

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

Typical Performance

(Supply Voltage = +5 V, $T_A = +25\text{ }^{\circ}\text{C}$, $Z_0 = 50\text{ }\Omega$)

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, $T_A = +25\text{ }^{\circ}\text{C}$

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

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

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

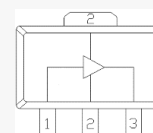


Package Style: SOT89

Applications

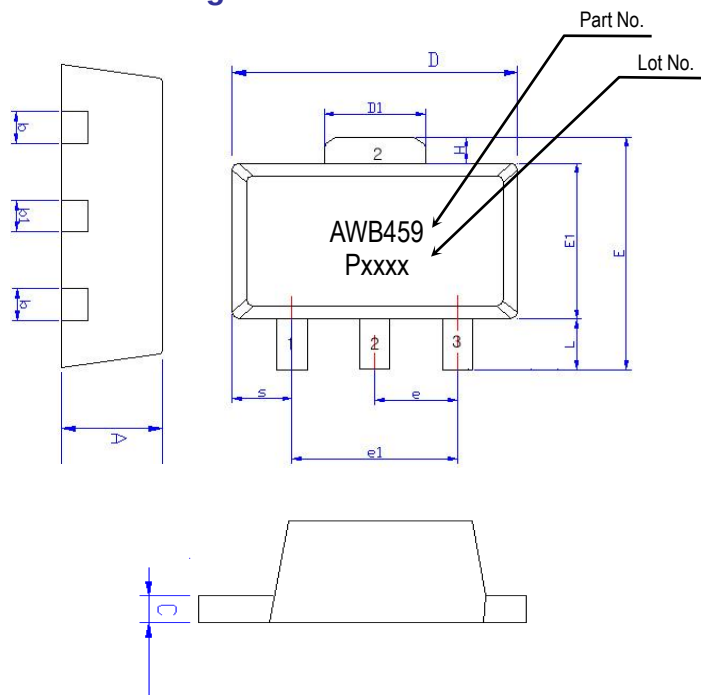
- IF 1.5 ~ 500 MHz (6.5 V)
- IF 21.4 ~ 512 MHz (3 V)
- IF 30 ~ 512 MHz
(2.3 V & 3 V & 5 V & 8 V)
- IF 30 ~ 512 MHz (8 V, 140 mA)
- DVB 470 ~ 800 MHz (5 V & 8 V)
- IF 1.5 ~ 1000 MHz (6.5 V)
- MoCA
(800 ~ 1600 MHz, 5 V & 8 V)
- 1200 ~ 1700 MHz (5 V & 8 V)
- Wide Band
(1000 ~ 2000 MHz, 5 V & 8 V)
(30 ~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

Pin Configuration



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

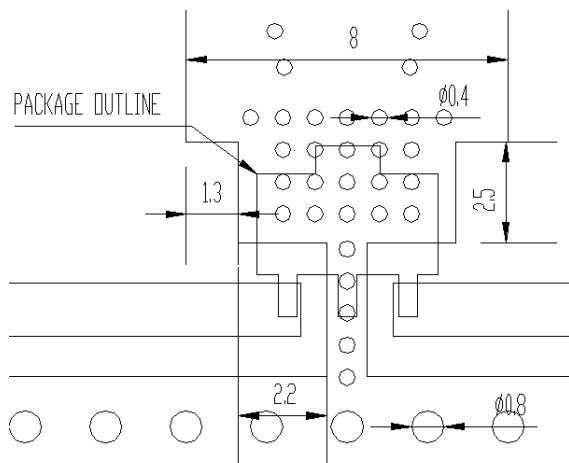
Outline Drawing



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: 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

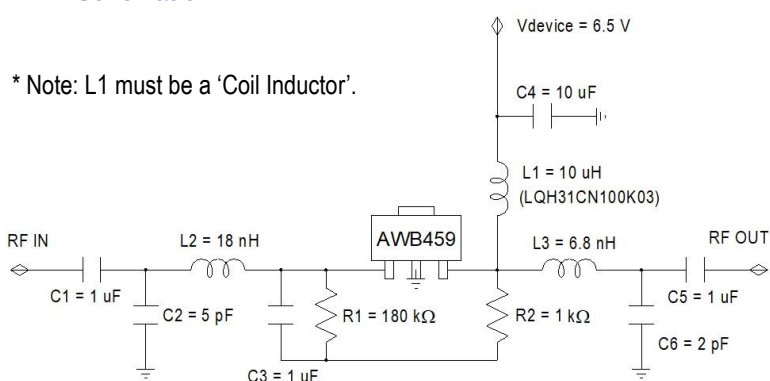
APPLICATION CIRCUIT

IF
1.5 ~ 500 MHz
+6.5 V

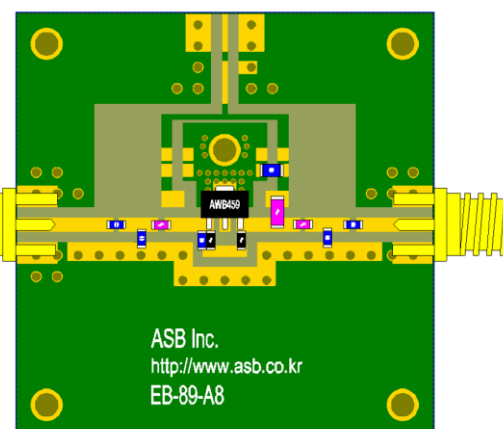
Frequency (MHz)	1.5	250	500
Magnitude S21 (dB)	23.5	24.0	23.5
Magnitude S11 (dB)	-11	-18	-15
Magnitude S22 (dB)	-11	-18	-13
Output P1dB (dBm)	22	26	26
Output IP3 ¹⁾ (dBm)	41	43	42
Noise Figure (dB)	1.25	0.95	1.35
Device Voltage (V)	+6.5		
Current (mA)	140		

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

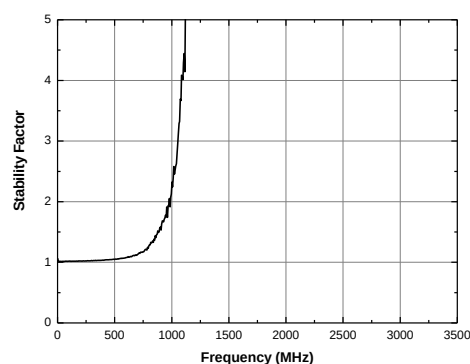
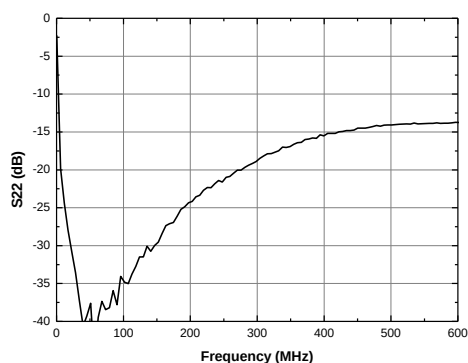
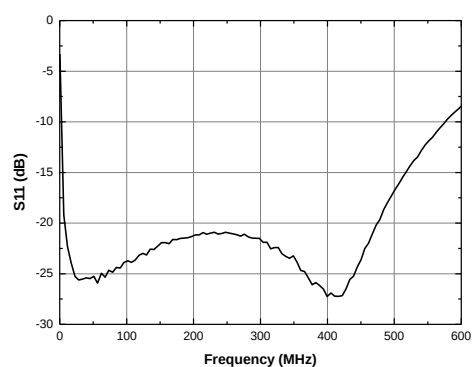
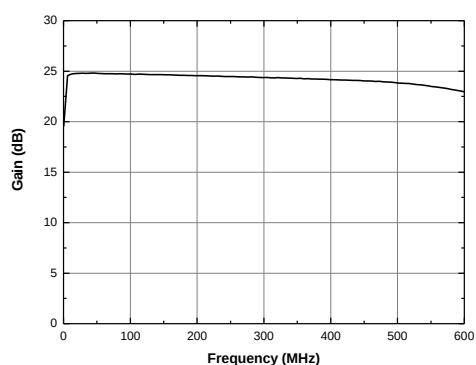
Schematic



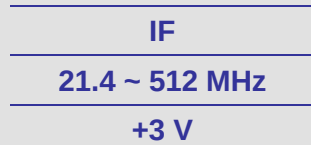
Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

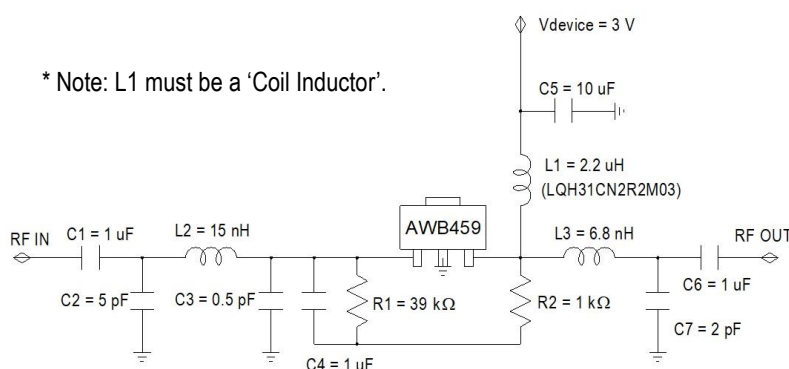


Frequency (MHz)	21.4	250	512
Magnitude S21 (dB)	24	23.5	23
Magnitude S11 (dB)	-16	-14	-20
Magnitude S22 (dB)	-18	-20	-15
Output P1dB (dBm)	18.5	19	19
Output IP3 ¹⁾ (dBm)	35.5	35.0	34.0
Noise Figure (dB)	0.7	0.9	1.1
Device Voltage (V)	+3		
Current (mA)	100		

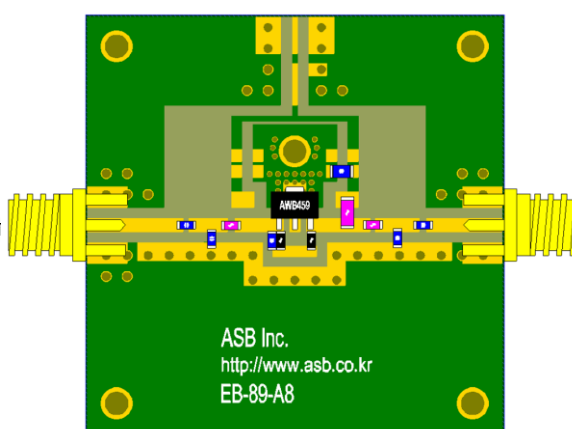
1) OIP3 is measured with two tones at an output power of +8 dBm/tone separated by 1 MHz.

Schematic

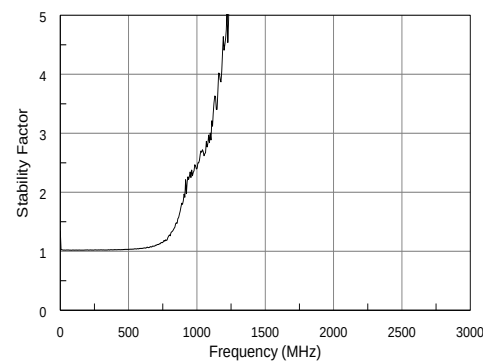
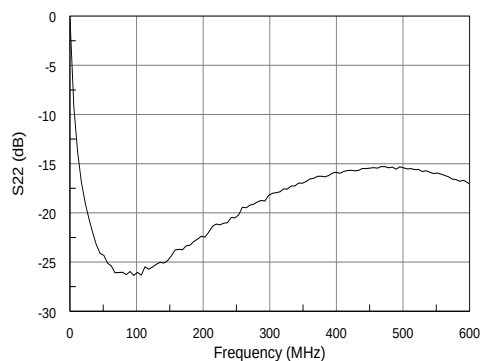
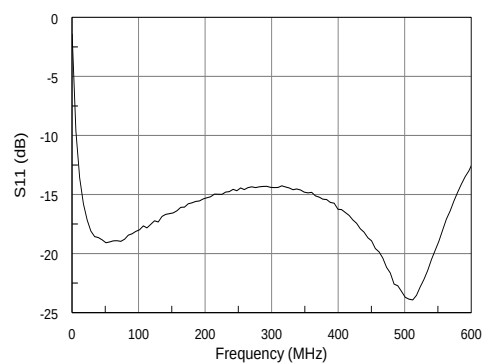
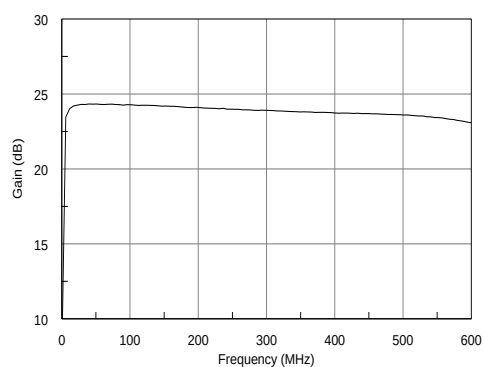
* Note: L1 must be a 'Coil Inductor'.



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

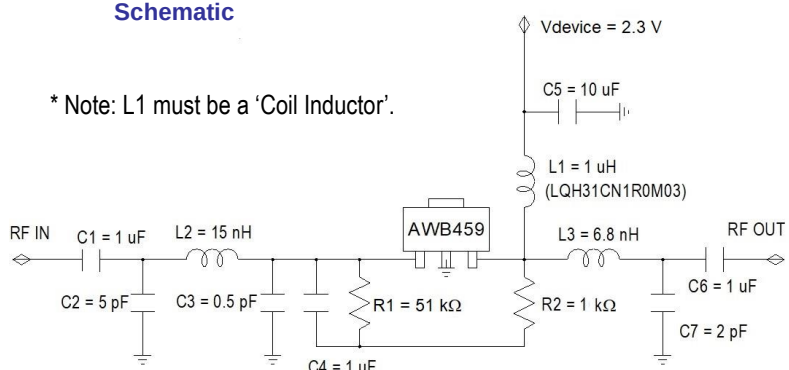
IF
30 ~ 512 MHz
+2.3 V

Frequency (MHz)	30	250	512
Magnitude S21 (dB)	23.5	23.2	23.0
Magnitude S11 (dB)	-13.3	-11.7	-14.0
Magnitude S22 (dB)	-14.7	-17.4	-19.1
Output P1dB (dBm)	16.4	17.1	17.1
Output IP3 ¹⁾ (dBm)	32.3	31.8	30.5
Noise Figure (dB)	0.6	0.9	1.0
Device Voltage (V)	+2.3		
Current (mA)	60		

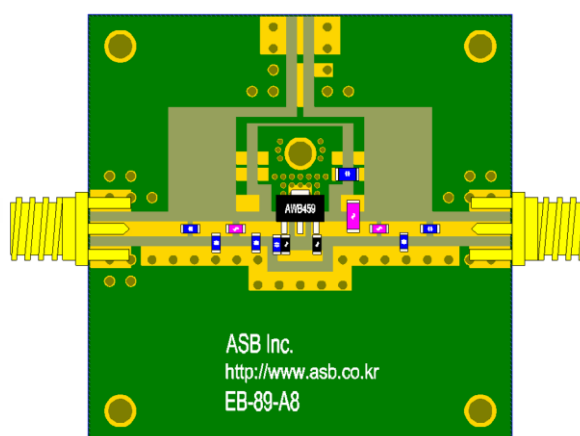
1) OIP3 is measured with two tones at an output power of +0 dBm/tone separated by 1 MHz.

Schematic

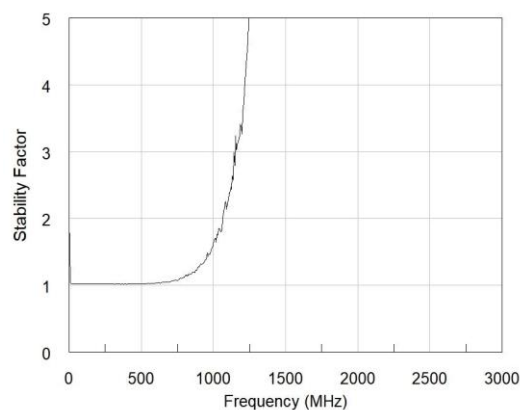
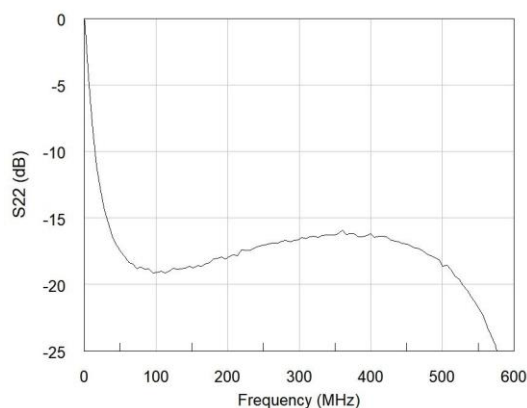
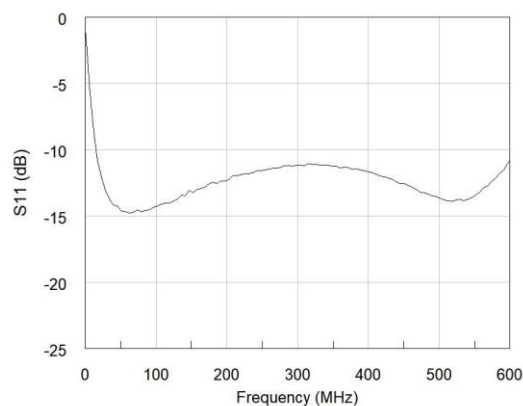
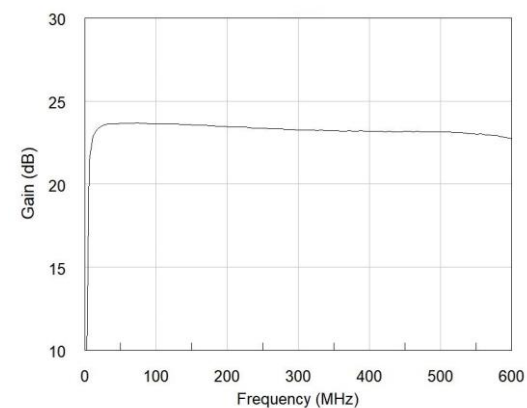
* Note: L1 must be a 'Coil Inductor'.



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

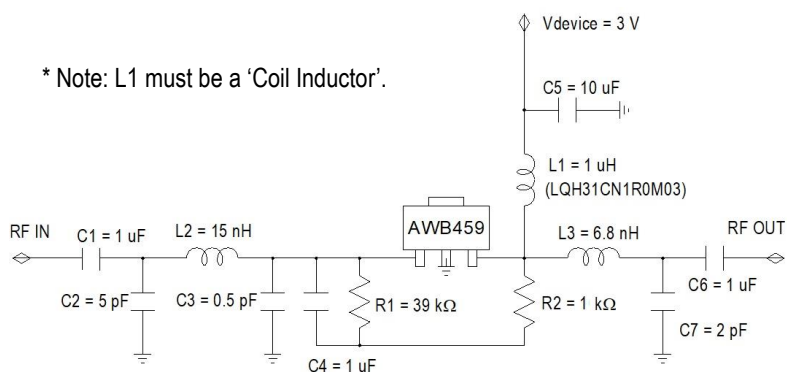
IF
30 ~ 512 MHz
+3 V

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		

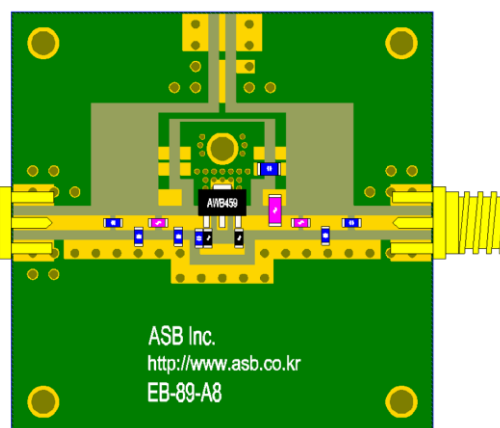
1) OIP3 is measured with two tones at an output power of +8 dBm/tone separated by 1 MHz.

Schematic

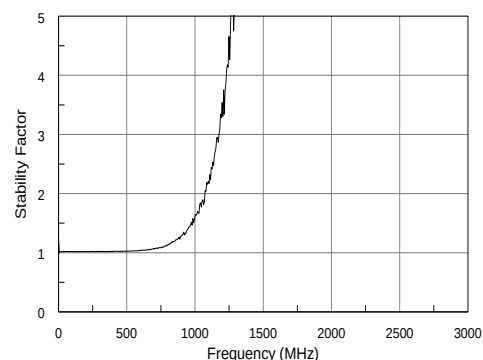
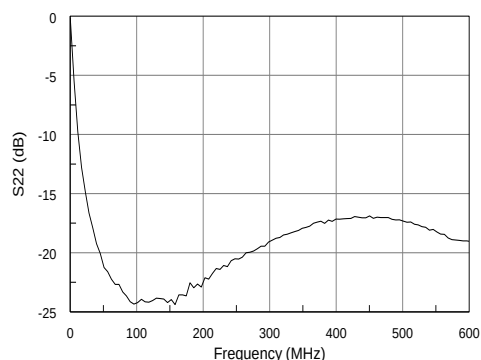
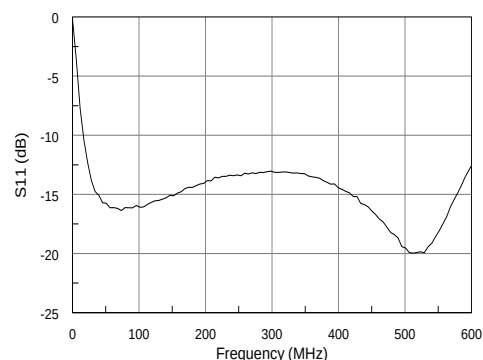
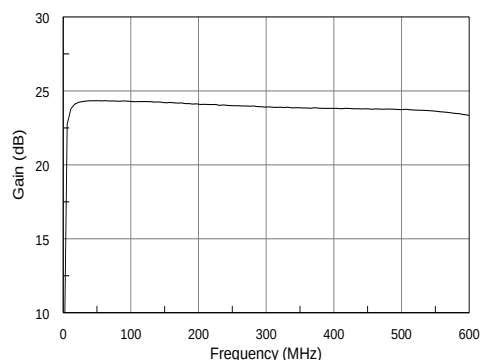
* Note: L1 must be a 'Coil Inductor'.



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

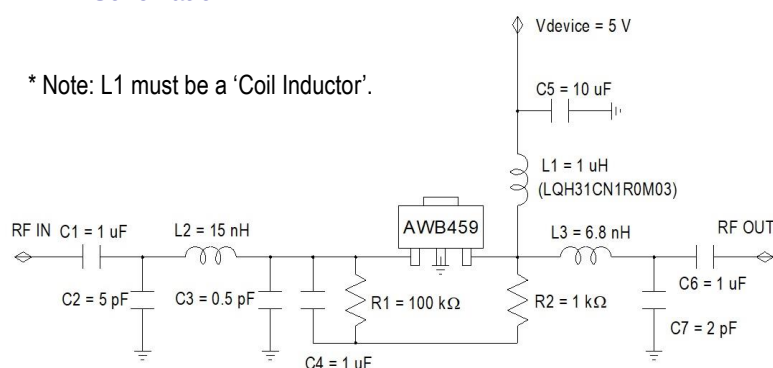
IF
30 ~ 512 MHz
+5 V

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		

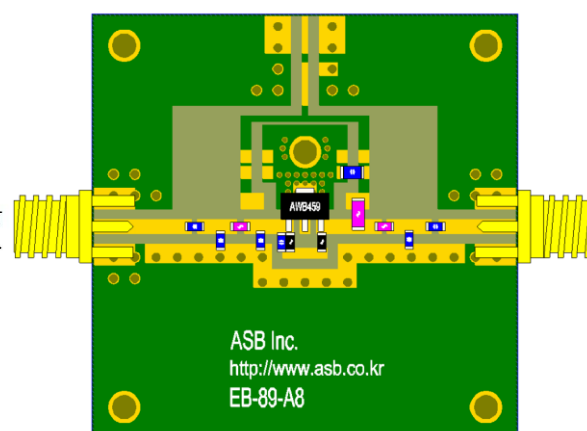
1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1 MHz.

Schematic

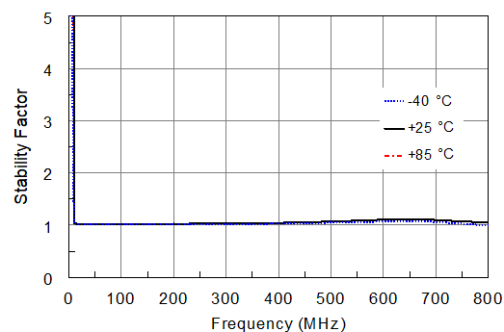
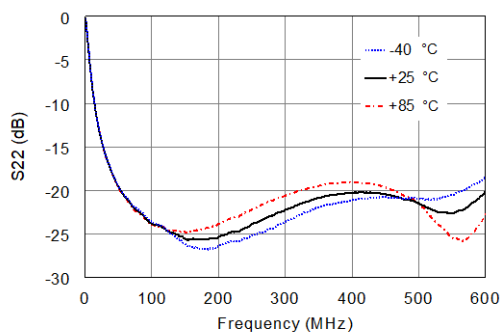
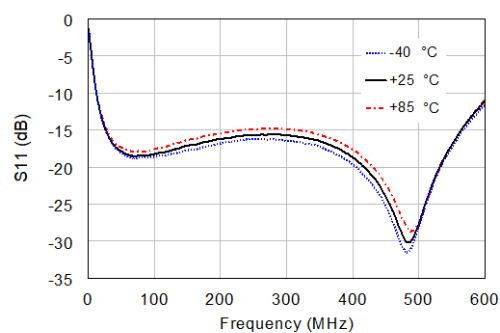
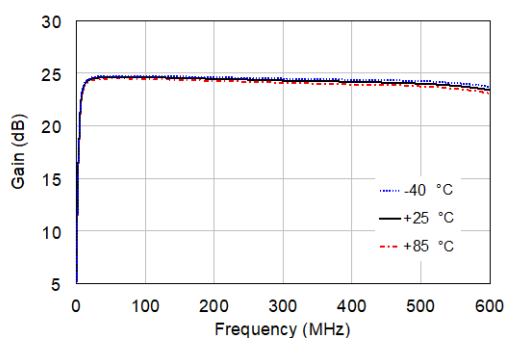
* Note: L1 must be a 'Coil Inductor'.



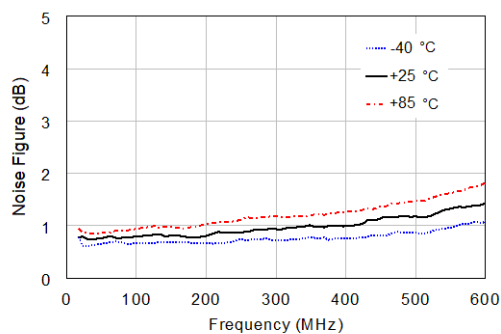
Board Layout (FR4, 40x40 mm², 0.8T)



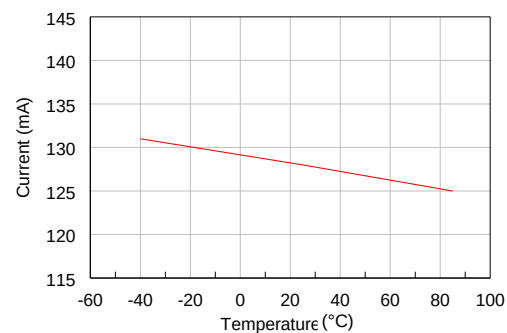
S-parameters & K-factor



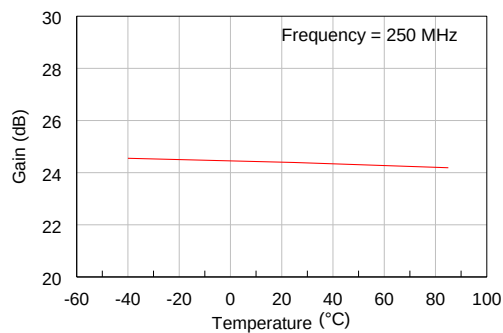
Noise Figure



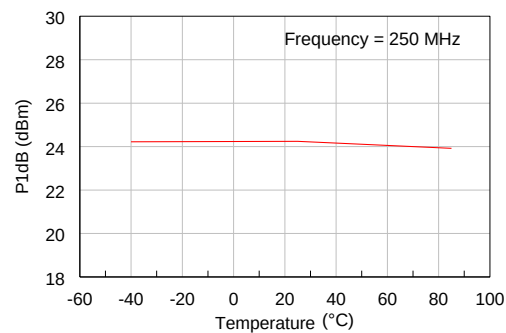
Current



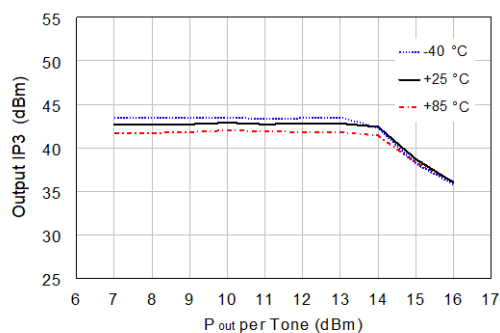
Gain



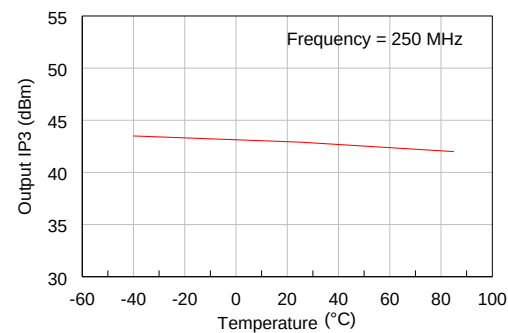
P1dB



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



Output IP3 @ 10 dBm / tone



APPLICATION CIRCUIT

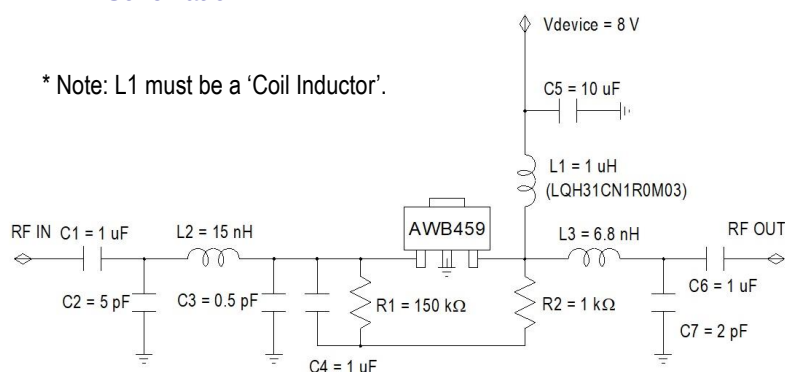
IF
30 ~ 512 MHz
+8 V

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		

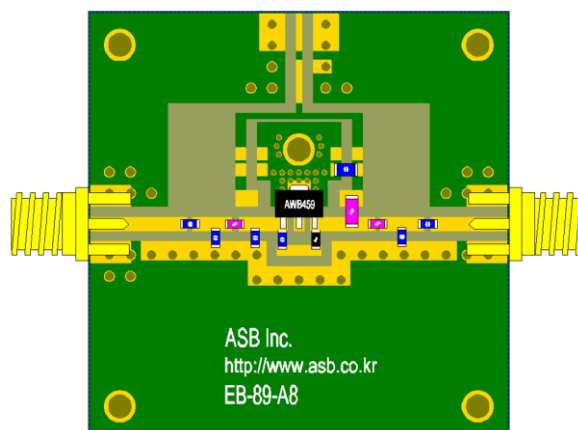
1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1 MHz.

Schematic

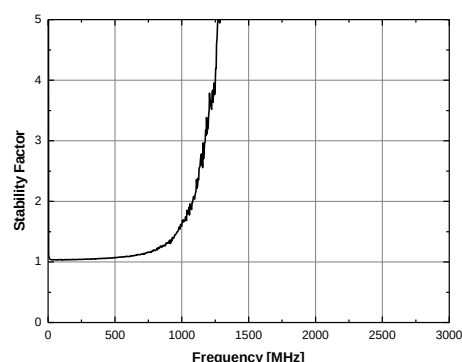
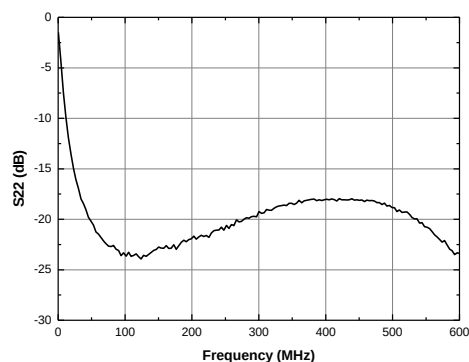
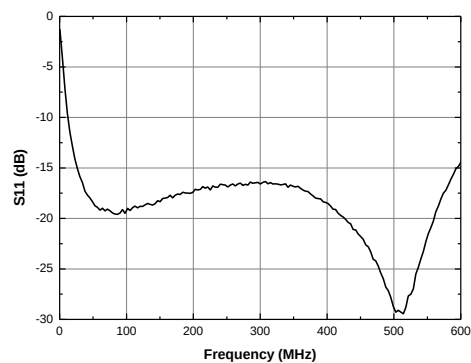
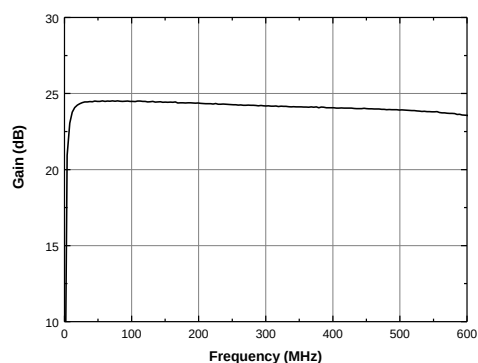
* Note: L1 must be a 'Coil Inductor'.



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



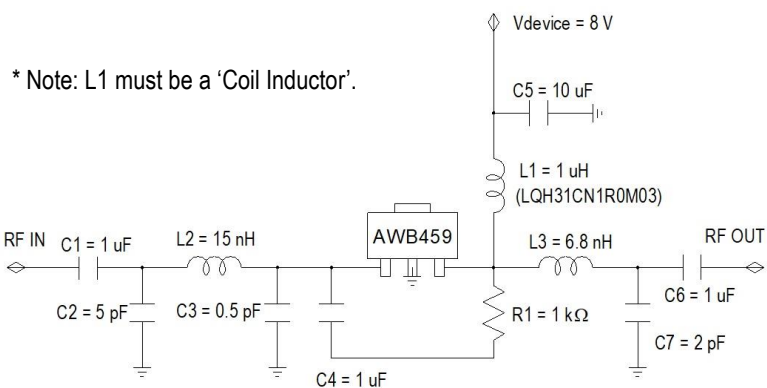
APPLICATION CIRCUIT

IF
30 ~ 512 MHz
+8 V

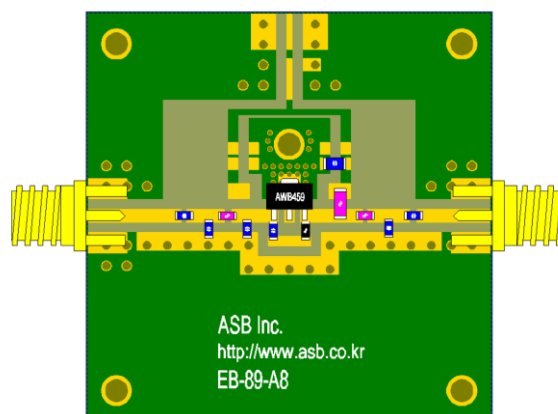
Frequency (MHz)	30	250	512
Magnitude S21 (dB)	24.0	24.0	23.5
Magnitude S11 (dB)	-15	-15	-18
Magnitude S22 (dB)	-15	-18	-18
Output P1dB (dBm)	26.5	27.0	27.0
Output IP3 ¹⁾ (dBm)	40.0	40.5	40.5
Noise Figure (dB)	0.8	1.2	1.2
Device Voltage (V)	+8		
Current (mA)	140		

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

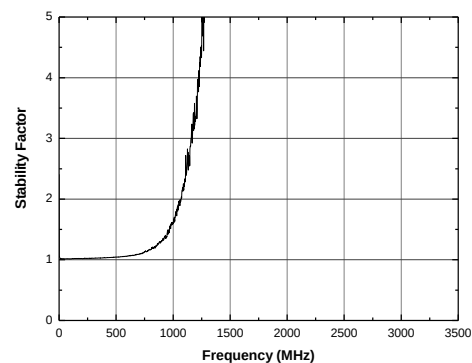
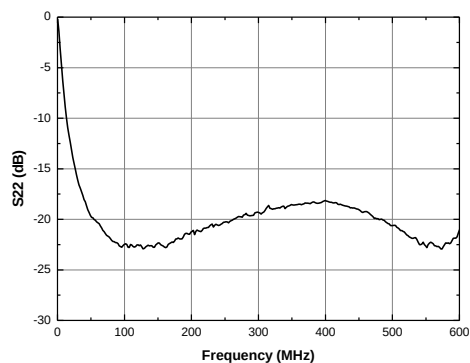
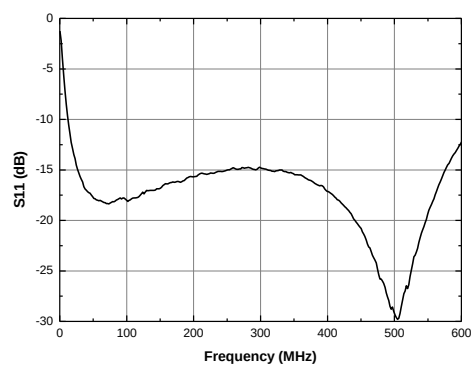
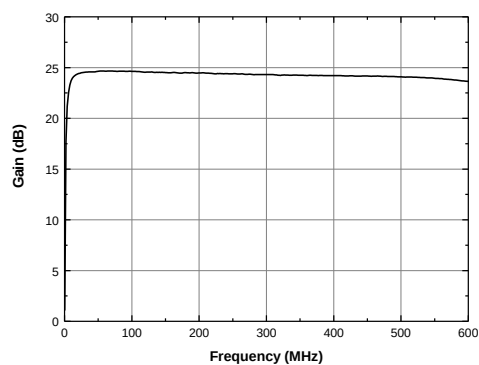
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

DVB

470 ~ 800 MHz

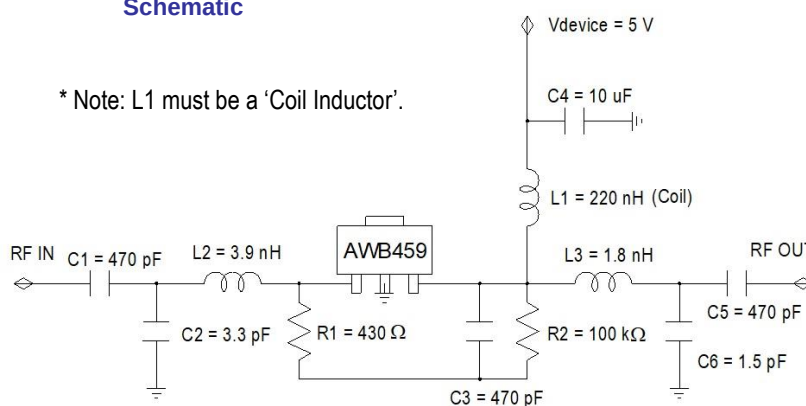
+5 V

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	

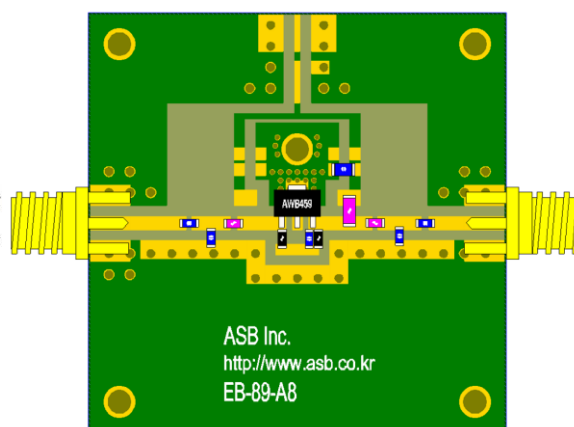
1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1 MHz.

Schematic

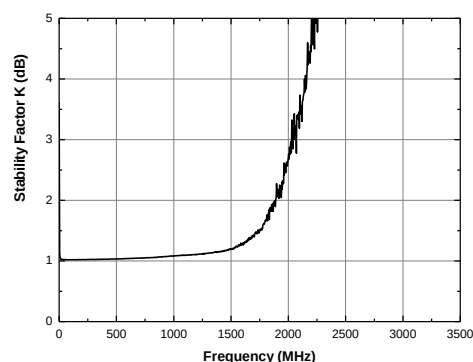
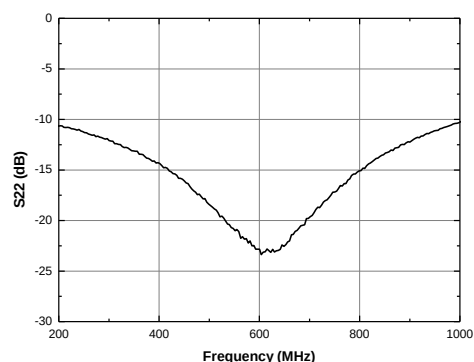
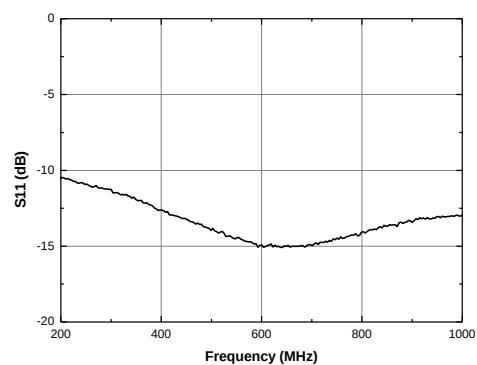
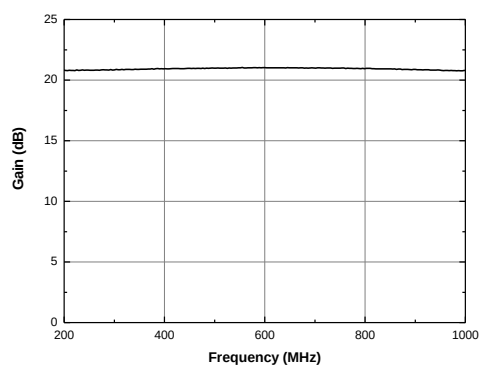
* Note: L1 must be a 'Coil Inductor'.



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

DVB

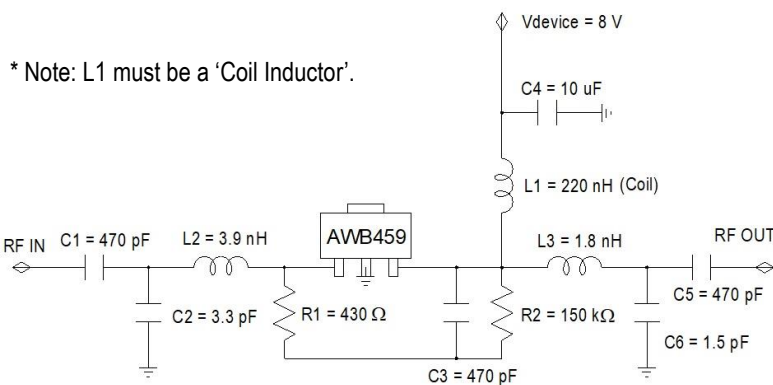
470 ~ 800 MHz

+8 V

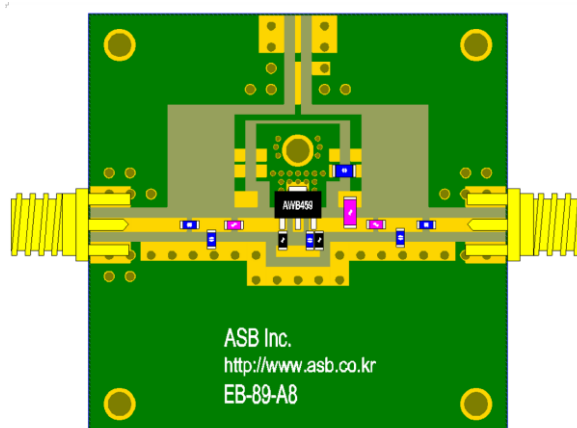
Frequency (MHz)	470	800
Magnitude S21 (dB)	20.5	20.5
Magnitude S11 (dB)	-12	-17
Magnitude S22 (dB)	-14	-17
Output P1dB (dBm)	26	26
Output IP3 ¹⁾ (dBm)	42	42
Noise Figure (dB)	1.3	1.3
Device Voltage (V)	+8	
Current (mA)	200	

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

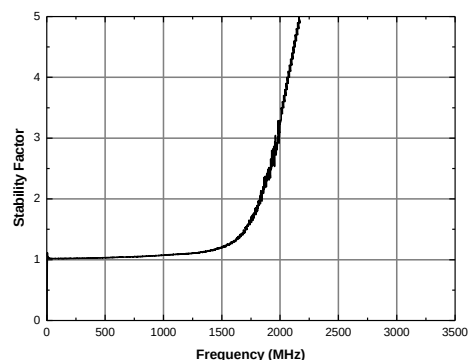
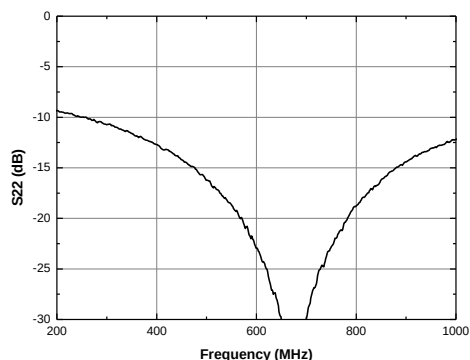
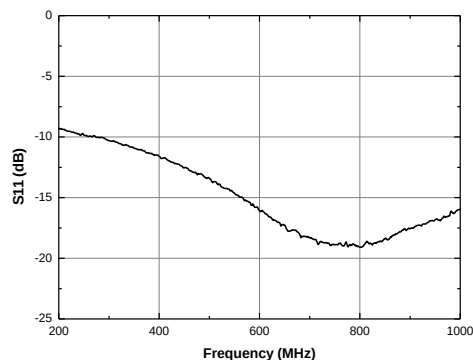
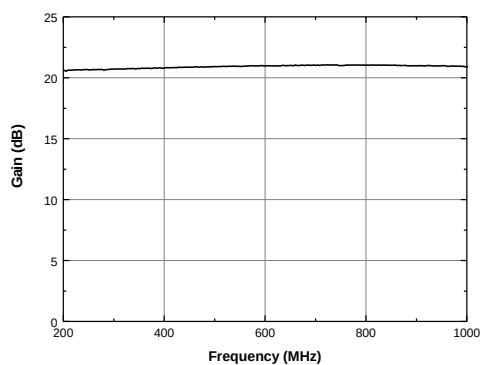
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

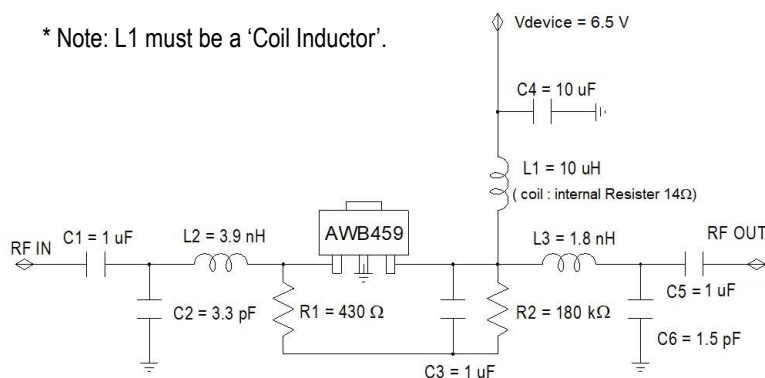
IF
1.5 ~ 1000 MHz
+6.5 V

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)	+6.5		
Current (mA)	140		

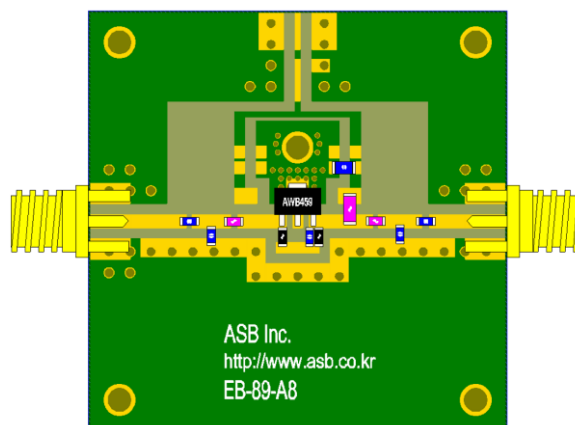
1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1 MHz.

Schematic

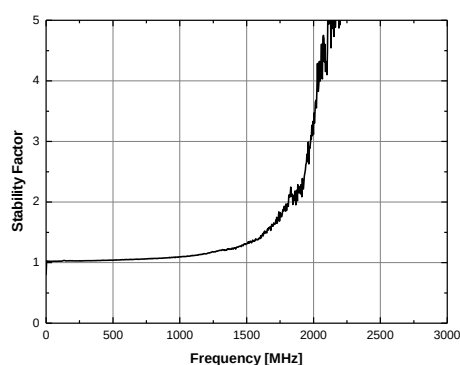
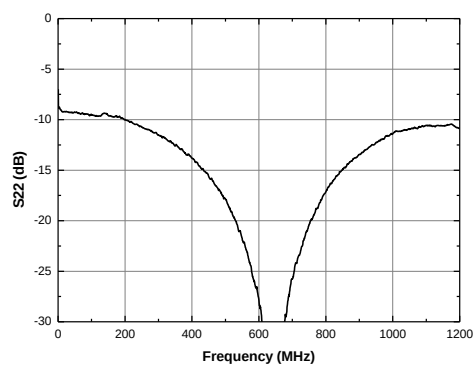
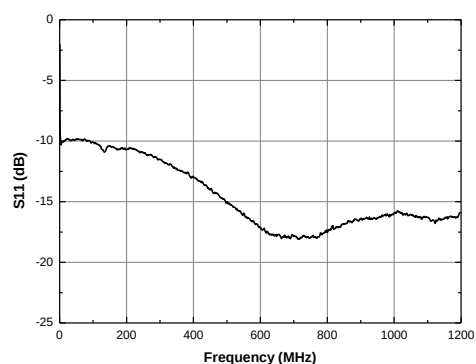
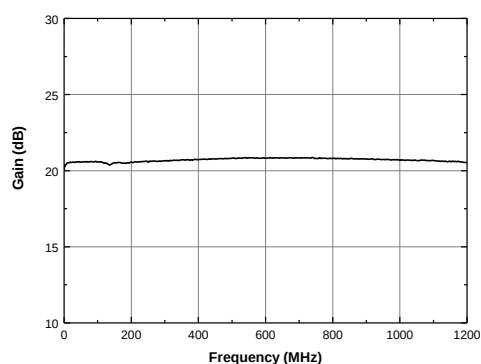
* Note: L1 must be a 'Coil Inductor'.



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

MoCA

800 ~ 1600 MHz

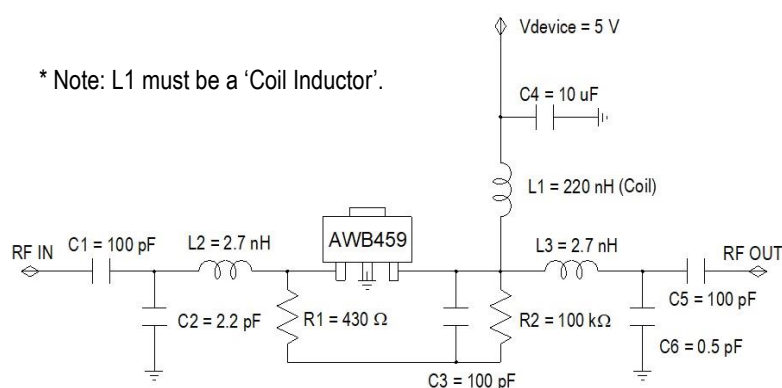
+5 V

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		

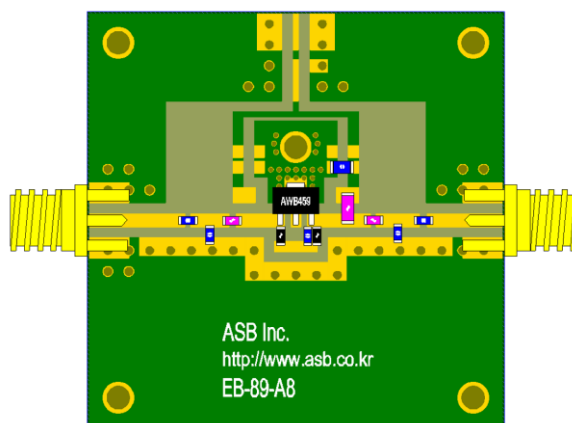
1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1 MHz.

Schematic

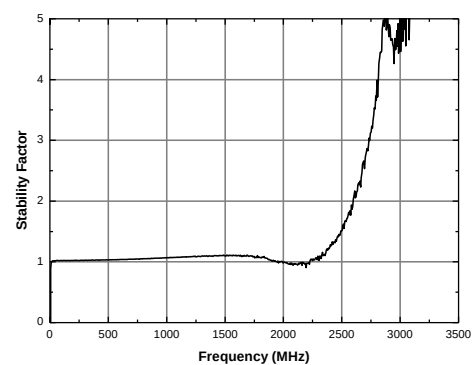
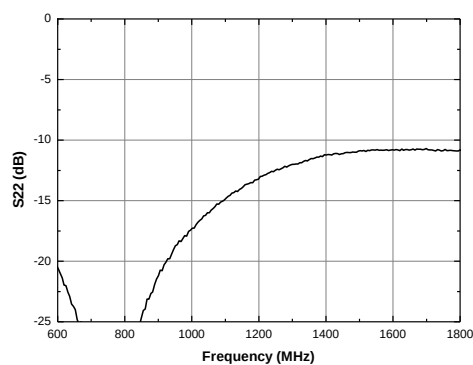
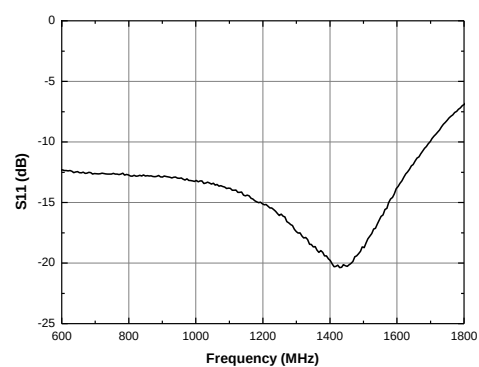
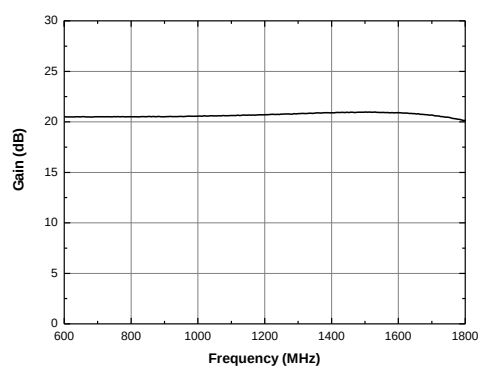
* Note: L1 must be a 'Coil Inductor'.



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

MoCA

800 ~ 1600 MHz

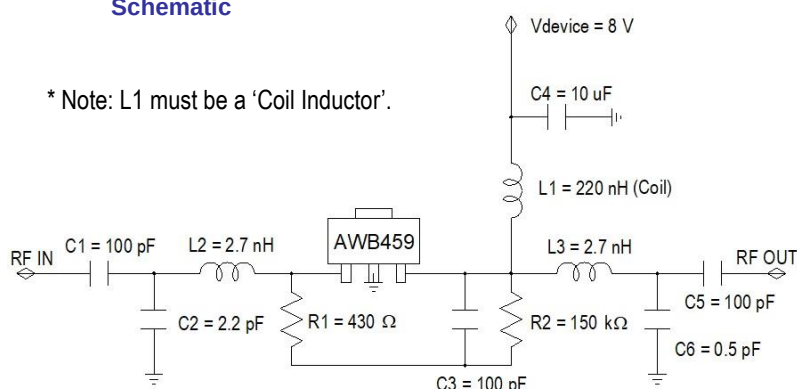
+8 V

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		

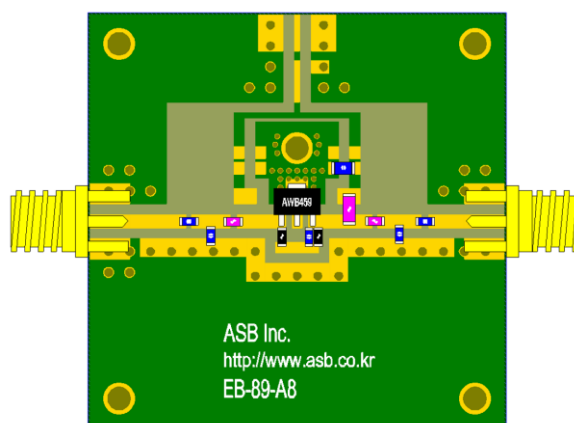
1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1 MHz.

Schematic

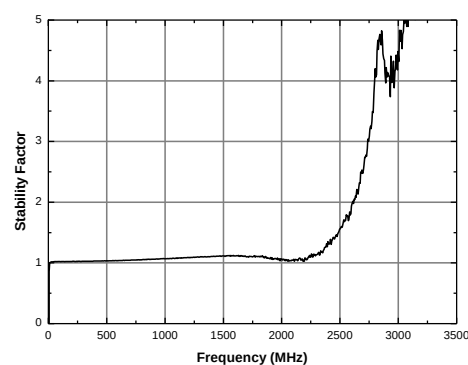
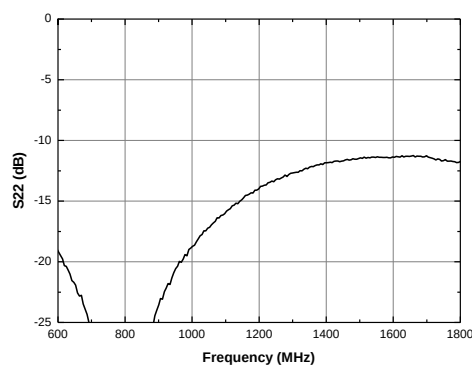
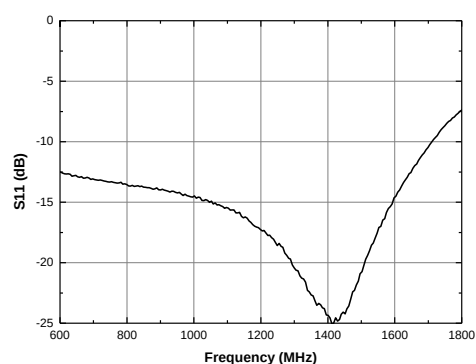
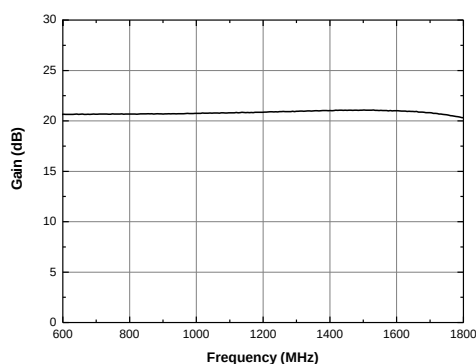
* Note: L1 must be a 'Coil Inductor'.



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

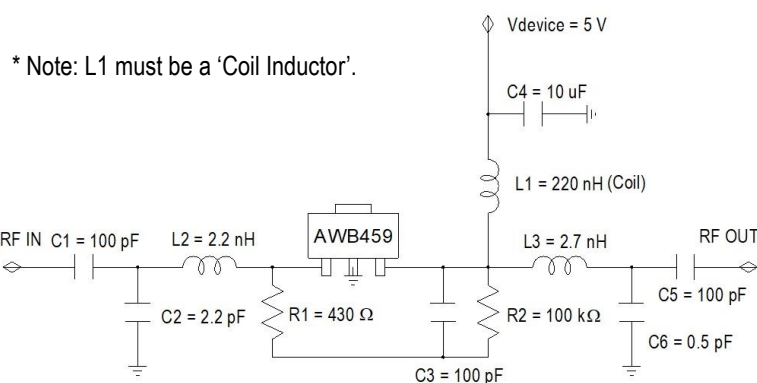
1200 ~ 1700 MHz

+5 V

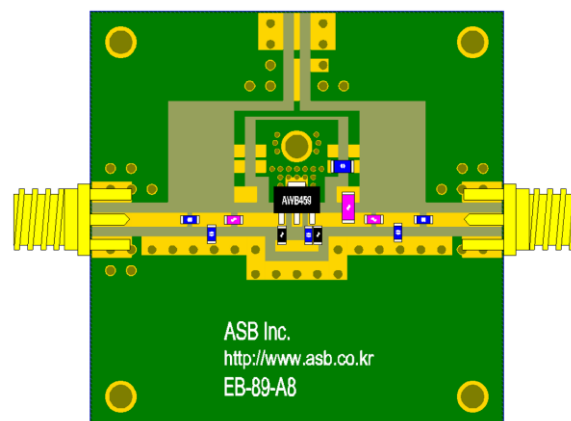
Frequency (MHz)	1200	1700
Magnitude S21 (dB)	21	21.5
Magnitude S11 (dB)	-13	-12
Magnitude S22 (dB)	-18	-15
Output P1dB (dBm)	23	22
Output IP3 ¹⁾ (dBm)	39	37
Noise Figure (dB)	1.3	1.4
Device Voltage (V)	+5	
Current (mA)	130	

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

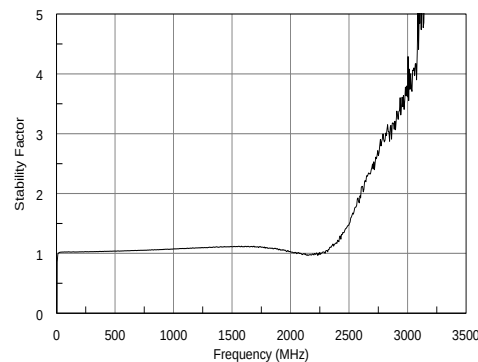
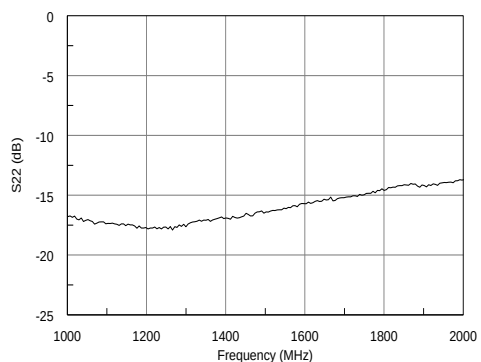
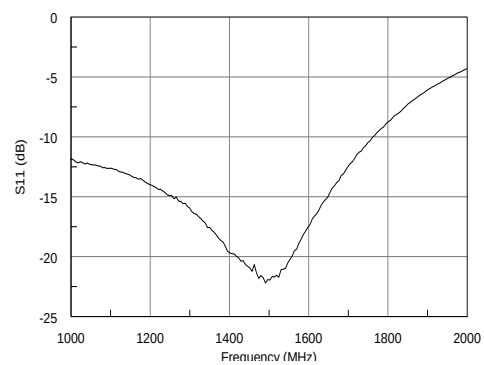
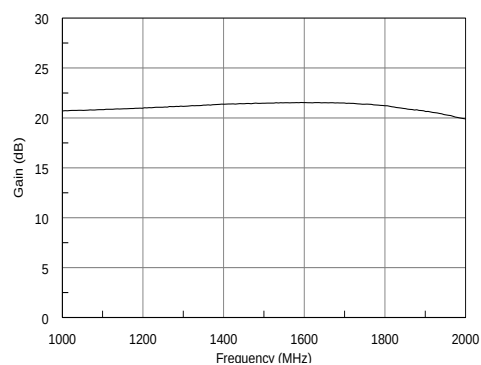
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

1200 ~ 1700 MHz

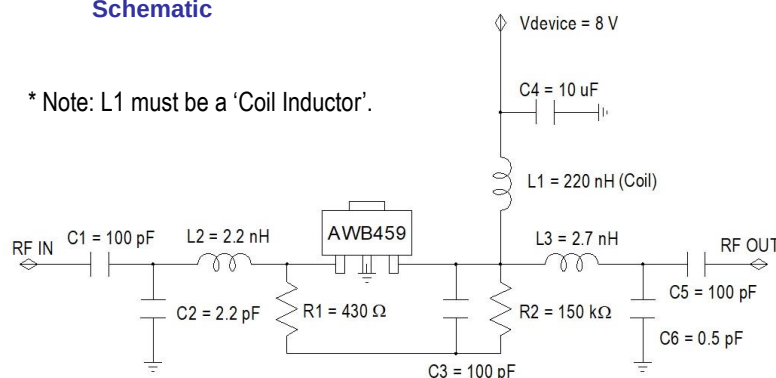
+8 V

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	

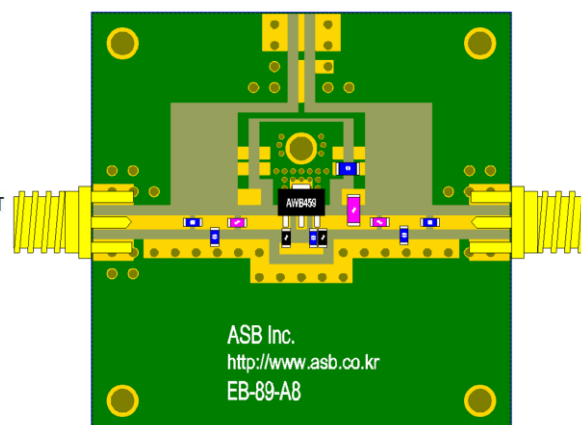
1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1 MHz.

Schematic

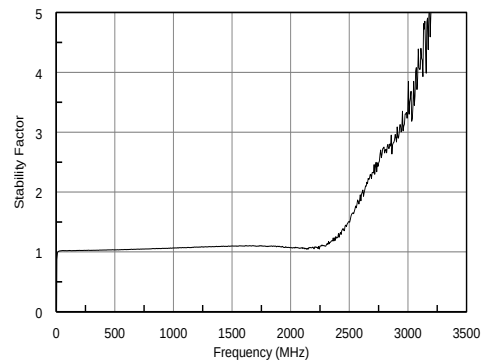
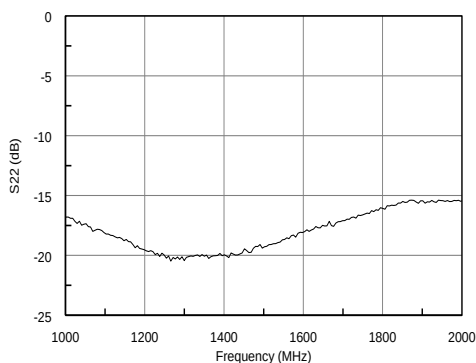
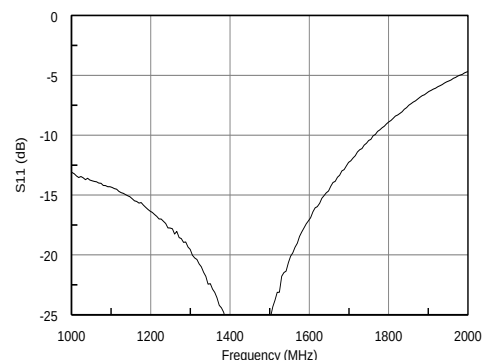
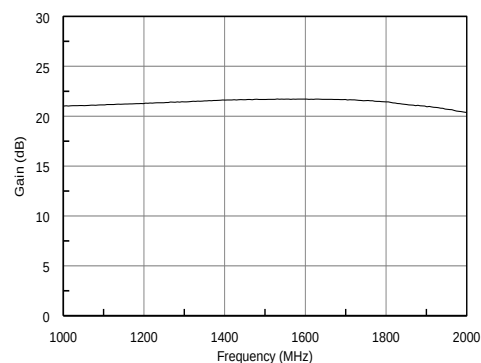
* Note: L1 must be a 'Coil Inductor'.



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



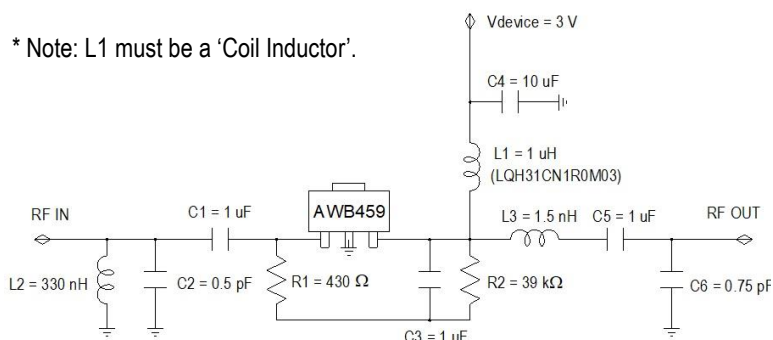
APPLICATION CIRCUIT

Wide Band
30 ~ 2000 MHz
+3 V

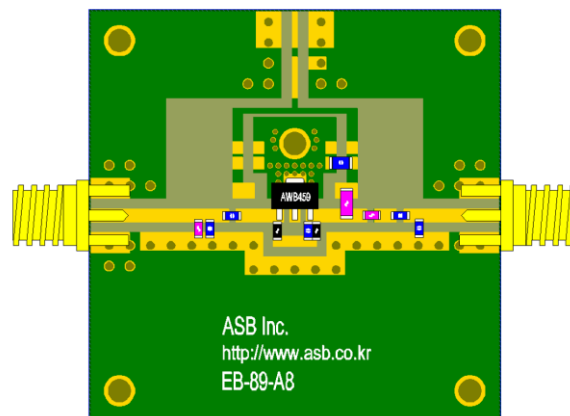
Frequency (MHz)	30	500	1000	2000
Magnitude S21 (dB)	19.9	20	19.7	18.7
Magnitude S11 (dB)	-9.5	-10.5	-8.5	-7.5
Magnitude S22 (dB)	-11.0	-14.5	-17.0	-9.0
Output P1dB (dBm)	19.0	19.5	19.5	18.5
Output IP3 ¹⁾ (dBm)	37.0	34.5	32.0	28.0
Noise Figure (dB)	1.0	1.3	1.5	2.3
Device Voltage (V)	+3			
Current (mA)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

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

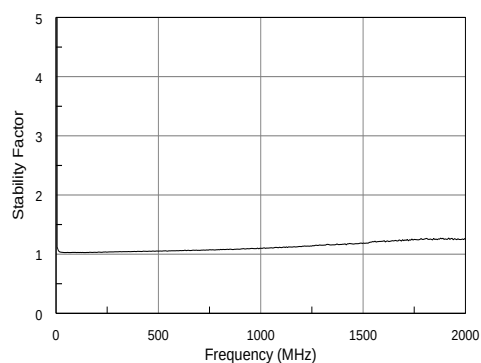
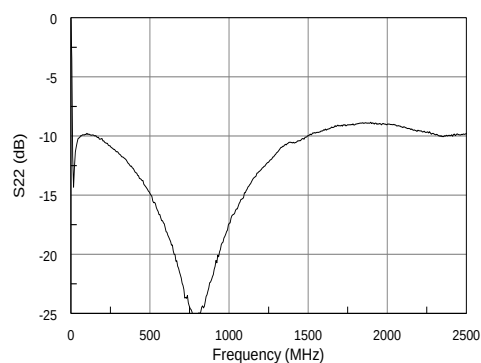
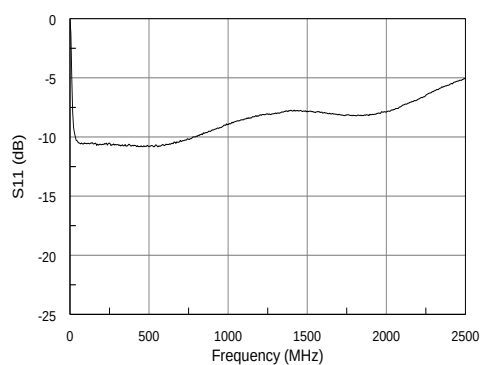
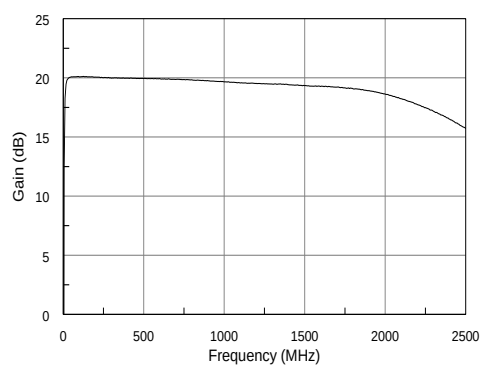
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

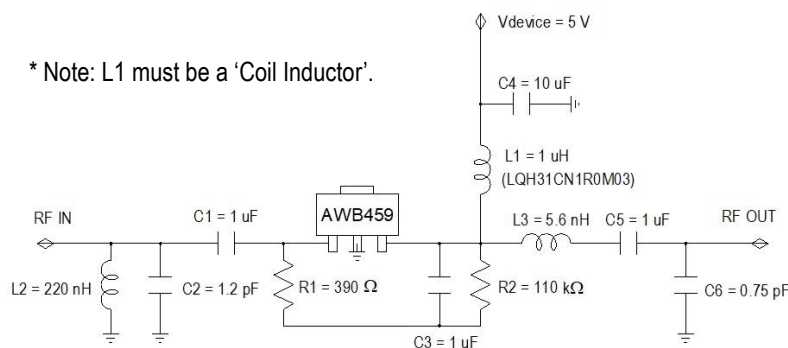
Wide Band
30 ~ 2000 MHz
+5 V

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			

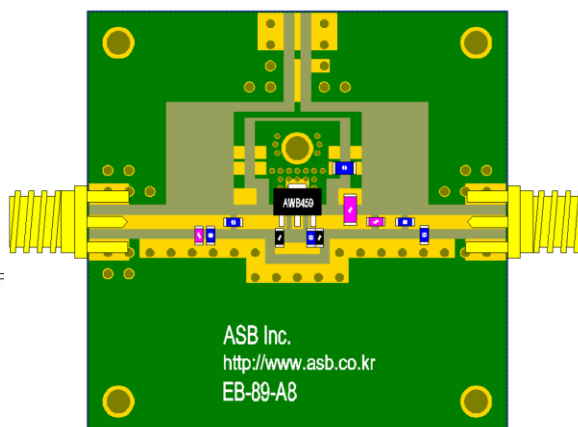
1) OIP3 is measured with two tones at an output power of +8 dBm/tone separated by 1 MHz.

Schematic

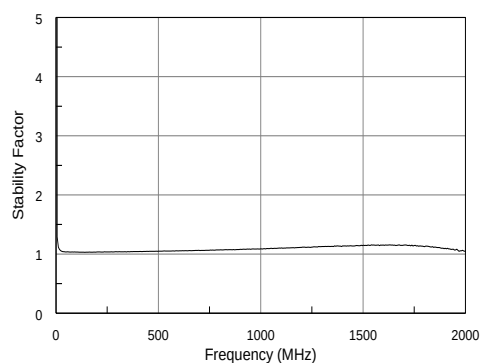
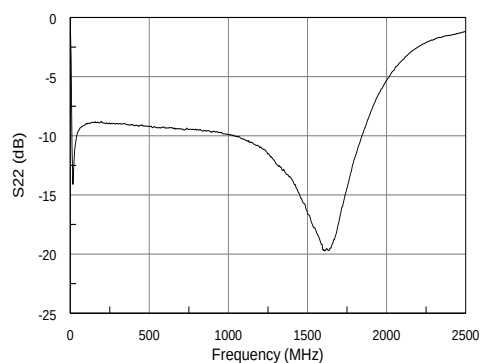
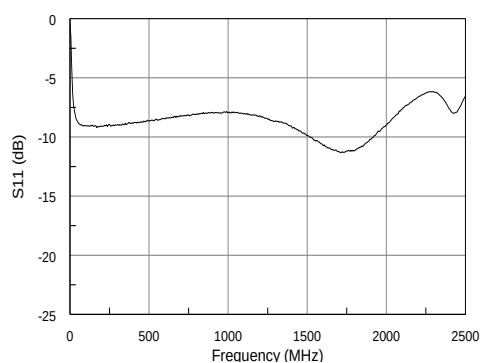
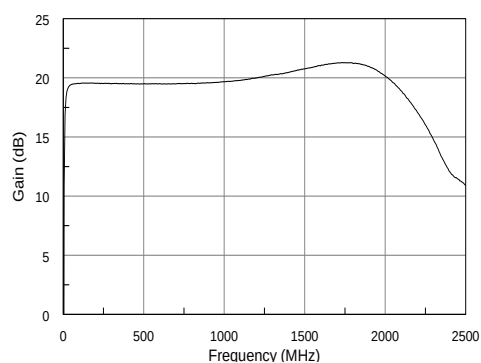
* Note: L1 must be a 'Coil Inductor'.



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



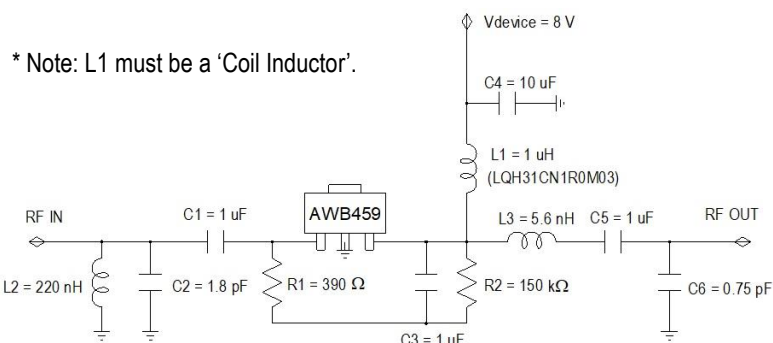
APPLICATION CIRCUIT

Wide Band
30 ~ 2000 MHz
+8 V

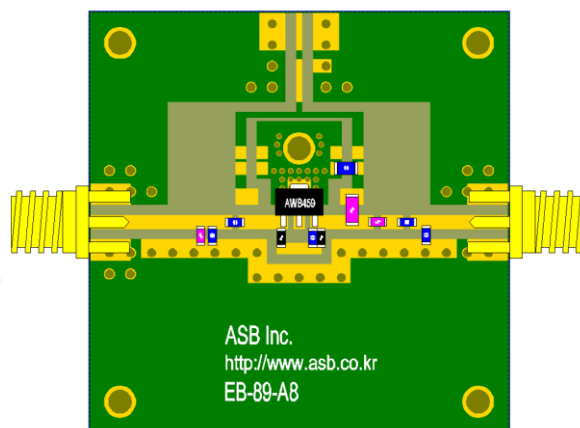
Frequency (MHz)	30	500	1000	2000
Magnitude S21 (dB)	19.0	19.5	19.5	19.5
Magnitude S11 (dB)	-7.5	-8.3	-8.1	-8.4
Magnitude S22 (dB)	-10.5	-8.5	-9.5	-4.0
Output P1dB (dBm)	27.0	28.0	27.0	20.5
Output IP3 ¹⁾ (dBm)	42.0	45.0	42.0	35.5
Noise Figure (dB)	1.4	1.4	1.4	1.7
Device Voltage (V)	+8			
Current (mA)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

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

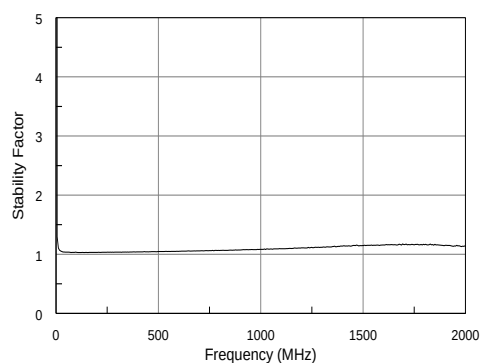
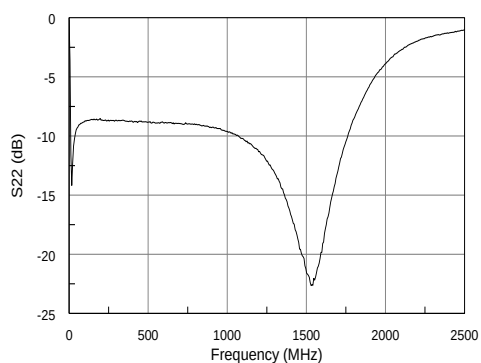
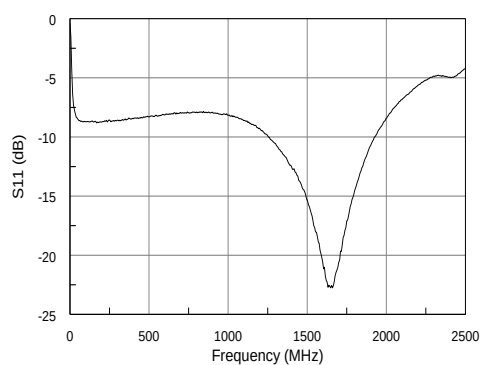
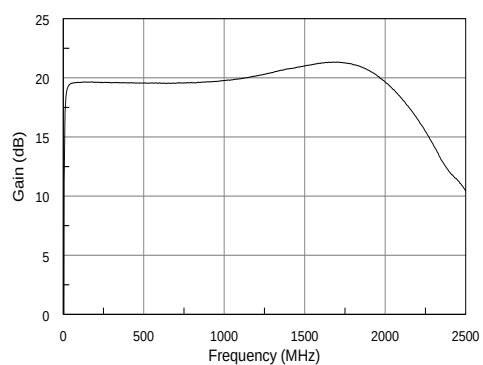
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

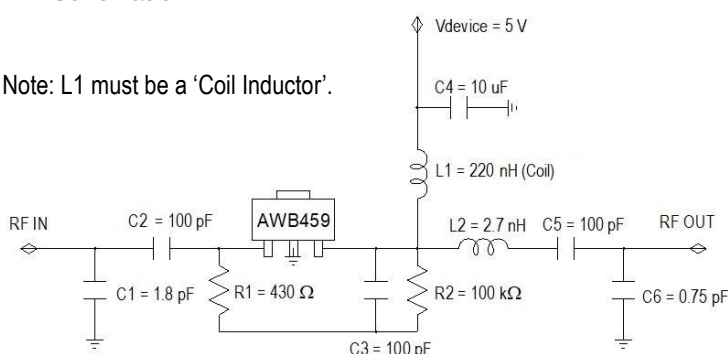
Wide Band
1000 ~ 2000 MHz
+5 V

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		

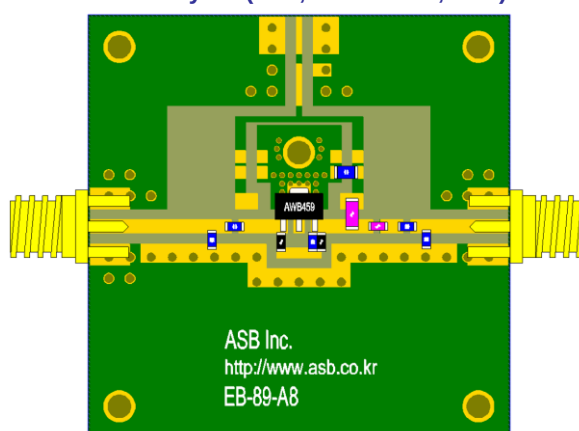
1) OIP3 is measured with two tones at an output power of +7 dBm/tone separated by 1 MHz.

Schematic

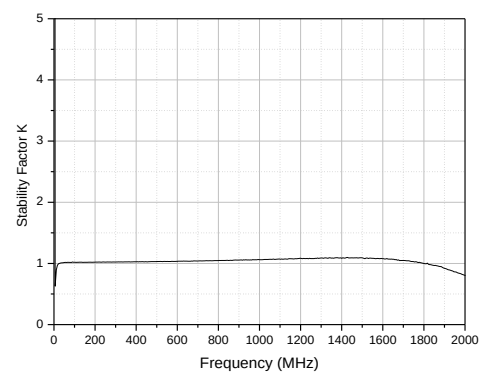
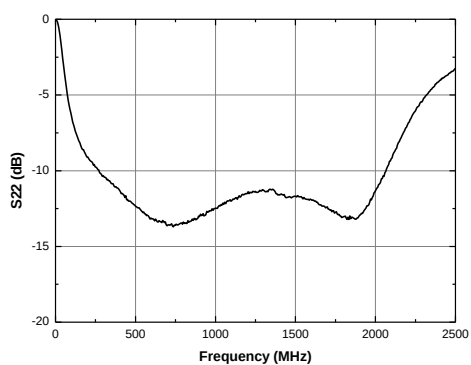
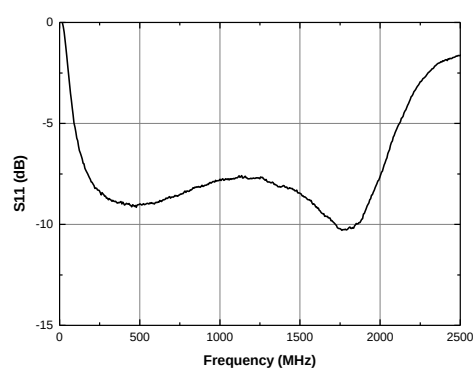
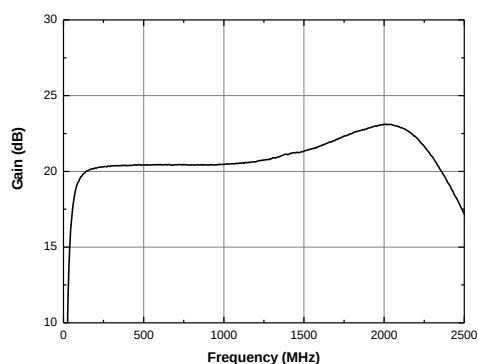
* Note: L1 must be a 'Coil Inductor'.



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



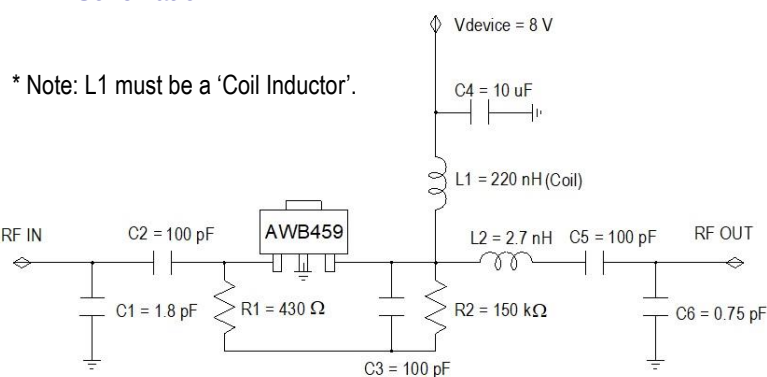
APPLICATION CIRCUIT

Wide Band
1000 ~ 2000 MHz
+8 V

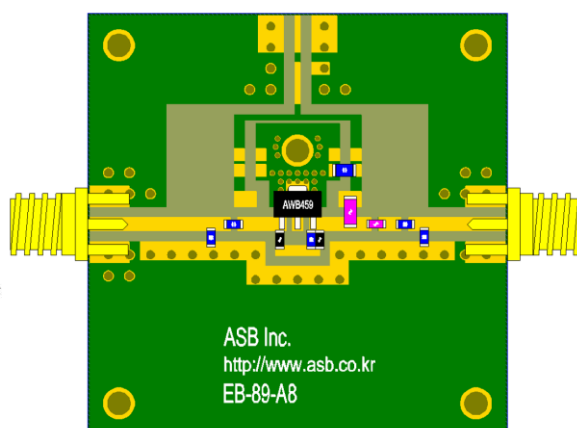
Frequency (MHz)	1000	1500	2000
Magnitude S21 (dB)	20.2	21.0	22.5
Magnitude S11 (dB)	-8	-9	-8
Magnitude S22 (dB)	-12	-11	-13
Output P1dB (dBm)	27.5	27.0	23.5
Output IP3 ¹⁾ (dBm)	40.5	40.5	37.5
Noise Figure (dB)	1.4	1.6	1.8
Device Voltage (V)	+8		
Current (mA)	200		

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

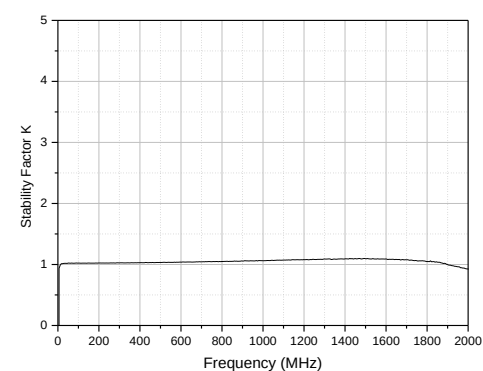
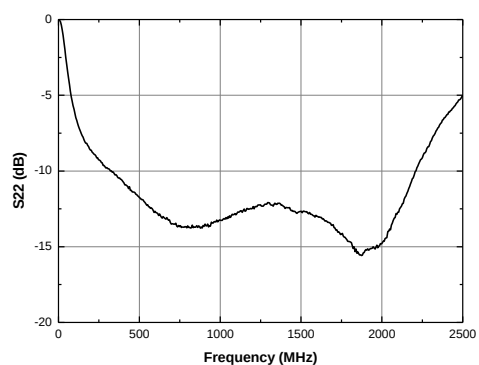
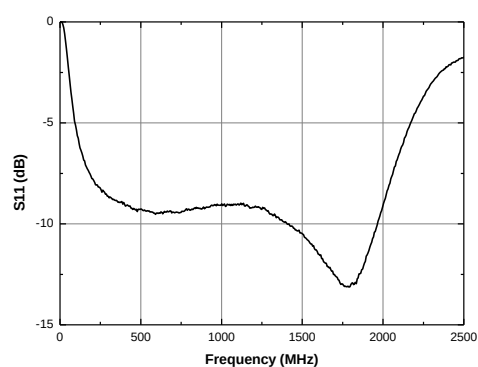
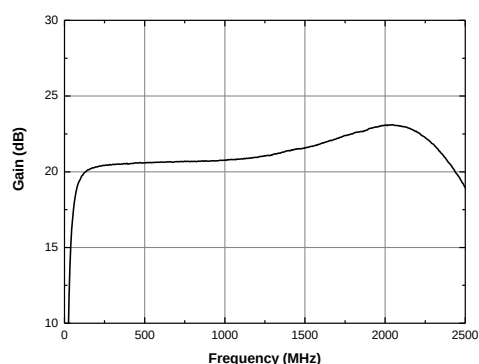
Schematic



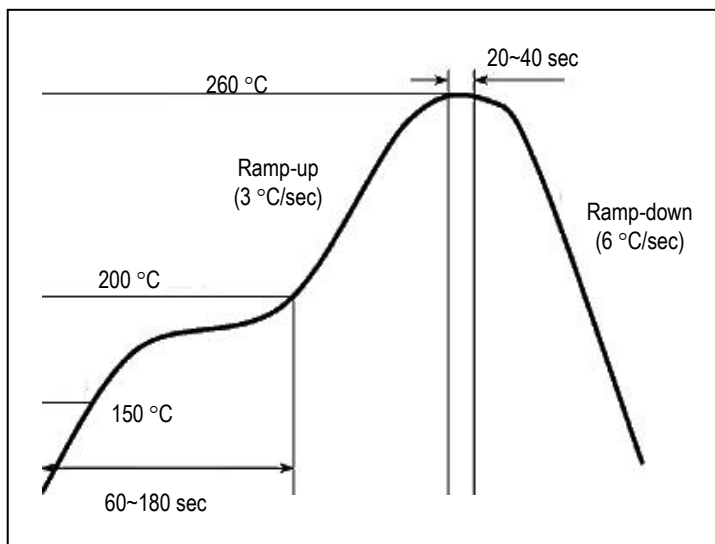
Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



Recommended Soldering Reflow Profile



Copyright ©2013-2019 ASB Inc. All rights reserved. Datasheet subject to change without notice. ASB assumes no responsibility for any errors which may appear in this datasheet. No part of the datasheet may be copied or reproduced in any form or by any means without the prior written consent of ASB.