

BG20A



5-800 MHz Internally Matched IF Amplifier

Device Features

- OIP3 = 39.0 dBm @ 70 MHz
- Gain = 24 dB @ 70 MHz
- Output P1 dB = 20.5 dBm @ 70 MHz
- 50 Ω Cascadable
- Patented temperature compensation
- Lead-free/RoHS-compliant SOT-89 SMT package



Product Description

BeRex's BG20A 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 BG20A 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.

Typical Performance¹

| Parameter | Frequency | | | | | Unit |
|-------------------|-----------|-------|-------|-------|------|------|
| | 70 | 140 | 250 | 500 | 800 | |
| Gain | 24.0 | 23.9 | 23.7 | 23.1 | 22.3 | dB |
| S11 | -19.5 | -21.2 | -22.0 | -26.0 | -30 | dB |
| S22 | -12.5 | -13.0 | -13.0 | -12.0 | -9.4 | dB |
| OIP3 ² | 39.0 | 37.0 | 37.0 | 36.0 | 33.0 | dBm |
| P1dB | 20.5 | 20.5 | 20.5 | 20.5 | 20.3 | dBm |
| Noise Figure | 3.4 | 3.4 | 3.5 | 3.6 | 3.6 | dB |

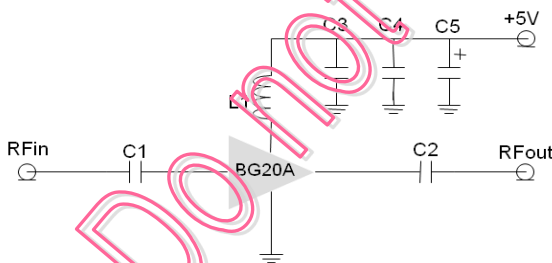
¹ Device performance _ measured on a BeRex evaluation board at 25°C, 50 Ω system.

² OIP3 _ measured with two tones at an output of 10 dBm per tone separated by 1 MHz.

Applications

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

Applications Circuit



*C1, C2=2700pF ± 5%; C3 = 100 pF ± 5%; C4 = 1000pF ± 5%

*C5 = 10uF; L1 = 470nH ± 5%

| | Min. | Typical | Max. | Unit |
|--|------|---------|------|-------|
| Bandwidth | 5 | | 800 | MHz |
| I _c @ (V _c = 5V) | 80 | 90 | 100 | mA |
| V _c | | 5.0 | | V |
| dG/dT | | -0.003 | | dB/°C |
| R _{TH} | | 50 | | °C/W |

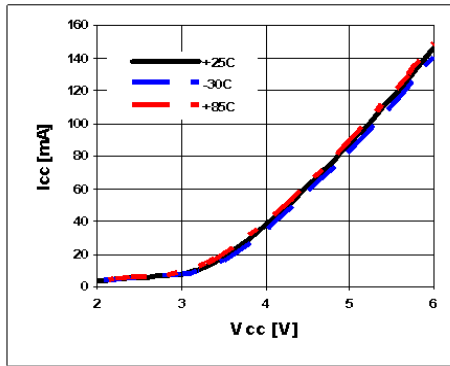
Absolute Maximum Ratings

| Parameter | Rating | Unit |
|----------------------------|-------------|------|
| Operating Case Temperature | -40 to +85 | °C |
| Storage Temperature | -55 to +155 | °C |
| Junction Temperature | +220 | °C |
| Operating Voltage | +6.5 | V |
| Supply Current | 200 | mA |
| Input RF Power | 23 | dBm |

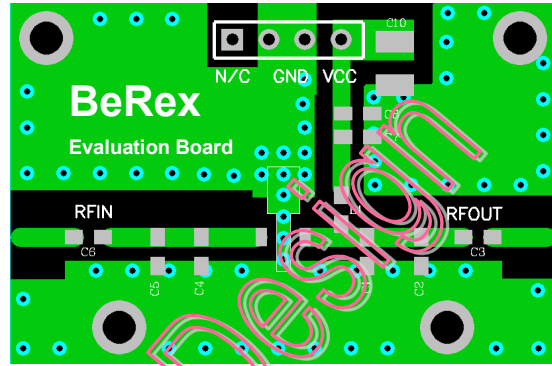
Operation of this device above any of these parameters may result in permanent damage.

5-800 MHz Internally Matched IF Amplifier

V-I Characteristics



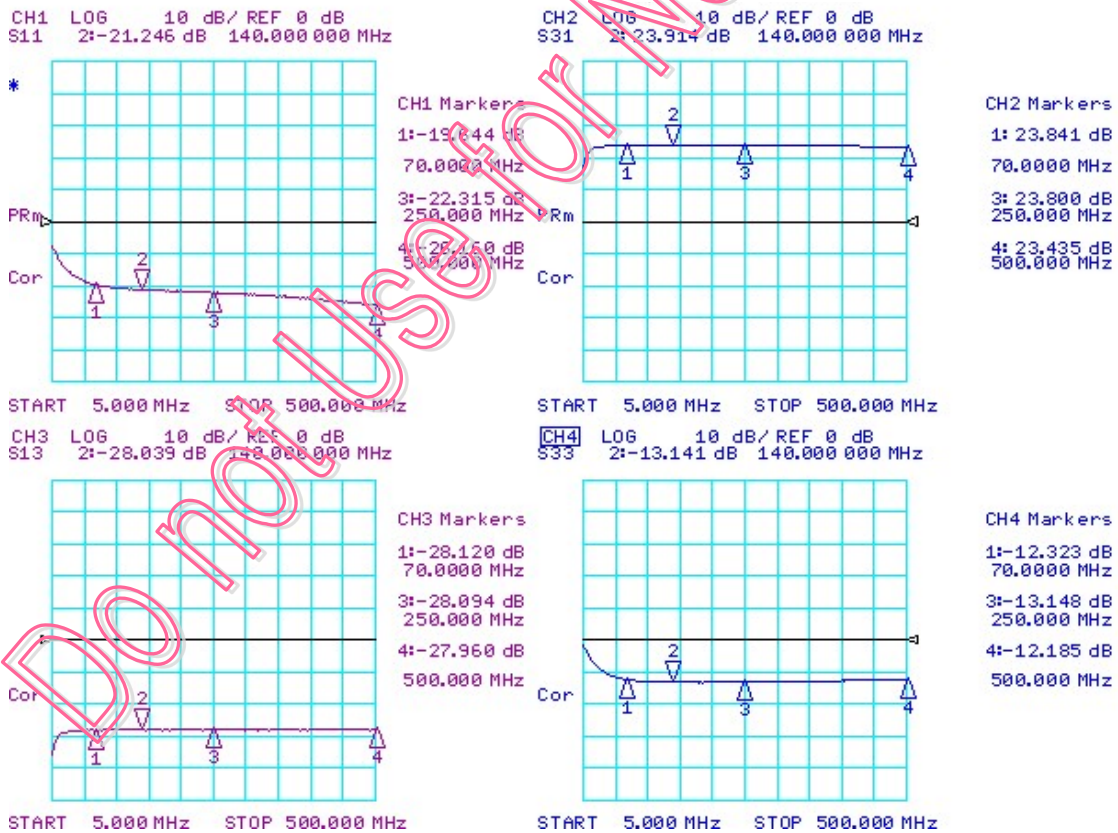
BeRex SOT89 Evaluation Board



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

Typical Device Data

S-parameters (Vc=5V, Ic=90mA, T=25°C)



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S-Parameter

(Vdevice = 5.0V, Icc = 86mA, 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] |
|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 10 | 0.331 | -56.956 | 10.899 | -130.684 | 0.027 | 51.642 | 0.666 | 138.145 |
| 50 | 0.124 | -121.832 | 15.402 | -175.255 | 0.039 | 8.389 | 0.274 | 50.493 |
| 100 | 0.094 | -148.663 | 15.715 | 170.439 | 0.039 | -2.297 | 0.229 | 17.022 |
| 150 | 0.085 | -164.361 | 15.673 | 160.148 | 0.040 | -9.520 | 0.220 | -1.972 |
| 200 | 0.082 | -173.639 | 15.667 | 150.953 | 0.040 | -14.447 | 0.217 | -15.671 |
| 250 | 0.077 | 179.776 | 15.488 | 142.474 | 0.039 | -19.359 | 0.220 | -26.966 |
| 300 | 0.073 | 174.971 | 15.506 | 133.989 | 0.040 | -24.824 | 0.223 | -36.438 |
| 350 | 0.068 | 169.602 | 15.220 | 125.499 | 0.040 | -29.937 | 0.227 | -45.740 |
| 400 | 0.062 | 165.033 | 15.275 | 117.646 | 0.039 | -34.787 | 0.233 | -54.264 |
| 450 | 0.056 | 160.728 | 14.921 | 108.985 | 0.040 | -39.029 | 0.240 | -61.890 |
| 500 | 0.049 | 155.970 | 14.851 | 101.860 | 0.040 | -43.699 | 0.246 | -68.880 |

Typical Performance (Vd = 5V, Vdevice*=4.85V, Ic = 85mA, T = 25°C)

| Freq | MHz | 70 | 140 | 250 | 500 | 800 |
|------|-----|-------|-------|-------|-------|------|
| S21 | dB | 24.0 | 23.9 | 23.7 | 23.1 | 22.3 |
| S11 | dB | -19.5 | -21.2 | -22.0 | -26.0 | -30 |
| S22 | dB | -12.5 | -13.0 | -13.0 | -12.0 | -9.4 |
| P1 | dBm | 20.5 | 20.5 | 20.5 | 20.5 | 20.3 |
| OIP3 | dBm | 39.0 | 37.0 | 37.0 | 36.0 | 33 |
| NF | dB | 3.4 | 3.4 | 3.5 | 3.6 | 3.6 |

*4.85V at the device is due to 0.15V drop across 470nH choke inductor.

5-800 MHz Internally Matched IF Amplifier

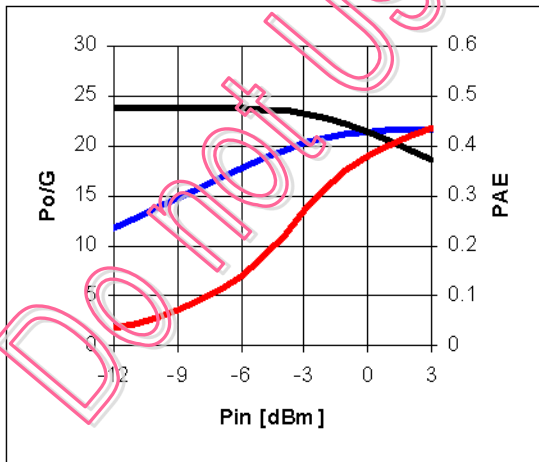
Typical Performance (Vd = 4.7V, Ic = 74mA, T = 25°C)

| Freq | MHz | 70 | 140 | 250 | 500 | 800 |
|------|-----|-------|-------|-------|-------|-------|
| S21 | dB | 23.8 | 23.8 | 23.6 | 23 | 22.1 |
| S11 | dB | -22.5 | -27.1 | -30.9 | -36 | -25.4 |
| S22 | dB | -11.5 | -12.3 | -12.2 | -10.5 | -8.7 |
| P1 | dBm | 19.5 | 19.9 | 20 | 19.5 | 19.3 |
| OIP3 | dBm | 36 | 37 | 35.5 | 33 | 31 |
| NF | dB | 3.4 | 3.4 | 3.5 | 3.6 | 3.6 |

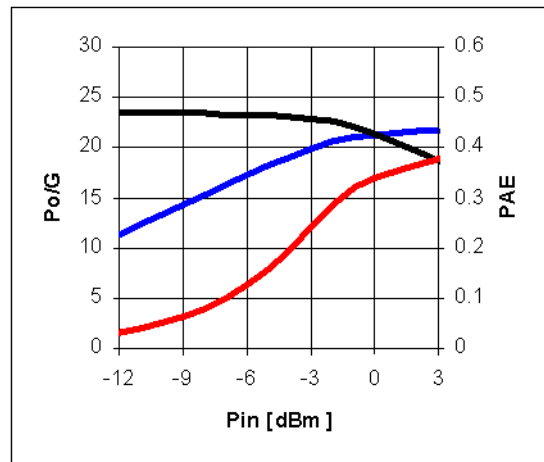
Typical Performance (Vd = 4.5V, Ic = 64mA, T = 25°C)

| Freq | MHz | 70 | 140 | 250 | 500 | 800 |
|------|-----|-------|-------|-------|-------|------|
| S21 | dB | 23.8 | 23.7 | 23.5 | 22.9 | 22 |
| S11 | dB | -23 | -29.2 | -35.4 | -35.1 | -24 |
| S22 | dB | -11.2 | -11.3 | -11.8 | -10.2 | -8.6 |
| P1 | dBm | 18.3 | 18.3 | 18.3 | 18.3 | 18.2 |
| OIP3 | dBm | 33.5 | 31.0 | 32.0 | 32.0 | 30.5 |
| NF | dB | 3.4 | 3.4 | 3.5 | 3.6 | 3.6 |

Pin-Pout-Gain

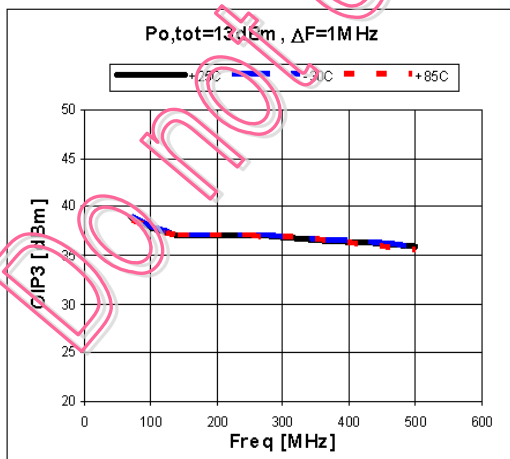
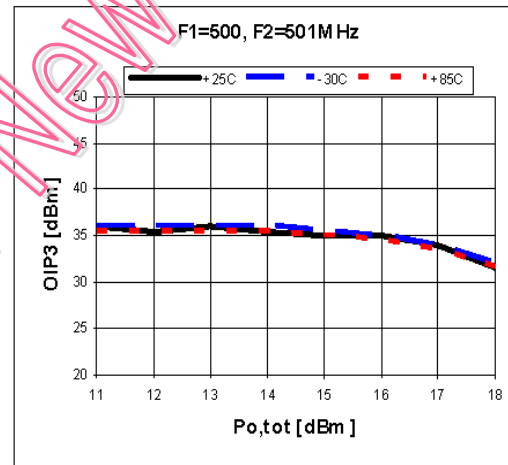
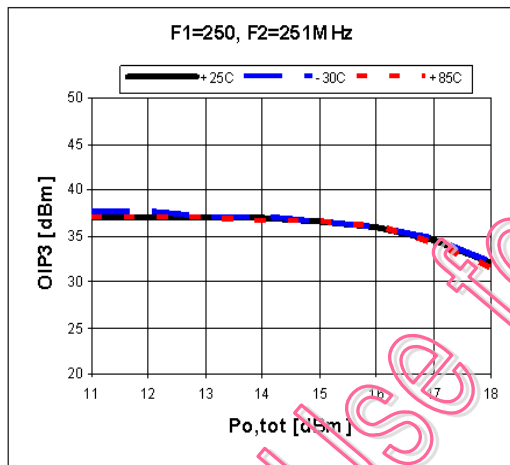
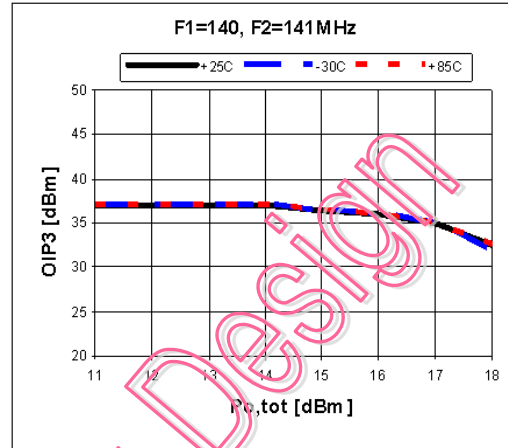
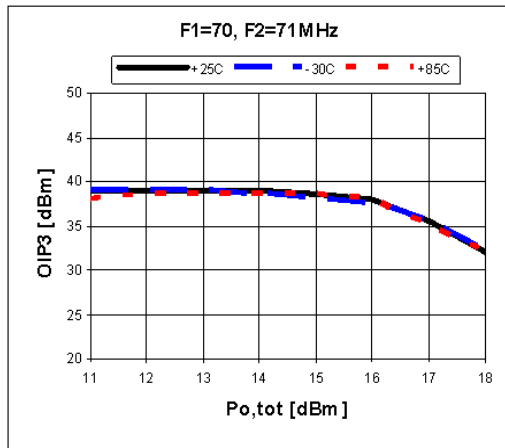


200MHz, 5V/86mA



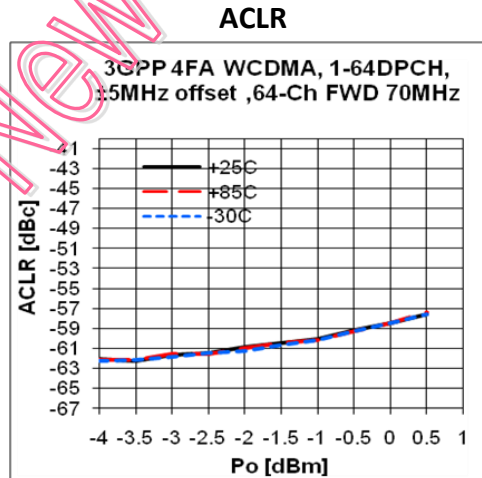
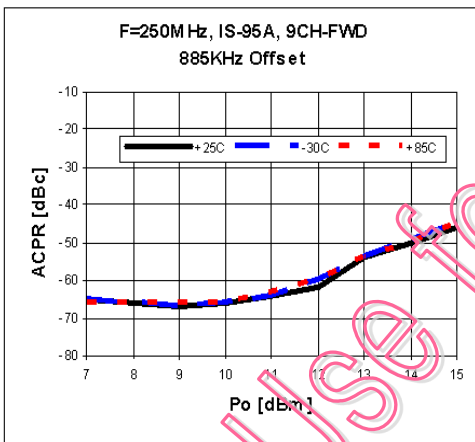
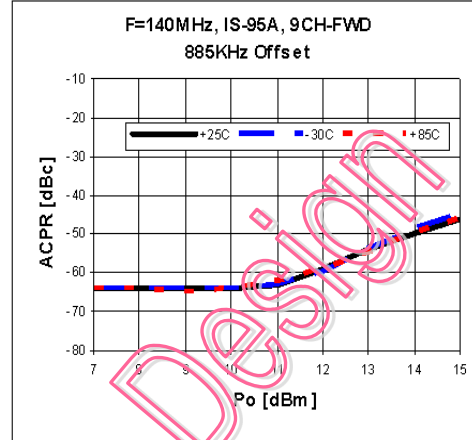
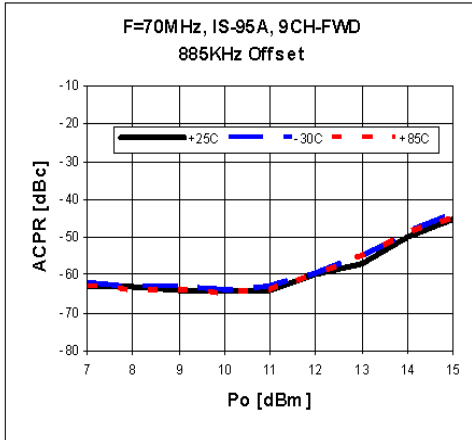
500 MHz, 5V/86mA

OIP3

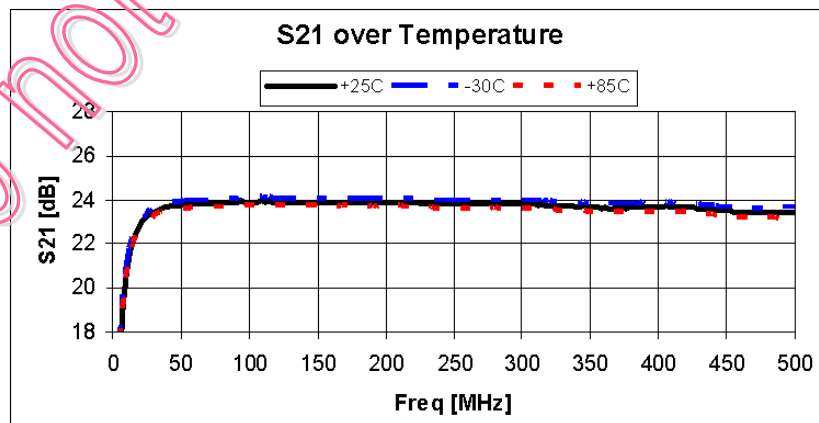


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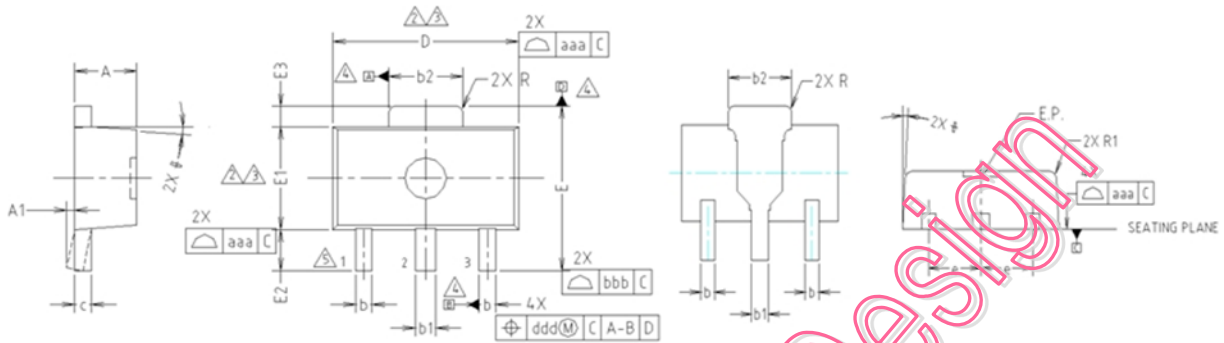
ACPR



Gain Flatness



Package Outline Dimension

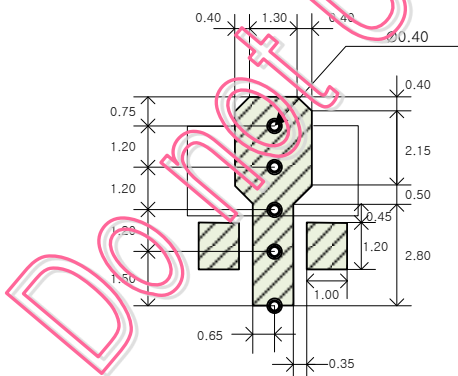


- NOTE:**
 1. DIMENSIONS IN MILLIMETERS.
- ⚠ DIMENSION D DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.5mm PER END. DIMENSION E1 DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.5mm PER 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 | 0.60 | 1.50 | 1.60 | |
| A1 | 0.60 | — | 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. | | | |
| R | 4° TYP. | | | |
| R1 | 0.15 TYP. | | | |
| | | | 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

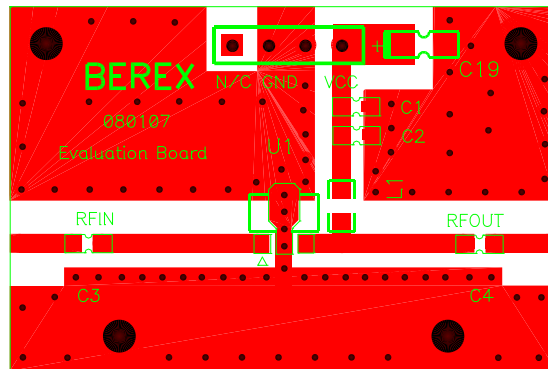
PCB Land Pattern



Note : All dimension _ millimeters

PCB lay out _ on BeRex website

PCB Mounting

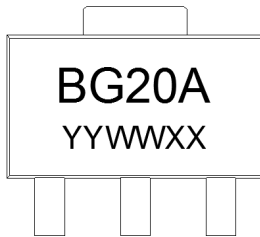


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Package Marking



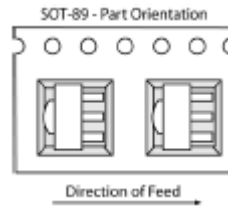
Pin 1

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



Proper ESD procedures should be followed when handling this device.

NATO CAGE code:

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