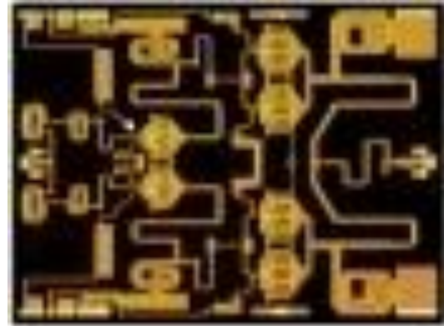
Applications

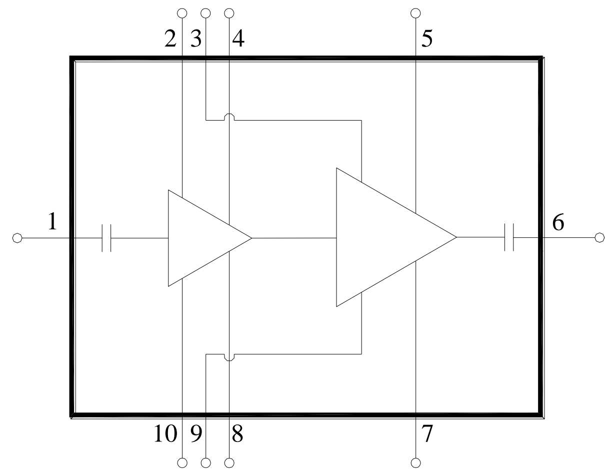
- Communications
- Electronic Warfare
- Test Instrumentation
- EMC Amplifier



Product Features

- Frequency Range: 2 – 6 GHz
- Psat: 45 dBm CW
- PAE: 40% CW
- Small Signal Gain: 27 dB
- Input Return Loss: >20 dB
- IM3: -30 dBc @ 40 dBm Pout/Tone
- Bias: V_D = 28 V, I_{DQ} = 400 mA, V_G = -2.8 V Typical
- Chip Dimensions: 6.4 x 5.0 x 0.10 mm

Functional Block Diagram



General Description

TriQuint's TGA2578 is a wideband power amplifier fabricated on TriQuint's 0.25um GaN on SiC process. Operating from 2 to 6 GHz, it achieves 30 W saturated output power with high efficiency of 40% PAE, and 27 dB small signal gain.

Fully matched to 50 ohms with integrated DC blocking caps on both I/O ports, the TGA2578 is ideally suited to support both commercial and defense related applications.

The TGA2578 is 100% DC and RF tested on-wafer to ensure compliance to power and PAE specifications.

Lead-free and RoHS compliant.

Pad Configuration

Pad No.	Symbol
1	RF In
2, 10	V_{G1}
3, 9	V_{G2}
4, 8	V_{D1}
5, 7	V_{D2}
6	RF Out

Ordering Information

Part	ECCN	Description
TGA2578	3A001.b.2.a	2-6 GHz 30 W Power Amplifier

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Absolute Maximum Ratings

Parameter	Value
Drain Voltage (V_D)	40 V
Gate Voltage Range (V_G)	-8 to 0 V
Drain Current (I_D)	5 A
Gate Current (I_G)	-15 to 30 mA
Power Dissipation, 85 °C (P_{DISS})	92.5 W
Input Power, CW, 50 Ω, (P_{IN})	27 dBm
Input Power, CW, VSWR 3:1, V_D = 30 V, 85 °C, (P_{IN})	27 dBm
Input Power, CW, VSWR 10:1, V_D = 28 V, 85 °C (P_{IN})	25 dBm
Channel trenperature (T_{CH})	275 °C
Mounting Temperature (30 Seconds)	320 °C
Storage Temperature	-55 to 150 °C

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.

Recommended Operating Conditions

Parameter	Value
Drain Voltage (V_D)	28 V
Drain Current (I_{DQ})	400 mA
Drain Current Under RF Drive (I_{D_Drive})	3800 mA
Gate Voltage (V_G)	-2.8 V

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

Electrical Specifications

Test conditions unless otherwise noted: 25 ^{0}C, V_D = 28 V, I_D = 400 mA, V_G = -2.8 V Typical

Parameter	Min	Typical	Max	Units
Operational Frequency Range	2		6	GHz
Small Signal Gain		27		dB
Input Return Loss		20		dB
Output Return Loss		5		dB
Output Power @ Pin = 23 dBm		45		dBm
Power Added Efficiency @ Pin = 23 dBm		40		%
IM3 @ Pout/Tone = 40 dBm		-30		dBc
IM5 @ Pout/Tone = 40 dBm		-40		dBc
Small Signal Gain Temperature Coefficient		-0.05		dB/°C
Output Power Temperature Coefficient		-0.02		dBm/°C

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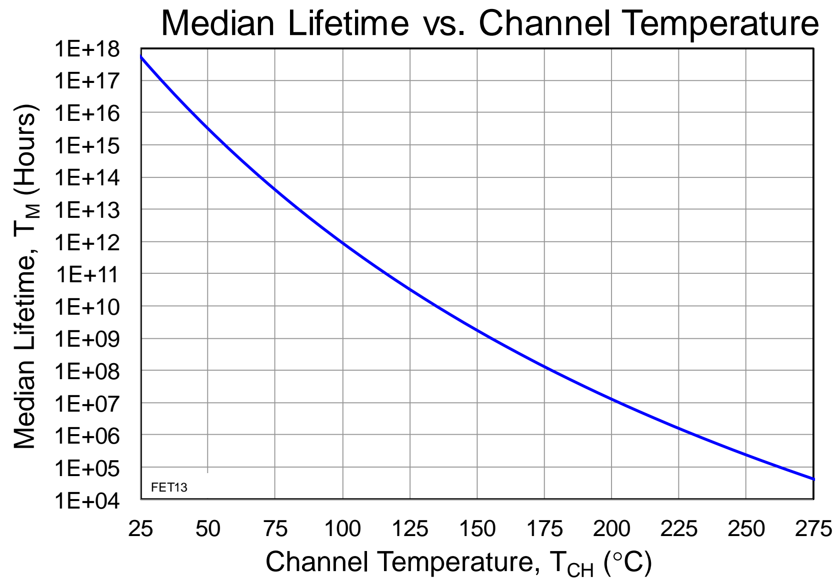
Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) [(1)]	T_{base} = 85 °C, V_D = 28 V, I_{D_Drive} = 3.5 A, Pout = 45 dBm, P_{DISS} = 67 W	2.05	ºC/W
Channel Temperature (T_{CH})		222	°C
Median Lifetime (T_M)		1.99+6	Hrs

Notes:

1. Thermal resistance measured to back of carrier plate. MMIC mounted on 40 mils CuMo carrier using 1.5 mil 80/20 AuSn.

Median Lifetime



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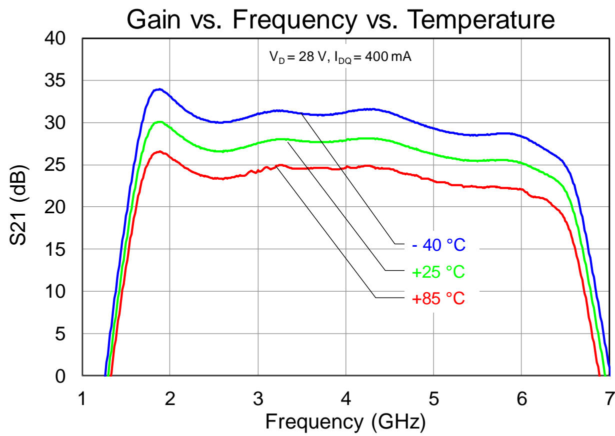
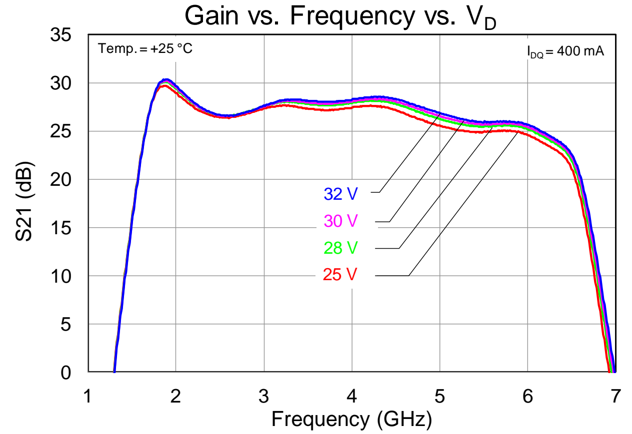
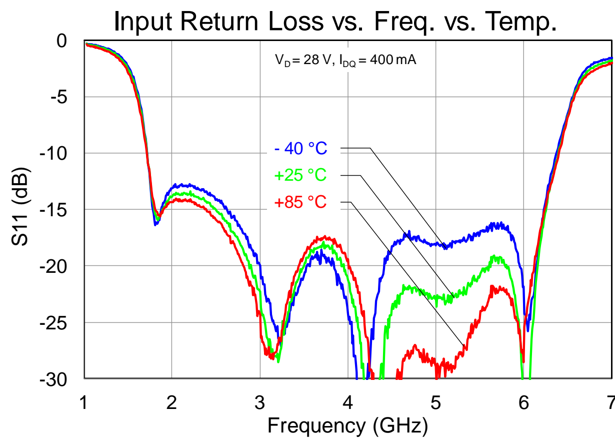
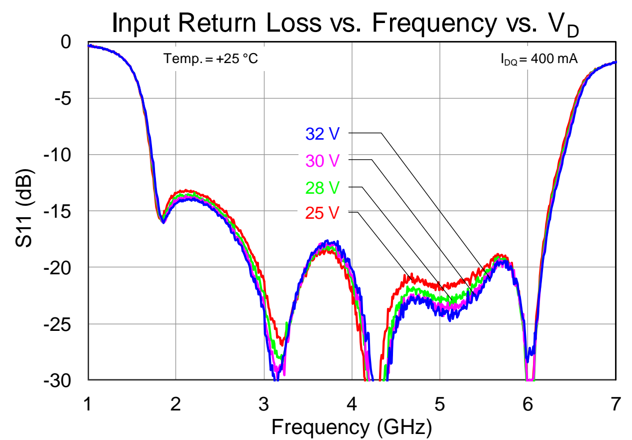
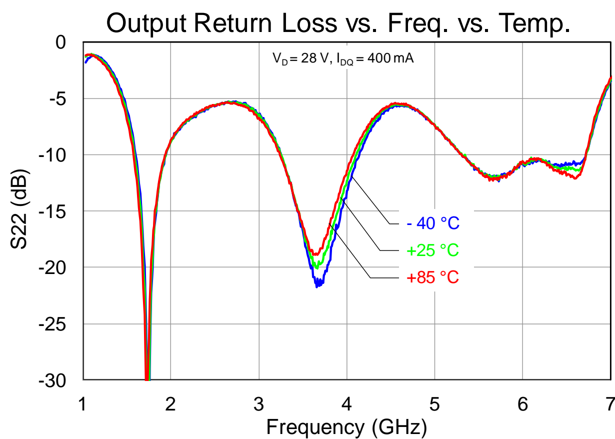
Typical Performance

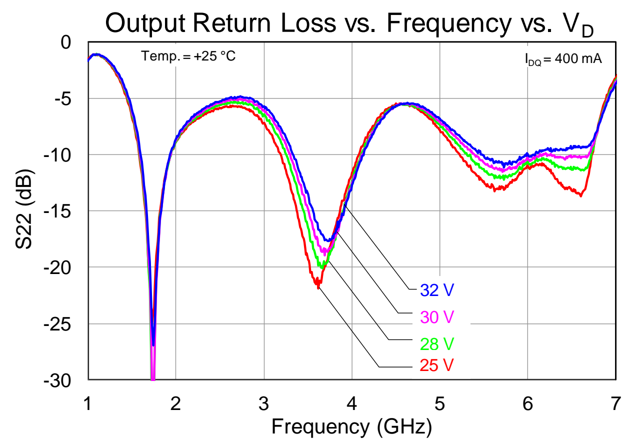












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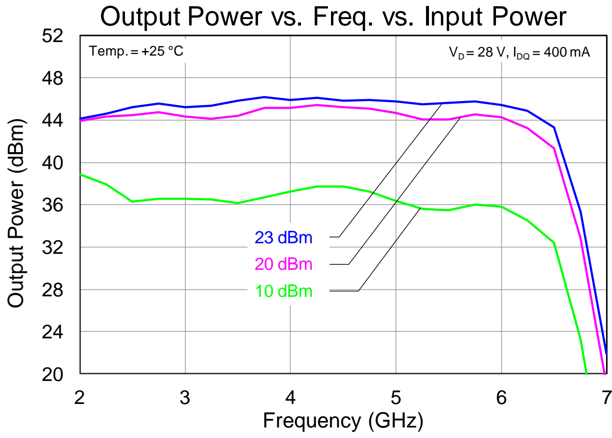

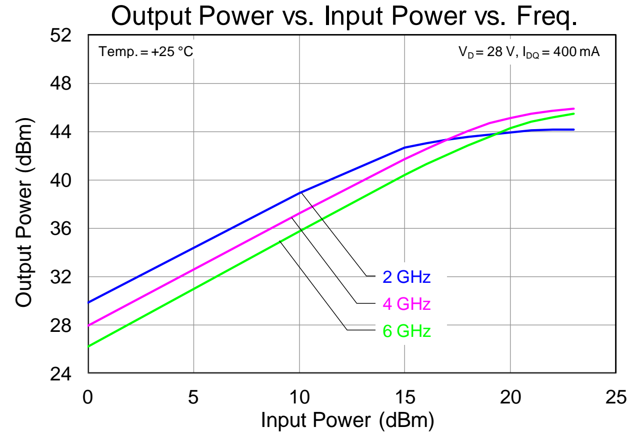

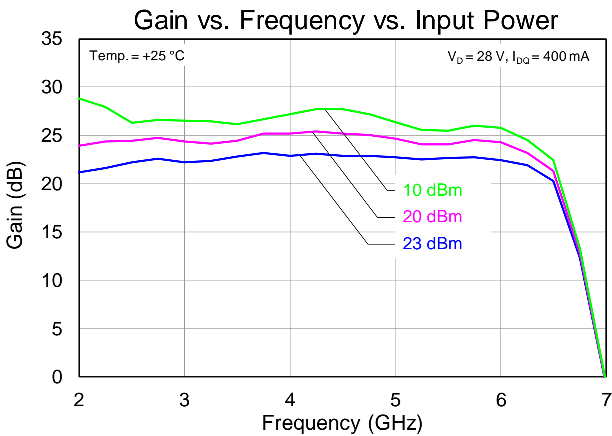

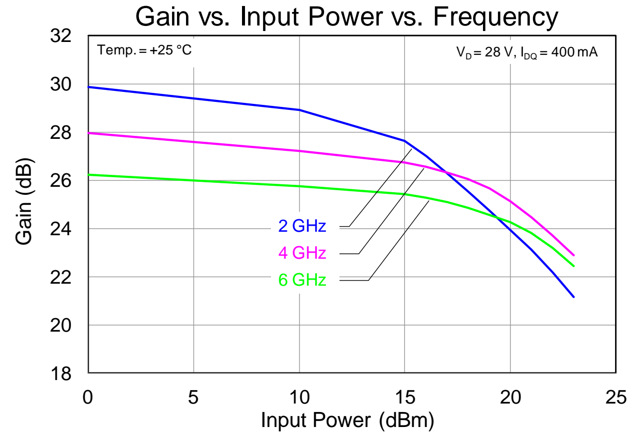

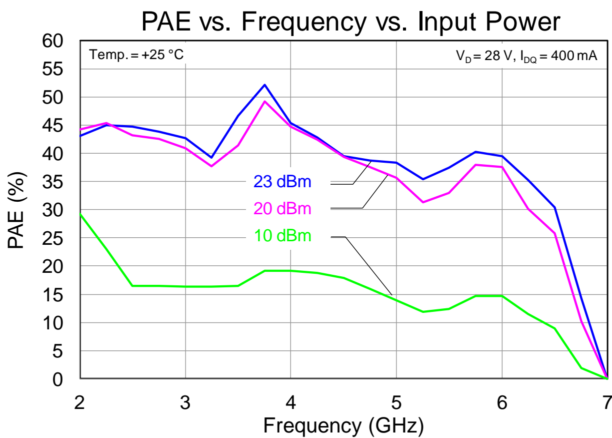

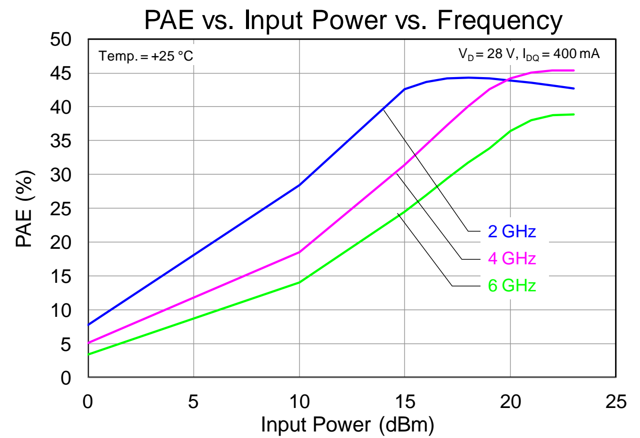

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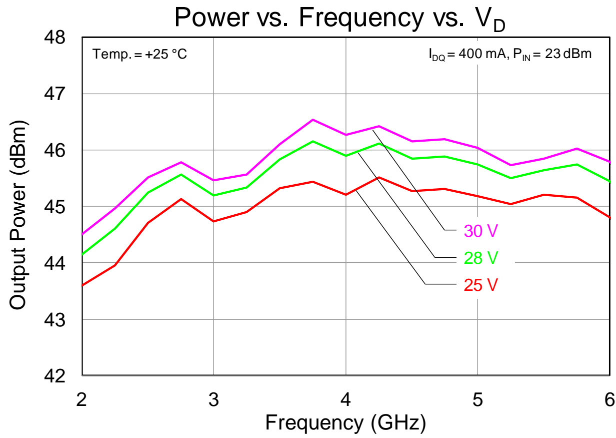

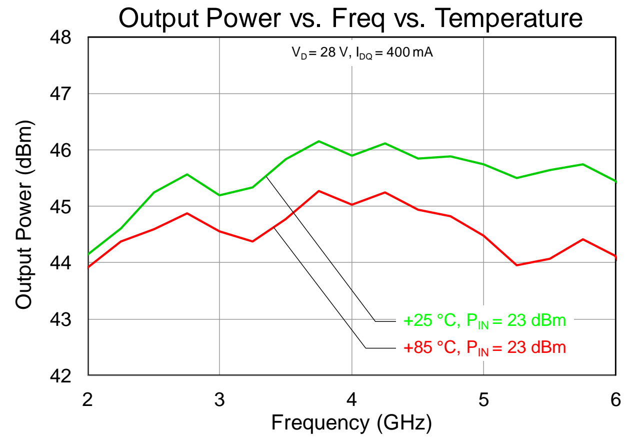

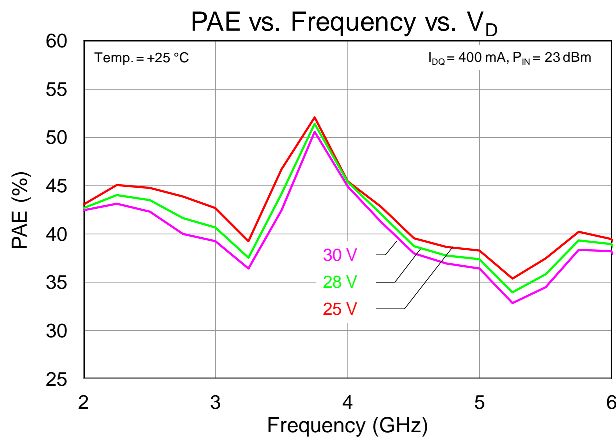

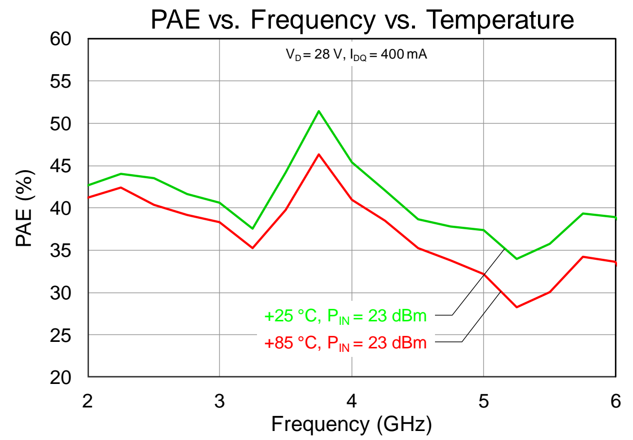

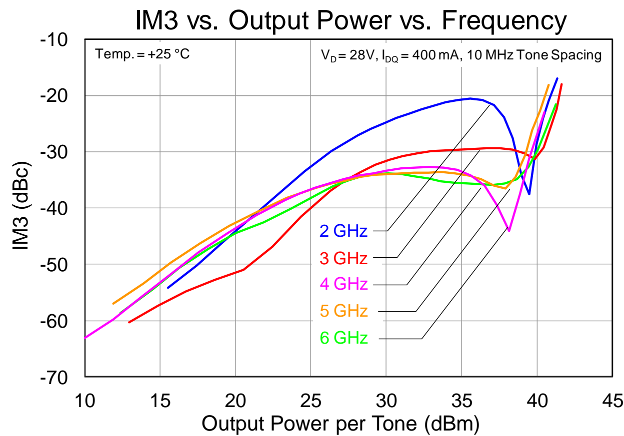

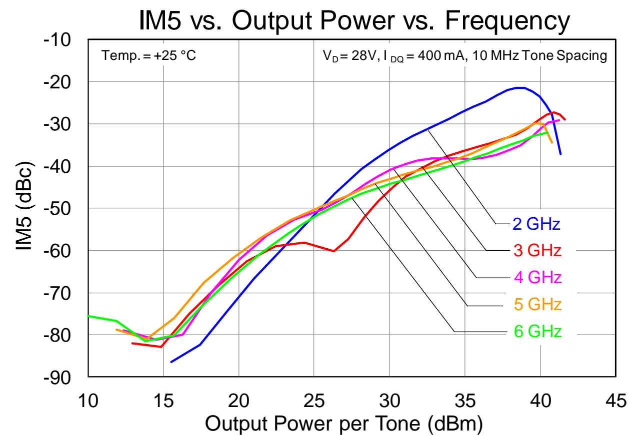

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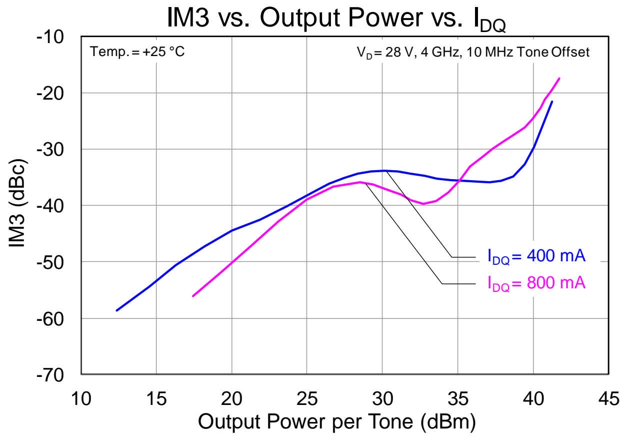

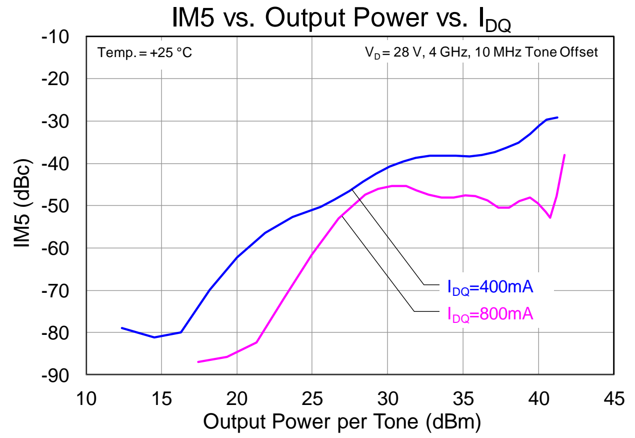

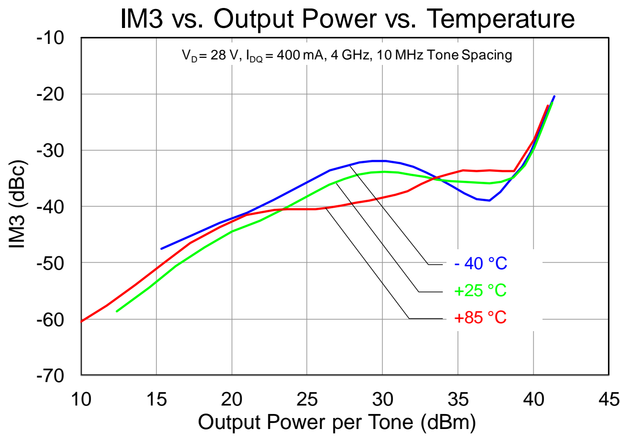

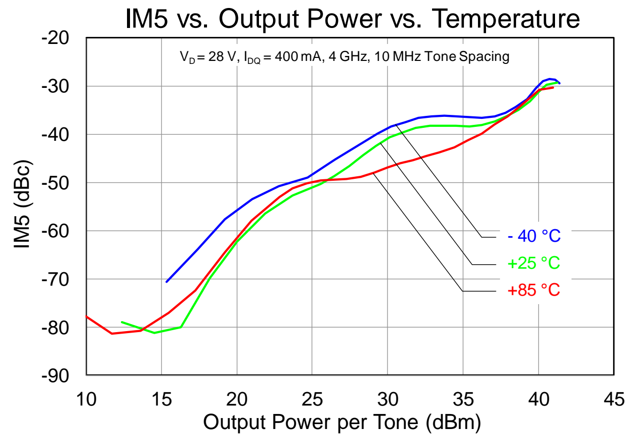

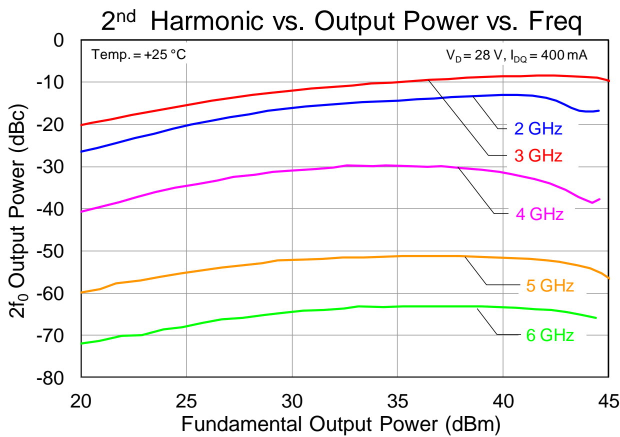

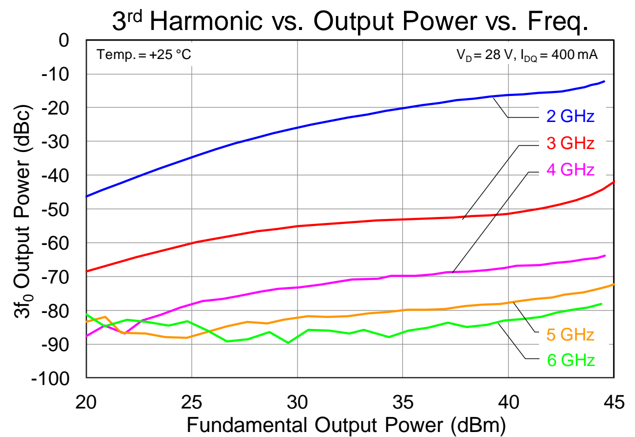

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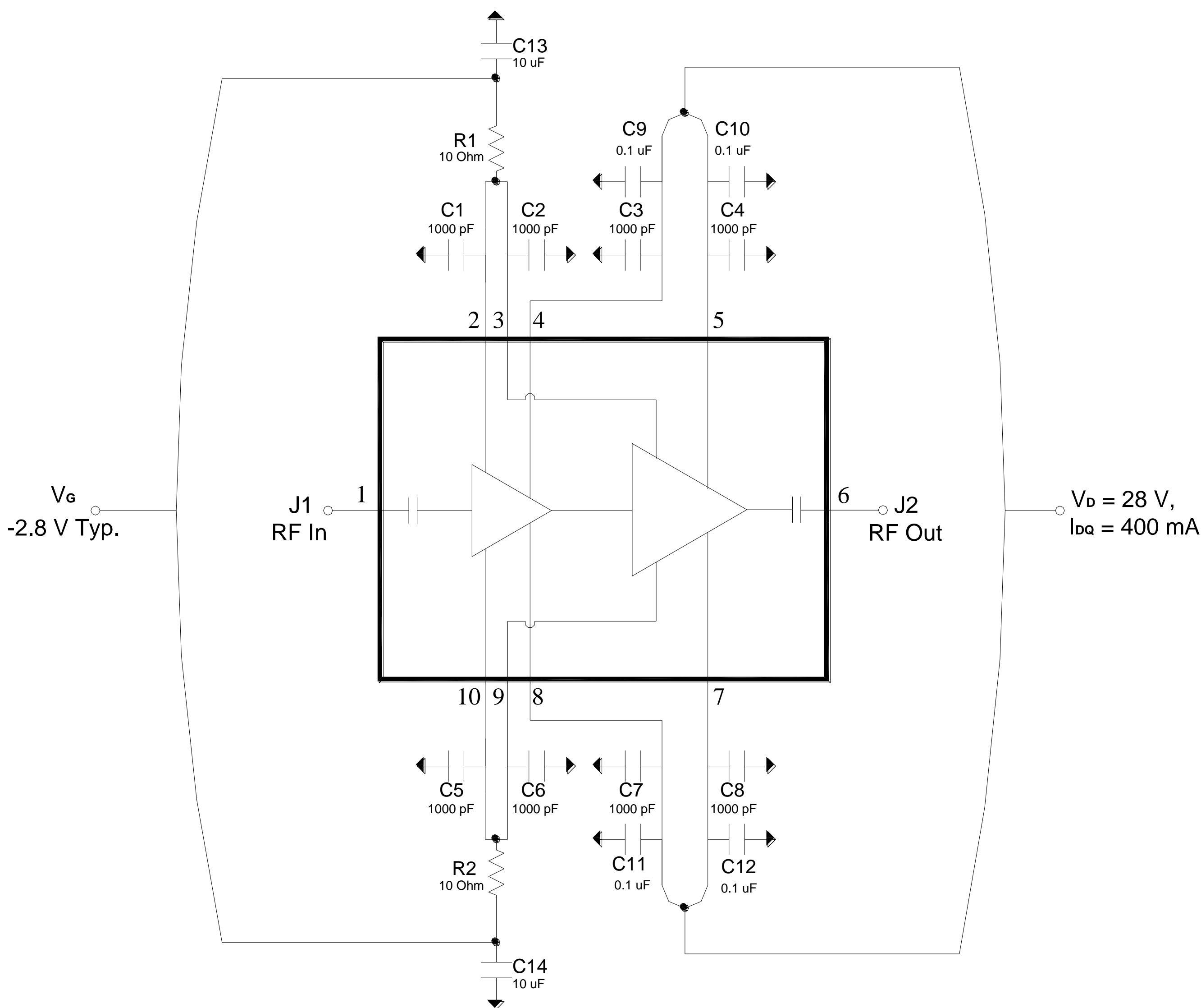
Application Circuit



Bias-up Procedure

1. Set I_D limit to 4.5 A, I_G limit to 25 mA
2. Apply -5.0 V to V_G
3. Apply +28 V to V_D
4. Adjust V_G more positive unitl I_{DQ} = 400 mA (V_G ~ -2.8 V Typical)
5. Apply RF signal

Bias-down Procedure

1. Turn off RF signal
2. Reduce V_G to -5.0 V. Ensure I_{DQ} ~ 0 mA
3. Set V_D to 0 V
4. Turn off V_D supply
5. Turn off V_G supply

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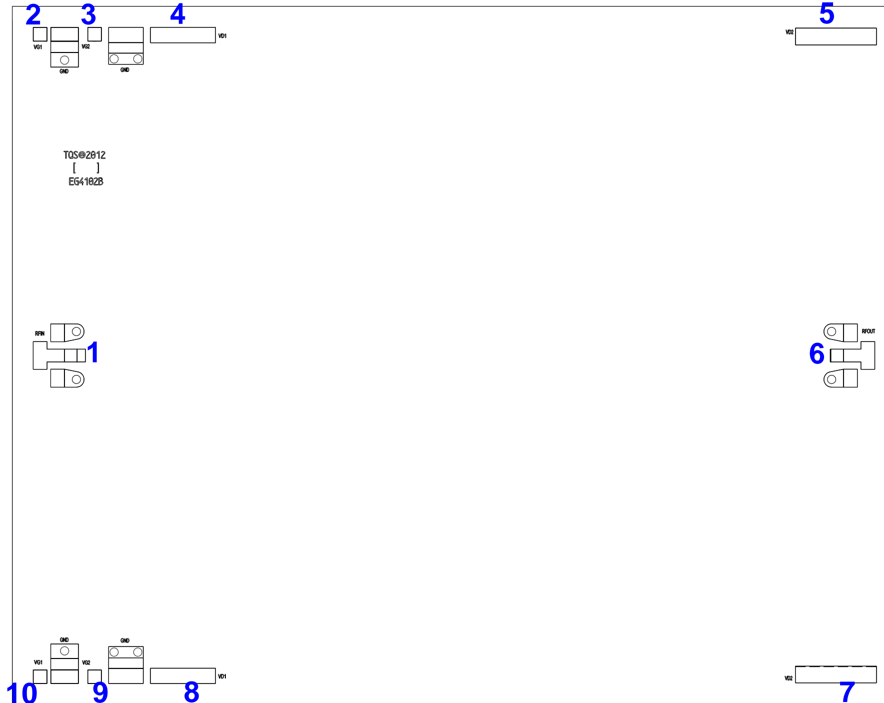
Bond Pad Description



Bond Pad	Symbol	Description
1	RF In	Input; matched to 50 ohms; AC coupled.
2, 10	V_{G1}	Gate voltage, V_{G1} top and bottom. Bias network is required; must be biased from both sides; see Application Circuit on page 9 as an example.
3, 9	V_{G2}	Gate voltage, V_{G1} top and bottom. Bias network is required; must be biased from both sides; see Application Circuit on page 9 as an example.
4, 8	V_{D1}	Drain voltage, V_{D1} top and bottom. Bias network is required; must be biased from both sides; see Application Circuit on page 9 as an example.
5, 7	V_{D2}	Drain voltage, V_{D2} top and bottom. Bias network is required; must be biased from both sides; see Application Circuit on page 9 as an example.
6	RF Out	Input; matched to 50 ohms; AC coupled.

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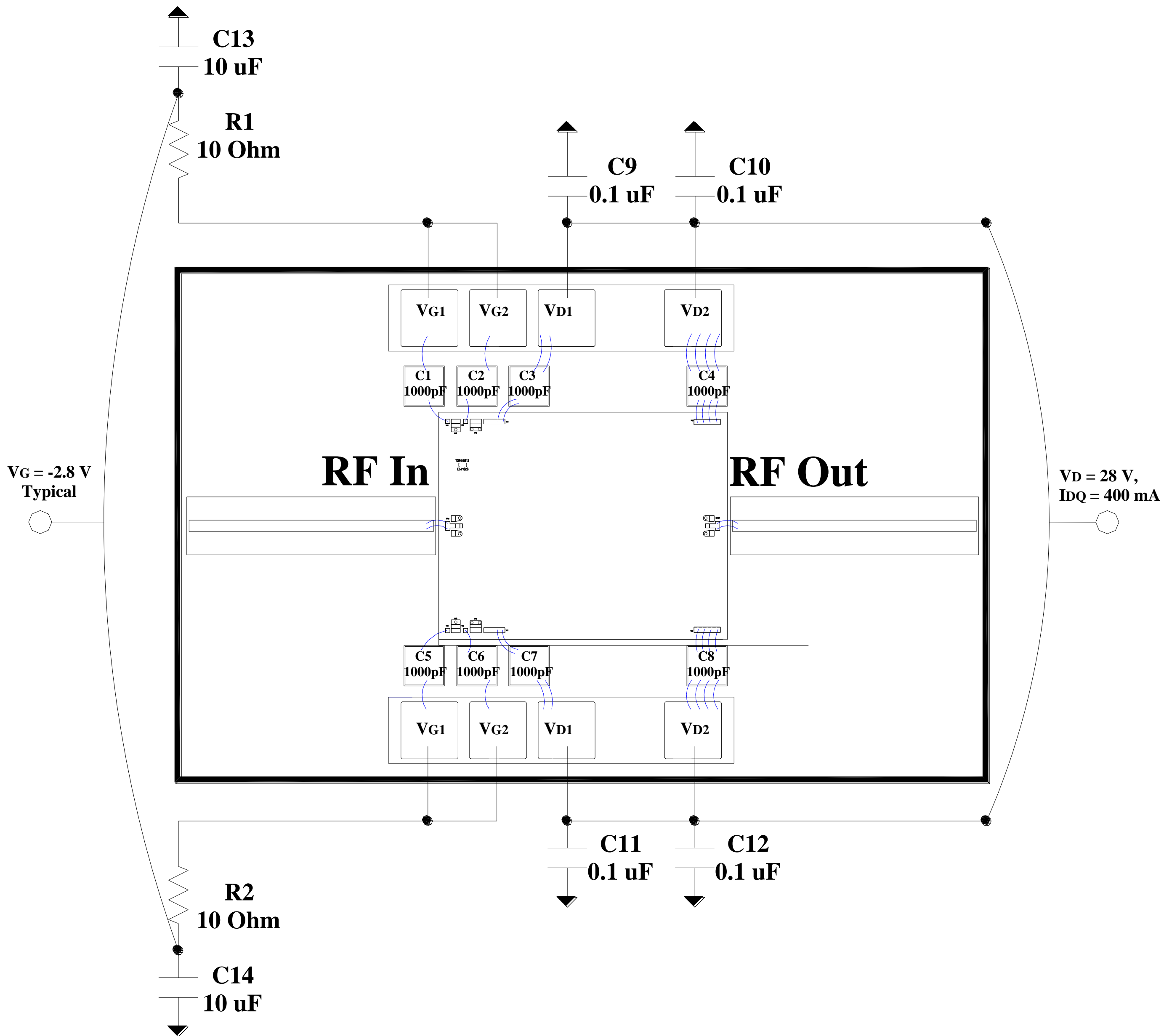
Assembly Drawing



DC bias must be applied from both sides as shown

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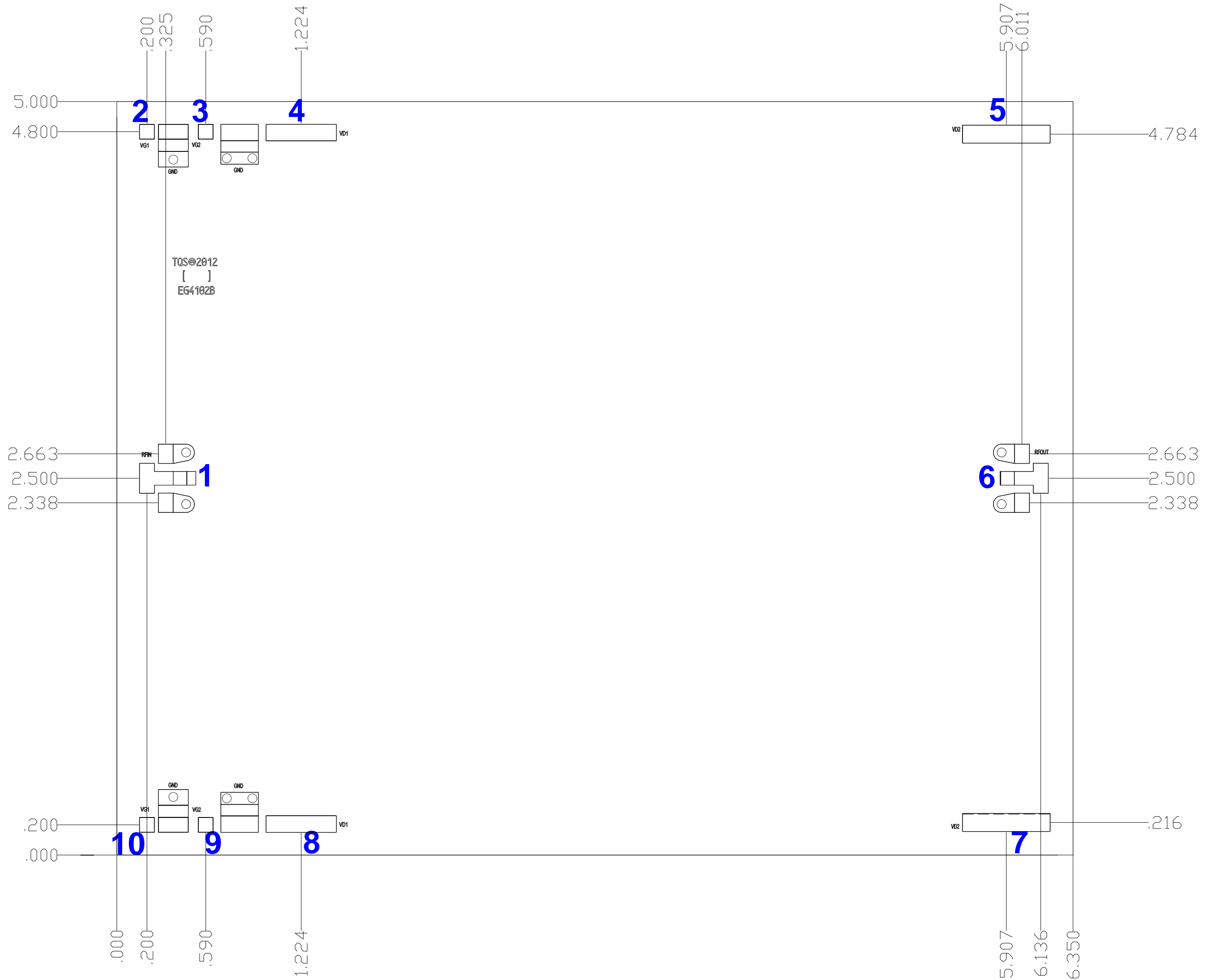
Mechanical Drawing



Unit: millimeters
Thickness: 0.10
Die x, y size tolerance: +/- 0.050
Chip edge to bond pad dimensions are shown to center of pad
Ground is backside of die

Bond Pad	Symbol	Pad Size	Bond Pad	Symbol	Pad Size
1	RF In	0.100 x 0.200	4, 8	V_{D1}	0.450 x 0.100
2, 10	V_{G1}	0.100 x 0.100	5, 7	V_{D2}	0.580 x 0.125
3, 9	V_{G2}	0.100 x 0.100	6	RF Out	0.100 x 0.200

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Assembly Notes

Component placement and adhesive attachment assembly notes:

- Vacuum pencils and/or vacuum collets are the preferred method of pick up.
- Air bridges must be avoided during placement.
- The force impact is critical during auto placement.
- Organic attachment (i.e. epoxy) can be used in low-power applications.
- Curing should be done in a convection oven; proper exhaust is a safety concern.

Reflow process assembly notes:

- Use AuSn (80/20) solder and limit exposure to temperatures above 300°C to 3-4 minutes, maximum.
- An alloy station or conveyor furnace with reducing atmosphere should be used.
- Do not use any kind of flux.
- Coefficient of thermal expansion matching is critical for long-term reliability.
- Devices must be stored in a dry nitrogen atmosphere.

Interconnect process assembly notes:

- Thermosonic ball bonding is the preferred interconnect technique.
- Force, time, and ultrasonics are critical parameters.
- Aluminum wire should not be used.
- Devices with small pad sizes should be bonded with 0.0007-inch wire.

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Product Compliance Information

ESD Sensitivity Ratings

Caution! ESD-Sensitive Device

ESD Rating: TBD
Value: TBD
Test: Human Body Model (HBM)
Standard: JEDEC Standard JESD22-A114

ECCN

US Department of Commerse: 3A001.b.2.a

Solderability

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 ($C_{15}H_{12}Br_4 0_2$) Free
- PFOS Free
- SVHC Free

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations, and information about TriQuint:

Web: www.triquint.com **Tel:** **+1.972.994.8465**
Email: info-sales@triquint.com **Fax:** **+1.972.994.8504**

For technical questions and application information: **Email:** info-products@triquint.com

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