

Features

- 16 dB Gain at 2 GHz
- 21 dBm P1dB at 2 GHz
- 34.5 dBm Output IP3 at 2 GHz
- MTTF > 100 Years
- Single Supply

Description

The ASX201, 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 5 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, Z₀ = 50 Ω)

| Parameters | Units | Typical | | | |
|--------------------------|-------|---------|------|------|------|
| | | 900 | 2000 | 2450 | 3500 |
| Frequency | MHz | 900 | 2000 | 2450 | 3500 |
| Gain | dB | 19.0 | 16.0 | 14.0 | 12.0 |
| S11 | dB | -13 | -15 | -15 | -14 |
| S22 | dB | -13 | -18 | -18 | -14 |
| Output IP3 ¹⁾ | dBm | 34.0 | 34.5 | 36.0 | 34.0 |
| Noise Figure | dB | 4.0 | 3.3 | 3.3 | 3.2 |
| Output P1dB | dBm | 20 | 21 | 22 | 20 |
| Current | mA | 66 | 66 | 66 | 66 |
| Device Voltage | V | +4.8 | +4.8 | +4.8 | +4.8 |

1) OIP3 measured with two tones at an output power of +5 dBm/tone separated by 1 MHz

Product Specifications

| Parameters | Units | Min | Typ | Max |
|-------------------|-------|------|------|-----|
| Testing Frequency | MHz | | 2000 | |
| Gain | dB | 15.0 | 16.0 | |
| S11 | dB | | -15 | |
| S22 | dB | | -18 | |
| Output IP3 | dBm | 33.0 | 34.5 | |
| Noise Figure | dB | | 3.3 | 3.5 |
| Output P1dB | dBm | 20 | 21 | |
| Current | mA | 61 | 66 | 72 |
| 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 Ω matched) ¹⁾ | +25 dBm |
| Thermal Resistance | 166 °C/W |

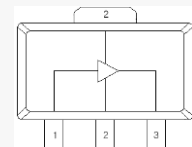
The operation of this device in excess of any of these limits may cause permanent damage.

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

Application Circuit

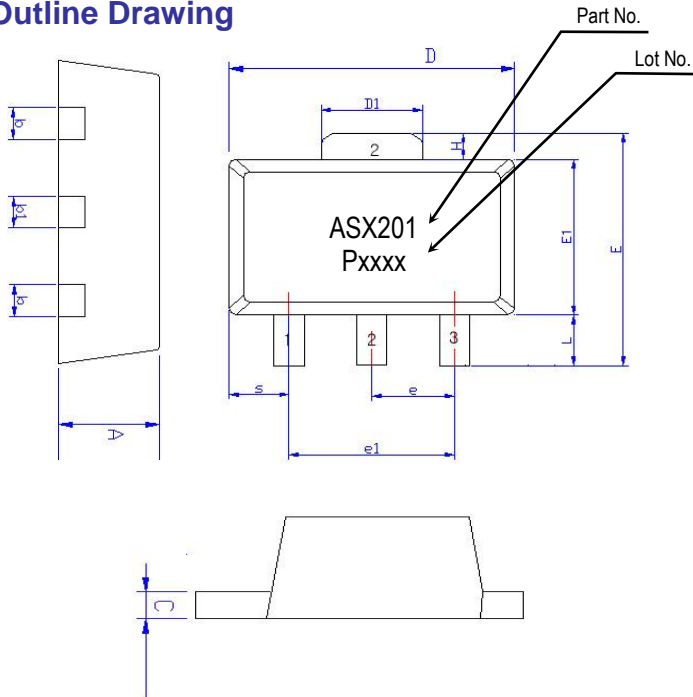
- IF (450 MHz)
- LTE
- CDMA
- GSM
- PCS
- WCDMA
- WiBro
- WLAN
- WiMAX
- C-Band (4500 MHz)

Pin Configuration



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

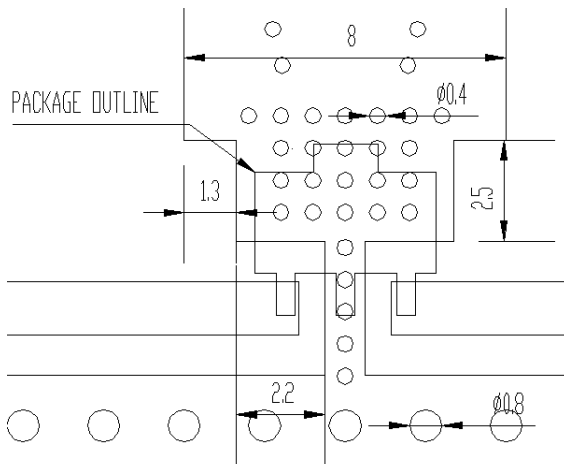
Outline Drawing



| 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 Voltage Level: 550 V |
| MM | Class A 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

IF

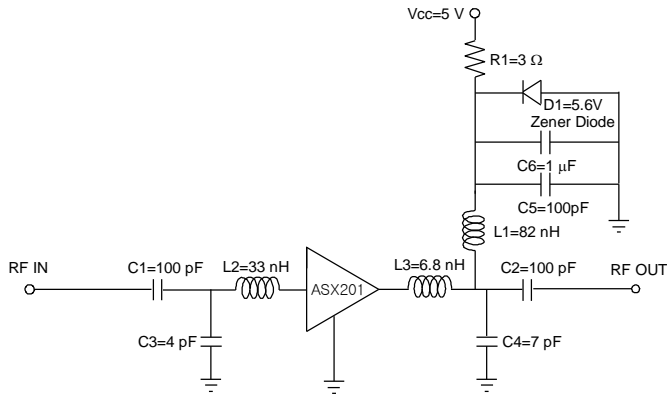
450 MHz

+5 V

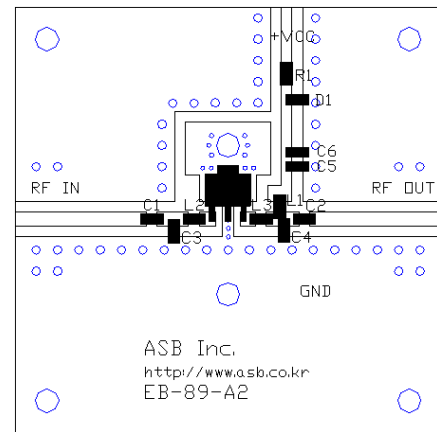
| Frequency (MHz) | 450 |
|--------------------------------|------|
| Magnitude S21 (dB) | 21.0 |
| Magnitude S11 (dB) | -18 |
| Magnitude S22 (dB) | -15 |
| Output P1dB (dBm) | 20.5 |
| Output IP3 ¹⁾ (dBm) | 35 |
| Noise Figure (dB) | 5.5 |
| Device Voltage (V) | +4.8 |
| Current (mA) | 66 |

1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1 MHz.

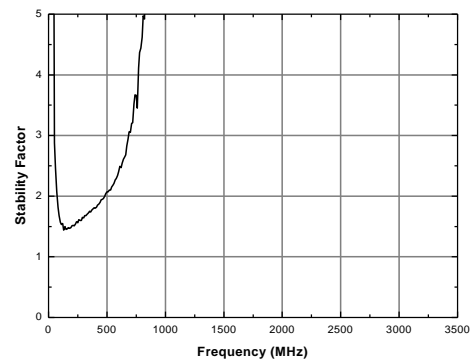
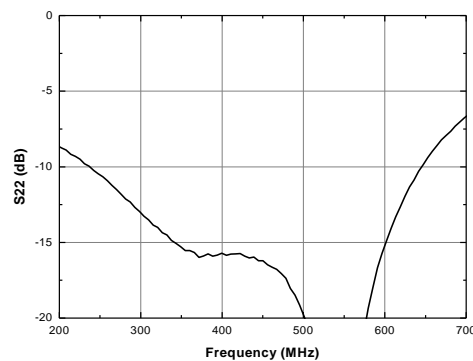
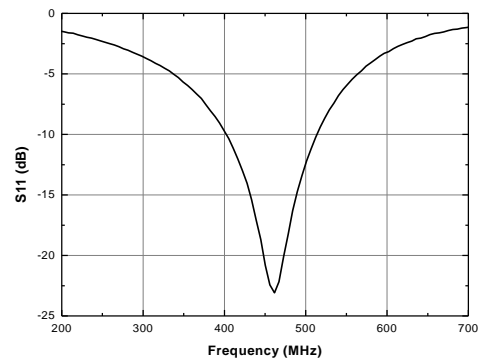
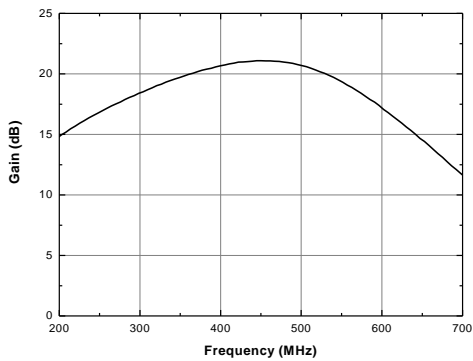
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

LTE

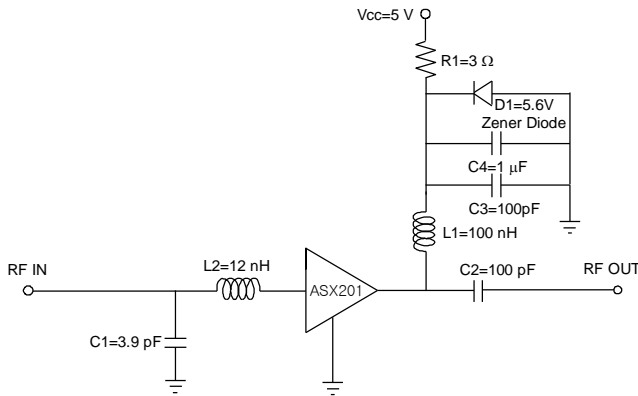
698 ~ 787 MHz

+5 V

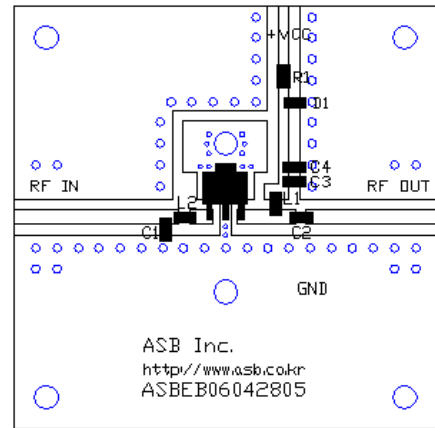
| Frequency (MHz) | 698 ~ 787 |
|--------------------------------|-----------|
| Magnitude S21 (dB) | 19.5 |
| Magnitude S11 (dB) | -12 |
| Magnitude S22 (dB) | -10 |
| Output P1dB (dBm) | 20 |
| Output IP3 ¹⁾ (dBm) | 33.5 |
| Noise Figure (dB) | 3.7 |
| Device Voltage (V) | +4.8 |
| Current (mA) | 66 |

1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1 MHz.

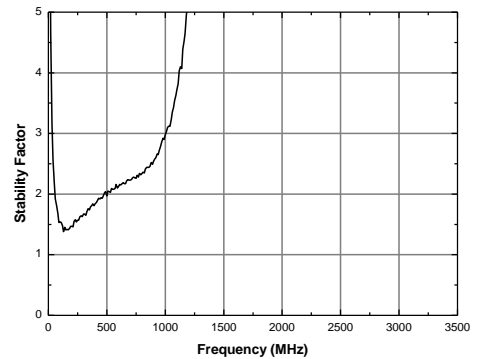
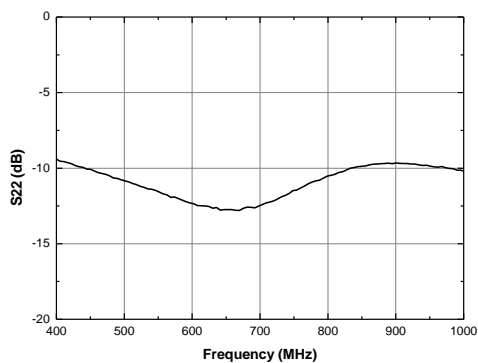
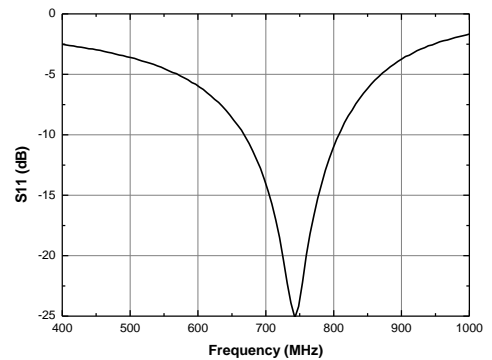
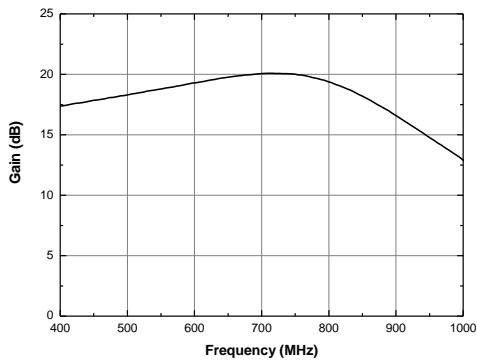
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

CDMA Rx

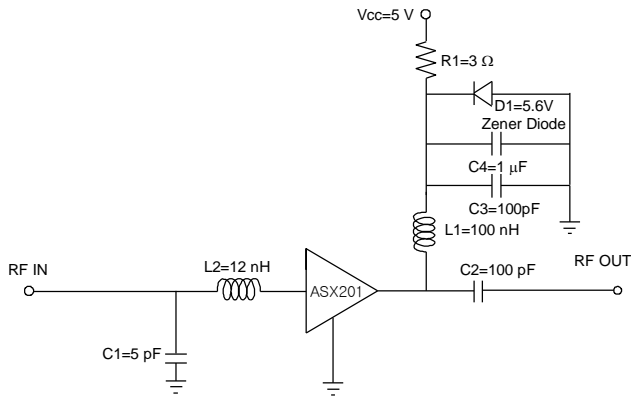
824 ~ 849 MHz

+5 V

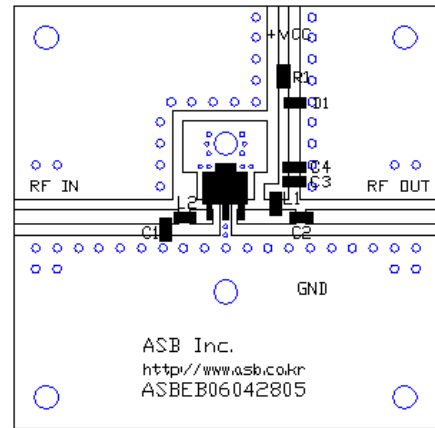
| Frequency (MHz) | 824 ~ 849 |
|--------------------------------|-----------|
| Magnitude S21 (dB) | 19.5 |
| Magnitude S11 (dB) | -18 |
| Magnitude S22 (dB) | -13 |
| Output P1dB (dBm) | 20 |
| Output IP3 ¹⁾ (dBm) | 34 |
| Noise Figure (dB) | 4.0 |
| Device Voltage (V) | +4.8 |
| Current (mA) | 66 |

1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1 MHz.

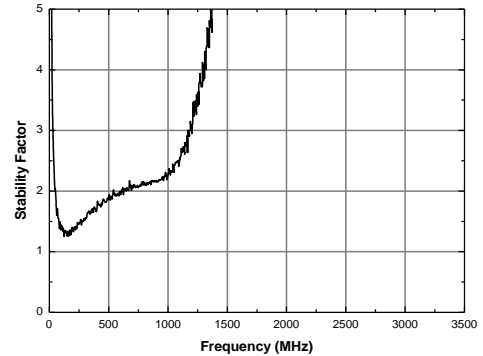
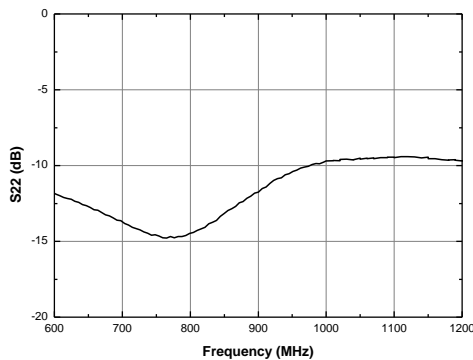
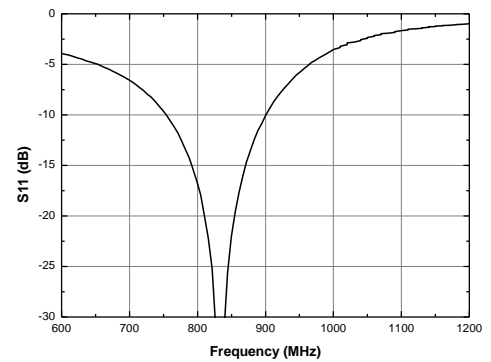
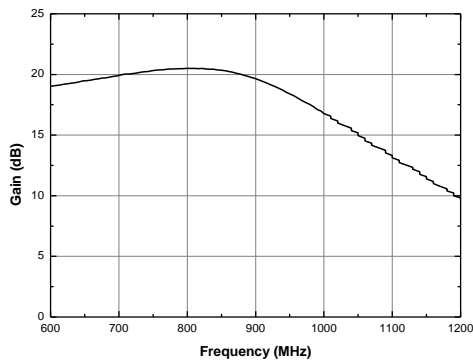
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

CDMA Tx

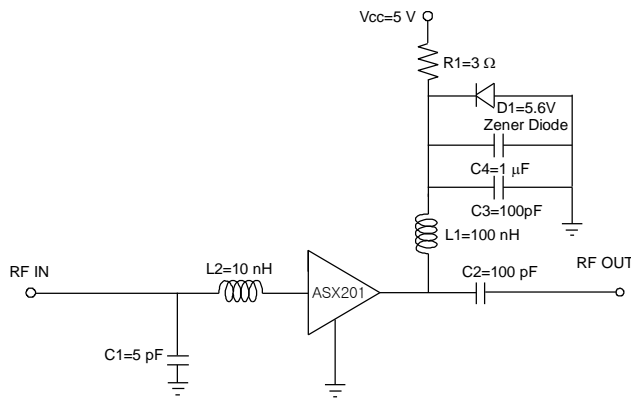
869 ~ 894 MHz

+5 V

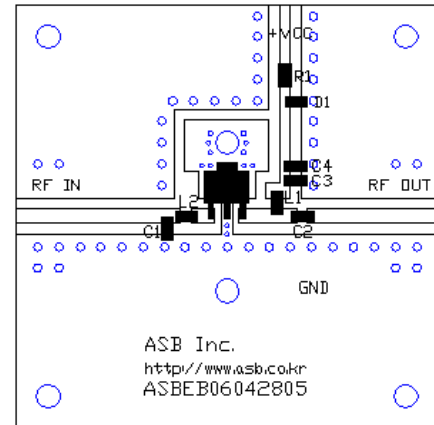
| Frequency (MHz) | 869 ~ 894 |
|--------------------------------|-----------|
| Magnitude S21 (dB) | 19.5 |
| Magnitude S11 (dB) | -13 |
| Magnitude S22 (dB) | -13 |
| Output P1dB (dBm) | 20 |
| Output IP3 ¹⁾ (dBm) | 34 |
| Noise Figure (dB) | 4.0 |
| Device Voltage (V) | +4.8 |
| Current (mA) | 66 |

1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1 MHz.

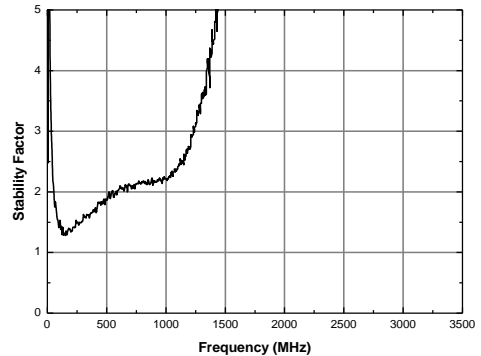
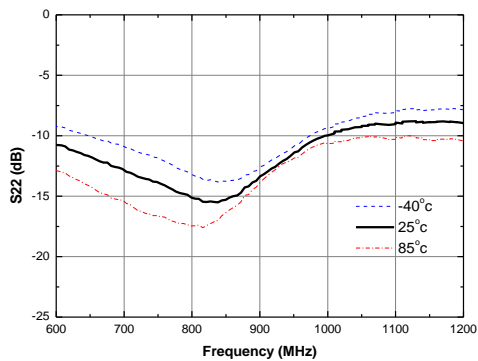
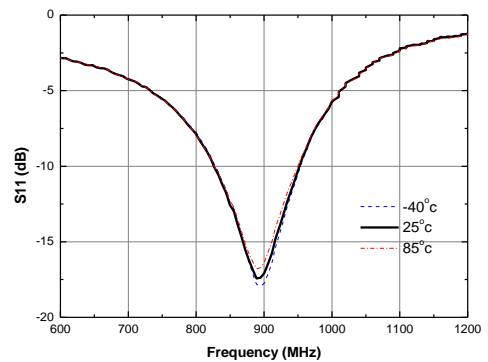
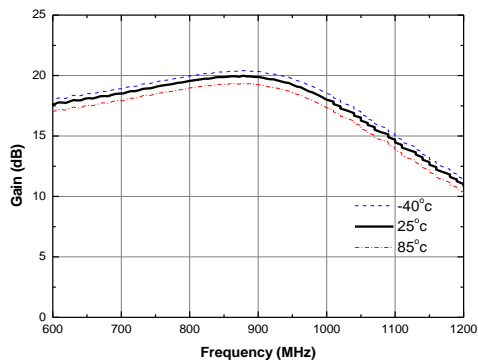
Schematic



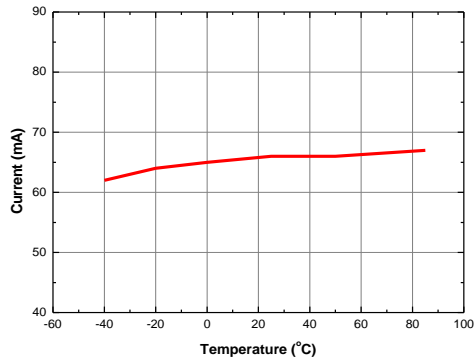
Board Layout (FR4, 40x40 mm², 0.8T)



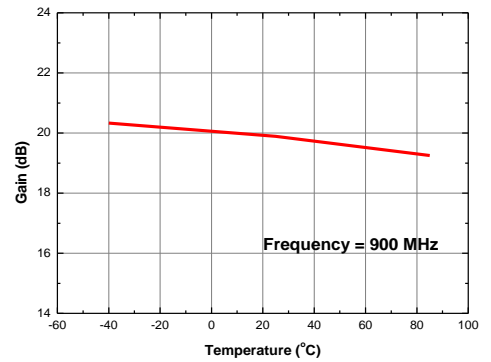
S-parameters & K-factor



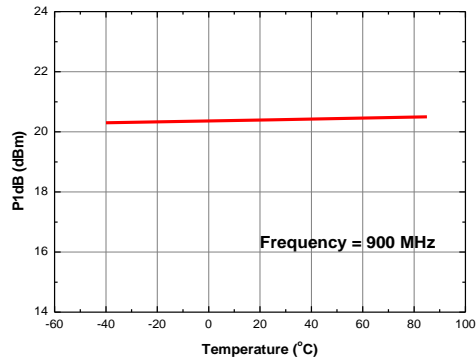
Current vs. Temperature



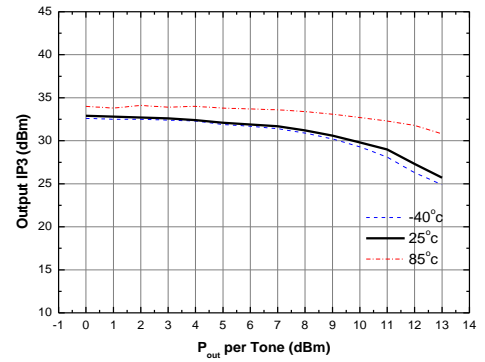
Gain vs. Temperature



P1dB vs. Temperature



Output IP3 vs. Tone Power (Frequency = 900 MHz)



APPLICATION CIRCUIT

GSM

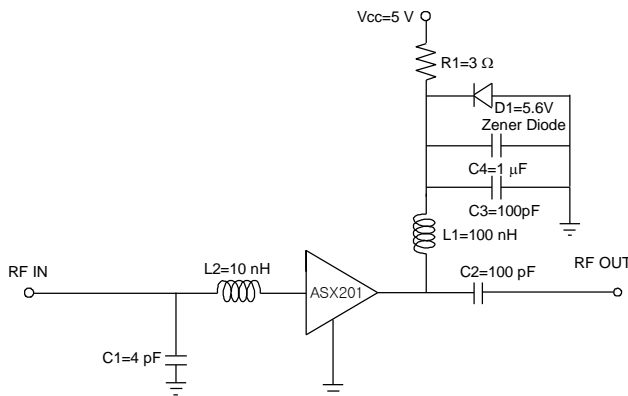
890 ~ 960 MHz

+5 V

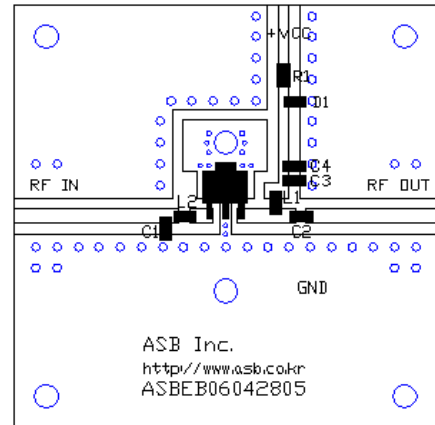
| Frequency (MHz) | 890 ~ 960 |
|--------------------------------|-----------|
| Magnitude S21 (dB) | 19.0 |
| Magnitude S11 (dB) | -13 |
| Magnitude S22 (dB) | -13 |
| Output P1dB (dBm) | 20 |
| Output IP3 ¹⁾ (dBm) | 34 |
| Noise Figure (dB) | 4.0 |
| Device Voltage (V) | +4.8 |
| Current (mA) | 66 |

1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1 MHz.

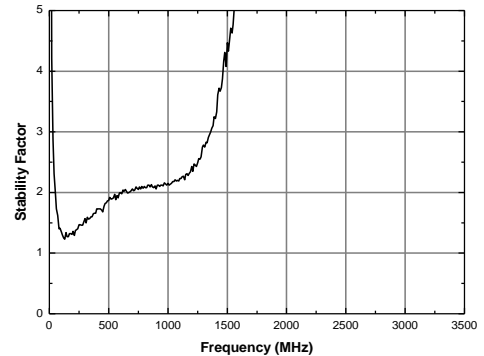
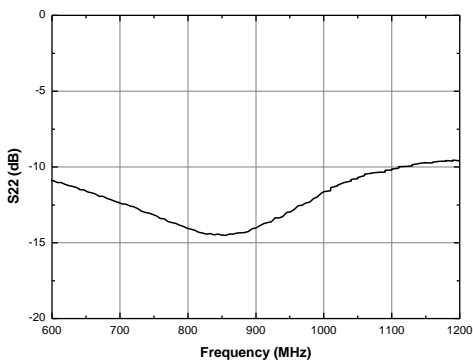
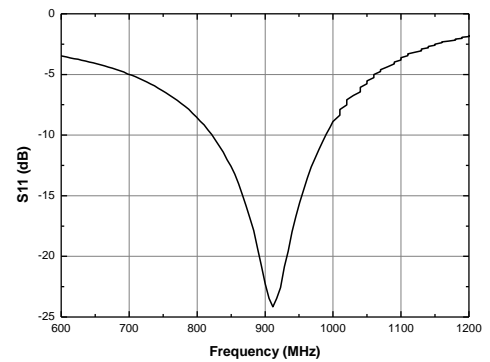
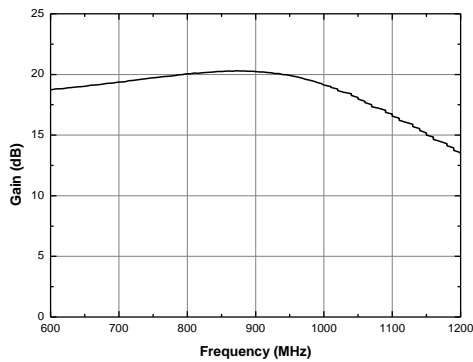
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

PCS Rx

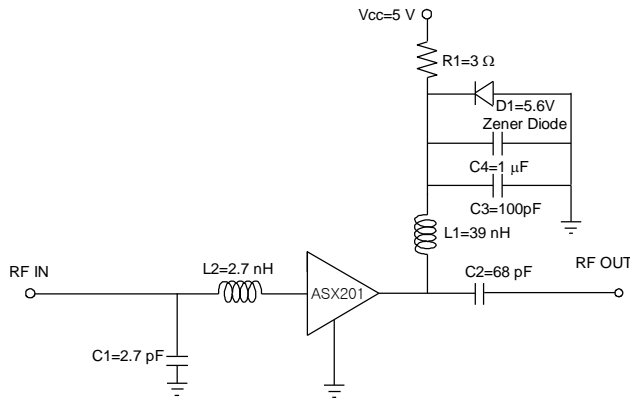
1750 ~ 1780 MHz

+5 V

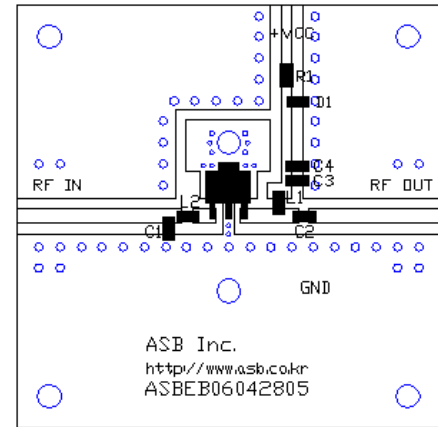
| Frequency (MHz) | 1750 ~ 1780 |
|--------------------------------|-------------|
| Magnitude S21 (dB) | 16.5 |
| Magnitude S11 (dB) | -15 |
| Magnitude S22 (dB) | -18 |
| Output P1dB (dBm) | 20 |
| Output IP3 ¹⁾ (dBm) | 34 |
| Noise Figure (dB) | 3.5 |
| Device Voltage (V) | +4.8 |
| Current (mA) | 66 |

1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1 MHz.

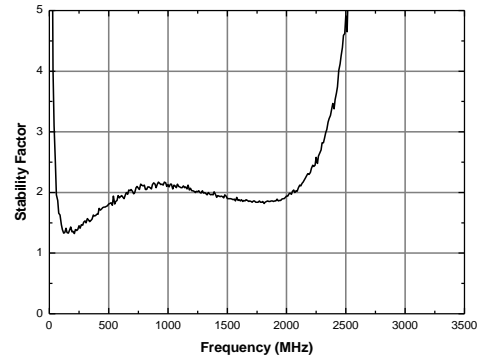
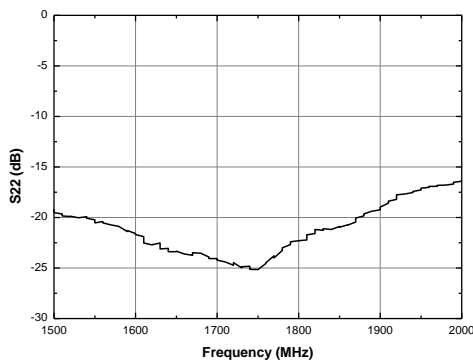
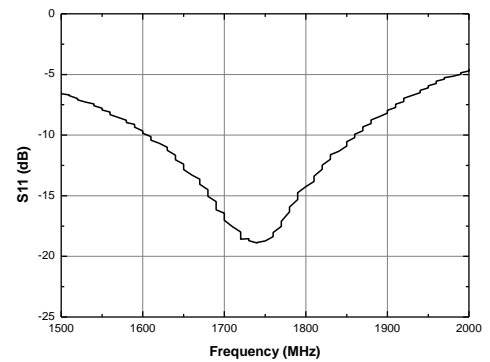
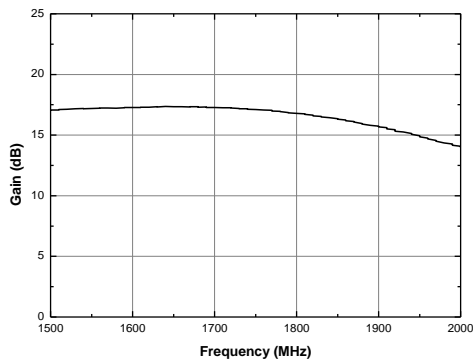
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

PCS Tx

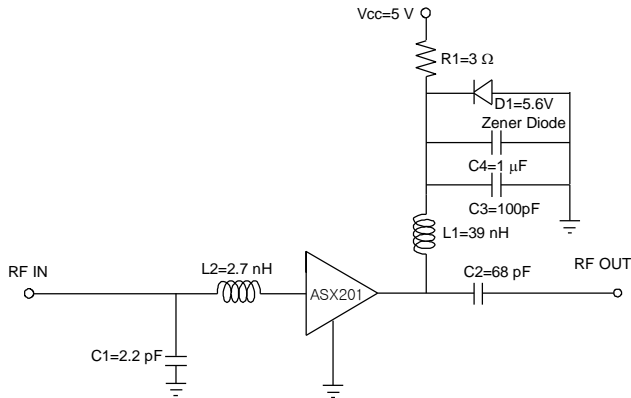
1840 ~ 1870 MHz

+5 V

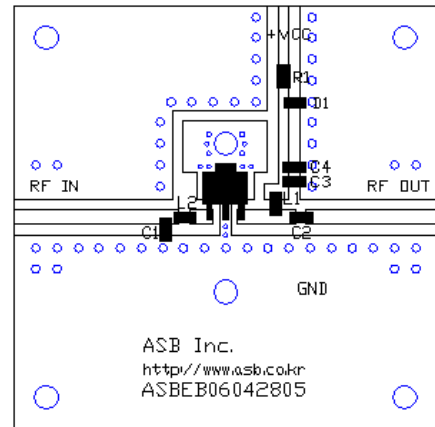
| Frequency (MHz) | 1840 ~ 1870 |
|--------------------------------|-------------|
| Magnitude S21 (dB) | 16.0 |
| Magnitude S11 (dB) | -15 |
| Magnitude S22 (dB) | -18 |
| Output P1dB (dBm) | 21 |
| Output IP3 ¹⁾ (dBm) | 34.5 |
| Noise Figure (dB) | 3.5 |
| Device Voltage (V) | +4.8 |
| Current (mA) | 66 |

1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1 MHz.

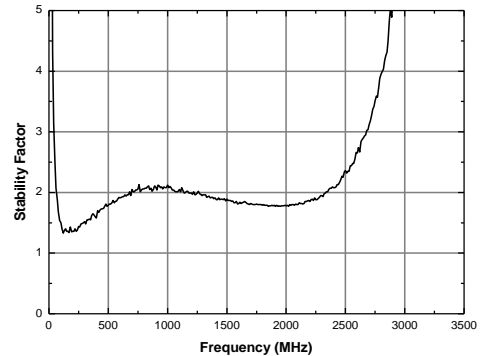
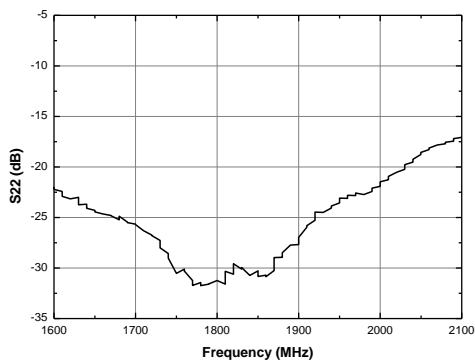
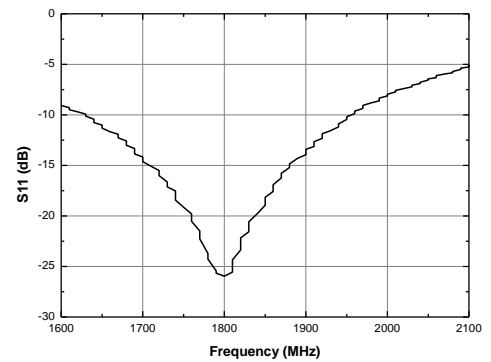
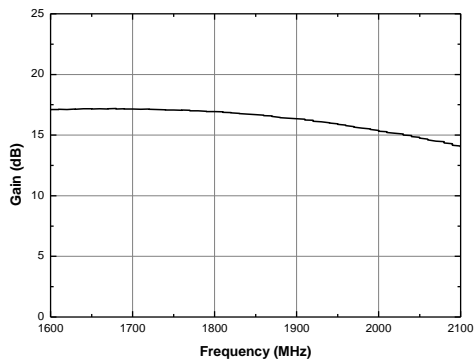
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

WCDMA Rx

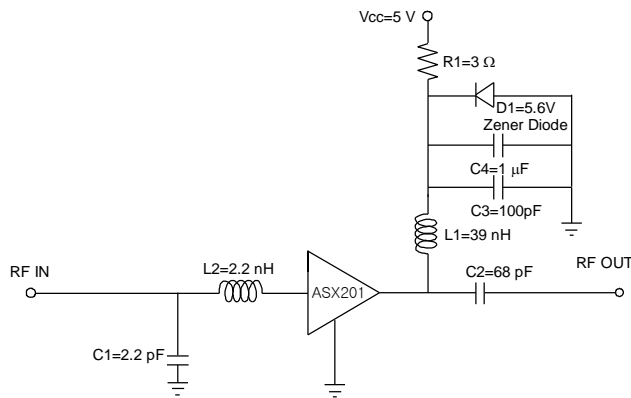
1920 ~ 1980 MHz

+5 V

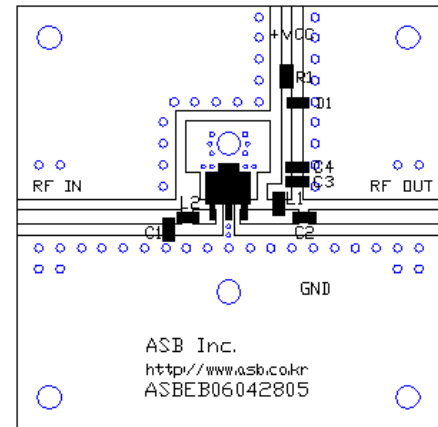
| Frequency (MHz) | 1920 ~ 1980 |
|--------------------------------|-------------|
| Magnitude S21 (dB) | 16.0 |
| Magnitude S11 (dB) | -15 |
| Magnitude S22 (dB) | -18 |
| Output P1dB (dBm) | 21 |
| Output IP3 ¹⁾ (dBm) | 34.5 |
| Noise Figure (dB) | 3.3 |
| Device Voltage (V) | +4.8 |
| Current (mA) | 66 |

1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1 MHz.

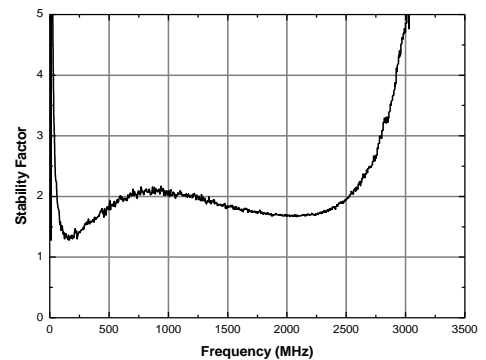
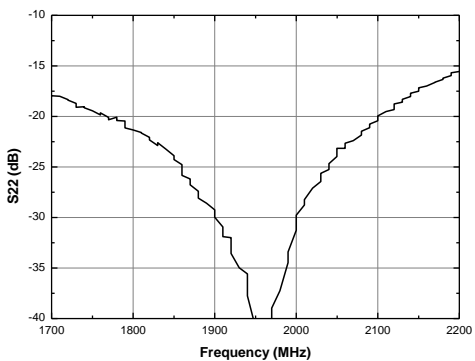
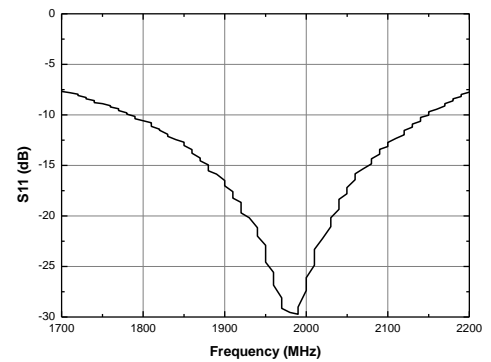
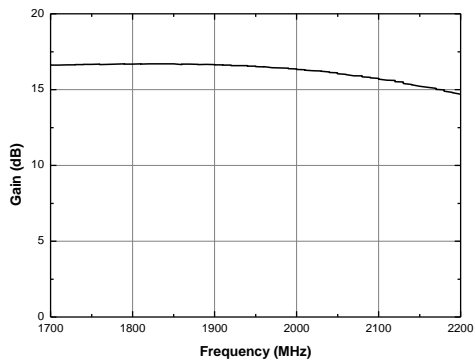
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

WCDMA Tx

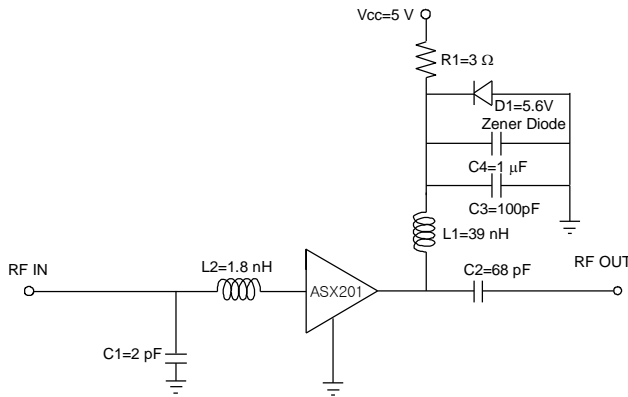
2110 ~ 2170 MHz

+5 V

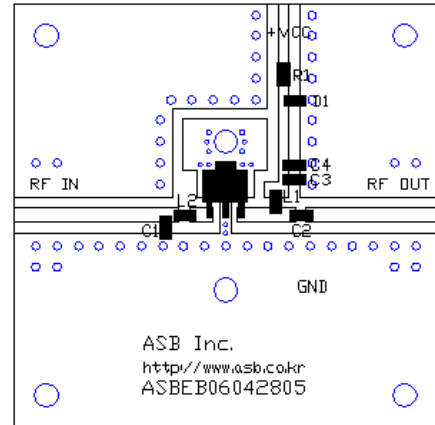
| Frequency (MHz) | 2110 ~ 2170 |
|--------------------------------|-------------|
| Magnitude S21 (dB) | 15.5 |
| Magnitude S11 (dB) | -17 |
| Magnitude S22 (dB) | -18 |
| Output P1dB (dBm) | 20.5 |
| Output IP3 ¹⁾ (dBm) | 36 |
| Noise Figure (dB) | 3.3 |
| Device Voltage (V) | +4.8 |
| Current (mA) | 66 |

1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1 MHz.

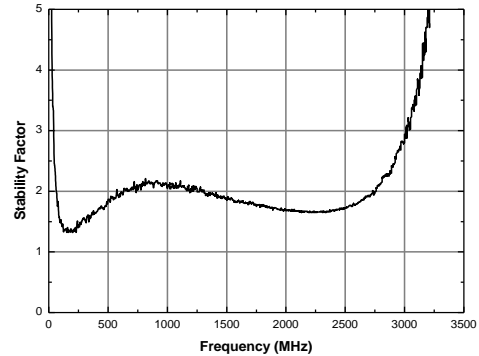
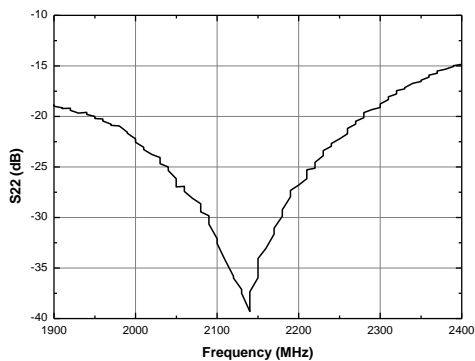
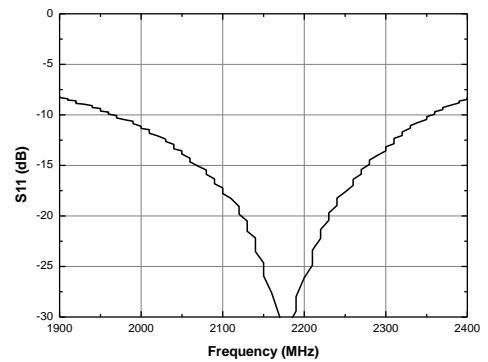
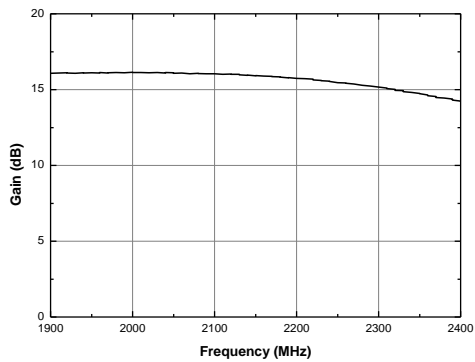
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

WiBro

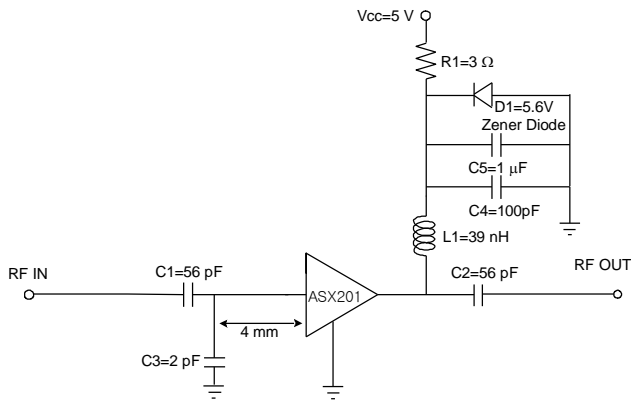
2300 ~ 2400 MHz

+5 V

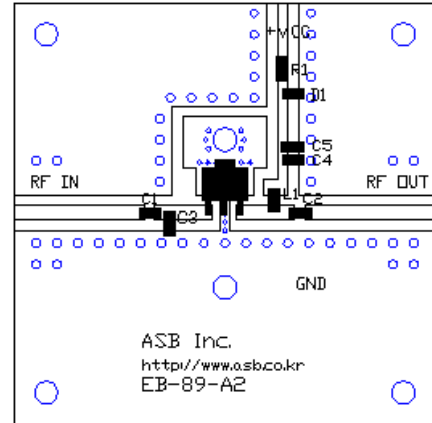
| Frequency (MHz) | 2300 ~ 2400 |
|--------------------------------|-------------|
| Magnitude S21 (dB) | 14.5 |
| Magnitude S11 (dB) | -15 |
| Magnitude S22 (dB) | -18 |
| Output P1dB (dBm) | 22 |
| Output IP3 ¹⁾ (dBm) | 36 |
| Noise Figure (dB) | 3.3 |
| Device Voltage (V) | +4.8 |
| Current (mA) | 66 |

1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1 MHz.

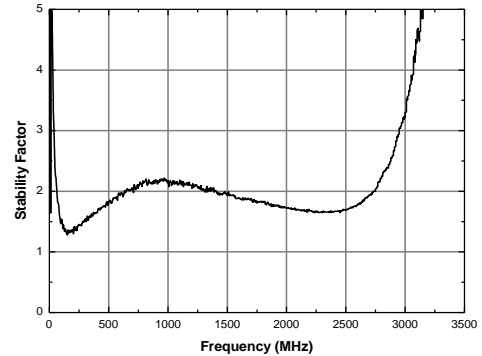
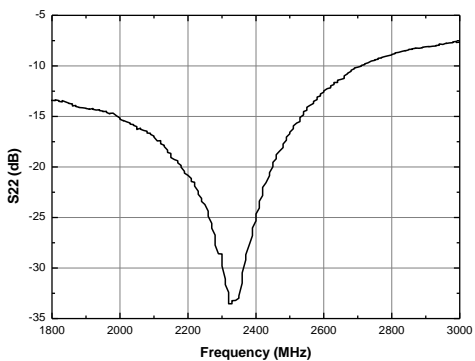
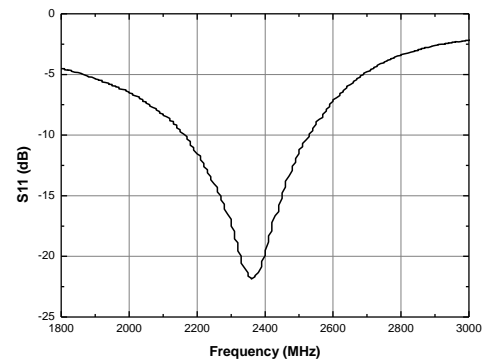
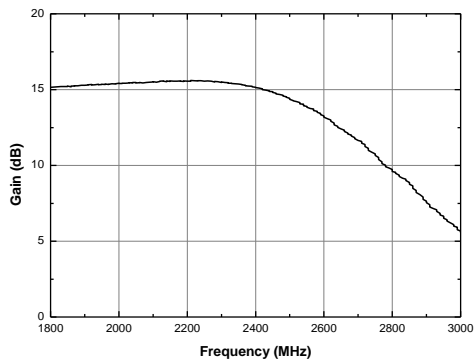
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

WLAN

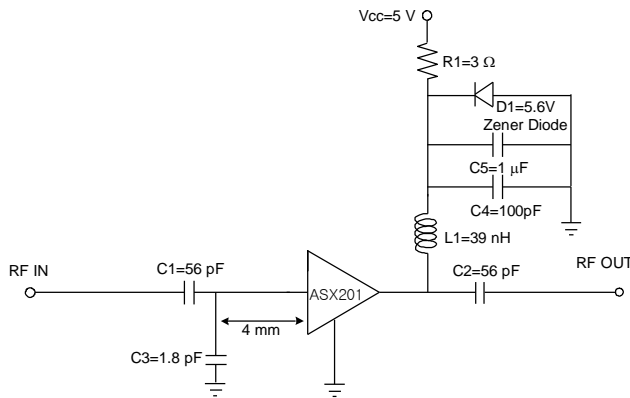
2400 ~ 2500 MHz

+5 V

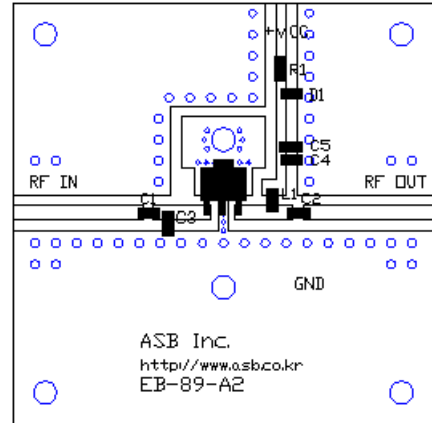
| Frequency (MHz) | 2400 ~ 2500 |
|--------------------------------|-------------|
| Magnitude S21 (dB) | 14.0 |
| Magnitude S11 (dB) | -15 |
| Magnitude S22 (dB) | -18 |
| Output P1dB (dBm) | 22 |
| Output IP3 ¹⁾ (dBm) | 36 |
| Noise Figure (dB) | 3.3 |
| Device Voltage (V) | +4.8 |
| Current (mA) | 66 |

1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1 MHz.

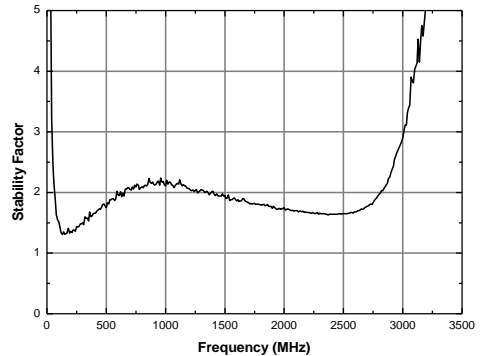
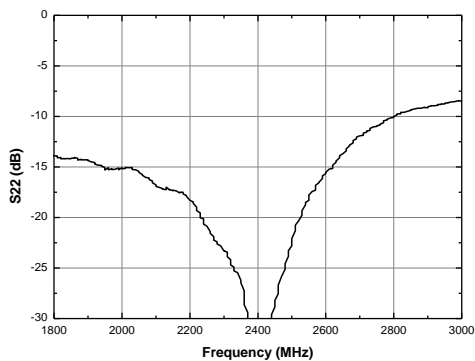
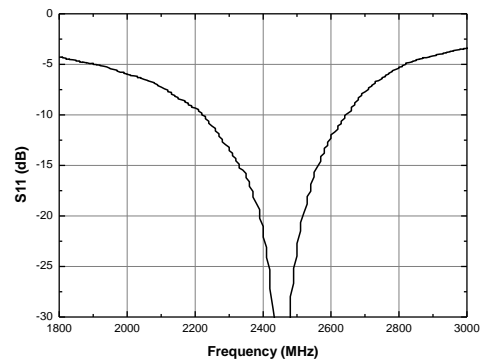
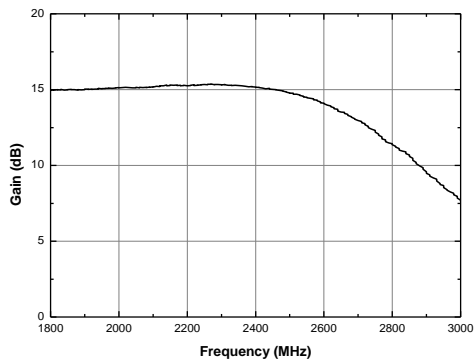
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

WiMAX

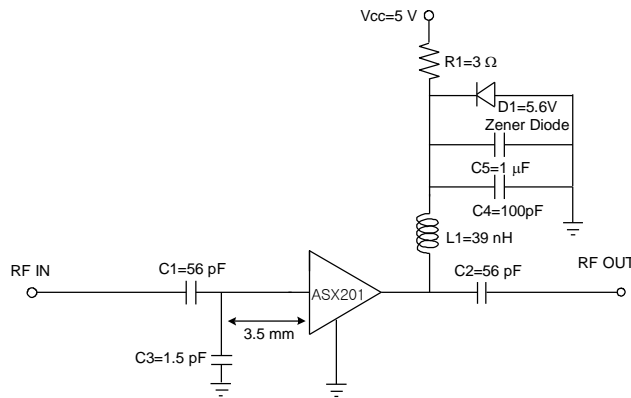
2500 ~ 2700 MHz

+5 V

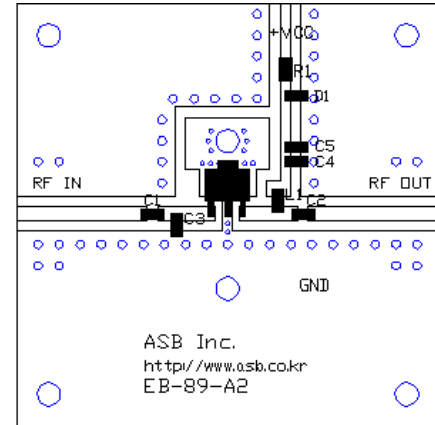
| Frequency (MHz) | 2500 ~ 2700 |
|--------------------------------|-------------|
| Magnitude S21 (dB) | 14.0 |
| Magnitude S11 (dB) | -14 |
| Magnitude S22 (dB) | -17 |
| Output P1dB (dBm) | 21 |
| Output IP3 ¹⁾ (dBm) | 37.5 |
| Noise Figure (dB) | 2.9 |
| Device Voltage (V) | +4.8 |
| Current (mA) | 66 |

1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1 MHz.

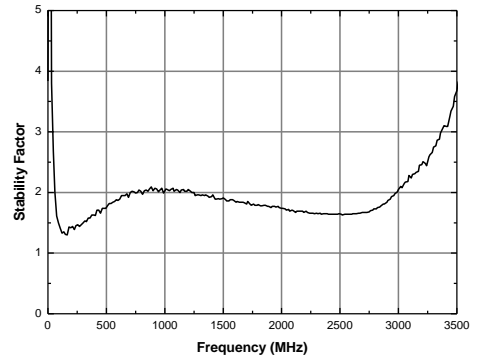
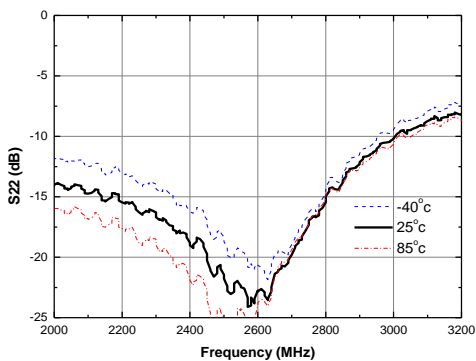
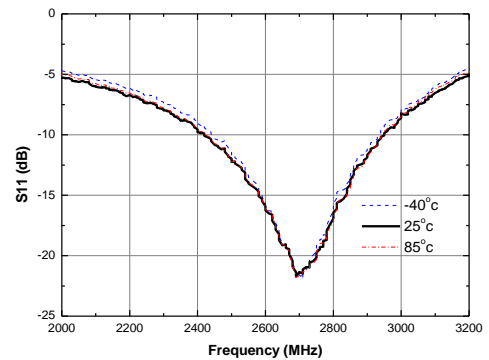
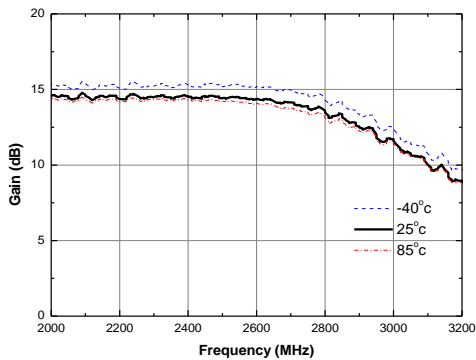
Schematic



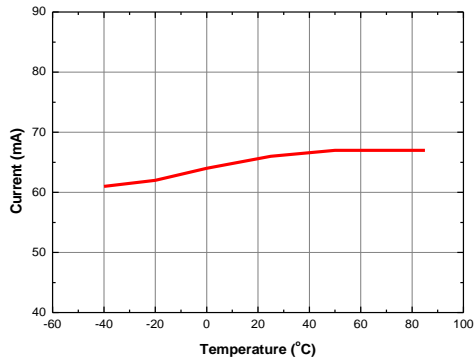
Board Layout (FR4, 40x40 mm², 0.8T)



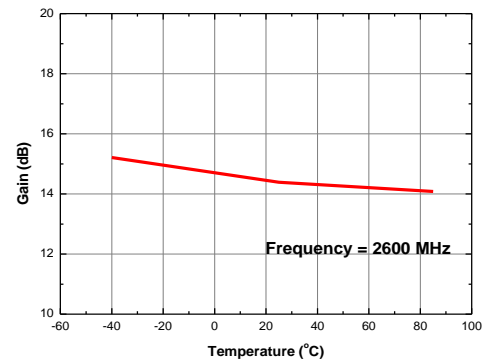
S-parameters & K-factor



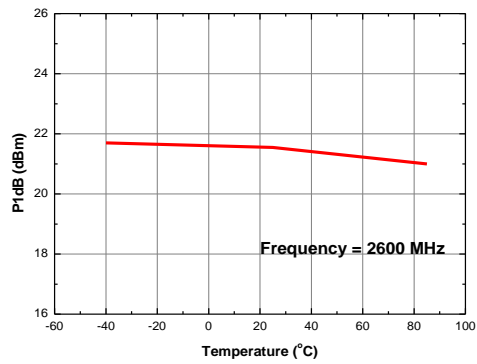
Current vs. Temperature



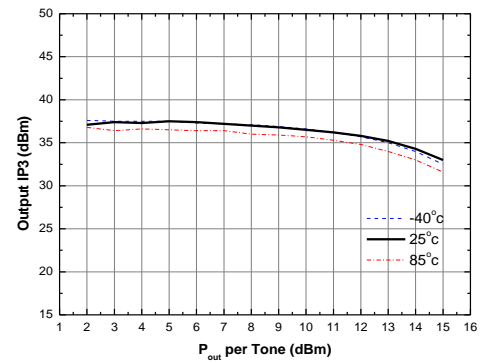
Gain vs. Temperature



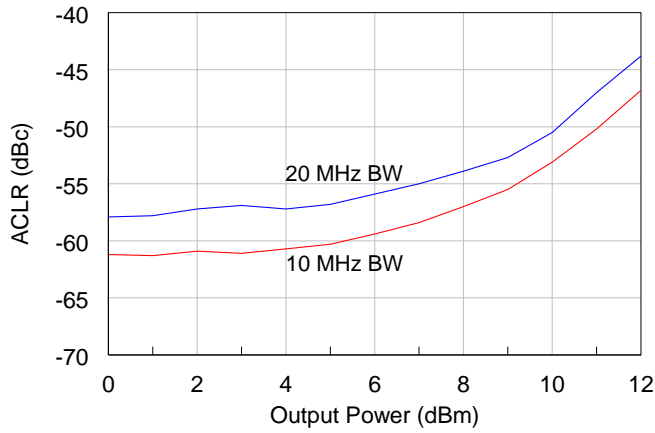
P1dB vs. Temperature



Output IP3 vs. Tone Power (Frequency = 2600 MHz)

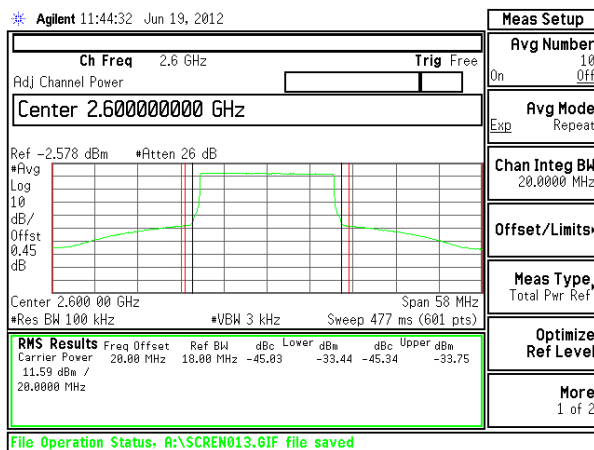


LTE ACLR – 10 MHz & 20 MHz



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

APPLICATION CIRCUIT

WiMAX

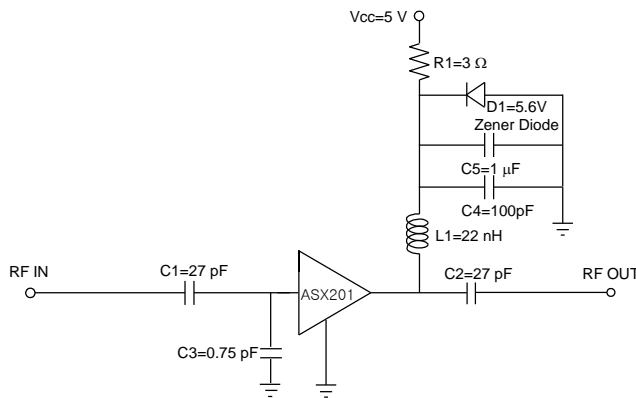
3400 ~ 3600 MHz

+5 V

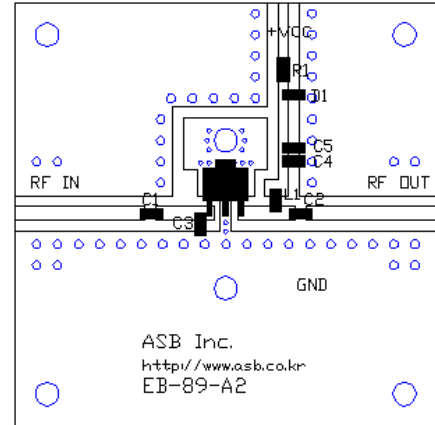
| Frequency (MHz) | 3400 ~ 3600 |
|--------------------------------|-------------|
| Magnitude S21 (dB) | 12.0 |
| Magnitude S11 (dB) | -12 |
| Magnitude S22 (dB) | -13 |
| Output P1dB (dBm) | 20 |
| Output IP3 ¹⁾ (dBm) | 35 |
| Noise Figure (dB) | 3.2 |
| Device Voltage (V) | +4.8 |
| Current (mA) | 66 |

1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1 MHz.

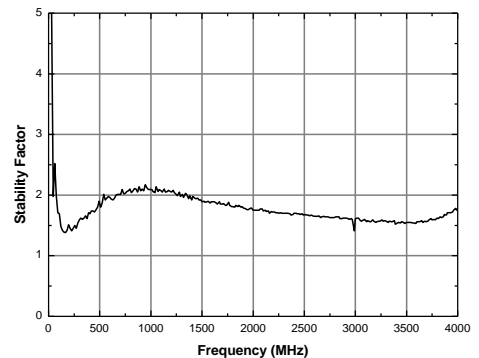
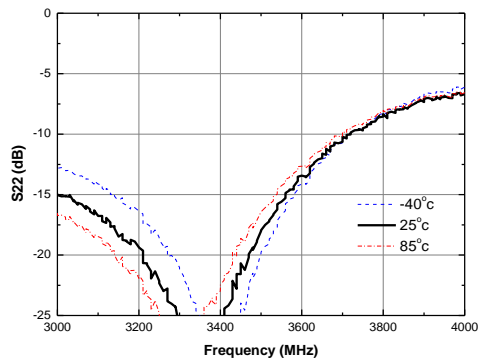
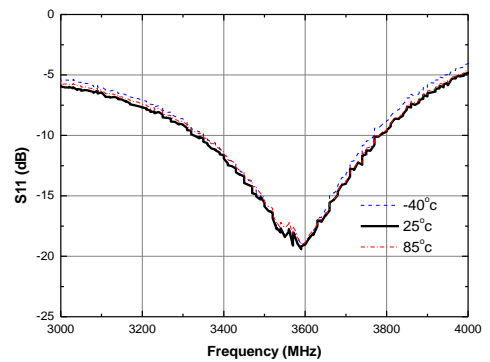
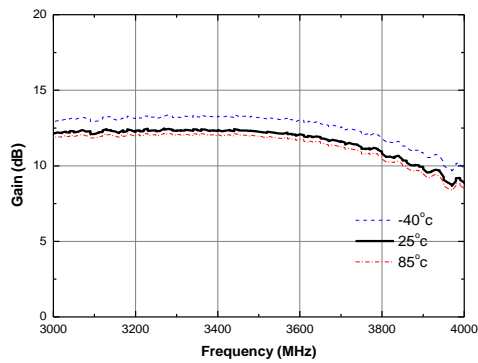
Schematic



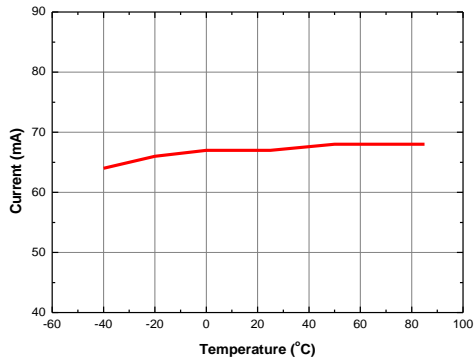
Board Layout (FR4, 40x40 mm², 0.8T)



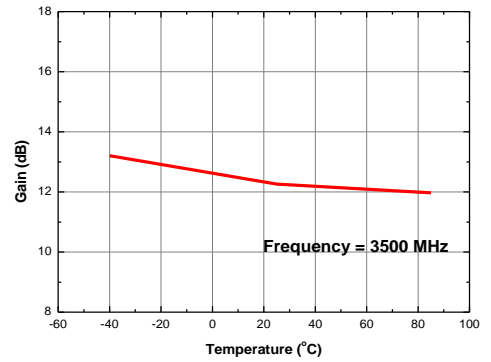
S-parameters & K-factor



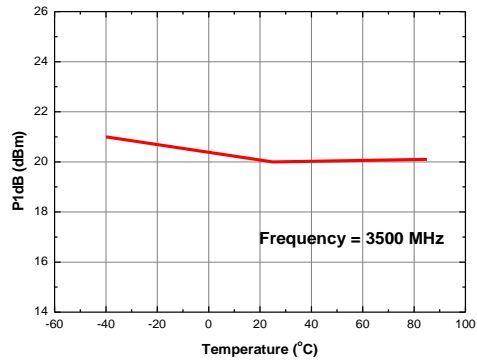
Current vs. Temperature



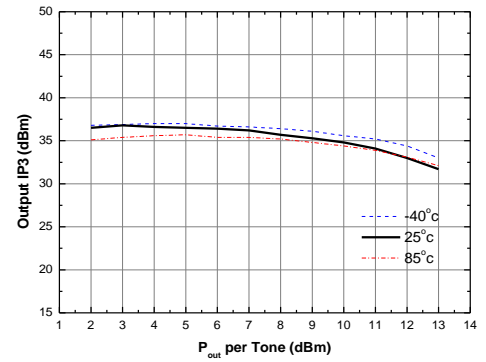
Gain vs. Temperature



P1dB vs. Temperature



Output IP3 vs. Tone Power (Frequency = 3500 MHz)



APPLICATION CIRCUIT

C-Band

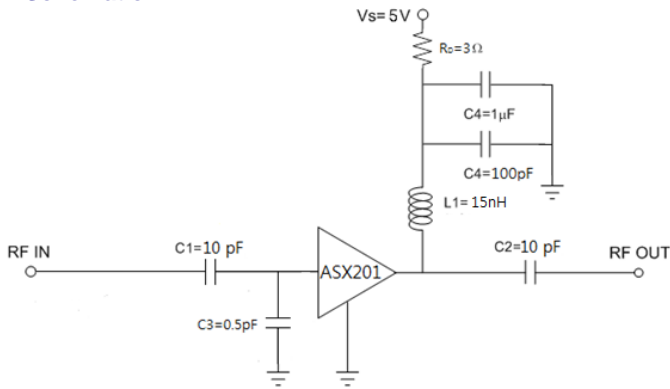
4500 MHz

+5 V

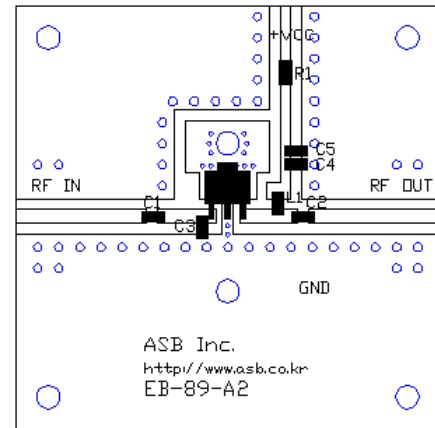
| | |
|--------------------------------|------|
| Frequency (MHz) | 4500 |
| Magnitude S21 (dB) | 8.9 |
| Magnitude S11 (dB) | -16 |
| Magnitude S22 (dB) | -13 |
| Output P1dB (dBm) | 21.5 |
| Output IP3 ¹⁾ (dBm) | 37 |
| Noise Figure (dB) | 3.4 |
| Device Voltage (V) | +4.8 |
| Current (mA) | 68 |

1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1 MHz.

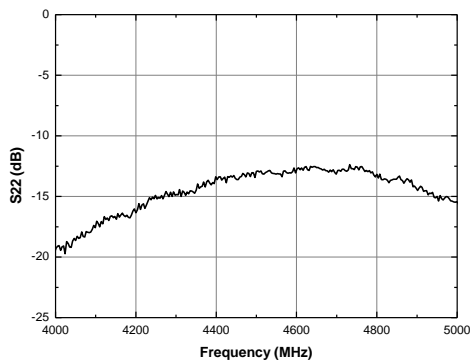
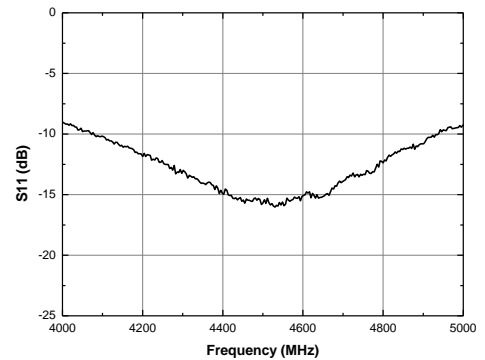
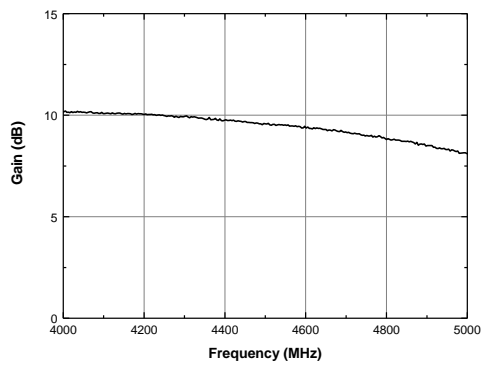
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor

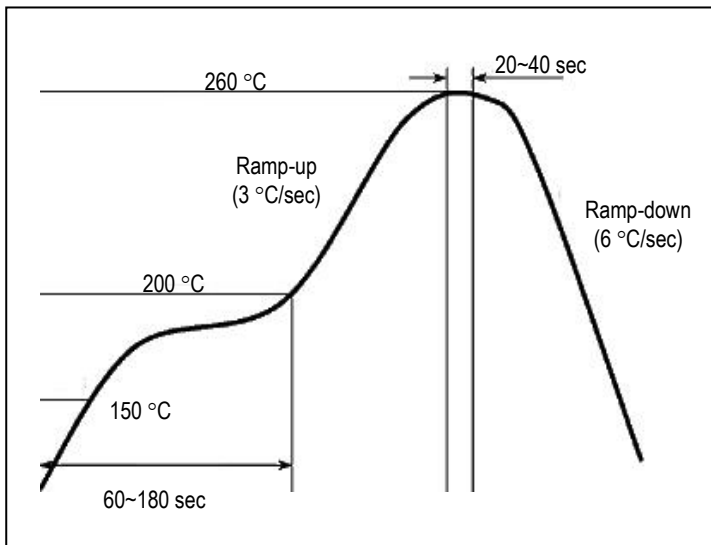


Performance with varying V_{DEVICE}

| V_{DEVICE} (V) | Current (mA) | Freq. (MHz) | Gain (dB) | S11 (dB) | S22 (dB) | OIP3 ¹⁾ (dBm) | P1dB (dBm) | NF (dB) |
|------------------|--------------|-------------|-----------|----------|----------|--------------------------|------------|---------|
| +4.8 | 66 | 880 | 20.0 | -21.5 | -14.3 | 35.3 | 21.0 | 4.06 |
| +4.5 | 51 | | 19.7 | -19.1 | -14.4 | 31.3 | 18.4 | 3.63 |
| +4.2 | 38 | | 19.2 | -16.5 | -14.7 | 27.5 | 15.5 | 3.15 |
| +4.8 | 66 | 1950 | 16.4 | -27.8 | -27.4 | 35.1 | 21.3 | 2.88 |
| +4.5 | 51 | | 16.2 | -26.8 | -25.2 | 31.5 | 18.8 | 2.55 |
| +4.2 | 38 | | 15.9 | -24.0 | -23.0 | 27.9 | 16.1 | 2.27 |
| +4.8 | 66 | 3500 | 12.3 | -14.4 | -13.4 | 35.2 | 19.6 | 3.71 |
| +4.5 | 51 | | 12.2 | -14.0 | -13.2 | 30.9 | 16.4 | 3.27 |
| +4.2 | 38 | | 11.8 | -13.2 | -12.7 | 27.2 | 14.3 | 3.01 |

1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1 MHz.

Recommended Soldering Reflow Profile



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