ASL30G

DC ~ 6000 MHz MMIC LNA

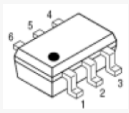
Features

- Two-stage LNA
- 30 dB gain & 0.8 dB NF at 1575 MHz
  GPS, GLONASS, Galileo and Compass
- Unconditionally Stable
- Need only 6 components
- 2 kV Contact Discharge ESD Rating achievable with one external L (Refer to an application circuit at page 8, 14)

Description

ASL30G is a two-stage LNA for GPS, GLONASS, Galileo and Compass receiver low noise block. It has a low noise, high gain, and high linearity over a wide range of frequency up to 6 GHz. It is also suitable for use in the low noise amplifier block of the mobile wireless system. The amplifier is available in a SOT363 package and passes the stringent DC, RF, and reliability tests.

RoHS-compliant GREEN Package



Package Style: SOT363

Typical Performance

(Supply Voltage = +3 V, T_A = +25 °C, Z_0 = 50 Ω)

Parameters	Units	Typical				
Frequency	MHz	900	1575	1950	2400	3500
Gain	dB	36	30	23	23	17
S11	dB	-18	-20	-20	-20	-18
S22	dB	-18.0	-16.0	-18.0	-18.0	-13.5
S12	dB	-40	-38	-34	-34	-28
Output IP3[1)]	dBm	22	22	21	21	18
Noise Figure	dB	0.9	0.8	1.1	1.1	1.6
Output P1dB	dBm	11	11	11	11	8
Current	mA	20	20	20	20	22
Device Voltage	V	+3	+3	+3	+3	+3

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

Product Specifications

Parameters	Units	Min	Typ	Max
Frequency	MHz		1575	
Gain	dB	28	30	33
S11	dB	-10	-20	
S22	dB	-10	-16	
S12	dB		-38	
Output IP3	dBm	20	22	
Noise Figure	dB		0.8	1.2
Output P1dB	dBm	10	11	
Current	mA	17	20	25
Device Voltage	V		+3	

Absolute Maximum Ratings, T_A = +25 °C

Parameters	Rating
Operating Case Temperature	-40 to +85 °C
Storage Temperature	-40 to +150 °C
Device Voltage	+5 V
Operating Junction Temperature	+150 °C
Input RF Power (CW, 50 Ω matched as in 1950 MHz application circuit)*	+22 dBm
Thermal Resistance	285 °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

- **GPS,GLONASS,Galileo,Compass**
- 1559 MHz ~ 1610 MHz
  (3 V, 4 V, 3.3 V, 1.8 V)
- 1559 MHz ~ 1610 MHz
  (Robust ESD, ± 2 kV)
- 1164 MHz ~ 1300 MHz (3 V, 3.3 V)
- 1164 MHz ~ 1300 MHz
  (Robust ESD, ± 2 kV)

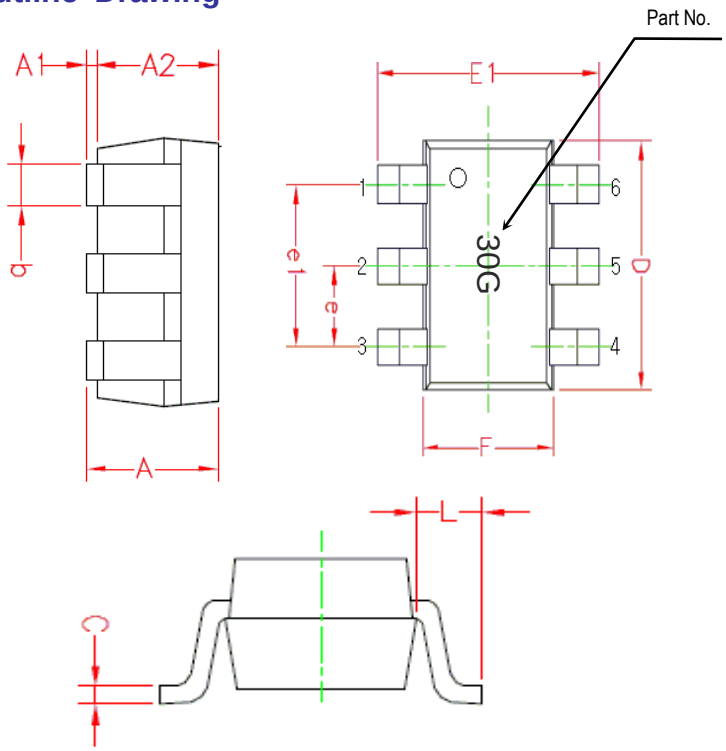
Others

- 900 MHz (3 V, 4 V)
- 1950 MHz (3 V, 4 V)
- 2400 MHz (3 V, 4 V)
- 3300 ~ 3800 MHz (3 V, 4 V)

Pin Configuration

Pin No.	Function
1	VDD
2, 4, 5	GND
3	RF OUT
6	RF IN

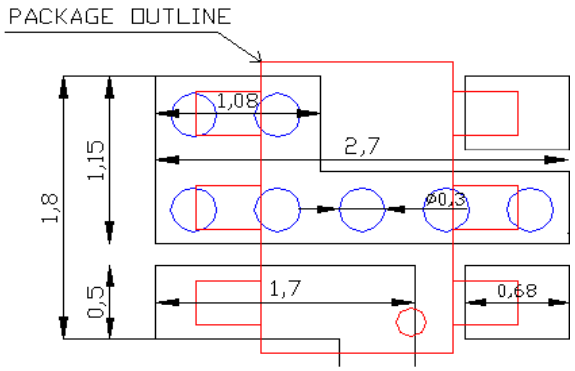
Outline Drawing



Symbols	Dimensions (In mm)		Dimensions (In inch)	
	MIN	MAX	MIN	MAX
A	0.90	1.10	.036	.044
A1	0.025	0.10	.001	.004
A2	0.875	1.00	.035	.040
b	0.20	0.40	.008	.016
C	0.10	0.15	.004	.006
D	1.90	2.10	.076	.084
F	1.15	1.35	.046	.054
E1	2.00	2.20	.080	.088
e	0.65 BSC.		.026 BSC.	
e1	1.30 BSC.		.052 BSC.	
L	0.425 REF.		.017 REF..	

Pin No.	Function	Pin No.	Function.
1	VDD	4	GND
2	GND	5	GND
3	RF OUT	6	RF IN

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 lead pin 2, 4 and 5 for better RF and thermal performance, as shown in the drawing at the left side.
3. You can download the gerber file of ASL30G from http://www.asb.co.kr/datasheet/EB-363-B55.zip

ESD Classification & Moisture Sensitivity Level

ESD Classification

HBM	Class H0 (Voltage Level: 200 V)
MM	Class M0 (Voltage Level: 50 V)
CDM	Class C4 (Voltage Level: 800 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

GSM

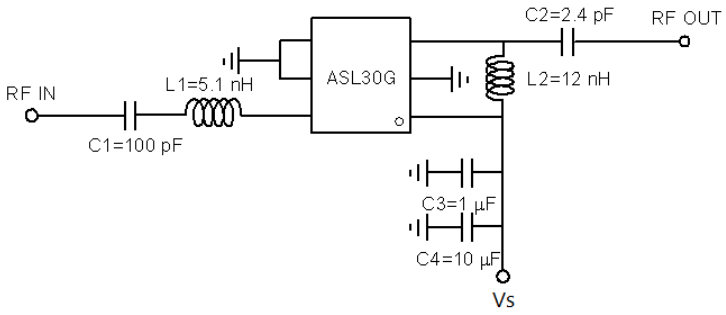
900 MHz

+3 V, +4 V

Parameter	Symbol	Test Conditions	TYP.		Unit
Power Gain	G_p	F = 900 MHz	36.0	37.5	dB
Noise Figure	NF	F = 900 MHz	0.9	0.9	dB
Input Return Loss	RL_{in}	F = 900 MHz	-18	-20	dB
Output Return Loss	RL_{out}	F = 900 MHz	-18	-14	dB
Reverse Isolation	ISO	F = 900 MHz	-40	-40	dB
1 dB Gain Compression Output Power	$P_{o(1dB)}$	F = 900 MHz	11.0	13.5	dBm
3rd Intercept Point Output Power 1)	OIP3	F = 900 MHz	22	25	dBm
Current	I_d	F = 900 MHz, Non-RF	20	30	mA
Device Voltage	V_d	F = 900 MHz, Non-RF	+3	+4	V

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

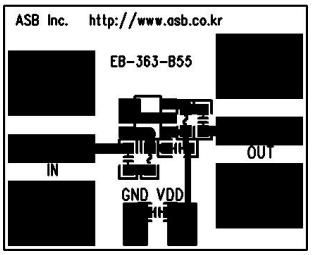
Schematic



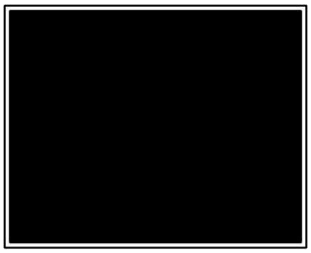
* Note: Gain and current can be reduced by controlling Vs to 2 V.
C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

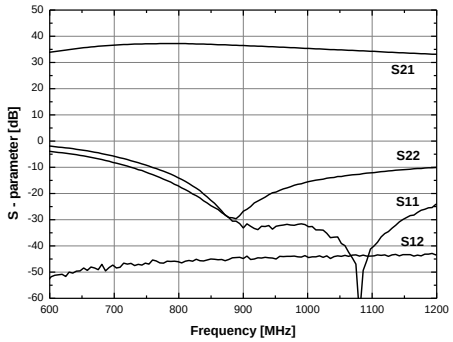
Top

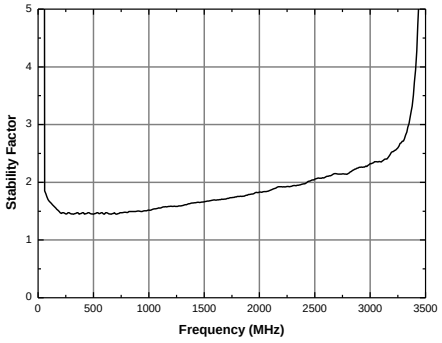


Bottom

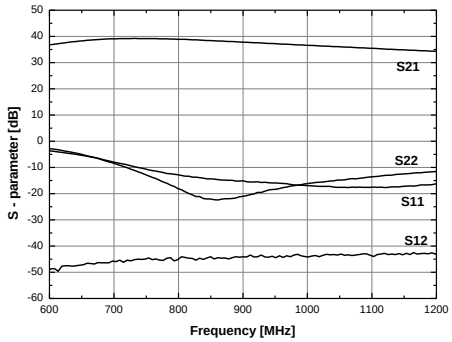


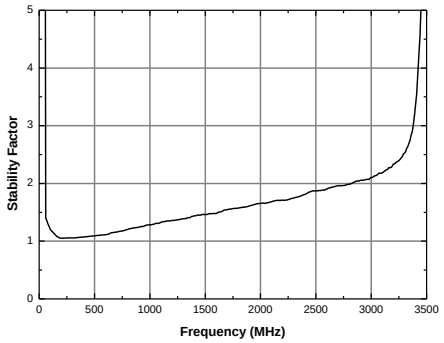
S-parameters & K-factor (3 V)





S-parameters & K-factor (4 V)





APPLICATION CIRCUIT

GPS,GLONASS,Galileo&Compass

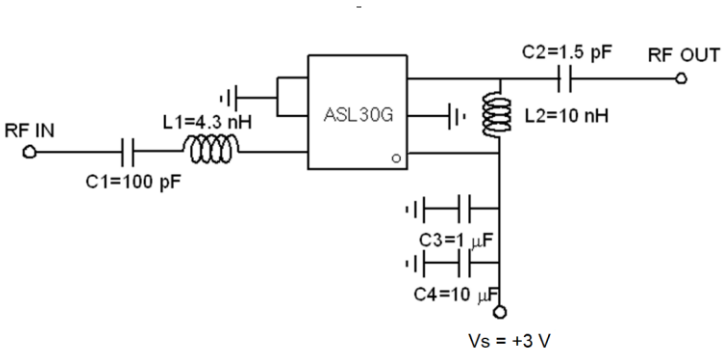
1164 MHz ~ 1300 MHz

+3 V

Parameter	Symbol	Unit	Frequency [MHz]	
			1176	1227
Power Gain	G_p	dB	33	32
Noise Figure	NF	dB	1.00	0.95
Input Return Loss	RL_{in}	dB	-18	-18
Output Return Loss	RL_{out}	dB	-18	-18
Reverse Isolation	ISO	dB	-40	-40
1 dB Gain Compression Output Power	$P_{o(1dB)}$	dBm	11.0	11.5
3rd Intercept Point Output Power[1)]	OIP3	dBm	21.0	21.5
Current	I_d	mA	20	20
Device Voltage	V_d	V	+3	+3

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

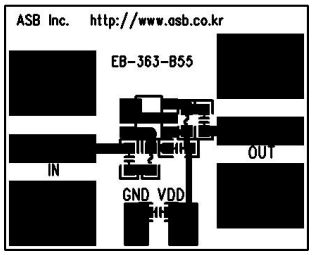
Schematic



* Note: Gain and current can be reduced by controlling Vs to 2 V.
C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

Top



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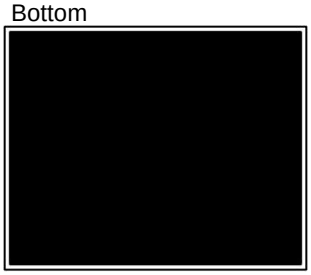
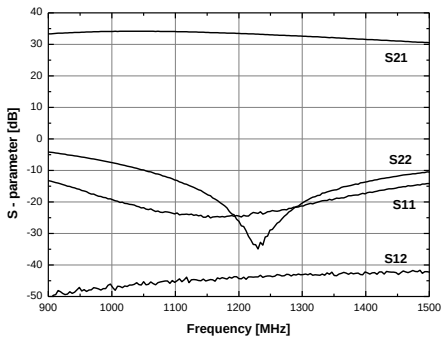
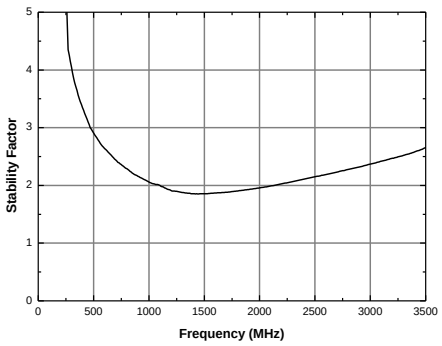


S-parameters & K-factor





APPLICATION CIRCUIT

GPS,GLONASS,Galileo&Compass

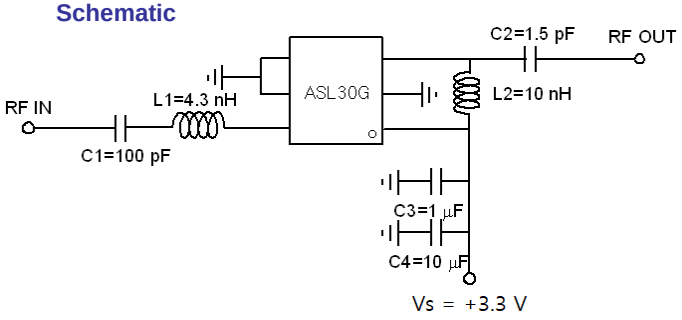
1164 MHz ~ 1300 MHz

+3.3 V

Parameter	Symbol	Unit	Frequency [MHz]	
			1176	1227
Power Gain	G_p	dB	33	32
Noise Figure	NF	dB	1.00	0.95
Input Return Loss	RL_{in}	dB	-18	-17
Output Return Loss	RL_{out}	dB	-17	-16
Reverse Isolation	ISO	dB	-40	-40
1 dB Gain Compression Output Power	$P_{o(1dB)}$	dBm	12	12
3rd Intercept Point Output Power[1)]	OIP3	dBm	22	23
Current	I_d	mA	23	23
Device Voltage	V_d	V	+3.3	+3.3

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

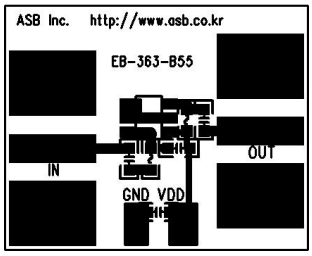
Schematic



* Note: Gain and current can be reduced by controlling Vs to 2 V.
C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

Top



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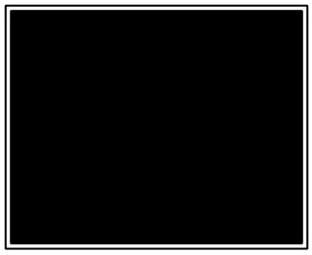
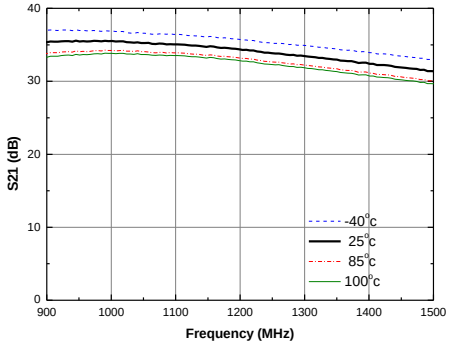
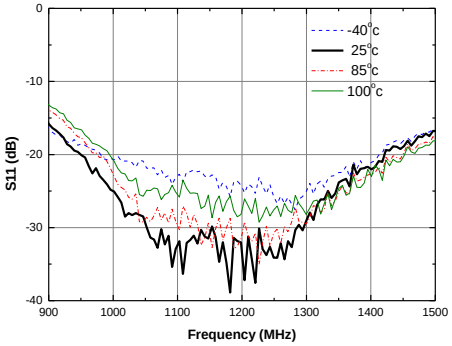
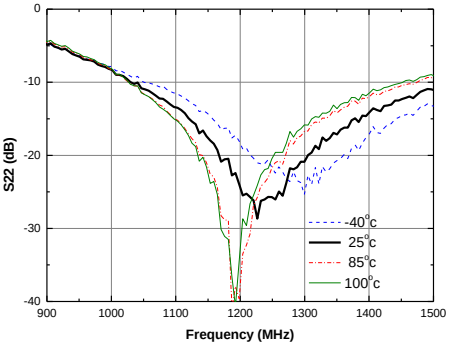
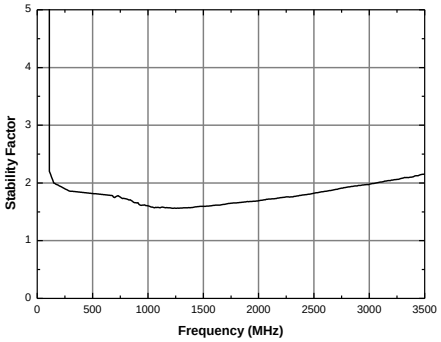


S-parameters & K-factor

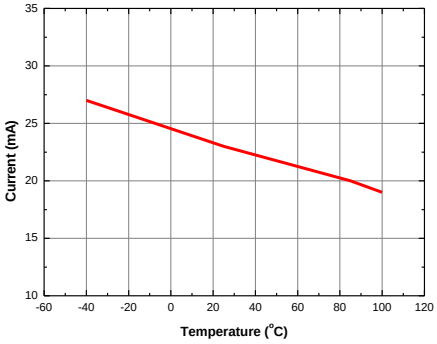




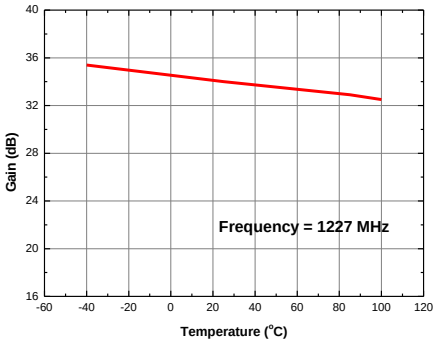




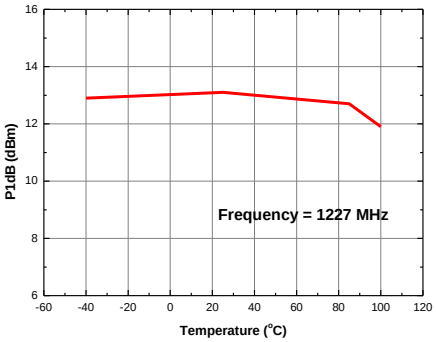
Current vs. Temperature



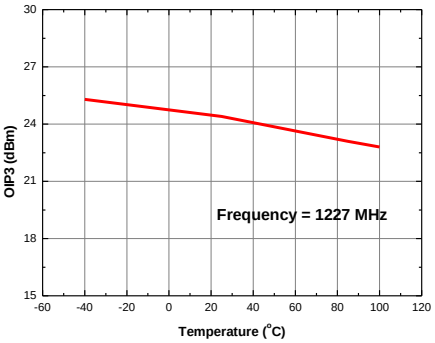
Gain vs. Temperature



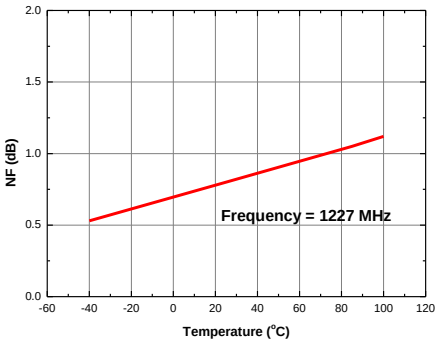
P1dB vs. Temperature



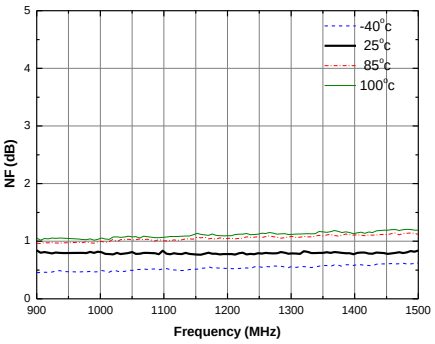
Output IP3 vs. Temperature



NF vs. Temperature



NF vs. Frequency



APPLICATION CIRCUIT

Robust ESD (± 2 kV)[1)]

GPS,GLONASS,Galileo&Compass

1164 MHz ~ 1300 MHz

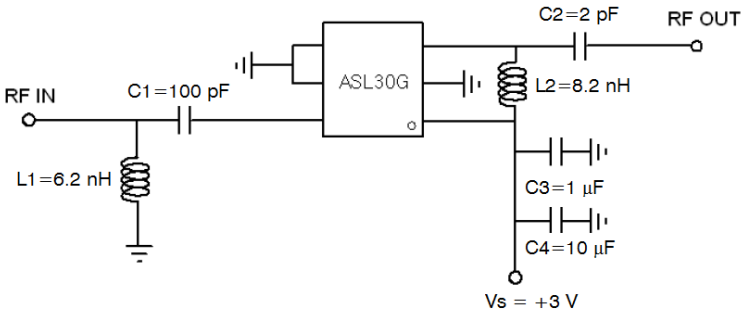
+3 V

Parameter	Symbol	Unit	Frequency [MHz]	
			1176	1227
Power Gain	G_p	dB	31.5	31.2
Noise Figure	NF	dB	1.45	1.45
Input Return Loss	RL_{in}	dB	-11	-11
Output Return Loss	RL_{out}	dB	-18	-18
Reverse Isolation	ISO	dB	-40	-40
1 dB Gain Compression Output Power	$P_{o(1dB)}$	dBm	11.0	11.5
3rd Intercept Point Output Power[1)]	OIP3	dBm	20	21
Current	I_d	mA	20	20
Device Voltage	V_d	V	+3	+3

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

1) Test Method: Contact discharge on GPS patch antenna input. Applying 10 times repeated voltage at 1 sec time Interval.

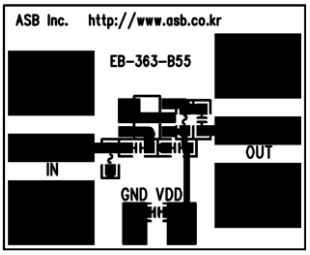
Schematic



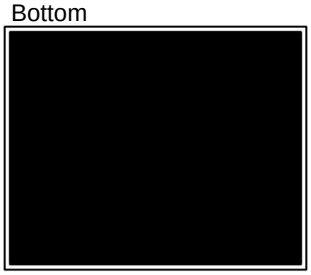
* Note: Gain and current can be reduced by controlling Vs to 2 V. C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

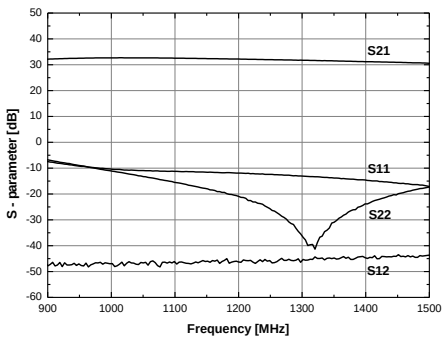
Top

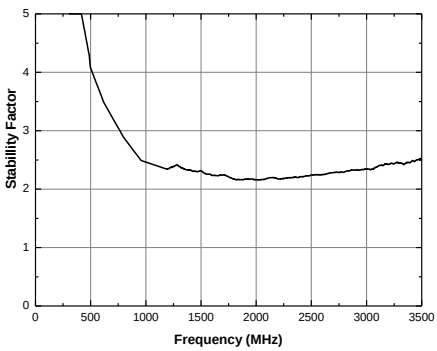


Bottom



S-parameters & K-factor





APPLICATION CIRCUIT

GPS,GLONASS,Galileo&Compass

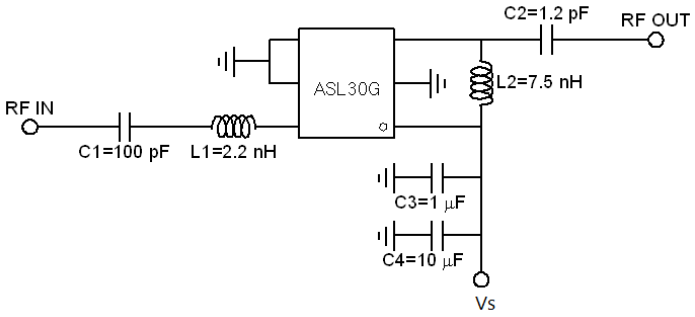
1559 MHz ~ 1610 MHz

+3 V, +4 V

Parameter	Symbol	Test Conditions	TYP.		Unit
Power Gain	G_p	F = 1575 MHz	30.0	30.5	dB
Noise Figure	NF	F = 1575 MHz	0.8	0.8	dB
Input Return Loss	RL_{in}	F = 1575 MHz	-20	-20	dB
Output Return Loss	RL_{out}	F = 1575 MHz	-16	-15	dB
Reverse Isolation	ISO	F = 1575 MHz	-38	-38	dB
1 dB Gain Compression Output Power	$P_{o(1dB)}$	F = 1575 MHz	11	13	dBm
3rd Intercept Point Output Power 1)	OIP3	F = 1575 MHz	22	26	dBm
Current	I_d	F = 1575 MHz, Non-RF	20	30	mA
Device Voltage	V_d	F = 1575 MHz, Non-RF	+3	+4	V

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

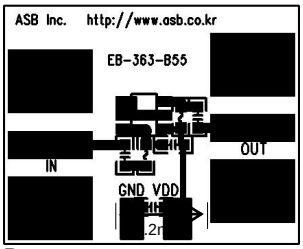
Schematic



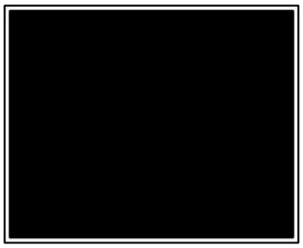
* Note: Gain and current can be reduced by controlling Vs to 2V.
C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

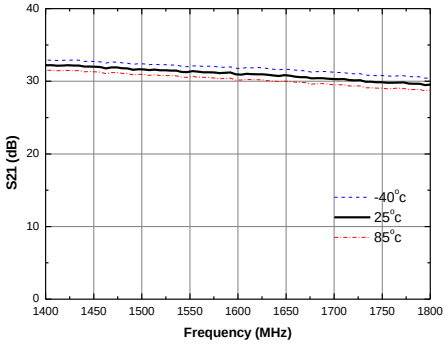
Top

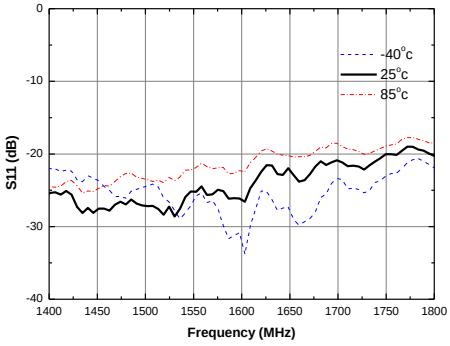


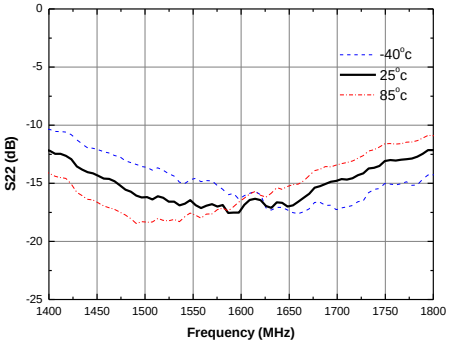
Bottom

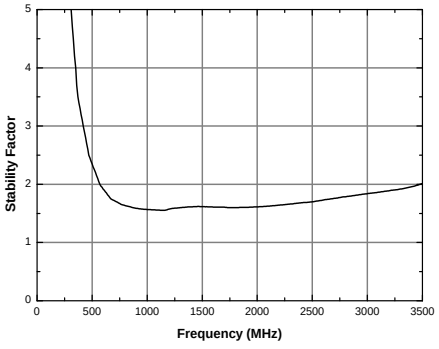


S-parameters & K-factor (3 V)

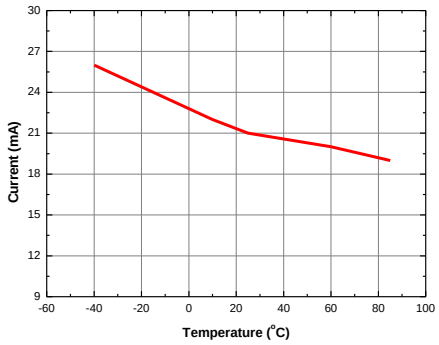




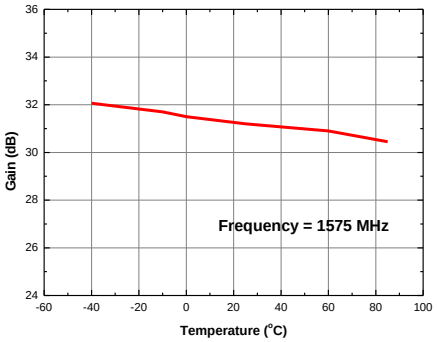




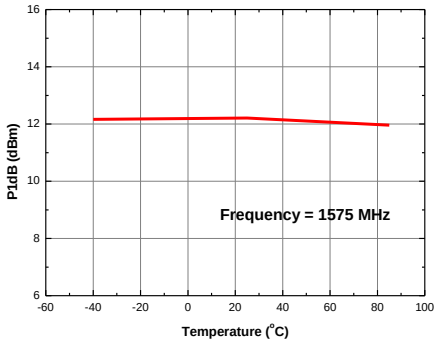
Current vs. Temperature



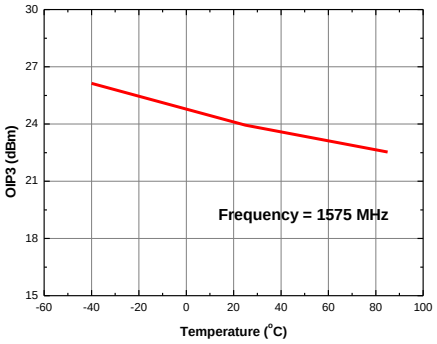
Gain vs. Temperature



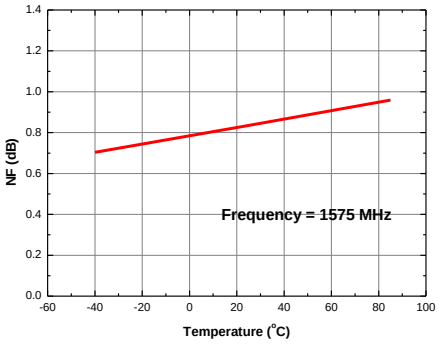
P1dB vs. Temperature

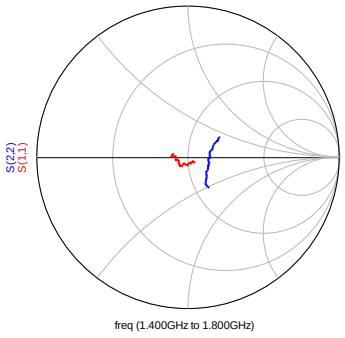


Output IP3 vs. Temperature

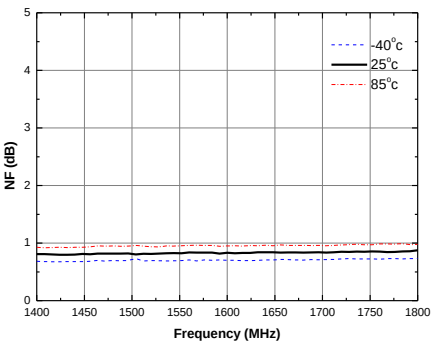


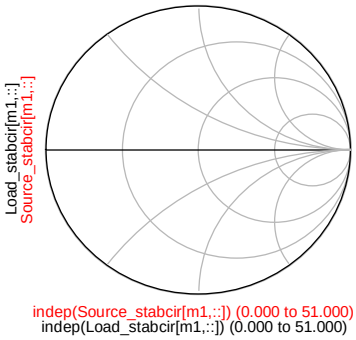
NF vs. Temperature





NF vs. Frequency





APPLICATION CIRCUIT

GPS,GLONASS,Galileo&Compass

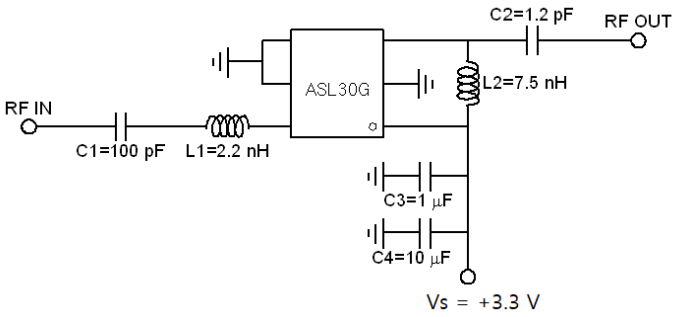
1559 MHz ~ 1610 MHz

+3.3 V

Parameter	Symbol	Test Conditions	TYP.	Unit
Power Gain	G_p	F = 1575 MHz	30.0	dB
Noise Figure	NF	F = 1575 MHz	0.8	dB
Input Return Loss	RL_{in}	F = 1575 MHz	-20	dB
Output Return Loss	RL_{out}	F = 1575 MHz	-16	dB
Reverse Isolation	ISO	F = 1575 MHz	-38	dB
1 dB Gain Compression Output Power	$P_{o(1dB)}$	F = 1575 MHz	12	dBm
3rd Intercept Point Output Power 1)	OIP3	F = 1575 MHz	23	dBm
Current	I_d	F = 1575 MHz, Non-RF	23	mA
Device Voltage	V_d	F = 1575 MHz, Non-RF	+3.3	V

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

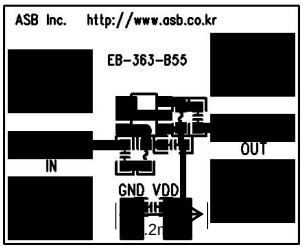
Schematic



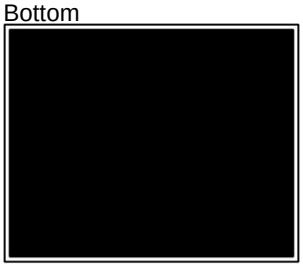
* Note: Gain and current can be reduced by controlling Vs to 2V.
C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

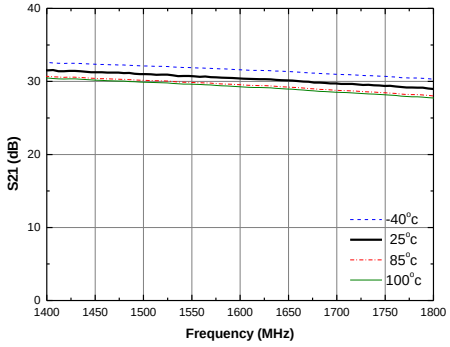
Top

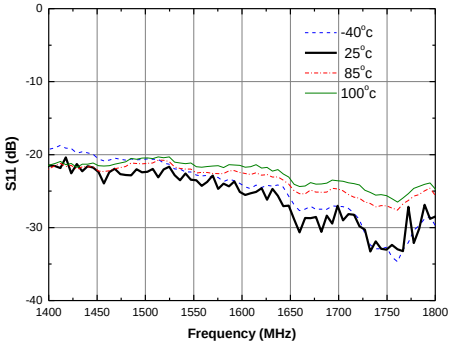


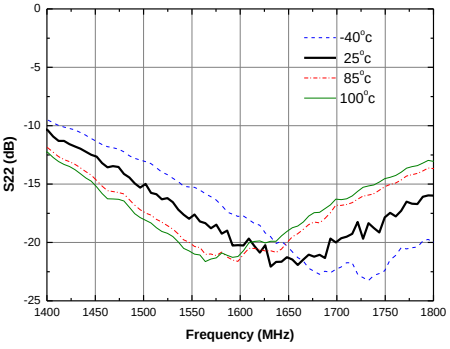
Bottom

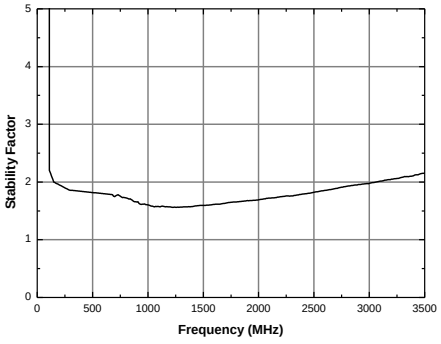


S-parameters & K-factor

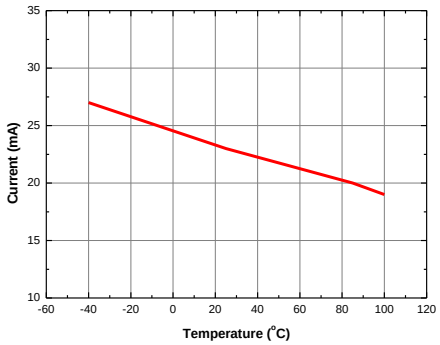




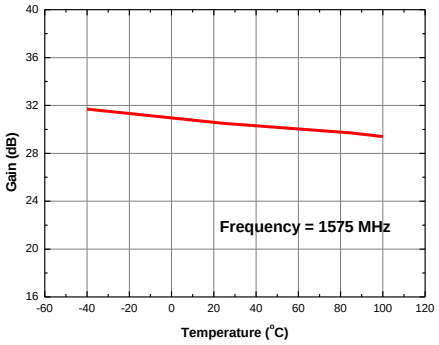




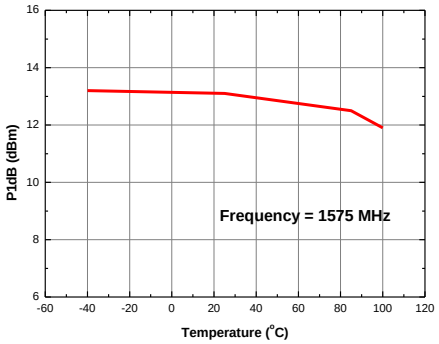
Current vs. Temperature



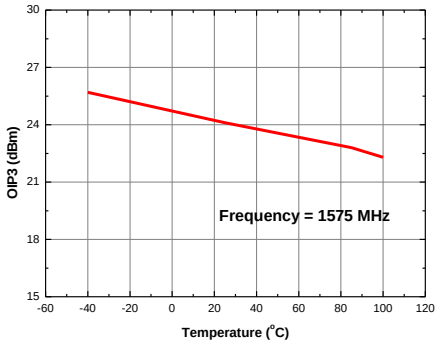
Gain vs. Temperature



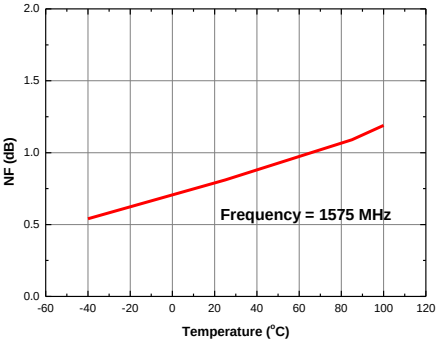
P1dB vs. Temperature



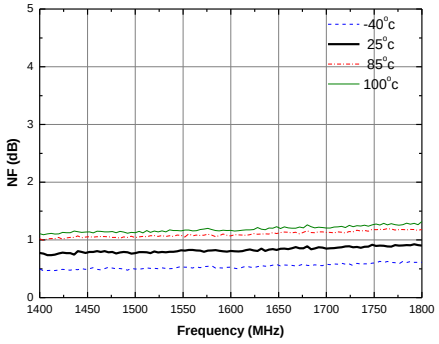
Output IP3 vs. Temperature



NF vs. Temperature



NF vs. Frequency



APPLICATION CIRCUIT

GPS,GLONASS,Galileo&Compass

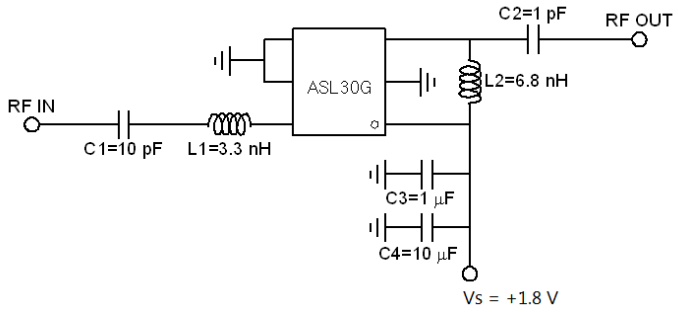
1559 MHz ~ 1610 MHz

+1.8 V

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Power Gain	G_p	F = 1.575 GHz		26		dB
Noise Figure	NF	F = 1.575 GHz		1.0		dB
Input Return Loss	RL_{in}	F = 1.575 GHz		-14		dB
Output Return Loss	RL_{out}	F = 1.575 GHz		-18		dB
Reverse Isolation	ISO	F = 1.575 GHz		-38		dB
1 dB Gain Compression Output Power	$P_{o(1dB)}$	F = 1.575 GHz		6		dBm
3rd Intercept Point Output Power 1)	OIP3	F = 1.575 GHz		15		dBm
Current	I_d	F = 1.575 GHz, Non-RF		8.5		mA

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

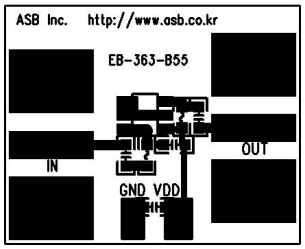
Schematic



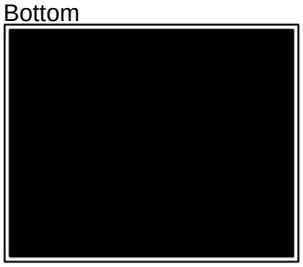
* Note: Gain and current can be reduced by controlling Vs to 2V.
C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

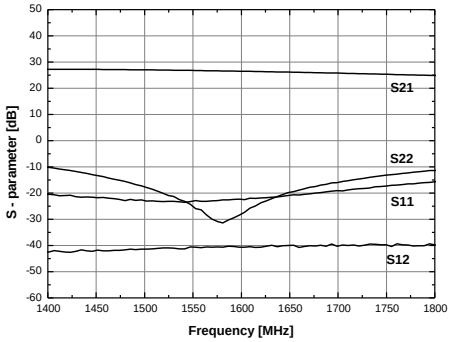
Top

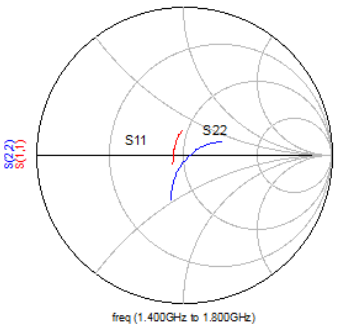


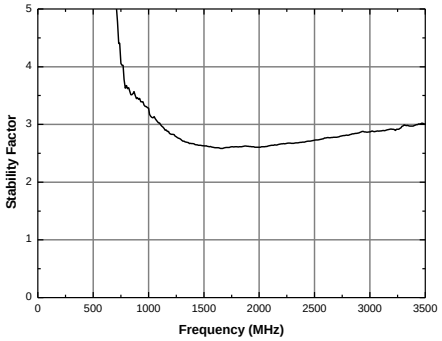
Bottom

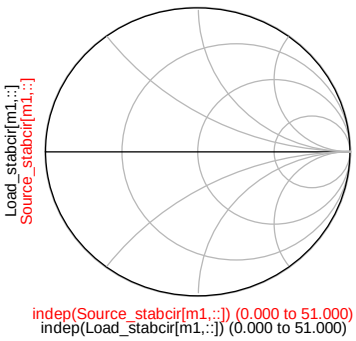


S-parameters & K-factor









APPLICATION CIRCUIT

Robust ESD (± 2 kV)[1)]

GPS,GLONASS,Galileo&Compass

1559 MHz ~ 1610 MHz

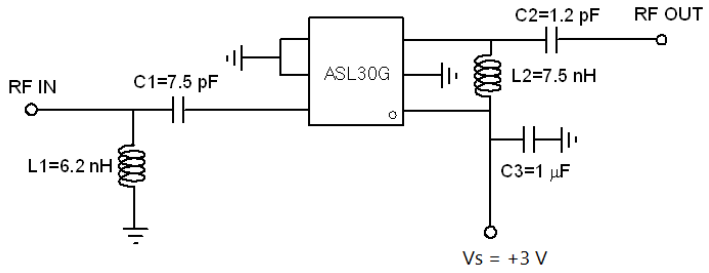
+3 V

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Power Gain	G_p	F = 1.575 GHz		30		dB
Noise Figure	NF	F = 1.575 GHz		1.1		dB
Input Return Loss	RL_{in}	F = 1.575 GHz		-15		dB
Output Return Loss	RL_{out}	F = 1.575 GHz		-18		dB
Reverse Isolation	ISO	F = 1.575 GHz		-40		dB
1 dB Gain Compression Output Power	$P_{o(1dB)}$	F = 1.575 GHz		11		dBm
3rd Intercept Point Output Power [1)]	OIP3	F = 1.575 GHz		22		dBm
Current	I_d	F = 1.575 GHz, Non-RF		20		mA

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

1) Test Method: Contact discharge on GPS patch antenna input. Applying 10 times repeated voltage at 1 sec time Interval.

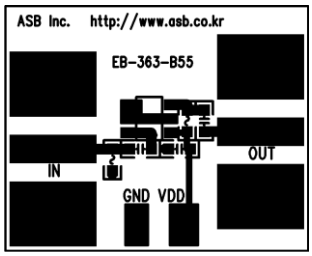
Schematic



* Note: Gain and current can be reduced by controlling Vs to 2 V. C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

Top



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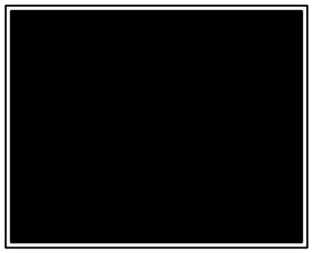
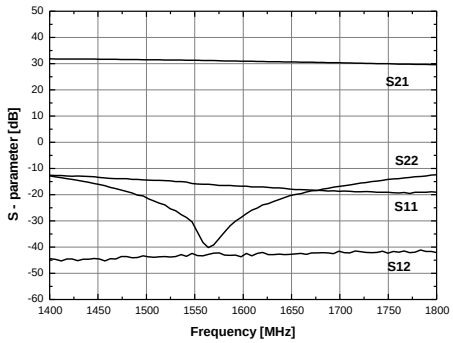
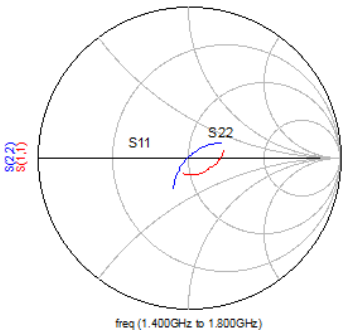
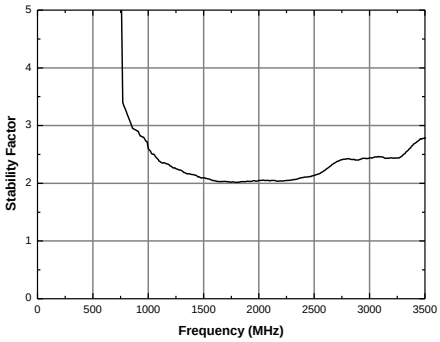
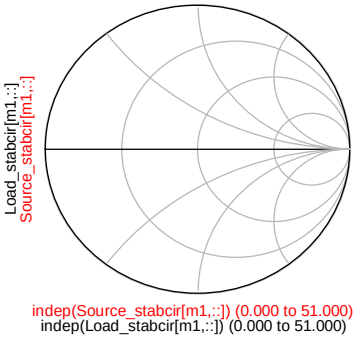


S-parameters & K-factor









APPLICATION CIRCUIT

Robust ESD (± 2 kV)[1)]

GPS,GLONASS,Galileo&Compass

1559 MHz ~ 1610 MHz

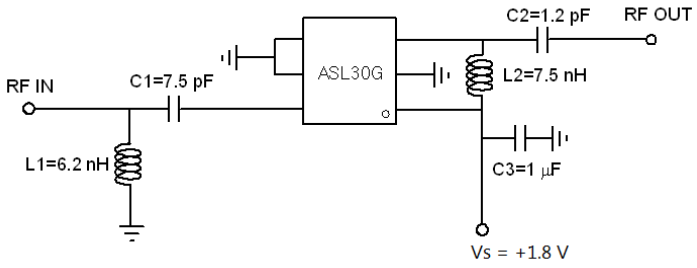
+1.8 V

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Power Gain	G_p	F = 1.575 GHz		26.5		dB
Noise Figure	NF	F = 1.575 GHz		1.25		dB
Input Return Loss	RL_{in}	F = 1.575 GHz		-12		dB
Output Return Loss	RL_{out}	F = 1.575 GHz		-14		dB
Reverse Isolation	ISO	F = 1.575 GHz		-40		dB
1 dB Gain Compression Output Power	$P_{o(1dB)}$	F = 1.575 GHz		6		dBm
3rd Intercept Point Output Power [1)]	OIP3	F = 1.575 GHz		15		dBm
Current	I_d	F = 1.575 GHz, Non-RF		8.5		mA

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

1) Test Method: Contact discharge on GPS patch antenna input. Applying 10 times repeated voltage at 1 sec time Interval.

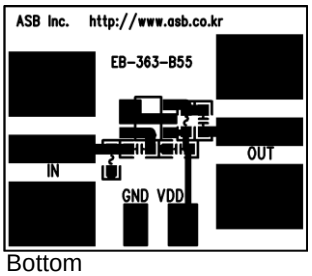
Schematic



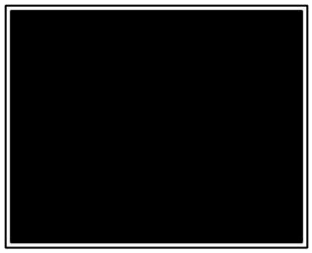
* Note: Gain and current can be reduced by controlling Vs to 2 V. C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

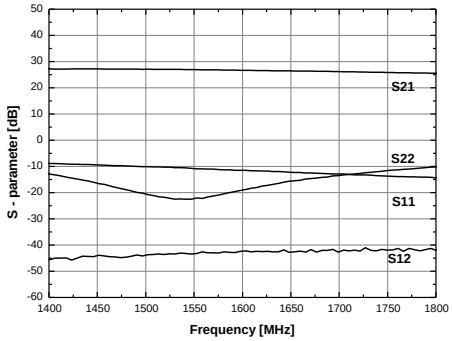
Top

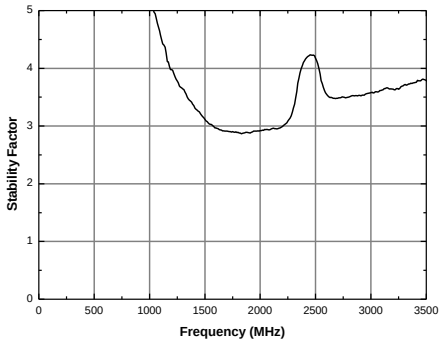


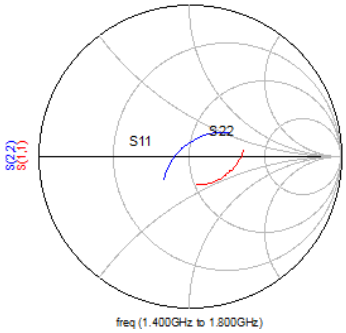
Bottom

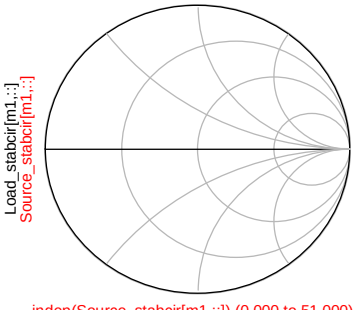


S-parameters & K-factor









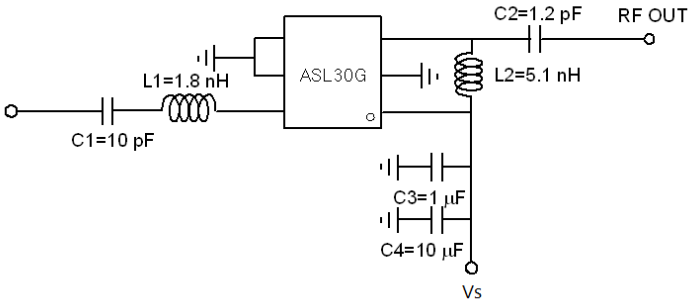
APPLICATION CIRCUIT

WCDMA
1950 MHz
+3 V, +4 V

Parameter	Symbol	Test Conditions	TYP.		Unit
Power Gain	G_p	F = 1950 MHz	25	26	dB
Noise Figure	NF	F = 1950 MHz	1.10	1.05	dB
Input Return Loss	RL_{in}	F = 1950 MHz	-20	-20	dB
Output Return Loss	RL_{out}	F = 1950 MHz	-18	-18	dB
Reverse Isolation	ISO	F = 1950 MHz	-34	-34	dB
1 dB Gain Compression Output Power	$P_{o(1dB)}$	F = 1950 MHz	11	13	dBm
3rd Intercept Point Output Power 1)	OIP3	F = 1950 MHz	21.0	24.5	dBm
Current	I_d	F = 1950 MHz, Non-RF	20	30	mA
Device Voltage	V_d	F = 1950 MHz, Non-RF	+3	+4	V

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

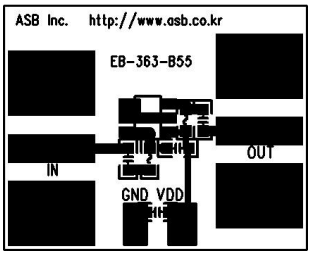
Schematic



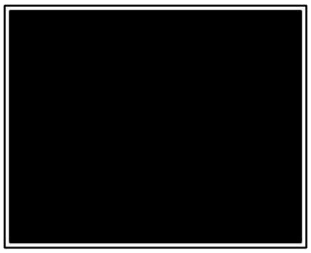
* Note: Gain and current can be reduced by controlling Vs to 2 V.
C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

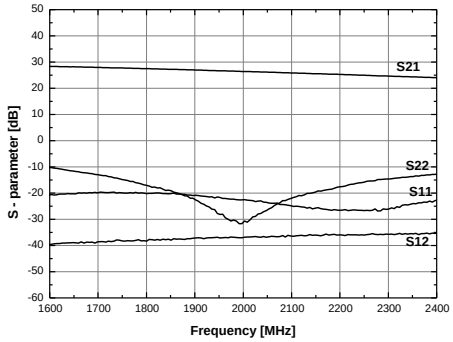
Top

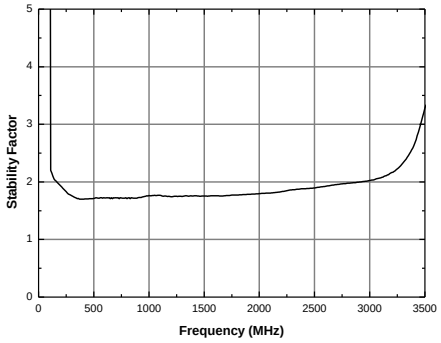


Bottom

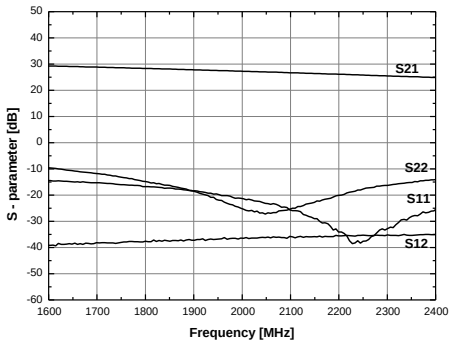


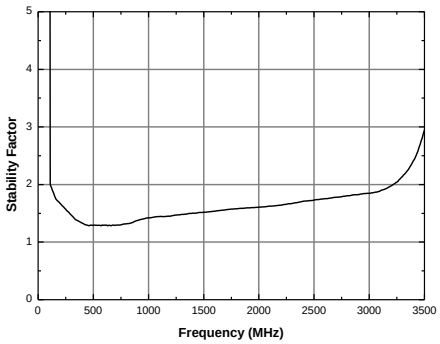
S-parameters & K-factor (3 V)





S-parameters & K-factor (4 V)





APPLICATION CIRCUIT

WLAN

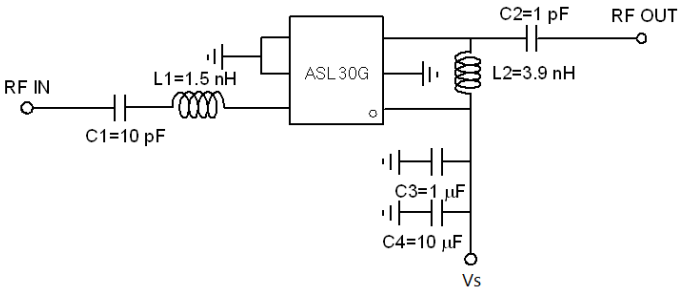
2400 MHz

+3 V, +4 V

Parameter	Symbol	Test Conditions	TYP.		Unit
Power Gain	G_p	F = 2400 MHz	23	24	dB
Noise Figure	NF	F = 2400 MHz	1.10	1.05	dB
Input Return Loss	RL_{in}	F = 2400 MHz	-20	-20	dB
Output Return Loss	RL_{out}	F = 2400 MHz	-18	-18	dB
Reverse Isolation	ISO	F = 2400 MHz	-34	-34	dB
1 dB Gain Compression Output Power	$P_{o(1dB)}$	F = 2400 MHz	11	13	dBm
3rd Intercept Point Output Power 1)	OIP3	F = 2400 MHz	21.0	24.5	dBm
Current	I_d	F = 2400 MHz, Non-RF	20	30	mA
Device Voltage	V_d	F = 2400 MHz, Non-RF	+3	+4	V

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

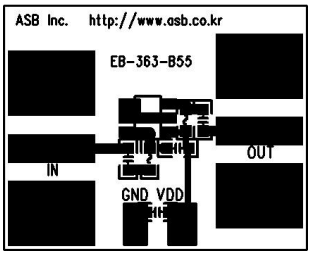
Schematic



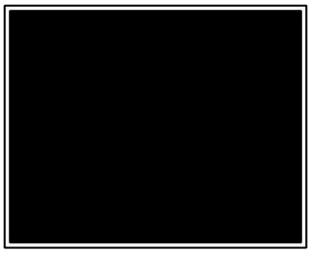
* Note: Gain and current can be reduced by controlling Vs to 2 V.
C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

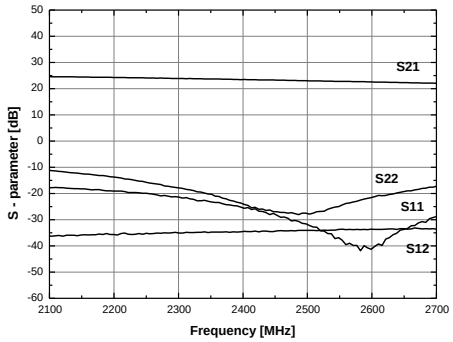
Top

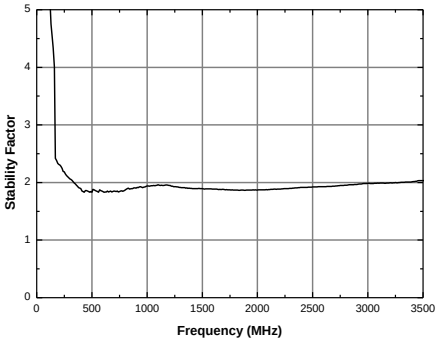


Bottom

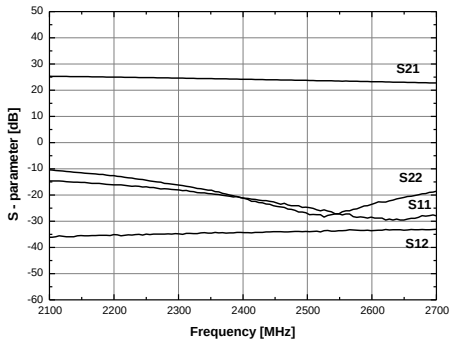


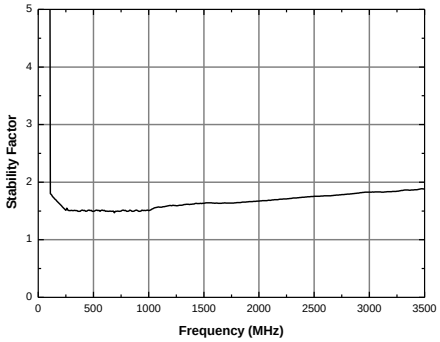
S-parameters & K-factor (3 V)





S-parameters & K-factor (4 V)





APPLICATION CIRCUIT

WiMAX

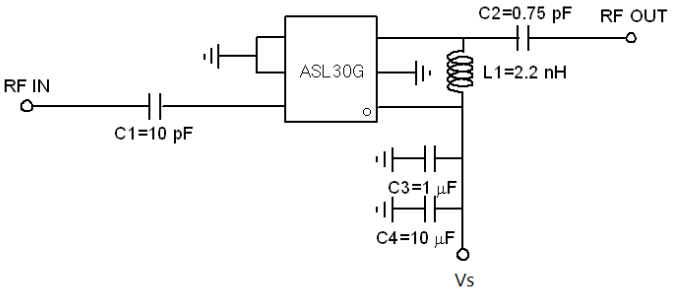
3300 ~ 3800 MHz

+3 V, +4 V

Parameter	Symbol	Unit	Frequency [MHz]			
			3300	3800	3300	3800
Power Gain	G_p	dB	18.5	17.0	19.0	17.5
Noise Figure	NF	dB	1.4	1.6	1.6	1.8
Input Return Loss	RL_{in}	dB	-18	-18	-18	-18
Output Return Loss	RL_{out}	dB	-12.5	-13.5	-12.0	-13.5
Reverse Isolation	ISO	dB	-30	-28	-29	-28
1 dB Gain Compression Output Power	$P_{o(1dB)}$	dBm	12.5	7.5	14.0	11.0
3rd Intercept Point Output Power[1)]	OIP3	dBm	21	18	25	22
Current	I_d	mA	22		33	
Device Voltage	V_d	V	+3		+4	

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

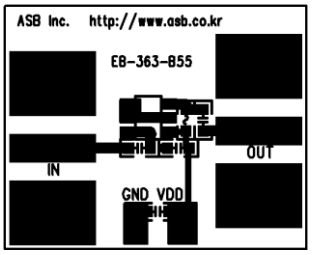
Schematic



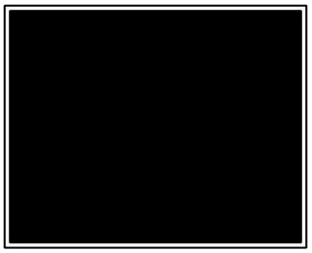
* Note: Gain and current can be reduced by controlling Vs to 2 V.
C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

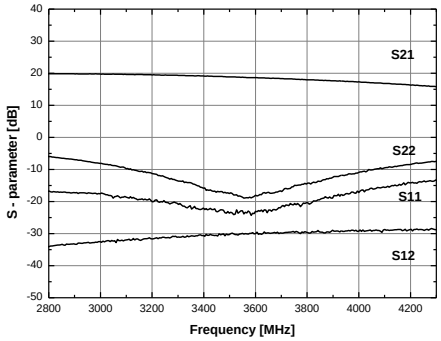
Top

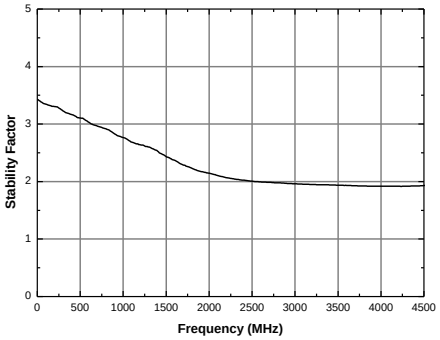


Bottom

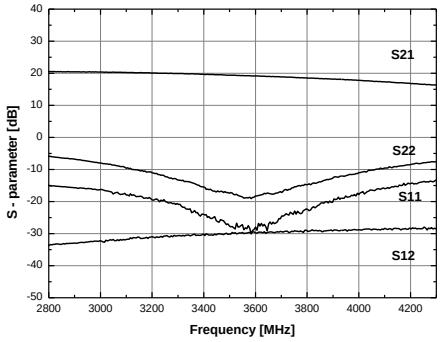


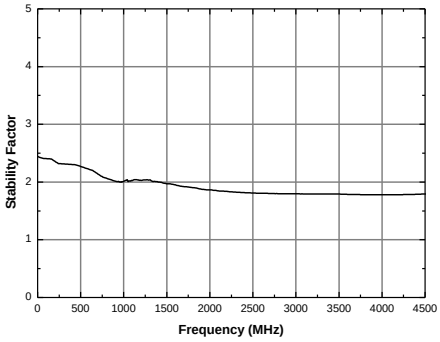
S-parameters & K-factor (3 V)





S-parameters & K-factor (4 V)





Recommended Soldering Reflow Profile