

Features

- 15.5 dB Gain at 1950 MHz
- 22.0 dBm P1dB at 1950 MHz
- 40.0 dBm OIP3 at 1950 MHz
- 2.3 dB NF at 1950 MHz
- MTTF > 100 Years
- Single Supply

Description

The ASW335, 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 4 GHz. The amplifier is available in a SOT89 package and passes through the stringent DC, RF, and reliability tests.



Package Style: SOT89

Typical Performance

(Supply Voltage = +5 V, T_A = +25 °C, Z₀ = 50 Ω)

Parameters	Units	Typical		
Frequency	MHz	100	900	1950
Gain	dB	18.8	17.5	15.5
S11	dB	-13.5	-15	-10
S22	dB	-18	-18	-11
Output IP3	dBm	44.0 ¹⁾	42.0 ²⁾	40.0 ²⁾
Noise Figure	dB	1.6	2.0	2.3
Output P1dB	dBm	22.0	22.0	22.0
Current	mA	100	100	100
Device Voltage	V	+5	+5	+5

1) OIP3 is measured with two tones at an output power of +9 dBm/tone separated by 1 MHz.

2) OIP3 is measured with two tones at an output power of +6 dBm/tone separated by 1 MHz.

Product Specifications

Parameters	Units	Min	Typ.	Max
Testing Frequency	MHz		1950	
Gain	dB	15.0	15.5	16.0
S11	dB		-10	
S22	dB		-11	
Output IP3	dBm	39.0	40.0	
Noise Figure	dB		2.3	2.5
Output P1dB	dBm	20.5	22.0	
Current	mA	90	100	110
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 1950 MHz application circuit)*	+23 dBm
Thermal Resistance	61 °C/W

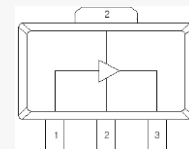
The operation of this device in excess of any of these limits may cause permanent damage.

* 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.

Application Circuit

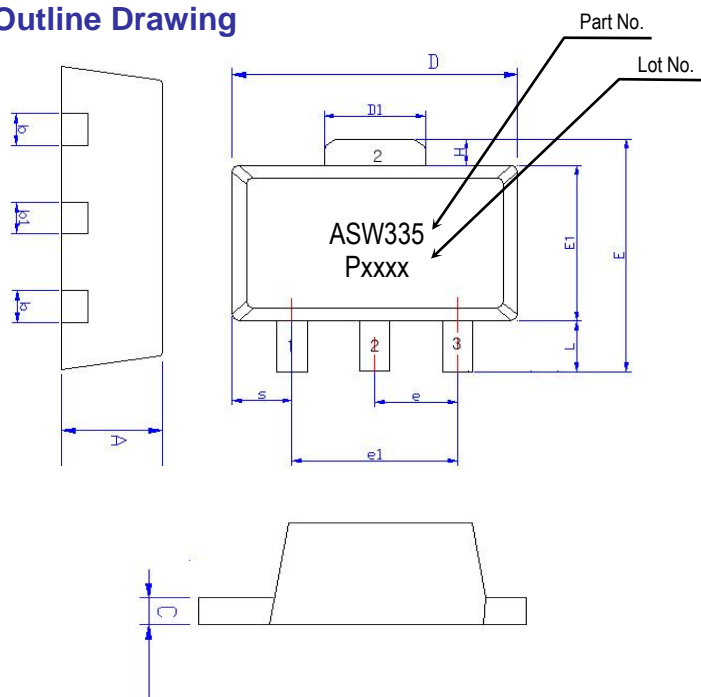
- IF (100 ~ 450 MHz)
- CMMB
- LTE (698 ~ 787 MHz)
- CDMA & GSM (900 MHz)
- LTE (1745 ~ 1860 MHz)
- WCDMA (1950 MHz)
- WLAN (2450 MHz)
- WiMAX
- ONU (70 ~ 2500 MHz)
- 900 ~ 2200 MHz
(SMATV, 50 Ω)

Pin Configuration



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

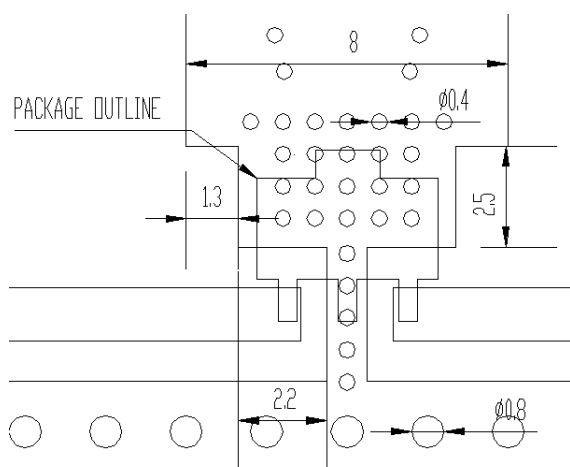
Outline Drawing



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 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

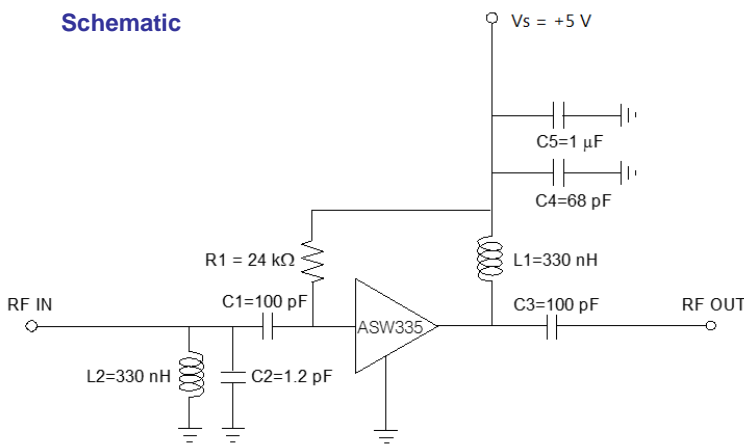
APPLICATION CIRCUIT

IF
100 ~ 450 MHz
+5 V

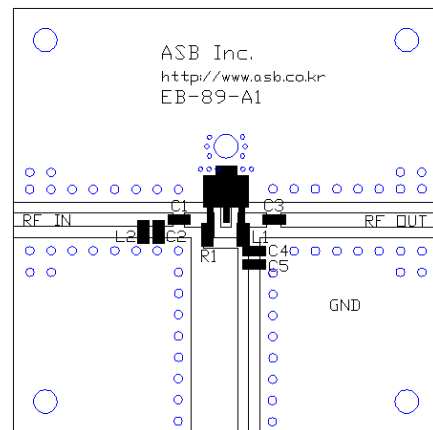
Frequency (MHz)	100	240	450
Magnitude S21 (dB)	18.8	18.5	17.3
Magnitude S11 (dB)	-13.5	-13.5	-10.0
Magnitude S22 (dB)	-18	-15	-12
Output P1dB (dBm)	22.0	22.5	22.0
Output IP3 ¹⁾ (dBm)	44.0	43.0	40.5
Noise Figure (dB)	1.6	1.8	1.7
Device Voltage (V)	+5	+5	+5
Current (mA)	100	100	100

1) OIP3 is measured with two tones at an output power of +9 dBm/tone separated by 1 MHz.

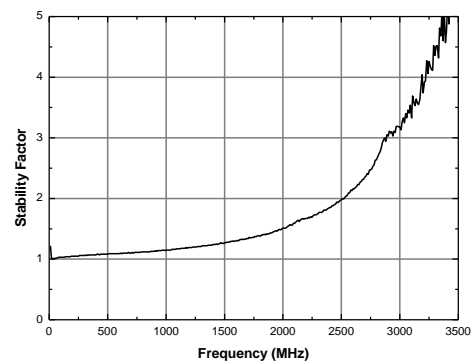
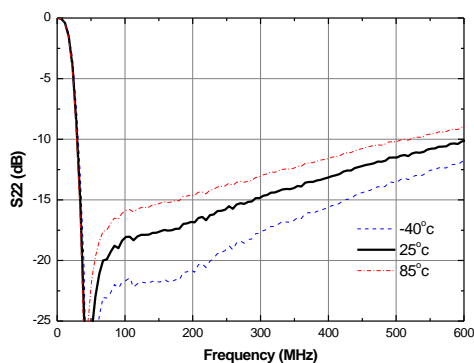
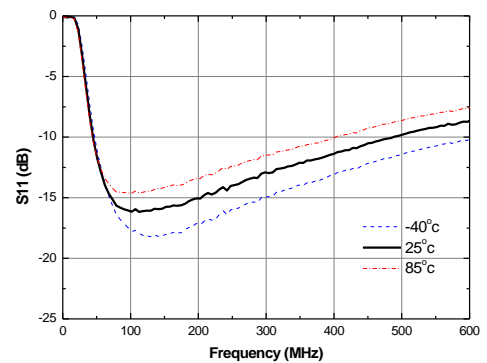
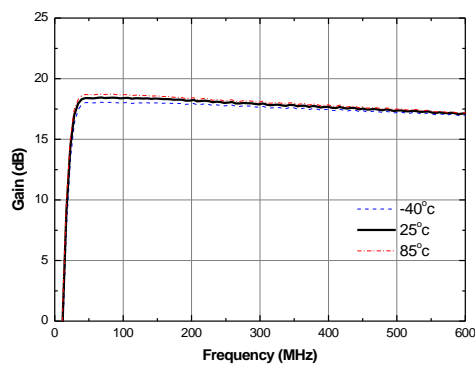
Schematic



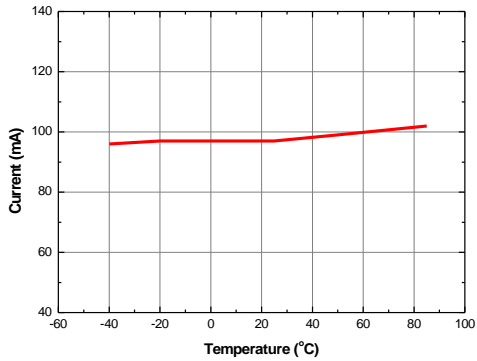
Board Layout (FR4, 40x40 mm², 0.8T)



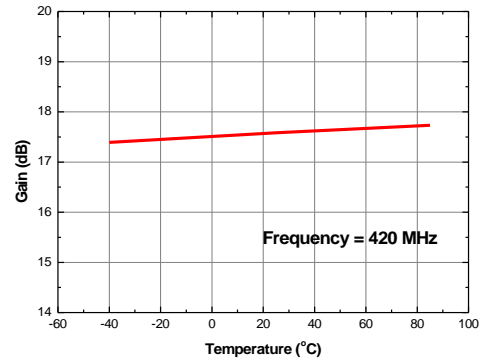
S-parameters & K-factor



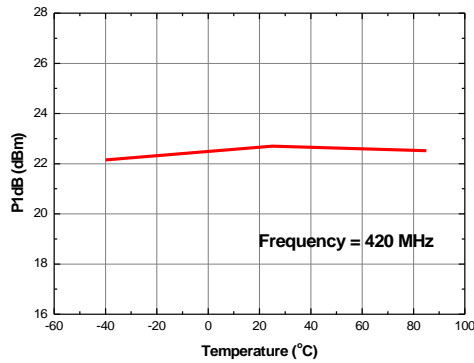
Current vs. Temperature



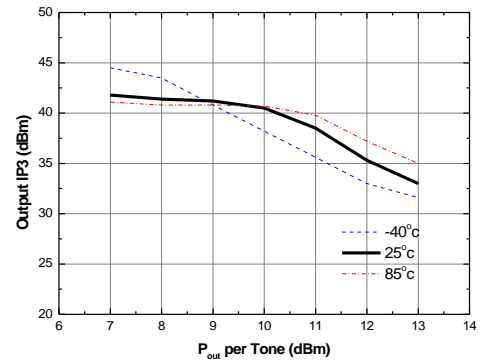
Gain vs. Temperature



P1dB vs. Temperature



Output IP3 vs. Tone Power (Frequency = 420 MHz)



APPLICATION CIRCUIT

CMMB

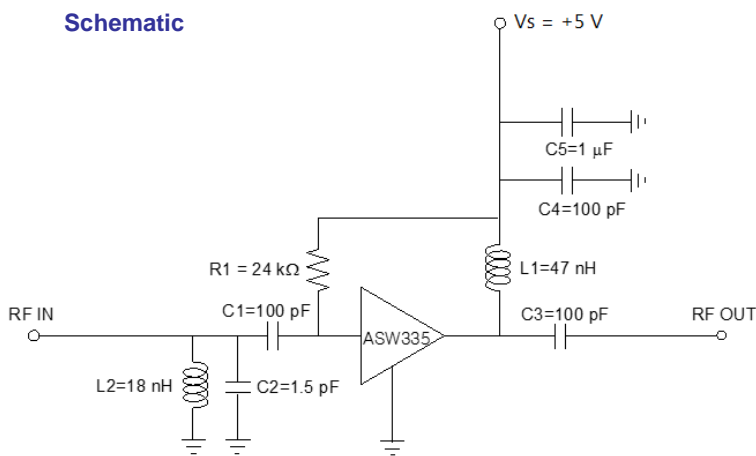
470 ~ 860 MHz

+5 V

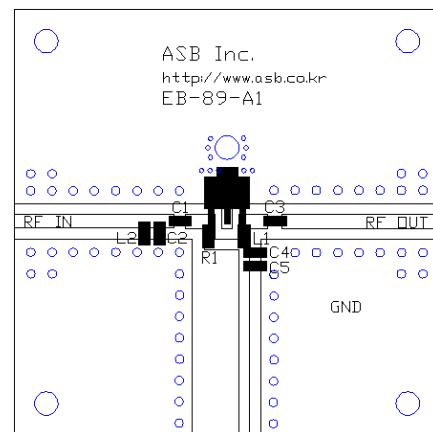
Frequency (MHz)	470	860
Magnitude S21 (dB)	18.0	17.5
Magnitude S11 (dB)	-16	-14
Magnitude S22 (dB)	-18	-15
Output P1dB (dBm)	22.5	22.5
Output IP3 ¹⁾ (dBm)	44	41
Noise Figure (dB)	1.8	1.7
Device Voltage (V)	+5	+5
Current (mA)	100	100

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

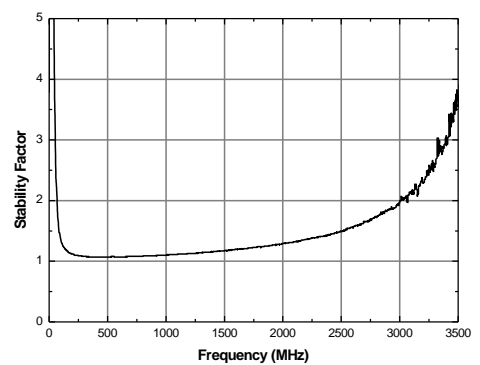
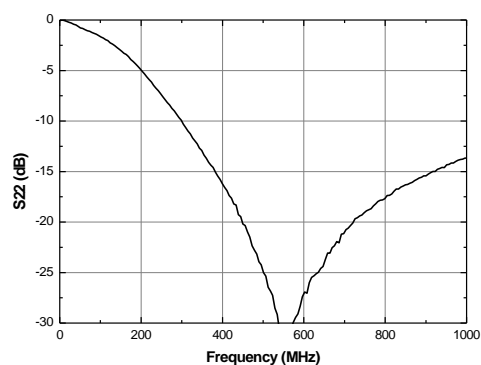
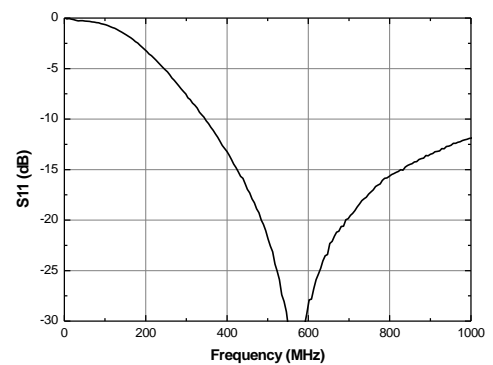
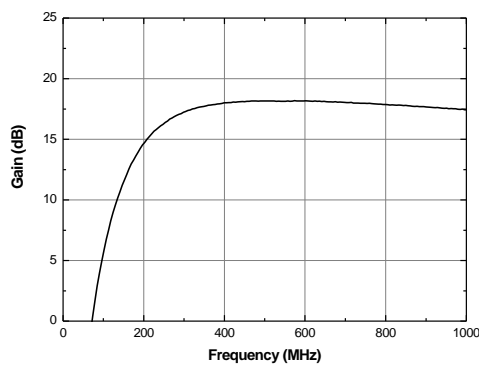
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

LTE

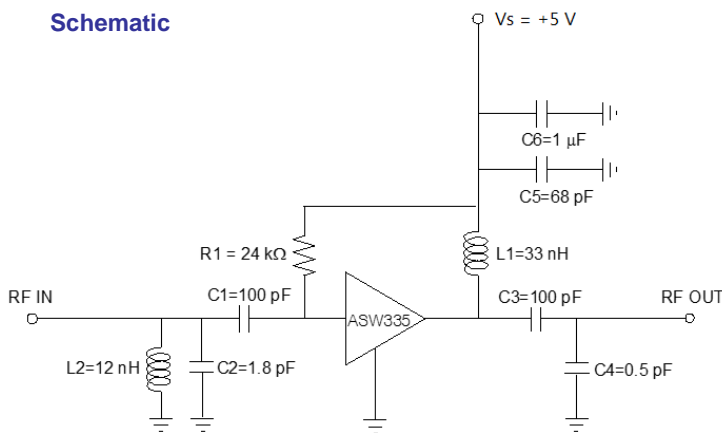
698 ~ 787 MHz

+5 V

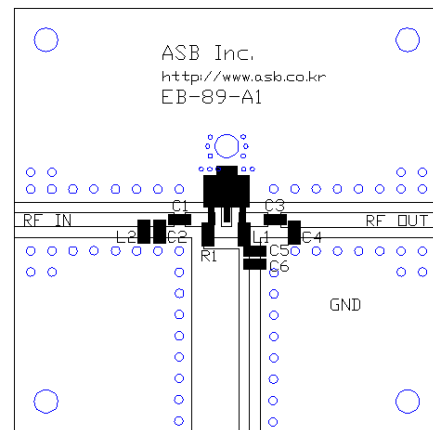
Frequency (MHz)	698 ~ 787
Magnitude S21 (dB)	17.5
Magnitude S11 (dB)	-18
Magnitude S22 (dB)	-18
Output P1dB (dBm)	22.5
Output IP3 ¹⁾ (dBm)	42
Noise Figure (dB)	1.6
Device Voltage (V)	+5
Current (mA)	100

1) OIP3 is measured with two tones at an output power of +6 dBm/tone separated by 1 MHz.

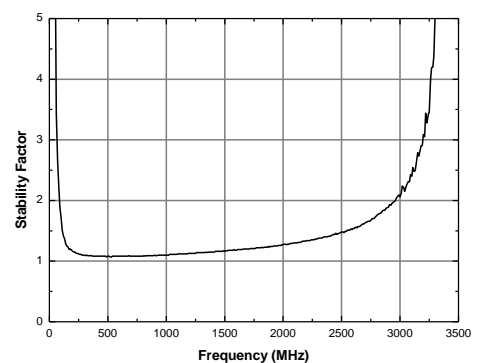
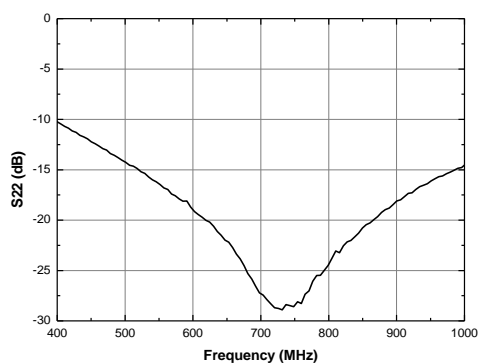
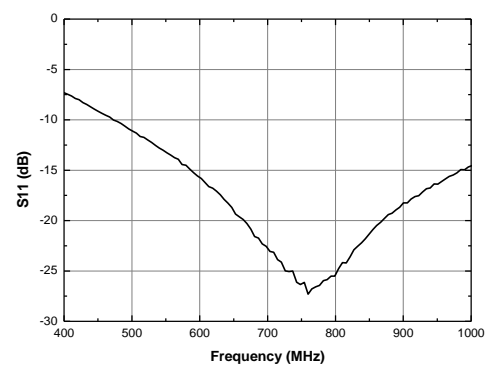
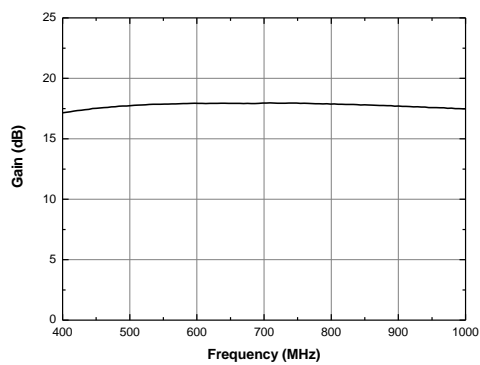
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

CDMA & GSM

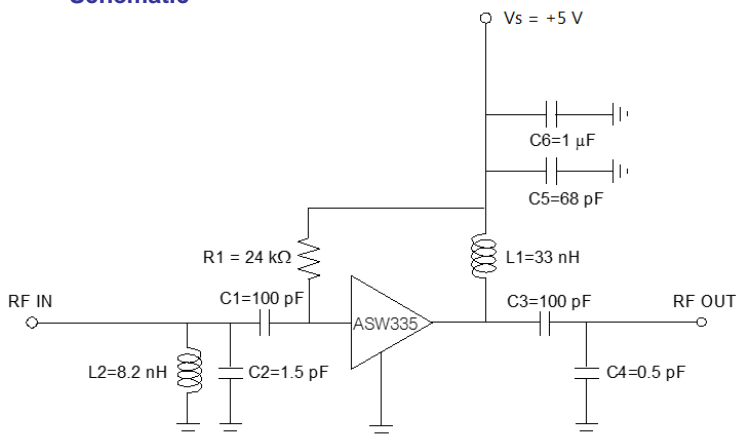
900 MHz

+5 V

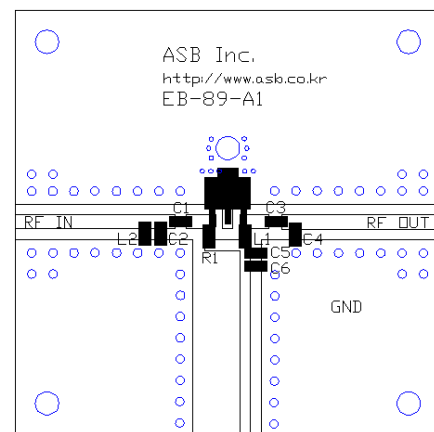
Frequency (MHz)	900
Magnitude S21 (dB)	17.5
Magnitude S11 (dB)	-15
Magnitude S22 (dB)	-18
Output P1dB (dBm)	22
Output IP3 ¹⁾ (dBm)	42
Noise Figure (dB)	2.0
Device Voltage (V)	+5
Current (mA)	100

1) OIP3 is measured with two tones at an output power of +6 dBm/tone separated by 1 MHz.

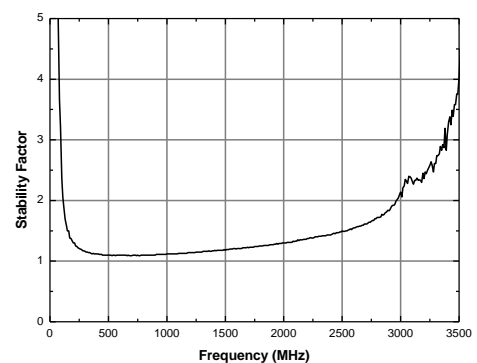
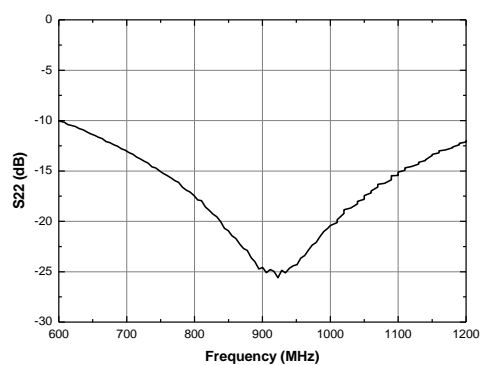
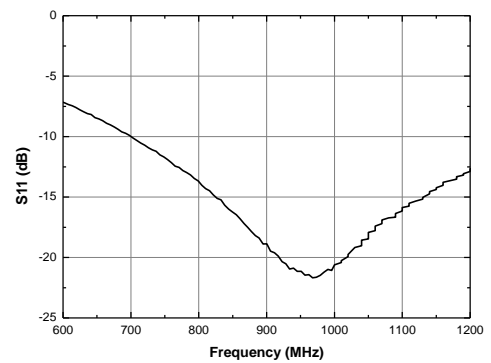
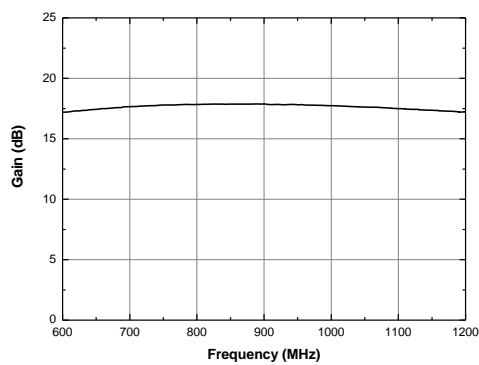
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



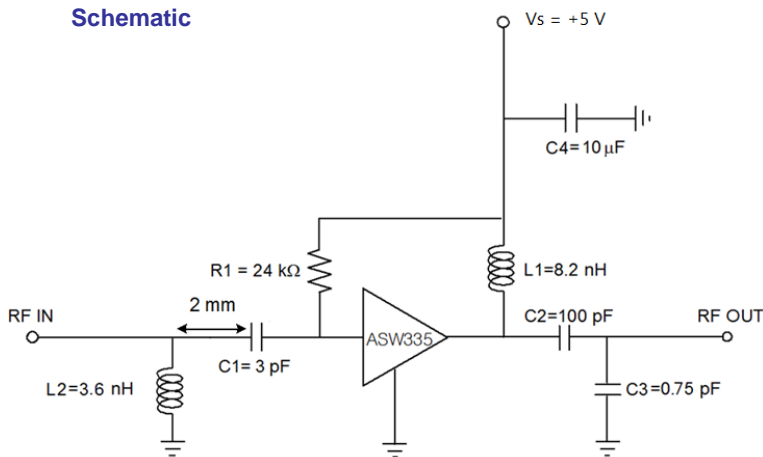
APPLICATION CIRCUIT

LTE
 1745 ~ 1860 MHz
 +5 V

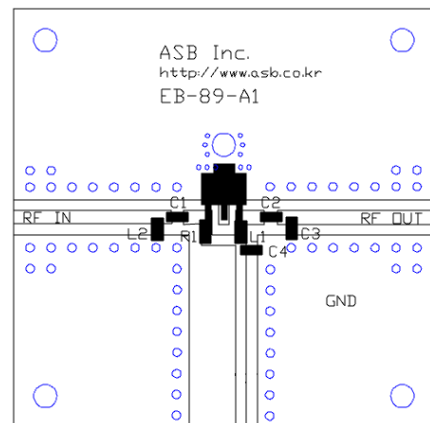
Frequency (MHz)	1745	1860
Magnitude S21 (dB)	16.0	16.0
Magnitude S11 (dB)	-18	-18
Magnitude S22 (dB)	-14	-13
Output P1dB (dBm)	22	22
Output IP3 ¹⁾ (dBm)	38.5	37.5
Noise Figure (dB)	2.2	2.2
Device Voltage (V)	+5	+5
Current (mA)	100	100

1) OIP3 is measured with two tones at an output power of +6 dBm/tone separated by 1 MHz.

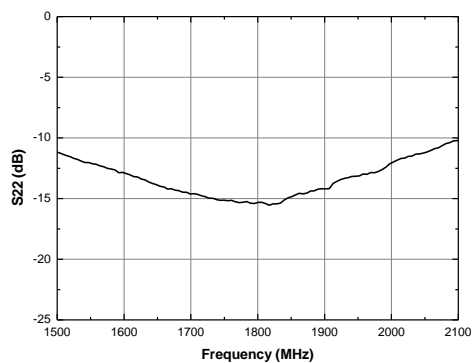
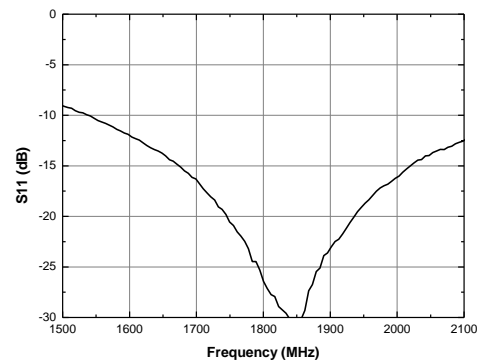
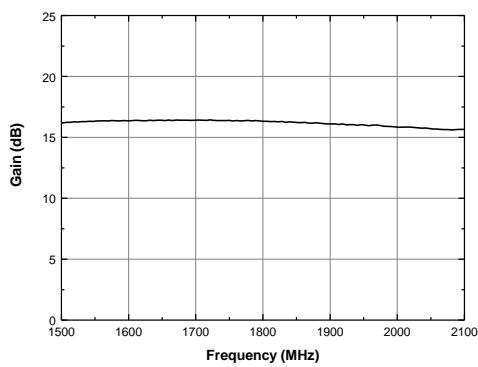
Schematic



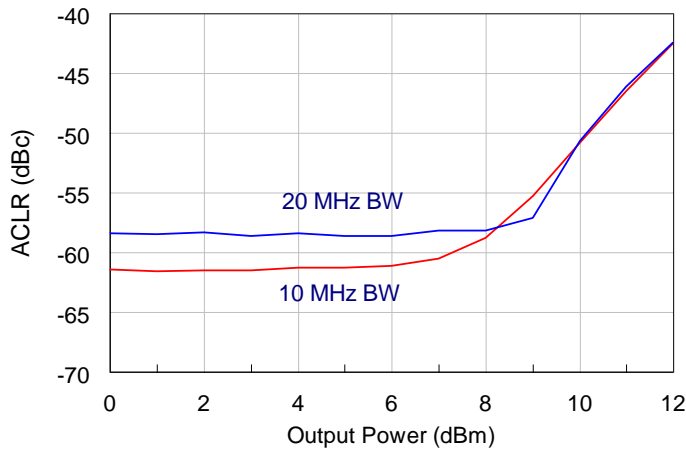
Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor

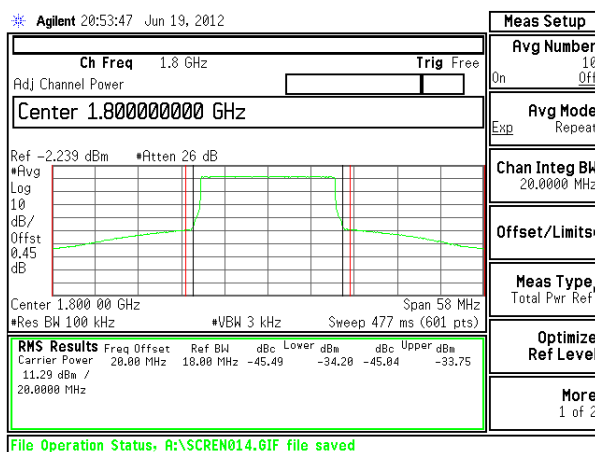


LTE ACLR – 10 MHz & 20 MHz



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

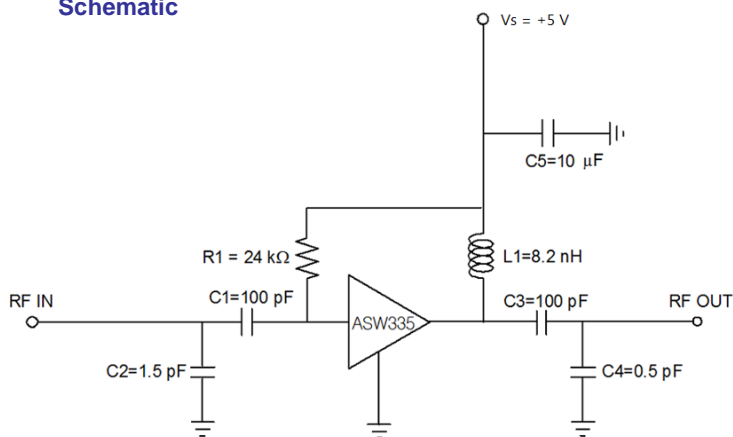
APPLICATION CIRCUIT

WCDMA
1950 MHz
+5 V

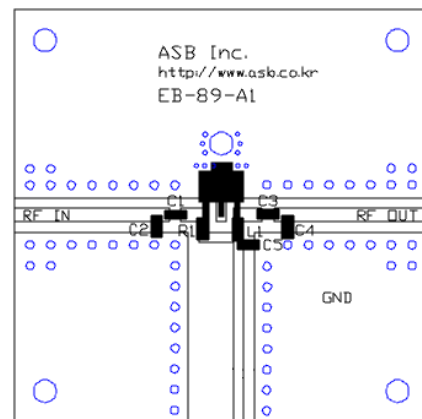
Frequency (MHz)	1950
Magnitude S21 (dB)	15.5
Magnitude S11 (dB)	-10
Magnitude S22 (dB)	-11
Output P1dB (dBm)	22
Output IP3 ¹⁾ (dBm)	40.0
Noise Figure (dB)	2.3
Device Voltage (V)	+5
Current (mA)	100

1) OIP3 is measured with two tones at an output power of +6 dBm/tone separated by 1 MHz.

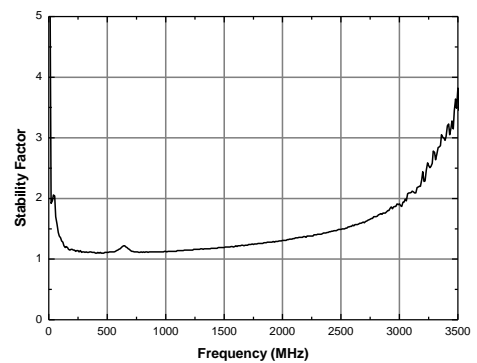
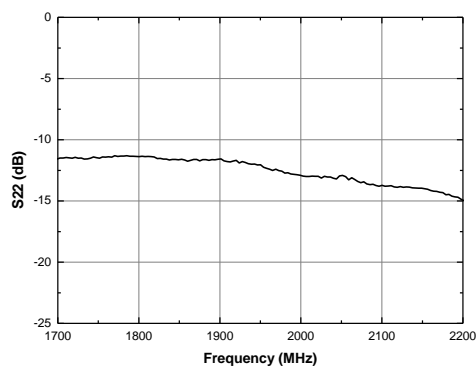
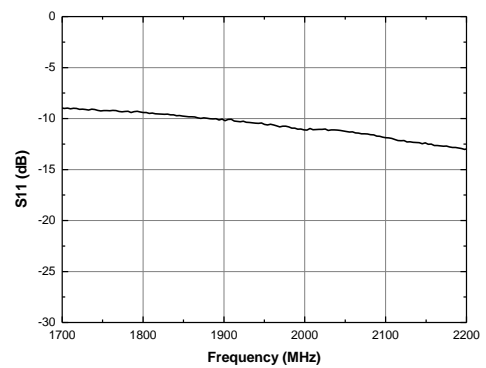
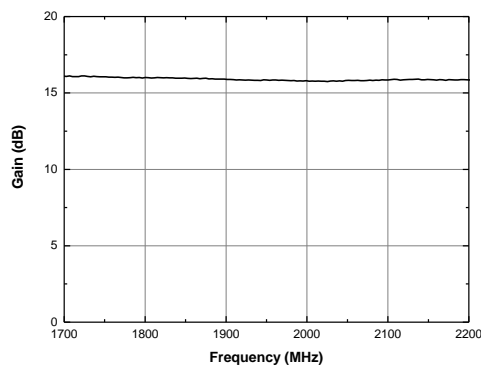
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

WLAN

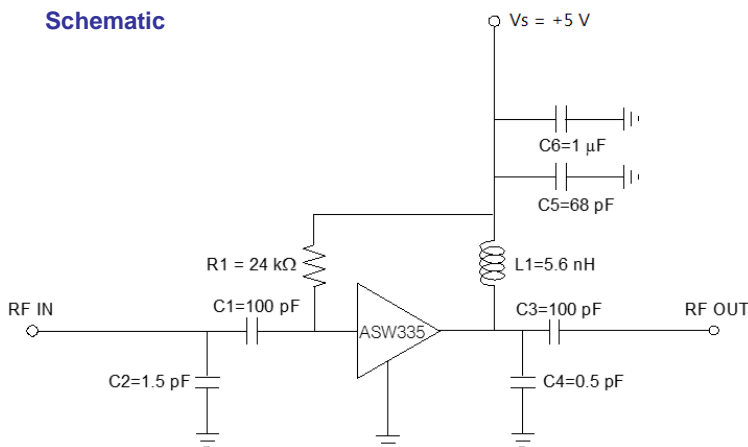
2450 MHz

+5 V

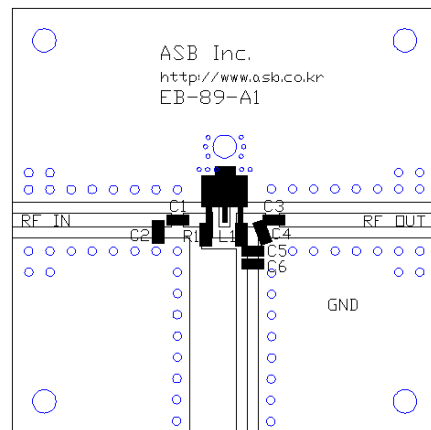
Frequency (MHz)	2450
Magnitude S21 (dB)	16.0
Magnitude S11 (dB)	-14
Magnitude S22 (dB)	-14
Output P1dB (dBm)	21
Output IP3 ¹⁾ (dBm)	38
Noise Figure (dB)	3.0
Device Voltage (V)	+5
Current (mA)	100

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

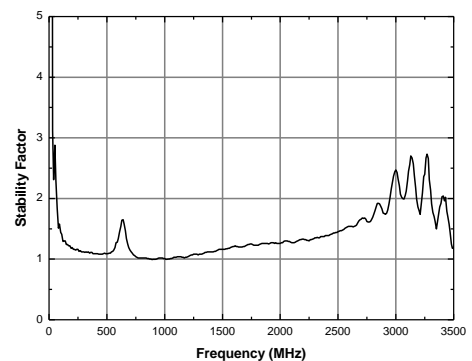
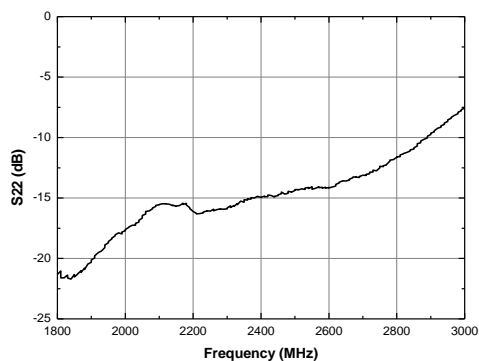
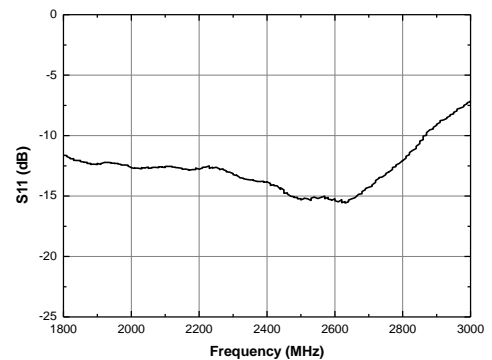
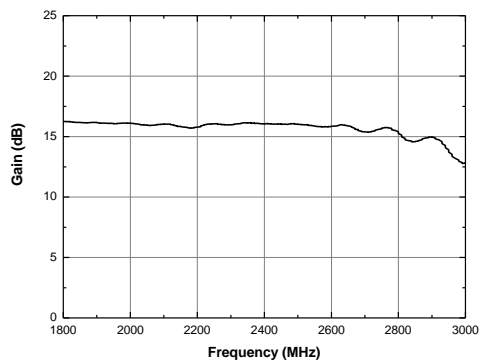
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



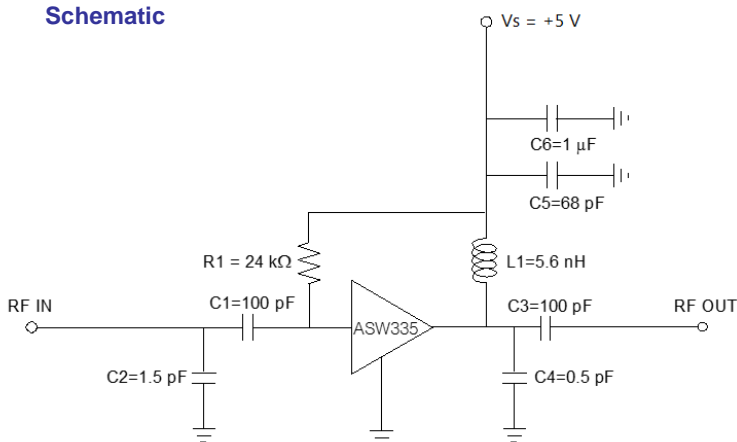
APPLICATION CIRCUIT

WiMAX
2500 ~ 2700 MHz
+5 V

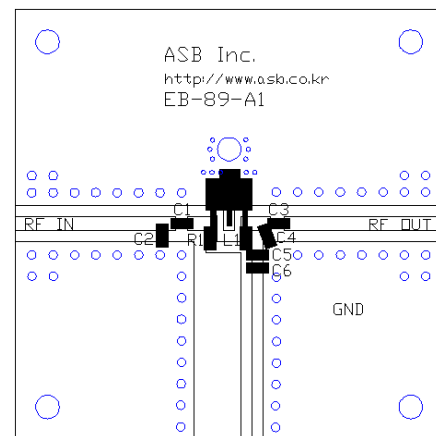
Frequency (MHz)	2500	2600	2700
Magnitude S21 (dB)	15.5	15.2	14.8
Magnitude S11 (dB)	-10	-9	-8
Magnitude S22 (dB)	-18	-15	-13
Output P1dB (dBm)	19.0	18.0	18.5
Output IP3 ¹⁾ (dBm)	36	36	37
Noise Figure (dB)	3.1	3.5	4.0
Device Voltage (V)	+5	+5	+5
Current (mA)	100	100	100

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

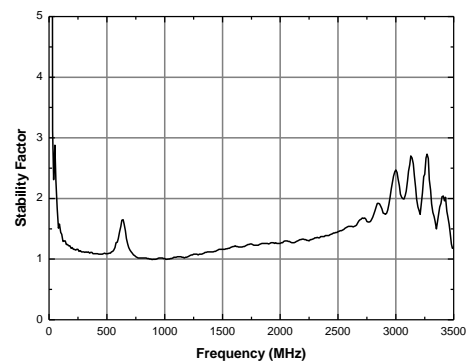
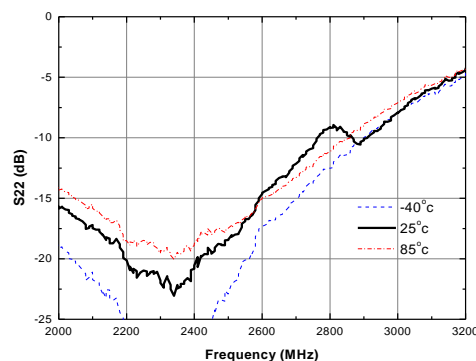
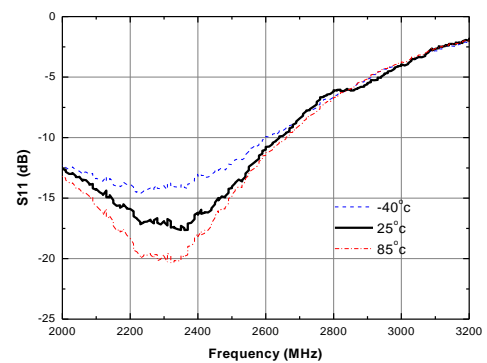
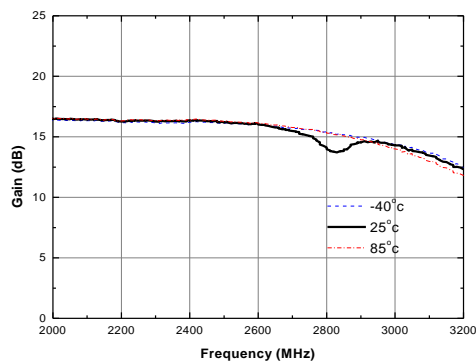
Schematic



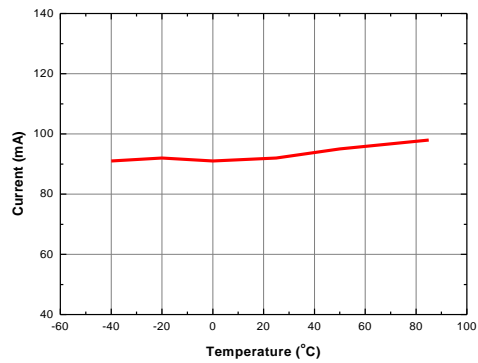
Board Layout (FR4, 40x40 mm², 0.8T)



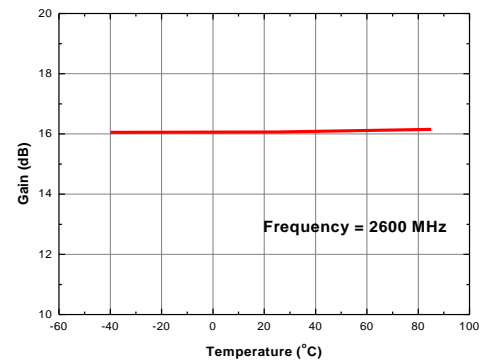
S-parameters & K-factor



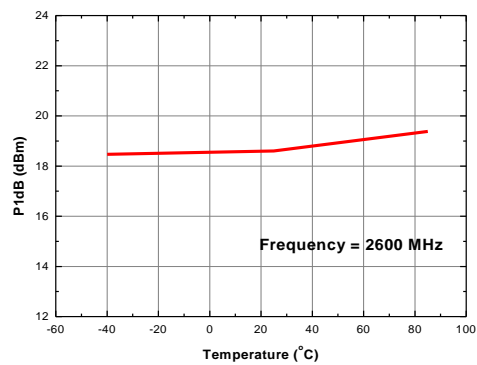
Current vs. Temperature



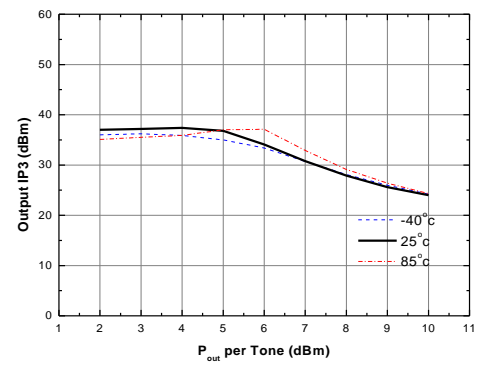
Gain vs. Temperature



P1dB vs. Temperature



Output IP3 vs. Tone Power (Frequency = 2600 MHz)



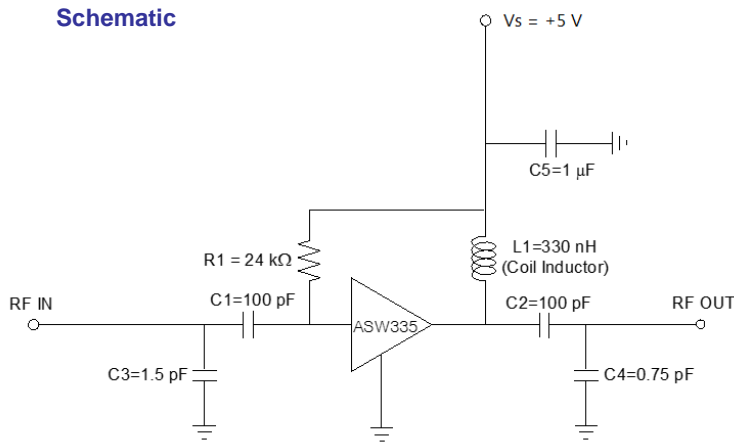
APPLICATION CIRCUIT

ONU
70 ~ 2500 MHz
+5 V

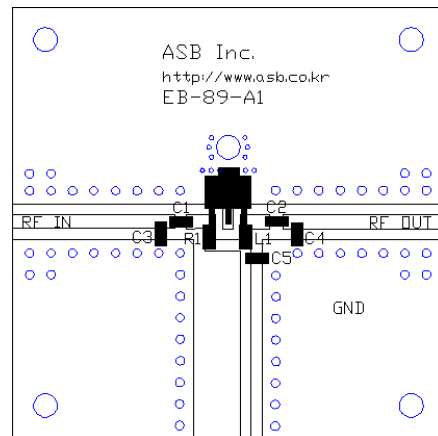
Frequency (MHz)	70	800	1700	2500
Magnitude S21 (dB)	17.9	16.7	15	14.6
Magnitude S11 (dB)	-9	-7	-7	-13
Magnitude S22 (dB)	-20	-7	-5	-8
Output P1dB (dBm)	21.5	21.5	22.5	19.5
Output IP3 ¹⁾ (dBm)	42.5	37	37	36
Noise Figure (dB)	1.4	1.7	1.9	3.2
Device Voltage (V)	+5	+5	+5	+5
Current (mA)	100	100	100	100

1) OIP3 is measured with two tones at an output power of +6 dBm/tone separated by 1 MHz.

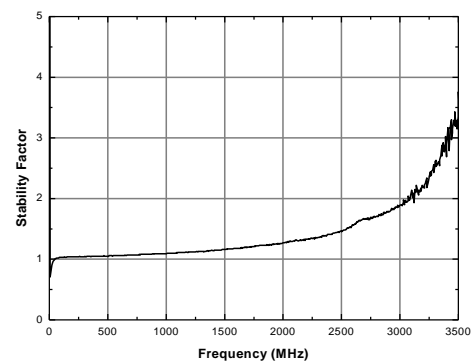
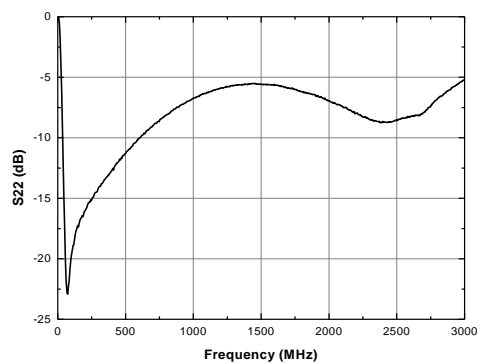
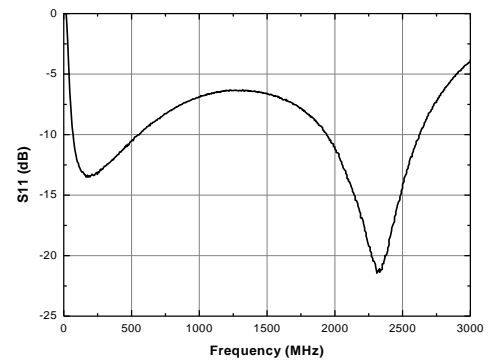
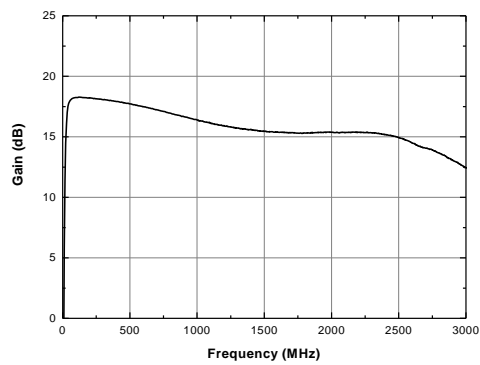
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

SMATV

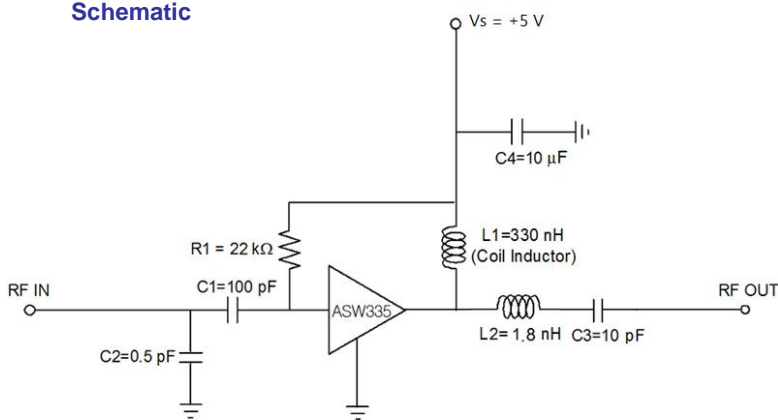
900 ~ 2200 MHz

+5 V, 50 Ω

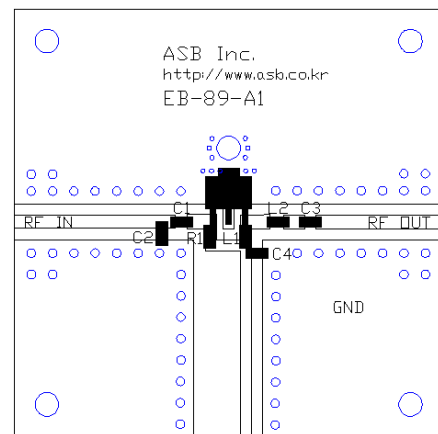
Frequency (MHz)	950	2200
Magnitude S21 (dB)	16.2	15.8
Magnitude S11 (dB)	-7	-12
Magnitude S22 (dB)	-7	-15
Output P1dB (dBm)	21.5	17.5
Output IP3 ¹⁾ (dBm)	41.5	38.0
Noise Figure (dB)	1.7	2.3
Device Voltage (V)	+5	+5
Current (mA)	100	100

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

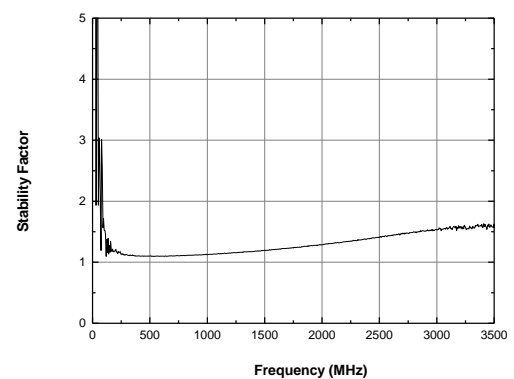
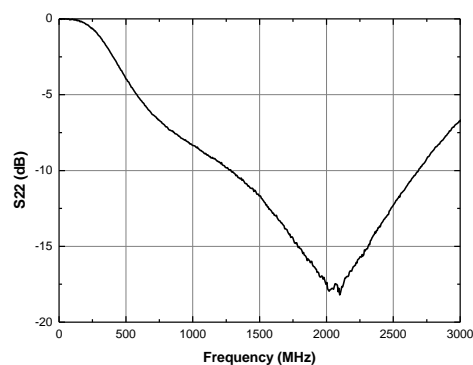
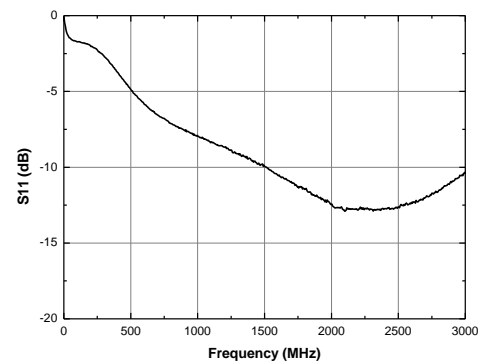
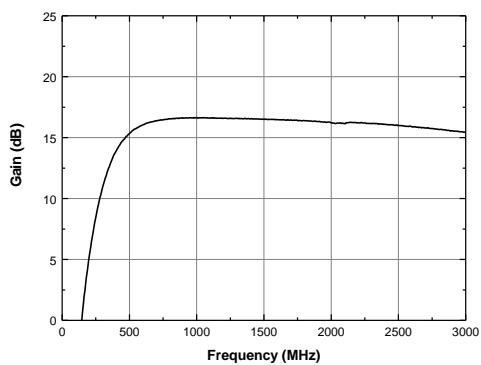
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



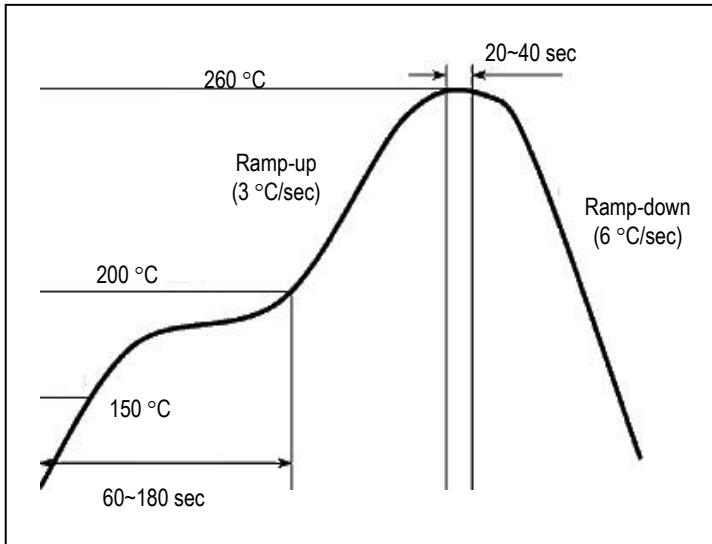
S-parameters & K-factor



Performance with varying Current

V _{DEVICE} (V)	Current (mA)	R1 (Ω)	Freq. (MHz)	Gain (dB)	S11 (dB)	S22 (dB)	OIP3 (dBm)	P1dB (dBm)	NF (dB)
5	100	24 k	900	17.6	-17.9	-33.1	42.5	22.9	1.83
			1950	15.9	-12.2	-13.9	42.1	22.6	2.21
5	90	30 k	900	17.6	-18.1	-33.3	40.8	22.8	1.85
			1950	15.9	-12.4	-13.5	40.4	22.3	2.19
5	80	43 k	900	17.5	-18.2	-32.2	38.9	22.4	1.84
			1950	15.8	-12.6	-13.3	38.1	21.7	2.21
5	70	68 k	900	17.4	-18.5	-30.6	37.1	21.7	1.83
			1950	15.7	-12.7	-12.9	36.4	21.2	2.31

Recommended Soldering Reflow Profile



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