1.0-2.0 GHz LOW NOISE AMPLIFIER WEA105[1]

WEA105 LNA is a low cost, low noise figure, wideband, and high linearity amplifier. The amplifier offers typical 1.0 dB noise figure and output IP_3 of 25 dBm at the frequency range from 1.0 GHz to 2.0 GHz and extendable from 0.80 to 2.20 GHz bands. WEA105 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:	1.0 dB
Output IP_3:	25 dBm
Gain:	33.0 dB
P_{1dB}:	13.0 dBm
Single power supply:	50 mA @ +5V
Frequency Range:	1.0 ~ 2.0 GHz, extendable from 0.80 to 2.20 GHz bands
Operating Temperature:	-40 ~ +85 ºC
Return Losses:	18 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 Ratings[2]:

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 WEA105 at room temperature

Index	Testing Item	Symbol	Test Constraints	Nom (RT)	Min	Max	Unit
1	Gain	S_{21}	1.0 – 2.0 GHz	33	31	35	dB
2	Gain Variation	ΔG	1.0 – 2.0 GHz	+/- 1.0		+/- 1.5	dB
3	Input VSWR	$VSWR_1$	1.0 – 2.0 GHz	1.25:1		1.4:1	
4	Output VSWR	$VSWR_2$	1.0 – 2.0 GHz	1.25:1		1.4:1	
5	Reverse Isolation	S_{12}	1.0 – 2.0 GHz	45	40		dB
6	Noise figure	NF	1.0 – 2.0 GHz	1.0		1.20	dB
7	Output Power 1dB compression Point	P_{1dB}	1.0 – 2.0 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	$^oC/W$
12	Operating Temperature	T_o			-40	+85	^oC
13	Maximum Average RF Input Power	$P_{IN, MAX}$	1.0 – 2.0 GHz			10	dBm

b) Passband Frequency Response

As shown in **Figure 1**, the typical gain of the WEA105 is 33.0 dB across 1.0 to 2.0 GHz. The typical input and output return losses are 18 dB across the frequency of 1.0 to 2.0 GHz.

Figure 2 shows the measured P_{1dB} and IP_3 of the WEA105. The typical P_{1dB} and IP_3 are 15 dBm and 25 dBm in the frequency range of 1.0 to 2.0 GHz, respectively.

Figure 3 illustrates the noise figure performance. The noise figure is 1.0 dB across the frequency range of 1.0 to 2.0 GHz. At 85 ^{0}C, WEA105 only has 0.20 dB noise increases. At –40 ^{0}C, WEA105 offers approximately 0.15 dB less noise figure than that at room temperature.

Figure 4 is the plot of the stability factor *k* of WEA105. The amplifier is conditional stable due to *k* is less than 1 in some frequency ranges.

Figure 5 is the block diagram of internal circuit of WEA105. It is a two-stage amplifier with the DC block capacitors at the input and output RF ports. All the RF matching networks, DC-DC converter, DC bias circuitries, and temperature compensation circuits are built in.

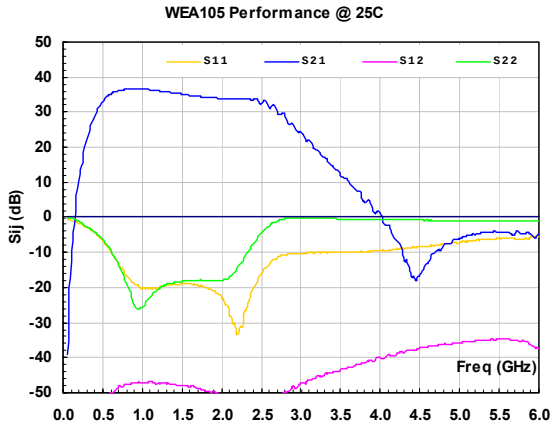

FIG. 1 Typical small signal performance.

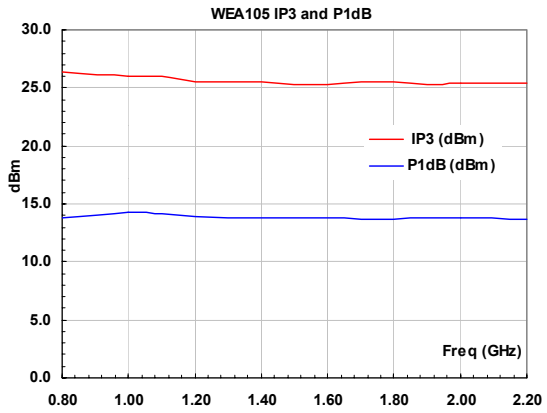

FIG. 2 Typical P_{1dB} and IP_3 at room temperature.

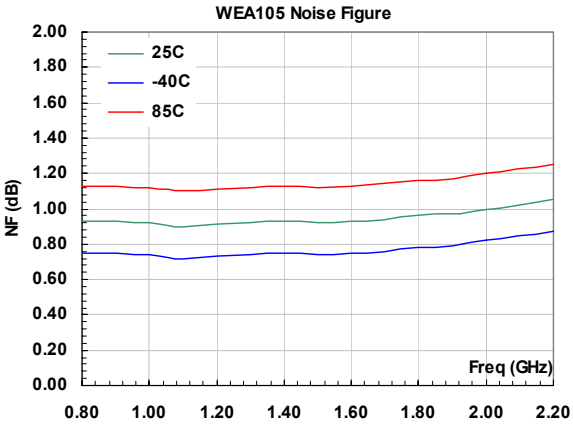

FIG. 3 Noise figure performance at full temperature

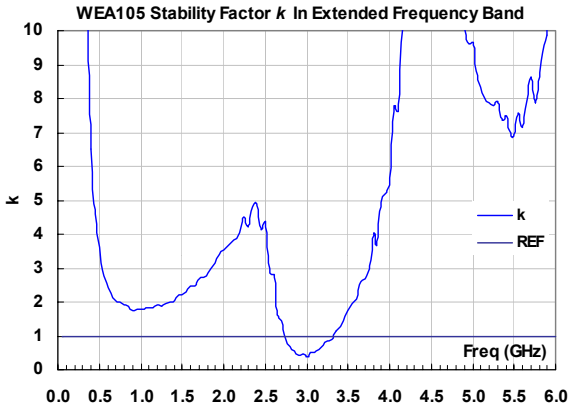

FIG. 4 Stability factor *k* of WEA105

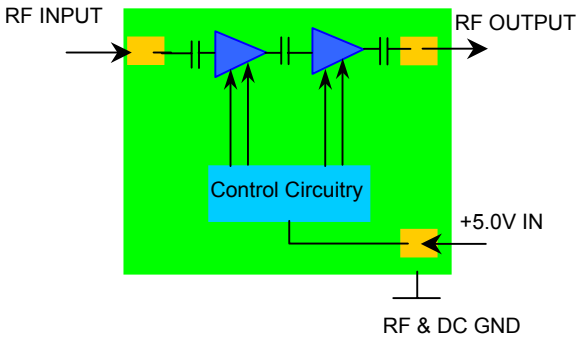

FIG. 5 Block diagram of internal circuit.

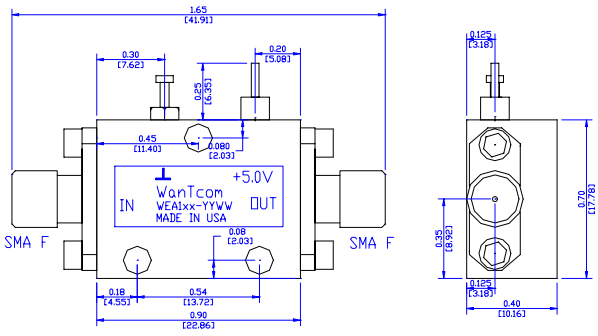

FIG. 6 WEA105 outline

Figure 6 shows the mechanical outline of WEA105. 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.

WEA105 Mechanical Outline, WP-10E:

Fig. 6 shows the detail outline of WEA105. It is the WanTcom's standard LNA outline, WP-10E.

Ordering Information

Model Number	WEA105

Small Signal S-Parameters:

!WEA105, @25C
!s-parameters at Vdd=5V, Idd=50 mA.
!Last updated 12/12/04.
GHZ s MA R 50

!F(GHz)	MAG S11	ANG S11	MAG S21	ANG S21	MAG S12	ANG S12	MAG S22	ANG S22
0.05	0.952	179.5	0.008	56.8	0.00020	-172.0	0.998	-21.6
0.1	0.906	127.7	0.173	-4.9	0.00014	82.9	0.983	-43.8
0.2	0.820	55.7	3.324	-92.0	0.00024	104.0	0.872	-87.3
0.3	0.721	-3.3	13.113	-162.0	0.00021	-159.0	0.736	-125.6
0.4	0.602	-55.7	28.349	140.2	0.00114	174.4	0.615	-162.1
0.5	0.460	-103.4	44.328	88.7	0.00205	138.0	0.480	162.2
0.6	0.321	-143.6	56.751	43.5	0.00317	109.1	0.338	130.0
0.7	0.215	-174.8	64.228	5.0	0.00378	83.5	0.209	104.6
0.8	0.150	163.7	67.399	-27.7	0.00410	64.0	0.114	89.7
0.9	0.114	146.6	67.952	-56.7	0.00451	46.2	0.055	99.6
1	0.094	137.0	67.143	-83.8	0.00449	32.3	0.052	137.9
1.1	0.096	130.3	65.800	-107.9	0.00439	19.7	0.075	147.0
1.2	0.103	115.8	63.851	-130.9	0.00432	7.5	0.095	142.4
1.3	0.106	100.3	62.006	-152.6	0.00426	-3.2	0.109	134.3
1.4	0.108	85.3	60.084	-172.6	0.00419	-11.3	0.118	126.7
1.5	0.115	72.5	57.282	167.8	0.00402	-19.6	0.124	119.8
1.6	0.115	55.3	54.692	148.3	0.00376	-28.3	0.129	113.5
1.7	0.107	37.4	53.284	129.7	0.00350	-37.6	0.129	109.3
1.8	0.099	25.1	51.773	111.6	0.00338	-44.6	0.128	106.4
1.9	0.091	8.9	49.991	93.9	0.00316	-55.4	0.127	106.1
2	0.072	-18.6	48.819	75.5	0.00290	-64.6	0.128	110.7
2.1	0.039	-44.2	48.221	56.9	0.00274	-74.2	0.141	121.1
2.2	0.016	-104.1	48.274	37.6	0.00240	-87.0	0.190	130.1
2.3	0.041	167.7	49.296	17.3	0.00223	-106.6	0.284	130.1
2.4	0.101	133.1	47.005	-3.9	0.00178	-133.0	0.423	121.5
2.5	0.163	105.1	41.529	-29.3	0.00174	-179.1	0.594	106.1
2.6	0.215	79.6	36.678	-60.1	0.00199	142.0	0.759	87.0
2.7	0.259	58.7	31.837	-88.2	0.00248	105.4	0.880	67.0
2.8	0.296	38.1	27.674	-110.0	0.00329	81.3	0.947	47.9
2.9	0.302	17.9	21.736	-128.4	0.00375	63.9	0.974	30.8
3	0.300	3.5	16.416	-143.7	0.00428	50.6	0.982	15.9
3.1	0.314	-9.1	12.510	-159.4	0.00481	40.8	0.976	2.3
3.2	0.316	-22.3	9.072	-175.7	0.00529	30.8	0.968	-10.1
3.3	0.309	-35.1	7.023	170.6	0.00574	23.3	0.964	-22.0
3.4	0.309	-43.6	5.345	156.5	0.00614	16.5	0.958	-33.0
3.5	0.325	-52.9	4.059	142.9	0.00675	9.7	0.949	-43.9
3.6	0.323	-68.0	3.284	132.0	0.00723	1.1	0.945	-54.5
3.7	0.312	-75.7	2.441	122.5	0.00807	-4.4	0.941	-64.7
3.8	0.324	-84.7	1.678	109.4	0.00822	-9.1	0.937	-75.0
3.9	0.339	-98.3	1.344	91.4	0.00875	-19.2	0.933	-85.2
4	0.332	-106.2	1.122	83.4	0.00997	-25.8	0.930	-95.3
4.1	0.346	-116.3	0.769	77.6	0.01100	-28.7	0.924	-105.4
4.2	0.357	-128.8	0.460	61.3	0.01100	-32.7	0.921	-115.6
4.3	0.361	-140.0	0.267	37.9	0.01200	-43.6	0.920	-125.6
4.4	0.371	-151.7	0.157	-3.8	0.01300	-51.6	0.917	-135.9
4.5	0.388	-162.3	0.146	-74.8	0.01400	-57.2	0.915	-146.4
5	0.428	134.5	0.490	-174.5	0.01600	-95.6	0.904	161.9
5.5	0.504	81.1	0.611	130.8	0.01800	-134.7	0.898	109.0
6	0.514	30.6	0.569	80.3	0.01400	-167.6	0.878	55.7

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