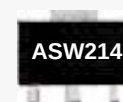


## Features

- 19.5 dB Gain at 900 MHz
- 16 dBm P1dB at 900 MHz
- 30 dBm Output IP3 at 900 MHz
- 5.5 dB NF at 900 MHz
- MTTF > 100 Years
- Single Supply

## Description

The ASW214, a power 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 8 GHz. 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,  $T_A$  = +25 °C,  $Z_0$  = 50  $\Omega$ )

| Parameters               | Units | Typical |      |      |       |
|--------------------------|-------|---------|------|------|-------|
| Frequency                | MHz   | 900     | 2000 | 3500 | 5800  |
| Gain                     | dB    | 19.5    | 18.0 | 15.0 | 12.5  |
| S11                      | dB    | -12.5   | -9.0 | -9.0 | -14.0 |
| S22                      | dB    | -11     | -14  | -10  | -14   |
| Output IP3 <sup>1)</sup> | dBm   | 30.0    | 32.0 | 28.0 | 24.5  |
| Noise Figure             | dB    | 5.5     | 5.7  | 6.4  | 5.7   |
| Output P1dB              | dBm   | 16.0    | 17.0 | 14.5 | 13.5  |
| Current                  | mA    | 52      | 52   | 52   | 52    |
| Device Voltage           | V     | +4.8    | +4.8 | +4.8 | +4.8  |

1) OIP3 is measured with two tones at an output power of +0 dBm/tone separated by 1 MHz.

## Product Specifications

| Parameters        | Units | Min  | Typ.  | Max |
|-------------------|-------|------|-------|-----|
| Testing Frequency | MHz   |      | 900   |     |
| Gain              | dB    | 18.5 | 19.5  |     |
| S11               | dB    |      | -12.5 |     |
| S22               | dB    |      | -11   |     |
| Output IP3        | dBm   | 29   | 30    |     |
| Noise Figure      | dB    |      | 5.5   | 6.0 |
| Output P1dB       | dBm   | 15   | 16    |     |
| Current           | mA    | 47   | 52    | 57  |
| Device Voltage    | V     |      | +4.8  |     |

## Absolute Maximum Ratings

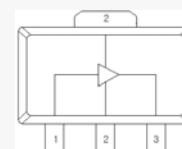
| Parameters                                | Rating         |
|-------------------------------------------|----------------|
| Operating Case Temperature                | -40 to +85 °C  |
| Storage Temperature                       | -40 to +150 °C |
| Device Voltage                            | +6 V           |
| Operating Junction Temperature            | +150 °C        |
| Input RF Power (CW, 50 $\Omega$ matched)* | 25 dBm         |
| Thermal Resistance                        | 194 °C/W       |

\* Please find the max. input power data from [http://www.asb.co.kr/pdf/Maximum\\_Input\\_Power\\_Analysis.pdf](http://www.asb.co.kr/pdf/Maximum_Input_Power_Analysis.pdf)

## Application Circuit

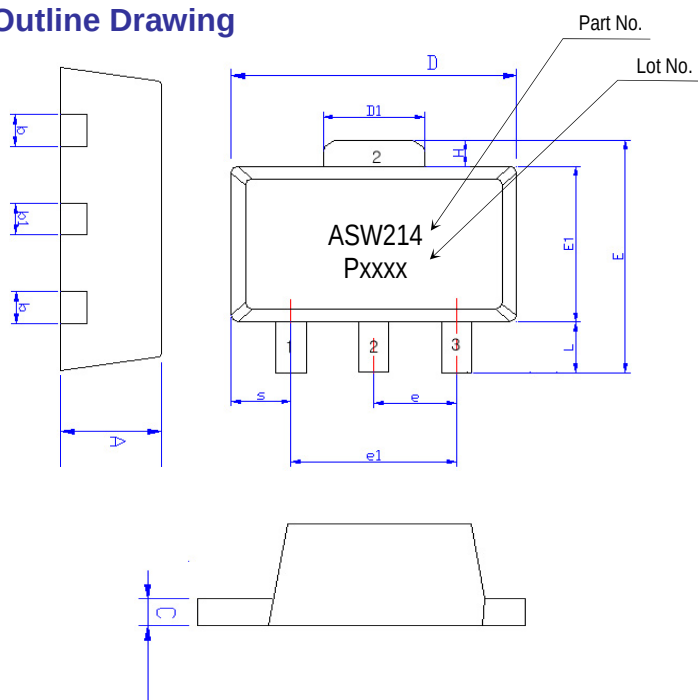
- IF
- 500 ~ 3500 MHz
- 1700 ~ 2500 MHz
- 3300 ~ 3800 MHz
- 4000 ~ 6000 MHz
- 70 ~ 2700 MHz
- 500 ~ 2700 MHz (3.3 V/ 35 mA)

## Pin Configuration



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

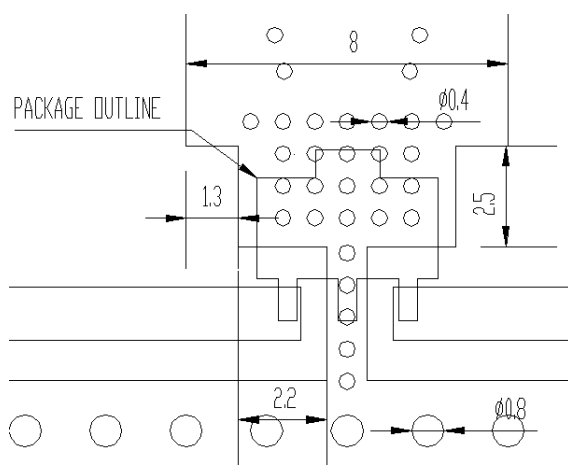
### Outline Drawing



| 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                    |
|     | Voltage Level: 500 V~1000 V |
| MM  | Class A                     |
|     | Voltage Level: <200 V       |

CAUTION: ESD-sensitive device!

#### Moisture Sensitivity Level (MSL)

Level 3 at 260 °C reflow

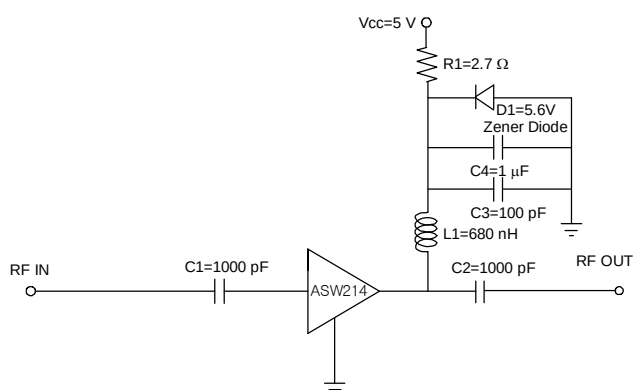
### APPLICATION CIRCUIT

IF  
70 ~ 450 MHz  
+5 V

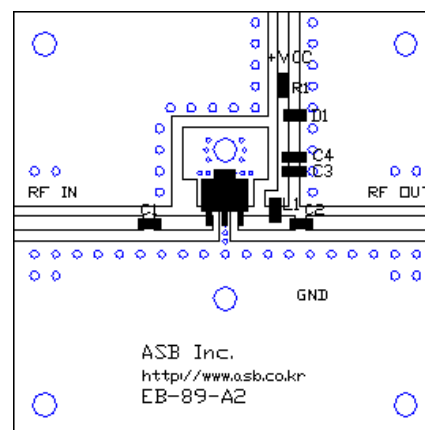
| Frequency (MHz)                | 70   | 150  | 300  | 450  |
|--------------------------------|------|------|------|------|
| Magnitude S21 (dB)             | 20.0 | 20.0 | 20.0 | 19.5 |
| Magnitude S11 (dB)             | -12  | -13  | -13  | -13  |
| Magnitude S22 (dB)             | -11  | -11  | -11  | -11  |
| Output P1dB (dBm)              | 16   | 16   | 16   | 16   |
| Output IP3 <sup>1)</sup> (dBm) | 30   | 30   | 30   | 31   |
| Noise Figure (dB)              | 5.3  | 5.5  | 6.0  | 5.5  |
| Device Voltage (V)             | +4.8 | +4.8 | +4.8 | +4.8 |
| Current (mA)                   | 52   | 52   | 52   | 52   |

1) OIP3 is measured with two tones at an output power of +0 dBm/tone separated by 1 MHz.

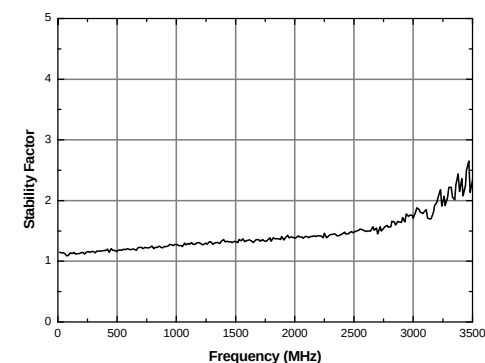
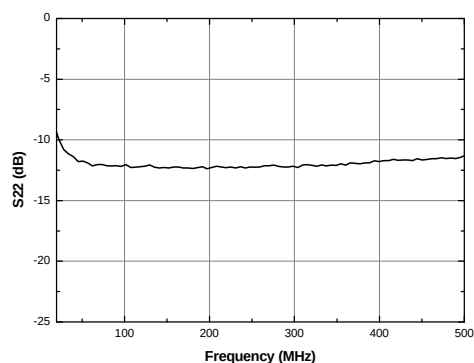
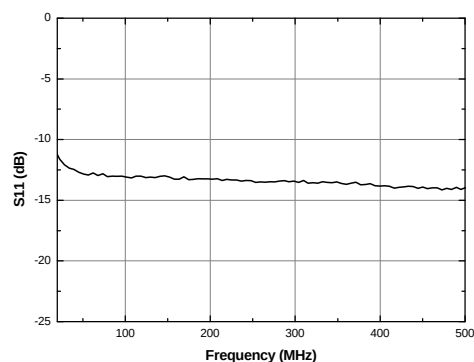
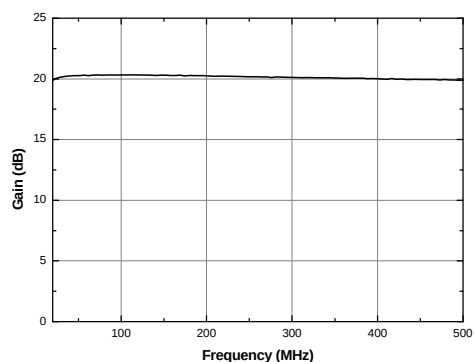
### Schematic



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



### S-parameters & K-factor



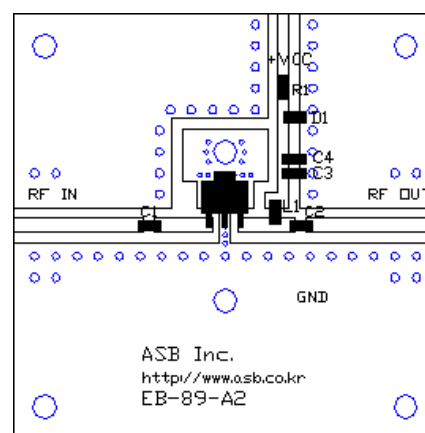
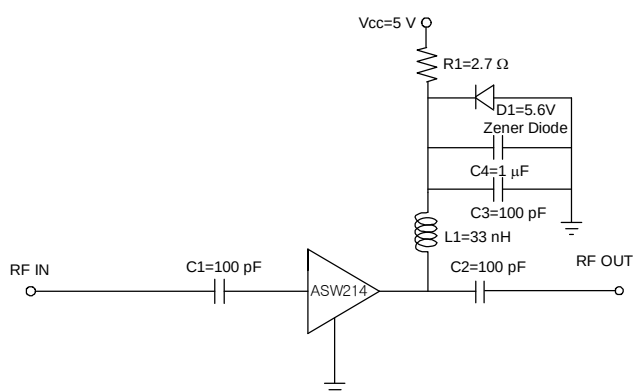
### APPLICATION CIRCUIT

Wide Band  
500 ~ 3500 MHz  
+5 V

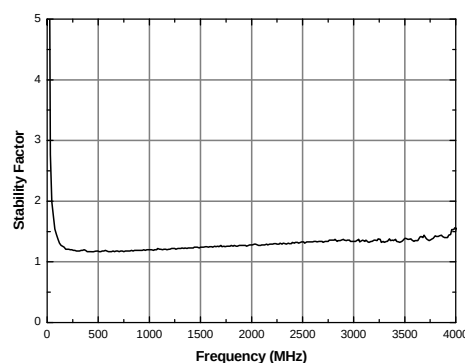
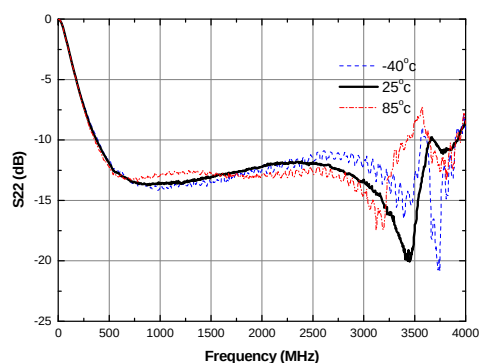
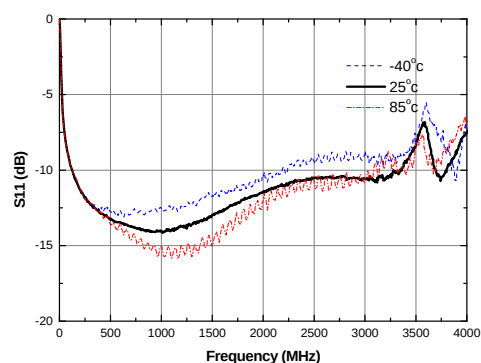
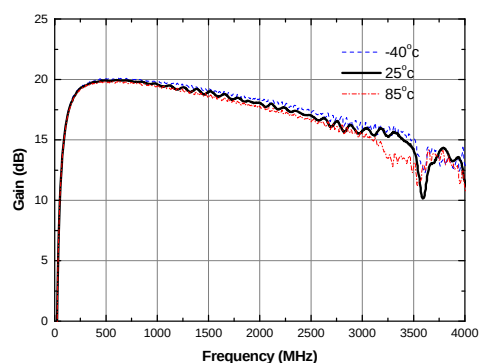
| Frequency (MHz)                | 500   | 900   | 1750  | 2000  | 2400  | 2700  | 3500  |
|--------------------------------|-------|-------|-------|-------|-------|-------|-------|
| Magnitude S21 (dB)             | 19.7  | 19.5  | 18.2  | 17.8  | 17.0  | 16.4  | 15.0  |
| Magnitude S11 (dB)             | -12.0 | -12.5 | -12.5 | -12.0 | -11.0 | -10.0 | -9.0  |
| Magnitude S22 (dB)             | -11.0 | -11.0 | -11.0 | -11.5 | -11.5 | -11.0 | -10.0 |
| Output P1dB (dBm)              | 16.0  | 16.0  | 16.0  | 16.0  | 16.0  | 16.0  | 14.5  |
| Output IP3 <sup>1)</sup> (dBm) | 30.0  | 30.0  | 30.0  | 30.0  | 30.5  | 30.5  | 28.0  |
| Noise Figure (dB)              | 5.7   | 5.5   | 5.5   | 5.7   | 5.7   | 6.0   | 6.4   |
| Device Voltage (V)             | +4.8  |       |       |       |       |       |       |
| Current (mA)                   | 52    |       |       |       |       |       |       |

1) OIP3 is measured with two tones at an output power of +0 dBm/tone separated by 1 MHz.

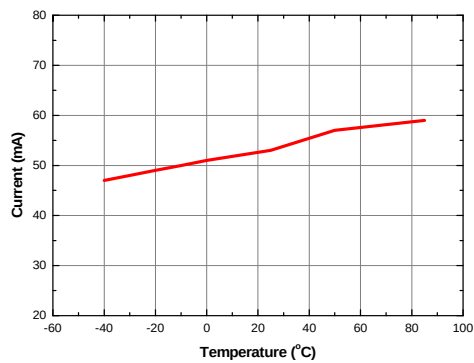
### Schematic



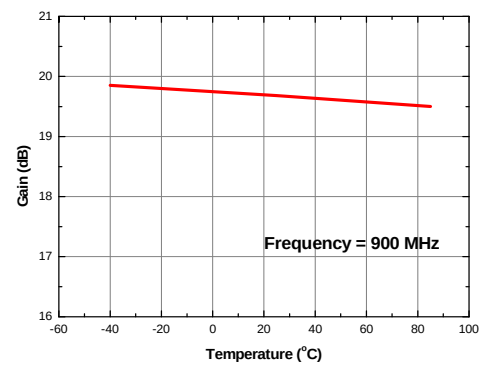
### S-parameters & K-factor



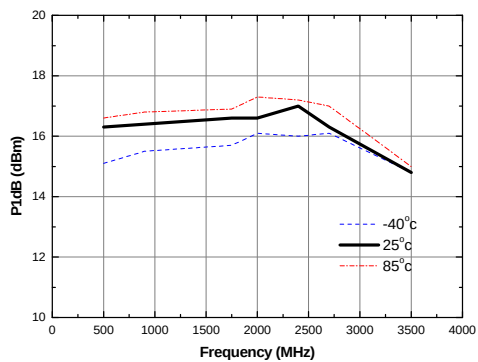
### Current vs. Temperature



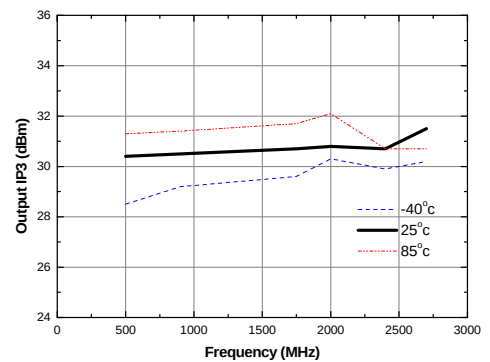
### Gain vs. Temperature



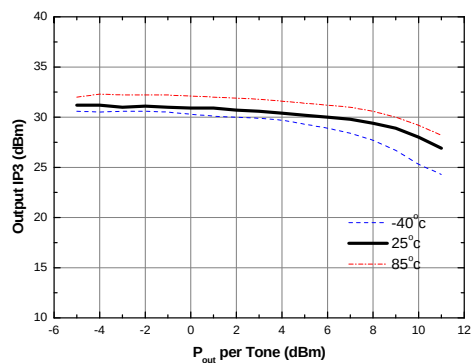
### P1dB vs. Frequency



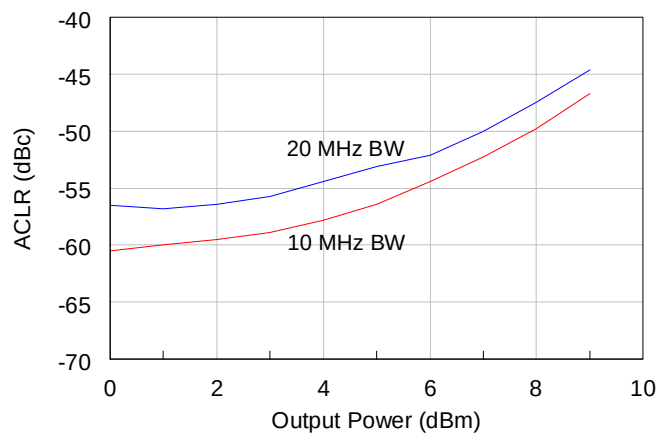
### Output IP3 vs. Frequency



### Output IP3 vs. Tone Power (Frequency = 2000 MHz)

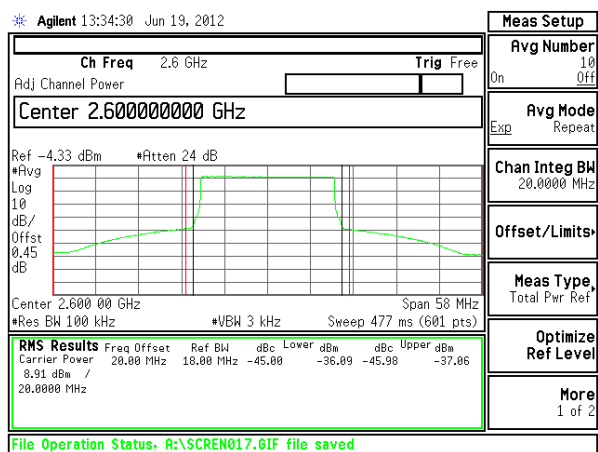


LTE ACLR – 10 MHz & 20 MHz



1) Test Source : LTE\_FDD\_test model 3.1, BW: 10 MHz & 20 MHz, Test Frequency: 2.6 GHz

LTE ACLR – 20 MHz



2) Test Source : LTE\_FDD\_test model 3.1, BW: 20 MHz, Test Frequency: 2.6 GHz

Performance with varying  $V_{\text{DEVICE}}$ 

| $V_{\text{DEVICE}}$<br>(V) | Current<br>(mA) | Freq.<br>(MHz) | Gain<br>(dB) | S11<br>(dB) | S22<br>(dB) | OIP3 <sup>1)</sup><br>(dBm) | P1dB<br>(dBm) | NF<br>(dB) |
|----------------------------|-----------------|----------------|--------------|-------------|-------------|-----------------------------|---------------|------------|
| +4.8                       | 54              | 900            | 19.6         | -14.5       | -13.0       | 31.0                        | 16.4          | 5.13       |
|                            |                 | 2000           | 17.9         | -12.2       | -12.7       | 30.7                        | 16.6          | 5.58       |
|                            |                 | 3500           | 15.0         | -9.4        | -11.5       | 29.5                        | 15.8          | --         |
| +4.65                      | 44              | 900            | 19.4         | -15.2       | -12.3       | 27.9                        | 14.4          | 5.12       |
|                            |                 | 2000           | 17.7         | -12.7       | -12.3       | 28.0                        | 15.4          | 5.40       |
|                            |                 | 3500           | 14.7         | -9.5        | -11.7       | 26.5                        | 13.6          | --         |
| +4.45                      | 36              | 900            | 18.9         | -16.6       | -11.2       | 24.4                        | 12.4          | 5.00       |
|                            |                 | 2000           | 17.4         | -13.4       | -11.5       | 24.7                        | 13.0          | 5.09       |
|                            |                 | 3500           | 14.6         | -9.6        | -10.4       | 25.2                        | 13.5          | --         |

1) OIP3 is measured with two tones at an output power of +0 dBm/tone separated by 1 MHz.

### APPLICATION CIRCUIT

Wide Band

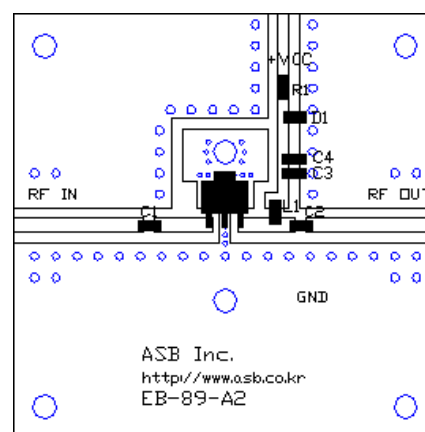
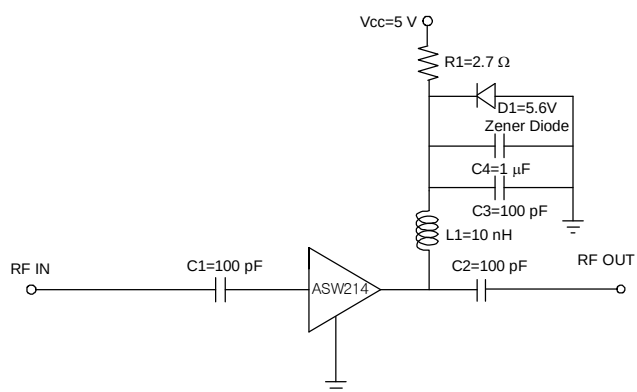
1700 ~ 2500 MHz

+5 V

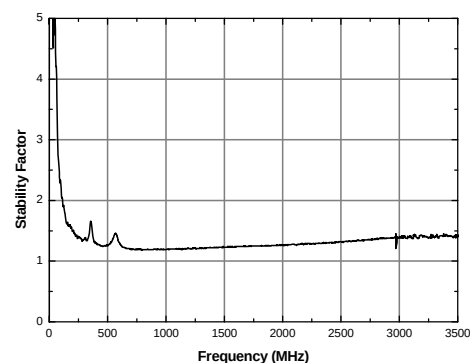
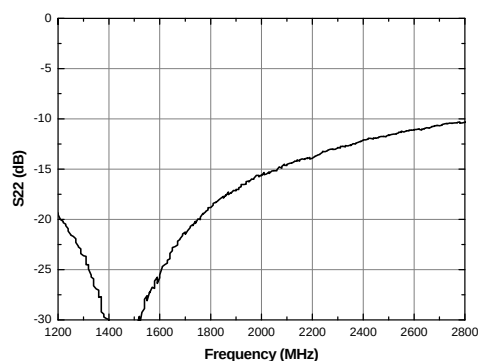
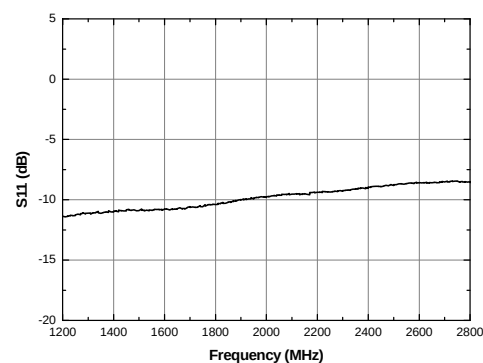
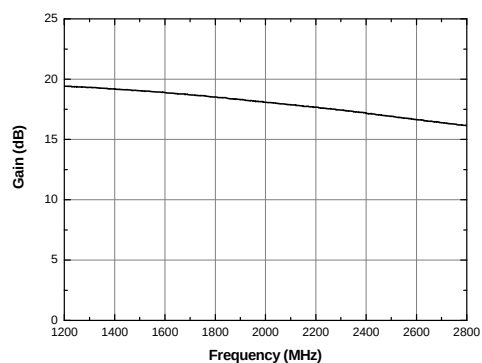
| Frequency (MHz)                | 1750 | 2000 | 2400 |
|--------------------------------|------|------|------|
| Magnitude S21 (dB)             | 18   | 18   | 17   |
| Magnitude S11 (dB)             | -10  | -9   | -8   |
| Magnitude S22 (dB)             | -15  | -14  | -11  |
| Output P1dB (dBm)              | 17   | 17   | 17   |
| Output IP3 <sup>1)</sup> (dBm) | 32   | 32   | 32   |
| Noise Figure (dB)              | 5.5  | 5.7  | 5.7  |
| Device Voltage (V)             | +4.8 |      |      |
| Current (mA)                   | 52   |      |      |

1) OIP3 is measured with two tones at an output power of +0 dBm/tone separated by 1 MHz.

### Schematic



### S-parameters & K-factor





### APPLICATION CIRCUIT

WiMAX

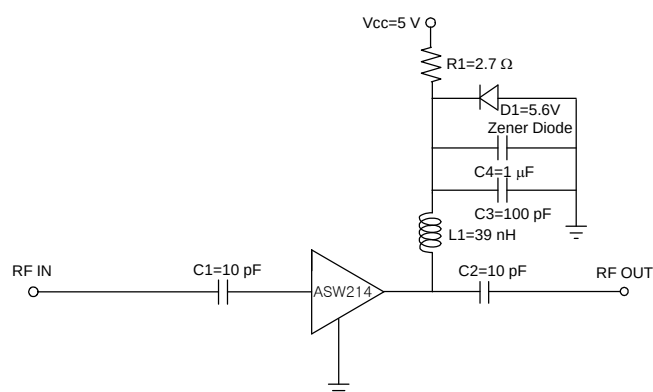
3300 ~ 3800 MHz

+5 V

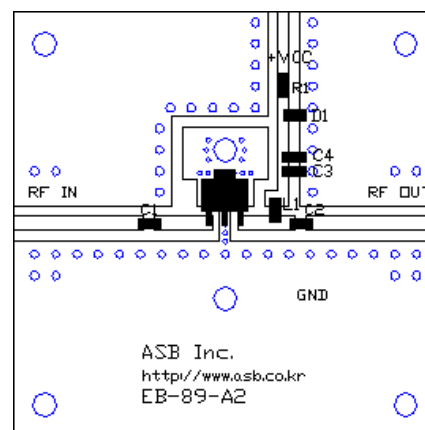
| Frequency (MHz)                | 3300 | 3800 |
|--------------------------------|------|------|
| Magnitude S21 (dB)             | 15.4 | 14.4 |
| Magnitude S11 (dB)             | -10  | -10  |
| Magnitude S22 (dB)             | -10  | -14  |
| Output P1dB (dBm)              | 16   | 15   |
| Output IP3 <sup>1)</sup> (dBm) | 27.5 | 26.5 |
| Noise Figure (dB)              | 6.4  | 6.5  |
| Device Voltage (V)             | +4.8 | +4.8 |
| Current (mA)                   | 52   | 52   |

1) OIP3 is measured with two tones at an output power of +0 dBm/tone separated by 1 MHz.

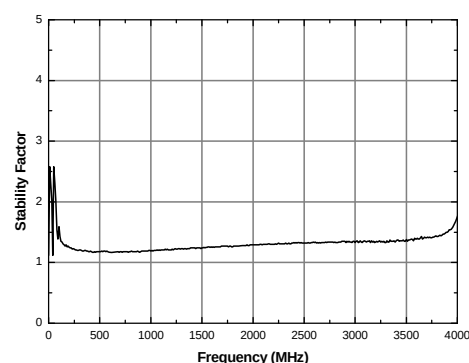
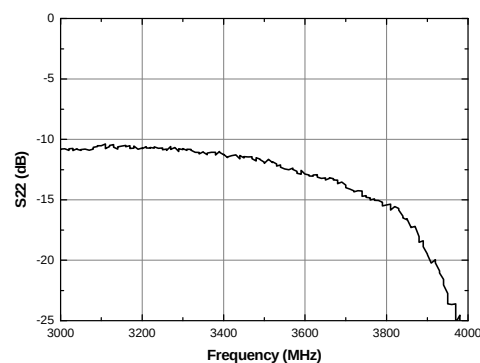
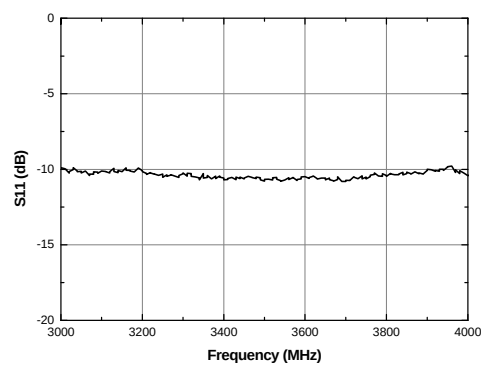
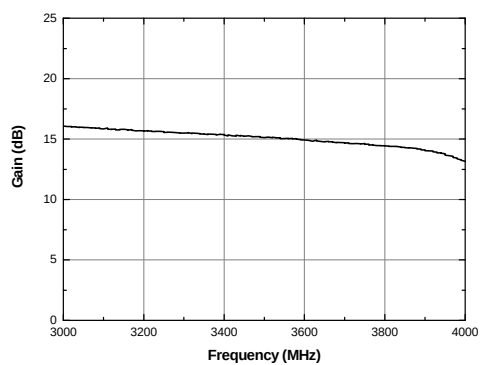
### Schematic



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



### S-parameters & K-factor



### APPLICATION CIRCUIT

C-Band

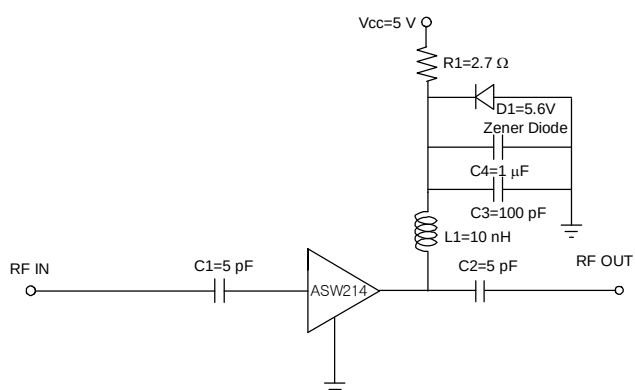
4000 ~ 6000 MHz

+5 V

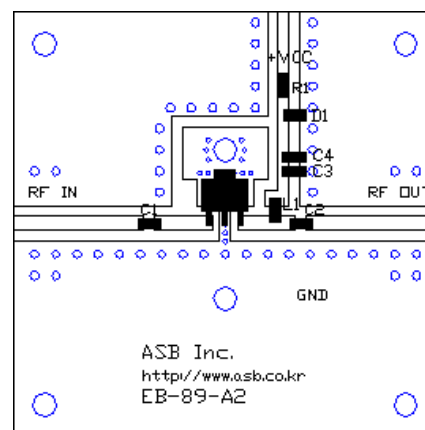
| Frequency (MHz)                | 4000 | 5000 | 5800 | 6000 |
|--------------------------------|------|------|------|------|
| Magnitude S21 (dB)             | 14.5 | 13.5 | 12.5 | 11.5 |
| Magnitude S11 (dB)             | -11  | -11  | -14  | -14  |
| Magnitude S22 (dB)             | -9   | -12  | -14  | -12  |
| Output P1dB (dBm)              | 16.0 | 15.0 | 13.5 | 13.5 |
| Output IP3 <sup>1)</sup> (dBm) | 28.5 | 27.0 | 24.5 | 24.5 |
| Noise Figure (dB)              | 5.6  | 5.5  | 5.7  | 6.0  |
| Device Voltage (V)             | +4.8 | +4.8 | +4.8 | +4.8 |
| Current (mA)                   | 52   | 52   | 52   | 52   |

1) OIP3 is measured with two tones at an output power of +0 dBm/tone separated by 1 MHz.

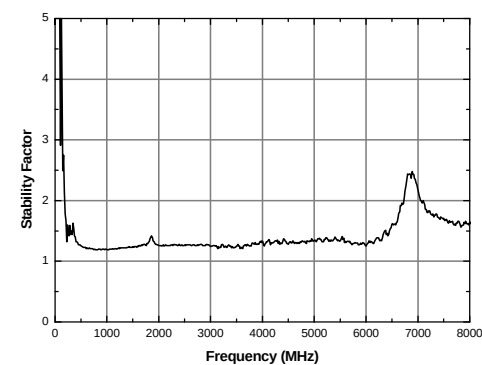
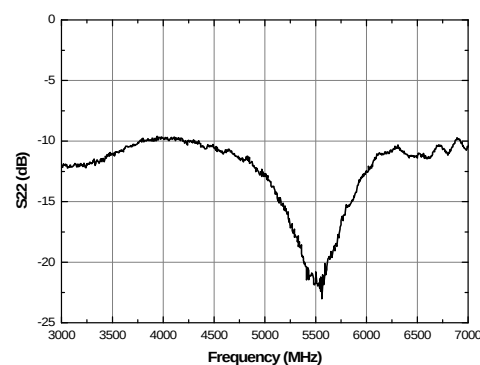
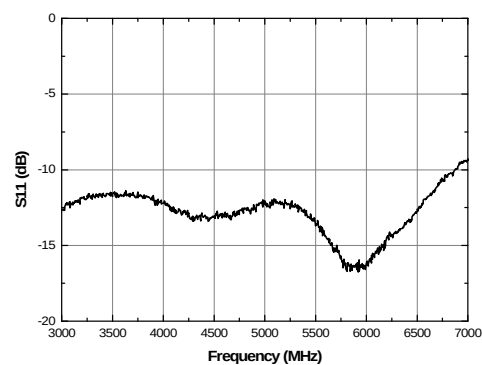
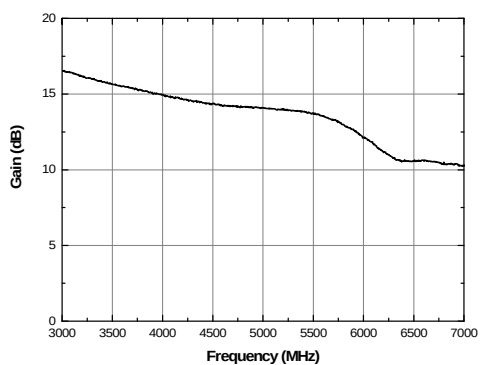
### Schematic



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



### S-parameters & K-factor



### APPLICATION CIRCUIT

ONU

70 ~ 2700 MHz

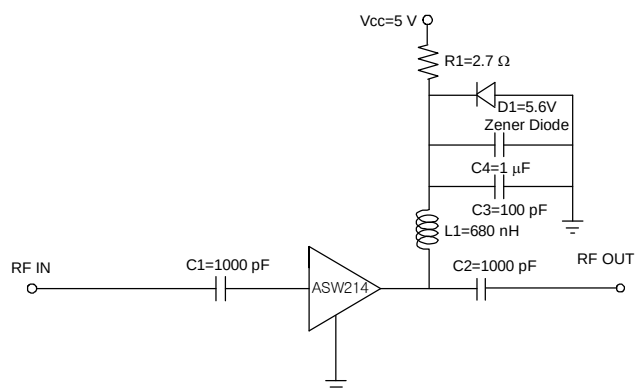
+5 V

| Frequency (MHz)                | 70   | 900  | 1800 | 2700 |
|--------------------------------|------|------|------|------|
| Magnitude S21 (dB)             | 20.0 | 19.0 | 17.5 | 15.5 |
| Magnitude S11 (dB)             | -13  | -14  | -15  | -12  |
| Magnitude S22 (dB)             | -11  | -10  | -9   | -12  |
| Output P1dB (dBm)              | 16   | 15   | 15   | 15   |
| Output IP3 <sup>1)</sup> (dBm) | 29.5 | 29.5 | 29.5 | 29.5 |
| Output IP2 <sup>2)</sup> (dBm) | 40   |      |      |      |
| Noise Figure (dB)              | 5.4  | 5.3  | 5.5  | 5.8  |
| Device Voltage (V)             | +4.8 | +4.8 | +4.8 | +4.8 |
| Current (mA)                   | 52   | 52   | 52   | 52   |

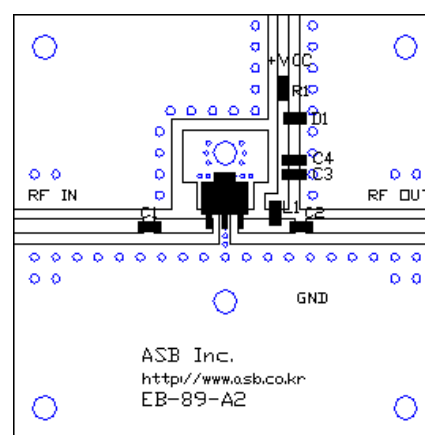
1) OIP3 is measured with two tones at an output power of +0 dBm/tone separated by 1 MHz.

2) OIP2 is measured with two tones (100MHz, 800MHz) at an output power of +0 dBm/tone, 700 MHz.

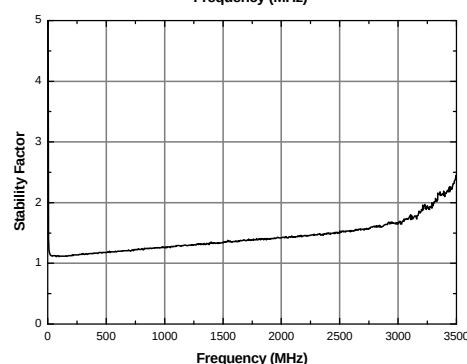
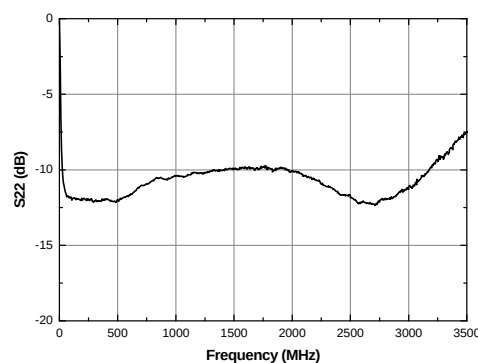
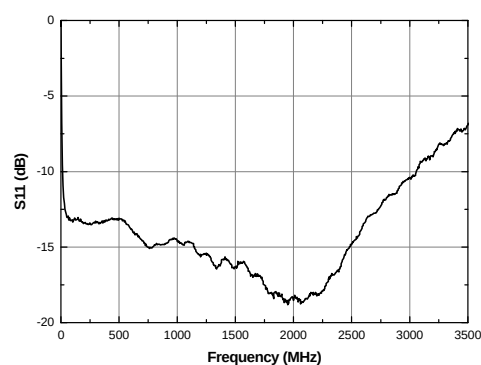
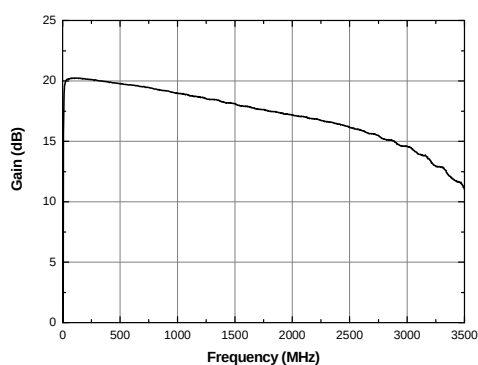
### Schematic



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



### S-parameters & K-factor



### APPLICATION CIRCUIT

Wide Band

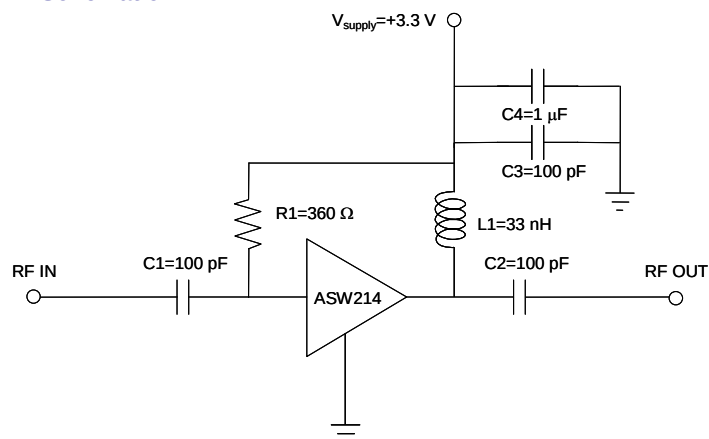
500 ~ 2700 MHz

+3.3 V/ 35 mA

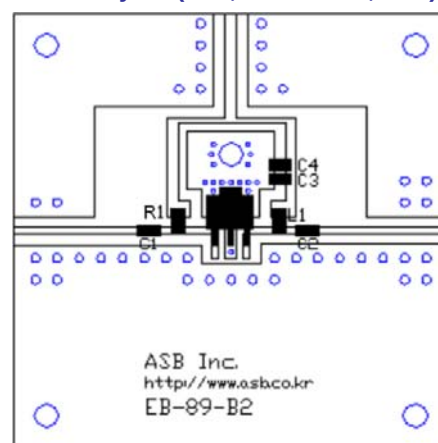
| Frequency (MHz)                | 900  | 2000 |
|--------------------------------|------|------|
| Magnitude S21 (dB)             | 18.0 | 16.3 |
| Magnitude S11 (dB)             | -11  | -13  |
| Magnitude S22 (dB)             | -12  | -10  |
| Output P1dB (dBm)              | 12.3 | 12.5 |
| Output IP3 <sup>1)</sup> (dBm) | 24   | 24.5 |
| Noise Figure (dB)              | 5.4  | 5.6  |
| Device Voltage (V)             | +3.3 | +3.3 |
| Current (mA)                   | 35   | 35   |

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

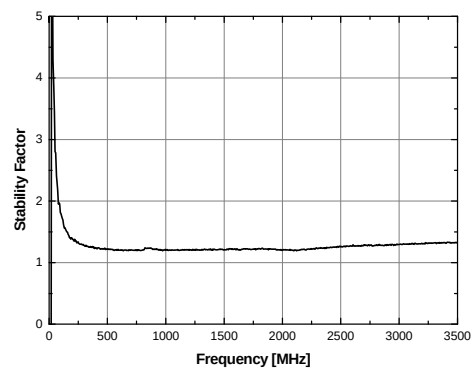
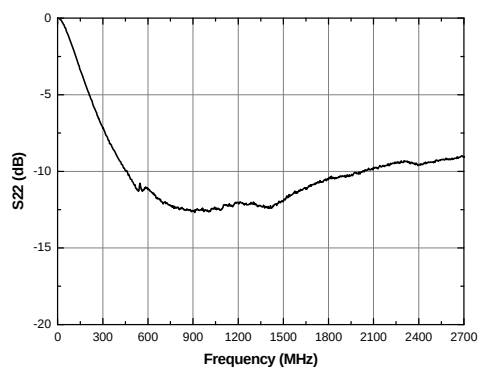
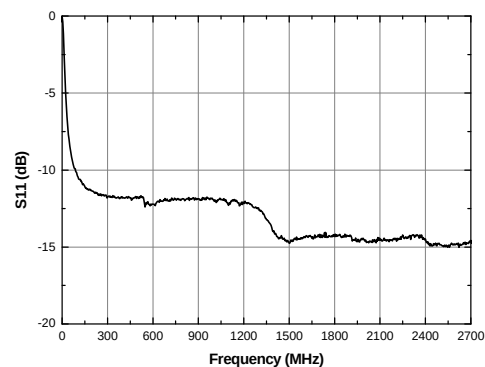
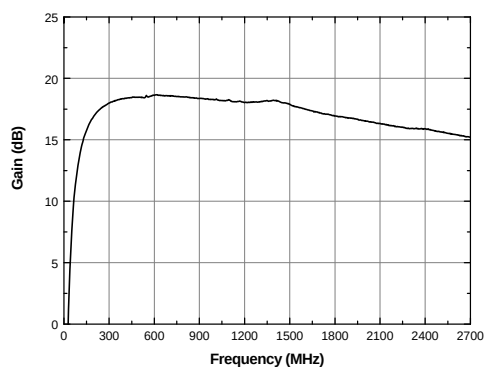
### Schematic



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



### S-parameters & K-factor



**Recommended Soldering Reflow Profile**