890087

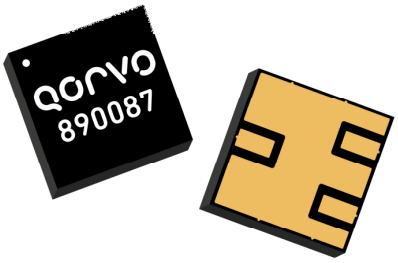
L1/L5 Low Loss GPS SAW Diplexer

General Description

890087 is an L1/L5 GPS diplexer in a compact size for use in any GPS application. Designed for rejection of unwanted GPS signals, this SAW diplexer also has excellent power handling capability for low power transmitters.

Housed in a 5.0 x 5.0 mm laminate with over mold package, this device allows for a compact and cost effective diplexer solution for GPS applications.

No matching components are required, making the PCB design and implementation easy.

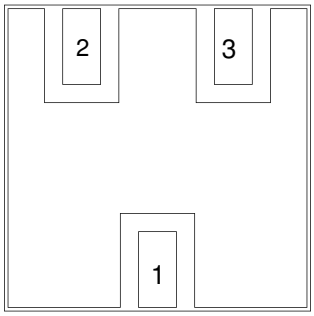


5.0 X 5.0 X 1.1 mm

Product Features

- Usable bandwidth 20.46 MHz for each band
- No matching required for operation at 50Ω
- Excellent rejection for GPS operation
- High Isolation
- High Rejection
- Laminate with Over Mold Surface Mount Package (SMP)
- Small size : 5.0 x 5.0 x 1.1mm
- Hermetic **RoHS** compliant, **Pb**-free

Functional Block Diagram



Top View

Applications

- General purpose GPS
- Communications Systems

Pin Configuration - Single Ended

Pin No.	Label
1	Antenna
2	L1 Band Output
3	L5 Band Output

Ordering Information

Part No.	Description
890087	Packaged Part
890087-EVB	Evaluation board

Absolute Maximum Ratings

Parameter	Rating
Operating Temperature (1)	–55 to +85 ℃
Storage Temperature (1)	–55 to +105 ℃
RF Input Power	TBD

Notes:
1. Operation of this device outside the parameter ranges given may cause permanent damage.

Electrical Specifications (1,2)

L1 Band GPS					
Parameter (3)	**Conditions**	**Min**	**Typical (4)**	**Max**	**Units**
Center Frequency		-	1575.42	-	MHz
Maximum Insertion Loss	1574.397 – 1576.443 MHz 1565.190 – 1585.650 MHz	- -	1.4 1.9	1.8 2.6	dB
Amplitude Variation	1574.397 – 1576.443 MHz 1565.190 – 1585.650 MHz	- -	0.1 0.6	0.2 1.1	dB
Group Delay Variation	1574.397 – 1576.443 MHz 1565.190 – 1585.650 MHz	- -	0.8 3.0	2.6 5.0	ns
Absolute Attenuation	824.0000 – 960.000 MHz 1500.000 – 1525.420 MHz 1625.420 – 1650.00 MHz 1710.000 – 2170.00 MHz	20 28 30 21	21 30 33 23	- - - -	dB dB dB dB
Return Loss at Port 2	1574.397 – 1576.443 MHz 1565.190 – 1585.650 MHz	10 9	20 12	-	dB
Nominal Impedance (5)	Single Ended	-	50	-	Ohm

Notes:
1. All specifications are based on the Qorvo schematics for the reference designs shown on page 5.
2. In production, devices will be tested at room temperature to a guard banded specification to ensure electrical compliance over temperature.
3. Electrical margin has been built into the design to account for the variations due to temperature drift and manufacture tolerances.
4. Typical values are based on average measurements at room temperature on pcb.
5. This is the optimum impedance in order to achieve the performance shown.

Electrical Specifications (1,2)

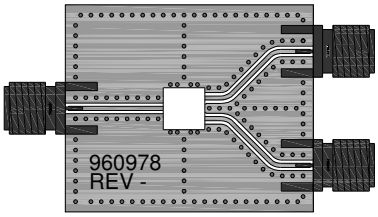
L5 Band GPS					
Parameter (3)	**Conditions**	**Min**	**Typical (4)**	**Max**	**Units**
Center Frequency		-	1176.45	-	MHz
Maximum Insertion Loss	1175.427 – 1177.473 MHz 1166.22 – 1186.68 MHz	-	1.0 1.9	1.45 2.7	dB
Amplitude Variation	1175.427 – 1177.473 MHz 1166.22 – 1186.68 MHz	-	.10 1.0	0.2 1.6	dB
Group Delay Variation	1175.427 – 1177.473 MHz 1166.22 – 1186.68 MHz	- -	1.4 4.8	4 10	ns
Absolute Attenuation	414 – 550 MHz 1020 – 1126.45 MHz 1226.45 – 1250 MHz 1310 – 1770 MHz	35 18 25 19	37 21 28 20	- - - -	dB dB dB dB
Return Loss at Port 3	1175.427 – 1177.473 MHz 1166.22 – 1186.68 MHz	10 6.3	20 9	-	dB
Nominal Impedance (5)	Single Ended	-	50	-	Ohm

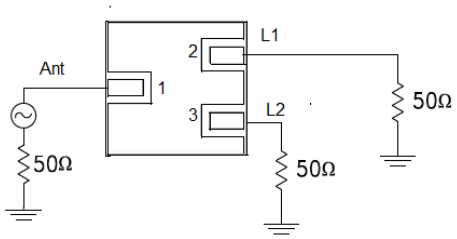
L1 Band – L5 Band Specifications					
Parameter (3)	**Conditions**	**Min**	**Typical (4)**	**Max**	**Units**
Nominal Impedance (5)	Single Ended	-	50	-	dB
Antenna Return Loss	1574.397 – 1576.443 MHz	10	19	-	
	1565.19 – 1585.65 MHz	10	16	-	
	1175.427 – 1177.473 MHz	10	20	-	
	1166.22 – 1186.68 MHz	10	11	-	
Isolation	1574.397 – 1576.443 MHz	23	26		dB
	1565.19 – 1585.65 MHz	23	26		
	1175.427 – 1177.473 MHz	23	25		
	1166.22 – 1186.68 MHz	23	25		

Notes:

1. All specifications are based on the Qorvo schematics for the reference designs shown on page 5.
2. In production, devices will be tested at room temperature to a guard banded specification to ensure electrical compliance over temperature.
3. Electrical margin has been built into the design to account for the variations due to temperature drift and manufacture tolerances.
4. Typical values are based on average measurements at room temperature on pcb.
5. This is the optimum impedance in order to achieve the performance shown.

Evaluation Board – 890087-EVB





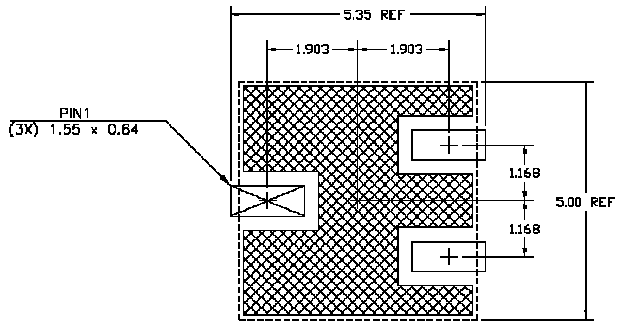
Notes:

1. No Impedance matching required. Value adjustment may be required in end user product circuits depending on component manufacturer and PCB material.
   PCB: .500 x.500 x .062; Construction: ½ oz *Cu* Top Layer; *TLY-5A* (.0075) ½ oz *Cu* Middle Layer, *FR4*; ½ oz *Cu* Bottom Layer. (dimensions are in inches)

Bill of Material – 890087-EVB

Reference Des.	Value	Description	Manuf.	Part Number
DUT	-	L1/L5 LL SAW Diplexer	Qorvo	890087
SMA	-	SMA connector	Radiall USA Inc.	9602-1111-018
PCB	-	3-Layer	Qorvo	960978

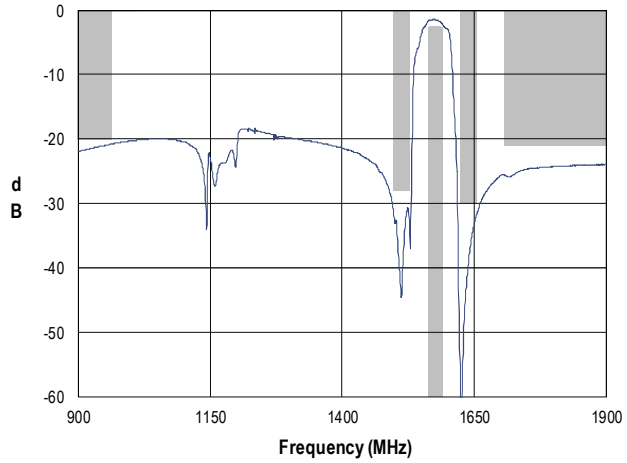
PCB Mounting Pattern



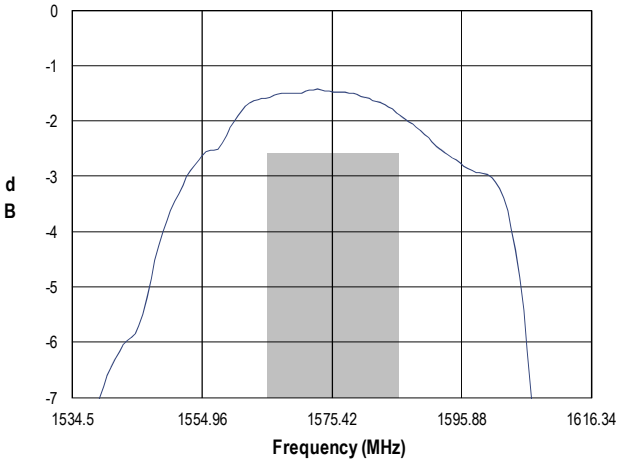
1. All dimensions are in millimeters. Angles are in degrees.
2. This drawing specifies the mounting pattern used on the Qorvo evaluation board for this product. Some modification may be necessary to suit end user assembly materials and processes.

L1 Typical Performance (at room temperature)

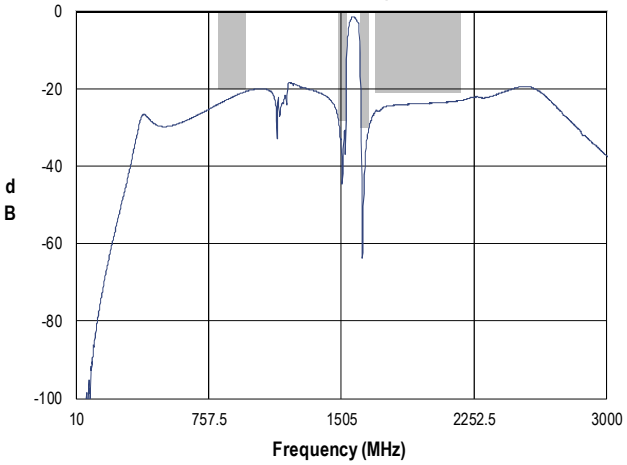
L1 Frequency Response



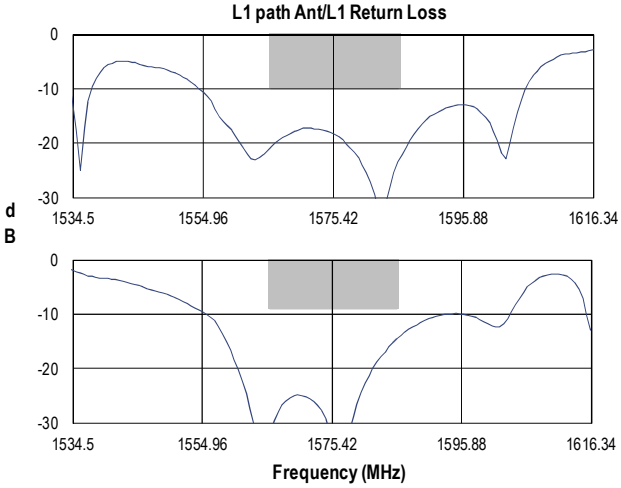
L1 Passband Response



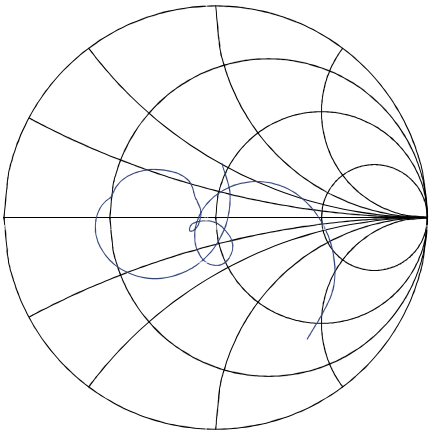
L1 Wideband Response



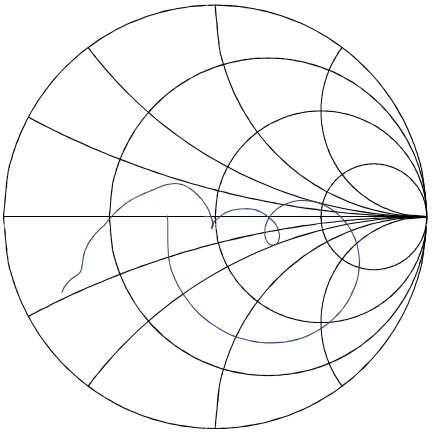
L1 path Ant/L1 Return Loss



L1 Path - Ant Port Impedance

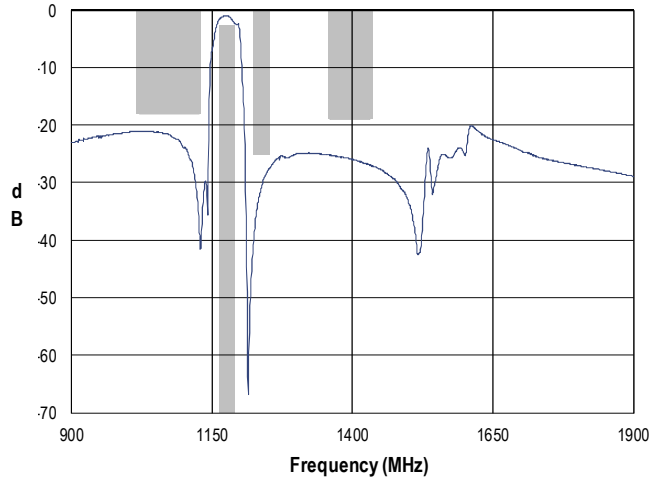


L1 Port Impedance

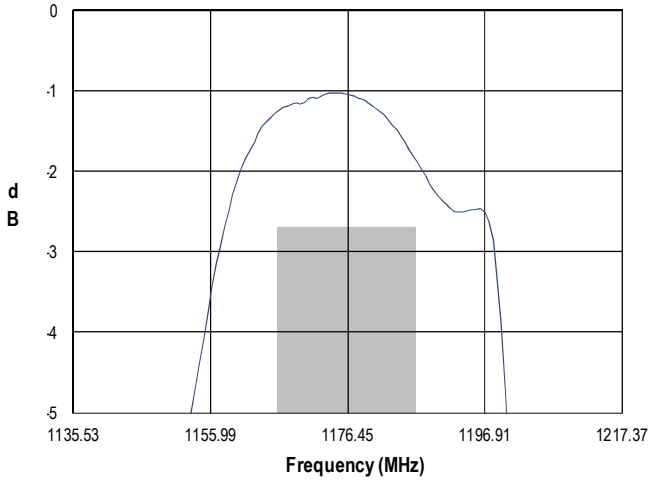


L5 Typical Performance (at room temperature)

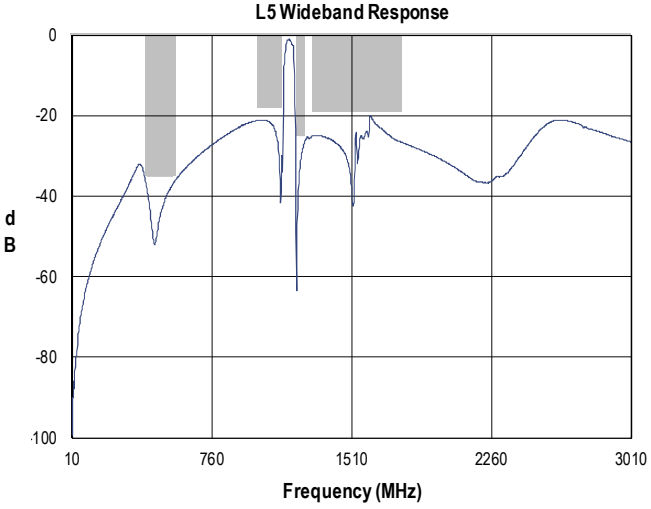
L5 Frequency Response



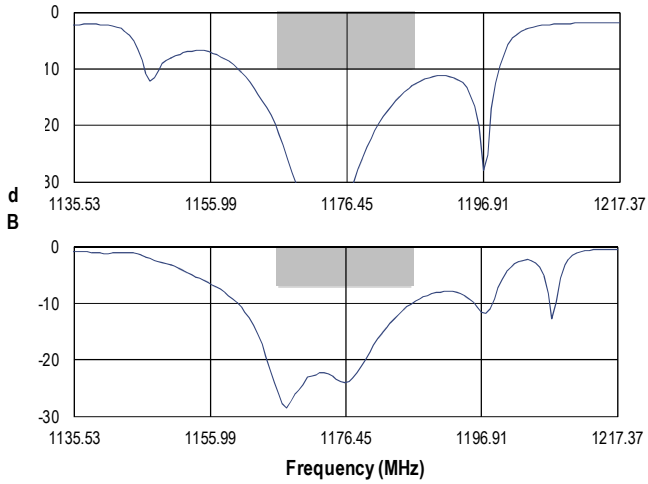
L5 Passband Response



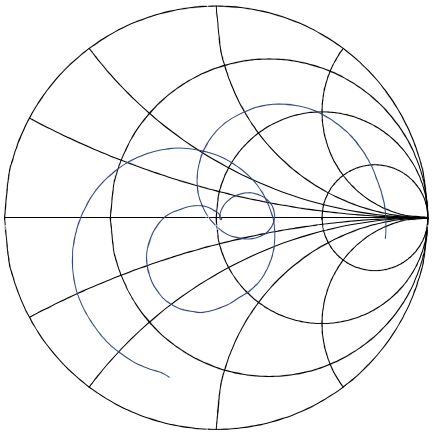
L5 Wideband Response



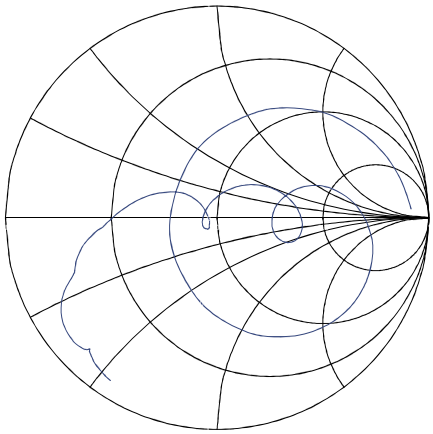
L5 Path Ant/L5 Return Loss



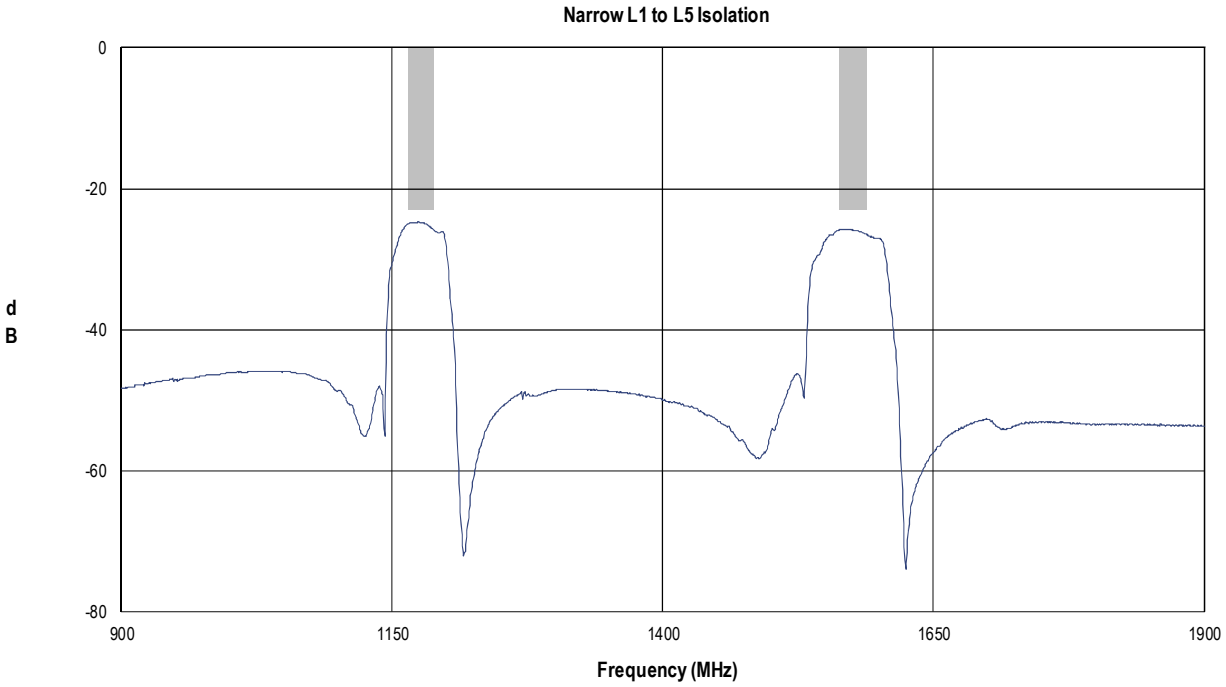
L5 Path - Ant Port Impedance



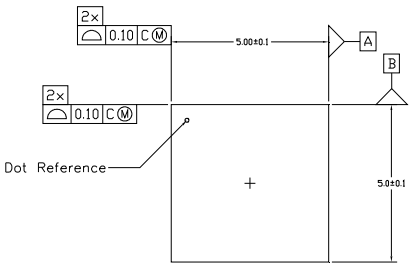
L5 Port Impedance

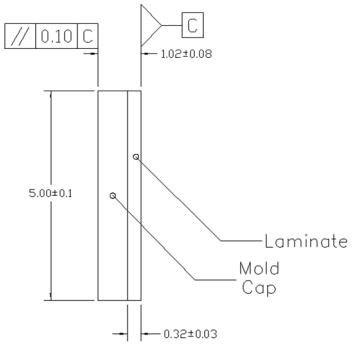


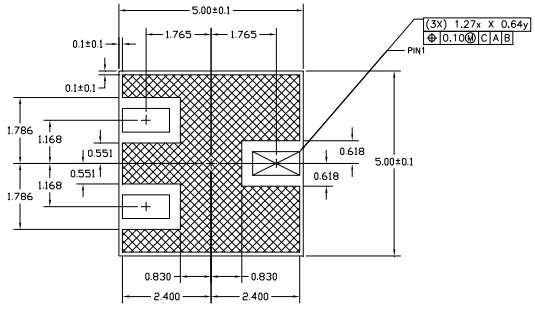
L1 L5 Isolation Performance



Package Information, Marking and Dimensions



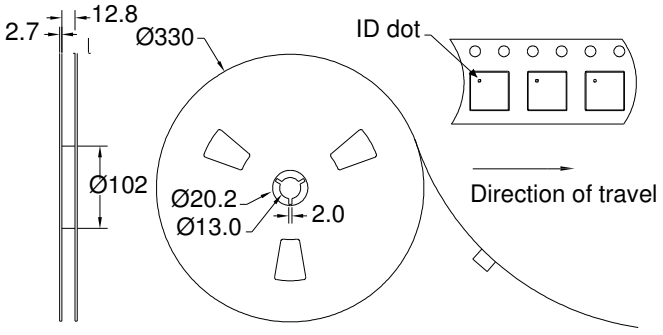


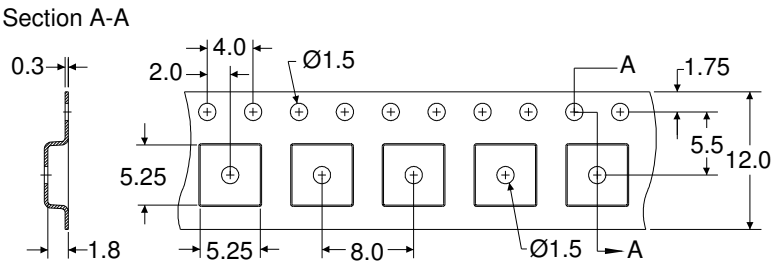


Package Style: 5X5 Module
Dimensions: 5 X 5 X 1.1 mm

All dimensions are in millimeters. Angles are in degrees

Tape and Reel Information





Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class TBD	ESDA / JEDEC JS-001
ESD – Charge Device Model (CDM)	Class TBD	ESDA /JEDEC JS-002
MSL – Moisture Sensitivity Level	Level 3	JEDEC Standard IPC/JEDEC J-STD-020

Caution!
ESD-Sensitive Device

Solderability

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

Refer to **Soldering Profile** for recommended guidelines

RoHS Compliance

This part is compliant with EU 2002/95/EC RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment). 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
- Qorvo Green

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

For technical questions and application information: **Email:** flapplication.engineering@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.