



1.5-3.2 GHz LOW NOISE AMPLIFIER WEA109¹

WEA109 LNA is a low cost, low noise figure, wideband, and high linearity amplifier. The amplifier offers typical 1.2 dB noise figure and output IP₃ of 26 dBm at the frequency range from 1.5 GHz to 3.2 GHz and extendable to 3.5 GHz bands. WEA109 LNA is most suitable for wireless data communications, tower top receiver amplifiers, cellular micro-cells, last-mile wireless communication systems, and wireless measurement applications.



Key Features:

Impedance:	50 Ohm
Low Noise:	1.2 dB
Output IP ₃ :	26 dBm
Gain:	28.0 dB
P _{1dB} :	15.0 dBm
Single power supply:	50 mA @ +5V
Frequency Range:	1.5 ~ 3.2 GHz
Operating Temperature:	-40 ~ +85 °C
Return Losses:	16 dB
Small size:	SMA Female, 0.90" x 0.70" x 0.4" (41.9 mm x 17.8 mm x 10.2 mm)
Built-in Functions:	DC blocks at input and output, temperature compensation circuits, and auto DC biases.

Absolute Maximum Ratings²:

Symbol	Parameters	Units	Absolute Maximum
V _{dd}	DC Power Supply Voltage	V	7.0
I _{dd}	Drain Current	mA	60
P _{diss}	Total Power Dissipation	mW	400
P _{In,Max}	RF Input Power	dBm	10
T _{ch}	Channel Temperature	°C	150
T _{STG}	Storage Temperature	°C	-65 ~ 150
T _{O,MAX}	Maximum Operating Temperature	°C	-55 ~ 100
R _{th,c}	Thermal Resistance	°C/W	220

¹ Specifications are subject to change without notice.

² Operation of this device above any one of these parameters may cause permanent damage.



Specifications:

a) **Table 1** Summary of the electrical specifications WEA109 at room temperature

Index	Testing Item	Symbol	Test Constraints	Nom (RT)	Min	Max	Unit
1	Gain	S_{21}	1.5 – 3.2 GHz	28	27	30	dB
2	Gain Variation	ΔG	1.5 – 3.2 GHz	+/- 0.50		+/- 1	dB
3	Input VSWR	$VSWR_1$	1.5 – 3.2 GHz	1.30:1		1.5:1	
4	Output VSWR	$VSWR_2$	1.5 – 3.2 GHz	1.30:1		1.5:1	
5	Reverse Isolation	S_{12}	1.5 – 3.2 GHz	45	40		dB
6	Noise figure	NF	1.5 – 3.2 GHz	1.20		1.40	dB
7	Output Power 1dB compression Point	P_{1dB}	1.5 – 3.2 GHz	15	13		dBm
8	Output-Third-Order Interception point	IP_3	Two-Tone, $P_{out} = +0$ dBm each, 1 MHz separation	27	25		dBm
9	Current Consumption	I_{dd}	$V_{dd} = +5$ V	50	45	55	mA
10	Power Supply Voltage	V_{dd}		+5	+4.7	+5.3	V
11	Thermal Resistance	$R_{th,c}$	Junction to case			220	$^{\circ}C/W$
12	Operating Temperature	T_o			-40	+85	$^{\circ}C$
13	Maximum Average RF Input Power	$P_{IN, MAX}$	1.5 – 3.2 GHz			10	dBm

b) Passband Frequency Response

As shown in **Figure 1**, the typical gain of the WEA109 is 28.0 dB across 1.5 to 3.2 GHz. The typical input and output return losses are 18 dB across the frequency of 1.5 to 3.2 GHz.

Figure 2 shows the measured P_{1dB} and IP_3 of the WEA109. The typical P_{1dB} and IP_3 are 15 dBm and 26 dBm in the frequency range of 1.5 to 3.2 GHz, respectively.

Figure 3 illustrates the noise figure performance. The noise figure is 1.2 dB across the frequency range of 1.5 to 3.2 GHz. At 85 $^{\circ}C$, WEA109 only has 0.20 dB noise increases. At -40 $^{\circ}C$, WEA109 offers approximately 0.15 dB less noise figure than that at room temperature.

Figure 4 is the plot of the stability factor k of WEA109. The amplifier is conditional stable due to k is less than 1 in some frequency ranges.

Figure 5 demonstrates the small signal performance of WEA109 at the extended frequency range.

Figure 6 shows the mechanical outline of WEA109. It is a WanTcom’s standard WP-10E housing. Both RF input and output ports are equipped with stainless SMA female connectors and the DC port connector is an EMI filtered feed thru pin.

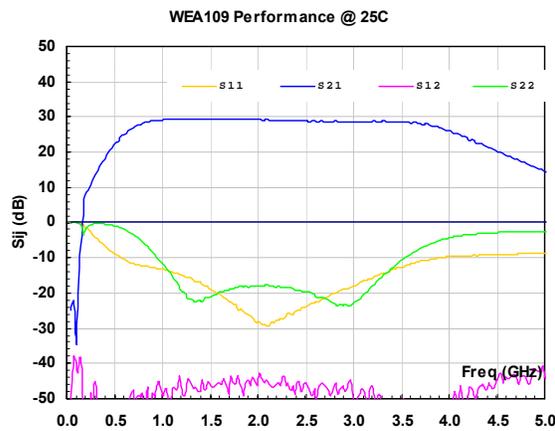


FIG. 1 Typical small signal performance.

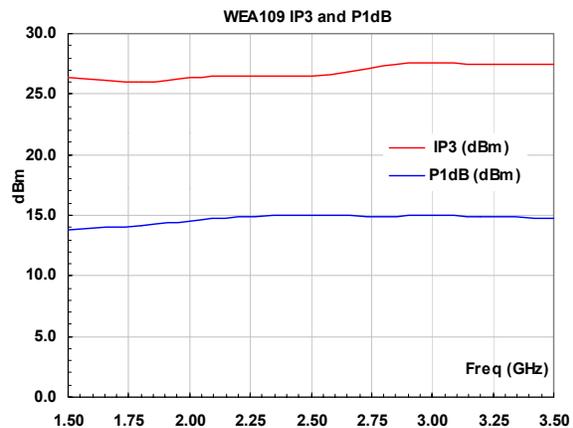


FIG. 2 Typical P_{1dB} and IP_3 at room temperature.

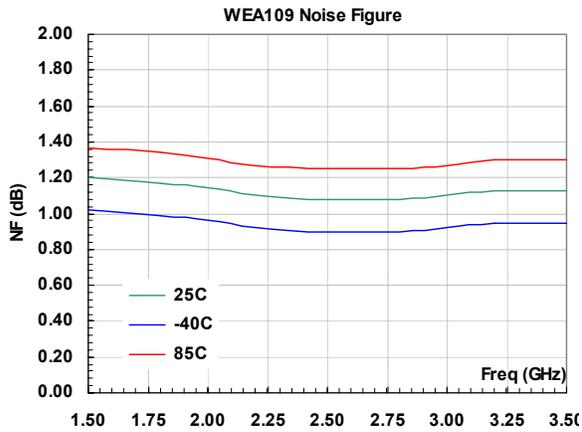


FIG. 3 Noise figure performance at full temperature

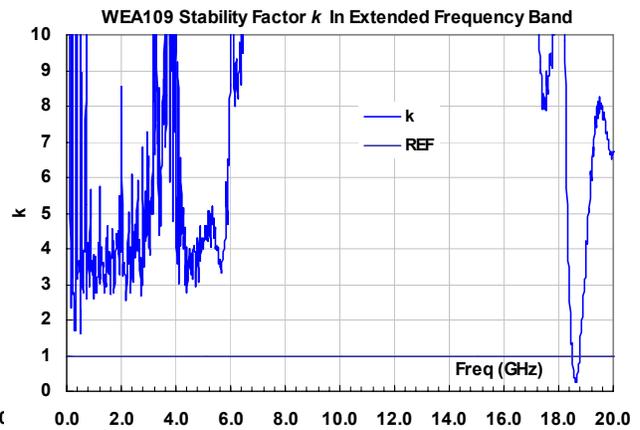


FIG. 4 Stability factor k of WEA109

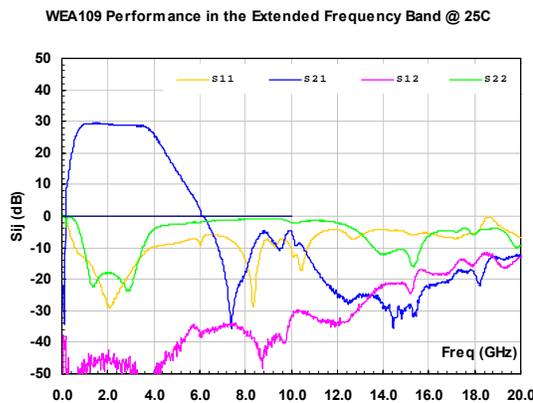


FIG. 5 Performance at the extended frequency band

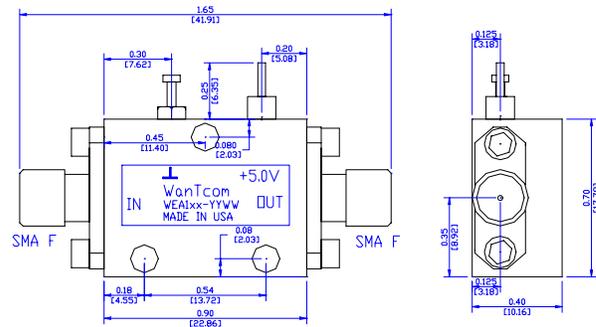


FIG. 6 WEA109 outline

WEA109 Mechanical Outline, WP-10E:

Fig. 6 shows the detail outline of WEA109. It is the WanTcom's standard LNA outline, WP-10E.

Ordering Information

Model Number	WEA109
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Small Signal S-Parameters:

IWEA109, @25C
!s-parameters at Vds=5V, Id=50 mA.
!Last updated 12/04/04.
GHZ s MA R 50

IF(GHz)	MAG S11	ANG S11	MAG S21	ANG S21	MAG S12	ANG S12	MAG S22	ANG S22
0.05	0.999	-12.1	0.047	-157.0	0.0200	-154.5	0.979	-10.6
0.1	0.999	-27.4	0.013	112.6	0.0089	116.5	0.999	-25.8
0.2	0.865	-58.8	2.488	-66.9	0.0006	122.3	0.760	-33.7
0.3	0.624	-82.4	4.725	-157.6	0.0039	-22.0	0.955	-61.2
0.4	0.462	-95.1	8.023	154.8	0.0016	106.7	0.951	-87.5
0.5	0.367	-103.7	12.729	117.7	0.0003	-158.1	0.906	-115.3
0.6	0.301	-111.4	17.915	80.0	0.0032	159.1	0.816	-144.5
0.7	0.265	-117.4	22.170	47.7	0.0011	95.3	0.681	-174.4
0.8	0.241	-123.2	25.600	18.2	0.0032	73.6	0.529	156.4
0.9	0.229	-132.2	27.904	-9.9	0.0040	86.8	0.381	127.4
1	0.217	-142.7	28.437	-34.8	0.0043	69.9	0.263	99.2
1.1	0.202	-155.1	29.016	-56.6	0.0059	68.9	0.172	68.3
1.2	0.183	-166.7	29.521	-77.4	0.0051	34.9	0.112	32.6
1.3	0.161	-179.7	29.411	-96.1	0.0045	38.7	0.080	-13.1
1.4	0.138	168.2	29.531	-114.2	0.0053	22.6	0.078	-60.6
1.5	0.115	158.0	29.714	-131.8	0.0038	3.7	0.088	-95.8
1.6	0.098	144.8	29.322	-148.9	0.0054	5.1	0.104	-123.2
1.7	0.076	136.9	29.327	-165.0	0.0040	16.9	0.111	-144.8
1.8	0.062	133.3	29.442	178.9	0.0045	-26.3	0.123	-163.1
1.9	0.053	125.9	28.994	163.1	0.0041	-8.0	0.125	-179.9
2	0.040	131.6	28.723	148.6	0.0039	-17.8	0.128	165.7
2.1	0.033	138.2	28.653	133.6	0.0049	-28.7	0.126	151.6
2.2	0.040	143.5	28.181	118.2	0.0056	-36.1	0.124	139.5
2.3	0.047	136.4	27.676	103.7	0.0049	-36.8	0.119	128.1
2.4	0.055	134.2	27.480	89.7	0.0036	-24.5	0.107	118.4
2.5	0.066	121.6	27.586	75.3	0.0041	-38.2	0.103	108.7
2.6	0.074	109.8	27.442	60.9	0.0034	-47.6	0.093	99.8
2.7	0.085	96.8	27.186	46.8	0.0051	-56.5	0.083	95.2
2.8	0.099	87.2	27.116	32.8	0.0034	-59.1	0.073	97.6
2.9	0.115	73.3	27.131	17.9	0.0043	-94.2	0.067	103.5
3	0.129	58.6	27.138	2.9	0.0031	-91.8	0.070	114.0
3.1	0.148	45.4	27.104	-11.9	0.0034	-86.9	0.094	120.0
3.2	0.167	31.1	27.125	-26.7	0.0017	-92.8	0.126	121.7
3.3	0.188	16.3	27.322	-42.2	0.0018	-79.1	0.170	115.6
3.4	0.210	2.8	27.208	-58.9	0.0023	-102.5	0.226	105.6
3.5	0.232	-11.4	26.521	-76.5	0.0024	-114.6	0.293	93.7
3.6	0.256	-26.3	25.841	-93.8	0.0017	-149.4	0.357	79.2
3.7	0.280	-41.6	25.215	-112.4	0.0008	-44.0	0.428	64.1
3.8	0.297	-56.9	23.826	-131.2	0.0014	-7.1	0.493	47.8
3.9	0.315	-72.1	21.939	-148.7	0.0026	-20.5	0.552	31.4
4	0.329	-86.5	20.389	-165.9	0.0018	-23.6	0.601	15.3
4.1	0.334	-100.1	18.197	175.9	0.0031	-25.8	0.640	-0.6
4.2	0.342	-113.8	15.544	159.3	0.0028	-21.5	0.670	-15.9
4.3	0.344	-126.4	13.396	144.9	0.0041	-34.6	0.691	-30.8
4.4	0.347	-138.1	11.846	130.7	0.0060	-28.5	0.708	-45.0
4.5	0.350	-150.0	10.358	116.0	0.0052	-35.3	0.718	-58.5
5	0.374	157.6	5.269	53.0	0.0085	-74.9	0.746	-119.3
5.5	0.421	107.0	2.704	-4.9	0.0140	-85.8	0.773	-173.0
6	0.367	52.4	1.315	-64.8	0.0130	-146.4	0.769	135.7
