Wireless Connectivity

MC12311 System in Package

Integrated smart radio for 315–960 MHz wireless connectivity applications

Overview

Part of Freescale's industry-leading wireless connectivity portfolio, the MC12311 smart radio is an integrated system-in-package solution designed for the implementation of wireless connectivity into smart metering, building automation, home automation and medical applications.

Powered by the very successful low-power HCS08QE 8-bit microcontroller, the MC12311 embeds a rich set of peripherals with a high-performance sub-1 GHz radio, capable of operating over a wide frequency range including 315, 433, 470, 868, 915, 928 and 960 MHz in the license-free industrial, scientific and medical (ISM) frequency bands. The MC12311 smart radio supports OOK, FSK, GFSK and MSK signal modulation to transmit information from 1.2–300 kbps 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 kbps and an output power adjustable from -18 to +17 dBm.

The MC12311 smart radio comes with 32 KB of on-chip, non-volatile flash memory and 2 KB of RAM for running various types of communications protocols, from fully proprietary protocols (simple media access controller (SMAC)) to globally standardized protocols (IEEE® 802.15.4 MAC and wireless M-Bus).

Freescale has taken a platform approach that includes hardware, software, development tools and reference designs to help simplify development. The BeeKit wireless toolkit provides an easy-to-use software environment to configure network parameters for Freescale's variety of platform alternatives, including SMAC and IEEE 802.15.4 MAC protocol stacks. A wireless M-Bus protocol stack is also available through a third-party partner.

Applications

- Metering and building control
  - Metering (water, electric, gas)
  - Thermostats
  - Lighting control
  - HVAC unit monitors
  - Water heaters
  - Window coverings
  - Ceiling fans
- Fire/security
  - Smoke/heat sensing and monitors
  - Fire alarms
  - Room occupancy
  - Intruder alarms
  - Motion detectors
  - Access control
- Wireless sensors networks
  - Liquid or gas flow detect and alarm
  - Usage data collection
  - Asset control (acceleration/theft)
  - Maintenance monitoring
  - Measurement data collection
  - Humidity monitor and control
  - Hazardous environment monitors
  - Vibration alerts
- Medical/health care/wellness
  - Glucose monitors
  - Cardiac rhythm tracking
  - Hearing appliance remotes
  - Infusion pumps
  - Blood pressure monitoring
  - Pulse oximetry monitoring
  - Weight management monitoring

Software Features

Freescale will support the MC12311 platform with several software solutions:

- SMAC
  - This codebase provides simple communication and test apps based on drivers/PHY utilities available as source code. This environment is useful for hardware and RF debug, hardware standards certification and developing proprietary applications.
- IEEE 802.15.4 MAC with custom PHY layer
  - The Freescale MAC is a robust, mature codebase useful for developing networking solutions. Freescale is implementing an IEEE 802.15.4 MAC-compatible custom sub-1 GHz PHY template for use across different frequency bands.
- Wireless M-Bus stack
  - Freescale offers wireless M-Bus codebase to the MC12311 platform available through an external partner.

Freescale MC12311 solutions are provided through the powerful BeeKit wireless connectivity toolkit software environment. BeeKit is a comprehensive codebase of wireless networking libraries, application templates and sample applications, which allows users to create, modify and update various wireless networking implementations. The MC12311 products are available as codebases within BeeKit.

Orderable Parts

Part Number	Description
MC12311CHN	315–960 MHz Smart Radio 32 KB Flash/2 KB RAM 56-LGA 8 mm x 8 mm Bulk Tray
MC12311CHNR2	315–960 MHz Smart Radio 32 KB Flash/2 KB RAM 56-LGA 8 mm x 8 mm Tape and Reel

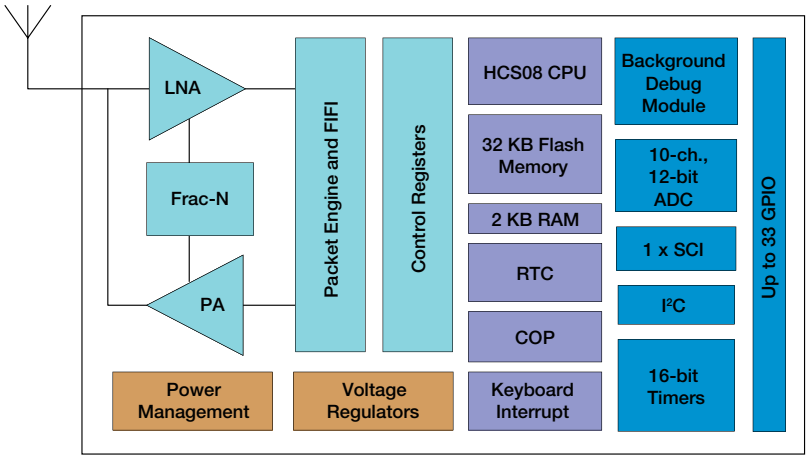
MC12311 Key Benefit Highlights

Flexible radio (multiple frequency bands, multiple modulation) provides common platform development for compliance with multiple standards.	Low power 8-bit microcontroller core offers a well-matched CPU to run target applications.
Optimized flash and RAM sizes provide a single-chip device for operation of the communication stack and the application.	Low-power consumption ideal for battery-powered equipment with a need for maximum battery life.

Features Summary

RF Transceiver Features	• High sensitivity: Down to -120 dBm at 1.2 kbps • High selectivity: 80 dB blocking immunity • Low current: Rx = 16 mA • Programmable output: -18 to +17 dBm in 1 dB steps • FSK bit rates up to 300 kbps • 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
Microcontroller Features	• 8-bit HCS08 CPU: Up to 50 MHz • 32 KB flash and 2 KB RAM • Mulitple low-power modes • In-circuit debug and flash programming available via on-chip background debug module (BDM) • System protection features • Programmable low voltage interrupt (LVI) • Optional watchdog timer (COP)
Peripherals	• ADC: 10-channel, 12-bit resolution • ACMPx: Two analog comparators • SCIx: Two serial communications interface modules • I²C: Up to 100 kbps • TPMx: One 6-channel (TPM3) and two 3-channel (TPM1 and TPM2) • Real-time counter • KBI: Two 8-bit port keyboard interrupt modules
Input/Output	• Up to 33 GPIO, including dedicated GPIO supporting transceiver • 13 KBI interrupts with selectable polarity
Operating Voltage and Temperature Range	• 1.8 to 3.6V operating voltage with on-chip voltage regulators • Temperature range of -40°C to +85°C

MC12311 Block Diagram



For more information, visit freescale.com/MC12311

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