APPLICATION NOTE

Classification | PRIVATE

QPA9501 - 4.8-5.0GHz Reference Design

Product Overview

The QPA9501 is high power amplifier module containing an internally matched 3-stage PA, compensated DC biasing circuit and output power detector. This PA module is optimized for the WiFi bands from 5.1-5.9GHz and hence well suited for LTE-U/LAA applications. It provides high gain (32 dB) and -47dBc ACLR at Pout of 22dBm with a 20MHz LTE signal without any DPD.

The QPA9501 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. With its optimized power dissipation, this amplifier module is well suited for implementation into next generation MIMO configurations and well designed to work with or without digital pre-distortion (DPD).

The QPA9501 is assembled in a small footprint 4.0 x 4.0 x 0.85 mm 20-pin QFN package.

Referenced Documents

The reference documents below take precedence over the contents of this application note, and should always be consulted for the latest information.

QPA9501 Data Sheet.

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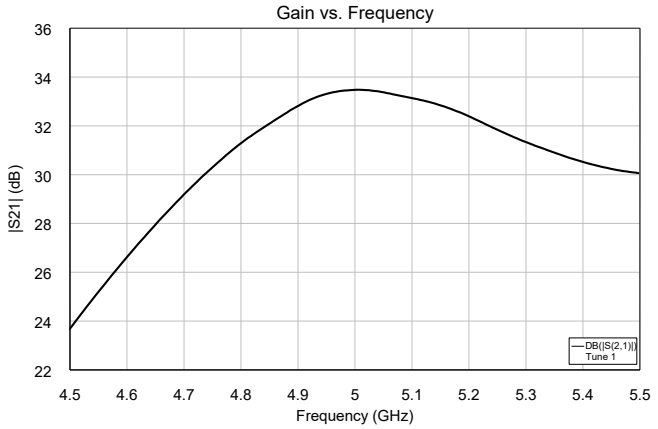
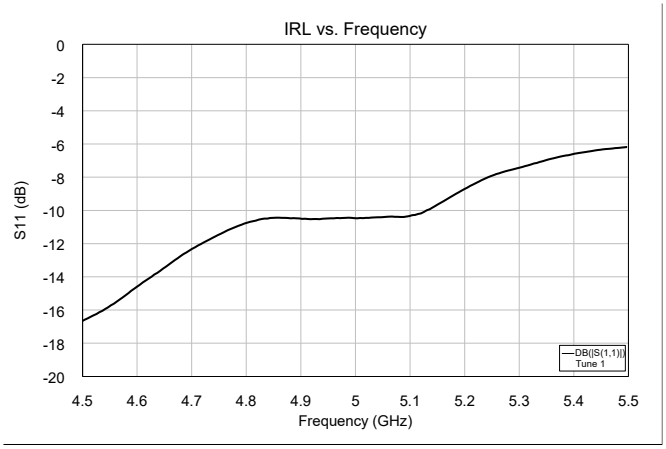
Application Electrical Performance

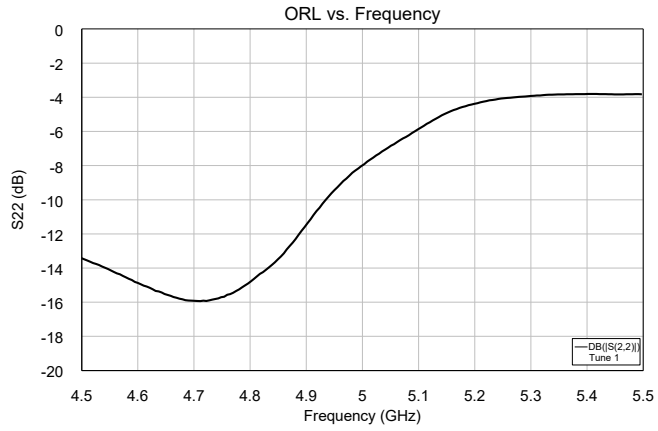
Qorvo Field and Factory Applications Engineers are available to provide technical assistance for determining appropriate matching networks for a particular application.

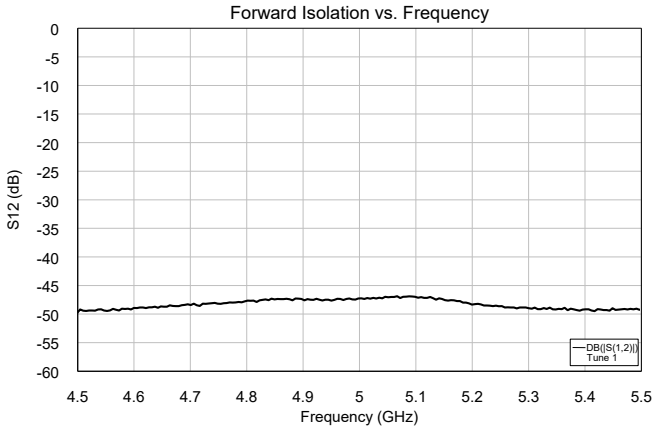
Parameter	Conditions	Typical Value			Units
Frequency		4800	4900	5000	MHz
Gain		31.3	32.8	33.5	dB
Input Return Loss		10.7	10.5	10.5	dB
Output Return Loss		14.8	11.5	8.0	dB
Output P1dB		+28.9	+29.4	+29.9	dBm
ACLR	Pout=22dBm, 20MHz LTE, PAR 9.5dB	-46.7	-51.4	-52.8	dBc
Device Current	V_{CC} and V_{CC1}	350			mA

Test conditions unless otherwise noted: Vcc1 = Vcc2 = Vcc3 = +5V, PA_EN = +3V, Icq=350mA Temp = +25 °C, 50 Ω system.









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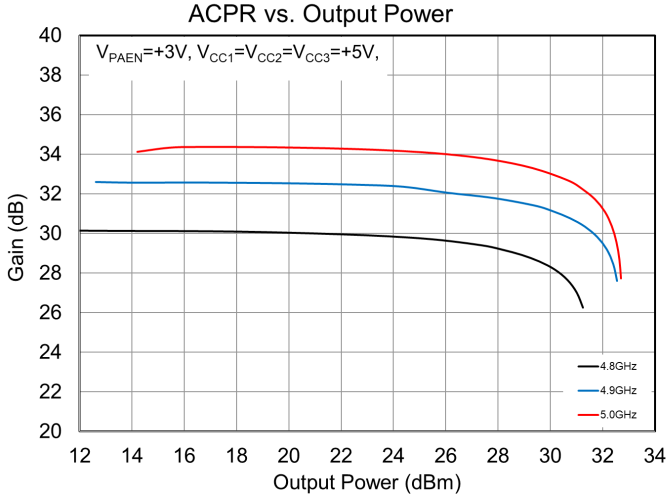
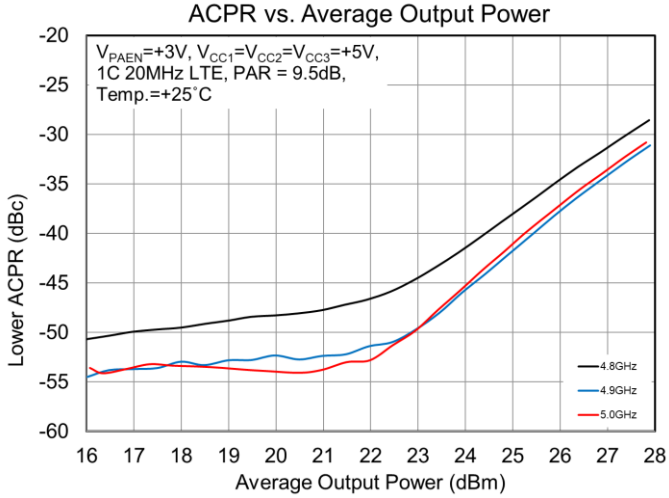
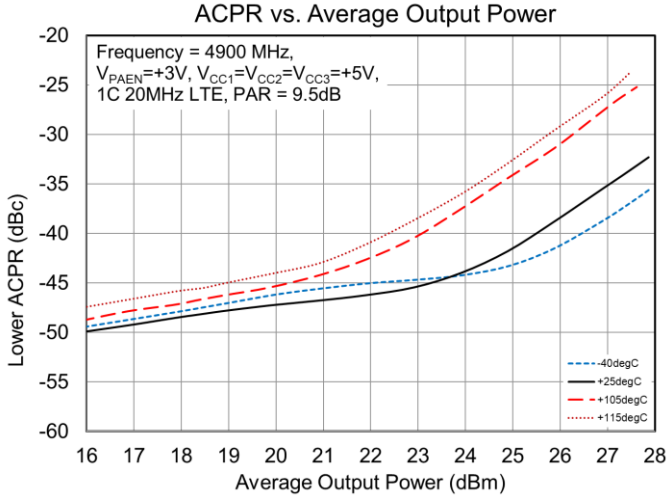
ACPR vs. Output Power



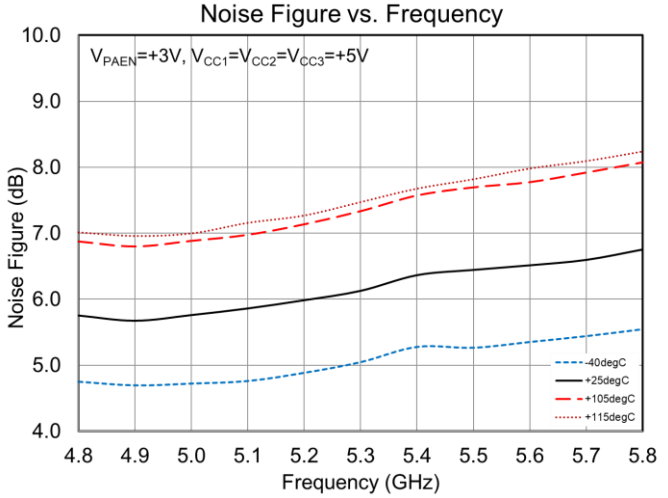
ACPR vs. Average Output Power



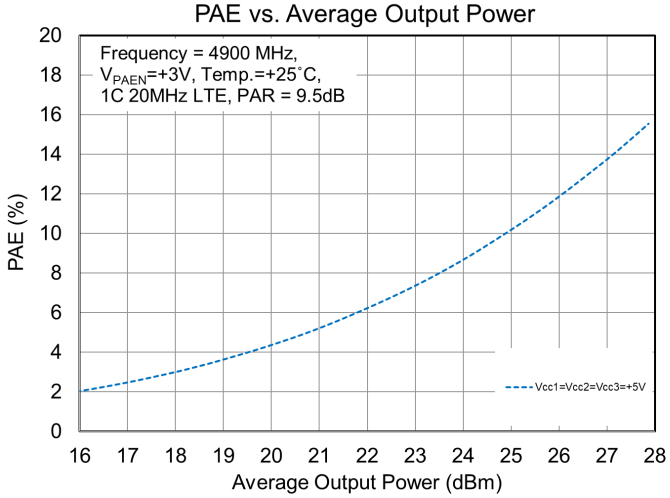
ACPR vs. Average Output Power



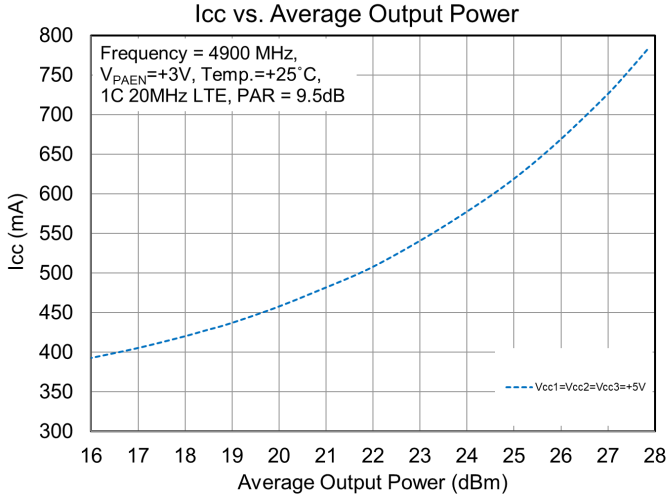
Noise Figure vs. Frequency



PAE vs. Average Output Power



Icc vs. Average Output Power



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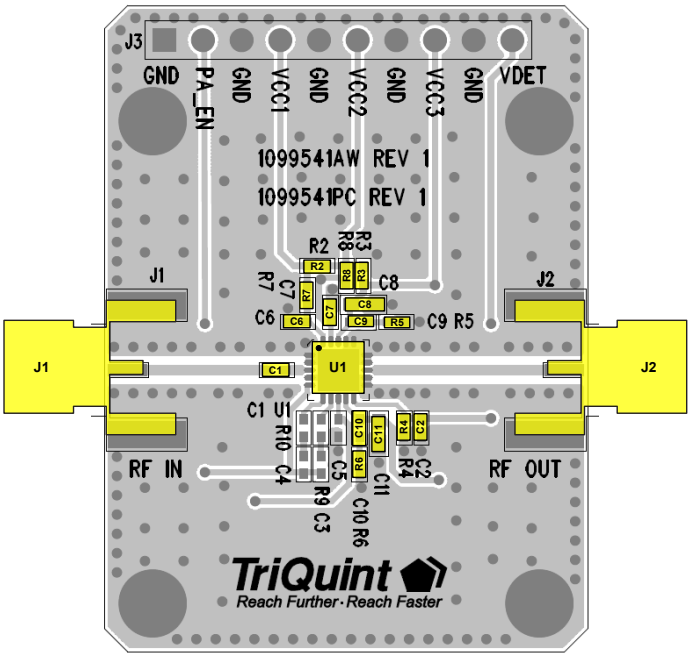
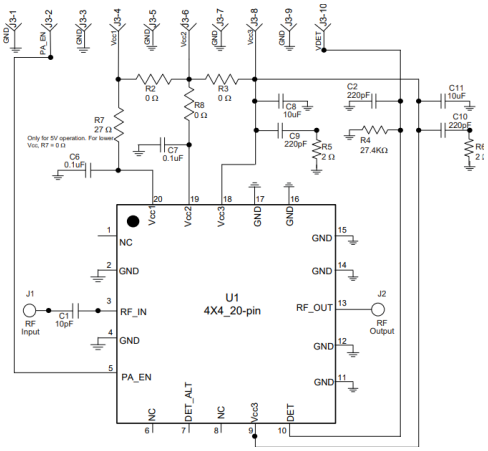
Evaluation Board Information

Evaluation Board and Schematic





Notes:

1. Components shown on PCB layout but not on the schematic are not used.
   - C3: Right edge of capacitor is 6.18mm from left edge of DUT
   - C1: Right edge of capacitor is 1.65mm from left edge of DUT
   - C4: Left edge of capacitor is 1.52mm from right edge of DUT
   - C5: Left edge of capacitor is 7.43mm from right edge of DUT
   - L1: Left edge of inductor is 2.43mm from right edge of DUT

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Evaluation Board – Bill of Material

Reference Des.	Value	Description	Manuf.	Part Number
n/a	-	Printed Circuit Board	Qorvo	
U1	-	High Gain Driver Amplifier	Qorvo	QPA9121
R2, R8, R3	0 Ω	Resistor, Chip, 0402, 5%	various	
C1, C5	10 pF	Capacitor, Chip, 0402, 5%	various	
C3	0.5 pF	Capacitor, Chip, 0402, 5%	various	
C4	0.4 pF	Capacitor, Chip, 0402, 5%	various	
C6, C7	0.1 uF	Capacitor, Chip, 0402, 10%	various	
C8, C11	10 uF	Capacitor, Chip, 0402, 10%	various	
C9, C10, C2	220 pF	Capacitor, Chip, 0402, 10%	various	
R7	27 Ω	Resistor, Chip, 0402, 5%, 1/10W	various	
R5, R6	2 Ω	Resistor, Chip, 0402, 5%, 1/16W	various	
R4	27.4 KΩ	Resistor, Chip, 0402, 5%, 1/16W	various	
L1	1.6 nH	Inductor, ±0.1nH, 0402	Murata	LQG15HS1N6B02D

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Additional Information

For information on ESD, Soldering Profiles, Packaging Standards, Handling and Assembly, please contact Qorvo for general guidelines.

Contact Information

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

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Email: customer.support@qorvo.com

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