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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 "Embedded - Microcontrollers"

Details	
Product Status	Active
Core Processor	ARM® Cortex®-M4F
Core Size	32-Bit Single-Core
Speed	168MHz
Connectivity	CANbus, FlexIO, I²C, SPI, UART/USART
Peripherals	DMA, LVD, PWM, WDT
Number of I/O	89
Program Memory Size	512KB (512K x 8)
Program Memory Type	FLASH
EEPROM Size	68K x 8
RAM Size	64K x 8
Voltage - Supply (Vcc/Vdd)	2.7V ~ 5.5V
Data Converters	A/D 16x12b; D/A 1x12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 105°C (TA)
Mounting Type	Surface Mount
Package / Case	100-LQFP
Supplier Device Package	100-LQFP (14x14)
Purchase URL	https://www.e-xfl.com/product-detail/nxp-semiconductors/mke18f512vll16

NXP Semiconductors
Product Brief

Document Number: KE1XF512PB
Rev. 1.1, 08/2016

Kinetis KE1xF512 MCUs

Robust 5V MCUs with ADCs, FlexTimers, CAN and expanding memory integration in Kinetis E-series. Now up to 512 KB flash and 64 KB SRAM.

1. Kinetis E family introduction

The Kinetis E family provides a highly scalable portfolio for robust 5V MCUs, with cores ranging from 20 MHz ARM® Cortex®-M0+ MCUs to 168 MHz ARM® Cortex®-M4 MCUs. With 2.7V ~ 5.5V supply and focus on exceptional EMC/ESD robustness, the Kinetis E family is well-suited for a wide range of applications in electrical harsh environments, and is optimized for cost-sensitive applications. The Kinetis E family offers a broad range of memory, peripherals, and package options.

Contents

2. Kinetis KE1xF sub-family overview

Kinetis KE1xF MCUs are the high-end series MCUs in Kinetis E family, providing robust 5V solution with the high performance ARM Cortex-M4 core running at up to 168 MHz. The KE1xF offers multiple ADCs and FlexTimers, a CAN 2.0B-compliant FlexCAN module and a broad suite of communication interfaces including LPUARTs, LPI2Cs, LPSPIs, and FlexIO which provide flexibility for serial communication emulation. The devices range from 256 KB flash in 64LQFP package extending up to 512 KB flash in 100LQFP package.

- KE14F: broad offering with mixed-signal integration, ADCs, DAC, ACMPs, FlexTimers.
- KE16F: expansion from KE14F family, with addition of 1 x FlexCAN module.
- KE18F: expansion from KE14F family, with addition of 2 x FlexCAN module.

3. Kinetis KE1xF key product features

- Up to 168 MHz ARM Cortex-M4 core supporting a broad range of processing bandwidth requirements while maintaining excellent cost-effectiveness, easy to use packages and a wide range of memory densities.
- Enhanced robust IOs make sure the high performance under noisy environment.
- FlexTimer featured 8-channel PWM supports three-phase motor control with dead time insertion and fault detect.
- 1-Msps 12-bit ADC with up to a 16-channel input per module with a fast sampling rate for prompt data conversion and storage.
- Analog comparator for fast response to external analog change.
- Programmable delay block with flexible trigger system providing various interconnections for on chip modules; ADC, DAC, FlexTimers, ACMP, and so on.
- CAN 2.0B-compliant FlexCAN provides high reliable serial communication interface for industry applications.
- FlexIO provides flexibility for serial communication interface implementation.
- Boot ROM provides on chip boot code and serial port drivers that could save flash space and provide flexible boot options and in-system programming support.
- Packages with big pin pitch make manufacture easy with high yield.
- 8 KB Cache could improve the code and data access efficiency.
- Digital signal processing capabilities with floating point unit offering outstanding computational power for control algorithms, sensor data processing, audio processing, among others, while increasing math accuracy and reducing code size.
- MPU for memory protect and code safety.
- Faster time to market with comprehensive enablement solutions, including SDK (drivers, libraries, stacks), IDE, bootloader, RTOS, online community and more.

4. Kinetis KE1xF product family feature summary

Table 1. Kinetis KE1xF product family feature summary

Sub-Family	KE14F	KE16F	KE18F
CPU Performance	168 MHz	168 MHz	168 MHz
Flash	256-512 KB	256-512 KB	256-512 KB
SRAM	32-64 KB	32-64 KB	32-64 KB
FlexMemory/EEPROM	64 KB/4 KB	64 KB/4 KB	64 KB/4 KB
Analog	3 x 12-bit ADC, 1 x 12-bit DAC, 3 x ACMP	3 x 12-bit ADC, 1 x 12-bit DAC, 3 x ACMP	3 x 12-bit ADC, 1 x 12-bit DAC, 3 x ACMP
Other Features	4 x FlexTimers, FlexIO	4 x FlexTimers, FlexIO, 1 x FlexCAN	4 x FlexTimers, FlexIO, 2 x FlexCAN
Package Options	100LQFP, 64LQFP	100LQFP, 64LQFP	100LQFP, 64LQFP

5. Kinetis KE1xF family block diagram

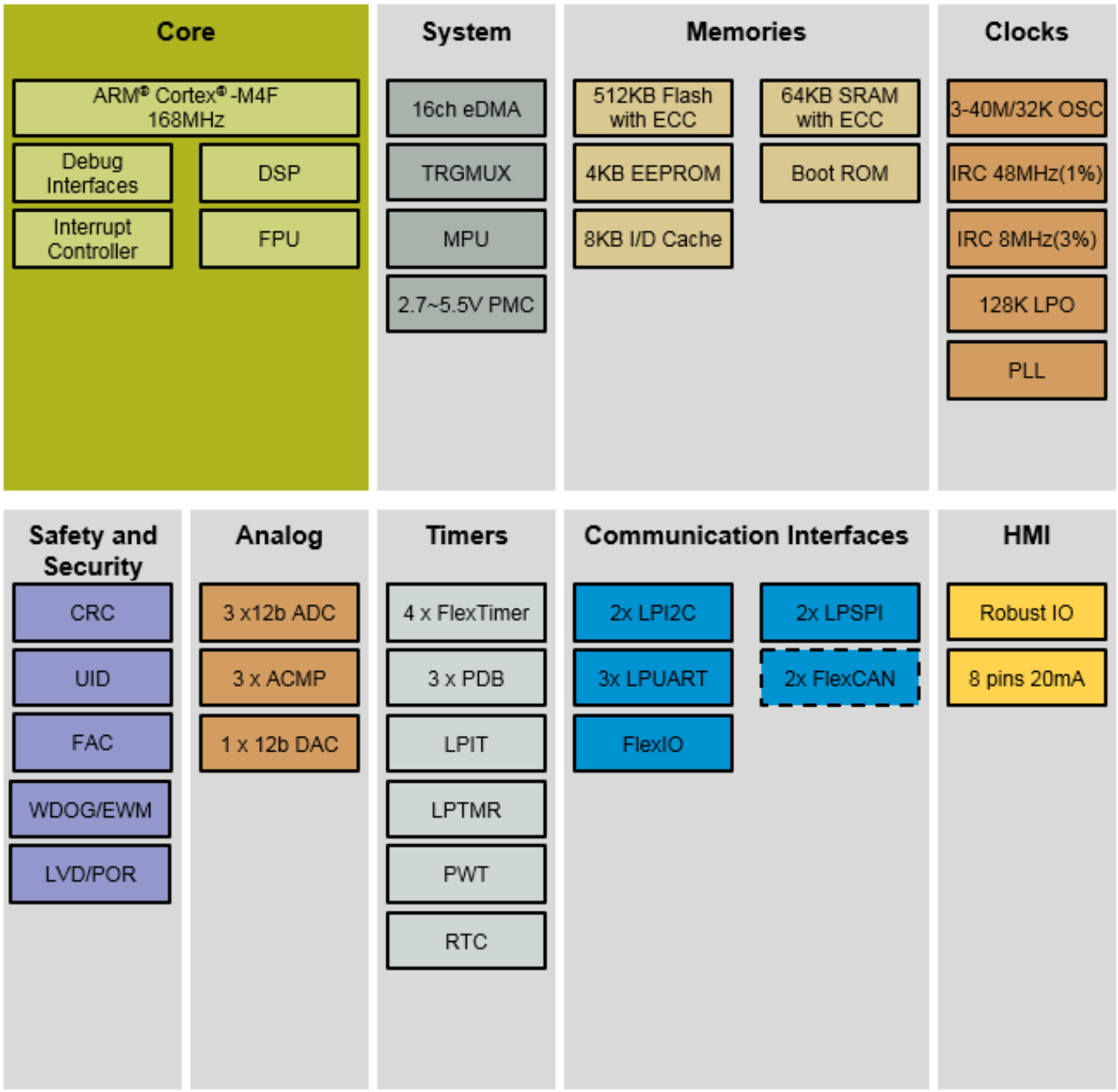

Figure 1. Kinetis KE1xF512 family block diagram

6. Kinetis KE1xF product family features

The following features are present for KE1xF product family.

Table 2. KE1xF product family features

Sub-Family	KE14F	KE16F	KE18F
Core	M4	M4	M4
FPU	Yes	Yes	Yes
Frequency	168 MHz	168 MHz	168 MHz
Flash	256 KB-512 KB	256 KB-512 KB	256 KB-512 KB
Cache	8 KB	8 KB	8 KB
SRAM	32-64 KB	32-64 KB	32-64 KB
FlexMemory/EEPROM	64 KB/4 KB	64 KB/4 KB	64 KB/4 KB
Clock	48 MHz FIRC (1%), 8 MHz SIRC (3%), XOSC (3-40 MHz, 30-40 KHz) 128 KHz LPO PLL	48 MHz FIRC (1%), 8 MHz SIRC (3%), XOSC (3-40 MHz, 30-40 KHz) 128 KHz LPO PLL	48 MHz FIRC (1%), 8 MHz SIRC (3%), XOSC (3-40 MHz, 30-40 KHz) 128 KHz LPO PLL
BootROM (UART, SPI, IIC, CAN)	Yes	Yes	Yes
DMA	16 channels	16 channels	16 channels
WDT/POR/LVD	Yes	Yes	Yes
ADC	3 x 12-bit, 1μs	3 x 12-bit, 1μs	3 x 12-bit, 1μs
ACMP	3	3	3
DAC	12-bit	12-bit	12-bit
Timer	4 x FlexTimer 1 x LPTMR	4 x FlexTimer 1 x LPTMR	4 x FlexTimer 1 x LPTMR
PDB	3	3	3
PIT	1	1	1
RTC	1	1	1
CAN	-	1	2
UART	3	3	3
SPI	2	2	2
I2C	2	2	2
FlexIO	4 timers, 4 shifters, 8 pins	4 timers, 4 shifters, 8 pins	4 timers, 4 shifters, 8 pins
VDD	2.7~5.5V	2.7~5.5V	2.7~5.5V
Temperature(Ta)	-40~105 ºC	-40~105 ºC	-40~105 ºC
Package(GPIOs)	100LQFP, 64LQFP	100LQFP, 64LQFP	100LQFP, 64LQFP

7. Comprehensive enablement solutions

7.1. Kinetis Software Development Kit (SDK)

- Extensive suite of robust peripheral drivers, stacks and middleware.
- Includes software examples demonstrating the usage of the HAL, peripheral drivers, middleware and RTOSes.
- Operating system abstraction (OSA) for NXP MQX™ RTOS, FreeRTOS, and Micrium µC/OS kernels and bare metal (no RTOS) applications.

7.2. Integrated Development Environments (IDE)

- Atollic® TrueSTUDIO® http://timor.atollic.com/products/target-support/nxp-freescale/
- IAR Embedded Workbench® https://www.iar.com/iar-embedded-workbench/partners/nxp
- ARM Keil® Microcontroller Development Kit http://www2.keil.com/nxp
- Kinetis Design Studio (KDS)
  - No-cost integrated development environment (IDE) for Kinetis MCUs
  - Eclipse and GCC-based IDE for C/C++ editing, compiling and debugging
- Broad ARM ecosystem support through NXP Connect partners

7.3. Online enablement with ARM mbed™ development platform

- Rapid and easy Kinetis MCU prototyping and development
- Online mbed SDK, Developer Community
- Free software libraries

7.4. Boot-loader

- Common boot-loader for all Kinetis MCUs
- In-system Flash programming over a serial connection: erase, program, verify
- ROM- or Flash-based boot-loader with open-source software and host-side programming utilities

7.5. Development hardware

- Tower System modular development platform
  - Rapid prototyping and evaluation
  - Low cost, interchangeable modules

8. Part identification

8.1. Description

Part numbers for the chip have fields that identify the specific part. You can use the values of these fields to determine the specific part you have received.

8.2. Format

Part numbers for this device have the following format: Q K## A M FFF R T PP CC N

8.3. Fields

The following table lists the possible values for each field in the part number (not all combinations are valid).

Table 3. Part number field descriptions

Field	Description	Values
Q	Qualification status	M = Fully-qualified, general market flow P = Prequalification
KE##	Kinetis family	KE14F KE16F KE18F
A	Key attribute	F = Cortex-M4 W/ DSP and FPU
FFF	Program Flash memory size	512 = 512 KB 256 = 256 KB
R	Silicon revision	(Blank) = Main A = Revision after main
T	Temperature range	V = -40°C – 105 °C
PP	Package identifier	LL = 100LQFP (14 mm × 14 mm) LH = 64LQFP (10 mm × 10 mm)
CC	Maximum CPU frequency (MHz)	16 = 168 MHz
N	Packaging type	R = Tape and reel (Blank) = Trays

9. Orderable part numbers

Table 4. Ordering information

Product	Memory		Package		IO and ADC Channel		
MC Part Number	Flash	SRAM	Pin Count	Package	GPIOs	GPIOs (INT / HD)[1]	ADC[2] channels (SE / DP)
MKE14F256VLH16	256KB	32KB	64	LQPF	58	58/8	38/0
MKE14F256VLL16	256KB	32KB	100	LQPF	89	89/8	48/0
MKE14F512VLH16	512KB	64KB	64	LQPF	58	58/8	38/0
MKE14F512VLL16	512KB	64KB	100	LQPF	89	89/8	48/0
MKE16F256VLH16	256KB	32KB	64	LQPF	58	58/8	38/0
MKE16F256VLL16	256KB	32KB	100	LQPF	89	89/8	48/0
MKE16F512VLH16	512KB	64KB	64	LQPF	58	58/8	38/0
MKE16F512VLL16	512KB	64KB	100	LQPF	89	89/8	48/0
MKE18F256VLH16	256KB	32KB	64	LQPF	58	58/8	38/0
MKE18F256VLL16	256KB	32KB	100	LQPF	89	89/8	48/0
MKE18F512VLH16	512KB	64KB	64	LQPF	58	58/8	38/0
MKE18F512VLL16	512KB	64KB	100	LQPF	89	89/8	48/0

[1] INT: interrupt pin numbers; HD: high drive pin numbers
[2] ADC0 + ADC1

10. Revision history

Table 5. Revision history

Revision	Date	Substantial changes
0	15 May 2016	Initial release
1	31 July 2016	Frequency from 160 MHz to 168 MHz. Updated enablement solution parts.
1.1	16 August 2016	Memory size update

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