

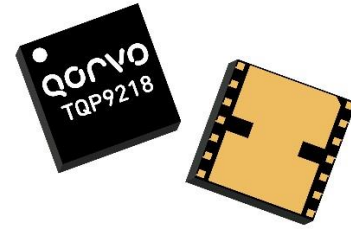
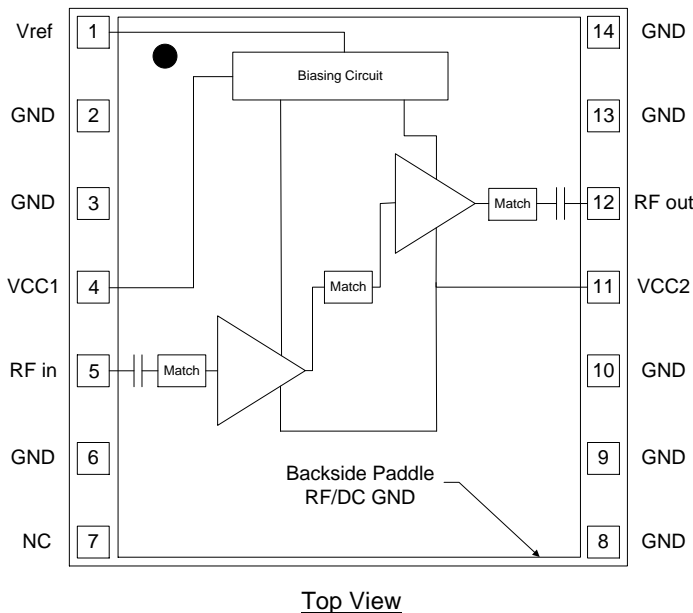
### General Description

The TQP9218 is a high-linearity two-stage power amplifier in a low-cost surface-mount package with on-chip bias control and temperature compensation circuits. The amplifier provides 31.5 dB gain over the 1805 – 1880 MHz frequency range and be utilized without the need of linearization circuitry such as DPD. It is able to achieve -48 dBc ACLR at +24 dBm output power using 20 MHz LTE signal (9.5 dB PAR).

The TQP9218 integrates two high performance amplifier stages onto a module to allow for a compact system design and requires very few external components for operation. The product is bias adjustable allowing the amplifier's power consumption to be optimized and is available in a lead-free/RoHS-compliant 7 x 7 mm surface mount package.

The TQP9218 is targeted for small cell or enterprise Femtocell basestation applications, distributed antenna systems (DAS), repeaters, and/or booster amplifiers.

### Functional Block Diagram



14 Pin 7 x 7 mm Leadless SMT Package

### Product Features

- 1805 – 1880 MHz Frequency Range
- Fully integrated, 2-Stage Power Amplifier
- Internally Matched 50 Ω Input/Output
- -48 dBc ACLR at Pavg = +24 dBm
- 31.5 dB Gain
- 15% PAE at +24 dBm
- >15dB Input / Output return Loss
- 212 mA Quiescent Current
- On-chip Control Bias and Temp. Comp Circuit
- RoHS compliant
- Covers Bands 3, 9

### Applications

- Small Cell / Picocell
- Enterprise Femtocell
- Customer Premises Equipment (CPE)
- Data Cards and Terminals
- Distributed Antenna Systems (DAS)
- Booster Amps, Repeaters

### Ordering Information

| Part No.    | Description                           |
|-------------|---------------------------------------|
| TQP9218     | 2,500 pieces on a 13" reel (standard) |
| TQP9218-PCB | 1805 –1880 MHz Evaluation Board       |

### Absolute Maximum Ratings

| Parameter                         | Rating         |
|-----------------------------------|----------------|
| Storage Temperature               | -55 to +150 °C |
| RF Input Power, CW, 50Ω, T=+25 °C | +13 dBm        |
| Supply Voltage (V <sub>CC</sub> ) | 6 V            |
| V <sub>REF</sub>                  | +3.5 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.

### Electrical Specifications

| Parameter                           | Conditions <sup>(1)</sup>                                    | Min  | Typ  | Max  | Units |
|-------------------------------------|--|------|------|------|-------|
| Frequency Range                     |  | 1805 |      | 1880 | MHz   |
| Test Frequency                      |  |      | 1840 |      | MHz   |
| Gain                                |  | 28.5 | 31.5 | 34.5 | dB    |
| Input Return Loss                   |  | 10   | 17   |      | dB    |
| Output Return Loss                  |  | 10   | 16   |      | dB    |
| Output P1dB                         |  |      | +33  |      | dBm   |
| ACLR                                | P <sub>out</sub> = +24 dBm, 20 MHz LTE E-TM1.1, 9.5 dB PAR   |      | -48  | -45  | dBc   |
| ACLR                                | P <sub>out</sub> = +24 dBm, 2X20 MHz LTE E-TM1.1, 9.5 dB PAR |      | -40  |      | dBc   |
| ACLR                                | P <sub>out</sub> = +24 dBm, 15 MHz LTE E-TM1.1, 9.5 dB PAR   |      | -52  |      | dBc   |
| ACLR                                | P <sub>out</sub> = +24 dBm, 10 MHz LTE E-TM1.1, 9.5 dB PAR   |      | -52  |      | dBc   |
| ACLR                                | P <sub>out</sub> = +24 dBm, 5 MHz LTE E-TM1.1, 9.5 dB PAR    |      | -52  |      | dBc   |
| Efficiency                          | P <sub>out</sub> = +24 dBm, 20 MHz LTE E-TM1.1, 9.5 dB PAR   | 13   | 15.2 |      | %     |
| Spurious Output Level               | P <sub>out</sub> = +24 dBm, 10:1 VSWR                        |      | <60  |      | dBc   |
| VSWR Survivability                  | No degradation or failure                                    | 10:1 |      |      | -     |
| Quiescent Current                   | V <sub>CC1</sub> + V <sub>CC2</sub>                          | 160  | 212  | 280  | mA    |
| Reference Current                   | Temp = -40°C to +85°C, V <sub>REF</sub> = +2.85V             |      | 6.5  | 10   | mA    |
| Leakage current                     | V <sub>CC</sub> = +4.5V, V <sub>ref</sub> = 0V               |      | 1.5  | 5    | μA    |
| Operational Current                 | P <sub>out</sub> = +24 dBm                                   |      | 365  | 460  | mA    |
| Switching Speed                     | 10% to 90% Rise time   |      | 620  |      | ns    |
|                                     | 90% to 10% Fall time   |      | 610  |      | ns    |
| Harmonics                           | 2F <sub>0</sub> at +24dBm, CW signal                         |      | -43  | -38  | dBc   |
|                                     | 3F <sub>0</sub> at +24dBm, CW signal                         |      | -61  | -56  | dBc   |
|                                     | 4F <sub>0</sub> at +24dBm, CW signal                         |      | -58  | -53  | dBc   |
| Thermal Resistance, θ <sub>jc</sub> | Module (junction to case)                                    |      |      | 37   | °C/W  |

Notes:

1. Test conditions unless otherwise noted: V<sub>CC1</sub> = V<sub>CC2</sub> = +4.5 V, V<sub>REF</sub> = +2.85V, Temp = +25 °C, 50 Ω system.

| Parameter | Conditions  | -40°C | +25°C | +85°C | Units |
|-----------|---|-------|-------|-------|-------|
| Gain      | Small Signal  | 33.0  | 31.5  | 30.0  | dB    |
| ACLR      | P <sub>OUT</sub> = +24 dBm, 20 MHz LTE E-TM1.1, 9.5dB PAR | -50   | -48   | -46   | dBc   |
| PAE       | P <sub>OUT</sub> = +24 dBm, 20 MHz LTE E-TM1.1, 9.5dB PAR | 16    | 15    | 14    | %     |

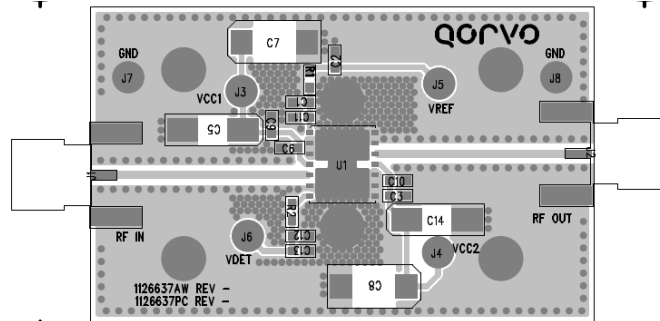
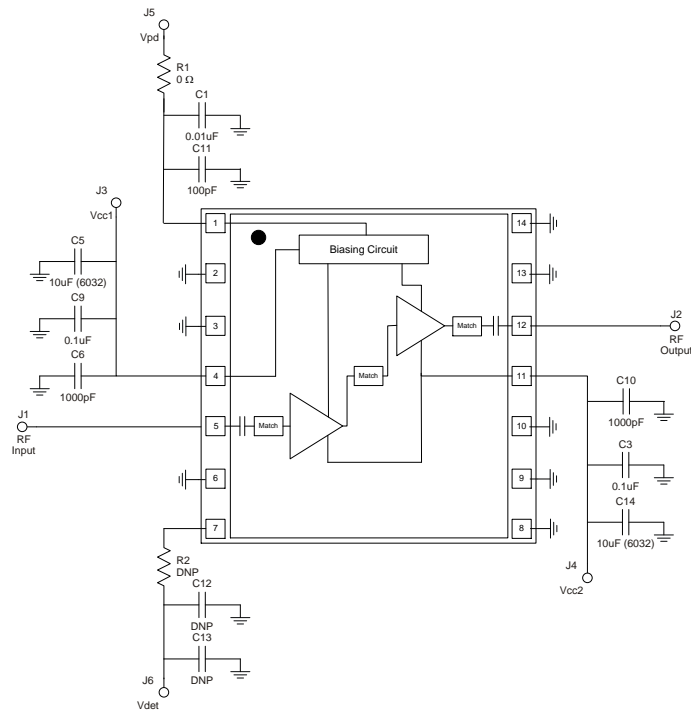
Test Frequency = 1840MHz

### Recommended Operating Conditions

| Parameter                               | Min   | Typ   | Max   | Units |
|---|-------|-------|-------|-------|
| V <sub>CC1</sub> , V <sub>CC2</sub>     | +3.6  | +4.5  | +5.25 | V     |
| V <sub>ref</sub>                        | +2.75 | +2.85 | +2.95 | V     |
| T <sub>CASE</sub>                       | -40   |       | +85   | °C    |
| T <sub>j</sub> at T <sub>CASE</sub> max |       |       | +165  | °C    |

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

### Evaluation Board – TQP9218-PCB



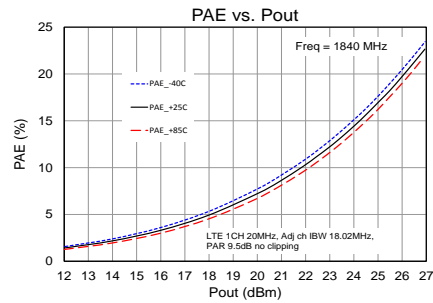
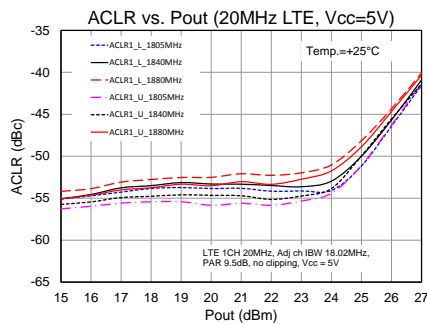
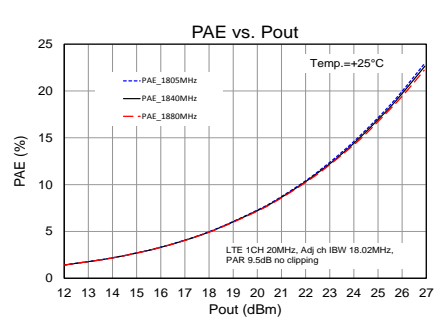
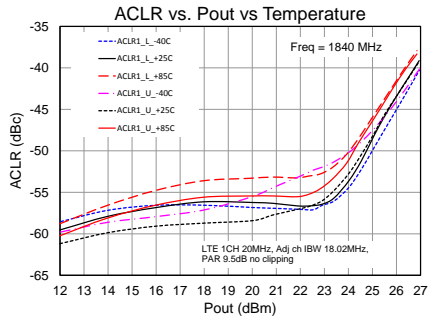
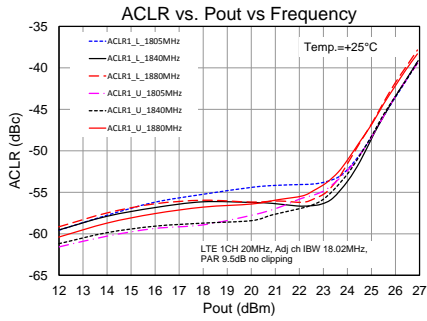
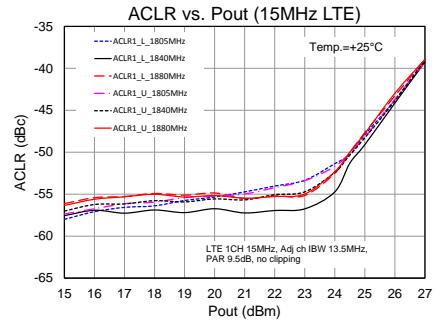
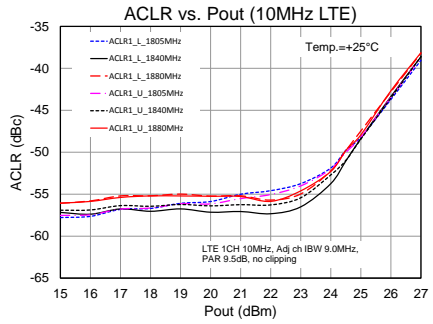
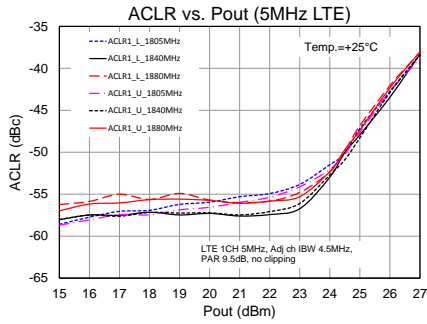
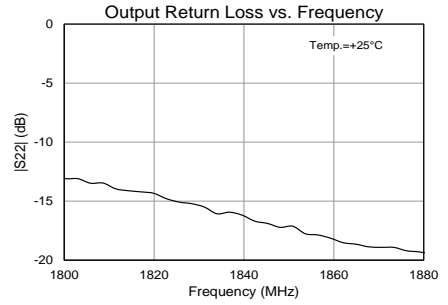
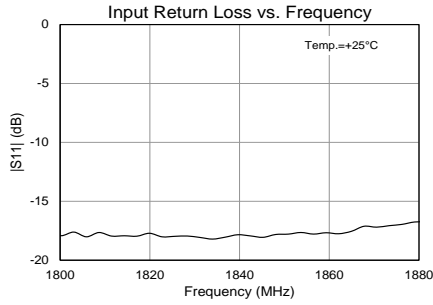
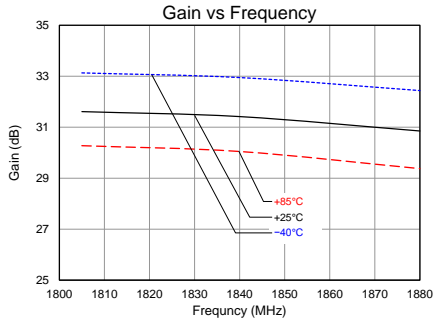
### Bill of Material – TQP9218-PCB

| Reference Des. | Value   | Description                           | Manuf.  | Part Number |
|----------------|---------|---------------------------------------|---------|-------------|
| n/a            | n/a     | Printed Circuit Board                 |         |             |
| U1             | n/a     | High Linearity 0.25 W Power Amplifier | Qorvo   | TQP9218     |
| R1             | 0 Ω     | Resistor, Chip, 0603, 5%              | various |             |
| C1             | 0.01 uF | Capacitor, Chip, 0603, 5%             | various |             |
| C11            | 100 pF  | Capacitor, Chip, 0603, 5%             | various |             |
| C3, C9         | 0.1 uF  | Capacitor, Chip, 0603, 5%             | various |             |
| C5, C14        | 10 uF   | Capacitor, Chip, 6032, 10%, Tantalum  | various |             |
| C6, C10        | 1000 pF | Capacitor, Chip, 0603, NPO/COG, 5%    | various |             |

| Vcc1=Vcc2=4.5V, Pout=24.5dBm, Signal PAR=9.5dB, F = 1840MHz |       |       |       |       |       |
|---|-------|-------|-------|-------|-------|
| LTE signal BW   | 5MHz  | 10MHz | 15MHz | 20MHz | Units |
| ACLR1-Low   | -50.0 | -51.5 | -51.5 | -51.5 | dBc   |
| ACLR1-high  | -51.5 | -51.5 | -50.0 | -50.5 | dBc   |

### Performance Plots – TQP9218-PCB

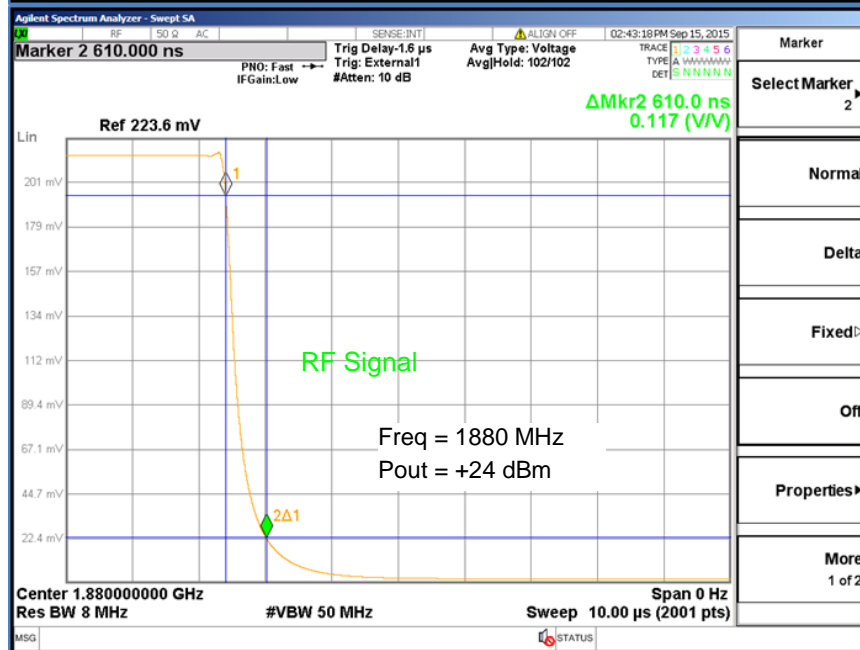
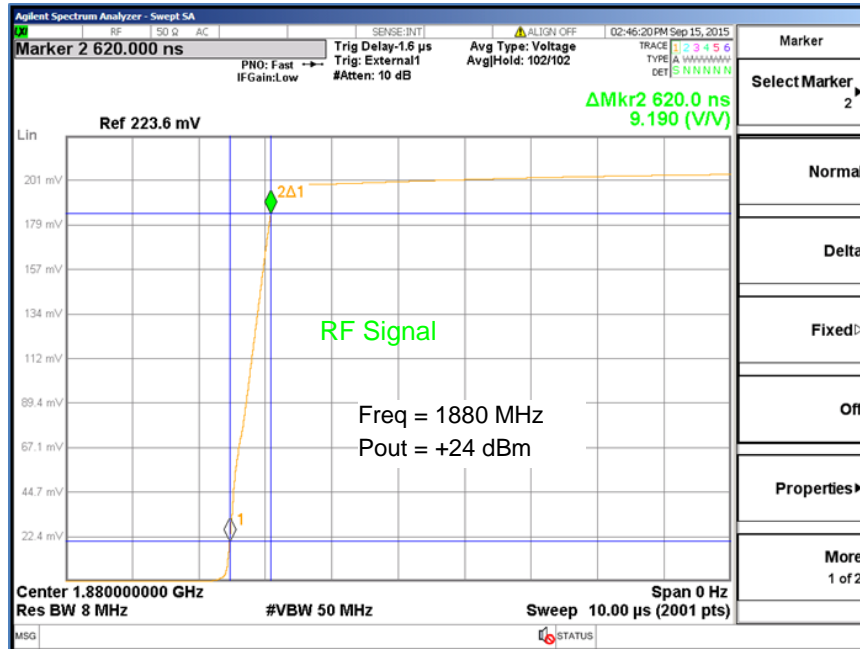
Test conditions unless otherwise noted:  $V_{CC1} = V_{CC2} = +4.5V$ ,  $V_{REF} = +2.85V$ ,  $I_{CQ} = 212mA$ ,  $I_{REF} = 6.5mA$ ,  $Temp. = +25^{\circ}C$



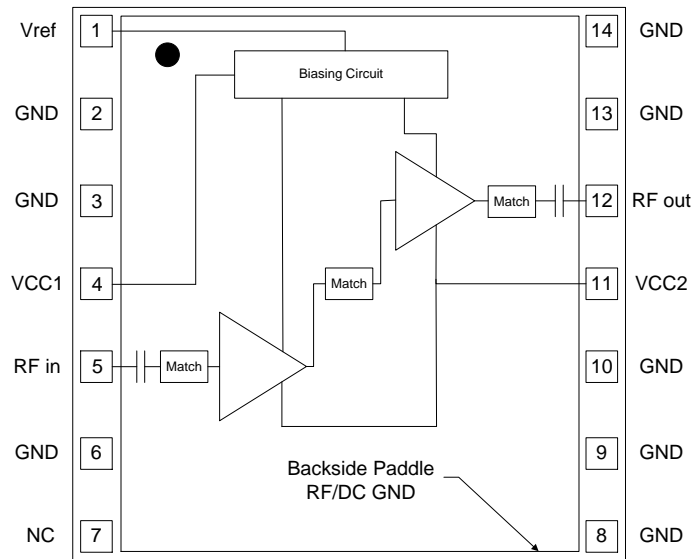
### Switching Speed

#### Switching Speed Measurement based on TQP9218 Application Board Using Shutdown Circuit: $V_{REF}=2.85V$ , $V_{CC}=4.5V$ , $C_1=NL$

| Parameter                             |       |
|---------------------------------------|-------|
| Turn-on Transition (10% RF – 90% RF)  | 620nS |
| Turn-off Transition (90% RF – 10% RF) | 610nS |



### Pin Configuration and Description

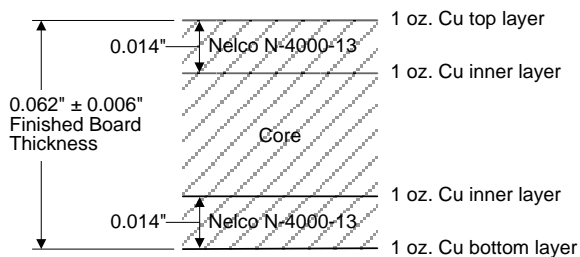


Top View

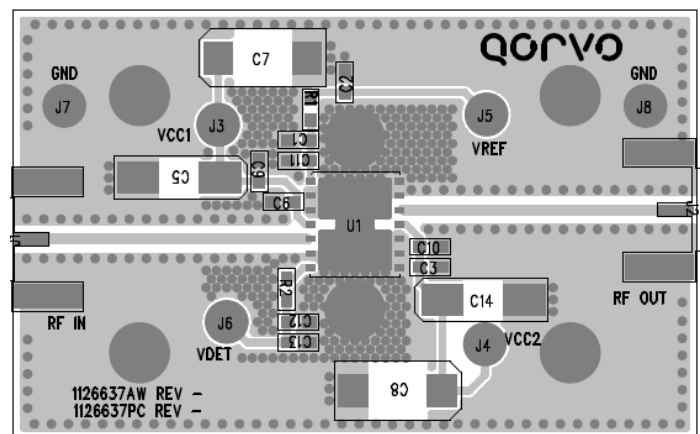
| Pad No.                   | Label            | Description   |
|---------------------------|------------------|---|
| 1                         | V <sub>REF</sub> | Sets the bias current for the amplifiers. It can also be used to power down the device. |
| 2, 3, 6, 8, 9, 10, 13, 14 | GND              | RF and DC ground.   |
| 4                         | V <sub>CC1</sub> | Voltage supply for the active bias circuitry.   |
| 5                         | RFin             | RF input pin. The DC is internally blocked at this pin.                                 |
| 7                         | NC               | No internal connection.   |
| 11                        | V <sub>CC2</sub> | DC voltage supply connection for AMP1 and AMP2.   |
| 12                        | RFout            | RF output pin. The DC is internally blocked at this pin.                                |
| Backside Paddle           | RF/DC GND        | RF/DC ground. See PCB Mounting Pattern for suggested footprint.                         |

### Evaluation Board PCB Information

#### Qorvo PCB 1126637 Material and Stack-up

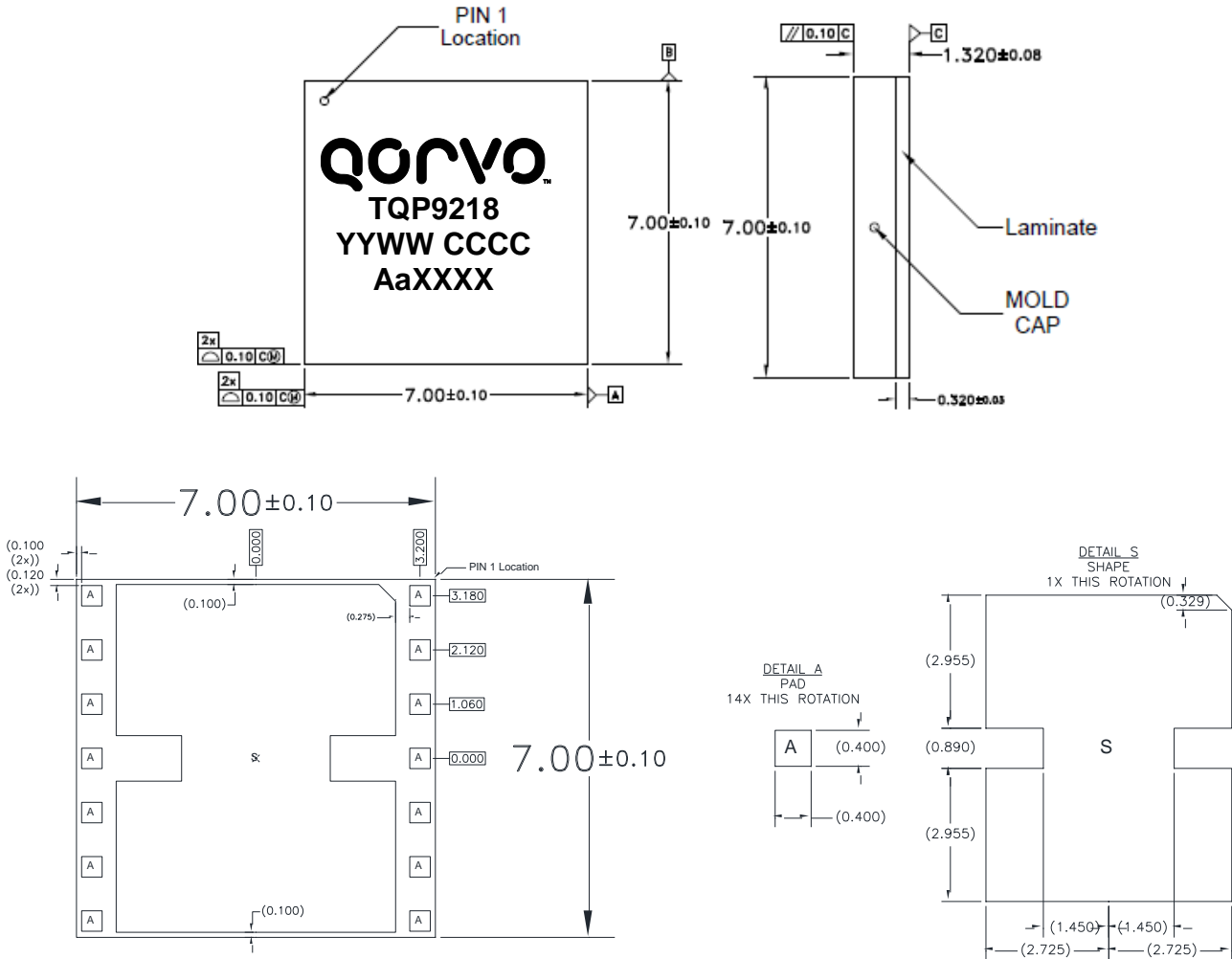


50 ohm line dimensions: width = .028"  
spacing = .028".



### Package Marking and Dimensions

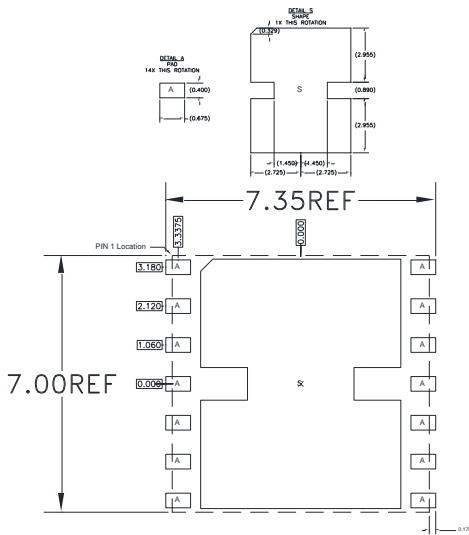
Marking: Part number – TQP9218  
 Assembly Code – YYWW  
 Country Code - CCCC  
 Lot code – AaXXXX



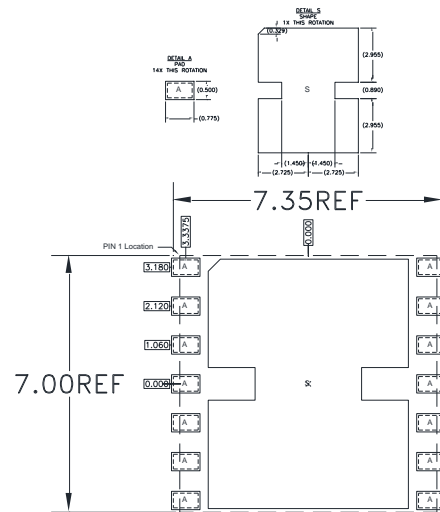
**Notes:**

1. All dimensions are in millimeters. Angles are in degrees.
2. Dimension and tolerance formats conform to ASME Y14.4M-1994.
3. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.

### PCB Mounting Pattern



RECOMMENDED  
LAND PATTERN



RECOMMENDED  
LAND PATTERN MASK

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.



### Handling Precautions

| Parameter                        | Rating   | Standard                 |
|----------------------------------|----------|--------------------------|
| ESD – Human Body Model (HBM)     | Class 2  | ESDA / JEDEC JS-001-2012 |
| ESD – Charged Device Model (CDM) | Class C3 | JEDEC JESD22-C101F       |
| MSL – Moisture Sensitivity Level | Level 3  | IPC/JEDEC J-STD-020      |



Caution!  
ESD-Sensitive Device

### Solderability

Compatible with both lead-free (260°C max. reflow temp.) and tin/lead (245°C max. reflow temp.) soldering processes. Solder profiles available upon request.

Contact plating: Electrolytic plated Au over Ni

### RoHS Compliance

This part is compliant with EU 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 (C<sub>15</sub>H<sub>12</sub>Br<sub>4</sub>O<sub>2</sub>) Free
- PFOS Free
- SVHC Free

### Contact Information

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

Tel: 1-844-890-8163

Web: [www.qorvo.com](http://www.qorvo.com)

Email: [customer.support@qorvo.com](mailto:customer.support@qorvo.com)

For technical questions and application information: Email: [appsupport@qorvo.com](mailto:appsupport@qorvo.com)

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