ASL30G

DC ~ 6000 MHz MMIC LNA

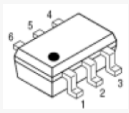
Features

- 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

"AEC-Q100 Qualified"

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	

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	+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

* Please find the max. input power data from http://www.asb.co.kr/pdf/Maximum_Input_Power_Analysis.pdf
The max. input power, in principle, depends upon the application frequency and the matching circuit.

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)

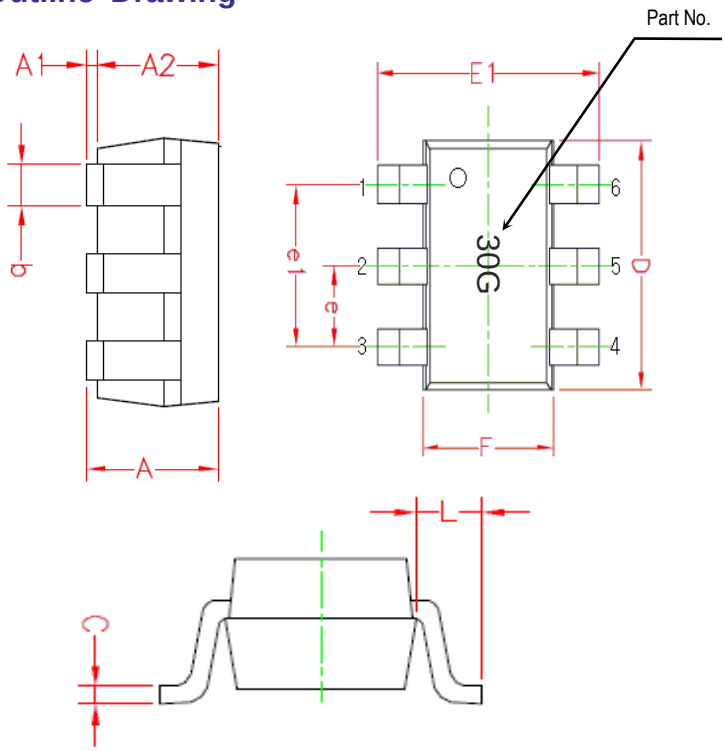
Others

- 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

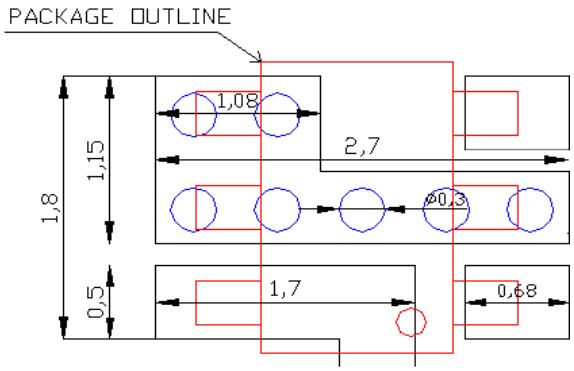
Outline Drawing



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
E	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 ASL226 from http://www.asb.co.kr/s-para/ASL226_gerber.zip

ESD Classification & Moisture Sensitivity Level

ESD Classification (Test Method : AEC-Q100)

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

CAUTION: ESD-sensitive device!

Moisture Sensitivity Level

Level 3 at 260 °C reflow

APPLICATION CIRCUIT

GSM

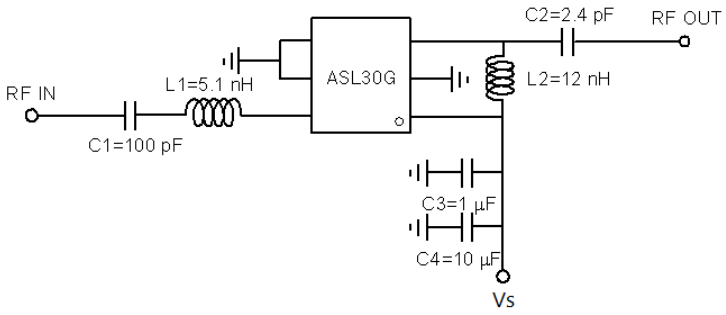
900 MHz

+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.

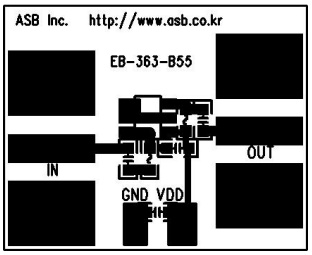
Schematic



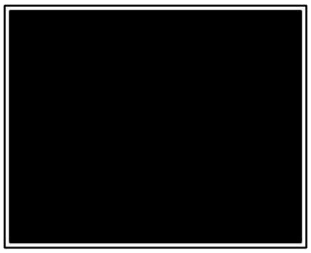
* Note: Gain and current can be reduced by controlling Vs to 2 V.
C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

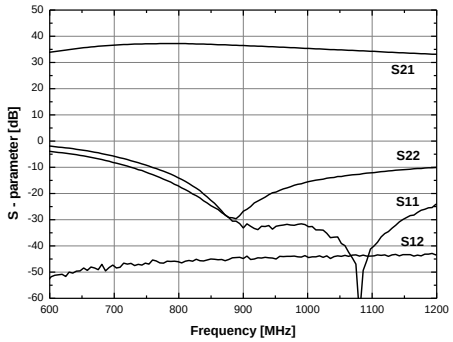
Top

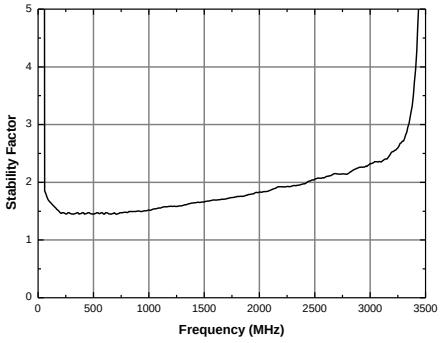


Bottom

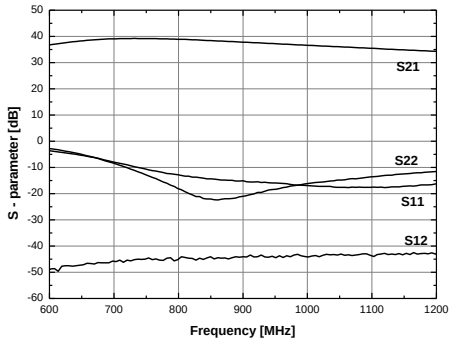


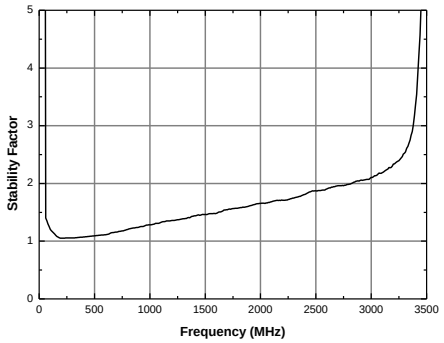
S-parameters & K-factor (3 V)





S-parameters & K-factor (4 V)





APPLICATION CIRCUIT

GPS,GLONASS,Galileo&Compass

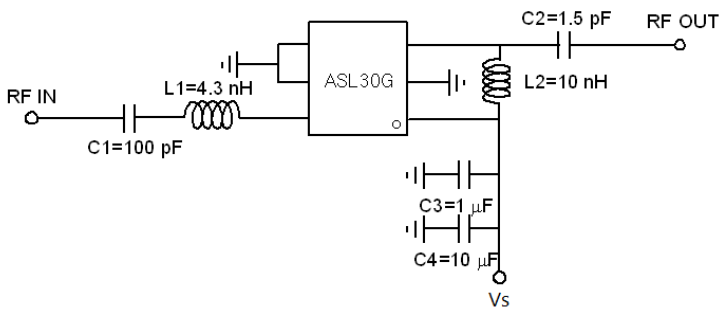
1164 MHz ~ 1300 MHz

+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.

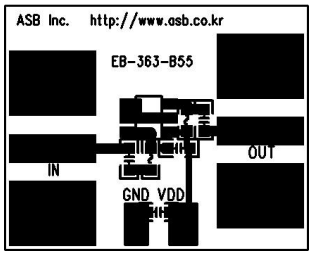
Schematic



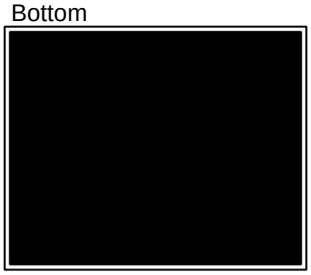
* Note: Gain and current can be reduced by controlling Vs to 2 V.
C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

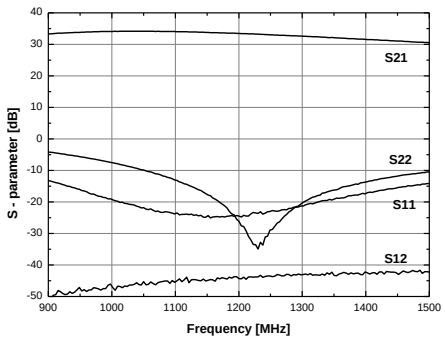
Top

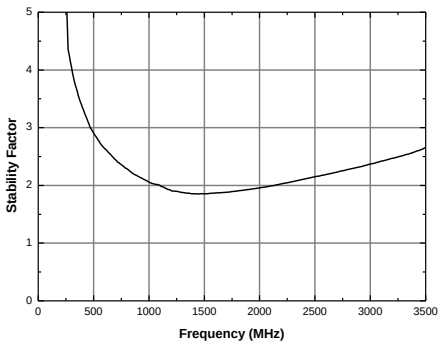


Bottom



S-parameters & K-factor





APPLICATION CIRCUIT

GPS,GLONASS,Galileo&Compass

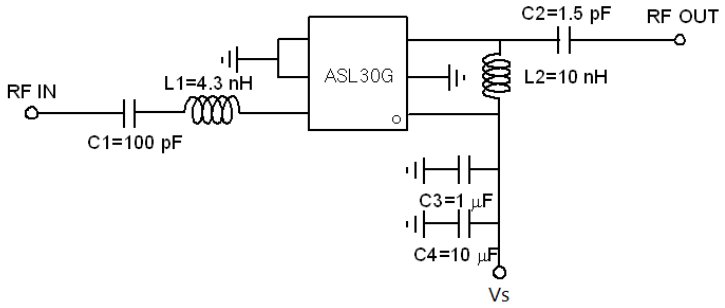
1164 MHz ~ 1300 MHz

+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.

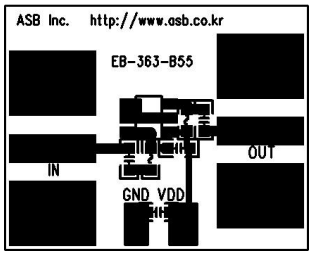
Schematic



* 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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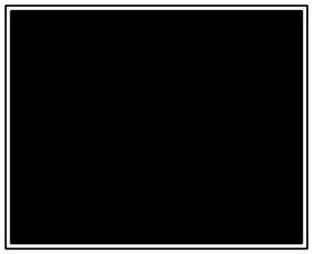
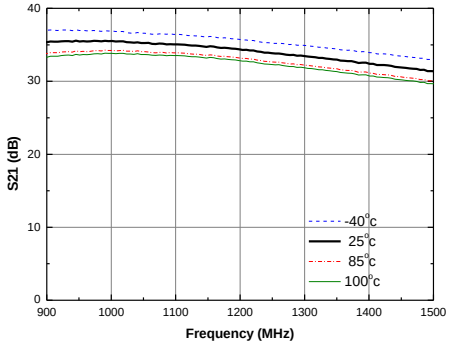
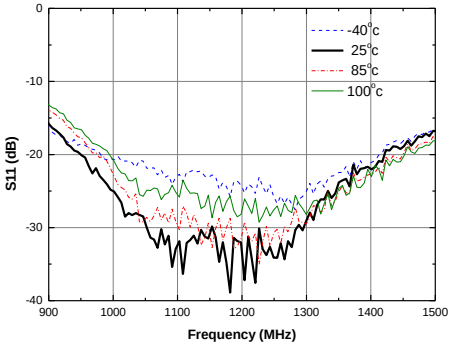
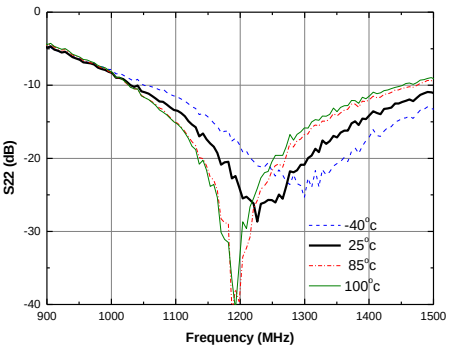
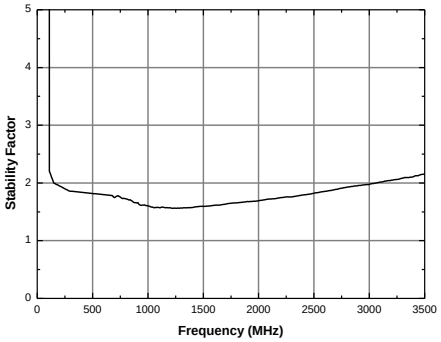


S-parameters & K-factor

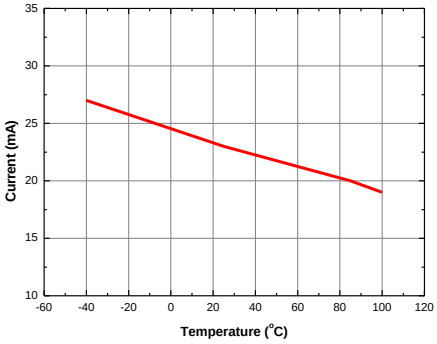




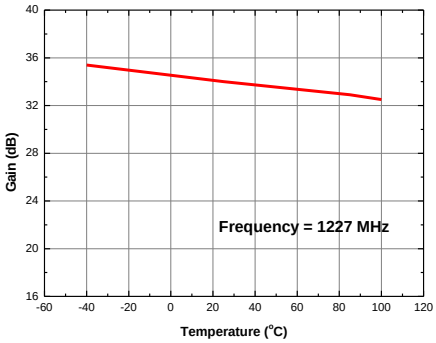




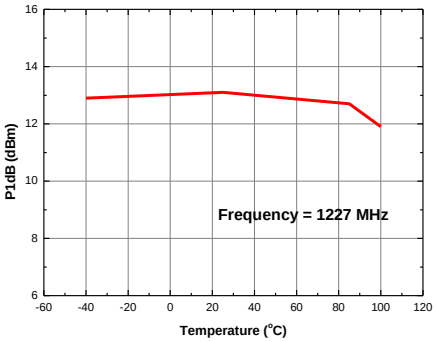
Current vs. Temperature



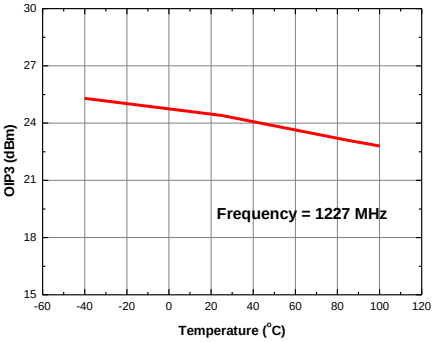
Gain vs. Temperature



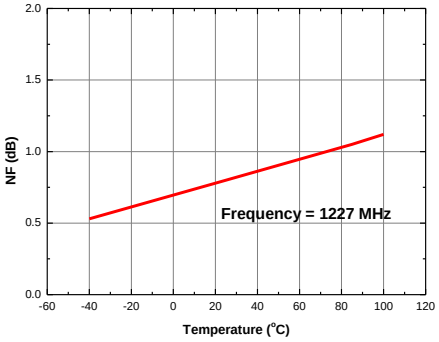
P1dB vs. Temperature



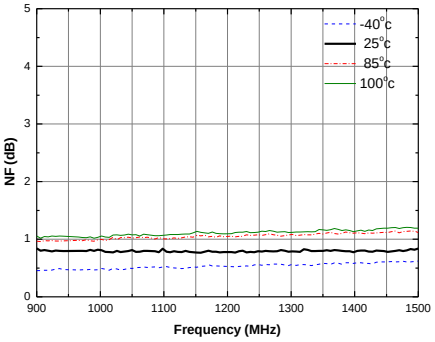
Output IP3 vs. Temperature



NF vs. Temperature



NF vs. Frequency



APPLICATION CIRCUIT

Robust ESD (± 2 kV)[1)]

GPS,GLONASS,Galileo&Compass

1164 MHz ~ 1300 MHz

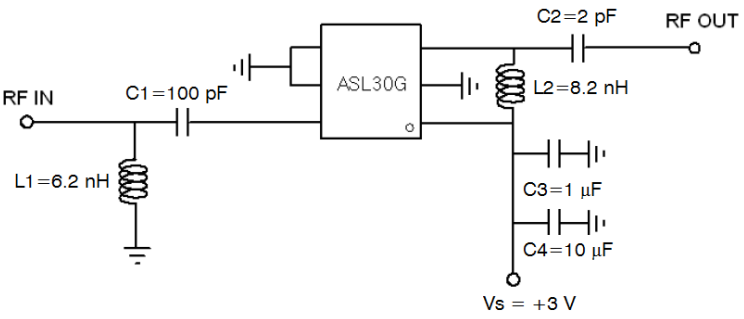
+3 V

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.

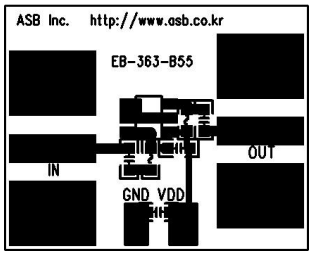
Schematic



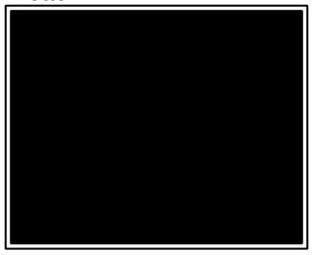
* Note: Gain and current can be reduced by controlling Vs to 2 V. C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

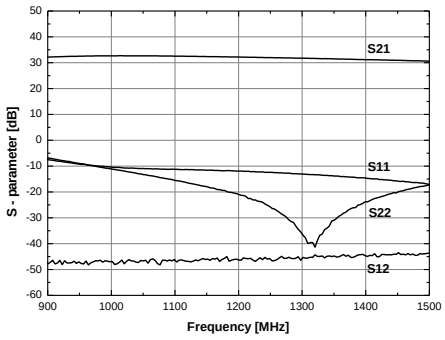
Top

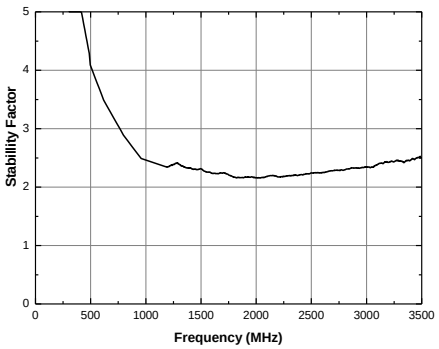


Bottom



S-parameters & K-factor





APPLICATION CIRCUIT

GPS,GLONASS,Galileo&Compass

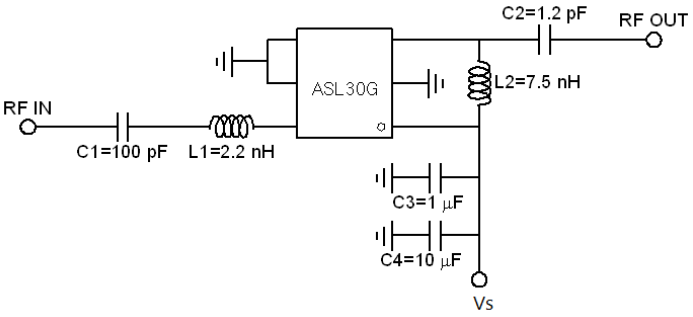
1559 MHz ~ 1610 MHz

+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.

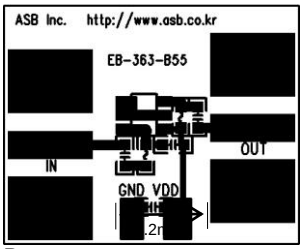
Schematic



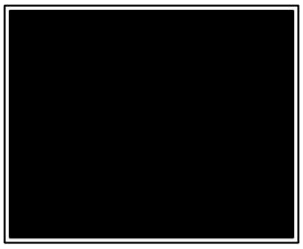
* Note: Gain and current can be reduced by controlling Vs to 2V.
C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

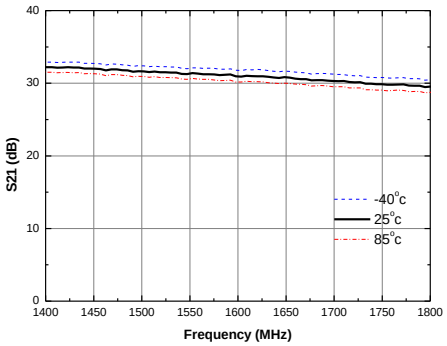
Top

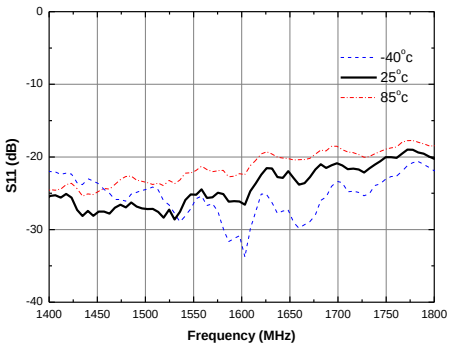


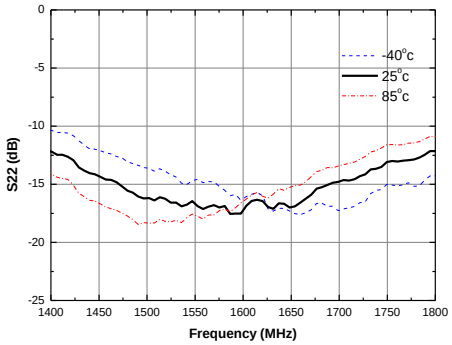
Bottom

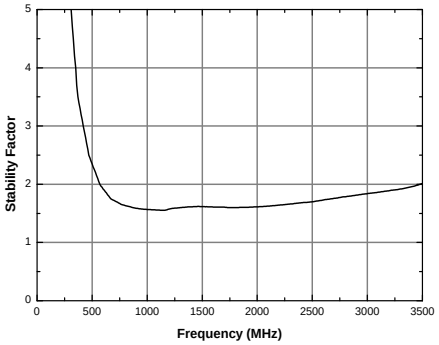


S-parameters & K-factor (3 V)

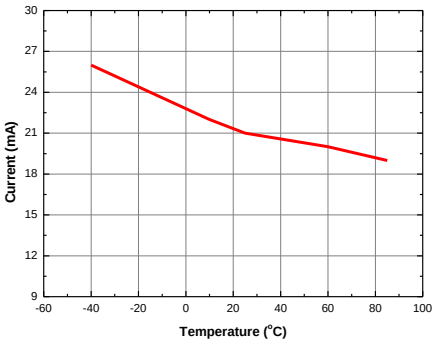




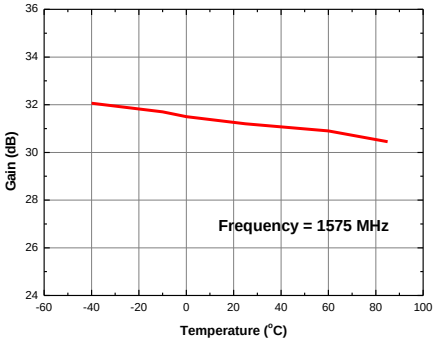




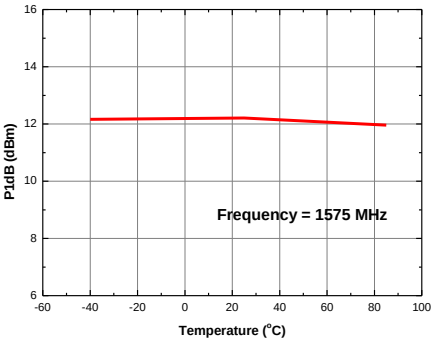
Current vs. Temperature



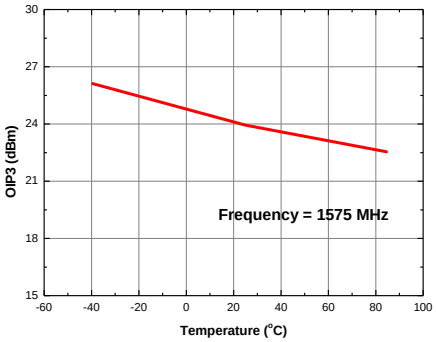
Gain vs. Temperature



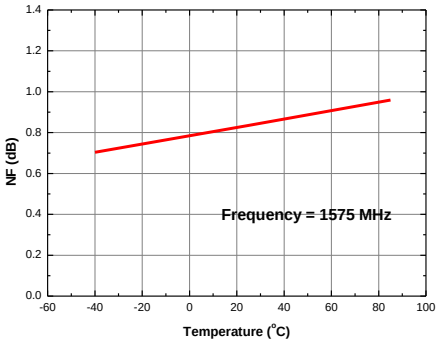
P1dB vs. Temperature

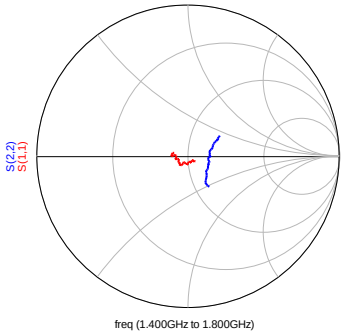


Output IP3 vs. Temperature

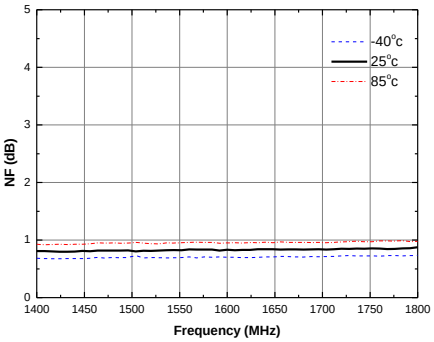


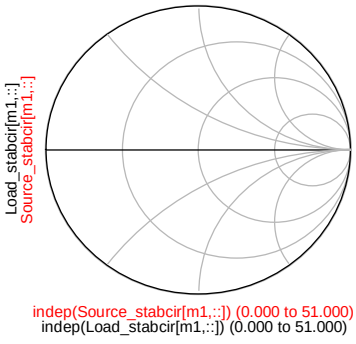
NF vs. Temperature





NF vs. Frequency





APPLICATION CIRCUIT

GPS,GLONASS,Galileo&Compass

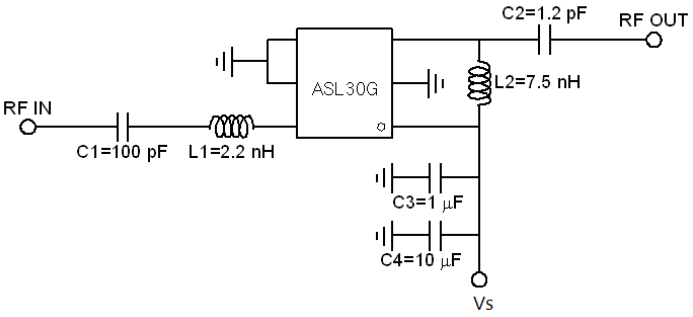
1559 MHz ~ 1610 MHz

+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.

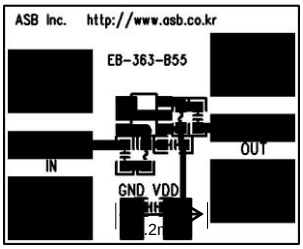
Schematic



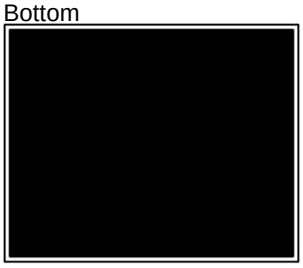
* Note: Gain and current can be reduced by controlling Vs to 2V.
C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

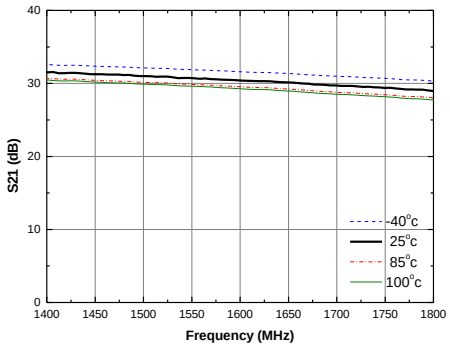
Top

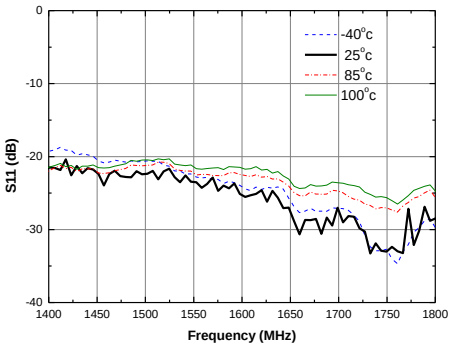


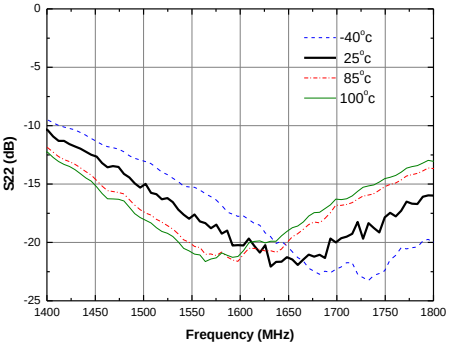
Bottom

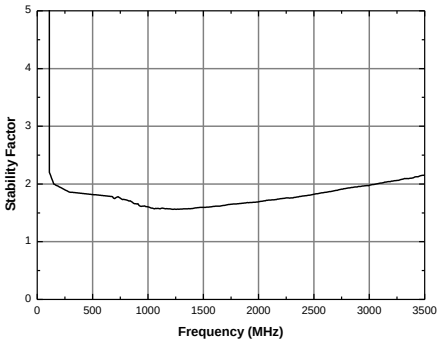


S-parameters & K-factor

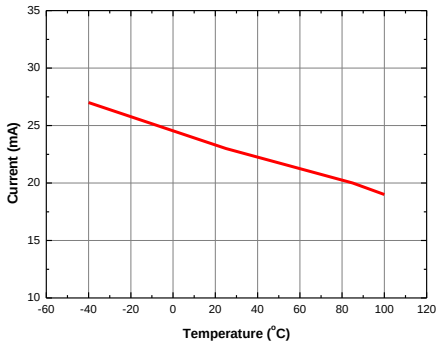




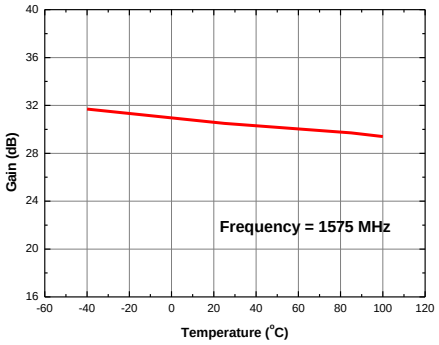




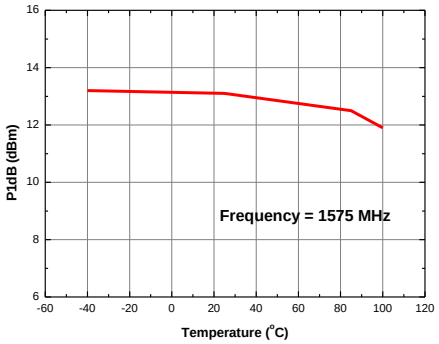
Current vs. Temperature



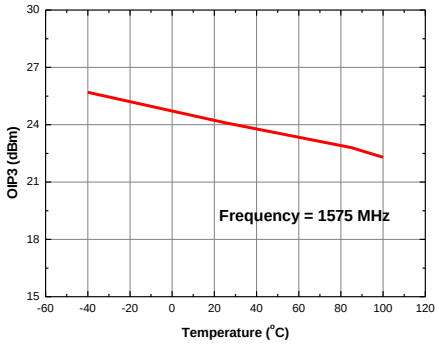
Gain vs. Temperature



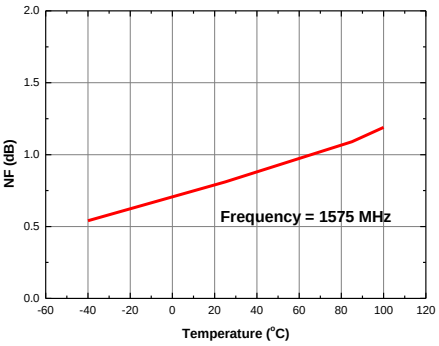
P1dB vs. Temperature



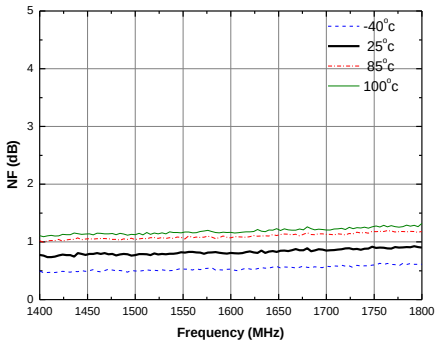
Output IP3 vs. Temperature



NF vs. Temperature



NF vs. Frequency



APPLICATION CIRCUIT

GPS,GLONASS,Galileo&Compass

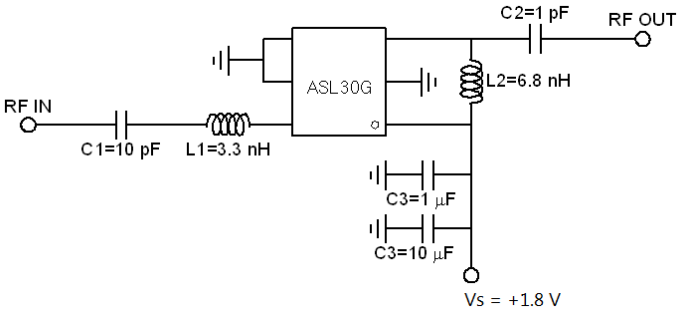
1559 MHz ~ 1610 MHz

+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.

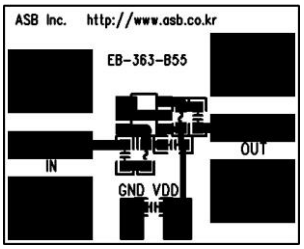
Schematic



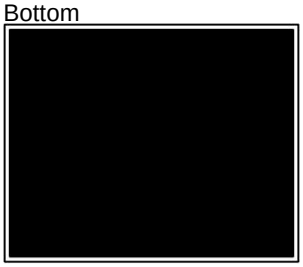
* Note: Gain and current can be reduced by controlling Vs to 2V.
C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

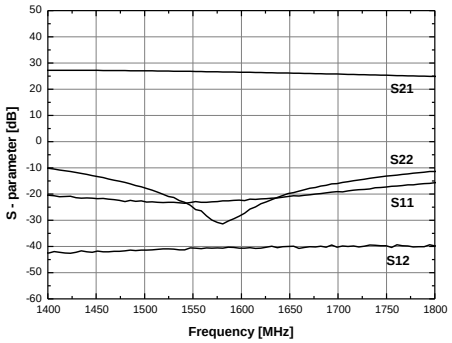
Top

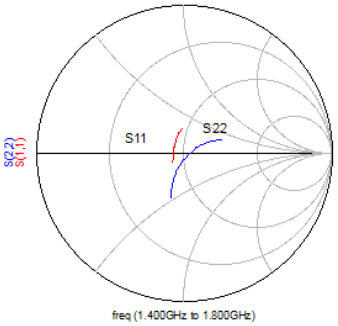


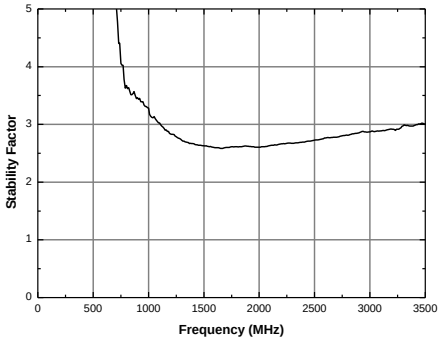
Bottom

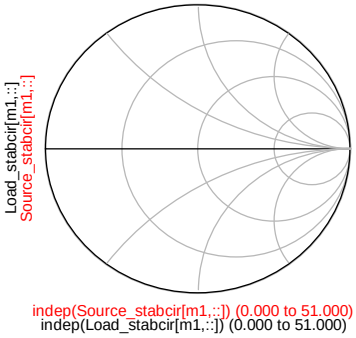


S-parameters & K-factor









APPLICATION CIRCUIT

Robust ESD (± 2 kV)[1)]

GPS,GLONASS,Galileo&Compass

1559 MHz ~ 1610 MHz

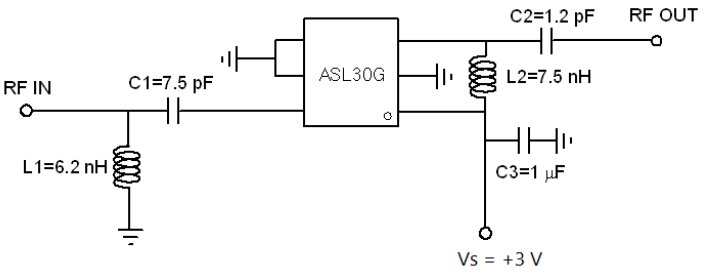
+3 V

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.

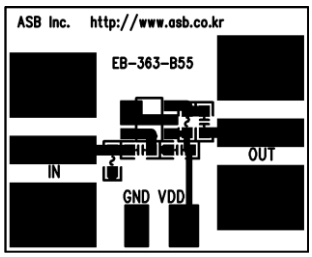
Schematic



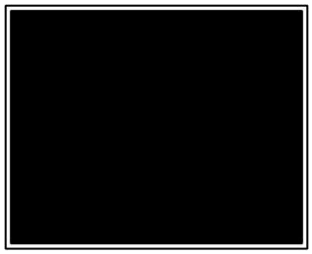
* Note: Gain and current can be reduced by controlling Vs to 2 V. C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

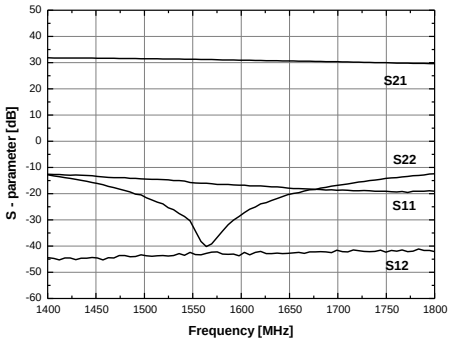
Top

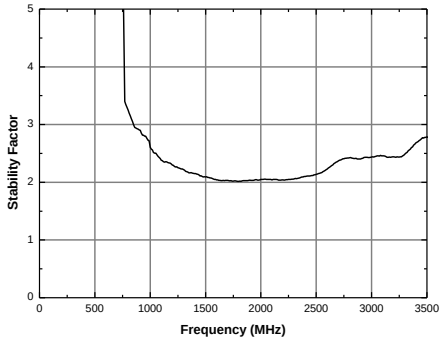


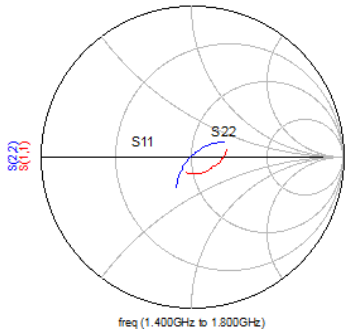
Bottom

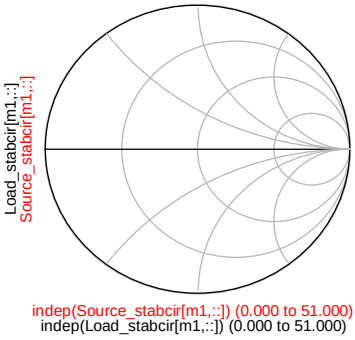


S-parameters & K-factor









APPLICATION CIRCUIT

Robust ESD (± 2 kV)[1)]

GPS,GLONASS,Galileo&Compass

1559 MHz ~ 1610 MHz

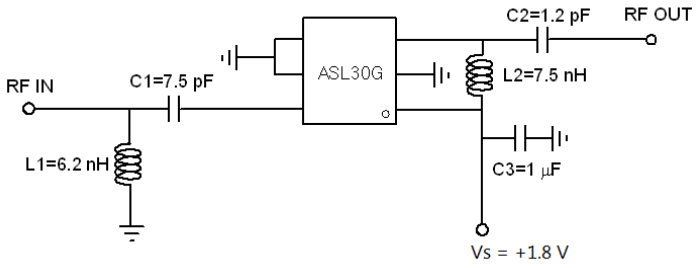
+1.8 V

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.

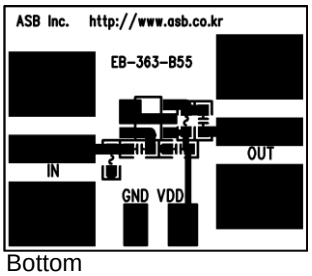
Schematic



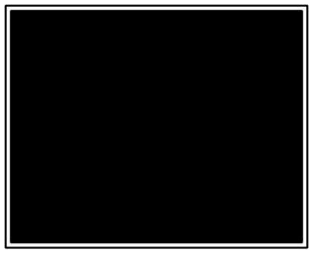
* Note: Gain and current can be reduced by controlling Vs to 2 V. C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

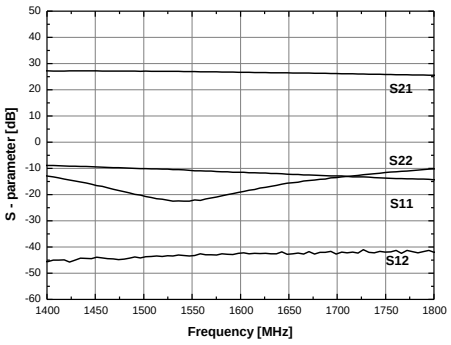
Top

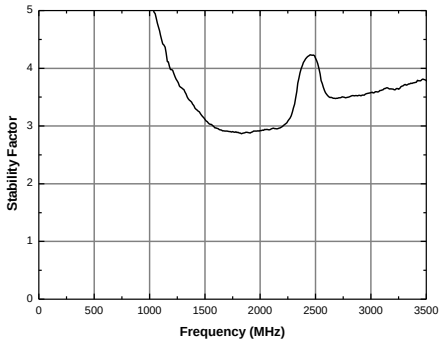


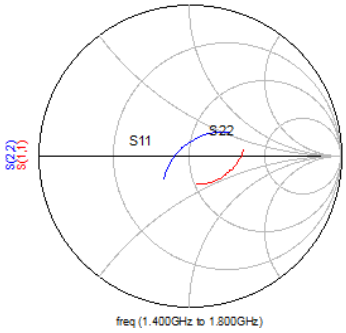
Bottom

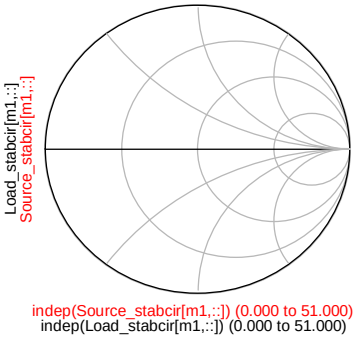


S-parameters & K-factor









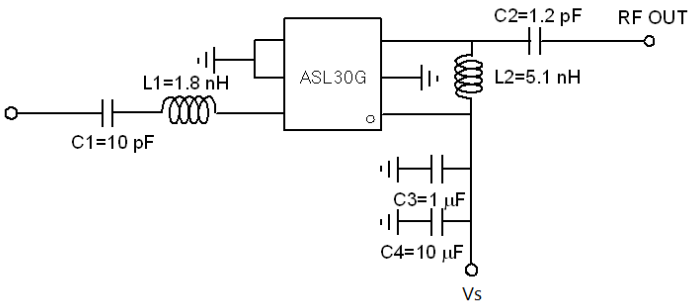
APPLICATION CIRCUIT

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.

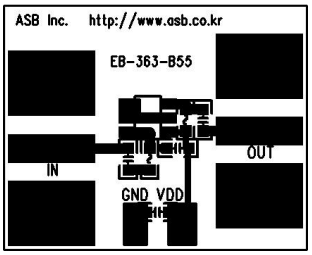
Schematic



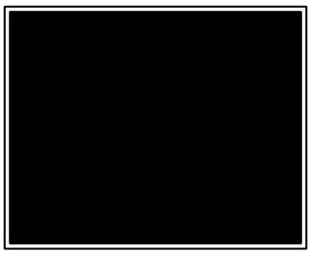
* Note: Gain and current can be reduced by controlling Vs to 2 V.
C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

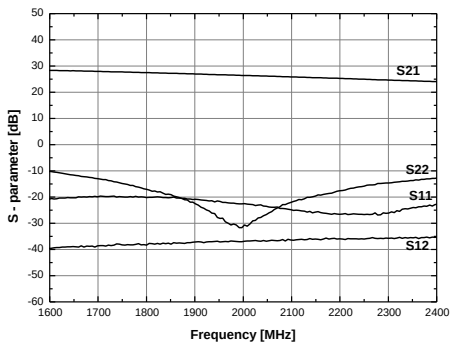
Top

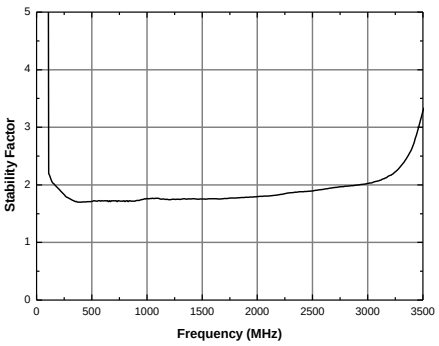


Bottom

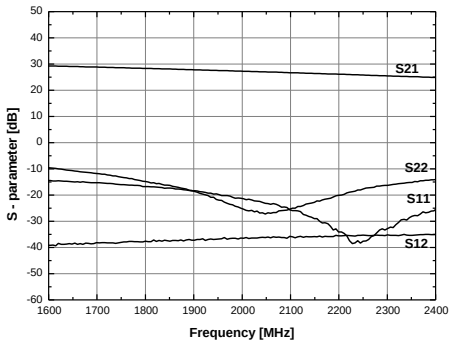


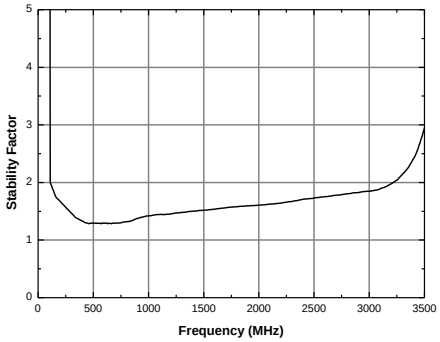
S-parameters & K-factor (3 V)





S-parameters & K-factor (4 V)





APPLICATION CIRCUIT

WLAN

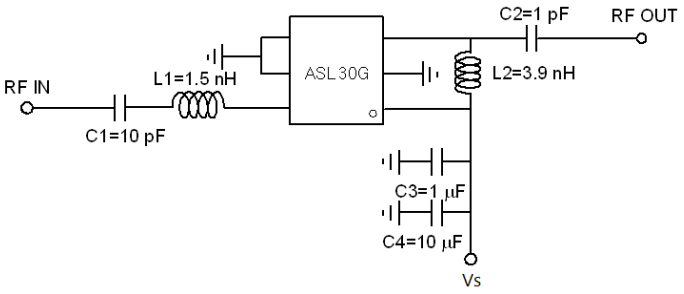
2400 MHz

+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.

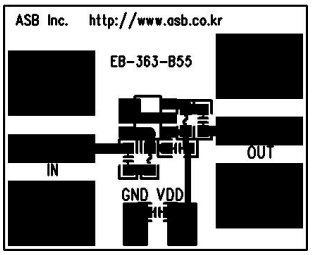
Schematic



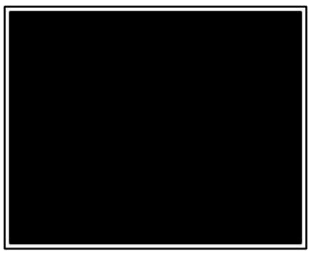
* Note: Gain and current can be reduced by controlling Vs to 2 V.
C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

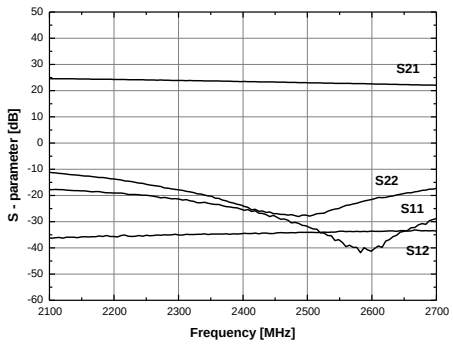
Top

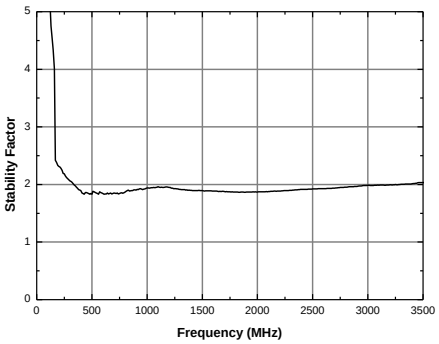


Bottom

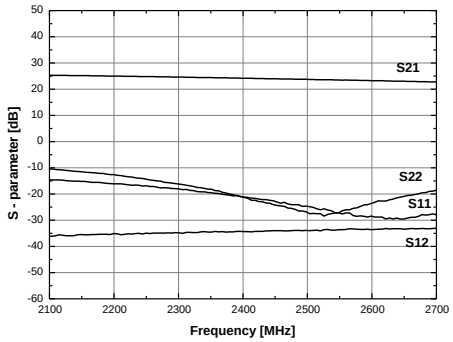


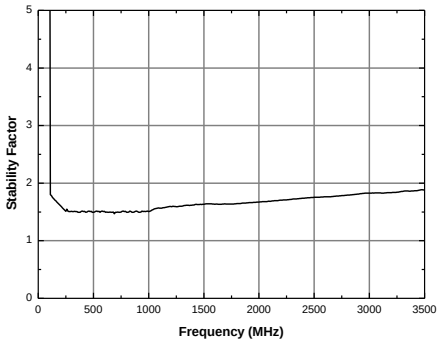
S-parameters & K-factor (3 V)





S-parameters & K-factor (4 V)





APPLICATION CIRCUIT

WiMAX

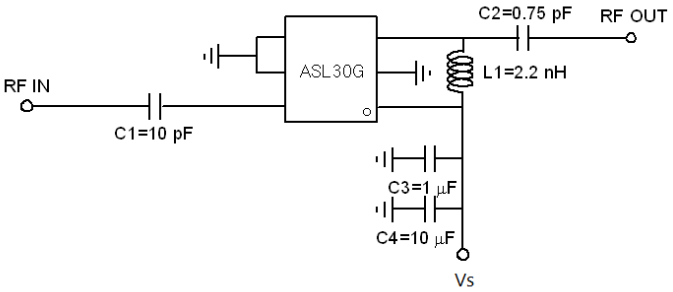
3300 ~ 3800 MHz

+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.

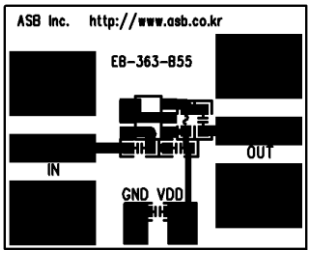
Schematic



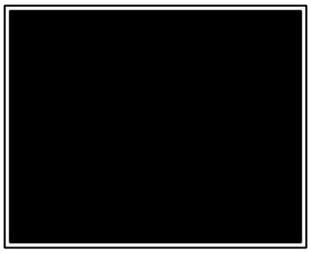
* Note: Gain and current can be reduced by controlling Vs to 2 V.
C3 must be placed as close as possible to the device.

Board Layout (FR4, 14x11.3 mm², 0.8T)

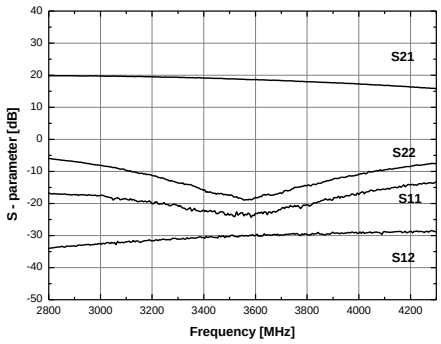
Top

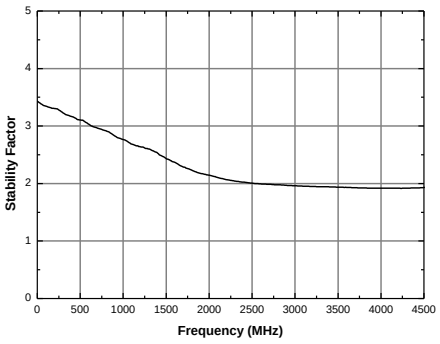


Bottom

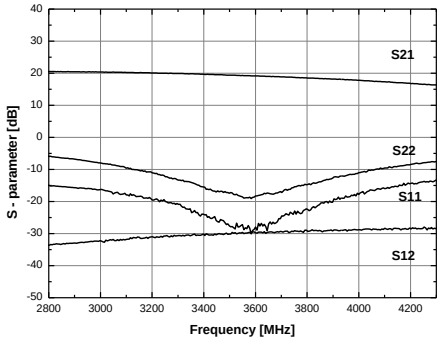


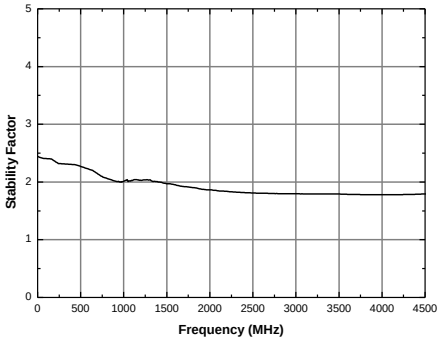
S-parameters & K-factor (3 V)





S-parameters & K-factor (4 V)





Recommended Soldering Reflow Profile