



TGA2817-SM

S-Band 60 W GaN Power Amplifier

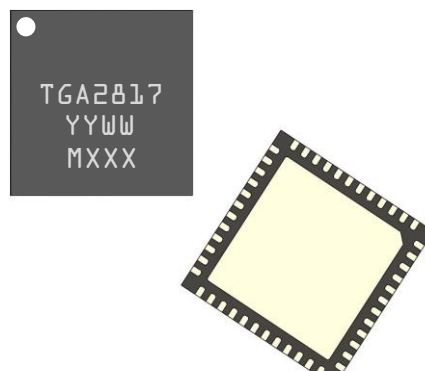
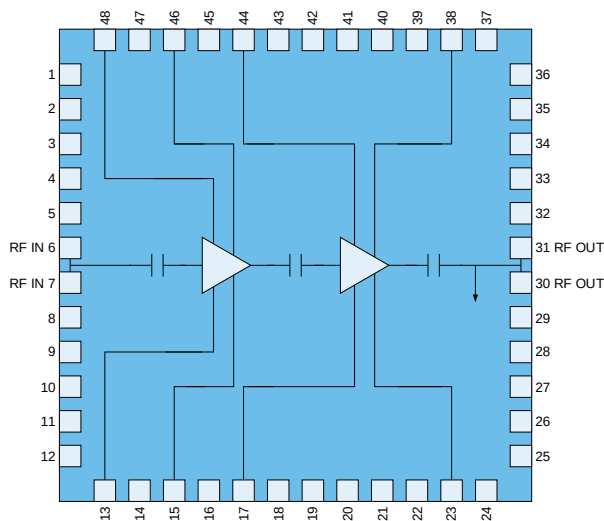
General Description

Qorvo's TGA2817-SM is a high-power, S-band amplifier fabricated on Qorvo's TQGaN25 0.25 μm 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

Functional Block Diagram



Product Features

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

Applications

- Military Radar
- Commercial Radar

Ordering Information

Part	Description
TGA2817-SM	S-Band 60 W GaN Power Amplifier
TGA2817-SM_EVB	TGA2817-SM Evaluation Board

Absolute Maximum Ratings

Parameter	Value/Range
Drain Voltage (V_D)	40 V
Drain Current (I_{D1}/I_{D2})	1.4 / 5.8 A
Gate Current (I_G)	See graph, page 8
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
Soldering Temperature	260 °C
Storage Temperature	-55 to 150 °C

Notes:

1. Based on die performance.

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

Electrical Specifications

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

Parameter	Condition	Min	Typical	Max	Units
Operational Frequency		2.9		3.5	GHz
Output Power ($P_{IN} = 24$ dBm)	2.9 GHz	47.2	48		dBm
	3.1 GHz	47.2	48		dBm
	3.3 GHz	47.4	48		dBm
Power Added Efficiency ($P_{IN} = 24$ dBm)	2.9 GHz	49.5	54		%
	3.1 GHz	48.0	54		%
	3.3 GHz	47.0	54		%
Large Signal Gain ($P_{IN} = 24$ dBm)			24		dB
Input Return Loss			>8		dB
Gate Leakage ($V_D = 10$ V, $V_G = -3.7$ V)		-30.6	-0.46	-0.0001	mA
Output Power Temperature Coefficient			-0.006		dBm/°C

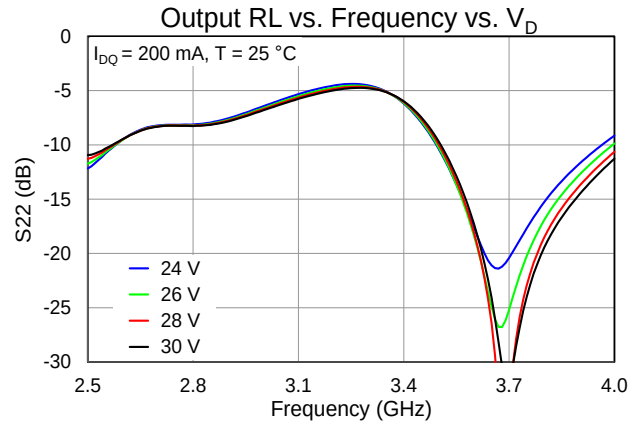
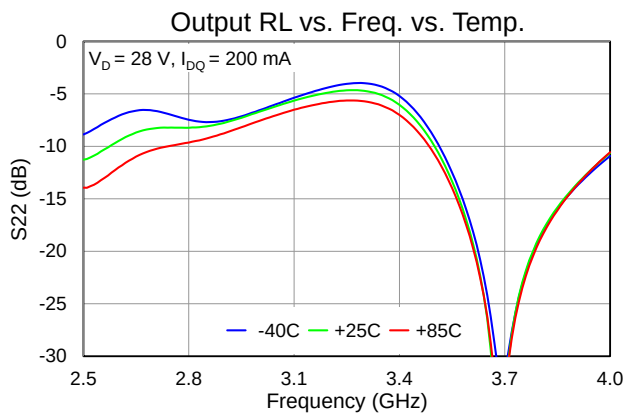
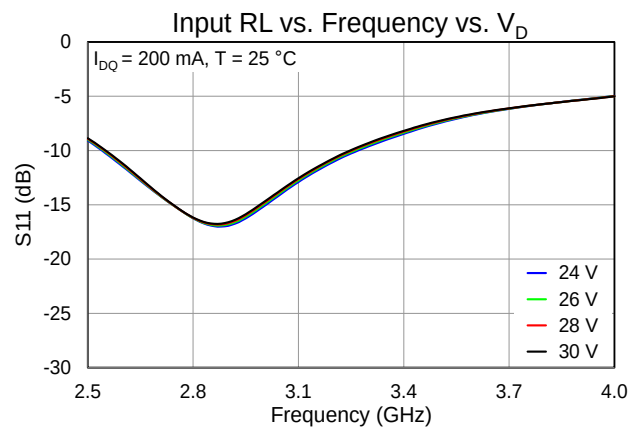
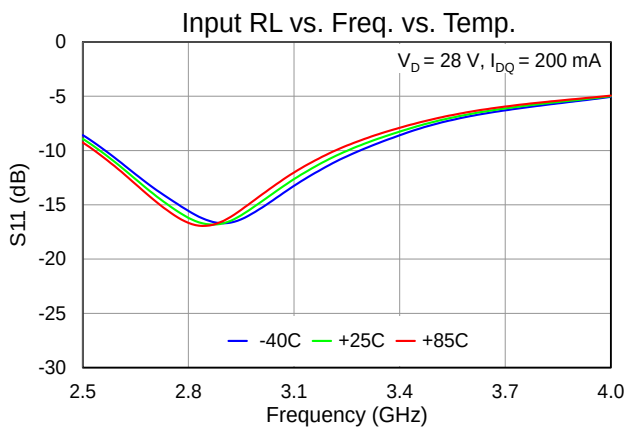
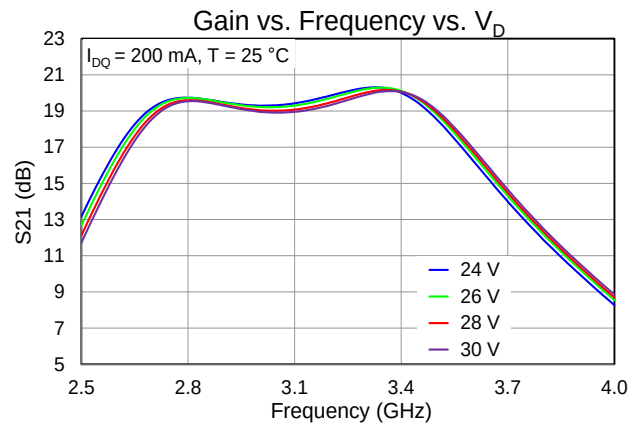
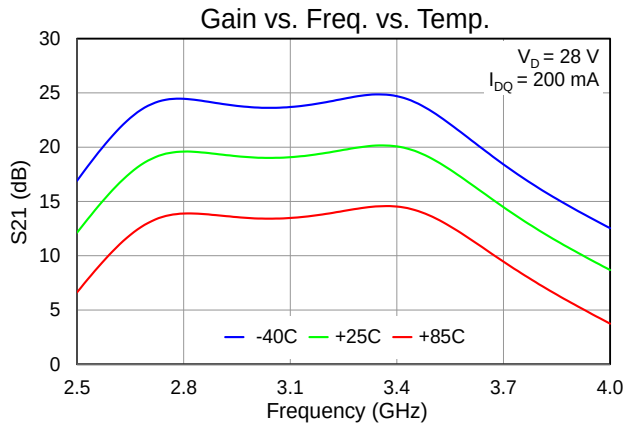
Recommended Operating Conditions

Parameter	Value/Range
Drain Voltage (V_D)	28 V
Drain Current (quiescent, I_{DQ})	200 mA
Drain Current (under drive, I_{D_DRIVE})	4.6 A
Gate Voltage Range (V_G)	-2.8 to -2.0 V
Operating Temperature	-40 to 85 °C

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

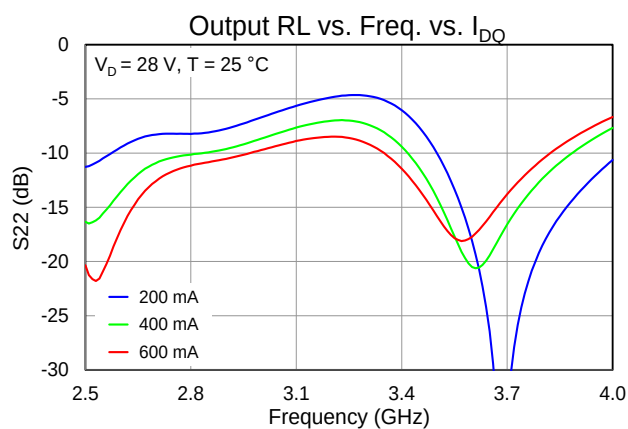
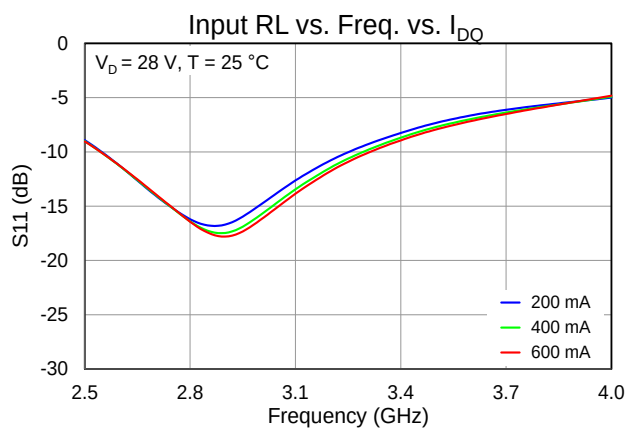
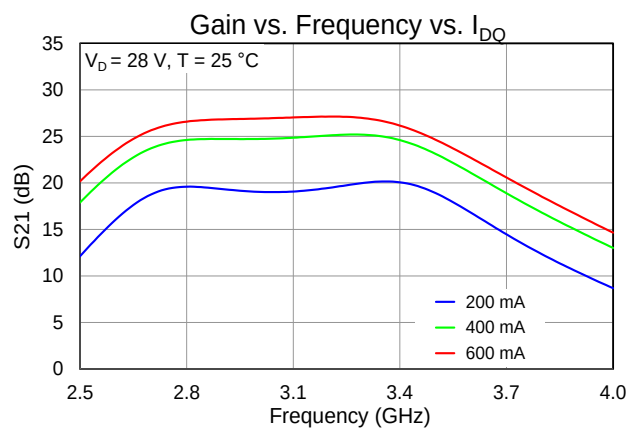
Typical Performance

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



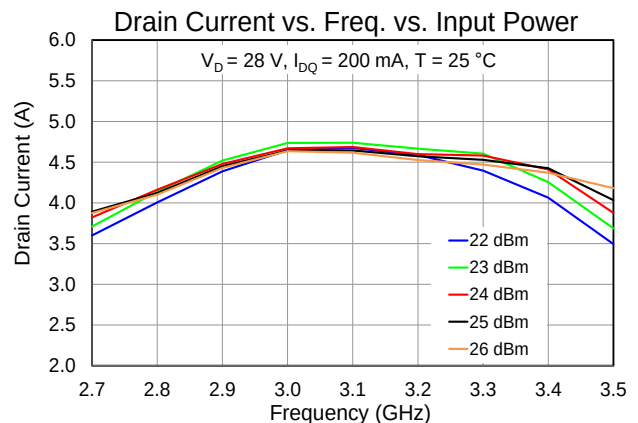
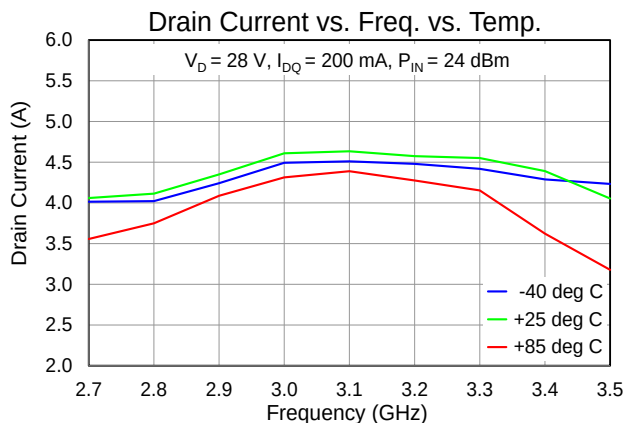
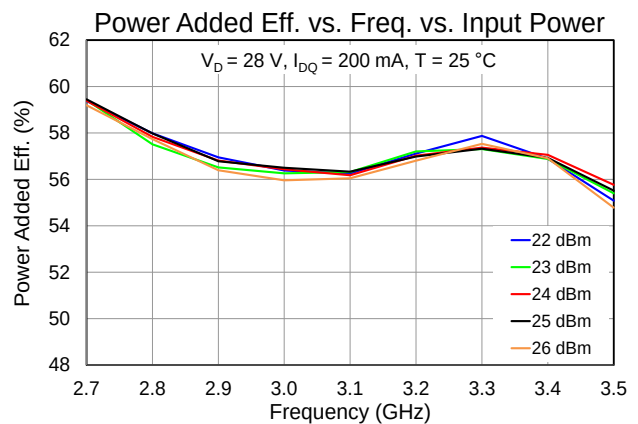
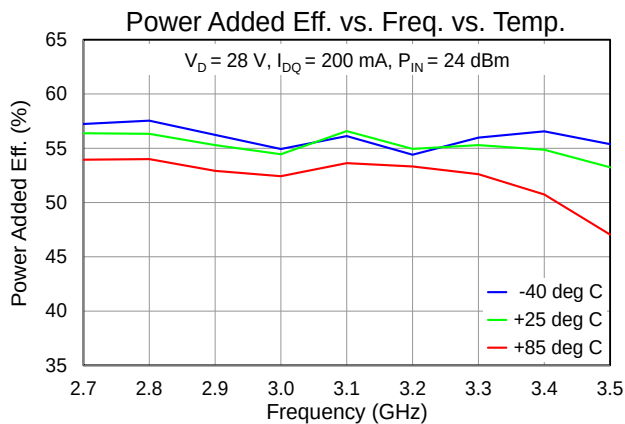
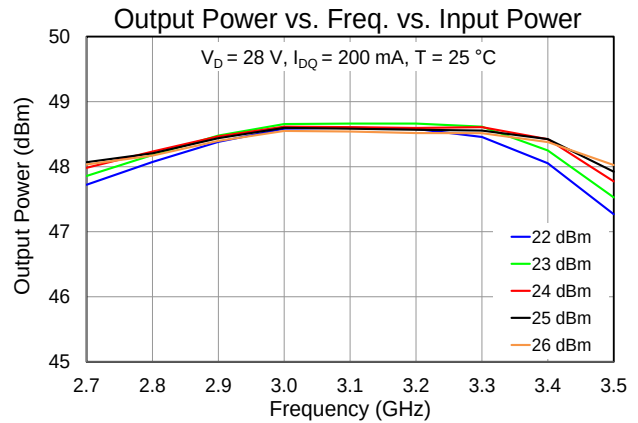
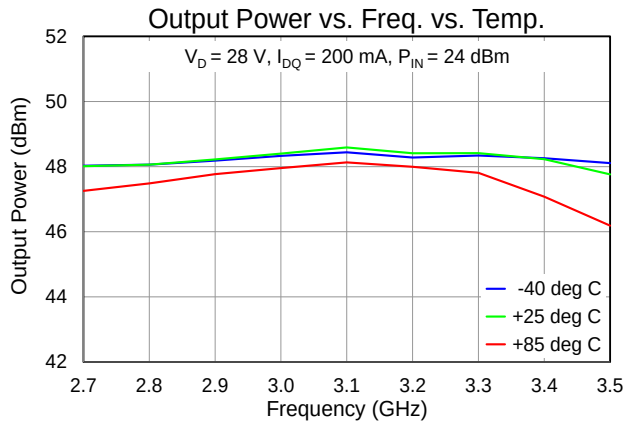
Typical Performance

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



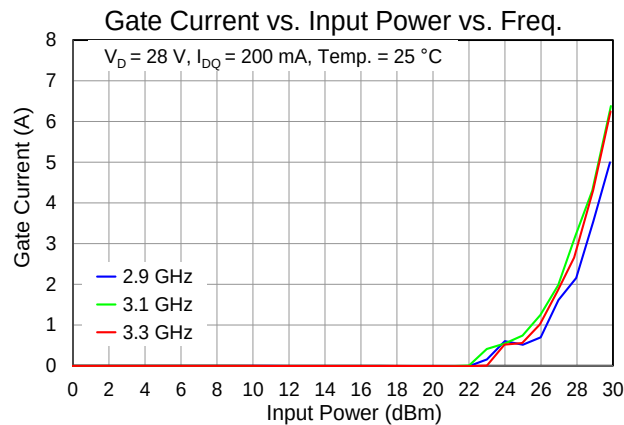
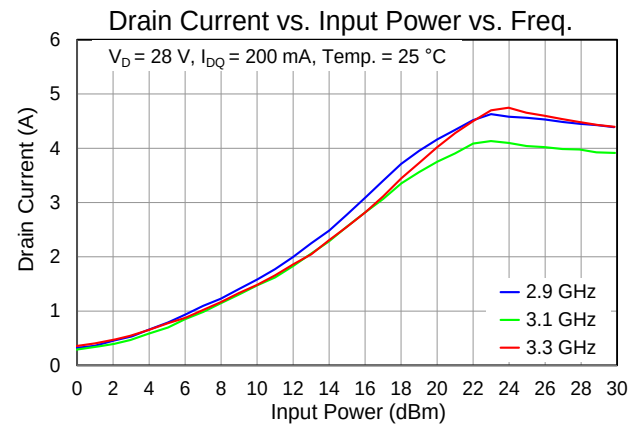
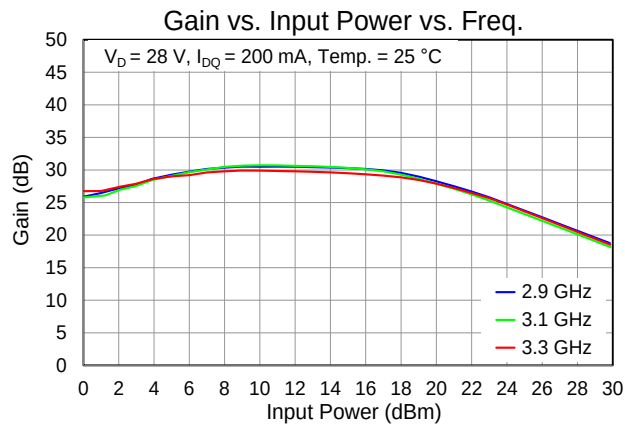
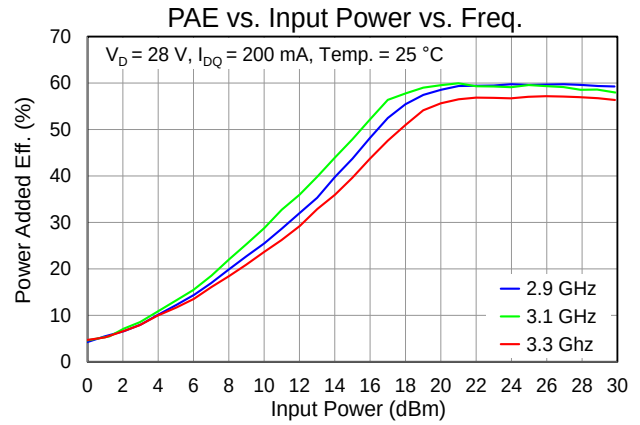
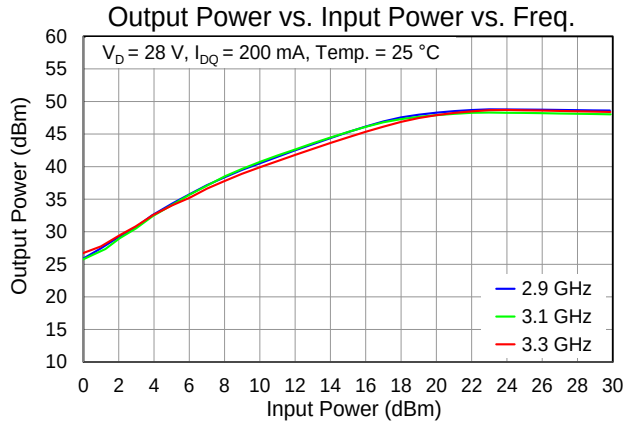
Typical Performance

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



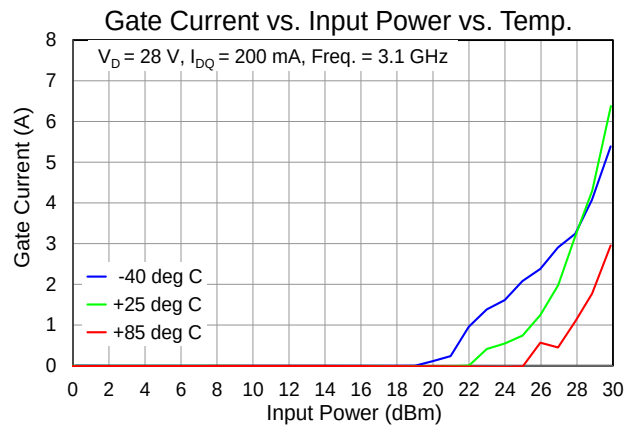
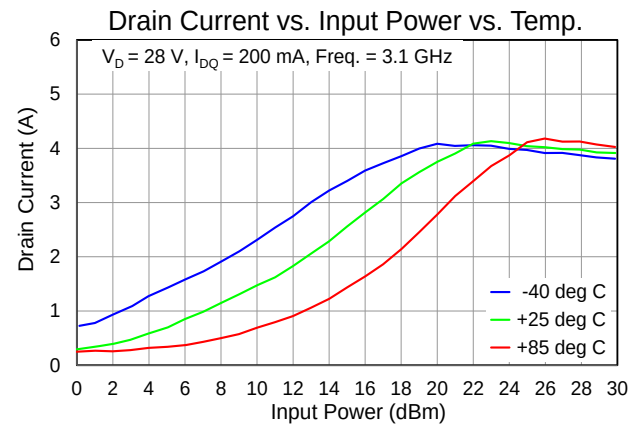
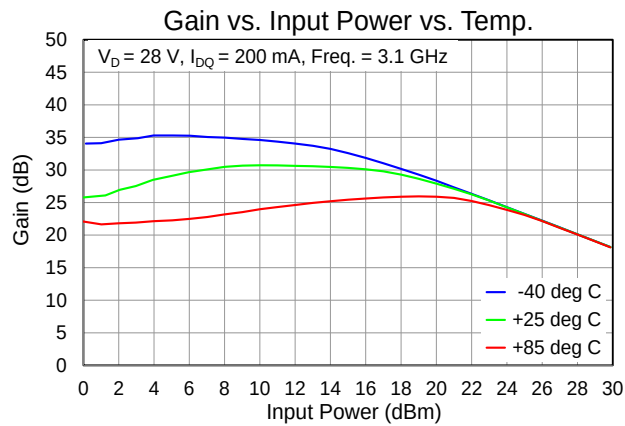
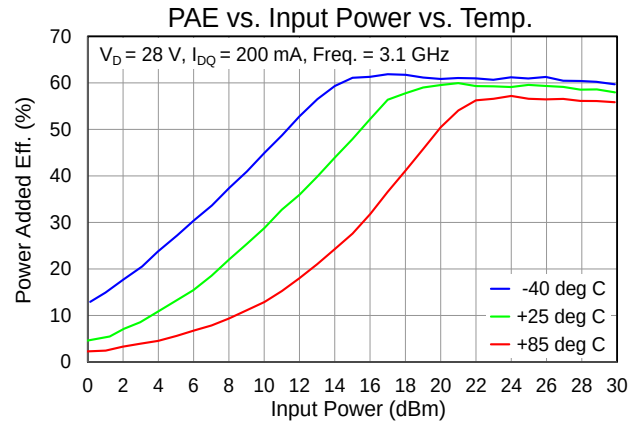
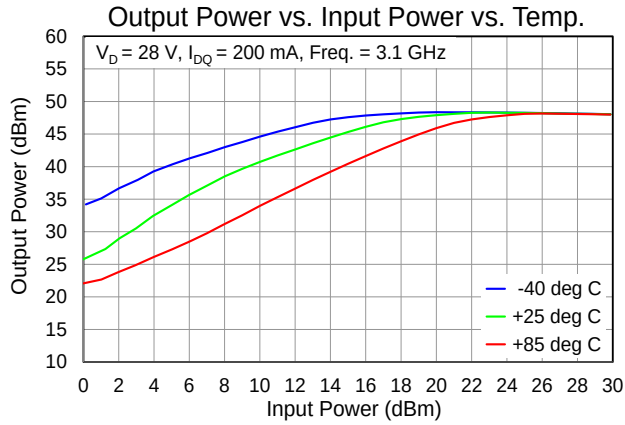
Typical Performance

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



Typical Performance

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



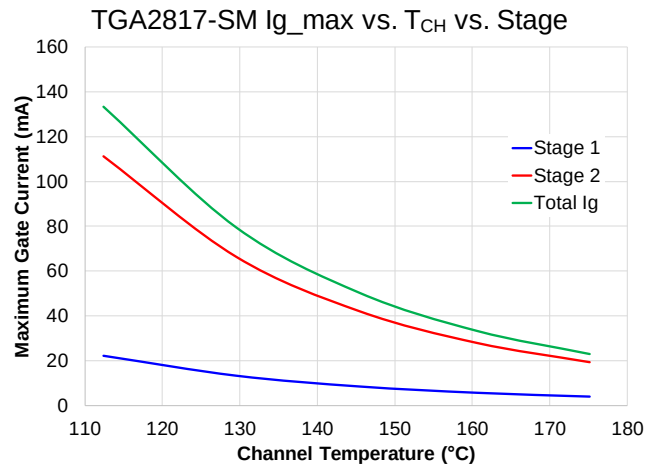
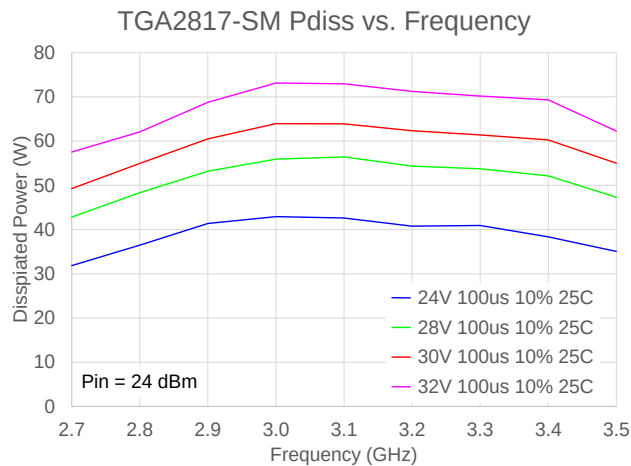
Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) ⁽¹⁾	$T_{BASE} = 85^{\circ}\text{C}$, $V_D = 28\text{ V}$, $I_D = 200\text{ mA}$ (quiescent DC, small signal), $P_{DISS} = 6.4\text{ W}$	0.396	$^{\circ}\text{C/W}$
Channel Temperature (T_{CH}) ⁽²⁾		87.5	$^{\circ}\text{C}$
Thermal Resistance (θ_{JC}) ⁽¹⁾	$T_{BASE} = 85^{\circ}\text{C}$, $V_D = 28\text{ V}$, $I_D = 4.5\text{ A}$, $P_{IN} = 24\text{ dBm}$, $P_{OUT} = 48.5\text{ dBm}$, $PW = 100\text{ us}$, $DC = 10\%$, $P_{DISS} = 53\text{ W}$	0.476	$^{\circ}\text{C/W}$
Channel Temperature (T_{CH}) ⁽²⁾		110.2	$^{\circ}\text{C}$
Thermal Resistance (θ_{JC}) ⁽¹⁾	$T_{BASE} = 85^{\circ}\text{C}$, $V_D = 32\text{ V}$, $I_D = 5.1\text{ A}$, $P_{IN} = 24\text{ dBm}$, $P_{OUT} = 49.4\text{ dBm}$, $PW = 100\text{ us}$, $DC = 10\%$, $P_{DISS} = 74\text{ W}$	0.492	$^{\circ}\text{C/W}$
Channel Temperature (T_{CH}) ⁽²⁾		121.4	$^{\circ}\text{C}$

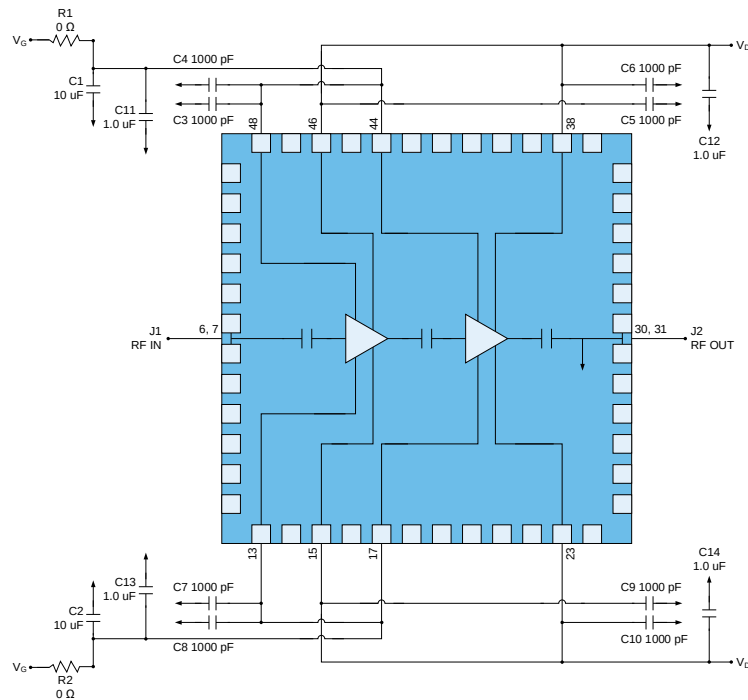
Notes:

- Thermal resistance is determined to the back of the package (at 85°C).
- IR scan equivalent. Refer to the following document: [GaN Device Channel Temperature, Thermal Resistance, and Reliability Estimates](#)

Power Dissipation and Maximum Gate Current



Application Circuit



Notes:

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

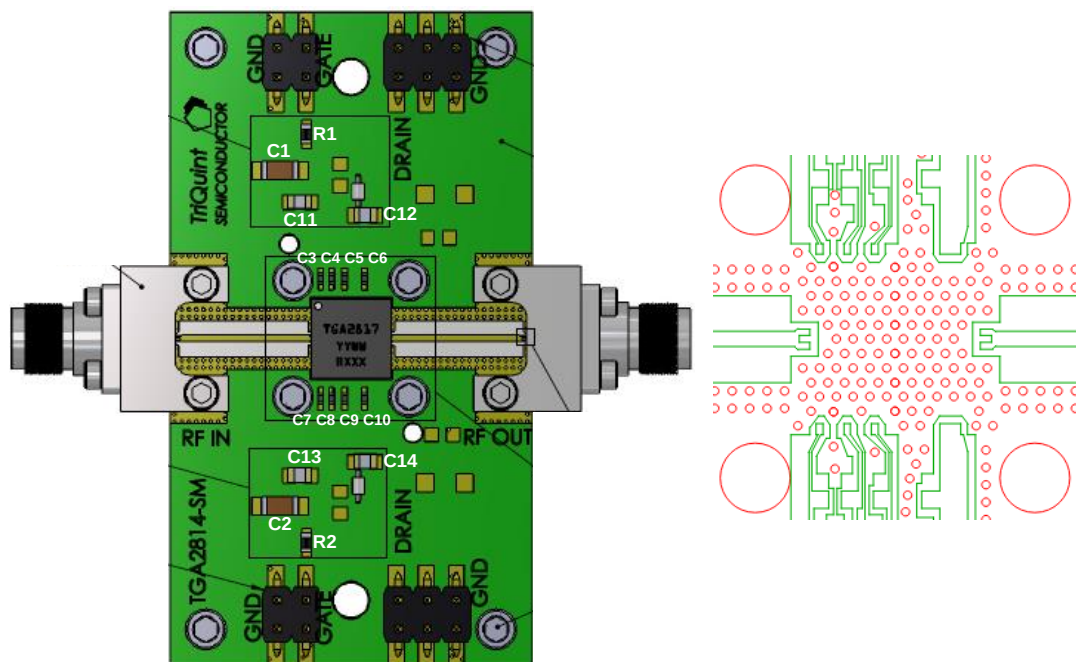
Bias-up Procedure

Set I_D limit to 6000 mA, I_G limit to 40 mA
Set V_G to -6.0 V
Set V_D +28 V
Adjust V_G more positive until $I_{DQ} = 200$ mA
Apply RF signal

Bias-down Procedure

Turn off RF signal
Reduce V_G to -6.0 V. Ensure $I_{DQ} \sim 0$ mA
Set V_D to 0 V
Turn off V_D supply
Turn off V_G supply

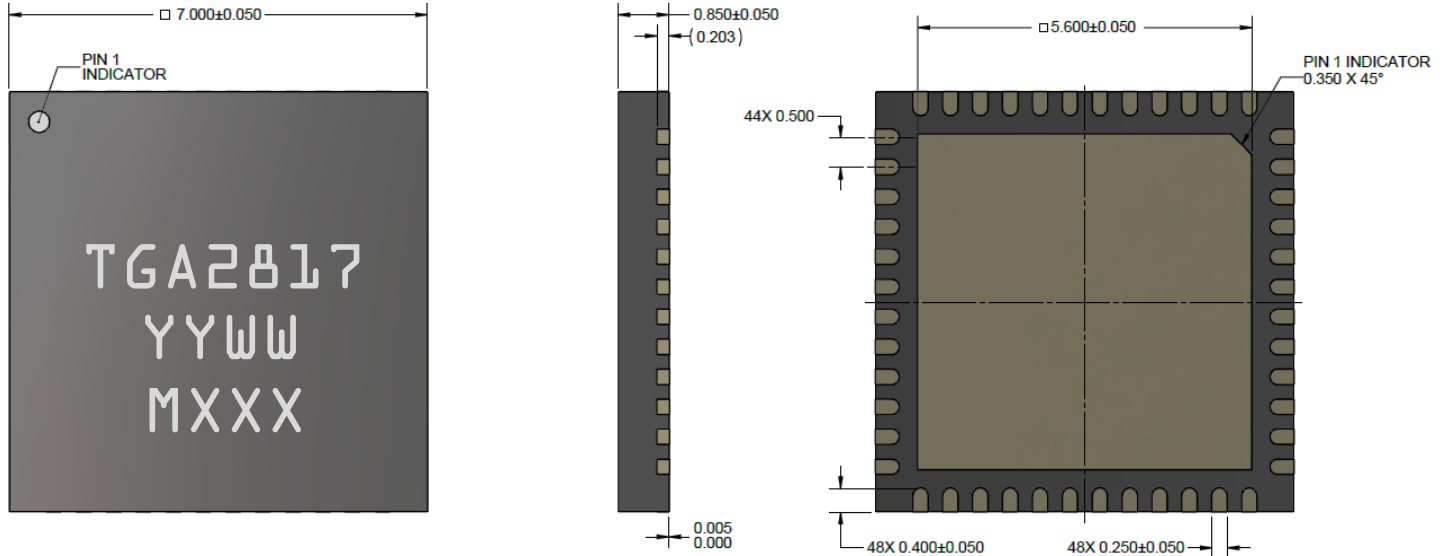
Evaluation Board and Mounting Detail



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 Design	Component	Value	Manufacture	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	

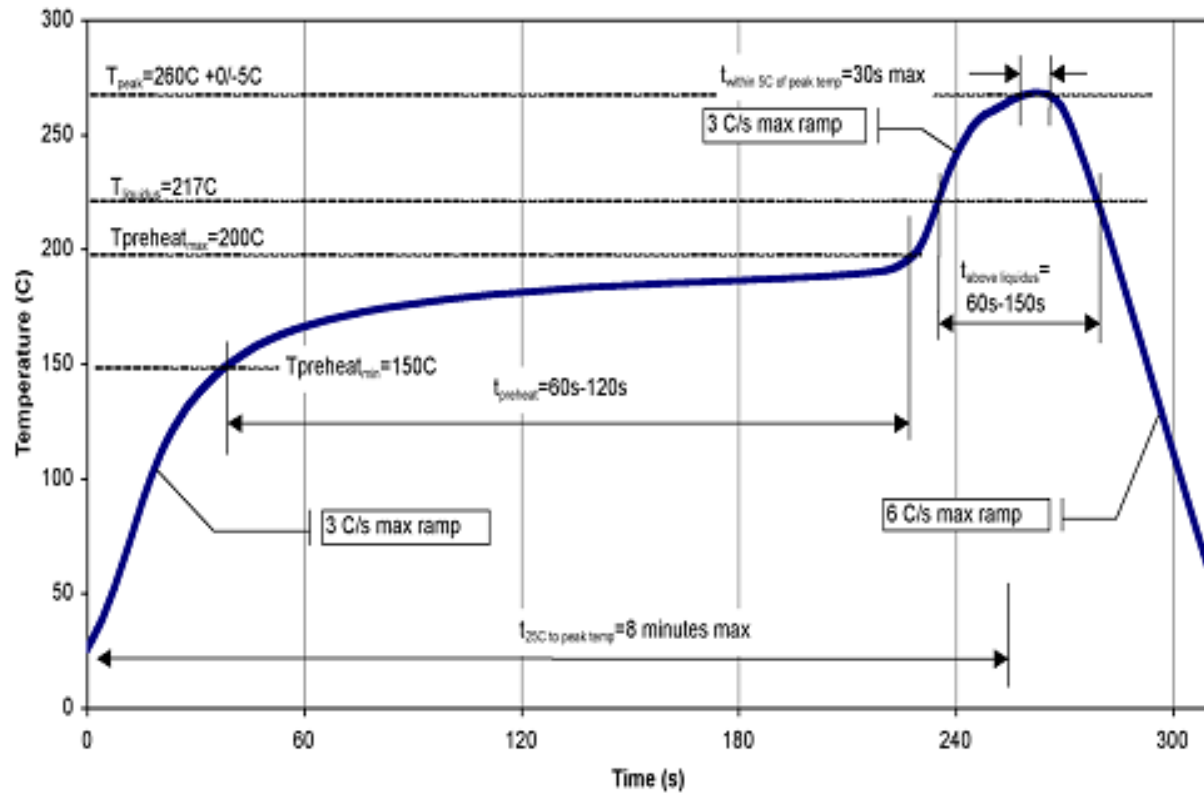
Mechanical Drawing and Pad Description



Package Leads are Gold Plated
Part is Mold Encapsulated
Dimensions are in mm
Tolerances: .XX = $\pm .25$, .XXX = $\pm .127$
Markings:
TGA2817: Part Number
YY: Assembly Year
WW: Assembly Week
MXXX: Batch ID

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}	1 st 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}	1 st 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}	2 nd 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}	2 nd 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.

Recommended Soldering Temperature Profile



Handling Precautions

Parameter	Rating	Standard
ESD - Human Body Model (HBM)	1C	JEDEC/JS-001-2014
ESD- Charge Device Model (CDM)	C3	JEDEC/JS-002-2014
MSL - Moisture Sensitivity Level	MSL3	JEDEC/IPC/JEDEC J-STD-020



Caution!
ESD-Sensitive Device

Solderability

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

RoHS Compliance

This part is compliant with 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment) as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C₁₅H₁₂Br₄O₂) Free
- PFOS Free
- SVHC Free

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations.

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