



# XMC™ – 32-bit industrial microcontrollers

One microcontroller platform. Countless solutions.



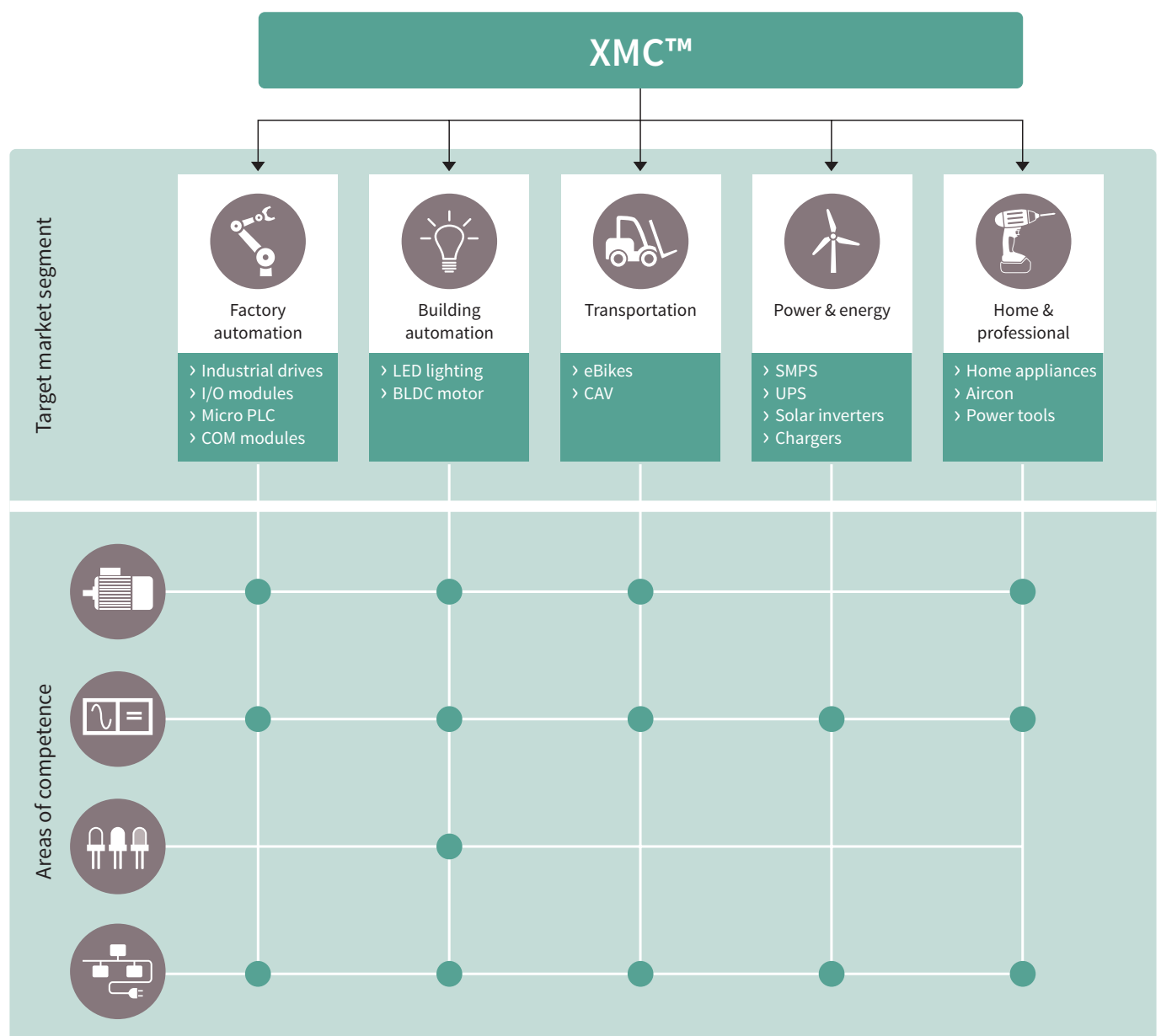
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# XMC™ – target markets and applications

Infineon's XMC™ 32-bit industrial microcontroller portfolio is designed for system cost and efficiency for demanding industrial applications. It comes with the most advanced peripheral set in the industry. Fast and largely autonomous peripherals can be configured to support individual needs.

Highlights include analog-mixed signal, timer/PWM and communication peripherals powered by either an ARM® Cortex®-M0 core (XMC1000 family) or a Cortex®-M4 core with a floating-point unit (XMC4000 family).





# XMC™ – one microcontroller platform. Countless solutions.

Infineon has combined its wealth of experience in microcontroller design for real-time critical applications with all the benefits of an industry-standard core. The unique result, the XMC™ microcontroller family based on

ARM® Cortex®-M cores, is dedicated to applications in the segments of power conversion, factory and building automation, transportation and home appliances.

XMC1000	
	<b>Cortex®-M0</b> > 32–48 MHz > Up to 200 kB flash > Package – TSSOP-16/28/38 – VQFN-24/40/48/64 – LQFP-64





XMC4000	
	<b>Cortex®-M4F</b> > 80–144 MHz > Up to 2 MB flash > Package – LQFP-64/100/144 – VQFN-48 – LFBGA-144/196

# XMC1000 – optimized peripherals for real-time success

XMC1000 microcontrollers bring together the ARM® Cortex®-M0 core and market-proven and differentiating peripherals in a leading-edge 65 nm manufacturing process. XMC1000 is the number one choice for bringing

traditional 8-bit designs to the next level, addressing a broad application spectrum from typical 8-bit applications up to digital power conversion and even field-oriented motor control.


ARM® Cortex®-M0	Co-processor	Clocks		Memory	Analog			Timer/PWM				Connectivity		Package
		Frequency [MHz]	Peripherals [MHz]		ADC 12 bit / S&H	Number of channels	Analog comparators	CCU4	CCU8	POSIF	BCCU	USIC	CAN2.0B	
XMC11x	–	32	64	Flash 8–64 kB RAM 16 kB	1/1	up to 12	–	1x	–	–	–	2x	–	VQFN-24/40 TSSOP-16/38
XMC12x	–	32	64	Flash 16–200 kB RAM 16 kB	1/2	up to 12	up to 3	1x	–	–	•	2x	–	VQFN-24/40 TSSOP-16/28/38
XMC13x	•	32	64	Flash 8–200 kB RAM 16 kB	1/2	up to 12	up to 3	1x	1x	•	•	2x	–	VQFN-24/40 TSSOP-16/38
XMC14x	•	48	96	Flash 32–200 kB RAM 16 kB	1/2	up to 12	up to 3	2x	2x	•	•	4x	•	VQFN-40/48/64 LQFP-64
Supply voltage range 1.8–5.5 V														
Temperature range -40 °C ... 85 °C/105 °C														






Key features		The MATH co-processor adds additional functionality, such as trigonometric operations or divisions, to the standard Cortex®-M0 instruction set, enabling field-oriented motor control. It runs up to 64 MHz. Offering 7 times faster division, 38 times faster cosine calculations and enabling high-resolution PARK transformation with 24-bit.
		The BCCU (Brightness and Color Control Unit) automatically runs light control algorithms for optimized dimming and color mixing. This significantly reduces the software development outlay for LED lighting applications.
		AC/DC power factor correction can be efficiently realized with high-performance and configurable analog comparators. With a propagation delay of only 30 ns and peripheral interconnection to the PWM timer, zero-current crossing in the coil is detected and a fast and deterministic control loop executed with a very low CPU load.
		The secure boot loader mode allows embedded code to be programmed to flash memory in a protected way using AES 128-bit cryptography. This helps to protect IP if manufacturing is outsourced, for example.

# XMC4000 – advanced industrial control & connectivity

All XMC4000 devices are powered by ARM® Cortex®-M4 with a built-in DSP instruction set. The single-precision floating-point unit, Direct Memory Access (DMA) feature and Memory Protection Unit (MPU) are state-of-the-art for all

devices – even the smallest XMC4000 runs with up to 80 MHz in core and peripherals. They come with a comprehensive set of common, fast and precise analog/mixed signal, timer/PWM and communication peripherals.

ARM® Cortex®-M4F	Frequency [MHz]	Memory		Analog		Timer/PWM						Connectivity						Package	
				ADC 12 bit / S&H	Number of channels	DAC 12 bit	CCU4 (4 ch)	CCU8 (4 ch)	HRPWM (150 ps)	POSIF	ΔΣ demodulator	USIC	CAN2.0B	USB	Ethernet		SDIO/SD/MMC		External Bus Unit (EBU)
XMC41x	80	Flash RAM	64–128 kB 20 kB	2/2	up to 9	2 ch	2x	1x	●	●	–	4x	up to 2	–	–	–	–	–	VQFN-48 TQFP-64
XMC42x	80	Flash RAM	256 kB 40 kB	2/2	up to 9	2 ch	2x	1x	●	●	–	4x	2x	●	–	–	–	–	VQFN-48 TQFP-64
XMC43x	144	Flash RAM	256 kB 128 kB	2/2	14	2 ch	2x	1x	–	–	–	4x	2x	●	●	●	●	–	LQFP-100
XMC44x	120	Flash RAM	256–512 kB 80 kB	4/4	up to 18	2 ch	4x	2x	●	●	●	4x	–	●	●	–	–	–	TQFP-64 LQFP-100
XMC45x	120	Flash RAM	512 kB–1 M 128–160 kB	4/4	up to 26	2 ch	4x	2x	–	2x	4 ch	4x	up to 3	●	●	–	●	●	LQFP-100/144 LFBGA-144
XMC47x	144	Flash RAM	1.5–2 MB 276–352 kB	4/4	up to 26	2 ch	4x	2x	–	2x	4 ch	6x	6x	●	●	–	●	●	LQFP-100/144 LFBGA-196
XMC48x	144	Flash RAM	1–2 MB 276–352 kB	4/4	up to 26	2 ch	4x	2x	–	2x	4 ch	6x	6x	●	●	●	●	●	LQFP-100/144 LFBGA-196
Supply voltage range 3.13 to 3.63 V																			
Temperature range -40 °C ... 85 °C/125 °C																			

Key features		125 °C ambient temperature for the ultimate robustness in harsh environments.
		A comprehensive set of highly flexible timers/PWMs, fast and accurate ADCs and position interfaces in combination with a programmable hardware interconnect matrix enable deterministic behavior and full application control.
		150 ps high-resolution PWM and smart analog comparator for achieving the highest energy-efficiency class for digital power conversion.
		Delta-sigma demodulator with integrated filters for cost- and size-efficient galvanic-isolated current measurement.
		The XMC4300 and XMC4800 are the industry's first-ever microcontrollers with an integrated EtherCAT® node on an ARM® Cortex®-M controller with on-chip flash and analog/mixed signal capabilities. This enables the most compact designs, eliminating the need for a dedicated EtherCAT® ASIC, external memory and crystal.

## Applications

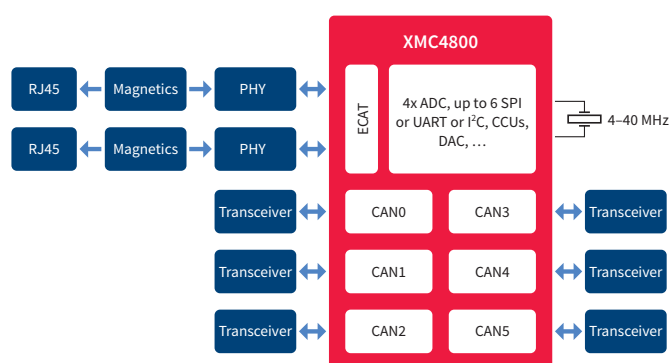
# Industrial automation



Global digitization is making inroads into manufacturing and taking its toll in the form of vast amounts of data – measurement and control data from sensors and actuators, data for local and remote diagnosis, and data transferred from one machine to another. But it is not only about the huge amount of data, it is also about time-deterministic behavior for maintaining the high level of productivity in manufacturing. EtherCAT® is the real-time Ethernet standard for combining great bandwidth with unrivaled isochronous time determinism in ranges of three-digit down to low two-digit nanoseconds.

The XMC4300 and XMC4800 series are the industry's first-ever microcontrollers with EtherCAT® integrated on a standard ARM® Cortex®-M controller with integrated flash memory and analog/mixed signal IP. This provides the most compact and cost-efficient EtherCAT® design without a dedicated ASIC, external memory and crystal.

EtherCAT® plus up to 6 CAN networks in parallel, including gateway functionality

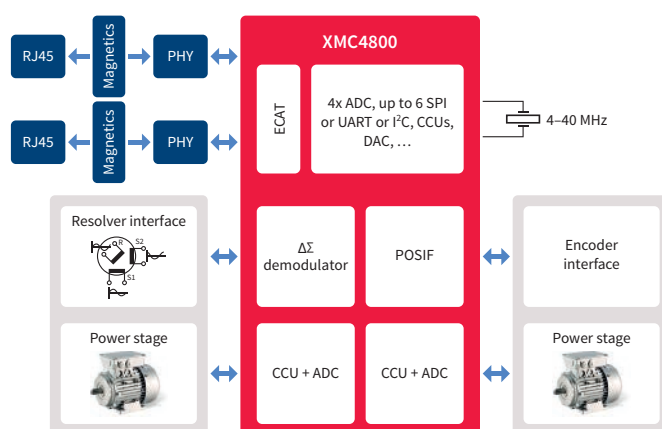


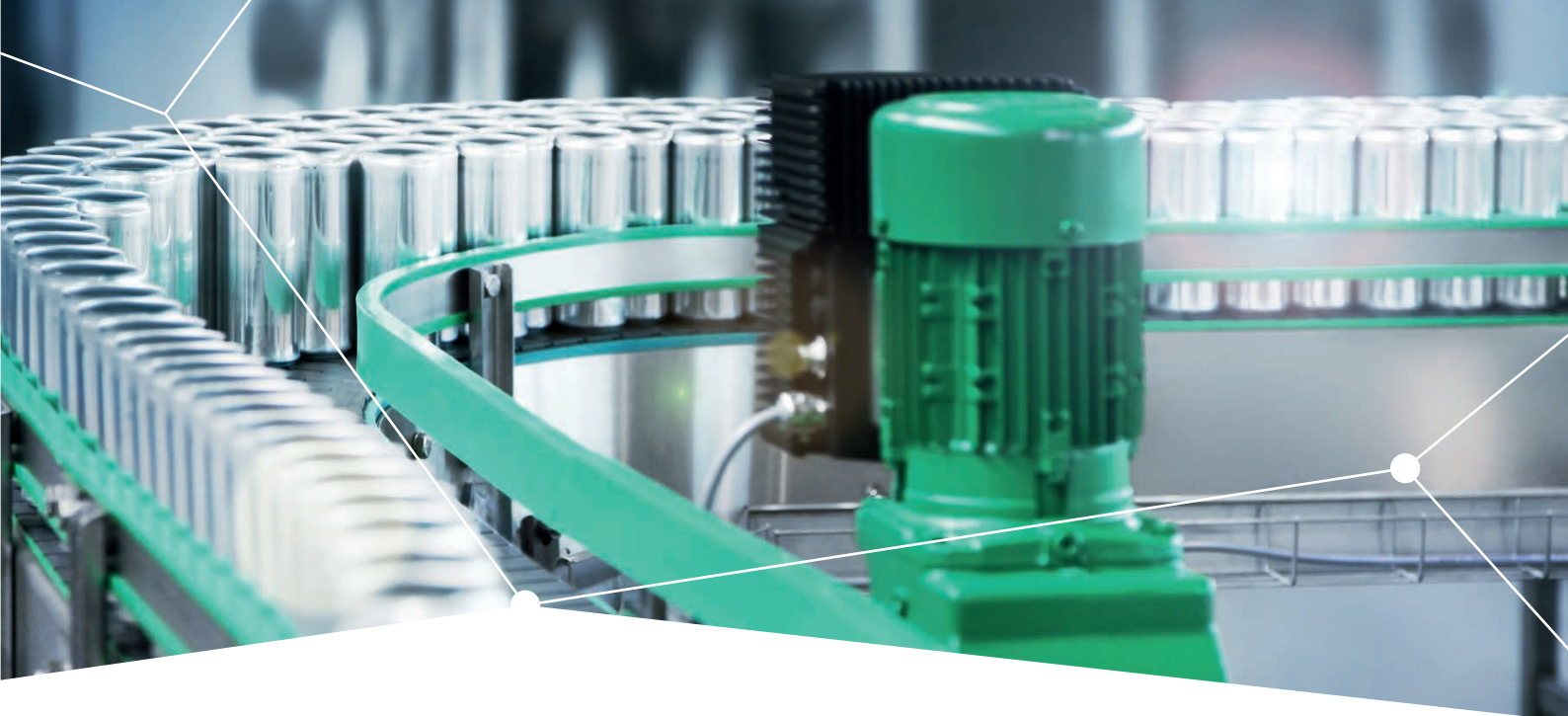
## Industrial drives

In today's competitive and highly dynamic environment, manufacturers are under constant pressure to find new ways of increasing energy efficiency, mobility and security – in all industrial drive applications.

The XMC4000 microcontroller family is the perfect fit to meet these challenges. The ARM® Cortex®-M4 with FPU offers the computing performance needed to run cascade control for the industrial AC and servo drives as well as communication stacks in the field level. The sophisticated software IP is protected by password-secured flash memory. With the position interface (POSIF) and the  $\Delta\Sigma$  demodulator, it couldn't be easier to connect to an encoder and a resolver interface.

EtherCAT® plus up to 2 motors with resolver/encoder in parallel





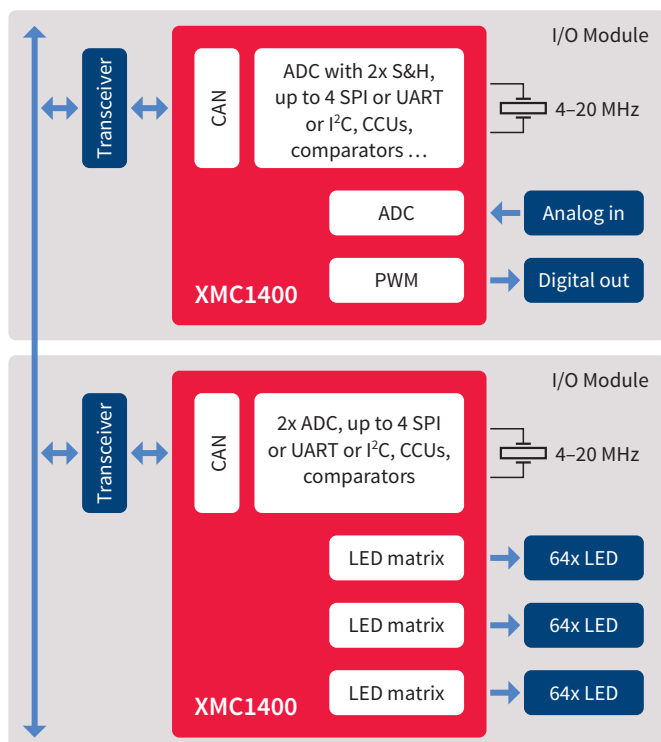
## I/O modules

Sense, control, drive, communicate – these tasks are versatile and complex on the field level. But there is a perfect I/O module for every dedicated task. Either in a cabinet on a DIN rail, in decentralized systems or as splash-proof installations – I/O modules are the backbone of every factory production line. Typically, I/O modules form compact in size, thereby providing limited PCB space, but are demanding in relation to the microcontroller features needed to fulfill their tasks. The XMC1400 series with up to 200 kB of flash, 2 CAN nodes, 4 serial channels, 3 x 64 LED matrix control and 9-channel LED brightness and color control is unrivaled when it comes to communication and

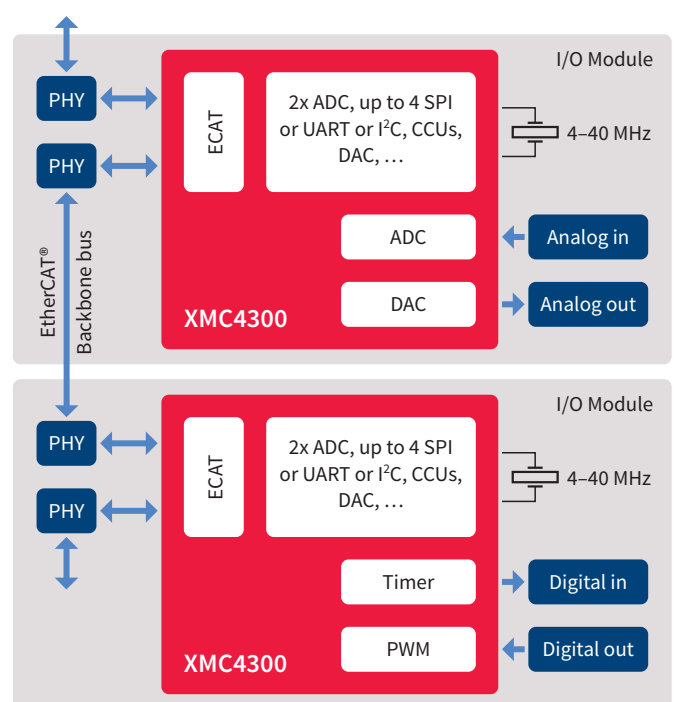
human-machine interface tasks. At the same time, the XMC1400 is in no way lacking in terms of actuator & sensor control IP as it comes with a 12-bit ADC including 2 sample & holds, 4 comparators and 16 PWM channels. All combined in small-footprint VQFN packages with 40 to 64 pins and 5 x 5 to 8 x 8 mm<sup>2</sup> in size.

In the event that the backbone bus requires more bandwidth than CAN or serial communication can provide, the XMC4300 is the right choice. It is equipped with integrated EtherCAT® and an outstanding 256 kB flash to 128 kB RAM ratio.

### I/O modules with CAN backbone bus



### I/O modules with EtherCAT® backbone bus with PHY to PHY connection



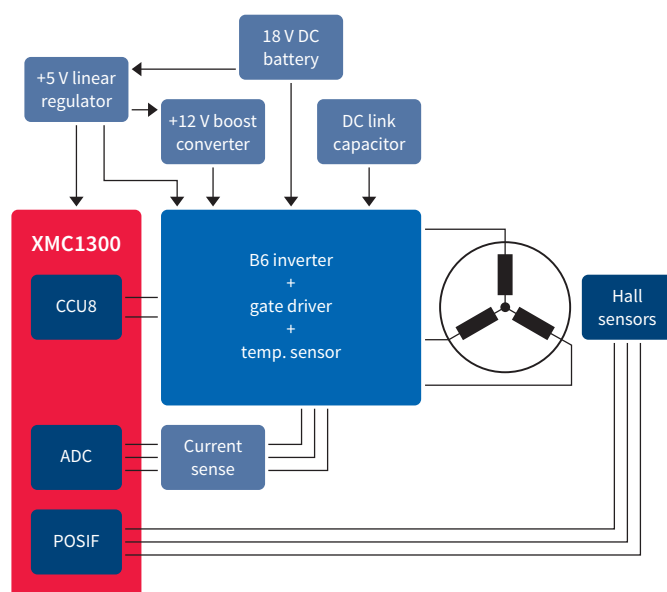
## Applications

# Motor control

Energy efficiency, mobility and security are some of the main challenges facing modern society. Infineon's motor control solutions address all of these needs, providing outstanding reliability, excellent quality and leading-edge innovations. From toys and power tools, to industrial pumps and industrial automation systems, Infineon's XMC™ microcontrollers and other semiconductor products enable our customers to design the most innovative, efficient, reliable and energy-friendly motor control and drive systems.

Infineon's XMC™ microcontroller family is perfectly suited as a controller for various types of motors, such as Permanent Magnet Synchronous Motors (PMSM), Brushless DC Motors (BLDC), AC Induction Motors (ACIM), servo motors and brushed DC motors. Our free and easy-to-use DAVE™ Integrated Development Environment (IDE) comes with a large number of pre-defined, configurable and tested software blocks (DAVE™ APPs) targeting specific applications, enabling rapid prototyping and application development. There are ready-made motor control example projects available in the form of DAVE™ APPs for all major motor control schemes.

Block diagram of power tool reference design



**The XMC1000 family** is engineered to offer the best-in-class cost/performance ratio for standard motor control. XMC1000 microcontrollers control the motors in industrial and building automation applications, such as pumps and fans. They are also ideally suited for some consumer applications, such as power tools or white goods. Furthermore, XMC1000 microcontrollers can be found controlling, flying or moving around on board many different types of drones and eBikes around the world.

Together with the dedicated MATH co-processor, the ARM® Cortex®-M0 core sets a new benchmark for CPU performance in this price/performance class of microcontrollers. Even highly sophisticated motor control schemes, including sensed and sensorless Field-Oriented Control (FOC), can easily be realized, while also leaving enough headroom for communication or to control a Human-Machine Interface (HMI).

Below is a block diagram and the PCB image of the 1 kW power tool reference design featuring the XMC1302 microcontroller, OptiMOS™ BSC010N04N, 40 V MOSFETs and EiceDRIVER™ 2EDL05M06 gate drivers.

Form-factor-optimized PCB for 1 kW power tool reference design





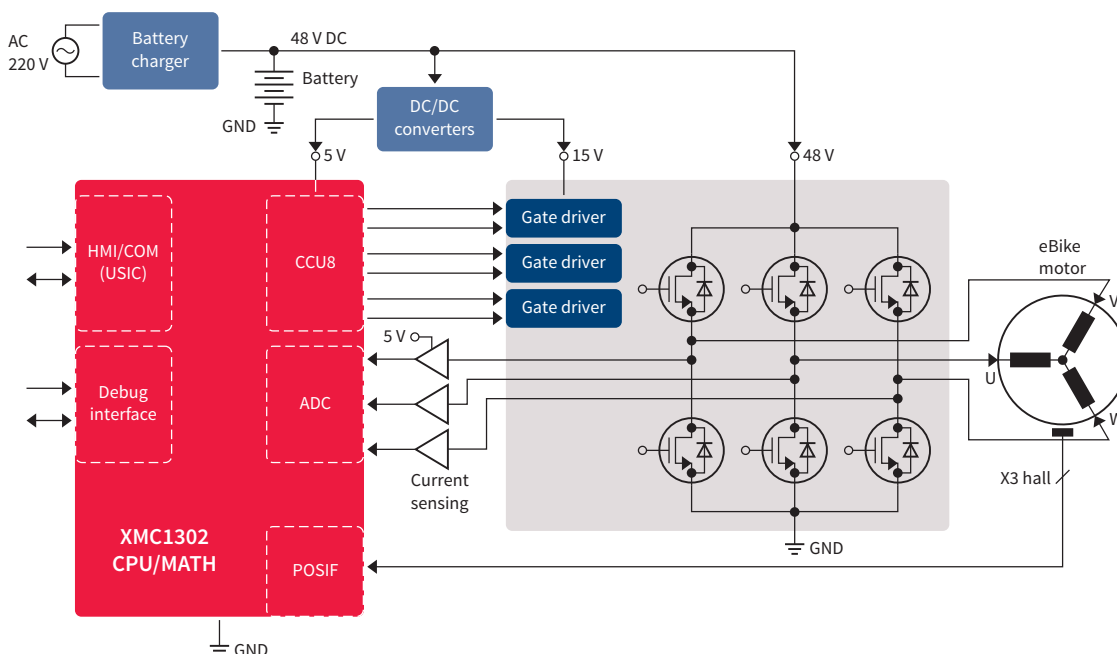
The following functionalities are what make the XMC1000 microcontroller family perfectly suited for standard motor control application

- › Easy 3-phase inverter implementation with a single CCU8 PWM unit, offering shadow register transfer, external input for fault control, binary and floating pre-scaler, 16-bit to 64-bit width
- › Motor control-specific **MATH co-processor** providing a 32-bit signed or unsigned divider, as well as a 24-bit CORDIC for trigonometric calculations, working in parallel with the main CPU

- › POSIF interface to directly connect hall sensors and incremental encoder
- › 12-bit ADC with on-chip adjustable gain of x1, x3, x6 or x12
- › 1.8 to 5.5 V supply voltage
- › Flexibility for serial communication, thanks to programmable Universal Serial Interface Channels (USIC)

Below is a block diagram of a typical eBike system powered by an XMC1302 microcontroller. In this particular use case, the XMC™ microcontroller is running sensed Field-Oriented Control (FOC) for startup and low-speed operation, and then switching to sensorless FOC for normal operation.

Block diagram of an eBike system controlled by the XMC1302 MCU



## Applications

# Switched-mode power supplies

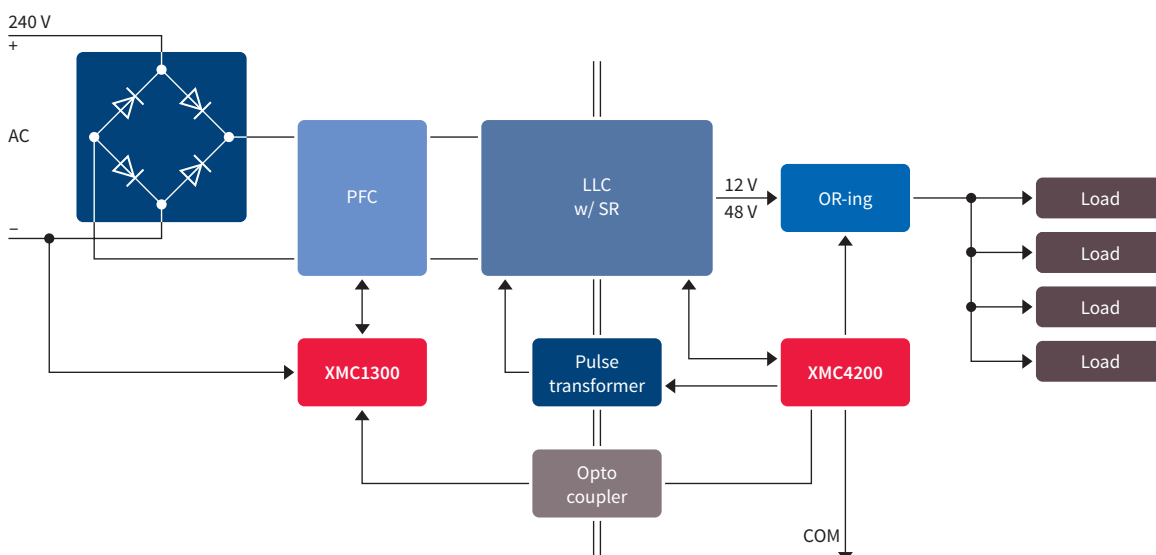
Power supply designs are subject to ever-increasing requirements. Some of them are fueled by customer demands or industry association guidelines (such as higher power density, communication, modularity or the 80 Plus Titanium efficiency standard). Whereas others are driven by the regulators (such as the EN 61000-3-2 PFC standard). These new or more stringent requirements are paving the way for the increased use of digitally controlled switched-mode power supply systems, simply because it is often not even possible to design a traditional control system with analog circuitry and meet all the requirements. This growth is also sometimes driven by the flexibility and modularity that MCU-based designs inherently provide. On the other hand, semiconductor technology advances have allowed MCU manufacturers to develop a new class of MCUs, optimized for digital power conversion applications in terms of features and price point. This new market development is what motivates ever more power supply designers to use digital control for SMPS.

Digital designs have a similar system cost compared to the traditional analog-based system, while also offering the many benefits of digital power conversion, such as:

- › Advanced and adaptive control algorithms (multiple loops, non-linear), more compact designs enabling high efficiency across a broad range of loads (titanium standard) and operating conditions (input voltage, temperature, aging)
- › Greater flexibility, enabling more cost-efficient platform solutions (e.g. one design for multiple power supplies, commissioning and field updates, regional specifics, etc.)
- › System monitoring and network connectivity/maintenance (e.g. hot swap or load balancing, PMBus communication, failure prediction)

The application example below shows a digitally controlled power supply used for server or telecom racks with typical power ratings of between 300 W and 3 KW. XMC™ micro-controllers are used for PFC and LLC control with variable output, load balancing and system status monitoring and reporting.

### Server/telecom SMPS with XMC™ for digital control





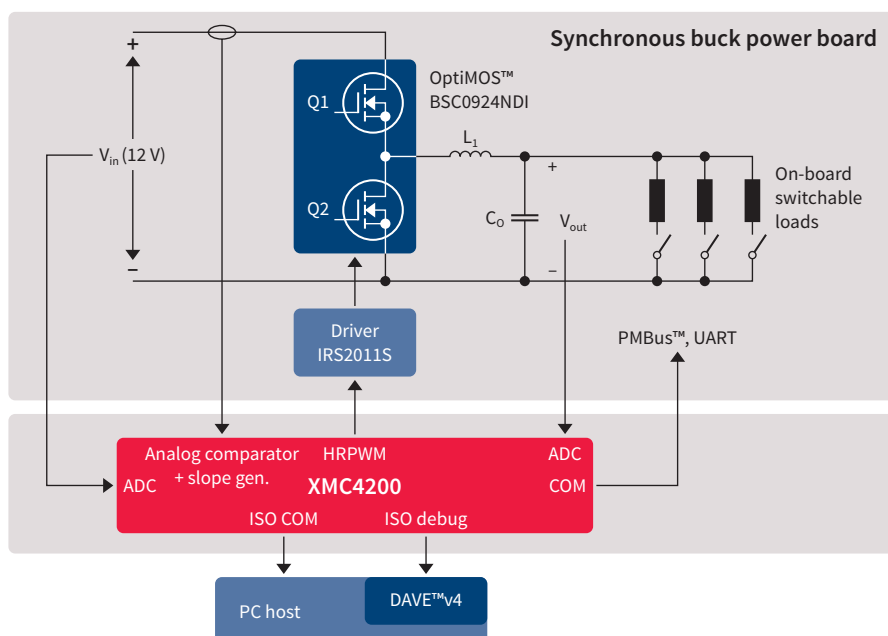
Thanks to the application-tailored features outlined below, XMC™ microcontrollers are particularly well positioned for use in SMPS applications

- 4-channel 150 ps HRPWM timer (XMC4200/4400 series)
- Rich connectivity: 2x CAN nodes, 4-channel serial COM unit (configurable to SPI, I<sup>2</sup>C, I<sup>2</sup>S, UART), USB FS
- Up to 4x 12-bit ADC with a sample time of 70 ns ensure fast reaction times and tighter control loops
- Extended temperature range up to an ambient temperature of 125 °C (XMC4000 family)
- Analog comparators with only 3 mV input offset voltage and a propagation delay of 30 ns (XMC1000 family)

This implementation with the XMC4200, as well as similar implementation with the XMC1300, is part of the new **XMC™ digital power explorer kit**. This kit consists of a power board with the synchronous buck converter and 2 control cards (XMC4200 series and XMC1300 series), helping engineers to take their first steps into digital power control, and experiment with different control modes in a safe, low-voltage environment. This kit makes it extremely easy to test and compare different buck converter control mechanisms (voltage control vs. current control, with slope compensation), and explore the benefits of dedicated power conversion peripherals, such as a high-resolution PWM or slope compensation module.

Below is an example of a synchronous buck converter realized with an XMC4200 microcontroller.

XMC™ digital power explorer in peak-current-mode control





## Applications

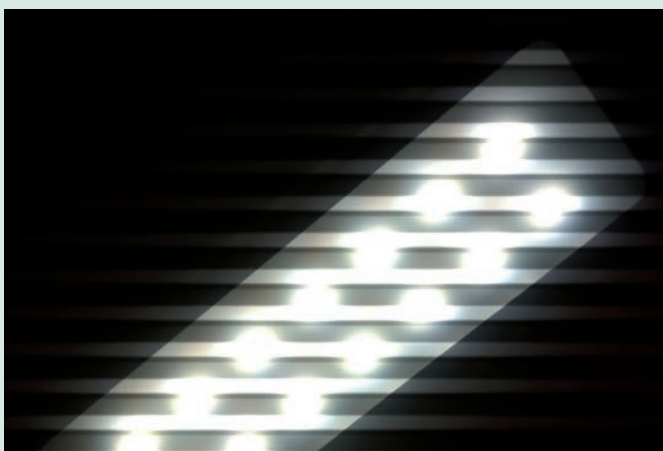
# Smart lighting

The term “smart lighting” refers to the expansion of traditional LED illumination technology to include new functionalities, such as wired or wireless connectivity, programmability, sensors, enhanced light quality and sophisticated color mixing. Thanks to special features dedicated to LED lighting, XMC™ microcontrollers help bring this new dimension into traditional LED lighting systems. With their Brightness and Color Control Unit (BCCU), XMC1200/1300/1400 series products offer an industry-unique module for automatically controlling the dimming level and color of multi-channel LED lamps. Users can quickly configure their ideal solution without the need for expert knowledge in lighting. In addition to LED control functions, XMC1200/1300/1400 series microcontrollers can also add DALI or DMX communication capability, facilitating advanced single-chip smart lighting solutions.

Besides LED driving, communication and housekeeping, XMC™ MCUs can also cover the SMPS functionality of an LED driver. All major single and dual-stage SMPS topologies commonly used in LED drivers can be implemented using XMC™ MCUs.

### Key features of the XMC1000 family for smart lighting applications

- › Automatic brightness control (using high-frequency pulse density modulation) based on the  $\Sigma\Delta$  principle enables completely flicker-free dimming through 9 output channels
- › Automatic exponential dimming and linear intensity changes make brightness or color changes appear smooth and natural to the human eye
- › Integrated high-speed analog comparators for peak-current control and zero-crossing detection
- › Tightly interconnected peripherals supporting various digital power conversion techniques



2 kHz flicker with a commercial ballast detected by an HD camera. Despite being invisible, it affects the human brain (below 3 kHz threshold).

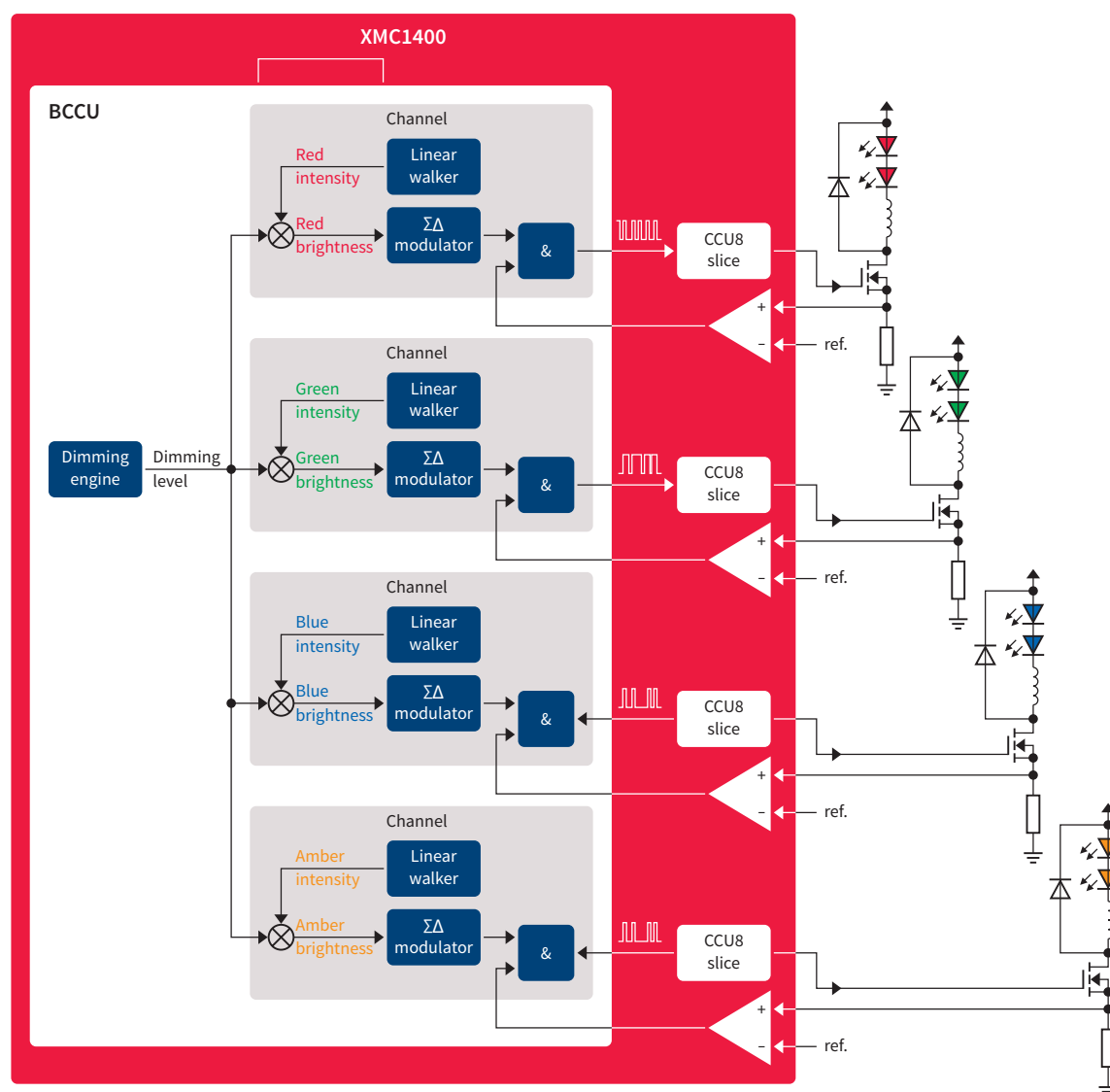


Infineon solution with XMC1200/XMC1300 series. Flickering (40–50 kHz) is neither visible nor perceptible and undetectable by most HD cameras.



The block diagram below shows an example of an XMC1000 family microcontroller in a smart lighting application. An XMC1402 microcontroller is used here for the direct

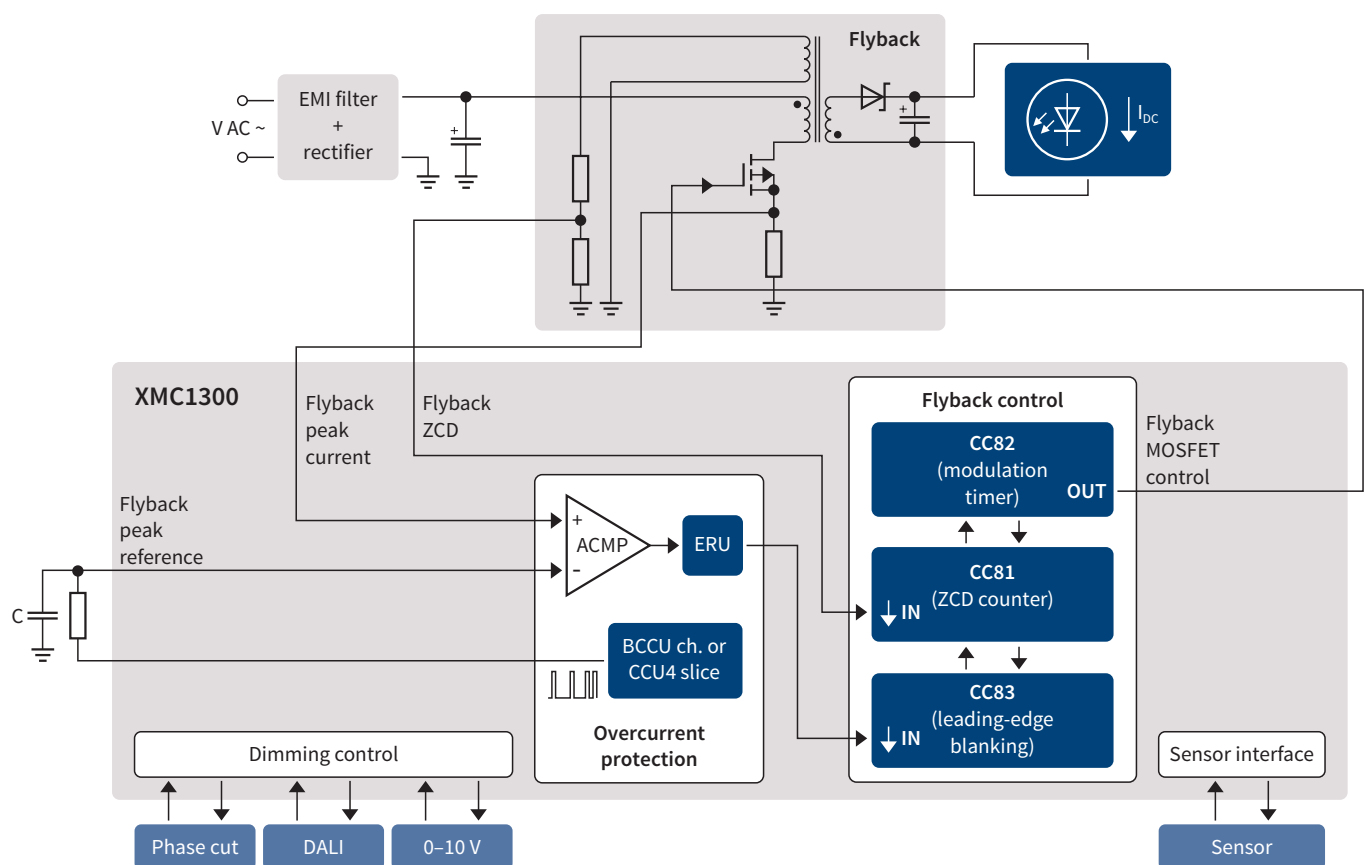
constant-current control of a 4-channel RGBA LED lighting system, while also handling DMX and DALI communication.





Here is one example of a full smart lighting system consisting of single-channel flyback PFC constant-current LED

driver, sensor (e.g. 24 GHz radar) and various dimming options (DALI, 0–10 V and phase cut).



# Efficient tools, software and services from evaluation until production – XMC™ ecosystem and enablement



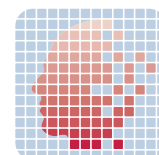
## DAVE™

A comprehensive set of development tools, ready-to-use software solutions and support services are available for the XMC™ microcontrollers portfolio. These tools and software products support the complete development cycle to ensure an efficient and fast design process.

[www.infineon.com/xmc-ecosystem](http://www.infineon.com/xmc-ecosystem)

Free-of-charge IDE using GNU C-compiler, providing graphical system design methods, a wide and configurable code repository and automatic code generator for users of the ARM® Cortex®-M XMC™ industrial microcontroller along the entire process – from Evaluation-to-Production (E2P).

XMC™ Lib and DAVE™ generated code can be used with other third-party tool chains.



## THIRD PARTIES

XMC™ Lib and DAVE™ APPs are tested with GCC, ARM®, TASKING, IAR compilers; they can be used with Altium, ARM®/KEIL, Atollic, IAR Systems, Rowley, and DAVE™ compiler IDEs

### DAVE™

Free Eclipse-based Integrated Development Environment (IDE) including GNU C-compiler, debugger and code generation plug-in

### EXAMPLES

XMC™ Lib and DAVE™ APPs composed to create applications

#### DAVE™ SDK

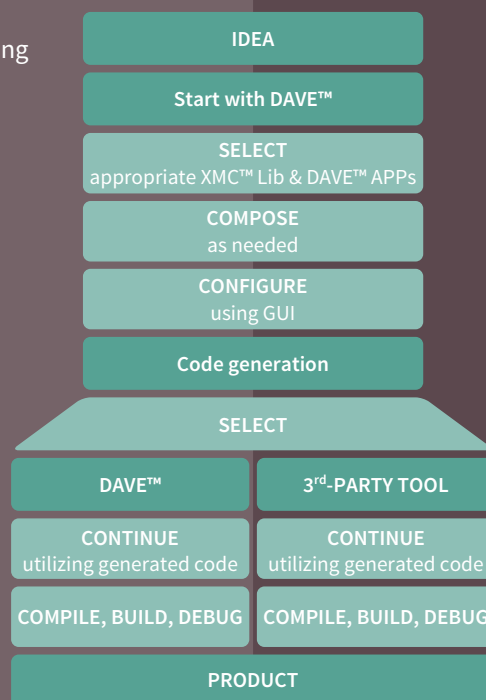
Software development kit for modifying, enhancing and developing new DAVE™ APPs

#### DAVE™ APPs

GUI-configurable application-oriented software components using XMC™ Lib; arranged in a library (APIs)

#### XMC™ Lib

CMSIS / MISRA 2004-compliant low-level driver library for peripherals (APIs)



XMC™ 32-bit industrial microcontrollers portfolio



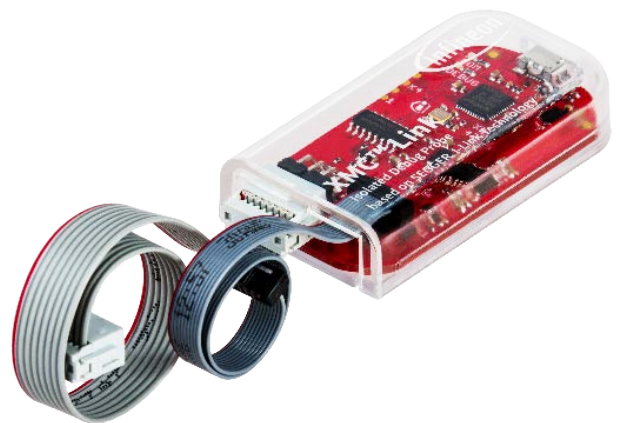
## XMC™ link

### Isolated debug probe, based on SEGGER J-Link technology

XMC™ link is a functionally isolated debug probe for all XMC™ microcontrollers.

Its technology is based on SEGGER J-Link and can therefore be used with all well-known ARM® Cortex® compiler/IDEs and tools chains, as well as DAVE™.

[www.infineon.com/xmclink](http://www.infineon.com/xmclink)



## Embedded coder library for XMC™

### Simplify development with XMC™ MCUs in MATLAB® Simulink®

The XMC™ embedded coder library for MATLAB® Simulink® provides support for code generation in all XMC™ microcontroller families.

The XMC™ embedded coder library enables the automatic code generation of your software algorithm, optimized for XMC™ MCUs, together with system and peripheral initialization.

## IEC60730 class B library for XMC™

### Support for the XMC1000 and XMC4000

IEC60730 class B software library for XMC™ industrial microcontrollers for preventing unsafe operation of the controlled equipment. This is a dedicated software library for XMC™ MCUs with routines for internal supervisory functions and for self-diagnostics.

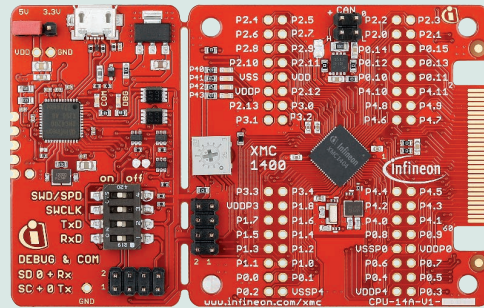
## Kits & evaluation boards

### Product-specific kits

#### XMC1400 boot kit

Order No.: KIT\_XMC14\_BOOT\_001

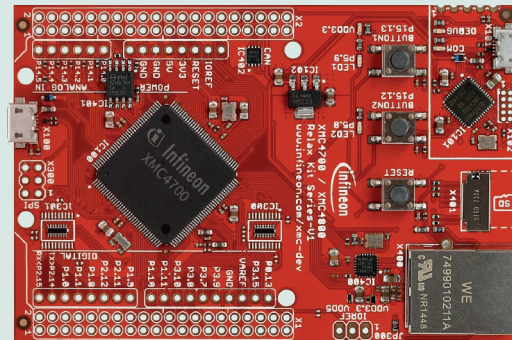
- › XMC1400 MCU series, ARM® Cortex®-M0
- › On-board CAN node
- › Hardware compatible with XMC™ LED lighting cards and motor control board



#### XMC4700 relax kit series

Order No.: KIT\_XMC47\_RELAX\_V1

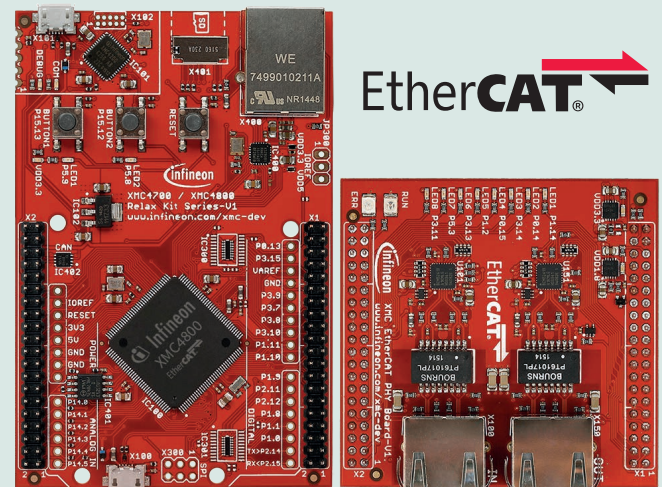
- › XMC4700 MCU series, ARM® Cortex®-M4
- › XMC4700 relax kit with Ethernet TCP/IP, CAN node, SD/MMC card slot, quad SPI flash, RTC
- › Hardware compatible with Arduino



#### XMC4800 relax EtherCAT® kit

Order No.: KIT\_XMC48\_RELAX\_ECAT\_V1

- › XMC4800 MCU series, ARM® Cortex®-M4
- › EtherCAT® slave controller on-chip
- › On-board Ethernet TCP/IP, CAN node, SD/MMC card slot, quad SPI flash, RTC
- › Physical layer for the EtherCAT® communication realized via the XMC™ EtherCAT® PHY board add-on

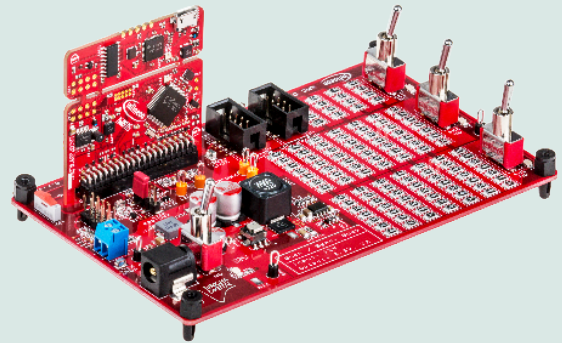


## Application-specific kits

### XMC™ digital power explorer kit

Order No.: KIT\_XMC\_DP\_EXP\_01

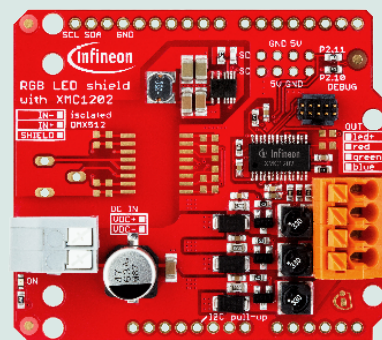
- › Easy entry into digital power control with XMC™ MCUs
- › Two different control card options: XMC1300 and XMC4200
- › High-resolution PWM (150 ps) and smart analog comparators on XMC4200
- › Synchronous buck converter board with BSC0924NDI dual n-channel OptiMOS™ and IRS2011S gate driver



### RGB LED lighting shield with XMC1202 for Arduino

Order No.: KIT\_LED\_XMC1202\_AS\_01

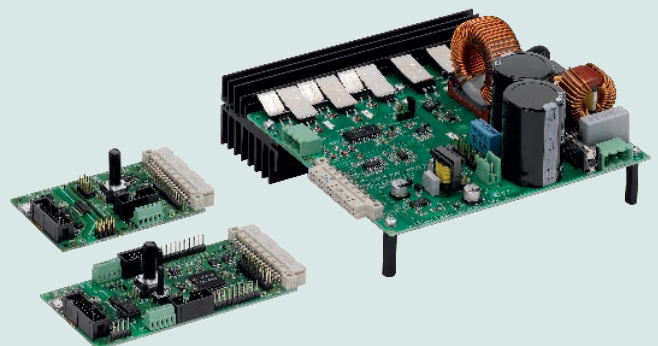
- › XMC1200 MCU series with Brightness and Color Control Unit (BCCU)
- › Three independent output channels for flicker-free, high-quality LED lighting solutions
- › Compatible with Arduino and the XMC1100 boot kit



### XMC 750 watt motor control kit





Order No.: KIT\_XMC750WATT\_MC\_AK\_V1

- › XMC1300 drive card with galvanic isolation
- › XMC4400 drive card with galvanic isolation
- › Inverter board:
  - 110–230 V / 750 W
  - Input filter and active PFC
  - Three-phase inverter by reverse conduction IGBT



## Functional safety for the XMC4000 MCUs family


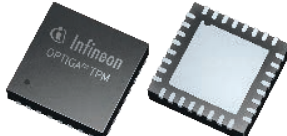
Supported by the XMC4000 family-powered ARM® Cortex®-M4F, allowing SIL2 and SIL3

XMC4000 safety package		
Documentation	Software	Consultancy
<b>Safety application note</b> <b>Failure mode report</b> <b>FMEDA tool</b>  by Infineon, revised in workshops by TÜV Süd	<b>Fault robust</b> <b>Software test library</b> by Yogitech    	  Implementation support by Hitex

## Embedded security for XMC™ MCUs

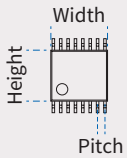
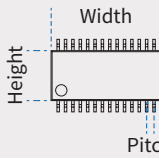
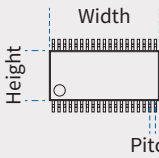
IP protection and field updates

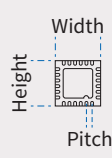
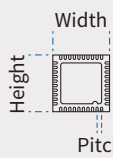
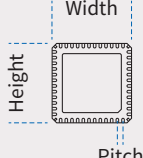
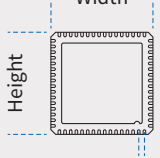
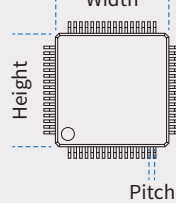
Infineon and its partners provide solutions which support you in protecting your data, allowing authentication and encryption and securing firmware file updates to prevent cloning and downtimes.

Security solutions		
Software	Hardware	
<b>Secure bootloader</b> by Infineon, XMC1000	<b>OPTIGA™ family</b> by Infineon – hardware-based security solutions	
<b>CodeMeter μEmbedded</b> by WIBU, XMC4000 exclusive	<b>OPTIGA™ Trust family</b>  	<b>OPTIGA™ TPM family</b>  
<b>KMS/CycurKEYS</b> by ESCRYPT, XMC4000	Turnkey & programmable security solutions	Standardized certified turnkey solution
<b>emSecure</b> by SEGGER		

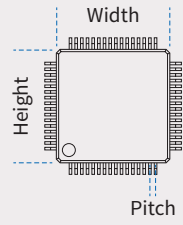
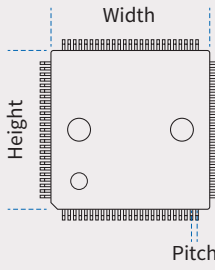
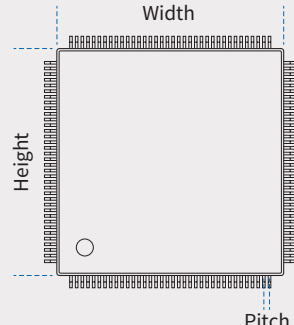
# XMC™ package overview

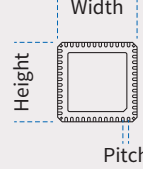
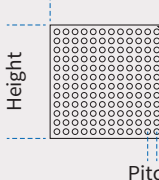
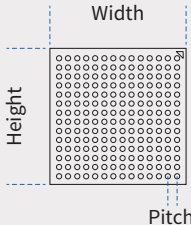
## XMC1000

		
TSSOP-16	TSSOP-28	TSSOP-38
Body 4.4 x 5 mm (H x W)	Body 4.4 x 9.7 mm (H x W)	Body 4.4 x 9.7 mm (H x W)
Pitch 0.65 mm	Pitch 0.65 mm	Pitch 0.5 mm

				
VQFN-24	VQFN-40	VQFN-48	VQFN-64	LQFP-64
Body 4 x 4 mm (H x W)	Body 5 x 5 mm (H x W)	Body 7 x 7 mm (H x W)	Body 9 x 9 mm (H x W)	Body 10 x 10 mm (H x W)
Pitch 0.5 mm	Pitch 0.4 mm	Pitch 0.5 mm	Pitch 0.5 mm	Pitch 0.5 mm

## XMC4000

		
LQFP-64	LQFP-100	LQFP-144
Body 10 x 10 mm (H x W)	Body 14 x 14 mm (H x W)	Body 20 x 20 mm (H x W)
Pitch 0.5 mm	Pitch 0.5 mm	Pitch 0.5 mm

		
VQFN-48	LFBGA-144	LFBGA-196
Body 7 x 7 mm (H x W)	Body 10 x 10 mm (H x W)	Body 12 x 12 mm (H x W)
Pitch 0.5 mm	Pitch 0.8 mm	Pitch 0.8 mm



Feature overview XMC™ family

Product type / part number	Markets			Budgetary web price (€/1 kpcs)	Package	GPIOs	Processor type	Core		Co-processor			System				Debug		Operating temperature range T <sub>A</sub> [°C]	Memory				Data/IP protection	Secure boot loader	Peripherals clock [MHz]	Analog		Timer/PWM				Communication										LED display	Capacitive touch															
	Automotive	Industrial	Consumer					Core frequency [MHz]	CORDIC/DV	DSP	FPU	ERU	DMA	MPU	CRC	PRNG	Watchdog	Real-Time Clock		SWD, SPD	JTAG, Trace	Supply voltage [V]	Flash				ECC	RAM	Cache	EEPROM emulation in flash	Secure boot loader	No. of 12-bit ADC/ No. of sample & hold/ No. of inputs	12-bit DAC	Comparator	CCU4	CCU8	HRPWM (150 ps)	ΔΣ Demodulator	POSIF	BCCU/LED	EtherCAT®	IEEE1588 Ethernet MAC			CAN 2.0B nodes	USB	SDIO/SD/MMC	# channels	USIC Universal Serial Interface Controller								External Bus Unit (EBU)		
																																																	SPI	Dual SPI	Quad SPI	UART/SCI	IIC/I <sup>2</sup> C	HS/I <sup>2</sup> S	LIN	SPI	Dual SPI	Quad SPI	UART/SCI
XMC1400 series																																																											
XMC1403-Q064X0128	-	●	●	1.84	VQFN-64	55	Cortex®-M0	48	-	-	-	1	-	-	-	●	●	●	●	-	1.8 to 5.5	-40 to 105	128	-	16	-	●	-	●	96	1/2/12	-	3x	8 ch	-	-	-	2x	-	-	-	2	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	-	-	-	
XMC1403-Q064X0200	-	●	●	2.32	VQFN-64	55	Cortex®-M0	48	-	-	-	1	-	-	-	●	●	●	●	-	1.8 to 5.5	-40 to 105	200	-	16	-	●	-	●	96	1/2/12	-	3x	8 ch	-	-	-	2x	-	-	-	2	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	-	-	-	
XMC1404-Q048X0064	-	●	●	1.48	VQFN-48	42	Cortex®-M0	48	●	-	-	1	-	-	-	●	●	●	●	-	1.8 to 5.5	-40 to 105	64	-	16	-	●	-	●	96	1/2/12	-	3x	8 ch	8 ch	-	-	-	2x	9 ch	-	-	2	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	3x 64 segment	24 ch	
XMC1404-Q048X0128	-	●	●	1.84	VQFN-48	42	Cortex®-M0	48	●	-	-	1	-	-	-	●	●	●	●	-	1.8 to 5.5	-40 to 105	128	-	16	-	●	-	●	96	1/2/12	-	3x	8 ch	8 ch	-	-	-	2x	9 ch	-	-	2	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	3x 64 segment	24 ch	
XMC1404-Q048X0200	-	●	●	2.32	VQFN-48	42	Cortex®-M0	48	●	-	-	1	-	-	-	●	●	●	●	-	1.8 to 5.5	-40 to 105	200	-	16	-	●	-	●	96	1/2/12	-	3x	8 ch	8 ch	-	-	-	2x	9 ch	-	-	2	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	3x 64 segment	24 ch	
XMC1404-Q064X0064	-	●	●	1.58	VQFN-64	55	Cortex®-M0	48	●	-	-	1	-	-	-	●	●	●	●	-	1.8 to 5.5	-40 to 105	64	-	16	-	●	-	●	96	1/2/12	-	3x	8 ch	8 ch	-	-	-	2x	9 ch	-	-	2	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	3x 64 segment	24 ch	
XMC1404-Q064X0128	-	●	●	1.94	VQFN-64	55	Cortex®-M0	48	●	-	-	1	-	-	-	●	●	●	●	-	1.8 to 5.5	-40 to 105	128	-	16	-	●	-	●	96	1/2/12	-	3x	8 ch	8 ch	-	-	-	2x	9 ch	-	-	2	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	3x 64 segment	24 ch	
XMC1404-Q064X0200	-	●	●	2.41	VQFN-64	55	Cortex®-M0	48	●	-	-	1	-	-	-	●	●	●	●	-	1.8 to 5.5	-40 to 105	200	-	16	-	●	-	●	96	1/2/12	-	3x	8 ch	8 ch	-	-	-	2x	9 ch	-	-	2	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	3x 64 segment	24 ch	
XMC1404-F064X0064	-	●	●	1.58	LQFP-64	55	Cortex®-M0	48	●	-	-	1	-	-	-	●	●	●	●	-	1.8 to 5.5	-40 to 105	64	-	16	-	●	-	●	96	1/2/12	-	3x	8 ch	8 ch	-	-	-	2x	9 ch	-	-	2	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	3x 64 segment	24 ch	
XMC1404-F064X0128	-	●	●	1.94	LQFP-64	55	Cortex®-M0	48	●	-	-	1	-	-	-	●	●	●	●	-	1.8 to 5.5	-40 to 105	128	-	16	-	●	-	●	96	1/2/12	-	3x	8 ch	8 ch	-	-	-	2x	9 ch	-	-	2	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	3x 64 segment	24 ch	
XMC1404-F064X0200	-	●	●	2.41	LQFP-64	55	Cortex®-M0	48	●	-	-	1	-	-	-	●	●	●	●	-	1.8 to 5.5	-40 to 105	200	-	16	-	●	-	●	96	1/2/12	-	3x	8 ch	8 ch	-	-	-	2x	9 ch	-	-	2	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	3x 64 segment	24 ch	
XMC4100 series																																																											
XMC4108-Q48K64	-	●	●	2.17	VQFN-48	30	Cortex®-M4	80	-	●	●	2	8 ch	1	1	●	●	●	●	●	3.13 to 3.63	-40 to 125	64	●	20	1	●	●	●	-	80	2/2/8	2 ch	-	8 ch	4 ch	-	-	1x	-	-	-	1	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	-	-	-
XMC4108-F64K64	-	●	●	2.52	TQFP-64	45	Cortex®-M4	80	-	●	●	2	8 ch	1	1	●	●	●	●	●	3.13 to 3.63	-40 to 125	64	●	20	1	●	●	●	-	80	2/2/9	2 ch	-	8 ch	4 ch	-	-	1x	-	-	-	1	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	-	-	-
XMC4104-Q48F64	-	●	●	2.70	VQFN-48	30	Cortex®-M4	80	-	●	●	2	8 ch	1	1	●	●	●	●	●	3.13 to 3.63	-40 to 85	64	●	20	1	●	●	●	-	80	2/2/8	2 ch	-	8 ch	4 ch	●	-	1x	-	-	-	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	1x 64 segment	8 ch		
XMC4104-Q48F128	-	●	●	2.80	VQFN-48	30	Cortex®-M4	80	-	●	●	2	8 ch	1	1	●	●	●	●	●	3.13 to 3.63	-40 to 85	128	●	20	1	●	●	●	-	80	2/2/8	2 ch	-	8 ch	4 ch	●	-	1x	-	-	-	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	1x 64 segment	8 ch		
XMC4104-Q48K64	-	●	●	2.97	VQFN-48	30	Cortex®-M4	80	-	●	●	2	8 ch	1	1	●	●	●	●	●	3.13 to 3.63	-40 to 125	64	●	20	1	●	●	●	-	80	2/2/8	2 ch	-	8 ch	4 ch	●	-	1x	-	-	-	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	1x 64 segment	8 ch		
XMC4104-Q48K128	-	●	●	3.09	VQFN-48	30	Cortex®-M4	80	-	●	●	2	8 ch	1	1	●	●	●	●	●	3.13 to 3.63	-40 to 125	128	●	20	1	●	●	●	-	80	2/2/8	2 ch	-	8 ch	4 ch	●	-	1x	-	-	-	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	1x 64 segment	8 ch		
XMC4104-F64F64	-	●	●	2.82	TQFP-64	45	Cortex®-M4	80	-	●	●	2	8 ch	1	1	●	●	●	●	●	3.13 to 3.63	-40 to 85	64	●	20	1	●	●	●	-	80	2/2/9	2 ch	-	8 ch	4 ch	●	-	1x	-	-	-	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	1x 64 segment	8 ch		
XMC4104-F64F128	-	●	●	2.92	TQFP-64	45	Cortex®-M4	80	-	●	●	2	8 ch	1	1	●	●	●	●	●	3.13 to 3.63	-40 to 85	128	●	20	1	●	●	●	-	80	2/2/9	2 ch	-	8 ch	4 ch	●	-	1x	-	-	-	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	1x 64 segment	8 ch		
XMC4104-F64K64	-	●	●	3.20	TQFP-64	45	Cortex®-M4	80	-	●	●	2	8 ch	1	1	●	●	●	●	●	3.13 to 3.63	-40 to 125	64	●	20	1	●	●	●	-	80	2/2/9	2 ch	-	8 ch	4 ch	●	-	1x	-	-	-	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	1x 64 segment	8 ch		
XMC4104-F64K128	-	●	●	3.31	TQFP-64	45	Cortex®-M4	80	-	●	●	2	8 ch	1	1	●	●	●	●	●	3.13 to 3.63	-40 to 125	128	●	20	1	●	●	●	-	80	2/2/9	2 ch	-	8 ch	4 ch	●	-	1x	-	-	-	-	-	4 ch	●	●	●	●	●	●	●	●	-	-	1x 64 segment			

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Infineon distribution partners and sales offices:

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- > India ..... 000 800 4402 951 (English)
- > USA ..... 1-866 951 9519 (English/German)
- > Other countries ..... 00\* 800 951 951 951 (English/German)
- > Direct access ..... +49 89 234-0 (interconnection fee, German/English)

\* Please note: Some countries may require you to dial a code other than "00" to access this international number, please visit [www.infineon.com/service](http://www.infineon.com/service) for your country!



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