

# 21–24 GHz GaAs MMIC Low Noise Amplifier



AA022N1-00

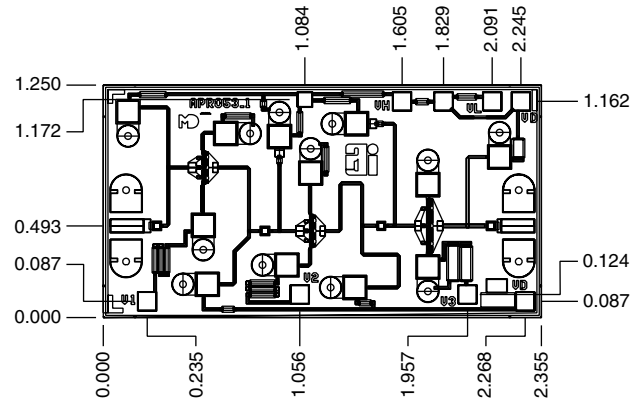
## Features

- Single Bias Supply Operation (4.5 V)
- 2.6 dB Typical Noise Figure at 23 GHz
- 19 dB Typical Small Signal Gain
- 0.25  $\mu\text{m}$  Ti/Pd/Au Gates
- 100% On-Wafer RF, DC and Noise Figure Testing
- 100% Visual Inspection to MIL-STD-883 MT 2010

## Description

Alpha's three-stage reactively-matched 21–24 GHz MMIC low noise amplifier has typical small signal gain of 19 dB with a typical noise figure of 2.6 dB at 23 GHz. The chip uses Alpha's proven 0.25  $\mu\text{m}$  low noise PHEMT technology, and is based upon MBE layers and electron beam lithography for the highest uniformity and repeatability. The FETs employ surface passivation to ensure a rugged reliable part with through-substrate via holes and gold-based backside metallization to facilitate a conductive epoxy die attach process.

## Chip Outline



Dimensions indicated in mm.  
All DC (V) pads are 0.1 x 0.1 mm and RF In, Out pads are 0.07 mm wide.  
Chip thickness = 0.1 mm.

## Absolute Maximum Ratings

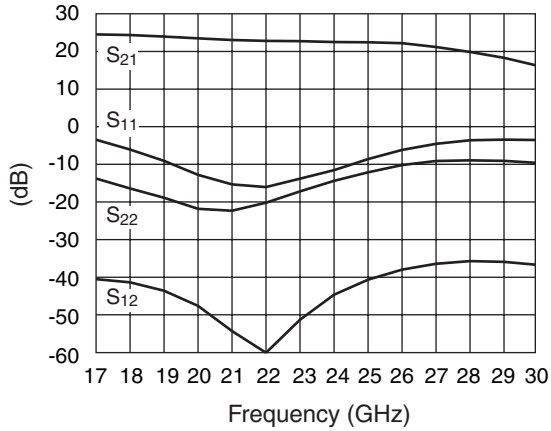
Characteristic	Value
Operating Temperature ( $T_C$ )	-55°C to +90°C
Storage Temperature ( $T_{ST}$ )	-65°C to +150°C
Bias Voltage ( $V_D$ )	6 V <sub>DC</sub>
Power In ( $P_{IN}$ )	10 dBm
Junction Temperature ( $T_J$ )	175°C

## Electrical Specifications at 25°C ( $V_{DS} = 4.5$ V)

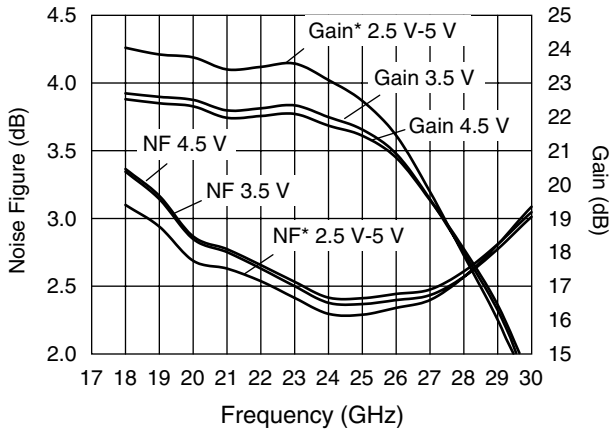
Parameter	Condition	Symbol	Min.	Typ. <sup>3</sup>	Max.	Unit
Drain Current		$I_{DS}$		35	50	mA
Small Signal Gain	F = 21–24 GHz	G	16	19		dB
Noise Figure	F = 23 GHz	NF		2.6	2.8	dB
Input Return Loss	F = 21–24 GHz	$RL_I$		-7	-6	dB
Output Return Loss	F = 21–24 GHz	$RL_O$		-14	-10	dB
Output Power at 1 dB Gain Compression <sup>1</sup>	F = 23 GHz	$P_{1\text{ dB}}$		8		dBm
Thermal Resistance <sup>2</sup>		$\theta_{JC}$		92		°C/W

1. Not measured on a 100% basis.
2. Calculated value based on measurement of discrete FET.
3. Typical represents the median parameter value across the specified frequency range for the median chip.

### Typical Performance Data

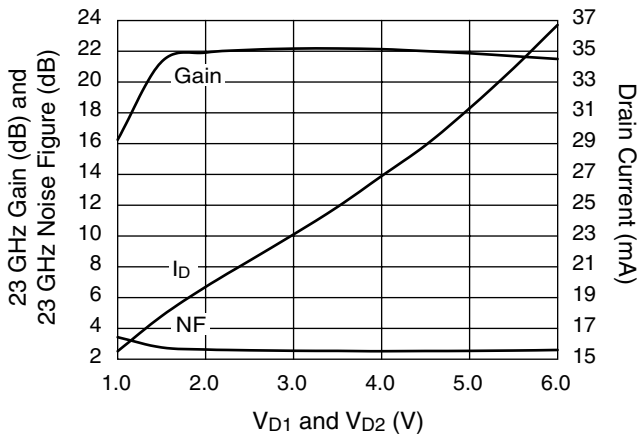


Typical Small Signal Performance S-Parameters ( $V_D = 4.5\text{ V}$ )



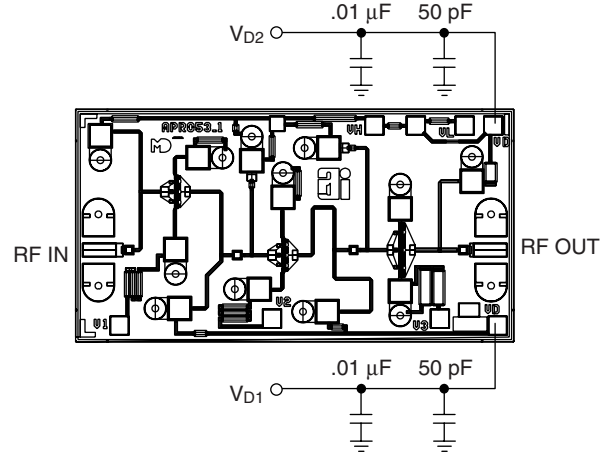
Typical Gain and Noise Figure Performance for Three Bias Conditions

\*Special Bias:  $V_{D1} = 2.5\text{ V}$ ,  $V_{D2} = 5.0\text{ V}$



Typical Gain and Noise Figure Performance vs. Drain Bias ( $V_{D1} = V_{D2}$ )

### Bias Arrangement



For biasing on, adjust  $V_{DS}$  from zero to the desired value (4.5 V recommended). For biasing off, reverse the biasing on procedure.

### Circuit Schematic

