

500 – 1500 MHz High Linearity LNA

Device Features

- Internally matched to 50 ohms
- Operated at 3.0V and 5.0V
- 37.5 dBm Output IP3 at 0dBm/tone at 700MHz
- 22.5dB Gain at 700MHz
- 21.1dBm P1dB at 700 MHz
- 0.43 dB NF at 700MHz on evaluation board
- Green/RoHS2 Compliant DFN8 2x2 Package

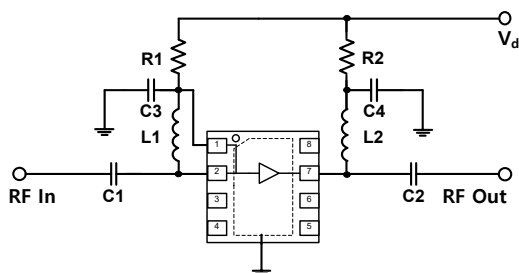
Product Description

BeRex's BLB01 is a high linearity LNA, based on GaAs material with E-pHEMT process and packaged in a RoHS2-compliant DFN 8L 2x2mm² Surface mount package. It is designed for use where low noise and high linearity are required and features low noise and high OIP3 at Frequency range of 0.5~1.5GHz. It is internally matched to 50 Ohms without external matching components, with fast enable switching speed for TD-LTE application. All devices are 100% RF/DC tested and classified as HBM ESD Class 1C.

Applications

- Base station Infrastructure/RFID
- Commercial/Industrial/Military wireless system
- TDD or FDD LTE systems

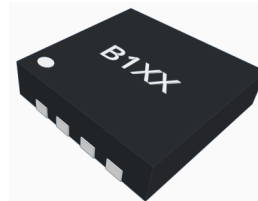
Applications Circuit



* Refer to [page 14](#) for Enable application.

| BOM | Value | Size | Vendor |
|-------|---------|------|-------------|
| C1,C4 | 100pF | 0603 | Samsung |
| C2,C3 | 12pF | 0603 | Samsung |
| R1 | 6.8Kohm | 0603 | Samsung |
| R2 | 0 ohm | 0603 | Samsung |
| L1 | 27nH | 0603 | Taiyo Yuden |
| L2 | 82nH | 0603 | Taiyo Yuden |

Part Marking (XX:Wafer number)



Electrical Specifications

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

| Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------------------|----------------------------|------|-------|------|------|
| Operational Frequency Range | | 500 | | 1500 | MHz |
| Test Frequency | | | 700 | | MHz |
| Gain | | 21.0 | 22.5 | | dB |
| Input Return Loss | | | -12.3 | | dB |
| Output Return Loss | | | -15.4 | | dB |
| Output IP3 | 0 dBm / tone , Δf=1 MHz | 34.5 | 37.5 | | dBm |
| Output P1dB | | 20.1 | 21.1 | | dBm |
| Noise Figure | | | 0.43 | 0.63 | dB |

* NF : Losses on input and output transmission lines on PCB are not de-embedded.

Device performance _ measured on a BeRex evaluation board at 25°C, Vd=3V, 50 Ω system.

| Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------------------|----------------------------|------|-------|------|------|
| Operational Frequency Range | | 500 | | 1500 | MHz |
| Test Frequency | | | 700 | | MHz |
| Gain | | 20.0 | 21.5 | | dB |
| Input Return Loss | | | -12.1 | | dB |
| Output Return Loss | | | -12.9 | | dB |
| Output IP3 | 0 dBm / tone , Δf=1 MHz | 27.5 | 30.5 | | dBm |
| Output P1dB | | 15.9 | 16.9 | | dBm |
| Noise Figure | | | 0.44 | 0.64 | dB |

* NF : Losses on input and output transmission lines on PCB are not de-embedded.

Recommended Operating Conditions

| Parameter | Min | Typ | Max | Unit |
|--|-----|--------|------|-------|
| Bandwidth | 500 | | 1500 | MHz |
| I _d @ (V _d = 5.0V) | 53 | 66 | 79 | mA |
| I _d @ (V _d = 3.0V) | 22 | 27 | 32 | mA |
| V _d | 3 | 5 | 5.25 | V |
| dG/dT | | -0.008 | | dB/°C |
| R _{TH} | | 24.76 | | °C/W |
| Operating Case Temperature | -40 | | +105 | °C |
| Switching Time(T _{on}) | | 140 | | ns |
| Switching Time(T _{off}) | | 140 | | ns |

Electrical specifications are measured at specified test conditions.

Specifications are not guaranteed over all recommended operating conditions.

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Absolute Maximum Ratings

| Parameter | Rating | Unit |
|----------------------|-------------|------|
| Storage Temperature | -55 to +155 | °C |
| Junction Temperature | +160 | °C |
| Supply Voltage | +6 | V |
| Supply Current | 130 | mA |
| Input RF Power | 21 | dBm |

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

Typical Performance (V_d=5.0V, I_d=66mA, T=25°C)

| Parameter | Frequency | | | | | Unit |
|---------------------|-----------|-------|-------|-------|-------|------|
| V _d = 5V | 500 | 700 | 800 | 900 | 1500 | MHz |
| Gain | 24.5 | 22.5 | 21.7 | 21 | 17.5 | dB |
| S11 | -15.5 | -12.3 | -12.0 | -11.7 | -11.5 | dB |
| S22 | -8.7 | -15.4 | -19.3 | -22.5 | -15.8 | dB |
| OIP3 | 38.0 | 37.5 | 35.5 | 35.5 | 32.5 | dBm |
| P1dB | 21.2 | 21.1 | 21.2 | 20.9 | 19.3 | dBm |
| Noise Figure | 0.6 | 0.43 | 0.4 | 0.44 | 0.7 | dB |

* NF : Losses on input and output transmission lines on PCB are not de-embedded.

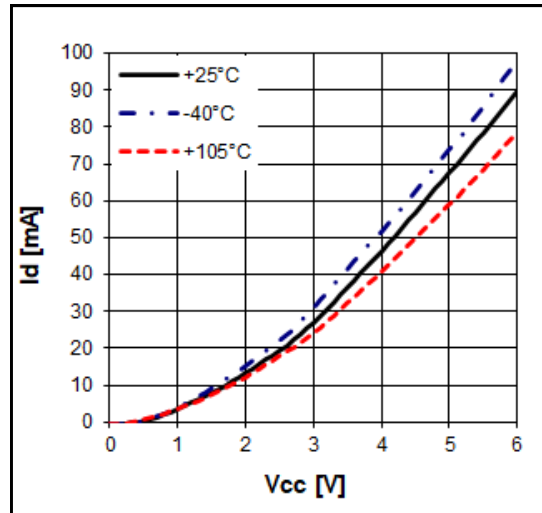
Typical Performance (V_d=3.0V, I_d=27mA, T=25°C)

| Parameter | Frequency | | | | | Unit |
|---------------------|-----------|-------|-------|-------|-------|------|
| V _d = 3V | 500 | 700 | 800 | 900 | 1500 | MHz |
| Gain | 23.3 | 21.4 | 20.5 | 19.7 | 16.1 | dB |
| S11 | -18.3 | -12.1 | -11.0 | -10.4 | -9.3 | dB |
| S22 | -7.4 | -12.9 | -15.0 | -16.5 | -13.7 | dB |
| OIP3 | 31.0 | 30.5 | 29.5 | 28.5 | 27.0 | dBm |
| P1dB | 16.2 | 16.9 | 17.1 | 17.2 | 17.5 | dBm |
| Noise Figure | 0.59 | 0.44 | 0.41 | 0.45 | 0.76 | dB |

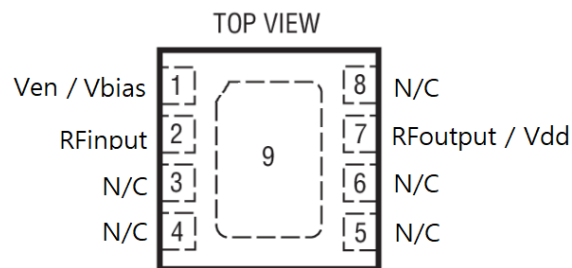
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V-I Characteristics

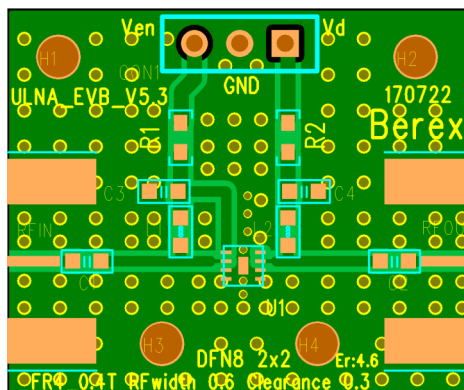


Pin Configuration



DC PACKAGE
8-LEAD (2mm × 2mm) PLASTIC DFN
EXPOSED PAD (PIN 9) IS GND, MUST BE SOLDERED TO PCB

Evaluation Board

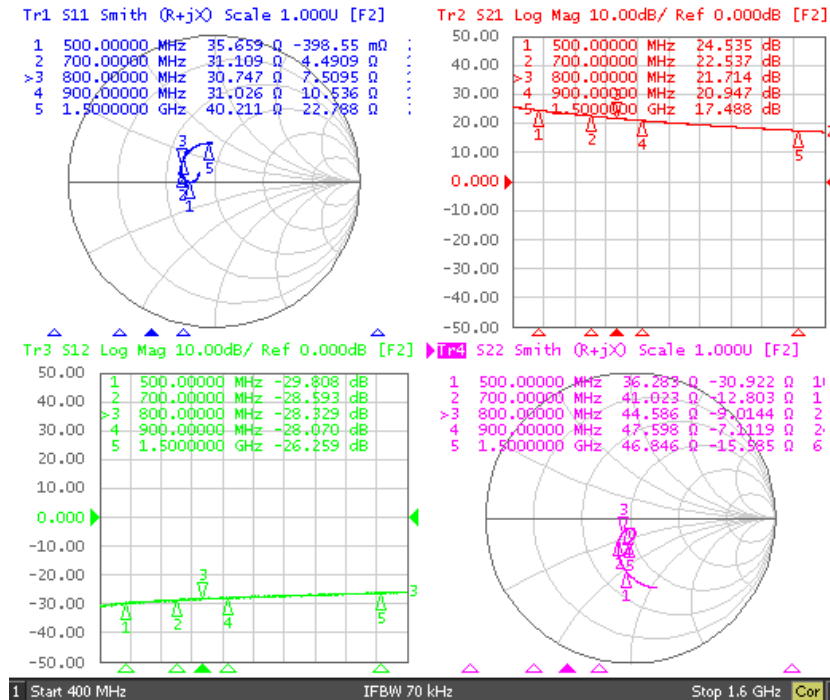


*Dielectric constant _ 4.2 *RF pattern width 24mil *16mil thick FR4 PCB

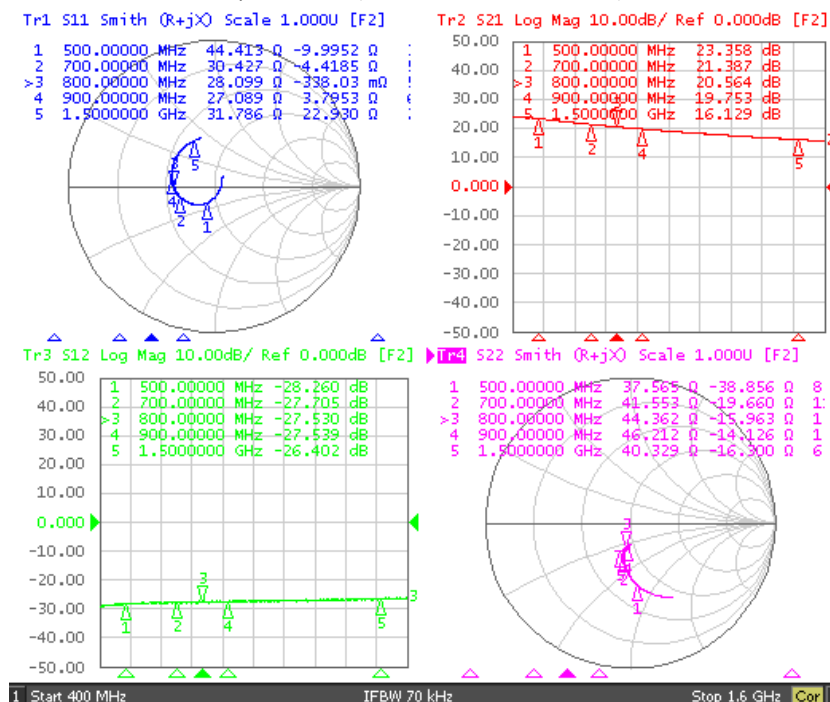
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Typical Device Data

S-parameters ($V_d=5.0V$, $I_d=66mA$, $T=25^\circ C$)



S-parameters ($V_d=3.0V$, $I_d=27mA$, $T=25^\circ C$)



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S-Parameter

(Vd=5.0V, Id = 66mA, 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 |
|---------------|------------|------------|------------|------------|------------|------------|------------|------------|
| 500 | 0.23 | -124.89 | 18.00 | 134.12 | 0.04 | 63.62 | 0.20 | -119.48 |
| 600 | 0.29 | -140.90 | 15.43 | 123.05 | 0.04 | 53.44 | 0.15 | -142.56 |
| 700 | 0.30 | -151.49 | 13.67 | 115.15 | 0.04 | 49.45 | 0.10 | -161.73 |
| 800 | 0.31 | -157.31 | 12.36 | 108.84 | 0.04 | 45.30 | 0.07 | -177.33 |
| 900 | 0.30 | -163.08 | 11.33 | 103.54 | 0.04 | 43.09 | 0.04 | 164.79 |
| 1000 | 0.29 | -166.98 | 10.52 | 98.37 | 0.04 | 37.82 | 0.01 | 113.63 |
| 1100 | 0.28 | -170.27 | 9.82 | 93.46 | 0.05 | 37.16 | 0.03 | 4.31 |
| 1200 | 0.27 | -172.29 | 9.17 | 88.78 | 0.05 | 31.40 | 0.06 | -13.23 |
| 1300 | 0.26 | -173.09 | 8.66 | 84.16 | 0.05 | 31.93 | 0.09 | -19.81 |
| 1400 | 0.24 | -174.55 | 8.18 | 79.84 | 0.05 | 28.25 | 0.12 | -25.54 |
| 1500 | 0.23 | -174.85 | 7.78 | 75.66 | 0.05 | 26.86 | 0.15 | -29.69 |

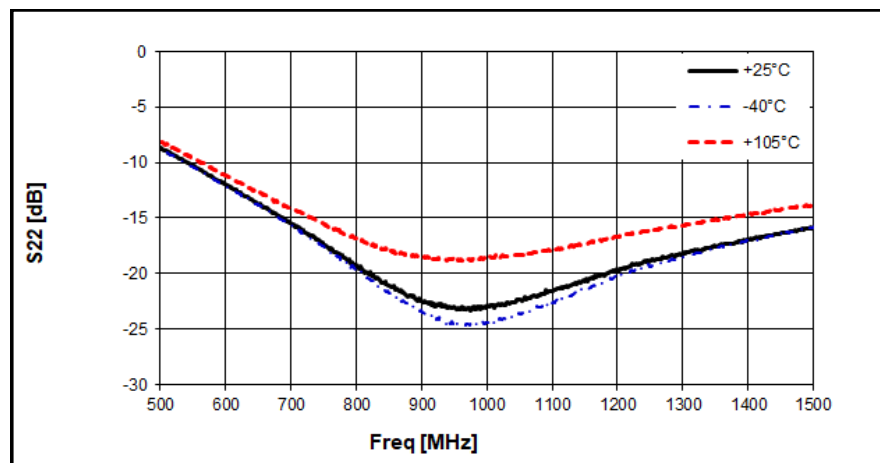
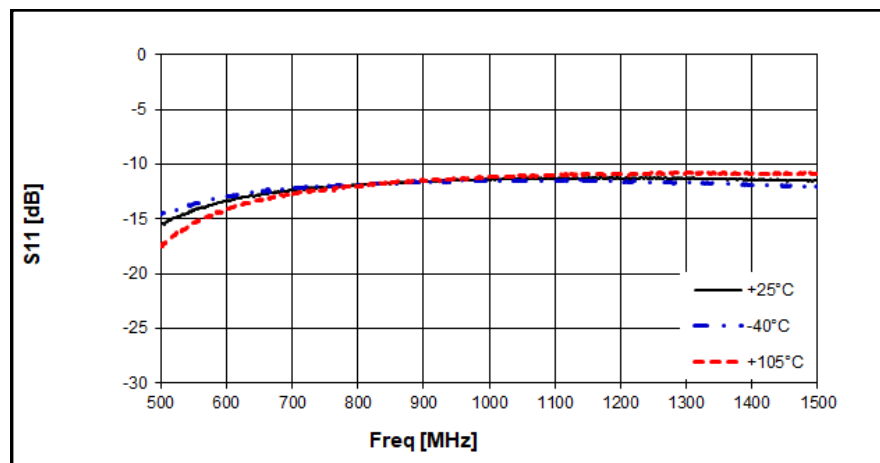
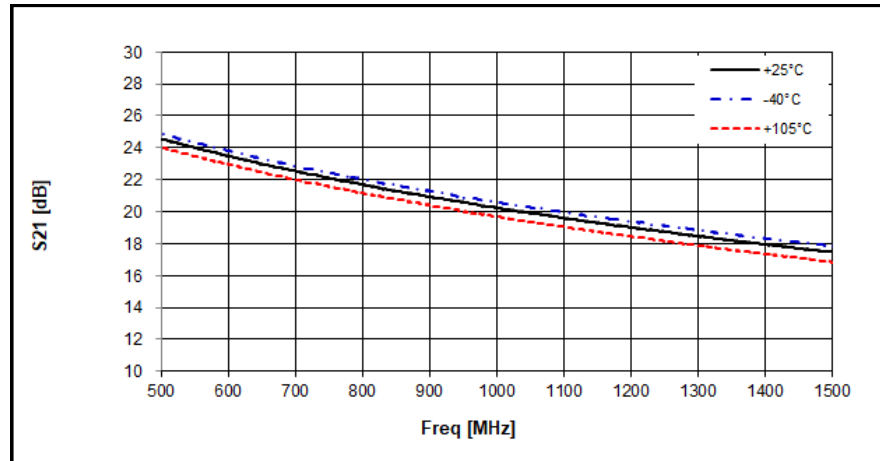
(Vd=3.0V, Id = 27mA, T = 25 °C, calibrated to device leads)

| Freq [MHz] | S11 Mag | S11 Ang | S21 Mag | S21 Ang | S12 Mag | S12 Ang | S22 Mag | S22 Ang |
|---------------|------------|------------|------------|------------|------------|------------|------------|------------|
| 500 | 0.26 | -75.46 | 15.48 | 141.37 | 0.04 | 55.53 | 0.26 | -88.42 |
| 600 | 0.31 | -107.06 | 13.30 | 127.53 | 0.05 | 45.23 | 0.17 | -102.44 |
| 700 | 0.34 | -122.34 | 11.75 | 118.21 | 0.04 | 38.40 | 0.11 | -104.33 |
| 800 | 0.35 | -131.66 | 10.55 | 110.48 | 0.04 | 35.85 | 0.08 | -95.78 |
| 900 | 0.35 | -138.83 | 9.63 | 104.26 | 0.04 | 31.10 | 0.07 | -76.19 |
| 1000 | 0.35 | -143.86 | 8.88 | 98.67 | 0.05 | 28.25 | 0.08 | -58.96 |
| 1100 | 0.35 | -148.58 | 8.25 | 93.39 | 0.05 | 25.15 | 0.11 | -50.97 |
| 1200 | 0.35 | -151.32 | 7.70 | 88.38 | 0.05 | 24.09 | 0.13 | -47.09 |
| 1300 | 0.35 | -153.89 | 7.23 | 83.57 | 0.05 | 22.66 | 0.16 | -47.34 |
| 1400 | 0.34 | -156.28 | 6.81 | 78.98 | 0.05 | 22.68 | 0.19 | -48.71 |
| 1500 | 0.34 | -158.25 | 6.44 | 74.59 | 0.05 | 19.77 | 0.21 | -49.29 |

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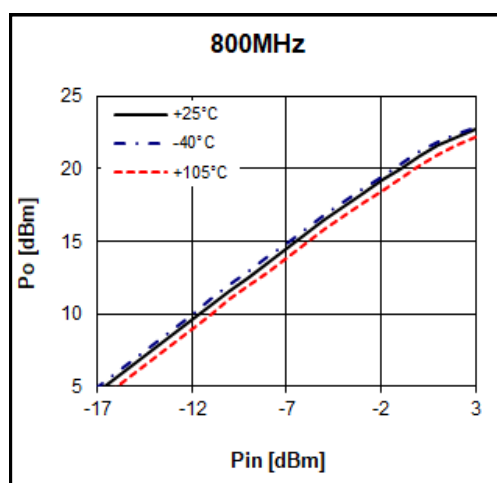
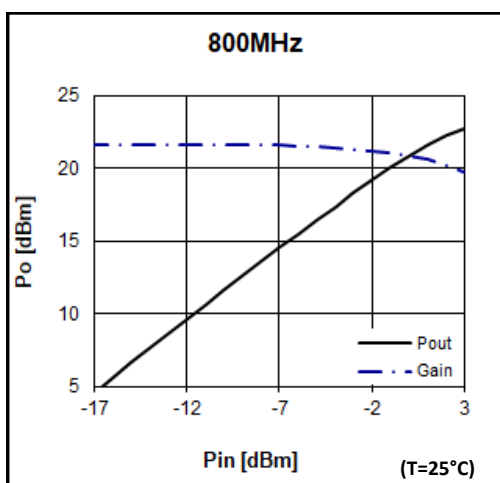
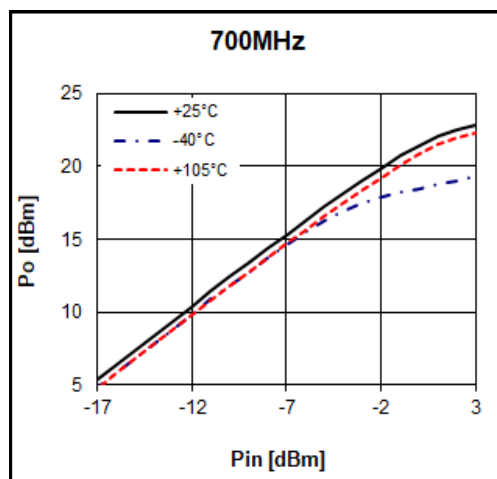
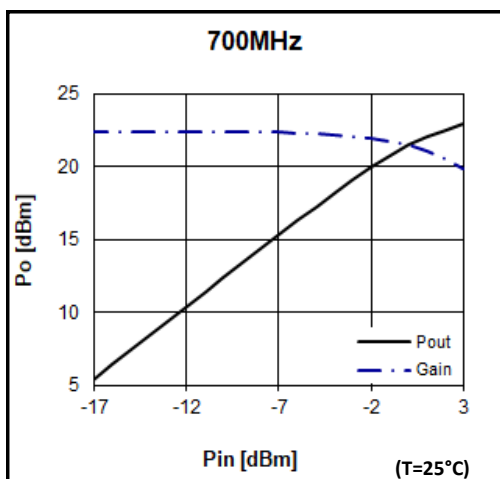
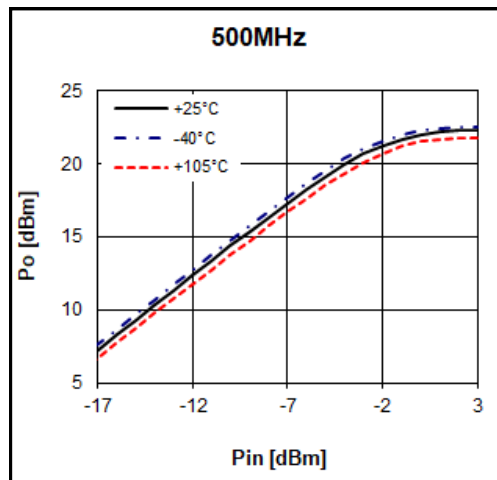
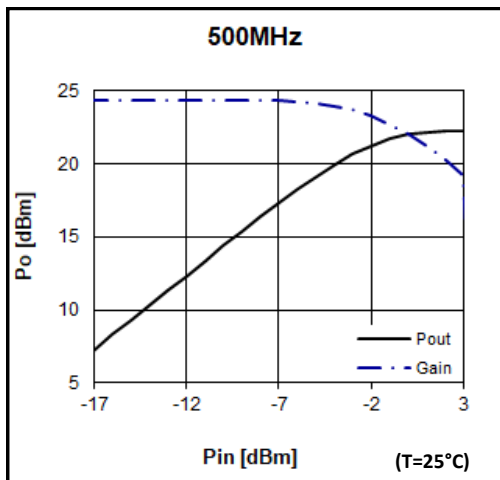
Typical Performance

$V_d = 5V$, $I_d = 66mA$



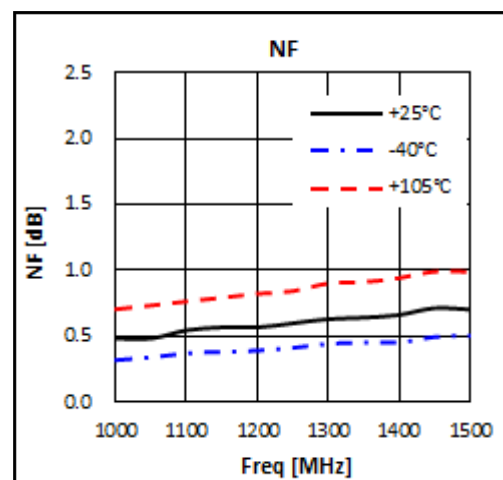
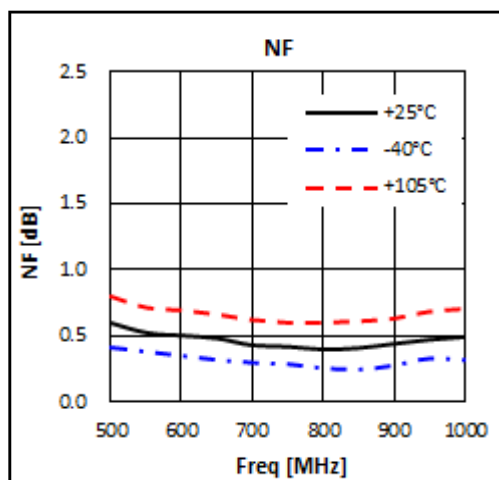
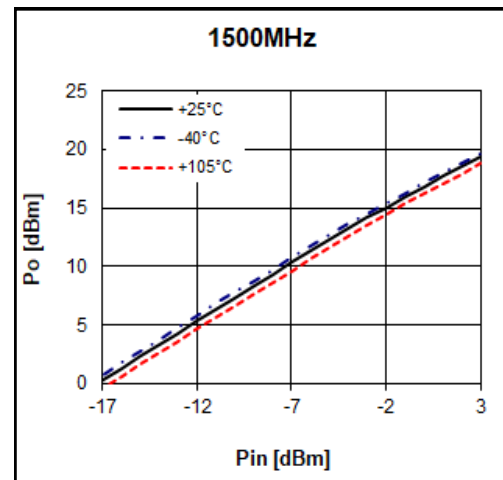
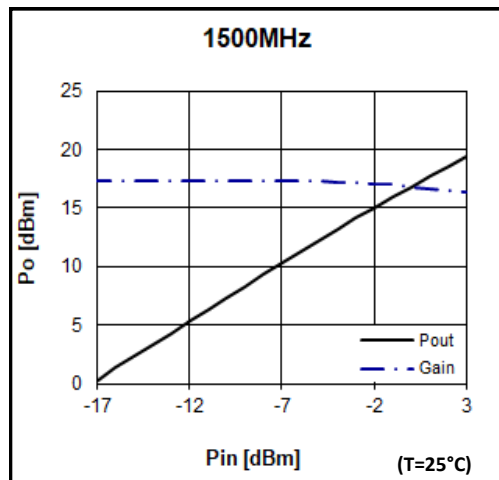
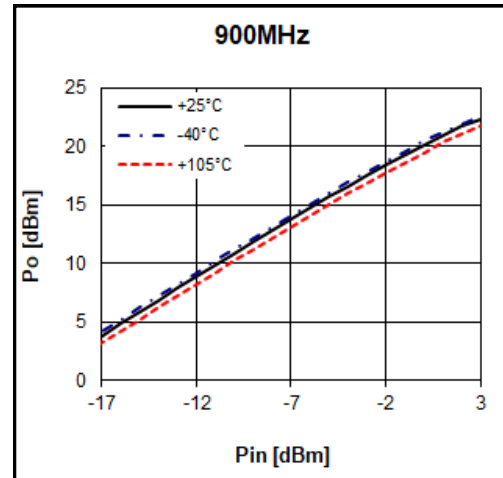
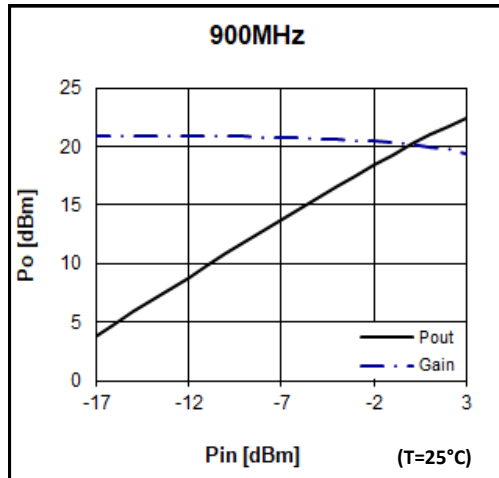
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$V_d = 5V, I_d = 66mA$



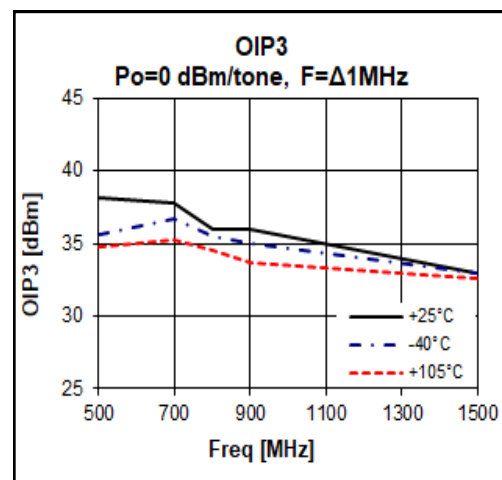
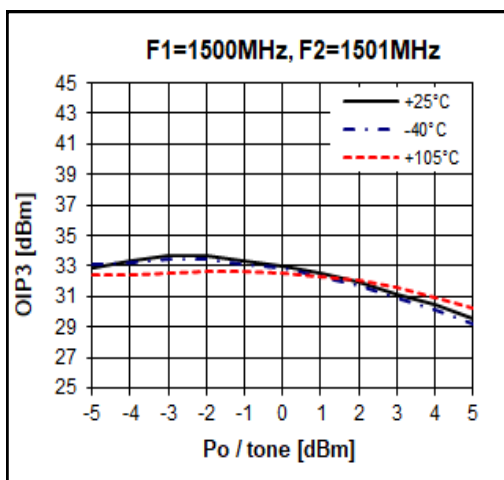
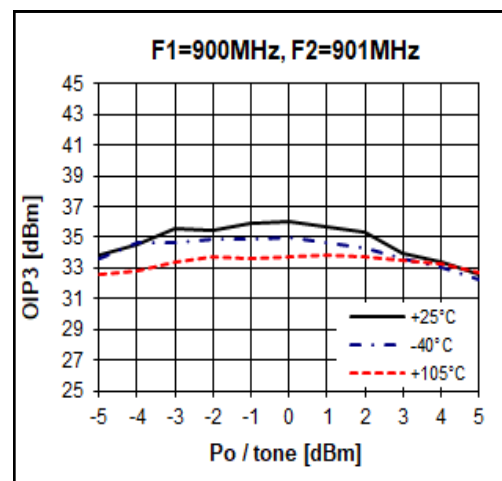
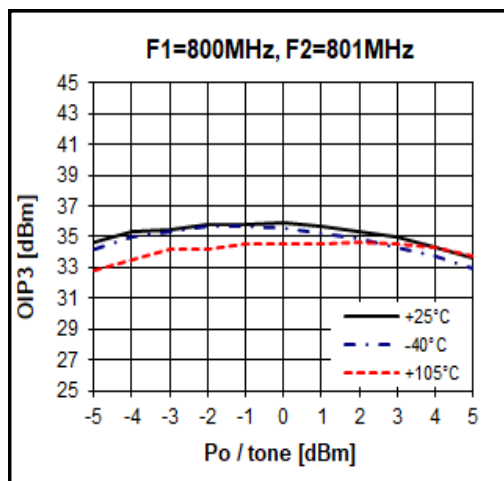
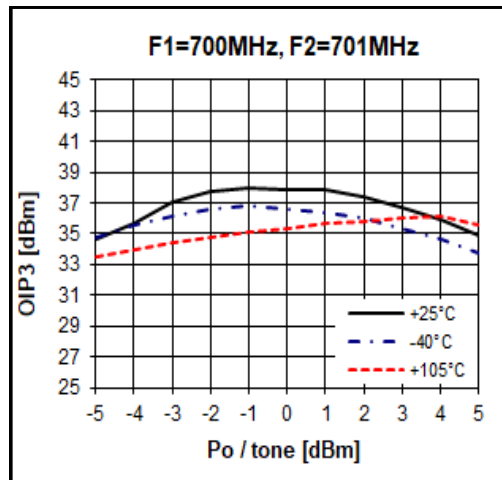
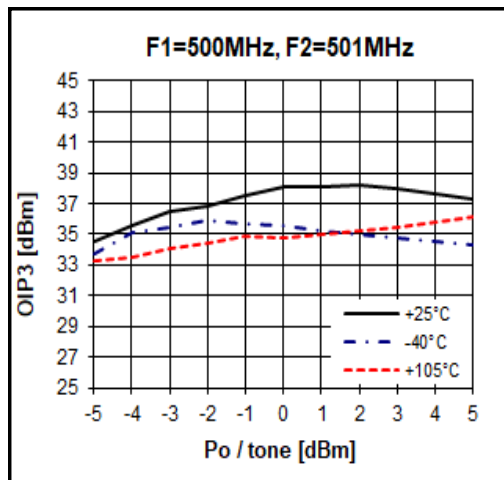
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$V_d = 5V, I_d = 66mA$



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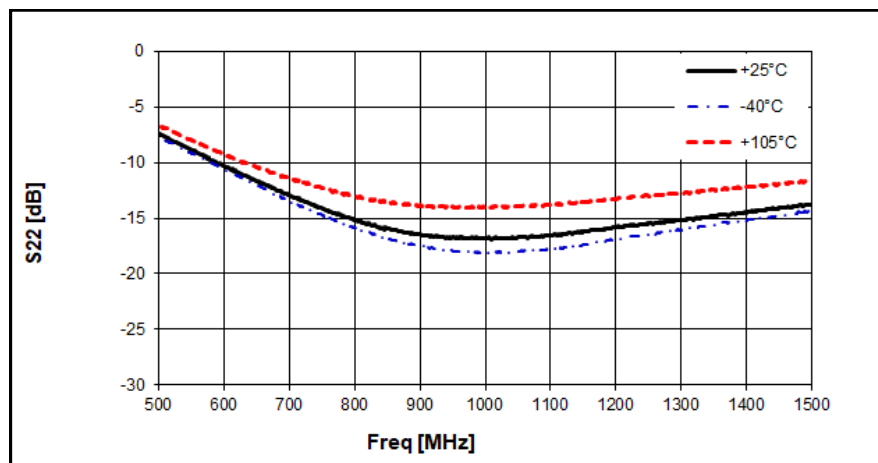
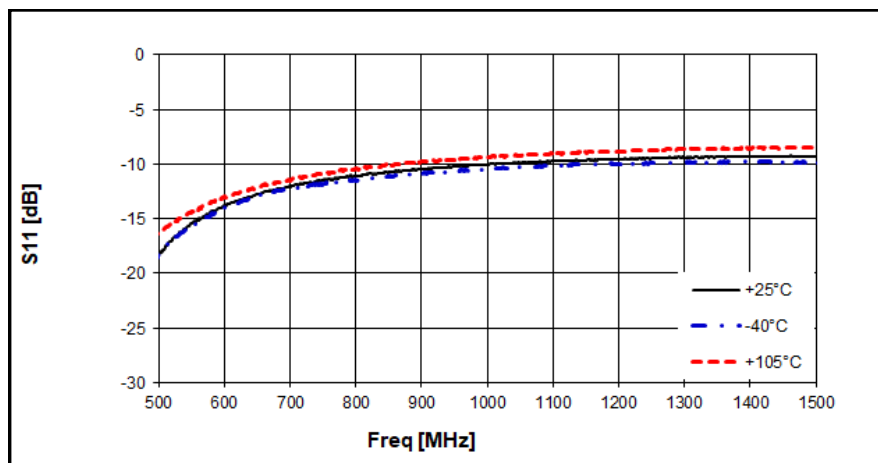
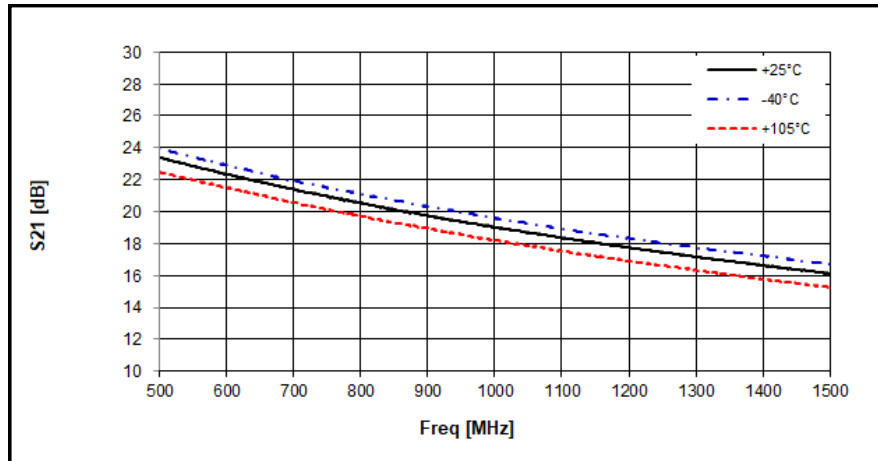
$V_d = 5V$, $I_d = 66mA$



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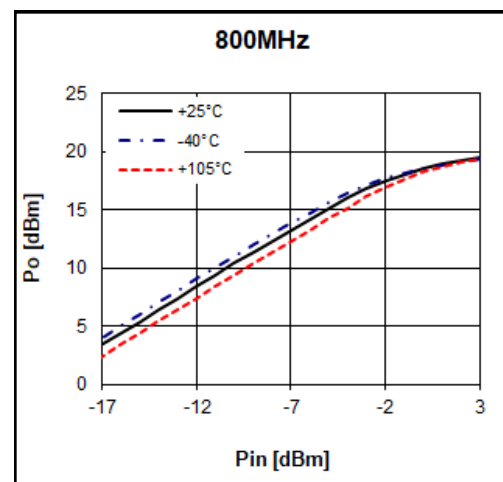
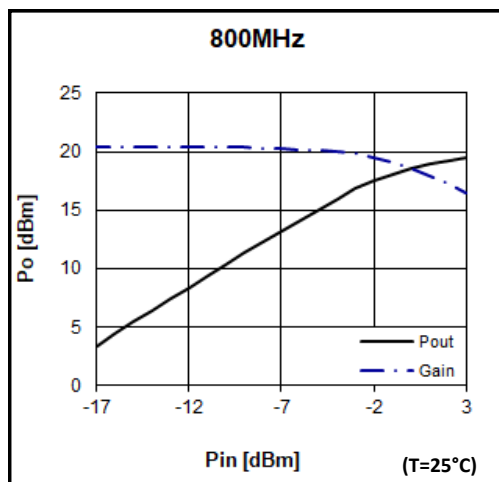
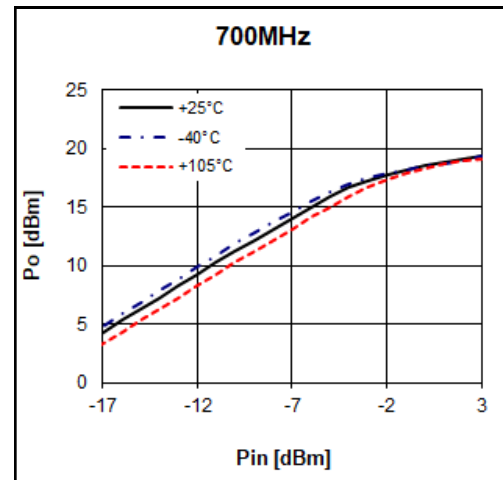
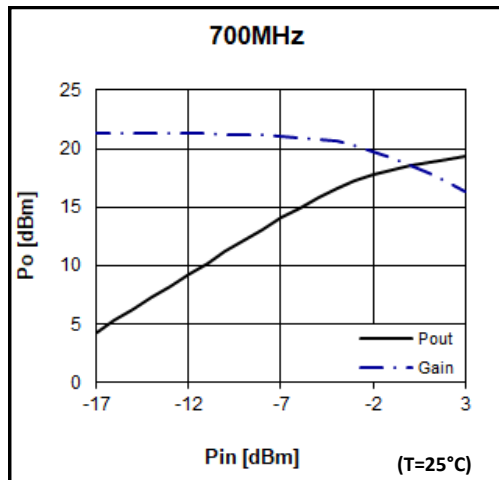
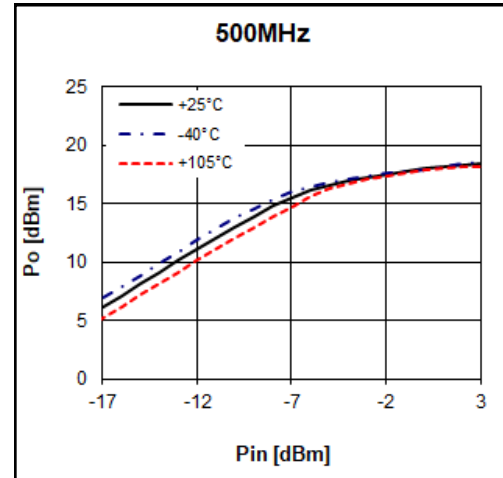
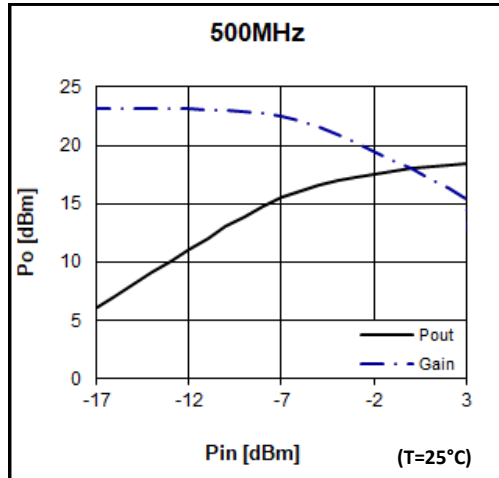
Typical Performance

$V_d = 3V$, $I_d = 27mA$



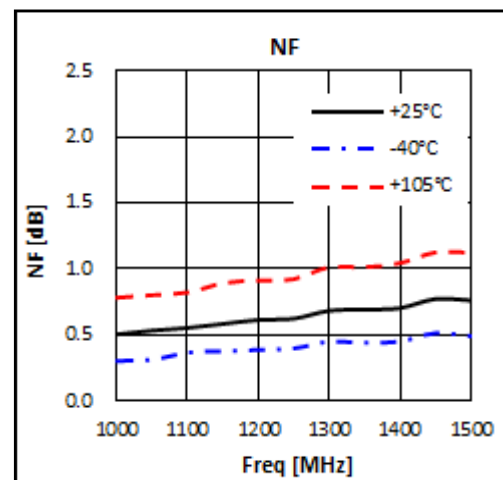
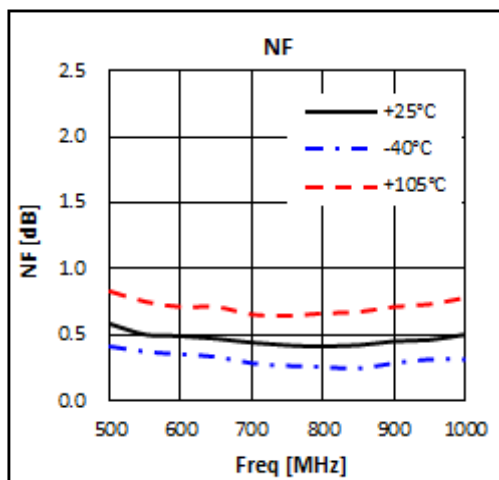
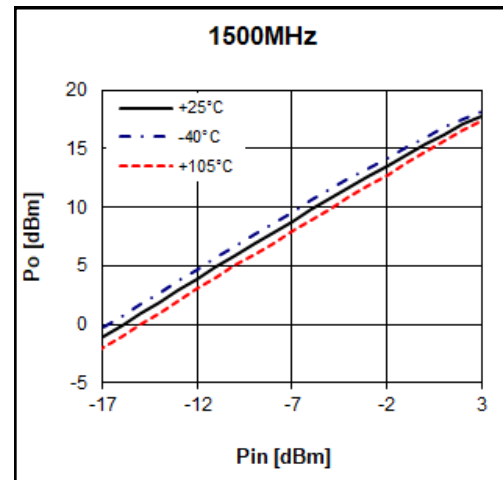
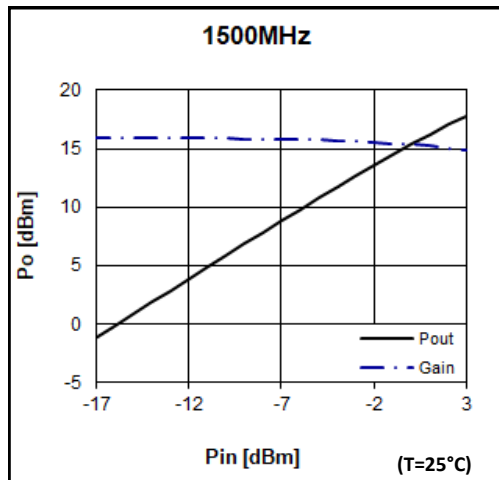
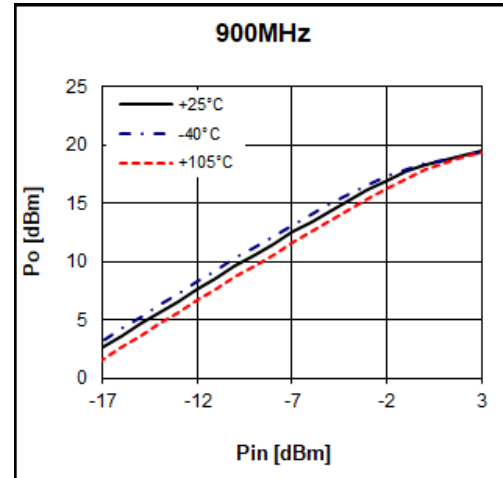
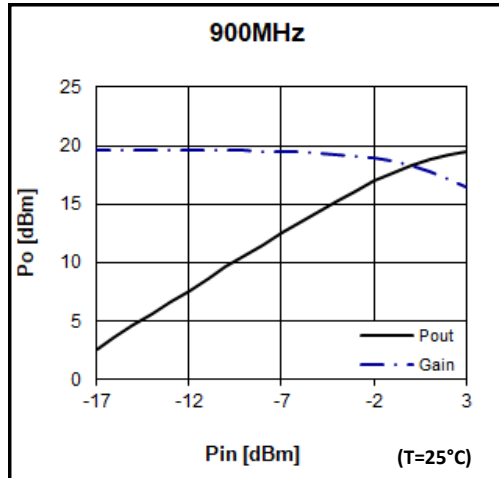
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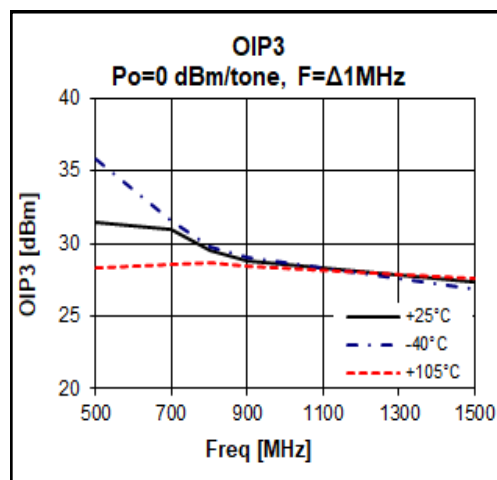
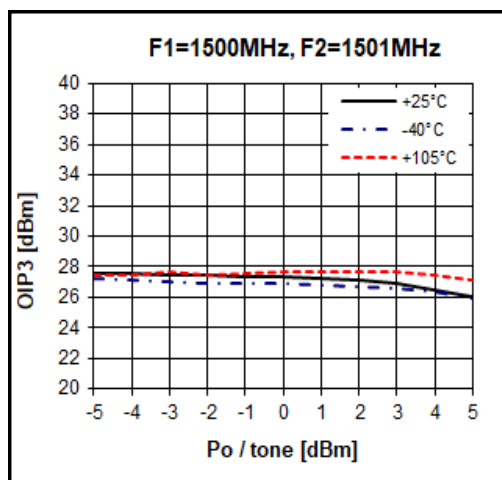
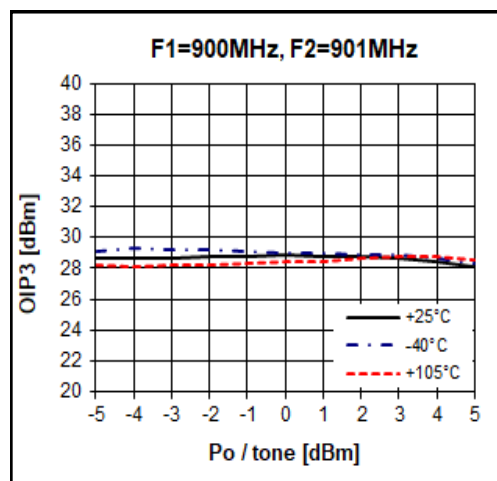
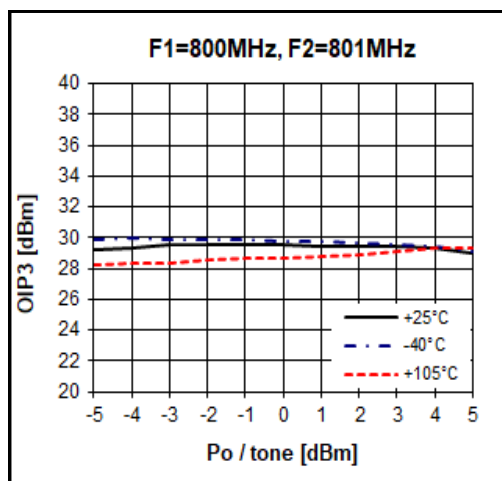
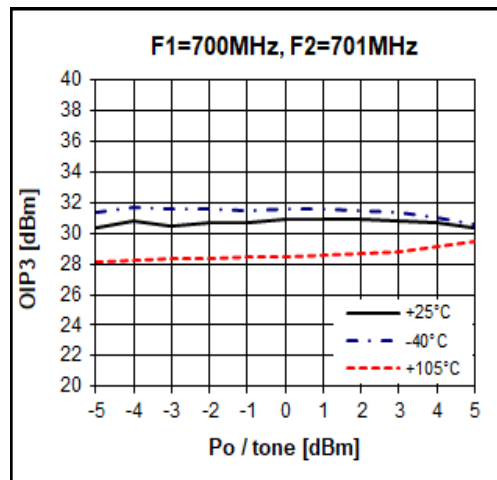
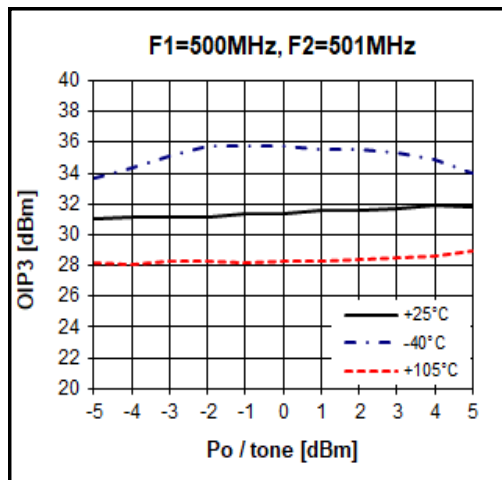
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$V_d = 3V, I_d = 27mA$



500 – 1500 MHz High Linearity LNA

$V_d = 3V$, $I_d = 27mA$



500 – 1500 MHz High Linearity LNA

Enable Application

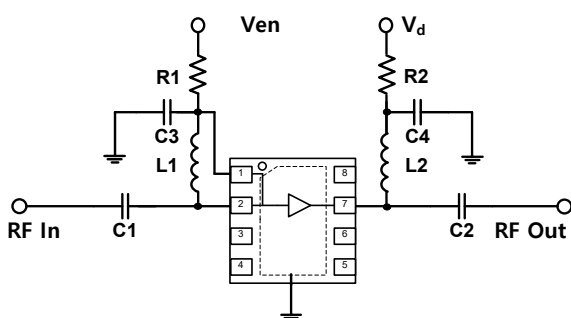
State function

| V _d | V _{en} | State |
|----------------|-----------------|-------|
| 5V | 0V | Off |
| 5V | 5V | On |

Switching Time

| | Min. | Typical | Max. | Unit |
|----------------------------------|------|---------|------|------|
| Raising time (T _{on}) | | 140 | | ns |
| Falling time (T _{off}) | | 140 | | ns |

Application circuit

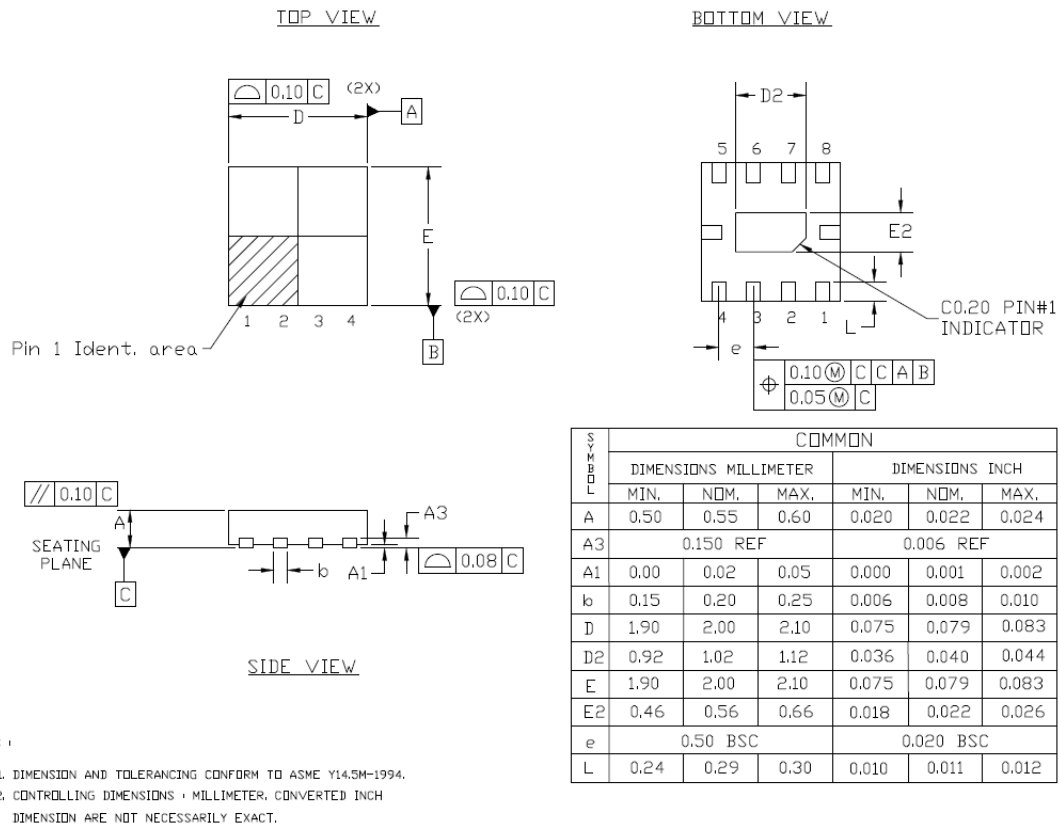


BOM

| Component | Value | Size | Vendor |
|-----------|---------|------|-------------|
| C1,C4 | 100pF | 0603 | Samsung |
| C2,C3 | 12pF | 0603 | Samsung |
| R1 | 6.8Kohm | 0603 | Samsung |
| R2 | 0 ohm | 0603 | Samsung |
| L1 | 27nH | 0603 | Taiyo Yuden |
| L2 | 82nH | 0603 | Taiyo Yuden |

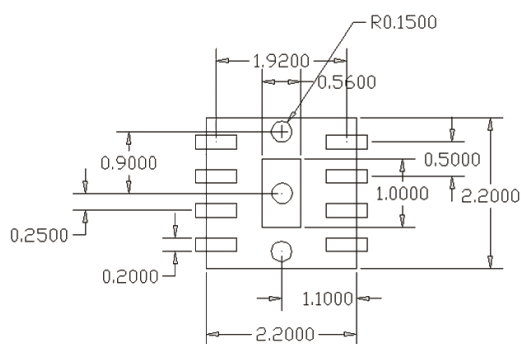
500 – 1500 MHz High Linearity LNA

Package Outline Dimension



Suggested PCB Land Pattern and PAD Layout

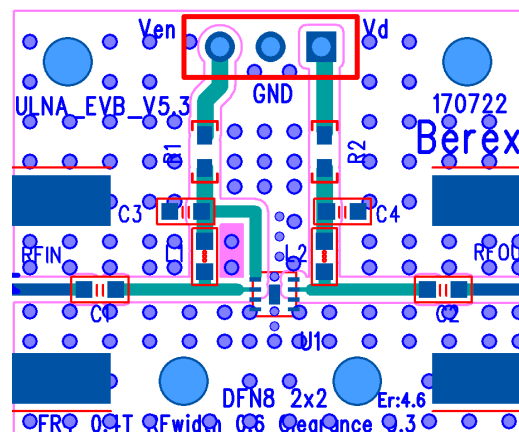
PCB Land Pattern



Note : All dimension _ millimeters

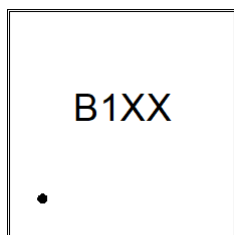
PCB lay out _ on BeRex website

PCB Mounting



500 – 1500 MHz High Linearity LNA

Package Marking

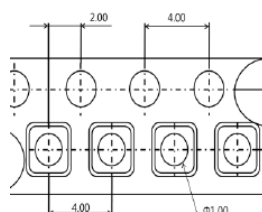


Pin 1

XX = Wafer No.

Tape & Reel

DFN8 2x2



Packaging information:

Tape Width (mm): 8

Reel Size (inches): 7

Device Cavity Pitch (mm): 4

Devices Per Reel: 3000

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 JS-001-2014 |

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



Proper ESD procedures should be followed when handling this device.

500 – 1500 MHz High Linearity LNA

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 |
|---|---|---|---|---|