AWG3017 Data Sheet

50 ~ 4000 MHz Wide-band Gain Block Amplifier MMIC

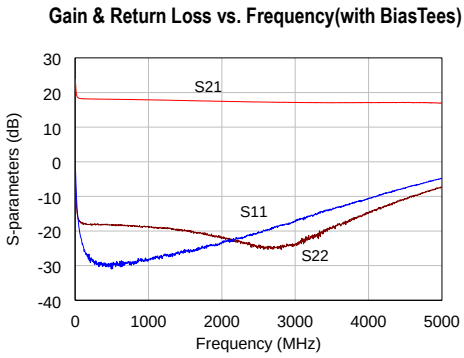
1. Product Overview

1.1 General Description

AWG3017, a gain block amplifier MMIC, has high linearity, low noise and high efficiency over a wide range of frequency from 30 MHz to 4000 MHz, being suitable for use in both receiver and transmitter of telecommunication system up to 4 GHz. It has an active bias network for stable current over temperature and process variation. The amplifier is available in an SOT89 package and passes through the stringent DC, RF, and reliability tests.

1.2 Features

- 16.9 dB gain at 2000 MHz
- 20.5 dBm P1dB at 2000 MHz
- 39.0 dBm OIP3 at 2000 MHz
- 39.5 dBm OIP3 at 2700 MHz: Application 7.1
- 41.0 dBm OIP3 at 2700 MHz: Application 8.1
- Gain flatness = 0.8 dB at 500 ~ 2500 MHz
- 50 Ω input & output matching
- MTTF > 100 Years
- Single supply: +5 V



1.3 Applications

- Wide-band application at 500 ~ 4000 MHz
- IF, CATV application at 30 ~ 1200 MHz
- SMATV, ONU application at 50 ~ 3000 MHz

1.4 Package Profile & RoHS Compliance

	RoHS-compliant GREEN Package
SOT89, 4.5x4.0 mm², surface mount	RoHS-compliant

2. Summary on Product Performances

2.1 Typical Performance

Supply voltage = +5 V, T_A = +25 °C, Z_O = 50 Ω.

Parameter	Typical								Unit
Frequency	70	150	900	2000	2000	2500	2700	3000	MHz
Gain	18.1	17.9	17.5	16.9	17.1	16.8	16.8	16.6	dB
S11	-18.0	-20.0	-18.0	-20.0	-20.0	-20.0	-16.0	-13.0	dB
S22	-15.0	-15.0	-12.0	-15.0	-15.0	-16.0	-18.0	-20.0	dB
Noise Figure	2.1	2.1	1.9	2.3	2.4	2.7	3.2	3.5	dB
Output IP3[1)]	37.0	38.0	39.0	39.0	40.0	40.0	41.0	37.0	dBm
Output P1dB	21.0	21.0	20.5	20.5	20.5	20.5	21.0	21.0	dBm
Current	104				123		140		mA
Device Voltage	+4.2				+4.5		+4.6		V

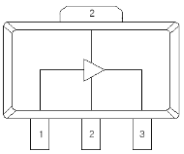
1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1MHz.

2.2 Product Specification

Supply voltage = +5 V, T_A = +25 °C, Z_O = 50 Ω.

Parameter	Min	Typ	Max	Unit
Frequency		2000		MHz
Gain		16.9		dB
S11		-20.0		dB
S22		-15.0		dB
Noise Figure		2.3		dB
OIP3		39.0		dBm
P1dB		20.5		dBm
Current		104		mA
Device Voltage		+4.2		V

2.3 Pin Configuration

Pin	Description	Simplified Outline
1	RF_IN	
2	Ground	
3	RF_OUT & Bias	

2.4 Absolute Maximum Ratings

Parameters	Max. Ratings
Operation Case Temperature	-40 to +85 °C
Storage Temperature	-40 to +150 °C
Device Voltage	+6 V
Operation Junction Temperature	+150 °C
Input RF Power (At 2000 MHz, CW, 50 Ω matched)*	+ 27 dBm

*Please find the max. input power data from http://www.asb.co.kr/pdf/Maximum_Input_Power_Analysis.pdf
The max. input power, in principle, depends upon the application frequency and matching circuit.

2.5 Thermal Resistance

Symbol	Description	Typ	Unit
R_{th}	Thermal resistance from junction to lead	55	°C/W

2.6 ESD Classification & Moisture Sensitivity Level

ESD Classification

HBM	Class 1B	Voltage Level: 750 V
MM	Class A	Voltage Level: 100 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.

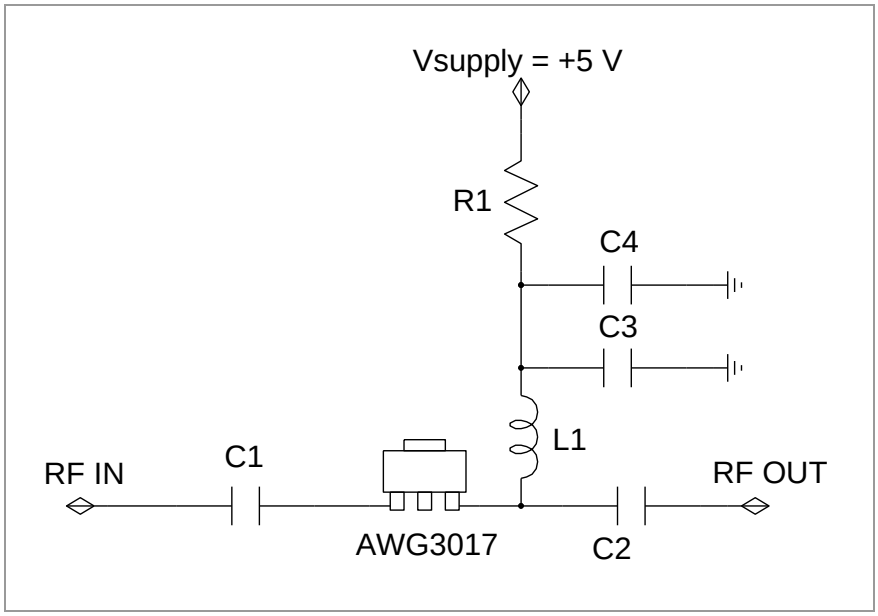
Moisture Sensitivity Level

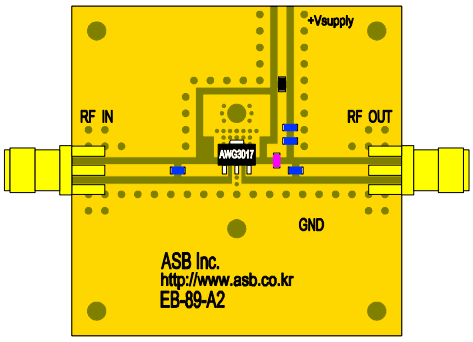
MSL 3 at 260 °C reflow

(Intentionally Blanked)

3. Application: 500 ~ 3000 MHz

3.1 Application Circuit & Evaluation Board





PCB Information	
Material	FR4
Thickness (mm)	0.8
Size (mm)	40x40
EB No.	EB-89-A2

Bill of Material

Symbol	Value	Size	Description	Manufacturer
AWG3017	-	-	MMIC Amplifier	ASB
C1, C2	100 pF	0603	DC blocking capacitor	Murata
C3	100 pF	0603	Decoupling capacitor	Murata
C4	1 μF	0603	Decoupling capacitor	Murata
L1	33 nH	0603	RF choke inductor	Murata
R1	7.5 Ω	0603	Drop resistor	Samsung

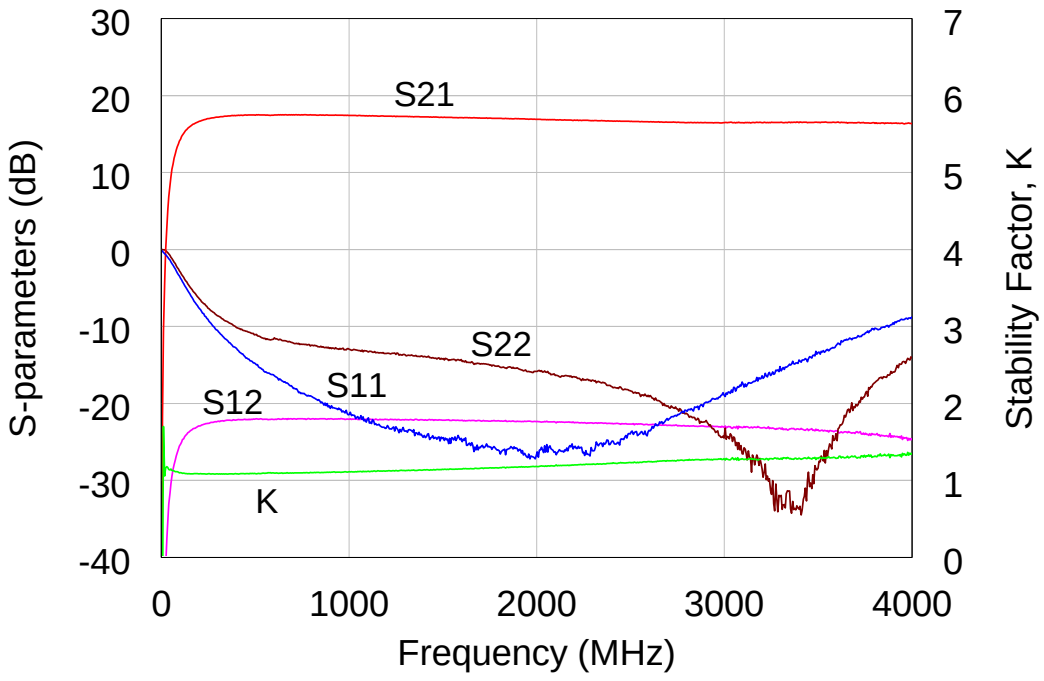
3.2 Performance Table

Supply voltage = +5 V, T_A = +25 °C, Z_O = 50 Ω.

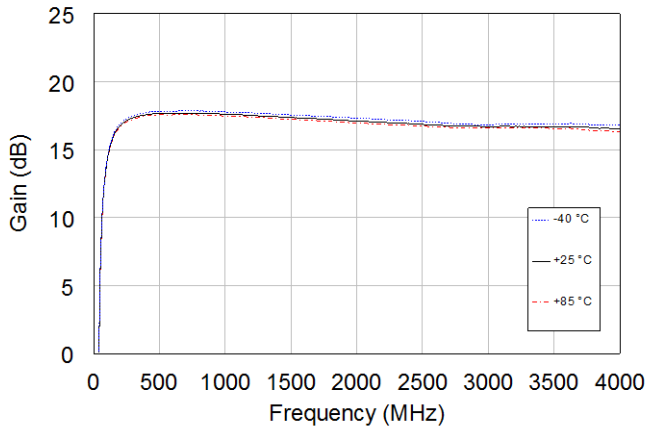
Parameter	Typical						Unit
Frequency	500	900	2000	2500	2700	3000	MHz
Gain	17.5	17.5	16.9	16.7	16.6	16.5	dB
S11	-14.0	-18.0	-20.0	-20.0	-20.0	-18.0	dB
S22	-11.0	-12.0	-15.0	-18.0	-18.0	-18.0	dB
Noise Figure	1.9	1.9	2.3	2.6	3.0	3.3	dB
Output IP3[1)]	40.0	39.0	39.0	39.0	37.0	32.0	dBm
Output P1dB	20.5	20.5	20.5	20.5	20.5	19.0	dBm
Current	104						mA
Device Voltage	+4.2						V

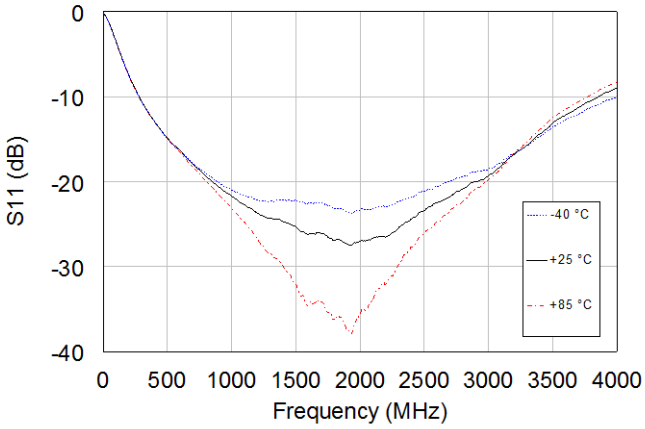
1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1MHz.

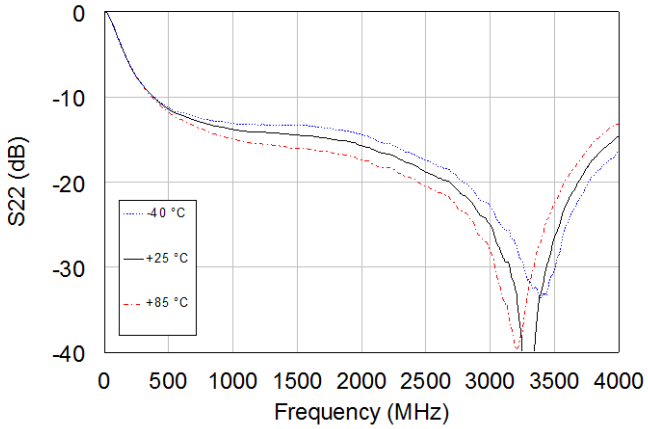
3.3 Plot of S-parameter & Stability Factor

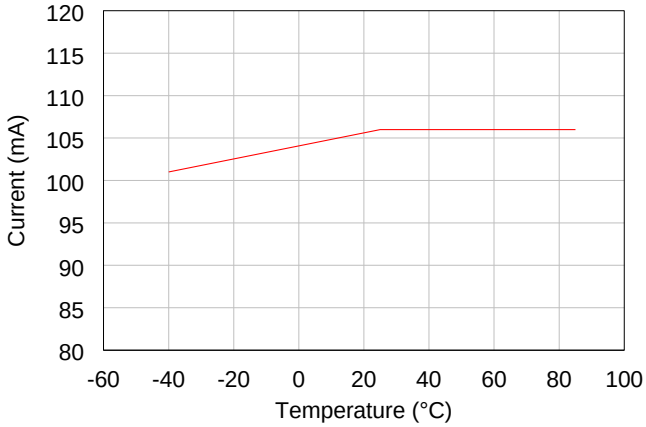


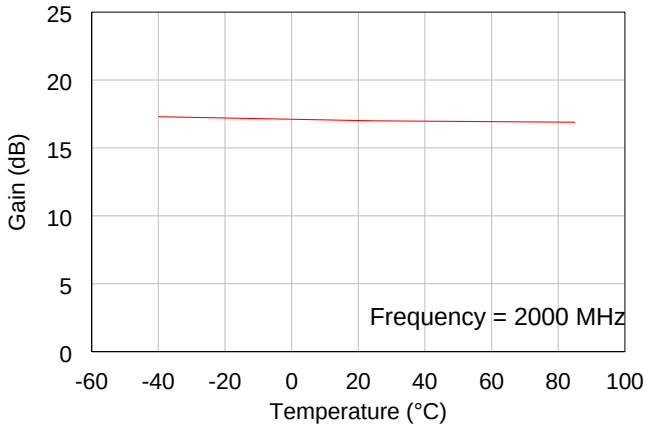
3.4 Plots of Noise Figure and Performances with Temperature

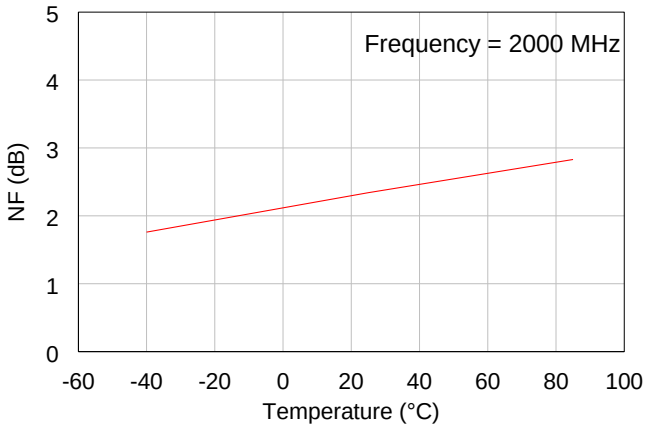


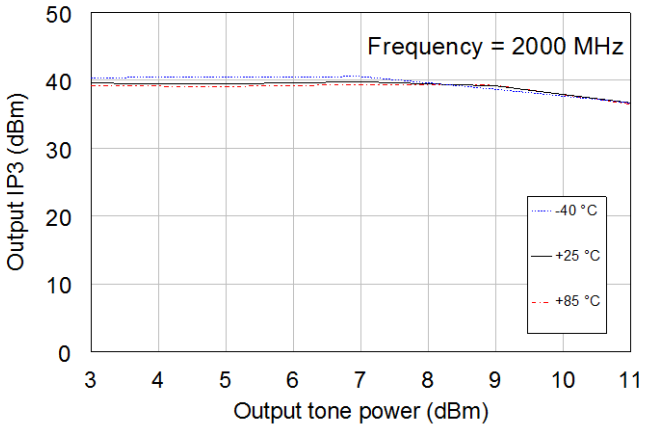


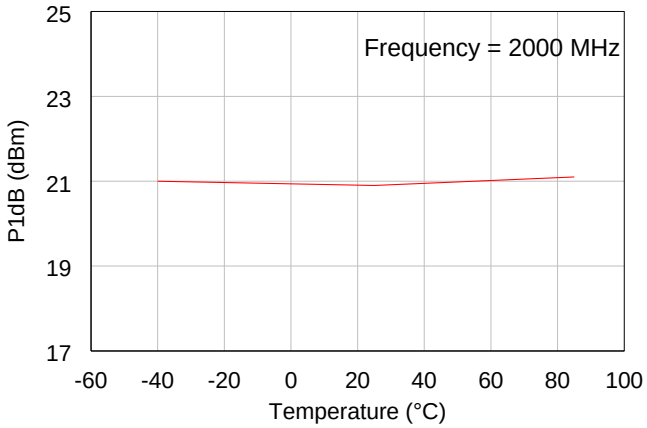






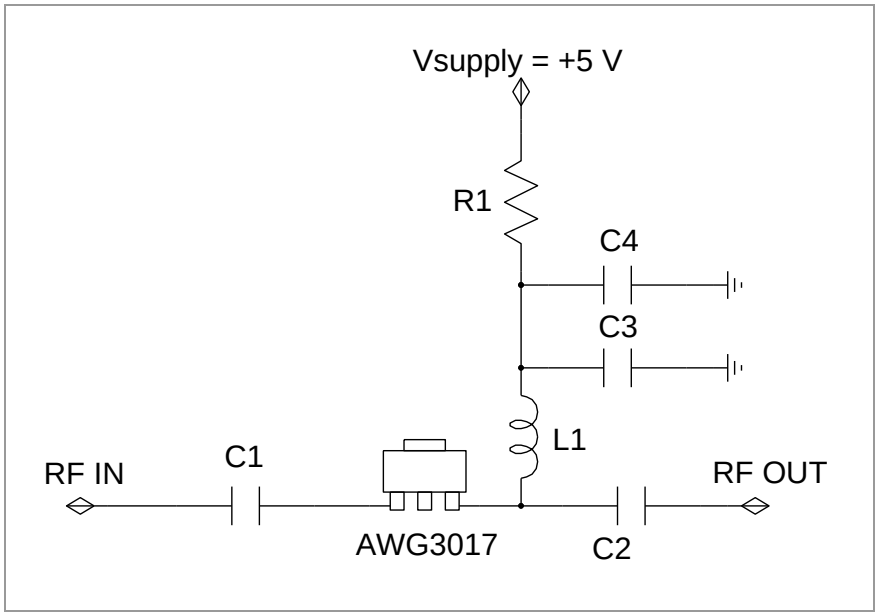


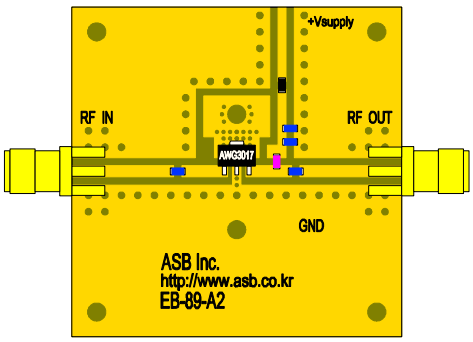

Frequency = 2000 MHz
Output IP3 (dBm)
Output tone power (dBm)
-40 °C
+25 °C
+85 °C
50
40
30
20
10
0
3
4
5
6
7
8
9
10
11


Frequency = 2000 MHz
P1dB (dBm)
Temperature (°C)
25
23
21
19
17
-60
-40
-20
0
20
40
60
80
100

4. Application: 30 ~ 1200 MHz (IF, CATV)

4.1 Application Circuit & Evaluation Board





PCB Information	
Material	FR4
Thickness (mm)	0.8
Size (mm)	40x40
EB No.	EB-89-A2

Bill of Material

Symbol	Value	Size	Description	Manufacturer
AWG3017	-	-	MMIC Amplifier	ASB
C1, C2	1 μF	0603	DC blocking capacitor	Murata
C3	-	-	Not used	
C4	10 μF	0805	Decoupling capacitor	Murata
L1	3.3 μH	0603	RF choke inductor	Samsung
R1	7.5 Ω	0603	Drop resistor	Samsung

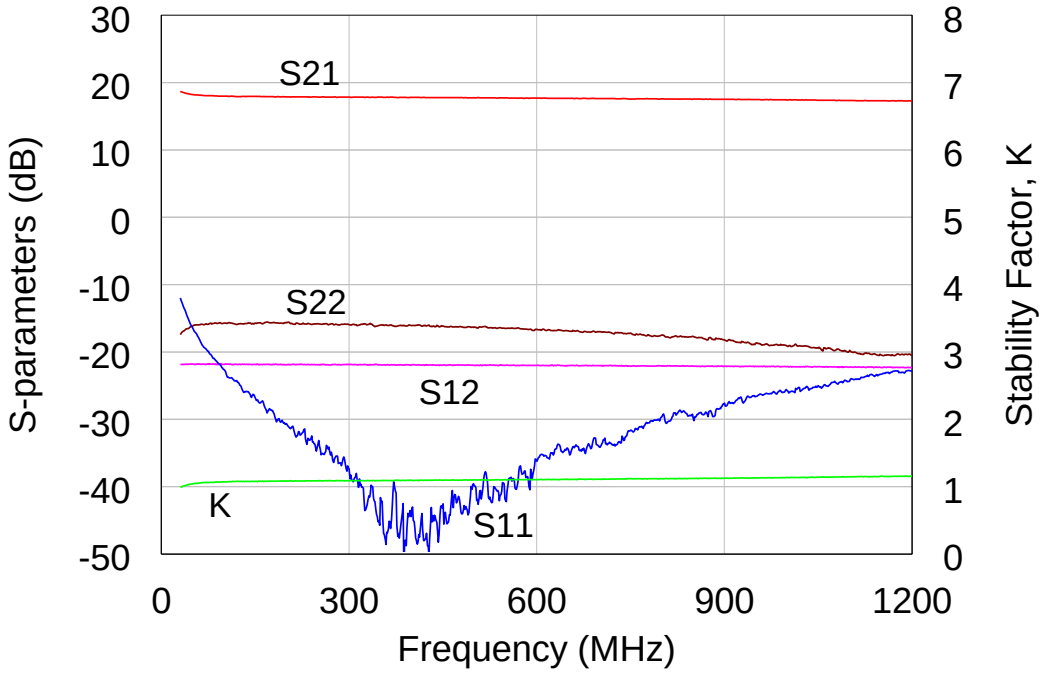
4.2 Performance Table

Supply voltage = +5 V, T_A = +25 °C, Z_O = 50 Ω.

Parameter	Typical								Unit
Frequency	30	70	150	300	450	860	1000	1200	MHz
Gain	18.7	18.1	17.9	17.9	17.8	17.6	17.4	17.3	dB
S11	-11.0	-18.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	dB
S22	-17.0	-15.0	-15.0	-15.0	-15.0	-17.0	-18.0	-18.0	dB
Noise Figure	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.0	dB
Output IP3[1)]	35.0	37.0	38.0	39.0	39.0	38.0	37.0	37.0	dBm
Output P1dB	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	dBm
Current	104								mA
Device Voltage	+4.2								V

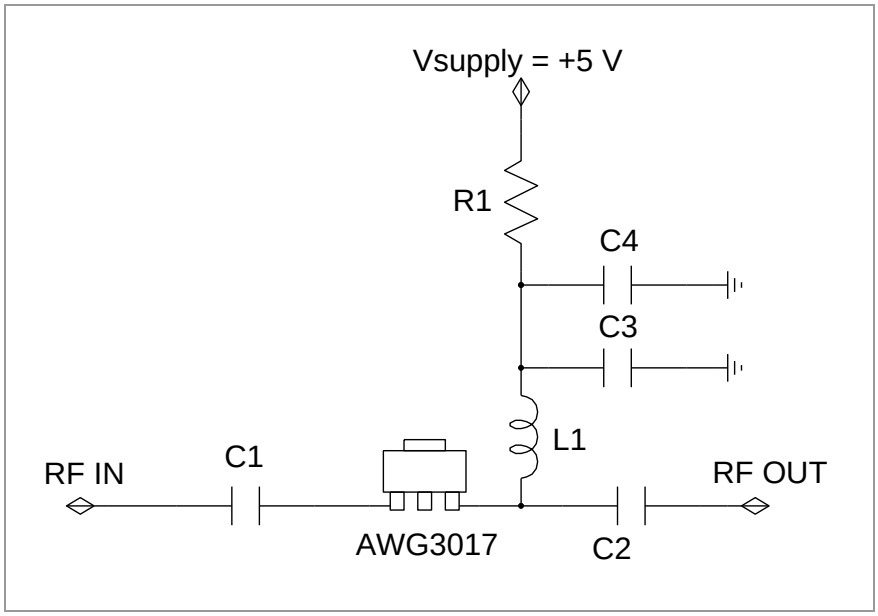
1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1MHz.

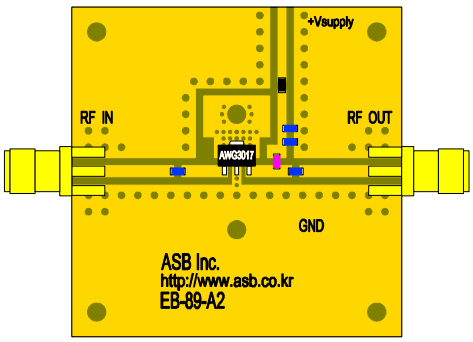
4.3 Plot of S-parameter & Stability Factor



5. Application: 50 ~ 3000 MHz (SMATV, ONU)

5.1 Application Circuit & Evaluation Board





PCB Information	
Material	FR4
Thickness (mm)	0.8
Size (mm)	40x40
EB No.	EB-89-A2

Bill of Material

Symbol	Value	Size	Description	Manufacturer
AWG3017	-	-	MMIC Amplifier	ASB
C1, C2	1 μF	0603	DC blocking capacitor	Murata
C3	-	-	Not used	
C4	10 μF	0805	Decoupling capacitor	Murata
L1	1 μH	0603	RF choke inductor	Samsung
R1	7.5 Ω	0603	Drop resistor	Samsung

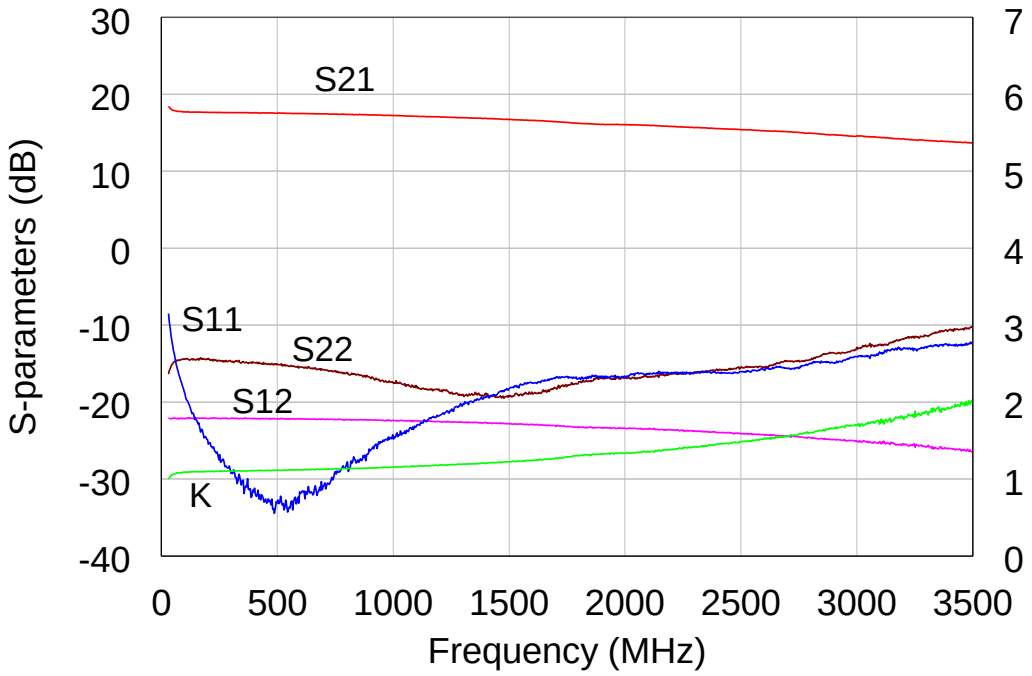
5.2 Performance Table

Supply voltage = +5 V, T_A = +25 °C, Z_O = 50 Ω.

Parameter	Typical						Unit
Frequency	50	500	1000	2000	2500	3000	MHz
Gain	17.9	17.6	17.2	16.1	15.4	14.6	dB
S11	-12.0	-20.0	-20.0	-16.0	-15.0	-14.0	dB
S22	-14.0	-15.0	-17.0	-16.0	-15.0	-12.0	dB
Noise Figure	2.3	1.9	2.0	2.2	2.8	3.1	dB
Output IP3[1)]	35.0	39.0	38.0	37.0	36.5	33.0	dBm
Output P1dB	20.5	20.5	20.5	20.5	20.0	18.0	dBm
Current	104						mA
Device Voltage	+4.2						V

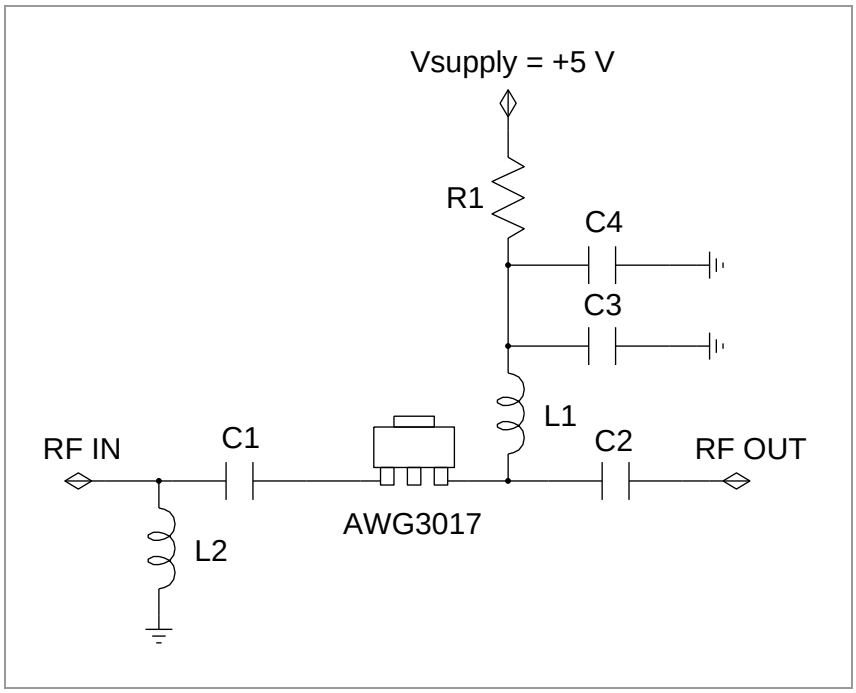
1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1MHz.

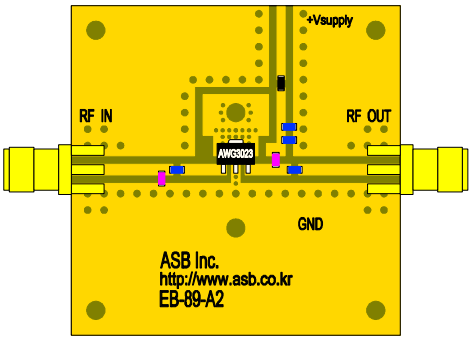
5.3 Plot of S-parameter & Stability Factor



6. Application: 500 ~ 4000 MHz

6.1 Application Circuit & Evaluation Board





PCB Information	
Material	FR4
Thickness (mm)	0.8
Size (mm)	40x40
EB No.	EB-89-A2

Bill of Material

Symbol	Value	Size	Description	Manufacturer
AWG3017	-	-	MMIC Amplifier	ASB
C1, C2, C3	100 pF	0603	DC blocking capacitor	Murata
C4	1 μF	0805	Decoupling capacitor	Murata
L1	33 nH	0603	RF choke inductor	Samsung
L2	82 nH	0603	Input matching inductor	Samsung
R1	7.5 Ω	0603	Drop resistor	Samsung

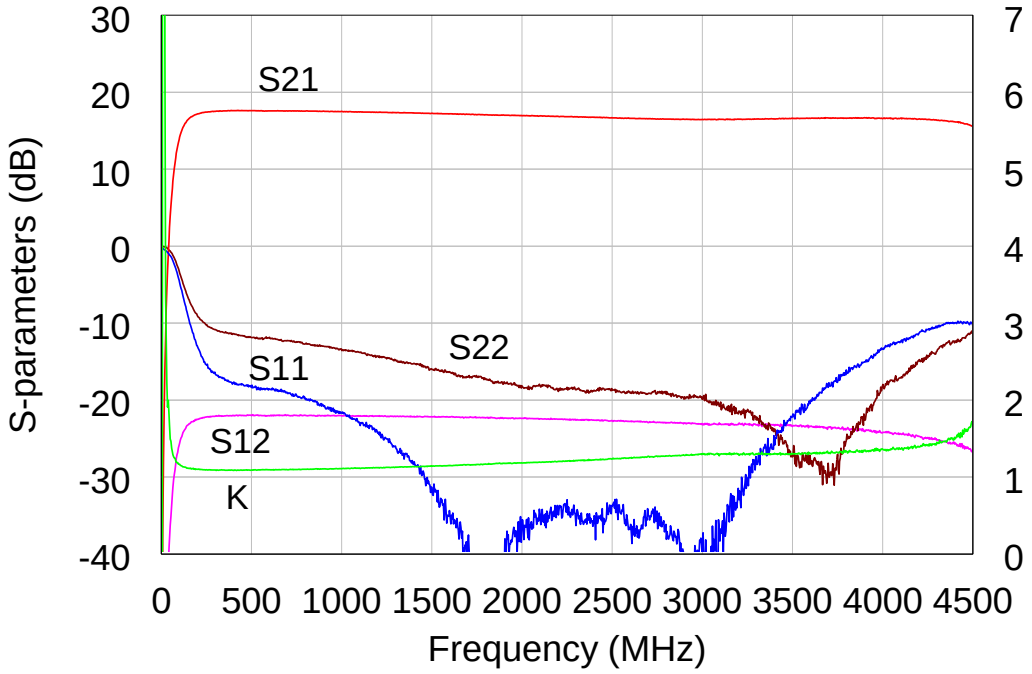
6.2 Performance Table

Supply voltage = +5 V, T_A = +25 °C, Z_O = 50 Ω.

Parameter	Typical					Unit
Frequency	500	1000	2000	3000	4000	MHz
Gain	17.6	17.3	17.0	16.5	16.5	dB
S11	-18.0	-20.0	-20.0	-20.0	-13.0	dB
S22	-10.0	-13.0	-17.0	-18.0	-17.0	dB
Noise Figure	1.9	1.9	2.3	3.0	4.4	dB
Output IP3[1)]	38.0	39.0	39.0	33.0	28.0	dBm
Output P1dB	20.0	20.0	20.0	19.0	18.0	dBm
Current	104					mA
Device Voltage	+4.2					V

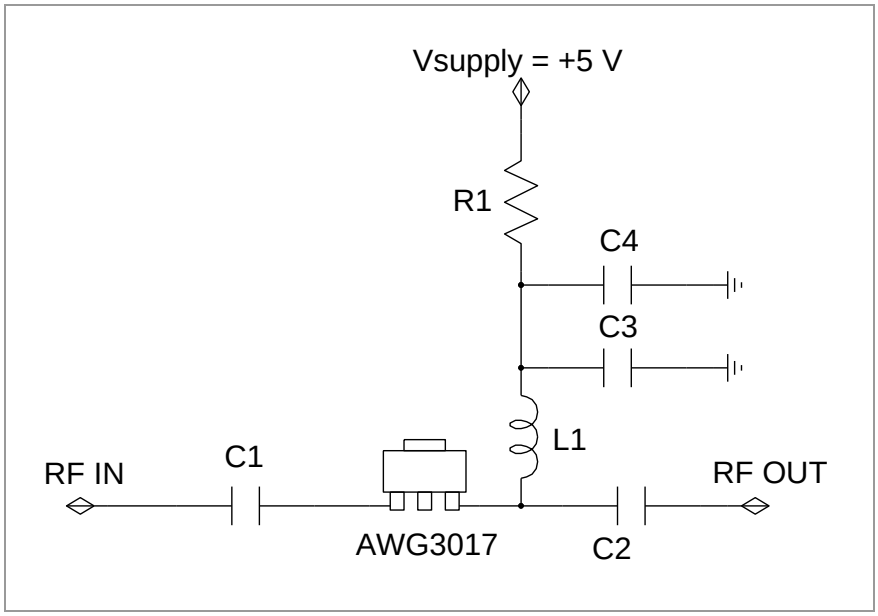
1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1MHz.

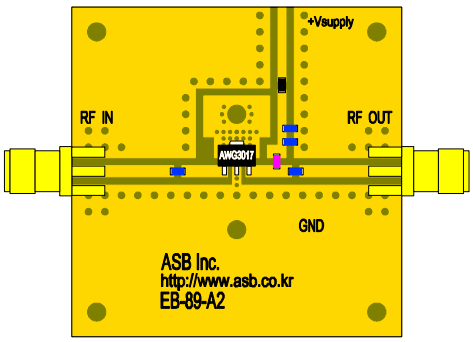
6.3 Plot of S-parameter & Stability Factor



7. Application: 500 ~ 3000 MHz (Vd = +4.5 V, Id = 123 mA)

7.1 Application Circuit & Evaluation Board





PCB Information	
Material	FR4
Thickness (mm)	0.8
Size (mm)	40x40
EB No.	EB-89-A2

Bill of Material

Symbol	Value	Size	Description	Manufacturer
AWG3017	-	-	MMIC Amplifier	ASB
C1, C2	100 pF	0603	DC blocking capacitor	Murata
C3	100 pF	0603	Decoupling capacitor	Murata
C4	1 μF	0603	Decoupling capacitor	Murata
L1	33 nH	0603	RF choke inductor	Murata
R1	3.9 Ω	0603	Drop resistor	Samsung

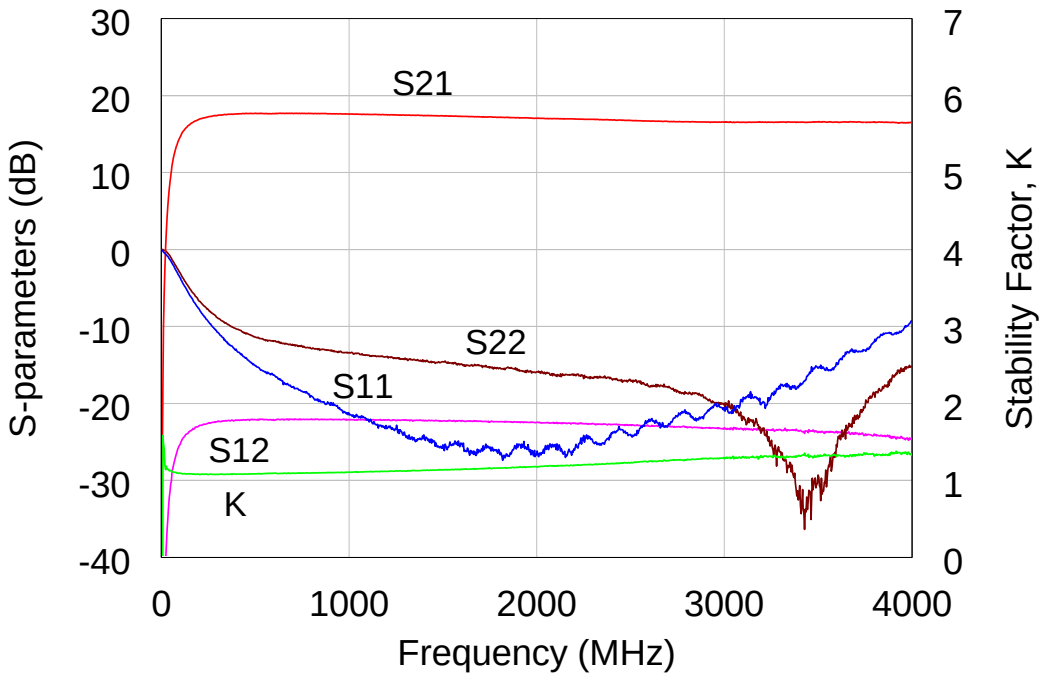
7.2 Performance Table

Supply voltage = +5 V, T_A = +25 °C, Z_O = 50 Ω.

Parameter	Typical						Unit
Frequency	500	900	2000	2500	2700	3000	MHz
Gain	17.7	17.6	17.1	16.8	16.6	16.6	dB
S11	-15.0	-18.0	-20.0	-20.0	-20.0	-18.0	dB
S22	-11.0	-13.0	-15.0	-16.0	-17.0	-18.0	dB
Noise Figure	2.0	2.0	2.4	2.7	3.1	3.4	dB
Output IP3[1)]	40.0	40.0	40.0	40.0	39.5	35.0	dBm
Output P1dB	21.0	21.0	20.5	20.5	20.5	20.0	dBm
Current	123						mA
Device Voltage	+4.5						V

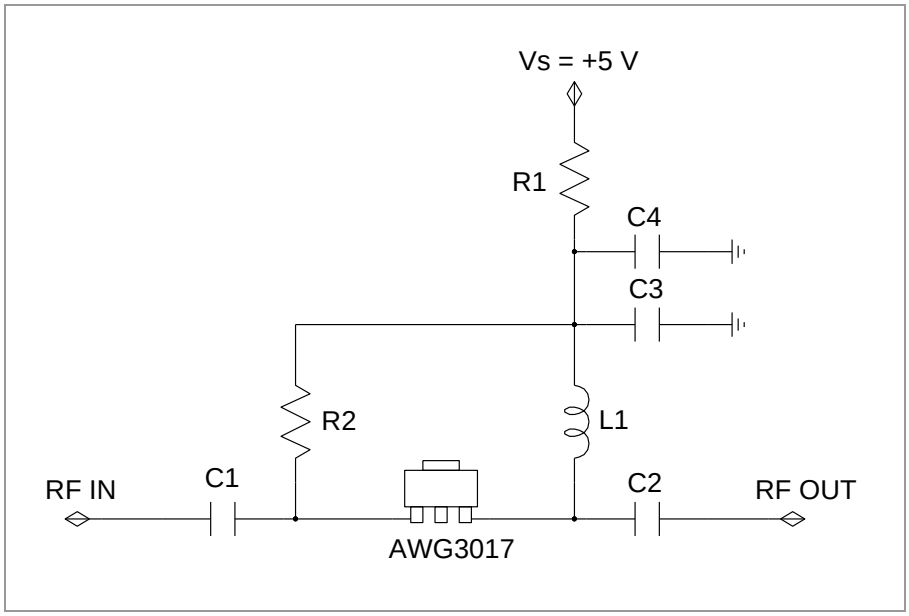
1) OIP3 is measured with two tones at an output power of +5 dBm/tone separated by 1MHz.

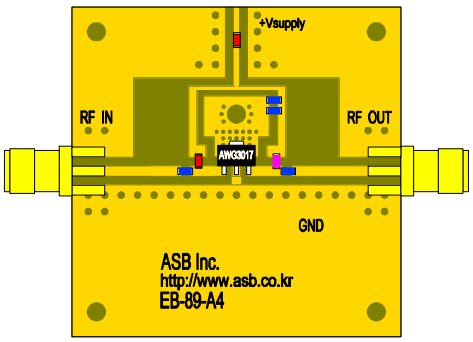
7.3 Plot of S-parameter & Stability Factor



8. Application: 500 ~ 3000 MHz (Vd = +4.6 V, Id = 140 mA)

8.1 Application Circuit & Evaluation Board





PCB Information	
Material	FR4
Thickness (mm)	0.8
Size (mm)	40x40
EB No.	EB-89-A2

Bill of Material

Symbol	Value	Size	Description	Manufacturer
AWG3017	-	-	MMIC Amplifier	ASB
C1, C2	100 pF	0603	DC blocking capacitor	Murata
C3	100 pF	0603	Decoupling capacitor	Murata
C4	1 μF	0603	Decoupling capacitor	Murata
L1	82 nH	0603	RF choke inductor	Murata
R1	3 Ω	0603	Drop resistor	Samsung
R2	330 kΩ	0603	Bias resistor	Samsung

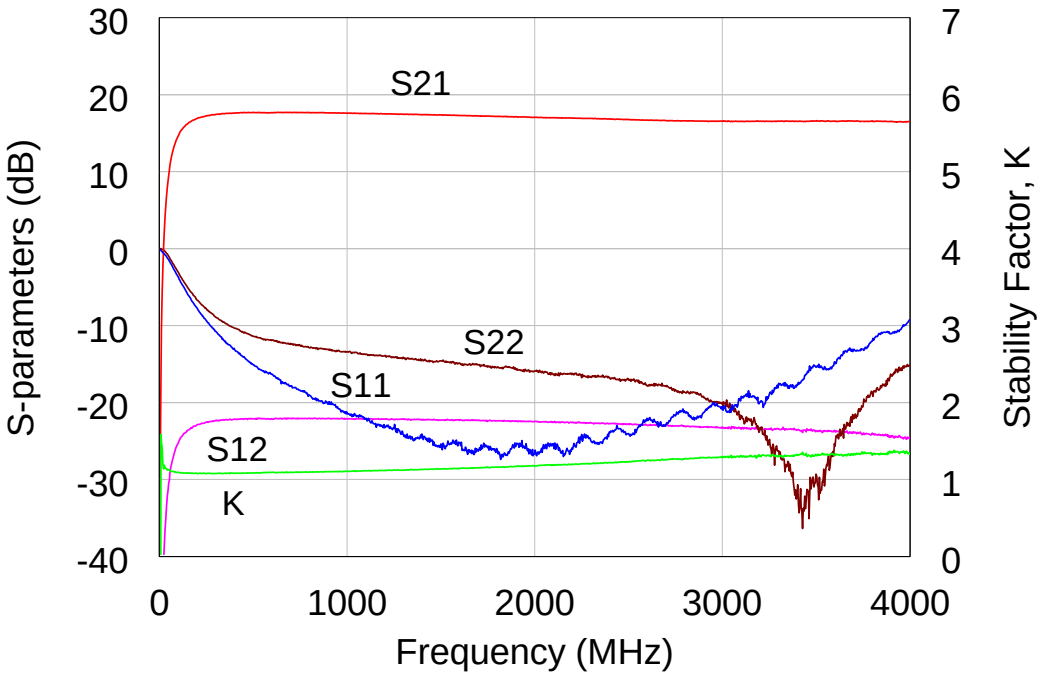
8.2 Performance Table

Supply voltage = +5 V, T_A = +25 °C, Z_O = 50 Ω.

Parameter	Typical						Unit
Frequency	500	900	2000	2500	2700	3000	MHz
Gain	18.0	17.9	17.2	16.9	16.8	16.6	dB
S11	-18.0	-20.0	-20.0	-18.0	-16.0	-13.0	dB
S22	-13.0	-15.0	-18.0	-17.0	-18.0	-20.0	dB
Noise Figure	2.0	2.1	2.4	2.8	3.2	3.5	dB
Output IP3[1)]	42.0	41.0	41.0	41.0	41.0	37.0	dBm
Output P1dB	21.5	21.5	21.5	21.0	21.0	21.0	dBm
Current	140						mA
Device Voltage	+4.6						V

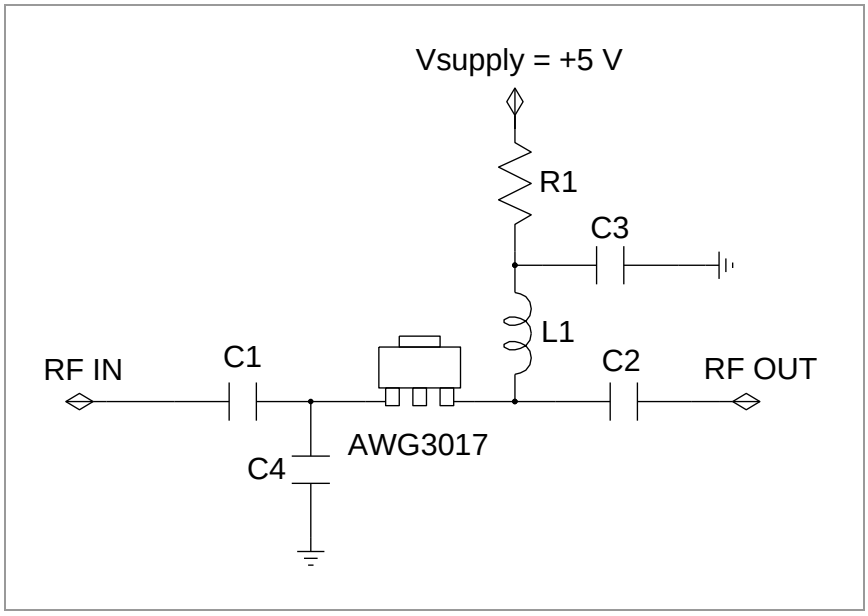
1) OIP3 is measured with two tones at an output power of +7 dBm/tone separated by 1MHz.

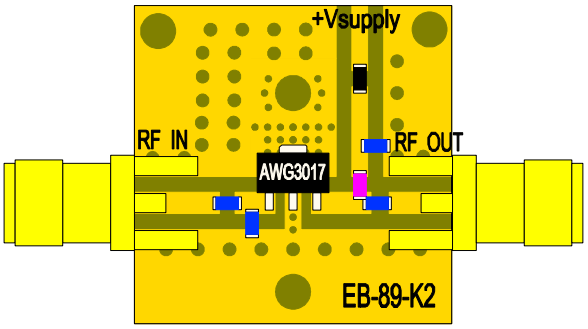
8.3 Plot of S-parameter & Stability Factor



9. Application: 100 ~ 4700 MHz (Vd = +4.2 V, Id = 104 mA)

9.1 Application Circuit & Evaluation Board





PCB Information	
Material	FR4
Thickness (mm)	0.8
Size (mm)	40x40
EB No.	EB-89-A2

Bill of Material

Symbol	Value	Size	Description	Manufacturer
AWG3017	-	-	MMIC Amplifier	ASB
C1, C2	100 pF	0603	DC blocking capacitor	Murata
C3	1 μF	0603	Decoupling capacitor	Murata
C4	0.5 pF	0603	Input matching capacitor	Murata
L1	130 nH	0603	RF choke coil inductor	Murata
R1	7.5 Ω	0603	Drop resistor	Samsung

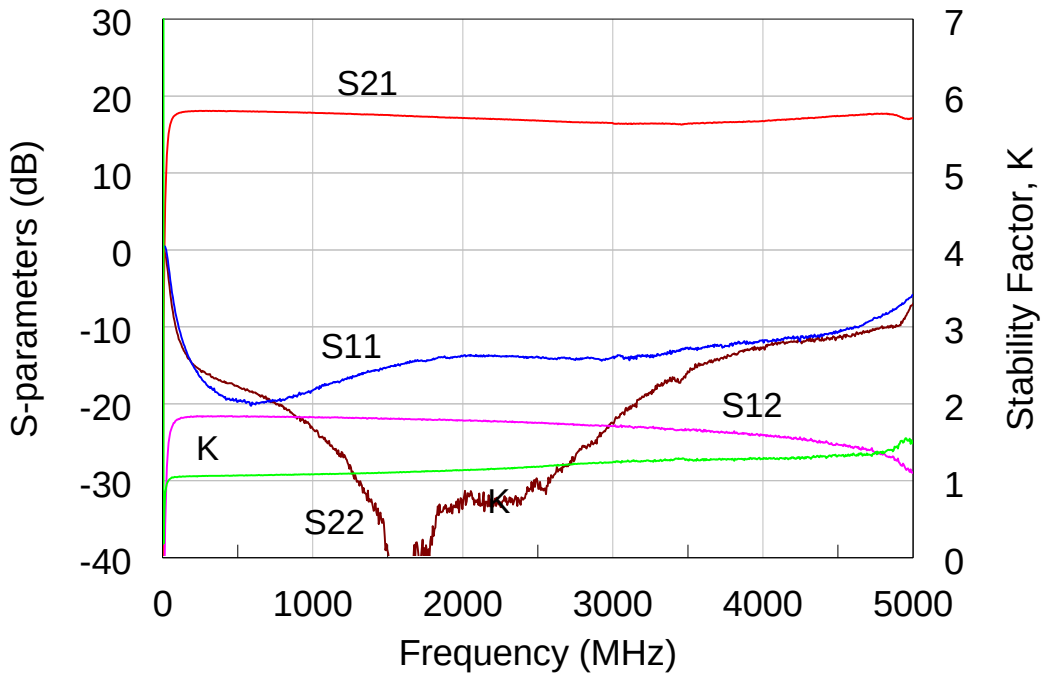
9.2 Performance Table

Supply voltage = +5 V, T_A = +25 °C, Z_O = 50 Ω.

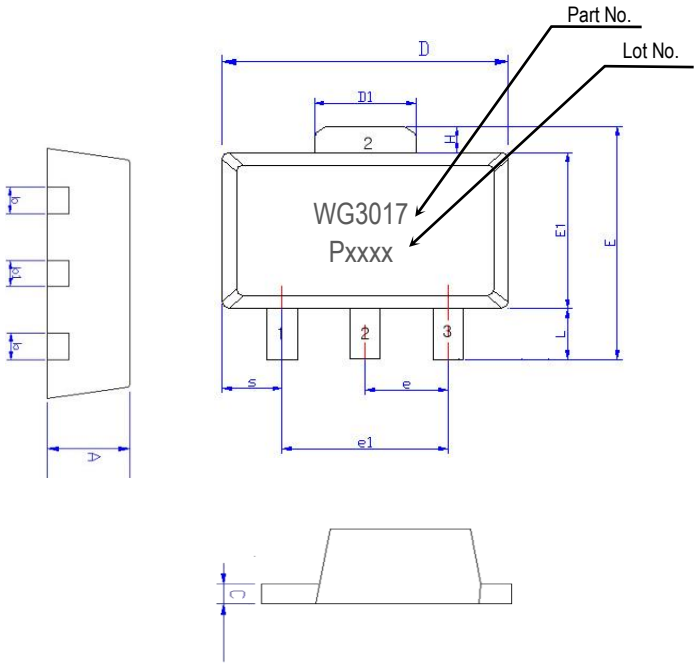
Parameter	Typical					Unit
Frequency	100	1000	2000	4000	4700	MHz
Gain	17.5	17.3	17.0	16.7	17.6	dB
S11	-9.0	-15.0	-14.0	-12.0	-9.0	dB
S22	-10.0	-18.0	-20.0	-13.0	-9.0	dB
Noise Figure	1.9	2.0	2.3	3.3	4.4	dB
Output IP3[1)]	37.0	37.0	36.5	26.5	20.0	dBm
Output P1dB	20.0	20.0	21.0	16.5	13.5	dBm
Current	104					mA
Device Voltage	+4.2					V

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

9.3 Plot of S-parameter & Stability Factor

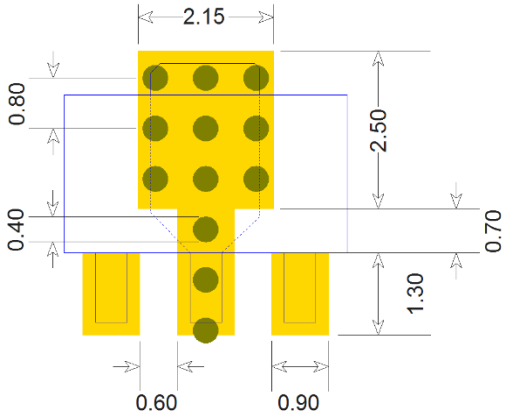


10. Package Outline (SOT89, 4.5x4.0x1.5 mm)



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

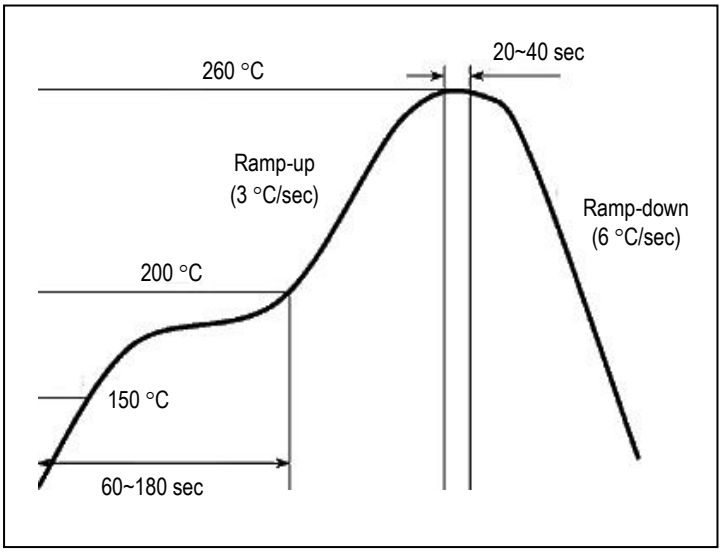
11. Surface Mount Recommendation (In mm)



NOTE

1. The number and size of ground via holes in a circuit board are 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.

12. Recommended Soldering Reflow Profile



(End of Datasheet)

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