AWB459

Wide band MMIC Amplifier

Features

- 20 dB Gain at 1200 MHz
- 23.5 dBm P1dB at 1200 MHz
- 38 dBm Output IP3 at 1200 MHz
- 1.25 dB NF
- +5 V Single Supply

Description

The AWB459, 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 2 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

RoHS-compliant GREEN Package

Package Style: SOT89

Typical Performance

(Supply Voltage = +5 V, T_A = +25 °C, Z_0 = 50 Ω)

Parameters	Units	Typical				
Frequency	MHz	30	512	800	1200	1600
Gain	dB	24.0	23.5	20.0	20.0	20.5
S11	dB	-15	-16	-12	-14	-13
S22	dB	-15	-16	-18	-12	-10
Output IP3[1)]	dBm	40	40	39	38	38
Noise Figure	dB	0.8	1.1	1.2	1.25	1.4
Output P1dB	dBm	23.0	23.5	23.5	23.5	24.0
Current	mA	130				
Device Voltage	V	+5				

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

Product Specifications

Parameters	Units	Min	Typ.	Max
Testing Frequency	MHz		1200	
Gain	dB		20.0	
S11	dB		-14	
S22	dB		-12	
Output IP3	dBm		38	
Noise Figure	dB		1.25	
Output P1dB	dBm		23.5	
Current	mA	110	130	
Device Voltage	V		+5	

Absolute Maximum Ratings

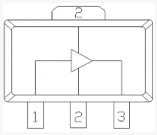
Parameters	Rating
Operating Case Temperature	-40 to +85 °C
Storage Temperature	-40 to +150 °C
Device Voltage	+10 V
Operating Junction Temperature	+150 °C
Input RF Power (CW, 50 Ω matched as in 512 MHz application circuit)*	+26 dBm
Thermal Resistance	43 °C/W

* Please find the max. input power data from http://www.asb.co.kr/pdf/Maximum_Input_Power_Analysis.pdf
The max. input power, in principle, depends upon the application frequency and the matching circuit.

Applications

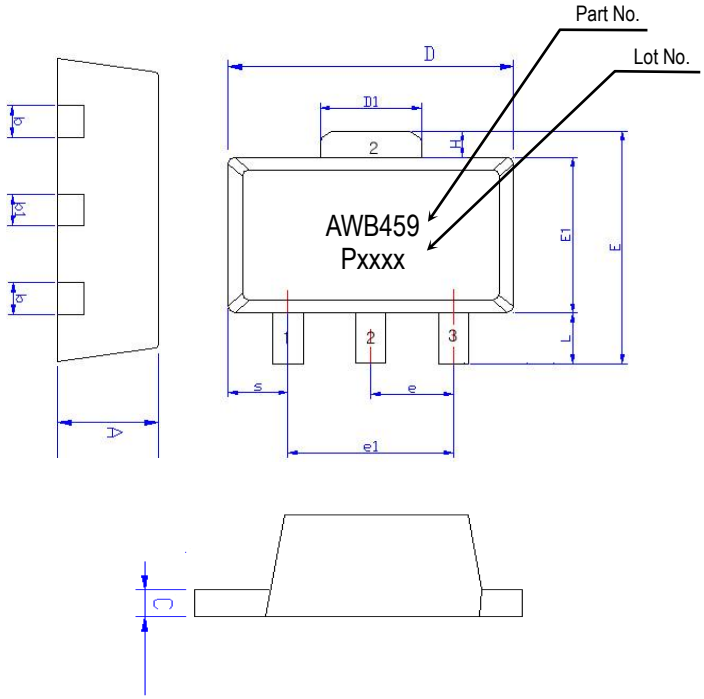
- IF 1.5 ~ 500 MHz (6.5 V)
- IF 21.4 ~ 512 MHz (3 V)
- IF 30 ~ 512 MHz (3 V & 5 V & 8 V)
- IF 30 ~ 512 MHz (8 V, 140 mA)
- DVB 470 ~ 800 MHz (5 V & 8 V)
- IF 1.5 ~ 1000 MHz (8 V)
- MoCA (800 ~ 1600 MHz, 5 V & 8 V)
- 1200 ~ 1700 MHz (5 V & 8 V)
- Wide Band (1000 ~ 2000 MHz, 5 V & 8 V) (30 ~ 2000 MHz, 3 V & 5 V & 8 V)

Pin Configuration



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

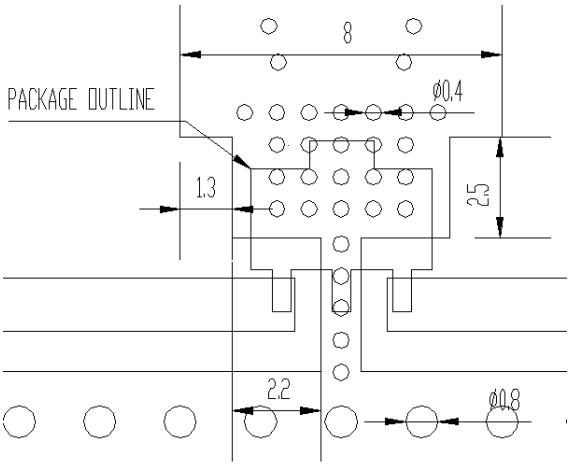
Outline Drawing



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

HBM	Class 1B
	Voltage Level: 550 V
MM	Class A
	Voltage Level: 50 V

CAUTION: ESD-sensitive device!

Moisture Sensitivity Level (MSL)

Level 3 at 260 °C reflow

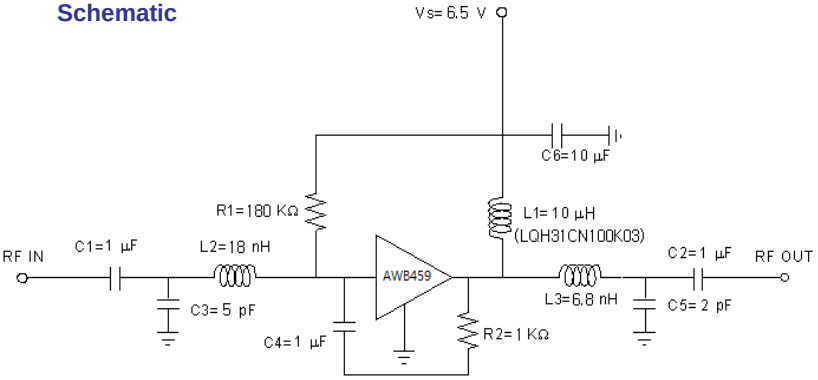
APPLICATION CIRCUIT

IF
1.5 ~ 500 MHz
+6.5 V

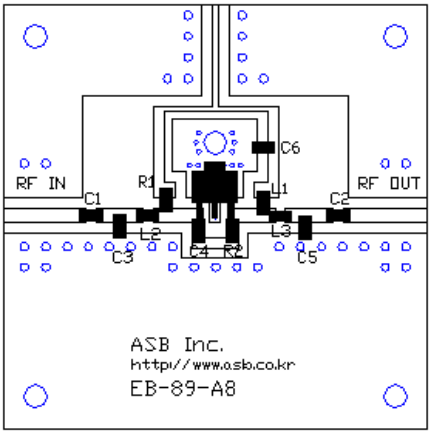
Frequency (MHz)	1.5	250	500
Magnitude S21 (dB)	23.5	24.0	23.5
Magnitude S11 (dB)	-11	-18	-15
Magnitude S22 (dB)	-11	-18	-13
Output P1dB (dBm)	22	26	26
Output IP3[1)] (dBm)	41	43	42
Noise Figure (dB)	1.25	0.95	1.35
Device Voltage (V)	+6.5		
Current (mA)	140		

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

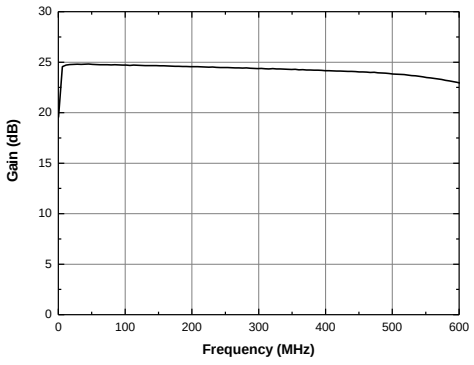
Schematic

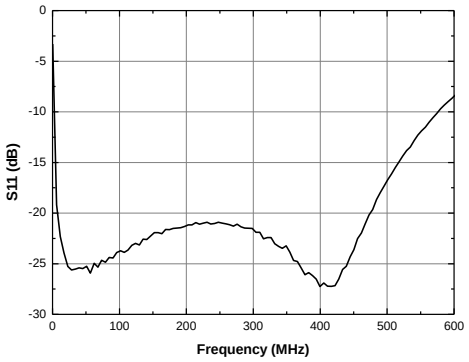


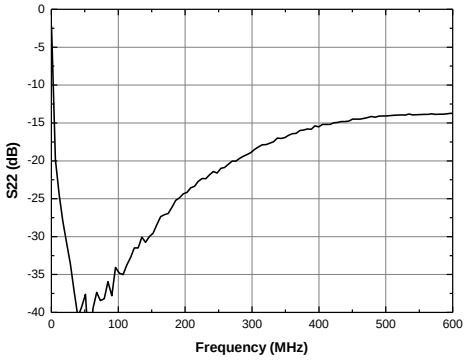
Board Layout (FR4, 40x40 mm², 0.8T)

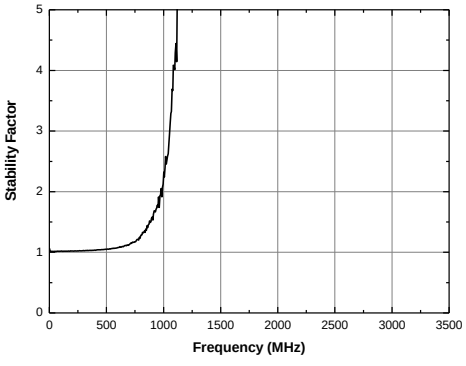


S-parameters & K-factor

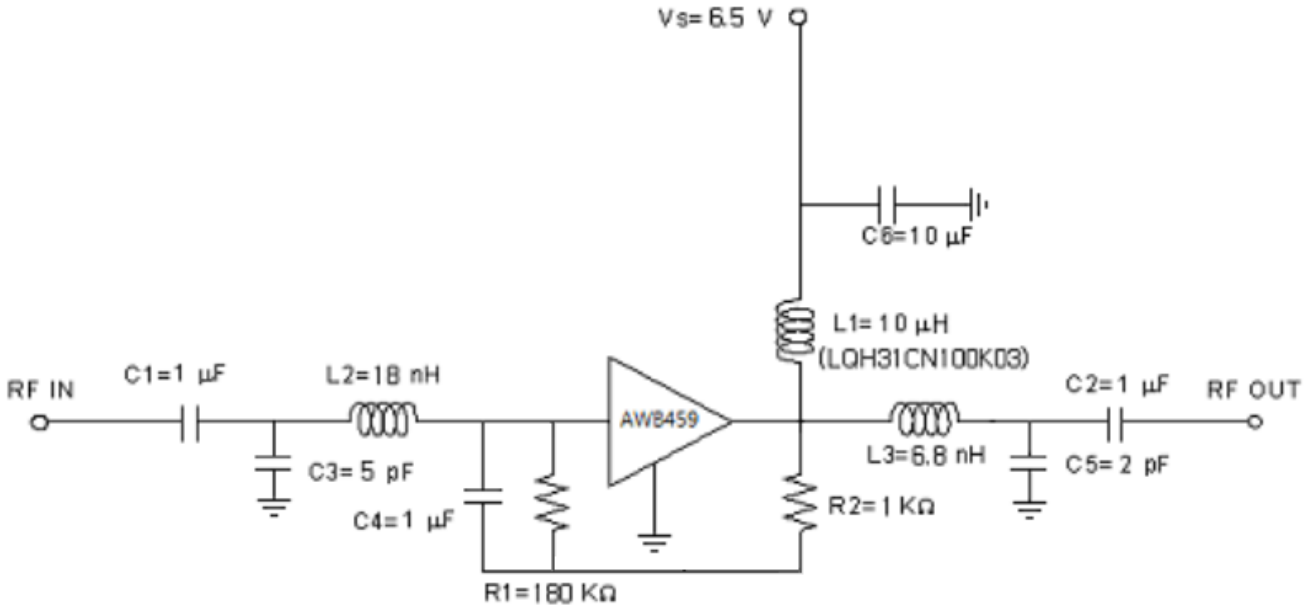








ALTERNATIVE APPLICATION CIRCUIT



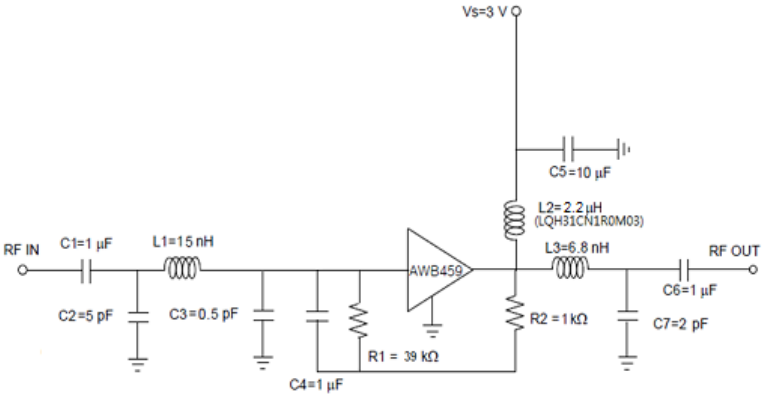
APPLICATION CIRCUIT

IF
21.4 ~ 512 MHz
+3 V

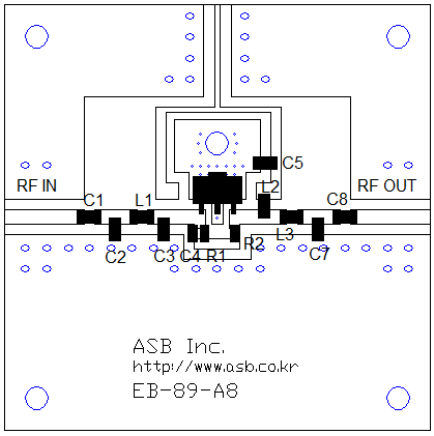
Frequency (MHz)	21.4	250	512
Magnitude S21 (dB)	24	23.5	23
Magnitude S11 (dB)	-16	-14	-20
Magnitude S22 (dB)	-18	-20	-15
Output P1dB (dBm)	18.5	19	19
Output IP3[1)] (dBm)	35.5	35.0	34.0
Noise Figure (dB)	0.7	0.9	1.1
Device Voltage (V)	+3		
Current (mA)	100		

1) OIP3 is measured with two tones at an output power of +8 dBm/tone separated by 1 MHz.

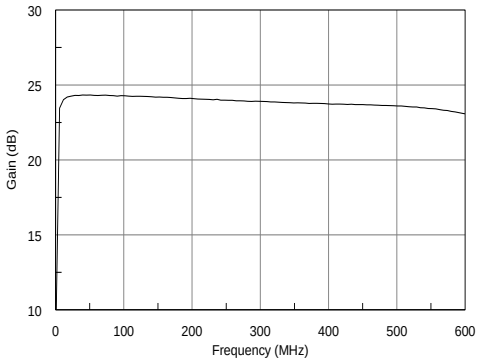
Schematic

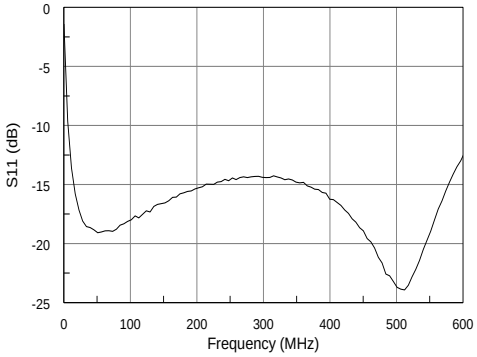


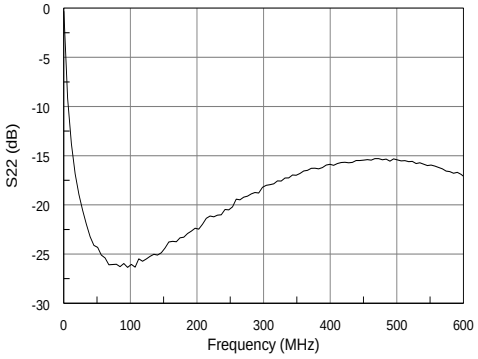
Board Layout (FR4, 40x40 mm², 0.8T)

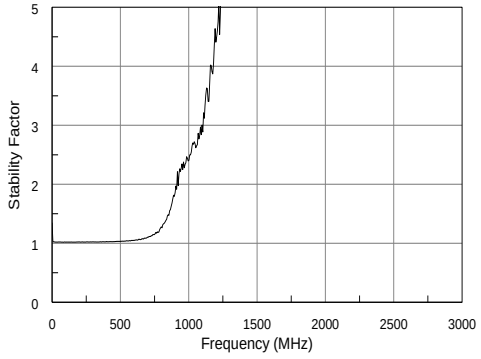


S-parameters & K-factor









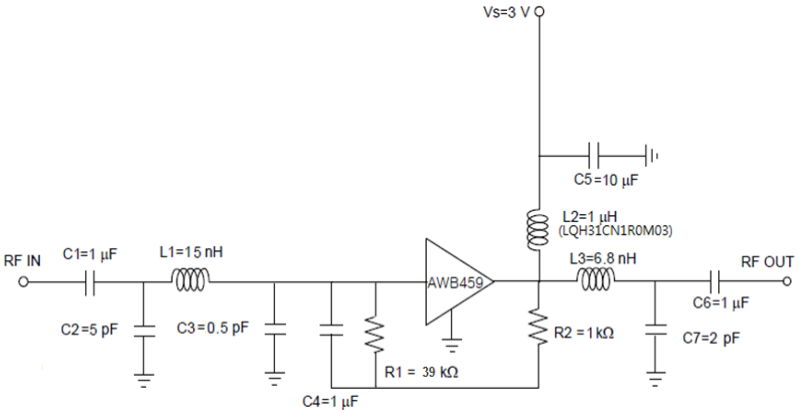
APPLICATION CIRCUIT

IF
30 ~ 512 MHz
+3 V

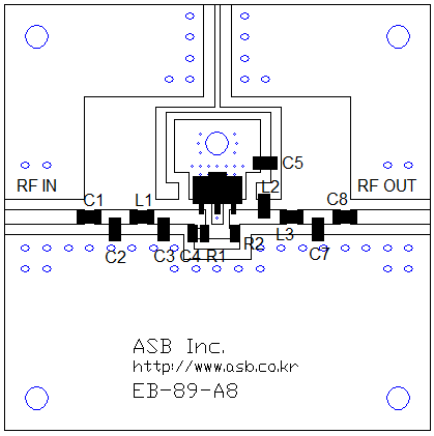
Frequency (MHz)	30	250	512
Magnitude S21 (dB)	24	24	23.5
Magnitude S11 (dB)	-14	-13	-19
Magnitude S22 (dB)	-17	-20	-17
Output P1dB (dBm)	18.5	19	19.5
Output IP3[1] (dBm)	37.0	37.0	35.5
Noise Figure (dB)	0.7	0.9	1.1
Device Voltage (V)	+3		
Current (mA)	100		

1) OIP3 is measured with two tones at an output power of +8 dBm/tone separated by 1 MHz.

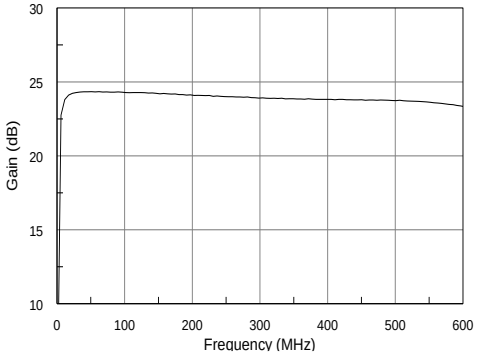
Schematic

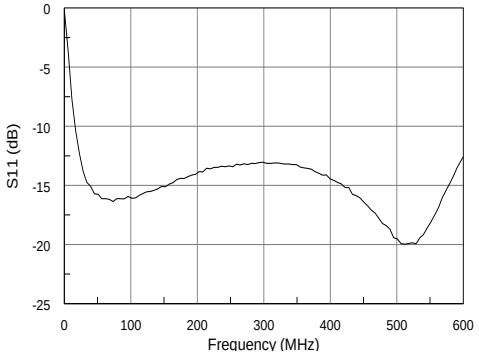


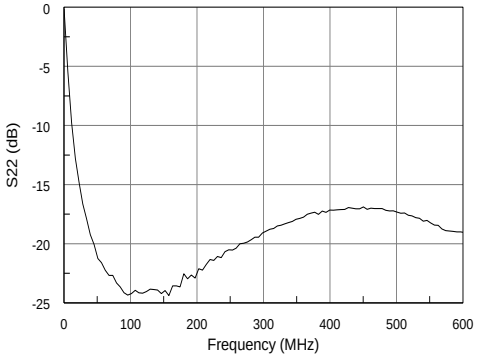
Board Layout (FR4, 40x40 mm², 0.8T)

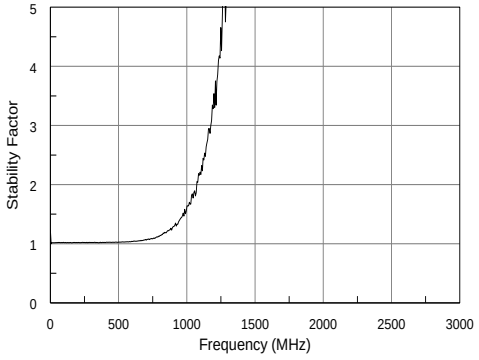


S-parameters & K-factor









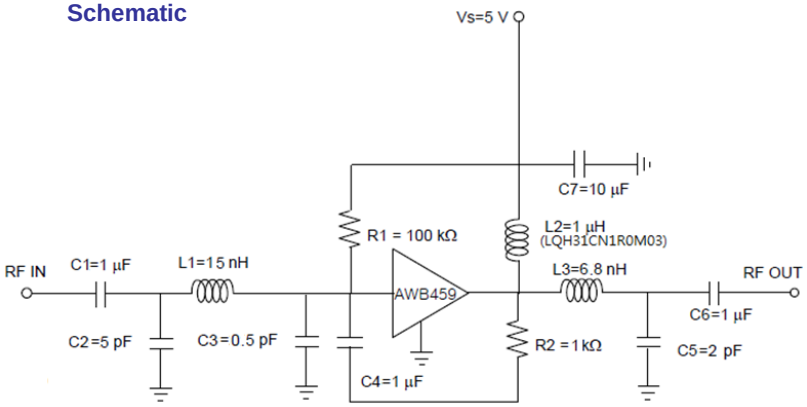
APPLICATION CIRCUIT

IF
30 ~ 512 MHz
+5 V

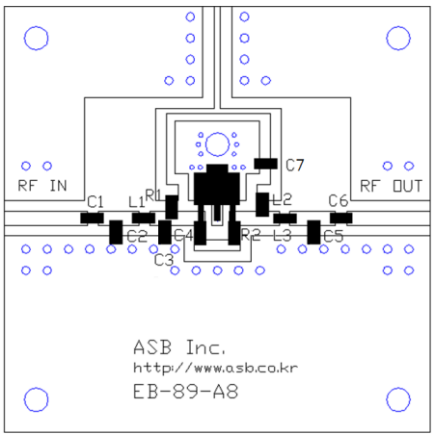
Frequency (MHz)	30	250	512
Magnitude S21 (dB)	24.0	24.0	23.5
Magnitude S11 (dB)	-15	-16	-16
Magnitude S22 (dB)	-15	-16	-16
Output P1dB (dBm)	23.0	23.0	23.5
Output IP3[1)] (dBm)	40	42	40
Noise Figure (dB)	0.8	1.1	1.1
Device Voltage (V)	+5		
Current (mA)	130		

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

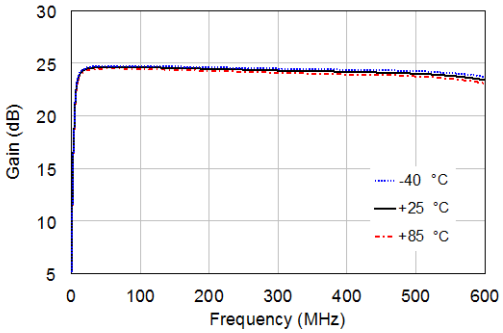
Schematic

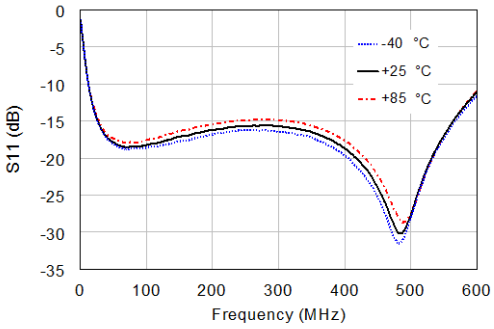


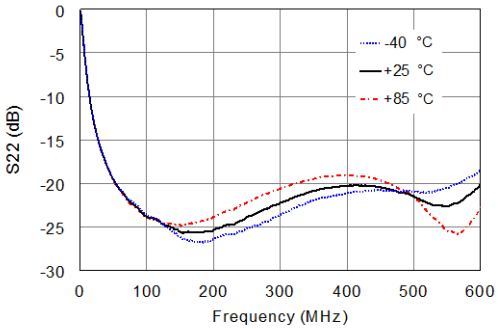
Board Layout (FR4, 40x40 mm², 0.8T)

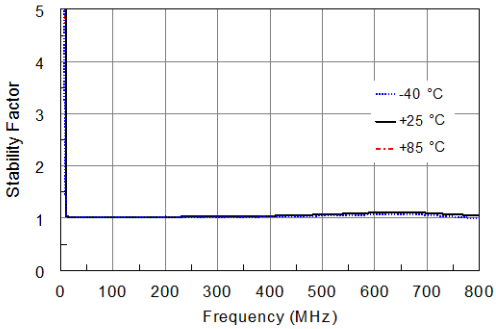


S-parameters & K-factor

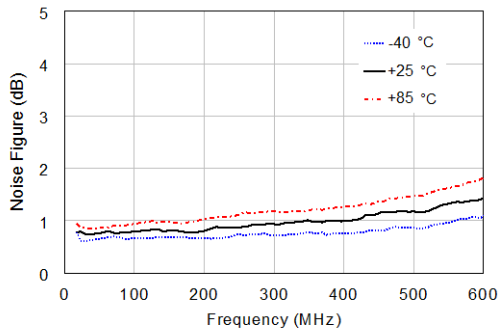




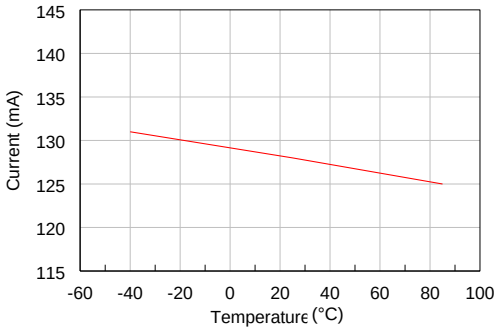




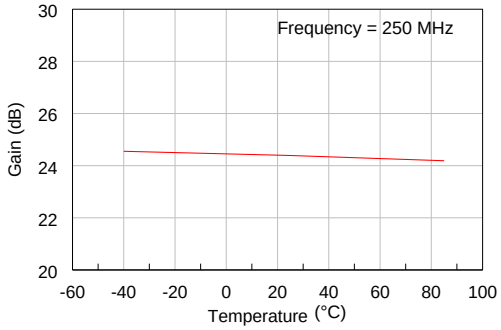
Noise Figure



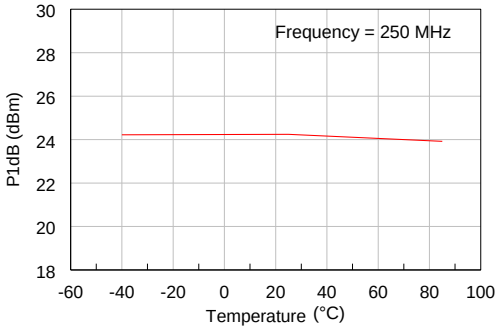
Current



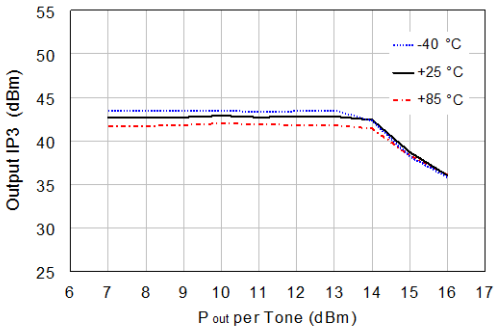
Gain



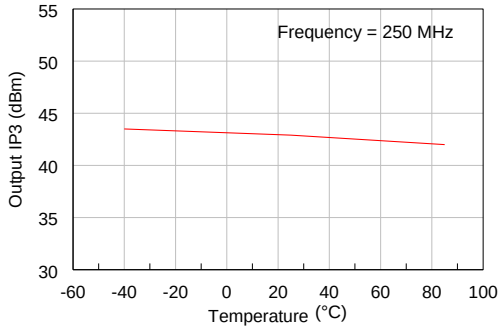
P1dB



Output IP3 vs. Tone Power (Frequency = 250 MHz)



Output IP3 @ 10 dBm / tone



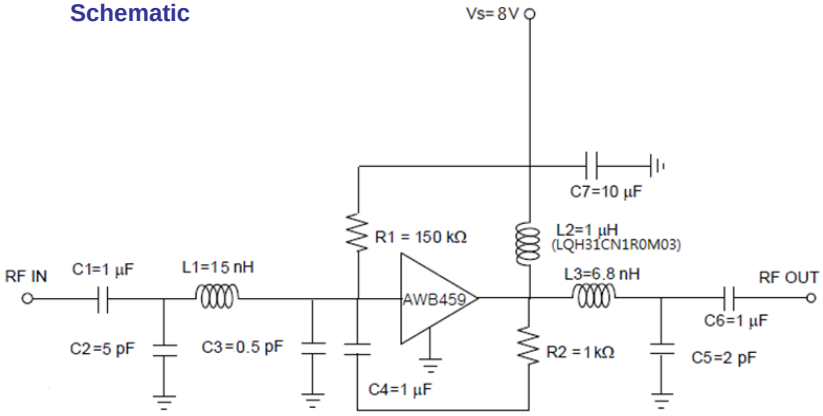
APPLICATION CIRCUIT

IF
30 ~ 512 MHz
+8 V

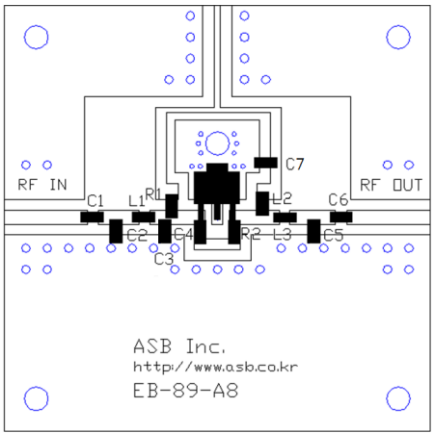
Frequency (MHz)	30	250	512
Magnitude S21 (dB)	24.0	24.0	23.5
Magnitude S11 (dB)	-15	-16	-16
Magnitude S22 (dB)	-15	-16	-16
Output P1dB (dBm)	27	28	28
Output IP3[1)] (dBm)	40	41	41
Noise Figure (dB)	0.9	1.2	1.2
Device Voltage (V)	+8		
Current (mA)	200		

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

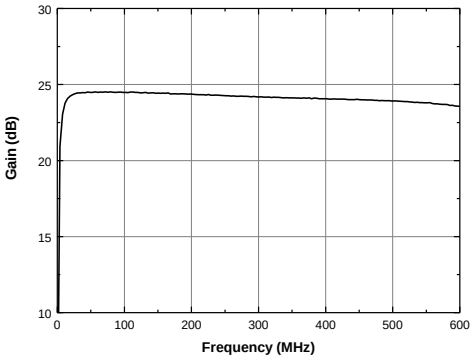
Schematic

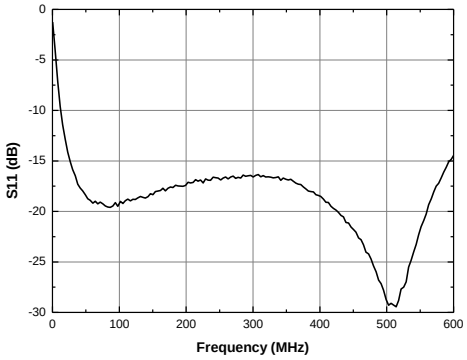


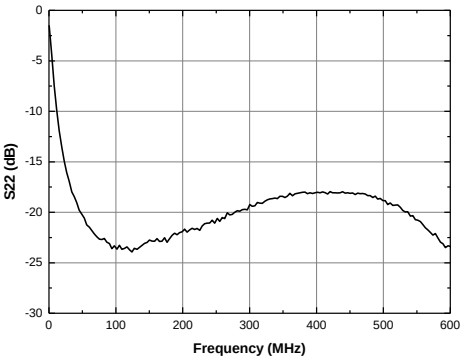
Board Layout (FR4, 40x40 mm², 0.8T)

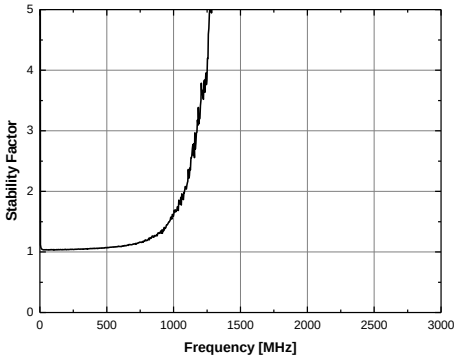


S-parameters & K-factor









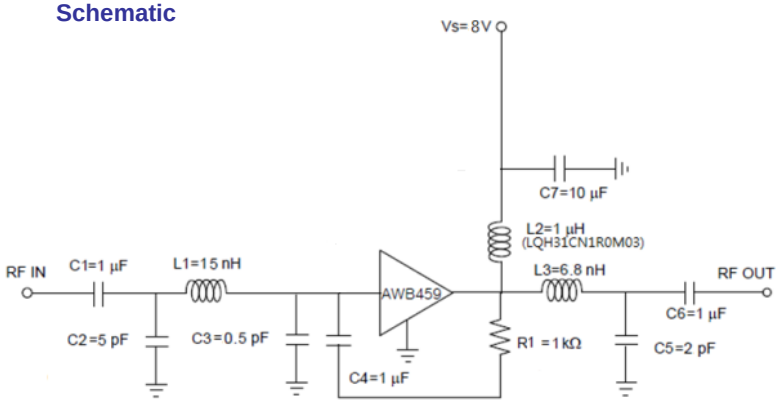
APPLICATION CIRCUIT

IF
30 ~ 512 MHz
+8 V

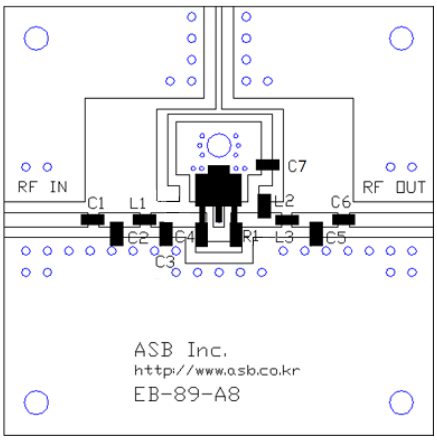
Frequency (MHz)	30	250	512
Magnitude S21 (dB)	24.0	24.0	23.5
Magnitude S11 (dB)	-15	-15	-18
Magnitude S22 (dB)	-15	-18	-18
Output P1dB (dBm)	26.5	27.0	27.0
Output IP3[1)] (dBm)	40.0	40.5	40.5
Noise Figure (dB)	0.8	1.2	1.2
Device Voltage (V)	+8		
Current (mA)	140		

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

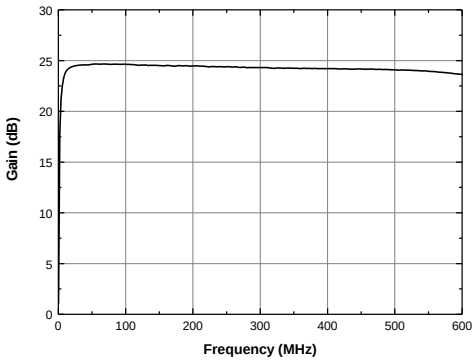
Schematic

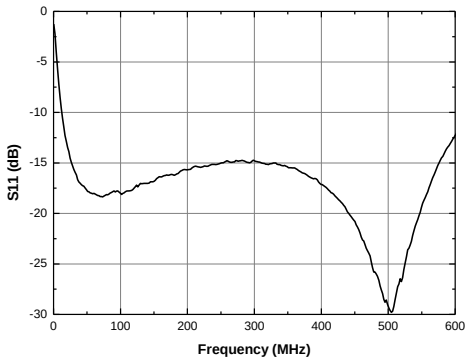


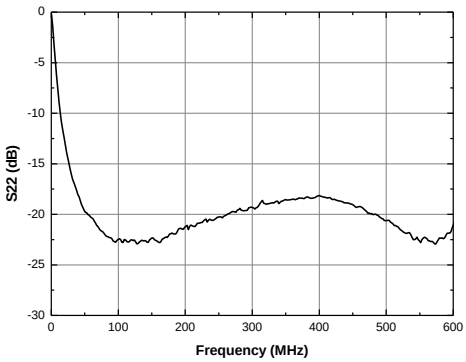
Board Layout (FR4, 40x40 mm^2, 0.8T)

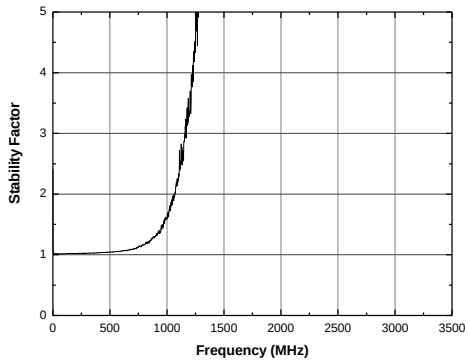


S-parameters & K-factor









APPLICATION CIRCUIT

DVB

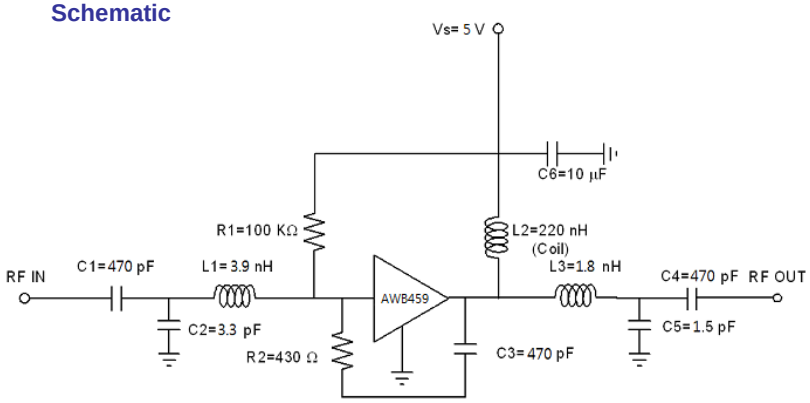
470 ~ 800 MHz

+5 V

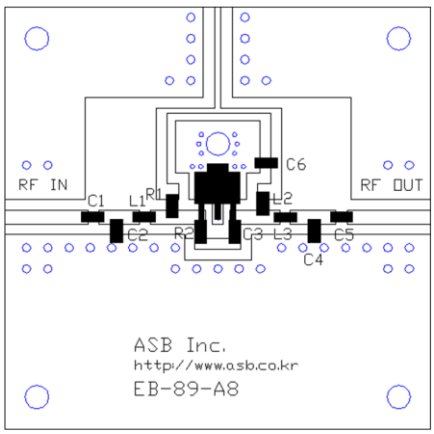
Frequency (MHz)	470	800
Magnitude S21 (dB)	20.5	20.5
Magnitude S11 (dB)	-13	-13
Magnitude S22 (dB)	-16	-14
Output P1dB (dBm)	24	24
Output IP3[1] (dBm)	41.5	39.5
Noise Figure (dB)	1.3	1.3
Device Voltage (V)	+5	
Current (mA)	130	

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

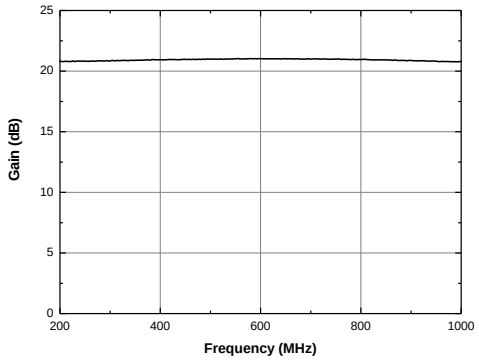
Schematic

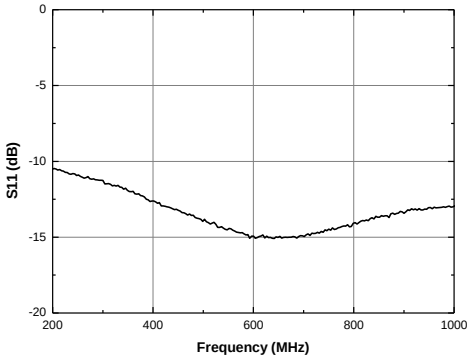


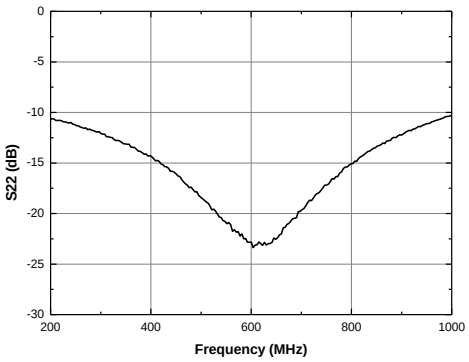
Board Layout (FR4, 40x40 mm², 0.8T)

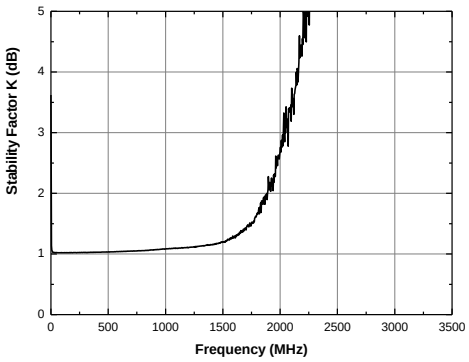


S-parameters & K-factor









APPLICATION CIRCUIT

DVB

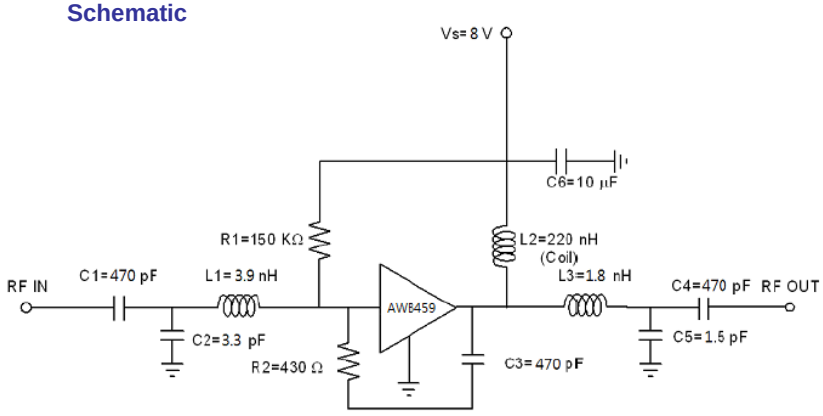
470 ~ 800 MHz

+8 V

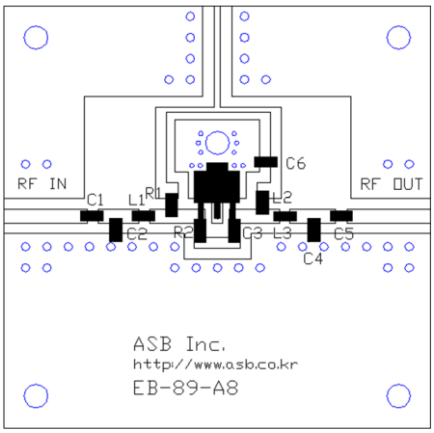
Frequency (MHz)	470	800
Magnitude S21 (dB)	20.5	20.5
Magnitude S11 (dB)	-12	-17
Magnitude S22 (dB)	-14	-17
Output P1dB (dBm)	26	26
Output IP3[1] (dBm)	42	42
Noise Figure (dB)	1.3	1.3
Device Voltage (V)	+8	
Current (mA)	200	

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

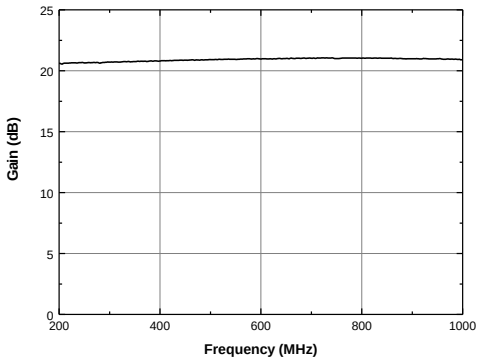
Schematic

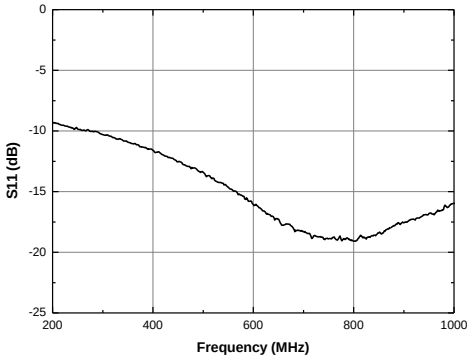


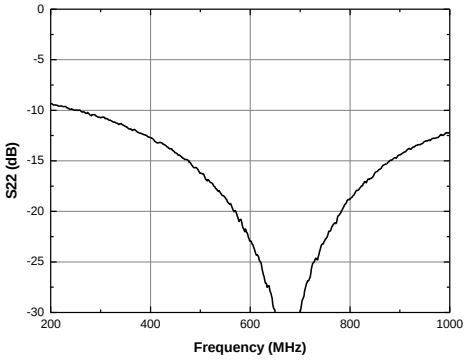
Board Layout (FR4, 40x40 mm², 0.8T)

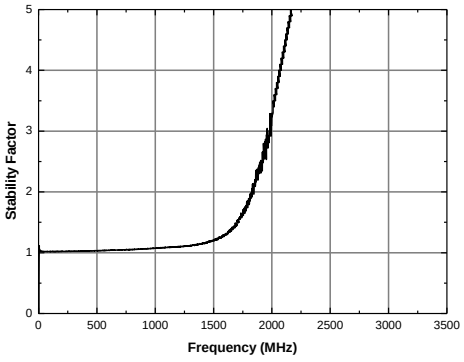


S-parameters & K-factor









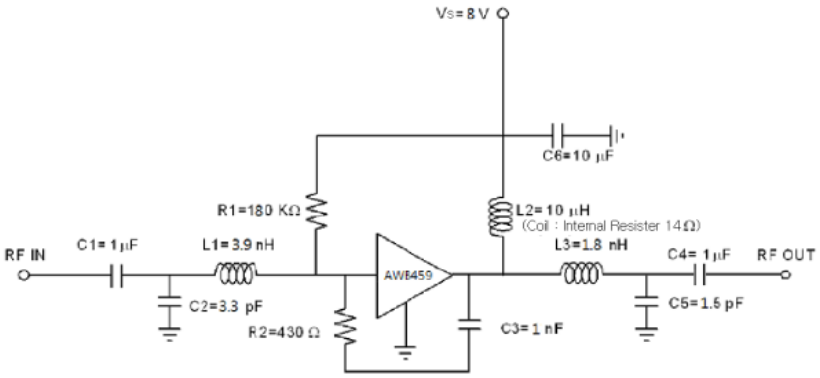
APPLICATION CIRCUIT

IF
1.5 ~ 1000 MHz
+8 V

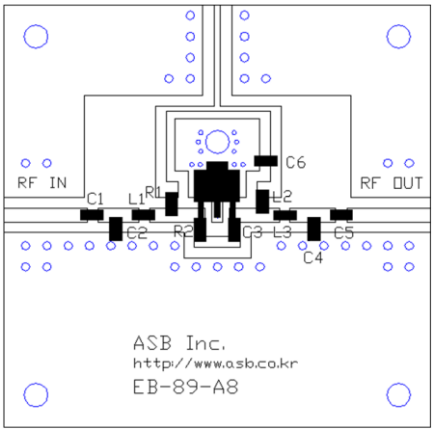
Frequency (MHz)	1.5	500	1000
Magnitude S21 (dB)	20.0	20.5	20.4
Magnitude S11 (dB)	-8	-14	-15
Magnitude S22 (dB)	-8	-17	-10
Output P1dB (dBm)	22.5	25.0	25.0
Output IP3[1)] (dBm)	39	41	39
Noise Figure (dB)	1.4	1.3	1.2
Device Voltage (V)	+8		
Current (mA)	140		

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

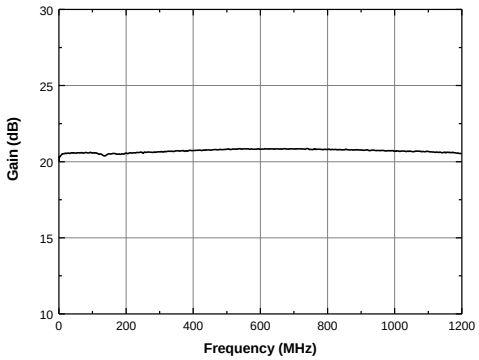
Schematic

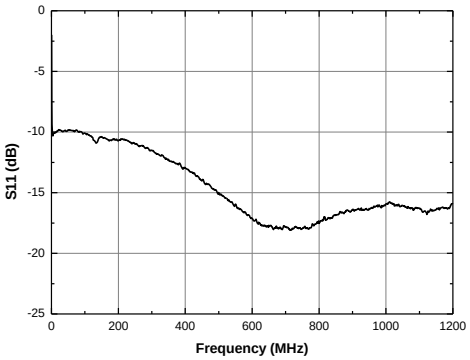


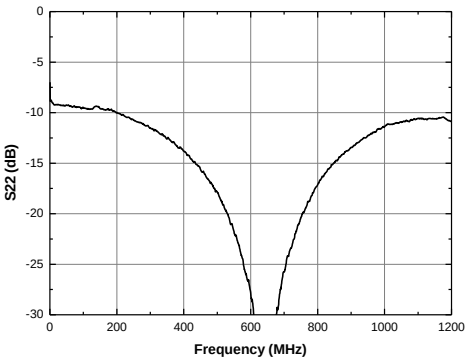
Board Layout (FR4, 40x40 mm^2, 0.8T)

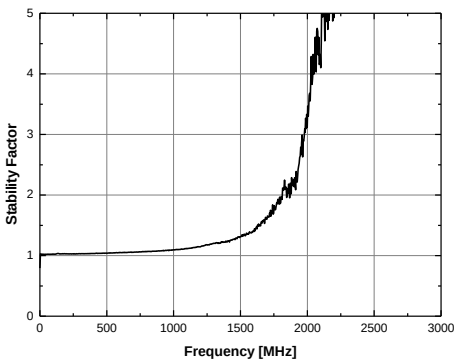


S-parameters & K-factor









APPLICATION CIRCUIT

MoCA

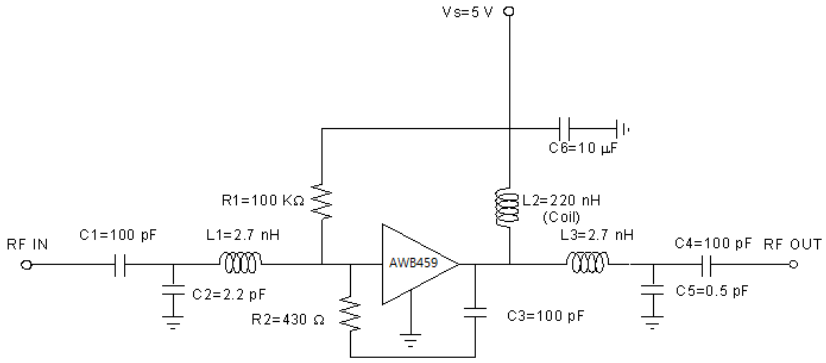
800 ~ 1600 MHz

+5 V

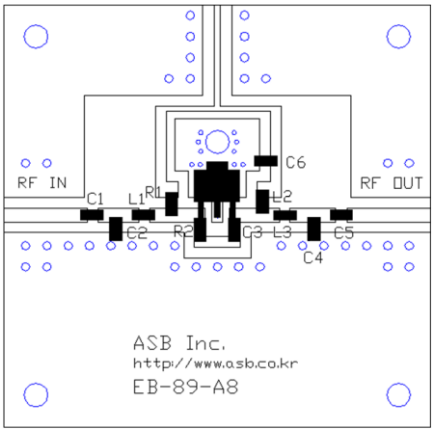
Frequency (MHz)	800	1200	1600
Magnitude S21 (dB)	20.0	20.0	20.5
Magnitude S11 (dB)	-12	-14	-13
Magnitude S22 (dB)	-18	-12	-10
Output P1dB (dBm)	23.5	23.5	24.0
Output IP3[1)] (dBm)	39	38	38
Noise Figure (dB)	1.2	1.25	1.4
Device Voltage (V)	+5		
Current (mA)	130		

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

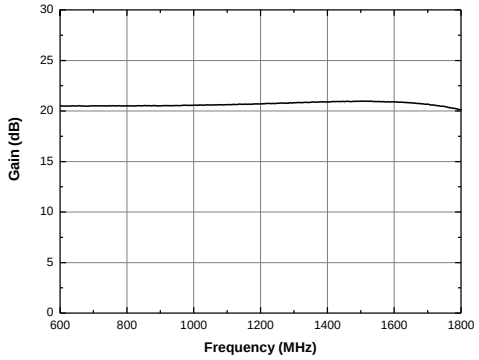
Schematic

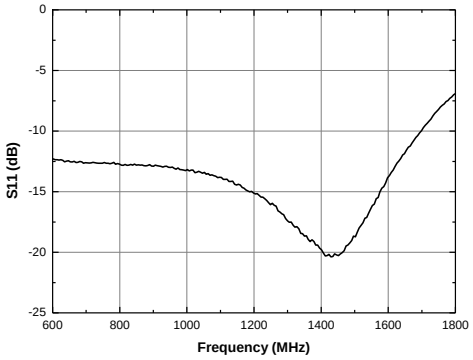


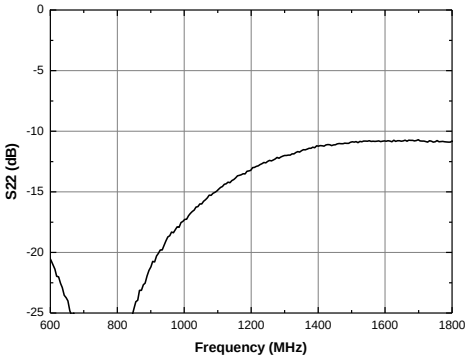
Board Layout (FR4, 40x40 mm^2, 0.8T)

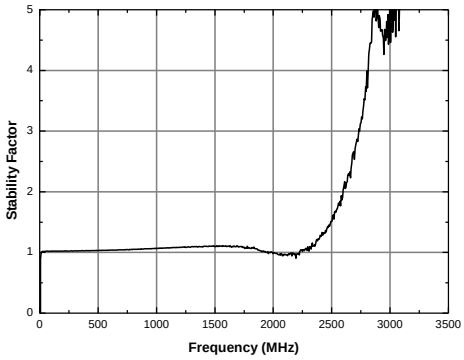


S-parameters & K-factor









APPLICATION CIRCUIT

MoCA

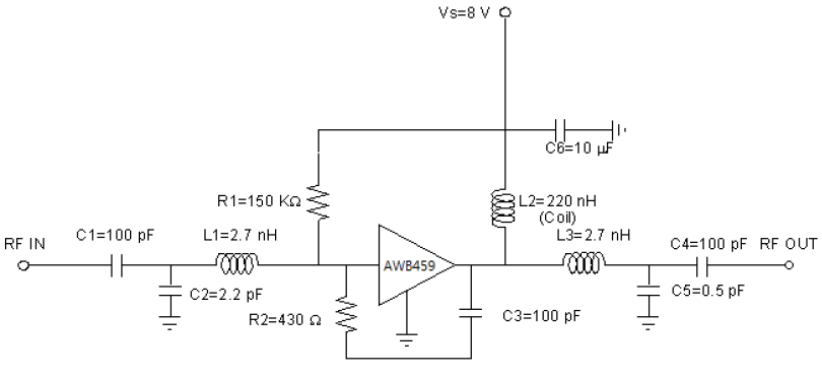
800 ~ 1600 MHz

+8 V

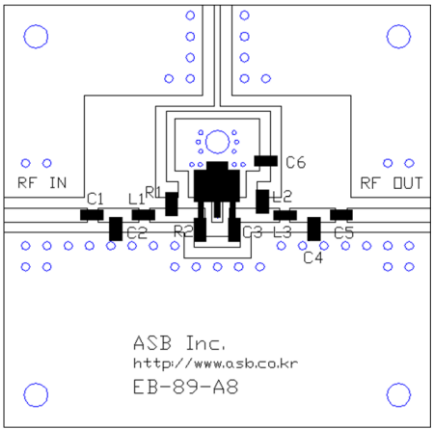
Frequency (MHz)	800	1200	1600
Magnitude S21 (dB)	20.0	20.0	20.5
Magnitude S11 (dB)	-12	-16	-13
Magnitude S22 (dB)	-18	-12	-10
Output P1dB (dBm)	27.5	27.0	27.0
Output IP3[1] (dBm)	42	42	41
Noise Figure (dB)	1.3	1.3	1.45
Device Voltage (V)	+8		
Current (mA)	200		

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

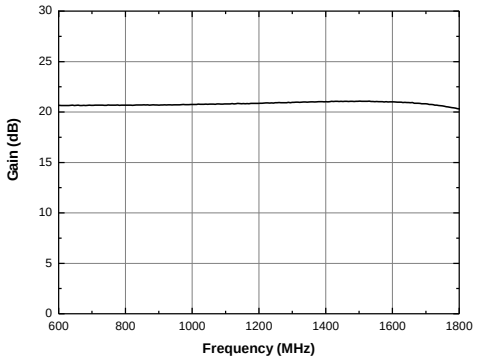
Schematic

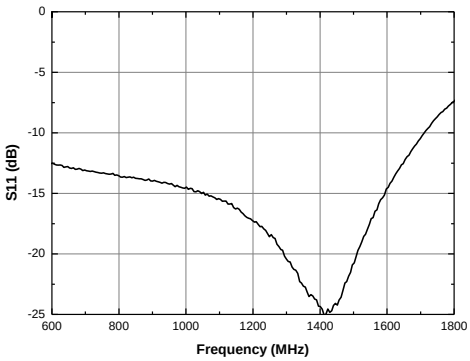


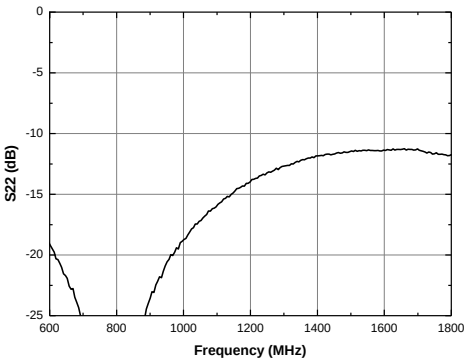
Board Layout (FR4, 40x40 mm², 0.8T)

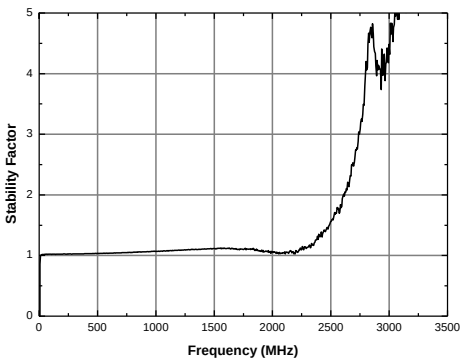


S-parameters & K-factor









APPLICATION CIRCUIT

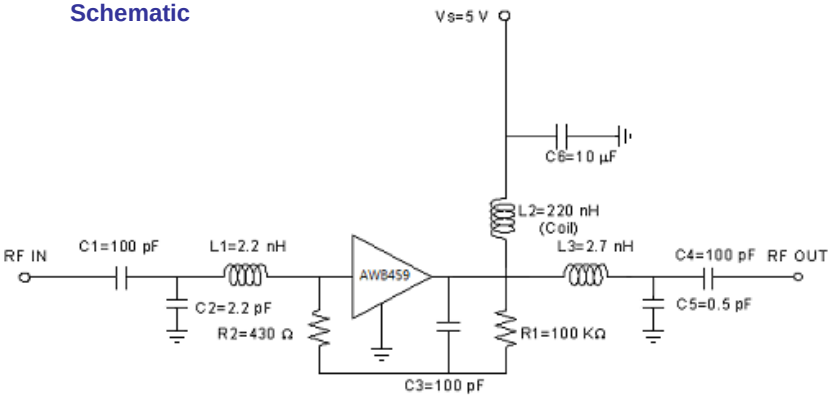
1200 ~ 1700 MHz

+5 V

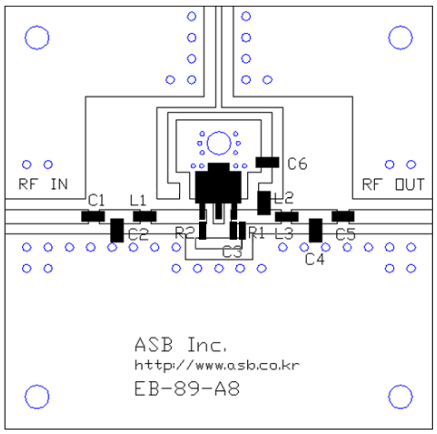
Frequency (MHz)	1200	1700
Magnitude S21 (dB)	21	21.5
Magnitude S11 (dB)	-13	-12
Magnitude S22 (dB)	-18	-15
Output P1dB (dBm)	23	22
Output IP3[1] (dBm)	39	37
Noise Figure (dB)	1.3	1.4
Device Voltage (V)	+5	
Current (mA)	130	

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

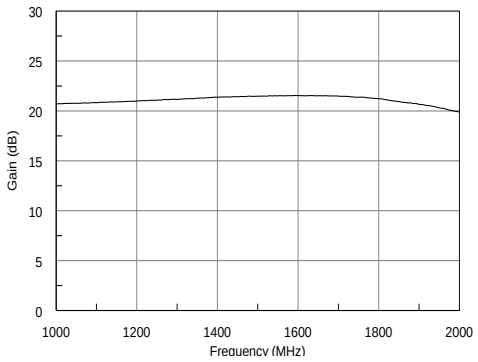
Schematic

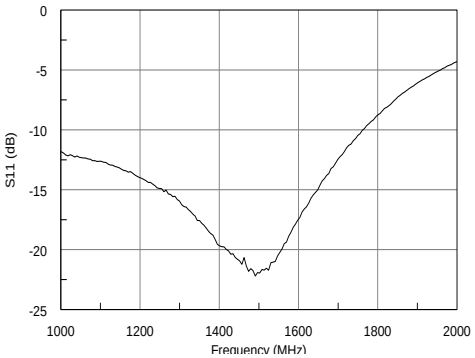


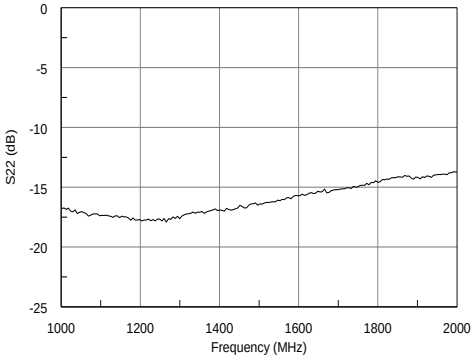
Board Layout (FR4, 40x40 mm², 0.8T)

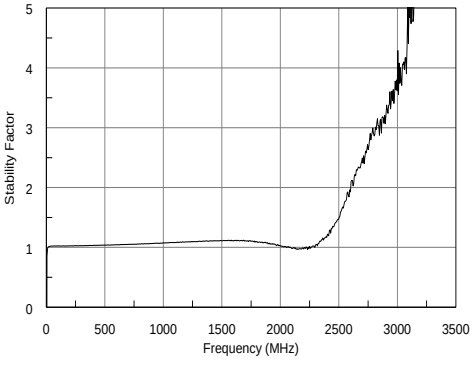


S-parameters & K-factor









APPLICATION CIRCUIT

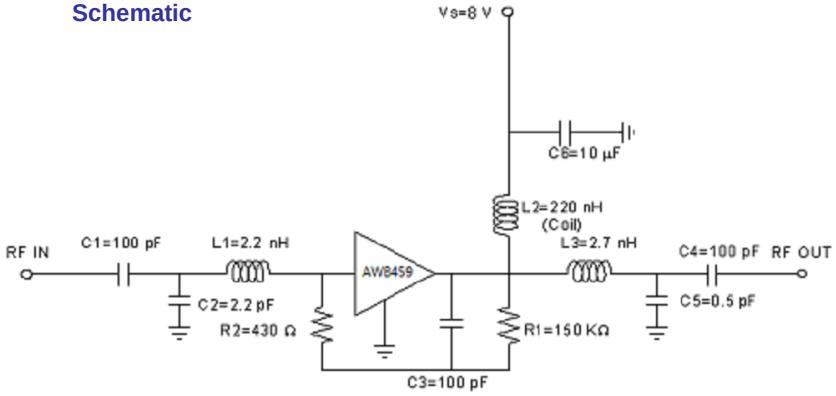
1200 ~ 1700 MHz

+8 V

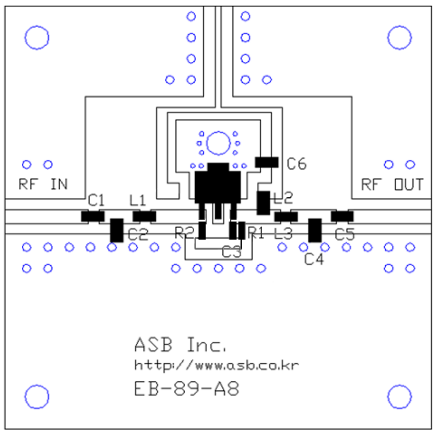
Frequency (MHz)	1200	1700
Magnitude S21 (dB)	21	21.5
Magnitude S11 (dB)	-15	-12
Magnitude S22 (dB)	-19	-16
Output P1dB (dBm)	27	26
Output IP3[1] (dBm)	43	47
Noise Figure (dB)	1.3	1.5
Device Voltage (V)	+8	
Current (mA)	200	

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

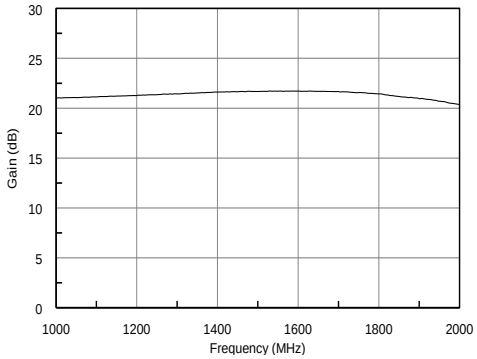
Schematic

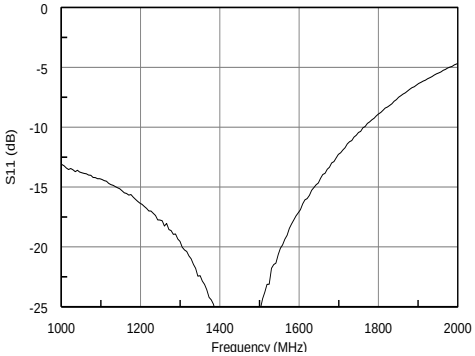


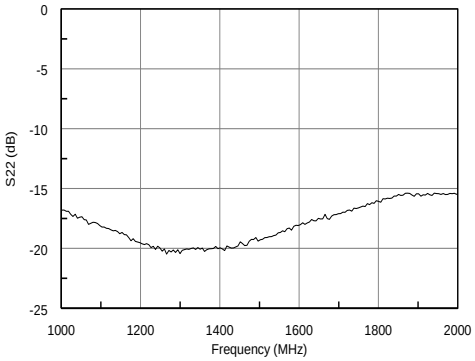
Board Layout (FR4, 40x40 mm², 0.8T)

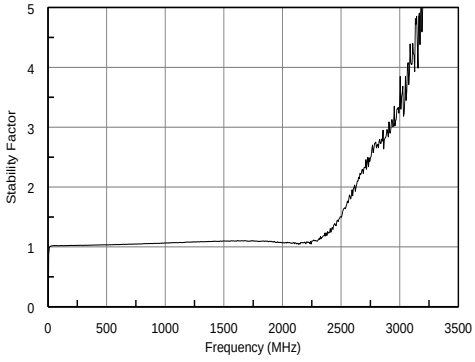


S-parameters & K-factor









APPLICATION CIRCUIT

Wide Band

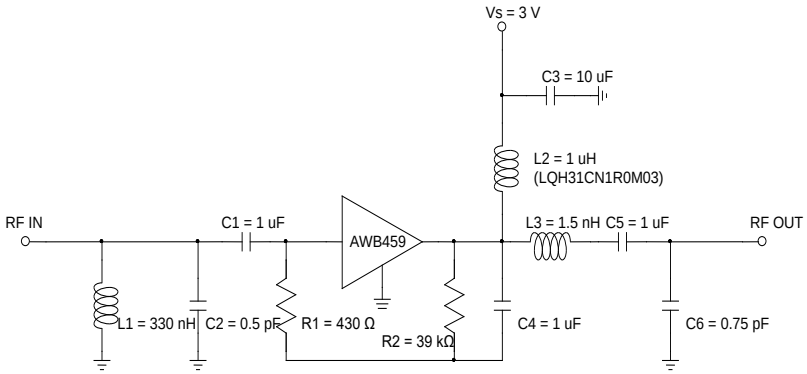
30 ~ 2000 MHz

+3 V

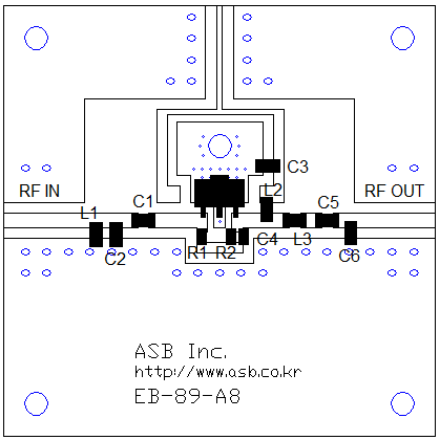
Frequency (MHz)	30	500	1000	2000
Magnitude S21 (dB)	19.9	20	19.7	18.7
Magnitude S11 (dB)	-9.5	-10.5	-8.5	-7.5
Magnitude S22 (dB)	-11.0	-14.5	-17.0	-9.0
Output P1dB (dBm)	19.0	19.5	19.5	18.5
Output IP3[1)] (dBm)	37.0	34.5	32.0	28.0
Noise Figure (dB)	1.0	1.3	1.5	2.3
Device Voltage (V)	+3			
Current (mA)	100			

1) OIP3 is measured with two tones at an output power of +8 dBm/tone separated by 1 MHz.

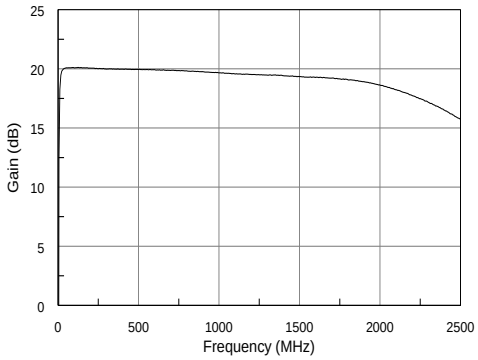
Schematic

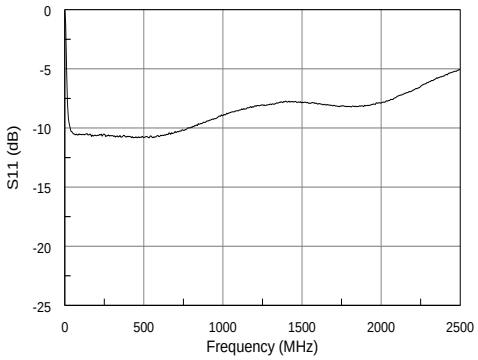


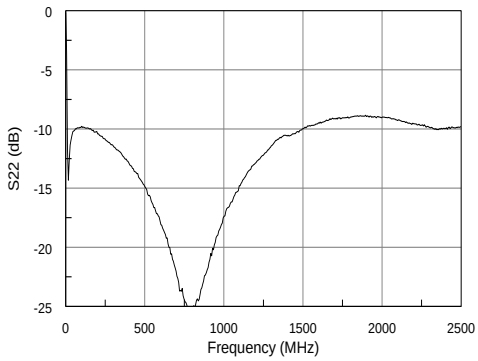
Board Layout (FR4, 40x40 mm², 0.8T)

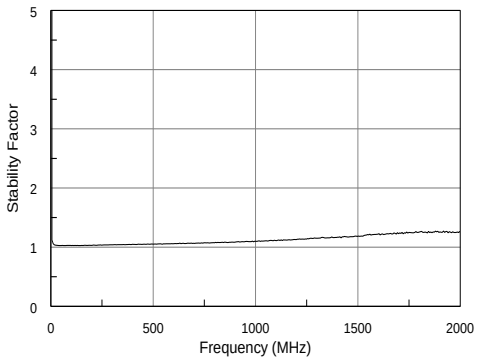


S-parameters & K-factor









APPLICATION CIRCUIT

Wide Band

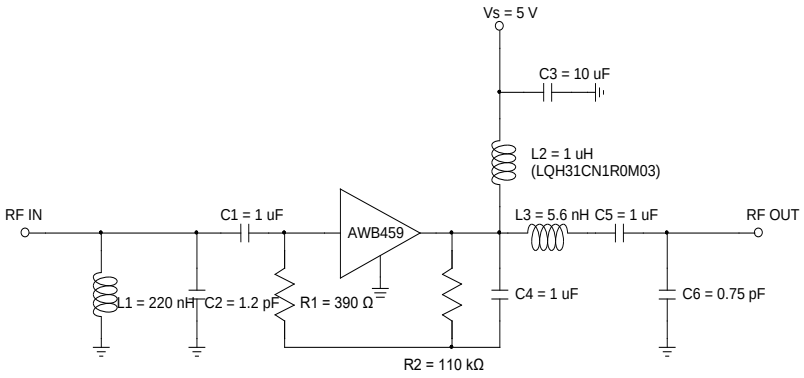
30 ~ 2000 MHz

+5 V

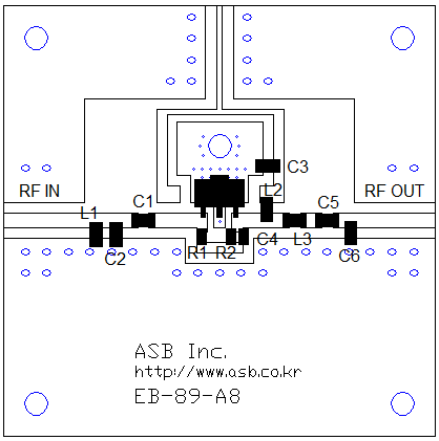
Frequency (MHz)	30	500	1000	2000
Magnitude S21 (dB)	19.2	19.5	19.7	20.4
Magnitude S11 (dB)	-7.5	-8.5	-7.5	-8.5
Magnitude S22 (dB)	-10.5	-9.0	-9.5	-5.5
Output P1dB (dBm)	23.0	24.0	23.5	18.0
Output IP3[1)] (dBm)	41.0	42.0	40.5	34.5
Noise Figure (dB)	1.2	1.2	1.3	1.4
Device Voltage (V)	+5			
Current (mA)	120			

1) OIP3 is measured with two tones at an output power of +8 dBm/tone separated by 1 MHz.

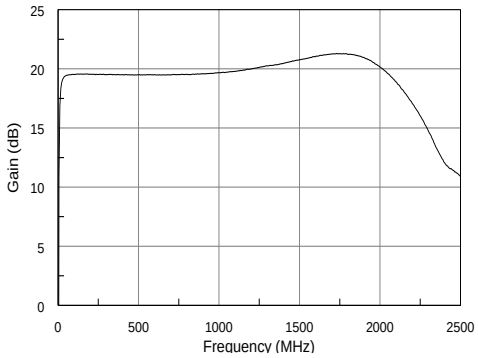
Schematic

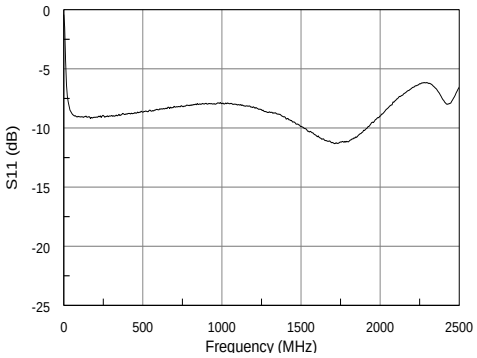


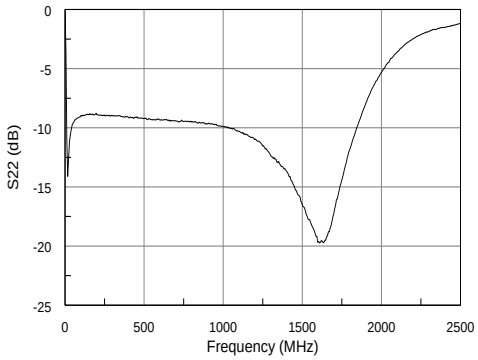
Board Layout (FR4, 40x40 mm², 0.8T)

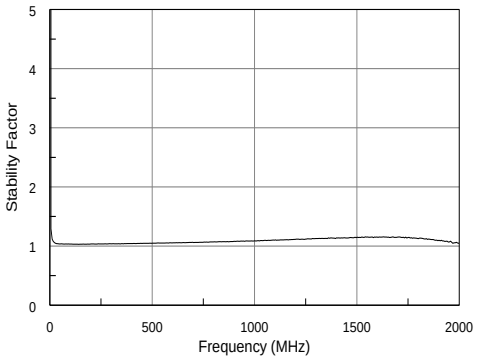


S-parameters & K-factor









APPLICATION CIRCUIT

Wide Band

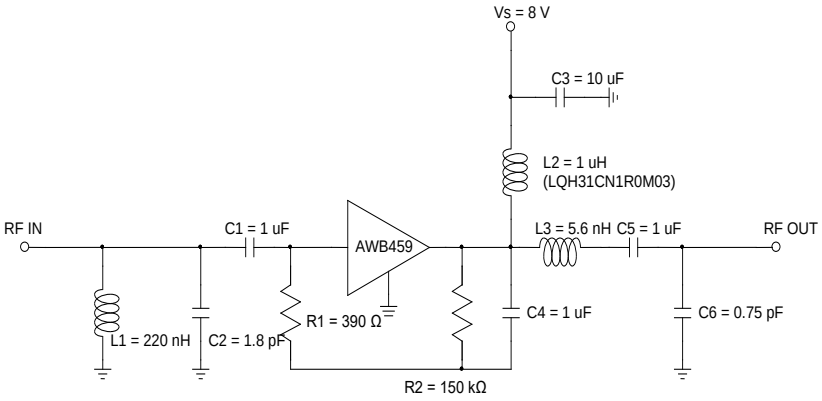
30 ~ 2000 MHz

+8 V

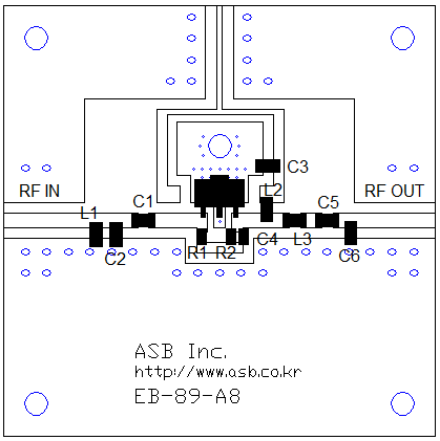
Frequency (MHz)	30	500	1000	2000
Magnitude S21 (dB)	19.0	19.5	19.5	19.5
Magnitude S11 (dB)	-7.5	-8.3	-8.1	-8.4
Magnitude S22 (dB)	-10.5	-8.5	-9.5	-4.0
Output P1dB (dBm)	27.0	28.0	27.0	20.5
Output IP3[1] (dBm)	42.0	45.0	42.0	35.5
Noise Figure (dB)	1.4	1.4	1.4	1.7
Device Voltage (V)	+8			
Current (mA)	180			

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

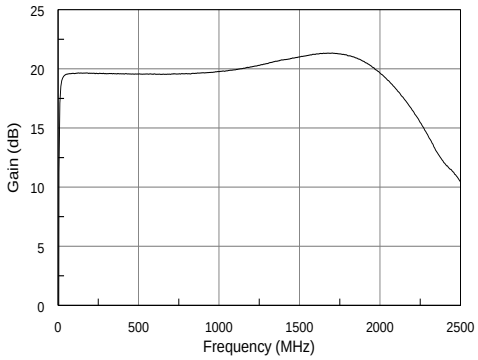
Schematic

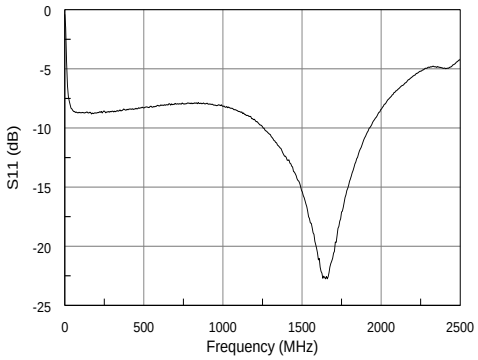


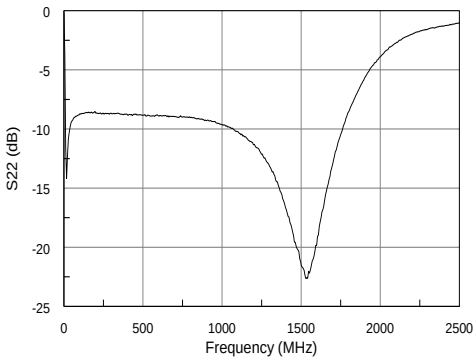
Board Layout (FR4, 40x40 mm², 0.8T)

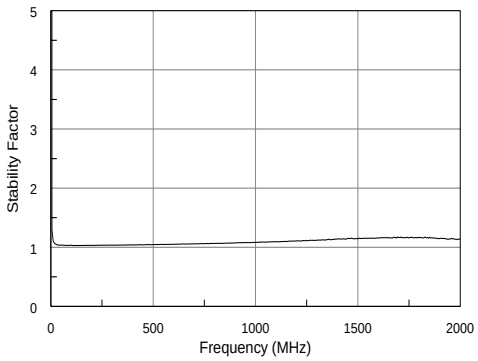


S-parameters & K-factor









APPLICATION CIRCUIT

Wide Band

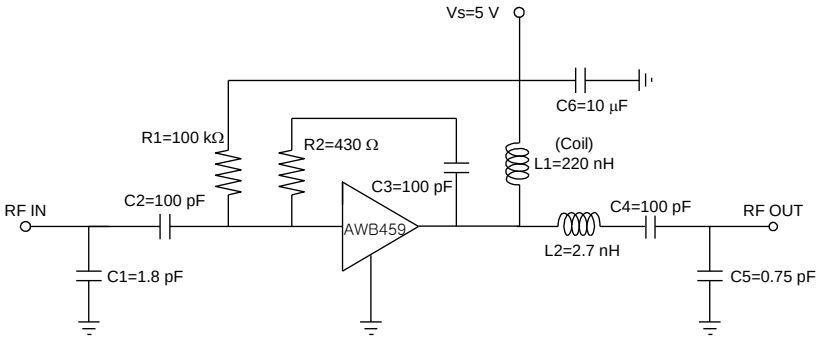
1000 ~ 2000 MHz

+5 V

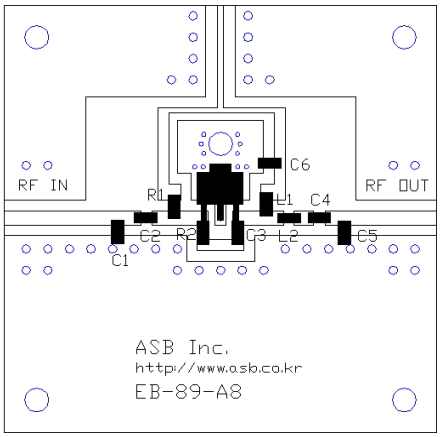
Frequency (MHz)	1000	1500	2000
Magnitude S21 (dB)	20.1	21.0	22.8
Magnitude S11 (dB)	-7	-8	-7
Magnitude S22 (dB)	-11	-10	-10
Output P1dB (dBm)	24.0	23.5	20.0
Output IP3[1)] (dBm)	39.0	38.5	35.0
Noise Figure (dB)	1.40	1.40	1.65
Device Voltage (V)	+5		
Current (mA)	130		

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

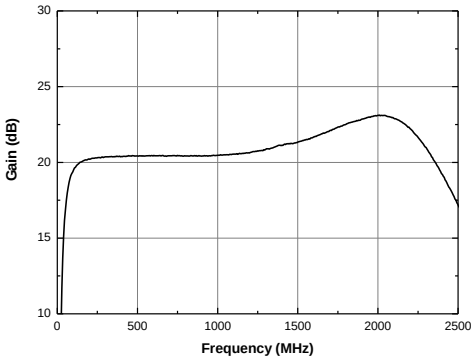
Schematic

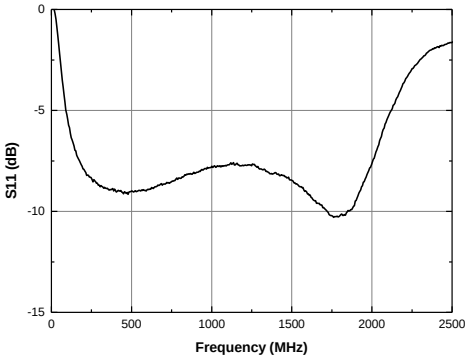


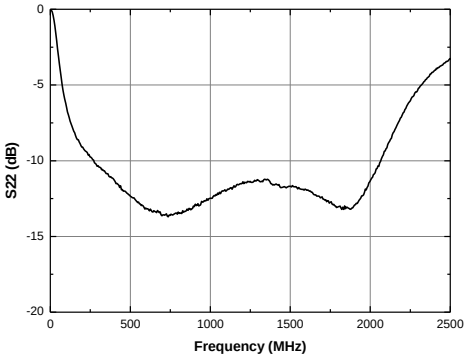
Board Layout (FR4, 40x40 mm², 0.8T)

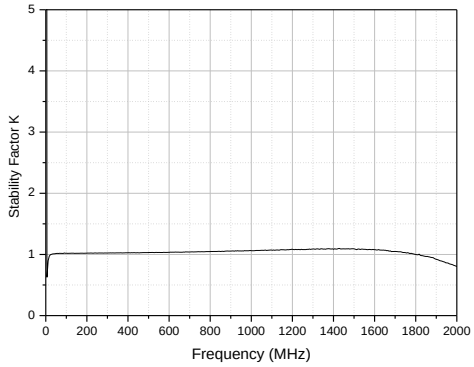


S-parameters & K-factor









APPLICATION CIRCUIT

Wide Band

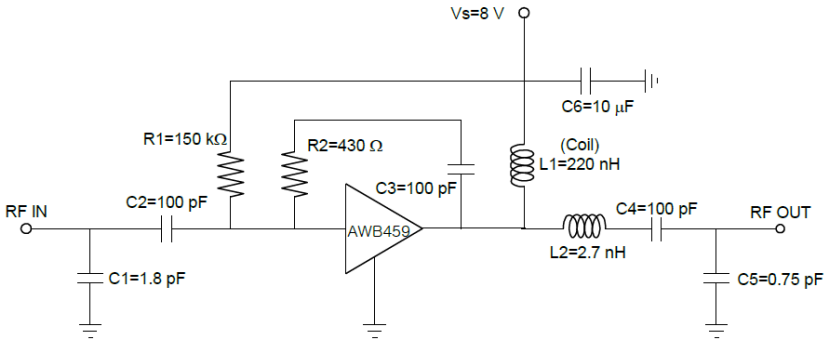
1000 ~ 2000 MHz

+8 V

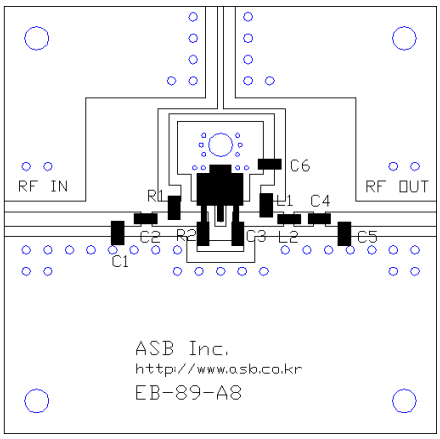
Frequency (MHz)	1000	1500	2000
Magnitude S21 (dB)	20.2	21.0	22.5
Magnitude S11 (dB)	-8	-9	-8
Magnitude S22 (dB)	-12	-11	-13
Output P1dB (dBm)	27.5	27.0	23.5
Output IP3[1)] (dBm)	40.5	40.5	37.5
Noise Figure (dB)	1.4	1.6	1.8
Device Voltage (V)	+8		
Current (mA)	200		

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

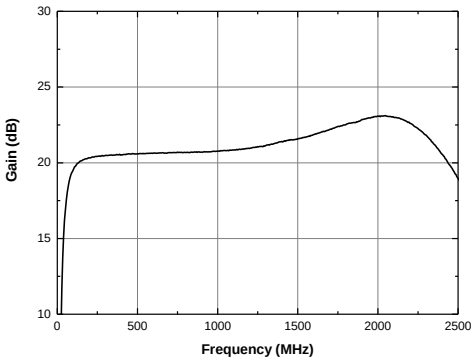
Schematic

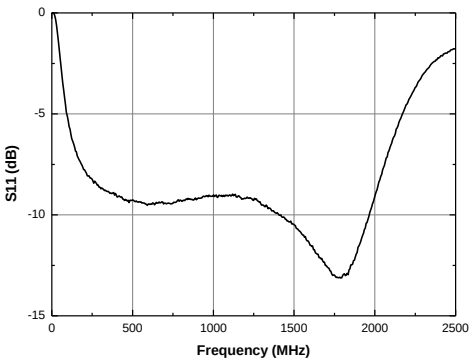


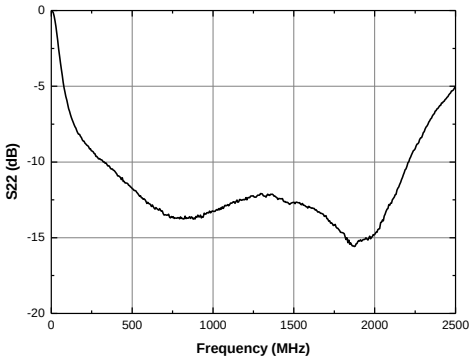
Board Layout (FR4, 40x40 mm², 0.8T)

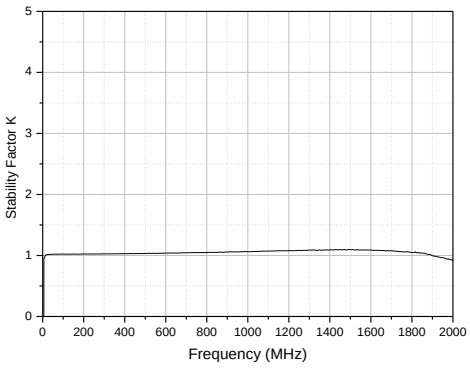


S-parameters & K-factor









Recommended Soldering Reflow Profile