



1.7 – 2.2 GHz LOW NOISE AMPLIFIER WBA1722A¹

WBA1722A LNA is a super low noise figure, wideband, and high linearity connectorized amplifier with unconditional stable design. The amplifier offers typical 0.60 dB noise figure, 30.0 dB gain, and 33.0 dBm output IP₃ in the frequency range from 1.7 GHz to 2.2 GHz of DCS, PCS, and 3G bands.

WBA1722A is most suitable for cellular base stations, wireless data communications, tower top receiver amplifiers, last-mile wireless communication systems, and wireless measurement applications.

WBA1722A is designed to meet the rugged standards of MIL-STD-202.

WBA1722A is RoHS complied product.



Key Features:

Impedance:	50 Ohm
MTBF ² :	>600,000 hrs (68 Years)
Low Noise:	0.60 dB
Output IP ₃ :	33.0 dBm
Gain:	30.0 dB
P _{1dB} :	19.0 dBm
Single Power Supply:	90 mA @ +5V
Frequency Range:	1.7 ~ 2.2 GHz
Operating Temperature:	-40 ~ +85 °C
VSWR:	1.22:1
Small Size:	WP-5
Built-In Functions:	DC blocks at input and output, DC-DC converter temperature compensation circuits, and auto DC biases.

Absolute Maximum Ratings³:

Symbol	Parameters	Units	Absolute Maximum
V _{dd}	DC Power Supply Voltage	V	5.5
I _{dd}	Drain Current	mA	120
P _{diss}	Total Power Dissipation	mW	700
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 MTBF: Mean Time Between Failure, Per TR-NWT-000332, ISSUE 3, SEPTEMBER, 1990, T=40°C

³ Operation of this device above any one of these parameters may cause permanent damage.



Specifications:

a) **Table 1** Summary of the electrical specifications WBA1722A at room temperature

Index	Testing Item	Symbol	Test Constraints	Nom (RT)	Min	Max	Unit
1	Gain	S_{21}	1.7 – 2.2 GHz	30	28.5	32.5	dB
2	Gain Variation	ΔG	1.7 – 2.2 GHz	+/- 1.0		+/- 1.3	dB
3	Input VSWR	$VSWR_1$	1.7 – 2.2 GHz	1.22		1.35	
4	Output VSWR	$VSWR_2$	1.7 – 2.2 GHz	1.22		1.35	
5	Reverse Isolation	S_{12}	1.7 – 2.2 GHz	45	40		dB
6	Noise figure	NF	1.7 – 2.2 GHz	0.60		0.75	dB
7	Output Power 1dB compression Point	P_{1dB}	1.7 – 2.2 GHz	19	17		dBm
8	Output-Third-Order Interception point	IP_3	Two-Tone, $P_{out} = +0$ dBm each, 1 MHz separation	33	31		dBm
9	Current Consumption	I_{dd}	$V_{dd} = +5$ V	90	85	95	mA
10	Power Supply Voltage	V_{dd}		+5	+4.7	+5.3	V
11	Thermal Resistance	$R_{th,c}$	Junction to case			215	°C/W
12	Operating Temperature	T_o			-40	+85	°C
13	Maximum Average RF Input Power	$P_{IN, MAX}$	1.7 – 2.2 GHz			10	dBm

b) Passband Frequency Response

As shown in **Figure 1**, the typical gain of the WBA1722A is 30.0 dB across 1.7 to 2.2 GHz. The typical input and output return losses are 20 dB across the frequency of 1.7 to 2.2 GHz.

Figure 2 shows the measured P_{1dB} and IP_3 of the WBA1722A. The typical P_{1dB} and IP_3 are 19.0 dBm and 33.0 dBm in the frequency range of 1.7 to 2.2 GHz, respectively.

Figure 3 illustrates the measured noise figure performance at full temperature. The noise figure is 0.60 dB across the frequency range of 1.7 to 2.2 GHz at room temperature. At 85 °C, WBA1722A only has 0.20 dB noise increases. At -40 °C, WBA1722A offers approximately 0.15 dB less noise figure than that at room temperature.

Figure 4 demonstrates the stability factor k of the amplifier. All the k values are greater than 1.0 from the temperature range from -40 °C to +85 °C. The amplifier is unconditional stable.

Figure 5 is the frequency response of WBA1722A in the extended frequency range. The amplifier is usable from 1.5 GHz to 2.5 GHz frequency range,

Figure 6 is the block diagram of internal circuit of WBA1722A. 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.

Figure 7 shows the mechanical outline of WBA1722A. The package is WanTcom standard housing, WP-5. All the RF ports are equipped with SMA female connectors and feed through for the +5.0 V DC input.

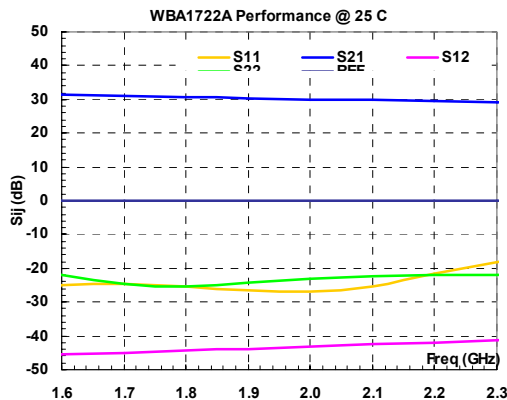


FIG. 1 Typical small signal performance.

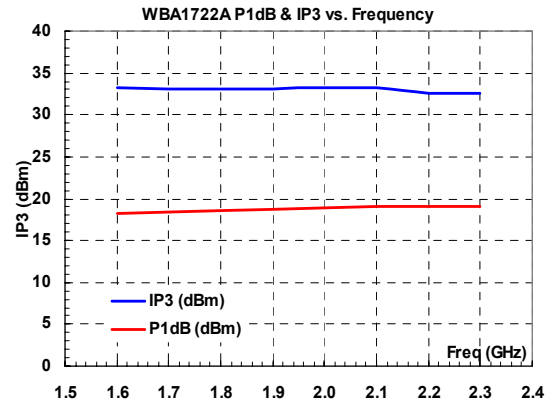


FIG. 2 Typical P_{1dB} and IP_3 at room temperature.

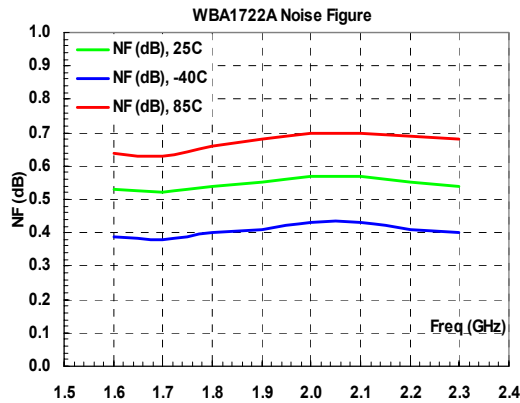


FIG. 3 Noise figure performance at full temperature

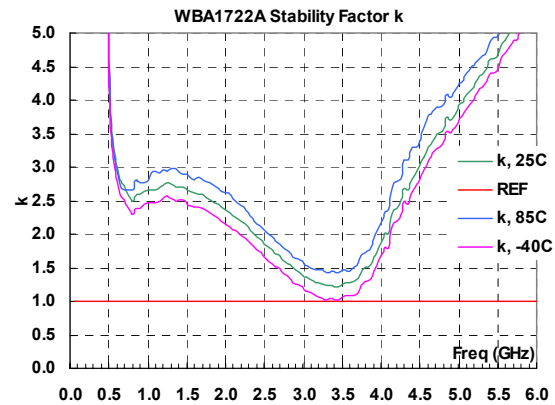


FIG. 4 Stability factor k

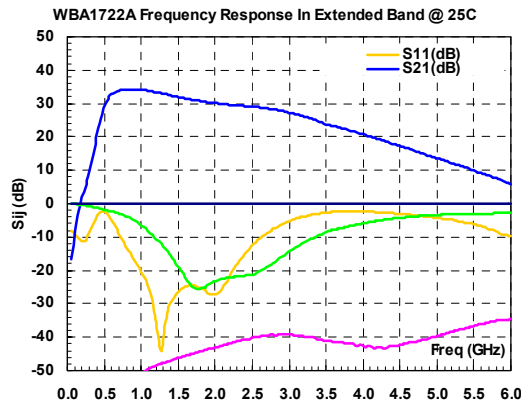


FIG. 5 Frequency response in extended frequency

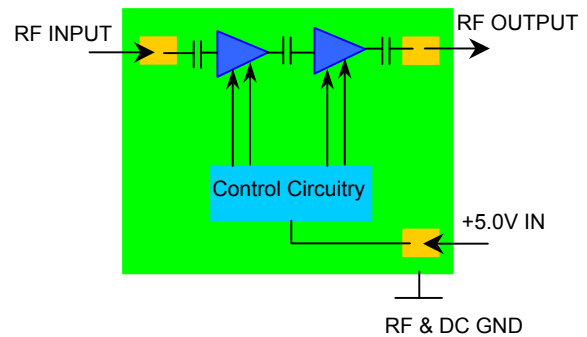


FIG. 6 Block diagram of WBA1722A

WBA1722A Mechanical Outline, WP-5:

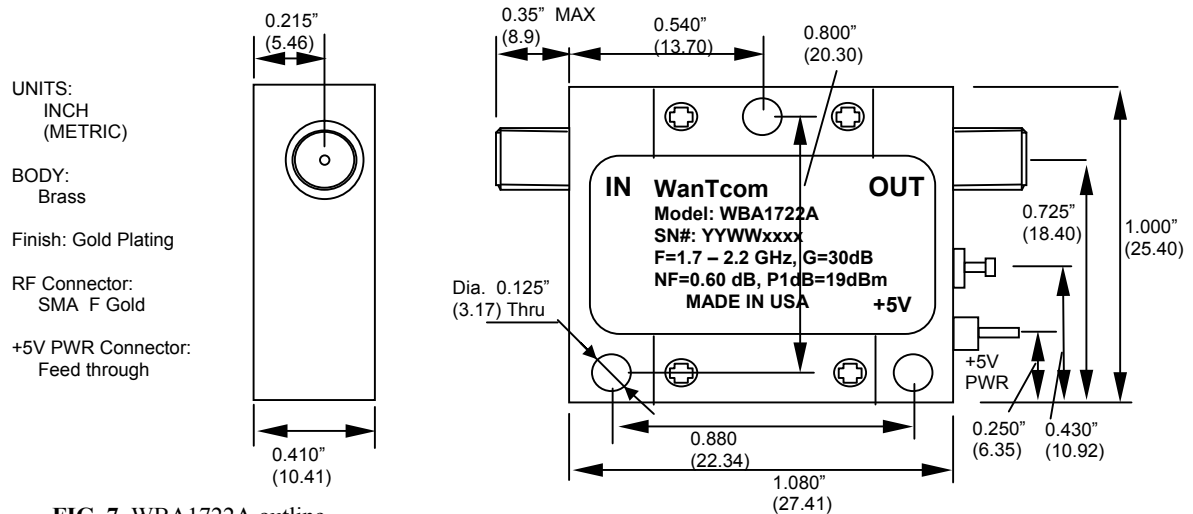


FIG. 7 WBA1722A outline



Ordering Information

Model Number	WBA1722A
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Small Signal S-Parameters:

IWBA1722A

Is-parameters at $V_{dd}=+5V$, $I_{dd}=90mA$. Last updated 4/22/04.

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	0.381	-37.7	0.189	-165.3	0.000135	-43.8	0.995	-10.4
0.1	0.340	-57.2	0.450	168.5	0.000060	-44.9	0.984	-17.5
0.2	0.247	-131.0	1.309	153.3	0.000036	-60.8	0.946	-34.4
0.3	0.349	122.7	3.396	164.4	0.000078	-102.0	0.905	-50.2
0.4	0.623	47.8	11.778	146.3	0.000138	-79.2	0.859	-66.1
0.5	0.740	-14.3	27.042	101.3	0.000621	-116.5	0.805	-81.9
0.6	0.567	-64.1	40.638	53.2	0.001116	-154.7	0.758	-97.2
0.7	0.359	-95.2	47.486	11.8	0.001577	178.4	0.711	-113.8
0.8	0.228	-112.7	50.369	-21.3	0.002129	155.3	0.645	-131.6
0.9	0.149	-125.6	50.795	-49.7	0.002511	137.2	0.565	-149.5
1	0.097	-136.9	50.022	-75.1	0.002912	120.9	0.475	-166.9
1.1	0.057	-150.9	48.262	-98.3	0.003374	107.4	0.384	176.9
1.2	0.020	-165.1	46.126	-119.7	0.003714	95.3	0.301	162.0
1.3	0.010	15.8	43.748	-139.2	0.004094	84.1	0.230	148.7
1.4	0.032	-10.3	41.505	-157.5	0.004486	73.9	0.166	137.6
1.5	0.046	-25.6	39.448	-174.5	0.004889	64.4	0.115	130.7
1.6	0.057	-41.1	37.486	169.3	0.005270	56.1	0.078	130.7
1.7	0.059	-60.1	35.709	153.7	0.005596	48.4	0.058	138.8
1.8	0.053	-79.5	34.181	138.6	0.006024	39.3	0.054	153.9
1.9	0.047	-105.4	32.891	123.8	0.006483	31.5	0.061	158.3
2	0.044	-141.2	31.732	109.3	0.006973	23.5	0.070	153.2
2.1	0.053	171.0	30.691	95.1	0.007495	15.5	0.076	141.3
2.2	0.084	131.5	29.869	81.1	0.008010	7.9	0.079	123.5
2.3	0.124	104.7	29.231	66.7	0.008516	-0.4	0.081	105.1
2.4	0.174	82.2	28.574	51.7	0.009240	-9.2	0.082	80.9
2.5	0.233	64.0	27.962	36.7	0.009775	-18.3	0.084	54.6
2.6	0.298	47.7	27.280	21.6	0.010000	-27.5	0.094	25.7
2.7	0.359	31.8	26.468	6.3	0.010000	-37.7	0.109	-3.2
2.8	0.426	16.5	25.397	-9.2	0.011000	-48.1	0.131	-29.9
2.9	0.488	1.9	24.279	-24.6	0.011000	-57.2	0.161	-54.2
3	0.545	-12.5	22.957	-40.0	0.011000	-66.8	0.191	-76.6
3.1	0.595	-26.0	21.505	-55.2	0.011000	-75.4	0.225	-96.5
3.2	0.639	-39.9	20.064	-70.1	0.010000	-83.9	0.260	-115.7
3.3	0.676	-52.9	18.617	-84.9	0.010000	-91.7	0.296	-133.0
3.4	0.706	-64.7	17.226	-99.1	0.009483	-98.2	0.334	-150.3
3.5	0.730	-76.3	15.683	-111.7	0.008933	-104.1	0.375	-167.3
3.6	0.755	-88.0	14.554	-123.3	0.008532	-108.8	0.406	175.2
3.7	0.760	-99.2	13.744	-136.0	0.008426	-114.4	0.427	159.8
3.8	0.763	-109.7	12.858	-149.3	0.007936	-117.1	0.451	144.9
3.9	0.766	-120.2	11.979	-162.5	0.007608	-121.2	0.477	130.4
4	0.757	-130.0	11.100	-175.3	0.007325	-126.1	0.504	116.9
4.1	0.759	-138.9	10.235	172.9	0.007411	-127.6	0.527	103.0
4.2	0.742	-148.6	9.336	160.9	0.007160	-127.6	0.551	89.5
4.3	0.735	-157.6	8.540	148.6	0.007032	-129.2	0.571	76.3
4.4	0.720	-166.0	7.830	136.2	0.007449	-130.8	0.592	63.5
4.5	0.712	-174.4	7.190	124.6	0.007696	-131.3	0.611	50.8
5	0.614	146.4	4.572	66.0	0.010000	-146.0	0.675	-8.8
5.5	0.494	110.6	2.967	5.6	0.015000	-170.7	0.709	-61.4
6	0.330	87.7	1.973	-51.2	0.019000	159.2	0.730	-107.7
