BG11C

50-4000 MHz Cascadable InGaP HBT Gain Block

Device Features

- OIP3 = 30.0 dBm @ 1900 MHz
- Gain = 20.8 dB @ 1900 MHz
- Output P1 = 17.3 dBm @1900 MHz
- Patented temperature compensation
- RoHS2-compliant SOT-89 SMT package

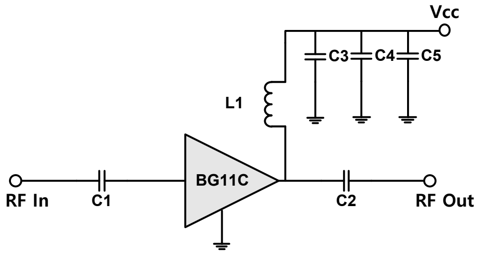
Product Description

BeRex's BG11C is a high performance InGaP HBT MMIC amplifier is 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 BG11C is designed for high linearity gain block applications that require excellent gain flatness and over voltage protection without additional external components. It is packaged in a RoHS2-compliant SOT-89 surface mount package.

Applications

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

Applications Circuit



C1, C2, C3 = 100pF ± 5%, C4 = 1000pF ± 5%, C5 = 10uF, L1 = 33nH ±5%

*C1,C2 = 12nF; L1 = 2.7uH for IF Bandwidth

Electrical Specifications

Device performance _ measured on a BeRex evaluation board at 25°C, Vc=5V, 50 Ω system.

Parameter	Conditions	Min	Typ	Max	Unit
Operational Frequency Range		50		4000	MHz
Test Frequency			1900		MHz
Gain		19.3	20.8		dB
Input Return Loss			-18.5		dB
Output Return Loss			-16.0		dB
Output IP3	6 dBm / tone , Δf=1 MHz	27.0	30.0		dBm
Output P1dB		16.3	17.3		dBm
Noise Figure			4.0		dB

Recommended Operating Conditions

Parameter	Min	Typ	Max	Unit
Bandwidth	50		4000	MHz
I_c @ (V_c = 5V)	38	48	58	mA
V_c	4.0	5	5.25	V
dG/dT		-0.004		dB/°C
R_{TH}		50		°C/W
Operating Case Temperature	-40		+85	°C

Electrical specifications are measured at specified test conditions.

Specifications are not guaranteed over all recommended operating conditions.

Absolute Maximum Ratings

Parameter	Rating	Unit
Storage Temperature	-55 to +155	°C
Junction Temperature	+165	°C
Supply Voltage	+6.0	V
Supply Current	160	mA
Input RF Power	23	dBm

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

Typical Performance (Vc = 5V, Ic = 48mA, T = 25°C)

Freq	MHz	70	150	250	500	900	1900	2140	2450	3500
S21	dB	22.8	22.5	22.4	22.3	21.9	20.8	20.4	19.9	16.2
S11	dB	-18.6	-17.2	-19.0	-17.5	-18.8	-18.5	-21.8	-26.0	-8.5
S22	dB	-7.1	-10.5	-16.6	-19.4	-17.0	-16.0	-16.7	-16.1	-6.0
P1	dBm	15.9	15.9	16.0	15.8	16.4	17.3	17.0	16.5	
OIP3	dBm	29.9	28.0	30.0	28.0	29.5	30.0	29.0	28.0	
NF	dB	4.3	4.8	4.2	4.5	3.9	4.0	4.1	4.2	

Typical Performance (Vc = 4.7V, Ic = 40mA, T = 25°C)

Freq	MHz	70	500	900	1900	2140	2450	3500
S21	dB	22.6	22.0	21.7	20.6	20.4	19.8	16.2
S11	dB	-17.2	-16.3	-17.4	-17.7	-21.2	-28.4	-8.5
S22	dB	-6.9	-17.9	-15.8	-15.6	-16.8	-16.8	-6.0
P1	dBm	14.5	14.1	14.4	14.5	15.8	15.5	
OIP3	dBm	27.2	25.0	26.0	28.0	26.0	25.0	
NF	dB	4.2	4.5	3.8	4.0	4.1	4.1	

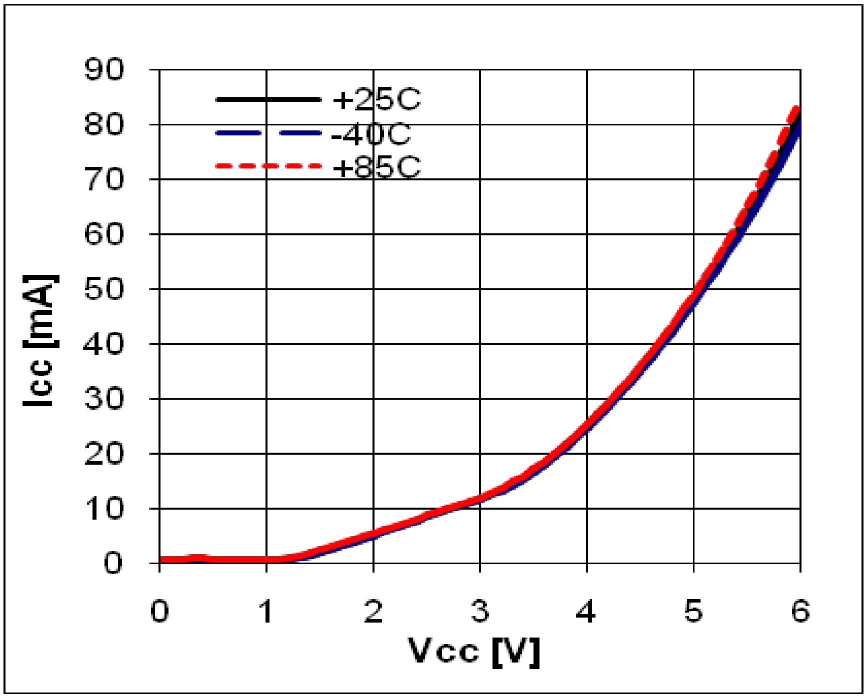
Typical Performance (Vc = 4.5V, Ic = 35mA, T = 25°C)

Freq	MHz	70	500	900	1900	2140	2450	3500
S21	dB	22.3	21.8	21.5	20.5	20.2	19.7	16.1
S11	dB	-16.1	-15.3	-16.2	-16.9	-20.1	-30.1	-8.6
S22	dB	-6.6	-16.7	-14.8	-15.1	-16.7	-17.3	-6.0
P1	dBm	13.0	12.9	13.0	14.3	13.5	15.0	
OIP3	dBm	25.6	23.0	24.0	26.0	25.0	23.0	
NF	dB	4.1	4.4	3.8	3.9	4.0	4.1	

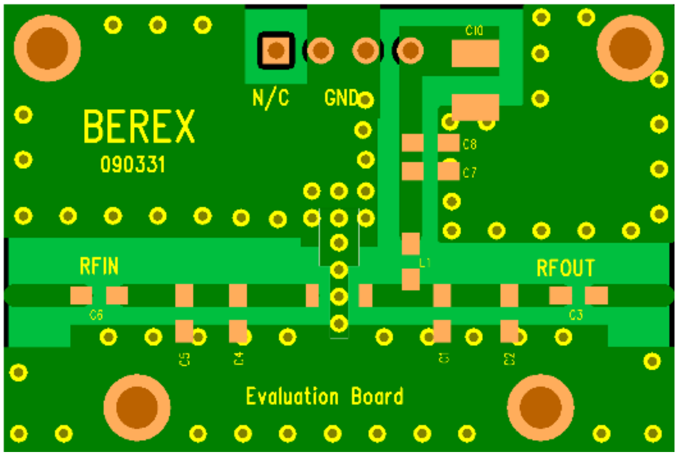
Typical Performance (Vc = 4.0V, Ic = 35mA, T = 25°C)

Freq	MHz	70	500	900	1900	2140	2450	3500
S21	dB	21.1	20.6	20.4	19.8	19.7	19.4	15.9
S11	dB	-12.8	-11.8	-12.2	-13.1	-15.3	-21.5	-9.4
S22	dB	-5.8	-12.8	-11.6	-12.7	-15.0	-18.9	-6.3
P1	dBm	9.1	8.7	8.0	10.0	11.0	13.0	
OIP3	dBm	20.6	17.0	19.0	19.5	19.0	17.0	
NF	dB	4.0	4.4	3.7	3.8	3.9	4.0	

V-I Characteristics



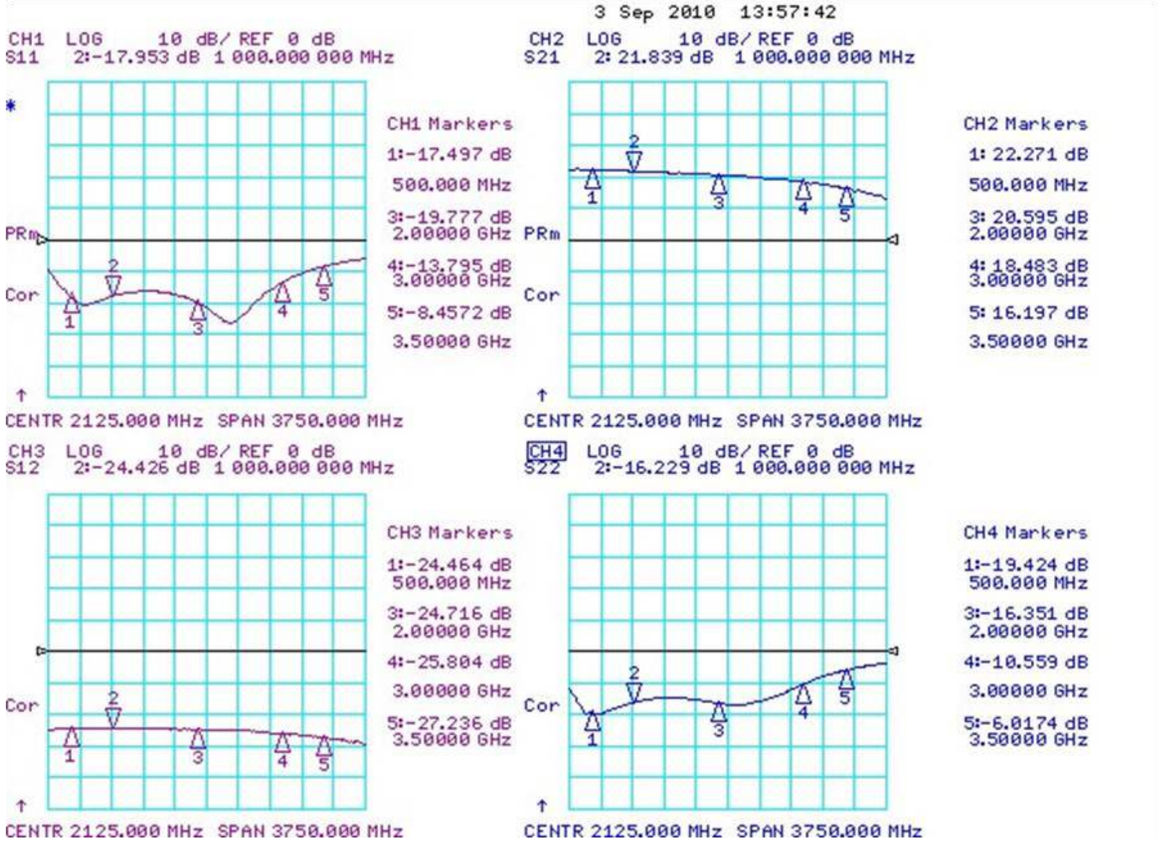
BeRex SOT89 Evaluation Board



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

Typical Device Data

S-parameters (Vc=5V, Ic=48mA, T=25°C)



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CH1 LOG 10 dB/ REF 0 dB
S11 2:-17.953 dB 1 000.000 000 MHz

CH1 Markers
1:-17.497 dB
500.000 MHz
3:-19.777 dB
2.00000 GHz
4:-13.795 dB
3.00000 GHz
5:-8.4572 dB
3.50000 GHz

CENTR 2125.000 MHz SPAN 3750.000 MHz

CH2 LOG 10 dB/ REF 0 dB
S21 2: 21.839 dB 1 000.000 000 MHz

CH2 Markers
1: 22.271 dB
500.000 MHz
3: 20.595 dB
2.00000 GHz
4: 18.483 dB
3.00000 GHz
5: 16.197 dB
3.50000 GHz

CENTR 2125.000 MHz SPAN 3750.000 MHz

CH3 LOG 10 dB/ REF 0 dB
S12 2:-24.426 dB 1 000.000 000 MHz

CH3 Markers
1:-24.464 dB
500.000 MHz
3:-24.716 dB
2.00000 GHz
4:-25.804 dB
3.00000 GHz
5:-27.236 dB
3.50000 GHz

CENTR 2125.000 MHz SPAN 3750.000 MHz

CH4 LOG 10 dB/ REF 0 dB
S22 2:-16.229 dB 1 000.000 000 MHz

CH4 Markers
1:-19.424 dB
500.000 MHz
3:-16.351 dB
2.00000 GHz
4:-10.559 dB
3.00000 GHz
5:-6.0174 dB
3.50000 GHz

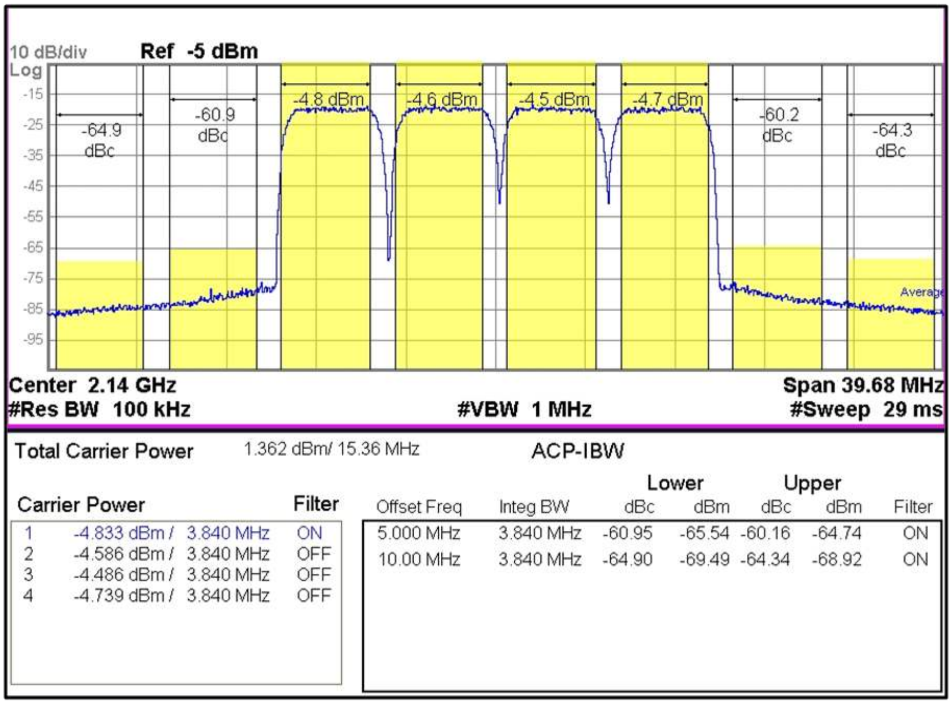
CENTR 2125.000 MHz SPAN 3750.000 MHz

S-Parameter

(Vdevice = 5.0V, Icc = 48mA, 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	0.443	-174.9	16.668	168.4	0.043	18.7	0.412	-35.0
500	0.533	148.5	13.133	149.2	0.064	3.2	0.134	-55.9
1000	0.500	115.5	13.361	128.8	0.061	-5.7	0.068	-42.3
1500	0.441	81.3	12.965	101.3	0.064	-10.7	0.047	-16.2
2000	0.336	52.9	11.607	79.4	0.060	-19.6	0.050	41.9
2500	0.257	10.3	12.000	54.8	0.062	-24.0	0.122	49.5
3000	0.155	-35.7	10.969	22.2	0.058	-31.7	0.189	26.0
3500	0.114	-105.1	8.593	-5.2	0.059	-36.1	0.297	-0.7
4000	0.131	167.8	6.650	-30.9	0.059	-44.6	0.373	-29.3

WCDMA 4FA 2140 -60dBc



Total Carrier Power 1.362 dBm/ 15.36 MHz

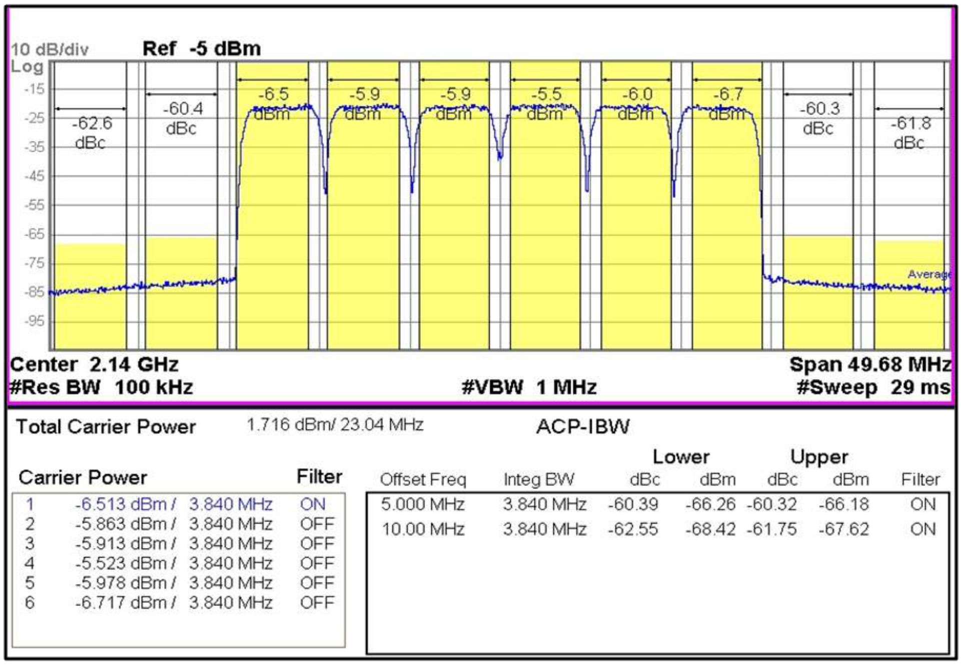
ACP-IBW

Carrier Power

	Carrier Power	Filter
1	-4.833 dBm / 3.840 MHz	ON
2	-4.586 dBm / 3.840 MHz	OFF
3	-4.486 dBm / 3.840 MHz	OFF
4	-4.739 dBm / 3.840 MHz	OFF

		Lower		Upper		
Offset Freq	Integ BW	dBc	dBm	dBc	dBm	Filter
5.000 MHz	3.840 MHz	-60.95	-65.54	-60.16	-64.74	ON
10.00 MHz	3.840 MHz	-64.90	-69.49	-64.34	-68.92	ON

WCDMA 6FA 2140 -60dBc



Total Carrier Power 1.716 dBm/ 23.04 MHz

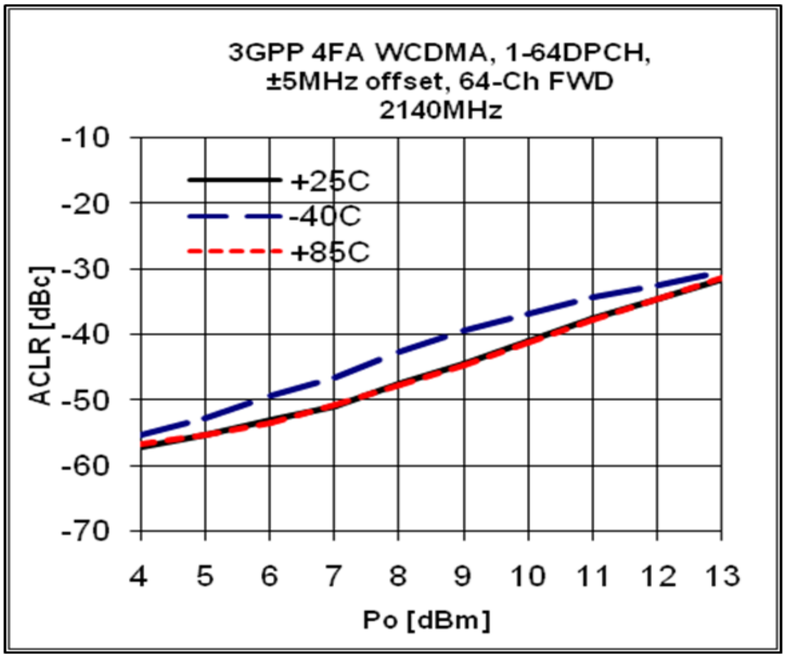
ACP-IBW

Carrier Power

	Carrier Power	Filter
1	-6.513 dBm / 3.840 MHz	ON
2	-5.863 dBm / 3.840 MHz	OFF
3	-5.913 dBm / 3.840 MHz	OFF
4	-5.523 dBm / 3.840 MHz	OFF
5	-5.978 dBm / 3.840 MHz	OFF
6	-6.717 dBm / 3.840 MHz	OFF

		Lower		Upper		
Offset Freq	Integ BW	dBc	dBm	dBc	dBm	Filter
5.000 MHz	3.840 MHz	-60.39	-66.26	-60.32	-66.18	ON
10.00 MHz	3.840 MHz	-62.55	-68.42	-61.75	-67.62	ON

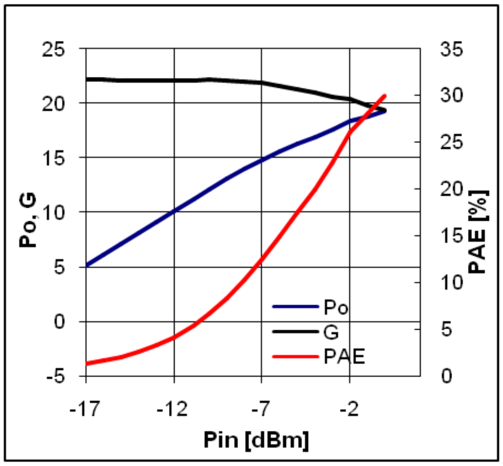
ACLR



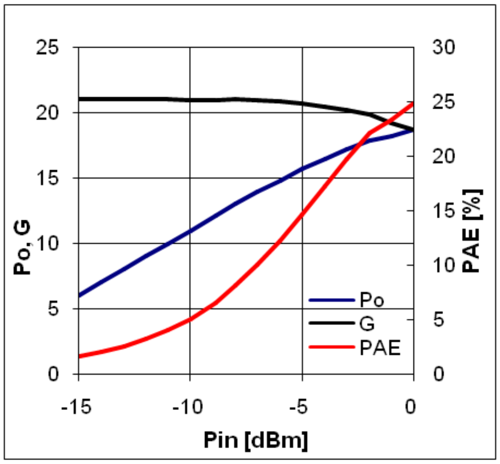
Typical Performance

(Vc=5V, Ic=48mA, T=25°C)

Pin-Pout-Gain

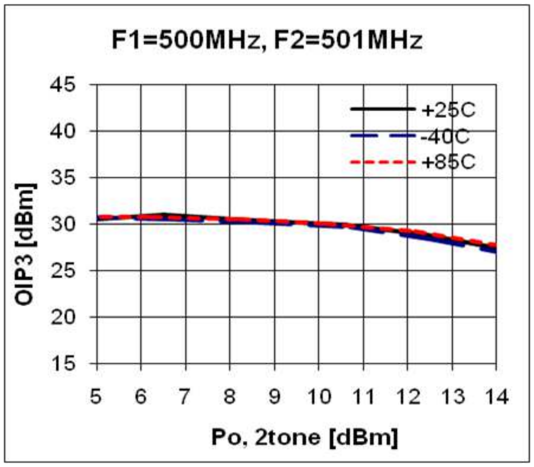


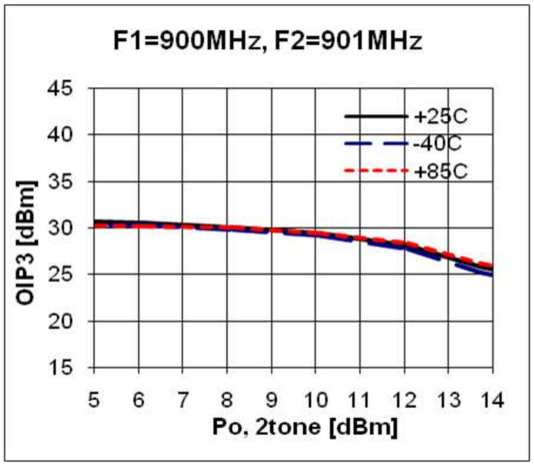
900MHz

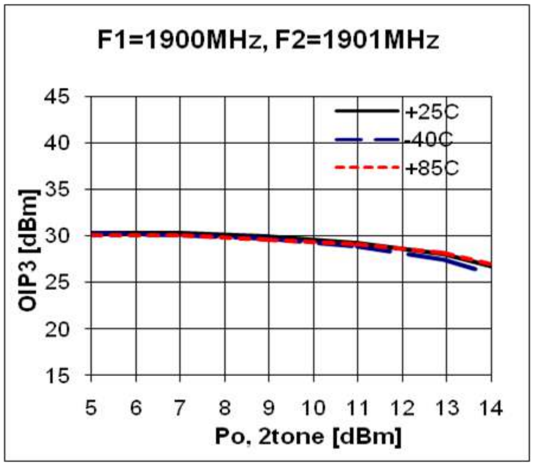


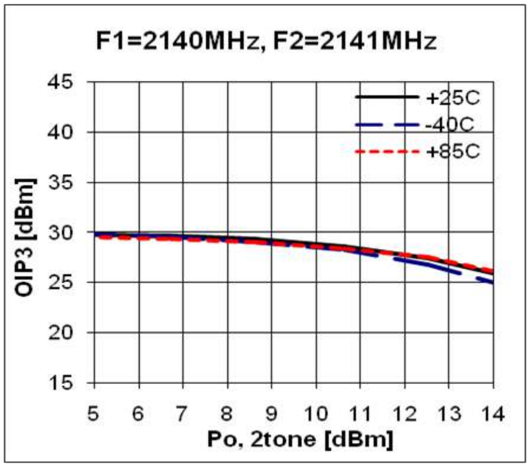
1900 MHz

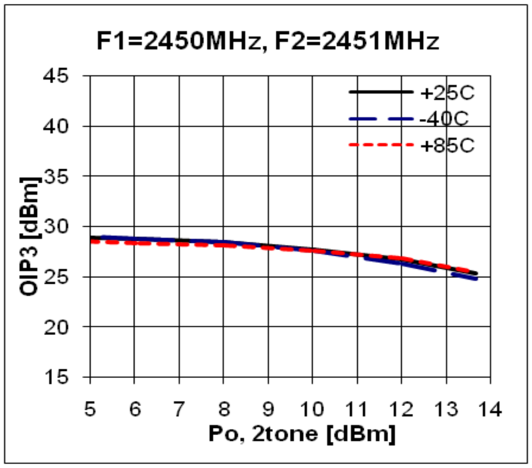
OIP3

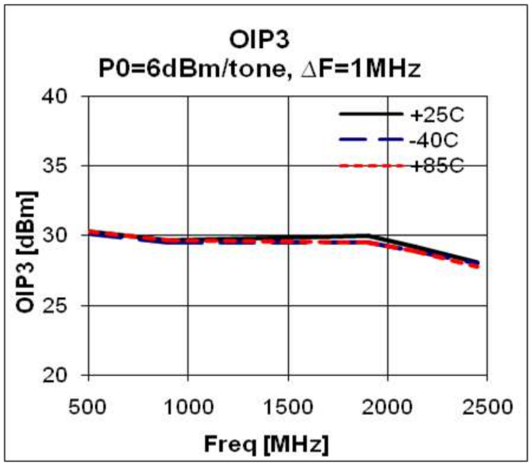

F1=500MHz, F2=501MHz
OIP3 [dBm]
45
40
35
30
25
20
15
5
6
7
8
9
10
11
12
13
14
Po, 2tone [dBm]
+25C
-40C
+85C


F1=900MHz, F2=901MHz
OIP3 [dBm]
45
40
35
30
25
20
15
5
6
7
8
9
10
11
12
13
14
Po, 2tone [dBm]
+25C
-40C
+85C

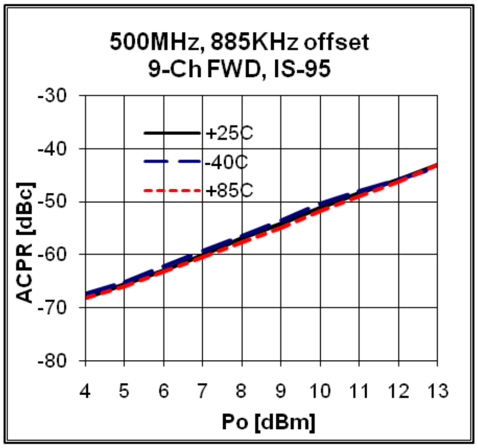

F1=1900MHz, F2=1901MHz
OIP3 [dBm]
45
40
35
30
25
20
15
5
6
7
8
9
10
11
12
13
14
Po, 2tone [dBm]
+25C
-40C
+85C

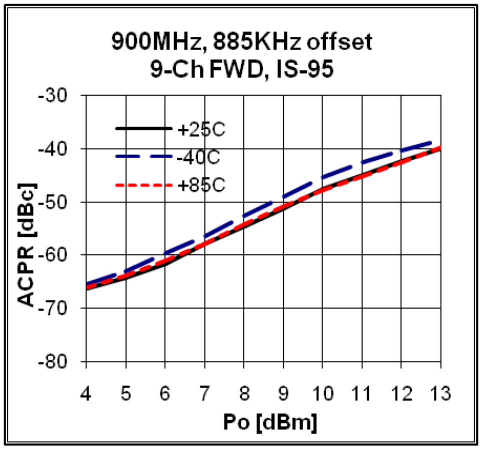

F1=2140MHz, F2=2141MHz
OIP3 [dBm]
45
40
35
30
25
20
15
5
6
7
8
9
10
11
12
13
14
Po, 2tone [dBm]
+25C
-40C
+85C

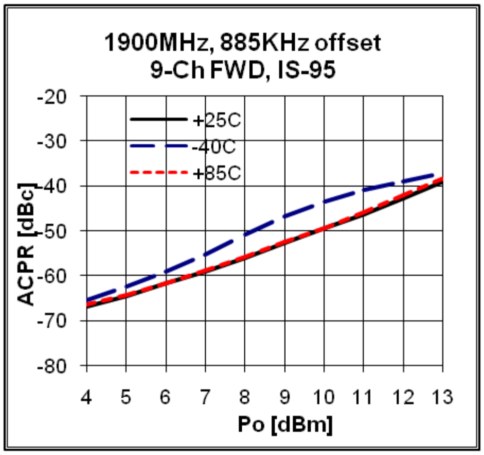

F1=2450MHz, F2=2451MHz
OIP3 [dBm]
45
40
35
30
25
20
15
5
6
7
8
9
10
11
12
13
14
Po, 2tone [dBm]
+25C
-40C
+85C

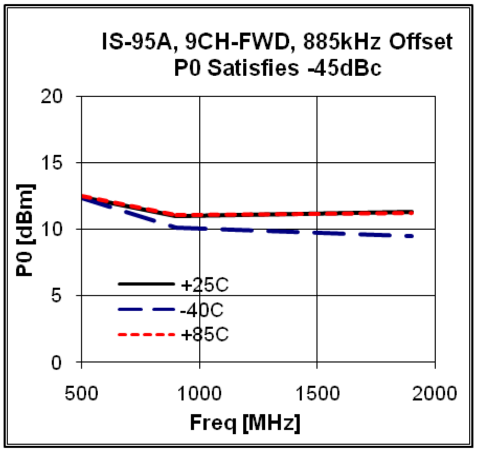

OIP3
P0=6dBm/tone, ΔF=1MHz
OIP3 [dBm]
40
35
30
25
20
500
1000
1500
2000
2500
Freq [MHz]
+25C
-40C
+85C

ACPR

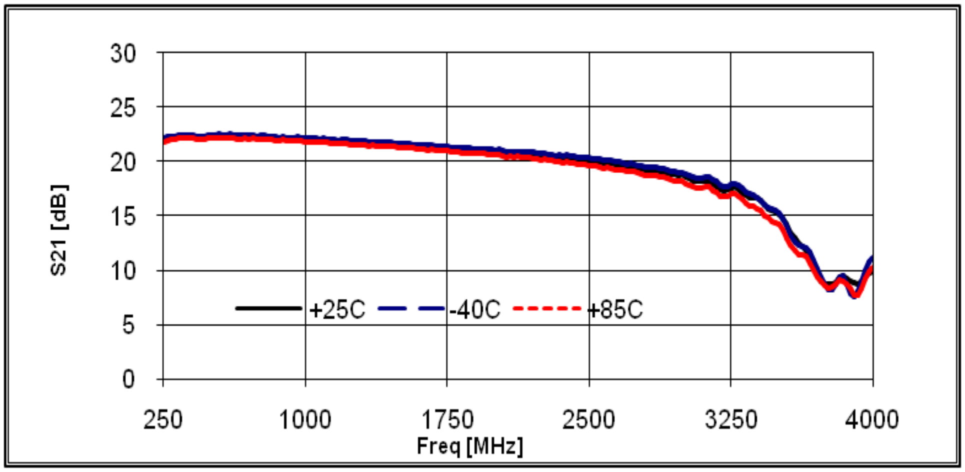




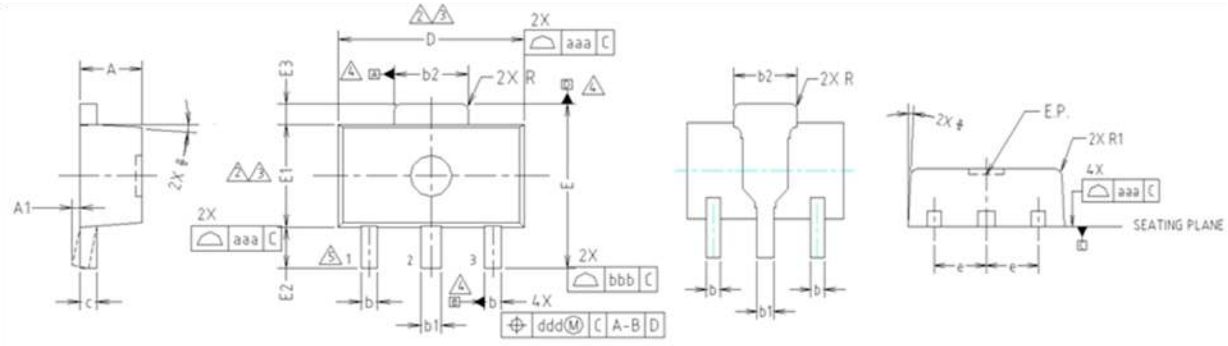




Gain Flatness



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 0.10mm FROM THE LEAD TIP.

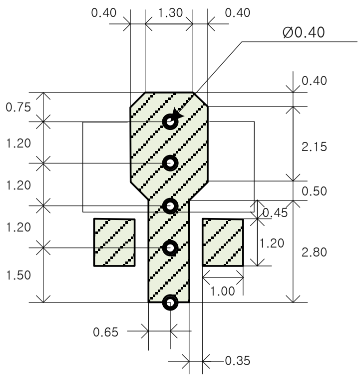
△5 TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.

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.			
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

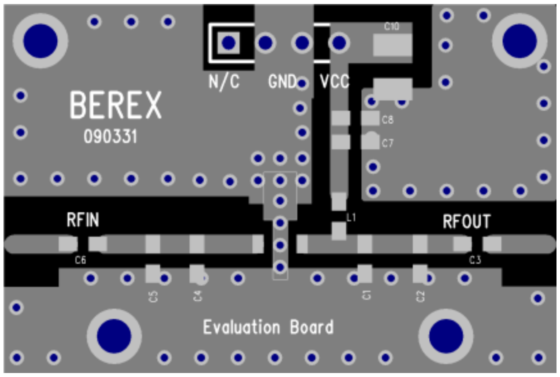
PCB Land Pattern



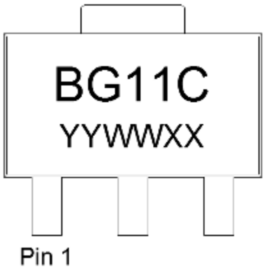
Note : All dimension _ millimeters

PCB lay out _ on BeRex website

PCB Mounting



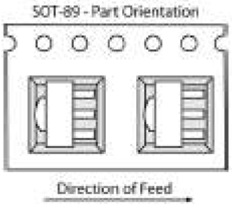
Package Marking



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-A114

MSL Rating:	**Level 1 at +260°C convection reflow**
Standard:	JEDEC Standard J-STD-020

Caution: ESD Sensitive
Appropriate precautions in handling, packaging
and testing devices must be observed.

Proper ESD procedures should be followed when handling this device.

RoHS Compliance

This part is compliant with Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive 2011/65/EU as amended by Directive 2015/863/EU.
This product also is compliant with a concentration of the Substances of Very High Concern (SVHC) candidate list which are contained in a quantity of less than 0.1%(w/w) in each components of a product and/or its packaging placed on the European Community market by the BeRex and Suppliers.

NATO CAGE code:

2	**N**	**9**	**6**	**F**