



# QPB9325

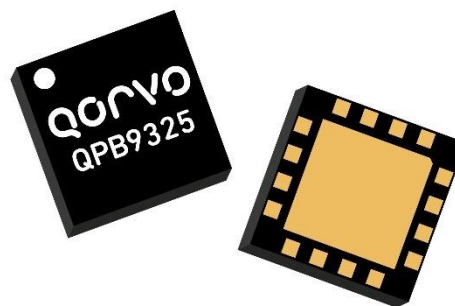
## High Power Switch LNA Module

### Product Overview

The Qorvo® QPB9325 is a highly integrated front-end module targeted for TDD macro or picocell base stations. The LNA switch module integrates RF functional blocks such as a pin-diode based high power switch capable of handling up to 52 W with an LTE signal (8 dB PAR) along with two LNA stages. Further integration is also implemented where the pin diode driver and DC-DC converter circuits are implemented inside the module to enable only the need for an external 5 V power supply. The control voltage for the switch and Gain control. mode is with 3.3 V logic.

The QPB9325 can be utilized across the 3.3-4.2 GHz range to provide 1.2 dB noise figure for operation in the receive mode and 0.5 dB insertion loss in the transmit mode. The LNAs utilize Qorvo's high performance E-pHEMT process while the switch allows for power levels up to 360 W peak power to be routed to an external load termination.

The QPB9325 is packaged in a RoHS-compliant, compact 8x8 mm surface-mount leadless package. The switch LNA module is targeted for wireless infrastructure applications configured for TDD-based architectures.

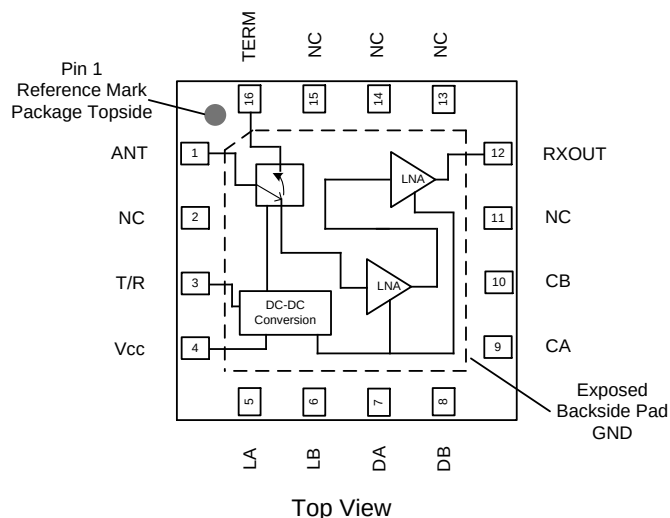


16 Pin 8 mm x 8 mm Leadless SMT Package

### Key Features

- 3.3-4.2 GHz frequency range
- Integrates a high-power switch, two LNA stages, pin diode driver circuits, and dc converter
- Ideal for TDD systems with an isolator
- Only requires a 5 V supply with 3.3 V logic Ctrl.
- Max RF Input power: 52 W Pavg (8 dB PAR)
- 34.1 dB gain
- 1.2 dB noise figure
- -2.2 dBm IIP3 (Rx mode)
- 0.5 dB Insertion Loss (Tx mode)
- Compact package size, 8x8 mm

### Functional Block Diagram



### Applications

- Wireless Infrastructure
- Macro or picocell base stations
- TDD-based architectures

### Ordering Information

| Part No.    | Description            |
|-------------|------------------------|
| QPB9325TR13 | 2500 pcs on a 13" reel |
| QPB9325EVB  | Evaluation board       |

## Absolute Maximum Ratings

| Parameter                          | Rating         |
|------------------------------------|----------------|
| Storage Temperature                | -50 to +150 °C |
| Max Operating Temperature          | +115 °C        |
| V <sub>CC</sub>                    | +6 V           |
| RF at ANT (Tx Mode) <sup>(1)</sup> | +47.2 dBm      |
| RF at ANT (Tx Mode) <sup>(2)</sup> | +44.2 dBm      |
| RF at ANT (Rx Mode) <sup>(2)</sup> | +20 dBm        |

Notes:

1. 10s, 8 dB PAR, 88% duty cycle, +100 °C, 1CH LTE
2. Indefinitely, 8 dB PAR, 88% duty cycle, +100 °C, 1CH LTE

Operation of this device outside the parameter ranges given above may cause permanent damage.

## Recommended Operating Conditions

| Parameter                                                     | Min   | Typ | Max   | Units |
|---------------------------------------------------------------|-------|-----|-------|-------|
| V <sub>CC</sub>                                               | +4.75 | +5  | +5.25 | V     |
| T/R Mode Low Voltage                                          | 0     |     | 0.8   | V     |
| T/R Mode High Voltage                                         | 2.0   |     | 3.6   | V     |
| T <sub>CASE</sub>                                             | -40   |     | +105  | °C    |
| T <sub>j</sub> for >10 <sup>6</sup> hours MTTF <sup>(3)</sup> |       |     | +190  | °C    |

Notes:

3. For RX Mode operation

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

## Electrical Specifications

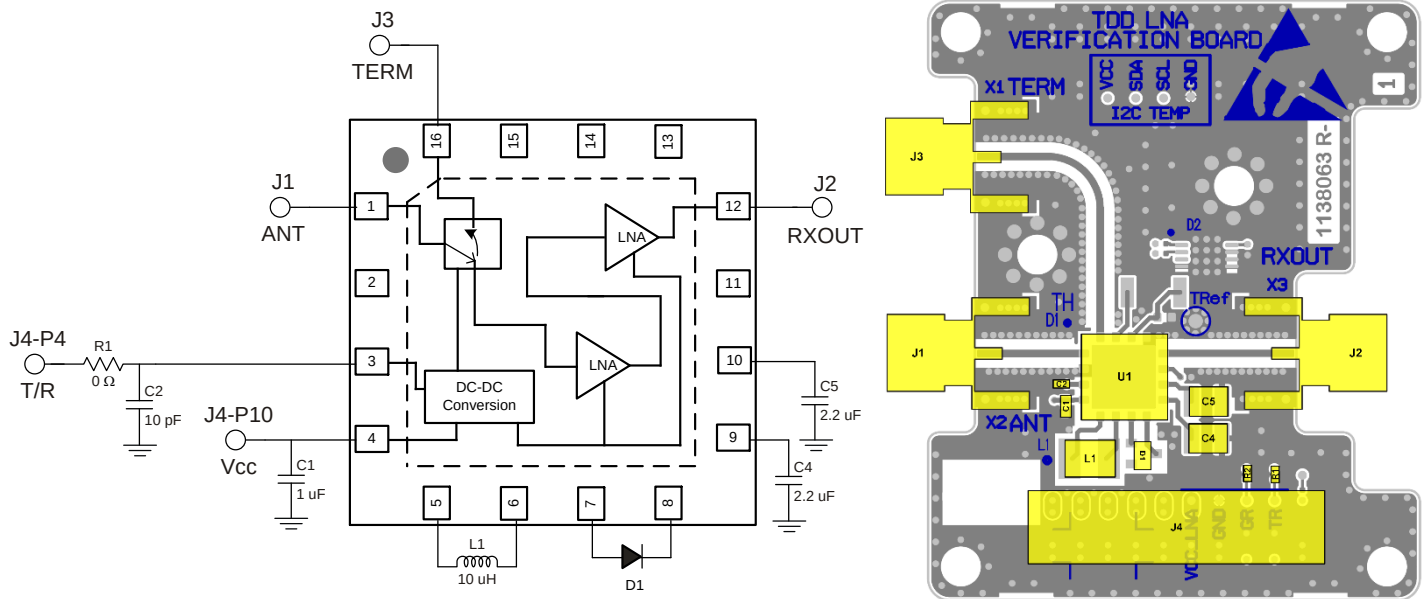
Test conditions unless otherwise noted: V<sub>CC</sub> = +5.0 V, Temp. = +25 °C, 50 Ω system

| Parameter                                | Conditions                                          | Min                 | Typ    | Max  | Units |
|------------------------------------------|-----------------------------------------------------|---------------------|--------|------|-------|
| Operational Frequency Range              |                                                     | 3300 <sup>(4)</sup> |        | 4200 | MHz   |
| Test Frequency                           |                                                     |                     | 3700   |      | MHz   |
| Gain                                     | Rx mode                                             | 31                  | 34.1   |      | dB    |
| Gain Flatness                            | Rx mode                                             |                     | 1.0    |      | dB    |
| Noise Figure                             | Rx mode                                             |                     | 1.2    | 1.65 | dB    |
| Input IP3                                | Rx mode, Pin/tone = -33 dBm, Δf = 1 MHz             | -10                 | -2.2   |      | dBm   |
| Input P1dB                               | Rx mode                                             | -20                 | -15    |      | dBm   |
| Input Return Loss (ANT)                  | Rx mode                                             |                     | 30     |      | dB    |
| Output Return Loss (Rx Out)              | Rx mode                                             |                     | 26     |      | dB    |
| Reverse Isolation                        | Rx mode                                             |                     | 58     |      | dB    |
| Insertion Loss                           | Tx mode                                             |                     | 0.5    | 1.0  | dB    |
| Input P0.1dB                             | Tx mode                                             |                     | >+46.6 |      | dBm   |
| Return Loss (ANT, TERM)                  | Tx mode                                             |                     | 25     |      | dB    |
| Operating Current                        | Rx mode                                             |                     | 240    |      | mA    |
| Operating Current                        | Tx mode                                             |                     | 140    | 150  | mA    |
| Switching Time (ANT to Rx Out)           | RF<0.1dB after T/R command                          |                     | 2      |      | μs    |
| Switching Time (ANT to Term)             | RF<0.1dB after T/R command                          |                     | 1      |      | μs    |
| Switching Time (ANT to Rx Out/Term)      | ANT to RXOUT/TERM with RF<0.5dB after DC turn on    |                     | 1      |      | s     |
| In Band Spurious Emission <sup>(5)</sup> | Rx Mode at Rx out with Pin = -49 dBm <sup>(6)</sup> |                     | -85    |      | dBc   |
| Out of Band Emissions <sup>(7)</sup>     | Rx Mode at Rx out from DC to 12275 MHz              |                     | -73    |      | dBm   |
| Thermal Resistance                       | Rx mode                                             |                     |        | 22   | °C/W  |
| Thermal Resistance                       | Tx mode                                             |                     |        | 22   | °C/W  |

Notes:

4. External matchings applied
5. Pin is a CW signal swept from 3.6 to 3.8 GHz. Spec refers to any spurious mixing product that occurs from 3.6 to 3.8 GHz.
6. Recommend to follow Qorvo EVB layout for lowest spur level; any deviation can increase spur level.
7. Measure Pout with IBW = 4.5 MHz over frequency range with no input power applied.

## Application Circuit Schematic and Layout – QPB9325EVB



Note: L1 is placed 5mm from bottom edge of U1 to top edge of L1 for in band spur suppression.

## Bill of Material – QPB9325EVB

| Ref Des | Value       | Description                              | Manuf.    | Part Number   |
|---------|-------------|------------------------------------------|-----------|---------------|
| -       | -           | Printed Circuit Board                    |           |               |
| U1      | -           | High Power Switch LNA Module             | Qorvo     | QPB9325       |
| R1, R2  | 0 $\Omega$  | Resistor, Chip, 0402, 5%                 | Various   |               |
| C1      | 1 $\mu$ F   | Capacitor, Chip, 0603, 20%, X7R          | Various   |               |
| C2      | 10 pF       | Capacitor, Chip, 0402, NPO/COG, 5%       | Various   |               |
| C4, C5  | 2.2 $\mu$ F | Capacitor, Chip, 1210, 100 V, 10%, X7R   | Various   |               |
| D1      | -           | Diode, 200 V 200 mA SOT23                | Various   |               |
| L1      | 10 $\mu$ H  | Inductor, Power, 10 $\mu$ H, 20%, 0.84 A | Coilcraft | LPS4018-103ML |

## Logic Table

| Parameter | High    | Low     |
|-----------|---------|---------|
| T/R       | Rx Mode | Tx Mode |

## Typical Performance, Rx Mode – QPB9325EVB

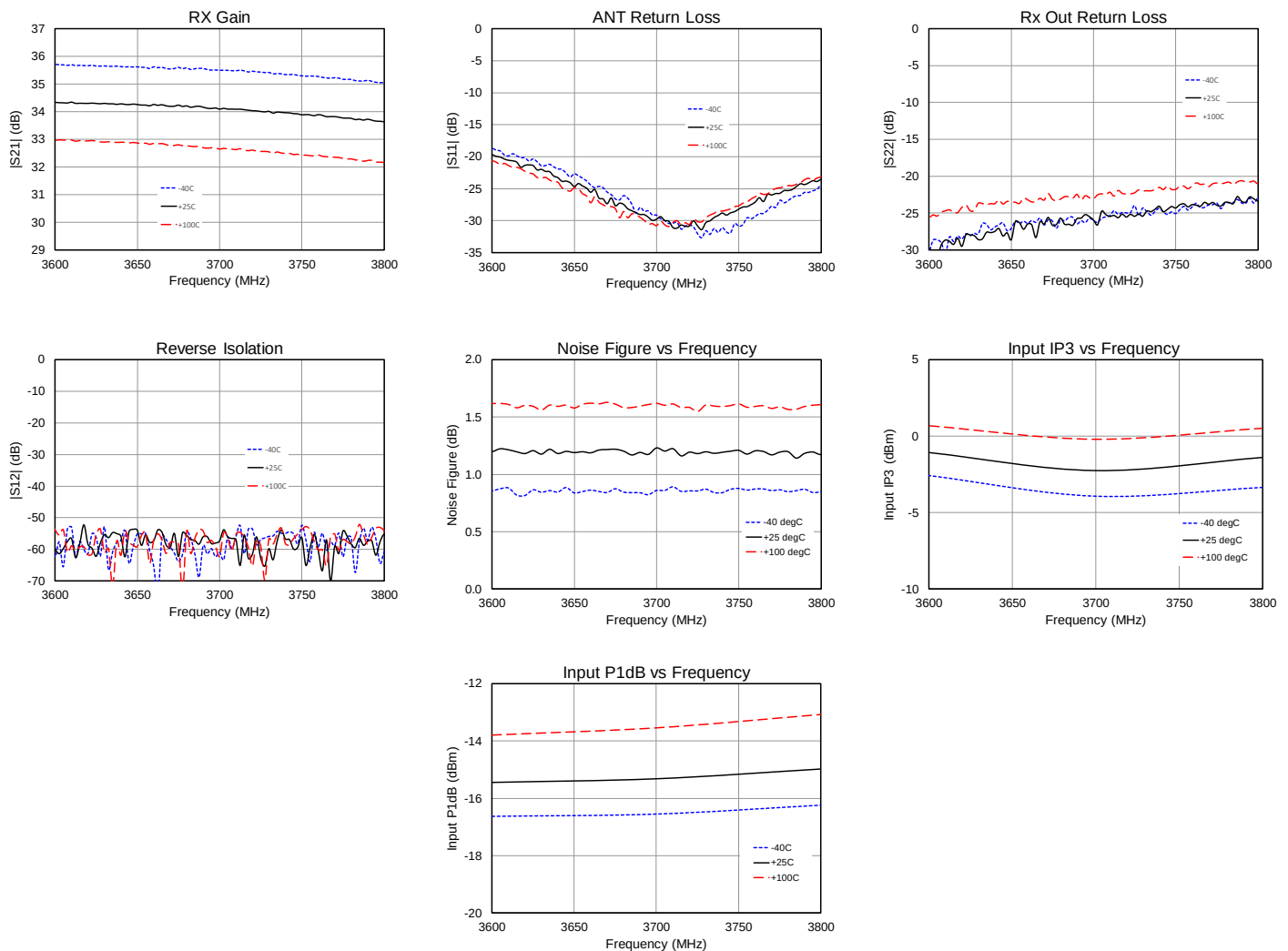
| Parameter         | Conditions <sup>(1)</sup>              | Typical Value |       |       | Units |
|-------------------|----------------------------------------|---------------|-------|-------|-------|
| Frequency         |                                        | 3600          | 3700  | 3800  | MHz   |
| Gain              |                                        | 34.3          | 34.1  | 33.6  | dB    |
| Input IP3         | Pin = -33 dBm/tone, $\Delta f = 1$ MHz | -1.1          | -2.2  | -1.4  | dBm   |
| Input P1dB        |                                        | -15.4         | -15.3 | -15.0 | dBm   |
| Noise Figure      | De-embedded from Evaluation board PCB  | 1.2           | 1.2   | 1.2   | dB    |
| Return Loss       | ANT port                               | 20            | 30    | 24    | dB    |
| Return Loss       | Rx Out port                            | 30            | 26    | 24    | dB    |
| Reverse Isolation | Rx Out to ANT port                     | 58            | 58    | 58    | dB    |

Notes:

1. Test conditions unless otherwise noted:  $V_{CC} = +5.0$  V,  $T/R = 3$  V, Temp. = +25 °C

## Performance Plots, Rx Mode – QPB9325EVB

Test conditions unless otherwise noted:  $V_{CC} = +5.0$  V,  $T/R = 3$  V; Temp. = +25 °C



## Typical Performance, Tx Mode – QPB9325EVB

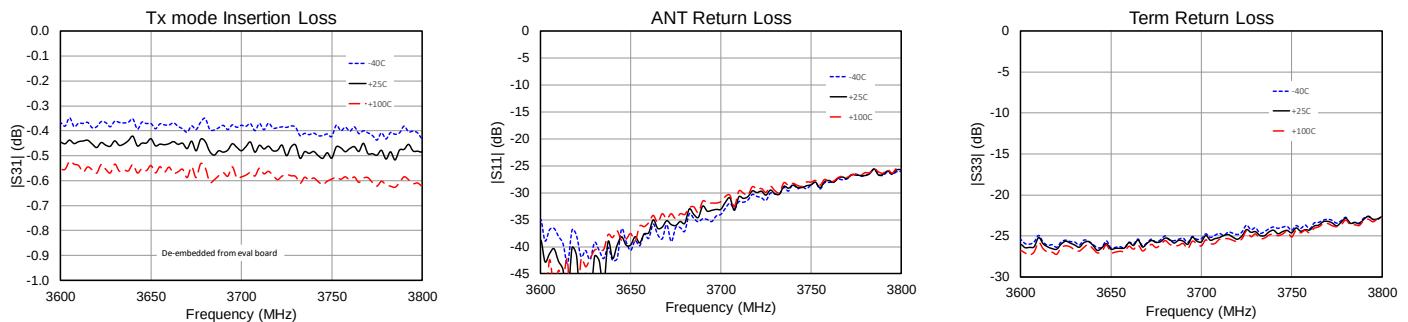
| Parameter         | Conditions <sup>(1)</sup>             | Typical Value |       |       | Units |
|-------------------|---------------------------------------|---------------|-------|-------|-------|
| Frequency         |                                       | 3600          | 3700  | 3800  | MHz   |
| Insertion Loss    | De-embedded from Evaluation board PCB | 0.5           | 0.5   | 0.5   | dB    |
| Input Compression | Pin = +46.6dBm                        | < 0.1         | < 0.1 | < 0.1 | dB    |
| Return Loss       | ANT port                              | 40            | 33    | 26    | dB    |
| Return Loss       | TERM port                             | 26            | 25    | 23    | dB    |

Notes:

1. Test conditions unless otherwise noted:  $V_{CC} = +5.0$  V, T/R = 0 V, Temp. = +25 °C

## Performance Plots, Tx Mode – QPB9325EVB

Test conditions unless otherwise noted:  $V_{CC} = +5.0$  V, T/R = 0 V; Temp. = +25 °C



## 3.9 GHz to 4.2 GHz Performance, Tx Mode – QPB9325EVB

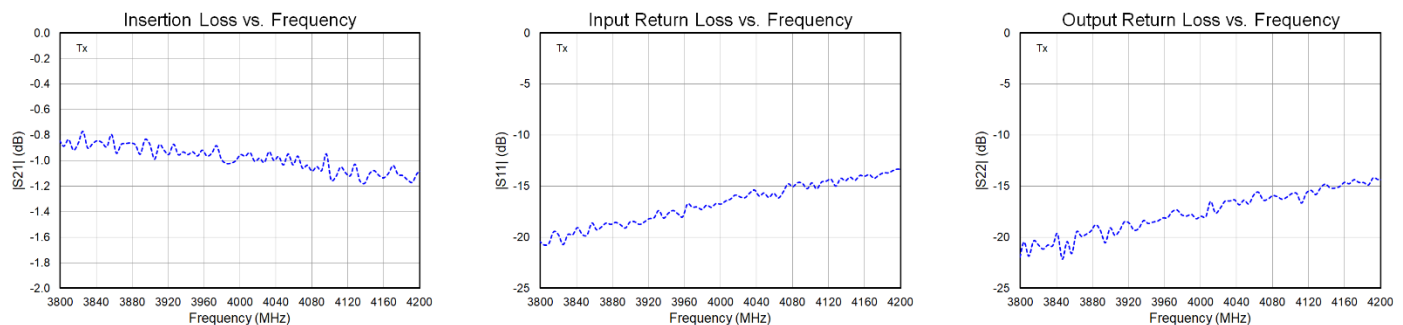
| Parameter      | Conditions <sup>(1)</sup> | Typical Value |      |      | Units |
|----------------|---------------------------|---------------|------|------|-------|
| Frequency      |                           | 3900          | 4000 | 4200 | MHz   |
| Insertion Loss | Evaluation board          | 0.87          | 0.95 | 1.07 | dB    |
| Return Loss    | ANT port                  | 18            | 16.7 | 13.4 | dB    |
| Return Loss    | TERM port                 | 19            | 17.9 | 14.4 | dB    |

Notes:

1. Test conditions unless otherwise noted:  $V_{CC} = +5.0$  V, T/R = 0 V, Temp. = +25 °C

## 3.9 GHz to 4.2 GHz Performance Plots, Tx Mode – QPB9325EVB

Test conditions unless otherwise noted:  $V_{CC} = +5.0$  V, T/R = 0 V, Temp. = +25 °C, Input ANT port, Output TERM port, On EVB



### 3.9 GHz to 4.2 GHz Performance, Rx Mode – QPB9325EVB

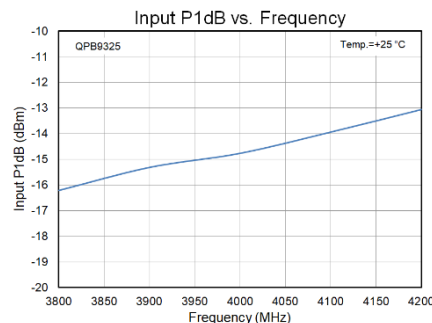
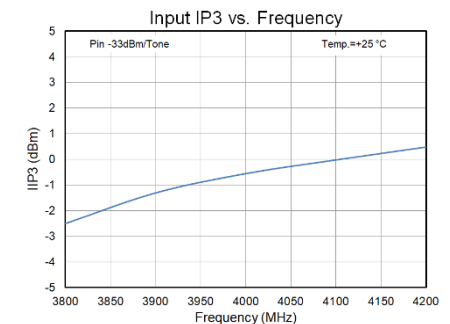
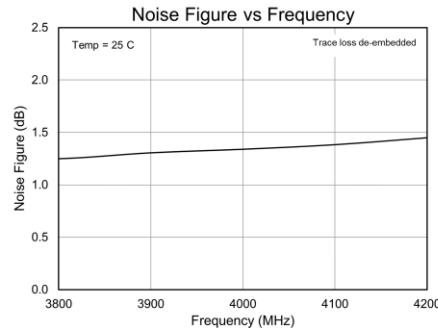
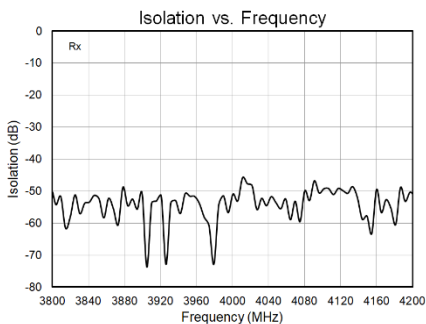
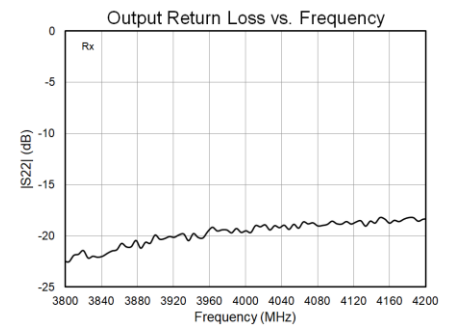
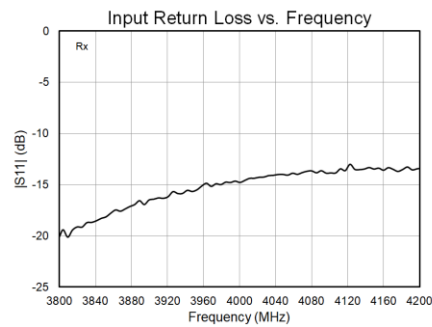
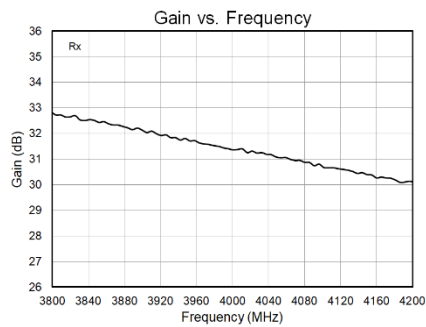
| Parameter         | Conditions <sup>(1)</sup>    | Typical Value |       |       | Units |
|-------------------|------------------------------|---------------|-------|-------|-------|
| Frequency         |                              | 3900          | 4000  | 4200  | MHz   |
| Gain              |                              | 32.1          | 31.4  | 30.1  | dB    |
| Input IP3         | Pin = -33 dBm/tone, Δf=1 MHz | -1.31         | -0.56 | 0.47  | dBm   |
| Input P1dB        |                              | -15.3         | -14.7 | -13.0 | dBm   |
| Noise Figure      | Trace Loss de-embedded       | 1.30          | 1.34  | 1.45  | dB    |
| Return Loss       | ANT port                     | 16            | 15    | 13    | dB    |
| Return Loss       | Rx Out port                  | 20            | 19    | 18    | dB    |
| Reverse Isolation | Rx Out to ANT port           | 50            | 51    | 52    | dB    |

Notes:

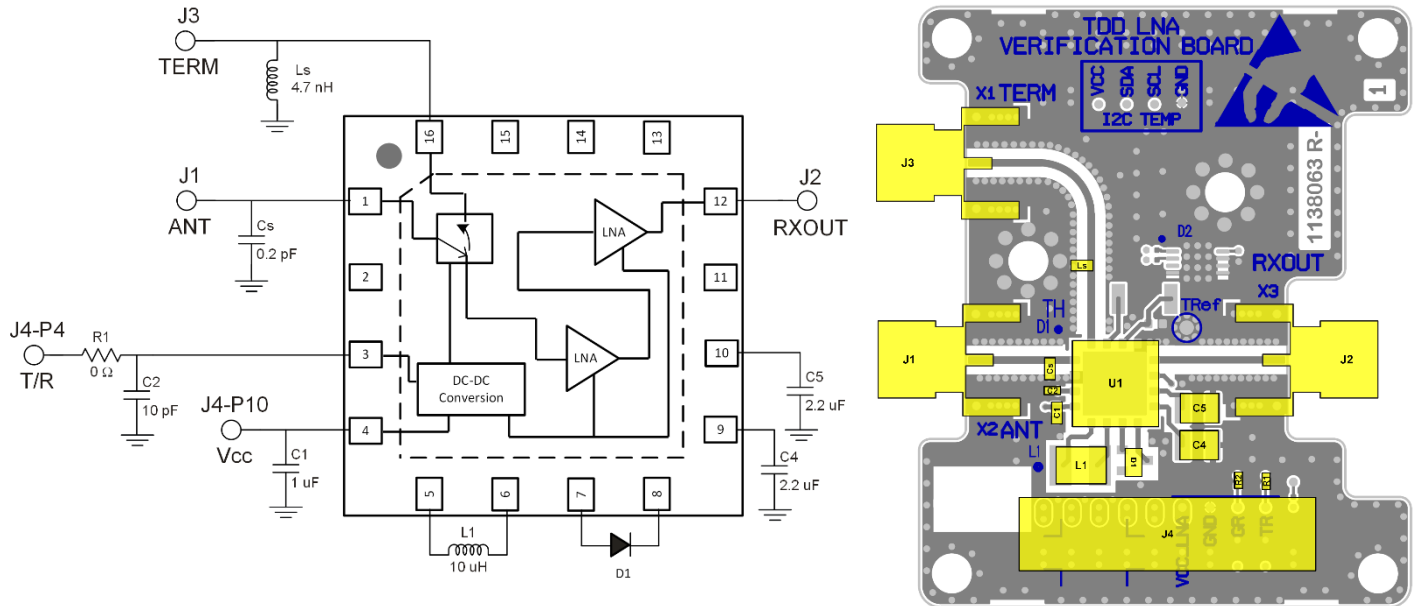
1. Test conditions unless otherwise noted:  $V_{CC} = +5.0$  V,  $T/R = 3$  V, Temp. = +25 °C

### 3.9 GHz to 4.2 GHz Performance Plots, Rx Mode – QPB9325EVB

Test conditions unless otherwise noted:  $V_{CC} = +5.0$  V,  $T/R = 3$  V; Temp. = +25 °C



## Application Reference – 3.3GHz to 3.8GHz with on EVB Matchings



Note: L1 is placed 5mm from bottom edge of U1 to top edge of L1 for in band spur suppression.

## Bill of Material – 3.3GHz to 3.8GHz with on EVB Matchings

| Ref Des | Value       | Description                              | Manuf.    | Part Number   |
|---------|-------------|------------------------------------------|-----------|---------------|
| -       | -           | Printed Circuit Board                    |           |               |
| U1      | -           | High Power Switch LNA Module             | Qorvo     | QPB9325       |
| R1, R2  | 0 $\Omega$  | Resistor, Chip, 0402, 5%                 | Various   |               |
| C1      | 1 $\mu$ F   | Capacitor, Chip, 0603, 20%, X7R          | Various   |               |
| C2      | 10 pF       | Capacitor, Chip, 0402, NPO/COG, 5%       | Various   |               |
| C4, C5  | 2.2 $\mu$ F | Capacitor, Chip, 1210, 100 V, 10%, X7R   | Various   |               |
| D1      | -           | Diode, 200 V 200 mA SOT23                | Various   |               |
| L1      | 10 $\mu$ H  | Inductor, Power, 10 $\mu$ H, 20%, 0.84 A | Coilcraft | LPS4018-103ML |
| Cs      | 0.2 pF      | Capacitor, Chip, 0603                    | AVX       |               |
| Ls      | 4.7 nH      | Inductor, Chip, 0603                     | Toko      |               |

### 3.3 GHz to 3.8 GHz Performance, Tx Mode – with on EVB Matchings

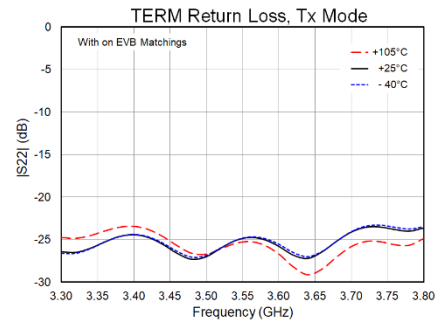
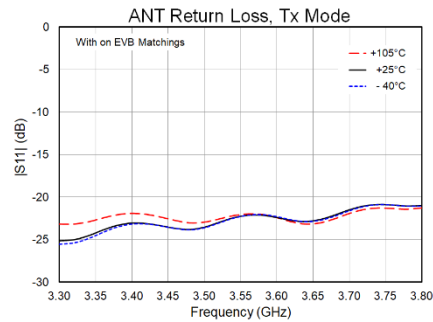
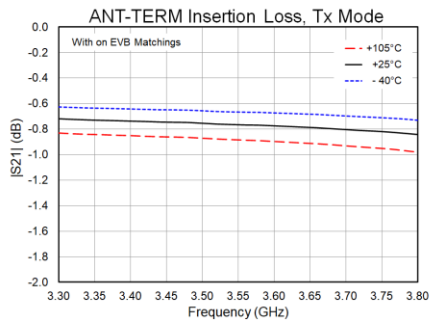
| Parameter      | Conditions <sup>(1)</sup> | Typical Value |      |      |      |      | Units |
|----------------|---------------------------|---------------|------|------|------|------|-------|
| Frequency      |                           | 3300          | 3400 | 3600 | 3700 | 3800 | MHz   |
| Insertion Loss | Evaluation board          | 0.72          | 0.74 | 0.78 | 0.81 | 0.84 | dB    |
| Return Loss    | ANT port                  | 25.1          | 23.0 | 22.3 | 21.5 | 20.9 | dB    |
|                | TERM port                 | 26.4          | 24.4 | 25.8 | 24.1 | 23.6 | dB    |

Notes:

1. Test conditions unless otherwise noted:  $V_{CC} = +5.0$  V,  $T/R = 0$  V, Temp. = +25 °C, with on EVB matchings

### 3.3 GHz to 3.8 GHz Performance Plots, Tx Mode – with on EVB Matchings

Test conditions unless otherwise noted:  $V_{CC} = +5.0$  V,  $T/R = 0$  V, ANT-input port, TERM-output port, with on EVB matchings





### 3.3 GHz to 3.8 GHz Performance, Rx Mode – with on EVB Matchings

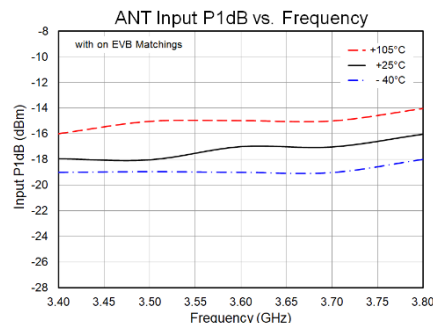
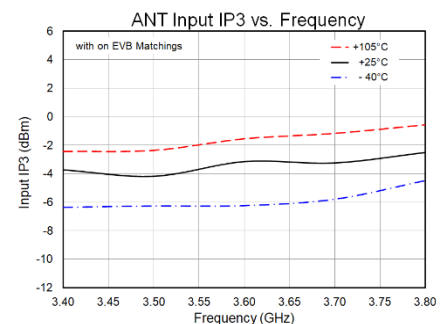
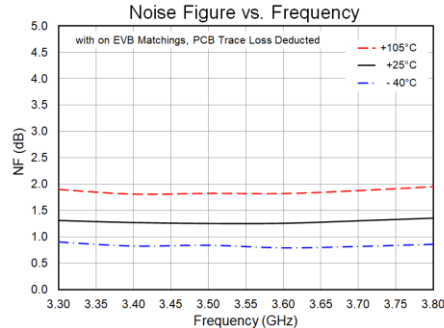
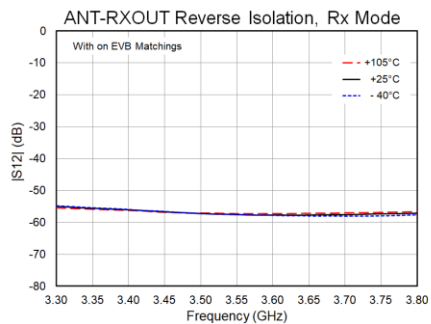
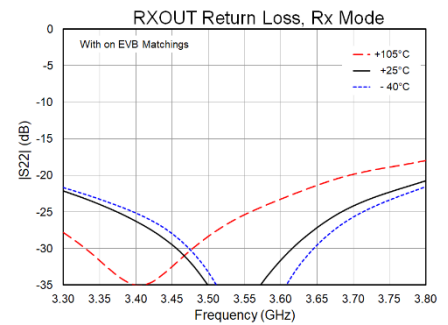
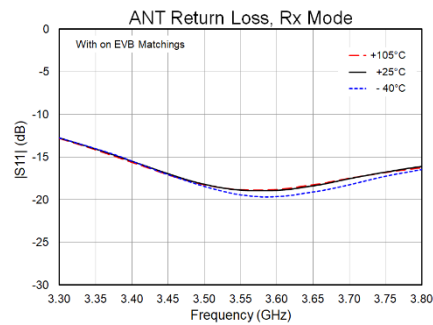
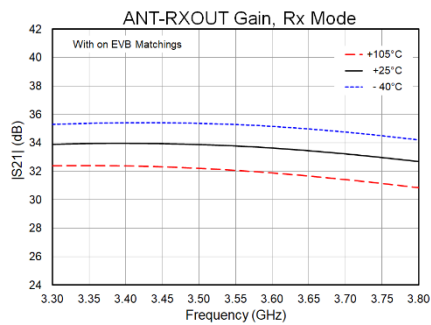
| Parameter         | Conditions <sup>(1)</sup>            | Typical Value |       |       |       |       | Units |
|-------------------|--------------------------------------|---------------|-------|-------|-------|-------|-------|
| Frequency         |                                      | 3300          | 3400  | 3600  | 3700  | 3800  | MHz   |
| Gain              |                                      | 33.9          | 33.9  | 33.6  | 33.2  | 34.2  | dB    |
| Input IP3         | Pin = -33 dBm/tone, $\Delta f=1$ MHz | -2.24         | -3.73 | -3.16 | -3.25 | -2.53 | dBm   |
| Input P1dB        |                                      | -16.9         | -17.9 | -16.9 | -17.0 | -16.0 | dBm   |
| Noise Figure      | PCB trace loss deducted              | 1.31          | 1.27  | 1.26  | 1.30  | 1.35  | dB    |
| Return Loss       | ANT port                             | 12.8          | 15.5  | 18.9  | 17.2  | 16.1  | dB    |
|                   | RXOUT port                           | 22.1          | 26.2  | 31.5  | 24.2  | 20.7  | dB    |
| Reverse Isolation | RXOUT to ANT port                    | 54.9          | 56.0  | 57.6  | 57.6  | 57.0  | dB    |

Notes:

1. Test conditions unless otherwise noted:  $V_{CC} = +5.0$  V,  $T/R = 3$  V, Temp. = +25 °C, with on EVB matchings

### 3.3 GHz to 3.8 GHz Performance Plots, Rx Mode – with on EVB Matchings

Test conditions unless otherwise noted:  $V_{CC} = +5.0$  V,  $T/R = 3$  V; Temp. = +25 °C

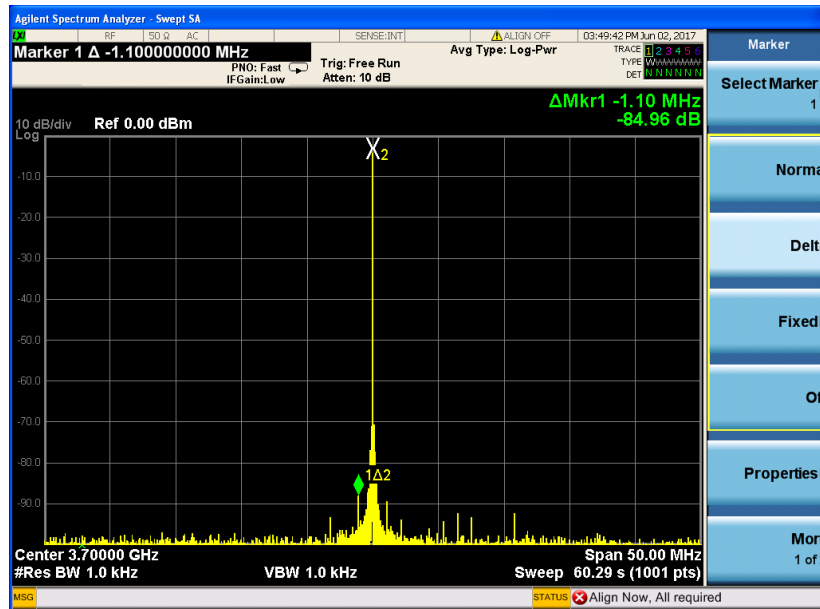


## Application Circuit for Reduced Spurious

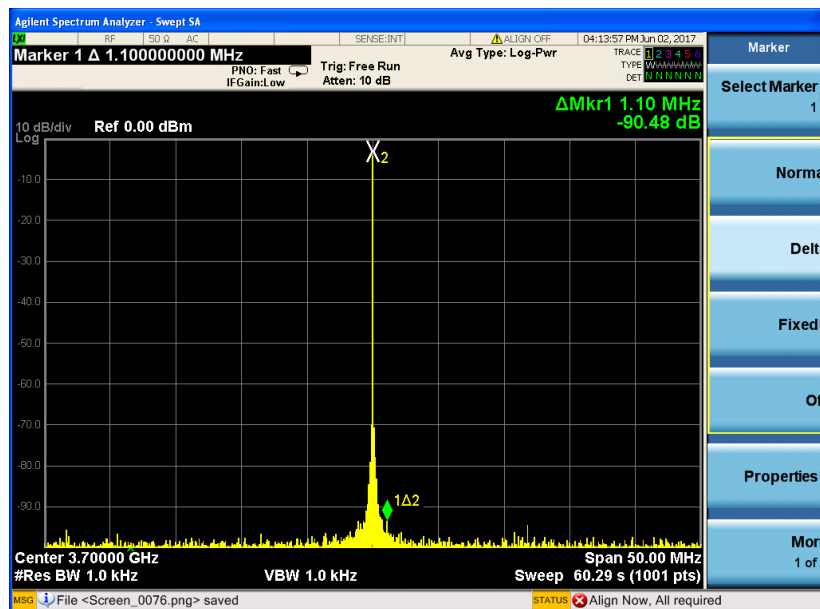
This section describes an alternative way to route the DC-DC converter signals for further improvement of in-band spurious emissions.

## Spurious Performance – Modified PCB

Test conditions unless otherwise noted:  $V_{CC} = +5.0$  V,  $T/R = +3.0$  V,  $R_{Fin} = -35$  dBm CW; Temp. = +25 °C

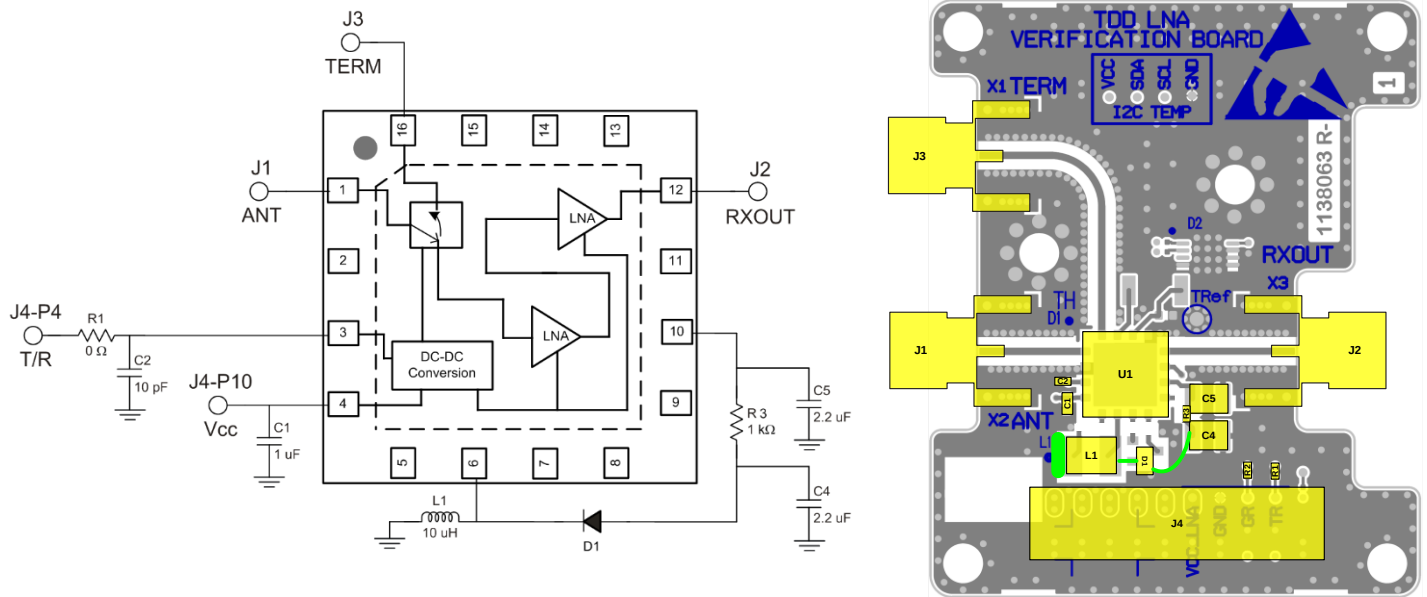


Original PCB Configuration



Modified PCB Configuration

## Application Circuit Schematic and Layout – Modified PCB

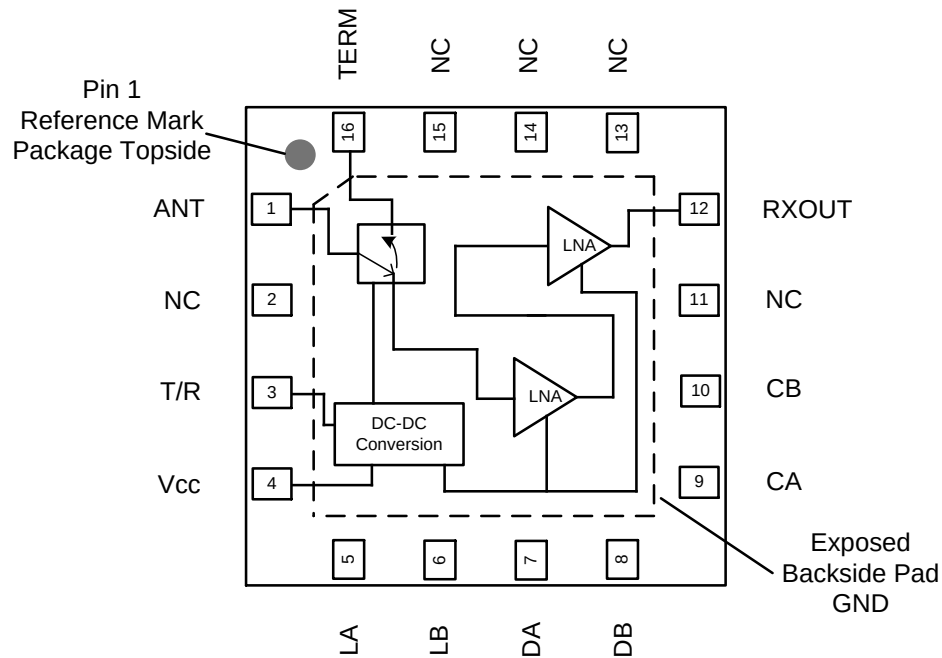


Note: R3 is the only additional component. All other parts are same as unmodified Evaluation Board

## Bill of Material – Modified PCB

| Ref Des | Value        | Description                              | Manuf.    | Part Number   |
|---------|--------------|------------------------------------------|-----------|---------------|
| -       | -            | Printed Circuit Board                    |           |               |
| U1      | -            | High Power Switch LNA Module             | Qorvo     | QPB9325       |
| R1, R2  | 0 $\Omega$   | Resistor, Chip, 0402, 5%                 | Various   |               |
| C1      | 1 $\mu$ F    | Capacitor, Chip, 0603, 20%, X7R          | Various   |               |
| C2      | 10 pF        | Capacitor, Chip, 0402, NPO/COG, 5%       | Various   |               |
| C4, C5  | 2.2 $\mu$ F  | Capacitor, Chip, 1210, 100 V, 10%, X7R   | Various   |               |
| D1      | -            | Diode, 200 V, 200 mA, SOT23              | Various   |               |
| L1      | 10 $\mu$ H   | Inductor, Power, 10 $\mu$ H, 20%, 0.84 A | Coilcraft | LPS4018-103ML |
| R3      | 1 k $\Omega$ | Resistor, Chip, 0402, 5%                 | Various   |               |

## Pin Configuration and Description

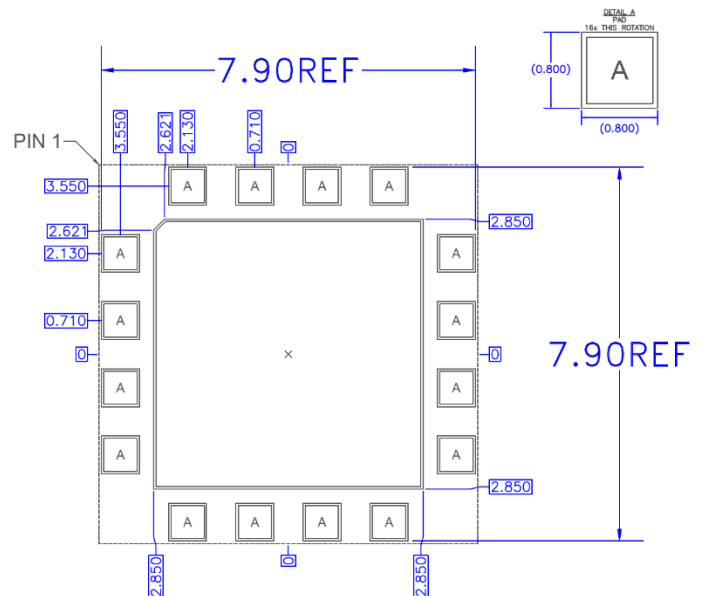
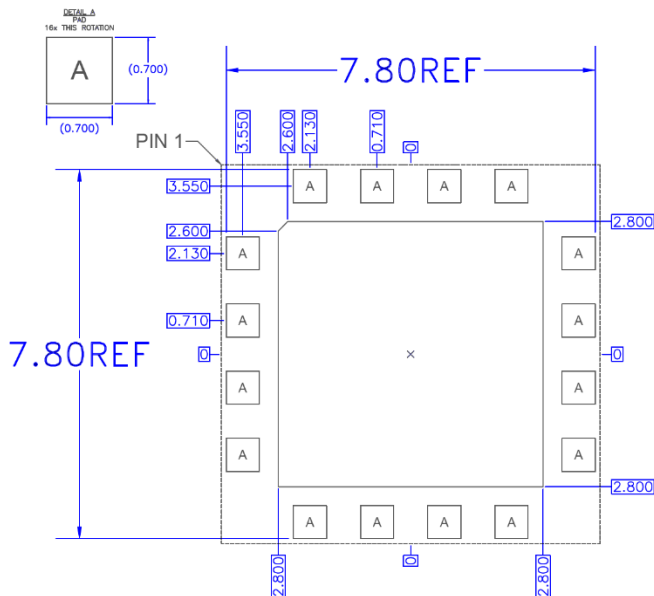
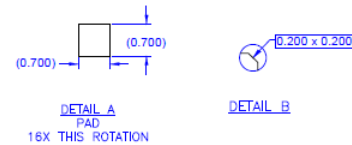
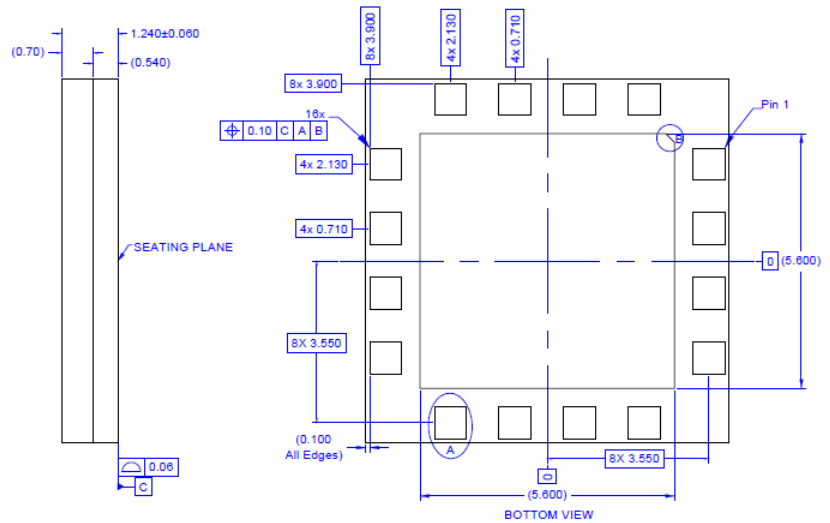
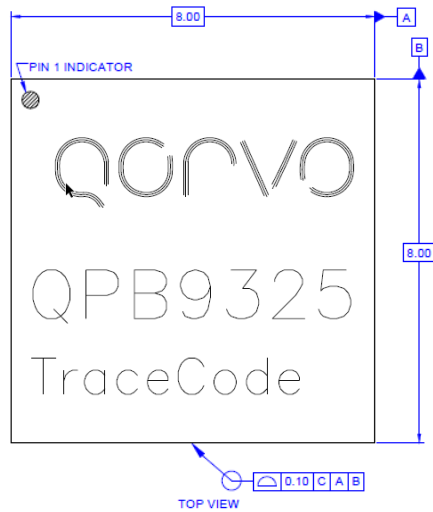


Top View

| Pin No.           | Label           | Description                                                                                                                                                                 |
|-------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                 | ANT             | RF antenna input/output port 50 ohms. Internally DC blocked.                                                                                                                |
| 2, 11, 13, 14, 15 | NC              | No Internal Connection.                                                                                                                                                     |
| 3                 | T/R             | Switch Control, Tx mode Low state, Rx mode High state.                                                                                                                      |
| 4                 | V <sub>CC</sub> | DC Power Supply Voltage.                                                                                                                                                    |
| 5                 | LA              | External inductor connection for internal power supply.                                                                                                                     |
| 6                 | LB              | External inductor connection for internal power supply.                                                                                                                     |
| 7                 | DA              | External diode anode connection for internal power supply.                                                                                                                  |
| 8                 | DB              | External diode cathode connection for internal power supply.                                                                                                                |
| 9                 | CA              | External bypass capacitor connection.                                                                                                                                       |
| 10                | CB              | External bypass capacitor connection.                                                                                                                                       |
| 12                | RXOUT           | RF LNA output port 50 ohms. Internally DC blocked.                                                                                                                          |
| 16                | TERM            | RF termination port 50 ohms. Internally DC blocked.                                                                                                                         |
| Backside Pad      | GND             | Ground connection. The back side of the package should be connected to the ground plan though as short of a connection as possible. PCB vias under the device are required. |

## Package Marking and Dimensions

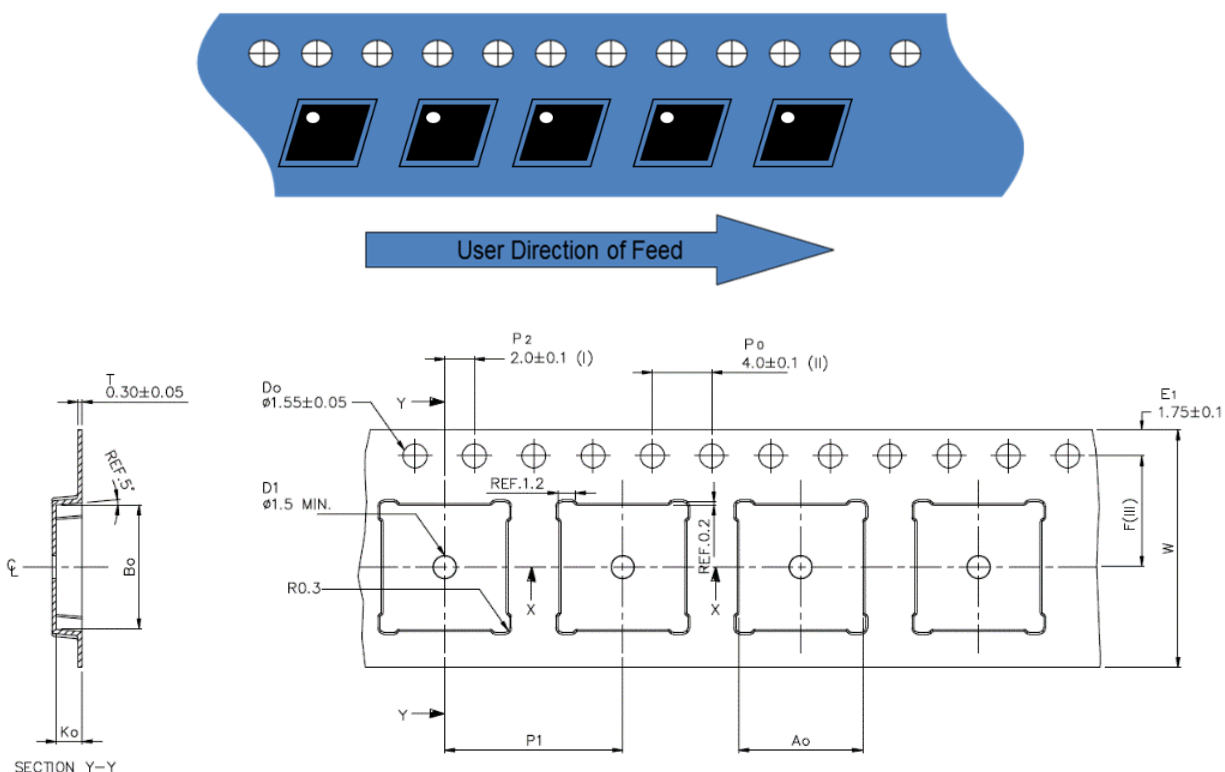
Marking: Part number – QPB9325  
Trace Code



### Notes:

1. All dimensions are in microns. 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.

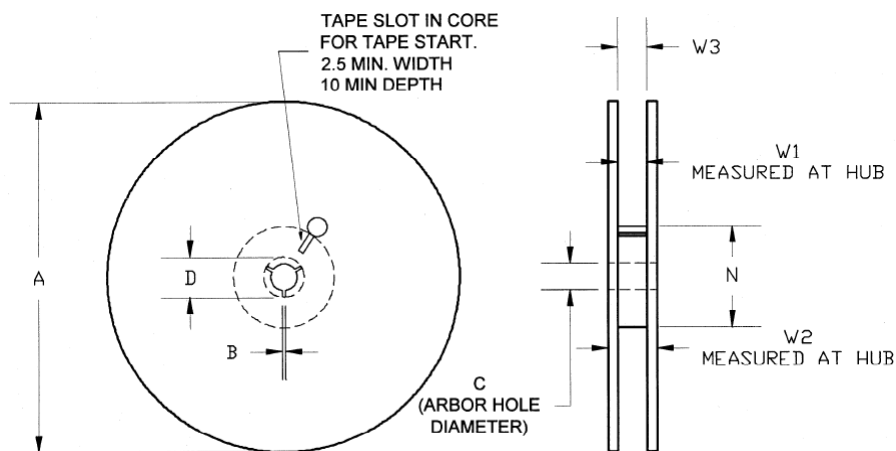
## Tape and Reel Information – Carrier and Cover Tape Dimensions



| Feature             | Measure                                  | Symbol | Size (in) | Size (mm) |
|---------------------|------------------------------------------|--------|-----------|-----------|
| Cavity              | Length                                   | A0     | 0.329     | 8.35      |
|                     | Width                                    | B0     | 0.329     | 8.35      |
|                     | Depth                                    | K0     | 0.069     | 1.76      |
|                     | Pitch                                    | P1     | 0.472     | 12.00     |
| Centerline Distance | Cavity to Perforation - Length Direction | P2     | 0.079     | 2.00      |
|                     | Cavity to Perforation - Width Direction  | F      | 0.295     | 7.50      |
| Cover Tape          | Width (Reference Only)                   | C      | 0.524     | 13.30     |
| Carrier Tape        | Width                                    | W      | 0.630     | 16.0      |

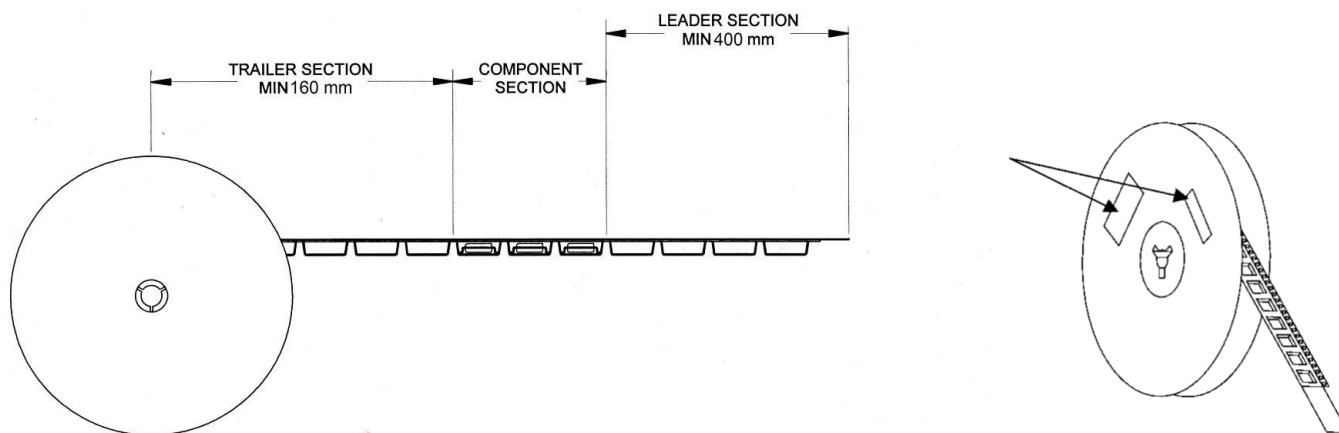
## Tape and Reel Information – Reel Dimensions (13")

Standard T/R size = 2,500 pieces on a 13" reel.



| Feature | Measure              | Symbol | Size (in) | Size (mm) |
|---------|----------------------|--------|-----------|-----------|
| Flange  | Diameter             | A      | 12.992    | 330.0     |
|         | Thickness            | W2     | 0.874     | 22.2      |
|         | Space Between Flange | W1     | 0.661     | 16.8      |
| Hub     | Outer Diameter       | N      | 4.016     | 102.0     |
|         | 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)     | Class 1C | 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 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

## Contact Information

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

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

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

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

## Important Notice

The information contained herein is believed to be reliable; however, Qorvo makes no warranties regarding the information contained herein and assumes no responsibility or liability whatsoever for the use of the information contained herein. All information contained herein is subject to change without notice. Customers should obtain and verify the latest relevant information before placing orders for Qorvo products. The information contained herein or any use of such information does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other intellectual property rights, whether with regard to such information itself or anything described by such information. **THIS 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.

Copyright 2021 © Qorvo, Inc. | Qorvo is a registered trademark of Qorvo, Inc.