

Package Style: SOT343

### Application Circuit

- LTE (700)
- CDMA, GSM
- 2000 MHz (Low Noise)
- 2000 MHz (High Gain)
- 2400 MHz
- WiMAX
- LTE 2600
- 3300 MHz
- 50 ~ 1000 MHz (50 Ω)
- 470 ~ 860 MHz (50 Ω)
- TETRA 360 ~ 450 MHz
- IF 20 ~ 108 MHz
- Wide Band 5 ~ 1000 MHz
- GPS, GLONASS, Galileo, Compass
- 1559 ~ 1610 MHz (GPS)
- 1500 ~ 1610 MHz (GPS)
- 1164 ~ 1620 MHz (GPS Wide)
- 1164 ~ 1620 MHz (High current)
- 1100 ~ 1700 MHz (GPS Wide)
- 50 ~ 2500 MHz  
(Trans-impedance Amplifier, 50 Ω)

### Features

- 19.0 dB Gain at 900 MHz
- 0.4 dB NF at 900 MHz
- 30 dBm OIP3 at 900 MHz
- 18 dBm P1dB at 900 MHz

### Description

AST54S is a one-stage LNA which has a low noise, high gain, and high linearity over a wide range of frequency up to 4 GHz. It is also suitable for use in the low noise amplifier block of mobile wireless systems of LTE, CDMA, WCDMA, WLAN so on. The amplifier is available in a SOT343 package and passes the stringent DC, RF, and reliability tests.

### Typical Performance

(Supply Voltage = +5 V, T<sub>A</sub> = +25 °C, Z<sub>0</sub> = 50 Ω)

Parameters	Units	Typical			
Testing Frequency	MHz	900	2000	2400	3300
Gain	dB	19.0	12.8	12.5	10.0
S11	dB	-18	-18	-20	-18
S22	dB	-10	-10	-10	-16
Output IP3 <sup>1)</sup>	dBm	30.0	34.0	34.0	37.5
Noise Figure	dB	0.40	0.50	0.65	0.80
Output P1dB	dBm	18	19	19	18
Current	mA	40			
Device Voltage	V	+3.3			

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

### Product Specifications<sup>1)</sup>

Parameters	Units	Min	Typ	Max
Frequency	MHz		2000	
Gain	dB	12.3	13.0	13.5
S11	dB	-16	-18	
S22	dB	-10	-12	
Output IP3	dBm	32	34	
Noise Figure	dB		0.50	0.65
Output P1dB	dBm	17	19	
Current	mA	35	40	45
Device Voltage	V		+3.3	

1) 100% in-house DC & RF testing is done on packaged products before taping

### 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 as in 2000 MHz application circuit)*	+22 dBm
Thermal Resistance	165 °C/W

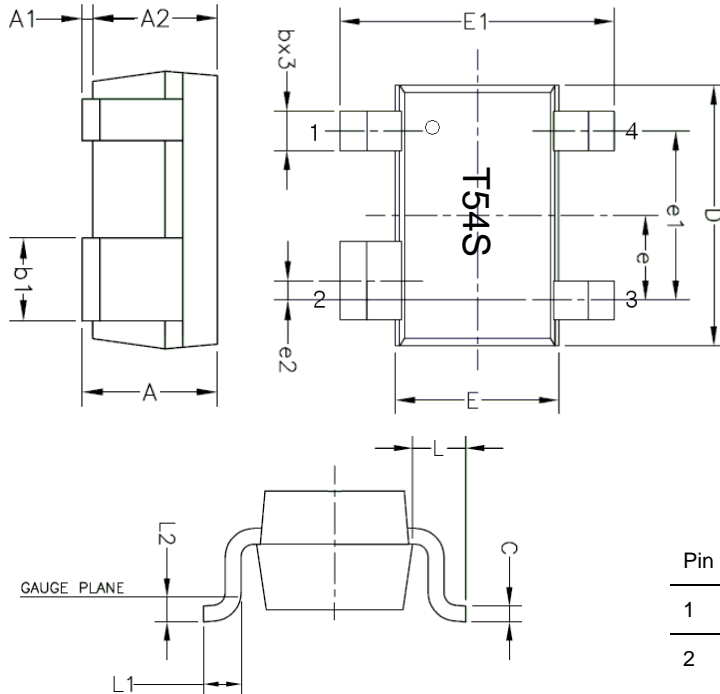
The operation of this device in excess of any of these limits may cause permanent damage.

\* Refer to the max. input RF power data at [http://www.asb.co.kr/pdf/Maximum\\_Input\\_Power\\_Analysis.pdf](http://www.asb.co.kr/pdf/Maximum_Input_Power_Analysis.pdf). The max. input RF power, in principle, depends upon application frequency, matching circuit, and device voltage.

### Pin Configuration

Pin No.	Function
1	RF OUT & Bias
2, 4	GND
3	RF IN

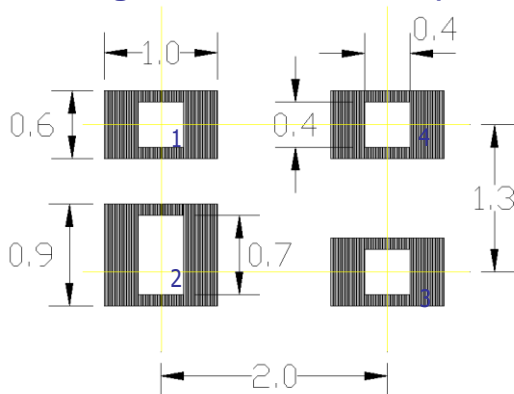
### Outline Drawing



Symbols	Dimensions (In mm)	
	MIN	MAX
A	0.90	1.10
A1	0.025	0.10
A2	0.875	1.00
b	0.20	0.40
b1	0.50	0.70
C	0.10	0.15
D	1.90	2.10
E	1.15	1.35
E1	2.00	2.30
e	0.65BSC	
e1	1.30BSC	
e2	0.15BSC	
L	0.425REF	
L1	0.300REF	
L2	0.200REF	

Pin NO.	Function	Pin NO.	Function.
1	RF OUT & Bias	3	RF IN
2	GND	4	GND

### Mounting Recommendation (In mm)



### ESD Classification & Moisture Sensitivity Level

#### ESD Classification

HBM Class 1A (Voltage Level: 200 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

Level 3 at 260 °C reflow

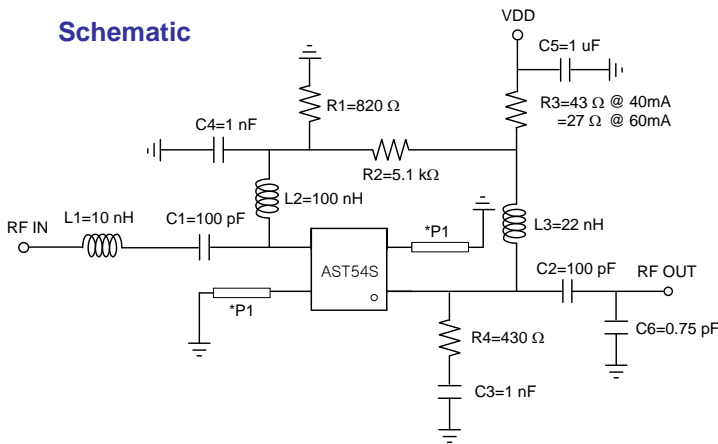
### APPLICATION CIRCUIT

**LTE 700**  
**698 ~ 787 MHz**  
**+5 V**

Parameter	Symbol	Unit	Frequency		Frequency	
			698	787	698	787
Power Gain	$G_p$	dB	19.0	18.0	19.5	18.5
Noise Figure	NF	dB	0.4	0.4	0.4	0.4
Input Return Loss	$RL_{in}$	dB	-18	-18	-18	-18
Output Return Loss	$RL_{out}$	dB	-10	-10	-10	-10
1 dB Gain Compression Output Power	$P_{o(1dB)}$	dBm	17	17	19	19
3 <sup>rd</sup> Intercept Point Output Power <sup>1)</sup>	OIP3	dBm	30	31	33	33
Circuit Current	$I_d$	mA	40	40	60	60

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

### Schematic

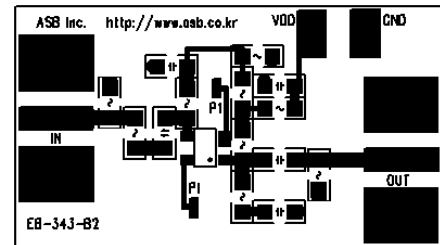


Note: 1) The length of the strip line P1 is given as below at the PCB with  $\epsilon_r = 4.5$  and  $T = 0.8$  mm.

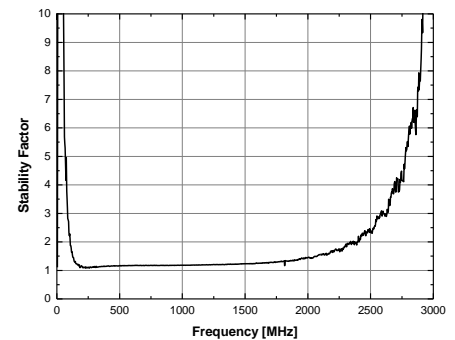
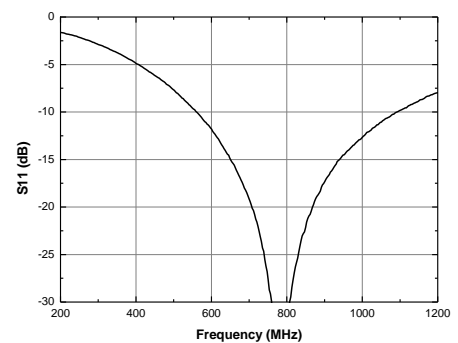
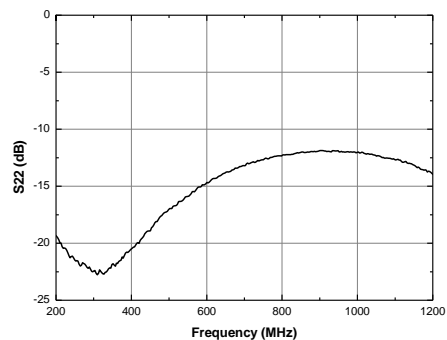
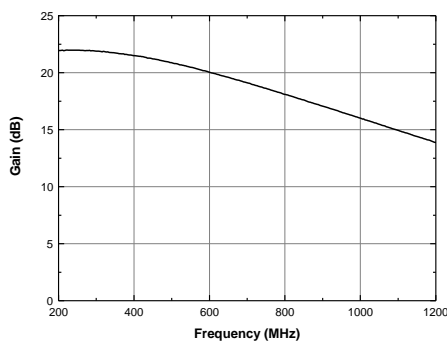
P1 Length: 3 mm, Width: 0.3 mm

2) Gain and S11 are in trade-off and varied with the length of P1

### Board Layout (FR4, 23x13 mm<sup>2</sup>, 0.8T)



### S-parameters & K-factor



### APPLICATION CIRCUIT

GSM, CDMA

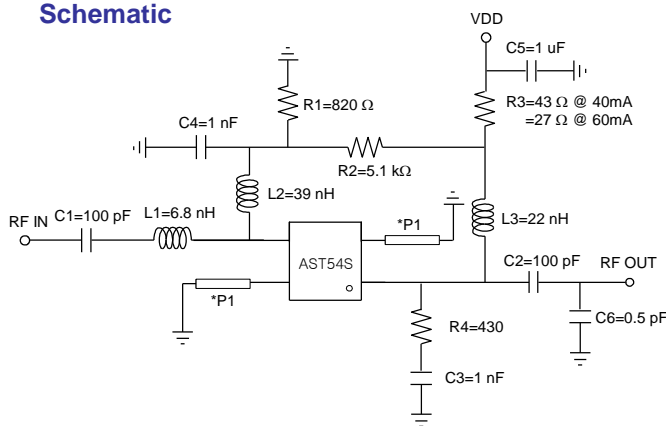
824 ~ 960 MHz

+5 V

Parameter	Symbol	Unit	Frequency		Frequency	
			824	960	824	960
Power Gain	$G_p$	dB	19.5	18.1	19.6	18.2
Noise Figure	NF	dB	0.4	0.4	0.4	0.4
Input Return Loss	$RL_{in}$	dB	-18	-18	-18	-18
Output Return Loss	$RL_{out}$	dB	-10	-10	-10	-10
1 dB Gain Compression Output Power	$P_{o(1dB)}$	dBm	17	18	19	19
3 <sup>rd</sup> Intercept Point Output Power <sup>1)</sup>	OIP3	dBm	30	30	32	32
Circuit Current	$I_d$	mA	40	40	60	60

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

### Schematic

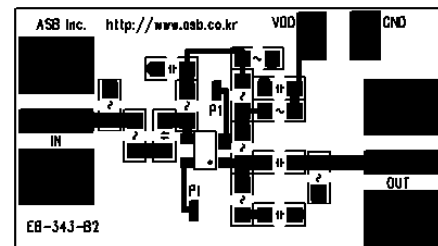


Note: 1) The length of the strip line P1 is given as below at the PCB with  $\epsilon_r = 4.5$  and  $T = 0.8$  mm.

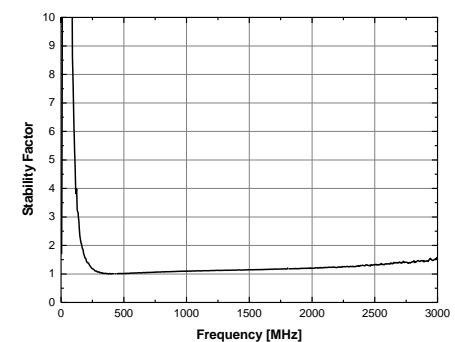
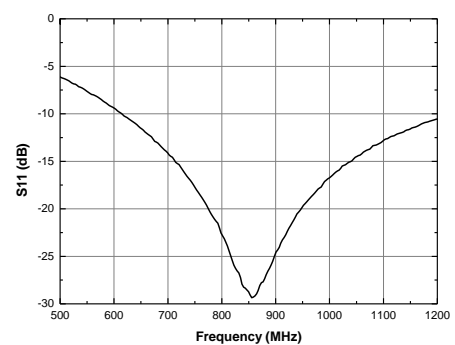
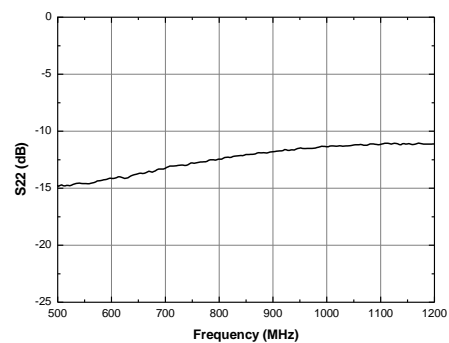
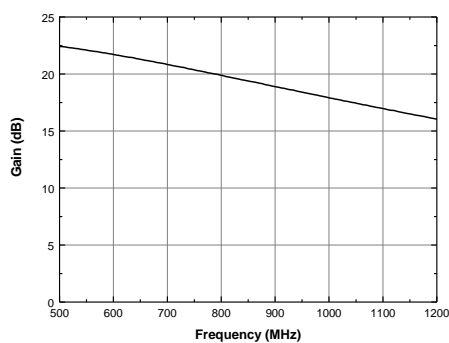
P1 Length: 2.0 mm, Width: 0.3 mm

2) Gain and S11 are in trade-off and varied with the length of P1

### Board Layout (FR4, 23x13 mm<sup>2</sup>, 0.8T)



### S-parameters & K-factor



### APPLICATION CIRCUIT

GPS, GLONASS, Galileo, Compass

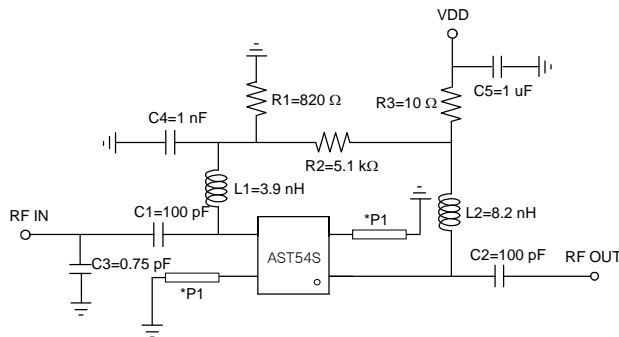
1559 ~ 1610 MHz

+3 V, 18 mA

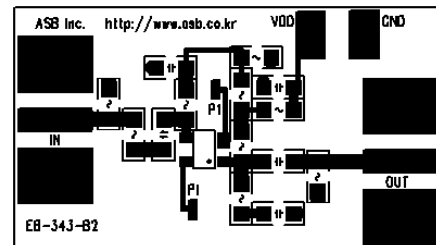
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Power Gain	$G_p$	F = 1575 MHz		14.5		dB
Noise Figure	NF	F = 1575 MHz		0.5		dB
Input Return Loss	$RL_{in}$	F = 1575 MHz		-18		dB
Output Return Loss	$RL_{out}$	F = 1575 MHz		-10		dB
1 dB Gain Compression Output Power	$P_{o(1dB)}$	F = 1575 MHz		17.5		dBm
3 <sup>rd</sup> Intercept Point Output Power <sup>1)</sup>	OIP3	F = 1575 MHz		28		dBm
Circuit Current	$I_d$	F = 1575 MHz Non-RF		18		mA

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

### Schematic



### Board Layout (FR4, 23x13 mm<sup>2</sup>, 0.8T)

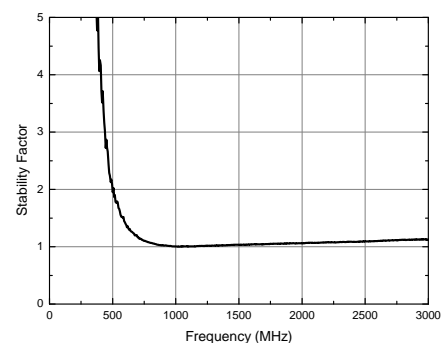
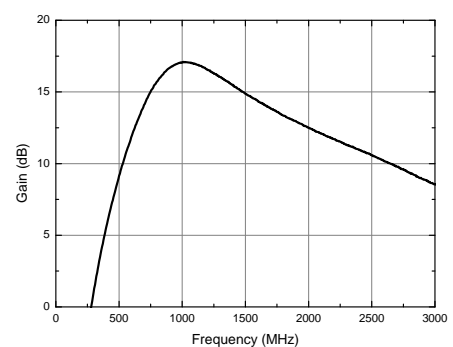
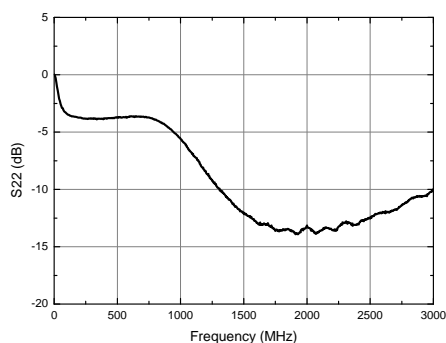
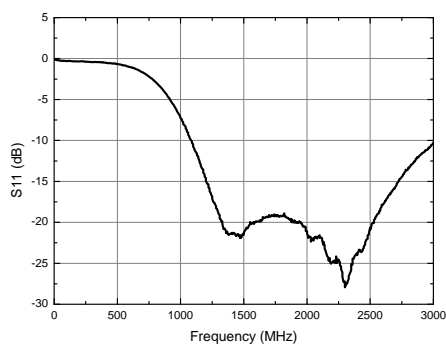


Note: 1) The length of the strip line P1 is given as below at the PCB with  $\epsilon_r = 4.5$  and  $T = 0.8$  mm.

P1 Length: 2.0 mm, Width: 0.3 mm

2) Gain and S11 are in trade-off and varied with the length of P1

### S-parameters & K-factor



### APPLICATION CIRCUIT

GPS, GLONASS, Galileo, Compass

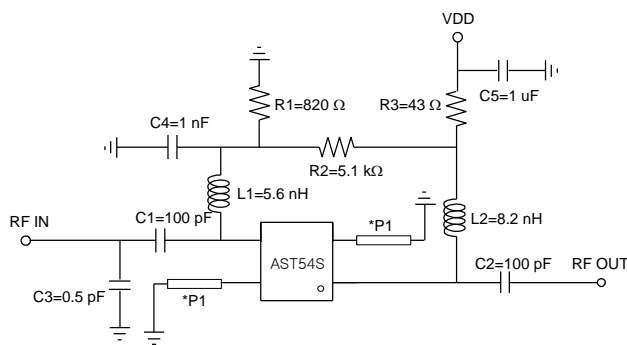
1500 ~ 1610 MHz

+5 V, 40 mA

Parameter	Symbol	Unit	Frequency (MHz)	
			1500	1610
Power Gain	$G_p$	dB	15.2	14.9
Noise Figure	NF	dB	0.45	0.50
Input Return Loss	$RL_{in}$	dB	-18	-18
Output Return Loss	$RL_{out}$	dB	-18	-18
1 dB Gain Compression Output Power	$P_{o(1dB)}$	dBm	18	18
3 <sup>rd</sup> Intercept Point Output Power <sup>1)</sup>	OIP3	dBm	33	33
Circuit Current	$I_d$	mA	40	40

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

### Schematic

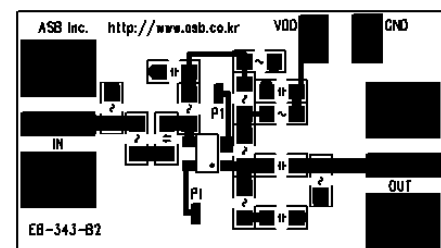


Note: 1) The length of the strip line P1 is given as below at the PCB with  $\epsilon_r = 4.5$  and  $T = 0.8$  mm.

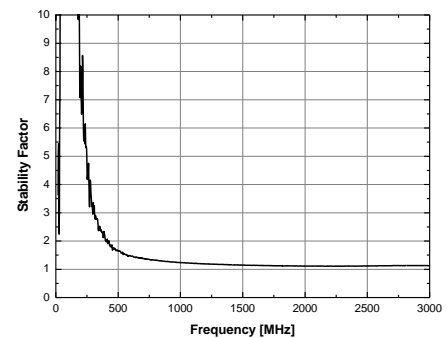
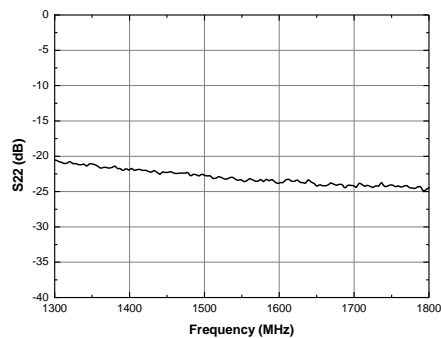
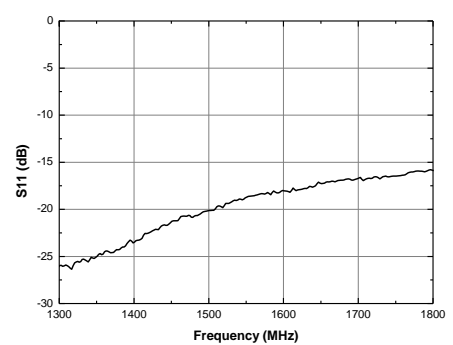
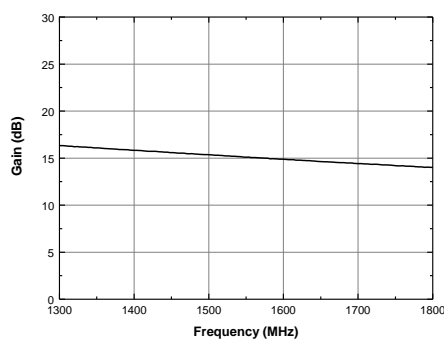
P1 Length: 3 mm, Width: 0.3 mm

2) Gain and  $S_{11}$  are in trade-off and varied with the length of P1

### Board Layout (FR4, 23x13 mm<sup>2</sup>, 0.8T)



### S-parameters & K-factor



### APPLICATION CIRCUIT

GPS, GLONASS, Galileo, Compass

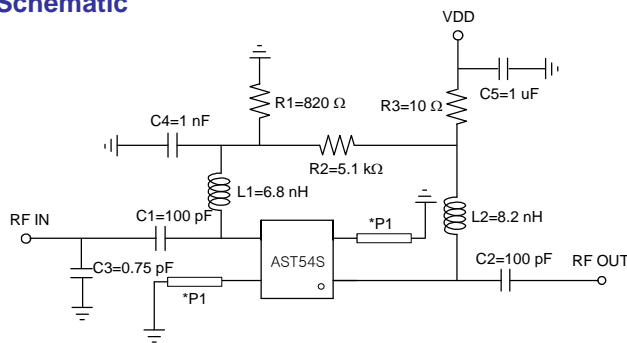
1164 ~ 1620 MHz

+3 V, 18 mA

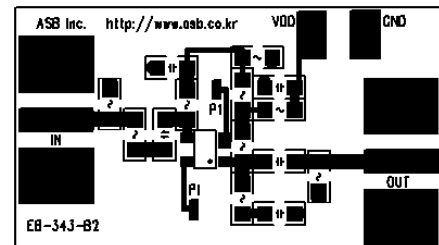
Parameter	Symbol	Unit	Frequency (MHz)	
			1164 ~ 1300	1559 ~ 1620
Power Gain	$G_p$	dB	16.5	14.5
Noise Figure	NF	dB	0.5	0.5
Input Return Loss	$RL_{in}$	dB	-11	-12
Output Return Loss	$RL_{out}$	dB	-12	-15
1 dB Gain Compression Output Power	$P_{o(1dB)}$	dBm	16.0	16.5
3 <sup>rd</sup> Intercept Point Output Power <sup>1)</sup>	OIP3	dBm	26	27
Circuit Current	$I_d$	mA	18	18

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

### Schematic



### Board Layout (FR4, 23x13 mm<sup>2</sup>, 0.8T)

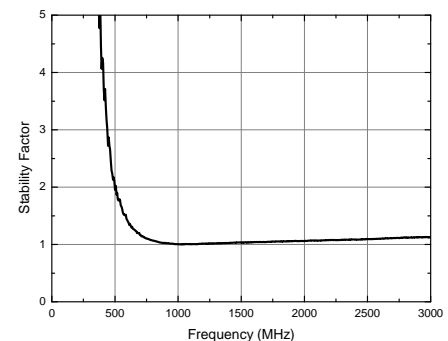
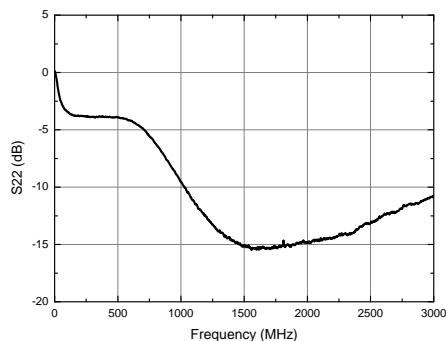
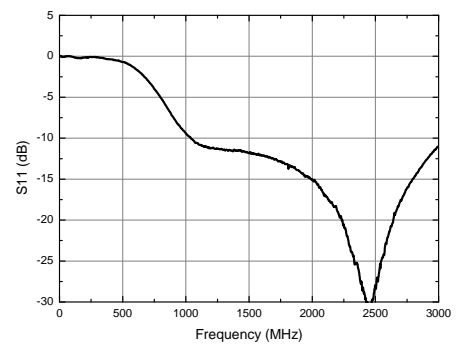
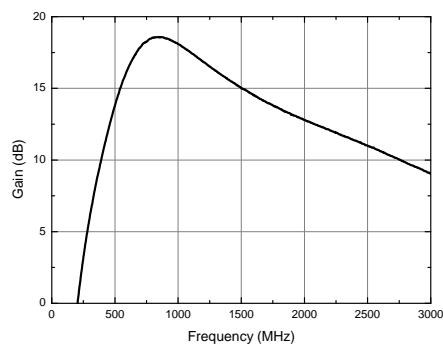


Note: 1) The length of the strip line P1 is given as below at the PCB with  $\epsilon_r = 4.5$  and  $T = 0.8$  mm.

P1 Length: 2 mm, Width: 0.3 mm

2) Gain and S11 are in trade-off and varied with the length of P1

### S-parameters & K-factor



### APPLICATION CIRCUIT

GPS, GLONASS, Galileo, Compass

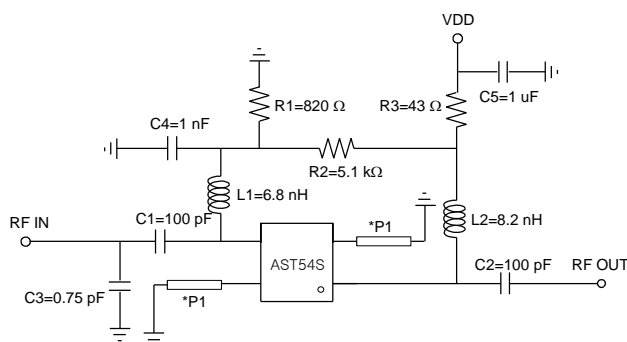
1164 ~ 1620 MHz

+5 V, 40 mA

Parameter	Symbol	Unit	Frequency (MHz)	
			1164 ~ 1300	1559 ~ 1620
Power Gain	$G_p$	dB	17.4	15.2
Noise Figure	NF	dB	0.45	0.45
Input Return Loss	$RL_{in}$	dB	-12	-10
Output Return Loss	$RL_{out}$	dB	-18	-18
1 dB Gain Compression Output Power	$P_{o(1dB)}$	dBm	17	18
3 <sup>rd</sup> Intercept Point Output Power <sup>1)</sup>	OIP3	dBm	30	32
Circuit Current	$I_d$	mA	40	40

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

### Schematic

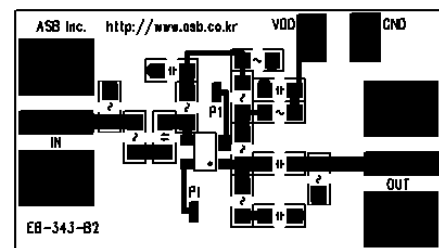


Note: 1) The length of the strip line P1 is given as below at the PCB with  $\epsilon_r = 4.5$  and  $T = 0.8$  mm.

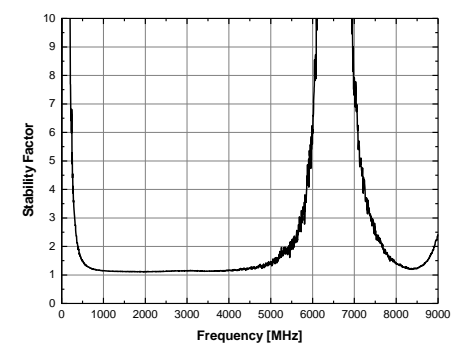
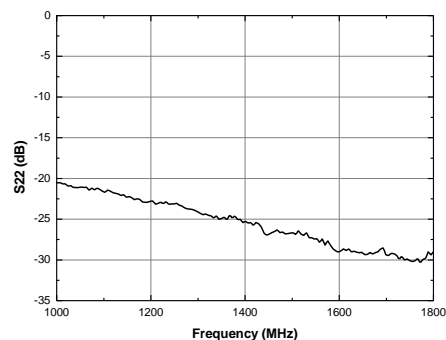
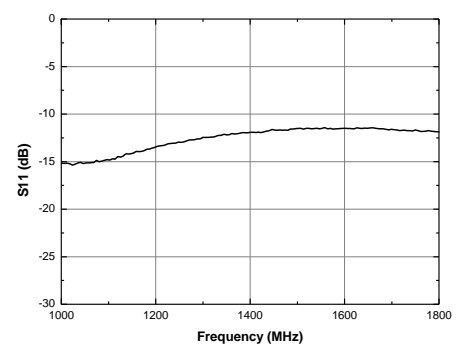
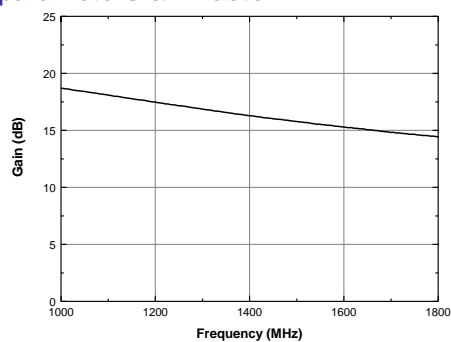
P1 Length: 1 mm, Width: 0.3 mm

2) Gain and S11 are in trade-off and varied with the length of P1

### Board Layout (FR4, 23x13 mm<sup>2</sup>, 0.8T)



### S-parameters & K-factor





### APPLICATION CIRCUIT

GPS, GLONASS, Galileo, Compass

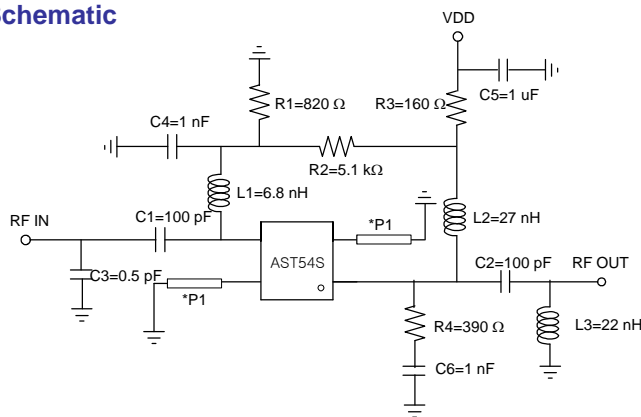
1100 ~ 1700 MHz

+5 V, 15 mA

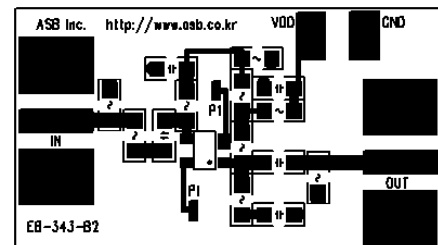
Parameter	Symbol	Unit	Frequency (MHz)		
			1100	1400	1700
Power Gain	$G_p$	dB	17.6	15.8	14.1
Noise Figure	NF	dB	0.55	0.50	0.50
Input Return Loss	$RL_{in}$	dB	-13	-14	-14
Output Return Loss	$RL_{out}$	dB	-14	-14	-13
1 dB Gain Compression Output Power	$P_{o(1dB)}$	dBm	10	11	12
3 <sup>rd</sup> Intercept Point Output Power <sup>1)</sup>	OIP3	dBm	23	24	25
Circuit Current	$I_d$	mA	15	15	15

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

### Schematic



### Board Layout (FR4, 23x13 mm<sup>2</sup>, 0.8T)

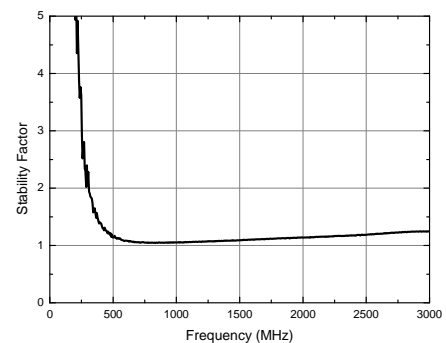
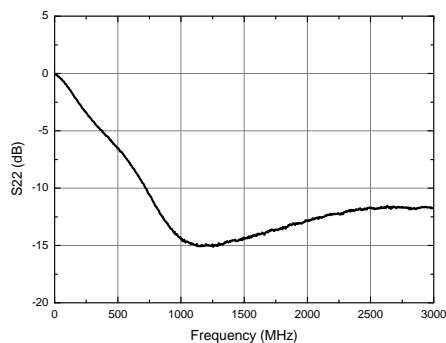
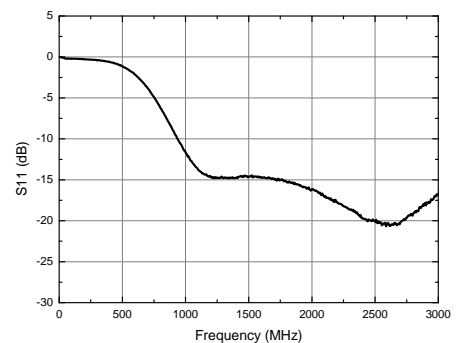
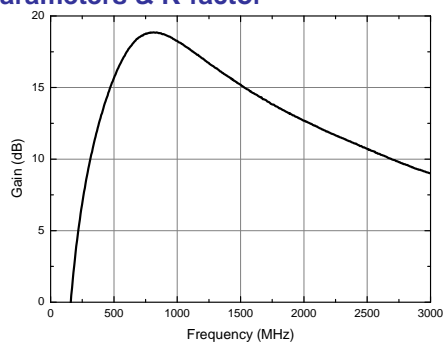


Note: 1) The length of the strip line P1 is given as below at the PCB with  $\epsilon_r = 4.5$  and  $T = 0.8$  mm.

P1 Length: 2.4mm Width: 0.3 mm

2) Gain and S11 are in trade-off and varied with the length of P1

### S-parameters & K-factor



### APPLICATION CIRCUIT

WCDMA

$S_{11} < -18 \text{ dB}$  &

Low Noise

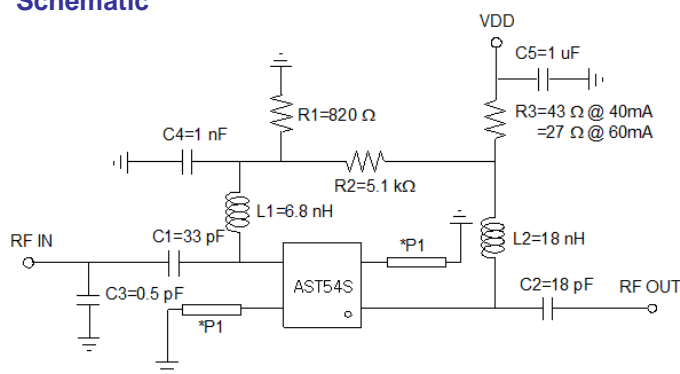
2000 MHz

+5 V

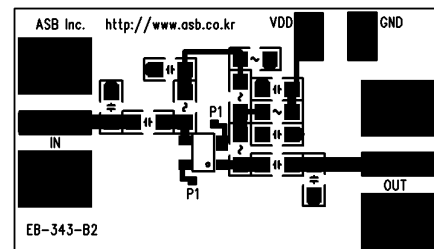
Parameter	Symbol	Test Conditions	TYP.		Unit
Power Gain	$G_p$	F = 2 GHz	12.8	12.9	dB
Noise Figure	NF	F = 2 GHz	0.5	0.5	dB
Input Return Loss	$RL_{in}$	F = 2 GHz	-18	-18	dB
Output Return Loss	$RL_{out}$	F = 2 GHz	-10	-10	dB
1 dB Gain Compression Output Power	$P_{o(1dB)}$	F = 2 GHz	19	20	dBm
3 <sup>rd</sup> Intercept Point Output Power <sup>1)</sup>	OIP3	F = 2 GHz	34	36	dBm
Circuit Current	$I_d$	F = 2 GHz Non-RF	40	60	mA

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

### Schematic



### Board Layout (FR4, 23x13 mm<sup>2</sup>, 0.8T)

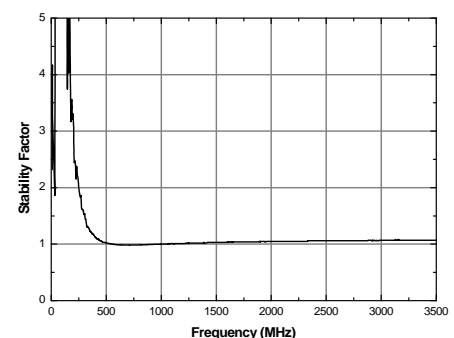
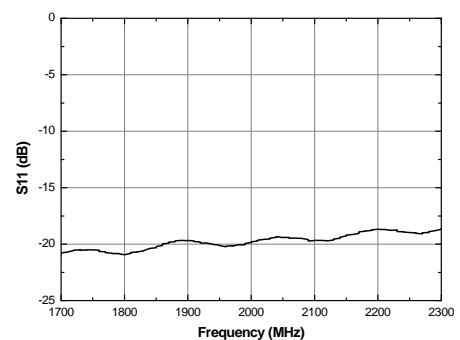
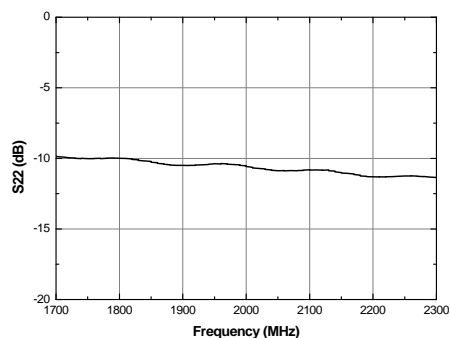
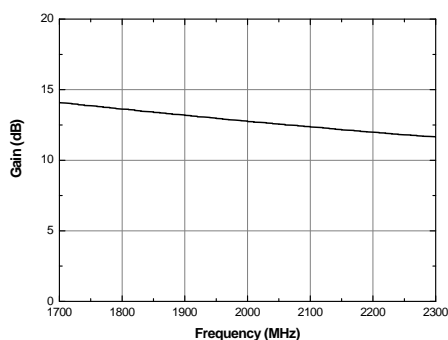


Note: 1) The length of the strip line P1 is given as below at the PCB with  $\epsilon_r = 4.5$  and  $T = 0.8 \text{ mm}$ .

P1 Length: 2.2 mm, Width: 0.3 mm

2) Gain and  $S_{11}$  are in trade-off and varied with the length of P1

### S-parameters & K-factor



### APPLICATION CIRCUIT

WCDMA

$S_{11} < -18 \text{ dB}$  &

High Gain

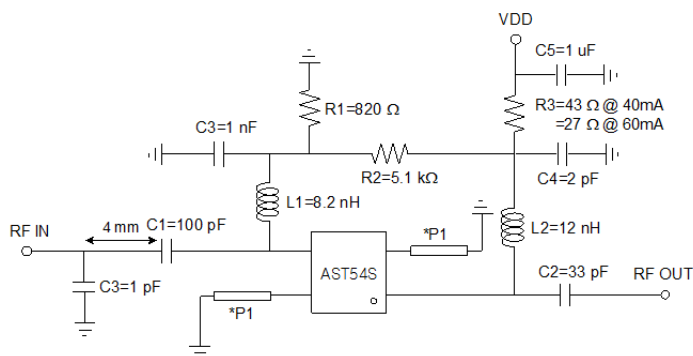
2000 MHz

+5 V

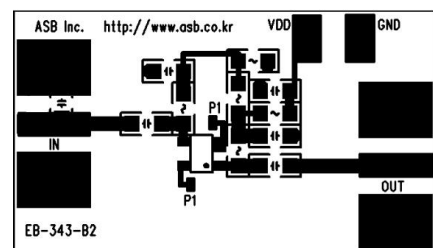
Parameter	Symbol	Test Conditions	TYP.		Unit
Power Gain	$G_p$	F = 2 GHz	14.5	14.6	dB
Noise Figure	NF	F = 2 GHz	0.6	0.6	dB
Input Return Loss	$RL_{in}$	F = 2 GHz	-18	-18	dB
Output Return Loss	$RL_{out}$	F = 2 GHz	-12	-12	dB
1 dB Gain Compression Output Power	$P_{o(1dB)}$	F = 2 GHz	19	20	dBm
3 <sup>rd</sup> Intercept Point Output Power <sup>1)</sup>	OIP3	F = 2 GHz	34	36	dBm
Circuit Current	$I_d$	F = 2 GHz Non-RF	40	60	mA

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

### Schematic



### Board Layout (FR4, 23x13 mm<sup>2</sup>, 0.8T)

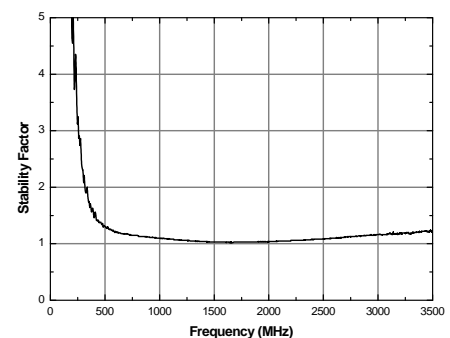
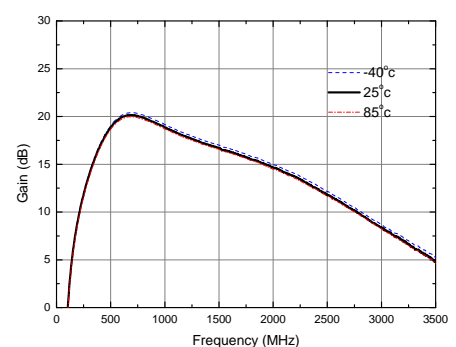
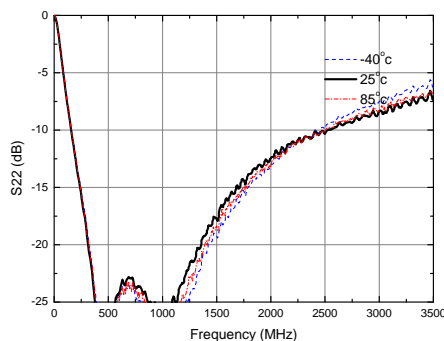
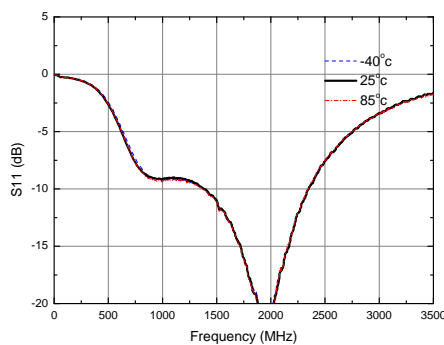


Note: 1) The length of the strip line P1 is given as below at the PCB with  $\epsilon_r = 4.5$  and  $T = 0.8 \text{ mm}$ .

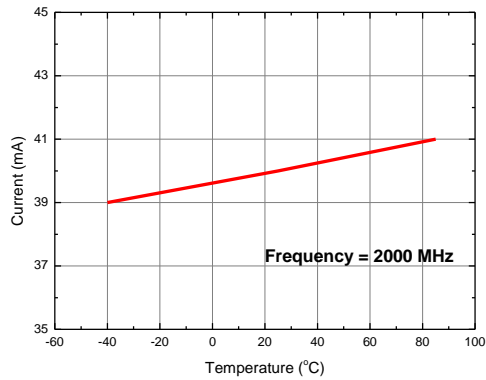
P1 Length: 0.75 mm, Width: 0.3 mm

2) Gain and  $S_{11}$  are in trade-off and varied with the length of P1

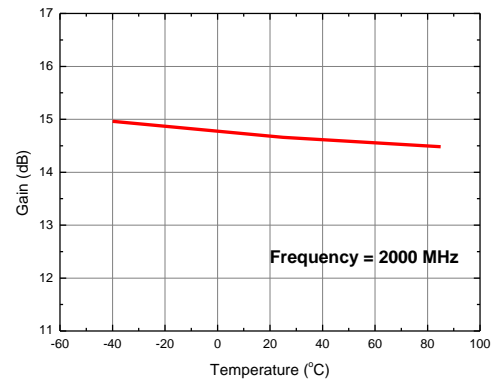
### S-parameters & K-factor



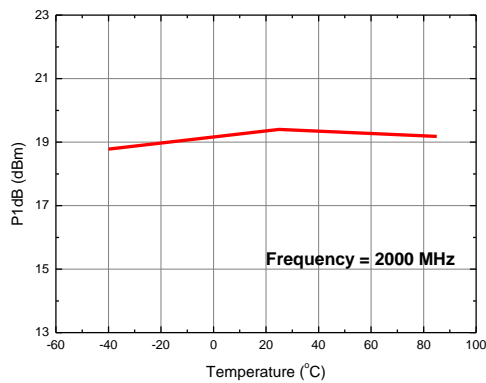
### Current vs. Temperature



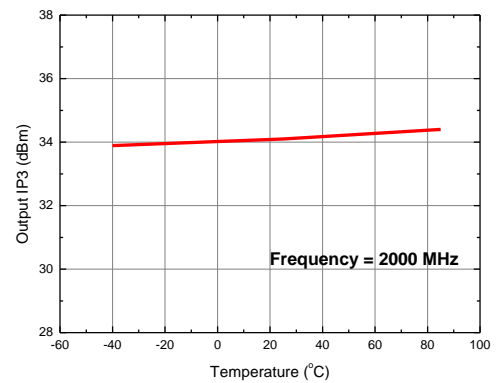
### Gain vs. Temperature



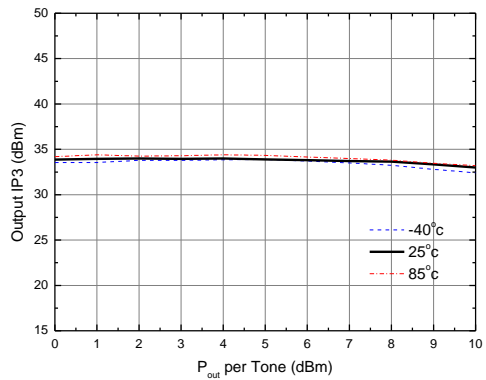
### P1dB vs. Temperature



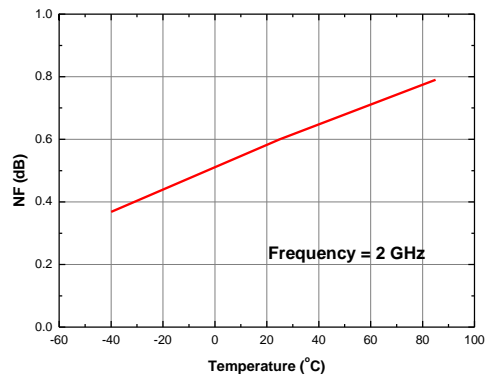
### Output IP3 vs. Temperature



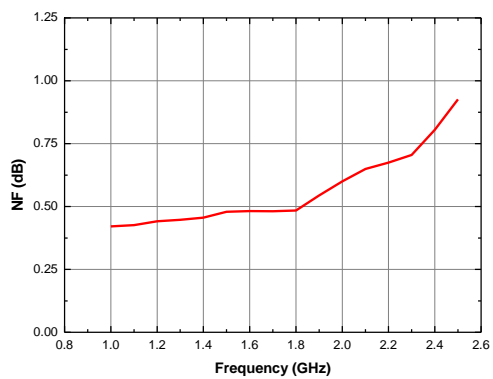
### Output IP3 vs. Tone Power (Frequency = 2000 MHz)



### NF vs. Temperature



### NF vs. Frequency



### APPLICATION CIRCUIT

WLAN

$S_{11} < -18 \text{ dB}$

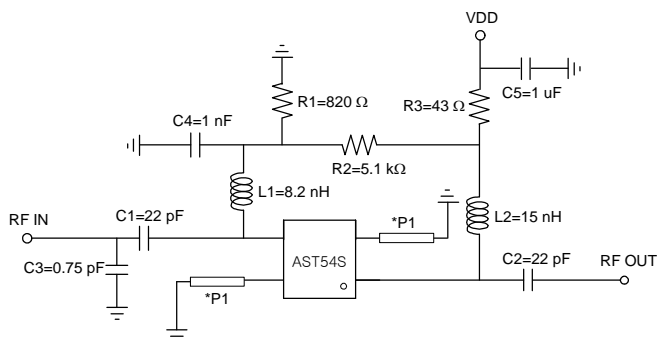
2400 MHz

+5 V

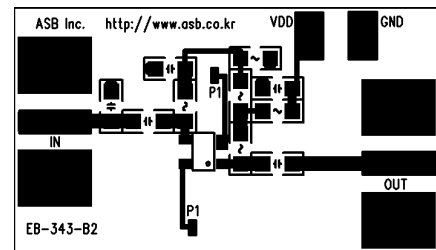
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Power Gain	$G_p$	$F = 2.4 \text{ GHz}$		12.5		dB
Noise Figure	NF	$F = 2.4 \text{ GHz}$		0.65		dB
Input Return Loss	$RL_{in}$	$F = 2.4 \text{ GHz}$		-20		dB
Output Return Loss	$RL_{out}$	$F = 2.4 \text{ GHz}$		-10		dB
1 dB Gain Compression Output Power	$P_{o(1dB)}$	$F = 2.4 \text{ GHz}$		19		dBm
3 <sup>rd</sup> Intercept Point Output Power <sup>1)</sup>	OIP3	$F = 2.4 \text{ GHz}$		34		dBm
Circuit Current	$I_d$	$F = 2.4 \text{ GHz}$ Non-RF		40		mA

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

### Schematic



### Board Layout (FR4, 23x13 mm<sup>2</sup>, 0.8T)

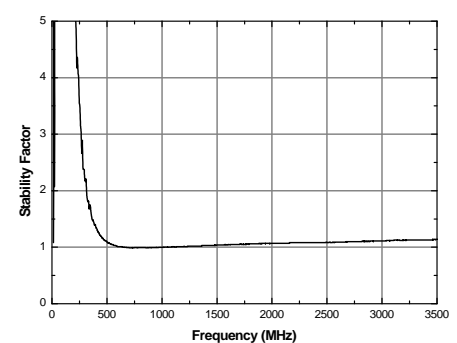
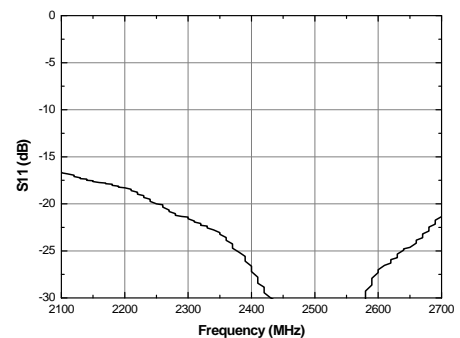
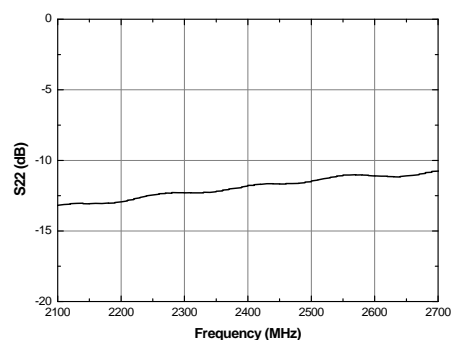
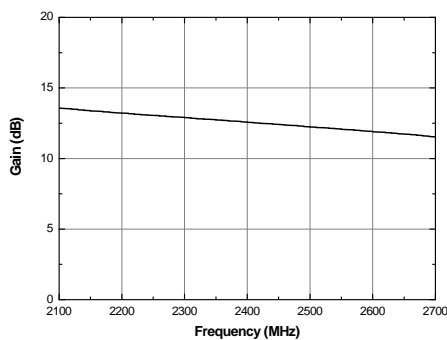


Note: 1) The length of the strip line P1 is given as below at the PCB with  $\epsilon_r = 4.5$  and  $T = 0.8 \text{ mm}$ .

P1 Length: 3.1 mm, Width: 0.3 mm

2) Gain and  $S_{11}$  are in trade-off and varied with the length of P1

### S-parameters & K-factor



### APPLICATION CIRCUIT

WiMAX, LTE

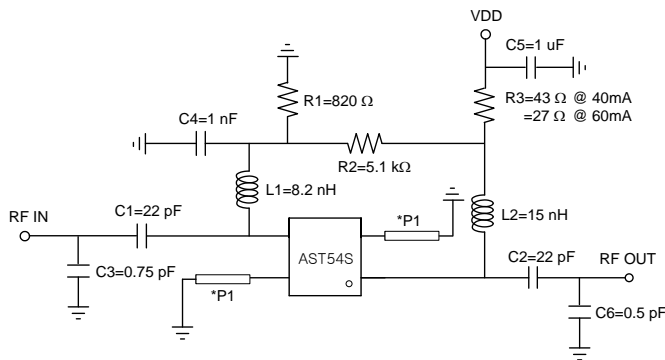
2300 ~ 2700 MHz

+5 V

Parameter	Symbol	Unit	Frequency		Frequency	
			2300	2700	2300	2700
Power Gain	$G_p$	dB	13.6	12.3	14.0	12.7
Noise Figure	NF	dB	0.60	0.65	0.65	0.70
Input Return Loss	$RL_{in}$	dB	-17	-18	-18	-18
Output Return Loss	$RL_{out}$	dB	-10	-10	-10	-10
1 dB Gain Compression Output Power	$P_{o(1dB)}$	dBm	18.5	19.5	20.5	20.5
3 <sup>rd</sup> Intercept Point Output Power <sup>1)</sup>	OIP3	dBm	32	33	35	35
Circuit Current	$I_d$	mA	40	40	60	60

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

### Schematic

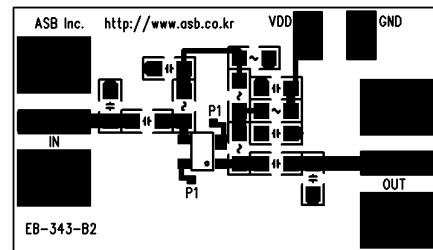


Note: 1) The length of the strip line P1 is given as below at the PCB with  $\epsilon_r = 4.5$  and  $T = 0.8$  mm.

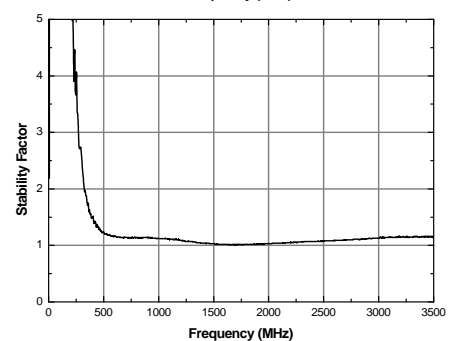
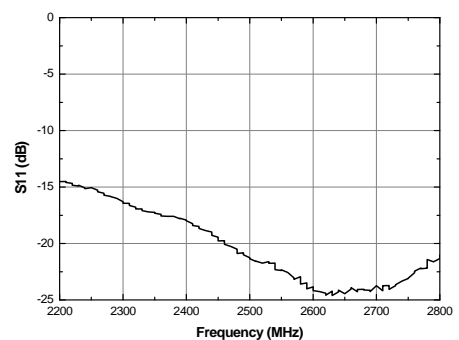
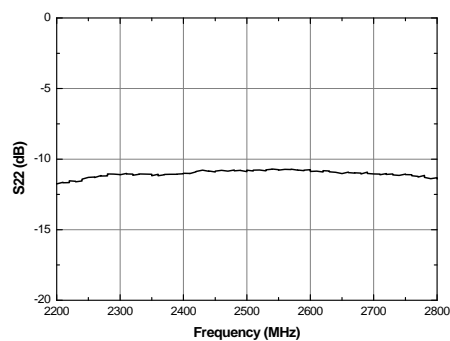
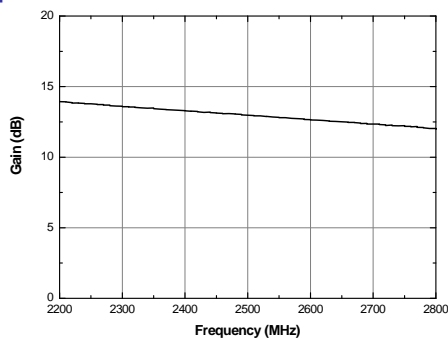
P1 Length: 0.5 mm, Width: 0.3 mm

2) Gain and S11 are in trade-off and varied with the length of P1

### Board Layout (FR4, 23x13 mm<sup>2</sup>, 0.8T)



### S-parameters & K-factor



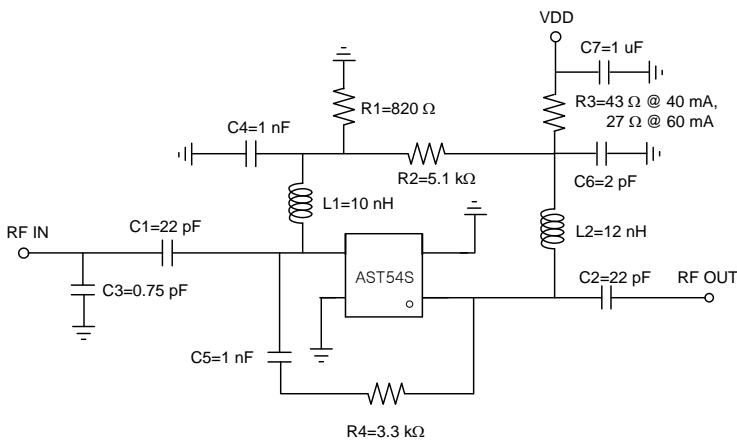
### APPLICATION CIRCUIT

**LTE 2600**  
**2600 ~ 2700 MHz**  
**+5 V**

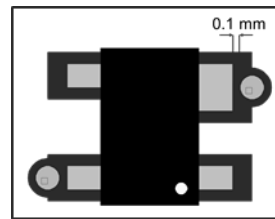
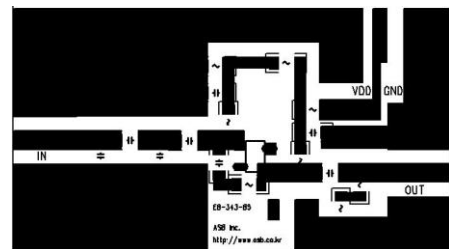
Parameter	Symbol	Unit	Frequency		Frequency	
			2600	2700	2600	2700
Power Gain	$G_p$	dB	13.5	13.2	13.6	13.3
Noise Figure	NF	dB	0.6	0.6	0.6	0.6
Input Return Loss	$RL_{in}$	dB	-18	-18	-18	-18
Output Return Loss	$RL_{out}$	dB	-10	-10	-10	-10
1 dB Gain Compression Output Power	$P_{\alpha(1dB)}$	dBm	19	19	20	20
3 <sup>rd</sup> Intercept Point Output Power <sup>1)</sup>	OIP3	dBm	32	34	34	34
Circuit Current	$I_d$	mA	40	40	60	60

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

### Schematic

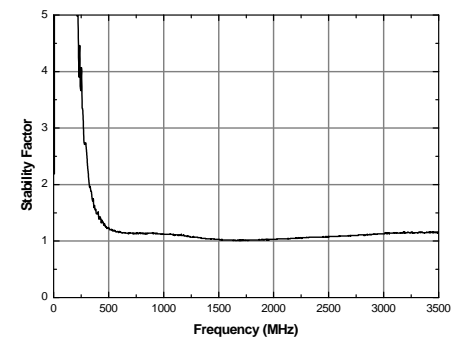
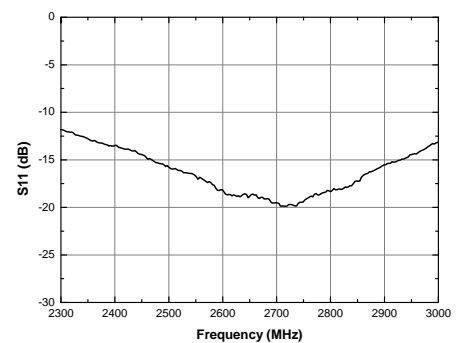
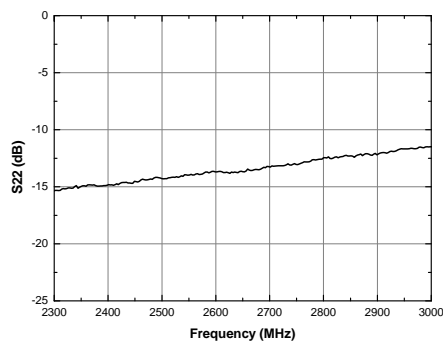
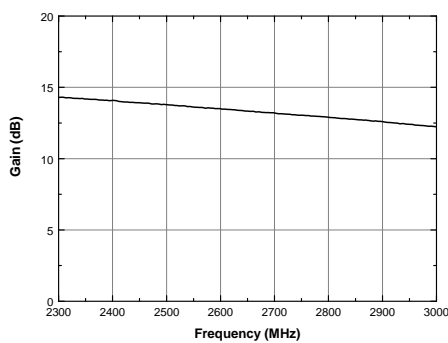


### Board Layout (FR4, 23x13 mm<sup>2</sup>, 0.8T)



Note: The ground via holes must be placed close to the lead pin 2 and 4 within 0.1 mm.

### S-parameters & K-factor



### APPLICATION CIRCUIT

WiMAX

$S_{11} < -18 \text{ dB}$

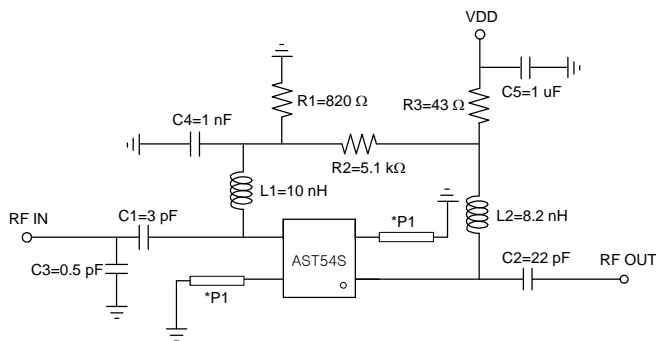
3300 MHz

+5 V

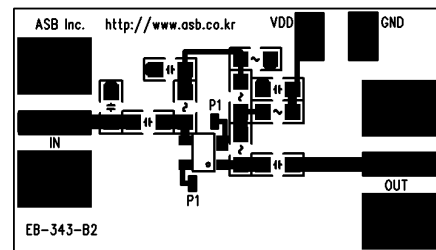
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Power Gain	$G_p$	F = 3.3 GHz		10		dB
Noise Figure	NF	F = 3.3 GHz		0.8		dB
Input Return Loss	$RL_{in}$	F = 3.3 GHz		-18		dB
Output Return Loss	$RL_{out}$	F = 3.3 GHz		-16		dB
1 dB Gain Compression Output Power	$P_{o(1dB)}$	F = 3.3 GHz		18		dBm
3 <sup>rd</sup> Intercept Point Output Power <sup>1)</sup>	OIP3	F = 3.3 GHz		37.5		dBm
Circuit Current	$I_d$	F = 3.3 GHz Non-RF		40		mA

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

### Schematic



### Board Layout (FR4, 23x13 mm<sup>2</sup>, 0.8T)

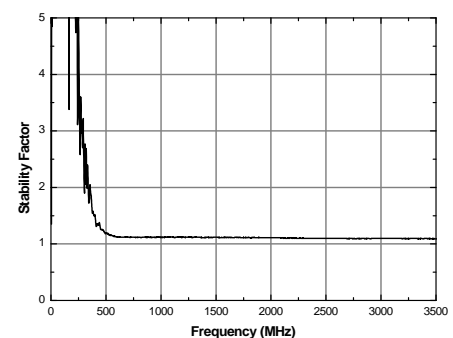
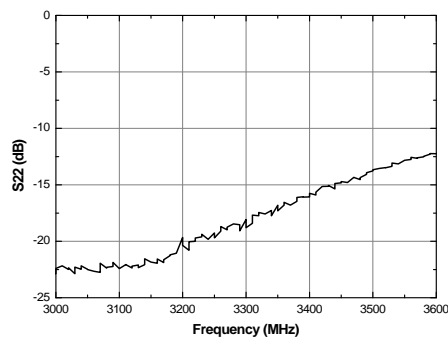
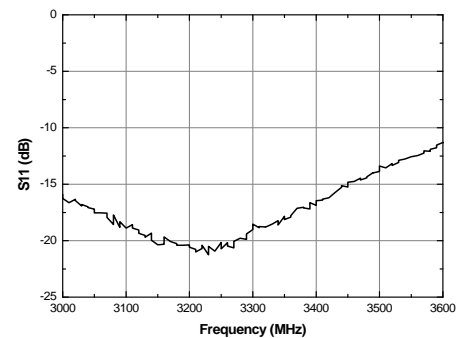
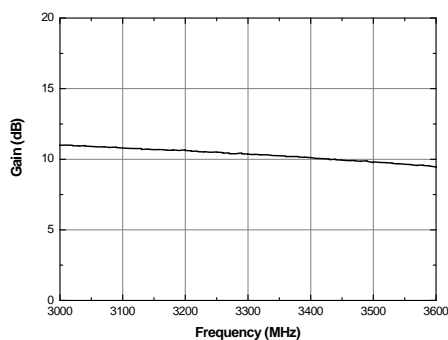


Note: 1) The length of the strip line P1 is given as below at the PCB with  $\epsilon_r = 4.5$  and  $T = 0.8 \text{ mm}$ .

P1 Length: 0.7 mm, Width: 0.3 mm

2) Gain and  $S_{11}$  are in trade-off and varied with the length of P1

### S-parameters & K-factor





### APPLICATION CIRCUIT

CATV (50 Ω)

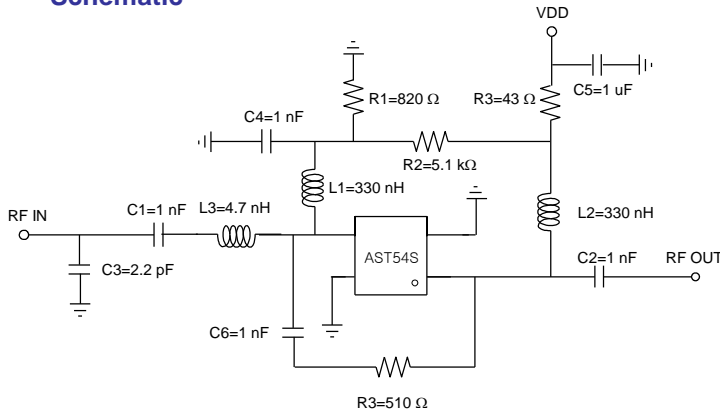
50 ~ 1000 MHz

+5 V

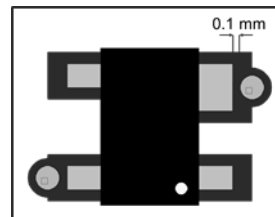
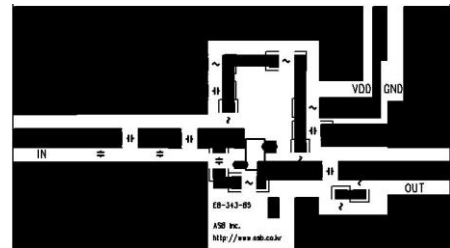
Parameter	Symbol	Unit	Frequency (MHz)		
			50	500	860
Power Gain	$G_p$	dB	20	19	18
Noise Figure	NF	dB	1.00	1.05	1.10
Input Return Loss	$RL_{in}$	dB	-18	-12	-16
Output Return Loss	$RL_{out}$	dB	-9	-12	-18
1 dB Gain Compression Output Power	$P_{o(1dB)}$	dBm	15	17	16
3 <sup>rd</sup> Intercept Point Output Power <sup>1)</sup>	OIP3	dBm	26	29	28
Circuit Current	$I_d$	mA	40	40	40

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

### Schematic

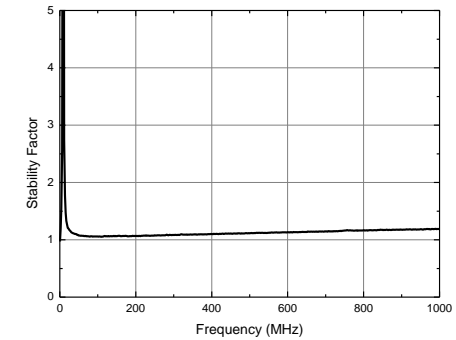
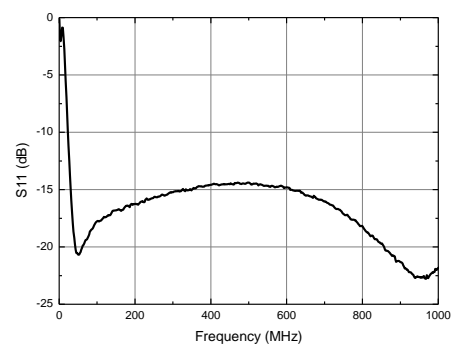
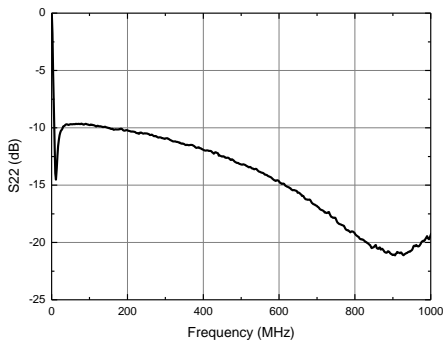
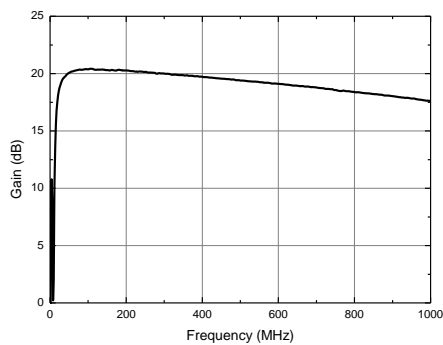


### Board Layout (FR4, 28x16 mm<sup>2</sup>, 0.8T)



Note: The ground via holes must be placed close to the lead pin 2 and 4 within 0.1 mm.

### S-parameters & K-factor



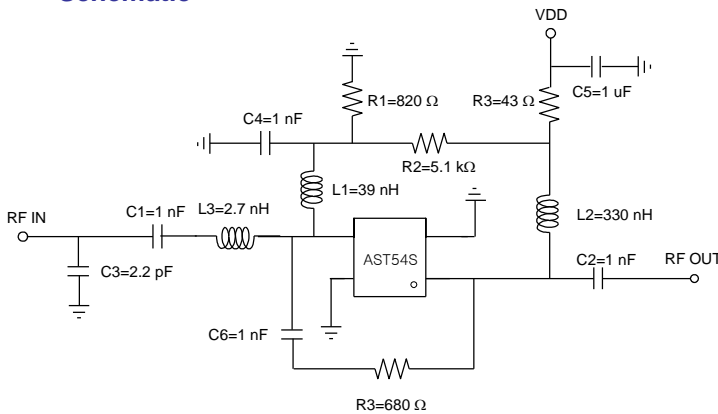
### APPLICATION CIRCUIT

**CMMB (50 Ω)**  
**470 ~ 860 MHz**  
**+5 V**

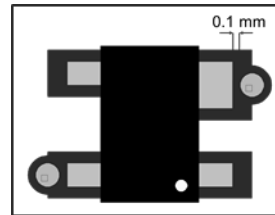
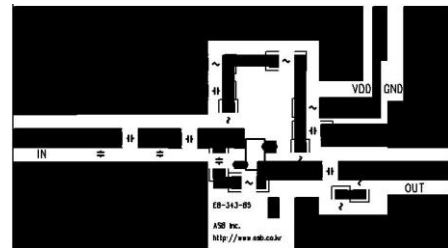
Parameter	Symbol	Unit	Frequency (MHz)	
			470	860
Power Gain	$G_p$	dB	20	18
Noise Figure	NF	dB	0.9	0.9
Input Return Loss	$RL_{in}$	dB	-17	-12
Output Return Loss	$RL_{out}$	dB	-15	-18
1 dB Gain Compression Output Power	$P_{o(1dB)}$	dBm	17	16
3 <sup>rd</sup> Intercept Point Output Power <sup>1)</sup>	OIP3	dBm	29	28
Circuit Current	$I_d$	mA	40	40

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

### Schematic

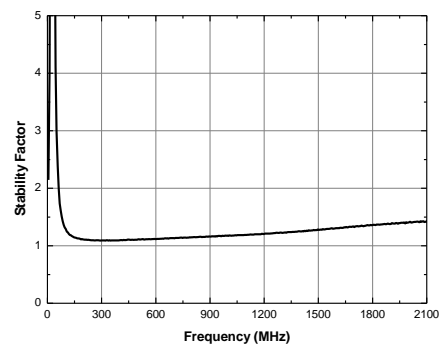
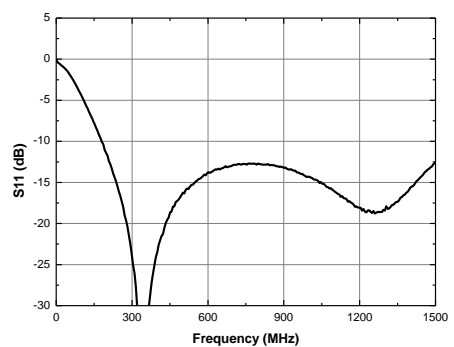
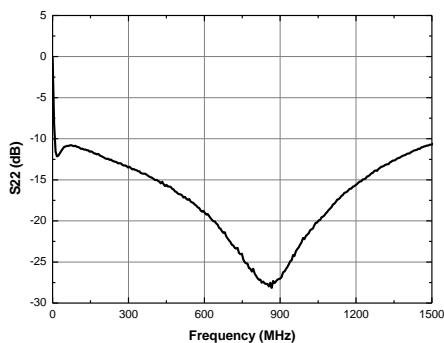
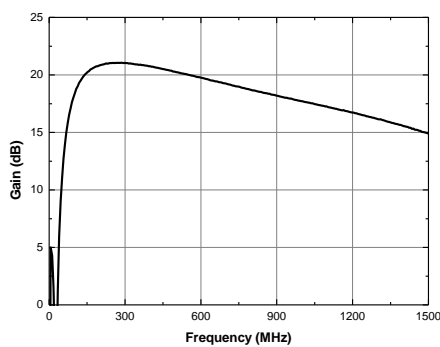


### Board Layout (FR4, 28x16 mm<sup>2</sup>, 0.8T)



Note: The ground via holes must be placed close to the lead pin 2 and 4 within 0.1 mm.

### S-parameters & K-factor



### APPLICATION CIRCUIT

TETRA

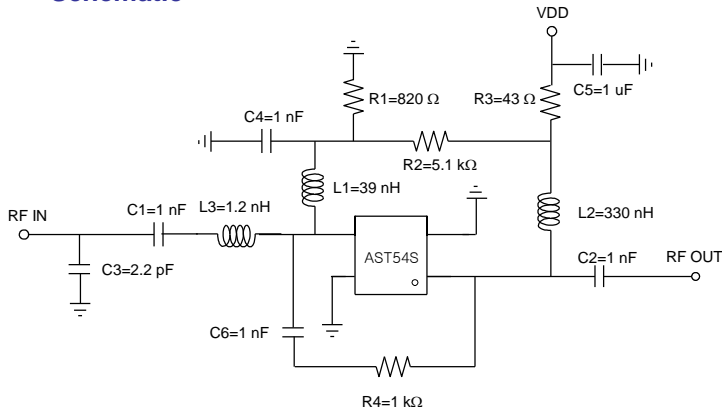
360 ~ 450 MHz

+5 V

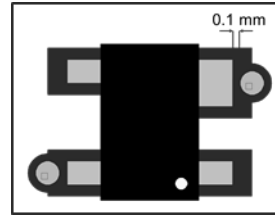
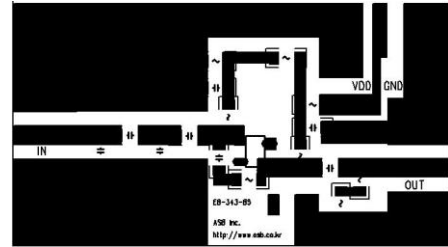
Parameter	Symbol	Unit	Frequency (MHz)	
			360	450
Power Gain	$G_p$	dB	22.6	22.2
Noise Figure	NF	dB	0.8	0.8
Input Return Loss	$RL_{in}$	dB	-18	-18
Output Return Loss	$RL_{out}$	dB	-12	-12
1 dB Gain Compression Output Power	$P_{o(1dB)}$	dBm	18	18
3 <sup>rd</sup> Intercept Point Output Power <sup>1)</sup>	OIP3	dBm	29	29
Circuit Current	$I_d$	mA	40	40

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

### Schematic

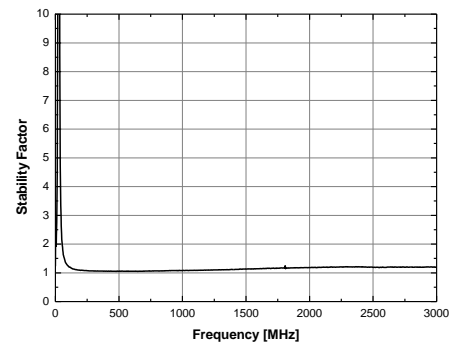
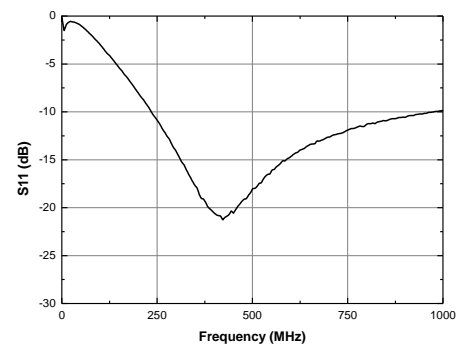
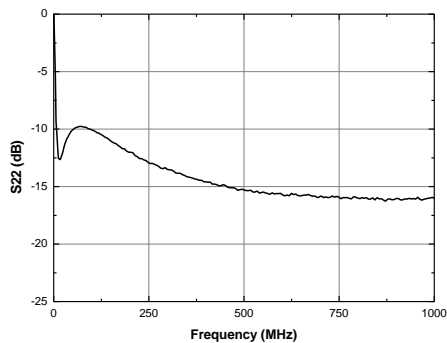
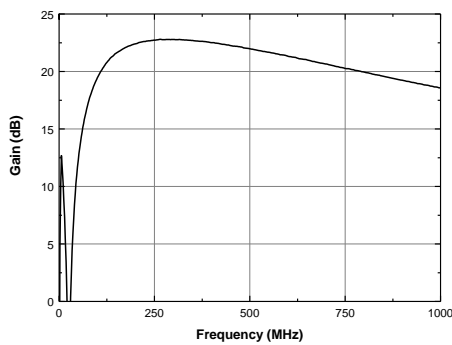


### Board Layout (FR4, 28x16 mm<sup>2</sup>, 0.8T)



Note: The ground via holes must be placed close to the lead pin 2 and 4 within 0.1 mm.

### S-parameters & K-factor



### APPLICATION CIRCUIT

**IF**  


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**20 ~ 108 MHz**  

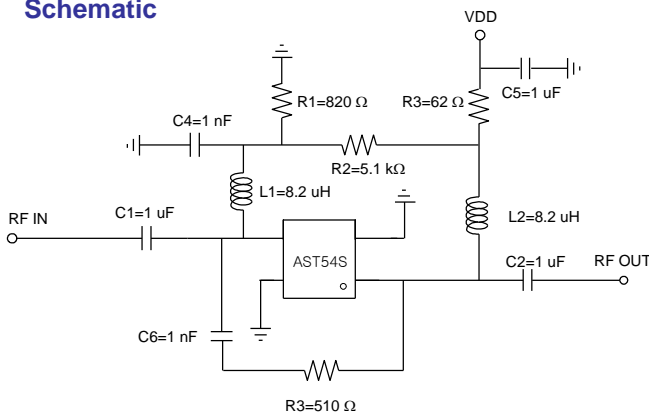

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**+3.3 V**

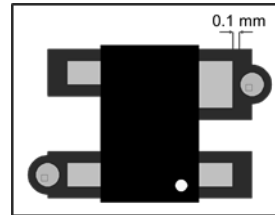
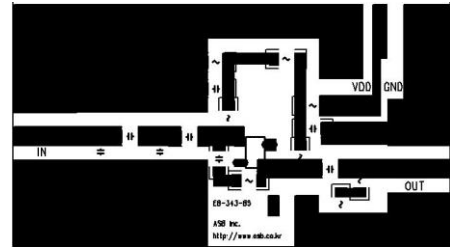
Parameter	Symbol	Unit	Frequency (MHz)	
			20	108
Power Gain	$G_p$	dB	18.3	18.2
Noise Figure	NF	dB	1.1	1.1
Input Return Loss	$RL_{in}$	dB	-18	-18
Output Return Loss	$RL_{out}$	dB	-18	-18
1 dB Gain Compression Output Power	$P_{o(1dB)}$	dBm	7	7
3 <sup>rd</sup> Intercept Point Output Power <sup>1)</sup>	OIP3	dBm	17	17
Circuit Current	$I_d$	mA	12	12

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

### Schematic

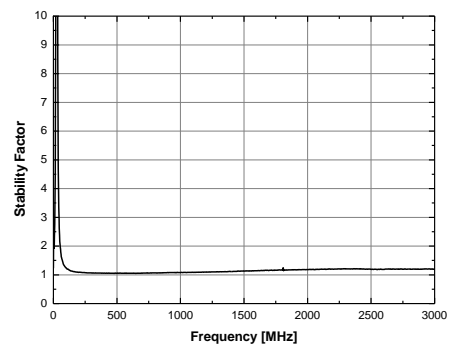
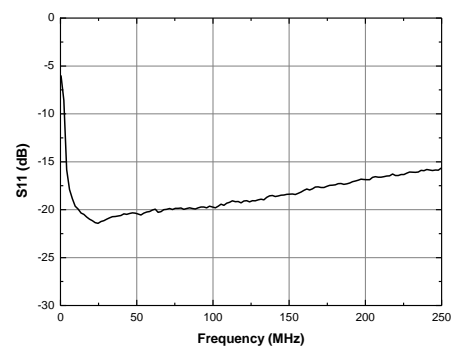
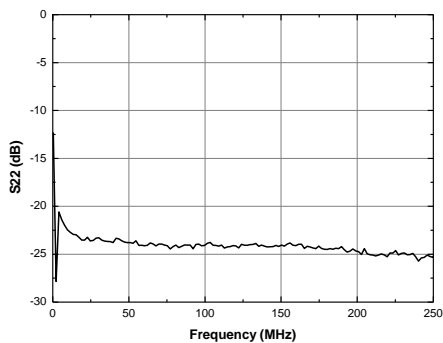
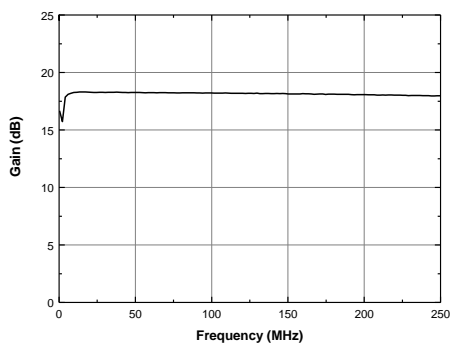


### Board Layout (FR4, 28x16 mm<sup>2</sup>, 0.8T)



Note: The ground via holes must be placed close to the lead pin 2 and 4 within 0.1 mm.

### S-parameters & K-factor



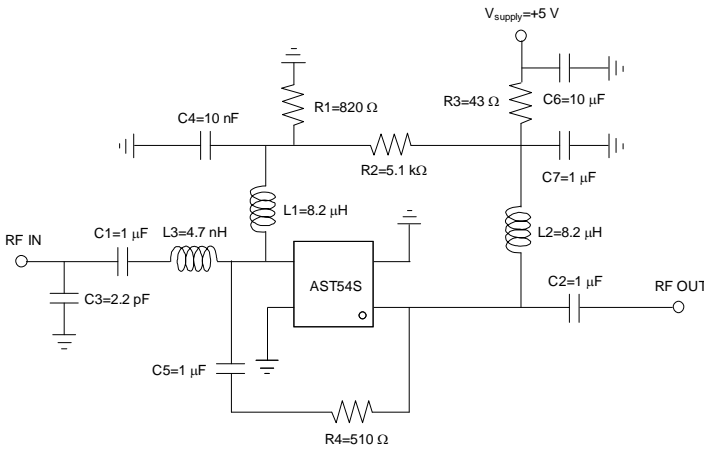
### APPLICATION CIRCUIT

**Wide Band**  
**5 ~ 1000 MHz**  
**+5 V**

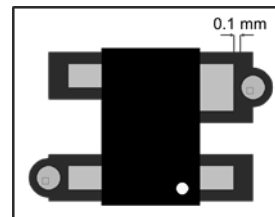
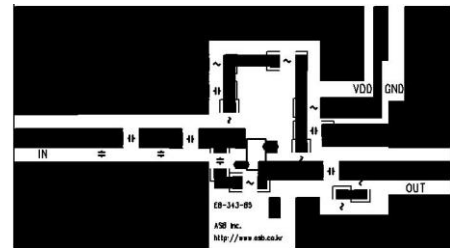
Parameter	Symbol	Unit	Frequency (MHz)		
			5	500	1000
Power Gain	$G_p$	dB	20.0	19.0	17.5
Noise Figure	NF	dB	-	1.0	1.0
Input Return Loss	$RL_{in}$	dB	-18	-12	-17
Output Return Loss	$RL_{out}$	dB	-10	-13	-18
1 dB Gain Compression Output Power	$P_{o(1dB)}$	dBm	16	17	17
3 <sup>rd</sup> Intercept Point Output Power <sup>1)</sup>	OIP3	dBm	28	31	30
Circuit Current	$I_d$	mA	42	42	42

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

### Schematic

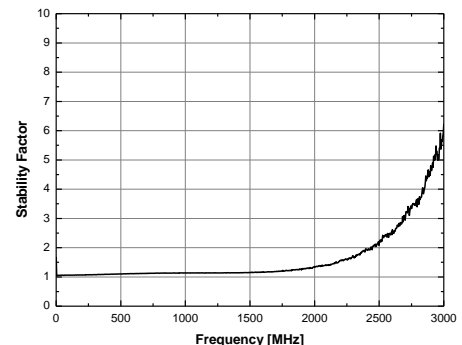
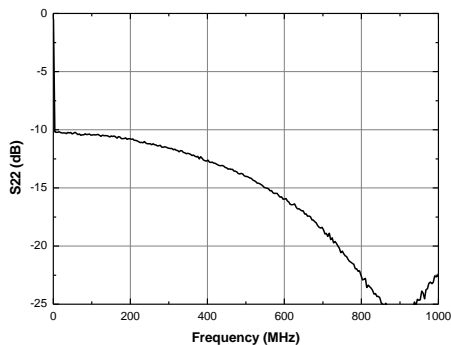
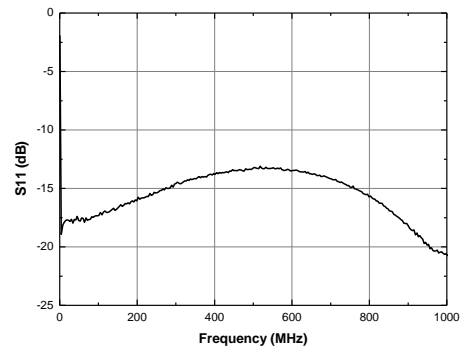
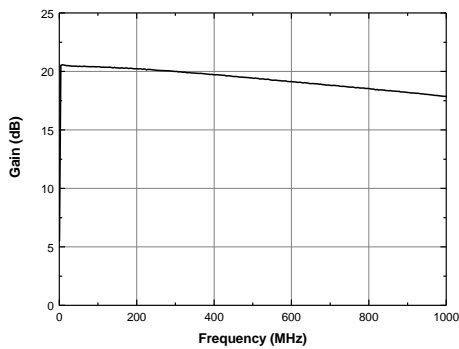


### Board Layout (FR4, 28x16 mm<sup>2</sup>, 0.8T)



Note: The ground via holes must be placed close to the lead pin 2 and 4 within 0.1 mm.

### S-parameters & K-factor



### APPLICATION CIRCUIT

#### Trans-impedance Amplifier

50 Ω

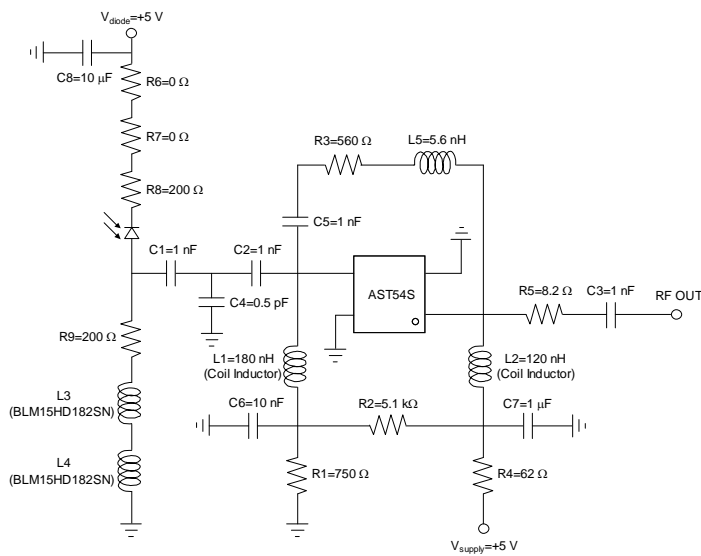
50 ~ 2500 MHz

+5 V

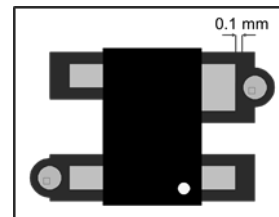
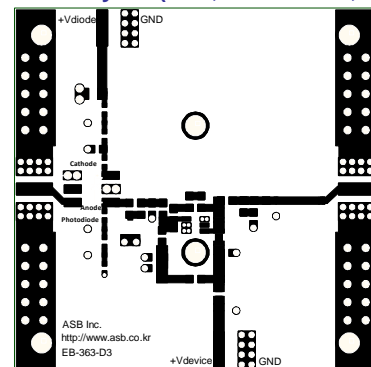
Parameter	Symbol	Unit	Frequency (MHz)				
			50	200	950	2150	2500
Power Gain	$G_p$	dB	18.9	17.1	15.3	14.9	17.5
Output Return Loss	$RL_{out}$	dB	-10	-4	-6	-5	-9
EIN	EIN	pA/rtHz	8.2	6.0	5.8	5.1	8.5
3 <sup>rd</sup> Intercept Point Output Power <sup>1)</sup>	OIP3	dBm	16 <sup>1)</sup>	16 <sup>1)</sup>	12 <sup>2)</sup>	7 <sup>3)</sup>	3 <sup>4)</sup>
Circuit Current	$I_d$	mA	30				

- 1) OIP3 is measured with two tones at an output power of -12 dBm/tone separated by 1MHz.
- 2) OIP3 is measured with two tones at an output power of -16 dBm/tone separated by 1MHz.
- 3) OIP3 is measured with two tones at an output power of -18 dBm/tone separated by 1MHz.
- 4) OIP3 is measured with two tones at an output power of -20 dBm/tone separated by 1MHz.

### Schematic

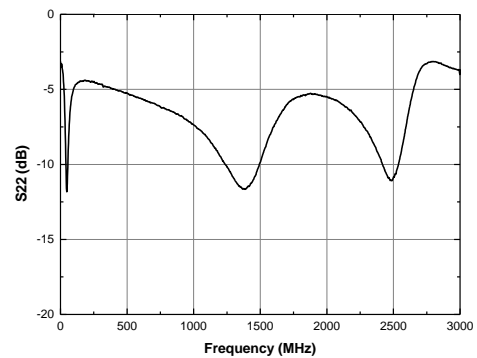
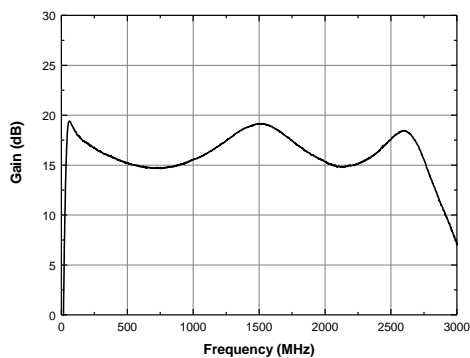


### Board Layout (FR4, 40x40 mm<sup>2</sup>, 0.8T)

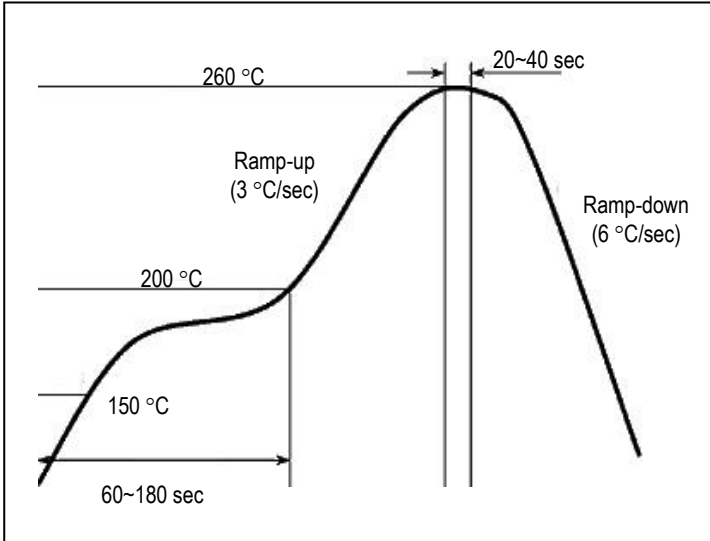


Note: The ground via holes must be placed close to the lead pin 2 and 4 within 0.1 mm.

### S-parameters



Recommended Soldering Reflow Profile



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