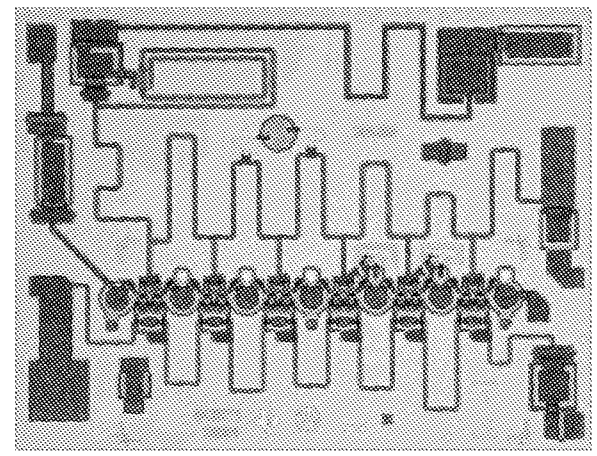
TGA8622-SCC

Amplifier **8622**

- **2 to 20-GHz Frequency Range**
- **7.5-dB Gain with Greater than 30-dB Gain-Control Capability**
- **20-dBm Output Power at 1-dB Gain Compression**
- **7-dB Noise Figure**
- **Input and Output SWR 1.7:1 Midband**
- **2,769 x 2,159 x 0,152 mm (0.109 x 0.085 x 0.006 in.)**

PHOTO ENLARGEMENT

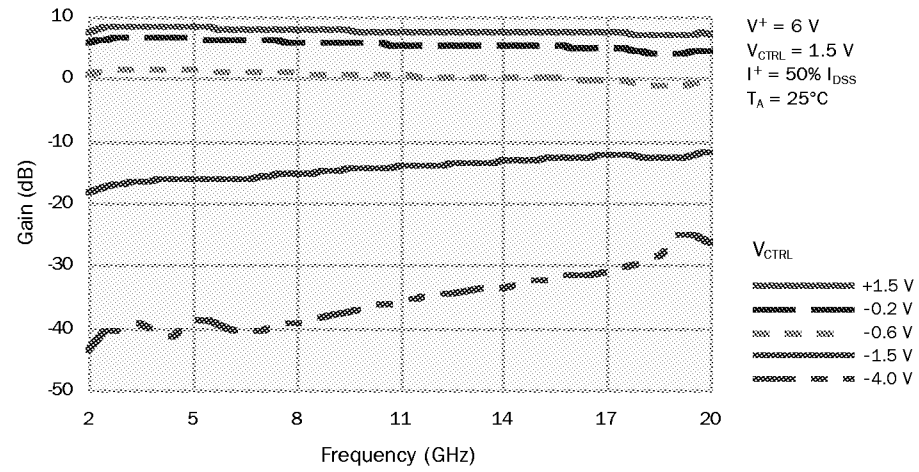


DESCRIPTION

The Texas Instruments TGA8622-SCC is a broadband general-purpose amplifier that operates over the 2 to 20-GHz frequency range. Six 200-µm dual-gate FETs provide the amplifier with a typical gain of 7.5-dB. Midband input and output SWRs are typically 1.7:1. This amplifier is directly cascadable and can be used in both gain control and active temperature compensation applications. Ground is provided to the circuitry through vias to the backside metallization.

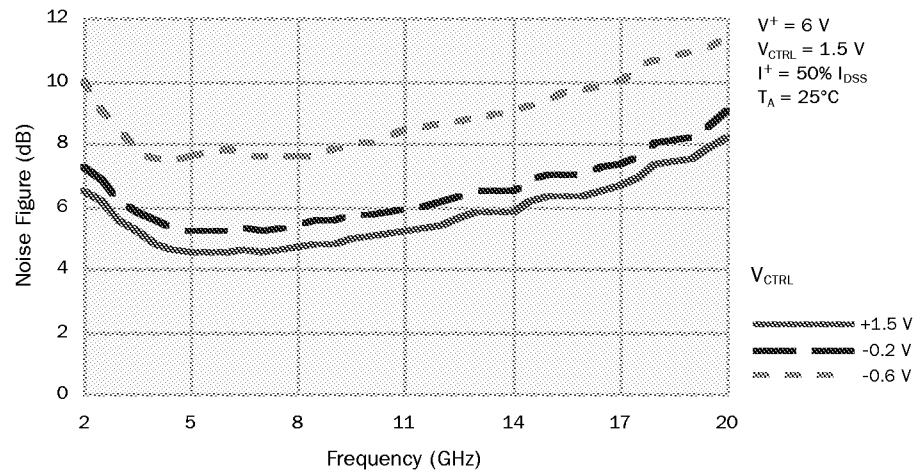
The TGA8622-SCC is available in chip form and is readily assembled using automated equipment. The device bond pads and backside are gold plated for compatibility with eutectic alloy attach methods as well as thermocompression and thermosonic wire-bonding processes.

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

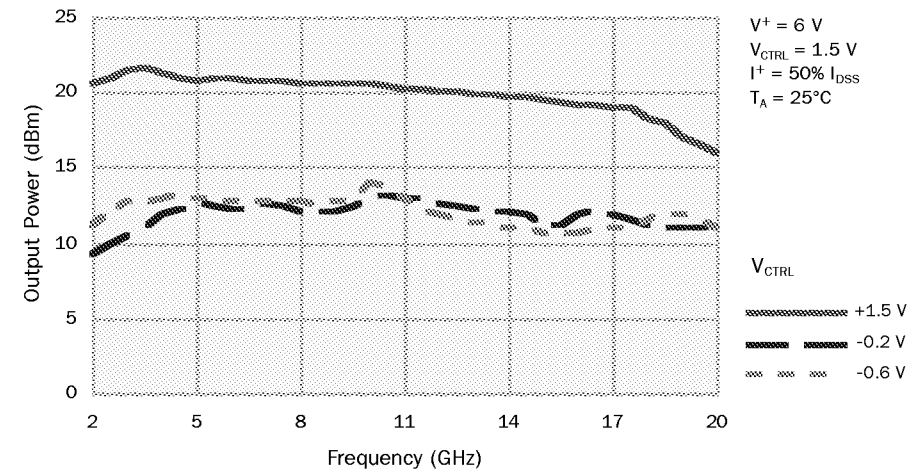


V_{CTRL} for particular gain levels is shown for reference only and may vary from device to device.

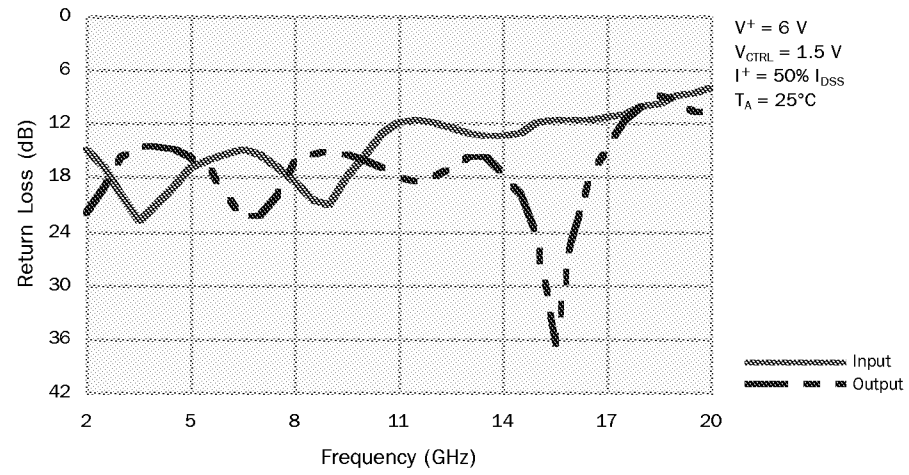
TYPICAL NOISE FIGURE
NF vs. V_{CTRL}



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



TYPICAL RETURN LOSS



ABSOLUTE MAXIMUM RATINGS

Positive supply voltage, V^+ ..... 8 V

Positive supply voltage range with respect to negative supply voltage, V^+-V^- ..... 0 to 12 V

Negative supply voltage range, V^- ..... 0 to -5 V

Gain control voltage range, V_{CTRL} ..... -5 V to 4 V

Gain control voltage range with respect to positive supply voltage, V_{CTRL} -V^+ ..... 0 to -10 V

Positive supply current, I^+ ..... 370 mA

Power dissipation, P_D, at (or below) 25°C base-plate temperature* ..... 2.9 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 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.

* For operation above 25°C base-plate temperature, derate linearly at the rate of 6.1 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)
2.0	0.18	168	2.34	128	0.007	81	0.08	55	7.4
2.5	0.14	150	2.55	108	0.011	59	0.15	-33	8.1
3.0	0.10	148	2.62	87	0.013	37	0.17	-81	8.4
3.5	0.07	175	2.66	66	0.014	16	0.19	-116	8.5
4.0	0.09	-160	2.64	46	0.014	-5	0.19	-143	8.4
4.5	0.12	-153	2.61	26	0.014	-24	0.18	-165	8.3
5.0	0.14	-158	2.57	7	0.014	-37	0.17	176	8.2
5.5	0.16	-166	2.54	-12	0.015	-61	0.14	160	8.1
6.0	0.17	-177	2.49	-30	0.015	-81	0.11	152	7.9
6.5	0.18	172	2.47	-48	0.016	-99	0.07	163	7.8
7.0	0.17	163	2.46	-66	0.016	-118	0.08	-166	7.8
7.5	0.14	159	2.46	-84	0.018	-136	0.11	-149	7.8
8.0	0.12	159	2.44	-103	0.020	-155	0.15	-149	7.8
8.5	0.09	166	2.43	-121	0.021	-172	0.17	-152	7.7
9.0	0.09	-174	2.42	-139	0.023	171	0.18	-153	7.7
9.5	0.12	-161	2.41	-158	0.024	155	0.17	-157	7.7
10.0	0.17	-157	2.40	-177	0.025	139	0.16	-160	7.6
10.5	0.22	-157	2.38	165	0.026	124	0.15	-165	7.5
11.0	0.26	-160	2.36	147	0.026	108	0.13	-167	7.4
11.5	0.27	-162	2.35	128	0.026	91	0.12	-167	7.4
12.0	0.26	-165	2.35	110	0.025	77	0.13	-167	7.4
12.5	0.24	-169	2.38	91	0.025	61	0.14	-172	7.5
13.0	0.23	-174	2.36	71	0.025	44	0.17	172	7.5
13.5	0.22	-178	2.35	53	0.025	25	0.17	144	7.4
14.0	0.21	-175	2.38	33	0.025	4	0.14	120	7.5
14.5	0.22	-169	2.38	12	0.027	-18	0.10	100	7.5
15.0	0.25	-164	2.38	-8	0.028	-41	0.06	80	7.5
15.5	0.26	-162	2.39	-29	0.030	-62	0.02	2	7.6
16.0	0.26	-162	2.36	-51	0.031	-84	0.07	-122	7.5
16.5	0.26	-166	2.31	-72	0.033	-104	0.13	-151	7.3
17.0	0.26	-170	2.33	-93	0.036	-125	0.19	-175	7.3
17.5	0.28	-172	2.31	-116	0.038	-146	0.25	159	7.3
18.0	0.33	-174	2.22	-138	0.035	-166	0.31	133	6.9
18.5	0.33	-174	2.19	-159	0.037	-174	0.36	114	6.8
19.0	0.36	-169	2.21	179	0.042	163	0.37	98	6.9
19.5	0.38	-167	2.29	155	0.041	140	0.29	95	7.2
20.0	0.40	-164	2.28	125	0.040	119	0.28	133	7.1

T_A = 25°C, V^+ = 6 V, V_{CTRL} = 1.5 V, I^+ = 50% I_{DSS}

Reference planes for S-parameter data include bond wires as specified in the equivalent schematic. The expanded set of 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 = 2 to 20 GHz	7.5	dB
SWR (in)	Input standing wave ratio	f = 2 to 10 GHz	1.3:1	-
		f = 10 to 20 GHz	1.7:1	
SWR (out)	Output standing wave ratio	f = 2 to 10 GHz	1.3:1	-
		f = 10 to 20 GHz	1.7:1	
P_{1dB}	Output power at 1–dB gain compression	f = 2 to 18 GHz	20	dBm
		f = 18 to 20 GHz	17	
NF	Noise figure	f = 2 to 20 GHz	7	dB
IP_3	Output third–order intercept point	f = 2 GHz	33	dBm
		f = 10 GHz	33	
		f = 18 GHz	30	

V^+ = 6 V, V_{CTRL} = 1.5 V, I^+ = 50% I_{DSS}, T_A = 25°C

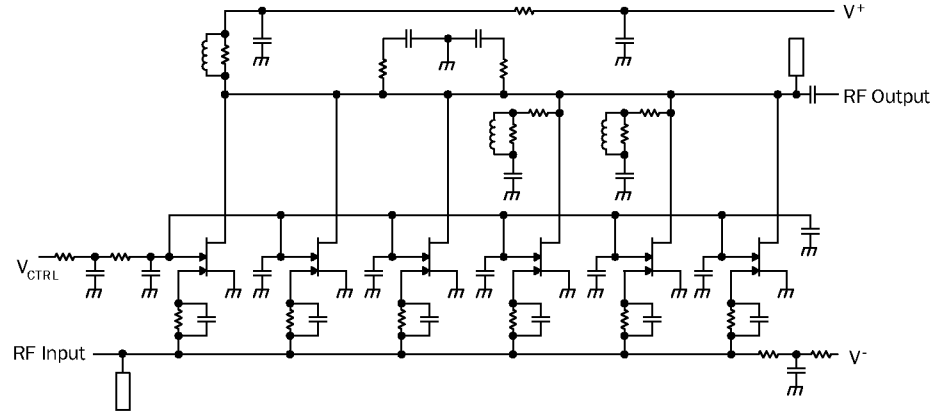
DC CHARACTERISTICS

PARAMETER		TEST CONDITIONS	MIN	MAX	UNIT
I_{DSS}	Zero–gate–voltage drain current at saturatio	V_{DS} = 0.5 V to 3.5 V, V_{GS} = 0 V	156	444	mA

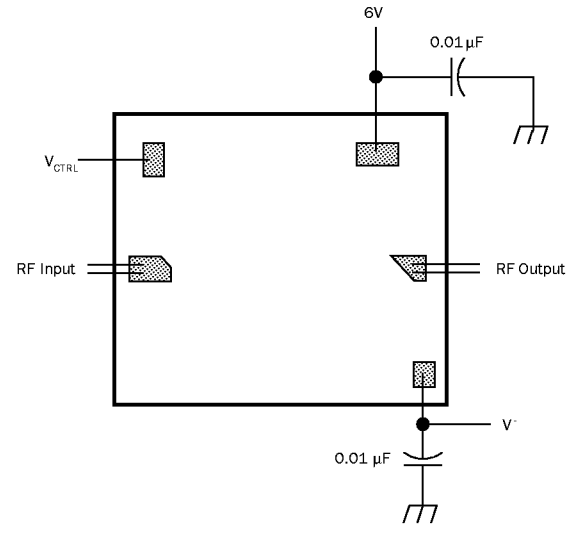
T_A = 25°C

V_{DS} for I_{DSS} is the drain voltage between 0.5 V and 3.5 V at which the drain current is highest at DC autoprobe.

EQUIVALENT SCHEMATIC



RECOMMENDED BIAS CIRCUIT



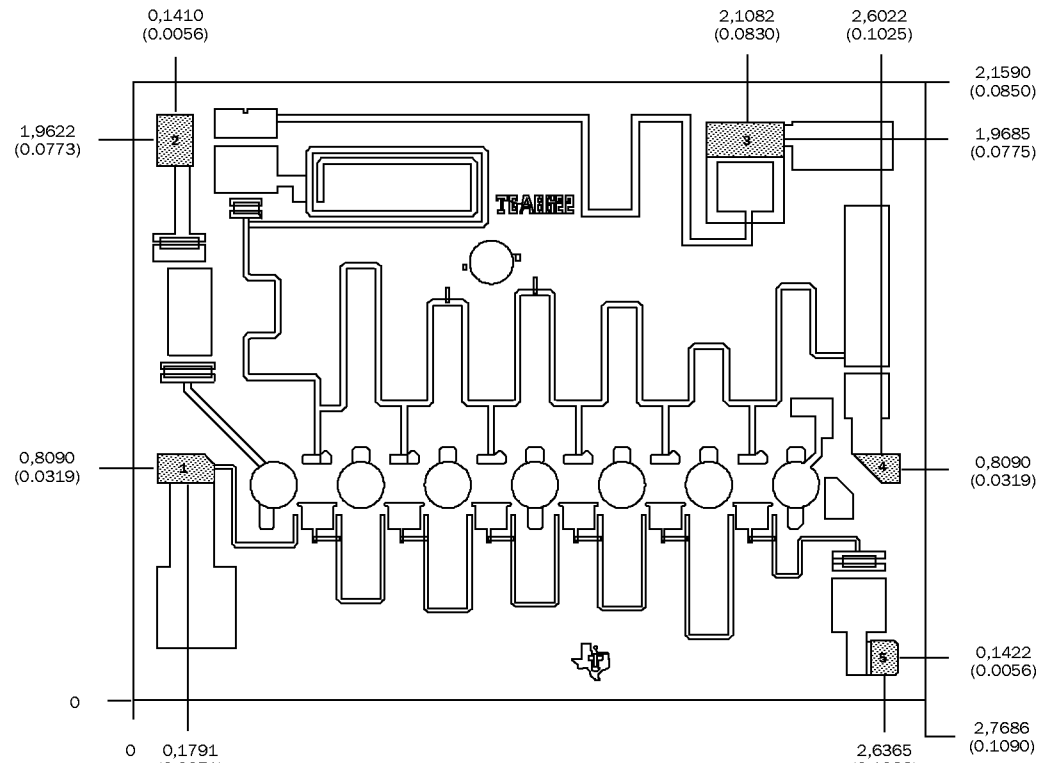
RF connections: Bond using two 1-mil diameter, 20-mil-length gold wires at both RF Input and RF Output.

Measuring I_{DSS}: Set V^-, V^+, and V_{CTRL} to 0 V. Connect V_{CTRL} to V^+. Short V^- to ground.
Increase V^+, V_{CTRL} from 0 V and measure I^+ maximum for V^+, $V_{CTRL} \leq 4$ V. I^+ maximum is I_{DSS}.

Maximum-gain bias (in this sequence):
Set V^- to -1 V, V^+ to 6 V, and V_{CTRL} to 1.5 V. Adjust V^- to achieve $I^+ = 50\%\ I_{DSS}$.

Gain reduction: set bias for maximum gain condition and decrease V_{CTRL} from 1.5 V.
(I^+ will drop accordingly; do not readjust V^-.)

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):	0,1981 x 0,1016 (0.0078 x 0.0040)
Bond Pad #2 (V_{CTRL}):	0,1270 x 0,1778 (0.0050 x 0.0070)
Bond Pad #3 (V^+):	0,3429 x 0,1143 (0.0135 x 0.0045)
Bond Pad #4 (RF Output):	0,1676 x 0,1016 (0.0066 x 0.0040)
Bond Pad #5 (V^-):	0,0864 x 0,1245 (0.0034 x 0.0049)

This device is susceptible to damage from electric discharge. Handling and packaging of this device and/or assembly should be accomplished only with adequate provisions to prevent electrostatic discharge damage.
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TEXAS INSTRUMENTS Microwave GaAs Products Phone: 972 995 8465 Fax: 972 995 4288 Email: GaAs@ti.com Web: http://www.ti.com/mgp