Texas Instruments TGA8622

Monolithic 2- to 20-GHz Dual-Gate Distributed Amplifier

Features

- 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 less than 2.3:1 over entire control range

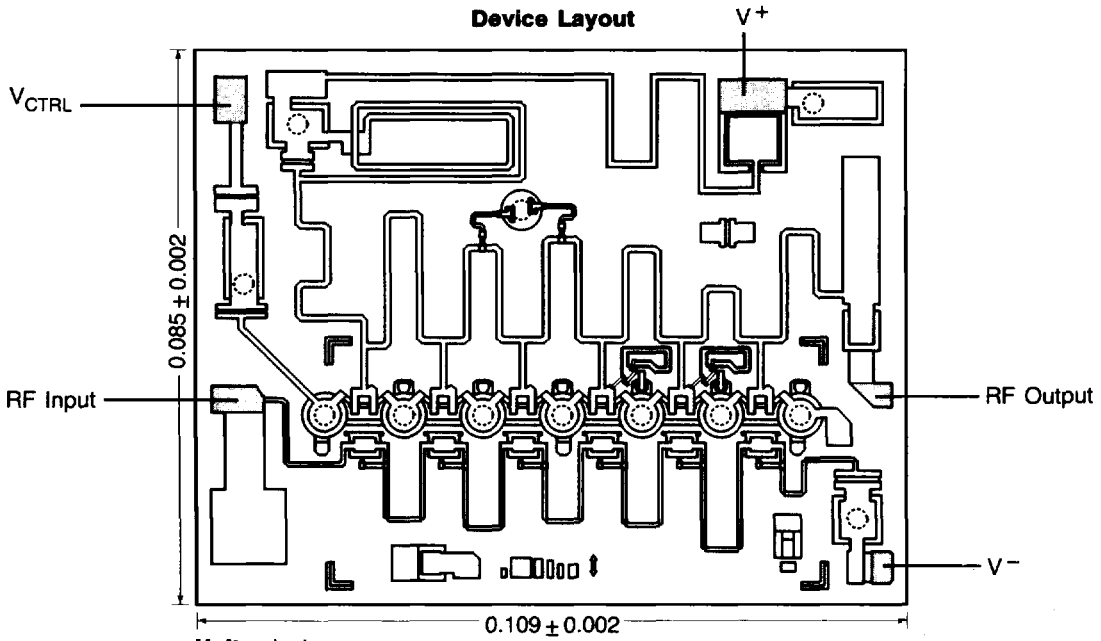
Description

The Texas Instruments TGA8622 is a broadband general-purpose amplifier which 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, while maintaining input and output SWRs of less than 2.3:1. This amplifier is directly cascadable, and can be used in both gain control and active temperature compensation applications.

The TGA8622 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.

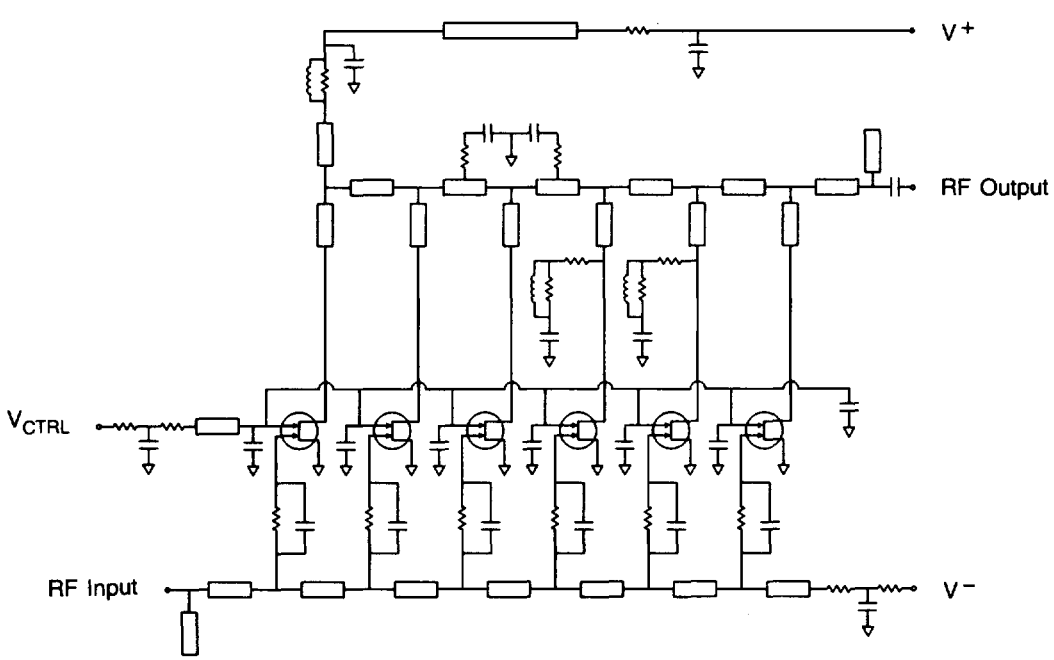
Advance Information documents contain information on new products in the sampling or preproduction phase of development. Characteristic data and other specifications are subject to change without notice.

Device Layout



Units: inches
Thickness: 0.006 (Ref. only)
☐ **Bonding pad area**

Circuit Topology



Absolute Maximum Ratings (T_A = 25°C)

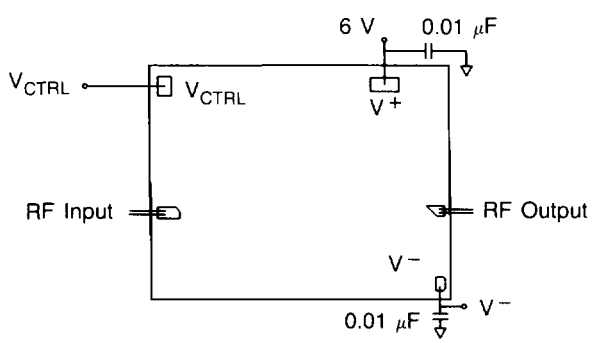
Parameter	Symbol	Value	Units	Notes
Positive supply voltage	V^+	8.0	volts	
Negative supply voltage	V^-	0 to −5.0	volts	1
Gain control voltage	V_{CTRL}	−5.0 to 4.0	volts	2
Power dissipation	P_{DISS}	1.5	watts	
Operating channel temperature	T_{CH}	150	°C	3
Mounting temperature (30 seconds)	T_M	320	°C	
Storage temperature	T_{STG}	−65 to 150	°C	

(1) $0\ V \leq (V^+ - V^-) \leq 10\ V$

(2) $0\ V \leq (V^+ - V_{CTRL}) \leq 10\ V$

(3) Operating channel temperature will directly affect the device MTTF. For maximum life, it is recommended that channel temperature be maintained at the lowest possible level.

Recommended Bias Circuit



- RF Connections: Bond using two 1-mil diameter, 20-mil length gold wires at both input and 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^-.)

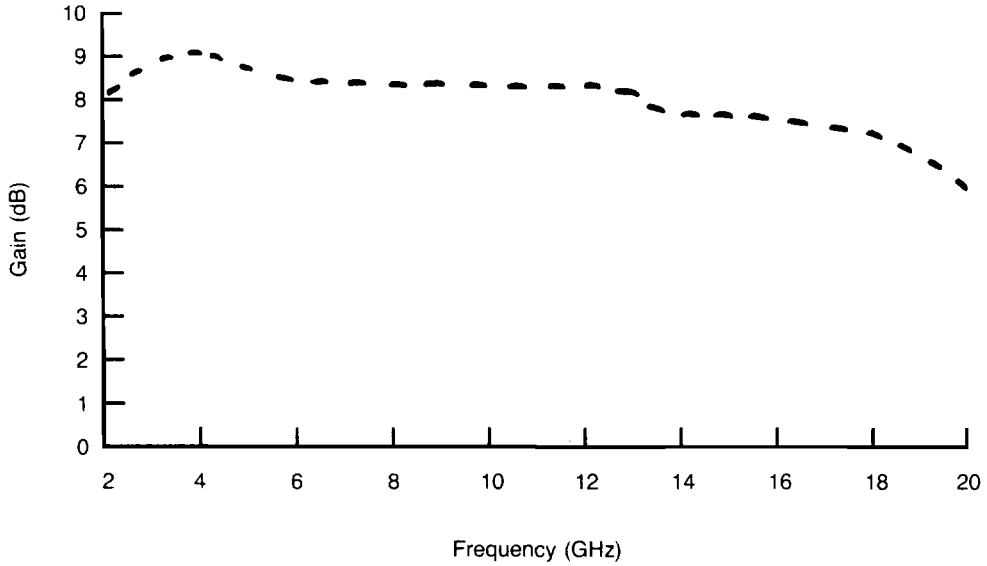
Typical Electrical Characteristics

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

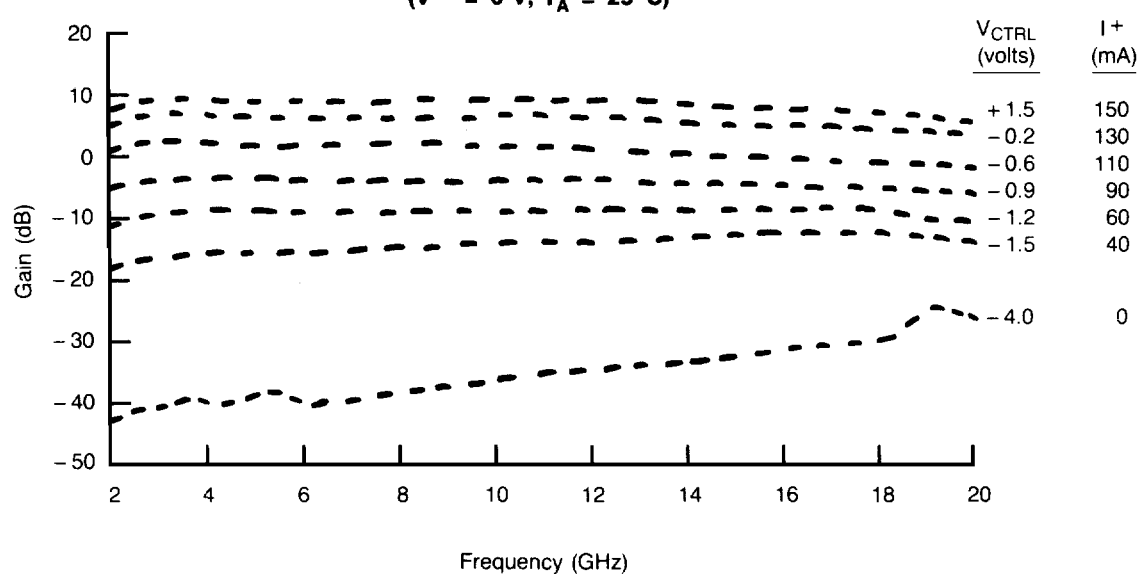
Parameter	Symbol	Test Conditions	Value	Units
Positive supply current	I^+	50% I_{DSS}	150	mA
Average small-signal gain	$\lvert S_{21} \rvert$	2 GHz	8	dB
		10 GHz	8	dB
		18 GHz	7	dB
		20 GHz	6	dB
Input/output standing-wave ratio	SWR	2 GHz	1.5:1	
		10 GHz	1.5:1	
		18 GHz	1.6:1	
		20 GHz	2.3:1	
Noise figure	NF	2 GHz	6.5	dB
		10 GHz	5.2	dB
		18 GHz	7.6	dB
		20 GHz	8.5	dB
Output power at 1-dB gain compression	P_{1dB}	2 GHz	20.5	dBm
		10 GHz	21.0	dBm
		18 GHz	19.0	dBm
		20 GHz	16.0	dBm
Output third-order intercept	IP_3	2 GHz	33.5	dBm
		10 GHz	33.0	dBm
		18 GHz	30.5	dBm

NOTE: DC specification limits available upon request.

Typical Small-Signal Gain
(V^+ = 6 V, I^+ = 50% I_{DSS}, V_{CTRL} = +1.5 V, T_A = 25°C)

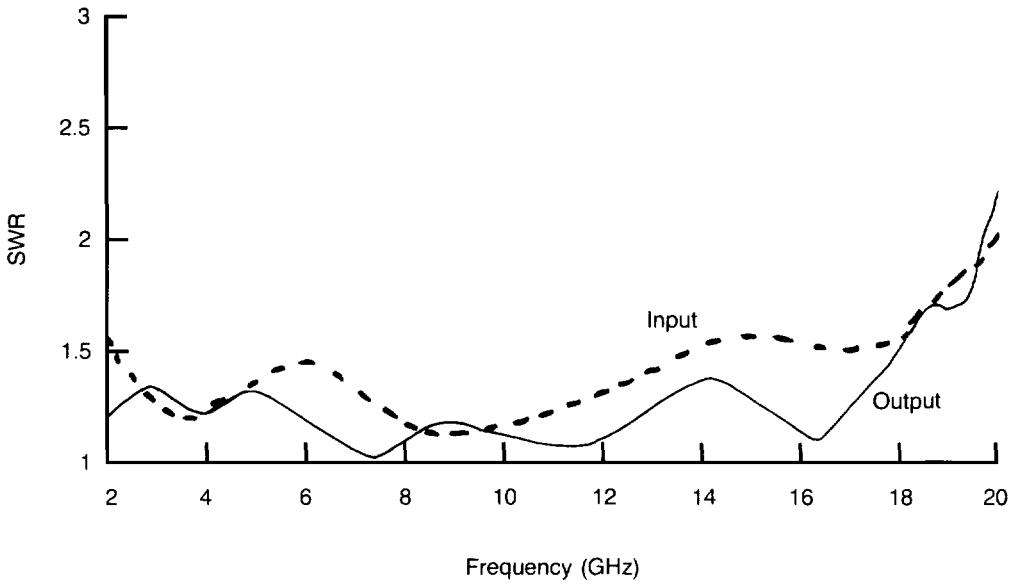


Typical Voltage-Controlled Gain Response
(V^+ = 6 V, T_A = 25°C)

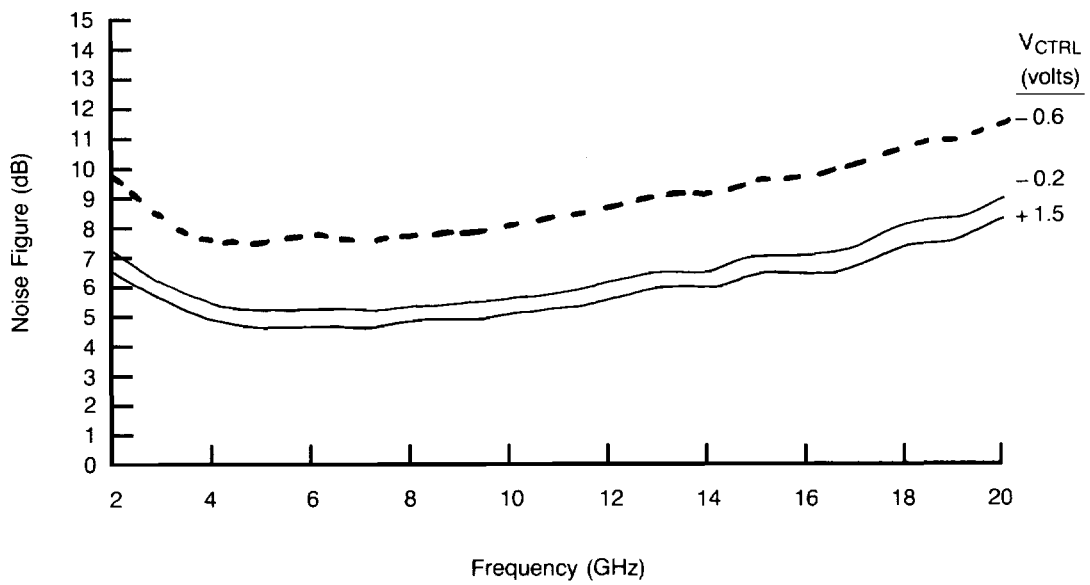


NOTE: V_{CTRL} and I^+ for particular gain levels are shown for reference only and may vary from device to device.

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



Typical Noise Figure
(V^+ = 6 V, T_A = 25°C)



Typical Output Power at 1-dB Gain Compression
(V^+ = 6 V, T_A = 25°C)