

BIF5

5-800 MHz Internally Matched IF Amplifier



Device Features

- OIP3 = 43.0 dBm @ 70 MHz
- Gain = 17.5 dB @ 70 MHz
- Output P1 dB = 20.5 dBm @ 70 MHz
- 50 Ω Cascadable
- Patented temperature compensation
- Patented over voltage protection
- Lead-free/RoHS-compliant SOT-89 SMT package



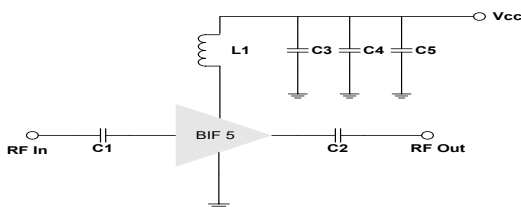
Product Description

BeRex's BIF5 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 and a patented **over voltage protection** circuit to protect a internal device. The BIF5 is designed for high linearity IF amplifier that requires excellent gain, high OIP3 and 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=100nF \pm 5%; C3 = 100 pF \pm 5%; C4 = 1000pF \pm 5%

*C5 = 10uF; L1 = 1uH \pm 5%

*C1, C2 = 100pF; L1 = 33nH \pm 5% for RF Bandwidth

Typical Performance¹

| Parameter | Frequency | | | | | Unit |
|-------------------|-----------|-------|-------|-------|-------|------|
| | 70 | 140 | 250 | 500 | 800 | |
| Gain | 17.5 | 17.5 | 17.5 | 17.5 | 17.1 | dB |
| S11 | -15.8 | -15.4 | -15.5 | -14.1 | -18.3 | dB |
| S22 | -17.1 | -19.1 | -26.3 | -16.1 | -10.8 | dB |
| OIP3 ² | 43.0 | 42.5 | 41.0 | 40.0 | 37.0 | dBm |
| P1dB | 20.5 | 20.5 | 20.5 | 21.0 | 21.0 | dBm |
| Noise Figure | 4.0 | 4.1 | 4.2 | 4.3 | 4.3 | 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 10 dBm per tone separated by 1 MHz.

| | Min. | Typical | Max. | Unit |
|--|------|---------|------|-------|
| Bandwidth | 5 | | 800 | MHz |
| I _c @ (V _c = 5V) | 97 | 107 | 117 | mA |
| V _c | | 5.0 | | V |
| dG/dT | | -0.003 | | dB/°C |
| R _{TH} | | 50 | | °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 | +6.0 | V |
| Supply Current | 160 | mA |
| Input RF Power | 23 | dBm |

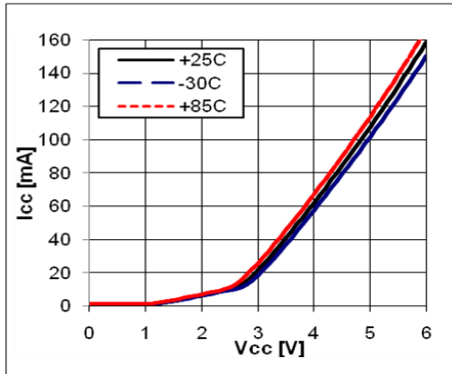
Operation of this device above any of these parameters may result in permanent damage.

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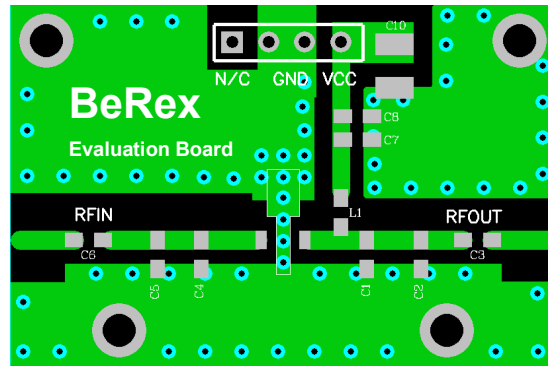
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V-I Characteristics



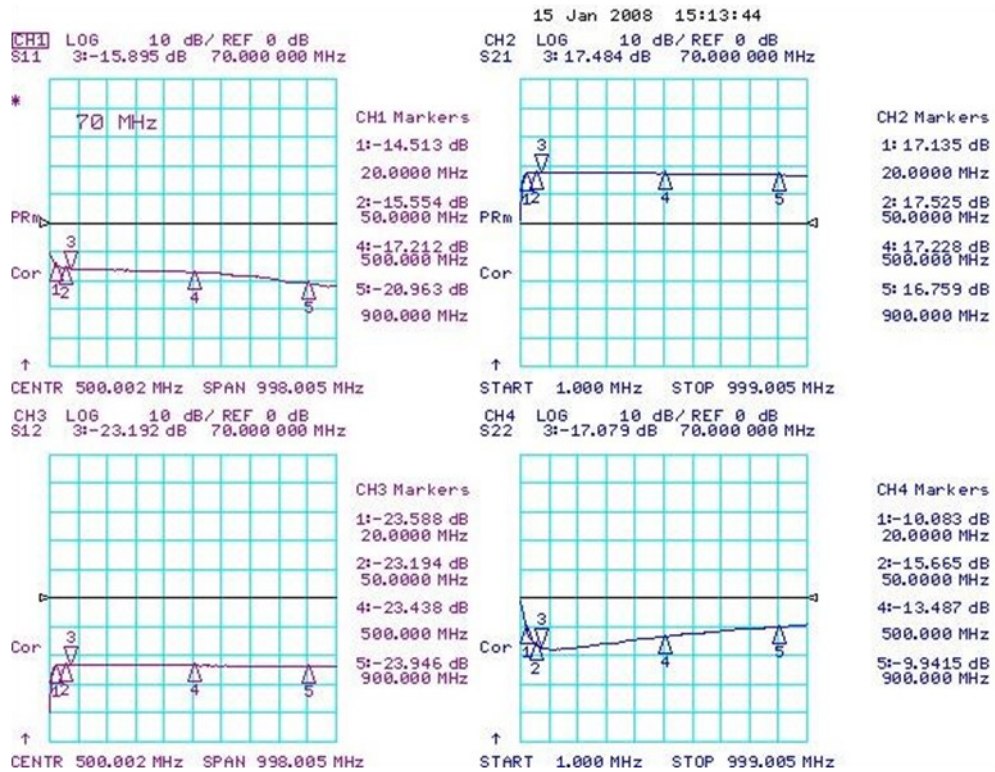
BeRex SOT89 Evaluation Board



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

Typical Device Data

S-parameters (Vc=5V, Ic=107mA, T=25°C)



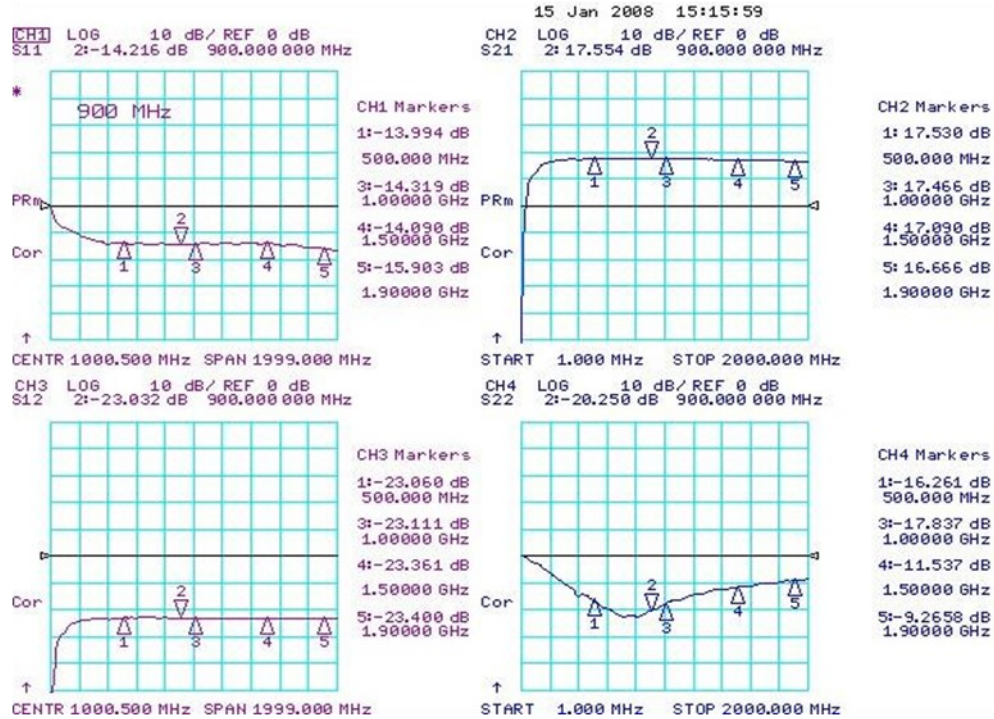
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RF Bandwidth

S-parameters (Vc=5V, Ic=107mA, T=25°C)



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S-Parameter

(V_{device} = 5.0V, I_{cc} = 107mA, 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 | 0.635 | 175.5 | 8.232 | 175.6 | 0.066 | 0.3 | 0.155 | -12.0 |
| 500 | 0.627 | 157.0 | 7.315 | 159.7 | 0.072 | -1.4 | 0.178 | -62.9 |
| 1000 | 0.603 | 136.7 | 7.880 | 144.7 | 0.066 | -1.8 | 0.235 | -111.5 |
| 1500 | 0.580 | 118.0 | 6.733 | 131.1 | 0.070 | 2.4 | 0.322 | -151.7 |
| 2000 | 0.491 | 99.4 | 6.895 | 114.4 | 0.069 | -1.7 | 0.393 | 175.7 |
| 2500 | 0.471 | 86.3 | 6.953 | 104.4 | 0.071 | 5.1 | 0.470 | 147.9 |
| 3000 | 0.432 | 69.7 | 8.427 | 80.7 | 0.080 | -0.9 | 0.549 | 119.3 |
| 3500 | 0.415 | 63.8 | 7.474 | 53.8 | 0.079 | -0.9 | 0.608 | 97.8 |
| 4000 | 0.457 | 51.4 | 6.617 | 32.7 | 0.090 | -8.8 | 0.640 | 68.7 |

Typical Performance (V_d = 5V, I_c = 107mA, T = 25°C)

| Freq | MHz | 70 | 140 | 250 | *500 | 800 |
|------|-----|-------|-------|-------|-------|-------|
| S21 | dB | 17.5 | 17.5 | 17.5 | 17.5 | 17.1 |
| S11 | dB | -15.8 | -15.4 | -15.5 | -14.1 | -18.3 |
| S22 | dB | -17.1 | -19.1 | -26.3 | -16.1 | -10.8 |
| P1 | dBm | 20.5 | 20.5 | 20.5 | 21.0 | 21 |
| OIP3 | dBm | 43 | 42.5 | 41.0 | 40.0 | 37 |
| NF | dB | 4.0 | 4.1 | 4.2 | 4.3 | 4.3 |

Typical Performance (V_d = 4.7V, I_c = 95mA, T = 25°C)

| Freq | MHz | 70 | 140 | 250 | 500 | 800 |
|------|-----|-------|-------|-------|-------|-------|
| S21 | dB | 17.6 | 17.5 | 17.4 | 17.4 | 17.1 |
| S11 | dB | -15.1 | -17.3 | -18.1 | -17.5 | -18.7 |
| S22 | dB | -14.3 | -13.7 | -14.1 | -14 | -10.7 |
| P1 | dBm | 19.6 | 20.2 | 20.1 | 20.4 | 20 |
| OIP3 | dBm | 41 | 40.5 | 39.5 | 37 | 35.5 |
| NF | dB | 4.0 | 4.1 | 4.2 | 4.3 | 4.3 |

Typical Performance (V_d = 4.5V, I_c = 85mA, T = 25°C)

| Freq | MHz | 70 | 140 | 250 | 500 | 800 |
|------|-----|-------|-------|-------|-------|-------|
| S21 | dB | 17.4 | 17.4 | 17.5 | 17.4 | 17 |
| S11 | dB | -15.3 | -17.6 | -18.3 | -17.8 | -18.9 |
| S22 | dB | -14.2 | -13.5 | -13.9 | -13.9 | -10.6 |
| P1 | dBm | 19.2 | 19.0 | 19.2 | 19.4 | 19.4 |
| OIP3 | dBm | 40.0 | 41.0 | 38.5 | 36.5 | 35 |
| NF | dB | 4.0 | 4.1 | 4.2 | 4.3 | 4.3 |

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Typical Performance (Vd = 4V, Ic = 63mA, T = 25°C)

| Freq | MHz | 70 | 140 | 250 | 500 | 800 |
|------|-----|-------|-------|-------|-------|-------|
| S21 | dB | 17.4 | 17.3 | 17.2 | 17.2 | 16.9 |
| S11 | dB | -16 | -18.6 | -19.5 | -18.9 | -20.1 |
| S22 | dB | -13.8 | -13.1 | -13.5 | -13.5 | -10.3 |
| P1 | dBm | 17 | 17.5 | 17.7 | 17.5 | 17.2 |
| OIP3 | dBm | 35.5 | 35.5 | 35 | 33 | 32 |
| NF | dB | 4.0 | 4.1 | 4.2 | 4.3 | 4.3 |

Typical Performance (Vd = 3.5V, Ic = 41mA, T = 25°C)

| Freq | MHz | 70 | 140 | 250 | 500 | 800 |
|------|-----|-------|-------|-------|-------|-------|
| S21 | dB | 17.1 | 17.0 | 16.9 | 16.8 | 16.5 |
| S11 | dB | -17.9 | -21.2 | -22.6 | -21.7 | -23.1 |
| S22 | dB | -13.1 | -12.3 | -12.6 | -12.6 | -9.8 |
| P1 | dBm | 13.7 | 14.6 | 14.6 | 14.5 | 14.2 |
| OIP3 | dBm | 29 | 29 | 29 | 27.5 | 27.5 |
| NF | dB | 4.0 | 4.1 | 4.2 | 4.3 | 4.3 |

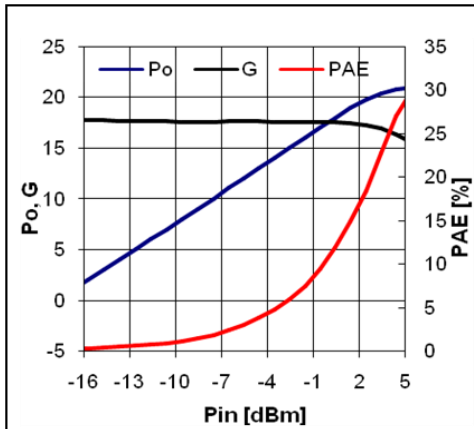
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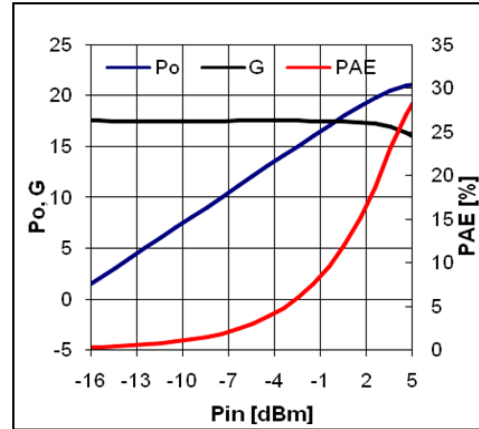


Device Performance

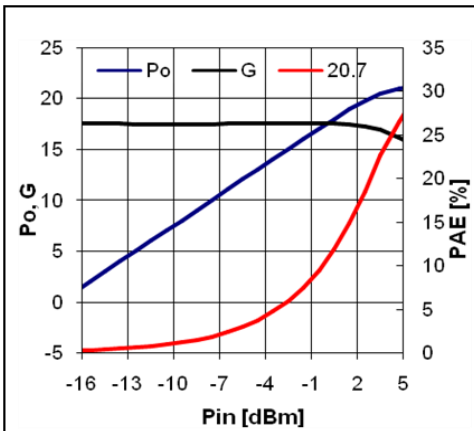
Pin-Pout-Gain



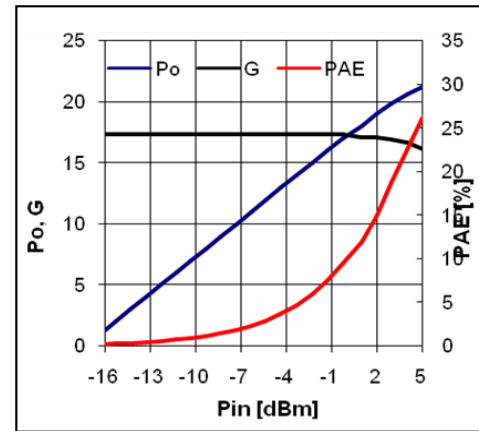
70MHz, 5V/107mA



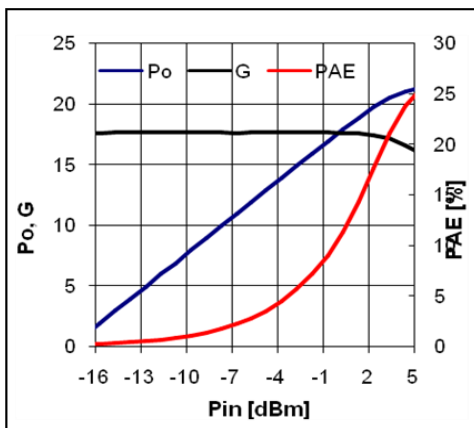
140MHz, 5V/107mA



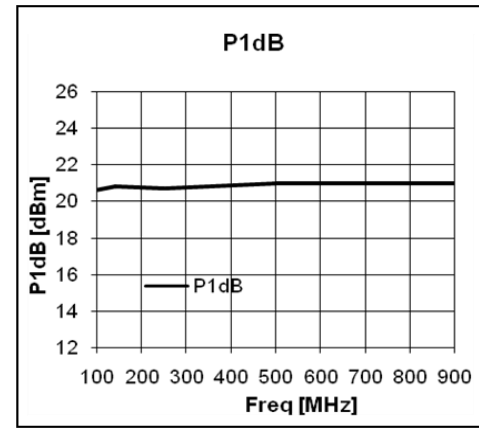
250MHz, 5V/107mA



500MHz, 5V/107mA



900MHz, 5V/107mA

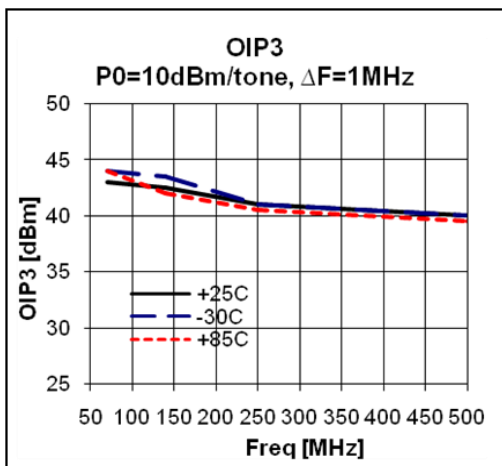
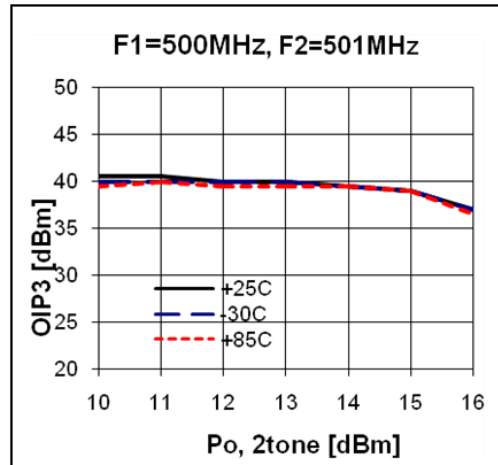
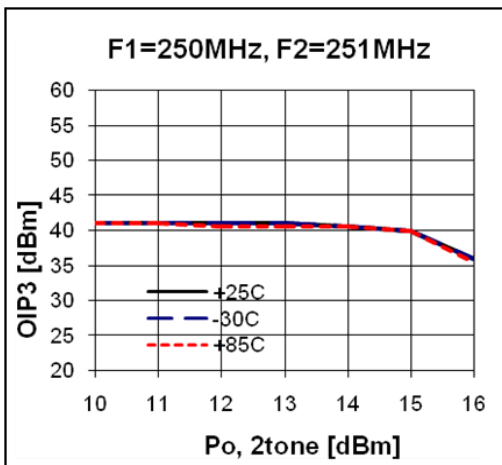
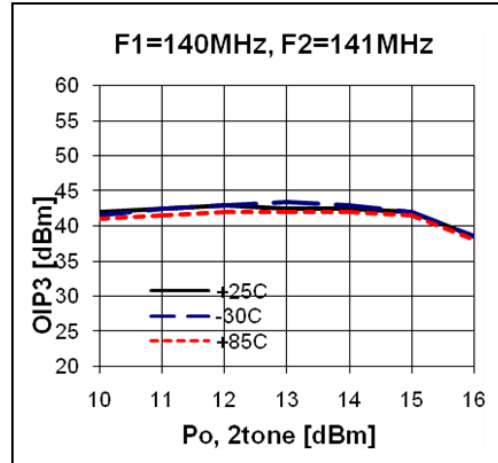
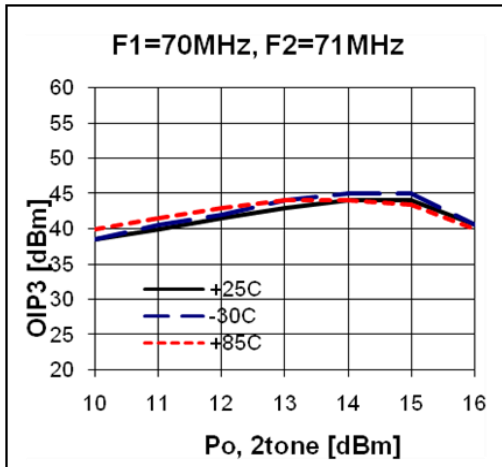


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OIP3

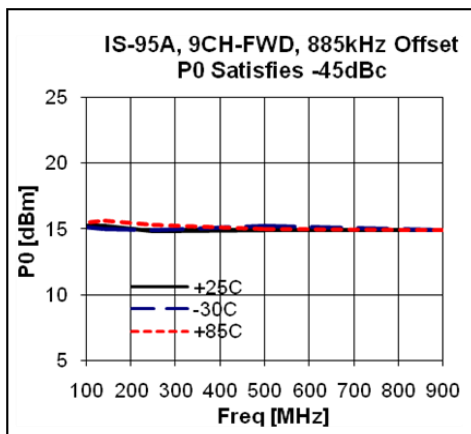
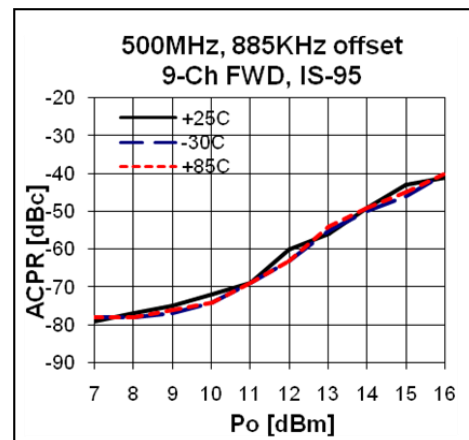
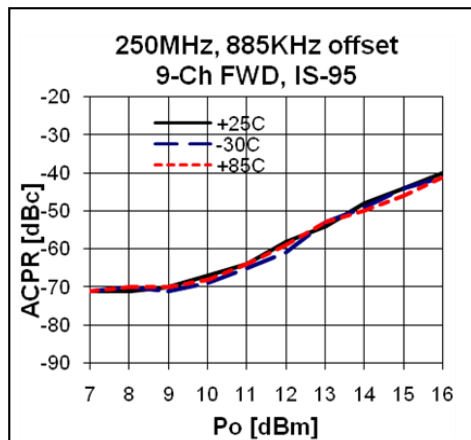
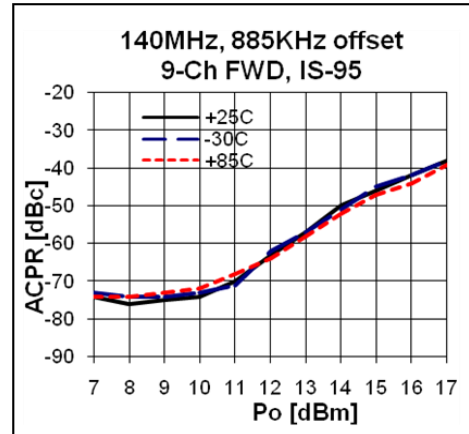
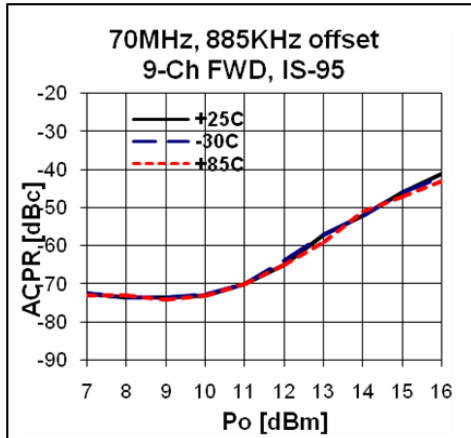


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ACPR

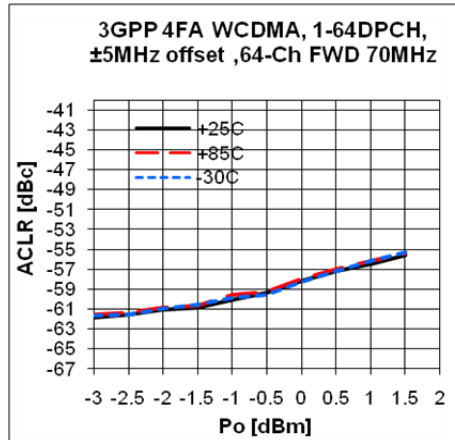


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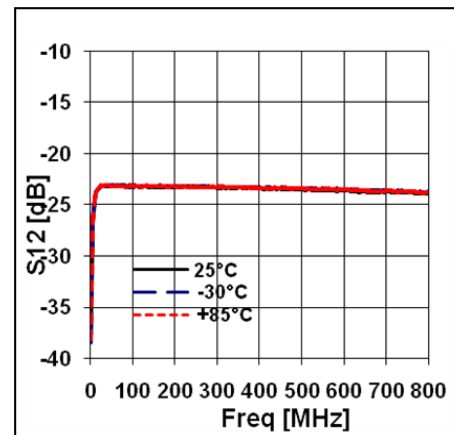
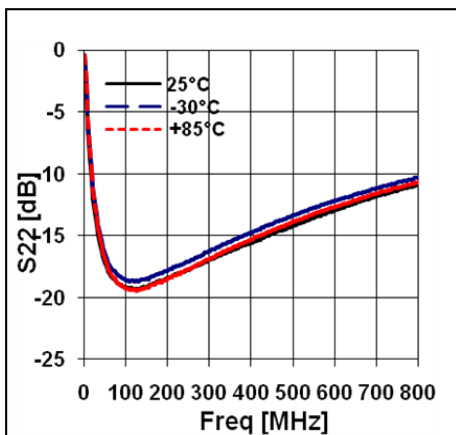
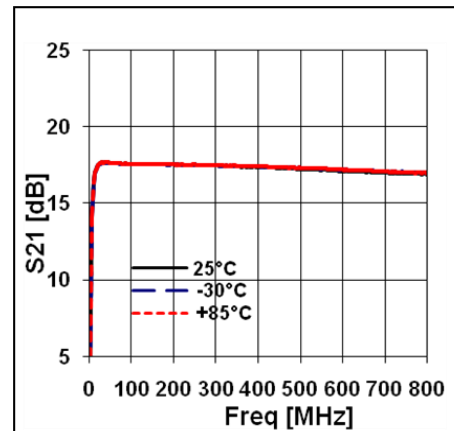
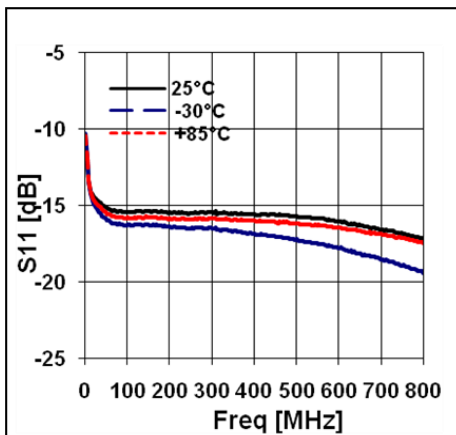
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ACLR



S-Parameters over Temperature

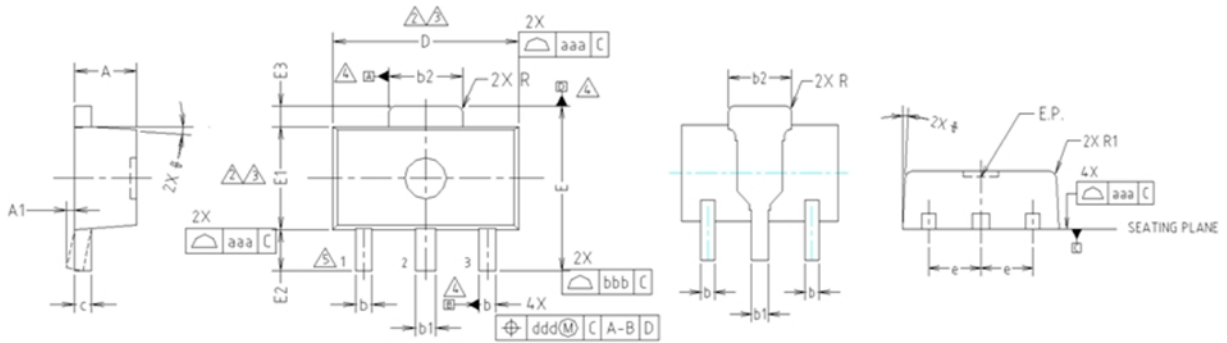


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Package Outline Dimension

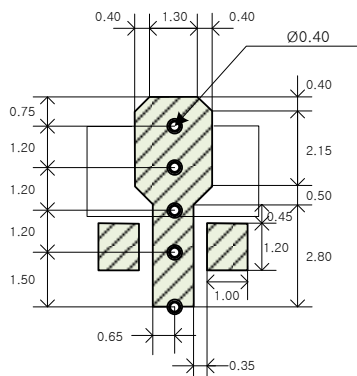


- NOTE:**
1. DIMENSIONS IN MILLIMETERS.
- ⚠ DIMENSION D DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.5mm PER END. DIMENSION E1 DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.5mm PER SIDE.
 - ⚠ 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

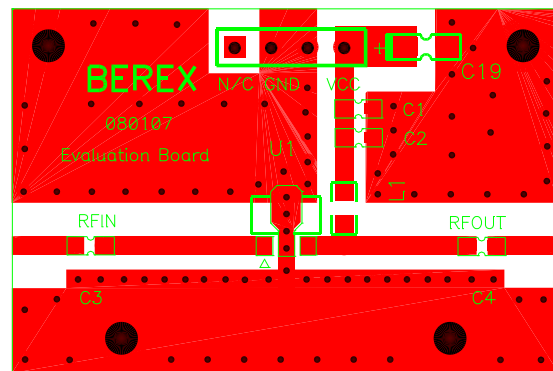
PCB Land Pattern



Note : All dimension _ millimeters

PCB lay out _ on BeRex website

PCB Mounting

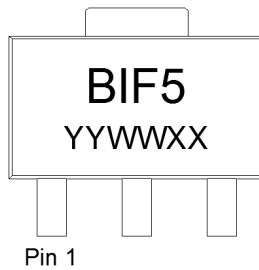


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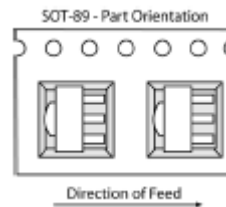
Package Marking



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 |



Proper ESD procedures should be followed when handling this device.

NATO CAGE code:

| | | | | |
|---|---|---|---|---|
| 2 | N | 9 | 6 | F |
|---|---|---|---|---|