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 a SOT89 package and passes through the stringent DC, RF, and reliability tests.

RoHS-compliant

Package Style: SOT89

Typical Performance

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

Parameters	Units	Typical		Typical	
Frequency	MHz	900	2000	900	2000
Gain	dB	18.0	11.5	18.0	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	31.0	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.

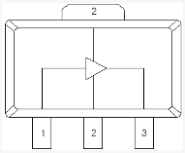
Application Circuit

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

Product Specifications

Parameters	Units	Min	Typ	Max
Testing Frequency	MHz		900	
Gain	dB	18.0	18.0	
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	

Pin Configuration



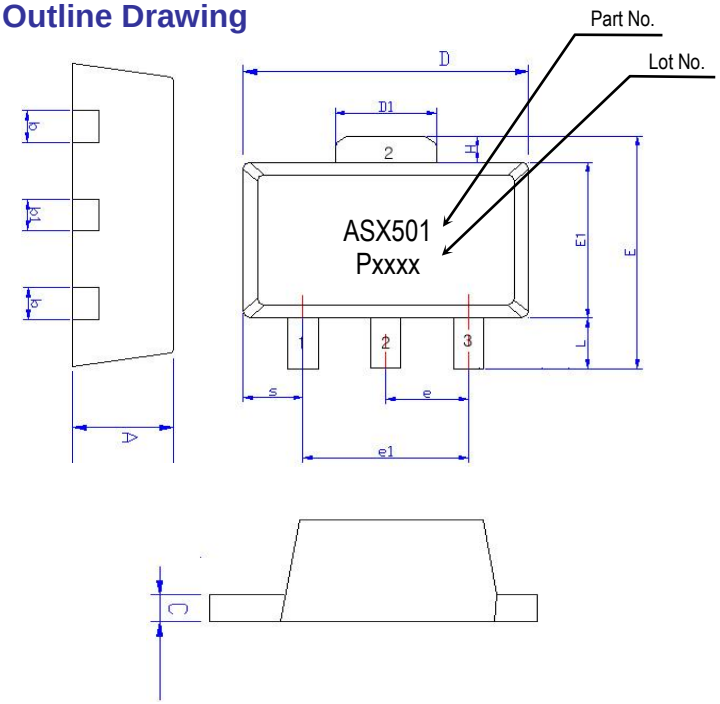
Pin No.	Function
1	RF IN
2	GND
3	RF OUT / Bias

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, 50 Ω matched)*	+25 dBm
Thermal Resistance	23 °C/W

The operation of this device in excess of any of these limits may cause permanent damage.
* Refer to the max. input RF power data at http://www.asb.co.kr/pdf/Maximum_Input_Power_Analysis.pdf. The max. input RF power, in principle, depends upon application frequency, matching circuit, and device voltage.

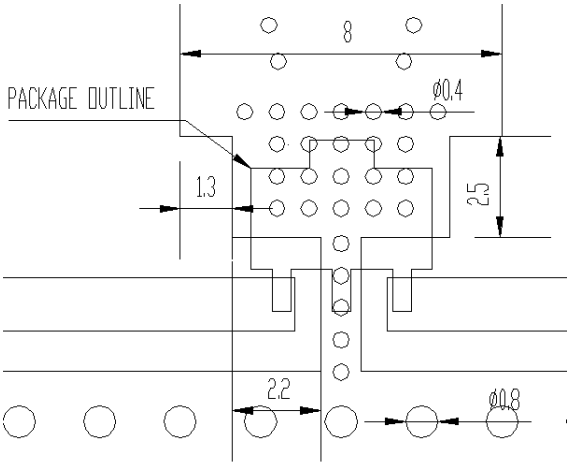
Outline Drawing



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: Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices

Moisture Sensitivity Level (MSL)

Level 3 at 260 °C reflow

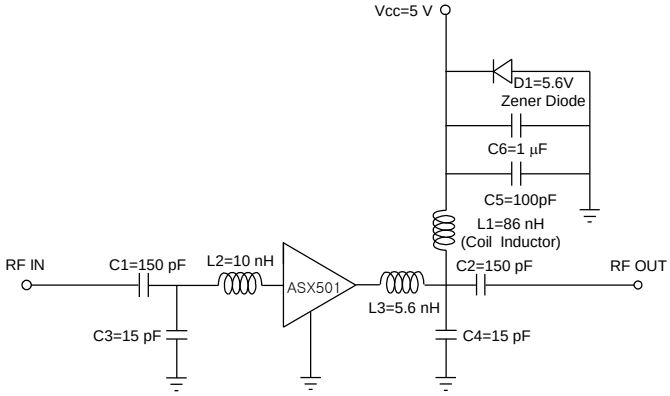
APPLICATION CIRCUIT

IF
450 ~ 470 MHz
+5 V

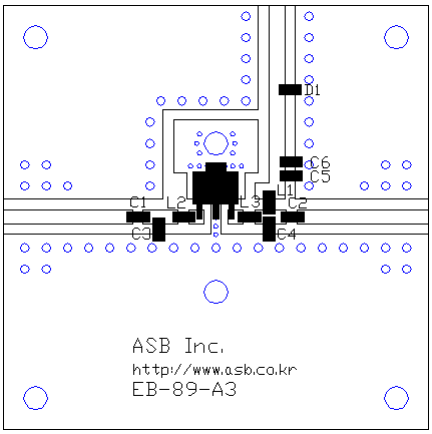
Frequency (MHz)	450 ~ 470
Magnitude S21 (dB)	20.0
Magnitude S11 (dB)	-11
Magnitude S22 (dB)	-12
Output P1dB (dBm)	31.5
Output IP3[1)] (dBm)	45
Noise Figure (dB)	6.2
Device Voltage (V)	+5
Current (mA)	560

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

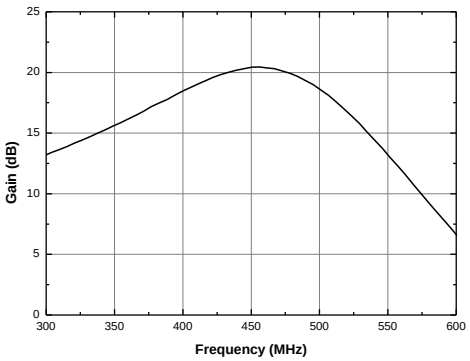
Schematic

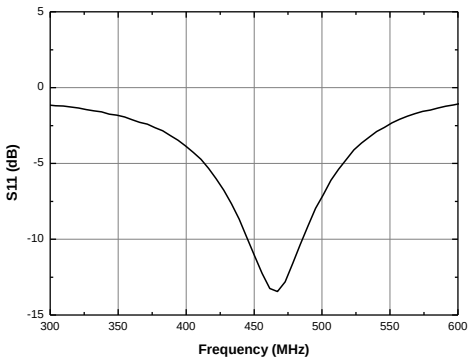


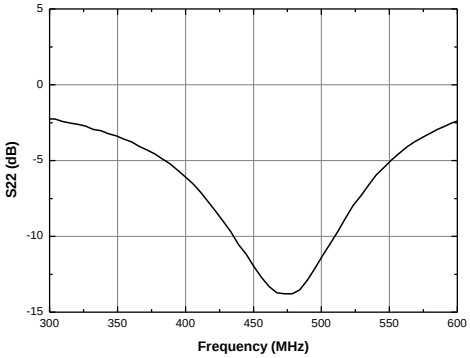
Board Layout (FR4, 40x40 mm², 0.8T)

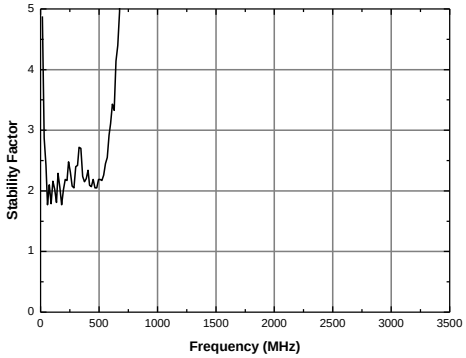


S-parameters & K-factor









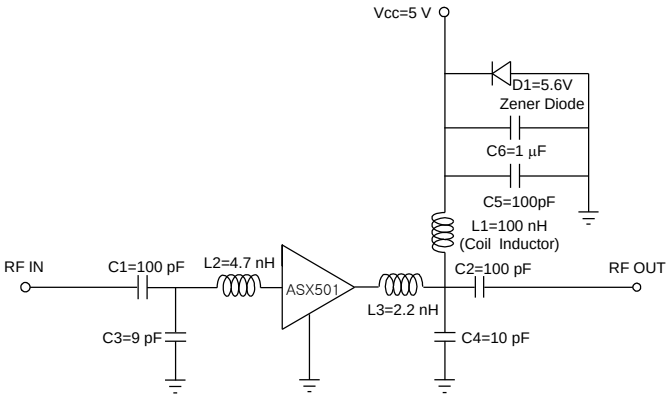
APPLICATION CIRCUIT

LTE
698 ~ 787 MHz
+5 V

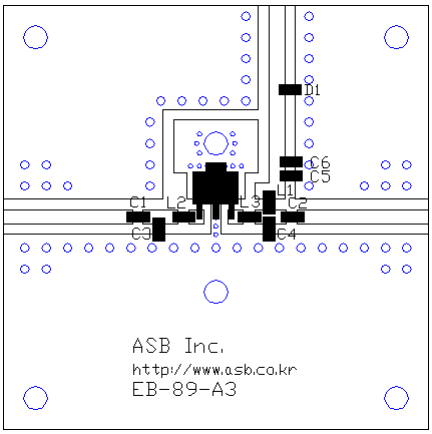
Frequency (MHz)	698 ~ 787
Magnitude S21 (dB)	17.5
Magnitude S11 (dB)	-9
Magnitude S22 (dB)	-15
Output P1dB (dBm)	33
Output IP3[1)] (dBm)	47
Noise Figure (dB)	4.8
Device Voltage (V)	+5
Current (mA)	560

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

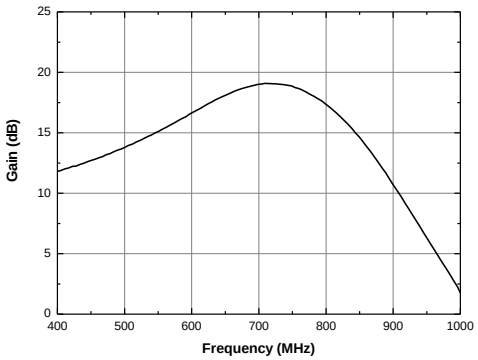
Schematic

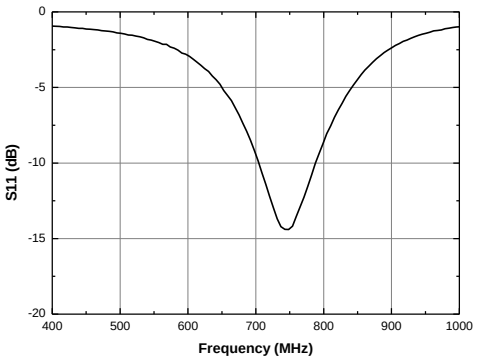


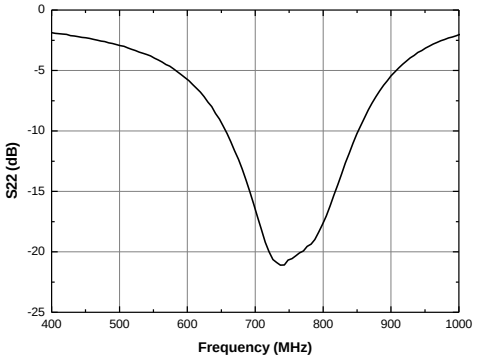
Board Layout (FR4, 40x40 mm², 0.8T)

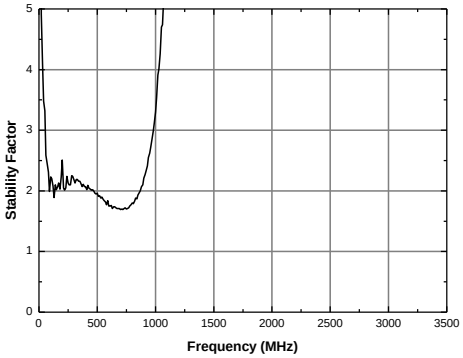


S-parameters & K-factor









APPLICATION CIRCUIT

CDMA Rx

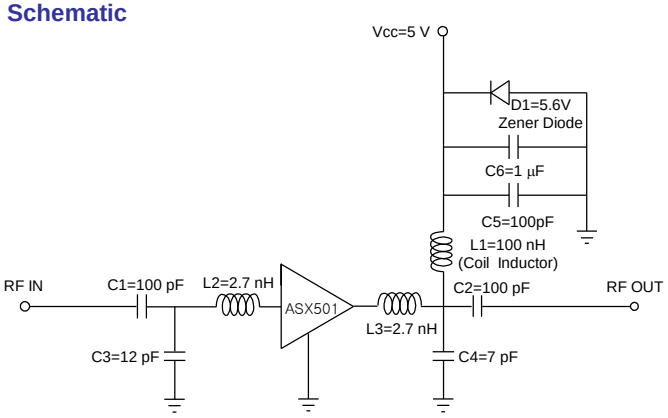
824 ~ 849 MHz

+5 V

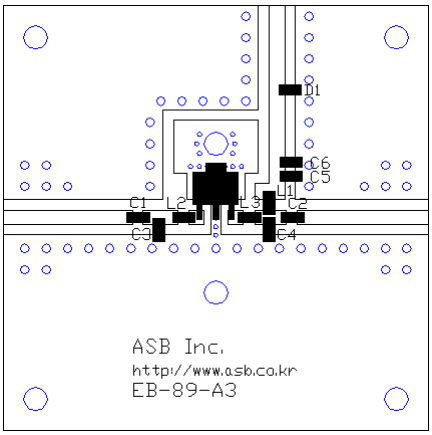
Frequency (MHz)	824 ~ 849
Magnitude S21 (dB)	17.5
Magnitude S11 (dB)	-13
Magnitude S22 (dB)	-18
Output P1dB (dBm)	30.5
Output IP3[1)] (dBm)	46
Noise Figure (dB)	4.6
Device Voltage (V)	+5
Current (mA)	560

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

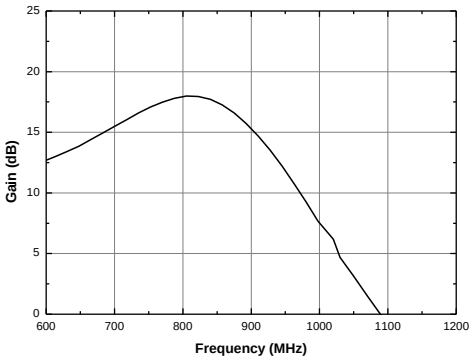
Schematic

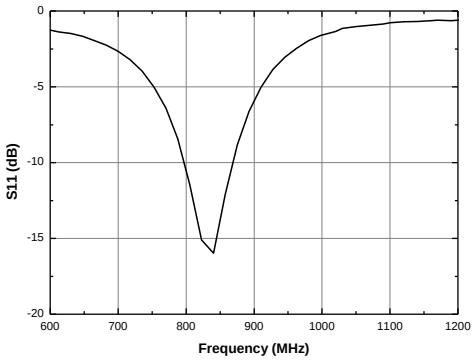


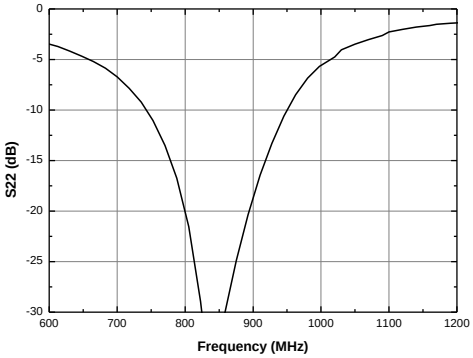
Board Layout (FR4, 40x40 mm², 0.8T)

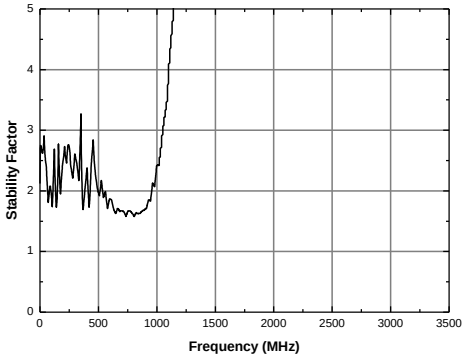


S-parameters & K-factor









APPLICATION CIRCUIT

CDMA Tx

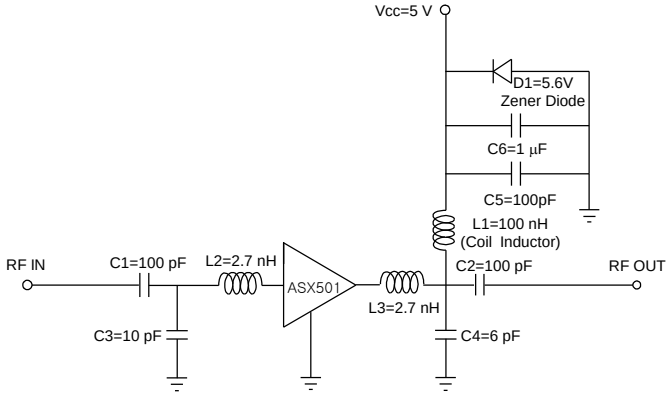
869 ~ 894 MHz

+5 V

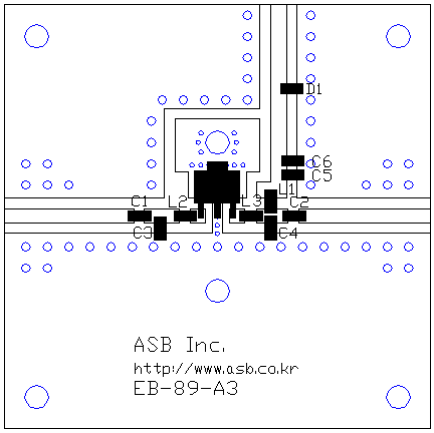
Frequency (MHz)	869 ~ 894
Magnitude S21 (dB)	17.5
Magnitude S11 (dB)	-16
Magnitude S22 (dB)	-16
Output P1dB (dBm)	31
Output IP3[1)] (dBm)	46
Noise Figure (dB)	4.8
Device Voltage (V)	+5
Current (mA)	560

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

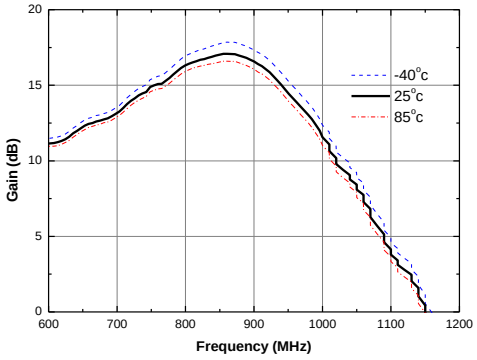
Schematic

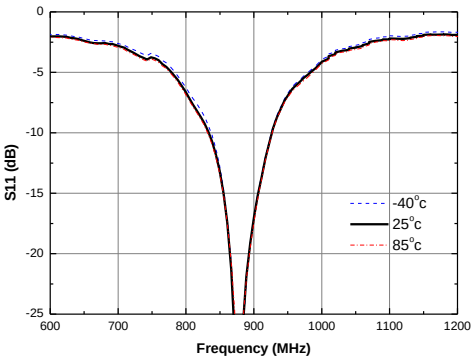


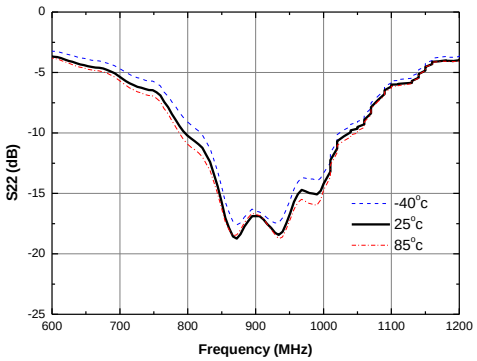
Board Layout (FR4, 40x40 mm², 0.8T)

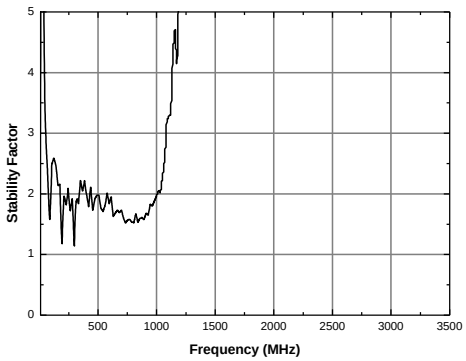


S-parameters & K-factor

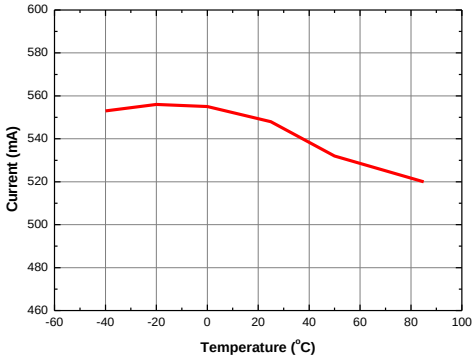




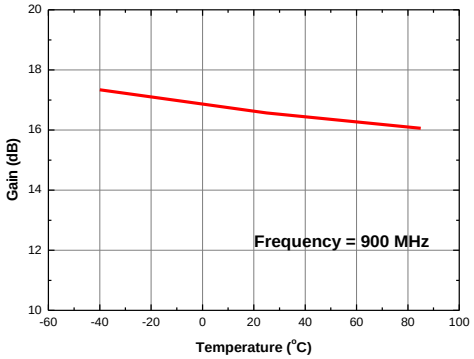




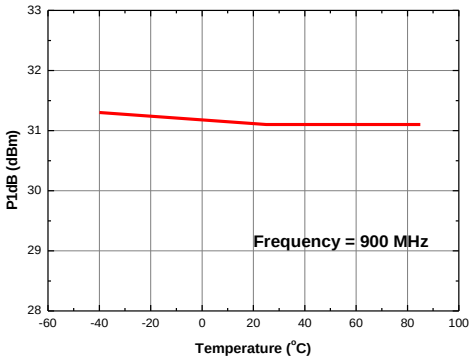
Current vs. Temperature



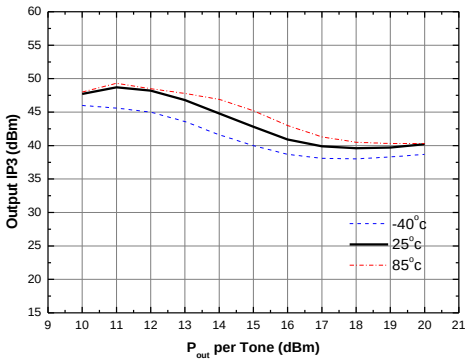
Gain vs. Temperature



P1dB vs. Temperature



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



APPLICATION CIRCUIT

GSM Rx

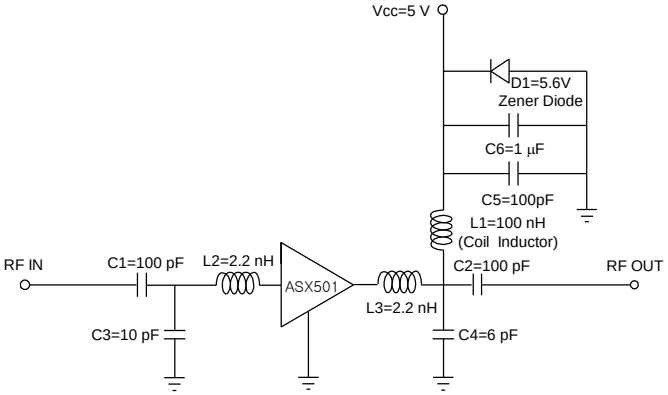
890 ~ 915 MHz

+5 V

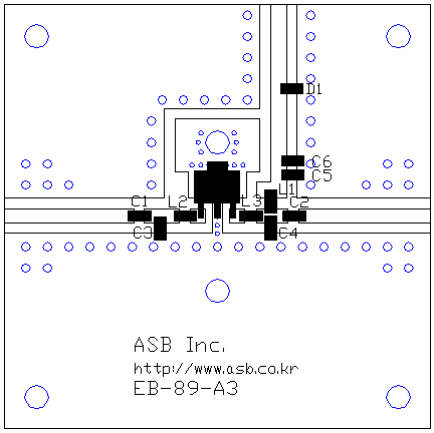
Frequency (MHz)	890 ~ 915
Magnitude S21 (dB)	17.8
Magnitude S11 (dB)	-16
Magnitude S22 (dB)	-17
Output P1dB (dBm)	31.5
Output IP3[1)] (dBm)	47
Noise Figure (dB)	4.7
Device Voltage (V)	+5
Current (mA)	560

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

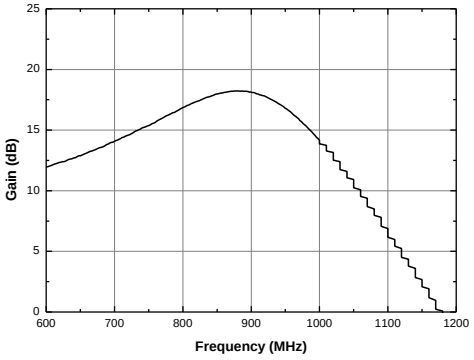
Schematic

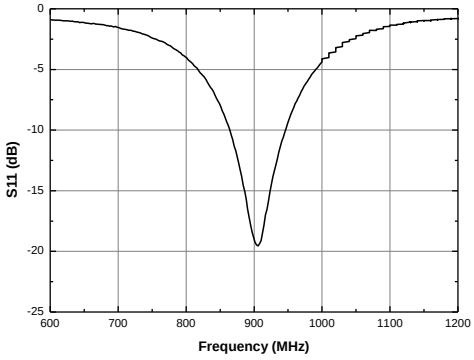


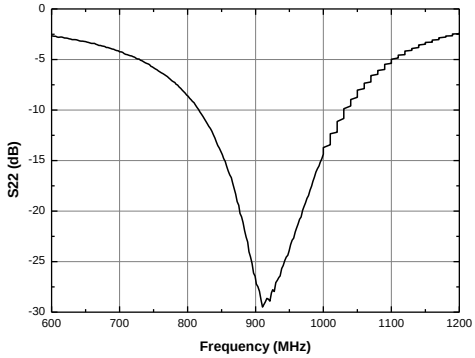
Board Layout (FR4, 40x40 mm², 0.8T)

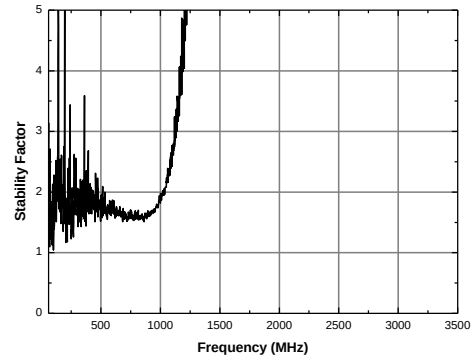


S-parameters & K-factor









APPLICATION CIRCUIT

GSM Tx

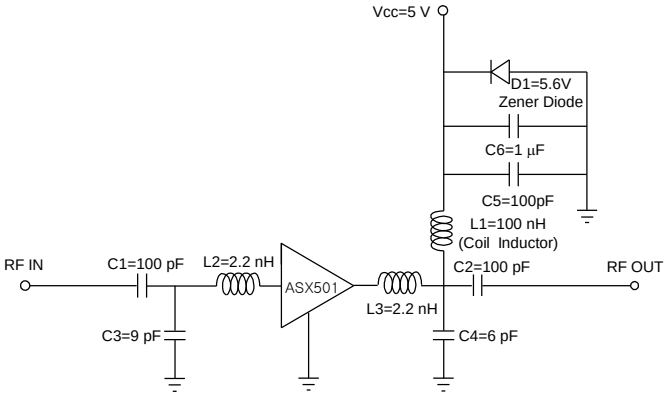
935 ~ 960 MHz

+5 V

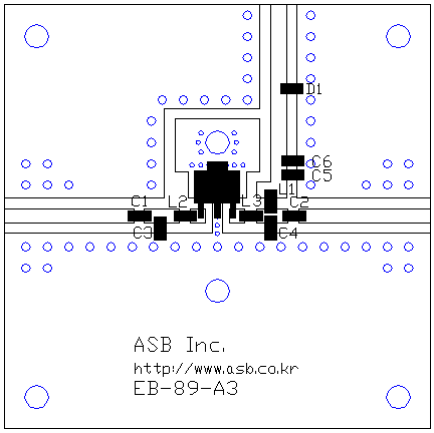
Frequency (MHz)	935 ~ 960
Magnitude S21 (dB)	17.6
Magnitude S11 (dB)	-18
Magnitude S22 (dB)	-18
Output P1dB (dBm)	31.5
Output IP3[1)] (dBm)	47
Noise Figure (dB)	4.5
Device Voltage (V)	+5
Current (mA)	560

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

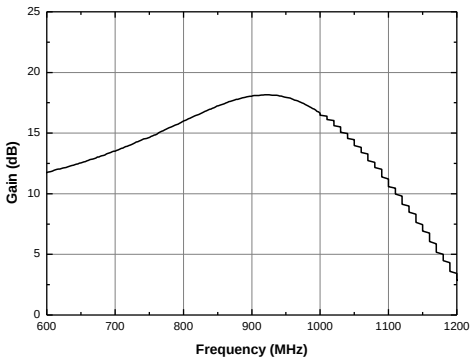
Schematic

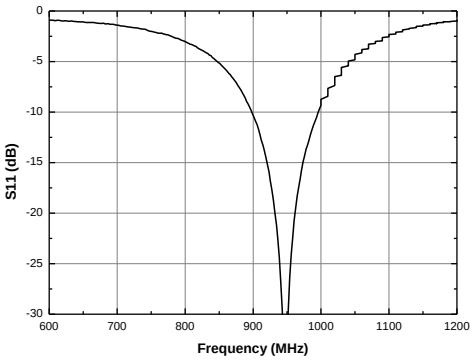


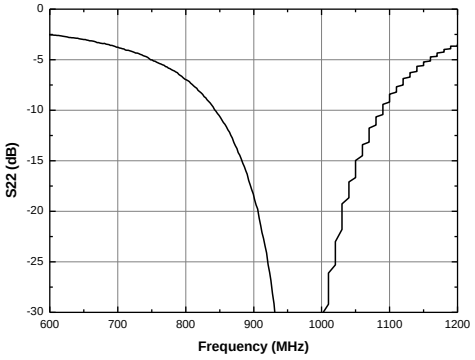
Board Layout (FR4, 40x40 mm², 0.8T)

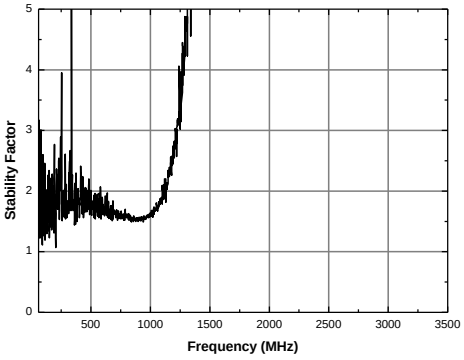


S-parameters & K-factor









APPLICATION CIRCUIT

PCS Rx

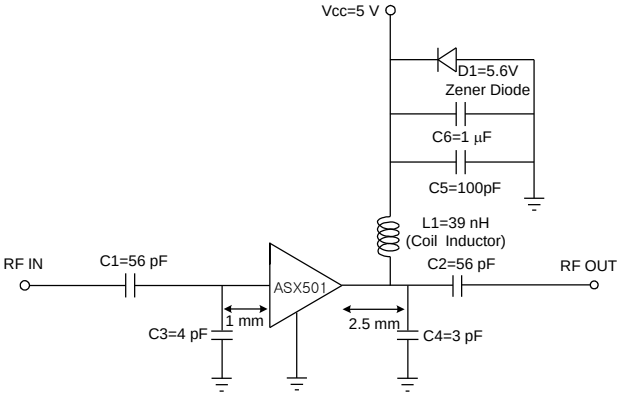
1750 ~ 1780 MHz

+5 V

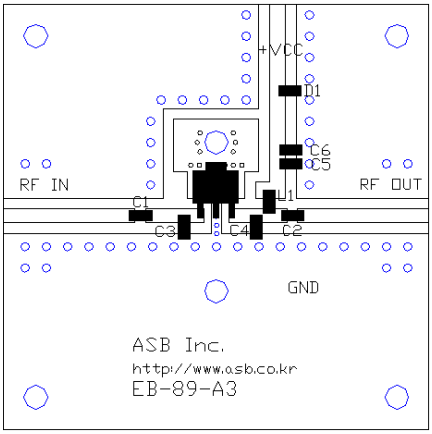
Frequency (MHz)	1750 ~ 1780
Magnitude S21 (dB)	12.0
Magnitude S11 (dB)	-16
Magnitude S22 (dB)	-17
Output P1dB (dBm)	31
Output IP3[1)] (dBm)	47
Noise Figure (dB)	4.6
Device Voltage (V)	+5
Current (mA)	560

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

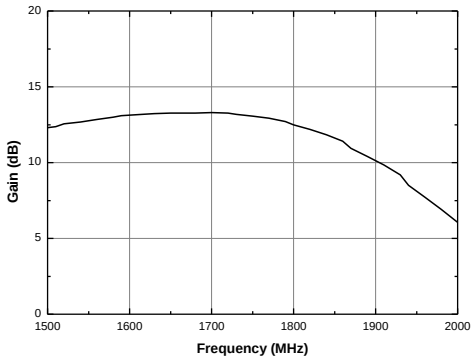
Schematic

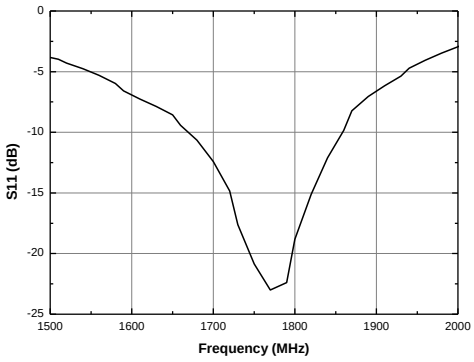


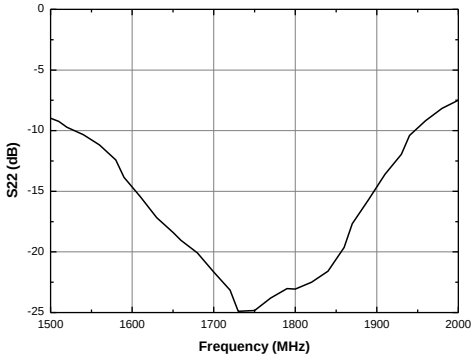
Board Layout (FR4, 40x40 mm², 0.8T)

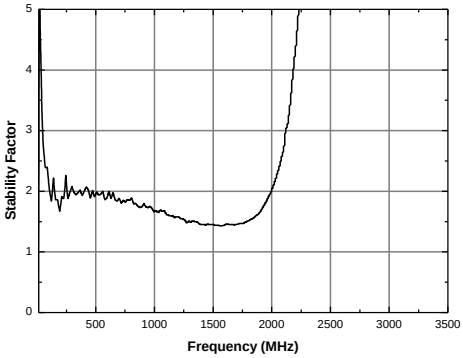


S-parameters & K-factor









APPLICATION CIRCUIT

PCS Tx

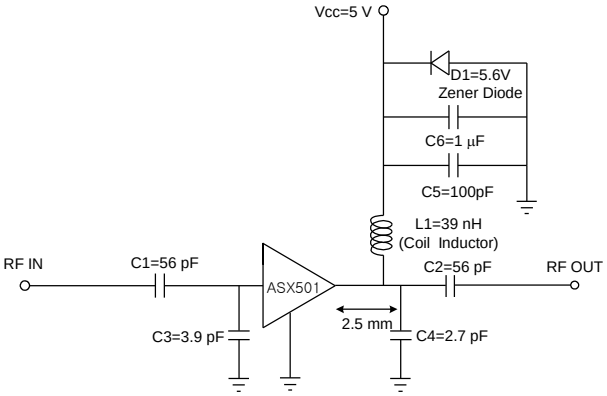
1840 ~ 1870 MHz

+5 V

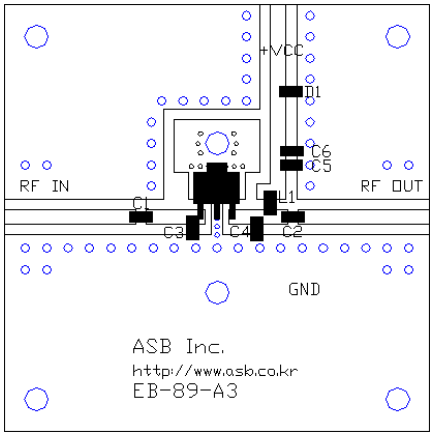
Frequency (MHz)	1840 ~ 1870
Magnitude S21 (dB)	11.5
Magnitude S11 (dB)	-16
Magnitude S22 (dB)	-18
Output P1dB (dBm)	31
Output IP3[1)] (dBm)	47
Noise Figure (dB)	4.6
Device Voltage (V)	+5
Current (mA)	560

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

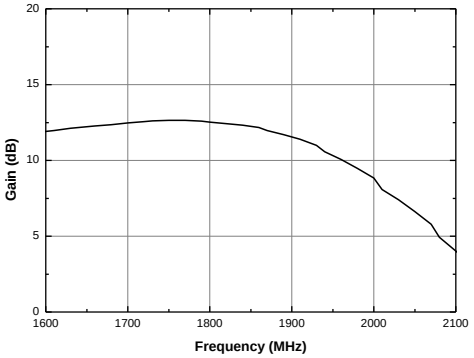
Schematic

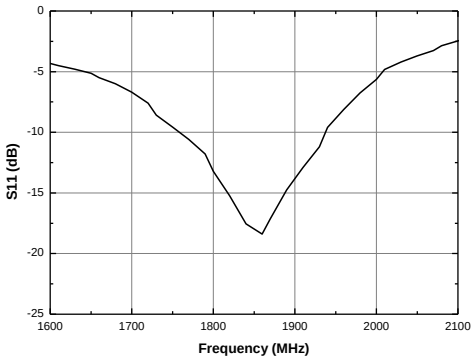


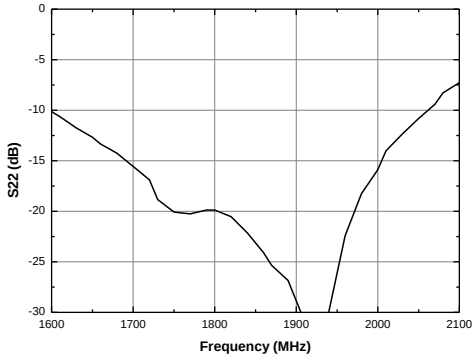
Board Layout (FR4, 40x40 mm², 0.8T)

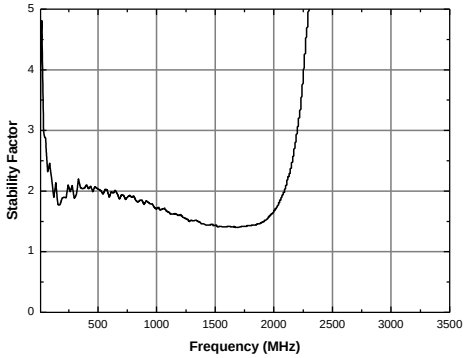


S-parameters & K-factor









APPLICATION CIRCUIT

WCDMA Rx

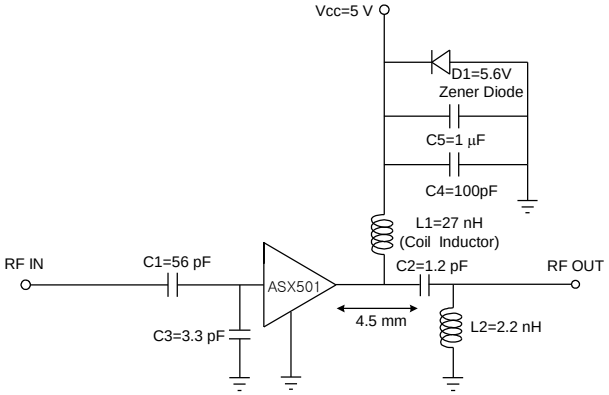
1920 ~ 1980 MHz

+5 V

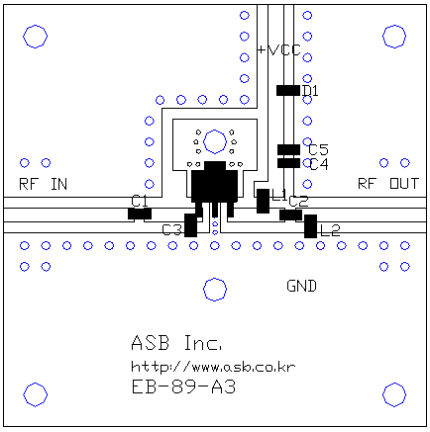
Frequency (MHz)	1920 ~ 1980
Magnitude S21 (dB)	11.5
Magnitude S11 (dB)	-15
Magnitude S22 (dB)	-13
Output P1dB (dBm)	31
Output IP3[1)] (dBm)	47
Noise Figure (dB)	5.0
Device Voltage (V)	+5
Current (mA)	560

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

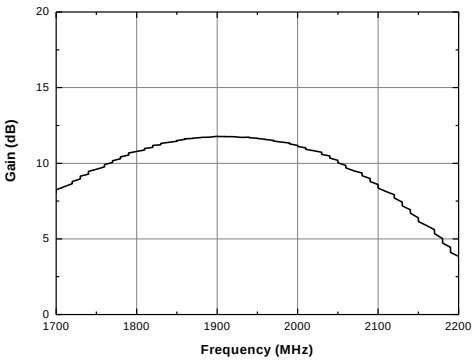
Schematic

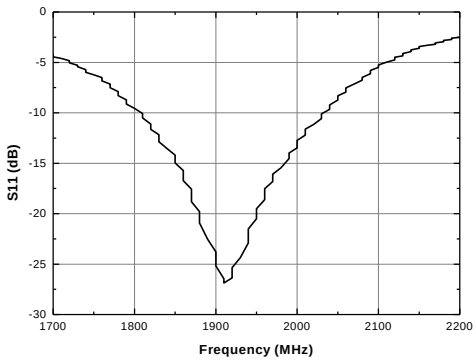


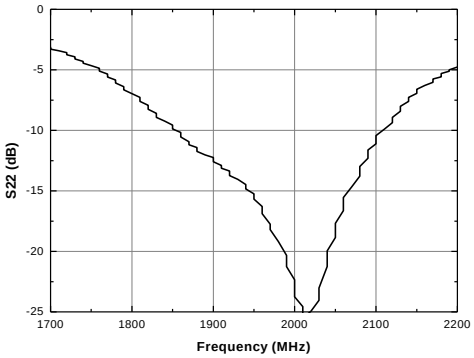
Board Layout (FR4, 40x40 mm², 0.8T)

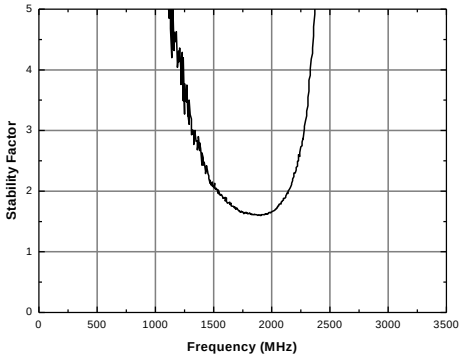


S-parameters & K-factor









APPLICATION CIRCUIT

WCDMA Tx

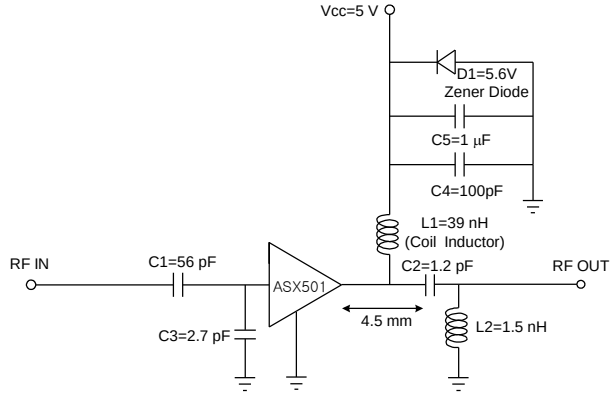
2110 ~ 2170 MHz

+5 V

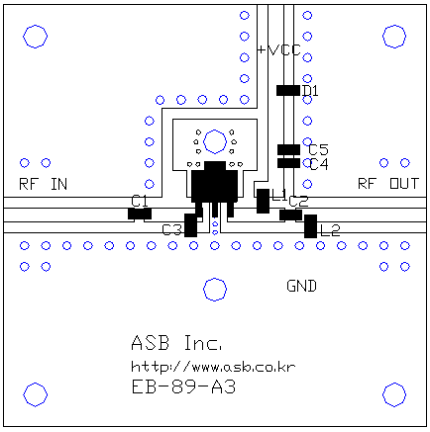
Frequency (MHz)	2110 ~ 2170
Magnitude S21 (dB)	9.0
Magnitude S11 (dB)	-20
Magnitude S22 (dB)	-6
Output P1dB (dBm)	31
Output IP3[1)] (dBm)	47
Noise Figure (dB)	5.6
Device Voltage (V)	+5
Current (mA)	560

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

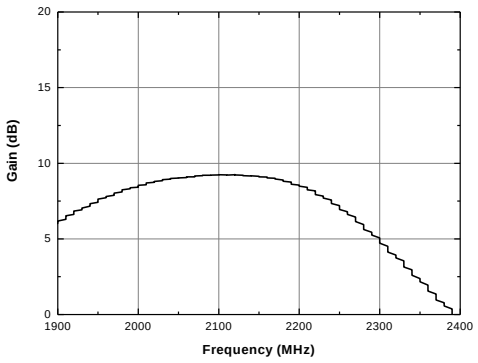
Schematic

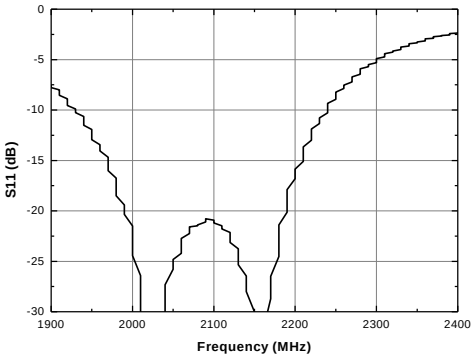


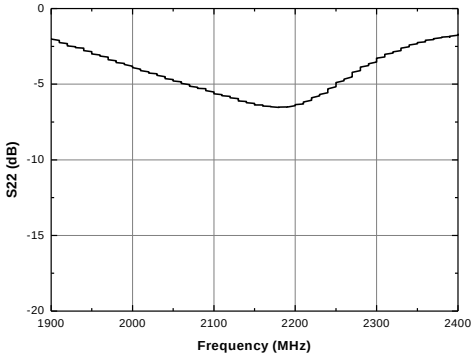
Board Layout (FR4, 40x40 mm², 0.8T)

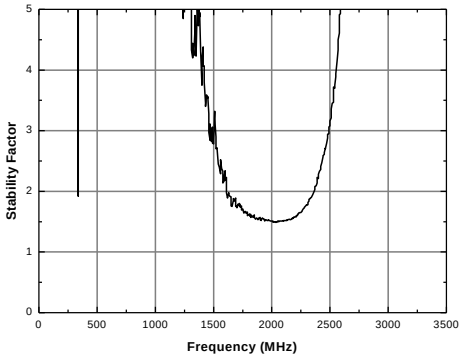


S-parameters & K-factor









APPLICATION CIRCUIT

P1dB of about 36 dBm solution

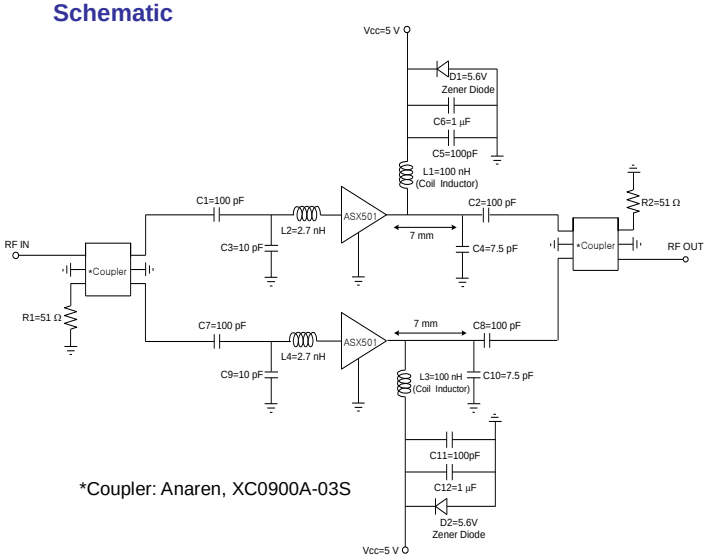
RFID (908 ~ 923 MHz)

+5 V

Frequency (MHz)	908	915	923
Magnitude S21 (dB)	17.1	17.0	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)	48.0	48.5	49.0
Noise Figure (dB)	5.0	4.9	4.9
Device Voltage (V)	+5	+5	+5
Current (mA)	1120	1120	1120

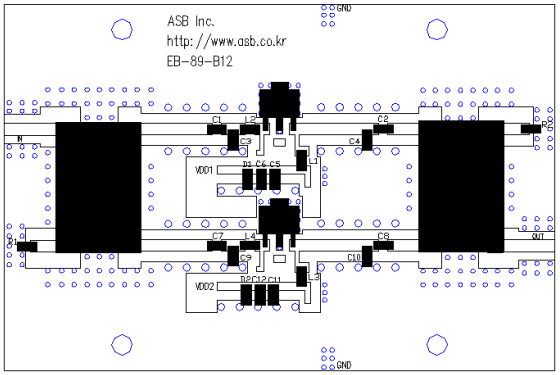
1) OIP3 is measured with two tones at an output power of +14 dBm/tone separated by 1 MHz.

Schematic

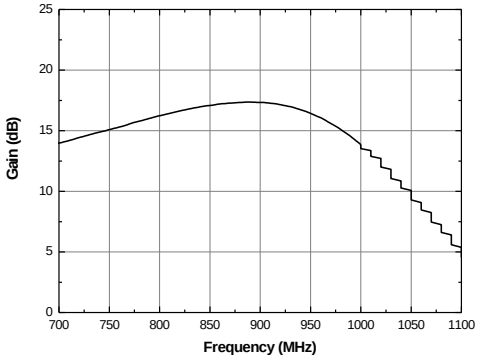


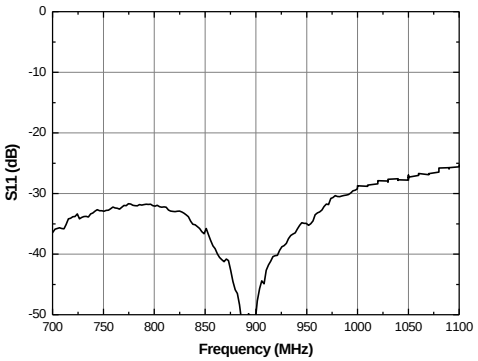
*Coupler: Anaren, XC0900A-03S

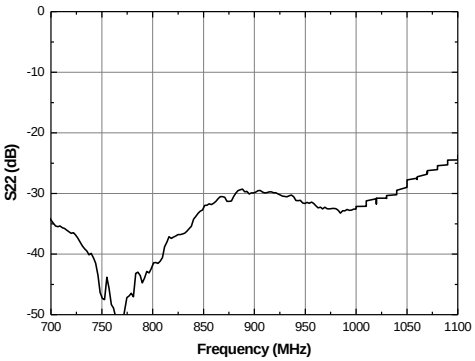
Board Layout (FR4, 59.5x39.5 mm^2, 0.8T)

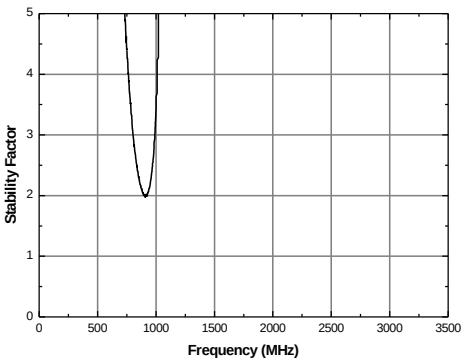


S-parameters & K-factor









Recommended Soldering Reflow Profile