



1.0 – 2.0 GHz LOW NOISE AMPLIFIER WBA1020-20A¹

WBA1020-20A LNA is a super low noise figure, wideband, and high linearity amplifier with very compact design. The amplifier offers the noise figure of 0.90 dB, 19.0 dB gain, 15.0 dB P_{1dB}, and output IP₃ of 30.0 dBm at the frequency range from 1.0 GHz to 2.0 GHz.

With the exceptional gain flatness, WBA1020-20A 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 GPS, DCS, PCS, and 3G bands.



Key Features:

Impedance:	50 Ohm
Exceptional Low Noise:	0.90 dB
Output IP ₃ :	30.0 dBm
Gain:	19.0
Gain Flatness:	+/-0.10 dB
Input VSWR:	1.50:1
Output VSWR:	1.50:1
P _{1dB} :	15.0 dBm
Single Power Supply:	38 mA, @ +5.0 V
Frequency Range:	1000 ~ 2000 MHz
Operating Temperature:	-40 ~ +85 °C
Input & output Connector:	SMA Female
+5.0V DC PWR:	Feed Through

Preliminary

Specifications:

a) Table 1 Summary of the electrical specifications of WBA1020-20A at room temperature

Index	Testing Item	Symbol	Test Constraints	Nom (RT)	Min	Max	Unit
1	Gain	S ₂₁	1000 - 2000 MHz	19	18.5	19.7	dB
2	Gain Variation	ΔG	1000 - 2000 MHz	+/- 0.10		+/-0.25	dB
3	Input Return Loss	S ₁₁	1000 - 2000 MHz	15	12		dB
4	Output Return Loss	S ₂₂	1000 - 2000 MHz	15	12		dB
5	Reverse Isolation	S ₁₂	1000 - 2000 MHz	22	20		dB
6	Noise figure	NF	1000 - 2000 MHz	0.90		1.1	dB
7	Output P _{1dB} compression	P _{1dB}	1000 - 2000 MHz	15.0	14		dBm
8	Output-Third-Order Interception point	IP ₃	Two-Tone, Pout 0 dBm each, 1 MHz separation	30	28		dBm
10	Current Consumption	I _{dd}	V _{dd} = +5 V	38	35	43	mA
11	Power Supply Voltage	V _{dd}		5.0	4.80	5.20	V
12	Operating Temperature	T _o			-40	+85	°C
14	Maximum Average RF Input Power	P _{IN, MAX}	1000 - 2000 MHz			10	dBm
15	Weight			20		25	Gram

¹ Specifications are subject to change without notice.



b) Passband Frequency Response

As shown in **Figure 1**, the typical gain of the WBA1020-20A is 19.0 dB across 1.0 to 2.0 GHz. The gain variation is typically +/- 0.10dB. The typical input and output return losses are 15.0 dB across the frequency of 1.0 to 2.0 GHz, respectively.

Figure 2 shows the measured input and output VSWR of the WBA1020-20A. The typical VSWR are better than 1.6 in the frequency range of 1.0 to 2.0 GHz, respectively.

Figure 3 shows the measured P_{1dB} and IP_3 of the WBA1020-20A. The typical P_{1dB} and IP_3 are 15.0 dBm and 30.0 dBm in the frequency range of 1.0 to 2.0 GHz, respectively. The output power of each tone is set at 0 dBm with the frequency separation of 1 MHz between the two-tone.

Figure 4 illustrates the measured noise figure at full temperature. The noise figure is from 0.90 to 1.0 dB across the frequency range of 1.0 to 2.0 GHz at room temperature. At 85 °C, WBA1020-20A only has 0.30 dB noise increases. At -40 °C, WBA1020-20A offers approximately 0.25 dB less noise figure than that at room temperature.

Figure 5 demonstrates the frequency response of WHM1020-20A in the extended frequency range.

Figure 6 demonstrates the stability factor k of the amplifier. The amplifier is conditional stable since k is less than 1 in the frequency range of 2.2 to 3.2 GHz.

Figure 7 shows the mechanical outline of WBA1020-20A. It is a standard WP-10 connectorized housing.

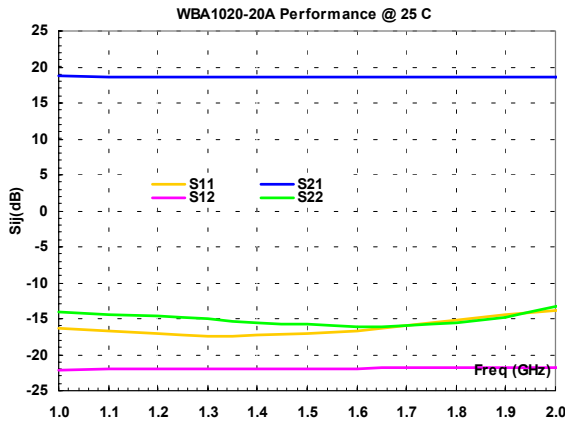


FIG. 1 Typical small signal performance.

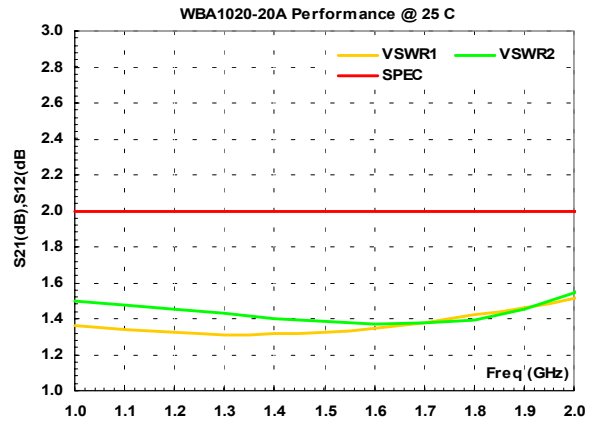


FIG. 2 Input and output VSWR of the WBA1020-20A

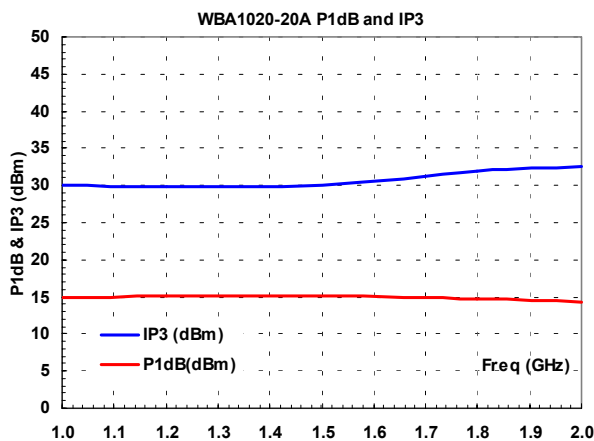


FIG. 3 P1dB and Output IP3 of WBA1020-20A

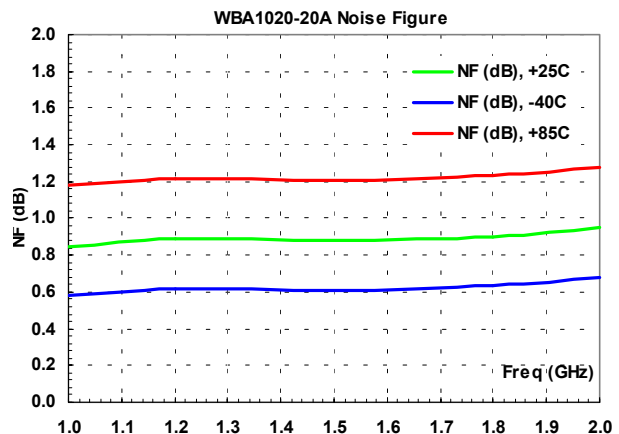


FIG. 4 Noise figure performance at full temperature

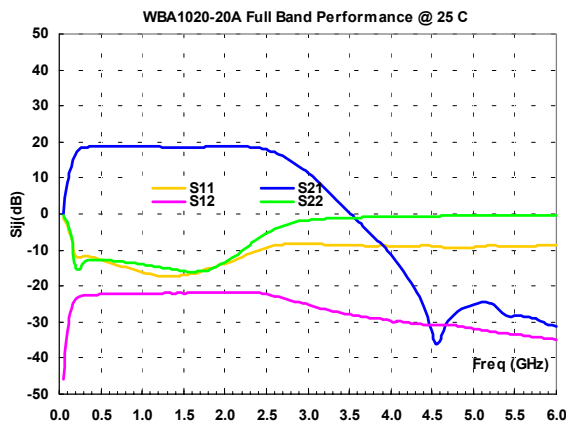


FIG. 5 The frequency response in the extended band.

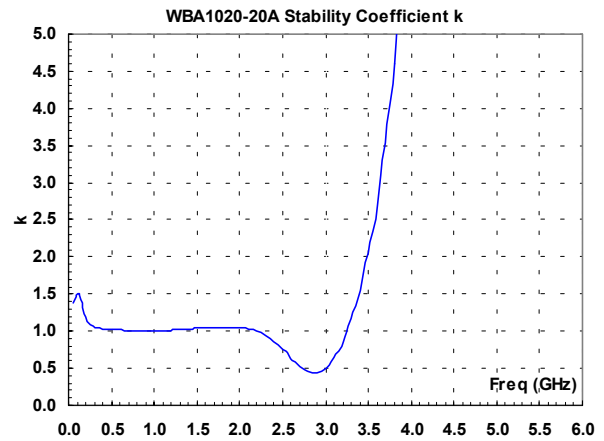
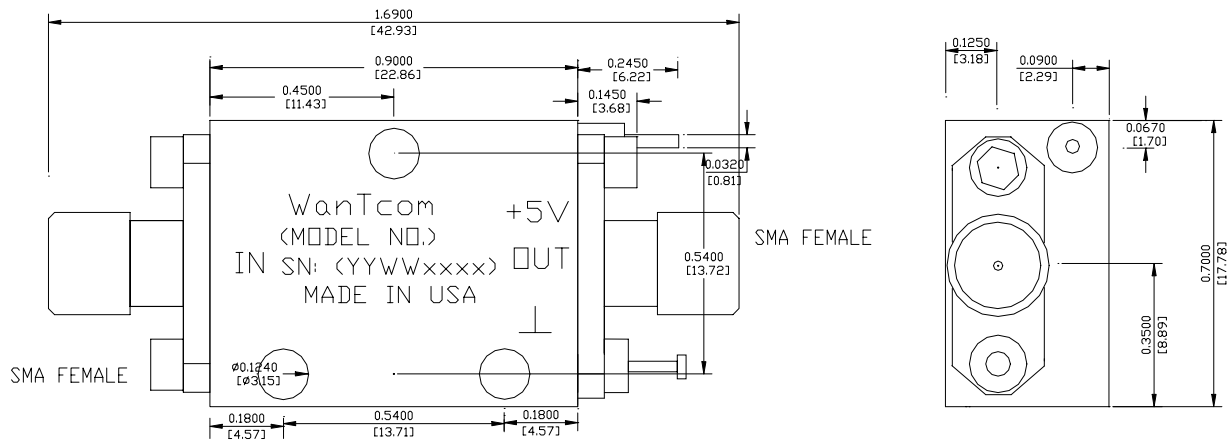


FIG. 6 The stability factor k

WBA1020-20A MECHANICAL OUTLINE: WP-10



BODY MATERIAL: BRASS
 FINISH: PAINTED OR NO PLATING

FIG. 7 WP-10 Outline

ORDERING INFORMATION

Model Number:	WBA1020-20A
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Small Signal S-Parameters:

IWBA1020-20A

Is-parameters at Vds=5V, Id=38 mA. Last updated 03/09/04.

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	0.897	168.2	0.994	12.7	0.0051	-135.3	0.971	-39.2
0.1	0.705	125.3	2.669	-39.3	0.0230	173.2	0.785	-70.9
0.2	0.256	78.5	6.709	-103.5	0.0670	88.8	0.176	-108.3
0.3	0.259	71.5	8.286	-151.1	0.0730	47.4	0.208	-72.8
0.4	0.247	45.5	8.580	-179.6	0.0750	25.7	0.233	-90.5
0.5	0.228	21.5	8.678	159.2	0.0760	10.9	0.232	-108.6
0.6	0.212	-0.1	8.682	141.2	0.0770	-0.8	0.227	-127.2
0.7	0.192	-19.6	8.675	125.0	0.0770	-10.6	0.220	-144.7
0.8	0.181	-39.3	8.665	109.9	0.0780	-19.6	0.213	-162.8
0.9	0.166	-57.4	8.649	95.7	0.0780	-27.7	0.207	179.3
1	0.154	-76.0	8.615	82.0	0.0780	-35.1	0.200	160.2
1.1	0.146	-95.8	8.560	68.4	0.0790	-42.5	0.191	141.1
1.2	0.139	-114.5	8.529	55.2	0.0790	-49.8	0.184	120.8
1.3	0.134	-134.4	8.486	42.3	0.0800	-56.7	0.177	99.5
1.4	0.138	-154.0	8.445	29.2	0.0790	-63.5	0.167	76.7
1.5	0.140	-172.9	8.445	16.0	0.0790	-70.3	0.161	51.8
1.6	0.147	168.1	8.471	2.7	0.0800	-77.1	0.157	24.4
1.7	0.158	149.6	8.500	-10.6	0.0810	-83.9	0.159	-4.1
1.8	0.174	133.5	8.551	-24.2	0.0810	-90.5	0.165	-36.4
1.9	0.188	117.6	8.583	-38.4	0.0810	-97.6	0.183	-68.9
2	0.204	104.2	8.584	-53.4	0.0810	-104.9	0.214	-101.7
2.1	0.221	92.2	8.567	-68.7	0.0800	-112.0	0.254	-134.0
2.2	0.252	80.9	8.532	-84.7	0.0810	-119.1	0.305	-164.5
2.3	0.286	67.9	8.417	-101.9	0.0800	-127.4	0.374	165.3
2.4	0.313	54.4	8.190	-120.4	0.0800	-135.8	0.452	134.8
2.5	0.343	40.6	7.821	-139.1	0.0780	-144.3	0.539	104.1
2.6	0.363	27.6	7.217	-157.9	0.0730	-152.6	0.622	73.5
2.7	0.373	14.9	6.396	-176.0	0.0680	-161.7	0.690	43.5
2.8	0.384	2.4	5.433	164.8	0.0640	-169.1	0.746	15.1
2.9	0.384	-8.6	4.497	146.3	0.0590	-174.7	0.789	-11.6
3	0.383	-19.0	3.657	129.4	0.0540	-179.8	0.817	-36.0
3.1	0.379	-27.7	2.893	114.5	0.0510	175.5	0.837	-58.5
3.2	0.377	-35.8	2.244	101.0	0.0470	171.5	0.853	-79.4
3.3	0.374	-43.8	1.760	88.4	0.0450	168.1	0.864	-98.3
3.4	0.371	-51.0	1.377	77.9	0.0420	164.0	0.875	-116.0
3.5	0.367	-57.8	1.066	68.5	0.0400	159.9	0.884	-132.6
3.6	0.364	-64.5	0.822	59.5	0.0390	156.5	0.891	-147.8
3.7	0.357	-69.8	0.628	50.9	0.0370	153.3	0.899	-162.3
3.8	0.356	-75.4	0.483	42.6	0.0350	149.8	0.905	-176.0
3.9	0.362	-81.3	0.370	35.5	0.0340	146.0	0.910	171.1
4	0.353	-86.7	0.276	29.4	0.0330	142.3	0.917	158.8
4.1	0.357	-91.4	0.196	24.6	0.0320	139.6	0.920	146.9
4.2	0.359	-96.8	0.133	19.8	0.0310	136.5	0.925	135.4
4.3	0.360	-102.4	0.089	14.9	0.0300	133.4	0.929	124.5
4.4	0.365	-107.9	0.052	14.4	0.0290	130.9	0.933	113.8
4.5	0.360	-113.8	0.025	30.7	0.0290	127.9	0.936	103.6
5	0.344	-133.4	0.055	110.7	0.0250	103.7	0.947	56.9
5.5	0.356	-156.6	0.039	85.1	0.0210	86.6	0.959	14.0
6	0.369	-175.7	0.028	52.7	0.0180	70.7	0.968	-24.6