

# RFPA5201E

WiFi Power Amplifier  
5.0V, 2.4GHz to 2.5GHz

The RFPA5201E is an integrated Power Amplifier (PA) designed for high performance WiFi systems requiring up to +29dBm linear output power. The PA is manufactured on an advanced RFMD InGaP Heterojunction Bipolar Transistor (HBT) process for optimal efficiency and linearity (EVM).

The RFPA5201E integrates the power detector, biasing and input/output match which reduces the number of external components and manufacturability cost. The device is mounted on a 14-pin, 7 x 7mm LGA laminate package and meets the RF specifications for 802.11b/g/n systems.



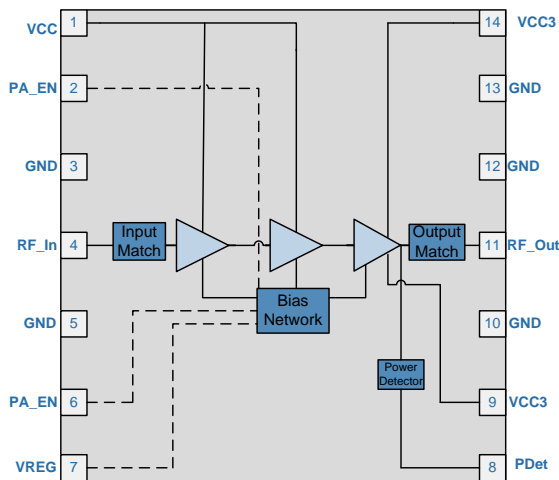
Package: Laminate, 14-pin,  
7.0mm x 7.0mm x 1.0mm

## Features

- $P_{OUT} = 29\text{dBm}$ ; EVM = -30dB  
11n MCS7
- Input and Output Matched  
to  $50\Omega$
- High Gain: 33dB
- Integrated Power Detector
- High Impedance Enable Pin
- High PAE Design

## Applications

- IEEE 802.11b/g/n WiFi Systems
- Customer Premise Equipment (CPE)
- Wireless Access Points, Gateways & Routers
- Microcells



Functional Block Diagram

## Ordering Information

RFPA5201ESB	Standard 5 piece bag
RFPA5201ESQ	Standard 25 piece bag
RFPA5201ESR	Standard 100 piece reel
RFPA5201ETR13	Standard 2500 piece reel
RFPA5201EPCK-410	Fully assembled evaluation board w/5 piece bag

## Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage (RF Applied)	-0.5 to +5.5	V
Supply Voltage (No RF Applied)	-0.5 to +6.0	V
DC Supply Current	1800	mA
Input RF Power with 50W Output Load	10	dBm
Maximum VSWR with no damage	10:1	
Operating Ambient Temperature	-40 to +85	°C
Storage Temperature	-40 to +150	°C
Moisture Sensitivity Level	MSL3	



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.

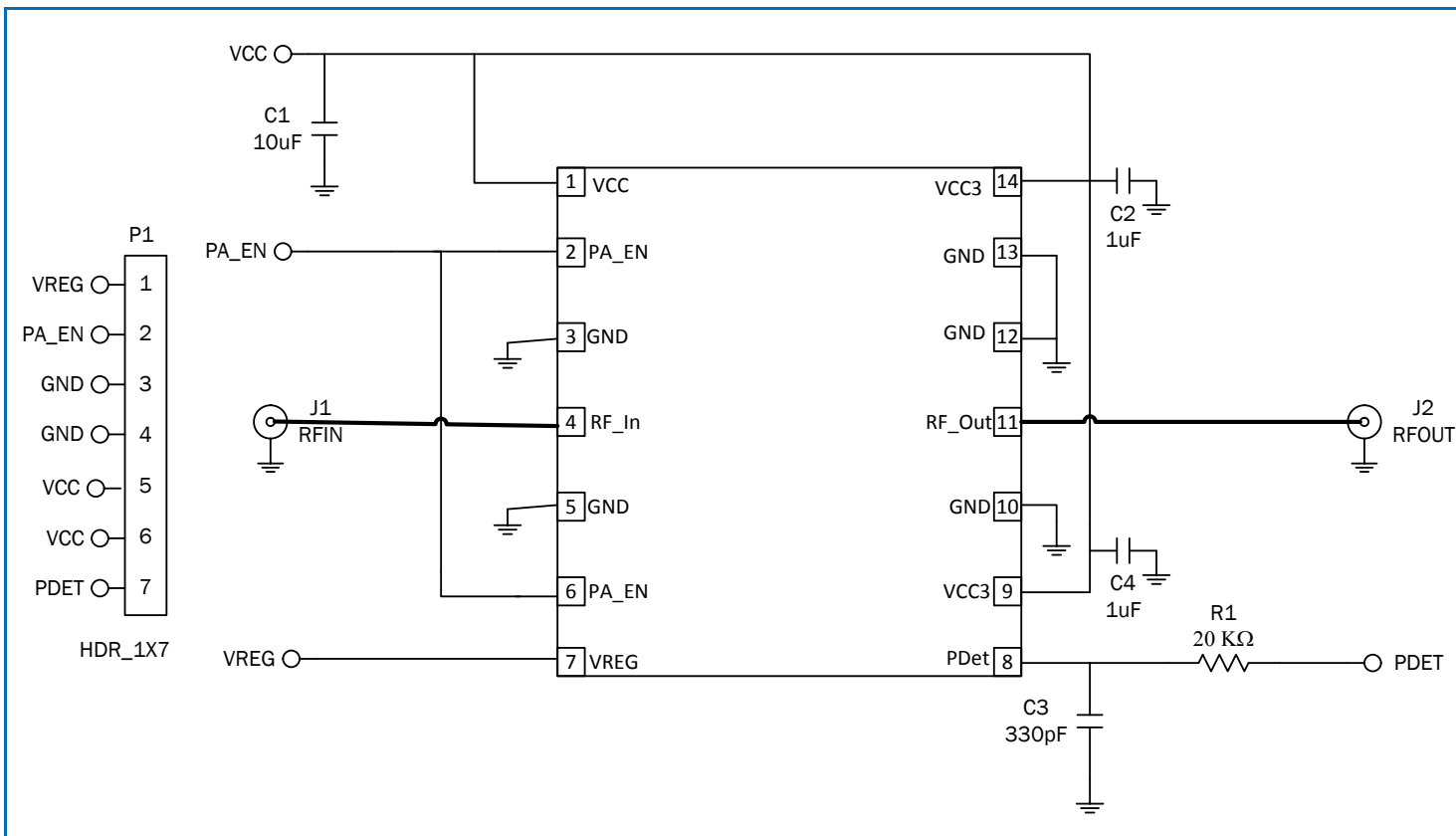
Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical performance or functional operation of the device under Absolute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

## Nominal Operating Parameters

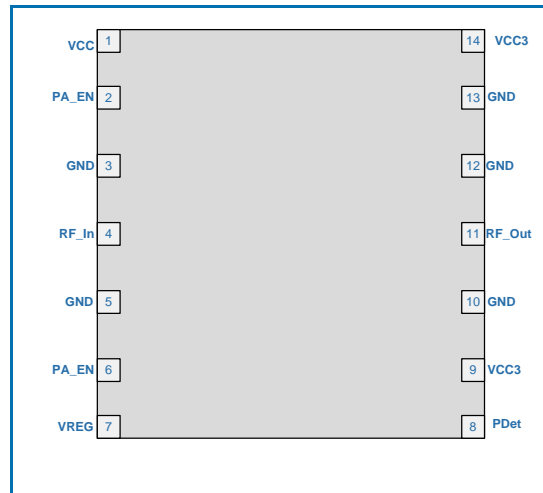
Parameter	Specification			Unit	Condition
	Min	Typ	Max		
<b>Compliance</b>					<b>802.11b/g/n</b>
Operating Frequency	2412		2484	MHz	
Supply Voltage	4.75	5	5.25	V	802.11n HT20 and HT40 MCS7
PA_EN Voltage High	1.75	2.9	5	V	Can be tied to Vreg when using 2.85v min and sources 12mA typ.
PA_EN Voltage Low		0	0.2	V	Turns PA OFF
V <sub>REG</sub> Voltage High	2.85	2.9	3	V	Can be tied to PA_EN. Requires 12mA typ and 2.85V min
V <sub>REG</sub> Voltage Low		0	0.2	V	
<b>Typical Conditions</b>					<b>V<sub>CC</sub> = 5.0V, V<sub>REG</sub> = 2.9V, PA_EN = 2.9V; 11n MCS7 HT20 and HT40, temperature = 25°C, unless otherwise noted</b>
Output Power		29		dBm	802.11n HT20 and HT40 MCS7
11n Dynamic EVM		2.5	3	%	
Second Harmonic		-38	-36	dBm/MHz	At rated P <sub>OUT</sub>
Third Harmonic		-48	-45	dBm/MHz	
Gain	31.5	33.5		dB	
Gain Variation		+/-1		dB	Over 40MHz channel
		+/-2.5		dB	Over temperature of -40°C to +85°C
Power Detect Range	0.1		2.2	V	P <sub>OUT</sub> = 0dBm to 30dBm
Power Detect Voltage	1.8	1.9	2.0	V	At rated P <sub>OUT</sub>
Input Return Loss		-15	-12	dB	In specified frequency band
Output Return Loss		-10	-8	dB	
Operating Current		875	1000	mA	At rated P <sub>OUT</sub>
Quiescent Current		350	425	mA	V <sub>CC</sub> = 5.0, V <sub>REG</sub> = PA_EN = 2.9V and RF = OFF
PAE (Power Added Efficiency)		18.5		%	At rated P <sub>OUT</sub> (PA only)
Power Down Current		16		mA	PA_EN = 0V, V <sub>CC</sub> = 5V, V <sub>REG</sub> = 2.9V
I <sub>REG</sub>		12	15	mA	V <sub>CC</sub> =5V, PA_EN = 2.9V, V <sub>REG</sub> = 2.9V
Leakage Current		0.5	0.7	mA	V <sub>CC</sub> =5V, V <sub>REG</sub> = 0V, PA_EN=0V

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
<b>Typical Conditions (continued)</b>					<b>V<sub>CC</sub> = 5.0V, V<sub>REG</sub> = 2.9V, PA_EN = 2.9V; 11n MCS7 HT20 and HT40, temperature = 25°C, unless otherwise noted</b>
Turn-on time from setting of V <sub>REGS</sub>			1	μsec	Output stable to within 90% of final gain
Turn-off time from setting of V <sub>REGS</sub>			1	μsec	
Stability	-25		33	dBm	No spurs above -47dBm into 4:1 VSWR
Output P1dB		35		dBm	CW signal
Spectral Mask Margin to 802.11n limits		2		dB	P <sub>OUT</sub> = 31dBm; MCS0 HT20
<b>General Performance</b>					
ESD					
Human Body Model	500			V	EIA/JESD22-114A all pins
Charge Device Model	1000			V	JESD22-C101C all pins
Thermal Resistance					
Theta <sub>jc</sub>		13		°C/W	P <sub>OUT</sub> - 29dBm; duty cycle - 90%; V <sub>CC</sub> = 5V; V <sub>REG</sub> = 2.90V; junction to bottom of laminate package; T <sub>REF</sub> = 85°C
Theta <sub>j-ref</sub>		18		°C/W	P <sub>OUT</sub> - 29dBm; duty cycle - 90%; V <sub>CC</sub> = 5V; V <sub>REG</sub> = 2.90V; junction to bottom of PCB; T <sub>REF</sub> = 85°C
Junction Temperature for Long Term Reliability (T <sub>jmax</sub> )		175		°C	P <sub>OUT</sub> - 29dBm; V <sub>CC</sub> = 5V; V <sub>REG</sub> = 2.90V; T <sub>REF</sub> = 85°C

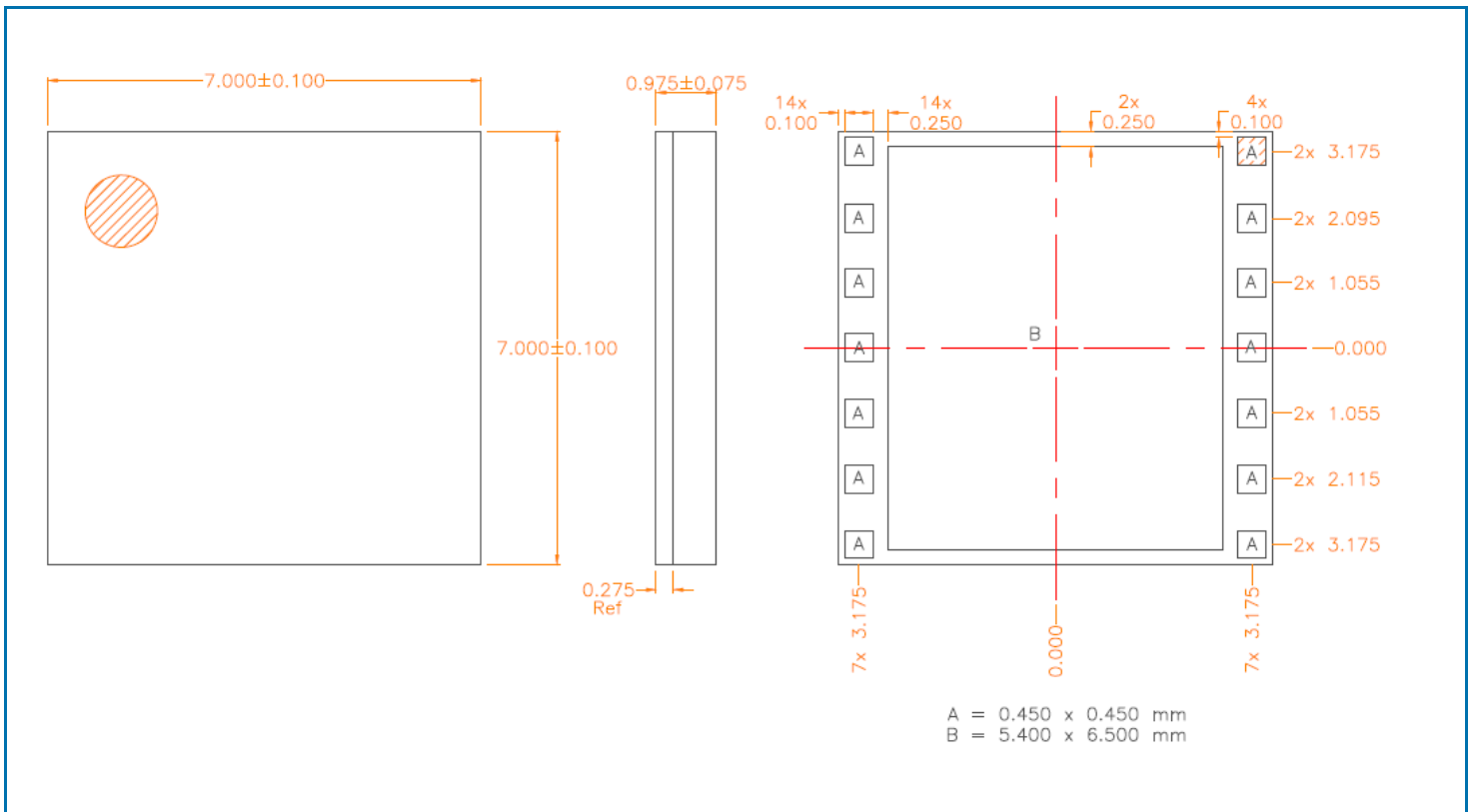
Evaluation Board Schematic



### Pin Out

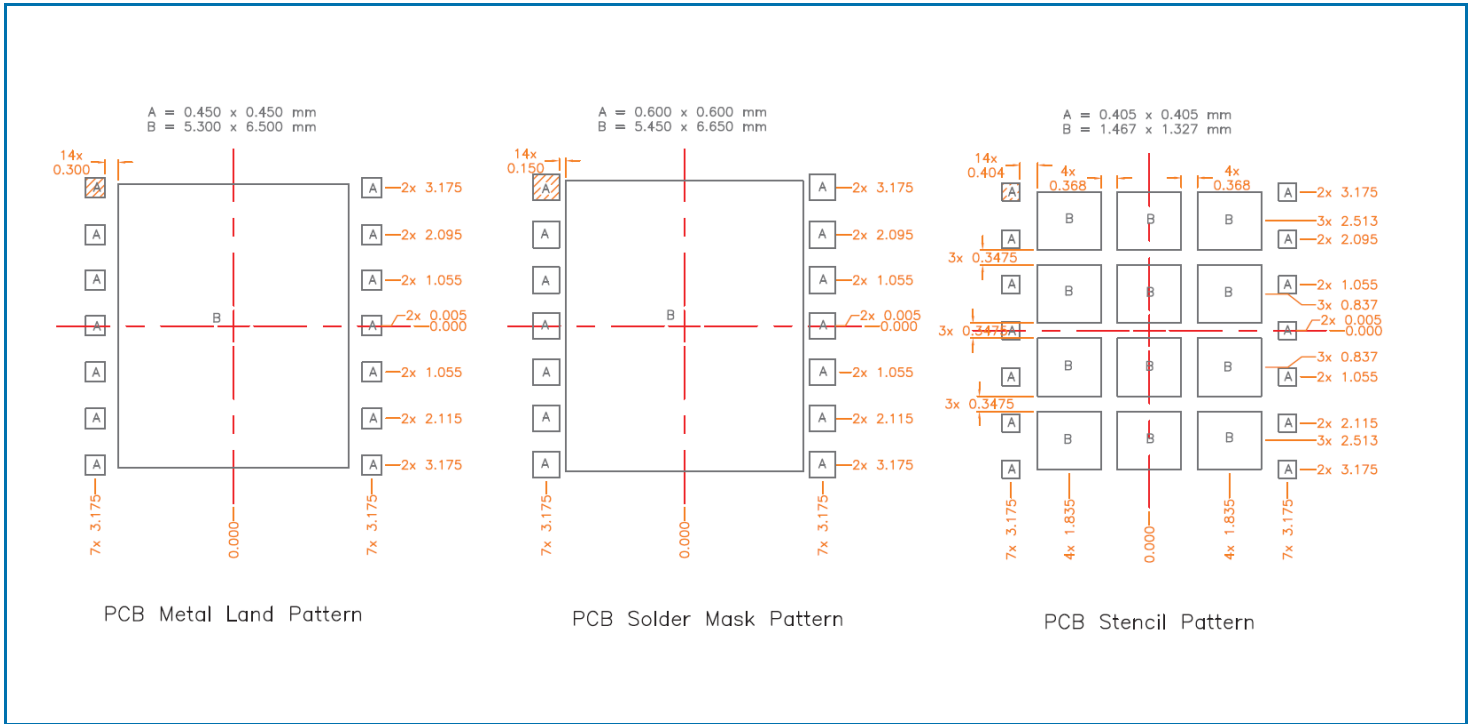


### Package Drawing



- Notes**
1. Shaded area represents Pin 1 location.
  2. Thermal vias for center slug "B" should be incorporated into the PCB design. The number and size of thermal vias will depend on the application. Example of the number and size of vias can be found on the RFMD evaluation board layout.

PCB Pattern



Notes

1. Shaded area represents Pin 1 location.

## Pin Names and Descriptions

Pin	Name	Description
1	VCC	This pin is connected internally to the collectors of RF device. To achieve specified performance, the layout of the pin should match the Recommended Land Pattern.
2	PA_EN	High Impedance enable pin, Apply < 0.6VDC to power down the PA. Apply 1.75VDC to 5VDC to enable the PA.
3	GND	Ground connection.
4	RF_IN	RF input, is internally matched to 50Ω. DC Blocked
5	GND	Ground connection.
6	PA_EN	High Impedance enable pin, Apply < 0.6VDC to power down the PA. Apply 1.75VDC to 5VDC to enable the PA.
7	VREG	PA bias voltage. This pin requires regulated supply for best performance.
8	PDET	Power detector provides an output voltage proportional to the RF output power level.
9	VCC3	This pin is connected internally to the collectors of RF device. To achieve specified performance, the layout of the pin should match the Recommended Land Pattern
10	GND	Ground connection.
11	RFOUT	RF output. Internally matched to 50Ω and DC Blocked
12	GND	Ground connection.
13	GND	Ground connection.
14	VCC3	This pin is connected internally to the collectors of RF device. To achieve specified performance, the layout of the pin should match the Recommended Land Pattern
Pkg Base	GND	Ground connection. The back side of the package should be connected to the ground plane through as short connection as possible, e.g., PCB vias under the device are recommended.