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32-bit Kinetis L Series MCUs

Kinetis KL2x MCU Family

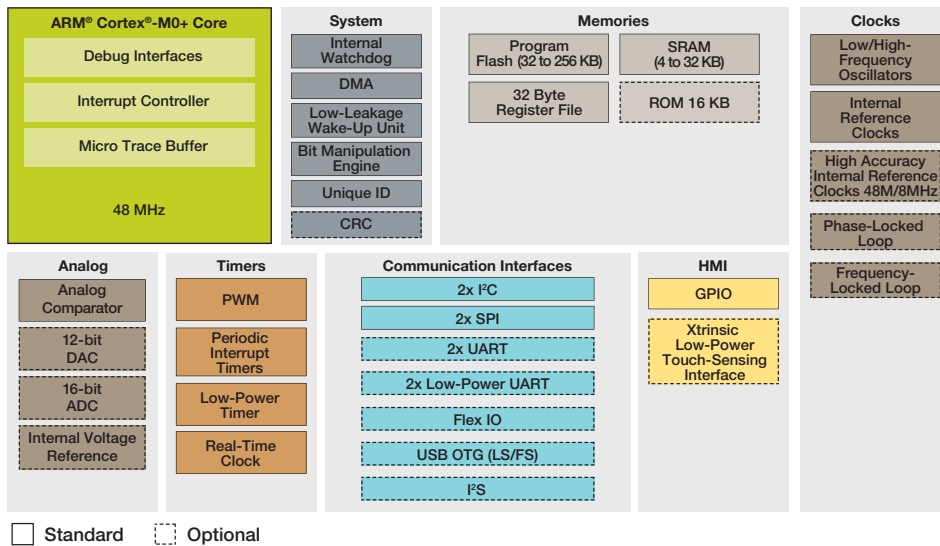## Ultra-low-power MCUs with USB OTG

Overview

The Kinetis KL2x family of ARM® Cortex®-M0+ MCUs combine ultra-low-power performance with a rich suite of analog, communication, timing and control peripherals, including a USB 2.0 On-the-Go controller. Family members start from 32 KB of flash in a small 3.5 x 3.5 mm2 XFBGA package, extending up to 256 KB in a 121 MAPBGA package. The KL2x MCU family is compatible with the ARM Cortex-M4 based Kinetis K20 MCU family, offering a migration path to higher performance and feature integration.

Target Applications

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

Kinetis KL2x MCU Family Block Diagram

ARM® Cortex®-M0+ Core	System	Memories	Clocks
Debug Interfaces	Internal Watchdog	Program Flash (32 to 256 KB) / SRAM (4 to 32 KB)	Low/High-Frequency Oscillators
Interrupt Controller	DMA	32 Byte Register File / ROM 16 KB	Internal Reference Clocks
Micro Trace Buffer	Low-Leakage Wake-Up Unit		High Accuracy Internal Reference Clocks 48M/8MHz
48 MHz	Bit Manipulation Engine		Phase-Locked Loop
	Unique ID		Frequency-Locked Loop
	CRC		

Analog	Timers	Communication Interfaces	HMI
Analog Comparator	PWM	2x I²C	GPIO
12-bit DAC	Periodic Interrupt Timers	2x SPI	Xtrinsic Low-Power Touch-Sensing Interface
16-bit ADC	Low-Power Timer	2x UART	
Internal Voltage Reference	Real-Time Clock	2x Low-Power UART	
		Flex IO	
		USB OTG (LS/FS)	
		I²S	

☐ Standard   ⬚ Optional

Features

Ultra-Low-Power

- Next-generation 32-bit ARM Cortex-M0+ core. Two times 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

- LPUART, SPI, I²C, Flex IO, ADC, DAC, LP timer and DMA support low-power mode operation without waking up the core

Memory

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

- 16 KB ROM with integrated bootloader

- Security circuitry to prevent unauthorized access to RAM and flash contents

Energy Efficient Solutions™
optimized for low power

Features cont.

Performance

- ARM Cortex-M0+ core, 48 MHz core frequency over full voltage and temperature range (–40 ℃ +105 ℃)
- Bit manipulation engine for improved bit handling of peripheral modules
- Thumb instruction set combines high code density with 32-bit performance
- Up to 4-channel 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 input mode operation in order to achieve improved noise rejection
- High-speed comparator with internal 6-bit DAC
- 12-bit DAC with DMA support
- 1.2 V high-accuracy internal voltage reference

Timing and Control

- One 6-channel and two 2-channel,16-bit low-power timer PWM modules with DMA support
- 2-channel 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

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 volts to power external components from 5-volt input
- Two I^2C with DMA support, up to 1Mb/s and compatible with SMBus V2 features
- Three UART with up to two LPUART, and DMA support
- Two SPI with DMA support

- I^2S module for audio applications
- Flex IO with capability of emulating multiple serial interface, such as IrDA, UART, SPI, I^2C, etc.

Software and Tools

- Freescale Freedom Development Platforms and Tower System modules
- Kinetis Software Development Kit (SDK)
- Integrated development environment (IDE)
  - Kinetis Design Studio IDE
  - CodeWarrior for Microcontrollers V10.x (Eclipse) IDE with Processor Expert software modeling tool
  - IAR Embedded Workbench, Keil MDK, Atollic
- Runtime software and RTOS
  - MQX™ Lite, FreeRTOS, CodeSourcery G++ (GNU)
- Full ARM ecosystem support

Kinetis KL2x MCU Family Options

Sub-Family	Part Number	CPU (MHz)	Flash (KB)	SRAM (KB)	DMA	Low-Power UART	UART	ISO7 816-3	SPI	I²C	TSI	I²S	Flex IO	RTC	12-bit DAC	16-bit ADC w/ DP Ch.	12-bit ADC	Total I/Os	Other	FM (32 QFN 5x5, 0.5 mm)	FT (48 QFN 7x7, 0.5 mm)	DA (36X FBGA 3.5x3.5, 0.5 mm)	LH (64 LQFP 10x10, 0.5 mm)	LK (80 LQFP 12x12, 0.5 mm)	LL (100 LQFP 14x14, 0.5 mm)	MP (64 MAPBGA 5x5, 0.5 mm)	MC (121 MAPBGA 8x8, 0.65 mm)
KL24	MKL24Z32xxx4	48 MHz	32	4	√	1	2		2	2				√			√	23~66	USB 2.0 FS OTG/Host/Device	√	√	√	√				
	MKL24Z64xxx4	48 MHz	64	8	√	1	2		2	2				√			√	23~66	USB 2.0 FS OTG/Host/Device	√	√	√	√				
KL25	MKL25Z32xxx4	48 MHz	32	4	√	1	2		2	2	√			√	√	√		23~66	USB 2.0 FS OTG/Host/Device	√	√	√	√				
	MKL25Z64xxx4	48 MHz	64	8	√	1	2		2	2	√			√	√	√		23~66	USB 2.0 FS OTG/Host/Device	√	√	√	√				
	MKL25Z128xxx4	48 MHz	128	16	√	1	2		2	2	√			√	√	√		23~66	USB 2.0 FS OTG/Host/Device	√	√	√	√				
KL26	MKL26Z32xxx4	48 MHz	32	4	√	1	2		2	2	√	√		√	√	√		23~50	USB 2.0 FS OTG/Host/Device	√	√	√					
	MKL26Z64xxx4	48 MHz	64	8	√	1	2		2	2	√	√		√	√	√		23~50	USB 2.0 FS OTG/Host/Device	√	√	√					
	MKL26Z128xxx4	48 MHz	128	16	√	1	2		2	2	√	√		√	√	√		23~80	USB 2.0 FS OTG/Host/Device	√	√	√		√		√	√
	MKL26Z256xxx4	48 MHz	256	32	√	1	2		2	2	√	√		√	√	√		50~80	USB 2.0 FS OTG/Host/Device			√		√		√	√
KL27	MKL27Z128xxx4	48 MHz	128	32	√	2	1	1	2x 16b	2			√	√	√	√		23~50	USB 2.0 FS Device, with crystal-less USB	√	√	√					√
	MKL27Z256xxx4	48 MHz	256	32	√	2	1	1	2x 16b	2			√	√	√	√		23~50	USB 2.0 FS Device, with crystal-less USB	√	√	√					√
	MKL27Z32xxx4	48 MHz	32	8	√	2	1	1	2x 16b	2			√	√			√	23~50	Crystal-less USB, Device Only, Low Power Keep Alive	*	*	√	√			*	
	MKL27Z64xxx4	48 MHz	64	16	√	2	1	1	2x 16b	2			√	√			√	23~50	Crystal-less USB, Device Only, Low Power Keep Alive	*	*	√	√			*	

* This package is included in a Package Your Way program for Kinetis MCUs. Please visit Freescale.com/KPYW for more detail.

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

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