

# XMC™ – Product Introduction

XMC™ Microcontrollers  
April 2016



# Agenda

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Introduction to XMC™

2

Product Portfolio

3

Safety

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Security

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Ecosystem

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# What is XMC™



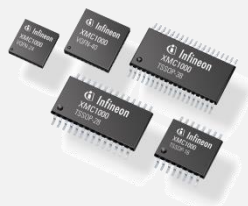
**One microcontroller platform  
Countless Solutions**

> **XMC™ - Industrial & Multimarket  
Microcontroller based on ARM® Cortex® M**

> **XMC™ - Application / Segment specific  
Microcontrollers**

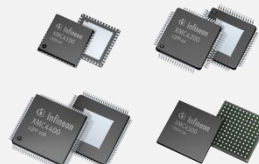
> **XMC™ comprises of 2 major families**

## XMC1000



- > **Cortex® M0 based**
- > **Applications:**
  - > **Low cost motor control**
  - > **Lighting**
  - > **Power conversion**

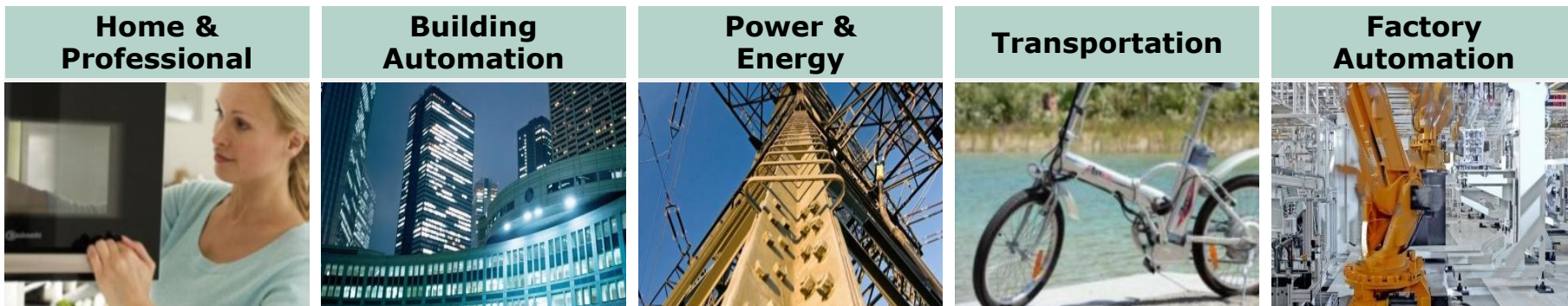
## XMC4000



- > **Cortex® M4 based**
- > **Applications:**
  - > **Automation (Industrial Drives, PLC, I/O)**
  - > **Power conversion**

**Our differentiators are the peripherals not the core**

# XMC™ – Target Segments



## Applications



## Requirements

- |   |  |  |  |   |
|---|--|--|--|---|
| <ul style="list-style-type: none"> <li>› Form factor, size and weight</li> <li>› Family concept</li> <li>› IP protection</li> <li>› Fast ramp-up</li> </ul> | <ul style="list-style-type: none"> <li>› Energy efficiency</li> <li>› Robustness for harsh environment</li> <li>› Up-time</li> </ul> | <ul style="list-style-type: none"> <li>› Energy efficiency</li> <li>› Ease of use</li> <li>› Remote monitoring</li> <li>› Appealing design and form factors</li> </ul> | <ul style="list-style-type: none"> <li>› Robustness for harsh environment</li> <li>› Functional safety</li> <li>› Reliability &amp; quality</li> <li>› Lifetime</li> </ul> | <ul style="list-style-type: none"> <li>› Up-time</li> <li>› Connectivity</li> <li>› Reliability &amp; quality</li> <li>› Lifetime</li> <li>› Safety &amp; security</li> </ul> |
|---|--|--|--|---|

## It's all about...



**MOTOR CONTROL**



**LIGHTING**



**POWER CONVERSION**



**COMMUNICATION**

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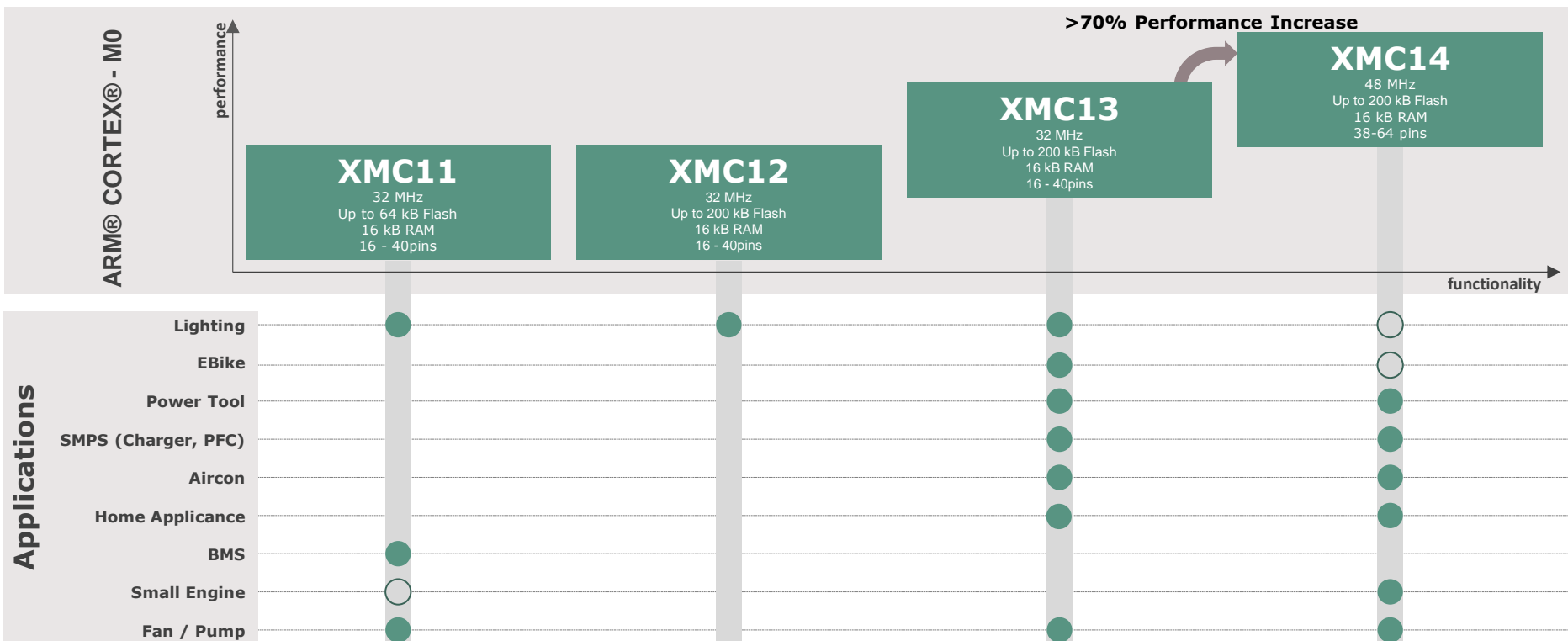
Security

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Ecosystem

# XMC1000 MCUs powered by ARM® Cortex®-M0

One Microcontroller platform. Countless solutions.



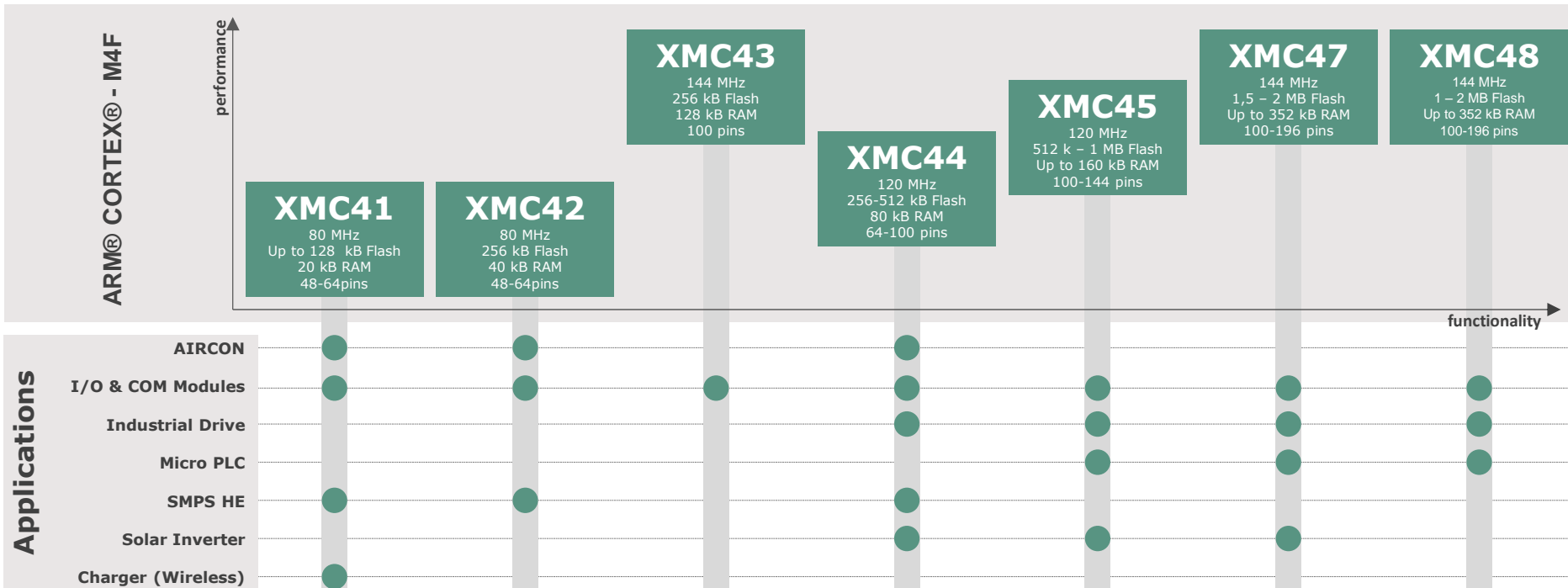
Key Features	Description
	The MATH co-processor adds additional functionality, like trigonometric operations or divisions, to the standard Cortex®- M0 instruction set, enabling field oriented motor control. It runs up to 64 MHz. Offering 7 times faster division, 38 times faster cosine calculations and enable 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 SW development effort for LED lighting applications.
	AC/DC power factor correction can be efficiently realized with high-performance and configurable analog comparators. With only 30 ns propagation delay and peripheral interconnection to the PWM timer, zero current crossing in the coil is detected and a fast and deterministic control loop executed with very little CPU load.
	With the secure boot loader mode, embedded code can be programmed to flash memory in a protected way using AES 128-bit cryptography. This helps to protect IP if manufacturing is outsourced for instance.

# XMC1000 Details

ARM® CORTEX®M0	Co-Processor	Clocks		Memory		Analog			Timer/PWM				Connectivity		Package
		Frequency	Peripherals	Flash	RAM	ADC12bit / S&H	Number of channels	Analog Comparators	CCU4	CCU8	POSIF	BCCU	USIC	CAN2.0B	
<b>XMC11x</b>	-	32	64	Flash 8-64 kB	RAM 16 kB	1/1	up to 12	-	1x	-	-	-	2x	-	VQFN-24/40 TSSOP-16/38
<b>XMC12x</b>	-	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
<b>XMC13x</b>	•	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
<b>XMC14x</b>	•	48	96	Flash 32-200 kB	RAM 16 kB	1/2	up to 12	up to 3	2x	2x	•	•	4x	•	VQFN40/48/64 LQFP64
Supply Voltage Range 1.8 V - 5.5 V															
Temperature Range -40 °C ... 85 °C / 105 °C															

# XMC4000 MCUs powered by ARM® Cortex®-M4

One Microcontroller platform. Countless solutions.



Key Features	Description
	Extended Temperature Range – up to Ta 125 °C + continues up time of 20 years @ Tj 110 °C
<b>ERU, ADC, PWM</b>	A comprehensive set of most 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 to achieve the highest energy efficiency class for digital power conversion.
<b>EtherCAT</b>	First EtherCAT® microcontroller on an ARM® Cortex®-M controller with on-chip flash. This enables the most compact designs, eliminating the need for a dedicated EtherCAT® ASIC, external memory and crystal.

# XMC4000 Details

ARM® CORTEX®M4F	Frequency [MHz]	Memory		Analog			Timer/PWM					Connectivity					Package		
		Flash	RAM	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)
<b>XMC41x</b>	80	Flash RAM	64-128 kB 20 kB	2/2	up to 9	2ch	2x	1x	•	•	-	4x	up to 2	-	-	-	-	-	VQFN-48 TQFP-64
<b>XMC42x</b>	80	Flash RAM	256 kB 40 kB	2/2	up to 9	2ch	2x	1x	•	•	-	4x	2x	•	-	-	-	-	VQFN-48 TQFP-64
<b>XMC43x</b>	144	Flash RAM	256 kB 128 kB	2/2	14	2ch	2x	1x	-	-	-	4x	2x	•	•	•	•	-	LQFP-100
<b>XMC44x</b>	120	Flash RAM	256-512 kB 80 kB	4/4	up to 18	2ch	4x	2x	•	•	•	4x	2x	•	•	-	-	-	TQFP-64 LQFP-100
<b>XMC45x</b>	120	Flash RAM	512 kB-1 M 128-160 kB	4/4	up to 26	2ch	4x	2x	-	2x	4ch	4x	up to 3	•	•	-	•	•	LQFP-100/144 LFBGA-144
<b>XMC47x</b>	144	Flash RAM	1,5 - 2 MB 276-352 kB	4/4	up to 26	2ch	4x	2x	-	2x	4ch	6x	6x	•	•	-	•	•	LQFP-100/144 LFBGA-196
<b>XMC48x</b>	144	Flash RAM	1 - 2 MB 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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# Safety

## Definition

Measures of techniques implemented to reduce the risk of injury, loss and danger to persons, property or the environment, in any facility or place involving the manufacturing, producing and processing of goods or merchandise.



Safety Systems have to fulfill certain standards. For industrial this is regulated by IEC61508. Every safety related system needs to go through a compliance test (e.g. TÜEV certification).



Infineon provides a safety package for its XMC4000 family, reducing the effort on customer side to fulfill the necessary standards on system level. This package contains following content and support structure:

### Documentation

**Safety Application Note**

**Failure Mode Report**

**FMEDA Tool**

by Infineon

### Software

**Fault Robust Software Test Library**

by Yogitech



### Consultancy



Implementation support  
by Hitex

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## Security Solutions

### Software

#### Secure Bootloader

by Infineon, XMC1000



#### CodeMeter $\mu$ Embedded

by WIBU, XMC4000 exclusive

#### KMS/CycurKEYS

by ESCRYPT, XMC4000

#### emSecure

by Segger

### Hardware

#### OPTIGA™ Family

by Infineon – Hardware based security solutions

#### OPTIGA™ Trust



Turnkey & programmable security solutions

#### OPTIGA™ TPM



Standardized certified turnkey solution

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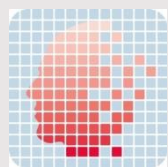
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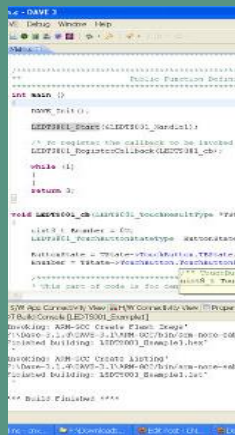
Ecosystem

# DAVE™ makes powerful hardware accessible

Software complexity in embedded systems grows faster than Moore's law.



## Digital Application Virtual Engineer



- › **Free** Eclipse CDT based IDE using GNU C-Compiler
- › **Code generation** with **graphical user interface** (GUI)  
*Configurable and reusable code repository consist of **XMC™ Lib** (for all peripherals), **DAVE™ APPs**, and **EXAMPLES***
- › Automatic assignment of chip resources (resolver)
- › Debugger and Flash loader
- › **All XMC™ MCUs** powered by ARM® Cortex®-M supported
- › XMC™ Lib and DAVE™ APPs **tested** with GCC compiler, ARM® compiler, and TASKING compiler **released for** Altium, ARM/KEIL, Atollic, DAVE™, IAR Systems, and Rowley

### XMC™ Link

Isolated Debug Probe,  
based on SEGGER  
J-Link  
Technology



# XMC™ Evaluation Kits – some examples

## GETTING STARTED

## APPLICATION SPECIFIC

XMC1000

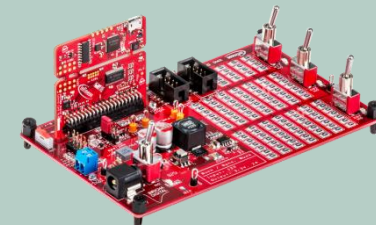
- > XMC1100 Boot Kit
- > XMC1200 Boot Kit
- > XMC1300 Boot Kit
- > **XMC 2Go**



**Power Tool KIT**  
using XMC1302  
1 kW/20 V<sub>DC</sub>  
BLDC Motor Control



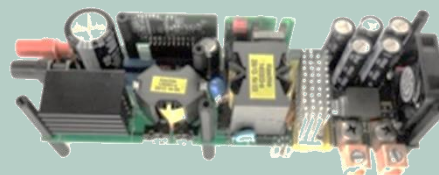
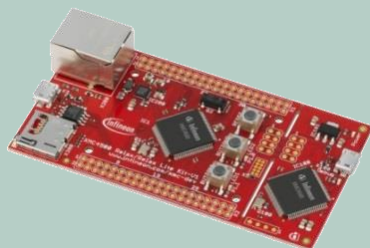
**Arduino  
RGB Lighting Kit**  
using XMC1202



**Digital Power  
Explorer Kit**  
using  
XMC1300/XMC4200

XMC4000

- > XMC4500 Relax Kit
- > XMC4500 Relax Lite Kit



**600 W LLC Reference Design**  
using XMC4200  
Achieves TITANIUM efficiency  
standard



**750 W power inverter**  
with PFC  
(115 V<sub>AC</sub> to 230 V<sub>AC</sub>)  
nominal 3 A motor current

# Support material:

## Collaterals and Brochures



- › Product Briefs
- › Selection Guides
- › Application Brochures
- › Presentations
- › Press Releases, Ads

› [www.infineon.com/XMC](http://www.infineon.com/XMC)

## Technical Material



- › Application Notes
- › Technical Articles
- › Simulation Models
- › Datasheets, MCDS Files
- › PCB Design Data

› [www.infineon.com/XMC](http://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 \(TAC\)](#)

# Glossary abbreviations

- › ADC Analog-to-Digital Converter
- › BCCU Brightness and Colour Control Unit
- › CAGR Compound Annual Growth Rate
- › CAN Controller Area Network
- › CCU4 Capture Compare Unit 4
- › CCU8 Capture Compare Unit 8
- › CPU Central Processing Unit
- › DAC Digital-to-Analog Converter
- › DAVE™ Free development IDE for XMC™
- › EtherCAT® Ethernet for Control Automation Technology
- › HRPWM High Resolution Pulse Width Modulation
- › I/O Input / Output
- › I2C Inter Integrated Circuit (also known as IIC)
- › IGBT Insulated Gate Bipolar Transistor

# Glossary abbreviations

› IOT	Internet of Things
› LED	Light Emitting Diode
› MCU	Microcontroller
› MMC	MultiMediaCard
› POSIF	Position Interface
› PWM	Pulse Width Modulation
› RAM	Random Access Memory
› SD	Secure Digital
› SDIO	Secure Digital Input Output
› SPI	Serial Peripheral Interface
› UART	Universal Asynchronous Receiver Transmitter
› USB	Universal Serial Bus
› USIC	Universal Serial Interface Channel

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