# 18–23 GHz GaAs MMIC Power Amplifier



AA022P1-00

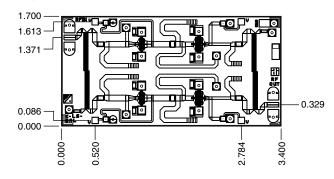
#### **Features**

- Single Bias Supply Operation (6 V)
- 14 dB Typical Small Signal Gain
- 24.5 dBm Typical P<sub>1 dB</sub> Output Power at 23 GHz
- 0.25 µm Ti/Pd/Au Gates
- 100% On-Wafer RF and DC Testing
- 100% Visual Inspection to MIL-STD-883 MT 2010

## **Description**

Alpha's two-stage balanced K band GaAs MMIC power amplifier has a typical P $_{1\ dB}$  of 24.5 dBm with 13 dB associated gain and 11% power added efficiency at 23 GHz. The chip uses Alpha's proven 0.25  $\mu m$  MESFET 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. All chips are screened for small signal S-parameters and power characteristics prior to shipment for guaranteed performance. A broad range of applications exist in both the high reliability and commercial areas where high power and gain are required.

## **Chip Outline**



Dimensions indicated in mm. All DC (V) pads are  $0.1 \times 0.1 \text{ mm}$  and RF In, Out pads are 0.07 mm wide. Chip thickness = 0.1 mm.

# **Absolute Maximum Ratings**

Characteristic	Value	
Operating Temperature (T <sub>C</sub> )	-55°C to +90°C	
Storage Temperature (T <sub>ST</sub> )	-65°C to +150°C	
Bias Voltage (V <sub>D</sub> )	7 V <sub>DC</sub>	
Power In (P <sub>IN</sub> )	22 dBm	
Junction Temperature (T <sub>J</sub> )	175°C	

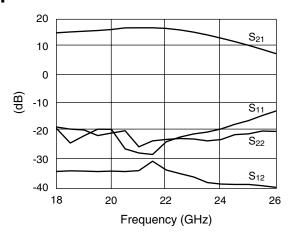
# Electrical Specifications at $25^{\circ}$ C ( $V_{DS} = 6$ V)

Parameter	Condition	Symbol	Min.	Typ. <sup>2</sup>	Max.	Unit
Drain Current (at Saturation)		I <sub>DS</sub>		300	390	mA
Small Signal Gain	F = 18–23 GHz	G	12	14		dB
Input Return Loss	F = 18–23 GHz	RL		-15	-10	dB
Output Return Loss	F = 18–23 GHz	RLO		-17	-10	dB
Output Power at 1 dB Gain Compression	F = 23 GHz	P <sub>1 dB</sub>	22	24.5		dBm
Saturated Output Power	F = 23 GHz	P <sub>SAT</sub>	24	25.5		dBm
Gain at Saturation	F = 23 GHz	G <sub>SAT</sub>		13		dB
Thermal Resistance <sup>1</sup>		Θ <sub>JC</sub>		39		°C/W

<sup>1.</sup> Calculated value based on measurement of discrete FET.

Typical represents the median parameter value across the specified frequency range for the median chip.

# **Typical Performance Data**

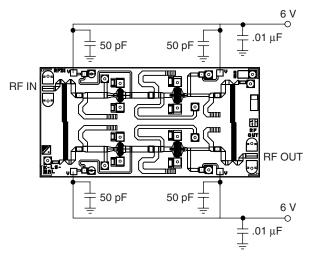


Typical Small Signal Performance S-Parameters (V<sub>DS</sub> = 6 V)

#### 26 PIN 25 16 24 12 23 Pout (dBm) 22 10 21 20 8 19 18 17 16 21 22 23 25 18 24 Frequency (GHz)

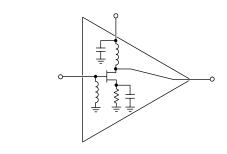
Output Characteristics as a Function of Frequency and Input Drive Level (V<sub>DS</sub> = 6 V)

# **Bias Arrangement**



For biasing on, adjust  $V_{DS}$  from zero to the desired value (6 V recommended). For biasing off, reverse the biasing on procedure.

#### **Circuit Schematic**



Detail A

