



AW000309

RM30 Radio Module User Manual

Revision	Date	Done By	Checked By
1	July 5, 2010	R. Rago	J. Deligiannis
2	July 30, 2010	R. Rago	J. Deligiannis

Table of Contents

- 1 Introduction3
 - Key Features3
- 2 Mechanical Specifications3
 - Dimensions3
- 3 Connector Specifications4
 - 3.1 16-pin Connector Specifications (J1)4
 - 3.2 10-pin Connector Specifications (J2)4
 - 3.3 2- pin FM RDS antenna connector (J4)5
 - 3.4 3-pin Opt Out connector (J8)5
- 3 Power Supply6
- 4 ZigBee Radio Interface Specifications.....6
 - 4.1 Introduction6
 - 4.2 General Specifications6
 - 4.3 ZigBee Radio Transmitter Specifications6
 - 4.4 ZigBee Radio Receiver Specifications7
 - 4.5 ZigBee Antenna Specifications7
- 5.0 Regulatory Requirements (FCC and IC)8
 - 5.1 RF Exposure Warning.....8
 - 5.2 Labelling Requirements8

1 Introduction

This document is the User Manual for the Energate RM30 Radio Module. This Radio Module can be integrated into any number of products that require wireless connectivity.

Key Features

- Includes two radio subsystems which can be independently populated: a ZigBee Transceiver and a FM RDS (Radio Data System) Receiver
- ZigBee transceiver utilizes Ember EM357 ZigBee System-on-a-Chip (SoC)
- ZigBee RF Performance
 - Frequency: 2405-2480MHz (ZigBee Ch11 to 26)
 - Data Rate: 250kb/s
 - Transmit Power: 100mW (Typical)
 - Receiver Sensitivity: -102dBm (Typical) for PER=1%
- Two UART channels (one per RF Subsystem)
- Supply Voltage: +3.3 VDC (Typical)
- Operating Temperature
 - a. ZigBee transceiver: -40 to 85 °C
 - b. FM RDS receiver: -10 to 75 °C
- ZigBee PCB Mount Chip Antenna: +1.5dBi (Peak Gain)
- FM RDS antenna: connector for external 50 ohm antenna or external short wire antenna.

2 Mechanical Specifications

Dimensions

Parameter	Typical dimension	Units	Notes
Length	80.0	mm	
Width	44.0	mm	
Thickness	13.0	mm	Total thickness Including the 10-pin connector

3 Connector Specifications

3.1 16-pin Connector Specifications (J1)

The Energate RM30 Radio Module has a 16-pin connector Samtec CLP-108-02-L-D BE.

The mating connector is the Samtec ASP-146581-01

Below is the pin-out of this connector.

Pin	Signal	Comment
1	VSW	Unregulated power supply input (not used in the RM30)
2	VSW	Unregulated power supply input (not used in the RM30)
3	GND	
4	GND	
5	VMOD	+3.3V supply to the RM30.
6	VMOD	+3.3V supply to the RM30.
7	RM_AUX	Access to the reset input of RM1 (ZigBee) through an option resistor
8	MASTER RESET	Reset input to both radio modules through option resistors
9	RM_RX1	Serial UART input to RM1 (ZigBee)
10	RM1_EN	Ember 357 PB5
11	RM_TX1	Serial UART output from RM1 (ZigBee)
12	RM0_EN	Interrupt output from RM0 (FM RDS)
13	RM_PRG	Ember 357 PA6
14	RM_TX0	Serial UART output from RM0 (FM RDS)
15	RM_RST	Reset terminal of RM0 (FM RDS)
16	RM_RX0	Serial UART input to RM0 (FM RDS)

3.2 10-pin Connector Specifications (J2)

The Energate RM30 Radio Module has a 10-pin connector Harwin M22-045024V1005.

The mating connector is the Harwin M22-7131042

Below is the pin-out of this connector.

Pin	Signal	Comment
1	VMOD	+3.3V supply to the RM30.
2	RM_TX1	Serial UART output from the Radio Module
3	RM_RX1	Serial UART input to the Radio Module
4	REFLASH A	Ember 357 PC1
5	NC	
6	NC	
7	REFLASH B	Ember 357 PB4
8	NC	
9	NC	
10	GND	

3.3 2-pin FM RDS antenna connector (J4)

The external FM RDS antenna is connected to a 2-pin Hirose DF13-2P-1.25H(50) connector.

The mating connector is the Hirose DF13-2S-1.25C receptacle with two Hirose DF13-2630SC FA contacts.

Below is the pin-out of this connector.

Pin	Signal	Comment
1	GND	
2	ANT	FM Antenna

3.4 3-pin Opt Out connector (J8)

This connector is used to connect an optional Opt Out switch. The connector mounted on the RM30 PCB is the 3-pin Hirose DF13-3P-1.25H(50) connector.

The mating connector is the Hirose DF13-3S-1.25C receptacle with three Hirose DF13-2630SC FA contacts.

Below is the pin-out of this connector.

Pin	Signal	Comment
1	GND	
2	NOPTOUT	Opt Out (Active low) input
3	GND	

3 Power Supply

Parameter		Min	Typ	Max	Units	Notes
Voltage		3.1	3.3	3.5	V	
ZigBee transceiver input current	Current, Tx		170		mA	Conditions: 1) Pout=+20dBm (100mW) 2) Vcc=+3.3V
	Current, Rx		41		mA	
FM RDS receiver input current	LED On		51		mA	Conditions: Vcc=+3.3V
	LED Off		39		mA	

4 ZigBee Radio Interface Specifications

4.1 Introduction

The following section describes the radio specifications for the ZigBee subsystem of the RM30 Radio Module. The design utilizes an Ember EM357 ZigBee System-on-a-chip (SoC) to provide wireless connectivity using the IEEE 802.14.5a protocol. The EM357 is connected to an external Front End which includes a RF power amplifier and a Low Noise Amplifier. The Power Amplifier boosts the transmitted RF signal power to 100mW (Typ) and the Low Noise Amplifier improves the Receiver Sensitivity to a typical value of -102 dBm.

4.2 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	ZigBee Transceiver
Regulatory Compliance	FCC Part15 (Sub C) Industry Canada RS-210 (Issue7)				Full modular approval.

4.3 ZigBee 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 to +4dBm (2.5mW) for Channel 26 (2480 MHz).

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

4.4 ZigBee Radio Receiver Specifications

Parameter	Min	Typ	Max	Units	Notes
Receiver maximum input signal (PER=1%)		0		dBm	
Receiver sensitivity (PER=1%)		-102		dBm	

4.5 ZigBee Antenna Specifications

The antenna used on the RM30 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 RM30 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.

5.0 Regulatory Requirements (FCC and IC)

The Energate RM30 Radio Module device complies with FCC (Part 15) and Industry Canada (RS-210) regulatory requirements. Operation of the RM30 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 RM30 Radio Module can be integrated into a variety of different products. With this in mind, the RM30 has obtained Full Modular Approval from both the FCC and IC. This approval means that the RM30 is designed in such a way that it is a self-contained entity. The RM30 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.

5.1 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.

5.2 Labelling Requirements

When integrating the Energate RM30 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-RM30 IC ID: 8022A-RM30
----------	---------------------------------------

NOTE: It is mandatory that end users of the Energate RM30 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.