

Ultra-lowpower MCUs

Kinetis[®] KL0x MCU Family

The Kinetis KL0x MCU family is the entry point into the Kinetis L series of MCUs built on the ARM® Cortex®-M0+ core.

TARGET APPLICATIONS

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

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.

FEATURES

Ultra-Low Power

- Next-generation 32-bit Cortex-M0+ core with two times more CoreMarks®/mA than the closest 8-/16-bit architecture
- Multiple flexible low-power modes, including a 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

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 four-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

- 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 six-channel and one two-channel, 16-bit low-power timer PWM modules with DMA support
- Two-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 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 Mbit/s and compatible with SMBus V2 features
- ▶ LPUART and SPI with DMA support

KINETIS KLOx MCU FAMILY OPTIONS



SOFTWARE AND TOOLS

- Kinetis Design Studio Integrated Development Environment (IDE)
- CodeWarrior[®] for MCUs V10.x (Eclipse) IDE with Processor Expert[®] software configuration tool

KINETIS KLOx MCU FAMILY BLOCK DIAGRAM

- IAR Embedded Workbench[®], ARM Keil[®] MDX, Atollic[®], GCC
- ► FreeRTOS™
- ▶ Full ARM ecosystem support
- Online enablement with ARM mbed[™] development platform

Freedom development platform

The Freedom development platform is a small, low-power, cost-effective evaluation

ARM mbed enabled

Document Number

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and development system perfect for quick application prototyping and demonstration of Kinetis MCU families. The platform offers an easy-to-use massstorage device mode flash programmer, a virtual serial port and classic programming and run control capabilities.

- Low cost (<\$20 USD MSRP)</p>
- 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 thirdparty expansion boards

Learn more at www.nxp.com/Freedom.

	CPU (MHz)	Me	Features																				
																Other	FG	AF	FK	LC	FM	LF	Freedom Hardware
Part Number		Flash (KB)	SRAM (KB)	Boot ROM (KB	DMA	UART	SPI	I ² C	TSI	RTC	LLWU	12-bit DAC	12-bit ADC	VREF	Total I/Os		16 QFN (3 x 3, 0.5 mm)	20 WLCSP (< 2 × 2, 0.4 mm)	24 QFN (4 x 4, 0.5 mm)	32 LQFP (7 × 7, 0.8 mm)	32 QFN (5 × 5, 0.5 mm)	48 LOFP (7 x 7, 0.5 mm)	
MKL02Z8xxx4	48 MHz	8	1			1	1	2					\checkmark		14~28		\checkmark						FRDM-KL02Z
MKL02Z16xxx4	48 MHz	16	2			1	1	2					\checkmark		14~28		\checkmark		\checkmark		\checkmark		FRDM-KL02Z
MKL02Z32xxx4	48 MHz	32	4			1	1	2					\checkmark		14~28		\checkmark	\checkmark	\checkmark		\checkmark		FRDM-KL02Z
MKL03Z8xxx4	48 MHz	8	2	8		1	1	1		\checkmark	√*		\checkmark	\checkmark	14~22		\checkmark		\checkmark				FRDM-KL03Z
MKL03Z16xxx4	48 MHz	16	2	8		1	1	1		\checkmark	√*		\checkmark	\checkmark	14~22		\checkmark		\checkmark				FRDM-KL03Z
MKL03Z32xxx4	48 MHz	32	2	8		1	1	1		\checkmark	√*		\checkmark	\checkmark	14~22		\checkmark	\checkmark	\checkmark				FRDM-KL03Z
MKL04Z8xxx4	48 MHz	8	1		\checkmark	1	1	1		\checkmark	\checkmark		\checkmark		22~28				\checkmark	\checkmark	\checkmark		FRDM-KL05Z
MKL04Z16xxx4	48 MHz	16	2		\checkmark	1	1	1		\checkmark	\checkmark		\checkmark		22~41				\checkmark	\checkmark	\checkmark	\checkmark	FRDM-KL05Z
MKL04Z32xxx4	48 MHz	32	4		\checkmark	1	1	1		\checkmark	\checkmark		\checkmark		22~41				\checkmark	\checkmark	\checkmark	\checkmark	FRDM-KL05Z
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MKL05Z32xxx4	48 MHz	32	4		\checkmark	1	1	1	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark		22~41				\checkmark	\checkmark	\checkmark	\checkmark	FRDM-KL05Z
	Number MKL02Z8xxx4 MKL02Z16xxx4 MKL02Z32xxx4 MKL03Z32xxx4 MKL03Z32xxx4 MKL04Z8xxx4 MKL04Z8xxx4 MKL04Z16xxx4 MKL04Z32xxx4 MKL05Z8xxx4 MKL05Z16xxx4	Number Participation MKL02Z8xxx4 48 MHz MKL02Z16xxx4 48 MHz MKL02Z32xxx4 48 MHz MKL03Z8xxx4 48 MHz MKL03Z16xxx4 48 MHz MKL03Z32xxx4 48 MHz MKL03Z32xxx4 48 MHz MKL04Z8xxx4 48 MHz MKL04Z8xxx4 48 MHz MKL04Z32xxx4 48 MHz MKL04Z32xxx4 48 MHz MKL05Z8xxx4 48 MHz	Part Number Image: System 2 Image: System	Number D H N MKL02Z8xxx4 48 MHz 8 1 MKL02Z16xxx4 48 MHz 16 2 MKL02Z16xxx4 48 MHz 32 4 MKL02Z32xxx4 48 MHz 8 2 MKL03Z8xxx4 48 MHz 8 2 MKL03Z16xxx4 48 MHz 16 2 MKL03Z32xxx4 48 MHz 32 2 MKL04Z8xxx4 48 MHz 8 1 MKL04Z8xx44 48 MHz 32 4 MKL04Z32xxx4 48 MHz 32 4 MKL05Z8xx44 48 MHz 32 4 MKL05Z8xx44 48 MHz 32 4 MKL05Z8xx44 48 MHz 8 1 MKL05Z16xxx4 48 MHz 16 2	Part Number Ît Number It Number Ît Number It Number	Part Number FH Image: Constraint of the system of the sys	Part Number FH Image: Second	Part Number ÎH ÎH ÎH ÎH ÎH ÎH IH	Part Number THU Image: Constraint of the system of the sy	Part Number FM R <t< td=""><td>Part Number ÎH IH IH</td><td>Part Number (H) Number (H) Nu</td><td>Part Number THU Number THU Ne <t< td=""><td>Part Number (H) Number (H) Number (H) NG (H) NG</td><td>Part Number (ff) (ff)</td><td>Part Number THU Number THU O THU REP THURRADE TH</td><td>Part Number THU <th< td=""><td>Part Number FG MKL02Z6xxx4 48 MHz 8 1 I 1 1 2 I J J I<</td><td>Part Number THUM RG RFG AF MKL02Z8xxx4 48 MHz 8 1 1 1 2 5 1 14-28 1 1 1 2 5 1 14-28 1 1 1 2 5 1 14-28 1 1 1 2 5 1 14-28 1 1 1 1 2 5 1 14-28 1 1 1 2 5 1 1 2 5 1 1 2 5 1 1 2 5 1 1 2 5 1 1 2 5 1 1 1 2 1</td><td>Part Number THUNDY RS RS</td><td>Part Number FG AF FK LC MKL02Z8xxx4 48 MHz 8 1 1 1 2 5 <td< td=""><td>Part Number FG AF FK LC FM (a) (b) (b) (b) (b) (b) (c) (c)</td></td<></td></th<></td></t<><td>Part Number FG AF FK LC FM LF (a) (b) (b)</td></td></t<>	Part Number ÎH IH	Part Number (H) Number (H) Nu	Part Number THU Number THU Ne <t< td=""><td>Part Number (H) Number (H) Number (H) NG (H) NG</td><td>Part Number (ff) (ff)</td><td>Part Number THU Number THU O THU REP THURRADE TH</td><td>Part Number THU <th< td=""><td>Part Number FG MKL02Z6xxx4 48 MHz 8 1 I 1 1 2 I J J I<</td><td>Part Number THUM RG RFG AF MKL02Z8xxx4 48 MHz 8 1 1 1 2 5 1 14-28 1 1 1 2 5 1 14-28 1 1 1 2 5 1 14-28 1 1 1 2 5 1 14-28 1 1 1 1 2 5 1 14-28 1 1 1 2 5 1 1 2 5 1 1 2 5 1 1 2 5 1 1 2 5 1 1 2 5 1 1 1 2 1</td><td>Part Number THUNDY RS RS</td><td>Part Number FG AF FK LC MKL02Z8xxx4 48 MHz 8 1 1 1 2 5 <td< td=""><td>Part Number FG AF FK LC FM (a) (b) (b) (b) (b) (b) (c) (c)</td></td<></td></th<></td></t<> <td>Part Number FG AF FK LC FM LF (a) (b) (b)</td>	Part Number (H) Number (H) Number (H) NG	Part Number (ff)	Part Number THU Number THU O THU REP THURRADE TH	Part Number THU <th< td=""><td>Part Number FG MKL02Z6xxx4 48 MHz 8 1 I 1 1 2 I J J I<</td><td>Part Number THUM RG RFG AF MKL02Z8xxx4 48 MHz 8 1 1 1 2 5 1 14-28 1 1 1 2 5 1 14-28 1 1 1 2 5 1 14-28 1 1 1 2 5 1 14-28 1 1 1 1 2 5 1 14-28 1 1 1 2 5 1 1 2 5 1 1 2 5 1 1 2 5 1 1 2 5 1 1 2 5 1 1 1 2 1</td><td>Part Number THUNDY RS RS</td><td>Part Number FG AF FK LC MKL02Z8xxx4 48 MHz 8 1 1 1 2 5 <td< td=""><td>Part Number FG AF FK LC FM (a) (b) (b) (b) (b) (b) (c) (c)</td></td<></td></th<>	Part Number FG MKL02Z6xxx4 48 MHz 8 1 I 1 1 2 I J J I<	Part Number THUM RG RFG AF MKL02Z8xxx4 48 MHz 8 1 1 1 2 5 1 14-28 1 1 1 2 5 1 14-28 1 1 1 2 5 1 14-28 1 1 1 2 5 1 14-28 1 1 1 1 2 5 1 14-28 1 1 1 2 5 1 1 2 5 1 1 2 5 1 1 2 5 1 1 2 5 1 1 2 5 1 1 1 2 1	Part Number THUNDY RS	Part Number FG AF FK LC MKL02Z8xxx4 48 MHz 8 1 1 1 2 5 <td< td=""><td>Part Number FG AF FK LC FM (a) (b) (b) (b) (b) (b) (c) (c)</td></td<>	Part Number FG AF FK LC FM (a) (b) (b) (b) (b) (b) (c)	Part Number FG AF FK LC FM LF (a) (b)

*Low-power wakeup pin only

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