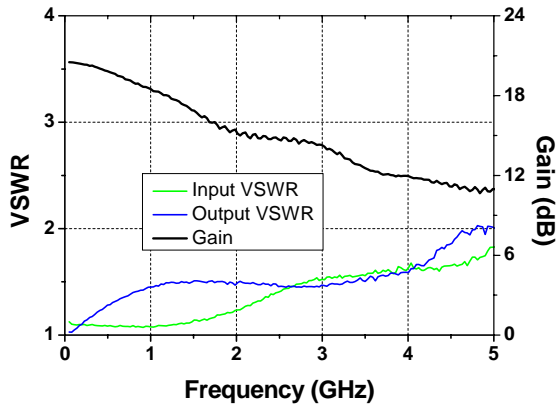


Product Description

F2176 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.

F2176 is RoHS compliant and manufactured with green molding compounds that contain no antimony trioxide nor halogenated fire retardants.



F2176



RoHS Compliant & Green Package

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



Product Features

- Lead Free, RoHS Compliant
- IP3=35dBm @ 850MHz
- High Gain:16.2dB@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	18.0	19.3 16.2 14.9	22.0
P _{1dB}	Output Power at 1dB Compression	dBm	850MHz 1950MHz		20.0 18.3	
OIP ₃	Output Third Order Intercept Point	dBm	850MHz 1950MHz		35.0 32.0	
Bandwidth	VSWR<2.0	MHz			4500	
Input VSWR	Input VSWR	Ratio	1950MHz		1.2	2.0
Output VSWR	Output VSWR	Ratio	1950MHz		1.6	2.0
NF	Noise Figure	dB	1950MHz		3.6	
V _D	Device Operating Voltage	V		4.7	5.1	5.5
I _D	Device Operating Current	mA		67	75	83

Test condition: V_S=8V I_D=75mA Typ OIP₃ Tone Spacing=1MHz, Pout per ton=5 dBm
R_{BIAS}=39 Ohms T_L=25°C Z_S=Z_L=50 Ohms App circuit page 4

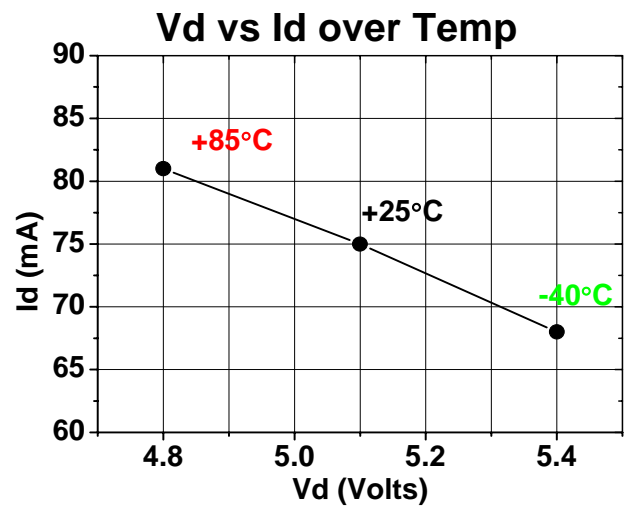
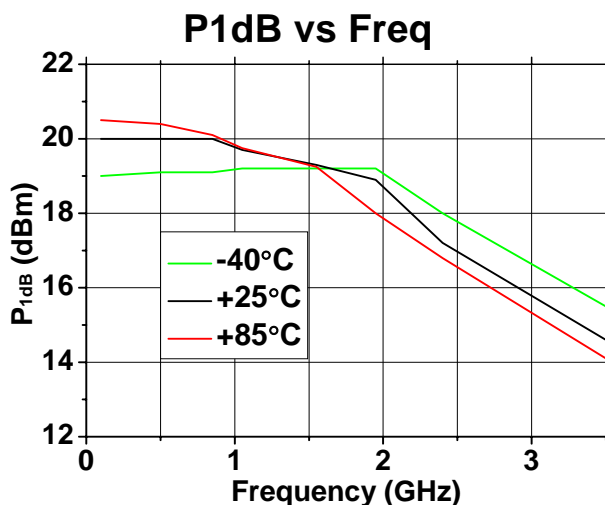
Typical RF Performance at Key Operating Frequencies

symbol	parameter	units	Frequency (MHz)					
			100	500	850	1950	2400	3500
G	Small Signal Gain	dB	21.1	20.3	19.3	16.2	14.9	13.3
OIP ₃		dBm	34.7	35.0	35.0	32.0	30.5	26.5
P _{1dB}		dBm	20.2	20.1	20.0	18.3	17.9	14.0
Input VSWR			1.14	1.06	1.16	1.17	1.05	1.19
Output VSWR			1.16	1.41	1.34	1.69	1.58	1.62
S ₁₂	Reverse Isolation	dB	23.3	23.0	22.5	22.2	21.8	21.4
NF	Noise Figure	dB	3.3	3.4	3.6	3.6	3.7	4.3

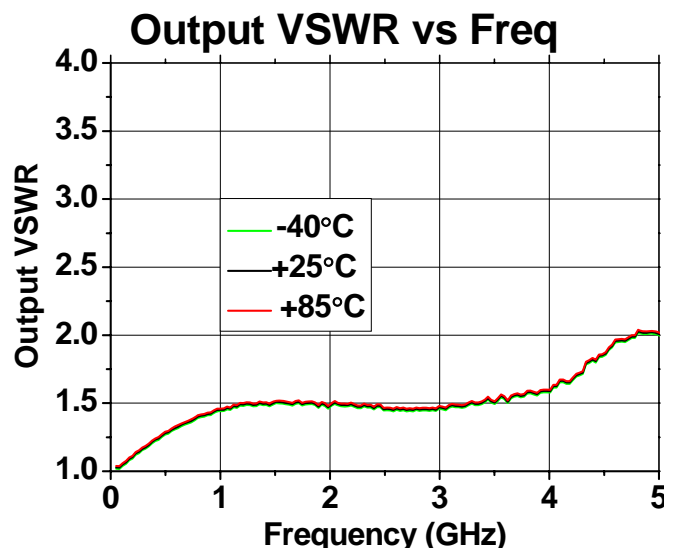
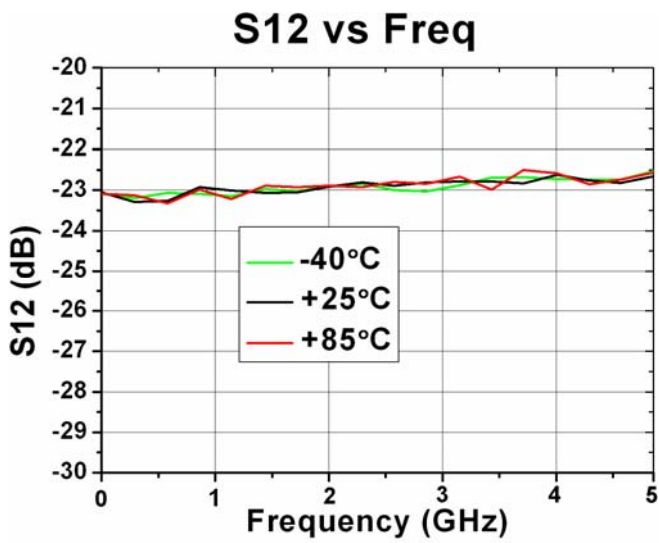
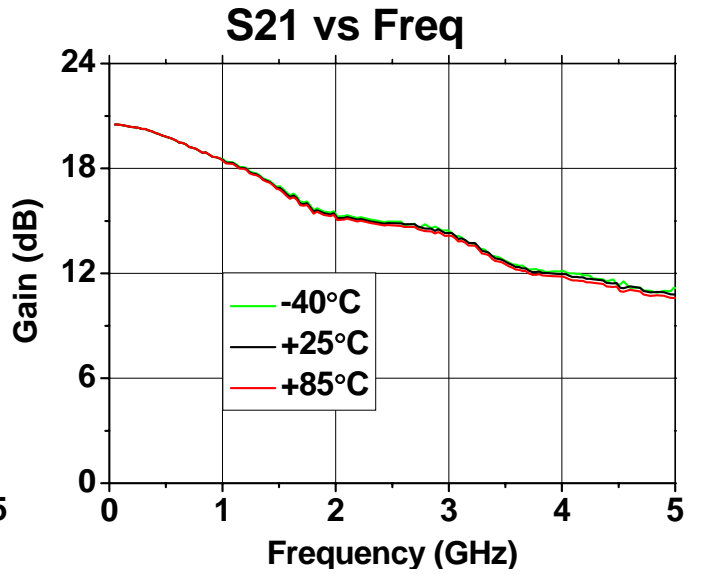
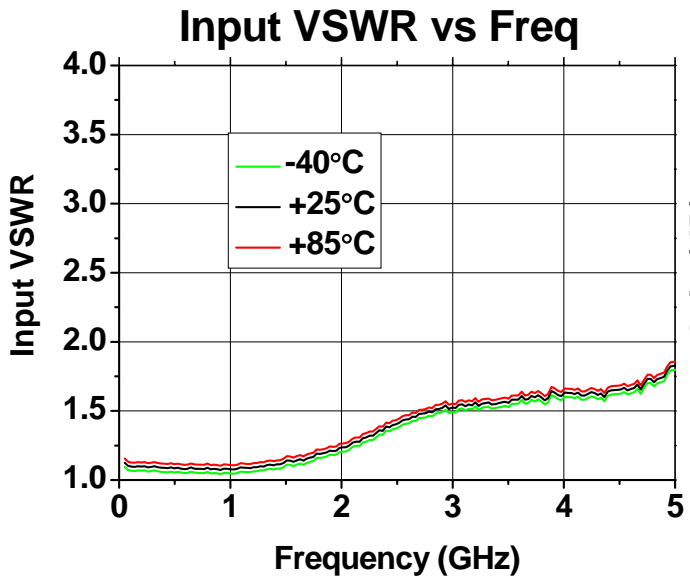
Test condition: V_S=8V I_D=75mA Typ R_{BIAS}=39 Ohms T_L=25°C Z_S=Z_L=50 Ohms,
 OIP₃ Tone Spacing=1MHz, Pout per ton=5 dBm App circuit page 4

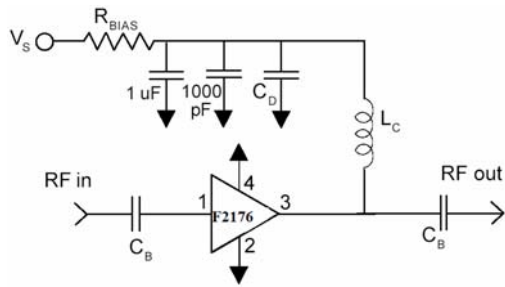
Absolute Maximum Ratings

Parameters	Absolute Limit	
Max. Device Current (I _D)	150 mA	Operation beyond any one of these limits may cause permanent damage. Bias Conditions should satisfy the following expression: $I_D V_D < (T_J - T_L) / R_{TH-j-l}$ $T_L = T_{LEAD}$
Max. Device Voltage(V _D)	6V	
Max. RF Input Power	+18 dBm	
Max. Junction Temp. (T _J)	+150°C	
Operating Temp. range (T _L)	-40°C ~ +85°C	
Max. Storage Temp.	+150°C	



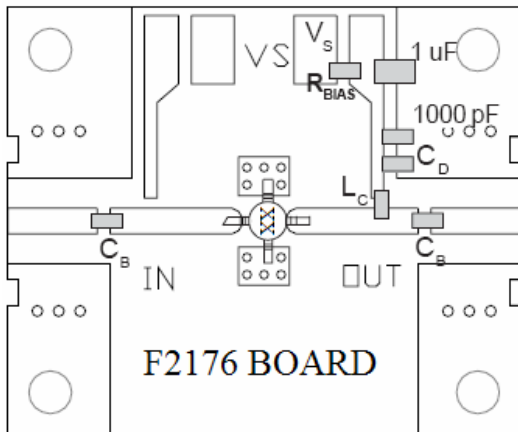
Test Condition: $V_s=8V$, $R_{\text{-bias}}=39\Omega$, $Temp=+25^\circ C$





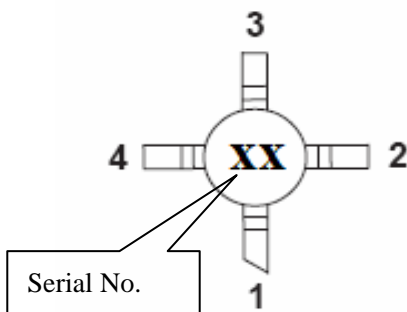
Application Circuit Element Values

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



Supply voltage(V _S)	Recommended Bias Resistor Value for I _D =75mA			
	R _{BIAS} =(V _S - V _D) / I _D			
	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. Pin 2 and pin 4 using a large ground pad area with many plated through-holes as shown.
2. Measurement for this data sheet is made on 0.5 mm thick FR-4 board with 3.5 dielectric constant.

Marking and Pin definition



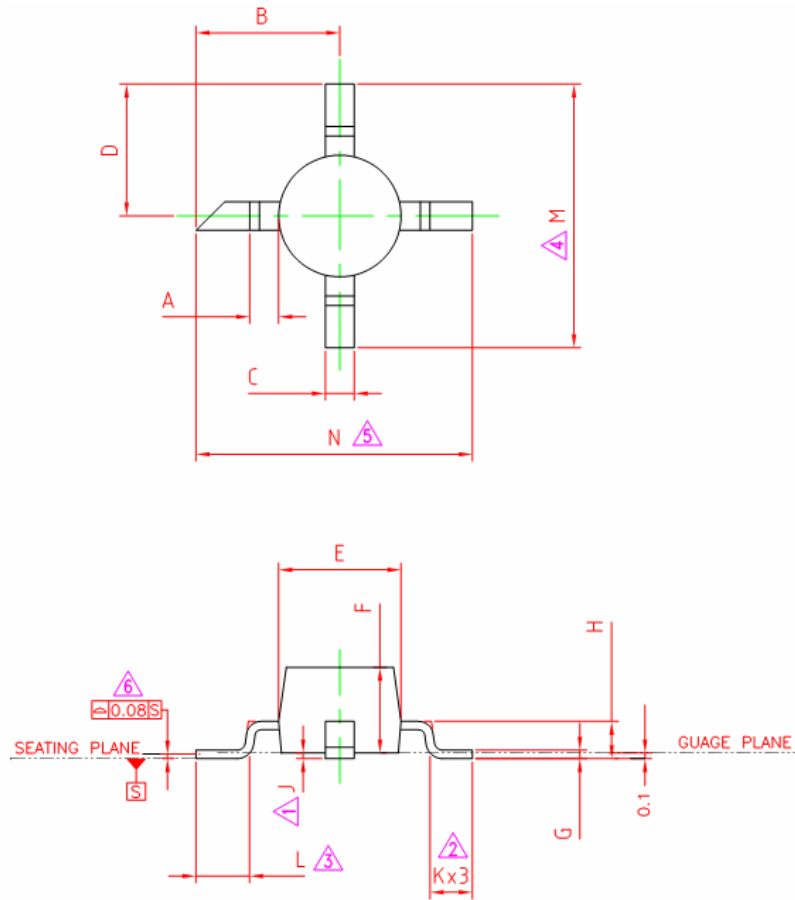
ESD sensitive

Note: F2176 must precaution in handing, testing and packaging !

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.

Micro-X Packaging and PCB Pad Layout

Units: inch [millimeter]



Symbol	Millimeters			Inches		
	MIN	TYP	MAX	MIN	NOM	MAX
A	0.535 REF			.021 REF		
B	2.39	2.54	2.69	.094	.100	.106
C	0.436	0.510	0.586	.017	.020	.023
D	2.19	2.34	2.49	.086	.092	.098
E	1.91	2.16	2.41	.075	.085	.095
F	1.32	1.52	1.72	.052	.060	.068
G	0.10	0.15	0.20	.004	.006	.008
H	0.535	0.660	0.785	.021	.026	.031
△ J	0.05	0.10	0.15	0.0023	0.004	0.006
△ K	0.65	0.75	0.85	0.025	0.029	0.033
△ L	0.85	0.95	1.05	0.033	0.037	0.041
△ M	4.53	4.68	4.83	0.178	0.184	0.190
△ N	4.73	4.88	5.03	0.186	0.192	0.198

Note: All dimensions are subject to Millimeters. Inches for reference only.