

Device Features

- OIP3 = 41.0 dBm @ 1900 MHz
- Gain = 15.5 dB @ 1900 MHz
- Output P1 dB = 25.5 dBm @ 1900 MHz
- 50 Ω Cascadable
- RoHS2-compliant SOT-89 SMT package



Product Description

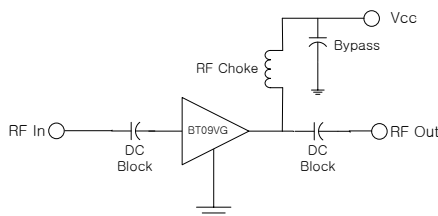
BeRex's BT09VG is a high performance and a high dynamic range amplifier in a low cost surface mount package(SOT-89) with a RoHS2-compliant, that incorporates reliable heterojunction-bipolar-transistor (HBT) devices fabricated with InGaP GaAs technology.

This device is designed for use where high linearity is required and features high OIP3 and P1 with low consumption current (85mA) and requires a few external matching components such as a DC blocking capacitors on the In/Output pin, a bypass capacitor and a RF choke for the out port.

Applications

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

Application Circuits



*external matching circuit: refer to the page 5 to 14.

Typical Performance¹

| Parameter | Frequency | | | | Unit |
|-------------------|-----------|-------|-------|-------|------|
| | 900 | 1900 | 2450 | 3500 | MHz |
| Gain | 21.5 | 15.5 | 13.5 | 10.8 | dB |
| S11 | -16.0 | -30.0 | -14.0 | -15.0 | dB |
| S22 | -24.0 | -19.0 | -19.0 | -14.0 | dB |
| OIP3 ² | 39.0 | 41.0 | 41.0 | 42.0 | dBm |
| P1dB | 24.5 | 25.5 | 27.0 | 25.0 | dBm |
| Noise Figure | 3.7 | 4.0 | 4.7 | 5.4 | 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 13 dBm per tone separated by 1 MHz.

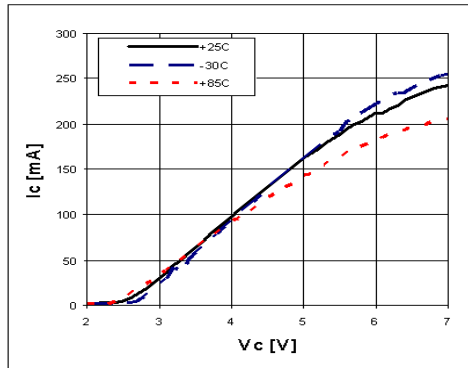
| | Min. | Typical | Max. | Unit |
|--|------|---------|------|------|
| Bandwidth | 5 | | 4000 | MHz |
| I _C @ (V _C = 5V) | 140 | 160 | 180 | mA |
| V _C | | 5.0 | | V |
| R _{TH} | | 50 | | °C/W |

Absolute Maximum Ratings

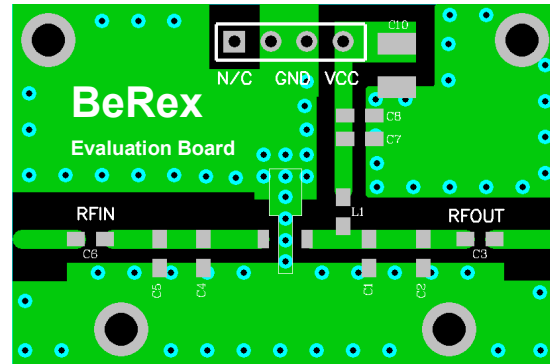
| Parameter | Rating | Unit |
|----------------------------|-------------|------|
| Operating Case Temperature | -40 to +85 | °C |
| Storage Temperature | -55 to +155 | °C |
| Junction Temperature | +190 | °C |
| Operating Voltage | +7.0 | V |
| Supply Current | 220 | mA |
| Input RF Power | 23 | dBm |

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

V-I Characteristics



BeRex SOT89 Evaluation Board

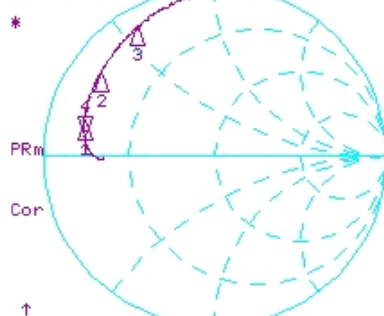


*Dielectric constant _ 4.2 *RF pattern width 52mil *31mil thick FR4 PCB

Typical Device Data

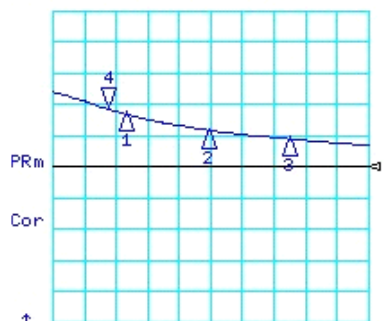
S-parameters ($V_c=5V$, $I_c=160mA$, $T=25^\circ C$)

CH1 S11 1 U FS
4: 6.4502 Ω 3.9817 Ω 827.04 pF
766.230 037 MHz



START 100.000 MHz STOP 4000.000 MHz

CH2 L06 10 dB/ REF 0 dB
S31 4: 18.735 dB 766.230 037 MHz

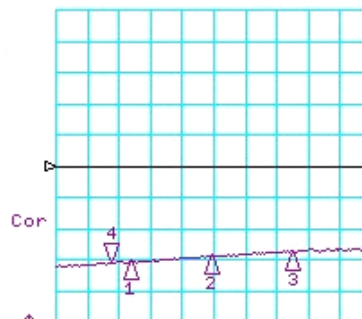


START 100.000 MHz STOP 4000.000 MHz

CH1 Markers

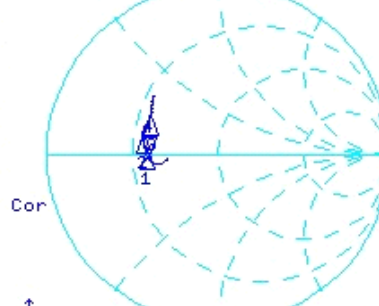
| | |
|------|-----------------|
| 1: | 5.9448 Ω |
| 2: | 6.3701 Ω |
| 3: | 16.157 Ω |
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| 100: | 16.157 Ω |

CH3 L06 10 dB/ REF 0 dB
S13 4: -30.845 dB 766.230 037 MHz



START 100.000 MHz STOP 4000.000 MHz

CH4 S33 1 U FS
4: 20.566 Ω -661.13 m Ω 314.18 pF
766.230 037 MHz



START 100.000 MHz STOP 4000.000 MHz

CH3 Markers

| | |
|------|-----------------|
| 1: | 5.9448 Ω |
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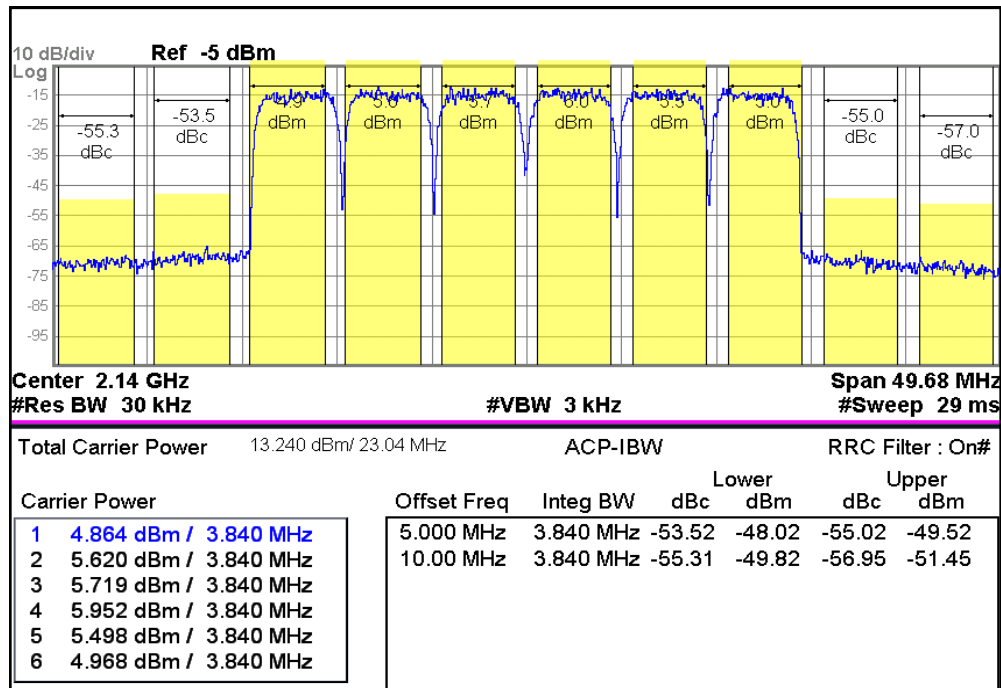
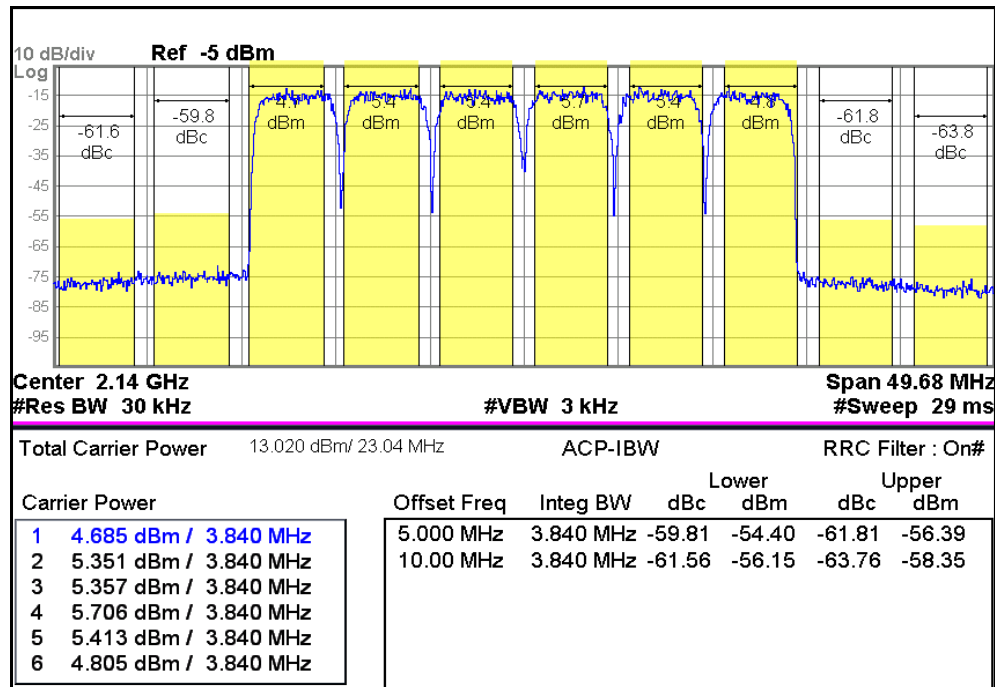
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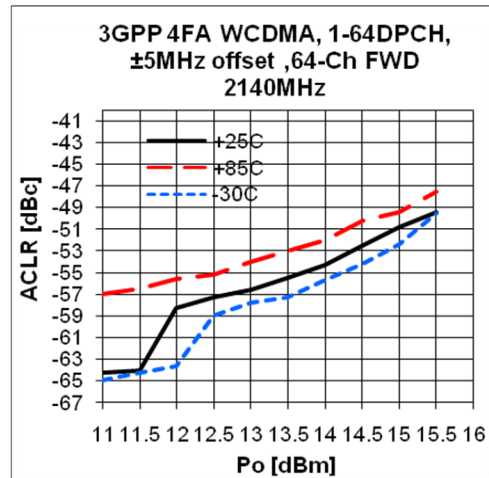
S-Parameter

(Vdevice = 5.0V, Icc = 160mA, T = 25 °C, calibrated to device leads)

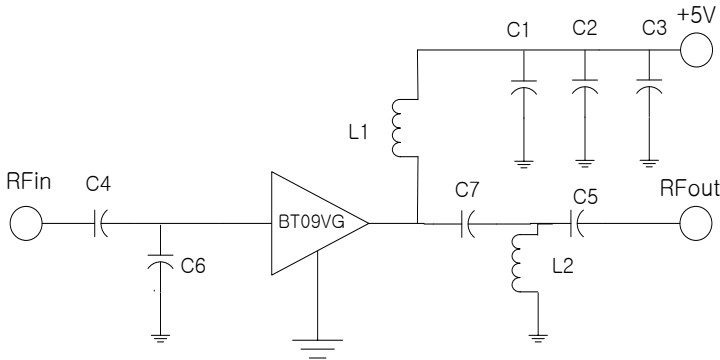
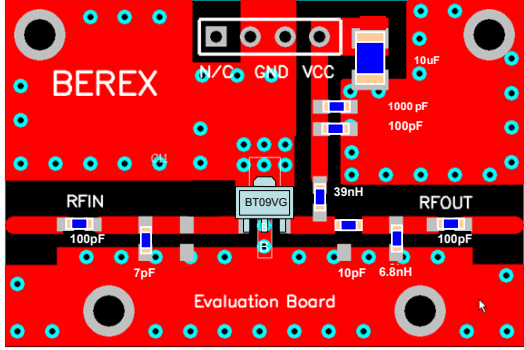
| Freq [MHz] | S11 Mag | S11 Ang | S21 Mag | S21 Ang | S12 Mag | S12 Ang | S22 Mag | S22 Ang |
|-----------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| 100 | 0.65 | -180.00 | 16.00 | 170.00 | 0.03 | 2.50 | 0.30 | -170.00 |
| 500 | 0.74 | 180.00 | 11.00 | 130.00 | 0.03 | 8.90 | 0.38 | -170.00 |
| 1000 | 0.79 | 170.00 | 7.00 | 98.00 | 0.03 | 14.00 | 0.42 | 180.00 |
| 1500 | 0.81 | 150.00 | 5.00 | 82.00 | 0.03 | 18.00 | 0.44 | 170.00 |
| 2000 | 0.83 | 140.00 | 3.90 | 69.00 | 0.04 | 19.00 | 0.46 | 170.00 |
| 2500 | 0.85 | 130.00 | 3.20 | 57.00 | 0.04 | 19.00 | 0.45 | 160.00 |
| 3000 | 0.88 | 120.00 | 2.80 | 46.00 | 0.04 | 18.00 | 0.45 | 150.00 |
| 3500 | 0.92 | 110.00 | 2.50 | 35.00 | 0.04 | 14.00 | 0.48 | 140.00 |
| 4000 | 0.96 | 98.00 | 2.20 | 23.00 | 0.05 | 11.00 | 0.51 | 140.00 |

WCDMA 6FA 2140 –55dBc

WCDMA 6FA 2140 –60dBc


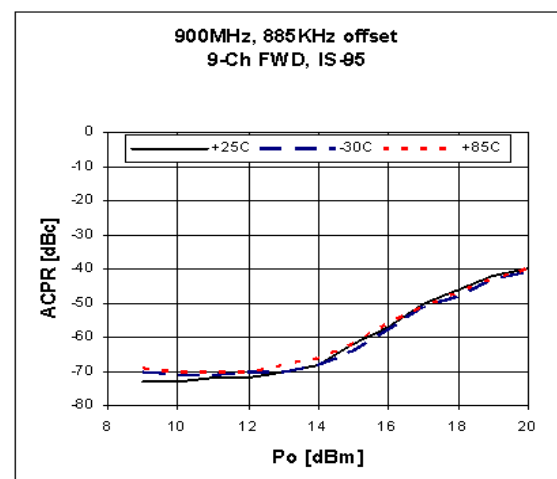
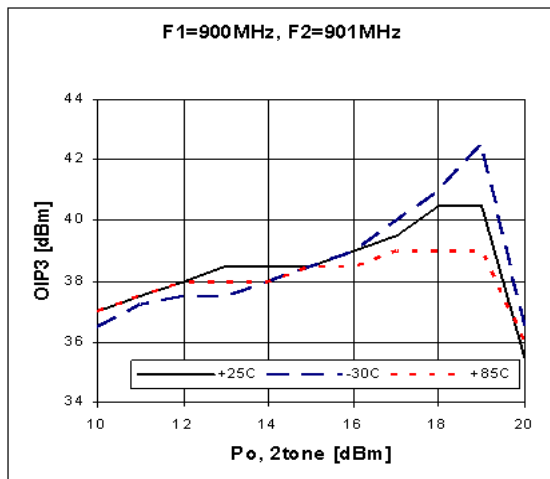
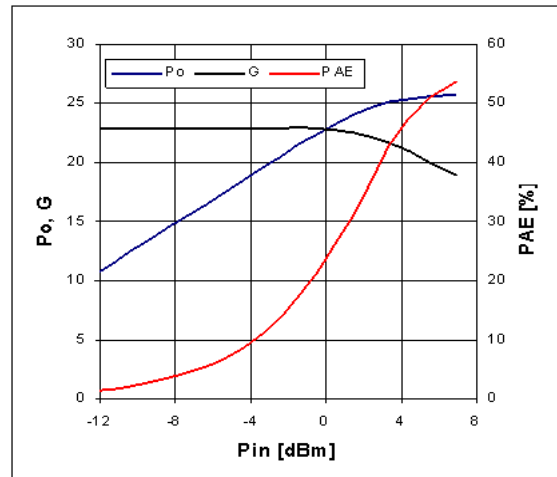
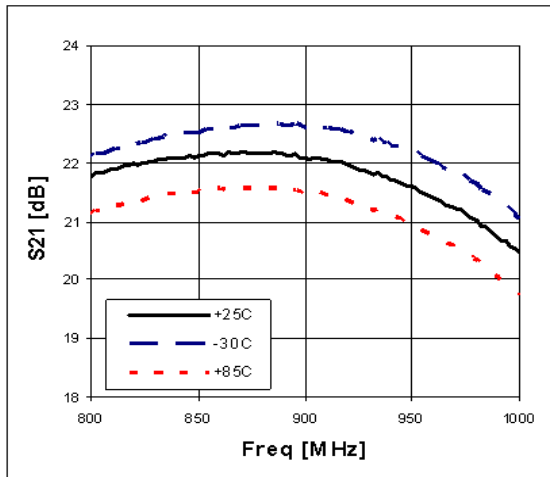
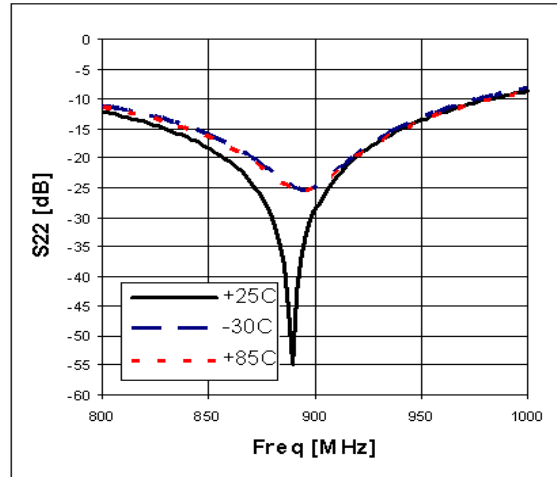
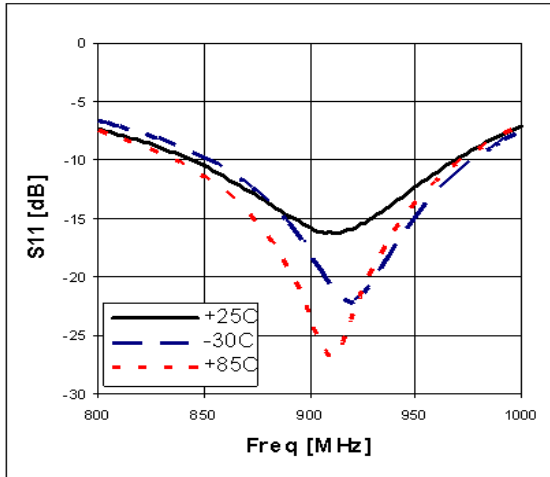
ACLR



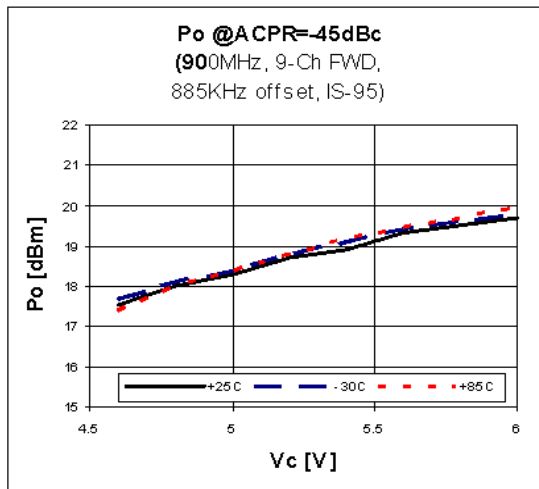
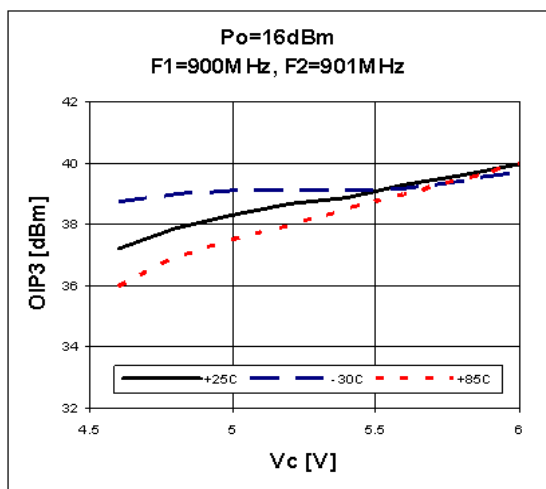
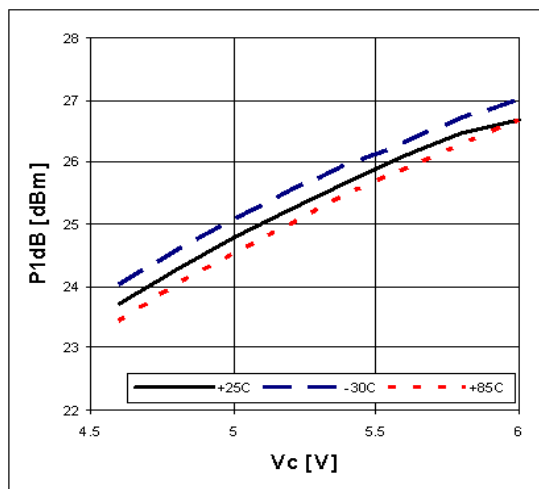
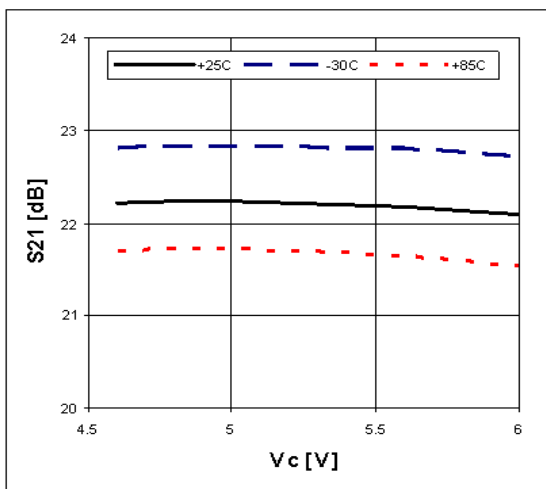
Application Circuit: 900 MHz

| Schematic Diagram | BOM | Tolerance |
|---|--|-----------|
|  | C1 | 100pF |
| | C2 | 1000pF |
| | C3* | 10uF |
| | C4 | 100pF |
| | C5 | 100pF |
| | C6 | 7pF |
| | C7 | 10pF |
| | L1 | 39nH |
| | L2 | 6.8nH |
| | | |
|  | Note: 1. PCB: 31mil thick FR4. 2. Distance between the center of the shunt cap(C6) and the input pin of BT09VG _ <u>7.0mm.</u> 3. Distance between the center of the series cap(C7) and the output pin of BT09VG _ <u>3.5mm.</u> 4. Distance between the center of the shunt inductor(L2) and the output pin of BT09VG _ <u>5.5mm.</u> | |

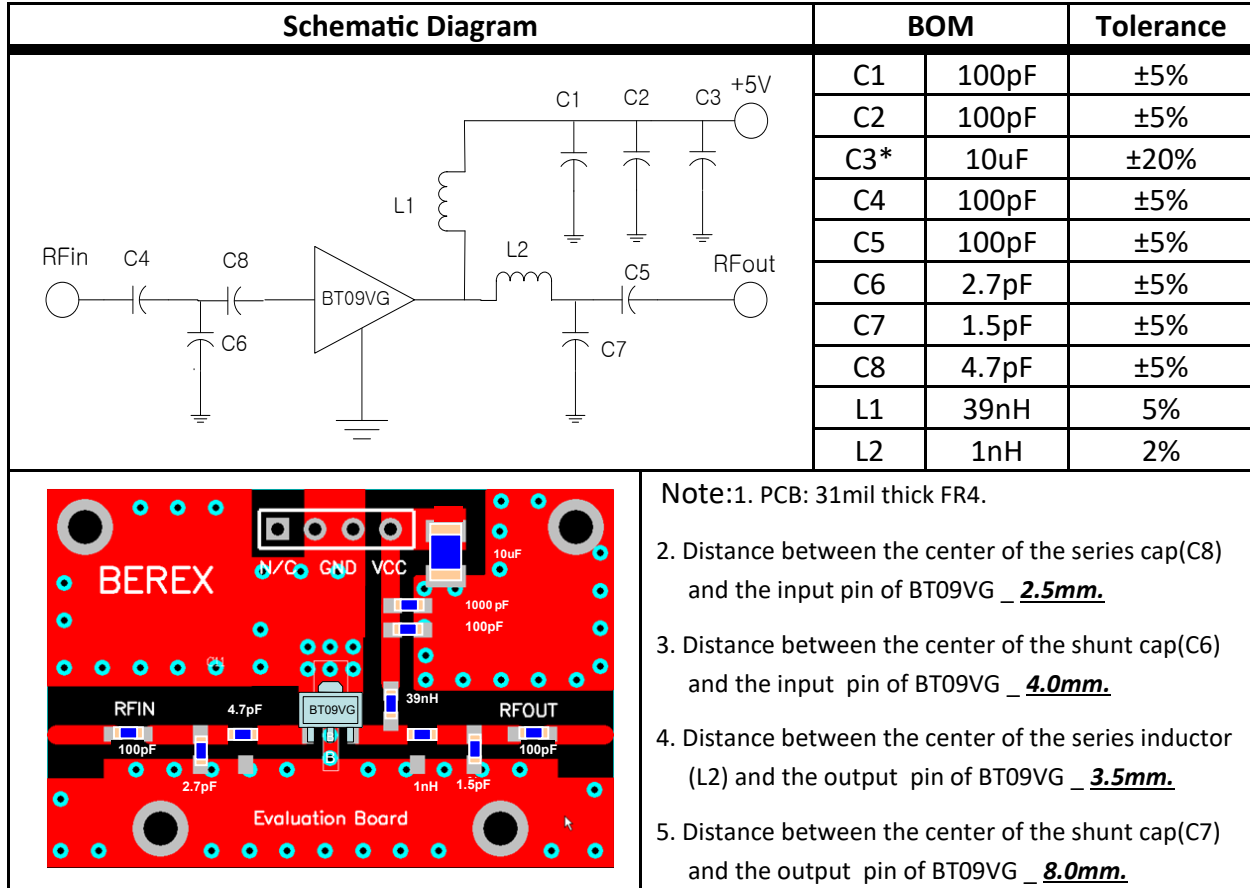
Typical Performance



Performance Variation with Supply Voltage

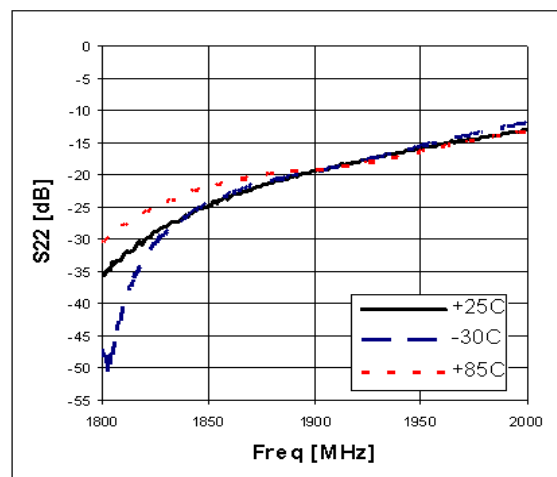
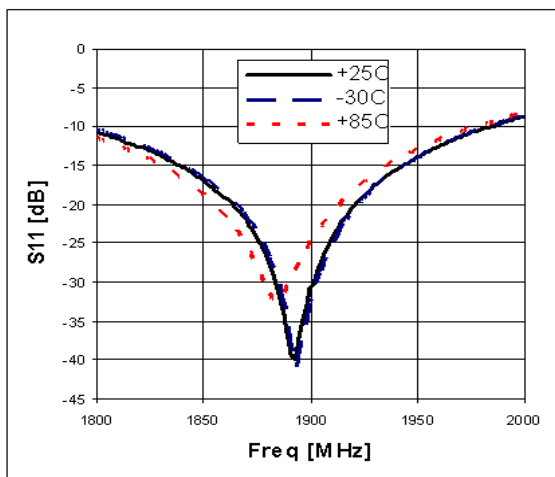


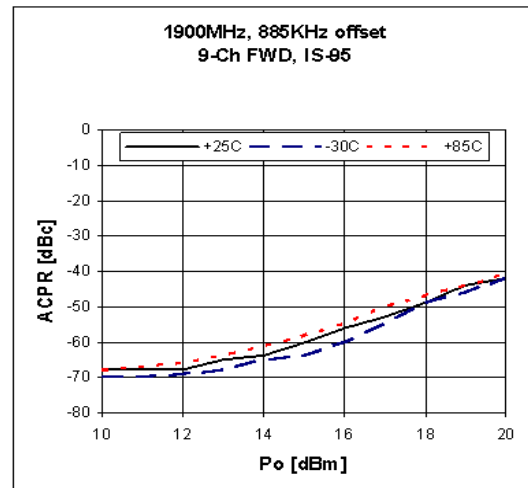
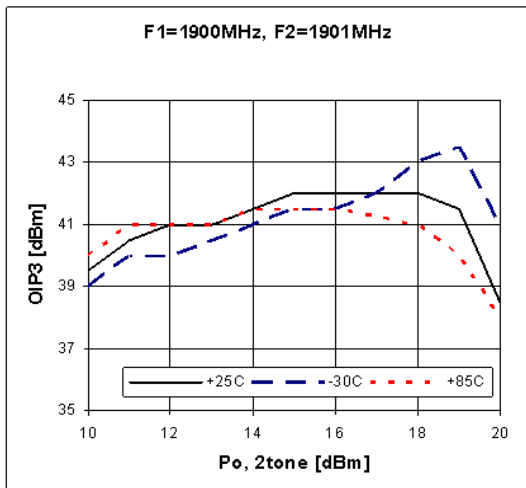
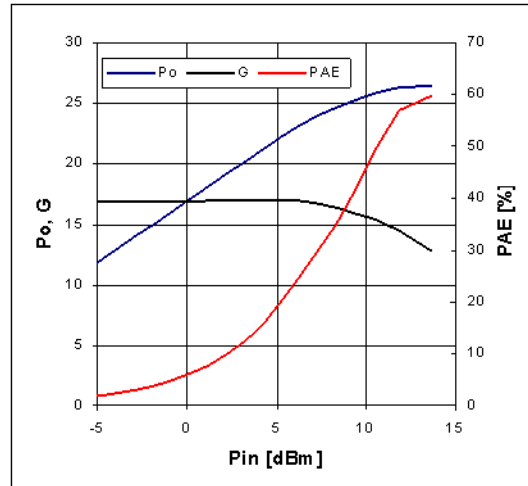
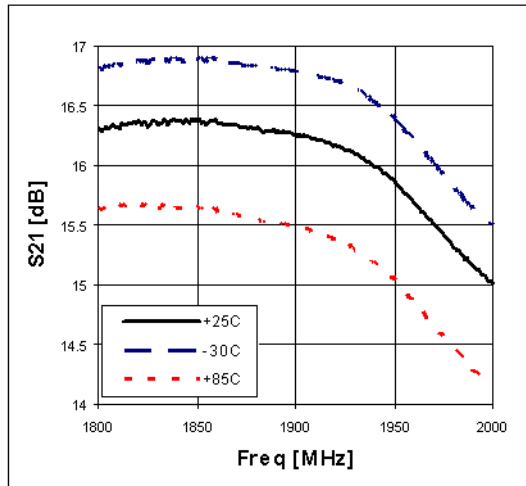
Application Circuit: 1900MHz



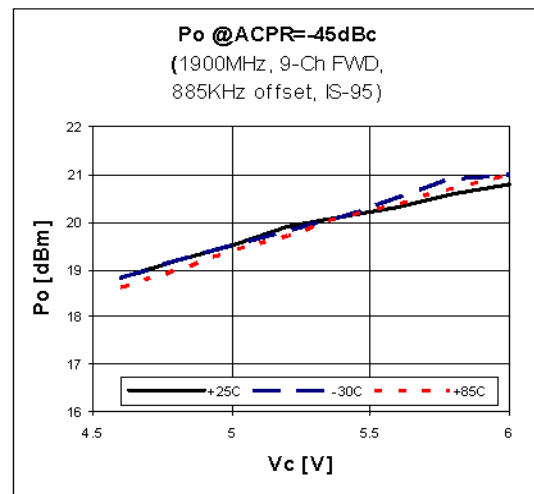
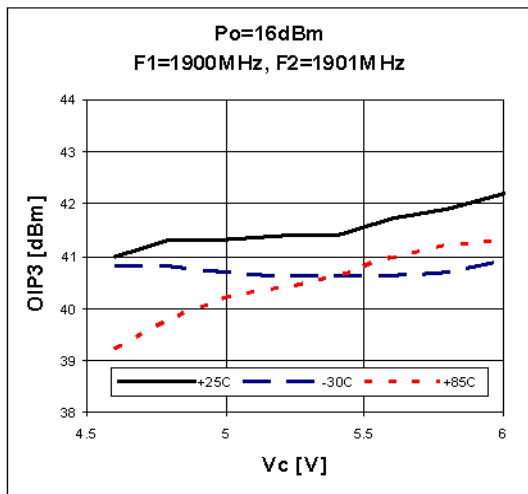
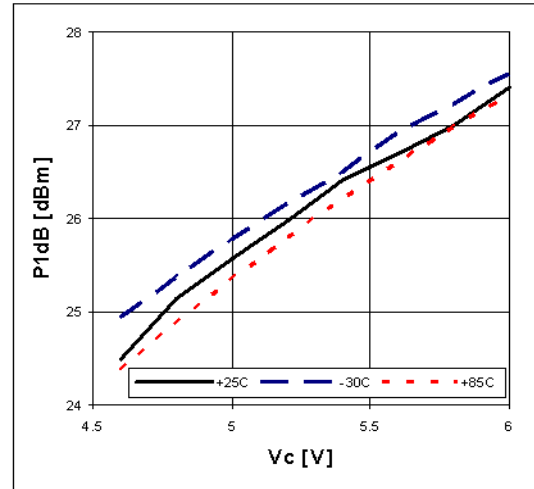
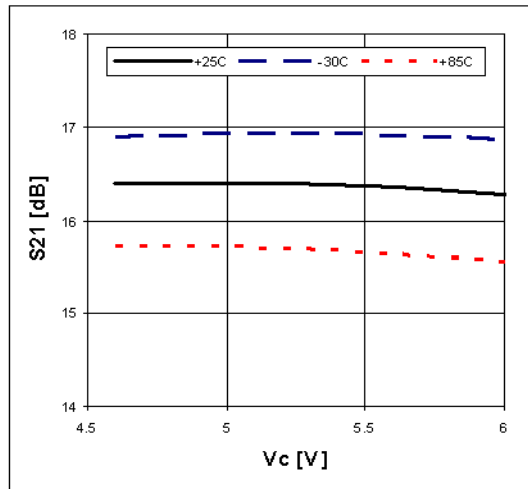
*Skipping C3 reduces device ruggedness.

Typical Performance

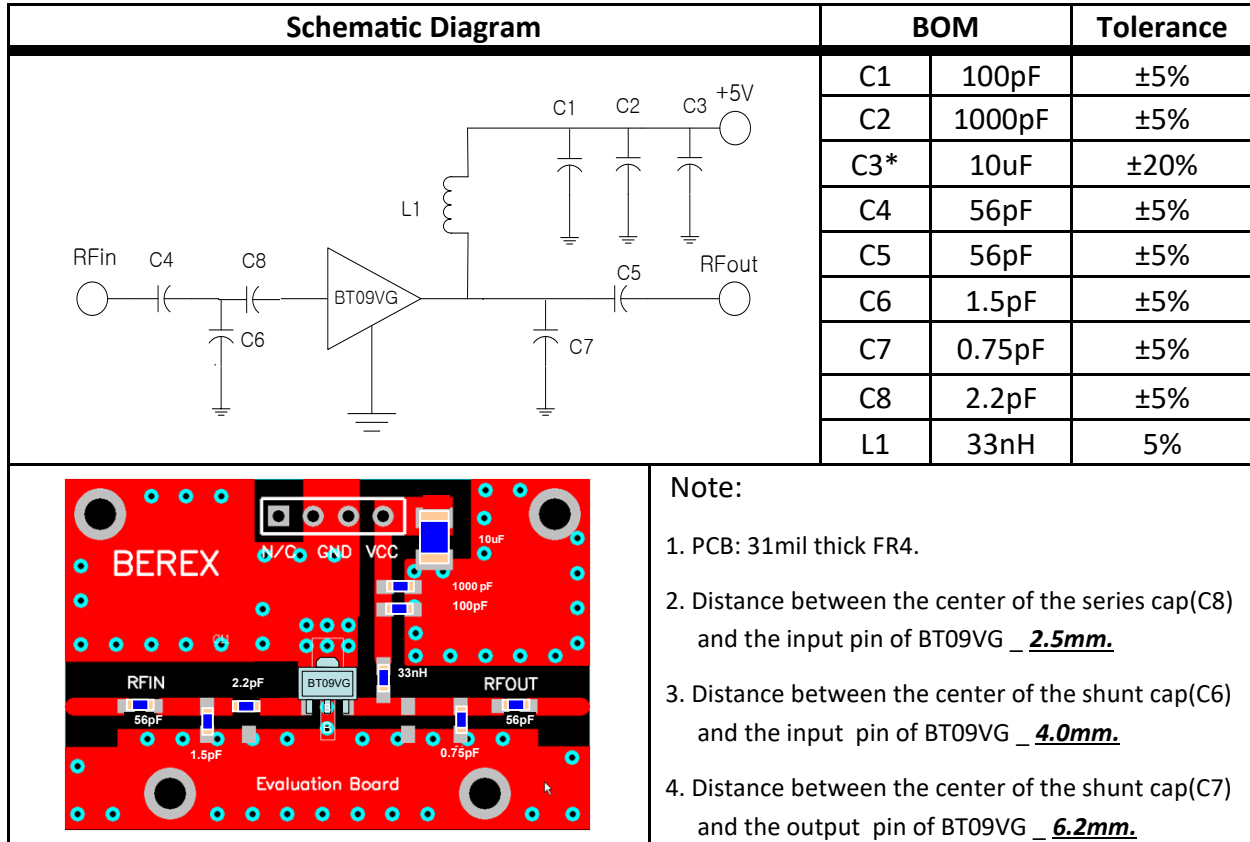




Performance Variation with Supply Voltage

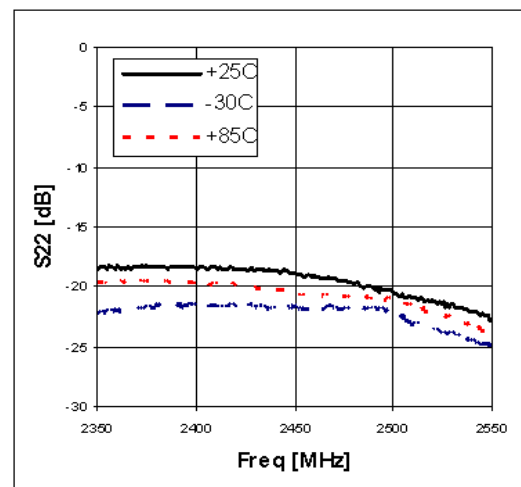
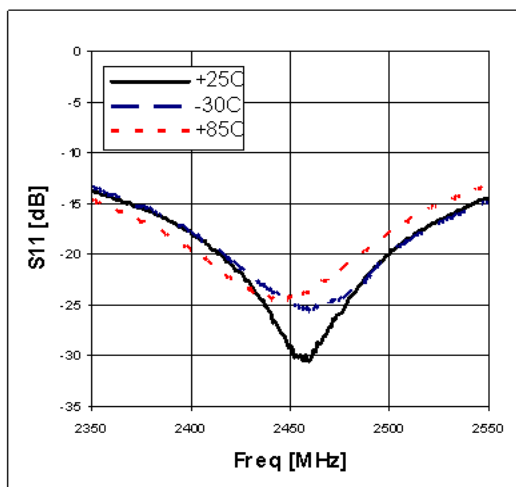


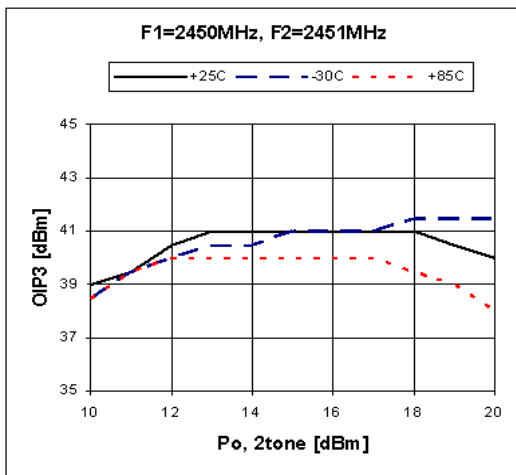
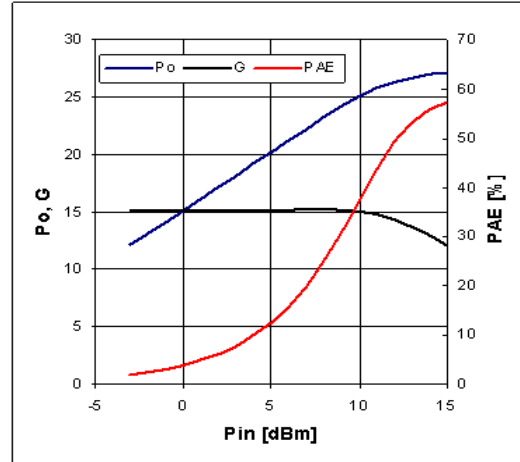
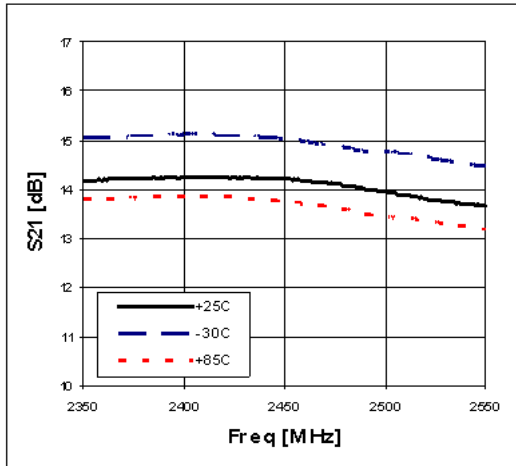
Application Circuit: 2450MHz



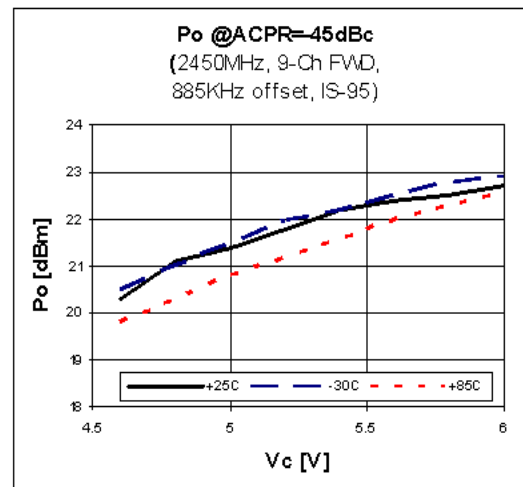
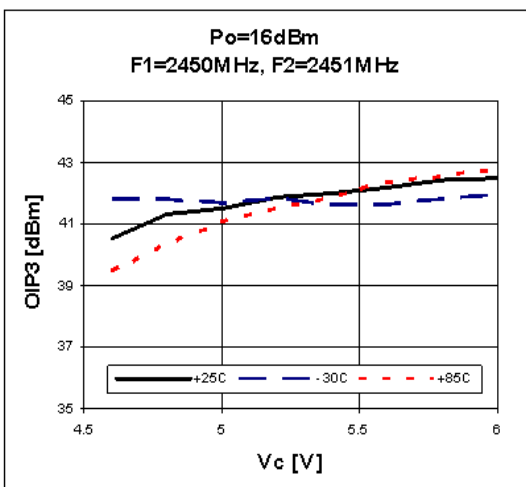
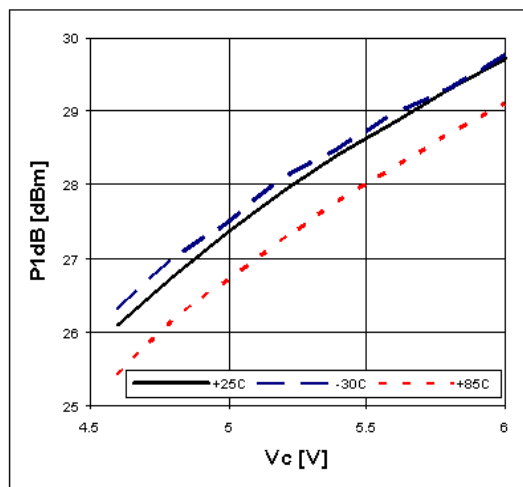
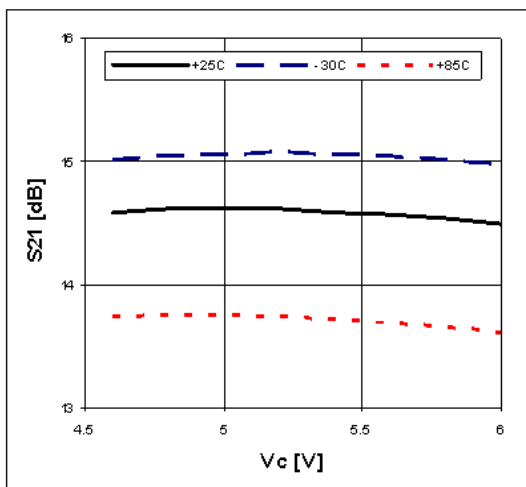
*Skipping C3 reduces device ruggedness.

Typical Performance

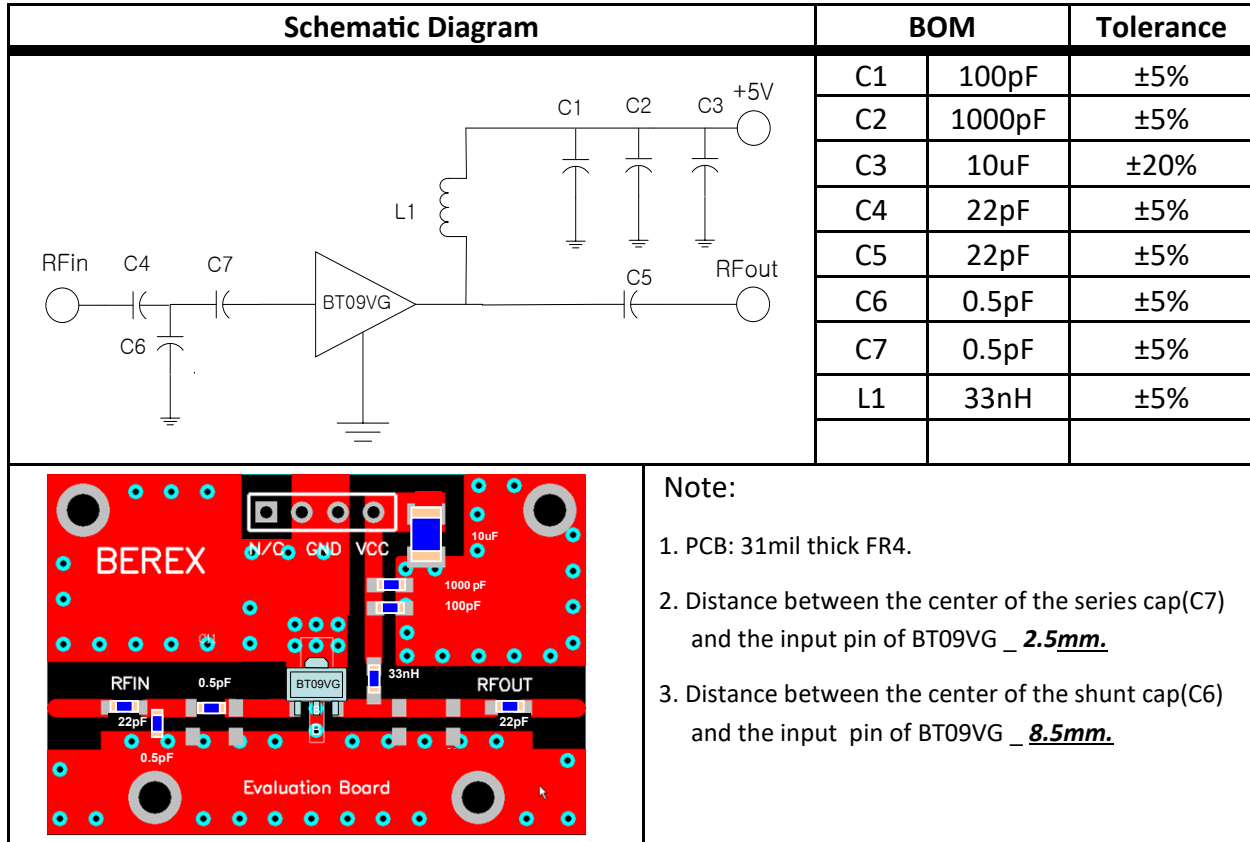




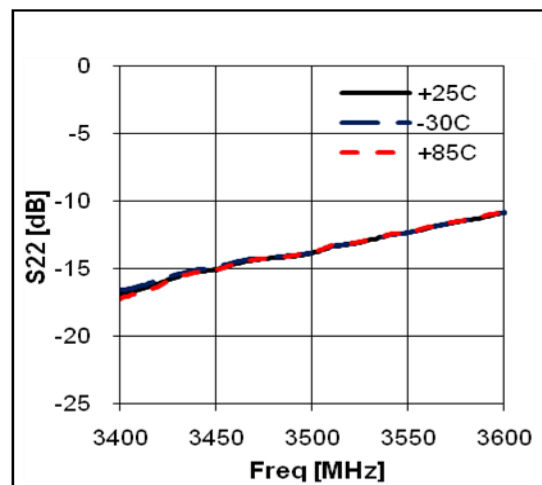
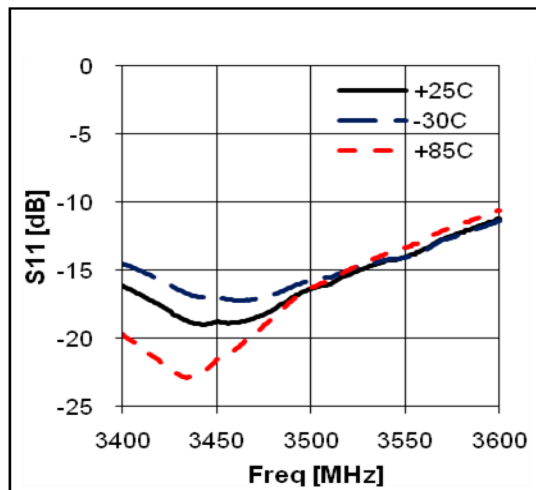
Performance Variation with Supply Voltage

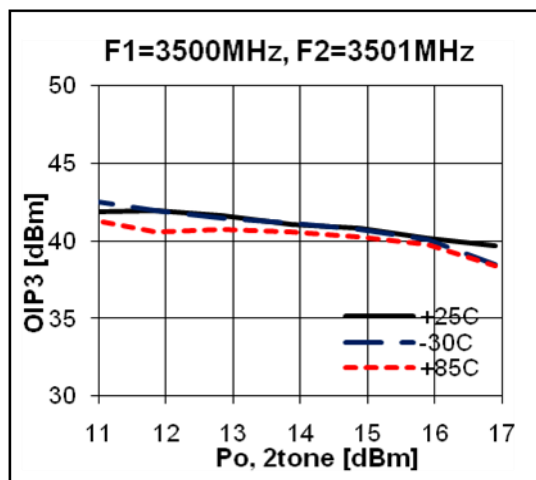
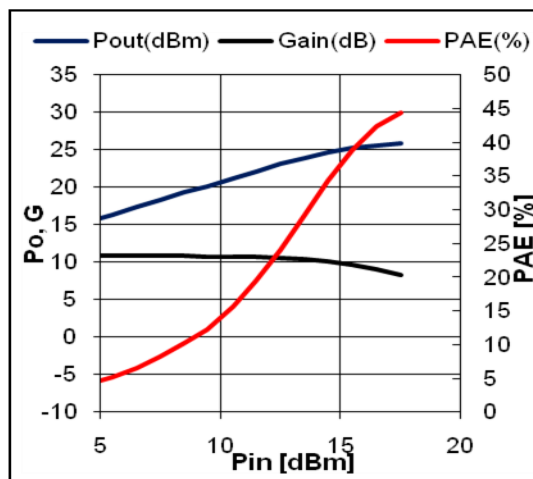
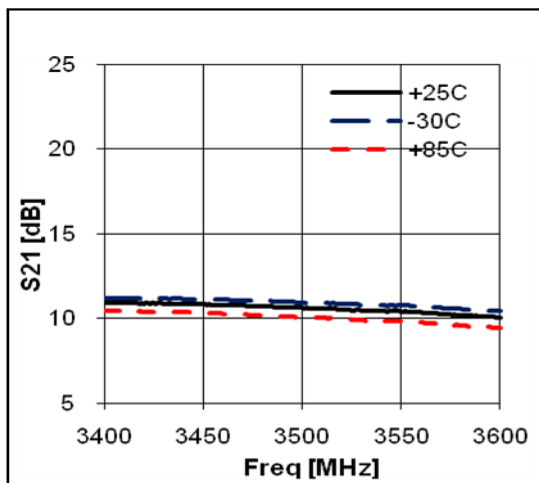


Application Circuit: 3500MHz

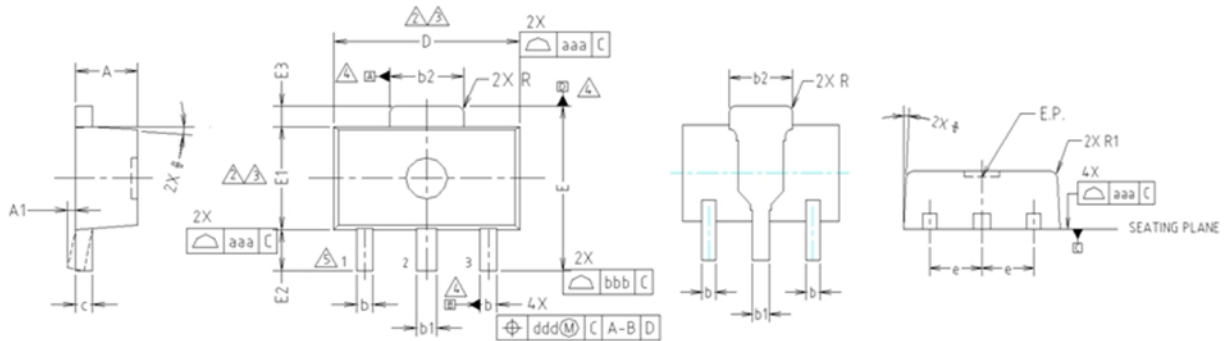


Typical Performance





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.

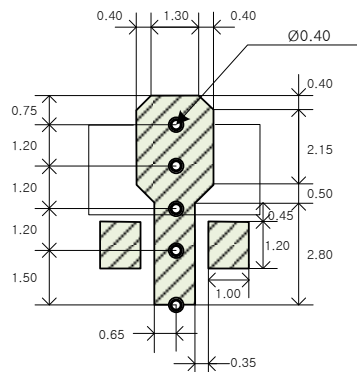
⚠ DATUMS A, B AND D TO BE DETERMINED 0.18mm FROM THE LEAD TIP.

⚠ 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 | |
| | MINIMUM | MAXIMUM | | |
| aaa | 0.15 | | | |
| bbb | 0.20 | | | |
| ccc | 0.10 | | | |
| ddd | 0.10 | | | |

Suggested PCB Land Pattern and PAD Layout

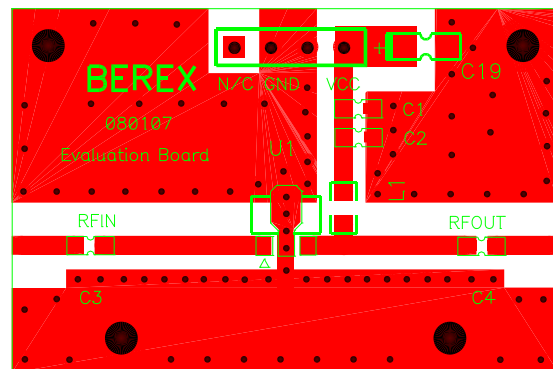
PCB Land Pattern



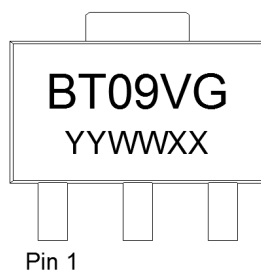
Note : All dimension are in millimeters

PCB lay out _ on BeRex website

PCB Mounting



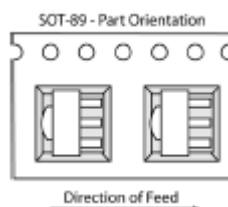
Package Marking



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 1B |
| Value: | Passes <1000V |
| 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 |
|---|---|---|---|---|