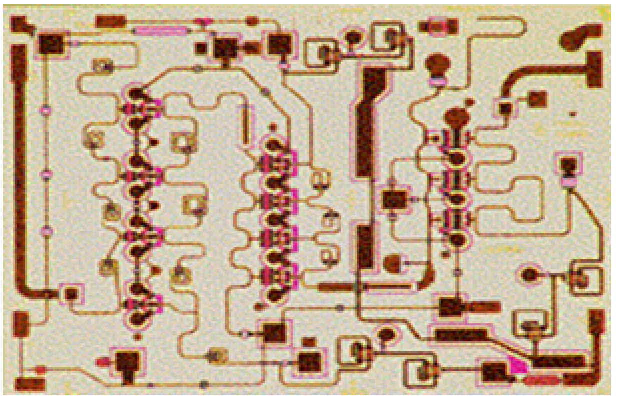
TriQuint SEMICONDUCTOR®

Product Data Sheet
August 5, 2008

2 - 18 GHz Gain Block Amplifier TGA6345



Key Features and Performance

- 2 to 18 GHz Frequency Range
- 23 dB Typical Gain
- 1.6:1 Typical Input / Output SWR
- 22 dBm Typical Output Power at 1 dB Gain Compression
- 6 dB Typical Noise Figure
- 4.1 x 3.2 x 0.1 mm (0.163 x 0.125 x 0.004 in.)

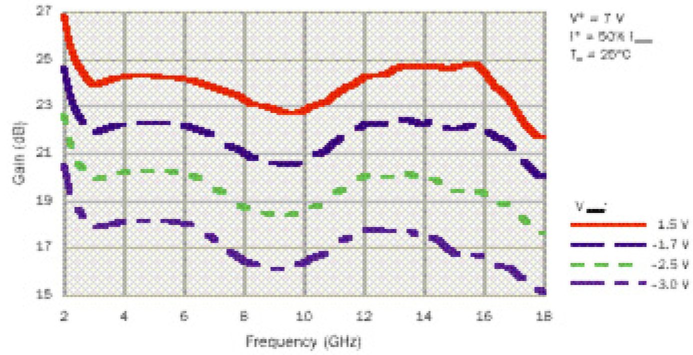
Description

The TriQuint TGA6345 is a monolithic amplifier which operates over the 2 to 18 GHz Frequency range. This device consist of three cascaded distributed amplifier sections. Typical small signal gain is 23 dB, which is adjustable by using the control voltage, V_{CTRL}. The TGA6345 provides 22 dBm typical output power at 1 dB gain compression.

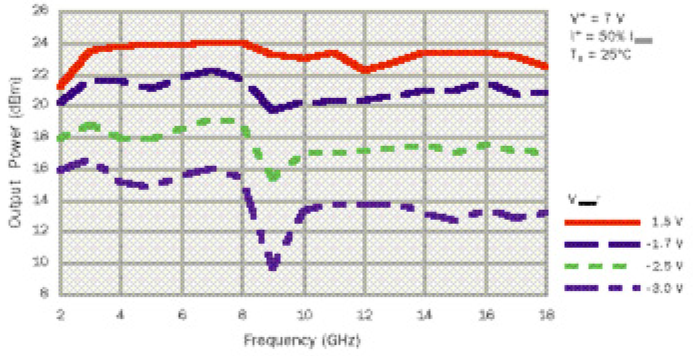
The TGA6345 is suitable for a variety of applications such as phased array radar's and wide-band electronic warfare systems including jammers and expendable decoys, and electronic counter measures. Bond pad and backside metallization is gold plated for compatibility with eutectic alloy attachment methods as well as the thermosonic wire bonding processes. Ground is provided to the circuitry through vias to the backside metallization.

Note: Datasheet is subject to change without notice.

TYPICAL SMALL-SIGNAL POWER GAIN
G_P vs. V_{CTRL}



TYPICAL OUTPUT POWER
P_{1dB} vs. V_{CTRL}



TYPICAL RETURN LOSS

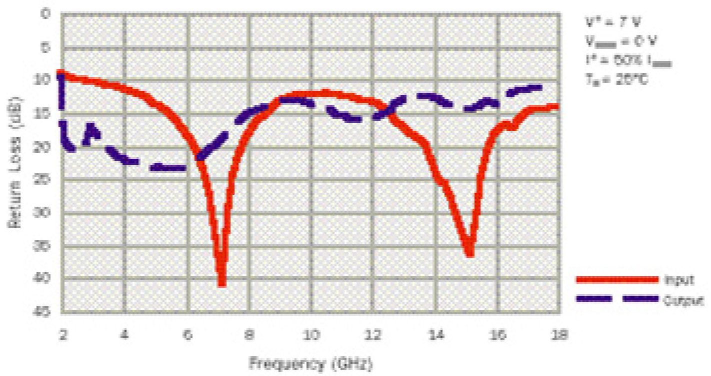


TABLE I
MAXIMUM RATINGS

SYMBOL	PARAMETER	VALUE
V^+	POSITIVE SUPPLY VOLTAGE	9V
$V^+ - V^-$	POSITIVE SUPPLY VOLTAGE RANGE WITH RESPECT TO NEGATIVE SUPPLY VOLTAGE	0V to 10V
V^-	NEGATIVE SUPPLY VOLTAGE RANGE	0V to –5V
V_{CTRL}	GAIN CONTROL VOLTAGE RANGE	-4V to 5V
$V_{CTRL} - V^+$	GAIN CONTROL VOLTAGE RANGE WITH RESPECT TO POSITIVE SUPPLY VOLTAGE	0V to –11V
I^+	POSITIVE SUPPLY CURRENT	I_{DSS}
P_D	POWER DISSIPATION, AT (OR BELOW) 25°C BASE-PLATE TEMPERATURE *	6.8W
P_{IN}	INPUT CONTINUOUS WAVE POWER	25dBm
T_{CH} **	OPERATING CHANNEL TEMPERATURE	150 ^{0}C
T_M	MOUNTING TEMPERATURE (30 SECONDS)	320 ^{0}C
T_{STG}	STORAGE TEMPERATURE	-65 to 150 ^{0}C

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

Stresses beyond those listed under “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 Specifications” is not implied. Exposure to maximum rated conditions for extended periods may affect device reliability.

*For operation above 25°C base-plate temperature, derate linearly at the rate of 6.1mW/°C.
** Operating channel temperature, T_{CH}, directly affects the device MTTF. For maximum life, it is recommended that channel temperature be maintained at the lowest possible level.

TABLE II
DC PROBE TESTS
(T_A = 25 °C ± 5°C)

Symbol	Parameter	Minimum	Maximum	Value
I_{DSS1-3}	Saturated Drain Current	162	486	mA
G_{M1-3}	Saturated Drain Current	176	365	mA
V_{P1-3}	Pinch-off Voltage	-2.6	-0.8	V
V_{P4-7}	Pinch-off Voltage	-2.6	-0.8	V
V_{P8-11}	Pinch-off Voltage	-2.6	-0.8	V

TABLE III
AUTOPROBE FET PARAMETER MEASUREMENT CONDITONS

FET Parameters	Test Conditions
I_{DSS} : Maximum drain current (I_{DS}) with gate voltage (V_{GS}) at zero volts.	V_{GS} = 0.0 V, drain voltage (V_{DS}) is swept from 0.5 V up to a maximum of 3.5 V in search of the maximum value of I_{DS}; voltage for I_{DSS} is recorded as VDSP.
G_m : Transconductance; $\frac{(I_{DSS} - IDS1)}{VG1}$	For all material types, V_{DS} is swept between 0.5 V and VDSP in search of the maximum value of I_{ds}. This maximum I_{DS} is recorded as IDS1. For Intermediate and Power material, IDS1 is measured at V_{GS} = VG1 = -0.5 V. For Low Noise, HFET and pHEMT material, V_{GS} = VG1 = -0.25 V. For LNBECOLC, use V_{GS} = VG1 = -0.10 V.
V_P : Pinch-Off Voltage; V_{GS} for I_{DS} = 0.5 mA/mm of gate width.	V_{DS} fixed at 2.0 V, V_{GS} is swept to bring I_{DS} to 0.5 mA/mm.

TABLE IV
RF SPECIFICATIONS
(T_A = 25 °C ± 5°C)
V_d = 7 V, V_{cntl} = 0 V, I_d = 326 mA ±5%

Symbol	Parameter	Test Condition	Limit Min	Limit Nom	Limit Max	Units
Gain	Small Signal Gain	F = 2 – 16 GHz F = >16 – 18	20.0 15.5	23		dB
IRL	Input Return Loss	F = 2 – 18 GHz	7.5			dB
ORL	Output Return Loss	F = 2 – 18 GHz	9.0			dB
NF	Noise Figure	F = 2 – 11 GHz		5.5		dB
		F = >11 – 18		7.5		dB
P_{1dB}	Output Power @ P1dB	F = 2 – 18 GHz	17	22		dBm
IP_3	Output Third-Order Intercept Point	F = 2 GHz		31		dBm
		F = 6 GHz		33		dBm
		F = 9 GHz		32.5		dBm
		F = 12 GHz		31.5		dBm
		F = 18 GHz		32.5		dBm
	Output Second-Order Intercept Point	F = 2 GHz		37		dBm
		F = 4 GHz		40		dBm
		F = 6 GHz		40.5		dBm
		F = 9 GHz		46.5		dBm
	Output Second Harmonic at 1dB Gain Compression	F = 2 GHz		-23		dBc
		F = 4 GHz		-26.5		dBc
		F = 6 GHz		-23.5		dBc
		F = 9 GHz		-27.5		dBc
	Output Third Harmonic at 1dB Gain Compression	F = 2 GHz		-34.5		dBc
		F = 4 GHz		-25		dBc
		F = 6 GHz		-23.5		dBc
	Output Fourth Harmonic at 1dB Gain Compression	F = 2 GHz		-58		dBc
		F = 4 GHz		-47		dBc

TYPICAL S-PARAMETERS

Frequency (GHz)	S_{11} MAG	S_{11} ANG(°)	S_{21} MAG	S_{21} ANG(°)	S_{12} MAG	S_{12} ANG(°)	S_{22} MAG	S_{22} ANG(°)	GAIN (dB)
0.5	0.71	-45	0.39	75	0.000	-177	0.94	-74	-8.2
1.0	0.50	-67	8.52	-34	0.000	129	0.40	-137	18.6
2.0	0.35	-97	21.40	131	0.001	117	0.19	102	26.6
3.0	0.31	-131	14.81	18	0.001	106	0.14	149	23.4
4.0	0.27	-171	15.56	-72	0.001	96	0.08	143	23.8
5.0	0.21	147	15.66	-159	0.001	89	0.07	154	23.9
6.0	0.12	104	15.44	116	0.001	96	0.07	173	23.8
7.0	0.01	-11	14.74	34	0.001	120	0.11	-176	23.4
8.0	0.13	-156	13.81	-46	0.002	130	0.18	174	22.8
9.0	0.22	162	13.19	-123	0.001	121	0.22	154	22.4
10.0	0.25	115	13.11	162	0.001	123	0.21	132	22.4
11.0	0.24	66	14.26	85	0.001	168	0.17	126	23.1
12.0	0.22	12	15.70	2	0.002	-160	0.16	135	23.9
13.0	0.14	-44	16.07	-83	0.002	-169	0.23	135	24.1
14.0	0.07	-94	16.07	-170	0.002	-174	0.24	116	24.1
15.0	0.02	-46	16.00	103	0.003	-177	0.19	115	24.1
16.0	0.13	-12	16.30	8	0.001	-166	0.21	113	24.2
17.0	0.18	-61	14.18	-86	0.003	164	0.27	106	23.0
18.0	0.20	-116	12.09	-172	0.002	169	0.29	91	21.7
19.0	0.16	-160	13.16	92	0.003	3	0.37	39	22.4
20.0	0.20	-174	12.08	-6	0.005	-76	0.18	-51	21.6

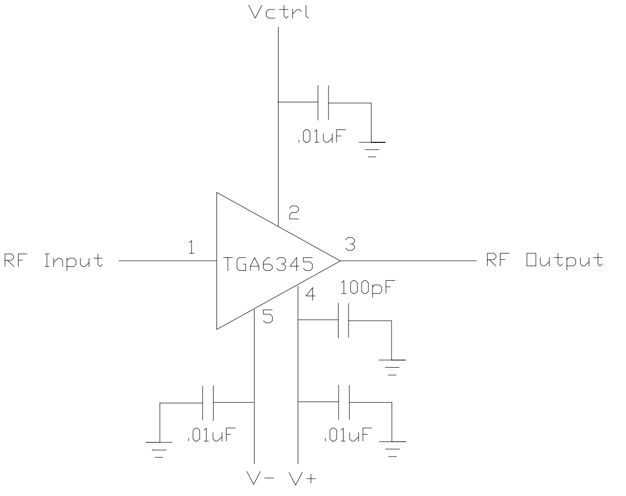
Reference planes for S-parameter data include bond wires as specified in the "Recommended Bias Network". The S-parameters are also available on floppy disk and the world wide web.

THERMAL INFORMATION

Parameter	Test condition	T_{CH} (°C)	$R_{\theta JC}$ (°C/W)	T_M (HRS)
$R_{\theta JC}$ Thermal Resistance (channel to backside of carrier)	V_d = 7 V, V_{cntl} = 0 V, I_d = 342 mA ±5%	127.3	23.93	7.7E6

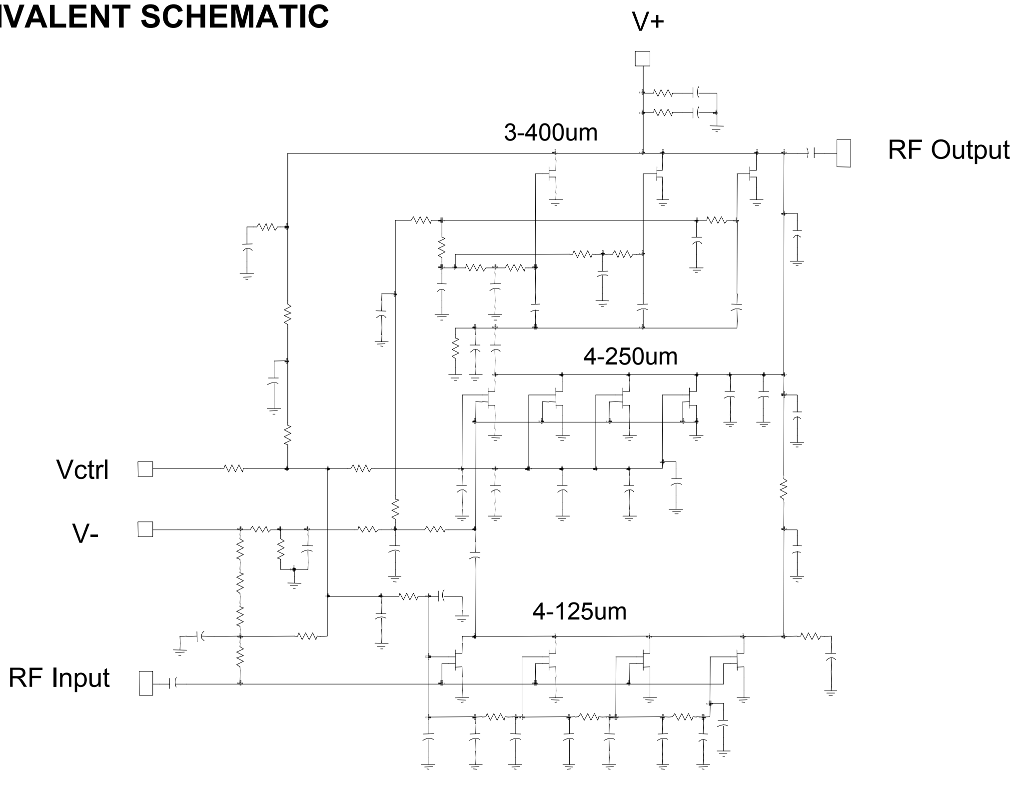
Note: Assumes eutectic attach using 1.5 mil 80/20 AuSn mounted to a 20 mil CuMo Carrier at 70°C baseplate temperature. Worst case condition with no RF applied, 100% of DC power is dissipated.

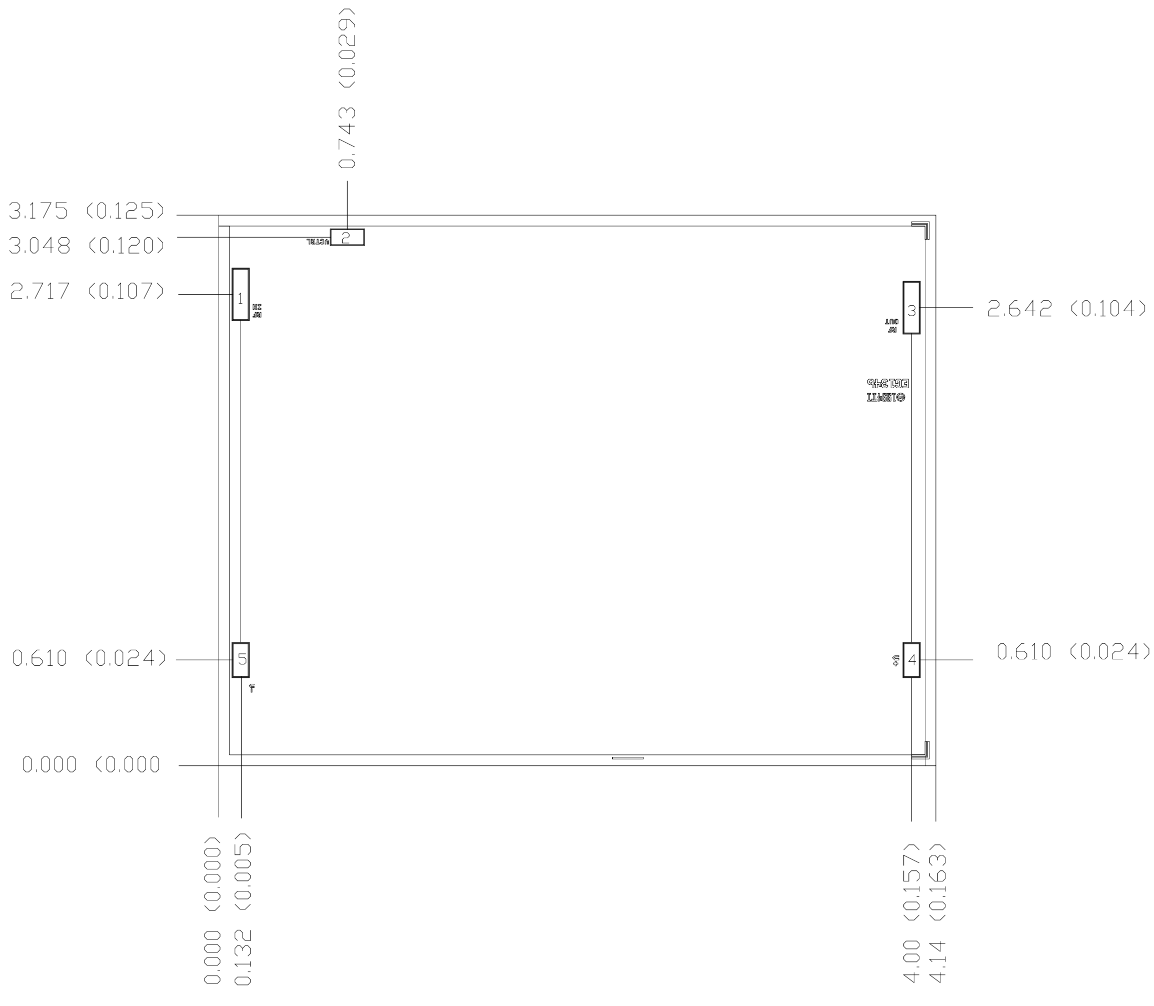
RECOMMENDTED BIAS NETWORK



RF connections: Bond two 1-mil diameter, 25-mil-length gold bond wires at both RF Input and RF Output for optimum RF performance.
Close placement of external components is essential to stability.

EQUIVALENT SCHEMATIC





Units: millimeters (inches)
Thickness: 0.1016 (0.004) (reference only)
Chip edge to bond pad dimensions are shown to center of bond pad
Chip size tolerance: +/- 0.0508 (0.002)

Bond pad #1 (RF Input)	0.100 x 0.305 (0.004 x 0.012)
Bond pad #2 (Vctrl)	0.198 x 0.096 (0.008 x 0.004)
Bond pad #3 (RF Output)	0.100 x 0.300 (0.004 x 0.012)
Bond pad #4 (V+)	0.102 x 0.203 (0.004 x 0.008)
Bond pad #5 (V-)	0.102 x 0.203 (0.004 x 0.008)

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