The Kinetis KW41Z/31Z/21Z MCU family for wireless applications is the second multi-mode family in the Kinetis W series portfolio. Primarily used for automation and healthcare purposes, these MCUs enable low-energy and long-range connectivity.

**TARGET APPLICATIONS**
- Home automation
  - Access control
  - Appliances
  - Lighting control
  - Smart thermostats
  - Water heater control
  - Curtain/window blind control
  - Security systems
- Building automation
  - Building control and monitoring
  - Building HVAC control
  - Fire/security
  - Retail pricing management
  - Security and access control
  - Usage data collection
- Healthcare
  - Fitness monitoring
  - Home healthcare
  - Institutional care
  - Medication asset
  - Patient monitoring

**OVERVIEW**
Integrating a Bluetooth® Low Energy (BLE) v4.2, Generic FSK (at 250, 500 and 1000 kbit/s) and IEEE® 802.15.4 compliant modem, Kinetis KW41Z/31Z/21Z MCUs can support multiple protocols running concurrently (time slice) in a single chip. These MCUs also integrate a buck-boost DC-DC converter, supporting a wide range of operating voltages from 0.9 V to 4.2 V, significantly reducing the peak current in receive and transmit modes. At the same time, this MCU family delivers an excellent link budget that ensures the longest range of communication and high immunity to interference.
KW41Z/31Z/21Z MCUs offer multi-protocol support which allow the system to concurrently operate in an 802.15.4 based network, like Thread, and a BLE network, eliminating the need for multiple radios, reducing system complexity and cost. With up to 512 KB of flash and up to 128 KB of SRAM on chip, KW41Z/31Z/21Z MCUs provide the ultimate option for running all your connectivity needs in a single device.

Take advantage of the robust enablement package that includes the BLE host stack, generic FSK, Thread® stack, 802.15.4 MAC and Simple MAC (SMAC) software protocol stacks, RTOS, development tools and IDEs. These tools are designed for use with Kinetis KW41Z/31Z/21Z MCUs and are fully integrated in the Kinetis software development kit (KSDK).

**ENABLEMENT**
- Freedom development board
- USB dongle for sniffer applications or connection to PC
- BLE v4.2 host stack and application profiles
- Generic FSK at 250, 500 and 1000 kbit/s
- 802.15.4 MAC/PHY support
- Thread® network stack
- Support for host MCU and MPU (Linux®) processors
- Support for IAR Embedded Workbench® and Kinetis Design Studio (KDS) IDEs
- Full integration with Kinetis SDK
- Multiple reference designs
- Support for multiple RTOSes including FreeRTOS™

**KINETIS KW41Z/31Z/21Z FAMILY FEATURES AND BENEFITS**
- **Features**
  - Dual-mode concurrent BLE and 802.15.4 radio capability with Kinetis® KW41Z MCUs
  - 6.8 mA typical Rx and 6.1 mA Tx current with DC-DC activated
  - -95 dBm typical BLE sensitivity
  - -100 dBm typical generic FSK (at 250 kbit/s) sensitivity
  - -100 dBm typical 802.15.4 sensitivity
  - +3.5 dBm maximum output power
  - 48 MHz ARM® Cortex®-M0+ core
  - 16-bit analog-to-digital converter (ADC)
  - 12-bit digital-to-analog converter (DAC)
  - 6-bit high-speed analog comparator (CMP)
  - Small 7 x 7 laminate QFN
  - Fast antenna diversity for 802.15.4
  - Compatible with NXP MCU family
- **Benefits**
  - Supports concurrent operations in a single chip between an 802.15.4 and BLE network lowering system cost and complexity
  - Significantly reduces power consumption and extends battery life
  - High link budget improves range and lowers cost by reducing the need for external power amplifiers
  - Integrated balun enables smaller design and reduces system costs
  - Significantly improves operation in harsh 2.4 GHz environments such as condominiums and apartments
  - High-performance, low-power core with adequate memory to run BLE, generic FSK and Thread® protocol stacks and application
  - Fast encryption/decryption utilizing hardware security algorithms for network commissioning and transmissions of supported protocols
  - Supports a wide range of batteries from single alkaline or coin-cell to Lithium-ion
  - Supports high-performance on-chip analog at the MCU level for sensor aggregation and other sophisticated applications
  - Smaller size and low component count reduces cost
  - Allows the hardware to automatically select between two antennas, improving reliability in high-interference environments
  - Software protocol stacks, tools and IDE are compatible with Kinetis MCUs, and integrated in the Kinetis software development kit (KSDK)
### DEVELOPMENT TOOLS

<table>
<thead>
<tr>
<th>Board Name</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>FRDM-KW41Z</td>
<td>Freedom development board for Kinetis® KW41Z MCUs with 2.4 GHz BLE, generic FSK and 802.15.4 wireless connectivity solutions</td>
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<tr>
<td>USB-KW41Z</td>
<td>USB dongle for sniffer operations for Kinetis KW41Z MCUs with 2.4 GHz BLE, generic FSK and 802.15.4 wireless connectivity solutions</td>
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</tbody>
</table>

### ORDERABLE PART NUMBERS

<table>
<thead>
<tr>
<th>Part Number</th>
<th>2.4 GHz RF Compatibility</th>
<th>Flash/RAM</th>
<th>Package</th>
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<tbody>
<tr>
<td>MKW41Z512VHT4</td>
<td>BLE/Generic</td>
<td>512 KB/128 KB</td>
<td>7 x 7 laminate QFN</td>
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<tr>
<td>MKW41Z256VHT4</td>
<td>FSK/802.15.4 (Supports concurrent operation)</td>
<td>256 KB/64 KB</td>
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<tr>
<td>MKW31Z512VHT4</td>
<td>BLE/Generic FSK</td>
<td>512 KB/128 KB</td>
<td>7 x 7 laminate QFN</td>
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<tr>
<td>MKW31Z256VHT4</td>
<td>FSK</td>
<td>256 KB/64 KB</td>
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<tr>
<td>MKW21Z512VHT4</td>
<td>802.15.4</td>
<td>512 KB/128 KB</td>
<td>7 x 7 laminate QFN</td>
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<tr>
<td>MKW21Z256VHT4</td>
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<td>256 KB/64 KB</td>
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