

Features

- 16 dB Gain at 900 MHz
- 21 dBm P1dB at 900 MHz
- 44 dBm Output IP3 at 900 MHz
- 1.9 dB NF at 900 MHz
- MTTF > 100 Years
- Single Supply

Description

The ASW314, a power amplifier MMIC, has a high linearity, high gain, and high efficiency over a wide range of frequency, being suitable for use in both receiver and transmitter of telecommunication systems up to 3 GHz. 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 °C, Z₀ = 50 Ω)

Parameters	Units	Typical				
Frequency	MHz	5	150	900	1950	2700
Gain	dB	13.7	16.2	16.0	14.5	14.5
S11	dB	-13	-13	-20	-13	-18
S22	dB	-12	-13	-15	-13	-11
Output IP3	dBm	40 ¹⁾	41 ¹⁾	44 ²⁾	43 ²⁾	38 ³⁾
Noise Figure	dB	2.9	1.7	1.9	3.0	3.1
Output P1dB	dBm	20.0	22.0	21.0	23.0	20.5
Current	mA	105	105	105	105	105
Device Voltage	V	+5	+5	+5	+5	+5

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 +7 dBm/tone separated by 1 MHz.

3) OIP3 is measured with two tones at an output power of +4 dBm/tone separated by 1 MHz.

Product Specifications

Parameters	Units	Min	Typ.	Max
Testing Frequency	MHz		900	
Gain	dB	15.0	16.0	
S11	dB		-20	
S22	dB		-15	
Output IP3	dBm	41	44	
Noise Figure	dB		1.9	2.2
Output P1dB	dBm	20	21	
Current	mA	85	105	125
Device Voltage	V		+5	

Absolute Maximum Ratings, T_A = +25 °C

Parameters	Rating
Operating Case Temperature	-40 to +85 °C
Storage Temperature	-40 to +150 °C
Device Voltage	+6 V
Operating Junction Temperature	+150 °C
Input RF Power (CW, 50 Ω matched as in 900 MHz application circuit)*	+23 dBm
Thermal Resistance	60 °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.

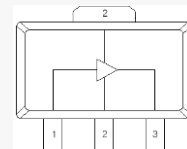


Package Style: SOT89

Application Circuit

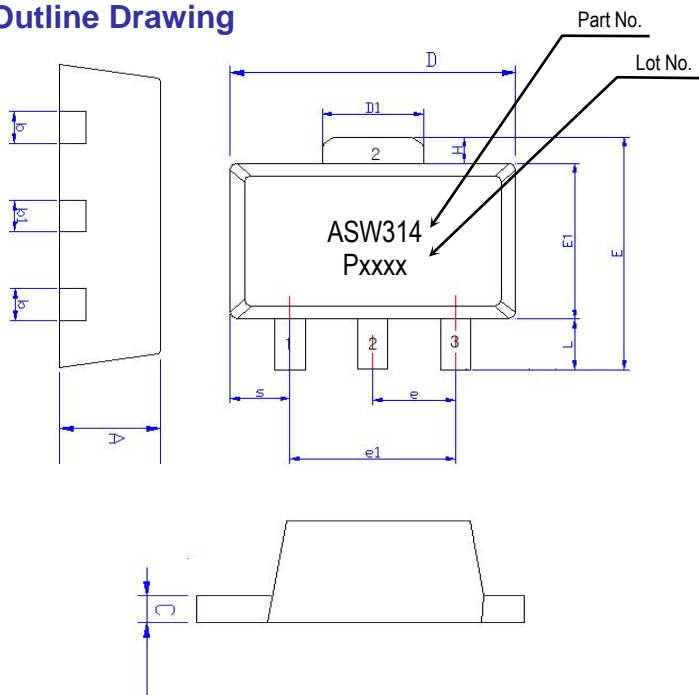
- IF (80 ~ 450 MHz)
- 170 ~ 794 MHz
- LTE (698 ~ 787 MHz)
- CMMB
- 900 MHz
- LTE (1745 ~ 1860 MHz)
- 1880 ~ 2025 MHz
- 1950 MHz
- 2300 ~ 2400 MHz
- 2400 MHz
- 2700 MHz
- 800 ~ 1500 MHz
(MoCA, 50 Ω)
- 900 ~ 2200 MHz
(SMATV, 50 Ω)
- 20 ~ 3000 MHz
- 500~ 3000 MHz
- 5 ~ 1000 MHz

Pin Configuration



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

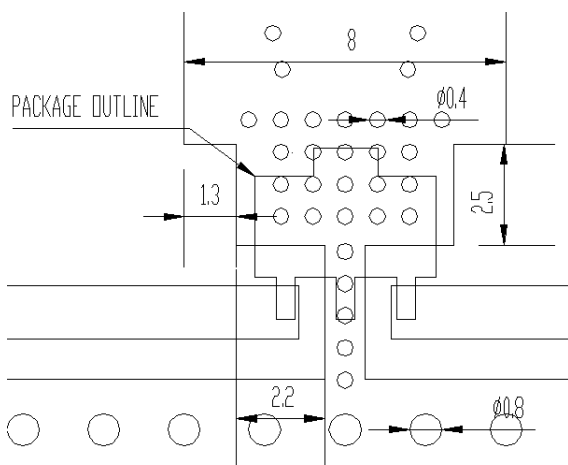
Outline Drawing



Symbols	Dimensions (In mm)		
	MIN	NOM	MAX
A	1.40	1.50	1.60
L	0.89	1.04	1.20
b	0.36	0.42	0.48
b1	0.41	0.47	0.53
C	0.38	0.40	0.43
D	4.40	4.50	4.60
D1	1.40	1.60	1.75
E	3.64	---	4.25
E1	2.40	2.50	2.60
e1	2.90	3.00	3.10
H	0.35	0.40	0.45
S	0.65	0.75	0.85
e	1.40	1.50	1.60

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

Mounting Recommendation (In mm)



- Note:**
1. The number and size of ground via holes in a circuit board is critical for thermal and RF grounding considerations.
 2. We recommend that the ground via holes be placed on the bottom of the lead pin 2 and exposed pad of the device for better RF and thermal performance, as shown in the drawing at the left side.

ESD Classification & Moisture Sensitivity Level

ESD Classification

HBM	Class 1A Voltage Level: 400 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

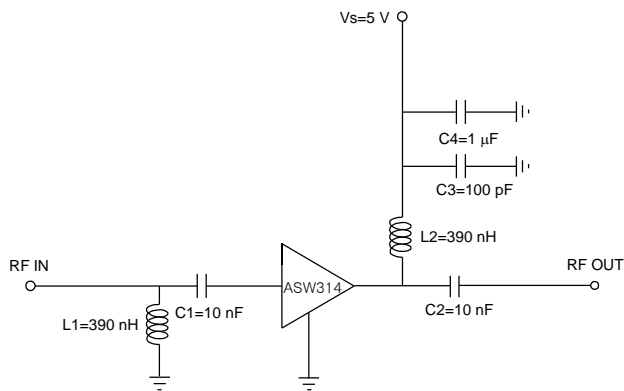
APPLICATION CIRCUIT

IF
 80 ~ 450 MHz
 +5 V

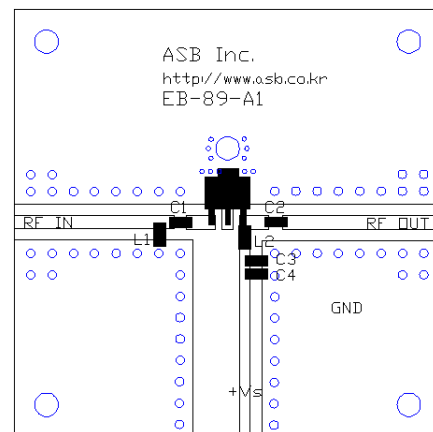
Frequency (MHz)	80	150	350	450
Magnitude S21 (dB)	16.7	16.2	16.0	15.9
Magnitude S11 (dB)	-12	-13	-12	-12
Magnitude S22 (dB)	-12	-13	-12	-12
Output P1dB (dBm)	22	22	22	22
Output IP3 ¹⁾ (dBm)	41	40	40	42
Noise Figure (dB)	1.7	1.7	1.9	2.0
Device Voltage (V)	+5	+5	+5	+5
Current (mA)	105	105	105	105

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

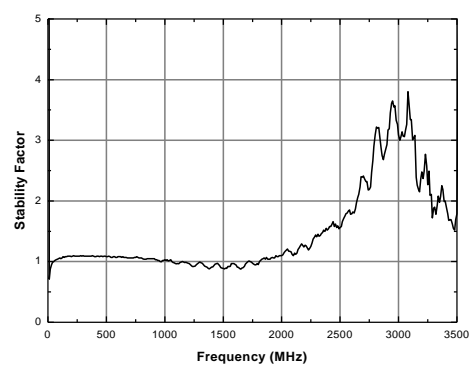
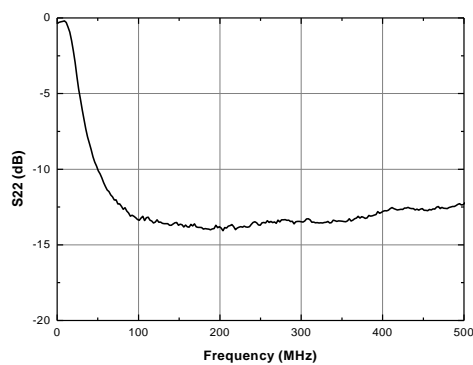
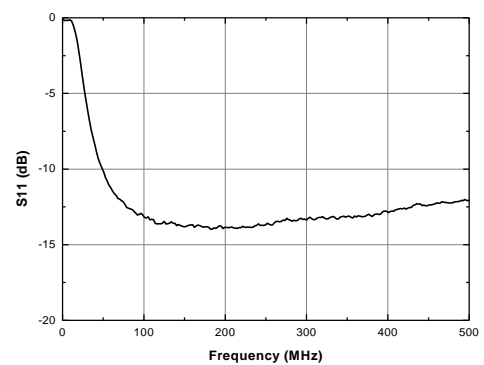
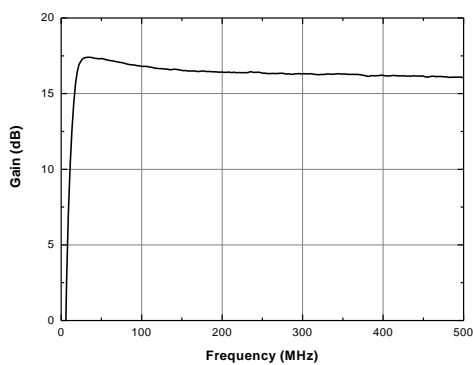
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

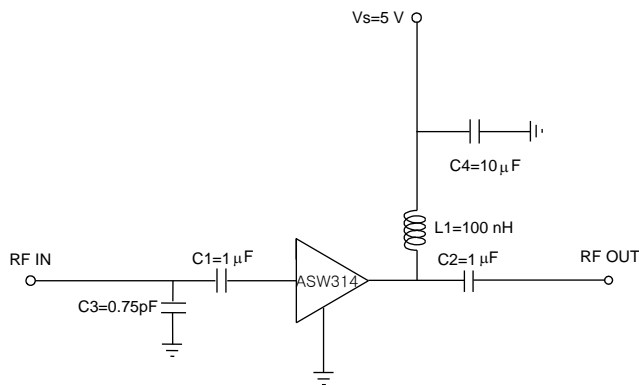
170 ~ 794 MHz

+5 V

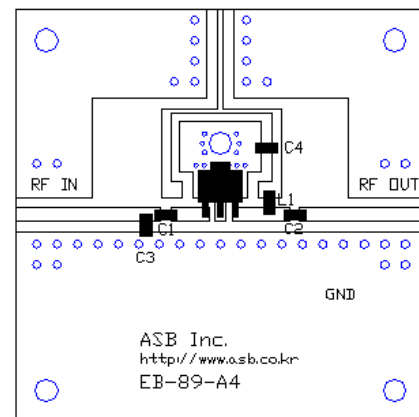
Frequency (MHz)	170	794
Magnitude S21 (dB)	16.1	15.8
Magnitude S11 (dB)	-9	-9
Magnitude S22 (dB)	-10	-10
Output P1dB (dBm)	21.5	21.5
Output IP3 ¹⁾ (dBm)	42.5	41.5
Noise Figure (dB)	1.6	1.8
Device Voltage (V)	+5	+5
Current (mA)	105	105

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

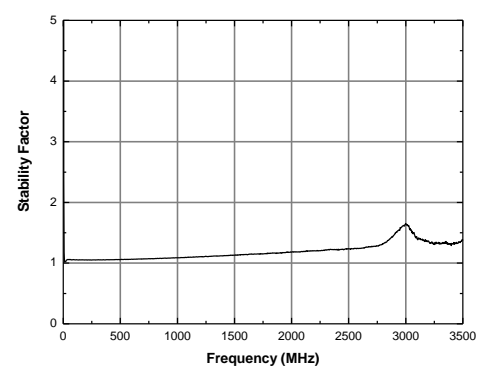
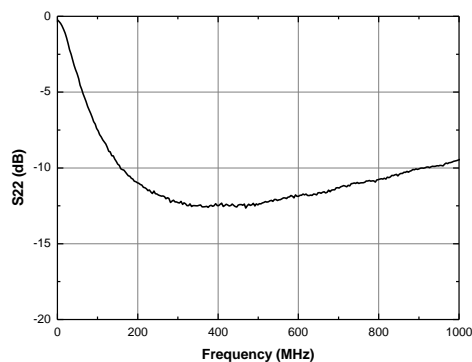
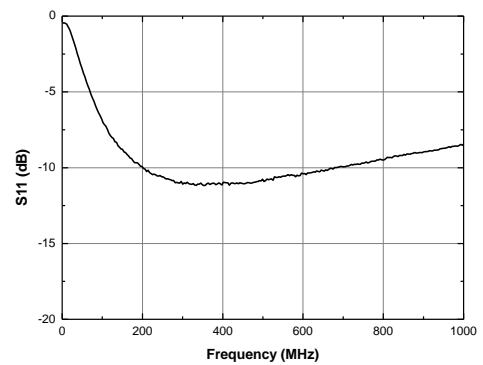
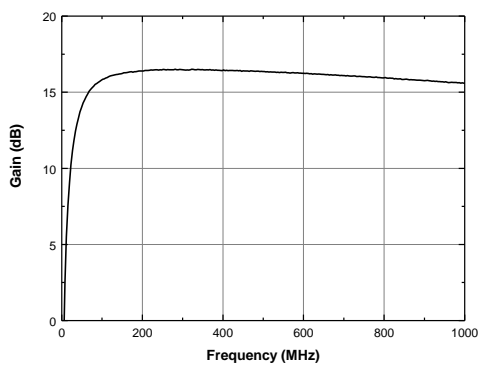
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



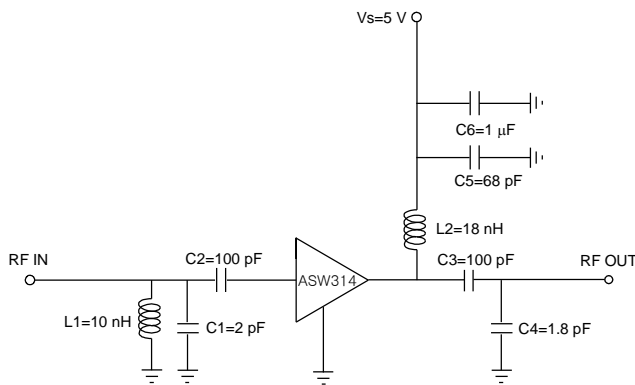
APPLICATION CIRCUIT

LTE
 698 ~ 787 MHz
 +5 V

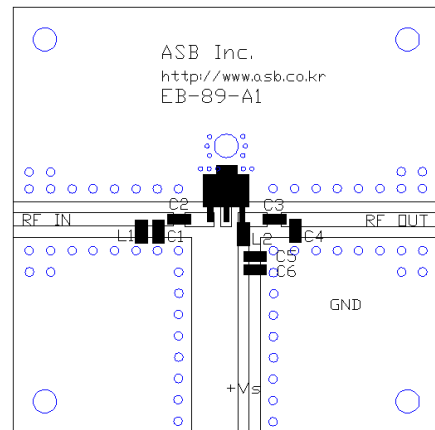
Frequency (MHz)	698 ~ 787
Magnitude S21 (dB)	16.0
Magnitude S11 (dB)	-15
Magnitude S22 (dB)	-18
Output P1dB (dBm)	21.5
Output IP3 ¹⁾ (dBm)	43.5
Noise Figure (dB)	2.0
Device Voltage (V)	+5
Current (mA)	105

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

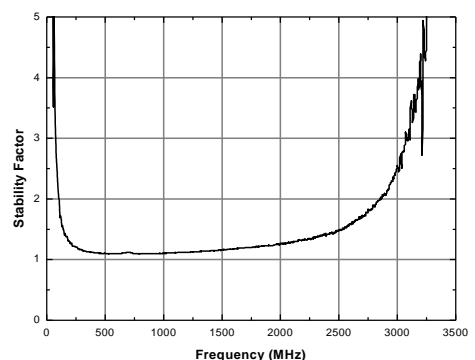
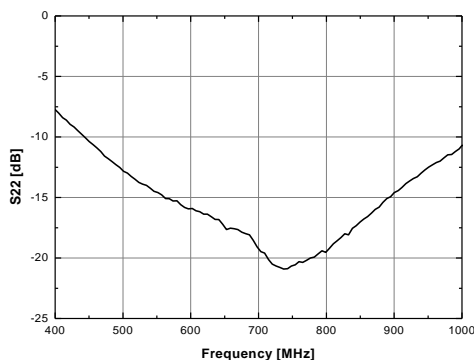
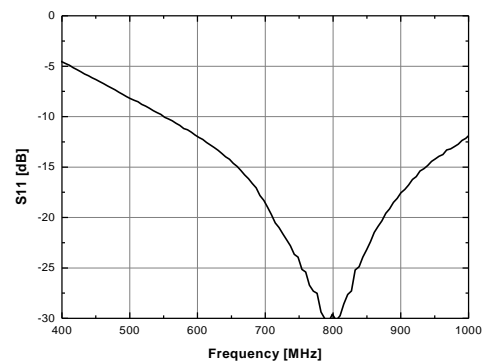
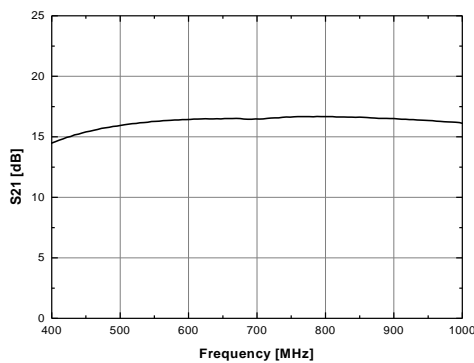
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

CMMB

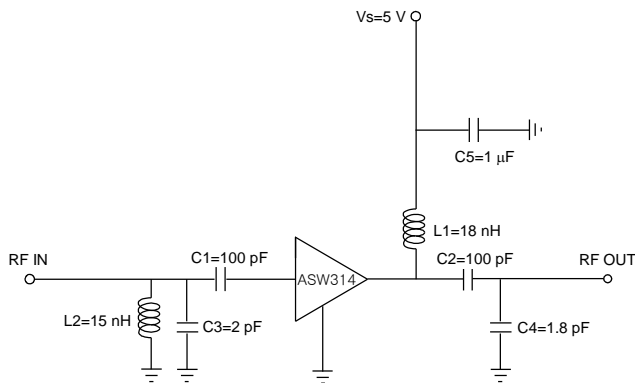
470 ~ 860 MHz

+5 V

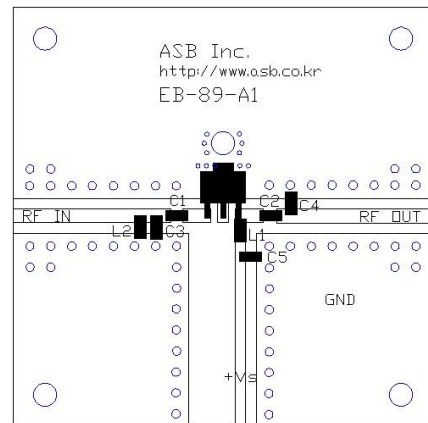
Frequency (MHz)	470	860
Magnitude S21 (dB)	16.0	16.0
Magnitude S11 (dB)	-12	-11
Magnitude S22 (dB)	-13	-11
Output P1dB (dBm)	22.0	21.5
Output IP3 ¹⁾ (dBm)	42.5	43.0
Noise Figure (dB)	2.2	1.8
Device Voltage (V)	+5	+5
Current (mA)	105	105

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

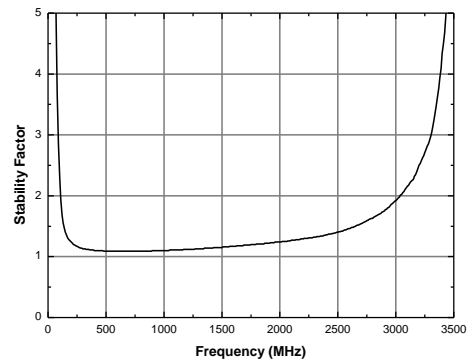
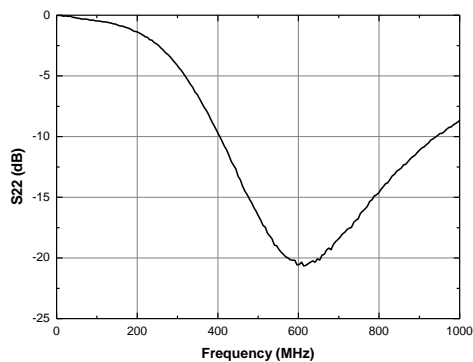
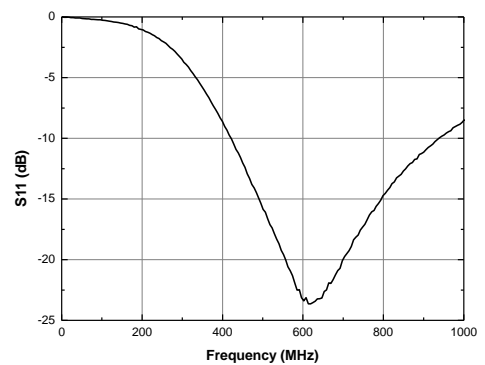
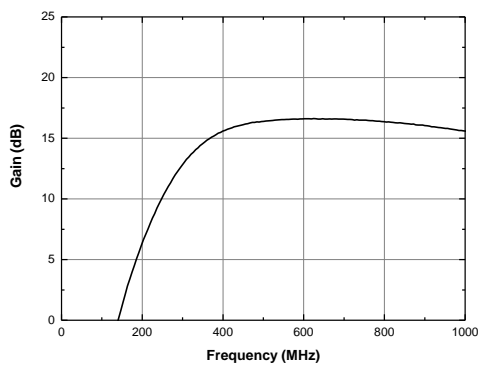
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

GSM / CDMA

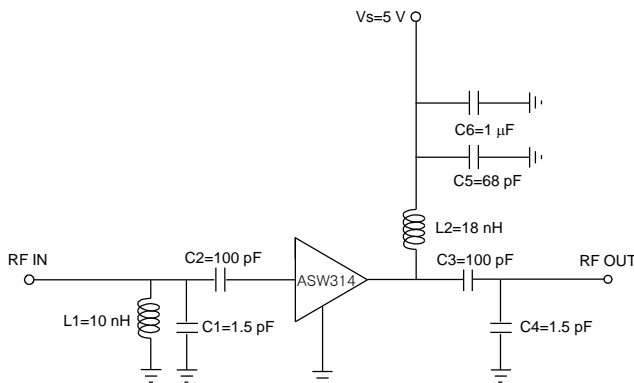
900 MHz

+5 V

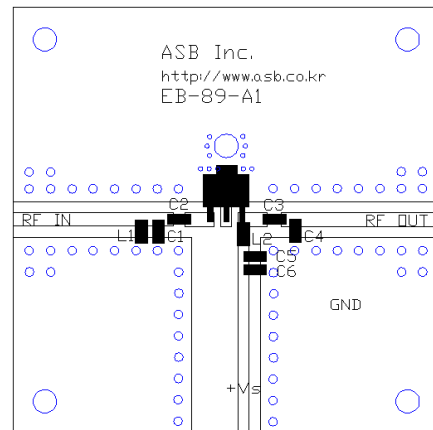
Frequency (MHz)	900
Magnitude S21 (dB)	16.0
Magnitude S11 (dB)	-20
Magnitude S22 (dB)	-15
Output P1dB (dBm)	21
Output IP3 ¹⁾ (dBm)	44
Noise Figure (dB)	1.9
Device Voltage (V)	+5
Current (mA)	105

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

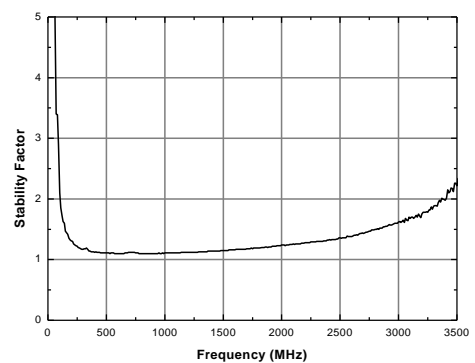
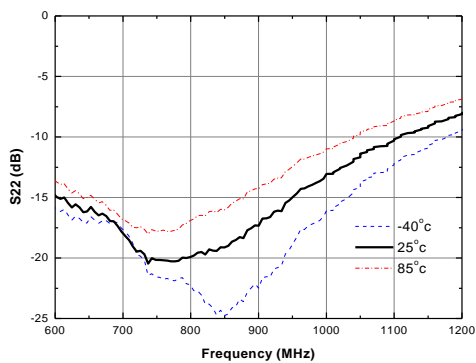
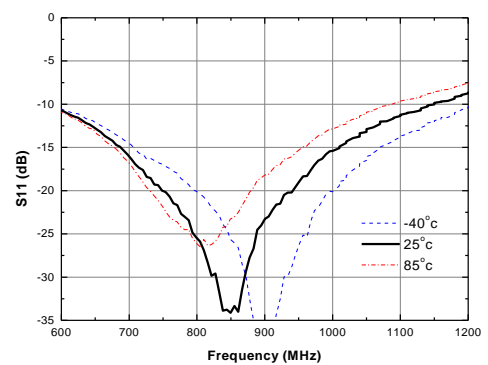
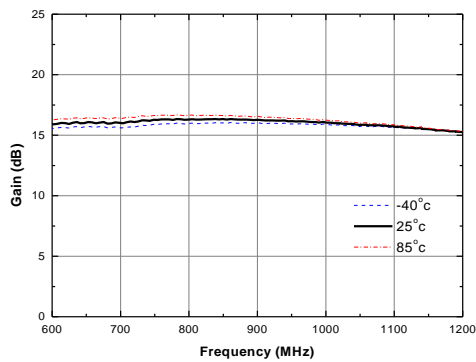
Schematic



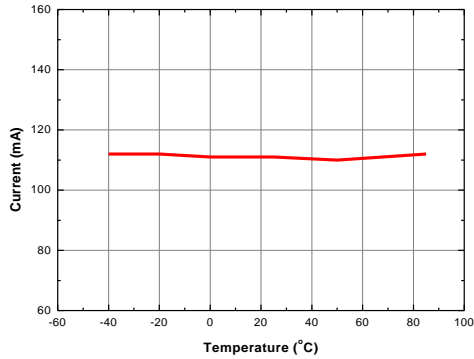
Board Layout (FR4, 40x40 mm², 0.8T)



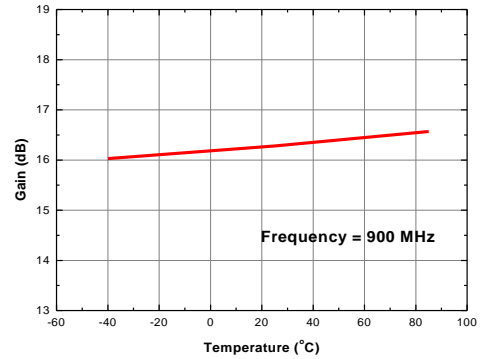
S-parameters & K-factor



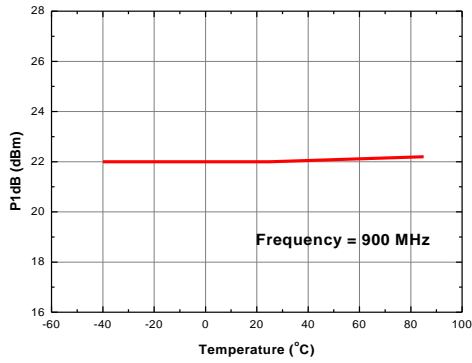
Current vs. Temperature



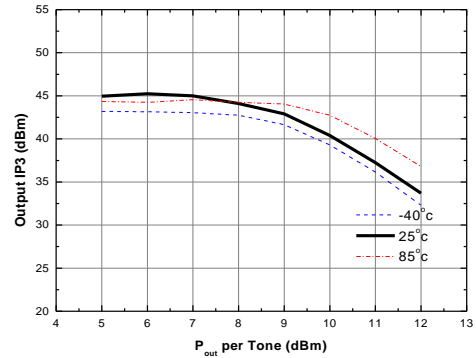
Gain vs. Temperature



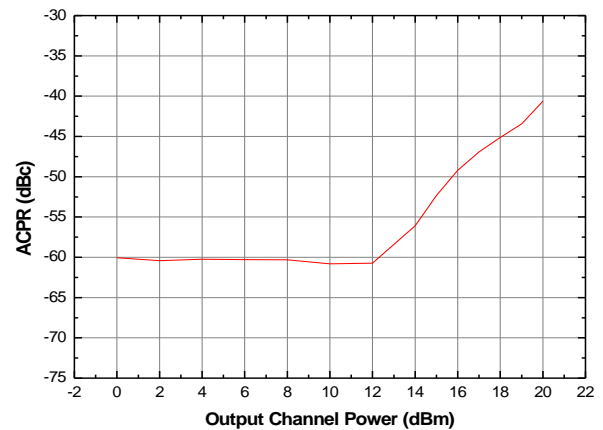
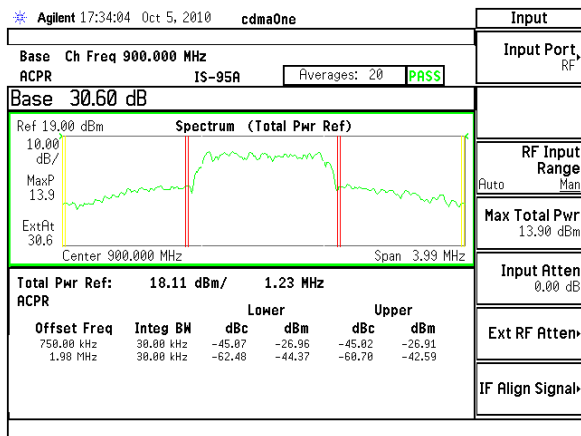
P1dB vs. Temperature



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



CDMA ACPR – 1FA



* Test Source : IS-95, 9 ch. Forward 30 kHz Meas BW, 900 MHz / 750 kHz offset

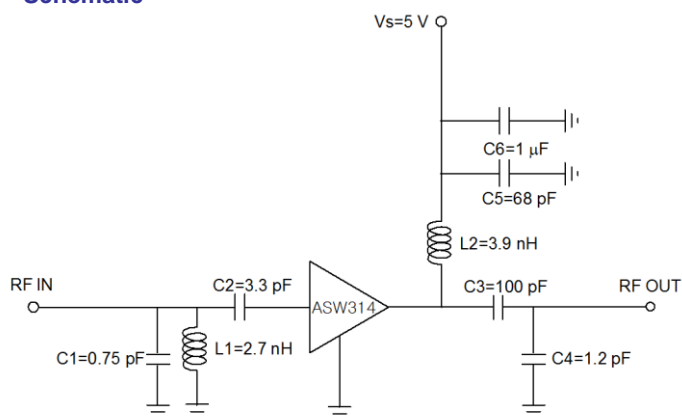
APPLICATION CIRCUIT

LTE
1745 ~ 1860 MHz
+5 V

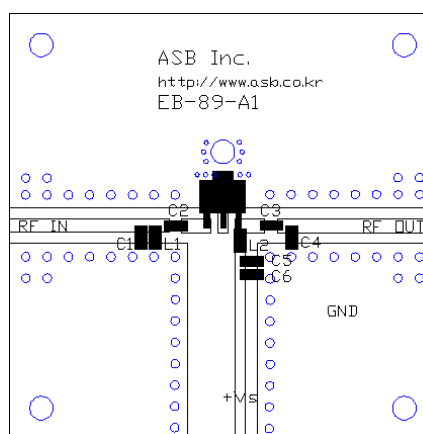
Frequency (MHz)	1745	1860
Magnitude S21 (dB)	14.7	14.7
Magnitude S11 (dB)	-14	-14
Magnitude S22 (dB)	-14	-14
Output P1dB (dBm)	22	22
Output IP3 ¹⁾ (dBm)	41	40
Noise Figure (dB)	2.8	2.7
Device Voltage (V)	+5	+5
Current (mA)	105	105

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

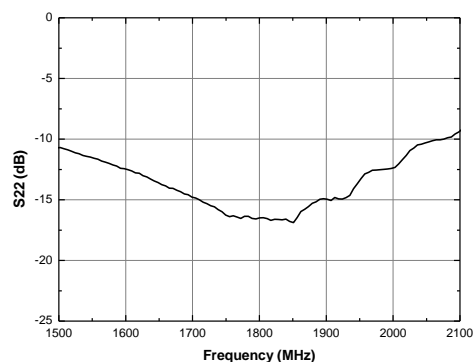
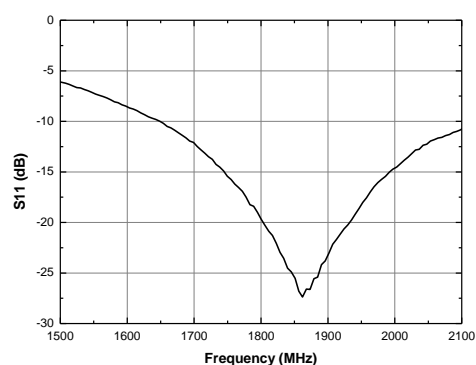
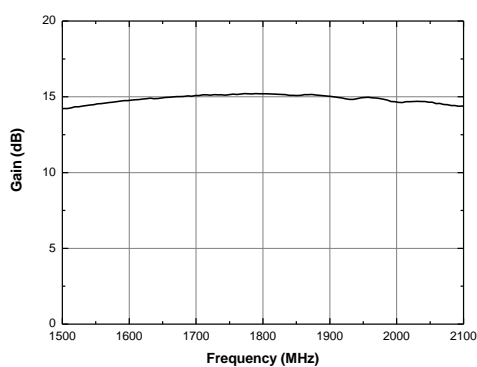
Schematic



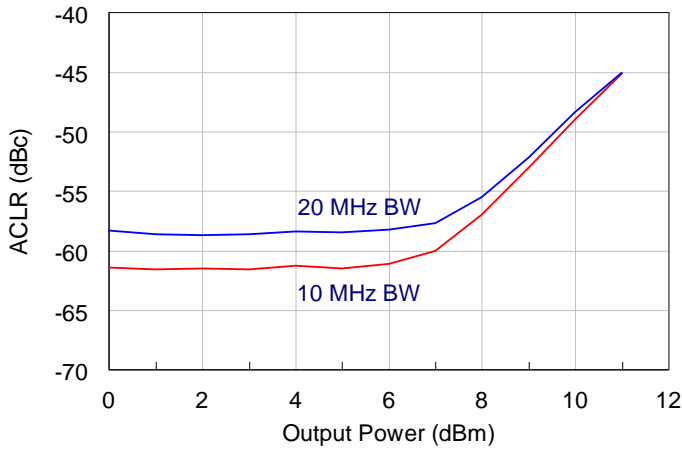
Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor

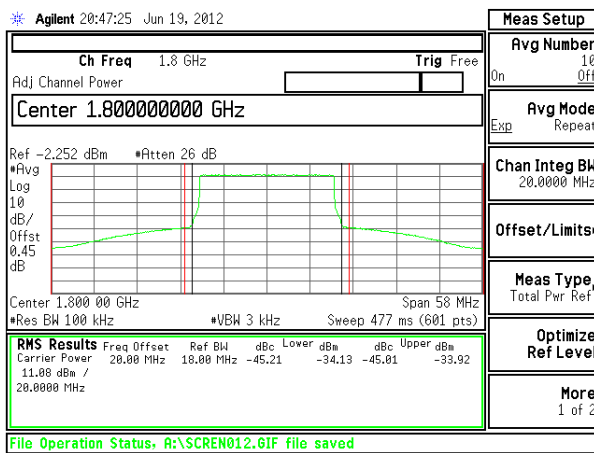


LTE ACLR – 10 MHz & 20 MHz



1) Test Source : LTE_FDD_test model 3.1, BW: 10 MHz & 20 MHz, Test Frequency: 1.8 GHz

LTE ACLR – 20 MHz



2) Test Source : LTE_FDD_test model 3.1, BW: 20 MHz, Test Frequency: 1.8 GHz

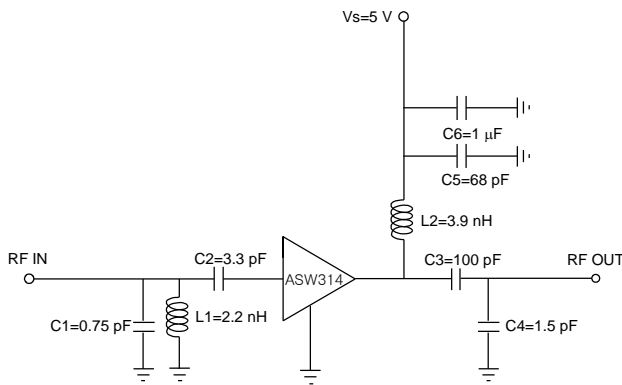
APPLICATION CIRCUIT

PCS
1880 ~ 2025 MHz
+5 V

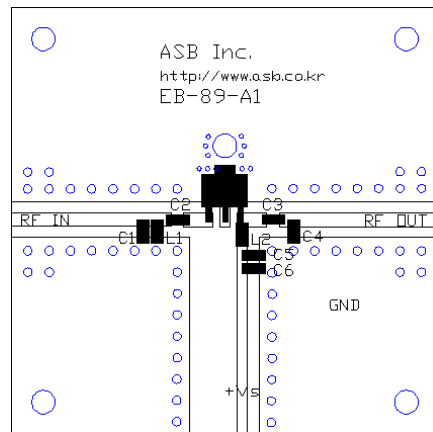
Frequency (MHz)	1880 ~ 2025
Magnitude S21 (dB)	14.0
Magnitude S11 (dB)	-13
Magnitude S22 (dB)	-13
Output P1dB (dBm)	23
Output IP3 ¹⁾ (dBm)	42
Noise Figure (dB)	3.0
Device Voltage (V)	+5
Current (mA)	105

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

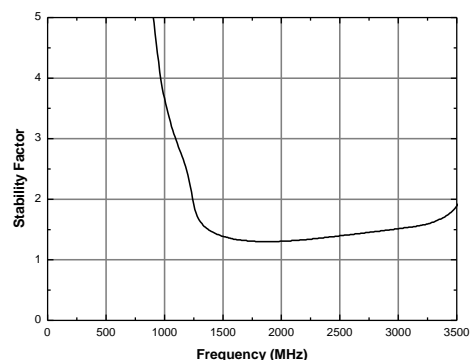
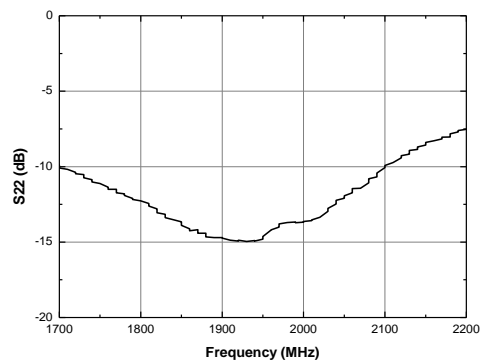
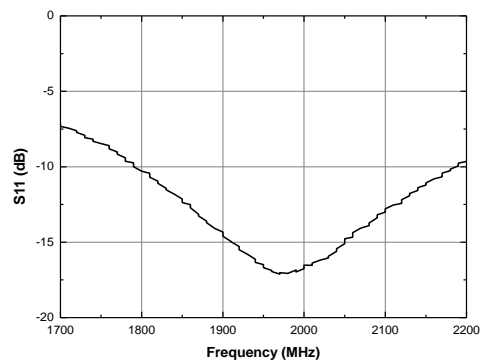
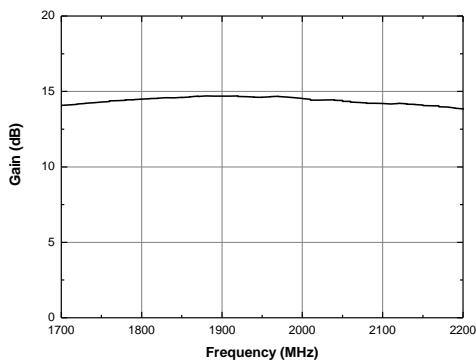
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



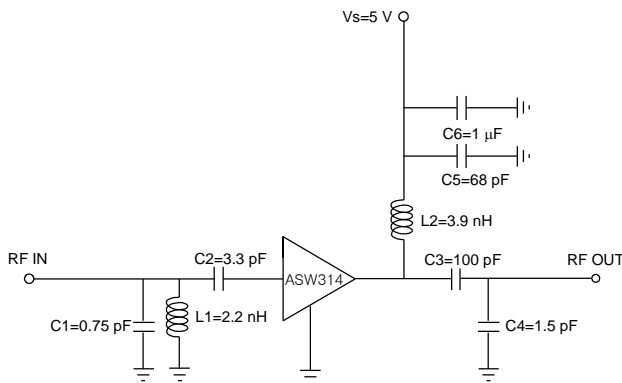
APPLICATION CIRCUIT

WCDMA
1950 MHz
+5 V

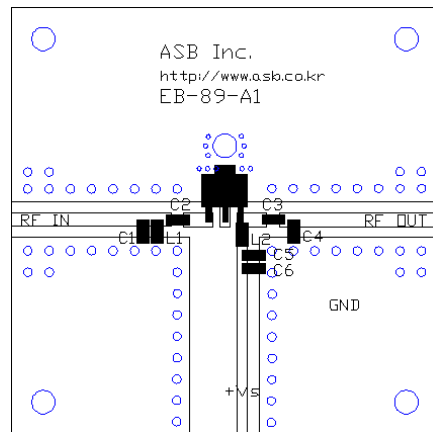
Frequency (MHz)	1950
Magnitude S21 (dB)	14.5
Magnitude S11 (dB)	-13
Magnitude S22 (dB)	-13
Output P1dB (dBm)	23
Output IP3 ¹⁾ (dBm)	43
Noise Figure (dB)	3.0
Device Voltage (V)	+5
Current (mA)	105

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

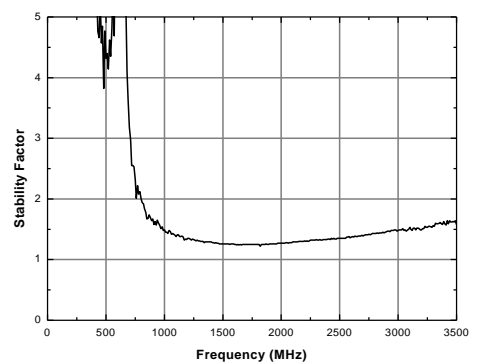
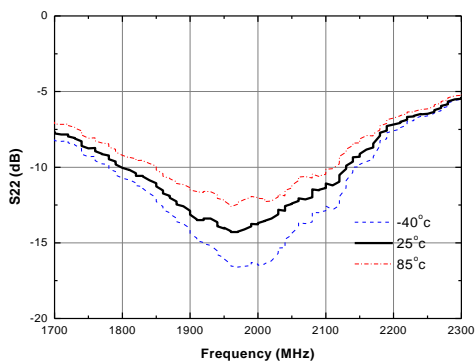
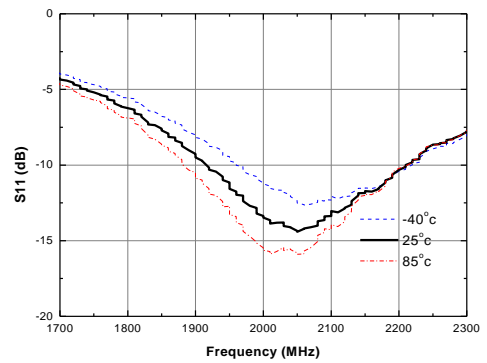
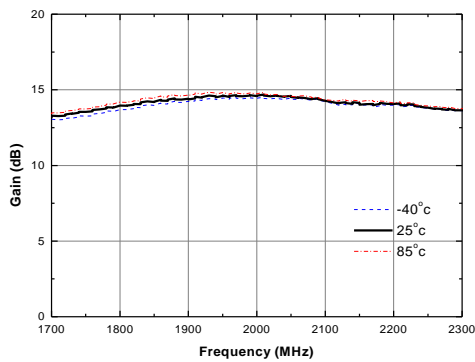
Schematic



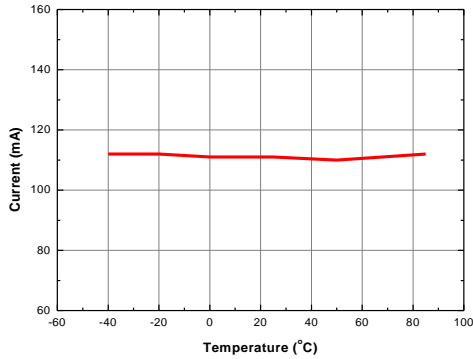
Board Layout (FR4, 40x40 mm², 0.8T)



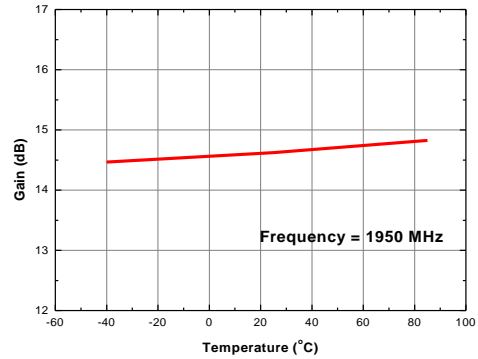
S-parameters & K-factor



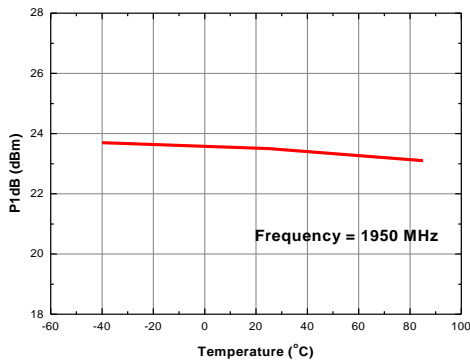
Current vs. Temperature



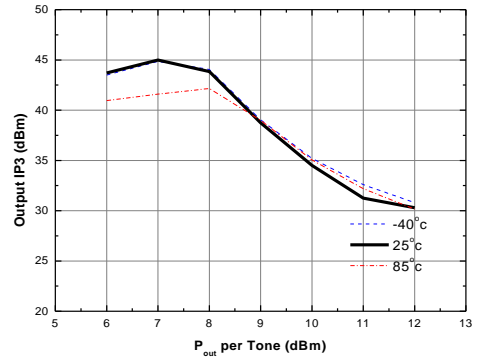
Gain vs. Temperature



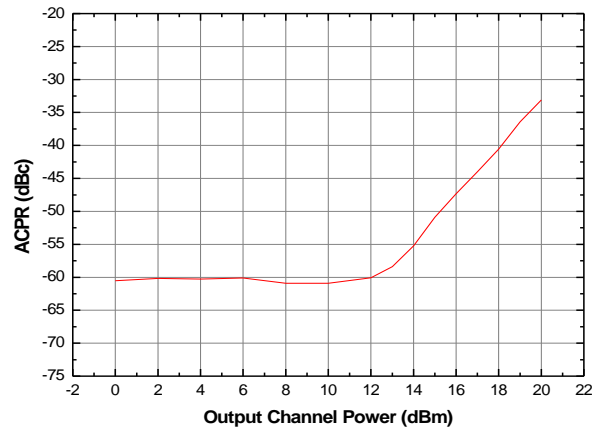
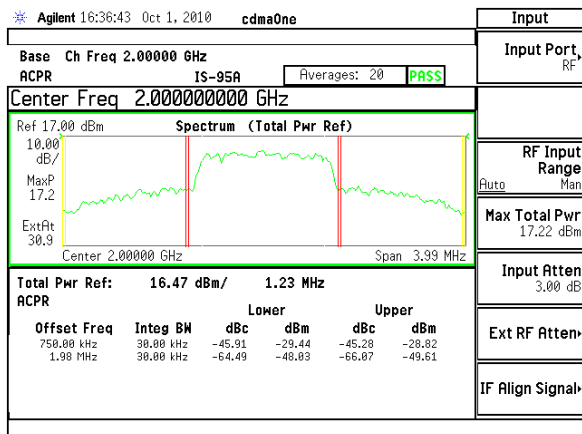
P1dB vs. Temperature



Output IP3 vs. Tone Power (Frequency = 1950 MHz)



WCDMA ACPR – 1FA



* Test Source : IS-95, 9 ch. Forward 30 kHz Meas BW, 2000 MHz / 750 kHz offset

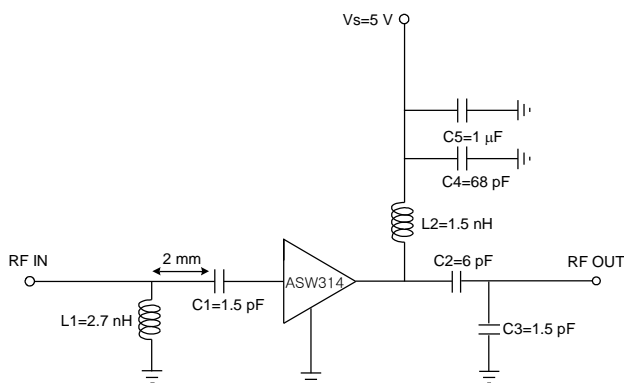
APPLICATION CIRCUIT

WLAN
2300 ~ 2400 MHz
+5 V

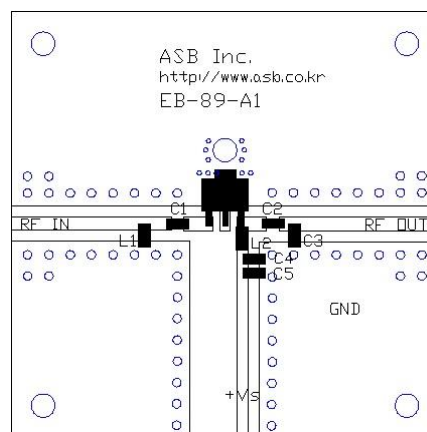
Frequency (MHz)	2300	2400
Magnitude S21 (dB)	14.4	14.5
Magnitude S11 (dB)	-18	-18
Magnitude S22 (dB)	-18	-15
Output P1dB (dBm)	21.5	21.5
Output IP3 ¹⁾ (dBm)	41.0	40.5
Noise Figure (dB)	2.6	2.6
Device Voltage (V)	+5	+5
Current (mA)	105	105

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

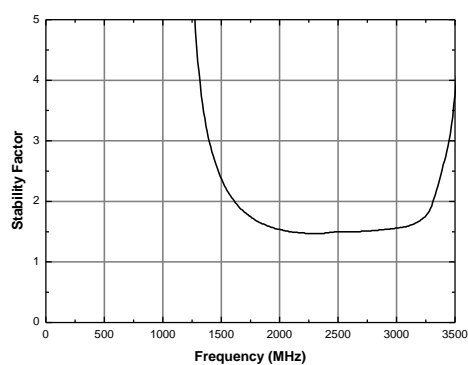
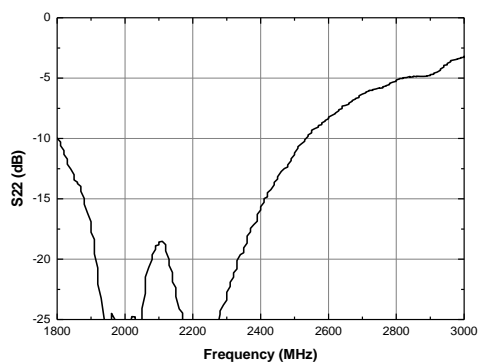
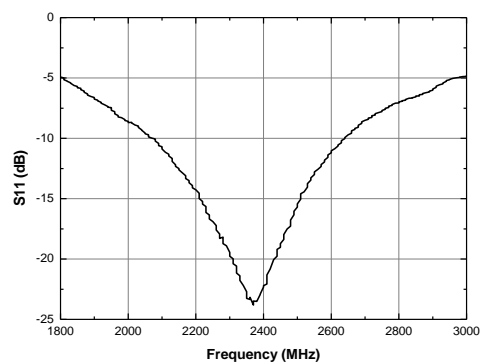
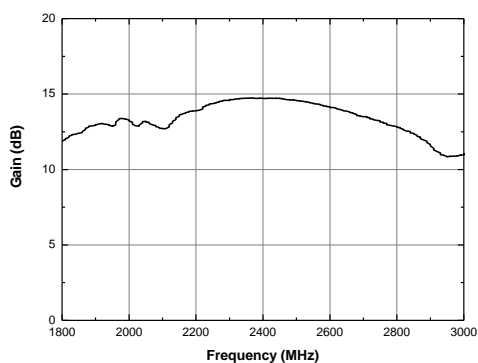
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



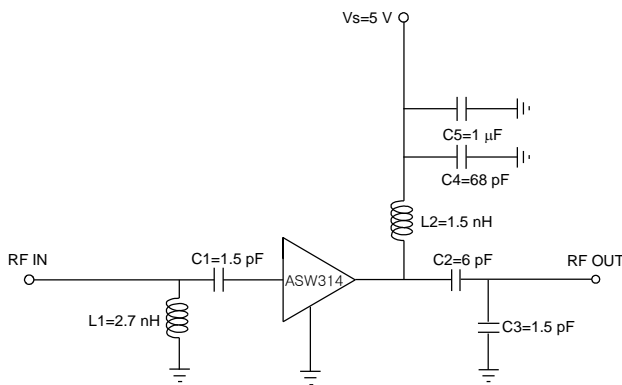
APPLICATION CIRCUIT

WLAN
2400 MHz
+5 V

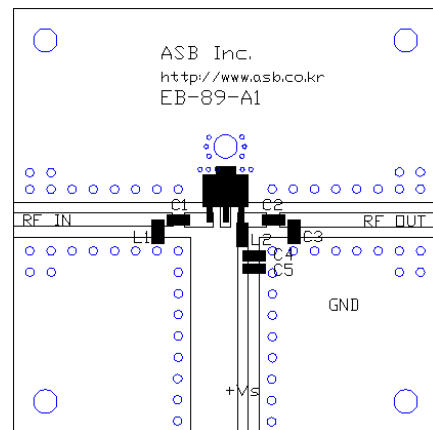
Frequency (MHz)	2400
Magnitude S21 (dB)	14.5
Magnitude S11 (dB)	-15
Magnitude S22 (dB)	-15
Output P1dB (dBm)	21.5
Output IP3 ¹⁾ (dBm)	40
Noise Figure (dB)	2.6
Device Voltage (V)	+5
Current (mA)	105

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

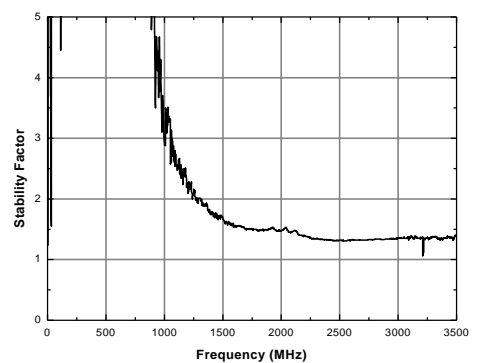
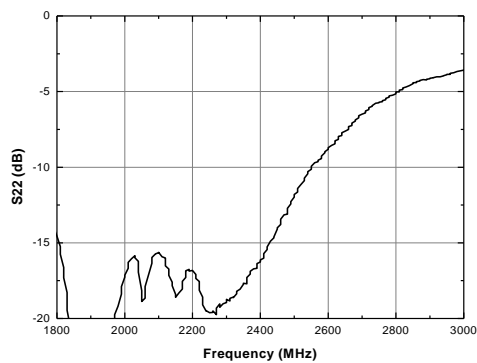
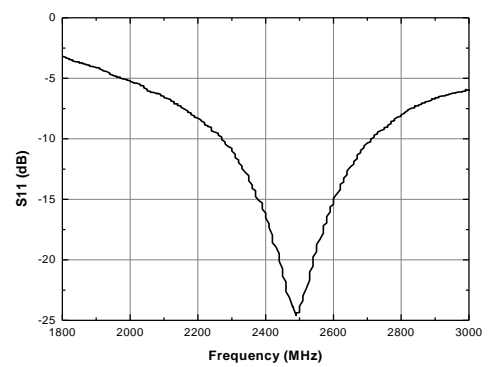
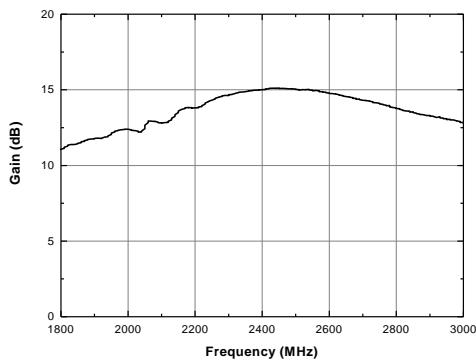
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



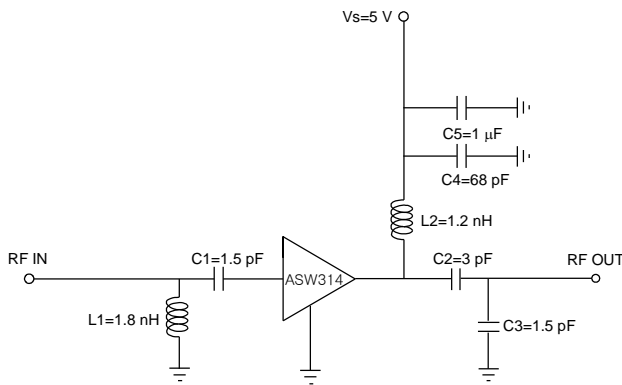
APPLICATION CIRCUIT

LTE
2700 MHz
+5 V

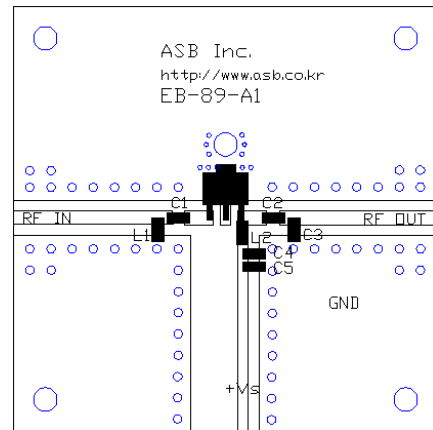
Frequency (MHz)	2700
Magnitude S21 (dB)	14.5
Magnitude S11 (dB)	-18
Magnitude S22 (dB)	-11
Output P1dB (dBm)	20.5
Output IP3 ¹⁾ (dBm)	38
Noise Figure (dB)	3.1
Device Voltage (V)	+5
Current (mA)	105

1) OIP3 is measured with two tones at an output power of +4 dBm/tone separated by 1 MHz.

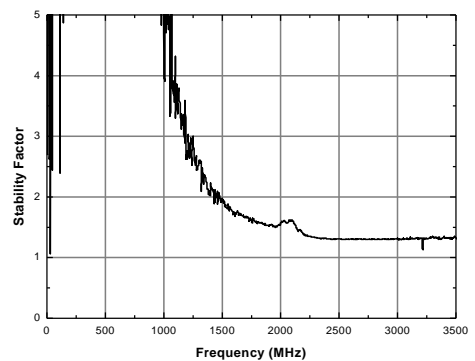
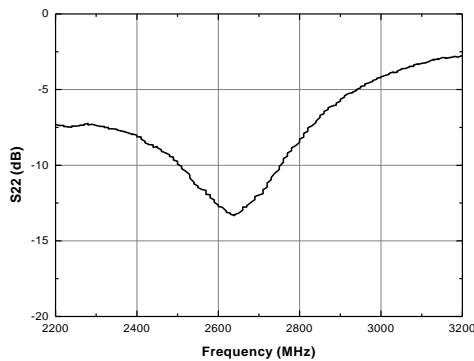
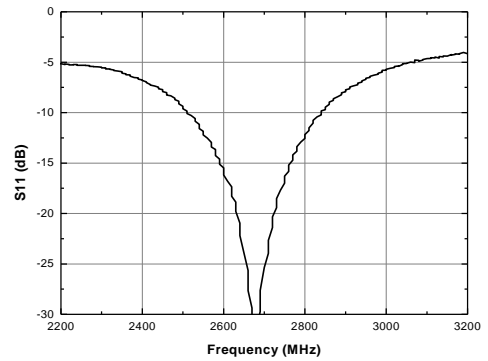
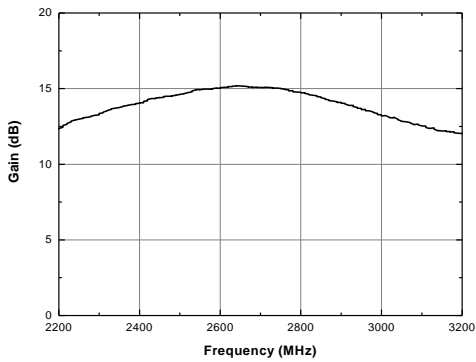
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



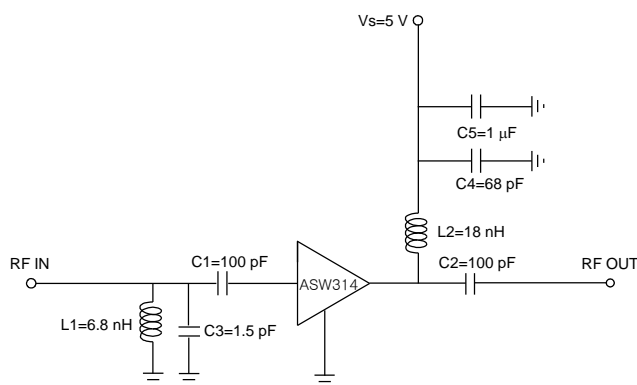
APPLICATION CIRCUIT

MoCA
800 ~ 1500 MHz
+5 V, 50 Ω

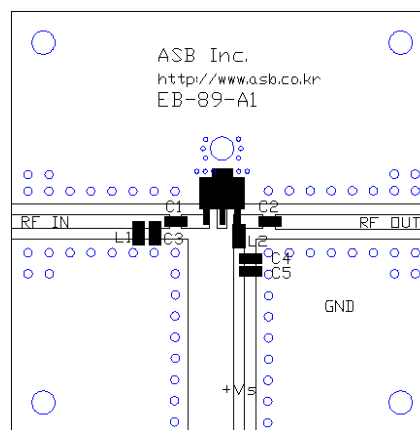
Frequency (MHz)	800	1200	1500
Magnitude S21 (dB)	15.5	15.5	15.1
Magnitude S11 (dB)	-12	-17	-12
Magnitude S22 (dB)	-18	-18	-13
Output P1dB (dBm)	22	22	22
Output IP3 ¹⁾ (dBm)	42	43	42
Noise Figure (dB)	2.4	2.0	2.0
Device Voltage (V)	+5	+5	+5
Current (mA)	105	105	105

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

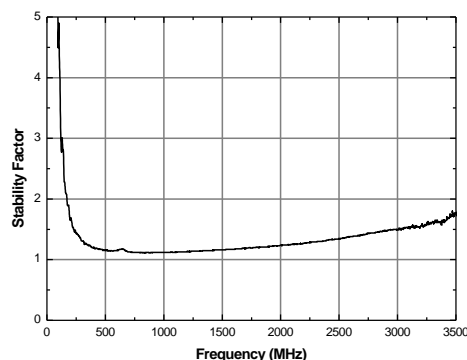
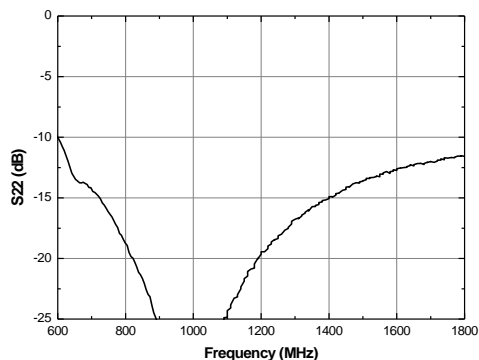
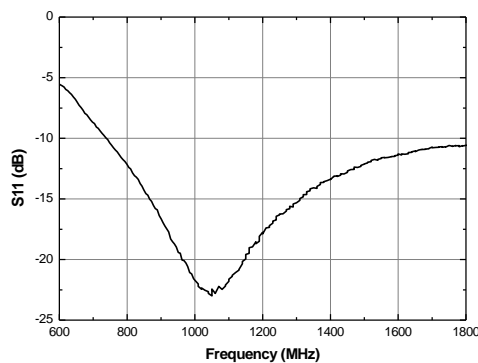
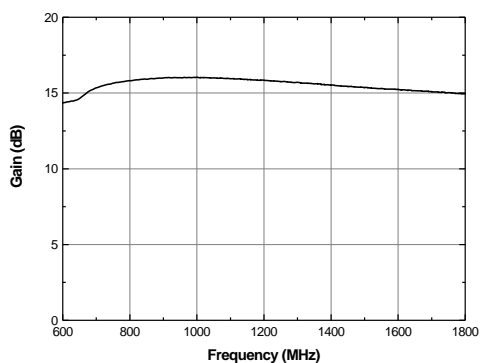
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

SMATV

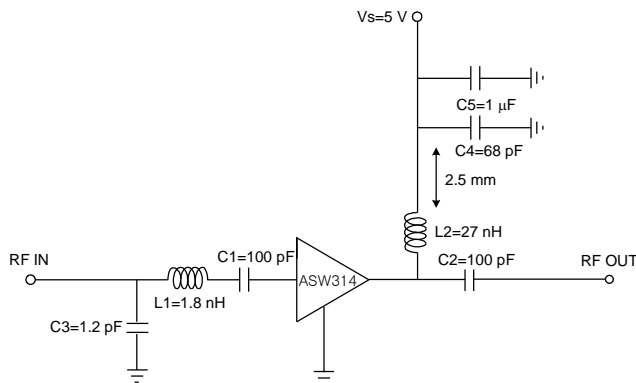
900 ~ 2200 MHz

+5 V, 50 Ω

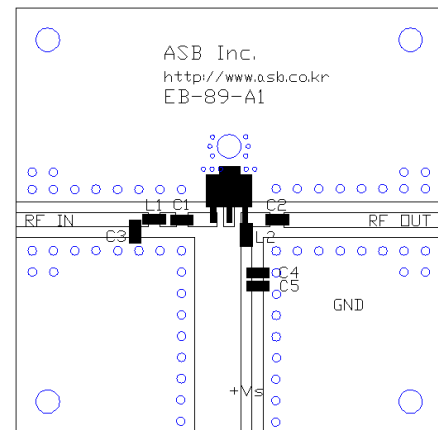
Frequency (MHz)	900	1500	2200
Magnitude S21 (dB)	15.5	15.0	15.0
Magnitude S11 (dB)	-8	-9	-20
Magnitude S22 (dB)	-9	-9	-14
Output P1dB (dBm)	21.5	21.5	18.0
Output IP3 ¹⁾ (dBm)	43.0	41.0	38.5
Noise Figure (dB)	1.9	2.0	2.4
Device Voltage (V)	+5	+5	+5
Current (mA)	105	105	105

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

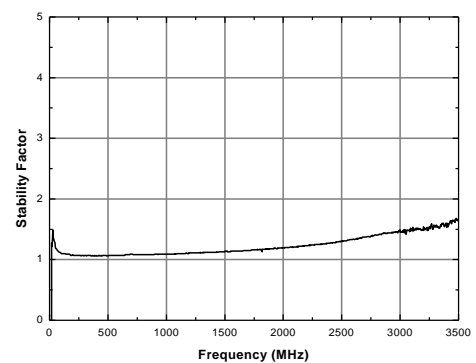
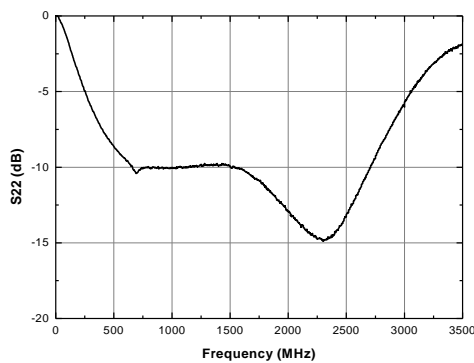
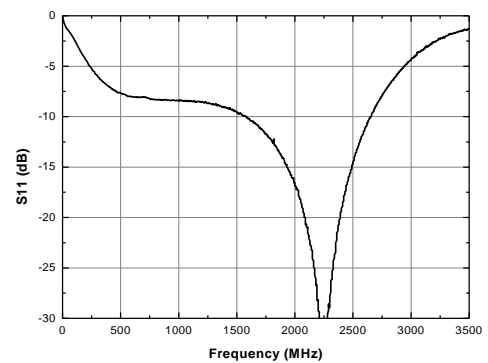
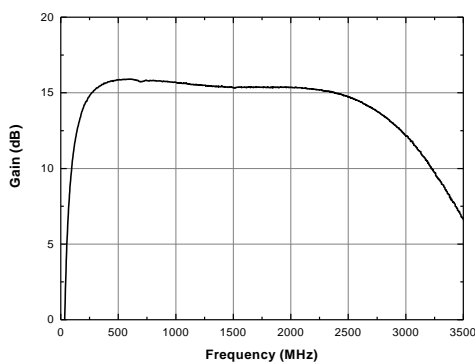
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

ONU & Wideband

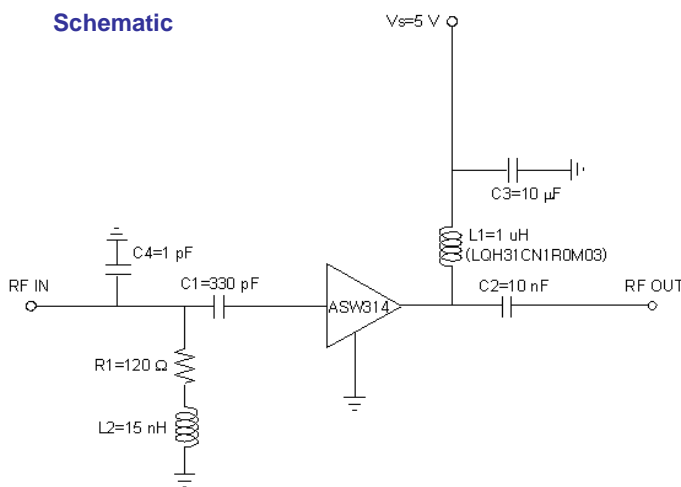
20 ~ 3000 MHz

+5 V

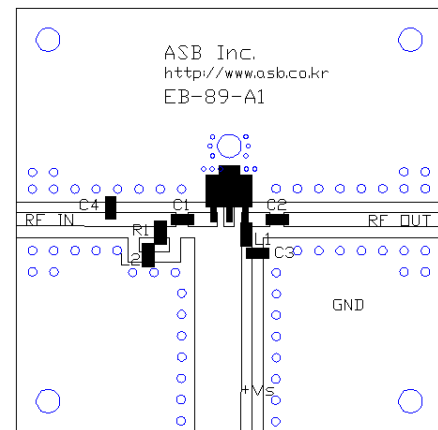
Frequency (MHz)	20	1000	2000	3000
Magnitude S21 (dB)	14.0	14.0	13.5	13.0
Magnitude S11 (dB)	-10.0	-10.0	-7.0	-17.0
Magnitude S22 (dB)	-7.0	-9.0	-6.5	-6.5
Output P1dB (dBm)	21.5	21.5	20.0	18.5
Output IP3 (dBm) ¹⁾	43.0	41.5	39.5	36.0
Noise Figure (dB)	3.4	3.0	2.5	3.4
Device Voltage (V)	+5	+5	+5	+5
Current (mA)	105	105	105	105

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

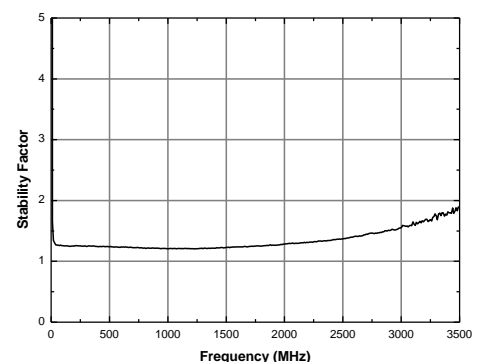
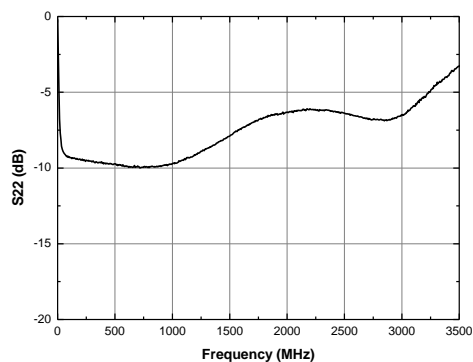
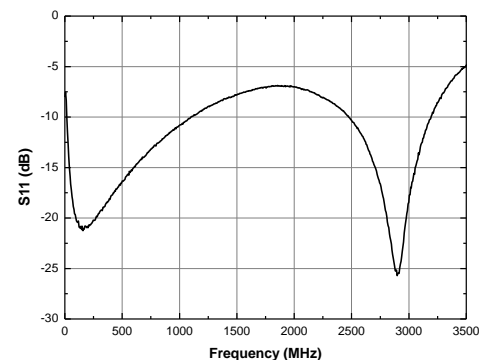
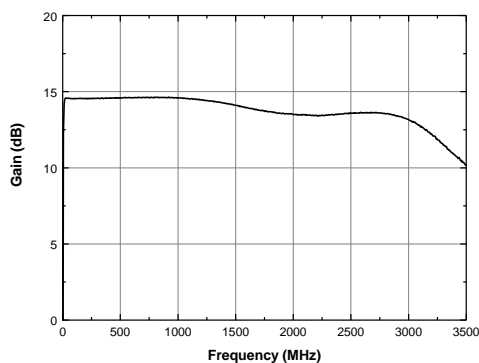
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

SMATV & Wideband

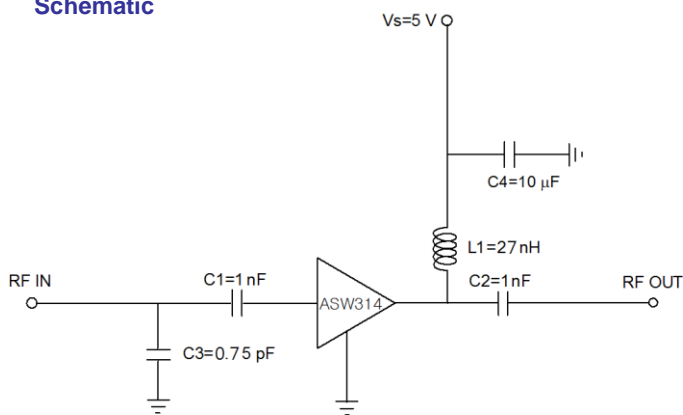
500 ~ 3000 MHz

+5 V

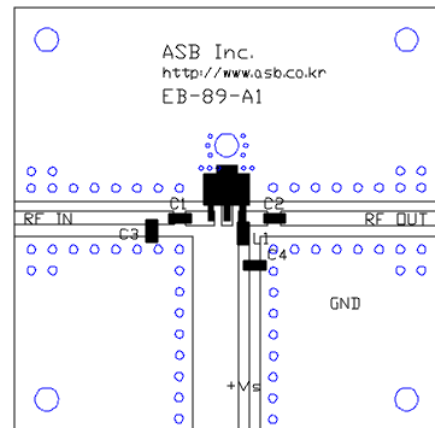
Frequency (MHz)	500	900	2000	3000
Magnitude S21 (dB)	15.0	15.0	13.5	14.0
Magnitude S11 (dB)	-7	-8	-7	-13
Magnitude S22 (dB)	-8	-10	-7	-7
Output P1dB (dBm)	21	21	19	18
Output IP3 (dBm) ¹⁾	45	45	41	36
Noise Figure (dB)	1.9	2.0	2.3	3.1
Device Voltage (V)	+5	+5	+5	+5
Current (mA)	105	105	105	105

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

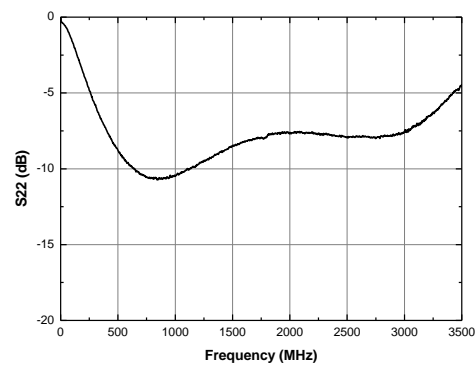
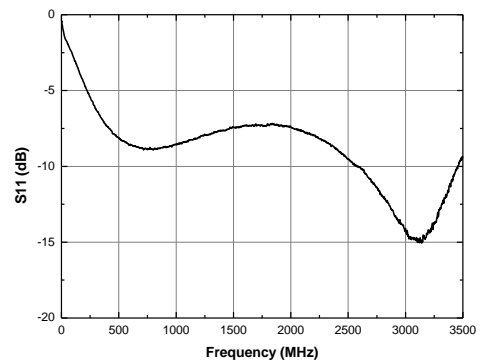
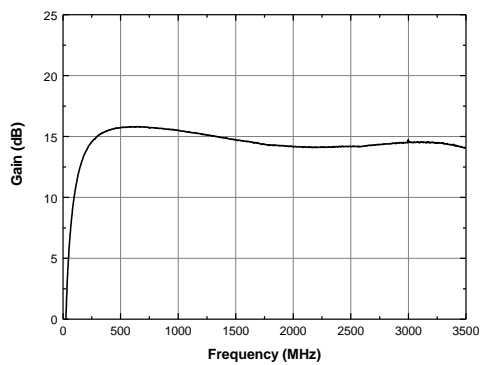
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

IF

5 ~ 1000 MHz

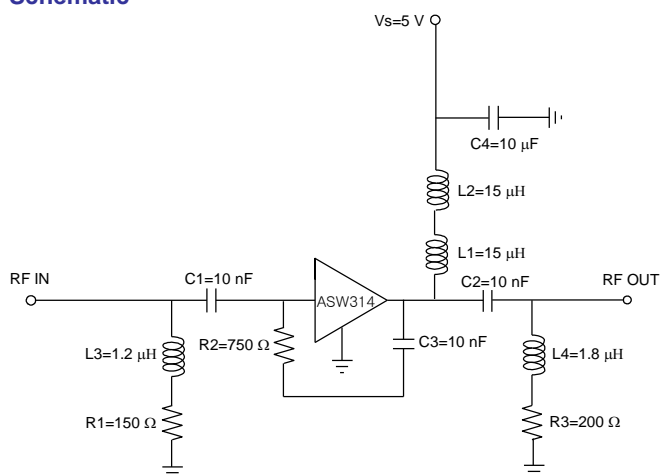
+5 V

Frequency (MHz)	5	50	1000
Magnitude S21 (dB)	13.7	13.8	12.6
Magnitude S11 (dB)	-13	-20	-13
Magnitude S22 (dB)	-12	-20	-11
Output P1dB (dBm)	20	21	21
Output IP3 (dBm)	40 ¹⁾	40 ¹⁾	39 ²⁾
Noise Figure (dB)	2.9	2.2	2.7
Device Voltage (V)	+5	+5	+5
Current (mA)	105	105	105

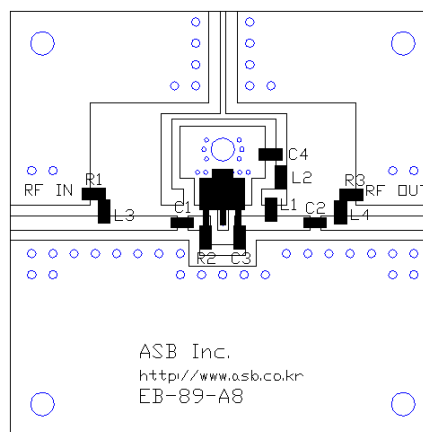
1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1 MHz.

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

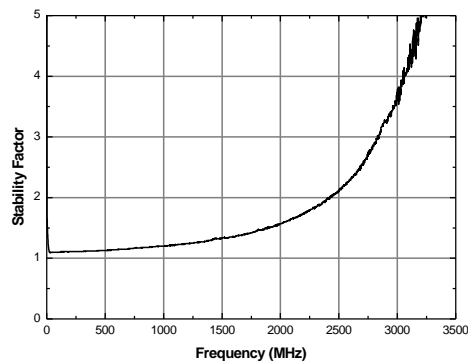
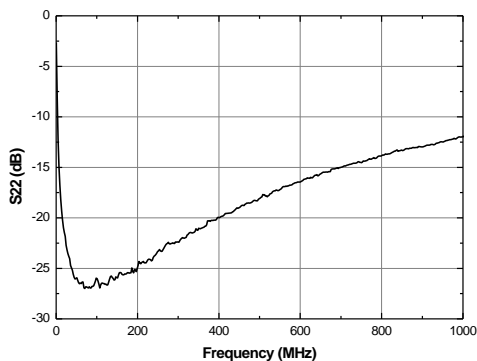
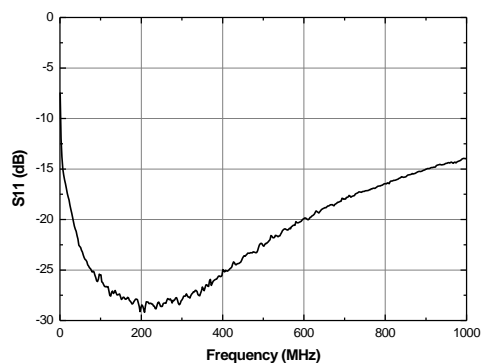
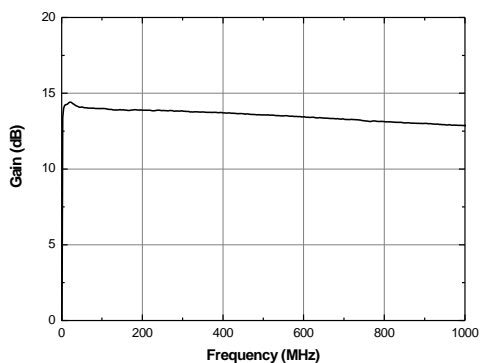
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



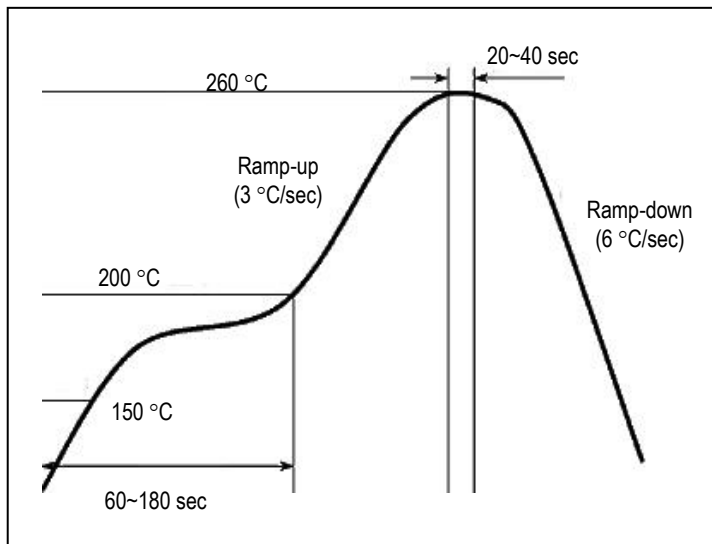
S-parameters & K-factor



Performance with varying V_{DEVICE}

V_{DEVICE} (V)	Current (mA)	Freq. (MHz)	Gain (dB)	S11 (dB)	S22 (dB)	OIP3 (dBm)	P1dB (dBm)	NF (dB)
5.0	105	150	16.4	-13.7	-13.8	40.0	22.8	1.65
		900	16.2	-22.7	-15.4	45.6	21.6	1.86
		1950	14.6	-17.8	-11.5	44.5	23.7	2.92
4.6	95	150	16.4	-14.1	-14.1	42.7	21.7	1.62
		900	16.1	-23.0	-15.9	43.5	21.4	1.76
		1950	14.6	-15.6	-13.3	41.7	23.0	2.85
4.3	85	150	16.4	-14.1	-14.2	42.5	21.5	1.64
		900	16.0	-23.0	-15.7	41.2	20.0	1.73
		1950	14.6	-15.8	-13.0	38.0	21.6	2.83
3.95	75	150	16.3	-13.9	-14.1	42.7	20.6	1.64
		900	15.9	-22.5	-15.6	38.3	19.1	1.72
		1950	14.5	-15.8	-12.6	35.6	20.6	2.80

Recommended Soldering Reflow Profile



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