

ABU1510 Data Sheet

5 ~ 1200 MHz Wide-band CATV Linear Amplifier MMIC

1. Product Overview

1.1 General Description

ABU1510, a wide-band linear amplifier MMIC, has high linearity and low noise over a wide range of frequency from 5 MHz to 1200 MHz, being suitable for use in the fiber receiver, distribution amplifiers, and drop amplifiers of CATV. The amplifier is available in an SOT89 package and passes through the stringent 100% DC & RF test in an automated test handler.

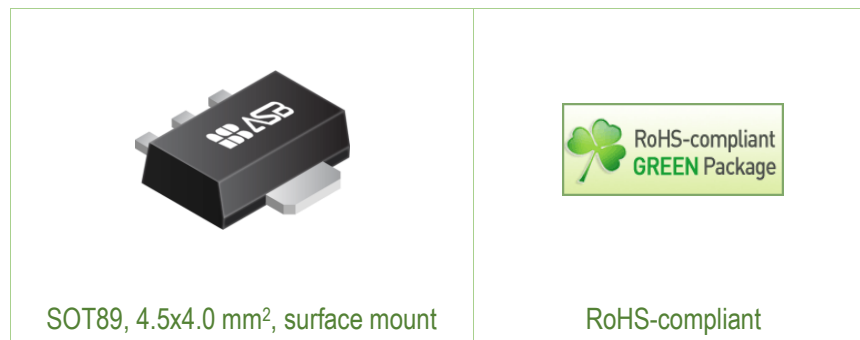
1.2 Features

- Low-noise and high linearity
- Wide-band CATV application at 5 ~ 1200 MHz
- 75 Ω input & output matching
- Robust under hard operating conditions
- 10.3 dB gain at 500 MHz
- CSO of 60 dBc, CTB of 62 dBc
@ Pout = 89 dB μ V flat for NTSC 77 channels, device voltage = +5 V
- Single supply: +5 V

1.3 Applications

- CATV Reverse at 5 ~ 300 MHz
- CATV Forward at 50 ~ 1200 MHz
- Optical Node, FTTH, RFoG

1.4 Package Profile & RoHS Compliance



2. Summary on Product Performances

2.1 Typical Performance

Supply voltage = +5 V, T_A = +25 °C, Z_O = 75 Ω.

| Parameter | Typical | | | Unit |
|--------------------------|------------------|------|------|------|
| Frequency | 50 | 500 | 1200 | MHz |
| Noise Figure | 3.4 | 3.7 | 4.2 | dB |
| Gain | 10.1 | 10.0 | 9.9 | dB |
| S11 | -19 | -18 | -16 | dB |
| S22 | -16 | -20 | -18 | dB |
| Output IP3 ¹⁾ | 31 | 34 | 30 | dBm |
| Output IP2 ²⁾ | 63 | | | dBm |
| Output P1dB | 19 | 18 | 16 | dBm |
| CSO | 60 ³⁾ | | | dBc |
| CTB | 62 ³⁾ | | | dBc |
| Current | 103 | | | mA |
| Device Voltage | +5 | | | V |

1) OIP3 is measured with two tones at an output power of +3 dBm/tone separated by 6 MHz.

2) OIP2 is measured with two tones (F1 = 400 MHz + F2 = 450 MHz) at an output power of +3 dBm/tone.

3) CSO & CTB measured at P_{out} = 89 dBμV flat for NTSC 77 channels.

2.2 Product Specification

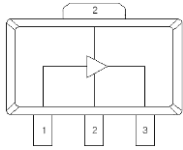
Supply voltage = +5 V, T_A = +25 °C, Z_O = 75 Ω.

| Parameter | Min | Typ | Max | Unit |
|--------------------------|-----|------|-----|------|
| Frequency | | 500 | | MHz |
| Noise Figure | | 3.7 | | dB |
| Gain | | 10.0 | | dB |
| S11 | | -18 | | dB |
| S22 | | -20 | | dB |
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2) OIP2 is measured with two tones (F1 = 400 MHz + F2 = 450 MHz) at an output power of +3 dBm/tone.

2.3 Pin Configuration

| Pin | Description | Simplified Outline |
|-----|---------------|---|
| 1 | RF_IN |  |
| 2 | Ground | |
| 3 | RF_OUT & Bias | |

2.4 Absolute Maximum Ratings, T_A = +25 °C

| Parameters | Max. Ratings |
|-----------------------------------|----------------|
| Operating Case Temperature | -40 to +85 °C |
| Storage Temperature | -40 to +150 °C |
| Device Voltage | +6 V |
| Device Current | 140 mA |
| Power Dissipation | +0.7 W |
| Junction Temperature | +150 °C |
| Input RF Power (CW, 75 Ω matched) | +23 dBm |

The operation of this device in excess of any of these limits may cause permanent damage.

* Refer to the max. input RF power data at http://www.asb.co.kr/pdf/Maximum_Input_Power_Analysis.pdf. The max. input RF power, in principle, depends upon application frequency, matching circuit, and device voltage.

2.5 Thermal Resistance

| Symbol | Description | Typ | Unit |
|-----------------|--|-----|------|
| R _{th} | Thermal resistance from junction to lead | 70 | °C/W |

2.6 ESD Classification & Moisture Sensitivity Level

ESD Classification

| | |
|-----|----------|
| HBM | Class 1A |
|-----|----------|

CAUTION: Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

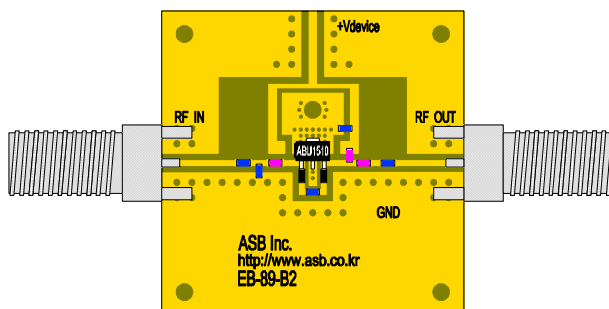
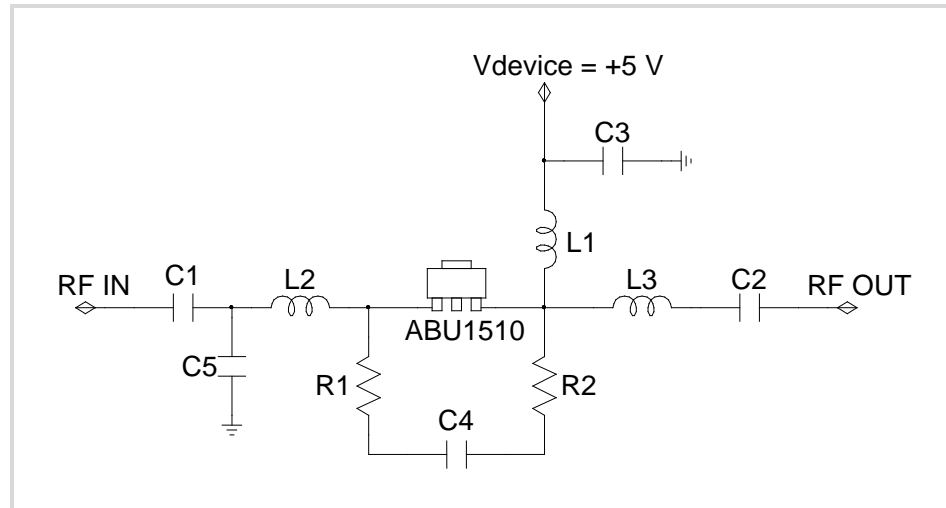
Moisture Sensitivity Level

| |
|------------------------|
| MSL 3 at 260 °C reflow |
|------------------------|

(Intentionally Blanked)

3. Application: 50 ~ 1200 MHz ($V_{\text{device}} = +5 \text{ V}$)

3.1 Application Circuit & Evaluation Board



| PCB Information | |
|-----------------|----------|
| Material | FR4 |
| Thickness (mm) | 0.8 |
| Size (mm) | 40x40 |
| EB No. | EB-89-B2 |

Bill of Material

| Symbol | Value | Size | Description | Manufacturer |
|---------|------------------|------|-----------------------|--------------|
| ABU1510 | - | - | MMIC Amplifier | ASB |
| C1, C2 | 4.7 nF | 0603 | DC blocking capacitor | Murata |
| C3 | 10 μF | 0805 | Decoupling capacitor | Murata |
| C4 | 10 nF | 0402 | Matching capacitor | Murata |
| C5 | 0.5 pF | 0603 | Matching capacitor | Murata |
| L1 | 1 μH | 1206 | RF choke inductor | Murata |
| L2 | 8.2 nH | 0603 | Matching inductor | Murata |
| L3 | 6.8 nH | 0603 | Matching inductor | Murata |
| R1 | 51 Ω | 0402 | Feedback resistor | Samsung |
| R2 | 330 Ω | 0402 | Feedback resistor | Samsung |

3.2 Performance Table

Supply voltage = +5 V, T_A = +25 °C, Z_O = 75 Ω.

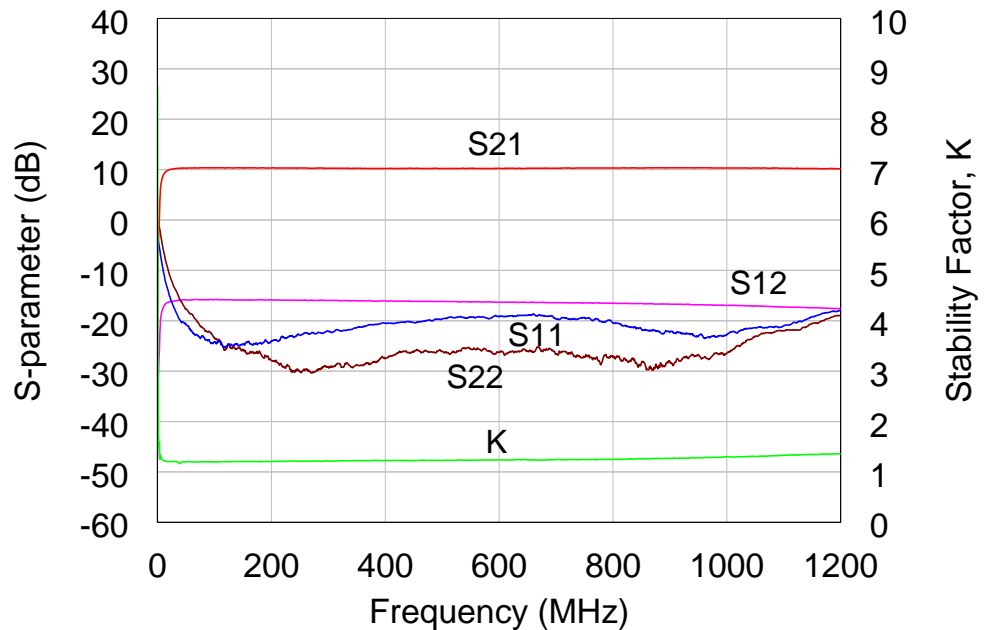
| Parameter | Typical | | | Unit |
|--------------------------|------------------|------|------|------|
| Frequency | 50 | 500 | 1200 | MHz |
| Noise Figure | 3.4 | 3.7 | 4.2 | dB |
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| Output IP3 ¹⁾ | 31 | 34 | 30 | dBm |
| Output IP2 ²⁾ | 63 | | | dBm |
| Output P1dB | 19 | 18 | 16 | dBm |
| CSO | 60 ³⁾ | | | dBc |
| CTB | 62 ³⁾ | | | dBc |
| Current | 103 | | | mA |
| Device Voltage | +5 | | | V |

1) OIP3 is measured with two tones at an output power of +3 dBm/tone separated by 6 MHz.

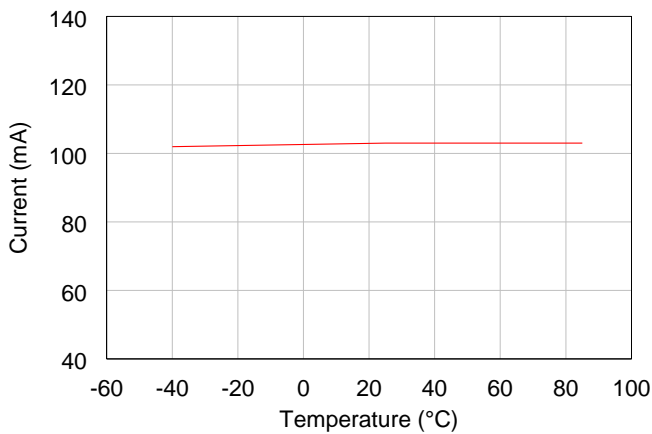
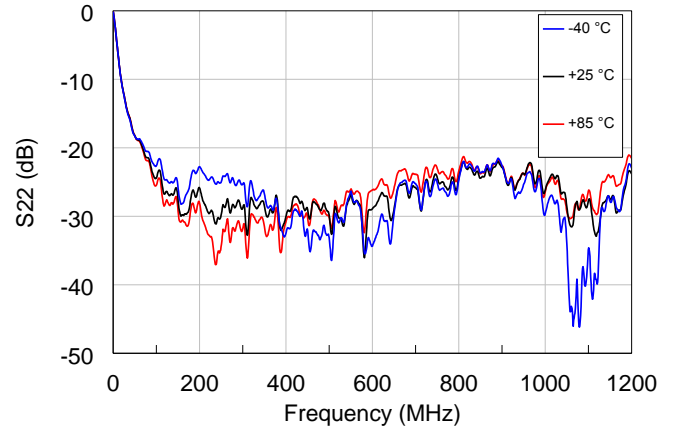
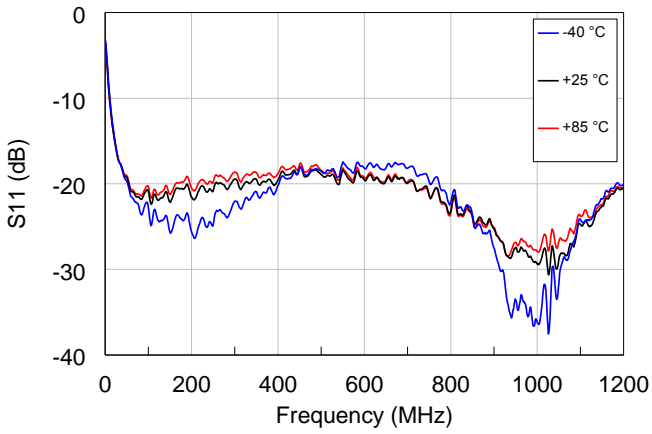
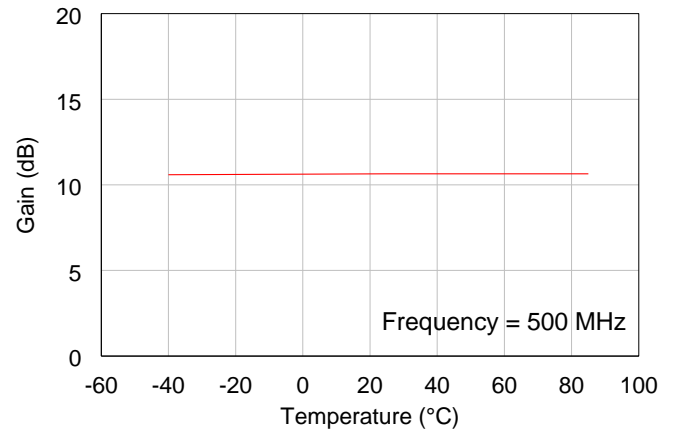
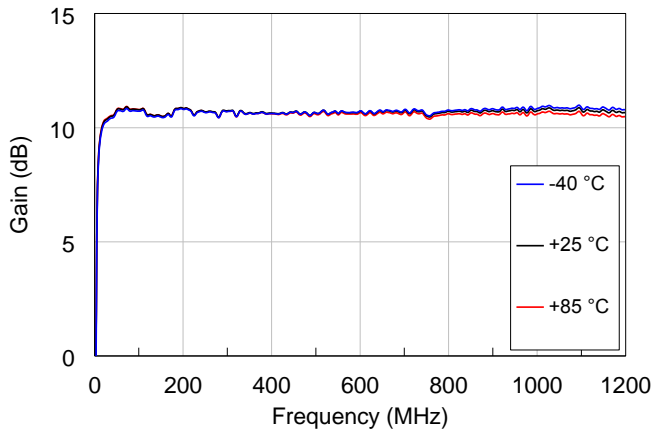
2) OIP2 is measured with two tones (F1 = 400 MHz + F2 = 450 MHz) at an output power of +3 dBm/tone.

3) CSO & CTB measured at P_{out} = 89 dBμV flat for NTSC 77 channels.

3.3 Plot of S-parameter & Stability Factor

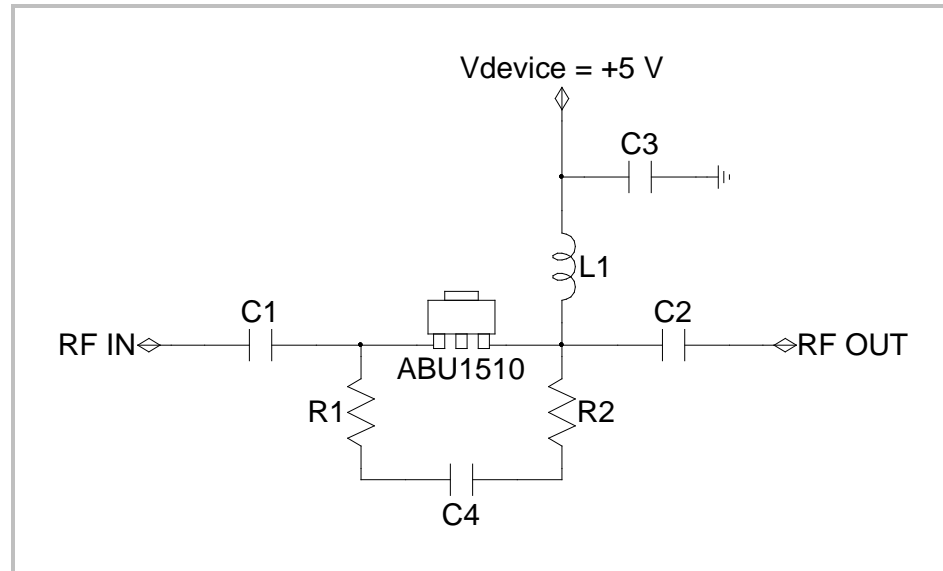


3.4 Plots of Noise Figure and Performances with Temperature

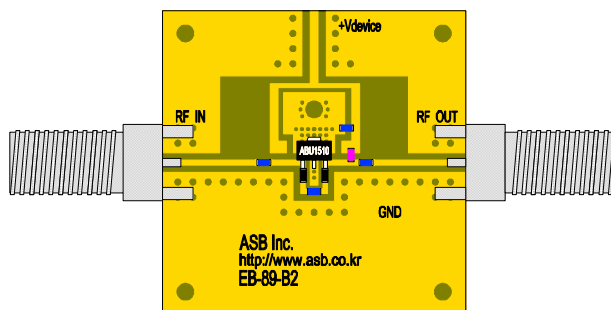


4. Application: 5 ~ 300 MHz ($V_{\text{device}} = +5 \text{ V}$)

4.1 Application Circuit & Evaluation Board



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| PCB Information | |
|-----------------|----------|
| Material | FR4 |
| Thickness (mm) | 0.8 |
| Size (mm) | 40x40 |
| EB No. | EB-89-B2 |

Bill of Material

| Symbol | Value | Size | Description | Manufacturer |
|---------|------------------|------|-----------------------|--------------|
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| C1, C2 | 1 μF | 0603 | DC blocking capacitor | Murata |
| C3 | 10 μF | 0805 | Decoupling capacitor | Murata |
| C4 | 1 μF | 0402 | Feedback capacitor | Murata |
| L1 | 22 μH | 1206 | RF choke inductor | Murata |
| R1 | 51 Ω | 0402 | Feedback resistor | Samsung |
| R2 | 330 Ω | 0402 | Feedback resistor | Samsung |

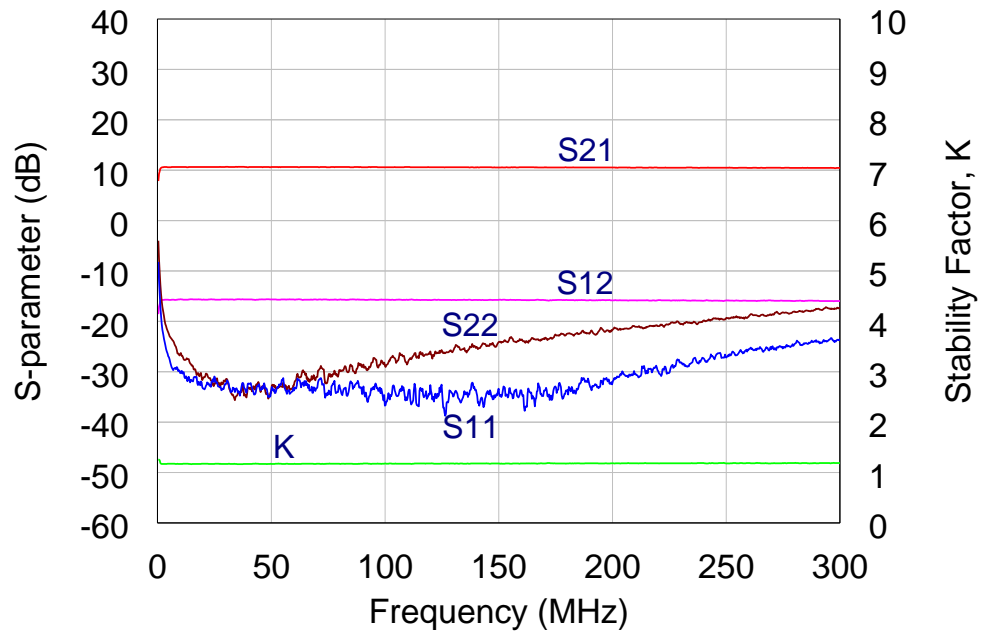
4.2 Performance Table

Supply voltage = +5 V, T_A = +25 °C, Z_O = 75 Ω.

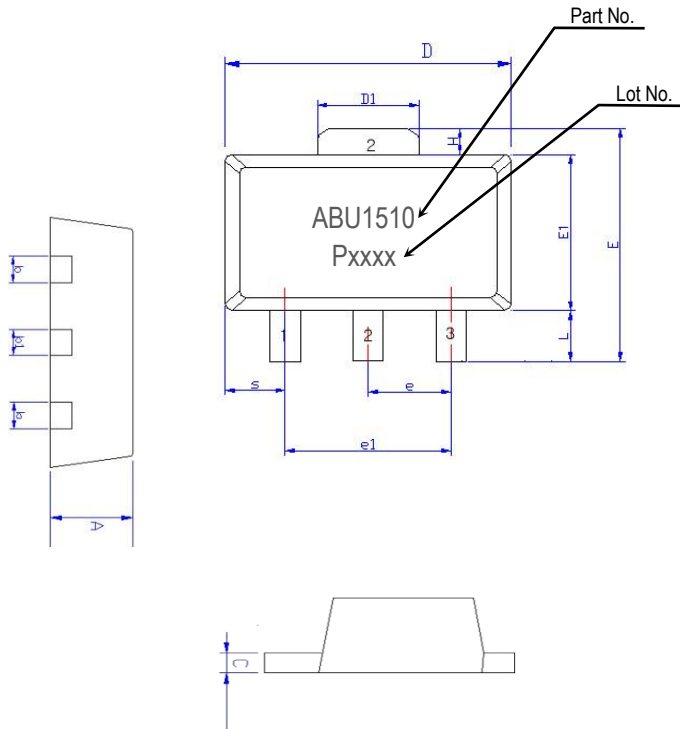
| Parameter | Typical | | | Unit |
|----------------|-------------------|------------------|------------------|------|
| Frequency | 5 | 50 | 300 | MHz |
| Noise Figure | 3.7 ³⁾ | 3.3 | 3.5 | dB |
| Gain | 10.4 | 10.4 | 10.2 | dB |
| S11 | -20 | -20 | -20 | dB |
| S22 | -20 | -20 | -16 | dB |
| Output IP3 | 37 ¹⁾ | 37 ²⁾ | 36 ²⁾ | dBm |
| Output IP2 | 57 ¹⁾ | 61 ²⁾ | 62 ²⁾ | dBm |
| Output P1dB | 14 | 18 | 17 | dBm |
| Current | 100 | | | mA |
| Device Voltage | +5 | | | V |

1) OIP3 & OIP2 are measured with two tones at an output power of +3 dBm/tone separated by 1 MHz.
 2) OIP3 & OIP2 are measured with two tones at an output power of +6 dBm/tone separated by 6 MHz.
 3) NF is measured at 10 MHz.

4.3 Plot of S-parameter & Stability Factor

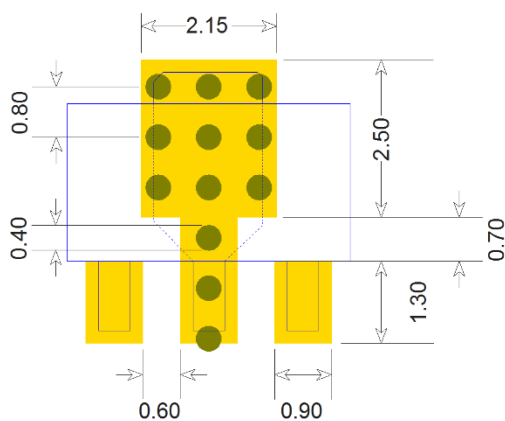


5. Package Outline (SOT89, 4.5x4.0x1.5 mm)



| Symbols | Dimensions (In mm) | | |
|---------|--------------------|------|------|
| | MIN | NOM | MAX |
| A | 1.40 | 1.50 | 1.60 |
| L | 0.89 | 1.04 | 1.20 |
| b | 0.36 | 0.42 | 0.48 |
| b1 | 0.41 | 0.47 | 0.53 |
| C | 0.38 | 0.40 | 0.43 |
| D | 4.40 | 4.50 | 4.60 |
| D1 | 1.40 | 1.60 | 1.75 |
| E | 3.64 | --- | 4.25 |
| E1 | 2.40 | 2.50 | 2.60 |
| e1 | 2.90 | 3.00 | 3.10 |
| H | 0.35 | 0.40 | 0.45 |
| S | 0.65 | 0.75 | 0.85 |
| e | 1.40 | 1.50 | 1.60 |

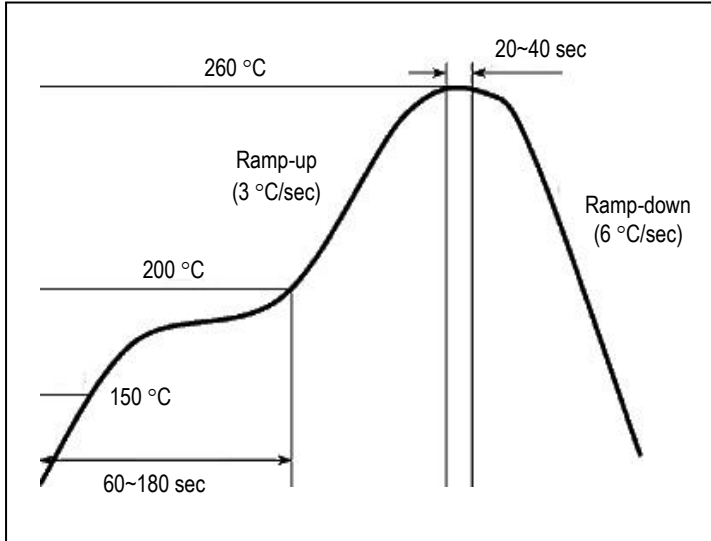
6. Surface Mount Recommendation (In mm)



NOTE

1. The number and size of ground via holes in a circuit board are critical for thermal and RF grounding considerations.
2. Recommended is that the ground via holes be placed on the bottom of the lead pin 2 and exposed pad of the device for better RF and thermal performance, as shown in the drawing at the left side.

7. Recommended Soldering Reflow Profile



(End of Datasheet)

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