



QPA9122

2.3 – 5.0 GHz 0.5 W Driver Amplifier

Product Overview

The QPA9122 is a wideband, high gain, and high peak power driver amplifier. It provides 36dB gain at 2.6GHz and achieves a peak power of 27dBm P3dB. With a quiescent current of 95mA, the amplifier can provide good DPD linearity performance with wideband signals of up to 160 MHz IBW making it perfectly suited for m-MIMO applications.

The QPA9122 is internally match to 50 Ω over the entire operating frequency band of 2.3 – 5.0 GHz and incorporates a shut-down function through the V_{PD} pin.

The QPA9122 is housed in a 16-pin 3X3mm SMT package and is footprint compatible to QPA9120 and pin-compatible to QPA9121.

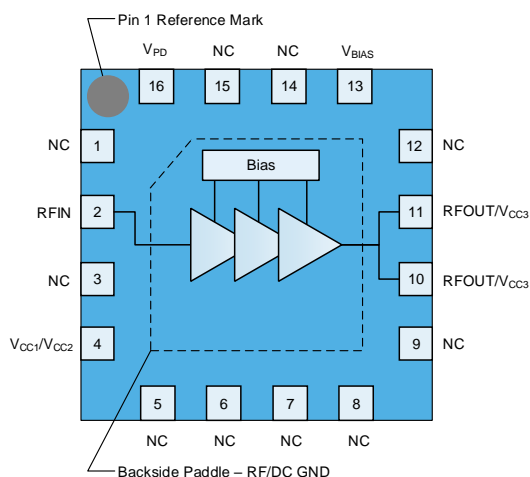


16 Pad 3 x 3 mm Laminate Package

Key Features

- 2.3–5.0 GHz Operational Frequency
- 50 Ω Matched RF Input and Output
- +27 dBm P3dB
- 36.0 dB Gain at 2.6 GHz
- +5V Single Supply, I_Q 95 mA
- DC Power Shutdown Feature

Functional Block Diagram



Top View

Applications

- 5G m-MIMO
- Mobile Infrastructure
- General Purpose Wireless
- TDD / FDD System

Ordering Information

| Part No. | Description |
|---------------|--------------------------------|
| QPA9122TR7 | 2500 pcs on 7" reel (standard) |
| QPA9122EVB-01 | Evaluation Board |

Absolute Maximum Ratings

| Parameter | Rating |
|---|---------------|
| Storage Temperature | -65 to +150°C |
| T _{CASE} | -40 to +125°C |
| RF Input Power, ON state, CW, T=25 °C, 2:1 VSWR, In-band | +10 dBm |
| RF Input Power, OFF state, CW, T=25 °C, 2:1 VSWR, In-band | +10 dBm |
| Device Voltage (V _{CC1}) | +6 V |

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.

Recommended Operating Conditions

| Parameter | Min | Typ | Max | Units |
|--|-------|-----|-------|-------|
| Supply Voltage (V _{CC}) | +4.75 | +5 | +5.25 | V |
| T _{CASE} | -40 | | +105 | °C |
| T _j for >10 ⁶ hours MTTF | | | +218 | °C |

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions. Operating the part above the maximum recommended T_{case} may degrade performance.

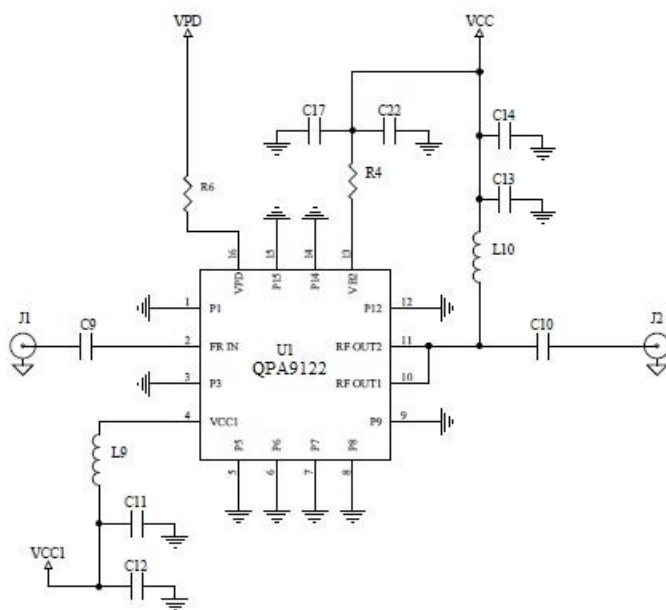
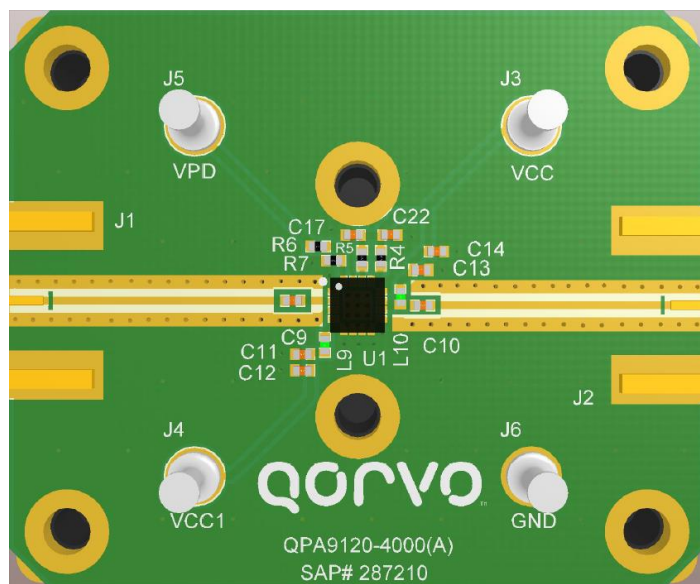
Electrical Specifications

| Parameter | Conditions ⁽¹⁾ | Min | Typ | Max | Units |
|-------------------------------------|--|------|-------|-----------------|-------|
| Operational Frequency Range | | 2300 | | 5000 | MHz |
| Gain | At 2.6 GHz | 33.7 | 36 | 39.7 | dB |
| | At 3.6 GHz | 34 | 36.5 | 40 | dB |
| Gain Flatness | Any 100 MHz BW within band | | 0.8 | | dB |
| Input Return Loss | | | 15 | | dB |
| Output Return Loss | | | 12 | | dB |
| Reverse Isolation | ON state | | 50 | | dB |
| Forward Isolation | OFF state | | 45 | | dB |
| Output P _{1dB} | At 2.6 GHz | 24.5 | 25.3 | | dBm |
| | At 3.6 GHz | 25 | 26 | | dBm |
| Output P _{3dB} | At 2.6 GHz | 25.5 | 26.9 | | dBm |
| | At 3.6 GHz | 25.5 | 27 | | dBm |
| ACPR | At 2.6 GHz, P _{out} =+15 dBm, 1C LTE 20MHz, 8dB PAR | | -45.7 | -38 | dBc |
| | At 3.6 GHz, P _{out} =+15 dBm, 1C LTE 20MHz, 8dB PAR | | -39.5 | -34 | dBc |
| Noise Figure | At 3.6 GHz | | 5.3 | | dB |
| Device Current, ON | I _{CQ} Quiescent Current | 50 | 95 | 125 | mA |
| Device Current, OFF | V _{PD} = 0 V | | 2 | | μA |
| V _{PD} , Logic Low | | 0 | | 0.63 | V |
| V _{PD} , Logic High | | 1.17 | | V _{CC} | V |
| Device ON or OFF Timing | 50% Ctrl to 10/90% RF | | 0.45 | | μS |
| Thermal Resistance, θ _{jc} | Junction to case | | 65 | | °C/W |

Notes:

1. Test conditions unless otherwise noted: V_{CC} = +5.0 V, V_{PD} = +1.8 V, Temp = +25 °C, 50 Ω system.

Evaluation Board - QPA9122EVB01



Notes:

- Components shown on PCB layout but not on the schematic are not used.

Bill of Materials

| Reference Des. | Value | Description | Manuf. | Part Number |
|--------------------|--------------|----------------------------|--------------------|--------------------|
| n/a | - | Printed Circuit Board | Qorvo | |
| U1 | - | High Gain Driver Amplifier | Qorvo | QPA9122 |
| C9, C10 | 18 pF | CAP, 5%, 50V, C0G, 0402 | Murata | GRM1555C1H180JA01D |
| C12, C14 | 1 μ F | CAP, 10V, X5R, CER, 0402 | Various | |
| C11, C13, C17, C22 | 100 pF | CAP, 5%, 50V, C0G, 0402 | Murata | GRM1555C1H101JA01D |
| R4 | 51 Ω | RES, 5%, 1/16W, 0402 | Various | |
| R6 | 0 Ω | RES, 1/10W, 0402 | Various | |
| L9 | 8.2 Ω | RES, 5%, 1/16W, 0402 | Various | |
| L10 | 12 nH | IND, 5%, 0402 | Coilcraft | 0402CS-12NXJLW |
| J1, J2 | - | Conn, SMA F STRT .062" | Cinch Connectivity | 142-0701-851 |
| R5, R7 | DNP | n/a | n/a | n/a |

Logic Table

| Parameter, V_{PD} | High | Low |
|---------------------|------|-----|
| Device State | ON | OFF |

Typical Performance

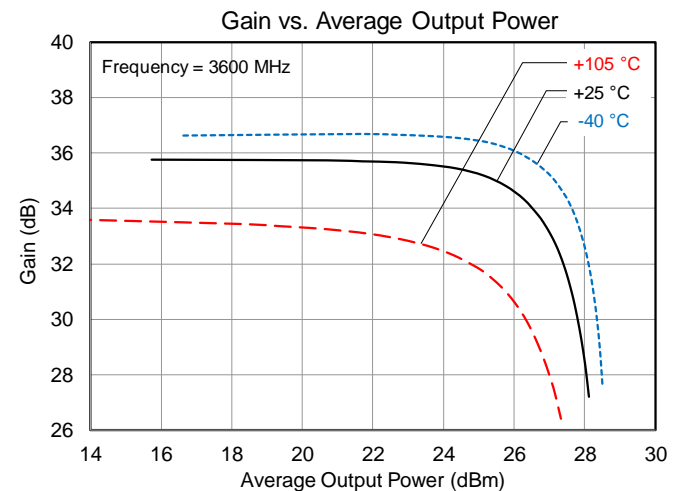
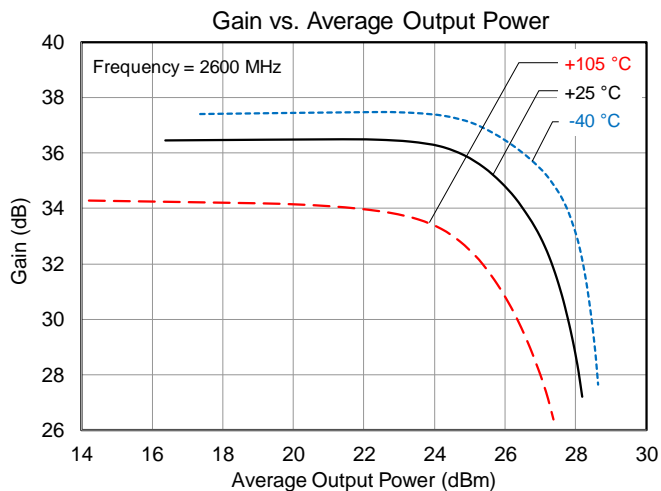
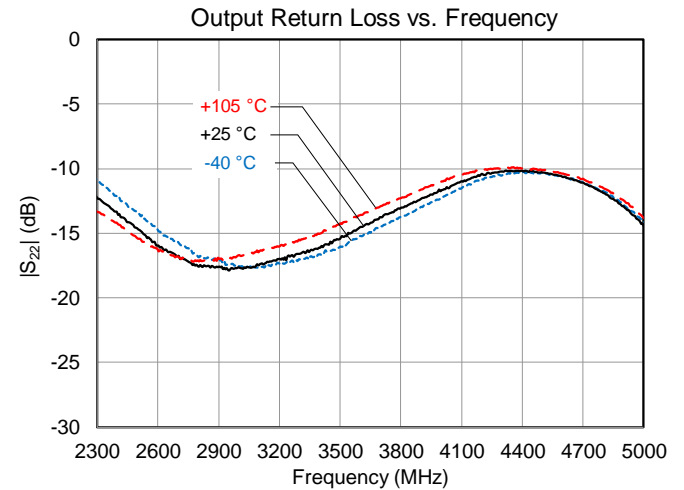
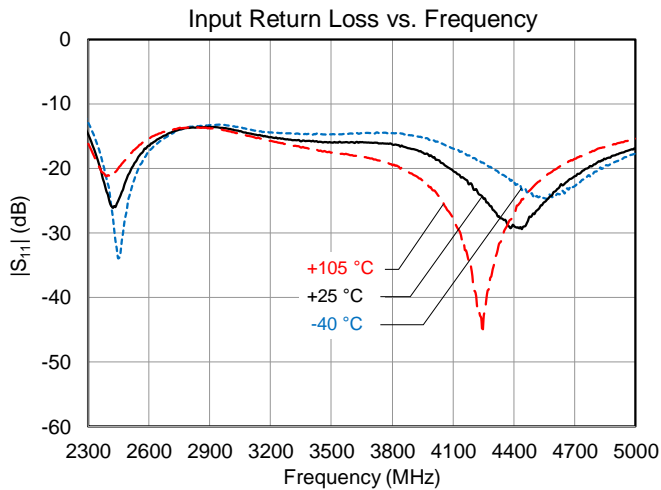
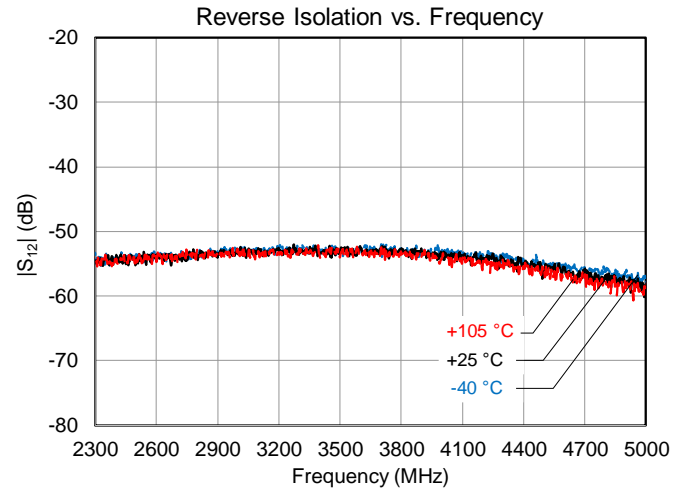
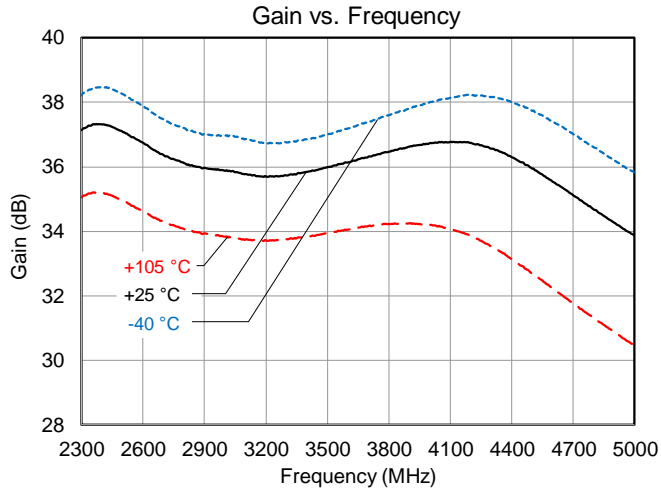
| Parameter | Conditions | Typical Value | | | Units |
|--------------------|--|---------------|-------|-------|-------|
| Frequency | | 2600 | 3600 | 4900 | MHz |
| Gain | | 36.8 | 36 | 34 | dB |
| Input Return Loss | | 16.6 | 16.7 | 18.9 | dB |
| Output Return Loss | | 17.4 | 18.1 | 13.3 | dB |
| Output P3dB | | 26.9 | 27.2 | 26.8 | dBm |
| Output IP3 | $P_{out} = +0 \text{ dBm/tone}, \Delta f = 1 \text{ MHz}$ | 32.4 | 32.9 | 30.0 | dBm |
| ACPR | $P_{out}=+15 \text{ dBm}, 1\text{C LTE}, 20\text{MHz}, 8.5\text{dB PAR}$ | -46.1 | -40.7 | -38.1 | dBc |
| Device Current | V_{CC} and V_{CC1} combined | 95 | | | mA |

Notes:

1. Test Conditions unless otherwise noted: V_{CC} and V_{CC1} on EVB = +5.0 V, $I_{CC} = 95 \text{ mA}$, $V_{PD} = +1.8 \text{ V}$, Temp.=+25 °C

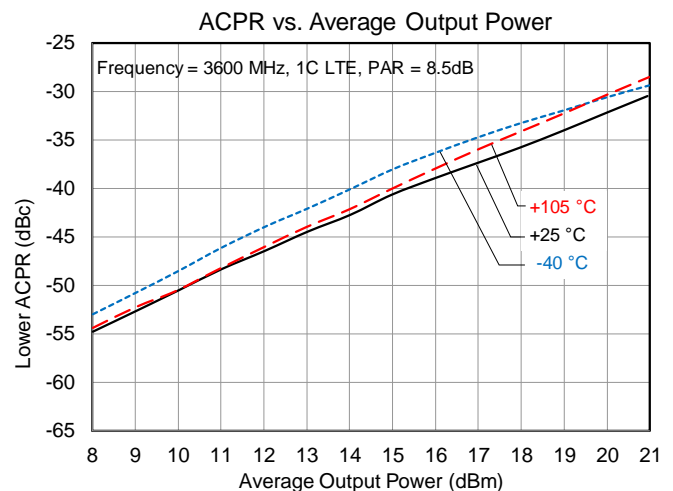
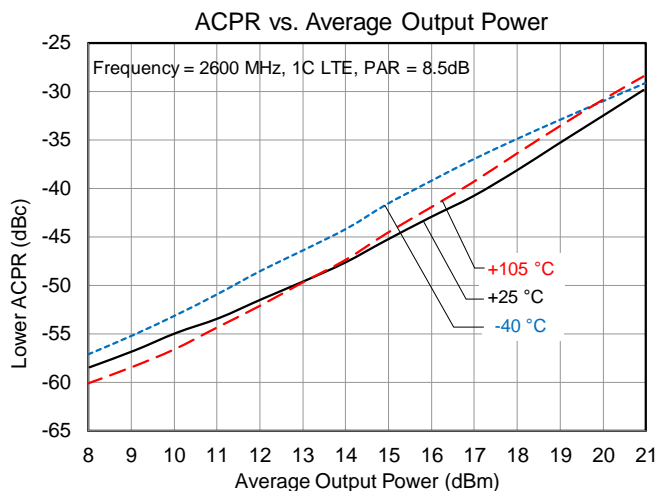
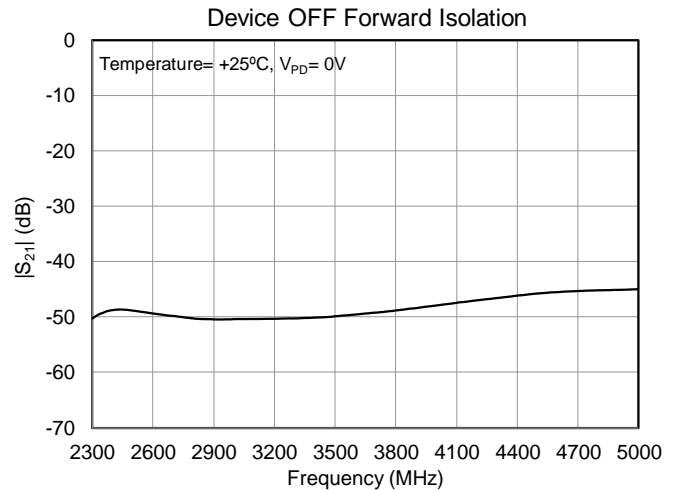
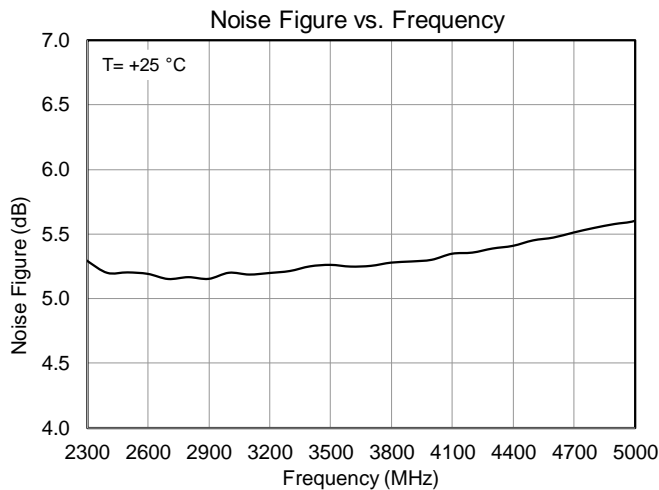
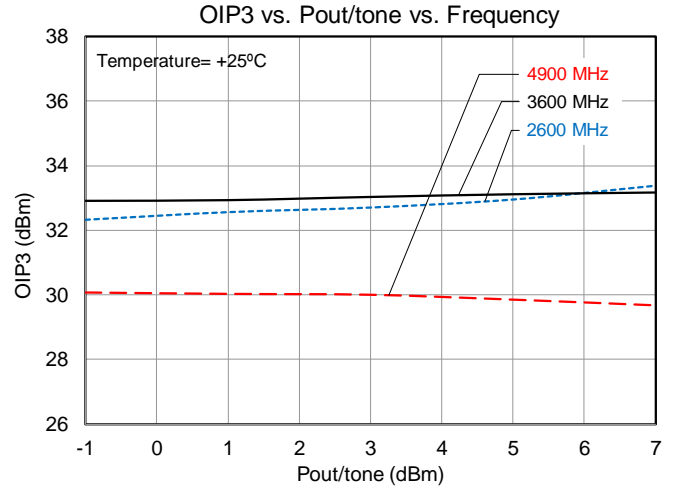
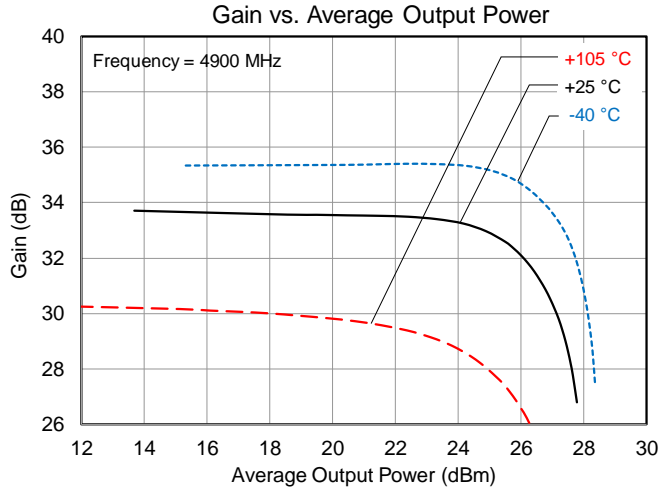
Performance Plots – QPA9122EVB01

Test conditions unless otherwise noted: V_{CC} and V_{CC1} on EVB = +5.0 V, I_{CC} = 95 mA, V_{PD} = +1.8 V, Temp. = +25 °C



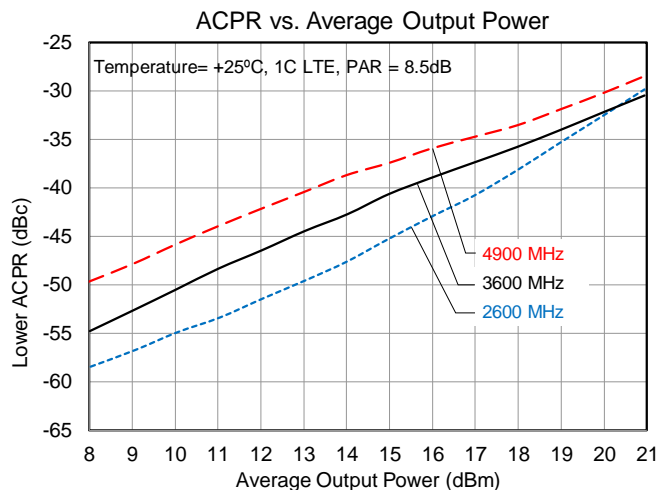
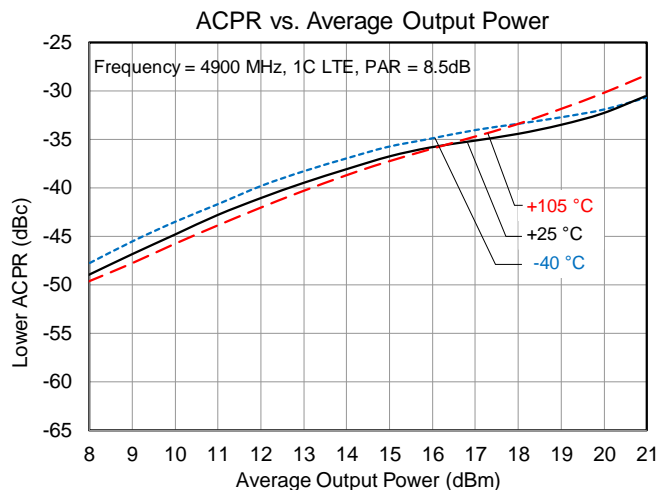
Performance Plots – QPA9122EVB01 (Continued)

Test conditions unless otherwise noted: V_{CC} and V_{CC1} on EVB = +5.0 V, I_{CC} = 95 mA, V_{PD} = +1.8 V, Temp. = +25 °C

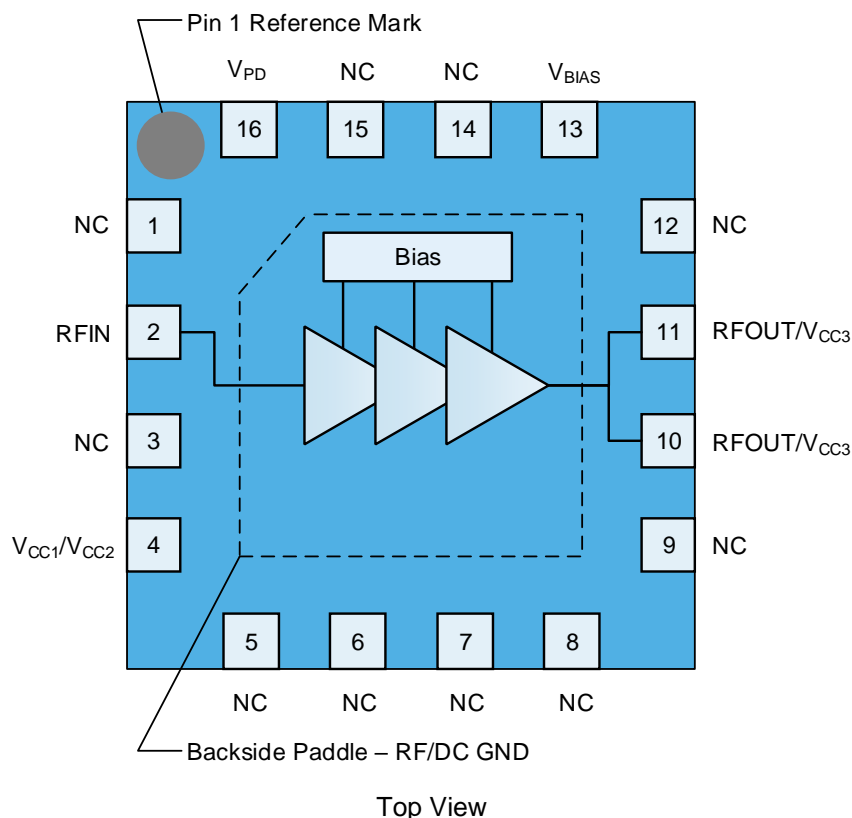


Performance Plots – QPA9122EVB01 (Continued)

Test conditions unless otherwise noted: V_{CC} and V_{CC1} on EVB = +5.0 V, I_{CC} = 95 mA, V_{PD} = +1.8 V, Temp. = +25 °C



Pad Configuration and Description

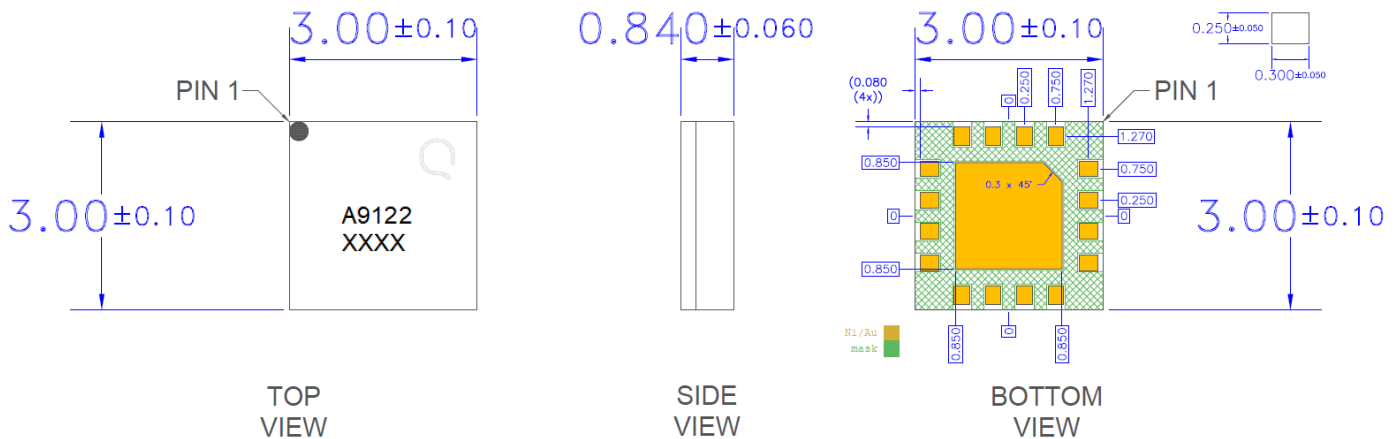


| Pad No. | Label | Description |
|---------------------------------|-------------------------------------|--|
| 1, 3, 5, 6, 7, 8, 9, 12, 14, 15 | NC | No electrical connection internally. It may be left floating or connected to ground. Land pads should be provided for PCB mounting integrity. |
| 2 | RF IN | RF input. External DC block required. |
| 4 | V _{CC1} / V _{CC2} | First and second stage DC supply. |
| 10, 11 | RFOUT / V _{CC3} | RF output and third stage DC supply. External choke and DC block capacitor required. |
| 13 | V _{BIAS} | Bias circuit supply voltage. |
| 16 | V _{PD} | PA on/off logic control. |
| Backside Paddle | GND | RF/DC ground connection. The back side of the package should be connected to the ground plane through as short of a connection as possible. PCB vias under the device as many as possible are recommended. |

Package Marking and Dimensions

Marking: Part Number – A9122

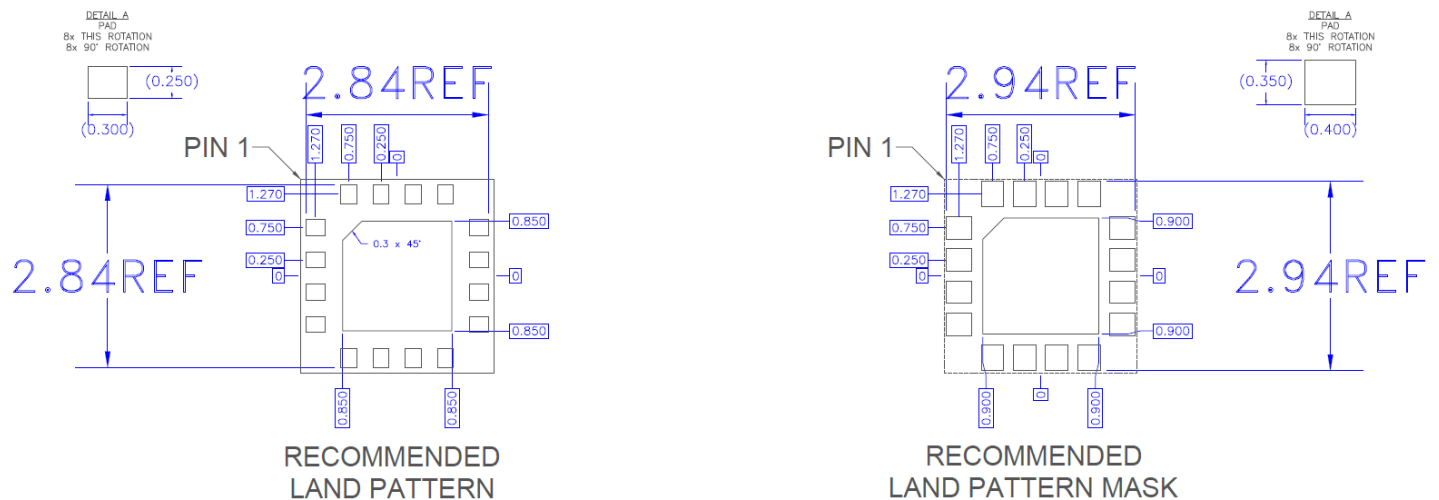
Trace Code – XXXX up to 4 Characters assigned by sub-contractor



Notes:

2. All dimensions are in millimeters. Angles are in degrees.
3. The terminal #1 identifier and terminal numbering conform to SPE-000677.
4. Contact plating: ENEPIG

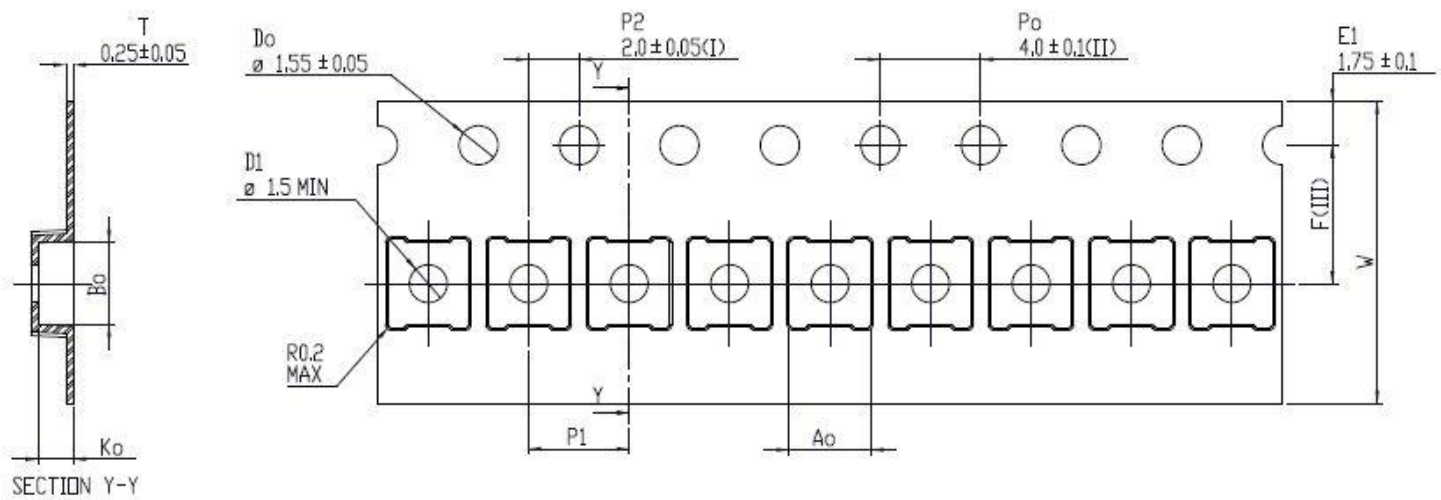
Recommended PCB Layout Pattern



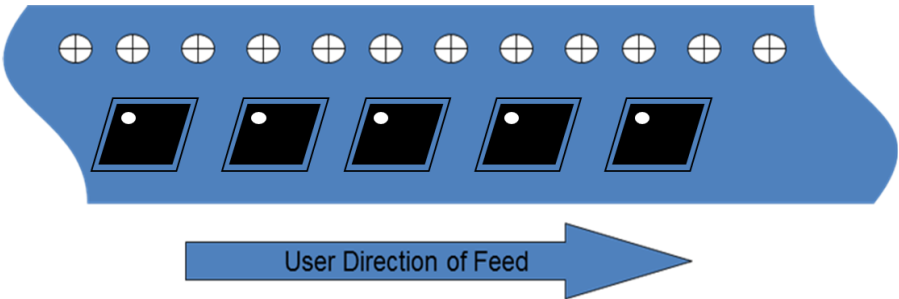
Notes:

1. All dimensions are in millimeters. Angles are in degrees.
2. Use 1 oz. copper minimum for top and bottom layer metal.
3. Via holes are required under the backside paddle of this device for proper RF/DC grounding and thermal dissipation. We recommend a 0.35 mm ($\#80/.0135$) diameter bit for drilling via holes and a final plated thru diameter of 0.25 mm (0.01).
4. Ensure good package backside paddle solder attach for reliable operation and best electrical performance.

Tape and Reel Information – Carrier and Cover Tape Dimensions

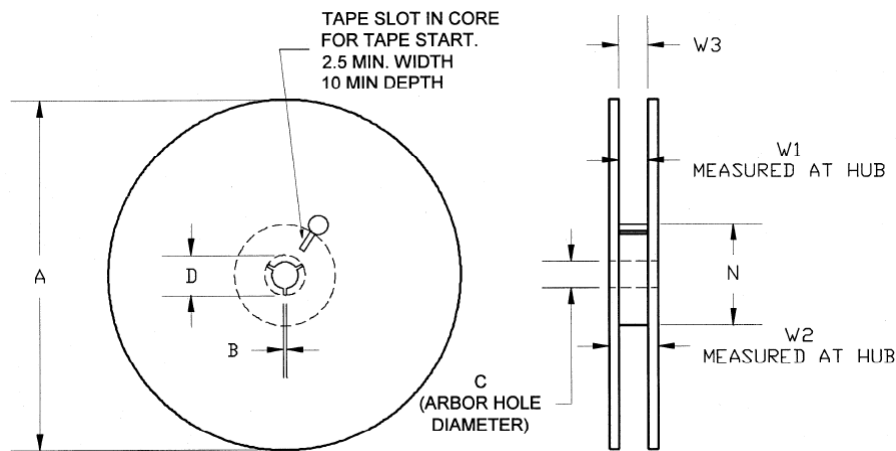


| Feature | Measure | Symbol | Size (in) | Size (mm) |
|---------------------|--|--------|-----------|-----------|
| Cavity | Length | A0 | 0.128 | 3.25 |
| | Width | B0 | 0.128 | 3.25 |
| | Depth | K0 | 0.055 | 1.40 |
| | Pitch | P1 | 0.157 | 4.00 |
| Centerline Distance | Cavity to Perforation - Length Direction | P2 | 0.079 | 2.00 |
| | Cavity to Perforation - Width Direction | F | 0.217 | 5.50 |
| Cover Tape | Width | C | 0.362 | 9.20 |
| Carrier Tape | Width | W | 0.472 | 12.00 |



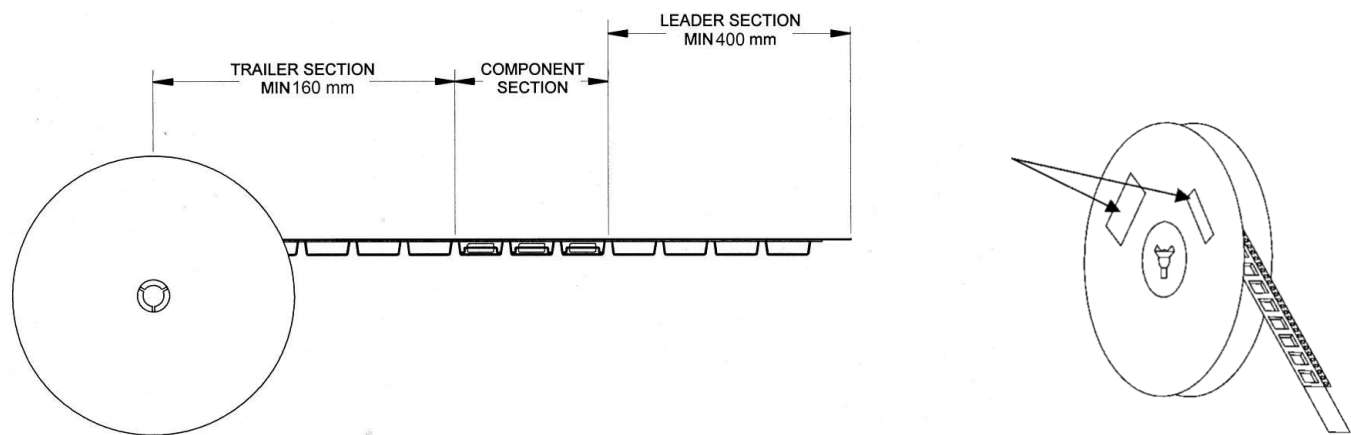
Tape and Reel Information – Reel Dimensions

Standard T/R size = 2,500 pieces on a 7" reel.



| Feature | Measure | Symbol | Size (in) | Size (mm) |
|---------|----------------------|--------|-----------|-----------|
| Flange | Diameter | A | 6.969 | 177.0 |
| | Thickness | W2 | 0.717 | 18.2 |
| | Space Between Flange | W1 | 0.504 | 12.8 |
| Hub | Outer Diameter | N | 2.283 | 58.0 |
| | Arbor Hole Diameter | C | 0.512 | 13.0 |
| | Key Slit Width | B | 0.079 | 2.0 |
| | Key Slit Diameter | D | 0.787 | 20.0 |

Tape and Reel Information – Tape Length and Label Placement



- Notes:
1. Empty part cavities at the trailing and leading ends are sealed with cover tape. See EIA 481-1-A.
 2. Labels are placed on the flange opposite the sprockets in the carrier tape.

Handling Precautions

| Parameter | Rating | Standard |
|----------------------------------|--------|--------------------------|
| ESD – Human Body Model (HBM) | 1C | ESDA / JEDEC JS-001-2017 |
| ESD – Charged Device Model (CDM) | C3 | JEDEC JESD22-C101F |
| MSL – Moisture Sensitivity Level | MSL3 | 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. Solder profiles available upon request.

Contact plating: ENEPIG

RoHS Compliance

This part is compliant with 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:

- Product uses RoHS Exemption 7c-I to meet RoHS Compliance requirements
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C₁₅H₁₂Br₄O₂) Free
- PFOS Free
- SVHC Free

Contact Information

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

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Tel: 1-844-890-8163

Email: customer.support@qorvo.com

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