FCC Approved RM2420 RF Communication Module Data Sheet

RAE Systems has partnered with Ember to manufacture and promote module-level products. RAE Systems manufactures the EM2420 RF Communications Module as the **RM2420** RF Communications Module.

The RM2420 module offers a complete microcontroller/transceiver solution Containing all hardware features necessary for development of a low-data-rate, low-power wireless application. The primary components include a 2.4GHz, IEEE 802.15.4 compliant Zigbee-ready transceiver (RM2420), an 8-bit microcontroller (ATmega128L or ATmega64L), a 40-pin interface connector, a reverse-polar SAM antenna connector, three low profile crystals (32.768KHz, 16MHz) and power management circuitry.

The RM2420 Module is available to companies who have purchased the Ember EM2420 Developer's Kit and it complies with part 15 of the FCC rules.

Specifications

Frequency Band	16 channels of operation in the 2.4GHz world wide ISM band. 5MHz channel spacing.
High Performance	RX sensitivity of better than -90 dBm at 1% packet error rate for a 20 byte payload.
Efficient	Built-in CRC and AES-128 encryption. Buffered full packet transmit and receive. High performance SPI data and control interface operates up to 10MHz.
Power	+3.3V $\pm$ .3V from carrier board, 3.0V to 3.6V from battery pack
Microcontroller	ATmega128L (U2) or Atmega64L (U2).
Radio	RM2420 (U5) Rx sensitivity; -94dBm (1% PER, 20-byte packet) Type Tx power: 0dBm max
Interfaces	40-pin surface-mount RM2420 RCM header (J1) 2-pin surface-mount right-angle battery connector (J2)
Flexible	Designed for a broad spectrum of applications including IEEE 802.15.4 and Zigbee compliant devices.
Range	Line of sight range of 75 meters. Available option of a +10dBm output amplifier for longer range transmission.
RF	250kbps OQPSK Direct Sequence Spread Spectrum radio in accordance with the IEEE 802.15.4 specification. 0dBm output power.
Dimensions	1 x 1.75 inches
Antenna Interface	50-Ohm reverse polar SMA
Operating Temperature Range	-40ºC to +85ºC
External Power Pin	Used to power external sensors (J1.7) 20mA max

Indicators	Two LEDs, one red, one yellow (DS1, DS2)

Specifications (continued)

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Operating Voltage	1.8 V (1.6 V to 2.0 V) Internal Regulator Disabled 3.3 V (2.0V to 3.6 V) Internal Regulator Enabled
Current Consumption	0.5 µA Sleep 20.7 mA TX @ 0 dBm 19.7 mA RX / Idle
Frequency Range	2405 to 2480 MHz
Output Power	-32 to +0 dBm
Data Rate	250 kbps
FCC ID	SU3RM2420 - 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

*On going projects to enhance our products means that these specifications are subject to changes

Interface Decal Dimensions
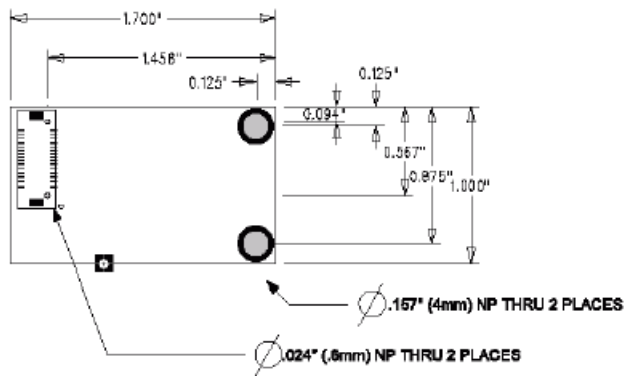
Components

Microcontroller (U2)

The 8-bit flash-based ATmega 128L/ATmega64L microcontroller contains software for the configuration and control of the RM2420, AMC and network functions, and the user-defined application software. The microcontroller utilizes a 32.768KHz crystal for MAC timing and power management, as well as external crystal operating at 8Hz. A variety of peripherals are routed to headers on the Developer Kit carrier board for application development. For detail information on the microcontroller, see www.atmel.com.

When configuring the Ember Studio Debug Reader, enter the following baud rate into the Debug Preference Window: 100,000. This rate is set by the microcontroller operating frequency.

Radio (U5)

The radio is an RM2420, a true single-chip 2.4GHz IEEE 802.15.4 – compliant and Zigbee-ready radio frequency transceiver designed for low-power and low-voltage wireless applications. It includes a digital direct sequence spread-spectrum (DSSS) baseband modem with an effective data rate of 250kbps.
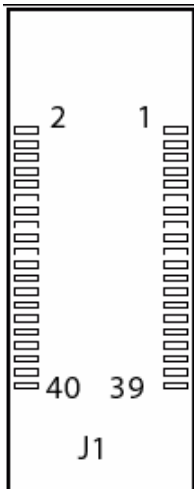
Channel Frequencies

These channels are equivalent to IEEE 802.15.4 channels 11 to 26.

RM2420 Channel Frequencies (GHz)

Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2.405	6	2.435	12	2.465
1	2.410	7	2.440	13	2.470
2	2.415	8	2.445	14	2.475
3	2.420	9	2.450	15	2.480
4	2.425	10	2.455	—	—
5	2.430	11	2.460	—	—

Pin Layout

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J1

Viewed from bottom

Pin	ATmega 128/64 Pin Name	Description
1	GND	Digital GND
2	GND	Digital GND
3	PD3 (TXD1/INT3)	EmberNet stack defaults to Alternate Function TX UART (TXD1)
4	nRESET	External reset, active low
5	PD2 (RXD1/INT2)	EmberNet stack defaults to Alternate Function RX UART (Rxd1)
6	PG1 (nRD)	General purpose I/O
7	+3.3V out	External power pin used to run custom external sensors and/or devices; 20mA max
8	+3.3V in	Input power from carrier boards
9	GND	Digital GND
10	GND	Digital GND
11	PD1 (SDA/INT1)	General purpose I/O; EmberNet defaults signal as an output connected to EM2 (button 1) on carrier board (with J11 installed)
12	PG0 (nWR)	General purpose I/O
13	PD0 (SDl/INT0)	General purpose I/O; EmberNet defaults signal as an output connected to EM1 (button 0) on carrier board (with J10 installed)
14	PC2	Dedicated connection to red LED (D55 on carrier board) for debugging purposes
15	PB7 (OC2/OC1C)	General purpose I/O
16	PC3	Dedicated connection to yellow LED (DS4 on carrier board) for debugging purposes
17	PB6	General purpose I/O
18	PC5	Dedicated connection to orange LED (DS2 on carrier board) for debugging purposes

Pin	ATmega 128/64 Pin Name	Description
19	NC	Dedicated for use with carrier board emulator/debug module
20	PC6	Dedicated connection to green LED (DS3 on carrier board) for debugging purposes
21	PB3	Master In/Slave Out SPI (used to configure the EM2420)
22	PG2	General purpose I/O
23	PB2 (MOSI)	Master Out/Slave In SPI (used to configure the RM2420)
24	AVCC	Analog voltage reference pin
25	PB1 (SCK)	SPI clock (used to configure the RM2420)
26	AGND	Analog ground pin (same as digital GND)
27	PC1	Dedicated signal for Temperature Enable (active high) for temperature sensor on carrier board
28	AREF	ADC voltage reference pin
29	NC	——
30	PF1 (ADC1)	EmberNet stack uses alternate function ACD1 to monitor external battery pack voltage
31	NC	——
32	PF2 (ADC2)	EmberNet stack uses alternate function ACD2 for temperature calibration
33	PE3 (OC3A/AIN1)	General purpose I/O
34	PF4 (ADC4/TCK)	General purpose I/O; if JTAG is enabled, the EmberNet stack uses alternate function TCK for JTAG
35	PE2 (XCK0/AIN0)	General Purpose I/O
36	PF5 (ADC5/TMS)	General purpose I/O; if JTAG is enabled, the EmberNet stack uses alternate function TMS for JTAG
37	PE1 (TXD0/PDO)	EmberNet stack defaults to alternate function TX UART (TXD0)
38	PF6 (ADC6/TDO)	General purpose I/O; if JTAG is enabled, the EmberNet stack uses alternate function TDO for JTAG
39	PE0 (RXD0/PDI)	EmberNet stack defaults to alternate function RX UART (RXD0)
40	PF7 (ADC7/TDI)	General purpose I/O; if JTAG is enabled, the EmberNet stack uses alternate function TDI for JTAG

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J1
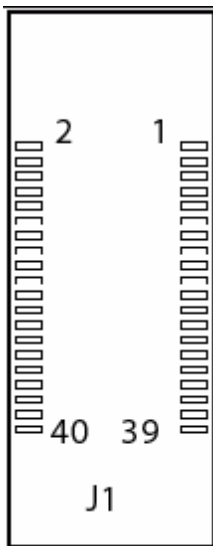
Viewed from bottom

Instructions
All users of this device must state on the outside of the host "Contains FCC ID: SU3RM2420".

Warning (Part 15.21)
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device must be operated as supplied by RAE Systems. Any changes or modifications made the device RM2420 can be jeopardize, but there is one exception. The radio's antenna can be replaced as long as the specification of the antenna matches the original (ant-2.4-cw-rcs-sma by Linx technologies).