



Application Note

Title: **EM9209 Module Description**

Product Family: **Wireless & Sensing**

Part Number: EM9209

Keywords: EM9209, Zoe, Long Range

**Description**

The EM9209 is a single-chip low-power transceiver dedicated to digital data communications in the 2.45 GHz ISM band. It uses a FSK modulation with programmable bit rate from 1.2 to 72 kb/s, including a high sensitivity mode with programmable bit rate up to 12kbps achieving a sensitivity down to -115dBm. A fully integrated power amplifier achieves +10dBm output power, achieving a 125dBm link budget allowing long range half duplex radio link.

The EM9209 module provides a full integration of the EM9209 low power RF Transceiver from EM Microelectronic into a dedicated application PCB. It offers a plug and play solution for a quick and easy evaluation or any application using the EM9209 without any additional hardware or RF layout.

**Features**

- Low power 2.4 GHz high sensitivity transceiver module
- From -20 to +10 dBm output power in 8 programmable steps
- No external Power Amplifier required
- Integrated 26MHz crystal oscillator
- Integrated matching network
- RF output for 50 Ω antenna or RF SMA connector
- 11 castellisation pads

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on 14.03.2017*

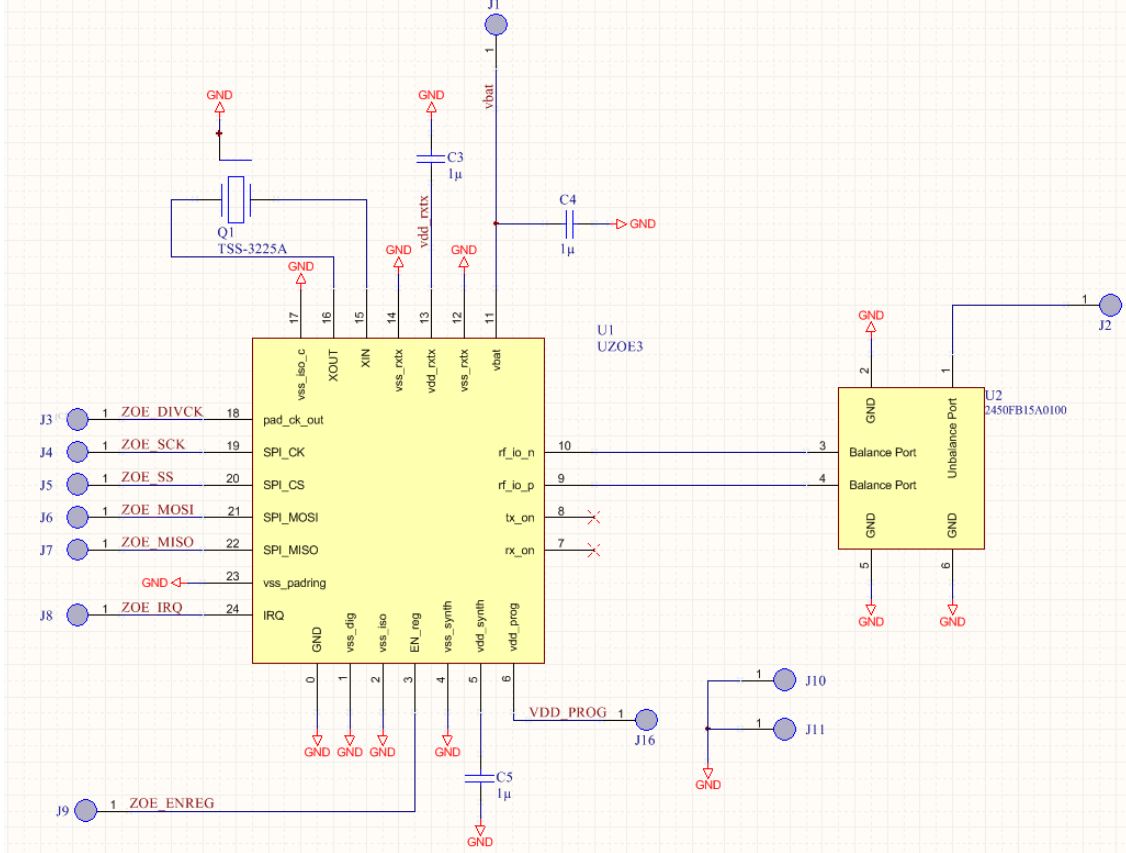
**Electrical characteristics**

Parameter	Min	Typ	Max	Unit
Operating power supply	1.9	2.5	3.6	V
<b>Consumption</b>				
powerdown			1	µA
Standby		140		µA
Transmit mode -1dBm		11		mA
Transmit mode +10dBm		36		mA
Receive mode – Normal sensitivity mode		7		mA
Receive mode – High sensitivity mode		8		mA
<b>RF characteristics</b>				
Operating frequency	2400		2480	MHz
Number of RF channels	20			
Modulation type	FSK			
RF Datarate	1.2		72	kbps
Output power	-20		10	dBm
Output power steps		8		
Sensitivity		-115		dBm

Please refer to EM9209 datasheet for additional information

**Module Electrical Schematic**

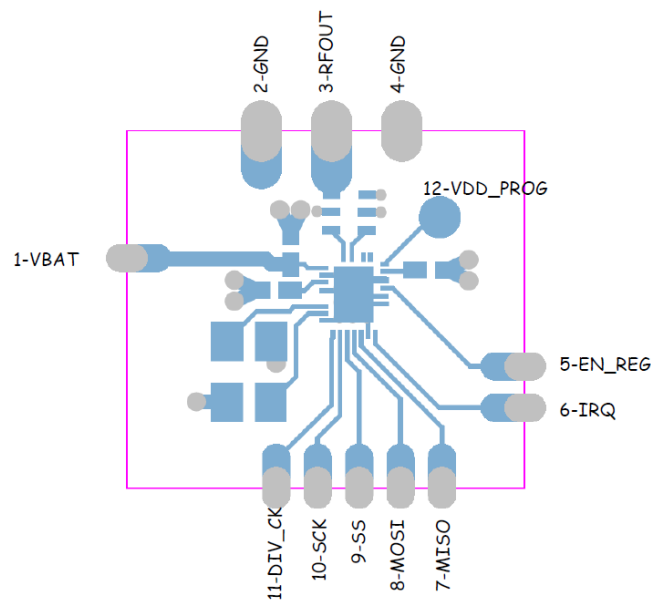
The EM9209 features all the components for any EM9209 high sensitivity application. No external component is required.



**Module layout**

The EM9209 module PCB is a 2 layer PCB of 0.8mm thickness. The dielectric is Rogers R04350. The top layer is represented hereafter.

The bottom layer is a common ground plane layer, covering all the components. It is not represented.



## Module pinout

The EM9209 module offers 11 pins for power supply and signal control/monitoring and a direct 50  $\Omega$  SMA output for antenna or RF connector connection.

Pin	Signal name	Description
1	VBAT	Supply voltage of the module
2	GND	Common ground
3	RFOUT	Input/output RF port. 50 $\Omega$ impedance
4	GND	Common ground
5	EN_REG	Master chip enable signal
6	IRQ	Interrupt output for external microcontroller
7	MISO	SPI data output
8	MOSI	SPI data input
9	SS	SPI slave select, active high
10	SCK	SPI clock input
11	DIV_CK	Programmable clock output
12	VDD_PROG	Programming voltage. Must not be connected

Pin 12, VDD\_PROG, is used for OTP programming. It shall not be connected in the application.

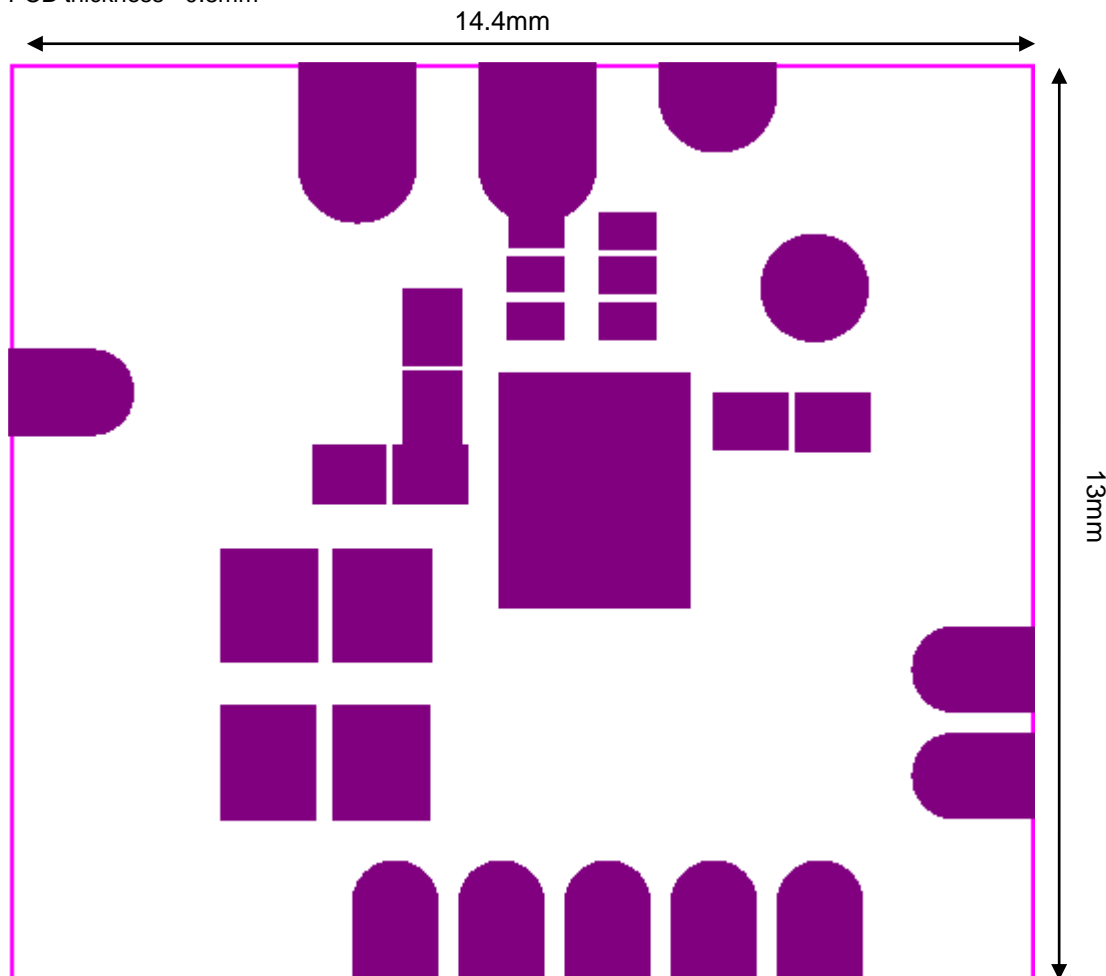
## Module Bill of Materials

Hereafter is the complete bill of materials of the EM9209 module. No external component is necessary to fulfill a complete RF operation.

Component	Value	Description
C3	1 $\mu$ F	+/-10%
C4	1 $\mu$ F	+/-10%
C5	1 $\mu$ F	+/-10%
Q1	26MHz	TSS-3225J Crystal, $\pm$ 20ppm, CL=10pF
U2	Balun	2450FB15A0100

## Outline and dimensions

PCB thickness= 0.8mm



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