freescale Kinetis

32-bit Microcontrollers

Kinetis KL0x MCU Family

Ultra-low-power MCUs

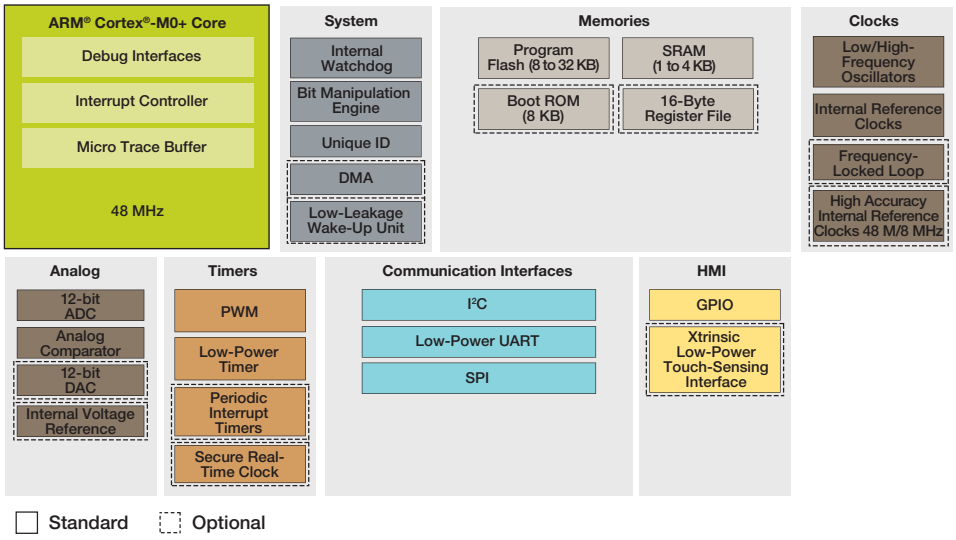
Overview

The Kinetis KL0x MCU family is the entry point into the Kinetis L series of MCUs built on the ARM® Cortex®-M0+ core. The Kinetis KL0x MCU family provides a bridge for 8-bit customers migrating into the Kinetis MCU portfolio, and is software and tool compatible with all other Kinetis L series families. Devices start from 8 KB of flash and a small footprint of 1.6 mm x 2.0 mm 20WLCSP 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.

Target Applications

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

Kinetis KL0x MCU Family Block Diagram



Features

Ultra Low Power

- Next-generation 32-bit Cortex-M0+ core. 2x more CoreMark®/mA than the closest 8/16-bit architecture.
- 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

Memory

- 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
- 8 KB ROM bootloader for easy flash upgrade

Energy Efficient Solutions optimized for low power

Performance

- Cortex-M0+ core, 48 MHz core frequency over full voltage and temperature range (–40 ˚C to +105 ˚C), except CSP (-40 ˚C to +85 ˚C)
- Single-cycle fast I/O access port facilitates bit banging and software protocol emulation, maintaining an 8-bit 'look and feel'
- 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
- Integrated 1.2 V reference

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 1 Mb/s and compatible with SMBus V2 features
- LPUART and SPI with DMA support

Software and Tools

- Kinetis Design Studio Integrated Development Environment (IDE)
- CodeWarrior for MCUs V10.x (Eclipse) IDE with Processor Expert software configuration tool
- IAR Embedded Workbench®, ARM Keil® MDX, Atollic®, GCC
- MQX™ Lite RTOS, 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 MCU Family Options

Sub-Family	Part Number	CPU (MHz)	Memory			Features												√ Package						Freescale Freedom Hardware
			Flash (KB)	SRAM (KB)	Boot ROM (KB)	DMA	UART	SPI	I²C	TSI	RTC	LLWU	12-bit DAC	12-bit ADC	VREF	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)	
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
KL03	MKL03Z8xxx4	48 MHz	8	2	8		1	1	1		√	√*		√	√	14~22		√		√				FRDM-KL03Z
	MKL03Z16xxx4	48 MHz	16	2	8		1	1	1		√	√*		√	√	14~22		√		√				FRDM-KL03Z
	MKL03Z32xxx4	48 MHz	32	2	8		1	1	1		√	√*		√	√	14~22		√	√	√				FRDM-KL03Z
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

*Low power wakeup pin only

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

Doc Number: LSERIESKL0FS Rev 7