APPLICATION NOTE

Classification | PRIVATE

# QPA9119 - 1.805GHz-1.88GHz 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.

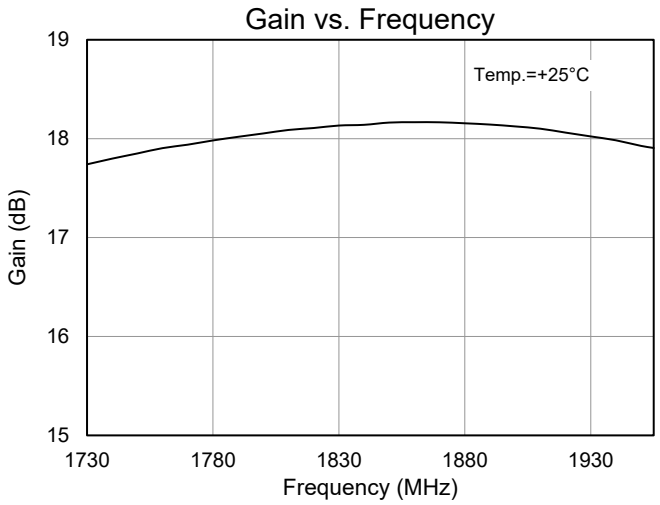
QPA9119 Data Sheet.

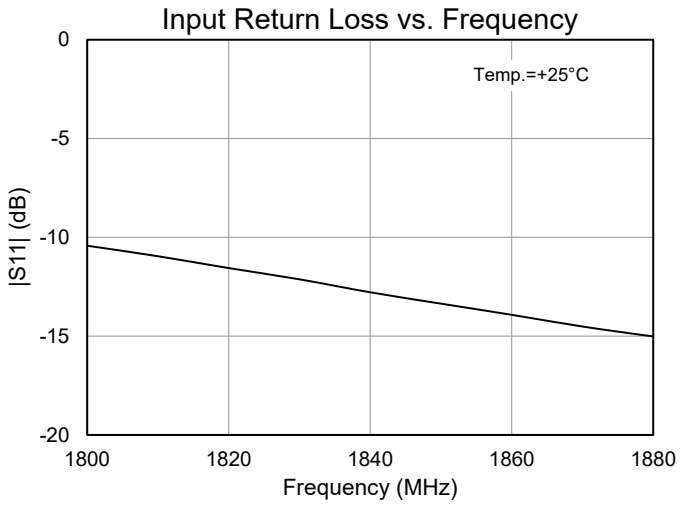
# Application Electrical Performance

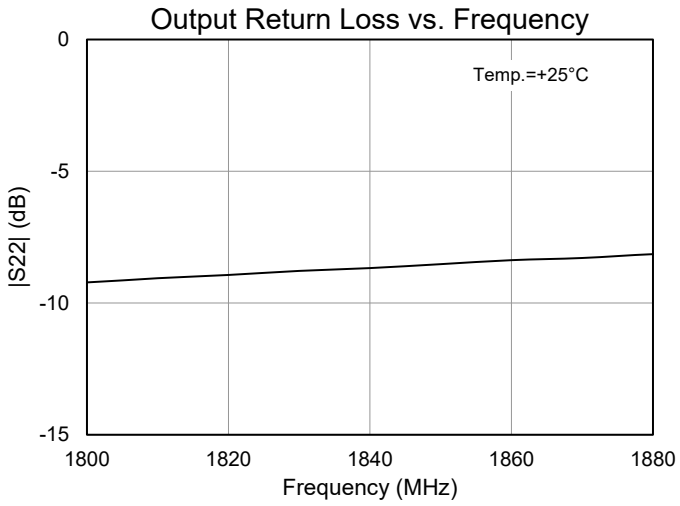
Qorvo Field and Factory Applications Engineers are available to provide technical assistance for determining appropriate matching networks for a particular application.

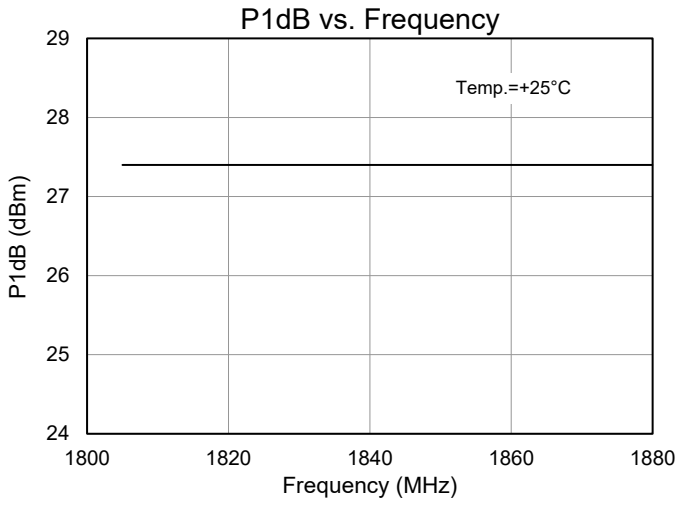
| Parameter | Conditions | Typical Value | | | Units |
|---|---|---|---|---|---|
| Frequency | | 1805 | 1840 | 1880 | MHz |
| Gain | | 18.1 | 18.1 | 18.2 | dB |
| Input Return Loss | | 10.0 | 12.0 | 15.0 | dB |
| Output Return Loss | | 9.2 | 8.7 | 8.1 | dB |
| Output P1dB | | +27.4 | +27.4 | +27.4 | dBm |
| Output IP3 | Pout= +11 dBm/tone, Δf= 1 MHz | +45.2 | +46.6 | +46.8 | dBm |
| Quiescent Collector Current, $I_{CQ}$ | | 135 | | | |

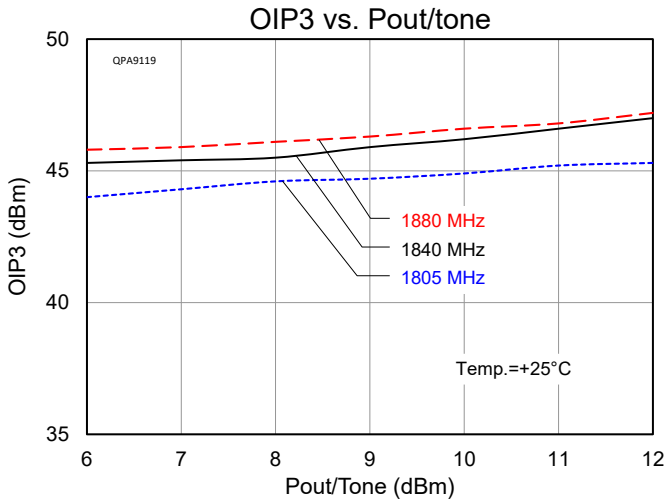
Test conditions unless otherwise noted: VCC = VPD = +5.0 V, Temp = +25 °C, 50 Ω system.



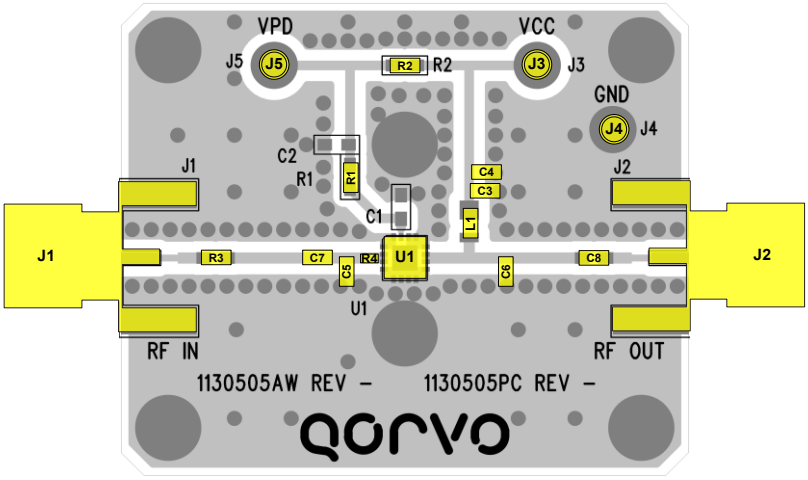



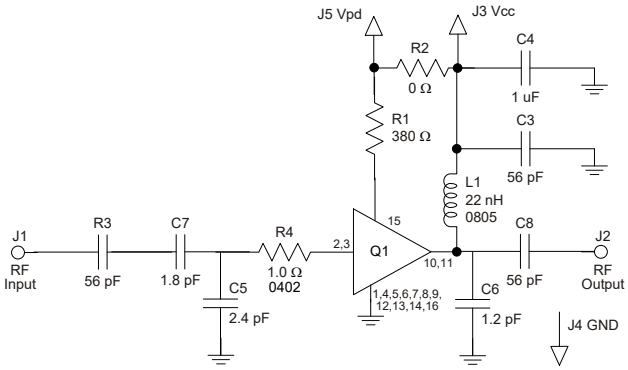





# Evaluation Board Information

## 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): 30 mil
   - Distance between U1 (left edge) to C7 (right edge): 160 mil
   - Distance between U1 (left edge) to C5 (right edge): 95 mil
   - Distance between U1 (right edge) to C6 (left edge): 340 mil

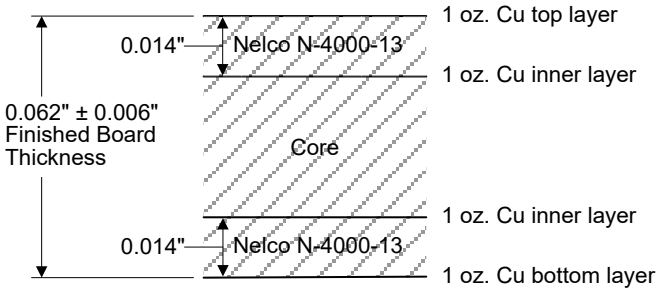
## Evaluation Board – Bill of Material

| Reference Des. | Value | Description | Manuf. | Part Number |
|---|---|---|---|---|
| n/a | n/a | Printed Circuit Board | Qorvo | |
| U1 | n/a | ½ W High Linearity Amplifier | Qorvo | QPA9119 |
| C8, C3, R3 | 56 pF | CAP, 0603, +/-1%. 200V NPO/COG | various | |
| C5 | 2.4 pF | CAP, 0603, +/-0.1pF. 200V. NPO/COG | various | |
| C7 | 1.8 pF | CAP, 0603, +/-0.1pF. 200V. NPO/COG | various | |
| C4 | 1.0 uF | CAP, 0603, 10%, X5R, 10V | various | |
| L1 | 22 nH | IND, 0805, 5%, Ceramic | Coilcraft | 0805CS-221XJL |
| C6 | 1.2 pF | CAP, 0603, +/-0.1pF. 200V. NPO/COG | various | |
| R4 | 1.0 Ω | RES, 0603, 1% | various | |
| R1 | 380 Ω | RES, 0603, 1% | various | |
| R2 | 0 Ω | RES, 0603, Jumper | various | |

## 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:

**Web:** www.qorvo.com

**Tel:** 1-844-890-8163

**Email:** customer.support@qorvo.com

## Important Notice

The information contained in this Data Sheet and any associated documents ("Data Sheet Information") is believed to be reliable; however, Qorvo makes no warranties regarding the Data Sheet Information and assumes no responsibility or liability whatsoever for the use of said information. All Data Sheet Information is subject to change without notice. Customers should obtain and verify the latest relevant Data Sheet Information before placing orders for Qorvo® products. Data Sheet Information or the use thereof does not grant, explicitly, implicitly or otherwise any rights or licenses to any third party with respect to patents or any other intellectual property whether with regard to such Data Sheet Information itself or anything described by such information.

DATA SHEET INFORMATION DOES NOT CONSTITUTE A WARRANTY WITH RESPECT TO THE PRODUCTS DESCRIBED HEREIN, AND QORVO HEREBY DISCLAIMS ANY AND ALL WARRANTIES WITH RESPECT TO SUCH PRODUCTS WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Without limiting the generality of the foregoing, Qorvo® products are not warranted or authorized for use as critical components in medical, life-saving, or life-sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death. Applications described in the Data Sheet Information are for illustrative purposes only. Customers are responsible for validating that a particular product described in the Data Sheet Information is suitable for use in a particular application.