



Package Style: QFN, 16-pin, 3.0mm x 3.0mm x 0.5mm

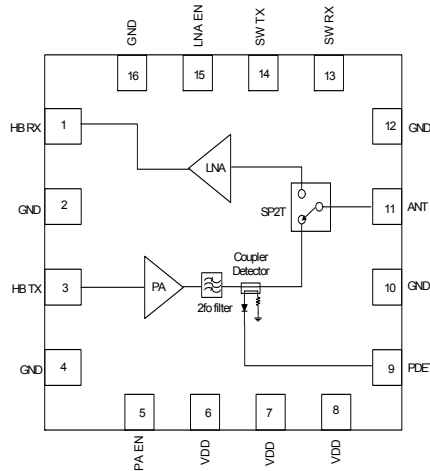


**Features**

- Single Supply Voltage 3.0V to 4.8V
- Integrated 5GHz Amplifier, LNA, and SPT2T Tx/Rx Switch
- P<sub>OUT</sub> = 15.5 dBm, 11a, OFDM at 2.5% EVM
- Low Height Package, Suited for SiP and CoB Designs

**Applications**

- Cellular handsets
- Mobile devices
- Tablets
- Consumer electronics
- Gaming
- Netbooks/Notebooks
- TV/monitors/video



Functional Block Diagram

**Product Description**

The RF5516 provides a complete integrated solution in a single Front-End Module (FEM) for WiFi 802.11a systems. The ultra small form factor and integrated matching minimizes the layout area in the customer's application and greatly reduces the number of external components to only one bypass capacitor for supply decoupling. This simplifies the total Front-End solution by reducing the bill of materials, system footprint, and manufacturability cost. The RF5516 integrates a Power Amplifier (PA), Single Pole Double Throw switch (SP2T), Low Noise Amplifier (LNA), and a power detector coupler for improved accuracy. The device is provided in a 3mmx3mmx0.5mm, 16-pin package. This module meets or exceeds the RF Front End needs of IEEE 802.11a WiFi RF systems.

**Ordering Information**

RF5516SB	Standard 5 piece bag
RF5516	Standard 25 piece bag
RF5516SR	Standard 100 piece bag
RF5516TR7	Standard 2500 piece reel
RF5516PCK-410	Fully assembled Evaluation Board and 5 loose sample pieces

**Optimum Technology Matching® Applied**

- |                                      |                                      |  |                                   |
|--------------------------------------|--------------------------------------|--|-----------------------------------|
| <input type="checkbox"/> GaAs HBT    | <input type="checkbox"/> SiGe BiCMOS | <input checked="" type="checkbox"/> GaAs pHEMT | <input type="checkbox"/> GaN HEMT |
| <input type="checkbox"/> GaAs MESFET | <input type="checkbox"/> Si BiCMOS   | <input type="checkbox"/> Si CMOS               |                                   |
| <input type="checkbox"/> InGaP HBT   | <input type="checkbox"/> SiGe HBT    | <input type="checkbox"/> Si BJT                |                                   |

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## Absolute Maximum Ratings

Parameter	Rating	Unit
DC Supply Voltage	5.5	V <sub>DC</sub>
Maximum TX and RX Input Power (No Damage)	5	dBm
Operating Temperature	-10 to +70	°C
Extreme Operating Temperature	-30 to +85	°C
Storage Temperature	-40 to +150	°C
Moisture Sensitivity	MSL2	



**Caution!** ESD sensitive device.

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.

RoHS status based on EUDirective2002/95/EC (at time of this document revision).

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Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
<b>Transmit Parameters</b>					Nominal conditions: T=25 °C; V <sub>DD</sub> =3.3V; PA_EN=3.0V; Freq=5.5GHz; 802.11a 54Mbps; pulsed at 1% to 99% duty cycle unless otherwise noted.
<b>Compliance</b>					IEEE802.11a/n; FCC CFR 15.45, .205, .209
Operating Frequency Range	5.15		5.85	GHz	
DC Supply Voltage	3.0	3.3	4.8	V	Nominal operating range 3.3V to 4.2V
PA Enable Voltage	2.80	3.0	3.6	V	
Output Power	14.5	15.5		dBm	Nominal conditions (Temp=25 °C; V <sub>DD</sub> =3.3V; PA_EN=3.0V; Freq=5.5GHz)
	13	14		dBm	Over all conditions (Temp=-10 °C to +70 °C; V <sub>DD</sub> =3.3V to 4.2V; PA_EN=2.8V to 3.6V; Freq=5.1GHz to 5.85 GHz)
Operating Current		175	225	mA	P <sub>OUT</sub> =15.5dBm 802.11a 54Mbps
Supply Leakage Current		10	50	µA	V <sub>DD</sub> =3.6V; Control voltage LOW; PA_EN LOW
Error Vector Magnitude at Rated Power		2.5	3	%	P <sub>OUT</sub> =15.5dBm 802.11a 54Mbps
Thermal Resistance		33		°C/W	V <sub>CC</sub> =6, I <sub>CC</sub> =140mA, T <sub>REF</sub> =85 °C
Harmonics					P <sub>OUT</sub> =15.5dBm, 802.11a 6Mbps signal
2fo		-45	-42	dBm	
3fo		-45	-42	dBm	
Gain	28	32	34	dB	Temp = 25 °C; V <sub>DD</sub> =3.3V; V <sub>REG</sub> =3.0V
	26	32	35.5	dB	Over all conditions (Temp=-10 °C to +70 °C; V <sub>DD</sub> =3.3V to 4.2V; PA_EN=2.8V to 3.6V; Freq=5.15 GHz to 5.85GHz)
Gain Variation	-2		2	dB	Over frequency per 100MHz band
Ripple across band	-1		1	dB	Per 20MHz channel bandwidth
Power Detector Voltage	0.2		1.3	V	P <sub>OUT</sub> =18dBm 802.11a 54Mbps
<b>Receive Parameters</b>					Unless otherwise stated, T=25 °C, V <sub>DD</sub> =3.3V, PAEN=0 V, SWTX=0 V, LNA_EN=3.0V, and SWRX=3.0V
<b>Compliance</b>					IEEE802.11a/n; FCC CFR 15.25, .205, .209
Frequency	5.15		5.85	GHz	
LNA Voltage Supply (V <sub>DD</sub> )	3.0		4.8	V	
Gain	8.5	11	14	dB	Over all nominal operating conditions
Noise Figure		2.8	4	dB	Over all nominal operating conditions

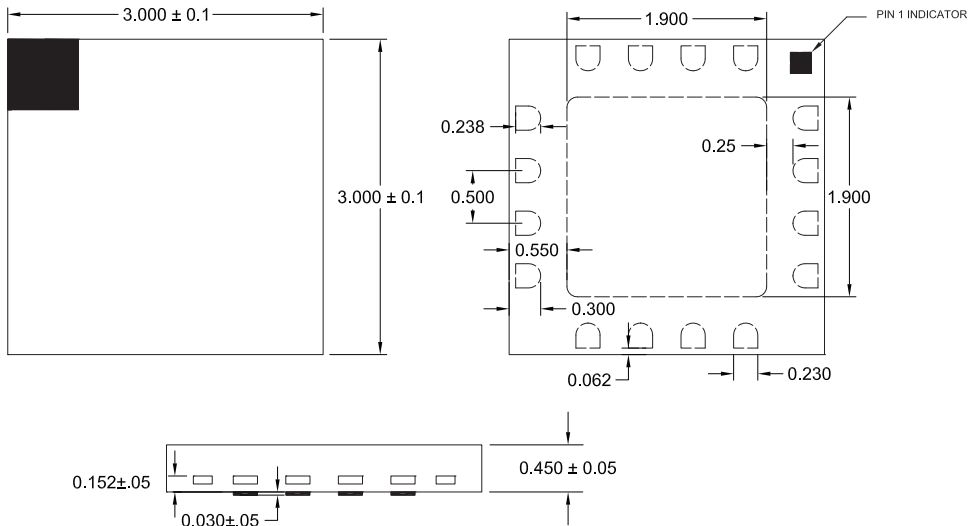
Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
<b>Receive Parameters, cont.</b>					
Input IP3	+3	+5		dBm	Over all nominal operating conditions
Input 1dB Compression	-5	-2.5		dBm	
Return Loss					
Input	3	5		dB	Freq=5.15GHz to 5.85GHz over temp and supply voltage
Output	6.5	10		dB	Freq=5.15GHz to 5.85GHz over temp and supply voltage
Passband Ripple	-0.5		+0.5	dB	In a 20MHz channel
LNA Current	4.5	10	15	mA	Over all nominal operating conditions
RX to TX Isolation	20			dB	
<b>Control Parameters</b>					
Switch Control Logic HIGH	2.8		4.2	V	SWTX, SWRX
Switch Control Logic LOW			0.2	V	
I <sub>CTRL-H</sub>			30	μA	
I <sub>CTRL-L</sub>			30	μA	
PA <sub>EN-H</sub>	2.8	3.0	3.0	V	
PA <sub>EN-L</sub>			0.2	V	
I <sub>PAEN</sub>		2	3.5	mA	
LNA Enable Voltage (LNA_EN)	2.8	3.0	3.0	V	LNA enabled
			0.2	V	LNA disabled
Switch Speed			500	ns	

**Logic Control Table**

MODE	SWTX	SWRX	PA_EN	LNA_EN
TRANSMIT	HIGH	LOW	HIGH	LOW
RECEIVE	LOW	HIGH	LOW	HIGH

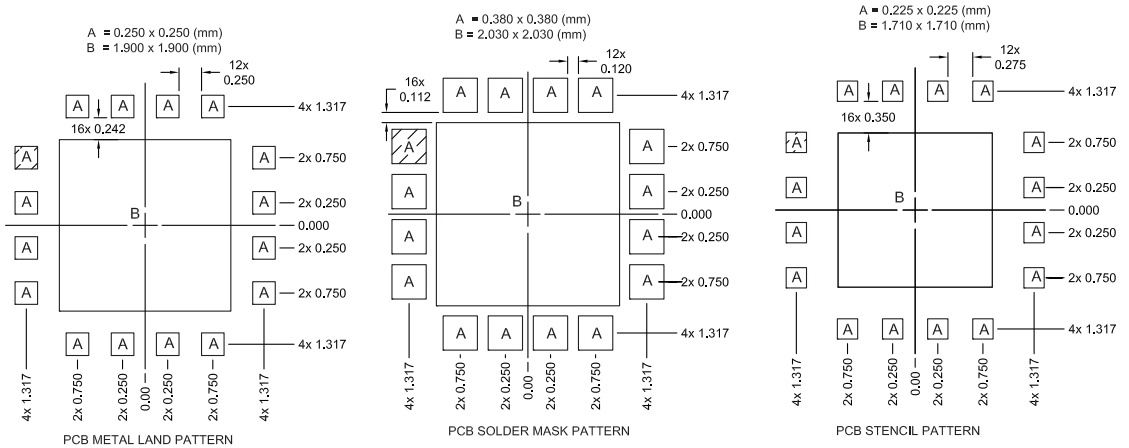
Pin	Function	Description
1	HBRX	Receiver output. This port is DC blocked internally and matched to 50Ω.
2	GND	Ground connection.
3	HBTX	Transmit RF input. This port is DC blocked internally and matched to 50Ω.
4	GND	Ground connection.
5	PA EN	Bias voltage for the PA. See logic control table for proper settings.
6	VDD1	Supply voltage for the LNA.
7	VDD2	Supply voltage for the PA.
8	VDD3	Same as pin 7.
9	PDET	Power detector for the transmit path.
10	GND	Ground connection.
11	ANT	Antenna port. Internally DC blocked and matched to 50Ω.
12	GND	Ground connection.
13	SWRX	Control switch for the receive mode. See logic control table for proper settings.
14	SWTX	Control switch for the transmit mode. See logic control table for proper settings.
15	LNA EN	Bias voltage for the LNA. See logic control table for proper settings.
16	GND	Ground connection.
Pkg Base	GND	The center metal base of the QFN package provides DC and RF ground as well as heat sink for the front-end module.

### Package Drawing



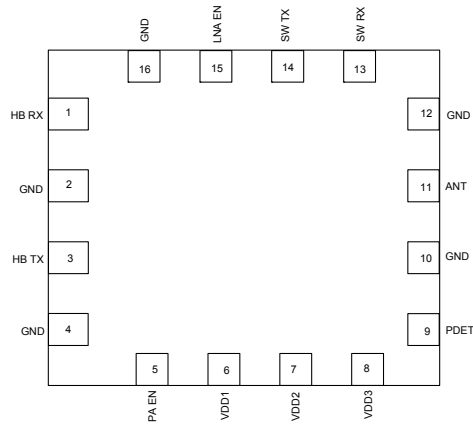
NOTES:  
 1 Shaded Area is Pin 1 Indicator

**PCB Patterns**

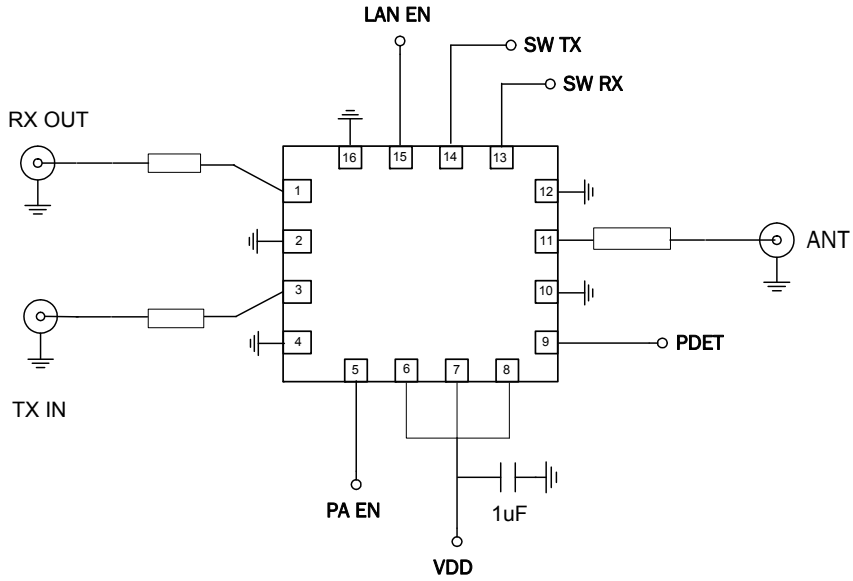


Thermal vias for center slug “B” should be incorporated into the PCB design. The number and size of the thermal vias will depend on the application, the power dissipation, and the electrical requirements. Example of the number and size of vias can be found on the RFMD evaluation board layout.

## Pin Out



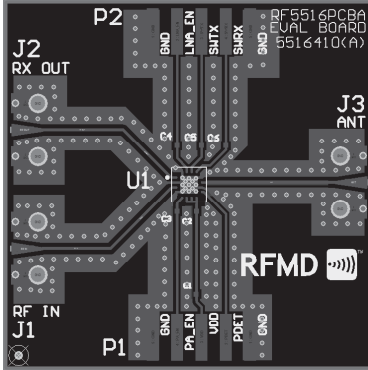
**Application Schematic**



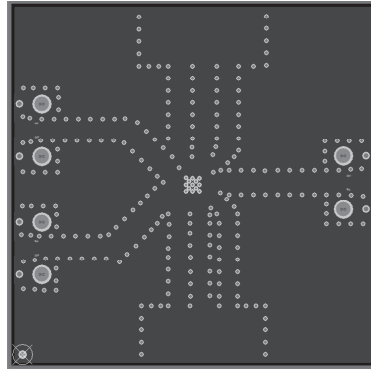
## Evaluation Board Layout

**Board Size 1.5" x 1.5"**  
**Board Thickness 0.044", Board Material RF-4**

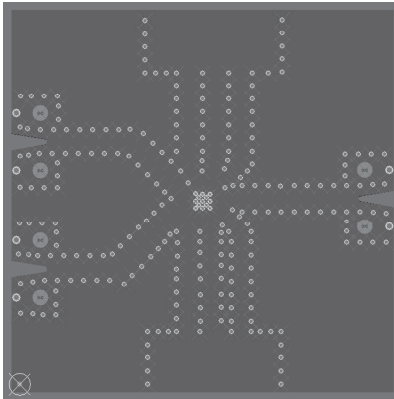
TOP SIGNAL



MID LAYER-1



MID LAYER-2



BOTTOM LAYER

