

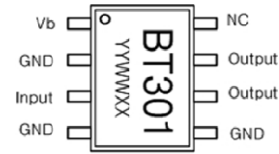
# BT301

## 500-4000 MHz High Power Amplifier



### Device Features

- OIP3 = 49.0 dBm @ 1900 MHz
- Gain = 12.5 dB @ 1900 MHz
- Output P1 dB = 30.3 dBm @ 1900 MHz
- 50 Ω Cascadable
- Patented Over Voltage Protection Circuit
- Lead-free/RoHS-compliant SOIC 8 SMT package



YY = Year, WW = Work week,  
XX = Wafer Number

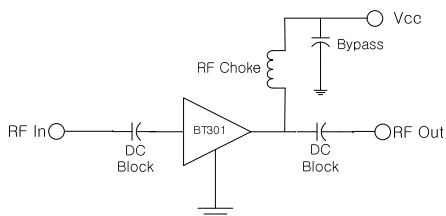
### Product Description

BeRex's BT301 is a high power and a high dynamic range amplifier in a low cost surface mount package(SOIC-8) with a RoHS-compliant, that incorporates reliable hetero-junction-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 Power with low consumption current (350mA) 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. All devices are 100% RF/DC tested.

### Applications

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

### Application Circuits



\*external matching circuit: refer to the page 4 to 11.

### Typical Performance<sup>1</sup>

| Parameter         | Frequency |       |       |       | Unit |
|-------------------|-----------|-------|-------|-------|------|
|                   | 900       | 1900  | 2140  | 2450  |      |
| Gain              | 18.5      | 12.5  | 11.5  | 10.5  | dB   |
| S11               | -15.0     | -18.0 | -18.0 | -12.0 | dB   |
| S22               | -7.0      | -12.0 | -12.0 | -11.0 | dB   |
| OIP3 <sup>2</sup> | 49.0      | 49.0  | 47.0  | 49.0  | dBm  |
| P1dB              | 29.5      | 30.3  | 30.3  | 30.3  | dBm  |
| IS-95C ACPR       | 22.5      | 22.5  | -     | -     | dBm  |
| WCDMA ACLR        | -         | -     | 21.0  | 21.0  | dBm  |
| Noise Figure      | 8.5       | 8.6   | 7.5   | 7.5   | dB   |

<sup>1</sup> Device performance \_ measured on a BeRex evaluation board at 25°C, 50 Ω system.

<sup>2</sup> OIP3 \_ measured with two tones at an output of 16 dBm per tone separated by 1 MHz.

\*ACPR&ACLR CH Power \_ measured at 50dBc.

\*ACPR Test set-up: IS-95 CDMA, 9Ch. FWD, +885KHz offset.

\*ACLR Test set-up: 3GPP WCDMA, TM1+64DPCH, +5MHz offset.

|  | Min. | Typical | Max. | Unit |
|--|------|---------|------|------|
| Bandwidth                              | 500  |         | 4000 | MHz  |
| I <sub>C</sub> @ (V <sub>C</sub> = 5V) | 310  | 350     | 390  | mA   |
| V <sub>C</sub>                         |      | 5.0     |      | V    |
| R <sub>TH</sub>                        |      | 19.6    |      | °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             | 600         | mA   |
| Input RF Power             | 28          | dBm  |

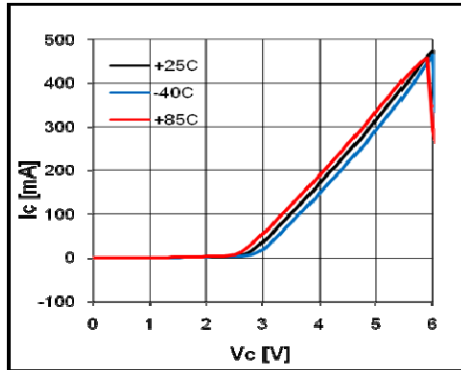
\*Operation of this device above any of these parameters may result in permanent damage.

# BT301

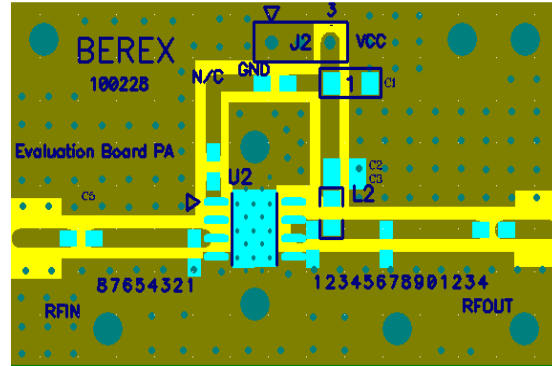
500-4000 MHz High Power Amplifier



## V-I Characteristics



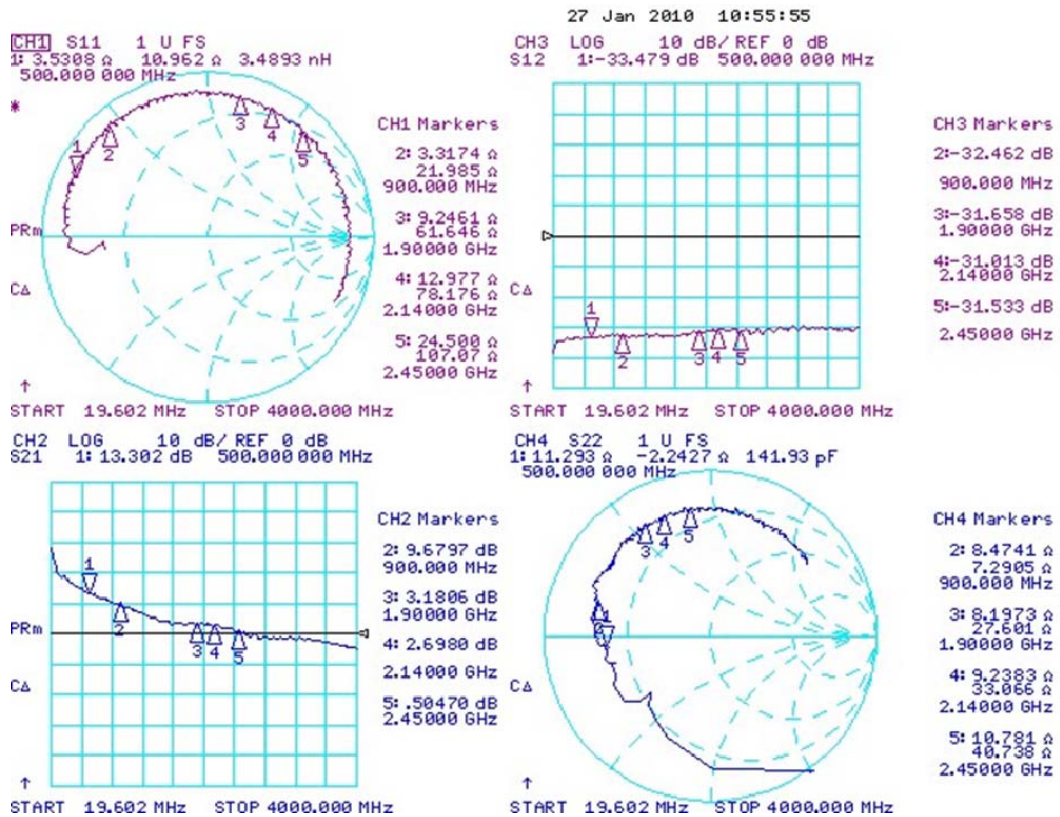
## BeRex SOT89 Evaluation Board



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

## Typical Device Data

S-parameters (Vc=5V, Ic=340mA, T=25°C)



# BT301

500-4000 MHz High Power Amplifier



## S-Parameter

(V<sub>device</sub> = 5.0V, I<sub>cc</sub> = 340mA, T = 25 °C, calibrated to device leads)

| Freq<br>[MHz] | S11<br>[Mag] | S11<br>[Ang] | S21<br>[Mag] | S21<br>[Ang] | S12<br>[Mag] | S12<br>[Ang] | S22<br>[Mag] | S22<br>[Ang] |
|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 100           | 0.842        | -178.0       | 11.489       | 131.4        | 0.019        | 18.2         | 0.534        | -134.7       |
| 500           | 0.895        | 157.3        | 4.894        | 104.8        | 0.023        | 10.6         | 0.659        | -176.7       |
| 1000          | 0.893        | 130.8        | 2.766        | 83.9         | 0.022        | 9.8          | 0.754        | 160.4        |
| 1500          | 0.870        | 106.2        | 1.658        | 75.1         | 0.025        | 21.7         | 0.773        | 139.8        |
| 2000          | 0.852        | 82.2         | 1.512        | 64.0         | 0.027        | 21.5         | 0.761        | 120.1        |
| 2500          | 0.840        | 58.8         | 1.047        | 47.2         | 0.026        | 21.6         | 0.773        | 101.7        |
| 3000          | 0.841        | 35.6         | 0.888        | 50.8         | 0.029        | 16.4         | 0.792        | 83.2         |
| 3500          | 0.850        | 12.5         | 0.840        | 36.8         | 0.031        | 23.4         | 0.659        | 62.6         |
| 4000          | 0.879        | -6.4         | 0.542        | 24.0         | 0.031        | 16.3         | 0.634        | 41.3         |

# BT301

500-4000 MHz High Power Amplifier



## Application Circuit: 900 MHz

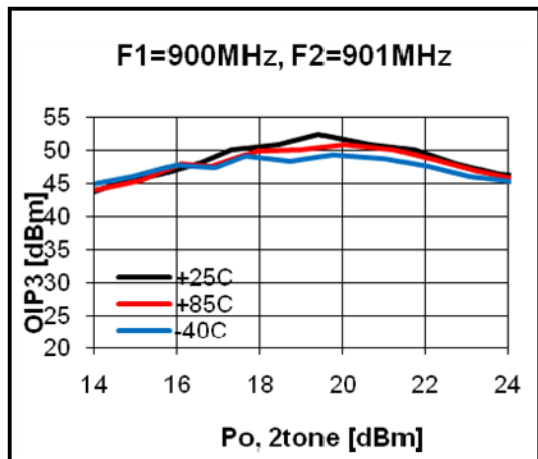
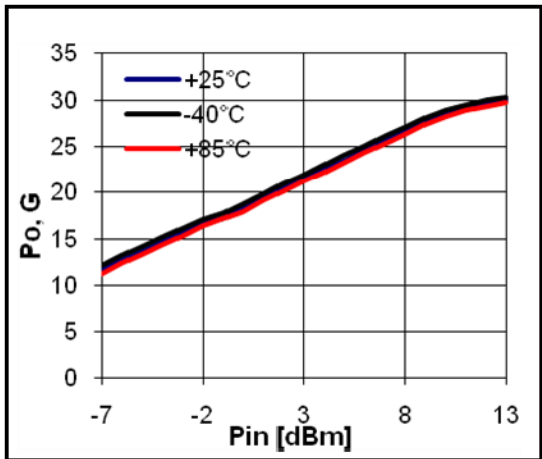
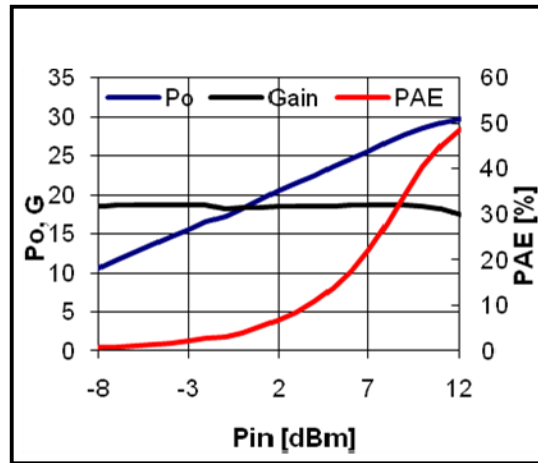
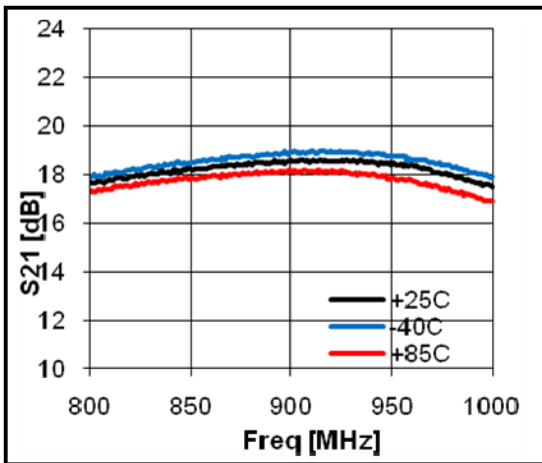
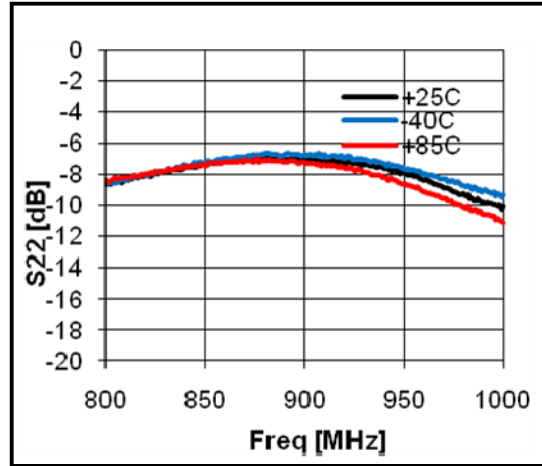
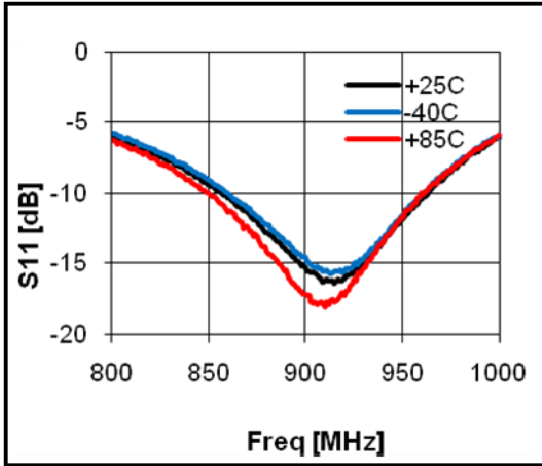
| Schematic Diagram | BOM  | Tolerance |
|-------------------|--|-----------|
|                   | C1   | 10uF ±20% |
|                   | C2   | 1.0nF ±5% |
|                   | C3   | 100pF ±5% |
|                   | C4   | 3pF ±5%   |
|                   | C5   | 100pF ±5% |
|                   | C6   | 4.7pF ±5% |
|                   | C7   | 5.0pF ±5% |
|                   | C8   | 2.7pF ±5% |
|                   | R1   | 12ohm ±5% |
| L1                | 56nH ±5%   |           |
| L2                | 4.7nH ±5%  |           |
| PCB Diagram       | Notice   |           |
|                   | <ol style="list-style-type: none"> <li>1. PCB: 31mil thick FR4</li> <li>2. Distance between the center of the shunt Inductor(C6) and the input pin of BT301 _ <b>5.6 mm</b>.</li> <li>3. Distance between the center of the shunt cap. (C7) and the output pin of BT301 _ <b>12 mm</b>.</li> </ol> <p>※ BT301 with both input and output ports opened simultaneously may cause instability. Please See an application note or contact company for application support.</p> |           |

# BT301

500-4000 MHz High Power Amplifier



## Typical Performance

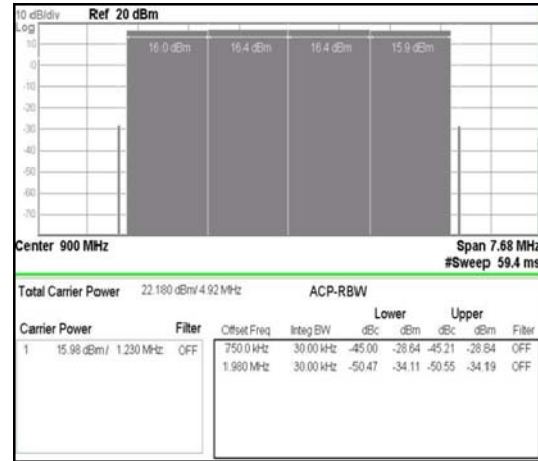
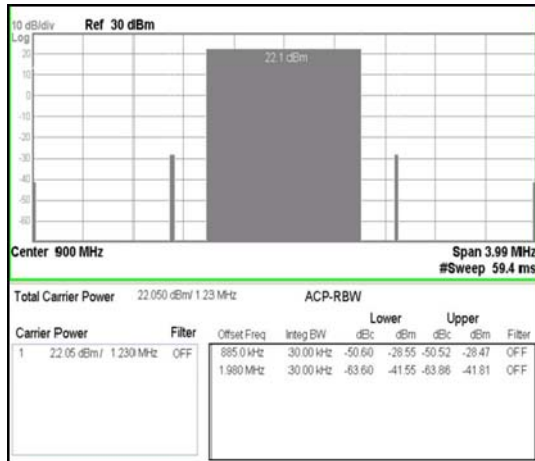
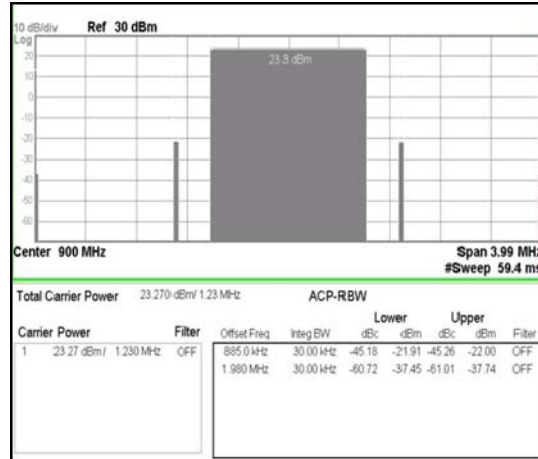
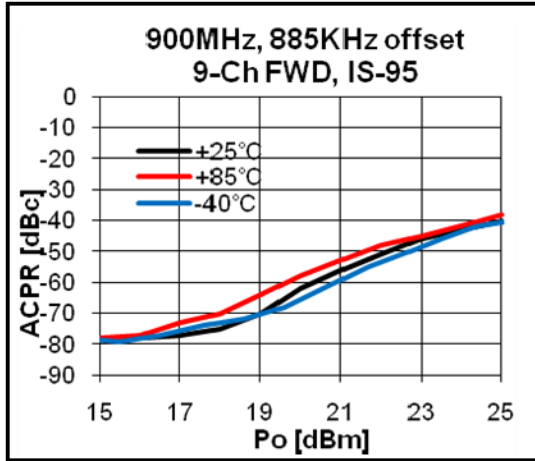


# BT301

500-4000 MHz High Power Amplifier



## Typical Performance



# BT301

500-4000 MHz High Power Amplifier



## Application Circuit: 1900 MHz

| Schematic Diagram | BOM   | Tolerance  |
|-------------------|---|------------|
|                   | C1  | 10uF ±20%  |
|                   | C2  | 1nF ±5%    |
|                   | C3  | 100pF ±5%  |
|                   | C4  | 100pF ±5%  |
|                   | C5  | 100pF ±5%  |
|                   | C6  | 3pF ±5%    |
|                   | C7  | 2.5pF ±5%  |
|                   | C8  | 2.5pF ±5%  |
|                   | R1  | 12 ohm ±5% |
|                   | L1  | 56nH ±5%   |
| L2                | 6.8nH ±5%   |            |
| PCB Diagram       | Notice  |            |
|                   | <ol style="list-style-type: none"> <li>1. PCB: 31mil thick FR4</li> <li>2. Distance between the center of the series cap. (C8) and the input pin of BT301 <b><u>1.6 mm</u></b>.</li> <li>3. Distance between the center of the shunt cap. (C6) and the input pin of BT301 <b><u>4.0 mm</u></b>.</li> <li>4. Distance between the center of the shunt cap. (C7) and the output pin of BT301 <b><u>2.5 mm</u></b>.</li> </ol> |            |

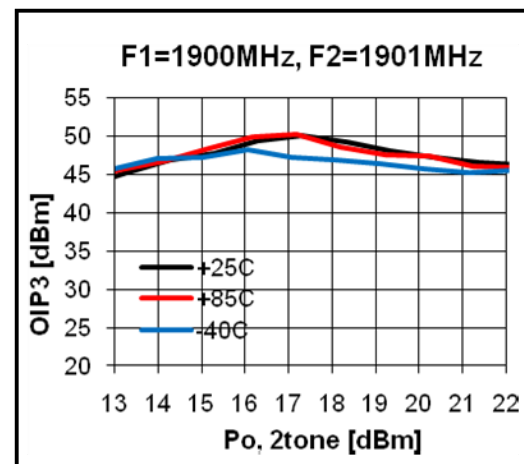
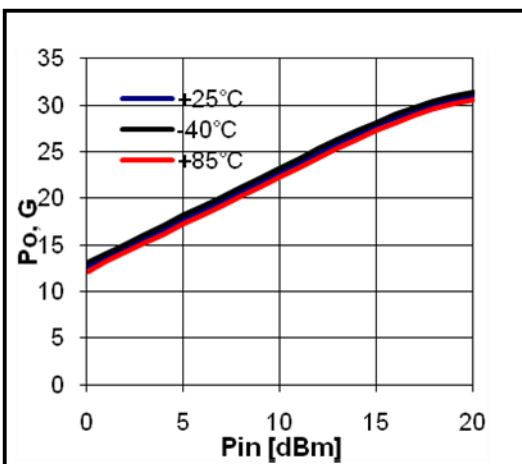
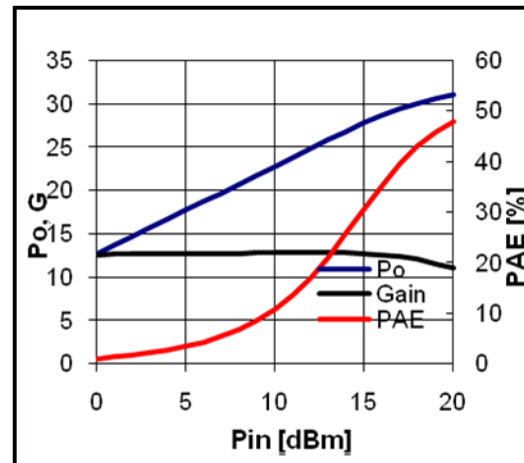
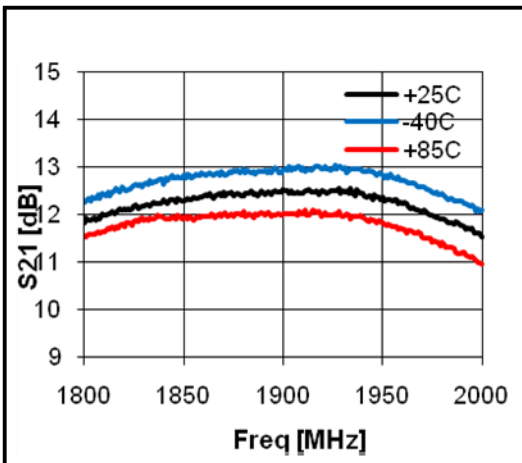
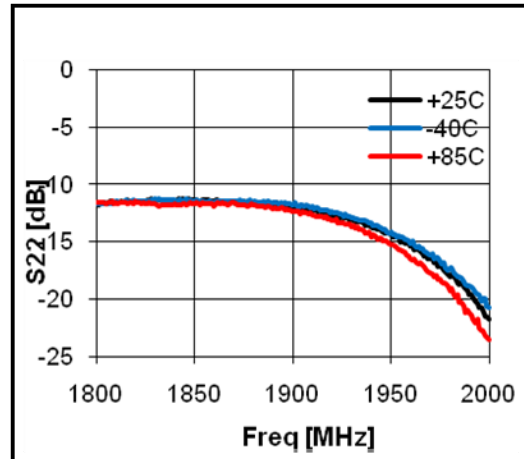
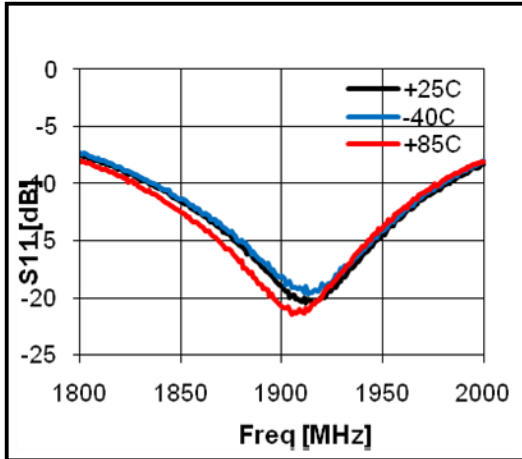


# BT301

500-4000 MHz High Power Amplifier



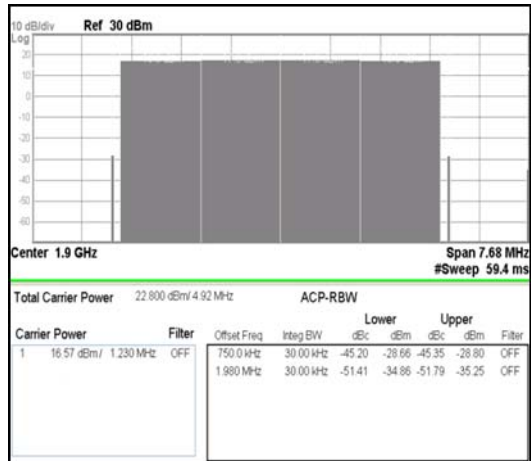
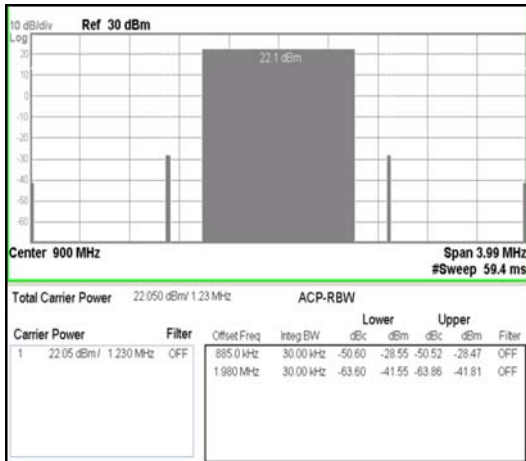
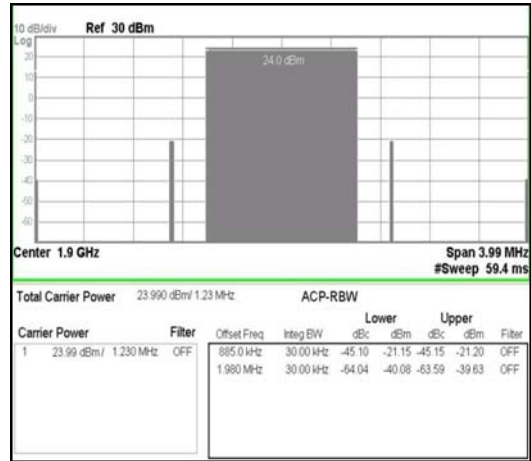
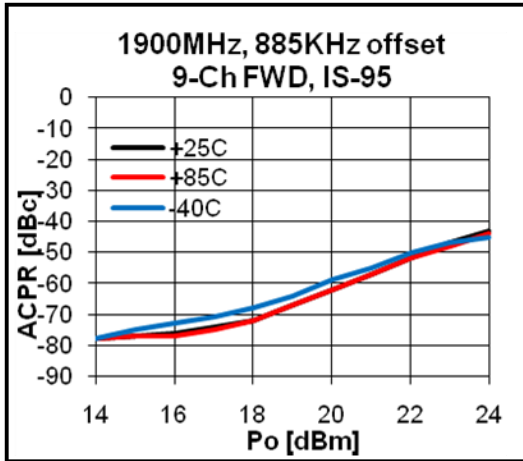
## Typical Performance





# BT301

## 500-4000 MHz High Power Amplifier



# BT301

500-4000 MHz High Power Amplifier



## Application Circuit: 2140MHz

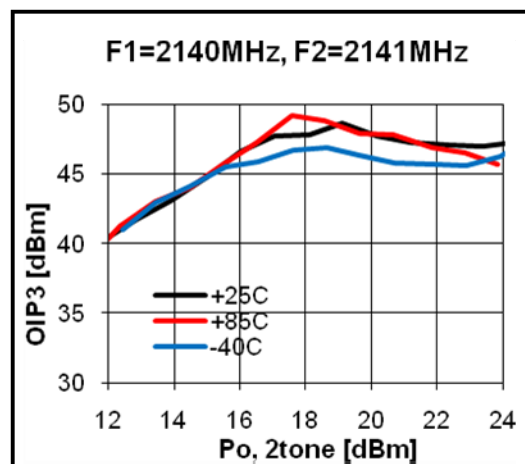
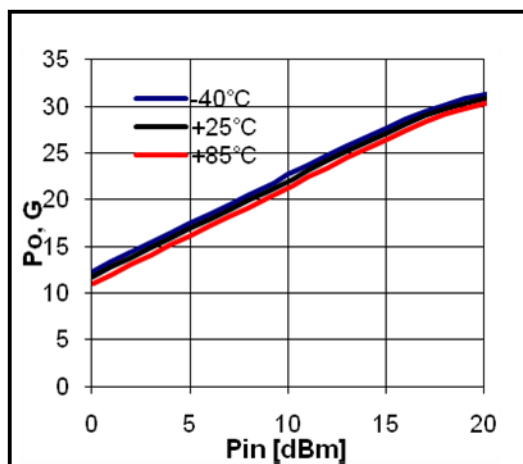
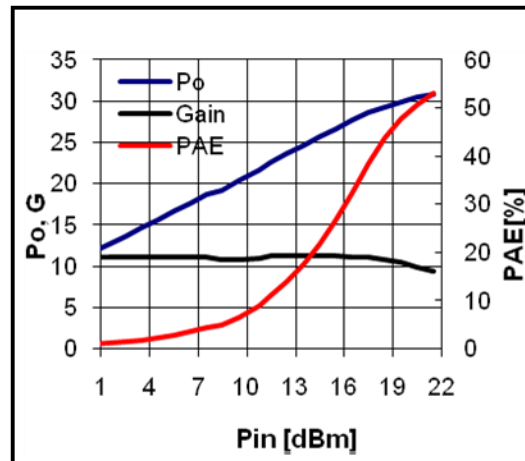
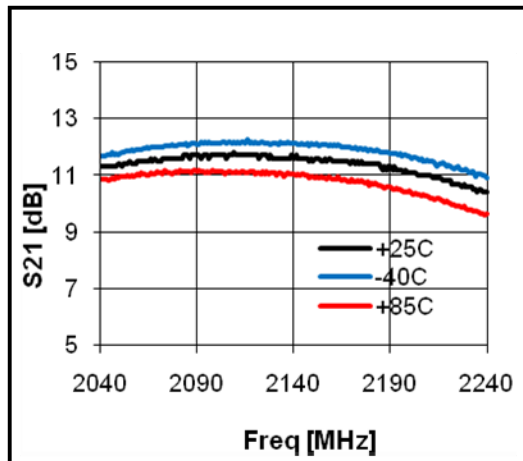
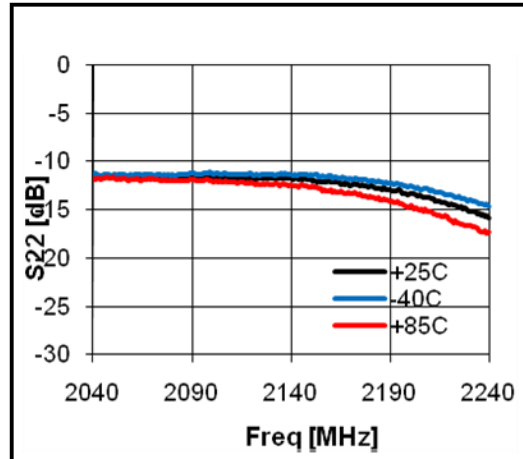
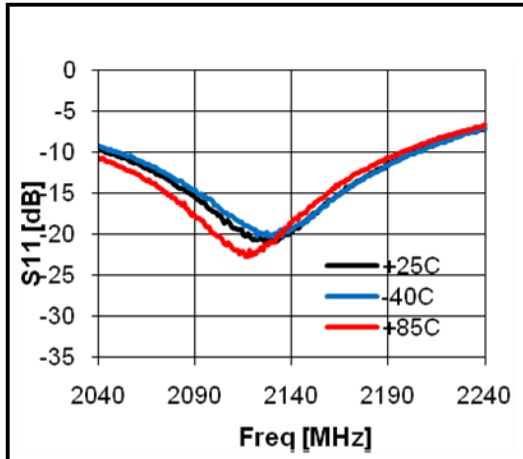
| Schematic Diagram | BOM   | Tolerance |
|-------------------|---|-----------|
|                   | C1  | 10uF ±20% |
|                   | C2  | 1nF ±5%   |
|                   | C3  | 100pF ±5% |
|                   | C4  | 100pF ±5% |
|                   | C5  | 100pF ±5% |
|                   | C6  | 2.5pF ±5% |
|                   | C7  | 1.8pF ±5% |
|                   | C8  | 1.8pF ±5% |
|                   | C9  | 5.0pF ±5% |
| R1                | 12 ohm ±5%  |           |
| L1                | 56nH ±5%  |           |
| L2                | 4.7nH ±5%   |           |
| PCB Diagram       | Notice  |           |
|                   | <ol style="list-style-type: none"> <li>1. PCB: 31mil thick FR4</li> <li>2. Distance between the center of the shunt cap. (C8) and the input pin of BT301 _ <b>1.6 mm</b>.</li> <li>3. Distance between the center of the shunt cap. (C6) and the input pin of BT301 _ <b>3.0 mm</b>.</li> <li>4. Distance between the center of the shunt cap. (C7) and the output pin of BT301 _ <b>2.5 mm</b>.</li> </ol> |           |

# BT301

500-4000 MHz High Power Amplifier

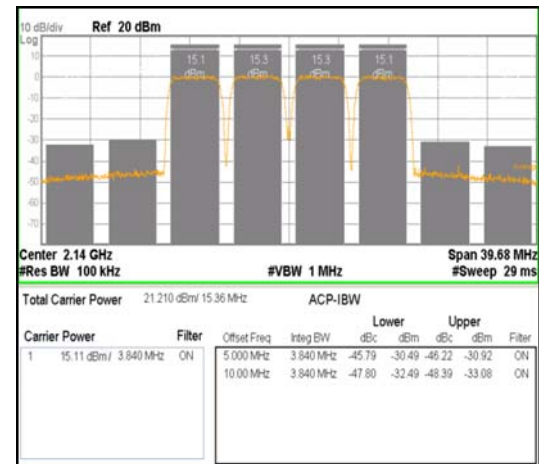
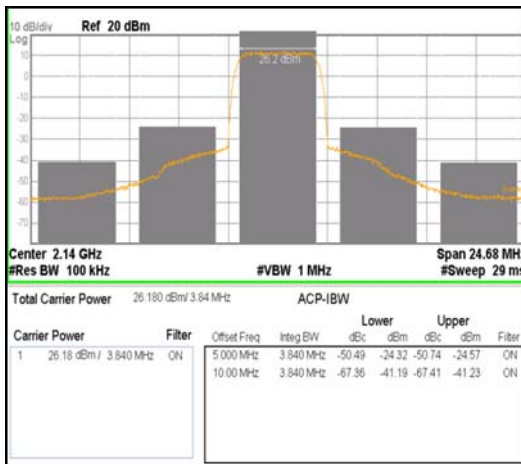
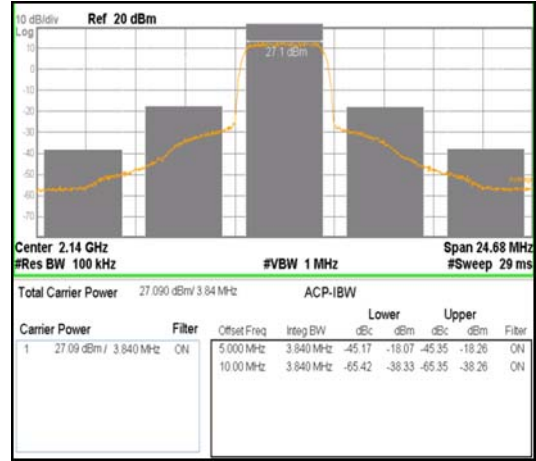
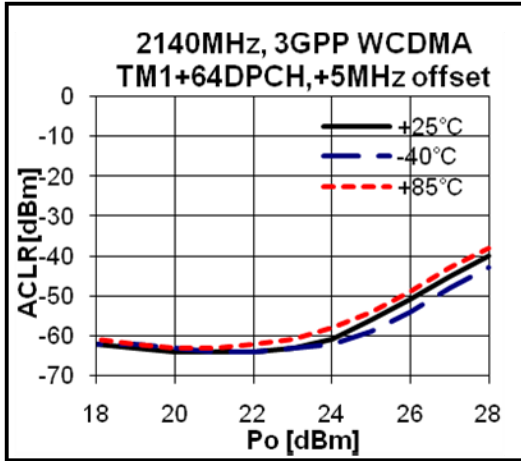


## Typical Performance



# BT301

## 500-4000 MHz High Power Amplifier



# BT301

500-4000 MHz High Power Amplifier



## Application Circuit: 2450MHz

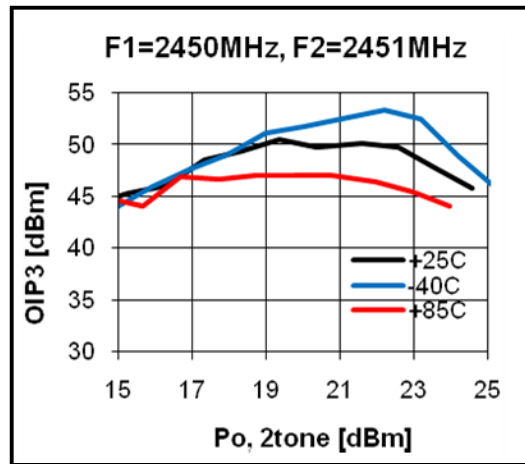
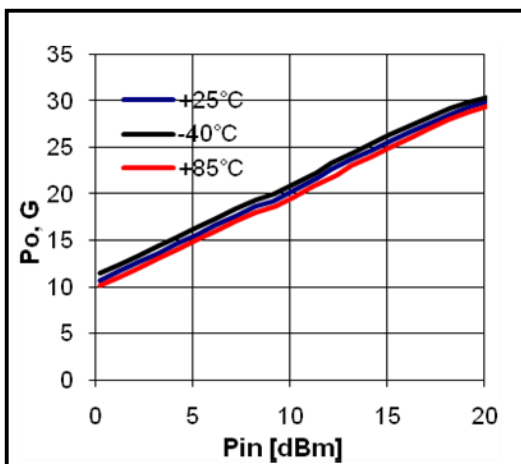
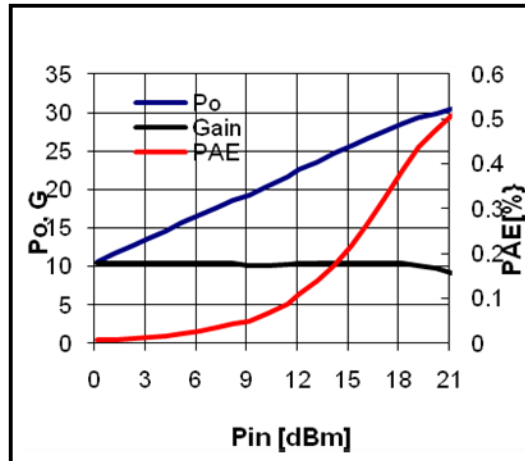
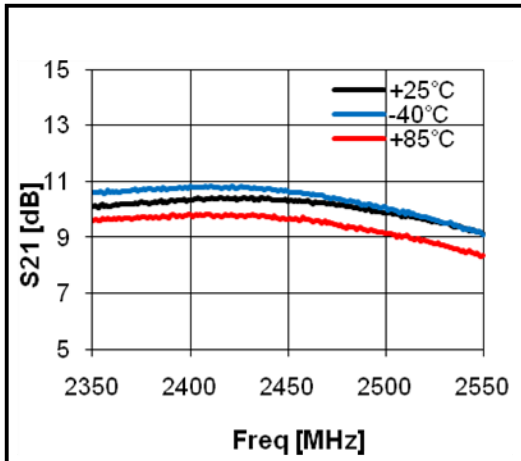
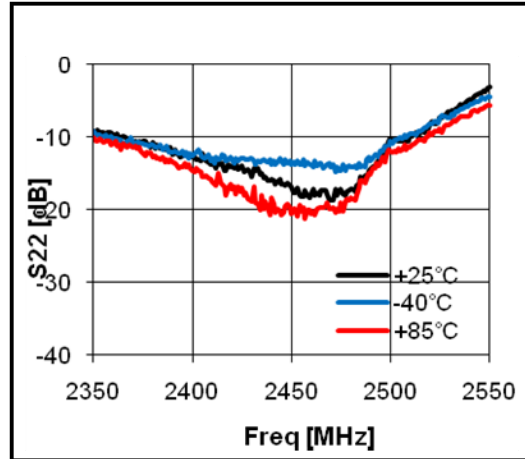
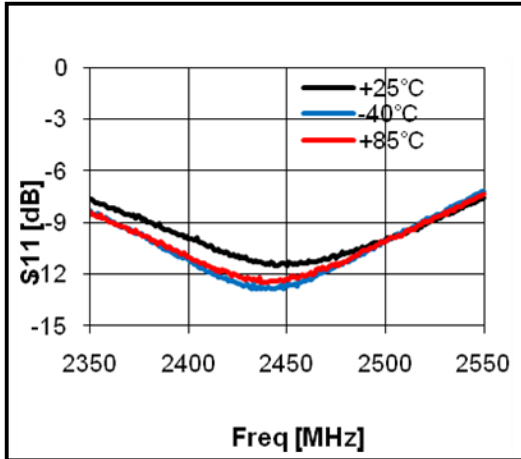
| Schematic Diagram | BOM   | Tolerance  |
|-------------------|---|------------|
|                   | C1  | 10uF ±20%  |
|                   | C2  | 1nF ±5%    |
|                   | C3  | 100pF ±5%  |
|                   | C4  | 100pF ±5%  |
|                   | C5  | 100pF ±5%  |
|                   | C6  | 1.5pF ±5%  |
|                   | C7  | 1.5pF ±5%  |
|                   | C8  | 1.8pF ±5%  |
|                   | R1  | 12 ohm ±5% |
| L1                | 56nH ±5%  |            |
| L2                | 3.9nH ±5%   |            |
| PCB Diagram       | Notice  |            |
|                   | <ol style="list-style-type: none"> <li>1. PCB: 31mil thick FR4</li> <li>2. Distance between the center of the series cap. (C8) and the input pin of BT301 _ <b><u>1.6 mm</u></b>.</li> <li>3. Distance between the center of the shunt cap. (C6) and the input pin of BT301 _ <b><u>3.4 mm</u></b>.</li> <li>4. Distance between the center of the shunt cap. (C7) and the output pin of BT301 _ <b><u>2.0 mm</u></b>.</li> </ol> |            |

# BT301

500-4000 MHz High Power Amplifier

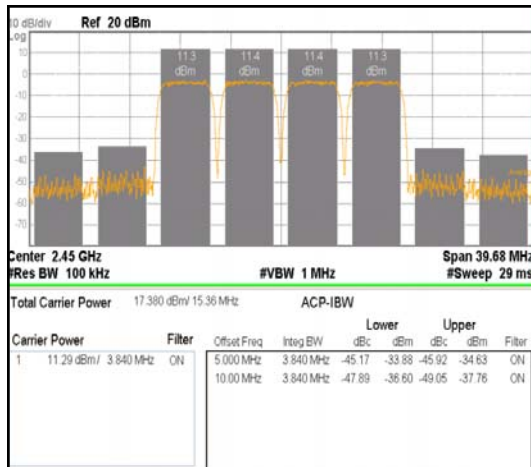
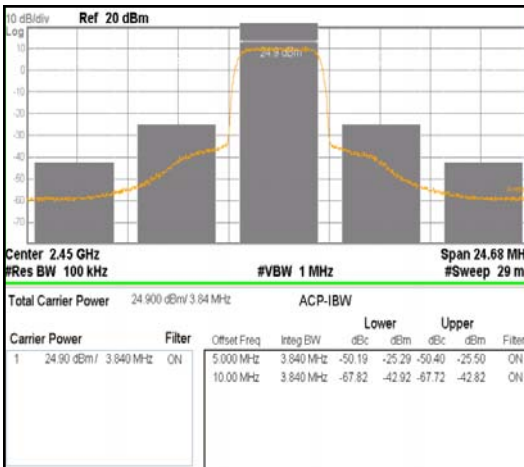
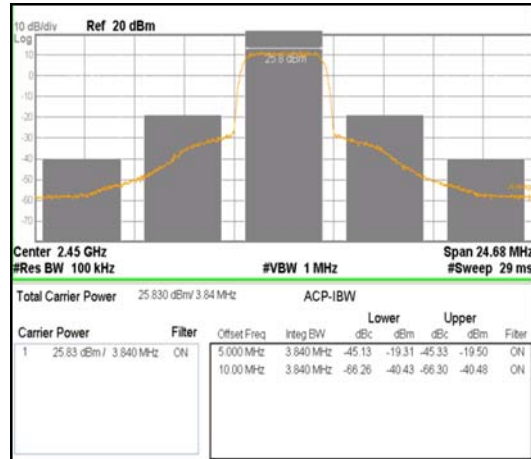
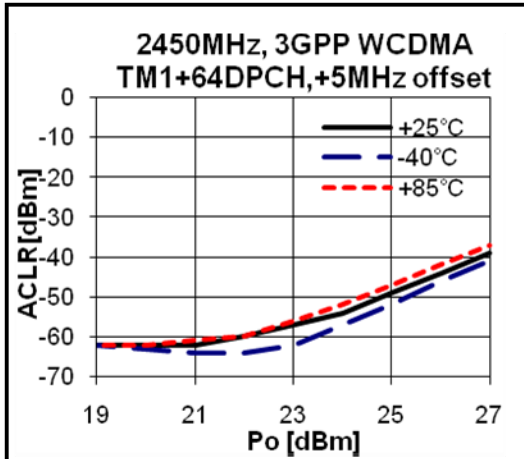


## Typical Performance



# BT301

## 500-4000 MHz High Power Amplifier



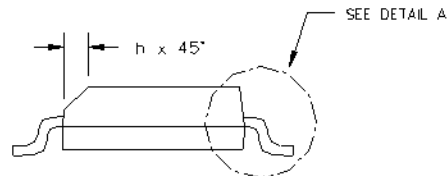
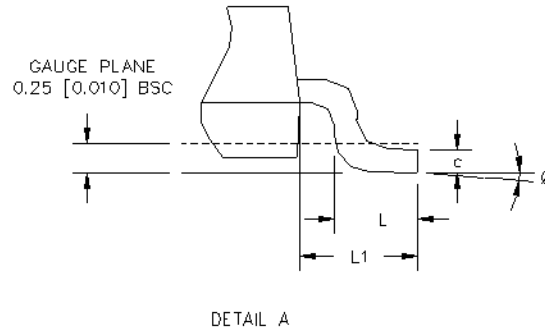
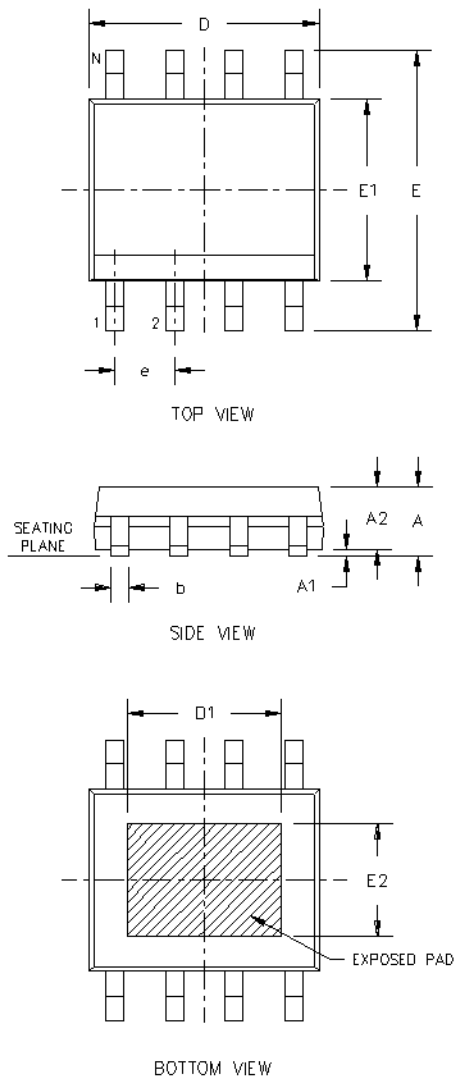


# BT301

500-4000 MHz High Power Amplifier



## Package Outline Dimension



| SYM | DIMENSION IN INCHES |       |       | DIMENSION IN MM |       |       |
|-----|---------------------|-------|-------|-----------------|-------|-------|
|     | MIN                 | NOM   | MAX   | MIN             | NOM   | MAX   |
| A   | 0.056               | 0.058 | 0.061 | 1.42            | 1.47  | 1.55  |
| A1  | 0.001               | 0.004 | 0.005 | 0.025           | 0.102 | 0.127 |
| A2  | 0.051               | 0.054 | 0.057 | 1.30            | 1.37  | 1.45  |
| b   | 0.014               | 0.016 | 0.020 | 0.36            | 0.41  | 0.51  |
| c   | 0.007               | 0.008 | 0.010 | 0.18            | 0.20  | 0.25  |
| D   | 0.191               | 0.193 | 0.195 | 4.85            | 4.90  | 4.95  |
| E1  | 0.151               | 0.153 | 0.155 | 3.84            | 3.89  | 3.94  |
| E   | 0.234               | 0.240 | 0.244 | 5.94            | 6.10  | 6.20  |
| e   | 0.050               |       |       | 1.27            |       |       |
| L   | 0.020               | 0.027 | 0.032 | 0.51            | 0.69  | 0.81  |
| L1  | 0.042               | 0.044 | 0.046 | 1.07            | 1.12  | 1.17  |
| Ø   | 0"                  | -     | 8"    | 0"              | -     | 8"    |
| h   | 0.011               | 0.015 | 0.019 | 0.28            | 0.38  | 0.48  |
| D1  | 0.120               | -     | 0.130 | 3.05            | -     | 3.30  |
| E2  | 0.085               | -     | 0.095 | 2.16            | -     | 2.41  |

- NOTES:
1. DIMENSION D DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. DIMENSION E1 DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSIONS.
  2. COPLANARITY APPLIES TO THE TERMINALS. COPLANARITY SHALL NOT EXCEED 0.003" [0.08 mm]
  3. BASED FROM JEDEC MS-012 VARIATION AA.

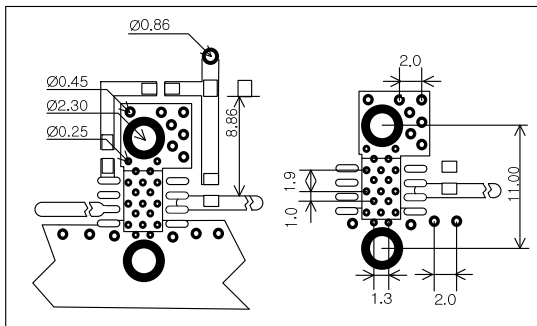
# BT301

500-4000 MHz High Power Amplifier

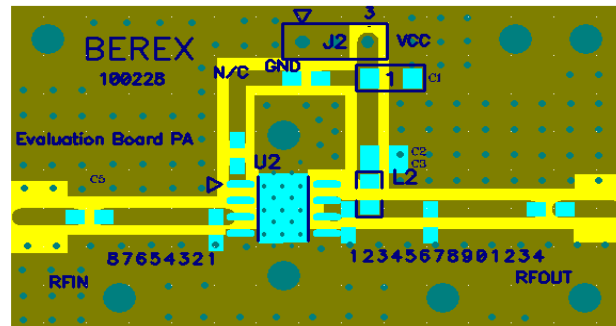


## Suggested PCB Land Pattern and PAD Layout

PCB Land Pattern



PCB Mounting



Note : All dimension are in millimeters

PCB lay out \_on BeRex website

## 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

|                    |                                     |
|--------------------|-------------------------------------|
| <b>ESD Rating:</b> | Class 1B                            |
| <b>Value:</b>      | Passes <1000V                       |
| <b>Test:</b>       | Human Body Model (HBM)              |
| <b>Standard:</b>   | JEDEC Standard JESD22-A114B         |
| <b>MSL Rating:</b> | Level 1 at +265°C convection reflow |
| <b>Standard:</b>   | JEDEC Standard J-STD-020            |

## NATO CAGE code:

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