ASL21X

Low Noise GPS, GLONASS, Galileo and Compass Amplifier

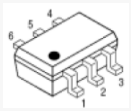
Features

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

Description

ASL21X is an LNA for GPS, GLONASS, Galileo, Compass and XM 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



Typical Performance

(Supply Voltage = +1.8 ~ +5.0 V, T_A = +25 °C, Z_0 = 50 Ω)

Parameters	Units	Typical							
Testing Frequency	MHz	1575	1575	1575	2450	2450	2450	2450	2338
Gain	dB	18	20.5	21.5	21.5	21.0	13	20.0	22.0
S11	dB	-8	-15	-10	-15	-15	-12	-18	-11
S22	dB	-12	-12	-12	-10	-12	-10	-10	-14
Input IP3	dBm	-20[1)]	-18[1)]	-12[1)]	-10[1)]	-13[1)]	5[2)]	-11[1)]	-3[3)]
Noise Figure	dB	1.10	0.70	0.60	0.80	0.85	0.95	0.85	0.70
Output P1dB	dBm	-10	-5	-2	0	-1	6	-2	3
Supply Current	mA	2.0	6.0	11.0	11.0	11.0	11.0	10.0	23.0
Supply Voltage	V	+1.8	+1.8	+3.0	+3.0	+3.0	+3.0	+3.3	+5.0
Control Current	μA	300	300	300	300	-	300	300	-
Control Voltage V_{CTL}	V	+1.8	+1.8	+3.0	+3.0	-	+3.0	+3.3	-

1) IIP3 is measured with two tones at an input power of -40 dBm/tone separated by 1 MHz
2) IIP3 is measured with two tones at an input power of -30 dBm/tone separated by 1 MHz
3) IIP3 is measured with two tones at an input power of -35 dBm/tone separated by 1 MHz

Robust ESD(±10kV)

Parameters	Units	Typical	
Testing Frequency	MHz	1575	1575
Gain	dB	20.0	23.0
S11	dB	-12	-12
S22	dB	-10	-15
Input IP3	dBm	-15[1)]	-10[1)]
Noise Figure	dB	1.1	1.0
Output P1dB	dBm	-5	-1
Supply Current	mA	6.0	11.0
Supply Voltage	V	+1.8	+3.0
Control Current	μA	300	300
Control Voltage V_{CTL}	V	+1.8	+3.0

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

Application Circuit

GPS/GLONASS/Galileo/Compass

- 1559 ~ 1610MHz (1.8V, 6mA, Robust ESD, ±10 kV)
- 1559 ~ 1610MHz (3.0V, 11mA, Robust ESD, ±10 kV)
- 1559 ~ 1610MHz (1.8V, 2mA)
- 1559 ~ 1610MHz (1.8V, 6mA)
- 1559 ~ 1610MHz (3.0V, 4mA , Robust ESD, ±3 kV)
- 1559 ~ 1610MHz (3.0V, 11mA, Robust ESD, ±3 kV)
- 1559 ~ 1610MHz (3V, 5mA, without Power ON/OFF Function)
- 1559 ~ 1610MHz (3V, 11mA)
- 1164 ~ 1300 MHz (3V, 11mA)
- 1550 ~ 1620 MHz (3V, 11mA)
- 2400 ~ 2500 MHz (3V, 11mA)
- 2400 ~ 2500 MHz (3V, 11mA, without Power ON/OFF Function)
- 2400 ~ 2500 MHz (3V, 11mA, Gain 13dB)
- 2400 ~ 2480 MHz (3.3V, 10mA)
- XM (5V, 23mA, without Power ON/OFF Function)
- XM (5V, 23mA, Low Gain, without Power ON/OFF Function)

Product Specifications

Parameters	Units	Min	Typ	Max
Frequency	MHz		1575	
Gain	dB	18	20.5	22
S11	dB		-12	-6
S22	dB		-12	-9
Noise Figure	dB		0.70	
Supply Current	mA	4	6	8
Supply Voltage	V		+1.8	
Control Voltage V_{CTL} 1)	V		+1.8	

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

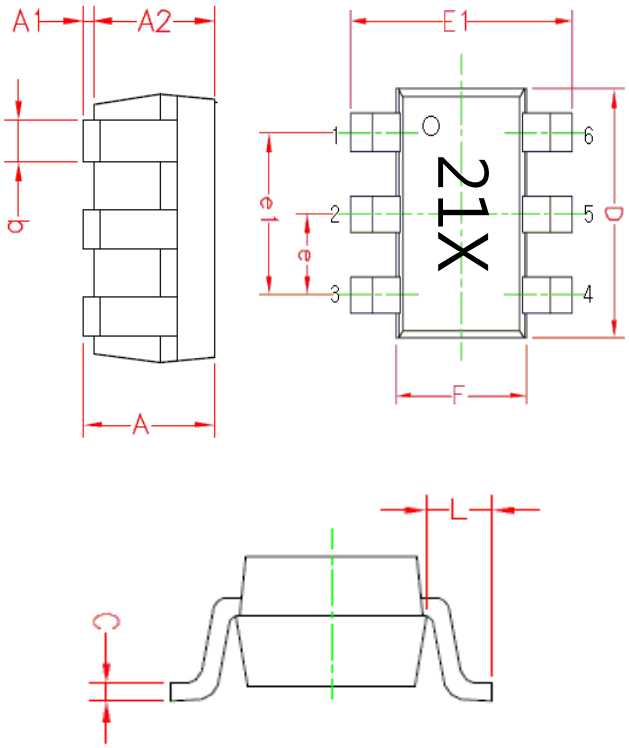
Absolute Maximum Ratings

Parameters	Rating
Operating Case Temperature	-40 to +105 °C
Storage Temperature	-40 to +150 °C
Device Voltage	+6 V
Operating Junction Temperature	+150 °C
Input RF Power (CW, 50ohm matched)*	+22 dBm

Pin Configuration

Pin No.	Function
1	RFIN
2,5	GND
3	Enable
4	RFOUT & Bias
6	NC (Not connected)

Outline Drawing



Symbols	Dimensions (In mm)		
	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.025	0.062	0.10
A2	0.875	0.937	1.00
b	0.20	0.30	0.40
C	0.10	0.125	0.15
D	1.90	2.00	2.10
F	1.15	1.25	1.35
E1	2.00	2.10	2.20
e	--	0.65BSC	--
e1	--	1.30BSC	--
L	--	0.425REF	--

Pin NO.	Function	Pin NO.	Function.
1	RFIN	4	RFOUT & Bias
2	GND	5	GND
3	Enable	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

Low Noise GPS, GLONASS, Galileo and Compass Amplifier

APPLICATION CIRCUIT

Robust ESD (± 10 kV)[1)]

GPS, GLONASS, Galileo, Compass

1559 ~ 1610 MHz

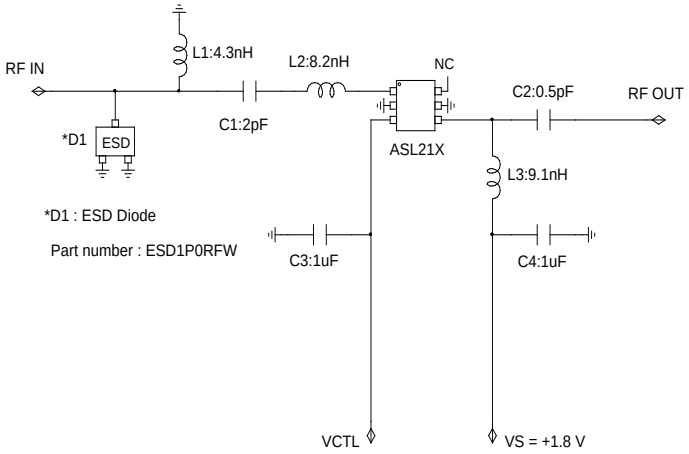
+1.8 V, 6 mA

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

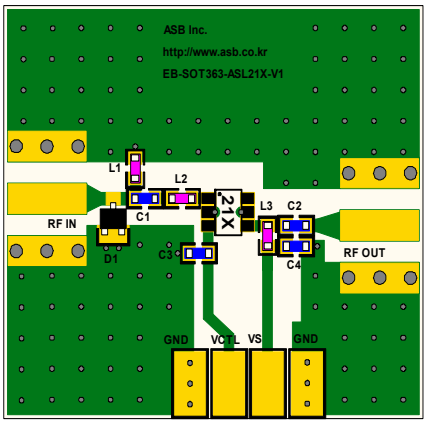
Frequency (MHz)	1559 ~ 1610
Magnitude S21 (dB)	20
Magnitude S11 (dB)	-12
Magnitude S22 (dB)	-10
Noise Figure (dB)	1.1
Input IP3 (dBm) [1)]	-15
Output P1dB (dBm)	-3
Supply Current (mA)	6
Supply Voltage (V)	+1.8
Control Current (μA)	300
Control Voltage V_{CTL} (V)	+1.8

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

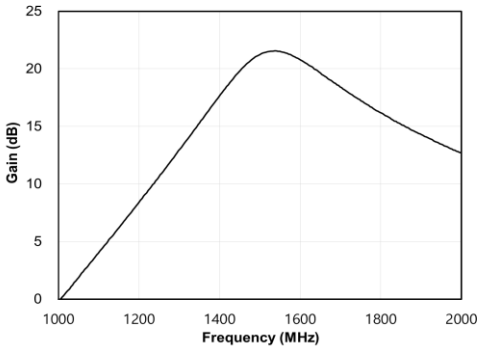
Schematic

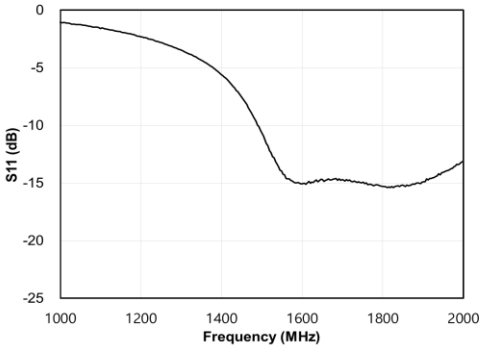


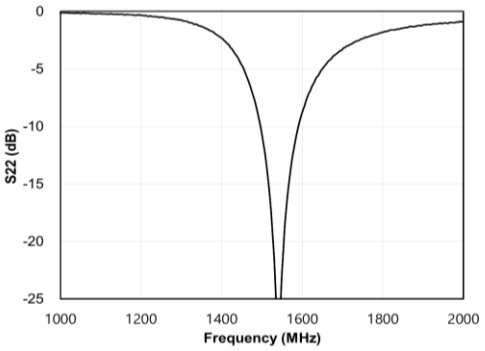
Board Layout (FR4, 20x20 mm², 0.8T)

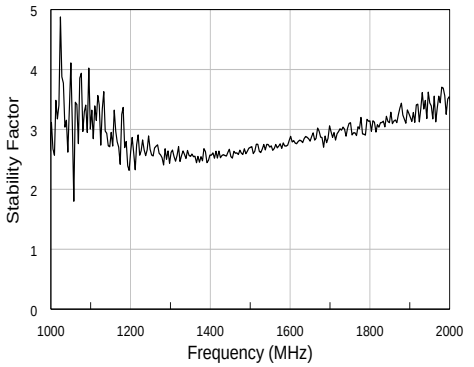


S-parameters









Low Noise GPS, GLONASS, Galileo and Compass Amplifier

APPLICATION CIRCUIT

Robust ESD (± 10 kV)[1)]

GPS, GLONASS, Galileo, Compass

1559 ~ 1610 MHz

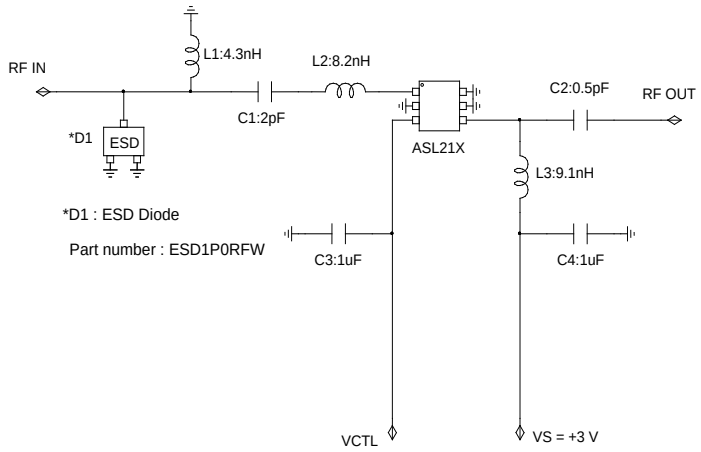
+3 V, 11 mA

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

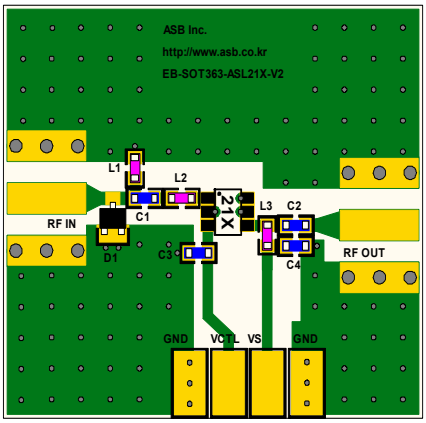
Frequency (MHz)	1559 ~ 1610
Magnitude S21 (dB)	23
Magnitude S11 (dB)	-12
Magnitude S22 (dB)	-15
Noise Figure (dB)	1.0
Input IP3 (dBm) [1)]	-10
Output P1dB (dBm)	0
Supply Current (mA)	11
Supply Voltage (V)	+3.0
Control Current (μA)	300
Control Voltage V_{CTL} (V)	+3.0

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

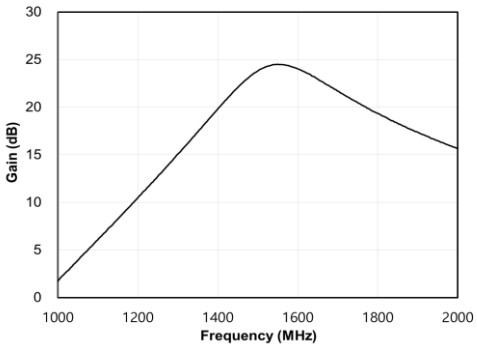
Schematic

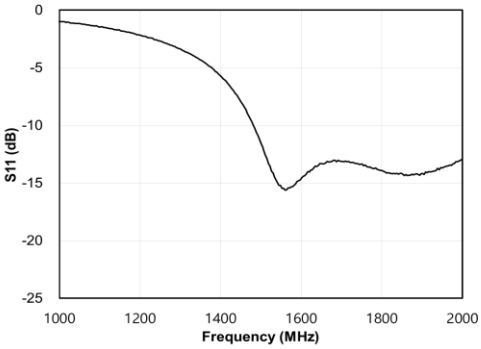


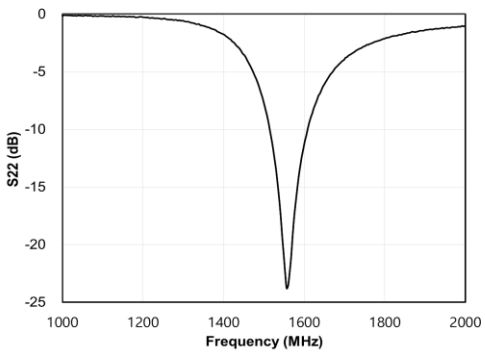
Board Layout (FR4, 20x20 mm², 0.8T)

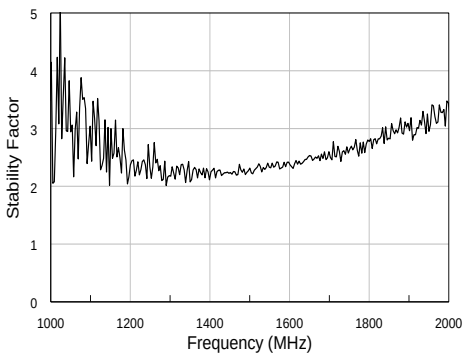


S-parameters









Low Noise GPS, GLONASS, Galileo and Compass Amplifier

APPLICATION CIRCUIT

GPS, GLONASS, Galileo, Compass

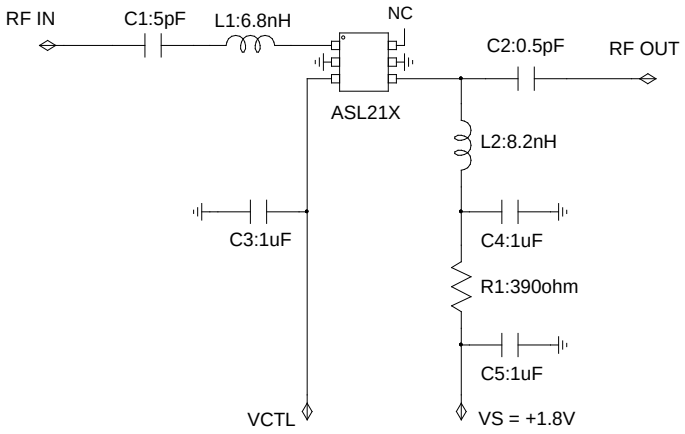
1559 ~ 1610 MHz

+1.8 V, 2 mA

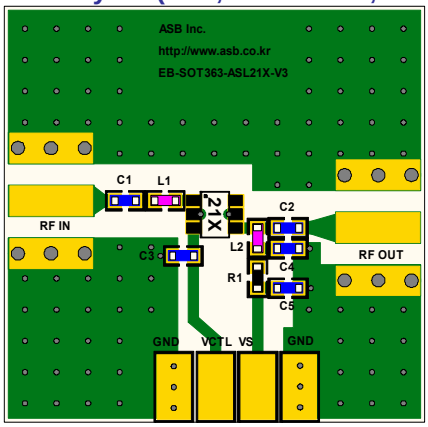
Frequency (MHz)	1559 ~ 1610
Magnitude S21 (dB)	18
Magnitude S11 (dB)	-8
Magnitude S22 (dB)	-12
Noise Figure (dB)	1.1
Input IP3 (dBm) [1)]	-20
Output P1dB (dBm)	-10
Supply Current (mA)	2
Supply Voltage (V)	+1.8
Control Current (μA)	300
Control Voltage V_{CTL} (V)	+1.8

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

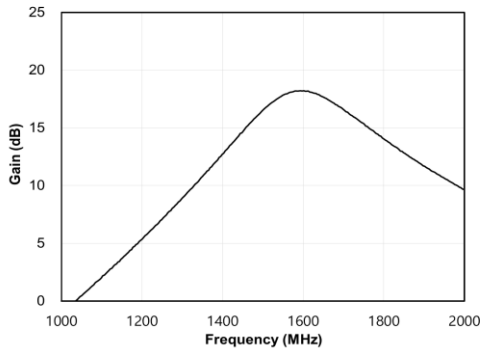
Schematic

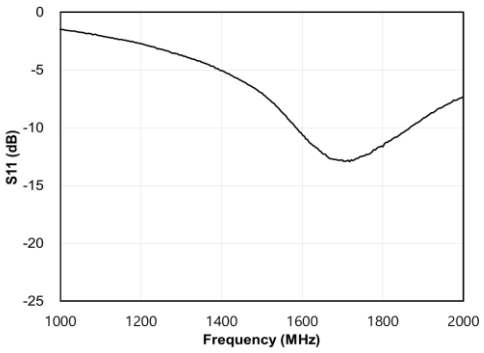


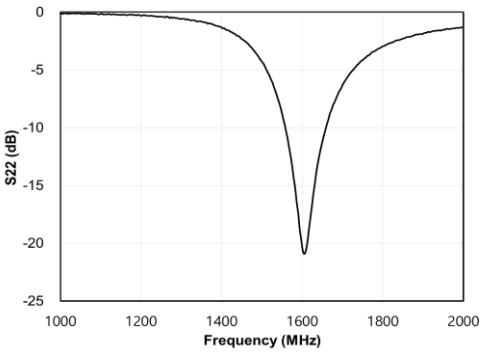
Board Layout (FR4, 20x20 mm^2, 0.8T)

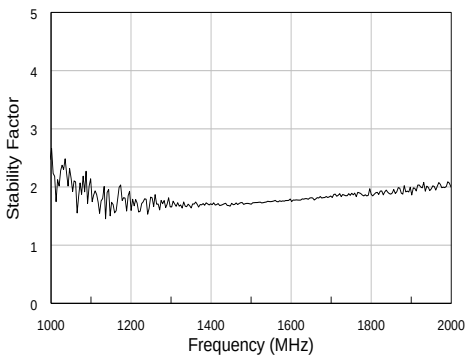


S-parameters & K-factor









Low Noise GPS, GLONASS, Galileo and Compass Amplifier

APPLICATION CIRCUIT

GPS, GLONASS, Galileo, Compass

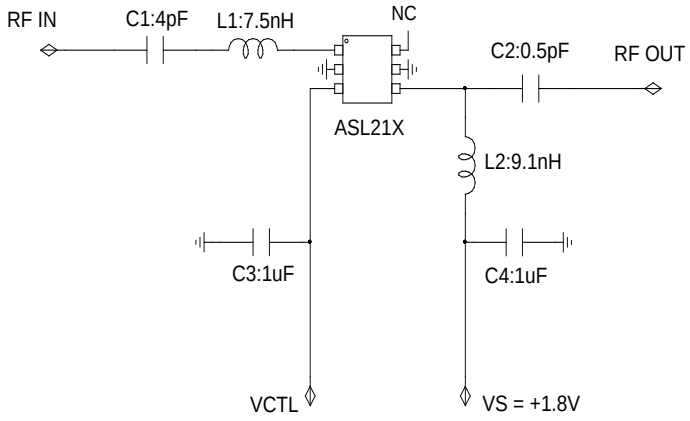
1559 ~ 1610 MHz

+1.8 V, 6 mA

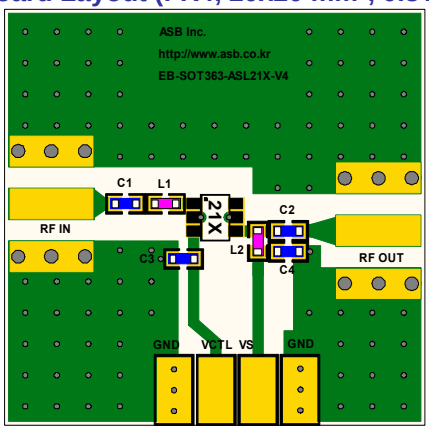
Frequency (MHz)	1559 ~ 1610
Magnitude S21 (dB)	20.5
Magnitude S11 (dB)	-15
Magnitude S22 (dB)	-12
Noise Figure (dB)	0.70
Input IP3 (dBm) [1)]	-18
Output P1dB (dBm)	-5
Supply Current (mA)	6
Supply Voltage (V)	+1.8
Control Current (μA)	300
Control Voltage V_{CTL} (V)	+1.8

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

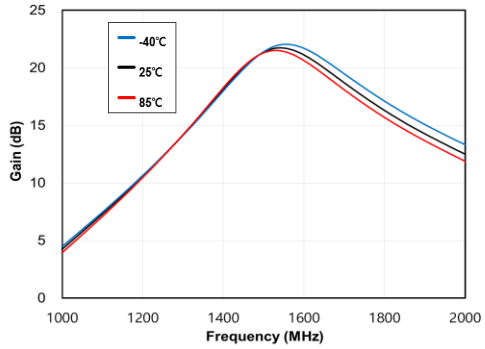
Schematic

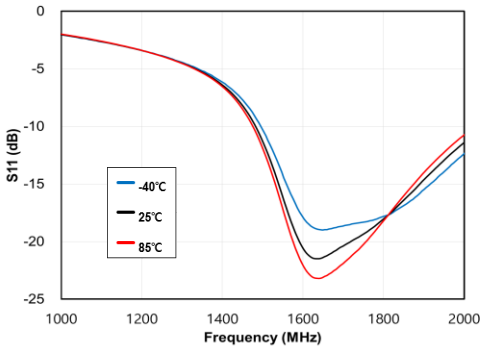


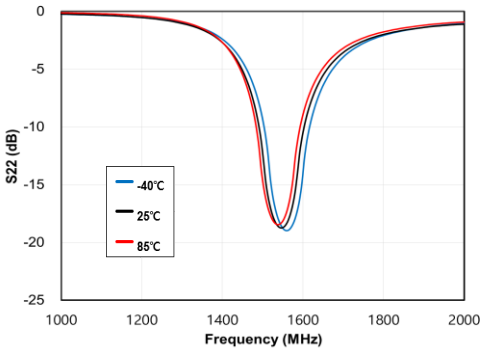
Board Layout (FR4, 20x20 mm², 0.8T)

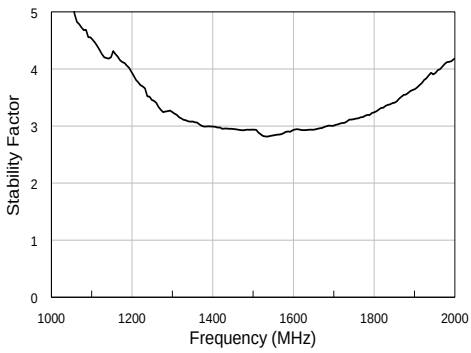


S-parameters & K-factor

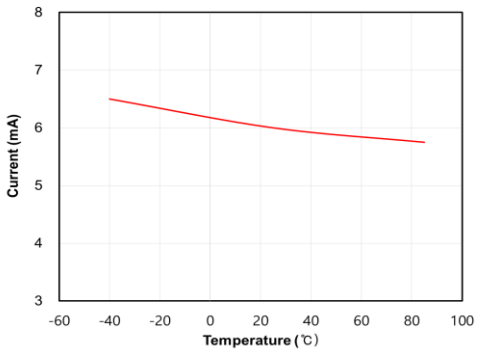




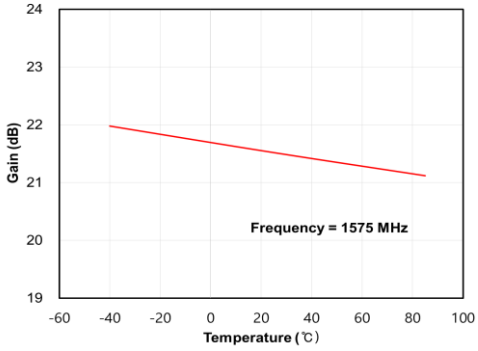




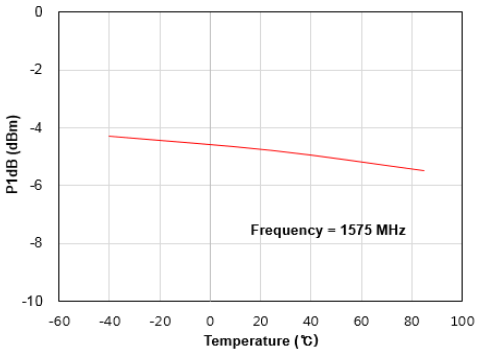
Current vs. Temperature



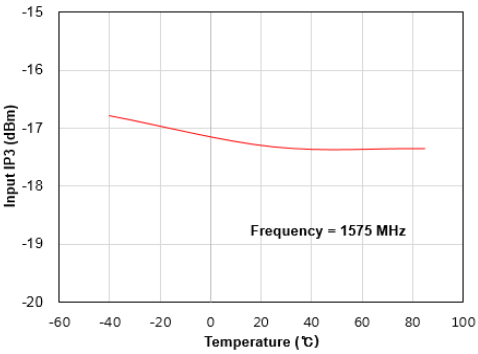
Gain vs. Temperature



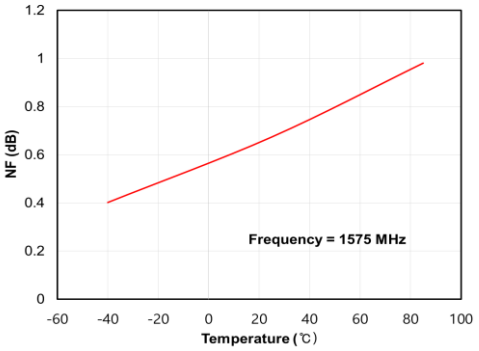
P1dB vs. Temperature



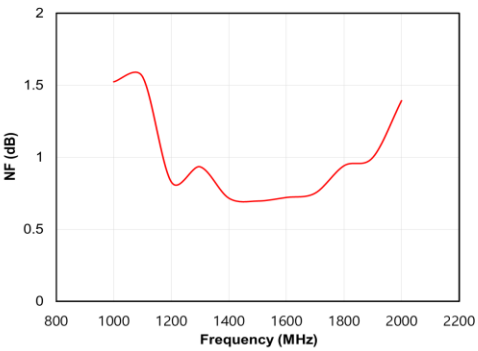
Input IP3 vs. Temperature



NF vs. Temperature



NF vs. Frequency



Low Noise GPS, GLONASS, Galileo and Compass Amplifier

APPLICATION CIRCUIT

Robust ESD (± 3 kV)[1)]

GPS, GLONASS, Galileo, Compass

1559 ~ 1610 MHz

+3 V / 4mA

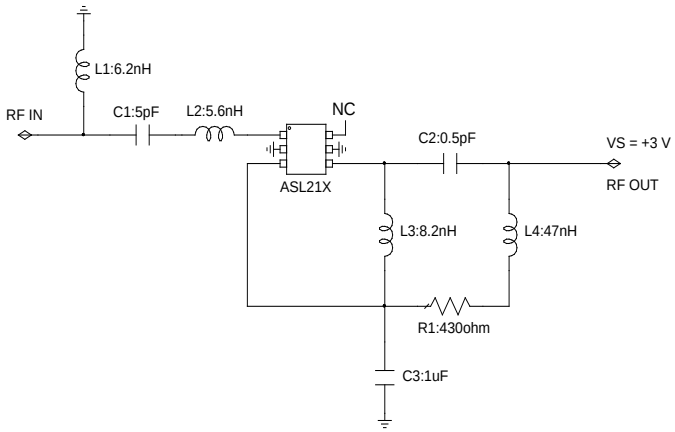
Without Power ON/OFF Function

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

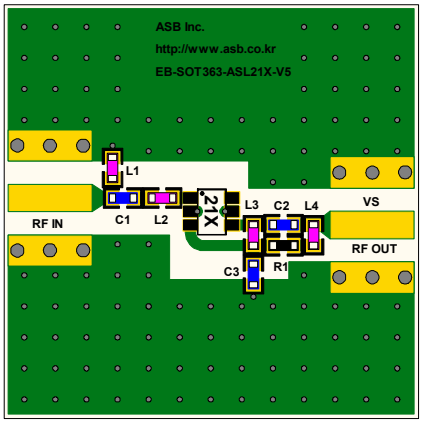
Frequency (MHz)	1559 ~ 1610
Magnitude S21 (dB)	20
Magnitude S11 (dB)	-15
Magnitude S22 (dB)	-11
Noise Figure (dB)	0.95
Input IP3 (dBm) [1)]	-17.0
Output P1dB (dBm)	-3.5
Supply Current (mA)	4
Supply Voltage (V)	+3

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

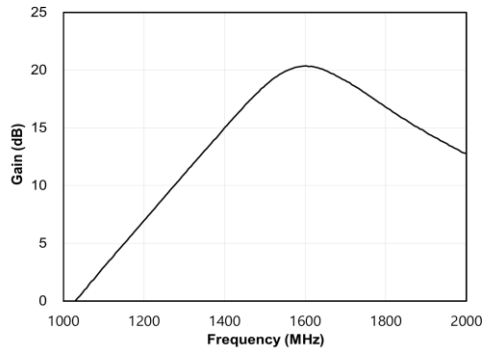
Schematic

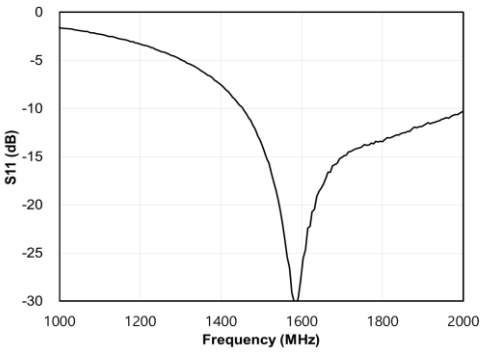


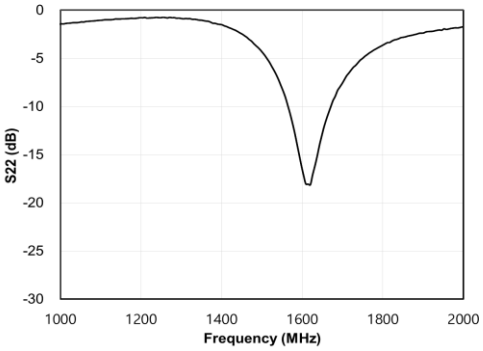
Board Layout (FR4, 20x20 mm², 0.8T)

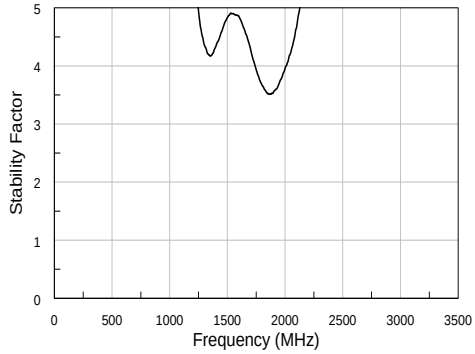


S-parameters & K-factor









Low Noise GPS, GLONASS, Galileo and Compass Amplifier

APPLICATION CIRCUIT

Robust ESD (± 3 kV)[1)]

GPS, GLONASS, Galileo, Compass

1559 ~ 1610 MHz

+3 V / 11 mA

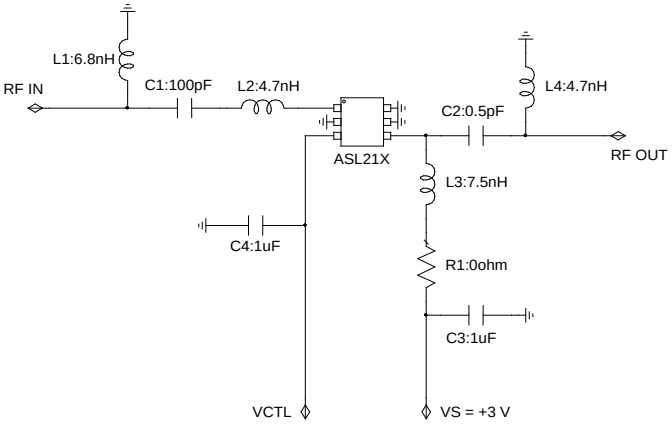
Without Power ON/OFF Function

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

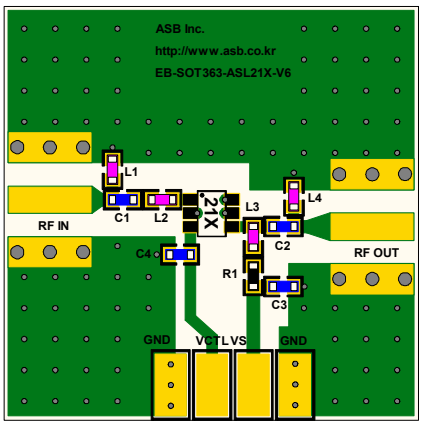
Frequency (MHz)	1559 ~ 1610
Magnitude S21 (dB)	23.5
Magnitude S11 (dB)	-15
Magnitude S22 (dB)	-15
Noise Figure (dB)	0.65
Input IP3 (dBm) [1)]	-14
Output P1dB (dBm)	0
Supply Current (mA)	11
Supply Voltage (V)	+3

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

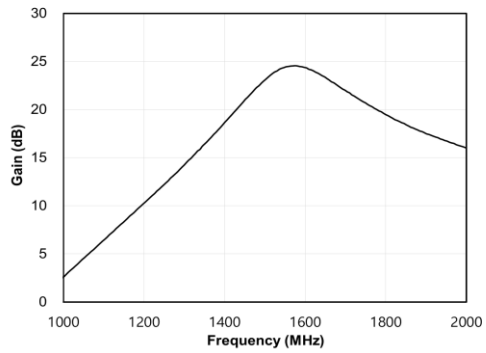
Schematic

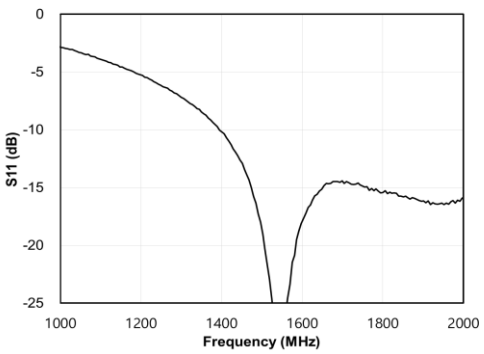


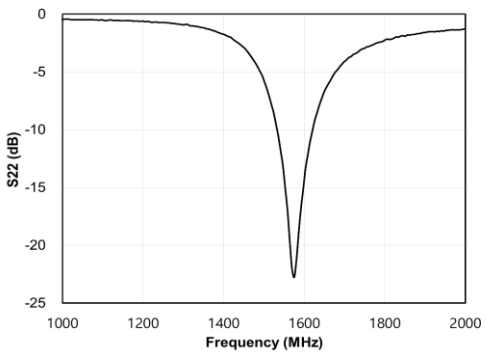
Board Layout (FR4, 20x20 mm², 0.8T)

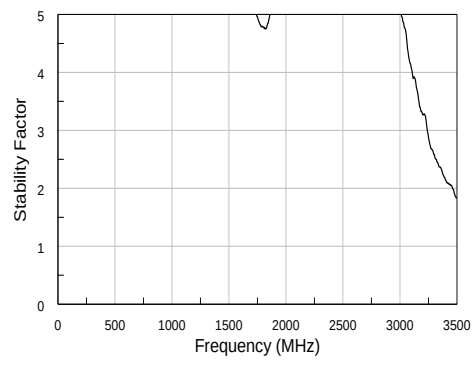


S-parameters & K-factor









Low Noise GPS, GLONASS, Galileo and Compass Amplifier

APPLICATION CIRCUIT

GPS, GLONASS, Galileo, Compass

1559 ~ 1610 MHz

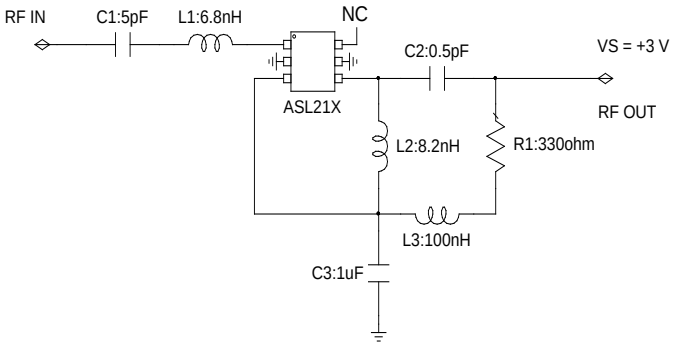
+3 V, 5mA

Without Power ON & OFF Function

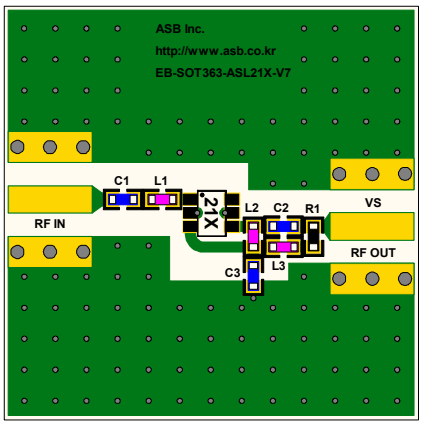
Frequency (MHz)	1559 ~ 1610
Magnitude S21 (dB)	19.5
Magnitude S11 (dB)	-12
Magnitude S22 (dB)	-12
Noise Figure (dB)	0.7
Input IP3 (dBm) [1)]	-20
Output P1dB (dBm)	-6
Supply Current (mA)	5
Supply Voltage (V)	+3

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

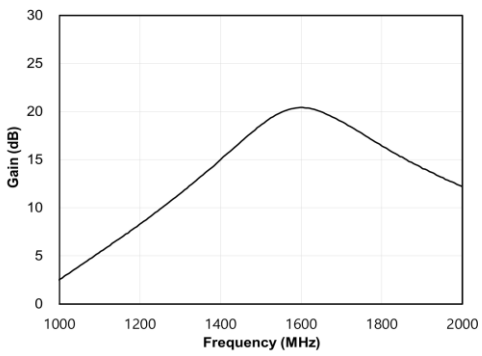
Schematic

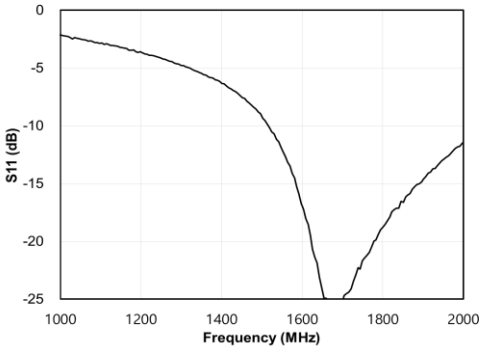


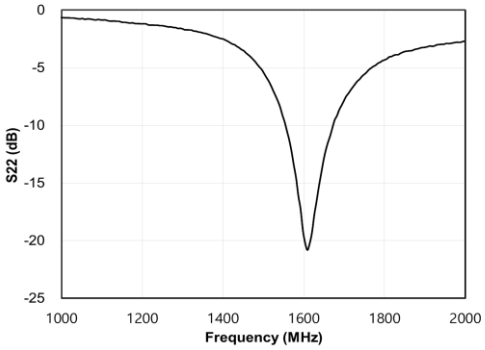
Board Layout (FR4, 20x20 mm^2, 0.8T)

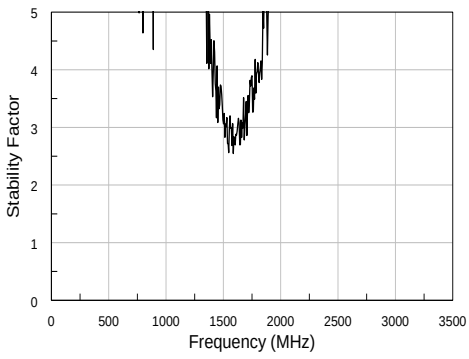


S-parameters & K-factor









Low Noise GPS, GLONASS, Galileo and Compass Amplifier

APPLICATION CIRCUIT

GPS, GLONASS, Galileo, Compass

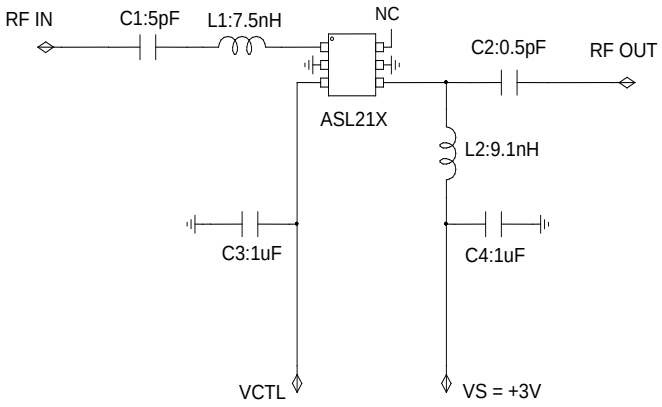
1559 ~ 1610 MHz

+3 V, 11 mA

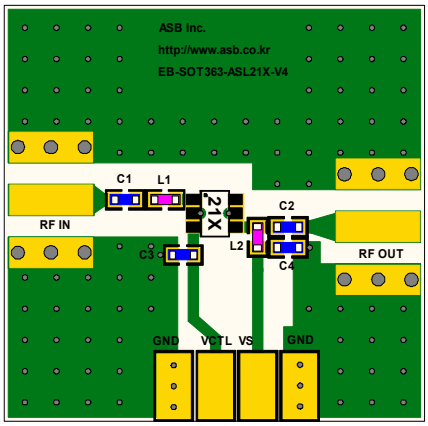
Frequency (MHz)	1559 ~ 1610
Magnitude S21 (dB)	21.5
Magnitude S11 (dB)	-10
Magnitude S22 (dB)	-12
Noise Figure (dB)	0.6
Input IP3 (dBm) [1]	-12
Output P1dB (dBm)	-2
Supply Current (mA)	11
Supply Voltage (V)	+3.0
Control Current (μA)	300
Control Voltage V_{CTL} (V)	+3.0

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

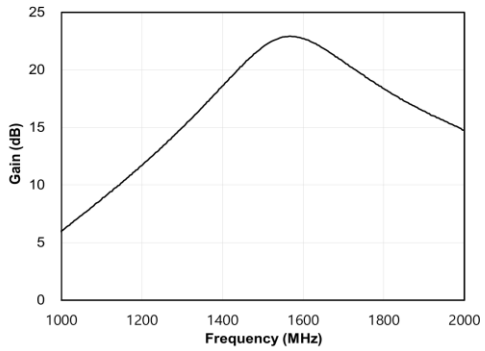
Schematic

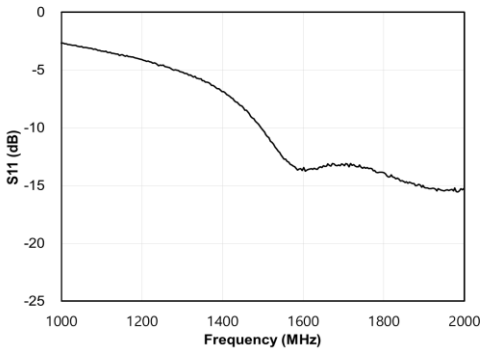


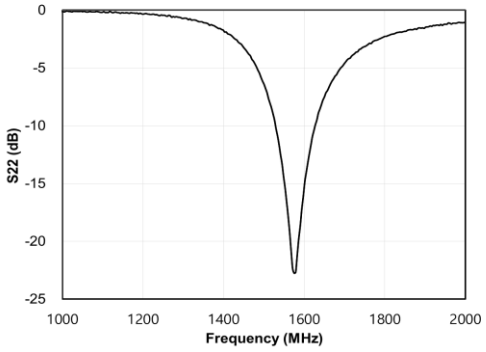
Board Layout (FR4, 20x20 mm², 0.8T)

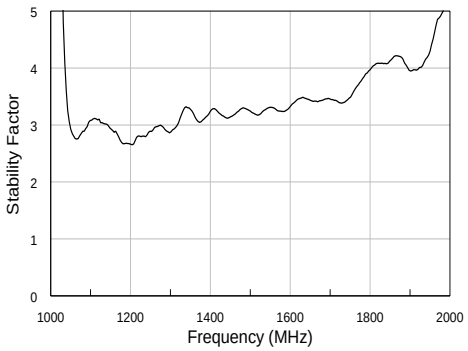


S-parameters & K-factor









Low Noise GPS, GLONASS, Galileo and Compass Amplifier

APPLICATION CIRCUIT

GPS, GLONASS, Galileo, Compass

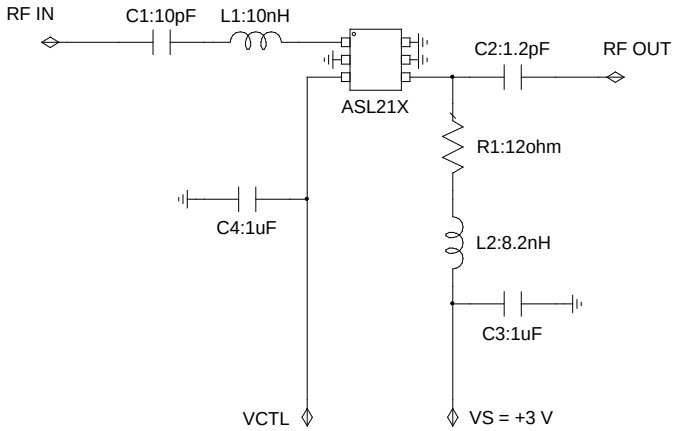
1164 ~ 1300 MHz

+3 V, 11 mA

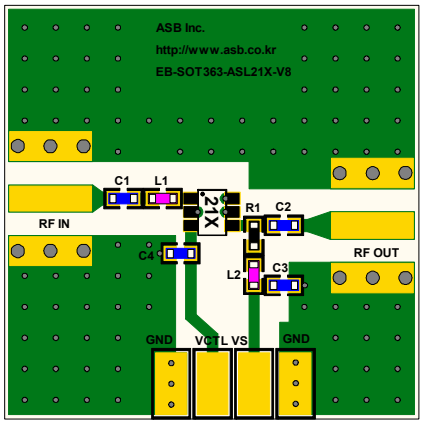
Frequency (MHz)	1164	1300
Magnitude S21 (dB)	21	21
Magnitude S11 (dB)	-8	-12
Magnitude S22 (dB)	-10	-10
Noise Figure (dB)	0.65	0.65
Input IP3 (dBm) [1)]	1	1
Output P1dB (dBm)	6.5	6.0
Supply Current (mA)	11	11
Supply Voltage (V)	+3.0	+3.0
Control Current (μA)	300	300
Control Voltage V_{CTL} (V)	+3.0	+3.0

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

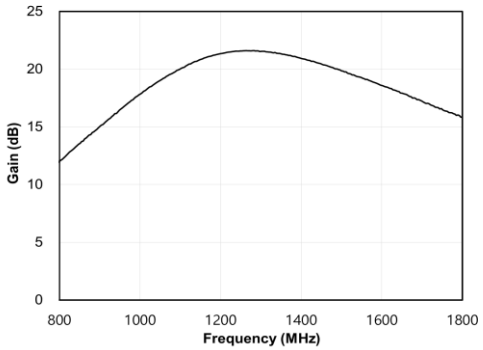
Schematic

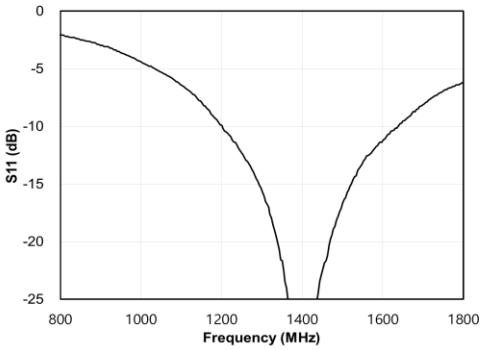


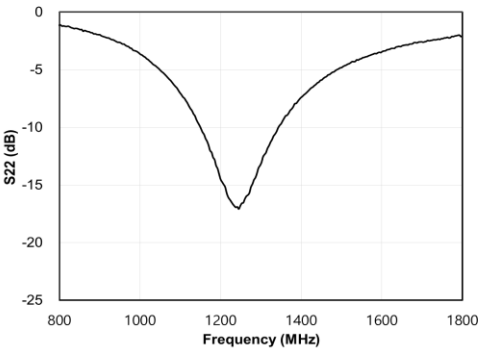
Board Layout (FR4, 20x20 mm², 0.8T)

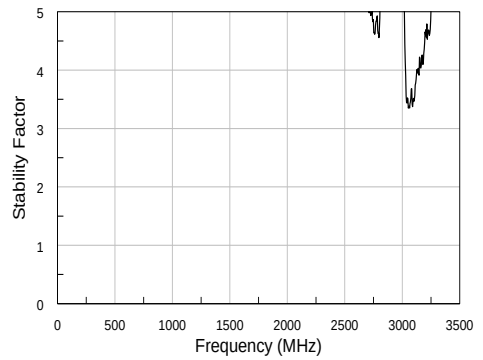


S-parameters & K-factor









Low Noise GPS, GLONASS, Galileo and Compass Amplifier

APPLICATION CIRCUIT

GPS, GLONASS, Galileo, Compass

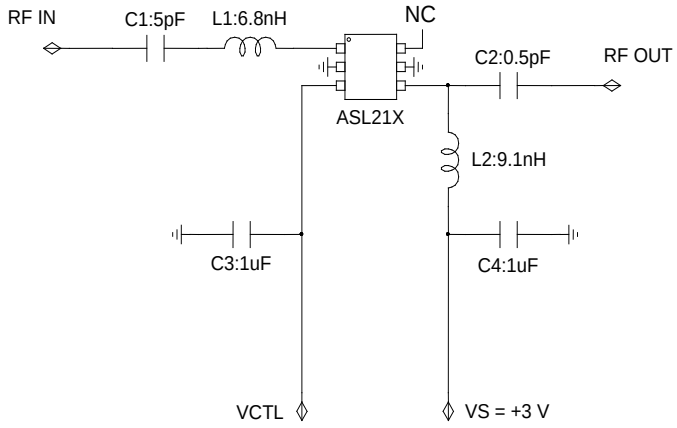
1550 ~ 1620 MHz

+3 V, 11 mA

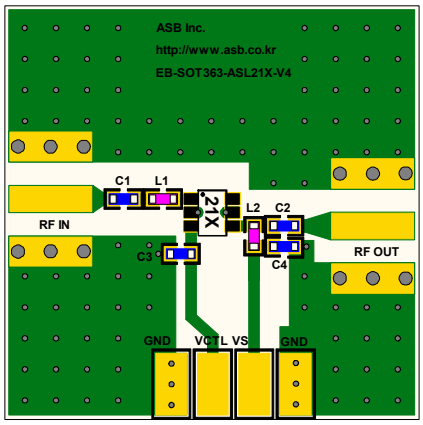
Frequency (MHz)	1550	1620
Magnitude S21 (dB)	22.0	22
Magnitude S11 (dB)	-10	-11
Magnitude S22 (dB)	-11	-10
Noise Figure (dB)	0.65	0.65
Input IP3 (dBm) [1)]	-9	-10
Output P1dB (dBm)	-1	-2
Supply Current (mA)	11	11
Supply Voltage (V)	+3.0	+3.0
Control Current (μA)	300	300
Control Voltage V_{CTL} (V)	+3.0	+3.0

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

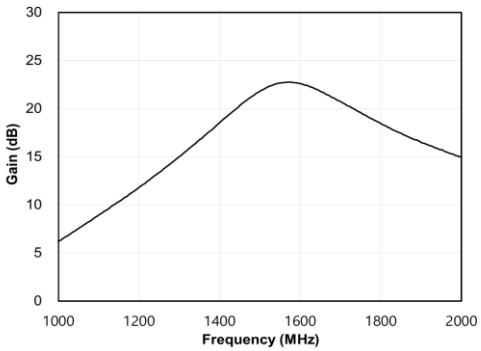
Schematic

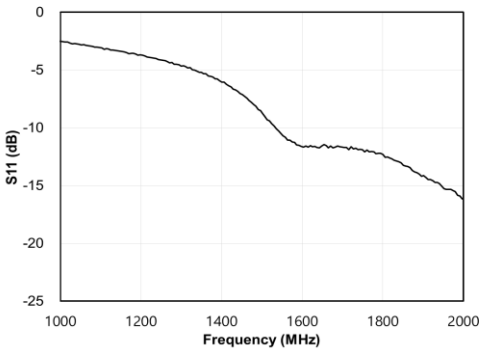


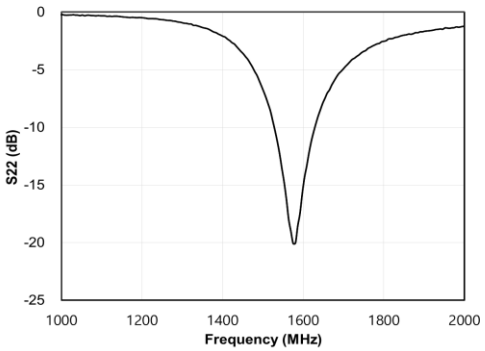
Board Layout (FR4, 20x20 mm², 0.8T)

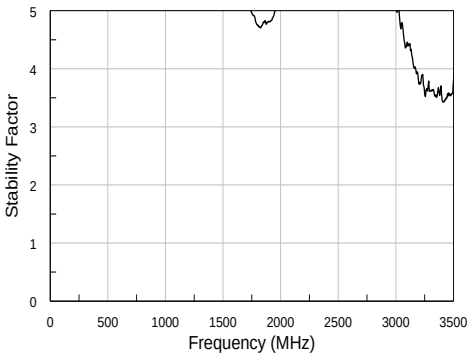


S-parameters & K-factor









Low Noise GPS, GLONASS, Galileo and Compass Amplifier

APPLICATION CIRCUIT

WLAN

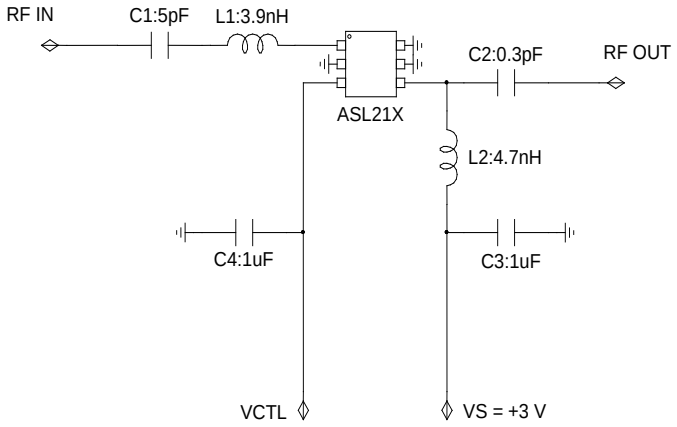
2400 ~ 2500 MHz

+3 V, 11 mA

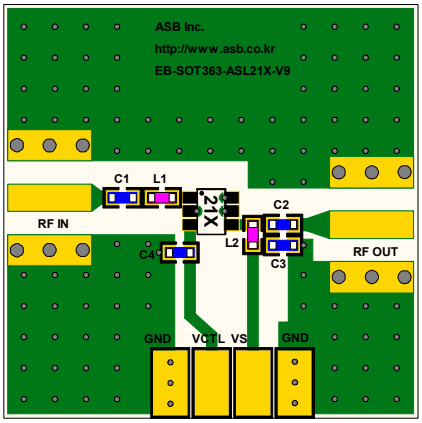
Frequency (MHz)	2400 ~ 2500
Magnitude S21 (dB)	21.5
Magnitude S11 (dB)	-15
Magnitude S22 (dB)	-10
Noise Figure (dB)	0.8
Input IP3 (dBm) [1]	-10
Output P1dB(dBm)	0
Supply Current (mA)	11
Supply Voltage (V)	+3.0

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

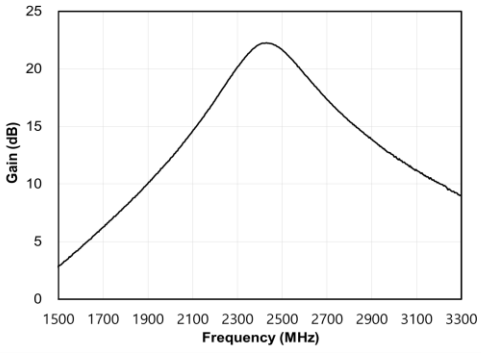
Schematic

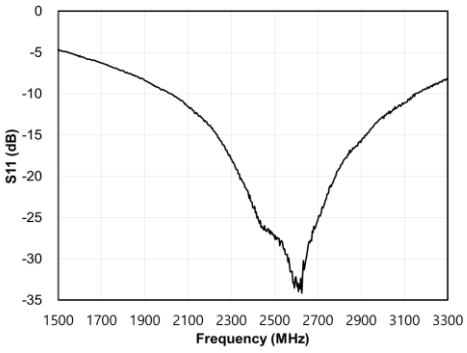


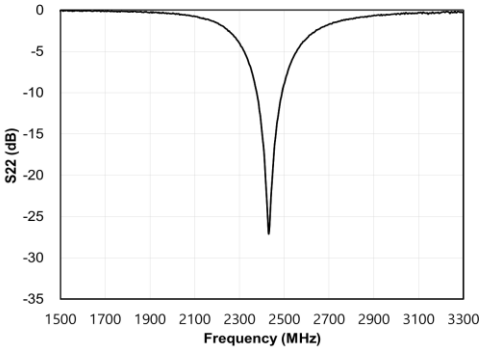
Board Layout (FR4, 20x20 mm^2, 0.8T)

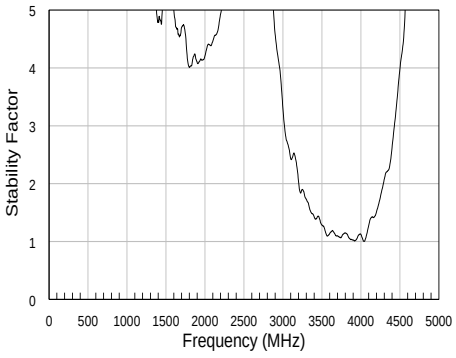


S-parameters & K-factor









Low Noise GPS, GLONASS, Galileo and Compass Amplifier

APPLICATION CIRCUIT

WLAN

2400 ~ 2500 MHz

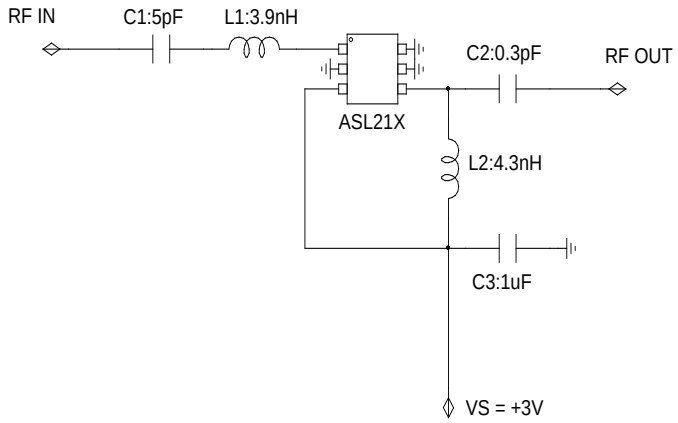
+3 V, 11 mA

Without Power ON/OFF Function

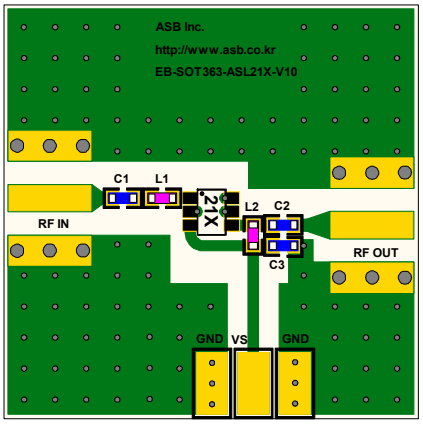
Frequency (MHz)	2400	2450	2500
Magnitude S21 (dB)	20.5	21	21
Magnitude S11 (dB)	-15	-15	-15
Magnitude S22 (dB)	-8	-12	-10
Noise Figure (dB)	0.8	0.85	0.85
Input IP3 (dBm) [1)]	-13	-13	-13
Output P1dB(dBm)	-1	-1	-1
Supply Current (mA)	11	11	11
Supply Voltage (V)	+3.0	+3.0	+3.0

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

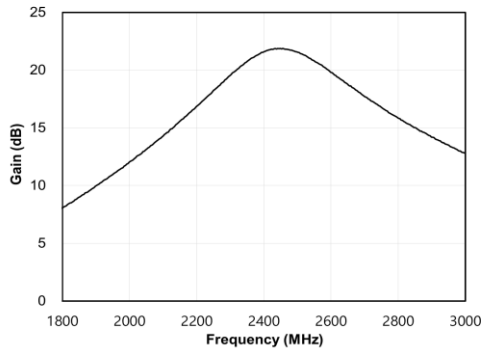
Schematic

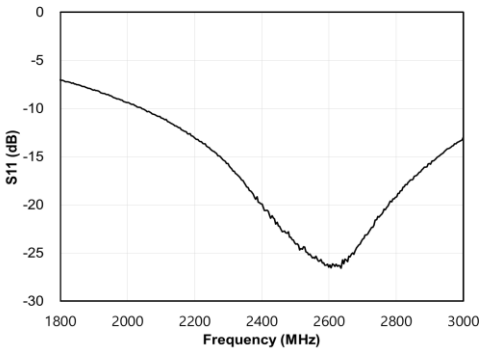


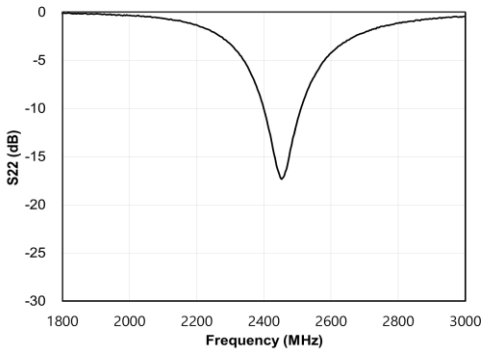
Board Layout (FR4, 20x20 mm², 0.8T)

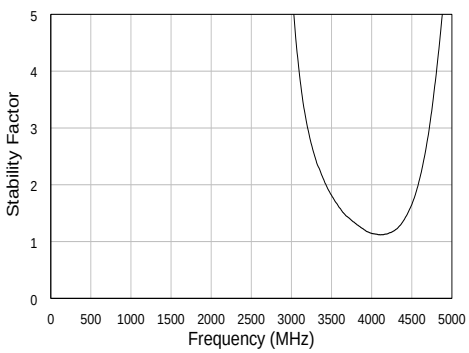


S-parameters & K-factor









Low Noise GPS, GLONASS, Galileo and Compass Amplifier

APPLICATION CIRCUIT

WLAN

Gain 13 dB

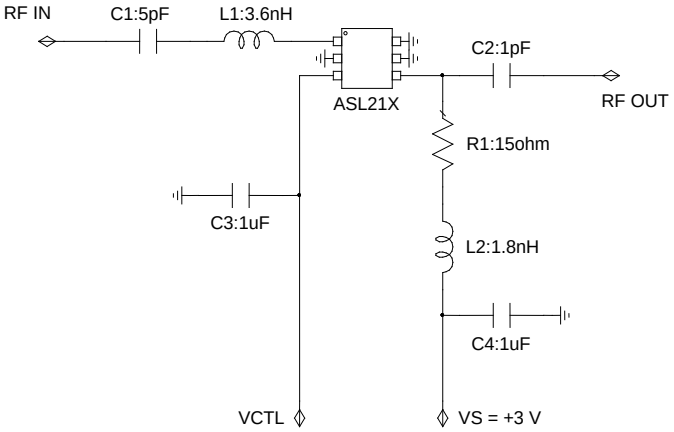
2400 ~ 2500MHz

+3 V, 11 mA

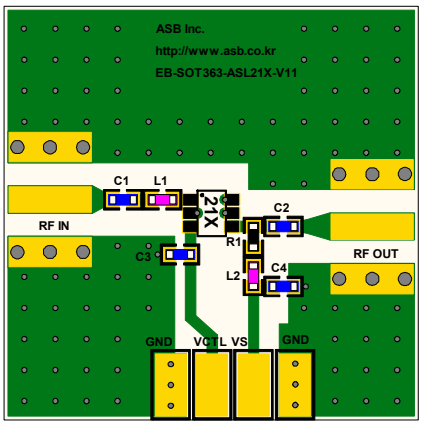
Frequency (MHz)	2400 ~ 2500
Magnitude S21 (dB)	13
Magnitude S11 (dB)	-12
Magnitude S22 (dB)	-10
Noise Figure (dB)	0.95
Input IP3 (dBm) [1)]	5
Output P1dB (dBm)	6
Supply Current (mA)	11
Supply Voltage (V)	+3.0
Control Current (μA)	300
Control Voltage V_{CTL} (V)	+3.0

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

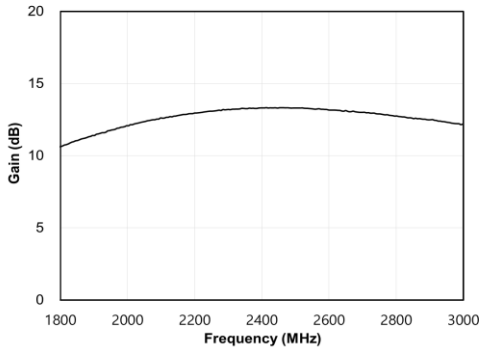
Schematic

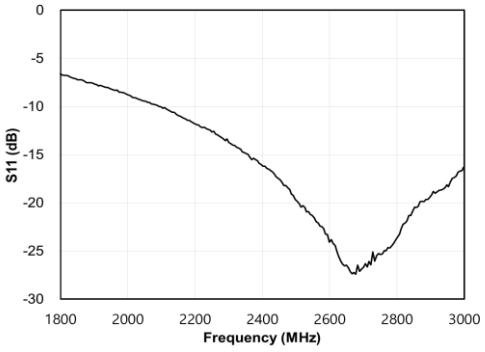


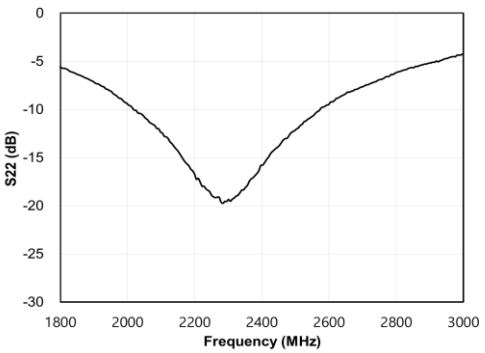
Board Layout (FR4, 20x20 mm², 0.8T)

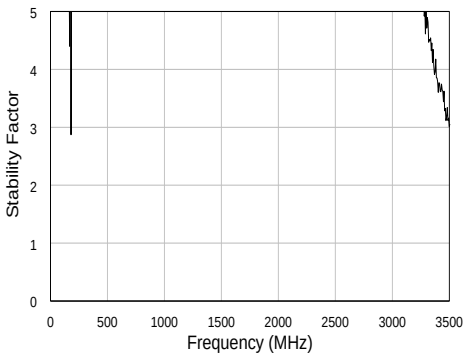


S-parameters & K-factor









Low Noise GPS, GLONASS, Galileo and Compass Amplifier

APPLICATION CIRCUIT

WLAN

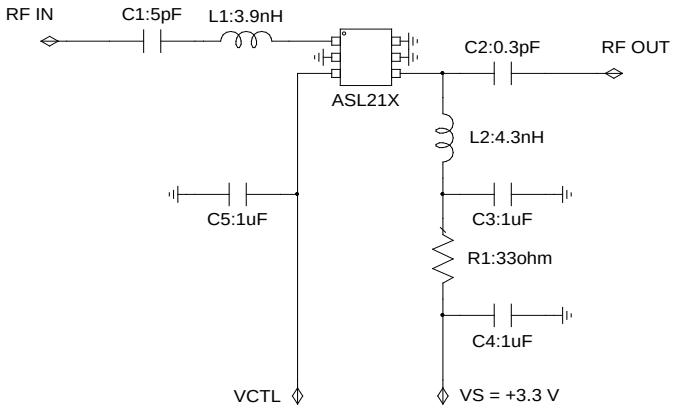
2400 ~ 2500 MHz

+3.3 V, 10 mA

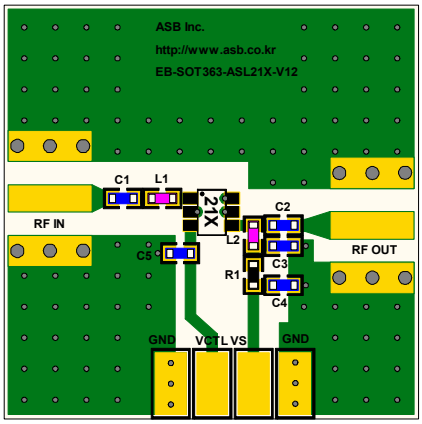
Frequency (MHz)	2400 ~ 2500
Magnitude S21 (dB)	20
Magnitude S11 (dB)	-18
Magnitude S22 (dB)	-10
Noise Figure (dB)	0.85
Input IP3 (dBm) [1)]	-11
Output P1dB (dBm)	-2
Supply Current (mA)	10
Supply Voltage (V)	+3.3
Control Current (μA)	300
Control Voltage V_{CTL} (V)	+3.3

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

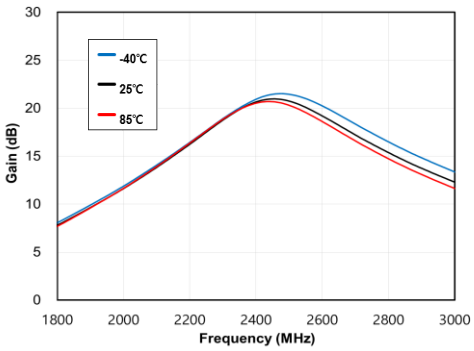
Schematic

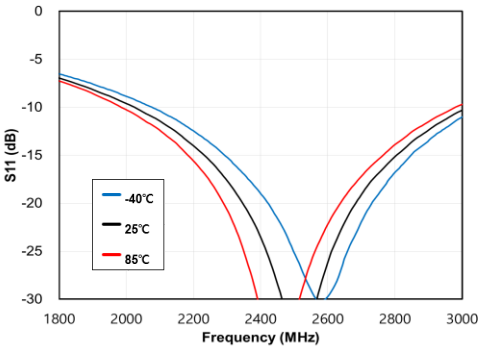


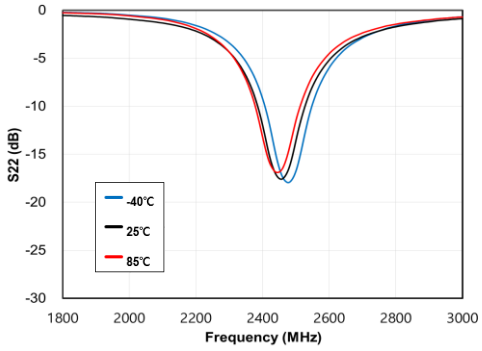
Board Layout (FR4, 20x20 mm², 0.8T)

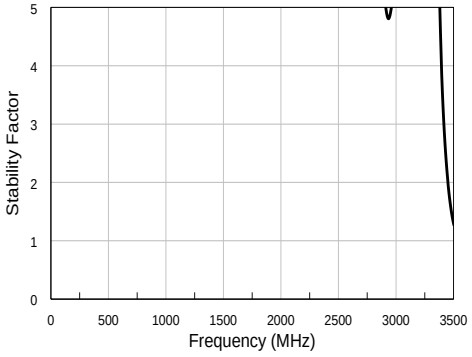


S-parameters & K-factor

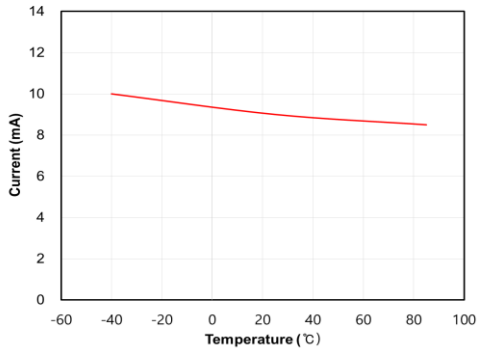




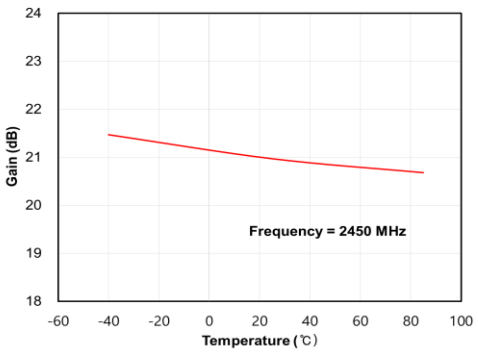




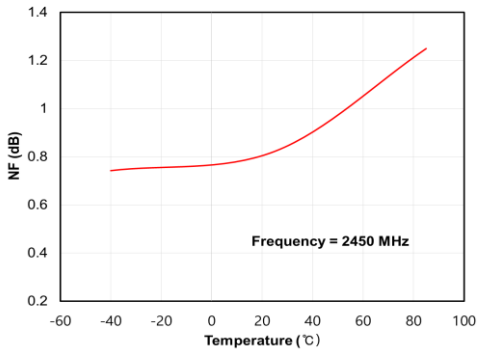
Current vs. Temperature



Gain vs. Temperature



NF vs. Temperature



Low Noise GPS, GLONASS, Galileo and Compass Amplifier

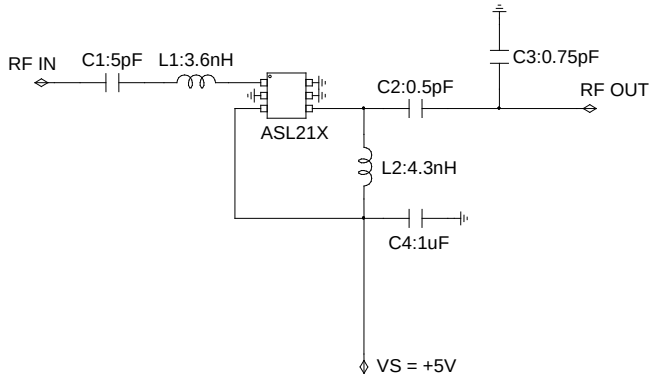
APPLICATION CIRCUIT

XM
2338
+5 V, 23 mA
Without Power ON/OFF Function

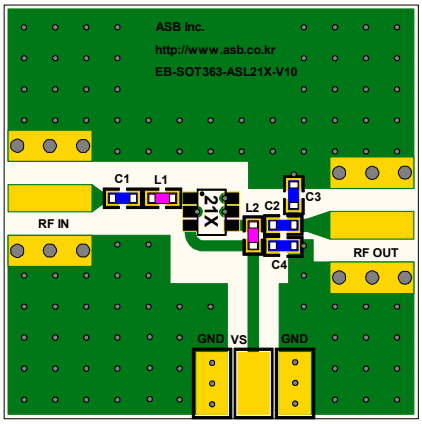
Frequency (MHz)	2338
Magnitude S21 (dB)	22
Magnitude S11 (dB)	-11
Magnitude S22 (dB)	-14
Noise Figure (dB)	0.7
Input IP3 (dBm) [1]	-3
Output P1dB (dBm)	3
Supply Current (mA)	23
Supply Voltage (V)	+5.0

1) IIP3 is measured with two tones at an input power of -35 dBm/tone separated by 1MHz

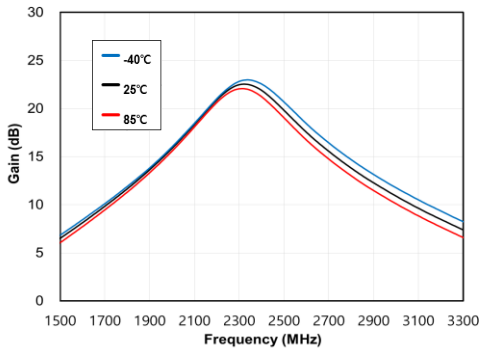
Schematic

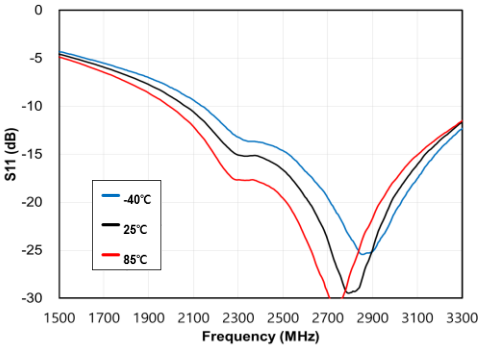


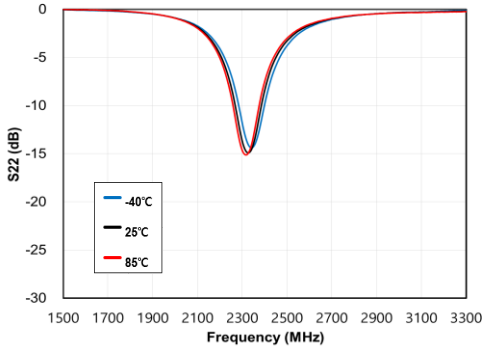
Board Layout (FR4, 20x20 mm², 0.8T)

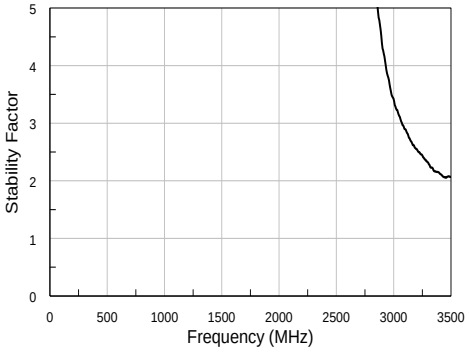


S-parameters & K-factor

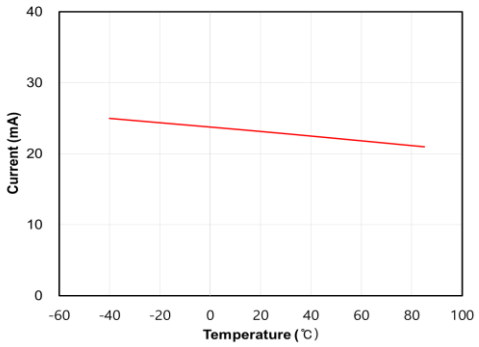




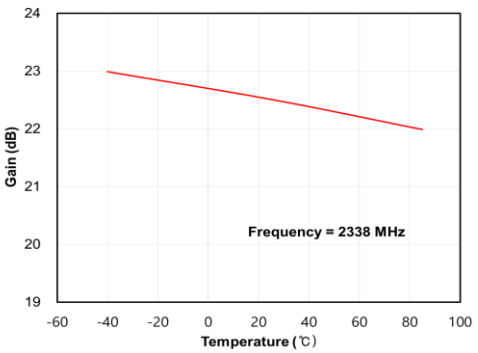




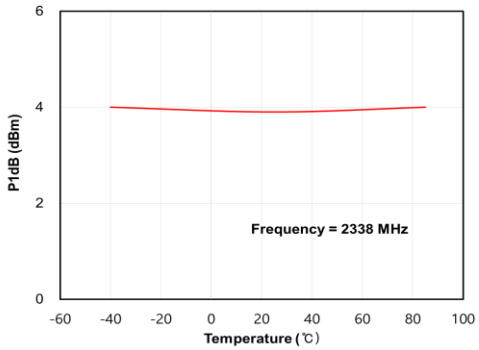
Current vs. Temperature



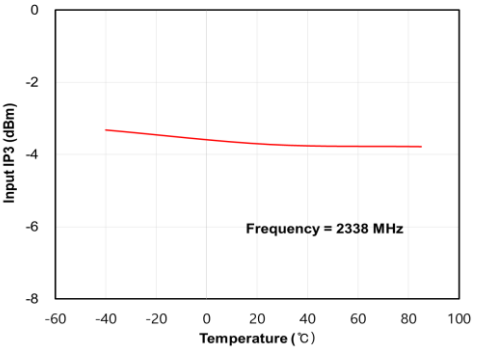
Gain vs. Temperature



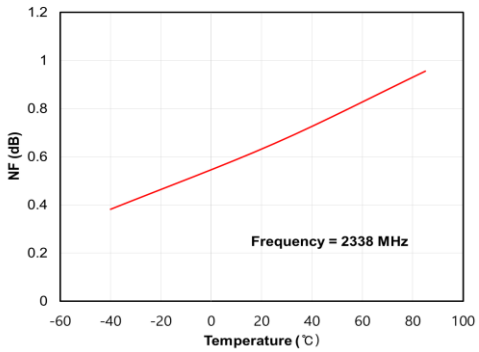
P1dB vs. Temperature



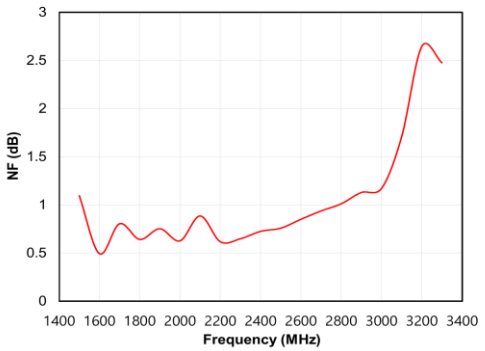
Input IP3 vs. Temperature



NF vs. Temperature



NF vs. Frequency



Low Noise GPS, GLONASS, Galileo and Compass Amplifier

APPLICATION CIRCUIT

XM (Low Gain)

2338

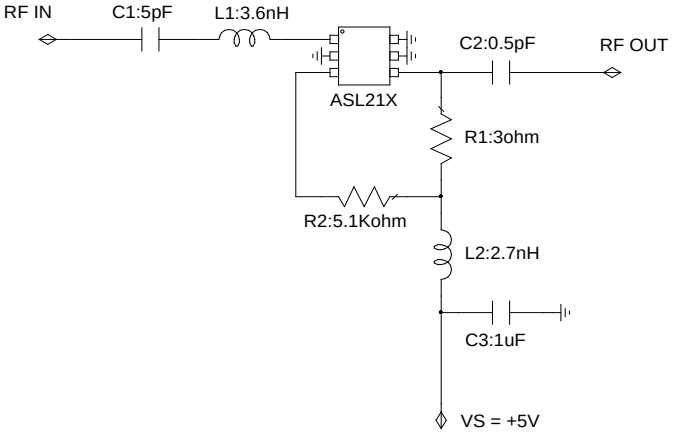
+5 V, 23 mA

Without Power ON &OFF Function

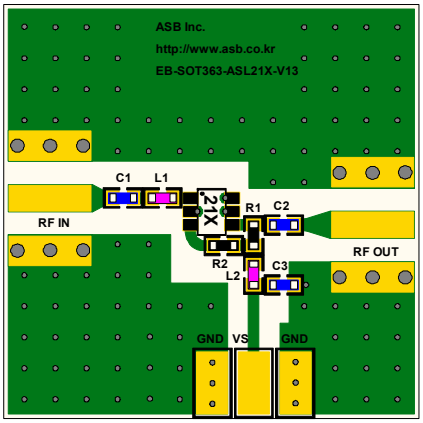
Frequency (MHz)	2338
Magnitude S21 (dB)	19.5
Magnitude S11 (dB)	-11
Magnitude S22 (dB)	-9
Noise Figure (dB)	0.7
Input IP3 (dBm) [1)]	3
Output P1dB (dBm)	6
Supply Current (mA)	23
Supply Voltage (V)	+5.0

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

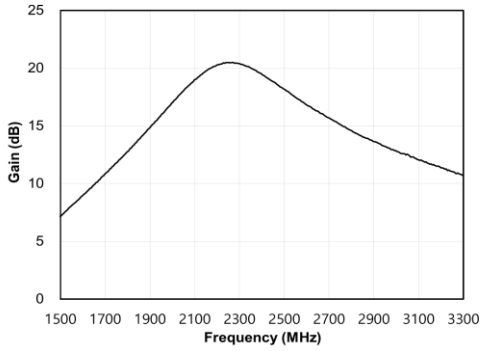
Schematic

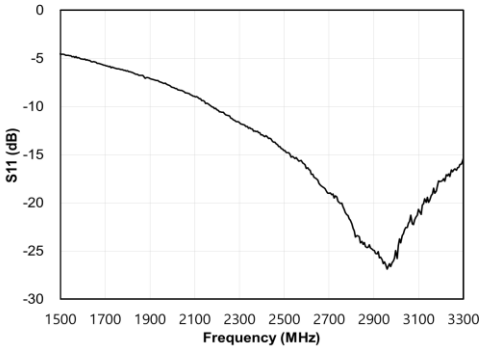


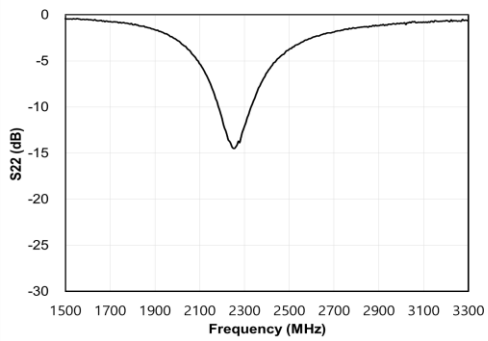
Board Layout (FR4, 20x20 mm², 0.8T)

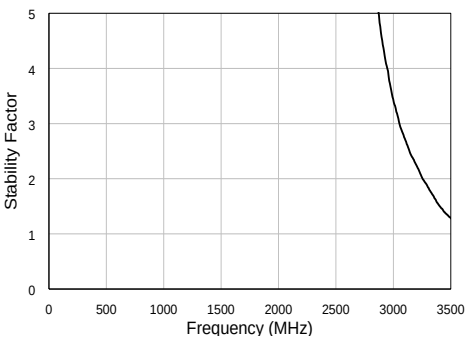


S-parameters & K-factor









(End of Datasheet)