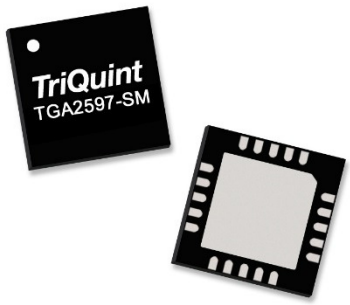
TGA2597-SM

2 - 6 GHz GaN Driver Amplifier

Applications

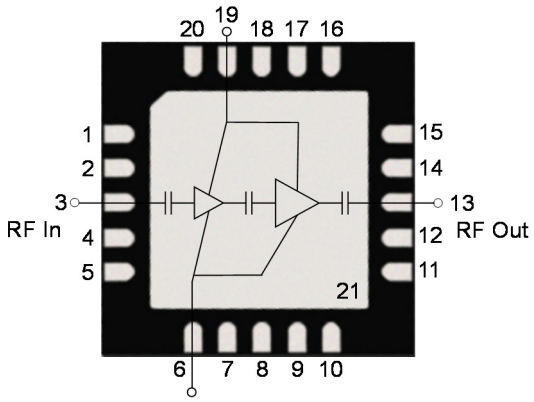
- Commercial and Military Radar
- Communications
- Electronic Warfare (EW)



Product Features

- Frequency Range: 2 - 6 GHz
- Small Signal Gain: > 24 dB
- Power: > 32 dBm
- PAE: > 31 %
- IM3: < -24 dBc
- Bias: V_D = 25 V, I_{DQ} = 40 mA
- Package Dimensions: 4.0 x 4.0 x 0.85 mm

Functional Block Diagram



General Description

TriQuint's TGA2597-SM is a packaged driver amplifier fabricated on TriQuint's TQGaN25 0.25um GaN on SiC production process. The TGA2597-SM operates from 2.0 to 6.0GHz and provides 32 dBm of output power with14 dB of large signal gain and 31 % power-added efficiency.

Using GaN MMIC technology and plastic packaging, the TGA2597-SM provides a low cost driver solution that provides the added benefit of operating on the same voltage rail as the corresponding GaN HPA. It can also serve as the output power amplifier in lower power architectures.

The TGA2597-SM is offered in a 4x4 mm plastic overmold QFN. It is internally matched to 50 ohms and includes integrated DC blocking caps on both RF ports allowing for simple system integration.

Lead-Free & RoHS compliant.

Evaluation Boards are available on request.

Pad Configuration

Pad Number	Symbol
3	RF Input
6	V_G
13	RF Output
19	V_D
1-2,4-5,7-12,14-18, 20	N/C
21	GND

Ordering Information

Part	ECCN	Description
TGA2597-SM	EAR99	2 - 6 GHz GaN Driver Amplifier

Absolute Maximum Ratings

Parameter	Value
Drain Voltage (V_D)	40 V
Gate Voltage Limits (V_G)	-8 V / 0 V
Drain Current (I_D)	400 mA
Gate Current (I_G @T_{CH}=200 °C)	-0.6 / 4.2 mA
Power Dissipation, 85 °C (P_{DISS})	5.4 W
Input Power, CW, 50 Ω [1]	24 dBm
Input Power, CW, VSWR 3:1 [1]	24 dBm
Channel Temperature (T_{CH})	275 °C

Notes:

1. V_D = 25V, I_{DQ} = 40mA, T_B = 85 °C

Recommended Operating Conditions

Parameter	Value
Drain Voltage (V_D)	25 V
Gate Voltage (V_G), typical	-2.5 V
Quiescent Drain Current (I_{DQ})	40 mA
Operating Drain Current (I_{D_DRIVE})	250 mA

Electrical Specifications

Test conditions, unless otherwise noted: T = 25 °C, CW input power, part mounted to EVB (page 11)

Parameter	Min	Typical	Max	Units
Operating Frequency Range	2.0		6.0	GHz
Output Power (@ Pin = 18 dBm)		> 32		dBm
Power Added Efficiency (@ Pin = 18 dBm)		> 31		%
Small Signal Gain		> 24		dB
Input Return Loss		> 19		dB
Output Return Loss		> 5		dB
IM3 (Pout/Tone ≤ 24 dBm, 10 MHz tone spacing)		< -24		dBc
Small Signal Gain Temperature Coefficient		-0.050		dB/°C
Output Power Temperature Coefficient		-0.009		dB/°C

Specifications

Thermal and Reliability Information

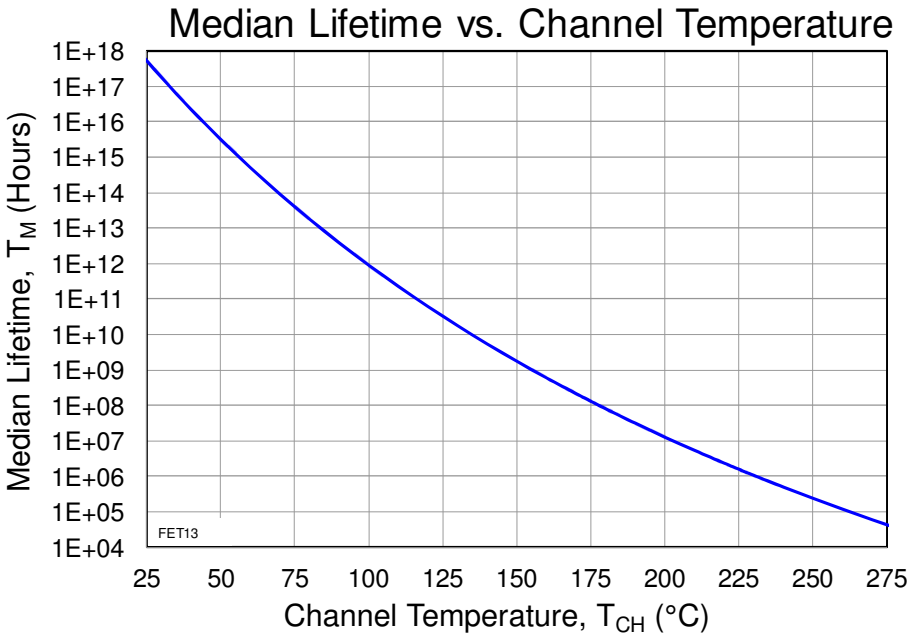
Parameter	Conditions	Value	Units
Thermal Resistance (θ_{JC}) (1)	T_{PKG} = 85°C, V_D = 25 V, I_{DQ} = 40 mA, I_{D_DRIVE} = 206 mA, P_{IN} = 18 dBm, P_{OUT} = 31.8 dBm, P_{DISS} = 3.7 W	24.6	ºC/W
Channel Temperature (T_{CH}) (1)		176	°C
Median Lifetime (T_M)		1.18E08	Hrs

Note:

1. Package backside temperature fixed at 85 °C.

Median Lifetime

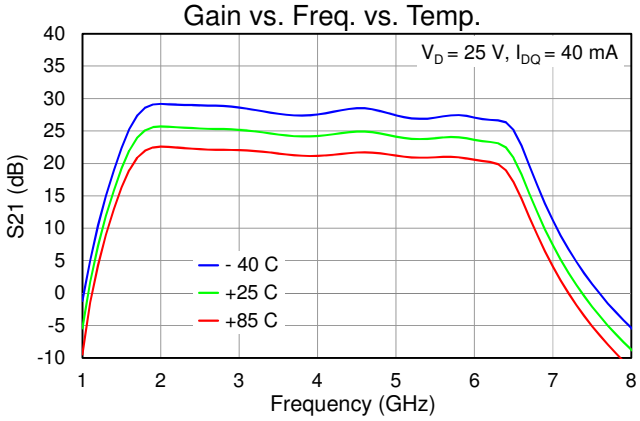
Test Conditions: 40 V; Failure Criterion = 10% reduction in $I_{D\ MAX}$



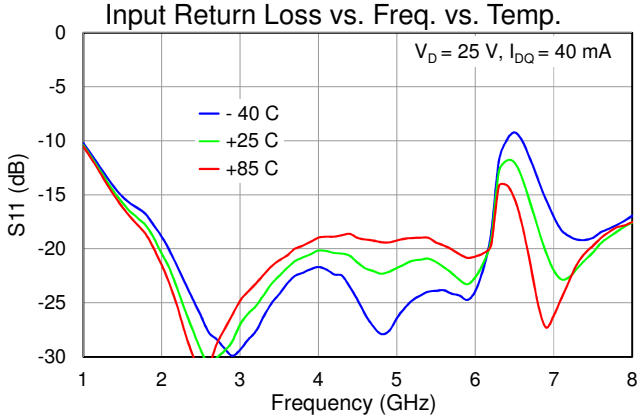
Typical Performance

Test conditions, unless otherwise noted: T = 25 °C, part mounted to EVB (page 11)

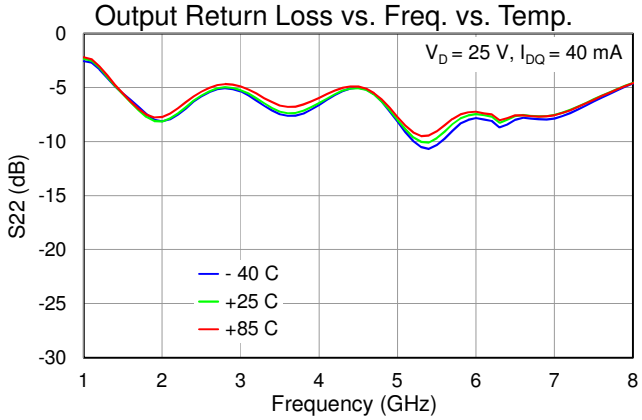
Gain vs. Freq. vs. Temp.



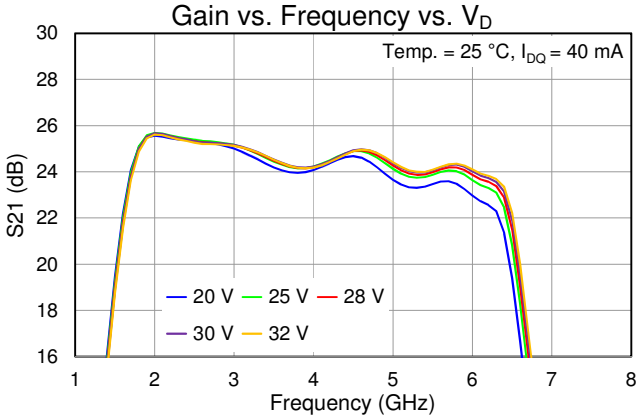
Input Return Loss vs. Freq. vs. Temp.



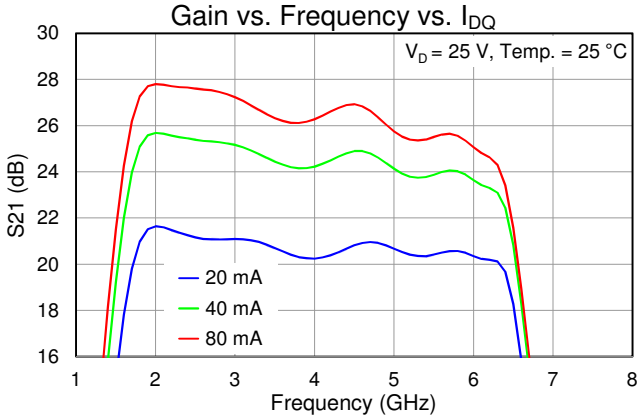
Output Return Loss vs. Freq. vs. Temp.



Gain vs. Frequency vs. V_D

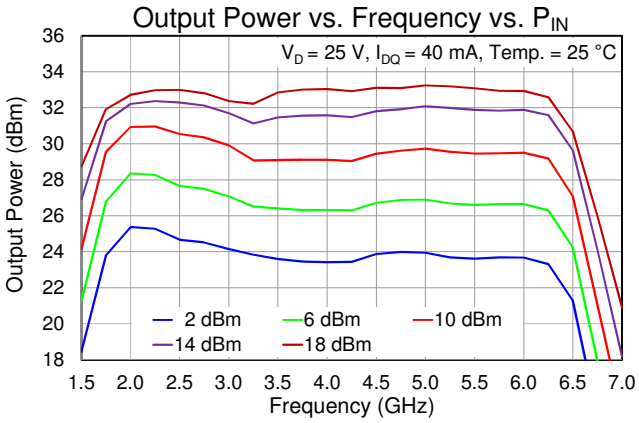


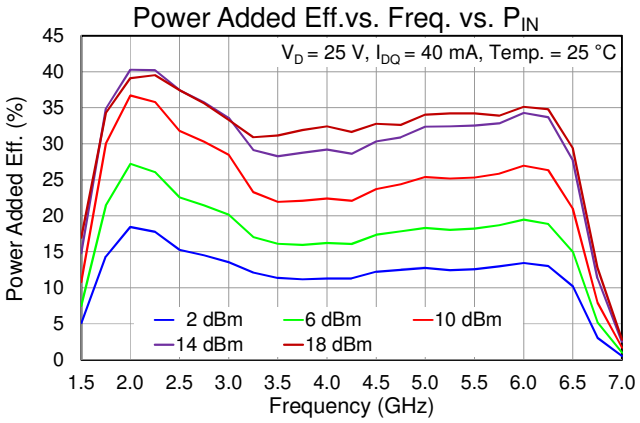
Gain vs. Frequency vs. I_{DQ}

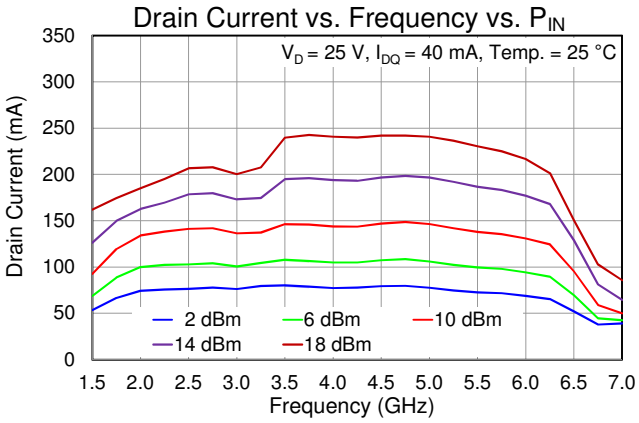


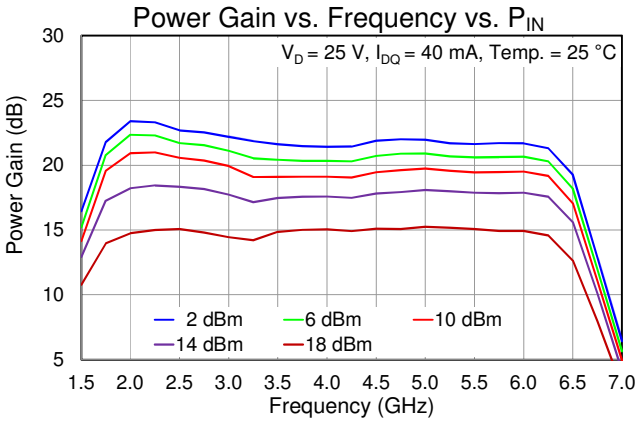
Typical Performance

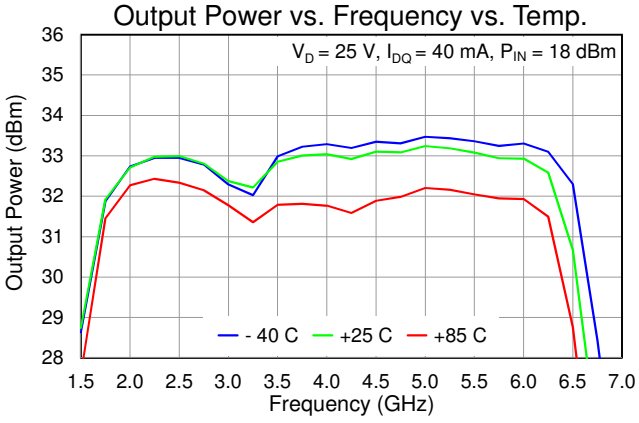
Test conditions, unless otherwise noted: T = 25 °C, part mounted to EVB (page 11)

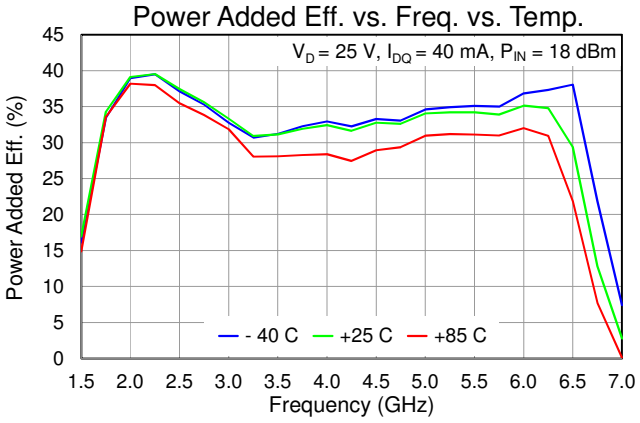








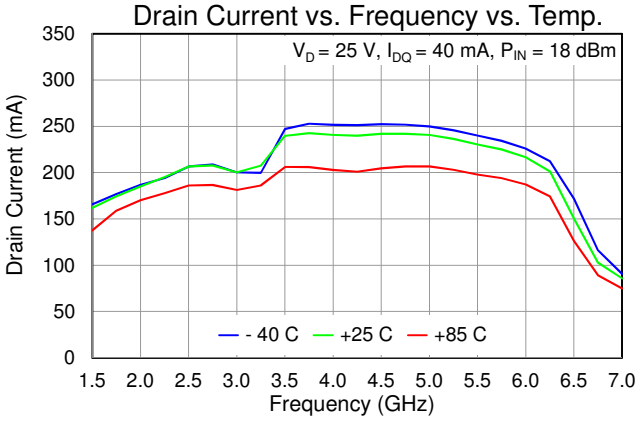




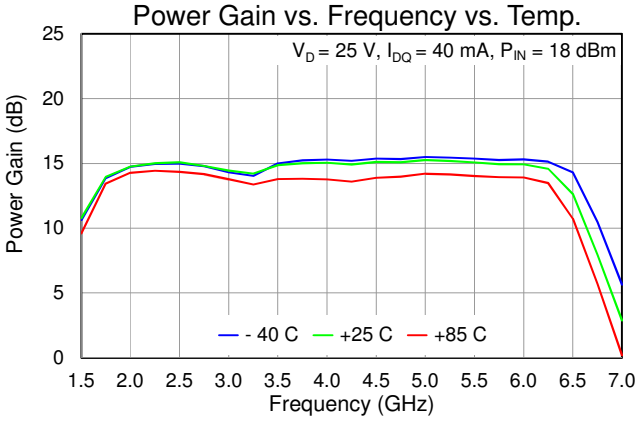
Typical Performance

Test conditions, unless otherwise noted: T = 25 °C, part mounted to EVB (page 11)

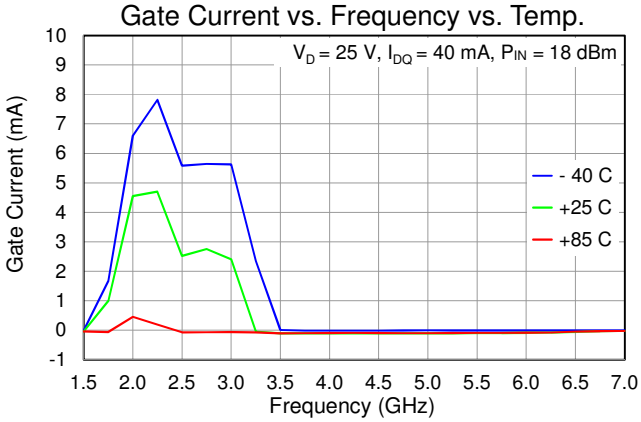
Drain Current vs. Frequency vs. Temp.



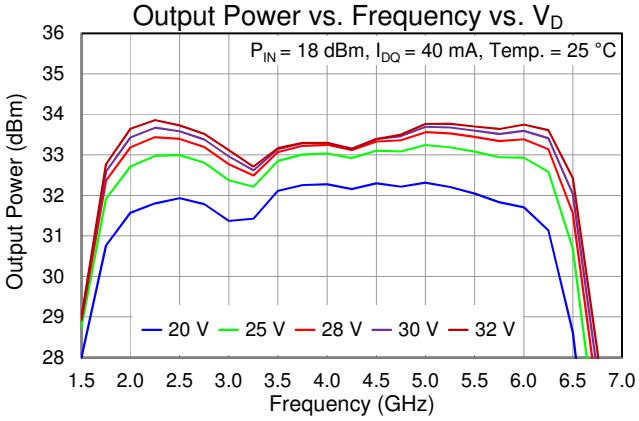
Power Gain vs. Frequency vs. Temp.



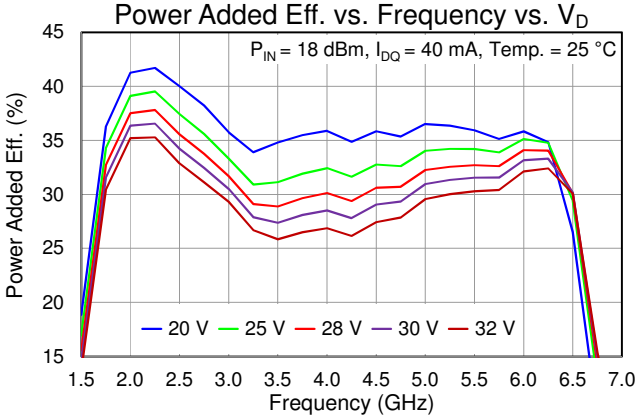
Gate Current vs. Frequency vs. Temp.



Output Power vs. Frequency vs. V_D

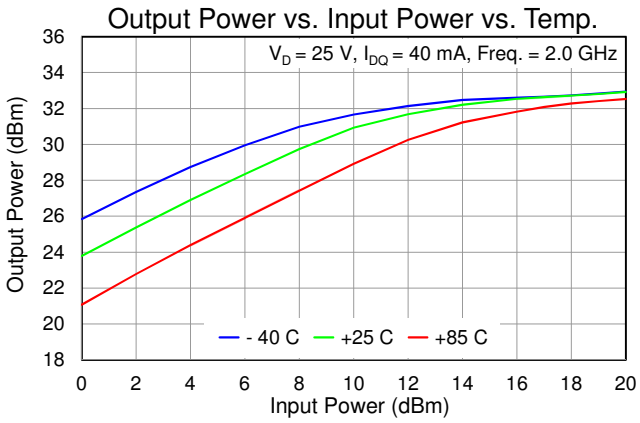


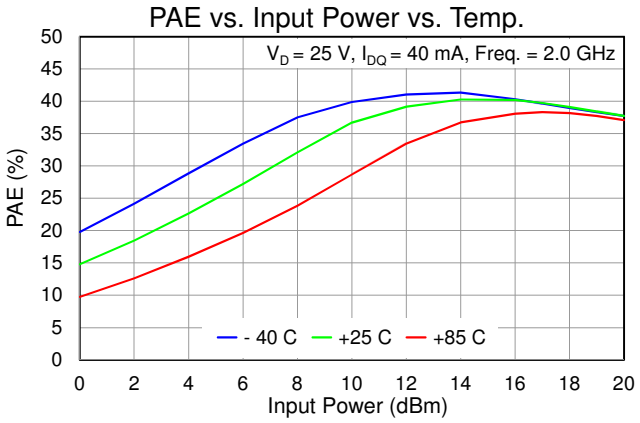
Power Added Eff. vs. Frequency vs. V_D

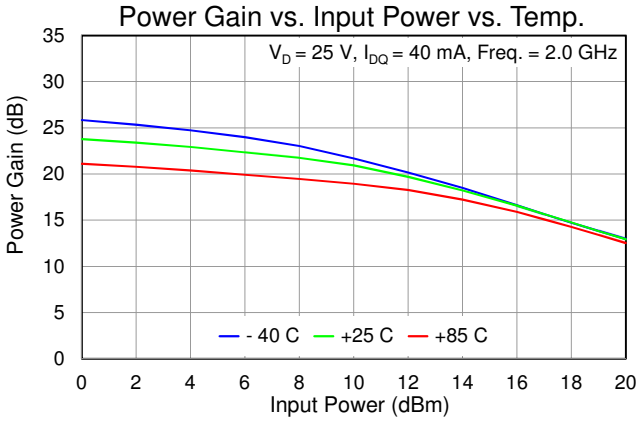


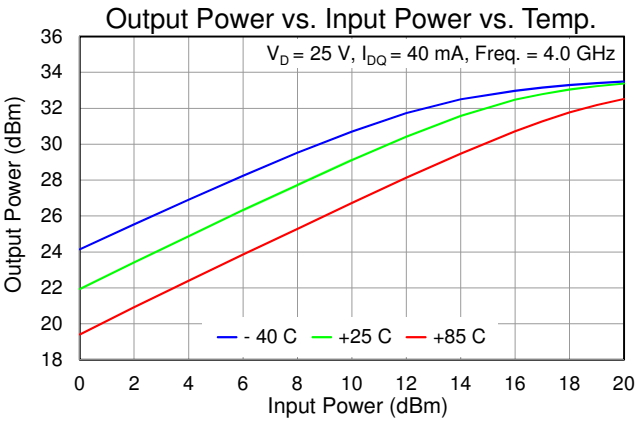
Typical Performance

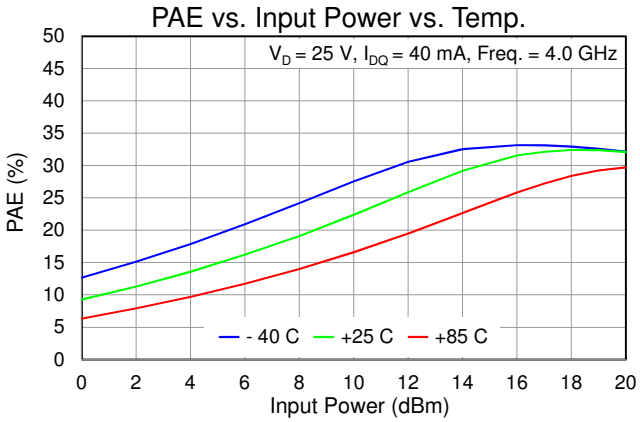
Test conditions, unless otherwise noted: T = 25 °C, part mounted to EVB (page 11)

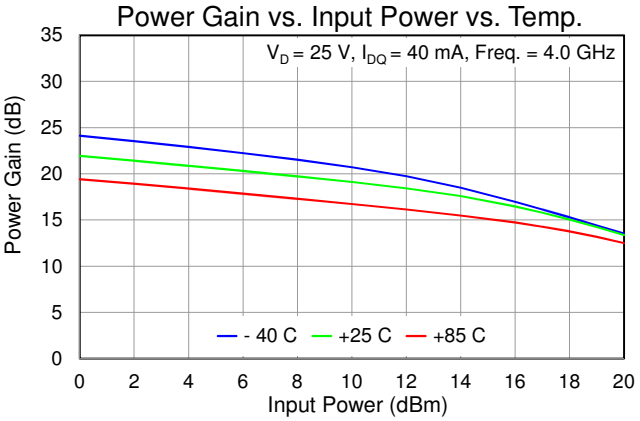








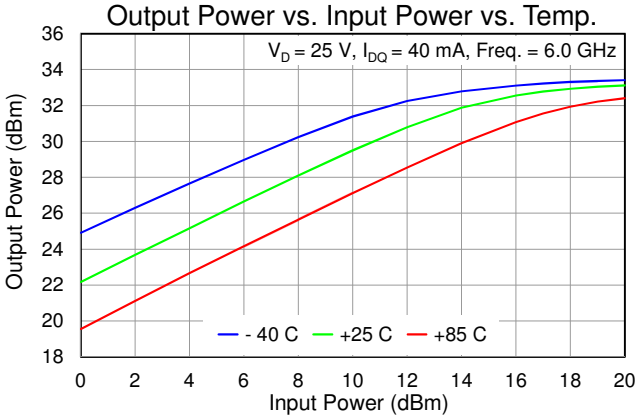




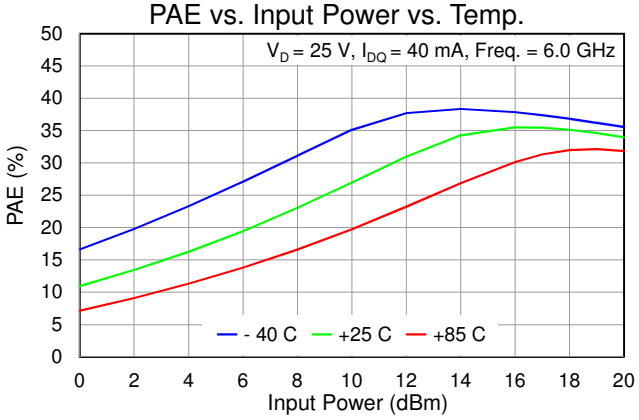
Typical Performance

Test conditions, unless otherwise noted: T = 25 °C, part mounted to EVB (page 11)

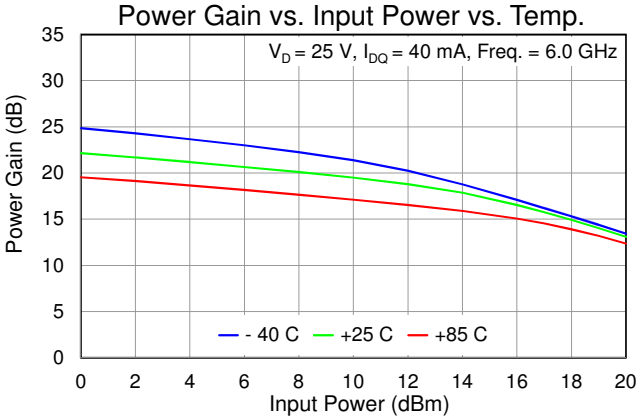
Output Power vs. Input Power vs. Temp.



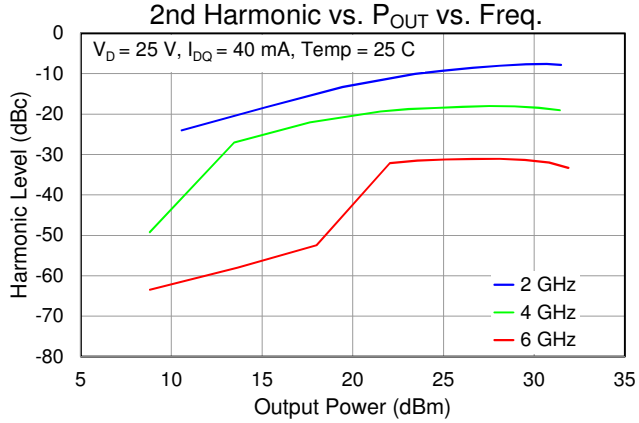
PAE vs. Input Power vs. Temp.



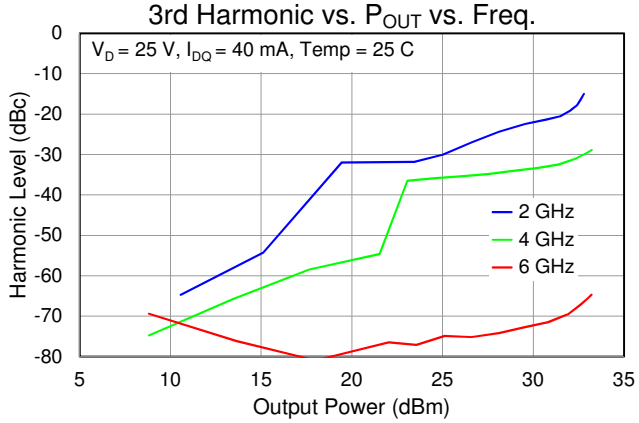
Power Gain vs. Input Power vs. Temp.



2nd Harmonic vs. P_{OUT} vs. Freq.



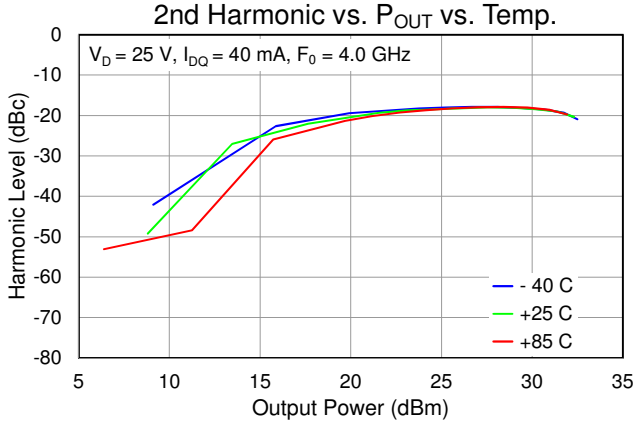
3rd Harmonic vs. P_{OUT} vs. Freq.



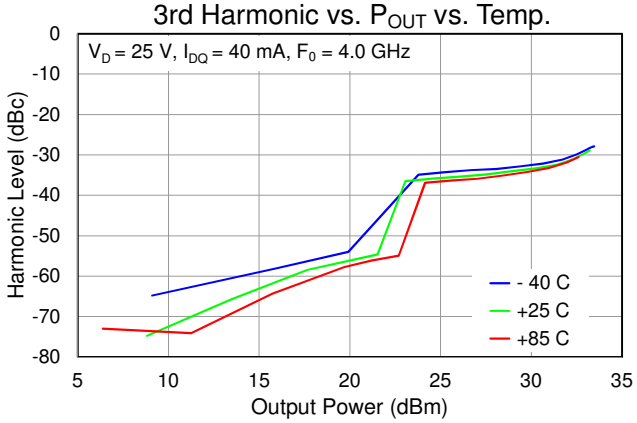
Typical Performance

Test conditions, unless otherwise noted: T = 25 °C, part mounted to EVB (page 11)

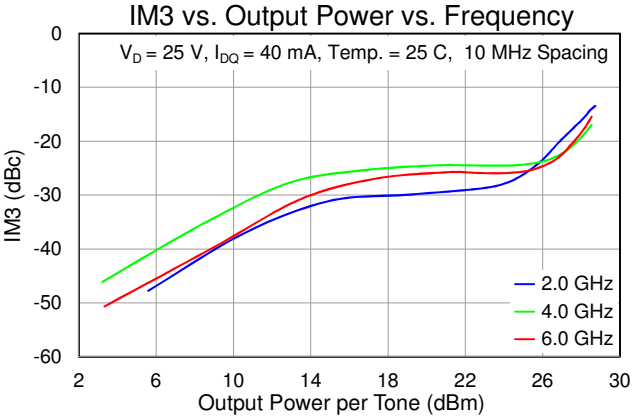
2nd Harmonic vs. P_{OUT} vs. Temp.



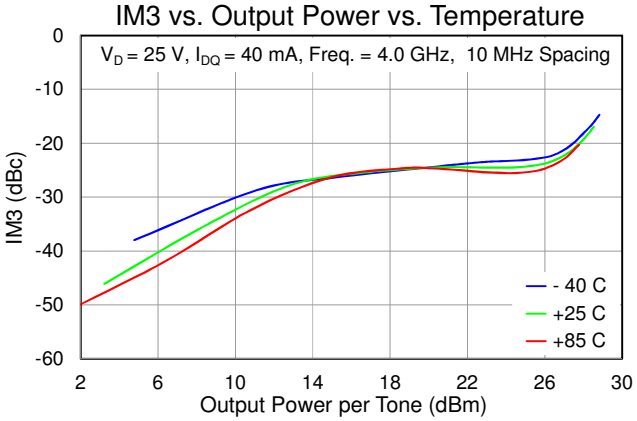
3rd Harmonic vs. P_{OUT} vs. Temp.



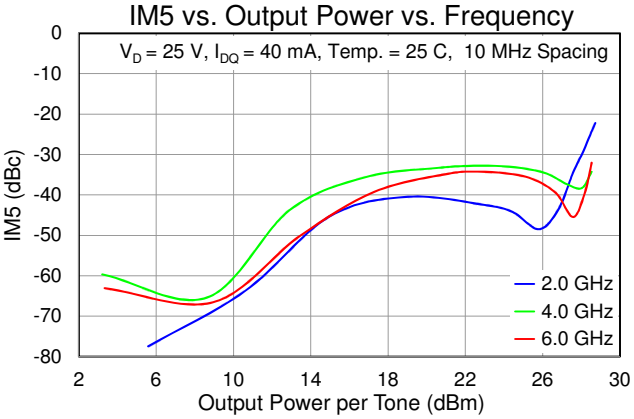
IM3 vs. Output Power vs. Frequency



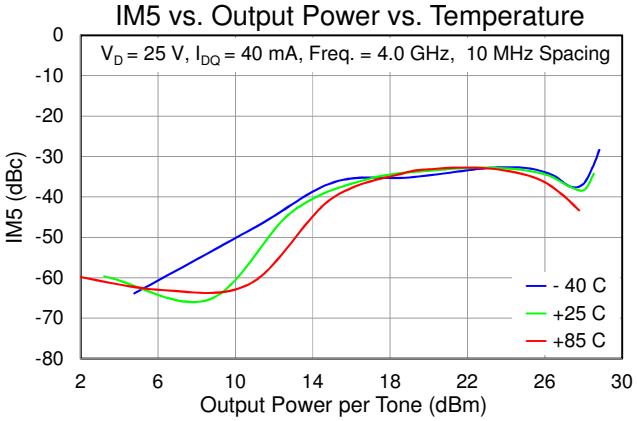
IM3 vs. Output Power vs. Temperature



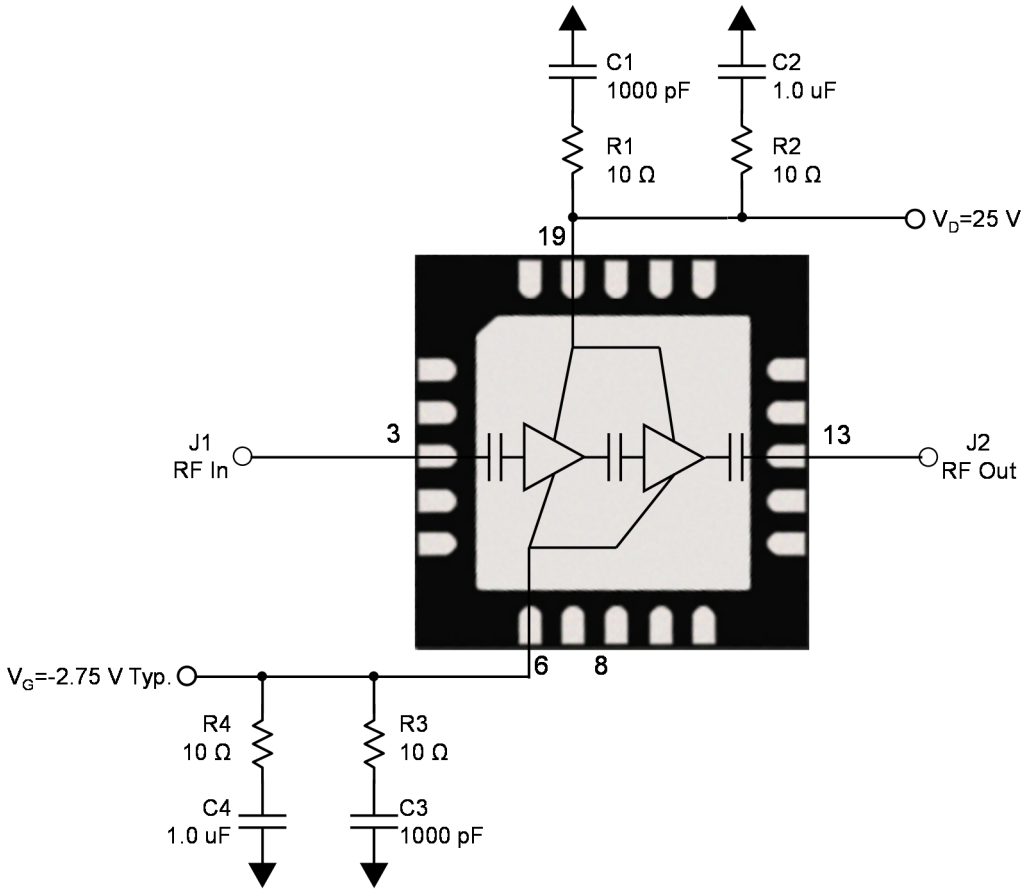
IM5 vs. Output Power vs. Frequency



IM5 vs. Output Power vs. Temperature



Application Circuit



Bias-up Procedure

1. Set I_D limit to 400 mA, I_G limit to 4.5 mA
2. Set V_G to -5.0V
3. Set V_D +25V
4. Adjust V_G more positive until I_{DQ} = 40 mA.
5. Apply RF signal

Bias-down Procedure

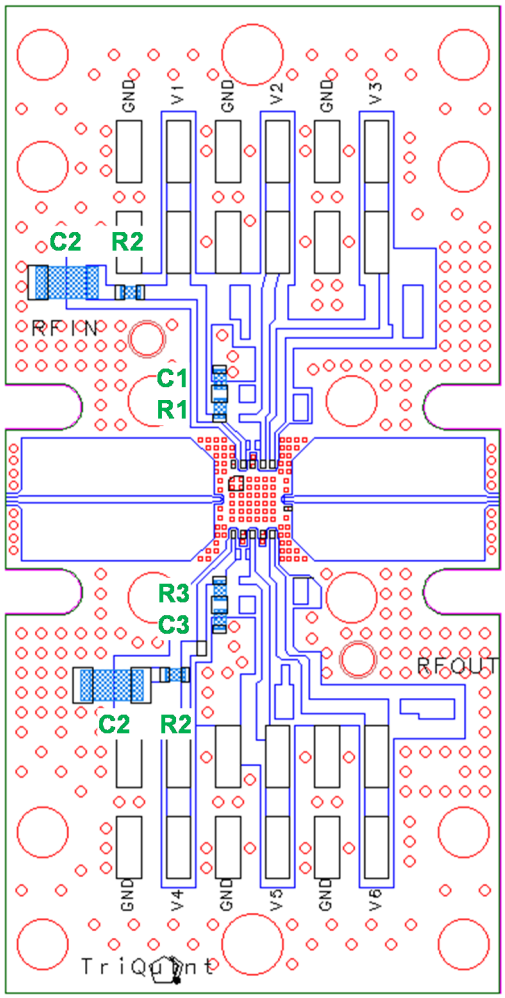
1. Turn off RF signal
2. Set V_G to -5.0V. Ensure I_{DQ} ~ 0mA
3. Set V_D to 0V
4. Turn off V_D supply
5. Turn off V_G supply

Applications Information

Evaluation Board Layout

RF Layer is 0.008" thick Rogers Corp. RO4003C, εr = 3.38. Metal layers are 0.5 oz. copper. The microstrip line at the connector interface is optimized for the Southwest Microwave end launch connector 1092-02A-5.

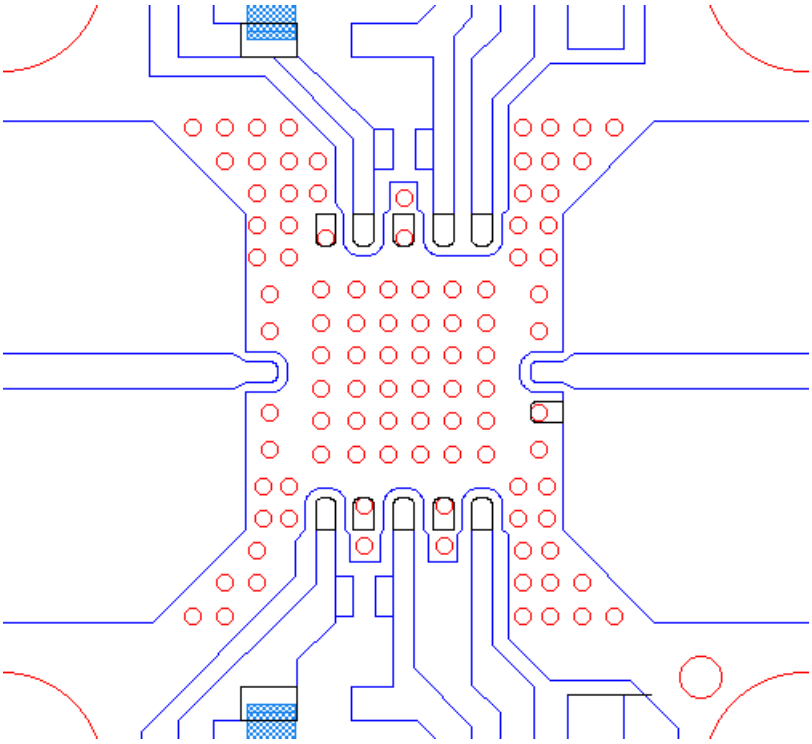
The pad pattern shown has been developed and tested for optimized assembly at TriQuint Semiconductor. The PCB land pattern has been developed to accommodate lead and package tolerances. Since surface mount processes vary from company to company, careful process development is recommended.



Bill of Materials

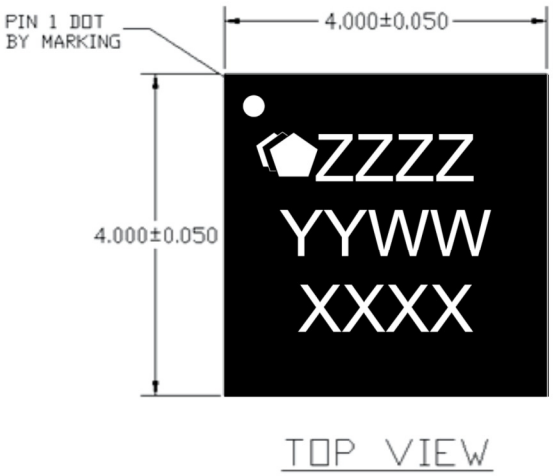
Ref. Designation	Value	Description	Manufacturer	Part Number
C1, C3	1000 pF	Cap., 50V, 10% X7R, 0402 case	Various	
C3, C4	1.0 uF	Cap., 50V, 10% X5R, 1206 case	Various	
R1 – R4	10 Ohms	Resistor, 0402 case	Various	

Mounting Detail

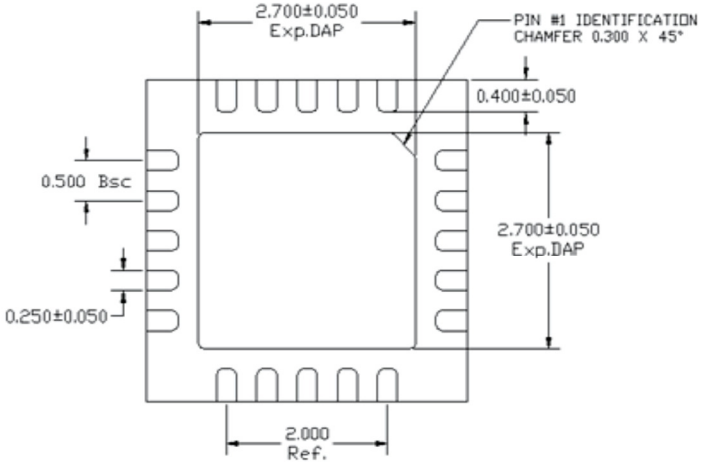


Note:
Multiple vias should be employed under package center paddle to minimize inductance and thermal resistance.

Mechanical Information

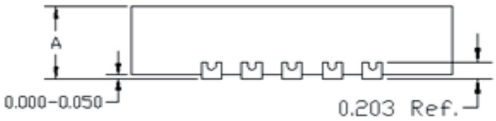


TOP VIEW



BOTTOM VIEW

		SLP
A	MAX.	0.900
	NOM.	0.850
	MIN.	0.800



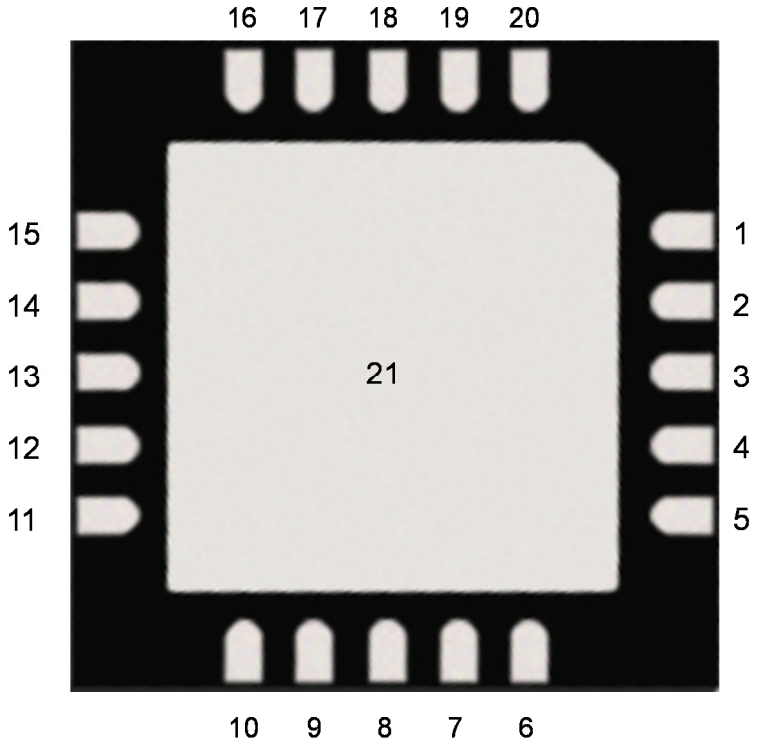
SIDE VIEW

The TGA2597-SM will be marked with the “ZZZZ” and “YYWW” designators and a lot code marked below the part designator. Here, the “ZZZZ” will be “2597”. The “YY” represents the last two digits of the year the part was manufactured, the “WW” is the work week, and the “XXXX” is an auto-generated number.

This package is lead-free/RoHS-compliant. This package is compatible with both lead free and tin-lead soldering processes.

Dimensions are in millimeters.

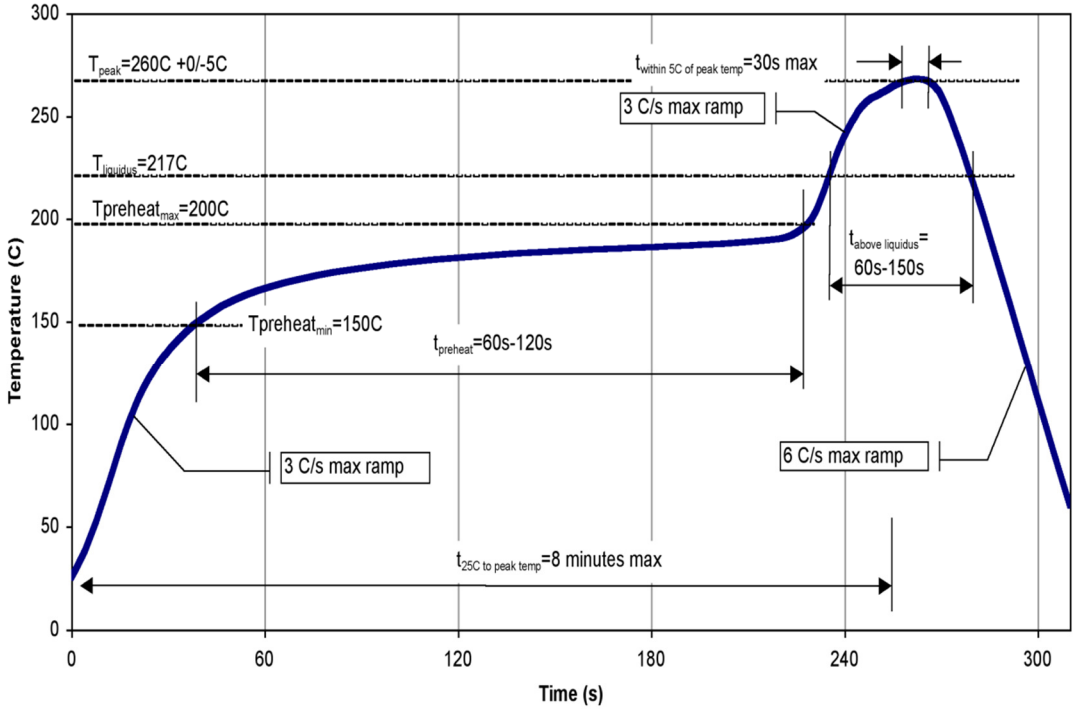
Pad Description



Bottom view of package base

Pin Number	Label	Description
3	RF Input	RF input, matched to 50 Ω, DC blocked
6	V_G	Gate voltage. Bias network required.
13	RF Output	RF output, matched to 50 Ω, DC blocked
19	V_D	Drain voltage. Bias network required.
1-2,4-5,7-12,14-18, 20	GND	Connected to ground paddle (21); recommend grounding on PCB for improved package isolation.
21	GND	Backside paddle. Multiple vias should be employed to minimize inductance and thermal resistance. Copper-filled vias recommended for best thermal performance.

Recommended Soldering Temperature Profile



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

Compatible with the latest version of J-STD-020 Lead free solder, 260 °C.

MSL Rating

TBD at 260 °C convection reflow
The part is rated Moisture Sensitivity Level TBD
JEDEC standard IPC/JEDEC J-STD-020.

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 (C15H12Br402) 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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