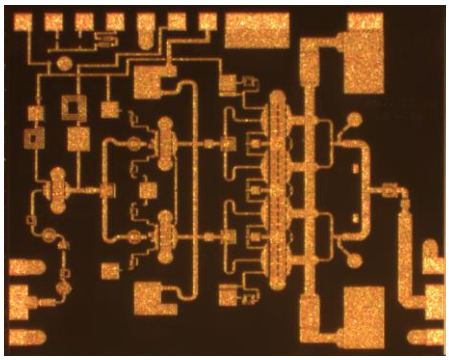
TGA2621

16 - 18 GHz 1 W GaAs Power Amplifier

Applications

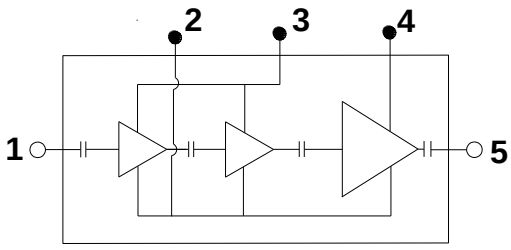
- Commercial and Military Radar
- Satellite Communications



Product Features

- Frequency Range: 16 - 18 GHz
- Psat: 30.5 dBm at Pin = 10 dBm
- PAE: 28 % at Pin = 10 dBm
- Small Signal Gain: 26.5 dB
- Input Return Loss: > 13 dB
- Bias: V_D = 6 V, I_{DQ} = 400 mA, V_G = -0.6 V Typical
- Chip Dimensions: 2.0 x 2.5 x 0.1 mm

Functional Block Diagram



General Description

TriQuint's TGA2621 is a Ku-band Power Amplifier fabricated on TriQuint's TQPHT15 0.15 µm GaAs pHEMT process. The TGA2621 operates from 16 to 18 GHz and typically provides 1 W of saturated output power with an efficiency of 28% PAE and 26.5 dB of small signal gain.

The TGA2621 is well suited to support both radar and satellite communications as a driver or low power amplifier.

Both RF ports have intergrated DC blocking caps and are fully matched to 50 ohms allowing for simple system integration.

Lead-free and RoHS compliant

Evaluation Boards are available upon request.

Pad Configuration

Pad No.	Symbol
1	RF_{IN}
2	V_G
3	V_{D1}
4	V_{D2}
5	RF_{OUT}

Ordering Information

Part	ECCN	Description
TGA2621	EAR99	16 - 18 GHz GaAs PA

Absolute Maximum Ratings

Parameter	Value
Drain Voltage (V_D)	6.25 V
Gate Voltage Range (V_G)	-2 to 0 V
Drain Current (I_D)	1300 mA
Gate Current (I_G)	-5 to 5 mA
Power Dissipation, 85 °C (P_{DISS})	3.8 W
Input Power, CW, 50 Ω, (P_{IN})	17 dBm
Channel temperature (T_{CH})	200 °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)	6 V
Drain Current (I_{DQ})	400 mA
Gate Voltage (V_G)	-0.6 V Typical
Temperature (T_{BASE})	-40 to 85 °C

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

Electrical Specifications

Test conditions unless otherwise noted: 25 ^{0}C, V_D = 6 V, I_{DQ} = 400 mA, V_G = -0.6 V Typical, CW

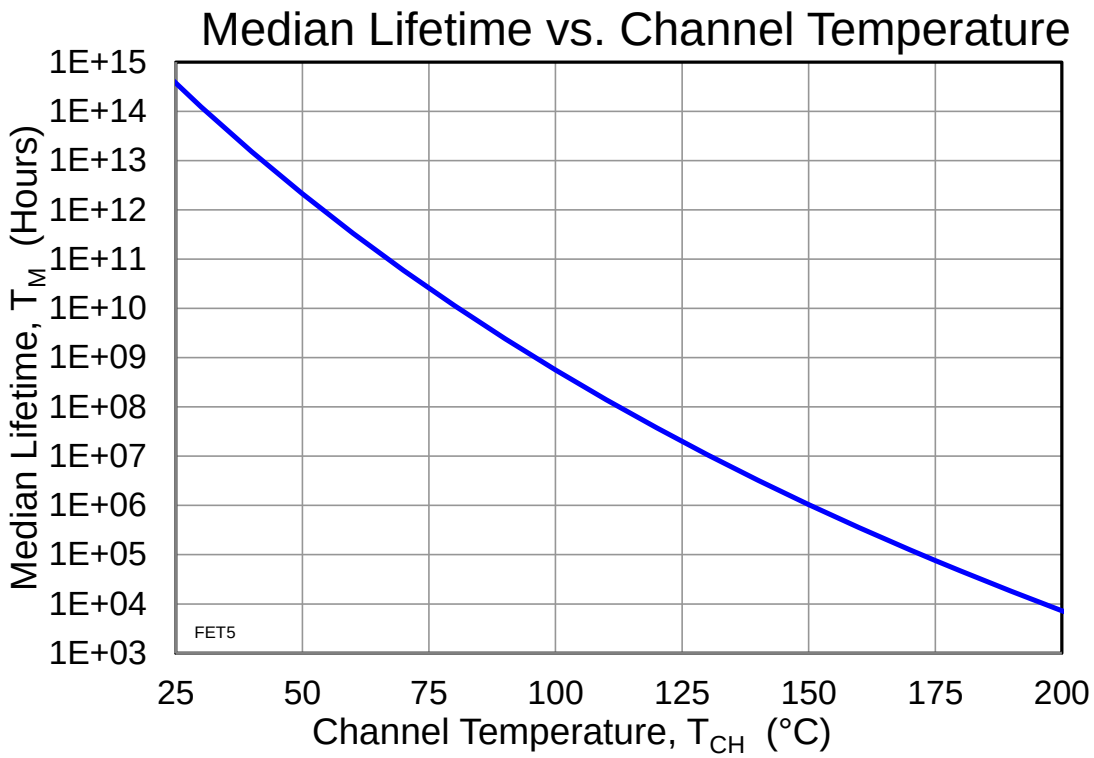
Parameter	Min	Typical	Max	Units
Operational Frequency Range	16		18	GHz
Small Signal Gain		26.5		dB
Input Return Loss		> 13		dB
Output Return Loss		> 6		dB
Output Power (Pin = 10 dBm)		30.5		dBm
Power Added Efficiency (Pin = 10 dBm)		28		%
IM3 (Pout/tone = 20 dBm, spacing = 10 MHz)		-25.5		dBc
IM5 (Pout/tone = 20 dBm, spacing = 10 MHz)		-46.5		dBc
Small Signal Gain Temperature Coefficient		-0.03		dB/°C
Output Power Temperature Coefficient		-0.02		dBm/°C

Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) (1)	T_{base} = 85 °C, V_D = 6 V (CW) I_{DQ} = 400 mA, P_{DISS} = 2.4 W	26	ºC/W
Channel Temperature (T_{CH}) (Without RF)		147	°C
Median Lifetime (T_M)		1.5 x 10^6	Hrs
Thermal Resistance (θ_{JC}) (1)	T_{base} = 85 °C, V_D = 6 V (CW) I_{DQ} = 400 mA, I_{D_Drive} = 617 mA P_{IN} = 10 dBm, P_{OUT} = 30 dBm, Freq = 17 GHz, P_{DISS} = 2.7 W	26.1	ºC/W
Channel Temperature (T_{CH}) (Under RF drive)		150	°C
Median Lifetime (T_M)		1.0 x 10^6	Hrs

Notes:
1. Thermal resistance calculated at back of a 40 mil CuMo carrier plate with 1.5 mil of AuSn solder for die attach.

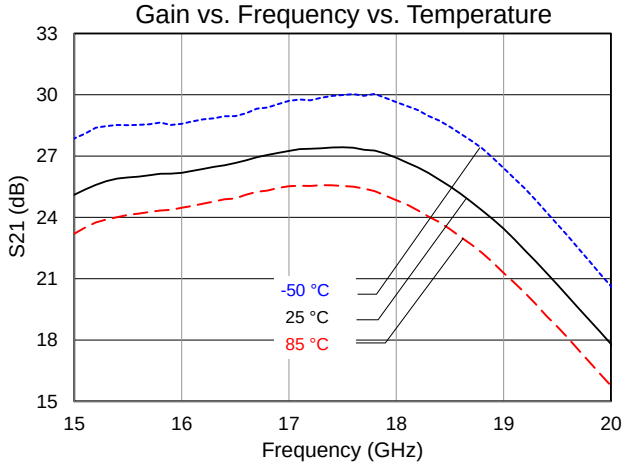
Test Conditions: V_D = 6 V; Failure Criteria is 10% reduction in I_{D_MAX}



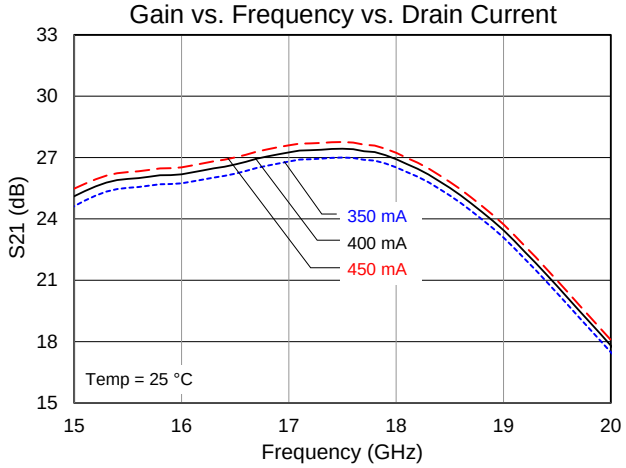
Typical Performance: Small Signal

Conditions unless otherwise specified: V_D = 6 V, I_{DQ} = 400 mA, V_G = -0.6 V Typical, CW

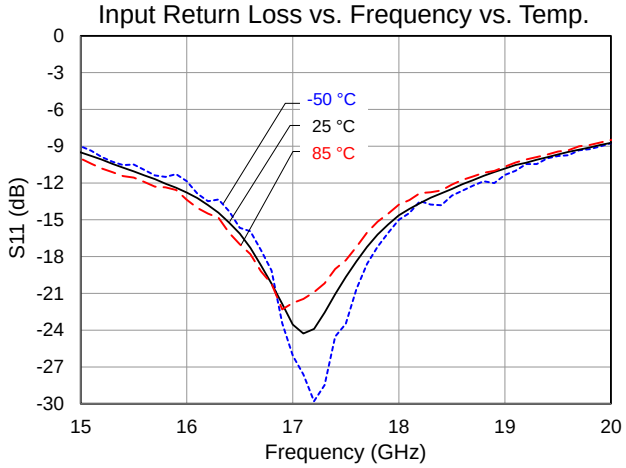
Gain vs. Frequency vs. Temperature



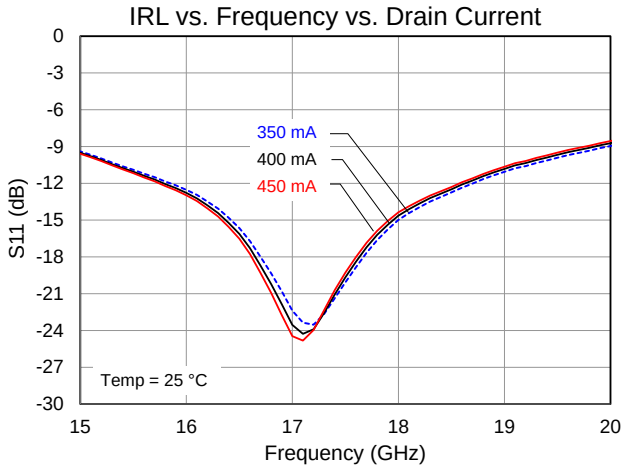
Gain vs. Frequency vs. Drain Current



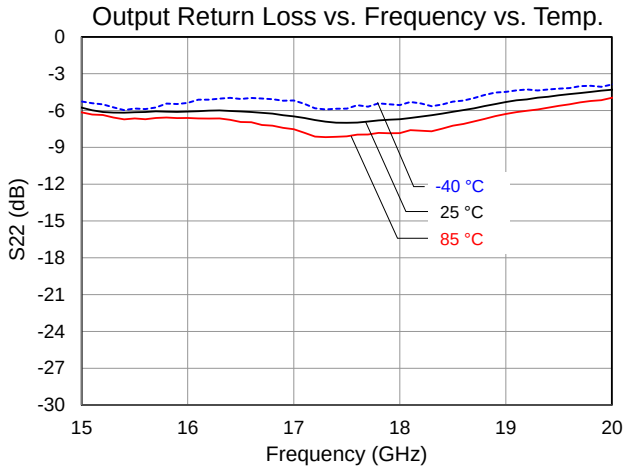
Input Return Loss vs. Frequency vs. Temp.



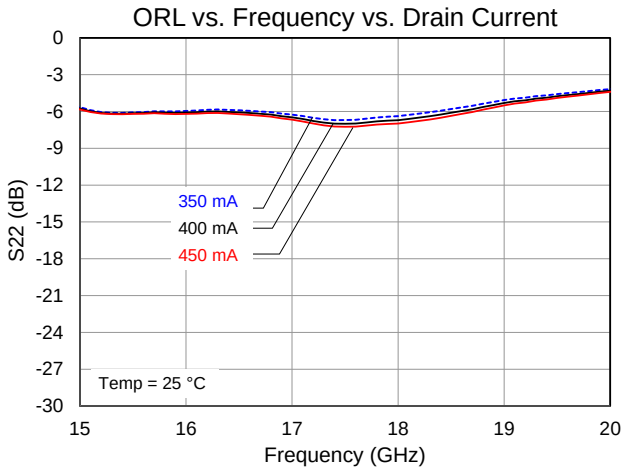
IRL vs. Frequency vs. Drain Current



Output Return Loss vs. Frequency vs. Temp.



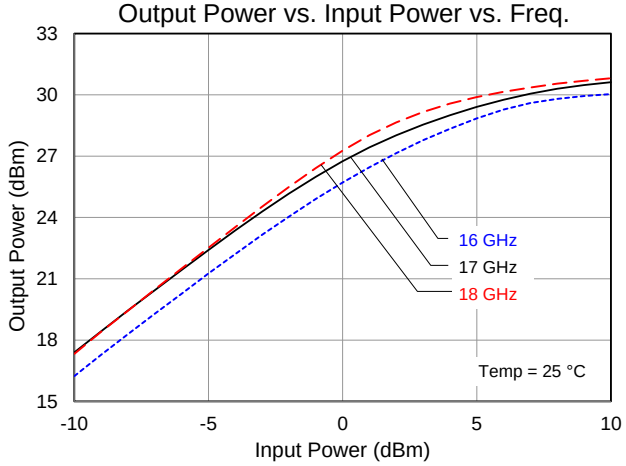
ORL vs. Frequency vs. Drain Current



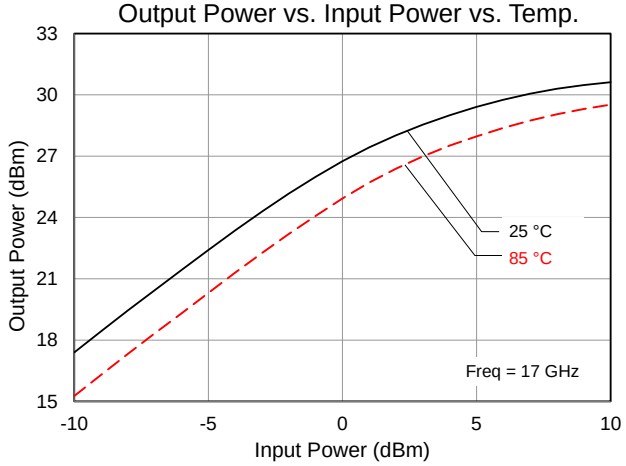
Typical Performance: Large Signal

Conditions unless otherwise specified: V_D = 6 V, I_{DQ} = 400 mA, V_G = -0.6 V Typical, CW

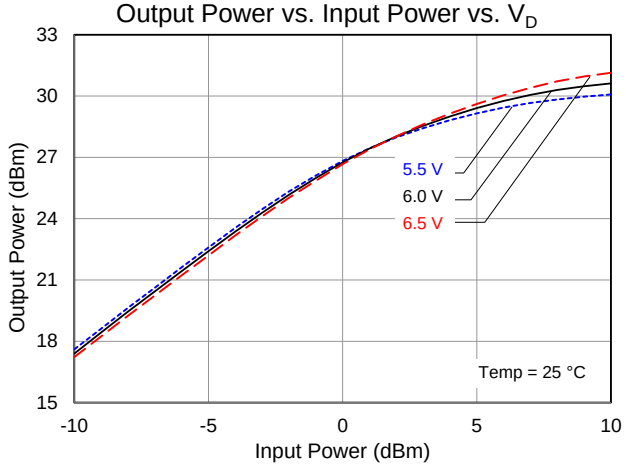
Output Power vs. Input Power vs. Freq.



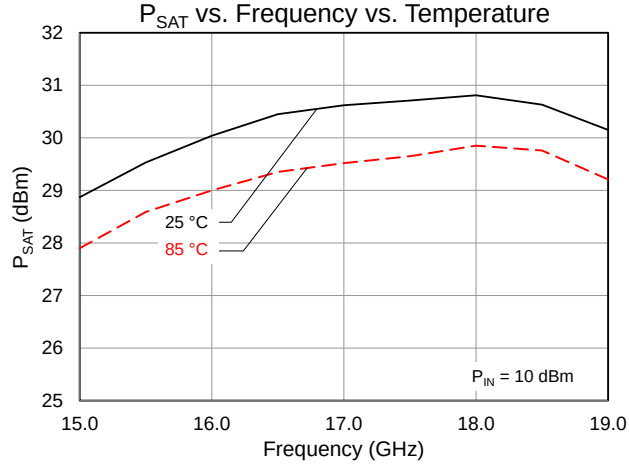
Output Power vs. Input Power vs. Temp.



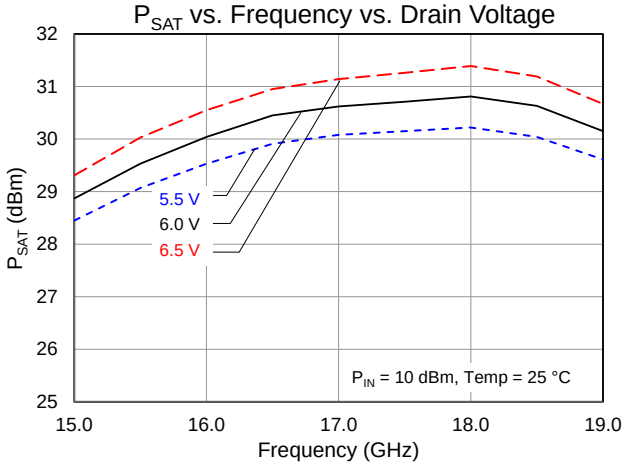
Output Power vs. Input Power vs. V_D



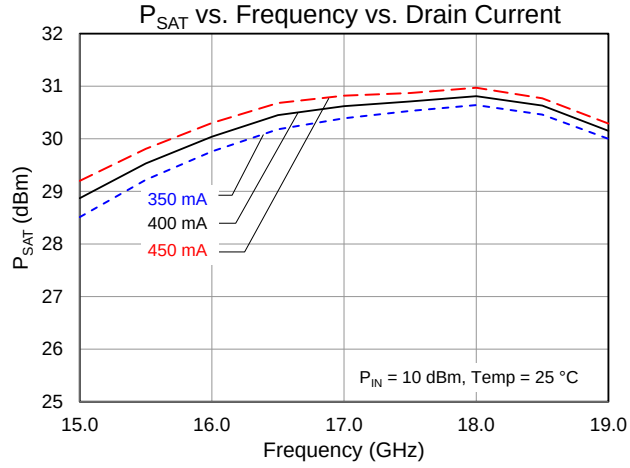
P_{SAT} vs. Frequency vs. Temperature



P_{SAT} vs. Frequency vs. Drain Voltage



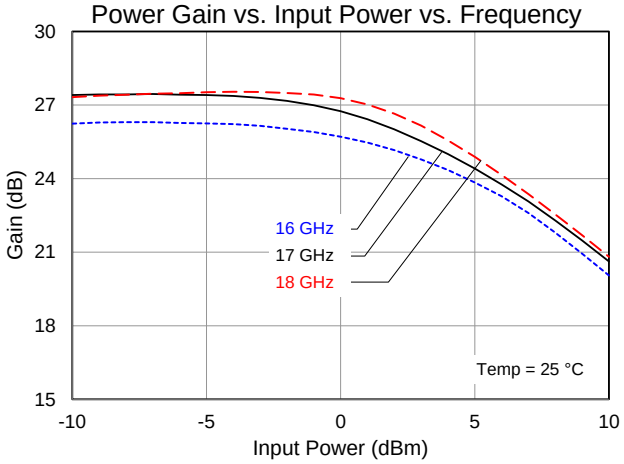
P_{SAT} vs. Frequency vs. Drain Current



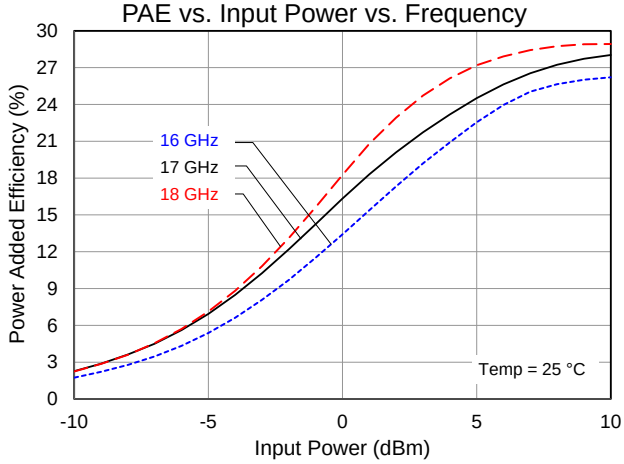
Typical Performance: Large Signal

Conditions unless otherwise specified: V_D = 6 V, I_{DQ} = 400 mA, V_G = -0.6 V Typical, CW

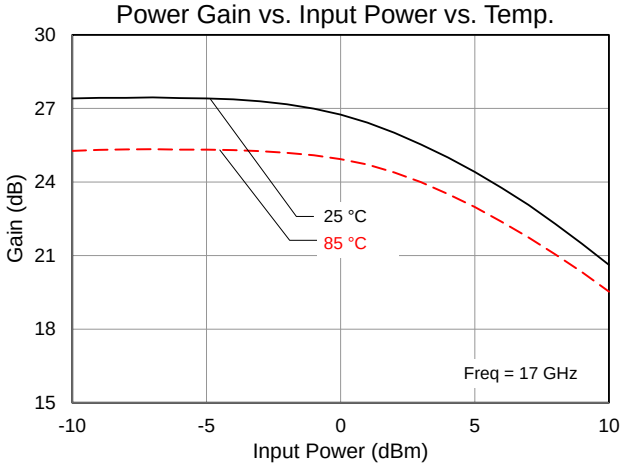
Power Gain vs. Input Power vs. Frequency



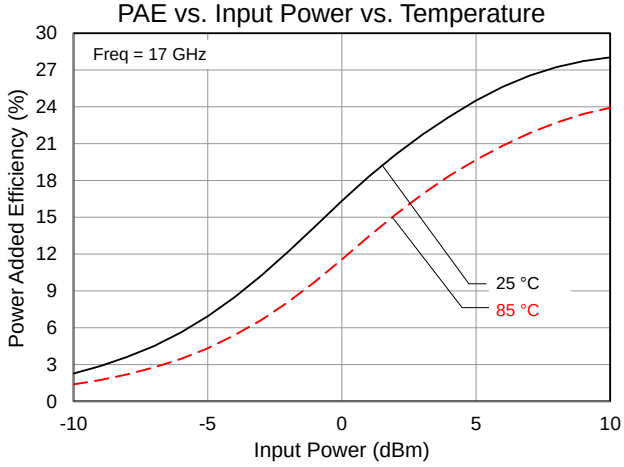
PAE vs. Input Power vs. Frequency



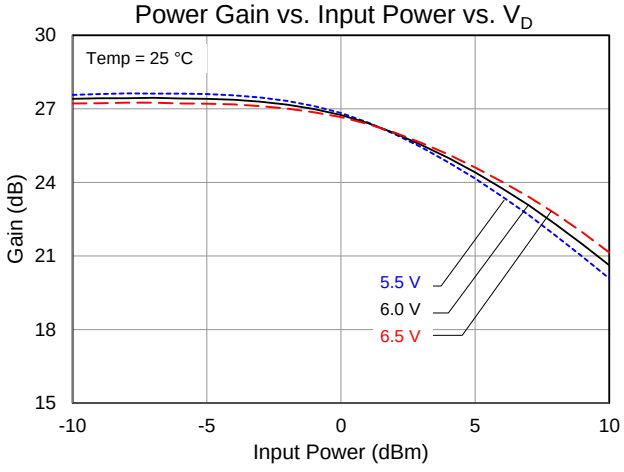
Power Gain vs. Input Power vs. Temp.



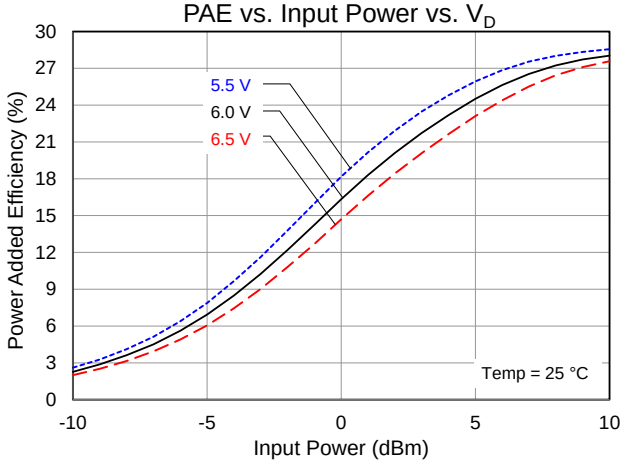
PAE vs. Input Power vs. Temperature



Power Gain vs. Input Power vs. V_D



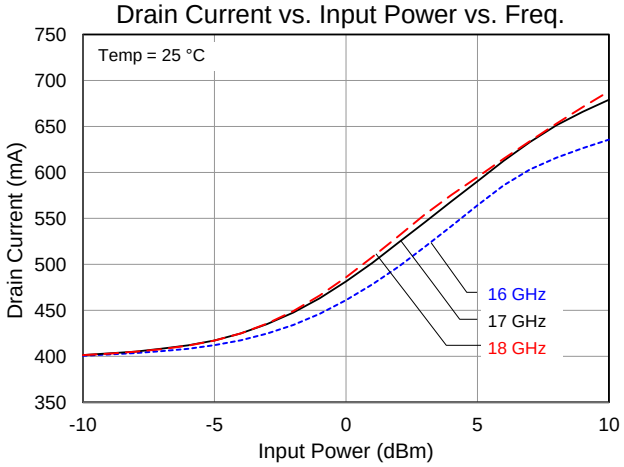
PAE vs. Input Power vs. V_D



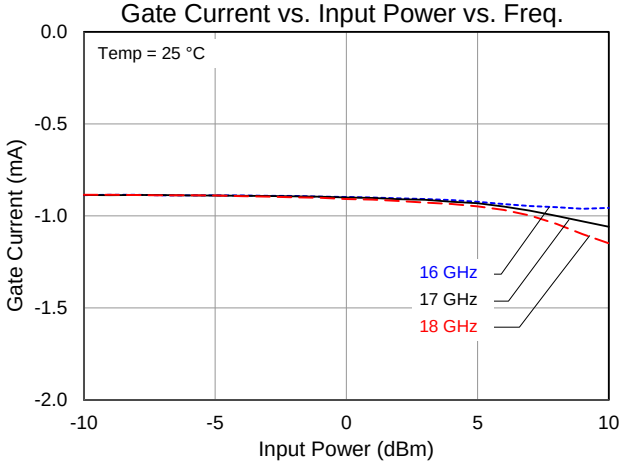
Typical Performance: Large Signal

Conditions unless otherwise specified: V_D = 6 V, I_{DQ} = 400 mA, V_G = -0.6 V Typical, CW

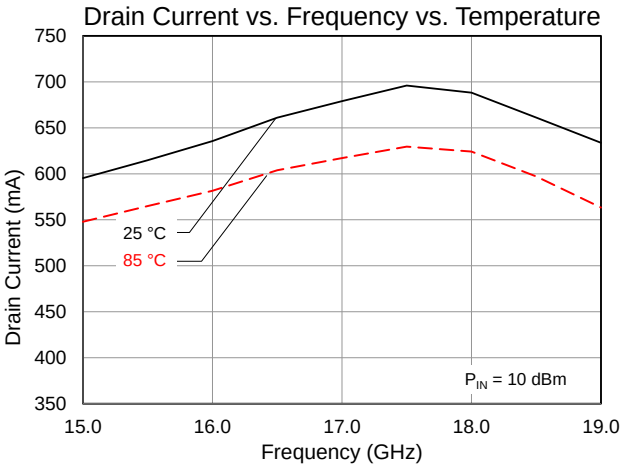
Drain Current vs. Input Power vs. Freq.



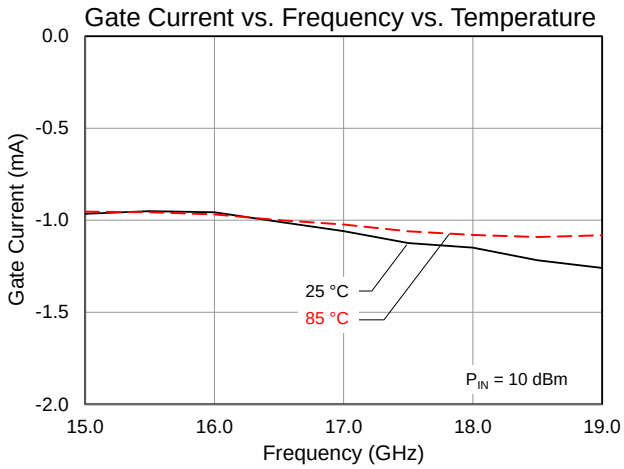
Gate Current vs. Input Power vs. Freq.



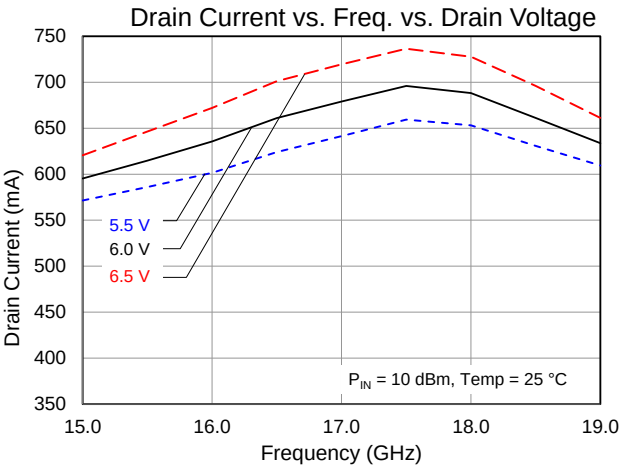
Drain Current vs. Frequency vs. Temperature



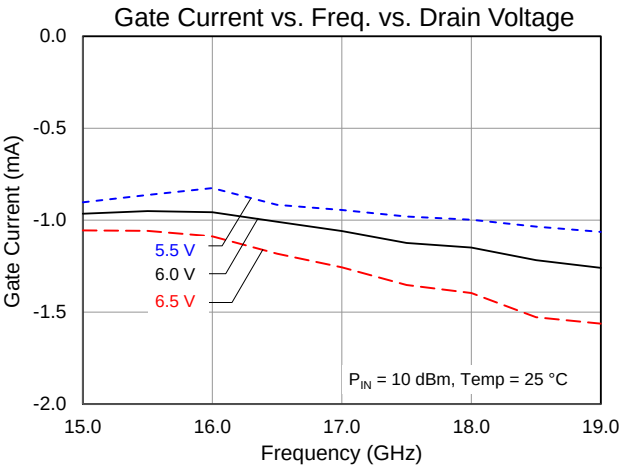
Gate Current vs. Frequency vs. Temperature



Drain Current vs. Freq. vs. Drain Voltage



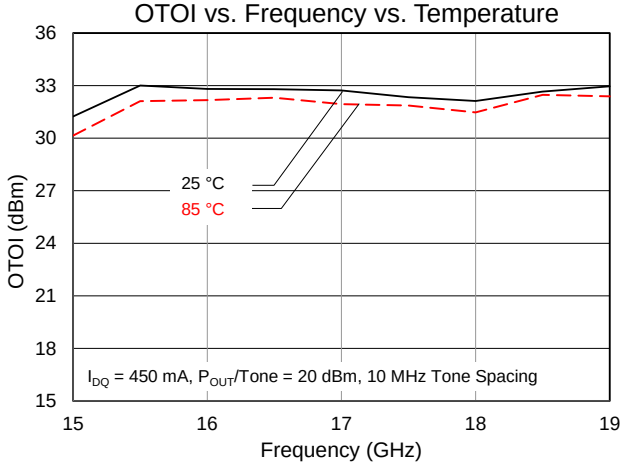
Gate Current vs. Freq. vs. Drain Voltage



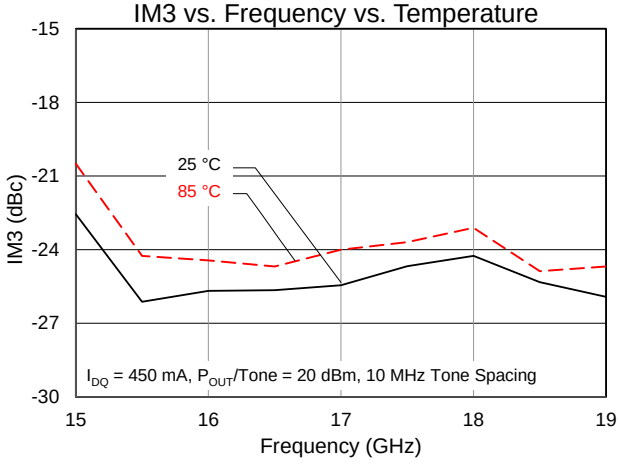
Typical Performance: Linearity

Conditions unless otherwise specified: V_D = 6 V, I_{DQ} = 400 mA, V_G = -0.6 V Typical, CW

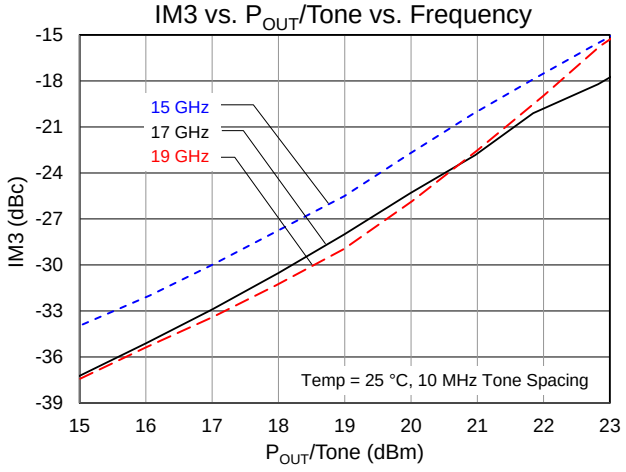
OTOI vs. Frequency vs. Temperature



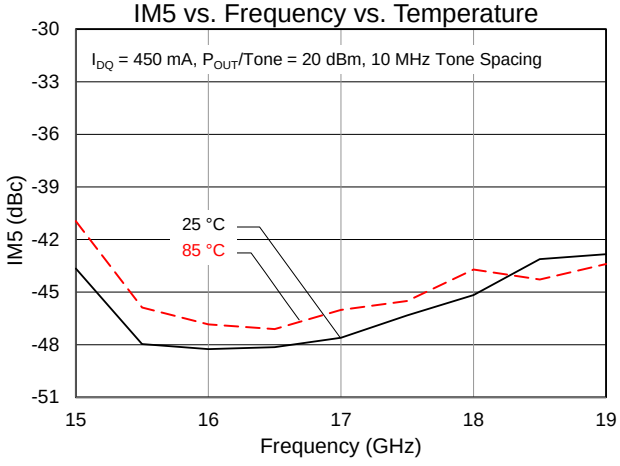
IM3 vs. Frequency vs. Temperature



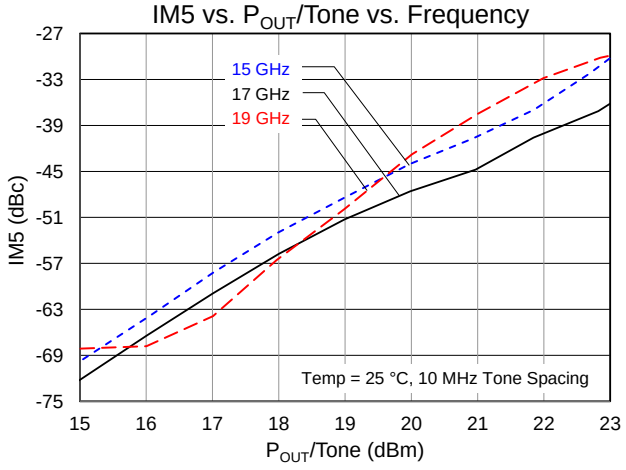
IM3 vs. P_{OUT}/Tone vs. Frequency



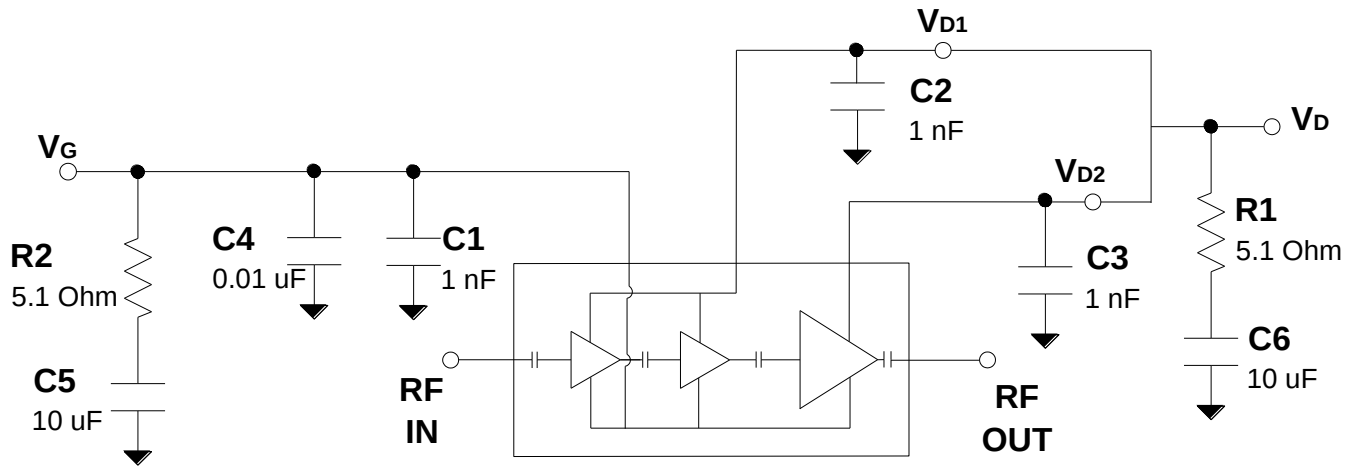
IM5 vs. Frequency vs. Temperature



IM5 vs. P_{OUT}/Tone vs. Frequency



Application Information



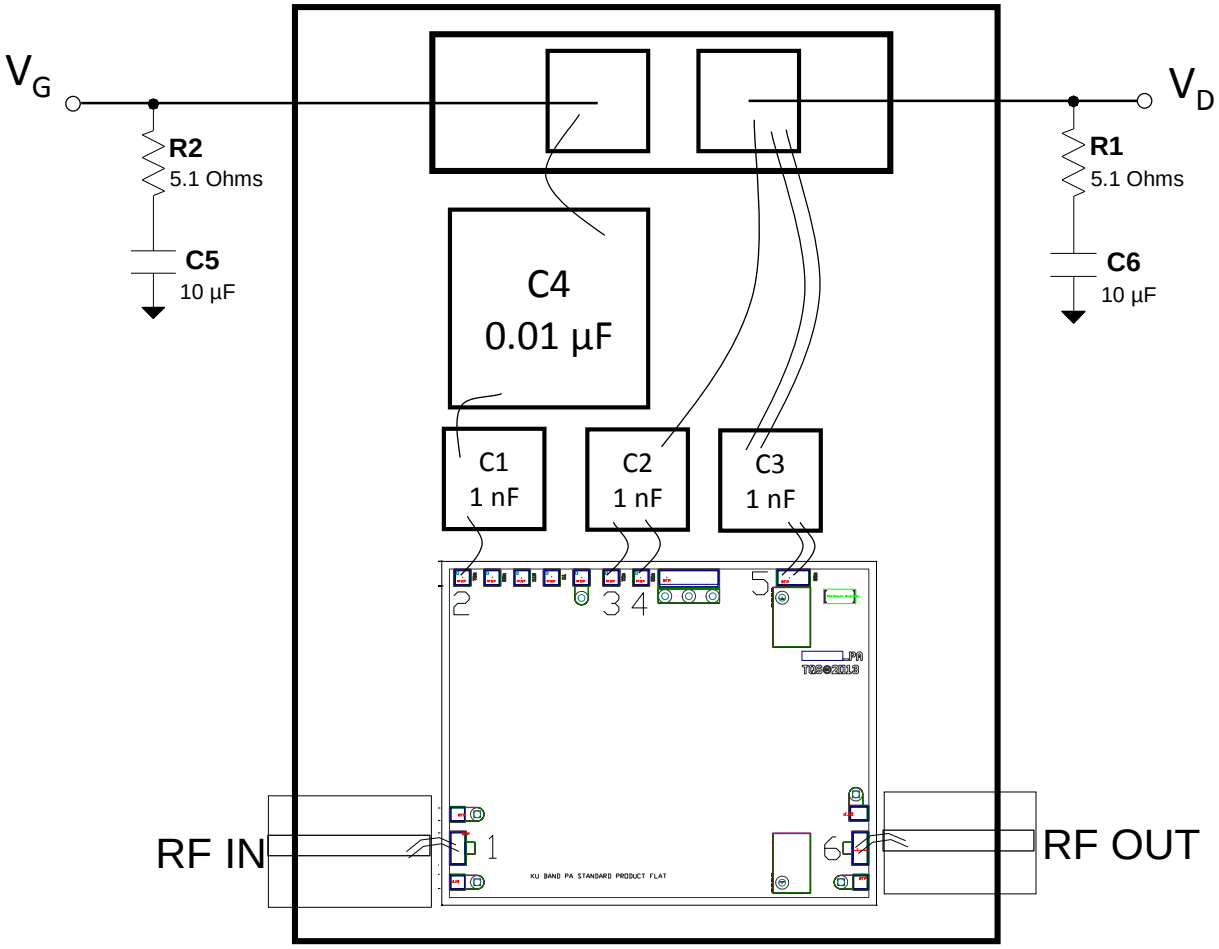
Bias-up Procedure

1. Set I_D limit to 1 A, I_G limit to 4 mA
2. Apply -2 V to V_G for pinch off
3. Apply 6 V to V_D
4. Adjust V_G more positive until I_{DQ} = 400 mA (V_G ~ -0.6 V Typical)
5. Apply RF signal

Bias-down Procedure

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

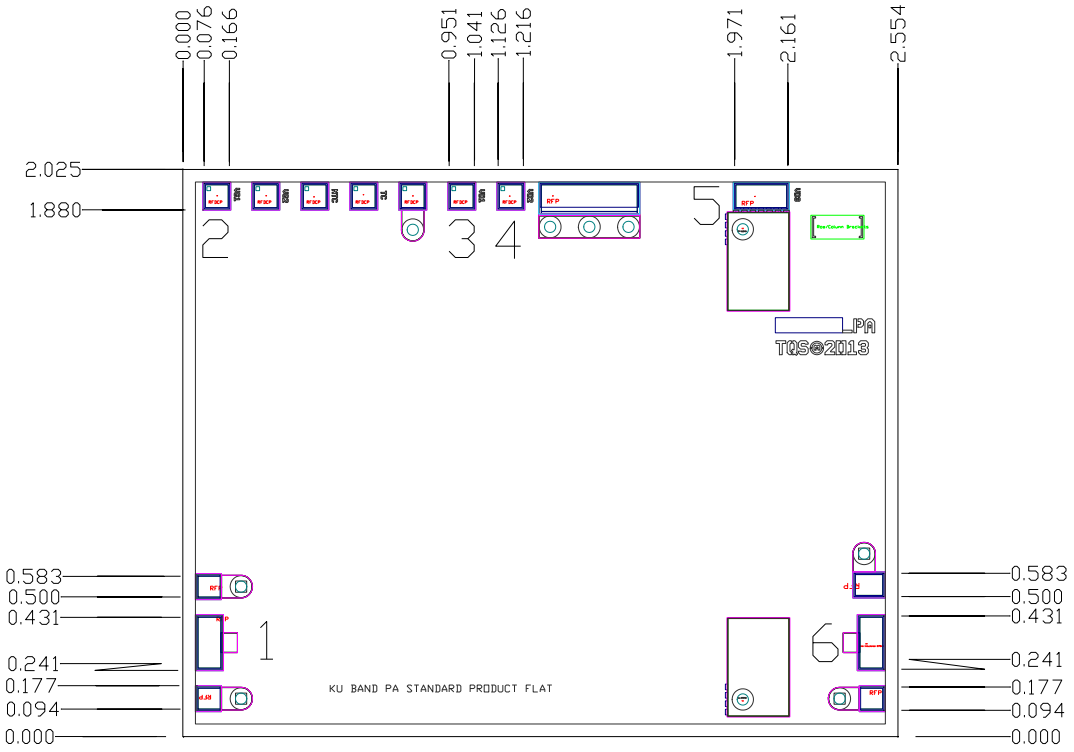
Assembly Drawing



Bill of Material

Reference Des.	Value	Description	Manuf.	Part Number
C1, C2, C3	1 nF	Capacitor, 50 V, SLC	Various	
C4	0.01 µF	Capacitor, 0402, 50 V, MLCC	Various	
C5	10 µF	Capacitor, 0805, 50 V, MLCC	Various	
C6	10 µF	Capacitor, 0805, 25 V, MLCC	Various	
R1, R2	5.1 Ohms	Resistor, 0402, SMD	Various	

Mechanical Information



Units: millimeters
Thickness: 0.10
Die x,y size tolerance: ± 0.050
Ground is backside of die
RF_{IN} and RF_{OUT} pads are symmetric

Pad Description

Pad No.	Symbol	Description	Pad Size
1	RF_{IN}	Input; matched to 50 Ω; DC blocked	0.1 x 0.2 mm
2	V_G	Gate voltage; bias network is required; see recommended Application	0.1 x 0.1 mm
3,4	V_{D1} (1)	Drain voltage; bias network is required; see recommended Application	0.1 x 0.1 mm
5	V_{D2} (1)	Drain voltage; bias network is required; see recommended Application	0.2 x 0.1 mm
6	RF_{OUT}	Output; matched to 50 Ω; DC blocked	0.1 x 0.2 mm

Notes:
1. Pads 3,4, & 5 may be tied together off-chip.

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.

Solder attachment reflow process assembly notes:

- Use AuSn (80/20) solder and limit exposure to temperatures above 300°C to 3 to 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.

Organic adhesive attachment assembly notes:

- Organic adhesives such as ABLEBOND 84-1, or equivalent, can be used.
- Epoxies cure at temperatures of 100 to 200°C.

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.

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 Commerce: EAR99

Solderability

Use only AuSn (80/20) solder and limit exposure to temperatures above 300 °C to 3-4 minutes, maximum.

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

Contact Information

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

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

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