Advanced Semiconductor Business Inc.

ASL19W

DC-3000 MHz High Linearity LNA MMIC

Features

- 20 dB Gain at 850 MHz
- 0.9 dB NF
- 22 dBm P1dB
- 35.5 dBm Output IP3
- MTTF > 100 Years
- Single Supply

Description

The ASL19W, 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 an SOT-89 package and passes through the stringent DC, RF, and reliability tests.

RoHS-compliant

Package Style: SOT-89

Typical Performance

Parameters	Units	Typical		
		Low Noise		
Frequency	MHz	850	2000	2700
Gain	dB	20	13	11
S11	dB	-20	-20	-16
S22	dB	-18	-15	-14
Output IP3[1)]	dBm	35.5	37	38
Noise Figure	dB	0.9	0.9	1.1
Output P1dB	dBm	22	22	22
Supply Current	mA	73	73	73
Supply Voltage	V	5	5	5

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

Product Specifications

Parameters	Units	Min	Typ	Max
Testing Frequency	MHz		850	
Gain	dB	19	20	
S11	dB		-20	
S22	dB		-18	
Output IP3	dBm	34	35.5	
Noise Figure	dB		0.9	1.1
Output P1dB	dBm	20	22	
Supply Current	mA	55	73	86
Supply Voltage	V		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, 50ohm matched)*	22 dBm

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

Applications

- CDMA, GSM, W-CDMA, PCS Gain Block Amplifier
- Low Noise Amplifier
- IF Amplifier
- WiBro/WiMAX Amplifier
- Bluetooth Amplifier
- Wireless LAN Amplifier

More Information

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OIP3 & Noise Figure Vs. Bias Resistor

RD (ohm)	RB (ohm)	Vd (V)	Ic (mA)	CDMA		WCDMA		RD (ohm)	RB (ohm)	Vd (V)	Ic (mA)	CDMA		WCDMA	
				NF (dB)	OIP3 (dBm)	NF (dB)	OIP3 (dBm)					NF (dB)	OIP3 (dBm)	NF (dB)	OIP3 (dBm)
8.2	6.2k	4.38	73	1.01	36	0.86	38.4	20	7.5k	3.68	66	1.05	35.2	0.89	36.8
	5.6k	4.51	59	0.98	35.2	0.86	37.1		6.8k	3.86	59	0.97	34.7	0.88	36.5
	5.1k	4.61	47	0.98	33.4	0.87	34.4		6.2k	4.06	48	0.99	33.2	0.86	35.2
	4.7k	4.7	36	0.99	30.6	0.9	30.8		5.6k	4.21	41	1.03	31.4	0.9	33.5
	4.3k	4.76	28	0.96	27.8	0.96	27.7		5.1k	4.34	34	1.04	29.2	0.92	31.2
10	6.2k	4.33	68	0.93	35.8	0.84	38		4.7k	4.48	27	1.05	27.1	0.94	29.1
	5.6k	4.46	55	0.96	34.6	0.87	36.2		4.3k	4.59	21	1.05	25.7	0.99	27.5
	5.1k	4.56	44	0.98	32.5	0.88	33.9	30	11k	2.84	73	0.98	34.9	0.88	36.5
	4.7k	4.64	36	0.97	30.6	0.91	30.5		10k	2.99	68	0.98	36.3	0.87	38.8
	4.3k	4.74	26	1.05	27	0.95	27.8		9.1k	3.14	63	1.01	35.9	0.89	37.8
12	6.8k	4.08	75	0.97	35.8	0.89	37		8.2k	3.31	57	0.95	34.6	0.89	36.5
	6.2k	4.26	61	1.01	35.3	0.86	37.2		7.5k	3.49	52	0.99	33.7	0.86	35.6
	5.6k	1.39	50	0.98	34	0.88	35.8		6.8k	3.48	47	0.99	32.7	0.88	35.6
	5.1k	4.51	41	0.96	31.9	0.88	32.7		6.2k	3.85	38	1.06	30.8	0.89	32.9
	4.7k	4.62	31	1.04	28.8	0.91	30		5.6k	4.22	33	1	29.1	0.92	30.8
	4.3k	4.7	24	1.06	26.5	0.95	27.6		5.1k	4.18	28	1.08	26.9	0.94	29
15	6.8k	3.99	68	0.99	35.5	0.87	37		4.7k	4.35	22	1.03	25.8	0.97	27.6
	6.2k	4.14	58	1.01	34.9	0.87	35.8								
	5.6k	4.29	47	1.04	33.3	0.86	34.4								
	5.1k	4.43	38	1.04	30.9	0.9	31.1								
	4.7k	4.55	30	1.07	28.1	0.93	28.8								
	4.3k	4.65	23	1.09	26.1	0.97	26.8								

* Test Application Circuit : ASL19W CDMA / WCDMA application circuit

* OIP3 Test Condition : Freq. – 894MHz / – 2140MHz, +10dBm output power per tone

* Vd : Applied voltage to the device

DC-3000 MHz High Linearity LNA MMIC

APPLICATION CIRCUIT

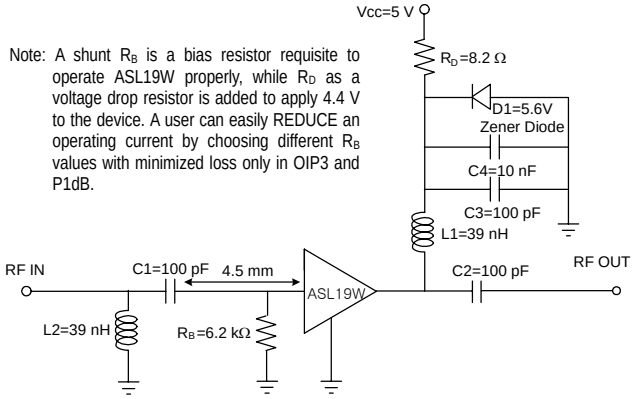
Low Noise
500 ~ 3500
+5 V

Frequency (MHz)	900	2000
Magnitude S21 (dB)	19	13
Magnitude S11 (dB)	-7	-7
Magnitude S22 (dB)	-18	-18
Output P1dB (dBm)	22	22
Output IP3[1)] (dBm)	37	37.5
Noise Figure (dB)	0.7	0.9
Supply Voltage (V)	5	5
Current (mA)	73	73

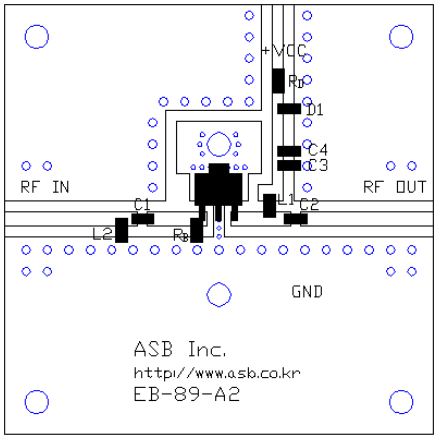
1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1 MHz.

Schematic

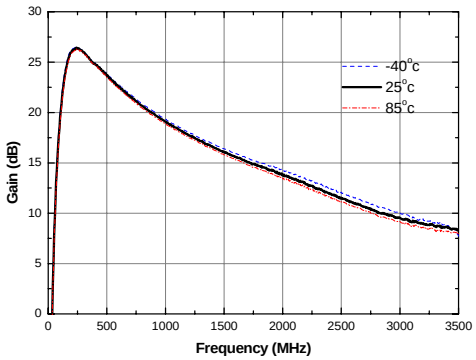
Note: A shunt R_B is a bias resistor requisite to operate ASL19W properly, while R_D as a voltage drop resistor is added to apply 4.4 V to the device. A user can easily REDUCE an operating current by choosing different R_B values with minimized loss only in OIP3 and P1dB.

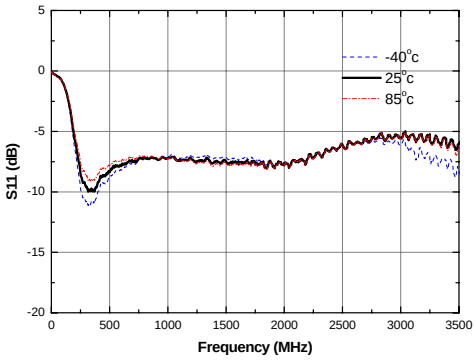


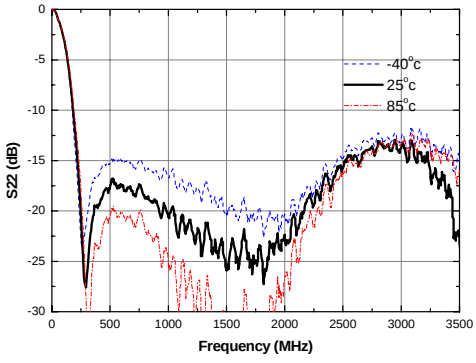
Board Layout (FR4, 40x40 mm^2, 0.8T)

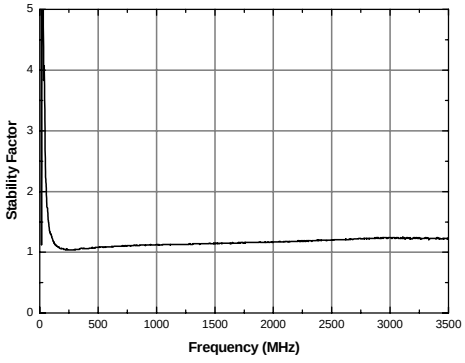


S-parameters & K-factor

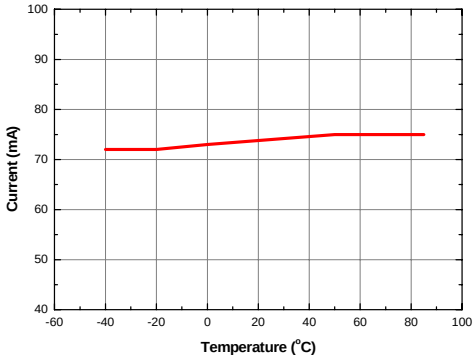




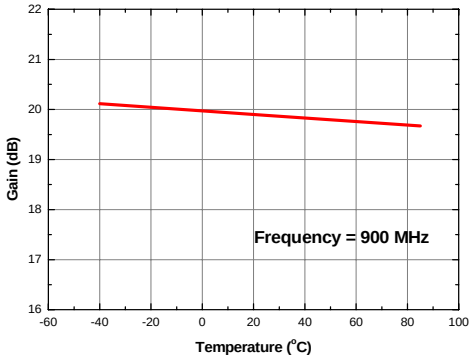




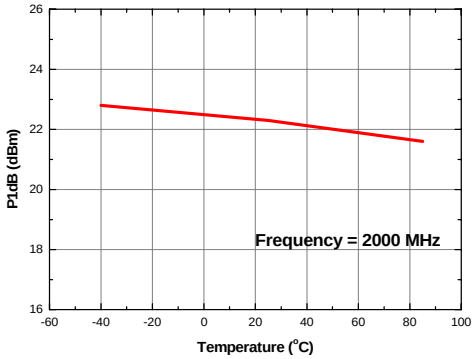
Current vs. Temperature



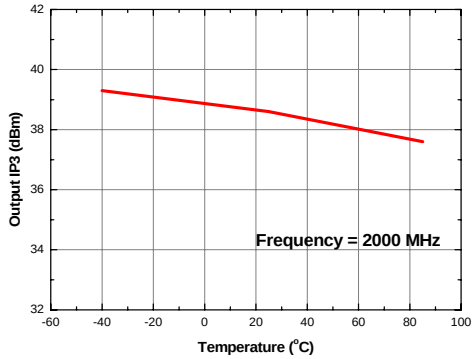
Gain vs. Temperature



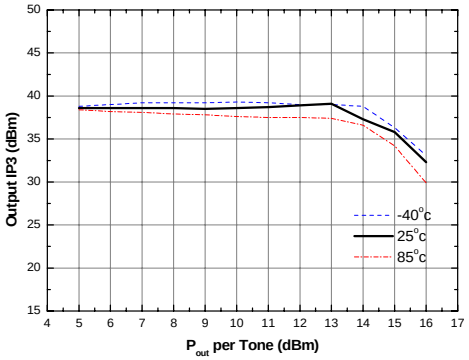
P1dB vs. Temperature



Output IP3 vs. Temperature



Output IP3 vs. Tone Power (Frequency = 2000 MHz)



APPLICATION CIRCUIT

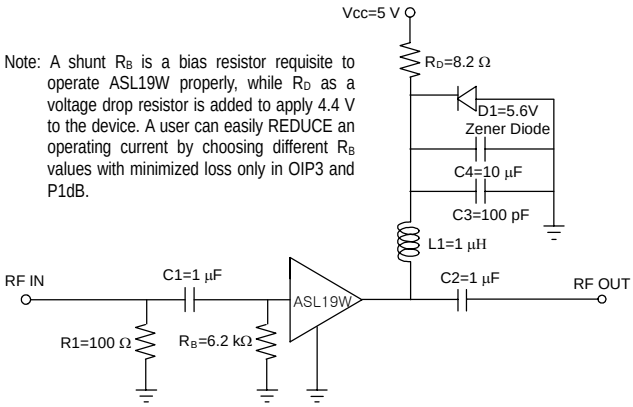
IF
30 ~ 400
+5 V

Frequency (MHz)	70	150	300
Magnitude S21 (dB)	24.5	24	22.5
Magnitude S11 (dB)	-13	-13	-10
Magnitude S22 (dB)	-15	-18	-18
Output P1dB (dBm)	21	21	21
Output IP3[1)] (dBm)	32	32.5	34
Noise Figure (dB)	2.9	2.9	2.8
Supply Voltage (V)	5	5	5
Current (mA)	73	73	73

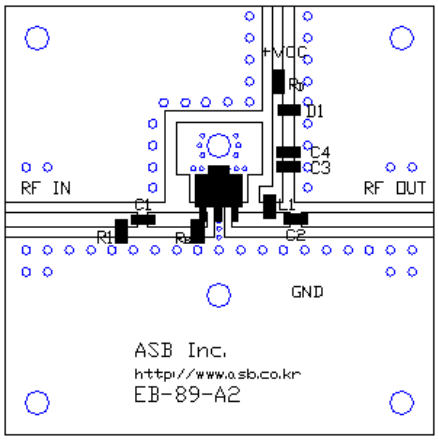
1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1 MHz.

Schematic

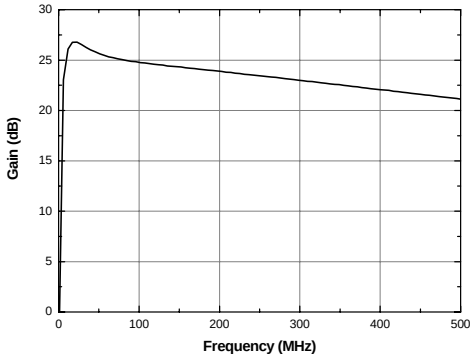
Note: A shunt R_B is a bias resistor requisite to operate ASL19W properly, while R_D as a voltage drop resistor is added to apply 4.4 V to the device. A user can easily REDUCE an operating current by choosing different R_B values with minimized loss only in OIP3 and P1dB.

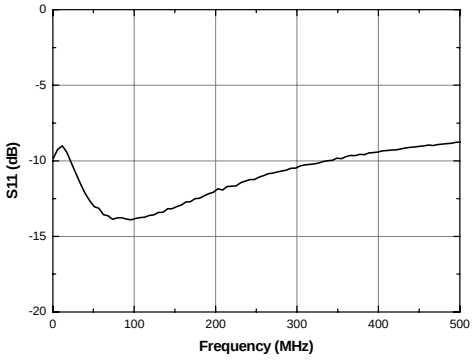


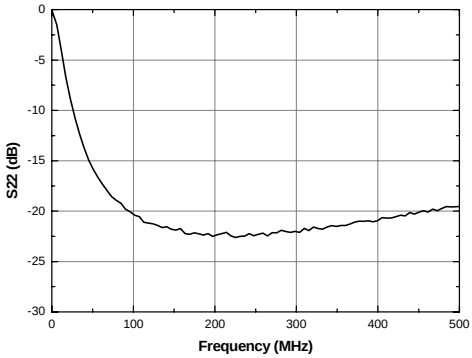
Board Layout (FR4, 40x40 mm^2, 0.8T)

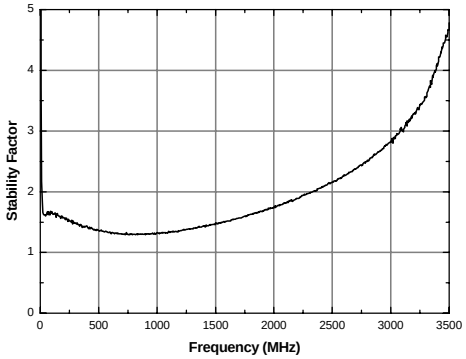


S-parameters & K-factor









APPLICATION CIRCUIT

450

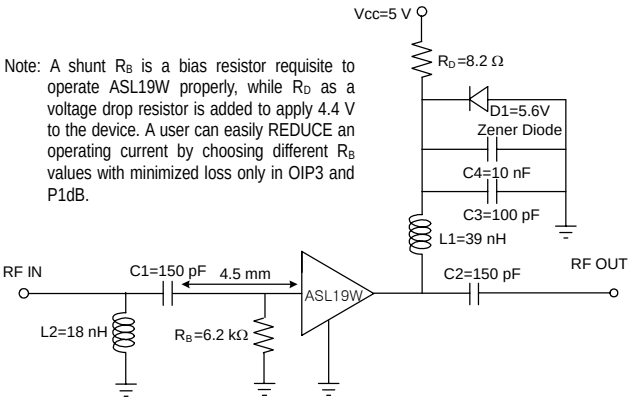
+5 V

Frequency (MHz)	450
Magnitude S21 (dB)	23.5
Magnitude S11 (dB)	-18
Magnitude S22 (dB)	-18
Output P1dB (dBm)	21.5
Output IP3[1)] (dBm)	32
Noise Figure (dB)	1.15
Supply Voltage (V)	5
Current (mA)	73

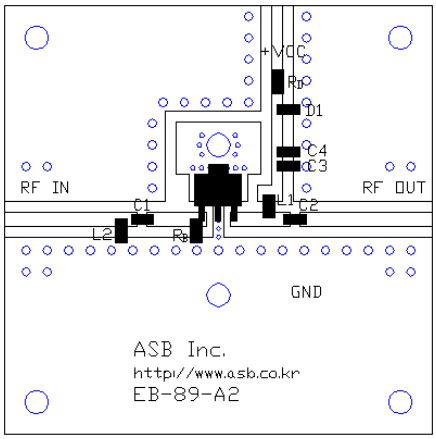
1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1 MHz.

Schematic

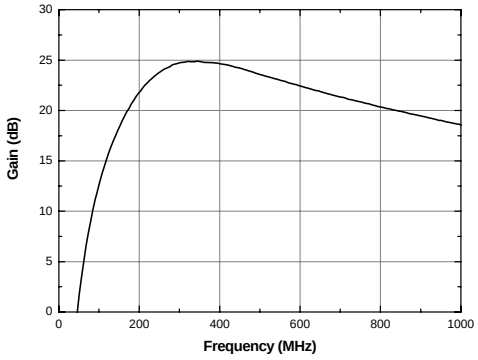
Note: A shunt R_B is a bias resistor requisite to operate ASL19W properly, while R_D as a voltage drop resistor is added to apply 4.4 V to the device. A user can easily REDUCE an operating current by choosing different R_B values with minimized loss only in OIP3 and P1dB.

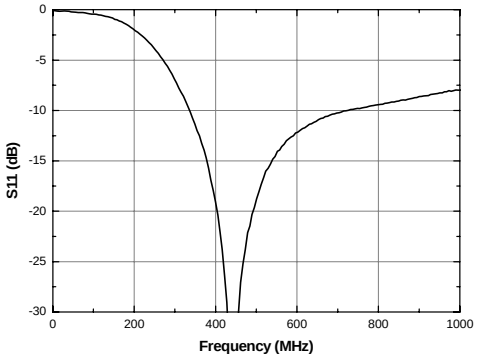


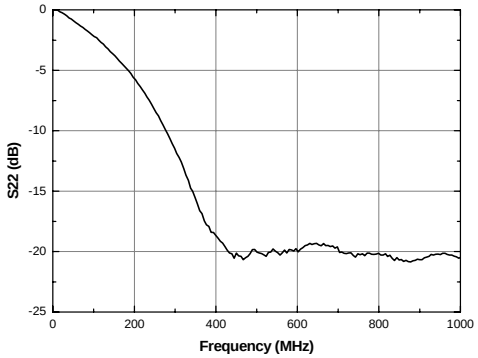
Board Layout (FR4, 40x40 mm², 0.8T)

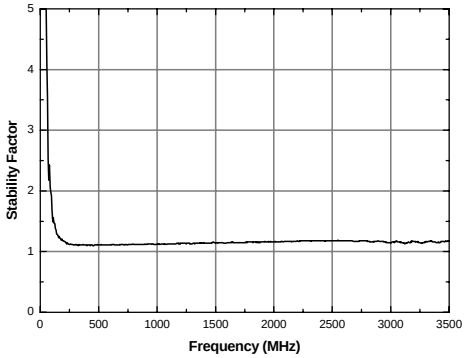


S-parameters & K-factor









APPLICATION CIRCUIT

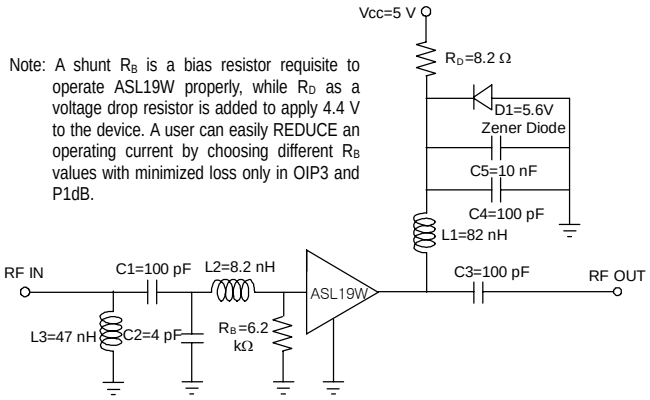
LTE
698 ~ 787
+5 V

Frequency (MHz)	698~787
Magnitude S21 (dB)	20
Magnitude S11 (dB)	-18
Magnitude S22 (dB)	-14
Output P1dB (dBm)	22
Output IP3[1)] (dBm)	35
Noise Figure (dB)	0.8
Supply Voltage (V)	5
Current (mA)	73

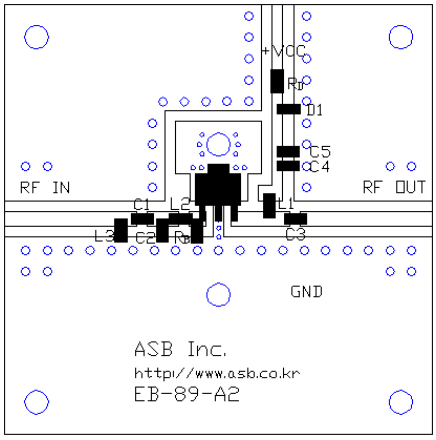
1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1 MHz.

Schematic

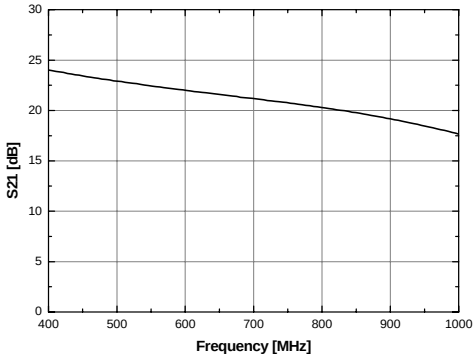
Note: A shunt R_B is a bias resistor requisite to operate ASL19W properly, while R_D as a voltage drop resistor is added to apply 4.4 V to the device. A user can easily REDUCE an operating current by choosing different R_B values with minimized loss only in OIP3 and P1dB.

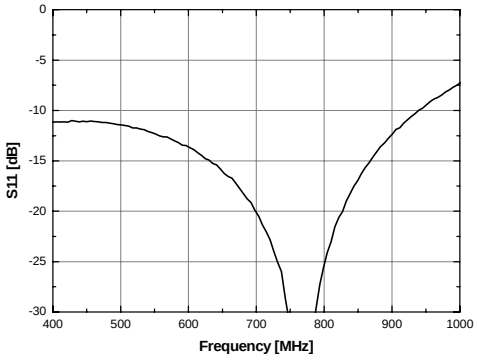


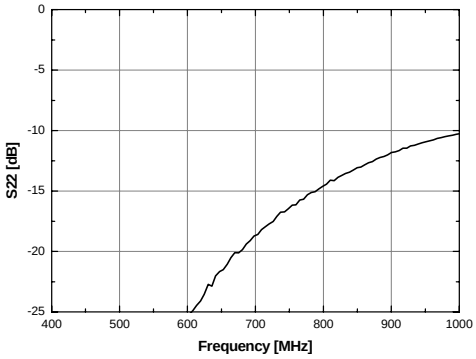
Board Layout (FR4, 40x40 mm², 0.8T)

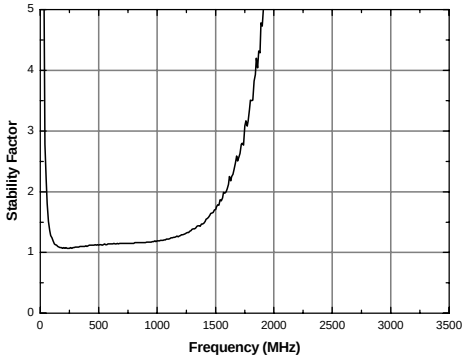


S-parameters & K-factor









APPLICATION CIRCUIT

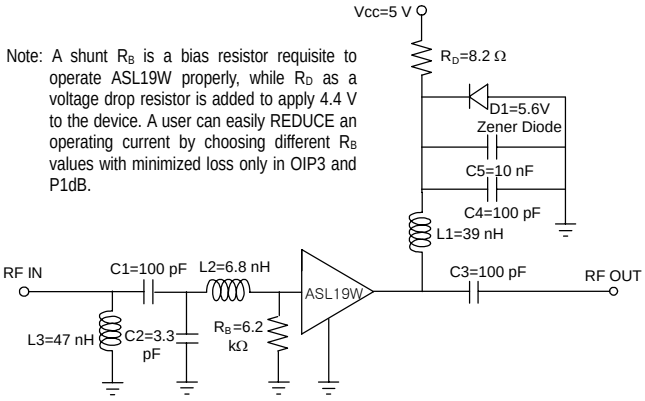
Low Noise
CDMA
824 ~ 894
+5 V

Frequency (MHz)	824	894
Magnitude S21 (dB)	20	20
Magnitude S11 (dB)	-15	-18
Magnitude S22 (dB)	-18	-15
Output P1dB (dBm)	22	22
Output IP3[1)] (dBm)	35.5	35.5
Noise Figure (dB)	0.9	0.95
Supply Voltage (V)	5	5
Current (mA)	73	73

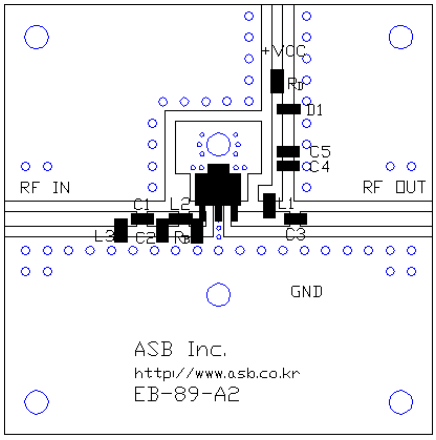
1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1 MHz.

Schematic

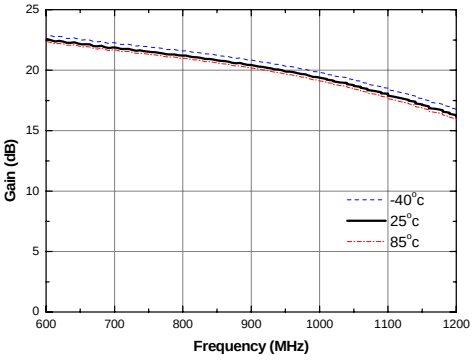
Note: A shunt R_B is a bias resistor requisite to operate ASL19W properly, while R_D as a voltage drop resistor is added to apply 4.4 V to the device. A user can easily REDUCE an operating current by choosing different R_B values with minimized loss only in OIP3 and P1dB.

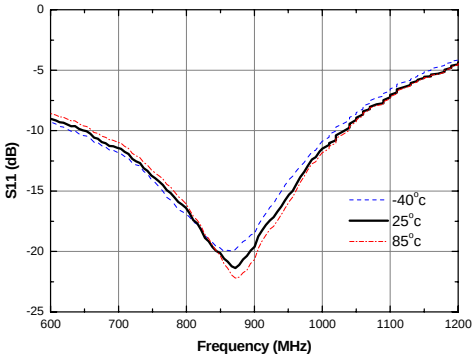


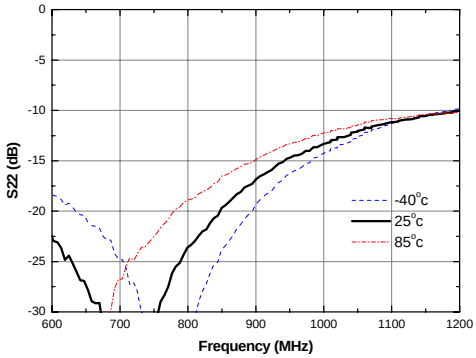
Board Layout (FR4, 40x40 mm^2, 0.8T)

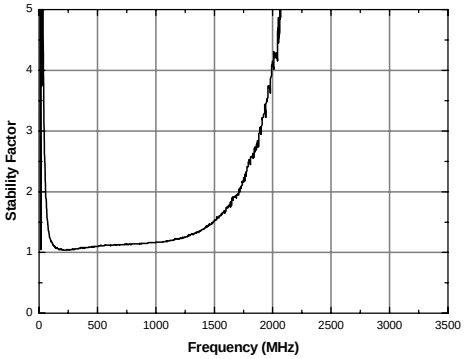


S-parameters & K-factor

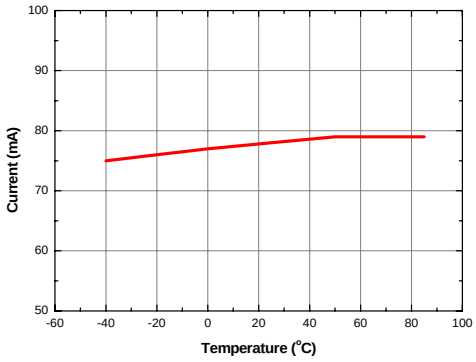




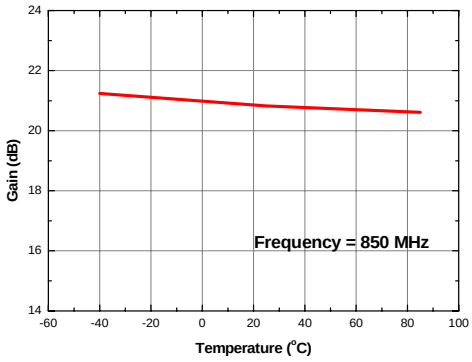




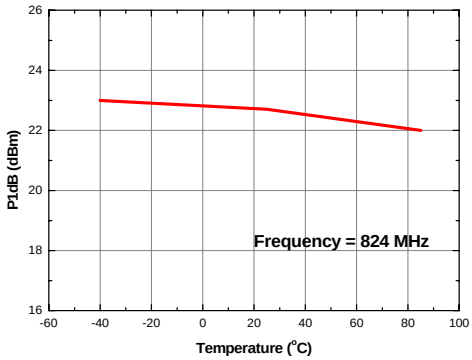
Current vs. Temperature



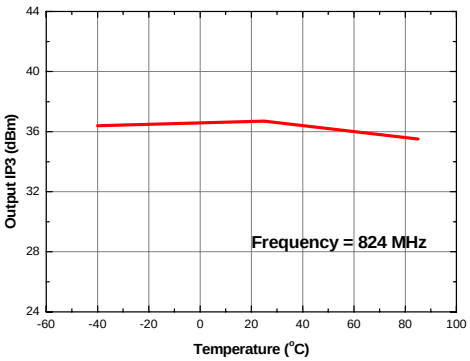
Gain vs. Temperature



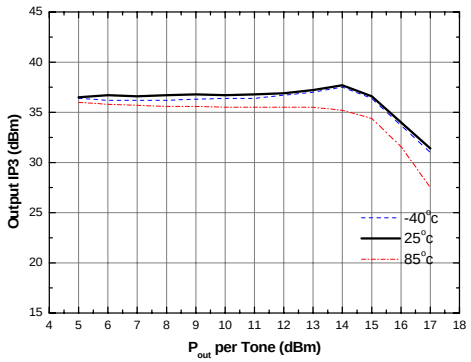
P1dB vs. Temperature



Output IP3 vs. Temperature



Output IP3 vs. Tone Power (Frequency = 824 MHz)



APPLICATION CIRCUIT

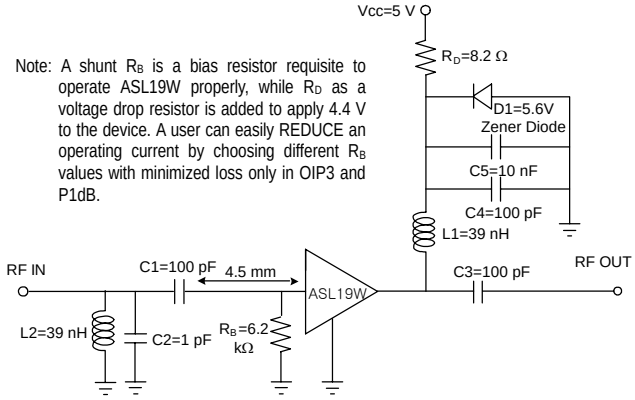
Low Noise
PCS
1750 ~ 1870
+5 V

Frequency (MHz)	1750~1870
Magnitude S21 (dB)	13.5
Magnitude S11 (dB)	-18
Magnitude S22 (dB)	-15
Output P1dB (dBm)	21
Output IP3[1)] (dBm)	37
Noise Figure (dB)	0.9
Supply Voltage (V)	5
Current (mA)	73

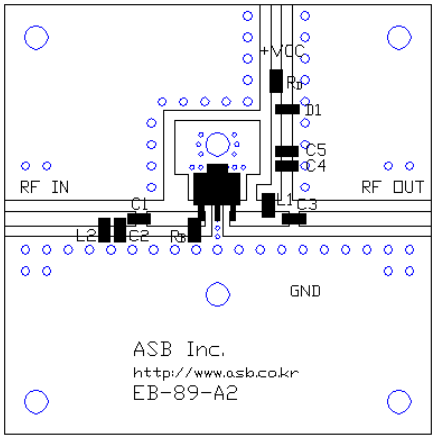
1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1 MHz.

Schematic

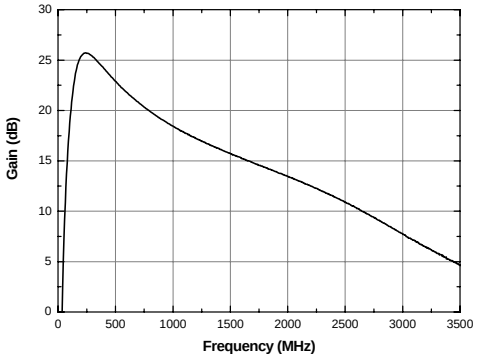
Note: A shunt R_B is a bias resistor requisite to operate ASL19W properly, while R_D as a voltage drop resistor is added to apply 4.4 V to the device. A user can easily REDUCE an operating current by choosing different R_B values with minimized loss only in OIP3 and P1dB.

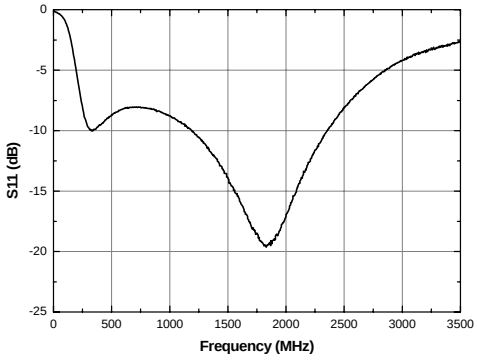


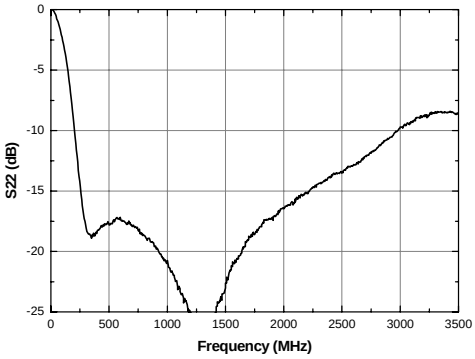
Board Layout (FR4, 40x40 mm^2, 0.8T)

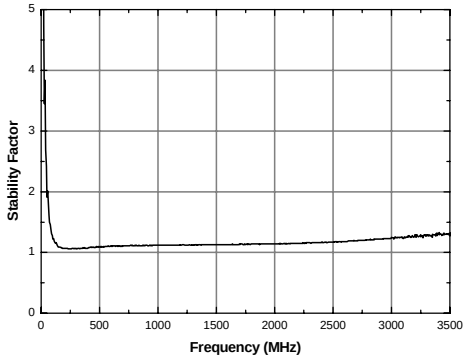


S-parameters & K-factor









APPLICATION CIRCUIT

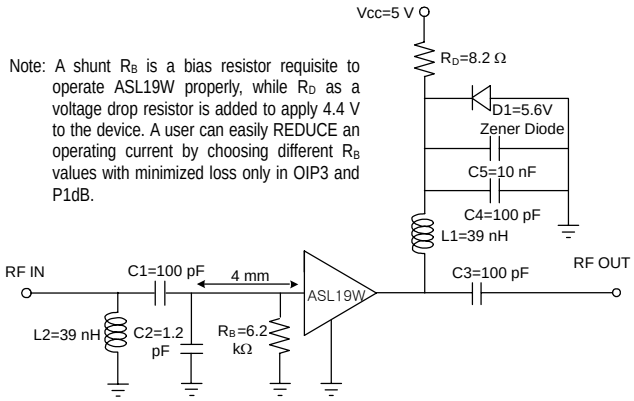
Low Noise
US PCS
1850 ~ 1920
+5 V

Frequency (MHz)	1850~1920
Magnitude S21 (dB)	14.5
Magnitude S11 (dB)	-15
Magnitude S22 (dB)	-15
Output P1dB (dBm)	22
Output IP3[1)] (dBm)	37
Noise Figure (dB)	0.9
Supply Voltage (V)	5
Current (mA)	73

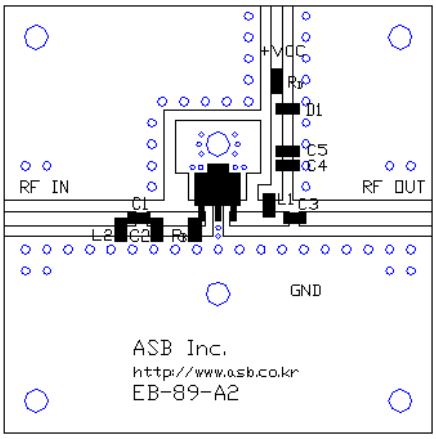
1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1 MHz.

Schematic

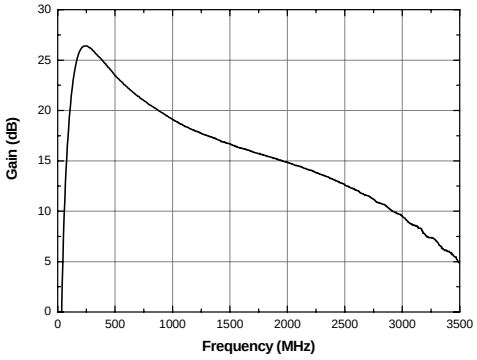
Note: A shunt R_B is a bias resistor requisite to operate ASL19W properly, while R_D as a voltage drop resistor is added to apply 4.4 V to the device. A user can easily REDUCE an operating current by choosing different R_B values with minimized loss only in OIP3 and P1dB.

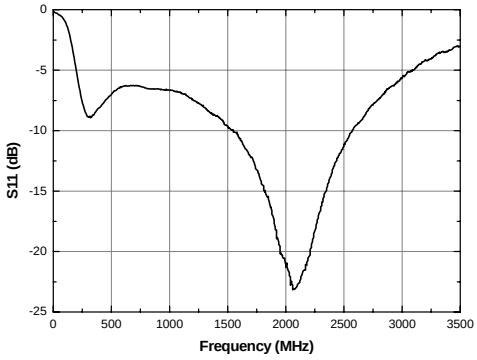


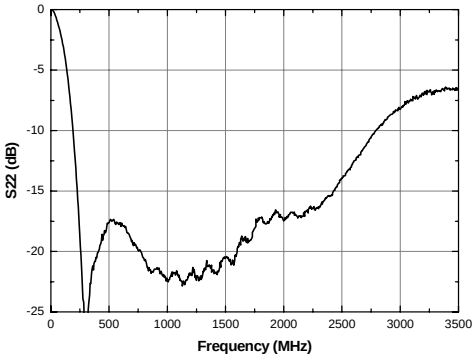
Board Layout (FR4, 40x40 mm^2, 0.8T)

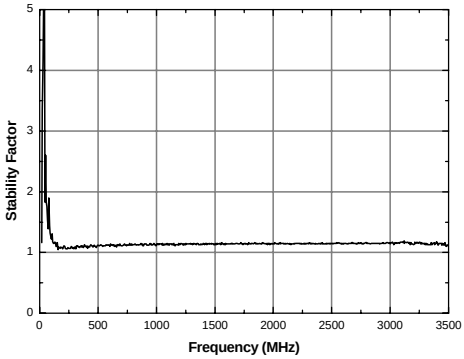


S-parameters & K-factor









APPLICATION CIRCUIT

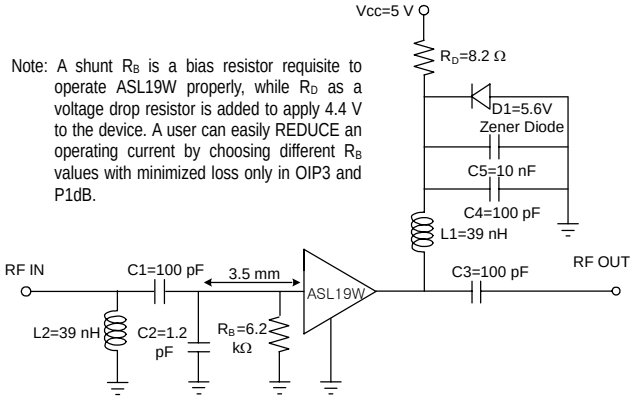
Low Noise
WCDMA
1920 ~ 2170
+5 V

Frequency (MHz)	1920~1980	2110~2170
Magnitude S21 (dB)	13.5	13
Magnitude S11 (dB)	-18	-18
Magnitude S22 (dB)	-15	-14
Output P1dB (dBm)	22	22
Output IP3[1)] (dBm)	37	37
Noise Figure (dB)	0.9	0.9
Supply Voltage (V)	5	5
Current (mA)	73	73

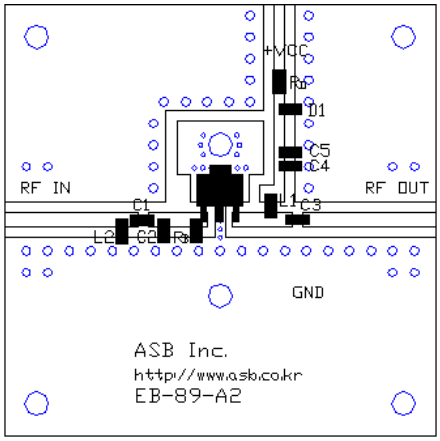
1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1 MHz.

Schematic

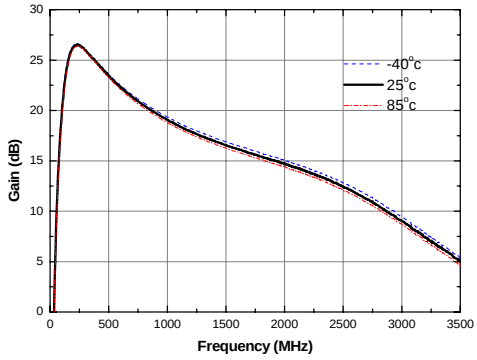
Note: A shunt R_B is a bias resistor requisite to operate ASL19W properly, while R_D as a voltage drop resistor is added to apply 4.4 V to the device. A user can easily REDUCE an operating current by choosing different R_B values with minimized loss only in OIP3 and P1dB.

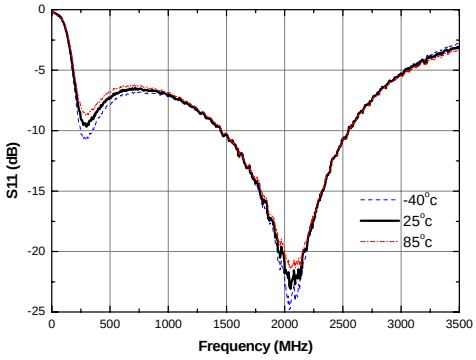


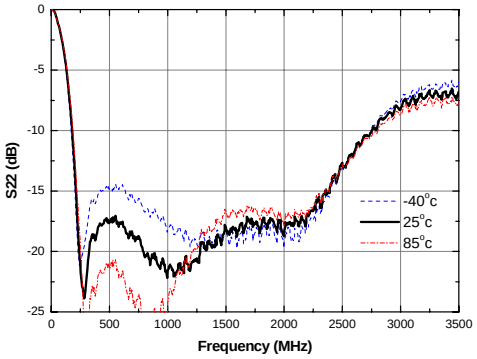
Board Layout (FR4, 40x40 mm^2, 0.8T)

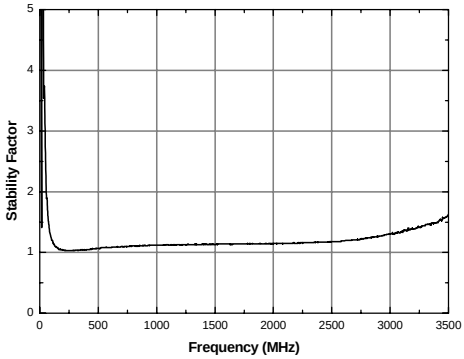


S-parameters & K-factor

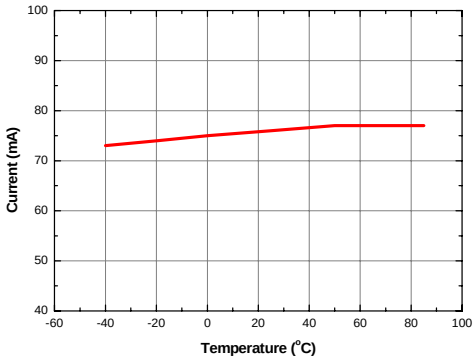




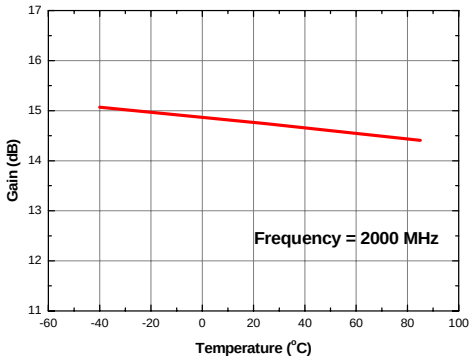




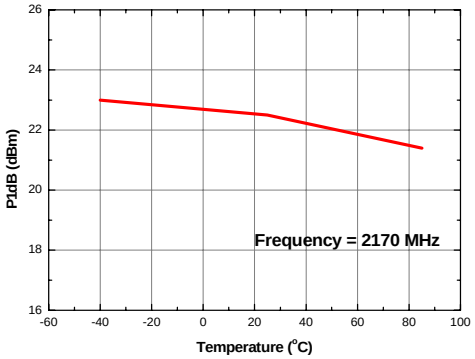
Current vs. Temperature



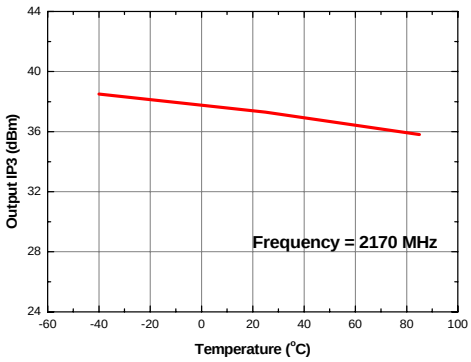
Gain vs. Temperature



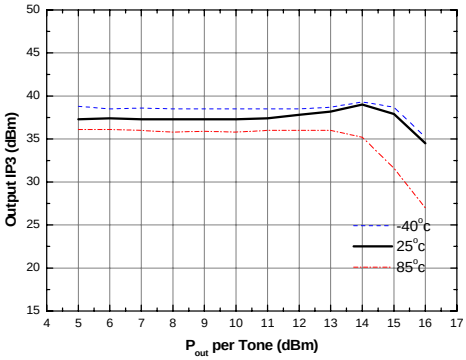
P1dB vs. Temperature



Output IP3 vs. Temperature



Output IP3 vs. Tone Power (Frequency = 2170 MHz)



APPLICATION CIRCUIT

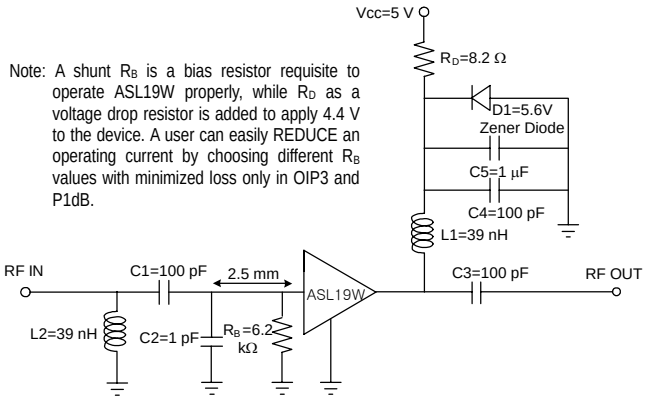
Low Noise
2300 ~ 2700
+5 V

Frequency (MHz)	2300	2500	2700
Magnitude S21 (dB)	12	11.5	11
Magnitude S11 (dB)	-18	-18	-16
Magnitude S22 (dB)	-17	-16	-14
Output P1dB (dBm)	22	22	22
Output IP3[1)] (dBm)	37.5	37.5	38
Noise Figure (dB)	1.0	1.1	1.1
Supply Voltage (V)	5	5	5
Current (mA)	73	73	73

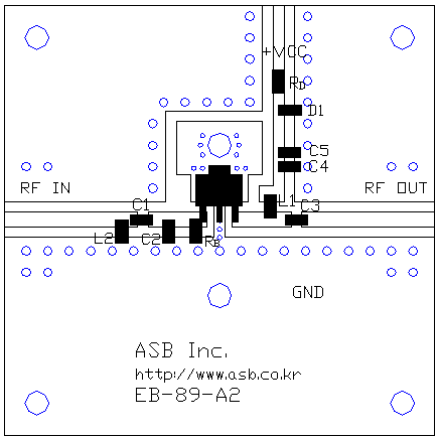
1) OIP3 is measured with two tones at an output power of +10 dBm/tone separated by 1 MHz.

Schematic

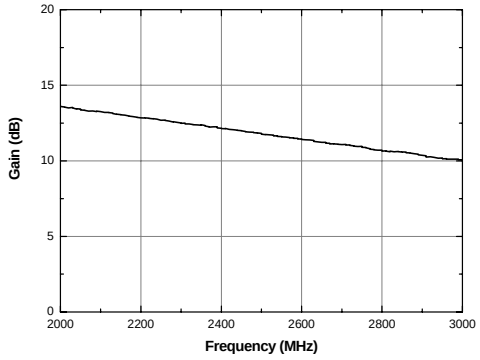
Note: A shunt R_B is a bias resistor requisite to operate ASL19W properly, while R_D as a voltage drop resistor is added to apply 4.4 V to the device. A user can easily REDUCE an operating current by choosing different R_B values with minimized loss only in OIP3 and P1dB.

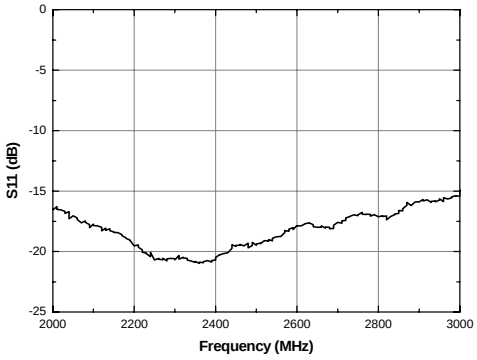


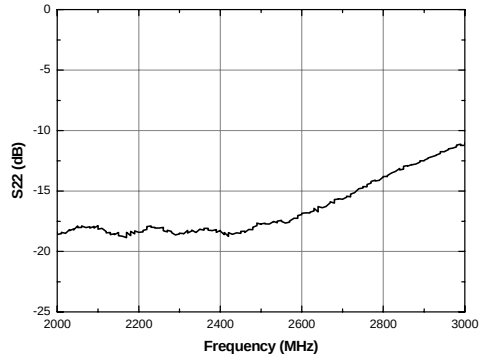
Board Layout (FR4, 40x40 mm^2, 0.8T)

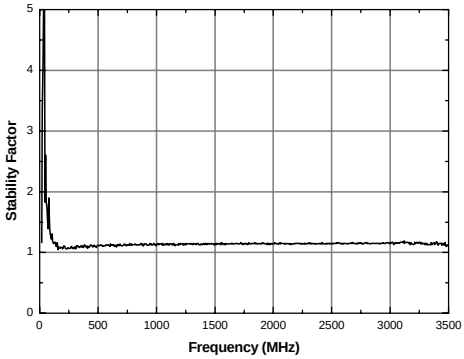


S-parameters & K-factor









APPLICATION CIRCUIT

DVB-T (V band)

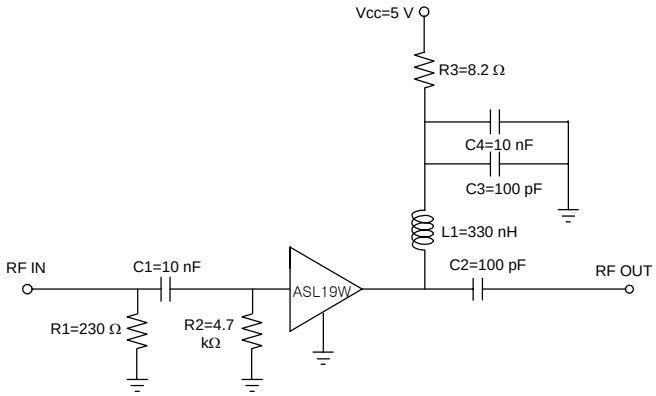
176 ~ 264

+5 V

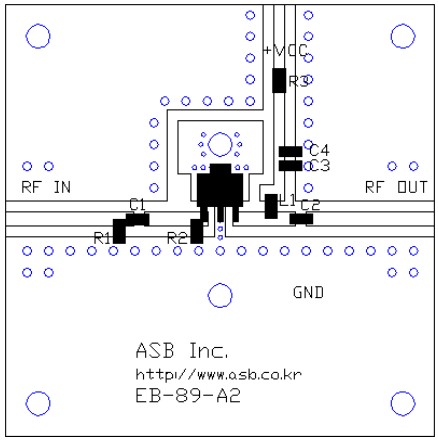
Frequency (MHz)	176	264
Gain Flatness (dB)	*0.8*	
Magnitude S21 (dB)	24.3	23.6
Magnitude S11 (dB)	-10	-10
Magnitude S22 (dB)	-14	-15
Output P1dB (dBm)	20	20
Output IP3[1)] (dBm)	30	30
Noise Figure (dB)	1.7	1.6
Supply Voltage (V)	5	5
Current (mA)	37	37

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

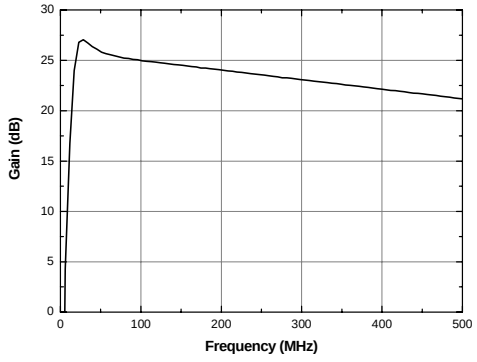
Schematic

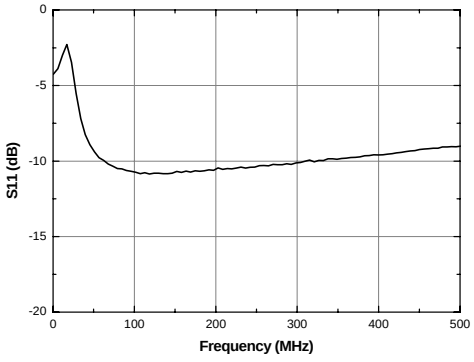


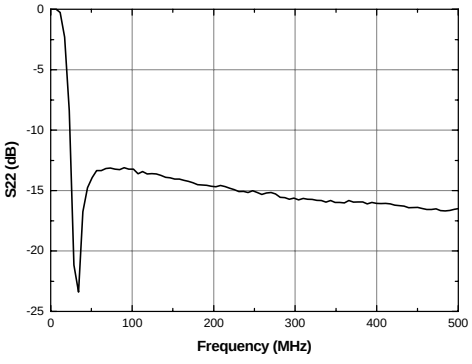
Board Layout (FR4, 40x40 mm^2, 0.8T)

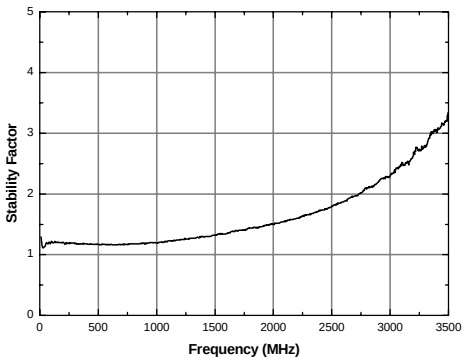


S-parameters & K-factor









APPLICATION CIRCUIT

DVB-T (U band)

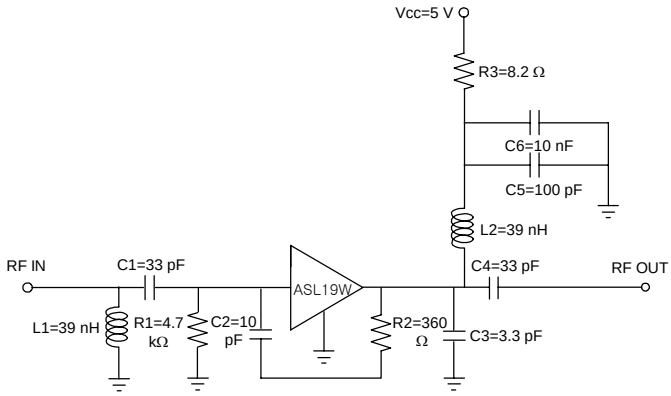
478 ~ 862

+5 V

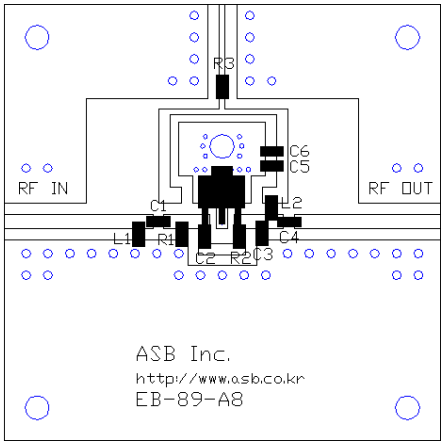
Frequency (MHz)	478	862
Gain Flatness (dB)	*0.6*	
Magnitude S21 (dB)	17.3	16.8
Magnitude S11 (dB)	-9	-12
Magnitude S22 (dB)	-9	-20
Output P1dB (dBm)	20	16
Output IP3[1)] (dBm)	28	25
Noise Figure (dB)	1.43	1.48
Supply Voltage (V)	5	5
Current (mA)	37	37

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

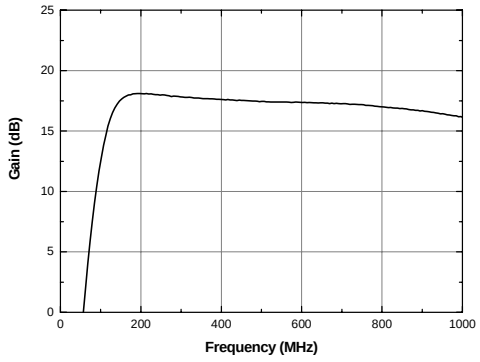
Schematic

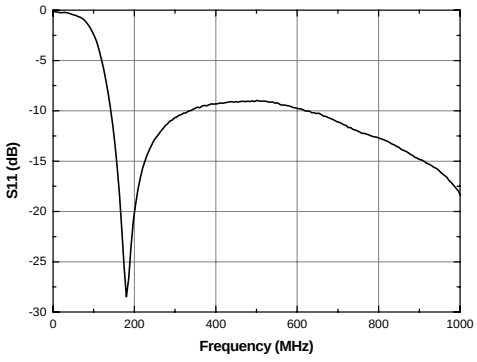


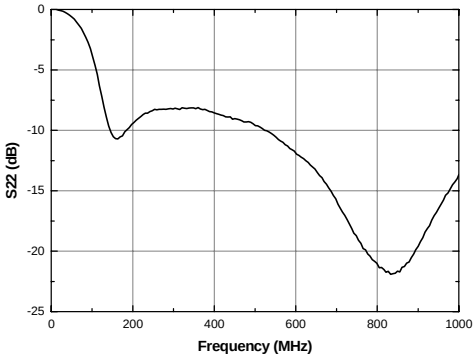
Board Layout (FR4, 40x40 mm^2, 0.8T)

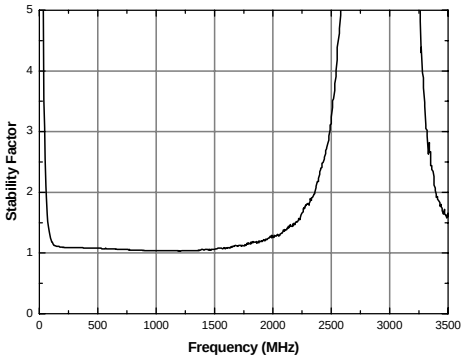


S-parameters & K-factor









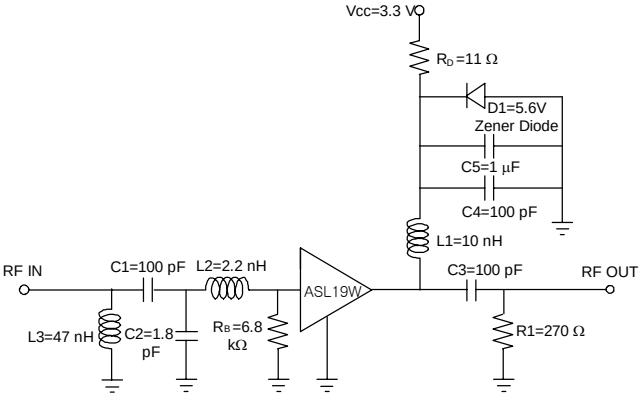
APPLICATION CIRCUIT

GPS
1575
+3.3 V

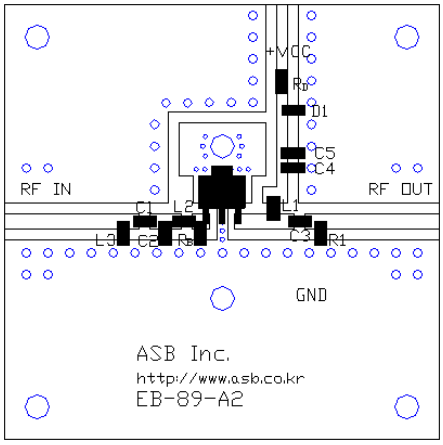
Frequency (MHz)	1575
Magnitude S21 (dB)	14.0
Magnitude S11 (dB)	-14
Magnitude S22 (dB)	-14
Output P1dB (dBm)	17
Output IP3[1)] (dBm)	27.5
Noise Figure (dB)	1.1
Supply Voltage (V)	3.3
Current (mA)	20

1) OIP3 is measured with two tones at an output power of +0 dBm/tone separated by 1 MHz.

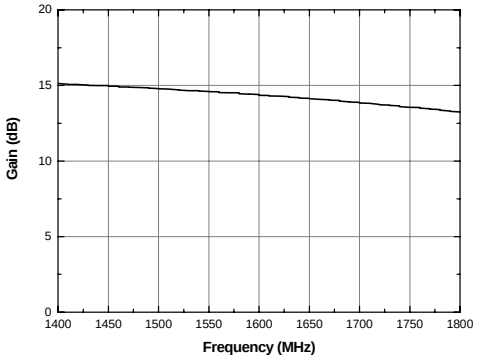
Schematic

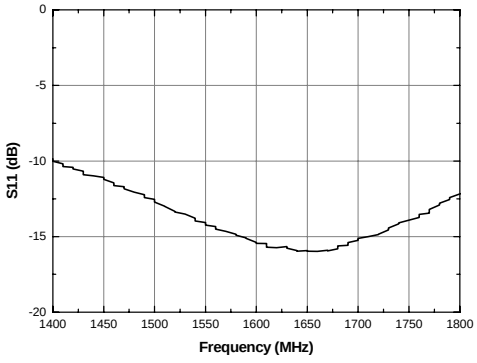


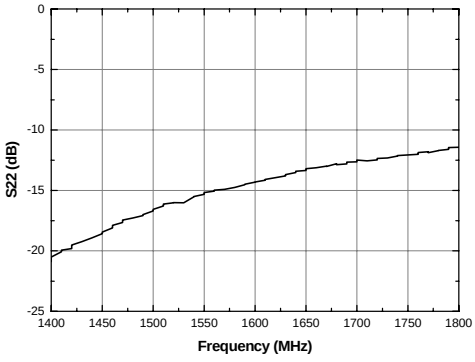
Board Layout (FR4, 40x40 mm^2, 0.8T)

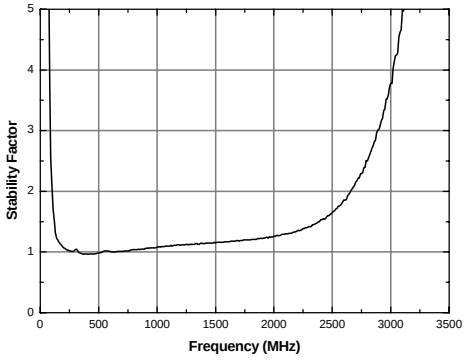


S-parameters & K-factor

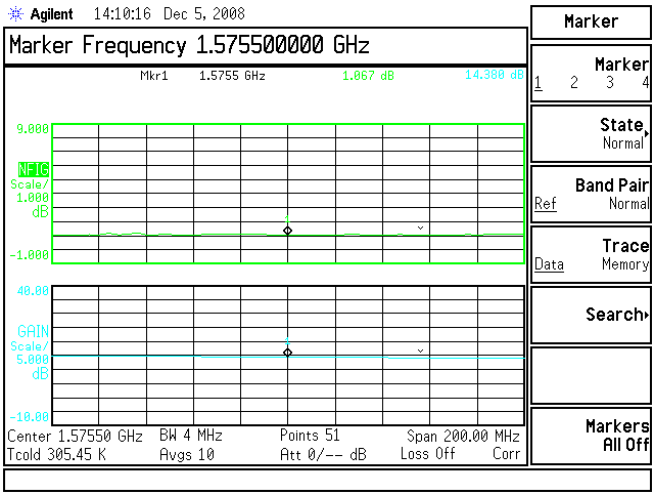




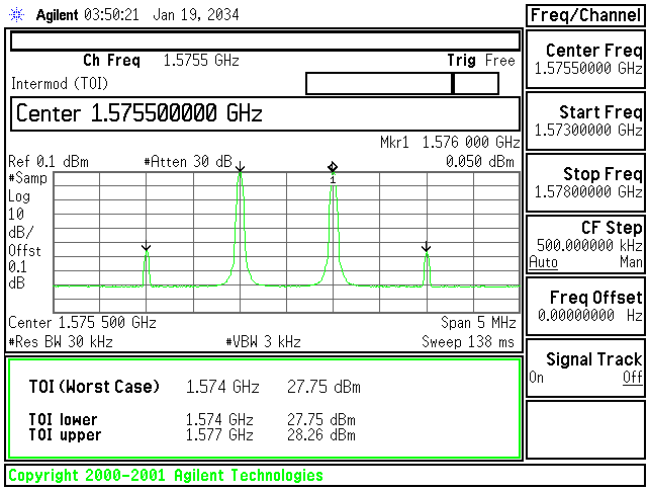




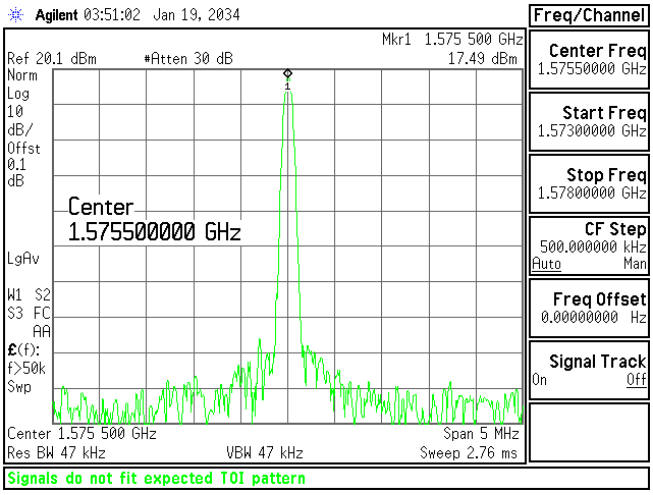
NF


Agilent 14:10:16 Dec 5, 2008
Marker Frequency 1.575500000 GHz
Mkr1 1.5755 GHz
1.067 dB
14.380 dB
NFIG
Scale/ 1.000 dB
9.000
-1.000
GAIN
Scale/ 5.000 dB
40.00
-10.00
Center 1.57550 GHz
BW 4 MHz
Points 51
Span 200.00 MHz
Tcold 305.45 K
Avgs 10
Att 0/-- dB
Loss Off
Corr
Marker
Marker 1 2 3 4
State Normal
Band Pair Ref Normal
Trace Data Memory
Search
Markers All Off

OIP3

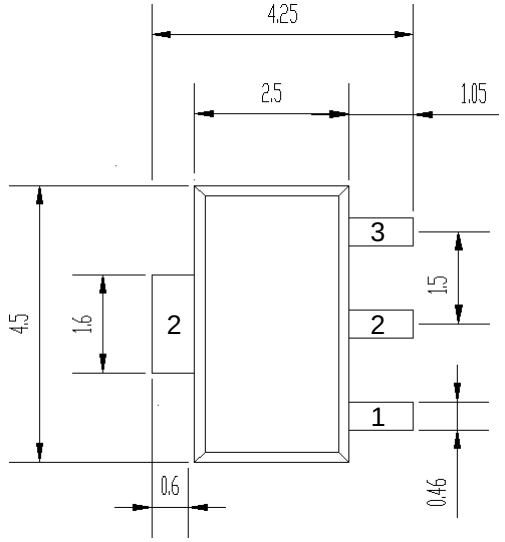

Agilent 03:50:21 Jan 19, 2034
Ch Freq 1.5755 GHz
Trig Free
Intermod (TOI)
Center 1.575500000 GHz
Mkr1 1.576 000 GHz
Ref 0.1 dBm
#Atten 30 dB
0.050 dBm
#Samp
Log
10
dB/
Offst
0.1
dB
Center 1.575 500 GHz
Span 5 MHz
#Res BW 30 kHz
#VBW 3 kHz
Sweep 138 ms
TOI (Worst Case) 1.574 GHz 27.75 dBm
TOI lower 1.574 GHz 27.75 dBm
TOI upper 1.577 GHz 28.26 dBm
Copyright 2000-2001 Agilent Technologies
Freq/Channel
Center Freq 1.57550000 GHz
Start Freq 1.57300000 GHz
Stop Freq 1.57800000 GHz
CF Step 500.000000 kHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

P1dB

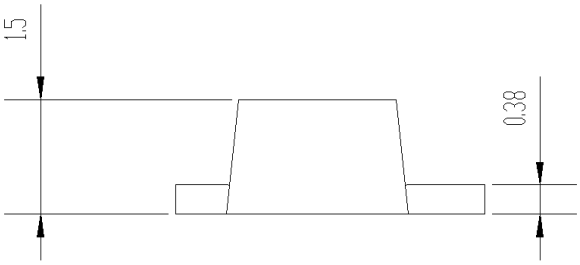

Agilent 03:51:02 Jan 19, 2034
Mkr1 1.575 500 GHz
Ref 20.1 dBm
#Atten 30 dB
17.49 dBm
Norm
Log
10
dB/
Offst
0.1
dB
Center
1.575500000 GHz
LgAv
W1 S2
S3 FC
AA
£(f):
f>50k
Swp
Center 1.575 500 GHz
Span 5 MHz
Res BW 47 kHz
VBW 47 kHz
Sweep 2.76 ms
Signals do not fit expected TOI pattern
Freq/Channel
Center Freq 1.57550000 GHz
Start Freq 1.57300000 GHz
Stop Freq 1.57800000 GHz
CF Step 500.000000 kHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

Outline Drawing

(Unit: mm)

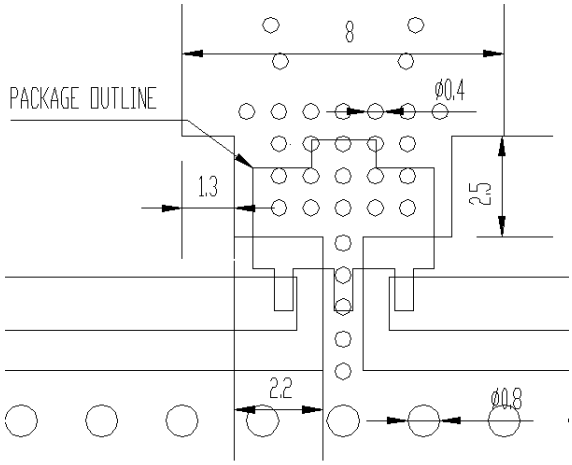


Function	Pin No.
Input	1
Ground	2
Output	3



Mounting Recommendation

(Unit: 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 the lead pin 2 and exposed pad of the device 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