

Welcome to E-XFL.COM

What is "Embedded - Microcontrollers"?

"Embedded - Microcontrollers" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "<u>Embedded -</u> <u>Microcontrollers</u>"

Details

E·XFl

Product Status	Obsolete
Core Processor	ARM® Cortex®-M3
Core Size	32-Bit Single-Core
Speed	60MHz
Connectivity	CANbus, CSIO, EBI/EMI, I ² C, LINbus, UART/USART, USB
Peripherals	DMA, LVD, POR, PWM, WDT
Number of I/O	122
Program Memory Size	1.5625MB (1.5625M × 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	192К х 8
Voltage - Supply (Vcc/Vdd)	2.7V ~ 5.5V
Data Converters	A/D 24x12b; D/A 2x10b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 105°C (TA)
Mounting Type	Surface Mount
Package / Case	144-LQFP
Supplier Device Package	144-LQFP (20x20)
Purchase URL	https://www.e-xfl.com/product-detail/infineon-technologies/mb9bf529spmc-gk7e1

Email: info@E-XFL.COM

Address: Room A, 16/F, Full Win Commercial Centre, 573 Nathan Road, Mongkok, Hong Kong







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CORE & CODE

TECHNICAL TIPS FOR SYSTEM DESIGNERS

Core & Code offers technical expertise and content tailored forembedded system designers. Published on a quarterly basis, Core & Code features articles, "how-to" design pieces, application notes, new products and more from Cypress and other industry thought leaders on embedded technologies, products, issues and best practices for designing products in automotive, industrial, consumer and networking markets. This platform provides a forum to share knowledge on the industry and recommendations to ease the design process. Get the latest industry news on our blog, use the All Issues section to explore past articles and browse upcoming industry events to get more involved. Core & Code is powered by Cypress, a global leader in embedded systems solutions.



















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CYPRESS® FM MICROCONTROLLERS

The Cypress® FM microcontrollers (MCUs) incorporate the latest ARM® Cortex® standard cores (MO+, M3 and M4), offering users the optimal product for a wide range of industrial and consumer applications. The scalable platform ranges from low-pin-count, low-power microcontrollers to high-performance products with a rich set of peripherals (including CAN, USB and Ethernet) and up to 2MB flash memory. The high-speed, embedded flash process technology offers the endurance of 100K erase/write cycles and up to 20 years of data retention.



ARM CORTEX-M CPU COMPARISON

	MO	M0+ (used in FM0+)	M3 (used in FM3)	M4 (used in FM4)
Power consumption (CPU)	16µW/MHz	11.2µW/MHz	0.1mW/MHz	_
Performance	0.84 DMIPS/MHz	0.93 DMIPS/MHz	1.25 DMIPS/MHz	Same as M3
IRQs	NMI + 32	NMI + 32	NMI + 240 8-256 levels	Same as M3
Pipeline	3 stage	2 stage	3 stage + branch speculation	Same as M3
Instruction set	Thumb®/Thumb-2 subset	Thumb®/Thumb-2 subset	Thumb®/Thumb-2	Same as M3
Single cycle multiply 32x32	\checkmark	✓	✓	Same as M3
Hardware divided (2-12 cycles)	_	_	\checkmark	Same as M3
Debug	Up to 4 Breakpoints and 2 Watchpoints	Up to 4 Breakpoints and 2 Watchpoints	Up to 8 Breakpoints and 4 Watchpoints	Same as M3
Trace	-	Micro trace buffer	ETM	Same as M3
Bit manipulation	✓	✓	✓	Same as M3
DSP instructions	_	_	_	\checkmark
Single precision FPU	-	-	-	\checkmark

KEY FEATURES

Outstanding Performance

- ARM Cortex-M series core
- High CPU clock frequencies of up to 200MHz (FM4) and 144MHz (FM3)
- Highly reliable, high-speed, secure embedded flash memory
- True zero-wait-state flash operation at 72MHz
- Pre-fetch buffer for zero-wait-state operation at 200MHz
- Support for voltages ranging from 1.65-5.5V
- 1.65-3.6V: low-power products
- 1.8-5.5V: ultra-low-leakage products
- 2.7-5.5V: high-performance products
- DMA controller with dedicated bus layer and up to eight independent channels

Functional Safety

- Internal, trimmed RC oscillators as an independent clock source
- Clock supervisor
- Two-stage (interrupt and reset), programmable LVD (low voltage detector)
- CRC hardware module
- MPU (memory protection unit)
- Programmable emergency stop input for PWM motor control
- Self-test library for IEC61508 and IEC60730
- Watchdog timer

High-Performance Flash Memory

- Memory densities up to 2MB flash/256KB RAM
- Highly reliable flash memory
- 100,000 write/erase cycles endurance
- Up to 20 years of data retention
- Flash security function
- Dual-operation flash for EEPROM emulation on many devices

Low Power

- Dedicated low-power chip design with clock and power gating
- Multiple low-power options for finely grained power-saving modes
- Dedicated power domain for deep standby modes
- Low-power, low-leakage products for handheld, battery-powered applications

APPLICATIONS

Cypress FM microcontrollers are appropriate for a wide variety of applications, including:

- Industrial
- Motor control and other inverter applications
- Factory automation

- I/O Ports
- Internal pull-up resistors (enable/disable)
- Flexible resource relocation: most peripheral functions can be routed to two or more MCU pins
- 12mA general-purpose IOs
- Readable external pin state

Connectivity

- Up to two channels CAN controller
- CAN-FD controller on some series
- Full-speed USB host/device, up to two channels each
- Up to two channels Ethernet MAC
- Flexible, multi-function serial interfaces covering I²C,
 SPI (up to 20 Mbps), LIN and UART
 I²C/SPI/LIN/UART selectable within each channel
- 8/16-bit external bus interface with support for SRAM, NOR-, NAND-flash and SDRAM (FM4)
- HDMI-CEC macro (with IR receive macro)

Advanced Peripherals

- Up to three multifunction timers (for motor control)

 Includes waveform generator with dead time insertion
 Includes advanced A/D converter trigger unit
- Quadrature decoder unit for motor-control feedback and HMI input devices, multi-turn capability
- Base timer (PWM, PWC, PPG and reload timer)
- Sub-clock option
- Up to three independent (synchronously triggerable), high-speed 12-bit A/D converters, conversion time: 0.5µs on FM4, 1µs on FM3
- Up to two channels, 12-bit D/A converters

Debug Interface

- JTAG and SWJ debug interfaces
- Embedded trace macro-cell on many devices





The Cypress FM MCU lineup consists of three families—FMO+, FM3 and FM4—each of which uses a specific ARM Cortex-M core. Users can easily transition between device types and families because of the compatibility of the instruction sets.

• White goods

• Home appliances

- Power tools
- Medical and healthcare applications
- Handheld devices

			S6E2CxAHOA	S6E2CxAJOA	S6E2CxALOA	
			S6E2Cx9HOA	S6E2Cx9JOA	S6E2Cx9LOA	
			MB9BFx29S	MB9BFx29T		
М	MB9BFx68N	MB9BFx68R	S6E2Cx8HOA	S6E2Cx8JOA	S6E2Cx8LOA	
			MB9BFx18S	MB9BFx18T		
			MB9BFx28S	MB9BFx28T		
М	MB9BFx67N	MB9BFx67R		 		
			MB9BFx17S	MB9BFx17T		
Μ	MB9BFx66N	MB9BFx66R		1		
	MB9BFx16N		MB9BFx16S	MB9BFx16T		
М	MB9AFx16N	MB9BFx16R				
М	MB9AF156N	MB9AF156R				
κA	S6E1B15FxA	S6E1B15GxA				
	MB9BFx15N	MB9BFx15R				
М	MB9AFx15N	Planning		Planning		
М	MB9AF155N	MB9AF155R				
ĸА	S6E1B15FxA	S6E1B15GxA		 		
М	MB9BFx14N	MB9BFx14R		1		
M	MB9AFx14N			1 1 1		
М	MB9AFx44N	MB9AF154R		1		
ĸА	S6E1B15FxA	S6E1B15GxA				
М	MB9BFx12N	MB9BFx12R				
2M	MB9AFx12N					
M	MB9AFx42N					
M	MB9AFx32N		FM2	FM4		
	Planning			FM3 High P	erformance	
М			— a —	FM3 Bo	sic	
М	MB9AFx11N			FM3 Low	Power	
М	MB9AFx41N			FM3 U	LL I	
М	MB9AFx31N			FMO+ E	ntry	
	Planning			FM0+ Ultra	Low Power	
						Pin
	100	120	144	176	216	
	100	120	144	170	210	

CYPRESS FM4 FAMILY

CORTEX-M4 - CORE PRODUCTS HIGH PERFORMANCE

- For industrial applications
- Higher spec with FPU/DSP
- Quadruple performance in arithmetic program (compared with FM3)

The FM4 family of 32-bit, general purpose MCUs is based on the ARM Cortex-M4F processor core. This family, which features DSP and floating point (FPU) functions, covers the highest end of the product range.

The MCUs are designed for applications that require advanced, high-speed computing performance such as general-purpose inverters, servomotors, PLCs and other industrial equipment, as well as inverter-based home appliances such as washing machines and air conditioners.

KEY FEATURES

- Frequency: up to 200MHz
- Operating voltage: 2.7-5.5V
- Low power consumption: 0.4mA/MHz, 1.5uA RTC mode
- Flash: 256KB-2MB
- Up to 256KB RAM
- 48-216 pin packages
- IP: Ethernet, CAN, USB2.0, motor control

MOTOR AND INVERTOR

- High spec vector arithmetic
- Enhanced motor control timer
- High speed sampling A/D converter (conversion speed: 2Msps)

FM4 PRODUCT LINEUP

Flash/RAM size

APPLICATIONS

- Inverter motor control
- Factory automation, PLCs
- Highly efficient white goods
- Medical
- Surveillance

NETWORKS

- Enriched communication function
- (SD I/F, Ethernet, CAN-FD, High speed serial I/F, HS SPI)
- Large size memory
- SDRAM I/F



KEY FEATURES



FM4 PACKAGE LINEUP

Pin	LQFP	QFP	BGA	QFN
216	24x24mm/0.4mm	—	—	-
192	—	—	12x12mm/0.8mm	_
176	24x24mm/0.5mm	—	—	—
144	20x20mm/0.5mm	-	7x7mm/0.5mm	-
120	16x16mm/0.50mm	—	—	_
112	—	—	7x7mm/0.5mm	-
100	14x14mm/0.50mm	14x20mm/0.65m	—	-
80	14x14mm/0.65mm 12x12mm/0.50mm	—	—	-
64	12x12mm/0.65mm 10x10mm/0.50mm	_	_	9x9mm/0.50mm
48	7x7mm/0.50mm	_	_	9x9mm/0.50mm

• Max frequency: 200MHz

• Operation voltage: 2.7V~5.5V

8

S6E2CC



Operation Panel Control LCD Panel Touch Panel Sub MCU LCD Backlight Reset IC UART/SIO FLASH FLASH MFS 1MB 1MB DMA SRAM Memory QSPI DSTC 256KB USB USB ASIC **CYPRESS** EBUS 200 MHZ SDCard/Wifi SD Network ETH CAN-FD CAN-FD CAN CAN CAN CAN



CYPRESS FM3 FAMILY

The FM3 family of 32-bit general-purpose MCUs is based on the ARM Cortex-M3 CPU, providing a scalable platform for many consumer and industrial applications. Popular applications range from motor control, factory automation, white goods and power tools to medical devices, major home appliances, digital consumer devices and office automation equipment.

The MCUs include a host of peripheral features, including multiple motor-control timers, high-speed ADCs, and a variety of communication interfaces. The wide operating voltage range (1.8V to 5.5V) improves the signal-to-noise ratio, resulting in a robust design that is unique among Cortex-M3 microcontroller families. Available packages range from 32 pin to 176 pin with flash memory densities ranging from 64KB to 1.5MB.

The FM3 family, which features a maximum operating frequency of 20-144 MHz, is split into four groups: high-performance, basic, low-power and ultra-low-leakage. All products are based on the same architecture for software compatibility, use the same peripherals and are pin compatible in most cases. The main differences between the groups are the CPU operating frequency and supply voltage.

SUB-FAMILIES

HIGH PERFORMANCE	BASIC	LOW POWER	ULTRA LOW LEAKAGE
• Up to 144MHz	• Up to 72MHz	• 40MHz	• 20MHz
• 2.7V-5.5V	• 2.7V-5.5V	• 1.65V-3.6V	• 1.8V-5.5V
• Up to 1MB flash	• Up to 1.5MB flash	• Separated power domains	• Low stop mode current
• Up to 128KB RAM	• Up to 192KB RAM	• LCD	consumption
• USB, device and host	• USB, device and host	• USB, device and host	• LCD, CAN
• CAN	• CAN		• Standard set of peripherals
• Ethernet	 Motor control 		
• Motor control	 Optimized cost 		

APPLICATIONS

- Factory automation
- Building automation
- Motor control
- Home appliances
- Power tools
- Handheld devices
- Medical

KEY FEATURES



FM4 PACKAGE LINEUP

Pin	LQFP	QFP	BGA	QFN
192	—	—	12x12mm/0.8mm	-
176	24x24mm/0.5mm	—	—	-
144	20x20mm/0.5mm	—	—	-
120	16x16mm/0.50mm	-	-	-
112	—	—	10x10mm/0.8mm	_
100	14x14mm/0.50mm	14x20mm/0.65mm	—	-
96	—	—	6x6mm/0.5m	-
80	14x14mm/0.65mm 12x12mm/0.50mm	—	—	-
64	12x12mm/0.65mm 10x10mm/0.50mm	—	_	9x9mm/0.50mm
52	10x10mm/0.65mm	—	—	—
48	7x7mm/0.50mm	_	_	7x7mm/0.50mm
32	7x7mm/0.50mm	_	_	5x5mm/0.50mm

Note: Left value is body size, right value is pin pitch.

FM3 HIGH-PERFORMANCE GROUP



MB9BD10S/T

RC Oscillator +/-2%	ARM [®] Cortex [®] -M3 – CPU	OCU 6ch	ICU 4ch
Clock Supervisor	144MHz (Max) FPU	ADT 3ch	FRTim 3ch
Subclock (option)	2.7-5.5V	Multi Function Timer 3 units	Waveform Generator
Low Voltage Detector 2ch	Main CLK: 4MHz SUB CLK: 326Hz	PPG 9ch	CRC/PRGC
Memory Protection Unit		Base Timer 16ch	External IR 32ch + NA
SWJ/TPIU/ETM Debug Ports		Dual Timer	DMA 8cł
		Watch Counter	CRC
MFS (UART/CSIO/LIN) 8ch	Package: LQFP144*1, LQFP176*2	Resource Pin Relocation	Hardware Watchdog
USB FS Host+Function 2ch each	MB9BFD16S/T FLASH SRAM 512K 64K		
CAN (32 MSB) 2ch	MB9BFD17S/T FLASH SRAM 768K 64K	12-bit ADC	
Ethernet MAC 10/100MBit 2ch	MB9BFD18S/T FLASH SRAM 1MB 128K	12-bit ADC 24cl 32cl	h*1 h*2
External Bus Interface 8/16 Data 19*1/25*2 Addr 8CS		12-bit ADC	

BASIC GROUP

- Frequency: up to 72MHz
- Operating voltage: 2.7-5.5V
- Flash: 64KB-1.5MB
- Up to 192KB RAM
- 32-176 pin packages
- IP: CAN, USB2.0, motor control

FM3 BASIC GROUP

Flash/RAM size

3	
<u>^</u>	۸B۶
	۸BS
MB9BFx24K MB9BFx24L MB9AFx14L N	4B9 4B9
MB9BFx22K MB9BFx22L MB9AFx12K MB9AFx12L N	4B9 4B9
MB9BFx21K ^{EE} MB9BFx21L ^{EE} M MB9AFx11K MB9AFx11L M	4B9 4B9
MB9AF421K MB9AF421L CA MB9AF121K MB9AF121L	
48 64	
	MB9BFx24K

MB9A310N



APPLICATIONS

- Household appliances
- Motor control
- Office automation
- Power tools
- Factory automation sensors



MB9A310K

RC Oscillator +/-2% Clock Supervisor Subclock (option)	ARM® Cortex®-M3 — CPU 40MHz (Max) 2.7-5.5V	OCU 6ch ADT 3ch Multifunction Timer 1 unit	ICU 4ch FRTim 3ch Waveform Generator
Low Voltage Detector 2ch	Main CLK: 4MHz SUB CLK: 32kHz	PPG 3ch	QDU 1ch
		Base Timer 8ch	External IRQs 16ch + NMI
SWJ Debug Port	Package: LQFP48, QFN48	Dual Timer	DMA 4ch
MFS (UART/SPI/I²C) 4ch	MB9AF311K FLASH SRAM 64K+32K 16K	RTC y:m:h;m:s	CRC
USB FS Host+Function	MB9AF312K FLASH SRAM 128K+32K 16K	Resource Pin Relocation	Hardware Watchdog
		12-bit ADC 12-bit ADC	

MB9B520K/L/M

RC Oscillator +/-2% Clock Supervisor Subclock (option)	ARM® Cortex®-M3 — CPU 40MHz (Max) 2.7-5.5V	OCU 6ch ADT 3ch Multifunction Timer 1 unit	ICU 4ch FRTim 3ch Waveform Generator
Low Voltage Detector 2ch	Main CLK: 4MHz SUB CLK: 32kHz	PPG 3ch	QDU 1ch*1, 2ch*2,3
		Base Timer 8ch	External IRQs: NMI + 14ch*1, 19ch*2, 23ch*3
SWJ/TPIU Debug Ports	Package: LQFP, QFN, BGA 48pin*1, 64pin*2, 80pin*2	Dual Timer	DMA 8ch
MFS (UART/SPI/I ² C) 4ch* ¹ , 8ch* ^{2,3}	MB9BF521K/ FLASH SRAM L/M 64K+32K 16K	Watch Counter	CRC
USB FS Host+Function	MB9BF522K FLASH SRAM /L/M 128K+32K 16K	10-bit DAC 2ch	Hardware Watchdog
CAN (32 MSB)	MB9BF524K FLASH SRAM /L/M 256K+32K 32K	12-bit ADC 14ch*1	RTC y:m:h:m:s
		12-bit ADC 23ch*2 26ch*3	
*1 MB	9B520K: LQFP48, QFN48 *2 MB9B520L:	LQFP64, QFN64 *3 MB	9B520M: LQFP80, BGA96

MB9A420K/L

RC Oscillator +/-2%	ARM [®] Corte
Clock Supervisor	20MF 2.7
Subclock (option)	
Low Voltage Detector 2ch	Main CLK: 4MHz SUB CLK: 32kHz
	MAIN RC CLK: 4M SUB RC CLK: 100
SWJ/TPIU Debug Ports	Package: LQFP
MFS (UART/SPI/I2C) 4ch	MB9AF421K/L
CAN (32 MSB)	
· · ·	

LOW-POWER GROUP

- Frequency: 40MHz
- Operating voltage: 1.65-3.6V
- Separated power domains
- Low-power current: 200µA/MHZ (typical)
- USB2.0, LCDC, HDMI-CEC

FM3 LOW-POWER GROUP

Flash/RAM size FMB 512KB /32KB 384KB /32KB LCD MB9AFy44L MB9AFy44M 256KB /32KB 128KB /16KB 64KB LCD E MB9AFy41L E MB9AFy41M B9AFy41N /16KB MB9AFx41L MB9AFx41M 32KB /8KB 32 48 64 1 1



APPLICATIONS

- Handheld devices
- Metering
- Medical devices
- Battery-powered applications



MB9AB40M/N

RC Oscillator +/-2% Clock Supervisor	ARM® Cortex®-M3 — CPU 40MHz (Max) 1.65-3.6V		
Subclock (option)		Dual Timer	External IRQs 11ch*1/16ch*2 + NMI
Low Voltage Detector 2ch	Main CLK: 4MHz	Base Timer 8ch	DMA 8ch
		RTC y:m:h:m:s	Hardware Watchdog
SWJ/TPIU Debug Ports*1 SWJ/TPIU/ETM Debug Ports*2	Package: LQFP80*1, LQFP100*2 BGA112*2	Resource Pin Relocation	CRC
MFS (UART/SPI/I²C) 8ch	MB9AFB41 FLASH SRAM M/N 64K+32K 16K	LCDC (33seg x 8co	om)*1 (40seg x 8com)*2
USB FS Host+Function	MB9AFB42 FLASH SRAM M/N 128K+32K 16K	12-bit ADC 17ch*1	
HDMI-CEC 2ch	MB9AFB44 FLASH SRAM M/N 256K+32K 32K	12-bit ADC 24ch*2	
	*1 MB9AB4	10m: LQFP80 *2 MB9A1	B40N: LQFP100. BGA112

MB9A140L

RC Oscillator +/-2% Clock Supervisor	ARM® Cortex®-M3 — CPU 40MHz (Max) 1.65-3.6V		
Subclock (option)		Dual Timer	External IRQs 7ch + NMI
Low Voltage Detector 2ch	Main CLK: 4MHz SUB CLK: 20LHz		DMA 8ch
		RTC y:m:h:m:s	Hardware Watchdog
SWJ Debug Ports	Package: LQFP64	Resource Pin Relocation	CRC
MFS (UART/SPI/I²C) 8ch	MB9AF141L FLASH SRAM 64K+32K 16K		
	MB9AF142L FLASH SRAM 128K+32K 16K	12-bit ADC	
HDMI-CEC 2ch	MB9AF144L FLASH SRAM 256K+32K 32K	12-bit ADC	

ULTRA-LOW-LEAKAGE GROUP

- Frequency: 20MHz
- Operating voltage: 1.8-5.5V
- Low leakage current, ~ 0.4µA (at DS-Stop mode)
- Low-power-consumption mode
- Various IP: LCDC, HDMI-CEC
- Standard set of peripherals
- Optimized low-leakage process technology

FM3 ULTRA-LOW-LEAKAGE GROUP



RC Oscillator +/-2%	ARM [®] Corte
Clock Supervisor	20MH 1.8
Subclock (option)	
Low Voltage Detector 2ch	Main CLK: 4MHz
	MAIN RC CLK: 4M SUB RC CLK: 100
SWJ/TPIU Debug Ports	Package LQFP100
MFS (UART/SPI/I²C) 8ch	MB9AFA31 M/N
	MB9AFA32 M/N
HDMI-CEC 2ch	

APPLICATIONS

- Metering
- Mobile devices
- Handheld devices

CYPRESS FMO+ FAMILY

The FMO+ family, which is based on the ARM Cortex-MO+ core, is designed for industrial and cost-sensitive applications with low power requirements such as white goods, sensors, meters, HMI systems and power tools.

The family, which operates at 40MHz, has a run-mode current of 70µA/MHz and an RTC mode current of 0.7µA. The FMO+ family can be easily embedded into systems adopting Cypress's 8-, 16- or 32-bit MCUs, accelerating product development and reducing development costs. The FMO+ family includes two groups for ultra-low-power and cost-effective applications.

ULTRA-LOW-POWER GROUP

- Operating voltage: 1.65-3.6V
- Frequency: 40MHz
- Low power consumption
- EEPROM emulation
- Analog peripherals

S6E1A1

ENTRY-LEVEL GROUP

- Operating voltage: 2.7-5.5V
- Frequency: 40MHz
- Flash: 56KB to 88KB
- 6KB RAM
- Cost efficient





FMO+ PACKAGE LINEUP

Pin	LQFP	QFP	BGA	QFN
192	—	—	—	-
176	—	—	—	-
144	—	—	—	-
120	16x16mm/0.50mm	—	—	-
112	—	—	10x10mm/0.8mm	-
100	14x14mm/0.50mm	14x20mm/0.65mm	—	-
96	—	_	6x6mm/0.5m	-
80	14x14mm/0.65mm 12x12mm/0.50mm	—	-	-
64	12x12mm/0.65mm	—	_	_
52	10x10mm/0.65mm	—	—	—
48	7x7mm/0.50mm	—	—	7x7mm/0.50mm
32	7x7mm/0.80mm	—	—	5x5mm/0.50mm

Note: Left value is body size, right value is pin pitch.

RC Oscillator +/-2% Clock Supervisor Subclock (option)	ARM® Cortex®-M3 — CPU 40MHz (Max) 2.7-5.5V	OCU 6ch ADT 3ch Multifunction Timer 1 unit	ICU 4ch FRTim 3ch Waveform Generator
Low Voltage Detector 2ch	Main CLK: 4MHz SUB CLK: 32kHz	PPG 3ch	QDU 1ch
		Base Timer 8ch	External IRQs: NMI + 8ch
SW Debug Port	Package: LQFP, QFN 32pin, 48pin	Dual Timer	DMA 8ch
MFS (UART/SPI/I²C) 3ch	S6E1A11B/C FLASH SRAM 56KB 6K	Watch Counter	
	S6E1A12B/C FLASH SRAM 88KB 6K	Resource Pin Relocation	Hardware Watchdog
			RTC y:m:h:m:s
		12-bit ADC 5ch*², 8ch*1	
	*1 S6E1A1xBOA: L0	QFP48, QFN48 *2 S6E1	A1xCOA: LQFP32, QFN3

		· · · · · ·			
6E1B15ExA	S6E1B15FxA	Planning S6E1B15GxA			
6E1B15ExA	S6E1B15FxA	Planning S6E1B15GxA			
66E1B15ExA	S6E1B15FxA	Planning S6E1B15GxA			
					D .
80	100	120	144	176	Pins

FMO+ PACKAGE LINEUP

Part Number Package Code	Functional Pins	Package	Dimensions in mm (pitch)	Package Code	Photo
JPMC	32	LQFP	7x7 (0.8)	FPT-32P-M30	
JWQN	32	QFN	5x5 (0.5)	LCC-32P-M19	
KPMC	48	LQFP	7x7 (0.5)	FPT-48P-M49	
KQN	48	QFN	7x7 (0.5)	LCC-48P-M73	
LPMC	64	LQFP	12x12 (0.65)	FPT-64P-M39	
LPMC 1	64	LQFP	10x10 (0.5)	FPT-64P-M38	
lqn	64	QFN	9x9 (0.5)	LCC-64P-M24	
MPMC	80	LQFP	12x12 (0.5)	FPT-80P-M37	
MPMC1	80	LQFP	14x14 (0.65)	FPT-80P-M40	
MBGL	80 (96 balls)	BGA	6x6 (0.5)	BGA-96P-M07	
NPF	100	QFP	14x20 (0.65)	FPT100P-M36	
NPMC	100	LQFP	14×14 (0.5)	FPT-100P-M23	
NBGL	100 (112 balls)	BGA	10x10 (0.8)	BGA-112P-M04	E FMB M89AF156N 1230 M00 ES E1 ARM
NBGL	100 (112 balls)	BGA	7x7 (0.5)	BGA-112P-M05	
RBGL	120 (144 balls)	BGA	7x7 (0.5)	BGA-114P-M09	
RPMC	120	LQFP	16x16 (0.5)	FPT-120P-M37	
SPMC	144	LQFP	20×20 (0.5)	FPT-144P-M08	
TPMC	176	LQFP	24×24 (0.5)	FPT-176P-M07	
TBGL	176 (192 balls)	BGA	12×12 (0.8)	BGA-192P-M06	

DEVELOPMENT TOOLS

Cypress's microcontroller families are supported by development tools, including integrated development environments (IDEs), middleware and evaluation boards that have a proven track record with partner vendors.









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www.falcon-denshi.co.jp/en

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Flash Programme

DEVELOPMENT TOOLS	DEVELOPMENT TOOLS
www.j-fsg.co.jp/en/ Flash Support Group offers single programmers and on-board programmers. Flash Programmer	SEGGER offers debugging tools, realtime OS and middleware.
GAIO Technology offers software testing tool and simulator products.	V/SEGGER www.j-fsg.co.jp/en/
From compiler and debugging environment to realtime OS, Green Hills offers total comprehensive tool solutions.	www.sevenstax.de/en/home OS
SOFTWARE www.ghs.com Debugger OS Middleware Simulator	Sohwa & Sophia Sohwa & Sophia Technologies offers debugging tools and EJSC www ss-technologies. IDE/Compiler Debugger OS
GRAPE GRAPE SYSTEMS offers realtime OS, USB and SD card middleware. www.grape.co.jp/ OS english Middleware	TASKING TASKING offers compiler, debugger, RTOS and TCP/IP middler
DEVELOPMENTTOOLS Debugger OS Middleware Flash Programmer	Algorithm Specialist Debugger OS TEchno Mathematical Co., Ltd. Techno Mathematical offers audio middleware.
iSystem offers complete software development and analysis solutions which are complemented by a unique software test tool (testIDEA), requiring no code instrumentation.	www.tmath.co.jp/eng TSUTUNN Tsuzuki widely supports FM family products from debugging env tsuzuki.jp/products/list03.html IDE/Compiler Debugger
Kyoto Microcomputer Co.,Ltd. Kyoto Microcomputer offers debugging environment, PARTNERJet. IDE/Compiler Debugger	Image: Constraint of the sector of the se
Mentor Graphics offers GNU based integrated development environment, Sourcery CodeBench. www.mentor.com IDE/Compiler Debugger Simulator	YOKOGAWA Yokogawa Digital Computer Corporation Www2.yokogawa-digital.com/en/ Debugger
Micrium Micrium offers realtime OS, USB and TCP/IP stacks. www.micrium.com OS Middleware	Wave Technology Wave Technology offers programmers for mass product wavetechnology.co.jp/en/
MINATO ELECTRONICS offers single and gang flash programmers. www.minato.co.jp/en NAITO DENSEI MACHIDA MFG NAITO DENSEI MACHIDA MFG offers flash programmers best suited to be burned on production line. 禁査内藤電誠町田製作所 www.sys.ndk-m.com Flash Programmer	XELTEK offers in-system, cluster, gang, parallel and automated pr density eMMC NAND flash chips.
PERSONAL MEDIA CORP. PERSIONAL MEDIA offers embedded solutions related to T-Kernel and iT-Kernel. www.personal-media.co.jp OS Middleware	
KOWEBOTS RoweBots offers tiny Linux. www.rowebots.com ROWLEY S Across Works http://www.rowley. LCO.uk OS IDE/Compiler Debugger OS	

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PRODUCT BROCHURE

Flash Programmer Middleware Middleware ebugging tools and EJSCATT. Flash Programmer Simulator Middleware TOS and TCP/IP middleware. Middleware eware. Middleware cts from debugging environment to engineering services. Debugger t generation RTOS of ITRON, and TCP/IP supporting FM Family. Middleware fers debugging tools and flash programmers. Flash Programmer mmers for mass production Flash Programmer arallel and automated programmers for various PICS, FPGAs, MCUs and high

Flash Programmer

SOFTWARE ENABLEMENT

A diverse range of software enablement components are available, including real-time operating systems, low-level peripheral libraries and protocol stacks. In many cases, the user can choose between commercial and free solutions.

CYPRESS LOW-LEVEL AND MIDDLEWARE COMPONENTS

- Peripheral, low-level library
- CMSIS compliant
- USB library
- Ethernet TCP/IP stack, software switch
- Functional safety self-test libraries (IEC60730 – Class B, IEC61508 SIL2)
- EEPROM emulation library
- Motor control platform
- Capacitive touch library
- Virtual starter kit
- Pin and Code Wizard

OPERATING SYSTEMS

- FreeRTOS
- Micrium µC/OS-II
- Segger emboss
- Avix/RT

PARTNER MIDDLEWARE **COMPONENTS**

- USB library
- Ethernet TCP/IP stacks and applications layers
- CANopen protocol stacks

CYPRESS FM FAMILY MCU SIMULATOR

Cypress's FM family MCU simulator is a virtual starter kit for Cypress's FM family of MCUs. This tool provides a complete simulation shortened due to the efficiency of the debugging and analysis ability of this virtual starter kit.



	DEVELOPER'S VIEW				
	APPLICATIONS	Software Examples Application Notes			
ACTION	MIDDLEWARE	Solution Libraries (Source Code) 3rd party products			
ABSTRA	LOW LEVEL DRIVERS	Driver Libraries (Source Code) Software Examples			
ļ	HARDWARE	Mircocontroller Evaluation Boards			

APPLICATIONS

Software Development

- Driver development
- Middleware development
- Application development

Software Sequence Evaluation

- Communication protocol with external devices
- Interrupt response sequence
- Task sequence

System Evaluation

- Peripheral behavior
- System behavior

http://www.cypress.com/spansion-redirect

environment allowing users to utilize a software development kit versus evaluation boards. Overall software development time is dramatically

PIN AND CODE WIZARD

This Windows-based tool is for the Cypress FM family of ARM Cortex-M microcontrollers to enable easy configuration of pin assignments for multiplexed options. It allows developers to graphically assign pin functions in an intuitive and simple manner that aids collision avoidance and generates register initialization code.

Automatic Pin Assignment

Assign the selected peripherals to pin automatically



Edit Window

Customize while reviewing the pin assignment status and display the status of any conflicts

Pin	ADC_PRIORITY	BT_I/O Mode5	MFS0_CSIO	GPIO
1		TIO A0_1	SCK0_2	B- PSA
2		TIDA1_1	SOT0_2	⊞ □ P3B
3		TID A2_1	SIN0_2	⊞- ■ P3C
4		TID A3_1		⊞ 🔲 P3D
5		0 0A OLT		H P3E
6		V TIOA1 0		B P3F
10				B P46
11				B P47
13	ADTG_1			B → PE0
15				⊞ □ PE2
16				⊞- ■ PE3
18	AN01			⊞-
19	AN02			
20	AN03			
23	AN06	TIO A2_0	SCK0_0	
24	AN07		SOTO 0	₩- P22
25			SIN0 0	■ P21
26				⊞- ♥ P01
27				H- V P03
28				⊞ ♥ P04
29				B- V POF
30				
31		TID A2 2		P. 0 P60

Project Output

Project output includes source code file with initialization code for user assigned pin functions

a			
stie1xx_pdI - Release *	~	9	/##
-🖓 🛄 common			White the function initializes GPID
	•		
- Output			<pre>kkinkkinkinkinkinkinkinkinkinkinkinkinki</pre>
base_types.h			static void iomux_uriU_init(void)
		I T	// Init GPIO pin function
- Ki core_cm0plus.h			Geisleis Taitis (CP101PIN_P01, Geisleis TaitPullup(00));
- 🔂 core_cmFunc.h			Gpiolpin Initin(GPIOlPIN P04, Gpiolpin InitPullup(Ou));
- 🔂 core_cminstr.h			Gpiolpin_InitIn(GPIOlPIN_POF, Gpiolpin_InitPullup(Ou));
		L	Gpiolpin_Initin(GPIULPIN_PIS, Gpiolpin_InitPullup(Uu));
		9	/**
			** ¥brief This function deinitializes GPID
- 🔜 intrinsics.h			**
- 🔂 mcu.h			static void Low x CPID Delpit(void)
🛏 🔝 pdl.h		P.	
			// Delnit GPIO pin function
🗕 🔛 s6e1xx.h			,
📥 stddef.h			
📥 🔛 stdint.h			/##
🛏 🔝 system_s6e1xx.h		I T	***************************************
- 🗠 xencoding_limits.h			** ¥brief This function initializes the GPIU ports and peripheral pin
- 🔄 ycheck h			with and the according to the data actings of the firm inzero.
🛏 🔝 ysizet.h		- L	which has a state of the set of t
🖵 🔝 yvals.h			
- 🗄 🧰 driver	- A.		Iomux_MFS3_LIN_Init();
-🖓 🛄 source_files			Ionux MFS1 UART Init():
H 🖸 🛅 main.c			lomux_MFSU_USIU_Init();
└─⊞ 🎰 startup_s6e1xx.s			Iomux_GPIO_Init();
-🗉 🗀 utility			
— 🖹 Readme.txt			,
-🗉 🚞 Output		9	/##
			** Wbrief This function de-initializes the GPIO ports and peripheral pin
			** functions according to the user settings of the Pin Wizard to the
6e1xx_pdl			RE COTOLLE VOLUME

FEATURES

- Graphical user interface for assigning pin functions
- Generates register initialization source code for user assigned pin functions
- Automatic collision detection and reporting for error control
- Ability to do manual pin assignments and adjustments
- Generates source code to pre-build projects for supported IDEs

http://www.cypress.com/documentation/software-and-drivers/pin-and-code-wizard-0

EVALUATION BOARDS

Developers can select the right-sized solution from a wide range of MCU evaluation boards. In addition to the basic MCU motherboards, application-specific adapter boards are available. These boards come with sample software and libraries to guarantee an out-of-the-box experience. Some boards are available bundled with a JTAG adapter.

Tool	Features
5K-FM3-100PMC-MB9BF516N 5K-FM3-100PMC-9BF516N-JL	Starter Kit with MB9BF516N (100pin MCU)
	 All MCU pins accessible CAN, USB Host+Func, RS23 2 x 7seg LEDs, buttons 3V and 5V operation Optionally available with J-L JTAG adapter Extendable th pin bagders (different extension)

SK-FM3-64PMC1 SK-FM3-64PMC1-JLINK

SK-FM3-64PMC1-

SK-FM3-176PMC-

ETHERNET

MB9AFB44N

MB9AF132L

Starter Kit with MB9AF314L MCU(64pin MCU)

• All MCU pins accessible

boards available)

- USB Host+Func, RS232
- 2 x 7seg LEDs, buttons
- 3V and 5V operation
- Optionally available with J-Link ITAG adapter

Starter Kit with MB9AF132L MCU(64pin MCU)

- All MCU pins accessible
- USB Host+Func, RS232
- 2 x 7seg LEDs, buttons
- 3V and 5V operation

Starter Kit with MB9BFD18T MCU(176pin MCU)

- JTAG/USB adapter on board
- All MCU pins accessible • Dual EtherMAC I/F
- USB Host+Func, RS232
- CAN
- 2 x 7seg LEDs, buttons, rotary
- encoder, poti
- 3V and 5V operation

Starter Kit with MB9AFB44N MCU(100pin MCU)

- JTAG/USB adapter on board
- All MCU pins accessible
- Segment LC display • USB Host+Func, RS232
- Buzzer
- FRAM UHF RFID memory
- Capacitive touch buttons
 - 3V and 5V operation





V MCU

- 32
- Link nrough

SK-FM3-80PMC-MB9BF524M SK-FM3-48PMC-MB9BF524K

Tool



SK-FM3-48PMC-USBSTICK



SK-FM3-9BF516N-TOUCHKIT





Features

Starter Kit with MB9BF524M/K MCU (80pin/48pin MCU)

- All MCU pins accessible
- USB Host+Func, RS232
- CAN
- 2 x 7seg LEDs, buttons
- 3V and 5V operation

Starter Kit with MB9AF312K MCU(48pin MCU)

- All MCU pins accessible
- USB Host
- USB Device
- JTAG debug Interface adapter included
- Temp sensor, button, LED

Starter Kit with MB9BF516N MCU (100pin MCU) and capacitive touch board

- All MCU pins accessible
- USB Host+Func, RS232
- 2 x 7seg LEDs, buttons
- 3V and 5V operation
- Optionally available with J-Link ITAG adapter

Adapter board for SK-FM3-100PMC-MB9BF516N

- Allows the connection of Cypress's inverter boards like SK-POWER-3P-LV2-MC (not included) to the starter kit
- Extension board for SK-FM3-100PMC-MB9BF516N (not included) Complete evaluation system consists of SK-FM3-100PMCMB9BF516N, ADA-FM3-100PMCMC, SK-POWER-3P-LV2-MC and a motor

EVALUATION BOARDS

SK-POWER-3P-LV2-MC 3-phase MOSFET Power Stage, 24V, 8A max. SK-PML-17T IFT Direct-Drive Starter Kit with FMA M997ED181 (172pin Comment of voltage measurements in emperature sensor and acenvaltage fournet detection with incactor IEDs SK-PML-17T IFT Direct-Drive Starter Kit with FMA M997ED181 (172pin Comment of voltage measurements in emperature sensor and acenvaltage fournet detection with incactor IEDs IFT Direct-Drive Starter Kit with FMA M997ED181 (172pin Comment of voltage measurements in emperature sensor and acenvaltage fournet detection with incactor IEDs IFT Direct-Drive Starter Kit with FMA M997ED181 (172pin Comment of voltage measurements in emperature sensor and acenvaltage fournet detection with incactor IEDs IFT Direct-Drive Starter Kit with M897ED181 (172pin Comment of voltage measurements in emperature sensor and comment of voltage measurements in emperature sensor in the included Complete evaluation system consists of ACU evaluation board Complete evaluation system consists of ACU evaluation board PLAT RET MANDED with KIRS PLAT RET MANDED with KIRS PLAT RET MANDED with M898F506R MCU (120pin MCU) - Elements (NCU pins accessible Complete Filt with FMA M898F506R MCU (120pin MCU) - All MCU pins accessible - Oraboard TIAC connector - USB Hoat and ICMS System consort - System and ICMS System consort - System and ICMS System consord - System and ICMS System consort - System and ICMS S	Tool	Features	ТооІ	Features
PMXM motors for included] • Current and voltage measurements • Importative sensor and • envoltage/current detection with • envoltage/current detection with • envoltage/current detection with • Itis ADATM3-100PMCCFAC, • Ethernet, USB, CAN interface • SKFM3-176PMCFA, etc. • Init ADATM3-100PMCCFAC, • SKFM3-176PMCFA, etc. • Environment • Itis ADATM3-100PMCC • Ethernet, USB, CAN interface • Omplete evaluation system • external RAM • Carplete evaluation system • external RAM • Carplete evaluation system • external RAM • MB9R516N + ADAFM3- • OPMACHA, etc. • OPMACK_AC, SKPCWVR.3PV2- • External RAM • MagR57800PMC • MagR57800PMC • MagR57804B with SPI • External RAM • OPMACK for included] • External RAM • External RAM • External RAM • MagR57804B with SPI • External RAM • MagR57804B with SPI • External RAM • MagR57804B with SPI • External RAM	SK-POWER-3P-LV2-MC	 3-phase MOSFET Power Stage, 24V, 8A max. Allows the connection of BLDC or 	SK-FM3-176PMC-TFT SK-FM4-120PMC-TFT	TFT Direct-Drive Starter Kit with FM3 MB9BFD18T (176pin) or FM4 MB9BF568R (120pin)
SK-FM3-176PMC-FA K-fM3-176PMC-FA SK-FM3-176PMC-FA Fieldbus Starter Kit with FM3 MSPEP511X SK-FM3-176PMC-FA Fieldbus Starter Kit with FM3 MSPEP512 SK-FM3-176PMC-FA Fieldbus S		 PMSM motors (not included) Current and voltage measurements Temperature sensor and overvoltage/current detection with indicator LEDs Fits ADA-FM3-100PMC-MC, SK-FM3-176PMC-ETHERNET, SK-FM3-176PMC-ETA etc. 		 MCU Includes QVGA color TFT display Ethernet, USB, CAN interfaces on board Cap touch buttons 8MB external Flash and 2MB external RAM
ADA-FM3-100PMC-RHD-TAG1 WHF RFID Module with 4KByte RFAM • Extension board for SKFM3-100PMC (not included) • Based on dualinterface UHF RFID interface and 4KByte FRAM • The memory can be accessed from the MCU Via os SPI interface and via RFID reader/writer devices SK-FM4-U120-98560-MEM SK-FM4-U120-98560-MEM • All MCU pins accessible • USB device (mini-USB Type B) • All MCU pins accessible • USB device (mini-USB Type B) • Available with external 32MB NAND Flash and 16MB SDRAM (aptional) • SD-card slot • SV and 5V operation • SK-FM3-176PMC-FA • SK-FM3-176PMC-FA • SK-FM3-176PMC-FA • SX -FM3-176PMC-FA • SX -FM3-176PMC-FA <tr< td=""><td></td><td>(not included) Complete evaluation system consists of MCU evaluation board (e.g., SKFM3-100PMC- MB9BF516N + ADAFM3- 100PMC-MC), SK-POWER-3PLV2- MC and a motor</td><td>Keil MCB9BF500UME</td><td>Starter Kit with MB9BF506R MCU(120pin MCU) ULINK-ME JTAG adapter • Limited set of peripherals • USB Host+Func. • Buttons • All MCU pins accessible</td></tr<>		(not included) Complete evaluation system consists of MCU evaluation board (e.g., SKFM3-100PMC- MB9BF516N + ADAFM3- 100PMC-MC), SK-POWER-3PLV2- MC and a motor	Keil MCB9BF500UME	Starter Kit with MB9BF506R MCU(120pin MCU) ULINK-ME JTAG adapter • Limited set of peripherals • USB Host+Func. • Buttons • All MCU pins accessible
 Based on ducl-interface UHF RFID chip MB97R804B with SPI interface and 4KByte FRAM The memory can be accessed from the MCU via a SPI interface and 4KByte FRAM The memory can be accessed from the MCU via a SPI interface and via RFID reader/writer devices SK-FM4-U120-9B560 Starter Kit with FM4 MB9BF568R VISB device [mint/USB Type B] CMSIS-DAP [TAG adapter on board] SUB device [mint/USB Type B] CMSIS-DAP [TAG adapter on board] SBC-rard slot SD-card slot SD-ca	ADA-FM3-100PMC- RFID-TAG1	 UHF RFID Module with 4KByte FRAM Extension board for SK-FM3- 100PMC (not included) 		
 SK-FM4-U120-98560 SK-FM4-U120-98560-MEM All MCU pins accessible USB device (mini-USB Type B) CMSIS-DAP JTAG adapter on board RGB LED User buttons, potentiometer, reset button SD-card slot 3V and 5V operation Available with external 32/MB NAND Flash and 16/MB SDRAM (optional) Fieldbus Starter Kit with FM3 MB9BFD18T MCU (176pin MCU) Covers various protocols EtherCAT, Powerlink, Profinet MODBUS TCP, Ethernet/IP 2 x CAN, USB 	FUITISU Z	 Based on dual-interface UHF RFID chip MB97R804B with SPI interface and 4KByte FRAM The memory can be accessed from the MCU via a SPI interface and via RFID reader/writer devices 	IAR Kickstart KSK-MB9BF506	Starter Kit with MB9BF506R MCU (120pin MCU) J-Link Lite (on board) • Many peripherals • LCD • SD card slot
 board RGB LED User buttons, potentiometer, reset button SD-card slot 3V and 5V operation Available with external 32/MB NAND Flash and 16/MB SDRAM (optional) SK-FM3-176PMC-FA Fieldbus Starter Kit with FM3 (DBBSFD18T MCU (176pin MCU) Covers various protocols EtherCAT, Powerlink, Profinet MOBBUS TCP, Ethernet/IP 2 x CAN, USB SK-FM3-100PMC 	SK-FM4-U120-9B560 SK-FM4-U120-9B560-MEM	 Starrer Kit with FM4 MB9BF308K MCU (120pin MCU) All MCU pins accessible USB device (mini-USB Type B) CMSIS-DAP ITAG adapter on 		 CAIN, USB, RS232 Motor control power stage
SK-FM3-176PMC-FA Fieldbus Starter Kit with FM3 MB9BFD18T MCU (176pin MCU) • Covers various protocols EtherCAT, Powerlink, Profinet MODBUS TCP, Ethernet/IP IAR KickStart Kit for MB9BF516R • All MCU pins accessible • On-board JTAG adapter plus standard JTAG connector		 board RGB LED User buttons, potentiometer, reset button SD-card slot 3V and 5V operation Available with external 32MB NAND Flash and 16MB SDRAM (optional) 	SK-FM3-100PMC	 FM3 MB9BF618T All MCU pins accessible On-board JTAG adapter plus standard JTAG connector Trace connector USB Host and Device Dual Ethernet (2 connectors) Reset button, user button Power LED, user LED
 Covers various protocols EtherCAT, Powerlink, Profinet MODBUS TCP, Ethernet/IP 2 x CAN, USB Covers various protocols EtherCAT, Powerlink, Profinet MODBUS TCP, Ethernet/IP 2 x CAN, USB AR KickStart Kit for MB9BF516R All MCU pins accessible On-board JTAG adapter plus standard JTAG connector 	SK-FM3-176PMC-FA	Fieldbus Starter Kit with FM3 MB9BFD18T MCU (176pin MCU)		FM3 MRORF516D
 User interface (push buttons, LCD module, RGB LED) External RAM and Flash memory Motor control interface Debug interface 		 Covers various protocols EtherCAT, Powerlink, Profinet MODBUS TCP, Ethernet/IP 2 x CAN, USB User interface (push buttons, LCD module, RGB LED) External RAM and Flash memory Motor control interface Debug interface 	TAR KickStart Kit for MB9BF516R	 All MCU pins accessible On-board JTAG adapter plus standard JTAG connector Trace connector USB Host and Device Reset button, user button Power LED, user LED

CYPRESS FM FAMILY SOLUTIONS

In addition to other development tools, Cypress offers a range of solutions packages including FM Touch, FM Connect USB, FM Connect Ethernet, FM Inverter, FM Safety and FM Color.

FM Connect USB	
 USB host and device Low level drivers Various USB class implementations Mass storage class, virtual COM port, HID mouse, HID keyboard LibUSB Covers embedded aswell as PC side 	 10/ IEE Lov Fre imp IwI Ap HT SN
 MCUs: large selection of FM3 and FM4 devices Several evaluation boards available 	 MC hig and Twi ave M4 Sta
FM Connect Fieldbus	FM Th
 Sample implementation for fieldbus protocol slave supports: Modbus TCP Powerlink EtherCAT Profinet RT Open source stack implementations plus third-party offerings EtherCAT with ASIC 	 Refe 2 in 60n Volta safe Print Cor Bara
ET1100 • Switch/hub onboard	
	 USB host and device Low level drivers Various USB class implementations Mass storage class, virtual COM port, HID mouse, HID keyboard LibUSB Covers embedded aswell as PC side MCUs: large selection of FM3 and FM4 devices Several evaluation boards available FM Connect Fieldbus Sample implementation for fieldbus protocol slave supports: Modbus TCP Powerlink EtherCAT Profinet RT Open source stack implementations plus third-party offerings EtherCAT with ASIC

FM Connect Ethernet

- /100Mbps E802.3 Ethernet w-level drive ee TCP/IP stack plementations IP, uP oplication layer, TTP server, DHCP, ATP, etc.
- CUs: various FM3 gh-performance ad FM4 devices vinMAC derivatives railable (2 Ethernet AC on chip) arter kit available

nermal Printer

erence solution nch print heads mm/s tage and heat eguard nter API ontrol GUI rcode printing

CU: FM3 series 39AF312K

FM Inverter

- Dedicated application library available
- Various software examples
- Various motor types supported

- MCUs: the majority of FMO+/FM3/FM4 family devices
- Up to 3 MFTs, QDU- quadrature decoder unit
- Starter kits and power stage

FM Safety

- IEC60730 class B IEC61508 SIL2
- Self test libraries (STL) available
- Covers CPU, clock, interrupts, RAM, ROM, IO, ADC
- MCUs: all FM family members
- Various HW features implemented on FM family MCUs
- CRC, watchdog, LVD, clock supervisor, etc.

CYPRESS FM TOUCH

FM Touch is a solutions package for capacitive touch applications based on any member of the FMO+, FM3 and FM4 families. FM Touch consists of a dedicated firmware library as well as a development GUI that runs on Windows PC. Documentation including application notes is available, as is sample software. Dedicated starter kits including initial hardware enable rapid project ramp-up.

Selected features support capacitive touch buttons, sliders, scroll wheels, x/y matrix and proximity sensing

- Uses one ADC input pin per touch channel, no additional hardware required
- High sensitivity (<<10fF), high dynamic range and SNR (signal to noise ratio)
- Solid front panels or a multi-layer front panel possible
- Automatic offset calibration and crosstalk suppression
- Optimized RAM/ROM footprint for embedded applications





CYPRESS FM CONNECT USB

The FM Connect USB platform is a set of hardware and software components, tools and documentation. The package supports multiple, out-of-the-box, embedded USB solutions and both HOST and DEVICE use cases.

Selected FM Connect USB features

- Support for up to two USB interfaces per MCU
- Support for USB host/function or dual role
- USB Wizard, as code generator for USB firmware
- USB device functions, virtual COM, HID mouse/joystick/data communication, Lib USB COM
- USB host functions, HID mouse/keyboard, USB mass storage
- PC drivers: LibUSB and Windows native driver support
- Can be used with all FM family microcontrollers with on-chip USB hardware



CYPRESS FM CONNECT ETHERNET

The FM Connect Ethernet package utilizes proven open source components such as the IwIP TCP/IP stack and internal developments such as the L3 FM low-level library. This enables the rapid implementation of solutions such as web-based diagnostic systems or maintenance interfaces for industrial devices.

Selected FM Connect Ethernet features

- Up to 2-channel Ethernet
- Software switch module
- Low-level driver, TCP/IP stacks
- Sample software, web server, etc.
- Commercial products from partners (e.g., Sevenstax)



CYPRESS FM COLOR

FM Color, a solution for simple and cost-efficient, full-color HMIs, enables designers to add colored HMI functionality/TFT display control to designs without needing additional hardware. An FM3 or FM4 MCU controls both the application and the TFT display; no dedicated graphic controller is needed. The TFT display can be directly connected to FM3/FM4 MCUs.

Selected FM Color features

- Up to 320x240 pixel, 8-bit color depth with internal RAM
- Up to 480x272, 16-bit color with external SRAM (8-bit or 16-bit external bus)
- Firmware module TFT driver to generate the timing signals to control the TFT display, handle the data flow from RAM to TFT, and synchronize the update of the TFT content with the display timing
- Predefined HMI objects: e.g., simple buttons, checkboxes, text and progress bars
- Control routines for user interaction via buttons, a USB mouse, keyboard or touchscreen
- PC-based, simple scene generator "TFT wizard





CYPRESS FM SAFETY

To help customers obtain relevant safety certifications, Cypress embeds specific hardware components into its FM family of MCUs. Self-test libraries for IEC61508 and IEC60730 standards available.

Software packages: Self-Test Libraries (STL)

- Addresses IEC60730 class B and IEC61508 requirements
- Pre-operation self-test (POST): system startup
- Built-in self-test (BIST): run periodically
- APIs include CPU, Clock, RAM, flash, interrupt, ADC, GPIO test routines
- Utilizes the functional safety hardware features
- IEC60730 STL memory footprint: approximately 4.6KB flash (max.), 80-bytes RAM usage
- ICE61508 (SIL2) version available on request



CYPRESS FM INVERTER

FM Inverter is a solution to drive three-phase motors such as PMSM with the FM family. The package consists of firmware for different motor and control types, a GUI for parameterization, documentation

Selected FM Inverter features

- Up to 3-channel, flexible 3-phase motor timers on 144MHz FM
- Automatic dead-time insertion, freely programmable ADC trigge
- Up to three independent 12-bit 1Msps ADC units, with up to 32
- Up to 3-channel ABZ quadrature decoder units
- DTTI input for emergency motor stop
- 3.3V and true 5V single-supply operation
- Dedicated starter kit and power stage extension board availabl
- Ready-to-run sample software for different motor types
- GUI for PC-based parameterization
- Can be used with all FM3 microcontrollers except the low-power

ion,	software	examples,	dedicated	starter	kits	and	support.	
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ADDITIONAL SOLUTIONS

- Inverter motor control solution for consumer electronics such as air conditioners, refrigerators and washing machines
- RF solution for RF control, sensor control and NFC
- ESL (virtual simulation) to identify fatal errors and to shorten the debugging and development time
- Audio/video solutions

Check Cypress's seminar page in the news section of our website for workshops and other application-development support.

White Goods

- Products: washing machines, dishwashers, air conditioners
- MCUs: FMO+ and FM3 basic group
- Cost-optimized products
- Reliable flash for EEPROM emulation
- On-chip RC oscillator: = -2%
- Hardware motor control support
- 2 or 3 fast, independent, 12-bit ADCs
- Wide supply voltage range: 2.7-5.5V
- Operating temperature range between -40°C and +105°C

Factory Automation

- Products: PLCs, motor control, sensors
- MCUs: FM3 high-performance and basic groups, and FM4
- High performance
- Up to 200MHz CPU clock
- DSP functionality on FM4
- FPU on FM4
- Faster flash in group: 14ns access + code pre-fetch = OWS at 144MHz
- Up to 1.5MB flash
- Wide supply voltage range: 2.7-5.5V
- Hardware motor control support, up to three motors, including software package
- Three independent, fast, 12-bit ADCs
- Many safety features (e.g., MPU, CRC, two-stage LVD)
- Twin AMC dual-Ethernet device
- Scalable lineup, pin compatibility between high-performance and basic groups MCUs to cover a wide range of applications
- Many devices suitable for extended temperature ranges between -40°C and +105°C

- **Medical and Handheld Devices**
- MCUs: FMO+ and FM3 low-power and ultra-low-leakage groups
- Ideal feature mix for HMI (human machine interface)
- LCD segment controller
- High-performance, capacitive touch software library
- USB host and function (OTG functionality), including corresponding software packages
- Two independent, fast, 12-bit ADCs
- Low-voltage supply: 1.65-3.6V
- Low-current consumption and deep standby modes

Motor/Inverter Control

- MCUs: FM4 family
- High-spec vector arithmetic
- Single-cycle instruction by DSP
- Enhanced motor control timer
- Enhanced A/D convertor
- High-speed sampling (conversion speed: 2Msps)
- Window comparator

Networking

- MCUs: FM4 and FM3 high-performance families
- Enriched communication function
- SD card I/F (SDIO)
- Ethernet, CAN
- High-speed 12C fast mode (~1Mbps)
- High-speed SPI (~20Mbps)
- Large memory
- SDRAM I/F
- DSTC (descriptor system data transfer controller, maximum: 1,024ch)

WHY CYPRESS?

Good track record, 16bit MCUs,

Longevity

Long history in MCUs

Industrial and automotive MCU development for >25 years





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CONTACT US

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ABOUT CYPRESS

Cypress delivers high-performance, mixed-signal, programmable solutions that provide customers with rapid time-to-market and exceptional system value. Cypress offerings include the PSoC Programmable System-on-Chip, USB controllers, general-purpose programmable clocks, and memories. Cypress also offers wired and wireless connectivity solutions ranging from its CyFi low-power RF solution, to West Bridge and EZ-USB FX2LP controllers that enhance connectivity and performance in multimedia handsets. Cypress serves numerous markets, including consumer, computation, data communications, automotive and industrial. Cypress trades on the NYSE under the ticker symbol CY. Visit Cypress online at **www.cypress.com**.

