

RFFM8250Q

WiFi Switch + LNA Module

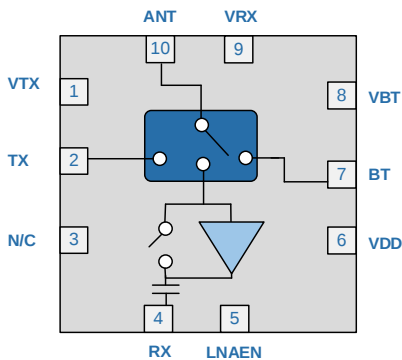
2.4GHz to 2.5GHz

Tested in Accordance with AEC-Q100



Package: QFN, 10-pin,
1.75mm x 1.75mm x 0.5mm

The RFFM8250Q provides an integrated Switch + LNA solution in a single Front End Module (FEM) for automotive WiFi 802.11b/g/n/ac and Bluetooth systems. The ultra-small form factor and integrated matching greatly reduces the number of external components and layout area in the customer applications. This simplifies the total front end solution by reducing the bill of materials, system footprint, and manufacturing cost. The RFFM8250Q integrates a Single Pole 3-Throw (SP3T) switch and a Low Noise Amplifier (LNA) with bypass mode. The device is tested in accordance with AEC-Q100 and is provided in a 1.75mm x 1.75mm x 0.5mm 10-pin QFN package.



Functional Block Diagram

Features

- SP3T T/R Switch with Bluetooth Support
- LNA with Bypass Mode
- Input and Output Matched to 50Ω
- Wide Voltage Supply Range
- Supports WiFi chipsets with Integrated Power Amplifier (iPA)
- Low Profile Package for Module Designs

Applications

- Automotive WiFi
- WiFi Direct
- Automotive Diagnostics
- WiFi Infotainment
- 2.5GHz ISM Band Solutions for Automotive

Ordering Information

RFFM8250QSB	Standard 5-piece sample bag
RFFM8250QSQ	Standard 25-piece sample bag
RFFM8250QSR	Standard 100-piece reel
RFFM8250QTR7	Standard 2500-piece reel
RFFM8250QPCK-410	Fully assembled evaluation board w/ 5-piece bag

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Absolute Maximum Ratings

Parameter	Rating	Unit
DC Supply Voltage (No RF Applied)	-0.5 to 6	V
DC Supply Current	100	mA
Operating Ambient Temperature	-40 to +85	°C
Storage Temperature	-40 to +150	°C
Maximum TX Input Power into 50Ω Load for 11b/g/n/ac (No Damage)	+30	dBm
Maximum RX Input Power (No Damage)	+10	dBm
Bypass Mode Maximum RX input power (No damage)	+23	dBm
Moisture Sensitivity	MSL2	



Caution! ESD sensitive device.



RFMD Green: RoHS status based on EU Directive 2011/65/EU (at time of this document revision), halogen free per IEC 61249-2-21, < 1000ppm each of antimony trioxide in polymeric materials and red phosphorus as a flame retardant, and <2% antimony in solder.

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical performance or functional operation of the device under Absolute Maximum Rating conditions is not implied.

Nominal Operating Parameters

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
Compliance					802.11b, 802.11g, 802.11n, 802.11ac
Operating Frequency	2.412		2.484	GHz	
Operating Ambient Temperature	-40	25	85	°C	
Power Supply V _{DD}	3.0	3.6	5.0	V	
Control Voltage-High	2.8	3.1	4.8	V	VTX, VRX, LNAEN, and VBT Should not exceed V _{CC} voltage
Control Voltage-Low		0	0.2	V	
Transmit (TX-ANT)					Over all conditions unless otherwise noted
Insertion Loss		0.6	1.2	dB	Temp = 25°C; V _{DD} = 3.6V; Control Voltage = 3.1V
		0.6	1.8	dB	
TX Port Return Loss	10	18		dB	
ANT Port Return Loss	10	18		dB	
Input P1dB	27	30		dBm	T = 25°C, Control voltage = 3.1V; V _{DD} = 3.6V; CW signal
ANT-Rx Isolation	28	35		dB	TX mode
Receive (ANT-RX)-LNA On					Over all conditions unless otherwise noted
Gain (S21)	11	13	16	dB	Temp = 25°C; V _{DD} = 3.6V; Control Voltage = 3.1V
	10	13	17	dB	
Gain Flatness	-0.25		+0.25	dB	over any 20MHz BW
Gain Flatness across band	-0.5		+0.5	dB	
Noise Figure		2.3	2.7	dB	Temp = 25°C; V _{DD} = 3.6V; Control Voltage = 3.1V
		2.5	3.5	dB	
RX Port Return Loss	10	15		dB	
ANT Port Return Loss	3	5		dB	
Input P1dB	-7	-5		dBm	Temp = 25°C; V _{DD} = 3.6V; Control Voltage = 3.1V
Current Consumption	5	10		mA	
LNA_EN Control Current		250	500	μA	
LNA Turn On Time		200	500	nS	

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Parameter	Specification			Unit	Condition
	Min	Typ	Max		
Receive (ANT-RX)-Bypass Mode					Over all conditions unless otherwise noted
Insertion Loss		7	9	dB	Temp = 25°C; V _{DD} = 3.6V; Control Voltage = 3.1V
		7	10	dB	
RX Port Return Loss	8	10		dB	
ANT Port Return Loss	8	10		dB	
Input P1dB	17	21		dBm	
Bluetooth TX/RX					Over all conditions unless otherwise noted
Input P1dB	25	+27		dBm	Temp = 25°C; V _{DD} = 3.6V; Control Voltage = 3.1V
Insertion Loss		0.6	1.2	dB	
		0.6	1.5	dB	
BT Port Return Loss	12	18		dB	
ANT Port Return Loss	12	18		dB	
General Specifications					
V _{DD} Leakage Current		1	10	μA	
Switch Control Current-High-Each Line		1	10	μA	
Switch Control Current-Low-Each Line		0.1	1	μA	
Switching Speed		100	500	ns	
ESD-Human Body Model		1000		V	
ESD-Charge Device Model		1000		V	

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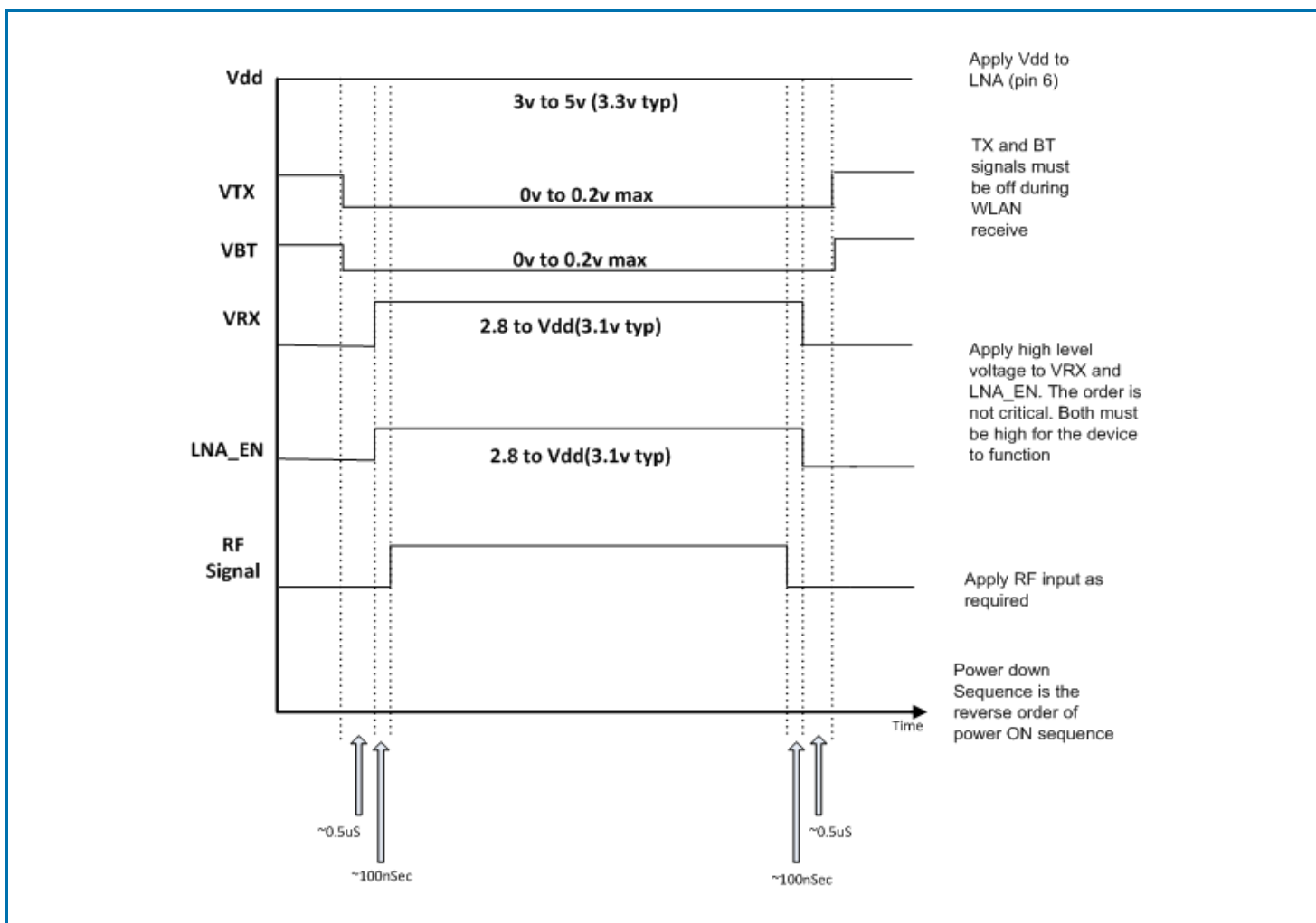
Switch Control Logic Truth Table

Operating Mode	VTX	LNAEN	VRX	VBT
Standby	Low	Low	Low	Low
802.11b/g/n/ac TX Mode	High	Low	Low	Low
802.11b/g/n/ac RX Gain	Low	High	High	Low
802.11b/g/n/ac RX Bypass	Low	Low	High	Low
BT RX/TX	Low	Low	Low	High

Notes:

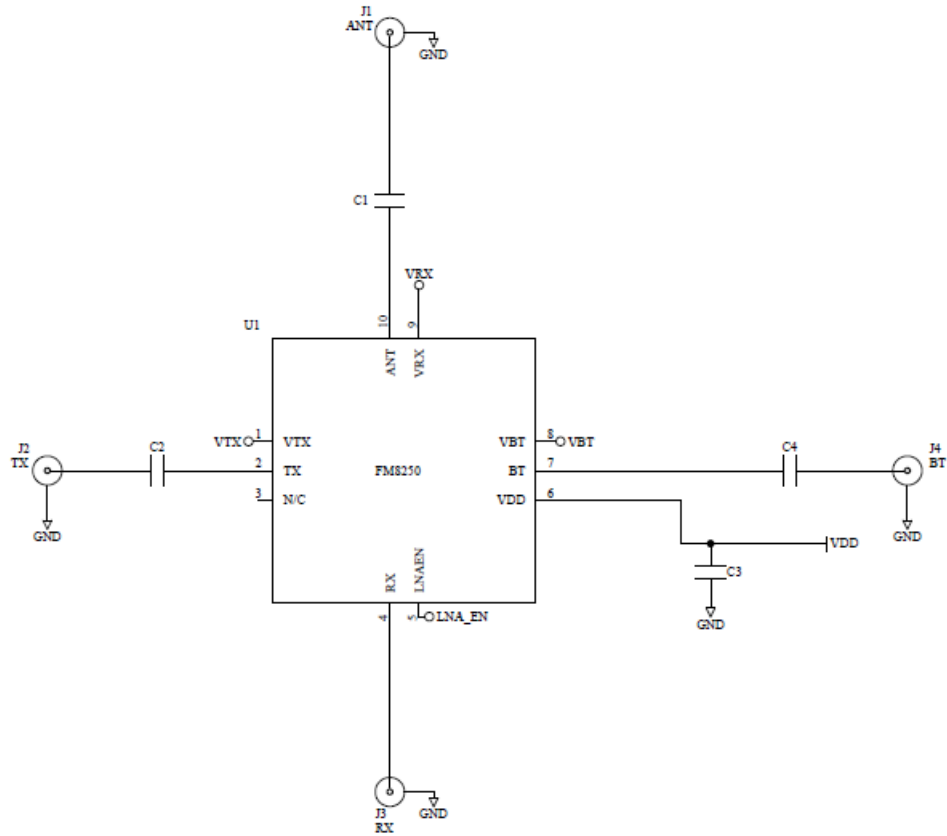
- High = 2.8 to V_{CC} . Low = 0V to 0.2V.

Timing Diagram



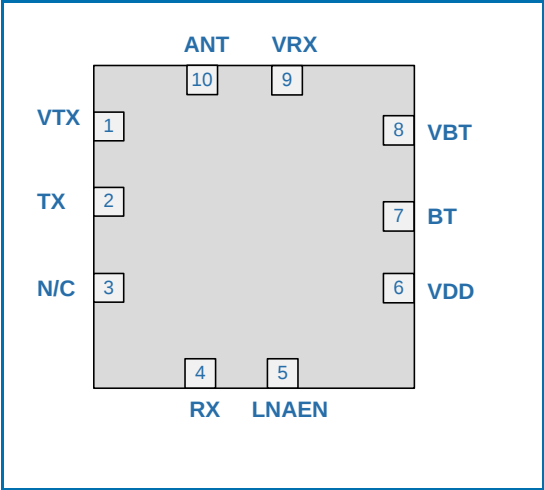
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Applications Schematic

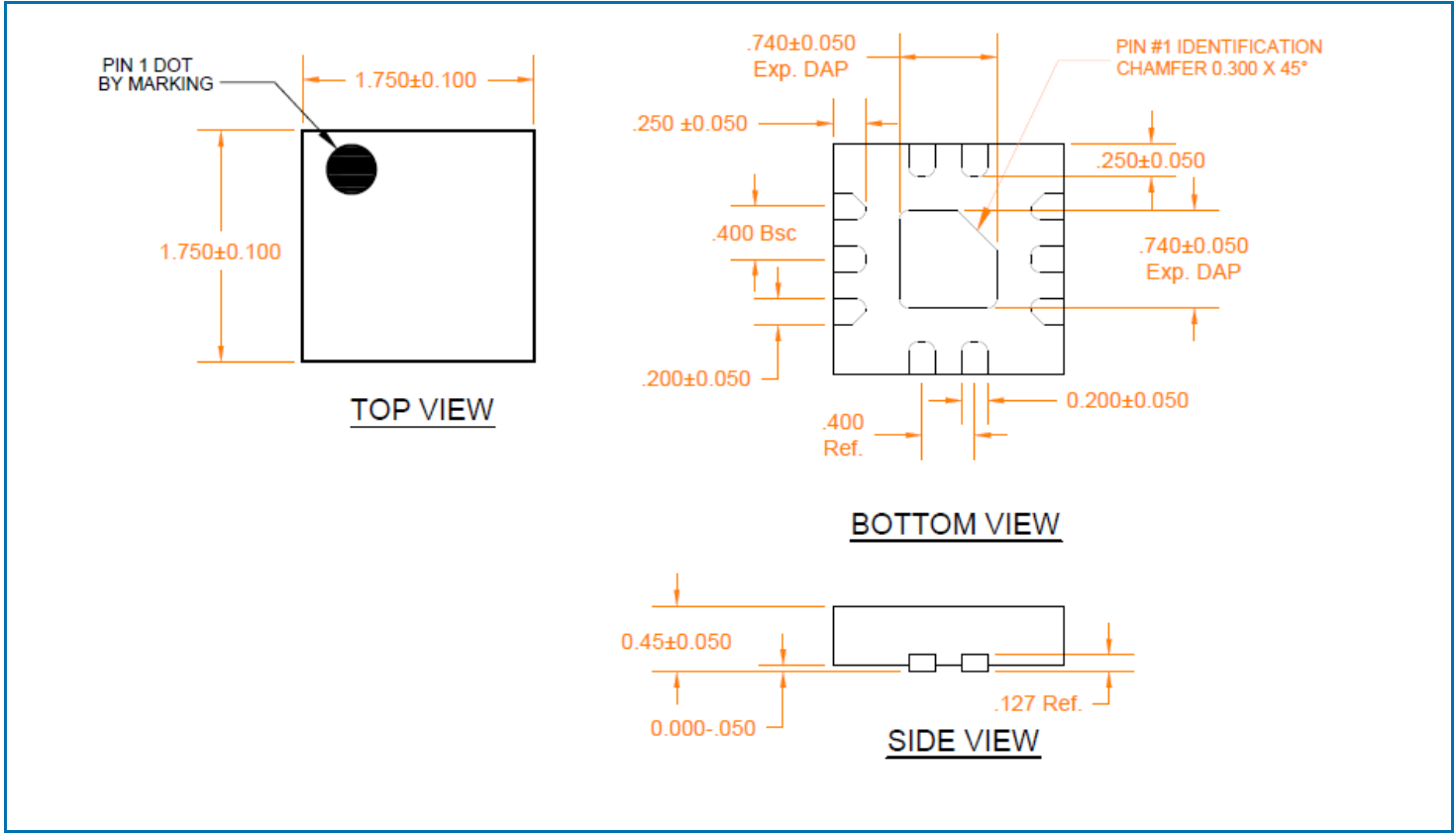


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Pin Out

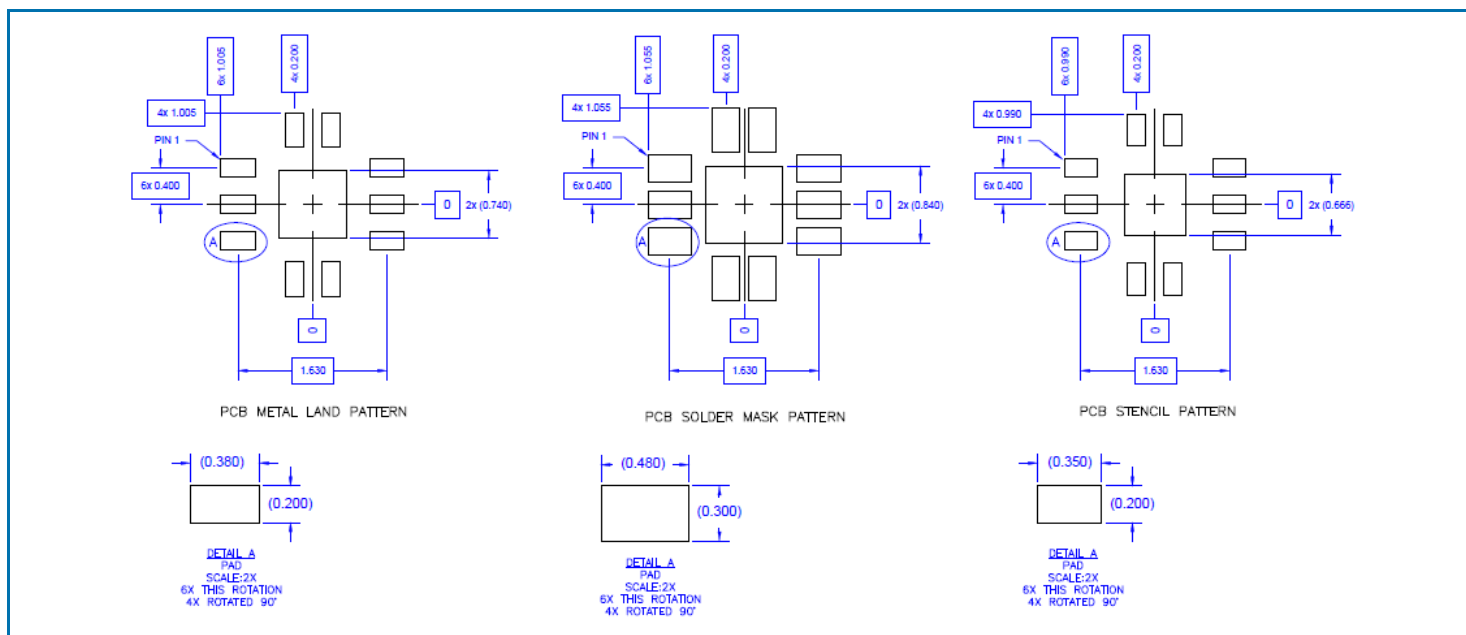


Package Drawing (dimensions in mm)



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PCB Patterns (dimensions in mm)



Note:

Thermal vias for center slug "C" should be incorporated into the PCB design. The number and size of thermal vias will depend on the application, power, dissipation and electrical requirements. Example of the number and size of vias can be found on the RFMD evaluation board layout (gerber files are available upon request)

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Pin Names and Descriptions

Pin	Name	Description
1	VTX	Transmit switch control pin. See switch truth table for proper level.
2	TX	RF input port for the 802.11b/g/n PA. Input is matched to 50Ω. An external DC block is required.
3	N/C	No connect. This pin is not connected internally and can be left floating or connected to ground.
4	RX	RF output port for the 802.11b/g/n LNA. Port is matched to 50Ω. This pin is DC blocked internally.
5	LNAEN	Control voltage for the LNA. When this pin is set to a LOW logic state, the bypass mode is enabled.
6	VDD	Supply voltage for the LNA. See applications schematic for biasing and bypassing components.
7	BT	RF bidirectional port for Bluetooth®. Input is matched to 50Ω. An external DC block is required.
8	VBT	Bluetooth® switch control pin. See truth table for proper level.
9	VRX	Receive switch control pin. See switch truth table for proper level.
10	ANT	RF bidirectional antenna port matched to 50Ω. An external DC block is required.
Pkg Base	GND	Ground connection. The backside of the package should be connected to the ground plane through a short path, i.e., PCB vias under the device are recommended.