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Single-Chip Transceiver Makes it Easy to Design ZigBee/802.15.4 Products

System-on-Chip (SoC) technology enables high performance standards-compliant operation in a single, small package

Wireless control and monitoring applications are the primary of focus of ZigBee and the related IEEE 802.15.4 transmission standards. With extremely low power consumption and low cost, these systems are attractive solutions for many residential, commercial, industrial and medical applications, including these examples (and many more):

- Security
- HVAC control
- Lighting control
- Thermostat/humidistat
- Automated meter reading
- Industrial process control
- Factory traffic management
- Sensor networks
- Asset management
- Patient monitoring
- Data collection

To address these promising markets, California Eastern Laboratories (CEL) offers a line of fully-integrated ZigBee and IEEE 802.15.4 solutions. The ZIC2410 Series combines a powerful ZigBee-compliant RF transceiver with an industry-workhorse 8051-based 8-bit microprocessor, provided in a choice of packages.

At +8 dBm, the ZAC2410 delivers high output power. Combined with an excellent receiver sensitivity of –98 dBm, the total link budget is 106 dB, which in many cases will allow designers to create systems without power amplifiers or other range extending components.

The ZIC2410 ZigBee/IEEE 802.15.4 transceiver from CEL combines high RF performance with powerful and flexible control and interface functions.

The low-power, high performance 8051-based MCU offers a robust set of peripherals, including an on board a-law/μ-law CODEC with ADPCM support. Combined with an I^2S interface, this enables the ZIC2410 to transmit voice as well as data.

System-on-chip (SoC) technology allows the combination of RF, digital, power management and interface circuitry in a single package that can be handled by automated assembly equipment.

RF Transceiver

The RF transceiver supports the ZigBee or IEEE 802.15.4 transmission standards with the high sensitivity and power output noted above. Modulation is DSSS/O-QPSK at a data rate of 500 kbps or 1 Mbps for proprietary applications, as well as the 250 kbps data rate established for the ZigBee Alliance standard. TX/RX switching speed is 44 μs. The receiver includes RSSI for system performance moni-

toring. All functions are on-chip, including the VCO, LNA and power amplifier. Operation is from a single 1.5 volt supply, with 3.3-volt I/O support.

Hard-wired IEEE 802.15.4 MAC

A self-contained MAC reduces the computational load on the device CPU. The MAC includes two 256 byte circular FIFO registers and management circuitry. 128-bit AES encryption/decryption is supported, along with CRC-16 computation and check and hard-wired auto-acknowledge. Direct memory access (DMA) moves data in and out of the MAC with no CPU overhead.

8051 Microcontroller

The industry-standard 8051-type microcontroller provides core computation capabilities for the ZIC2410. On-chip memory includes 96 kB embedded flash memory in three banks of 32 kB, 8 kB of data memory plus 128 bytes of CPU-dedicated memory, and a 1 kB boot ROM. The high performance 8051 supports serial communications with a I^2S/PCM interface with two 128-byte FIFOs, plus two high speed UARTs with two 16-byte FIFOs.

System-Level Functions

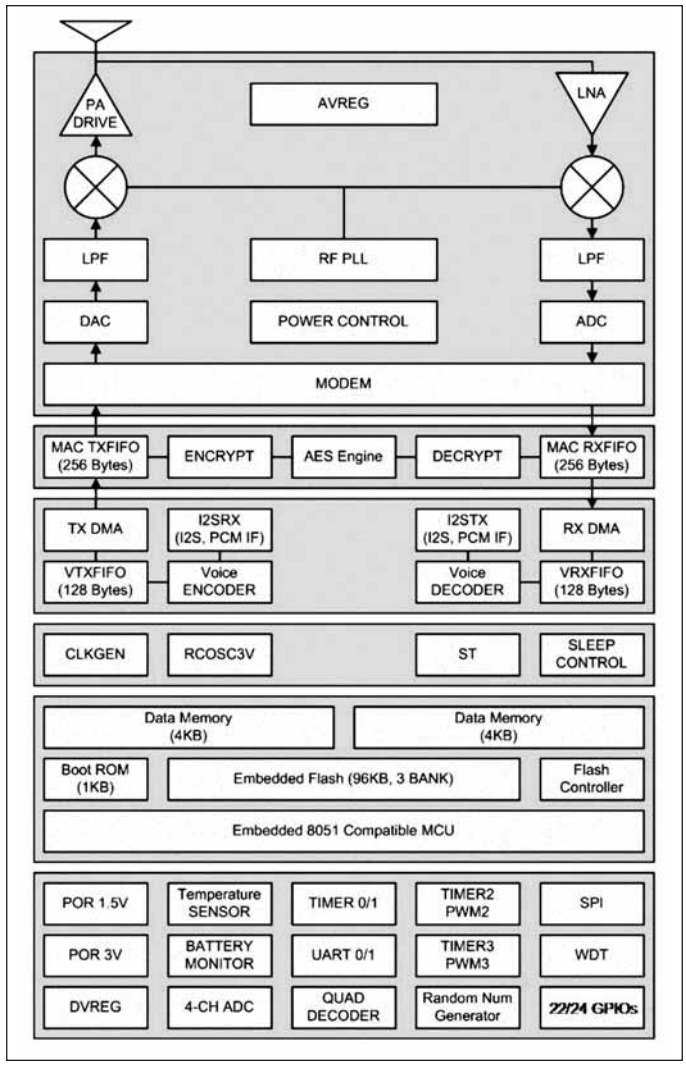
The ZIC2410 system clock uses a 16 MHz or 19.2 MHz crystal, or an external clock source. The sleep timer uses either a 32.768 kHz crystal or an internal RC oscillator. Power management features are centered on the power-saving single 1.5V supply with battery monitoring. Core and I/O run from the 1.5V supply, and step-down regulation supports 3.3V I/O. Three low power modes are included (25 µA, <2 µA and 0.3 µA), along with deep sleep mode support.

The ZIC2410-EDK-1 Demonstration Kit

To help design engineers evaluate the ZIC2410, a comprehensive demonstration and development kit is available. The kit includes four ZIC2410 demo boards, configurable as needed, along with a wireless network analyzer that enables network monitoring with PC analysis data packets. USB cables, USB hub and batteries are all included.

Extensive software and documentation is provided, including:

- ZigBee profile development software
- ZigBee application simulation software
- ZigBee packet analyzer software
- ZigBee stack software library
- Device programmer to load the developed code
- Communications test software
- Keil C-compiler to compile code from the profile builder for programming the ZIC2410
- USB driver for interface board communications



Architecture of the ZIC2410 System-on-Chip.

Summary

The ZIC2410 family from CEL offers OEMs a fast development route for low power wireless control and monitoring systems. ZigBee and the related IEEE 802.15.4 standards are supported, with the added ability to use proprietary protocols for up to 1 Mbps data rate. High link budget performance, a high performance 8051 MCU and extensive development support make the ZIC 2410 an excellent choice for the growing number of low-power ZigBee/IEEE 802.15.4 applications.

For more information about the ZIC2410 ZigBee/IEEE 802.15.4 transceiver, contact CEL at:

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