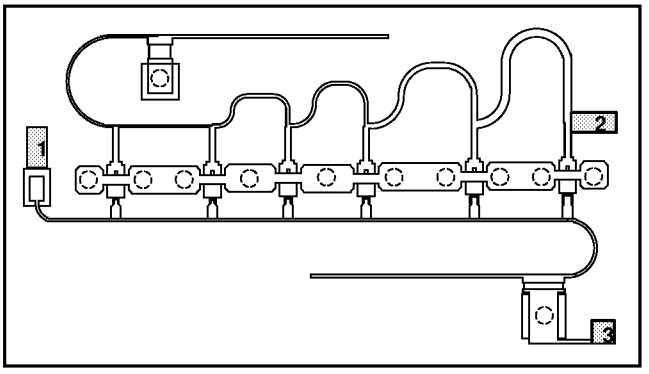
- **Positive Gain Slope**
- **26-dBm Typical Output Power at 1-dB Gain Compression**
- **6-dB Typical Gain**
- **1.6:1 Typical Input/Output SWR**
- **Size: 3,327 × 1,880 × 0,152 mm (0.131 × 0.074 × 0.006 in)**



description

The Texas Instruments TGA8220-SCC is a GaAs monolithic distributed amplifier that operates over the 2 to 18 GHz frequency range. Six 335-μm gate-width FETs provide 26 dBm of typical output power at 1-dB gain compression and 10% power-added efficiency. Small-signal gain is typically 6 dB with positive gain slope across the band. Typical input and output return losses are 13 dB.

This medium power amplifier is suitable for a variety of wide-band applications such as distribution networks, video RF logarithmic amplifiers, and oscillator distribution. The TGA8220-SCC is also cascadable with the Texas Instruments TGA8300-SCC and/or the TGA8622-SCC.

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 TGA8220-SCC is available in chip form and is readily assembled using automated equipment.

TYPICAL GAIN AND POWER vs FREQUENCY

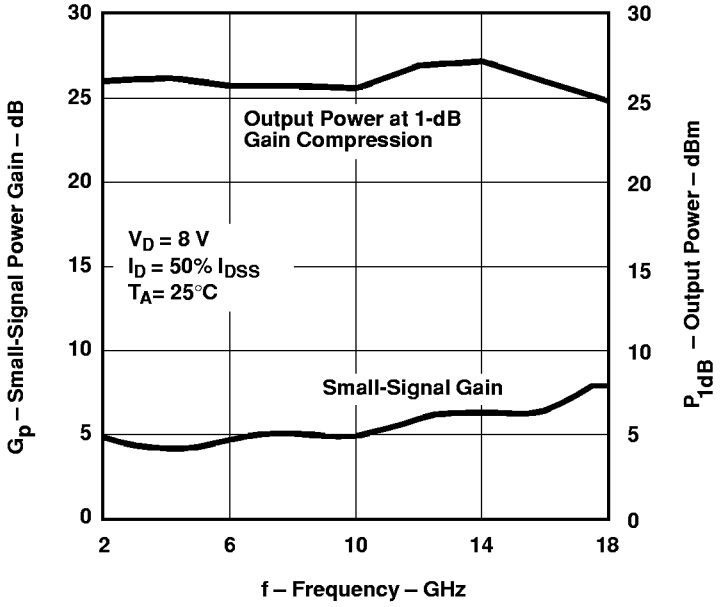


Figure 1

This device is susceptible to damage from electrostatic discharge. Handling and packaging of this device and/or this assembly should be accomplished only with adequate provisions to prevent electrostatic discharge damage.

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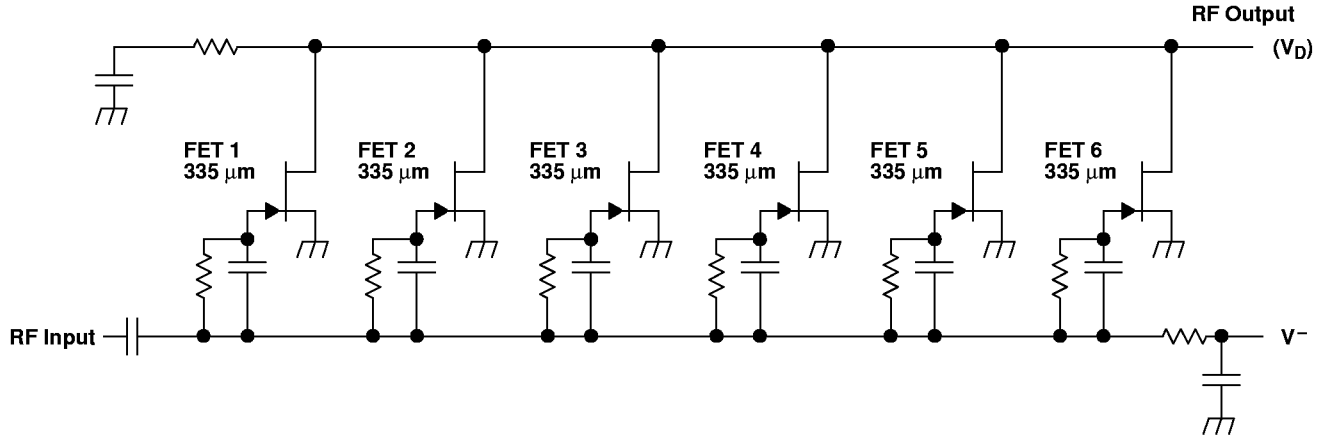
equivalent schematic



absolute maximum ratings over operating channel temperature range, T_{CH} (unless otherwise noted)†

Positive supply voltage, V_D . . . . . 9 V
Negative supply voltage range, V^- . . . . . 0 V to –5 V
Positive supply voltage range with respect to negative supply voltage, $V_D - V^-$ . . . . . 0 V to 10 V
Positive supply current, I_D . . . . . I_{DSS}
Power dissipation at (or below) 25°C base-plate temperature, P_D (see Note 1) . . . . . 4.8 W
Input continuous wave power, P_{in} . . . . . 20 dBm
Operating channel temperature, T_{CH} (see Note 2) . . . . . 150°C
Mounting temperature (30 s) . . . . . 320°C
Storage temperature range, T_{stg} . . . . . –65°C to 150°C

† 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 "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. For operation above 25°C base-plate temperature, derate linearly at the rate of 10.2 mW/°C.
2. Operating channel temperature directly affects the device MTTF. For maximum life, it is recommended that channel temperature be maintained at the lowest possible level.

electrical characteristics, T_A = 25°C

PARAMETER		TEST CONDITIONS		MIN	MAX	UNIT
I_{DSS}	Total zero-gate-voltage drain current at saturation	V_{DS} = 0.5 V to 3.5 V‡,	V_{GS} = 0	422	784	mA

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

operating characteristics, V_D = 8 V, I_D = 50% I_{DSS}, T_A = 25°C

PARAMETER		TEST CONDITIONS	TYP	UNIT
G_p	Small-signal power gain	f = 2 to 18 GHz	6	dB
SWR(in)	Input standing-wave ratio	f = 2 to 18 GHz	1.6:1	—
SWR(out)	Output standing-wave ratio	f = 2 to 18 GHz	1.6:1	—
NF	Noise figure	f = 2 to 18 GHz	7.5	dB
P_{1dB}	Output power at 1-dB gain compression	f = 2 to 18 GHz	26	dBm
IP_3	Output third-order intercept point	f = 2 GHz	36	dBm
		f = 6 GHz	38	
		f = 12 GHz	40	
		f = 18 GHz	37	

operating characteristics, V_D = 8 V, I_D = 50% I_{DSS}, T_A = 25°C

typical s-parameters (see Note 3)

FREQUENCY (GHz)	s_{11}		s_{21}		s_{12}		s_{22}		GAIN (dB)
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
0.5	0.71	−51	2.14	176	0.003	81	0.20	−160	6.6
1.0	0.57	−83	2.02	151	0.005	64	0.23	−166	6.1
1.5	0.48	−114	1.85	135	0.007	53	0.27	−171	5.3
2.0	0.41	−139	1.74	122	0.009	41	0.31	−179	4.8
2.5	0.35	−160	1.69	110	0.011	33	0.34	171	4.5
3.0	0.30	−177	1.65	99	0.012	24	0.37	160	4.3
3.5	0.26	170	1.63	87	0.013	16	0.40	147	4.2
4.0	0.23	159	1.61	75	0.014	9	0.41	134	4.1
4.5	0.20	150	1.61	64	0.015	2	0.41	119	4.1
5.0	0.16	142	1.63	52	0.017	−5	0.39	103	4.3
5.5	0.13	134	1.67	40	0.019	−16	0.35	85	4.5
6.0	0.11	126	1.71	27	0.021	−27	0.31	64	4.7
6.5	0.10	119	1.75	14	0.023	−40	0.26	39	4.9
7.0	0.10	116	1.77	−0	0.025	−54	0.21	9	5.0
7.5	0.11	119	1.79	−14	0.027	−68	0.18	−28	5.1
8.0	0.13	123	1.79	−28	0.028	−84	0.18	−69	5.1
8.5	0.15	126	1.78	−42	0.027	−96	0.21	−106	5.0
9.0	0.18	126	1.75	−55	0.028	−107	0.24	−133	4.9
9.5	0.20	122	1.75	−67	0.029	−117	0.27	−154	4.9
10.0	0.22	115	1.76	−80	0.030	−126	0.27	−174	4.9
10.5	0.25	107	1.80	−92	0.032	−135	0.26	165	5.1
11.0	0.26	99	1.85	−106	0.036	−144	0.22	142	5.3
11.5	0.27	91	1.91	−119	0.040	−155	0.18	114	5.6
12.0	0.27	82	1.97	−134	0.044	−167	0.13	78	5.9
12.5	0.25	72	2.03	−149	0.047	−180	0.09	26	6.1
13.0	0.22	58	2.05	−165	0.050	168	0.09	−45	6.2
13.5	0.21	38	2.06	−180	0.055	156	0.13	−91	6.3
14.0	0.20	17	2.07	165	0.056	140	0.16	−124	6.3
14.5	0.21	2	2.06	149	0.056	129	0.19	−156	6.3
15.0	0.20	−7	2.04	134	0.059	118	0.21	173	6.2
15.5	0.19	−14	2.05	120	0.062	105	0.23	143	6.2
16.0	0.17	−19	2.09	105	0.066	92	0.24	114	6.4
16.5	0.14	−30	2.19	90	0.071	80	0.23	89	6.8
17.0	0.09	−56	2.31	73	0.082	63	0.19	62	7.3
17.5	0.05	−133	2.47	54	0.091	44	0.12	28	7.9
18.0	0.18	130	2.48	34	0.094	26	0.02	−84	7.9
18.5	0.27	100	2.58	10	0.106	3	0.09	169	8.2
19.0	0.36	81	2.41	−14	0.105	−19	0.18	144	7.6
19.5	0.40	67	2.19	−34	0.105	−37	0.25	127	6.8
20.0	0.38	60	2.06	−51	0.107	−53	0.28	113	6.3
20.5	0.32	62	2.12	−70	0.120	−71	0.26	102	6.5

NOTE 3: 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.

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PARAMETER MEASUREMENT INFORMATION

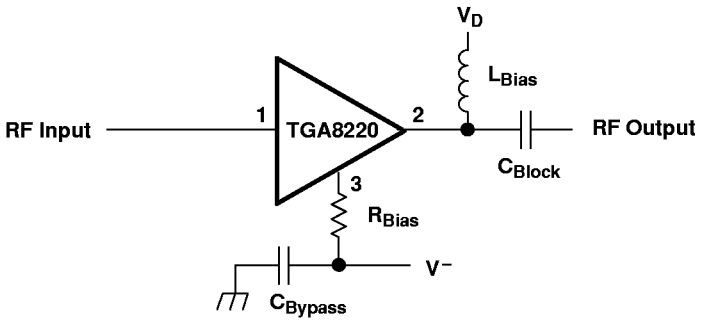

Figure 2. Typical Bias Network

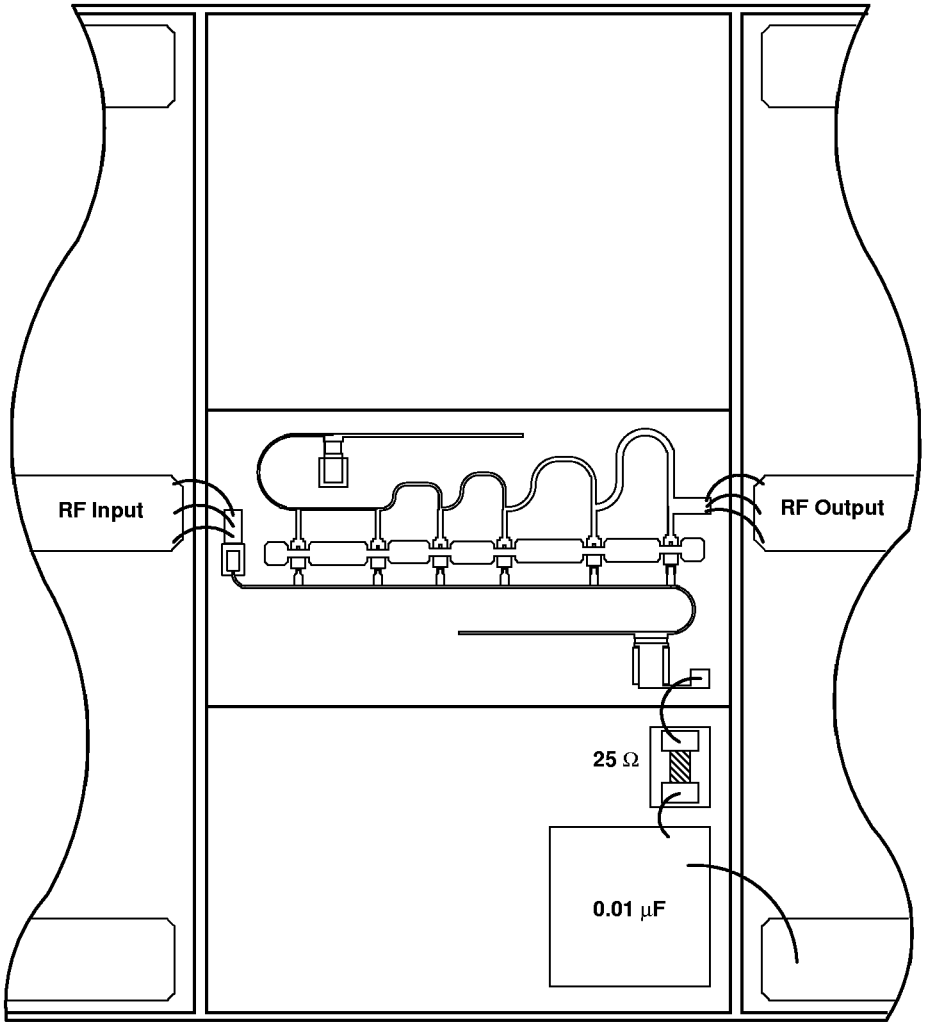

Figure 3. Recommended Assembly Diagram

NOTES: A. RF connections: bond using three 1-mil diameter, 20- to 25-mil-length gold bond wires at both RF input and RF output for optimum RF performance.
B. Close placement of external components is essential to stability.
C. Refer to Texas Instruments *Gallium Arsenide Products Designers' Information*, MMIC Assembly Procedures, literature number GMNA002.

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TYPICAL CHARACTERISTICS

RETURN LOSS
vs
FREQUENCY

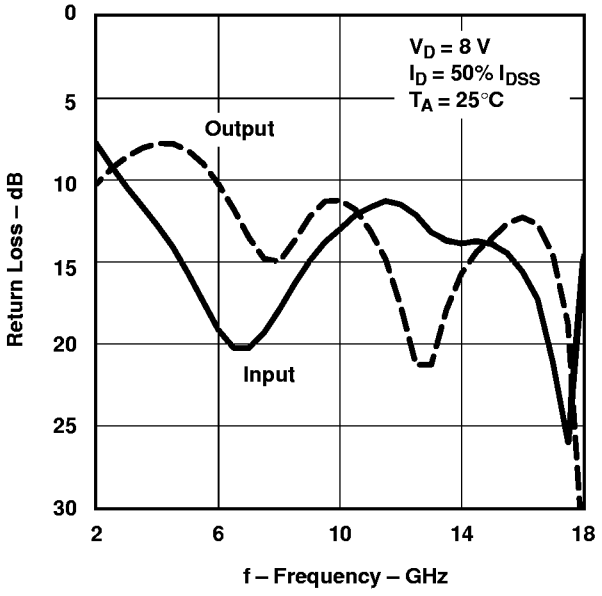

Figure 4

NOISE FIGURE
vs
FREQUENCY

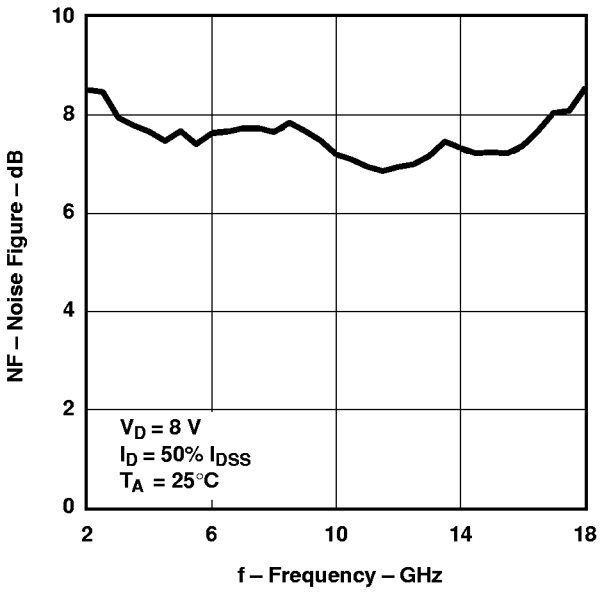

Figure 5

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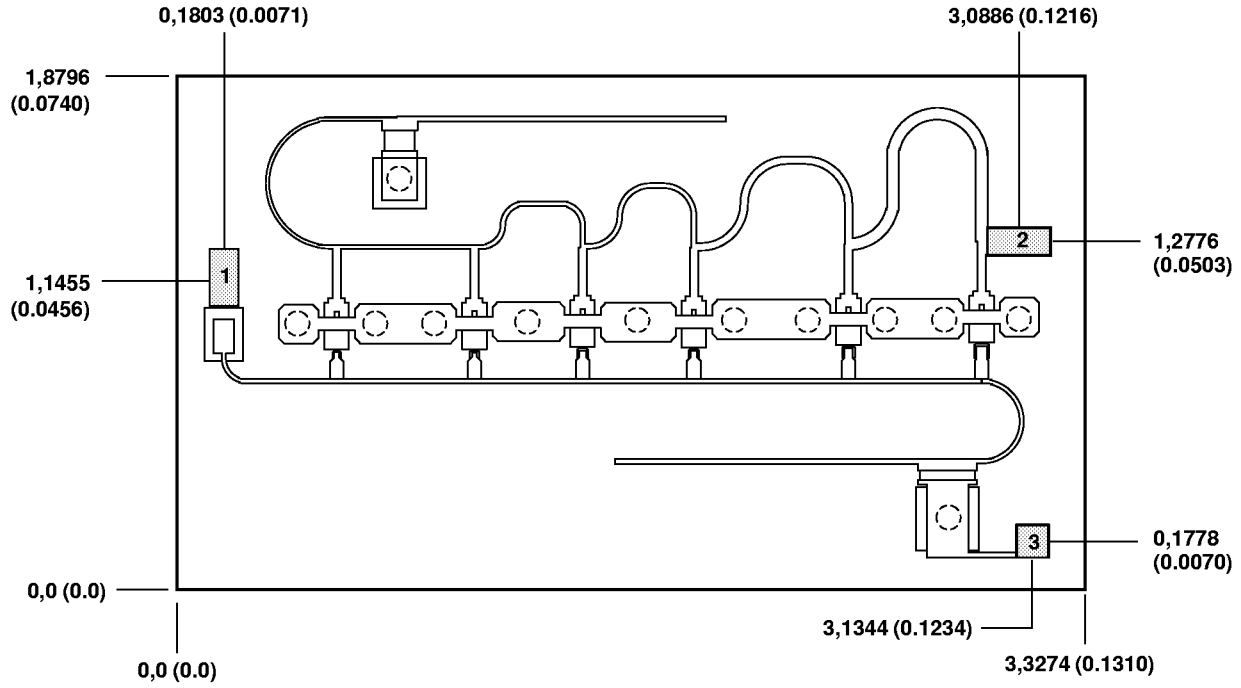
MECHANICAL DATA



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 tolerance: ± 0,0508 (0.002)

Bond pad #1 (RF Input):	0,1143 x 0,2184 (0.0045 × 0.0086)
Bond pad #2 (RF Output/V_D):	0,2362 x 0,1092 (0.0093 × 0.0043)
Bond pad #3 (V^-):	0,1270 x 0,1270 (0.0050 × 0.0050)

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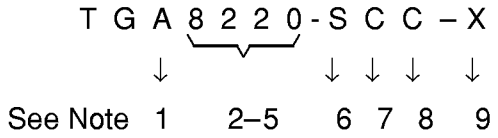
CATALOG DEVICE NOMENCLATURE

Category
FETs and MMICs

Order Number
TGA8220-SCC

Explanation



NOTES:

1 The product type, coded as
F = Discrete GaAs FET
A = Monolithic amplifier
V = Monolithic VCO
S = Switch
D = Diode
L = Attenuator, Limiter
P = Phase Shifter

2–5 A specific 4-digit number identifying the device; i.e., 8220

6 Performance screening codes as
S = Standard
X = Special

7 Packaging coded as
C = Chip form
P = Standard package
S = Special package

8 Reliability screening coded as
S = Special
C = Commercial
M = Military

9 TI internal procurement code or package designator

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Printed in U.S.A.