ZMN2430HPA

High Power ZigBee Module with Chip Antenna

- *2.4 GHz ZigBee Transceiver Module*

- *Small Size, Light Weight, Built-In Antenna*

- *Sleep Current less than 3 μA*

- *FCC and ETSI Certified for Unlicensed Operation*

The ZMN2430HPA 2.4 GHz transceiver module is a low cost, high-power solution for point-to-point, point-to-multipoint and MESH wireless systems. The ZMN2430HPA 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 ZMN2400HPA module is easy to integrate, requires no external antenna, and provides robust wireless communications including MESH network operation. The ZMN2430HPA also includes RFM's powerful CSM application profile, which eliminates the need for customer firmware programming.

Shown with Shield Removed
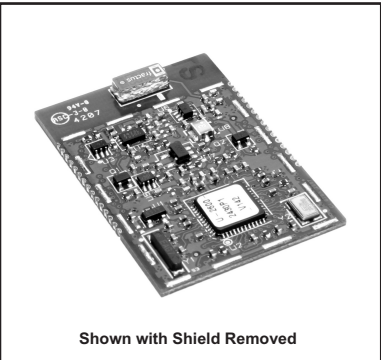
ZMN2430HPA Absolute Maximum Ratings

Rating	Value	Units
All Input/Output Pins	-0.3 to +6.0	V
Non-Operating Ambient Temperature Range	-40 to +85	^{o}C

ZMN2430HPA Electrical Characteristics

Characteristic	Sym	Notes	Minimum	Typical	Maximum	Units
Operating Frequency Range			2405		2475	MHz
Operating Frequency Tolerance			-300		300	kHz
Spread Spectrum Method			Direct Sequence			
Modulation Type			O-QPSK			
Number of RF Channels				15		
RF Data Transmission Rate				250		kb/s
Symbol Rate Tolerance					120	ppm
RF Channel Spacing				5		MHz
Receiver Sensitivity, 10E-5 BER				-95		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			14	15	16	dBm
Transmit Power Adjustment					20	dB
Optimum Antenna Impedance				50		Ω

ZMN2430HPA 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				33		mA
Transmit Mode Current				130		mA
Sleep Mode Current					3	µA
Operating Temperature Range			-40		85	°C

ZMN2430HPA Firmware Configurations

ZMN2430HPA 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 **ZMN2430HPA-C**. Router modules are capable of retransmitting messages and provide the mesh networking infrastructure in a ZigBee network. The part number for a router is **ZMN2430HPA-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 designationfor an end node is **ZMN2430HPA-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 ZMN2430HPA modules.

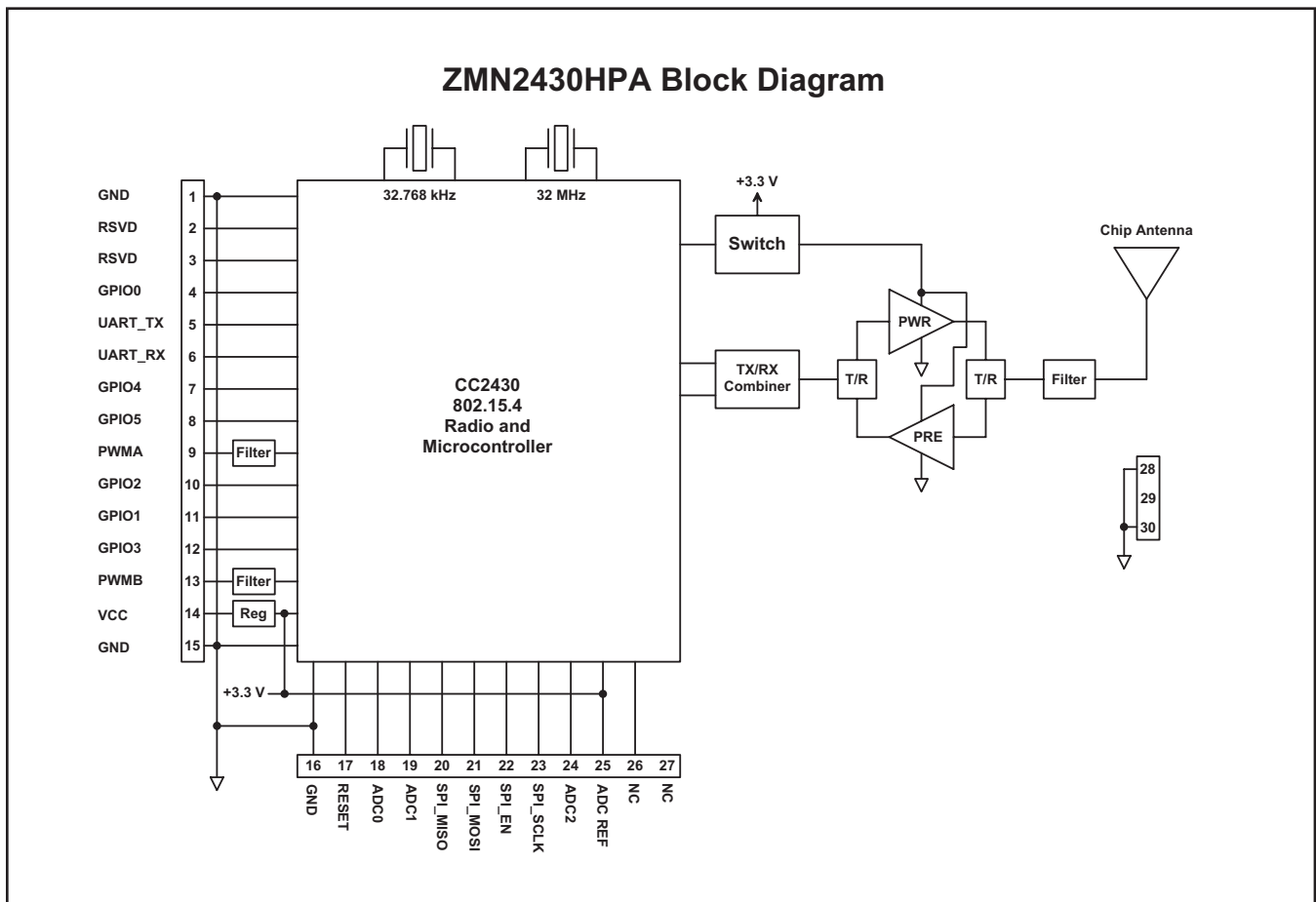**CAUTION: Electrostatic Sensitive Device. Observe precautions when handling.**

ZMN2430HPA Block Diagram

Figure 1

ZMN2430HPA Hardware

The major hardware component of the ZMN2430HPA is the CC2430 IEEE 802.15.4 compatible transceiver with integrated 8051 microcontroller. The ZMN2430HPA operates in the frequency band of 2405 to 2475 MHz at a nominal output power of 40 mW.

The ZMN2430HPA includes a low noise preamplifier in the receiver path and a power amplifier in the transmitter path, greatly increasing the operating range of the CC2430. 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 ZMN2430HPA 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.

ZMN2430HPA Firmware

The main firmware components in the ZMN2430HPA include the ZigBee protocol stack and the 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 ZMN2430HPA 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 *ZMN2430HP ZigBee Module Developer's Kit User's Manual* for complete details of the CSM profile API.

ZMN2430HPA 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.
29	NC	No connection.
30	GND	RF ground. Connect to the host circuit board ground plane.

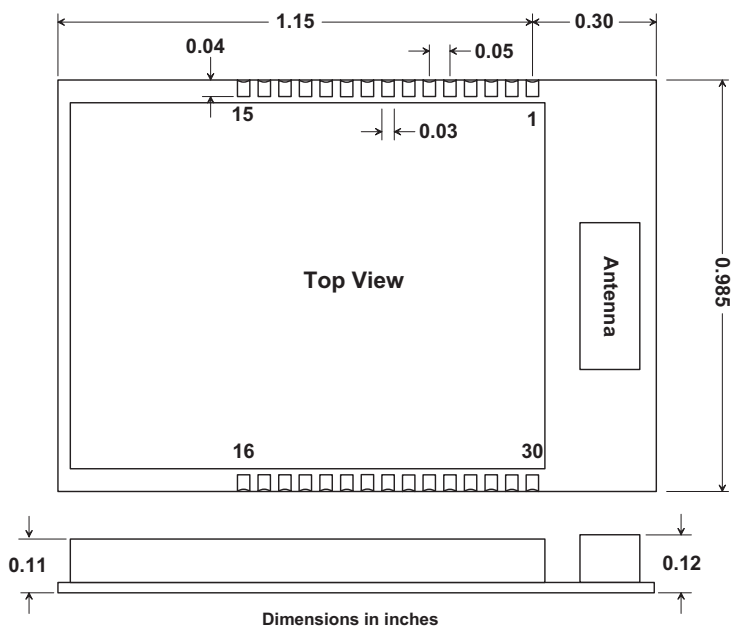## ZMN2430HPA Outline and Mounting Dimensions

Figure 2

Reflow Profile

An example solder reflow profile for mounting the radio module on its host circuit board is shown in Figure 3.
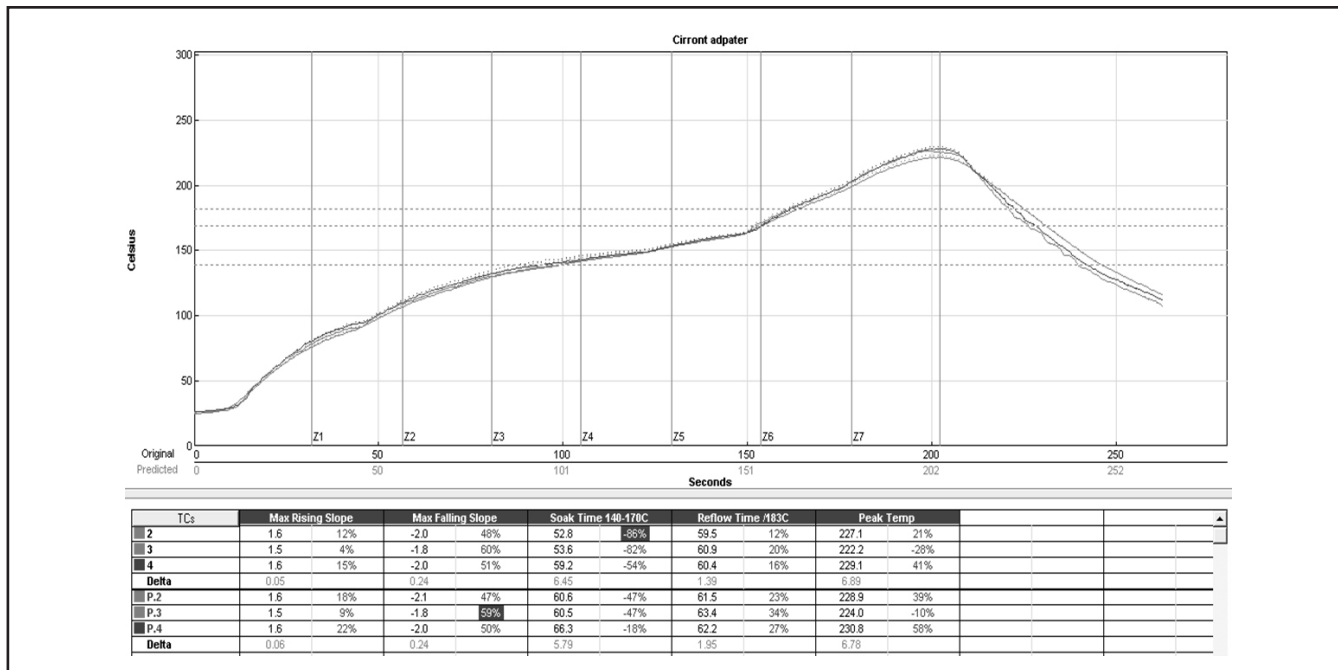

Figure 3

Note: Specifications subject to change without notice.