

32-bit L Series MCUs

# Kinetis KL2 Family

## Ultra-low-power MCUs with USB OTG

### Target Applications

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

### Overview

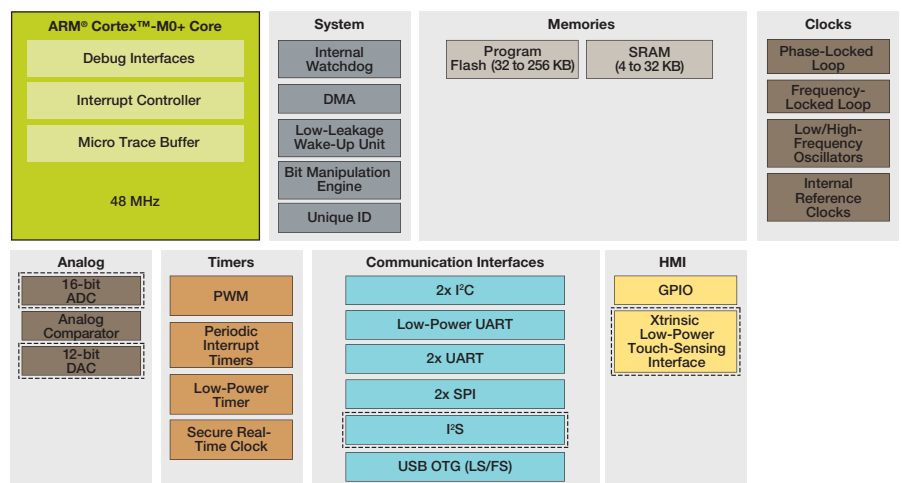
The Kinetis KL2 MCU family is pin, software and tool compatible with all other Kinetis L families and adds a Full-Speed USB 2.0 On-The-Go controller with an integrated low-voltage regulator. The Kinetis KL2 MCU family is also compatible with the Kinetis K20 family of MCUs built on the ARM® Cortex™-M4 core, providing a migration path to higher performance and feature integration. Devices start from 32 KB of flash in a small-footprint 5 x 5 mm 32 QFN package, extending up to 256 KB in a 100 LQFP/121 MBGA package. Each family member combines ultra-low-power performance with a rich suite of analog, communication, timing and control peripherals.

### 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 which reduces dynamic power by placing peripherals in an asynchronous stop mode
- LPSCI, SPI, I<sup>2</sup>C, ADC, DAC, LP timer and DMA support low power mode operation without waking up the core

### Kinetis KL2 MCU Family Block Diagram



Standard  Optional



## Flash and SRAM

- Up to 256 KB flash with 64 byte flash cache, up to 32 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 +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

- Up to 16-bit ADC with configurable resolution, sample time and conversion speed/power. Integrated temperature sensor. Single or differential output mode operation in order to achieve improved noise rejection
- High-speed comparator with internal 6-bit DAC
- 12-bit DAC with DMA support

## Timing and Control

- One 6-ch. and two 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 for 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

- USB 2.0 On-The-Go (Full Speed). Integrated USB low-voltage regulator supplies up to 120 mA off chip at 3.3 V to power external components from 5 V input
- Two I<sup>2</sup>C with DMA support, up to 400 Kb/s and compatible with SMBus V2 features
- One LPUART and two UART with DMA support
- Two SPI with DMA support
- I<sup>2</sup>S module for audio applications

## Software and Tools

- Integrated development environments
  - CodeWarrior for Microcontrollers V10.x (Eclipse) IDE with Processor Expert
  - IAR Embedded Workbench, Keil MDK, Atollic, CodeRed
- Runtime software and RTOS
  - MQX-Lite, FreeRTOS, CodeSourcery G++ (GNU)
- Full ARM ecosystem support
- mbed-enabled with online IDE, SDK and vibrant community [mbed.org](http://mbed.org) (Freescale Freedom hardware for Kinetis KLO family, FRDM-KL25Z)



## 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](http://freescale.com/Freedom) or [freescale.com/FRDM-KL25Z](http://freescale.com/FRDM-KL25Z)

## Freescale Tower System Development Platform

The Freescale Tower System is a modular development platform for 8-, 16- and 32-bit MCUs and MPUs that enables advanced development through rapid prototyping. Featuring more than fifty development boards or modules, the Tower System provides designers with building blocks for entry-level to advanced MCU development.

- Modular, interchangeable boards
- Open source hardware and software allow for quick development
- Integrated debugging interface allows for easy programming and run control via standard USB cable

Learn more at [freescale.com/Tower](http://freescale.com/Tower) or [freescale.com/TWR-KL25Z48M](http://freescale.com/TWR-KL25Z48M)

## Kinetis KL2x Family Options

Sub-Family	Part Number	CPU (MHz)	Memory		Features										Package						Development Hardware						
			Flash (KB)	SRAM (KB)	DMA	UART	SPI	I <sup>2</sup> C	TSI	I <sup>2</sup> S	RTC	12-bit DAC	16-bit ADC w/ DP Ch.	12-bit ADC	Total I/Os	Other	32 QFN (5 x 5, 0.5 mm)	AD	FT	LH		LK	LL	MC			
KL24	MKL24Z32xxx4	48 MHz	32	4	✓	3	2	2			✓			✓	23-66	USB 2.0 FS OTG/Host/Device	✓		✓	✓	✓						FRDM-KL25Z: Freescale Freedom Development Platform
	MKL24Z64xxx4	48 MHz	64	8	✓	3	2	2			✓			✓	23-66	USB 2.0 FS OTG/Host/Device	✓		✓	✓	✓						
KL25	MKL25Z32xxx4	48 MHz	32	4	✓	3	2	2	✓		✓	✓	✓	✓	23-66	USB 2.0 FS OTG/Host/Device	✓		✓	✓	✓						TWR-KL25Z48M: Tower System MCU module
	MKL25Z64xxx4	48 MHz	64	8	✓	3	2	2	✓		✓	✓	✓	✓	23-66	USB 2.0 FS OTG/Host/Device	✓	✓	✓	✓	✓						
	MKL25Z128xxx4	48 MHz	128	16	✓	3	2	2	✓		✓	✓	✓	✓	23-66	USB 2.0 FS OTG/Host/Device	✓	✓	✓	✓	✓						
KL26	MKL26Z128xxx4	48 MHz	128	16	✓	3	2	2	✓	✓	✓	✓	✓	✓	50-80	USB 2.0 FS OTG/Host/Device	✓		✓	✓	✓	✓	✓	✓	✓		
	MKL26Z256xxx4	48 MHz	256	32	✓	3	2	2	✓	✓	✓	✓	✓	✓	50-80	USB 2.0 FS OTG/Host/Device				✓	✓	✓	✓	✓	✓		

\* Proposed family member. Refer to family product brief on [freescale.com](http://freescale.com) for latest information.

For current information about Kinetis products and documentation, please visit [freescale.com/Kinetis/Lseries](http://freescale.com/Kinetis/Lseries)

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