32-bit Microcontrollers

Kinetis K10 Family

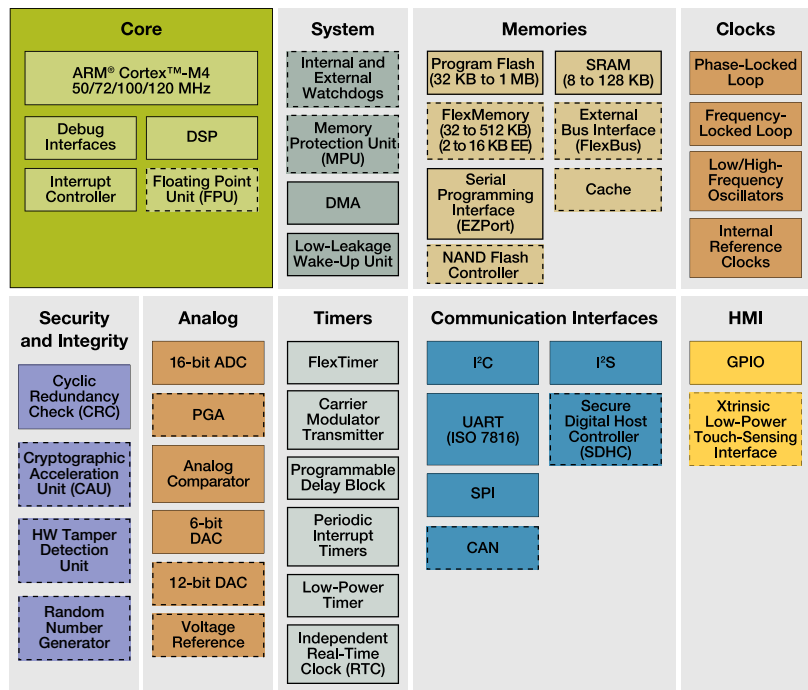## Low-power, mixed-signal MCUs

Target Applications

- Remote sensors
- HVAC systems
- Gaming controllers
- Flow meters

Overview

The Kinetis MCU portfolio consists of multiple pin-, peripheral- and software-compatible MCU families based on the ARM® Cortex™-M4 core. Families are built from innovative 90 nm thin-film storage (TFS) flash technology with unique FlexMemory (EEPROM) capability, and offer industry-leading low power and mixed signal analog integration.

The K10 MCU family is the entry point into the Kinetis portfolio. Devices start from 32 KB of flash in a small-footprint 5x5 mm 32 QFN package extending up to 1 MB in a 144 MAPBGA package with a rich suite of analog, communication, timing and control peripherals. Additionally, pin compatibility, flexible low-power capabilities and innovative FlexMemory help to solve many of the major pain points for system implementation.

Kinetis K10 Family

Core	System	Memories		Clocks
Core	**System**	**Memories**		**Clocks**
ARM® Cortex™-M4 50/72/100/120 MHz	Internal and External Watchdogs	Program Flash (32 KB to 1 MB)	SRAM (8 to 128 KB)	Phase-Locked Loop
Debug Interfaces / DSP	Memory Protection Unit (MPU)	FlexMemory (32 to 512 KB) (2 to 16 KB EE)	External Bus Interface (FlexBus)	Frequency-Locked Loop
Interrupt Controller / Floating Point Unit (FPU)	DMA	Serial Programming Interface (EZPort)	Cache	Low/High-Frequency Oscillators
	Low-Leakage Wake-Up Unit	NAND Flash Controller		Internal Reference Clocks

Security and Integrity	Analog	Timers	Communication Interfaces		HMI
Cyclic Redundancy Check (CRC)	16-bit ADC	FlexTimer	I²C	I²S	GPIO
Cryptographic Acceleration Unit (CAU)	PGA	Carrier Modulator Transmitter	UART (ISO 7816)	Secure Digital Host Controller (SDHC)	Xtrinsic Low-Power Touch-Sensing Interface
HW Tamper Detection Unit	Analog Comparator	Programmable Delay Block	SPI		
Random Number Generator	6-bit DAC	Periodic Interrupt Timers	CAN		
	12-bit DAC	Low-Power Timer			
	Voltage Reference	Independent Real-Time Clock (RTC)			

☐ Standard Feature   ⬜ Optional Feature

freescale™

Kinetis

Energy Efficient Solutions
optimized for low power

One-Stop Enablement Offering—MCU + IDE + RTOS

Freescale Tower System hardware development environment:

- Integrated development environments
  - Eclipse-based CodeWarrior V10.x IDE and Processor Expert
  - IAR Embedded Workbench
  - Keil MDK
  - CodeSourcery Sourcery G++ (GNU)
- Runtime software and RTOS
  - Math, DSP and encryption libraries
  - Motor control libraries
  - Complimentary bootloaders (USB, Ethernet, RF, serial)
  - Complimentary Freescale embedded GUI
  - Complimentary Freescale MQX™
  - Cost-effective Nano™ SSL/Nano™ SSH for Freescale MQX RTOS
  - Micrium µC/OS-III
  - Express Logic ThreadX
  - SEGGER embOS
  - freeRTOS
  - Mocana (security)
- Full ARM ecosystem

Features

- ARM® Cortex™-M4 core with DSP instruction support and optional single precision floating point unit
- Up to 32-channel DMA. Up to 16 KB of cache. Cross bar switch

- 32 KB–1 MB flash. Up to 128 KB of SRAM
- 32–512 KB FlexMemory

- 10 ultra-low-power modes with flash programming and analog operation down to 1.71V
- Low-power timer, low-power RTC, low-leakage wake-up unit

- High-speed 16-bit ADCs. Programmable gain amplifiers
- 12-bit DAC. High-speed comparators
- On-chip voltage reference
- Cryptographic acceleration unit (CAU)
- HW tamper detection unit
- Random number generator

- Low-power capacitive touch-sensing interface

- Up to six UARTs with IrDA support. One UART with ISO 7816 support
- I²S interface, up to two CAN modules, up to three DSPI interfaces, up to two I²C interfaces

Benefits

- Up to 120 MHz core supporting a broad range of processing bandwidth needs
- Peripheral and memory servicing with reduced CPU loading. Optimized bus bandwidth and flash execution performance. Concurrent multi-master bus accesses for increased bus bandwidth

- High reliability, fast access program memory with 4-level security protection. Independent flash banks allow concurrent code execution and firmware updating
- FlexMemory provides 32 byte–16 KB of user-segmentable byte write/erase EEPROM. In addition, FlexNVM from 32–512 KB for extra program code, data or EEPROM backup

- Peripheral activity and wake-up times can be optimized to suit application requirements enabling extended battery life (Stop currents of <500 nA, run currents of <200 µA/MHz, 4 µs wake-up from Stop)
- Continual device operation in reduced power states with flexible wake-up options

- Fast, accurate signal conditioning capability with support for single or differential operation for improved noise rejection
- Support for small amplitude signal processing
- Analog signal generation for audio applications
- Fast, accurate motor over-current protection
- Eliminates need for external voltage reference reducing overall system cost
- Secure data transfer and storage. Faster than software implementations and with minimal CPU loading. Supports a wide variety of algorithms: DES, 3DES, AES, MD5, SHA-1, SHA-256
- Secure key storage with internal/external tamper detect for unsecured flash, temperature/clock/supply voltage variations and physical attack

- Provides a modern upgrade from mechanical to touch keypad, rotary and slider user interfaces and operates in all low-power modes with minimal current added. Supports up to 16 inputs

- Variety of data size, format and transmission/reception settings supported for multiple industrial communication protocols
- Multiple communication interfaces for simple and efficient data exchange, industrial network bridging and audio system interfacing

K10 Family Options

Part Number	CPU (MHz)	Flash (KB)	Flex NVM (KB)	SRAM (KB)	Cache (KB)	Single Precision Floating Point Unit	Memory Protection	CAN	Secure Digital Host	NAND Flash Controller	External Bus Interface	12-bit DAC	Prog. Gain Amplifier	5V Tolerant I/O	Other	FM 32 QFN (5x5)	FT 48QFN (7X7)	LF 48LQFP (7X7)	MP 64MAPBGA (5X5)	LH 64LQFP (10X10)	LK 80LQFP (12X12)	MB 81BGA (8X8)	LL 100LQFP (14X14)	ML 104BGA (8X8)	MC 121BGA (8x8)	LQ 144LQFP (20x20)	MD 144BGA (13x13)
MK10DN32Vyy5	50	32		8												√	√	√	√	√							
MK10DN64Vyy5	50	64		16												√	√	√	√	√							
MK10DN128Vyy5	50	128		16												√	√	√	√	√							
MK10DN512Vyy10	100	512		128			√	√	√		√	√	√	√							√	√	√		√	√	√
MK10FN1M0Vyy12	120	1 MB		128	16	√	√	√	√	√	√	√	√	√												√	√
MK10DX32Vyy5	50	32v	32	8												√	√	√	√	√							
MK10DX64Vyy5	50	64	32	16												√	√	√	√	√							
MK10DX128Vyy5	50	128	32	16												√	√	√	√	√							
MK10DX64Vyy7	72	64	32	16			√				√	√	√	√							√	√	√				
MK10DX128Vyy7	72	128	32	32			√				√	√	√	√							√	√	√	√	√		
MK10DX256Vyy7	72	256	32	64			√				√	√	√	√							√	√	√	√	√		
MK10DX128Vyy10	100	128	128	32		√	√	√		√	√	√	√													√	√
MK10DX256Vyy10	100	256	256	64		√	√	√		√	√	√	√													√	√
MK10FX512Vyy12	120	512	512	128	16	√	√	√	√		√	√	√	√												√	√
MK11DX128Vyy5(R)	50	128	64	32											Encryption and Tamper Detect						√	√					
MK11DX256Vyy5(R)	50	256	64	32											Encryption and Tamper Detect						√	√					
MK11DX512Vyy5(R)	50	512		64											Encryption and Tamper Detect						√	√					
MK12DX128Vyy5(R)	50	128	64	32								√							√		√	√	√			
MK12DX256Vyy5(R)	50	256	64	32								√							√		√	√	√			
MK12DX512Vyy5(R)	50	512		64								√							√		√	√	√			

yy = package designator

For current information about Kinetis products and documentation, please visit freescale.com/Kinetis

freescale™