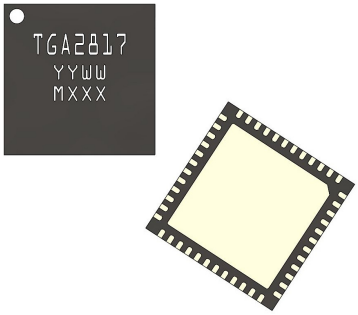
TGA2817-SM

S-Band 60 W GaN Power Amplifier

Applications

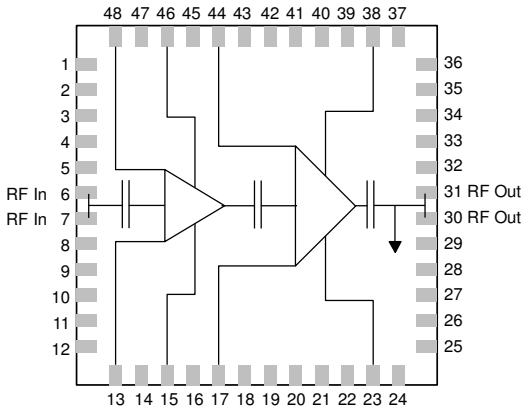
- Military Radar
- Commercial Radar
- Wideband Amplifiers



Product Features

- Frequency Range: 2.9 – 3.5 GHz
- Pout: > 48 dBm (at Pin = 24 dBm)
- Large Signal Gain: > 24 dB (at Pin = 24 dBm)
- PAE: > 54 % (at Pin = 24 dBm)
- Bias: V_D = 28 V, I_{DQ} = 200 mA, V_G = –2.8 V (Typ)
- Package Dimensions: 7.00 x 7.00 x 0.85 mm

Functional Block Diagram



General Description

TriQuint's TGA2817-SM is a high-power, S-band amplifier fabricated on TriQuint's TQGaN25 0.25um GaN on SiC production process. Covering 2.9-3.5 GHz, the TGA2817-SM provides > 48 dBm of saturated output power and > 24 dB of large-signal gain while achieving > 54 % power added efficiency.

The TGA2817-SM can also support a variety of operating conditions to best support system requirements. With good thermal properties, it can support a range of bias voltages and will perform well under pulse applications. The TGA2817-SM is matched to 50 ohms with integrated DC blocking caps on both I/O ports. It is ideal for use in both commercial and military radar systems.

Lead-free and RoHS compliant.

Evaluation board available on request.

Pad Configuration

Pad Number	Symbol
6, 7	RF Input
13, 48	V_{G1}
15, 46	V_{D1}
17, 44	V_{G2}
23, 38	V_{D2}
30, 31	RF Output
1-5, 8-12, 14, 16, 18-22, 24-29, 32-37, 39-43, 45, 47, 49	GND

Ordering Information

Part	ECCN	Description
TGA2817-SM	3A001.b.2.a	S-Band 60 W GaN Power Amplifier
TGA2817-SM_EVB	EAR99	TGA2817-SM Evaluation Board

Absolute Maximum Ratings

Parameter	Value
Drain Voltage (V_D)	40 V
Drain Current (I_{D1}/I_{D2})	1.4/5.8 A
Gate Current (I_G)	See graph
Dissipated Power (P_{DISS})	92 W
Input Power: 50 Ω, 85 °C [1]	30 dBm
Input Power: 3:1 VSWR, 85 °C [1]	28 dBm
Channel Temperature, T_{CH}	275 °C
Storage Temperature	-55 to 150 °C

[1] Based on die performance

Operation of this device outside the parameter ranges given above may cause permanent damage.

Recommended Operating Conditions

Parameter	Value
Drain Voltage	28 V
Drain Current (quiescent, I_{DQ})	200 mA
Drain Current (under drive, I_D)	4.6 A
Gate Voltage	-2.8 V
Operating Temperature	-40 to 85 °C

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

Electrical Specifications

Test conditions, unless otherwise noted: 25 °C, V_D = 28 V, I_{DQ} = 200 mA, Pulse Width = 100 us, Duty Cycle = 10%

Parameter	Min	Typical	Max	Units
Frequency	2.9		3.5	GHz
Output Power (P_{IN} = 24 dBm)		> 48.0		dBm
Large Signal Gain (P_{IN} = 24 dBm)		> 24.2		dB
Power Added Efficiency (P_{IN} = 24 dBm)		> 54.0		%
Input Return Loss		> 8.3		dB
Output Power Temperature Coefficient		-0.006		dBm/°C

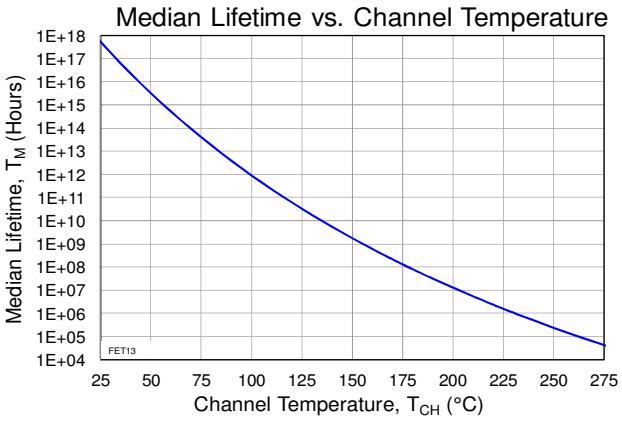
Specifications

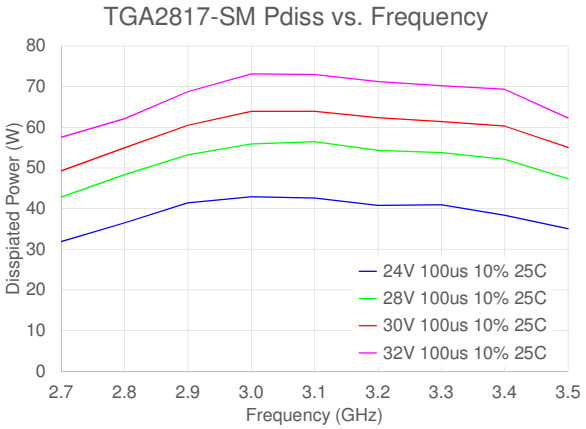
Thermal and Reliability Information

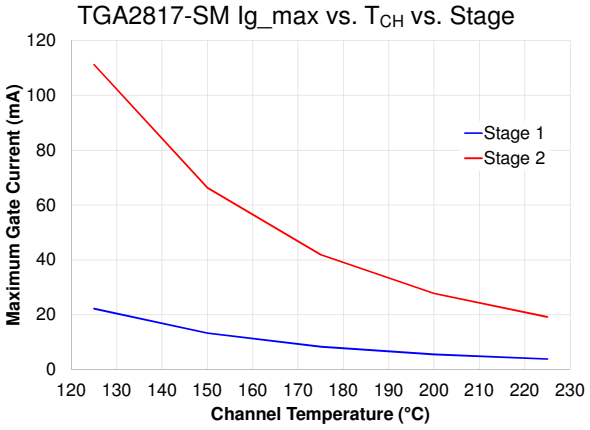
Parameter	Conditions	Value	Units
Thermal Resistance (θ_{JC}) (1)	T_{BASE} = 85°C, V_D = 28 V, I_D = 200 mA (quiescent DC, small signal), P_{DISS} = 6.4 W	1.094	°C/W
Channel Temperature (T_{CH})		92.0	°C
Median Lifetime (T_M)		2.90E+12	Hrs
Thermal Resistance (θ_{JC}) (1)	T_{BASE} = 85°C, V_D = 28 V, I_D = 4.5 A, P_{IN} = 24 dBm, P_{OUT} = 48.5 dBm, PW = 100 us, DC = 10%, P_{DISS} = 53 W	0.698	°C/W
Channel Temperature (T_{CH})		122.0	°C
Median Lifetime (T_M)		4.79E+10	Hrs
Thermal Resistance (θ_{JC}) (1)	T_{BASE} = 85°C, V_D = 32 V, I_D = 5.1 A, P_{IN} = 24 dBm, P_{OUT} = 49.4 dBm, PW = 100 us, DC = 10%, P_{DISS} = 74 W	0.716	°C/W
Channel Temperature (T_{CH})		138.0	°C
Median Lifetime (T_M)		6.85E+09	Hrs

Median Lifetime

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



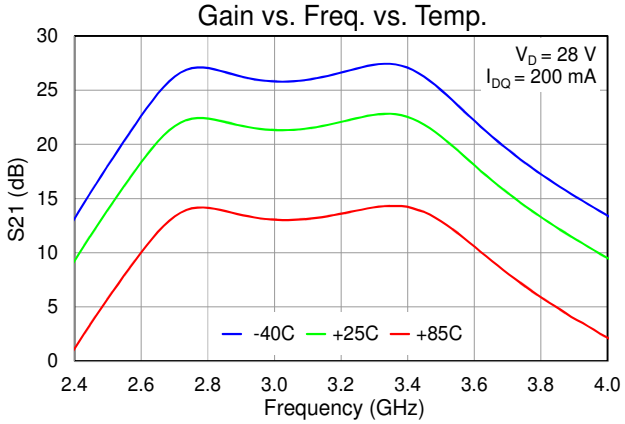




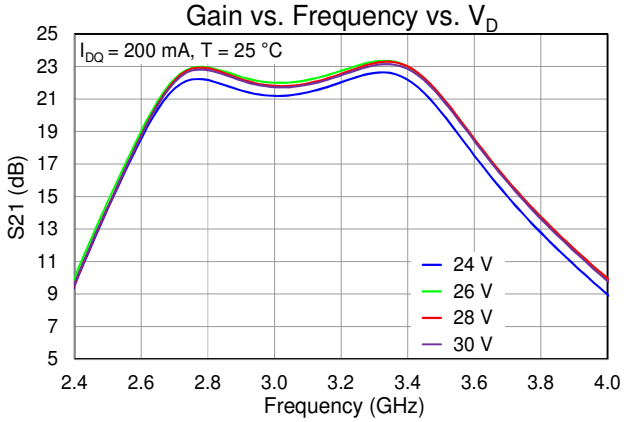
Typical Performance

Test conditions unless otherwise noted: Temp. = 25 ℃

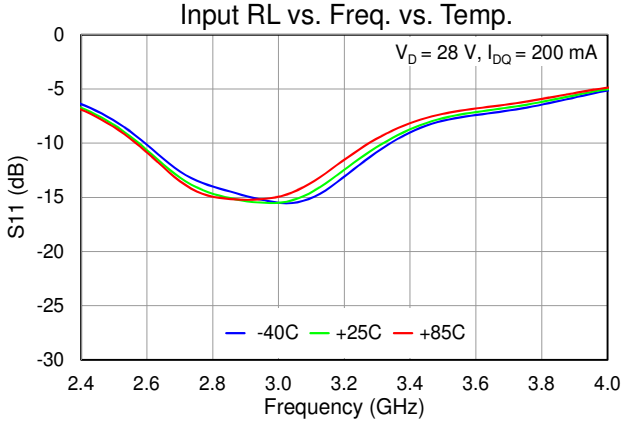
Gain vs. Freq. vs. Temp.



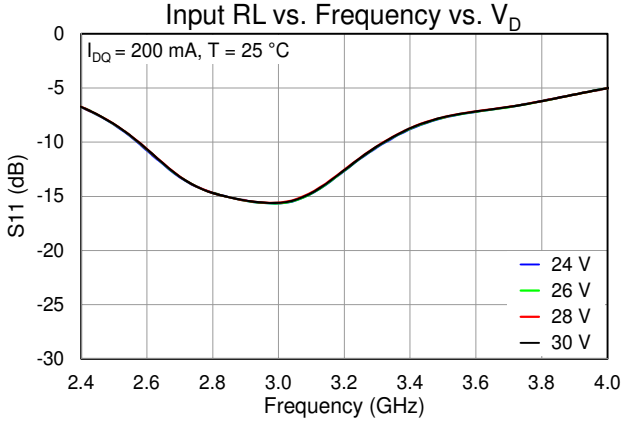
Gain vs. Frequency vs. V_D



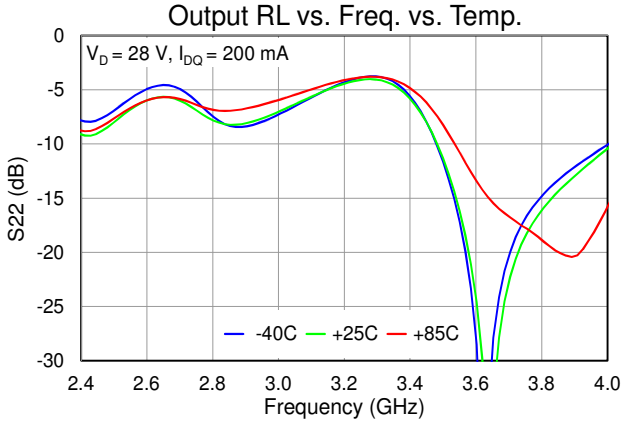
Input RL vs. Freq. vs. Temp.



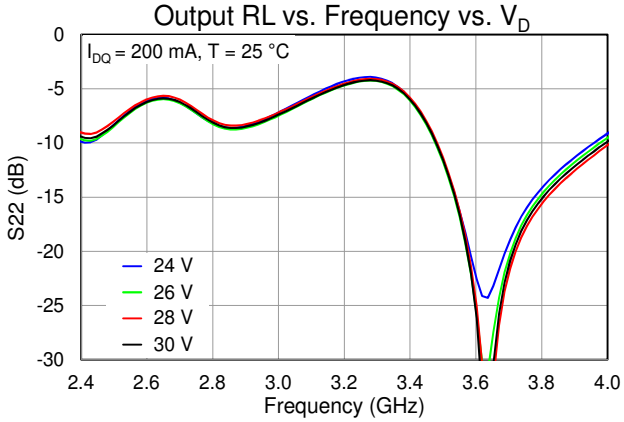
Input RL vs. Frequency vs. V_D



Output RL vs. Freq. vs. Temp.



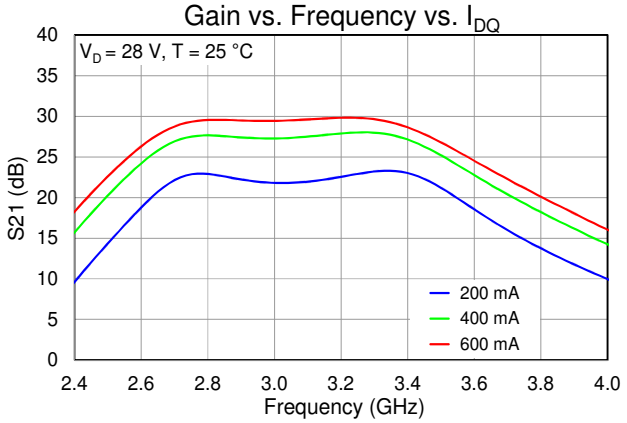
Output RL vs. Frequency vs. V_D



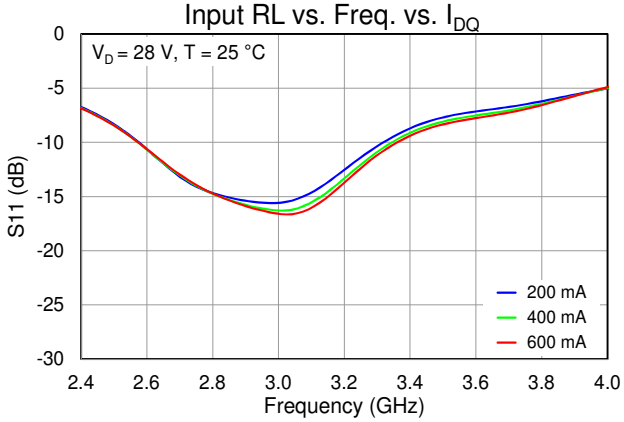
Typical Performance

Test conditions unless otherwise noted: Temp. = 25 ℃

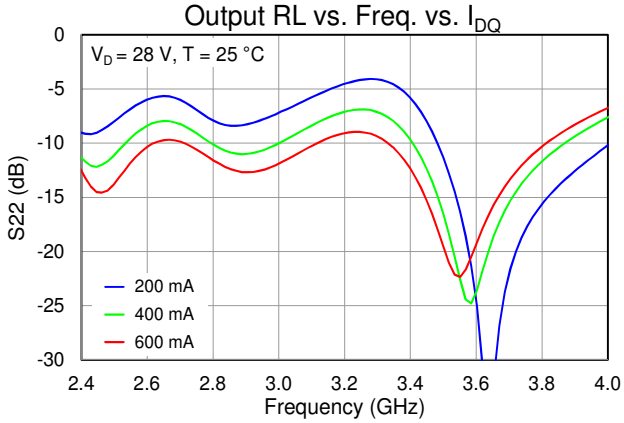
Gain vs. Frequency vs. I_{DQ}



Input RL vs. Freq. vs. I_{DQ}

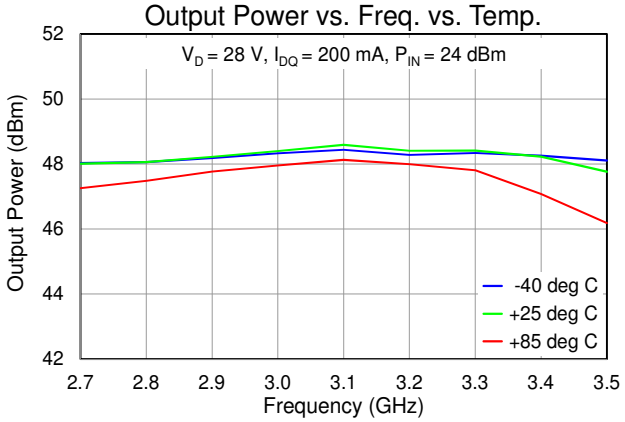


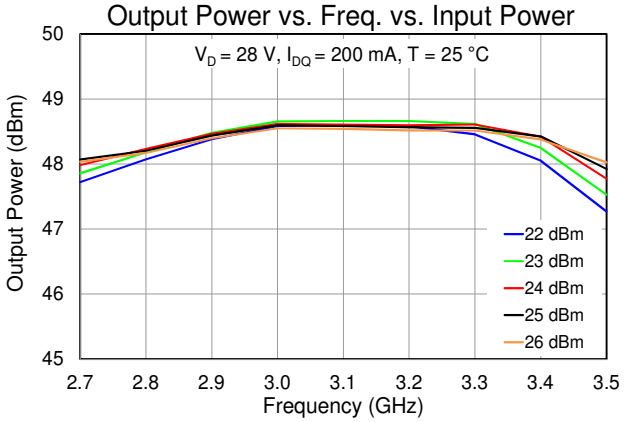
Output RL vs. Freq. vs. I_{DQ}

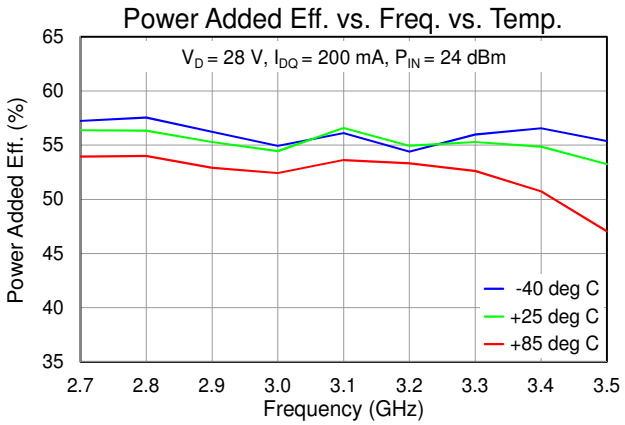


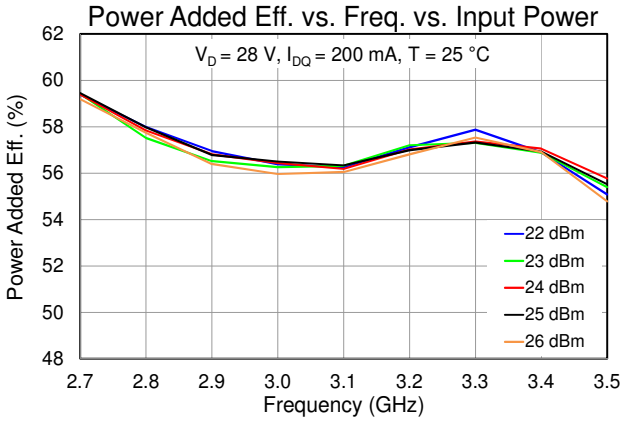
Typical Performance

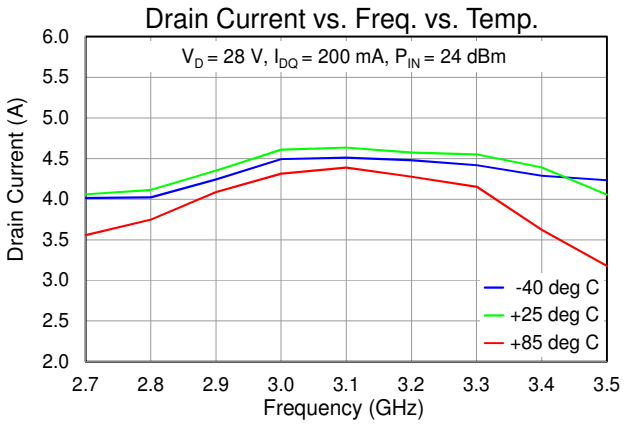
Test conditions unless otherwise noted: Temp. = 25 °C, Pulsed input power PW = 100 us, Duty Cycle = 10%

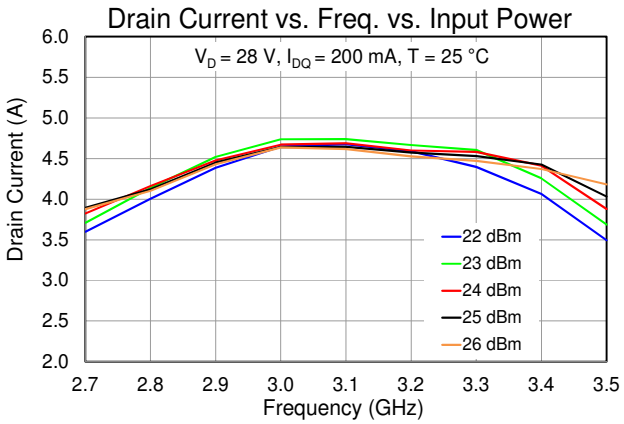








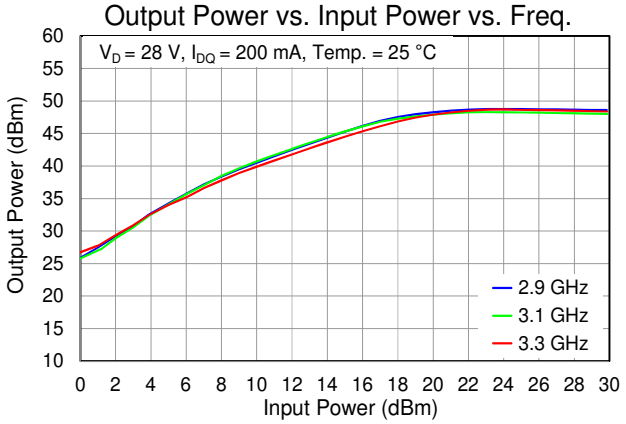




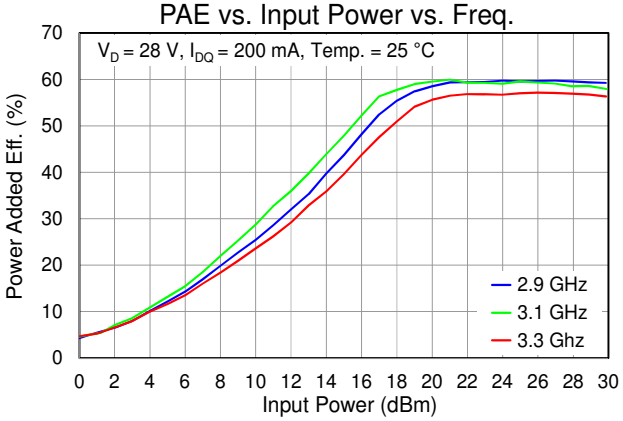
Typical Performance

Test conditions unless otherwise noted: Pulsed input power PW = 100 us, Duty Cycle = 10%

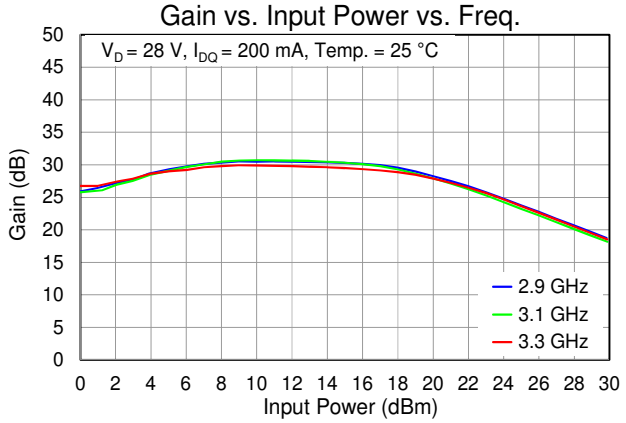
Output Power vs. Input Power vs. Freq.



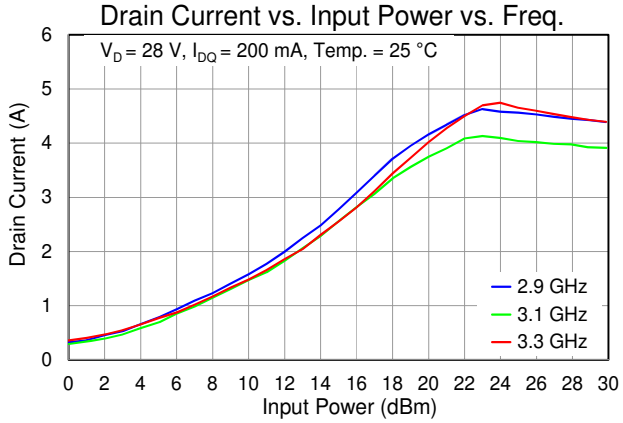
PAE vs. Input Power vs. Freq.



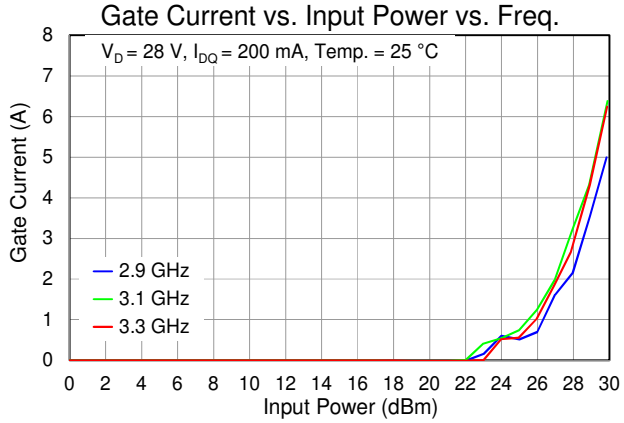
Gain vs. Input Power vs. Freq.



Drain Current vs. Input Power vs. Freq.



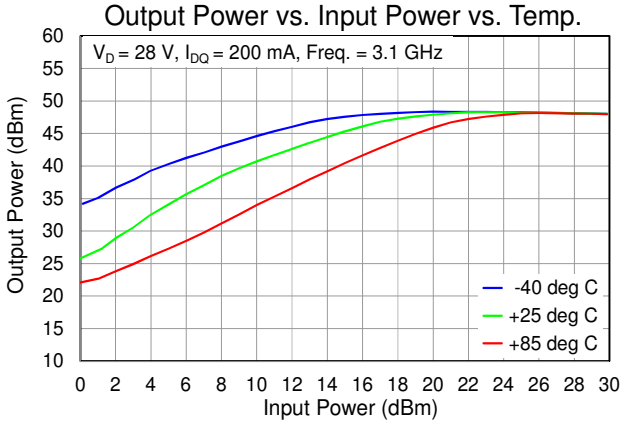
Gate Current vs. Input Power vs. Freq.



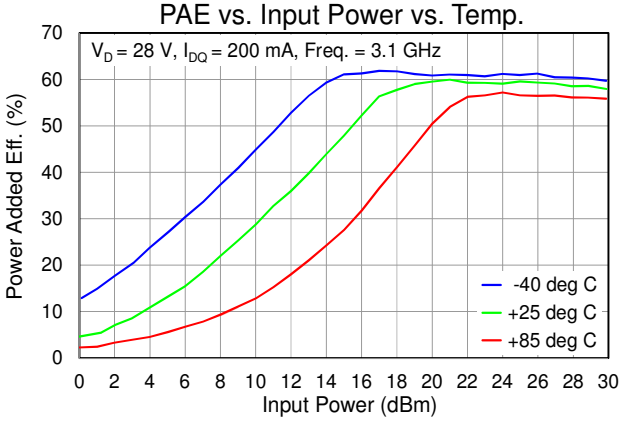
Typical Performance

Test conditions unless otherwise noted: Pulsed input power PW = 100 us, Duty Cycle = 10%

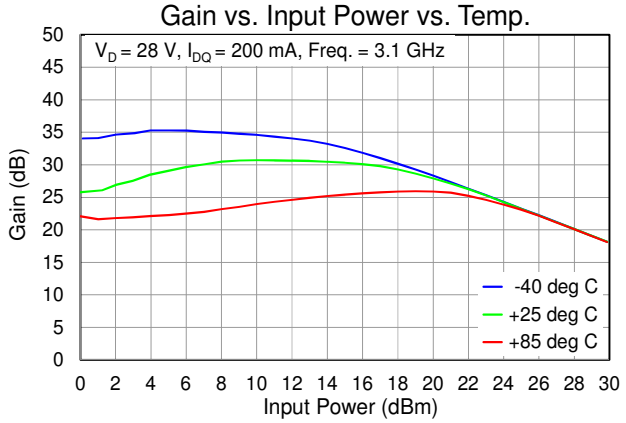
Output Power vs. Input Power vs. Temp.



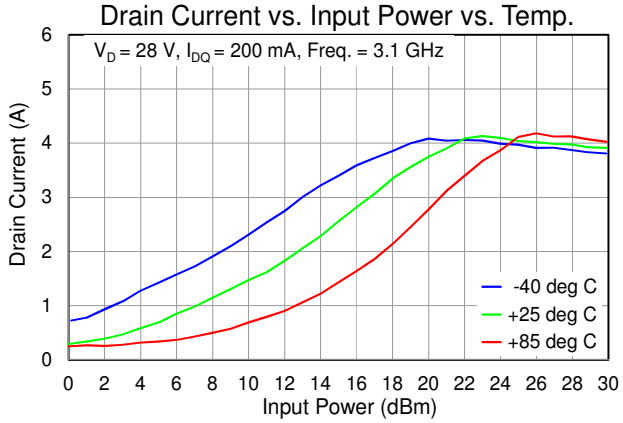
PAE vs. Input Power vs. Temp.



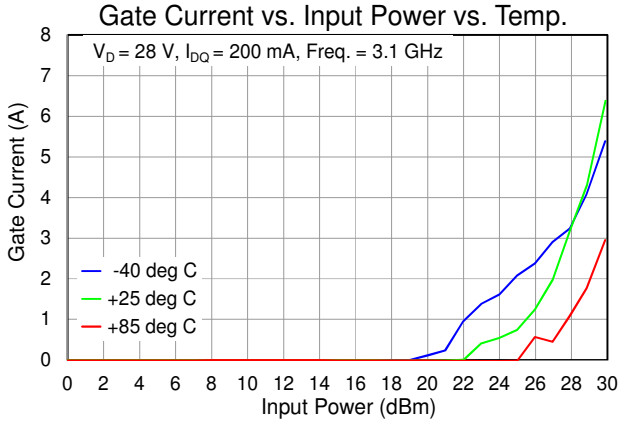
Gain vs. Input Power vs. Temp.



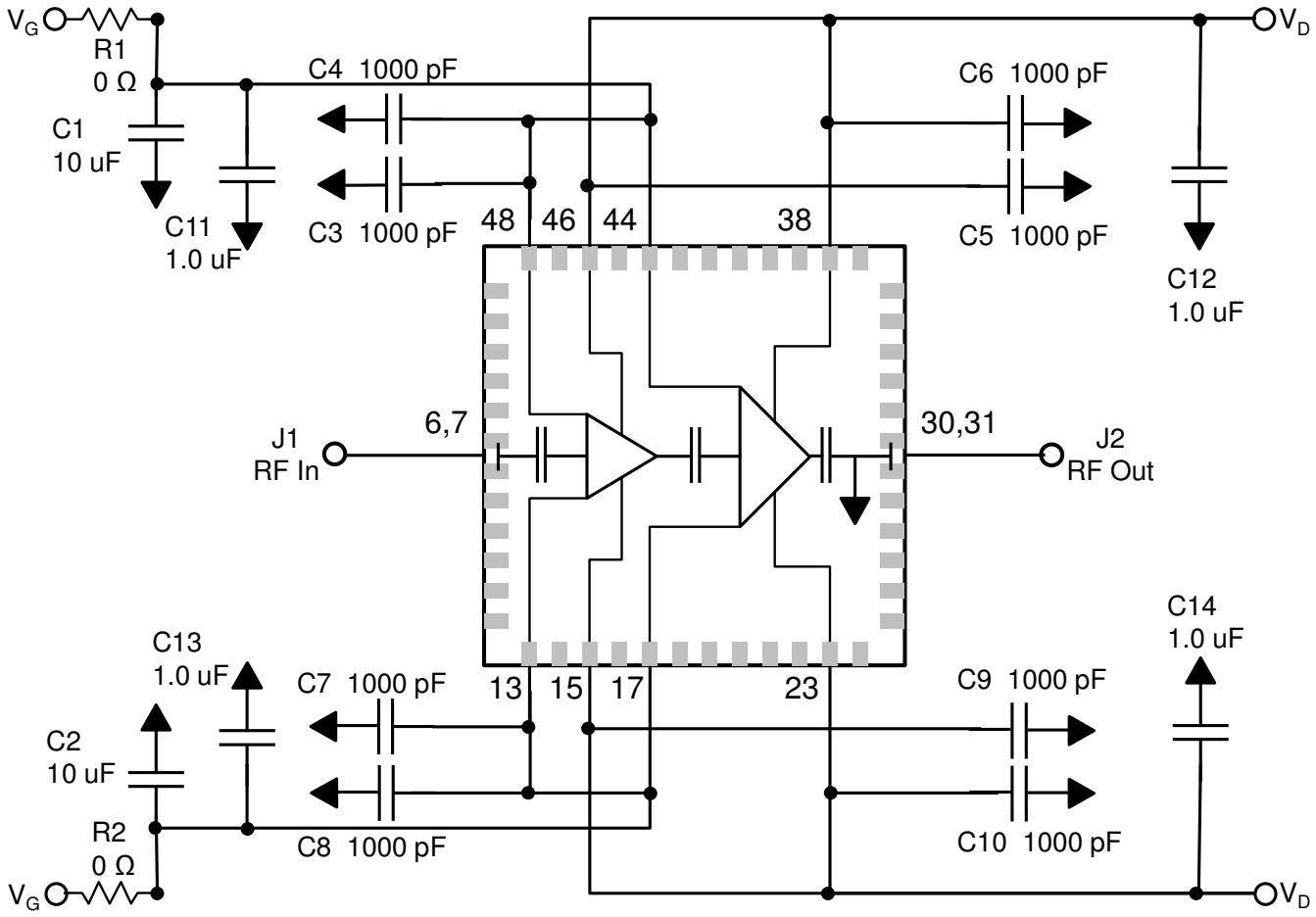
Drain Current vs. Input Power vs. Temp.



Gate Current vs. Input Power vs. Temp.



Application Circuit



Notes:

1. V_G and V_D must be biased from both sides (top and bottom).

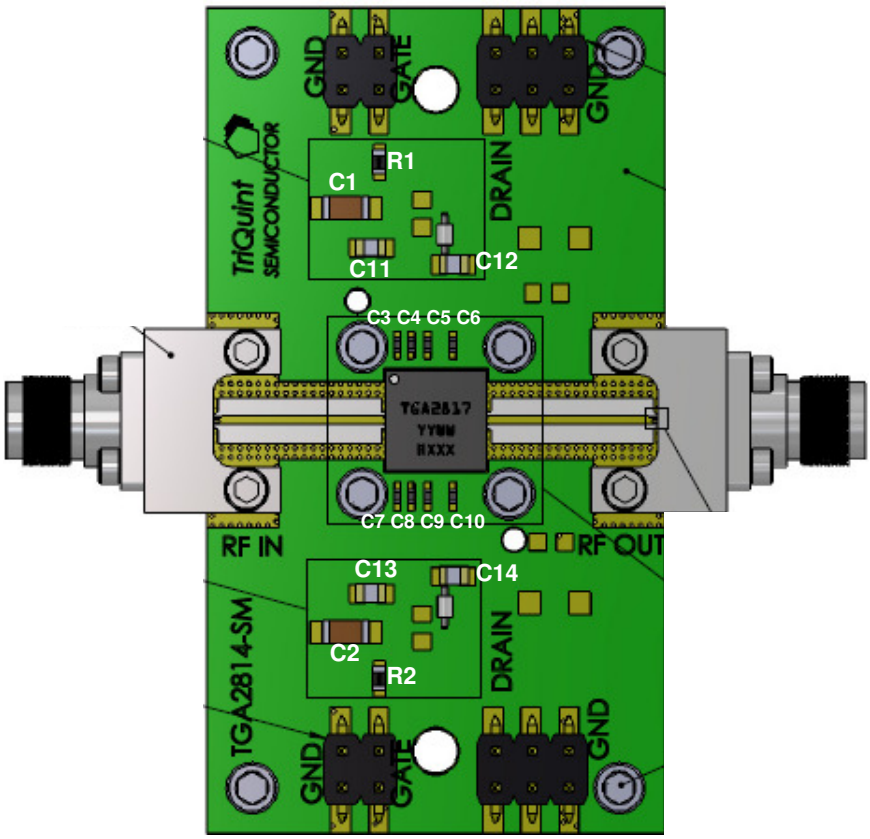
Bias-up Procedure

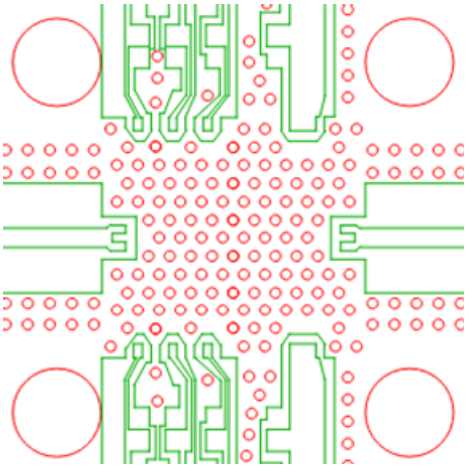
1. Set I_D limit to 6000mA, I_G limit to 40mA
2. Set V_G to -6.0 V
3. Set V_D +28 V
4. Adjust V_G more positive until I_{DQ} = 200mA (V_G ~ -2.8 V Typical)
5. Apply RF signal

Bias-down Procedure

1. Turn off RF signal
2. Reduce V_G to -6.0V. Ensure I_{DQ} ~ 0mA
3. Set V_D to 0V
4. Turn off V_D supply
5. Turn off V_G supply

Evaluation Board and Mounting Detail

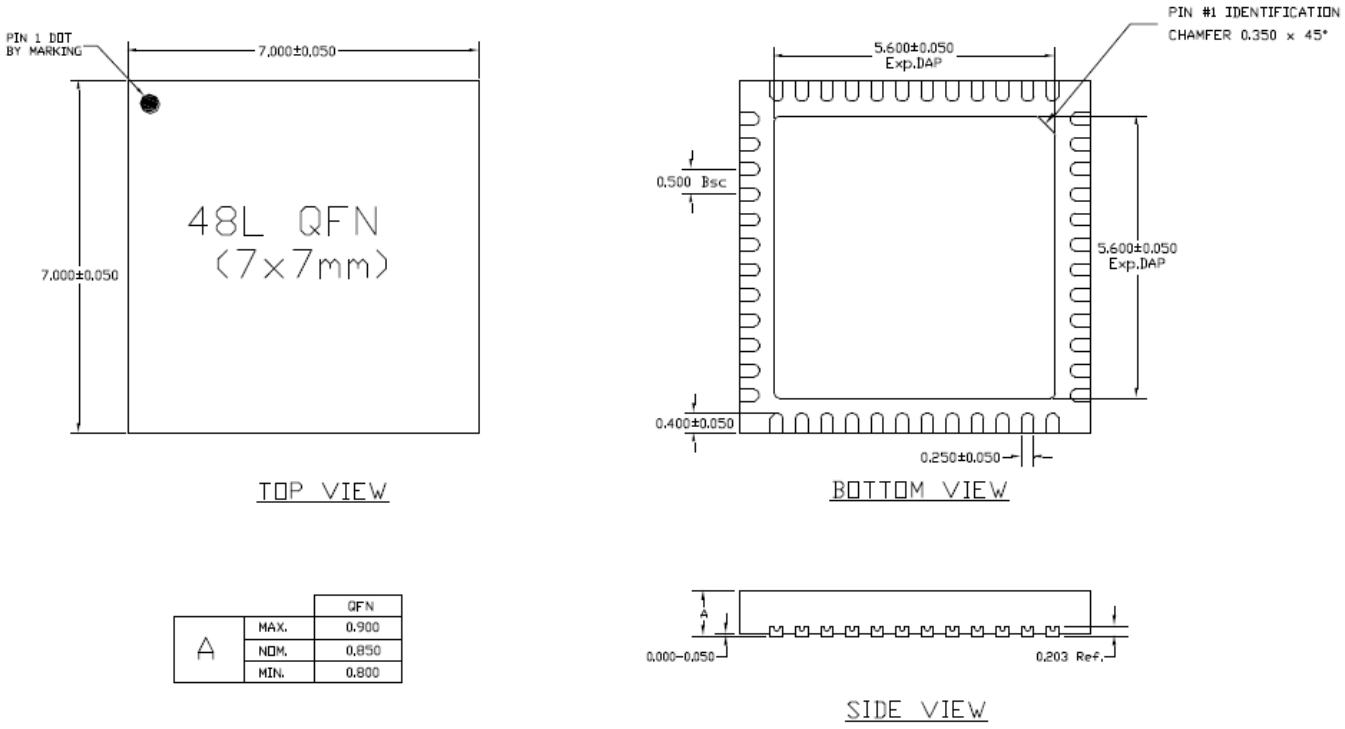




RF Layer is 0.008" thick Rogers Corp. RO40003C (ε_r = 3.35). Metal layers are 0.5 oz. copper. The microstrip line at the connector interface is optimized for the Southwest Microwave end launch connector 1092-02A-5.

Reference Des.	Component	Value	Manuf.	Part Number
C1, C2	Surface Mount Cap	10 uF, 20 %, 50 V (1206), X5R	Various	
C3 – C10	Surface Mount Cap	1000 pF, 10 %, 50 V (0402), X7R	Various	
C11 – C14	Surface Mount Cap	1.0 uF, 10 %, 25 V (0402), X7R	Various	
R1, R2	Surface Mount Res	0 Ohm, 5 % (0603)	Various	

Mechanical Drawing and Pad Description



		QFN
A	MAX.	0.900
	NOM.	0.850
	MIN.	0.800

Dimensions are in mm.

Pad No.	Symbol	Description
1-5, 8-12, 14, 16, 18-22, 24-29, 32-37, 39-43, 45, 47, 49	GND	Ground connection.
6, 7	RF Input	50 Ohm RF input. Pad is capacitively coupled to block on-chip DC voltages.
13, 48	V_{G1}	1st Stage Gate Voltage; bias network is required; must be biased from both sides (V_{G1} and V_{G2} can be tied together in application)
15, 46	V_{D1}	1st Stage Drain Voltage; bias network is required; must be biased from both sides (V_{D1} and V_{D2} can be tied together in application)
17, 44	V_{G2}	2nd Stage Gate Voltage; bias network is required; must be biased from both sides (V_{G1} and V_{G2} can be tied together in application)
23, 38	V_{D2}	2nd Stage Drain Voltage; bias network is required; must be biased from both sides (V_{D1} and V_{D2} can be tied together in application)
30, 31	RF Output	50 Ohm RF output. Pad is capacitively coupled to block on-chip DC voltages. Pad is DC grounded.

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

MSL Rating

MSL Rating: Level 3
Test: 260℃ convection reflow
Standard: JEDEC Standard IPC/JEDEC J-STD-020

ECCN

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

Solderability

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

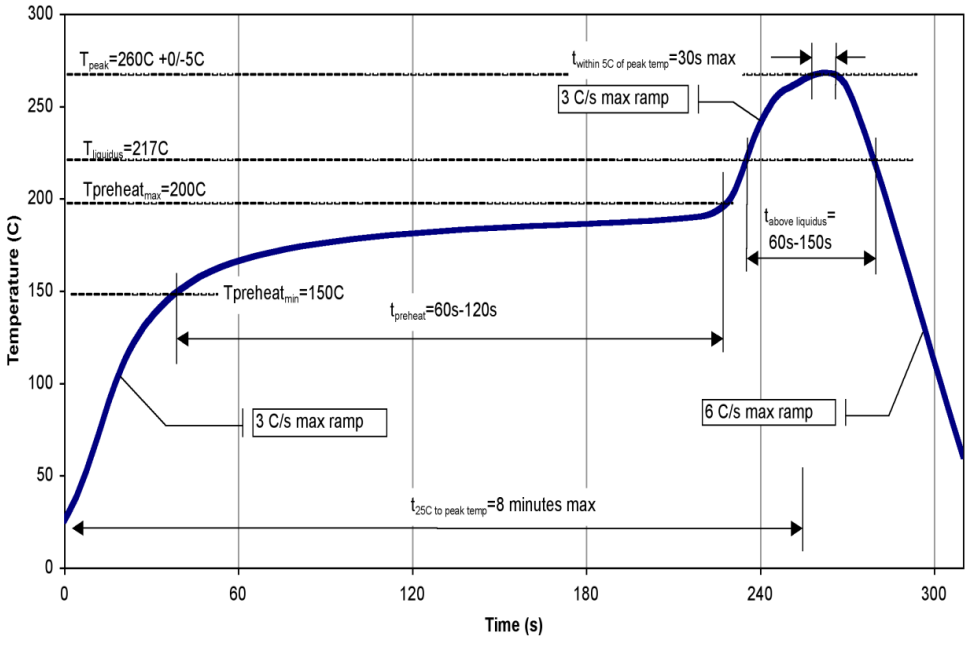
RoHS-Compliance

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

Recommended Soldering Temperature Profile



Contact Information

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Email: info-sales@tqs.com **Fax:** +1.972.994.8504

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

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