few seconds using an average speed connection.

For portability and accessibility, the COSEL Product Selector App complies with the two major mobile platforms: Apple and Android and is available from their respective App Stores. A version for MacBook users is available from the Mac App Store and for PC users, the Windows 10 App is available from the Microsoft store. Note that a Windows 7&8 version is available from CODICO's website:

www.codico.com/en/cosel-app.htm

A07

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COSEL's »Product Selector APP«

COSEL PRODUCT SELECTOR

Welcome to the Cosel product selector tool.
This tool is designed to help you identify the right product for your application based on a number of parameters.

Start >

Microsoft | Available on the App Store | GET IT ON Google Play

PERFECT MATCH!



When the Ag9900 family of modules was released in 2017, nobody expected a smaller version would be possible, but SILVERTEL has done it again. Now in full production is the new Low Profile version of this miniature PD module called the Ag9900-LP setting the pace for Plug&Play PoE modules.

With a height of under 8mm, just low enough to match with the latest generation of low profile RJ45 connectors. Still, with the same tiny footprint as the Ag9900 (14x21mm), the new module is targeted at the next generation of IOT applications and products, requiring low power POE (<IEEE802.3af standard) in as small a package as possible.

The module still provides the complete solution, which includes the PoE signature, 1.5KV isolation and DC to DC conversion to 12V, 5V and 3.3V. The output voltages are easily adjustable via a simple pull up/down resistor. The Ag9900-LP requires

just three external low cost components; two diode bridges and an electrolytic capacitor.

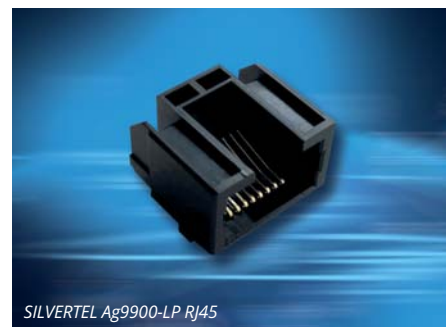
The product is fully compliant to IEEE802.3af and comes with fixed Class »0« signature. Like its older siblings, they all are inherently safe with overload, short-circuit and over-temperature protection. The entire series as well as a perfect matching RJ45 (#281681 »RJ45 Modular Jack«) socket are available via the CODICO Sample Shop – free of charge.

A08

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SILVERTEL Ag9900-LP



SILVERTEL Ag9900-LP RJ45

SAGAMI IS FILTERING CLASS D APPLICATIONS



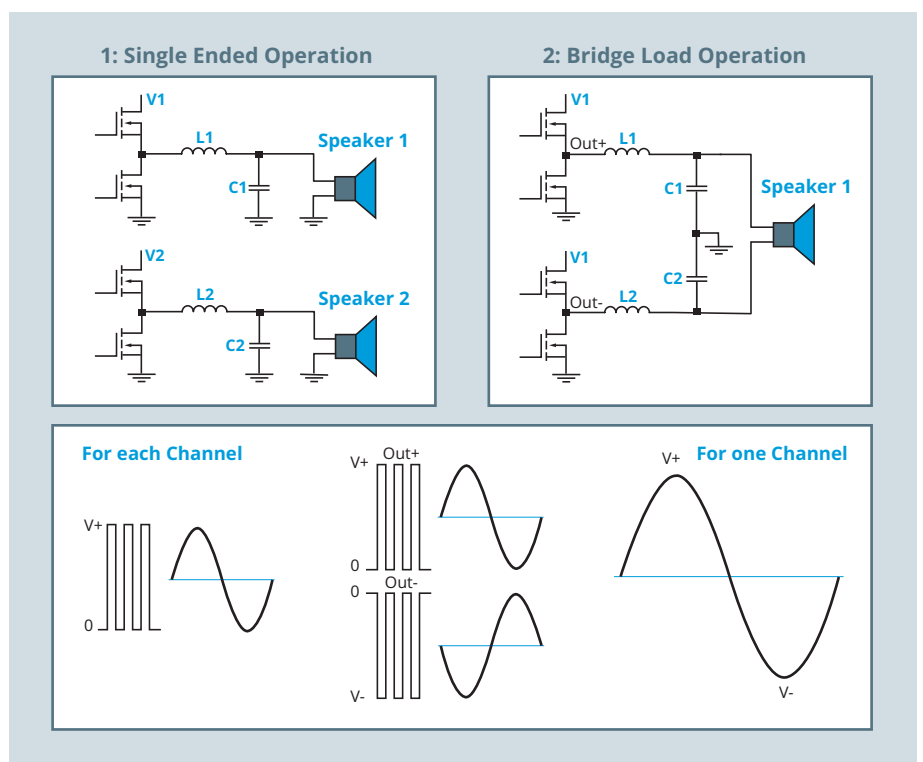
The undesirable modulation frequency, normally in the range of 300kHz to 3MHz, is filtered by an output low pass LC filter 2nd order. Besides the modulation frequency the speaker impedance needs to be considered for designing the filter. SAGAMI offers a wide range of high quality Class D inductors. For selected series SAGAMI uses oxygen free copper to achieve the best results in total harmonic distortion. Available types are single, 2in1 and 4in1 inductors either in SMD or THT technology. Single inductors are mainly used for Single-Ended operation or high power applications like e.g. subwoofers. The 2in1 and 4in1 on the other hand are often used in Bridge-Tied-Load applications to filter one or even two speaker lines with one component. In that way it is possible to reduce the quantity of components per output, space on the PCB and pick and place cost.

	DRP	DBL	DBE	7G31	CVE
Structure	4in1	2in1	2in1	Single	Single
Inductance Range	3.3μH	1μH to 22μH	3.3μH to 22μH	10μH to 22μH	0.8μH to 33μH
Saturation Current Range	14.3A	up to 12A	up to 16A	50A to 31A	up to 117.6A
Dimensions (WxDxH) (mm)	15.3x9.2x10	6.7x7.2x8.5 to 12.8x10.5x10.7	12.8x10.5x10.2 to 15x13.5x16	19x31x33	13.4x19x19.5 to 16.5x26.9x22.3
Pinning	SMD	SMD	SMD	THT	THT
AEC-Q200	yes	yes	yes	yes	yes

P01

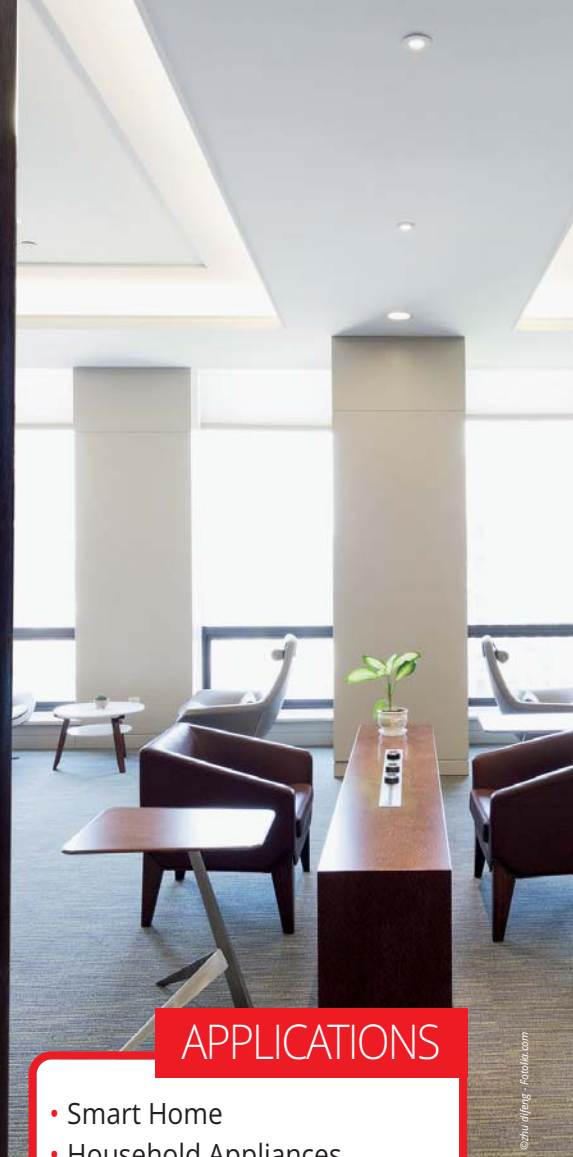
Sebastian Gebhart, +43 1 86305 205
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Class D amplifier designs provide advantages like a compact design layout and a low heat dissipation. The main reason for the low self-heating is that the MOFETs are either completely closed or open and not operated in intermediate states like the transistors in linear amplifiers. This results in an average efficiency above 90%. These benefits make the Class D amplifier suitable for automotive applications and consumer electronics. By pulse width modulation the analog input signal is transformed to square wave signal whose average voltage is similar to the analog one. In Single-Ended operation (1) the half bridge boosts the amplitude of the modulated analog signal to the half of the working voltage. If the same amplifier is operated in Bridge-Tied-Load (2) two separate half bridges where one is working with negative working voltage, the amplitude of the modulated signal can be increased to the working voltage. That way it's possible to distribute up to four times higher output power at a single output.





ZERO EMISSION



APPLICATIONS

- Smart Home
- Household Appliances
- Streetlights and various Lamp Controls
- Motor Controls
- Chargers
- UPS Power Source
- Frequency Converters

SANYOU enters the market with two brand new designs of miniature power magnetic latching PCB relays.

The main advantages of this relay design are:

- Zero standby coil consumption
- Less heat generation inside relay during operations

SRDK – one pole 10A relay

SRDK is a one pole 10A relay with a maximum current rating of 12A in the well-known sugar cube format low profile style with either a single coil or a 2-coil magnetic latching system. The magnetic structure of the coil system has been designed in a way to reduce arcing and thus contact wasting. The relay is available in NO or CO contact version.

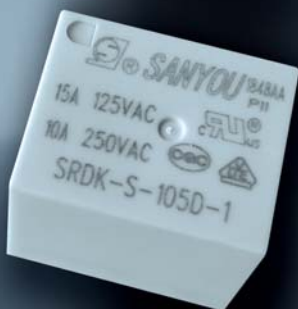
The TV-10 rating of SRDK demonstrates its ability to switch enormous inrush peaks of 141 Amps. Especially in building automation and smart home applications such as LED light controls, high inrush currents are critical and contact welding must be avoided as this would consequently cause the functional damage of the relay and the entire equipment.

Coil voltages range from 5 to 48VDC with a nominal power consumption of 400mW for the

single coil version and 800mW for the dual coil and can be ordered in positive or reverse polarity. To change the status of the contacts an impulse of only 100ms is needed.

The maximum ambient temperature is indicated with 85°C, in case you want to use the relay up to 105°C, customer specific solutions can be provided by the supplier. Insulation between coil and contact meets 2.000VAC.

Plastic materials fulfill the requirements of glow wire standard acc. to IEC 60335-1 and meet CTI ≥250V. The relay casing is either available in flux-tight or sealed version for use under hard conditions. UL and VDE certification is currently in process.



SRDK

SM-K – one pole 16A relay

SM-K is a one pole 16A relay with a maximum current rating of 20A with either a single or a 2-coil magnetic latching system. The SM-K is designed with a new magnetic structure and has been applied for national invention patent protection.

The design advantages are:

- Use of »Z« type magnetic structure in order to reduce magnetic loss, thus increasing the hold force to improve the relay's ability to resist interferences.

- Use the design of a two pieces yoke to increase the magnetic contact area resulting in an increase of contact pressure and improving the capacity of handling over-currents at the contacts.

The relay is available in NC, NO or CO contact version, enabling you to use it in a wide range of applications such as very high capacitive inrush loads with peaks over 110 Amps or strong inductive motor-loads (see table).

Coil voltages range from 3 to 24VDC, single coil version with 400mW power consumption, dual

coil only 600mW. The relays can be controlled in positive or reverse polarity and an impulse of only 100ms is enough to change the status. The indicated maximum ambient temperature is 85°C. Insulation between coil and contact meets 4.000VAC, additionally the relay meets the requirements of reinforced insulation.

Plastic materials fulfill the requirements of glow wire standard according to IEC 60335-1 and meet CTI ≥250V. The relay casing is either available in flux-tight or sealed version. UL and VDE certification is currently in process.

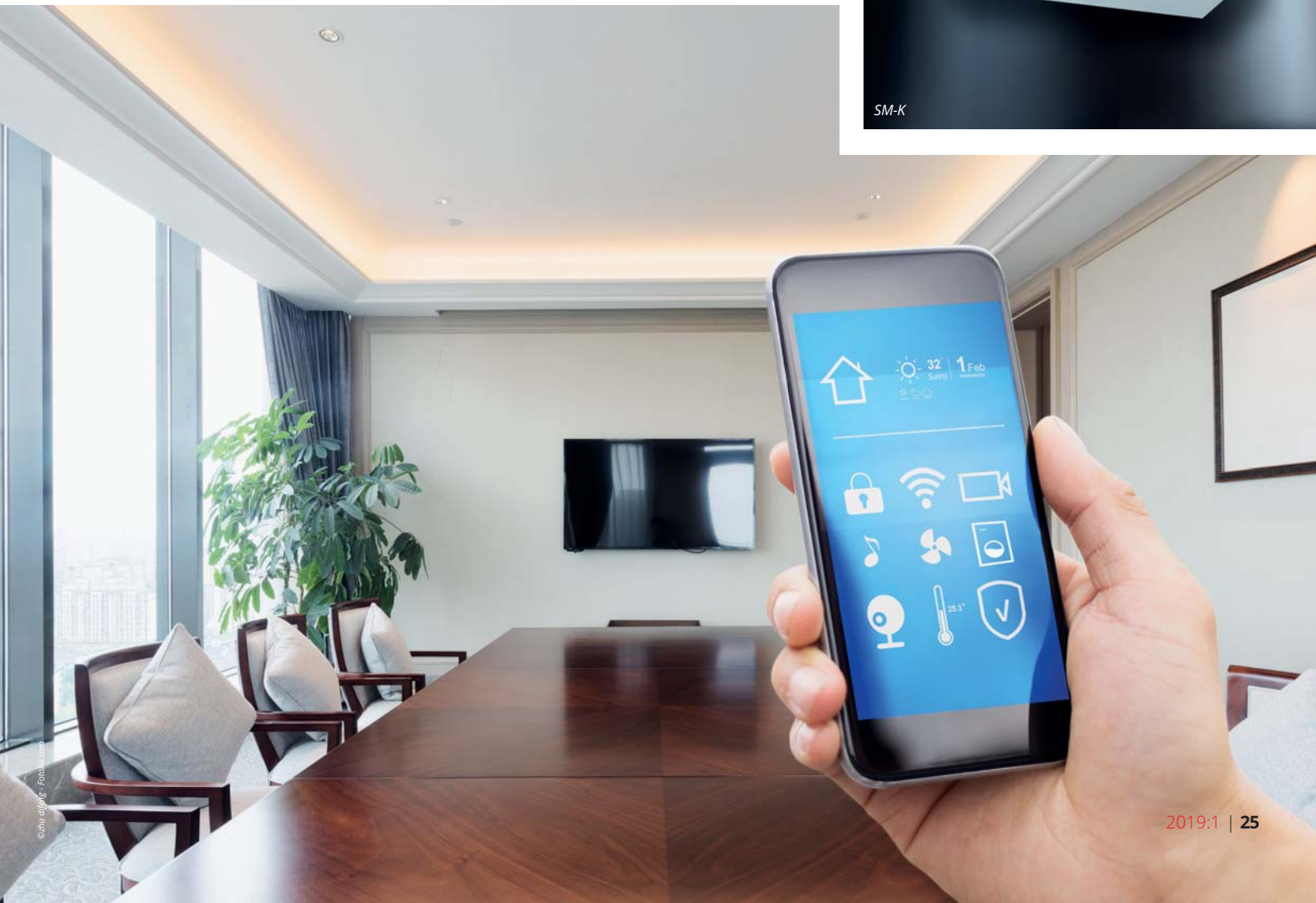
P02

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	SRDK	SM-K
Resistive Load	10A/12A, 277VAC	16A/20A, 277VAC
Incandescent Lamp	1500W, 220VAC	2000W, 230VAC
LED Light	400W, 220VAC	400W, 220VAC
Tungsten Lamp	5A, 277VAC	5A, 277VAC
Electronic Ballast	5A, 277VAC	12A, 277VAC
Motor Load	1/6HP, 120/240VAC	1.5HP, 250VAC
TV-Rating	TV-10	TV-8

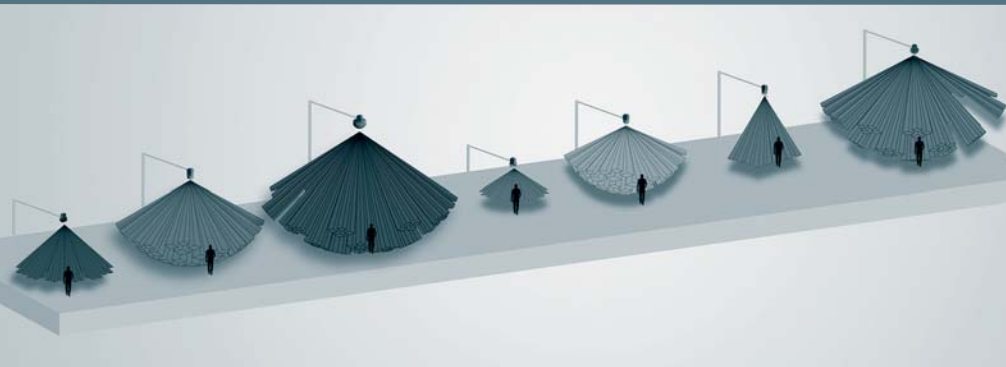


SM-K





PANASONIC's



The pyroelectric sensors complement the PaPIRs families: EKMC with a standby current consumption of 170µA and EKMB with 1µA, 2µA and 6µA, applicable for battery-free and battery-operated devices. The PaPIRs' »connect&detect« principle, the modular portfolio with different optics, wide range of sensor variations, and the extremely high PANASONIC quality standards ensure maximum design flexibility as well as optimal solution for each individual application, and a fast and reliable time to market.

PaPIRs – High Density Long Distance PIR Motion Sensor

PANASONIC's new passive infrared sensor convinces through the unbelievable small optic and a specified installation height up to 17m. A special lens design with an additional lip allows fast integration into IP-rated applications by using for example an o-ring construction.

The quad sensor based design with a very high detection zone density of 128 guarantees reliable response even at huge distances. The detection area is circular and symmetrical which simplifies sensor integration because of the independence of sensor orientation within the final product.

Features

- Detection distance up to 17m
- Detection area: at 12m ≈ 16m and at 17m ≈ 23.4m
- Lens diameter: min. 19.3mm
- Output: digital (open-drain output) and analogue (operational-amplifier output)
- Available lens colours: white, pearl white and black





PaPIRs – Slight Motion PIR Sensor

PANASONIC's latest passive infrared sensor called »Slight Motion Detection Type« impresses through a very small optic ($\varnothing 14,60\text{mm}$), a circular detection area of 7.60m at a typical installation height of 3m and 112 detection zones.

The sensor is very sensitive and designed to detect small movements.

The high number of detection zones guarantees a reliable activation because each individual switching zone can trigger the sensor.

Hence, PANASONIC's new motion sensor is the perfect component for small, unobtrusive and aesthetic lighting and HVAC products. Its outstanding design fits well into environments such as offices, meeting rooms, or waiting rooms, for example. Thanks to its very small optic and the thermal stability, the passive infrared sensor can easily be integrated into smart luminaires and smart LED bulbs.

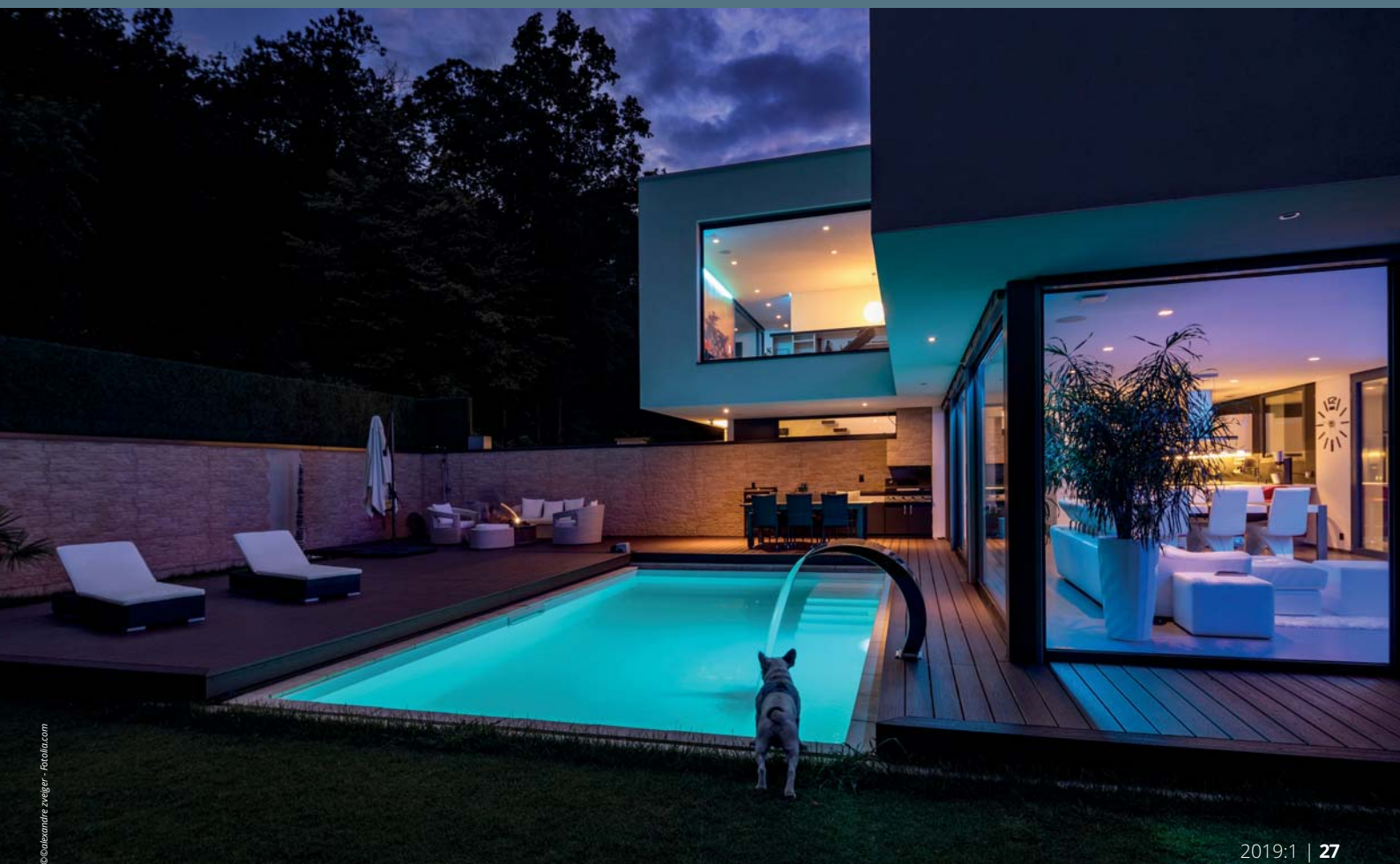
Features

- Detection area diameter of 7.60m at 3m
- Lens diameter of only 14.60mm
- Output: digital (open drain output) and analog (operational-amplifier output)
- Available lens colors: white, pearl white, and black

P03

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NEW PIR SENSORS





AEC-Q200

CERTIFIED FILM CAPACITORS

This X2-capacitor in THB-version offers a guaranteed high humidity resistance (THB test: 85°C, 85%, 240VAC, 1000 hours) and high thermal shock resistance (-40 up to 85°C, 1000 cycles). A flame-retardant plastic case and non-combustible resin are utilized leading to accreditation in accordance with UL/CSA and European safety regulation for class X2.

ECWFG Series

Power film cap ECWFG-series offers high humidity resistance (85°C, 85% RH, 500VDC, 1000 hours), high thermal shock resistance (-55 up to 85°C, 1000 cycles) and a high temperature load test (125°C, 450VDC, 1000 hours). Functioning as Power Factor Correction or smoothing capacitors, ECWFG-series is ideal for a broad spectrum of applications including DC/DC, DC/AC, AC/DC converter, input and output filtering, or snubber for industrial power supply, EV/PHEV charger and inverter applications for renewable energy. For more information, prices or samples please contact:

P04

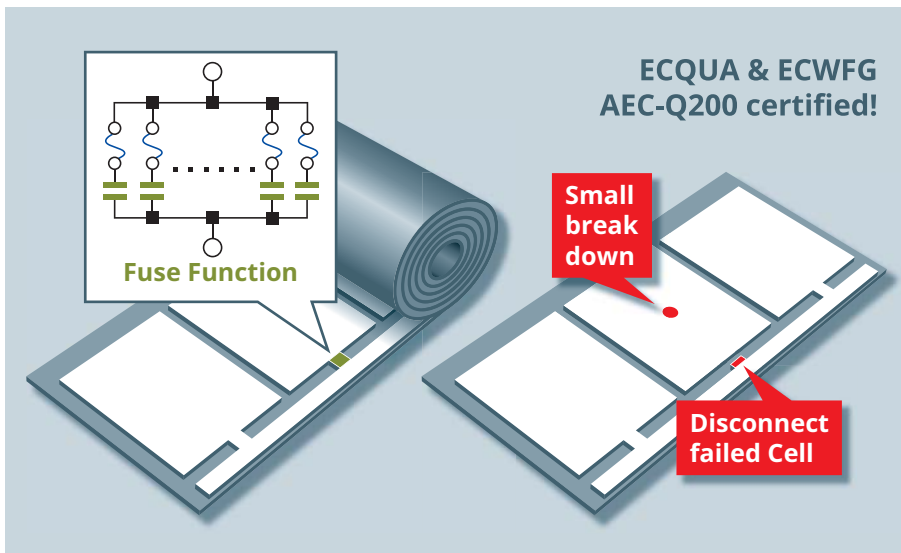
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	ECQUA	ECWFG
Operating Temperature Range	-40 to 110°C	-40 to 110°C
Rated Voltage	275VAC (extendable to 305 VAC for short periods)	630VDC
Capacitance Range	100nF to 4.7µF	1µF to 4.7µF



PANASONIC ECWFG

PANASONIC relies on its burgeoning film dielectric technology to create new products for on-board charging and powertrain electronics. They recently introduced AEC-Q200 certified metallized polypropylene film caps – ECQUA- and ECWFG-series.

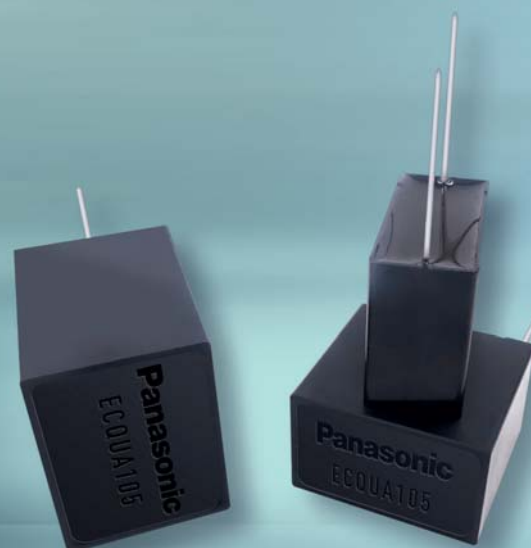


The original in-house patterned metallization process achieves a very stable capacitance level over the capacitor's lifetime and therefore guarantees a high reliability for the application. The patterns serve as a fuse mechanism function that prevents catastrophic short mode failure. A flame-retardant plastic case and non-combustible resin further reduce the risk of flammability.

ECQUA Series

Functioning as interference suppression capacitors, ECQUA series is ideal for a broad spectrum of applications including input/output filtering for charging stations or the input side of on-board chargers, industrial power supplies, the range of EV/PHEV applications and renewable energy infrastructure.

PANASONIC ECQUA





RUBYCON's new PSV series (135°C/4,000hrs) reaches the highest ripple current in the market!

RUBYCON launched the new PSV series, 135°C/3,000hrs, which has 1.5 times higher ripple current than today's PHV series with a very stable ESR over temperature.

RUBYCON offers its original hybrid capacitor technology based on the polymer materials combined with a proprietary functional gel (ARSII™). This structure has the big advantage to preserve a relative stable ESR over temperature, because this new mixture does not solidify at low temperature (unlike most electrolytic caps) and has a low rate of evaporation at high temperature. From such low and stable ESR, the rated ripple current will be higher compared to standard technology.

The PSV series is one of the leading products to show advantages of RUBYCON's hybrid technology. This capacitor fits perfectly for the automotive powertrain applications or motor controls where the space is a limiting factor.

In this case, PSV series will make a difference offering smaller size and reducing the number of capacitors inside the application.

Samples are available for PSV series, Mass Production started in April 2019.



Beside the new PSV, RUBYCON expanded its voltage range of all existing hybrid series. PEV series (105°C/10,000hrs) and PFV series (125°C/4,000hrs) were expanded up to 80V. PJV series (125°C/4,000hrs), PHV series (135°C/4,000hrs) and PLV series (150°C/1,000hrs) were expanded

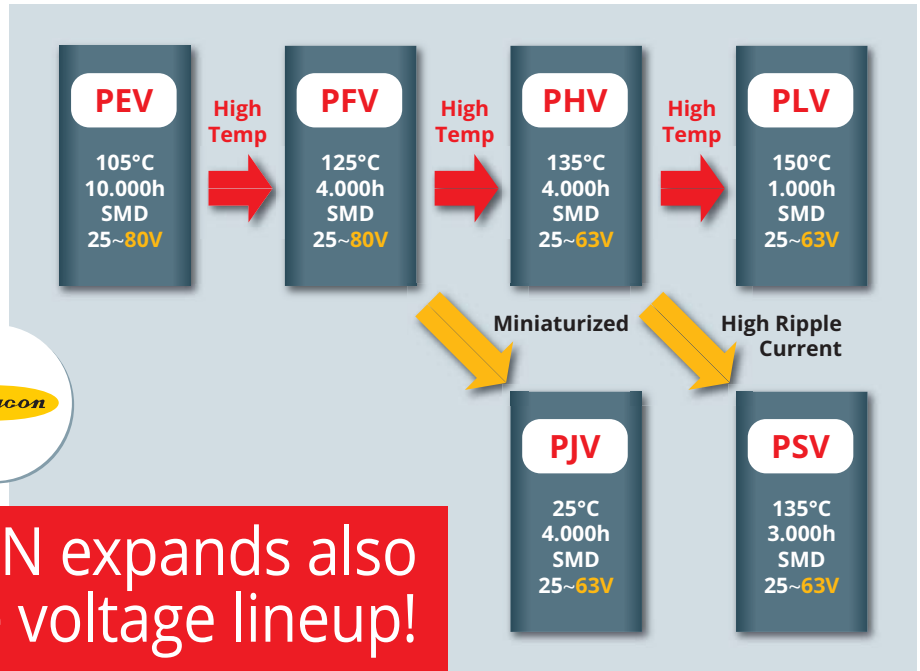
PSV

SMD Hybrid Polymer Cap with high lifetime under rough conditions / AEC-Q200 conform

Temperature Range	-55 to +135°C
Rated Voltage Range	25 to 63Vdc
Capacitance Range	33 to 330µF
Rated Ripple Current	1,650 to 3,000mA r.m.s./135°C
Product size (mm)	ø8×10.5 (L) to ø10×10.5 (L)
Lifetime @ 135°C	3,000h



RUBYCON expands also the voltage lineup!



to 63V. Currently, higher and higher voltage request is coming from automotive market. Beside autonomous drives and mild hybrid system, even more applications are using electronic control circuits. This trend will be hard to achieve with today's 12V power supply, which is not enough to cover many electronic applications. So now, the market is considering 48V power supply for future.

Hybrid capacitors are used in automotive market quite often because of higher temperature resistance with higher ripple current and small size. Hybrid capacitors with 25V are popular in 12V power supply while for 48V, the rated voltage of hybrid capacitors must be increased as well.

A further advantage of RUBYCON hybrid capacitors is the ESR at lower temperature. Normally capacitors show higher ESR increase in below 0°C. As RUBYCON's technology is different from others, RUBYCON hybrid capacitor has more stable ESR over the whole temperature range.

For your reference, please check our Impulse back number 01/2018 »Polymer Capacitor Hybrid Type«. As the new PSV series catalog specification states ESR also at -40°C (10kHz and 100kHz), RUBYCON has definite confidence in low ESR and higher ripple current capability of

their product. To run the car in the northern countries or cold areas, RUBYCON hybrid capacitors will be the most reliable capacitor to be used.

The hybrid capacitors are not only used in automotive market. From its small size and wide temperature range, it is suitable for electronic tools, communication and lighting application as well. Especially to use that application in outdoor, RUBYCON hybrid capacitors will sure provide you highest reliability.

All series conform AEC-Q200.

For more information, please feel free to contact:

P05

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	PEV	PFV	PJV	PHV	PLV
	105°C/10,000h	125°C/4,000h	125°C/4,000h	135°C/4,000h	150°C/4,000h
Temperature Range	-55 to +105°C	-55 to +125°C	-55 to +125°C	-55 to +135°C	-55 to +150°C
Rated Voltage	25 to 80Vdc	25 to 80Vdc	25 to 63Vdc	25 to 63Vdc	25 to 63Vdc
Capacitance Range	10µF to 330µF	10µF to 330µF	47µF to 470µF	33µF to 330µF	
Rated Ripple Current	1,000 to 2,500 mA r.m.s./105°C 100kHz	700 to 2,000mA r.m.s./125°C 100kHz	1,500 to 2,800mA r.m.s./125°C 100kHz	900 to 2,000mA r.m.s./135°C 100kHz	900 to 1,800mA r.m.s./150°C 100kHz
Product size (mm)	ø6.3×6.1 (L) to ø10×10.5 (L)	ø6.3×6.1 (L) to ø10×10.5 (L)	ø8×10.5 (L) to ø10×10.5 (L)	ø6.3×6.1 (L) to ø10×10.5 (L)	ø8×10.5 (L) to ø10×10.5 (L)

EDLCs FOR SMART METERING



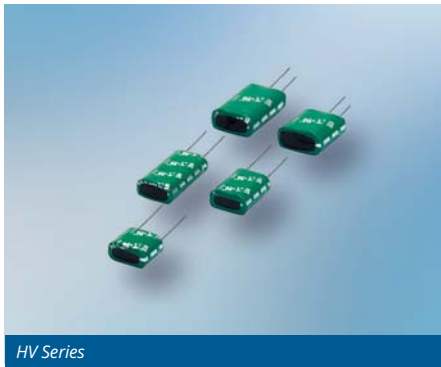
The rise in »smart« metering has ushered in a new era for utility companies. Smart meters enable gas, water and electricity utilities to monitor consumers' consumption more precisely, providing insight for technology and pricing decisions and empowering their customers to make informed choices in home energy use.

These digital meters also can inform a company of a power outage or remotely switch electricity services on or off. In times of power or equipment failure, supercapacitors provide enough backup power to »push« critical consumer usage data to utilities, potentially saving companies significant revenue. Making sure this technology is powered efficiently and reliability is critical, EATON supercaps play an important role in keeping the lights, gas and water on. HV- and TV-series are high-reliability, high-power,

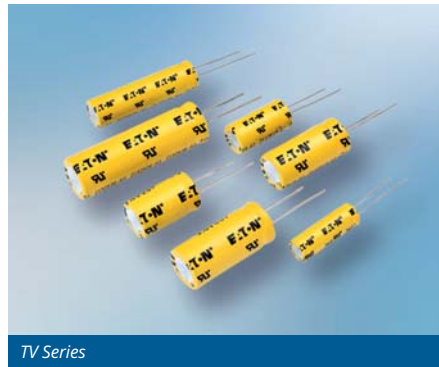
ultra-high capacitance energy storage devices that are ideal for smart metering. Utilizing electrochemical double layer capacitor (EDLC) construction, combined with proprietary materials and processes, allows EATON to offer a wide variety of capacitor solutions tailored to applications for backup power, pulse power and hybrid power systems. These supercapacitors can be applied as the sole energy storage or in combination with batteries to optimize cost, lifetime and run time.

The product lines feature an ultra-low ESR for high power density with environmentally friendly materials for a green power solution. Both series can withstand most indoor & outdoor environments with operating temperatures of -40°C to +85°C. Supercapacitors help reduce maintenance requirements and provide a long life and cost effective energy storage option.

Thanks to supercaps such as EATON's, today's utility companies and consumers are making smarter, more responsible and cost-saving decisions on energy usage. Most importantly, everyone benefits from consistent and reliable delivery of gas, water and electricity.



HV Series



TV Series



KR Series

HV-Series

EATON's HV family offers high power capability in compact package sizes. The high capacitance of 1F to 100F enables long-term power backup and high peak current capability. These supercapacitors offer an ultra-low ESR (levels as low as 12mΩ) that ensures minimal voltage drop during peak current demand, increasing the amount of power that can be delivered to the load. HV-series is configurable in series and parallel, increasing the voltage rating and energy storage capability.

TV-Series

EATON's 3-volt TV supercapacitors enable higher performance, longer operating life or lower cost designs for many industrial electronics. TV-series offers a 20 percent increase in stored energy and peak power density by increasing the operating voltage and lowering the ESR. As a result, the usable energy can increase up to 70 percent. The TV family provides energy storage for backup power,

ride through, RF radio transmissions and other pulse power requirements.

Supercaps for pulse applications

For battery powered devices, like gas and water meters, a supercapacitor can assist at large power peaks for frequent data transmission. Therefore, the lifetime of the battery for the continuous power requirement will be increased significantly.

Additionally an EDLC reacts much faster than a battery. Using a supercapacitor for the pulse power needed for regular data transmission reduces the size and cost of the DC/DC converter of electricity meters.

Supercaps as backup

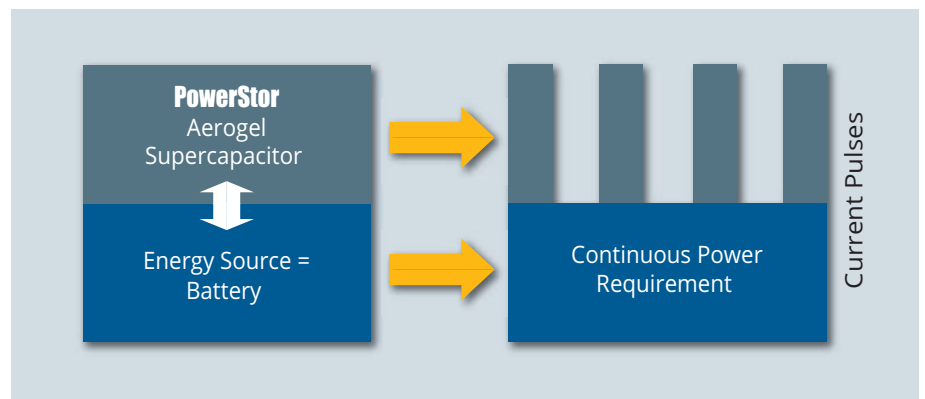
As RTC backup, for e.g. electricity meters, a supercapacitor with low leakage current is required. Typically coin cells, which are available in different styles (horizontal and vertical), are used. Anti tampering protection needs EDLC power as well to record the event once the mains power is disconnected, and for status and data transmission. In case of electricity shutdown in the area, a supercapacitor needs to provide energy to make a call to report the blackout event and safely shutdown the concentrator systems and save into memory.

EATON's product portfolio offers a wide selection of different versions of supercaps, including modules, for several applications.

For more information, prices or samples please contact

P06

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TALK TO ME

Crystal Solution for Automotive Power Line Communication



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KDS/Daishinku has developed CMOS TCXO DSB211SJA that fits to On-Board Chargers.

In our last Impulse 02/2018 Article »On Board Charger for AC Charging«, we focused on electronic components used in AC charging side of On Board Chargers (OBCs). Beside the power charging line, OBCs have also a communication line to exchange information between EV and the charging station about »which vehicle type is used, and what will be the most appropriate current« etc.

There are two charging standards right now for OBCs, CHAdeMO (Charge de Move) and COMBO (Combined charging system). Concerning communication standards, CHAdeMO is using CAN network while COMBO is using power line communication (PLC). In this article, we would like to focus on the 25MHz clock source with crystal components used in a COMBO/PLC network. For the PLC chipset, it's common to use 25MHz

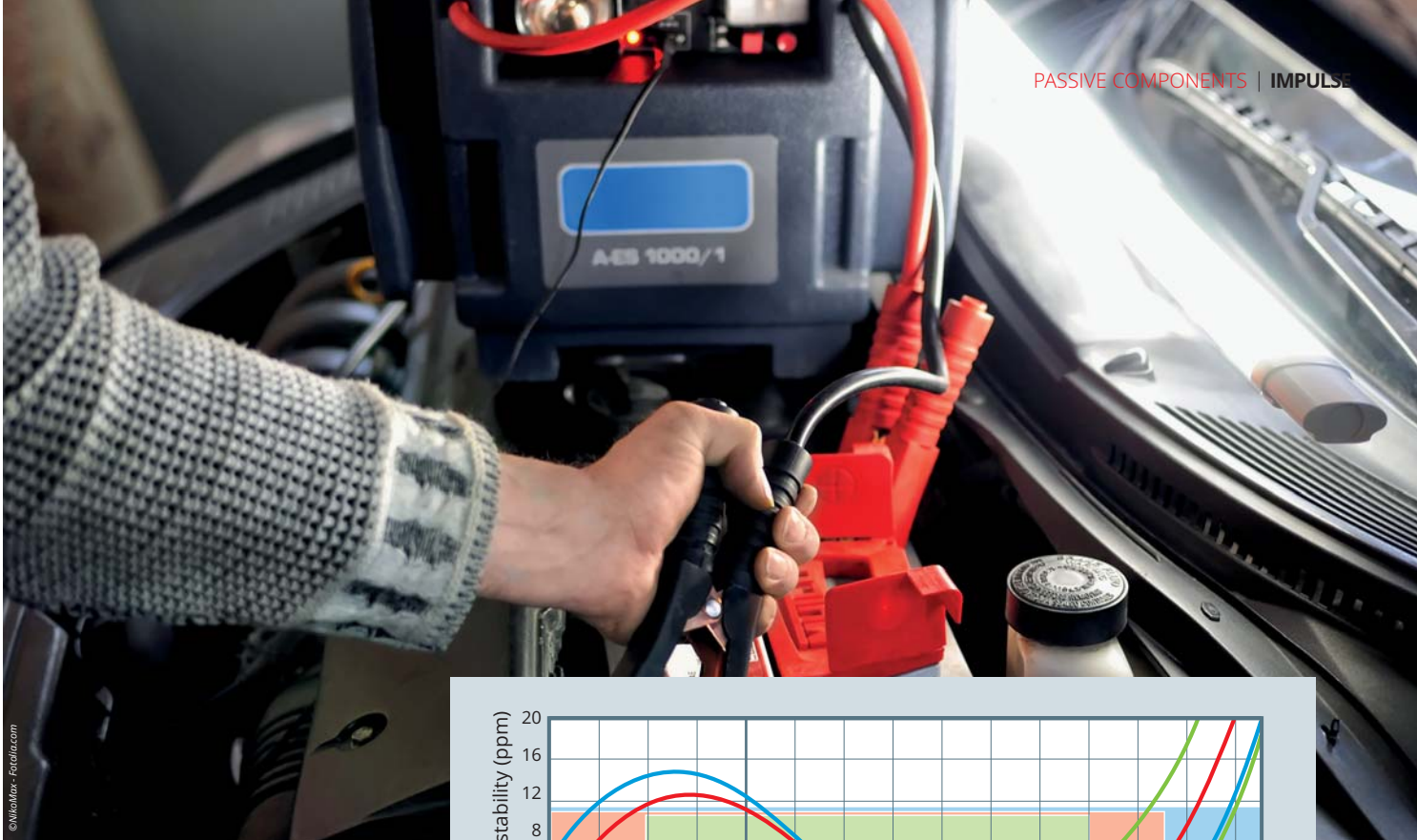
crystal as outside clock source. It requires $\pm 10\text{ppm}$ as initial tolerance at 25°C and $\pm 10\text{ppm}$ as temperature characteristic. The operating temperature condition of an usual PLC was 0 to $+70^\circ\text{C}$, and this condition had no problem for the crystal to keep an overall tolerance of $\pm 20\text{ppm}$.

Adopting this PLC to the automotive sector, a problem came to the regarding operating temperature range. It is necessary to expand the operating temperature range to -40 to $+85^\circ\text{C}$ or -40 to $+105^\circ\text{C}$. This creates difficulties for the crystal to maintain the same tolerance as under previous conditions, especially the temperature characteristic of $\pm 10\text{ppm}$.

This is due to AT-cut crystal temperature characteristics. Nowadays AT-cut crystals are used widely for MHz-clock because of its stableness

against temperature. The characteristic shows cubic curve from $+25^\circ\text{C}$ as center. However, the wider the temperature range expands, the higher is the design difficulty to create a stable curve. If the application can stay within the temperature range of -40 to $+85^\circ\text{C}$, the crystal unit still has a design possibility to reach an overall tolerance of $\pm 20\text{ppm}$ (or $\pm 25\text{ppm}$, which chipset suppliers also accept including aging tolerance). Nevertheless, it is difficult to keep the temperature characteristics within $\pm 10\text{ppm}$. Therefore the initial tolerance has to be reduced to ± 7 to



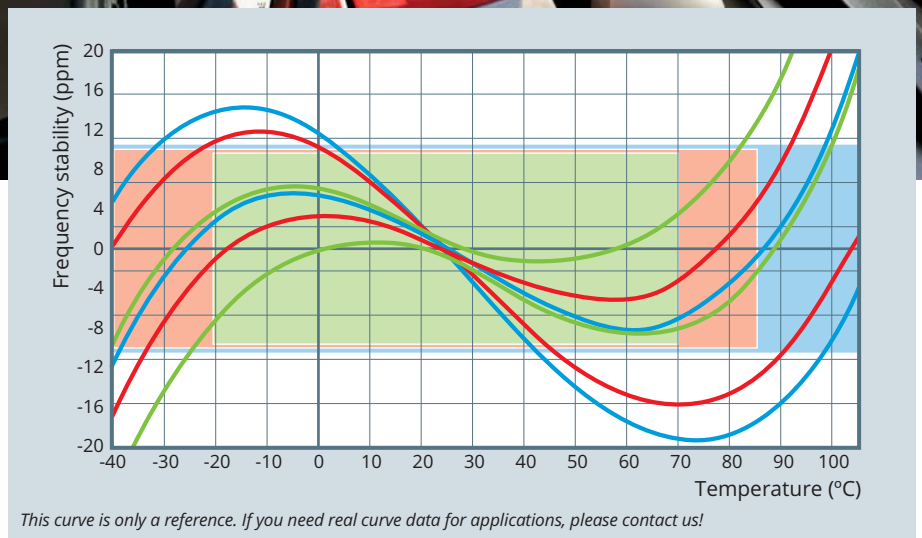


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8ppm with a lower yield rate to make tolerance space for better temperature characteristics. The major product DSX321G from KDS can reach the specification on paper, but please consider a price markup compared to standard specification due to the low yield rate.

What about the temperature range -40 to 105°C? Unfortunately, it is difficult to reach this with crystals. As the graph shows, the curve of -40 to 105°C as temperature characteristic will be totally out from ±20ppm. Even if the initial tolerance reduced to the limit, the overall tolerances will be more than ±25ppm.

A possible solution for an operating in the temperature range -40 to 105°C is to use TCXO which has a temperature compensate function to get a more stable tolerance over the temperature. TCXO's overall tolerance is less than ±10ppm.



However, TCXOs normally are designed for clipped sine wave output. For the chipset to work with the CMOS signal, it is necessary to implement a CMOS converter circuit after TCXO.

Another solution for an operating temperature range -40 to 105°C is the new DSB211SJA from KDS. Instead of an additional CMOS conversion circuit of a TCXO, DSB211SJA is a TCXO with CMOS output. Due to CMOS conversion, DSB211SJA

doesn't have very tight tolerance like ±0,5ppm which clipped sine wave TCXO has. Even though DSB211SJA has ±5,0ppm tolerance over the operating temperature range of -40 to 105°C, including other tolerances it will be less than ±20ppm which usual PLC requests.

Optionally, DSB211SJA is also available with an operating temperature range from -40 to +125°C with a ±20ppm tolerance. Even if the crystal location temperature can only stay at 125°C, which is required for the PLC chipset, it's still possible to maintain the PLC network connection. DSB 211SJA will be available from 2020. Samples are already available. So if you are looking for a clock source for your OBC communication, the use of the DSB 211SJA is a possible solution.

For more information, please feel free to contact:

	DSX321G	DSB211SJA
Size	3.2×2.5mm (max. height 0.9mm)	2.0×1.6mm (max. height 0.8mm)
Frequency	25MHz	25MHz
Operating Temperature Range	-40 to +85°C	-40 to +105°C
Overall Frequency Tolerance*	±23ppm	±7,5ppm
Storage Temperature Range	-40 to +125°C	-40 to +125°C
Supply Voltage	-	+1.8V to +3.3V
Output Signal	-	CMOS
Samples	Already available	April 2019
MP	Already available	Beginning of 2020

*Initial tolerance + Temperature Characteristic + Aging 1 year

P07

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PwrBlade®

The Connector Family celebrates over 20 Years of Excellence!

2018 marked the 20th anniversary of one of the most widely accepted and influential power connectors in the industry today, the PwrBlade® power connectors from AMPHENOL ICC. From its initial release, PwrBlade® was considered a game-changer for its high performance stamped and formed contacts. Since then, the PwrBlade® family has served as the de-facto standard in data centers and has expanded over 3 generations, which now features PwrBlade+®, PwrBlade ULTRA® and other key developments including cable assembly options.

New world technology has driven the advancement of the PwrBlade® family in areas such as; power density, ultra-low contact resistance, and overall design modularity. The family's latest addition, PwrBlade ULTRA®, offers customers a highly configurable power & signal connector, capable of carrying over 200A per linear inch while maintaining an ultra-low contact resistance of just 0.4mΩ!

The connector also features AMPHENOL ICC's proprietary GCS® plating technology which provides ultra-low resistance and increases overall efficiency. In addition, PwrBlade ULTRA® was

designed with an ultra-low profile height of just 9.6mm to reduce airflow impedance.

The PwrBlade® power distribution connector family from AICC includes power and signal contacts to provide power distribution and power control in a single connector. Options for either vertical or right-angle versions of PCB-mount headers and receptacles deliver support for coplanar, backplane or mezzanine connections.

The connectors are ideal for robust power connections to embedded AC/DC power supplies or for Board-to-Board connections in servers, sto-

rage enclosures and communications equipment. PwrBlade® connectors are available in wide variety of other configurations with either solder or pressfit board termination. The connectors can also be customized to address unique application requirements.

PwrBlade®

PwrBlade® connectors can be provided with one to 20 power contacts and zero to 148 signal contacts. Individual power contacts are rated at 48A current-carrying capacity; connector configurations with multiple power contacts are rated at 30A per power contact as tested for 30°C temperature rise in still air.

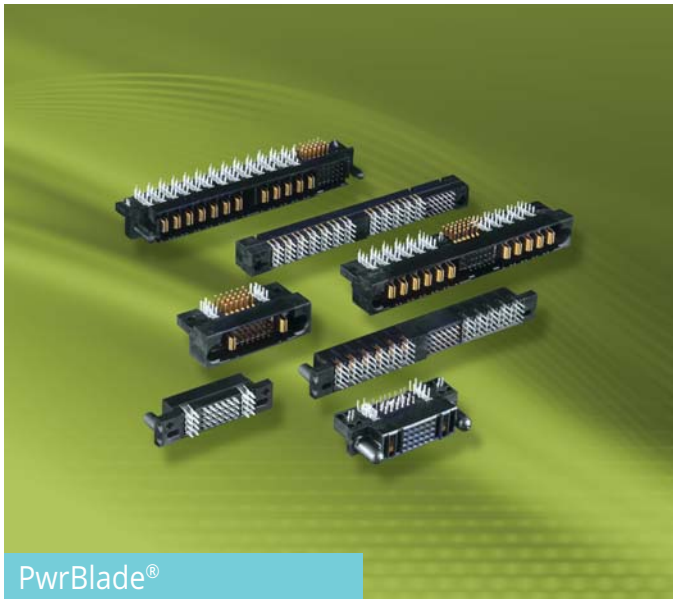
Capability for two levels of sequential mating for power contacts and two levels for signal contacts can support up to three levels of sequencing of power and signals. Sequential mating of ground, followed by power and signals can be used to provide »hot swap« capability. Molded guide posts on the header engage with the corresponding receptacle connector to assure alignment during blind-mating.

PwrBlade+®

The PwrBlade+® connector is a next generation AC/DC power distribution connector system for demanding applications requiring higher linear current density and low power loss. It is capable of 192A/linear inch with eight adjacent high power contacts energized simultaneously and 0.7m power contact resistance after environmental exposure.

The PwrBlade+® connector builds on the PwrBlade® connector's proven technology but includes enhancements to achieve increased performance and density. It is rated up to 75A per power contact without exceeding a 30°C temperature rise in still air. This product features an innovative high power contact design and housing that allows higher current carrying capability in a more compact package.

The high power contact features an optimized beam design and material property enhancements that significantly increase linear current density making it ideal for next generation 1U/2U servers, storage enclosures, telecommunications equipment and datacom/networking equipment.



PwrBlade®

The PwrBlade+® connector also features a highly vented housing design, a low power contact option for applications with multiple voltages and lower power requirements and half-bullet guides for a reduced connector footprint.

The PwrBlade+® connector is available with power and signal contacts integrated into a single molded housing for power distribution and power control. Similar to other AMPHENOL ICC power solutions, it is modularly tooled making the product highly configurable in terms of the number and placement of the power and signal contacts for custom power needs. Right angle and co-planar options are available to accommodate various system architectures.



PwrBlade+®

PwrBlade ULTRA®

The PwrBlade ULTRA® connector is the newest addition to the PwrBlade® product line. This new design offers an overall height reduction of 24% to reduce airflow impedance in high density power supplies. Three contact choices are available; High Power (up to 75A/contact), Low Power (up to 45A/contact), and Signal.

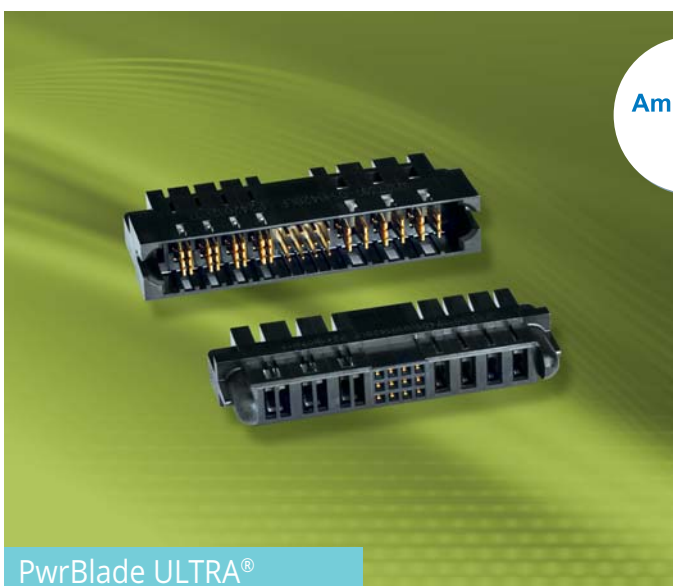
Ultra-high conductivity materials and new highly conductive plating, combine to produce an ultra-low resistance of just 0.4mΩ at end-of-life conditions. The result is the lowest profile power distribution connector capable of delivering more than 200 Amps per linear inch.

PwrBlade+® Cable Connector

PwrBlade+® cable connectors offer flexibility to meet a wide variety of customer needs. The connectors come in both Cable-to-Cable and Cable-to-Board solutions. The available wire range is 10AWG-6AWG for high power, 16AWG-12AWG for low power, and 26AWG-22AWG for signal allowing users to select the appropriate connector to meet their application needs. The PwrBlade+® cable is designed to operate between -40 and +125°C. It provides a flexible, low cost solution in applications such as telecommunication switches, high-end servers, and hot swappable power supplies.

S01

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PwrBlade ULTRA®

Amphenol
ICC



PwrBlade+® Cable Connector

FOR AUTOMOTIVE APPLICATIONS

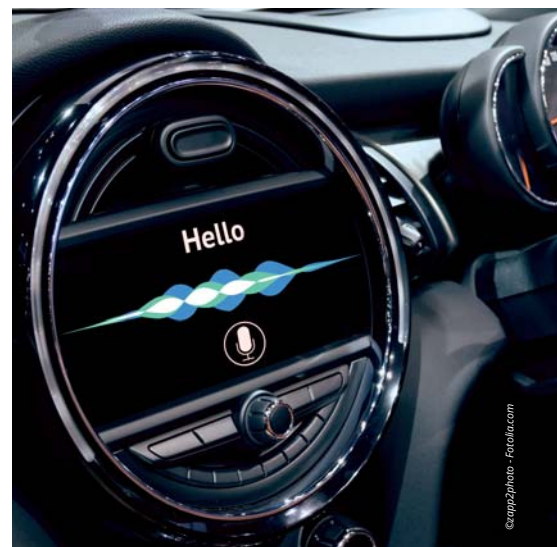
Minitek MicroSpace™



Minitek MicroSpace™ 1.27mm, 8 positions, staggered type, top latch with optional CPA



Minitek MicroSpace™ 1.5/1.8mm, 2 positions, top latch



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Crimp-to-Wire-Connector Platform



Compact, robust and versatile connector system!

Minitek MicroSpace™ Crimp-to-Wire connector platform's unique design enables LV214 Severity-2 and performs at 1.8, 1.5 and 1.27mm pitch. AMPHENOL ICC's Minitek MicroSpace™ will be available in single and double row versions, with top and side latch configuration. The right choice when high vibration endurance, primary latch, TPA, CPA, Poka Yoke, Kojiri safe are required with flexible configurations.

The Minitek MicroSpace™ Crimp-to-Wire's compact design addresses the growing demand for miniaturizing components. The connector is capable of reducing the PCB footprint by 50% due to the increase in signal density.

The connector is rated up to 100 mating cycles on Gold/GXT® contacts and enables current rating up to 4A per contact. LV214 Severity-2 com-

patibility makes this crimp-to-wire connector especially suitable for automotive applications. Moreover, this vibration-tolerant product is marked by its high connector locking strength of more than 75N.

- LV214 Severity-2 compatible
- Operating Temperature: -40 to +130°C
- Keying to prevent visual mismatching
- Primary and secondary contact retention

FEATURES	BENEFITS
Design based on existing and proven design controls	Suitable for harsh environments
Existing crimp section and automated crimp tooling up to 22AWG	No specific industrial tools required
4N normal force for vibration and >75N connector locking strength	High vibration and locking resistance
Poka-Yoke polarization	Visual mismatching prevention system
Terminal Positioning Assurance (TPA)	Ensures proper terminal insertion and retention
Current rating up to 4A per contact	Meets higher power performance requirements
Connector Positioning Assurance (CPA)	Assures that connectors are properly mated and locked together

Configurations

- Latch Position: top or side
- Single row: 2 to 15 Positions
- SR staggered: 2 to 16 Positions
- Double row: 4 to 30 Positions
- Header soldering options: SMD & Pin-in-Paste (PiP)
- Wire-to-Wire configuration: available

502

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MORE POWER

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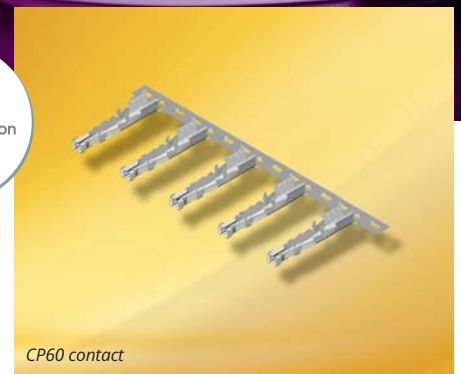
CVILUX has introduced the CP60-series to meet the increased demand for high powered Wire-to-Board connectors.

This new system with 5.70mm pitch is available in 2 to 12 circuits in a dual row design. The connector range consists of headers, sockets and crimp contacts that have the capacity to handle up to 23A current rating.

The PCB-headers are available in straight and right angled version in LCP with flammability rating of UL94V-0. In order to provide strong mechanical bonds this power connector system is equipped with through-hole-technology. Molded mounting pegs on the side of the header will assure that the solder leads are properly position-

ed on the PCB to prevent damage of printed circuitry while connect and disconnect.

The connector housing design features a positive polarization to prevent mismatching. Furthermore the Board-to-Wire connector utilises a latching lock system that allows higher cable pull retention force. The locking tab is useful in high vibration assembly operations and provides consistent and secure mating. The connector locking can withstand 68N force. The power connection system can be applied with 23A (amps) maximum current rating and 600V AC when using AWG12 cable



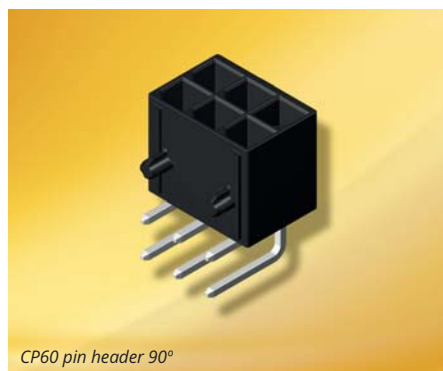
CP60 contact

size. It can withstand a dielectric voltage of 2200V AC for one minute.

This system is popular using in home appliance, power supply units as well as in the automotive industry.

S03

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CP60 pin header 90°



CP60 pin header 180°



CP60 crimp contact

The perfect match for industrial automation applications such as inverters, servers, controllers and drivers!

HANDLING
ASSEMBLY
AVAILABILITY

FAST,
FASTER,
PUSH-IN



0156 THR header

0156/0159 Series

The 0156 and 0159 series from DINKLE are inter-mate and inter-changeable with all well-known manufacturers and impress with their compact design as well as technical details.

The Push-In design adopts specially designed spring technology, which allows fast and easy wiring without the need of any tooling. The structure is rigid, durable and heads moderate force to release the wire with a screwdriver.

Special highlights for both series are high-temperature resistant THR versions with 2.6mm pin length, as well as a big variety of locking flanges for additional inter-locking strength.

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 include screw flange, locking lever and snap-in latches
- THR socket available with a pin length of 2.6mm
- Inter-mate and inter-changeable with all well-known manufacturers

	0156	0159	0225
Pitch	2.54; 3.50mm	3.50mm	3.50; 5; 5.08mm
Rated Voltage Current [UL]	150V/5A, 150V/8A	150V/8A	300V/8A
Rated Voltage Current [IEC]	320V/6A, 320V/10A	250V/8A	320V/14A, 630V/17.5A
Wire Cross-Section [AWG]	30~16	24~16	28~12
Number of Positions	4-44P	4-40P	2-40P



0159 with locking lever

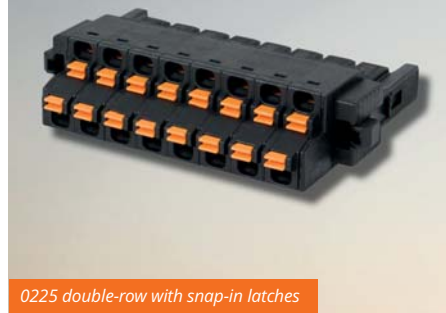


0159 THR header



0156 with screw flange

DF51K-SERIES



0225 double-row with snap-in latches

0225 Series

The 0225 series from DINKLE is available for single and double level connections to meet high density wiring requirements. Due to the compact size and low height (7.50mm for single-row and 12mm for double-row version) this terminal block connectors help saving space in industrial automation applications.

The patented »S-cage« combines the spring and wire cage feature in a one-piece structure, which offers more reliable and secure connection without the need of any tooling. For an excellent resistance to vibration this series offers a big variety of locking flanges like screw flange, locking lever and snap-in latches.

Highlights

- Two rows for connecting conductors with a 1.5mm² diameter and 12mm height
- Pitches in 3.5, 5.00 and 5.08mm in 300V and 8A are suitable for most industrial applications
- THR socket available with a pin length of 2.6mm
- Adopts the patented S-cage structure for a reliable and quick connection
- Insulation material meets UL94-V0 standards and product design is compliant with UL1059 standards
- A variety of locking flanges are available for additional inter-locking strength

S04

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0225 double row PCB header



HIROSE Electric Co. Ltd, a world-class manufacturer in connectors, introduced the DF51K series of robust Wire-to-Board connectors for applications requiring more strength and durability. A wide range of applications are suitable such as industrial machinery, medical devices, smart meters, industrial robots, and many others.

DF51K connectors feature a center lock design that allows the connectors to be placed side-by-side to save space on the board. The mating operation is user-friendly and a clear tactile click confirms secure engagement and a reliable connection.

The DF51K series is part of the SignalBee product family. SignalBee consists of compact and high performance Wire-to-Board and Wire-to-Wire connectors that are designed for the requirements of industrial applications.

Highlights

- Number of contacts:
 - 1 row: 2-6, 2 rows: 4-30
- Contact pitch: 2mm
- Current rating: 2A (max)
- Voltage rating: AC/DC 250V
- Temperature: -55 to +105°C
- Cable size: AWG 22-30
- Accepts resin sealing
- UL/C-UL Certified

S05

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These connectors feature a strong contact lance strength which increases the contact retention in the housing and prevents the contacts from pulling loose if the cables are wrenched.

Furthermore DF51K is polarized through the use of guide keys to prevent incorrect mating. DF51K offers many variations for design flexibility. Single or double row versions are available in a straight or right angle housing with the option of gold or tin plating.

ULTRA LOW



HIROSE expands its card connector portfolio in Europe with the successful KP-series for micro SIM and nano SIM cards. The extremely slim and small design follows the market trend of size reduction of devices.

Due to the two-contact and embossed terminal design, the card connectors offer a superior contact reliability for various applications. The KP-series is available with Push-Pull design as well as an user friendly Push-Push mechanism.

A card detection switch is delivered in open or closed condition, depending on the series. All card readers of the KP-series are equipped with a reversed card insertion protection. When the card is being inserted in reverse, a stopper prevents it from full insertion. Following series of KP-card connectors are now also available for customers in Europe.

KP10: Micro SIM Card Connector

FEATURES

- Reduction of mounting space by low profile
- Reverse Card insertion protection
- Contact deformation prevention design
- Card detecting switch (normally open)

SPECIFICATIONS

- Recommended Card Type: SIM
- Mounting Style: SMT
- Connector Height: 1.18, 1.25mm
- Eject Mechanism: Push-Pull, Push-Push
- Mating/Unmating Cycles: 5000

KP13: Nano SIM Card Connector

FEATURES

- Wide variations covering Push-Push, Push-Pull, Tray type
- Card fly-out prevention for Push-Push type
- Designed to release card from the rear of the socket (Push-Pull, Tray type)
- Easy inspection with exposed contact design

SPECIFICATIONS

- Recommended Card Type: nano SIM
- Mounting Style: SMT
- Connector Height: 1.12, 1.18, 1.45mm
- Eject Mechanism: Push-Pull, Push-Push, Tray type
- Mating/Unmating Cycles: 3000, 5000

Beside the new SIM connectors, CODICO offers the well-established SD and Micro SD™ card connector series DM1 & DM3 from HIROSE.

S06

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DM1: SD™ Card Connector

FEATURES

- Withstands higher force of card insertion
- No damage to the card when accidentally pulled-out
- Accidental card fall-out prevention
- Reliable card insertion and withdrawal
- Designed to accept Secure Digital I/O card (Built-in Ground Contact)

SPECIFICATIONS

- Recommended Card Type: SD
- Mounting Style: SMT
- Connector Height: 2.9mm
- Eject Mechanism: Push-Push
- Mating/Unmating Cycles: 10000

DM3: Micro SD™ Card Connector

FEATURES

- Extremely small size
- Reverse card insertion protection
- Effective ground and shield configuration
- Rigid and strong construction
- Card detection switch (normally open)

SPECIFICATIONS

- Recommended Card Type: Micro SD™
- Mounting Style: SMT
- Connector Height: 1.68, 1.83mm
- Eject Mechanism: Push-Push, Hinge
- Mating/Unmating Cycles: 5000, 10000

KP15: Micro SD™ Nano SIM Combo Card

FEATURES

- Wide variations covering 3in2 Tray and Stacking Combo type produces a space saving design
- User friendly card removal design with top and bottom slot (Stacking type)
- Easy to remove tray with eject pin (Tray type)

SPECIFICATIONS

- Recommended Card Type: Combo (Micro SD™/nano SIM)
- Mounting Style: SMT
- Connector Height: 1.37, 2mm
- Eject Mechanism: Push-Pull, Tray type
- Mating/Unmating Cycles: 3000, 10000

DF62



HRS HIROSE
ELECTRIC
EUROPE BV.

HIROSE's small Slim In-Line, Wire-to-Wire Connectors

HIROSE has introduced the DF62 series with a simplified, slim design for applications needing Wire-to-Wire connections inside small and narrow spaces as well as for space-constrained applications.

The connector housings are low profile. The mated dimensions of the plug and socket are only 18.6mm length and the height and width are under 10mm. The connector outline is contoured to prevent it from being trapped in a small area during the wiring process.

Offering an ease of operation, this connector features a simple center latch that provides a secured locking. The positive lock gives a tactile click during mating and an audible click to confirm correct engagement. The lock strength is an impressive 50N despite its small size. The latch is also protected by tapered side guards that prevent entanglement in the harness and accidental unmating. The visible lock structure has a slot to allow a visual check of complete mating.

Highly reliable crimp contacts are utilised to provide strong resistance against rough operation and vibration. The box shape contact head of the female contact works as a mating guide to align

the male contact, enabling smooth mating and the prevention of contact buckling.

Furthermore the crimp contact has two special contact points that protrude slightly to follow the surface of the male contact during the mating process giving a more ruggedized connection. The lance area of the crimp contact is reinforced to prevent the cable being pulled out. The lance strength is 25N/pin using AWG28 cable.

In order to provide water resistant in-line connectors too, HIROSE expanded this series with the waterproof (IP67) type DF62W. This can be used in environments that requires water resistance and small size.

The water resistant feature is accomplished utilizing a wire seal and housing seal that are pre-assembled in the housing. The crimped contacts and wire are easily inserted through the seals to complete the cable assembly.



Features

- Number of Positions: 2-7, 13, 24 and 2-4, 6, 9 for waterproof version
- Current rating: 4A (max)
- Pitch: 2x2.2mm
- Cable Size: AWG22 to AWG30
- Operating Temperature: -40 to +105°C
- 30 mating cycle

The DF62W design features don't expose metal components, reducing the possibility of shock.

Ideal applications are robots, portable medical devices, LED lighting, servo amplifiers, gaming equipment and home appliances.

S07

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FLEXIBLE CONNECTION



With individual bridging lengths!

The PANTA[®] SMD R Jumpers from SUMIDA are flexible board connections with individual bridging lengths between 20-40mm. This jumper is a flexible solution for various assembly configurations on electronic PCB assemblies and allows a variety of possible applications e.g. Automotive. The SMD connection can be bended up to 180°C after the soldering process.

The SMD jumpers are economic alternatives compared to e.g. milled and rigid-flexible PCB's and are higher in flexibility and resistance against breakage.

As flexible connecting element for surface connection (Surface Mount Technology, SMT) the SMD-Jumpers are very compact in size and allow the production of smaller and more cost effective electronic devices. Also they can be placed on both sides of the printed circuit boards (PCBs). The components can be automatically placed with standard equipment and due to their

high temperature resistance they can be reflow soldered. An additional assembly and soldering process is not necessary.

The PANTA[®] SMD R combine advantages of SMD Jumper with individual insulation length of PANTA[®] FIX Jumper. Solid round conductors ensure a fast and safe assembly. The PANTA[®] round-flat-round technology combines both. The copper conductors are rolled flat to a defined geometry in the insulation area. Ensuring the highest standards of vibration and bending resistance. The smooth notch-free transition from round to

Features

- Pitch: 1, 1.25, 1.27mm
- Number of Pins: 4 to 16
- Bridging length: 20-40mm (pad to pad)
- Insulation material Nomex[®]
- Operating temperature -40 to +125°C
- Current rating 1A@20°C (according DIN EN 60512-5-2)
- Tape & Reel Packaging
- Insulation resistance 1010Ω
- Conductor material Cu-ETP (E-Cu); min 1.5µm Sn plated
- Wire size AWG 28 (0,32mm)
- Recommended Reflow Profile DIN EN 61760
- Voltage rating (VDC): 200V
- Dielectric strength (VDC): 700V

flat guarantees fracture-safe connection point. This results in a reduction of the bending stress in the connection area and move occurring bending forces in the flexible area.

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Y-Circ®-P now available
in a waterproof version

WATERPROOF

YAMAICHI Electronic expands the push-pull connector series Y-Circ®-P with the IP68-compliant waterproof T-series as a part of the Y-Circ®-P circular push-pull connector family.

The waterproof T-series is based on the technology of the Y-Circ®-P product family from YAMAICHI, which can be connected to existing circular push-pull connectors on the market. With the miniaturization in the development focus it offers many new advantages. The T-series also features an one-piece collet for error-free installation and an optimised mechanism for reliable locking. This provides for higher mating cycles and, thanks to the special pin assignment for high-speed data transmission, the interference-free transmission of signals up to 10 Gbps.

Miniaturisation reduces cost, space requirements and installation effort

The new jack is housed in the same reduced installation space as the basic compact jack of the existing B-series, together with contact carrier

and housing coding. The IP68 sealing not only has similar dimensions, but it also integrates the entire locking mechanism and ensures the reuse of the B-series insulators.

One-piece collet allows for error-free installation

With the optimised cable sealing, the installation of the new waterproof connector is more robust, faster and less risky. Compared with the commercially available connectors (with up to three parts) the sealing of the cable has been reduced to one single sealing collet. This simplifies the installation and minimizes the risk of damage to the sealing.

Optimised mechanical system ensures reliable locking

The new design of the T-series also includes the optimised locking system. The standard three or more ratchet hooks which provide support during installation have been reduced to two pieces and significantly extended, thanks to which high mating cycles can be achieved. The longer hooks provide the same coding as with the B-series.

Production in Germany

To ensure fast and flexible production the new waterproof Y-Circ®-P T-series is also produced by YAMAICHI Electronics in Germany. In-house production provides high production depth and extensive experience in connector production and cable assembly.

Availability & portfolio

For the time being, the versions of the T-series in size 09 are immediately available as cable connectors and cable sockets and as PCB sockets in various versions. Other sizes are in preparation.

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INDUSTRIAL CONNECTION SYSTEMS

Take a benefit from SOURIAU's expertise and portfolio!



Industrial applications like welding & metal cutting require precision controls to guarantee performance, reliability and safety for higher productivity and improved quality in difficult conditions. From manual to automated welding throughout plasma cutting and fume extraction, rapid set up and easy, quick servicing are a must.

Interface connectors supposed to be designed for user-friendly operation allowing an easy, quick and secure connection. Therefore an ergonomic design granting daily trustworthy operation for any machine equipment is one of the crucial factors in choosing a proper connector. SOURIAU has a long-lasting experience in deve-

loping and manufacturing standardized and customized interface connections for industrial equipment.

CIRCULAR CONNECTORS with 1/3 bayonet coupling system:

851 Series

The 851 series is fully qualified according the MIL-DTL-26482H standard and was originally designed for the aeronautical and military market.

With new surface materials and platings the connectors are RoHS compliant and fully accepted in industrial applications with harsh environmental conditions due to the high number of mating cycles (500 cycles) and corrosion resistance (500h salt spray).

The sturdy design is compatible with a wide range of standard backshells & strain reliefs for combination with conduits.

An audible click ensures a quick and proper mating through a 1/3 bayonet coupling system. This feature eliminates uncertain connections and reduces time as well as labor during installation.

851 connectors offer a large range of layouts combining power supply and signal transmission in a unique solution to reduce system complexity and minimize component/installation costs.



Series 851



Series 851



Trim Trio Series, UTS/Plastic



Trim Trio Series, UTO/Metal

Trim Trio Series

The Trim Trio connectors line is based on a unique feature of contacts which can be used in several connector shapes and a wide range of contact layouts. This trio of contacts (machined, stamped & formed, high speed) can be used in a wide range of connectors from plastic to metal shells, from bayonet to push-pull coupling mechanisms, from rectangular to circular connector shells. Using the same contact technology and based on the same design with a 1/3 bayonet coupling, the UTS series (full plastic, waterproof IP68 connector), the UTG series (metal/plastic



Trim Trio Series, UTG/Plastic+Metal

connector for heavy use) and UTO series (metal IP68 connector for intensive use) are interchangeable and intermatable giving you the flexibility to switch from a series to another to address new requirements without an important impact on your equipment and on your production lines. Your product upgrade is easier, faster and without additional costs!

CIRCULAR CONNECTORS with Push-Pull coupling system:

UTL Series

Trim Trio also includes the UTL series (UL/IEC Power+Control), a plastic push-pull connector designed to comply with all modern safety standards of industrial markets with blind mateable option. It is suitable for outdoor industrial applications thanks to a high sealing performance (IP68/IP69K) and an extreme UV resistance with F1 material per UL746C.

Designed and qualified according to the UL1977 and IEC61984 standards, the UTL connector series offers a 5VA flammability rating, hot wire, and current breaking capacity to meet all standards of industrial equipment. The UTL series is highly suitable to be qualified IEC power connectors on your equipment, making it easier and faster to pass certifications yourself.



UTL Series



JMX Series

JMX Series

The waterproof and extreme high temperature resistance characteristics of the JMX series makes it ideal for a diversity of Industrial applications requiring a lightweight, yet durable harsh environment interconnect solution i. e. Instrumentation and Measurement.

This plastic Push-Pull connector offers up to 5,000 mating cycles without any impact on performance. It is designed to withstand dust and corrosive atmospheres while still maintaining mechanical and electrical functionality.

No matter which connector series turns out to be the perfect match for your application, in addition to this we provide overmolded cable assemblies to offer a turnkey solution for a quick, reliable and secured installation especially in harsh environments. Our engineers are here to support you also on those customized solutions.

S10

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KNOWLEDGE MANAGEMENT

An investment in knowledge pays the best interest.

Benjamin Franklin

Benjamin Franklin's quote on the topic of knowledge management is right on the money. In order to sustainably improve the quality of our processes and, consequently, the quality of our services, it is essentially important for CODICO to determine knowledge, to look at available knowledge, and to obtain, communicate, and maintain knowledge.

Due to the rising complexity of corporate processes, knowledge is increasingly becoming a strategic resource for the continued existence of the company. Knowledge management in itself is morphing into an interface between people, organisation, and technology.

The »new« ISO 9001:2015 standard also explicitly requires organisations to capture and preserve knowledge.

How does CODICO practice knowledge management?

The greatest challenge seems to be to determine knowledge. Based on our corporate strategy and our objectives, we also ask ourselves the following questions: »Do we have the necessary knowledge to implement the strategy and achieve the objectives? Which knowledge, which skills

of the company and of each individual employee are necessary to this end? Now and in the future? Is the available knowledge sufficient? Are measures necessary to acquire knowledge?« Once the requirements are clearly defined, CODICO offers a multitude of possibilities. Employees can attend training, seminars and lessons-learned workshops, or obtain consulting from internal or external sources. New staff, in particular, will undergo a bespoke training and mentoring programme.

In addition, CODICO organises a CODICO ACADEMY WEEK several times a year for national and international staff. At these events, our suppliers directly present the latest developments on the market. In addition, the Academy Week provides room for an intensive exchange of experiences between our specialists.

Well-trained & motivated employees are a key success factor for CODICO!

An additional challenge is preserving knowledge. To live up to this particular challenge, our employees actively contribute to the creation of and maintenance of process descriptions, working instructions, check lists, and the CODICO Infobase.

What are the plans for the future?

To allow CODICO to continue expanding its extensive wealth of knowledge in the future, the company is currently working on further programmes, such as the introduction of a document management system and the expansion and availability of digital content. For additional information, please contact:

D03

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WE TAKE IT SERIOUSLY!

The new GDPR at CODICO

The new GDPR has been in force throughout the EU since May 2018. Many had predicted horror scenarios and a tsunami of warning letters. Now, almost a year later, it's time to take stock. The following is an interview with our data protection officer Marlene Giesinger.

What has really changed for our customers with the introduction of the GDPR?

In reality, the tighter legal framework introduced by the GDPR did not result in any major changes for our business partners. Although the implementation of the EU GDPR 2018 was a complex organisational and administrative undertaking for CODICO – as for all companies dealing in earnest with the topic – CODICO had already taken the essential issue – i.e. the protection of personal data – seriously in the previous years. The handling of customer data requires particular care, and we feel obliged to live up to this task.

How was the implementation in practice? Can you name a few milestones?

A CODICO project team was already created in 2017, consisting of employees from various departments, which dealt with the topic of the EU GDPR and defined common approaches. In collaboration with various external partners, the team examined the technical and legal aspects and developed the necessary action plans.

This led to the introduction of specific measures such as, for instance, the necessary procedure index, working instructions, or the inclusion of the issue »data protection« in the training schedule. There was also a review of agreements with service providers to render them GDPR-compliant.

The adjustment to new legal requirements, the introduction of new roles and processes, and calculation do not represent major hurdles. It is mostly the legal ambiguities around the EU GDPR that cause uncertainty among many people.

What were the biggest challenges for implementation?

Above all the legal interpretation and the implementation of deletion periods posed a challenge, but they were necessary. One of the success factors in implementation was definitely the committed and professional collaboration between all members of the CODICO project team. Moreover, the fact that our CODICO management supports all the necessary measures aimed at compliance with the required rights and obligations for the protection of data provides us with the indispensable backing.

What are your duties as GDPR officer?

I am the go-to-person when it comes to data protection issues and the introduction or expansion

of systems, I am in charge of training for new staff, and I also act as an internal and external interface. It is important to me personally to communicate the corresponding awareness.

What remains to be done?

We need to stay on the ball ...

We must understand that our new digital world also requires new rules, and these rules must also be clearly defined. For those who want to have mobile access to content anytime from anywhere, this should be worth the price.

Our business partners pay this price by giving us their consent. From this perspective, the EU GDPR is definitely an opportunity to deliver a proof of mutual trust. We will continue to commit ourselves to that!

Mrs. Giesinger, we thank you for the interview.

For all questions regarding the issue of data protection, please contact our data protection officer:

D04

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Author: Paul Pölzl

HEXABIKE

Just one wheel change to make the E-Bike!



Picture 1: First design concept

In the course of preparing their diploma thesis at the Higher Technical Training College (HTL) Rennweg in Vienna, the team behind the HexaBike set themselves the goal of simplifying the conversion to an E-Bike, and so making it more attractive for a larger target group.

At the present time, most E-bike conversion kits may indeed be relatively flexible, but the individual components, such as the motor, the accumulator battery, and the motor control unit, often have to be secured individually to the bicycle. As a rule, too, the cabling work for these components has to be carried out by the user.

This, among other things, explains why E-Bikes themselves have enjoyed a real boom over the past few years, while E-Bike conversion kits are hardly any better known than they were five years ago. The HexaBike addresses precisely this problem. Thanks to an innovative spokeless bearing, it is now possible to arrange almost all the components which are needed for supporting the pedal power inside the rear wheel.

Essentially, the conversion is comparable with changing the rear wheel.

Coming up with the idea

The concept behind the HexaBike came about during the quest for a diploma thesis idea at the HTL Rennweg. At the beginning, the idea was toyed with of building a spokeless bicycle. This original idea was soon discarded, because it offered no technical advantage over a normal bicycle. In the course of a discussion among the people who are now colleagues in the team, it was finally decided that a spokeless bicycle might well be just an eyecatcher, but the space gained by the design inside the wheel can nevertheless be put to good use in solving an actual problem. The decision taken in the end was to combine an

E-Bike system with the spokeless design, so that all the E-Bike components are combined in one easily exchangeable unit and have no negative effect on the torque moment of the wheel. Since the intention is that this unit should be as closed as possible, it makes sense for the system to be controlled by way of a Smartphone App. In the course of coming up with this idea, a first design concept came about (Picture 1). Since the details of the structure had not yet been fully planned, in this case there are still covers over the construction arrangements in the wheels. Even though the design, as illustrated here, was not actually adopted for the prototype, it is a good example of what a future development of the HexaBike could look like.

Development

The next step was to derive a working model from the theoretical function principle. In this situation, not only was the spokeless bearing further optimised, a system was also developed



Picture 2: Structure of the HexaBike

which matches up with our design, for transferring the power from the tread crank onto the rear wheel. As well as this, the electric motor was placed in the rear wheel, and a structural design was developed with which it is possible for the wheel to be driven electrically. The accumulator is secured to the HexaBike by means of a 3D-printed housing and also protected against external influences. Finally, a housing was designed for the electronics unit, which was itself an in-team development, and also a connection for the front wheel. All the parts were conceived for production by means of CNC machining, since it had originally been planned to create the bike using only the machines which were available at the College. The entire construction was finally brought together into one overall module (Picture 2), in order to have a model for manufacture and assembly.

There were immediate difficulties when it came to starting actual manufacture of the HexaBike. Because the CNC machines at the College were defective, another method of manufacture had to be found. This meant in the end that almost all the turned parts had to be made by hand, although it was possible to outsource the production of the sheet metal parts to the company Croy GmbH, who were able, by means of a laser cutter, not only to work more precisely but also a great deal faster than would have been possible for our team. In the course of this operation

the design was optimised still further, resulting in a weight saving of 1kg.

Once all the individual parts had been manufactured, they still had to be assembled and adjusted precisely to the bicycle frame which had been purchased. When the HexaBike was being put together, a few more minor problems were encountered, which were dealt with during the assembly process. For example, the friction between the drive roller and the rim, which is nee-

ded to drive the wheel, was increased by adding a rubber coating. While this article was being written, the construction of the HexaBike was concluded (Picture 3). Now all that has to be done is for the electronic components to be secured in the wheel and the cabling fitted.

Control (Android App)

The development of the Android App for controlling the E-Bike system has likewise almost been concluded. It is true that the HexaBike can also be controlled without an App, in the pure Electric Mode, by way of an accelerator lever, but anyone who wants to get the full function from the HexaBike system can apply the most widely differing adjustments and settings with an Android-App, which is connected via Bluetooth to the HexaBike, and read out important data such as battery level and speed.

In conclusion, the project team wish to thank all the people who have made an important contribution to the project. And above all to CODICO GmbH, whose financial support made the project possible at all. Thanks also to Croy GmbH, who cut all the sheet metal parts needed with a laser cutter, and the bicycle shop radgeber.bike, who came to our aid with the necessary know-how and tools.

D05

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Picture 3: HexaBike

GROWTH AS AN OPPORTUNITY

CODICO is expanding its headquarters in Perchtoldsdorf!

CODICO has been at home in Perchtoldsdorf for over 40 years. In 2019, the family company will be enlarging its site by expanding the office spaces, creating a recreational park for its employees, and upscaling the logistics centre, thus accommodating the company's recent growth.

CODICO was founded by Dr. Heinrich Hawlik in 1977, with the aim of conquering the world of electronics from Perchtoldsdorf. What began at a small scale is now a full-blown reality. The positive and continuous upward trend required an enlargement of the office and storage areas several times in the past. First, the growing company occupied a small office building in 1984, and then moved into its own office building in close proximity to the current site in 1991. The leap to the current address was taken in 2007.

Growth as an opportunity

In addition to its headquarters, CODICO also operates competence centres in Italy, Germany, and Sweden, and has a total of 42 offices spread throughout Europe. *»But our heart beats right here in Perchtoldsdorf. This is where we have our head office, where our management is based, and here lies our logistics centre, from where we supply the entire world«,* explains CODICO CEO Sven Krumpel.

The company almost doubled its turnover in the last five years. In order to continue enhancing the level of service and to boost its capacities,

CODICO now needs to make a significant investment in its logistics centre, allowing it to treble its current capacity. The new, 5,000m² CODICO warehouse will feature a markedly higher level of automation and a conveyor technology, rendering the company fit for further success in the future.

The refurbishment of the company's headquarters also provides an opportunity to offer CODICO's employees something probably unique in Austria. In today's work environment, work-life balance is an essential motivation factor – the aim is to offer a setting that helps reconcile professional and private life. For this reason, CODICO decided to take a progressive approach: by the end of the year, the company will create a 10,000m² recreational park for its employees on an adjacent empty plot. The park will offer sports facilities and space for relaxed get-togethers, and the company will plant numerous fruit and vegetable varieties as part of a Corporate Farming Project, so that the staff can directly provide themselves with fresh produce during the breaks.

For Sven Krumpel, this refurbishment is not just a necessity brought about by the company's international growth. It's actually more of an opportunity. *»Everybody should feel comfortable in our office. We want to be an employer who creates an attractive environment that meets society's needs and encourages everyone to come and work with us for the long term!«*

»Our heart beats right here in Perchtoldsdorf. This is where we have our head office, where our management is based, and here lies our logistics centre, from where we supply the entire world!«



At its headquarters in Perchtoldsdorf, CODICO currently employs a workforce of 110 in a space measuring approx. 2,000m². After the refurbishment (at an estimated investment of 17 million euros), the office space will grow to approx. 3,700m², with the number of staff required rising to 205.

For the sake of sustainability

For Sven Krumpel, a fundamental condition for this project are environmental protection and sustainability issues, and these played an essential role in its implementation. The office and logistics building were erected and equipped taking environmental aspects into consideration, such as an energy-efficient cooling system, the use of LED technology and energy-efficient machinery, and the reduction of electromagnetic smog. In addition, CODICO applies a special waste management concept and introduced operational measures for waste avoidance, recycling, and disposal. Since the company site is located directly at the southern railway line, employees can use public transport as an alternative means of mobility.

This refurbishing project will bestow CODICO with a state-of-the-art logistics centre to drive international growth further forward. Moreover, it will help create numerous new jobs. CODICO is putting all its commitment and energy into readying the company for future success!

D06

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CODICO goes on exhibition tour!

According to the motto »See and be seen«, a good trade fair appearance increases the awareness of the own brand and offers an unsurpassed closeness to the customer. CODICO attaches great importance to direct customer contact and always offers visitors an unforgettable experience – see for yourself!

November 2018:

ELECTRONICA, Munich

In 2018 CODICO was once again present at the world's leading trade fair for electronic components, systems and applications. In addition to technical highlights and innovations, visitors were offered fine refreshments and power-snacks for the tough exhibition day. Our fair game, CODICO's Extreme Bowling Track, was a real eye-catcher alongside state-of-the-art applications such as Voice Wake or solutions for gesture recognition.

offer amazing products and valuable industry know-how to numerous technology experts consisting of decision-makers, visionaries and leading suppliers.

March 2019: AMPER, Brno

The range of exhibits at AMPER, the 27th trade fair for electrical engineering, electronics, automation, communication, lighting and safety technology, covered all the technologies, products and solutions in the electronics industry. CODICO presented an abundance of active and passive components to the fair audience and enjoyed numerous promising and exciting discussions.

February 2019:

EMBEDDED WORLD, Nuremberg

In February 2019 we again immersed ourselves in the world of embedded systems and presented our products and services to the visitors of the Nuremberg trade fair. In addition to a variety of displays, power modules and exhibits from the wireless, sensor, connector and IOT sectors, a brand-new game, CODICO's Balance Labyrinth, attracted numerous curious visitors who enjoyed facing the balancing challenge.

March 2019:

ELEKTRONIK, Gothenburg

The ELEKTRONIK focused on new exciting solutions and created a dynamic meeting place in the electronics-intensive Gothenburg region. CODICO used this get-together to attract international visitors with a wide range of products and technologies, such as Bluetooth and WIFI for audio applications, Powerline Communication and a broad portfolio of durable E-Caps and relays.

March 2019:

SMART IOT, London

As a company with a plethora of solutions for the IOT sector, CODICO took the opportunity to present them at SMART IOT in London and

D07

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The CODICO TEAM says hello!

Vasily Budko



My name is Vasily Budko. I joined CODICO in August 2010 as a Field application engineer, that time I was living in Moscow. Since October 2014 I am working in the headquarter in Perchtoldsdorf. The scope of my present responsibilities is mainly taking care of PLC (Powerline communication) and Wifi related projects based on Qualcomm chipsets. As before CODICO I was working as a hardware and a software designer for embedded systems, now I do a review of customers powerline designs, provide access to relevant documents and a software packages for our customer, answer various technical requests.

Sometimes I design and perform non-trivial tests and do some researches in the laboratory as many customer projects give new challenges which I need to respond. I also develop a software for automating documentation distribution and another software for configuration of evaluation boards.

I am a father of two wonderful kids – 17 years old son Ivan and 7 years old daughter Jaroslava. Most of my free time I spend with them and they have adopted some of my hobbies (or I hope so) – hiking, riding a bike, cooking and music. Traveling is also one of my passions, however I prefer smaller cozy towns to lights of big cities and walk in a forest to visiting crowded touristic places.

I enjoy life in Austria and I am happy that I made the decision to move here. I am still trying to find a good balance between work and private life and hope to get close to it soon. I try to stay in a positive mood despite of challenges life is bringing, but every step makes me stronger.

Always happy to answer you, see you soon.

D08

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Judith Obermeier

After being with CODICO for five years now, it's my turn to introduce myself. My name is Judith Obermeier and since 2014 I have been working in the Order Administration Department. During the first few years I was with the Passive Components Group, but since Order Processing started working almost two years ago as a cross-group team, I have been looking after the 7th Region in Germany, as well as a number of important key customers. What I like about my job in particular is that every order is something individual, and something of a challenge. I really like going into details with each customer, and working together with them to come up with the best possible solution.

As well as the everyday work, I really enjoy the exchanges I have with my colleagues here at CODICO. We like having lunch together, and it's fun for me sometimes to cook for my colleagues as well. Traditional Austrian cuisine is a particular favourite of mine. I love the idea of traditional home cooking bringing in the spirit and the history of Austria. And whether it be from Italy or Hungary, in many Austrian dishes you can detect the influence of our neighbouring countries. And because I simply love to cook, and do a lot of it, my colleagues are also happy if we sometimes enjoy together meals which I have prepared myself.

I have been told that I am a person with a great sense of humour. I'm a great one for jokes, and I'm perfectly ready to laugh at myself too. I like spending my leisure time with my friends and my family. Whether indoors or outdoors, the main thing is to ring the changes. This is reflected in my hobbies, too, my holiday trips, and the whole way I plan and enjoy my leisure time. For two years now I have been the proud owner of a Vespa. It takes me out into the countryside, but I also like taking part in large Vespa event. And if I'm not out on two wheels, then I enjoy being with my foster dog, »Tim«, a nine-year old terrier. Taking him for walks in the woods around Perchtoldsdorf is a great experience for us both, every time we go out ;-)! If you have any questions about order administration or Austrian recipes, just give me a call!

D09

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Mario Pollesel



My name is Mario Pollesel and I am 32 years old.

I joined CODICO in middle 2015. I've started as sales engineer and I'm involved in sales and promotion of active components. Before CODICO, I worked for a small Italian company, always in the electronic industry, as sales engineer for active, passive components and for connectors.

I have around 13 years of experience in this sector, since I started working immediately after completing my studies (high school, electrotechnical diploma). CODICO was, for me, an incredible opportunity to work in a multicultural and multinational company, establishing relationships with suppliers and colleagues from all over the world. We have the opportunity to show to our customers the news of the electronic market, helping them to choose the most suitable component for their applications.

Especially thanks to the support of our technicians, we can support the customers from the design phase to production. We are, indeed, partners. I'm based in the North-East part of Italy, near Venice. In 2015 CODICO opened an office in Treviso area, to better support my work.

I like sports a lot, especially football. I have played soccer for several years, and this allowed me to understand the importance of being part of a team. My hobby is photography. In particular of rural and non-rural landscapes. I usually practice my hobby during the weekend. This is very important also because it allows me to dispose of the stress accumulated during the working week, to be able to start again at 100% of concentration.

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

Thanks for the attention.

D10

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Tim Schmid

I started back then, straight after leaving school, in the Order Processing department for Passive Components. That was where I gained my first impressions of the company and of professional work. I looked after a number of different key customers in Austria and Germany. My tasks included the administrative handling of orders from the customers as well as dealing with the manufacturers. Top priority is customer satisfaction, such as meeting the delivery deadlines required. It's great fun meeting the challenges, and successfully solving problems which might look difficult in the beginning.

At the end of 2015 I then changed to the Internal Sales Service at Passive Components. There were a lot of new tasks waiting for me there. I provided assistance for a number of key customers throughout Austria, as well as customers in the regions of Upper Austria and Salzburg, with both technical and commercial support. Ensuring close co-operation with External Sales Service was also one of my responsibilities. I found it fun getting to know customer care from another side in comparison with my previous activities.

Since the beginning of this year I have now been working as a sales engineer in the External Service section, while always remaining loyal to the Passive Components Department. I am responsible for looking after customers in Austria, in the Federal Provinces of Vienna, Lower Austria, Burgenland, Styria, Carinthia, Tirol, and Vorarlberg. I enjoy getting to know my customers personally, and I have already conducted some very interesting conversations with regard to new projects. It is exciting to follow a project right from the start, guiding and assisting the customer over its entire development, right through to manufacture. As well as that, I also benefit in particular in my everyday work from all the experience gained at CODICO from my earlier activities. I am very glad that I had the opportunity of learning everything from the ground up, which meant that I was repeatedly being confronted with new challenges. I look forward to my work every day, and the pleasant collegial atmosphere in the office. You notice immediately that the concept of »family« is very important at CODICO. The close co-operation within the team and the department means that there is always active and effective support provided when dealing with challenging tasks.

Away from work I find a balance to my everyday work at the fitness center. Several times a week I go there to do strength training and to keep myself fit. Among my other hobbies are, of course, skiing in the winter, while in the summer I like relaxing out of doors, best of all near a pool or at the seaside. And a summer evening barbecue with friends is a must, as well. I would be very happy to help you with any future projects and enquiries you may have. And I am also ready and able to have a personal discussion with you.

D11

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