ASW214

5 ~ 8000 MHz MMIC Amplifier

Features

- 19.5 dB Gain at 900 MHz
- 16 dBm P1dB at 900 MHz
- 30 dBm Output IP3 at 900 MHz
- 5.5 dB NF at 900 MHz
- MTTF > 100 Years
- Single Supply

Description

The ASW214, 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 8 GHz. The amplifier is available in a SOT89 package and passes through the stringent DC, RF, and reliability tests.

RoHS-compliant

Package Style: SOT89

Typical Performance

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

Parameters	Units	Typical			
Frequency	MHz	900	2000	3500	5800
Gain	dB	19.5	18.0	15.0	12.5
S11	dB	-12.5	-9.0	-9.0	-14.0
S22	dB	-11	-14	-10	-14
Output IP3[1)]	dBm	30.0	32.0	28.0	24.5
Noise Figure	dB	5.5	5.7	6.4	5.7
Output P1dB	dBm	16.0	17.0	14.5	13.5
Current	mA	52	52	52	52
Device Voltage	V	+5	+5	+5	+5

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

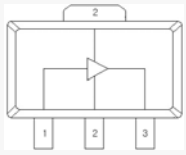
Application Circuit

- IF
- 500 ~ 3500 MHz
- 1700 ~ 2500 MHz
- 3300 ~ 3800 MHz
- 4000 ~ 6000 MHz
- 70 ~ 2700 MHz
- 500 ~ 2700 MHz (3.3 V/ 35 mA)

Product Specifications

Parameters	Units	Min	Typ.	Max
Testing Frequency	MHz		900	
Gain	dB	18.5	19.5	
S11	dB		-12.5	
S22	dB		-11	
Output IP3	dBm	29	30	
Noise Figure	dB		5.5	6.0
Output P1dB	dBm	15	16	
Current	mA	47	52	57
Device Voltage	V		+5	

Pin Configuration



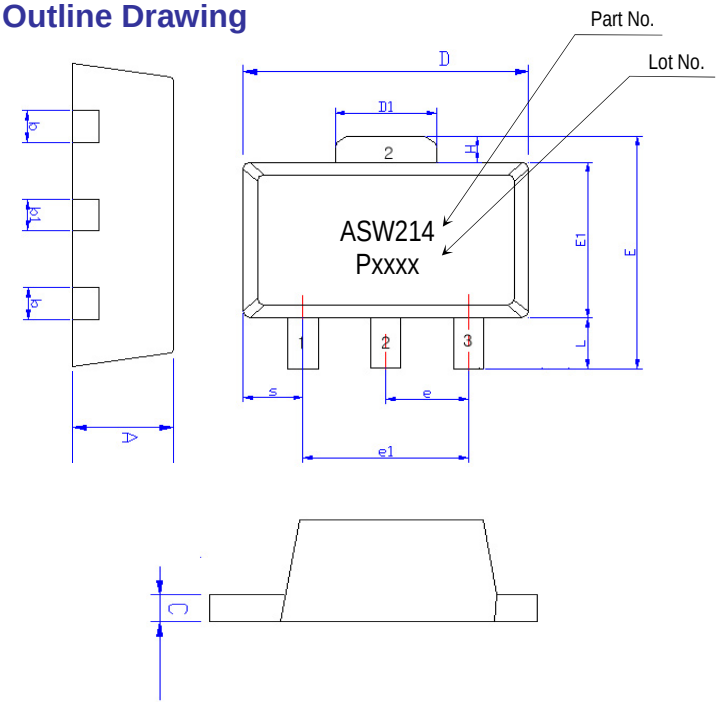
Pin No.	Function
1	RF IN
2	GND
3	RF OUT & Bias

Absolute Maximum Ratings

Parameters	Rating
Operating Case Temperature	-40 to +85 °C
Storage Temperature	-40 to +150 °C
Device Voltage	+6 V
Operating Junction Temperature	+150 °C
Input RF Power (CW, 50 Ω matched)*	25 dBm

Please find the max. input power data from http://www.asb.co.kr/pdf/Maximum_Input_Power_Analysis.pdf

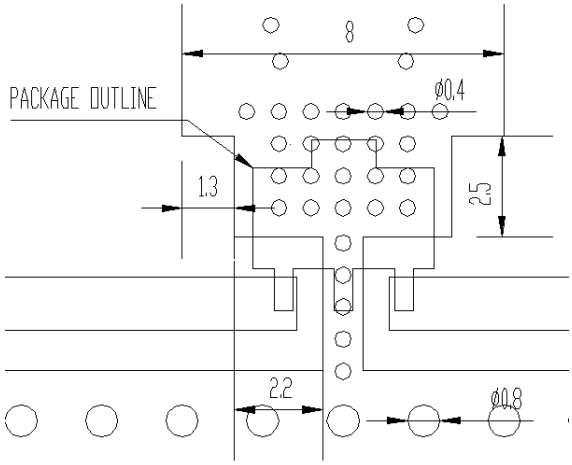
Outline Drawing



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

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

Mounting Recommendation (In mm)



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

ESD Classification & Moisture Sensitivity Level

ESD Classification

HBM	Class 1B
	Voltage Level: 500 V~1000 V
MM	Class A
	Voltage Level: <200 V

CAUTION: ESD-sensitive device!

Moisture Sensitivity Level (MSL)

Level 3 at 260 °C reflow

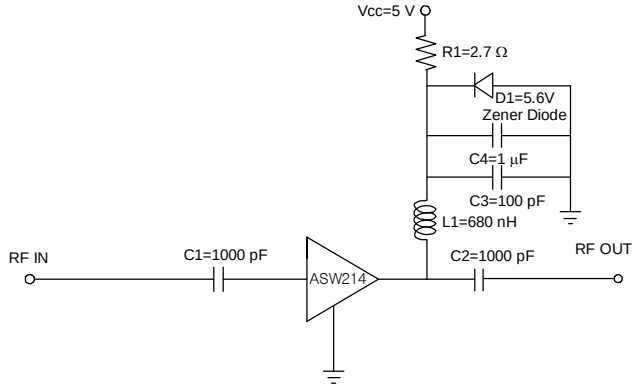
APPLICATION CIRCUIT

IF
70 ~ 450 MHz
+5 V

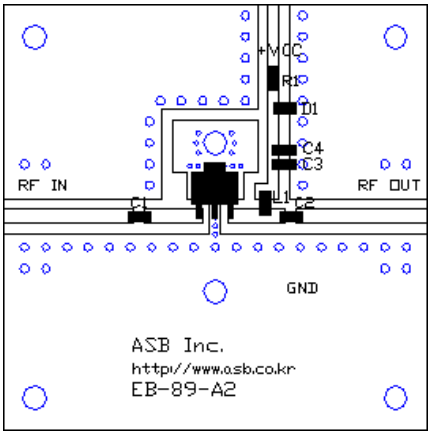
Frequency (MHz)	70	150	300	450
Magnitude S21 (dB)	20.0	20.0	20.0	19.5
Magnitude S11 (dB)	-12	-13	-13	-13
Magnitude S22 (dB)	-11	-11	-11	-11
Output P1dB (dBm)	16	16	16	16
Output IP3[1)] (dBm)	30	30	30	31
Noise Figure (dB)	5.3	5.5	6.0	5.5
Device Voltage (V)	+5	+5	+5	+5
Current (mA)	52	52	52	52

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

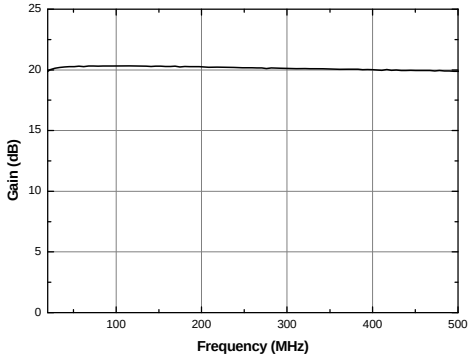
Schematic

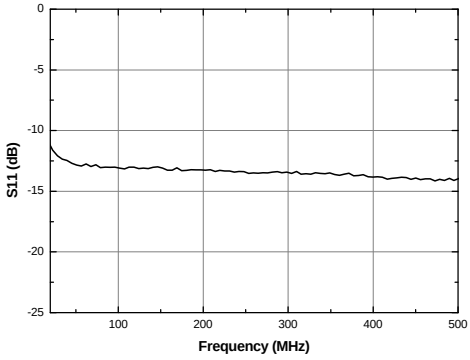


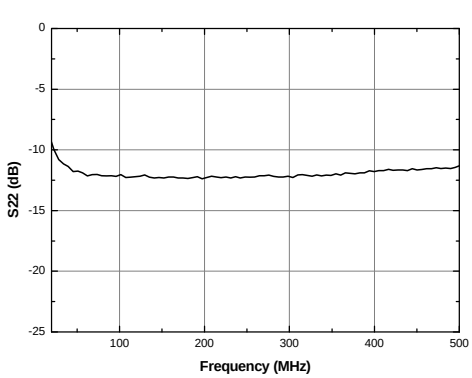
Board Layout (FR4, 40x40 mm², 0.8T)

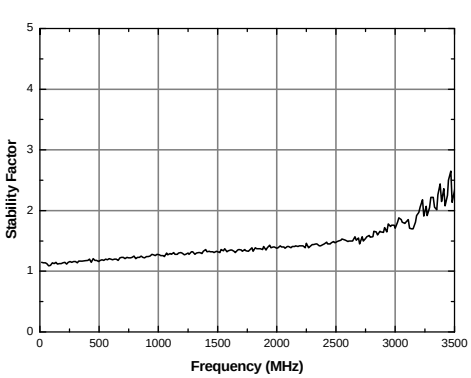


S-parameters & K-factor









APPLICATION CIRCUIT

Wide Band

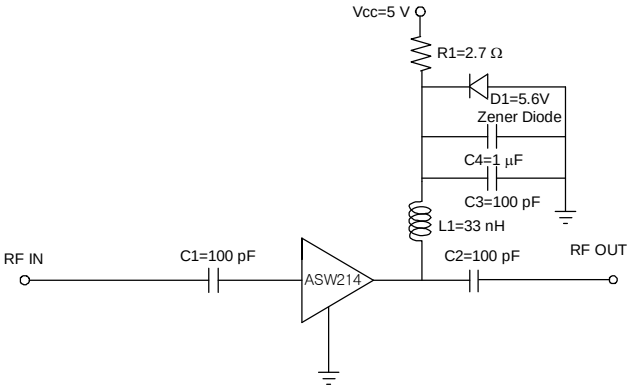
500 ~ 3500 MHz

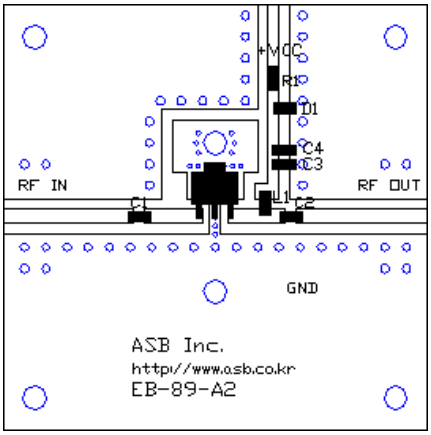
+5 V

Frequency (MHz)	500	900	1750	2000	2400	2700	3500
Magnitude S21 (dB)	19.7	19.5	18.2	17.8	17.0	16.4	15.0
Magnitude S11 (dB)	-12.0	-12.5	-12.5	-12.0	-11.0	-10.0	-9.0
Magnitude S22 (dB)	-11.0	-11.0	-11.0	-11.5	-11.5	-11.0	-10.0
Output P1dB (dBm)	16.0	16.0	16.0	16.0	16.0	16.0	14.5
Output IP3[1)] (dBm)	30.0	30.0	30.0	30.0	30.5	30.5	28.0
Noise Figure (dB)	5.7	5.5	5.5	5.7	5.7	6.0	6.4
Device Voltage (V)	+5						
Current (mA)	52						

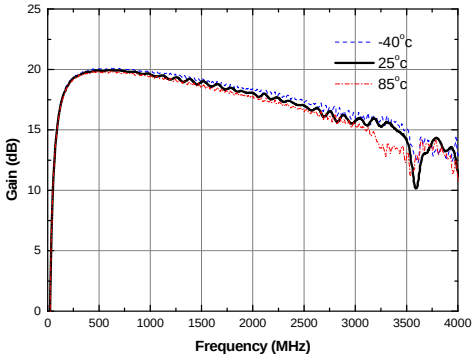
1) OIP3 is measured with two tones at an output power of +0 dBm/tone separated by 1 MHz.

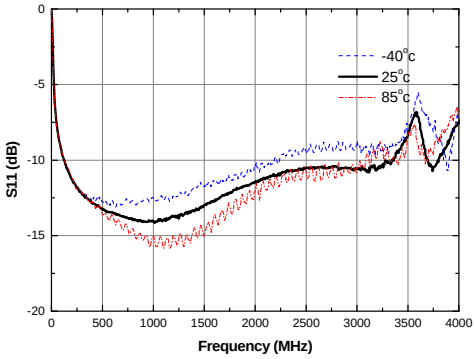
Schematic

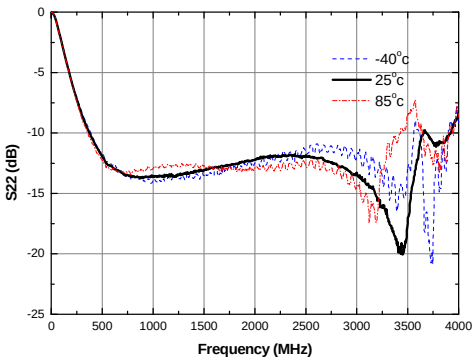


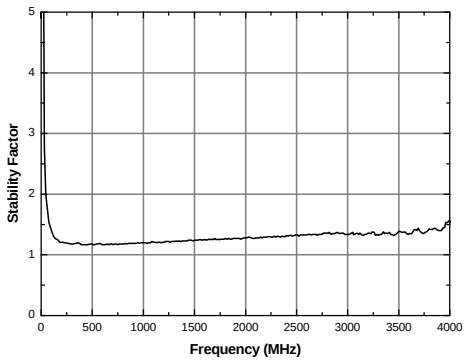


S-parameters & K-factor

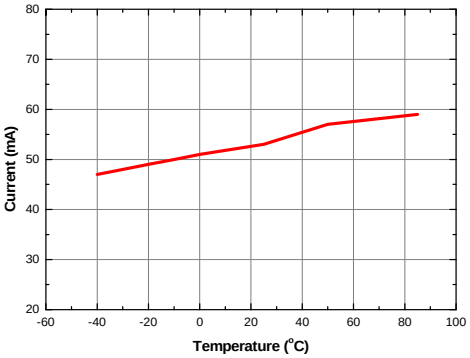




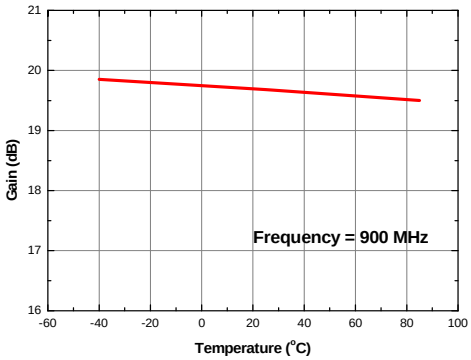




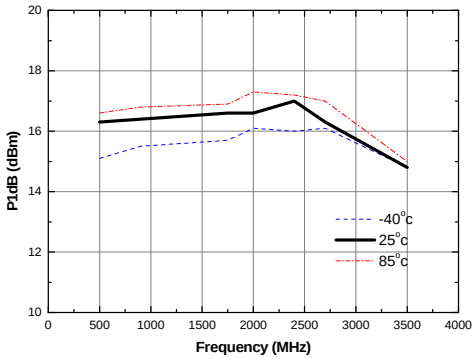
Current vs. Temperature



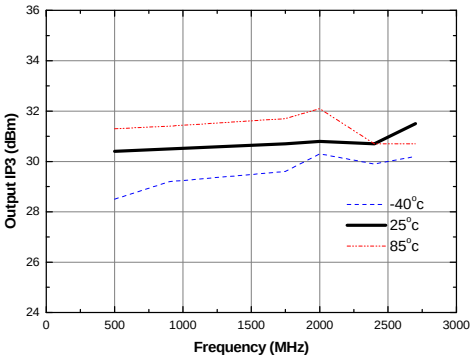
Gain vs. Temperature



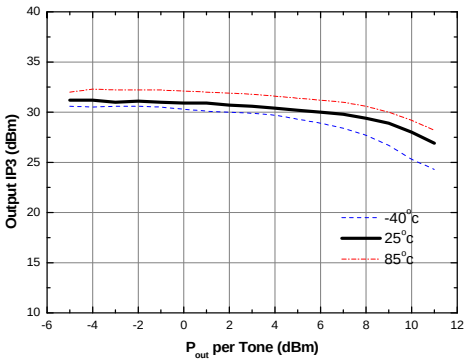
P1dB vs. Frequency



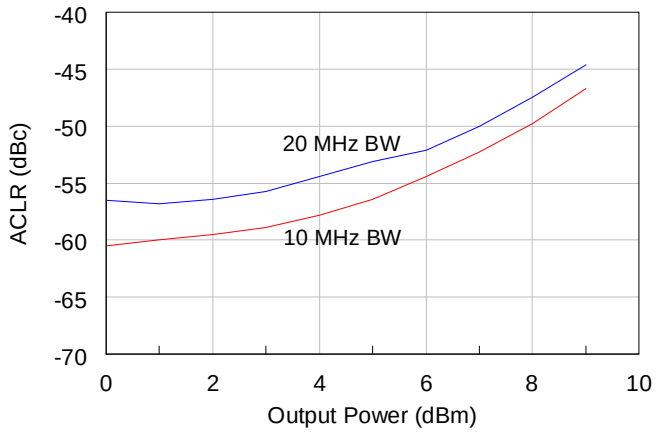
Output IP3 vs. Frequency



Output IP3 vs. Tone Power (Frequency = 2000 MHz)

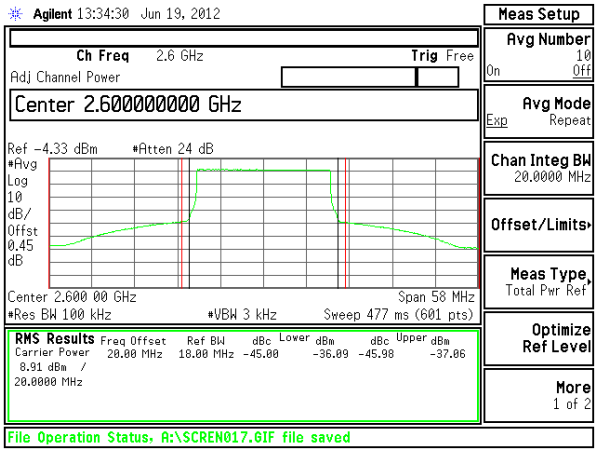


LTE ACLR – 10 MHz & 20 MHz



1) Test Source : LTE_FDD_test model 3.1, BW: 10 MHz & 20 MHz, Test Frequency: 2.6 GHz

LTE ACLR – 20 MHz



2) Test Source : LTE_FDD_test model 3.1, BW: 20 MHz, Test Frequency: 2.6 GHz

Performance with varying V_{DEVICE}

V_{DEVICE} (V)	Current (mA)	Freq. (MHz)	Gain (dB)	S11 (dB)	S22 (dB)	OIP3[1)] (dBm)	P1dB (dBm)	NF (dB)
+4.8	54	900	19.6	-14.5	-13.0	31.0	16.4	5.13
		2000	17.9	-12.2	-12.7	30.7	16.6	5.58
		3500	15.0	-9.4	-11.5	29.5	15.8	--
+4.65	44	900	19.4	-15.2	-12.3	27.9	14.4	5.12
		2000	17.7	-12.7	-12.3	28.0	15.4	5.40
		3500	14.7	-9.5	-11.7	26.5	13.6	--
+4.45	36	900	18.9	-16.6	-11.2	24.4	12.4	5.00
		2000	17.4	-13.4	-11.5	24.7	13.0	5.09
		3500	14.6	-9.6	-10.4	25.2	13.5	--

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

APPLICATION CIRCUIT

Wide Band

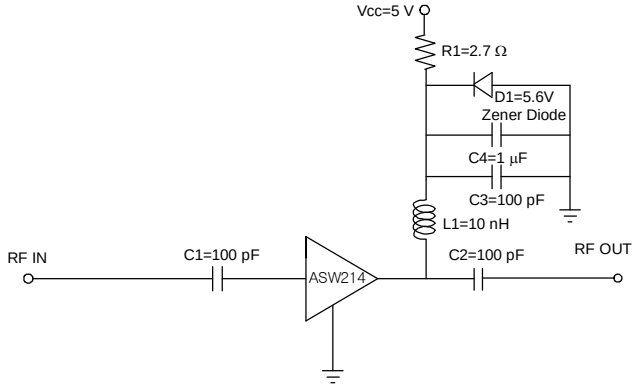
1700 ~ 2500 MHz

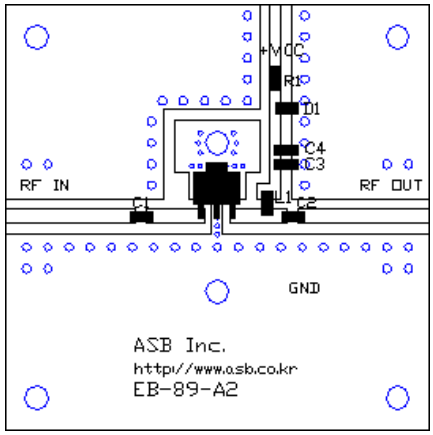
+5 V

Frequency (MHz)	1750	2000	2400
Magnitude S21 (dB)	18	18	17
Magnitude S11 (dB)	-10	-9	-8
Magnitude S22 (dB)	-15	-14	-11
Output P1dB (dBm)	17	17	17
Output IP3[1)] (dBm)	32	32	32
Noise Figure (dB)	5.5	5.7	5.7
Device Voltage (V)	+5		
Current (mA)	52		

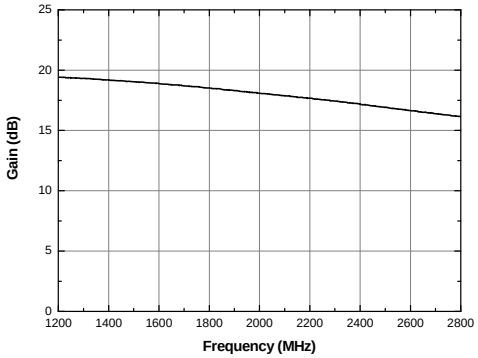
1) OIP3 is measured with two tones at an output power of +0 dBm/tone separated by 1 MHz.

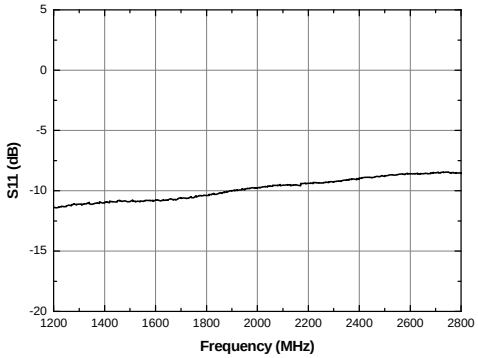
Schematic

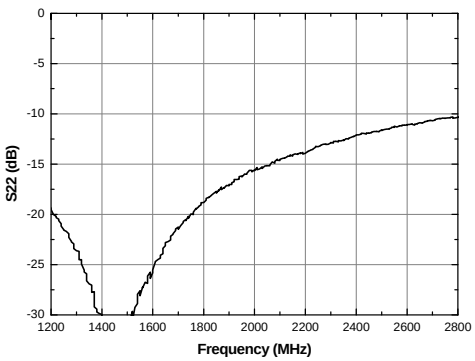


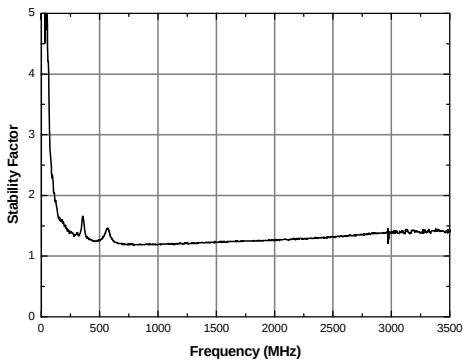


S-parameters & K-factor









APPLICATION CIRCUIT

WiMAX

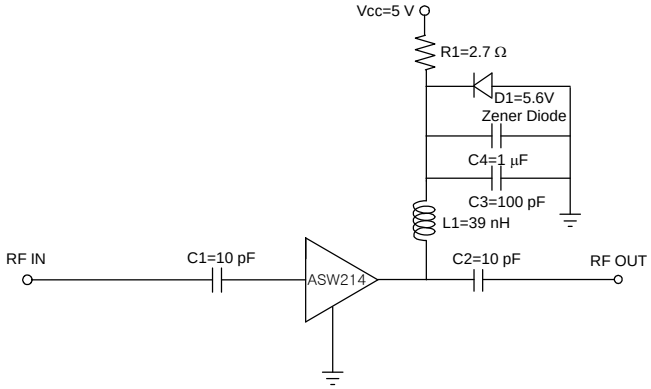
3300 ~ 3800 MHz

+5 V

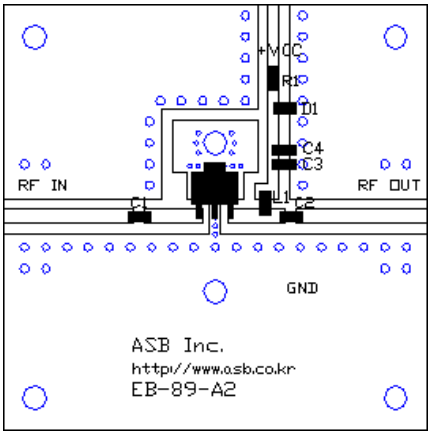
Frequency (MHz)	3300	3800
Magnitude S21 (dB)	15.4	14.4
Magnitude S11 (dB)	-10	-10
Magnitude S22 (dB)	-10	-14
Output P1dB (dBm)	16	15
Output IP3[1)] (dBm)	27.5	26.5
Noise Figure (dB)	6.4	6.5
Device Voltage (V)	+5	+5
Current (mA)	52	52

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

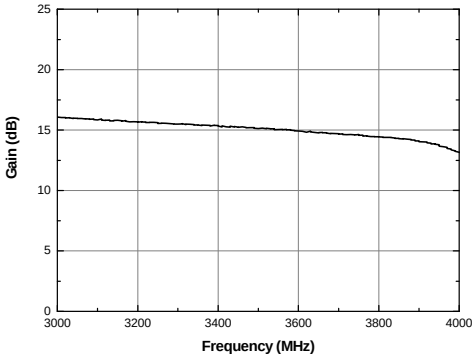
Schematic

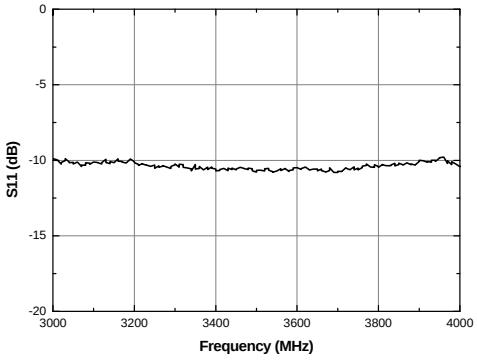


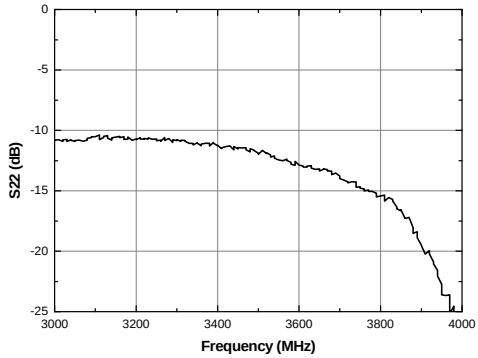
Board Layout (FR4, 40x40 mm², 0.8T)

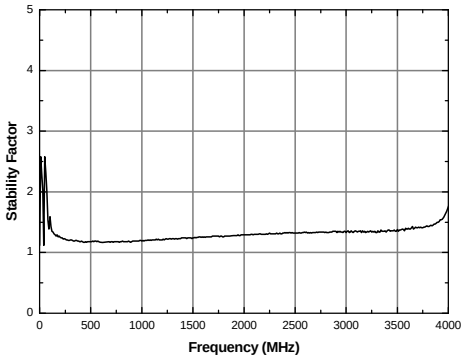


S-parameters & K-factor









APPLICATION CIRCUIT

C-Band

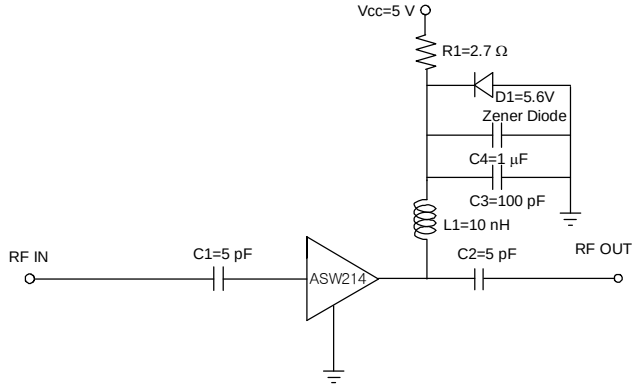
4000 ~ 6000 MHz

+5 V

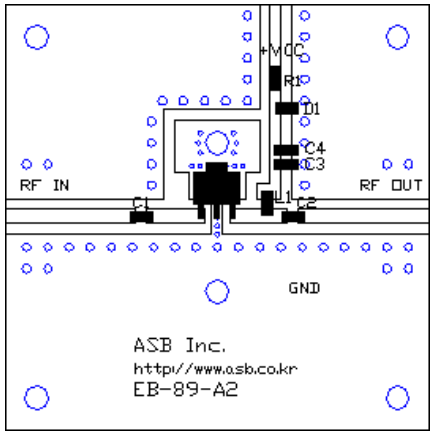
Frequency (MHz)	4000	5000	5800	6000
Magnitude S21 (dB)	14.5	13.5	12.5	11.5
Magnitude S11 (dB)	-11	-11	-14	-14
Magnitude S22 (dB)	-9	-12	-14	-12
Output P1dB (dBm)	16.0	15.0	13.5	13.5
Output IP3[1)] (dBm)	28.5	27.0	24.5	24.5
Noise Figure (dB)	5.6	5.5	5.7	6.0
Device Voltage (V)	+5	+5	+5	+5
Current (mA)	52	52	52	52

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

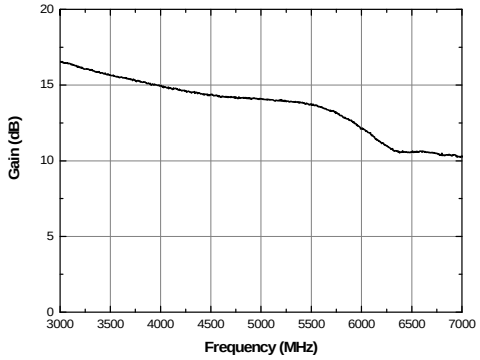
Schematic

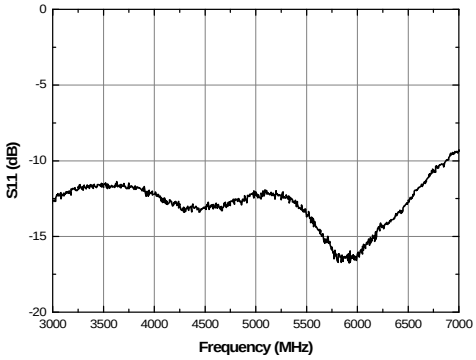


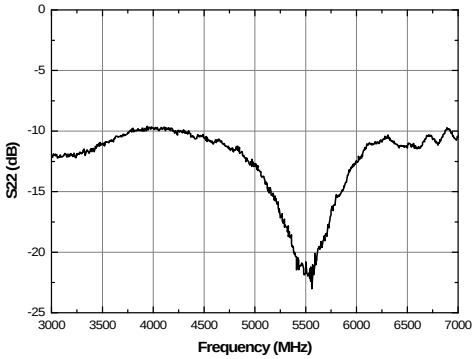
Board Layout (FR4, 40x40 mm², 0.8T)

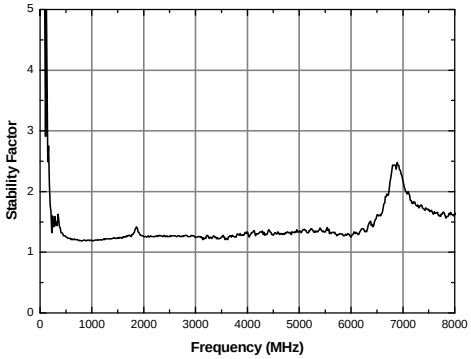


S-parameters & K-factor









APPLICATION CIRCUIT

ONU

70 ~ 2700 MHz

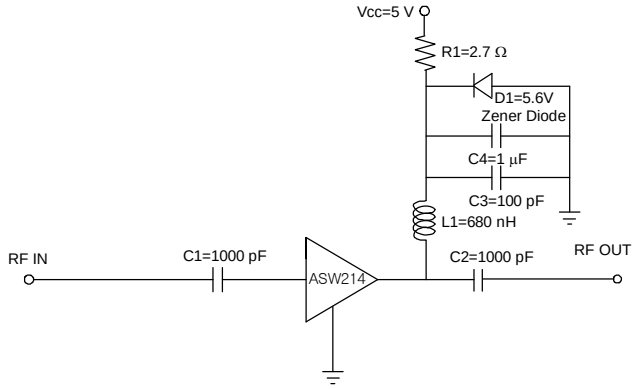
+5 V

Frequency (MHz)	70	900	1800	2700
Magnitude S21 (dB)	20.0	19.0	17.5	15.5
Magnitude S11 (dB)	-13	-14	-15	-12
Magnitude S22 (dB)	-11	-10	-9	-12
Output P1dB (dBm)	16	15	15	15
Output IP3[1)] (dBm)	29.5	29.5	29.5	29.5
Output IP2[2)] (dBm)	40			
Noise Figure (dB)	5.4	5.3	5.5	5.8
Device Voltage (V)	+5	+5	+5	+5
Current (mA)	52	52	52	52

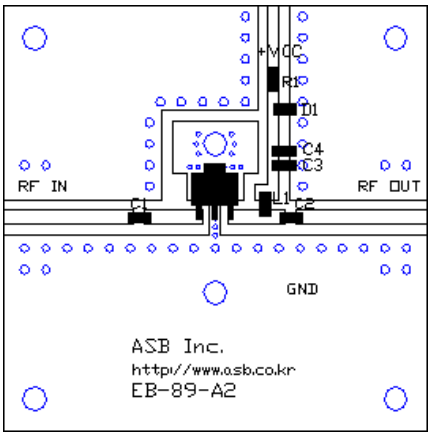
1) OIP3 is measured with two tones at an output power of +0 dBm/tone separated by 1 MHz.

2) OIP2 is measured with two tones (100MHz, 800MHz) at an output power of +0 dBm/tone, 700 MHz.

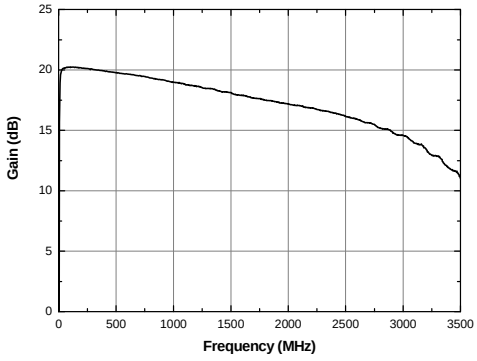
Schematic

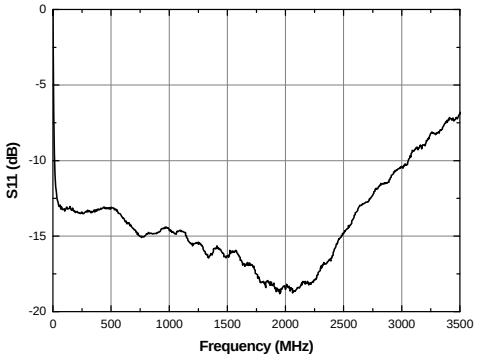


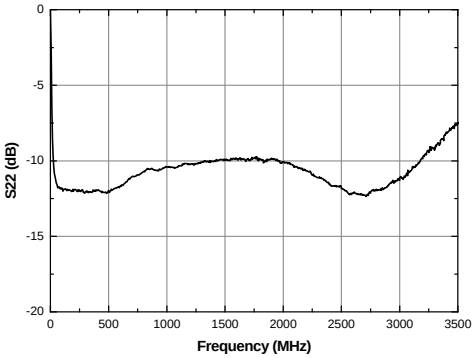
Board Layout (FR4, 40x40 mm², 0.8T)

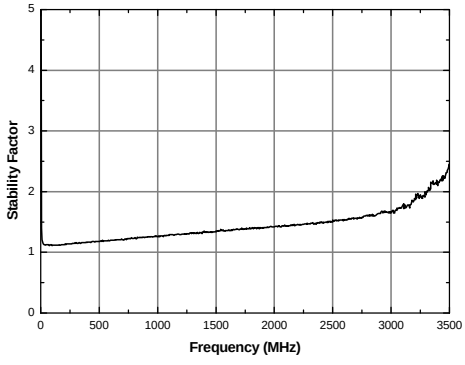


S-parameters & K-factor









APPLICATION CIRCUIT

Wide Band

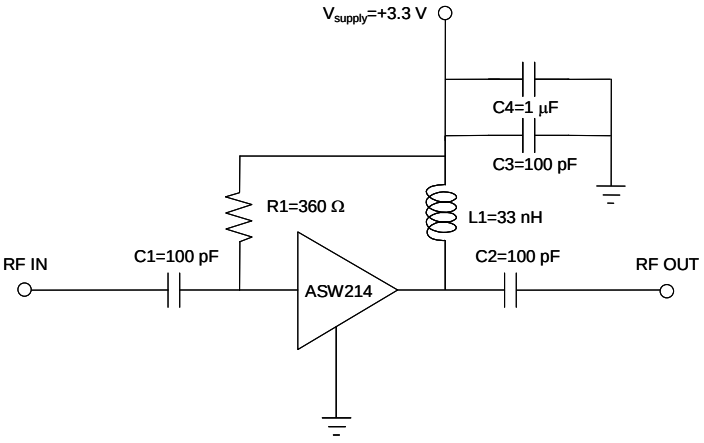
500 ~ 2700 MHz

+3.3 V/ 35 mA

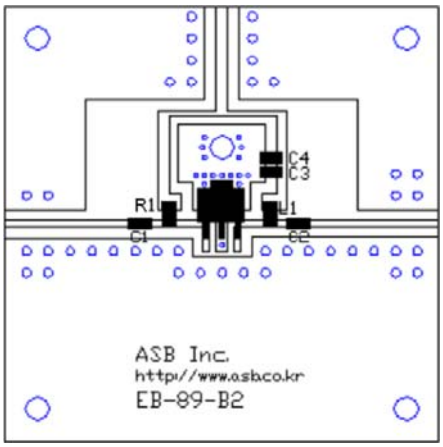
Frequency (MHz)	900	2000
Magnitude S21 (dB)	18.0	16.3
Magnitude S11 (dB)	-11	-13
Magnitude S22 (dB)	-12	-10
Output P1dB (dBm)	12.3	12.5
Output IP3[1)] (dBm)	24	24.5
Noise Figure (dB)	5.4	5.6
Device Voltage (V)	+3.3	+3.3
Current (mA)	35	35

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

Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor