ASW208

5 ~ 6000 MHz MMIC Amplifier

Features

- 19 dB Gain at 2 GHz
- 22 dBm P1dB at 2 GHz
- 35 dBm Output IP3 at 2 GHz
- 1.7 dB NF at 2 GHz
- MTTF > 100 Years
- Single Supply

Description

The ASW208, a gain block amplifier MMIC, has a low noise, high gain, and high linearity over a wide range of frequency, being suitable for use in both receiver and transmitter of telecommunication systems up to 6 GHz. The amplifier is available in a SOT89 package and passes through the stringent DC, RF, and reliability tests.

RoHS-compliant GREEN Package

Package Style: SOT89

Typical Performance

(Supply Voltage = Device Voltage, T_A = +25 °C, Zo = 50 Ω)

Parameters	Units	Typical				
Frequency	MHz	50	900	2000	2700	3000
Gain	dB	21.0	21.0	19.0	17.0	16.2
S11	dB	-9	-14	-12	-11	-13
S22	dB	-18	-12	-12	-12	-11
Output IP3[1)]	dBm	32[1)]	37[2)]	35[2)]	33[2)]	29[3)]
Noise Figure	dB	5.2	1.6	1.7	1.9	2.4
Output P1dB	dBm	23	22	22	21	20
Current	mA	80	80	80	80	80
Device Voltage	V	+5.5	+5.5	+5.5	+5.5	+5.0

1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1 MHz.
2) OIP3 is measured with two tones at an output power of +12 dBm/tone separated by 1 MHz.
3) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1 MHz.

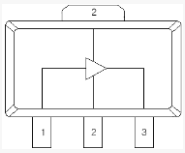
Application Circuit

- 500 ~ 3500 MHz (5.5 V)
- 500 ~ 3500 MHz (5 V)
- IF, 50 ~ 450 MHz (5.5 V)
- IF, 50 ~ 450 MHz (5 V)
- 3000 ~ 4500 MHz (5 V)
- SMATV, 950 ~ 2150 MHz (5.5 V)
- SMATV, 950 ~ 2150 MHz (5 V)
- 50 ~ 2600 MHz (5 V, 75 Ω)
- 1000 ~ 2600 MHz

Product Specifications

Parameters	Units	Min	Typ	Max
Testing Frequency	MHz		2000	
Gain	dB	18	19	
S11	dB	-9	-12	
S22	dB	-9	-12	
Output IP3	dBm	32	35	
Noise Figure	dB		1.7	2.0
Output P1dB	dBm	20.5	22.0	
Current	mA	60	80	100
Device Voltage	V		+5.5	

Pin Configuration



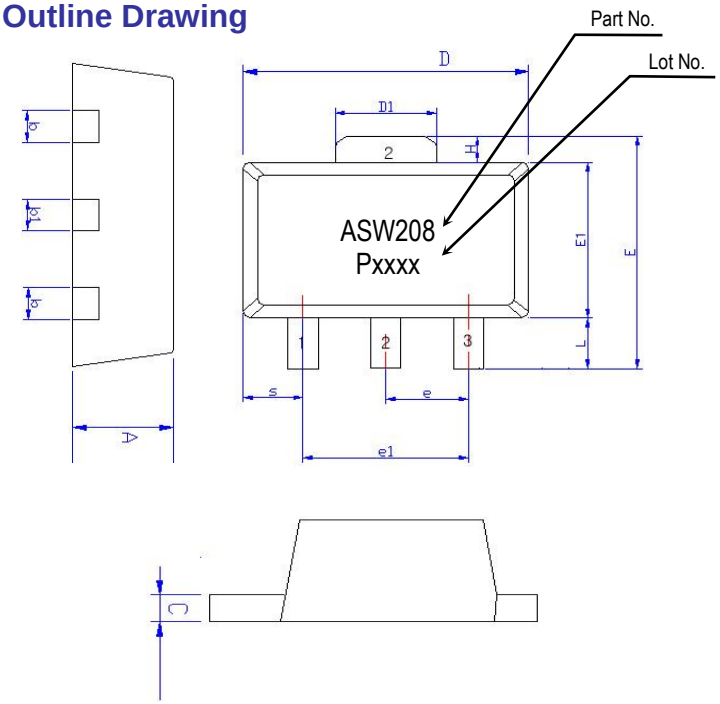
Pin No.	Function
1	RF IN
2	GND
3	RF OUT & Bias

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 (Continuous)	+22 dBm
Thermal Resistance	62 °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.

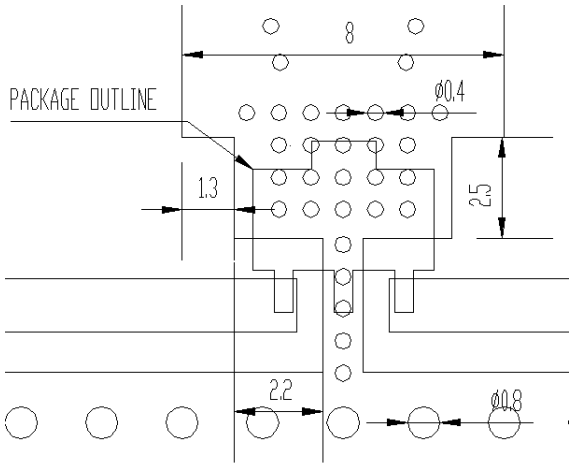
Outline Drawing



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

Wide Band

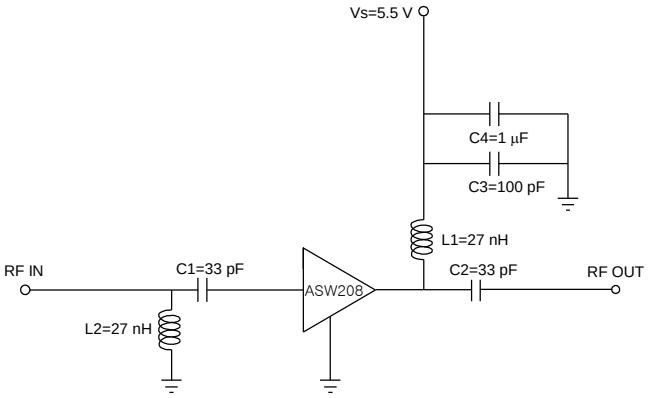
500 ~ 3500 MHz

+5.5 V

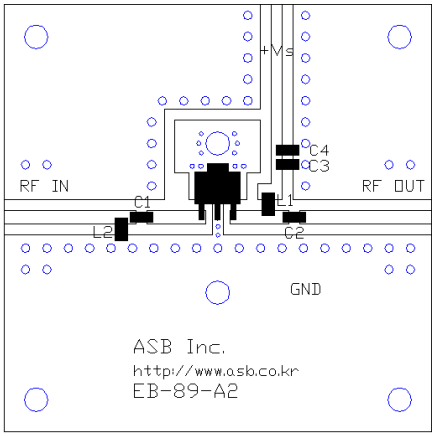
Frequency (MHz)	900	2000	2700
Magnitude S21 (dB)	21	19	17
Magnitude S11 (dB)	-14	-12	-11
Magnitude S22 (dB)	-12	-12	-12
Output P1dB (dBm)	22	22	21
Output IP3[1)] (dBm)	37	35	33
Noise Figure (dB)	1.6	1.7	1.9
Device Voltage (V)	+5.5	+5.5	+5.5
Current (mA)	80	80	80

1) OIP3 is measured with two tones at an output power of +12 dBm/tone separated by 1MHz.

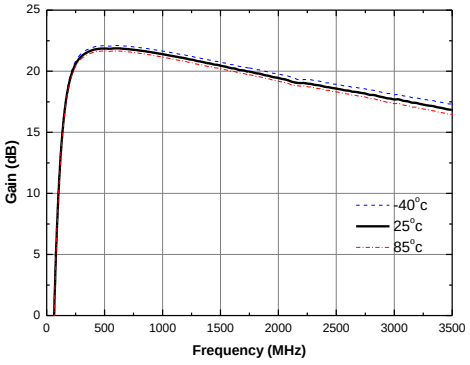
Schematic

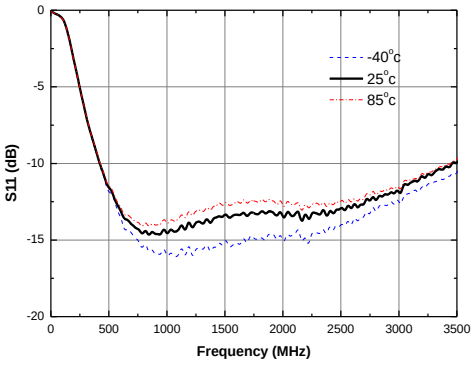


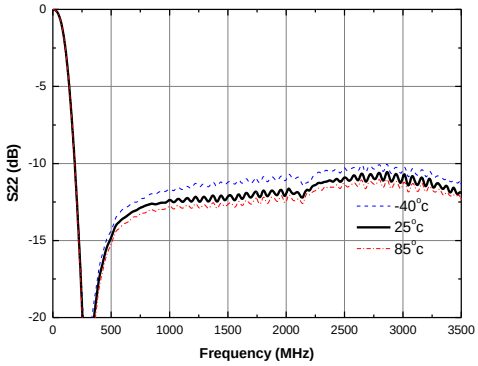
Board Layout (FR4, 40x40 mm², 0.8T)

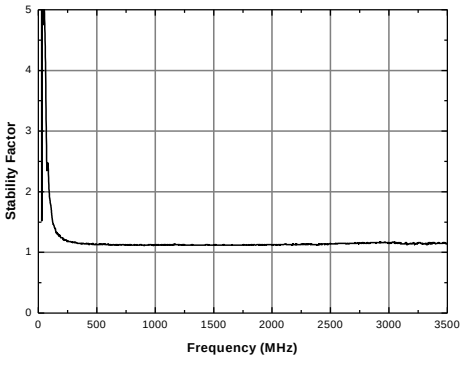


S-parameters & K-factor

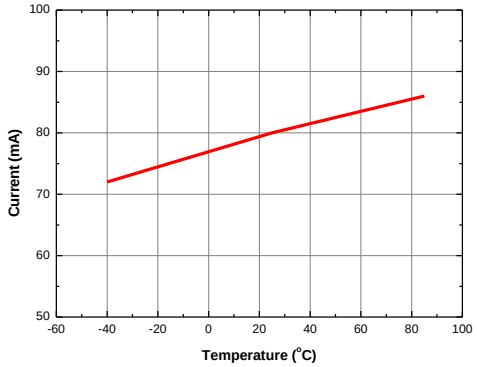




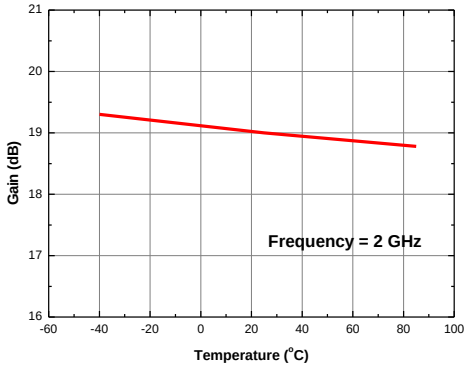




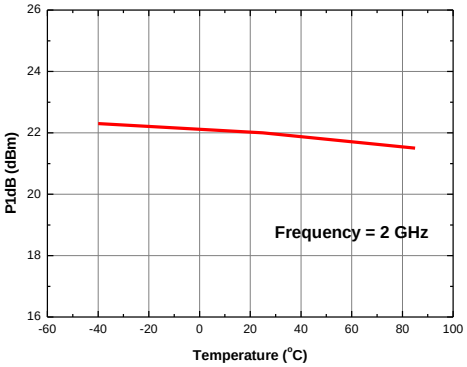
Current vs. Temperature



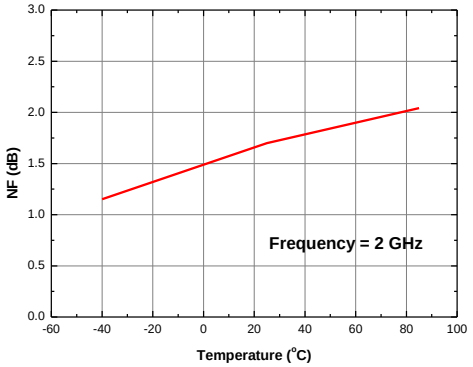
Gain vs. Temperature



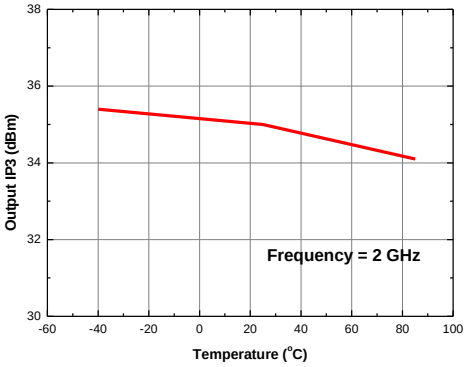
P1dB vs. Temperature



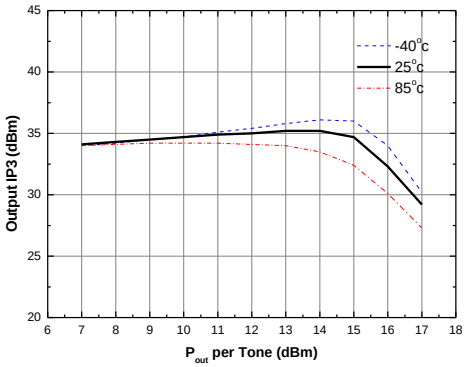
NF vs. Temperature



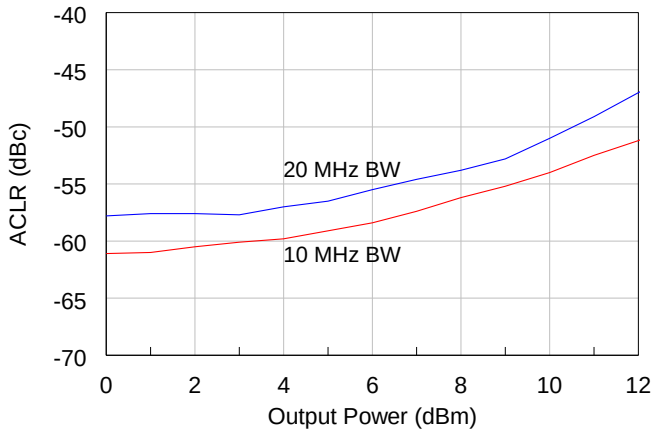
Output IP3 vs. Temperature



Output IP3 vs. Tone Power (Frequency = 2 GHz)

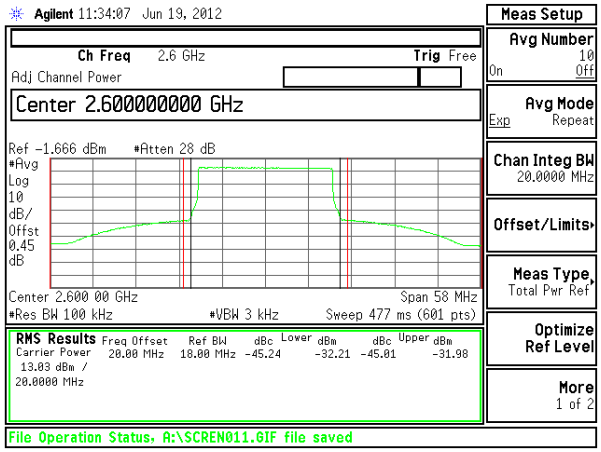


LTE ACLR – 10 MHz & 20 MHz



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

Wide Band

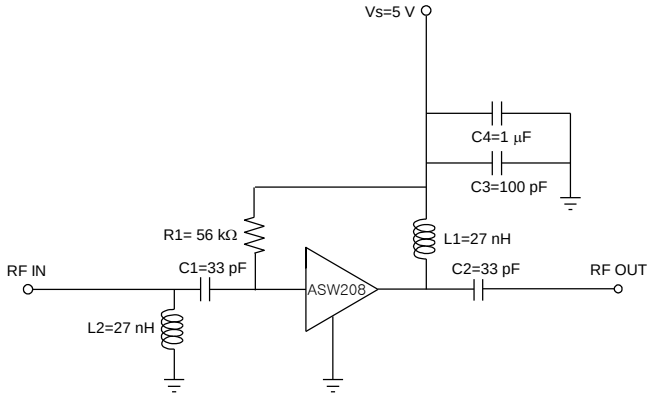
500 ~ 3500 MHz

+5 V

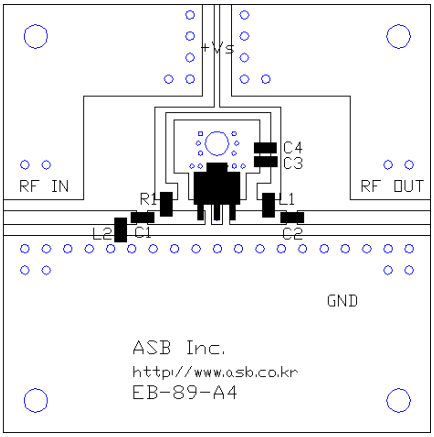
Frequency (MHz)	900	2000	2700
Magnitude S21 (dB)	21	19	17
Magnitude S11 (dB)	-14	-11	-11
Magnitude S22 (dB)	-12	-11	-10
Output P1dB (dBm)	22	22	21
Output IP3[1)] (dBm)	37	35	33
Noise Figure (dB)	1.6	1.7	1.9
Device Voltage (V)	+5	+5	+5
Current (mA)	80	80	80

1) OIP3 is measured with two tones at an output power of +12 dBm/tone separated by 1MHz.

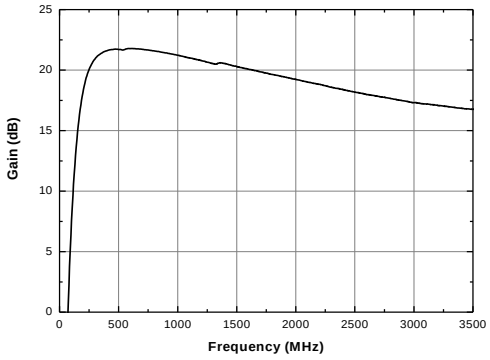
Schematic

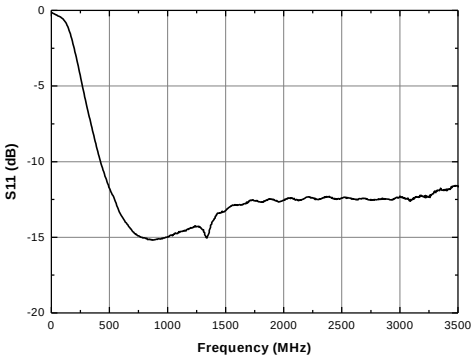


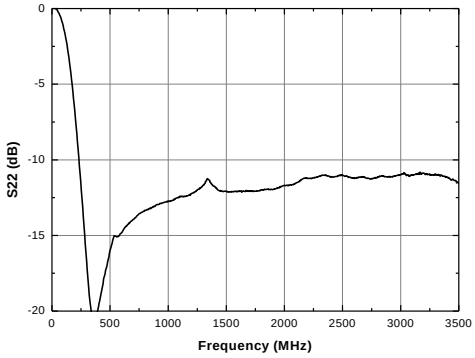
Board Layout (FR4, 40x40 mm², 0.8T)

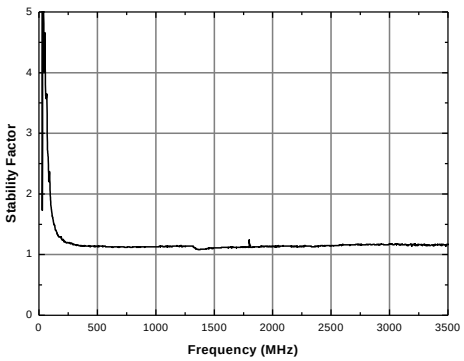


S-parameters & K-factor









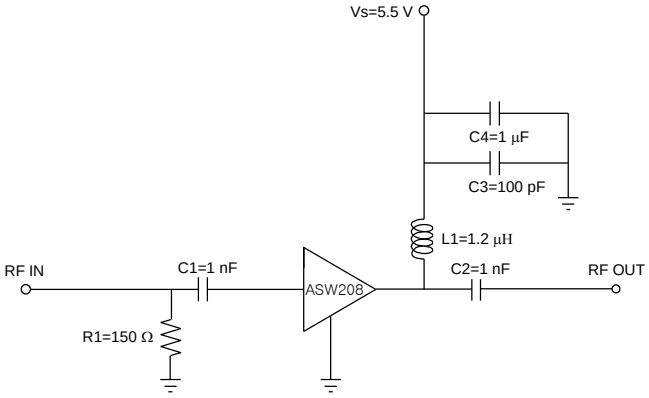
APPLICATION CIRCUIT

IF
50 ~ 450 MHz
+5.5 V

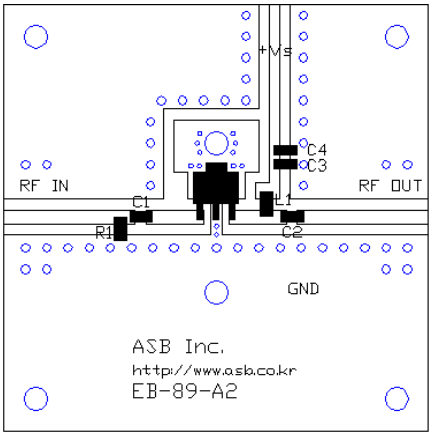
Frequency (MHz)	50	150	300	450
Magnitude S21 (dB)	21.0	20.0	20.0	19.5
Magnitude S11 (dB)	-9	-14	-15	-15
Magnitude S22 (dB)	-18	-18	-15	-15
Output P1dB (dBm)	23.0	23.5	23.5	23.5
Output IP3[1)] (dBm)	32	33	34	34
Noise Figure (dB)	5.2	3.4	3.2	3.2
Device Voltage (V)	+5.5	+5.5	+5.5	+5.5
Current (mA)	80	80	80	80

1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1MHz.

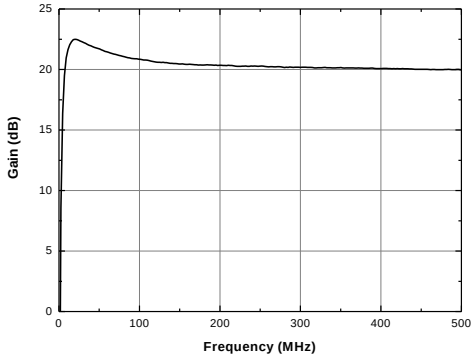
Schematic

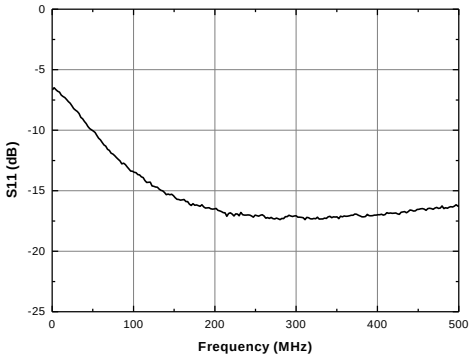


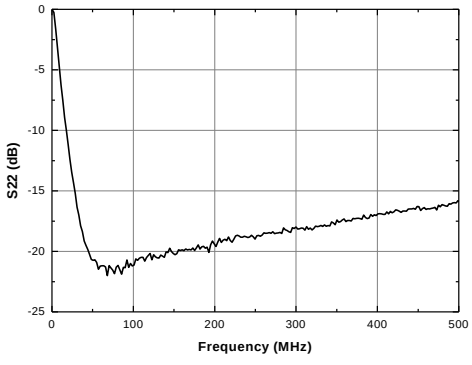
Board Layout (FR4, 40x40 mm², 0.8T)

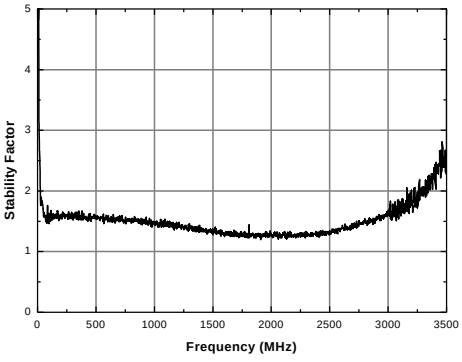


S-parameters & K-factor









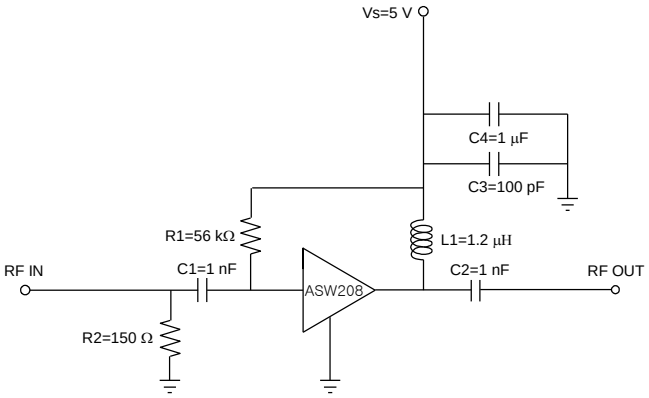
APPLICATION CIRCUIT

IF
50 ~ 450 MHz
+5 V

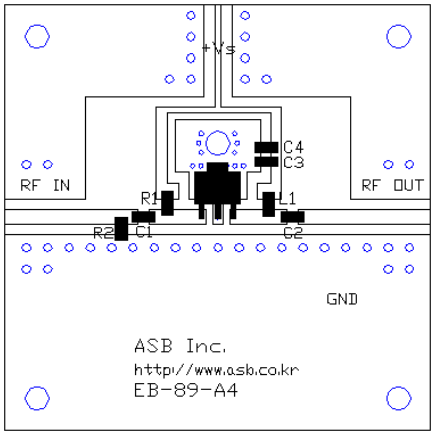
Frequency (MHz)	50	150	300	450
Magnitude S21 (dB)	21.0	20.0	19.5	19.5
Magnitude S11 (dB)	-10	-14	-15	-15
Magnitude S22 (dB)	-18	-18	-15	-15
Output P1dB (dBm)	22	22	22	22
Output IP3[1)] (dBm)	31	32	33	33
Noise Figure (dB)	4.0	3.2	3.2	3.2
Device Voltage (V)	+5	+5	+5	+5
Current (mA)	80	80	80	80

1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1MHz.

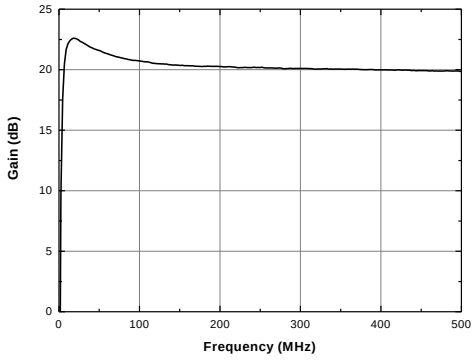
Schematic

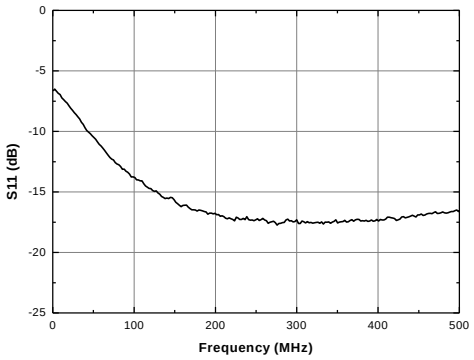


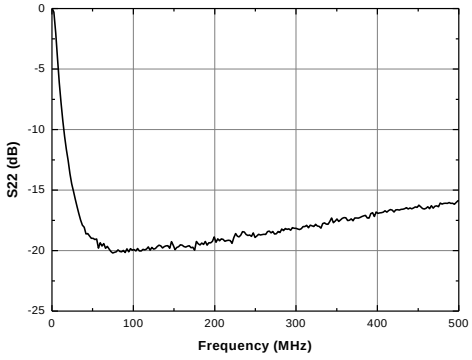
Board Layout (FR4, 40x40 mm², 0.8T)

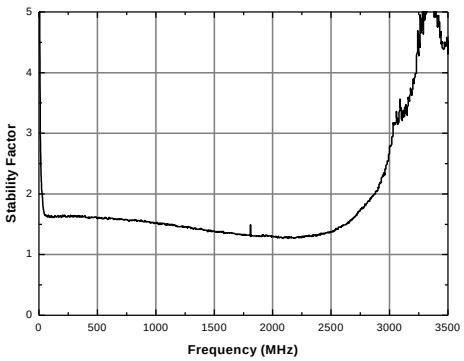


S-parameters & K-factor









APPLICATION CIRCUIT

Wide Band

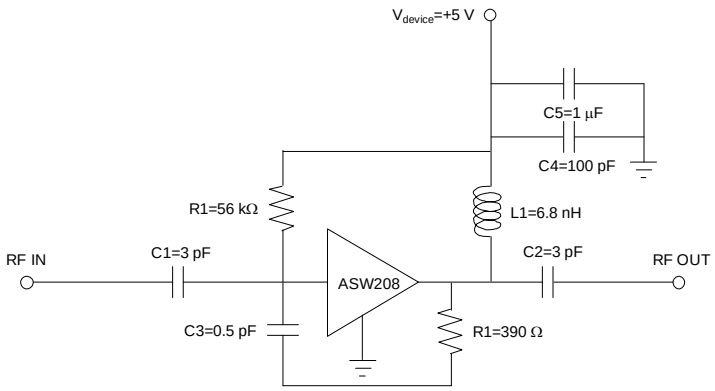
3000 ~ 4500 MHz

+5 V

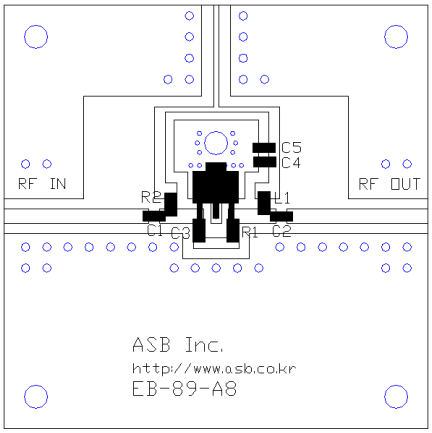
Frequency (MHz)	3000	4500
Magnitude S21 (dB)	16.2	16.4
Magnitude S11 (dB)	-13	-12
Magnitude S22 (dB)	-11	-13
Output P1dB (dBm)	20.0	16.5
Output IP3[1)] (dBm)	29.0	27.5
Noise Figure (dB)	2.4	2.7
Device Voltage (V)	+5	+5
Current (mA)	80	80

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

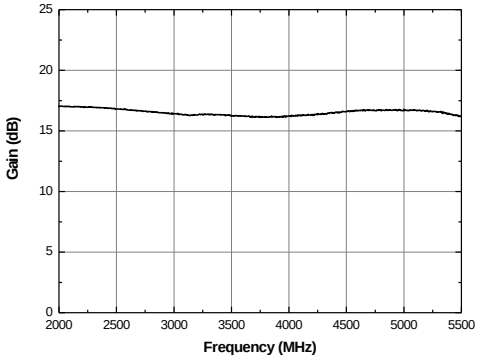
Schematic

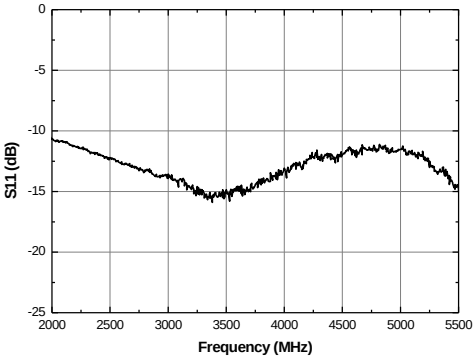


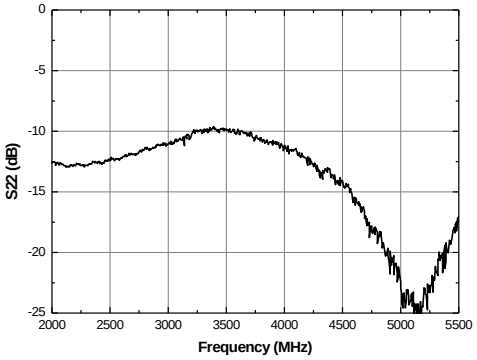
Board Layout (FR4, 40x40 mm², 0.8T)

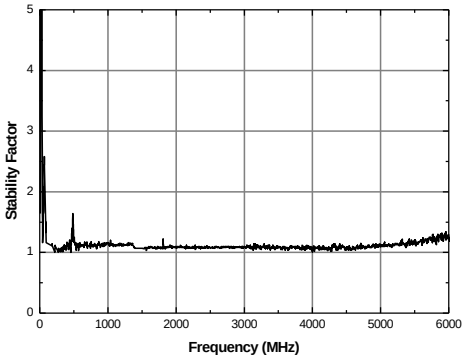


S-parameters & K-factor









APPLICATION CIRCUIT

SMATV

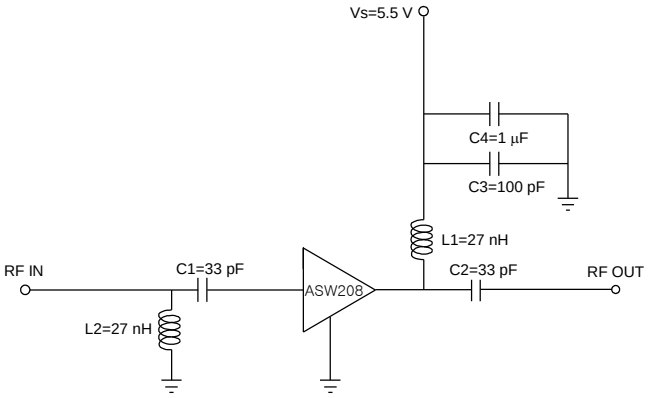
950 ~ 2150 MHz

+5.5 V

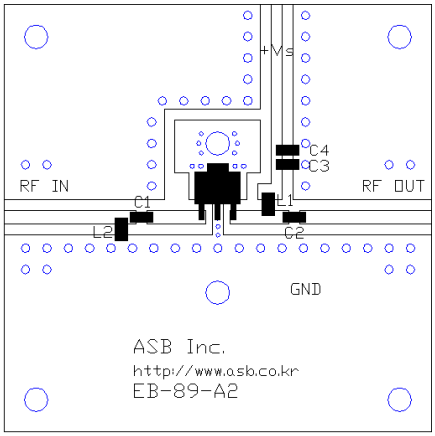
Frequency (MHz)	950	1500	2150
Magnitude S21 (dB)	21.0	20.0	17.5
Magnitude S11 (dB)	-14	-12	-11
Magnitude S22 (dB)	-12	-12	-12
Output P1dB (dBm)	22	22	21
Output IP3[1)] (dBm)	37	35	34
Noise Figure (dB)	1.6	1.7	1.8
Device Voltage (V)	+5.5	+5.5	+5.5
Current (mA)	80	80	80

1) OIP3 is measured with two tones at an output power of +12 dBm/tone separated by 1MHz.

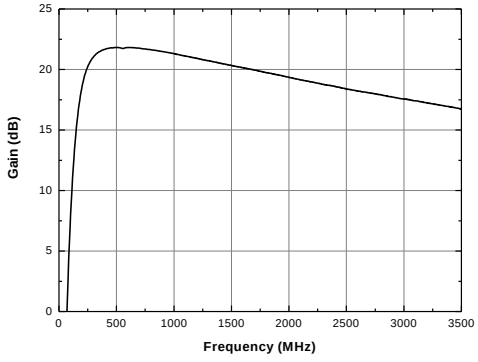
Schematic

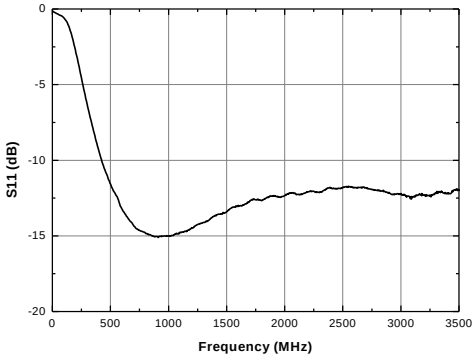


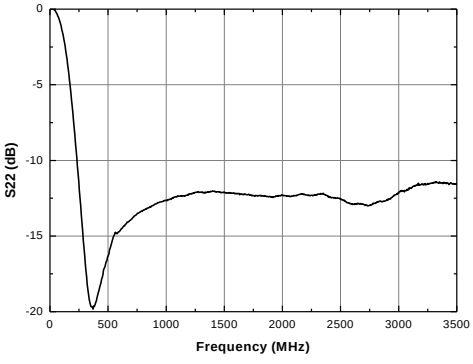
Board Layout (FR4, 40x40 mm², 0.8T)

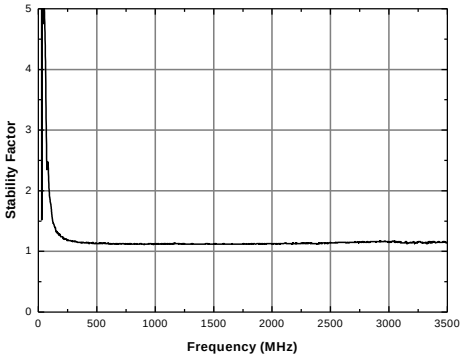


S-parameters & K-factor









APPLICATION CIRCUIT

SMATV

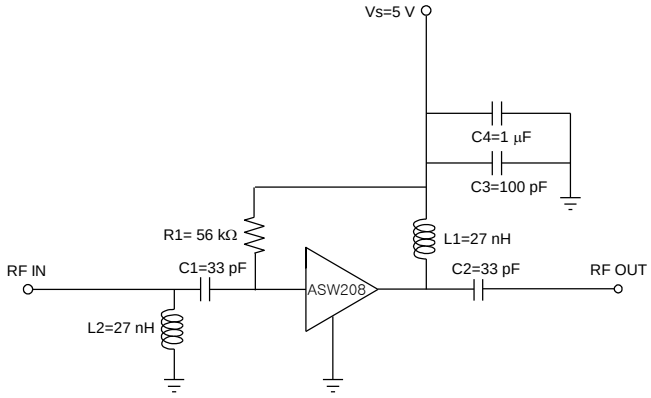
950 ~ 2150 MHz

+5 V

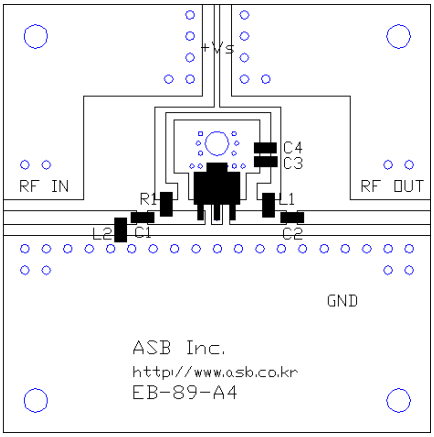
Frequency (MHz)	950	1500	2150
Magnitude S21 (dB)	21	20	18
Magnitude S11 (dB)	-14	-11	-11
Magnitude S22 (dB)	-12	-11	-10
Output P1dB (dBm)	22	22	21
Output IP3[1)] (dBm)	37	35	34
Noise Figure (dB)	1.6	1.7	1.8
Device Voltage (V)	+5	+5	+5
Current (mA)	80	80	80

1) OIP3 is measured with two tones at an output power of +12 dBm/tone separated by 1MHz.

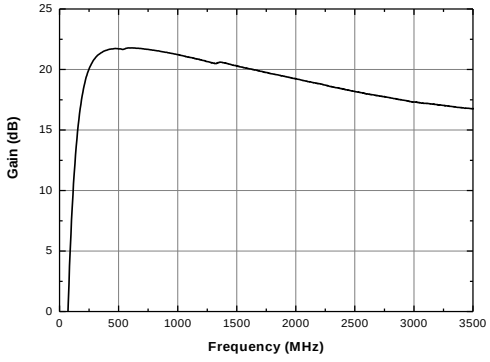
Schematic

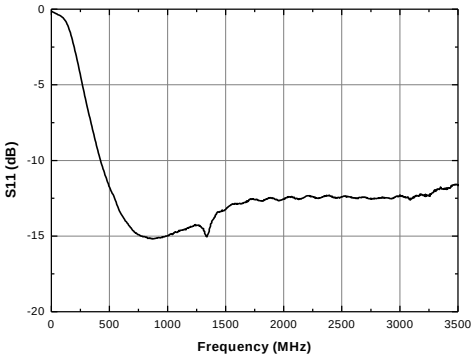


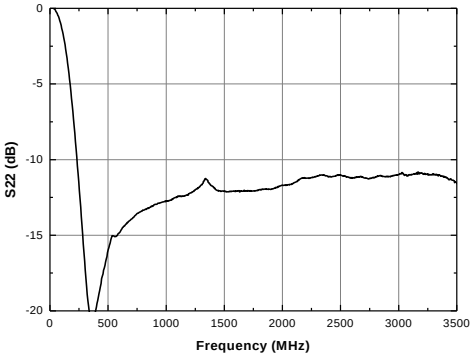
Board Layout (FR4, 40x40 mm², 0.8T)

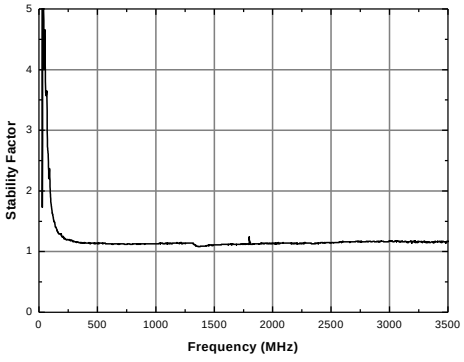


S-parameters & K-factor









APPLICATION CIRCUIT

ONU

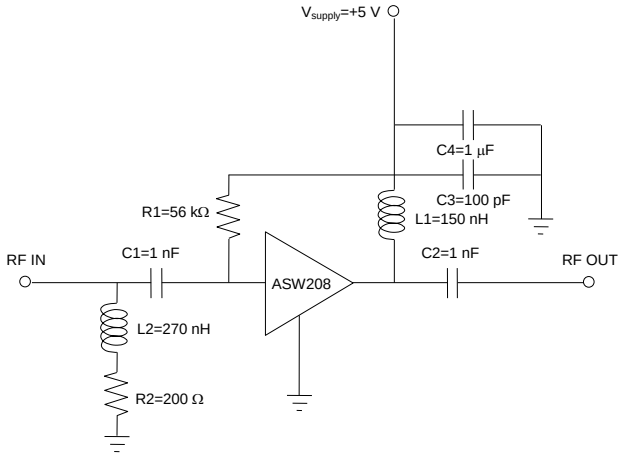
50 ~ 2600 MHz

+5 V, 75 Ω

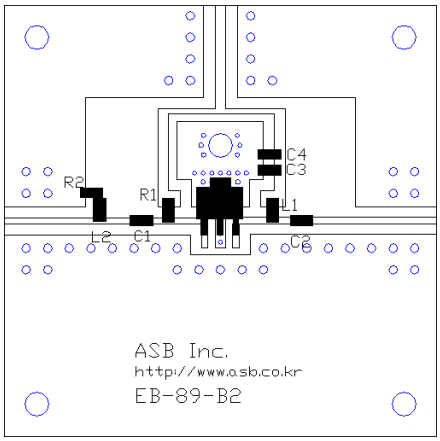
Frequency (MHz)	50	1300	2600
Magnitude S21 (dB)	21.8	20.0	17.0
Magnitude S11 (dB)	-7	-8	-10
Magnitude S22 (dB)	-7	-9	-15
Output P1dB (dBm)	21	21	20
Output IP3[1)] (dBm)	28.0	31.0	33.5
Output IP2[1)] (dBm)	29	46	49
Noise Figure (dB)	3.5	2.1	1.6
Device Voltage (V)	+5	+5	+5
Current (mA)	80	80	80

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

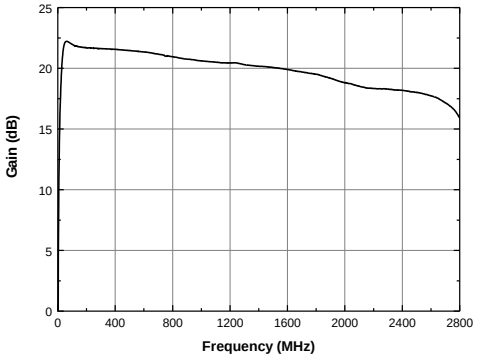
Schematic

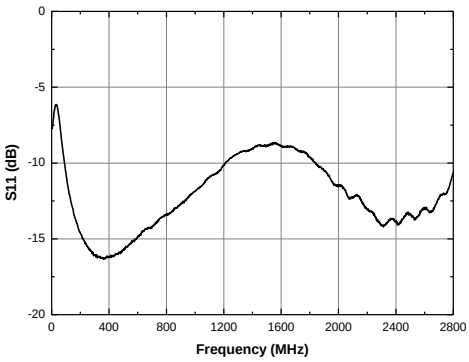


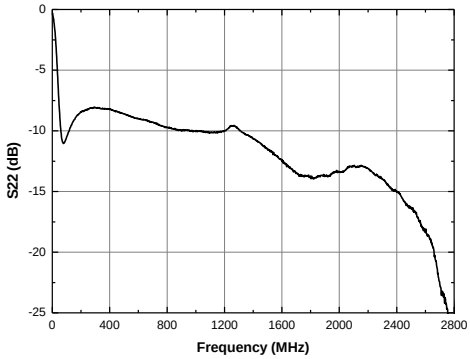
Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor







APPLICATION CIRCUIT

SMATV

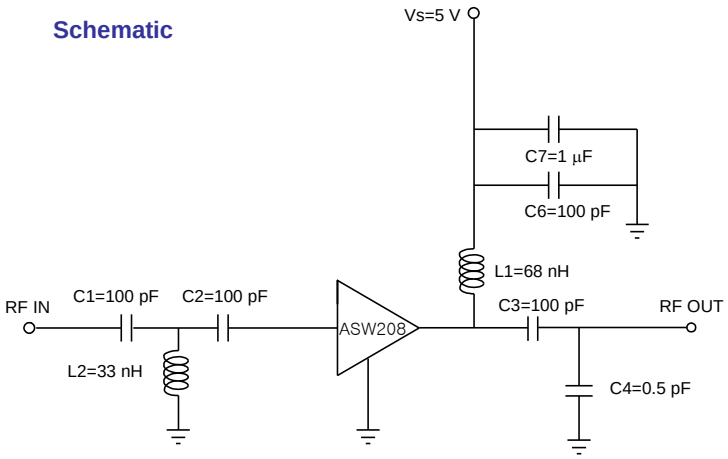
1000 ~ 2600 MHz

+5 V, 75 Ω

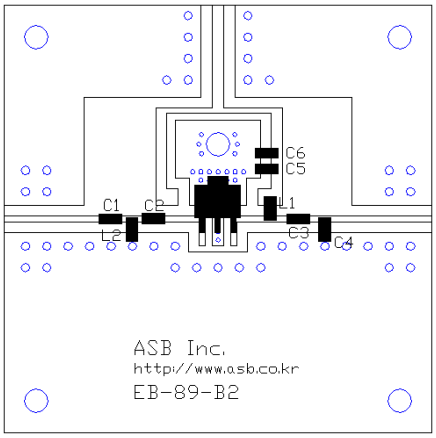
Frequency (MHz)	1000	1800	2600
Magnitude S21 (dB)	19.7	18.4	16.9
Magnitude S11 (dB)	-11	-8	-12
Magnitude S22 (dB)	-8	-15	-14
Output P1dB (dBm)	21	23	20
Output IP3[1)] (dBm)	30	24	31
Noise Figure (dB)	1.8	2.5	2.5
Device Voltage (V)	+5	+5	+5
Current (mA)	45	45	45

1) OIP3 is measured with two tones at an output power of +7 dBm/tone separated by 1MHz.

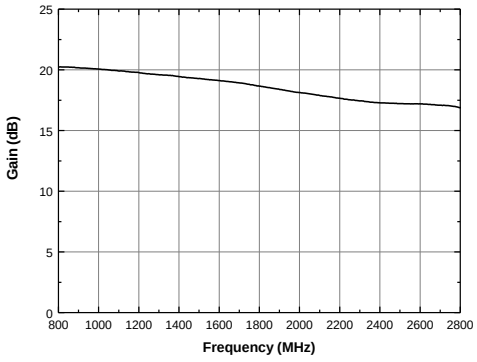
Schematic

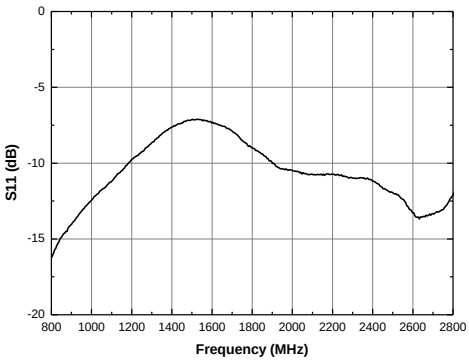


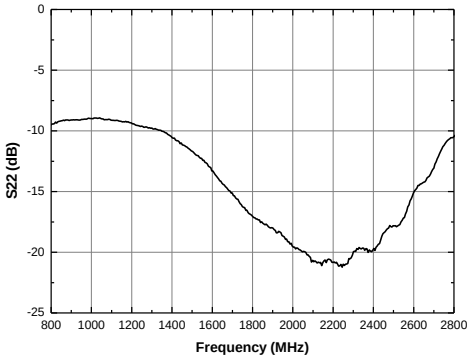
Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor







APPLICATION CIRCUIT

SMATV

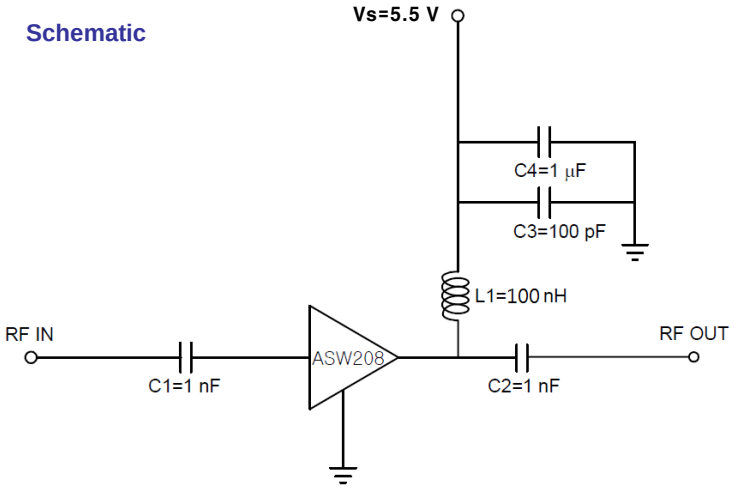
200 ~ 2600 MHz

+5.5 V, 75 Ω

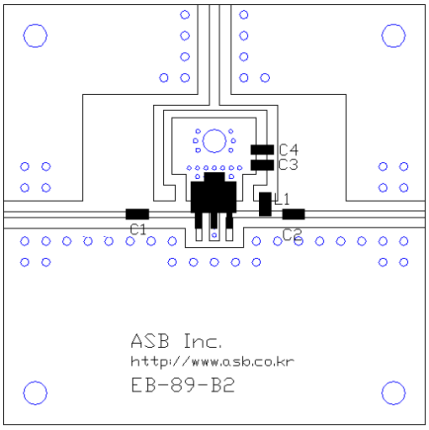
Frequency (MHz)	200	950	2150	2600
Magnitude S21 (dB)	21.5	20.7	18.0	17.2
Magnitude S11 (dB)	-10	-12	-18	-18
Magnitude S22 (dB)	-7.5	-9.5	-10	-12
Output P1dB (dBm)	23	21	23	22
Output IP3[1)] (dBm)	31	33	32	32
Noise Figure (dB)	1.6	1.2	1.6	1.6
Device Voltage (V)	+5.5	+5.5	+5.5	+5.5
Current (mA)	80	80	80	80

1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1MHz.

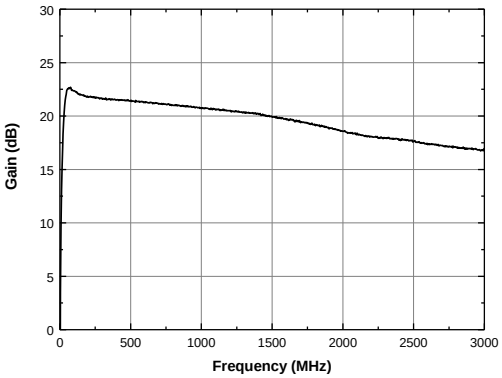
Schematic

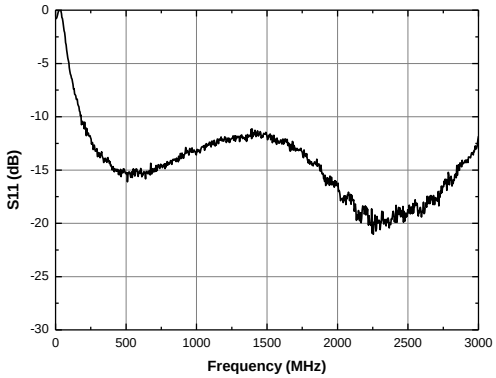


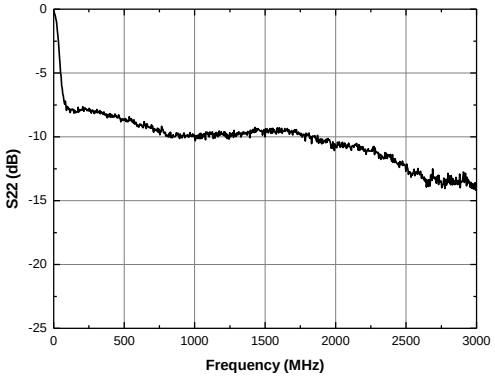
Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor







Recommended Soldering Reflow Profile