XMC – 32-bit Industrial Microcontrollers

One Microcontroller Platform. Countless Solutions.

Contents

XMC – One Microcontroller Platform. Countless Solutions.

Infineon has combined its wealth of experience in micro-controller design for real-time critical applications with all the benefits of ARM® Cortex™-M industry-standard cores to create the XMC microcontroller family. XMC is a unique fit for applications such as motor control, power conversion, factory and building automation, renewable energy, transportation, LED lighting and home appliances.

XMC controllers integrate the most advanced peripheral set in the industry, offering highly configurable, largely autonomous and unique functionality in many cases. Other highlights include fast launch high-integrity memory and a high temperature range from -40 up to 125°C.

Naturally there is a high level of compatibility between all XMC family members, based on common peripherals and architectures. This enables countless scalable solutions. For all XMC family members, the free-of-charge development environment DAVE™ greatly supports the software development process. This unique and revolutionary software platform simplifies and shortens development time thanks to features like auto code generation and resource management as well as predefined and tested application-oriented software components, so-called DAVE™ Apps .

A wide ecosystem landscape and a broad range of evaluation boards ensure fast time-to-development, supporting everything from rapid evaluation of specific microcontroller features to development of fully integrated application solutions.
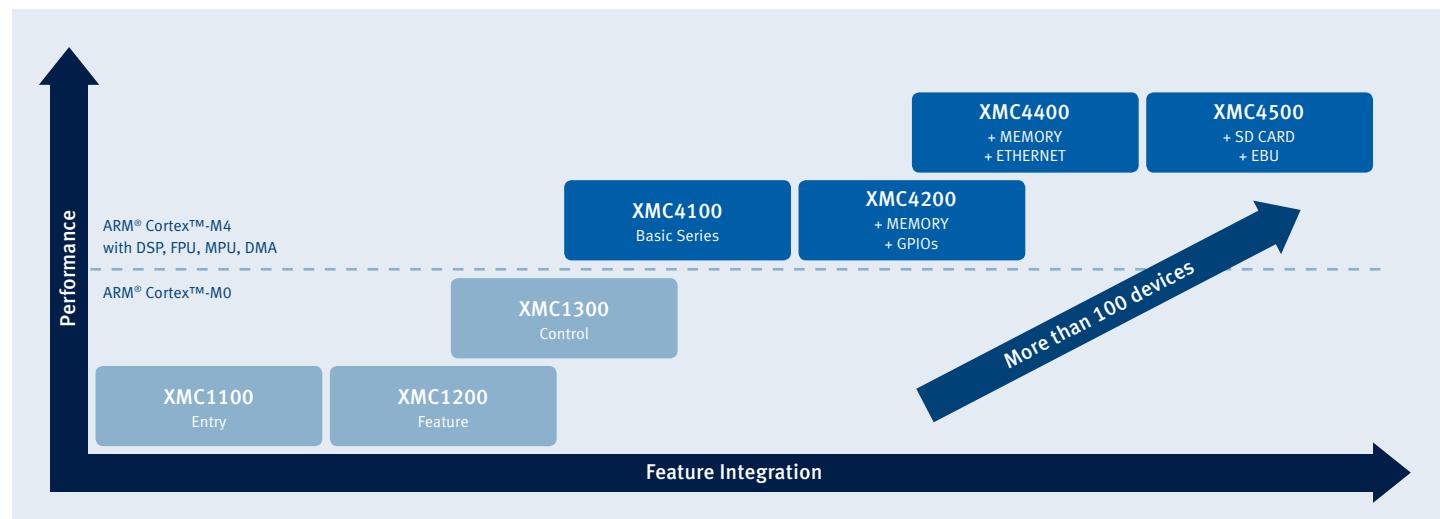
XMC4000
Advanced industrial control and connectivity

Infineon's leading-edge peripheral set, high quality, high temperature robustness and long-term availability are the main highlights of the XMC4000 ARM® Cortex™-M4-based family. Designed to tackle the imminent challenges of energy efficiency, advanced communication protocol support and fast time-to-market, this family marks a cornerstone in micro-controllers for modern industrial applications.

XMC1000
8-bit price for 32-bit power

XMC1000 is a revolution in itself. As the world's first ARM® Cortex™-M0 microcontroller manufactured using 65nm process technology, it offers current 8-bit users a new opportunity to enjoy 32-bit power, without having to compromise on price or ease of use. Special features for applications like LED lighting, low-end and consumer motor controls and power converters make this family truly unique.

Interconnection Matrix – The Real-time Architecture of XMC Microcontrollers

Concept

The Interconnection Matrix gives the user the opportunity for top-level control of interactions between modules through tailor-made event schemes. For many use cases, signals and events are already pre-configured. For easy user routing, the Event Request Unit (ERU) offers free user choices and simple logic combination. This benefits motor control by reducing SW in timer-ADC-IO interactions. The ERU enables realization of time-critical interconnections that require total real-time correctness and safety.

For example, if an application requires ADC conversions to start on timer events under specific conditions, the ERU is able to combine signals and implement gating and delay accordingly. This may involve dependence on a port pin, a time window due to a second timer or a certain event pattern.

As the ERU uses modular logic, users can select, combine, detect and memorize peripheral events and generate trigger pulses for distribution back to the system. The ERU can select input signals from up to 32 event sources and request actions via four output channels.

Benefits

- Reliable and deterministic control loops for real-time critical applications through peripheral interconnects
- High configurability and flexibility of peripheral interconnects as well as event/trigger signals
- Can be easily configured through a DAVE™ App
- A true XMC family feature, available in XMC4000 as well as XMC1000 products

XMC connection matrix features flexible peripheral interconnections for better real-time control
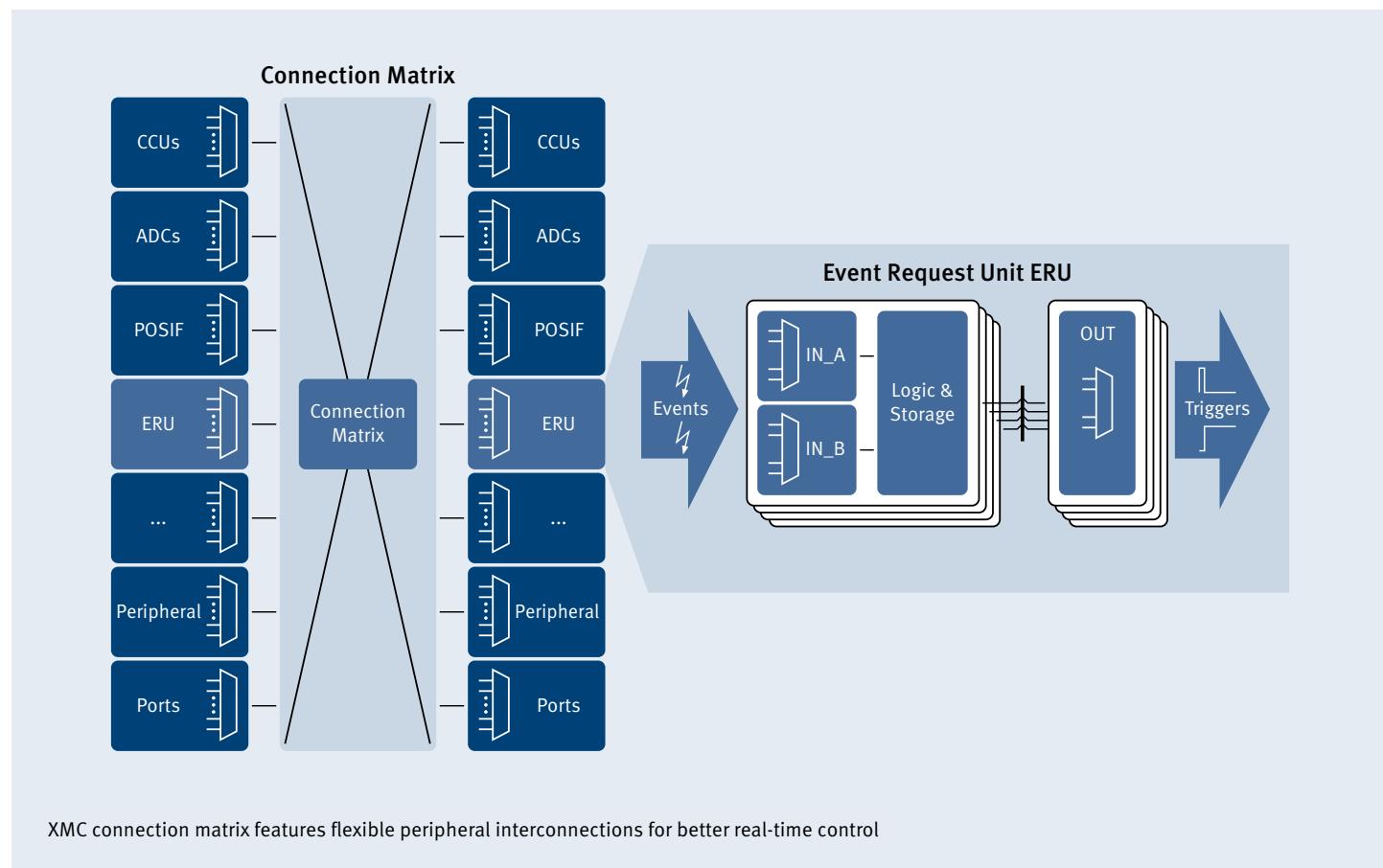
8-bit price for 32-bit power

XMC1000
ARM® Cortex™-M0 Microcontrollers

The XMC1000 product family integrates the ARM® Cortex™-M0 core into a leading-edge 65nm manufacturing process to overcome the limitations of today's 8-bit designs. XMC1000 offers current 8-bit users a new opportunity to enjoy 32-bit power, without having to compromise on price or ease of use.

Within its market segment, XMC1000 offers the largest Flash memory spectrum, scaling from 8KB to 200KB. Three different series cover a range of application fields. The XMC1100 series is designed for easy entry into the XMC world. The XMC1200 line features peripherals for LED lighting and HMI designs and the XMC1300 series addresses the real-time control needs of motor control or digital power conversion applications. Leveraging Infineon's competence as the world's largest supplier of security controllers, XMC1000 products deliver effective software IP protection functionality.

XMC1000 is a full member of the XMC family introduced at the beginning of 2012. It features similar peripherals as implemented in XMC4000 products, such as timers, A/D converters and serial communication interfaces. As is the case with XMC4000 products, the DAVE™ software development environment is available as a free download.

Target applications
- Low cost motor control
- LED lighting
- Digital power

Key features
- 32-bit ARM® Cortex™-M0, 32MHz
- 8KB to 200KB Flash memory offers best scalability at low end of market
- AES 128-bit secure loader for software IP protection
- LED color control engine
- Leading-edge XMC mixed signal and timer peripherals
- IEC 60730 class B compliant
- Peripherals for touch and LED display control
- 64MHz math co-processor for advanced control loops (CORDIC/DIVIDE)
- Extended temperature range up to 105°C
- Broad operating voltage range from 1.8 to 5.5V
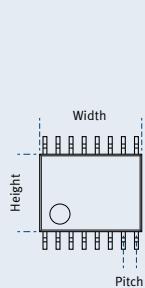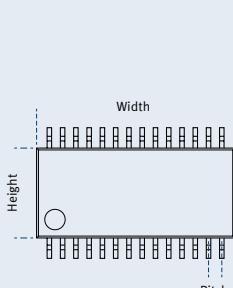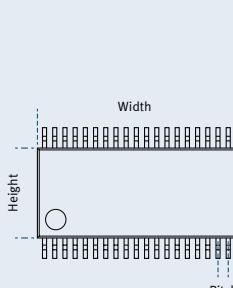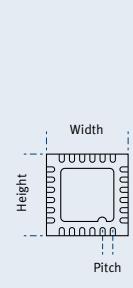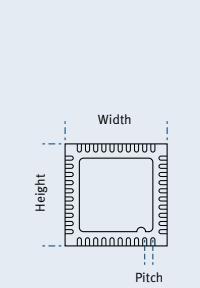
		XMC1100	XMC1200	XMC1300
System Performance	Core	ARM® Cortex™-M0		
	CPU Frequency	32MHz		
	Co-Processor	–	–	MATH[1]
	Flash Size	8-64kB	16-200kB	8-200kB
	RAM Size	16kB	16kB	16kB
Timers	POSIF	–	–	1x
	CCU4 (4ch)	1x	1x	1x
	CCU8 (4ch)	–	–	1x
Signal Processing	ADC 12-bit	1x	1x (2x S&H)	1x (2x S&H)
	Comparator	–	Up to 3x	3x
Communication	Serial Channels (UART, SPI, I²C, I²S)	2 Channels	2 Channels	2 Channels
Application Specific	Touch Control/LED Display Matrix	–	✓[2]	–
	LED Dimming & Color Control	–	✓[3]	✓[1]

[1] Not valid for all variants of this product series
[2] Only for XMC1201 sub-series
[3] Only for XMC1202 sub-series

	PG-TSSOP-16-8	PG-TSSOP-28-16	PG-TSSOP-38-9	PG-VQFN-24-19	PG-VQFN-40-13
Body	4.4 x 5 mm (H x W)	4.4 x 9.7 mm (H x W)	4.4 x 9.7 mm (H x W)	4 x 4mm (H x W)	5 x 5 mm (H x W)
Pitch	0.65 mm	0.65 mm	0.5 mm	0.5mm	0.4 mm

Advanced industrial control and connectivity

XMC4000
ARM® Cortex™-M4 Microcontrollers

The XMC4000 family marks a cornerstone in microcontroller design for real-time critical systems. With XMC4000, Infineon combines its leading-edge peripheral set with an industry-standard ARM® Cortex™-M4 core. Featuring Infineon's powerful peripheral set, configurable to specific application requirements, XMC4000 is the ultimate choice for today's industrial control solutions.

This family is designed to tackle today's challenges of improving energy efficiency, supporting advanced communication protocols and reducing time-to-market. Family members operate even in high-temperature environments of up to 125°C, granting you access to their exceptional performance in all corners of your system.
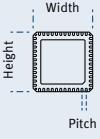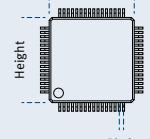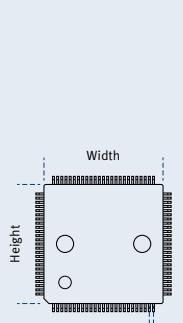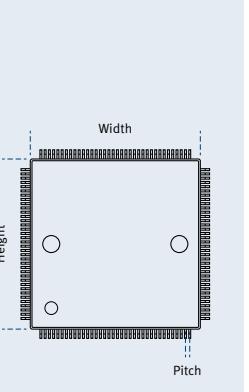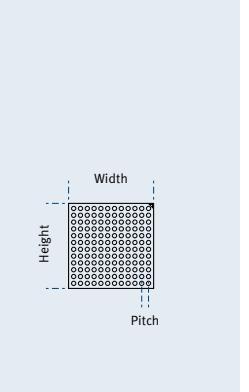
Target applications
- Motor control & automation
- Digital power
- Solar inverters

Family features
- ARM® Cortex™-M4 with floating point unit (FPU), single-cycle DSP MAC, 80–120 MHz CPU frequency
- Up to 1 MB embedded Flash with 22 ns access time and error correction unit (ECC)
- Up to 12-channel DMA
- Comprehensive set of delta-sigma demodulator, position interface, quadrature encoder interface
- 16-bit Timer/PMW system running core frequency (up to 120MHz) with emergency shutdown
- 4-channel high-resolution PWM (150 ps) (XMC4400, XMC4200, XMC4100)
- Up to 4x 12-bit ADC achieving 4 mega-samples per second (interleaved mode)
- 2x 12-bit DAC
- Up to 6 multi-functional serial interface modules configurable to Single-/Dual-/Quad-SPI, I²C, I²S, UART/LIN with Message Buffer
- Up to 160kB RAM with 4kB cache
- Up to 3x CAN 2.0 B with 64 Message Buffer
- External bus interface supporting SDRAM, SRAM, NOR/NAND Flash and memory-mapped IO devices (e.g. LCD)
- SD/MMC interface
- Touch interface & LED matrix
- Battery-backed real-time clock with calendar function and time-based or external wake-up capabilities
- Extended temperature range up to 125°C ambient temperature
- Free IEC60730 class B library approved by VDE

|		XMC4100	XMC4200	XMC4400	XMC4500
System Performance	Core	ARM® Cortex™-M4			
	CPU Frequency (at 125°C)	80MHz	80MHz	120MHz	120MHz
	Co-Processor	Floating Point Unit			
	Flash Size	128kB	256kB	512kB	1MB
	RAM Size	20kB	40kB	80kB	160kB
	Cache	1kB	1kB	4KB	4KB
Timers	POSIF	1x	1x	2x	2x
	CCU4 (4ch)	2x	2x	4x	4x
	CCU8 (4ch)	1x	1x	2x	2x
	High-resolution PWM (150ps) Channels	4x	4x	4x	–
Signal Processing	ADC 12-bit	2x	2x	4x	4x
	ΔΣ Demodulator	–	–	4x	4x
	DAC	2x	2x	2x	2x
Communication	IEEE 1588 Ethernet MAC	–	–	1x	1x
	USB	FS DEV	FS DEV	FS OTG	FS OTG
	SDIO/SD/MMC	–	–	–	✓
	Serial Channels (UART, SPI, I²C, I²S)	4x	4x	4x	6x
	Ext. Memory I/F	–	–	–	✓
	CAN	2x	2x	2x	3x
Application Specific	Touch Control/LED Display Matrix	✓	✓	✓	✓

PG-VQFN-48-53		**PG-LQFP-64-19**		**PG-LQFP-100-11**		**PG-LQFP-144-18**		**PG-LFBGA-144-10**	
Body	7 x 7 mm (H x W)	**Body**	10 x 10 mm (H x W)	**Body**	14 x 14 mm (H x W)	**Body**	20 x 20 mm (H x W)	**Body**	10 x 10 mm (H x W)
Pitch	0.5 mm	**Pitch**	0.5 mm	**Pitch**	0.5 mm	**Pitch**	0.5mm	**Pitch**	0.8 mm

Digital Power Conversion

Digital solutions are making clear inroads into the well-established analog domain. This is not surprising considering the benefits programmable microcontrollers bring to power supply systems. These include:

- Greater flexibility, enabling more cost-efficient platform solutions (e.g. variable output voltage, various operation modes for self-test, commissioning, regional specifics, etc.)
- System monitoring and network connectivity/ maintenance (e.g. hot swap or load balancing)

- Better and more flexible control algorithms. This enables high efficiency across a broad range of loads to meet TITANIUM-class efficiency standards

The application example below shows a 300W to 3KW digitally controlled power supply used for server racks. Microcontrollers are used for PFC, LLC control with variable output, load balancing and system status monitoring and reporting.
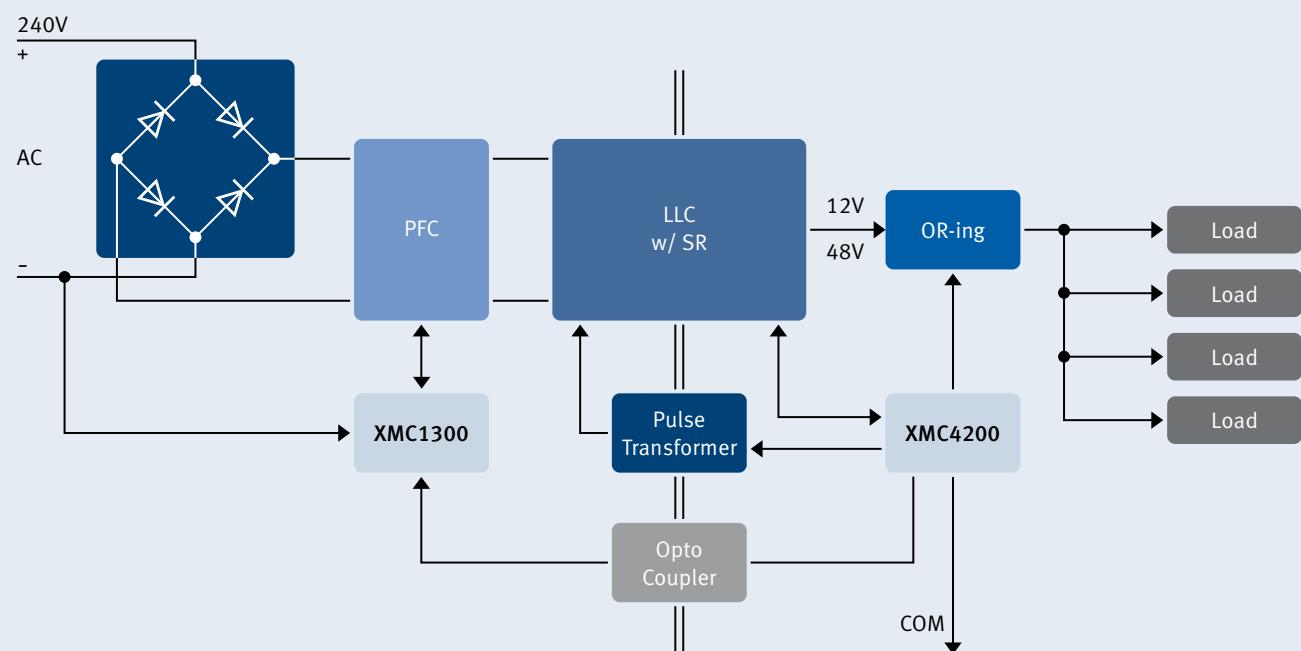
300W server SMPS with XMC for digital control

Precise and stable output voltage with 150ps High Resolution PWM (HRPWM)

Vout

Ripple due to control instability

Stepwidth 8.3ns

PWM

Stable output voltage

Stepwidth 150ps
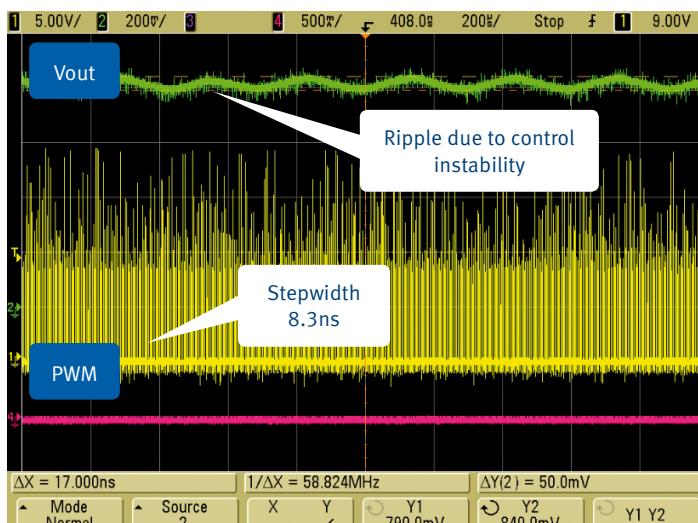
Ripple on output voltage measured on 280 kHz buck converter w/o HRPWM
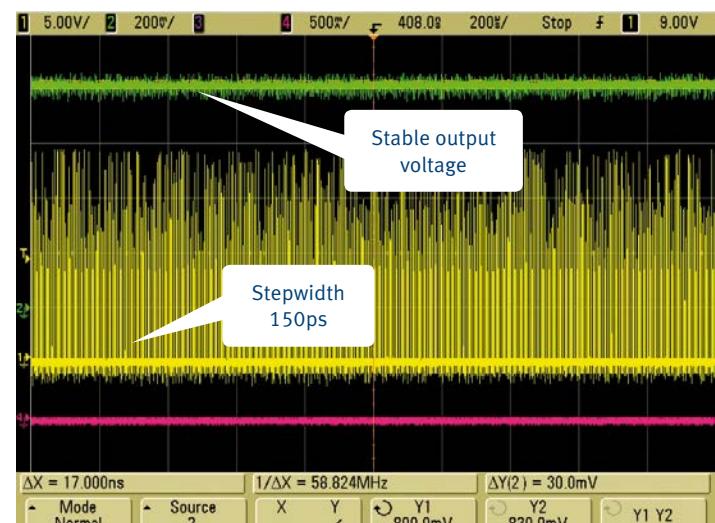
Stable output voltage measured on 280 kHz buck converter with HRPWM of XMC4400

XMC key features

- 4-channel 150ps HRPWM timer (XMC4000)
- Rich connectivity: 2x CAN nodes, 4-channel serial COM (configurable to SPI, I²C, I²S, UART), USB FS
- Up to 4x 12-bit ADC with 70ns sample time ensure fast reaction time

- Extended temperature range up to 125°C ambient temperature (XMC4000)
- Analog comparators with only 3mV input offset voltage and 30ns propagation delay (XMC1000)

Industrial Motor Control

Motor control in automation

Infineon XMC4000 microcontrollers are best suited to industrial motor control applications such as hyphenate AC and servo drives as shown here in a CNC machine. The ARM Cortex™-M4 with FPU offers the computing performance to run cascade control for the electrical drive as well as communication stacks to the field level to PLCs and other drives. Ready-to-start software support is provided with the DAVE™ Apps library for motor control and communication.

XMC key features

- Timer/PWM (CCU4/CCU8) - running up to core frequency, shadow register transfer, external input for fault control, binary and floating pre scaler, concatenation 32, 48, 64-bit width
- MPU for user task and privilege task separation

- Interconnect Matrix - peripheral interconnection and process parallelization with CPU involvement
- Small packages and up to 125°C operating temperature
- Free IEC60730 LIB approved by VDE
- Quadrature encoder with POSIF interface and Capture Compare Unit CCU4
- Resolver with carrier pattern generator and ADC
- 3-phase inverter with Capture Compare Unit CCU8
- In-phase current measurement via galvanic isolated delta-sigma demodulator (DSD)
- Sensor calibration, offset and gain adjustment with DAC
- Active PFC with Capture Compare Unit CCU4 and ADC
- Fieldbus interface with Ethernet MAC with IEEE1588 time stamping and/or CAN
- External memory extension for processing data image and code with external bus unit (EBU)
- Operator interface with USB 2.0 OTG and/or SD/MMC interface

Motor control and connectivity for a CNC machine, featured with XMC4500 microcontroller
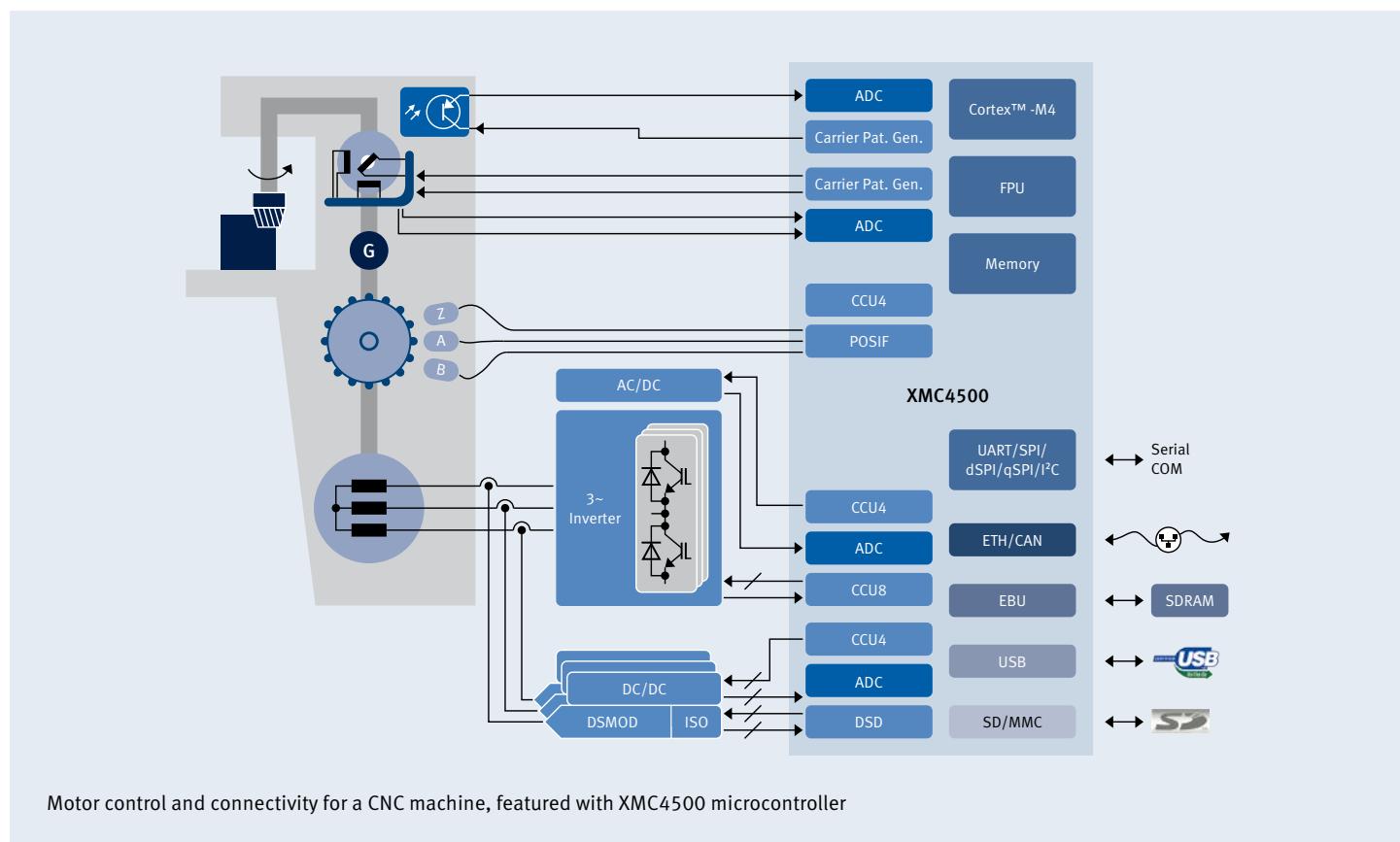
Low-cost motor control

Infineon XMC1000 microcontrollers are best suited to fans, pumps and electrical drives in power tools and white goods. The ARM Cortex™-M0 together with the math co-processor sets a new benchmark for CPU power in this price/performance class. Even the most sophisticated motor control systems including sensor and sensorless field oriented control can be realized easily with enough scope for serial communication with a network of other control devices and a human machine interface. Development assistance is provided by the DAVE™ Apps library for motor control and communication.

XMC key features
- Hall interface with POSIF interface and Capture Compare Unit CCU4
- 3-phase inverter with Capture Compare Unit CCU8
- Active PFC with Capture Compare Unit CCU4 and ADC
- Serial communication with universal serial interface channel USIC
- Timer/PWM (CCU4/CCU8) - running up to core frequency, shadow register transfer, external input for fault control, binary and floating pre scaler, concatenation 32, 48, 64-bit width

3-phase fan motorcontrolled with XMC1300 microcontroller
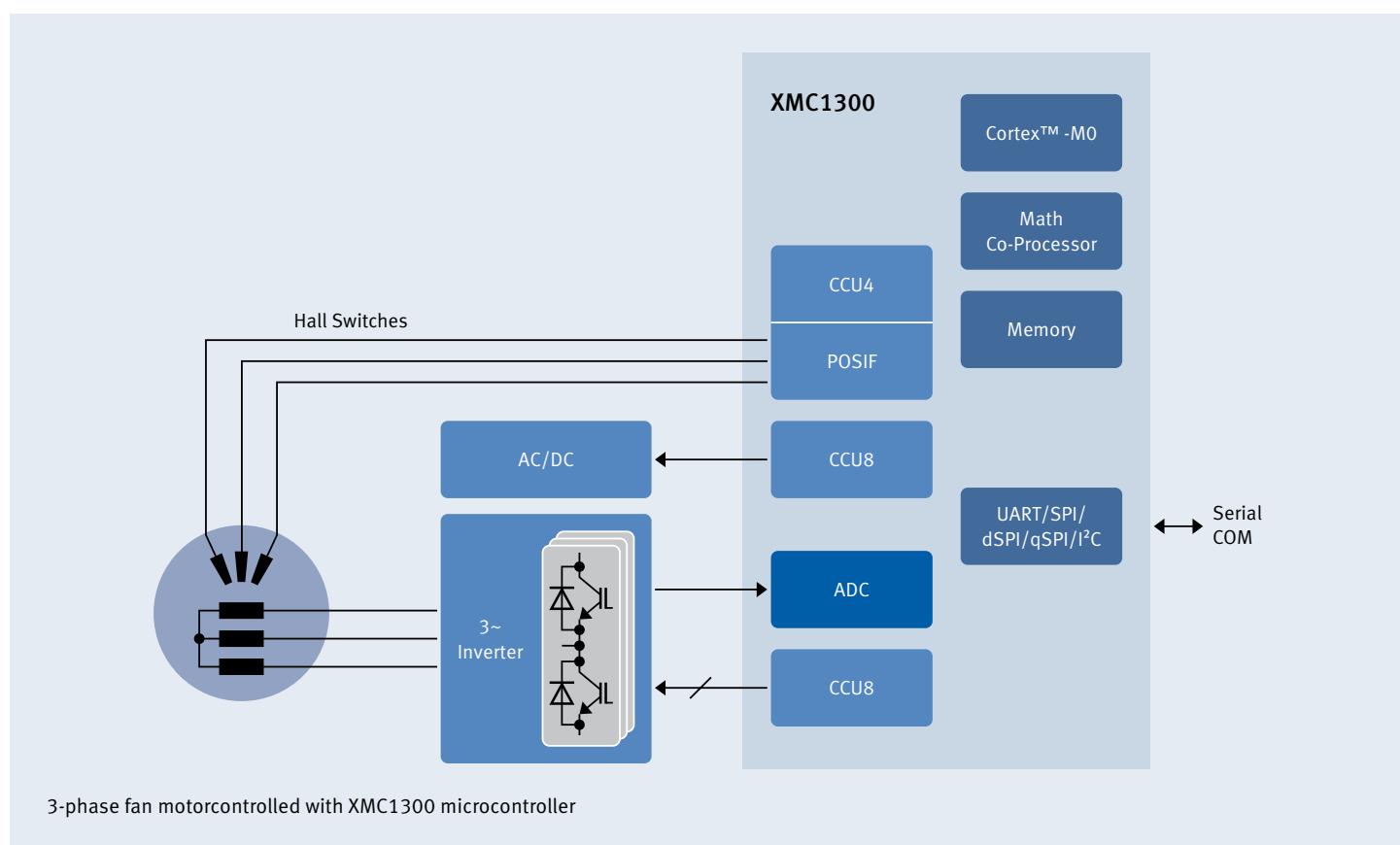
Smart Lighting

The term "smart lighting" covers everything from the use of energy-efficient and high-endurance LED technology through network connectivity to light quality and color mixing.

With the Brightness and Color Control Unit (BCCU), XMC1000 products offer a unique module to automatically control 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.

XMC1000 products can be used as DALI or DMX controllers and therefore fit standard lighting communication protocols. DAVE™ Apps are available for both standards.
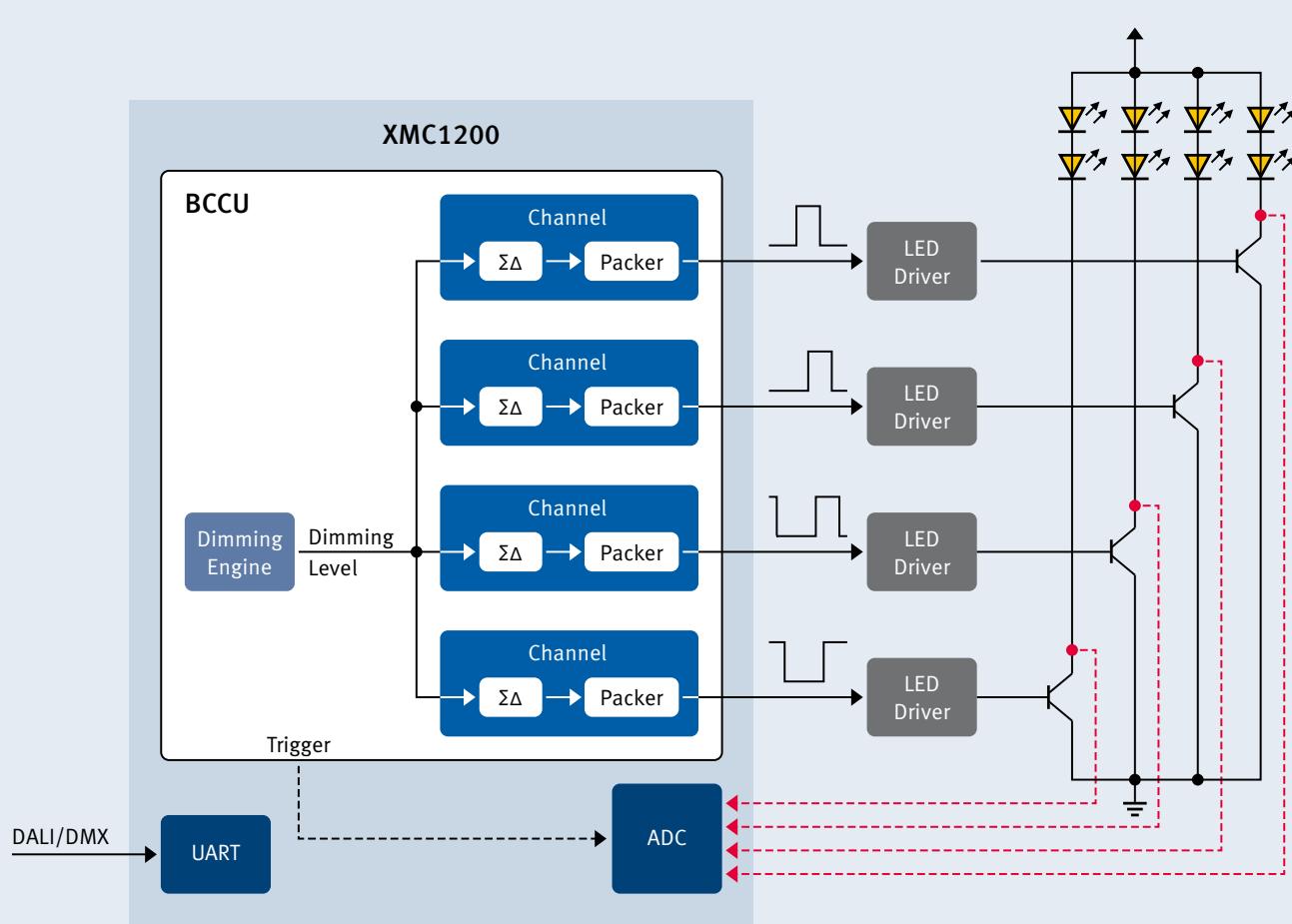
XMC1200 used as DALI/DMX slave and LED dimming controller with the BCCU

Superior flicker control thanks to the Brightness & Color Control Unit (BCCU)
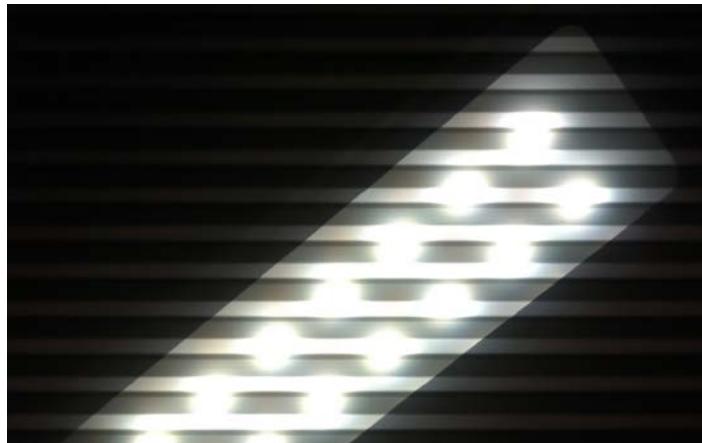
2 kHz flicker with a commercial stand-alone ballast detected by an HD camera. Although not visible, it affects the brain (below 3 kHz threshold).

Infineon solution with XMC1000. Flickering (40–50 kHz) is neither visible nor perceptible and only barely detectable by HD cameras.

XMC key features

- Automatic high-frequency brightness modulation based on the ΣΔ principle enable 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

- An integrated packer function ensures controlled switching rates for a wide range of high-power LED drivers
- Through the ERU connection matrix, the BCCU can for example trigger the ADC for synchronized feedback loops

Efficient Tools, Software and Services for the Complete Development Cycle
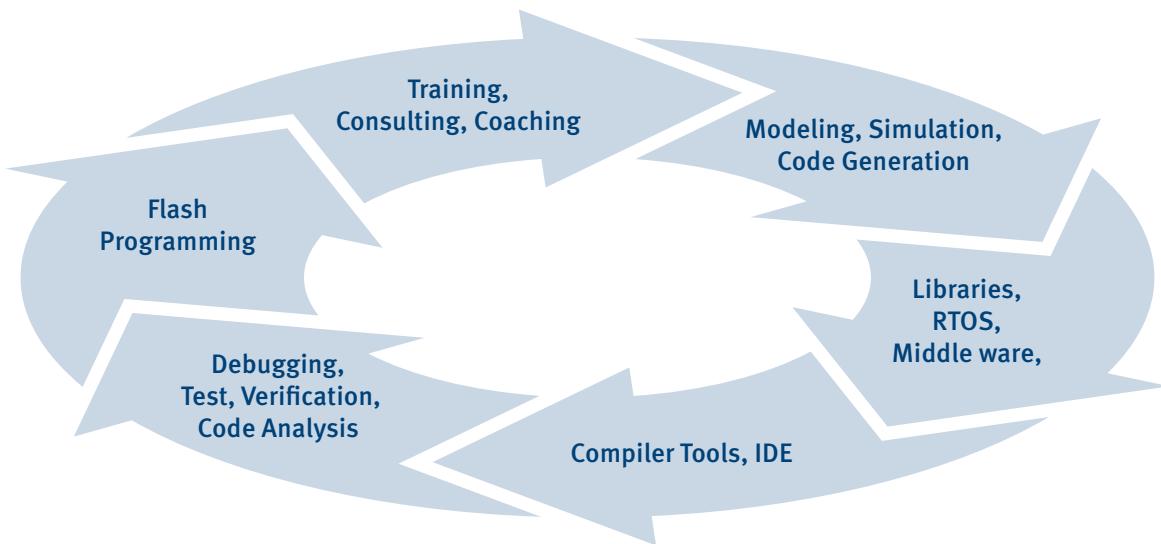
A complete set of development tools, ready-to-use software solutions and supporting services are available for XMC microcontrollers from Infineon and various third-party tool and software vendors. These tools and software products support the entire development cycle to ensure a highly efficient development process.

Training and consultant services
A complete set of documentation, tutorials, kits and starter-ware is available for XMC microcontrollers. In addition, XMC-specific training, coaching and consultant services are provided.

Model-based development
Model-based development methodologies are becoming more and more common. For example, Matlab/Simulink can save development and verification time for complex control algorithms. Similarly, UML can be used to manage complex software architectures more efficiently. A variety of tools and support functions are available for XMC microcontrollers, in particular in conjunction with the ARM® Cortex cores.

Application-specific libraries to abstract the used hardware

An efficient hardware abstraction layer can greatly accelerate software development time. With DAVE™ Apps, Infineon provides a highly innovative method to generate a tailored application-specific set of low-level drivers as well as standard and application-specific middleware.

RTOS and standard middleware solutions

Commonly used real-time operating systems (RTOS) and standard middleware solutions like file systems, graphic libraries as well as communication stacks for Ethernet, USB and CAN are often used to simplify software development. All major software vendors provide suitable solutions for the XMC microcontrollers, this includes also open source solutions.

C-compiler tools and IDE

The compiler tools consist of the C-compiler plus an assembler, linker and locator to translate the source code into binary code. These tools usually provide advanced optimization options to ensure a small code size and fast execution. The compiler tools are usually shipped in an Integrated Development Environment (IDE) including a Flash loader, a debugger and other utilities. The XMC family is supported by all major vendors. Tools include CMSIS device support packages for header files, startup code, linker script and register view in the debugger.

Debug, verification and analysis tools

With growing demands on software quality, tools for unit testing and static code analysis are becoming increasingly popular. Professional debuggers with trace, RTOS awareness and data analysis capabilities are very useful to identify sporadic or hidden problems or to carry out code coverage tests and comprehensive runtime analyses.

Flash programming

Inline programming (i.e. in the production line) is very efficient and has become very popular. For the XMC microcontroller, both free-of-charge solutions and very attractive commercial solutions are available. Production programmers like gang programmers are also widely used. Our partners can provide all required solutions.

Board design tools

In addition to the tools, software components and methodologies used to manage the software development cycle, support tools are also available for hardware board design with XMC microcontrollers. These include XMC-specific package libraries for PCB design tools as well as board tests based on boundary scan descriptions and IBIS models.

For more information and free downloads, visit www.infineon.com/xmc-dev

Selection-Matrix for Tools, Software and Services

|		Modeling, Simulation, Code Generation	RTOS, Middleware, Libraries	Compiler Tools, IDE	Debugging, Test, Verification	Flash Programming	Training, Consultant	PCB Design and Test	Evaluation Boards
A	ARM/KEIL		•	•	•				
	Altium			•	•			•	
	Atollic			•	•				
B	Bluewind						•		
C	CadSoft							•	
	CMX Systems		•						
	Codesys		•						
E	emtas		•						
	Expresslogic		•						
F	FreeRTOS		•						
G	Goepel							•	
H	HCC embedded		•						
	HI-LO Systems					•			
	HITEX				•	•	•		•
I	IAR System			•	•				
	Interniche		•						
	Infineon	•	•	•				•	•
	iSystem				•				
L	Lauterbach				•				
M	Mathworks	•							
	Micrium		•						
	MicroConsult						•		
P	Parasoft				•				
	port		•						
	PLS Development Tools				•				
R	Rowley			•	•				
S	SEGGER			•	•	•			
	SiSy	•		•	•				
	SevenStax		•						
T	Thesycon		•						
W	Willert	•						•	
V	Verifysoft				•				
X	XELTEK					•			

More information

www.infineon.com/xmc

www.infineon.com/dave

www.infineon.com/xmc-dev

www.infineon.com/iec60730
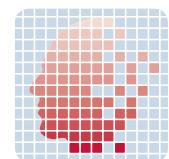
DAVE™ Teams Up With Well-Established ARM® Ecosystem

With DAVE™, software developers can generate a tailored software library to efficiently use the innovative set of peripherals of the XMC microcontrollers. DAVE™ is a free and complete development platform based on Eclipse CDT including the ARM GNU compiler, a free debugger with Flash loader and the data visualization tool xSPY.
The generated code can be also used in third party tools such as Atollic, IAR, Keil MDK, Rowley and TASKING.

DAVE™ comes with an extensive and powerful library of applications – DAVE™ Apps. DAVE™ Apps are object-oriented software building blocks. A DAVE™ App represents an application use case such as the generation of a PWM signal, measurement of analog signals or various types of data communication. Even middle ware components like communication stacks, file system or specific target applications like motor control or lighting are available as DAVE™ Apps.

Service Apps
- Clock, Reset
- Power Mgmt.
- Watchdog
- DMA
- NVIC/Exception
- I/O, EBU, Flash
- Debug Log
- …

Specific Middleware Apps
- Motor control
- Lighting
- Power conversion
- HMI

Standard Middleware Apps
- USB stack, and drivers
- TCP/IP stack
- SD/MMC, file system
- GUI lib plus LCD driver
- RTOS

Peripheral Apps
- PWM, Capture, Timer, Counter
- UART, SPI, I²C CAN, …
- ADC, DAC, …
- POSIF, …

Select a DAVE™ App from a large library of more than 170 Apps

A major innovation highlight of DAVE™ is the resource solver. While the user selects and configures the DAVE™ Apps on a logical level, the resources solver ensures that the necessary chip resources are properly assigned and mapped. Resource mapping can be done fully automatically by the solver considering the required inter-chip connectivity and user defined constraints like manually assigned pins.
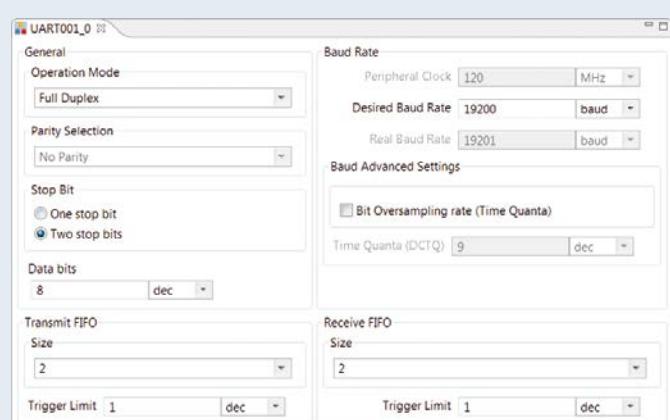
Configure the DAVE™ App using a graphical user interface

The generated code based on the selected and configured DAVE™ Apps is in fact a software library accessible as fully documented and human readable source code that provides all required functions (APIs) to build the final application. With DAVE™, software developers are free to concentrate on differentiating their IP leaving the time consuming low-level and middle ware work to DAVE™ Apps.

```
int main(void)
{
    //Initialization of the HW used by DAVE
    DAVE_Init();
    // Send data via UART channel defined in handle
    UART001_WriteData(UART001_Handle0,data);
    // Read data via UART channel defined in handle
    Readdata = UART001_ReadData(UART001_Handle0);
```

Complete your application using the APIs or macros from the generated library.

For more information and free downloads, visit www.infineon.com/dave

XMC Kits

XMC Kits bundle complete evaluation hardware, including on-board debugger, for XMC Microcontrollers with the complete and free toolchain DAVE™.

To address different evaluation purposes and requirements, XMC Kits come in various price performance classes from simple getting started evaluation up to application specific embedded solutions.

For more information and free downloads, visit www.infineon.com/xmc-dev

For these different purposes a wide range of DAVE™ Apps support a quick start into embedded programming with XMC Microcontrollers.

Getting started with easy-to-use evaluation kits

Our "getting started" XMC microcontroller evaluation kits, including the XMC1100/1200/1300 Boot Kit and the XMC4500 Relax/Relax Lite Kit, are the most cost-effective way to experience XMC1000 and XMC4000 devices.

All kits are equipped with a detachable on-board debugger and are fully supported by DAVE™ Apps. A demo program provides an introduction to the rich feature set of the XMC devices.
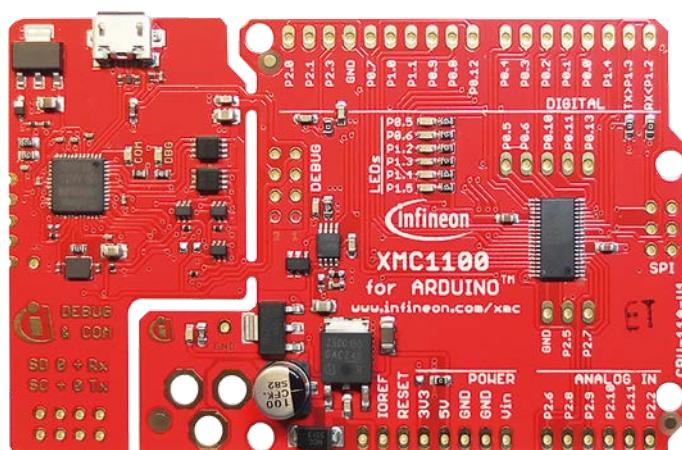
Example: XMC1100 Boot Kit with XMC1100 microcontroller

Advanced evaluation kits

The comprehensive XMC4000 application kit in hexagon shape is equipped with the corresponding XMC4000 microcontroller and an on-board debugger. Furthermore, the kits' functionality can be extended by additional satellite cards, for example the communication satellite card for XMC4000 controllers with Ethernet jack and PHY as well as RS485 and CAN interfaces.
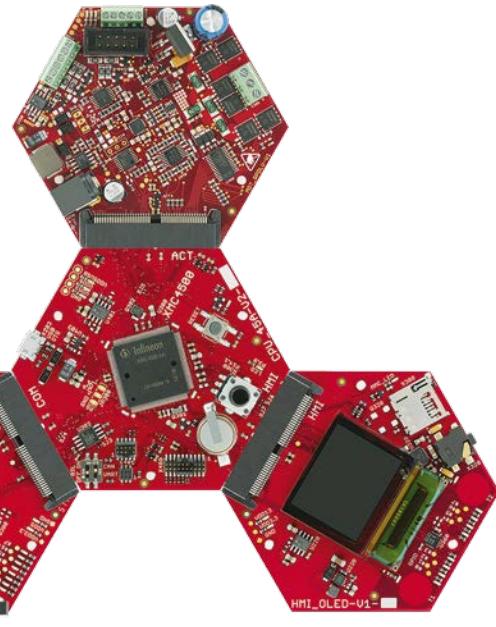
Example: XMC4500 automation kit with XMC4500 microcontroller, human machine interface-, motor control- and communication satellite card

Application-specific kits

Need to focus on a specific application with the full complement of ready-to-run hardware and software? Then the application-specifc XMC microcontroller kits are the perfect choice. Infineon has put together kits for motor control, switched-mode power supply and LED lighting complete with all hardware, dedicated software tools and a DAVE™ Apps library to kick-start your development work.
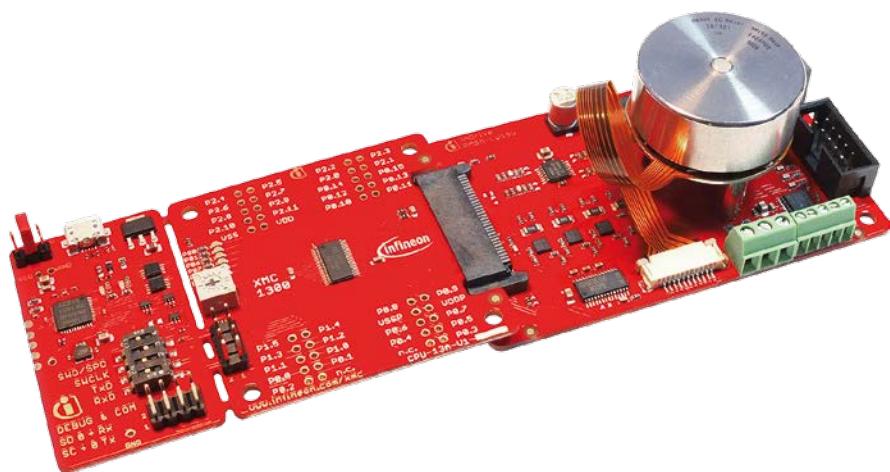
Example: XMC1000 motor control application kit with XMC1300 microcontroller, EiceDRIVER™ gate driver and N-Channel OptiMOS™ power transistors from Infineon plus a 3-phase brushless DC motor from Maxon

Portfolio Overview

| Memory (Flash, RAM and Cache)	TSSOP-16 4.4 x 5 mm 0.65mm pitch	VQFN-24 4 x 4 mm 0.5mm pitch	TSSOP-28 4.4 x 9.7 mm 0.65mm pitch	TSSOP-38 4.4 x 9.7 mm 0.5mm pitch	VQFN-40 5 x 5 mm 0.4mm pitch	VQFN-48 7 x 7 mm 0.5mm pitch	LQFP-64 10 x 10 mm 0.5mm pitch	LQFP-100 14 x 14 mm 0.5mm pitch	LFBGA-144 10 x 10 mm 0.8mm pitch	LQFP-144 20 x 20 mm 0.5mm pitch
1MB								XMC4500-F100_1024	XMC4500-E144_1024	XMC4500-F144_1024
768KB								XMC4500-F100_768 XMC4502-F100_768		XMC4500-F144_768
512KB							XMC4400-F64_512	XMC4504-F100_512 XMC4400-F100_512		XMC4504-F144_512
256KB						XMC4200-Q48_256	XMC4400-F64_256 XMC4402-F64_256 XMC4200-F64_256	XMC4402-F100_256 XMC4400-F100_256		
200KB				XMC1302-T038_0200 XMC1201-T038_0200	XMC1201-Q040_0200					
128KB				XMC1302-T038_0128 XMC1201-T038_0128	XMC1302-Q040_128 XMC1201-Q040_128	XMC4100-Q48_128 XMC4104-Q48_128	XMC4100-F64_128 XMC4104-F64_128			
64KB	XMC1100-T016F0064	XMC1302-Q024_0064 XMC1100-Q024_0064		XMC1302-T038_0064 XMC1201-T038_0064 XMC1100-T038_0064	XMC1302-Q040_0064 XMC1201-Q040_0064 XMC1100-Q040_0064	XMC4104-Q48_64 XMC4108-Q48_64	XMC4104-F64_64			
32KB	XMC1302-T016X0032 XMC1202-T016X0032 XMC1100-T016F0032	XMC1302-Q024_0032 XMC1302-Q024_0032 XMC1202-Q024_0032 XMC1100-Q024_0032	XMC1202-T028_0032	XMC1302-T038_0032 XMC1301-T038_0032 XMC1201-T038_0032 XMC1100-T038_0032	XMC1302-Q040_0032 XMC1301-Q040_0032 XMC1202-Q040_0032 XMC1201-Q040_0032 XMC1100-Q040_0032					
16KB	XMC1301-T016X0016 XMC1302-T016X0016 XMC1202-T016X0016 XMC1100-T016F0016	XMC1301-Q024_0016 XMC1302-Q024_0016 XMC1202-Q024_0016 XMC1100-Q024_0016	XMC1202-T028_0016	XMC1302-T038_0016 XMC1201-T038_0016 XMC1100-T038F0016	XMC1301-Q040_0016 XMC1302-Q040_0016 XMC1201-Q040_0016 XMC1100-Q040F0016					
8KB	XMC1301-T016_0008 XMC1302-T016_0008 XMC1100-T016_0008	XMC1301-Q024_0008 XMC1100-Q024_0008		XMC1301-T038_0008	XMC1301-Q040_0008					

PIN-Count / Package

XMC1000 Family = ARM® Cortex™-M0

XMC4000 Family = ARM® Cortex™-M4 with built in DSP and FPU
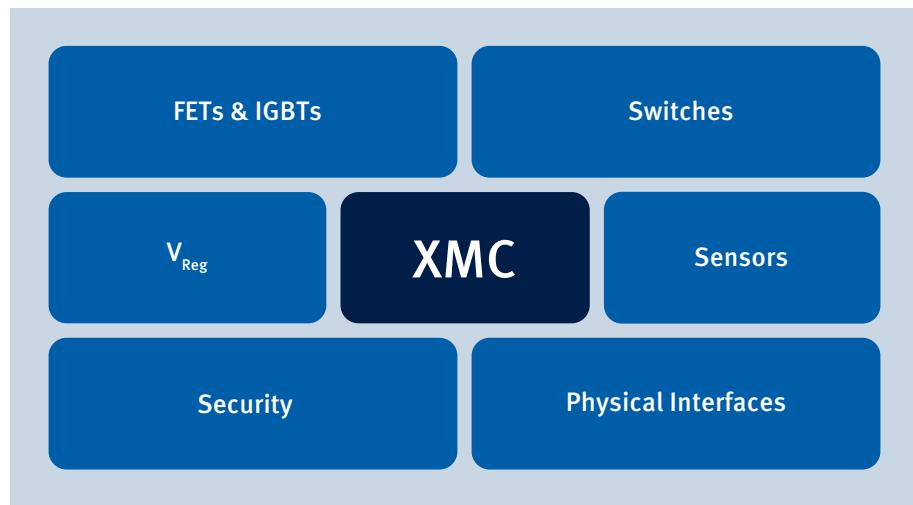
32-Bit Microcontroller

XMC4000 Microcontroller for Industrial and Multi Market powered by ARM® Cortex™-M4 Processor

| Product Type	Max Clock Frequency (MHz)	Program Memory (KByte)	SRAM (incl. Cache) (KByte)	Co-Processor [1]	Digital I/O Lines	Number of ADC Channels	Timed IO Channels (PWM, CAP-COM, GPTA)	External Bus Interface	CAN Nodes	Ethernet	Communication Interfaces [2]	Temperature Ranges [3]	Packages	Additional Features / Remarks
XMC4100 Series														
XMC4100-Q48	80	128	20+1	FPU	21	8	21	-	2	-	4xUSIC, USB FS DEV	F,K	PG-VQFN-48	EVR, POSIF, LETDS, 12-bit 2 channel DAC
XMC4104-Q48	80	64-128	20+1	FPU	21	8	21	-	1	-	4xUSIC	F,K	PG-VQFN-48	EVR, POSIF, 12-bit 2 channel DAC
XMC4108-Q48	80	64	20+1	FPU	35	9	31	-	1	-	4xUSIC	K	PG-VQFN-48	EVR, POSIF, 12-bit 2 channel DAC
XMC4100-F64	80	128	20+1	FPU	35	9	31	-	2	-	4xUSIC, USB FS DEV	F,K	PG-LQFP-64	EVR, POSIF, LETDS, 12-bit 2 channel DAC
XMC4104-F64	80	64-128	20+1	FPU	35	9	31	-	0	-	4xUSIC	F,K	PG-LQFP-64	EVR, POSIF, LETDS, 12-bit 2 channel DAC
XMC4200 Series														
XMC4200-Q48	80	256	40+1	FPU	21	8	21	-	2	-	4x USIC, USB FS DEV	F,K	PG-VQFN-48	EVR, POSIF, LETDS, 12-bit 2 channel DAC
XMC4200-F64	80	256	40+1	FPU	35	9	31	-	2	-	4x USIC, USB FS DEV	F,K	PG-LQFP-64	EVR, POSIF, LETDS, 12-bit 2 channel DAC
XMC4400 Series														
XMC4400-F64	120	256-512	80+4	FPU	31	9	29	-	2	✓	4xUSIC, USB FS OTG	F,K	PG-LQFP-64	EVR, POSIF, LETDS, 12-bit 2 channel DAC
XMC4402-F64	120	256	80+4	FPU	31	9	29	-	2	-	4xUSIC, USB FS OTG	F,K	PG-LQFP-64	EVR, POSIF, LETDS, 12-bit 2 channel DAC
XMC4400-F100	120	256-512	80+4	FPU	55	18	46	-	2	✓	4xUSIC, USB FS OTG	F,K	PG-LQFP-100	EVR, POSIF, LETDS, 12-bit 2 channel DAC
XMC4402-F100	120	256	80+4	FPU	55	18	46	-	2	-	4xUSIC, USB FS OTG	F,K	PG-LQFP-100	EVR, POSIF, LETDS, 12-bit 2 channel DAC
XMC4500 Series														
XMC4500 F100	120	768-1024	160+4	FPU	55	18	44	-	3	✓	6xUSIC, USB FS OTG, SDIO/SD/MMC	F,K	PG-LQFP-100	EVR, POSIF, LETDS, 12-bit 2 channel DAC
XMC4502-F100	120	768	160+4	FPU	55	18	44	-	3	-	6xUSIC, USB FS OTG, SDIO/SD/MMC	F,K	PG-LQFP-100	EVR, POSIF, LETDS, 12-bit 2 channel DAC
XMC4504-F100	120	512	160+4	FPU	55	18	44	-	0	-	6xUSIC, USB FS OTG, SDIO/SD/MMC	F,K	PG-LQFP-100	EVR, POSIF, LETDS, 12-bit 2 channel DAC
XMC4500-E144	120	1024	160+4	FPU	91	26	74	✓	3	✓	6xUSIC, USB FS OTG, SDIO/SD/MMC	F,X	PG-LFBGA-144	EVR, POSIF, LETDS, 12-bit 2 channel DAC
XMC4500-F144	120	1024	160+4	FPU	91	26	74	✓	3	✓	6xUSIC, USB FS OTG, SDIO/SD/MMC	F,K	PG-LQFP-144	EVR, POSIF, LETDS, 12-bit 2 channel DAC
XMC4500-F144	120	768	160+4	FPU	91	26	74	-	3	✓	6xUSIC, USB FS OTG, SDIO/SD/MMC	F,K	PG-LQFP-144	EVR, POSIF, LETDS, 12-bit 2 channel DAC
XMC4504-F144	120	512	160+4	FPU	91	26	74	✓	0	-	6xUSIC, USB FS OTG, SDIO/SD/MMC	F,K	PG-LQFP-144	EVR, POSIF, LETDS, 12-bit 2 channel DAC
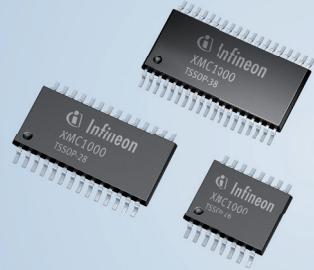
32-Bit Microcontroller

XMC1000 Microcontroller for Industrial and Multi Market powered by ARM® Cortex™-M0 Processor

Product Type	Max Clock Frequency (MHz)	Program Memory (KByte)	SRAM (incl. Cache) (KByte)	Co-Processor [1]	Digital I/O Lines	Number of ADC Channels	Timed IO Channels (PWM, CAP-COM, GPTA)	External Bus Interface	CAN Nodes	Ethernet	Communication Interfaces [2]	Temperature Ranges [3]	Packages	Additional Features / Remarks
XMC1100 Series														
XMC1100-T016	32	8-64	16	-	14	6	4	-	-	-	2xUSIC	F,X	PG-TSSOP-16	
XMC1100-Q024	32	8-64	16	-	22	8	4	-	-	-	2xUSIC	F	PG-VQFN-24	
XMC1100-T038	32	16-64	16	-	34	12	4	-	-	-	2xUSIC	F,X	PG-TSSOP-38	
XMC1100-Q040	32	16-64	16	-	35	12	4	-	-	-	2xUSIC	F	PG-VQFN-40	
XMC1200 Series														
XMC1202-T016	32	16-32	16	-	14	6	11	-	-	-	2xUSIC	X	PG-TSSOP-16	2x Comparator, BCCU
XMC1202-Q024	32	16-32	16	-	22	8	13	-	-	-	2xUSIC	X	PG-VQFN-24	3x Comparator, BCCU
XMC1202-T028	32	16-32	16	-	26	10	13	-	-	-	2xUSIC	X	PG-TSSOP-28	3x Comparator, BCCU
XMC1201-T038	32	16-200	16	-	34	12	6	-	-	-	2xUSIC	F	PG-TSSOP-38	LEDTS
XMC1201-Q040	32	16-200	16	-	35	12	6	-	-	-	2xUSIC	F	PG-VQFN-40	LEDTS
XMC1202-Q040	32	16-32	16	-	35	12	13	-	-	-	2xUSIC	X	PG-VQFN-40	3x Comparator, BCCU
XMC1300 Series														
XMC1301-T016	32	8-16	16	-	14	6	12	-	-	-	2xUSIC	F,X	PG-TSSOP-16	2x Comparator, CCU8 special purpose timer, POSIF
XMC1302-T016	32	8-32	16	MATH	14	6	12	-	-	-	2xUSIC	X	PG-TSSOP-16	2x Comparator, CCU8 special purpose timer, POSIF, BCCU
XMC1301-Q024	32	8-16	16	-	22	8	20	-	-	-	2xUSIC	F	PG-VQFN-24	3x Comparator, CCU8 special purpose timer, POSIF
XMC1302-Q024	32	16-64	16	MATH	22	8	20	-	-	-	2xUSIC	F,X	PG-VQFN-24	3x Comparator, CCU8 special purpose timer, POSIF, BCCU
XMC1301-T038	32	8-32	16	-	34	12	20	-	-	-	2xUSIC	F,X	PG-TSSOP-38	3x Comparator, CCU8 special purpose timer, POSIF
XMC1302-T038	32	16-200	16	MATH	33	12	29	-	-	-	2xUSIC	X	PG-TSSOP-38	3x Comparator, CCU8 special purpose timer, POSIF, BCCU
XMC1301-Q040	32	8-32	16	-	35	12	29	-	-	-	2xUSIC	F	PG-VQFN-40	3x Comparator, CCU8 special purpose timer, POSIF
XMC1302-Q040	32	16-128	16	MATH	35	12	29	-	-	-	2xUSIC	X	PG-VQFN-40	3x Comparator, CCU8 special purpose timer, POSIF, BCCU

[1] **VC** = Vector Computer (MDU + CORDIC), **MDU** = Multiply Divide Unit, **MAC** = Multiply-Accumulate-Unit (DSP), **FPU** = Floating Point Unit, **PCP** = Peripheral Control Processor

[2] **I2C** = Inter-Integrated Circuit, **USART** = Universal Synchronous Asynchronous Receiver Transmitter, **UART** = Universal Asynchronous Receiver Transmitter, **SSC** = Synchronous Serial Channel, **ASC** = Asynchronous Serial Channel, **MLI** = Micro Link Interface, **MSC** = Micro Second Channel, **LIN** = Local Interconnect Network, **BSL** = Boot Strap Loader, **SDLM** = Serial Data Link Module, **USIC** = Universal Serial Interface Channel (ASC, SSC, LIN, I2C, I2S)

[3] Ambient Temperature Range: B = 0 . 70ºC, F = -40 . 85ºC, X = -40 . 105ºC, K = -40 . 125ºC, A = -40 . 140ºC, L = -40 . 150ºC, H = -40 . 110ºC

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