Wan7com, Inc.

REV A

www.wantcominc.com

820- 850 MHz SUPER LOW NOISE AMPLIFIER WLA08-4045A[1]

WLA08-4045A LNA is a super low noise figure, medium power, and high linearity amplifier with unconditional stable. The amplifier offers the exceptional noise figure of ***0.35 dB***, 42.0 dB gain, 26.0 dBm P_{1dB} and output IP_3 of 41.0 dBm at the frequency range from 820 MHz to 850 MHz.

WLA08-4045A is most suitable for cellular base stations, wireless data communications, tower top receiver amplifiers, cellular micro-cells, last-mile wireless communication systems, and wireless measurement applications of Cellular and GSM bands.

WLA08-4045A is designed to meet rugged MIL-STD202 standard.

Additional heat sink required!

Key Features:

Qualified Standard:	MIL-STD 202
MTBF[2]:	>300,000 hrs (34 Years)
Impedance:	50 Ohm
Unconditional Stable:	**k > 1**
Exceptional Low Noise:	**0.35 dB**
Output IP_3:	**41.0 dBm**
Gain:	42.0
Gain Flatness:	+/-0.10 dB
Input VSWR:	**1.15:1**
Output VSWR:	**1.15:1**
P_{1dB}:	**26.0 dBm**
Single Power Supply:	220 mA, @ +9.0 V
Frequency Range:	820 ~ 850 MHz
Operating Temperature:	-40 ~ +85 ºC
Miniature Size:	1.08" x 1.00" x 0.41", SMA F.
Low Cost	

Adding the technology to your leverages:

- ✓ **Greatly reduce filter complexity and cost due to super low noise figure;**
- ✓ **Require no tuning for sub-system integration due to the excellent VSWR;**
- ✓ **Guarantee the stable system integration due to unconditional stable;**
- ✓ **Cutting time to proto, time to market, and time to volume production;**
- ✓ **Competitive cost with high quality.**

Absolute Maximum Ratings[3]:

Symbol	Parameters	Units	Absolute Maximum
V_{dd}	DC Power Supply Voltage	V	11.0
I_{dd}	Drain Current	mA	250
P_{diss}	Total Power Dissipation	W	2.4
$P_{In,Max}$	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	40

[1] Specifications are subject to change without notice.
[2] MTBF: Mean Time Between Failure, Per TR-NWT-000332, ISSUE 3, SEPTEMBER, 1990, T=40℃
[3] Operation of this device above any one of these parameters may cause permanent damage.

Specifications:

a) **Table 1** Summary of the electrical specifications of WLA08-4045A at room temperature

Index	Testing Item	Symbol	Test Constraints	Nom (RT)	Min	Max	Unit
1	Gain	S_{21}	820 - 850 MHz	42	40	43	dB
2	Gain Variation	ΔG	820 - 850 MHz	+/- 0.10		+/- 0.25	dB
3	Input Return Loss	S_{11}	820 - 850 MHz	23	20		dB
4	Output Return Loss	S_{22}	820 - 850 MHz	23	20		dB
5	Reverse Isolation	S_{12}	820 - 850 MHz	55	50		dB
6	**Noise figure**	**NF**	**820 - 850 MHz**	**0.35**		**0.45**	**dB**
7	Output P_{1dB} compression	P_{1dB}	820 - 850 MHz	26.0			dBm
8	Output-Third-Order Interception point	IP_3	Two-Tone, Pout 0 dBm each, 1 MHz separation	41.0			dBm
9	Current Consumption	I_{dd}	V_{dd}= +9 V	220			mA
10	Power Supply Voltage	V_{dd}		9.0	8.0	10.0	V
11	Operating Temperature	T_o			-40	+85	^oC
12	Maximum Average RF Input Power	$P_{IN, MAX}$	820 - 850 MHz			10	dBm

As shown in **Figure 1**, the typical gain of the WLA08-4045A is 42.0 dB across 820 MHz to 850MHz. The typical input and output return losses are 23 dB and better than 20 dB, respectively.

The noise figure, as shown in **Figure 2**, of WLA08-4045A is 0.35 dB[4] at room temperature during the first powering up. The noise adds about 0.03 ~ 0.05 dB after 1 hour powering up without additional heat sink. The increased noise figure after powering up in hours is due to the rising temperature of the LNA body. The LNA noise figure is 0.50 dB at 85 C and below 0.30 dB at –40 C, which is already difficult to measure by the existing state-of-the-art noise figure measurement system.

The output 1-dB compression point and IP_3 are shown in **Figure 3**. WLA08-4045A offers typical 26.0 dBm of P_{1dB} and minimum 40.0 dBm of IP_3. The output IP_3 is measured by two-tone mothod with 10 dBm output each tone and 1 MHz seperation.

Figure 4 demonstrates the stability factor ***k*** of the amplifier. ***k*** is greater than 1 in any frequency range and thus the amplifier is unconditional stable.

Figure 5 demonstrates the frequency response of WLA08-4045A in the extended frequency range.

Figure 6 is the block diagram of internal circuit of WLA08-4045A. 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 WLA08-4045A. The package is the bare brass WanTcom's standard housing, WP-5. All the RF ports are equipped with SMA female and the +9.0 V DC input with feed through. The DC power supply can be fed through the RF output SMA for remote power purpose (WLA08-4045A-BT model).

[4] In order to measure such low noise figure, a low ENR noise source such as HP465A is required to reduce the non-linearity of the detector due to the high ENR. Please refers to AN-106 which is available at www.wantcominc.com

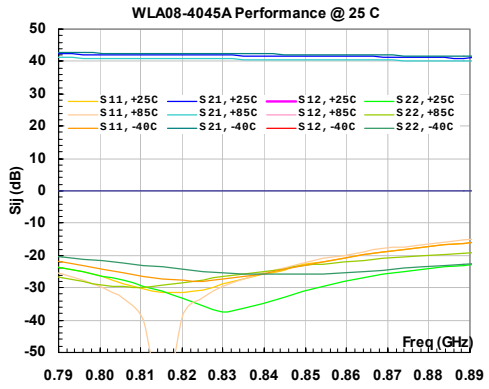

FIG. 1 Small signal passband performance

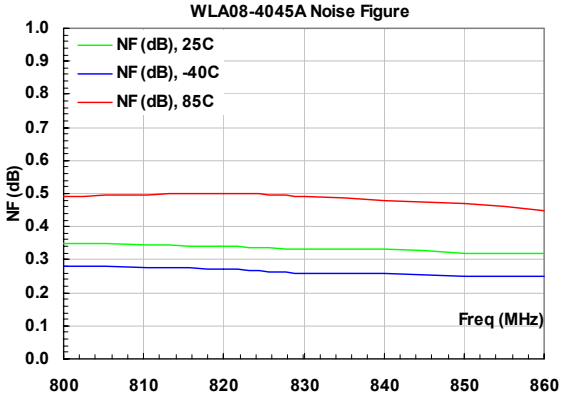

FIG. 2 Noise figure performance at full temperature

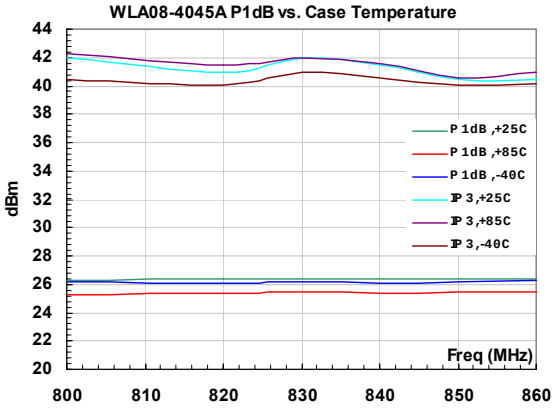

Fig. 3 Output 1-dB compression point and IP3

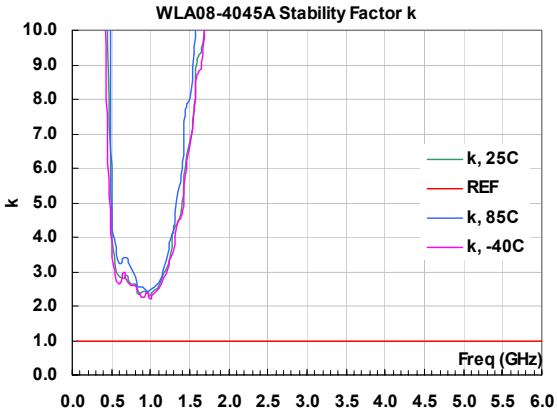

Fig. 4 Stability factor *k*

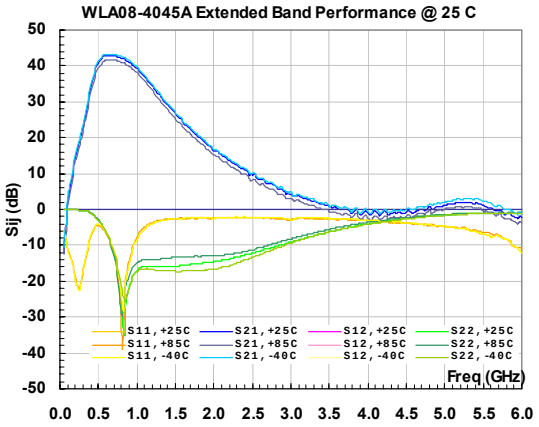

FIG. 5 Frequency response in the extended band.

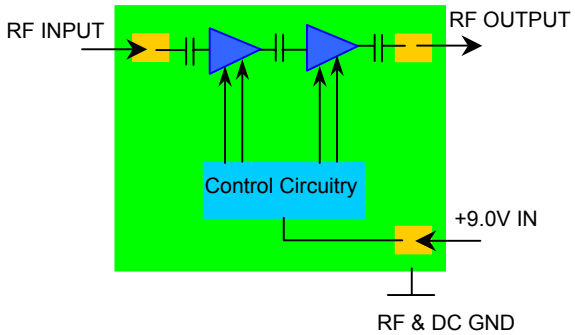

FIG. 6 Block diagram of WLA08-4045A

WLA08-4045A MECHANICAL OUTLINE: WP-5

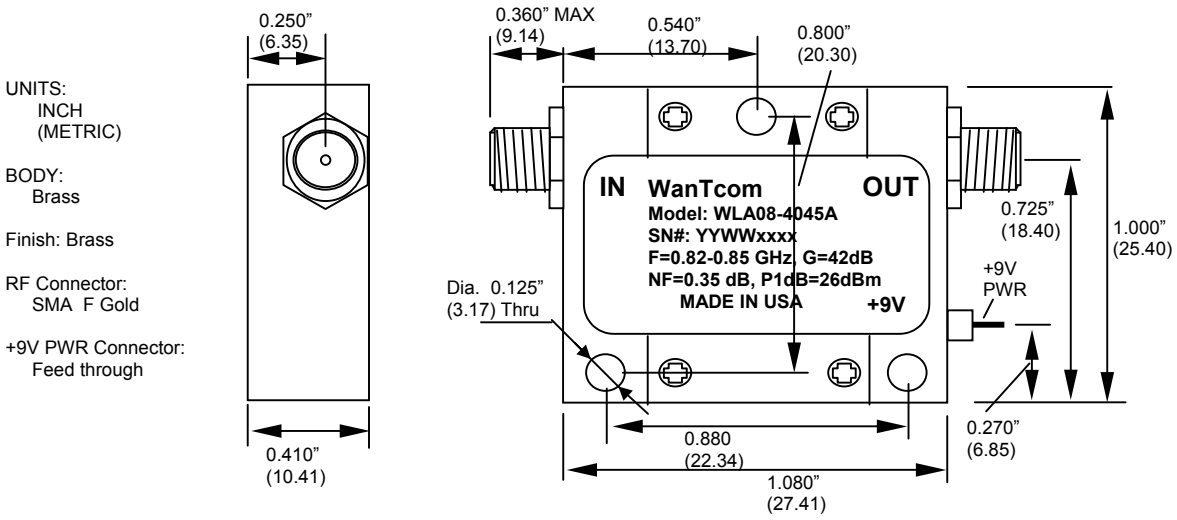

FIG. 7 WP-5 Outline

ORDERING INFORMATION

Function	Normal	With Bias-T
Model Number:	WLA08-4045A	WLA08-4045A-BT

SMALL SIGNAL S-PARAMETERS:

!WLA08-4045A, +25 ^{0}C
!s-parameters at Vdd=+9.0 V, Id=217 mA. Last updated 10/21/04.

GHZ s MA R 50

!Freq (GHz)		MAGS11	ANGS11	MAGS21	ANGS21	MAGS12	ANGS12	MAGS22	ANGS22
0.05	0.498	-63.1	0.275	-113.9	0.000082	28.8	0.999	-9.9	
0.1	0.290	-85.4	1.184	-165.3	0.000127	63.5	0.998	-20.0	
0.2	0.114	-139.0	5.169	162.2	0.000097	-142.3	0.990	-41.1	
0.3	0.132	63.3	13.339	146.8	0.000050	45.4	0.966	-63.8	
0.4	0.423	-14.6	49.588	112.5	0.000104	-38.4	0.887	-92.2	
0.5	0.609	-93.7	110.165	46.4	0.000358	-130.1	0.708	-122.6	
0.6	0.465	-160.1	139.697	-17.4	0.000810	-176.8	0.477	-153.3	
0.7	0.254	146.9	139.737	-67.7	0.001129	150.4	0.241	177.0	
0.8	0.048	70.7	127.969	-111.0	0.001540	125.1	0.049	162.2	
0.9	0.180	-105.6	111.724	-150.9	0.001861	99.7	0.084	-73.2	
1	0.382	-149.0	91.957	173.0	0.002102	78.2	0.142	-92.5	
1.1	0.537	174.7	70.407	140.8	0.002009	58.2	0.158	-108.3	
1.2	0.630	144.4	52.238	113.4	0.001912	40.1	0.159	-120.3	
1.3	0.685	118.5	38.360	90.6	0.001644	28.5	0.158	-131.1	
1.4	0.719	97.2	28.335	71.6	0.001680	23.3	0.160	-142.1	
1.5	0.734	78.2	21.209	54.0	0.001594	22.5	0.161	-153.1	
1.6	0.745	61.8	16.500	38.7	0.001444	20.1	0.167	-167.4	
1.7	0.755	47.0	13.093	25.8	0.001513	12.8	0.171	178.0	
1.8	0.761	33.4	10.373	14.1	0.001366	12.1	0.173	162.2	
1.9	0.761	20.7	8.266	2.4	0.001632	11.7	0.179	145.7	
2	0.735	10.7	6.637	-6.1	0.001636	8.4	0.186	129.1	
2.1	0.771	-0.5	5.708	-16.9	0.001704	2.2	0.194	111.2	
2.2	0.771	-11.6	4.852	-26.9	0.001769	-2.0	0.201	94.6	
2.3	0.771	-21.3	4.160	-35.7	0.001761	-7.6	0.215	78.0	
2.4	0.772	-31.2	3.585	-42.6	0.001882	-11.1	0.230	61.4	
2.5	0.764	-40.5	3.051	-49.7	0.002025	-16.0	0.243	44.6	
2.6	0.764	-49.8	2.597	-58.9	0.002019	-16.4	0.260	29.6	
2.7	0.767	-57.9	2.303	-67.6	0.001737	-21.1	0.282	14.8	
2.8	0.756	-67.0	2.046	-77.2	0.001874	-27.5	0.304	-1.2	
2.9	0.740	-75.6	1.837	-85.6	0.001835	-35.2	0.324	-15.3	
3	0.698	-80.8	1.607	-88.5	0.002116	-37.7	0.348	-28.6	
3.1	0.759	-87.3	1.566	-93.1	0.002197	-42.0	0.376	-42.5	
3.2	0.759	-97.4	1.412	-101.3	0.002132	-49.9	0.400	-56.8	
3.3	0.751	-105.2	1.302	-108.0	0.002284	-54.7	0.425	-69.7	
3.4	0.747	-112.7	1.186	-114.1	0.002449	-66.3	0.454	-81.5	
3.5	0.746	-120.4	1.086	-121.8	0.002084	-63.5	0.488	-95.6	
3.6	0.730	-128.4	1.055	-128.2	0.002020	-69.1	0.510	-107.6	
3.7	0.722	-135.4	0.990	-131.7	0.002282	-78.3	0.538	-119.2	
3.8	0.720	-142.5	0.904	-136.5	0.002266	-82.7	0.575	-131.0	
3.9	0.711	-150.4	0.836	-145.5	0.001914	-87.3	0.599	-143.3	
4	0.692	-156.4	0.883	-155.4	0.001916	-101.7	0.624	-153.6	
4.1	0.689	-164.7	0.938	-157.1	0.002099	-107.5	0.654	-164.3	
4.2	0.674	-172.4	0.909	-160.6	0.002206	-112.2	0.682	-175.6	
4.3	0.658	-178.3	0.858	-168.0	0.001892	-115.2	0.702	173.6	
4.4	0.652	175.2	0.908	-177.1	0.001920	-125.1	0.725	164.5	
4.5	0.648	166.8	0.932	176.3	0.001983	-134.5	0.753	154.3	
5	0.570	133.3	1.133	127.1	0.001806	160.5	0.843	108.7	
5.5	0.453	94.7	1.128	48.6	0.001723	36.6	0.882	67.8	
6	0.252	53.5	0.770	-19.2	0.001935	-35.1	0.890	30.1	