XMC™ – Introduction to targeted application segments

XMC™ Microcontrollers

April 2016

Agenda

1. XMC™ Portfolio from Application perspective
2. XMC™ in LED Lighting
3. XMC™ in Motor Control
4. XMC™ in Power Conversion
5. XMC™ in Industrial Automation

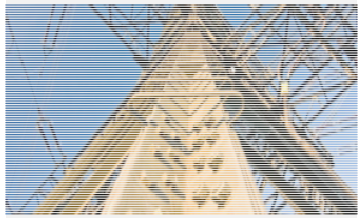
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XMC™ – Target Segments and Applications

Home & Professional	Building Automation	Power & Energy	Transportation	Factory Automation
				
Applications				
				
Requirements				
› Form factor, size and weight › Family concept › IP protection › Fast ramp-up	› Energy efficiency › Robustness for harsh environment › Up-time	› Energy efficiency › Ease of use › Remote monitoring › Appealing design and form factors	› Robustness for harsh environment › Functional safety › Reliability & quality › Lifetime	› Up-time › Connectivity › Reliability & quality › Lifetime › Safety & security

It's all about…



MOTOR CONTROL



LIGHTING



POWER CONVERSION



COMMUNICATION

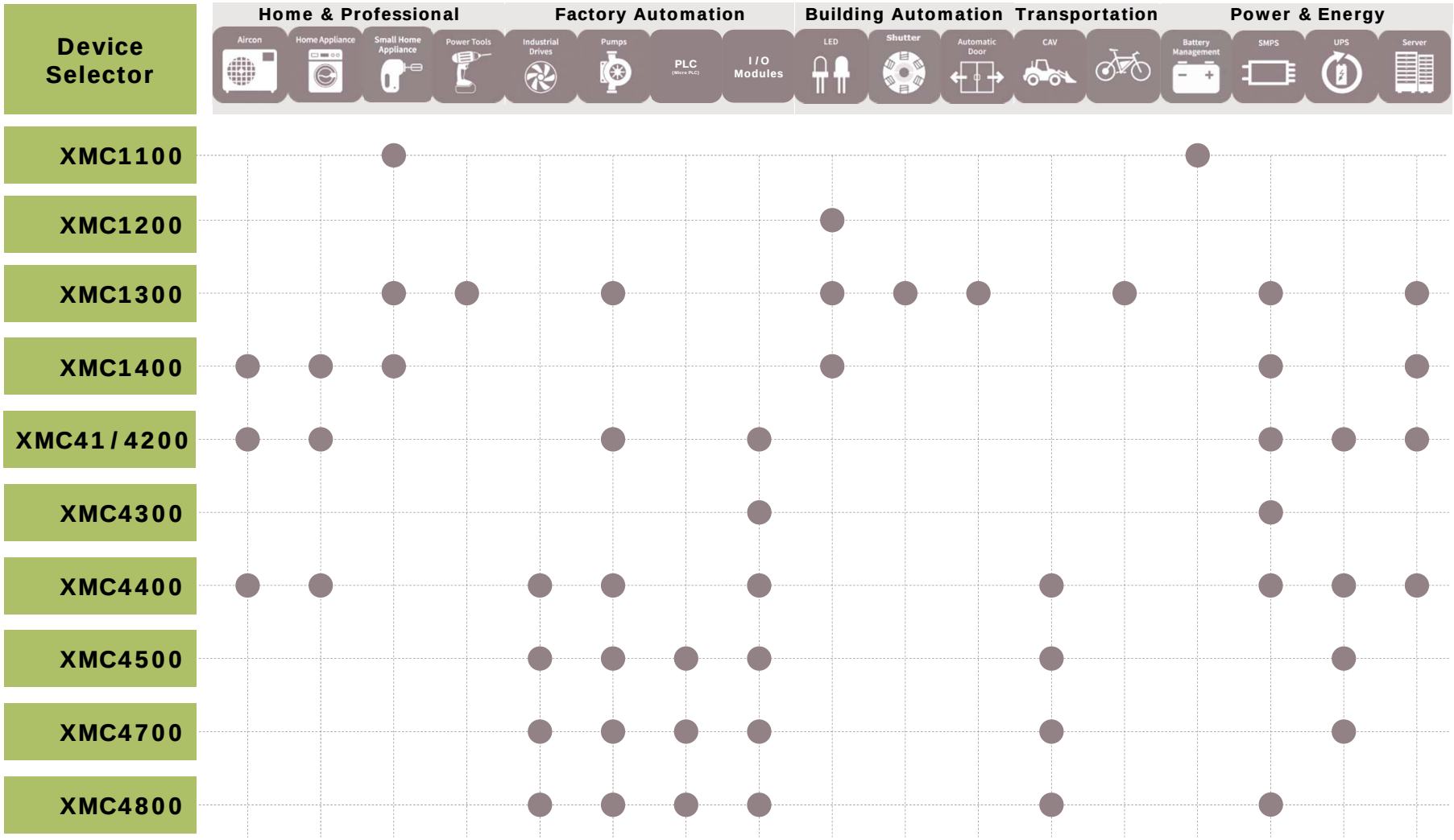
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XMC™ MCU Product Portfolio Application View

	XMC™ Entry	LED Lighting	Digital Power	Motor Control	Industrial I/O
XMC4000 ARM® Cortex®-M4F up to 144 MHz core 64 KB – 2 MB Flash up to 125 °C	**XMC4100** Basic control & Connectivity VQFN-48 LQFP-64		**XMC4200** Server power 150 ps HRPWM LQFP-64/100	**XMC4700** Industrial Drives, Hall & Encoder I/F, ΔΣ Demodulator LQFP-100/144, LFBGA-196	**XMC4800/4300** EtherCAT®,+Drives MultiCAN - 6 nodes, LQFP-100/144, LFBGA-196
				XMC4100/4400 Industrial Drives, Hall & Encoder I/F ΔΣ Demodulator LQFP-64/100/144 LFBGA-144	**XMC4500** MultiCAN - 3 nodes Ethernet, +Drives ext.Memory,SD/MMC LQFP-100/144, LFBGA-144
XMC1000 ARM® Cortex®-M0 up to 48 MHz core/ 96 MHz peripheral 8 – 200 KB Flash up to 105 °C 1.8 V-5.5 V		**XMC1400** Flicker-free, 4-Ch LED, SMPS, Connectivity VQFN-40/64 LQFP-64	**XMC1400** SMPS control Connectivity VQFN-40/64 LQFP-64	**XMC1400** Hall & Encoder I/F, MATH Co-processor CAN VQFN-40/64 LQFP-64	**XMC1400** MultiCAN - 2 nodes VQFN-48/64 LQFP-64
	XMC1100 Basic control & Connectivity TSSOP-16/38 VQFN-24/40	**XMC1200/1300** Flicker-free, 3-Ch LED, SMPS, Connectivity TSSOP-16/28/38 VQFN-24/40	**XMC1300** SMPS control Connectivity TSSOP-16/38 VQFN-24/40	**XMC1300** Hall & Encoder I/F MATH Co-processor TSSOP-16/38 VQFN-24/40	

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XMC Application Selector Guide



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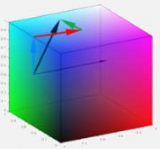
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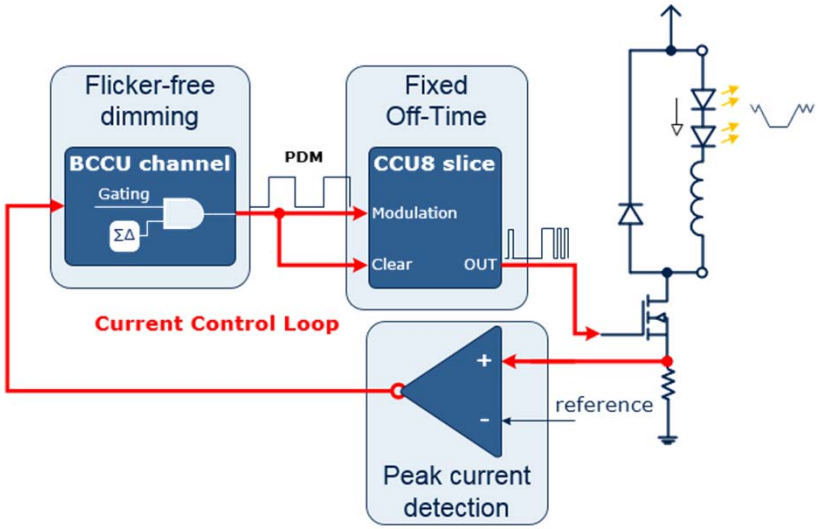
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Key XMC1000 features for driving LEDs

- Automatic exponential dimming with BCCU
- Automatic color control using BCCU
- Tight interconnects for very fast switching in peak current control mode
- Integrated analog comparators







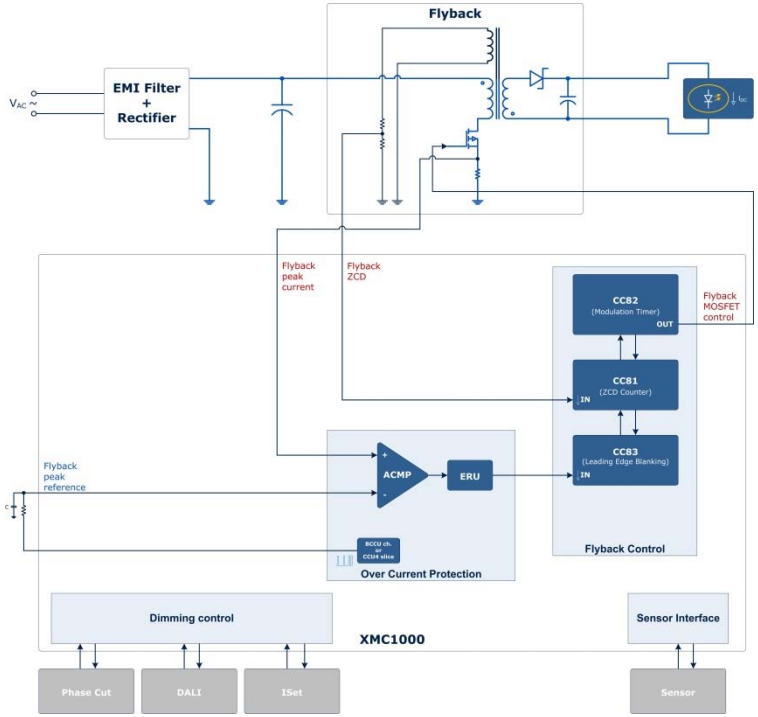
Example: Single-channel DC/DC Buck LED driver with peak-current control

XMC1000 LED Control with dedicated peripherals results in high-quality LED lighting at close to **0 % CPU load** combined with **connectivity**

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Lighting Power Supplies with XMC1000

- Integrated high-speed analog comparators for peak-current control and zero-crossing detection
- Tightly interconnected peripherals supporting fast switching for various digital power conversion techniques



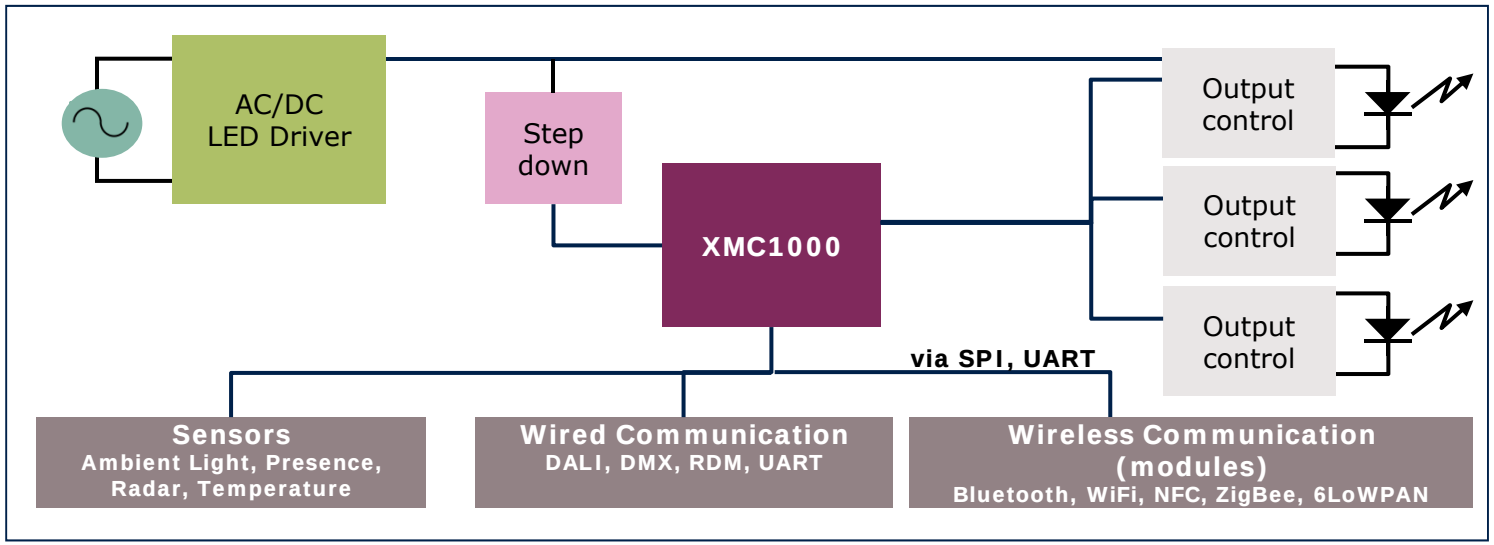
Example: Single-stage Flyback PFC constant-current LED driver

All major **single and dual-stage** SMPS **topologies** commonly used in LED drivers can be implemented using XMC™ MCUs

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Smart Lighting with XMC1000

- Smart Lighting adds communication, sensing and intelligent lighting control to stardard LED lighting features → Needs MCU
- DALI and DMX512 demo stacks available
- Easy Tunable White implementation thanks to BCCU
- General purpose interfaces to external communication ICs and sensors
- 3rd party connectivity stacks (DALI, KNX, RDM, Bluetooth, ZigBee, 6LoWPAN)



Example: Smart Lighting system with XMC™ on the secondary side

XMC™ MCUs enable **Smart Lighting features on top of "standard" LED driver functions** such as SMPS and/or LED output control

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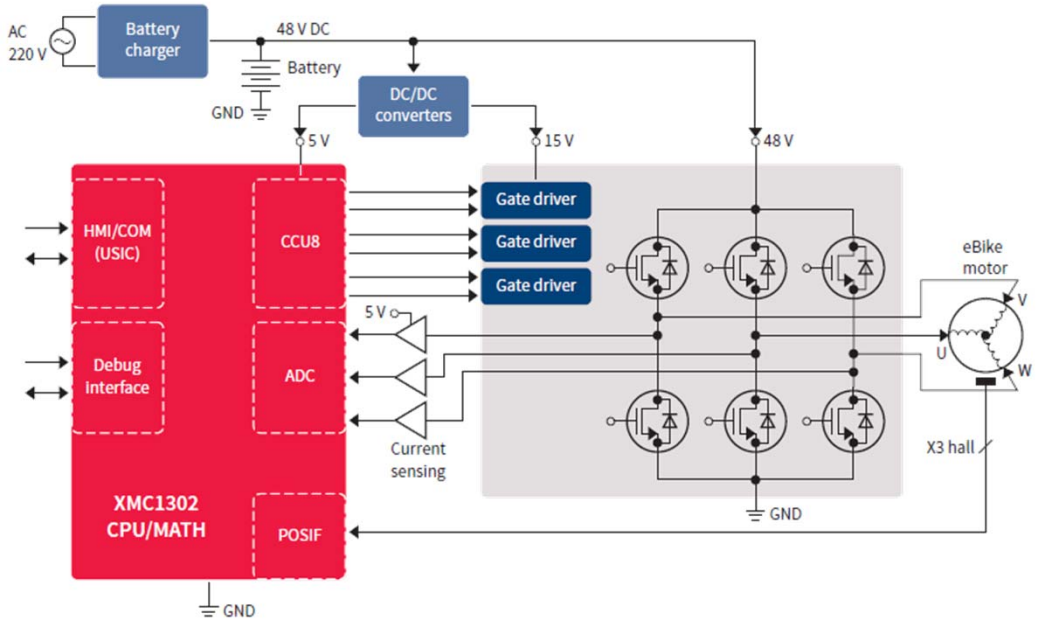
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Motor Control with XMC1300

- Easy **3-phase inverter** implementation with a single CCU8 PWM unit
- Motor control-specific **MATH co-processor**
- POSIF interface to connect **hall sensors and incremental encoder**
- 12-bit ADC with on-chip **adjustable gain for system level cost saving**



Example: eBike system controlled by the XMC1302 MCU



XMC1300 allows **most advanced** and **cost optimized** motor control **with a Cortex®-M0**

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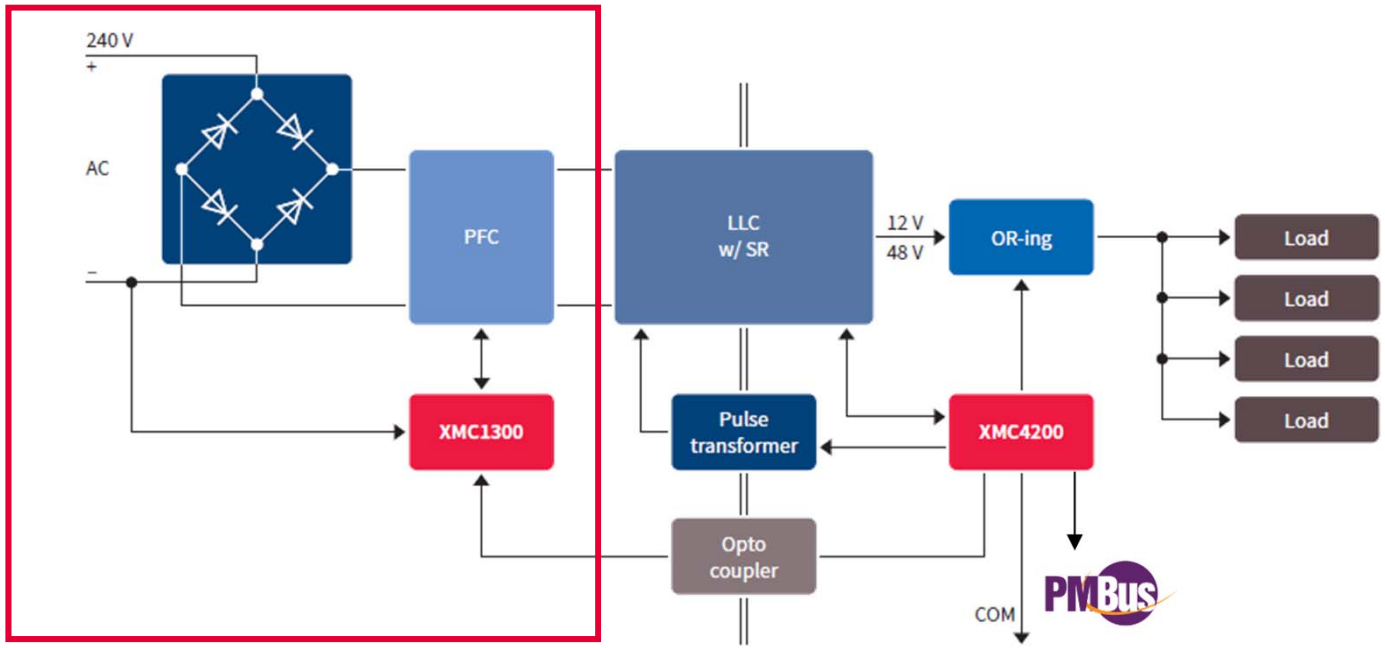
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Power Conversion with XMC1000 Primary side

- Analog comparators with only **3 mV input offset voltage** and a **propagation delay of 30 ns**
- **Tightly interconnected peripherals** supporting fast switching at various digital power conversion techniques
- Unparalelled **price / performance ratio** for primary power control



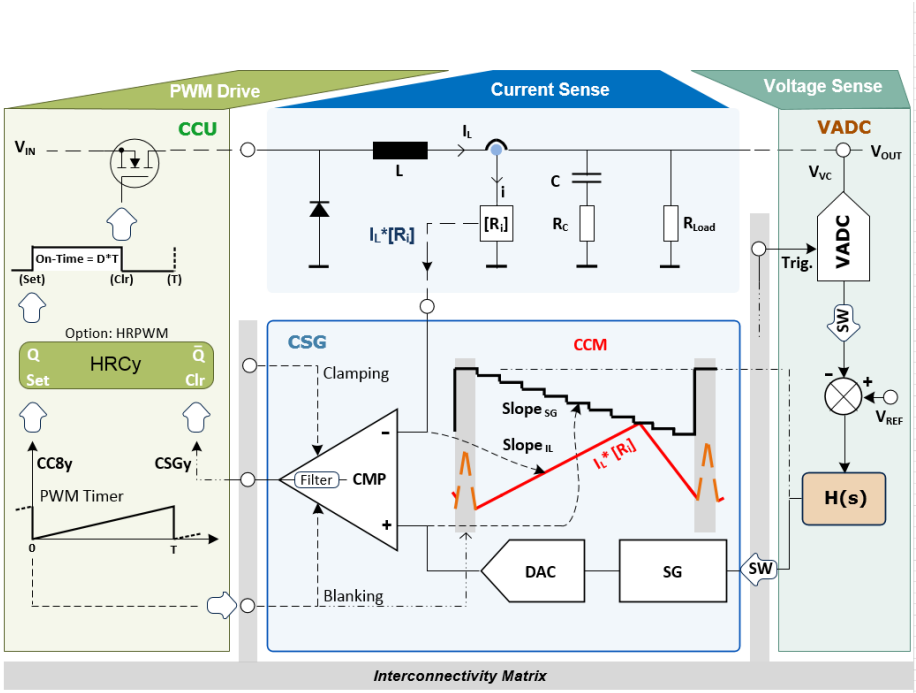
Example: Server/Telecom SMPS with XMC1300 used for digital PFC control

XMC™ dedicated peripherals for digital power conversion helping to increase efficiency, reduce system cost and add housekeeping features on primary side

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Power Conversion with XMC4000 Secondary side

- 4-channel 150 ps **HRPWM timer** (XMC4000)
- **Compensation Slope Generator (CSG)** for easy implementation of peak current control mode
- Up to 4 x **12-bit ADC (2MSPS)** with very sophisticated control options
- Extended temperature range up to **T_A 125 °C** (XMC4000 family only)



Example: Peak Current Control scheme using embedded Compensation Slope Generator and Analog Comparator

XMC™ dedicated peripherals for digital power conversion helping to increase efficiency and reduce system cost

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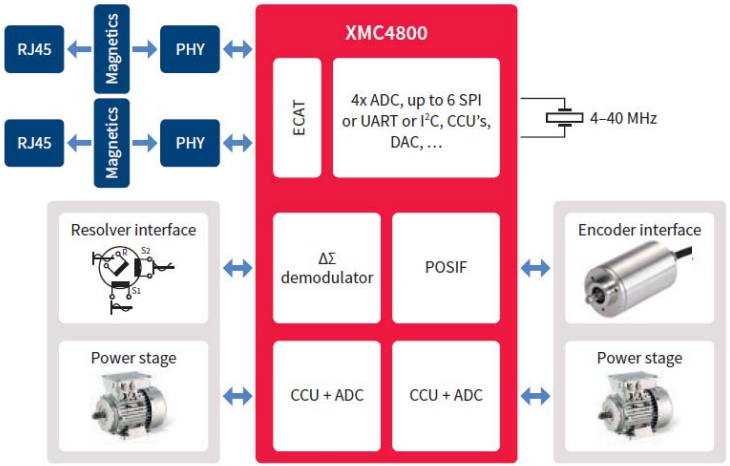
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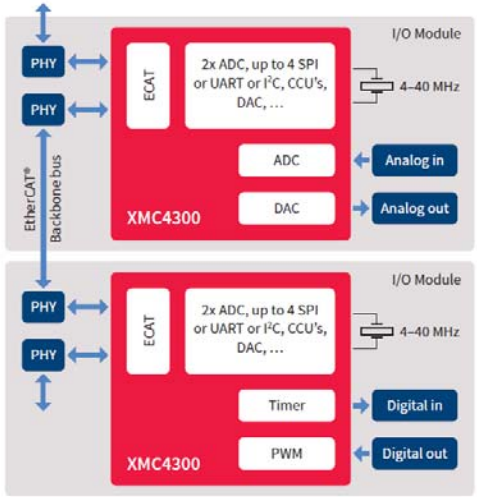
Factory Automation with XMC4000

- **Optimized peripherals for Industrial Drives**
  - Dedicated Inverter PWM generators (CCU8)
  - Fast and flexible 12-bit ADC
  - Interfaces for HALL sensors, encoders and resolvers
- Communication interfaces for system administration and maintenance **+ real-time optimized connectivity on control level.**

EtherCAT®



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

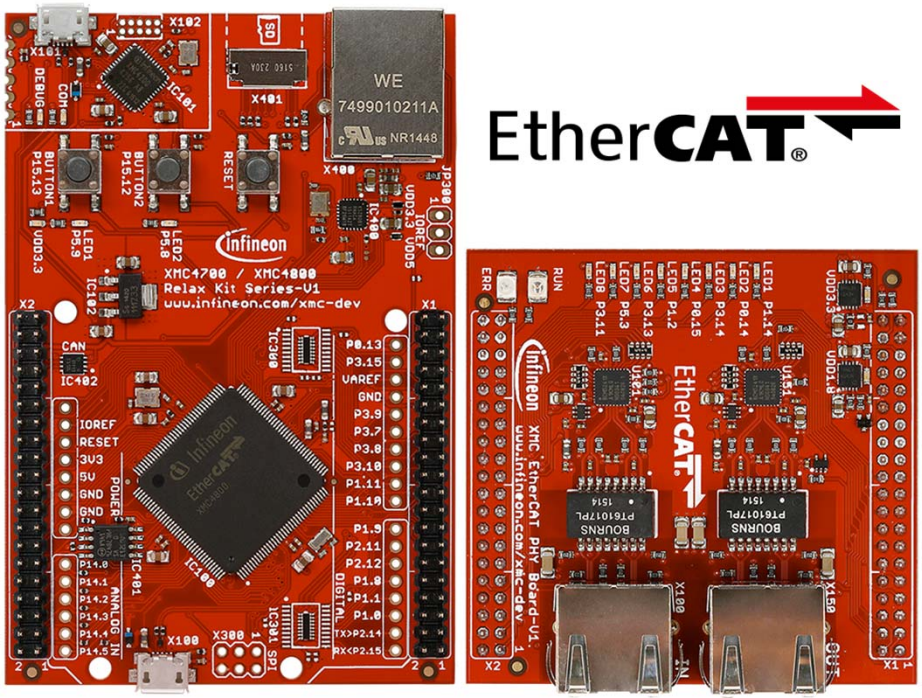


I/O modules with EtherCAT® backbone bus with PHY to PHY connection

XMC4800: a perfect combination for real-time control and industrial connectivity
XMC4300: enhanced connectivity for I/O and Communication modules

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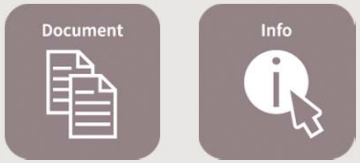
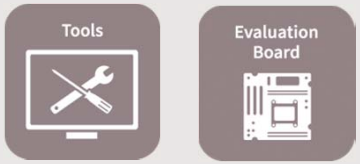
XMC4800 Relax EtherCAT Kit



- The XMC4800 Relax EtherCAT® Kit is a game changer for EtherCAT® development
- The XMC4800 is the first-ever microcontroller to integrate an EtherCAT® node on an ARM® Cortex®-M controller with on-chip flash and analog/mixed signal capabilities
- The physical layer for the EtherCAT® communication is realized by the add-on XMC™ EtherCAT® PHY Board
- Similiar to the XMC4700 Relax Kit, it is equipped with a standard Ethernet node, CAN node, 32 Mbit qSPI flash , microSD Card slot and runs Arduino™ shields operating on 3, 3 V

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Support material:

Collaterals and Brochures 	› Product Briefs › Selection Guides › Application Brochures › Presentations › Press Releases, Ads	› www.infineon.com/XMC
Technical Material 	› Application Notes › Technical Articles › Simulation Models › Datasheets, MCDS Files › PCB Design Data	› www.infineon.com/XMC › Kits and Boards › DAVE™ › Software and Tool Ecosystem
Videos 	› Technical Videos › Product Information Videos	› Infineon Media Center › XMC Mediathek
Contact 	› Forums › Product Support	› Infineon Forums › Technical Assistance Center (TAC)

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Glossary abbreviations

ADC	Analog-to-Digital Converter
BCCU	Brightness and Colour Control Unit
CAGR	Compound Annual Growth Rate
CAN	Controller Area Network
CORDIC	COrdinate Rotation Digital Computer
CSG	Compensation Slope Generator
CCU4	Capture Compare Unit 4
CCU8	Capture Compare Unit 8
CPU	Central Processing Unit
DALI	Digital Addressable Lighting Interface
DAC	Digital-to-Analog Converter
DAVE™	Free development IDE for XMC™
DMX	Digital Multiplex
EtherCAT®	Ethernet for Control Automation Technology
ERU	Event Request Unit

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Glossary abbreviations

HRPWM	High Resolution Pulse Width Modulation
I/O	Input / Output
IGBT	Insulated Gate Bipolar Transistor
LED	Light Emitting Diode
MCU	Microcontroller
MMC	MultiMediaCard
POSIF	Position Interface
PWM	Pulse Width Modulation
RAM	Random Access Memory
RDM	Remote Device Management
SD	Secure Digital
SMPS	Switched-mode power supply
SPI	Serial Peripheral Interface
PFC	Power Factor Correction
UART	Universal Asynchronous Receiver Transmitter

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