

BG14A

5-4000 MHz Cascadable InGaP HBT Gain Block



Device Features

- OIP3 = 35.5 dBm @ 1900 MHz
- Gain = 16 dB @ 1900 MHz
- Output P1 dB = 19.7 dBm @ 1900 MHz
- 50 Ω Cascadable
- Patented temperature compensation
- Lead-free/RoHS-compliant SOT-89 SMT package



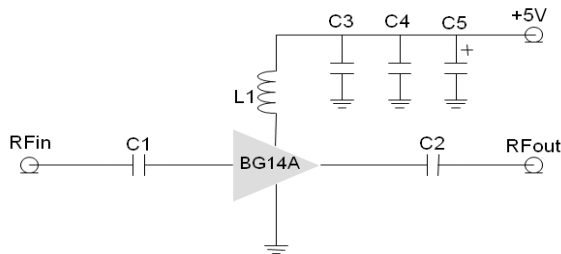
Product Description

BeRex's BG14A 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 BG14A 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.

Applications

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

Applications Circuit



- *C1, C2, C3 = 100 pF \pm 5%; C4 = 1000 pF \pm 5%; C5 = 10uF; L1 = 39nH
- *40nH or higher value L1 improves RF performance at under 500MHz.
- *Optimum value of L1 may vary with board design.
- *C1,C2=8200pF, L1=1200nH for 70MHz application,
- Vcc=5.2V if 1200nH is used to compensate IR drop across L1.
- *L1:6.8nH, C1&C2:10pF for 3.5GHz Application.

Typical Performance¹

	Frequency						Unit
	70	500	900	1900	2450	3500	MHz
Gain	17.0	17.3	16.7	16.0	15.4	14.1	dB
S11	-20.0	-18.5	-17.5	-27.5	-19.0	-26.3	dB
S22	-13.0	-14.0	-15.0	-10.5	-10.0	-12.5	dB
OIP3 ²	38.0	39.0	37.5	35.5	34.5	29.5	dBm
P1dB	20.0	20.0	19.5	19.5	19.5	17.9	dBm
N. F	5.4	5.5	5.5	6.0	6.3	7.3	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 9 dBm per tone separated by 1 MHz.

	Min.	Typical	Max.	Unit
Bandwidth	5		4000	MHz
I _c @ (V _c = 5V)	78	85	95	mA
V _c		5.0		V
dG/dT		-0.004		dB/°C
R _{TH}		85		°C/W

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	+6.5	V
Supply Current	150	mA
Input RF Power	23	dBm

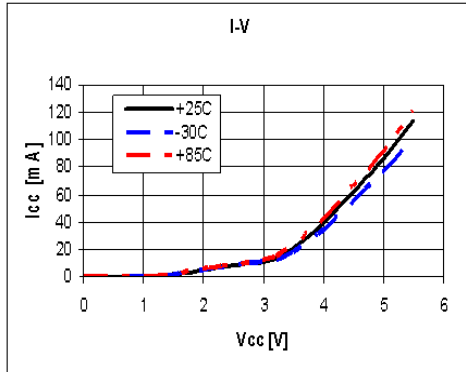
Operation of this device above any of these parameters may result in permanent damage.

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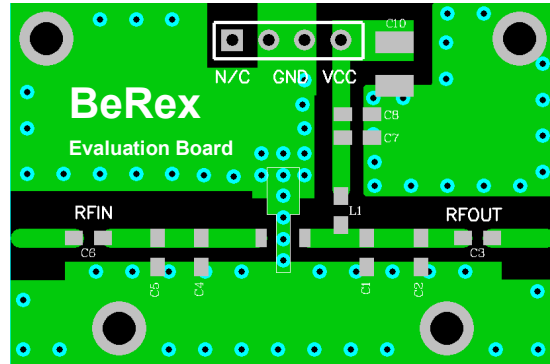
5-4000 MHz Cascadable InGaP HBT Gain Block



V-I Characteristics



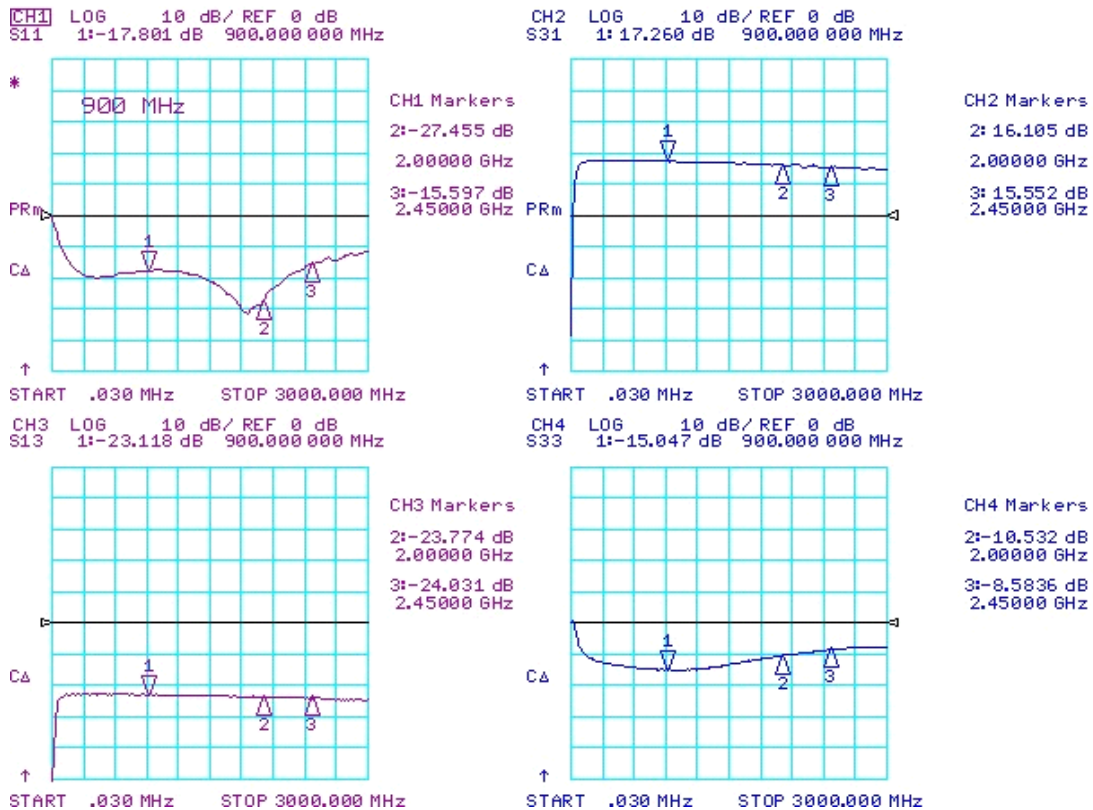
BeRex SOT89 Evaluation Board



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

Typical Device Data

S-parameters (Vc=5V, Ic=85mA, T=25°C)



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S-Parameter

(Vdevice = 5.0V, Icc = 85mA, 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	0.3594	-114	7.204	-136.6	0.05545	48.17	0.3891	121.6
500	0.2386	-174.2	7.588	173.1	0.06055	16.48	0.2227	18.23
1000	0.2243	167.2	7.145	153.3	0.06298	18.74	0.2032	-6.43
1500	0.2122	155.8	6.548	138.2	0.06691	23.42	0.1833	-20.22
2000	0.2016	147.5	5.923	125.6	0.07234	27.88	0.1623	-30.37
2500	0.1934	141.3	5.339	114.7	0.07908	31.52	0.1417	-38.68
3000	0.1882	136.5	4.822	105.2	0.08688	34.22	0.1221	-46.12
3500	0.1858	132.8	4.376	96.71	0.09554	36.05	0.1038	-53.45
4000	0.1861	129.9	3.994	89.05	0.1049	37.13	0.08659	-61.46

Typical Performance (Vd = 5V, Ic = 85mA, T = 25°C)

Freq	MHz	70	500	900	1900	2140	2450	3500
S21	dB	17.0	17.3	16.7	16.0	15.7	15.4	14.1
S11	dB	-20.0	-18.5	-17.5	-27.5	-23.0	-19.0	-26.3
S22	dB	-13.0	-14.0	-15.0	-10.5	-11.5	-10.0	-12.5
P1	dBm	20.0	20.0	19.5	19.5	19.5	19.5	17.9
OIP3	dBm	38.0	39.0	37.5	35.5	35.5	34.5	29.5
NF	dB	5.4	5.5	5.5	6.0	6.1	6.3	7.3

Typical Performance (Vd = 4.7V, Ic = 79mA, T = 25°C)

Freq	MHz	70	500	900	1900	2140	2450
S21	dB	17.1	16.6	16.6	15.6	15.3	15.1
S11	dB	-12.4	-20.6	-19.8	-23.4	-22.1	-21.6
S22	dB	-8.7	-11.9	-12.8	-10.2	-9.5	-11.2
P1	dBm	18.4	19.1	19.2	19.3	19.2	19.2
OIP3	dBm	37.5	37.5	36.0	35.0	34.0	33.5
NF	dB	5.4	5.5	5.5	6.0	6.1	6.3

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Typical Performance (Vd = 4.5V, Ic = 69mA, T = 25°C)

Freq	MHz	70	500	900	1900	2140	2450
S21	dB	16.9	16.9	16.5	15.9	15.3	15.0
S11	dB	-12.6	-21.2	-20.3	-23.5	-21.9	-21.7
S22	dB	-8.6	-11.8	-12.6	-10.1	-9.4	-11.1
P1	dBm	17.9	17.9	17.4	17.5	17.5	17.3
OIP3	dBm	37.5	37.5	33.5	32.5	32.5	32.5
NF	dB	5.4	5.5	5.5	6.0	6.1	6.3

Typical Performance (Vd = 4V, Ic = 45mA, T = 25°C)

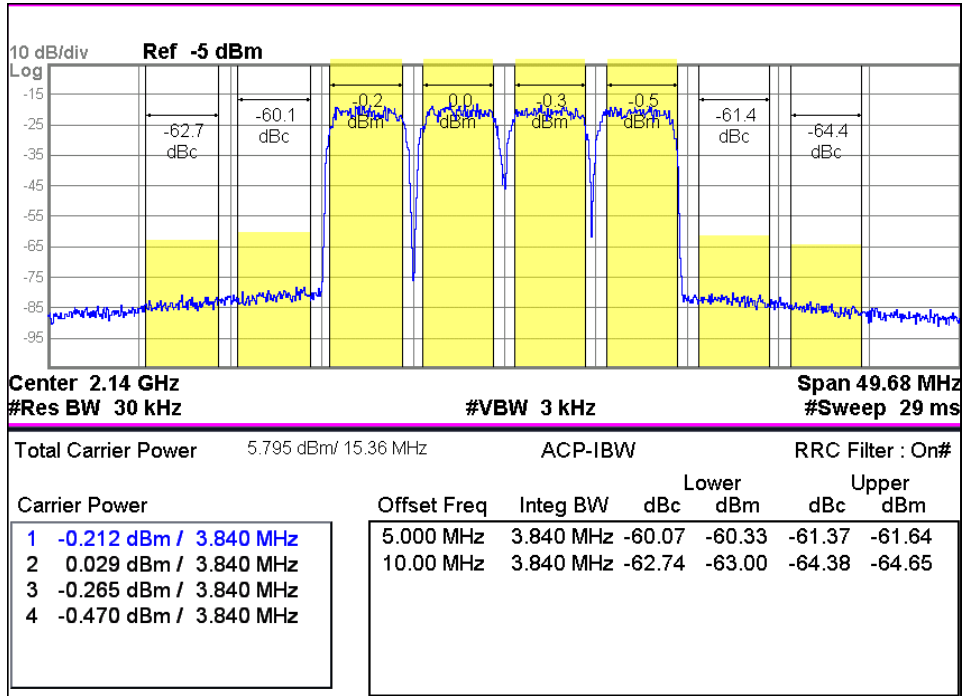
Freq	MHz	70	500	900	1900	2140	2450
S21	dB	16.7	16.2	16.2	15.3	15.0	14.8
S11	dB	-13.5	-24.0	-23.0	-23.2	-21.2	-21.8
S22	dB	-8.3	-11.1	-11.8	-9.6	-9.0	-10.6
P1	dBm	14.5	14.7	14.7	14.3	13.7	14.4
OIP3	dBm	29.5	27.5	27.5	28.0	27.0	27.5
NF	dB	5.4	5.5	5.5	6.0	6.1	6.3

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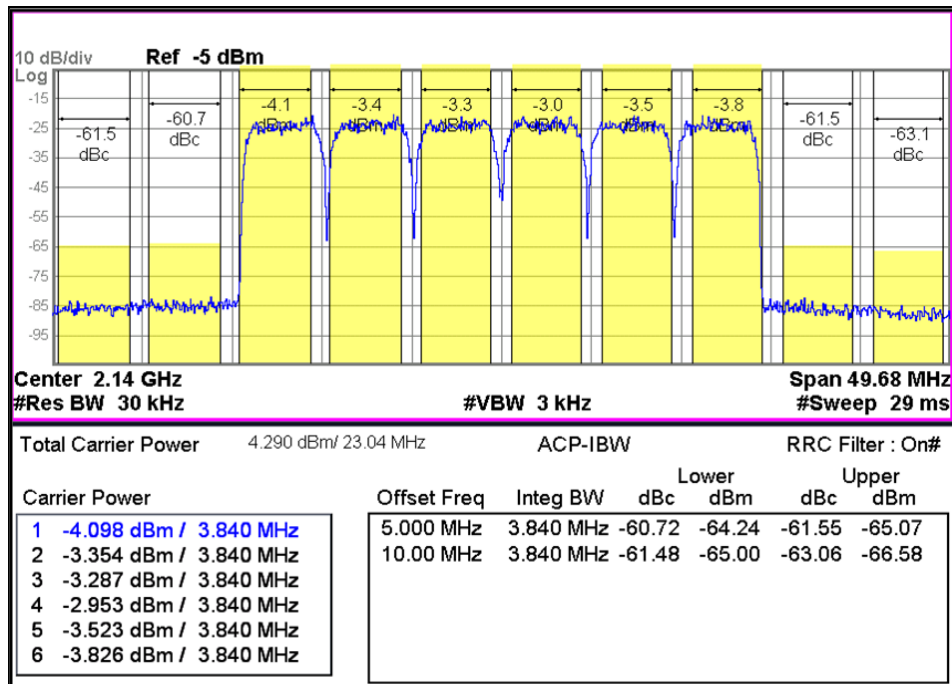


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WCDMA 4FA 2140 -60dBc



WCDMA 6FA 2140 -60dBc

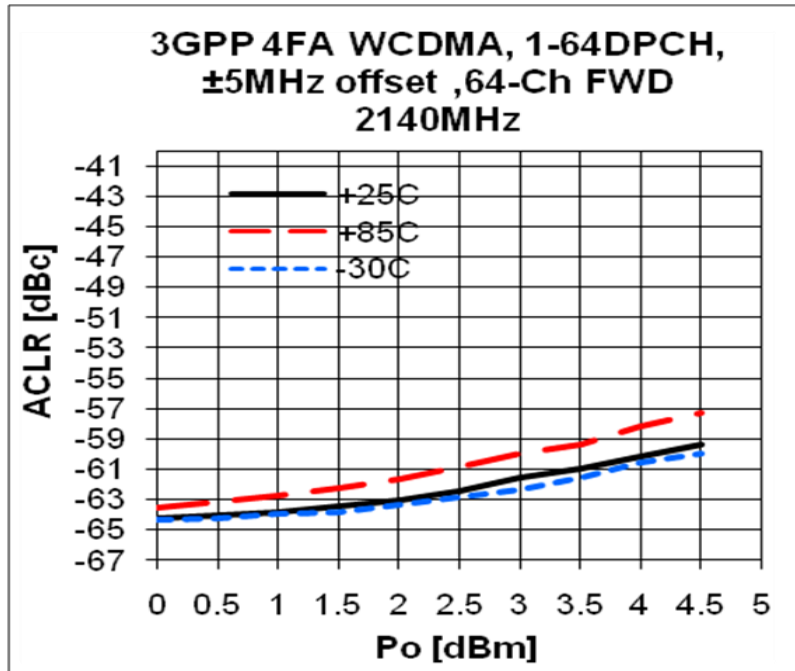


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5-4000 MHz Cascadable InGaP HBT Gain Block

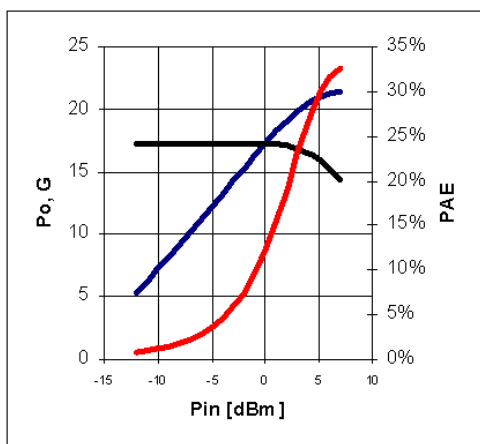


ACLR

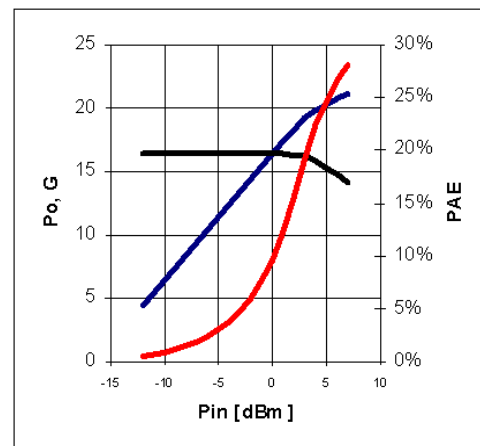


Device Performance

Pin-Pout-Gain



900MHz, 5V/85mA



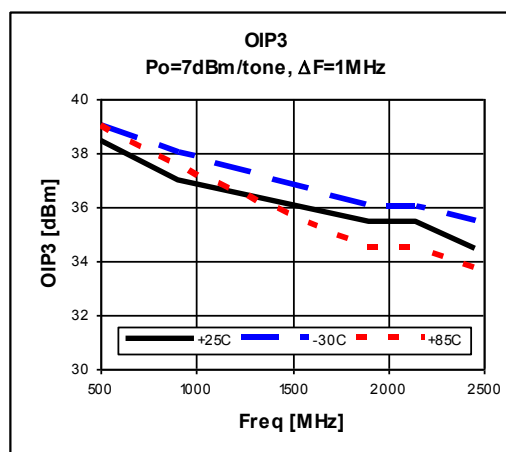
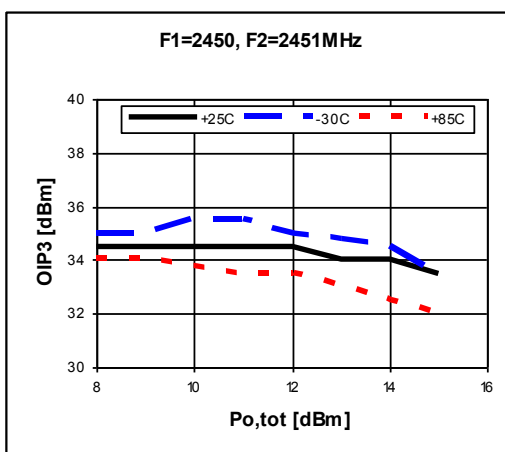
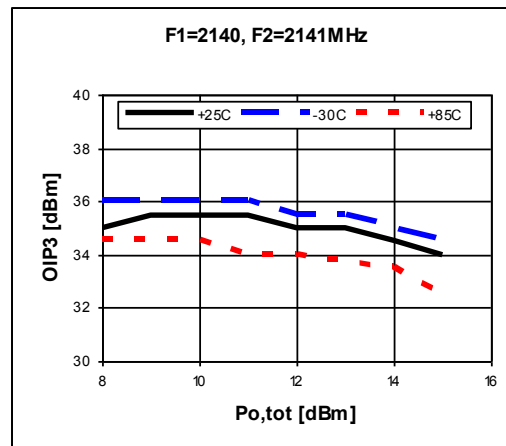
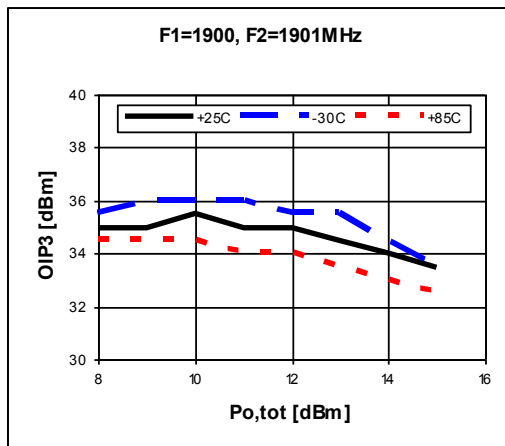
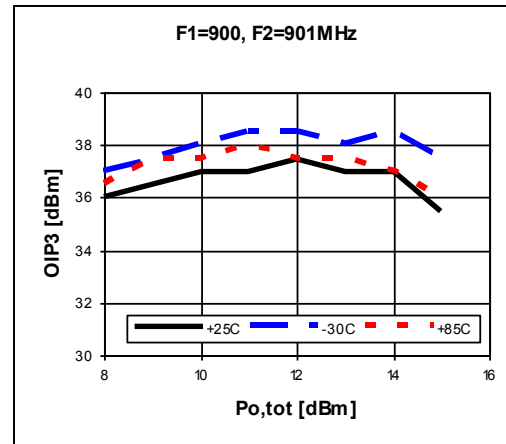
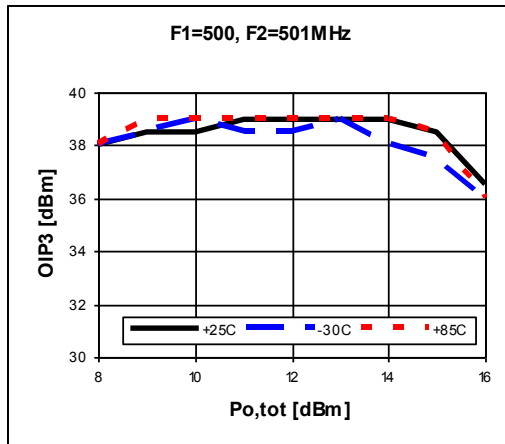
1900 MHz, 5V/85mA

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OIP3

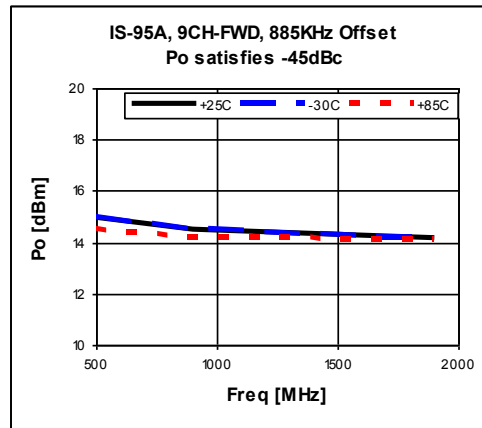
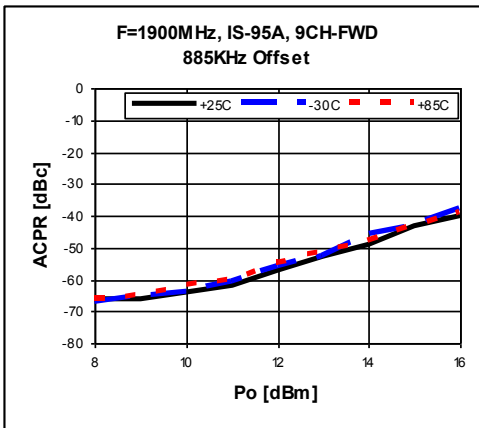
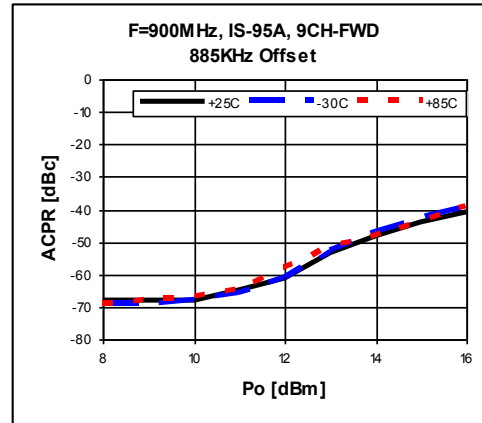
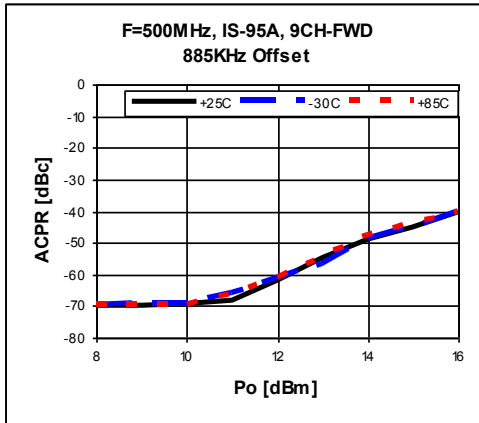


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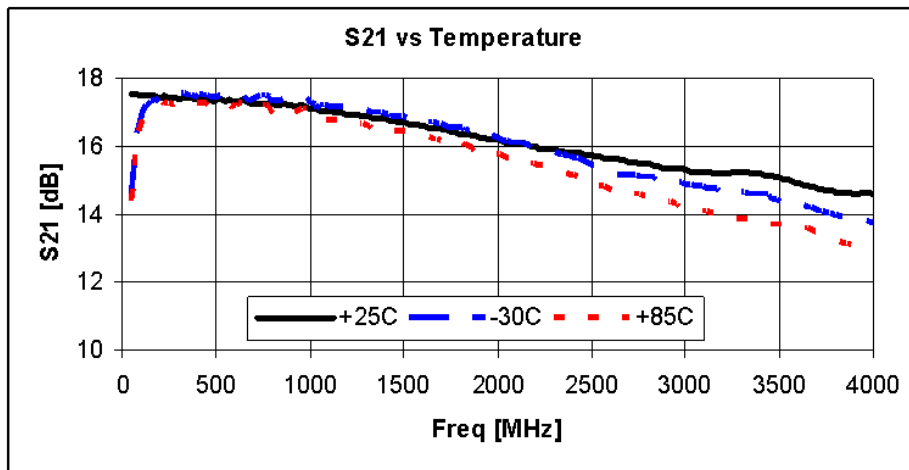
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ACPR



Gain Flatness

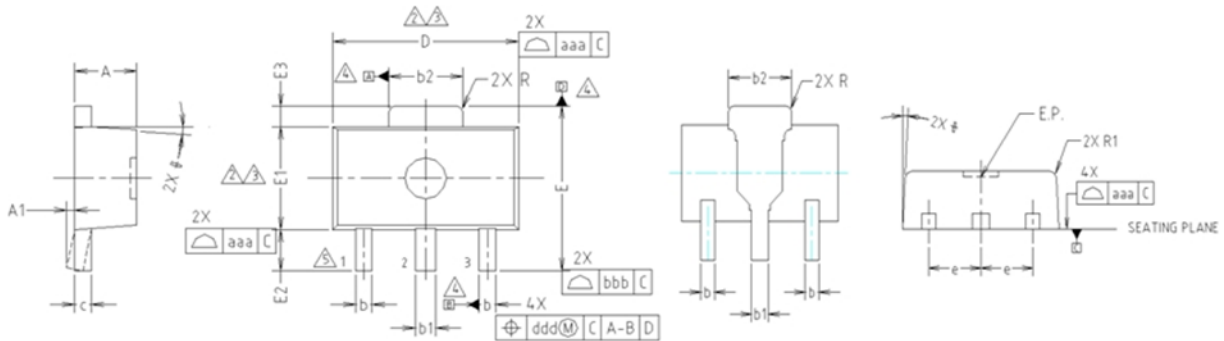


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Package Outline Dimension

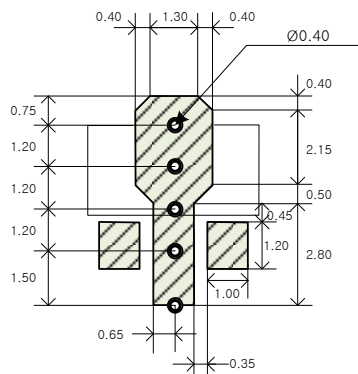


- NOTE:**
 1. DIMENSIONS IN MILLIMETERS.
- ⚠ DIMENSION D DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.5mm PER END. DIMENSION E1 DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.5mm PER SIDE.
 - ⚠ 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.
 - ⚠ DATUMS A, B AND D TO BE DETERMINED 0.18mm FROM THE LEAD TIP.
 - ⚠ 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

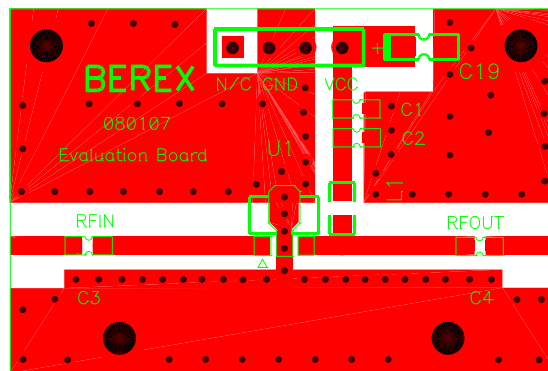
PCB Land Pattern



Note : All dimension _ millimeters

PCB lay out _ on BeRex website

PCB Mounting

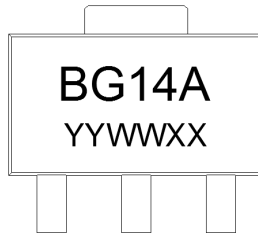


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Package Marking

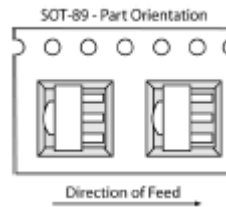


Pin 1

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
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