BG12B

50-4000 MHz Cascadable InGaP HBT Gain Block

Preliminary Datasheet

Device Features

- OIP3 = 36.5 dBm @ 900 MHz
- Gain = 17.0 dB @ 900 MHz
- Output P1 dB = 20.6 dBm @ 900 MHz
- Typical 3.0dB NF at 900MHz
- 50 Ω Cascadable
- Patented temperature compensation
- Lead-free/RoHS-compliant SOT-89 SMT package

Product Description

BeRex's BG12B is a high performance InGaP/GaAs HBT MMIC amplifier, internally matched to 50 Ohms and uses a patented ***temperature compensation*** circuit to provide stable current over the operating temperature range without the need for external components. The BG12B is designed for high linearity gain block applications that require excellent gain flatness. It is packaged in a RoHS-compliant with SOT-89 surface mount package.

Typical Performance[1]

Parameter	Frequency					Unit
	70	900	1900	2140	2450	MHz
Gain	18.5	17.0	15.0	14.6	14.0	dB
S11	-16.5	-17.0	-19.0	-20.0	-18.0	dB
S22	-14.5	-14.0	-14.0	-16.6	-20.5	dB
OIP3[2]	36.5	36.5	34.5	34.0	32.5	dBm
P1dB	20.1	20.6	19.4	19.2	17.9	dBm
Noise Figure	2.8	2.9	3.1	3.2	3.2	dB

[1] Device performance _ measured on a BeRex evaluation board at 25°C, 50 Ω system.

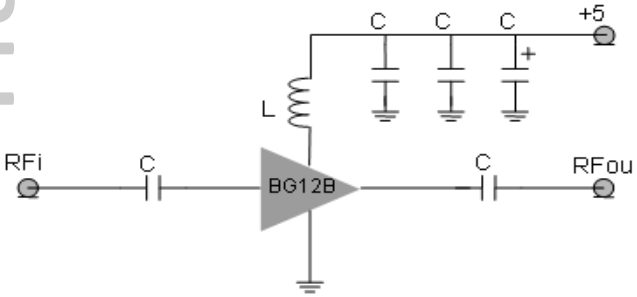
[2] OIP3 _ measured with two tones at an output of 5 dBm per tone separated by 1 MHz.

Applications

- Base station Infrastructure/RFID
- Commercial/Industrial/Military wireless system

	Min.	Typical	Max.	Unit
Bandwidth	50		4000	MHz
I_C @ (Vc = 5V)	67	77	87	mA
V_C		5.0		V
dG/dT		-0.003		dB/°C
R_{TH}		50.5		°C/W

Applications Circuit



*C1, C2, C3 =100 pF ± 5%; C4 = 1000 pF ± 5%; C5 = 10uF; L1 = 100nH

*39nH or higher value L1 improves RF performance at under 3GHz.

*Optimum value of L1 may vary with board design.

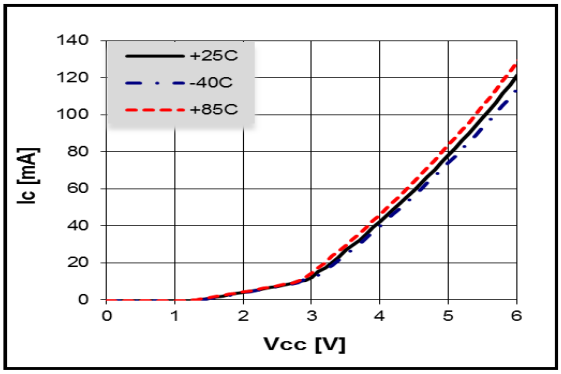
(L1:1000nH, C1&C2:1.2nF for 70MHz)

Absolute Maximum Ratings

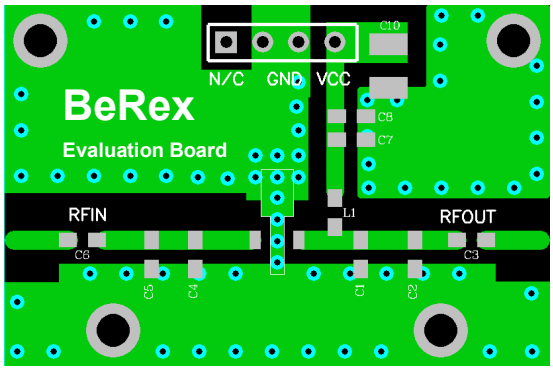
Parameter	Rating	Unit
Operating Case Temperature	-40 to +85	°C
Storage Temperature	-55 to +155	°C
Junction Temperature	+220	°C
Operating Voltage	+5.5	V
Supply Current	120	mA
Input RF Power	23	dBm

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

V-I Characteristics



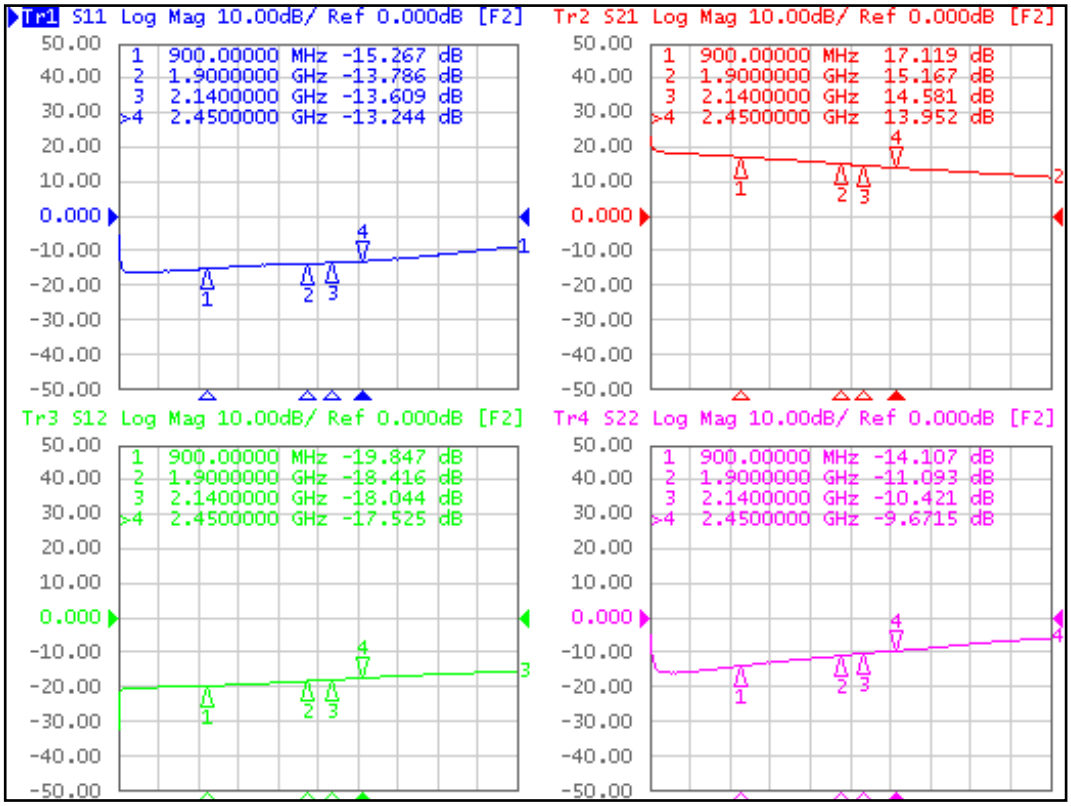
BeRex SOT89 Evaluation Board



*Dielectric constant _ 4.2 *RF pattern width 52mil *31mil thick FR4 PCB

Typical Device Data

S-parameters (Vc=5V, Ic=80mA, T=25°C)



S-Parameter

(Vdevice = 5.0V, Icc = 77mA, T = 25 °C, calibrated to device leads)

Freq [MHz]	S11 Mag	S11 Ang	S21 Mag	S21 Ang	S12 Mag	S12 Ang	S22 Mag	S22 Ang
100	0.435	-93.440	7.978	-161.916	0.087	37.728	0.265	168.924
500	0.143	166.000	7.808	118.617	0.097	-30.484	0.145	161.418
1000	0.125	90.075	7.087	50.486	0.101	-76.169	0.196	122.597
1500	0.121	35.562	6.289	-12.945	0.109	-120.275	0.208	69.413
2000	0.102	1.254	5.602	-74.986	0.118	-166.758	0.174	11.788
2500	0.150	-1.546	4.918	-137.711	0.125	143.157	0.089	-40.867
3000	0.334	-42.980	4.257	152.163	0.131	84.389	0.157	101.131
3500	0.521	-144.348	1.518	123.642	0.055	64.369	0.549	-41.536
4000	0.329	161.663	3.092	61.699	0.130	9.397	0.186	143.069

Typical Performance (Vd = 5V, Ic = 77mA, T = 25°C)

Freq	MHz	70	500	900	1900	2140	2450	3000
S21	dB	18.6	17.5	17.1	15.0	14.6	13.9	12.4
S11	dB	16.3	18.3	17.8	19.5	20.0	17.4	9.3
S22	dB	14.6	14.4	14.4	15.0	16.6	20.5	15.8
P1	dBm	20.1	20.6	20.9	20.0	19.2	18.3	16.9
OIP3	dBm	36.5	38.0	37.0	34.5	34.0	33.0	31.0
NF	dB	2.8	3.0	2.9	3.1	3.2	3.2	3.3

Typical Performance (Vd = 4.7 V, Ic = 65mA, Ta = 25)

Freq	MHz	70	500	900	1900	2140	2450	3000
S21	dB	18.6	17.5	17.1	15.0	14.5	13.8	12.4
S11	dB	16.4	18.8	18.2	19.7	20.0	17.3	9.3
S22	dB	14.8	14.5	14.5	14.8	16.3	20.0	16.1
P1	dBm	18.9	19.3	19.5	18.8	18.4	17.6	16.4
OIP3	dBm	36.0	36.0	35.0	32.5	33.0	32.0	30.5
NF	dB	2.7	2.9	2.8	3.0	3.1	3.1	3.2

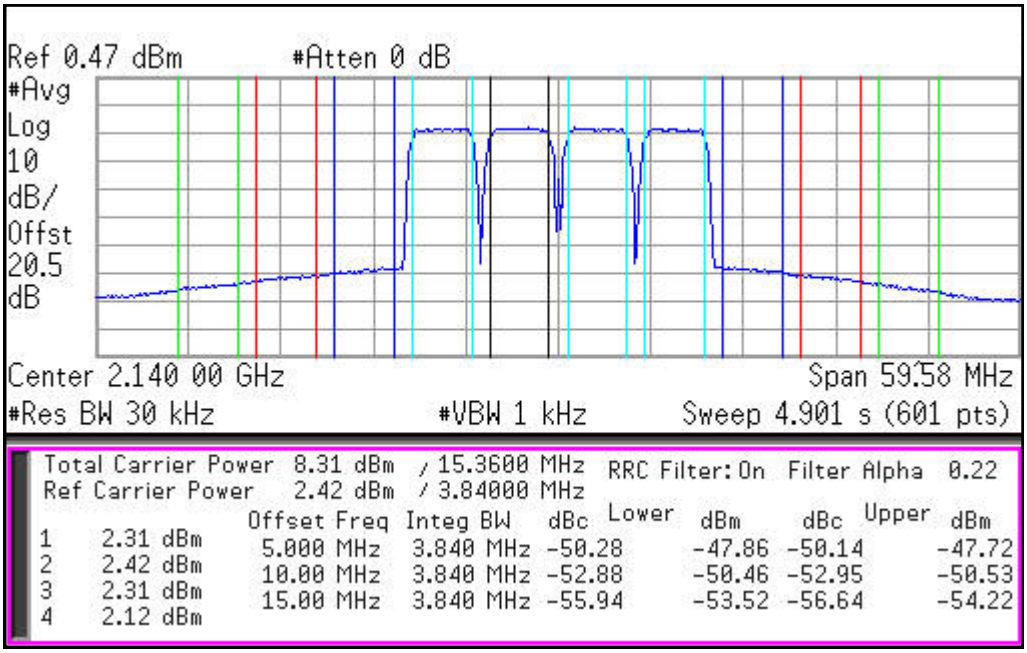
Typical Performance (Vd = 4.5 V, Ic = 58mA, Ta = 25 ℃)

Freq	MHz	70	500	900	1900	2140	2450	3000
S21	dB	18.5	17.4	17.0	14.9	14.5	13.8	12.3
S11	dB	16.6	19.2	18.5	19.8	20.0	17.2	9.2
S22	dB	15.0	14.6	14.5	14.7	16.2	19.7	16.4
P1	dBm	18.0	18.3	18.5	18.1	17.8	17.0	16.0
OIP3	dBm	35.0	34.5	34.0	30.5	32.0	31.0	29.5
NF	dB	2.6	2.9	2.8	3.0	3.0	3.1	3.2

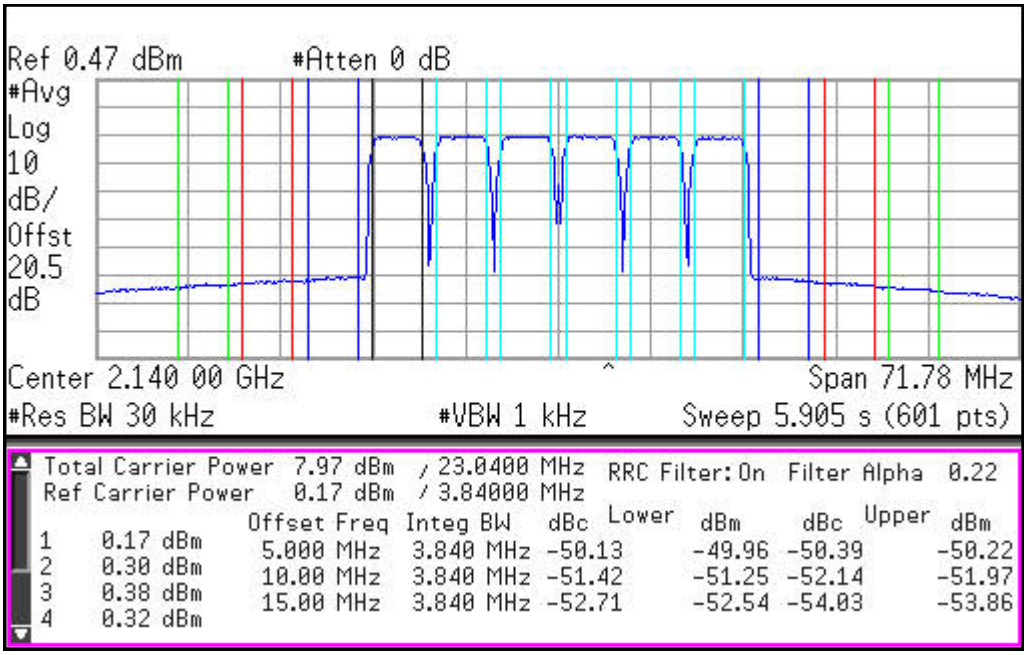
Typical Performance (Vd = 4 V, Ic = 41mA, Ta = 25 ℃)

Freq	MHz	70	500	900	1900	2140	2450	3500
S21	dB	18.2	17.1	16.8	14.7	14.3	13.6	12.2
S11	dB	17.1	21.3	19.8	20.5	20.1	16.7	9.0
S22	dB	15.5	15.0	14.7	14.4	15.7	18.8	17.3
P1	dBm	16.0	15.7	16.3	15.3	15.9	14.9	14.7
OIP3	dBm	30.0	29.5	29.0	28.0	28.5	27.0	27.0
NF	dB	2.5	2.8	2.7	2.8	2.9	3.0	3.0

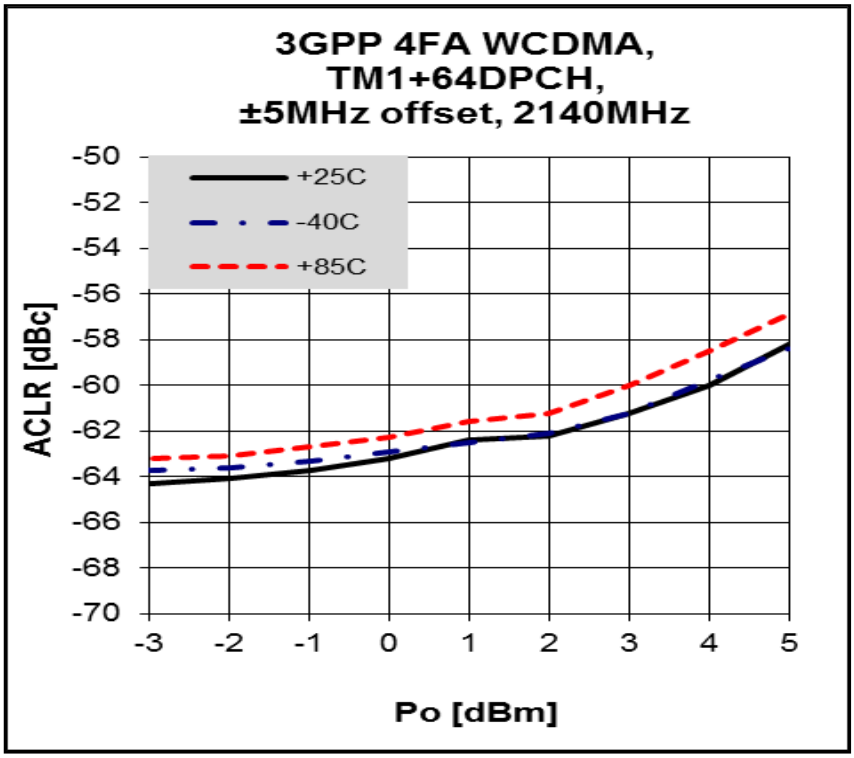
WCDMA 4FA 2140 -50dBc



WCDMA 6FA 2140 –50dBc

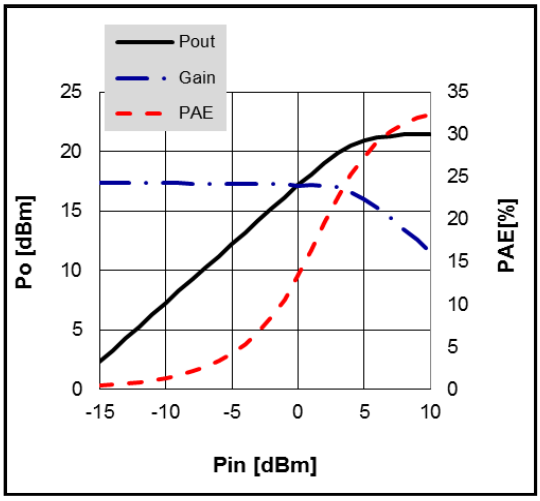


ACLR

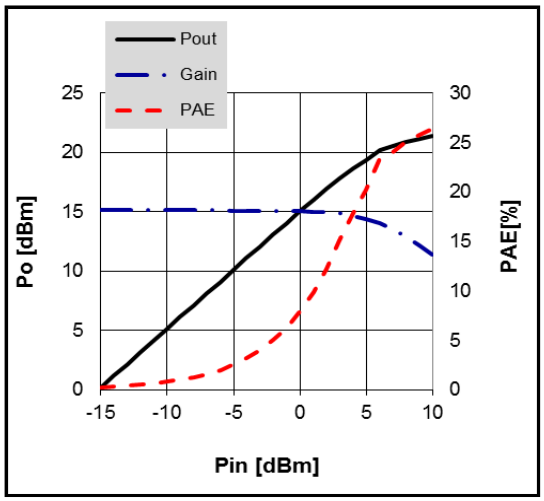


Device Performance

Pin-Pout-Gain

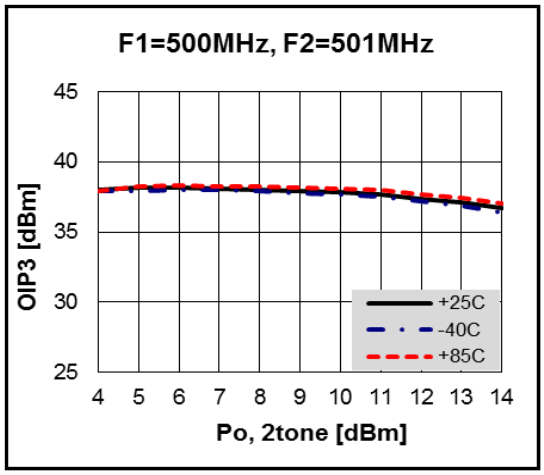


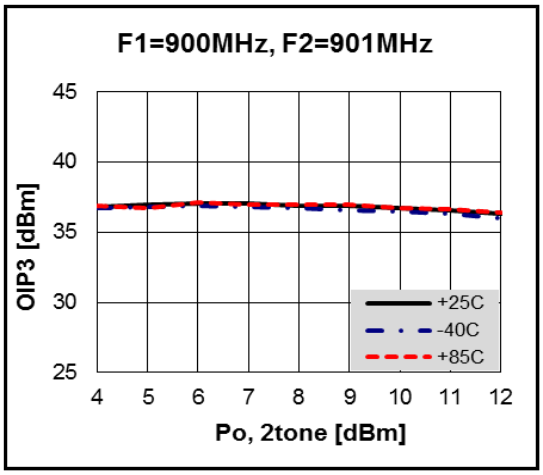
900MHz, 5V/77mA

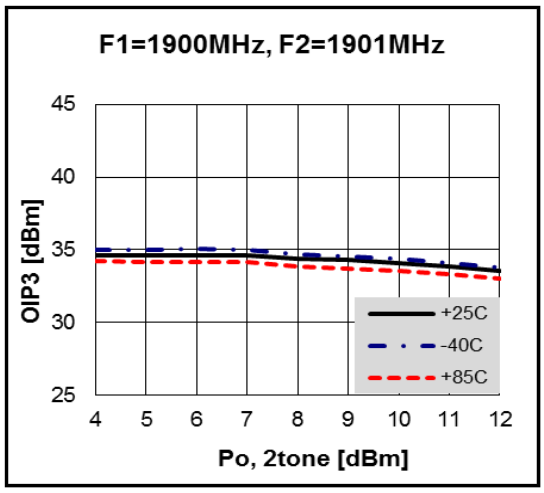


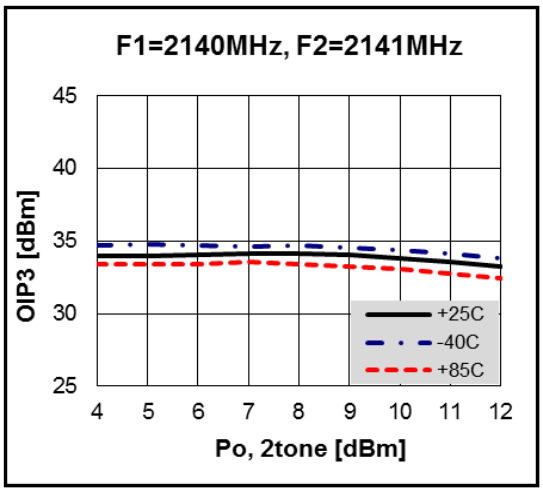
1900 MHz, 5V/77mA

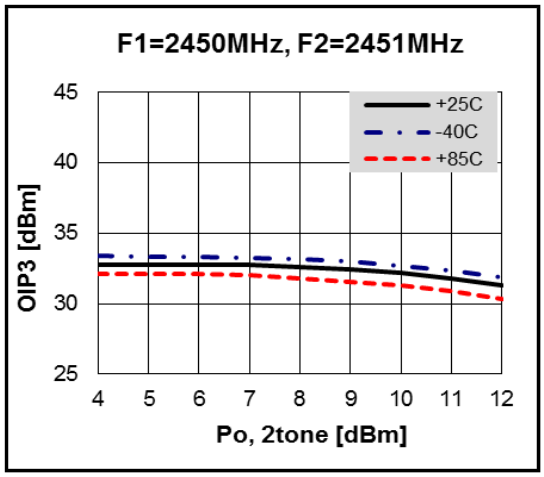
OIP3

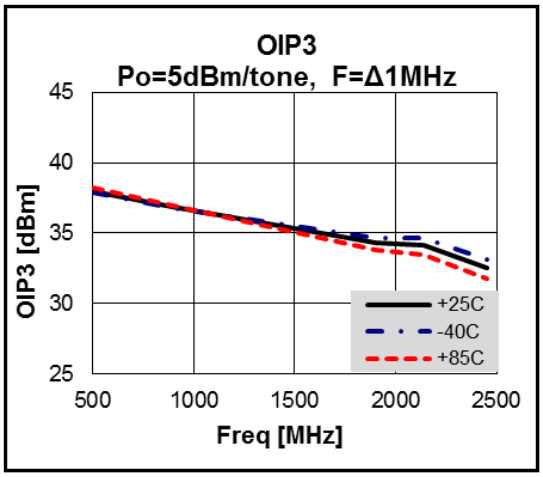




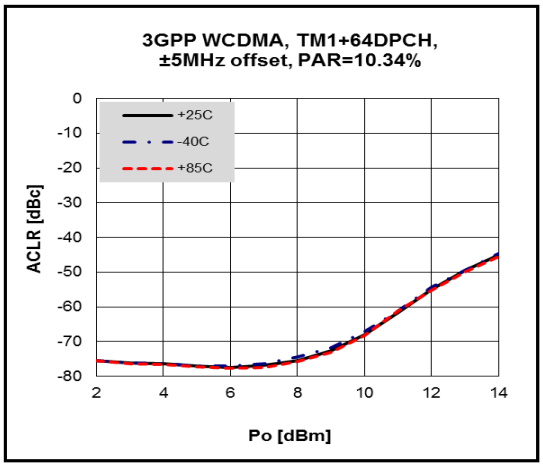


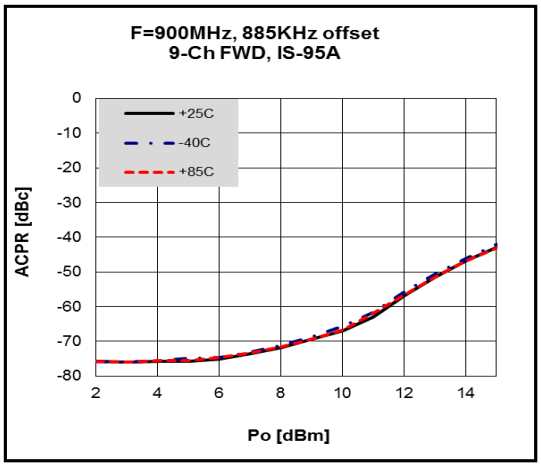


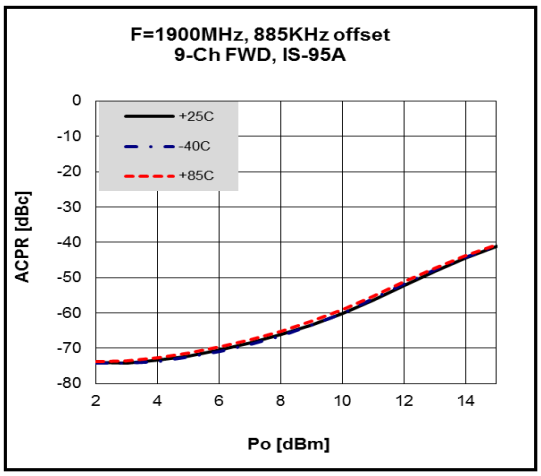


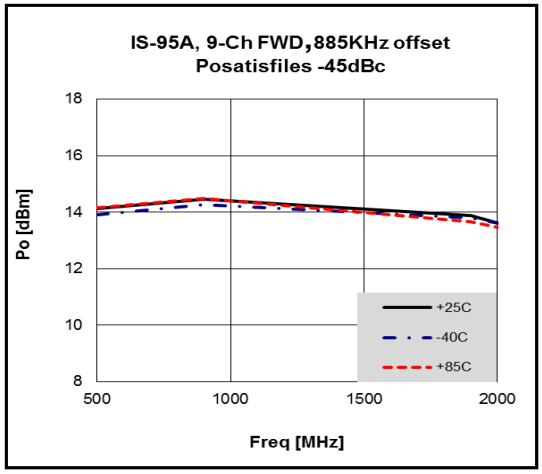


ACPR

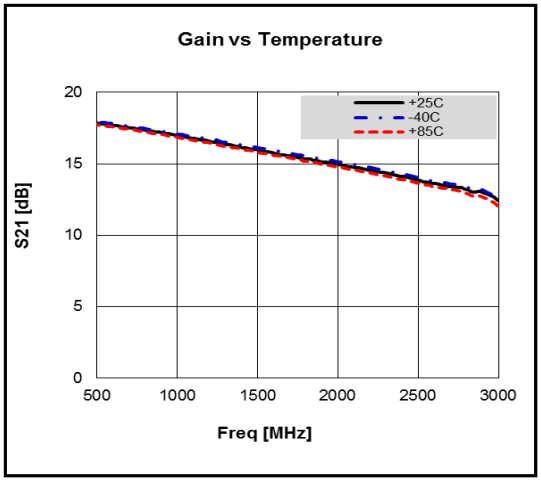


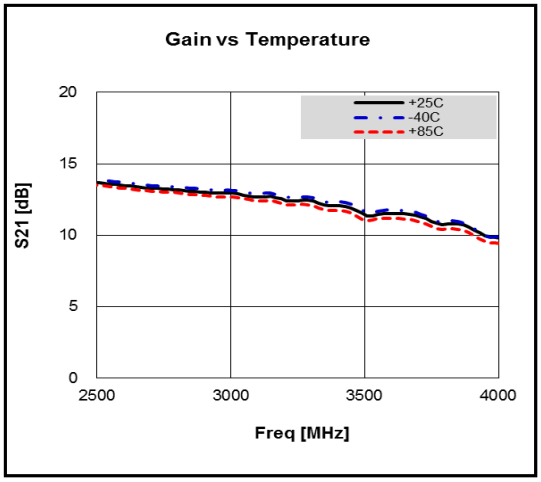




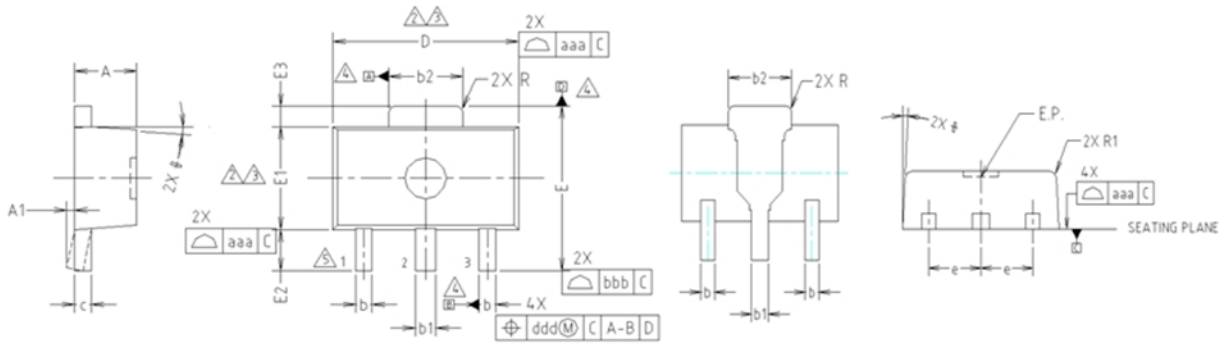


Gain vs Temperature





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.

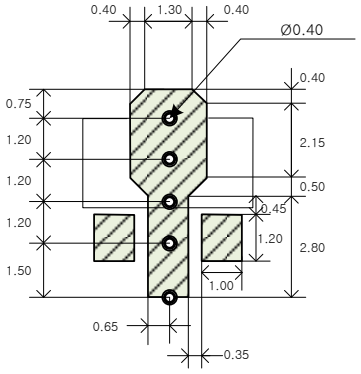
5. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.

SYMBOL	MILLIMETERS MINIMUM	NOMINAL	MAXIMUM	NOTE
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.			
θ	4° TYP.			
R	0.15 TYP.			
R1	–	–	0.20	

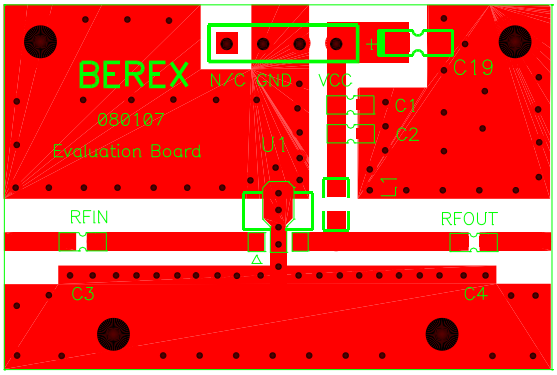
SYMBOL	TOLERANCES OF FORM AND POSITION	NOTE
aaa	0.15	
bbb	0.20	
ccc	0.10	
ddd	0.10	

Suggested PCB Land Pattern and PAD Layout

PCB Land Pattern



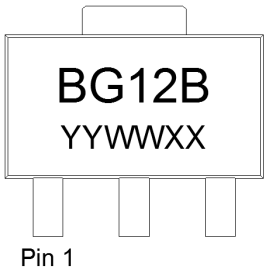
PCB Mounting



Note : All dimension _ millimeters

PCB lay out _ on BeRex website

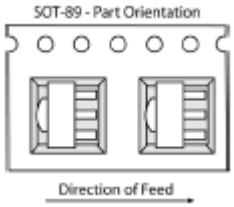
Package Marking



YY = Year, WW = Working Week,
XX = Wafer No.

Tape & Reel

SOT89



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**