The Kinetis KL4x family of MCUs based on ARM® Cortex®-M0+ cores 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 and low-power segment LCD controller with support for up to 376 segments.

**TARGET APPLICATIONS**
- Electronic scales
- Flow meters
- Smart meters
- Thermostats

Family members start from 128 KB of flash in a 64 LQFP package, extending up to 256 KB in a 121 MBGA package. The KL4x MCU family is compatible with the Cortex-M4 based M4-based Kinetis K40 MCU family, offering a migration path to higher performance and feature integration.

**FEATURES**

**Ultra-low power**
- Next-generation 32-bit Cortex-M0+ core
  - Two times more CoreMarks®/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 a new compute mode which 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 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

**Performance**
- 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
- Up to 4-channel DMA for peripheral and memory servicing with reduced CPU loading and faster system throughput

**Mixed signal**
- Up to 16-bit ADC
- High-speed comparator with internal 6-bit DAC
- 12-bit DAC with DMA support
Timing and control
- One six-channel and two 2-channel, 16-bit low-power timer PWM modules
- 2-channel, 32-bit periodic interrupt timer
- Low-power timer allows operation in all power modes except VLLS0
- Real-time clock

HMI
- Flexible, low-power LCD controller with up to 376 segments (47 x 8 or 51 x 4)
- LCD blink mode enables low average power while remaining in low-power mode. Segment fail detect alerts the user to failures in the display, which helps avoid the possibility of an erroneous readout in medical applications. Front plane/backplane reassignment provides pin-out flexibility to ease PCB design and allow LCD configuration changes via firmware with no hardware rework. Unused LCD pins can be configured as other GPIO functions.
- Capacitive touch-sensing inputs

Connectivity and communications
- USB 2.0 On-The-Go 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 PIC with DMA support, up to 1 Mbit/s and compatible with SMBus V2 features
- One LPUART and two UART with DMA support
- Two SPI with DMA support

Development tools and software
- Tower® System modules
- Freedom development platform
- Integrated development environment (IDE)
  - IAR Embedded Workbench®, ARM Keil® MDK, and Rowley Crossworks
  - CodeWarrior® for Microcontrollers v10.x (Eclipse) IDE with Processor Expert® software configuration tool
  - Kinetic Design Studio IDE

Processor Expert software configuration tool

KINETIS KL4x MCU FAMILY OPTIONS

<table>
<thead>
<tr>
<th>Sub-Family</th>
<th>Part Number</th>
<th>CPU (MHz)</th>
<th>Memory</th>
<th>Features</th>
<th>J Package</th>
<th>Development Hardware</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td></td>
<td></td>
<td>48 MHz</td>
<td>128 KB</td>
<td>Flash (KB)</td>
<td>16 KB</td>
<td>USB 2.0 Device, with embedded OSC</td>
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<tr>
<td>KL43</td>
<td>MKL43Z128xxx4</td>
<td>48 MHz</td>
<td>128 KB</td>
<td>SpRAM (KB)</td>
<td>16 KB</td>
<td>FRDM-KL43Z: Freedom development platform</td>
</tr>
<tr>
<td></td>
<td>MKL43Z256xxx4</td>
<td>48 MHz</td>
<td>256 KB</td>
<td>SpRAM (KB)</td>
<td>32 KB</td>
<td>TWR-KL43Z48M: Tower® System module</td>
</tr>
<tr>
<td>KL46</td>
<td>MKL46Z128xxx4</td>
<td>48 MHz</td>
<td>128 KB</td>
<td>Flash (KB)</td>
<td>16 KB</td>
<td>USB 2.0 OTG/Host/Device + Segment LCD</td>
</tr>
<tr>
<td></td>
<td>MKL46Z256xxx4</td>
<td>48 MHz</td>
<td>256 KB</td>
<td>SpRAM (KB)</td>
<td>32 KB</td>
<td>FRDM-KL46Z: Freedom development platform</td>
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KINETIS KL4x MCU FAMILY BLOCK DIAGRAM