

50-4000 MHz Cascadeable InGaP HBT Gain Block

Device Features

- 34dBm Output at 7dBm/tone at 900MHz
- 20.3dB Gain at 900MHz
- 19dBm P1dB at 900MHz
- Highly Reliable InGaP/GaAs HBT Technology
- Temperature Compensation Circuit patent
- Over Voltage Protection Circuit patent
- SOT-89 Surface Mount Package
- 50 ohm Cascadeable
- Lead-free/Green/RoHS compliant
- Application: commercial, space, military wireless system



Electrical Specifications ($T_a = 25^\circ\text{C}$, $V_s = 5\text{V}$)

Parameters	Test Conditions	Min	Typ	Max	Unit
Frequency Range		50		4000	MHz
Gain	70MHz 500MHz 900MHz 1900MHz 2450MHz	21.0 19.7 19.3 17.5 16.5	22.0 20.7 20.3 18.5 17.5		dB
S11	70MHz 500MHz 900MHz 1900MHz 2450MHz		-13.6 -11.6 -15.6 -16.5 -17.0		dB
S22	70MHz 500MHz 900MHz 1900MHz 2450MHz		-8.1 -18.8 -33.1 -20.5 -18.3		dB
OIP3	70MHz 500MHz 900MHz 1900MHz 2450MHz	33.0 33.0 32.0 29.5 28.5	35.0 35.0 34.0 31.5 30.5		dBm
P1dB	70MHz 500MHz 900MHz 1900MHz 2450MHz	17.9 17.5 18.0 17.5 16.5	18.9 18.8 19.0 18.9 17.8		dBm
Ic	$V_c = 5.0\text{V}$	62	72	82	mA
Vc			5.0		V
dG/dT			-0.004		dB/°C
Rth	Thermal Resistance		50		°C/W

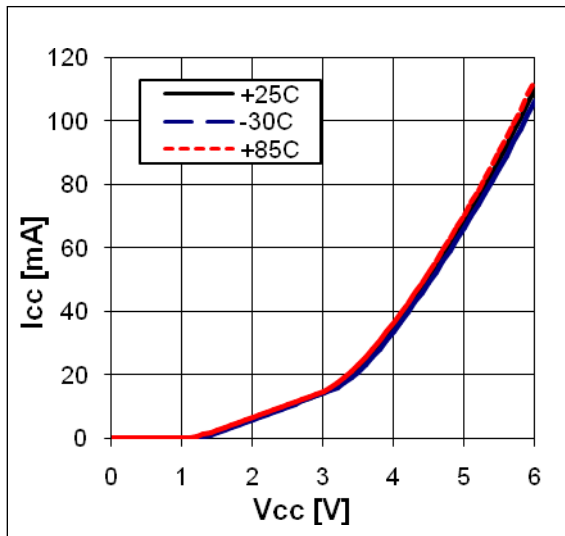
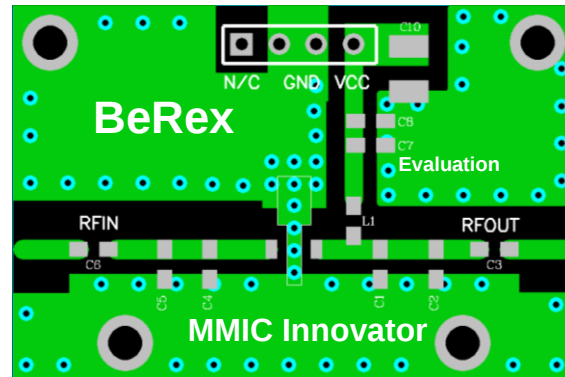
Test conditions unless otherwise noted.

1. Device performance is measured on BeRex evaluation board at 25°C , 50 ohm system.
2. OIP3 measured with two tones at an output power of 7dBm/tone separated by 1MHz.

Absolute Maximum Ratings

Parameters	Rating
Operating Case temperature	-40 to +85°C
Storage Temperature	-55 to +155°C
Junction Temperature	+220°C
Supply Voltage	6.0V
Max. Device Current	160mA
Input RF Power	23dBm

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

[I-V Characteristics]**[Generic SOT89 Evaluation Board]**

*Dielectric constant is 4.2

*RF pattern width 52mil

*31mil thick FR4 PCB

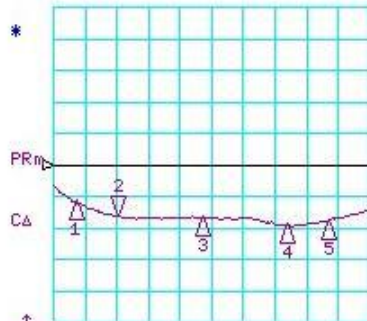
Application Circuit: 50-4000 MHz

Schematic Diagram	BOM	Tolerance
	C1	100pF *10nF
	C2	100 pF *10nF
	C3	100pF
	C4	1000pF
	C5	NC
	L1	33nH *10uH
*Application for IF Bandwidth		

Typical Device Data

S-parameters (Vc=5V, Ic=72mA, T=25°C)

CH1 LOG 10 dB/ REF 0 dB
S11 2:-16.205 dB 1 000.000 000 MHz

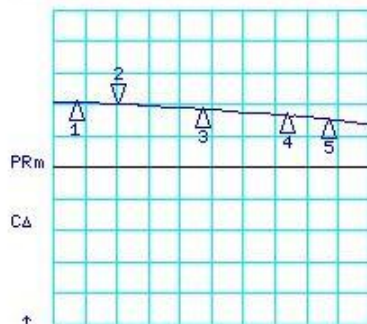


CH1 Markers

1:-11.693 dB
500.000 MHz
3:-16.670 dB
2.00000 GHz
4:-18.820 dB
3.00000 GHz
5:-17.776 dB
3.50000 GHz

↑
CENTR 2125.000 MHz SPAN 3750.000 MHz

CH2 LOG 10 dB/ REF 0 dB
S31 2: 20.213 dB 1 000.000 000 MHz

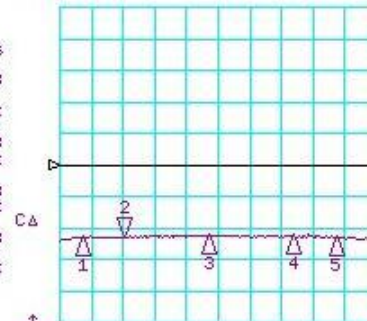


CH2 Markers

1: 20.715 dB
500.000 MHz
3: 18.582 dB
2.00000 GHz
4: 16.685 dB
3.00000 GHz
5: 15.360 dB
3.50000 GHz

↑
START 250.000 MHz STOP 4000.000 MHz

CH3 LOG 10 dB/ REF 0 dB
S13 2:-22.827 dB 1 000.000 000 MHz

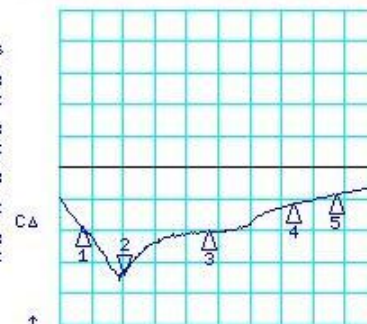


CH3 Markers

1:-23.129 dB
500.000 MHz
3:-22.633 dB
2.00000 GHz
4:-22.587 dB
3.00000 GHz
5:-23.120 dB
3.50000 GHz

↑
CENTR 2125.000 MHz SPAN 3750.000 MHz

CH4 LOG 10 dB/ REF 0 dB
S33 2:-34.027 dB 1 000.000 000 MHz



CH4 Markers

1:-19.042 dB
500.000 MHz
3:-20.439 dB
2.00000 GHz
4:-11.871 dB
3.00000 GHz
5:-8.6659 dB
3.50000 GHz

↑
START 250.000 MHz STOP 4000.000 MHz

Typical Performance (V_{device} = 5V, I_c = 72mA, T_a = 25°C)

Freq	MHz	70	150	250	500	900	1900	2140	2450	3500
S21	dB	22.0	21.6	21.2	20.7	20.3	18.5	18.3	17.5	16.6
S11	dB	-13.6	-14.7	-17.2	-11.6	-15.6	-16.5	-16.7	-17.0	-18.7
S22	dB	-8.1	-10.9	-13.8	-18.8	-33.1	-20.5	-20.2	-18.3	-11.9
P1	dBm	18.9	19.1	19.2	18.8	19.0	18.9	18.6	17.8	17.0
OIP3	dBm	35.0	35.5	34.0	35.0	34.0	31.5	31.0	30.5	29.0
NF	dB	3.4	3.4	3.4	3.6	3.4	3.2	3.4	3.4	3.6

Typical Performance (V_{device} = 4.7 V, I_c = 60 mA, T_a = 25 °C)

Freq	MHz	70	500	900	1900	2140	2450	3500
S21	dB	22	20.7	20.1	18.5	18	17.1	13.9
S11	dB	-7	-17	-21	-32	-32	-21	-9
S22	dB	-13	-20	-21	-17	-16	-14	-12
P1	dBm	17.8	17.9	17.5	17.1	17.7	16.2	
OIP3	dBm	33.5	34	32	31	31	29.5	
NF	dB	3.4	3.6	3.4	3.2	3.4	3.4	

Typical Performance (V_{device} = 4.5 V, I_c = 53 mA, T_a = 25 °C)

Freq	MHz	70	500	900	1900	2140	2450	3500
S21	dB	21.7	20.5	20.1	18.4	18.1	17.4	13.8
S11	dB	-12	-19	-20	-16	-15	-14	-12
S22	dB	-7.6	-17	-20	-29	-35	-22	-9
P1	dBm	14.1	16.8	16.5	16.2	16.8	15.7	
OIP3	dBm	31.5	32	30.5	29.5	30.5	29	
NF	dB	3.3	3.7	3.3	3.2	3.3	3.4	

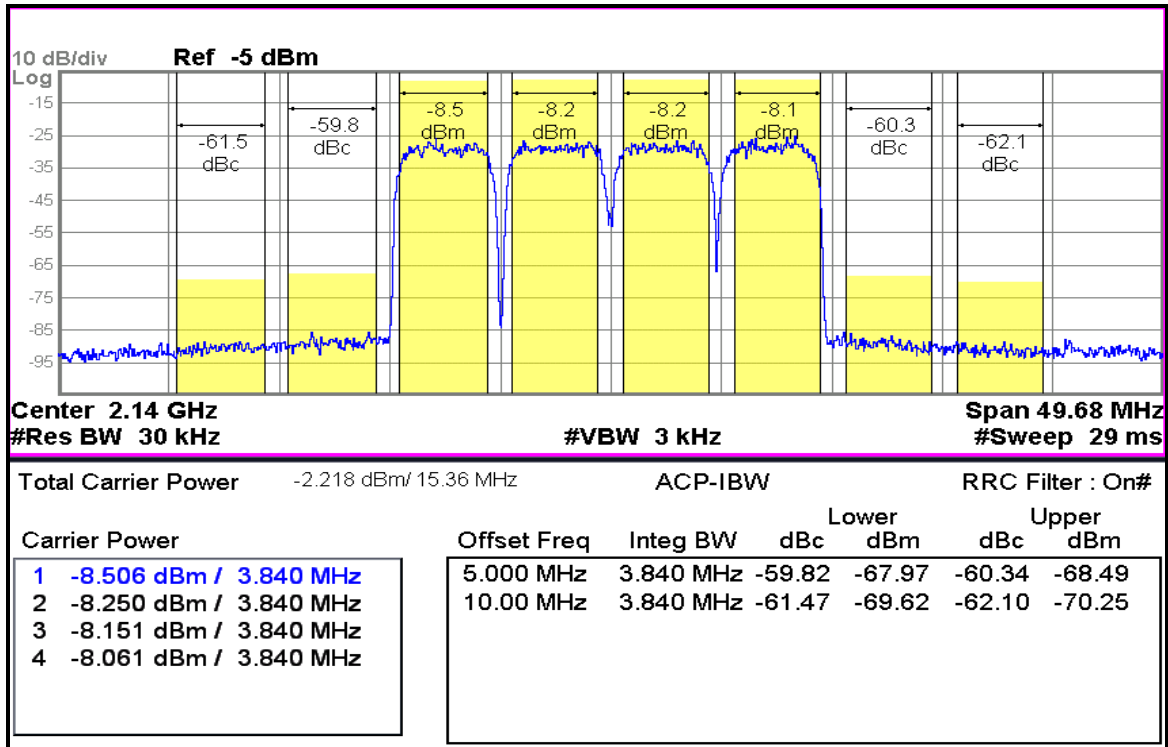
Typical Performance (V_{device} = 4 V, I_c = 38 mA, T_a = 25 °C)

Freq	MHz	70	500	900	1900	2140	2450	3500
S21	dB	21.3	20.1	19.5	18	17.6	16.7	13.6
S11	dB	-11	-16	-17	-15	-14	-13	-12
S22	dB	-7	-15	-17	-24	-39	-24	-9
P1	dBm	13.5	13.1	12.7	12.8	14	14.1	
OIP3	dBm	26	26	24.5	24.5	26	25.5	
NF	dB	3	3.7	3.3	3.2	3.3	3.4	

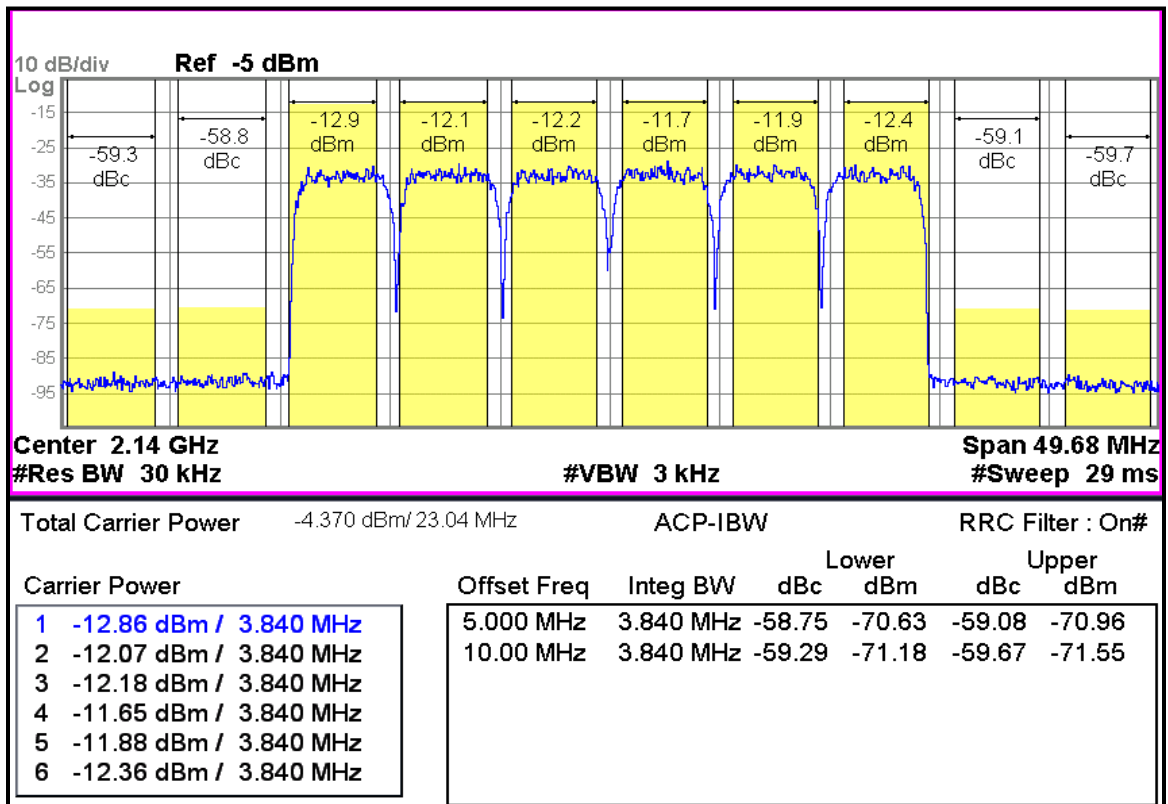
Typical Performance (V device = 3.5 V, I_c = 24 mA, T_a = 25 °C)

Freq	MHz	70	500	900	1900	2140	2450	3500
S21	dB	19.2	18.4	17.9	16.7	16.6	16	13.1
S11	dB	-8.5	-11.3	-11	-11	-10	-11	-11
S22	dB	-5.3	-10.8	-12	-16	-20	-27	-10
P1	dBm	8.3	6.7	6	6.4	9.1	12.3	
OIP3	dBm	19	18	16.5	15.5	17	17	
NF	dB	3	3.5	3.2	3.2	3.3	3.5	

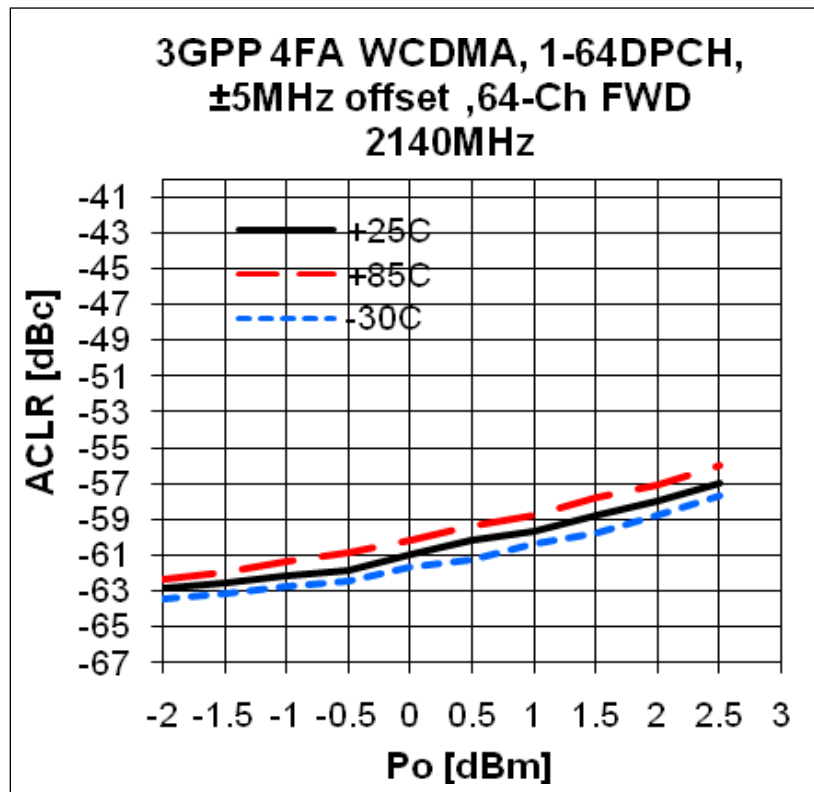
WCDMA 4FA 2140 - 60dBc



WCDMA 6FA 2140 -60dBc

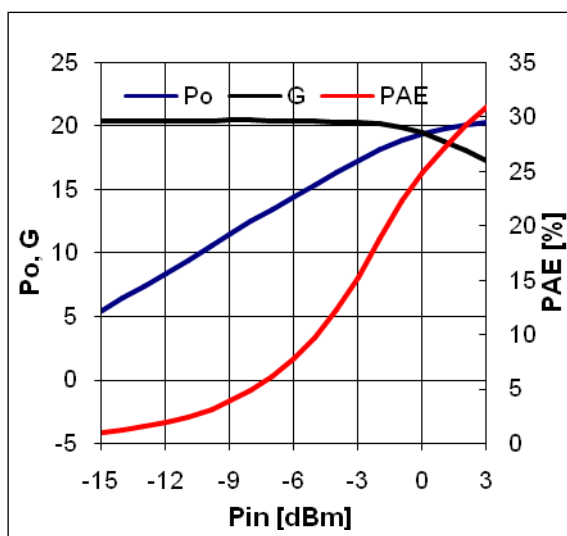


ACLR

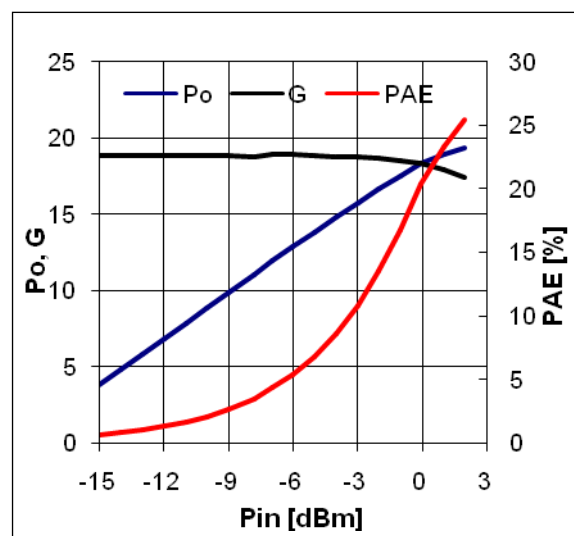


Device Performance

Pin-Pout-Gain

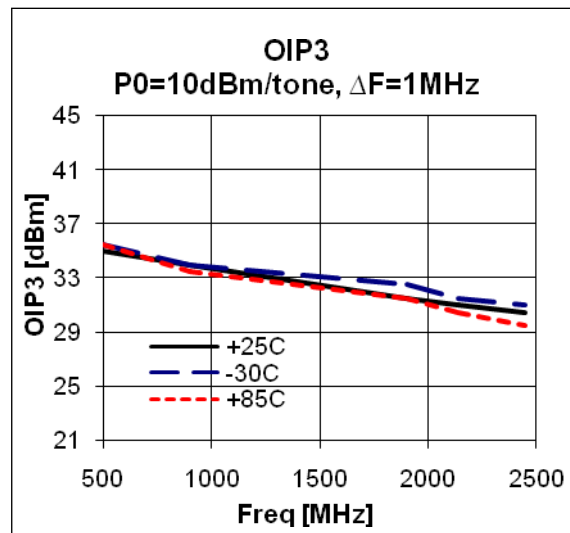
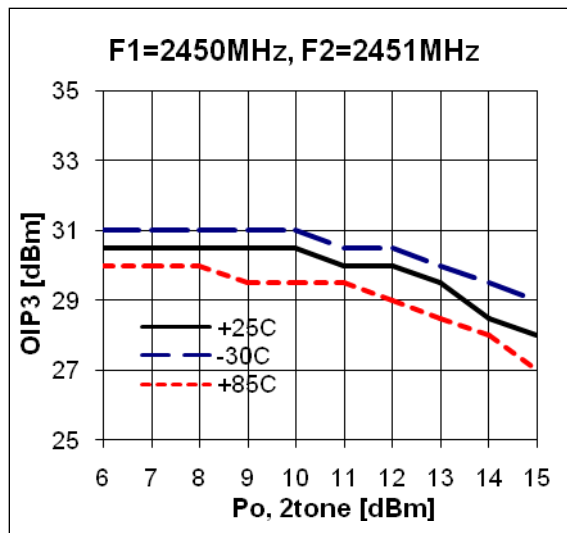
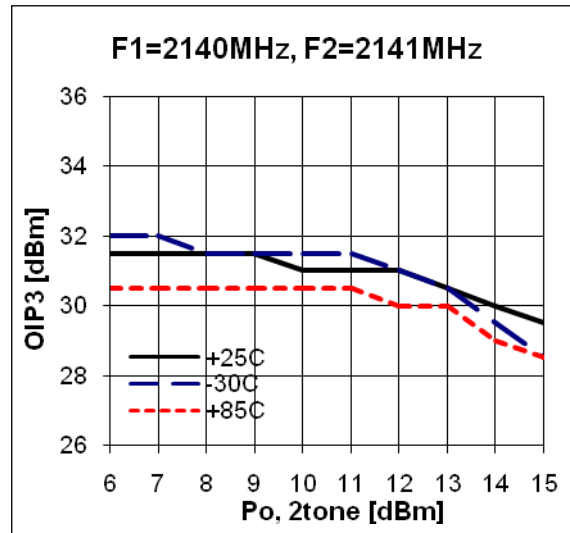
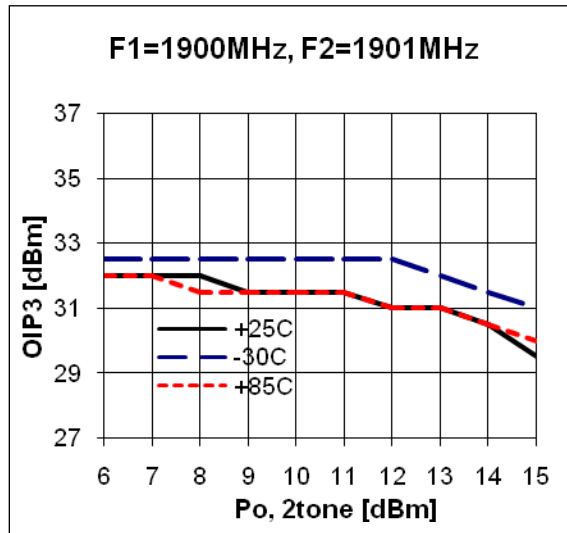
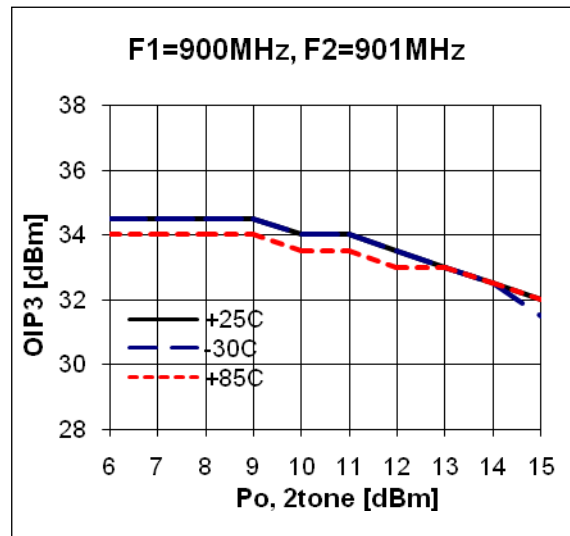
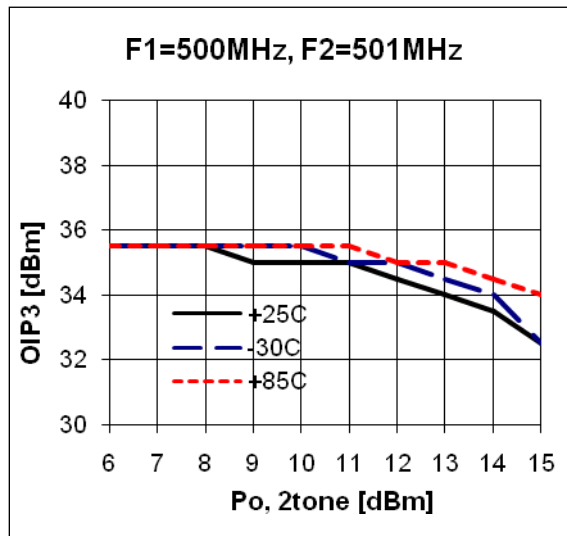


900MHz, 5V/71mA

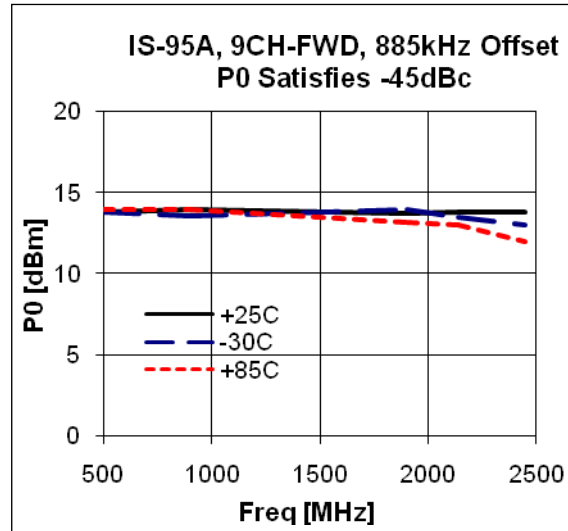
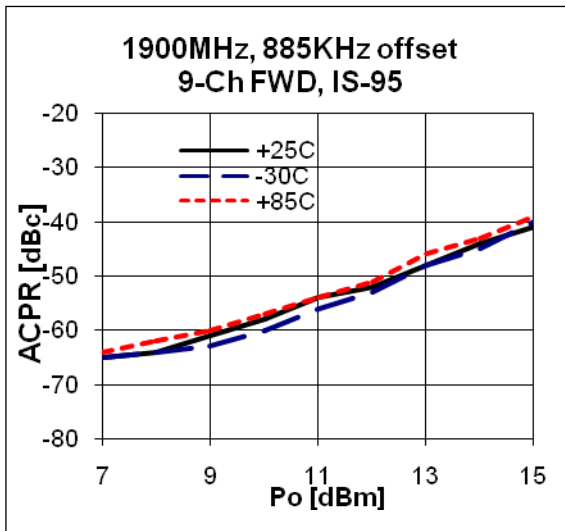
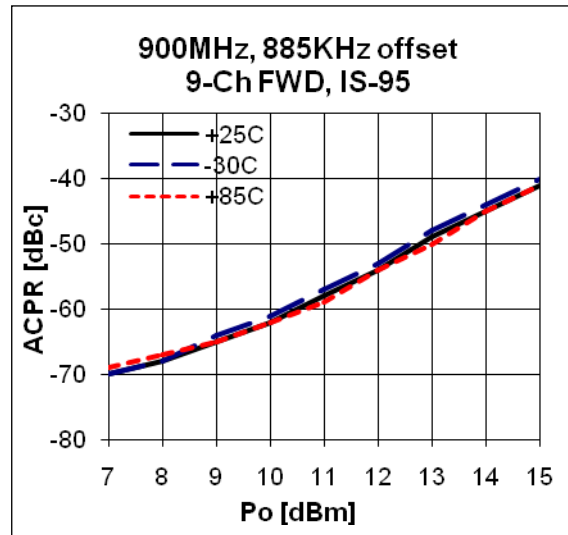
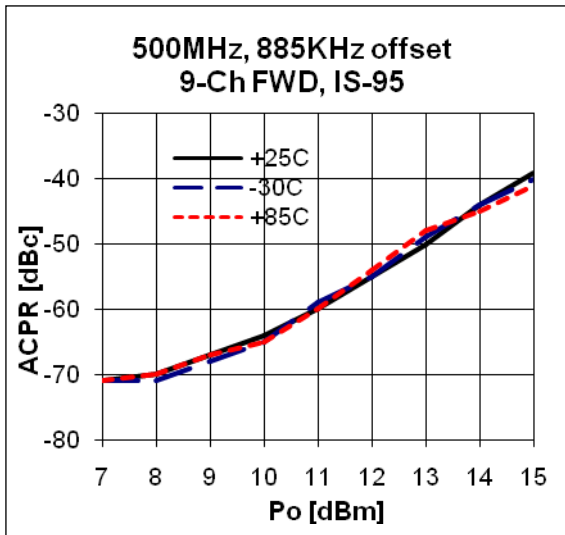


1900MHz, 5V/71mA

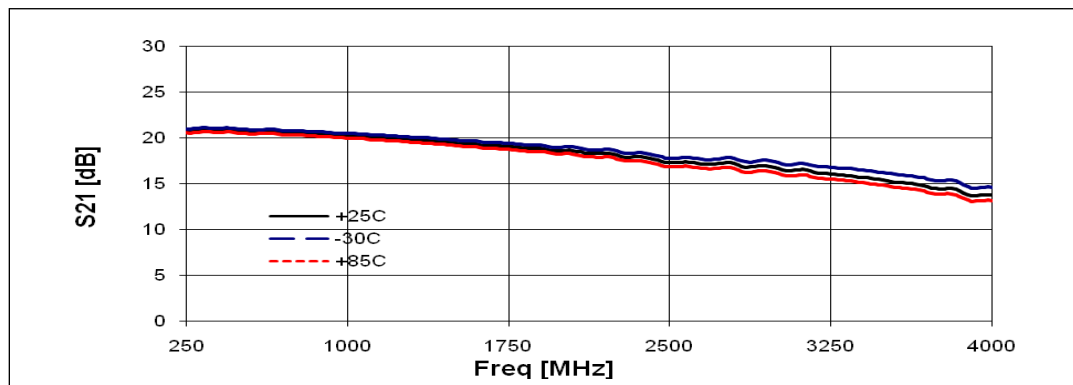
OIP3



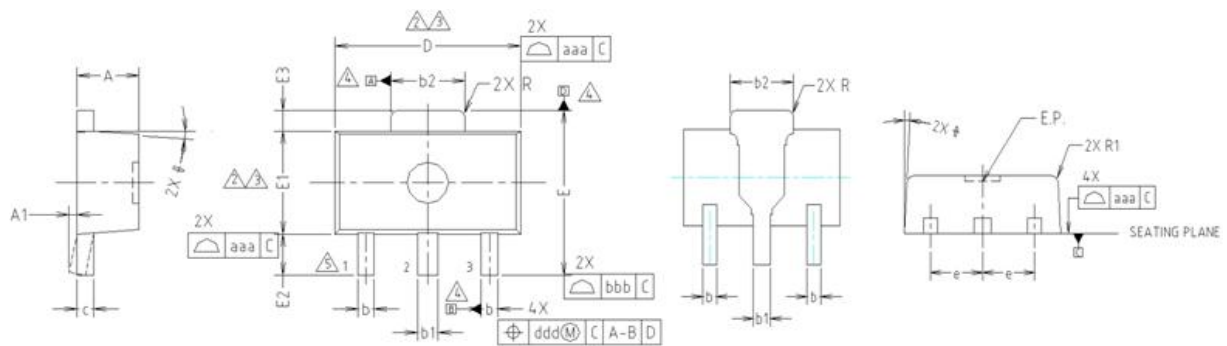
ACPR



Gain Flatness



Package Outline Dimension



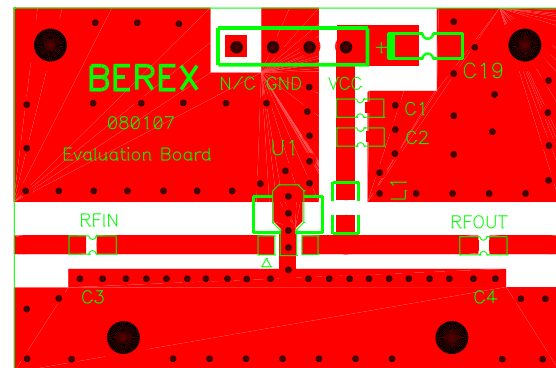
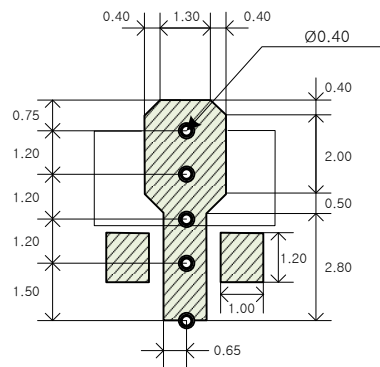
NOTE:

1. DIMENSIONS IN MILLIMETERS.

- 2. DIMENSION D DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.5mm PER END. DIMENSION E1 DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.5mm PER SIDE.
- 3. DIMENSIONS D AND E1 ARE DETERMINED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS AND INTERLEAD FLASH, BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY.
- 4. DATUMS A, B AND D TO BE DETERMINED 0.18mm FROM THE LEAD TIP.
- 5. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.

SYMBOL	MILLIMETERS			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A	1.40	1.50	1.60	
A1	0.00	—	0.10	
b	0.38	0.42	0.48	
b1	0.48	0.52	0.58	
b2	1.79	1.82	1.87	
c	0.40	0.42	0.46	
D	4.40	4.50	4.70	2,3
E	3.70	4.00	4.30	
E1	2.40	2.50	2.70	2,3
E2	0.80	1.00	1.20	
E3	0.40	0.50	0.60	
e	1.50 TYP.			
φ	4° TYP.			
R	0.15 TYP.			
R1	—	—	0.20	
SYMBOL	TOLERANCES OF FORM AND POSITION		NOTE	
aaa	0.15			
bbb	0.20			
ccc	0.10			
ddd	0.10			

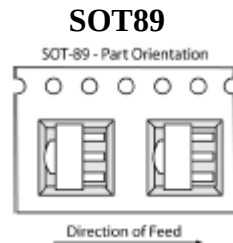
Suggested PCB Land Pattern and PAD Layout



Note : All dimension are in millimeters

Visit <http://www.berex.com> for PCB layout

Tape & Reel



Packaging information:

Tape Width (mm): 12
Reel Size (inches): 7
Device Cavity Pitch (mm): 8
Devices Per Reel: 1000

Lead plating finish

100% Tin Matte finish.

(All BeRex products undergoes a 1 hour, 150 degree C, Anneal bake to eliminate thin whisker growth concerns)

MSL / ESD Rating

ESD Rating:	Class 1C
Value:	Passes <2000V
Test:	Human Body Model (HBM)
Standard:	JEDEC Standard JESD22-A114B
MSL Rating:	Level 1 at +265°C convection reflow
Standard:	JEDEC Standard J-STD-020

NATO CAGE code:

2	N	9	6	F
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NOTICE

BeRex Corporation reserves the right to make changes of product specification or to discontinue product at any time without notice.