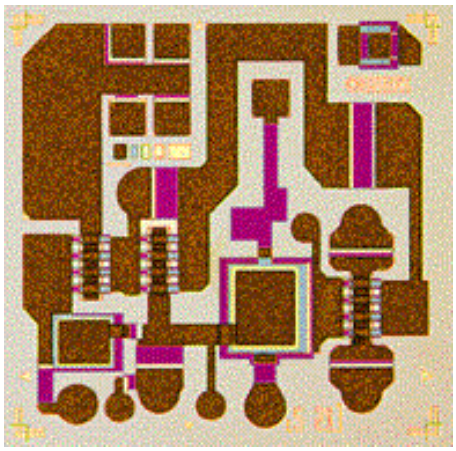
TriQuint SEMICONDUCTOR

Product Data Sheet

April 16, 2001

.1 - 3.5 GHz Low Noise Amplifier TGA8061-SCC



Key Features and Performance

- 100 MHz to 3.5 GHz Frequency Range
- 3 dB Bandwidth Exceeds 5 Octaves
- 2.4 dB Noise Figure with Low Input and Output SWR
- 18 dB Gain
- 15 dBm Output Power at 1 dB Gain Compression
- Operates from Single 12V Supply
- 1.524 x 1.524 x 0.102 mm (0.060 x 0.060 x 0.004 in.)

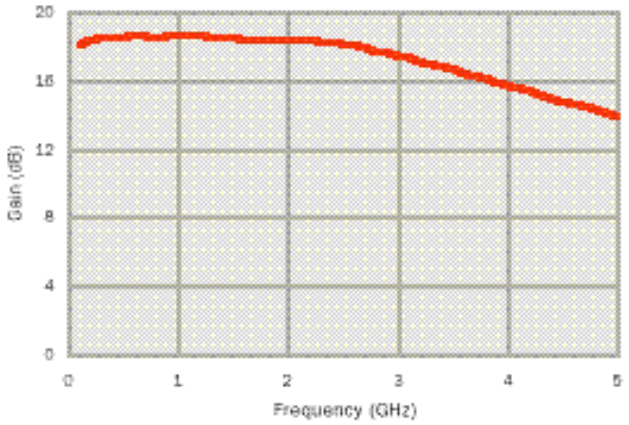
Description

The TriQuint TGA8061-SCC is a GaAs monolithic low noise amplifier intended for use as a universal gain block in applications requiring simultaneous flat gain, low noise figure, and low SWR over a very wide bandwidth. Three FET stages with resistive feedback maintain highly repeatable linear phase and amplitude characteristics.

The high isolation, low SWR, and unconditional stability of the TGA8061-SCC make it ideal for following or driving mixers and filters. Small size and low external parts count simplify system design and integration into higher-level assemblies.

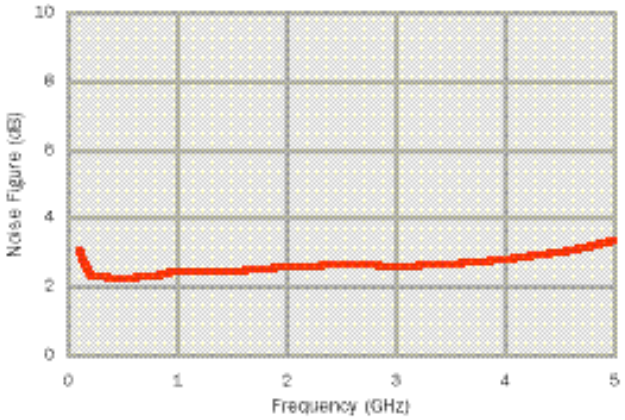
Bond pad and backside metallization is gold plated for compatibility with eutectic alloy attachment methods as well as thermocompression and thermosonic wire bonding processes. Ground is provided to the circuit through vias to the backside metallization.

TYPICAL SMALL-SIGNAL POWER GAIN



$V^+ = +12$ V
$V_0 = +5$ V
$T_A = 25°C$

TYPICAL NOISE FIGURE



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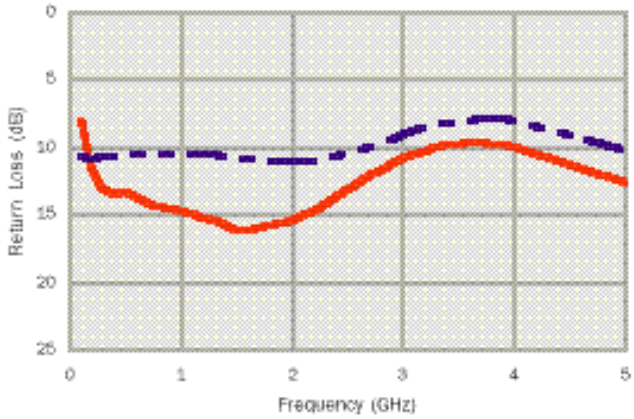
TYPICAL RETURN LOSS



$V^+ = +12$ V
$V_0 = +5$ V
$T_A = 25°C$

ABSOLUTE MAXIMUM RATINGS

Positive supply voltage, V+	16 V
Bias control voltage range, V_{ADJ}	0 V to 15 V
Positive supply current, I+	200 mA
Negative gate current, I-	3.9 mA
Power dissipation, P_D, at (or below) 25°C base-plate temperature *	1.9 W
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, TCH (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.

* For operation above 25°C base-plate temperature, derate linearly at the rate of 9.1 mW/°C.

TABLE I
DC PROBE TESTS (100%)
(T_A = 25 °C ± 5 °C)

NOTES	SYMBOL 2/	TEST CONDITIONS 3/	LIMITS		UNITS
			MIN	MAX	
	I_{DSS}	V_{GS} = 0.0 V 0.5 ≤ V_{DS} ≤ 3.5 V	60	180	mA
	G_M	V_{GS} = 0.25 V 0.5 ≤ V_{DS} ≤ 3.5 V	90	165	mS
1/	V_{P1}	I_{DS} = 300 mA	0.5	2.5	V
1/, 2/	$\|V_{BVGD}\|$	I_{GD} = 600 mA	8	30	V
1/, 2/	$\|V_{BVGS}\|$	I_{GS} = 600 mA	6	30	V

1/ V_P, V_{BVGD}, and V_{BVGS} are negative

2/ V_{BVGD}, V_{BVGS} tested on FET 1 and FET 3 only.

3/ The measurement conditions are subject to change at the manufacture's discretion (with appropriate notification to the buyer).

TABLE II
RF WAFER CHARACTERIZATION TEST
(T_A = 25°C ± 5°C)
V_D = 12V, V_{ADJ} = 6V

NOTE	TEST	MEASUREMENT CONDITIONS	VALUE			UNITS
			MIN	TYP	MAX	
	SMALL-SIGNAL GAIN MAGNITUDE	F = 0.1 – 2.5 GHz	15	18.3	---	dB
		F = 2.5 – 3.5 GHz	14	17.3	---	dB
	SMALL-SIGNAL GAIN RIPPLE	F = 0.1 – 3.5 GHz	---		3.0	dB Peak-to-Peak
	POWER OUTPUT AT 1 dB GAIN COMPRESSION	F = 2.0 – 2.5 GHz F = 2.5 – 3.5 GHz	13.0 12.0	16 14	--- ---	dBm dBm
	NOISE FIGURE	F = 0.1 – 0.3 GHz F = 0.3 – 3.5 GHz	--- ---		5.5 4.0	dB dB
	INPUT RETURN LOSS MAGNITUDE	F = 0.1 – 0.3 GHz F = 0.3 – 2.5 GHz F = 2.5 – 3.5 GHz	7.4 9.6 7.4	10.4 14.0 11.4	--- --- ---	dB dB dB
	OUTPUT RETURN LOSS MAGNITUDE	F = 0.1 – 3.5 GHz	7.4	9.6	---	dB

TYPICAL S-PARAMETERS

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		GAIN
(GHz)	MAG	ANG(°)	MAG	ANG(°)	MAG	ANG(°)	MAG	ANG(°)	(dB)
0.1	0.40	-46	7.93	0	0.0001	49	0.29	-3	18.0
0.2	0.26	-44	8.29	-1	0.0010	77	0.29	-4	18.4
0.3	0.22	-40	8.39	-7	0.0011	74	0.29	-5	18.5
0.4	0.21	-36	8.42	-12	0.0019	54	0.29	-7	18.5
0.5	0.21	-37	8.45	-16	0.0024	0	0.29	-8	18.5
0.6	0.21	-41	8.47	-20	0.0012	-54	0.30	-10	18.6
0.7	0.19	-41	8.47	-25	0.0003	-14	0.30	-11	18.6
0.8	0.19	-41	8.46	-29	0.0000	64	0.30	-13	18.5
0.9	0.19	-42	8.47	-33	0.0006	107	0.30	-14	18.6
1.0	0.18	-42	8.46	-37	0.0010	107	0.30	-15	18.6
1.1	0.18	-43	8.48	-41	0.0010	98	0.30	-16	18.6
1.2	0.17	-44	8.47	-45	0.0012	111	0.30	-17	18.6
1.3	0.17	-45	8.46	-49	0.0014	101	0.29	-19	18.5
1.4	0.16	-46	8.45	-53	0.0018	105	0.29	-20	18.5
1.5	0.16	-47	8.39	-58	0.0019	102	0.29	-22	18.5
1.6	0.16	-49	8.31	-62	0.0020	108	0.29	-24	18.4
1.7	0.16	-52	8.23	-66	0.0020	105	0.28	-26	18.3
1.8	0.16	-58	8.20	-69	0.0020	104	0.28	-28	18.3
1.9	0.16	-65	8.20	-73	0.0020	108	0.28	-31	18.3
2.0	0.17	-71	8.22	-77	0.0022	108	0.28	-34	18.3
2.1	0.18	-78	8.22	-81	0.0027	105	0.28	-37	18.3
2.2	0.18	-83	8.20	-86	0.0030	107	0.28	-41	18.3
2.3	0.19	-88	8.15	-90	0.0029	106	0.28	-45	18.2
2.4	0.21	-91	8.09	-95	0.0031	107	0.29	-48	18.2
2.5	0.22	-94	8.01	-99	0.0032	107	0.30	-51	18.1
2.6	0.23	-96	7.92	-104	0.0034	111	0.30	-55	18.0
2.7	0.25	-97	7.81	-108	0.0033	109	0.32	-58	17.9
2.8	0.26	-97	7.70	-12	0.0038	105	0.32	-60	17.7
2.9	0.27	-97	7.56	-17	0.0040	107	0.34	-62	17.6
3.0	0.28	-97	7.44	-121	0.0041	104	0.35	-64	17.4
3.1	0.29	-95	7.29	-125	0.0041	107	0.36	-65	17.3
3.2	0.30	-94	7.16	-129	0.0044	109	0.37	-66	17.1
3.3	0.31	-93	7.03	-133	0.0044	107	0.38	-67	16.9
3.4	0.32	-91	6.88	-137	0.0050	106	0.39	-67	16.8
3.5	0.32	-90	6.74	-141	0.0048	109	0.39	-67	16.6

V+ = 12 V, V_O = 5 V, T_A = 25°C

The reference plane for S-parameter data is located at the center of device bond pads.
The S-parameters are also available on floppy disk and the world wide web.

RF CHARACTERISTICS

PARAMETER	TEST CONDITIONS	TYP	UNIT
I_{P3} Third–order intercept	1.0 GHz	26	dBm
	2.0 GHz	25	
	3.5 GHz	22	
P_{1dB} 1–dB gain compression	0.1 GHz	15	dBm
	1.0 GHz	16	
	2.0 GHz	16	
	3.0 GHz	14	
	4.0 GHz	12	

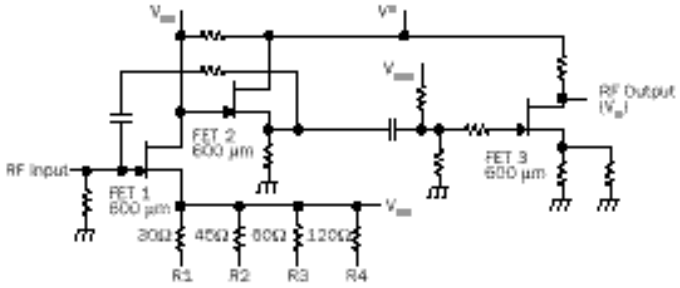
V+ = 12 V, V_O = 5 V, T_A = 25°C

DC CHARACTERISTICS

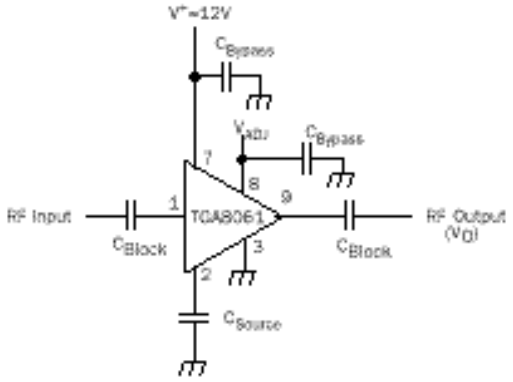
PARAMETER	TEST CONDITIONS	TYP	UNIT
I^+ Positive supply current	V^+ = 12 V, V_O = 5 V, T_A = 25°C	112	mA

T_A = 25°C

EQUIVALENT SCHEMATIC

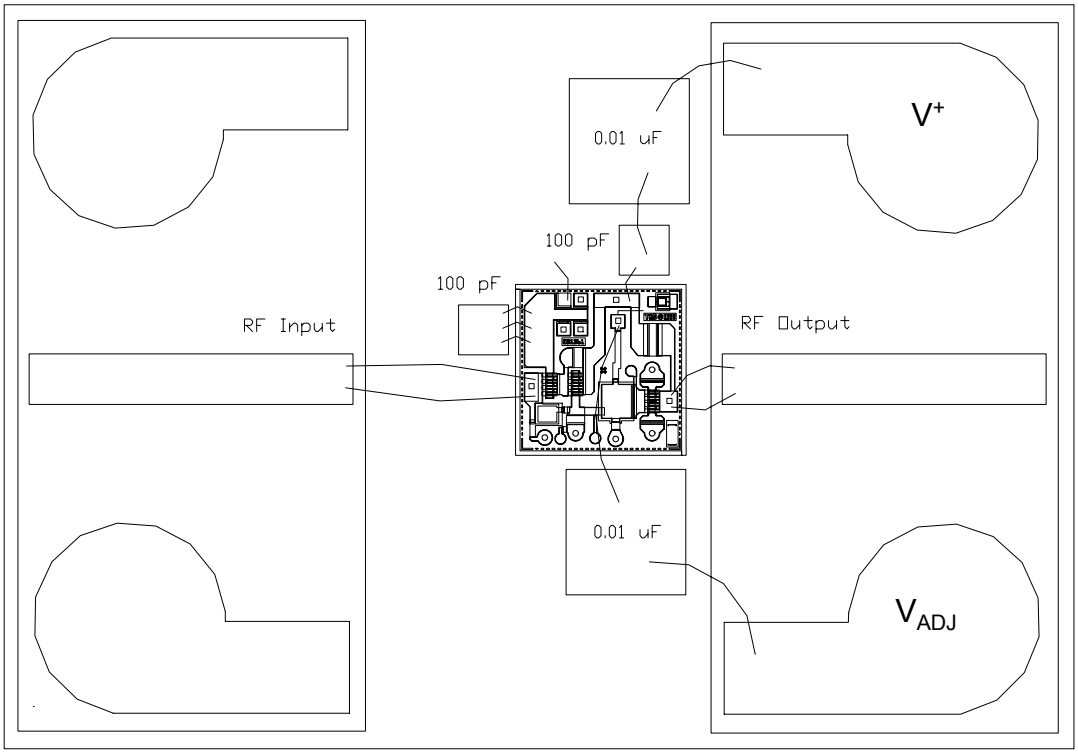


TYPICAL BIAS NETWORK



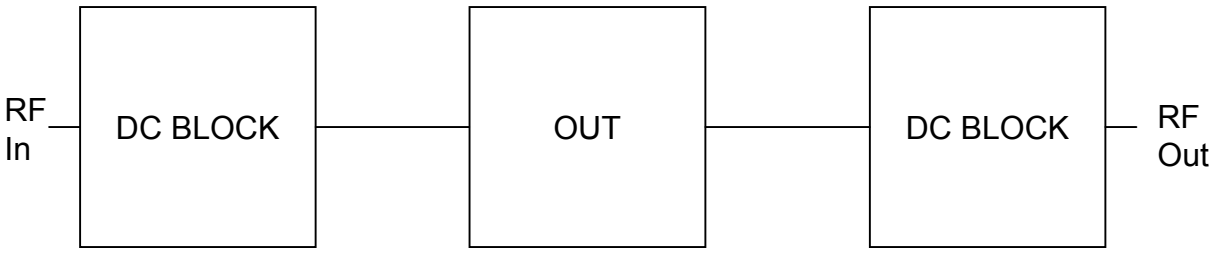
Select V_{ADJ} to set V_O = 5 V+/- 0.5 V. Select resistor R1-R4 to set V_{D1} = 4.5 V +/- 0.5 V.

RECOMMENDED ASSEMBLY DIAGRAM



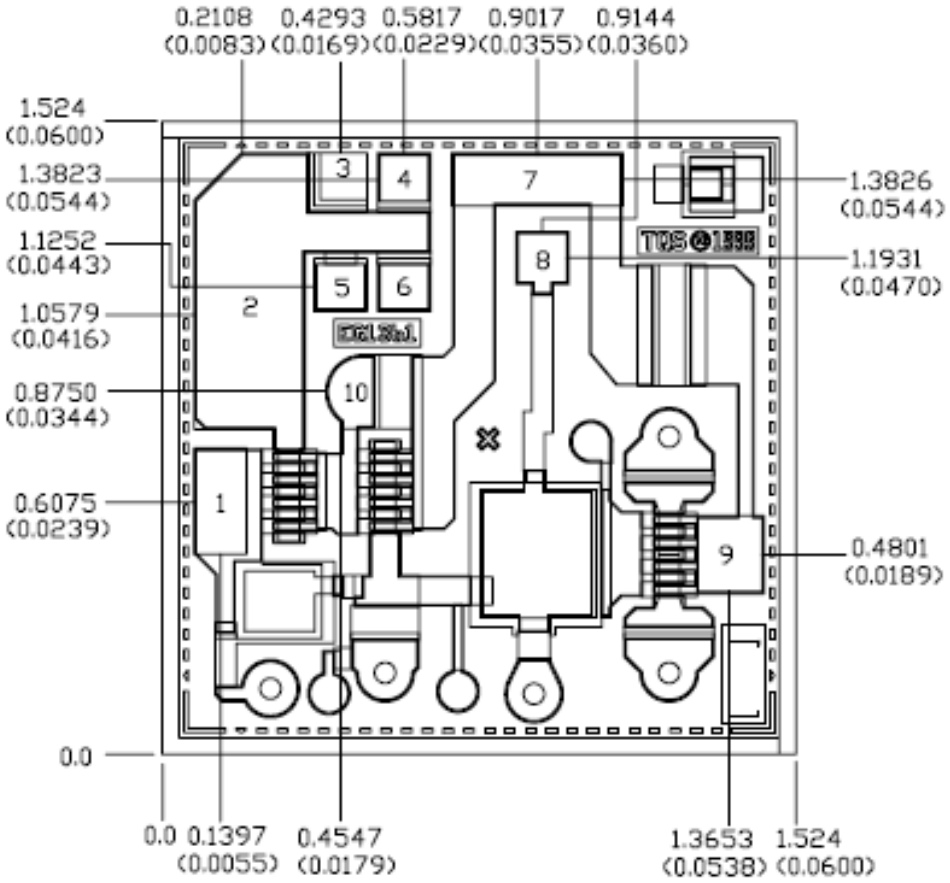
Close placement of external components is essential to stability.
V_{S1} connections: Bond using three 1 mil diameter, 15 to 30 mil length gold bond wires for optimum performance. The 100 pF capacitor should be placed within 15 mils of the chip, and source wires to this chip should be kept as short as possible.

RECOMMENDED TEST CONFIGURATION



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

MECHANICAL DRAWING



Units: Millimeters (inches)
Thickness: 0.01016 (0.004) (reference only)
Chip edge to bond pad dimensions are shown to center of bond pad
Chip size tolerance: +/-0.058 (0.002)

Bond pad #1 (RF Input):	0.1270 x 0.2540 (0.0050 x 0.0100)
Bond pad #2 (Vs1):	0.2616 x 0.6604 (0.0103 x 0.0260)
Bond pad #3 (R1):	0.1118 x 0.1118 (0.0044 x 0.0044)
Bond pad #4 (R2):	0.1219 x 0.1143 (0.0048 x 0.0045)
Bond pad #5 (R4):	0.1219 x 0.1118 (0.0048 x 0.0044)
Bond pad #6 (R3):	0.1219 x 0.1118 (0.0048 x 0.0044)
Bond pad #7 (V+):	0.4064 x 0.1219 (0.0160 x 0.0048)
Bond pad #8 (Vadj):	0.1219 x 0.1219 (0.0048 x 0.0048)
Bond pad #9 (RF Output):	0.1549 x 0.1829 (0.0061 x 0.0072)
Test point (pad) #10 (Vd1):	radius 0.0864 (0.0034) (half circle)

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