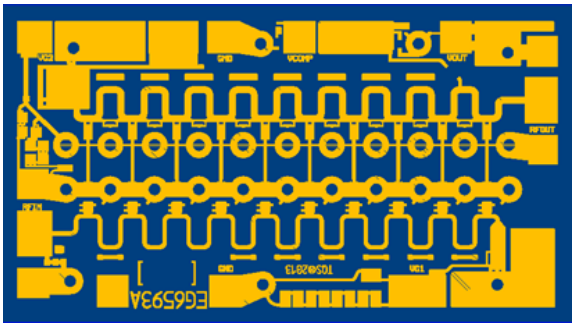
TGA4852

DC – 35GHz Wideband Amplifier



Product Description

The TriQuint TGA4852 is a medium power wideband AGC MMIC. Drain bias may be applied through the output port for best efficiency or through the on-chip drain termination. RF ports are DC coupled enabling the user to customize system corner frequencies. The TGA4852 requires off-chip decoupling and blocking components.

The TGA4852 is an excellent choice for 40Gb/s and 100Gb/s applications. The TGA4852 is capable of driving a modulator with an adjustable output voltage of 3-10 Vpp.

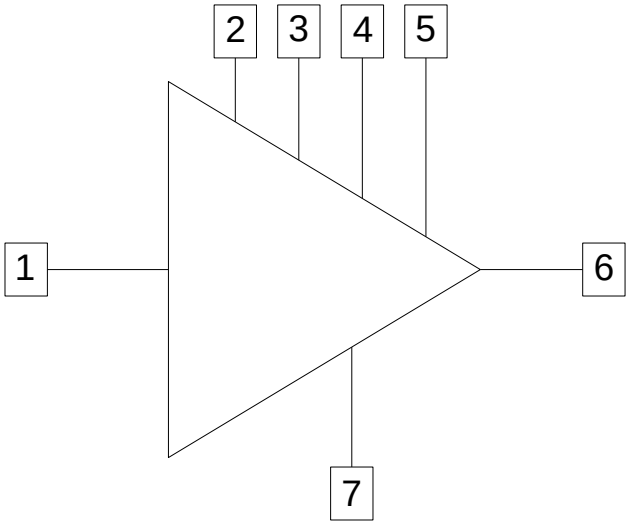
Bond pad and backside metallization is gold plated for compatibility with eutectic alloy attachment methods as well as the thermocompression and thermosonic wire bonding processes. Each device is 100% DC and RF tested on-wafer to ensure performance compliance. The device is available in die form.

Lead Free & RoHS Compliant.

Product Features

- 40 & 100Gb/s Optical Modulator Driver
- 0.15um Power pHEMT Technology
- On-chip Power Detector
- Bias: Vd = 6 V, Id = 215 mA (7 Vpp out)
- Chip Size: 1.80 x 1.00 x 0.1 mm

Functional Block Diagram



Applications

- 40Gb/s DPSK / DQPSK Driver
- 100Gb/s DP-QPSK Driver
- 40Gb/s Predriver or Gain Block
- Test Equipment

Ordering Information

Part No.	ECCN	Description
TGA4852	3A001.b.2.d	DC – 35GHz Amplifier

Absolute Maximum Ratings

Parameter	Value / Range
Drain Voltage, Vd	9 V
Drain Voltage Termination, VdT	(VdT - IdT*50) <= 9 V
Gate Voltage, Vg	-5 to 0 V
Control Voltage, Vc	MAX [(Vd-7), -1.3 V] to +3.9 V
Drain to Gate Voltage	13 V
Drain Current, Id	270 mA
Drain Current Termination, IdT	135 mA
Ig	-30 to + 16 mA
RF CW Input Power	10 Vpp (24 dBm)
Channel Temperature, Tch	200 °C
Mounting Temperature (30 sec)	320 °C
Storage Temperature	-40 to 150 °C

Notes:

1. Operation of this device outside the parameter ranges given above may cause permanent damage. These are stress ratings only, and functional operation of the device at these conditions is not implied.
2. If VdT pin is being used:
   assure (VdT - IdT*50) – Vc >= -0.5 V.
3. If RFout / Vd pin is being used:
   assure Vd - Vc >= -0.5 V.

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Vd		6		V
Id		215		mA
Vg		-1.8		V
Vc		0.7		V
Ig		<1		mA
Ic		<2		mA

Note:

1. Recommended operating conditions are measured at specified test conditions of Vout = 7 Vpp when Vin = 3.6 Vpp, 21.5 Gb/s.

Electrical Specifications

Test conditions unless otherwise noted: 25 ˚C, Vd = 7 V, Vc = 0.8 V, Id = 190 mA, Vg ~ -1.8 V typical.

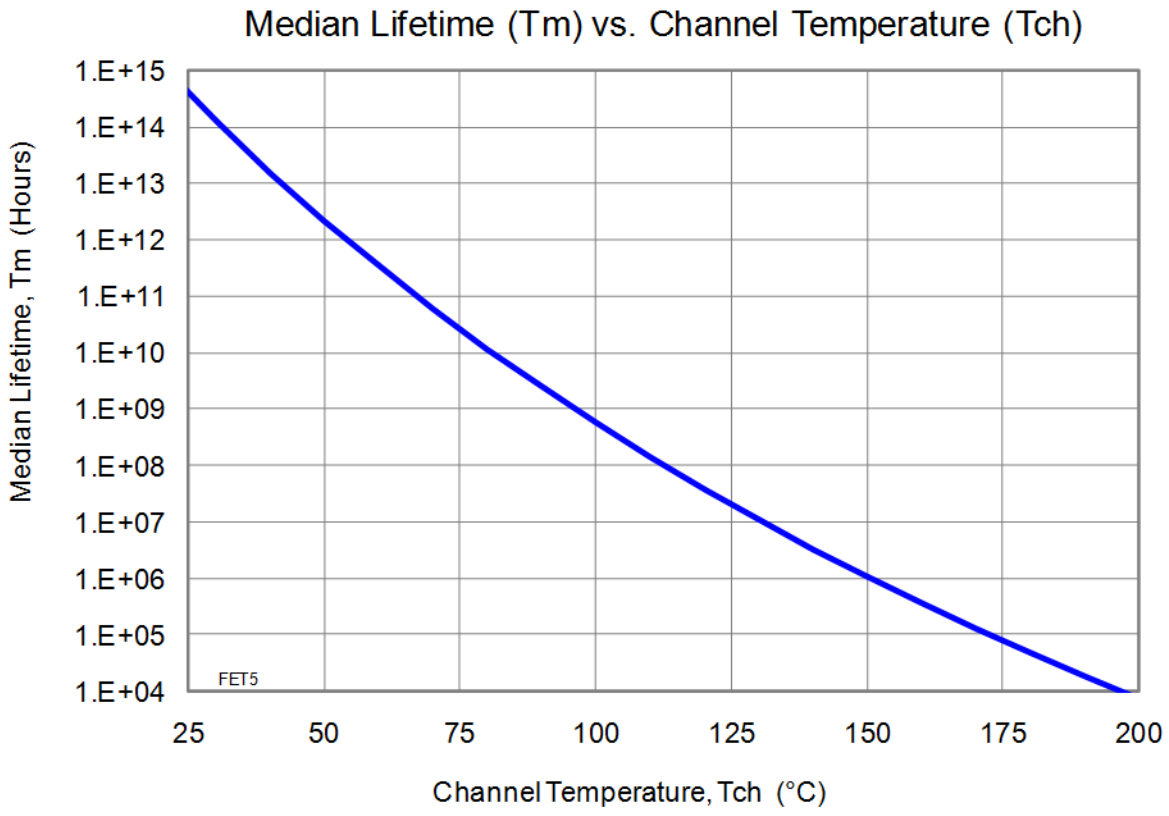
Parameter	Min	Typ	Max	Units
Operational Data rate		21.5		Gb/s
Small Signal Gain				
f = 0.1 - 20 GHz		11		dB
f = 20.1 - 30 GHz		10		
f = 30.1 - 35 GHz		9		
f = 35.1 - 40 GHz		6		
f = 40.1 – 50 GHz		4		
Input Return Loss				
f = 0.1 – 25 GHz		15		dB
f = 25.1 – 30 GHz		15		
f = 30.1 – 35 GHz		15		
f = 35.1 - 38 GHz		10		
f = 38.1 – 50 GHz		6		
Output Return Loss				
f = 0.1 - 20 GHz		15		dB
f = 20.1 - 30 GHz		12		
f = 30.1 - 35 GHz		10		
f = 35.1 - 50 GHz		-		
3 dB Bandwidth		37		GHz

Thermal and Reliability Information

Parameter	Test Conditions	Value
Thermal Resistance, θ_{JC}, measured to back of package	Tbase = 70 °C	θ_{JC} = 43.1 °C/W
Channel Temperature (Tch), and Median Lifetime (Tm)	Tbase = 70 °C Vd = 6 V, Id = 200 mA Pdiss = 1.2 W	Tch = 122 °C Tm = 3E+7 Hours
Channel Temperature (Tch), and Median Lifetime (Tm) Under RF Drive	Tbase = 70 °C Vd = 6 V, Id = 215 mA Vout = 7 Vpp Pdiss = 1.17 W	Tch = 120 °C Tm = 3.7E+7 Hours

Notes
1. Channel operating temperature will directly affect the device median lifetime (Tm). For maximum life, it is recommended that channel temperatures be maintained at the lowest possible levels.
2. θjc is the thermal resistance of the die mounted to a 0.020" thick Cu-Mo block using 0.8 mil conductive epoxy.

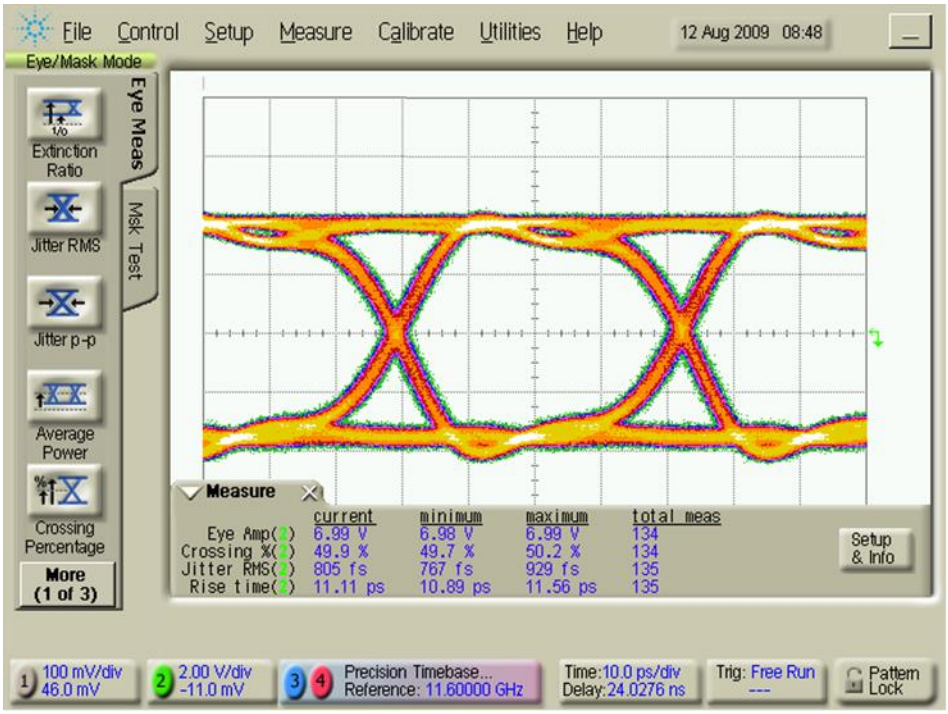
Median Lifetime

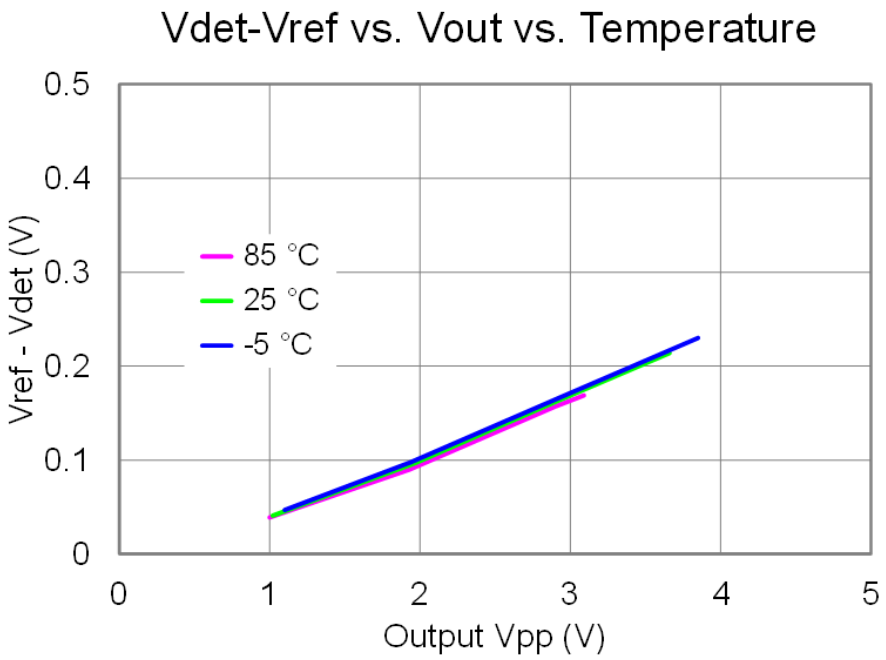


Typical Performance Electrical Eye Diagram

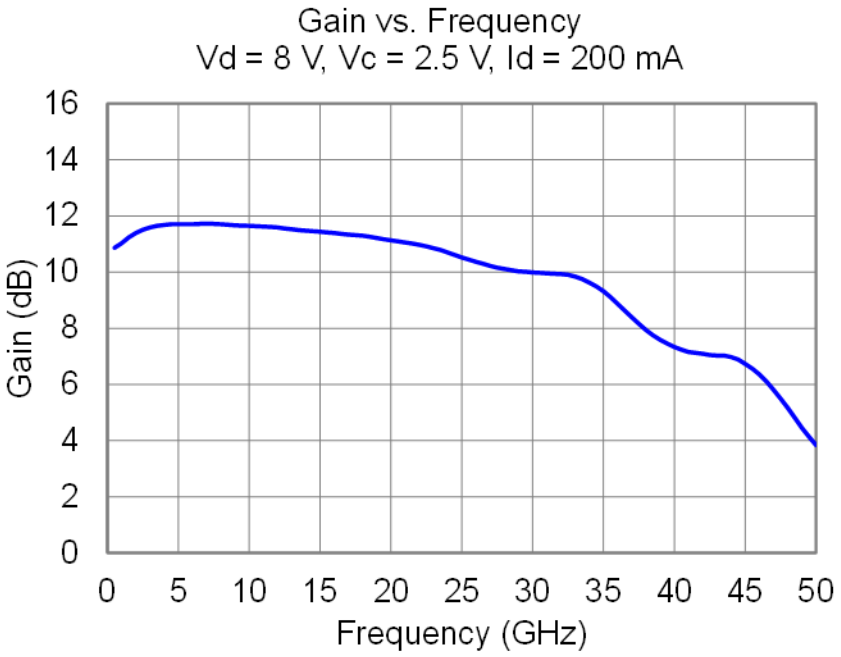
Vin = 3.6 Vpp, 21.5 Gb/s, PRBS signal 2^{31} -1, Vg adjusted to attain desired Vout., T = 25 °C

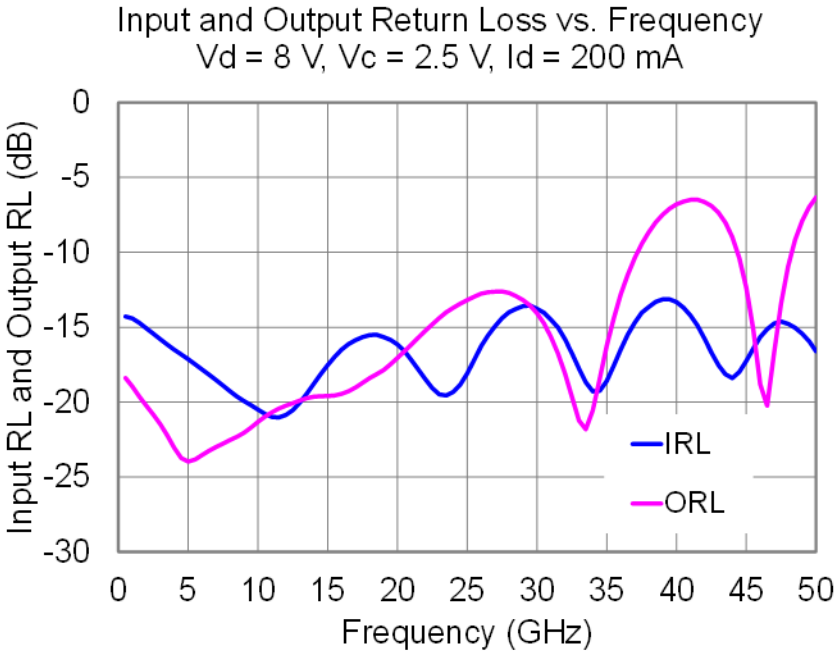
Vd = 6 V, Vc = 0.7 V, Id = 220 mA



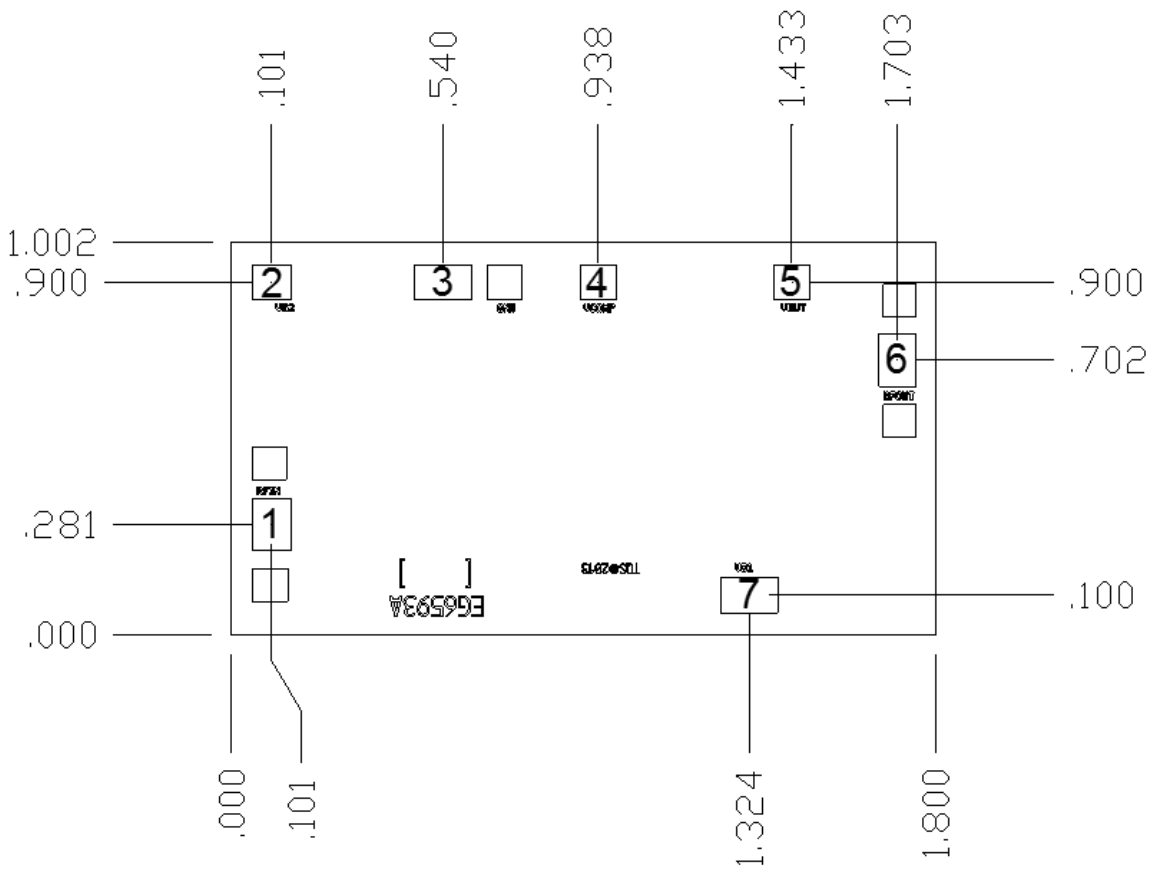


Typical Performance





Pin Configuration



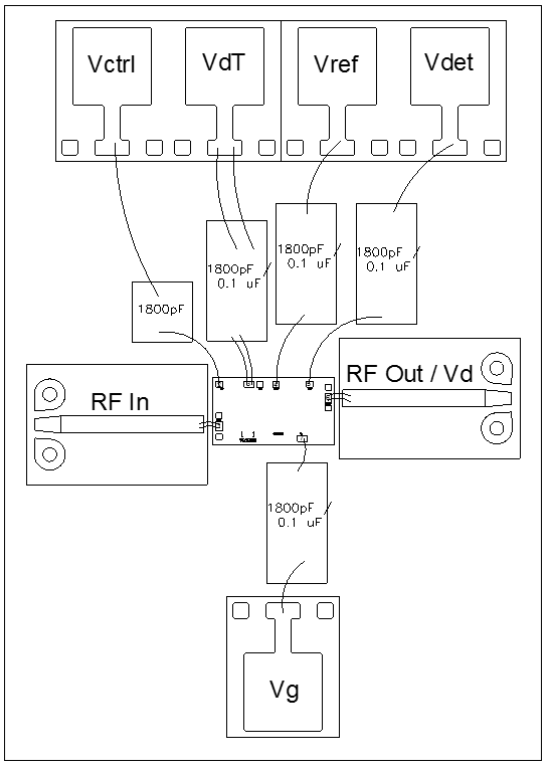
Units: millimeters
Chip edge to bond pad dimensions are shown to center of pad
Chip size tolerance: ± 0.051
Thickness: 0.100 (reference only)

Pin Description

Pin No.	Label	Description	Pad Size
1	RFin	RF Input	0.099 x 0.133
2	Vc	Control voltage pin	0.090 x 0.090
3	VdT	Vd pin for biasing through the termination resistor	0.146 x 0.090
4	Vref	Diode reference voltage	0.090 x 0.090
5	Vdet	Diode detector output voltage	0.090 x 0.090
6	RFout / Vd (RFout)	RF Output and/or Vd bias pin (avoids voltage drop across termination resistor)	0.094 x 0.136
7	Vg	Gate voltage pin	0.146 x 0.090

Application Circuit

Recommended Chip Assembly Diagram



Note: Input and Output ports are DC coupled.
If biasing Vd through the RFOut side, a bias tee is required.

Evaluation Board Bias Procedures

Laboratory Bias-up Procedure: see Note 1	Laboratory Bias-down Procedure
Set Vg to -3 V	Turn off RF supply. See note 2
Set Vd or VdT to 6 V	Vg set to -3 V
Vc set to desired value	Vc set to 0 V
Adjust Vg more positive until target Id is reached.	Turn Vd to 0 V
Adjust Vc for desired Vout signal	Turn Vg to 0 V
Adjust Vg for 50% crossing	
Re-adjust Vc and Vg, if necessary	
Apply RF signal to RF Input. See note 2	

Notes:

1. Any bias procedure will not harm the device as long as the guidelines explicitly stated in the Max Ratings Table and corresponding notes section on page 2 of the Datasheet are followed. For laboratory evaluation, the following is provided as a bias procedure that will allow user to observe and set each stage's quiescent point individually.
2. RF supply can be on during power up and power down sequences.

Assembly Notes

Reflow Attachment:

- Use AuSn (80/20) solder with limited exposure to temperatures at or above 300°C
- Use alloy station or conveyor furnace with reducing atmosphere
- No fluxes should be utilized
- Coefficient of thermal expansion matching is critical for long-term reliability
- Storage in dry nitrogen atmosphere

Adhesive Attachment:

- Organic attachment can be used in low-power applications
- Curing should be done in a convection oven; proper exhaust is a safety concern
- Microwave or radiant curing should not be used because of differential heating
- Coefficient of thermal expansion matching is critical

Component Pickup and Placement:

- Vacuum pencil and/or vacuum collet preferred method of pick up
- Avoidance of air bridges during placement
- Force impact critical during auto placement

Interconnect:

- Thermosonic ball bonding is the preferred interconnect technique
- Force, time, and ultrasonics are critical parameters
- Aluminum wire should not be used
- Discrete FET devices with small pad sizes should be bonded with 0.0007-inch wire
- Maximum stage temperature: 200°C

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	TBD	JEDEC Standard JESD22 A114

Caution!
ESD-Sensitive Device

Solderability

Compatible with AuSn eutectic solder

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

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