

Applications

- Military Radar
- Commercial Radar
- Wideband Amplifiers

Product Features

- Frequency Range: 3.1 – 3.6 GHz
- Pout: >50 dBm at $P_{IN} = 26$ dBm
- Power Gain: >24 dB at $P_{IN} = 26$ dBm
- PAE: >56 % at $P_{IN} = 26$ dBm
- Bias: $V_D = 30$ V pulsed (PW = 100 μ s, DC = 10 %), $I_{DQ} = 300$ mA, $V_G = -2.8$ V Typical
- Package Dimensions: 7.0 x 9.0 x 1.1 mm

General Description

TriQuint's TGA2813-SM is a packaged high power S-band amplifier which operates from 3.1 to 3.6 GHz. The TGA2813-SM is designed using TriQuint's TQGaN25 0.25- μ m GaN on SiC process.

The TGA2813-SM typically provides greater than 100 W of saturated output power, 56% power-added efficiency, and 24 dB power gain.

The TGA2813-SM is available in a low-cost, surface mount 42 lead 7x9 Overmold QFN. It is ideally suited to support both commercial and defense related radar applications.

Both RF ports have integrated DC blocking capacitors and are fully matched to 50 ohms.

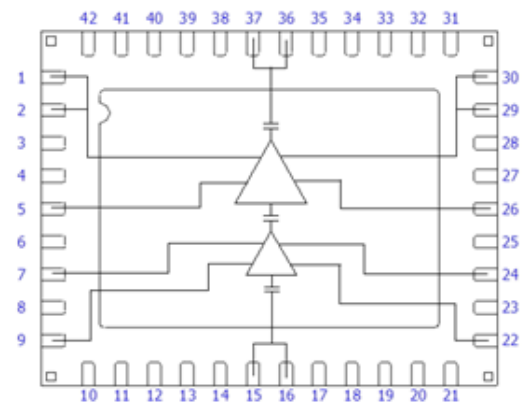
Lead-free and RoHS compliant

Evaluation Boards are available upon request.



QFN 7 x 9 mm 42 L

Functional Block Diagram



Pin Configuration

Pad No.	Symbol
1, 2, 29, 30	V_{D2}
5, 26	V_{G2}
7, 24	V_{D1}
9, 22	V_{G1}
15, 16	RF IN
36, 37	RF OUT
3, 4, 6, 8, 10-14, 17-21, 23, 25, 27, 28, 31-35, 38-42	GND

Ordering Information

Part	ECCN	Description
TGA2813-SM	3A001.b.2.a	3.1 – 3.6 GHz, 100 W GaN Power Amplifier
TGA2813-SM_EVB	EAR99	TGA2813-SM Evaluation Board

Absolute Maximum Ratings

Parameter	Value
Drain Voltage (V_D)	40 V
Gate Voltage Range (V_G)	-8 to 0 V
Drain Current (I_D)	10.4 A
Gate Current (I_G)	See Graph (page 3)
Power Dissipation (P_{DISS}), 85°C	202 W
Input Power, CW, 50 Ω , (P_{IN})	30 dBm
Input Power, CW, VSWR 3:1, $V_D = 30$ V, 85 °C, (P_{IN})	27 dBm
Channel Temperature (T_{CH})	275 °C
Mounting Temperature (30 Seconds)	260 °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) Pulsed: PW = 100 μ s, DC = 10 %	30 V
Drain Current (I_{DQ})	300 mA
Drain Current Under RF Drive (I_{D_DRIVE})	See plots p. 8
Gate Voltage (V_G)	-2.8 V (Typ.)
Gate Current Under RF Drive (I_{G_DRIVE})	See plots p. 8
Temperature (T_{BASE})	-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, $V_D = 30$ V (PW = 100 μ s, DC = 10 %), $I_{DQ} = 300$ mA, $V_G = -2.8$ V typical.

Parameter	Min	Typical	Max	Units
Operational Frequency Range	3.1		3.6	GHz
Input Return Loss		> 7		dB
Output Return Loss		> 3.5		dB
Output Power at $P_{IN} = 26$ dBm		> 50		dBm
Power Gain at $P_{IN} = 26$ dBm		> 24		dB
Power Added Efficiency at $P_{in} = 26$ dBm		> 56		%
Output Power Temperature Coefficient		-0.008		dBm/°C

Thermal and Reliability Information

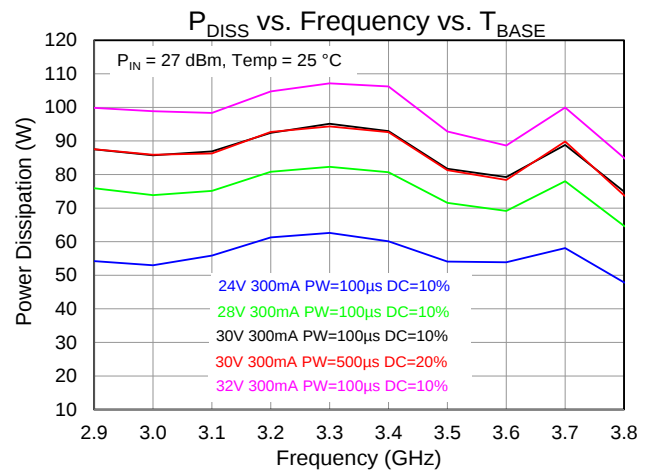
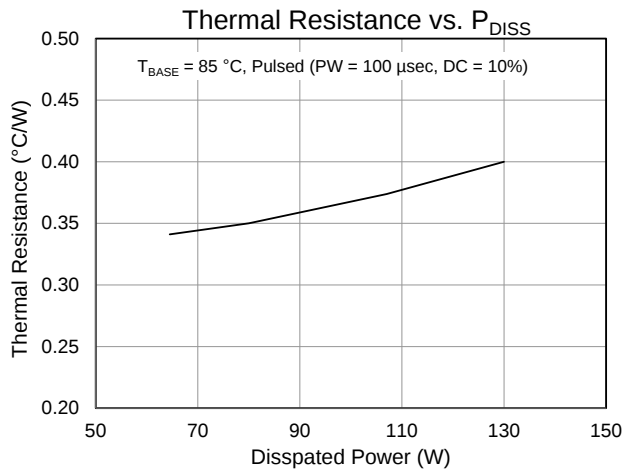
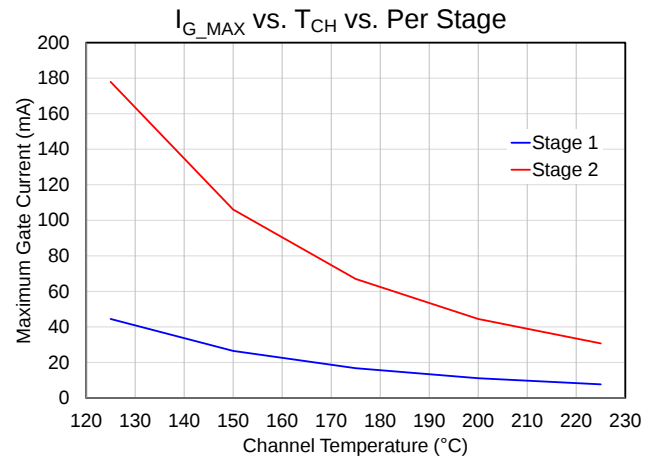
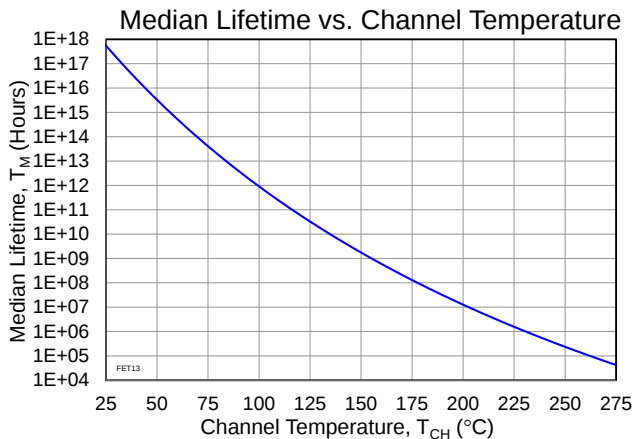
Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) ⁽¹⁾	$T_{BASE} = 85^{\circ}\text{C}$, $V_D = 30\text{ V}$, $I_{DQ} = 300\text{ mA}$	0.561	$^{\circ}\text{C/W}$
Channel Temperature (T_{CH}) (NO RF drive)		91	$^{\circ}\text{C}$
Median Lifetime (T_M)		3.37E+12	Hrs
Thermal Resistance (θ_{JC}) ⁽¹⁾	$T_{BASE} = 85^{\circ}\text{C}$, $V_D = 30\text{ V}$, $I_{D Drive} = 7.2\text{ A}$ (PW = 100 μs , DC = 10%) Freq. = 3.3 GHz:	0.362	$^{\circ}\text{C/W}$
Channel Temperature (T_{CH}) (Under RF drive)		119	$^{\circ}\text{C}$
Median Lifetime (T_M)		7.01E+10	Hrs
	$P_{IN} = 27\text{ dBm}$, $P_{OUT} = 50.7\text{ dBm}$, $P_{DISS} = 93\text{ W}$		

Notes:

1. Thermal resistance measured to back of package.

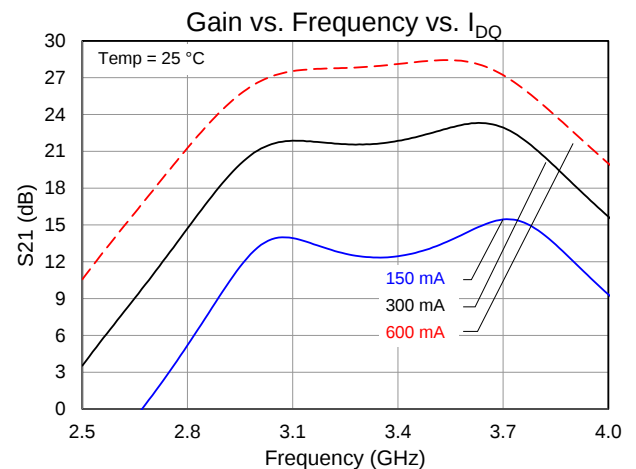
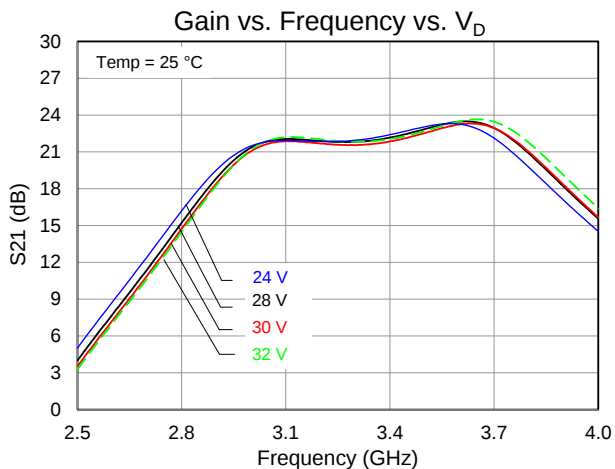
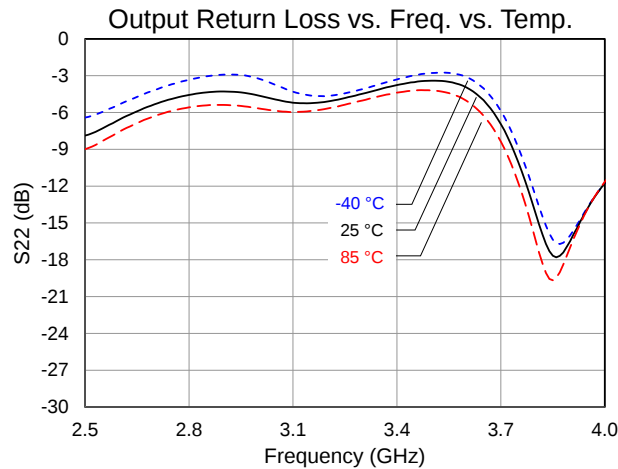
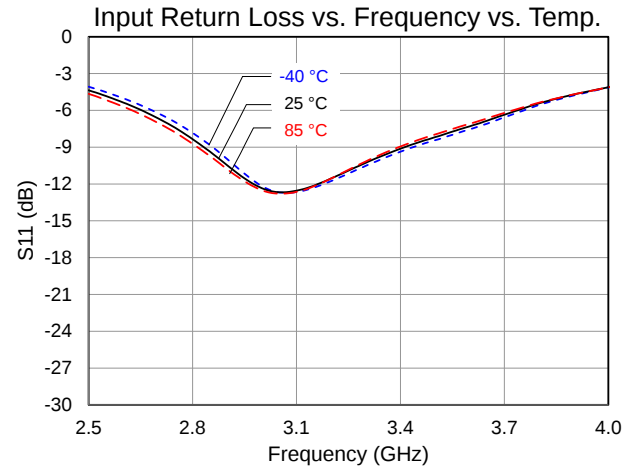
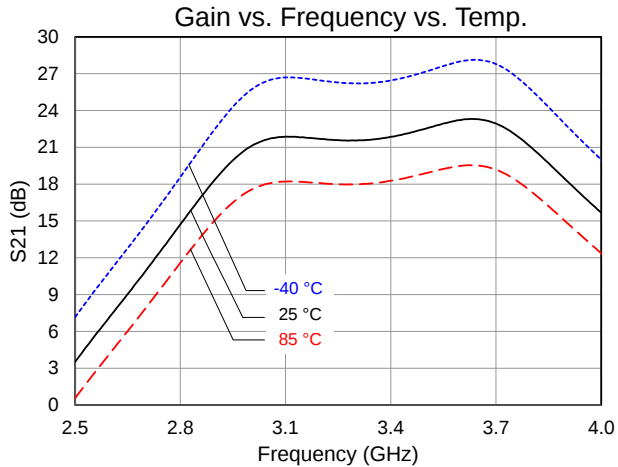
Median Lifetime, Power Dissipation and Max. Gate Current

Test conditions: $V_D = 40\text{V}$; Failure Criteria = 10% reduction in I_{D_MAX}



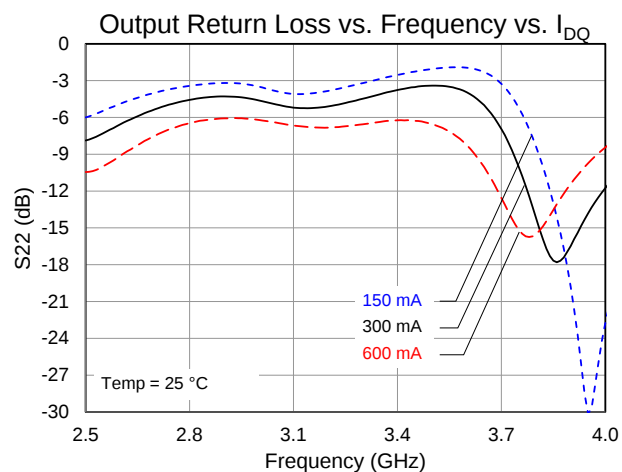
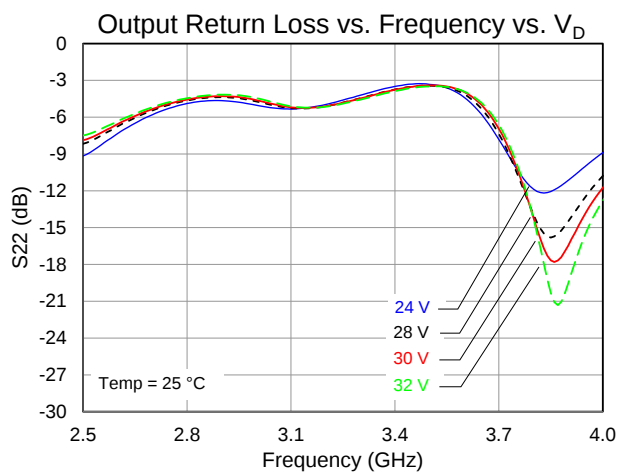
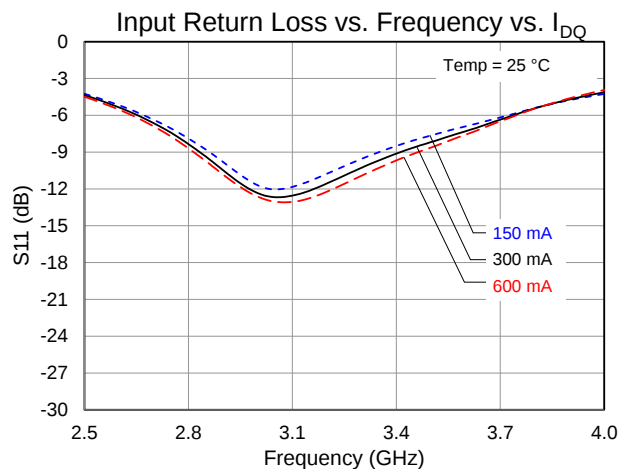
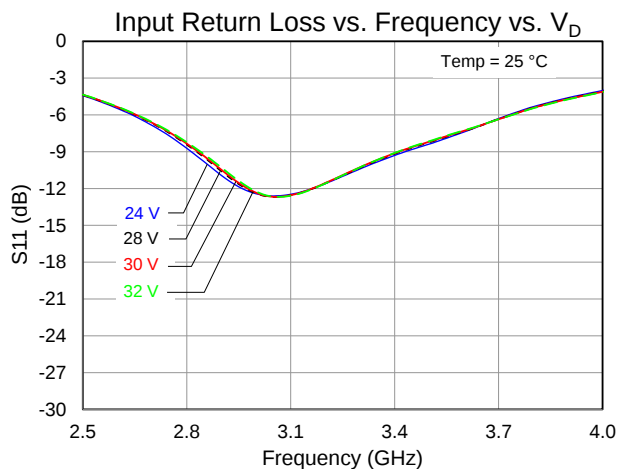
Typical Performance: Small Signal

Conditions unless otherwise specified: $V_D = 30$ V, $I_{DQ} = 300$ mA, $V_G = -2.8$ V typical.



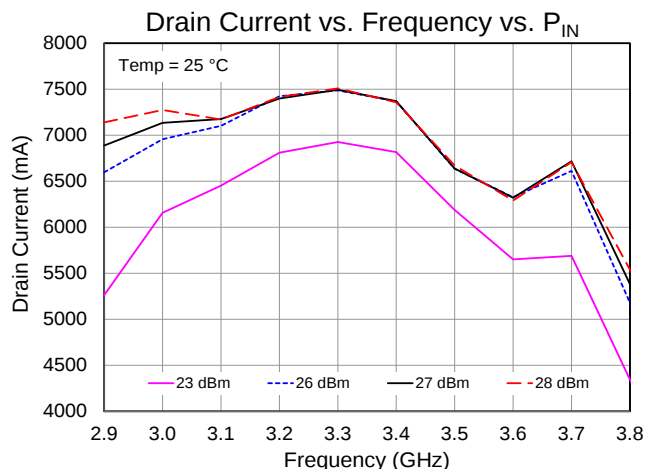
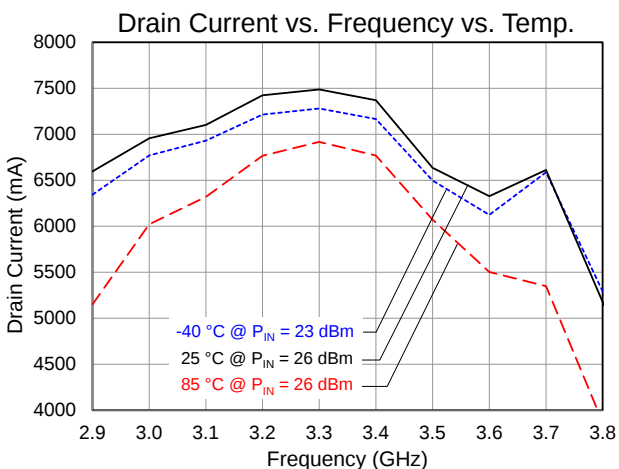
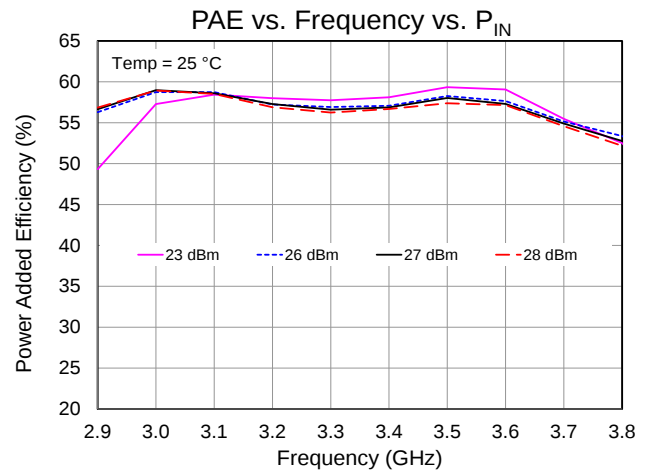
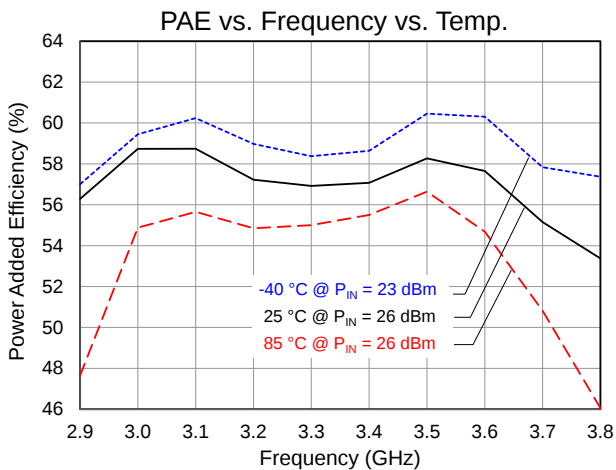
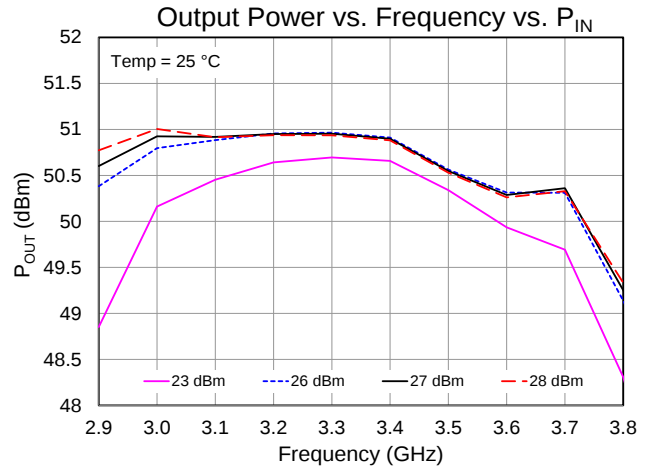
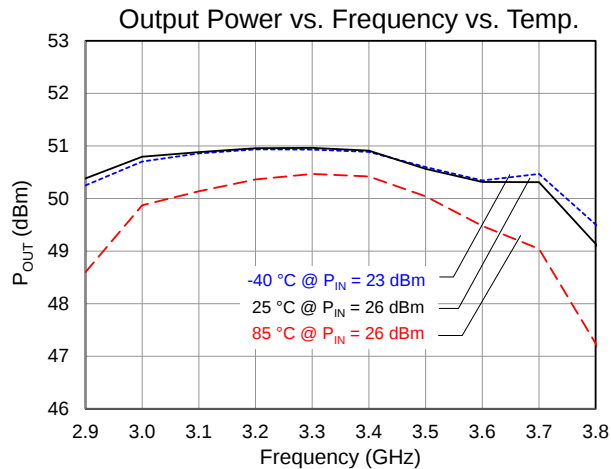
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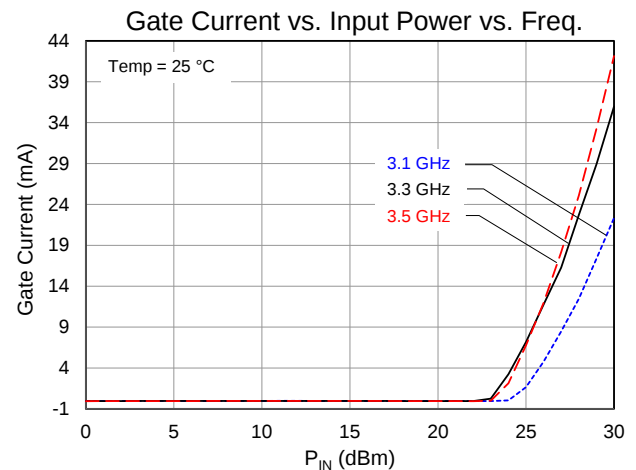
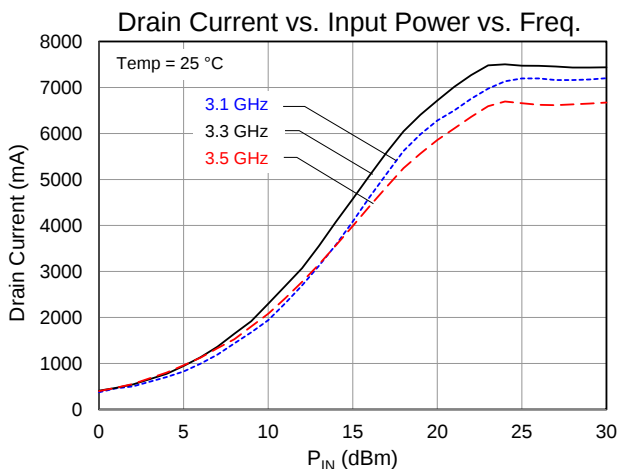
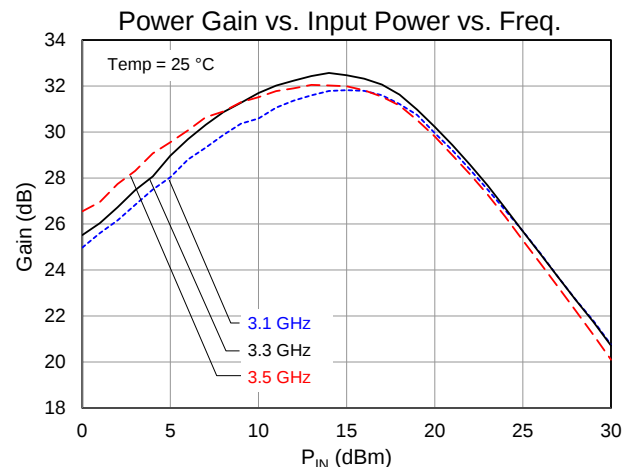
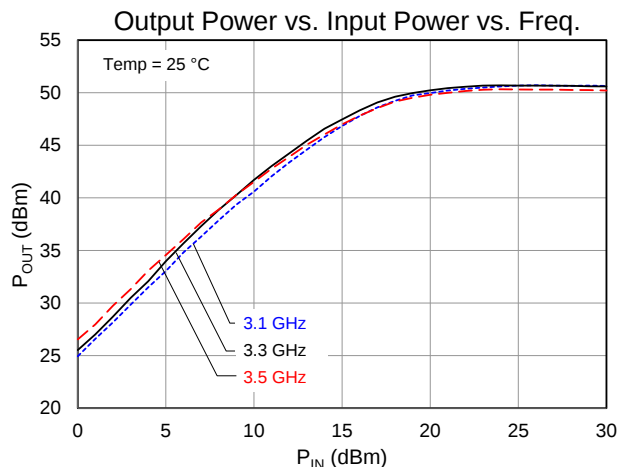
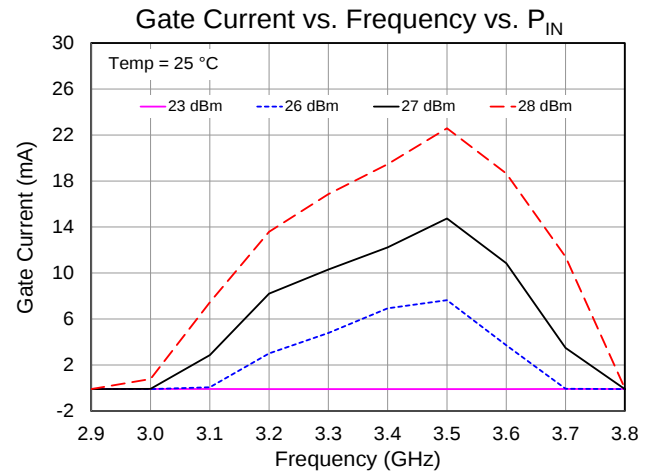
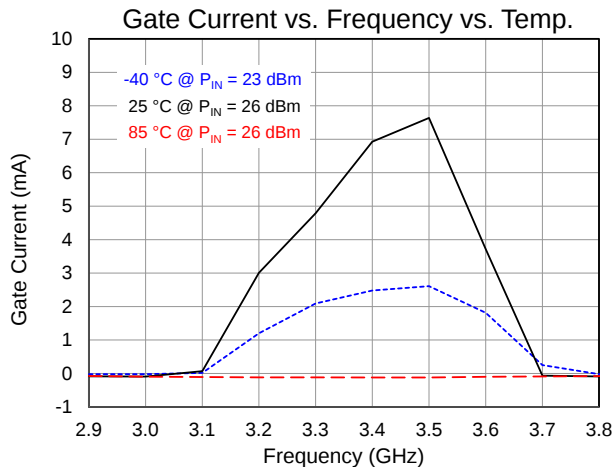
Typical Performance: Large Signal

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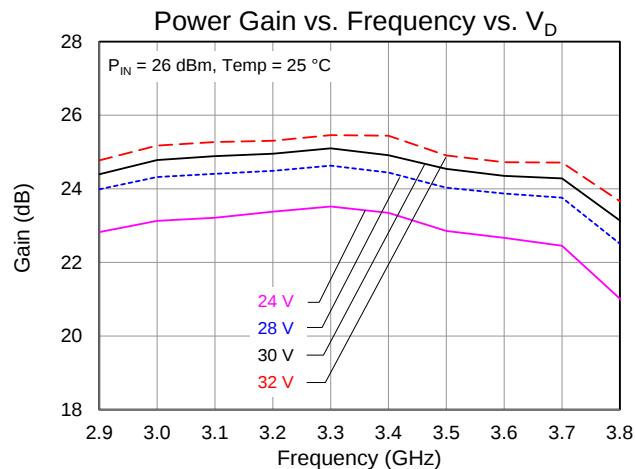
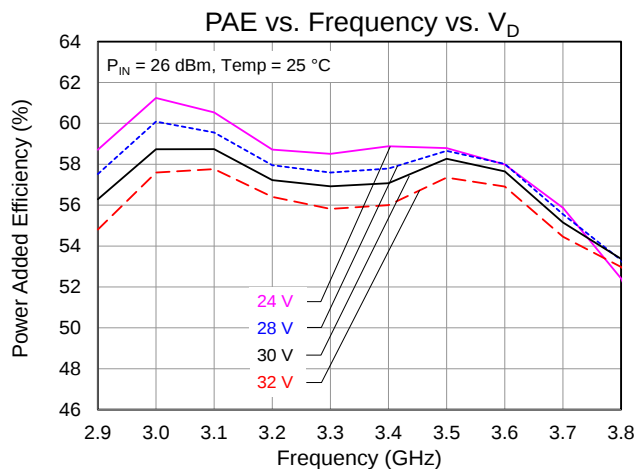
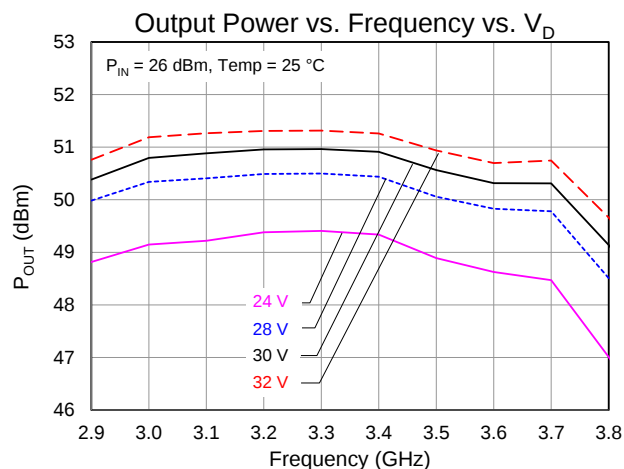
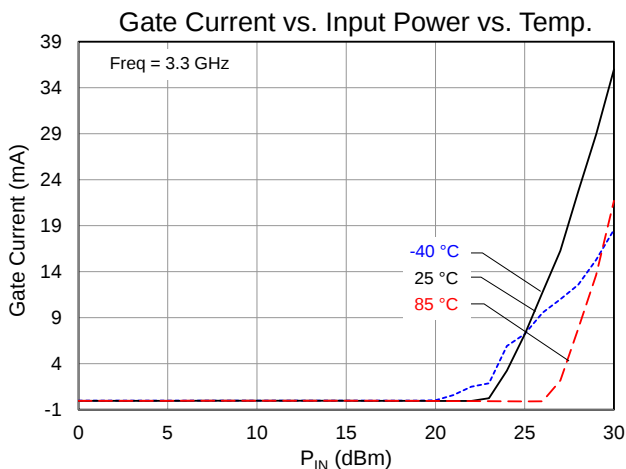
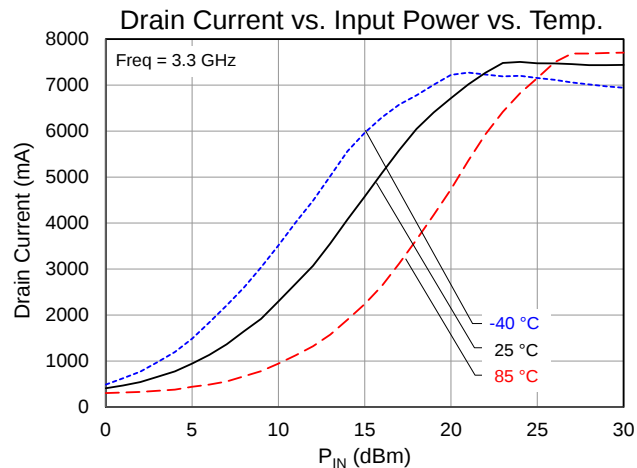
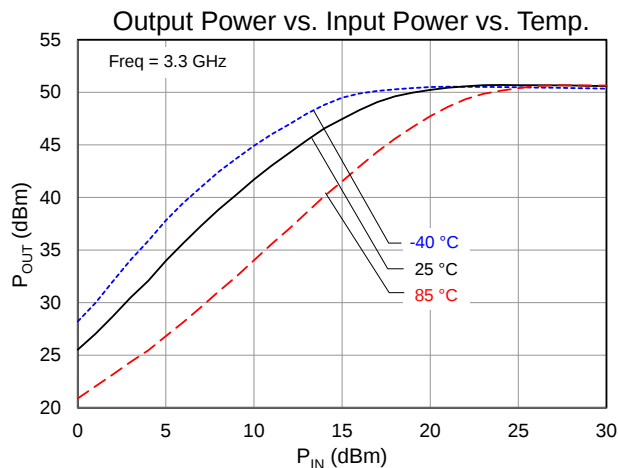
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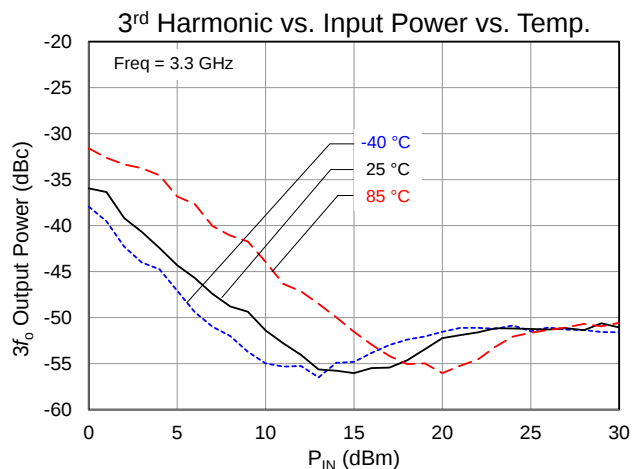
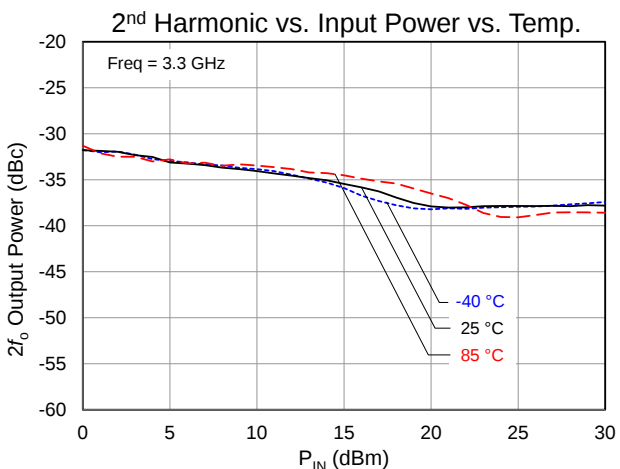
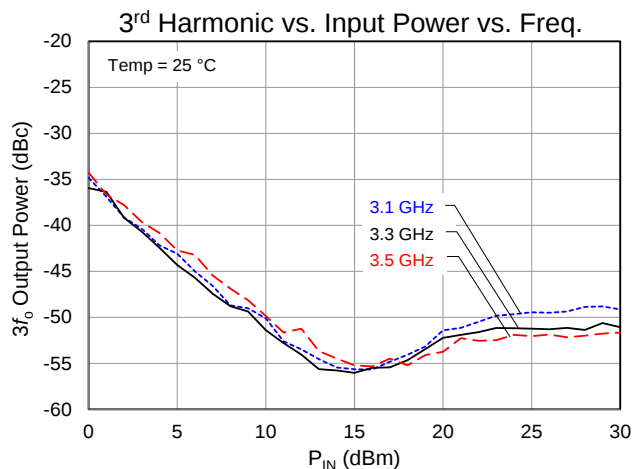
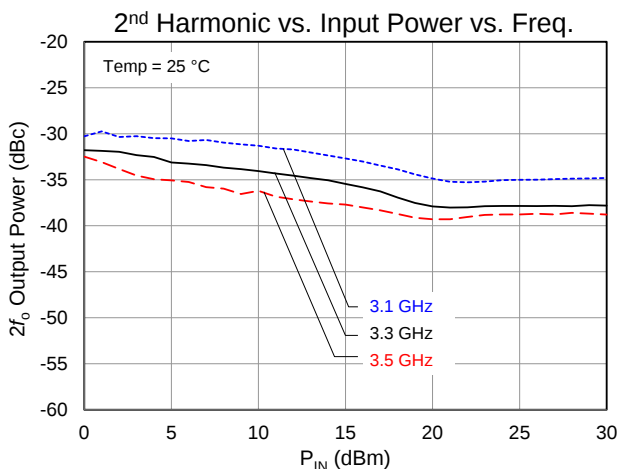
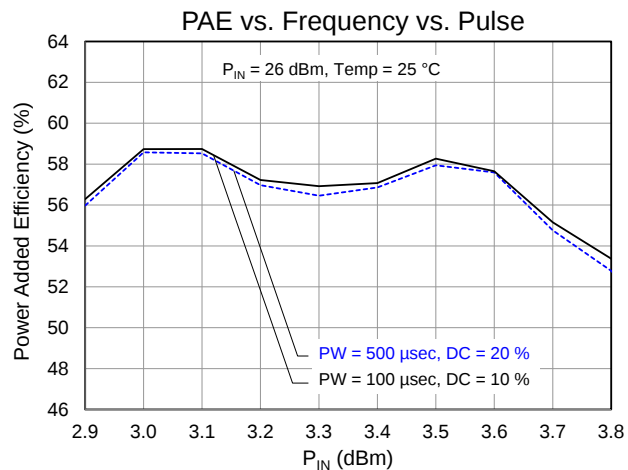
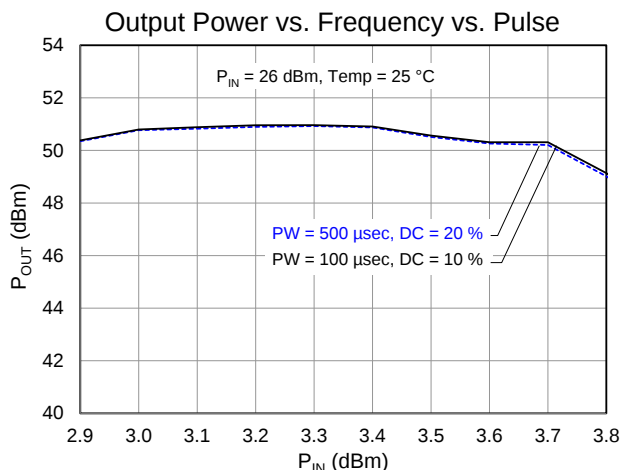
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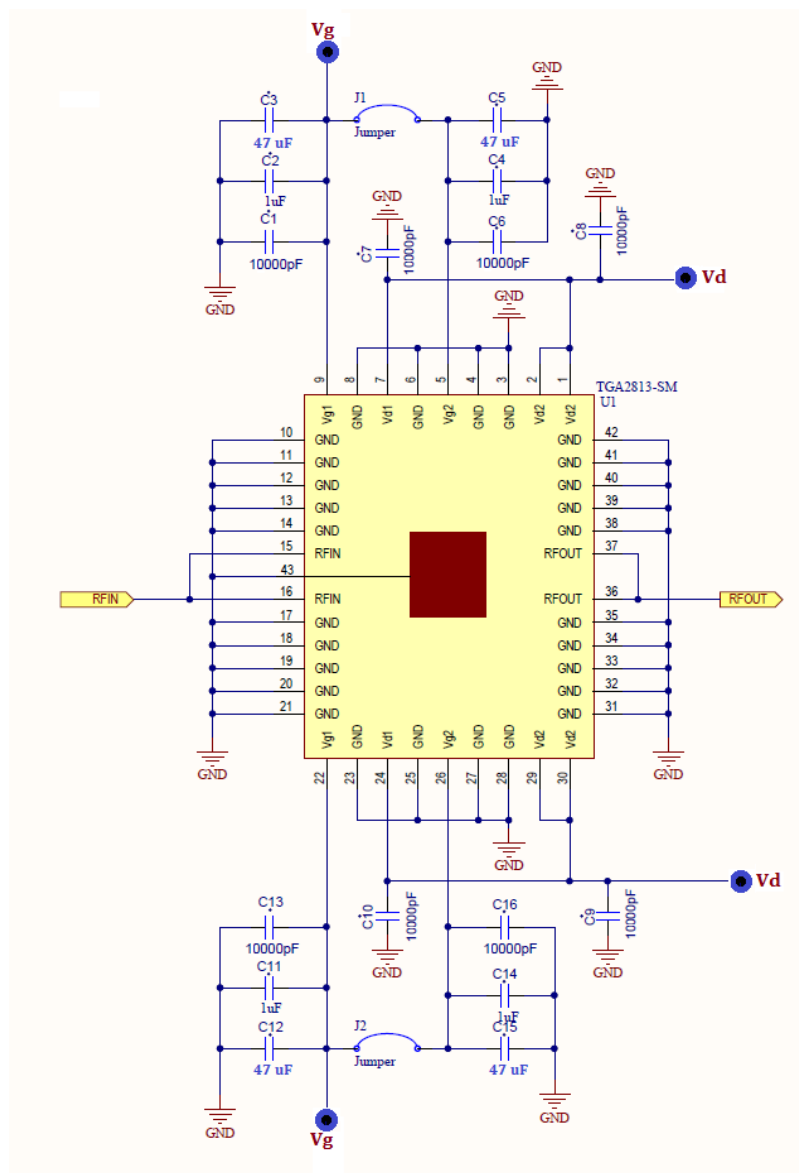


Typical Performance: Large Signal

Conditions unless otherwise specified: $V_D = 30$ V (PW = 100 μ s, DC = 10 %), $I_{DQ} = 300$ mA, $V_G = -2.8$ V typical.



Applications Information



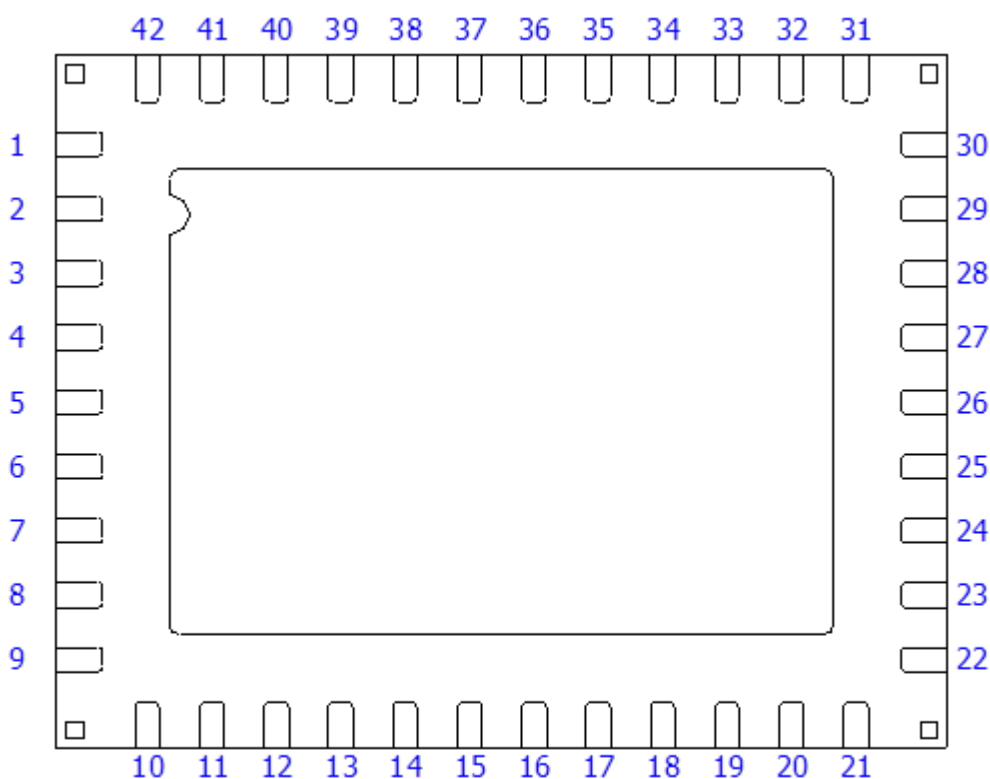
Bias-up Procedure

1. Set I_D limit to 10 A, I_G limit to 50 mA
2. Apply -5 V to V_G
3. Apply $+30$ V to V_D ; ensure I_{DQ} is approx. 0 mA
4. Adjust V_G until $I_{DQ} = 300$ mA ($V_G \sim -2.8$ V Typ.).
5. Turn on RF supply

Bias-down Procedure

1. Turn off RF supply
2. Reduce V_G to -5 V; ensure I_{DQ} is approx. 0 mA
3. Set V_D to 0 V
4. Turn off V_D supply
5. Turn off V_G supply

Pin Layout & Description

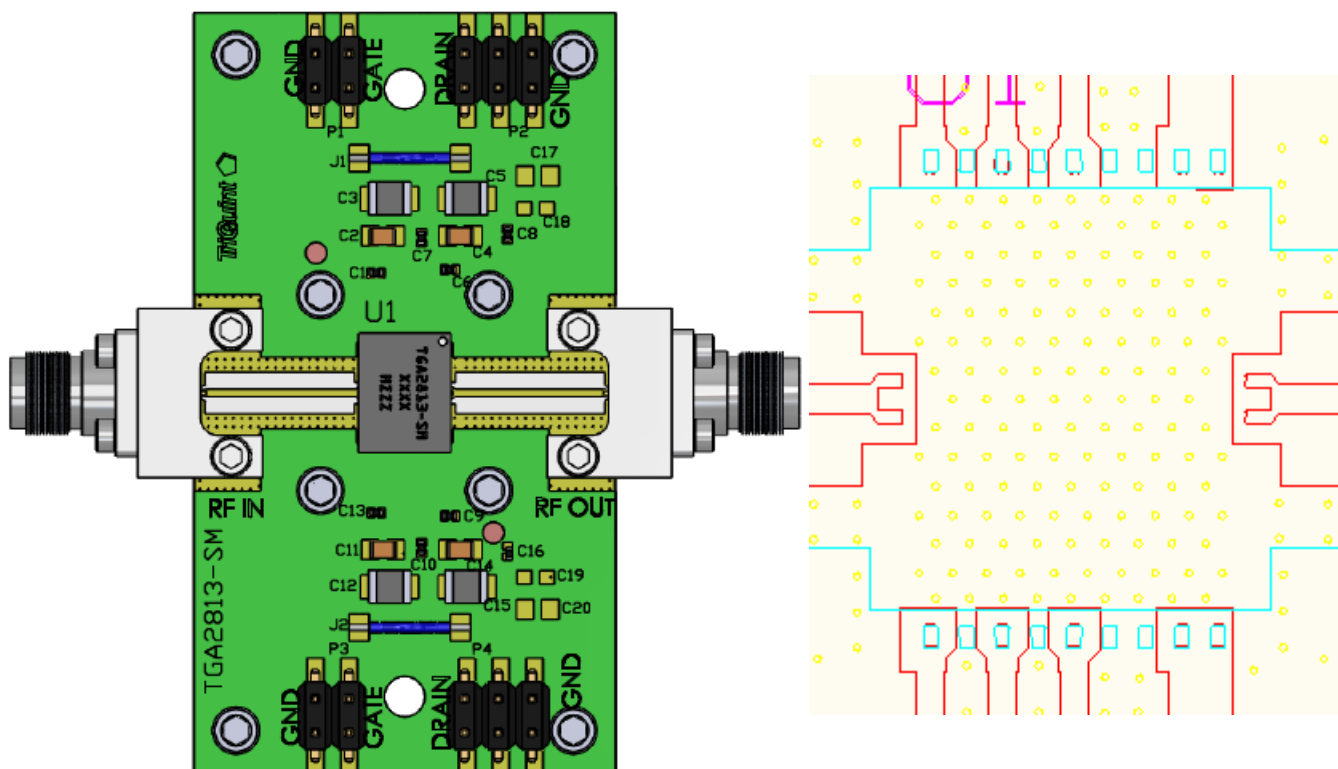


Through package view

Pin Description

Pin No.	Symbol	Description
1, 2, 29, 30	V_{D2}	Drain voltage; bias network is required; see recommended Application Information on page 10
5, 26	V_{G2}	Gate voltage; bias network is required; see recommended Application Information on page 10
7, 24	V_{D1}	Drain voltage; bias network is required; see recommended Application Information on page 10
9, 22	V_{G1}	Gate voltage; bias network is required; see recommended Application Information on page 10
15, 16	RF IN	Input; matched to 50 Ω ; DC blocked
36, 37	RF OUT	Output; matched to 50 Ω ; DC blocked. Pad is DC grounded.
3, 4, 6, 8, 10-14, 17-21, 23, 25, 27, 28, 31-35, 38-42	GND	Connected to ground paddle; must be grounded on PCB

Evaluation Board and Board Mounting Detail



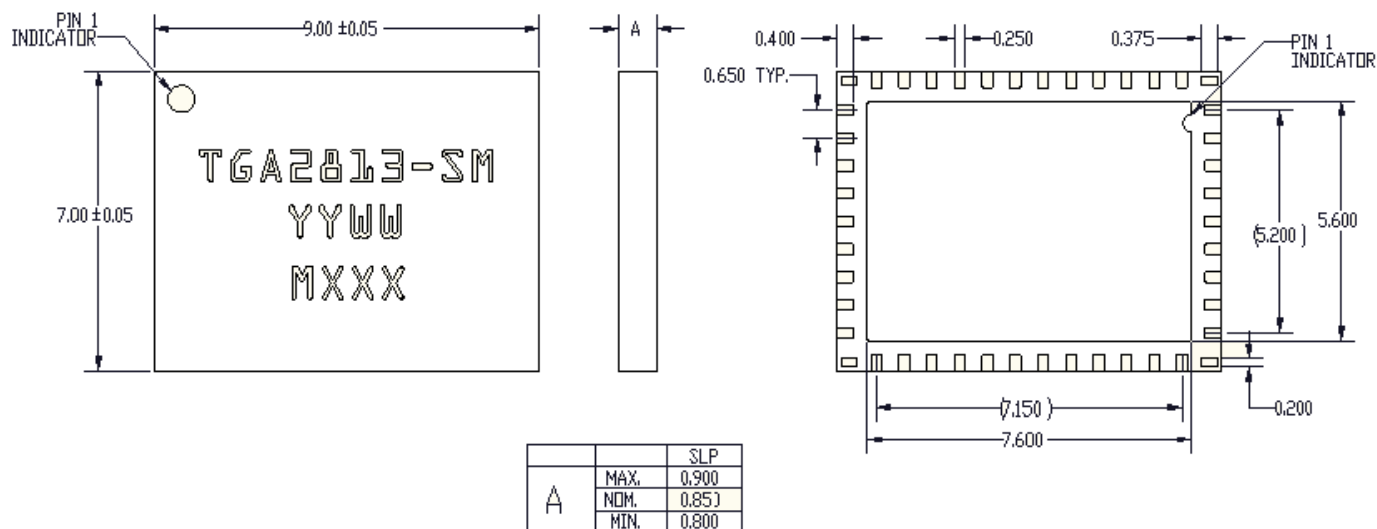
Material:
 Layer 1: ROGER 4350, 0.010 thick
 Metal 1 and Metal 2: 1.0 oz. Copper per layer

NOTE: Both Top and Bottom Vd and Vg must be biased.

Bill of Material

Reference Des.	Value	Description	Manuf.	Part Number
C1, C6 – C10, C13, C16	10000 pF	Cap, 0402, 50 V, 10%, X7R	Various	
C2, C4, C11, C14	1 μ F	Cap, 0805, 25 V, 10%, X7R	Various	
C3, C5, C12, C15	47 μ F	Cap, 1206, 25 V, 20%, X5R	Various	
J1, J2	Jumper Wires	20 AWG	Various	

Mechanical Information



Units: millimeter

Tolerances: unless specified

x.xx = ± 0.01

x.xxx = ± 0.005

Package Metal Base and Leads are GOLD PLATED.

Marking:

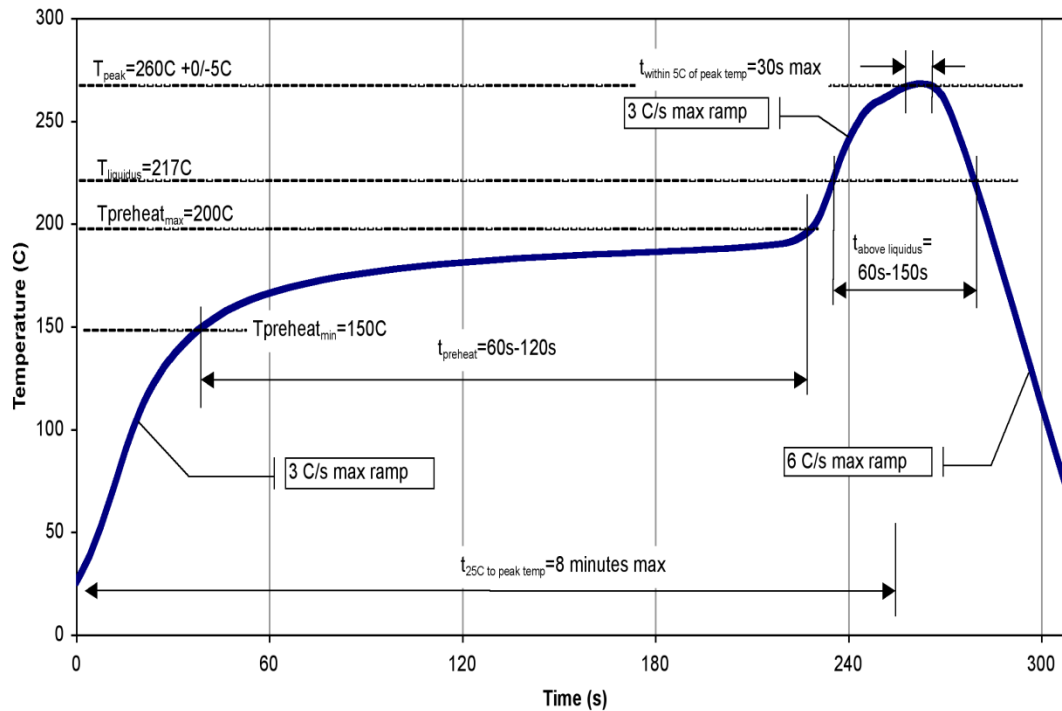
2813-SM: Part number

YY: Part Assembly year

WW: Part Assembly week

MXXX: Lot Number

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

MSL Rating

MSL Rating: Level TBD
Test: 260 °C 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°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

Contact Information

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

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Tel: +1.972.994.8465
Fax: +1.972.994.8504

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

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