



QPB9324

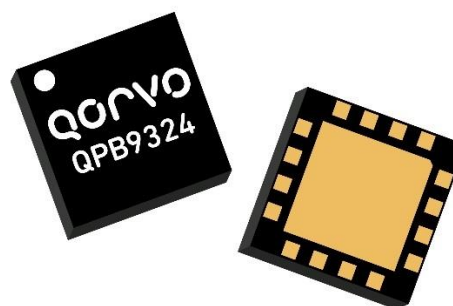
High Power Switch LNA Module

Product Overview

The Qorvo® QPB9324 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 QPB9324 can be utilized across the 3.4-3.6 GHz range to provide 1.1 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 QPB9324 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.

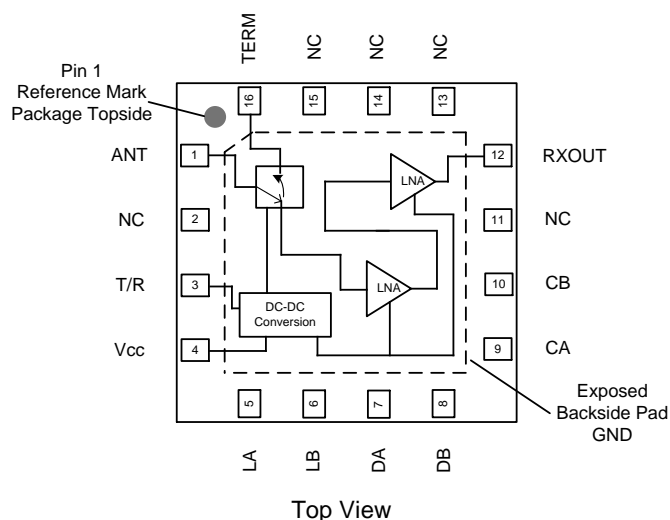


16 Pin 8 mm x 8 mm leadless SMT Package

Key Features

- 3.4-3.6 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 P_{avg} (8 dB PAR)
- 32.5 dB gain
- 1.1 dB noise figure
- -0.6 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
QPB9324TR13	2500 pcs on a 13" reel
QPB9324SR	100 pcs on a 7" reel
QPB9324PCB4B01	Evaluation board

Absolute Maximum Ratings

Parameter	Rating
Storage Temperature	-50 to 150 °C
V _{CC}	+6 V
RF at ANT (Tx Mode) ⁽¹⁾	+47.2 dBm
RF at ANT (Tx Mode) ⁽²⁾	+44.2 dBm
RF at ANT (Rx Mode) ⁽²⁾	+5.5 dBm

Notes:

- 10s, 8 dB PAR, 88% duty cycle
- Indefinitely, 8 dB PAR

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

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
V _{CC}	+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 _{CASE}	-40		+115	°C
T _j for >10 ⁶ hours MTTF ⁽¹⁾			+190	°C

Notes:

- For RX Mode operation

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

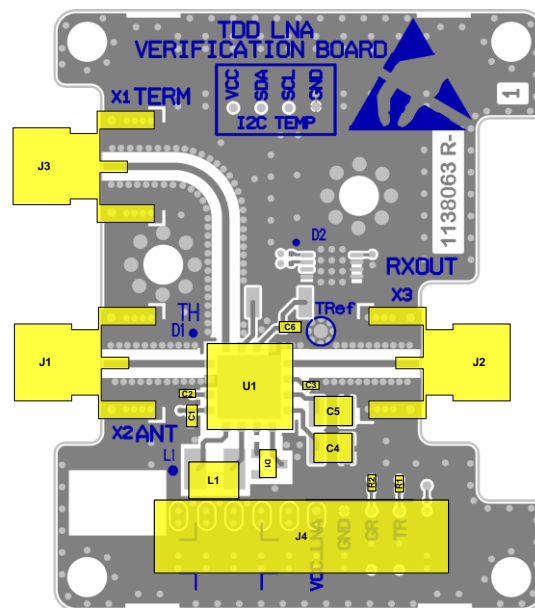
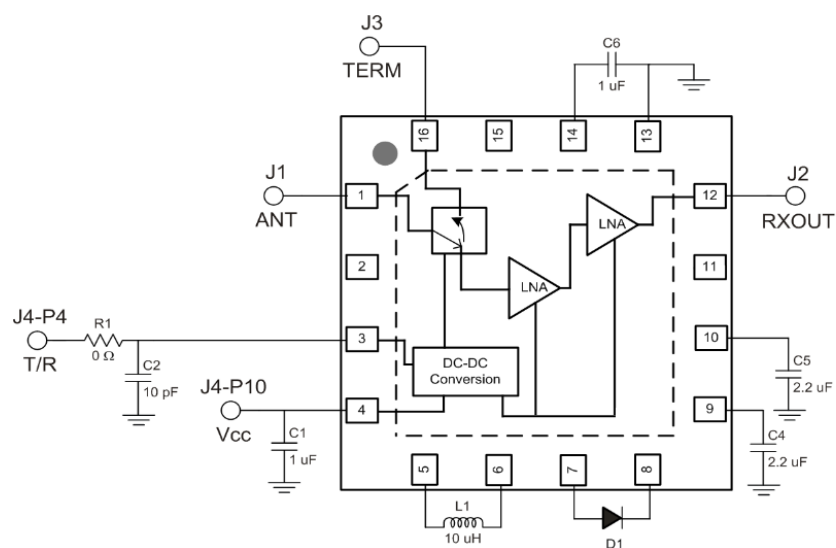
Electrical Specifications

Parameter	Conditions	Min	Typ	Max	Units
Operational Frequency Range		3400		3600	MHz
Test Frequency			3500		MHz
Gain	Rx mode		32.5		dB
Gain Flatness	Rx mode		0.8		dB
Noise Figure	Rx mode		1.1		dB
Input IP3	Rx mode, Pin/tone = -33dBm, Δf = 1MHz		-0.6		dBm
Input P1dB	Rx mode		-15.4		dBm
Input Return Loss (ANT)	Rx mode		30		dB
Output Return Loss (Rx Out)	Rx mode		12.2		dB
Reverse Isolation	Rx mode		58		dB
Insertion Loss	Tx mode		0.5		dB
Input P0.1dB	Tx mode		>+46.6		dBm
Return Loss (ANT, TERM)	Tx mode		30		dB
Operating Current	Rx mode		240		mA
Operating Current	Tx mode		100		mA
Switching Speed (ANT to Rx Out)	RF<0.1dB after T/R command		2		μs
Switching Speed (ANT to Term)	RF<0.1dB after T/R command		1		μs
Switching Speed (ANT to Rx Out/Term)	ANT to RXOUT/TERM with RF<0.5dB after DC turn on		1		s
In Band Spurious Emission ⁽¹⁾	Rx Mode at Rx out with Pin = -49dBm		-104		dBm
Out of Band Emissions ⁽²⁾	Rx Mode at Rx out from DC to 12275MHz		-65		dBm
Thermal Resistance	Rx mode			TBD	°C/W
Thermal Resistance	Tx mode			35	°C/W

Notes:

- Pin is a CW signal swept from 3.4 to 3.6GHz. Spec refers to any spurious mixing product that occurs from 3.4 to 3.6GHz.
- Measure Pout with IBW = 4.5Mhz over frequency range with no input power applied.

Application Circuit Schematic and Layout



Note:

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

Bill of Material

Ref Des	Value	Description	Manuf.	Part Number
n/a	n/a	Printed Circuit Board		
U1	n/a	High Power Switch LNA Module	Qorvo	QPB9324
R1, R2	0 Ω	Resistor, Chip, 0402, 5%	Various	
C1, C6	1 uF	Capacitor, Chip, 0603, 20%, X7R	Various	
C2, C3	10 pF	Capacitor, Chip, 0402, NPO/COG, 5%	Various	
C4, C5	2.2 uF	Capacitor, Chip, 1210, 100 V, 10%, X7R	Various	
D1	n/a	Diode 200 V 200 mA SOT23	Various	
L1	10 uH	Inductor, Power, 10 uH, 20%, 0.84 A	Coilcraft	LPS4018-103ML

Logic Table

Parameter	High	Low
T/R	Rx Mode	Tx Mode

Typical Performance – Rx Mode

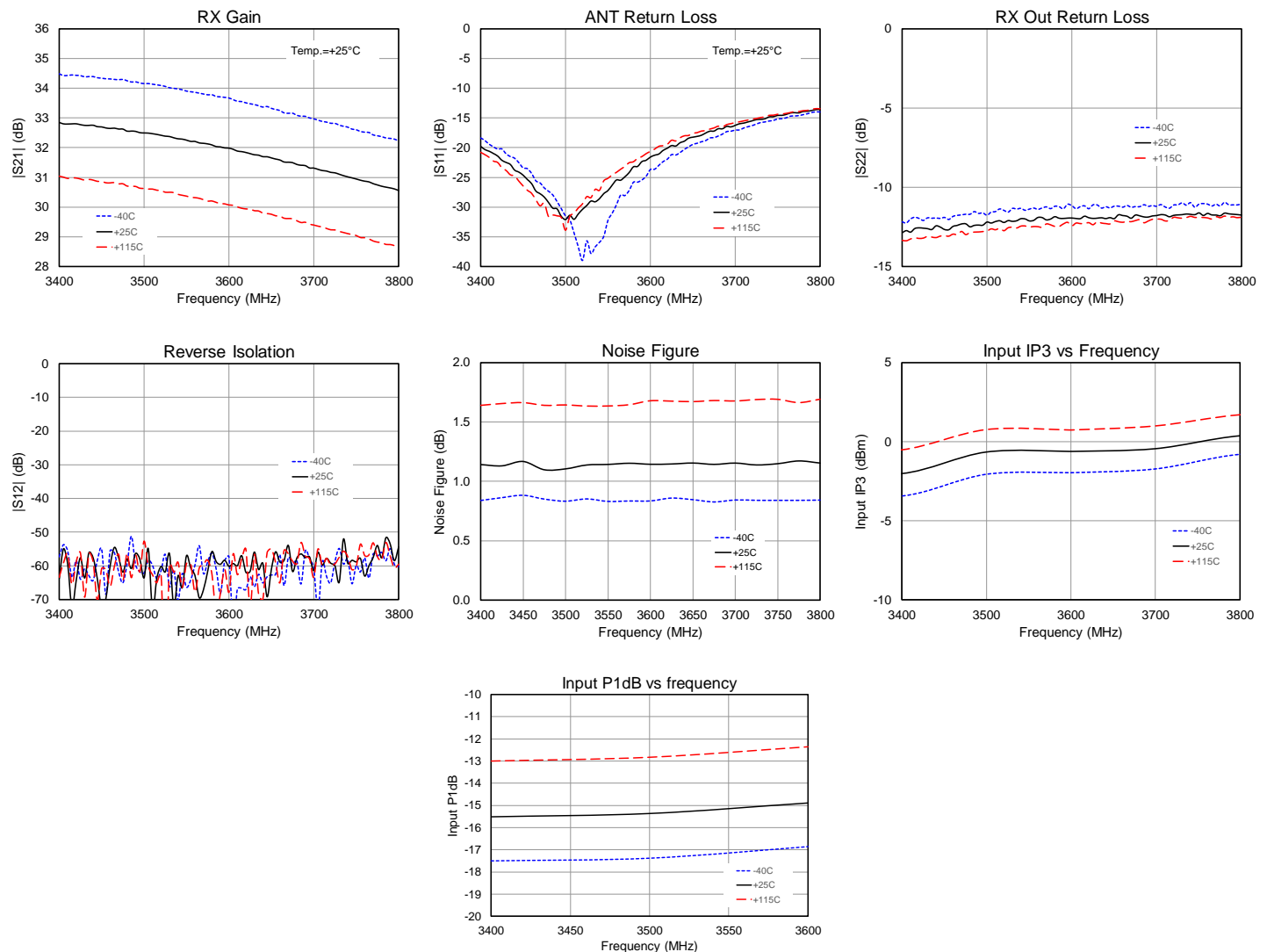
Parameter	Conditions ⁽¹⁾	Typical Value			Units
Frequency		3400	3500	3600	MHz
Gain		32.8	32.5	32.0	dB
Input IP3	Pin = -33 dBm/tone, Δf=1 MHz	-2.0	-0.6	-0.6	dBm
Input P1dB		-15.5	-15.4	-14.9	dBm
Noise Figure	De-embedded from Evaluation board PCB	1.1	1.1	1.1	dB
Return Loss	ANT port	20	30	22	dB
Return Loss	Rx Out port	12.9	12.2	11.9	dB
Reverse Isolation	Rx Out to ANT port	58	58	59	dB

Notes:

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

Performance Plots – Rx Mode

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



Typical Performance – Tx Mode

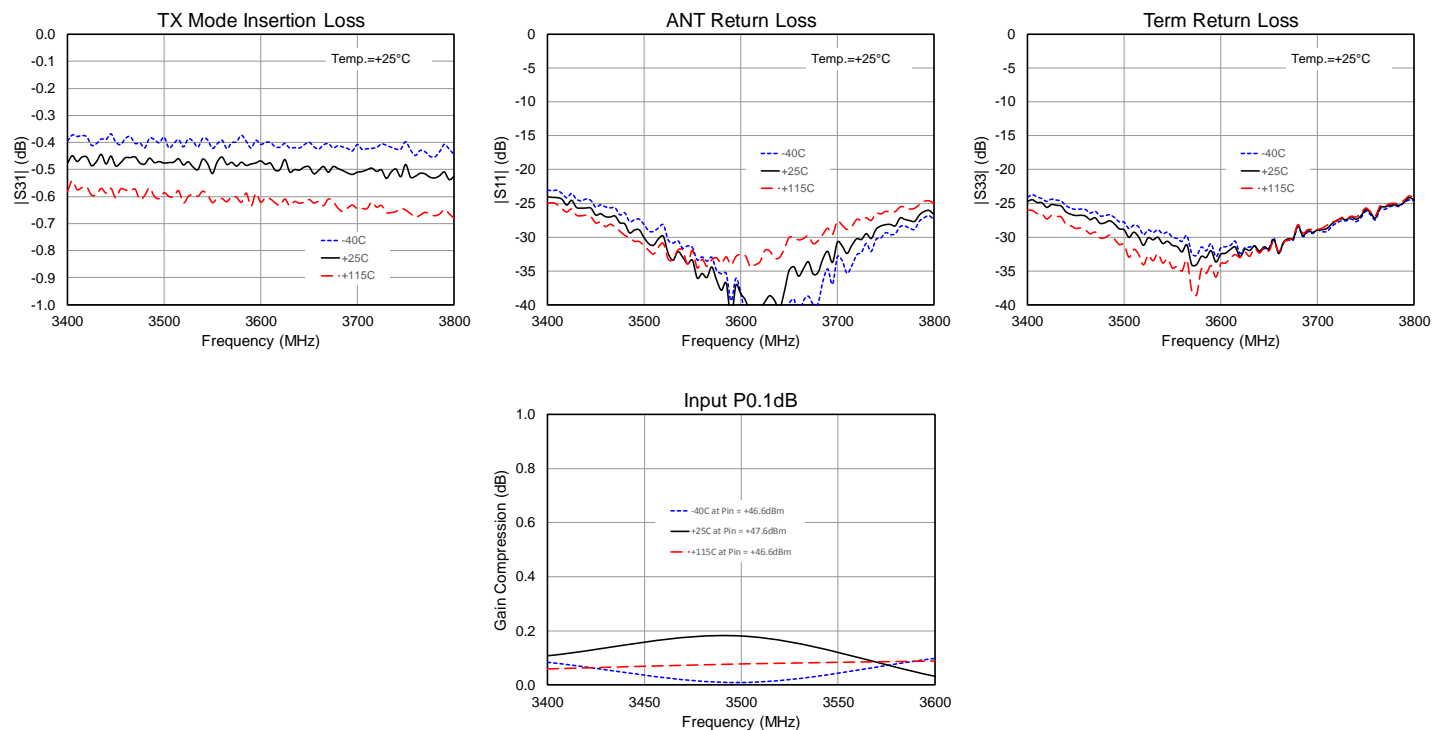
Parameter	Conditions ⁽¹⁾	Typical Value			Units
Frequency		3400	3500	3600	MHz
Insertion Loss	De-embedded from Evaluation board PCB	0.5	0.5	0.5	dB
Input P0.1dB compression	Pin = +47.6 dBm	0.1	0.2	0.1	dB
Return Loss	ANT port	25	30	35	dB
Return Loss	TERM port	25	29	33	dB

Notes:

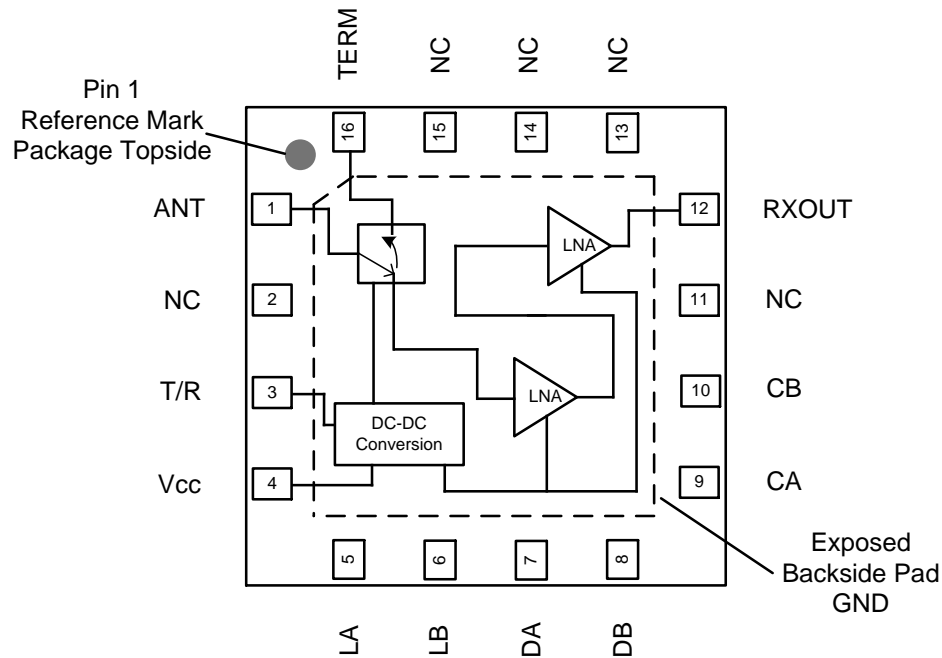
- Test conditions unless otherwise noted: $V_{CC} = +5.0$ V, $T/R = 3$ V, Temp. = +25 °C

Performance Plots – Tx Mode

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



Pin Configuration and Description

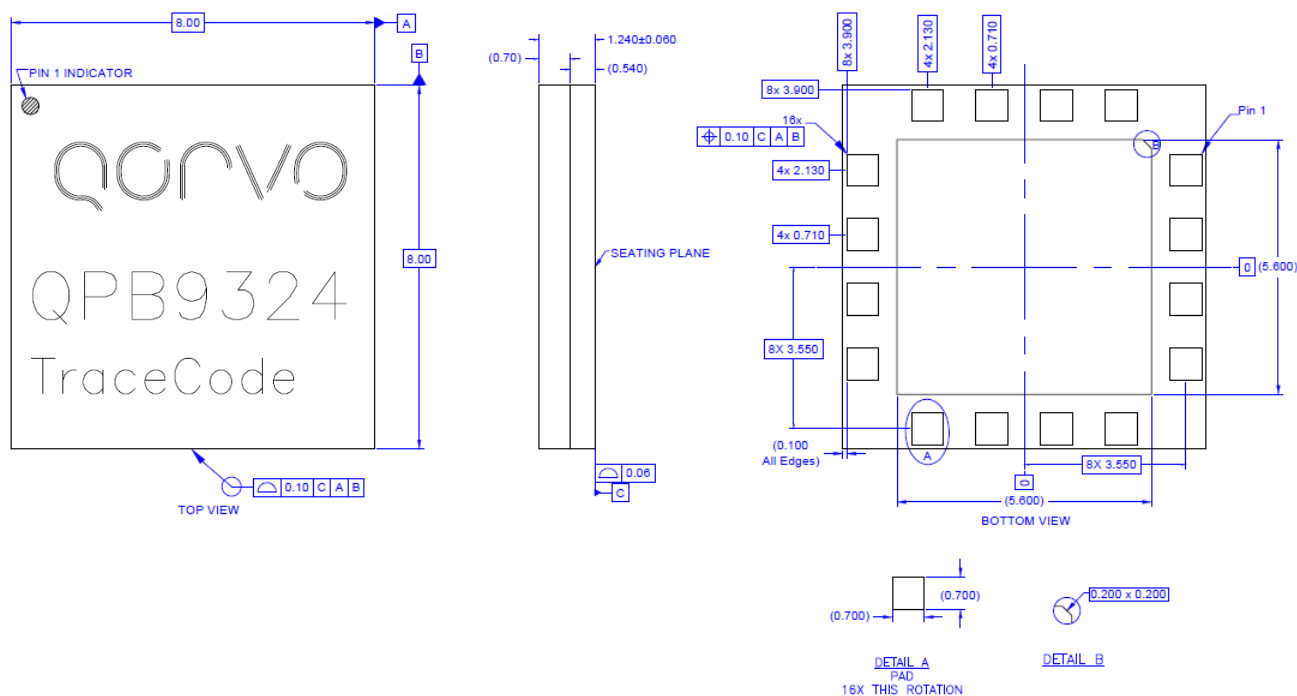


Top View

Pin No.	Label	Description
1	ANT	RF antenna input/output port 50 ohms.
2, 11, 13, 14, 15	NC	No Connection.
3	T/R	Switch Control, Tx mode Low state, Rx mode High state.
4	V _{CC}	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	Rx OUT	RF LNA output port 50 ohms.
16	TERM	RF termination port 50 ohms.
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 – QPB9324
 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.

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	TBD	ESDA / JEDEC JS-001-2012
ESD – Charged Device Model (CDM)	TBD	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 (C₁₅H₁₂Br₄O₂) 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

Email: customer.support@qorvo.com

For technical questions and application information: **Email:** appsupport@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 2017 © Qorvo, Inc. | Qorvo is a registered trademark of Qorvo, Inc.