



ZRM10

Radio Module User Manual

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1 Introduction

This document is the User Manual for the Energate ZRM10 Radio Module. This Radio Module can be integrated into any number of products that require wireless connectivity using the ZigBee protocol.

1.1 Key Features

- Utilizes Ember EM250 ZigBee System-on-a-Chip (SoC)
- RF Performance Optimized and Guaranteed
 - Frequency: 2405-2480MHz (ZigBee Ch11 to 26)
 - Data Rate: 250kb/s
 - Transmit Power: 100mW (Typical)
 - Receiver Sensitivity: -95dBm (Typical) for PER=1%
- Small Form Factor
- 17 GPIO Connections
- Supply Voltage: +3.3 VDC (Typical)
- Operating Temperature: -40 to 85 °C
- PCB Mount Chip Antenna: +1.5dBi (Peak Gain)

2 Mechanical Specifications

2.1 General Mechanical Specifications

Parameter	Min	Typ	Max	Units	Notes
Dimensions (L)			43.6	mm	
Dimensions (W)			29.3	mm	
Dimensions (T)			5.1	mm	Total thickness.

2.2 28-pin Connector Specifications

The 28-pin connector that is used on the Energate ZRM10 Radio Module is the Samtec FTS-114-03-L-DV.

Below is the pin-out of the Radio Module.

Pin	Signal	Function	Secondary Function	Comment
1	VBRD			+3.3V supply to the ZRM10.
2	VBRD			+3.3V supply to the ZRM10.
3	GPIO_1	MISO (SPI)	SDA (I2C)	Connected to SPI Flash (DOUT) on the module.
4	GPIO_2	MSCLK (SPI)	SCL (I2C)	Connected to SPI Flash (CLK) on the module.
5	GPIO_12			
6	GPIO_0	MOSI (SPI)		Connected to SPI Flash (DIN) on the module.
7	GPIO_3			
8	GPIO_11	/CS		Connected to SPI Flash (/CS) on the module.
9	GPIO_5	ADC1		
10	GPIO_4	ADC0		
11	GPIO_7	LED	ADC3	Connected to LED D1 on the module. D1 is currently NO POP.
12	GPIO_6	ADC2		
13	GPIO_9	TXD		UART connection to EM250.
14	GPIO_8			
15	RSTB	RSTB		
16	GPIO_10	RXD		UART connection to EM250.
17	GND			
18	GND			
19	SIF_CLK			
20	SIF_MISO			
21	SIF_MOSI			
22	SIF_LOADB			

Pin	Signal	Function	Secondary Function	Comment
23	GPIO_16			
24	GPIO_15	/WP		Connected to SPI Flash (/WP) on the module.
25	GPIO_14			
26	GPIO_13			
27	GND			
28	GND			

3 Radio Interface Specifications

3.1 Introduction

The following section describes the radio specifications for the ZRM10 Radio Module. The design utilizes an Ember EM250 ZigBee System-on-a-chip (SoC) to provide wireless connectivity using the IEEE 802.14.5a protocol. The EM250 is connected to an external RF power amplifier which boosts the transmitted RF signal power to 100mW (Typ).

3.2 General Specifications

Parameter	Min	Typ	Max	Units	Notes
Operating Frequency	2405		2483.5	MHz	
RF data rate		250		kb/s	
Ambient operating Temperature	-40	+24	+85	°C	
Regulatory Compliance	FCC Part15 (Sub C) Industry Canada RS-210 (Issue7)				Full modular approval.

3.3 Power Supply

Parameter	Min	Typ	Max	Units	Notes
Voltage	3.1	3.3	3.5	V	
Current, Tx		185		mA	Conditions: 1) Pout=+20dBm (100mW) 2) Vcc=+3.3V
Current, Rx		38		mA	
Current, Idle/Napping		8.5		mA	
Current, Standby		5		μA	

3.4 Radio Transmitter Specifications

The RF transmitter power is +20dBm (100mW) for the Channels 11 through 25. Due to requirements specified in FCC Regulations (Part 15, Restricted Frequency Bands), the RF transmit power is reduced for Channel 26 (2480 MHz).

Parameter	Min	Typ	Max	Units	Notes
Transmit Output Power (2405-2475MHz, Ch11-Ch25)		20		dBm	100mW (Typ)
Transmitter LQI		255			
Transmit frequency offset (24C)	-10		10	ppm	As measured with a CW tone at the transmitter output.
Transmit frequency offset (-40C to +85C)	-40		40	ppm	

3.5 Radio Receiver Specifications

Parameter	Min	Typ	Max	Units	Notes
Receiver maximum input signal (PER=1%)		0		dBm	
Receiver sensitivity (PER=1%)		-95		dBm	

3.6 Antenna Specifications

The antenna used on the ZRM10 is a chip antenna with these specifications:

Parameter	Min	Typ	Max	Units	Notes
Antenna Gain (Peak)		1.5		dBi	
Antenna Gain (Average)		-2.3		dBi	
Radiation Efficiency (Average)		70		%	

NOTE: When integrating the Energate ZRM10 Radio Module into other products, only the antenna provided on the Radio Module can be used. If any other antenna is used, this is a violation of FCC and Industry Canada regulations.

4.0 Regulatory Requirements (FCC and IC)

The Energate ZRM10 Radio Module device complies with FCC (Part 15) and Industry Canada (RS-210) regulatory requirements. Operation of the ZRM10 is subject to the following two conditions:

1. This device may not cause harmful interference
2. This device must accept any interference received, including interference that may cause undesired operation.

The Energate ZRM10 Radio Module can be integrated into a variety of different products. With this in mind, the ZRM10 has obtained Full Modular Approval from both the FCC and IC. This approval means that the ZRM10 is designed in such a way that it is a self-contained entity. The ZRM10 can then be attached to ANY product without any further testing by the FCC or IC for (radio) regulatory compliance in the 2400-2483.5MHz band.

4.1 RF Exposure Warning

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This device must be installed in accordance with the provided instructions and must be operated with minimum 20 cm spacing between the antennas and any person's body during wireless mode of operation. Further, this transmitter must not be collocated and operated in conjunction with any other antenna or transmitter.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

4.2 Labelling Requirements

When integrating the Energate ZRM10 Radio Module into other products, the following requirements must be met:

1. Use only the antenna provided.
2. Operate the module according to the specifications listed in this User Manual.
3. Include a label clearly visible on the exterior of the end product which states:

Contains FCC ID: WUR-ZRM10 IC ID: 8022A-ZRM10
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NOTE: It is mandatory that end users of the Energate ZRM10 consult all FCC and IC documentation for use of a product with modular approval, and ensure any products comply with all listed guidelines and additional testing that may be required.