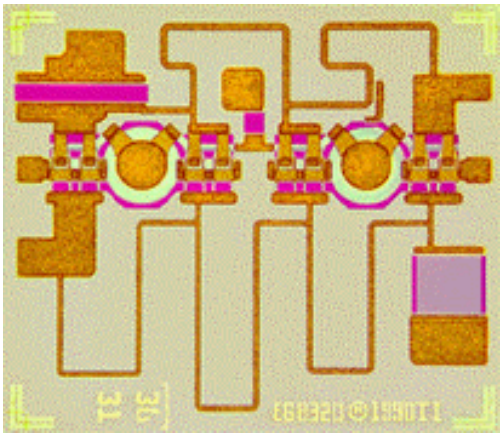
TriQuint SEMICONDUCTOR

Product Data Sheet

Gain Block Amplifier TGA8320-SCC



Key Features and Performance

- DC to 8 GHz Frequency Range (L, S, and C-band)
- 9.5 dB Gain
- 1.3:1 Input/Output SWR
- 17 dBm Output Power at 1 dB Gain Compression
- Typical Noise Figure is 5 dB
- 1.066 x 1.219 x 0.152 mm (0.042 x 0.048 x 0.006 in.)

Description

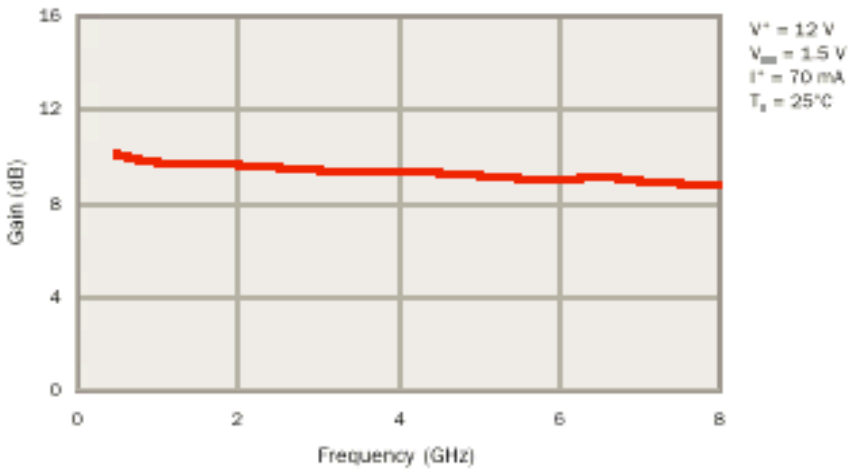
The TriQuint TGA8320-SCC is a general purpose gain block amplifier, which operates from DC to 8 GHz. Four 200 um FETs produce 9.5 dB nominal gain and a noise figure that is 5 dB across the band. Typical input and output return loss is 16 dB at midband. Nominal power output is 17 dBm at 1 dB gain compression. Ground is provided to the circuitry through vias to the backside metallization.

The TGA8320-SCC gain block amplifier is suitable for a variety of military and commercial applications such as L, S, and C-band radar systems, ECM, and communication systems.

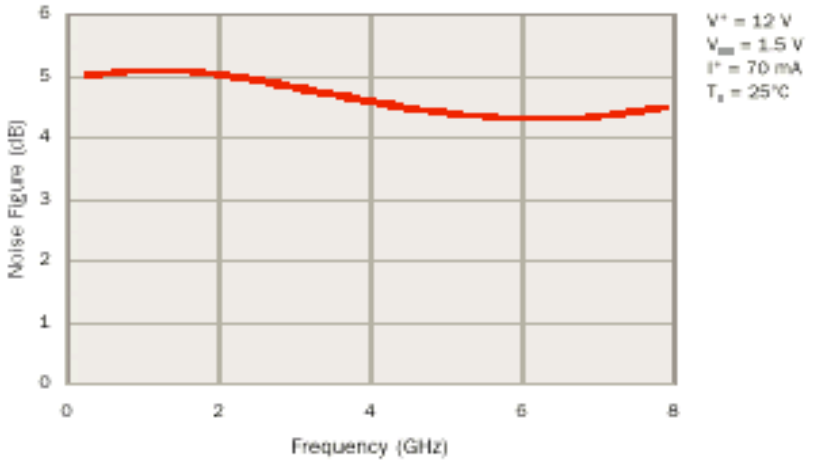
Bond pad and backside metallization is gold plated for compatibility with eutectic alloy attachment methods as well as the thermocompression and thermosonic wire-bonding processes.

The TGA8320-SCC is supplied in chip form and is readily assembled using automated equipment.

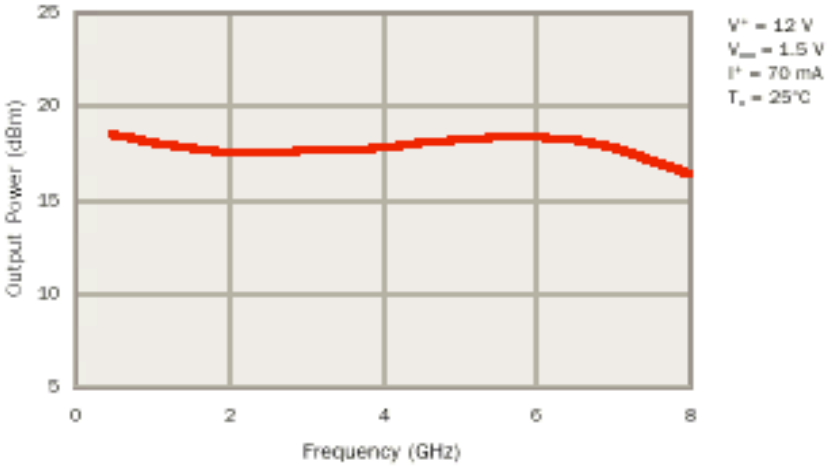
TYPICAL SMALL-SIGNAL GAIN



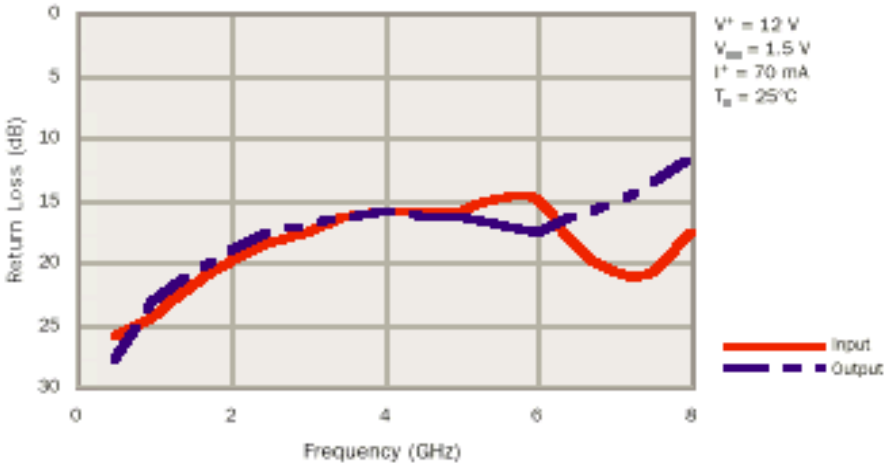
TYPICAL NOISE FIGURE



TYPICAL OUTPUT POWER
P_{1dB}



TYPICAL RETURN LOSS



ABSOLUTE MAXIMUM RATINGS

Positive supply voltage, V^+	13 V
Positive supply current, I^+	120 mA
Negative supply voltage range, V_{G1}*	-5 V to 0 V
Supply voltage range, V_{G2}**	-5 V to 4 V
Power dissipation, P_D, at (or below) 25°C base-plate temperature***	1.9 W
Input continuous wave power, P_{IN}	20 dBm
Operating channel temperature, T_{CH}†	150°C
Mounting temperature (30 sec), T_M	320°C
Storage temperature range, T_{STG}	-65 to 150°C

Ratings over operating channel temperature range, T_{ch} (unless otherwise noted)

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "RF Characteristics" is not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

* $0 V \le (V^+ - V_{G1}) \le 15 V$

** $0 V \le (V^+ - V_{G2}) \le 15 V$

*** For operation above 25°C base-plate temperature, derate linearly at the rate of 4.0 mW/°C.

† Operating channel temperature directly affects the device MTTF. For maximum life, it is recommended that channel temperature be maintained at the lowest possible level.

TYPICAL S-PARAMETERS

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		GAIN
(GHz)	MAG	ANG (°)	MAG	ANG (°)	MAG	ANG (°)	MAG	ANG (°)	(dB)
0.5	0.05	- 79	3.18	166	0.001	111	0.04	52	10.1
1.0	0.06	- 113	3.11	155	0.001	109	0.07	59	9.8
1.5	0.08	- 132	3.07	144	0.001	127	0.09	59	9.7
2.0	0.10	- 146	3.03	133	0.002	129	0.11	55	9.6
2.5	0.12	- 159	2.99	122	0.003	135	0.13	50	9.5
3.0	0.13	- 171	2.96	112	0.003	133	0.14	43	9.4
3.5	0.15	- 180	2.93	101	0.004	149	0.15	37	9.3
4.0	0.16	173	2.91	90	0.007	145	0.16	26	9.3
4.5	0.16	168	2.91	79	0.009	143	0.15	12	9.3
5.0	0.16	166	2.89	68	0.012	135	0.15	- 3	9.2
5.5	0.18	166	2.86	57	0.019	131	0.14	- 19	9.1
6.0	0.18	149	2.83	47	0.018	107	0. 13	- 39	9.0
6.5	0.12	148	2.86	36	0.017	105	0.15	- 70	9.1
7.0	0.09	164	2.83	24	0.018	104	0.17	- 99	9.0
7.5	0.09	- 164	2.80	12	0.020	101	0.21	- 124	8.9
8.0	0.13	- 150	2.73	0	0.022	95	0.26	- 144	8.7

T_A = 25°C, V^+ = 12 V, V_{G2} = 1.5 V, I^+ = 70 mA

Reference planes for S-parameter data include bond wires as specified in the "Recommended Assembly Diagram". The S-parameters are also available on floppy disk and the world wide web.

RF CHARACTERISTICS

PARAMETER		TEST CONDITIONS	TYP	UNIT
G_P	Small-signal power gain	f = DC to 8 GHz	9.5	dB
SWR(in)	Input standing wave ratio	f = DC to 8 GHz	1.3:1	-
SWR(out)	Output standing wave ratio	f = DC to 8 GHz	1.3:1	-
P_{1dB}	Output power at 1–dB gain compression	f = DC to 8 GHz	17	dBm
NF	Noise figure	f = DC to 8 GHz	5	dB
IP_3	Output third–order intercept point	f = 2 GHz	30	dBm
		f = 4 GHz	31	
		f = 8 GHz	28	
IP_2	Output second–order intercept point	f = 2 GHz	33	dBm
		f = 4 GHz	39	
	Output third harmonic at 1–dB gain compression	f_o = 2 GHz	- 23.5	dBc*
		f_o = 4 GHz	- 32	
	Output second harmonic at 1–dB gain compression	f_o = 2 GHz	- 19	dBc*
		f_o = 4 GHz	- 25	

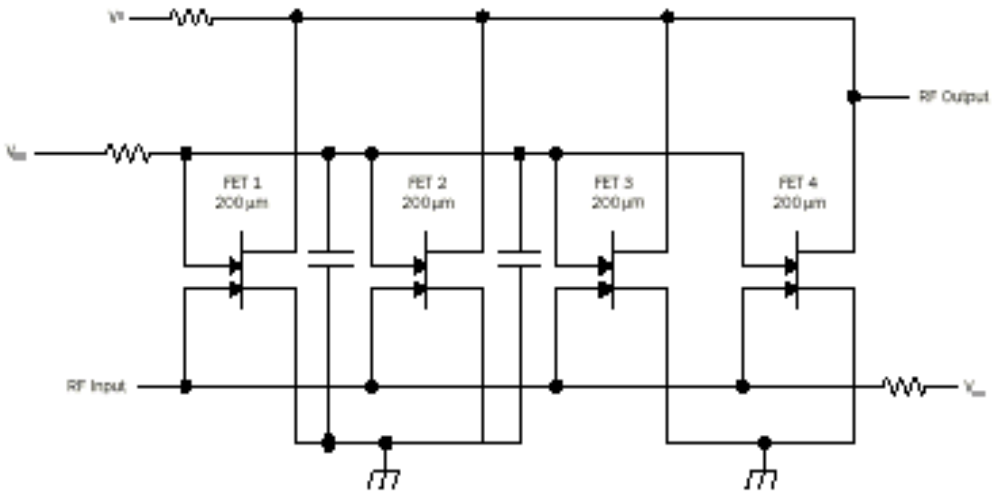
V^+ = 12 V, V_{G2} = 1.5 V, I^+ = 70 mA, T_A = 25°C

*Unit dBc applies to decibels with respect to the carrier or fundamental frequency, f_o.

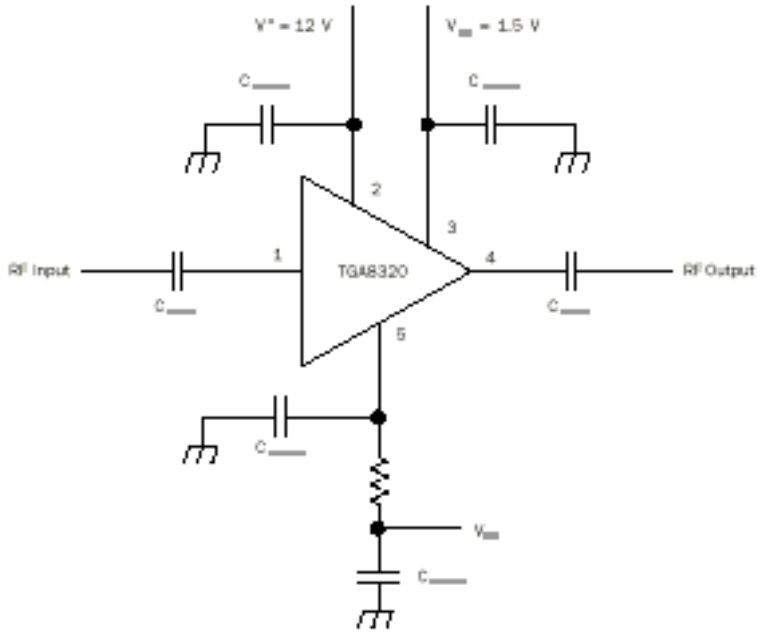
THERMAL INFORMATION

PARAMETER		TEST CONDITION	NOM	UNIT
$R_{\Theta JC}$	Thermal resistance, channel to backside	V^+ = 12 V, V_{G2} = 1.5 V, I^+ = 70 mA	27	°C/W

EQUIVALENT SCHEMATIC

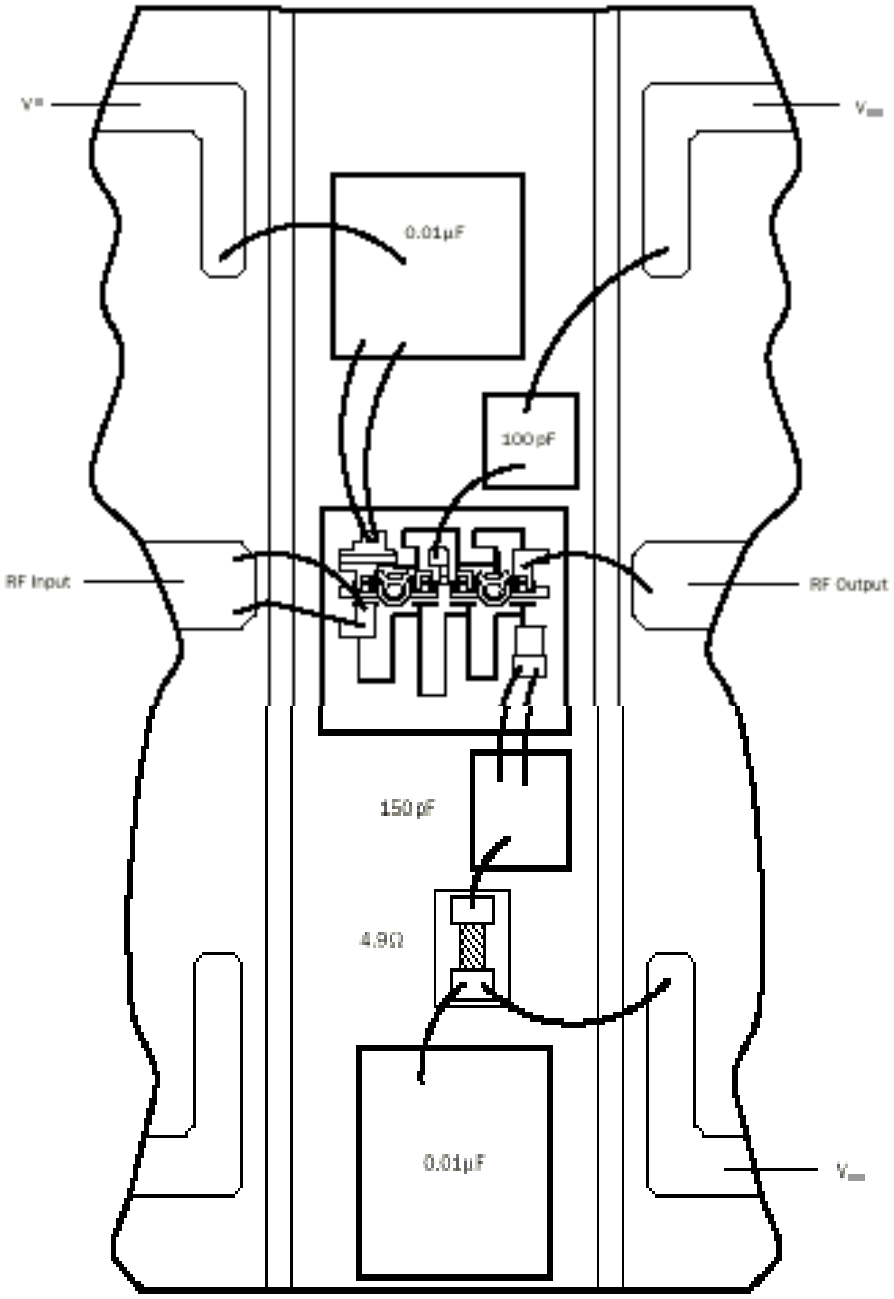


TYPICAL BIAS NETWORK



RECOMMENDED TEST CONFIGURATION

RECOMMENDED ASSEMBLY DIAGRAM

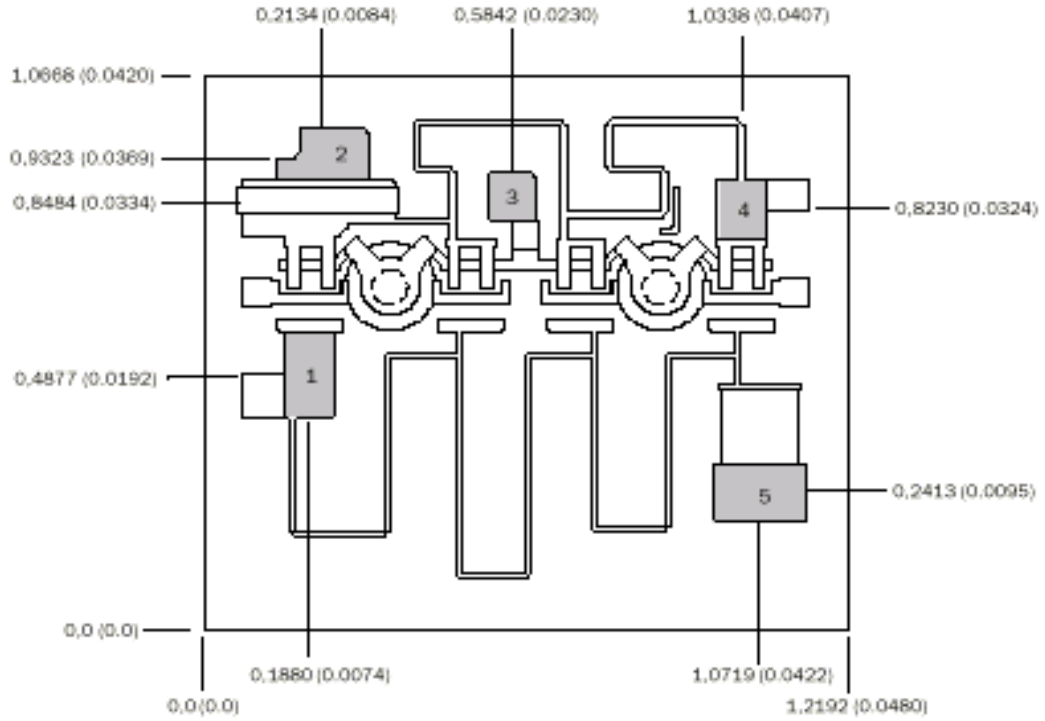


RF connections: Bond using two 1-mil diameter, 20 to 30-mil-length gold bond wires at RF Input and one 1-mil diameter, 20 to 30-mil-length gold bond wire at RF Output for optimum RF performance.

Close placement of external components is essential to stability.

Refer to TriQuint *Gallium Arsenide Products Designers' Information* on TriQuint's web site.

MECHANICAL DRAWING



Units: millimeters (inches)
Thickness: 0,1524 (0.006) (reference only)
Chip edge to bond pad dimensions are shown to center of bond pad.
Chip size ± 0,0508 (0.002)

Bond pad #1 (RF Input):	0,1016 x 0,1727 (0.0040 x 0.0068)
Bond pad #2 (V^+):	0,1905 x 0,1016 (0.0075 x 0.0040)
Bond pad #3 (V_{G2}):	0,1016 x 0,1016 (0.0040 x 0.0040)
Bond pad #4 (RF Output):	0,1016 x 0,1194 (0.0040 x 0.0047)
Bond pad #5 (V_{G1}):	0,1854 x 0,0991 (0.0073 x 0.0039)

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