



0.8- 2.2 GHz LOW NOISE AMPLIFIER WBA0822A¹

WBA0822A is a low noise figure, wideband, and high linearity amplifier. The amplifier offers typical 0.80 dB noise figure, +/- 0.25 dB exceptional gain flatness, 18.0 dB output P_{1dB}, and 29.5 dBm output IP₃ at the frequency range from 0.8 GHz to 2.2 GHz of UHF, Cellular, GPS, DCS, PCS, and 3G bands.

WBA0822A is most suitable for cellular base stations, wireless data communications, tower top receiver amplifiers, last-mile wireless communication systems, and wireless measurement applications.

WBA0822A is designed to meet the rugged standards of MIL-STD-202, and MIL-STD-883.



Key Features:

| | |
|-------------------------------|---|
| Impedance: | 50 Ohm |
| MTBF ² : | >150,000 hrs (17 years) |
| Unconditional Stable: | k>1 |
| Low Noise: | 0.80 dB |
| Output IP ₃ : | 29.5 dBm |
| Gain: | 29.0 dB |
| P _{1dB} : | 18.0 dBm |
| Single power supply: | 105 mA @ +5V |
| Wide Bandwidth: | 0.8 ~ 2.2 GHz |
| Operating Temperature: | -40 ~ +85 °C |
| Input & Output Return Losses: | 18.0 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 | 5.5 |
| I _{dd} | Drain Current | mA | 120 |
| P _{diss} | Total Power Dissipation | mW | 650 |
| P _{In,Max} | RF Input Power | dBm | 10 |
| T _{ch} | Channel Temperature | °C | 150 |
| T _{STG} | Storage Temperature | °C | -55 ~ 125 |
| T _{O,MAX} | Maximum Operating Temperature | °C | -40 ~ 85 |
| R _{th,c} | Thermal Resistance | °C/W | 215 |

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 WBA0822A at room temperature

| Index | Testing Item | Symbol | Test Constraints | Nom (RT) | Min | Max | Unit |
|-------|---------------------------------------|---------------|---|----------|------|---------|------|
| 1 | Gain | S_{21} | 0.8 – 2.2 GHz | 29 | 27 | 31 | dB |
| 2 | Gain Variation | ΔG | 0.8 – 2.2 GHz | +/- 0.25 | | +/-0.75 | dB |
| 3 | Input Return Loss | S_{11} | 0.8 – 2.2 GHz | 20 | 16 | | dB |
| 4 | Output Return Loss | S_{22} | 0.8 – 2.2 GHz | 18 | 15 | | dB |
| 5 | Reverse Isolation | S_{12} | 0.8 – 2.2 GHz | | 30 | | dB |
| 6 | Noise figure | NF | 0.8 – 2.2 GHz | 0.80 | 0.60 | 1.0 | dB |
| 7 | Output Power 1dB compression Point | P_{1dB} | 0.8 – 2.2 GHz | 18 | 16 | 20 | dBm |
| 8 | Output-Third-Order Interception point | IP_3 | Two-Tone, P_{out} +0 dBm each, 1 MHz separation | 29.5 | 27 | | dBm |
| 9 | Current Consumption | I_{dd} | V_{dd} = +5 V | 105 | 95 | 115 | 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 | $P_{IN, MAX}$ | 0.8 – 2.2 GHz | | | 10 | dBm |

b) Passband Frequency Response

As shown in **Figure 1**, the typical gain of the WBA0822A is from 29.0 dB across 0.80 to 2.2 GHz. The amplifier provides excellent gain flatness across the passband. The typical input and output return losses are 16 dB or better across the frequency of 0.80 to 2.2 GHz.

Figure 2 shows P_{1dB} and IP_3 of the WBA0822A. The typical P_{1dB} and IP_3 are 18.0 dBm and 29.5 dBm in the frequency range of 0.80 to 2.2 GHz, respectively.

Figure 3 illustrates the noise figure performance. The noise figure is 0.80 dB across the frequency range of 0.80 to 2.2 GHz at room temperature. At 85 °C, WBA0822A only has 0.20 dB noise increases. At -40 °C, WBA0822A offers approximately 0.18 dB less noise figure than that at room temperature.

Figure 4 is the plot of the stability factor k of WBA0822A. The amplifier is unconditional stable at all temperature since the stability factor k is great than 1 at all frequency ranges.

Figure 5 demonstrates the small signal performance of WBA0822A at the extended frequency range at full temperature.

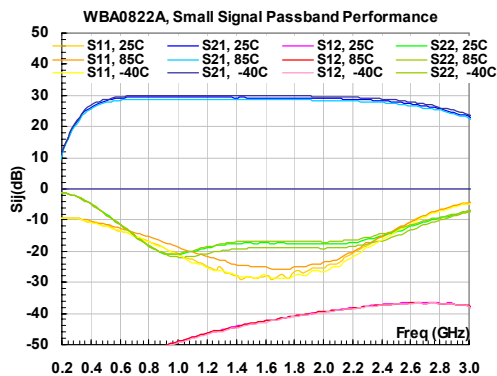


FIG. 1 Typical small signal performance.

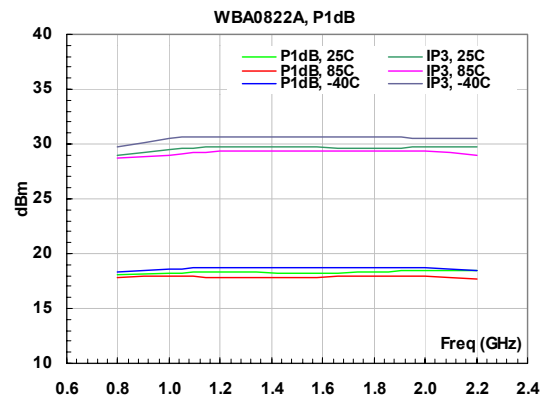


FIG. 2 Typical P_{1dB} and IP_3 at room temperature.

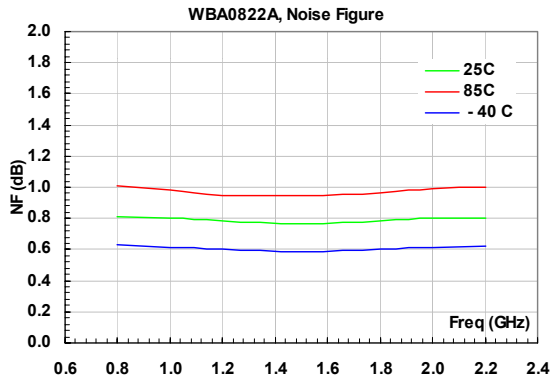


FIG. 3 Noise figure performance

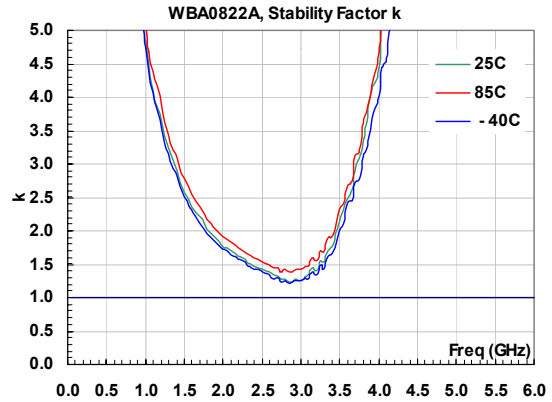


FIG. 4 Stability factor k of WBA0822A

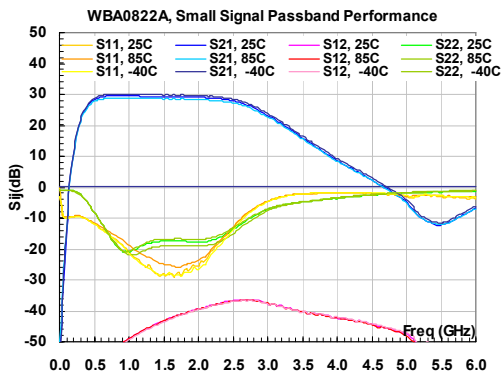


FIG. 5 Performance at the extended frequency band

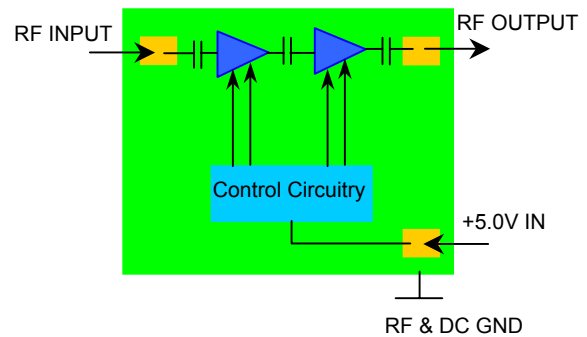


FIG. 6 Block diagram of WBA0822A

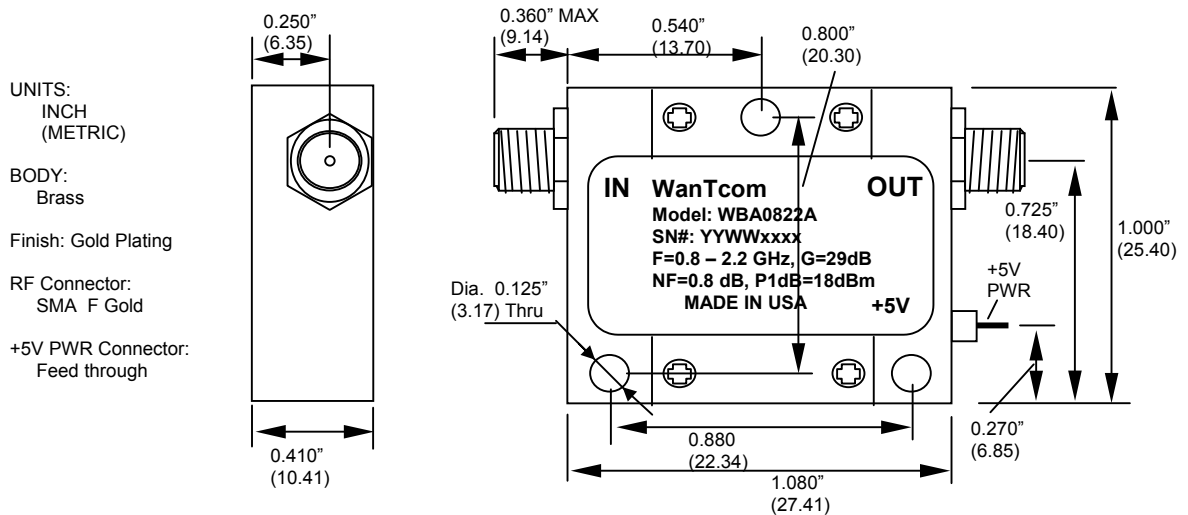


FIG. 7 WBA0822A outline



WBA0822A Mechanical Outline, WP-5:

Figure 7 shows the mechanical outline of WBA0822A. It is a WanTcom's standard WP-5 housing with gold plating finish. 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 | WBA0822A |
|---------------------|----------|

Small Signal S-Parameters:

IWBA0822A, +25 °C

Is-parameters at Vdd=5V, Idd=105mA. Last updated 11/1/05.

GHz s MA R 50

| IFreq(GHz) | MAGS11 | ANGS11 | MAGS21 | ANGS21 | MAGS12 | ANGS12 | MAGS22 | ANGS22 |
|------------|--------|--------|--------|--------|---------|--------|--------|--------|
| 0.1 | 0.317 | -18.5 | 0.601 | -88.2 | 0.00006 | 53.0 | 0.889 | 147.6 |
| 0.2 | 0.335 | -27.8 | 4.027 | -153.4 | 0.00006 | 38.8 | 0.864 | 111.6 |
| 0.3 | 0.335 | -46.0 | 11.258 | 146.9 | 0.00022 | -106.6 | 0.757 | 72.3 |
| 0.4 | 0.298 | -63.2 | 19.278 | 94.0 | 0.00060 | -154.4 | 0.574 | 34.4 |
| 0.5 | 0.257 | -79.0 | 24.745 | 50.2 | 0.00102 | 174.2 | 0.399 | 1.0 |
| 0.6 | 0.214 | -92.7 | 27.610 | 14.4 | 0.00154 | 149.0 | 0.267 | -29.1 |
| 0.7 | 0.175 | -104.7 | 28.955 | -15.0 | 0.00197 | 133.8 | 0.176 | -60.6 |
| 0.8 | 0.143 | -115.5 | 29.490 | -40.4 | 0.00240 | 119.2 | 0.119 | -96.7 |
| 0.9 | 0.114 | -123.0 | 29.627 | -63.1 | 0.00296 | 105.8 | 0.090 | -139.5 |
| 1 | 0.089 | -132.1 | 29.488 | -83.7 | 0.00349 | 95.2 | 0.089 | 177.8 |
| 1.1 | 0.072 | -139.6 | 29.288 | -102.9 | 0.00414 | 84.6 | 0.098 | 143.0 |
| 1.2 | 0.060 | -149.0 | 29.128 | -121.1 | 0.00472 | 74.0 | 0.112 | 116.4 |
| 1.3 | 0.055 | -153.8 | 28.954 | -138.6 | 0.00537 | 63.6 | 0.124 | 93.6 |
| 1.4 | 0.039 | -164.8 | 28.834 | -155.7 | 0.00605 | 53.1 | 0.130 | 74.2 |
| 1.5 | 0.039 | -172.2 | 28.740 | -172.6 | 0.00686 | 42.9 | 0.137 | 56.4 |
| 1.6 | 0.039 | 178.0 | 28.654 | 170.6 | 0.00754 | 33.7 | 0.137 | 39.9 |
| 1.7 | 0.039 | 155.1 | 28.608 | 153.7 | 0.00817 | 23.6 | 0.138 | 24.3 |
| 1.8 | 0.046 | 144.0 | 28.531 | 136.6 | 0.00908 | 12.9 | 0.134 | 8.3 |
| 1.9 | 0.051 | 126.8 | 28.410 | 119.4 | 0.00980 | 3.1 | 0.131 | -7.8 |
| 2 | 0.058 | 116.8 | 28.154 | 102.1 | 0.01100 | -7.6 | 0.130 | -24.4 |
| 2.1 | 0.070 | 104.6 | 27.730 | 84.9 | 0.01100 | -17.6 | 0.130 | -42.8 |
| 2.2 | 0.093 | 99.2 | 27.137 | 67.4 | 0.01200 | -28.5 | 0.138 | -65.2 |
| 2.3 | 0.122 | 94.2 | 26.511 | 49.1 | 0.01300 | -39.5 | 0.151 | -91.0 |
| 2.4 | 0.160 | 84.7 | 25.697 | 30.6 | 0.01400 | -50.8 | 0.174 | -117.2 |
| 2.5 | 0.222 | 74.9 | 24.414 | 11.4 | 0.01500 | -63.4 | 0.205 | -143.0 |
| 2.6 | 0.292 | 59.5 | 22.842 | -8.0 | 0.01500 | -76.1 | 0.249 | -168.2 |
| 2.7 | 0.383 | 45.2 | 20.929 | -27.6 | 0.01500 | -88.5 | 0.297 | 167.3 |
| 2.8 | 0.458 | 28.6 | 18.900 | -47.1 | 0.01500 | -102.5 | 0.343 | 145.3 |
| 2.9 | 0.532 | 10.9 | 16.522 | -66.1 | 0.01400 | -116.3 | 0.388 | 126.0 |
| 3 | 0.602 | -4.5 | 14.339 | -83.1 | 0.01300 | -127.1 | 0.442 | 105.8 |
| 3.1 | 0.644 | -20.7 | 12.545 | -99.5 | 0.01300 | -135.7 | 0.474 | 87.5 |
| 3.2 | 0.700 | -36.5 | 10.732 | -115.2 | 0.01200 | -145.0 | 0.504 | 71.0 |
| 3.3 | 0.731 | -49.6 | 9.097 | -129.4 | 0.01100 | -153.5 | 0.530 | 55.8 |
| 3.4 | 0.761 | -63.0 | 7.641 | -142.3 | 0.01000 | -161.0 | 0.554 | 41.4 |
| 3.5 | 0.778 | -75.6 | 6.402 | -154.6 | 0.00971 | -168.1 | 0.573 | 28.1 |
| 3.6 | 0.789 | -87.2 | 5.382 | -165.9 | 0.00920 | -176.6 | 0.593 | 15.1 |
| 3.7 | 0.796 | -98.4 | 4.521 | -177.3 | 0.00886 | 175.7 | 0.615 | 2.2 |
| 3.8 | 0.804 | -109.9 | 3.803 | 172.1 | 0.00850 | 165.6 | 0.633 | -9.7 |
| 3.9 | 0.806 | -120.3 | 3.202 | 162.6 | 0.00807 | 158.2 | 0.650 | -21.1 |
| 4 | 0.818 | -130.0 | 2.754 | 154.4 | 0.00789 | 151.8 | 0.663 | -32.2 |
| 4.1 | 0.808 | -139.9 | 2.386 | 145.8 | 0.00746 | 143.8 | 0.682 | -42.8 |
| 4.2 | 0.807 | -149.3 | 2.064 | 137.9 | 0.00723 | 135.6 | 0.698 | -53.3 |
| 4.3 | 0.811 | -158.1 | 1.748 | 129.6 | 0.00667 | 128.4 | 0.722 | -63.6 |
| 4.4 | 0.798 | -167.3 | 1.491 | 121.4 | 0.00634 | 119.2 | 0.739 | -73.7 |
| 4.5 | 0.796 | -176.9 | 1.253 | 113.5 | 0.00591 | 111.0 | 0.754 | -84.6 |
| 5 | 0.713 | 142.4 | 0.444 | 71.9 | 0.00435 | 66.9 | 0.813 | -131.3 |
| 5.5 | 0.713 | 104.4 | 0.165 | 119.0 | 0.00263 | 52.9 | 0.852 | -175.6 |
| 6 | 0.673 | 66.3 | 0.355 | 97.2 | 0.00269 | 48.5 | 0.888 | 144.8 |
