PH485

High Linearity InGaP HBT Amplifier

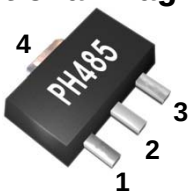
Features

- 800MHz - 3000MHz
- 15.0 dB Gain at 2140MHz
- +29 dBm P1dB
- +45 dBm Output IP3
- Single Voltage Supply
- Lead-free / Green / RoHS-compliant SOT-89 Package

Applications

- Mobile Infrastructure
- PCS, WCDMA, WiBro
- W-LAN / ISM
- RFID / Fixed Wireless

Functional Diagram



Function	Pin No.
RF IN	1
RF OUT / Bias	3
Ground	2,4

Description

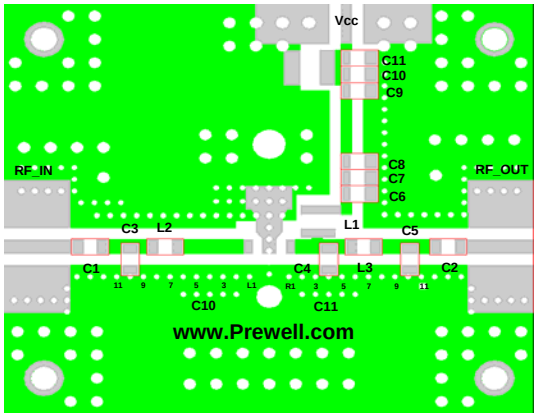
The PH485 is a high performance InGaP HBT MMIC Amplifier and high linearity driver amplifier in a high quality SOT-89 package. The device features excellent Input and output return loss, highly linear performance. The device can be easily matched to obtain optimum power and linearity. The product is targeted for use as driver amplifier for wireless infrastructure applications. The PH485 operates from a single +5.5 voltage supply and have an internal active bias. All devices are 100% RF and DC tested

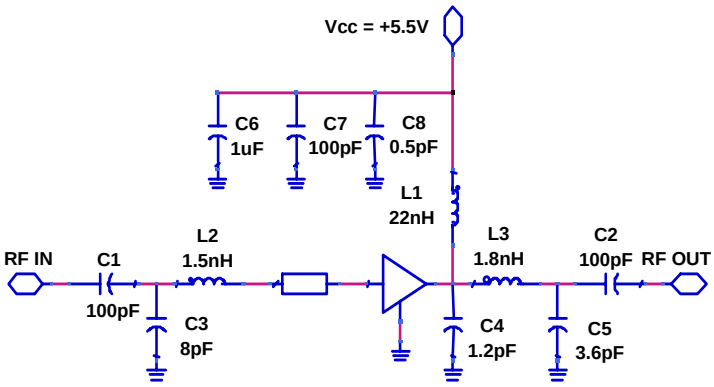
Specifications

Symbol	Parameters	Units	Freq.	Min.	Typ.	Max.
S21	Gain	dB	860 MHz 1900 MHz 2140 MHz		21.6 15.3 14.8	
S11	Input Return Loss	dB	860 MHz 1900 MHz 2140 MHz		-18 -14 -20	
S22	Output Return Loss	dB	860 MHz 1900 MHz 2140 MHz		-15 -13 -15	
P1dB	Output Power @1dB compression	dBm	860 MHz 1900 MHz 2140 MHz		25.0 28.0 28.5	
OIP3	Output Third Order intercept	dBm	860 MHz 1900 MHz 2140 MHz		43 44 44	
NF	Noise Figure	dB	860 MHz 1900 MHz 2140 MHz		3.3 3.6 3.6	
V / I	Device voltage / current	V/mA			5.5/162	
Rth	Thermal Resistance	°C/W			48	

Test Conditions : T=25°C, Supply Voltage=+5.5V, 50ohm System, OIP3 measured with two tones at an output power of +12dBm/tone separated by 1MHz.

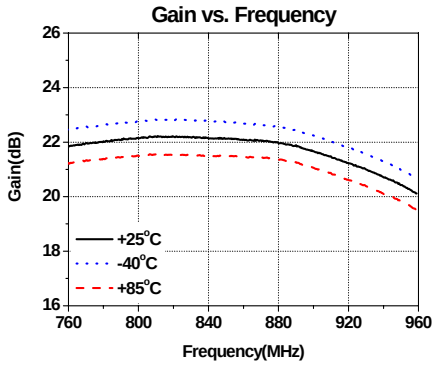
859 MHz Application Circuit

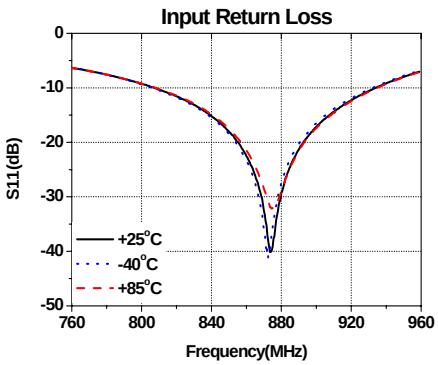


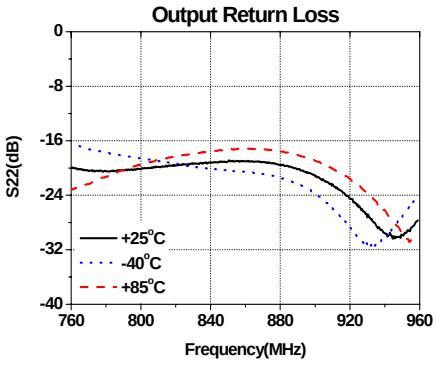


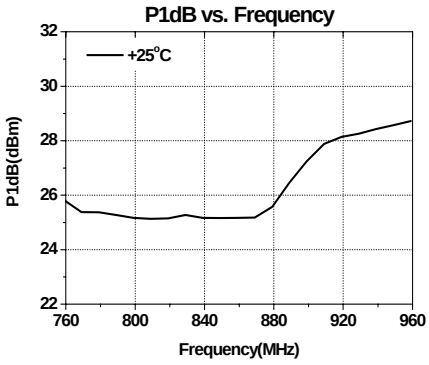
Test Board Information : FR4 PCB (Dielectric Constant = 4.6, thick = 0.8mm(32mil))
RF Microstrip Line Width = 1.2mm(47mil), Tuning Via Diameter ('R1','R2','R3', 'L1','L2',' L3',etc.) and Distance = 0.5mm(20mil)
All Passive Component Size is 1608(0603) and L1 is Ceramic inductor

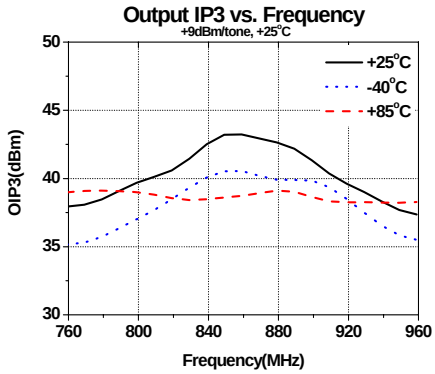
Frequency	859 MHz
S21 : Gain	21.8 dB
S11 : Input Return Loss	-20 dB
S22 : Output Return Loss	-17 dB
Output P1dB	+25 dBm
Output IP3 @9dBm	+43 dBm
Noise Figure	3.2 dB
Supply Voltage	5.5 V
Current	160 mA

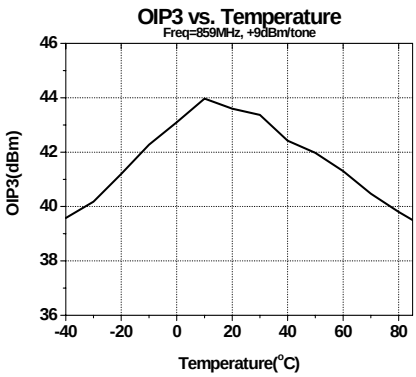


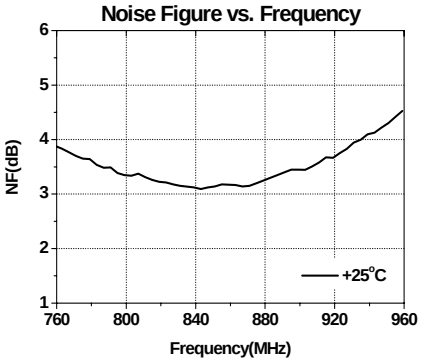




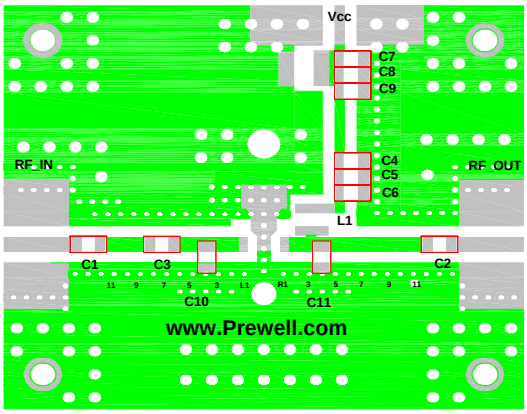


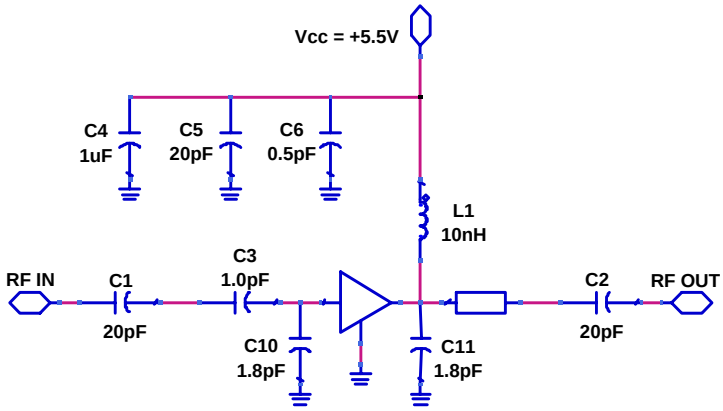






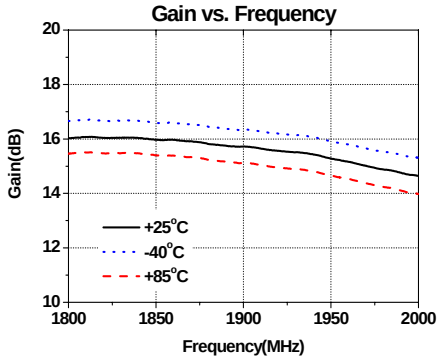
1900 MHz Application Circuit

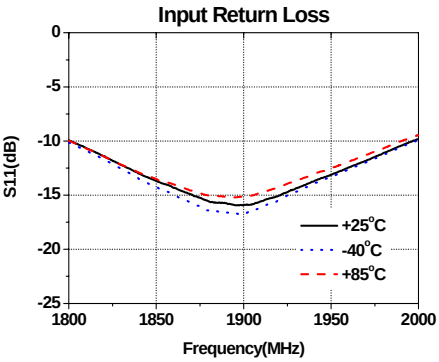


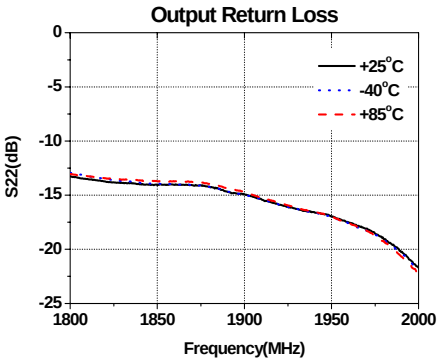


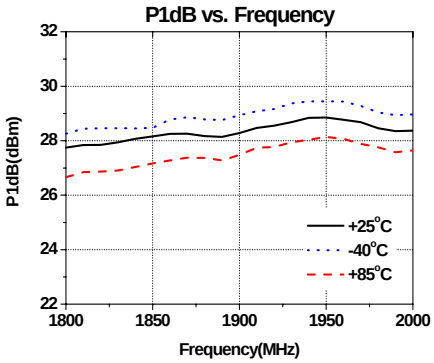
Test Board Information : FR4 PCB (Dielectric Constant = 4.6, thick = 0.8mm(32mil))
RF Microstrip Line Width = 1.2mm(47mil), Tuning Via Diameter ('R1','R2','R3', 'L1','L2',' L3',etc.) and Distance = 0.5mm(20mil)
All Passive Component Size is 1608(0603) and L1 is Ceramic inductor

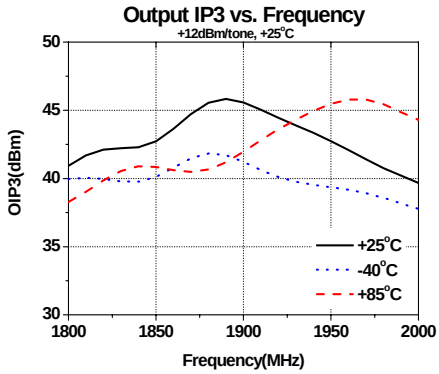
Frequency	1900 MHz
S21 : Gain	15.6 dB
S11 : Input Return Loss	-15 dB
S22 : Output Return Loss	-14 dB
Output P1dB	+28 dBm
Output IP3 @12dBm	+45 dBm
Noise Figure	3.6 dB
Supply Voltage	5.5 V
Current	162 mA

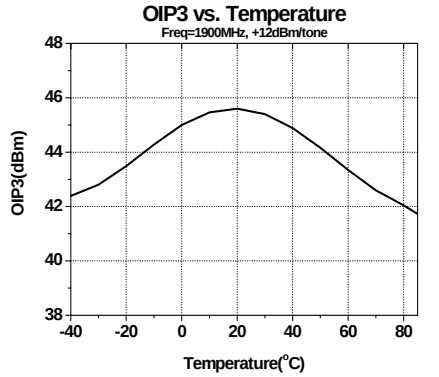


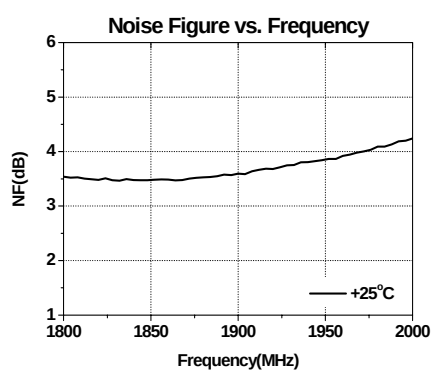




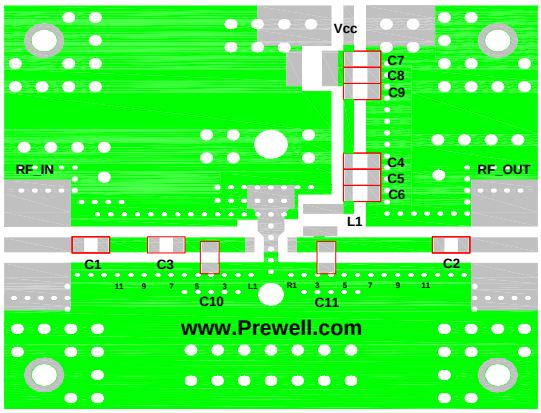


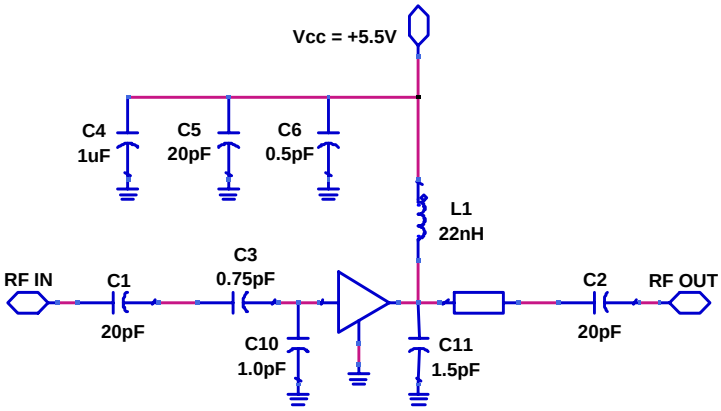






2140 MHz Application Circuit





Test Board Information : FR4 PCB (Dielectric Constant = 4.6, thick = 0.8mm(32mil))
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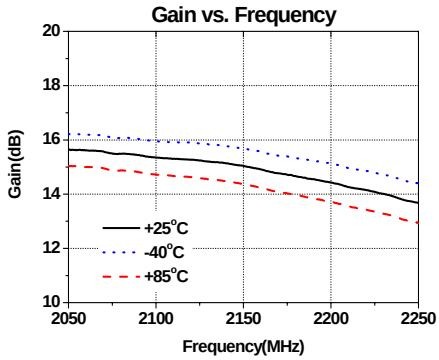
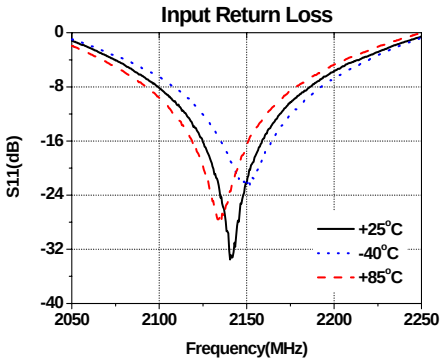
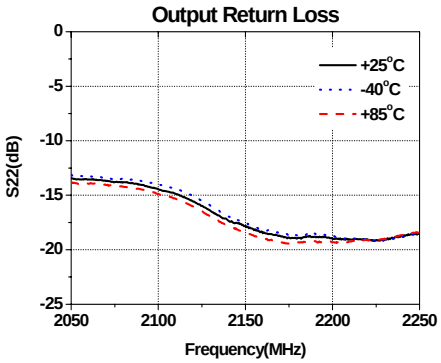
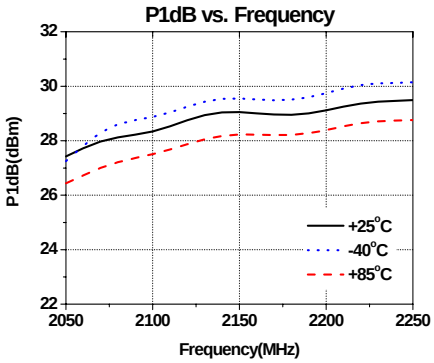
All Passive Component Size is 1608(0603) and L1 is Ceramic inductor

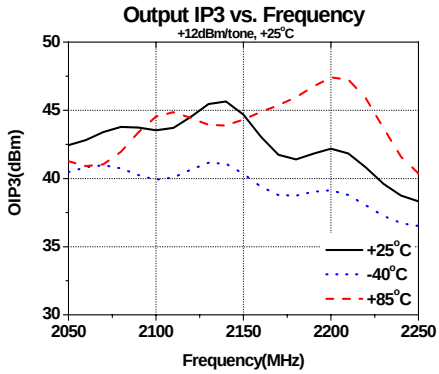
Frequency	2140 MHz
S21 : Gain	15.0 dB
S11 : Input Return Loss	-24 dB
S22 : Output Return Loss	-16 dB
Output P1dB	+29 dBm
Output IP3 @12dBm	+45 dBm
Noise Figure	3.6 dB
Supply Voltage	5.5 V
Current	162 mA

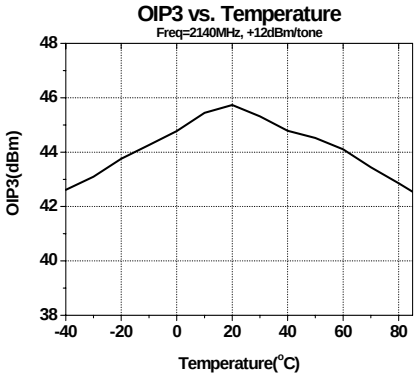


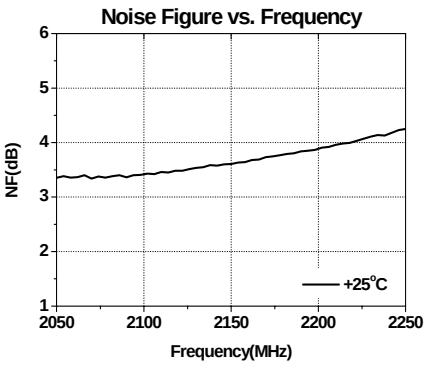


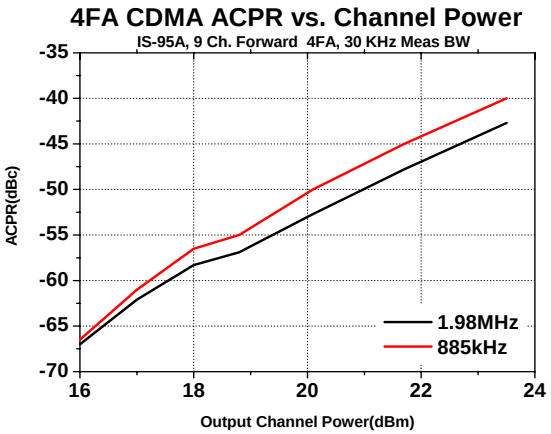


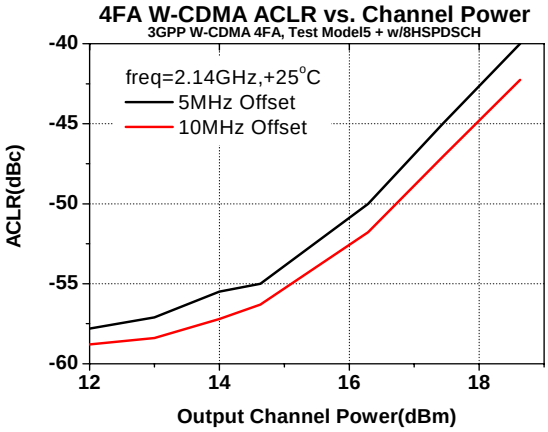


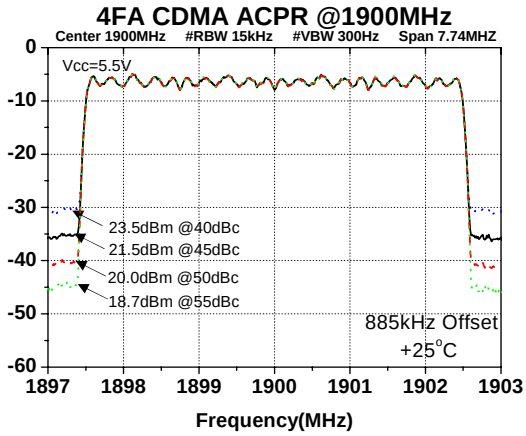


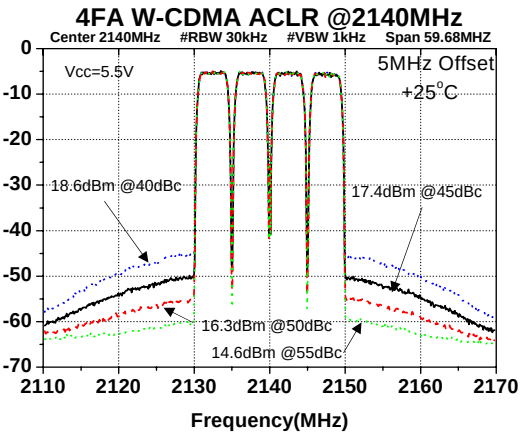





4FA CDMA ACPR vs. Channel Power
IS-95A, 9 Ch. Forward 4FA, 30 KHz Meas BW
ACPR(dBc)
-35
-40
-45
-50
-55
-60
-65
-70
16
18
20
22
24
Output Channel Power(dBm)
1.98MHz
885kHz


4FA W-CDMA ACLR vs. Channel Power
3GPP W-CDMA 4FA, Test Model5 + w/8HSPDSCH
ACLR(dBc)
-40
-45
-50
-55
-60
12
14
16
18
Output Channel Power(dBm)
freq=2.14GHz,+25°C
5MHz Offset
10MHz Offset


4FA CDMA ACPR @1900MHz
Center 1900MHz #RBW 15kHz #VBW 300Hz Span 7.74MHZ
0
-10
-20
-30
-40
-50
-60
1897
1898
1899
1900
1901
1902
1903
Frequency(MHz)
Vcc=5.5V
23.5dBm @40dBc
21.5dBm @45dBc
20.0dBm @50dBc
18.7dBm @55dBc
885kHz Offset
+25°C

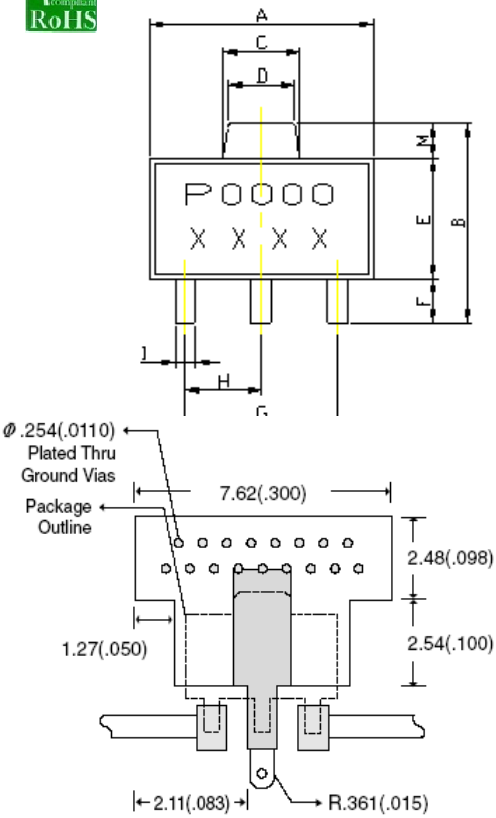

4FA W-CDMA ACLR @2140MHz
Center 2140MHz #RBW 30kHz #VBW 1kHz Span 59.68MHZ
0
-10
-20
-30
-40
-50
-60
-70
2110
2120
2130
2140
2150
2160
2170
Frequency(MHz)
Vcc=5.5V
5MHz Offset
+25°C
18.6dBm @40dBc
17.4dBm @45dBc
16.3dBm @50dBc
14.6dBm @55dBc

Absolute Maximum Ratings

Parameter	Rating	Unit
Device Voltage	+6	V
Device Current	220	mA
RF Power Input	15	dBm
Storage Temperature	-55 to +125	°C
Ambient Operating Temperature	-40 to +85	°C
Junction Temperature	180	°C

Operation of this device above any of these parameters may cause permanent damage.

Lead-free /RoHS Compliant / Green SOT-89 Package Outline

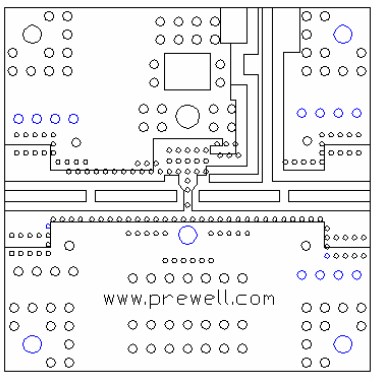


REF	DIMENSIONS Millimeters	
	Min.	Max.
A	4.40	4.60
B	4.05	4.25
C	1.50	1.70
D	1.30	1.50
E	2.40	2.60
F	0.89	1.20
G	3.00 REF.	
H	1.50 REF.	
I	0.40	0.52
J	1.40	1.60
K	0.35	0.41
L	5° TYP.	
M	0.70 REF.	

ESD / MSL Ratings

1. **ESD sensitive device.**
   Observe Handling Precautions.
2. **ESD Rating : Class 1C(Passes at 1000V min.)**
   Human Body Model (HBM), JESD22-A114
3. **ESD Rating : Class IV (Passes at 1000V min.)**
   Charged Device Model (CDM), JESD22-C101
4. **MSL (Moisture Sensitive Level) Rating : Level 3**
   at +260°C Convection reflow, J-STD-020

Evaluation Board Layout (4x4)



Mounting Instructions

1. **Use a large ground pad area with many plated through-holes as shown.**
2. **We recommend 1 oz copper minimum.**
3. **Measurement for our data sheet was made on 0.8mm thick FR-4 Board.**
4. **Add as much copper as possible to inner and outer layers near the part to ensure optimal thermal performance.**
5. **RF trace width depends on the board material and construction.**
6. **Add mounting screws near the part to fasten the board to a heatsink.**