TGA2586-FL

7.9 – 8.4 GHz 50W GaN Power Amplifier

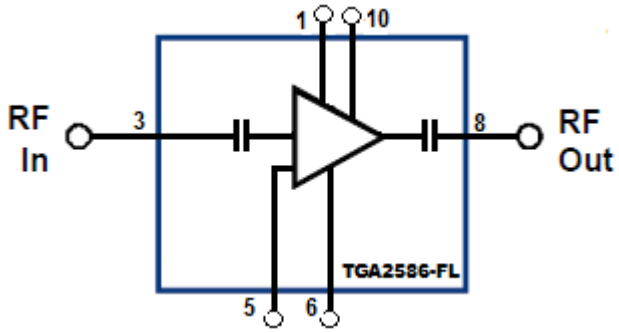
Applications

- Satellite Communications

Product Features

- Frequency Range: 7.9 – 8.4 GHz
- P_{SAT}: 47 dBm (CW)
- P_{1dB}: 43 dBm
- PAE: 36%
- Small Signal Gain: 14 dB
- Bias: V_D = 24 V, I_{DQ} = 2.24 A, V_G = -2.4 V Typical
- Integrated Thermistor Temperature Monitor
- Package Dimensions: 17.4 x 24.0 x 3.9 mm

Functional Block Diagram



General Description

TriQuint's TGA2586-FL is a high power amplifier operating between 7.9 and 8.4 GHz and typically provides greater than 47dBm of saturated output power, 36% power-added efficiency and 14dB small signal gain.

Ideally suited for satellite communications, the TGA2586-FL is packaged in a CuW-base, flanged package for superior thermal management.

The TGA2586-FL uses TriQuint's proven TQGaN25 process which provides superior performance while maintaining high reliability. In addition, the use of SiC substrates provides optimum thermal performance necessary for reliable high power operation.

Lead-free and RoHS compliant.

Evaluation Boards are available upon request.

Pad Configuration

Pad No.	Symbol
1	V_G
2, 4, 7, 9	N/C
3	RF IN
5	Temp (Thermistor)
6	V_D
8	RF OUT
10	V_D

Ordering Information

Part	ECCN	Description
TGA2586-FL	3A001.b.3.b	GaN High Power Amplifier

Absolute Maximum Ratings

Parameter	Value
Drain Voltage (V_D)	40 V
Drain to Gate Voltage (V_D-V_G)	100 V
Gate Voltage Range (V_G)	-5 to 0 V
Drain Current (I_D)	10 A
Gate Current (I_G)	-23 to 56 mA
Power Dissipation (P_{DISS})	100 W
RF Input Power, CW, 50 Ω, T = 25 °C (P_{IN})	+44 dBm
Channel Temperature (T_{CH})	275 °C
Mounting Temperature (30 Seconds)	260 °C
Storage Temperature	-40 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)	24 V
Drain Current (I_{DQ})	2240 mA
Drain Current Under RF Drive (I_{D_Drive})	5800 mA
Gate Voltage (V_G)	-2.4 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 = 24 V, I_{DQ} = 2240 mA , V_G = -2.4 V Typical

Parameter	Min	Typical	Max	Units
Operational Frequency Range	7.9		8.4	GHz
Small Signal Gain		14		dB
Input Return Loss		9		dB
Output Return Loss		15		dB
Output Power at Saturation (Pin = 37dBm)		47		dBm
Power-Added Efficiency (Pin = 37dBm)		36		%
Output TOI		48		dBm
Gain Temperature Coefficient		-0.016		dB/°C
Power Temperature Coefficient		-0.006		dBm/°C
TOI Temperature Coefficient		-0.008		dBm/°C

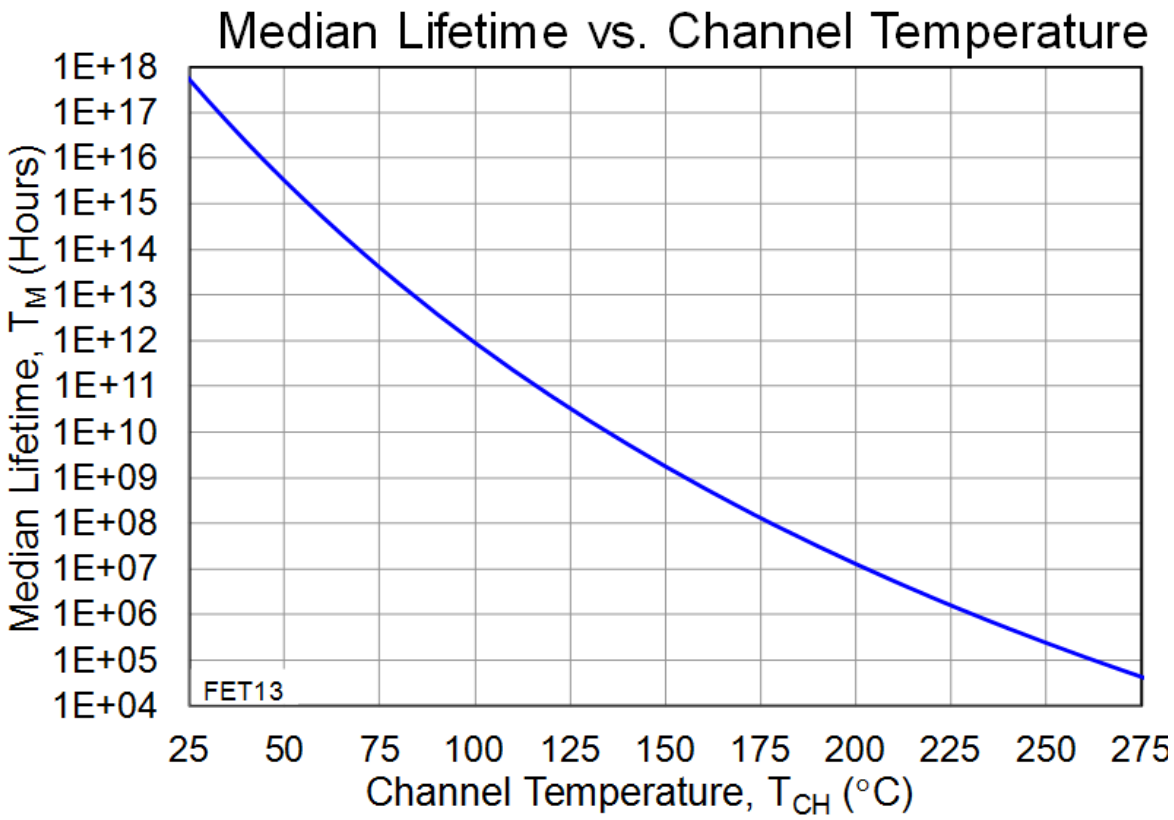
Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance, θ_{JC} (Note 1)	Tbaseplate = 85 °C	1.91	ºC/W
Channel Temperature, T_{CH} (Without RF Drive)	Tbaseplate = 85 °C, V_D = 24 V, I_{DQ} = 2240 mA, P_{DISS} = 54 W	188	°C
Median Lifetime, T_M (Without RF Drive)		3.75 x 10^7	Hrs
Channel Temperature, T_{CH} (Under RF Drive)	Tbaseplate = 85 °C, V_D = 24 V, $I_{D\ Drive}$ = 5800 mA, P_{OUT} = 47.6 dBm, P_{DISS} = 82 W, CW Operation.	241	°C
Median Lifetime, T_M (Under RF Drive)		4.55 x 10^5	Hrs

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

Median Lifetime

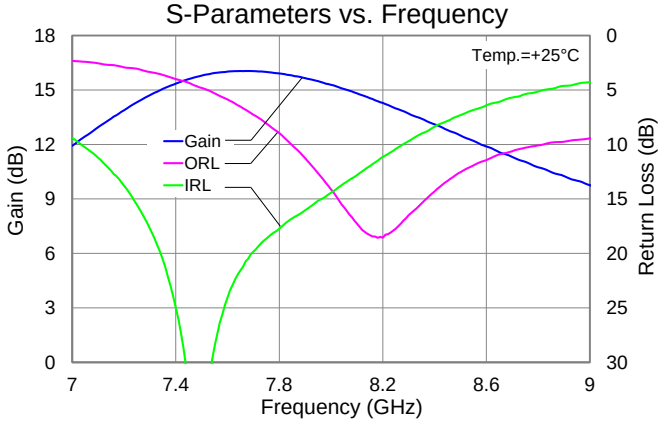
Test Conditions: V_D = 40V; Failure Criteria is 10% reduction in I_{D_MAX}



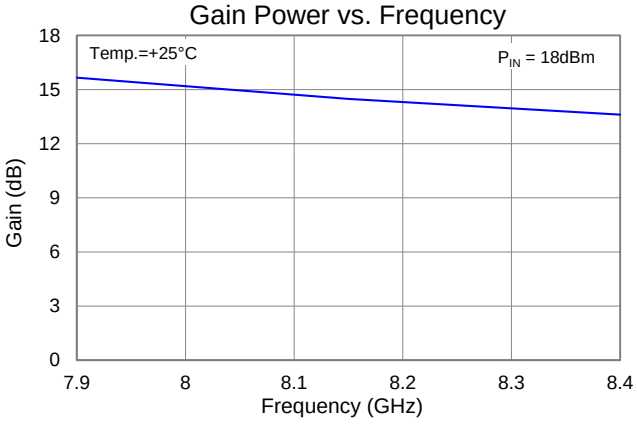
Typical Performance

Conditions unless otherwise specified: V_D = 24 V, I_{DQ} = 2.24 A, V_G = -2.4 V Typical, CW

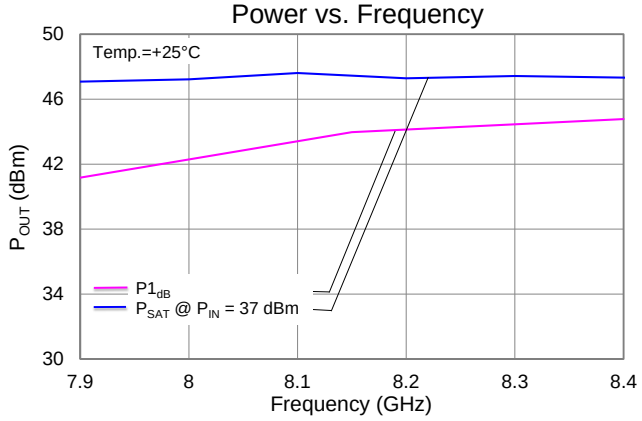
S-Parameters vs. Frequency



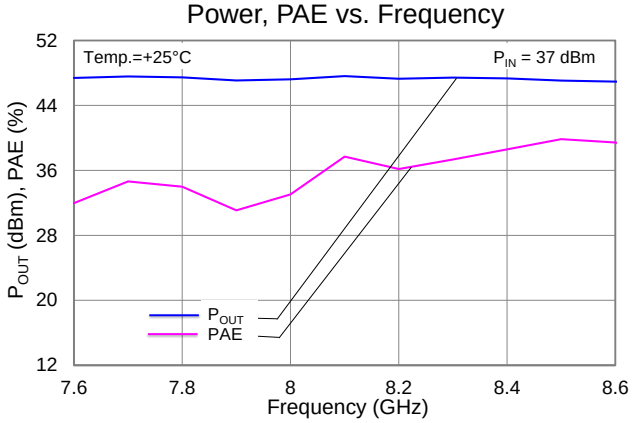
Gain Power vs. Frequency



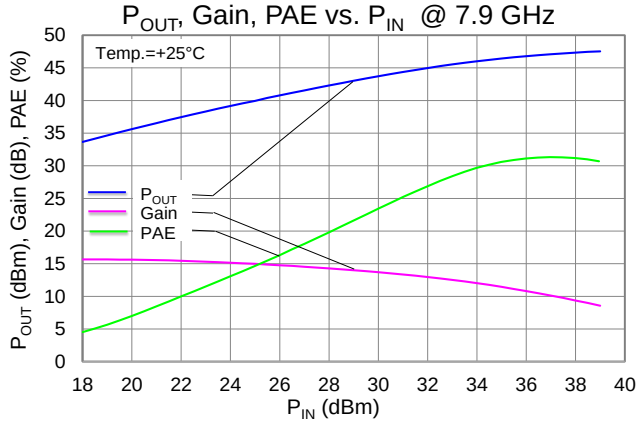
Power vs. Frequency



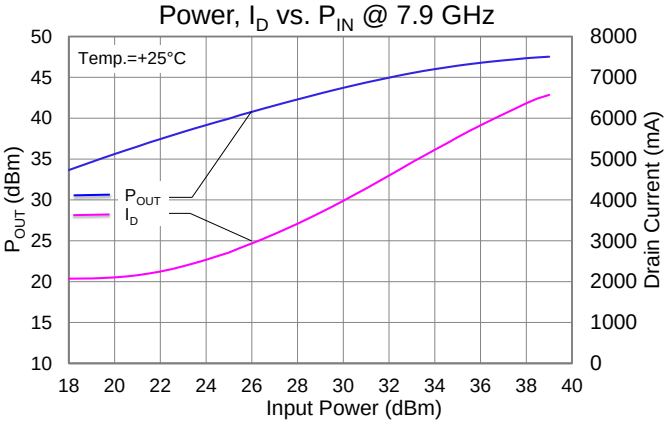
Power, PAE vs. Frequency



P_{OUT}, Gain, PAE vs. P_{IN} @ 7.9 GHz

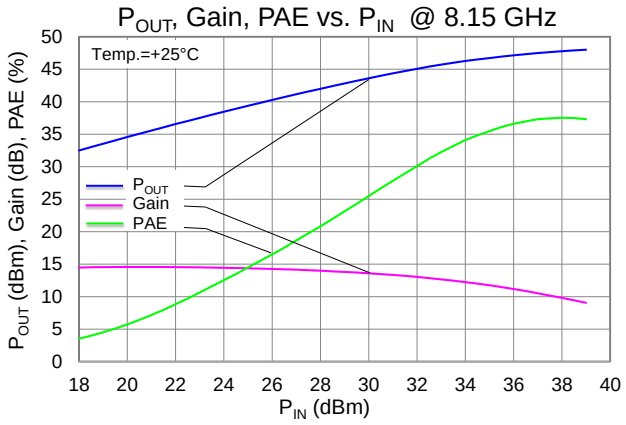


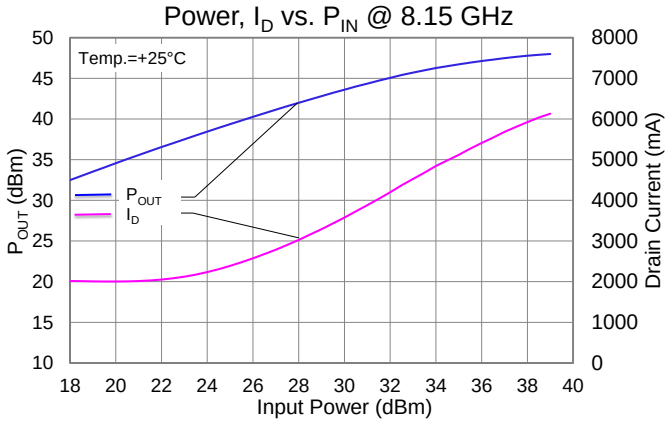
Power, I_D vs. P_{IN} @ 7.9 GHz

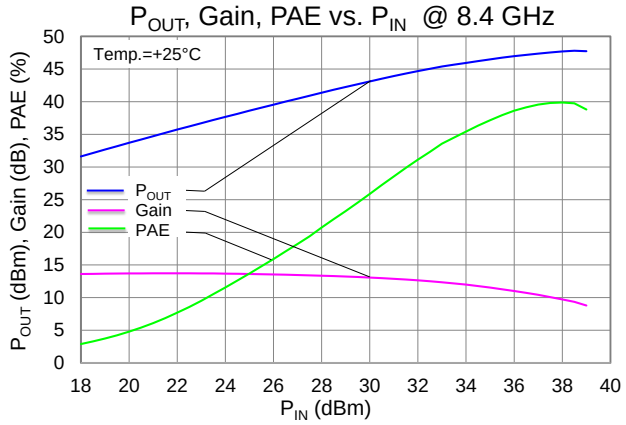


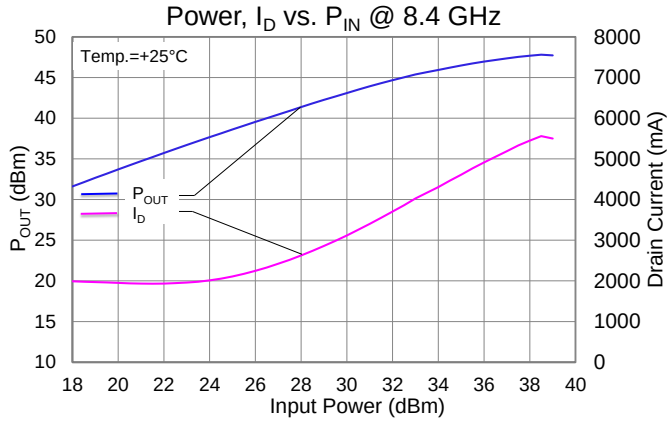
Typical Performance

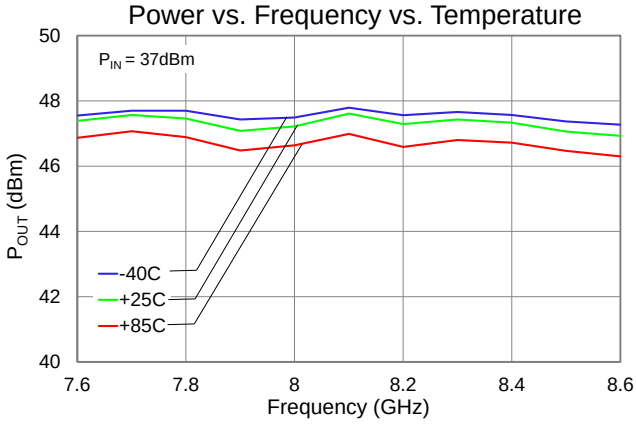
Conditions unless otherwise specified: V_D = 24 V, I_{DQ} = 2.24 A, V_G = -2.4 V Typical, CW

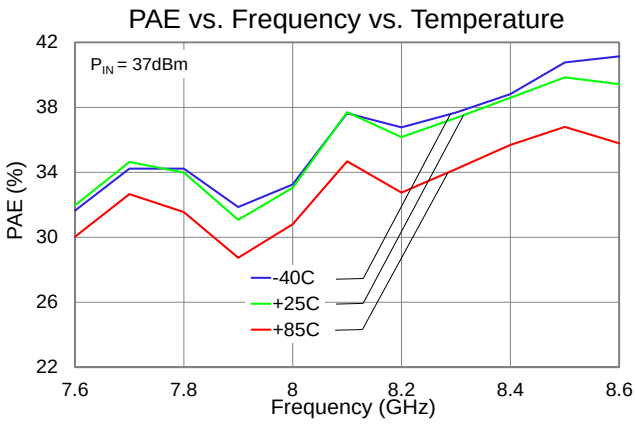








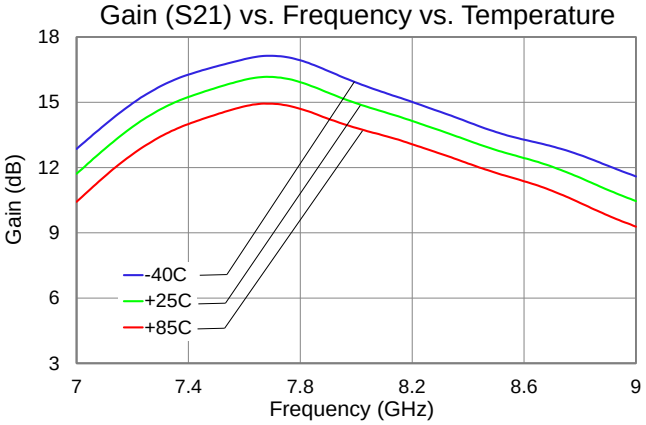




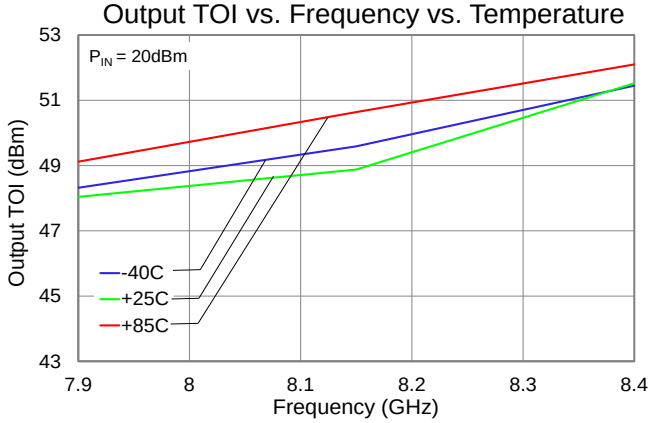
Typical Performance

Conditions unless otherwise specified: V_D = 24 V, I_{DQ} = 2.24 A, V_G = -2.4 V Typical, CW

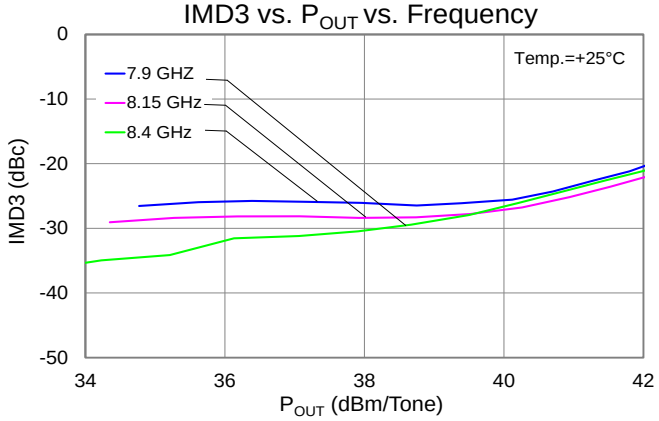
Gain (S21) vs. Frequency vs. Temperature



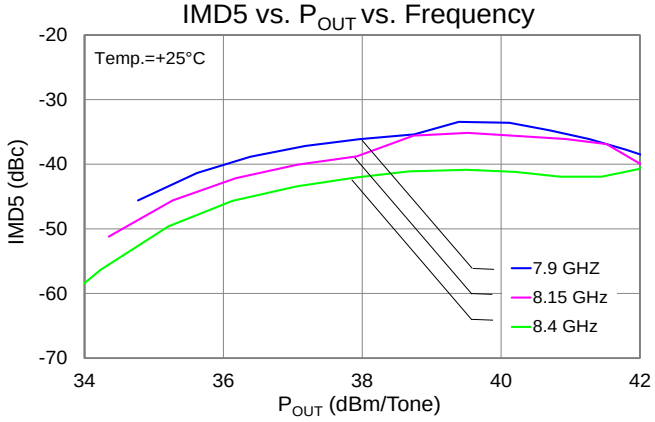
Output TOI vs. Frequency vs. Temperature



IMD3 vs. P_{OUT} vs. Frequency



IMD5 vs. P_{OUT} vs. Frequency

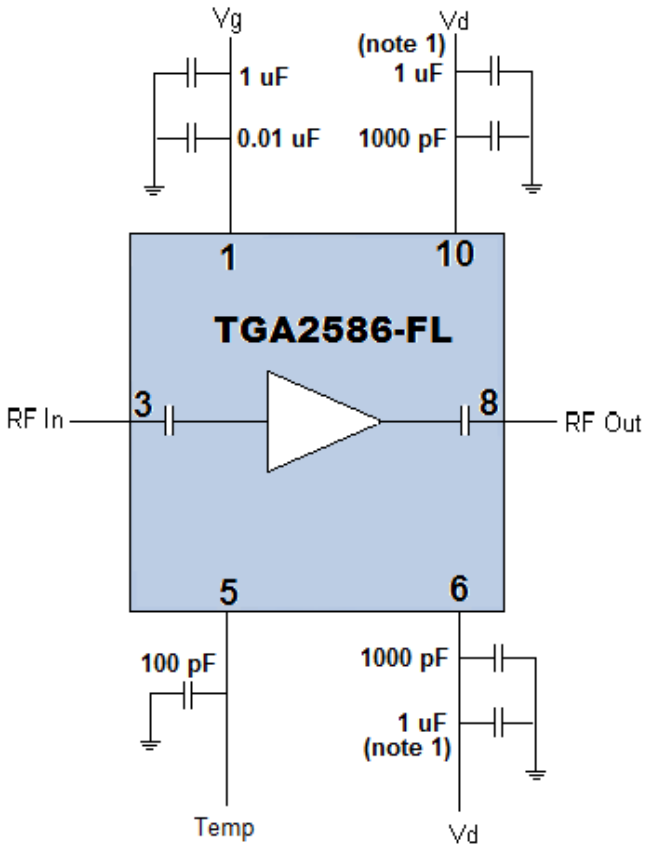


Typical Performance

A 100K Ω thermistor is assembled inside the TGA2586-FL package. Nominal resistance versus temperature is shown in the table below. This resistance measurement is taken between the Temp pin and ground pin to provide a useful indicator of the maximum package temperature.

deg C	R (Kohm)	deg C	R (Kohm)
0	378.80	65	17.89
5	284.71	70	14.84
10	216.16	75	12.37
15	165.70	80	10.37
20	128.17	85	8.74
25	100.00	90	7.40
30	78.66	95	6.29
35	62.36	100	5.37
40	49.81	105	4.61
45	40.06	110	3.96
50	32.44	115	3.43
55	26.44	120	2.97
60	21.68	125	2.59

Application Circuit



Note 1: These caps can be removed for drain pulsing.
Drain volatge must be biased from both sides top and bottom Vd pins.

Notes: To prevent damage to the device due to overshoot or oscillation issues, we recommend that current limits for all power supplies are set properly for each power supply before applying the voltage. The following are recommended current limits for each power supply:

Set 10 mA current limit to $V_{G.}$
Set 8 A current limit to $V_{D.}$

Bias-up Procedure

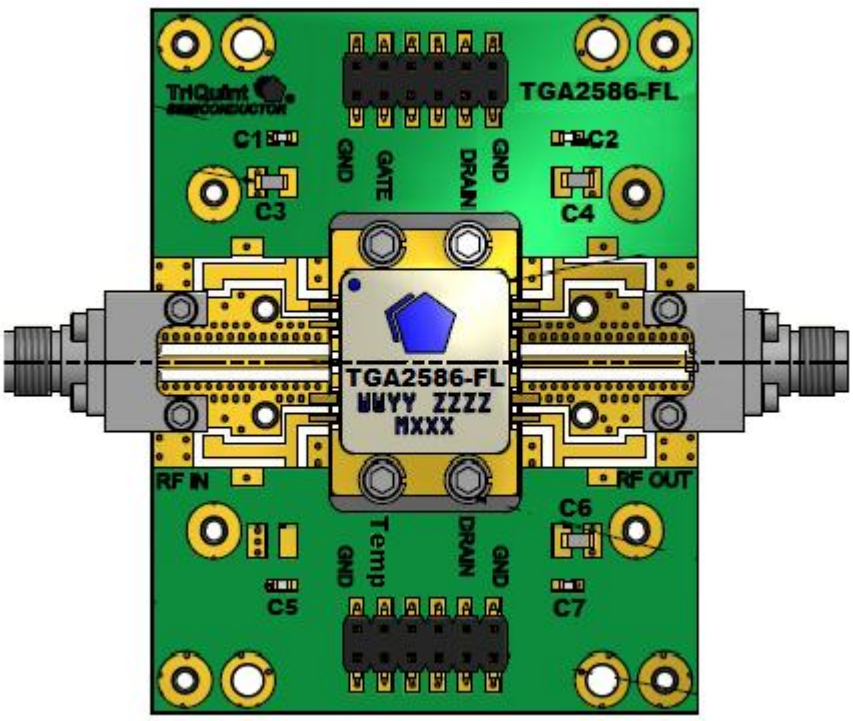
1. Apply -5.0 V to $V_{G.}$
2. Apply +24 V to $V_{D.}$
3. Adjust V_G until I_{DQ} = 2240 mA (V_G ~ -2.4 V Typ.)
4. Turn on RF supply.

Bias-down Procedure

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

Recommended Board Layout Assembly

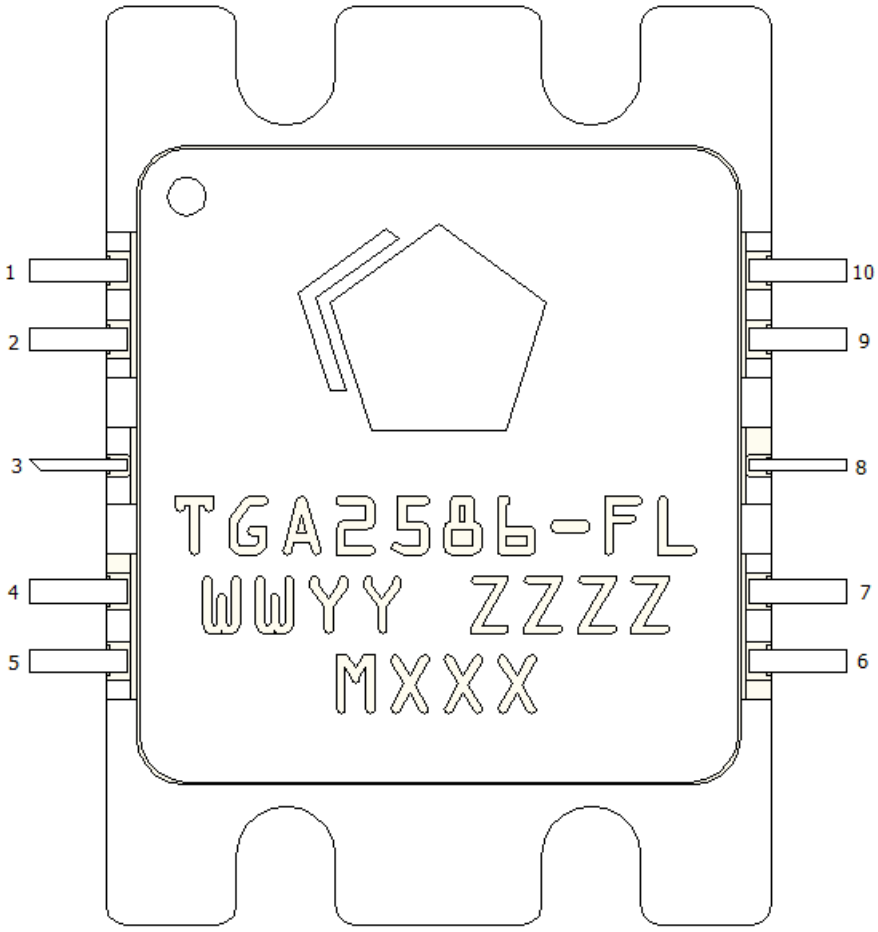
Top dielectric material is RO4350 0.020 inch thickness with 0.5 oz. copper.



Bill of Materials

Reference Design	Value	Description	Manufacturer
C1	0.01 uF	Cap, 0603, 50V, 10%	Various
C2, C7	1000 pF	Cap, 0603, 50V, 5%	Various
C3	1.0 uF	Cap, 1206, 16V, 10%	Various
C4, C6	1.0 uF	Cap, 1206, 50V, 10%, XR7	Various
C5	100 pF	Cap, 0603, 50V, 5%	Various

Pin Layout



Pin Description

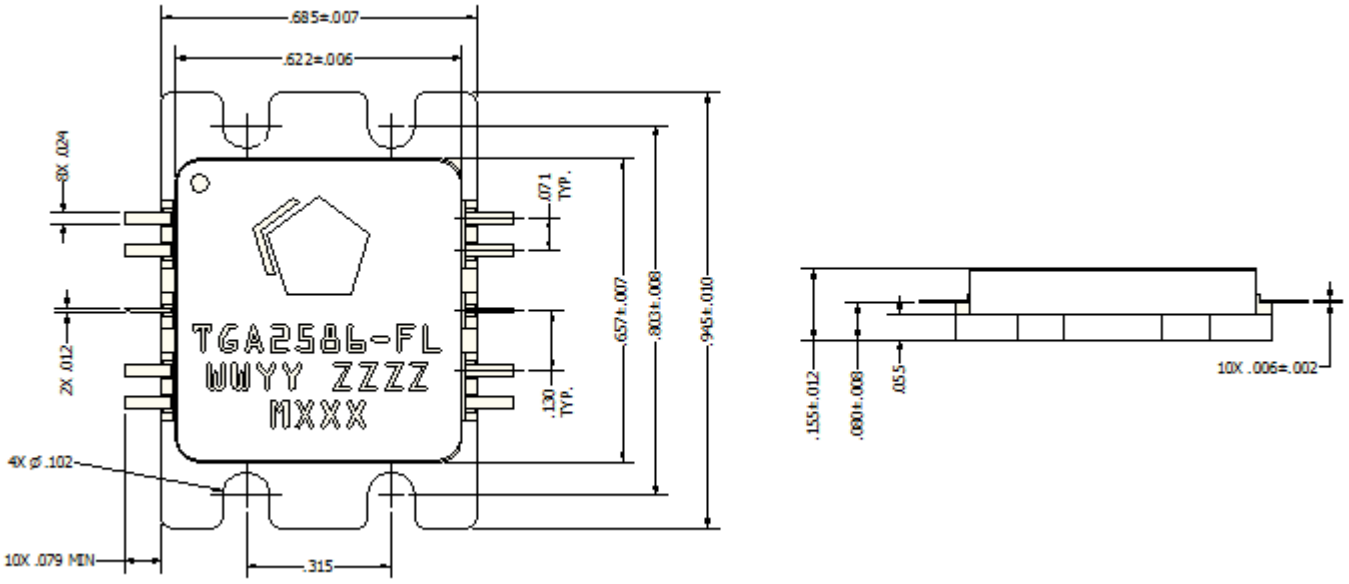
Pin	Symbol	Description
1	V_G	Gate voltage. Bias network is required. (1)
2, 4, 7, 9	N/C	No internal connection; must be grounded on PCB.
3	RF IN	RF input.
5	TEMP	Temperature sensing pin (Thermistor) (2)
6	V_D	Bottom Drain voltage. Bias network is required. (1)
8	RF OUT	RF output.
10	V_D	Top Drain voltage Bias network is required. (1)

Notes:

1. See Application Circuit on page 8 as an example.
2. See page 7 for addition thermal information.

Mechanical Information

All dimensions are in inches. Unless specified otherwise.



Marking: Part number – TGA2586-FL
Week/Year code – WWYY
Serial Number - ZZZZ
Batch ID – MXXX

Package Materials:

Base	Copper Tungsten (CuW)
Lead	Copper Alloy 194
Lid	Kovar
Plating Finish	Gold Plating

Part Is Hermetically Sealed

Assembly Notes

1. Clean the board or module with alcohol. Allow it to fully dry.
2. Nylock screws are recommended for mounting the TGA2586-FL to the board.
3. To improve the thermal and RF performance, we recommend the following:
   a. Apply thermal compound or 4 mils indium shim between the package and the board.
   b. Attach a heat sink to the bottom of the board and apply thermal compound or 4 mils indium shim between the heat sink and the board.
4. Apply solder to each pin of the TGA2586-FL.
5. Clean the assembly with alcohol.

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

TBD

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 ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Free
- SVHC Free

ECCN

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

Contact Information

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

Web: www.triquint.com **Tel:** +1.972.994.8465
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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