



Features

- Integrated 2.45 GHz, IEEE 802.15.4 compliant transceiver
 - 100mW (20dBm) TX output power
 - Adjustable output power (45dB dynamic range)
 - Selectable LNA for added range or increased noise immunity
 - -92dBm RX sensitivity with LNA disabled
 - -98dBm RX sensitivity with LNA enabled
 - RX and TX filtering for co-existence with IEEE 802.11g and Bluetooth devices
- Integrated IEEE 802.15.4 PHY and MAC
- 128 kB Embedded Flash and 5 kB SRAM for program and data storage
- 7 multi-purpose GPIO pins (GPIO, UART, I2C, SPI, ADC)
- Through-Hole Test Points to allow a custom wiring harness connecting VIN, GND, TTL-RXD and TTL-TXD for non-SMT integration of the module.
- Design based on the Ember EM250 or the STMicroelectronics SN250
- Integrated RC oscillator (10 kHz) for low power operation
- Less than 3uA current consumption in Deep Sleep mode
- Pins available for non-intrusive debug interface (SIF)
- Wide input voltage range (3.4 – 9 VDC) (alternate configuration for 2.2-3.6VDC)
- FCC Compliant

Applications

- Sensor networks
- Remote monitoring and security
- Industrial and Lighting controls
- Home automation and control

Description

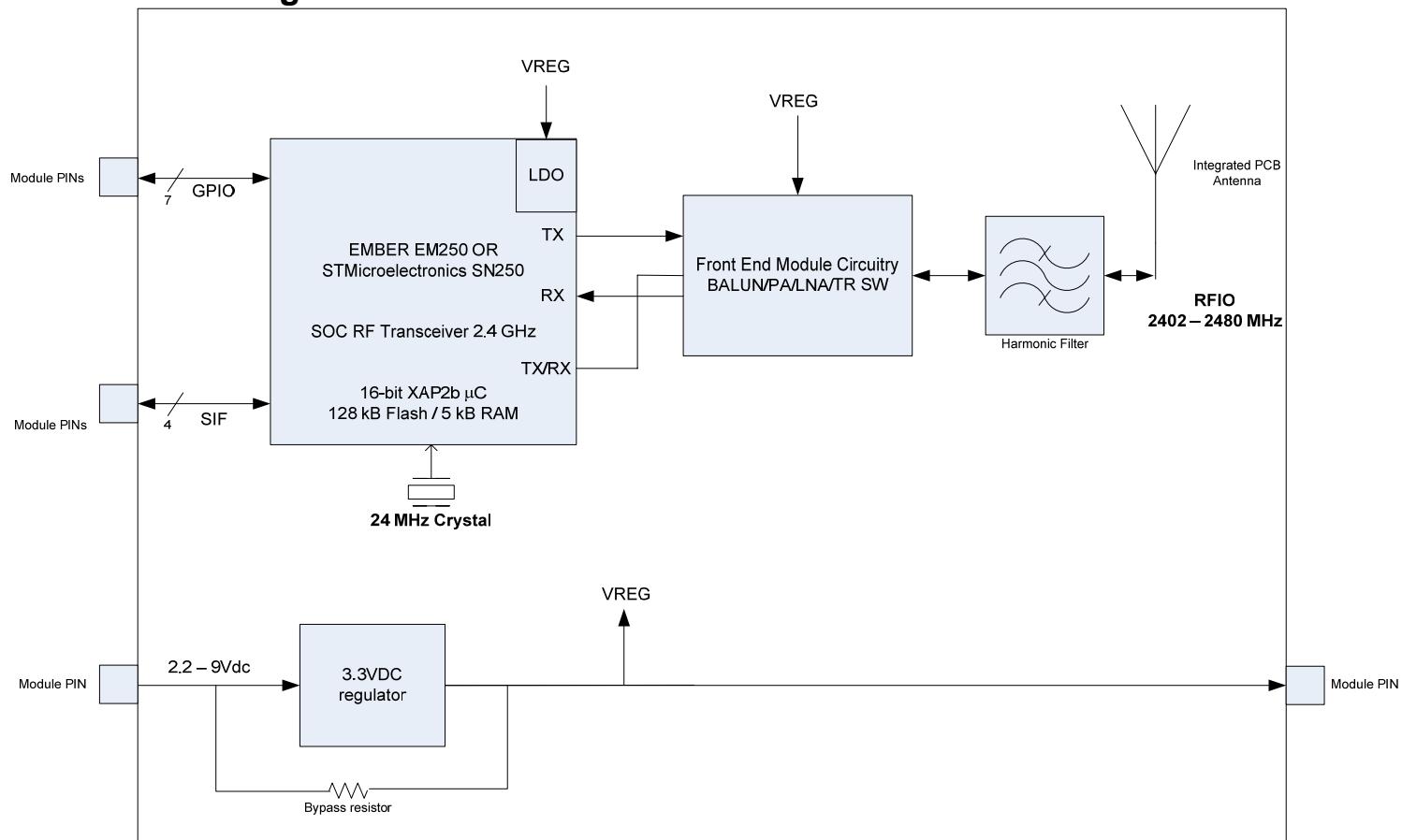
Cipher's URMA-2450 is a high power output, low power consumption ZigBee® module based on the EM250 or SN250 ZigBee® Network Processor which integrates a 2.4 GHz, IEEE 802.15.4-compliant transceiver with built-in PHY and MAC, along with an adjustable Power Amplifier (PA) and Low Noise Amplifier (LNA). This ZigBee® module enables OEMs to easily add wireless networking capability to their electronic devices, providing a comprehensive solution to create sensor and control networks with meshing and self healing capabilities.

A 24 MHz high stability crystal provides the timing requirements as per ZigBee® specifications. An internal RC oscillator allows low power operation. The Deep Sleep mode, with power consumption less than 3 μ A, allows applications where the battery life is a key point. An on board regulator (LDO) allows input voltage up to 9VDC. For applications supplying power at less than 3.6V, an alternate configuration of the module (without the regulator) allows for input supply voltage as low as 2.2VDC with minimal reduction in output power. The URMA-2450 module includes an integrated 2.45 GHz PCB "Inverted-F" antenna.

128 kB Flash and 5 kB of static RAM are available for data and program storage. To support user defined applications, a number of peripherals such as GPIO, UART, I2C, ADC and general purpose timers are available and user selectable. The module can be controlled by means of a standard serial interface allowing the connection to a variety of host microcontrollers.

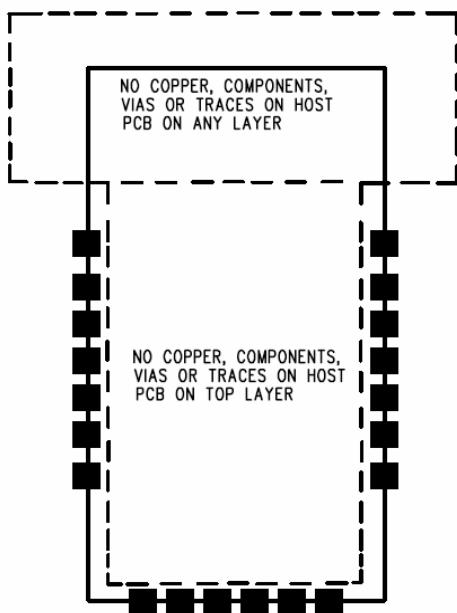
For additional information and details, please refer to the EM250 datasheet available at:
<http://portal.ember.com/em250/datasheet>

Block Diagram

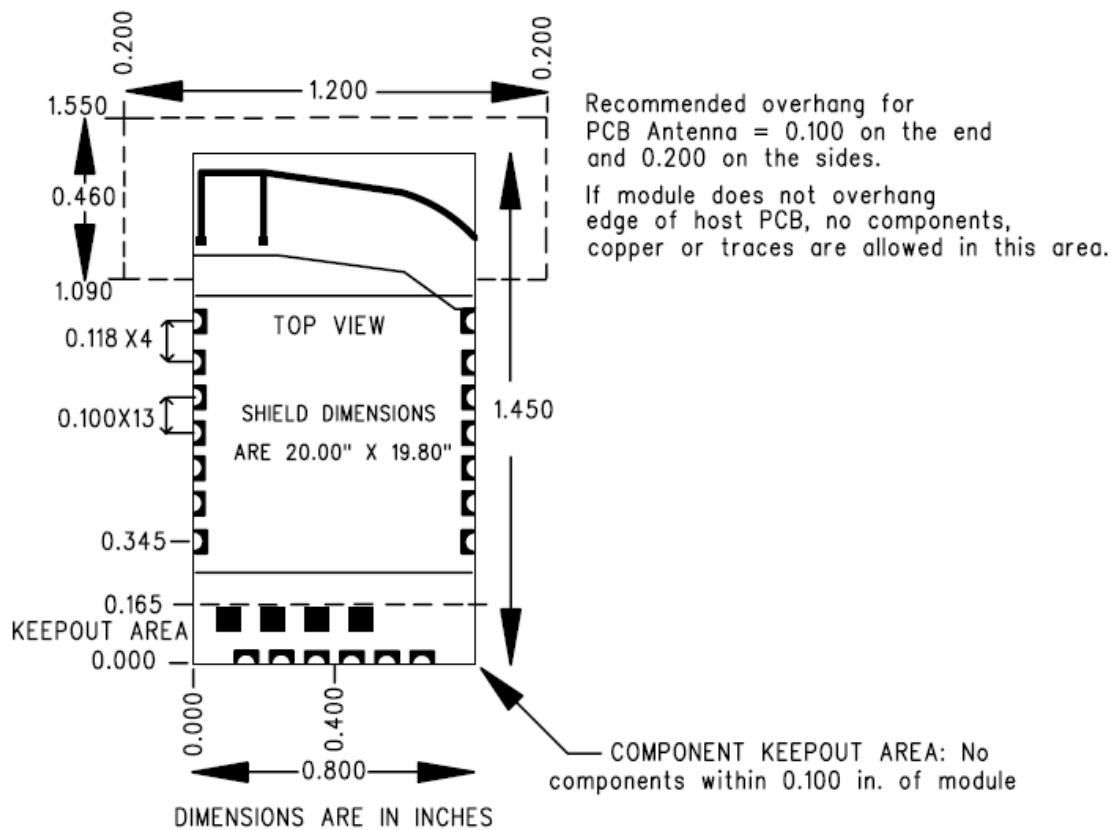


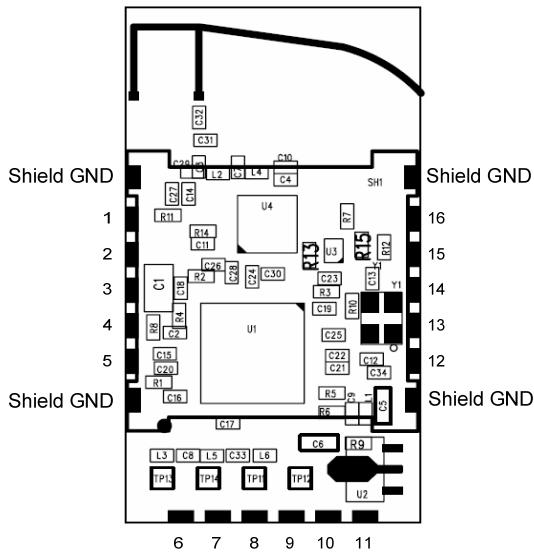
URMA-2450 Block Diagram

PCB Footprint Keep-outs



PCB Footprint Dimensions





Pin #	Function	Direction	Description
1	RFIO	bidirectional	RF signal optional input/output
2 (TP12) 4 Shield Grounds	RF GND	n/a	RF signal ground
3	nCTS	I	UART CTS handshake of Serial Controller SC1
	GPIO11	I/O	Digital I/O
	MCLK	O	SPI master clock of Serial Controller SC1
	TMR2IA.1	I	Capture Input A of Timer 2
4	nRTS	O	UART RTS handshake of Serial Controller SC1
	GPIO12	I/O	Digital I/O
	TMR2IB.1	I	Capture Input B for Timer 2
	GPIO5	I/O	Digital I/O
5	ADC1	I	ADC Input 1
	PTI_DATA	O	Data signal of Packet Trace Interface (PTI)
	GPIO6	I/O	Digital I/O
6	ADC2	I	ADC Input 2
	TMR2CLK	I	External clock input of Timer 2
	TMR1ENMSK	I	External enable mask of Timer 1
	ZBTXD	O	UART transmit data of Serial Controller SC1
7 (TP13)	GPIO9	I/O	Digital I/O
	MO	O	SPI master data out of Serial Controller SC1
	MSDA	I/O	I2C data of Serial Controller SC1
	TMR1IA.2	I	Capture Input A of Timer 1
	ZBRXD	I	UART receive data of Serial Controller SC1
8 (TP14)	GPIO10	I/O	Digital I/O
	MI	I	SPI master data in of Serial Controller SC1
	MSCL	I/O	I2C clock of Serial Controller SC1
	TMR1IB.2	I	Capture Input B of Timer 1
9 (TP11)	VIN	I	Input Voltage: 3.4 - 9Vdc
10	SIF_CLK	I	Programming and debug interface clock (internal pull-down)
11	SIF_MISO	O	Programming and debug interface, master in/slave out
12	SIF_MOSI	I	Programming and debug interface, master out/slave in (external pull-down required to guarantee state in Deep Sleep Mode)
13	NSIF_LOAD	I/O	Programming and debug interface, load strobe (open-collector with internal pull-up)
14	NRESET	I	Active low chip reset (internal pull-up)
15	IRQB	I	External interrupt source B
	GPIO14	I/O	Digital I/O
	TMR2OB	O	Waveform Output B of Timer 2
	TMR1IB.3	I	Capture Input B of Timer 1
16	VDD	O	Internal Regulator 3.3V Output

Maximum Ratings

Absolute Maximum Ratings

Symbol	Parameter	Values			Unit
		Min	Typ	Max	
V_{IN}	Regulator input voltage	-0.3		18	V
V_{DD}	EM250 & PA supply voltage	-0.3		3.6	V
V_{IN}	Input voltage on any digital pin	-0.3		$V_{DD} +0.3$	V
T_{stg}	Storage temperature	-40		85	°C

Physical Characteristics

Dimension	Typical Value	Unit
Width	0.85	inch
Height	1.5	inch
Thickness	0.15	inch
Weight	3.5	gram

Operating Range

Symbol	Parameter	Values			Unit
		Min	Typ	Max	
V_{IN}	Regulator input voltage	3.4		9	V
V_{DD}	Regulator output voltage		3.3		V
V_{DD}	Module supply voltage	2.2	3.3	3.6	V
T_{op}	Operating temperature	-40		85	°C

Electrical Characteristics

DC Electrical Characteristics

Symbol	Parameter	Conditions	Values			Unit
			Min	Typ	Max	
IRX	RX current (boost mode)	At 25°C		36		mA
IRX	RX current (normal mode)	At 25°C		38		mA
ITX	TX current (boost mode)	At 25°C		150		mA
ITX	TX current (normal mode)	At 25°C		42		mA
IDS	Deep sleep current (RC oscillator)	At 25°C		3		µA

DC I/O Specification

Symbol	Parameter	Values			Unit
		Min	Typ	Max	
VIL	Low Level Input Voltage	0		0.2* V _{DD}	V
VIH	High Level Input Voltage	0.8* V _{DD}		V _{DD}	V
IIL	Input current for logic 0			-0.5	µA
IIH	Input current for logic 1			0.5	µA
Ripu	Input pull-up resistor		30		kΩ
Ripd	Input pull-down resistor		30		kΩ
VOL	Low level output voltage	0		0.18* V _{DD}	V
VOH	High level output voltage	0.82* V _{DD}		V _{DD}	V
IOHS	Output source current (GPIO 12:5)			4	mA
IOLS	Output sink current (GPIO 12:5)			4	mA
IOHH	Output source current (GPIO 14)			8	mA
IOLH	Output sink current (GPIO 14)			8	mA
IOTot	Total output current for I/O			40	mA

RF Electrical Characteristics

Symbol	Parameter	Conditions	Values			Unit
			Min	Typ	Max	
	Frequency Range		2400		2500	MHz
TX	Output power		-25		20	dBm
RX	Sensitivity		-98		-92	dBm
CFE	Carrier frequency error		-40		+40	ppm
	Error Vector magnitude	As defined by IEEE 802.15.4		5	15	%
	Adjacent channel rejection			35		dB

Appendix A FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits of a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and the receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected

Consult the dealer or an experienced radio/TV technician for help.

Antenna

Cipher's URMA-2450 is for OEM integrations only. The end-user product will be professionally installed in such a manner that only the authorized antennas are used.

Caution

Any changes or modifications not expressly approved by the party responsible for compliance could cause the module to cease to comply with FCC rules part 15, and thus void the user's authority to operate the equipment.

A.1 Label instruction

Instruction manual for FCC ID Label

Module type: ZigBee® module **URMA-2450**
FCC-ID: WJU-URMA2450

This intends to inform you how to specify the FCC ID of our ZigBee® module URMA-2450 on your final product. Based on the Public Notice from FCC, the product into which our transmitter module is installed must display reference to the enclosed module. The label should use wording such as "Contains Transmitter Module FCC ID: WJU-URMA2450" or "Contains FCC ID: WJU-URMA2450", any similar wording that expressed the same meaning may be used.

Example label:

Contains FCC ID: WJU-URMA2450

A.2 Integration Requirements

Operate the module according to specifications listed in this data sheet.

On the exterior of the product include a clearly visible label stating: "Contains FCC ID: WJU-URMA2450"

Terms and Conditions

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Document Revision History

Revision History		
Release	Date	Revision
Initial Release	February 2, 2009	Preliminary - 01