



0.7- 4.0 GHz LOW NOISE AMPLIFIER WBA1045B ¹

WBA1045B LNA is the low noise figure, wideband, and high linearity amplifiers with unconditional stable design. The amplifier offers typical 1.0 dB noise figure, 35.0 dB gain, and 27.0 dBm output IP₃ at the frequency range from 0.70 GHz to 4.0 GHz.

WBA1045B is most suitable for cellular base stations, wireless data communications, tower top receiver amplifiers, cellular micro-cells, last-mile wireless communication systems, MMDS, WLL, and wireless measurement applications.

WBA1045B is designed to meet the rugged standards of MIL-STD-202, and MIL-STD-883.



Preliminary

Key Features:

Impedance:	50 Ohm
MTBF ² :	>300,000 hrs (34Years)
Unconditional Stable:	k>1
Low Noise:	1.0 dB
Output IP ₃ :	27.0 dBm
Gain:	35.0 dB
P _{1dB} :	15.0 dBm
Single power supply:	100 mA @ +5V
Frequency Range:	0.7 ~ 4.0 GHz
Operating Temperature:	-40 ~ +85 °C
Return Losses:	14.0 dB
Small size:	SMA Female, 0.90" x 0.70" x 0.4" (41.9 mm x 17.8 mm x 10.2 mm) gold plated housing.
Built-in Functions:	DC blocks at input and output, temperature compensation circuits, and auto DC biases.

Absolute Maximum Ratings³:

Symbol	Parameters	Units	Absolute Maximum
V _{dd}	DC Power Supply Voltage	V	6.0
I _{dd}	Drain Current	mA	120
P _{diss}	Total Power Dissipation	mW	600
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 WBA1045B at room temperature

Index	Testing Item	Symbol	Test Constraints	Nom (RT)	Min	Max	Unit
1	Gain	S_{21}	0.7 – 4.0 GHz	35			dB
2	Gain Variation	ΔG	0.1 GHz Bandwidth	+/- 0.15			dB
3	Input and Output Return Loss	S_{11}, S_{22}	0.7 – 2.5 GHz		15		dB
			2.5 – 3.3 GHz		18		dB
			3.3 – 3.7 GHz		14		dB
			3.7 – 4.0 GHz		10		dB
4	Reverse Isolation	S_{12}	0.7 – 4.0 GHz		45		dB
5	Noise figure	NF	0.7 – 4.0 GHz	1.0		1.5	dB
6	Output Power 1dB compression Point	P_{1dB}	0.7 – 4.0 GHz	15	14		dBm
7	Output-Third-Order Interception point	IP_3	Two-Tone, $P_{out} +0$ dBm each, 1 MHz separation	27	25		dBm
8	Current Consumption	I_{dd}	$V_{dd} = +5$ V	100			mA
9	Power Supply Voltage	V_{dd}		+5	+4.8	+5.2	V
10	Thermal Resistance	$R_{th,c}$	Junction to case			220	$^{\circ}C/W$
11	Operating Temperature	T_o			-40	+85	$^{\circ}C$
12	Maximum Average RF Input Power	$P_{IN, MAX}$	0.7 – 4.0 GHz			10	dBm

b) Passband Frequency Response

As shown in **Figure 1**, the typical gain of the WBA1045B is from 35.0 dB across 0.7 GHz to 4.0 GHz. The typical input and output return losses are 14 dB or better across the frequency of 0.7 GHz to 4.0 GHz.

Figure 2 shows P_{1dB} and IP_3 of the WBA1045B. The typical P_{1dB} and IP_3 are 15.0 dBm and 27.0 dBm in the frequency range of 0.7 GHz to 4.0 GHz, respectively.

Figure 3 illustrates the noise figure performance. The noise figure is 1.0 dB across the frequency range of 0.70 to 3.30 GHz and slightly higher above 3.30 GHz. At 85 $^{\circ}C$, WBA1045B only has 0.25 dB noise increases. At -40 $^{\circ}C$, WBA1045B offers approximately 0.20 dB less noise figure than that at room temperature.

Figure 4 is the plot of the stability factor k of WBA1045B. The amplifier is unconditional stable due to k is great than 1 at all frequency ranges.

Figure 5 demonstrates the internal block diagram of WBA1045B.

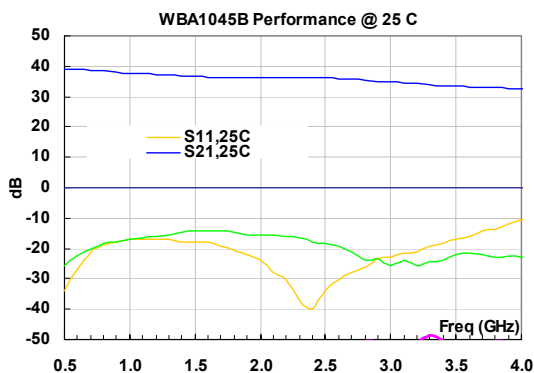


FIG. 1 Typical small signal performance.

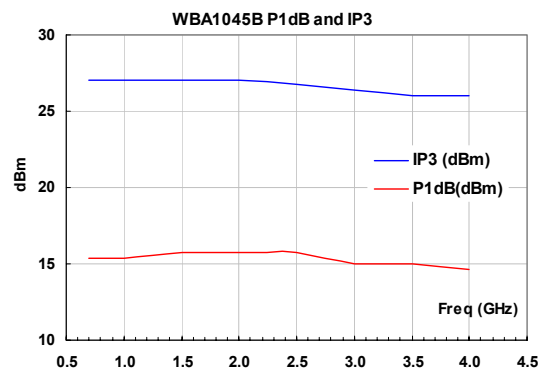


FIG. 2 Typical P_{1dB} and IP_3 at room temperature.

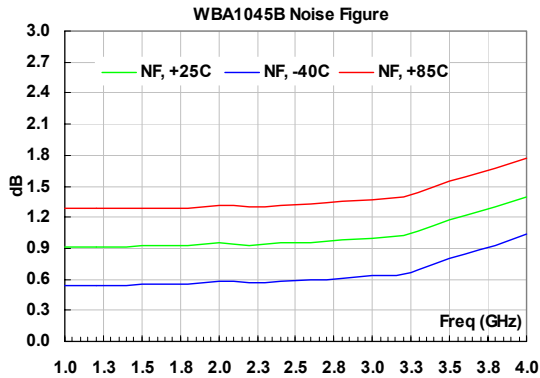


FIG. 3 Noise figure performance at room temperature

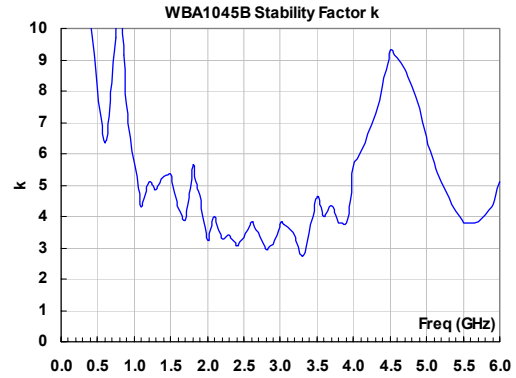


FIG. 4 Stability factor *k* of WBA1045B

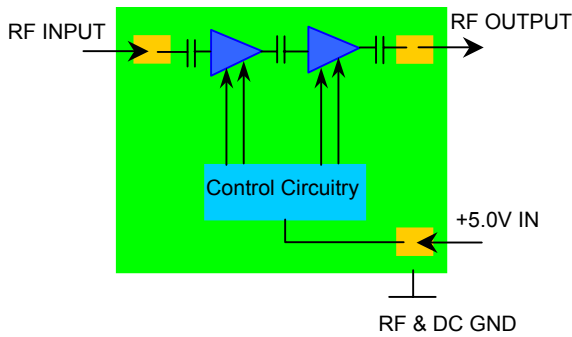


FIG. 5 Block diagram of WBA1045B

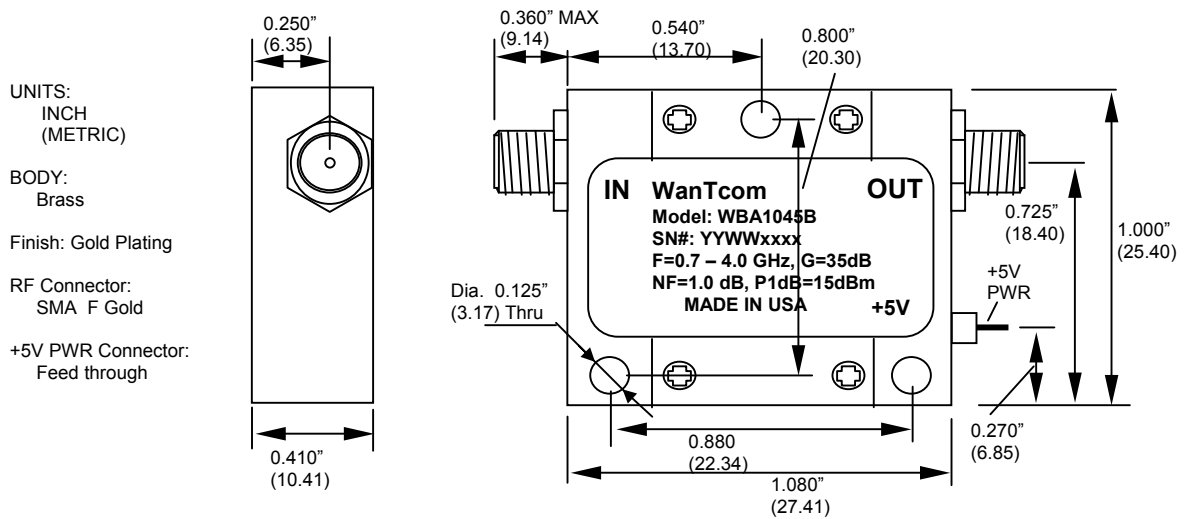


FIG. 6 WBA1045B outline



WBA1045B Mechanical Outline, WP-5:

Figure 6 shows the mechanical outline of WBA1045B. It is a WanTcom’s standard WP-5 housing with gold plating. Both RF input and output ports are equipped with SMA female connectors and the DC port connector is an EMI filtered feed thru pin.

Ordering Information

Model Number	WBA1045B
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Small Signal S-Parameters:

IWBA1045B

Is-parameters at Vdd=5V, Idd=100 mA. Last updated 01/14/03.

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	0.97	-167.3	0.33	-146.2	0.0002	-150.8	0.92	-171.7
0.1	0.94	152.6	6.60	104.4	0.0003	-162.2	0.75	127.2
0.3	0.34	44.2	70.14	-92.8	0.0005	94.6	0.10	46.5
0.5	0.02	-80.1	87.54	178.1	0.0007	40.5	0.05	-167.1
0.6	0.05	174.2	87.46	148.0	0.0009	75.6	0.08	-176.7
0.8	0.11	138.5	83.31	100.4	0.0005	88.7	0.12	168.3
1	0.14	112.1	77.36	61.0	0.0011	53.0	0.14	151.5
1.1	0.14	98.3	75.27	43.3	0.0015	49.0	0.15	146.0
1.2	0.14	87.4	72.85	26.5	0.0013	58.0	0.16	137.5
1.3	0.14	72.6	70.84	9.6	0.0014	33.1	0.17	126.2
1.4	0.13	63.8	70.08	-5.6	0.0013	39.7	0.19	119.9
1.5	0.13	52.0	68.54	-20.1	0.0013	45.6	0.19	111.1
1.6	0.13	38.1	66.37	-35.0	0.0017	34.5	0.19	99.6
1.7	0.11	26.7	65.93	-51.0	0.0019	29.7	0.19	90.1
1.8	0.09	12.1	66.03	-66.5	0.0013	33.5	0.18	77.2
1.9	0.08	0.5	65.09	-81.0	0.0016	14.1	0.17	65.9
2	0.07	-16.3	63.63	-95.3	0.0024	15.4	0.17	60.4
2.1	0.04	-20.6	64.50	-109.8	0.0019	20.4	0.17	47.9
2.2	0.03	-32.2	63.85	-125.0	0.0024	1.1	0.16	37.1
2.3	0.01	-31.6	63.61	-141.1	0.0023	-12.3	0.15	23.3
2.4	0.01	35.3	63.51	-157.3	0.0026	10.4	0.13	10.4
2.5	0.02	72.4	63.38	-173.1	0.0024	-10.7	0.12	-9.4
2.6	0.03	92.3	62.35	172.1	0.0021	-15.6	0.11	-26.7
2.7	0.04	71.4	60.18	156.9	0.0024	-16.5	0.09	-41.9
2.8	0.05	73.7	58.18	141.1	0.0030	-36.3	0.07	-73.1
2.9	0.07	62.3	56.82	125.6	0.0029	-37.1	0.07	-109.3
3	0.07	49.4	55.11	110.2	0.0024	-37.4	0.05	-130.1
3.1	0.09	39.7	53.20	95.5	0.0026	-55.7	0.07	-160.0
3.2	0.09	34.7	51.23	80.7	0.0029	-55.9	0.05	177.6
3.3	0.11	23.1	49.76	65.7	0.0038	-65.7	0.06	162.6
3.4	0.12	14.9	47.96	51.1	0.0030	-61.4	0.06	144.0
3.5	0.14	9.9	46.49	37.8	0.0023	-85.6	0.08	141.5
3.6	0.16	-0.5	45.50	24.0	0.0027	-87.8	0.08	133.3
3.7	0.19	-11.2	44.76	9.3	0.0025	-89.1	0.08	117.8
3.8	0.21	-21.2	44.10	-5.3	0.0029	-102.3	0.07	108.4
3.9	0.25	-33.4	43.40	-19.6	0.0029	-100.1	0.08	103.9
4	0.30	-44.5	43.12	-34.5	0.0019	-113.1	0.07	96.5
4.5	0.56	-106.5	40.89	-115.3	0.0009	150.8	0.03	134.9
5	0.81	-175.4	31.51	151.5	0.0008	76.3	0.22	148.6
5.5	0.82	121.6	17.04	53.3	0.0016	19.3	0.65	76.7
6	0.71	72.9	5.88	-29.8	0.0032	-19.4	0.80	6.4
