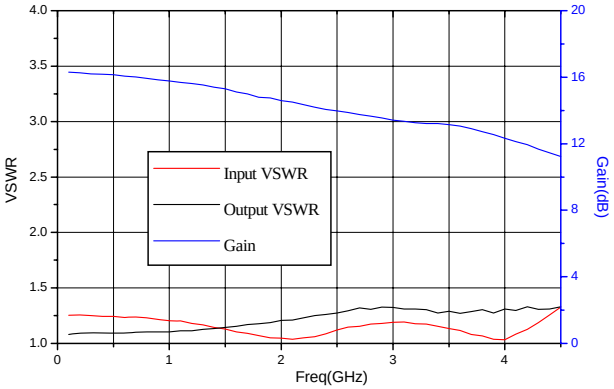
Product Description

F220 is a high performance InGaP/GaAs Heterojunction Bipolar Transistor MMIC Amplifier. A Darlington configuration provides DC-4.5GHz performance with excellent thermal performance. The heterojunction increases breakdown voltage and minimizes leakage current between junctions. Only a single positive supply voltage, DC-blocking capacitors, a bias resistor, and an optional RF choke are required for operation.

F220 is RoHS compliant and manufactured with green molding compounds that contain no antimony trioxide nor halogenated fire retardants.



F220

RoHS Compliant & Green Package

DC－4500MHz，Cascadable InGaP/GaAs HBT MMIC Amplifier

Product Features

- **Lead Free, RoHS Compliant**
- **High Gain:14.0dB @1950MHz**
- **Stable Gain Over Temperature**
- **1000V ESD，Class 1C**
- **Operation from Single Supply**
- **Low Thermal Resistance**

Applications

- **Driver Amplifier**
- **Cellular, PCS, GSM, UMTS**
- **IF Amplifier**
- **Wireless Data，Satellite Terminal**

Symbol	Parameter	Units	Freq	Min.	Typ.	Max.
G	Small Signal Gain	dB	850MHz 1950MHz 2400MHz	14.1	15.5 14.0 12.7	17.3
P_{1dB}	Output Power at 1dB Compression	dBm	850MHz 1950MHz		19.7 18.0	
OIP_3	Output Third Order Intercept Point	dBm	850MHz 1950MHz		34.0 32.0	
Bandwidth	VSWR<2.0	MHz			4500	
Input VSWR	Input VSWR	Ratio	1950MHz		1.2	2.0
Output VSWR	Output VSWR	Ratio	1950MHz		1.2	2.0
NF	Noise Figure	dB	1950MHz		4.0	
V_D	Device Operating Voltage	V		4.6	4.9	5.4
I_D	Device Operating Current	mA		73	81	89

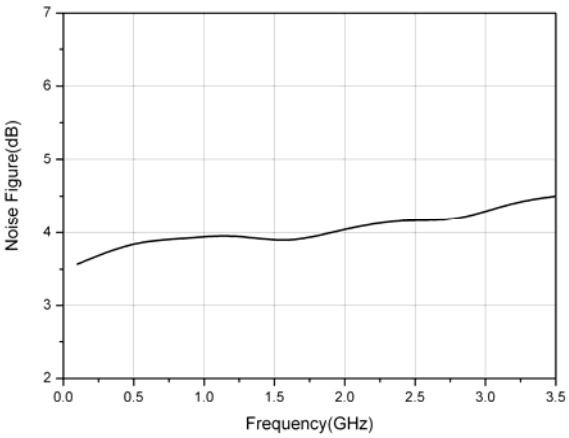
Test condition：Vs＝8V I_D＝81mA Typ OIP_3 Tone Spacing=1MHz, Pout per ton=5 dBm
R_{BIAS}=39 Ohms T_L=25℃ Z_S=Z_L=50 Ohms, App circuit page 4

Typical RF Performance at Key Operating Frequencies

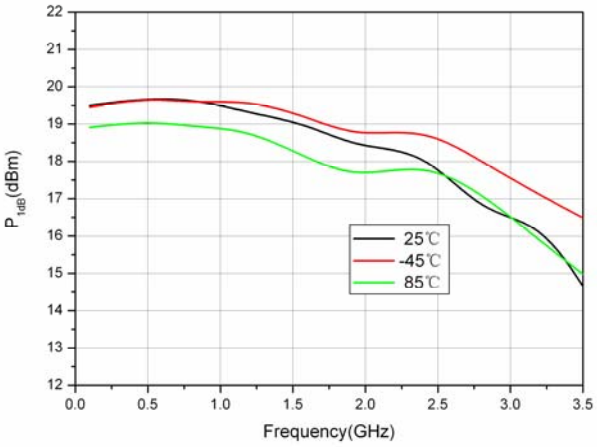
			Frequency（MHz）				
symbol	**parameter**	**units**	**100**	**500**	**850**	**1950**	**2400**
G	Small Signal Gain	dB	16.0	15.8	15.5	14.0	12.7
OIP_3		dBm	36.0	35.0	34.0	32.0	30.3
P_{1dB}		dBm	19.5	19.8	19.7	18.0	17.3
Input VSWR			1.20	1.20	1.25	1.16	1.14
Output VSWR			1.08	1.08	1.11	1.17	1.16
S_{12}	Reverse Isolation	dB	20.0	20.0	20.0	20.0	20.5
NF	Noise Figure	dB	4.0	3.8	3.9	4.0	4.3
Test condition：Vs＝8V I_D＝81mA Typ R_{BIAS}=39 Ohms T_L=25℃ Z_S=Z_L=50 Ohms, OIP_3 Tone Spacing=1MHz, Pout per ton=5 dBm App circuit page 4							

Absolute Maximum Ratings

Parameters	Absolute Limit	
Max. Device Current（I_D）	160 mA	Operation beyond any one of these limits may cause permanent damage. Bias Conditions should satisfy the following expression: $I_DV_D < (T_J - T_L) / R_{TH,j-l}$ $T_L=T_{LEAD}$
Max. Device Voltage(V_D)	7V	
Max. RF Input Power	+18 dBm	
Max. Junction Temp. (T_J)	+150℃	
Operating Temp. range (T_L)	-40℃ ～ +85℃	
Max. Storage Temp.	+150℃	

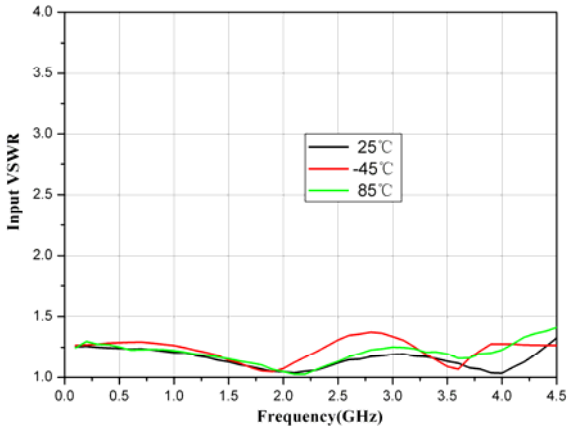


Noise figure vs. Frequency

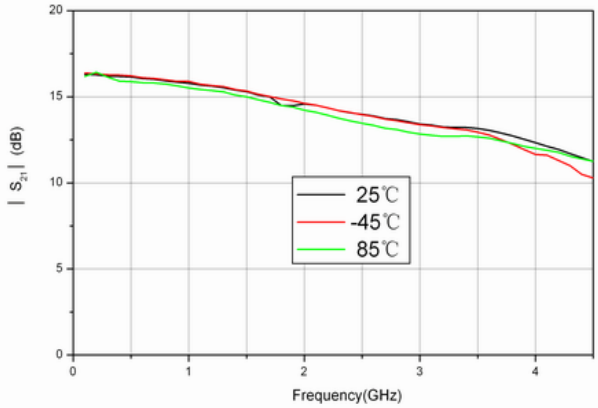


P_{1dB} vs. Frequency

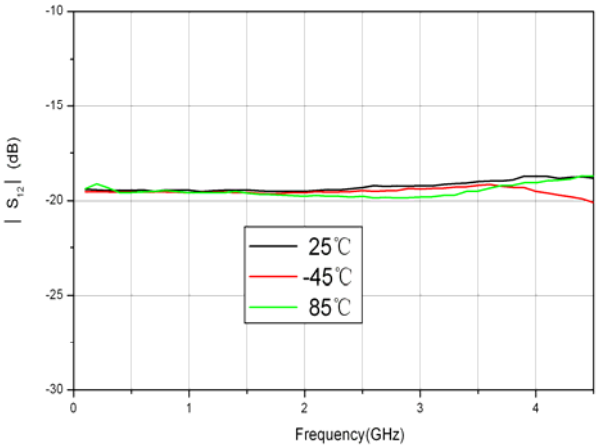
Test Condition：Vs＝8V, R-bias＝39ohm, Id＝81mA



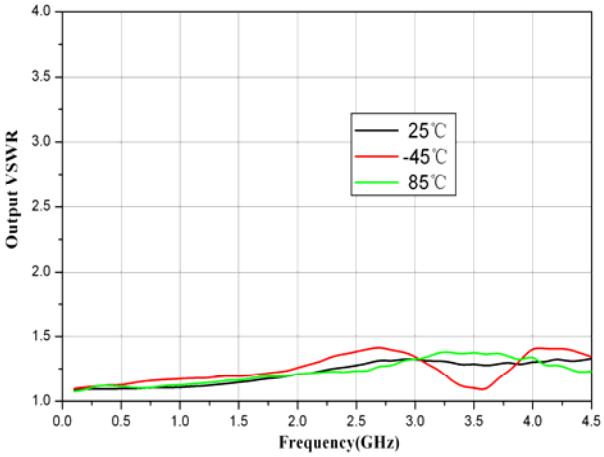
Input VSWR vs. Frequency



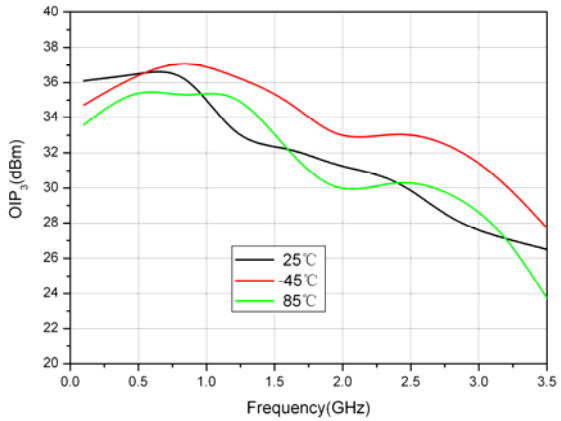
S21 vs. Frequency



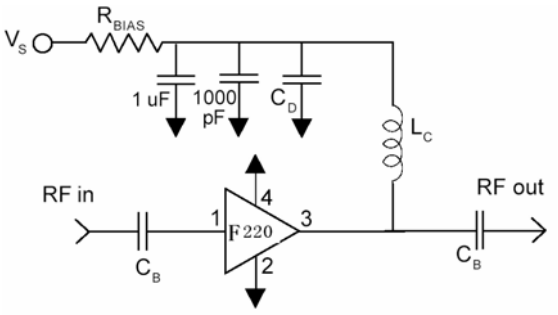
S12 vs. Frequency



Output VSWR vs. Frequency

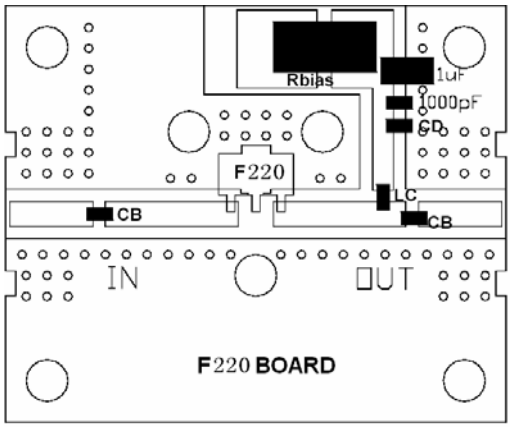


OIP_3 vs. Frequency



Application Circuit Element Values

Reference Designator	Frequencies（MHz）				
	500	**850**	**1950**	**2400**	**3500**
C_B	220pF	100pF	68 pF	56 pF	39pF
C_D	100pF	68 pF	22 pF	22 pF	15 PF
L_C	68 nH	33 nH	22 nH	18 nH	15 nH



Recommended Bias Resistor Value for I_D=81mA	**$R_{BIAS}=(V_S-V_D)/I_D$**			
Supply voltage(V_S)	6V	8V	10V	12V
R_{BIAS}	13 Ω	39 Ω	62 Ω	91 Ω
Note：R_{BIAS} provides DC bias stability over Temp.				

Mounting Instructions

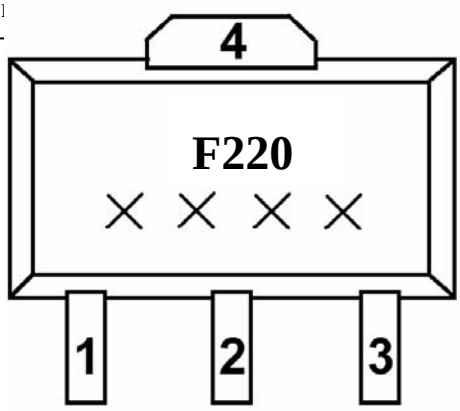
1.NOTE：For broadband RF unconditional stability do not put GND vias under the exposed backside GND paddle.

2. Solder the copper pad on the backside of the device package to the ground plane.

3. Use a large ground pad area with many plated through-holes as shown.

4. Measurement for this data sheet is made on 0.5 mm thick FR-4 board with 3.38 dielectric constant.

Serial



Marking and Pin definition

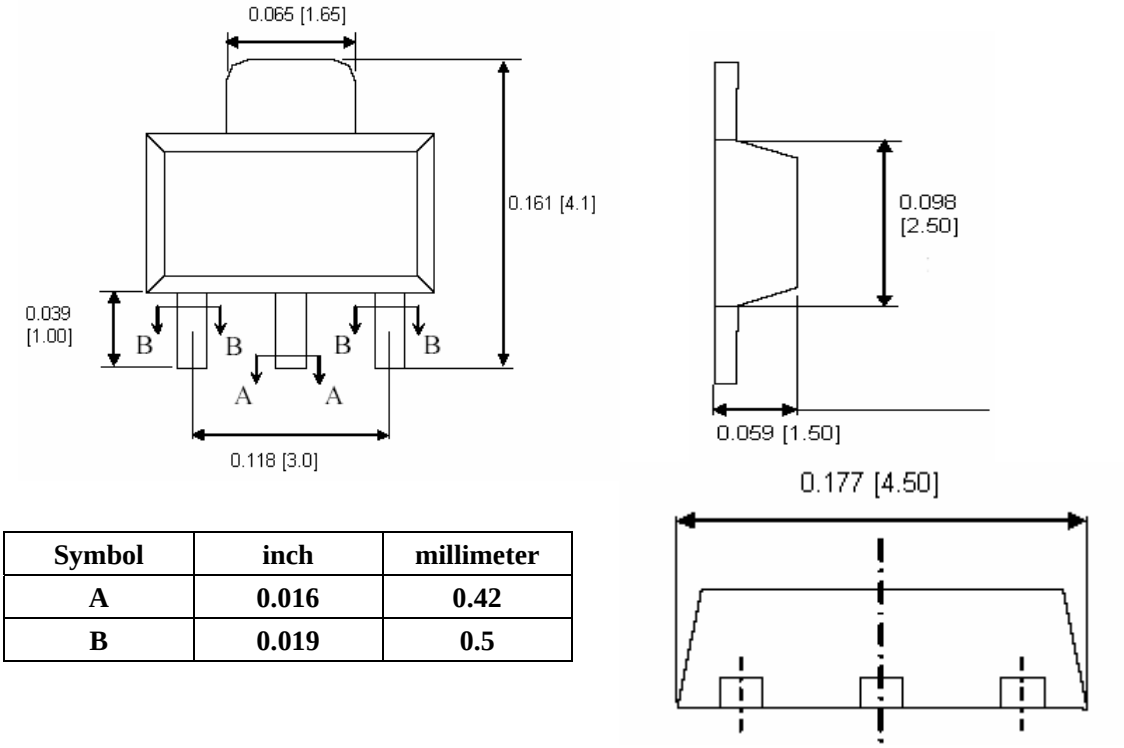
Pin	Function	Description
1	**RF IN**	RF input pin. This pin requires an external DC blocking capacitor.
2，4	**GND**	Connecting to ground. Use via holes for best performance to reduce lead inductance.
3	**RF OUT / BIAS**	RF output and bias pin. DC blocking capacitor is necessary for proper operating.

ESD sensitive

Note：F220 must precaution in handing, testing and packaging！

SOT89 Packaging and PCB Pad Layout

Units：inch [millimeter]



Symbol	inch	millimeter
A	0.016	0.42
B	0.019	0.5