T2G6000528-Q3

10W, 28V DC – 6 GHz, GaN RF Power Transistor

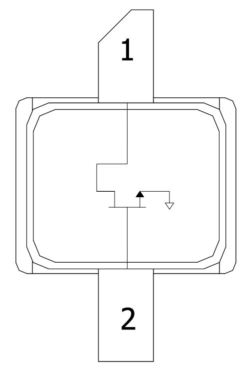
Applications

- Military radar
- Civilian radar
- Professional and military radio communications
- Test instrumentation
- Wideband or narrowband amplifiers
- Jammers

Product Features

- Frequency: DC to 6 GHz
- Output Power (P_{3dB}): 10 W at 3.3 GHz
- Linear Gain: >17 dB at 3.3 GHz
- Operating Voltage: 28 V
- Low thermal resistance package

Functional Block Diagram



General Description

The TriQuint T2G6000528-Q3 is a 10W (P_{3dB}) discrete GaN on SiC HEMT which operates from DC to 6 GHz. The device is constructed with TriQuint's proven TQGaN25 production process, which features advanced field plate techniques to optimize power and efficiency at high drain bias operating conditions. This optimization can potentially lower system costs in terms of fewer amplifier line-ups and lower thermal management costs.

Lead-free and ROHS compliant

Evaluation boards are available upon request.

Pin Configuration

Pin No.	Label
1	V_D / RF OUT
2	V_G / RF IN
Flange	Source

Ordering Information

Part	ECCN	Description
T2G6000528-Q3	EAR99	Packaged part Flangeless
T2G6000528-Q3-EVB3	EAR99	3.0-3.5 GHz Evaluation Board
T2G6000528-Q3-EVB5	EAR99	3.8-4.2 GHz Evaluation Board
T2G6000528-Q3-EVB6	EAR99	5.8 GHz Evaluation Board
T2G6000528-Q3-EVB1	EAR99	1.9 – 2.7 GHz Evaluation Board

Absolute Maximum Ratings

Parameter	Value
Breakdown Voltage (BV_{DG})	100 V (Min.)
Drain Gate Voltage (V_{DG})	40 V
Gate Voltage Range (V_G)	-10 to 0 V
Drain Current (I_D)	2.5 A
Gate Current (I_G)	-2.5 to 7 mA
Power Dissipation (P_D)	15 W
RF Input Power, CW, T = 25 °C (P_{IN})	34 dBm
Channel Temperature (T_{CH})	275 °C
Mounting Temperature (30 Seconds)	320 °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)	28 V (Typ.)
Drain Quiescent Current (I_{DQ})	50 mA (Typ.)
Peak Drain Current (I_D)	650 mA (Typ.)
Gate Voltage (V_G)	-3.0 V (Typ.)
Channel Temperature (T_{CH})	225 °C (Max)
Power Dissipation, CW (P_D)	11 W (Max)
Power Dissipation, Pulse (P_D)	12.5 W (Max)

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

RF Characterization – Load Pull Performance at 3.0 GHz [(1)]

Test conditions unless otherwise noted: T_A = 25 °C, V_D = 28 V, I_{DQ} = 50 mA

Symbol	Parameter	Min	Typical	Max	Units
G_{LIN}	Linear Gain		18.5		dB
P_{3dB}	Output Power at 3 dB Gain Compression		9.2		W
DE_{3dB}	Drain Efficiency at 3 dB Gain Compression		57.5		%
PAE_{3dB}	Power-Added Efficiency at 3 dB Gain Compression		55.9		%
G_{3dB}	Gain at 3 dB Compression		15.5		dB

Notes:
1. V_{DS} = 28 V, I_{DQ} = 50 mA; Pulse: 100µs, 20%

RF Characterization – Load Pull Performance at 6.0 GHz [(1)]

Test conditions unless otherwise noted: T_A = 25 °C, V_D = 28 V, I_{DQ} = 50 mA

Symbol	Parameter	Min	Typical	Max	Units
G_{LIN}	Linear Gain		15.0		dB
P_{3dB}	Output Power at 3 dB Gain Compression		9.3		W
DE_{3dB}	Drain Efficiency at 3 dB Gain Compression		63.0		%
PAE_{3dB}	Power-Added Efficiency at 3 dB Gain Compression		59.0		%
G_{3dB}	Gain at 3 dB Compression		12.0		dB

Notes:
1. V_{DS} = 28 V, I_{DQ} = 50 mA; Pulse: 100µs, 20%

RF Characterization – Performance at 3.3 GHz [1, 2]

Test conditions unless otherwise noted: T_A = 25 °C, V_D = 28 V, I_{DQ} = 50 mA

Symbol	Parameter	Min	Typical	Max	Units
G_{LIN}	Linear Gain	15.5	17.4		dB
P_{3dB}	Output Power at 3 dB Gain Compression	8.9	9.7		W
DE_{3dB}	Drain Efficiency at 3 dB Gain Compression	50.0	53.0		%
PAE_{3dB}	Power-Added Efficiency at 3 dB Gain Compression	45.0	49.7		%
G_{3dB}	Gain at 3 dB Compression	12.5	14.4		dB

Notes:

1. Performance at 3.3 GHz in the 3.0 to 3.5 GHz Evaluation Board
2. V_{DS} = 28 V, I_{DQ} = 50 mA; Pulse: 100µs, 20%

RF Characterization – Narrow Band Performance at 3.50 GHz [1]

Test conditions unless otherwise noted: T_A = 25 °C, V_D = 28 V, I_{DQ} = 50 mA

Symbol	Parameter	Typical
VSWR	Impedance Mismatch Ruggedness	10:1

Notes:

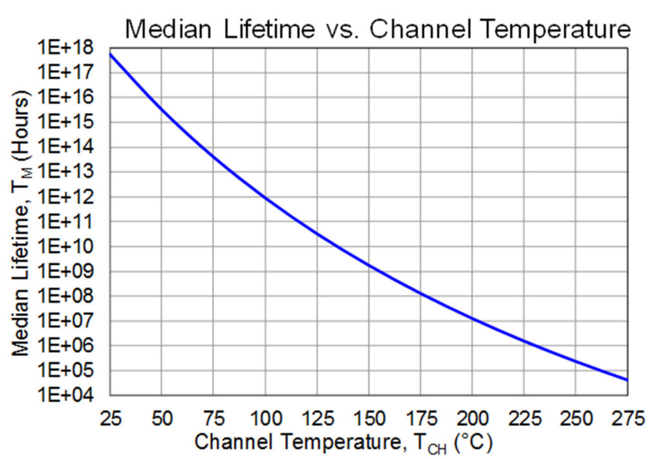
1. V_{DS} = 28 V, I_{DQ} = 50 mA, CW at P_{1dB}

Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC})	DC at 85 ℃ Case	12.4	ºC/W
Channel Temperature (T_{CH})		225	℃

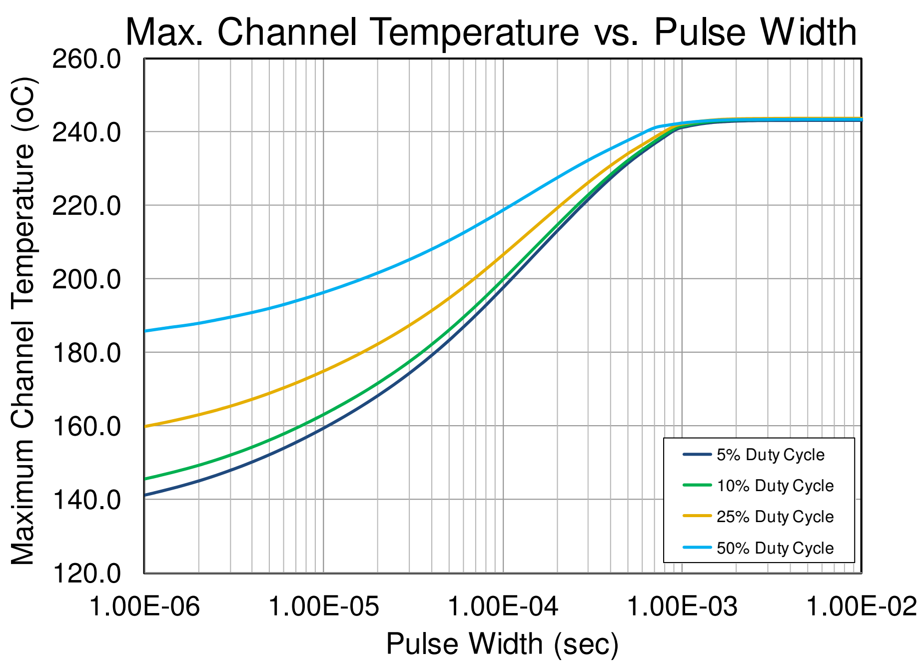
Notes:
Thermal resistance measured to bottom of package, CW.

Median Lifetime



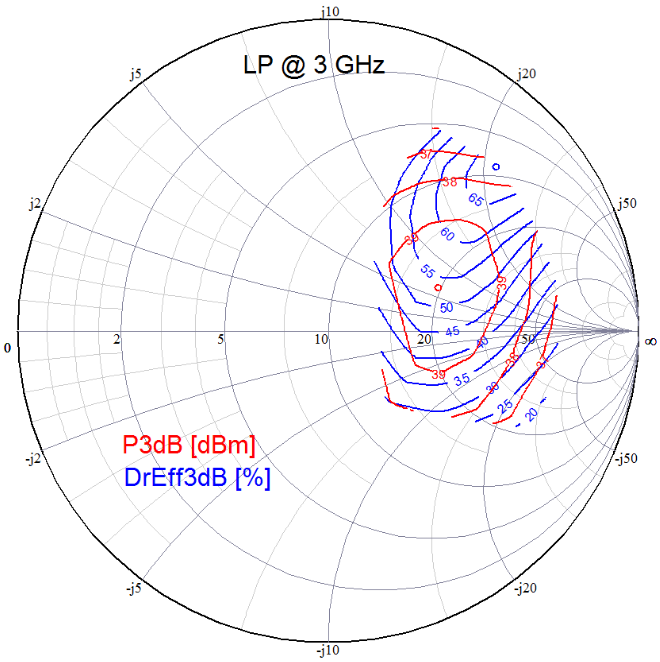
Maximum Channel Temperature

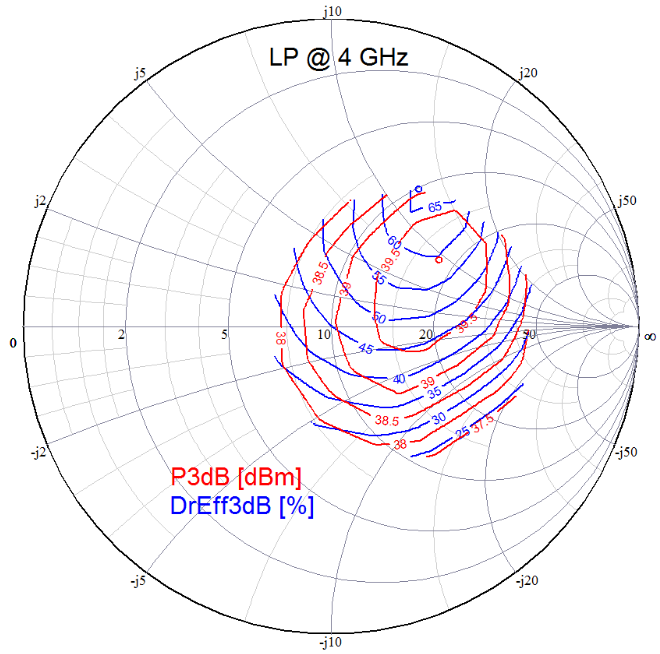
T_{BASE} = 85℃, P_D = 12.5 W

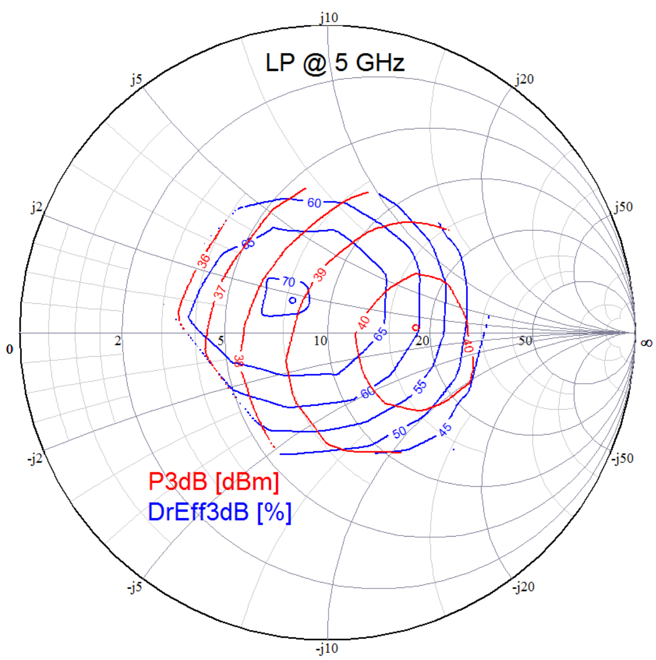


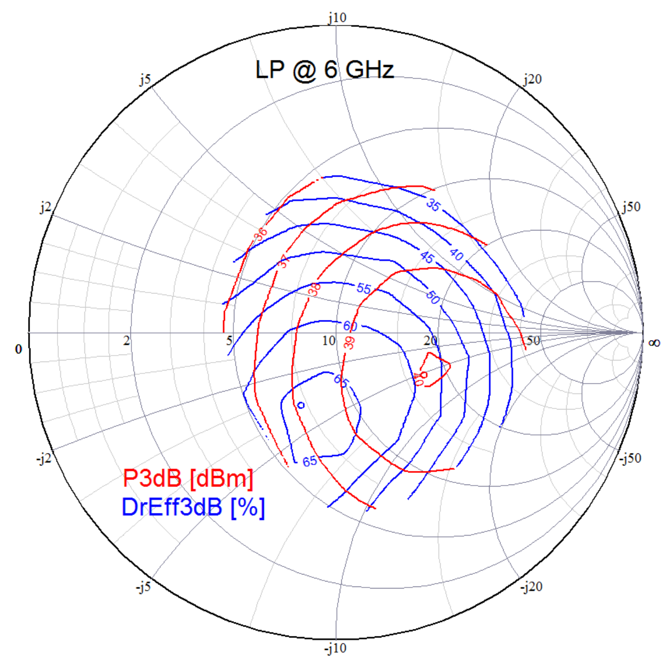
Load Pull Smith Charts [1, 2]

RF performance that the device typically exhibits when placed in the specified impedance environment. The impedances are not the impedances of the device, they are the impedances presented to the device via an RF circuit or load-pull system. The impedances listed follow an optimized trajectory to maintain high power and high efficiency.









Notes:

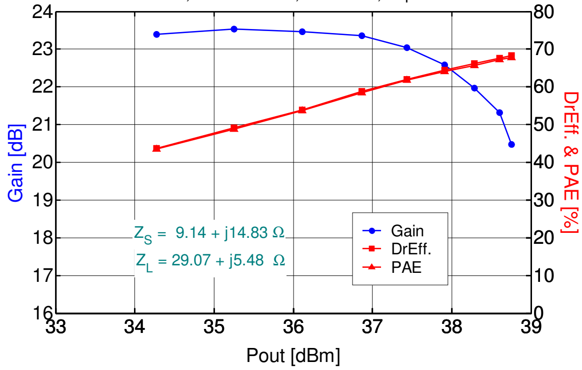
1. Test Conditions: V_{DS} = 28 V, I_{DQ} = 50 mA
2. Test Signal: Pulse Width = 100 µsec, Duty Cycle = 20%

Typical Performance

Performance is based on compromised impedance point and measured at DUT reference plane.

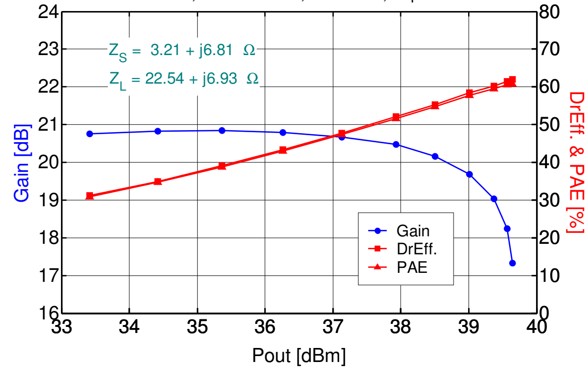
T2G6000528-Q3 Gain DrEff. and PAE vs. Pout

1000 MHz, 100 usec 20%, Vds = 28V, Idq = 50 mA



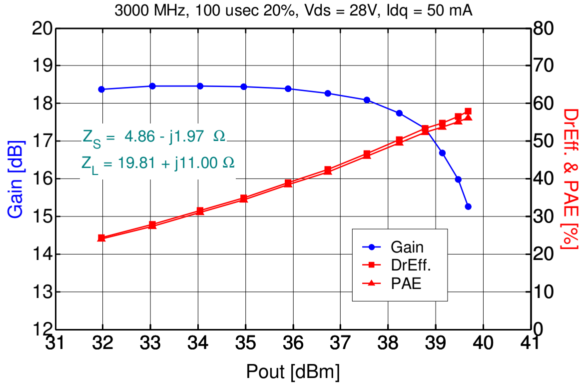
T2G6000528-Q3 Gain DrEff. and PAE vs. Pout

2000 MHz, 100 usec 20%, Vds = 28V, Idq = 50 mA



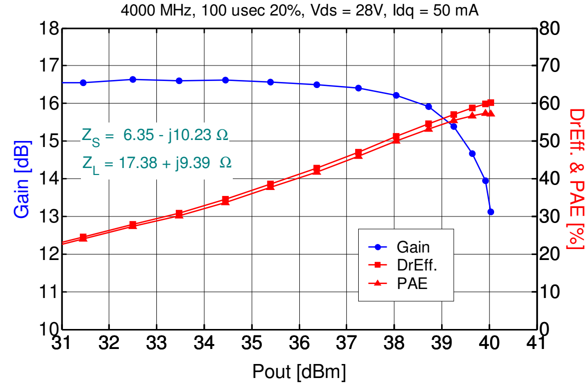
T2G6000528-Q3 Gain DrEff. and PAE vs. Pout

3000 MHz, 100 usec 20%, Vds = 28V, Idq = 50 mA



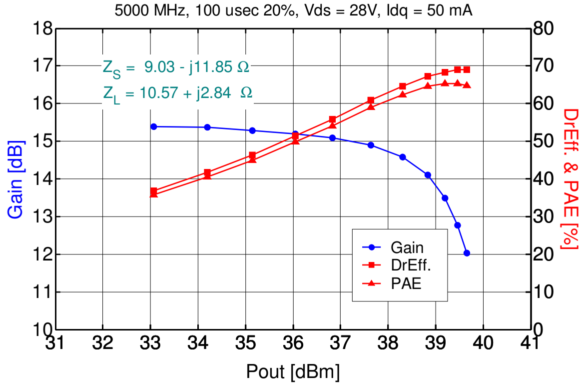
T2G6000528-Q3 Gain DrEff. and PAE vs. Pout

4000 MHz, 100 usec 20%, Vds = 28V, Idq = 50 mA



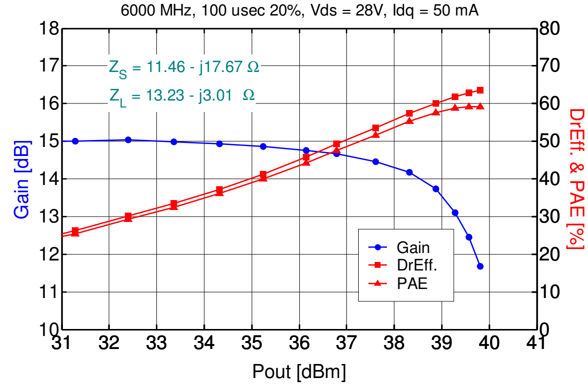
T2G6000528-Q3 Gain DrEff. and PAE vs. Pout

5000 MHz, 100 usec 20%, Vds = 28V, Idq = 50 mA



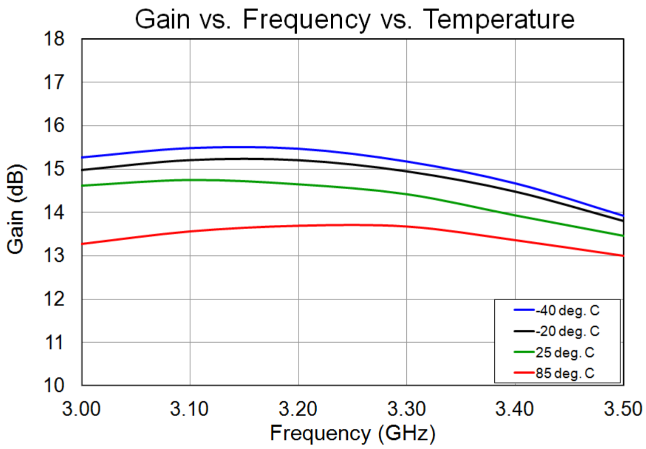
T2G6000528-Q3 Gain DrEff. and PAE vs. Pout

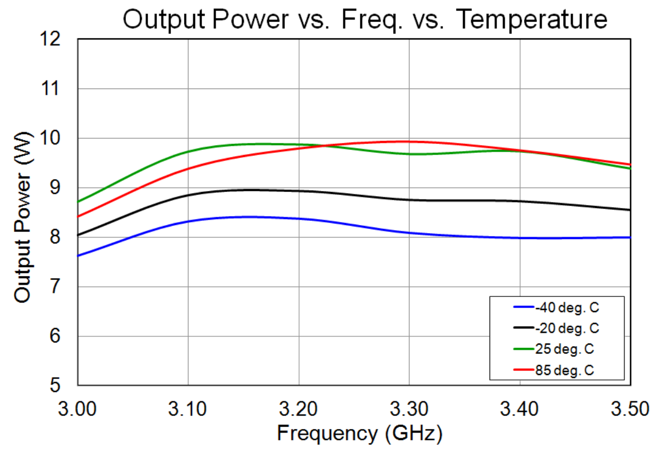
6000 MHz, 100 usec 20%, Vds = 28V, Idq = 50 mA

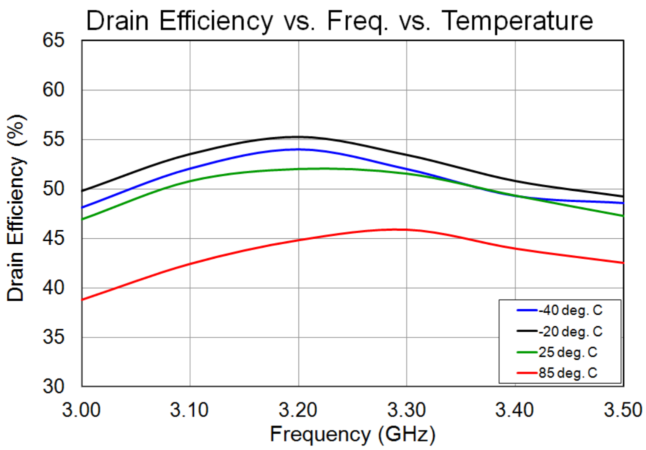


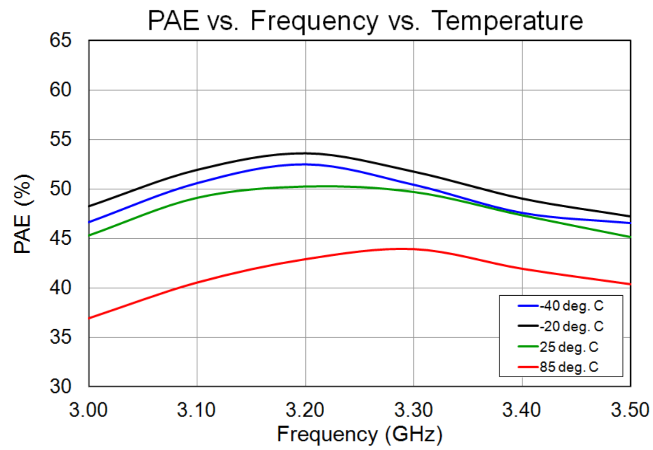
Performance Over Temperature (1, 2)

Performance measured in TriQuint's 3.0 GHz to 3.5 GHz Evaluation Board at 3 dB compression.







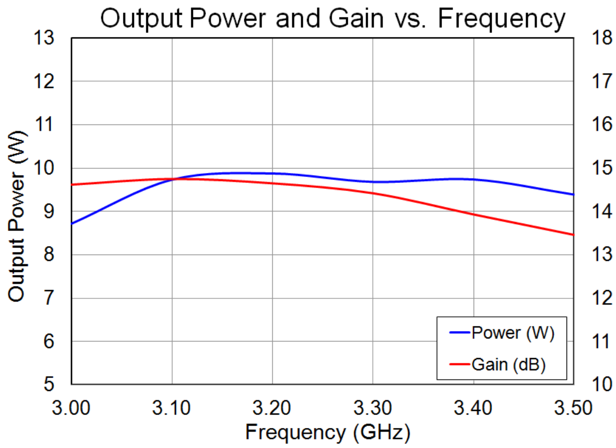


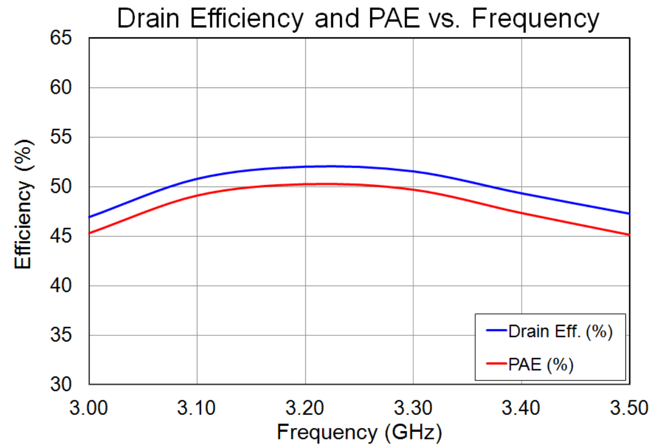
Notes:

1. Test Conditions: V_{DS} = 28 V, I_{DQ} = 50 mA
2. Test Signal: Pulse Width = 100 µs, Duty Cycle = 20%

Evaluation Board Performance [1, 2]

Performance at 3 dB Compression

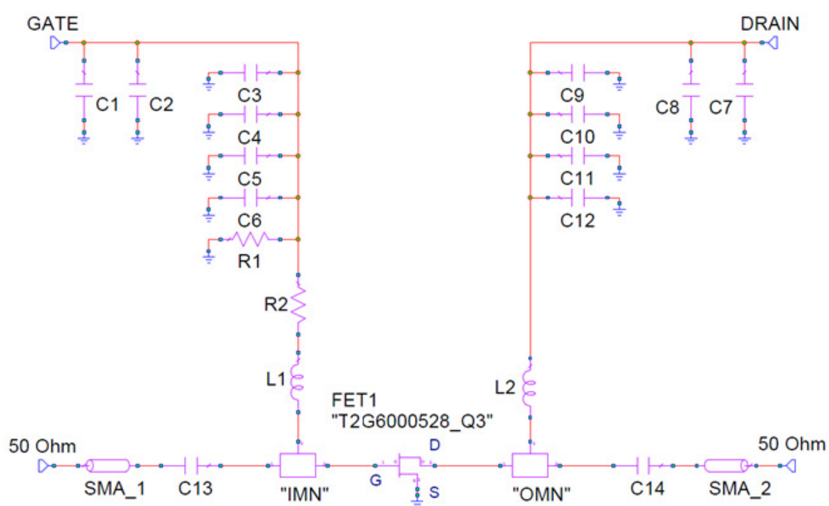




Notes:

1. Test Conditions: V_{DS} = 28 V, I_{DQ} = 50 mA
2. Test Signal: Pulse Width = 100 µs, Duty Cycle = 20 %

Application Circuit



Bias-up Procedure

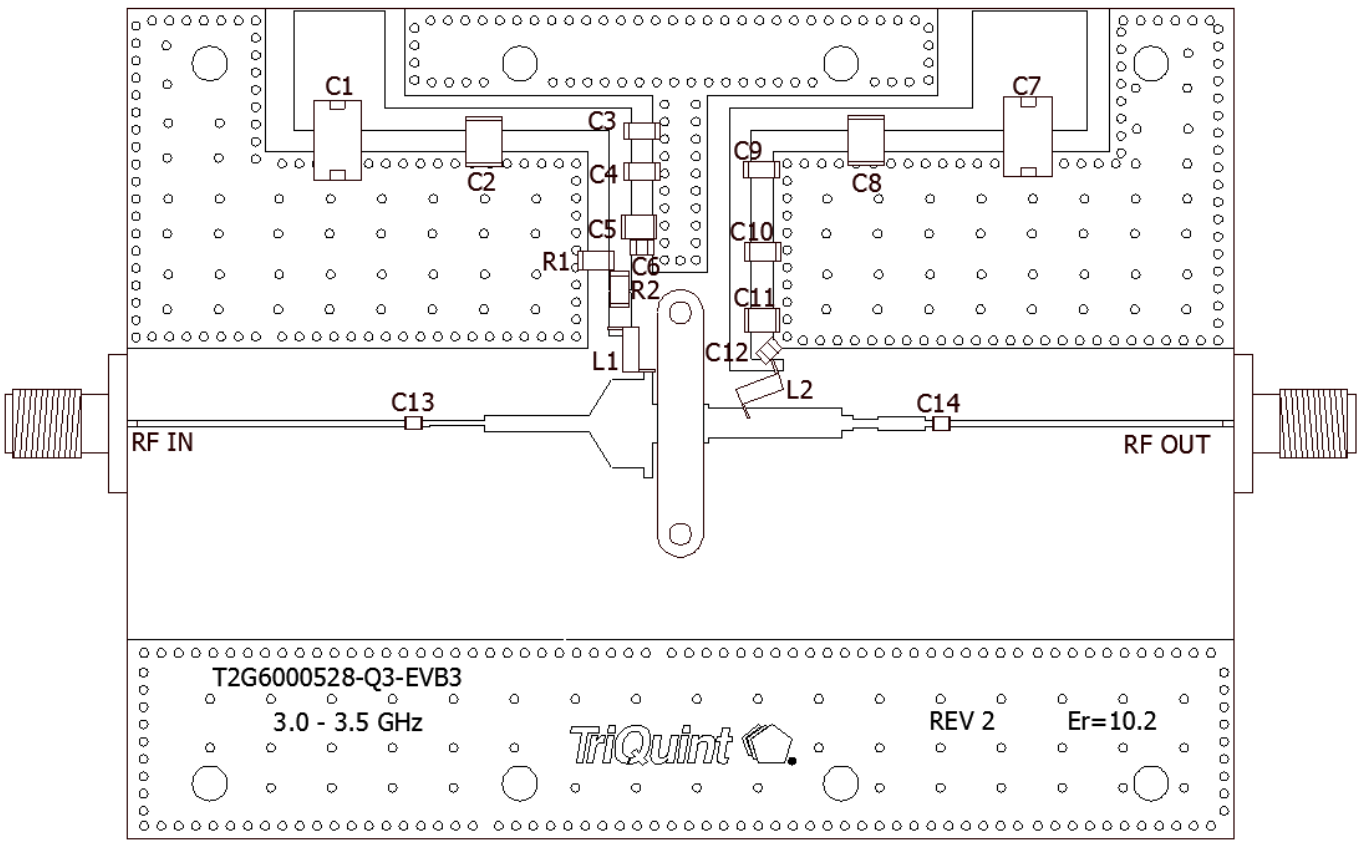
Set gate voltage (V_G) to -5.0V
Set drain voltage (V_D) to 28 V
Slowly increase V_G until quiescent I_D is 50 mA.
Apply RF signal

Bias-down Procedure

Turn off RF signal
Turn off V_D and wait 1 second to allow drain capacitor dissipation
Turn off V_G

Evaluation Board Layout

Top RF layer is 0.025” thick Rogers RO3210, ε_r = 10.2. The pad pattern shown has been developed and tested for optimized assembly at TriQuint Semiconductor. The PCB land pattern has been developed to accommodate lead and package tolerances.



Pin Description

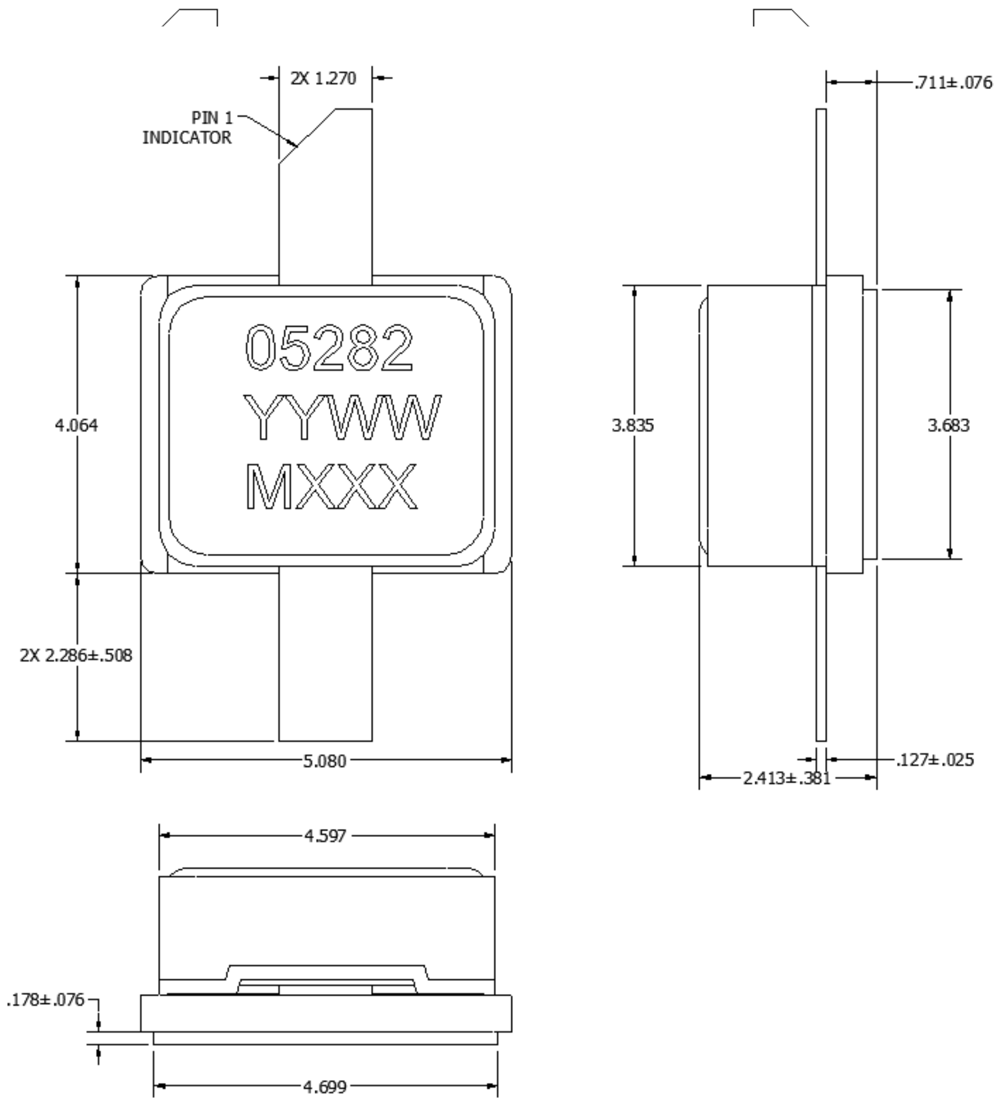
Pin	Symbol	Description
1	V_D / RF OUT	Drain voltage / RF Output matched to 50 ohms; see EVB Layout on page 9 as an example.
2	V_G / RF IN	Gate voltage / RF Input matched to 50 ohms; see EVB Layout on page 9 as an example.
3	Flange	Source connected to ground; see EVB Layout on page 9 as an example.

Notes:
Thermal resistance measured to bottom of package

C13, C14	27 pF	2	ATC	600L270JT200
R1	1000 ohm	1	Vishay Dale	CRCW0805100F100
R2	12 ohm	1	Vishay Dale	RM73B2B120J
L1, L2	9.85 nH	2	Coilcraft	16069JLB

Mechanical Information

All dimensions



Note:

This package is lead-free/RoHS-compliant. The plating material on the leads is NiAu. It is compatible with both lead-free (maximum 260 °C reflow temperature) and tin-lead (maximum 245°C reflow temperature) soldering processes.

Product Compliance Information

ESD Sensitivity Ratings

Caution! ESD-Sensitive Device

ESD Rating: Class 1A
Value: Passes ≥ 250 V to < 500 V max.
Test: Human Body Model (HBM)
Standard: JEDEC Standard JESD22-A114

MSL Rating

Level 3 at +260 °C convection reflow
The part is rated Moisture Sensitivity Level 3 at 260°C per JEDEC standard IPC/JEDEC J-STD-020.

ECCN

US Department of Commerce EAR99

Solderability

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

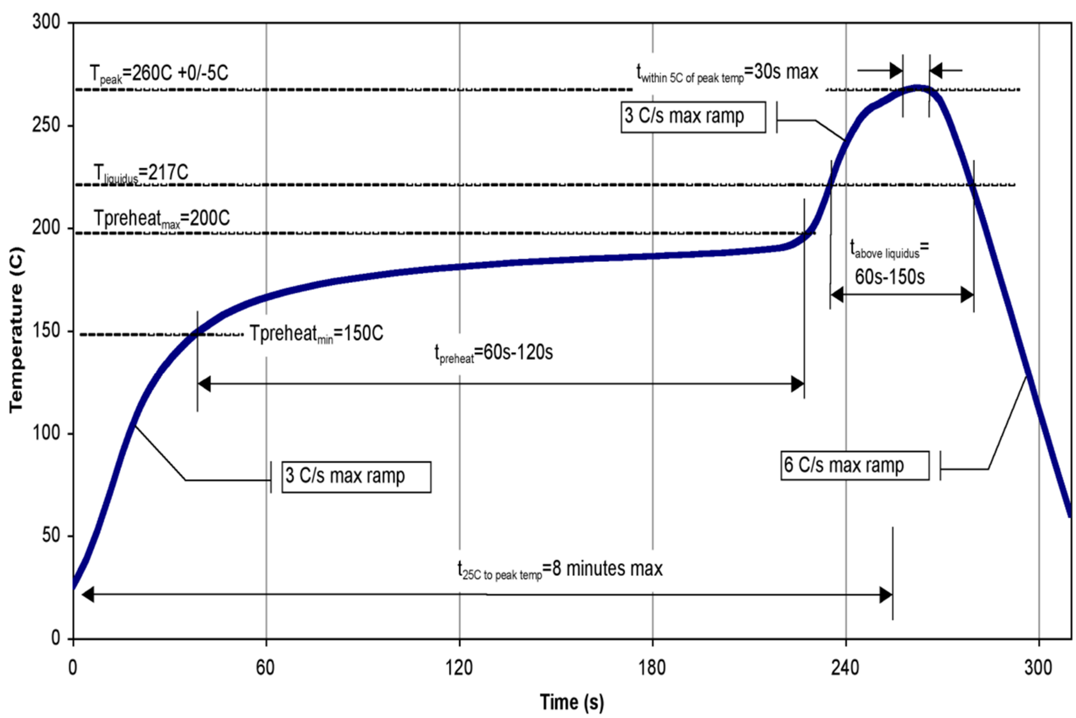
RoHs Compliance

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

Recommended Soldering Temperature Profile



Contact Information

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