

## Features

- 16.3 dB Gain at 2000 MHz
- 21 dBm P1dB
- 38 dBm Output IP3
- 3.1 dB NF
- MTTF > 100 Years
- Single Supply
- Minimal External Components

## Description

The AWB389, a gain block amplifier MMIC, has a high linearity, high gain, and high efficiency over a wide range of frequency, being suitable for use in both receiver and transmitter of telecommunication systems up to 4 GHz. It has an active bias network for stable current over temperature and process variation. The amplifier is available in a SOT89 package and passes through the stringent DC, RF, and reliability tests



Package Style: SOT89

## Typical Performance

(Supply Voltage = +5 V, T<sub>A</sub> = +25 °C, Z<sub>0</sub> = 50 Ω)

| Parameters               | Units | Typical |       |
|--------------------------|-------|---------|-------|
| Frequency                | MHz   | 900     | 2000  |
| Gain                     | dB    | 18.0    | 16.3  |
| S11                      | dB    | -12.0   | -11.0 |
| S22                      | dB    | -11.0   | -10.0 |
| Output IP3 <sup>1)</sup> | dBm   | 41      | 38    |
| Noise Figure             | dB    | 2.5     | 3.1   |
| Output P1dB              | dBm   | 22      | 21    |
| Current                  | mA    | 125     | 125   |
| Device Voltage           | V     | +5      | +5    |

1) OIP3 is measured with two tones at an output power of +9 dBm/tone separated by 1 MHz.

## Product Specifications

| Parameters        | Units | Min  | Typ.  | Max |
|-------------------|-------|------|-------|-----|
| Testing Frequency | MHz   |      | 2000  |     |
| Gain              | dB    | 15.7 | 16.3  |     |
| S11               | dB    | -9   | -11.0 |     |
| S22               | dB    | -8   | -10.0 |     |
| Output IP3        | dBm   | 30   | 38    |     |
| Noise Figure      | dB    |      | 3.1   | 3.3 |
| Output P1dB       | dBm   | 20   | 21    |     |
| Current           | mA    | 118  | 125   | 138 |
| Device Voltage    | V     |      | +5    |     |

## Absolute Maximum Ratings

| Parameters                     | Rating         |
|--------------------------------|----------------|
| Operating Case Temperature     | -40 to +85 °C  |
| Storage Temperature            | -40 to +150 °C |
| Device Voltage                 | +7 V           |
| Operating Junction Temperature | +150 °C        |
| Input RF Power (Continuous)*   | +22 dBm        |
| Thermal Resistance             | 50 °C/W        |

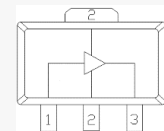
The operation of this device in excess of any of these limits may cause permanent damage.

\* Refer to the max. input RF power data at [http://www.asb.co.kr/pdf/Maximum\\_Input\\_Power\\_Analysis.pdf](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.

## Applications

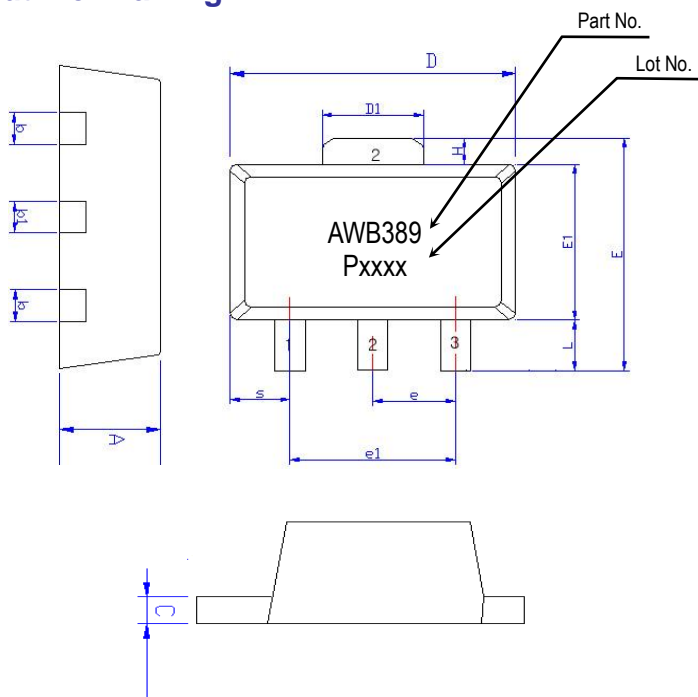
- SMATV (800 ~ 2200 MHz)
- Wide Band (100 ~ 1300 MHz)

## Pin Configuration



| Pin No. | Function      |
|---------|---------------|
| 1       | RF IN         |
| 2       | GND           |
| 3       | RF OUT & Bias |

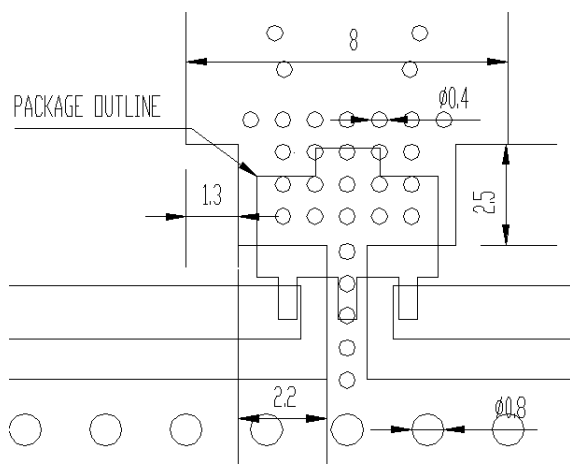
### Outline Drawing



| 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 |

| Pin No. | Function      |
|---------|---------------|
| 1       | RF IN         |
| 2       | GND           |
| 3       | RF OUT & Bias |

### Mounting Recommendation (In mm)



- Note:**
1. The number and size of ground via holes in a circuit board is critical for thermal and RF grounding considerations.
  2. We recommend 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.

### ESD Classification & Moisture Sensitivity Level

#### ESD Classification

|     |                                  |
|-----|----------------------------------|
| HBM | Class 1B<br>Voltage Level: 550 V |
| MM  | Class A<br>Voltage Level: 50 V   |

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)

Level 3 at 260 °C reflow

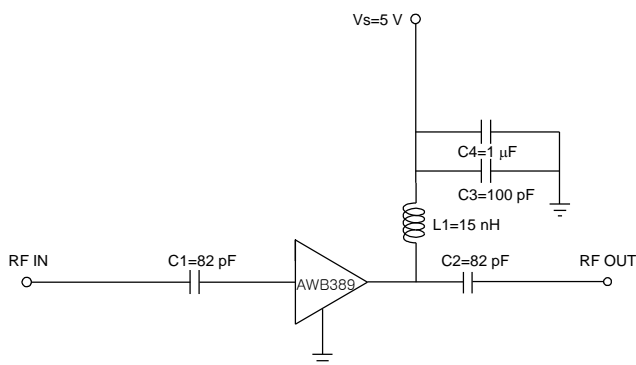
### APPLICATION CIRCUIT

**SMATV**  
**800 ~ 2200 MHz**  
**+5 V**

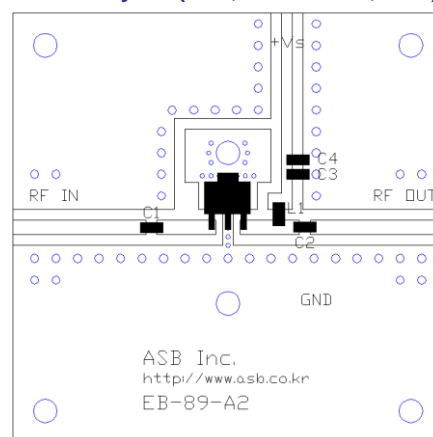
| Frequency (MHz)                | 900   | 2000  |
|--------------------------------|-------|-------|
| Magnitude S21 (dB)             | 18.0  | 16.3  |
| Magnitude S11 (dB)             | -12.0 | -11.0 |
| Magnitude S22 (dB)             | -11.0 | -10.0 |
| Output P1dB (dBm)              | 22    | 21    |
| Output IP3 <sup>1)</sup> (dBm) | 41    | 38    |
| Noise Figure (dB)              | 2.5   | 3.1   |
| Device Voltage (V)             | +5    | +5    |
| Current (mA)                   | 125   | 125   |

1) OIP3 is measured with two tones at an output power of +9 dBm/tone separated by 1 MHz.

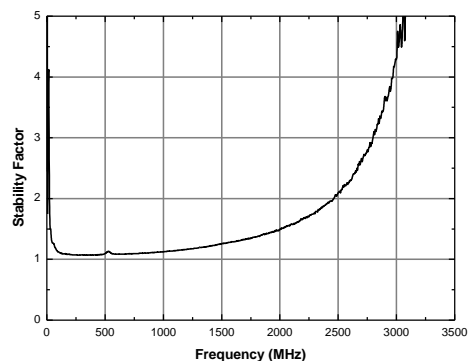
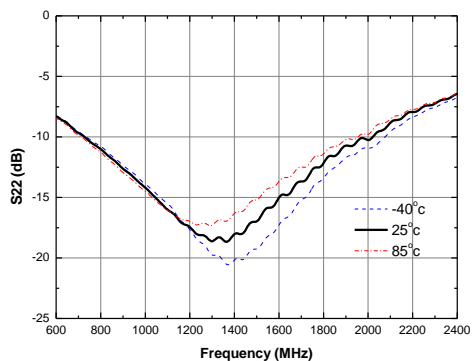
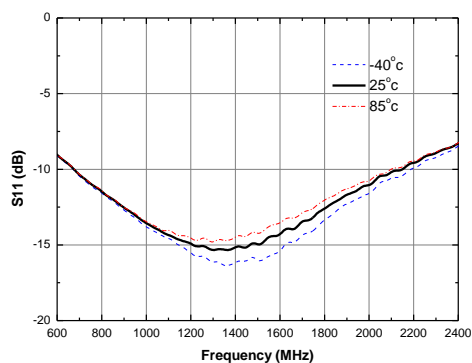
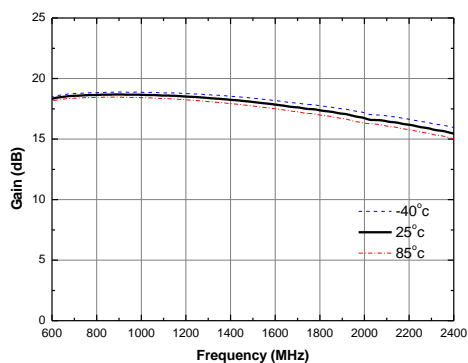
### Schematic



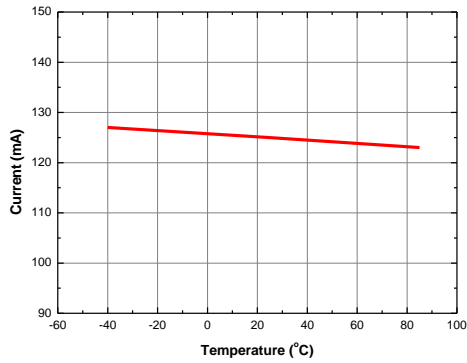
### Board Layout (FR4, 40x40 mm<sup>2</sup>, 0.8T)



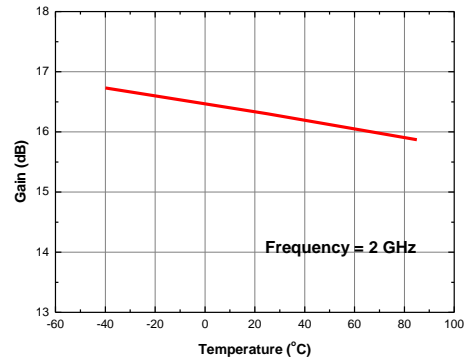
### S-parameters & K-factor



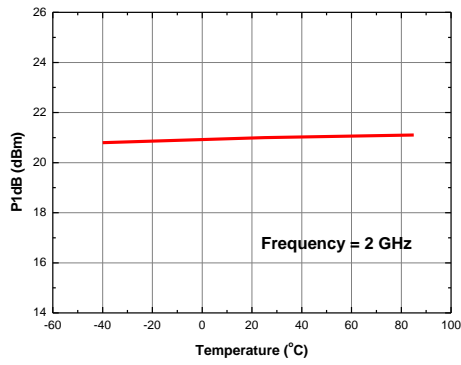
Current vs. Temperature



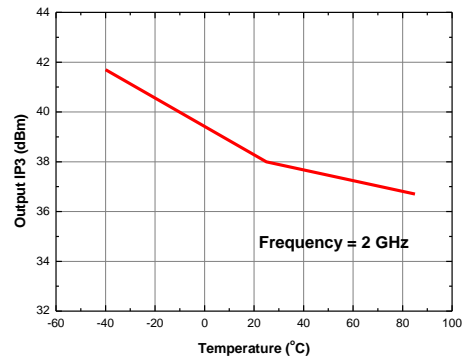
Gain vs. Temperature



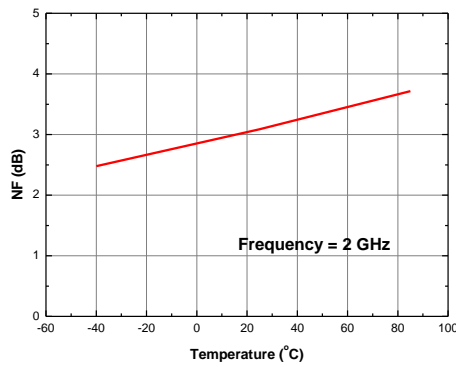
P1dB vs. Temperature



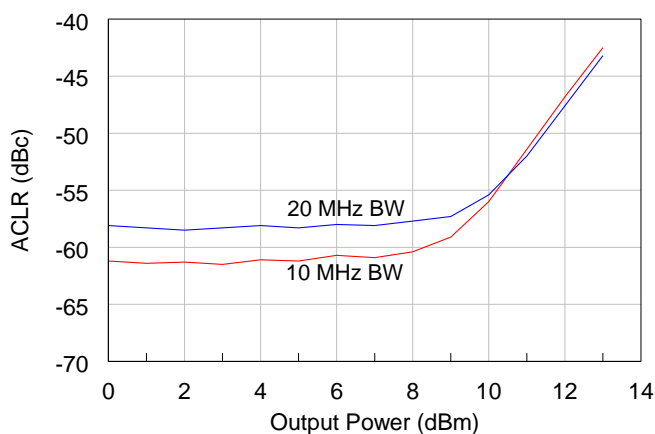
Output IP3 vs. Temperature



NF vs. Temperature

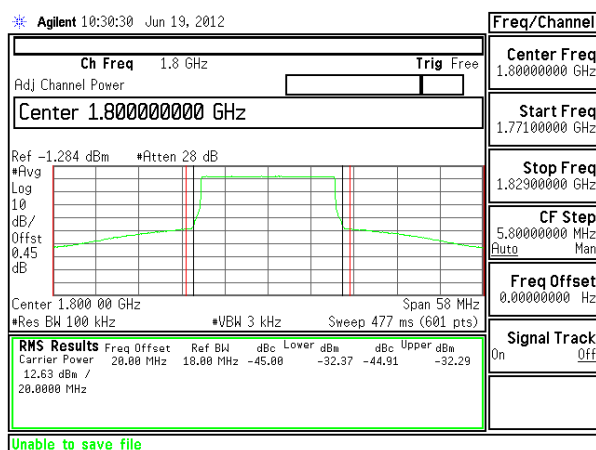


### LTE ACLR – 10 MHz & 20 MHz



1) Test Source : LTE\_FDD\_test model 3.1, BW: 10 MHz & 20 MHz, Test Frequency: 1.8 GHz

### LTE ACLR – 20 MHz



2) Test Source : LTE\_FDD\_test model 3.1, BW: 20 MHz, Test Frequency: 1.8 GHz

**APPLICATION CIRCUIT**

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**Wide Band**

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**100 ~ 1300 MHz**

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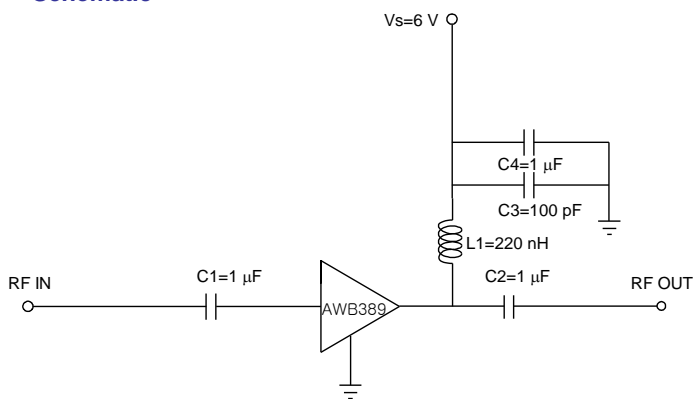
**+6 V**

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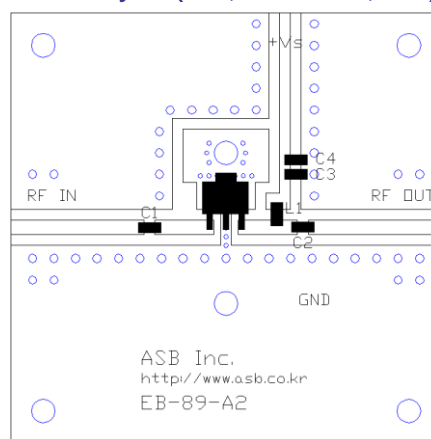
| Frequency (MHz)                | 100   | 1300  |
|--------------------------------|-------|-------|
| Magnitude S21 (dB)             | 19.5  | 18.0  |
| Magnitude S11 (dB)             | -12.0 | -12.0 |
| Magnitude S22 (dB)             | -16.0 | -10.0 |
| Output P1dB (dBm)              | 24    | 24    |
| Output IP3 <sup>1)</sup> (dBm) | 41    | 41    |
| Noise Figure (dB)              | 2.5   | 2.7   |
| Device Voltage (V)             | +6    | +6    |
| Current (mA)                   | 155   | 155   |

1) OIP3 is measured with two tones at an output power of +9 dBm/tone separated by 1 MHz.

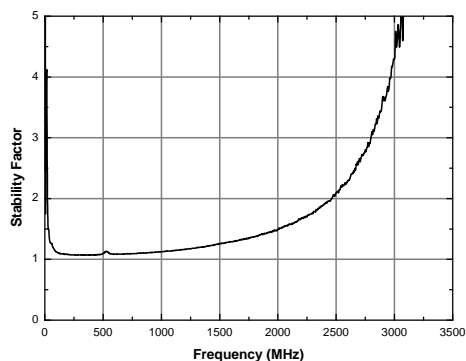
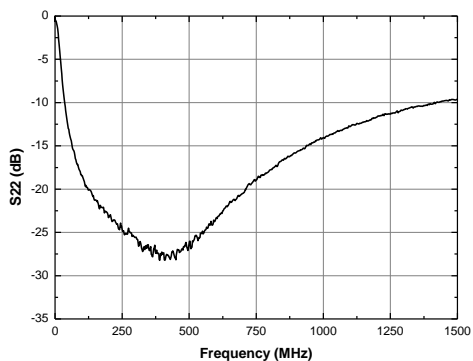
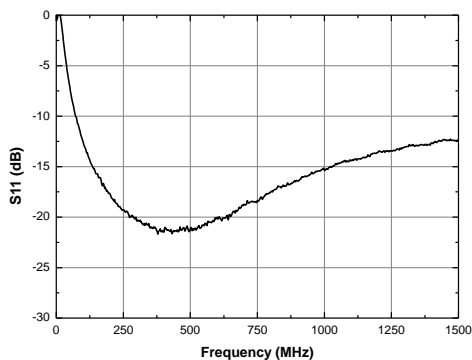
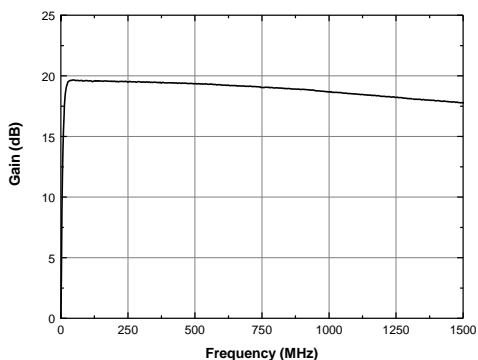
**Schematic**

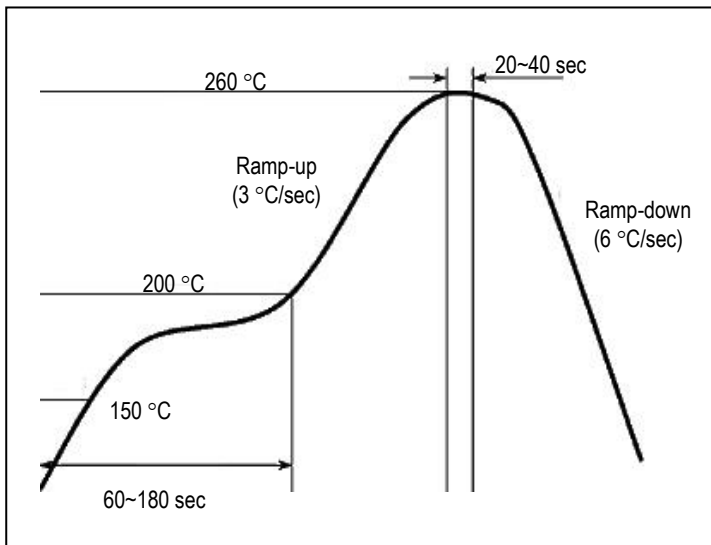


**Board Layout (FR4, 40x40 mm<sup>2</sup>, 0.8T)**



**S-parameters & K-factor**



**Recommended Soldering Reflow Profile**

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