RFPA5552

Wi-Fi Power Amplifier

Product Overview

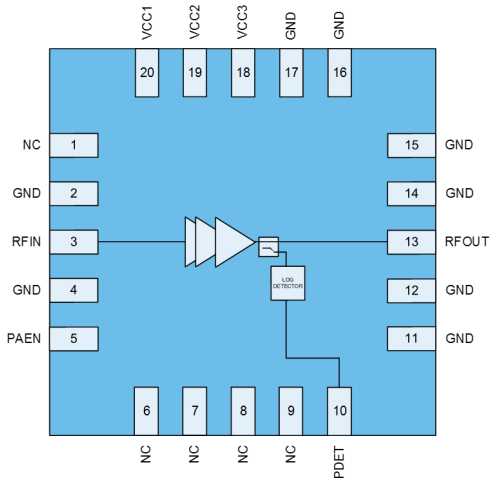
The Qorvo® RFPA5552 is a three-stage power amplifier (PA) designed for Wi-Fi 5 (802.11ac) systems. The compact form factor and integrated matching minimizes layout area in the application and greatly reduces the number of external components.

Performance is focused on optimizing the PA for a 3.3V supply voltage that conserves power consumption while maintaining the highest linear output power and leading edge throughput.

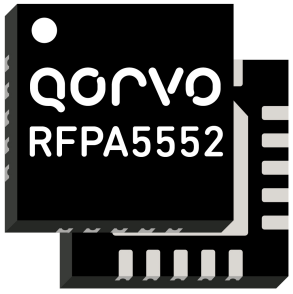
A key feature is the integration of a DC power detector with logarithmic feedback across power which enables power control to lower powers and enables the possibility to calibrate against a constant slope for applications which use higher gain antennas or end users wanting to reduce device calibration time in production.

The RFPA5552 integrates a 5GHz power amplifier (PA), regulator and power detector into a single device.

Functional Block Diagram



Top View



20 Pin 4x4 mm QFN Package

Key Features

- 4900 – 5925 MHz
- P_{OUT} = +15 dBm MCS11 HE80 -43 dB Dynamic EVM
- P_{OUT} = +21 dBm MCS9 VHT80 -35 dB Dynamic EVM
- P_{OUT} = +22 dBm MCS7 HT20/40 -30 dB Dynamic EVM
- P_{OUT} = +24 dBm MCS0 HT20 Spectral Mask Compliance
- Optimized for +3.3 V Operation
- 32 dB Tx Gain
- Low Power Consumption ~0.9W at +21dBm
- Integrated DC Logarithmic Power Detector
- Input and Output Matched to 50Ω

Applications

- Access Points
- Wireless Routers
- Residential Gateways
- Customer Premise Equipment
- Internet of Things

Ordering Information

Part Number	Description
RFPA5552SB	Sample bag with 5 pieces
RFPA5552SQ	Sample bag with 25 pieces
RFPA5552SR	7” reel with 100 pieces
RFPA5552TR13	13” reel with 2,500 pieces
RFPA5552PCK-410	Assembled Evaluation Board

Absolute Maximum Ratings

Parameter	Conditions	Rating
DC Supply Voltage		-0.5 to +6 V
Control Voltage	PAEN	-0.5 to +6 V
Storage Temperature		-40 to 150 °C
Junction Temperature	MTTF > 1.5x10^6 hours	160 °C
	MTTF > 1.0x10^6 hours	170 °C
RF Input Power at RFIN	Into 50 Ω Load for 802.11a/n/ac/ax (No Damage)	+10 dBm

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. This is an InGaP device designed for high duty cycle applications with Tj>30 °C over ambient.

For R1 placement, refer to Evaluation Board Schematic

Recommended Operating Conditions

Parameter	Min.	Typ.	Max.	Units
Operating Frequency	5180		5925	MHz
Extended Operating Frequency	4900		5925	MHz
Device Voltage (V_{CC})	+3	+3.3	+3.6	V
Control Voltage – High	+2.8	+3.1	V_{CC}	V
Control Voltage - Low	0		+0.2	V
$T_{OPERATING}$ *	-40		+85	°C

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions. * $T_{OPERATING}$ is temperature at package ground.

Electrical Specifications

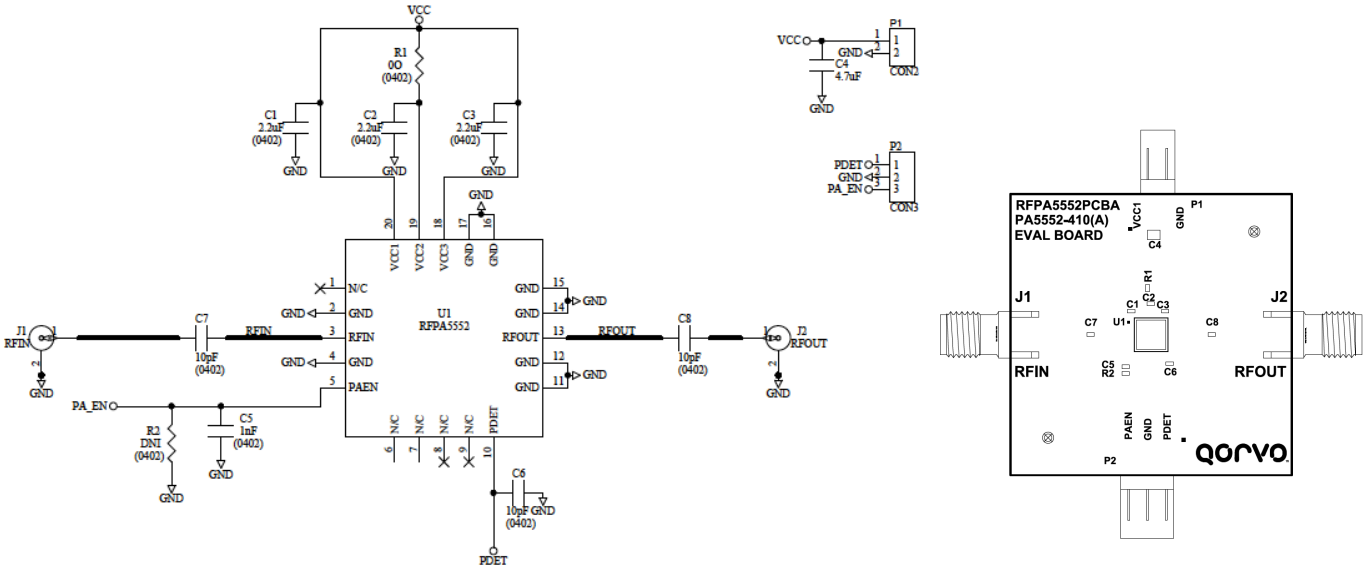
Parameter	Conditions	Min.	Typ.	Max.	Units
Transmit (RFIN-RFOUT) Mode	**Unless otherwise noted: V_{CC}=5V, T=+25ºC, PA_EN=High**				
Wi-Fi 6 HE80 Output Power	MCS11 1024QAM 11ax		15		dBm
Dynamic EVM				-43	dB
Wi-Fi 5 VHT160 Output Power	MCS9 256QAM 11ac		20		dBm
Dynamic EVM				-35	dB
Wi-Fi 5 VHT80 Output Power	MCS9 256QAM 11ac	20	21		dBm
Dynamic EVM				-35	dB
Wi-Fi 4 HT20/40 Output Power	MCS7 64QAM 11n	20.5	22		dBm
Dynamic EVM				-30	dB
Margin to VHT160 Spectral Mask POUT = +27 dBm, 11n MCS0 5 dBc	P_{OUT} = +21 dBm, 11ac MCS0	0	5		dBc
Margin to VHT80 Spectral Mask	P_{OUT} = +23 dBm, 11ac MCS0	0	5		dBc
Margin to HT20 Spectral Mask	P_{OUT} = +24 dBm, 11n MCS0	0	6		dBc
Gain		30	32		dB
Gain Variation	T= -40 to +85 °C	-2.5		+2.5	dB
Out of Band Gain	*f* = 3300-3800MHz		-10	-5	dB

Parameter	Conditions	Min.	Typ.	Max.	Units
	f > 7000MHz			12	dB
RFIN Port Return Loss			12		dB
RFOUT Port Return Loss			8		dB
Quiescent Current	RF Off		150		mA
	P_{OUT} = +21 dBm		275	340	mA
	P_{OUT} = +24 dBm		350	400	mA
2nd Harmonics	P_{OUT} = +24 dBm 802.11a 6 MBps		-42	-35	dBm/MHz
3rd Harmonics	P_{OUT} = +24 dBm 802.11a 6 MBps		-42	-35	dBm/MHz
DC Power Detect Voltage	RF Off		0.23		V
	P_{OUT} = 0 dBm		0.28		V
	P_{OUT} = +24 dBm		0.76		V
DC Power Detector Slope	P_{OUT} = 0 to +24 dBm		20		mV/dB
GENERAL SPECIFICATIONS	**Unless otherwise noted: V_{CC}=5V, T=+25ºC**				
Control Current - High			1	5	µA
Leakage Current	RF Off. V_{PAEN} = 0V		0.2	10	µA
TX Output P_{1dB}	CW		+30		dBm
Ramp ON/OFF Time	10<->90% Ref from Control Voltage to RF Power		200		nS
PA Stability - Output VSWR	CW No Spurious above -41.25 dBm/MHz		6:1		
Output Power Range		0		24	dBm
Thermal Resistance, θ_{jc}	Junction to Case		27		°C/W

Logic Truth Table

Mode	PA_EN
Transmit	High
Idle	Low

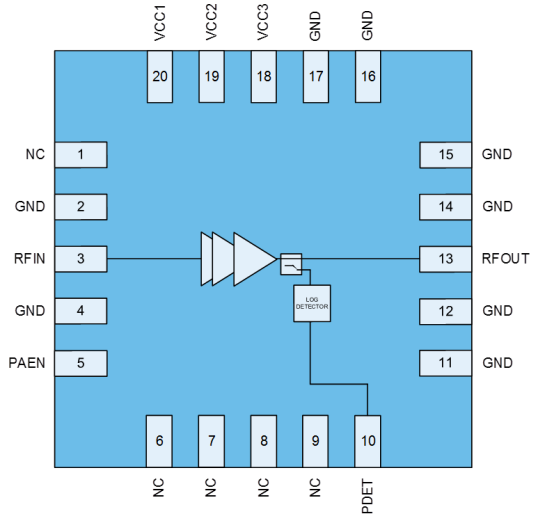
Evaluation Board Schematic and Layout



Bill of Material

Ref. Des.	Value	Description	Manuf.	Part number
-	-	Printed Circuit Board		
U1	-	5GHz Wi-Fi Power Amplifier	Qorvo	RFPA5552
C6, C7, C8	10 pF	Capacitor, Chip, 5%, 50V, C0G, 0402	Murata	GRM1555C1H100JA01D
C5	1000 pF	Capacitor, Chip, 10%, 50V, X7R, 0402	Murata	GRM155R71H102KA01D
C1, C2, C3	2.2 µF	Capacitor, Chip, 10%, 6.3V, X5R, 0402	Taiyo Yuden	RM JMK105BJ225KV-F
C4	4.7 µF	Capacitor, Chip, +80/-20%, 10V, Y5V, 0805	Taiyo Yuden	CE LMK212 F475ZG-T
R1	0 Ω	Resistor, Chip, 5%, 1/10W, 0402	Kamaya	RMC1/16SJPTH
R2	-	Do Not Install		

Pin Configuration and Description

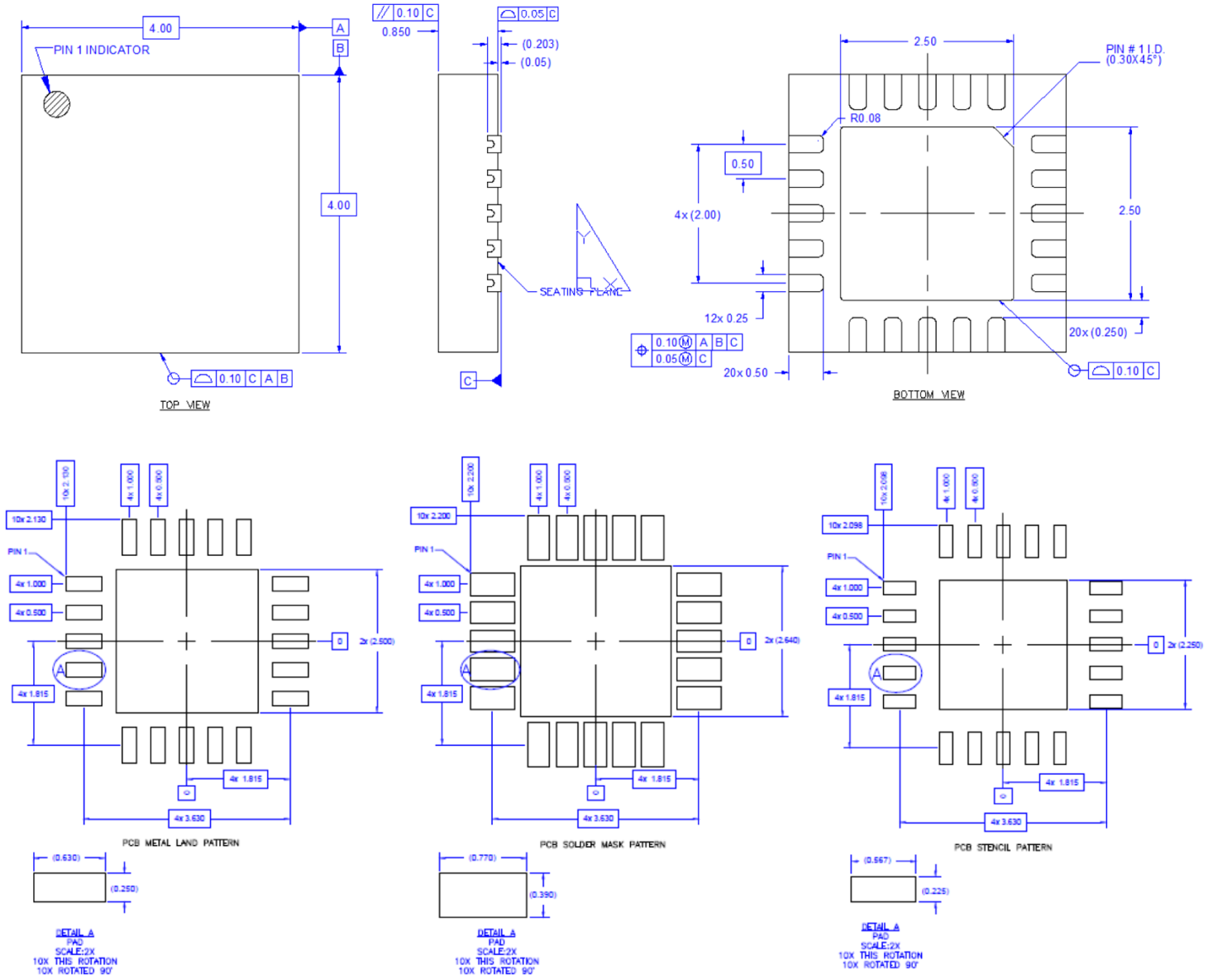


Top View

Pin Number	Label	Description
1	NC	No electrical connection.
2	GND	Ground connection.
3	RFIN	RF input. Internally matched to 50 Ω and DC Shorted. External DC blocking capacitor required.
4	GND	Ground connection.
5	PA_EN	Input enable bias voltage (regulated internally.)
6	NC	No electrical connection.
7	NC	No electrical connection.
8	NC	No electrical connection.
9	NC	No electrical connection.
10	PDET	DC power detector. Provides an output voltage proportional to the RF output power level
11	GND	Ground connection.
12	GND	Ground connection.
13	RFOUT	RF output. Internally matched to 50 Ω and DC shorted. External DC blocking capacitor required.
14	GND	Ground connection.
15	GND	Ground connection.
16	GND	Ground connection.
17	GND	Ground connection.
18	VCC3	3rd stage supply voltage
19	VCC2	2nd stage supply voltage
20	VCC1	1st stage supply voltage
Backside Paddle	GND	RF/DC ground. Use recommended via pattern to minimize inductance and thermal resistance. See PCB Mounting Pattern for suggested footprint.

Mechanical Information

Dimensions and PCB Mounting Pattern



Notes:
1. All dimensions are in miilimeters. Angles are in degrees.
2. Dimension and tolerance formats conform to ASME Y14.4M-1994.
3. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 2 (2kV)	ANSI/ESD/JEDEC JS-001
ESD – Charged Device Model (CDM)	Class C3 (500V)	JESD22-C101
MSL – Moisture Sensitivity Level	Level 2	IPC/JEDEC J-STD-020

Caution!

ESD sensitive device

Solderability

Compatible with both lead-free (260 °C max. reflow temperature) and tin/lead (245 °C max. reflow temperature) soldering processes.

Package lead plating: NiPdAu

RoHS Compliance

This part is compliant with the 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment), as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_40_2$) Free
- SVHC Free

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

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