

RFPA5542

WiFi Integrated PA Module
4.9GHz to 5.925GHz

The RFPA5542 is a three-stage power amplifier (PA) designed for 802.11a/n/ac applications. The integrated input and output 50Ω match greatly reduces the layout area, bill of materials and manufacturability cost in the customer application. The PA is optimized to minimize the required external components to maintain linear performance. The RFPA5542 is manufactured on an advanced InGaP heterojunction bipolar transistor (HBT) process and is capable of achieving linear powers up to 23dBm with an EVM <1.8% while maintaining excellent power added efficiency. The device is provided in a 4.0mm x 4.0mm x 0.90mm package that meets or exceeds the power requirements of IEEE802.11a/n/ac WiFi RF systems.



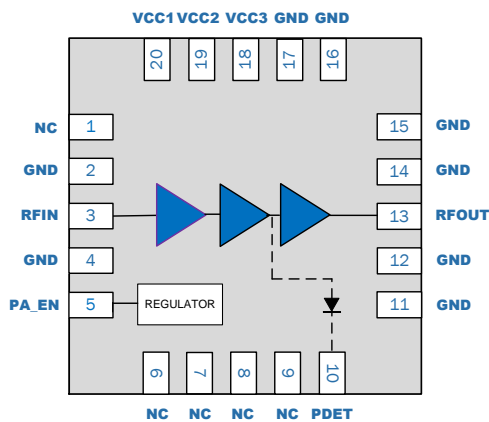
Package: QFN, 20-pin,
4.0mm x 4.0mm x 0.90mm

Features

- P_{OUT} = 23dBm, 5V, 11ac, 80MHz MCS9 at 1.8% EVM
- P_{OUT} = 25dBm, 5V, 11n, 20/40MHz MCS7 at 3% EVM
- Typical Gain = 33dB
- High PAE
- Required external components minimized
- Integrated Regulator
- Input and Output Matched to 50Ω
- Integrated Power Detector

Applications

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



Functional Block Diagram

Ordering Information

RFPA5542SB	Standard 5-piece Sample Bag
RFPA5542SQ	Standard 25-piece Sample Bag
RFPA5542SR	Standard 100-piece Reel
RFPA5542TR13	Standard 2500-piece Reel
RFPA5542PCK-410	Fully Assembled Evaluation Board

Absolute Maximum Ratings

Parameter	Rating	Unit
DC Supply Voltage	-0.5 to +6	V _{DC}
DC Supply Current	1000	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). *R1=0Ω	+10	dBm
Maximum TX Input Power into 10:1 VSWR Load for 11a/n/ac (No Damage). *R1=15Ω	+15	dBm
Junction Temperature	+160	C
Moisture Sensitivity Level (260°C JEDEC J-STD-020)	MSL2	

*Note: For R1 placement, please refer to the applications schematic.



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.

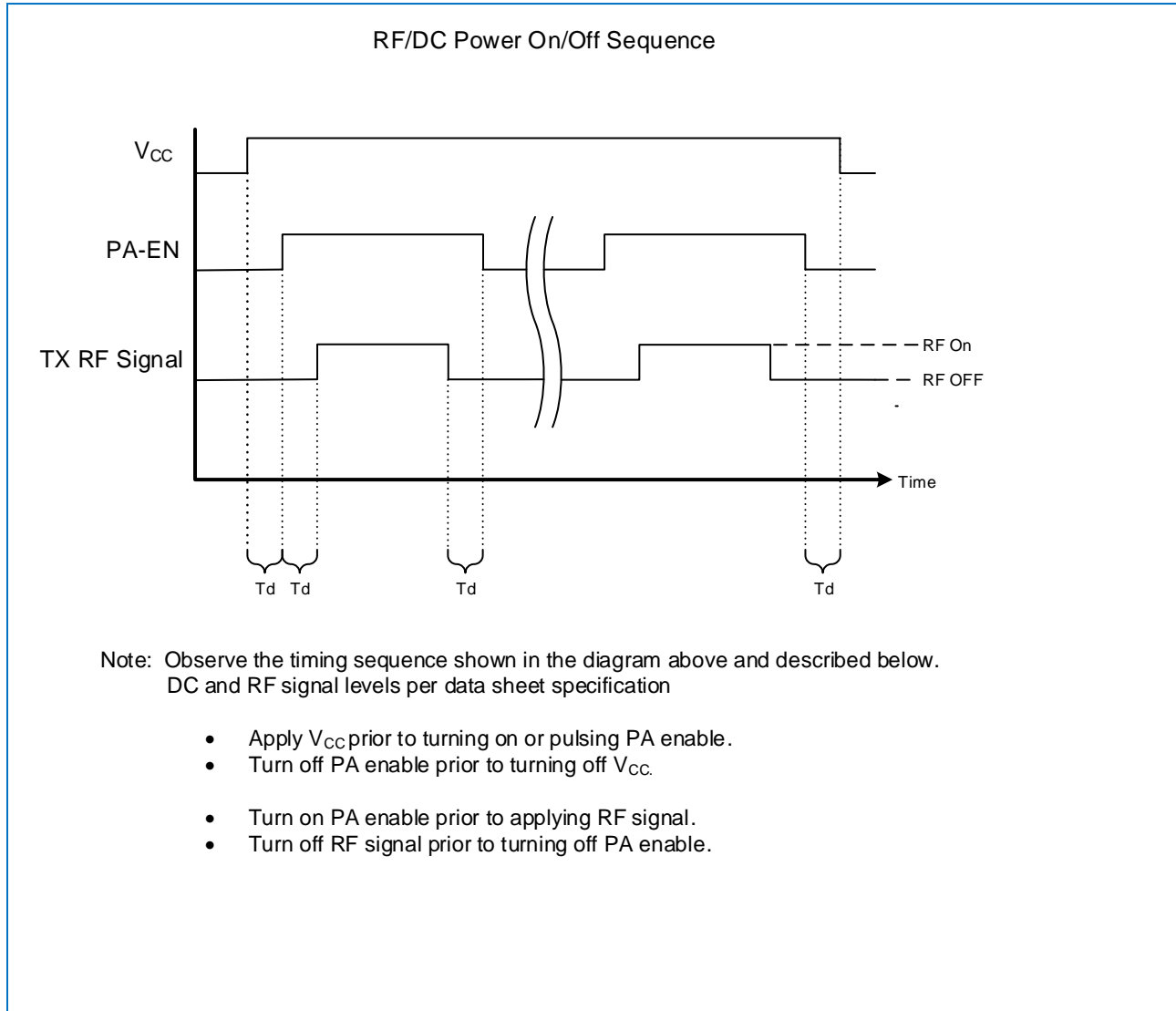
Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical performance or functional operation of the device under Absolute Maximum Rating conditions is not implied. This is an InGaP PA designed for high duty cycle applications with T_j>30°C over ambient.

Nominal Operating Parameters

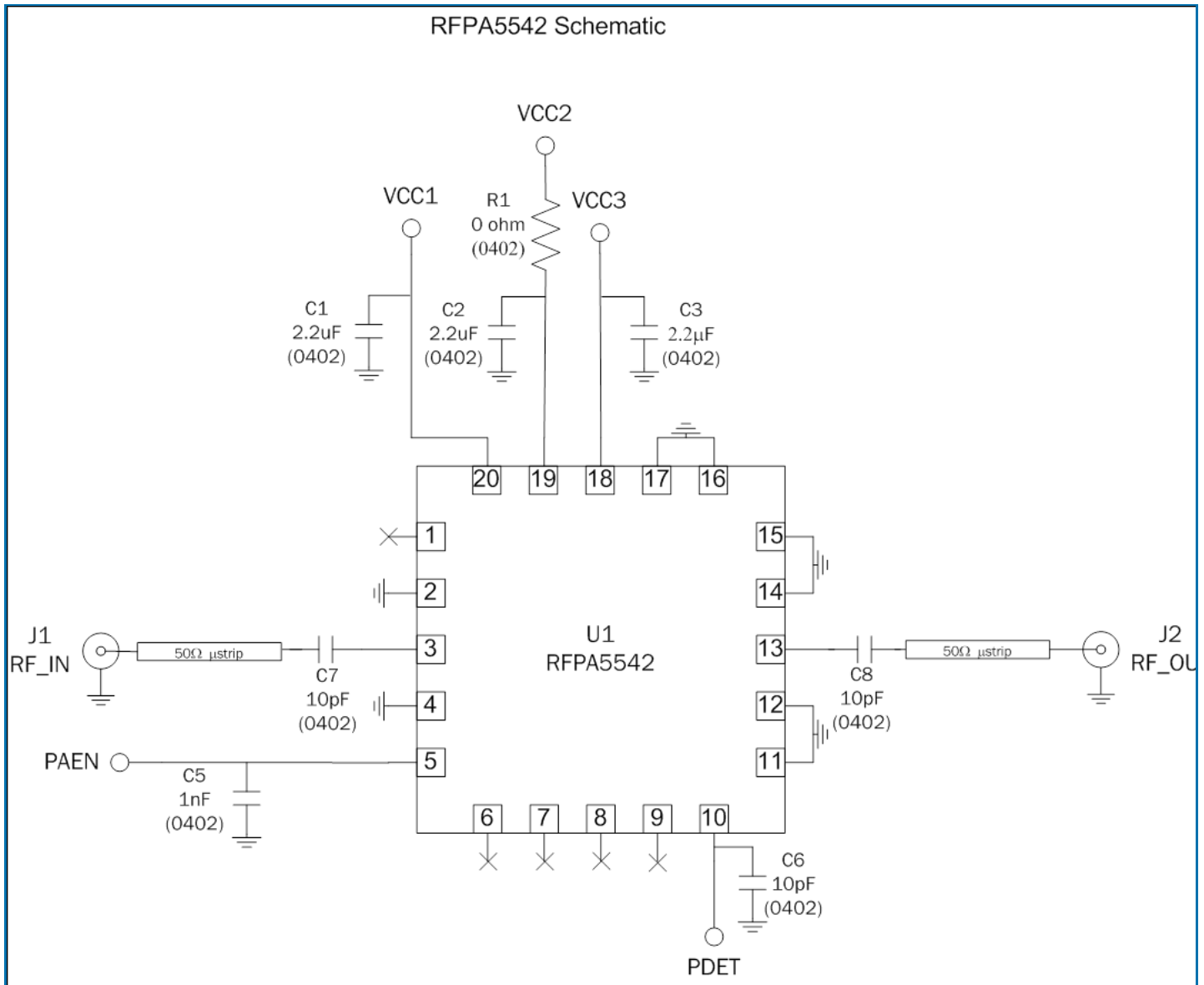
Parameter	Specification			Unit	Condition
	Min	Typ	Max		
Compliance					802.11a/n/ac
Operating Frequency	5.180		5.925	GHz	
Extended Operating Frequency	4.900		5.180	GHz	
Power Supply V _{CC}	4.75	5.00	5.25	V	
PA Enable - High	1.7	3.0	3.3	V	
PA Enable - Low	0		0.5	V	
5V Transmit Performance					T= +25°C, V_{CC}=5.0V, V_{PAEN} = 3.0V, Unless otherwise noted
11ac 80MHz Output Power	22	23		dBm	MCS9 256QAM
11ac 80MHz DEVM		1.5	1.8	%	
		-36.5	-35	dB	
11ac 160MHz Output Power	21	22		dBm	MCS9 256QAM
11ac 160MHz DEVM		1.5	1.8	%	
		-36.5	-35	dB	
11n 20/40MHz Output Power	23.5	25		dBm	MCS7 64QAM
11n 20/40MHz DEVM		2.5	3	%	
		-32.0	-30.5	dB	
Gain	31	33		dB	
Gain Variation over Temp	-2.5		+2.5	dB	Over operating frequency band
Margin to Spectral Mask		3		dB	P _{OUT} =23dBm; MCS0 160MHz
		3		dB	P _{OUT} =25dBm; MCS0 80MHz
		3		dB	P _{OUT} =26dBm; MCS0 40MHz
		3		dB	P _{OUT} =27dBm; MCS0 20MHz
Operating Current		285	310	mA	P _{OUT} =23dBm
		385	430	mA	P _{OUT} =27dBm
Quiescent Current		150	165	mA	RF=Off, T= +25°C, V _{CC} =5.0V, V _{PAEN} = 3.0V,

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
PA Enable Current		1	5	uA	PA_EN High
Leakage Current		0.2	1	uA	RF OFF; V _{CC} =5.0V, V _{PAEN} = 0V
5V Transmit Performance					T= +25°C, V_{CC}=5.0V, V_{PAEN} = 3.0V, Unless otherwise noted
Second Harmonic		-45	-40	dBm/MHz	P _{OUT} = 27dBm, measured with a standard IEEE802.11a 6 Mbps waveform
Third Harmonic		-50	-45	dBm/MHz	P _{OUT} = 27dBm, measured with a standard IEEE802.11a 6 Mbps waveform
OOB Gain		-5		dB	Gain @ 3.3-3.8GHz
		7		dB	Gain @ 7.0GHz
Input Return Loss		12		dB	
Output Return Loss		12		dB	
Power Detector Range		0.25		V	RF=Off
		0.55			P _{OUT} = 22dBm
		0.65		V	P _{OUT} = 23dBm
		0.85		V	P _{OUT} = 27dBm
General Specifications					
Stability					
Output VSWR			4:1		CW signal. No spurious above -41.25dBm/MHz for non-harmonic related signals.
Output Power Range	0		27	dBm	
Output P1dB		33		dBm	CW signal
Ramp ON/OFF time		200		nS	10-90% / 90-10% of gain
Thermal Resistance		25		°C/W	
ESD HBM	1500			V	EIA/JESD22-114A; All pins
ESD CDM	500			V	JESD22-C101C; All pins

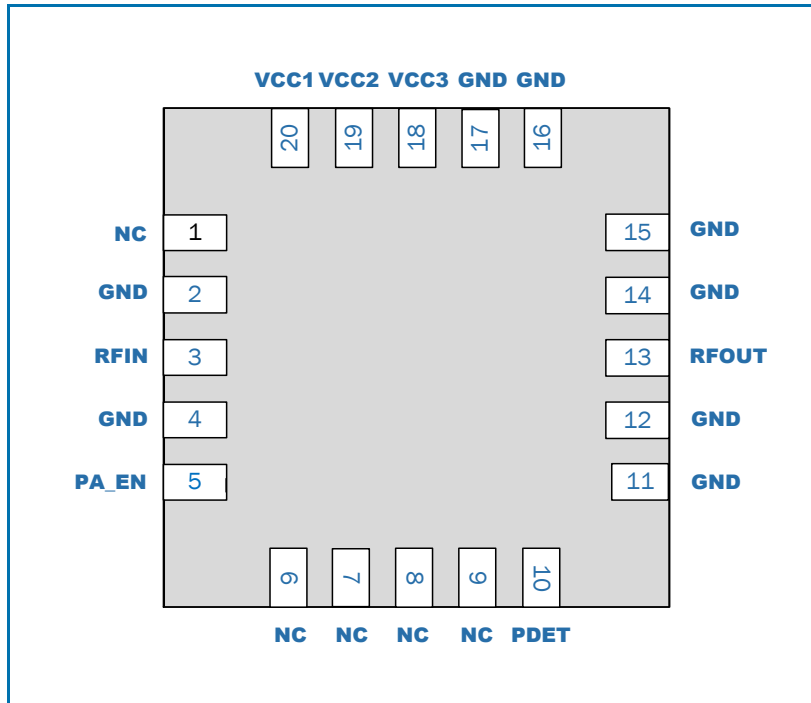
Timing Diagram



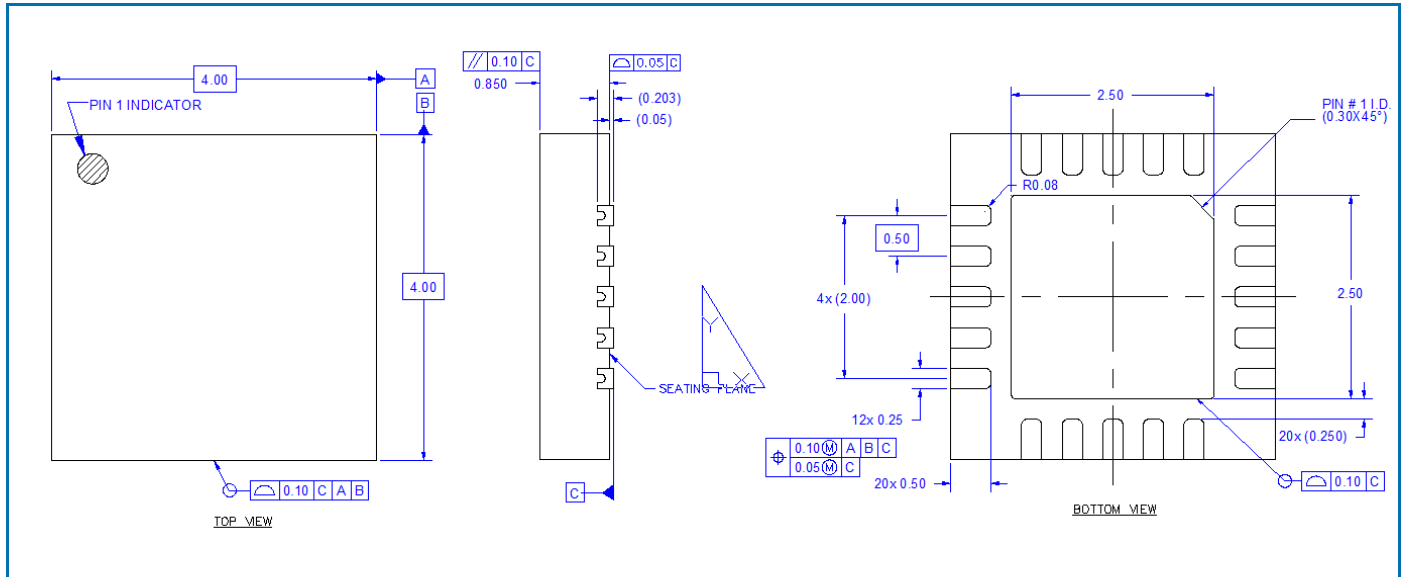
RFPA5542 Applications Schematic



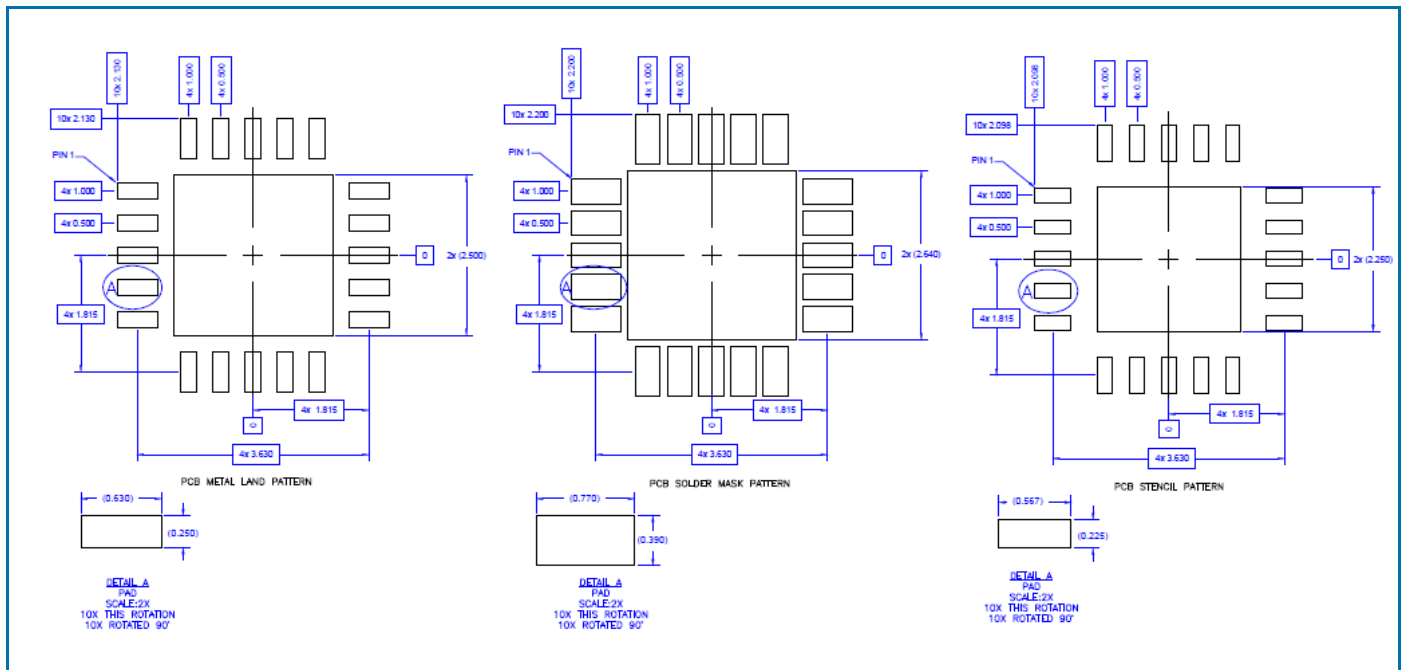
Pin Out



Package Drawing



PCB Patterns



Pin Names and Descriptions

Pin	Name	Description
1	NC	Not connected internally. It may be left floating or connected to ground.
2	GND	Ground connection. This pin is not connected internally and can be left floating or connected to ground.
3	RFIN	RF input, internally matched to 50Ω and DC shorted. External DC blocking capacitor required.
4	GND	Ground connection. This pin is not connected internally and can be left floating or connected to ground.
5	PA_EN	PA Enable pin. Apply <math><0.4V_{DC}</math>. Apply 1.5V _{DC} to V _{CC} to enable PA.
6	NC	Not connected internally. It may be left floating or connected to ground.
7	NC	Not connected internally. It may be left floating or connected to ground.
8	NC	Not connected internally. It may be left floating or connected to ground.
9	NC	Not connected internally. It may be left floating or connected to ground.
10	PDET	Power detector. Provides an output voltage proportional to the RF output power level.
11	GND	Ground connection. This pin is not connected internally and can be left floating or connected to ground.
12	GND	Ground connection. This pin is not connected internally and can be left floating or connected to ground.
13	RFOUT	RF output, internally matched to 50Ω and DC shorted. External DC blocking capacitor required.
14	GND	Ground connection. This pin is not connected internally and can be left floating or connected to ground.
15	GND	Ground connection. This pin is not connected internally and can be left floating or connected to ground.
16	GND	Ground connection. This pin is not connected internally and can be left floating or connected to ground.
17	GND	Ground connection. This pin is not connected internally and can be left floating or connected to ground.
18	VCC3	Third stage supply voltage
19	VCC2	Second stage supply voltage.
20	VCC1	First stage supply voltage.
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.

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