Ultra-low-power wireless MCU for sub-1 GHz wireless connectivity applications

Kinetis KW0x Wireless MCUs

Powered by the ultra-low-power 48 MHz ARM® Cortex®-M0+ 32-bit core, the KW0x family of MCUs embeds a rich set of peripherals such as a high-performance, bi-directional sub-1 GHz radio capable of operating over a wide frequency range of 315, 433, 470, 868, 915, 928 and 960 MHz in the license-free industrial, scientific and medical (ISM) frequency bands.

**TYPICAL APPLICATIONS**
- Smart metering
- Building control
- Home automation
- Wireless sensor networks
- Medical/healthcare

The KW0x smart radio supports OOK, FSK, GFSK and MSK signal modulation to transmit and receive information from 1.2 to 600 kbit/s for addressing the different types of communications required in the industrial market. An embedded front end radio integrates high-performance, low noise amplifiers and power amplifiers to reach a sensitivity of -120 dBm at 1.2 kbit/s and an output power adjustable from -18 to +17 dBm.

The KW0x smart radio has 128 KB of on-chip, non-volatile flash memory and 16 KB of RAM for running various types of communication protocols, from proprietary protocols (simple media access controller (SMAC)) to globally standardized protocols (IEEE® 802.15.4). This platform approach includes hardware, software, tools and reference designs to help simplify development.

**KINETIS KW0X KEY BENEFITS**
- Ultra-low-power 32-bit ARM Cortex -M0+ core offers a well-matched CPU to run target applications
- Optimized flash and RAM memory size provide a single-chip device for operation of the communication stack and the application
- Flexible radio (multiple frequency bands, multiple modulation) provides common platform development for compliance with multiple industry standards
- High performance and low power consumption are ideal for coin cell battery-operated equipment

**FEATURES SUMMARY**

**MCU**
- Ultra-low-power 32-bit ARM Cortex-M0+core. 2 x more CoreMark®/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 new compute operation which reduces dynamic power by placing peripherals in an asynchronous stop mode.

- I²C, ADC, DAC, LP timer and DMA support low-power mode operation without waking up the core.

RF Transceiver
- Supports 290–340 MHz, 424–510 MHz, and 862–1020 MHz frequency bands.
- High sensitivity: As low as -120 dBm at 1.2 kbit/s.
- High selectivity: 80 dB blocking immunity.
- Low current: RX = 16 mA, 100nA register retention.
- Programmable output: -18 to +17 dBm in 1 dB steps.
- FSK bit rates up to 600 kbit/s.
- FSK, GFSK, MSK, GMSK and OOK modulations.
- Packet engine with CRC, AES-128 encryption and 66 byte FIFO.
- Built-in temperature sensor and low battery indicator.

Memory
- 128 KB flash with 64 byte flash cache.
- 16 KB RAM.

Peripherals
- 16-bit ADC with configurable resolution, sample time and conversion speed/power.
- High-speed comparator with internal 6-bit DAC.
- 12-bit DAC with DMA support.

Interfaces
- Capacitive touch-sense interface supports external electrodes.
- GPIO with pin interrupt support, DMA request capability and other pin control options.
- One I²C with DMA support, up to 100 kbit/s and compatible with SMBus V2 features.
- One LPUART and two UART with DMA support.

Operating Voltage and Temperature Range
- 1.8 to 3.6 V operating voltage with on-chip voltage regulators.
- Temperature range of -40 °C to +85 °C.

SOFTWARE AND TOOLS
Radio Test Utility
- Run on PC connected through USB.
- Allows fast evaluation of radio performance in a lab environment without the need for writing software:
  - Common control allows setting of frequency, modulation and operation mode.
  - Transmit control allows setting of TX power, ramp and shaping for analysis.
  - Receive control allows setting of bandwidths, AFC, OOK thresholds, LNA Sensitivity, RSSI thresholds and readings.
  - Packet Handler control allows setting of packet preamble, sync and payload for board-to-board testing.

SMAC
- Simple communication and test applications based on drivers/PHY utilities available as source code.
- Small footprint (<10 KB).
- Supports point-to-point communication (bi-directional RF communication link), broadcast communication.

DEVELOPMENT TOOLS

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>USD</th>
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<tbody>
<tr>
<td>MRB-KW019032NA</td>
<td>KW01 915 MHz module with 32 MHz XTAL</td>
<td>$99</td>
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<td>• Device programmed with code for North America</td>
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<td>• Antenna</td>
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<td>• USB cable</td>
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<td>• Quick start guide</td>
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<tr>
<td>MRB-KW019032EU</td>
<td>KW01 868 MHz module with 32 MHz XTAL</td>
<td>$99</td>
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<td>• Device programmed with code for Europe</td>
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<tr>
<td>MRB-KW019030JA</td>
<td>KW01 900 MHz module with 30 MHz XTAL</td>
<td>$99</td>
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<td>• Device programmed with code for Japan</td>
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<td>• Quick start guide</td>
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<tr>
<td>TWR-RF-MRB</td>
<td>• Adaptor for connecting the modular reference board to the Kinetis Tower system</td>
<td>$99</td>
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*Please note: A minimum of two MRB-KW01 boards of the same style are typically required to demonstrate full functionality of the system. Refer to www.nxp.com/MRB-KW0x for additional information.*
## ORDERABLE PART

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>MKW01Z128CHN</td>
<td>• 290–1020 MHz smart radio</td>
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<td>• 128 KB flash/16 KB RAM</td>
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<td></td>
<td>• Bulk tray</td>
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**NOTE:** MRB-KW0x, TWR-RF-MRB and TWR-ELEV boards, as well as other boards for the TWR system each are ordered separately.

MRB-KW0x on TWR-RF-MRB