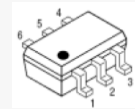


Features

- 13 dB Gain at 2000 MHz
- 22 dBm P1dB at 2000 MHz
- 37 dBm OIP3 at 2000 MHz
- 0.75 dB NF at 2000 MHz
- MTTF > 100 Years
- Single Supply

Description

The ASL13C is a wideband linear low noise amplifier MMIC, has a low noise and high linearity at low bias current, being suitable for use in both receiver and transmitter of telecommunication systems up to 3 GHz. S11 down to -20 dB is easily achieved for low noise application to provide a good productivity. The amplifier is available in a SOT363 package and passes through the stringent DC, RF, and reliability tests.



Package Style: SOT363

Typical Performance

(Supply Voltage = +5 V, T_A = +25 °C, Z_0 = 50 Ω)

Parameters	Units	Typical	
Frequency	MHz	824 ~ 960	1920 ~ 2170
Gain	dB	18.5	13.0
S11	dB	-18	-16
S22	dB	-10	-10
Output IP3 ¹⁾	dBm	34.5	36.5
Noise Figure	dB	0.85	0.75
Output P1dB	dBm	22	22
Current	mA	59	59
Device Voltage	V	+4.5	+4.5

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

Product Specifications

(Supply Voltage = +5 V, T_A = +25 °C, Z_0 = 50 Ω)

Parameters	Units	Min	Typ	Max
Testing Frequency	MHz		2000	
Gain	dB	12	13	
S11	dB		-18	
S22	dB		-12	
Output IP3	dBm	34.5	36.5	
Noise Figure	dB		0.75	0.95
Output P1dB	dBm	20	22	
Current	mA		59	
Device Voltage	V		+4.5	

Absolute Maximum Ratings

Parameters	Rating
Operating Case Temperature	-40 to +85 °C
Storage Temperature	-40 to +150 °C
Device Voltage	+6 V
Operating Junction Temperature	+150 °C
Input RF Power (CW, 50 Ω matched as in 2000 MHz application circuit)*	+22 dBm
Thermal Resistance	184 °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.

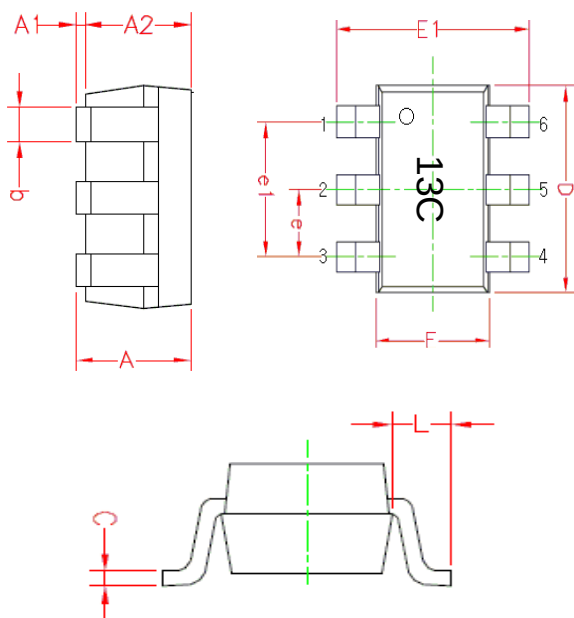
Application Circuit

- CDMA & GSM
- WCDMA
- TETRA
- IF
- FM, DVB, DMB
- 2000 MHz (3.3 V, 59 mA)
- 2100 ~ 2400 MHz (5 V, 59 mA)
- IF (30 ~ 600 MHz)

Pin Configuration

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

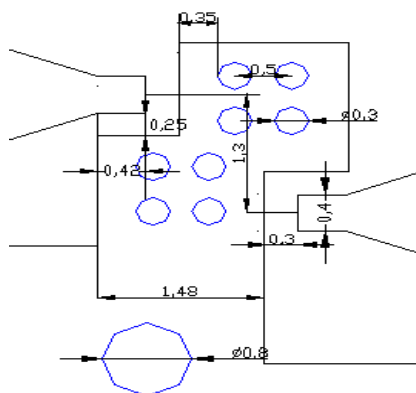
Outline Drawing



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	RF IN	4	RF OUT & Bias
2	GND	5	GND
3	GND	6	GND

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 for better RF and thermal performance, as shown in the drawing at the left side.

ESD Classification & Moisture Sensitivity Level

ESD Classification

HBM	Class 1A
	Voltage Level: 400 V
MM	Class A
	Voltage Level: 50 V

CAUTION: ESD-sensitive device!

Moisture Sensitivity Level (MSL)

Level 3 at 260 °C reflow

APPLICATION CIRCUIT

CDMA & GSM

824 ~ 960 MHz

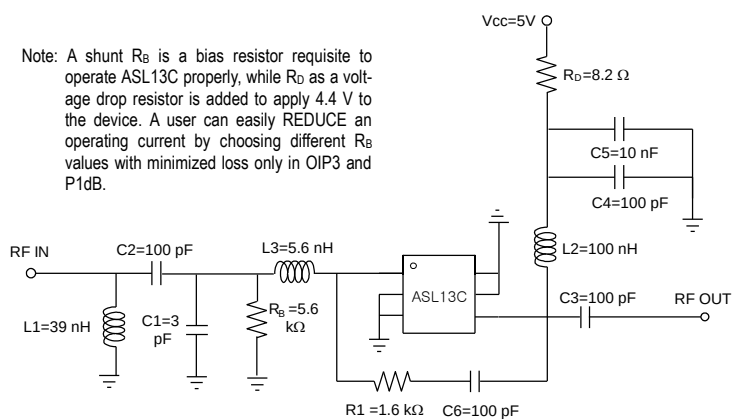
+5 V

Frequency (MHz)	824	894	890	960
Magnitude S21 (dB)	19.0	18.5	18.5	18.0
Magnitude S11 (dB)	-18	-18	-18	-18
Magnitude S22 (dB)	-10	-10	-10	-10
Output P1dB (dBm)	22		22	
Output IP3 ¹⁾ (dBm)	34.5		34.5	
Noise Figure (dB)	0.80		0.85	
Device Voltage (V)	+4.5		+4.5	
Current (mA)	59		59	

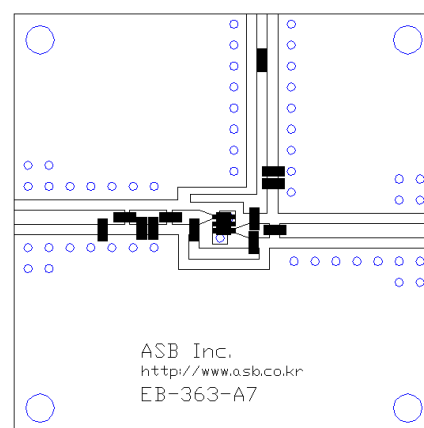
1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1 MHz.

Schematic

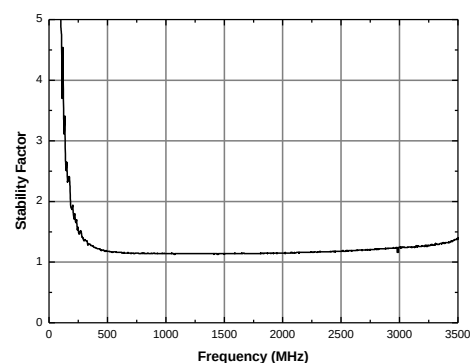
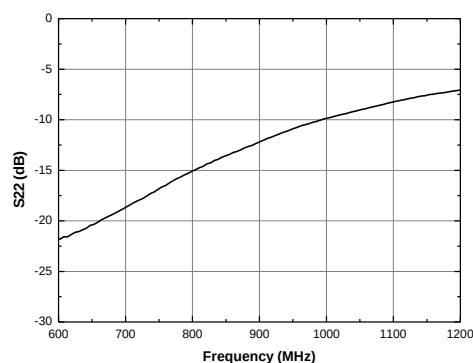
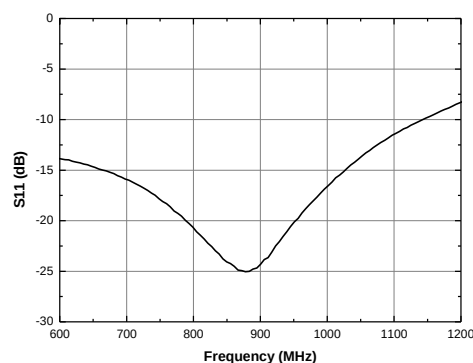
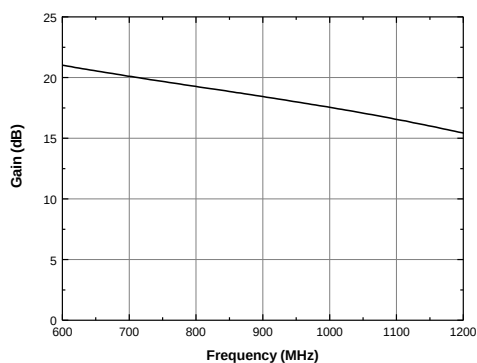
Note: A shunt R_B is a bias resistor requisite to operate ASL13C properly, while R_D as a voltage drop resistor is added to apply 4.4 V to the device. A user can easily REDUCE an operating current by choosing different R_B values with minimized loss only in OIP3 and P1dB.



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

WCDMA

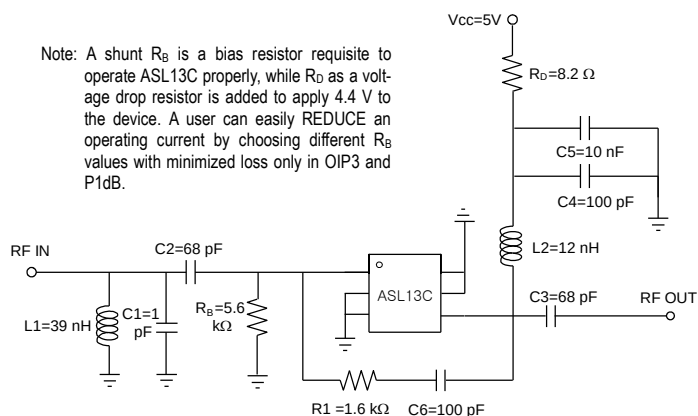
1920 ~ 2170 MHz

+5 V

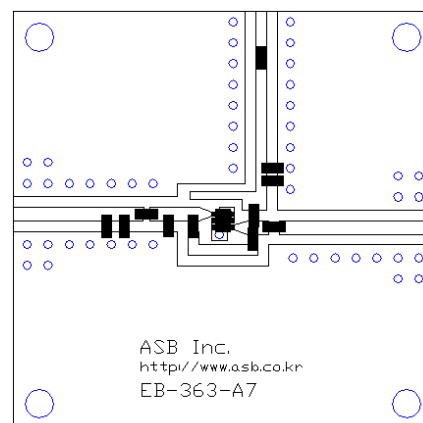
Frequency (MHz)	1920	2170
Magnitude S21 (dB)	13.5	12.5
Magnitude S11 (dB)	-18	-16
Magnitude S22 (dB)	-14	-10
Output P1dB (dBm)	22	22
Output IP3 ¹⁾ (dBm)	37.0	36.5
Noise Figure (dB)	0.75	0.75
Device Voltage (V)	+4.5	+4.5
Current (mA)	59	59

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

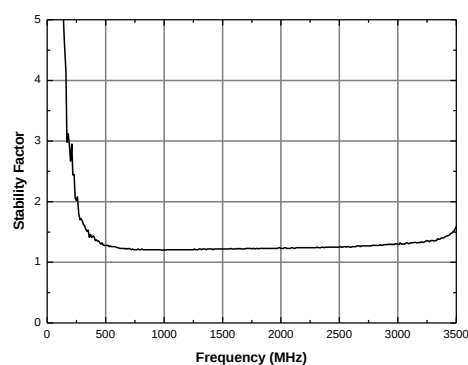
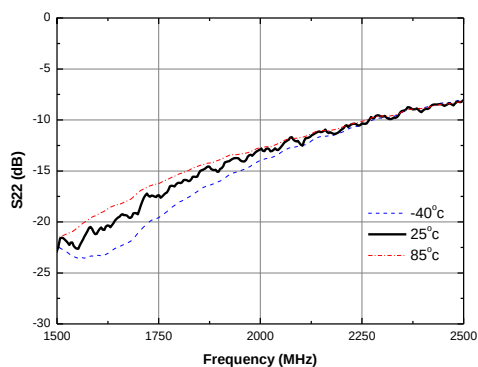
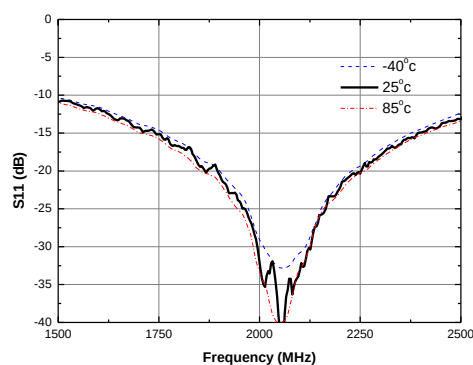
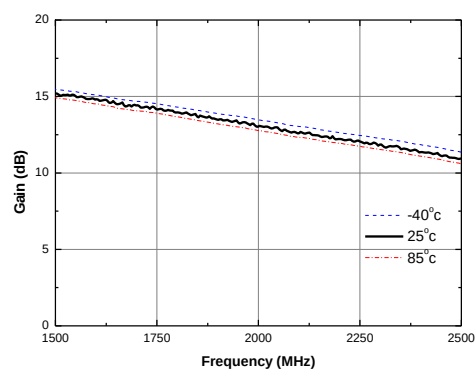
Schematic



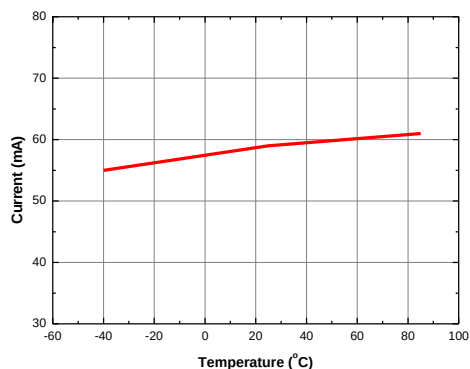
Board Layout (FR4, 40x40 mm², 0.8T)



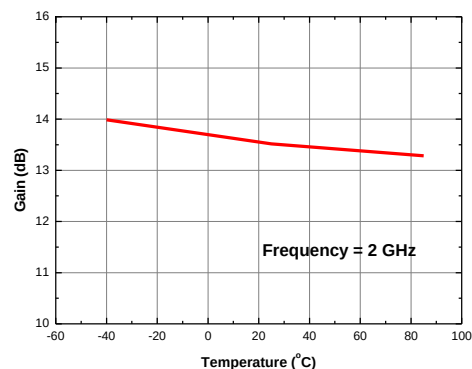
S-parameters & K-factor



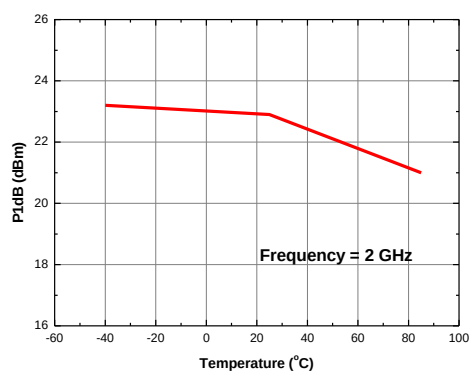
Current vs. Temperature



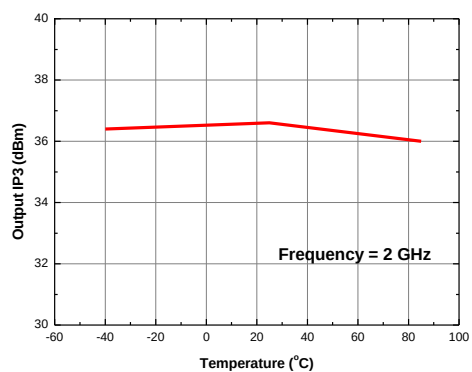
Gain vs. Temperature



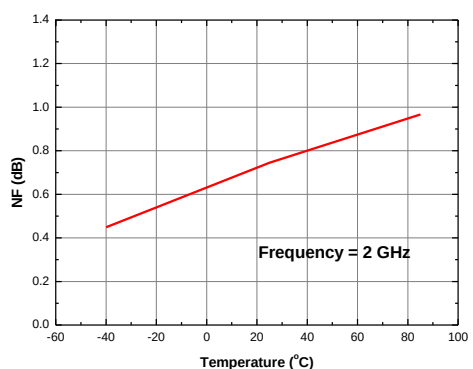
P1dB vs. Temperature



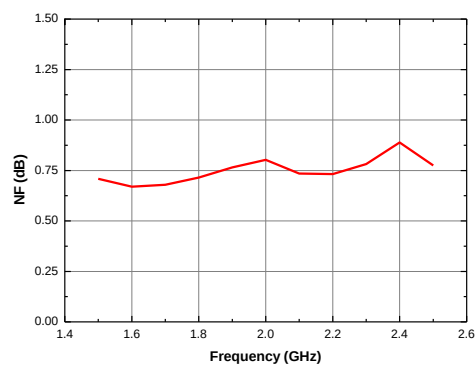
Output IP3 vs. Temperature



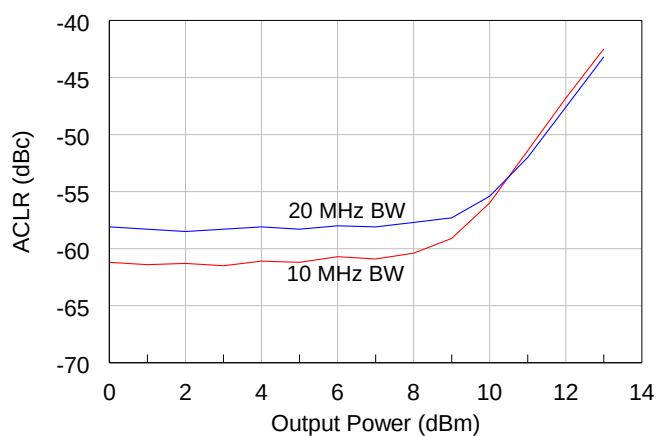
NF vs. Temperature



NF vs. Frequency

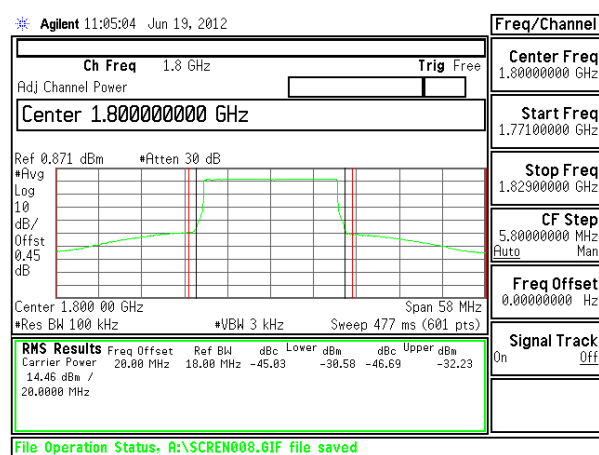


LTE ACLR – 10 MHz & 20 MHz



1) Test Source : LTE_FDD_test model 3.1, BW: 10 MHz & 20 MHz, Test Frequency: 1.8 GHz

LTE ACLR – 20 MHz



2) Test Source : LTE_FDD_test model 3.1, BW: 20 MHz, Test Frequency: 1.8 GHz

APPLICATION CIRCUIT

TETRA

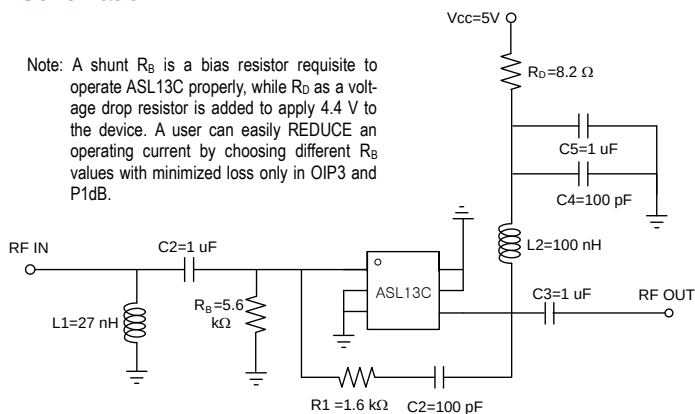
350 ~ 450 MHz

+5 V

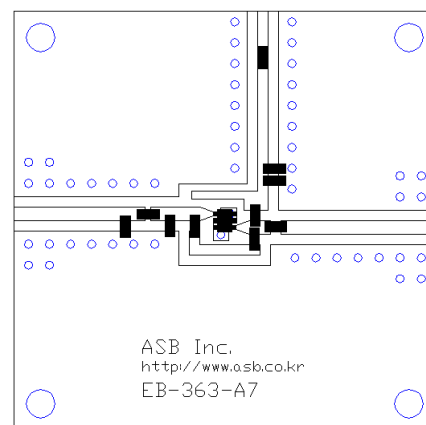
Frequency (MHz)	350	400	450
Magnitude S21 (dB)	24.0	23.5	23.0
Magnitude S11 (dB)	-18	-18	-18
Magnitude S22 (dB)	-10	-10	-10
Output P1dB (dBm)	22	22	22
Output IP3 ¹⁾ (dBm)	32.5	33.0	33.5
Noise Figure (dB)	0.95	0.90	0.85
Device Voltage (V)	+4.5	+4.5	+4.5
Current (mA)	59	59	59

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

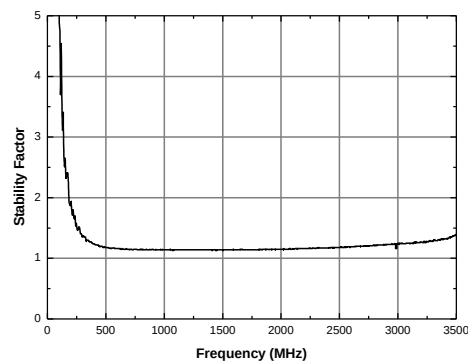
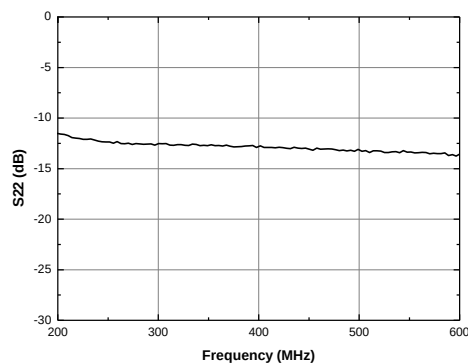
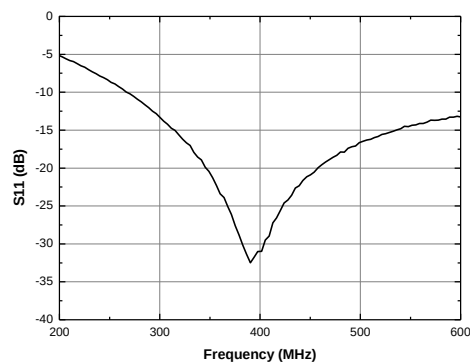
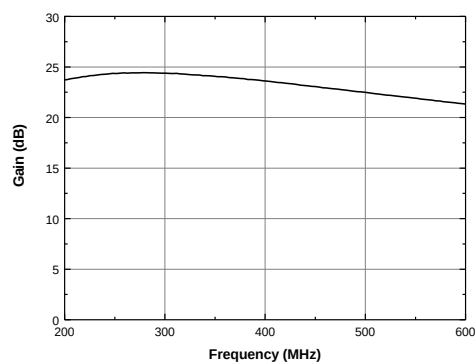
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



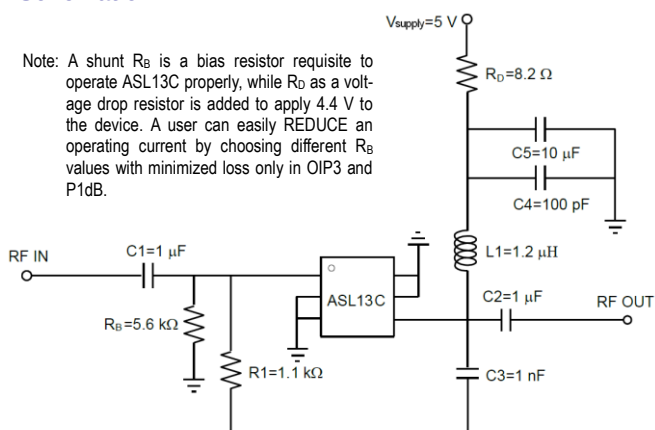
APPLICATION CIRCUIT

IF
30 ~ 450 MHz
+5 V

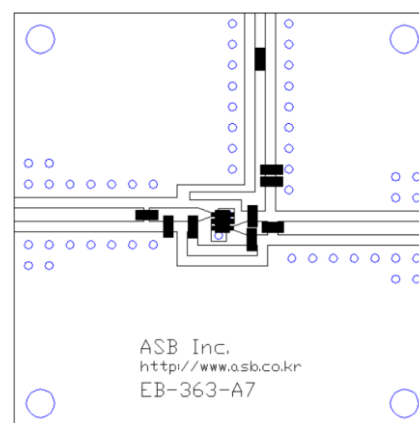
Frequency (MHz)	30	150	300	450
Magnitude S21 (dB)	25.0	24.5	23.5	22.0
Magnitude S11 (dB)	-15	-15	-14	-13
Magnitude S22 (dB)	-12	-13	-14	-15
Output P1dB (dBm)	22	22	22	22
Output IP3 ¹⁾ (dBm)	31	33	35	35
Noise Figure (dB)	0.85	0.75	0.75	0.70
Device Voltage (V)	+4.5	+4.5	+4.5	+4.5
Current (mA)	59	59	59	59

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

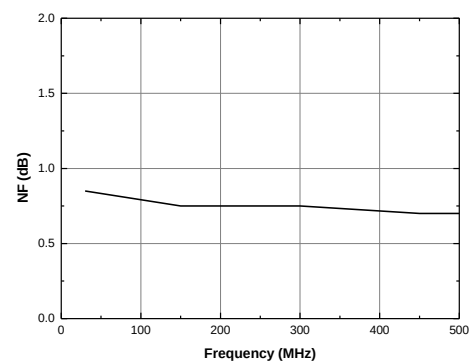
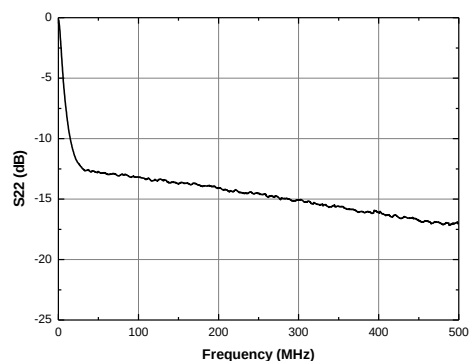
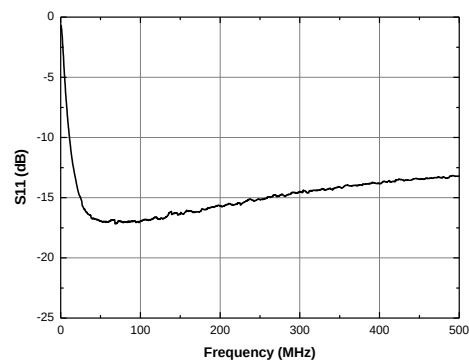
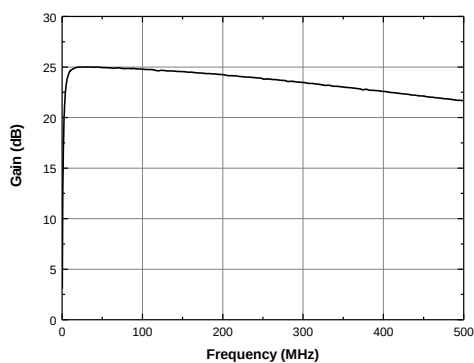
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & Noise Figure



APPLICATION CIRCUIT

FM, DVB, DMB

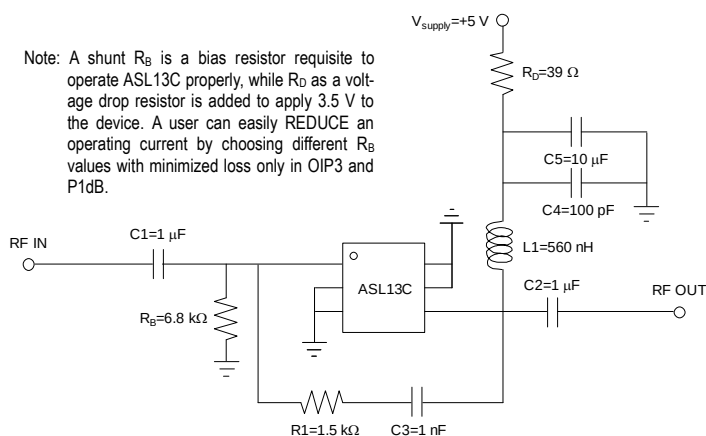
70 ~ 400 MHz

+5 V

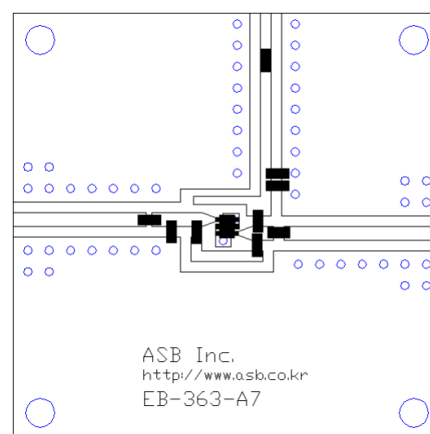
Frequency (MHz)	70	200	400
Magnitude S21 (dB)	25.0	24.0	22.5
Magnitude S11 (dB)	-9	-9	-10
Magnitude S22 (dB)	-18	-20	-17
Output P1dB (dBm)	16.5	16.5	17.0
Output IP3 ¹⁾ (dBm)	28.5	29.0	30.0
Noise Figure (dB)	0.75	0.75	0.75
Device Voltage (V)	+3.5	+3.5	+3.5
Current (mA)	40	40	40

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

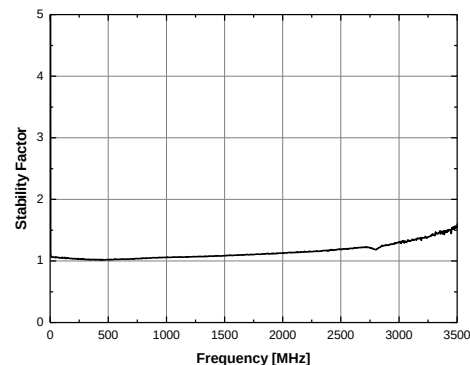
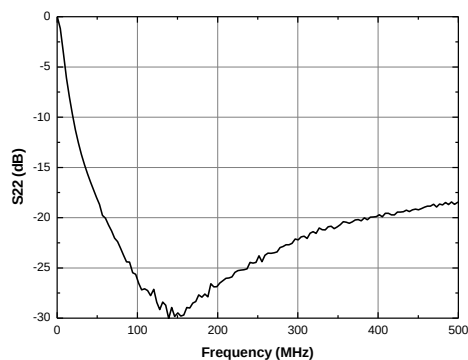
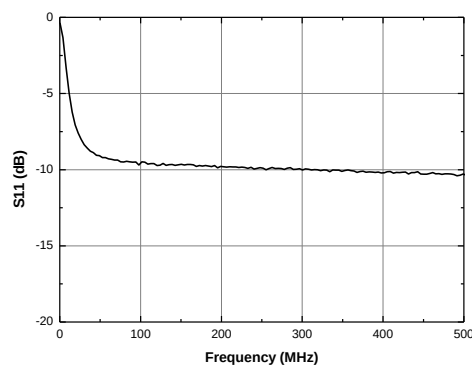
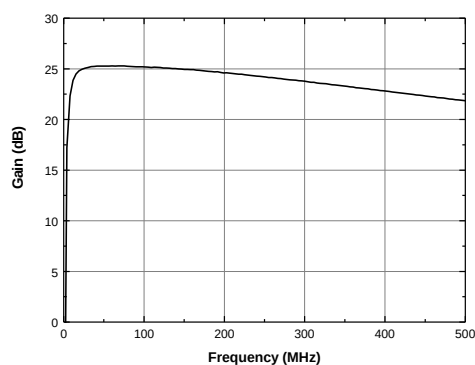
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

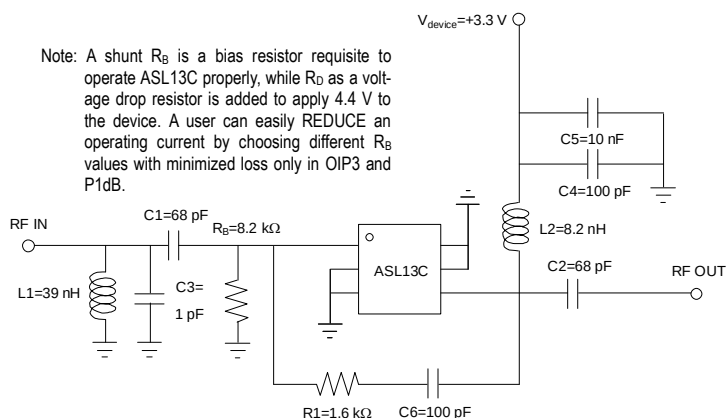
2000 MHz

+3.3 V

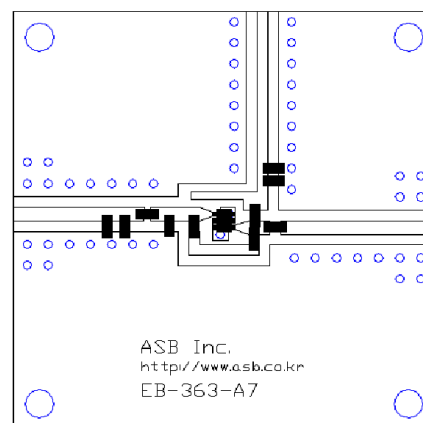
Frequency (MHz)	2000
Magnitude S21 (dB)	13
Magnitude S11 (dB)	-18
Magnitude S22 (dB)	-13
Output P1dB (dBm)	19
Output IP3 ¹⁾ (dBm)	35
Noise Figure (dB)	0.7
Device Voltage (V)	3.3
Current (mA)	59

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

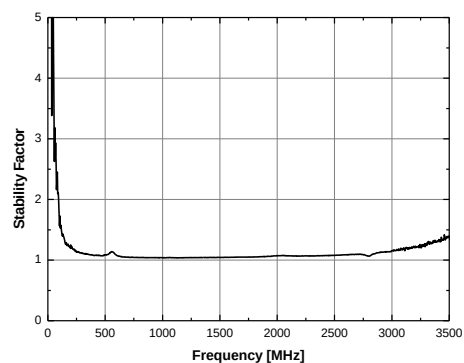
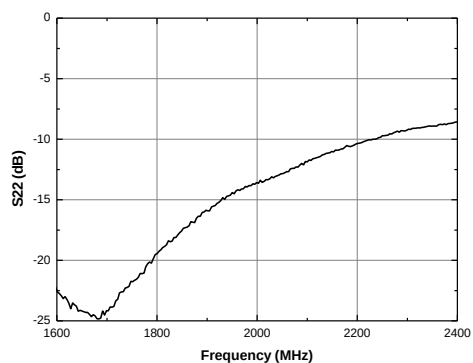
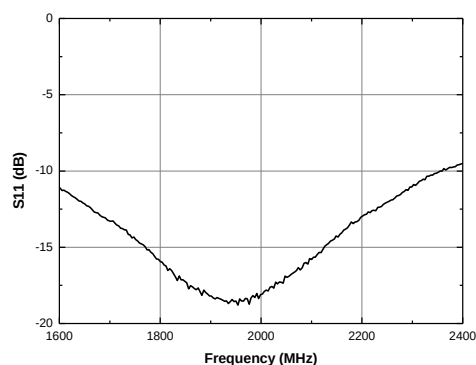
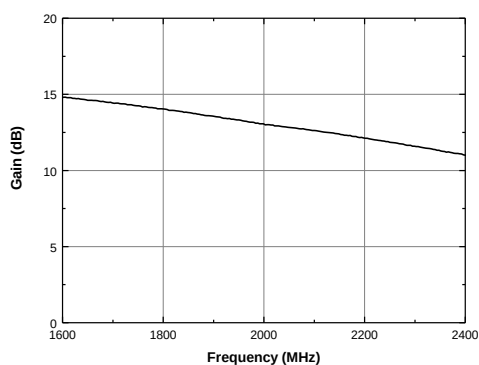
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



APPLICATION CIRCUIT

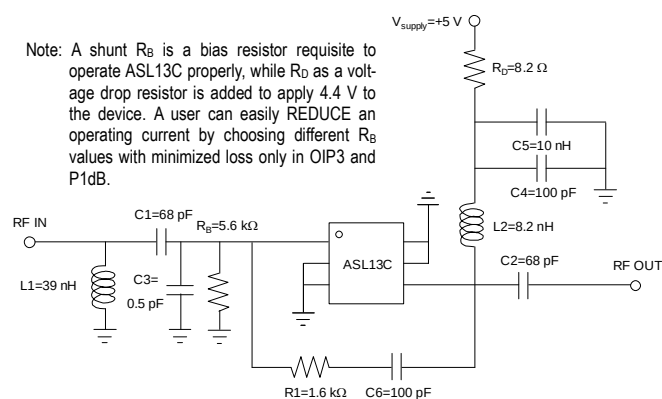
2100 ~ 2400 MHz

+5 V

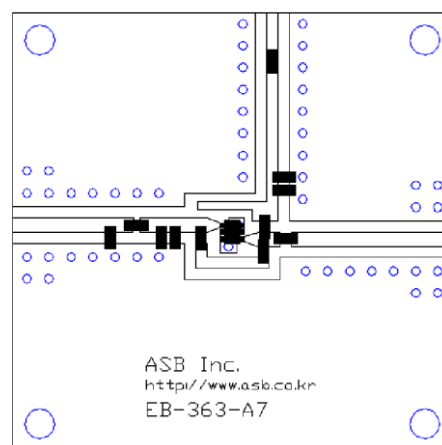
Frequency (MHz)	2100	2400
Magnitude S21 (dB)	12.4	11.3
Magnitude S11 (dB)	-13	-16
Magnitude S22 (dB)	-18	-12
Output P1dB (dBm)	22.5	22.5
Output IP3 ¹⁾ (dBm)	36	36
Noise Figure (dB)	0.9	0.8
Device Voltage (V)	+4.5	+4.5
Current (mA)	59	59

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

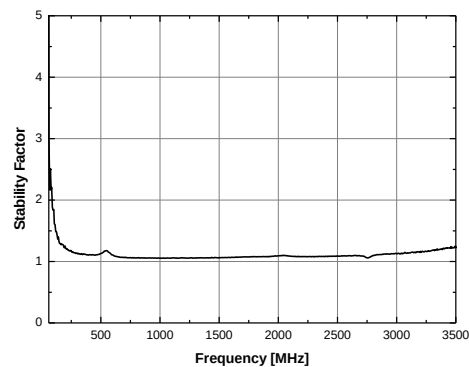
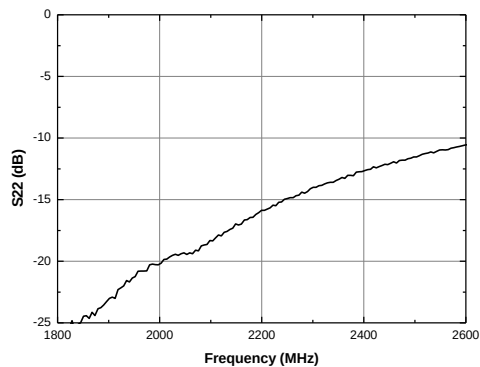
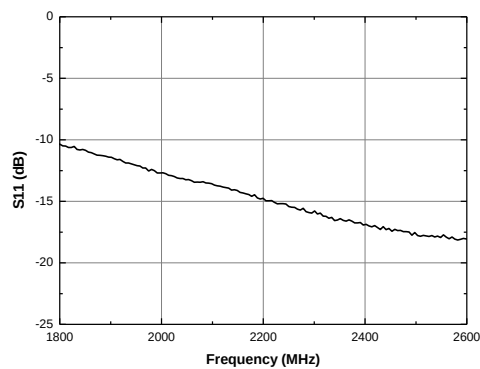
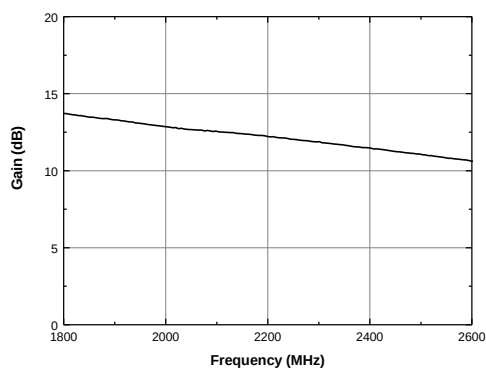
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



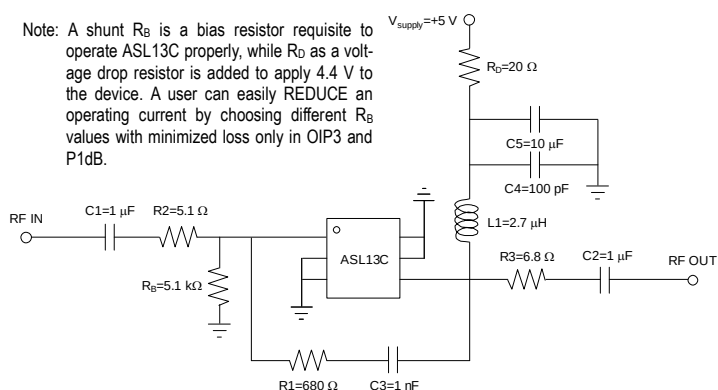
APPLICATION CIRCUIT

IF
30 ~ 600 MHz
+5 V

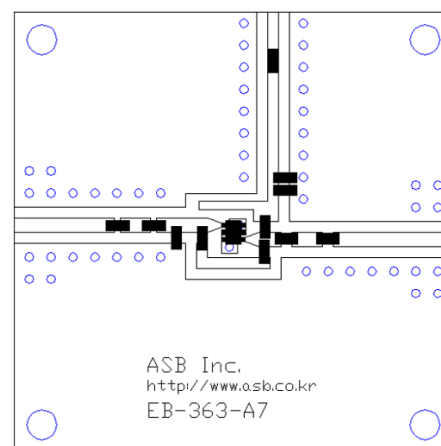
Frequency (MHz)	30	88	220	600
Magnitude S21 (dB)	20.5	20.5	20.0	18.0
Magnitude S11 (dB)	-20	-21	-18	-14
Magnitude S22 (dB)	-13	-13	-13	-15
Output P1dB (dBm)	17	18	18	18
Output IP3 ¹⁾ (dBm)	27	29	30	30
Noise Figure (dB)	1.6	1.3	1.5	1.3
Device Voltage (V)	+4.22	+4.22	+4.22	+4.22
Current (mA)	39	39	39	39

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

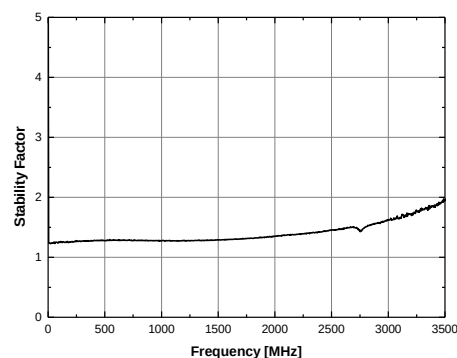
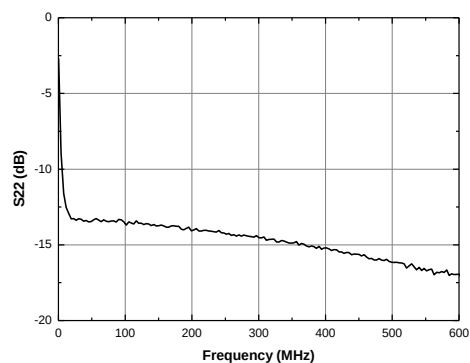
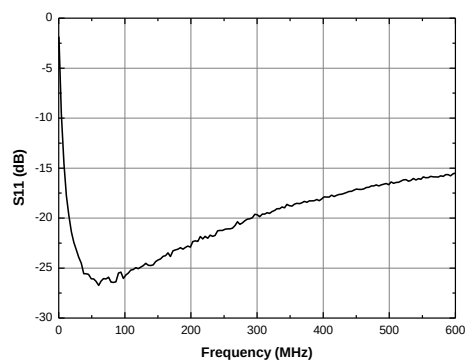
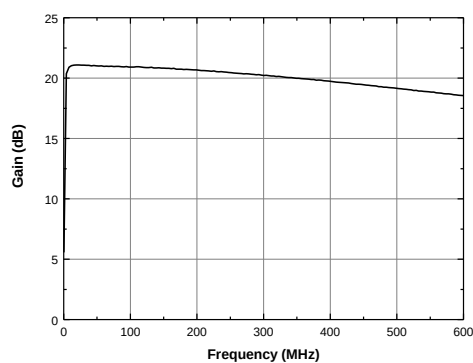
Schematic



Board Layout (FR4, 40x40 mm², 0.8T)



S-parameters & K-factor



Recommended Soldering Reflow Profile

