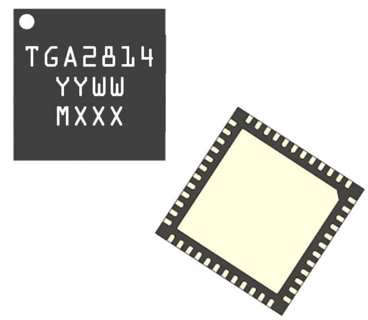
Applications

- Military Radar
- Commercial Radar
- Wideband Amplifiers



Product Features

- Frequency Range: 3.1 – 3.5 GHz
- Output Power: 49.5 dBm (at Pin = 25 dBm)
- Power Gain > 24 dB (at Pin = 25 dBm)
- PAE: 55% (at Pin = 25 dBm)
- Bias: V_D = 30 V, I_{DQ} = 200 mA, V_G = –2.90 V Typical
- Package Dimensions: 7.0 x 7.0 x 0.85 mm

General Description

TriQuint's TGA2814-SM is a high-power, S-band amplifier fabricated on TriQuint's production 0.25um GaN on SiC process (TQGaN25).The TGA2814-SM covers 3.1 – 3.5 GHz and provides > 80 W of saturated output power, 24 dB of large-signal gain, and achieves 55 % power-added efficiency.

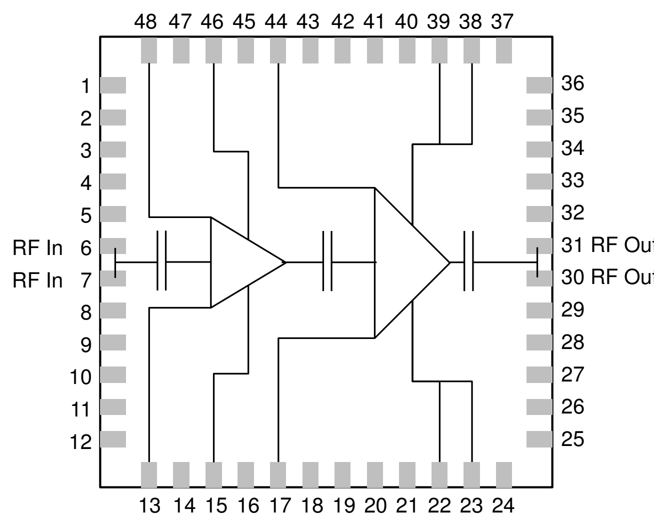
The TGA2814-SM can also support a variety of operating conditions to best support system requirements. With good thermal properties, it can support a range of bias voltages and performs well under pulse operation.

With DC blocking capacitors on both RF ports, which are matched to 50 ohms, the TGA2814-SM is ideal for both commercial and military radar systems.

Lead-free and RoHS compliant.

Evaluation boards are available on request.

Functional Block Diagram



Pad No.	Symbol
1-5, 8-12, 14, 16, 18-21, 24-29, 32-37, 40-43, 45, 47, 49	GND
6, 7	RF Input
13, 48	V_{G1}
15, 46	V_{D1}
17, 44	V_{G2}
22, 23, 38, 39	V_{D2}
30, 31	RF Output

Ordering Information

Part	ECCN	Description
TGA2814-SM	3A001.b.2.a	3.1 – 3.5 GHz 80W GaN Power Amplifier
TGA2814-SM_EVB	EAR99	TGA2814-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)	8.5 A
Gate Current (I_G)	See graph
Power Dissipation (P_{DISS})	166 W
Input Power, CW, 50 Ω, 85 °C, (P_{IN})	30 dBm
Input Power, VSWR 3:1, V_D = 30V, PW = 15ms, DC = 30%, 85 °C, (P_{IN})	27 dBm
Channel Temperature (T_{CH})	275 °C
Storage Temperature	–55 to 150 °C

Note: Max. Input Power ratings based on die data

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)	30 V
Drain Current (I_{DQ})	200 mA
Drain Current Under RF Drive (I_{D_Drive})	5500 mA
Gate Voltage (V_G)	-2.90 V (Typ.)

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, I_{DQ} = 200 mA, PW = 100 us, DC = 10 %

Parameter	Min	Typical	Max	Units
Operational Frequency Range	3.1		3.5	GHz
Input Return Loss (at I_{DQ}=400 mA)		> 12		dB
Output Return Loss (at I_{DQ}=400 mA)		> 7		dB
Small Signal Gain (at I_{DQ}=400 mA)		> 28		dB
Power Gain @ Saturation (Pin = 24 dBm)		> 24		dB
Output Power @ Saturation (Pin = 24 dBm)		> 49.5		dBm
Power Added Efficiency (Pin = 24 dBm)		> 55		%
Output Power Temperature Coefficient		–0.006		dBm/°C

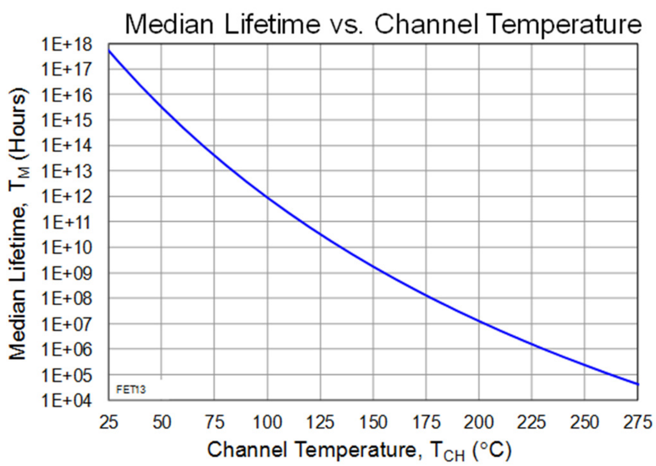
Thermal and Reliability Information

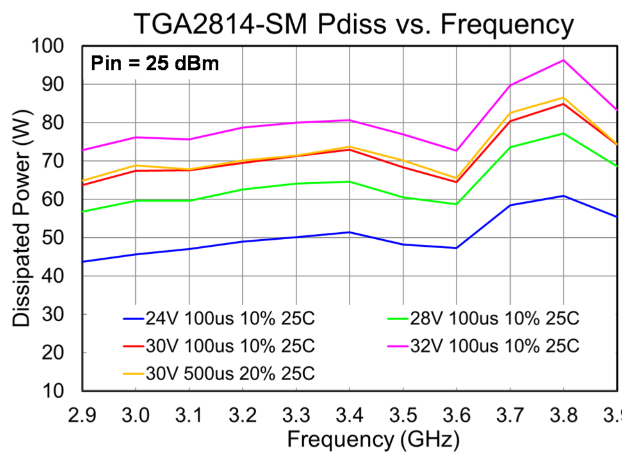
Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) [(1)]	T_{BASE} = 85 °C, V_D=30 V, I_{DQ}=200mA, Quiescent operation (DC only, no RF)	1.00	ºC/W
Channel Temperature (T_{CH})		91	°C
Median Lifetime (TM)		3.37E12	Hours
Thermal Resistance (θ_{JC}) [(1)]	T_{BASE} = 85 °C, V_D=30 V, I_D=5.3 A, Pin=25 dBm, Pout=49.5 dBm, PW=100 us, DC=10 %, Pdiss=58 W	0.69	ºC/W
Channel Temperature (T_{CH})		125.0	°C
Median Lifetime (TM)		3.28E10	Hours
Thermal Resistance (θ_{JC}) [(1)]	T_{BASE} = 85 °C, V_D=32 V, I_D=5.7 A, Pin=25 dBm, Pout=50.0 dBm, PW=100 us, DC=10 %, Pdiss=72 W	0.72	ºC/W
Channel Temperature (T_{CH})		137.0	°C
Median Lifetime (TM)		7.70E09	Hours

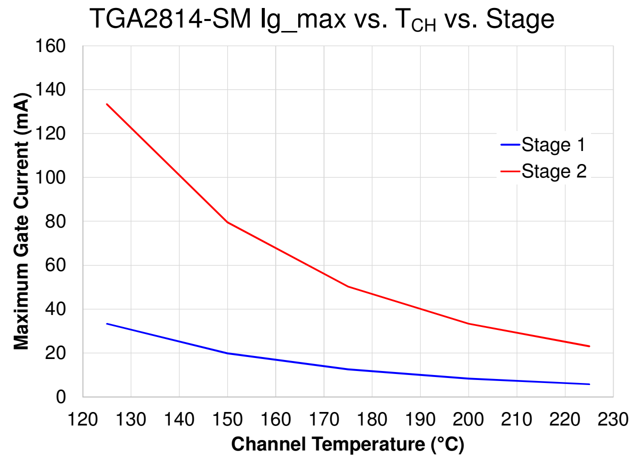
Notes: (1) Thermal resistance measured to back of package.

Median Lifetime, Power Dissipation, and Max. Gate Current

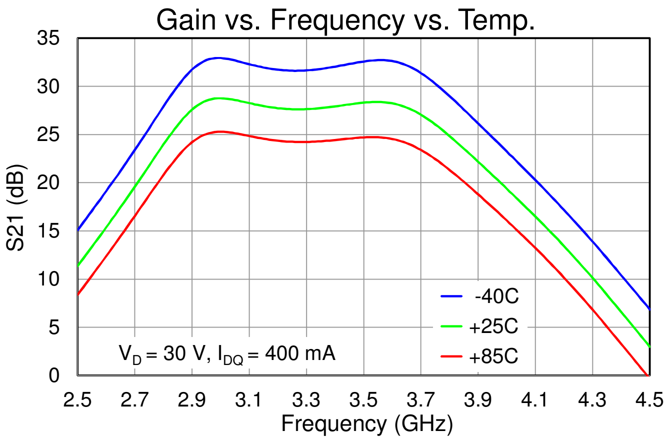
Test Conditions: V_D = 40 V
Failure Criteria = 10% reduction in I_{D_MAX}

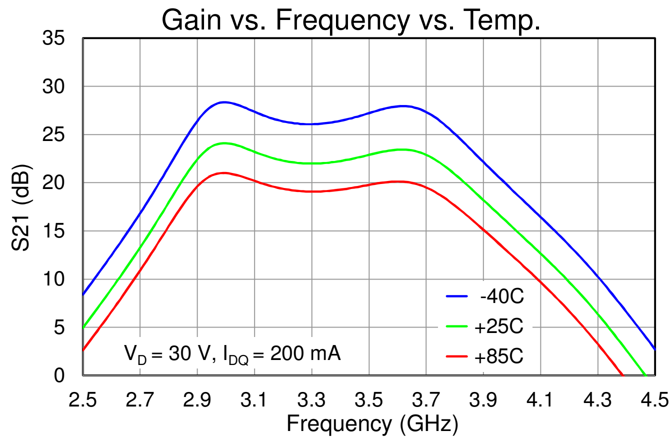


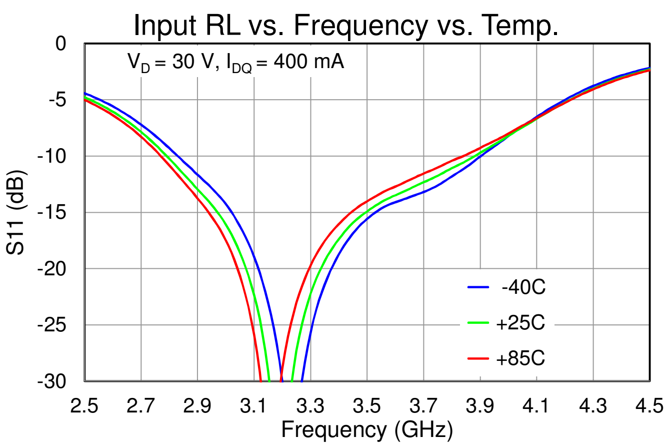


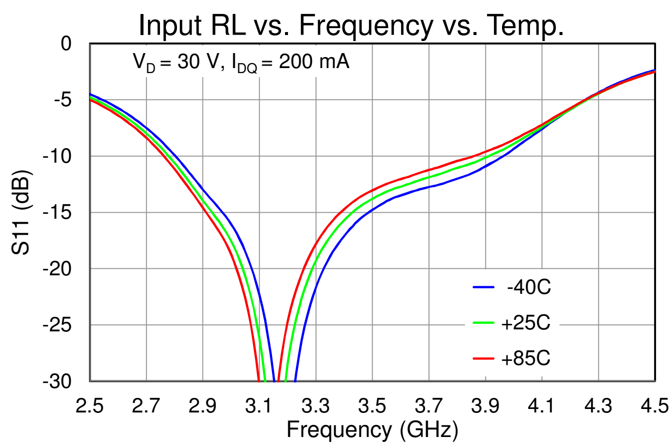


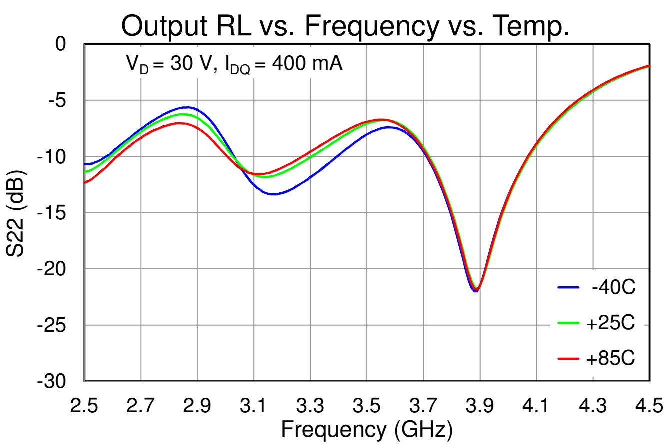
Typical Performance – Small Signal

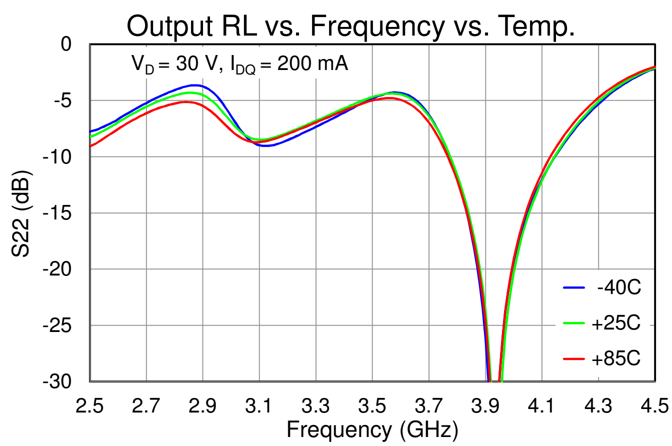




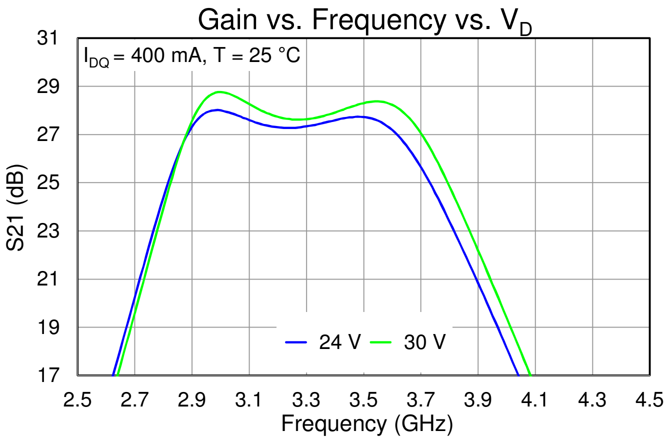


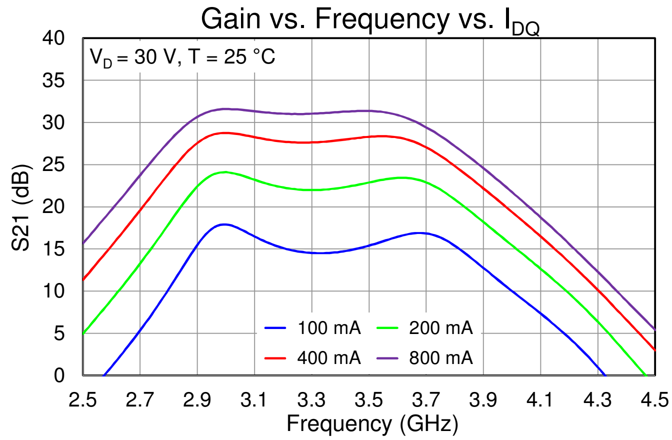


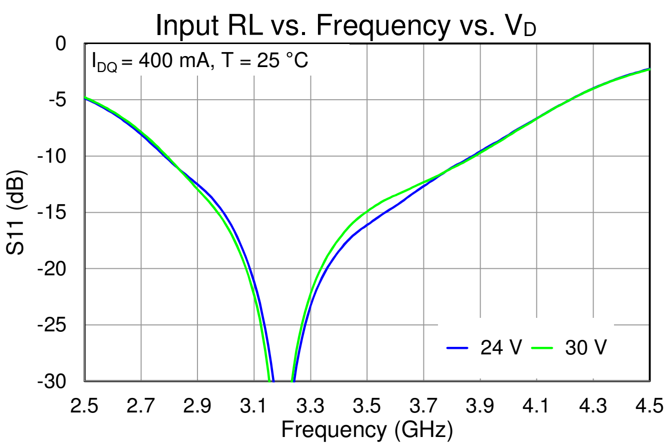


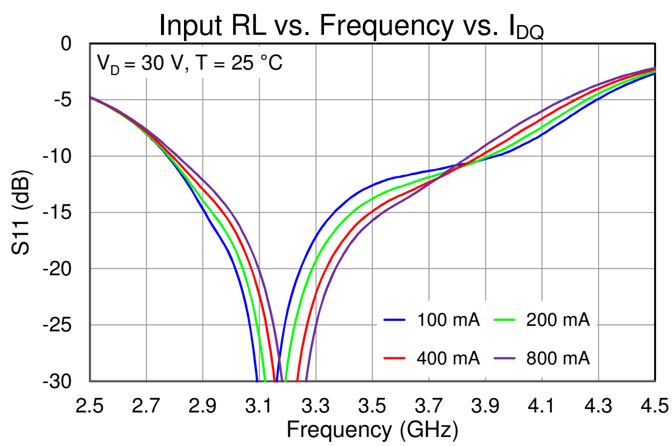


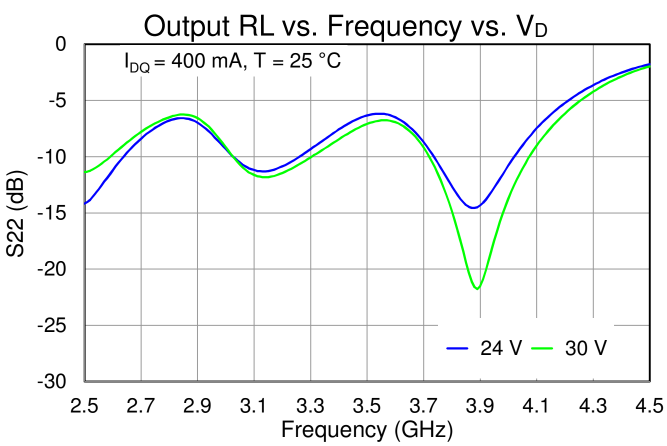
Typical Performance – Small Signal

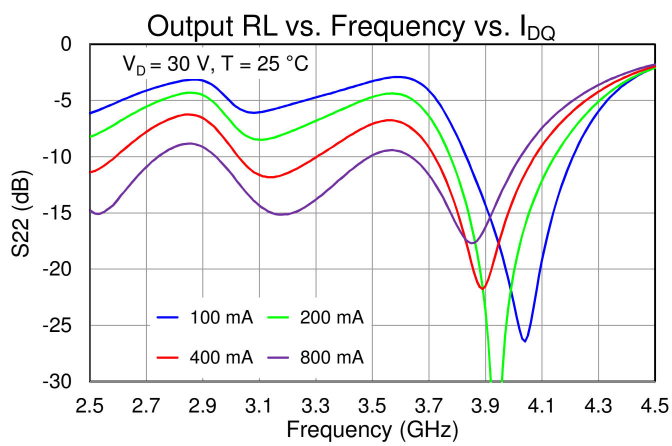






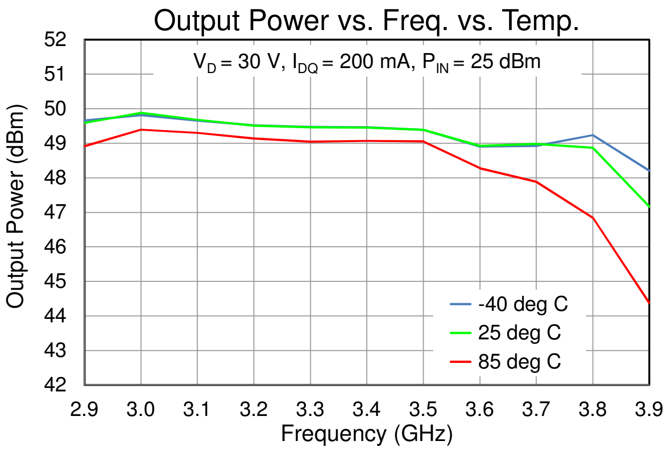


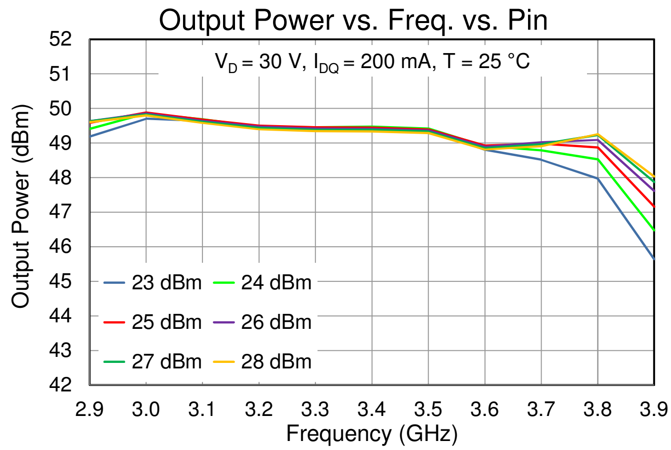


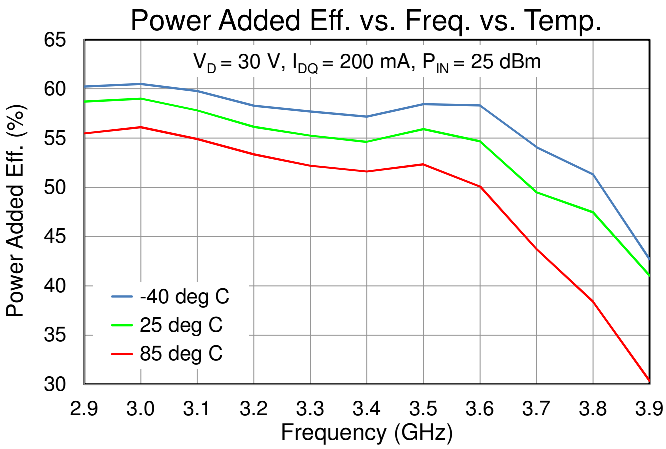


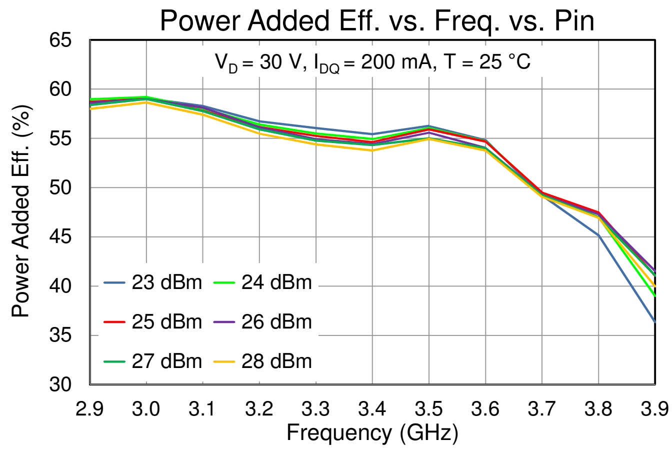
Typical Performance – Large Signal

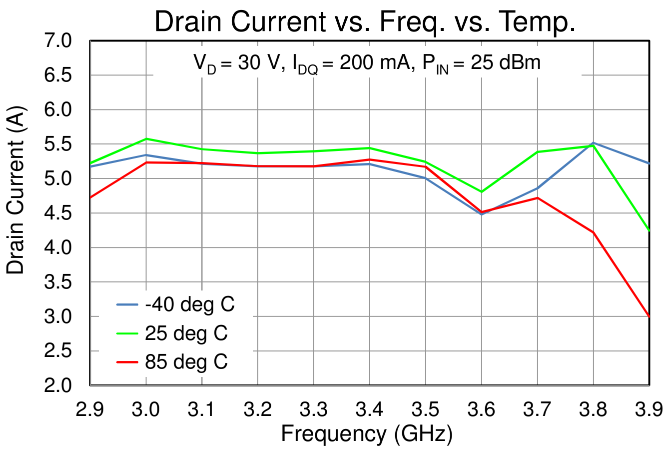
Test conditions unless otherwise noted: 25 °C, V_D = 30 V, I_{DQ} = 200 mA, PW = 100 us, DC = 10 %

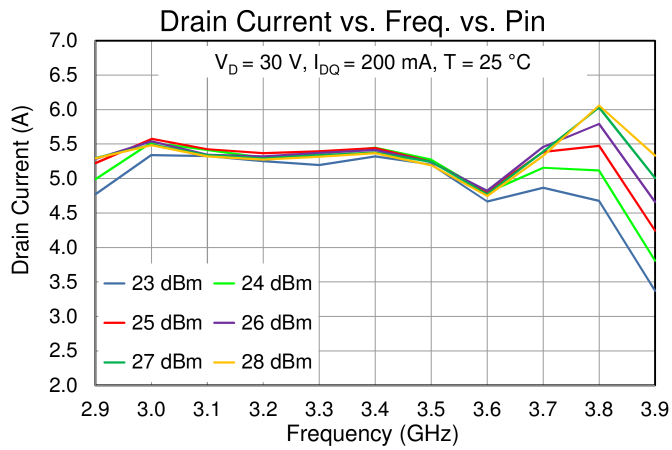








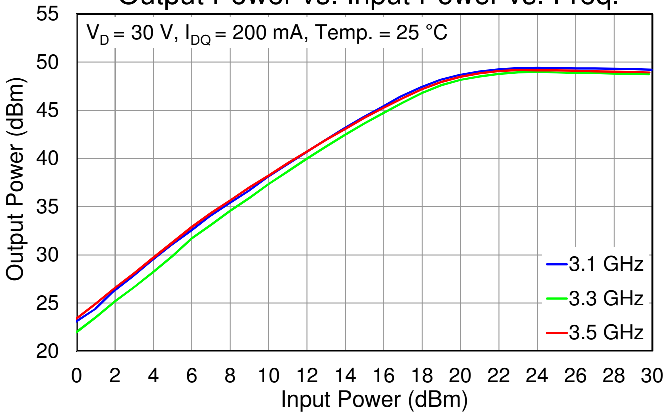




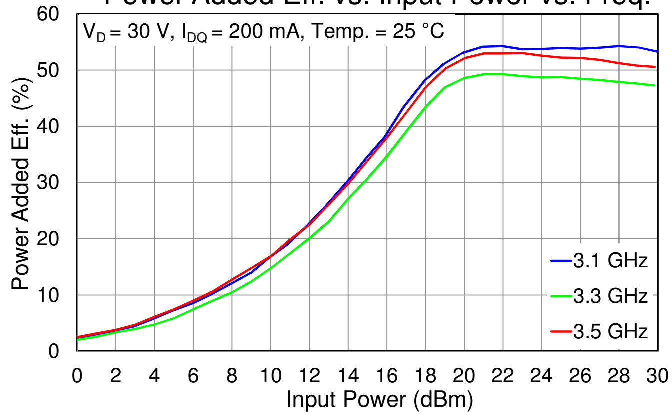
Typical Performance – Large Signal

Test conditions unless otherwise noted: 25 °C, V_D = 30 V, I_{DQ} = 200 mA, PW = 100 us, DC = 10 %

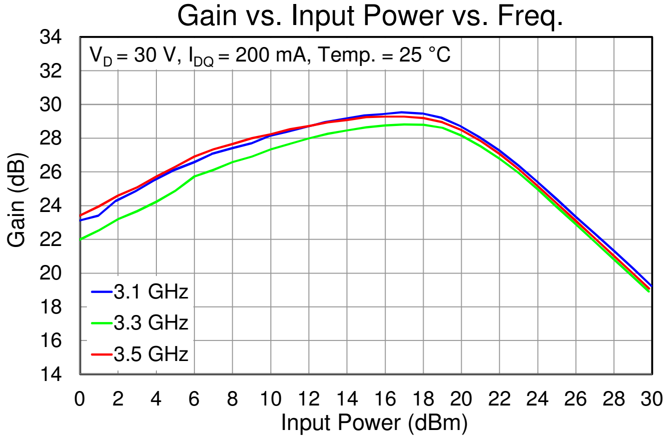
Output Power vs. Input Power vs. Freq.



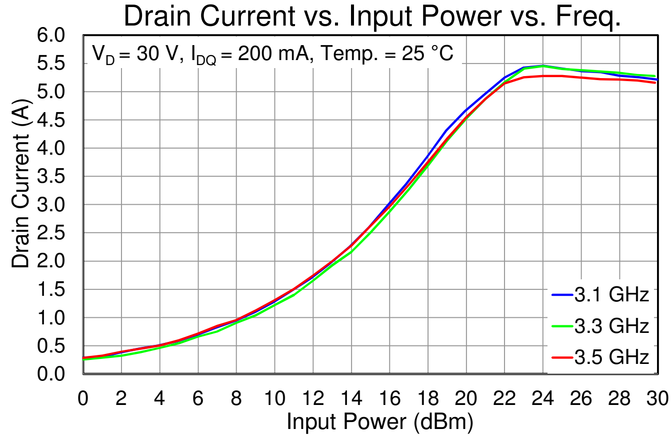
Power Added Eff. vs. Input Power vs. Freq.



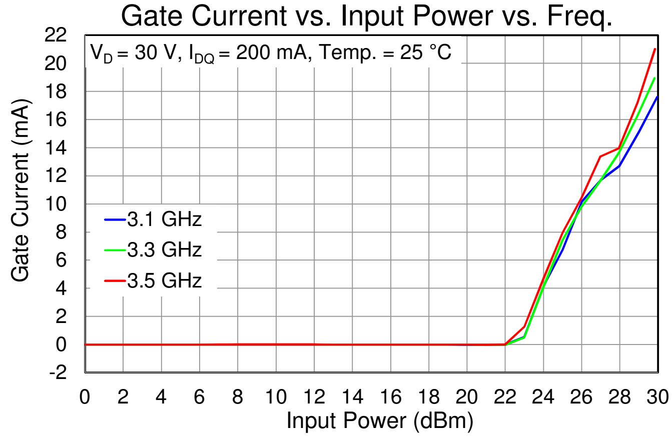
Gain vs. Input Power vs. Freq.



Drain Current vs. Input Power vs. Freq.

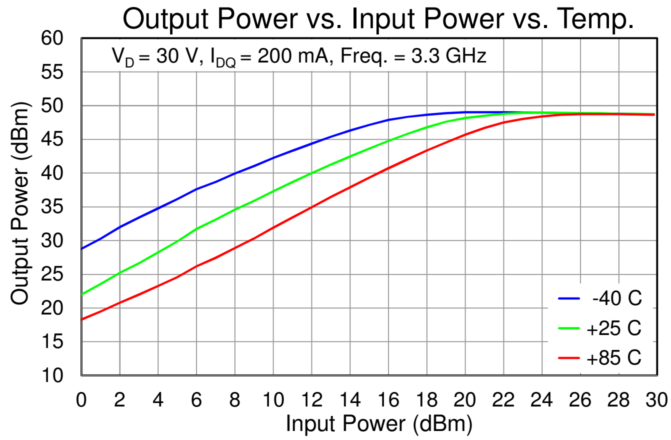


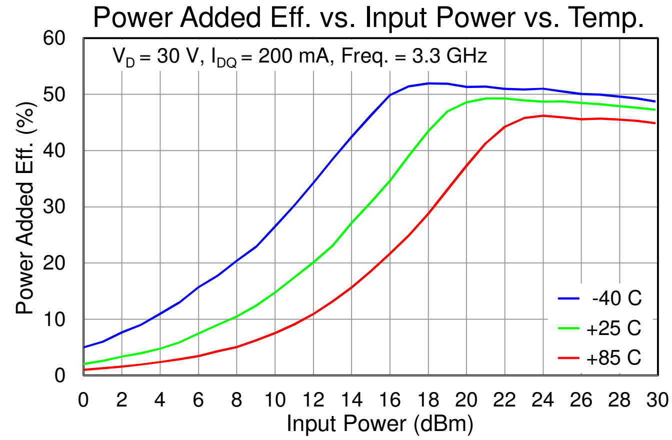
Gate Current vs. Input Power vs. Freq.

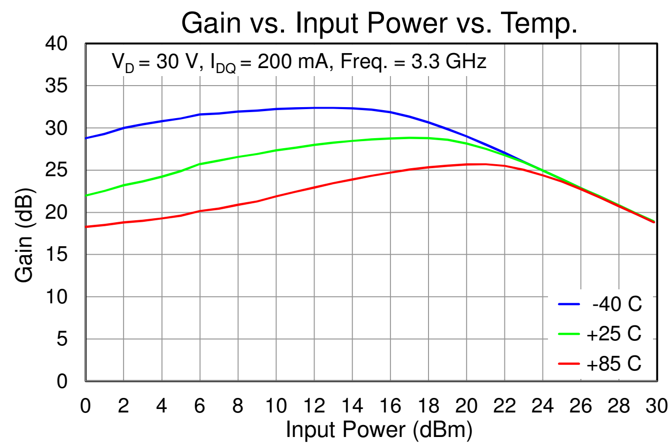


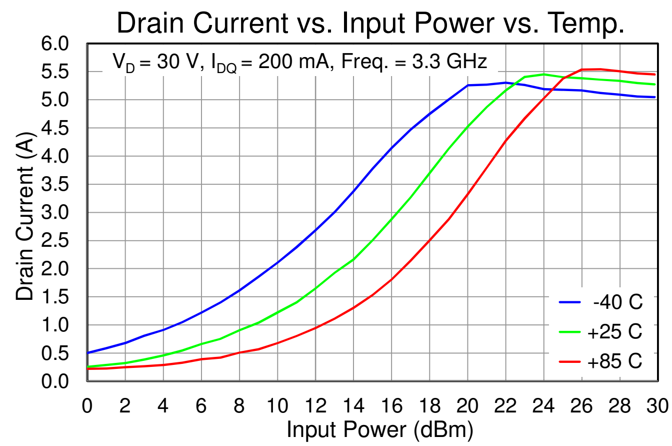
Typical Performance – Large Signal

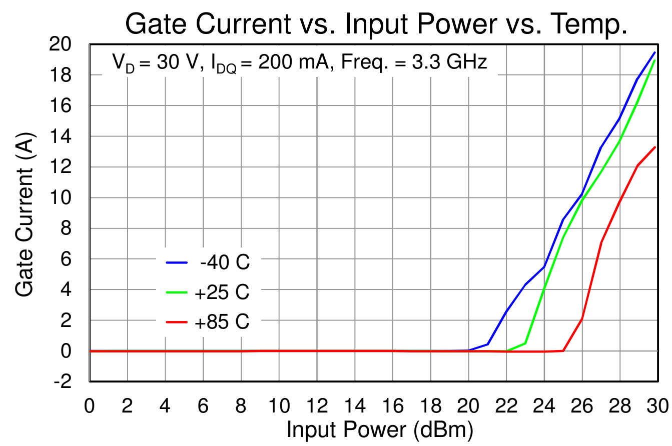
Test conditions unless otherwise noted: 25 °C, V_D = 30 V, I_{DQ} = 200 mA, PW = 100 us, DC = 10 %





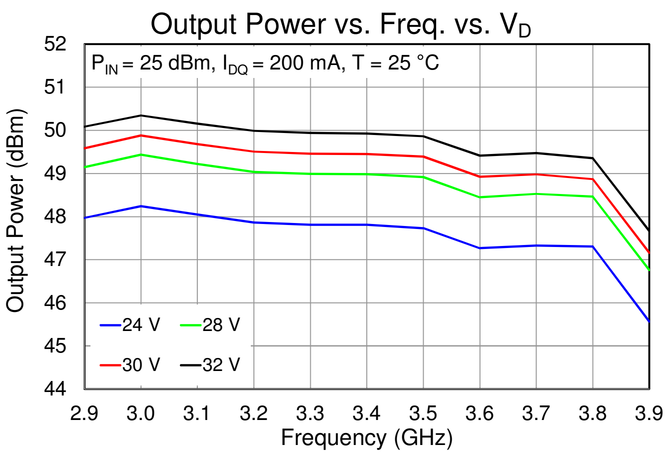


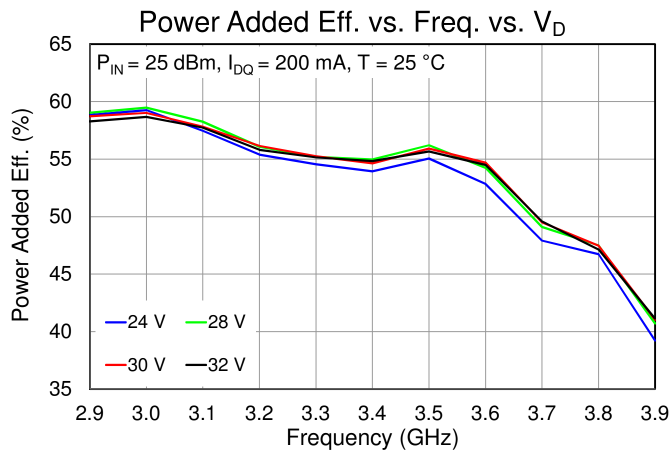


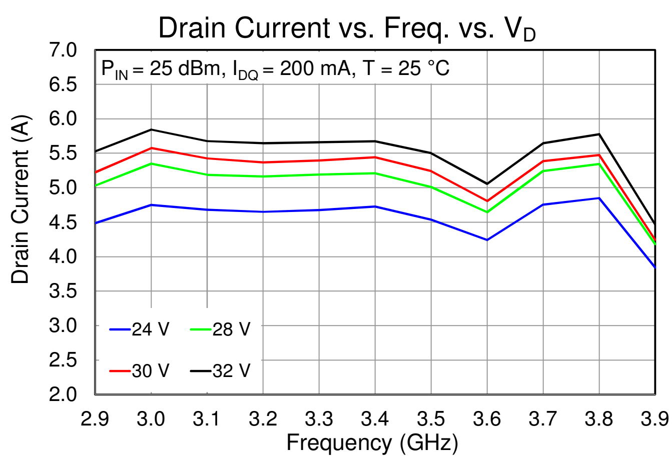


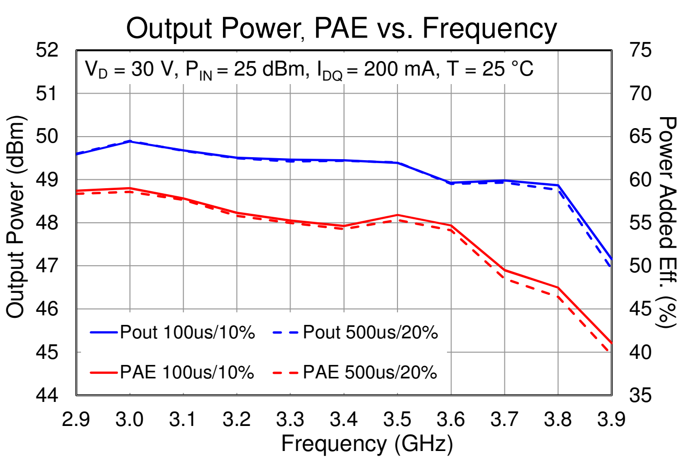
Typical Performance – Large Signal

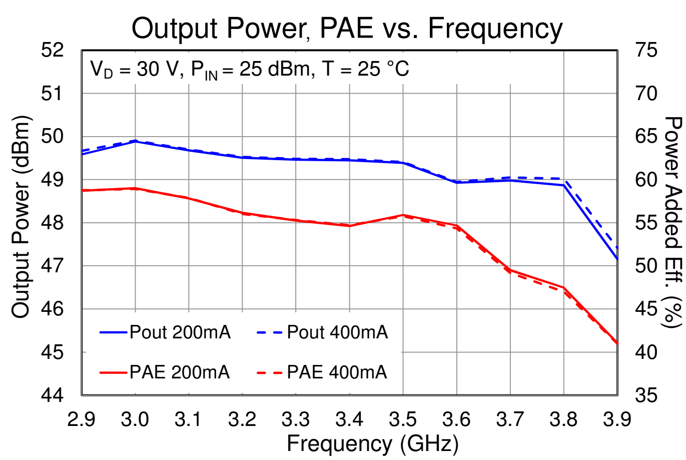
Test conditions unless otherwise noted: 25 ℃, V_D = 30 V, I_{DQ} = 200 mA, PW = 100 us, DC = 10 %











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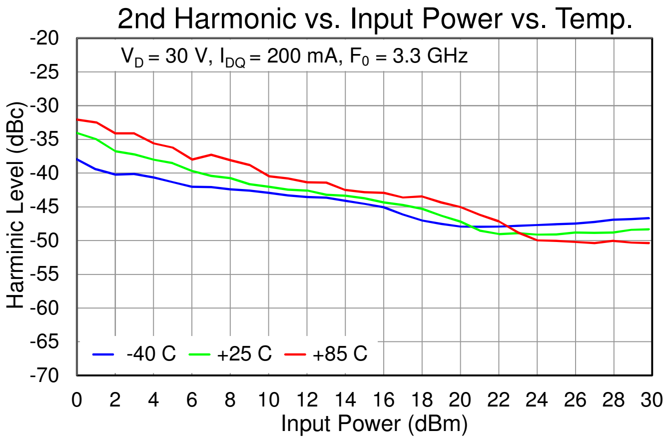
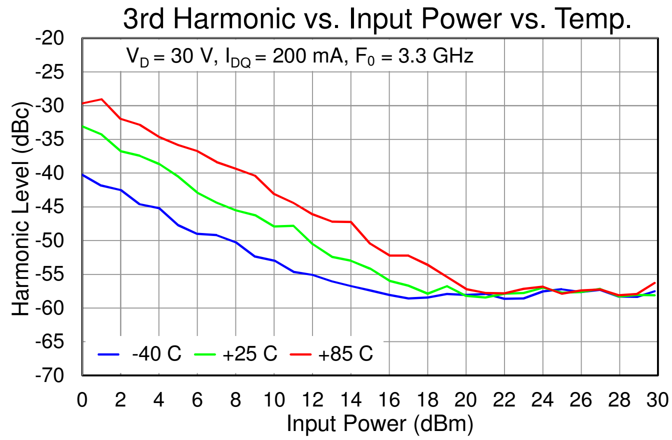
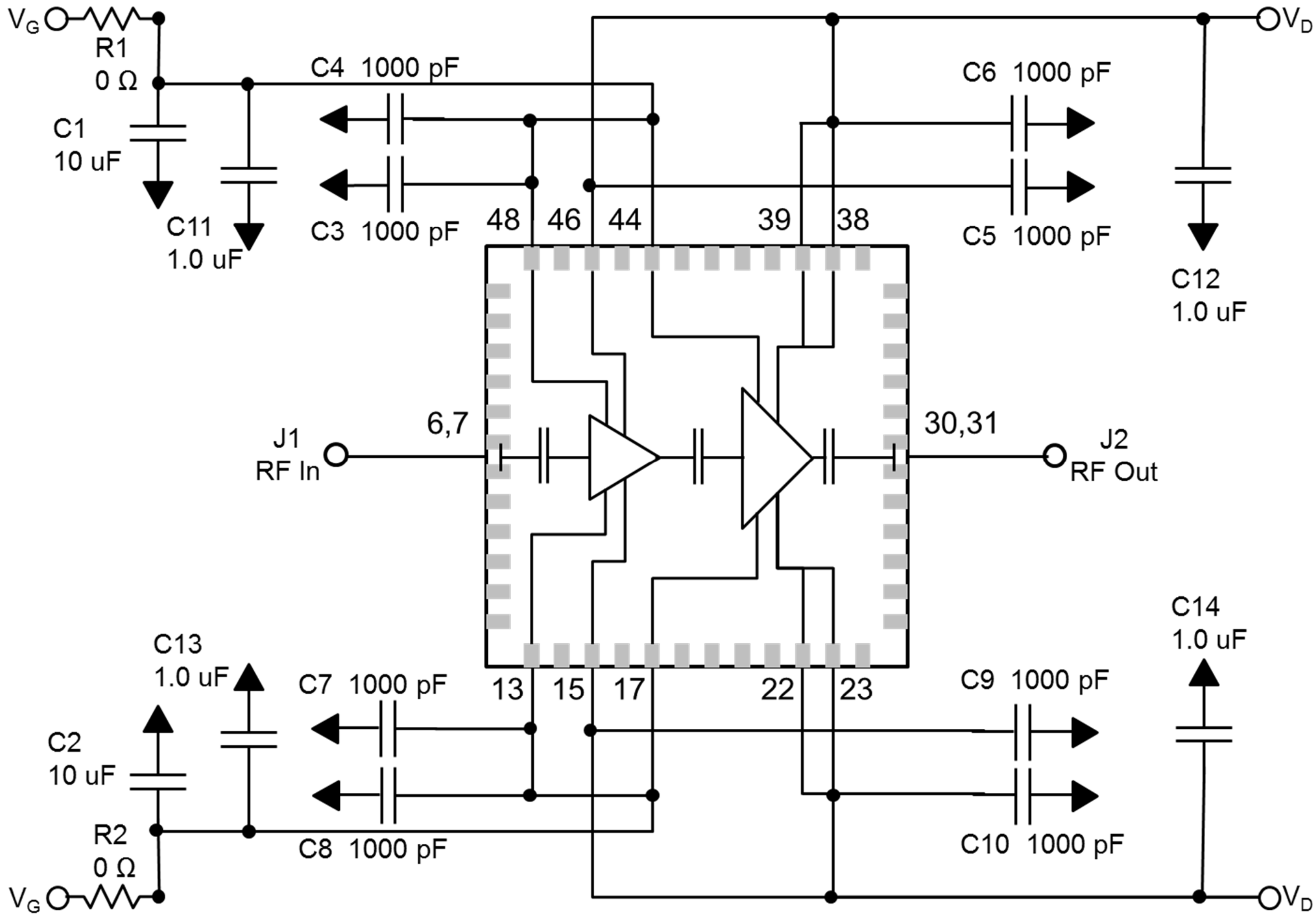




Application Circuit



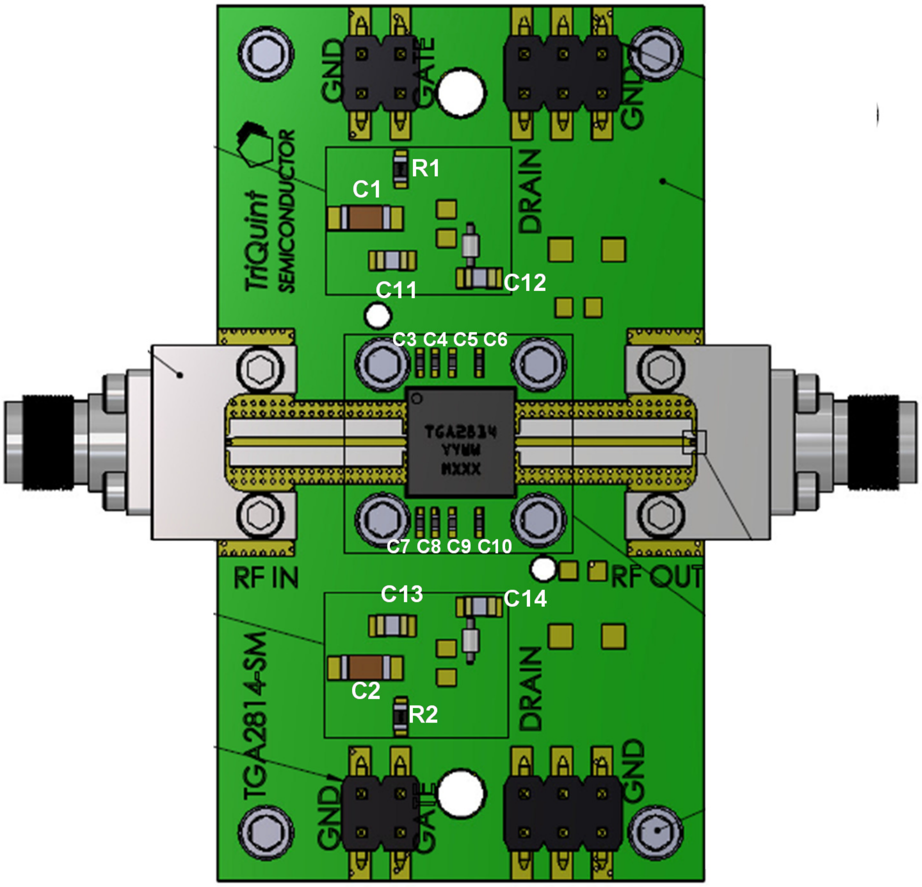
Bias-up Procedure

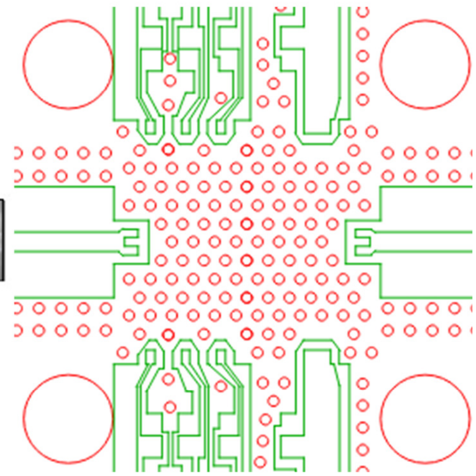
1. Set I_D limit to 6 A, I_G limit to 30 mA
2. Apply -5.0 V to V_G
3. Apply +30 V to V_D
4. Adjust V_G more positive until I_{DQ} = 200 mA (V_G ~ –2.90 V Typical)
5. Apply RF signal

Bias-down Procedure

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

Evaluation Board and Mounting Detail

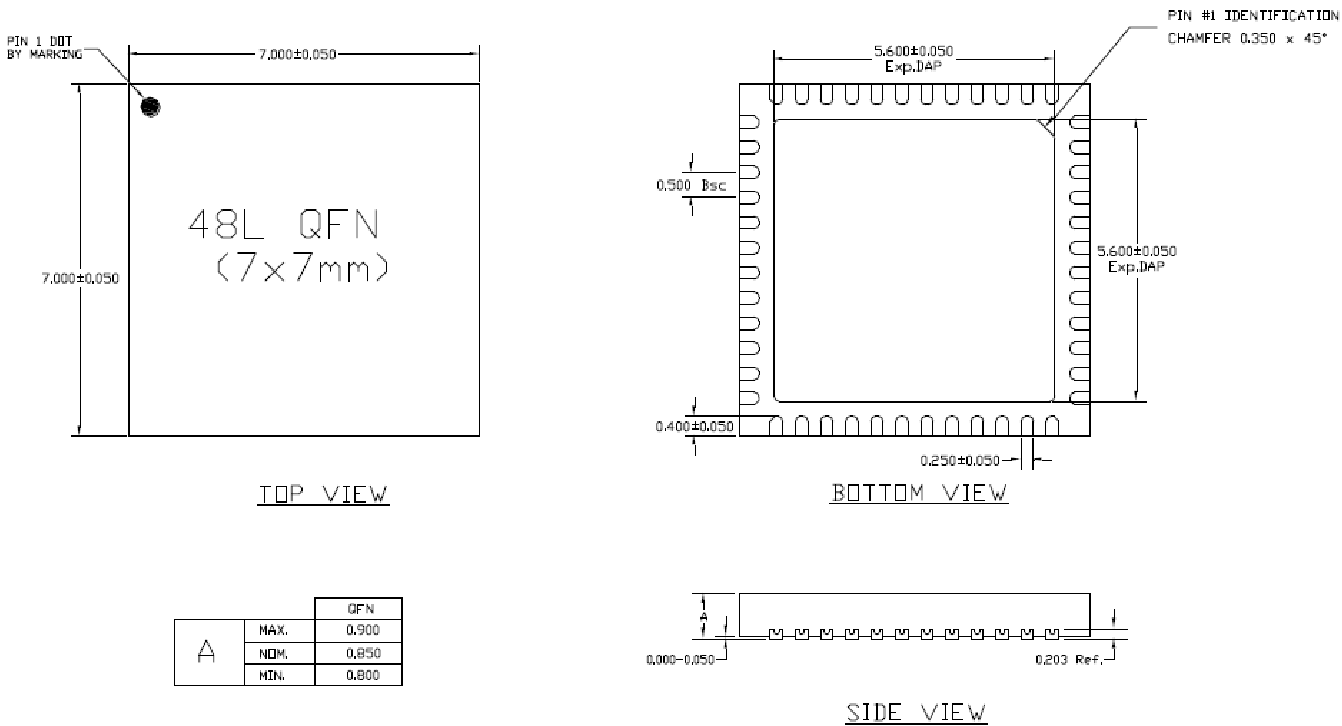




RF Layer is 0.008" thick Rogers Corp. RO40003C (ε_r = 3.35). Metal layers are 0.5 oz. copper. The microstrip line at the connector interface is optimized for the Southwest Microwave end launch connector 1092-02A-5.

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



Dimensions are in mm.

Pad No.	Symbol	Description
1-5, 8-12, 14, 16, 18-21, 24-29, 32-37, 40-43, 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)
22, 23, 38, 39	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

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 ℃.

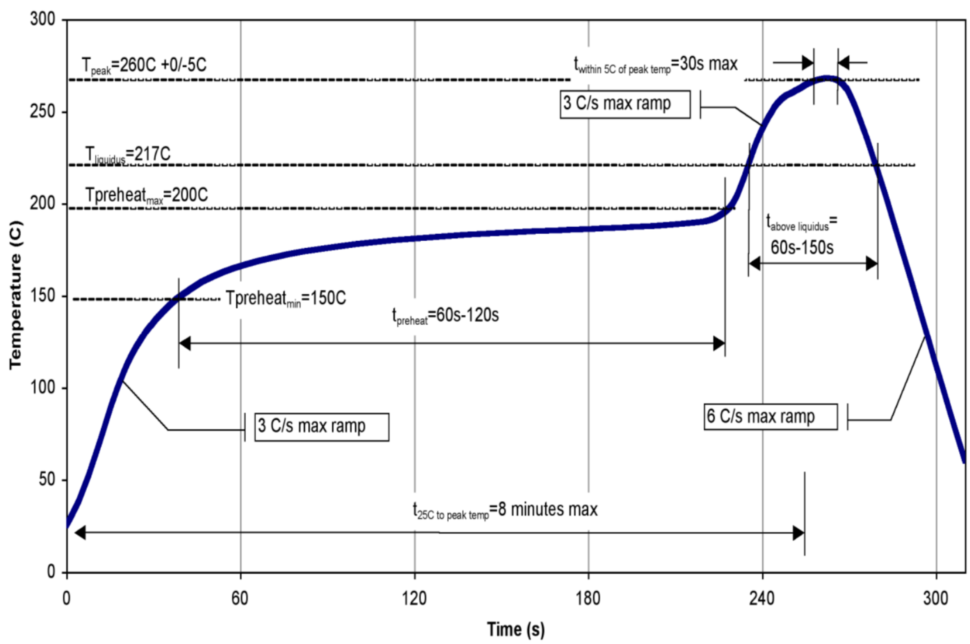
RoHS-Compliance

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

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

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

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

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