



2.5 – 3.5 GHz LOW NOISE AMPLIFIER WBA2535-12A¹

WBA2535-12A LNA is a low noise figure, wideband, and high linearity amplifier with exceptional gain flatness. The amplifier offers 1.0 dB noise figure, 14.0 dB gain, and 15.0 dBm P_{1dB} at the frequency range from 2.5 GHz to 3.5 GHz.

WBA2535-12A is most suitable for S-band analog or pulse communication systems.

WBA2535-12A is designed to meet the rugged standards of MIL-STD-202, and MIL-STD-883.

Preliminary

Key Features:

Impedance:	50 Ohm
Low Noise:	1.0 dB
Gain:	14.0 dB
Gain Flatness:	+/-0.2 dB
Input VSWR:	1.35:1
Output VSWR:	1.35:1
P _{1dB} :	15.0 dBm
Single Power Supply:	30 mA, @ +7.0 ~ +25.0 V
Frequency Range:	2.5 ~ 3.5 GHz
Operating Temperature:	-40 ~ +85 °C

Absolute Maximum Ratings²:

Symbol	Parameters	Units	Absolute Maximum
V _{dd}	DC Power Supply Voltage	V	+30V
I _{dd}	Drain Current	mA	40
P _{diss}	Total Power Dissipation	mW	300
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	-40 ~ +85
R _{th,c}	Thermal Resistance	°C/W	220

¹ Specifications are subject to change without notice.

² Operation of this device above any one of these parameters may cause permanent damage.

**Specifications:**

a) **Table 1** Summary of the electrical specifications of WBA2535-12A at room temperature

Index	Testing Item	Symbol	Test Constraints	Nom (RT)	Min	Max	Unit
1	Gain	S_{21}	2.5 – 3.5 GHz	14	13	15	dB
2	Gain Variation	ΔG	2.5 – 3.5 GHz	+/- 0.2		+/- 0.4	dB
3	Input Return Loss	S_{11}	2.5 – 3.5 GHz	16	15		dB
4	Output Return Loss	S_{22}	2.5 – 3.5 GHz	16	15		dB
5	Reverse Isolation	S_{12}	2.5 – 3.5 GHz	22	20		dB
6	Noise figure	NF	2.5 – 3.5 GHz	1.0		1.2	dB
7	Output P_{1dB} compression	P_{1dB}	2.5 – 3.5 GHz	15.0			dBm
8	Current Consumption	I_{dd}	$V_{dd} = +7.0 \sim +25 V$	30			mA
9	Power Supply Voltage	V_{dd}			7.0	25.0	V
10	Operating Temperature	T_o			-40	+85	°C
11	Maximum Average RF Input Power	$P_{IN, MAX}$	2.5 – 3.5 GHz			10.0	dBm

As shown in **Figure 1**, the typical gain of the WBA2535-12A is 14.0 dB across 2.5 GHz to 3.5 GHz. The typical input and output return losses are 16 dB, respectively.

The noise figure, as shown in **Figure 2**, of WBA2535-12A is 1.0 dB³ at room temperature. The noise figure only increases 0.20 dB at 85 °C and decreases 0.15 dB at -40 °C comparing to the noise figure at room temperature.

The output 1-dB compression point is shown in **Figure 3**. WBA2535-12A offers typical 15.0 dBm P_{1dB} .

Figure 4 demonstrates the stability factor k of the amplifier. k is less than 1.0 in some frequency ranges and thus the amplifier is conditional stable.

Figure 5 is the block diagram of internal circuit of WBA2535-12A. It is a one-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 6 shows the mechanical outline of WBA2535-12A. The package is the gold plated WanTcom's standard housing, WP-5. All the RF ports are equipped with SMA female and feed through for the +5.0 V DC input.

³ 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

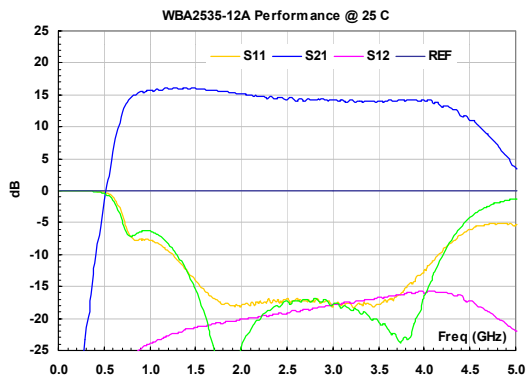


FIG. 1 Small signal performance of WBA2535-12A

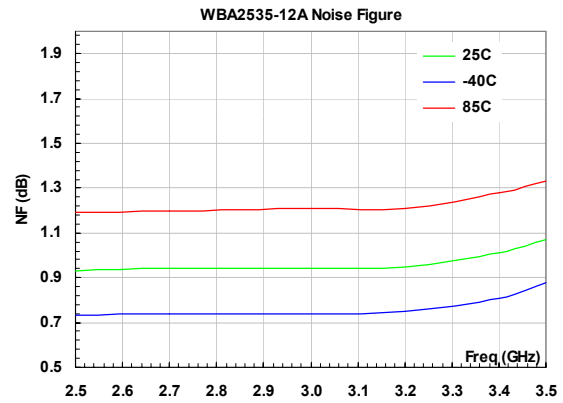


FIG. 2 Noise figure performance at full temperature

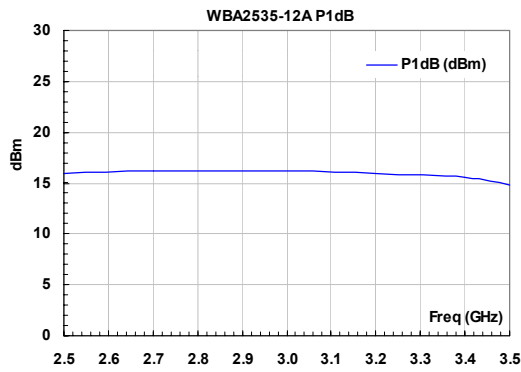


Fig. 3 Output 1-dB compression point

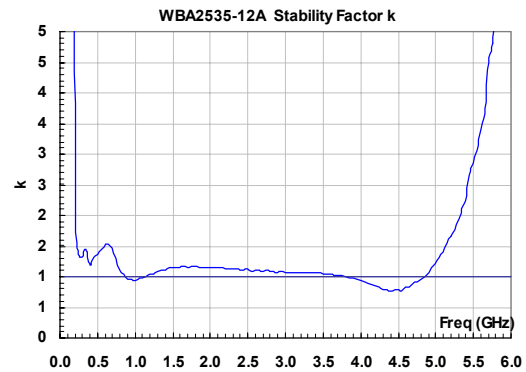


Fig. 4 Stability factor k

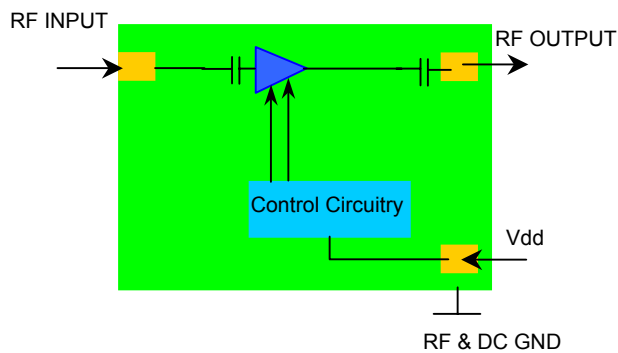


FIG. 5 Block diagram of WBA2535-12A



WBA2535-12A MECHANICAL OUTLINE: WP-5

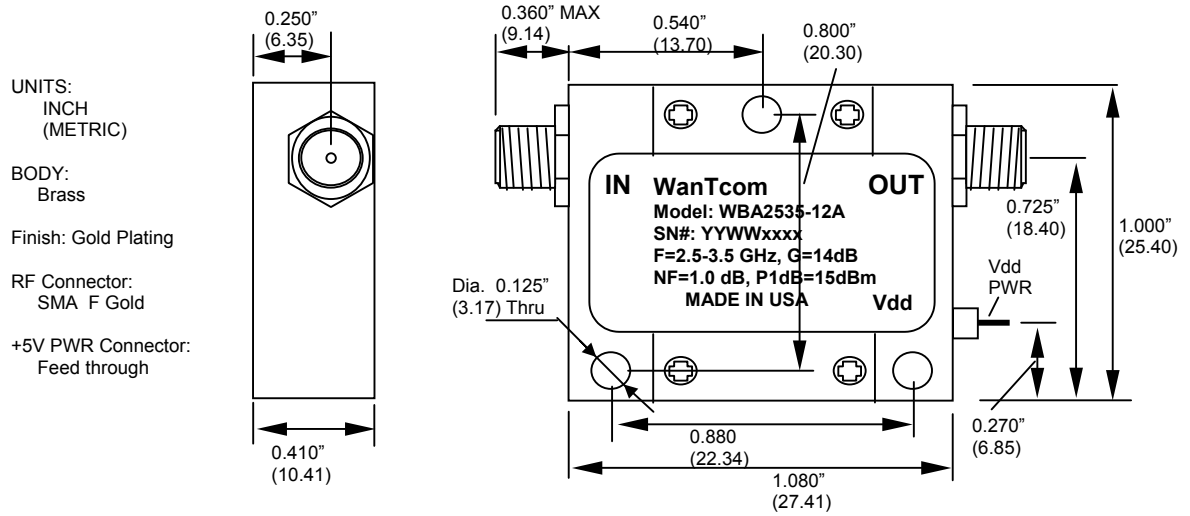


FIG. 6 WP-5 Outline

ORDERING INFORMATION

Function	Normal
Model Number:	WBA2535-12A



SMALL SIGNAL S-PARAMETERS:

IWBA2535-12A

!s-parameters at Vdd=+7 ~ +25V, Idd=30 mA, including the test board.

!Last updated 5/20/05.

GHZ s MA R 50

!F(GHz) MAG S11 ANG S11 MAG S21 ANG S21 MAG S12 ANG S12 MAG S22 ANG S22

0.05	0.999	-8.4	0.001	141.6	0.0001	-69.3	0.999	-8.4
0.1	0.999	-16.9	0.002	59.7	0.0001	120.6	0.999	-16.8
0.2	0.999	-33.8	0.013	123.5	0.0002	-20.6	0.999	-34.1
0.3	0.998	-51.3	0.074	111.3	0.0006	-34.9	0.996	-52.0
0.4	0.996	-69.9	0.267	89.4	0.0023	-47.8	0.985	-71.5
0.5	0.975	-91.8	0.808	60.7	0.0071	-70.2	0.949	-93.7
0.6	0.888	-117.4	2.113	23.1	0.0180	-101.9	0.834	-119.7
0.7	0.645	-142.8	4.173	-27.7	0.0370	-146.5	0.572	-141.4
0.8	0.431	-146.4	5.495	-78.0	0.0520	170.0	0.437	-138.2
0.9	0.412	-146.9	5.933	-116.3	0.0580	139.2	0.479	-145.9
1	0.414	-158.3	6.117	-147.0	0.0630	114.8	0.485	-164.5
1.1	0.383	-173.3	6.171	-172.8	0.0680	95.4	0.448	174.5
1.2	0.341	172.8	6.329	163.8	0.0730	79.0	0.384	153.0
1.3	0.287	159.7	6.348	141.9	0.0770	62.2	0.312	131.7
1.4	0.240	148.8	6.342	122.9	0.0830	48.4	0.238	110.4
1.5	0.198	141.3	6.318	104.3	0.0850	35.7	0.169	89.0
1.6	0.165	135.9	6.204	87.4	0.0870	22.7	0.107	66.6
1.7	0.143	133.0	6.100	71.1	0.0910	11.9	0.054	40.2
1.8	0.130	132.6	5.961	55.6	0.0920	0.8	0.016	-22.4
1.9	0.126	129.8	5.838	40.5	0.0960	-9.9	0.032	-132.0
2	0.125	126.6	5.725	26.3	0.0980	-19.4	0.059	-160.1
2.1	0.129	121.8	5.563	12.6	0.1010	-28.9	0.081	179.6
2.2	0.134	114.6	5.450	-0.4	0.1030	-37.8	0.099	160.8
2.3	0.144	105.2	5.334	-12.3	0.1050	-47.3	0.117	143.5
2.4	0.139	98.0	5.287	-25.3	0.1090	-56.0	0.125	126.1
2.5	0.146	88.7	5.140	-37.6	0.1090	-64.3	0.137	107.4
2.6	0.145	79.1	5.063	-50.8	0.1140	-74.6	0.139	89.3
2.7	0.137	71.0	5.097	-62.5	0.1190	-82.0	0.141	69.3
2.8	0.138	60.1	5.160	-75.1	0.1200	-90.1	0.141	49.0
2.9	0.137	48.8	5.231	-89.1	0.1240	-99.2	0.137	27.9
3	0.126	38.3	5.110	-101.3	0.1270	-108.3	0.127	7.8
3.1	0.125	23.5	5.086	-113.4	0.1290	-116.7	0.121	-13.5
3.2	0.131	11.9	5.191	-125.7	0.1320	-127.1	0.117	-35.2
3.3	0.128	-2.9	5.055	-138.6	0.1380	-136.2	0.110	-57.9
3.4	0.127	-16.5	5.007	-151.4	0.1410	-145.4	0.103	-82.0
3.5	0.131	-33.6	4.980	-163.3	0.1450	-154.6	0.096	-110.0
3.6	0.137	-50.4	5.056	-176.8	0.1470	-163.8	0.086	-139.1
3.7	0.148	-67.7	5.078	168.8	0.1510	-174.5	0.073	-176.0
3.8	0.173	-88.4	5.085	154.2	0.1560	175.7	0.071	129.4
3.9	0.195	-110.0	5.139	138.5	0.1560	164.1	0.092	74.7
4	0.235	-130.9	5.093	121.7	0.1600	150.5	0.147	32.4
4.1	0.287	-150.5	4.803	104.5	0.1630	138.0	0.221	-0.9
4.2	0.340	-171.4	4.519	87.7	0.1610	125.5	0.314	-31.2
4.3	0.400	167.8	4.359	68.8	0.1550	111.1	0.419	-58.2
4.4	0.452	147.3	3.860	50.2	0.1520	98.1	0.518	-84.7
4.5	0.504	126.8	3.562	34.0	0.1380	86.7	0.618	-109.9
5	0.542	43.3	1.511	-45.3	0.0810	31.1	0.862	150.2
5.5	0.466	-17.8	0.510	-100.4	0.0500	-8.7	0.918	74.2
6	0.372	-67.6	0.120	-137.3	0.0340	-49.3	0.950	10.3
