Infineon 250W 3-phase Motor control power card

for XMC™ Microcontrollers

XMC™: Infineon's 32-bit ARM Processor

Cortex® ARM® M Core

- √ Up to 48MHz internal CPU clock (XMC1000 – Cortex M0)
- √ Up to 144MHz internal M4F CPU clock (XMC4000 – Cortex M4F)
- √ 1.8 to 5V input voltage
- √ Up to T_A = -40 to 125°C

Application Specific Peripherals

- √ Motor Control
- √ Lighting
- √ Power Conversion
- √ Industrial Automation

Performance & Real Time

- √ Hardware Acceleration
- √ Multiple timers: CCU4, CCU8, POSIF & more
- √ USB, CAN, 12-bit ADCs, DAC

Availability until min.2031

XMC™
XMC1000
XMC4000





XMC™ 32-bit ARM® Cortex® M: full feature set family scalability!

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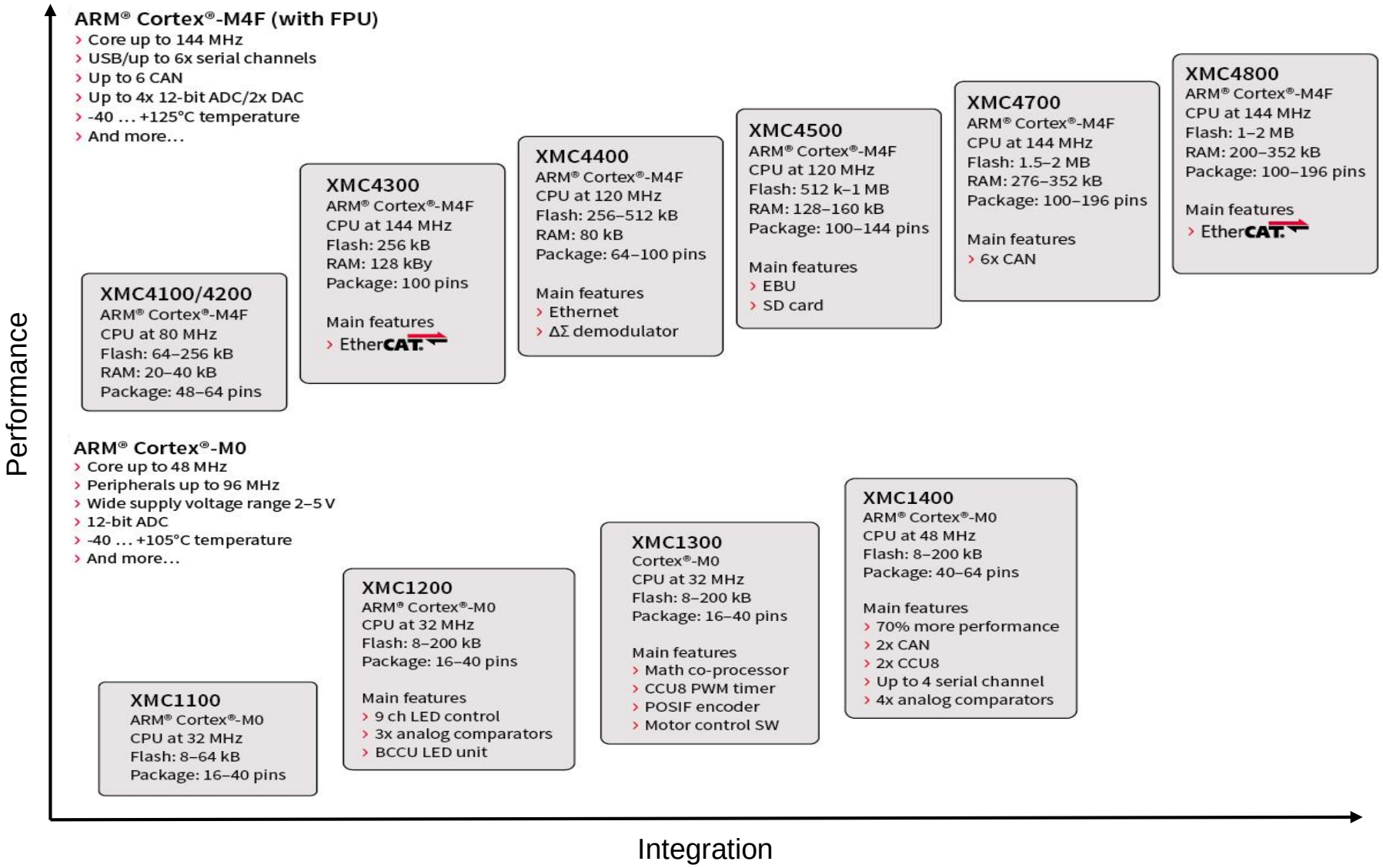
XMC™ - the right **solution** for Industry

ENABLEMENT	› Excellent Know-How & Support › Highest Quality Standards and Longterm Supply Availability › Future Vision and real Infineon Commitment for Industry
PLATFORM CONCEPT	› XMC1000 (Cortex M0) & XMC4000 (Cortex M4F) › From value efficiency to high performance devices › Family scalability
RIGHT FEATURES	› Strong Real.Time Capability (Hardware Acceleration) › Strong Mixed Signal Capability: multiple ADCs & DS-ADC › High Resolution PWM › Multiple Motor-Feedback systems
APPLICATION SPECIFIC PERIPHERALS	› Automation: ETHERCAT › Lighting: BCCU, DAC › Motor Control: HRPWM, ADC, MATH Co-processor
CONNECTIVITY & SECURITY	› Secure Boot Loader: ensure IP protection › IEC 60730 Class B compliant library – free › USB, CAN, 12-bit ADCs, DAC, POSIF, ETHERNET & more
EXTENSIVE ECOSYSTEM	› Free and comprehensive toolchain to get started by DAVE™ › Extended partner tools compatibility

XMC™ MCU family offer this **multiple combination** of functionality across multiple compatible products

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XMC™ MCU Product Portfolio



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XMC™ XMC1xxx Series – Super set

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

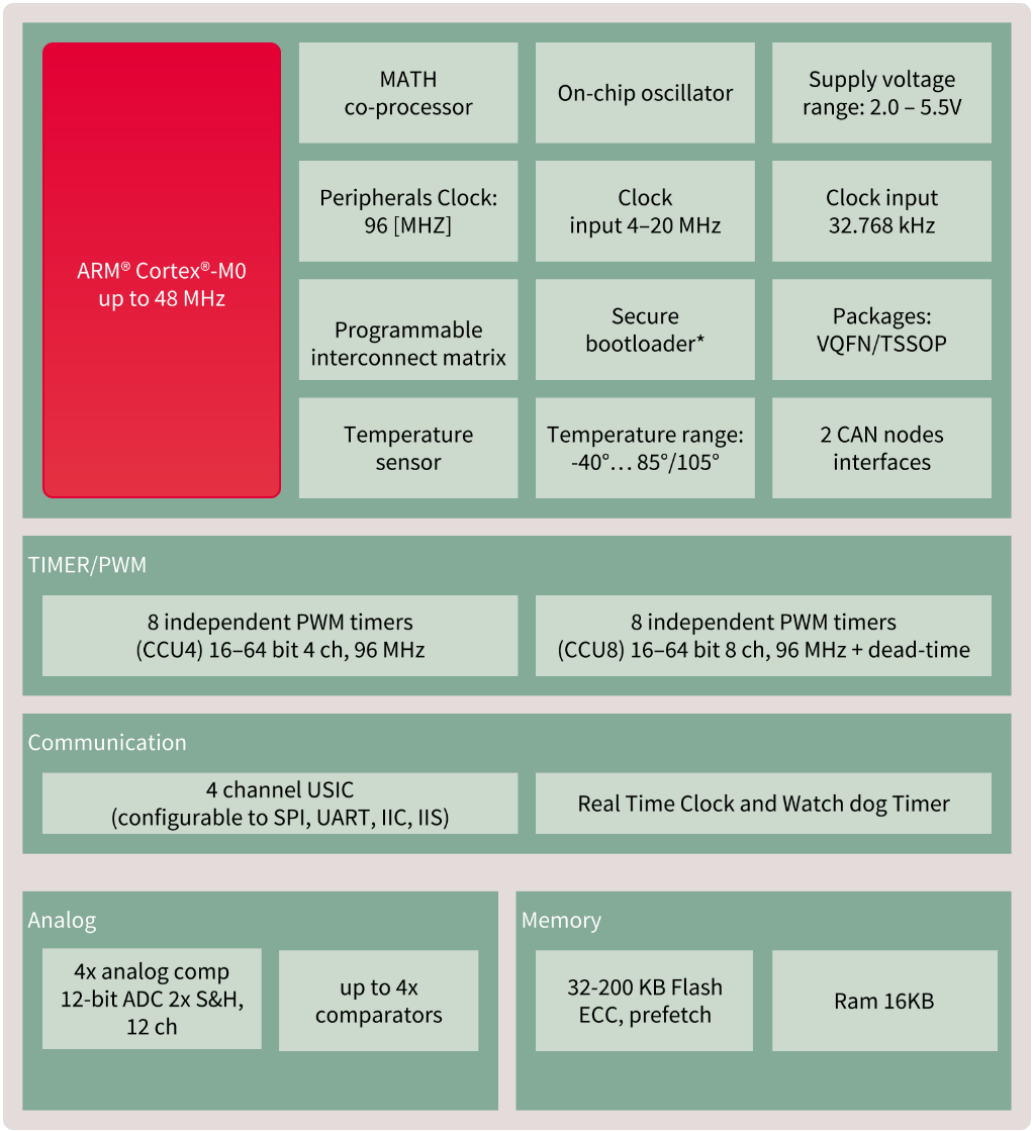
XMC1000 is the number one choice to bring traditional 8-bit designs to the next level.

Key features of XMC1000 family:

- ARM® Cortex®-M0 core, up to 48MHz
- Control peripherals like PWM timers run on up to 96MHz
- The MATH co-processor boosts standard Cortex®-M0 computing performance enabling divisions and trigonometric operations like SIN and COS
- The BCCU eases digital LED dimming and color control applications
- 30ns comparators enable AC-DC and low voltage DC-DC SMPS control e.g. up to 4 channel buck converters
- The ERU is a programmable hardware interconnect matrix that provides on-chip connectivity for real-time control and offloads the CPU
- The CCU PWM-timers feature rich and application oriented configurability like for motor control, SMPS or combustion engine control
- Hall sensors and optical encoders can be connected to POSIF, a position interface for motor position control
- With a 1Msps 12-bit ADC, XMC1000 microcontrollers are outstanding in their price / performance class
- MultiCAN provides connectivity with 2 nodes and 32 message objects

Packages:

- TSSOP16 / TSSOP28 / TSSOP 38
- VQFN24 / VQFN40 / VQFN48 / VQFN64
- LQFP64



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XMC™ XMC1000 portfolio

optimized peripherals for real-time success

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-16/28/38
XMC14x	•	48	96	Flash 32–200 kB RAM 16 kB	1/2	up to 12	up to 4	2x	2x	•	•	4x	2x	TSSOP-38 VQFN-40/48/64 LQFP-64
Supply voltage range 1.8–5.5 V														
Temperature range -40 °C … 85 °C/105 °C														

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XMC™ XMC4000 portfolio
optimized peripherals for real-time success

ARM® CORTEX®M4F		Memory	Analog			Timer/PWM					Connectivity							Package
	Frequency [MHz]		ADC12bit / S&H	Number of channels	DAC 12Bit	CCU4 (4ch)	CCU8 (4ch)	HRPWM(150ps)	POSIF	ΔΣDemodulator	USIC	CAN2.0B	USB	Ethernet	EtherCAT	SDIO/SD/MMC	ExternalBusUnit(EBU)	
XMC41x	80	Flash 64-128 kB RAM 20 kB	2/2	up to 9	2ch	2x	1x	●	●	-	4x	up to 2	-	-	-	-	-	VQFN-48 TQFP-64
XMC42x	80	Flash 256 kB RAM 40 kB	2/2	up to 9	2ch	2x	1x	●	●	-	4x	2x	●	-	-	-	-	VQFN-48 TQFP-64
XMC43x	144	Flash 256 kB RAM 128 kB	2/2	14	2ch	2x	1x	-	-	-	4x	2x	●	●	●	●	-	LQFP-100
XMC44x	120	Flash 256-512 kB RAM 80 kB	4/4	up to 18	2ch	4x	2x	●	●	●	4x	2x	●	●	-	-	-	TQFP-64 LQFP-100
XMC45x	120	Flash 512 kB-1 M RAM 128-160 kB	4/4	up to 26	2ch	4x	2x	-	2x	4ch	4x	up to 3	●	●	-	●	●	LQFP-100/144 LFBGA-144
XMC47x	144	Flash 1,5 - 2 MB RAM 276-352 kB	4/4	up to 26	2ch	4x	2x	-	2x	4ch	6x	6x	●	●	-	●	●	LQFP-100/144 LFBGA-196
XMC48x	144	Flash 1 - 2 MB RAM 276-352 kB	4/4	up to 26	2ch	4x	2x	-	2x	4ch	6x	6x	●	●	●	●	●	LQFP-100/144 LFBGA-196
Supply Voltage Range 3.13 to 3.63 V																		
Temperature Range -40 °C … 85 °C / 125 °C																		

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XMC™ XMC4xxx Series – Super set

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).

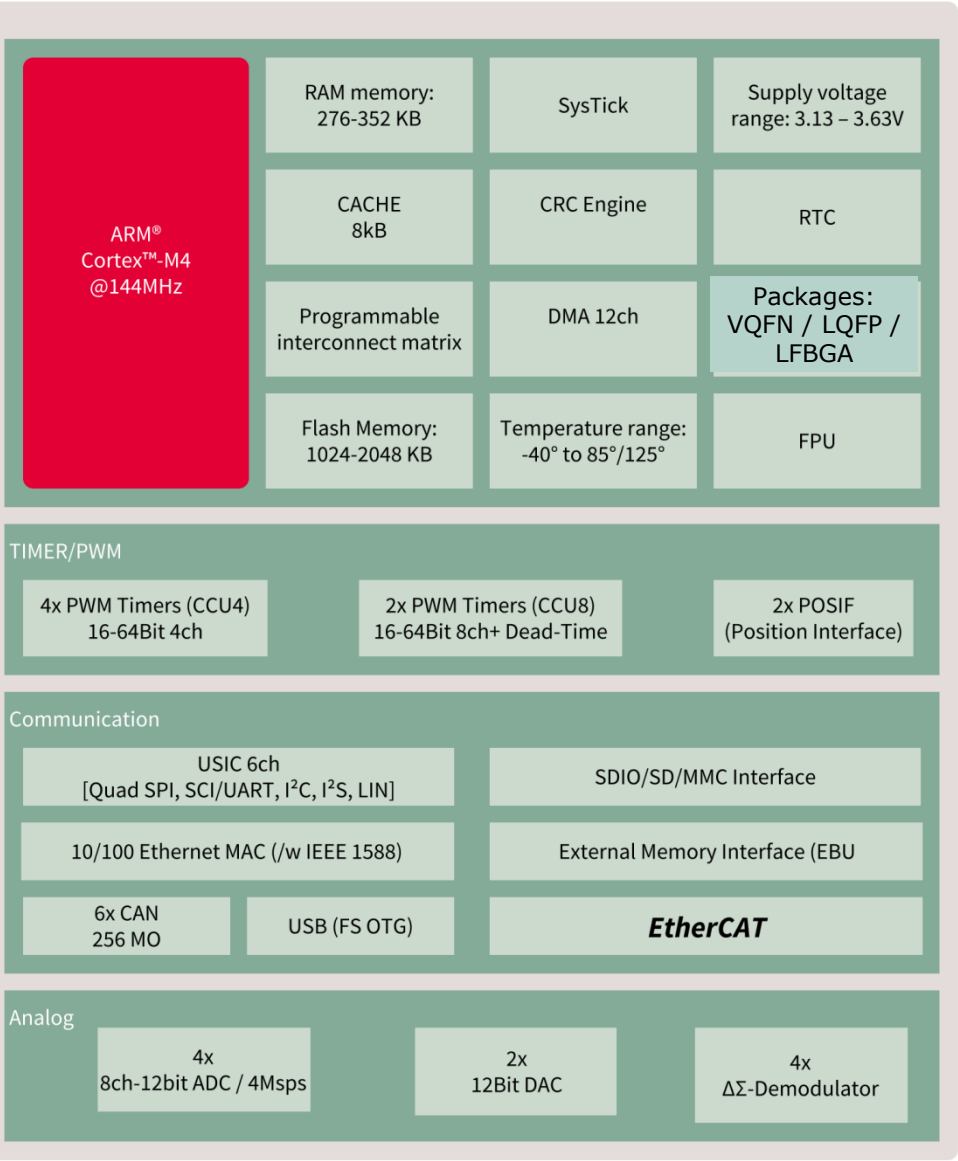
The XMC4000 family addresses industrial market needs and is ideal in particular for digital power conversion, motor control, sense & control, and IO applications.

Key features of the XMC4000 family:

- ARM® Cortex®-M4 with floating point unit (FPU), single-cycle DSP MAC, 80-144MHz CPU frequency
- Up to 2MB embedded Flash with 22ns access time and error correction unit
- Up to 352kB embedded RAM
- EtherCAT ® node
- 12-channel DMA (XMC4500), 8-channel DMA (XMC4400, XMC4200, XMC4100)
- Comprehensive set of timers, Delta sigma Demodulator, Position Interface, PWM with emergency shutdown and ADC trigger, Quadrature Encoder Interface
- 4-channel high-resolution, PWM (150ps) (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 SPI, I2C, I2S, UART
- Up to 6xCAN
- External bus interface supporting SDRAM, SRAM, NOR-/NAND-Flash and memory-mapped IO devices (e.g. LCD)
- SD/MMC interface
- Touch interface and 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

Packages:

- VQFN48
- LQFP64 / LQFP100 / LQFP144
- LFBGA196



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XMC™ for Motor Control Solutions

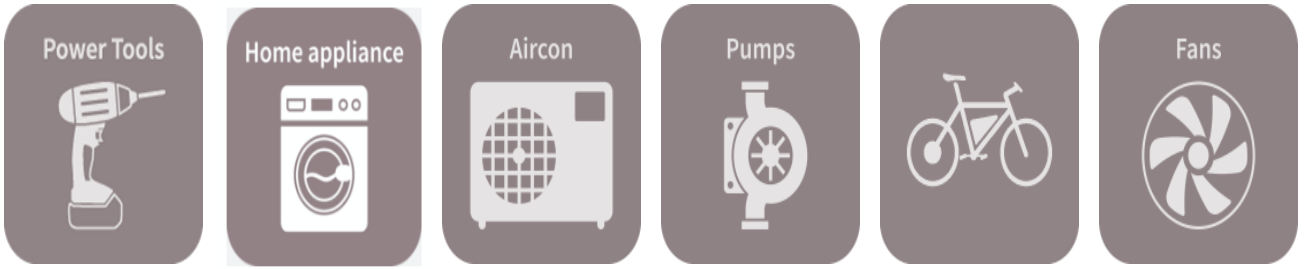
Flexible solutions

More efficiency drives the motor control towards brushless DC





All kinds of low-end motors:



Application specific peripherals for motor control:

- **PWM** – Pulse Width Modulation
- **POSIF** – Position Interface
- **MATH** – Co-processor
- **ERU** – Event Request Unit

XMC™ allows most advanced and cost optimized motor control in Cortex M0 and M4F

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XMC™ for Motor Control Solutions
Home & professional appliances

Home appliances needs:
Very cost sensitive
High scalability
Flexibility
Robust
Extended temperature
Reliable
Home & professional
Safety & class B

Home appliances & professional equipment

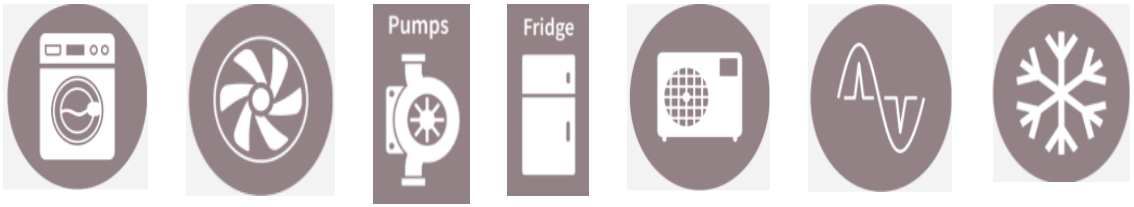
XMC™ for home & AURIX™ for professional

Safety/class B and PFC

Discrete solutions driver + MOSFETs | Integrated Power Solutions IPM

Motor control & PFC | Sensors | Induction

Dish washers, pumps, fan, fridge compressors, air conditioning



2.5 W	20 W	40 W	100 W	200 W	300 W and UP

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XMC™ - class B safety certification
available and Free of charge

Class B enable

All XMC™ devices:
XMC1xxx: ARM Cortex® M0
XMC4xxx: ARM Cortex® M4F

Safety enable

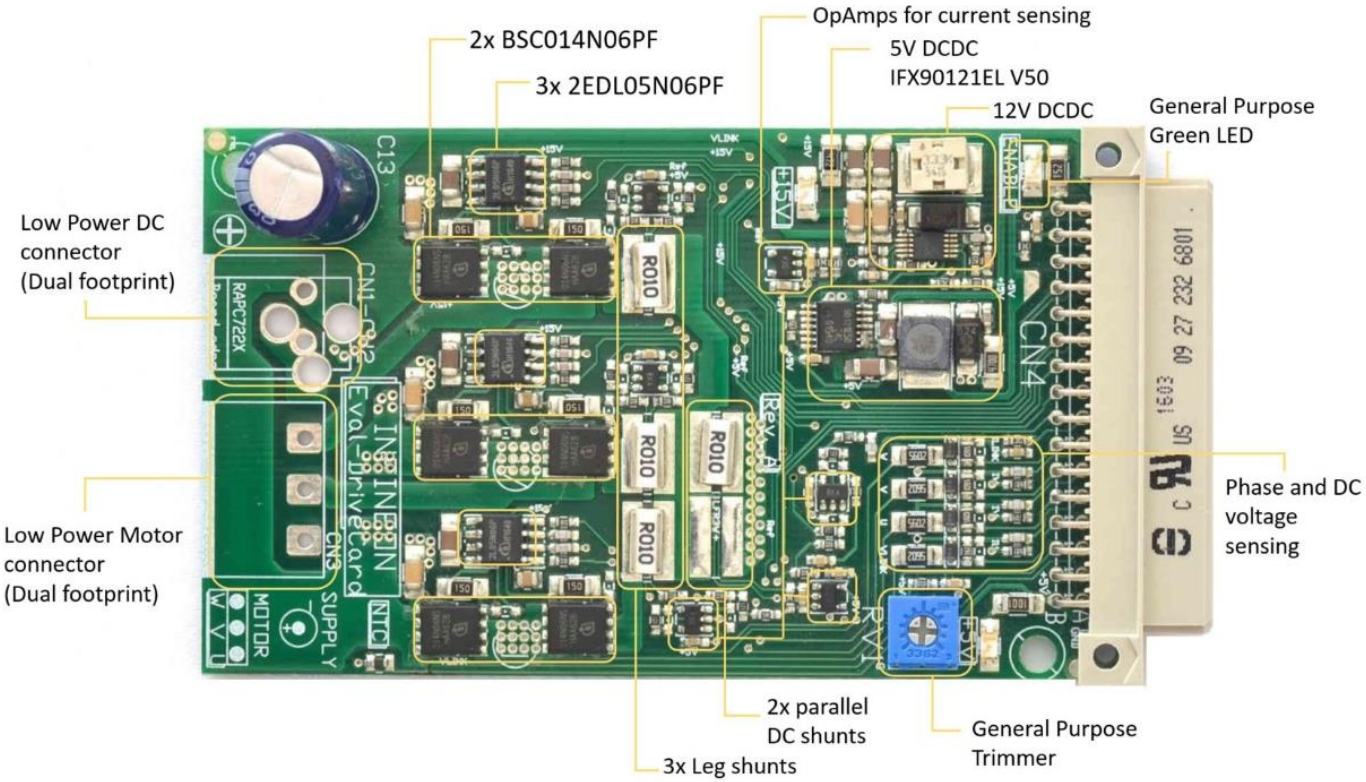
- Extended documentation and pre-certified software libraries to XMC™ Cortex® ARM® based controllers **free of charge**
- **Includes: user manual, source codes, examples for DAVE™, Keil and IAR, certificates**
- Infineon and Hitex close partnership enables your design for household electrical appliances (Class B – IEC 60335-1) – mandatory for home appliances start on 2019!
- Aim of the standards is to reduce the risks of a system to a tolerable amount:
  - Systematical and statistical failures: software and hardware
  - VDE (EUROPE) certified and UL (NAFTA/CHMT) on CYQ2/2018

Find more at: www.hitex.com/classb

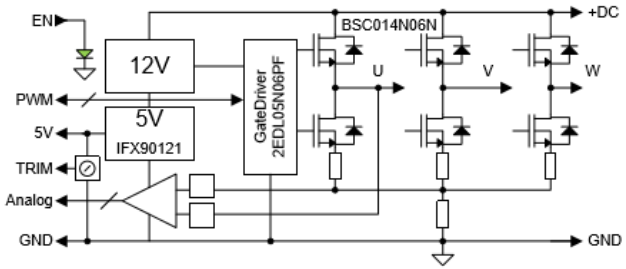
hitex EMBEDDED TOOLS & SOLUTIONS

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250W 3-phase Motor control power card
Hardware Overview



Low Power DC connector (Dual footprint)	Power stage	Power supply	OPN
	6XBSC014N06PF	5V DCDC IFX90121EL V50	KITMOTORDC250W24VTOBO1
Low Power Motor connector (dual footprint)	3x2EDL05N06PF	12V DCDC	Phase and DC voltage sensing



Orderable Part Number: KIT_MOTOR_DC_250W_24V

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250W 3-phase Motor control power card
Full feature set

- Low-voltage motor drive system either in H-Bridge or in 3-Phase full bridge configuration.250W @ 24V
- Shunts to sense leg currents and DC-link current, with OpAmps for conditioning to XMC™
- 3-phase motor control Power Card:
  - 3 Half-Bridges with SO8 gate driver IC and SSO8 power MOSFETs
- LV input from 13V to 60V
- Max motor voltage 48V (due to 60V mosfet)
- Target 300W @ 24V › 3 shunt + 1 single shunt
- BEMF measurement
- twice DC/DC stage (60→12V, and 12→5V)
  - Switched Mode DC/DC buck converter IFX90121EL V50 for 5V supply
  - Switched Mode DC/DC buck converter for 12V supply
- 2ED driver (easy reuse schematics for H-bridge)
- OBD J-link on board debugger isolated (on controller card)

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XMC™ for Motor Control Solutions
Flexible solutions

These boards are sold separately

[XMC1302 Driver Card](#)



[XMC1402 Driver Card](#)



[XMC4400 Driver Card](#)



XMC1302 Driver card

XMC1402 Driver card

XMC4400 Driver card

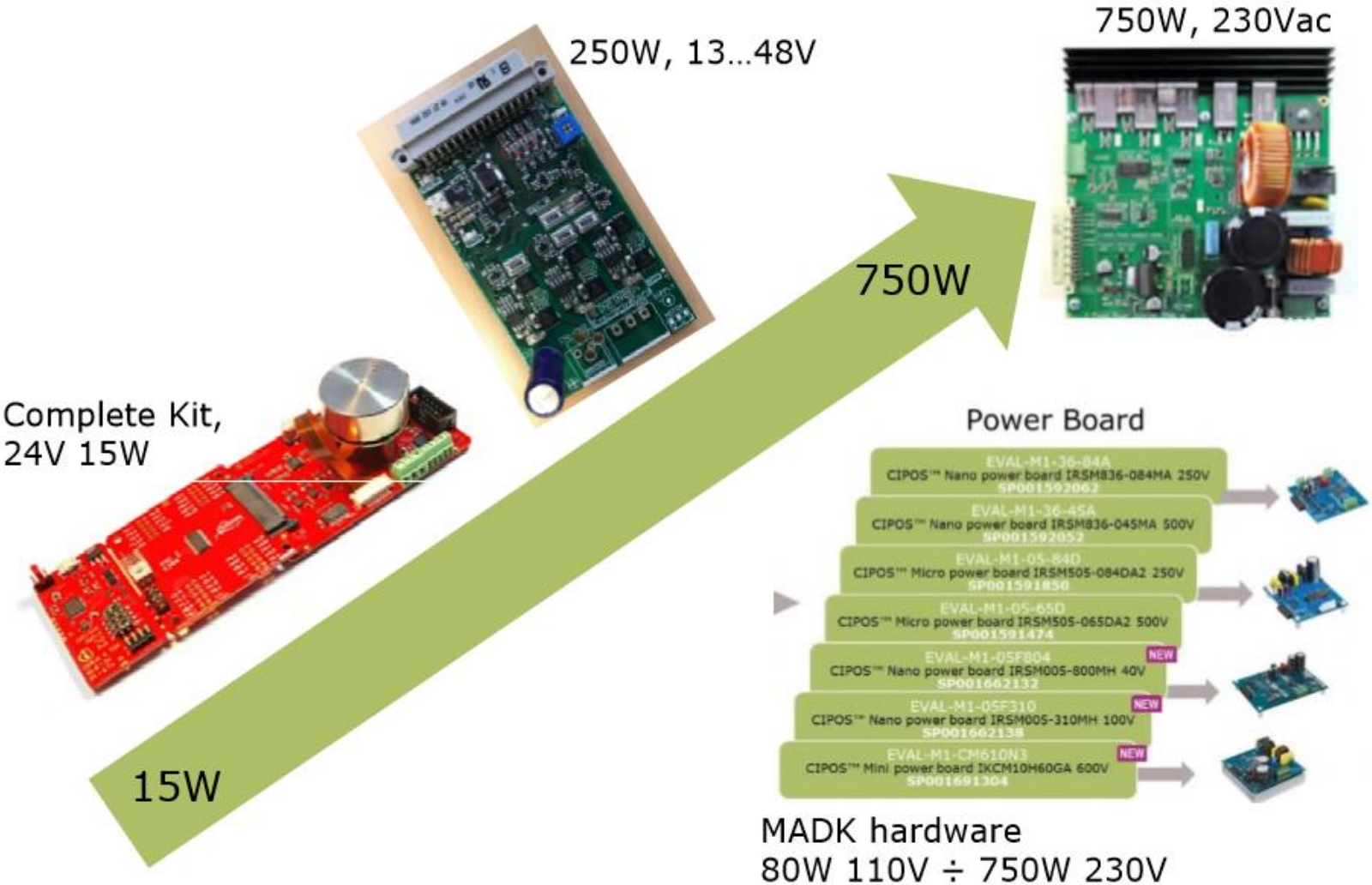


Infineon 250W 3-phase Motor control power card

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XMC™ for Motor Control Solutions

Flexible solutions



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More info:

www.infineon.com/XMC™

www.Infineon.com/makers

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Part of your life. Part of tomorrow.

Infineon