ASX403

400 ~ 3000 MHz MMIC Amplifier

Features

- 11 dB Gain at 2000 MHz
- 29.5 dBm P1dB at 2000 MHz
- 38.5 dBm OIP3 at 2000 MHz
- 4.5 dB NF at 2000 MHz
- MTTF > 100 Years

Description

The ASX403, 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 3 GHz. The amplifier is available in a SOIC8 package and passes through the stringent DC, RF, and reliability tests.

RoHS-compliant GREEN Package

Package Style: SOIC8

Typical Performance

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

Parameters	Units	Typical	
Frequency	MHz	900	2000
Gain	dB	16.5	11.0
S11	dB	-15	-20
S22	dB	-6	-9
Output IP3	dBm	38.0[1)]	38.5[2)]
Noise Figure	dB	4.7	4.5
Output P1dB	dBm	30.0	29.5
Current	mA	620	620
Device Voltage	V	+3.3	+3.3

1) OIP3 measured with two tones at an output power of +10 dBm/tone separated by 1 MHz.
2) OIP3 measured with two tones at an output power of +8 dBm/tone separated by 1 MHz.

Application Circuit

- CDMA & GSM (900 MHz)
- WCDMA (2000 MHz)

Product Specifications

Parameters	Units	Min	Typ	Max
Testing Frequency	MHz		2000	
Gain	dB		11.0	
S11	dB		-20	
S22	dB		-9	
Output IP3	dBm		38.5	
Noise Figure	dB		4.5	
Output P1dB	dBm		29.5	
Current	mA		620	
Device Voltage	V		+3.3	

Absolute Maximum Ratings

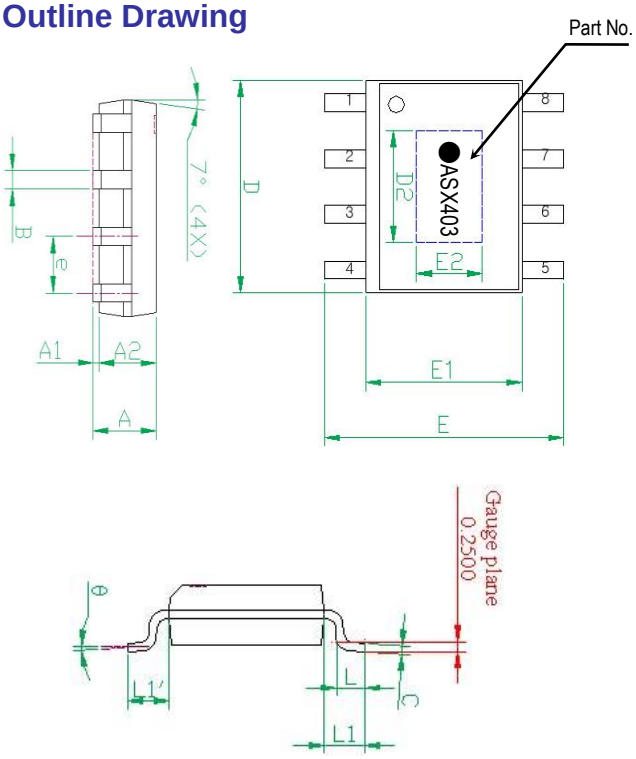
Parameters	Rating
Operating Case Temperature	-40 to +85 °C
Storage Temperature	-40 to +150 °C
Device Voltage	+4.0 V
Operating Junction Temperature	+150 °C
Input RF Power (CW, 50 Ω matched)[1)]	+23 dBm
Thermal Resistance	15 °C/W

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.

Pin Configuration

Pin No.	Function
1,4,5	GND
2,3	RF IN
6,7	RF OUT
8	V_{CTL}

Outline Drawing

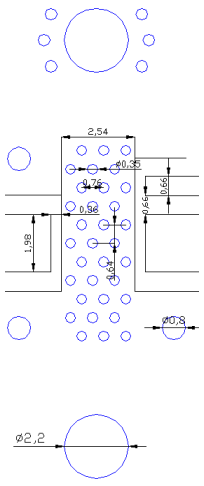


Symbols	Dimensions (In mm)		
	MIN	NOM	MAX
A	1.40	1.50	1.60
A1	0.00	---	0.10
A2	---	1.45	---
B	0.33	---	0.51
C	0.19	---	0.25
D	4.80	---	5.00
D2	3.20	3.30	3.40
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
E2	2.30	2.40	2.50
e	---	1.27	---
L	0.40	---	1.27
y	---	---	0.10
θ	0°	---	8°
|L1-L1'|	---	---	0.12
L1	1.04REF		

Pin No.	Function	Pin No.	Function.
1	GND	5	GND
2	RF IN	6	RF OUT
3	RF IN	7	RF OUT
4	GND	8	V_{CTL}

Note: 1. Backside metal paddle is RF and DC ground.

Mounting Recommendation (In mm)



Note: 1. Add as much copper as possible to inner and outer layers near the part to ensure optimal thermal performance.
2. To ensure reliable operation, device ground paddle-to-ground pad soldering is critical.
3. Add mounting screws near the part to fasten the board to a heat sinker. Ensure that the ground / thermal via region contacts the heat sinker.
4. A proper heat dissipation path underneath the area of the PCB for the mounted device is strictly required for proper thermal operation. Damage to the device can result from inappropriate heat dissipation.

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

CDMA & GSM

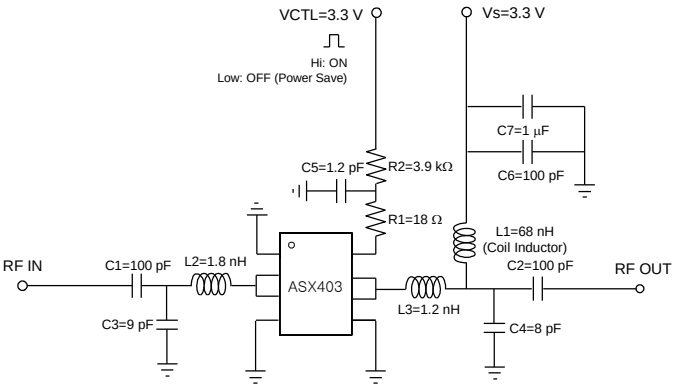
900 MHz

+3.3 V

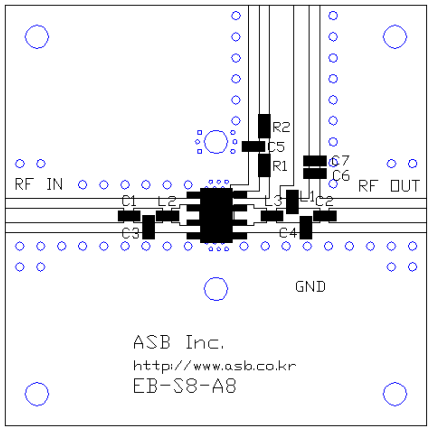
Frequency (MHz)	900
Magnitude S21 (dB)	16.5
Magnitude S11 (dB)	-15
Magnitude S22 (dB)	-6
Output P1dB (dBm)	30
Output IP3[1)] (dBm)	38
Noise Figure (dB)	4.7
Device Voltage (V)	+3.3
Current (mA)	620

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

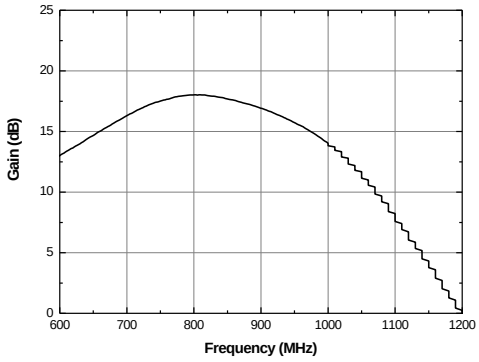
Schematic

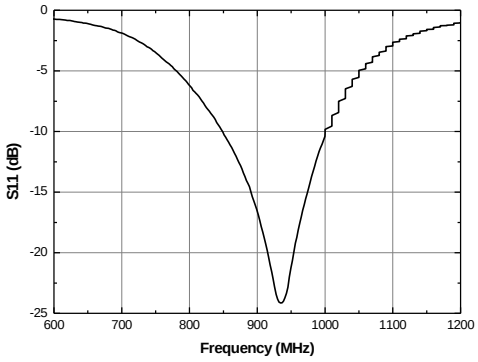


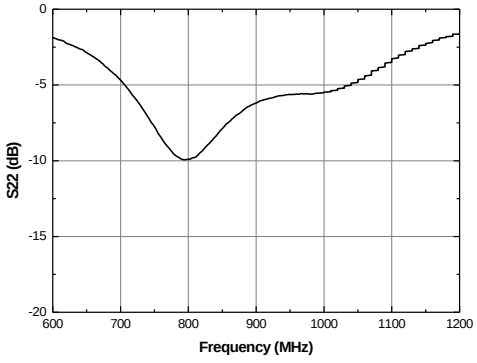
Board Layout (FR4, 40x40 mm², 0.8T)

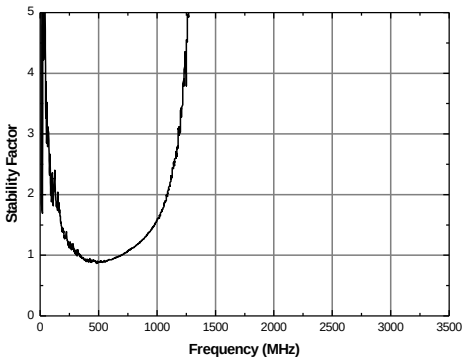


S-parameters & K-factor









APPLICATION CIRCUIT

WCDMA

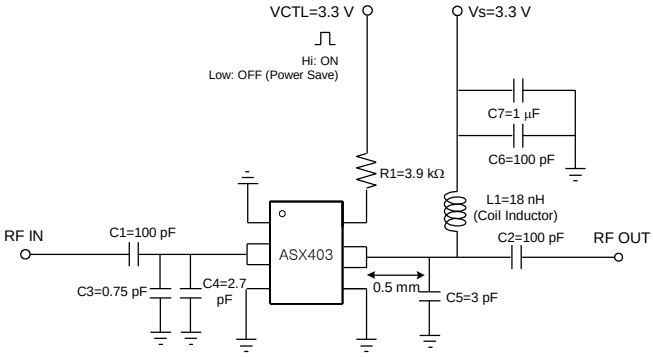
2000 MHz

+3.3 V

Frequency (MHz)	2000
Magnitude S21 (dB)	11.0
Magnitude S11 (dB)	-20
Magnitude S22 (dB)	-9
Output P1dB (dBm)	29.5
Output IP3[1)] (dBm)	38.5
Noise Figure (dB)	4.5
Device Voltage (V)	+3.3
Current (mA)	620

1) OIP3 is measured with two tones at an output power of +8 dBm/tone separated by 1 MHz.

Schematic



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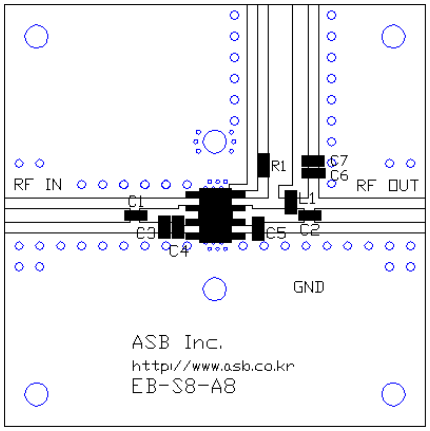
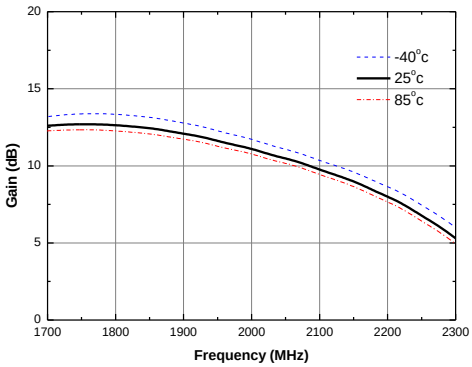
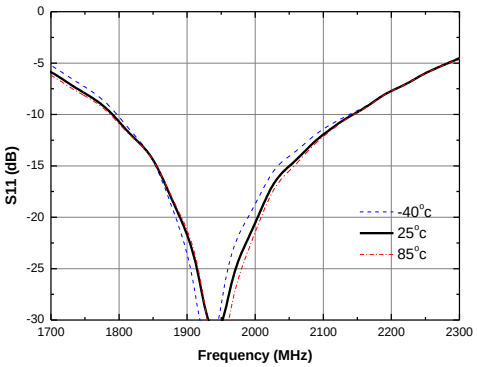
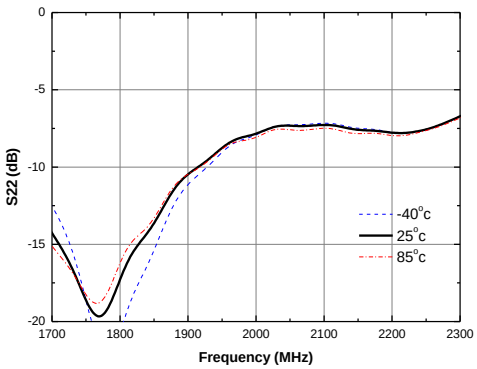
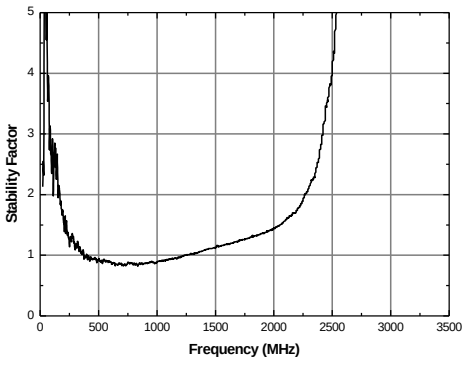


S-parameters & K-factor

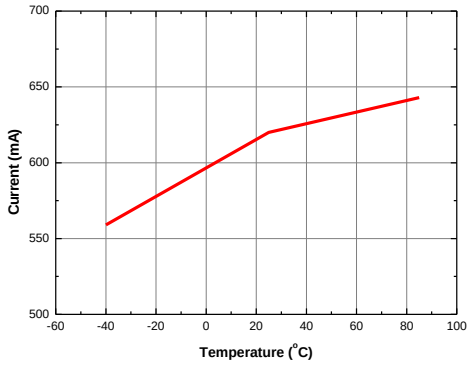




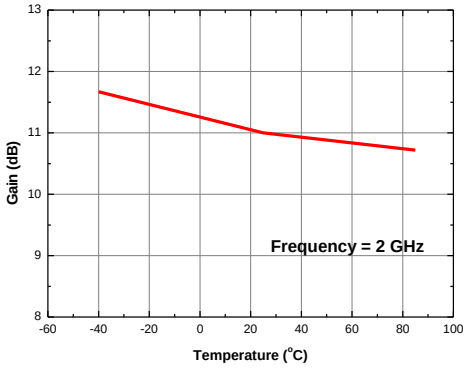




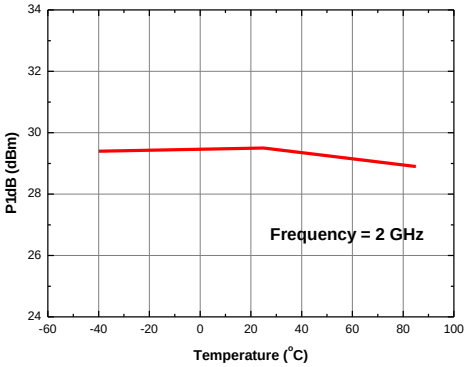
Current vs. Temperature



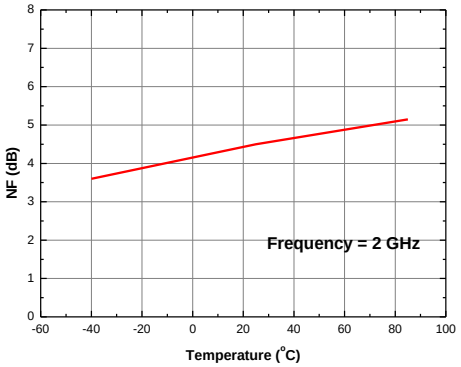
Gain vs. Temperature



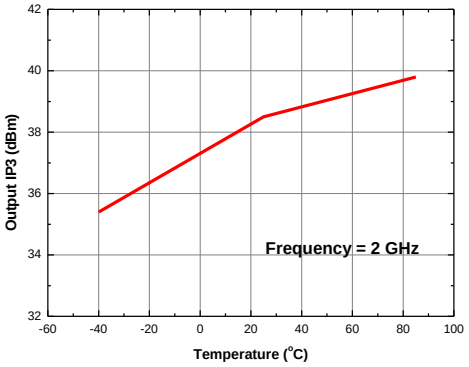
P1dB vs. Temperature



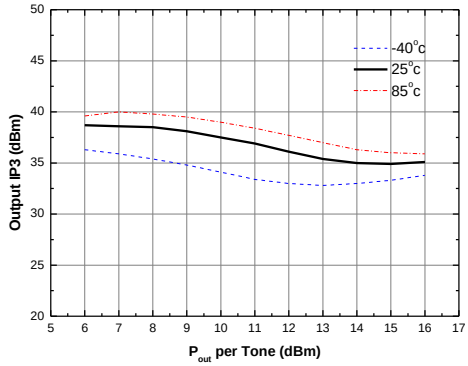
NF vs. Temperature



Output IP3 vs. Temperature



Output IP3 vs. Tone Power (Frequency = 2 GHz)



Performance with varying V_{CTL}

V_{CTL} (V)	Current (mA)	Freq. (MHz)	Gain (dB)	S11 (dB)	S22 (dB)	OIP3 (dBm)	P1dB (dBm)	NF (dB)
+3.3	620	900	16.9	-16.6	-6.2	39.0	30.2	4.6
+3.2	539		16.8	-16.0	-6.4	37.7	30.2	4.36
+3.1	455		16.7	-15.4	-6.5	35.3	30.3	4.08
+3.0	371		16.6	-14.6	-6.8	33.1	30.3	3.77
+2.9	286		16.4	-13.6	-7.1	30.8	30.4	3.43
+2.8	204		16.1	-12.2	-7.5	27.8	30.4	3.1
+3.3	620	2000	11.5	-25.1	-9.9	39.2	29.6	4.42
+3.2	540		11.4	-26.1	-10.0	37.2	29.8	4.24
+3.1	459		11.3	-27.3	-10.2	33.6	29.9	3.95
+3.0	378		11.2	-28.9	-10.3	33.3	30.0	3.66
+2.9	295		11.1	-30.3	-10.5	32.1	30.0	3.37
+2.8	214		10.9	-29.6	-10.6	30.5	30.0	3.02

Recommended Soldering Reflow Profile