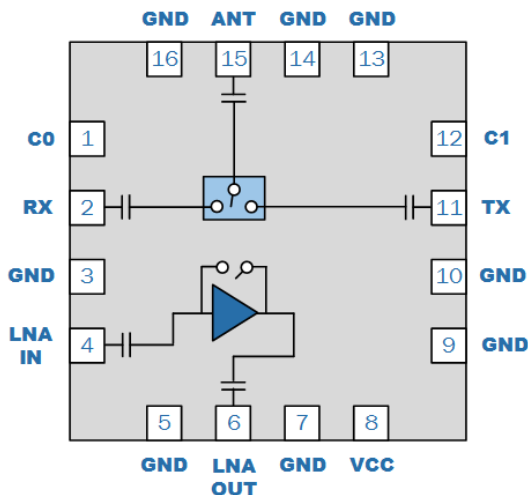


RFFM4554

Wi-Fi Integrated Front End Module
4.9GHz to 5.925GHz

The RFFM4554 is a front end module (FEM) designed for 802.11a/n/ac applications. The integrated single-pole double throw switch and low noise amplifier with bypass greatly reduces the layout area, bill of materials and manufacturability cost in the customer application. The RFFM4554 has a unique structure where the switch to LNA path has pins so filtering can be added in the ideal path for current Wi-Fi circuit applications. The device is provided in a 2.3mm x 2.3mm x 0.45mm 16-pin QFN package that meets or exceeds the power requirements of IEEE802.11a/n/ac Wi-Fi RF systems.



Functional Block Diagram

Ordering Information

RFFM4554SB	Standard 5-piece Sample Bag
RFFM4554SQ	Standard 25-piece Sample Bag
RFFM4554SR	Standard 100-piece Reel
RFFM4554TR7	Standard 2500-piece Reel
RFFM4554PCK401	Fully Assembled Evaluation Board

Revision DS20160930

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Package: QFN, 16-pin,
2.3mm x 2.3mm x 0.45mm

Features

- 13.5dB LNA Gain
- 5dB Bypass Loss
- 1.7dB Noise Figure
- TX to ANT path loss of 0.5dB
- Max Power at TX Input of 30dBm
- 2.4GHz Rejection
- Input and Output Matched to 50Ω
- Break out path between switch and LNA for optimal filter placement

Applications

- Customer Premise Equipment (CPE)
- Wireless Access Points, Gateways
- Routers
- Set-Top Box Applications
- Picocell/Femtocell
- Internet of Things

Disclaimer: Subject to change without notice

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Absolute Maximum Ratings

Parameter	Rating	Unit
DC Supply Voltage (No RF applied)	-0.5 to +5.5	V _{DC}
DC Supply Current	50	mA
Operating Case Temperature	-40 to +85	°C
Storage Temperature	-40 to +150	°C
Maximum TX Input Power into 50Ω Load for 11a/n/ac (No Damage)	+34	dBm
Maximum RX Input Power (No Damage)	+20	dBm
Bypass Mode Maximum RX Input Power (No Damage)	+30	dBm
Moisture Sensitivity Level (260°C JEDEC J-STD-020)	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					IEEE802.11a/n/ac
Operating Frequency	5.180		5.925	GHz	
Extended Operating Frequency	4.900		5.925	GHz	Functional with reduced performance
Operating Temperature	-40	+25	+85	°C	
Power Supply V _{CC}	3.0	3.3	5.25	V	
Control Voltage - High	2.5	3.3	V _{CC}	V	C0 and C1 should not exceed V _{CC}
Control Voltage - Low		0	0.2	V	C0 and C1
Transmit Performance (TX-ANT)					T=+25°C, V_{CC}=3.3-5V, C0=Low, C1=High, Only Through Path from RX to LNA_IN, CW Signal; Unless otherwise noted
Insertion Loss		0.5	0.95	dB	
Linear output Power	22	24		dBm	
11ac 80MHz Dynamic EVM		-45	-40	dB	
		0.6	1	%	
TX Port Return Loss	10	20		dB	
ANT Port Return Loss	10	20		dB	
2 nd Harmonics		-50	-40	dBm/MHz	P _{OUT} = 24dBm 802.11a 6Mbps
3 rd Harmonics		-50	-40	dBm/MHz	P _{OUT} = 24dBm 802.11a 6Mbps
Input P _{0.1dB}	30	32	x	dBm	
ANT-LNAOUT Isolation	40	45		dB	TX Mode: TX enabled and maximum power
TX-LNAOUT Isolation	30	40		dB	TX Mode: TX enabled and maximum power
Receive Performance (ANT-RX) – LNA On					T=+25°C, V_{CC}=3.3-5V, C0=High, C1=Low, Only Through Path from RX to LNA_IN, CW Signal; Unless otherwise noted
Gain	11	13.5		dB	
Small Signal Gain at 2500 MHz		-29	-25	dB	
Noise Figure		1.7	2.2	dB	
RX Port Return Loss	10	15		dB	

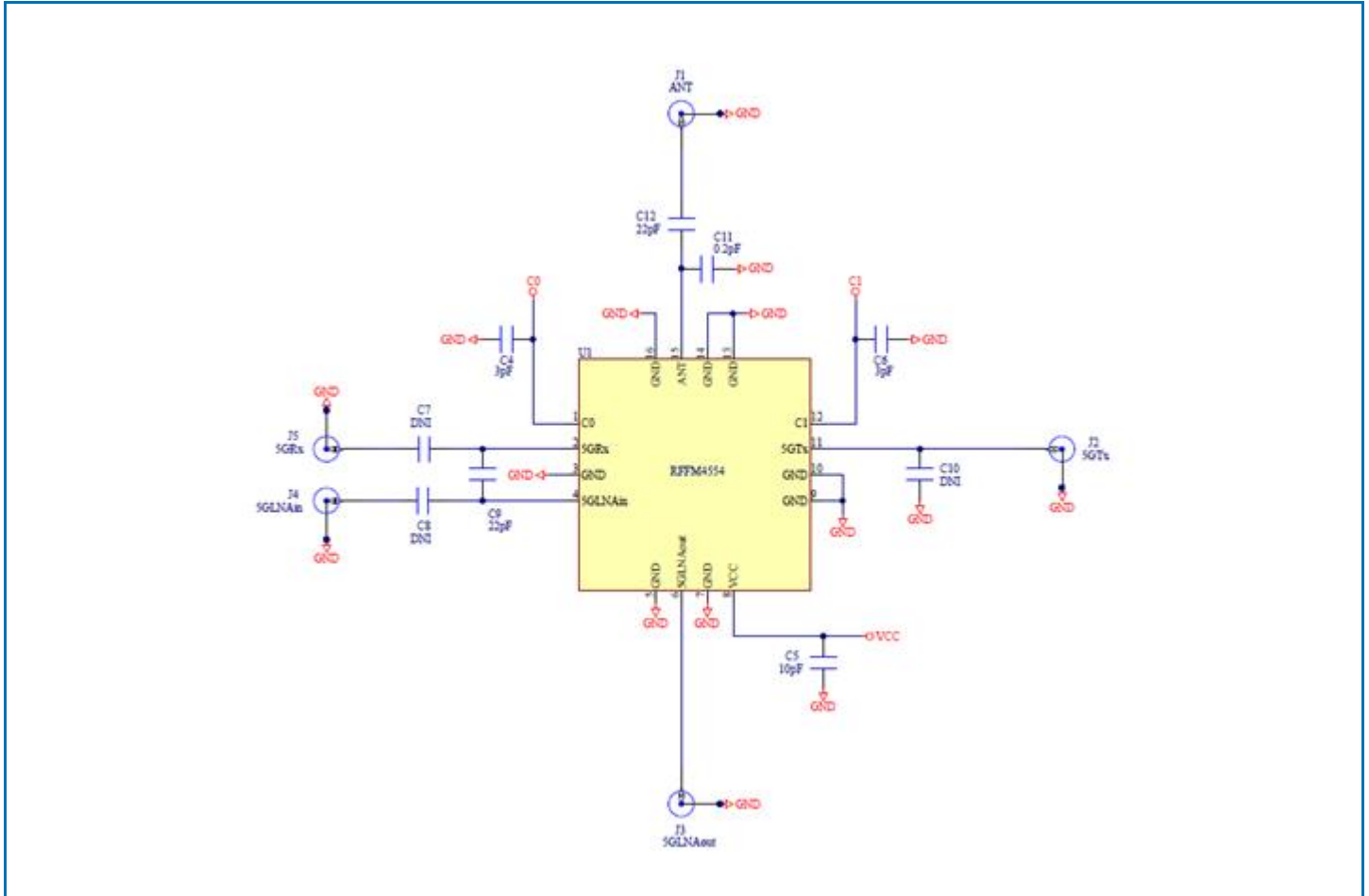
Parameter	Specification			Unit	Condition
	Min	Typ	Max		
ANT Port Return Loss	8	12		dB	
Input P1dB		-2		dBm	
IIP3	7	10		dBm	
Current Consumption		19	28	mA	
Receive Performance (ANT-RX) – Bypass Mode					T=+25°C, V_{CC}=3.3-5V, C0=High, C1=High, 50Ohm Trace from RX to LNA_IN, CW Signal; Unless otherwise noted
Insertion Loss		5		dB	
RX Port Return Loss	9.5	12		dB	
ANT Port Return Loss	9.5	12		dB	
Input P1dB		25		dBm	
General Specifications					T=+25°C, V_{CC}=3.3-5V, Unless otherwise noted
ANT-LNAOUT Isolation – Standby Mode	30			dB	
Leakage Current		10	25	μA	
LNA Turn On Time		180		nS	90% Steady State RF from 50% of V _{CONTROL} = 2.8V to 0V
Switch Control Current – High		15	50	μA	Each line
Switch Control Current - Low		0.1	1	μA	Each line
Switch Speed		100	500	nS	
ESD – Human Body Model	500			V	EIA/JESD22-114A; All pins
ESD – Charge Device Model	750			V	JESD22-C101C; All pins

Control Logic Truth Table

Operating Mode	C0	C1
Standby	Low	Low
802.11a/n/ac TX Mode	Low	High
802.11a/n/ac RX Gain	High	Low
802.11a/n/ac RX Bypass	High	High

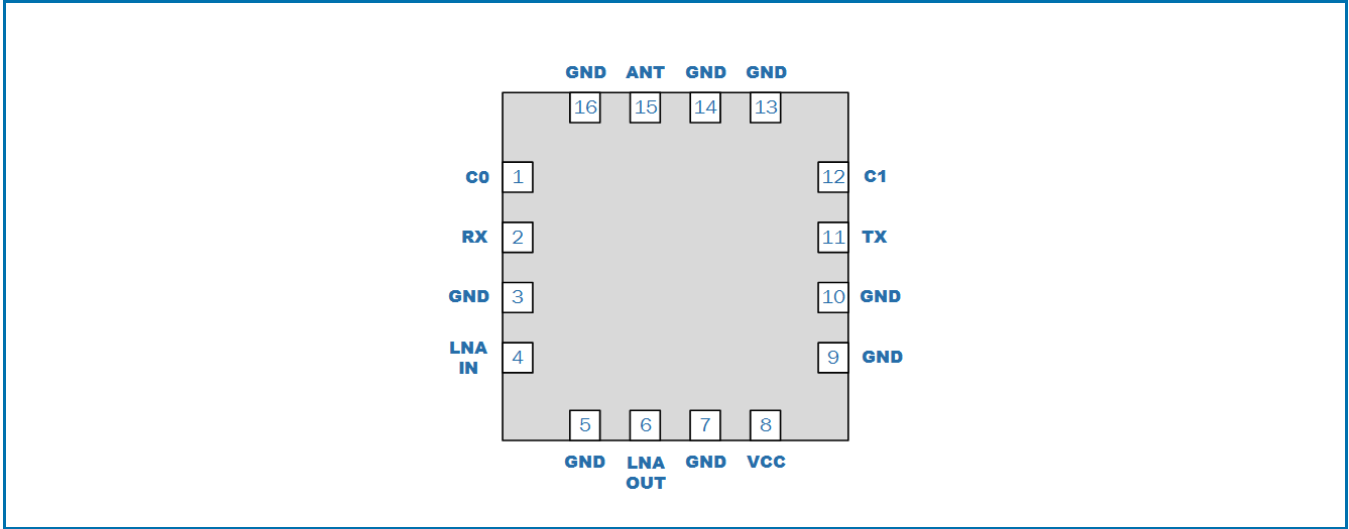
Note: High = 2.5 to V_{CC}. Low = 0V to 0.2V.

Applications Schematic

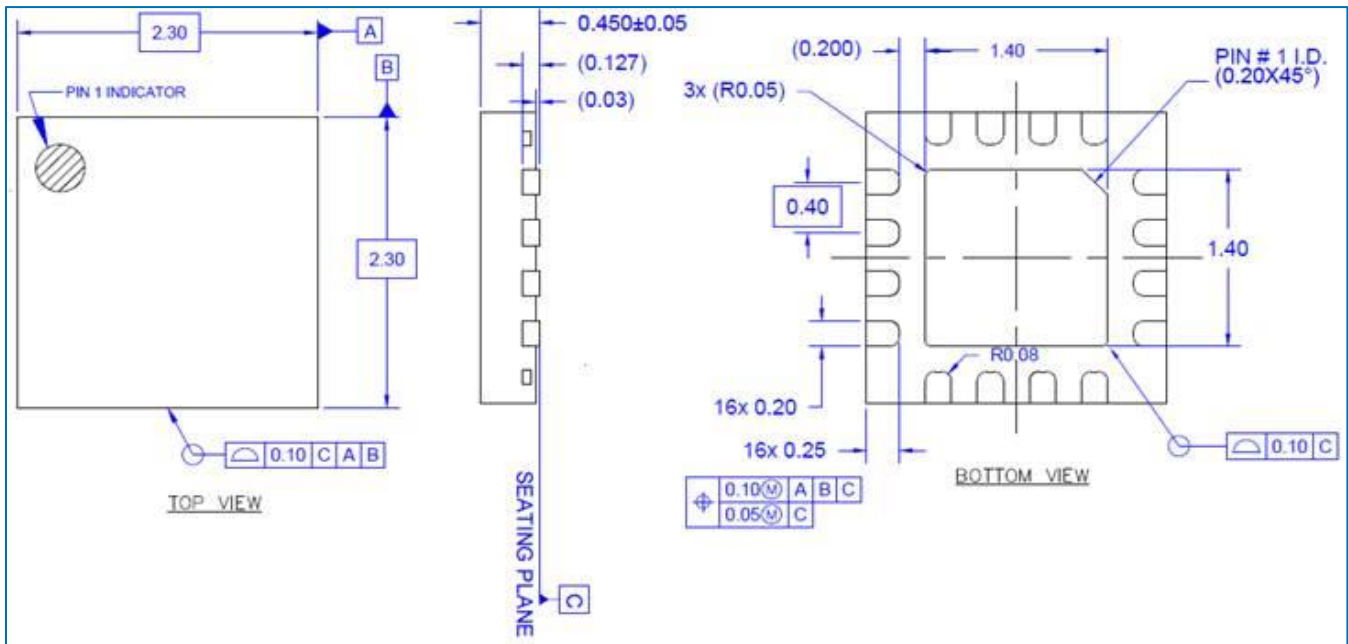


Note: The Qorvo evaluation board trace loss from 5 to 6GHz is 0.5dB on TX port, 0.6dB on ANT port, and 0.5dB on LNA_OUT port

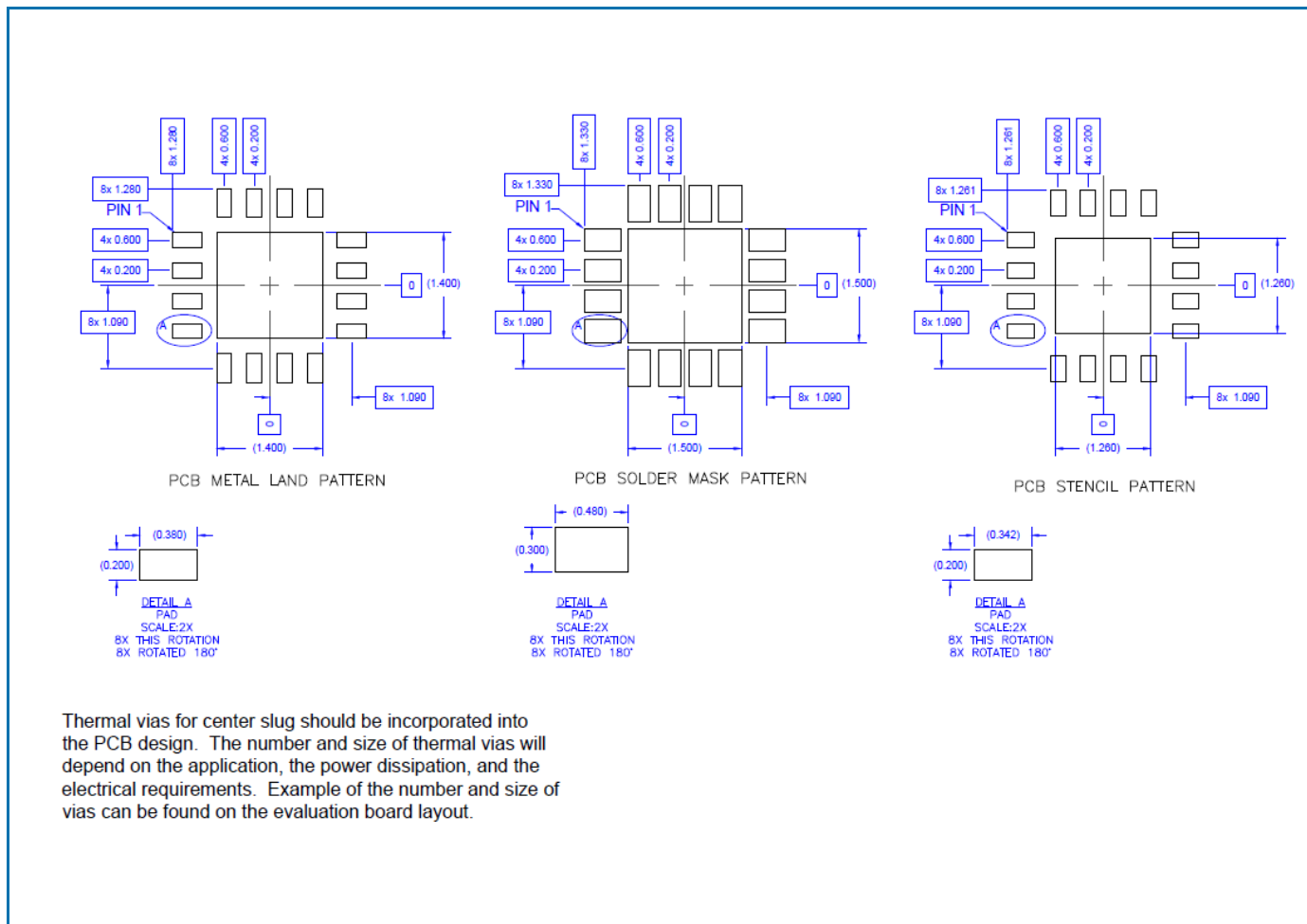
Pin Out



Package Drawing



PCB Patterns



Thermal vias for center slug should be incorporated into the PCB design. The number and size of thermal vias will depend on the application, the power dissipation, and the electrical requirements. Example of the number and size of vias can be found on the evaluation board layout.

Pin Names and Descriptions

Pin	Name	Description
1	C0	Control pin 0. See truth table for proper voltage level.
2	RX	RF output port for the RX throw of the T/R switch. This port is matched to 50Ω and AC coupled internally
3	GND	Ground connection
4	LNAIN	RF input port for the LNA. This port is matched to 50Ω and AC coupled internally
5	GND	Ground connection
6	LNAOUT	RF output port for the LNA. This port is matched to 50Ω and AC coupled internally
7	GND	Ground connection
8	VCC	Supply voltage for the module. See applications schematic for bypassing components.
9	GND	Ground connection
10	GND	Ground connection
11	TX	RF input port for the TX throw of the T/R switch. This port is matched to 50Ω and AC coupled internally
12	C1	Control pin 1. See truth table for proper voltage level.
13	GND	Ground connection
14	GND	Ground connection
15	ANT	RF bidirectional antenna port matched to 50Ω and AC coupled
16	GND	Ground connection
Pkg Base	GND	Ground connection. The back side of the package should be connected to the ground plan though as short of a connection as possible. PCB vias under the device are recommended.