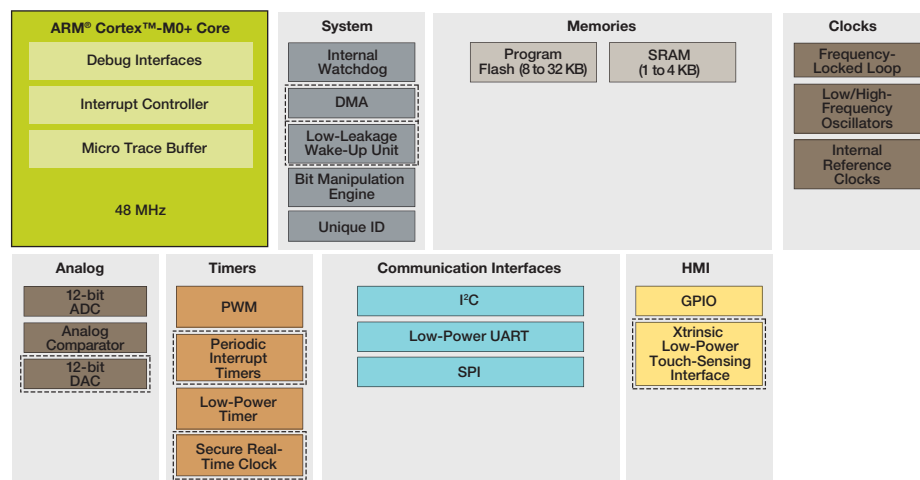# Kinetis KL0x Family

Ultra-low-power MCUs

Target Applications

- Low-power applications
- Battery-operated applications
- USB peripherals
- Consumer applications

Overview

The Kinetis KL0x MCU family is the entry point into the Kinetis L series of MCUs built on the ARM® Cortex™-M0+ core processor. The Kinetis KL0x MCU family provides a bridge for 8-bit customers migrating into the Kinetis portfolio, and is software and tool compatible with all other Kinetis L series families. Devices start from 8 KB of flash in a small-footprint 4 x 4 mm 24 QFN package, extending up to 32 KB in a 48 LQFP package. Each family member combines ultra-low-power performance with a rich suite of analog, communication, timing and control peripherals.

Kinetis KL0x MCU Family Block Diagram

ARM® Cortex™-M0+ Core
- Debug Interfaces
- Interrupt Controller
- Micro Trace Buffer
- 48 MHz

System
- Internal Watchdog
- DMA
- Low-Leakage Wake-Up Unit
- Bit Manipulation Engine
- Unique ID

Memories
- Program Flash (8 to 32 KB)
- SRAM (1 to 4 KB)

Clocks
- Frequency-Locked Loop
- Low/High-Frequency Oscillators
- Internal Reference Clocks

Analog
- 12-bit ADC
- Analog Comparator
- 12-bit DAC

Timers
- PWM
- Periodic Interrupt Timers
- Low-Power Timer
- Secure Real-Time Clock

Communication Interfaces
- I²C
- Low-Power UART
- SPI

HMI
- GPIO
- Xtrinsic Low-Power Touch-Sensing Interface

☐ Standard   ⬚ Optional

Energy Efficient Solutions optimized for low power ™

freescale™
Kinetis

Features

Ultra Low Power

- Next-generation 32-bit ARM Cortex-M0+ core. 2x more CoreMark/mA than the closest 8/16-bit architecture. Single-cycle fast I/O access port facilitates bit banging and software protocol emulation, maintaining an 8-bit "look and feel"
- Multiple flexible low power modes, including new compute mode that reduces dynamic power by placing peripherals in an asynchronous stop mode
- LPUART, SPI, I²C, ADC, DAC, LP timer and DMA support low power mode operation without waking up the core

Flash and SRAM

- Up to 32 KB flash with 64 byte flash cache, up to 4 KB RAM
- Security circuitry to prevent unauthorized access to RAM and flash contents

Performance

- ARM Cortex-M0+ core, 48 MHz core frequency over full voltage and temperature range (–40 °C to +105 °C)
- Bit manipulation engine for improved bit handling of peripheral modules
- Thumb instruction set combines high code density with 32-bit performance
- Up to 4-ch. DMA for peripheral and memory servicing with reduced CPU loading and faster system throughput
- Independent-clocked COP guards against clock skew or code runaway for fail-safe applications

Mixed Signal

- 12-bit ADC with configurable resolution, sample time and conversion speed/power. Integrated temperature sensor
- High-speed comparator with internal 6-bit DAC
- 12-bit DAC with DMA support

Timing and Control

- One 6-ch. and one 2-ch., 16-bit low-power timer PWM modules with DMA support
- 2-ch., 32-bit periodic interrupt timer provides time base for RTOS task schedule or trigger source for ADC conversion
- Low-power timer allows operation in all power modes except VLLS0
- Real-time clock with calendar

HMI

- Capacitive touch sense interface supports up to 16 external electrodes and DMA data transfer
- GPIO with pin interrupt support, DMA request capability and other pin control options

Connectivity and Communications

- I²C with DMA support, up to 400 Kb/s and compatible with SMBus V2 features
- LPUART and SPI with DMA support

Software and Tools

- CodeWarrior for MCUs V10.x (Eclipse) IDE with Processor Expert
- IAR Embedded Workbench, Keil MDK, Atollic, GCC
- MQX-Lite, FreeRTOS
- Full ARM ecosystem support

Freescale Freedom Development Platform

The Freescale Freedom development platform is a small, low-power, cost-effective evaluation and development system perfect for quick application prototyping and demonstration of Kinetis MCU families. The platform offers an easy-to-use mass-storage device mode flash programmer, a virtual serial port and classic programming and run control capabilities.

- Low cost (<$20 USD MSRP)
- Designed in an industry-standard compact form factor
- Easy access to the MCU I/O pins
- Integrated open standard serial and debug interface (OpenSDA)
- Compatible with a rich set of third-party expansion boards

Learn more at **freescale.com/Freedom**.

Kinetis KL0x Family Options

Sub-Family	Part Number	CPU (MHz)	Flash (KB)	SRAM (KB)	DMA	UART	SPI	I²C	TSI	I²S	RTC	LLWU	12-bit DAC	16-bit ADC w/ DP Ch.	12-bit ADC	Total I/Os	Other	FG 16 QFN (3 x 3, 0.5 mm)	AF 20 WLCSP (2 x 2, 0.4 mm)	FK 24 QFN (4 x 4, 0.5 mm)	LC 32 LQFP (7 x 7, 0.8 mm)	FM 32 QFN (5 x 5, 0.5 mm)	LF 48 LQFP (7 x 7, 0.5 mm)	Freescale Freedom Hardware
KL02	MKL02Z8xxx4	48 MHz	8	1		1	1	2							√	14~28		√						FRDM-KL02Z
	MKL02Z16xxx4	48 MHz	16	2		1	1	2							√	14~28		√		√			√	FRDM-KL02Z
	MKL02Z32xxx4	48 MHz	32	4		1	1	2							√	14~28		√	√	√			√	FRDM-KL02Z
KL04	MKL04Z8xxx4	48 MHz	8	1	√	1	1	1			√	√			√	22~28					√	√	√	FRDM-KL05Z
	MKL04Z16xxx4	48 MHz	16	2	√	1	1	1			√	√			√	22~41				√	√	√	√	FRDM-KL05Z
	MKL04Z32xxx4	48 MHz	32	4	√	1	1	1			√	√			√	22~41				√	√	√	√	FRDM-KL05Z
KL05	MKL05Z8xxx4	48 MHz	8	1	√	1	1	1	√		√	√	√		√	22~28					√	√	√	FRDM-KL05Z
	MKL05Z16xxx4	48 MHz	16	2	√	1	1	1	√		√	√	√		√	22~41				√	√	√	√	FRDM-KL05Z
	MKL05Z32xxx4	48 MHz	32	4	√	1	1	1	√		√	√	√		√	22~41				√	√	√	√	FRDM-KL05Z

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

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