

Kinetis Mini MCUs

# Kinetis KL03 20-pin Chip-Scale Package MCU Family

The Next World's Smallest ARM Powered® MCU



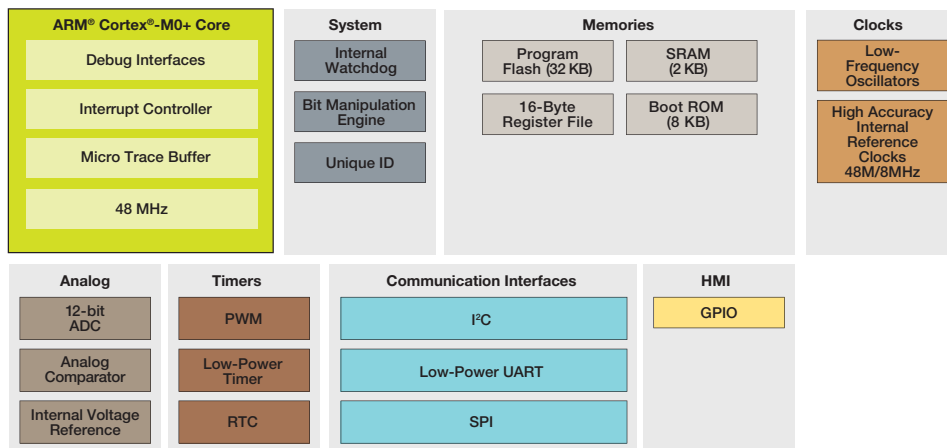
## Overview

The Kinetis KL03 chip-scale package (CSP) is the next world's smallest ARM Powered MCU designed to support the latest innovation in smart, small devices. Available in the ultra-small 1.6 x 2.0 mm<sup>2</sup> wafer-level CSP, the Kinetis KL03 CSP (MKL03Z32CAF4R) reduces board space while integrating even more rich MCU features than previously seen in the market. The Kinetis KL03 CSP consumes 35% less PCB area, yet delivers 60% more GPIO than the nearest competing MCU. As part of Freescale's Kinetis mini MCU portfolio, the Kinetis KL03 CSP allows designers to dramatically reduce their board size without compromising the performance, feature integration and power consumption of their end products.

## Target Applications

- Ingestible healthcare sensing
- Low-power devices
- Miniaturized wearables
- Portable consumer devices
- Remote sensing nodes

## Kinetis KL03 CSP MCU Family Block Diagram



## Features

### Ultra Low Power

- Next-generation 32-bit ARM® Cortex®-M0+ core. Two times more CoreMark®/mA than the closest 8/16-bit architecture.
- Multiple flexible low power modes with sleep current less than 1uA
- LPUART, SPI, I<sup>2</sup>C, ADC LP timer support low-power mode operation without waking up the core

### Memory

- 32 KB flash, 2 KB RAM
- Security circuitry to prevent unauthorized access to RAM and flash contents
- ROM boot loader for easy flash upgrade
- 16-Byte register file to keep data in low power modes

### Performance

- Cortex-M0+ core, 48 MHz core frequency over full voltage and temperature range (-40 °C to +105 °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

\* Package dependant.

- Independently 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
- Embedded 1.2 V reference for ADC
- Integrated temperature sensor
- High-speed comparator with internal 6-bit DAC

### Timing and Control

- Two 2-channel 16-bit low-power timer PWM modules
- Low-power timer allows operation in all power modes except VLLS0

### HMI

- Up to 22 controllable GPIO with pin interrupt support

### Connectivity and Communications

- High-speed I<sup>2</sup>C up to 1 Mb/s
- LPUART and SPI

- IAR Embedded Workbench®, ARM Keil® MDK, Atollic® GCC
- 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](http://freescale.com/Freedom).

## Software and Tools

- Kinetis Design Studio integrated development environment (IDE)

## Kinetis KL03 Family Options

| Sub-Family | Part Number  | CPU (MHz) | Memory     |           |               | Features |      |     |                  |     |                  |     |            |                     |            |      | √ Package |       |                                      |  |                                      |
|------------|--------------|-----------|------------|-----------|---------------|----------|------|-----|------------------|-----|------------------|-----|------------|---------------------|------------|------|-----------|-------|--------------------------------------|--|--------------------------------------|
|            |              |           | Flash (KB) | SRAM (KB) | Boot ROM (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 | VREF | GPIO      | Other | FG                                   | AF                                       | FK                                   |
|            |              |           |            |           |               |          |      |     |                  |     |                  |     |            |                     |            |      |           |       | 16 QFN (3 x 3, 0.5 mm <sup>2</sup> ) | 20 WLCSP (1.6 x 2, 0.4 mm <sup>2</sup> ) | 24 QFN (4 x 4, 0.5 mm <sup>2</sup> ) |
| KL03       | MKL03Z8xxx4  | 48 MHz    | 8          | 2         | 8             |          | 1    | 1   | 1                |     |                  | 1   |            |                     | √          | √    | Up to 22  |       | √                                    | √  |                                      |
|            | MKL03Z16xxx4 | 48 MHz    | 16         | 2         | 8             |          | 1    | 1   | 1                |     |                  | 1   |            |                     | √          | √    | Up to 22  |       | √                                    | √  |                                      |
|            | MKL03Z32xxx4 | 48 MHz    | 32         | 2         | 8             |          | 1    | 1   | 1                |     |                  | 1   |            |                     | √          | √    | Up to 22  |       | √                                    | √  |                                      |

For current information about Kinetis products and documentation, visit [freescale.com/Kinetis/KL03CSP](http://freescale.com/Kinetis/KL03CSP)