APPLICATION NOTE

Classification | PRIVATE

QPA9119 - 560MHz-680MHz Reference Design

Product Overview

The QPA9119 is a high linearity driver amplifier in a low-cost, RoHS compliant, surface mount package. This InGaP/GaAs HBT delivers high performance across a broad range of frequencies with +44 dBm OIP3 and +27.2 dBm P1dB while only consuming 130 mA quiescent current. All devices are 100% RF and DC tested.

The QPA9119 incorporates on-chip features that differentiate it from other products in the market. The amplifier integrates an on-chip DC over-voltage and RF over-drive protection. This protects the amplifier from electrical DC voltage surges and high input RF input power levels that may occur in a system. On-chip ESD protection allows the amplifier to have a very robust Class 1C HBM ESD rating.

The QPA9119 is targeted for use as a driver amplifier in wireless infrastructure where high linearity, medium power, and high efficiency are required. The device an excellent candidate for transceiver line cards in current and next generation multi-carrier 3G / 4G base stations.

Referenced Documents

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

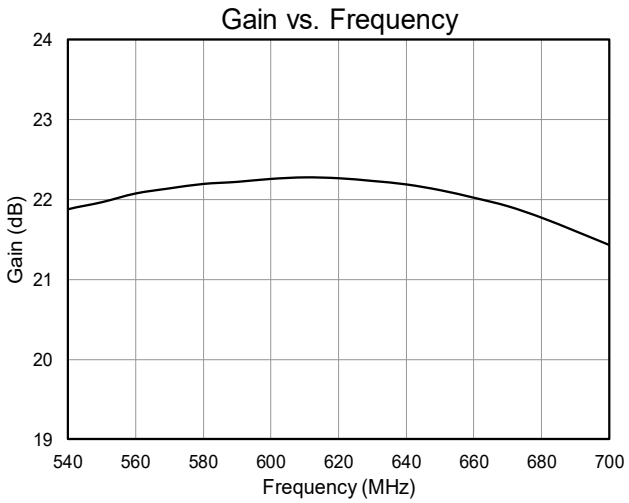
QPA9119 Data Sheet.

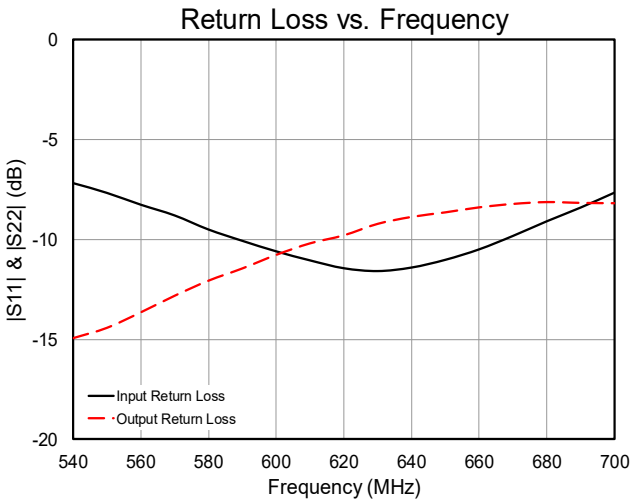
Application Electrical Performance

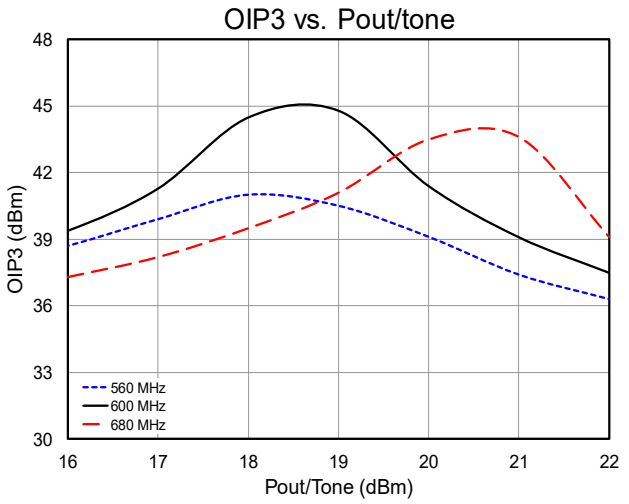
Qorvo Field and Factory Applications Engineers are available to provide technical assistance for determining appropriate matching networks for a particular application.

Parameter	Conditions	Typical Value			Units
Frequency		560	600	680	MHz
Gain		22.0	22.2	21.7	dB
Input Return Loss		8.2	10.8	9.0	dB
Output Return Loss		13.6	10.5	8.1	dB
Output P1dB		+27.6	+28.0	+28.8	dBm
Output IP3	Pout= +18 dBm/tone, Δf= 1 MHz	+41.0	+44.5	+39.5	dBm
Quiescent Collector Current, I_{CQ}		140			mA

Test conditions unless otherwise noted: VCC = VPD = +5.0 V, Temp = +25 °C, 50 Ω system.

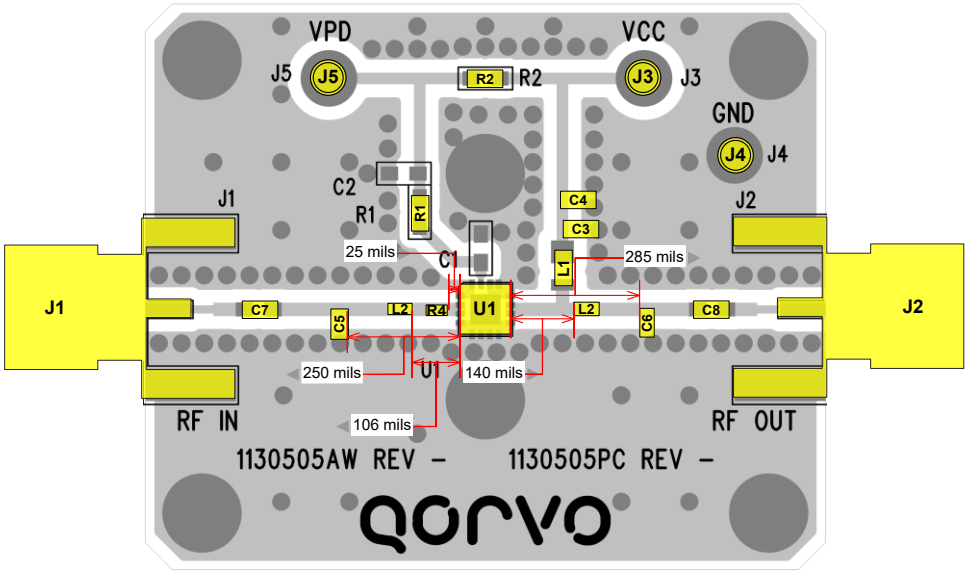


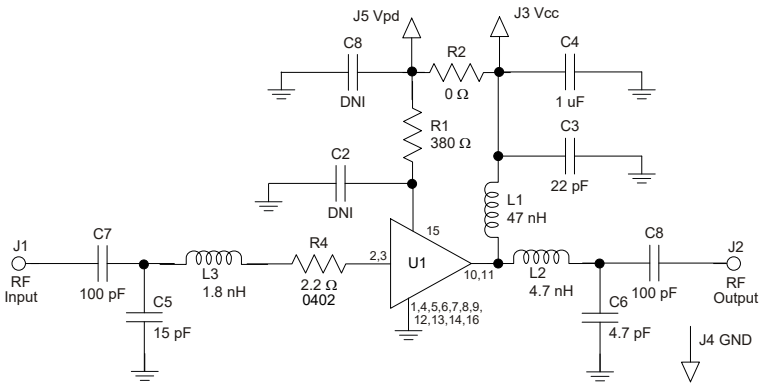




Evaluation Board Information

Evaluation Board and Schematic





Notes:

1. All components are of 0603 size unless stated on the schematic.
2. The recommended component values are dependent upon the frequency of operation.
3. Critical component placement locations:
   - Distance between U1 (left edge) to R4 (right edge): 25 mil
   - Distance between U1 (left edge) to L3 (right edge): 106 mil, (L3 labeled as L2 on input matching network)
   - Distance between U1 (left edge) to C5 (right edge): 250 mil
   - Distance between U1 (right edge) to L2 (left edge): 140 mil
   - Distance between U1 (right edge) to C6 (left edge): 285 mil

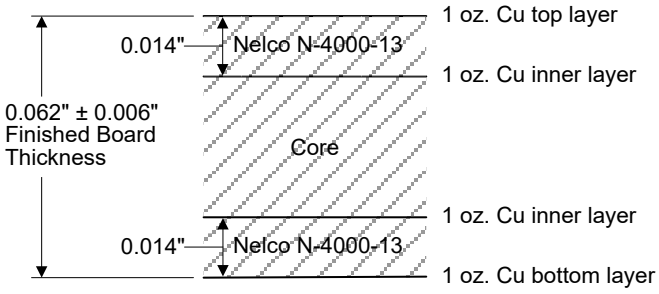
Evaluation Board – Bill of Material

Reference Des.	Value	Description	Manuf.	Part Number
n/a	n/a	Printed Circuit Board	Qorvo	
U1	n/a	0.5 W High Linearity Amplifier	Qorvo	QPA9119
R1	380 Ω	Res., Chip, 0603, +/-1%, 1/10W	various	
R2	0 Ω	Res., Chip, 0603	various	
R4	2.2 Ω	Res, Chip, 0603	various	
C5	15 pF	CAP, 0603, +/-0.1pF. 200V. NPO/COG	various	
C6	4.7 pF	CAP, 0603, +/-0.1pF. 200V. NPO/COG	various	
C7, C8	100 pF	Cap., Chip, 0603, +/-5%. 50V NPO/COG	various	
C3	22 pF	Cap., Chip, 0603, +/-5%. 50V NPO/COG	various	
C4	1.0 uF	CAP, 0603, 10%, X5R, 10V	various	
L1	18 nH	Inductor, 0805, 5%, Coilcraft CS series	Coilcraft	0805CS-180XJLB
L2	4.7 nH	IND, Chip, 0603, +/-0.3nH	TOKO	LL1608-FSL4N7S
L3	1.8 nH	IND, Chip, 0603, +/-0.3nH	TOKO	LL1608-FSL1N8S

Evaluation Board PCB Board Layers

PC Board Layout

PCB 1130505 Material (stack up)



50-ohm line dimensions: width = 0.029”, spacing = 0.029”

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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