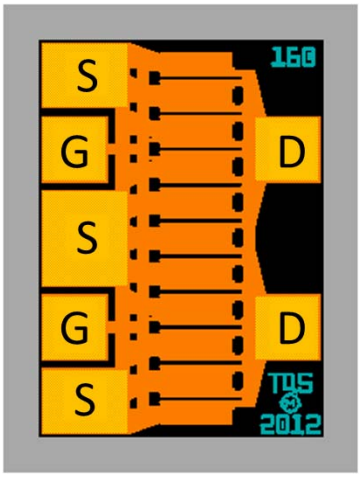
TGF2160

1600um Discrete GaAs pHEMT

Applications

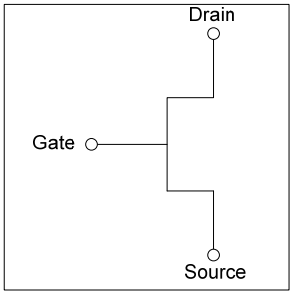
- Defense & Aerospace
- High-Reliability
- Test and Measurement
- Commercial
- Broadband Wireless



Product Features

- Frequency Range: DC - 20 GHz
- 32.5 dBm Typical Output Power - P1dB
- 10.4 dB Typical Gain @ 12 GHz
- 63% Typical PAE @ 12 GHz
- No Vias
- Technology: 0.25 um GaAs pHEMT
- Chip Dimensions: 0.41 x 0.54 x 0.10 mm

Functional Block Diagram



General Description

The TriQuint TGF2160 is a discrete 1600-Micron pHEMT which operates from DC to 20 GHz. The TGF2160 is designed using TriQuint's proven standard 0.25um power pHEMT production process. This process features advanced techniques to optimize microwave power and efficiency at high drain bias operating conditions.

The TGF2160 typically provides 32.5 dBm of output power at P1dB with gain of 10.4 dB and 63% power-added efficiency at 1 dB compression. This performance makes the TGF2160 appropriate for high efficiency applications. The protective overcoat layer with silicon nitride provides a level of environmental robustness and scratch protection.

Lead-free and RoHS compliant.

Pad Configuration

Pad Dimensions	Terminals
G (71um X 71um)	Gate
D (71um X 71um)	Drain
S (96um X 71um)	Source (outermost)
S (96um X 106um)	Source (center)

Ordering Information

Part	ECCN	Description
TGF2160	EAR99	1600um GaAs pHEMT

Absolute Maximum Ratings

Symbol	Parameter	Absolute	Continuous	Units
Vds	Drain-Source Voltage[2]	12	8	V
Vgs	Gate- Source Voltage	-7	-3	V
Id	Drain Current[2]	Idss	Idss	mA
Ig,f	Forward Gate Current	80	14	mA
Tch	Channel Temperature[3]	175 [4]	150 [5]	°C
Tstg	Storage Temperature	-65 to 150	-65 to 150	°C
Pin	Input Continuous Wave Power[2]	27	@ 3 dB Compression	dBm
Ptot	Total Power Dissipation	8.4	5.6	W

Notes:

1. These ratings represent the maximum operable values for this device. Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device and/or affect device lifetime. These are stress ratings only, and functional operation of the device at these conditions is not implied.
2. Combinations of supply voltage, supply current, input power, and output power shall not exceed the maximum total power dissipation listed in the table.
3. Junction operating temperature will directly affect the device median time to failure. For maximum life, it is recommended that junction temperatures be maintained at the lowest possible levels.
4. When operated at this channel temperature, the median life is 1.0E+5 hours.
5. When operated at this channel temperature, the median life is 1.0E+6 hours.

Electrical Characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
P1dB	Output Power at 1dB Compression	Freq = 12 GHz, Vds = 8 V, Ids = 50% Idss		32.5		dBm
G1dB	Gain at P1dB	Freq = 12 GHz, Vds = 8 V, Ids = 50% Idss		10.4		dB
PAE	PAE at P1dB	Freq = 12 GHz, Vds = 8 V, Ids = 50% Idss		63		%
Idss	Saturated Drain Current	Vds = 2 V, Vgs = 0 V	320	517 [1]	714	mA
Gm	Transconductance	Vds = 2 V, Ids = 50% Idss		619		mS
Vp	Pinch-Off Voltage	Vds = 2 V, Ids = 1.60 mA	-1.5	-1.0	-0.5	V
BVgd	Gate-Drain Breakdown Voltage	Ig = 1.60 mA, source open		-15	-12	V
BVgs	Gate-Source Breakdown Voltage	Ig = 1.60 mA, drain open		-15		V
Rth	Thermal Resistance	AuSn eutectic attach		31†		°C/W

† Based on IR Scan

Notes:

1. Typical Standard Deviation of 11.4mA (1 σ).

S-Parameters

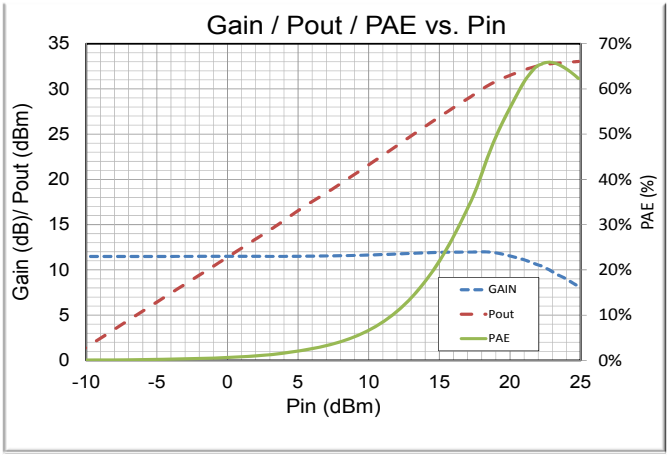
Test Conditions: V_{DS}=+8 V (typ.), I_{DS}=50% I_{DSS}, Temp=+25°C, 50Ω system

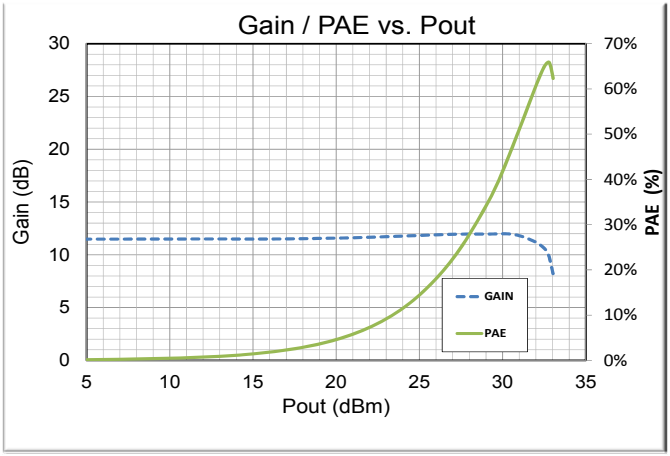
Freq (GHz)	S11 (mag)	S11 (ang)	S21 (mag)	S21 (ang)	S12 (mag)	S12 (ang)	S22 (mag)	S22 (ang)
1	0.91	-123.0	14.32	112.0	0.030	27.1	0.36	-142.5
2	0.91	-157.3	7.95	90.6	0.033	10.9	0.40	-164.1
3	0.91	-173.4	5.41	77.7	0.034	3.0	0.42	-173.6
4	0.91	175.7	4.07	67.3	0.034	-2.3	0.43	-179.7
5	0.92	167.1	3.25	57.9	0.033	-6.5	0.45	175.4
6	0.93	159.6	2.69	49.3	0.033	-9.9	0.47	171.0
7	0.93	152.8	2.28	40.8	0.033	-13.3	0.48	166.8
8	0.94	146.4	1.97	32.4	0.032	-16.8	0.51	162.8
9	0.95	140.3	1.73	24.3	0.031	-20.9	0.53	158.7
10	0.96	134.5	1.52	16.1	0.029	-23.4	0.55	154.3
11	0.97	129.1	1.35	8.5	0.028	-23.5	0.57	150.5
12	0.97	123.9	1.21	0.8	0.027	-25.0	0.60	146.3
13	0.98	119.0	1.08	-6.5	0.026	-25.7	0.62	142.6
14	0.99	114.0	0.98	-14.0	0.024	-25.0	0.65	138.1
15	0.99	109.6	0.88	-20.8	0.024	-19.3	0.68	134.5
16	0.99	104.9	0.80	-27.8	0.025	-19.7	0.70	130.1
17	0.99	100.9	0.73	-34.5	0.026	-20.4	0.73	126.4
18	0.99	96.6	0.66	-41.6	0.025	-20.1	0.75	121.9

Includes 1 bond wire on each Gate, 1 bond wire on each Drain, and 3 bond wires on each Source pad.

RF Tuned Data at 12 GHz

Bias conditions: V_{DS} = 8 V, I_{DQ} = 50% Idss, F = 12 GHz





Assembly Notes

Component placement and adhesive attachment assembly notes:

- Vacuum pencils and/or vacuum collets are the preferred method of pick up.
- Air bridges must be avoided during placement.
- The force impact is critical during auto placement.
- Organic attachment (i.e. epoxy) can be used in low-power applications.
- Curing should be done in a convection oven; proper exhaust is a safety concern.

Reflow process assembly notes:

- Recommend Eutectic die attach with AuSn (80/20) solder and limit exposure to temperatures above 300°C to 30 seconds, maximum.
- An alloy station or conveyor furnace with reducing atmosphere should be used.
- Do not use any kind of flux.
- Coefficient of thermal expansion matching is critical for long-term reliability.
- Devices must be stored in a dry nitrogen atmosphere.

Interconnect process assembly notes:

- Either Thermo-compression Wedge Bonding or Thermosonic Ball Bonding can be used to bond onto the die.
- Force, time, and ultrasonics are critical bonding parameters.
- Aluminum wire should not be used.
- Devices with small pad sizes should be bonded with 0.0008-inch wire.

Product Compliance Information

ESD Sensitivity

Caution! ESD-Sensitive Device

Caution – ESD Sensitive Device

• Proper ESD procedures should be followed when handling this device.

Not HAST Compliant.

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

Disclaimer

GaAs devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.

Contact Information

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