Advanced Semiconductor Business Inc.

ASX501

250-2500 MHz MMIC Amplifier

Features

- 18dB Gain at 900 MHz
- 31.5 dBm P1dB at 900 MHz
- 47 dBm Output IP3 at 900 MHz
- MTTF > 100 Years
- Single Supply

Description

The ASX501, a power amplifier MMIC, has a high linearity, high gain, and high efficiency over a wide range of frequency, being suitable for use in both receiver and transmitter of telecommunication systems up to 2.5 GHz. 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		Typical	
Frequency	MHz	900	2000	900	2000
Gain	dB	18	11.5	18	11.5
S11	dB	-16	-15	-16	-15
S22	dB	-17	-13	-17	-13
Output IP3	dBm	47[1)]	47[2)]	44[1)]	44[2)]
Noise Figure	dB	4.7	5.0	4.7	5.0
Output P1dB	dBm	31.5	31	31.5	31
Current	mA	560	560	457	457
Device Voltage	V	5	5	4.7	4.7

1) OIP3 measured with two tones at an output power of +12 dBm/tone separated by 1 MHz.
2) OIP3 measured with two tones at an output power of +15 dBm/tone separated by 1 MHz.

Application Circuit

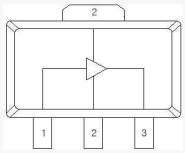
- 450 ~ 470 MHz
- LTE
- CDMA
- GSM
- PCS
- WCDMA
- 908 ~ 923 MHz (balanced)

Product Specifications*

Parameters	Units	Min	Typ	Max
Testing Frequency	MHz		900	
Gain	dB	18	18	
S11	dB		-16	
S22	dB		-17	
Output IP3	dBm	46	47	
Noise Figure	dB		4.7	4.8
Output P1dB	dBm	29.5	31.5	
Current	mA	520	560	600
Device Voltage	V		5	

* 100% in-house DC & RF testing is done on packaged products before taping.

Pin Configuration



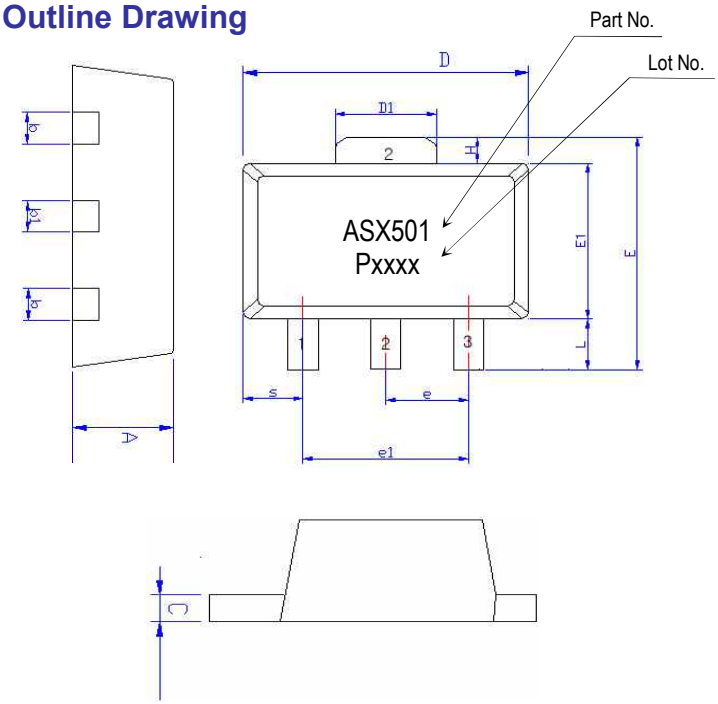
Pin No.	Function
1	RF IN
2	GND
3	RF OUT / Bias

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, 50ohm matched)*	25 dBm

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

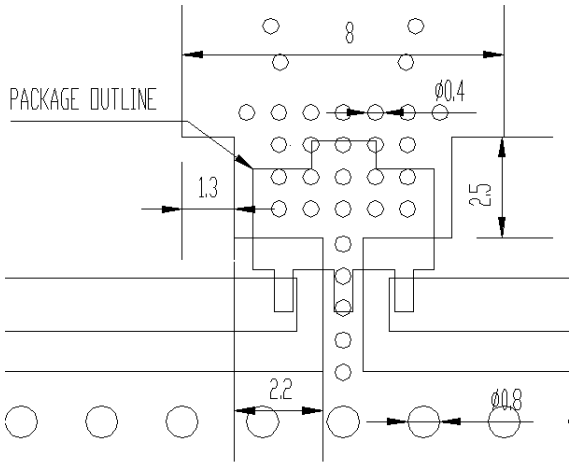
Outline Drawing



Symbols	Dimensions (In mm)		
	MIN	NOM	MAX
A	1.40	1.50	1.60
L	0.89	1.04	1.20
b	0.36	0.42	0.48
b1	0.41	0.47	0.53
C	0.38	0.40	0.43
D	4.40	4.50	4.60
D1	1.40	1.60	1.75
E	3.64	---	4.25
E1	2.40	2.50	2.60
e1	2.90	3.00	3.10
H	0.35	0.40	0.45
S	0.65	0.75	0.85
e	1.40	1.50	1.60

Pin No.	Function
1	RF IN
2	GND
3	RF OUT / Bias

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 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 1B
	Voltage Level: 500 V~1000 V
MM	Class A
	Voltage Level: <200 V

CAUTION: ESD-sensitive device!

Moisture Sensitivity Level (MSL)	
	Level 3 at 260°C reflow

APPLICATION CIRCUIT

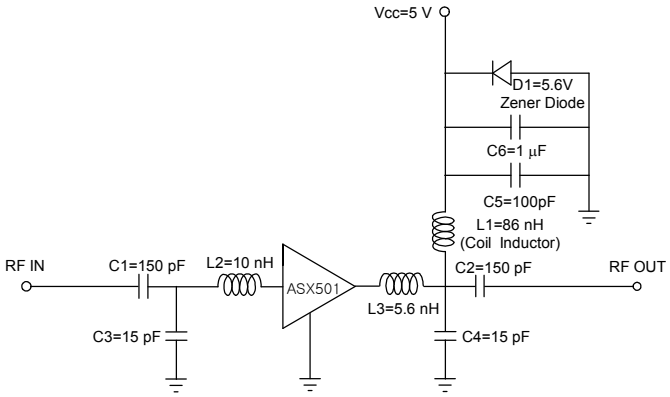
450 ~ 470 MHz

+5 V

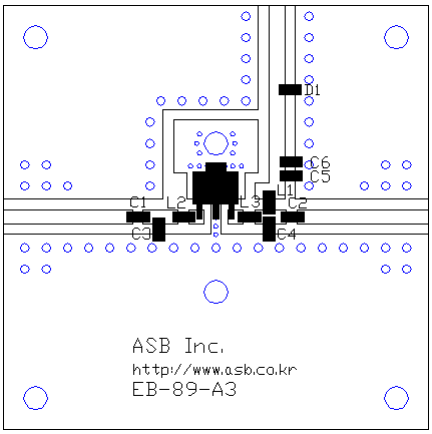
Frequency (MHz)	450~470
Magnitude S21 (dB)	20
Magnitude S11 (dB)	-11
Magnitude S22 (dB)	-12
Output P1dB (dBm)	31.5
Output IP3[1] (dBm)	45
Noise Figure (dB)	6.2
Device Voltage (V)	5
Current (mA)	560

1) OIP3 is measured with two tones at an output power of +11 dBm/tone separated by 1 MHz

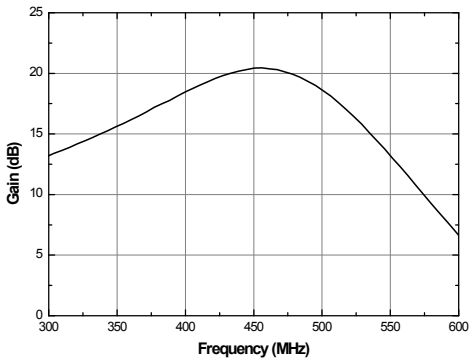
Schematic

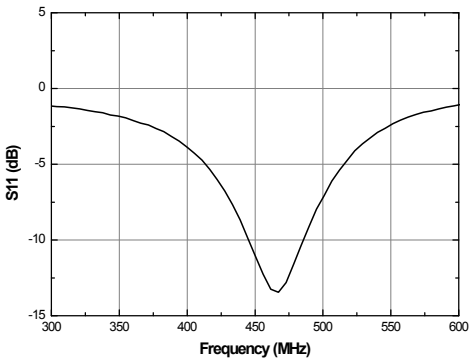


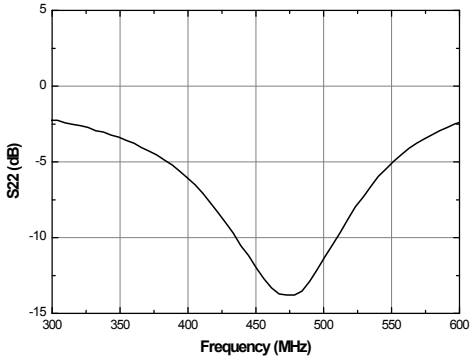
Board Layout (FR4, 40x40 mm^2, 0.8T)

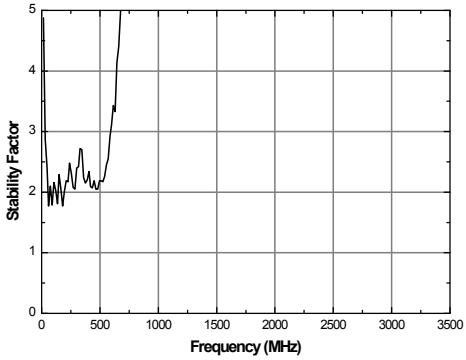


S-parameters & K-factor









APPLICATION CIRCUIT

LTE

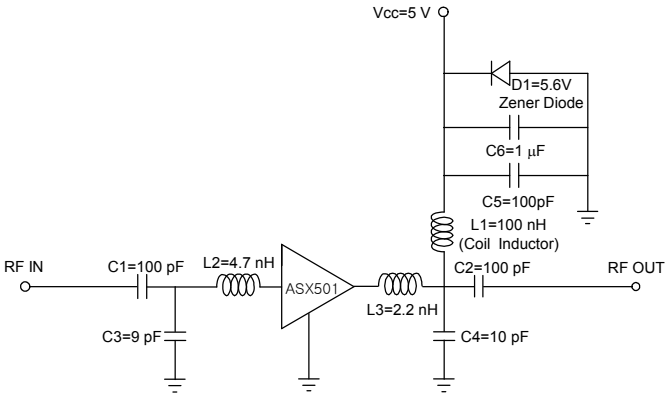
698 ~ 787 MHz

+5 V

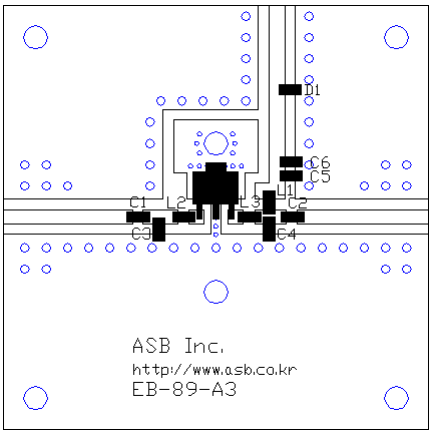
Frequency (MHz)	698~787
Magnitude S21 (dB)	17.5
Magnitude S11 (dB)	-9
Magnitude S22 (dB)	-15
Output P1dB (dBm)	33
Output IP3[1] (dBm)	47
Noise Figure (dB)	4.8
Device Voltage (V)	5
Current (mA)	560

1) OIP3 is measured with two tones at an output power of +15 dBm/tone separated by 1 MHz

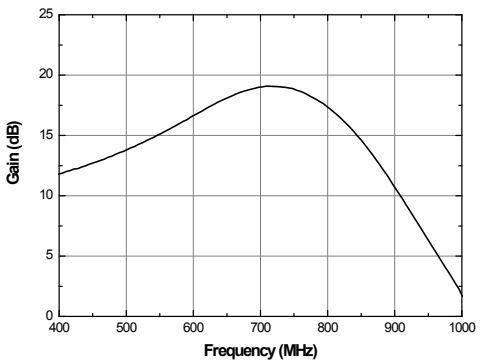
Schematic

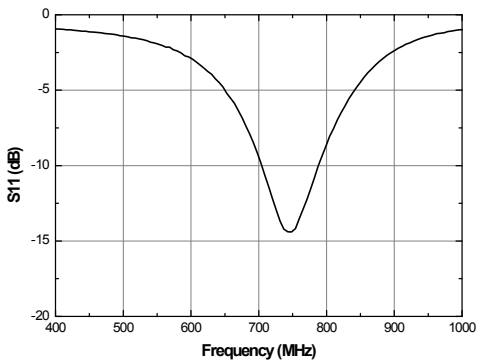


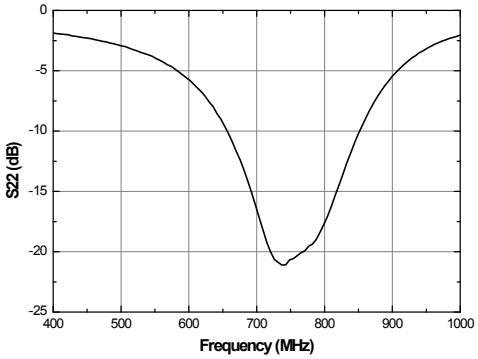
Board Layout (FR4, 40x40 mm^2, 0.8T)

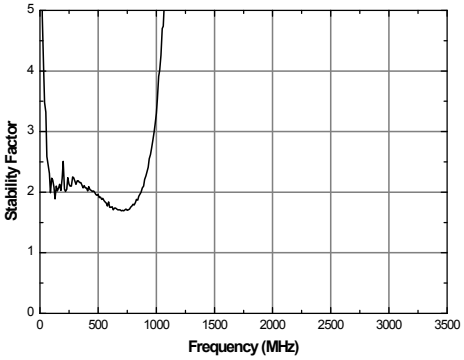


S-parameters & K-factor









APPLICATION CIRCUIT

CDMA Rx

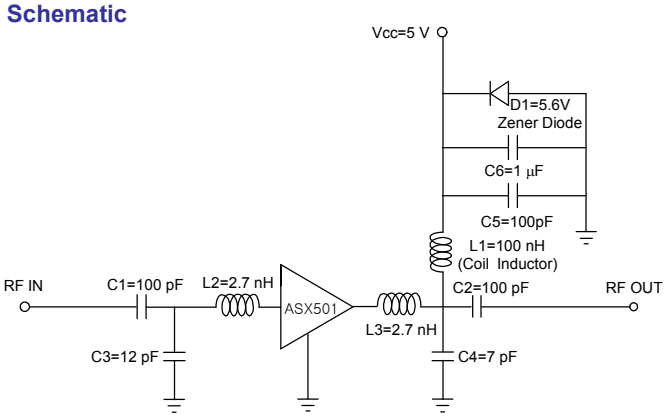
824 ~ 849 MHz

+5 V

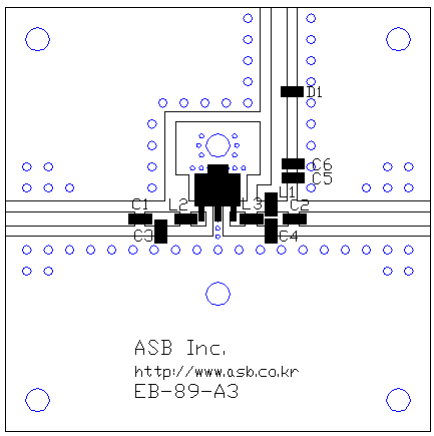
Frequency (MHz)	824~849
Magnitude S21 (dB)	17.5
Magnitude S11 (dB)	-13
Magnitude S22 (dB)	-18
Output P1dB (dBm)	30.5
Output IP3[1] (dBm)	46
Noise Figure (dB)	4.6
Device Voltage (V)	5
Current (mA)	560

1) OIP3 is measured with two tones at an output power of +12 dBm/tone separated by 1 MHz

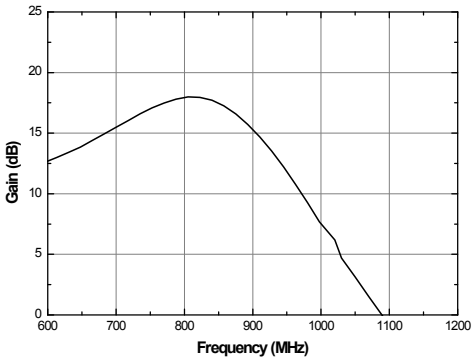
Schematic

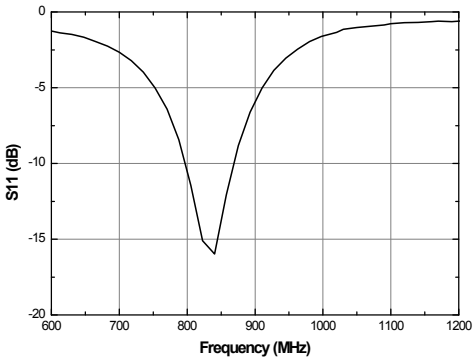


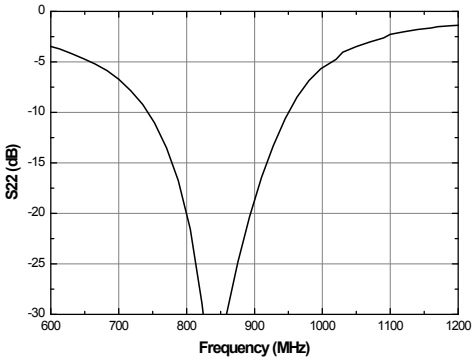
Board Layout (FR4, 40x40 mm^2, 0.8T)

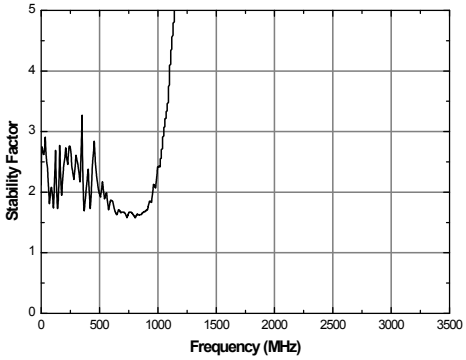


S-parameters & K-factor









APPLICATION CIRCUIT

CDMA Tx

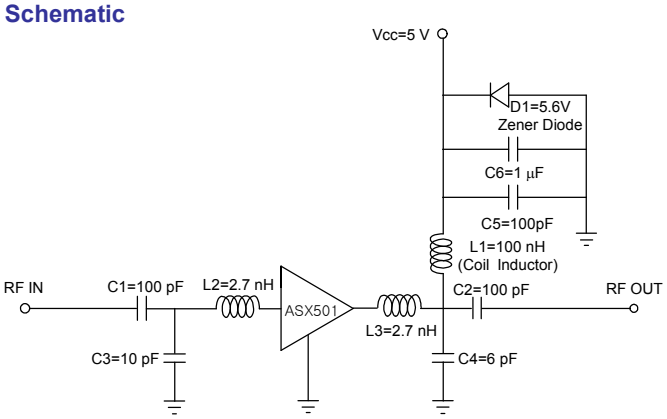
869 ~ 894 MHz

+5 V

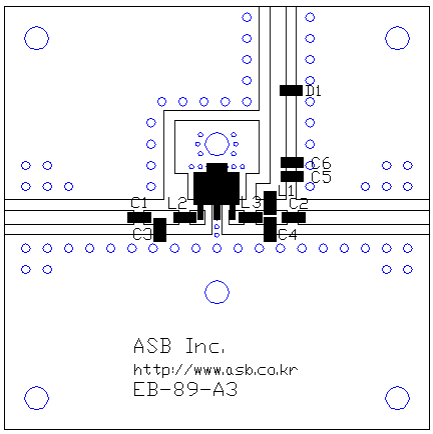
Frequency (MHz)	869~894
Magnitude S21 (dB)	17.5
Magnitude S11 (dB)	-16
Magnitude S22 (dB)	-16
Output P1dB (dBm)	31
Output IP3[1)] (dBm)	46
Noise Figure (dB)	4.8
Device Voltage (V)	5
Current (mA)	560

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

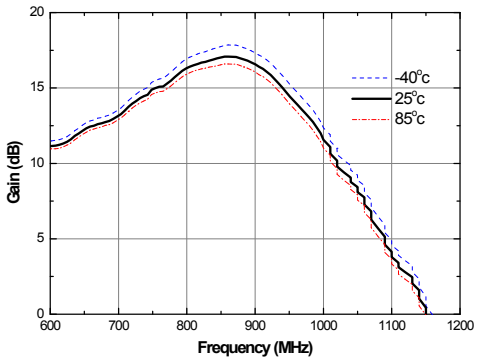
Schematic

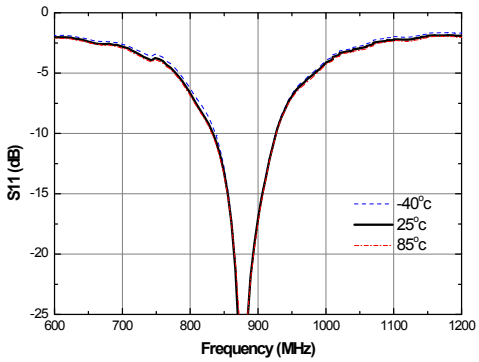


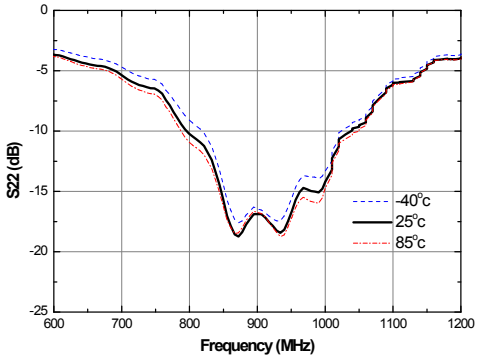
Board Layout (FR4, 40x40 mm^2, 0.8T)

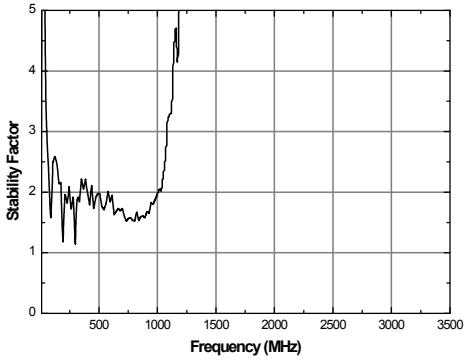


S-parameters & K-factor

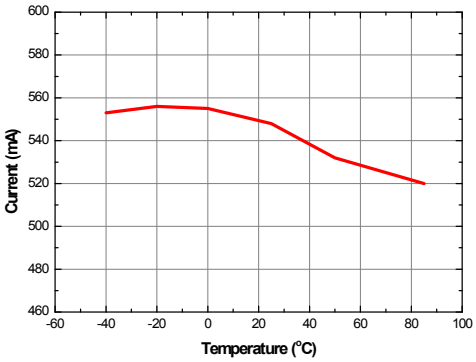




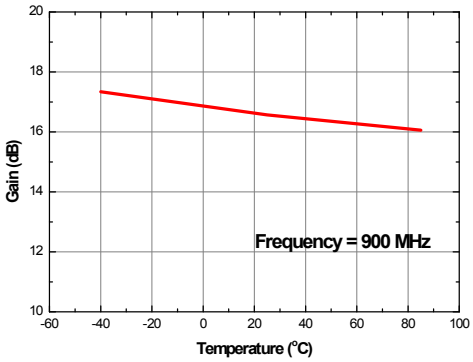




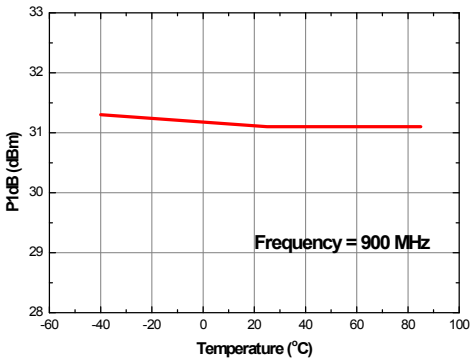
Current vs. Temperature



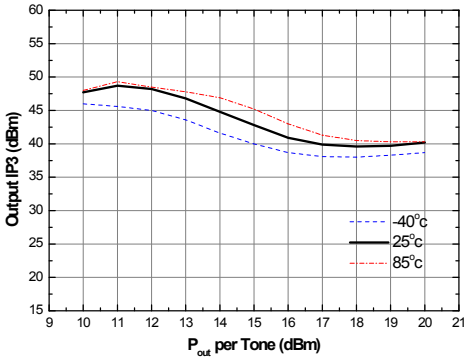
Gain vs. Temperature



P1dB vs. Temperature



Output IP3 vs. Tone Power (Frequency = 900 MHz)



APPLICATION CIRCUIT

GSM Rx

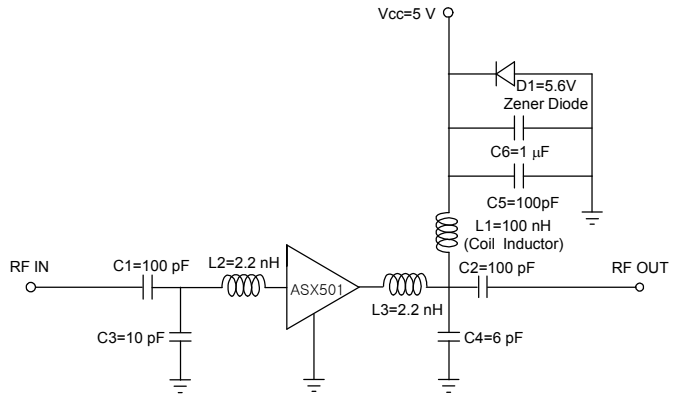
890 ~ 915 MHz

+5 V

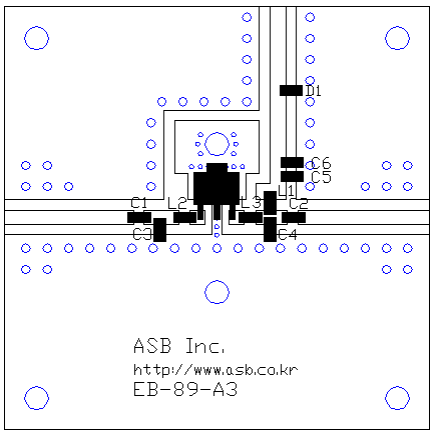
Frequency (MHz)	890~915
Magnitude S21 (dB)	17.8
Magnitude S11 (dB)	-16
Magnitude S22 (dB)	-17
Output P1dB (dBm)	31.5
Output IP3[1] (dBm)	47
Noise Figure (dB)	4.7
Device Voltage (V)	5
Current (mA)	560

1) OIP3 is measured with two tones at an output power of +12 dBm/tone separated by 1 MHz.

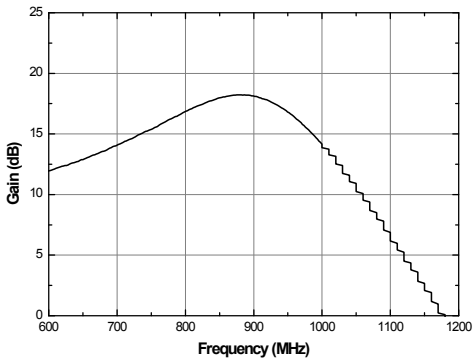
Schematic

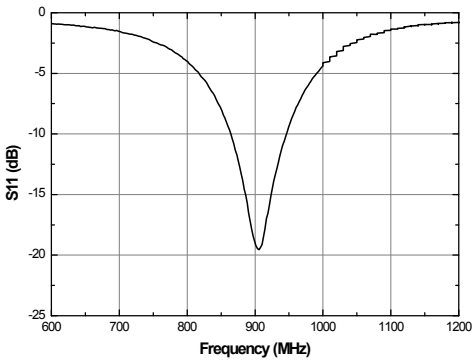


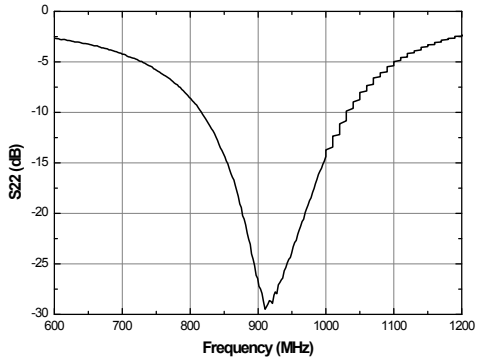
Board Layout (FR4, 40x40 mm^2, 0.8T)

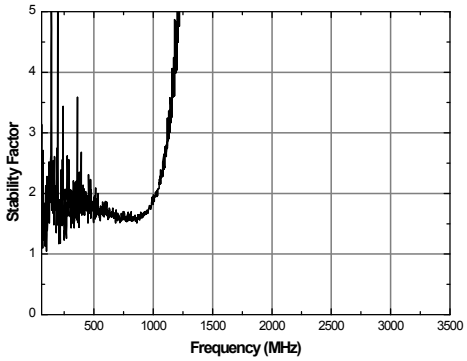


S-parameters & K-factor









APPLICATION CIRCUIT

GSM Tx

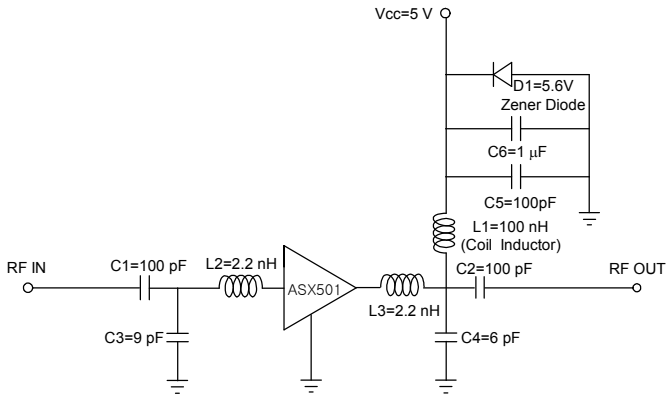
935 ~ 960 MHz

+5 V

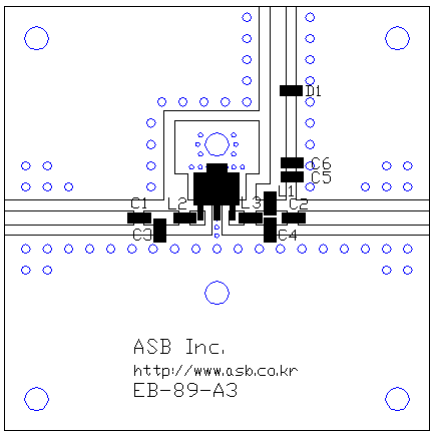
Frequency (MHz)	935~960
Magnitude S21 (dB)	17.6
Magnitude S11 (dB)	-18
Magnitude S22 (dB)	-18
Output P1dB (dBm)	31.5
Output IP3[1)] (dBm)	47
Noise Figure (dB)	4.5
Device Voltage (V)	5
Current (mA)	560

1) OIP3 is measured with two tones at an output power of +13 dBm/tone separated by 1 MHz.

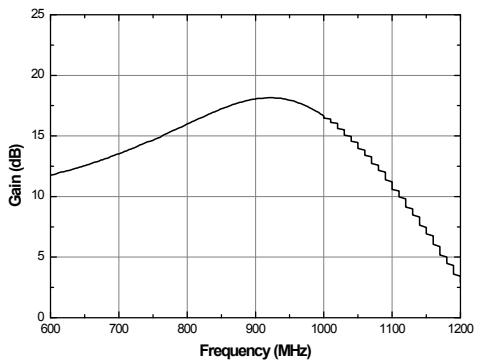
Schematic

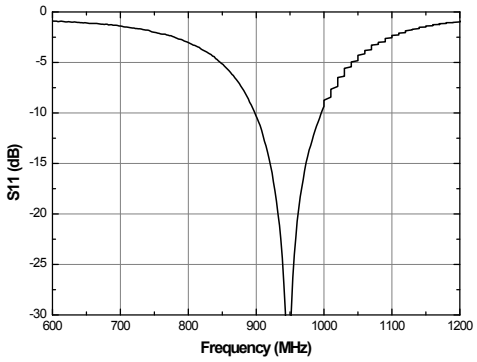


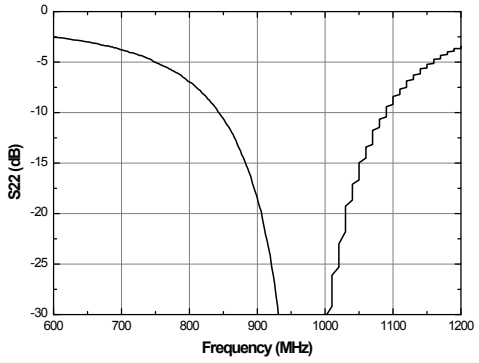
Board Layout (FR4, 40x40 mm^2, 0.8T)

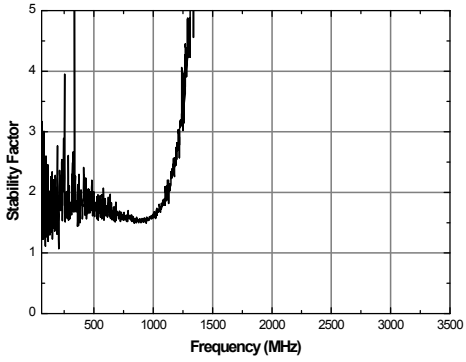


S-parameters & K-factor









APPLICATION CIRCUIT

PCS Rx

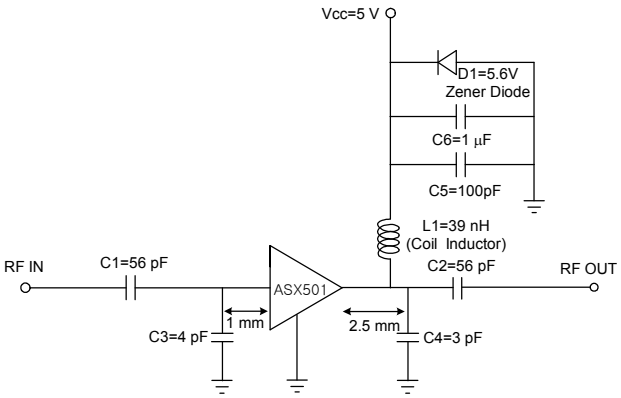
1750 ~ 1780 MHz

+5 V

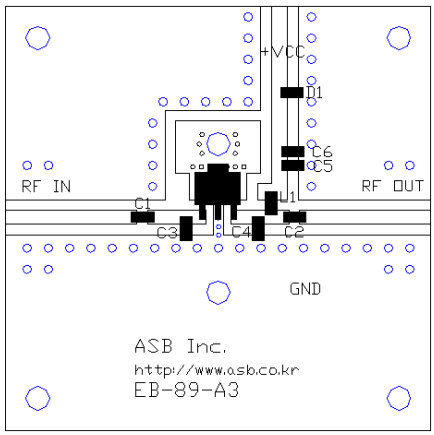
Frequency (MHz)	1750~1780
Magnitude S21 (dB)	12
Magnitude S11 (dB)	-16
Magnitude S22 (dB)	-17
Output P1dB (dBm)	31
Output IP3[1] (dBm)	47
Noise Figure (dB)	4.6
Device Voltage (V)	5
Current (mA)	560

1) OIP3 is measured with two tones at an output power of +13 dBm/tone separated by 1 MHz.

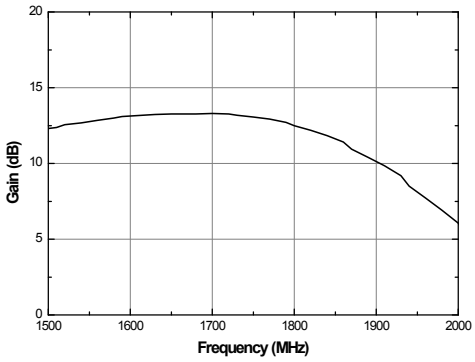
Schematic

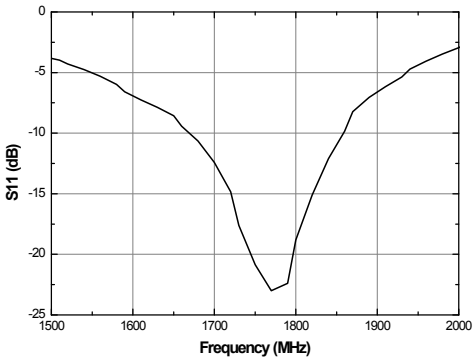


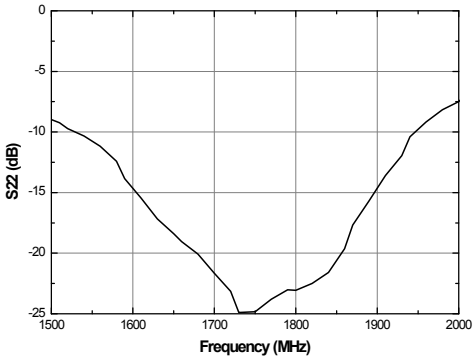
Board Layout (FR4, 40x40 mm^2, 0.8T)

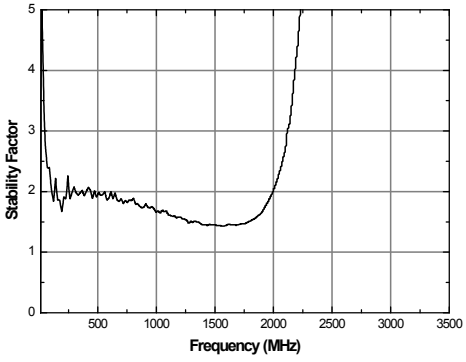


S-parameters & K-factor









APPLICATION CIRCUIT

PCS Tx

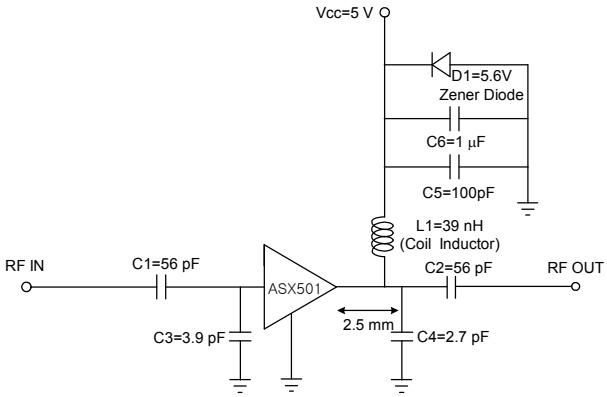
1840 ~ 1870 MHz

+5 V

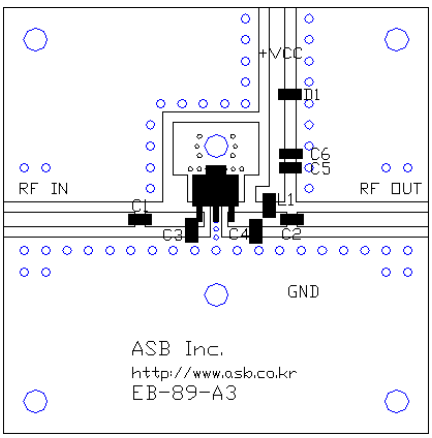
Frequency (MHz)	1840~1870
Magnitude S21 (dB)	11.5
Magnitude S11 (dB)	-16
Magnitude S22 (dB)	-18
Output P1dB (dBm)	31
Output IP3[1)] (dBm)	47
Noise Figure (dB)	4.6
Device Voltage (V)	5
Current (mA)	560

1) OIP3 is measured with two tones at an output power of +13 dBm/tone separated by 1 MHz.

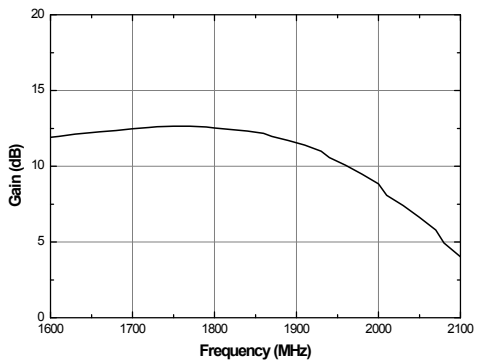
Schematic

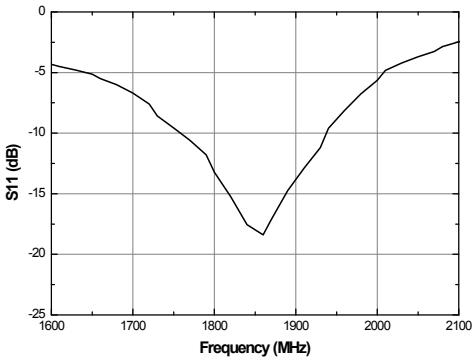


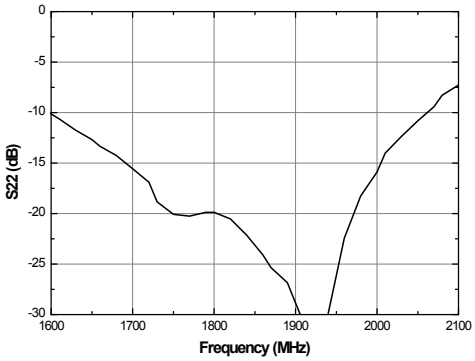
Board Layout (FR4, 40x40 mm^2, 0.8T)

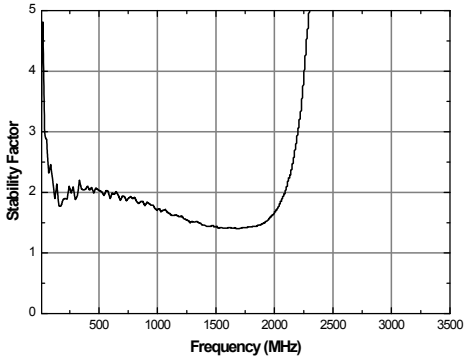


S-parameters & K-factor









APPLICATION CIRCUIT

WCDMA Rx

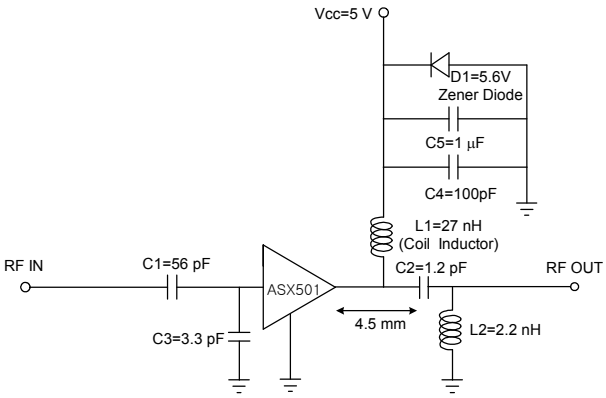
1920 ~ 1980 MHz

+5 V

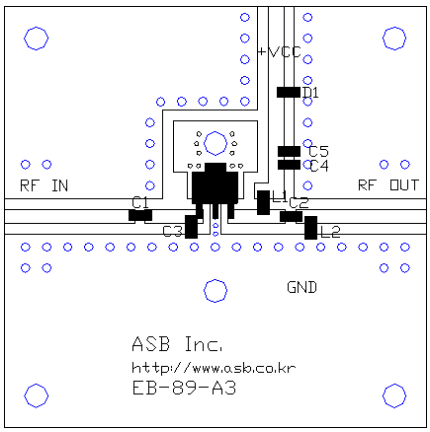
Frequency (MHz)	1920~1980
Magnitude S21 (dB)	11.5
Magnitude S11 (dB)	-15
Magnitude S22 (dB)	-13
Output P1dB (dBm)	31
Output IP3[1] (dBm)	47
Noise Figure (dB)	5.0
Device Voltage (V)	5
Current (mA)	560

1) OIP3 is measured with two tones at an output power of +15 dBm/tone separated by 1 MHz.

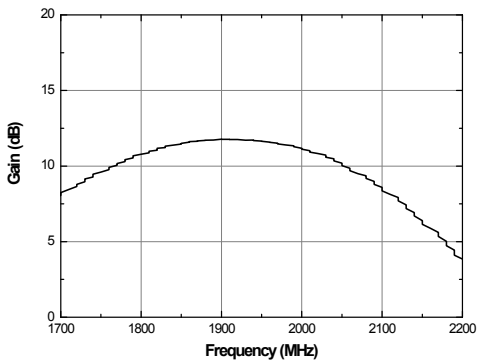
Schematic

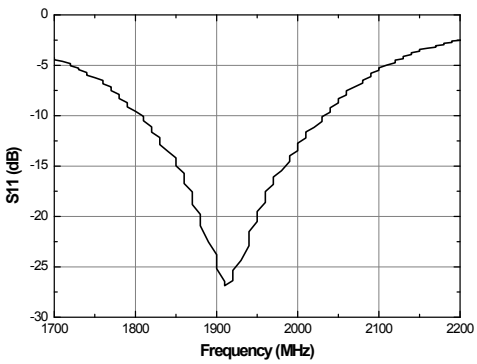


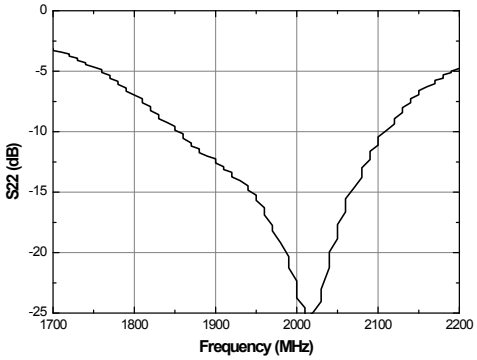
Board Layout (FR4, 40x40 mm^2, 0.8T)

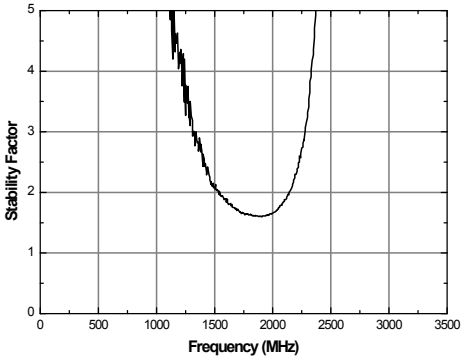


S-parameters & K-factor









APPLICATION CIRCUIT

WCDMA Tx

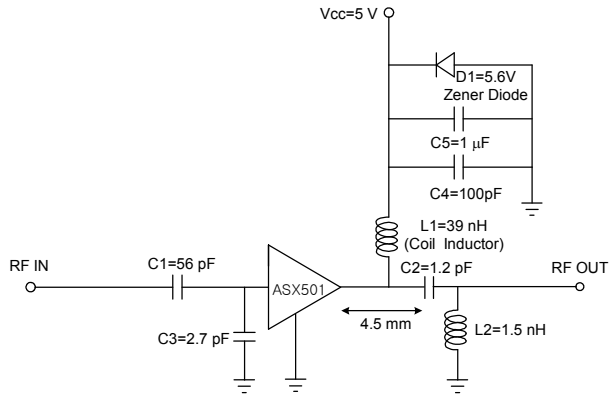
2110 ~ 2170 MHz

+5 V

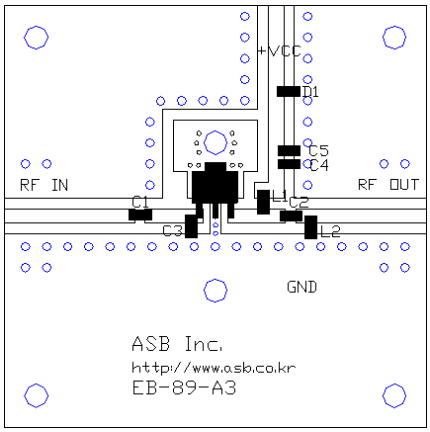
Frequency (MHz)	2110~2170
Magnitude S21 (dB)	9
Magnitude S11 (dB)	-20
Magnitude S22 (dB)	-6
Output P1dB (dBm)	31
Output IP3[1)] (dBm)	47
Noise Figure (dB)	5.6
Device Voltage (V)	5
Current (mA)	560

1) OIP3 is measured with two tones at an output power of +14 dBm/tone separated by 1 MHz.

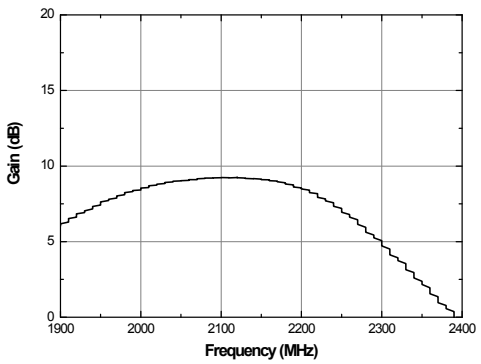
Schematic

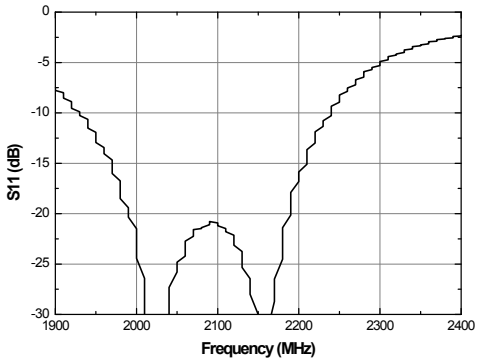


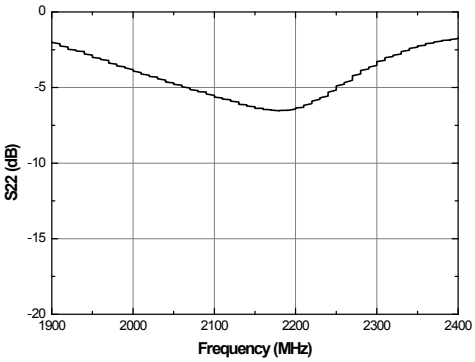
Board Layout (FR4, 40x40 mm^2, 0.8T)

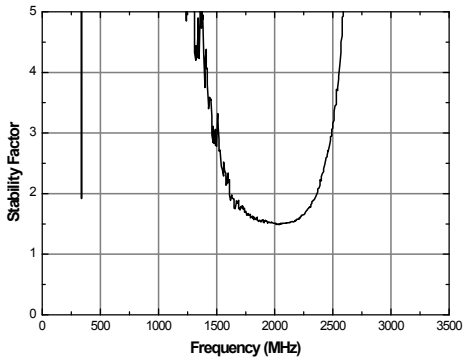


S-parameters & K-factor









APPLICATION CIRCUIT

P1dB of about 36 dBm solution

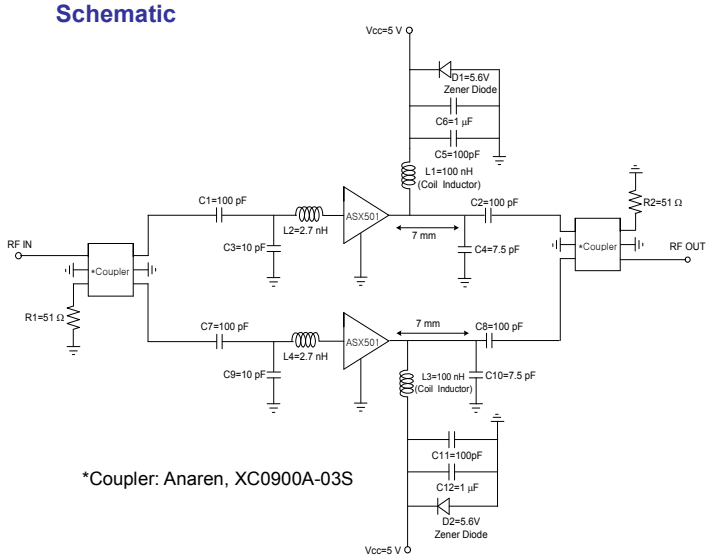
908 ~ 923 MHz

+5 V

Frequency (MHz)	908	915	923
Magnitude S21 (dB)	17.1	17	16.9
Magnitude S11 (dB)	-30	-30	-30
Magnitude S22 (dB)	-25	-25	-25
Output P1dB (dBm)	35.5	35.5	35.5
Output IP3[1)] (dBm)	48	48.5	49
Noise Figure (dB)	5.0	4.9	4.9
Device Voltage (V)	5	5	5
Current (mA)	1120	1120	1120

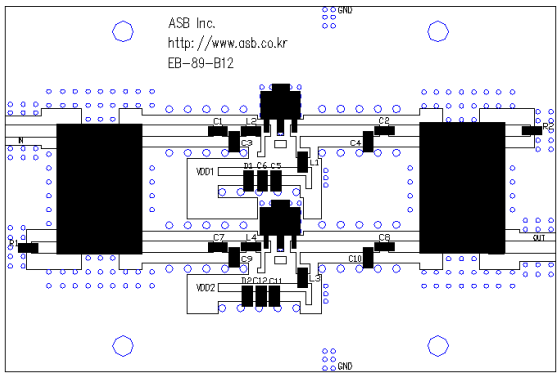
1) OIP3 is measured with two tones at an output power of +14 dBm/tone separated by 1 MHz.

Schematic



*Coupler: Anaren, XC0900A-03S

Board Layout (FR4, 59.5x39.5 mm^2, 0.8T)



S-parameters & K-factor