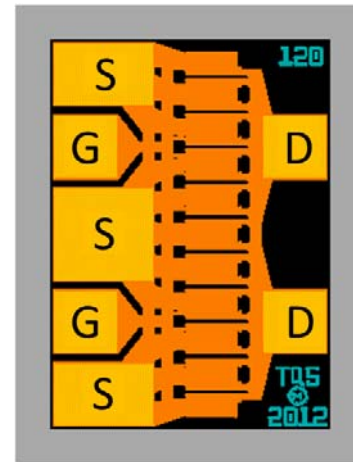


## Applications

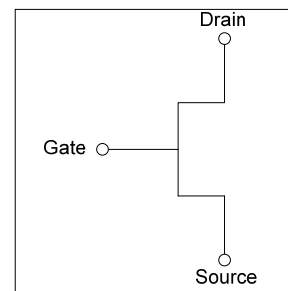
- Defense & Aerospace
- High-Reliability
- Test and Measurement
- Commercial
- Broadband Wireless



## Product Features

- Frequency Range: DC - 20 GHz
- 31 dBm Typical Output Power - P1dB
- 11 dB Typical Gain @ 12 GHz
- 57% 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 TGF2120 is a discrete 1200-Micron pHEMT which operates from DC to 20 GHz. The TGF2120 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 TGF2120 typically provides 31 dBm of output power at P1dB with gain of 11 dB and 57% power-added efficiency at 1 dB compression. This performance makes the TGF2120 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 (113.8um X 71um)	Source (outermost)
S (113.8um X 106um)	Source (center)

## Ordering Information

Part	ECCN	Description
TGF2120	EAR99	1200um GaAs pHEMT

### Absolute Maximum Ratings

Symbol	Parameter	Absolute	Continuous	Units
Vds	Drain-Source Voltage <sup>(2)</sup>	12	8	V
Vgs	Gate- Source Voltage	-7	-3	V
Id	Drain Current <sup>(2)</sup>	Idss	Idss	mA
Ig,f	Forward Gate Current	60	10	mA
Tch	Channel Temperature <sup>(3)</sup>	175 <sup>(4)</sup>	150 <sup>(5)</sup>	°C
Tstg	Storage Temperature	-65 to 150	-65 to 150	°C
Pin	Input Continuous Wave Power <sup>(2)</sup>	27	@ 3 dB Compression	dBm
Ptot	Total Power Dissipation	6.4	4.2	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		31		dBm
G1dB	Gain at P1dB	Freq = 12 GHz, Vds = 8 V, Ids = 50% Idss		11		dB
PAE	PAE at P1dB	Freq = 12 GHz, Vds = 8 V, Ids = 50% Idss		57		%
Idss	Saturated Drain Current	Vds = 2 V, Vgs = 0 V	240	388 <sup>(1)</sup>	536	mA
Gm	Transconductance	Vds = 2 V, Ids = 50% Idss		464		mS
Vp	Pinch-Off Voltage	Vds = 2 V, Ids = 1.20 mA	-1.5	-1.0	-0.5	V
BVgd	Gate-Drain Breakdown Voltage	Ig = 1.20 mA, source open		-15	-12	V
BVgs	Gate-Source Breakdown Voltage	Ig = 1.20 mA, drain open		-15		V
Rth	Thermal Resistance	AuSn eutectic attach		31 <sup>†</sup>		°C/W

<sup>†</sup> Based on IR Scan

Notes:

1. Typical Standard Deviation of 10.3mA (1  $\sigma$ ).

### S-Parameters

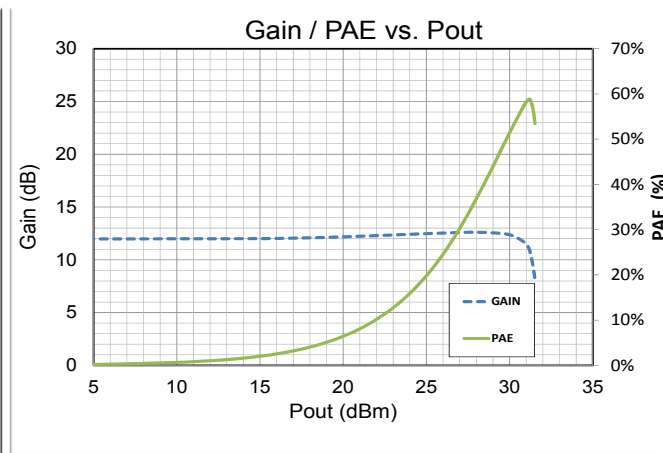
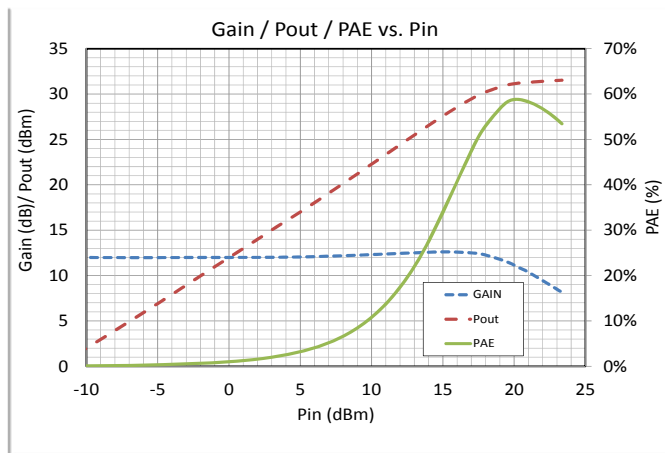
Test Conditions:  $V_{DS}=+8$  V (typ.),  $I_{DS}=50\%$   $I_{DSS}$ , Temp= $+25^{\circ}\text{C}$ , 50 $\Omega$  system

Freq (GHz)	S11 (mag)	S11 (ang)	S21 (mag)	S21 (ang)	S12 (mag)	S12 (ang)	S22 (mag)	S22 (ang)
1	0.92	-105.9	15.23	120.1	0.033	34.1	0.30	-112.2
2	0.91	-146.6	9.06	95.4	0.039	13.6	0.31	-148.4
3	0.91	-166.5	6.26	80.5	0.041	2.7	0.33	-165.0
4	0.91	-179.8	4.74	68.7	0.041	-5.1	0.34	-175.6
5	0.92	170.0	3.79	58.4	0.040	-11.2	0.36	176.6
6	0.92	161.5	3.13	48.9	0.040	-16.5	0.38	169.8
7	0.93	153.9	2.66	39.8	0.039	-21.6	0.40	163.9
8	0.94	147.1	2.29	30.9	0.038	-26.6	0.43	158.6
9	0.95	140.6	2.00	22.3	0.037	-32.2	0.46	153.2
10	0.96	134.7	1.76	13.8	0.035	-36.5	0.48	148.2
11	0.96	129.2	1.56	5.7	0.033	-38.9	0.51	143.4
12	0.97	123.9	1.39	-2.3	0.031	-42.4	0.54	138.9
13	0.97	119.1	1.25	-10.1	0.029	-45.3	0.57	134.2
14	0.98	114.2	1.13	-17.8	0.027	-47.4	0.61	129.7
15	0.99	109.9	1.01	-25.1	0.025	-44.9	0.64	125.3
16	0.99	105.4	0.92	-32.3	0.025	-45.0	0.67	121.1
17	0.99	101.4	0.84	-39.4	0.025	-45.5	0.70	116.9
18	0.99	97.2	0.76	-46.6	0.023	-46.8	0.73	112.6

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:  $V_{DS} = 8\text{ V}$ ,  $I_{DQ} = 50\% I_{dss}$ ,  $F = 12\text{ GHz}$



## 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<sub>15</sub>H<sub>12</sub>Br<sub>4</sub>O<sub>2</sub>) 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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