Texas Instruments TGA8014

Monolithic 6- to 18-GHz Power Amplifier

Features

- 0.5-watt typical midband output power at 1-dB gain compression
- 8-dB gain
- High-order matching filters optimize Class "A" efficiency
- Size: 0.140 × 0.074 × 0.004 inch
- Unconditional stability when biased as recommended

Description

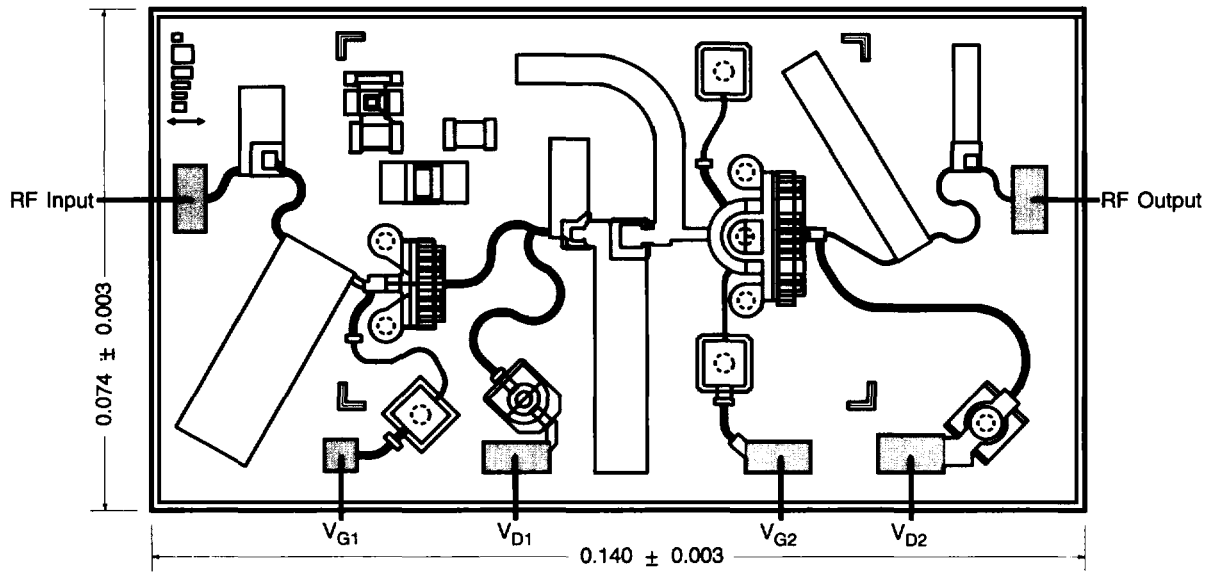
The TGA8014 is a two-stage GaAs monolithic medium-power amplifier. Reactively matched 900-μm and 1200-μm FETs provide 8-dB nominal gain with 14 percent typical power-added efficiency.

The small size and inherent reliability advantages of a monolithic device over a hybrid design make this device attractive for use in a variety of military applications. Driver and power stages in EW amplifiers, local oscillator buffers, and TWT replacement amplifiers are effectively addressed by the TGA8014 design.

The TGA8014 is supplied in chip form and is engineered for high-volume automated assembly. All metal surfaces are gold plated to be compatible with eutectic alloy attach methods and thermocompression and thermosonic wire-bonding processes.

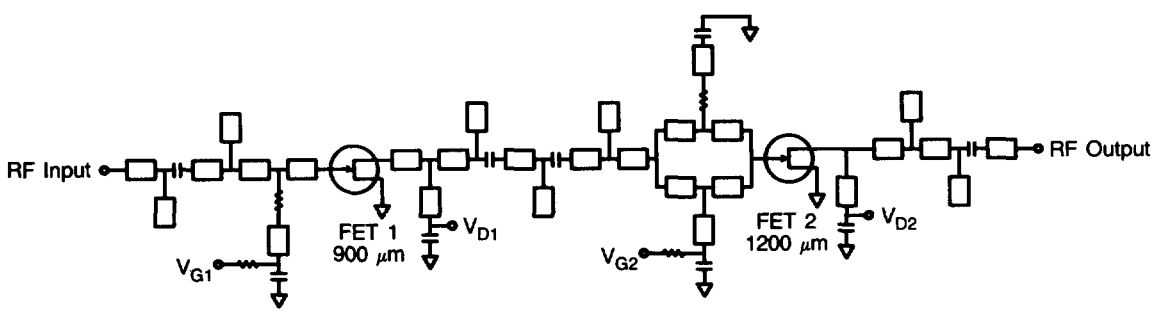
Advance Information documents contain information on new products in the sampling or preproduction phase of development. Characteristic data and other specifications are subject to change without notice.

Device Layout

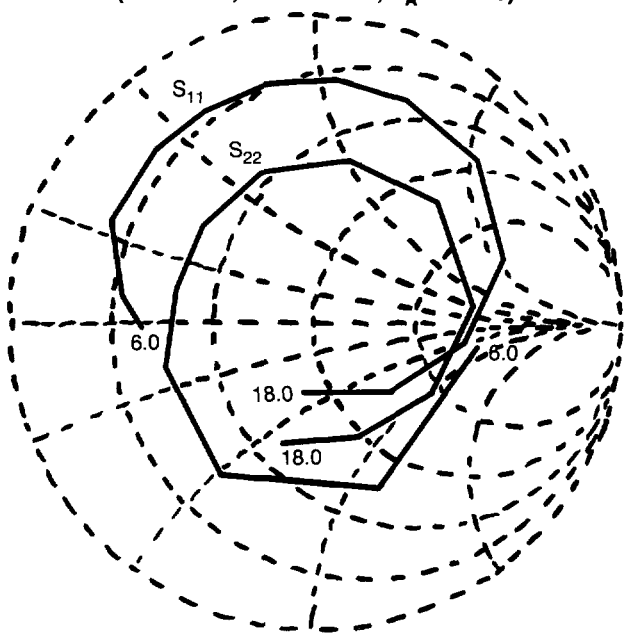


Units: inches
Thickness: 0.004 (Ref only)
Bonding pad area

Circuit Topology



Small-Signal Impedances
(V^+ = 8 V, V^- = −1 V, T_A = 25°C)



Catalog Device Nomenclature

FETs and MMICs

TGA8014-S C C - X
1 2-5 6 7 8 9

Where:

(1) The product type, coded as

- F = Discrete GaAs FET
- A = Monolithic amplifier
- V = Monolithic VCO
- S = Special monolithic function
- D = Diode

(2-5) A specific 4-digit number identifying the device, i.e., 8014

(6) Performance screening coded as

- S = Standard
- X = Special

(7) Packaging coded as

- C = Chip form
- P = Standard package
- S = Special package

(8) Reliability screening coded as

- C = Commercial
- M = Military

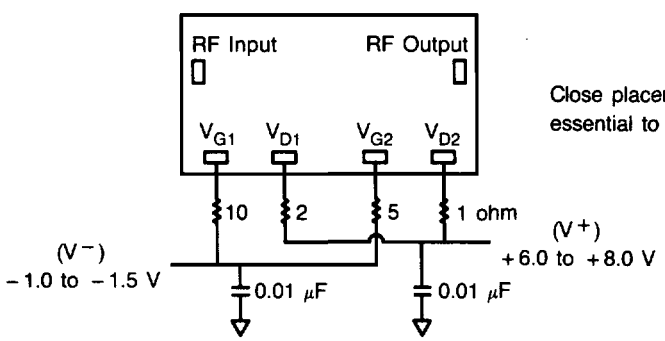
(9) TI internal procurement code X

Absolute Maximum Ratings (T_A = 25°C)

Parameter	Symbol	Value	Units	Notes
Positive supply voltage	V^+	9.0	volts	
Negative supply voltage	V^-	0 to −5.0	volts	
Power dissipation	P_{DISS}	4.0	watts	
Operating channel temperature	T_{CH}	150	°C	1
Mounting temperature (30 seconds)	T_M	320	°C	
Storage temperature	T_{STG}	−65 to 150	°C	

(1) 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



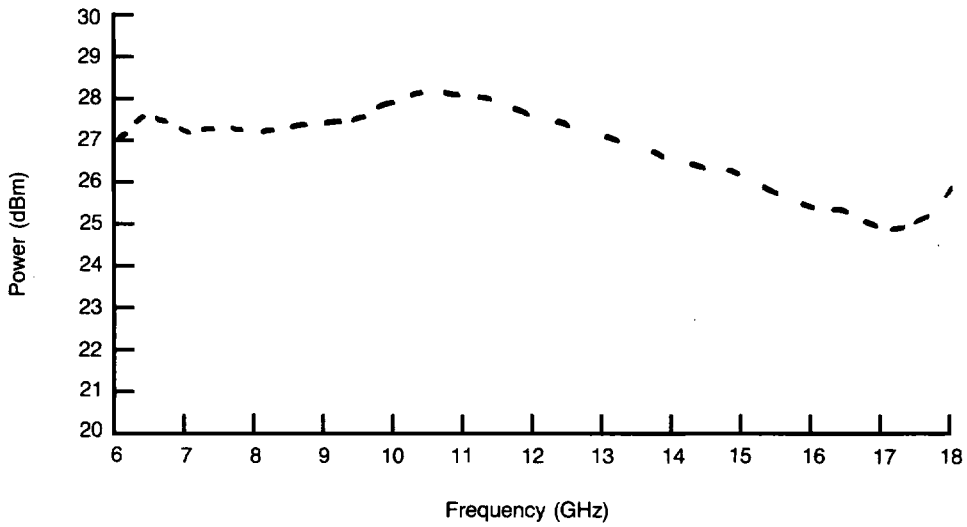
Close placement of external components is essential to stability.

Typical Electrical Characteristics
(V^+ = 8 V, V^- = −1 V, T_A = 25°C)

Parameter	Symbol	Test Conditions	Value	Units	Notes
Positive supply current	I^+		350	mA	
Average output power at 1-dB gain compression	P_{1dB}	6-18 GHz	26	dBm	
Average power-added efficiency	η	6-18 GHz	14%		
Average small-signal gain	$\lvert S_{21} \rvert$	6-18 GHz	8	dB	
Chip thermal impedance channel to backside	$\theta_{CH\text{-}B}$		14.9	°C/W	1,2

(1) Chip thermal impedance is greatly affected by eutectic alloy attach methods and is approximated for MMICs by measurements on discrete FETs.
(2) Assumes equal current densities in each FET.

Typical Output Power at 1-dB Gain Compression
(V^+ = 8 V, V^- = −1 V, T_A = 25°C)



Typical Small-Signal Gain
(V^+ = 8 V, V^- = −1 V, T_A = 25°C)