

Cascadable Broadband InGaP MMIC Amplifier

DC-14 GHz

P1A-1400MT

Description

P1dB's P1A-1400MT cascadable broadband InGaP HBT MMIC amplifier is a low-cost high-performance solution for your general-purpose RF and microwave amplification needs. This 50-ohm gain block is based upon a mature and reliable HBT (Heterojunction Bipolar Transistor) process and utilizes proprietary MMIC design techniques, providing best in class performance for small-signal applications.

The P1A-1400MT is packaged in a low-cost surface-mount ceramic package shipped in tape and reel, enabling ease of assembly for high-volume applications. The P1A-1400MT has a very simple application circuit including external DC decoupling caps which limit the low-frequency response as well as an external dropping resistor that provides excellent performance stability and design flexibility.

The P1A-1400MT is available in either packaged or die form, where its gold metallization is ideal for hybrid circuit designs. Packaged parts are available in bulk or tape and reel. Connectorized evaluation board designs are also available for characterization purposes.

Features

- Reliable Low-Cost InGaP HBT Design
- Extremely Broadband (optimized for low parasitic reactance)
- Excellent Gain Flatness and High P1dB
- Single Power Supply Operation
- 50 Ω Input/Output Matched
- Ceramic Micro X Package

Applications

- Narrowband and Broadband Applications for both Commercial and Military Designs
- Linear & saturated amplifier applications.
- Gain stage or driver amplifiers utilized in many applications such as point to point radio, test equipment, VSAT, and military communication systems.

Ordering Information

Part Number	Description
P1A-1400MT	Individual Part
P1A-1400MTK1	Tape & Reel, 1000 Pieces
P1A-1400MTE	Evaluation Board

Package Information



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Absolute Maximum Ratings

Parameter	Rating	Units
RF Input Power	+20	dBm
Power Dissipation	329	mW
Device Current	82	mA
Channel Temperature	150	°C
Operating Temperature	-45 to +85	°C
Storage Temperature	-65 to +150	°C
ESD Level (HBM)	Class 1A	
Moisture Sensitivity Level	MSL-2	

Caution! ESD sensitive device.

Caution! Exceeding any one or a combination of these limits may cause permanent damage.

RoHS Compliant

Nominal Operating Parameters

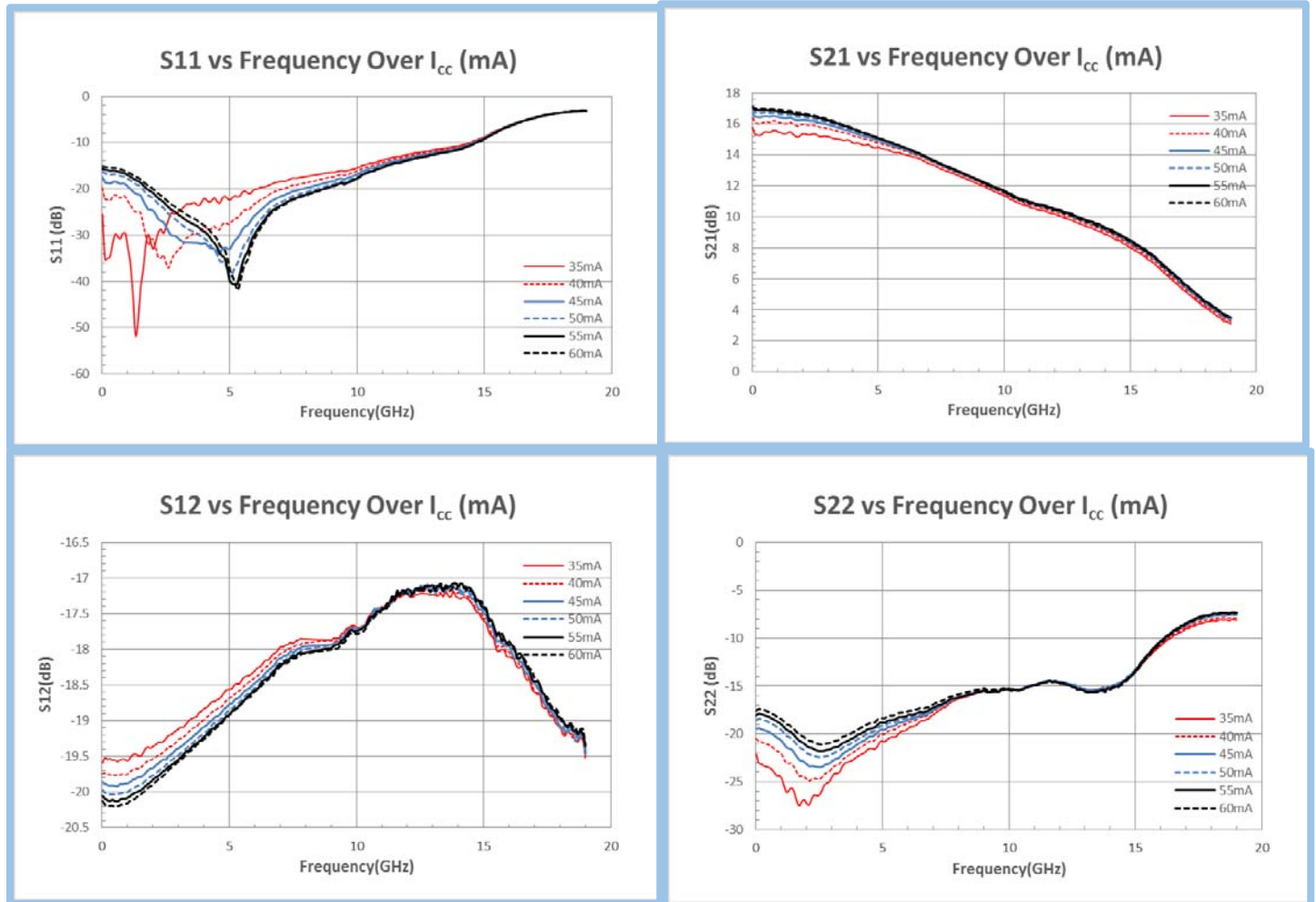
Parameter	Test Conditions	Units	Min.	Typ.	Max.
General Performance		Vd = +3.85V, Icc=50mA, Z ₀ =50Ω, Ta=+25°C			
Small Signal Power Gain, S ₂₁	f=0.1 to 1.0 GHz	dB	16.7	16.8	
	f=1.0 to 4.0 GHz	dB	15.7	16.2	
	f=4.0 to 6.0 GHz	dB	14.6	15.1	
	f=6.0 to 12.0 GHz	dB	10.6	12.6	
	f=12.0 to 14.0 GHz	dB	9.4	10.2	
Gain Flatness, G _F	f=0.1 to 6.0 GHz	dB		±1.0	
Input and Output VSWR	f=0.1 to 4.0 GHz			1.2	
	f=4.0 to 6.0 GHz			1.2	
	f=6.0 to 12.0 GHz			1.3	
	f=12.0 to 14.0 GHz			1.7	
Bandwidth, BW	BW3 (3dB)	GHz		7.5	
Output Power @ 1-dB Compression, P1dB	f=2.0 GHz	dBm		15.0	
	f=6.0 GHz	dBm		15.5	
	f=12.0 GHz	dBm		13.8	
Noise Figure, NF	f=3.0 GHz	dB		5.5	
3 rd Order Intercept, IP3	f=2.0 GHz	dBm		+29.0	
Reverse Isolation, S ₁₂	f=0.1 to 14.0 GHz	dB		-16.5	
Device Voltage, Vd		V	3.75	3.85	3.95
Gain Temperature Coefficient, $\partial G_T / \partial T$		dB/°C		-0.0015	

Nominal Operating Parameters

Parameter	Condition	Units	Min.	Typ.	Max.
MTTF versus Temperature at Icc = 50mA					
Case Temperature		°C		85	
Junction Temperature		°C		110	
MTTF		hours		>10 ⁹	
Thermal Resistance					
θ_{JC}	$\theta_{JC} = (T_J - T_{CASE}) / (P_D * I_{CC})$	°C/W		104	

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Typical Performance

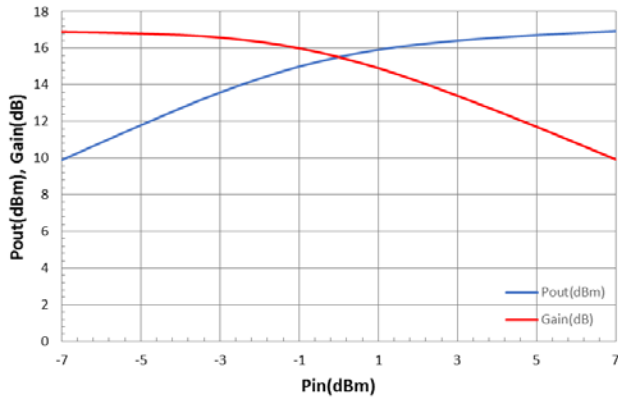


Note: The s-parameter gain results shown above were performed using a test fixture.

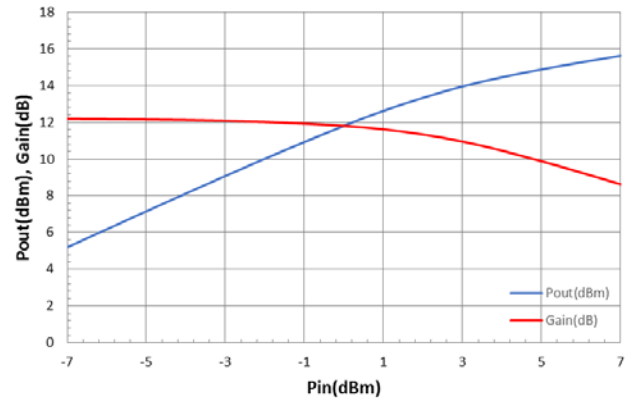
Cascadable Broadband InGaP MMIC Amplifier

Typical Performance (continued)

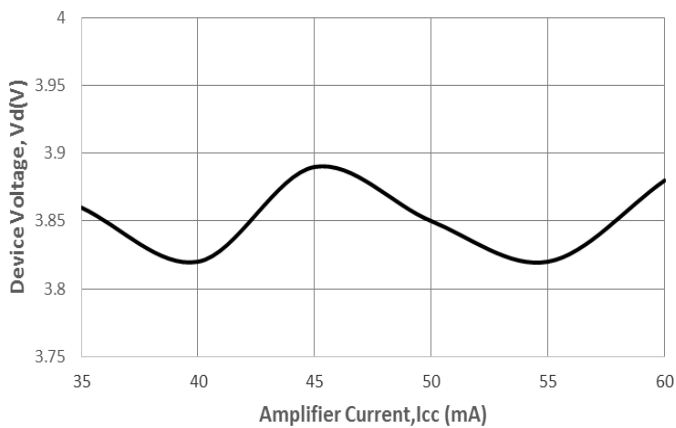
Pout/Gain vs Pin @ 2GHz



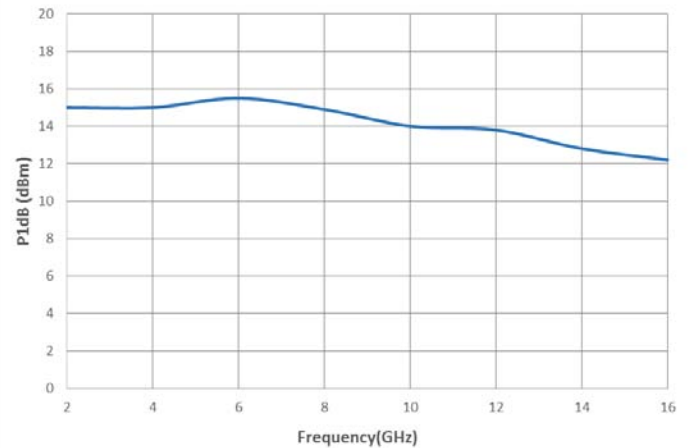
Pout/Gain vs Pin @ 12GHz



Device Voltage vs Amplifier Current

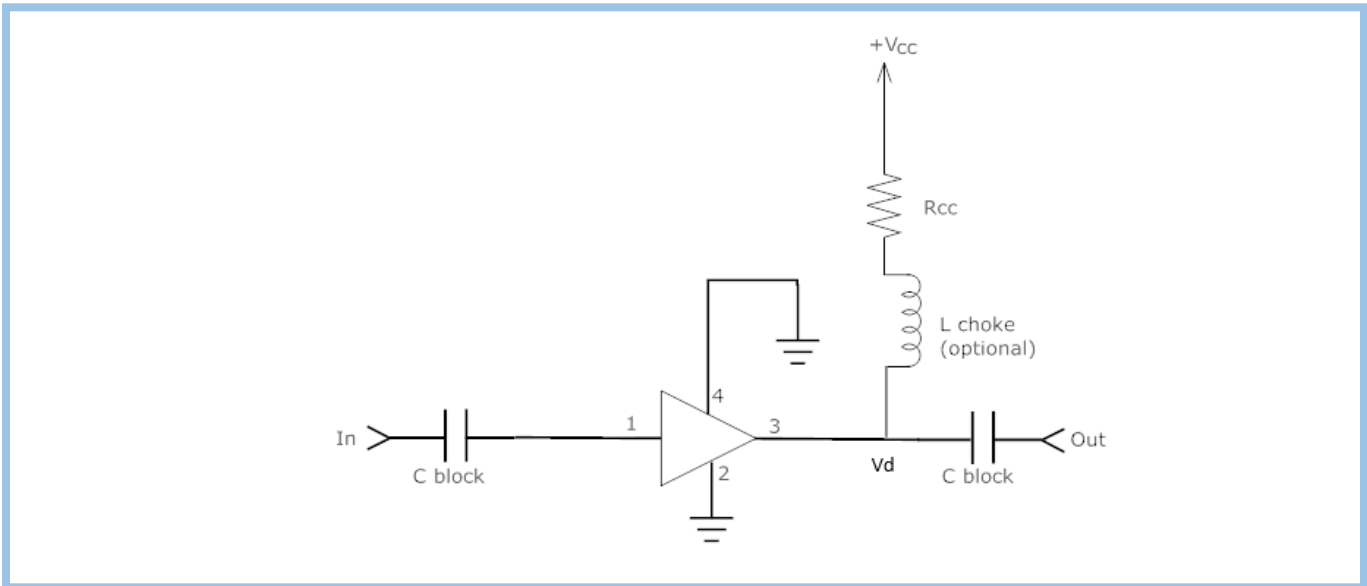


P1dB versus Frequency at 25°C



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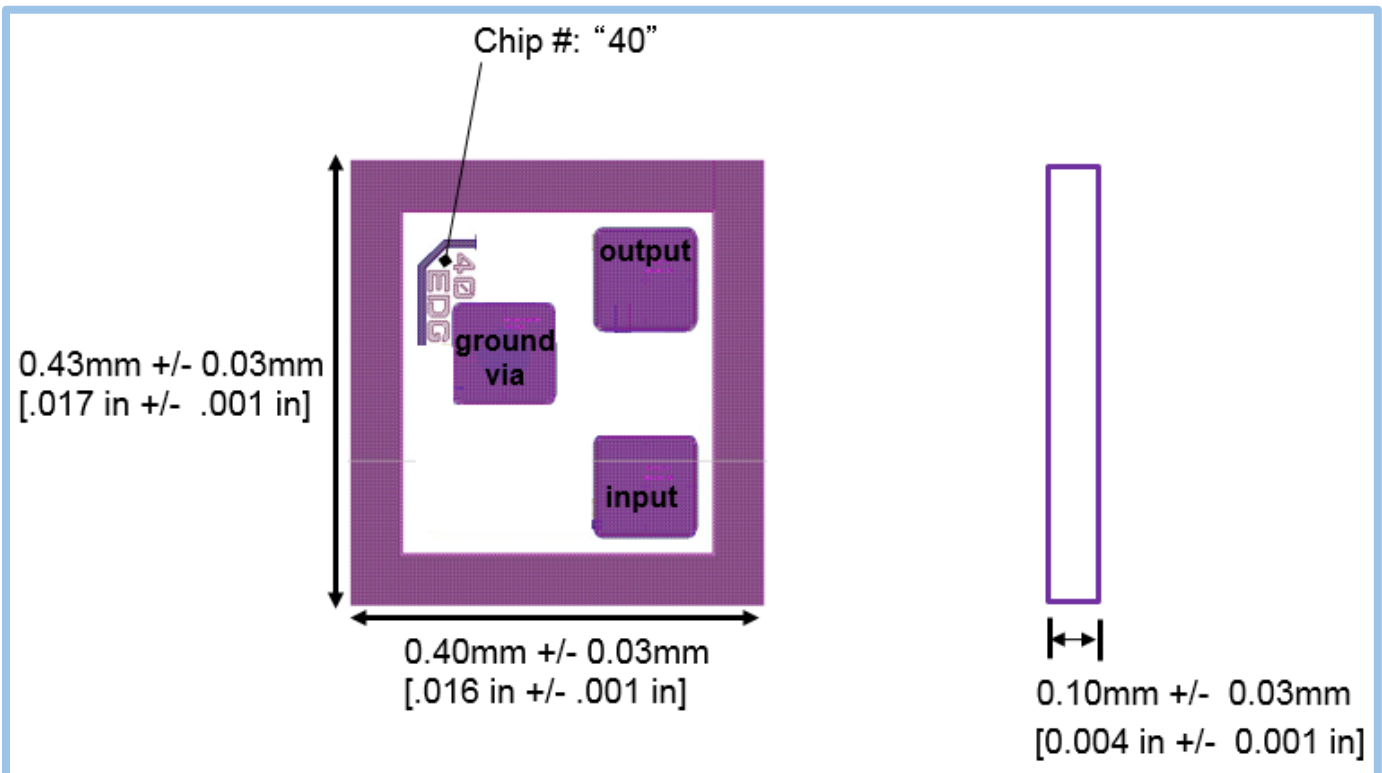
Typical Bias Configuration



Recommended Bias Resistor Values @ $I_{cc} = 50 \text{ mA}$

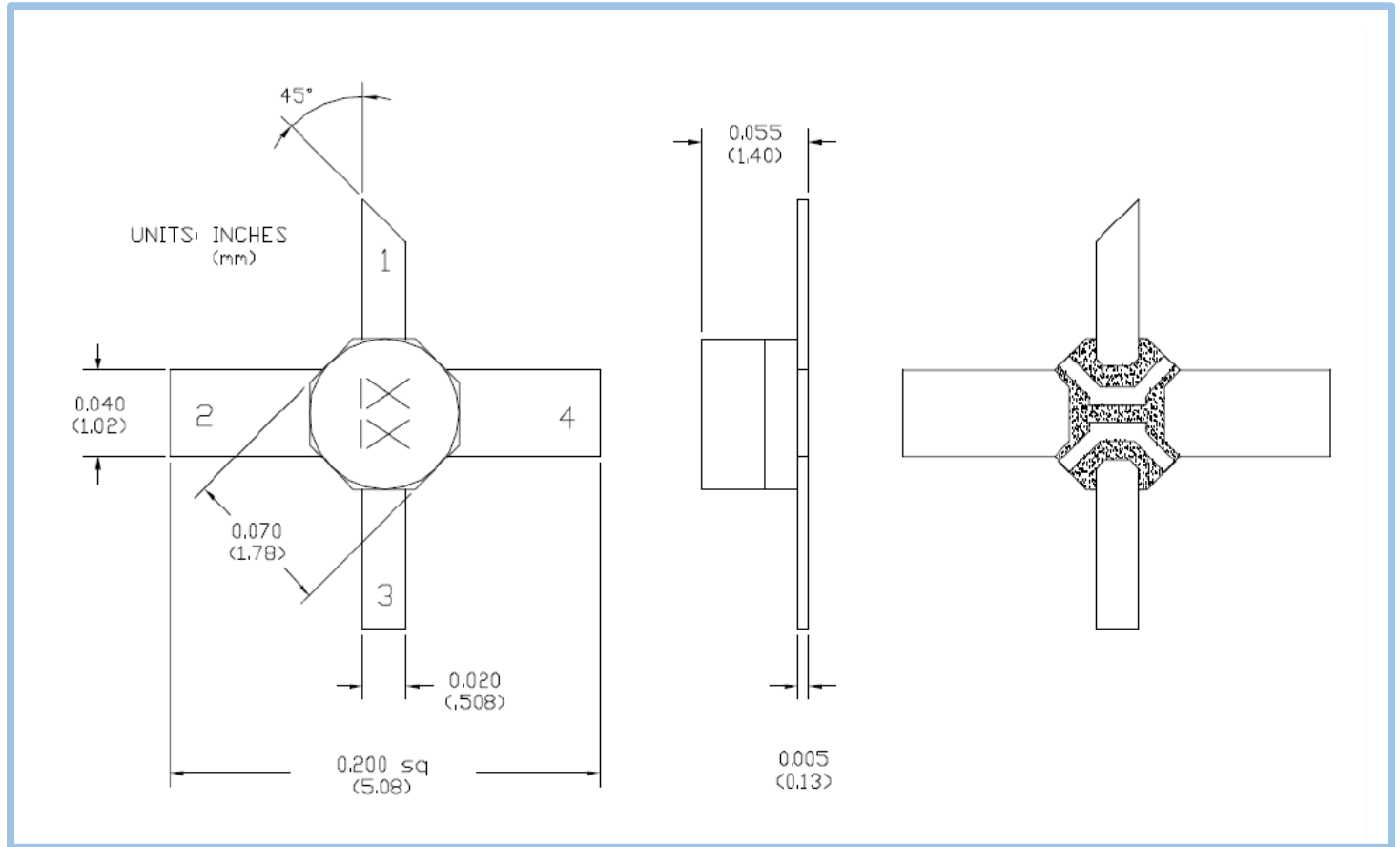
Supply Volatage, V_{cc} (V)	5	8	10	12	15	20
Bias Resistor, R_{cc} (Ω)	23	83	123	163	223	323

Die Drawing



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Package Dimensions & Pin Descriptions



Pin	Name	Description
1	RF _{in}	RF input pin. A DC blocking capacitor specified for the frequency of operation should be used.
2	Gnd	Ground Connection.
3	RF _{out}	RF output and bias pin. Biasing is accomplished with an external series resistor and a choke inductor. The resistor value is determined by the following equation: $R = \frac{(V_{cc} - V_d)}{I_{cc}}$
4	Gnd	Ground Connection.