ASL20G

Low Noise GPS, GLONASS, Galileo and Compass Amplifier

Features

- GPS, GLONASS, Galileo and Compass LNA
- 21 dB Gain at 1575 MHz
- 0.7 dB NF at 1575 MHz
- Power ON, OFF Function
- Supply Voltage = 1.8 ~ 5.0 V

Description

ASL20G is an LNA for GPS, GLONASS, Galileo, Compass in mobile equipment which requires lower current and lower noise. Power saving function is built in. Low noise performance is kept over the wide range of power enable voltage and DC power supply voltage.

RoHS-compliant GREEN Package

Package Style: UQFN6

Typical Performance

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

Parameters	Units	Typical							
Testing Frequency	MHz	1575	1575	1575	1575	1575	1575	1575	1575
Gain	dB	16.5	18	16.0	21.0	17.0	22.5	21.0	21.5
S11	dB	-8	-9	-15	-10	-6	-15	-10	-10
S22	dB	-15	-13	-15	-14	-18	-15	-15	-16
Noise Figure	dB	1.05	1.0	0.95	0.7	1.10	0.65	0.8	0.8
Input IP3[1)]	dBm	-15	-15	-5	-18	-16	-12	-18	-17
Output P1dB	dBm	-8	-7	1	-5	-9	0	-4.0	-3.5
Supply Current	mA	2.0	3.0	6.0	6.0	2.5	12.0	4	5
Supply Voltage	V	1.8	1.8	1.8	1.8	2.7	3.0	3.0	3.3
Control Current	μA	300	300	300	300	300	300	300	300
Control Voltage	V	+1.8	+1.8	+1.8	+1.8	+2.7	+3.0	+3.0	+3.3

1) IIP3 is measured with two tones at an input power of -40 dBm/tone separated by 1MHz.

Robust ESD(±10kV)

Parameters	Units	Typical		
Testing Frequency	MHz	1575	1575	1575
Gain	dB	22	18	23
S11	dB	-15	-12	-10
S22	dB	-15	-9	-15
Noise Figure	dBm	1.05	1.2	1.00
Input IP3	dB	-18[1)]	-16[2)]	-8[1)]
Output P1dB	dBm	-4	-7	1
Supply Current	mA	6.0	3.0	12.0
Supply Voltage	V	1.8	1.8	3
Control Current	μA	300	300	300
Control Voltage V_{CTL}	V	+1.8	+1.8	+3.0

1) IIP3 is measured with two tones at an input power of -40 dBm/tone separated by 1MHz.
2) IIP3 is measured with two tones at an input power of -30 dBm/tone separated by 1MHz.

Applications

GPS, GLONASS, Galileo, Compass

- 1559 ~ 1610MHz (1.8 V, 6 mA, Robust ESD, ±10 kV)
- 1559 ~ 1610MHz (1.8 V, 3 mA, Robust ESD, ±10 kV)
- 1559 ~ 1610MHz (3 V, 12 mA, Robust ESD, ±10 kV)
- 1559 ~ 1610MHz (1.8 V, 2 mA)
- 1559 ~ 1610MHz (1.8 V, 3 mA)
- 1559 ~ 1610MHz (1.8 V, 6 mA)
- 1559 ~ 1610MHz (2.7 V, 2.5 mA)
- 1559 ~ 1610MHz (3 V, 12 mA)
- 1559 ~ 1610MHz (3 V, 4 mA)
- 1559 ~ 1610MHz (3.3 V, 5 mA)

Pin Configuration

Pin No.	Function
1	RFOUT
2	VCTL
3	GND
4	RFIN
5	GND
6	NC(Not connected)

Product Specifications

Parameters	Units	Min	Typ	Max
Frequency	MHz		1575	
Gain	dB		21	
S11	dB		-10	
S22	dB		-14	
Noise Figure	dB		0.7	
Supply Current	mA	4	6	8
Supply Voltage	V		1.8	
Control Current	μA		300	
Control Voltage V_{CTL}[1)]	V		+1.8	

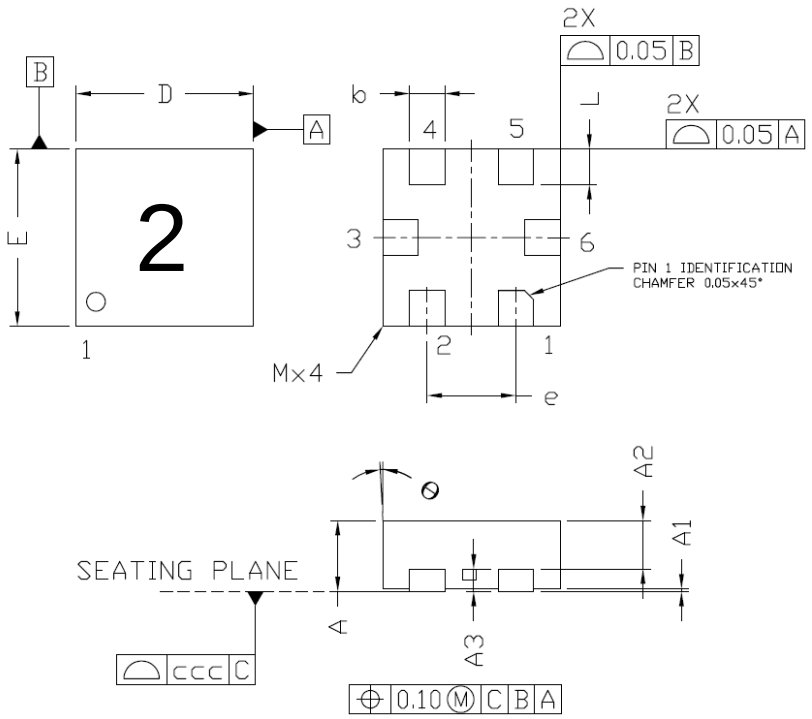
1) Power On V_{CTL} Voltage = 0.5 V < V_{CTL} < 5

Absolute Maximum Ratings

Parameters	Rating
Operating Case Temperature	-40 to +85 °C
Storage Temperature	-40 to +150 °C
Supply Voltage	+6 V
Operating Junction Temperature	+150 °C
Input RF Power (CW, 50 Ω matched)[1)]	+5 dBm

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

Outline Drawing



Symbol	Dimensions in Millimeters		
	MIN	NOM	MAX
A	0.35	---	0.40
A1	0.00	---	0.05
A2	0.223	---	0.273
A3	---	0.127REF	---
b	0.15	0.20	0.25
D	0.95	1.00	1.03
E	0.95	1.00	1.03
e	---	0.50BSC	---
L	0.15	0.20	0.25
θ	-12	---	0
ccc	---	0.05	---
M	---	---	0.05
Burr	0.00	0.03	0.06

Pin NO.	Function	Pin NO.	Function.
1	RFOUT	4	RFIN
2	VCTL	5	GND
3	GND	6	NC(not connected)

ESD Classification & Moisture Sensitivity Level

ESD Classification

HBM	Class 0
	Voltage Level: 200 V
MM	Class A
	Voltage Level: 50 V

CAUTION: ESD-sensitive device!

Moisture Sensitivity Level (MSL)

Level 3 at 260 °C reflow

APPLICATION CIRCUIT

Robust ESD (± 10 kV) [1)]

GPS, GLONASS, Galileo, Compass

1559 ~ 1610 MHz

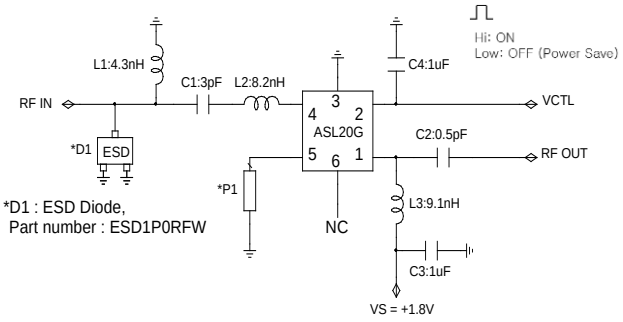
+1.8 V, 6 mA

1) Test Method : Contact discharge on RF input. Applying 10 times repeated voltage at 1 sec time interval.

Frequency (MHz)	1559 ~ 1610
Magnitude S21 (dB)	22
Magnitude S11 (dB)	-15
Magnitude S22 (dB)	-15
Noise Figure (dB)	1.05
Input IP3 (dBm) [1)]	-18
Output P1dB (dBm)	-4
Supply Current (mA)	6
Supply Voltage (V)	+1.8
Control Current (μA)	300
Control Voltage V_{CTL} (V)	+1.8

1) IIP3 is measured with two tones at an input power of -40 dBm/tone separated by 1MHz.

Schematic

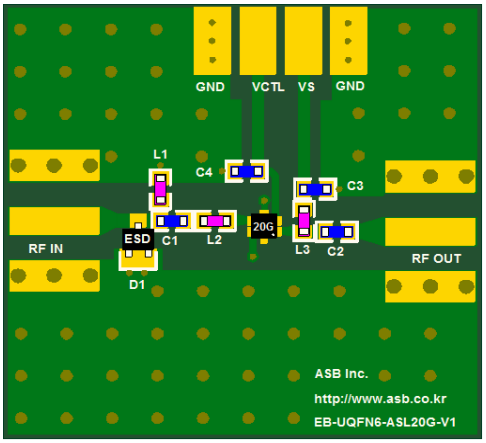


Note: 1) the length of the strip line P1 is given as below at the PCB with Er = 4.5 and T = 0.8 mm.

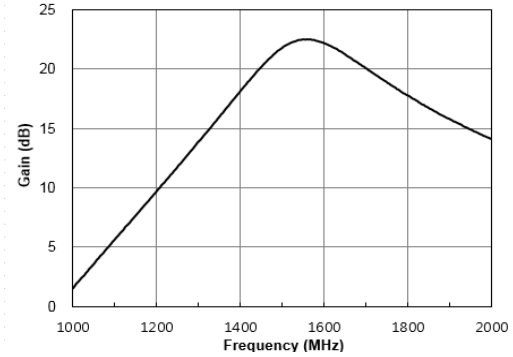
P1 Length: 1 mm, Width: 0.3 mm

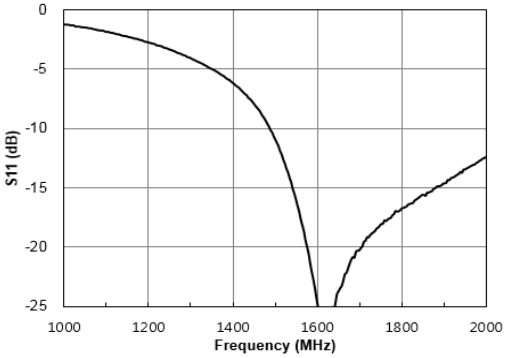
2) Gain and S11 are in trade-off and varied with the length of P1

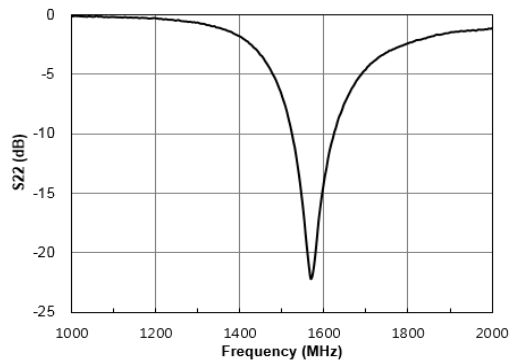
Board Layout (FR4, 22x20 mm², 0.8T)



S-parameters







APPLICATION CIRCUIT

Robust ESD (± 10 kV) 1)

GPS, GLONASS, Galileo, Compass

1559 ~ 1610 MHz

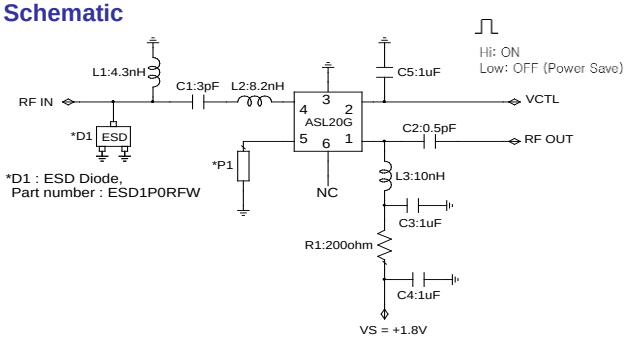
+1.8 V, 3 mA

1) Test Method : Contact discharge on RF input. Applying 10 times repeated voltage at 1 sec time interval.

Frequency (MHz)	1559 ~ 1610
Magnitude S21 (dB)	18
Magnitude S11 (dB)	-12
Magnitude S22 (dB)	-9
Noise Figure (dB)	1.2
Input IP3 (dBm) 1)	-16
Output P1dB (dBm)	-7
Supply Current (mA)	3
Supply Voltage (V)	+1.8
Control Current (μA)	300
Control Voltage V_{CTL} (V)	+1.8

1) IIP3 is measured with two tones at an input power of -30 dBm/tone separated by 1MHz.

Schematic

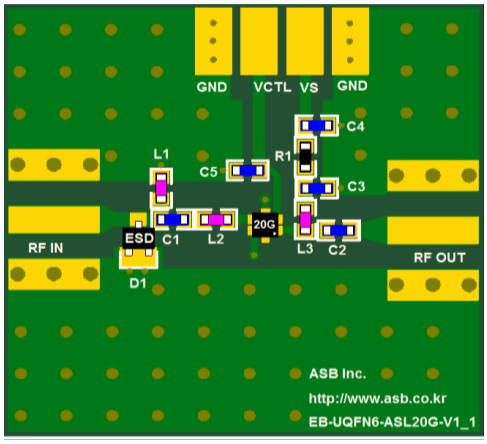


Note: 1) the length of the strip line P1 is given as below at the PCB with Er = 4.5 and T = 0.8 mm.

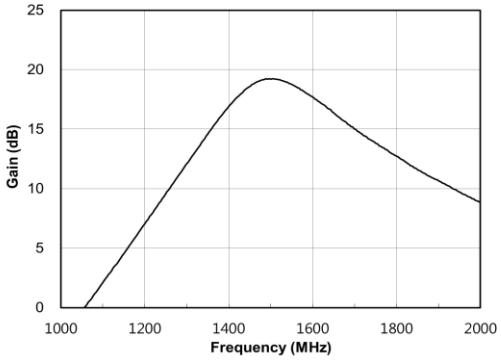
P1 Length: 1 mm, Width: 0.3 mm

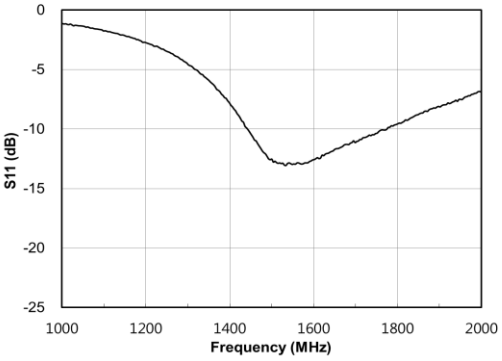
2) Gain and S11 are in trade-off and varied with the length of P1

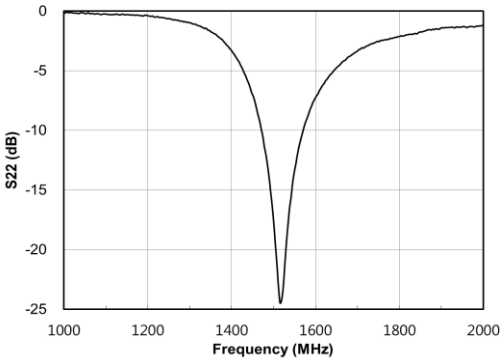
Board Layout (FR4, 22x20 mm², 0.8T)



S-parameters







APPLICATION CIRCUIT

Robust ESD (± 10 kV) 1)

GPS, GLONASS, Galileo, Compass

1559 ~ 1610 MHz

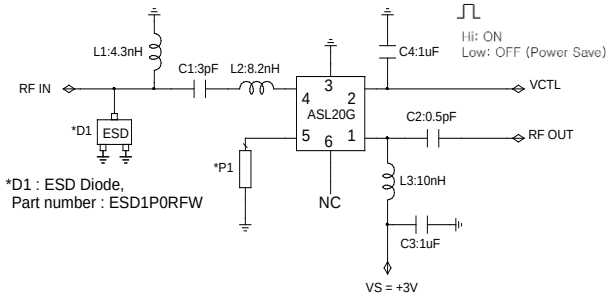
+3 V, 12 mA

1) Test Method : Contact discharge on RF input. Applying 10 times repeated voltage at 1 sec time interval.

Frequency (MHz)	1559 ~ 1610
Magnitude S21 (dB)	23
Magnitude S11 (dB)	-10
Magnitude S22 (dB)	-15
Noise Figure (dB)	1
Input IP3 (dBm) 1)	-8
Output P1dB (dBm)	1
Supply Current (mA)	12
Supply Voltage (V)	+3.0
Control Current (μA)	300
Control Voltage V_{CTL} (V)	+3.0

1) IIP3 is measured with two tones at an input power of -40 dBm /tone separated by 1MHz

Schematic

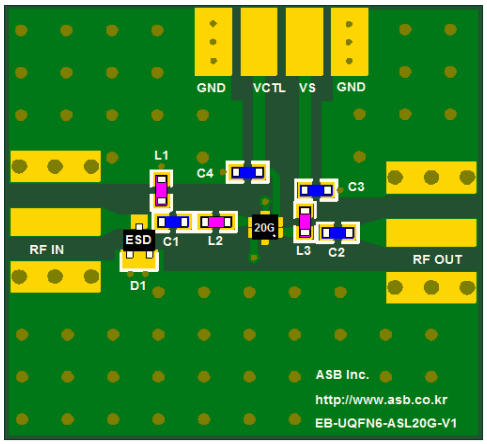


Note: 1) the length of the strip line P1 is given as below at the PCB with Er = 4.5 and T = 0.8 mm.

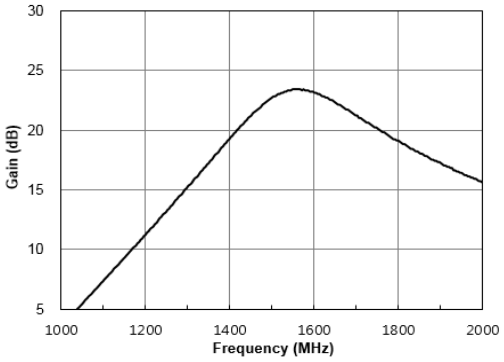
*P1 Length: 1 mm, Width: 0.3 mm

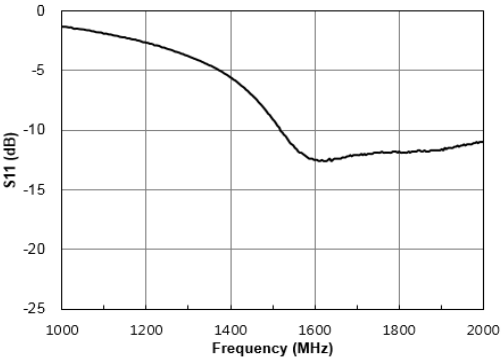
2) Gain and S11 are in trade-off and varied with the length of P1

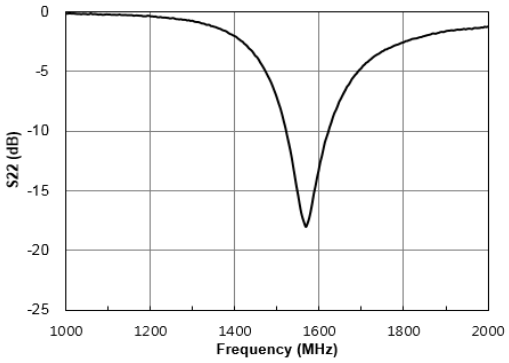
Board Layout (FR4, 22x20 mm², 0.8T)



S-parameters







APPLICATION CIRCUIT

GPS, GLONASS, Galileo, Compass

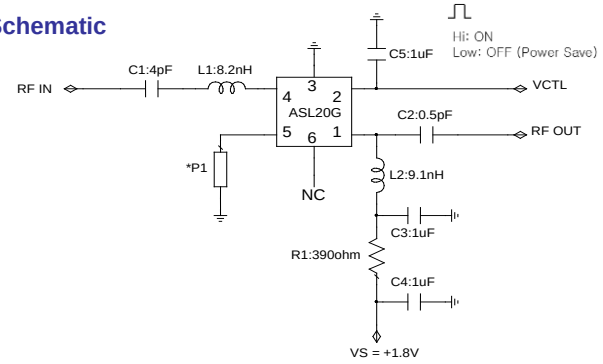
1559 ~ 1610 MHz

+1.8 V, 2 mA

Frequency (MHz)	1559 ~ 1610
Magnitude S21 (dB)	16.5
Magnitude S11 (dB)	-8
Magnitude S22 (dB)	-15
Noise Figure (dB)	1.05
Input IP3 (dBm) [1)]	-15
Output P1dB (dBm)	-8
Supply Current (mA)	2
Supply Voltage (V)	+1.8
Control Current (μA)	300
Control Voltage V_{CTL} (V)	+1.8

1) IIP3 is measured with two tones at an input power of -40 dBm/tone separated by 1MHz.

Schematic

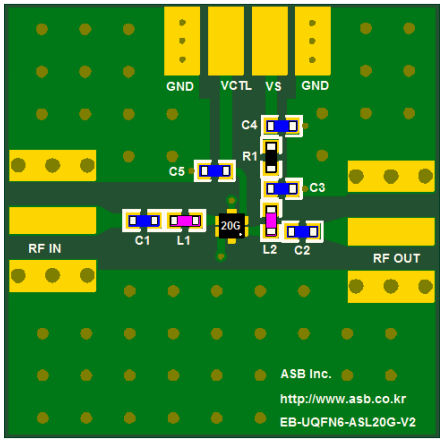


Note: 1) the length of the strip line P1 is given as below at the PCB with Er = 4.5 and T = 0.8 mm.

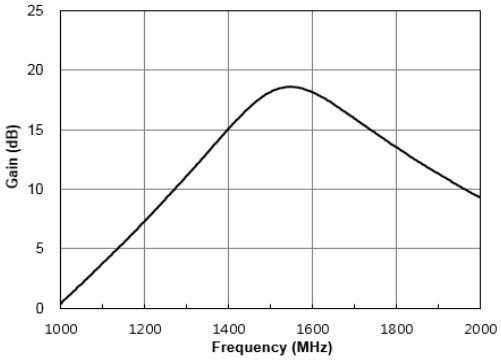
P1 Length: 1 mm, Width: 0.3 mm

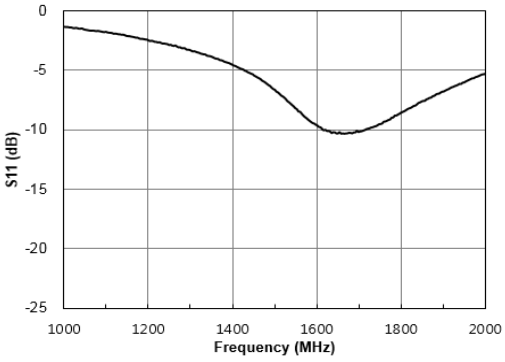
2) Gain and S11 are in trade-off and varied with the length of P1

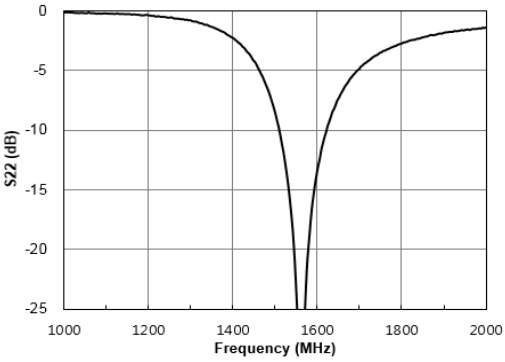
Board Layout (FR4, 20x20 mm², 0.8T)

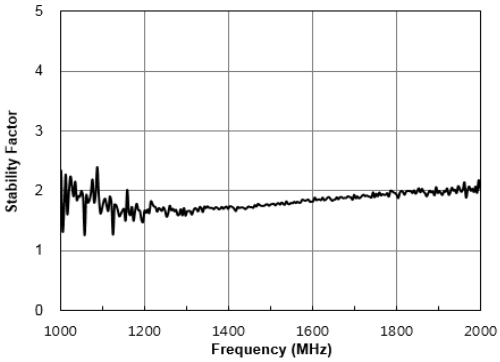


S-parameters & K-factor









APPLICATION CIRCUIT

GPS, GLONASS, Galileo, Compass

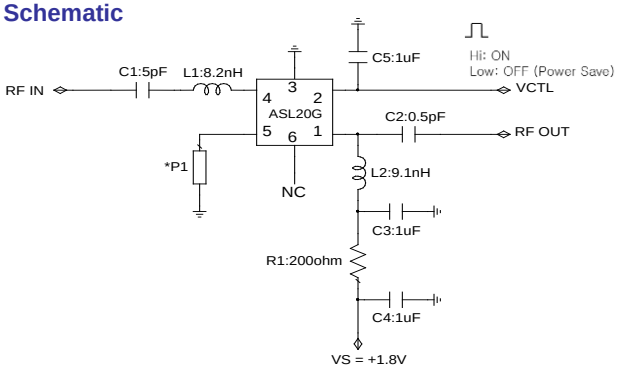
1559 ~ 1610 MHz

+1.8 V, 3 mA

Frequency (MHz)	1559 ~ 1610
Magnitude S21 (dB)	18
Magnitude S11 (dB)	-9
Magnitude S22 (dB)	-13
Noise Figure (dB)	1.0
Input IP3 (dBm) [1)]	-15
Output P1dB (dBm)	-7
Supply Current (mA)	3
Supply Voltage (V)	+1.8
Control Current (μA)	300
Control Voltage V_{CTL} (V)	+1.8

1) IIP3 is measured with two tones at an input power of -30 dBm/tone separated by 1MHz.

Schematic

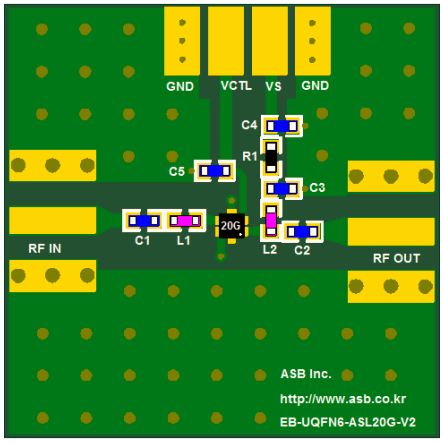


Note: 1) the length of the strip line P1 is given as below at the PCB with Er = 4.5 and T = 0.8 mm.

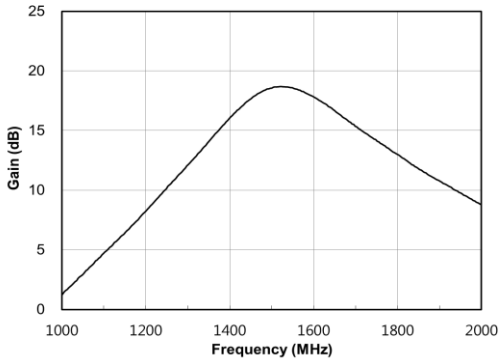
P1 Length: 1 mm, Width: 0.3 mm

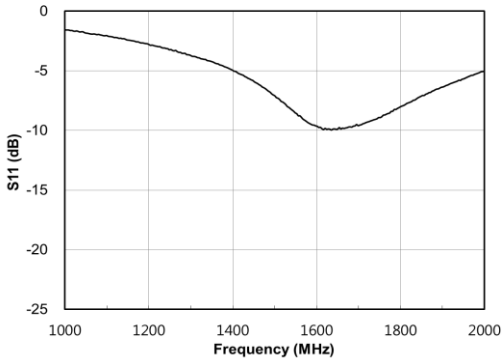
2) Gain and S11 are in trade-off and varied with the length of P1

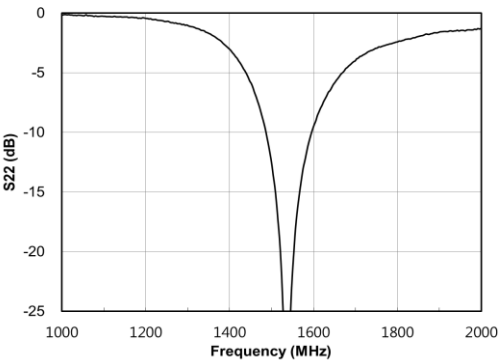
Board Layout (FR4, 20x20 mm², 0.8T)

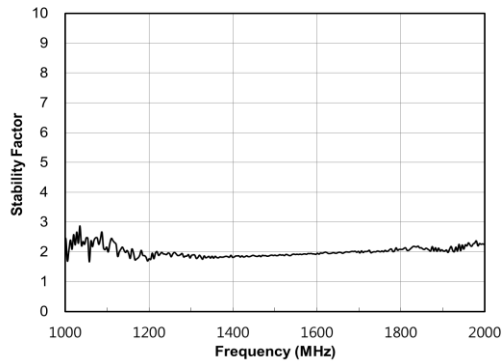


S-parameters & K-factor









APPLICATION CIRCUIT

GPS, GLONASS, Galileo, Compass

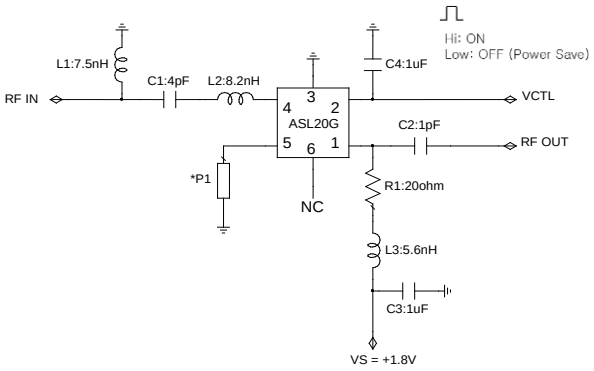
1559 ~ 1610 MHz

+1.8 V, 6 mA

Frequency (MHz)	1559 ~ 1610
Magnitude S21 (dB)	16
Magnitude S11 (dB)	-15
Magnitude S22 (dB)	-15
Noise Figure (dB)	0.95
Input IP3 (dBm) 1)	-5
Output P1dB (dBm)	1
Supply Current (mA)	6
Supply Voltage (V)	+1.8
Control Current (μA)	300
Control Voltage V_{CTL} (V)	+1.8

1) IIP3 is measured with two tones at an input power of -40 dBm/tone separated by 1MHz.

Schematic

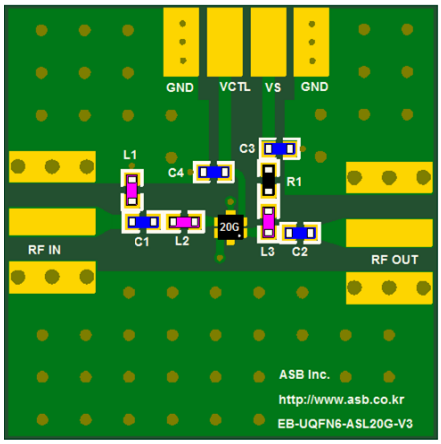


Note: 1) the length of the strip line P1 is given as below at the PCB with Er = 4.5 and T = 0.8 mm.

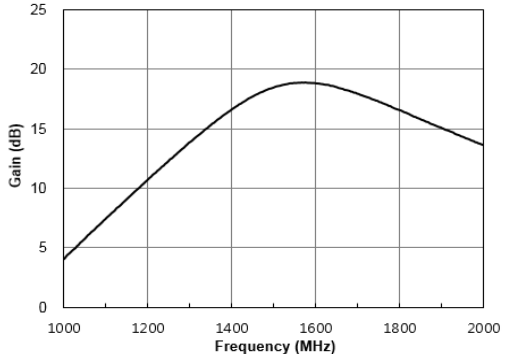
P1 Length: 1 mm, Width: 0.3 mm

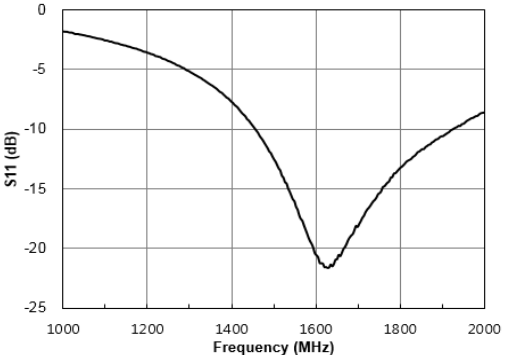
2) Gain and S11 are in trade-off and varied with the length of P1

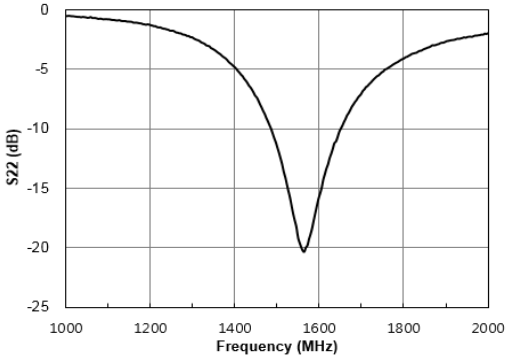
Board Layout (FR4, 20x20 mm², 0.8T)

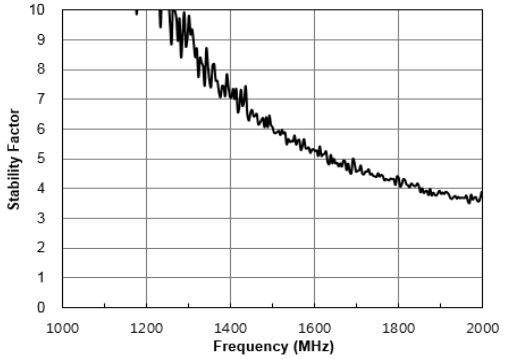


S-parameters & K-factor









Low Noise GPS, GLONASS, Galileo and Compass Amplifier

APPLICATION CIRCUIT

GPS, GLONASS, Galileo, Compass

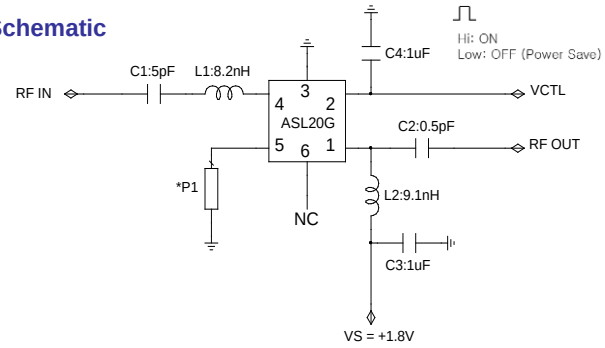
1559 ~ 1610 MHz

+1.8 V, 6 mA

Frequency (MHz)	1559 ~ 1610
Magnitude S21 (dB)	21
Magnitude S11 (dB)	-10
Magnitude S22 (dB)	-14
Noise Figure (dB)	0.7
Input IP3 (dBm) [1)]	-18
Output P1dB (dBm)	-5
Supply Current (mA)	6
Supply Voltage (V)	+1.8
Control Current (μA)	300
Control Voltage V_{CTL} (V)	+1.8

1) IIP3 is measured with two tones at an input power of -40 dBm/tone separated by 1MHz.

Schematic

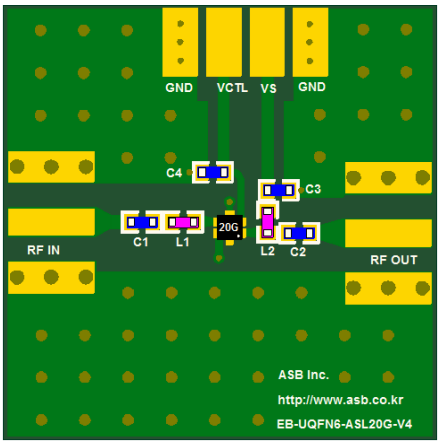


Note: 1) the length of the strip line P1 is given as below at the PCB with Er = 4.5 and T = 0.8 mm.

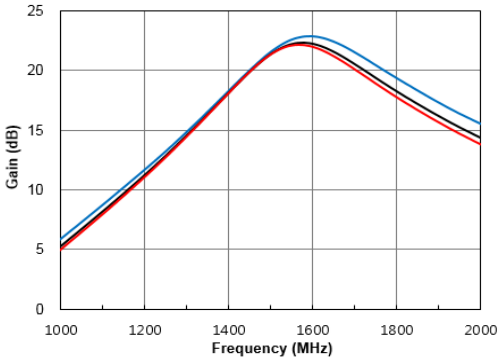
P1 Length: 1 mm, Width: 0.3 mm

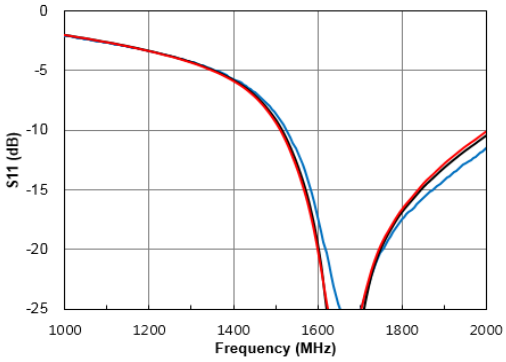
2) Gain and S11 are in trade-off and varied with the length of P1

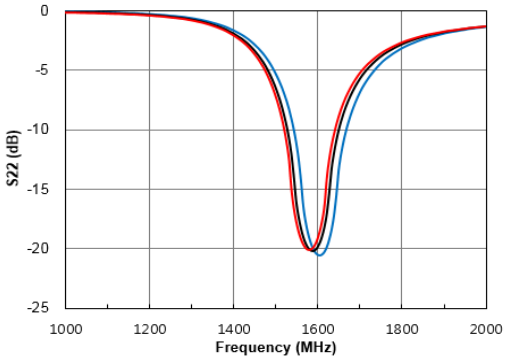
Board Layout (FR4, 20x20 mm², 0.8T)

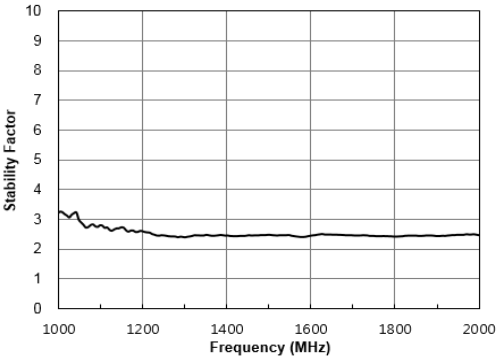


S-parameters & K-factor

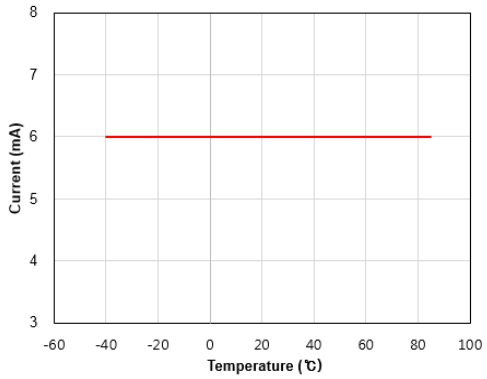




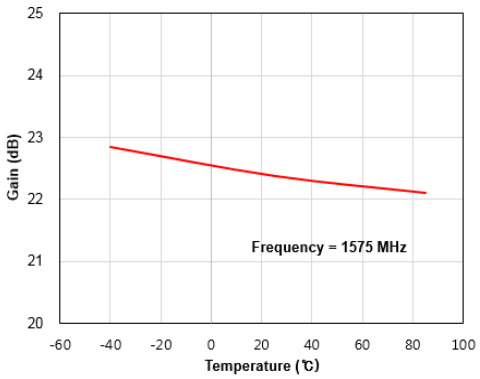




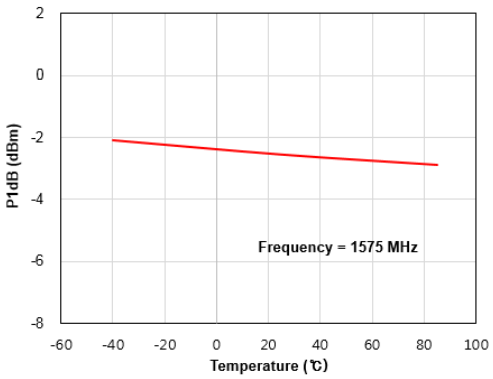
Current vs. Temperature



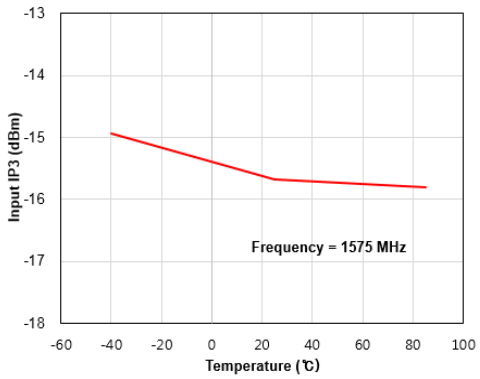
Gain vs. Temperature



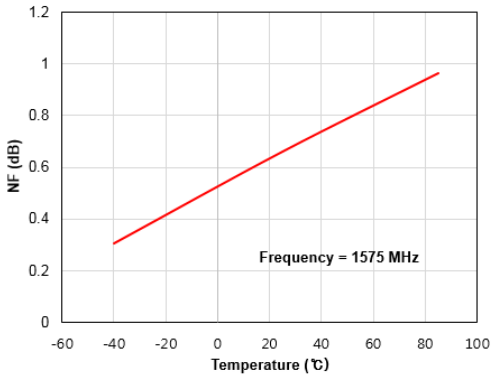
P1dB vs. Temperature



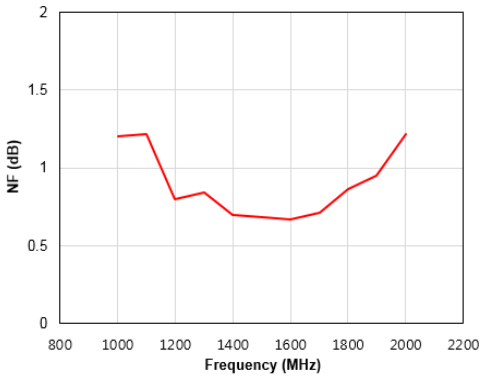
Input IP3 vs. Temperature



NF vs. Temperature



NF vs. Frequency



APPLICATION CIRCUIT

GPS, GLONASS, Galileo, Compass

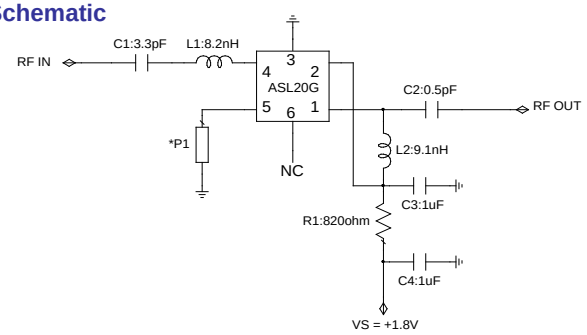
1559 ~ 1610 MHz

+2.7 V, 2.5 mA

Frequency (MHz)	1559 ~ 1610
Magnitude S21 (dB)	17
Magnitude S11 (dB)	-6
Magnitude S22 (dB)	-18
Noise Figure (dB)	1.1
Input IP3 (dBm) [1)]	-16
Output P1dB (dBm)	-9
Supply Current (mA)	2.5
Supply Voltage (V)	+2.7
Control Current (μA)	300
Control Voltage V_{CTL} (V)	+2.7

1) IIP3 is measured with two tones at an input power of -40 dBm/tone separated by 1MHz.

Schematic

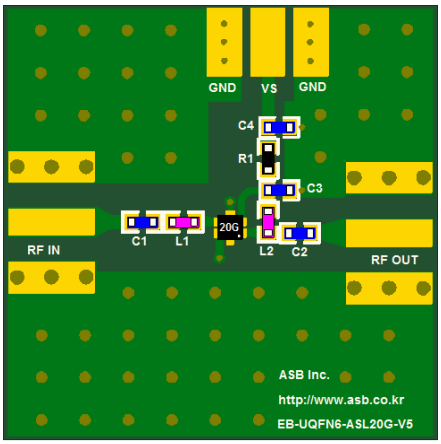


Note: 1) the length of the strip line P1 is given as below at the PCB with Er = 4.5 and T = 0.8 mm.

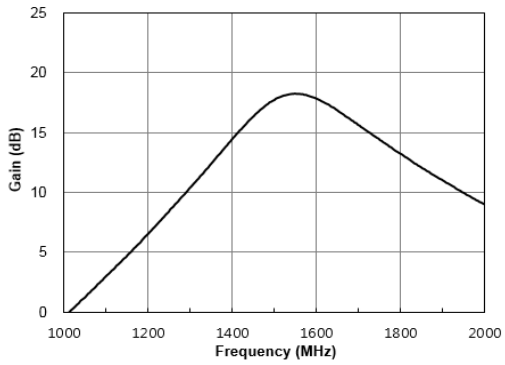
P1 Length: 1 mm, Width: 0.3 mm

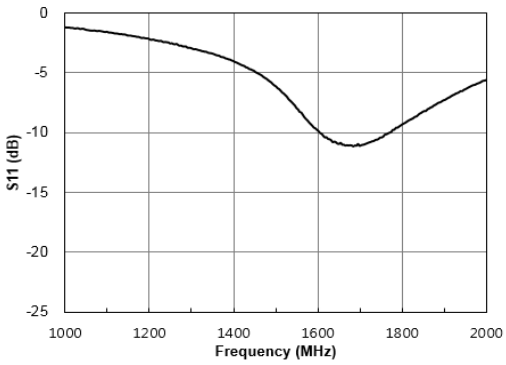
2) Gain and S11 are in trade-off and varied with the length of P1

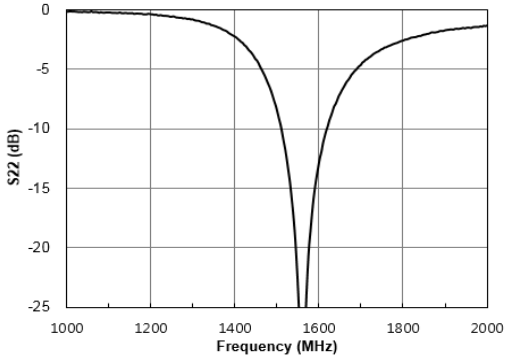
Board Layout (FR4, 20x20 mm², 0.8T)

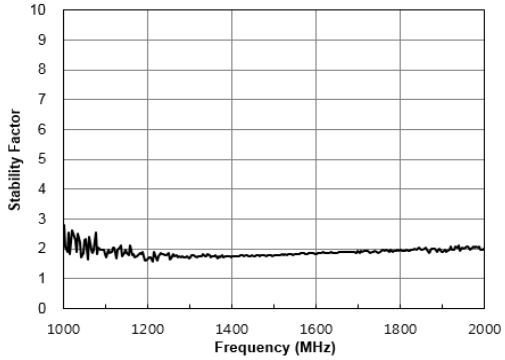


S-parameters & K-factor









APPLICATION CIRCUIT

GPS, GLONASS, Galileo, Compass

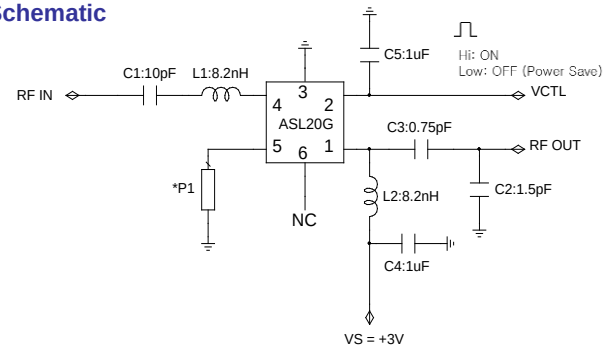
1559 ~ 1610 MHz

+3 V, 12 mA

Frequency (MHz)	1559 ~ 1610
Magnitude S21 (dB)	22.5
Magnitude S11 (dB)	-15
Magnitude S22 (dB)	-15
Noise Figure (dB)	0.65
Input IP3 (dBm) [1)]	-12
Output P1dB (dBm)	0
Supply Current (mA)	12
Supply Voltage (V)	+3.0
Control Current (μA)	300
Control Voltage V_{CTL} (V)	+3.0

1) IIP3 is measured with two tones at an input power of -40 dBm /tone separated by 1MHz

Schematic

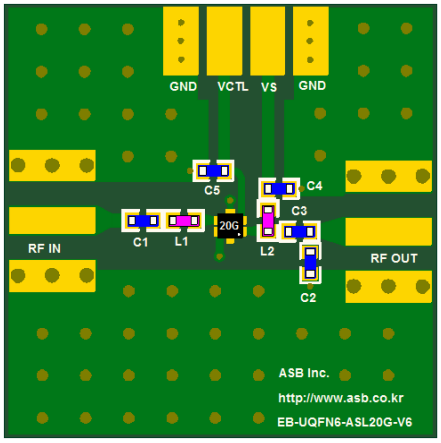


Note: 1) the length of the strip line P1 is given as below at the PCB with Er = 4.5 and T = 0.8 mm.

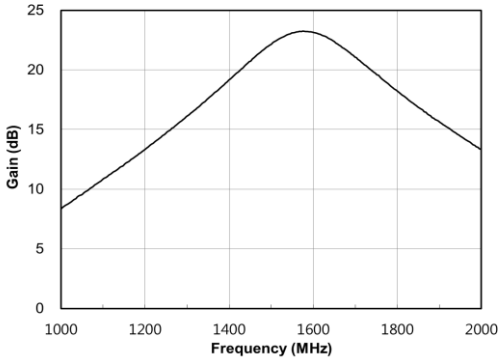
*P1 Length: 1 mm, Width: 0.3 mm

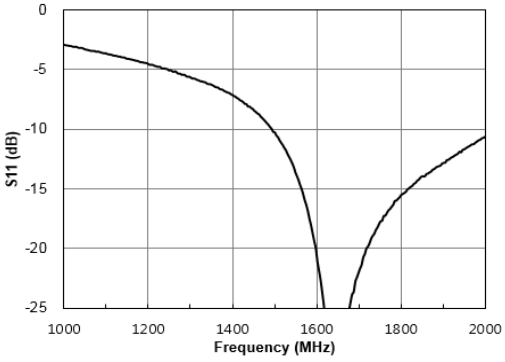
2) Gain and S11 are in trade-off and varied with the length of P1

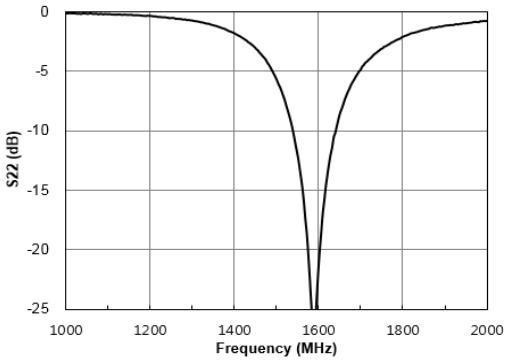
Board Layout (FR4, 20x20 mm², 0.8T)

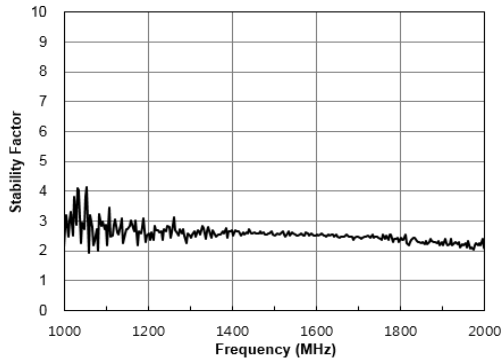


S-parameters & K-factor









APPLICATION CIRCUIT

GPS, GLONASS, Galileo, Compass

1559 ~ 1610 MHz

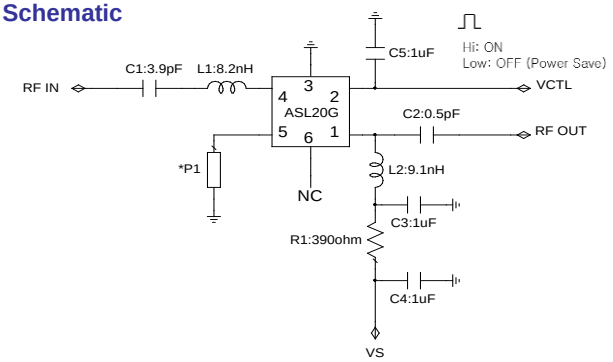
+3 V, 4 mA

+3.3 V, 5 mA

Frequency (MHz)	1559 ~ 1610	
Magnitude S21 (dB)	21.0	21.5
Magnitude S11 (dB)	-10	-10
Magnitude S22 (dB)	-15	-16
Noise Figure (dB)	0.8	0.8
Input IP3 (dBm) [1)]	-18	-17
Output P1dB (dBm)	-4.0	-3.5
Supply Current (mA)	4	5
Supply Voltage (V)	+3.0	+3.3
Control Current (μA)	300	300
Control Voltage V_{CTL} (V)	+3.0	+3.3

1) IIP3 is measured with two tones at an input power of -40 dBm/tone separated by 1MHz

Schematic

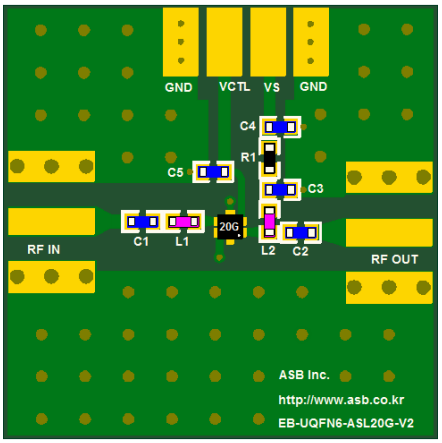


Note: 1) the length of the strip line P1 is given as below at the PCB with Er = 4.5 and T = 0.8 mm.

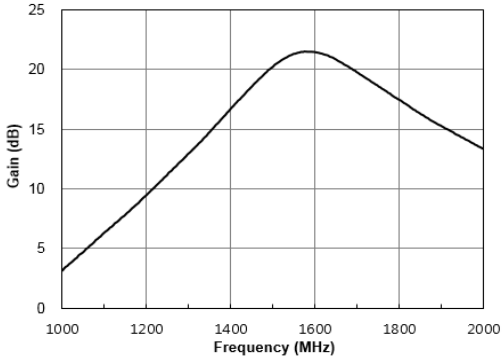
P1 Length: 1 mm, Width: 0.3 mm

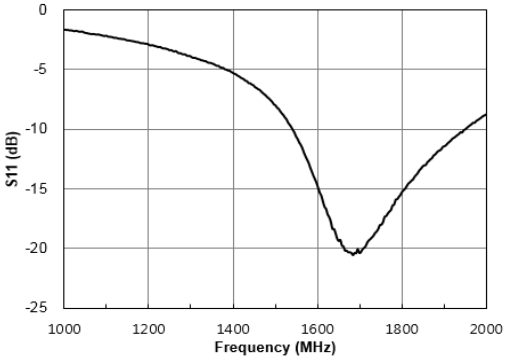
2) Gain and S11 are in trade-off and varied with the length of P1

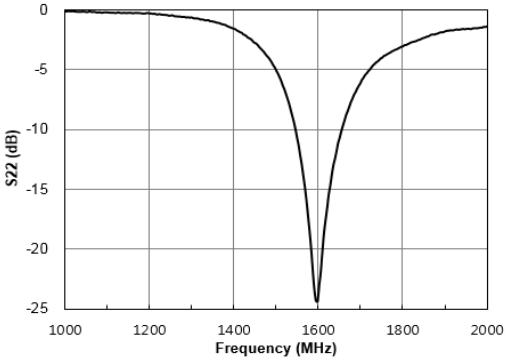
Board Layout (FR4, 20x20 mm², 0.8T)

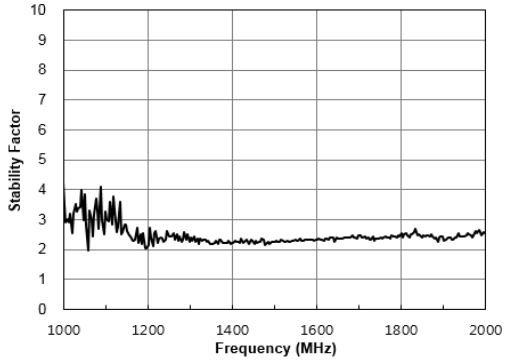


S-parameters & K-factor

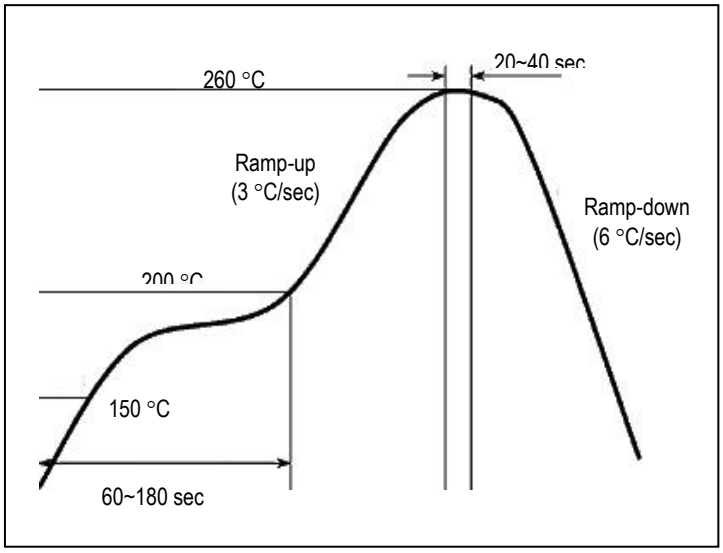








Recommended Soldering Reflow Profile



(End of Datasheet)