

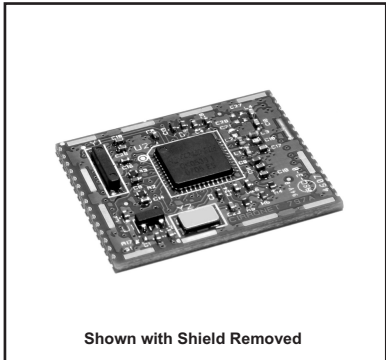


- **2.4 GHz ZigBee Transceiver Module**
- **Small Size, Light Weight, Low Cost**
- **Sleep Current less than 3 μ A**
- **FCC and ETSI Certified for Unlicensed Operation**

The ZMN2430 2.4 GHz transceiver module is a low cost solution for point-to-point, point-to-multipoint and MESH wireless systems. The ZMN2430 module provides the flexibility and versatility to serve applications ranging from cable replacements to sensor networks. Based on the IEEE 802.15.4 wireless standard and the ZigBee protocol stack, the ZMN2430 module is easy to integrate and provides robust wireless communications including MESH network operation. The ZMN2430 also includes RFM's powerful CSM application profile, which eliminates the need for customer firmware programming.

ZMN2430

ZigBee Transceiver Module



ZMN2430 Absolute Maximum Ratings

| Rating | Value | Units |
|---|--------------|--------------|
| All Input/Output Pins | -0.3 to +3.6 | V |
| Non-Operating Ambient Temperature Range | -40 to +85 | $^{\circ}$ C |

ZMN2430 Electrical Characteristics

| Characteristic | Sym | Notes | Minimum | Typical | Maximum | Units |
|--|-----|-------|-----------------|---------|---------|----------|
| Operating Frequency Range | | | 2405 | | 2480 | MHz |
| Operating Frequency Tolerance | | | -300 | | 300 | kHz |
| Spread Spectrum Method | | | Direct Sequence | | | |
| Modulation Type | | | O-QPSK | | | |
| Number of RF Channels | | | | 16 | | |
| RF Data Transmission Rate | | | | 250 | | kb/s |
| Symbol Rate Tolerance | | | | | 120 | ppm |
| RF Channel Spacing | | | | 5 | | MHz |
| Receiver Sensitivity, 10E-5 BER | | | | -92 | | dBm |
| Upper Adjacent Channel Rejection, +5 MHz | | | | 41 | | dB |
| Lower Adjacent Channel Rejection, -5 MHz | | | | 30 | | dB |
| Upper Alternate Channel Rejection, +10 MHz | | | | 55 | | dB |
| Lower Alternate Channel Rejection, -10 MHz | | | | 53 | | dB |
| Maximum RF Transmit Power | | | -3 | 0 | | dBm |
| Transmit Power Adjustment | | | | | 26 | dB |
| Optimum Antenna Impedance | | | | 50 | | Ω |

ZMN2430 Electrical Characteristics

| Characteristic | Sym | Notes | Minimum | Typical | Maximum | Units |
|---|-----------------|-------|---------|---------|---------|-------------------|
| ADC Input Range | | | 0 | | 3.3 | V |
| ADC Input Resolution | | | 7 | | 12 | bits |
| ADC Input Impedance | | | 55 | | | MΩ |
| PWM Output Resolution | | | | | 12 | bits |
| UART Baud Rate | | | 1.2 | | 115.2 | kb/s |
| Digital I/O: | | | | | | |
| Logic Low Input Level | | | -0.3 | | 0.5 | V |
| Logic High Input Level | | | 2.8 | | 3.6 | V |
| Logic Input Internal Pull-up/Pull-down Resistor | | | 20 | | | KΩ |
| GPIO3 Logic Low Sink Current | | | | | 20 | mA |
| Power Supply Voltage Range | V _{CC} | | +3.3 | | +5.5 | Vdc |
| Power Supply Voltage Ripple | | | | | 10 | mV _{P-P} |
| Receive Mode Current | | | | 27 | | mA |
| Transmit Mode Current | | | | 28 | | mA |
| Sleep Mode Current | | | | | 3 | μA |
| Operating Temperature Range | | | -40 | | 85 | °C |

ZMN2430 Firmware Configurations

ZMN2430 modules are shipped loaded with one of three firmware configurations: coordinator, router or end node. Each ZigBee network will include one, and only one coordinator. This module coordinates the overall network operation and is the host application or gateway interface point for the network. The part number designation for a coordinator is **ZMN2430-C**. Router modules are capable of retransmitting messages and provide the mesh networking infrastructure in a ZigBee network. The part number designation for a router is **ZMN2430-R**. End node modules provide field connection points for sensors, data loggers, PLCs, etc. The coordinator and the routers in a ZigBee network must stay active (awake) continuously to support network operation. End nodes can be sleep duty cycled where needed for extended battery life operation. The part number designation for an end node is **ZMN2430-E**. A router can provide the same field connection support as an end node, but a router cannot be sleep duty cycled without affecting mesh network operation. Specify the number of modules for each firmware configuration when ordering ZMN2430 modules.



CAUTION: Electrostatic Sensitive Device. Observe precautions when handling.

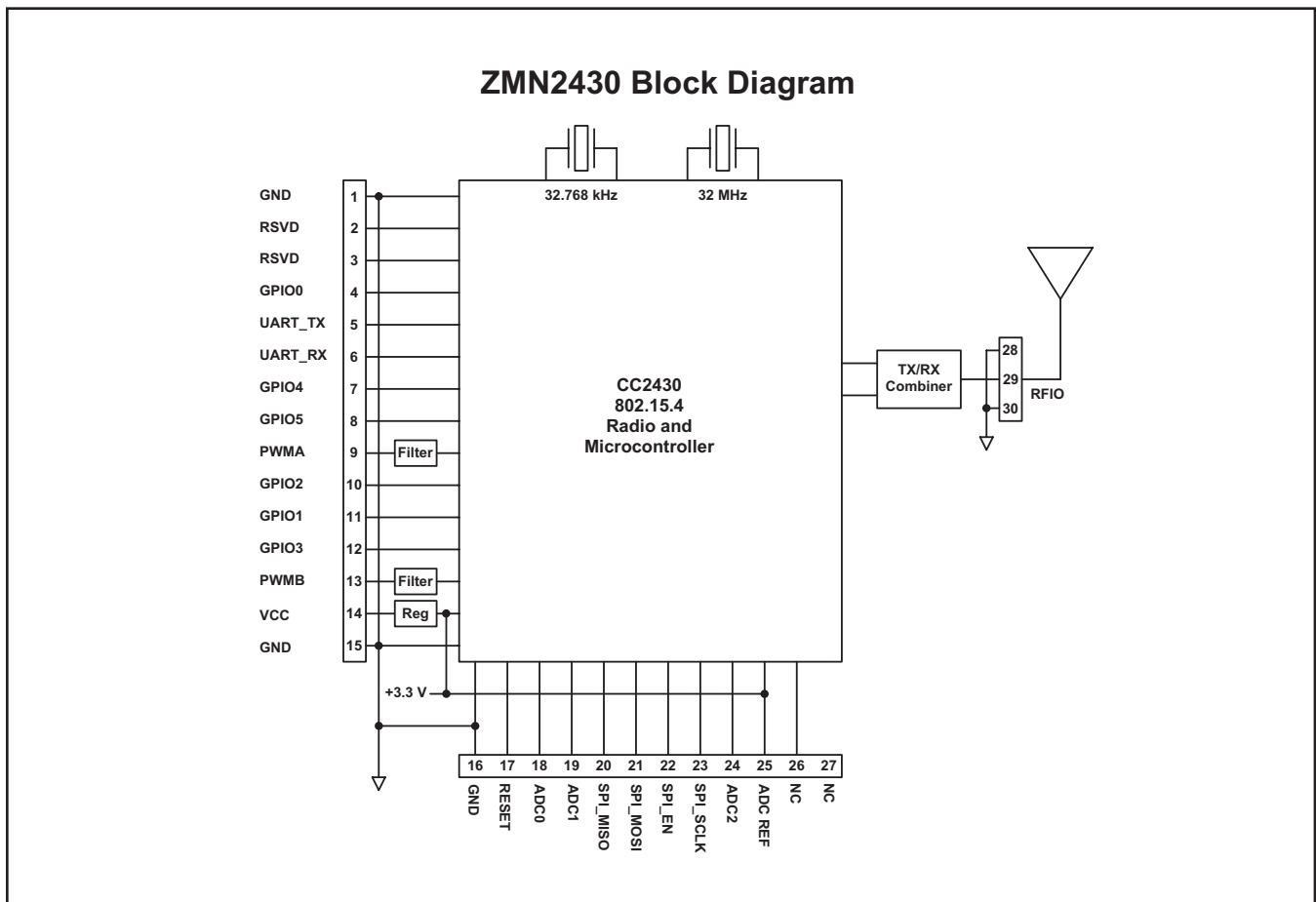


Figure 1

ZMN2430 Hardware

The major hardware component of the ZMN2430 is the CC2430 IEEE 802.15.4 compatible transceiver with integrated 8051 microcontroller. The ZMN2430 operates in the frequency band of 2405 to 2480 MHz at a nominal output power of 1 mW.

Two crystals are provided to operate the CC2430, a 32 MHz crystal for normal operation and a 32.768 kHz crystal for precision sleep mode operation.

The ZMN2430 provides a variety of application hardware interfaces including an SPI interface, UART interface, three 12-bit ADC inputs, two PWM (DAC) outputs, and six general purpose digital I/O ports.

ZMN2430 Firmware

The main firmware components in the ZMN2430 include the ZigBee protocol stack and RFM's CSM standard module application profile. The ZigBee protocol stack implements networking and security, with underlying support from the 802.15.4 Media Access Control (MAC) layer. The CSM profile provides an application programming interface (API) for all the ZMN2430 application hardware interfaces. The CSM profile includes Network Discovery, Send/Receive Serial Data, Read/Write SPI Port, Read ADC Inputs, Write DAC Outputs, Read/Write GPIO and Module Configuration services. In addition, the CSM profile provides two sleep modes - timer sleep and interrupt sleep. See the *ZMN2430 ZigBee Module Developer's Kit User's Manual* for complete details of the CSM profile API.

ZMN2430 I/O Pad Descriptions

| Pad | Name | Description |
|-----|----------|---|
| 1 | GND | Power supply and signal ground. Connect to the host circuit board ground. |
| 2 | RSVD | Reserved pin. Leave unconnected. |
| 3 | RSVD | Reserved pin. Leave unconnected. |
| 4 | GPIO0 | Configurable digital I/O port 0. When configured as an output, the power-on state is also configurable. |
| 5 | UART_TX | Serial data output from UART. |
| 6 | UART_RX | Serial data input to UART. |
| 7 | GPIO4 | Configurable digital I/O port 4. When configured as an output, the power-on state is also configurable. |
| 8 | GPIO5 | Configurable digital I/O port 5. When configured as an output, the power-on state is also configurable. |
| 9 | PWMA | Pulse-width modulated output A with internal low-pass filter. Provides a DAC function. |
| 10 | GPIO2 | Configurable digital I/O port 2. When configured as an output, the power-on state is also configurable. |
| 11 | GPIO1 | Configurable digital I/O port 1. When configured as an output, the power-on state is also configurable. |
| 12 | GPIO3 | Configurable digital I/O port 3. When configured as an output, this high current port can sink up to 20 mA. The power-on output state is also configurable. |
| 13 | PWMB | Pulse-width modulated output B with internal low-pass filter. Provides a DAC function. |
| 14 | VCC | Power supply input, +3.3 to +5.5 Vdc. |
| 15 | GND | Power supply and signal grounds. Connect to the host circuit board ground. |
| 16 | GND | Power supply and signal grounds. Connect to the host circuit board ground. |
| 17 | /RESET | Active low module hardware reset. Hold this input low when the power supply input is less than 2.7 Vdc. |
| 18 | ADCX | 7-bit to 12-bit ADC input 0. ADC full scale reading can be referenced to the module's +3.3 V regulated supply or to the ADC's internal +2.5 V reference. |
| 19 | ADCY | 7-bit to 12-bit ADC input 1. ADC full scale reading can be referenced to the module's +3.3 V regulated supply or to the ADC's internal +2.5 V reference. |
| 20 | SPI_MISO | SPI port data input. |
| 21 | SPI_MOSI | SPI port data output. |
| 22 | SPI_EN | Active-low enable output for SPI bus devices. |
| 23 | SPI_SCLK | SPI port clock signal. |
| 24 | ADCZ | 7-bit to 12-bit ADC input 2. ADC full scale reading can be referenced to the module's +3.3 V regulated supply or to the ADC's internal +2.5 V reference. |
| 25 | ADC REF | Module's +3.3 V regulated supply, used for ratiometric ADC readings. Current drain on this output should be no greater than 5 mA. |
| 26 | NC | No connection. |
| 27 | NC | No connection. |
| 28 | GND | RF ground. Connect to the host circuit board ground plane, and to shield when using coaxial cable. |
| 29 | RFIO | RF port. Connect the antenna to this port with a 50 Ω stripline or semi-rigid coaxial cable. |
| 30 | GND | RF ground. Connect to the host circuit board ground plane, and to shield when using coaxial cable. |

RFIO Stripline

The RFIO pad on the radio module is connected directly to an antenna on the host circuit board, or to an MMCX or similar RF connector. It is important that this connection be implemented as a 50 ohm stripline. Referring to Figure 3, the width of this stripline depends on the thickness of the circuit board between the stripline and the

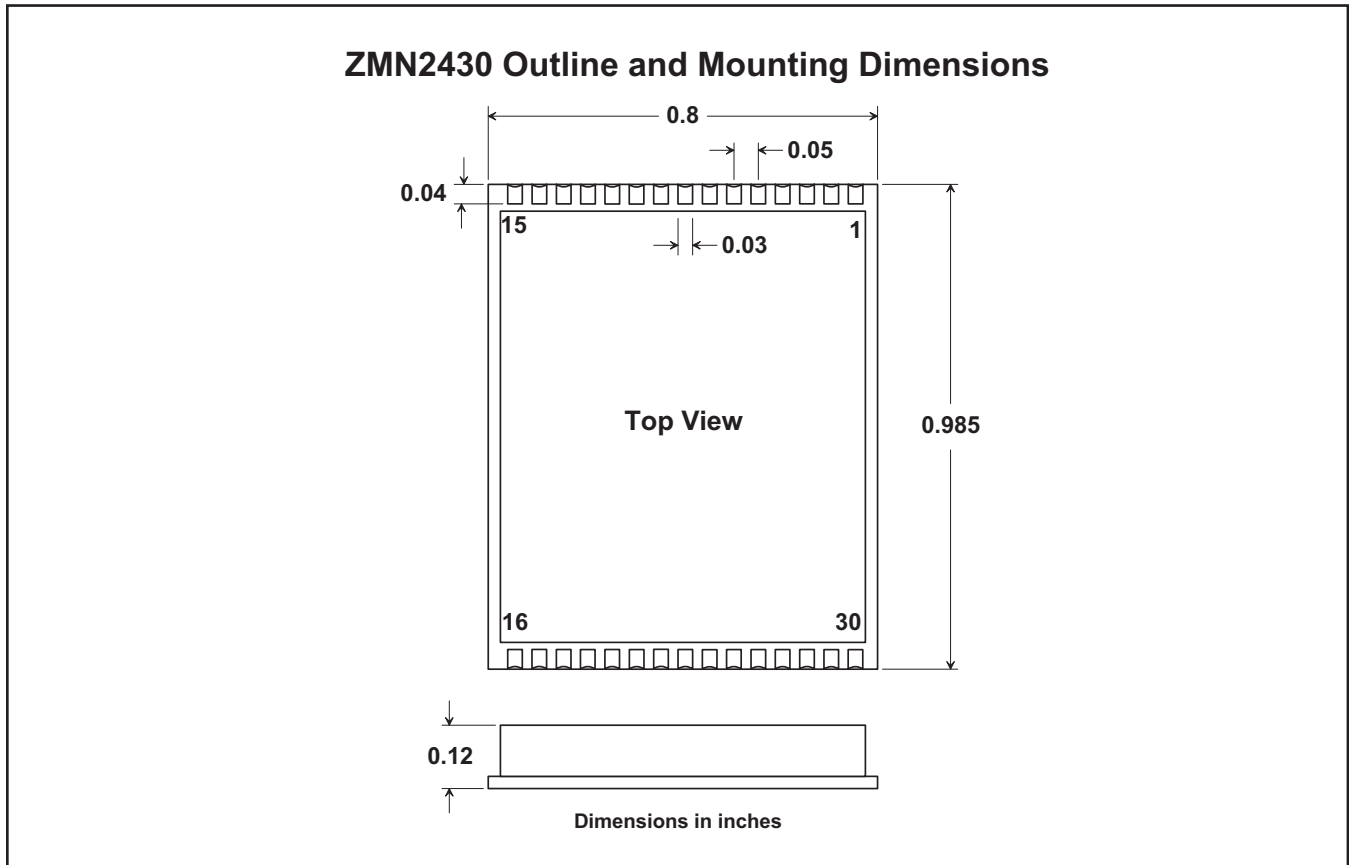


Figure 2

groundplane. For FR-4 type circuit board materials (dielectric constant of 4.7), the width of the stripline is equal to 1.75 times the thickness of the circuit board. Note that other circuit board traces should be spaced away from the stripline to prevent signal coupling, as shown in Figure 4. The stripline trace should be kept short to minimize its insertion loss.

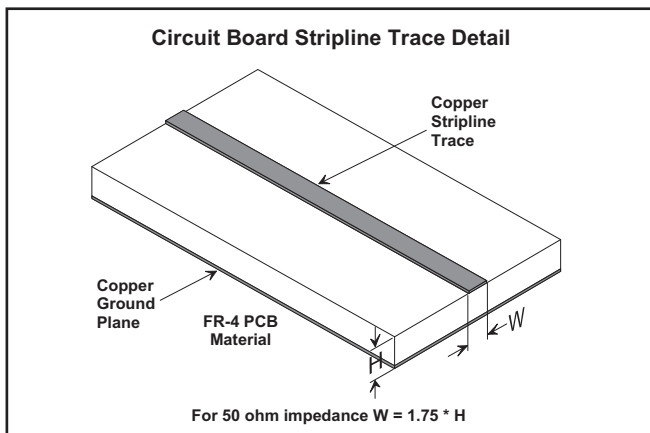


Figure 3

| Trace Separation from 50 Ohm Microstrip | Length of Trace Run Parallel to Microstrip |
|---|--|
| 100 mil | 125 mil |
| 150 mil | 200 mil |
| 200 mil | 290 mil |
| 250 mil | 450 mil |
| 300 mil | 650 mil |

Figure 4

Reflow Profile

An example solder reflow profile for mounting the radio module on its host circuit board is shown in Figure 5.

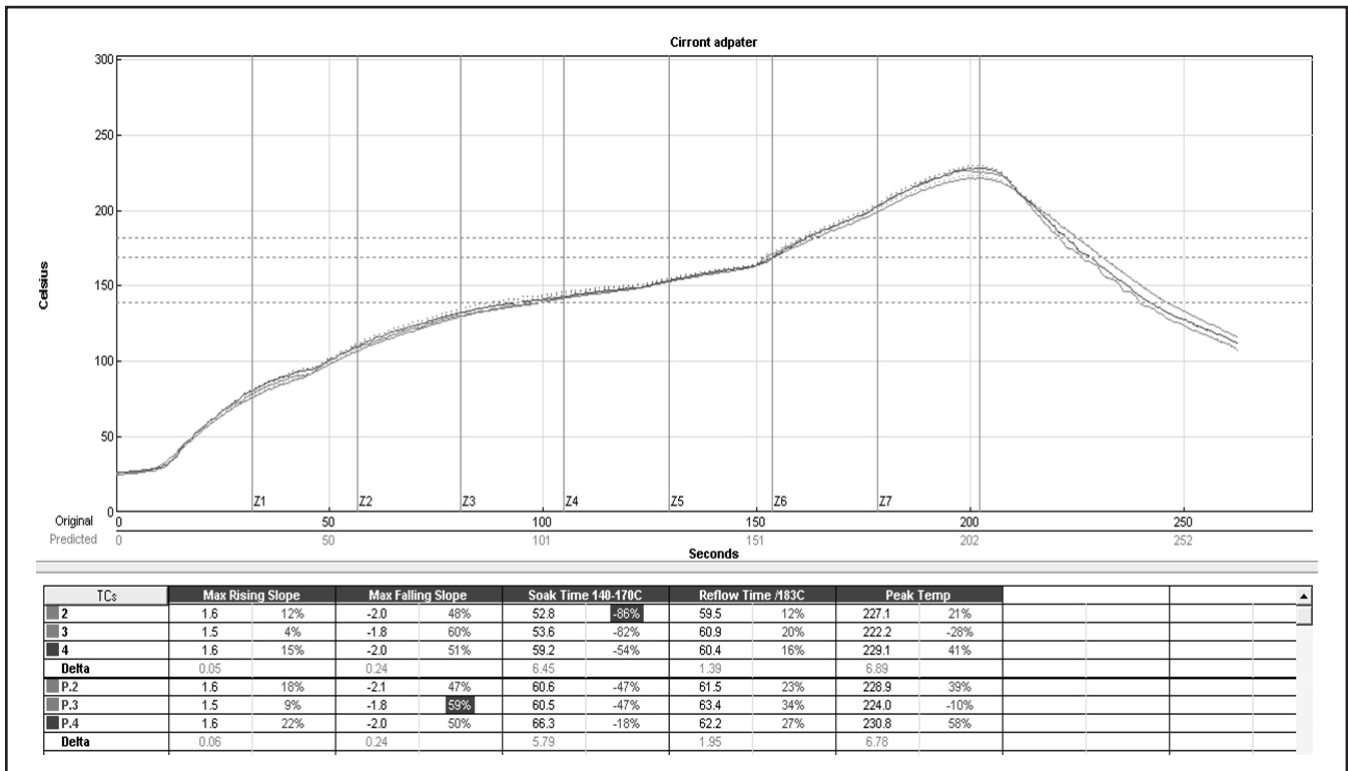


Figure 5

Note: Specifications subject to change without notice.