

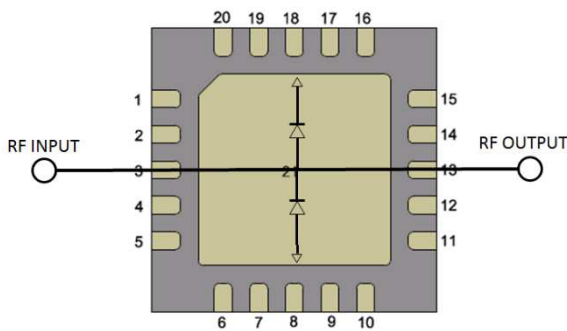
### Product Overview

Qorvo's QPP2209 is a high power VPIN limiter robust to short-pulse input signals up to 40W. It offers exceptionally low insertion loss over a wide bandwidth and requires no DC bias. The QPP2209 is housed in a low-cost plastic over-molded QFN package.

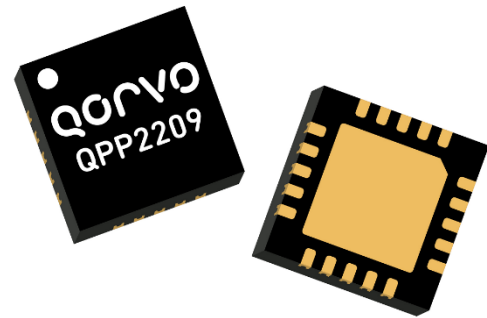
The QPP2209 is internally matched to 50 ohms and operates from 8 to 12 GHz with typical insertion loss less than 0.5dB and flat leakage below 19dBm. It is capable of withstanding 40W of incident power under short-pulse conditions. It is well suited for both commercial and defense related applications.

Lead-free and RoHS compliant.

### Functional Block Diagram



Top View



20L 4 x 4 mm OVM QFN Package

### Key Features

- Frequency Range: 8 to 12 GHz
- Insertion Loss: < 0.5 dB
- Peak Power Handling: 40 W (pulsed)
- Flat Leakage: < 19 dBm
- Spike Leakage < 20.5 dBm
- Passive (no DC bias required)
- Recovery time < 30 ns
- Package Dimensions: 4.00 x 4.00 x 0.85 mm

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

### Applications

- Receive Chain Protection
- Commercial and Military Radar

### Ordering Information

Part	Description
QPP2209TR7	8–12 GHz 40W VPIN Limiter, 500 pcs, 7-inch reel
QPP2209TR7X	8–12 GHz 40W VPIN Limiter, 50 pcs, 7-inch reel
QPP2209EVB01	Evaluation Board

## Absolute Maximum Ratings

Parameter	Rating
Incident Power, Pulsed <sup>1</sup> , 50 Ω, 25 °C	46 dBm
Incident Power, Pulsed <sup>1</sup> , 50 Ω, 85 °C	46 dBm
Incident Power, CW, 50 Ω, 25 °C	37 dBm
Incident Power, CW, 50 Ω, 85 °C	34 dBm
Mounting Temperature (30 s max)	260 °C
Storage Temperature	-40 to 150 °C

Note:

<sup>1</sup> Pulse conditions: PW = 100 us, Duty Cycle = 10%

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
Passive – No Bias				
Temperature Range	-40	+25	+85	°C

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

## Electrical Specifications

Parameter	Conditions <sup>(1)</sup>	Min	Typ.	Max	Units
Operational Frequency Range		8.0		12.0	GHz
Insertion Loss	8 GHz 10 GHz 12 GHz		0.32 0.35 0.47		dB
Input Return Loss	8 GHz 10 GHz 12 GHz		25 21 15		dB
Output Return Loss	8 GHz 10 GHz 12 GHz		30 21 15		dB
Flat Leakage Power at P <sub>IN</sub> > 30 dBm (Pulse)	8 GHz 10 GHz 12 GHz		18.2 18.0 18.2		dBm
Pulse Recovery Time			<30		ns
Spike Leakage			20.5		dBm
Insertion Loss Temperature Coefficient			0.004		dB/ °C

Notes:

1. Test conditions unless otherwise noted: Temp = +25 °C, 50 Ω system. S-Parameter CW, Power Pulse Parameters: PW= 100us, Duty Cycle = 10%

## Thermal and Reliability Information

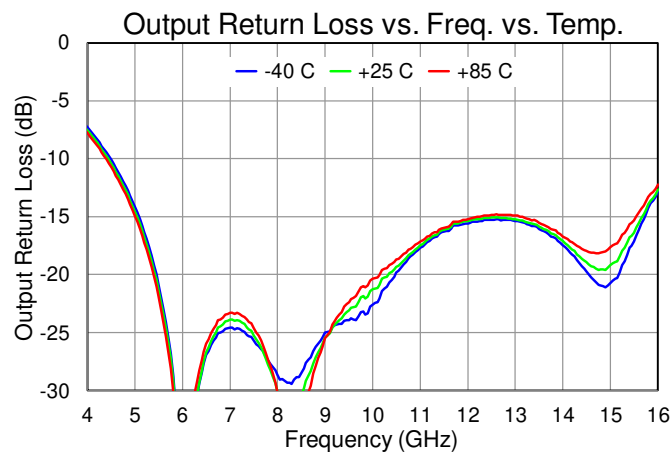
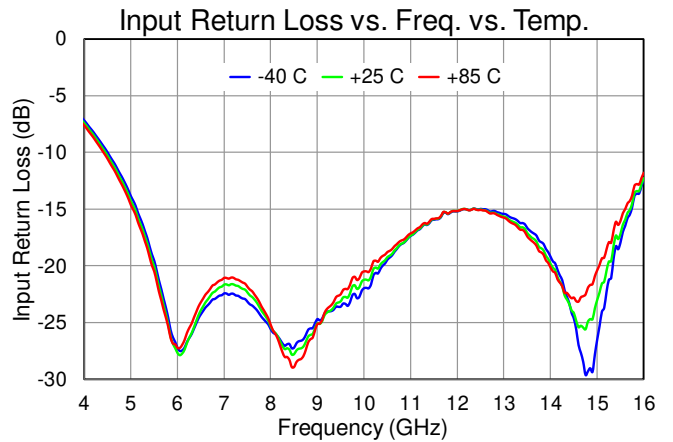
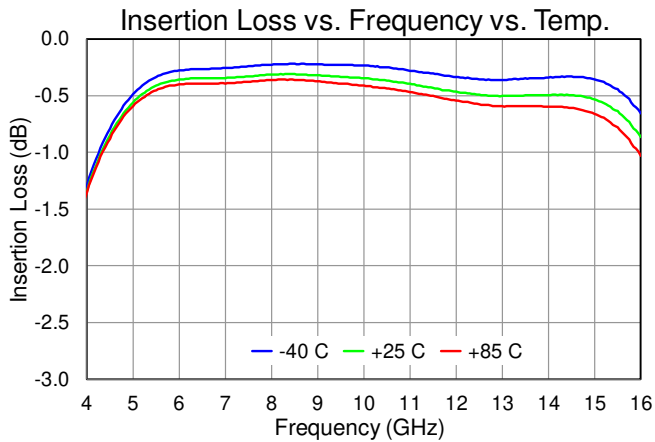
Parameter	Test Conditions	Value	Units
Incident Power (RF Operational Life Test <sup>(1)</sup> )	10 GHz Pulsed, PW=100 us, DC=10%, 50 Ω, 25 °C	40	W

Notes:

1. Test terminated after 100 hours.

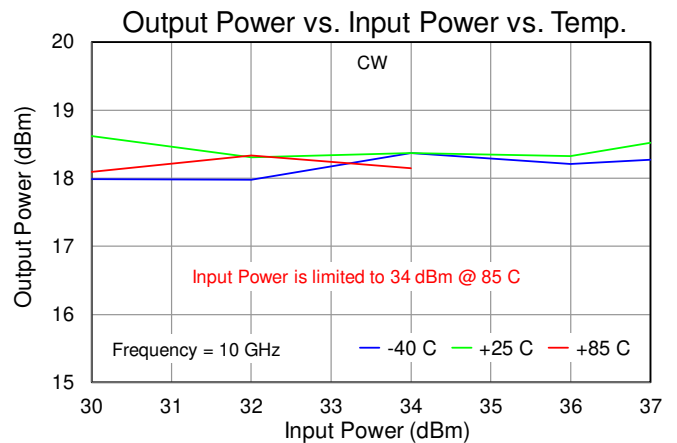
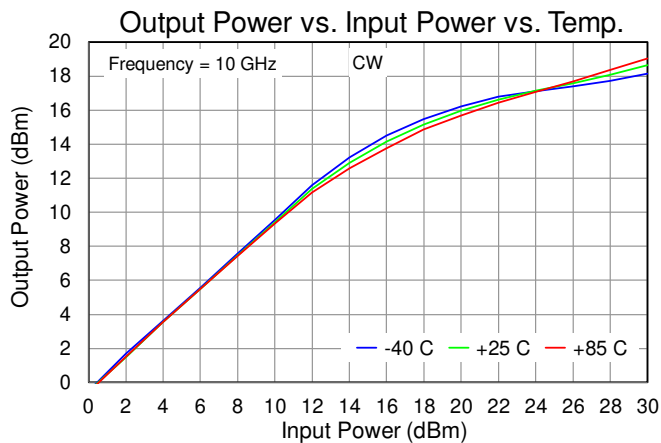
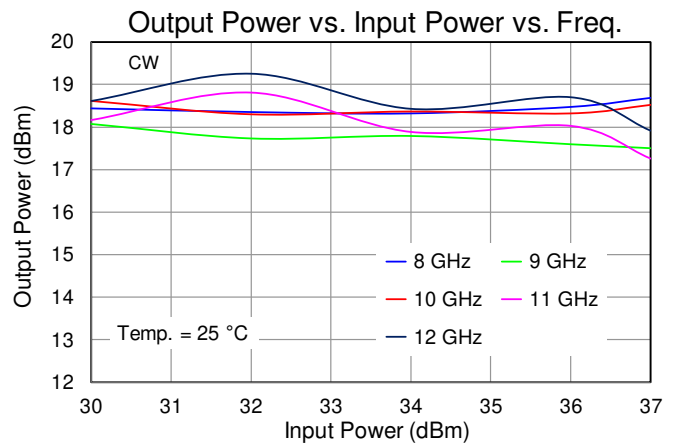
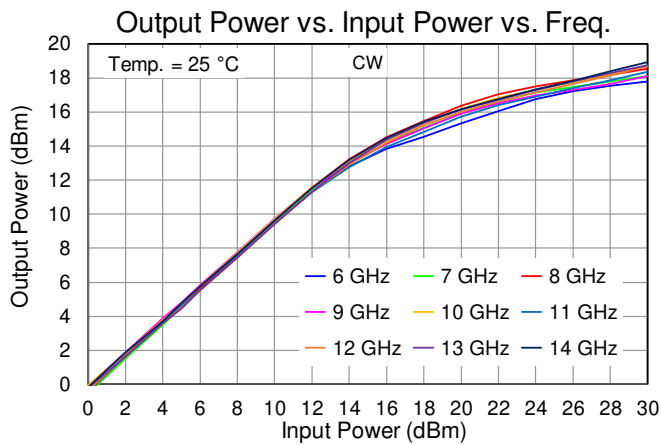
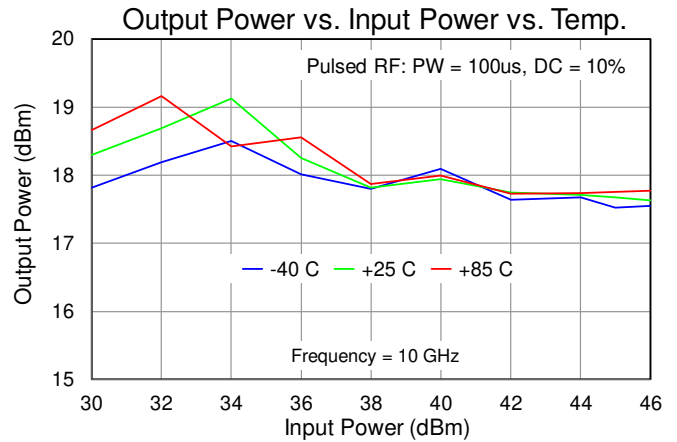
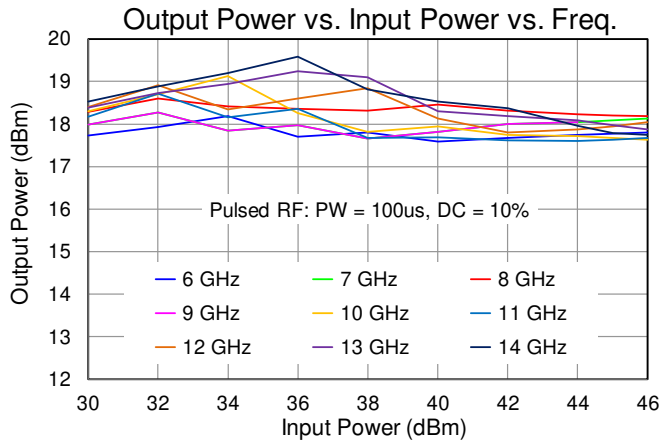
**Performance Plots – Small Signal**

Test conditions unless otherwise noted: Temp.=+25 °C, CW

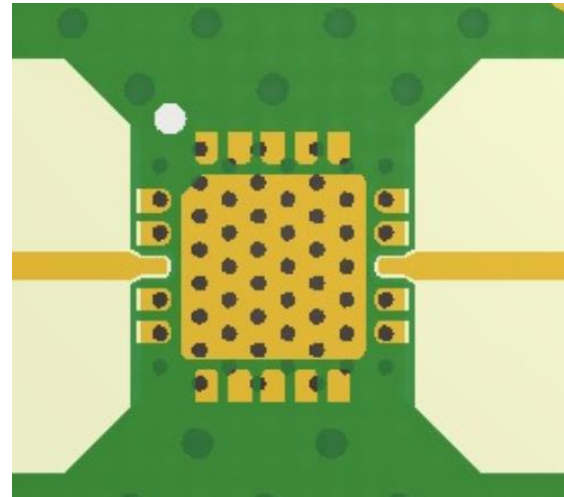
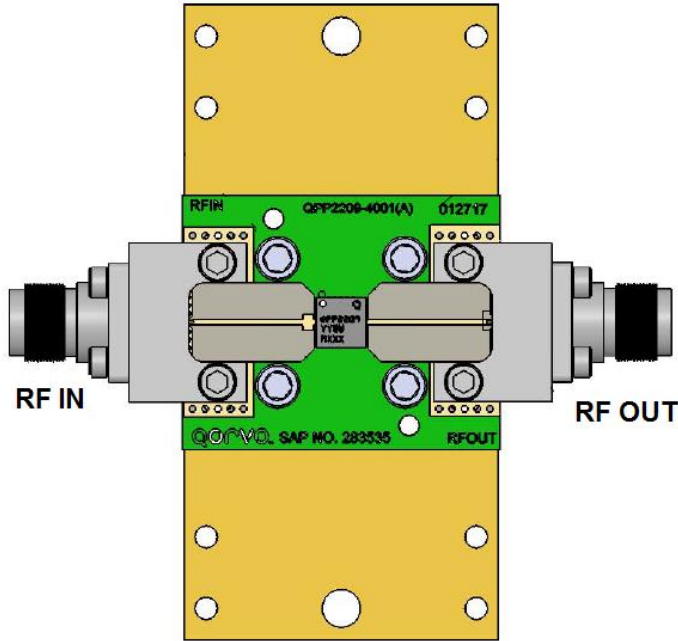


Performance Plots – Large Signal

Test conditions unless otherwise noted: Pulsed RF: PW = 100us, DC = 10%; Temp.=+25 °C



Application Circuit and Evaluation Board (EVB) and Mounting Detail



Notes:

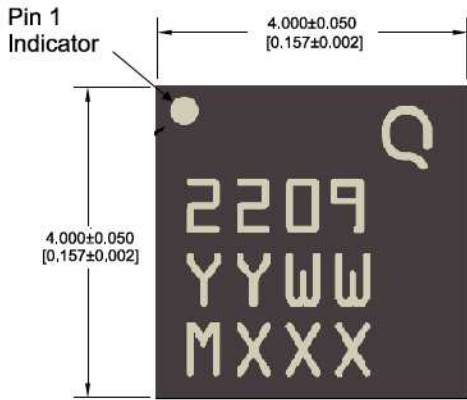
- 1. See Evaluation Board PCB Information for material and stack up.

Evaluation Board PCB Information

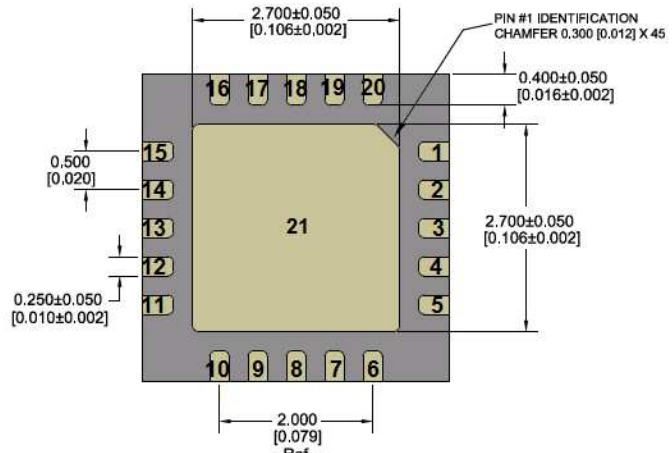
Layer Stack Legend

Material	Layer	Thickness	Dielectric Material	Type
	SILKSCREEN_TOP			Legend
Surface Material	SOLDERMASK_TOP	0.4mil	Solder Resist	Solder Mask
Copper	METAL1_TOP	1.3mil		Signal
Core		8.0mil	ROGERS 4003C	Dielectric
Copper	METAL2_BOT	1.3mil		Signal
<b>Total thickness: 11mil</b>				

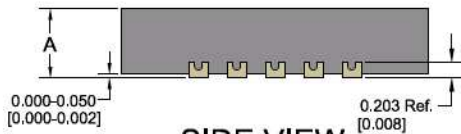
Package Marking, Pad Configuration and Description



TOP VIEW



BOTTOM VIEW



SIDE VIEW

A	MAX.	0.900 [0.035]
	NOM.	0.850 [0.033]
	MIN.	0.800 [0.031]

LASER MARK NOTES:

- 2209 IS PART #
- YY IS THE LAST TWO DIGITS OF THE CALENDAR YEAR
- WW IS THE WEEK NUMBER OF THE ASSEMBLY LOT START
- MXXX IS THE BATCH ID

NOTES: UNLESS OTHERWISE SPECIFIED;

1. TESTED QPP2209
2. PACKAGE IS MOLD ENCAPSULATED.
3. PACKAGE EXPOSED METALLIZATION ARE GOLD PLATED.

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN mm [INCHES]

.XX = ± .25 [.001]  
 TOLERANCES .XXX = ± .100 [.004] ANGLES = 0.5°  
 .XXXX = ± .0254 [.001]

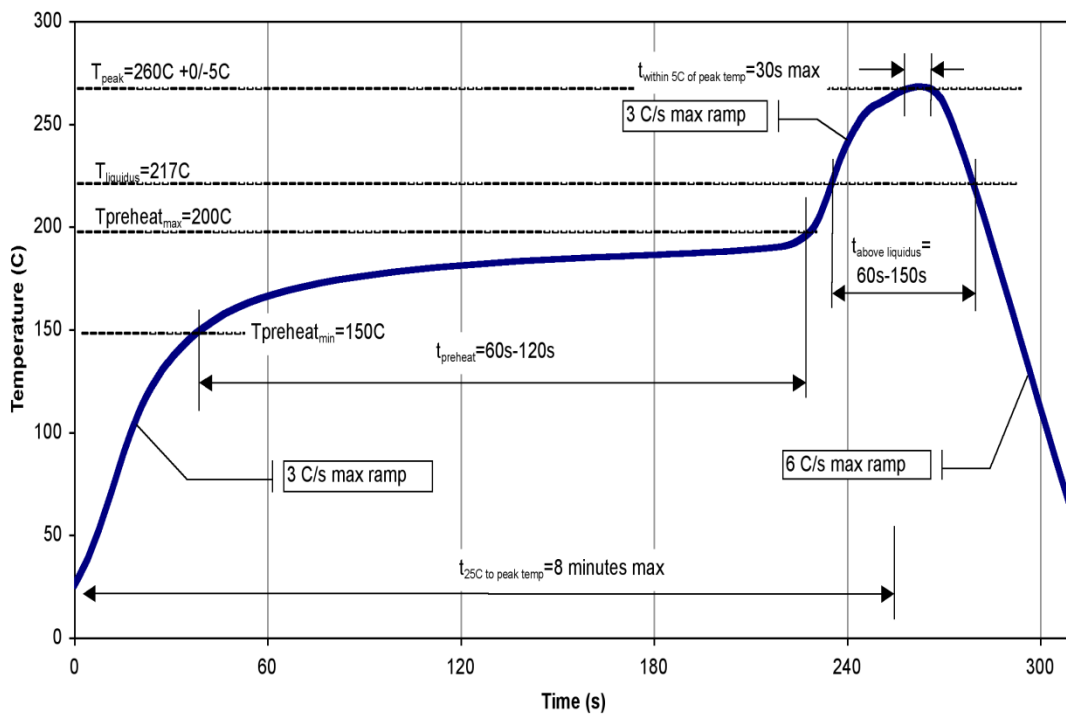
Pad No.	Label	Description
1, 2, 4–12, 14–20	NC	No connection; may be grounded if desired
3	RF Input	RF Input, matched to 50 Ohms, not DC blocked
13	RF Output	RF Output, matched to 50 Ohms, not DC blocked
21 (Slug)	GND	On PCB, multiple copper-filled vias should be employed under the center pad to minimize inductance and thermal resistance

NOTE: The RF Input and RF Output ports are not interchangeable.

## Solderability

1. Compatible with the latest version of J-STD-020, Lead-free solder, 260° C.
2. The use of no-clean solder to avoid washing after soldering is recommended.
3. Contact plating: Ni-Pd-Au

## Recommended Soldering Profile



## 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

## 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:

- Lead Free
- 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:

**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 2019 © Qorvo, Inc. | Qorvo is a registered trademark of Qorvo, Inc.