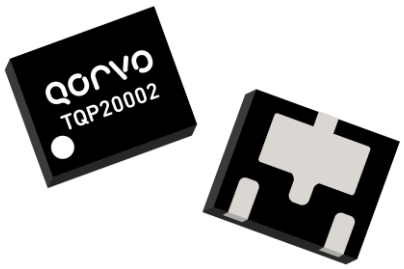
TQP200002
Dual ESD Diode

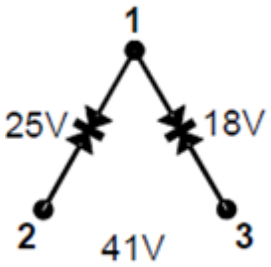
Product Overview

The TQP200002 ESD protection device is fabricated in GaAs MESFET technology and has been especially developed for high frequency applications. It delivers bi-directional protection with very low leakage currents and extremely low capacitance. It is ideally suited for cellular handsets, cordless phones, and broadband applications like CATV set top boxes and LNBs.



1.2 mm x 1.5 mm SMT

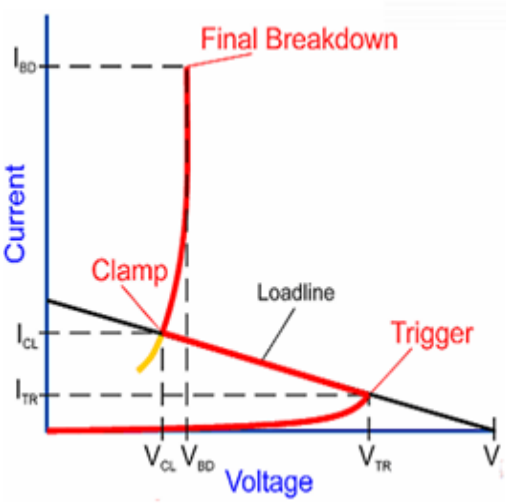
Functional Block Diagram



Key Features

- Snap-Back ESD protection
- Low clamp voltages 15 or 30 V
- Low trigger voltages 18, 25, or 41 V
- Two bidirectional protection lines
- Fast response time: under 1 ns
- Low capacitance: 0.22 pF
- Thin Small Leadless SMT Package (A=1.8 mm^2)

Snap Back Characteristics



Applications

- Cellular Handsets
- Cordless Phone
- LNBs
- CATV set top boxes

Ordering Information

Part Number	Description
TQP200002	13-inch reel with 10,000 pieces
TQP200002SR	7-inch reel with 100 pieces

Absolute Maximum Ratings

Parameter	Rating
Supply Voltage (V_{DD})	+25 V
Total Power Dissipation	+600 mW
IEC 61000-4-2 Air Discharge	+3000 V
IEC 61000-4-2 Contact Discharge	+3000 V
JEDEC Human Body Model (HBM)	+8000 V
Storage Temperature Range	−65 to +150 °C
Operating Temperature Range	-40 to +105 °C
Maximum Junction Temperature (for >10^6 hours MTTF)	+160 °C

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.

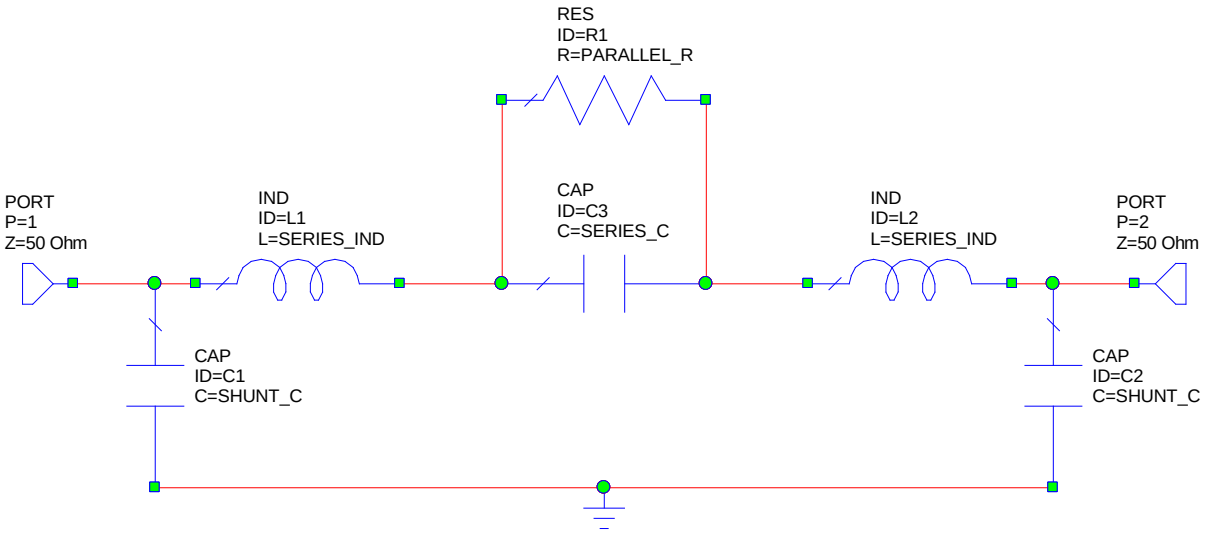
Electrical Specifications

Parameter	Condition [1]	Min	Typ	Max	Unit
Supply Voltage (V_{D13})		-7		+7	V
Supply Voltage (V_{D12})		-7		+7	V
Supply Voltage (V_{D23})		-17		+17	V
Trigger Voltage (V_1)	P1, 3	+13	+18	+23	V
Clamp Voltage (V_{C11})	P1, 3	+10	+15	+20	V
Leakage Current (I_{leak1})	1 V		+20		nA
Leakage Current (I_{leak1})	15 V		+500		nA
Capacitance (C_1)	1 V, 10 MHz		+290		fF
Trigger Voltage (V_2)	P1, 2	+20	+25	+30	V
Clamp Voltage (VC_{12})	P1, 2	+10	+15	+20	V
Leakage Current (I_{leak2})	1 V		+20		nA
Leakage Current (I_{leak2})	15 V		+500		nA
Capacitance (C_2)	1 V, 10 MHz		+290		fF
Trigger Voltage (V_3)	P2, 3	+31	+41	+46	V
Clamp Voltage (VC_{13})	P2, 3	+20	+30	+40	V
Leakage Current (I_{leak3})	1 V		+15		nA
Leakage Current (I_{leak3})	15 V		+300		nA
Capacitance (C_3)	1 V, 10 MHz		+220		fF

Notes:

1. Typical performance at these conditions: Temp = +25 °C, 75 Ω system

Device Characterization Data



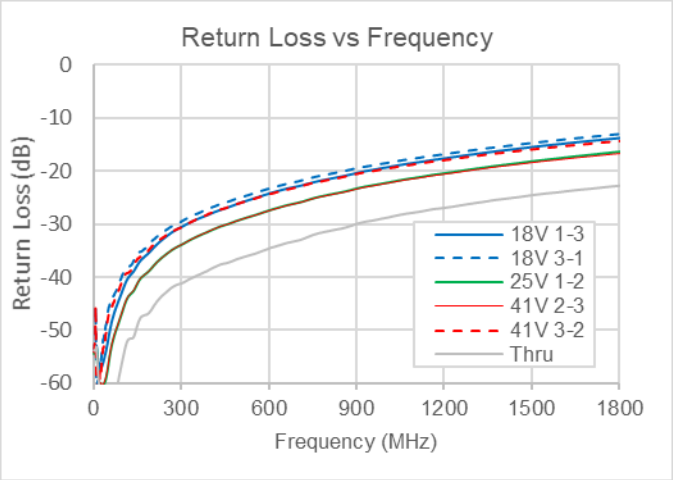
Pin 2 to Pin 3 Small Signal Element	Value	Unit
Series_C	0.22	pF
Shunt_C_In	0.08	pF
Shunt_C_Out	0.01	pF
Series_Ind	0.20	nH
Parallel_R	230	MΩ

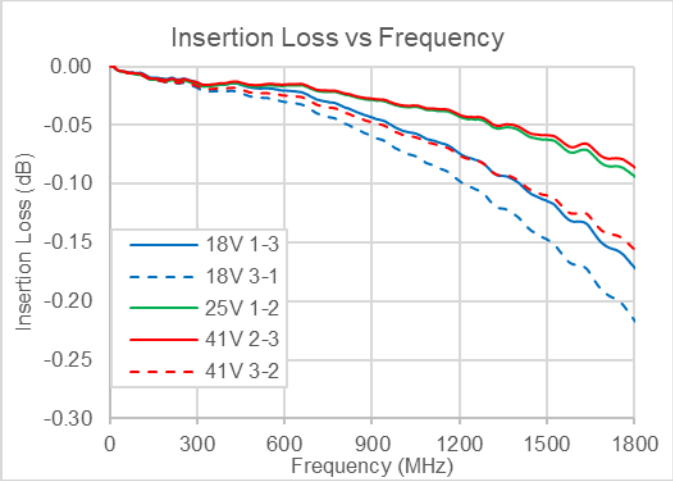
Notes:

1. Values of input and output shunt capacitances are dependent upon the board material and the board pad sizes and will be layout dependent.

Trigger Voltage	Unit	V1 = 18 V	V2 = 25 V	V3 = 41 V
Insertion Loss	dB	0.3	0.25	0.25
Input Return Loss	dB	19	21	21
Output Return Loss	dB	19	21	21

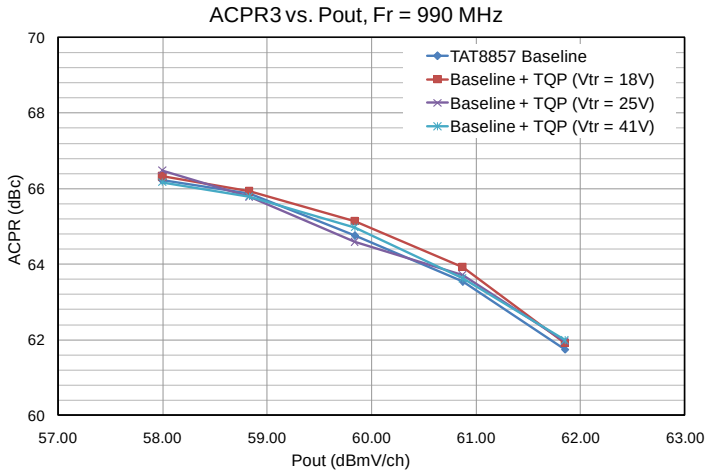
Typical Performance: 5MHz – 1800MHz





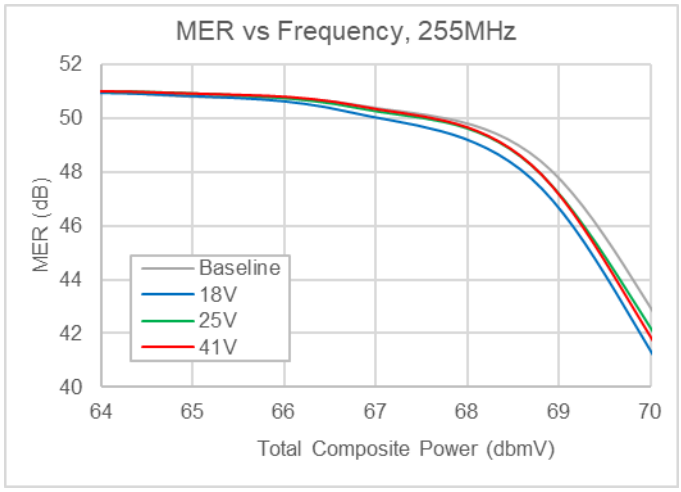
Notes:
1. Plots show effects of diode orientation from PCB trace to ground. Ex: 1-3 shows RF applied to pin 1 with pin 3 connected to ground.
2. Insertion Loss plot is loss compensated to remove the effect of the PCB.

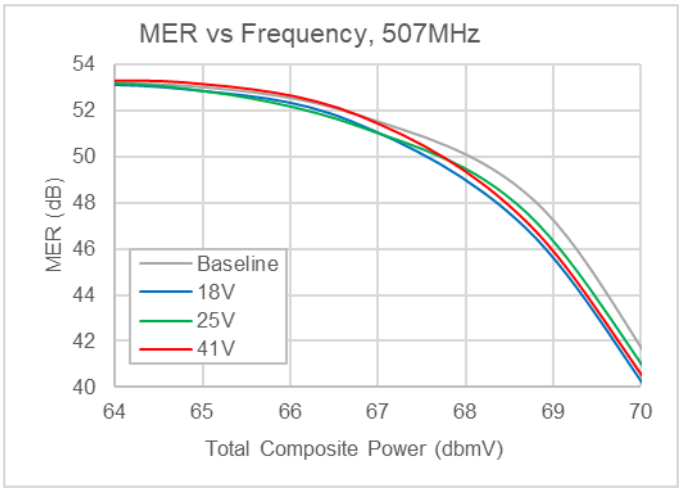
Distortion Performance: ACPR

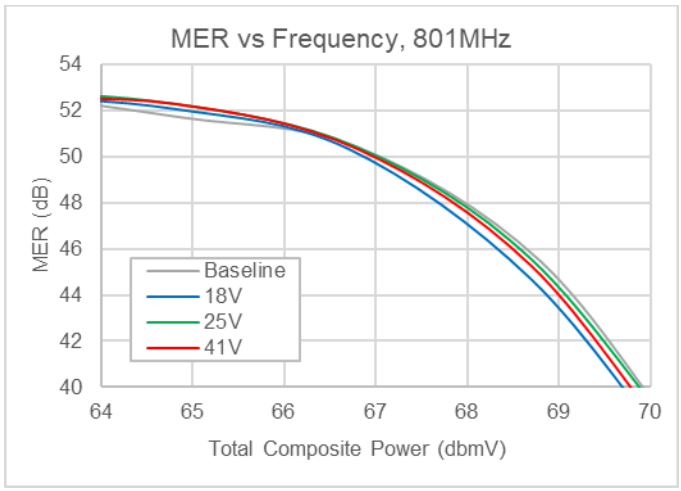


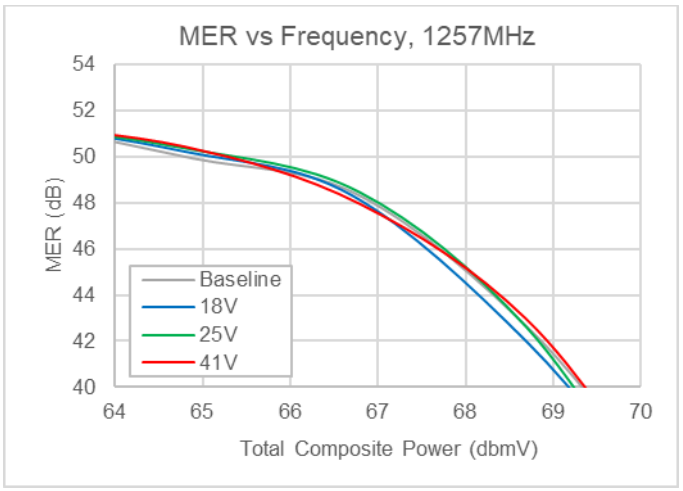
Notes:
1. ACPR data was taken against a baseline obtained for the TAT8857 at 990 MHz.
2. Channel plan: 4 combined channels, 256 QAM modulation per DOCSIS 3.0
3. ACPR3: -6 MHz from channel block edge to 12 MHz from channel block edge.

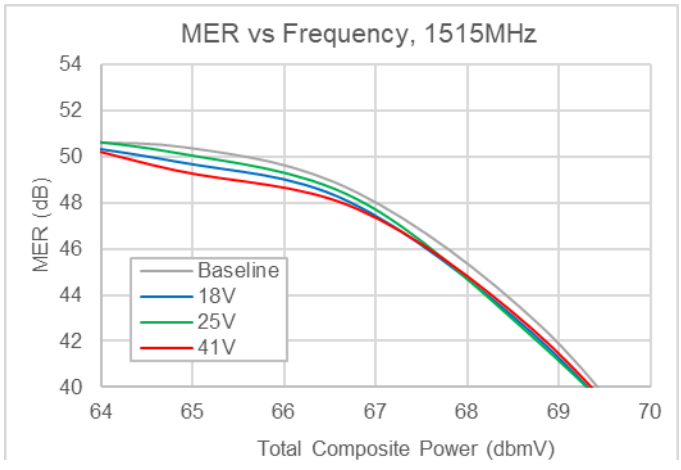
Distortion Performance; 1.8GHz MER

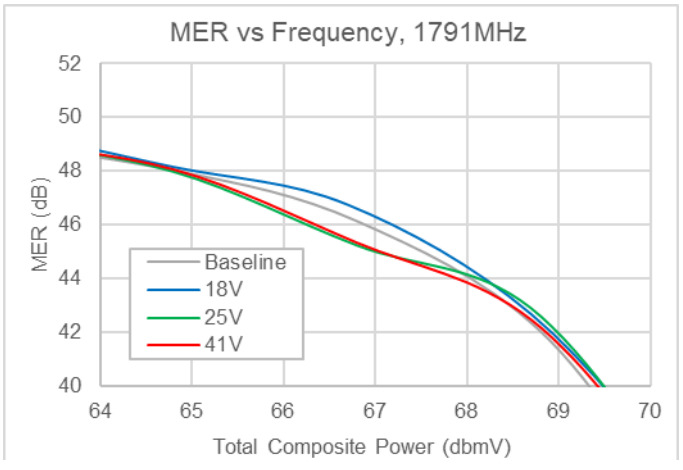








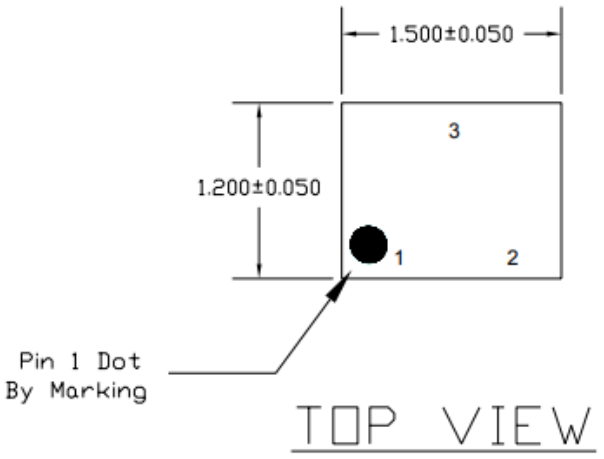


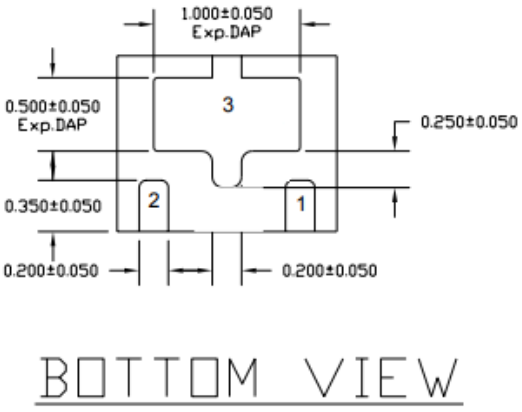


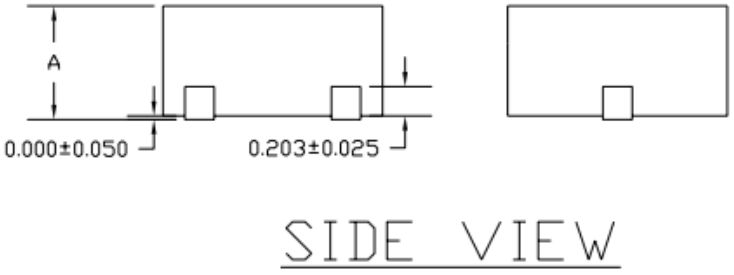
Notes:

1. Distortion data was taken against baselines obtained for the QPA8840 with the TQP200002 added to the output as noted.
2. 255 – 1791MHz, 256 chanels SC-QAM, 10dB tilt, 0dB offset. Source corrected, maximum correction 4.3dB.

Package Outline





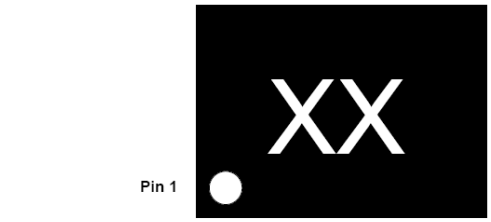


		TSLP
A	MAX.	0.800
	NOM.	0.750
	MIN.	0.700

01

ALL MEASUREMENT IN (MM)

Package Marking

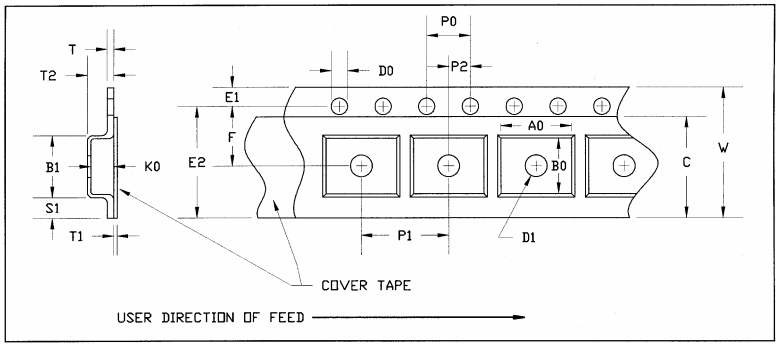


WHITE INK OR LASER MARK.

Line 1: XX = Last 2 digits of Qorvo assembly lot number

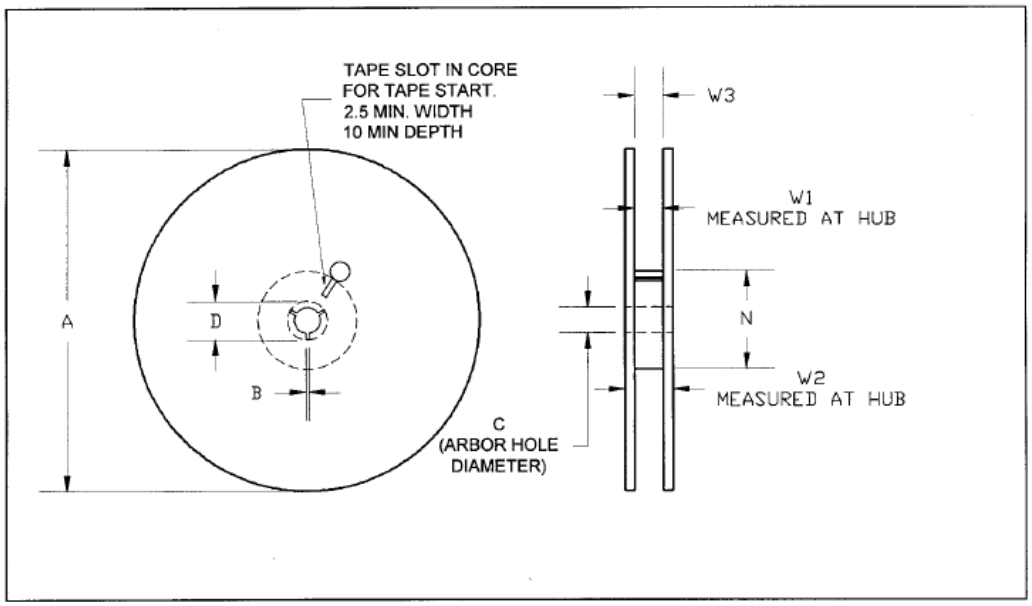
Tape and Reel Information

03L (T/SLP) 1.2X1.5mm



Part	Feature	Symbol	Size (in)	Size (mm)
Cavity	Length	A0	0.053	1.35
	Width	B0	0.068	1.75
	Depth	K0	0.040	1.02
	Pitch	P1	0.157	4.00
Distance Between Centerline	Cavity to Perforation	P2	0.079	2.00
	Length Direction			
	Cavity to Perforation	F	0.138	3.50
	Width Direction			
Cover Tape	Width	C	0.213	5.40
Carrier Tape	Width	W	0.315	8.00

Tape and Reel Information



T/SLP			13" REEL	
PART	FEATURE	SYMBOL	SIZE (in)	SIZE (mm)
FLANGE	DIAMETER	A	12.992	330.0
	THICKNESS	W2	0.567	14.4
	SPACE BETWEEN FLANGE	W1	0.331	8.4
HUB	OUTER DIAMETER	N	3.937	100.0
	ARBOR HOLE DIAMETER	C	0.512	13.0
	KEY SLIT WIDTH	B	0.059	1.5
	KEY SLIT DIAMETER	D	0.795	20.2

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 3B	ANSI/ESDA/JEDEC JS-001
ESD – Charged Device Model (CDM)	Class C3	ANSI/ESDA/JEDEC JS-002
MSL – Moisture Sensitivity Level	Level 1	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 ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Free
- SVHC Free

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: Matte Sn

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

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