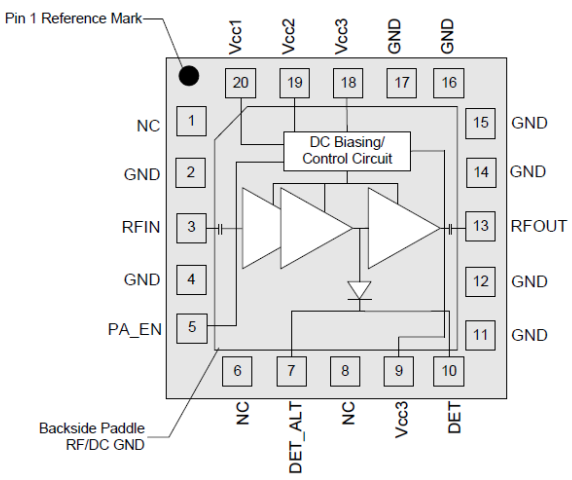
QPA5525Q

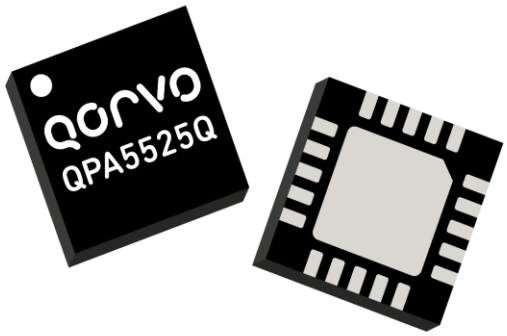
802.11ac/p Power amplifier

The QPA5525Q is power amplifier module containing an internally matched 3-stage PA, compensated DC biasing circuit and output power detector. This PA module provides high gain (32 dB), high linearity, industry leading EVM floor, and excellent spectral purity for 802.11p applications.

The QPA5525Q features chipset logic compatible control voltages and buffered PA enable pin (PAEN) all of which draw very low current to facilitate ease of use and compatibility with current and future transceiver generations. The QPA5525Q is assembled in a small footprint 4.0 x 4.0 x 0.85 mm 20-pin QFN package.



Functional Block Diagram



Package: QFN, 20-pin,
4mm x 4mm x 0.85mm

Features

- Tested in accordance with AEC-Q100 Grade 2
- Internally Matched Input/Output
- High Gain = 32dB
- Integrated CMOS Compatible Logic and Shutdown
- Supply Voltage: +3.15 V to +5.25 V
- Typ. P_{OUT} = +26 dBm, Class C Spectral Mask 802.11p

  Leadless 4.0 x 4.0 x 0.85 mm Pb-Free QFN Package

Applications

- 802.11ac/p Systems
- Automotive WiFi

Ordering Information

QPA5525QSB	Standard 5-piece Sample Bag
QPA5525QSQ	Standard 25-piece Sample Bag
QPA5525QSR	Standard 100-piece Reel
QPA5525QTR7	Standard 750-piece Reel
QPA5525QTR13	Standard 2500-piece Reel
QPA5525QPCK401	Fully Assembled Evaluation Board + 5-piece Sample Bag

Absolute Maximum Ratings

Parameter	Rating	Unit
DC Supply Voltage (No RF applied)	+6.0	V_{DC}
Operating Ambient Temperature	-40 to +105	ºC
Storage Temperature	-40 to +150	ºC
Maximum TX Input Power into 50Ω Load, CW, T= 25°C	+5	dBm

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.

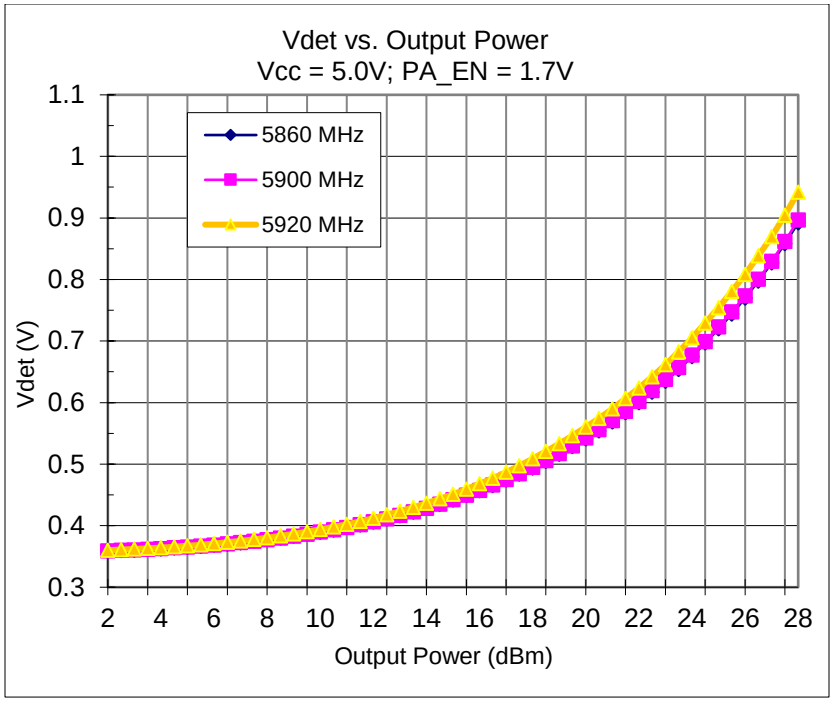
Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical performance or functional operation of the device under Absolute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

Nominal Operating Parameters

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
Compliance					**IEEE802.11a/n/ac/p**
Operating Frequency	5.15		5.925	GHz	
Operating Ambient Temperature	-40	25	+105	ºC	
Power Supply V_{CC}[1]	3.15	5.0	5.25	V	Vcc1 = Vcc2 = Vcc3
Tj (for >10^6 hours MTTF)			+170	ºC	
Transmit Performance					**T=+25ºC, V_{CC}= 5V, PA_EN = 1.7V; Unless otherwise noted**
11p Linear output Power		+26		dBm	802.11p, 5900MHz, 10MHz BW, M7, 27Mbps, 64QAM, 50% DC
11p DEVM		2.8	4.0	%	
		-31	-28	dB	
11ac Linear output Power		+24		dBm	802.11ac MCS9, 80MHz BW, 50% DC
11ac DEVM		1.3	2.0	%	
		-38	-34	dB	
Operational Current		640	750	mA	26dBm, 802.11p, 10MHz BW, M7, 50% DC
		545	675	mA	24dBm, 802.11ac, 80MHz BW, MCS9, 100% DC
Input Return Loss		10		dB	
Output Port Return Loss		10		dB	
2nd Harmonics @ 27.5dBm		-45		dBm/MHz	Pout = 27.5dBm, measured with a standard IEEE 802.11p waveform
3rd Harmonics @ 27.5dBm		-45		dBm/MHz	Pout = 27.5dBm, measured with a standard IEEE 802.11p waveform
Small Signal Gain	29	32	36	dB	
OP1dB		+31		dBm	Measured with CW
OIP3		+36		dBm	Pout = +12dBm/Tone, 1 MHz spacing, f0 = 5860 MHz
Power Detector Voltage		+0.37		V	No RF
		+0.69			Pout = +24dBm, Fo = 5855 MHz
Spectral Emission Mask Margin relative to IEEE 802.11p standard (Class C)	0	-2		dB	5900MHz, 10 MHz BW, M0; Pout=26dBm @ +25C

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
General Specifications					**T=+25ºC, V_{CC}= 5V, Unless otherwise noted**
Quiescent Current		350		mA	
TX Shutdown Current		10		µA	PA_EN = Low, No RF
PA Enable Current		20		µA	
PA Enable Voltage – High State	1.7	3.0	V**cc1**	V	
PA Enable Voltage – Low State		0.00	0.45	V	
Switch Speed		400		nS	
Thermal Resistance, θjb		20.22		ºC/W	Junction to Board

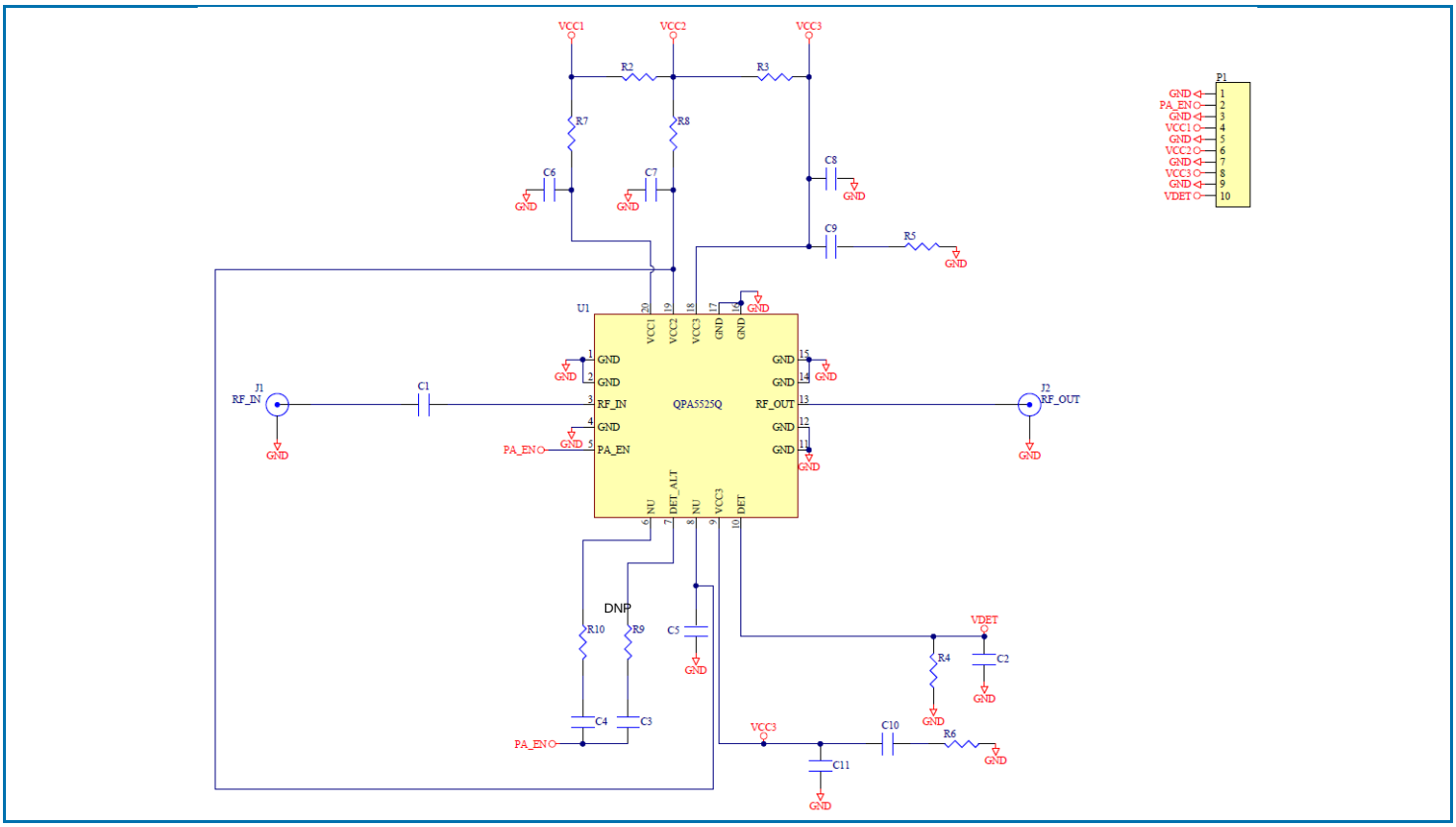
[1] RF performance degrades as Vcc is lowered <5.0V



Control Logic Truth Table

PA Mode	PA_EN
Disabled	Low
Enabled	High

Applications Schematic

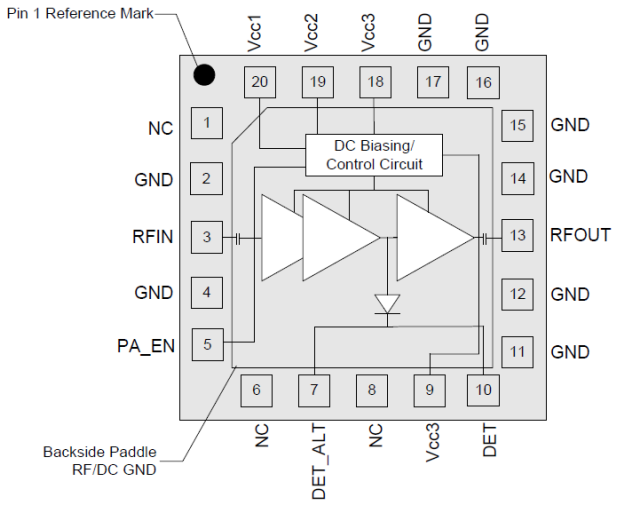


Bill of Material

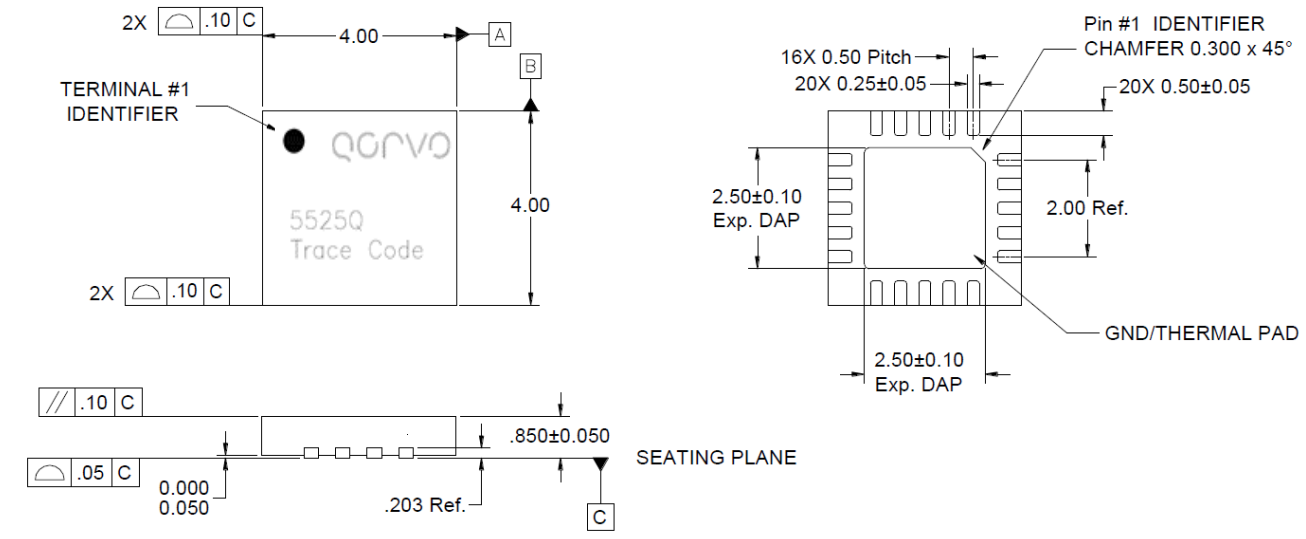
Material#	Rev	Qty	Ref Des	Description
QPA5525QSB	B	1	U1	5GHz High Power PA
284511	A	1		PCB, QPA5525Q
1099541		1		PCB, WLAN PA
21714		3	C2,C9,C10	CAP, 220pF, 10%, 50V, X7R, 0402
21730		2	C6,C7	CAP, 0.1uF, 10%, 10V, X5R, 0402
264344		1	C1	CAP, 10pF, 5%, 50V, CG, 0402
278575	A	2	C8,C11	CAP, 10uF, 20%, 10V, STD, 0603
010-0405-02R0LF		2	R5,R6	Res0402 2 ohm ROHS
1067980		1	R4	863000-027 RES0402 27.4K 1PCT 1/16W
21592		3	R2,R3,R8	RES, 0 OHM, 5%, 1/10W, 0402
43268		1	R7	RES, 27 OHM, 5%, 1/16W, 0402
23674		1	P1	CONN, HDR, ST, PLRZD, 10-PIN, 0.100"
46006		2	J1,J2	CONN, SMA, END LNCH, RND, 0.062"
1069007		1	HS1	452500-001 FAB. BLOCK, MOUNTING
1068796		4		850000-703 WASHER. FLAT. #2. SMALL. SS
1069247		4		860000-597 SCREW. MCH. PAN. XR. 2-56. 0.
1069257		4		034031-000 WASHER. SPLIT. #2. MEDIUM. SS
4XXX1		3	C3,C4,C5	NOT POPULATED ITEM-1
4XXX2		2	R9,R10	NOT POPULATED ITEM-2

Each EVB is shipped with a heat sink mounted to backside of PCB.

Pin Out

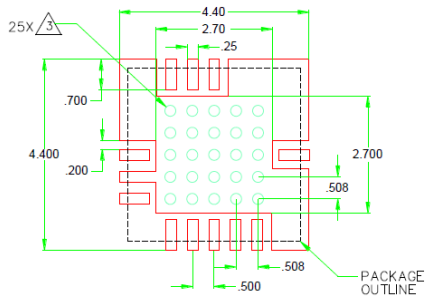


Package Drawing

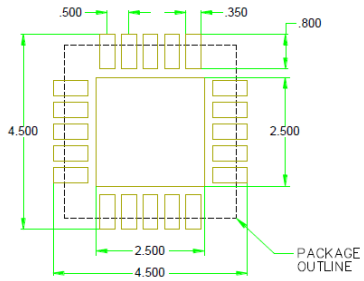


Notes:
1. All dimensions are in millimeters.
2. Contact plating: NiPdAu.

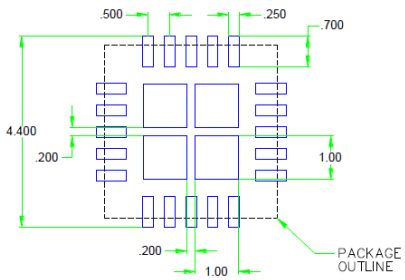
PCB Patterns



BOARD METAL & VIA PATTERN
TOP VIEW



SOLDER MASK
TOP VIEW



STENCIL APERATURE
TOP VIEW (NOTE 4)

Notes:

1. All dimensions are in millimeters. Angles are in degrees.
2. Use 1 oz. copper minimum for top and bottom layer metal.
3. Vias are required under the backside paddle of this device for proper RF/DC grounding and thermal dissipation. We recommend a 0.35mm (#80/.0135") diameter bit for drilling via holes and a final plated thru diameter of 0.25 mm (0.10”).
4. Ensure good package backside paddle solder attach for reliable operation and best electrical performance.

Pin Names and Descriptions

Pin	Name	Description
1	NC	No internal connection. This pin can be grounded or N/C on PCB.
2	GND	Ground
3	RF_IN	RF Input
4	GND	Ground
5	PA_EN	PA Enable
6	NC	No internal connection. This pin can be grounded or N/C on PCB.
7	DET_ALT	Alternate Detector Output
8	NC	No internal connection. This pin can be grounded or N/C on PCB.
9	VCC3	Supply voltage for third stage PA
10	DET	Detector Output
11	GND	Ground
12	GND	Ground
13	RF_OUT	RF Output
14	GND	Ground
15	GND	Ground
16	GND	Ground
17	GND	Ground
18	VCC3	Supply voltage for third stage PA
19	VCC2	Supply voltage for second stage PA
20	VCC1	Supply voltage for first stage PA
Backside Paddle	RF/DC GND	FEM RF/DC ground. Use recommended via pattern to minimize inductance and thermal resistance. See PCB Mounting Pattern for suggested footprint.

Product Compliance Information

ESD Sensitivity Ratings

Caution! ESD-Sensitive Device

ESD Rating:	Class 1B
Value:	Passes ≥ 500 V to < 1000V
Test:	Human Body Model (HBM)
Standard:	JEDEC Standard JESD22-A114

ESD Rating:	Class C2
Value:	Passes ≥ 500 V to <1000V Test: Charged Device Model (CDM)
Standard:	JEDEC Standard JESD22-C101

MSL Rating

MSL Rating:	Level 2
Test:	260°C convection reflow
Standard:	JEDEC Standard IPC/JEDEC J-STD-020

Solderability

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

Package contact plating: NiPdAu

This part is compliant with EU 2002/95/EC RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).

RoHs Compliance

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Free
- SVHC Free

Contact Information

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

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