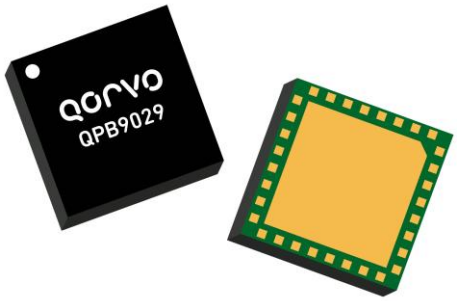
QPB9029

L-Band Switched Filter Bank Module

General Description

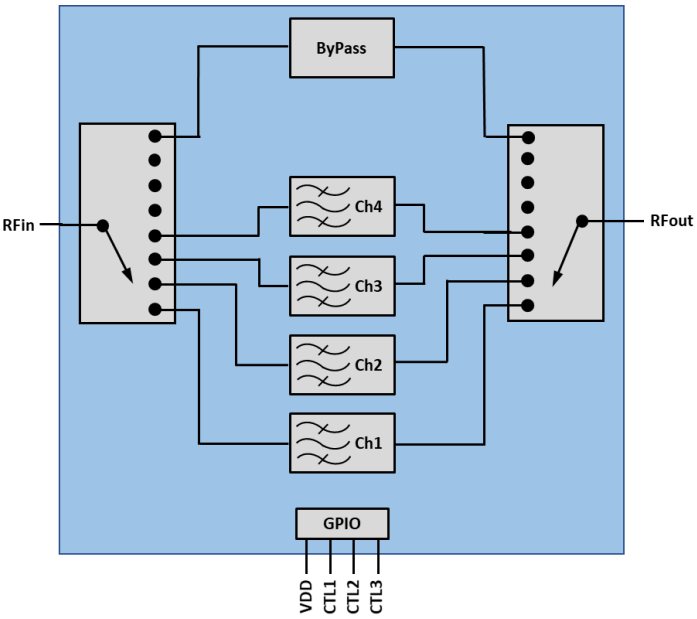
QPB9029 is an L-Band switched filter bank module. The device integrates two switches, one on each side of the 4 filters and bypass. Using Qorvo's TC-SAW filter technology, the device provides excellent band filtering capability. This module is housed in a compact 6 x 6 mm package for L-Band Radar applications.

The QPB9029 is part of Qorvo's extensive portfolio of RF BAW and SAW filters.



32 Pin 6 x 6 mm leadless OVM Package

Functional Block Diagram



Product Features

- Frequency range: 1.2 – 1.4 GHz
- Four Channels + Bypass
- Insertion Loss: 4 dB Max
- Out of Band Rejection: >15 dB
- Switch Control: GPIO
- Switching Speed: Typical 480 ns
- Package Size: 6.00 x 6.00 x 0.804 mm

Performance is typical across frequency. Please reference the electrical specification table and data plots for more details.

Applications

- Radar Applications

Ordering Information

Part	Description
QPB9029TR7X	L-Band Switched Filter Band Module 500 Piece 7" Reel
QPB9029TR7	250 Piece 7" Reel
QPB9029TR13	2500 Piece 13" Reel
QPB9029SR	100 Piece 7" Reel
QPB9029S2	2 Piece WP Sample
QPB9029EVB	QPB9029 Evaluation Board

Absolute Maximum Ratings [1]

Parameter	Min Value	Max Value	Units
Storage Temperature	-65	+150	°C
Operating Temperature [2]	-10	+55	°C
Switch Supply Voltage (VDD)	-	6.0	V
Control Voltage (CTL1 – CTL3)	-0.3	6.0	V
RF Input Power - Test conditions: CW @ 25°C [3]	-	+29	dBm

1. 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.
2. In production, devices will be tested at room temperature to a guard-banded specification to ensure compliance over temperature.
3. Power was applied at the center of each channel with a pulse width of 200ms and 50% of duty cycle.

Minimum Lifetime Ratings

Conditions	Rating
RF Input Power [1]	>10 Years

[1] Input Power: CW, 23 dBm, @ +85 °C

Recommended Operating Conditions

Parameter [1]	Min	Typ.	Max	Units
Device Voltage (VDD)	+3.3	+5.0	+5.5	V
Supply Current (I_{VDD})	-	100	-	µA
Start-up Time (90% of VDD to harmonic steady state)	-	<1140	-	ns
Switching Time (50% of $V_{CTL1-CTL3}$ to 10/90% of RF Output)	-	<500	-	ns
Low Control Voltage (1.8 V logic compatible)	-0.3	-	+0.63	V
High Control Voltage (1.8 V logic compatible)	1.17	1.8	VDD	V
Control Current (Each CTL)	-	2.1	-	µA

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

Switch Control Logic Truth Table

Channel	CTL1	CTL2	CTL3
1	0	0	0
2	0	0	1
3	0	1	0
4	0	1	1
NC	1	0	0
NC	1	0	1
NC	1	1	0
Bypass	1	1	1

Note: NC channels are internally grounded high isolation States

Note: CLT1 can be grounded if no access to the internal bypassed is needed.

Electrical Specifications

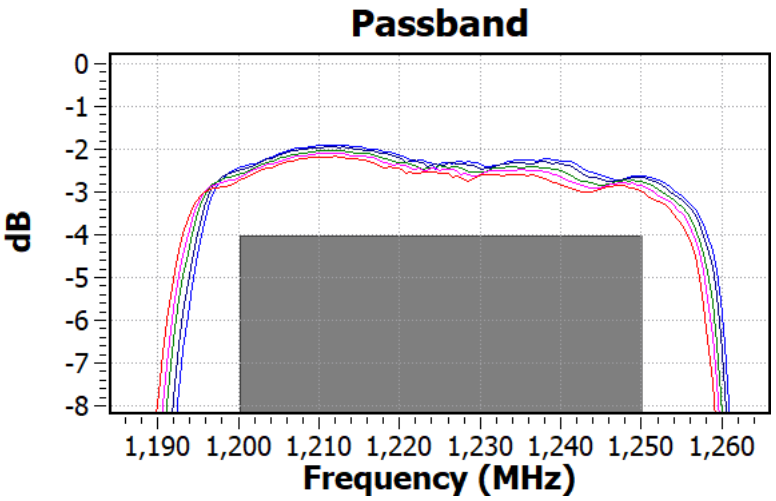
Test conditions unless otherwise noted: with Qorvo evaluation circuit on page 4, Temp = -10°C to +55°C, 50 Ω system

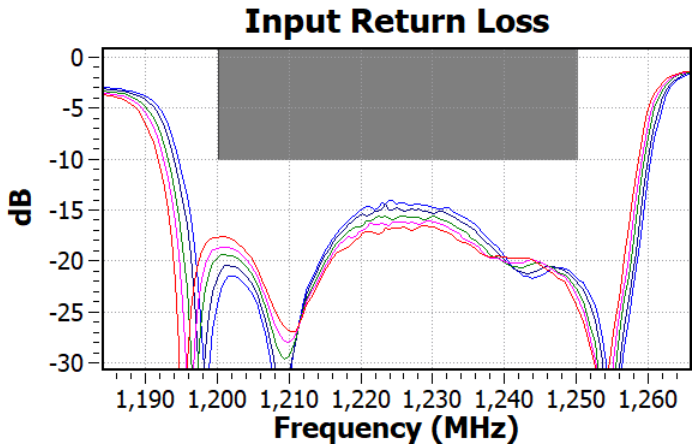
Parameter	Conditions (1) (2)		Min	Typ. (3)	Max	Unit
Frequency Range			1200	-	1400	MHz
Insertion Loss	Ch1. 1200 – 1250 MHz; fc = 1225 MHz		-	2.93	-	dB
	Ch2. 1250 – 1300 MHz; fc = 1275 MHz		-	2.97	-	
	Ch3. 1300 – 1350 MHz; fc = 1325 MHz		-	2.86	-	
	Ch4. 1350 – 1400 MHz; fc = 1375 MHz		-	2.68	-	
	ByPass: 1200 – 1400 MHz; fc = 1300 MHz		-	1.34	-	
Attenuation (Relative to 0 dB)	Ch1. @fc ±45 MHz	10 – 1180 MHz	-	18.63	-	dB
		1270 – 2500 MHz	-	15.51	-	
	Ch2. @fc ±45 MHz	10 – 1230 MHz	-	17.29	-	
		1320 – 2500 MHz	-	17.65	-	
	Ch3. @fc ±45 MHz	10 – 1280 MHz	-	18.23	-	
		1370 – 2500 MHz	-	17,48	-	
	Ch4. @fc ±45 MHz	10 – 1330 MHz	-	24.21	-	
		1420 – 2500 MHz	-	20.58	-	
Phase Ripple (Linearized phase, peak to adjacent valley over a 1 MHz sliding window within each channel)	Ch1. 1200 – 1250 MHz		-	4.34	-	deg
	Ch2. 1250 – 1300 MHz		-	3.67	-	
	Ch3. 1300 – 1350 MHz		-	3.02	-	
	Ch4. 1350 – 1400 MHz		-	2.67	-	
Amplitude Variation	Ch1. 1200 – 1250 MHz		-	0.91	-	dB
	Ch2. 1250 – 1300 MHz		-	0.83	-	
	Ch3. 1300 – 1350 MHz		-	0.84	-	
	Ch4. 1350 – 1400 MHz		-	0.55	-	
Input Return Loss	Ch1. 1200 – 1250 MHz		-	15.29	-	dB
	Ch2. 1250 – 1300 MHz		-	17.16	-	
	Ch3. 1300 – 1350 MHz		-	14.53	-	
	Ch4. 1350 – 1400 MHz		-	16.00	-	
	ByPass: 1200 – 1400 MHz		-	24.00	-	
Output Return Loss	Ch1. 1200 – 1250 MHz		-	13.44	-	dB
	Ch2. 1250 – 1300 MHz		-	14.80	-	
	Ch3. 1300 – 1350 MHz		-	17.20	-	
	Ch4. 1350 – 1400 MHz		-	16.09	-	
	ByPass: 1200 – 1400 MHz		-	24.15	-	

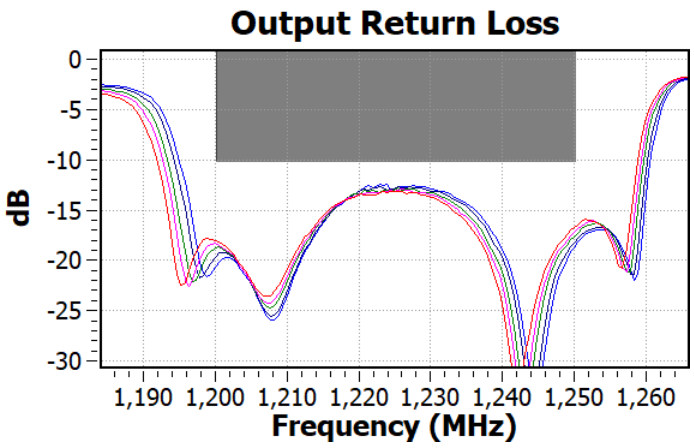
Notes:
1. In production, devices will be tested at room temperature to a guard banded specification to ensure compliance over temperature.
2. Electrical margin has been built into the design to account for variations due to temperature drift and manufacturing tolerances.
3. Typical values are based on average measurements at room temperature

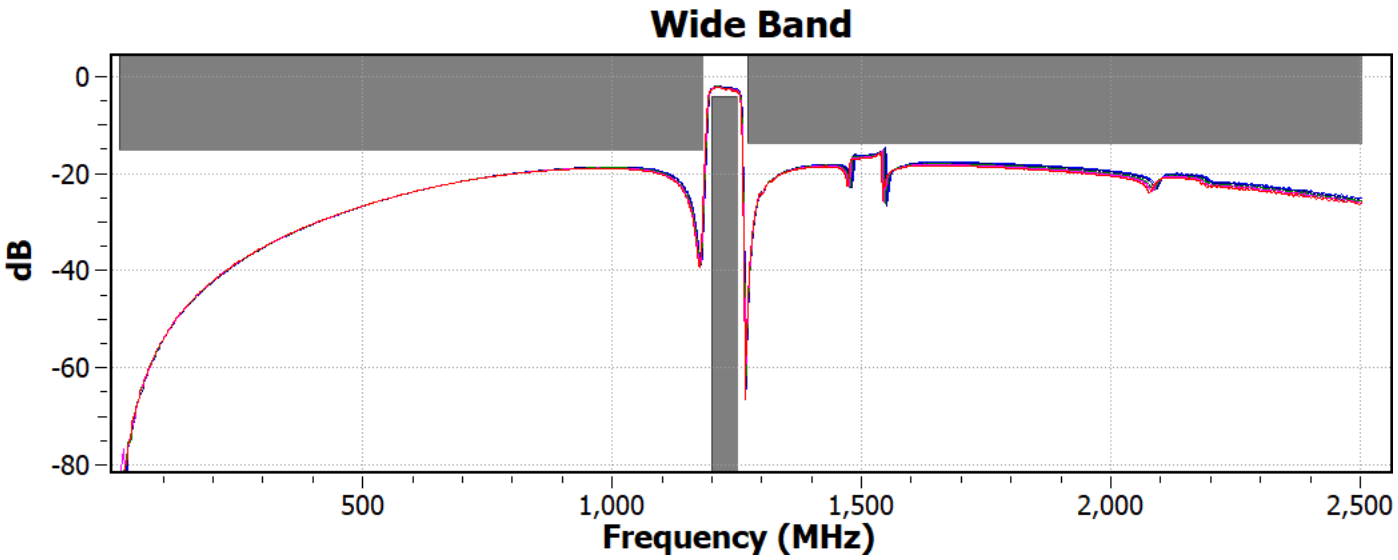
Performance Plots – Small Signal: Channel 1

Test conditions unless otherwise noted: Blue = -40°C; Dark Blue = -10°C; Green = +25°C; Lavender = +55°C; Red = +85°C



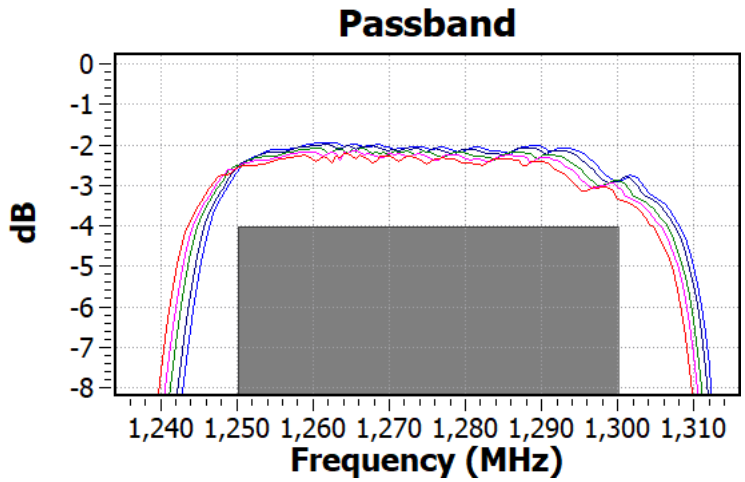


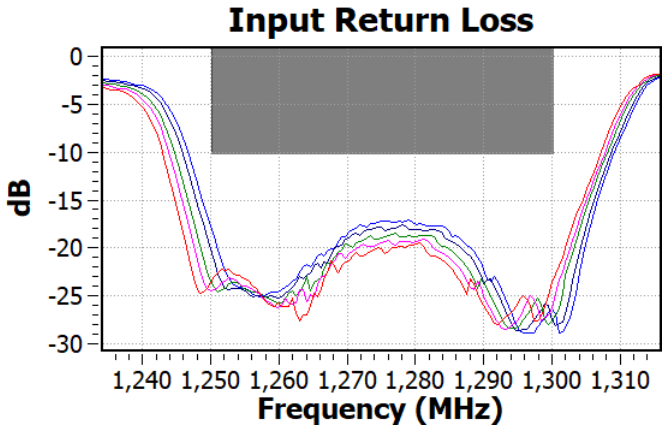


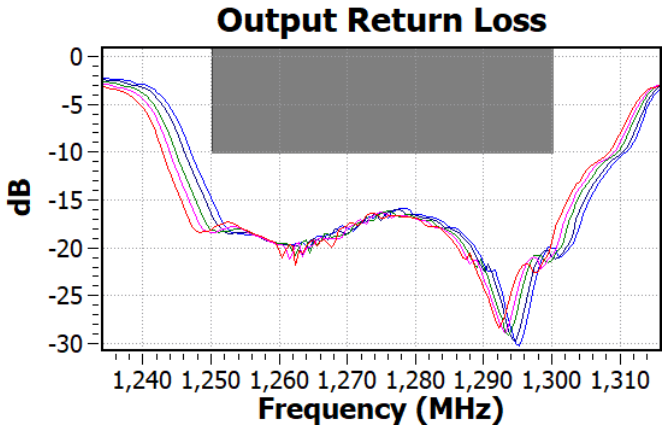


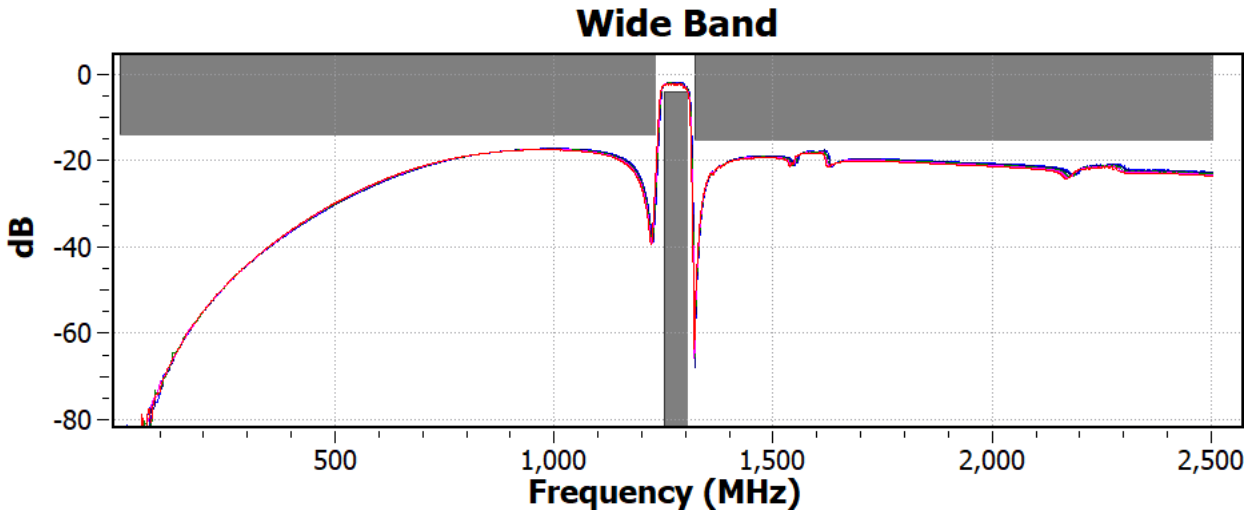
Performance Plots – Small Signal: Channel 2

Test conditions unless otherwise noted: Blue = -40°C; Dark Blue = -10°C; Green = +25°C; Lavender = +55°C; Red = +85°C



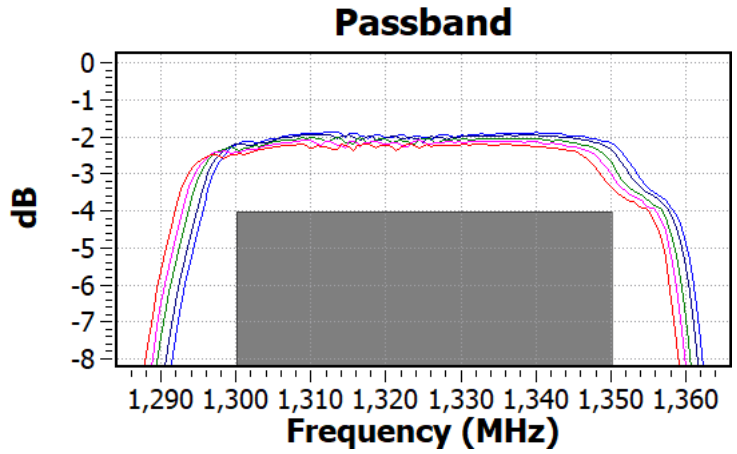


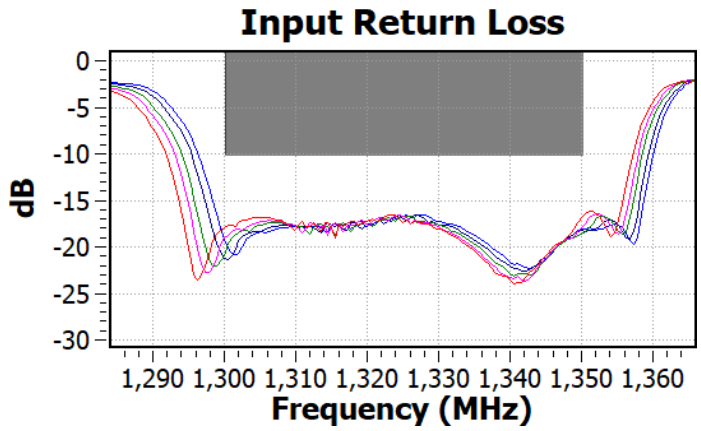


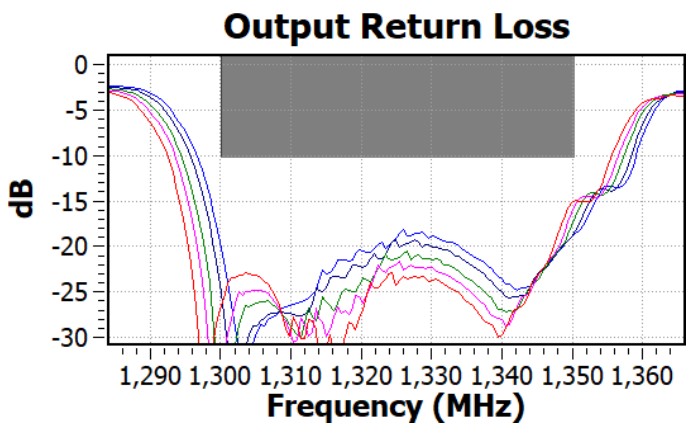


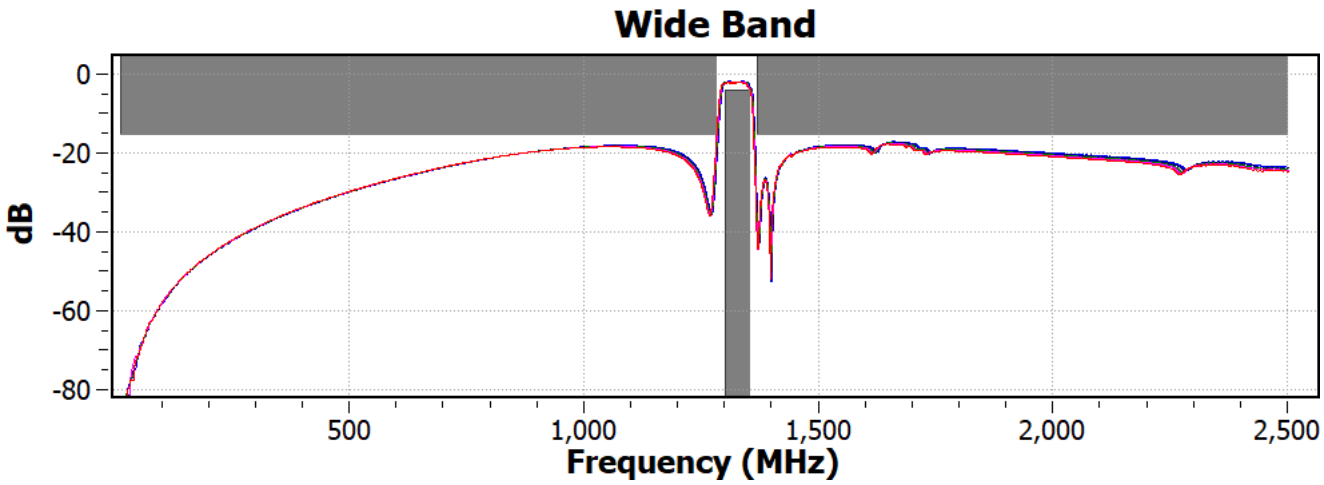
Performance Plots – Small Signal: Channel 3

Test conditions unless otherwise noted: Blue = -40°C; Dark Blue = -10°C; Green = +25°C; Lavender = +55°C; Red = +85°C



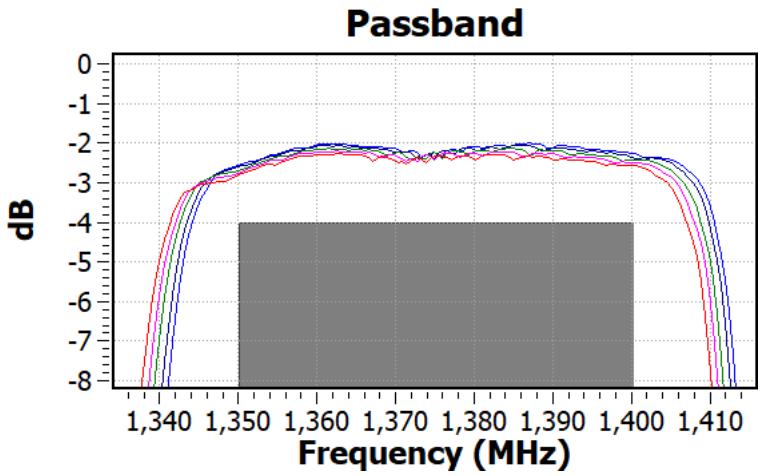


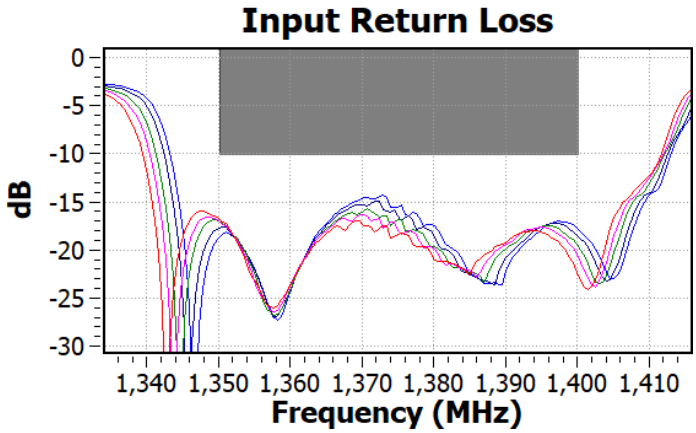


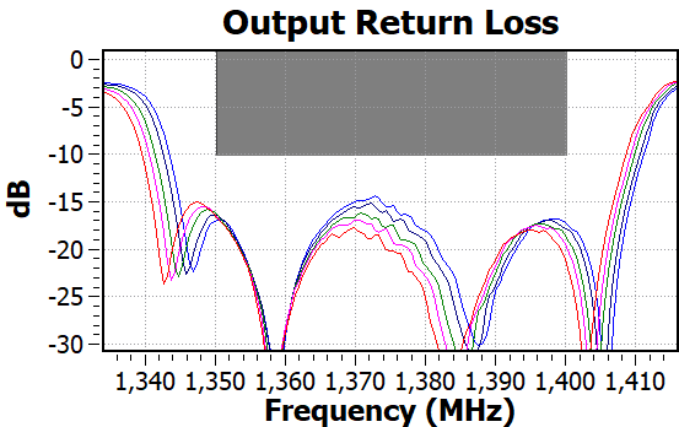


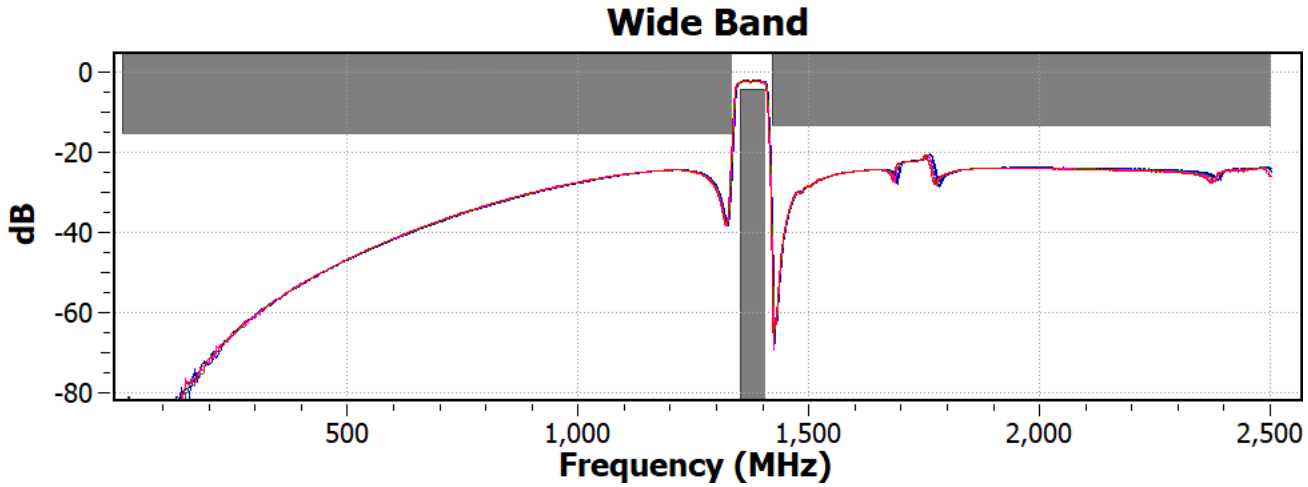
Performance Plots – Small Signal: Channel 4

Test conditions unless otherwise noted: Blue = -40°C; Dark Blue = -10°C; Green = +25°C; Lavender = +55°C; Red = +85°C



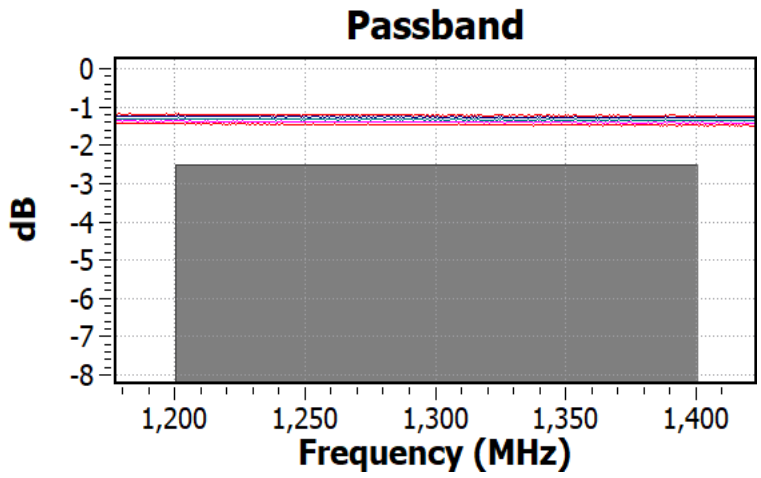


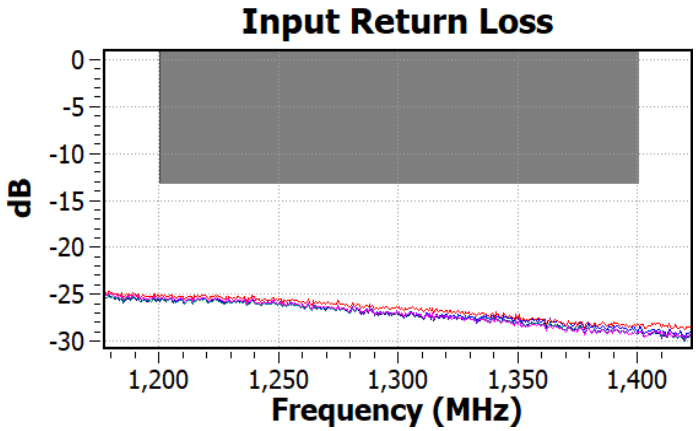


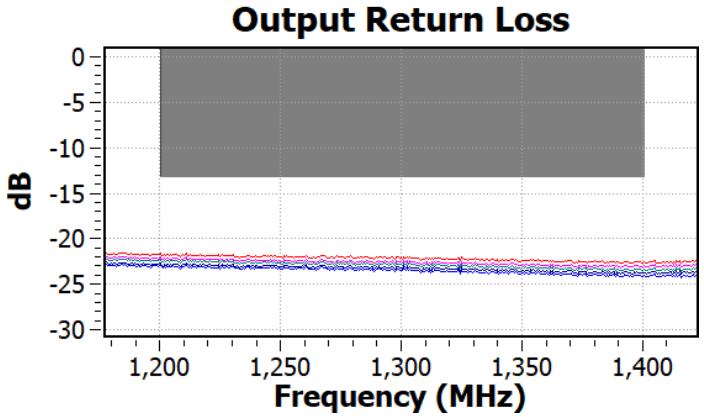


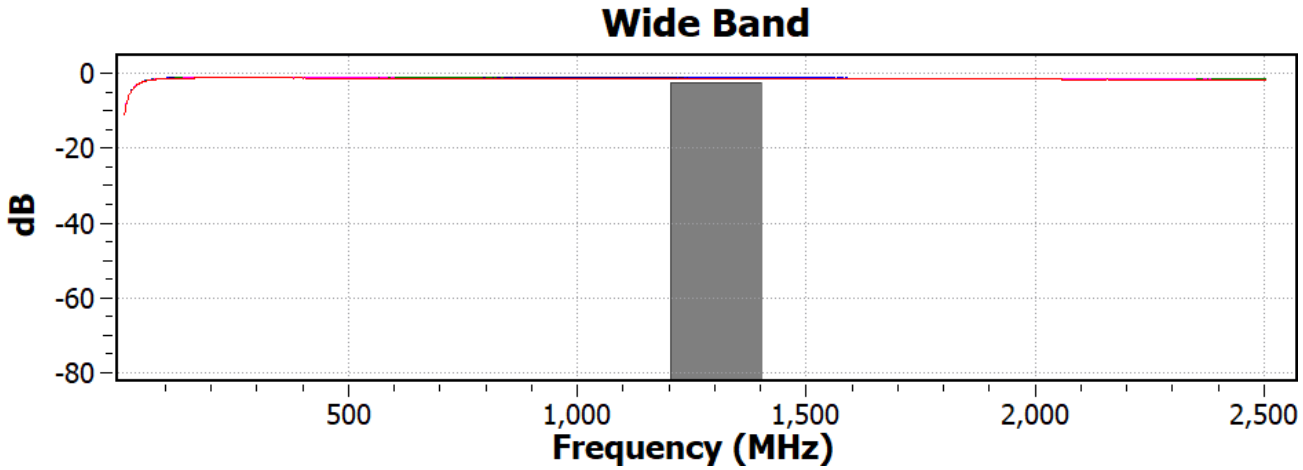
Performance Plots – Small Signal: Bypass Channel

Test conditions unless otherwise noted: Blue = -40°C; Dark Blue = -10°C; Green = +25°C; Lavender = +55°C; Red = +85°C

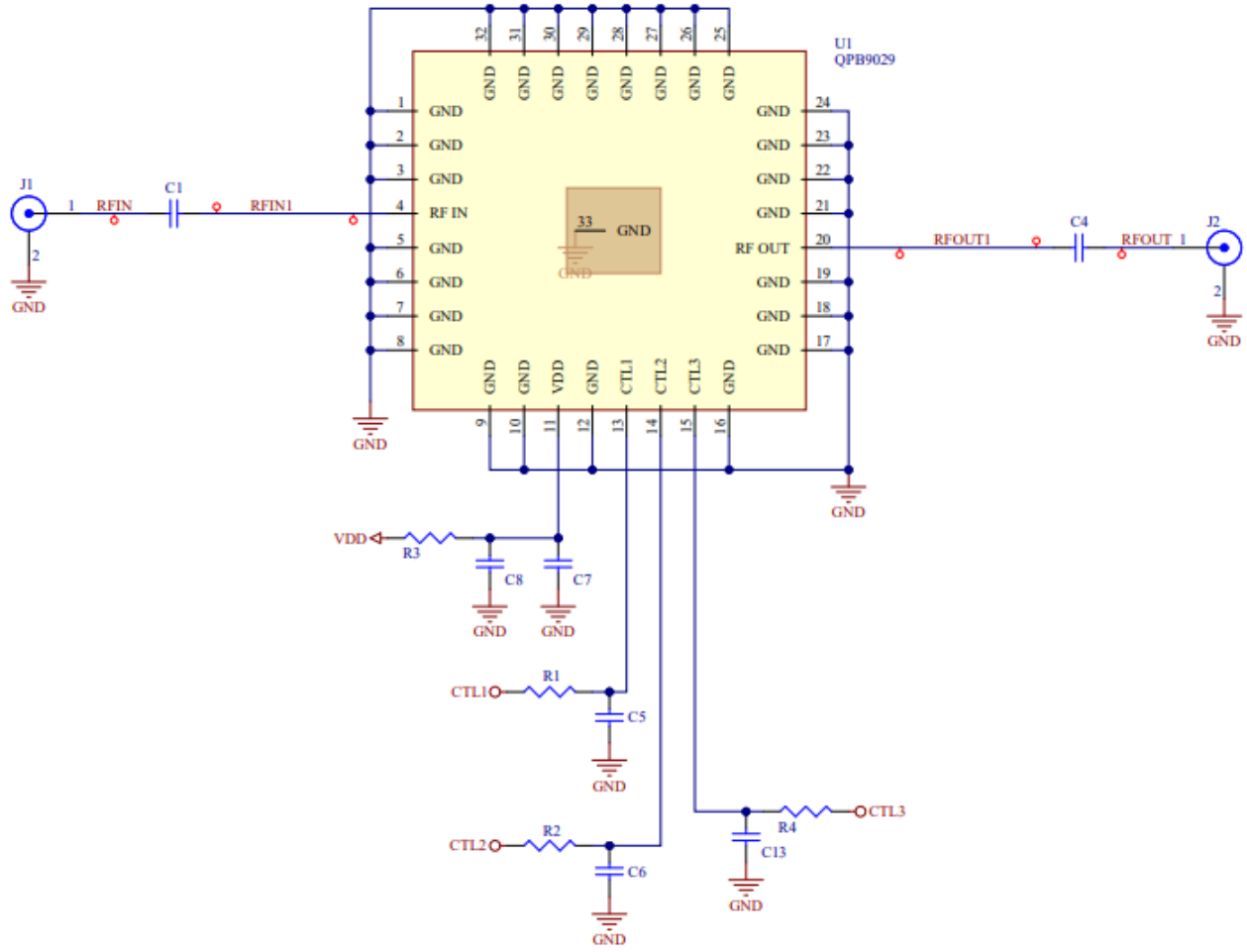








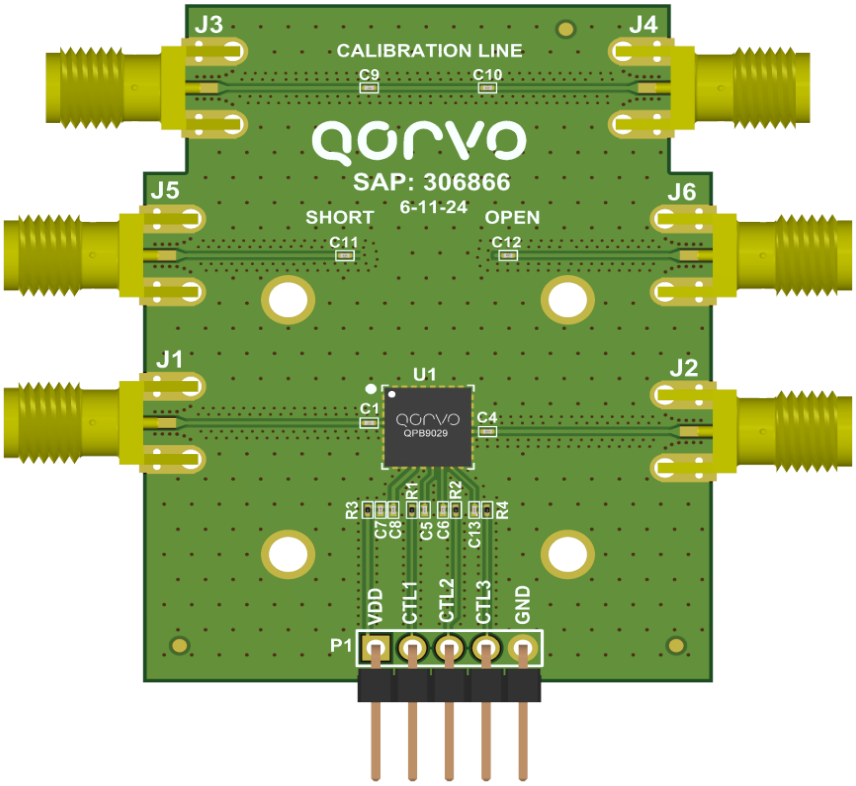
Applications Circuit

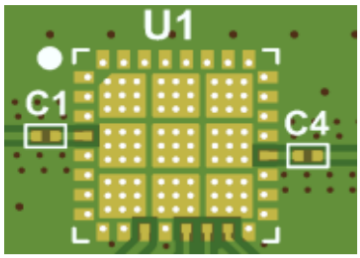


Notes:

- Blocking capacitors are required on any RF ports where a DC voltage may be present.
- CTL1 Logic can be grounded if no access to Bypass is needed.

Evaluation Board (EVB) Layout Assembly





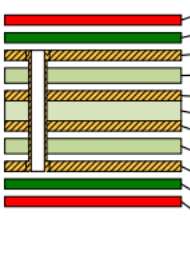
MOUNTING DETAIL

Recommended EVB Bill of Materials – QPB9029

Reference Des.	Value	Description	Manuf.	Part Number
U1	-	QPB9029	Qorvo	
C1, C4-C7, C10-C13	100 pF	CAP, 5%, 25V, COG, 0201	Various	
C8	10000 pF	CAP, 10%, 25V, X5R, 0201	Various	
R1, R2, R3, R4	0 Ω	RES, Jumper, 5%, 1/20W, 0201	Various	
J1, J2 J3, J4, J5, J6	-	Connector, SMA EL FLT Viper MAT-21-1038	Various	
P1	-	Connector, Header, RT-ANG, 1x5, 0.100”, T/H	Various	

Evaluation Board (EVB) PCB Information

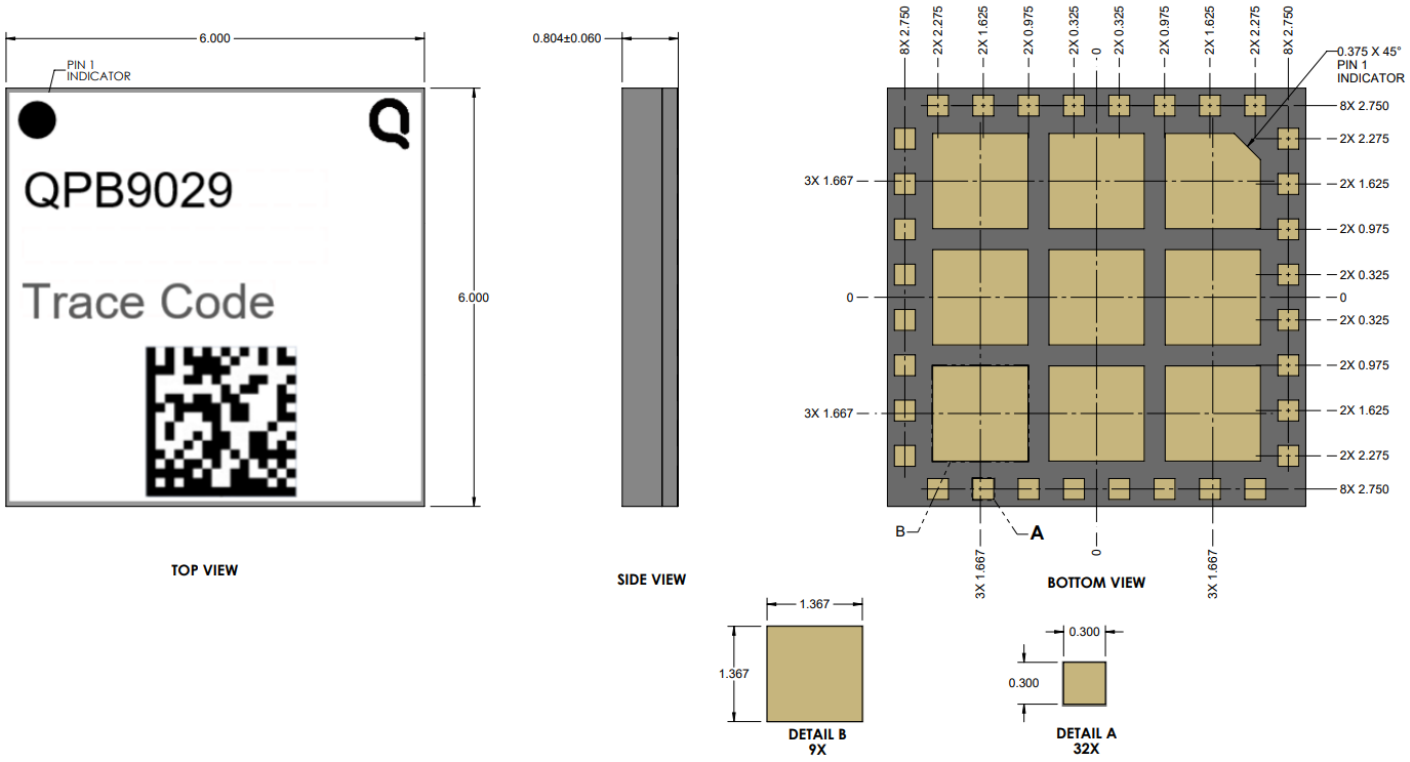
LAYER STACK LEGEND



Material	Layer	Thickness	Dielectric Material	Type
	Top Overlay			Legend
Surface Material	Top Solder	0.0008in	Solder Resist	Solder Mask
Copper	**Top Layer**	**0.0007in**		**Signal**
Prepreg		*0.0066in*	*Rogers R4350B*	*Dielectric*
Copper	**Layer 2**	**0.0007in**		**Signal**
Core		*0.0450in*	*FR4*	*Dielectric*
Copper	**Layer 3**	**0.0007in**		**Signal**
Prepreg		*0.0066in*	*Rogers R4350B*	*Dielectric*
Copper	**Bottom Layer**	**0.0007in**		**Signal**
Surface Material	Bottom Solder	0.0008in	Solder Resist	Solder Mask
	Bottom Overlay			Legend

Total thickness: 0.0626in

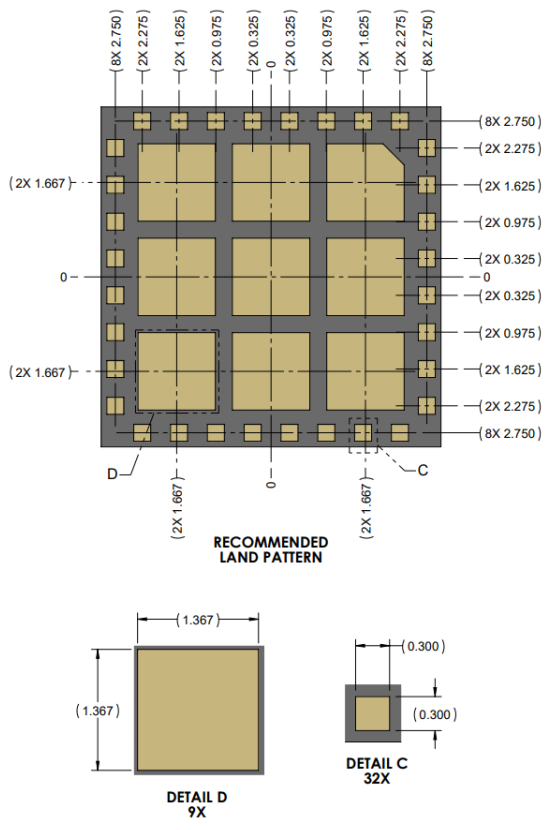
Package layout, Marking and Dimensions

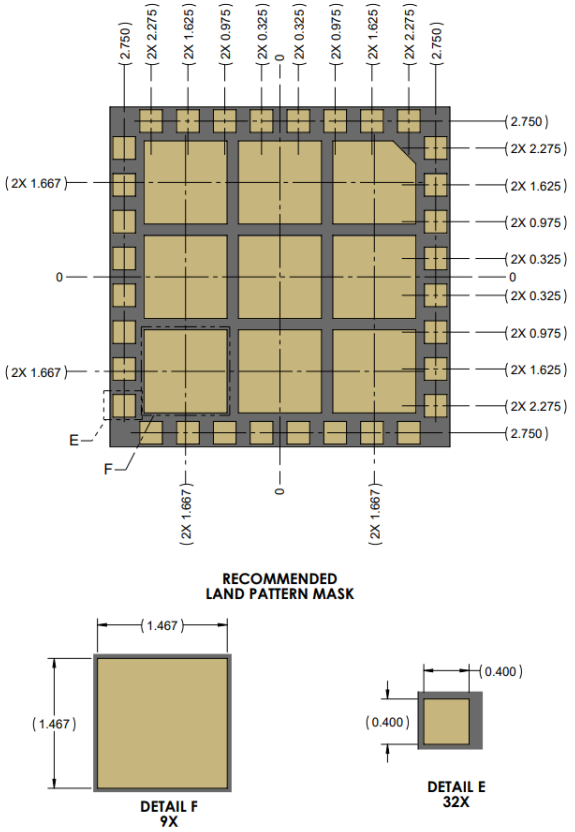


NOTES: UNLESS OTHERWISE SPECIFIED:

Units: millimeters
Tolerances: unless specified
x.xx = ± 0.25; x.xxx = ± 0.100; Angles = 0.5^0
Materials:
PACKAGE EXPOSED METALLIZATION IS GOLD PLATED.
PART IS MOLD ENCAPSULATED.
Marking:
PIN 1 INDICATOR
QORVO LOGO – USE Q5D
PART # 9029
TRACE CODE TO BE ASSIGNED BY SUBCON

PCB Mounting Pattern





Notes:
1. All dimensions are in millimeters. Angles are in degrees.
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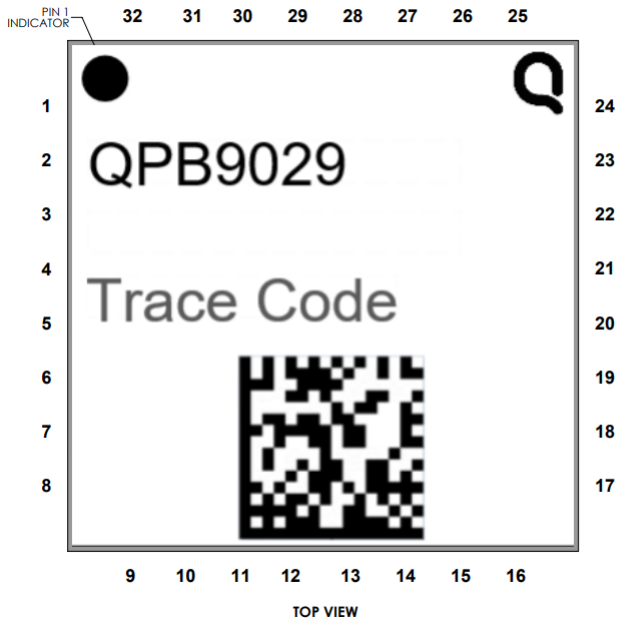
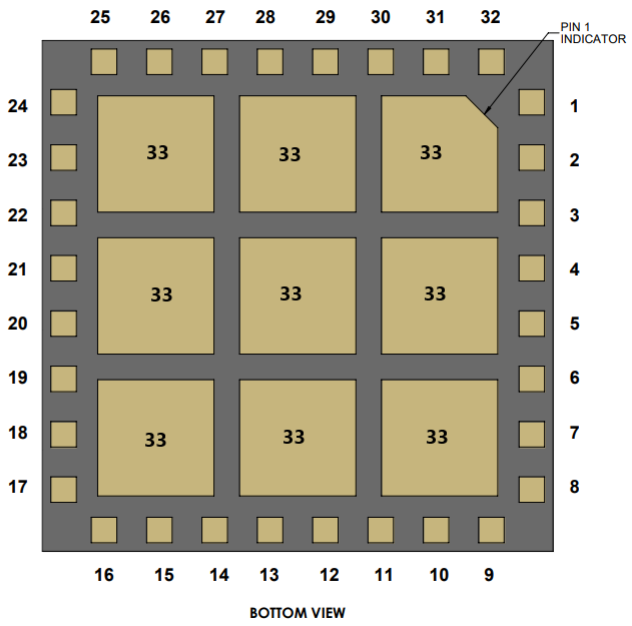
Package Marking, Pad Configuration and Description



TOP VIEW



BOTTOM VIEW

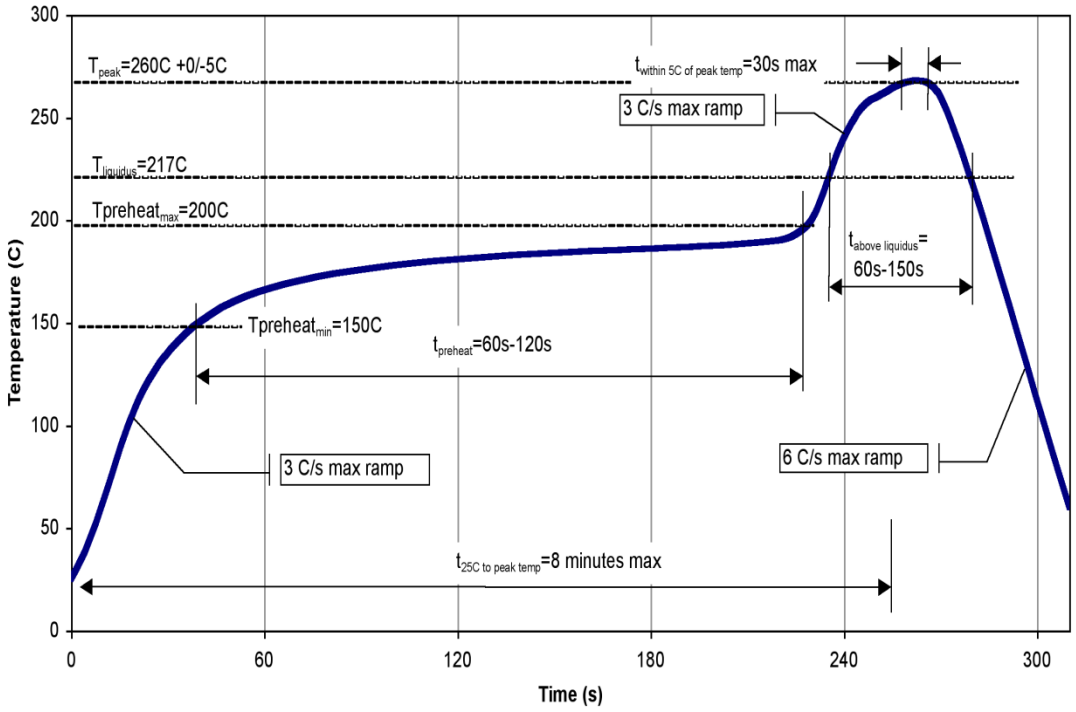
Pin	Symbol	Description
1-3, 5-10, 12, 16-19, 21-32	GND	Ground. Must be grounded on the PCB.
4	RFIN	RF Input. No External DC Blocking Required Unless DC is Applied
11	VDD	Switch Supply Voltage
13	CTRL1	Switch Control Line 1
14	CTRL2	Switch Control Line 2
15	CTRL3	Switch Control Line 3
20	RFOUT	RF Output. No External DC Blocking Required Unless DC is Applied
33 (Center) Package Base	GND	Ground. The back side of the package should be connected to the ground plane though as short of a connection as possible. PCB vias under the device are recommended.

Assembly Notes

Compatible with both lead-free (260°C peak reflow temperature) and tin/lead (245°C peak reflow temperature) soldering processes.

Contact plating: Thin NiENEPIG

Recommended Soldering Profile



Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1C	ANSI / ESD / JEDEC JS-001
ESD – Charged Device Model (CDM)	Class C3	ANSI / ESD / JEDEC JS-002
MSL – Moisture Sensitivity Level	Level 3	IPC/JEDEC J-STD-020

Caution!
ESD-Sensitive Device

RoHS Compliance

This product is compliant with the 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:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Free
- SVHC Free

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

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