



Design with  
multi-mode  
(BLE/Generic-  
FSK/802.15.4)  
radio solutions

## Kinetis® KW41Z/31Z/21Z MCUs for Wireless Applications

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 a long range of communication and high immunity to interference.



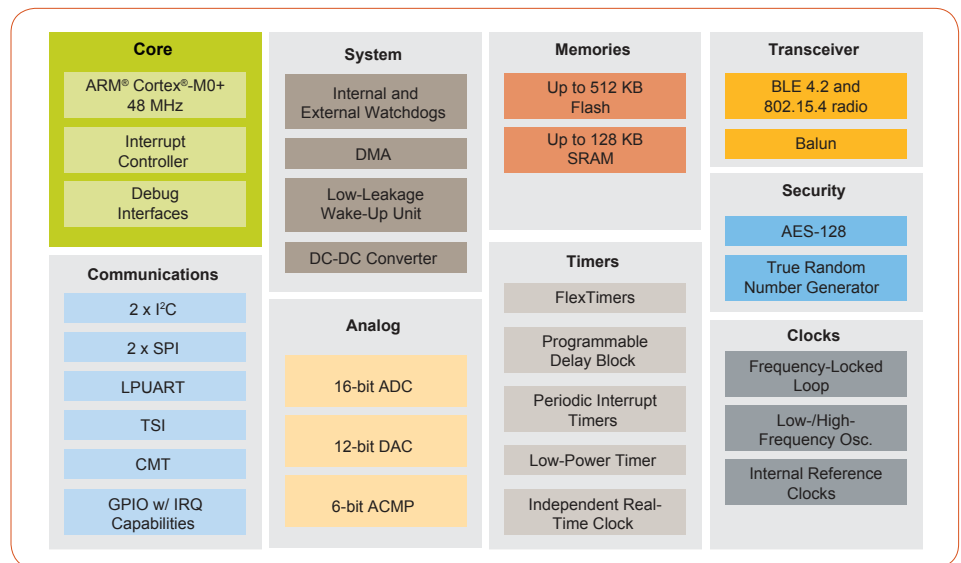
KW41Z/31Z/21Z MCUs offer multi-protocol support which allow the system to concurrently operate in an 802.15.4 based network, like Thread, and a BLE network, eliminating the need for multiple radios, reducing system complexity and cost. With up to 512 KB of flash and up to 128 KB of SRAM on chip, KW41Z/31Z/21Z MCUs provide an 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 NXP's MCUXpresso IDEs
- ▶ Full integration with NXP's MCUXpresso SDK
- ▶ Multiple reference designs
- ▶ Support for multiple RTOSes including FreeRTOS™

### KINETIS KW41Z/31Z/21Z WIRELESS MCU FAMILY BLOCK DIAGRAM



### KINETIS KW41Z/31Z/21Z FAMILY

| Features  | Benefits   |
|---|--|
| Dual-mode concurrent BLE and 802.15.4 radio capability with Kinetis® KW41Z MCUs   | Supports concurrent operations in a single chip between an 802.15.4 and BLE network lowering system cost and complexity  |
| 6.8 mA typical Rx and 6.1 mA Tx current with DC-DC activated  | Significantly reduces power consumption and extends battery life   |
| -95 dBm typical BLE sensitivity<br>-100 dBm typical generic FSK (at 250 kbit/s) sensitivity<br>-100 dBm typical 802.15.4 sensitivity<br>+3.5 dBm maximum output power | High link budget improves range and lowers cost by reducing the need for external power amplifiers<br>Integrated balun enables smaller design and reduces system costs |
| Excellent selectivity and blocking  | Significantly improves operation in harsh 2.4 GHz environments such as condominiums and apartments   |
| 48 MHz ARM® Cortex®-M0+ core<br>Up to 512 KB flash memory<br>Up to 128 KB SRAM  | High-performance, low-power core with adequate memory to run BLE, generic FSK and Thread® protocol stacks and application  |
| AES-128 accelerator<br>True random number generator   | Fast encryption/decryption utilizing hardware security algorithms for network commissioning and transmissions of supported protocols                                   |
| Buck-boost DC-DC converter working from 0.9 V to 4.2 V  | Supports a wide range of batteries from single alkaline or coin-cell to Lithium-ion  |
| 16-bit analog-to-digital converter (ADC)<br>12-bit digital-to-analog converter (DAC)<br>6-bit high-speed analog comparator (CMP)                                      | Supports high-performance on-chip analog at the MCU level for sensor aggregation and other sophisticated applications  |
| 7 x 7 QFN<br>3.9 x 3.8 WLCSP  | Smaller size and low component count reduces cost  |
| Fast antenna diversity for 802.15.4   | Allows the hardware to automatically select between two antennas, improving reliability in high-interference environments  |
| Compatible with NXP MCU family  | Software protocol stacks, tools and IDE are compatible with Kinetis MCUs, and integrated in the Kinetis software development kit (KSDK)                                |

## DEVELOPMENT TOOLS

| Board Name | Description   |
|------------|---|
| FRDM-KW41Z | Freedom development board for Kinetis® KW41Z MCUs with 2.4 GHz BLE, generic FSK and 802.15.4 wireless connectivity solutions        |
| USB-KW41Z  | USB dongle for sniffer operations for Kinetis KW41Z MCUs with 2.4 GHz BLE, generic FSK and 802.15.4 wireless connectivity solutions |

## ORDERABLE PART NUMBERS

| Part Number                                      | 2.4 GHz RF Compatibility                                    | Flash/RAM                     | Package                                   |
|--|---|-------------------------------|---|
| MKW41Z512VHT4<br>MKW41Z256VHT4<br>MKW41Z512CAT4R | BLE/Generic FSK/802.15.4<br>(Supports concurrent operation) | 512 KB/128 KB<br>256 KB/64 KB | 7 x 7 laminate QFN<br>3.893 x 3.797 WLCSP |
| MKW31Z512VHT4<br>MKW31Z256VHT4<br>MKW31Z512VHT4R | BLE/Generic FSK   | 512 KB/128 KB<br>256 KB/64 KB | 7 x 7 laminate QFN<br>3.893 x 3.797 WLCSP |
| MKW21Z512VHT4<br>MKW21Z256VHT4                   | 802.15.4  | 512 KB/128 KB<br>256 KB/64 KB | 7 x 7 laminate QFN                        |

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