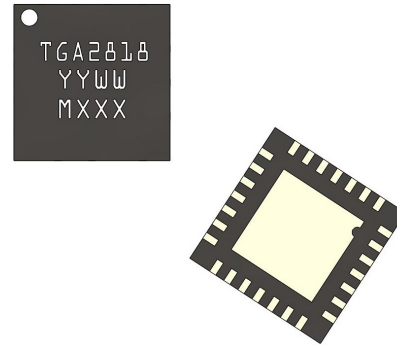


### Applications

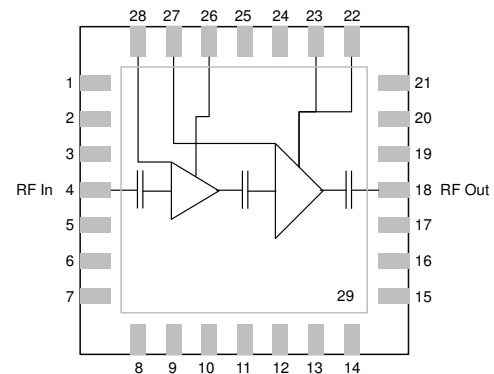
- Military Radar
- Civilian Radar
- Wideband Amplifiers



### Product Features

- Frequency Range: 2.8 - 3.7 GHz
- Pout: > 45.5 dBm (Pin=27 dBm)
- Large Signal Gain: > 18.0 dB (Pin=27 dBm)
- PAE: > 47 % (Pin=27 dBm)
- Bias:  $V_D=28$  V,  $I_{DQ}=200$  mA,  $V_G=-2.65$  V (Typ)
- Package Dimensions: 6.0 x 6.0 x 0.85 mm

### Functional Block Diagram



### General Description

TriQuint's TGA2818-SM is a high-power, S-band amplifier fabricated on TriQuint's TQGaN25 0.25um GaN on SiC production process. Covering 2.8-3.7 GHz, the TGA2818-SM provides greater than 45.5 dBm of saturated output power and greater than 18.0 dB of large-signal gain while achieving greater than 47 % power added efficiency.

The TGA2818-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 TGA2818-SM is matched to 50 ohms. It is ideal for use in both commercial and military radar systems.

Lead-free and RoHS compliant.

Evaluation boards available on request.

### Pad Configuration

Pad Number	Symbol
4	RF Input
18	RF Output
22, 23	$V_{D2}$
26	$V_{D1}$
27	$V_{G2}$
28	$V_{G1}$

### Ordering Information

Part	ECCN	Description
TGA2818-SM	EAR99	S-Band 30 W GaN Power Amplifier
TGA2818-SM_EVB	EAR99	TGA2818-SM Evaluation Board

### Absolute Maximum Ratings

Parameter	Value
Drain Voltage ( $V_D$ )	40 V
Drain Current ( $I_{D1}/I_{D2}$ )	0.6 / 2.7A
Gate Current ( $I_{G\_MAX}$ )	See graph
Dissipated Power ( $P_{DISS}$ )	60 W
Input Power: 50 $\Omega$ , 85 °C	33 dBm
Input Power: 3:1 VSWR, 85 °C	33 dBm
Channel Temperature, $T_{CH}$	275 °C
Storage Temperature	-55 to 150 °C

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, $I_D$ )	3.0 A
Gate Voltage	-2.65 V

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	2.8		3.7	GHz
Output Power (@ 27 dBm $P_{IN}$ )		> 45.5		dBm
Large Signal Gain (@ 27 dBm $P_{IN}$ )		> 18.0		dB
Power Added Efficiency (@ 27 dBm $P_{IN}$ )		> 47.0		%
Input Return Loss		> 15.0		dB
Output Return Loss		> 9.0		dB
Output Power Temperature Coefficient		-0.004		dBm/°C

### Specifications

#### Thermal and Reliability Information

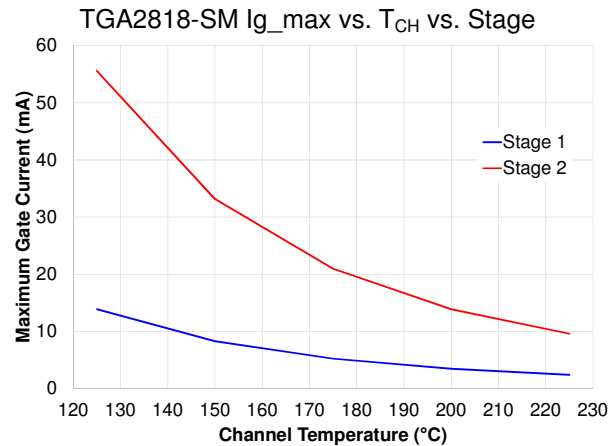
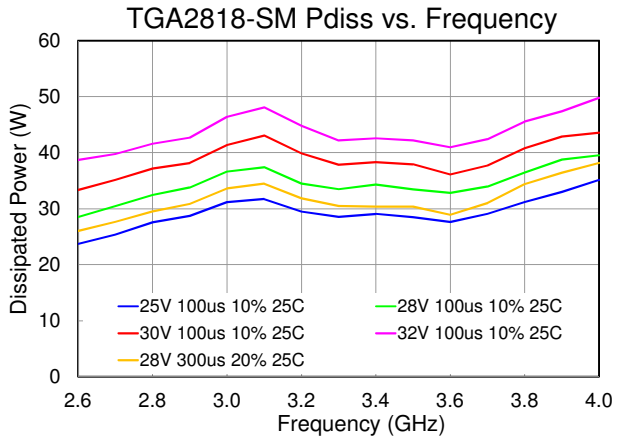
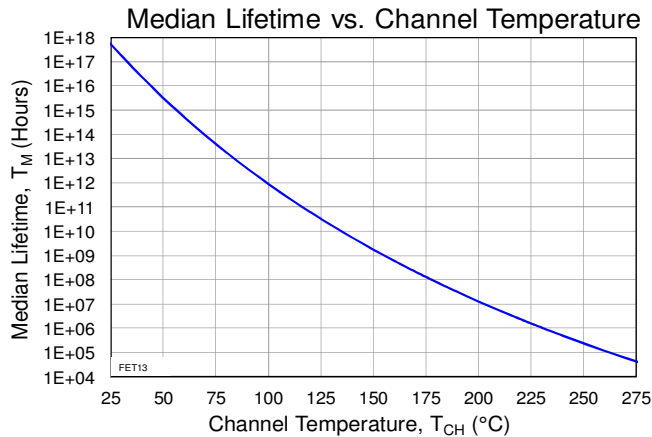
Parameter	Conditions	Value	Units
Thermal Resistance ( $\theta_{JC}$ ) <sup>(1)</sup>	$T_{BASE} = 85^{\circ}\text{C}$ , $V_D = 28\text{ V}$ , $I_{DQ} = 0.20\text{ A}$ , no RF applied, $P_{DISS} = 5.6\text{ W}$ (quiescent)	3.57	$^{\circ}\text{C/W}$
Channel Temperature ( $T_{CH}$ )		105	$^{\circ}\text{C}$
Median Lifetime ( $T_M$ )		$4.52\text{E}+11$	Hrs
Thermal Resistance ( $\theta_{JC}$ ) <sup>(1)</sup>	$T_{BASE} = 85^{\circ}\text{C}$ , $V_D = 28\text{ V}$ , $I_D = 2.40\text{ A}$ , $P_{IN} = 27\text{ dBm}$ , $P_{OUT} = 45.0\text{ dBm}$ , $PW = 100\text{ us}$ , $DC = 10\%$ , $P_{DISS} = 35.6\text{ W}$	1.26	$^{\circ}\text{C/W}$
Channel Temperature ( $T_{CH}$ )		130	$^{\circ}\text{C}$
Median Lifetime ( $T_M$ )		$178\text{E}+10$	Hrs
Thermal Resistance ( $\theta_{JC}$ ) <sup>(1)</sup>	$T_{BASE} = 85^{\circ}\text{C}$ , $V_D = 28\text{ V}$ , $I_D = 2.28\text{ A}$ , $P_{IN} = 27\text{ dBm}$ , $P_{OUT} = 44.9\text{ dBm}$ , $PW = 300\text{ us}$ , $DC = 20\%$ , $P_{DISS} = 33.2\text{ W}$	1.62	$^{\circ}\text{C/W}$
Channel Temperature ( $T_{CH}$ )		139	$^{\circ}\text{C}$
Median Lifetime ( $T_M$ )		$6.09\text{E}+09$	Hrs

Notes:

- Thermal resistance is determined from the channel to the back of the package (fixed  $85^{\circ}\text{C}$ ).

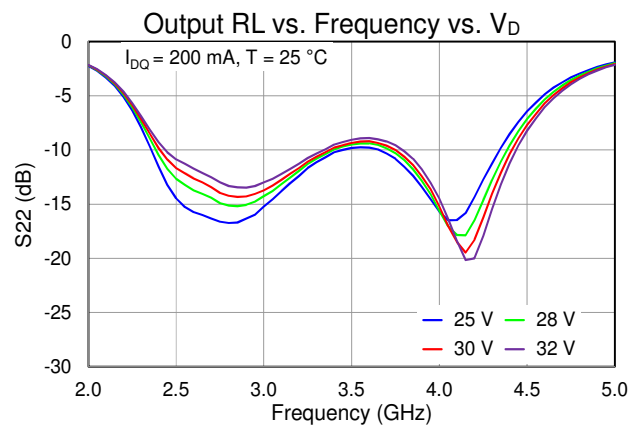
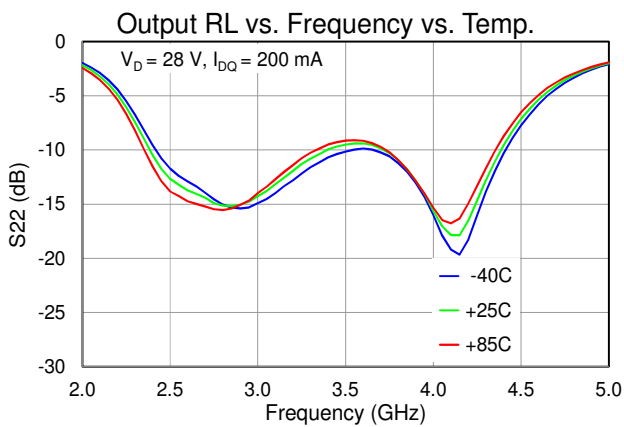
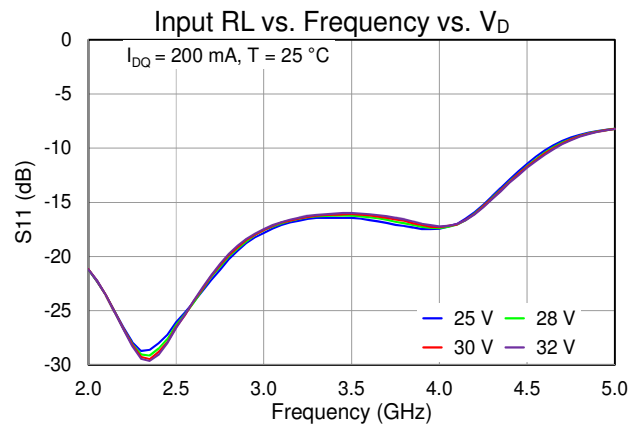
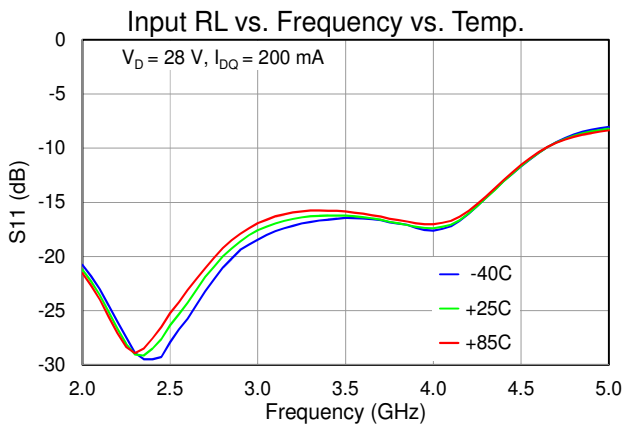
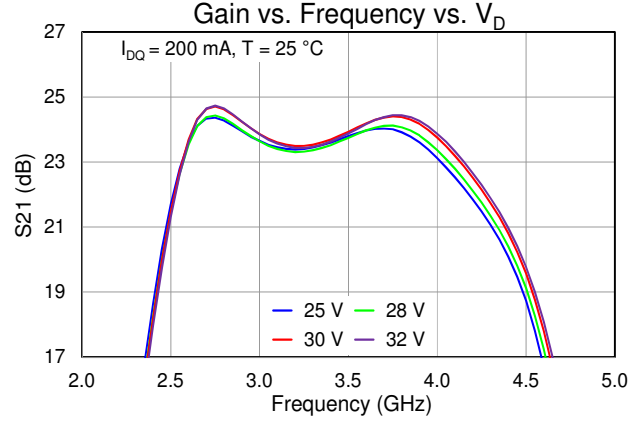
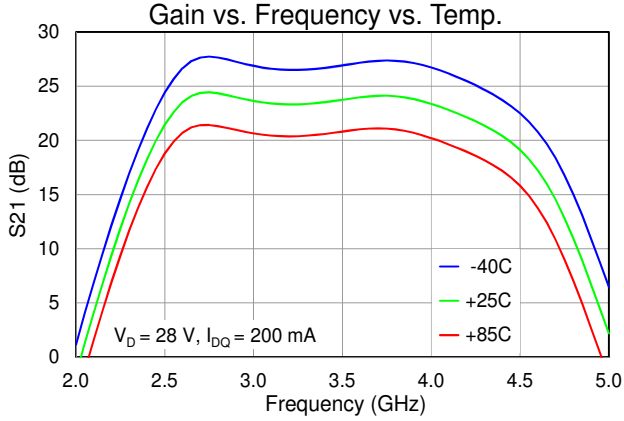
### Median Lifetime

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



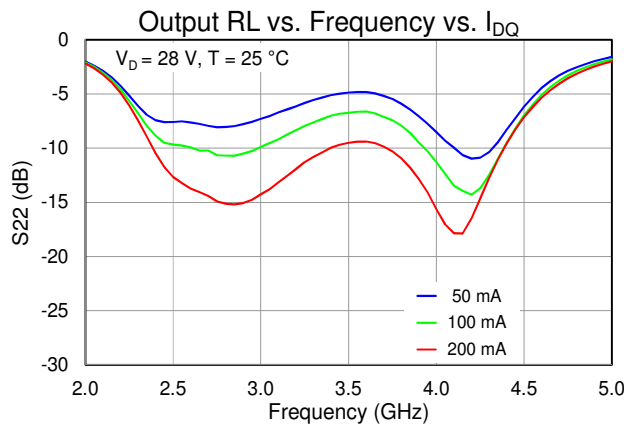
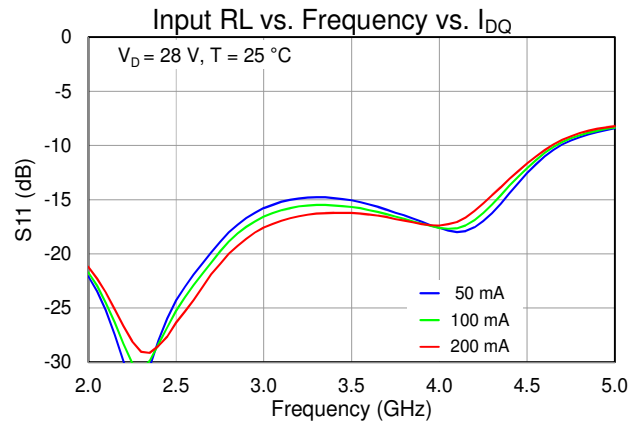
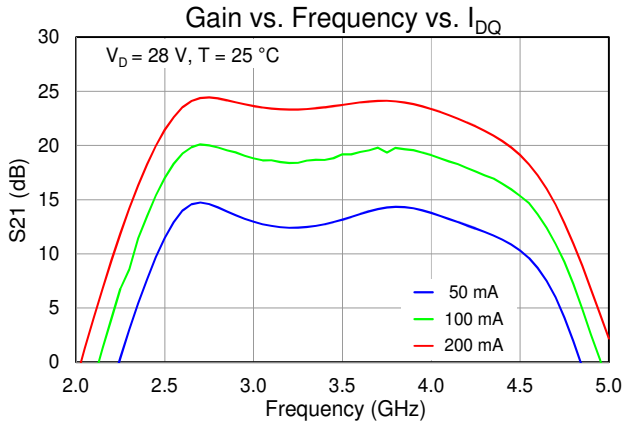
**Typical Performance – Small Signal**

Test conditions unless otherwise noted: Temp. = 25 °C



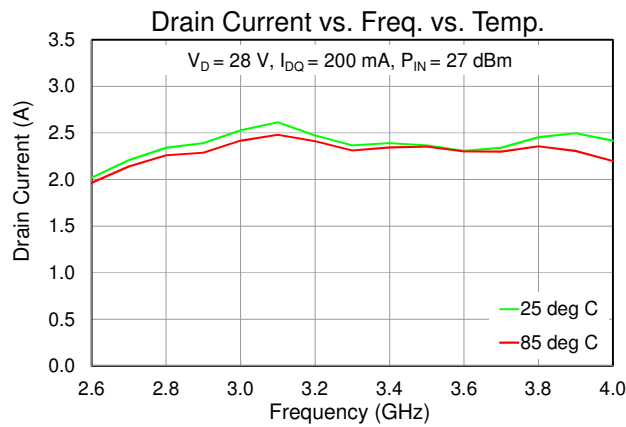
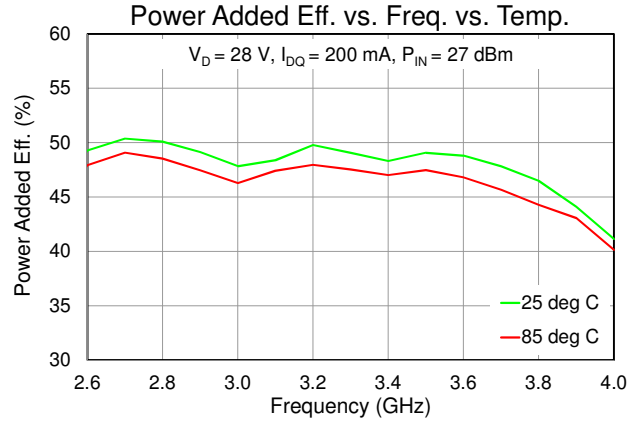
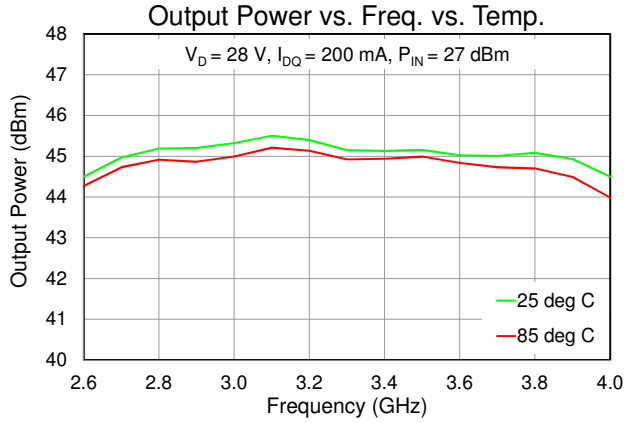
**Typical Performance – Small Signal**

Test conditions unless otherwise noted: Temp. = 25 °C



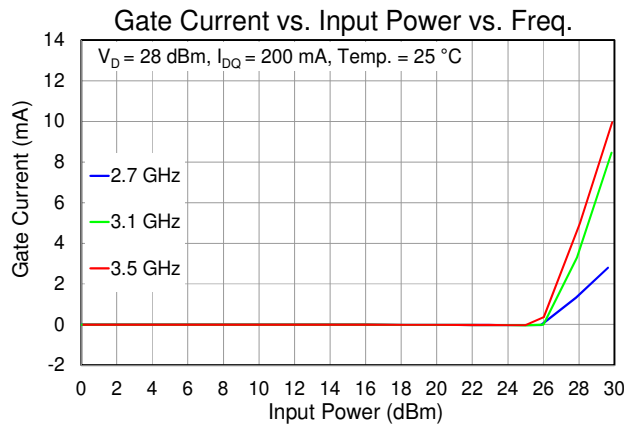
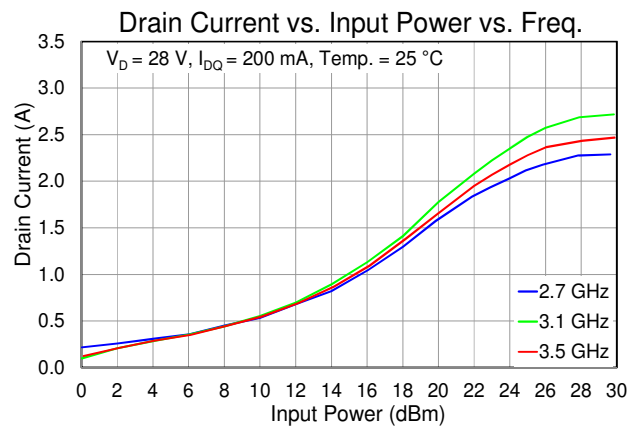
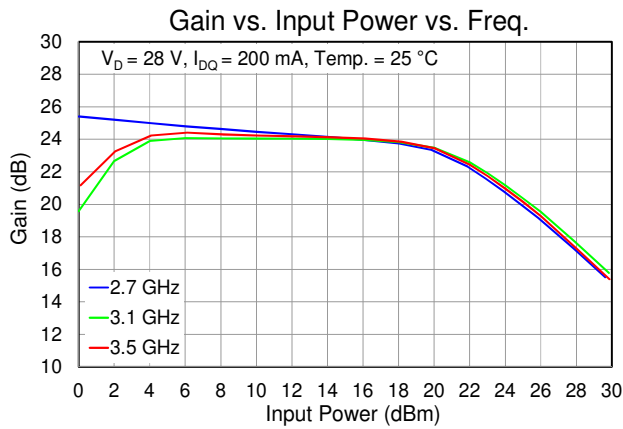
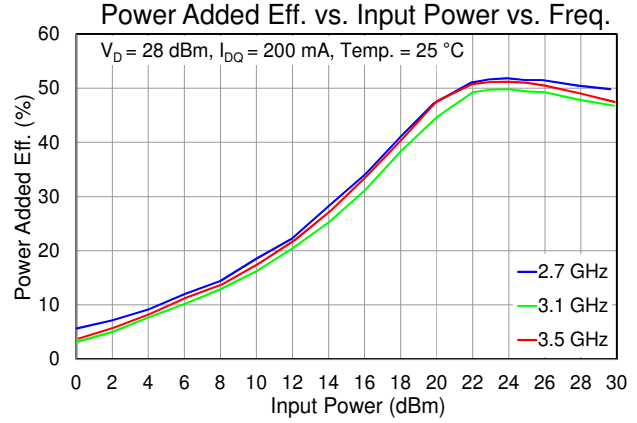
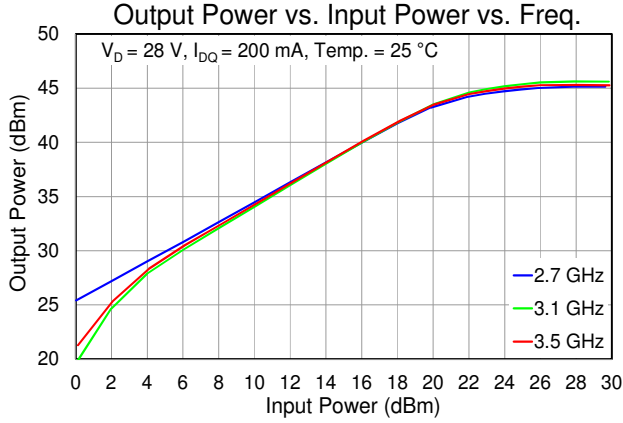
**Typical Performance – Large Signal**

Test conditions unless otherwise noted: Pulse parameters: PW = 100 us, Duty Cycle = 10%



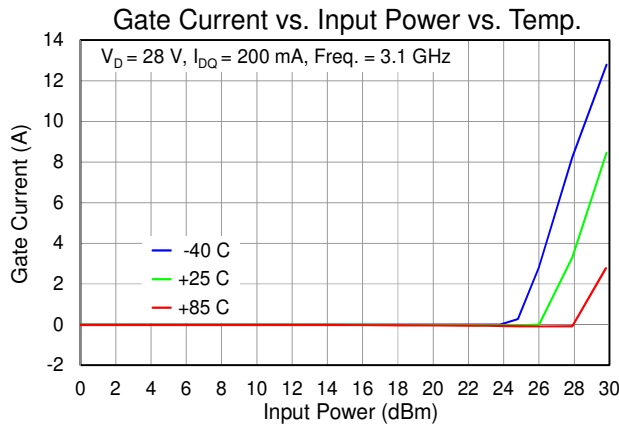
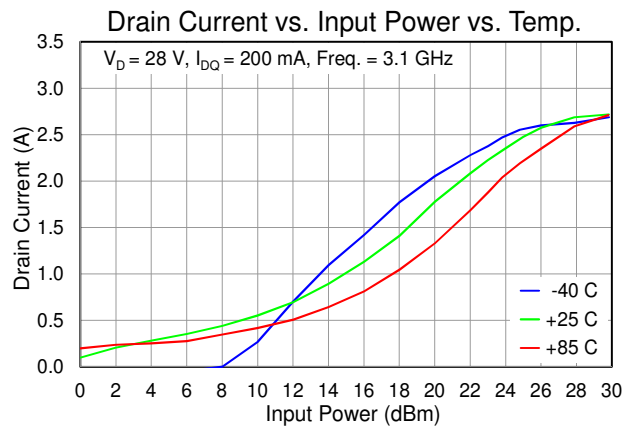
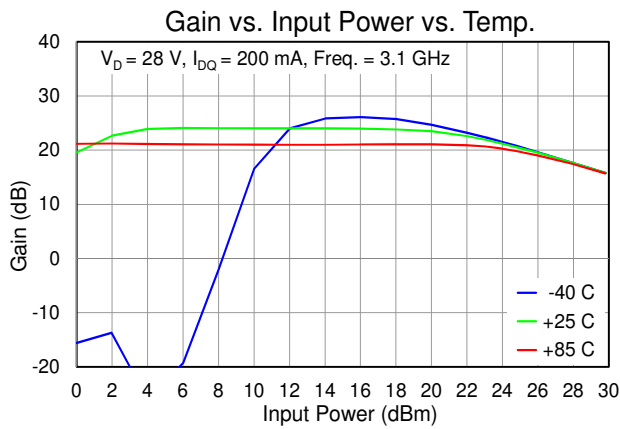
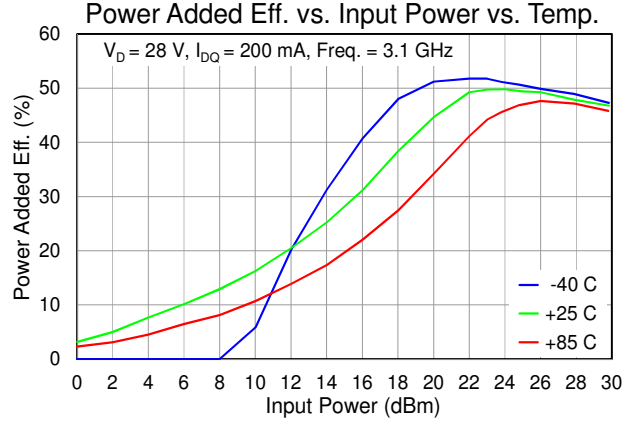
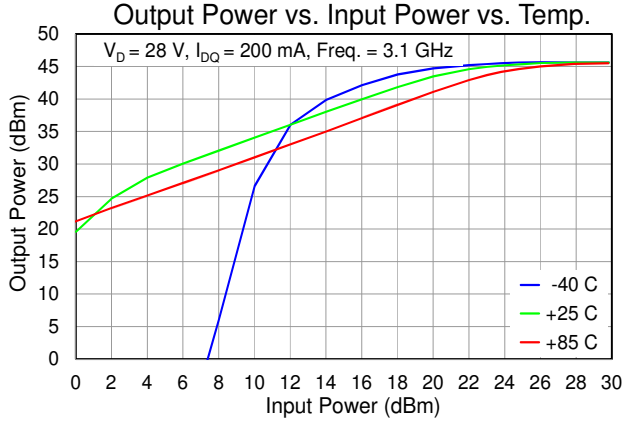
**Typical Performance – Large Signal**

Test conditions unless otherwise noted: Pulse parameters: PW = 100 us, Duty Cycle = 10%



**Typical Performance – Large Signal**

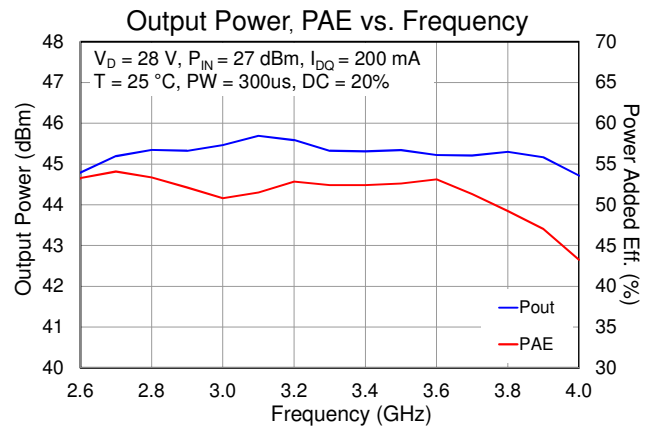
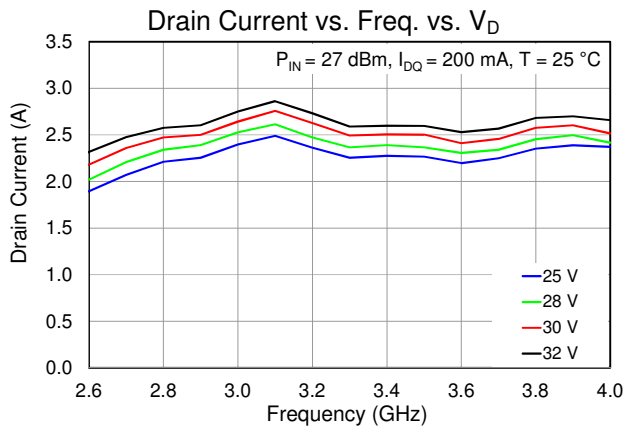
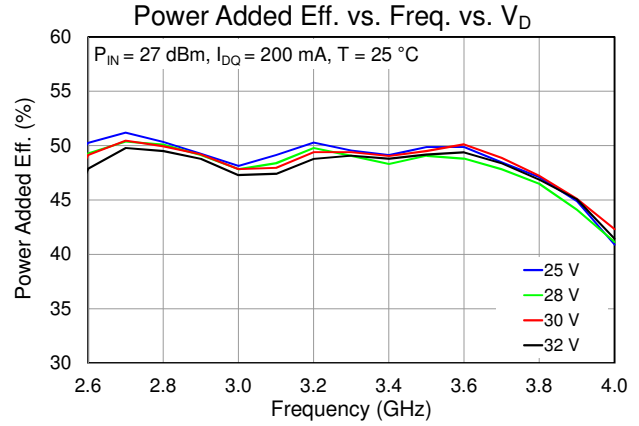
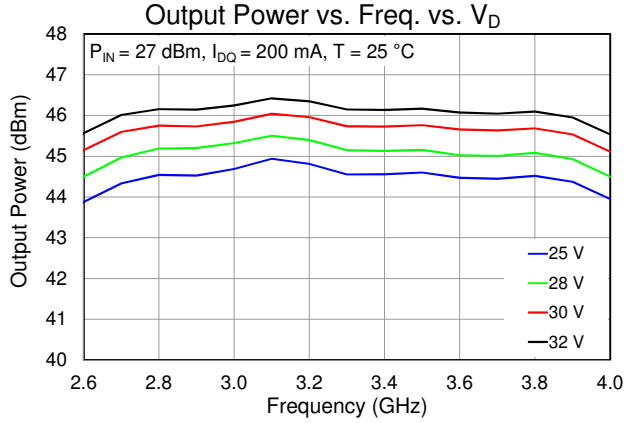
Test conditions unless otherwise noted: Pulse parameters: PW = 100 us, Duty Cycle = 10%



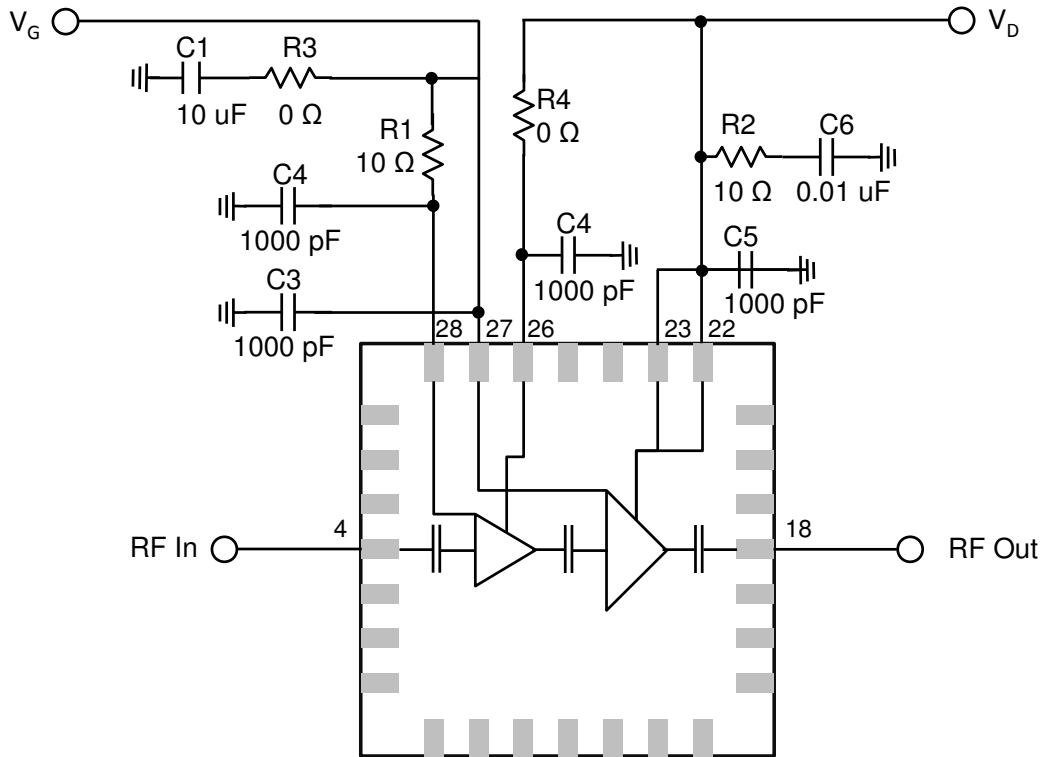


### Typical Performance – Large Signal

Test conditions unless otherwise noted: Pulse parameters: PW = 100 us, Duty Cycle = 10%



**Application Circuit**



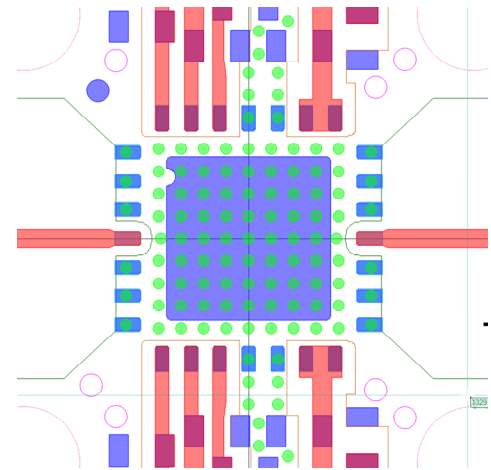
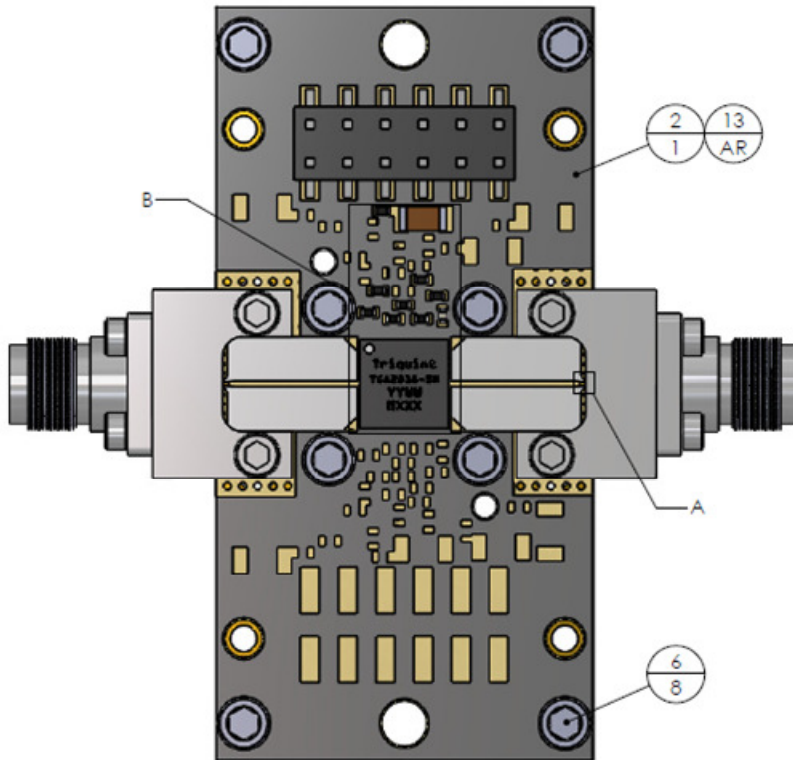
**Bias-up Procedure**

1. Set  $I_D$  limit to 3000 mA,  $I_G$  limit to 18 mA
2. Set  $V_G$  to -5.0 V
3. Set  $V_D$  +28 V
4. Adjust  $V_G$  more positive until  $I_{DQ} = 200\text{mA}$  ( $V_G \sim -2.65\text{ V}$  Typical)
5. Apply RF signal

**Bias-down Procedure**

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

## Evaluation Board and Mounting Detail

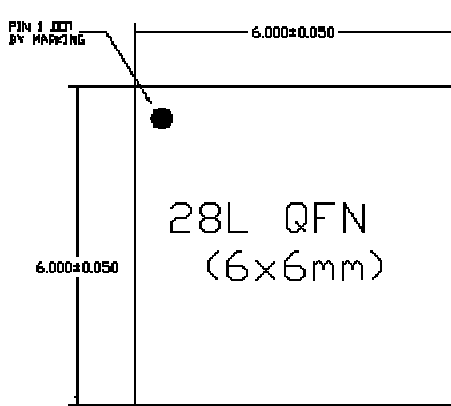


Mounting Detail

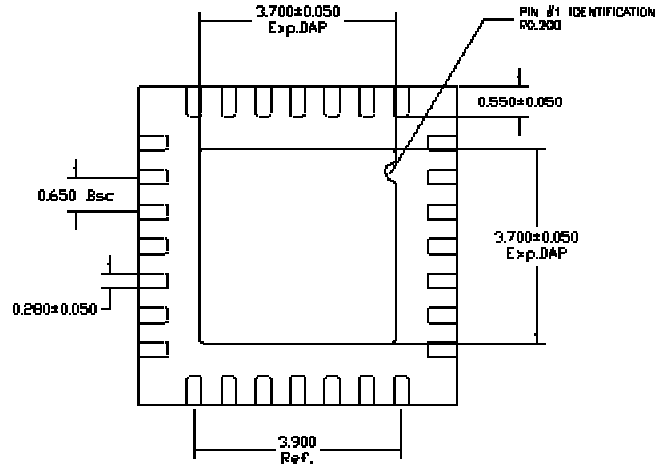
RF Layer is 0.008" thick Rogers Corp. RO40003C ( $\epsilon_r = 3.35$ ). Metal layers are 0.5 oz. copper. The microstrip line at the connector interface is optimized for the Southwest Microwave end launch connector 1092-02A-5.

Reference Des.	Component	Value	Manuf.	Part Number
C1	Surface Mount Cap	10 uF, 20%, 50 V, X5R (1206)	Various	
C2-C5	Surface Mount Cap	1000 pF, 10%, 100 V, X7R (0402)	Various	
C6	Surface Mount Cap	0.01 uF, 10%, 50 V, X7R, (0402)	Various	
R1 – R2	Surface Mount Res	10 Ohms, 5% (0402)	Various	
R3 – R4	Surface Mount Res	0 Ohms, 5% (0402)	Various	

## Mechanical Drawing and Bond Pad Description

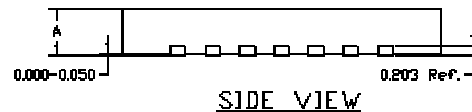


TOP VIEW



BOTTOM VIEW

A	QFN	
	MAX.	0.900
	MIN.	0.850



SIDE VIEW

Pin No.	Symbol	Description
1-3,5-7,11-12,15-17, 19-21, 24-25, 29	GND	Pads grounded on EVB; center pad connected to GND, no connection in package to GND for other pads
4	RF Input	50 Ohm RF input. Pad is capacitively coupled to block on-chip DC voltages.
8-10, 13-14	NC	No connection in package to GND; connect pads to GND for general PCB layout
18	RF Output	50 Ohm RF output. Pad is capacitively coupled to block on-chip DC voltages. Pad is DC grounded.
22, 23	V <sub>D2</sub>	2 <sup>nd</sup> Stage Drain Voltage; bias network is required (see recommended Application Circuit)
26	V <sub>D1</sub>	1 <sup>st</sup> Stage Drain Voltage; bias network is required (see recommended Application Circuit)
27	V <sub>G2</sub>	2 <sup>nd</sup> Stage Gate Voltage; bias network is required (see recommended Application Circuit)
28	V <sub>G1</sub>	1 <sup>st</sup> Stage Gate Voltage; bias network is required (see recommended Application Circuit)

**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.

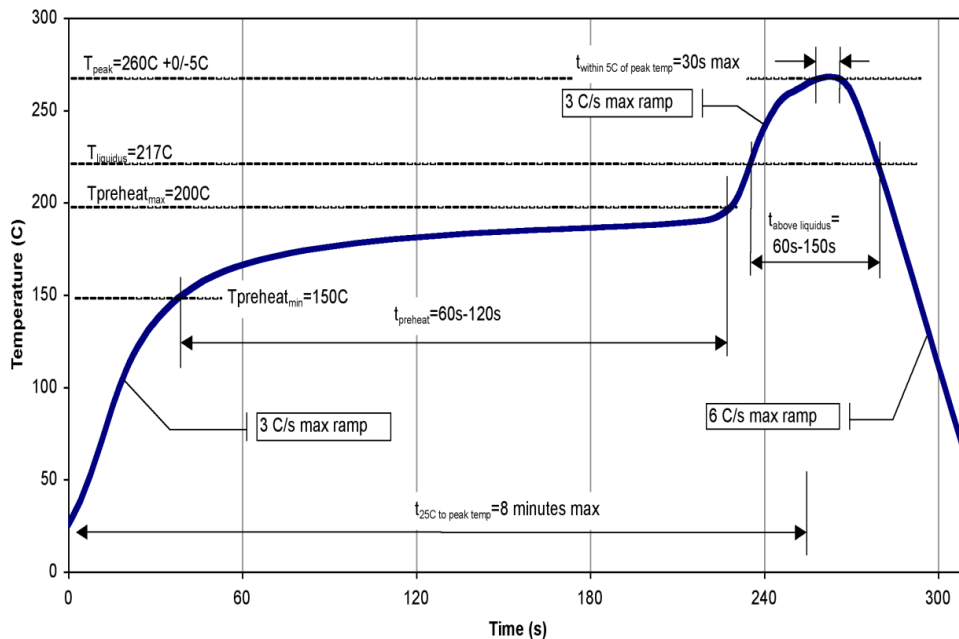
**RoHS-Compliance**

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 (C15H12Br4O2) Free
- PFOS Free
- SVHC Free

**Recommended Soldering Temperature Profile**



## Contact Information

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

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**Email:** [info-sales@tqs.com](mailto:info-sales@tqs.com)      **Fax:** +1.972.994.8504

For technical questions and application information:      **Email:** [info-products@tqs.com](mailto:info-products@tqs.com)

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