



1.75 – 2.05 GHz LOW NOISE BALANCE AMPLIFIER WA19-1733A¹

WA19-1733A LNA is a low noise figure, wideband, and high linear amplifier with unconditional stable design. The amplifier offers typical 0.65 dB noise figure and typical 36 dBm output IP3 at the frequency range from 1.75 to 2.05 GHz. WA19-1733A LNA 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.



Key Features:

Impedance:	50 Ohm
MTBF ² :	>300,000 hrs (34Years)
Unconditional Stable:	k>1
Low Noise:	0.65 dB typical
Output IP ₃ :	36.0 dBm
Gain:	17.0 dB
P _{1dB} :	18.0 dBm
Single power supply:	125 mA @ +7.0 ~ + 15V, option: +5V
Frequency Range:	1.75 ~ 2.05 GHz
Operating Temperature:	-40 ~ +85 °C
Return Losses:	20.0 dB
Alarm Output:	Soft Alarm, Hard Alarm, Soft Alarm Open Collector, Hard Alarm Open collector, Branch 1 Alarm, Branch 2 Alarm.

Absolute Maximum Ratings³:

Symbol	Parameters	Units	Absolute Maximum
V _{dd}	DC Power Supply Voltage	V	30
I _{dd}	Drain Current	mA	135
P _{diss}	Total Power Dissipation	W	3.75
P _{In,Max}	RF Input Power	dBm	13
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 ⁴	°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.

⁴ Last stage individual FET junction-to-case thermal resistance.



Specifications:

a) **Table 1** Summary of the electrical specifications WA19-1733A at room temperature

Index	Testing Item	Symbol	Test Constraints	Nom (RT)	Min	Max	Unit
1	Gain	S_{21}	1.75 – 2.05 GHz	17.0	15.5	17.5	dB
2	Gain Variation	ΔG	20 MHz Bandwidth	0.15		0.25	dB
3	Input Return Loss	S_{11}	1.75 – 2.05 GHz	22	20		dB
4	Output Return Loss	S_{22}	1.75 – 2.05 GHz	22	20		dB
5	Reverse Isolation	S_{12}	1.75 – 2.05 GHz		20		dB
6	Noise figure	NF	1.75 – 2.05 GHz	0.65		0.80	dB
7	Output P1dB compression	P_{1dB}	1.75 – 2.05 GHz		16		dBm
8	Output-Third-Order Interception point	$TOIP_3$	Two-Tone, Pout +0 dBm each, 1 MHz separation	36	34		dBm
9	Current Consumption	I_{dd}	$V_{dd} = +7 \sim +15$ V	125			mA
10	Power Supply Voltage	V_{dd}			+7	+15	V
11	Soft Alarm TTL Output	V_s	Normal/Fail, +/- 30% I_{d1} or I_{d2}	4.65/0.0			V
	Soft Alarm Open Collector Output	V_{so}	Normal/Fail, External 10K to an external + V_{cc}	Low/High ⁵			
	Hard Alarm TTL Output	V_h	Normal/Fail, +/- 30% I_{dd}	4.65/0.0			V
	Hard Alarm Open Collector Output	V_{ho}	Normal/Fail, External 10K to an external +Vcc	Low/High			
	Branch 1 Alarm TTL Output	V_{a1}	Normal/Fail, +/- 30% I_{d1}	4.65/0.0			V
	Branch 2 Alarm TTL Output	V_{a2}	Normal/Fail, +/- 30% I_{d2}	4.65/0.0			V
12	Maximum RF Input Power	P_{inmax}	1.75 – 2.05 GHz, composite average power		10		dBm

b) Passband Frequency Response

As shown in **Figure 1**, the typical gain of the WA19-1733A is 17.0 dB across 1.75 GHz to 2.05 GHz frequency range. The typical input and output return losses are 20 dB or better across 1.75 GHz to 2.05 GHz frequency range.

Figure 2 shows P_{1dB} and IP_3 of the WA19-1733A. The typical P_{1dB} and IP_3 are 19.0 dBm and 36.0 dBm in the frequency range of 1.75 GHz to 2.05 GHz, respectively.

Figure 3 illustrates the noise figure performance. The noise figure is 0.65 dB across the frequency range of 1.75 GHz to 2.05 GHz. At 85 °C, WA19-1733A only has 0.25 dB noise increases. At -40 °C, WA19-1733A offers approximately 0.20 dB less noise figure than that at room temperature.

Figure 4 is the plot of the stability factor k of WA19-1733A. The amplifier is unconditional stable at room temperature due to k is great than 1 at all frequency ranges.

Figure 5 illustrates the internal block diagram of WA19-1733A.

⁵ Need a 10 k Ohm pull up resistor to a high potential voltage such as +5 V.

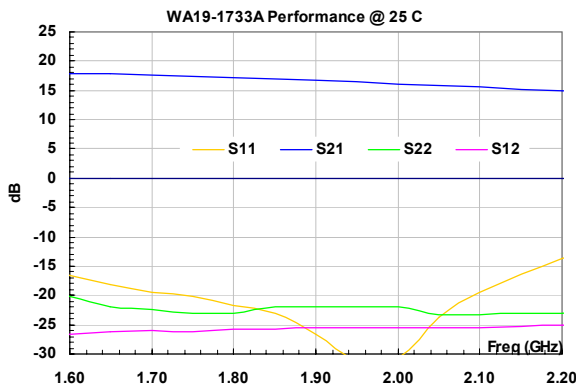


FIG. 1 Typical small signal performance.

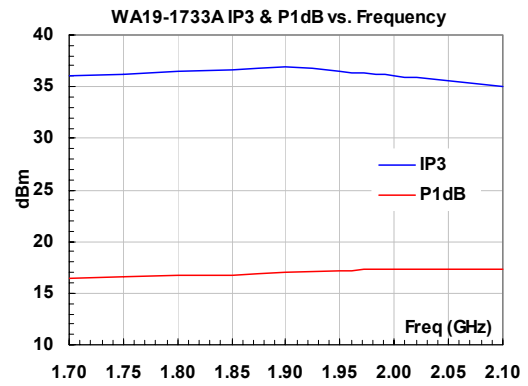


FIG. 2 Typical P_{1dB} and IP_3 at room temperature.

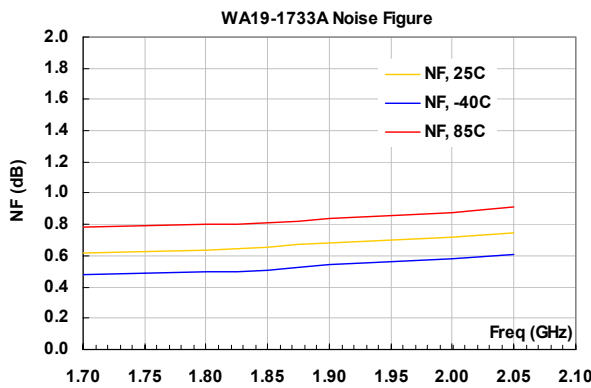


FIG. 3 Noise figure performance

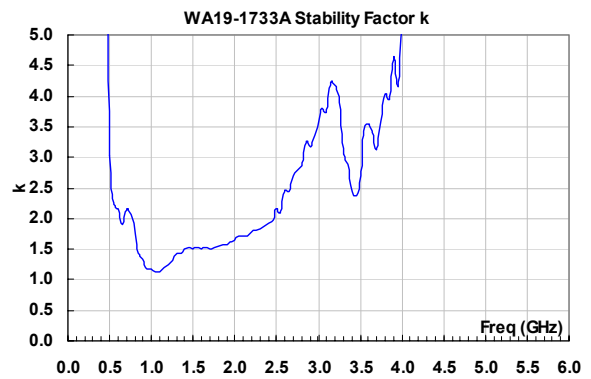


FIG. 4 Stability factor k of WA19-1733A

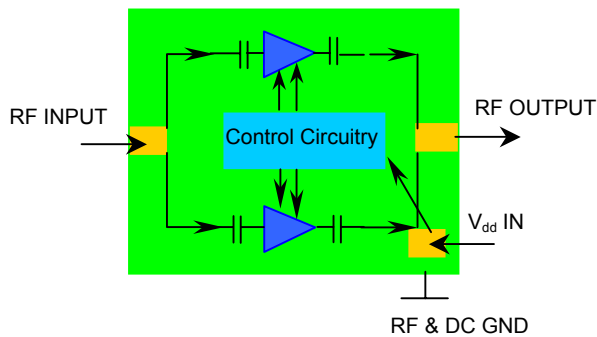


FIG. 5 Internal block diagram of WA19-1733A



WA19-1733A Mechanical Outline, WP-1:

WA19-1733A has a WanTcom's standard WP-1 housing with no plating, as shown in **Fig. 6**. Both RF input and output ports are equipped with SMA female connectors and the DC/Alarm port connector is 8-pin Molex socket connector 53048-0810.

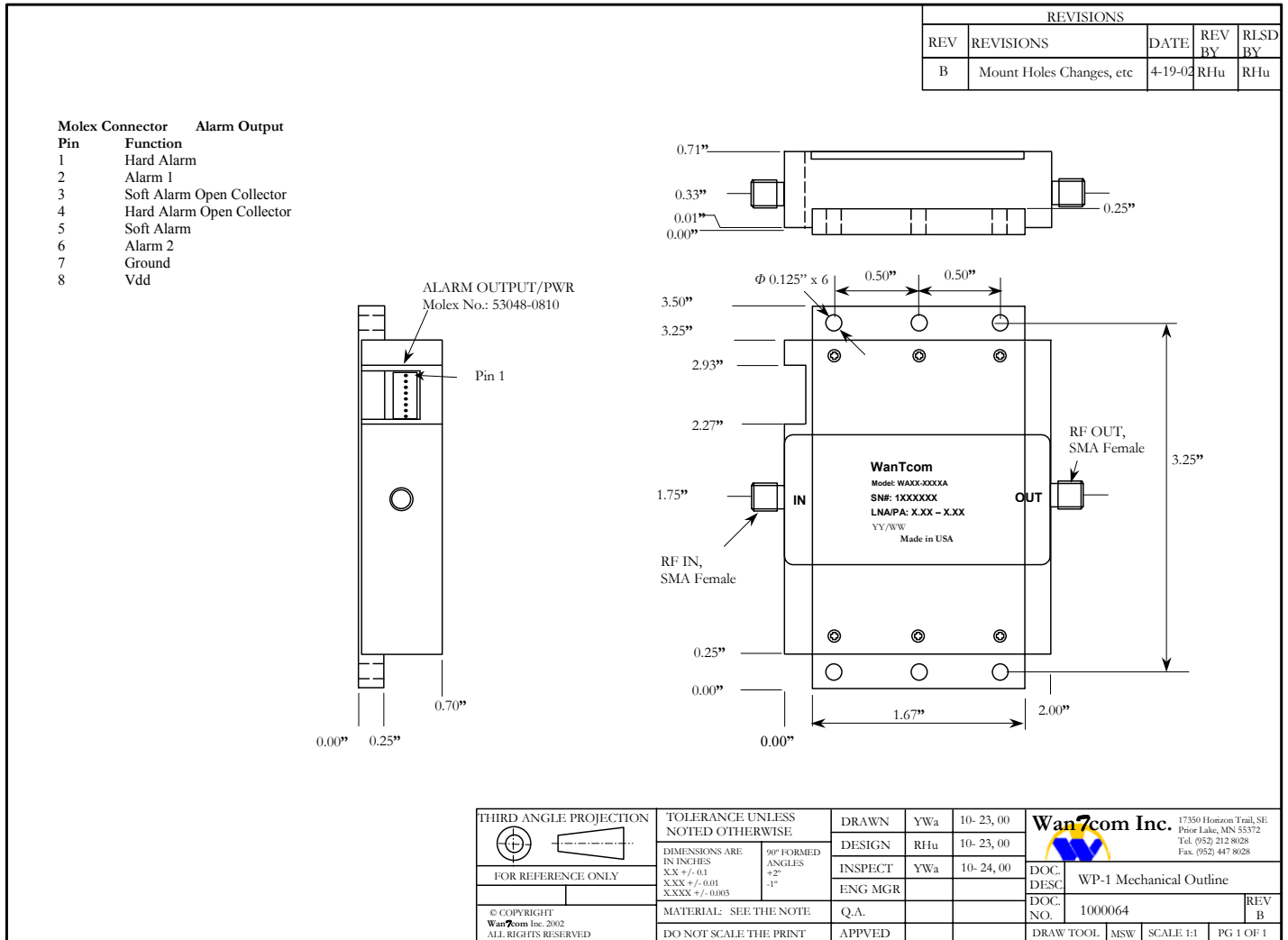


Fig. 6 WP-1 outline



Ordering Information

Model Number	WA19-1733A
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Small Signal S-Parameters:

IWA19-1733A
 Is-parameters at Vds=7~30V, Id=125mA. Last updated 05/21/03.

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	0.57	-45.3	0.05	-26.7	0.0013	-108.4	0.99	-42.3
0.1	0.46	-57.0	0.25	-49.9	0.0015	-129.2	0.99	-78.7
0.2	0.60	-72.1	0.90	-99.7	0.0020	59.1	0.98	-135.2
0.3	0.87	-115.7	1.53	-156.8	0.0020	108.5	0.96	-176.1
0.4	0.91	-153.9	1.52	179.2	0.0024	107.5	0.87	152.1
0.5	0.91	176.0	2.32	157.9	0.0038	98.0	0.85	132.7
0.6	0.84	150.3	2.98	125.1	0.0057	74.4	0.88	107.2
0.7	0.76	131.2	3.56	93.0	0.0099	31.3	0.85	80.6
0.8	0.73	115.2	4.33	64.7	0.0130	7.4	0.81	51.3
0.9	0.75	95.9	5.32	37.4	0.0170	-19.2	0.72	19.8
1	0.74	72.3	6.42	6.6	0.0230	-49.1	0.59	-17.0
1.1	0.68	46.1	7.47	-29.4	0.0300	-83.6	0.42	-60.3
1.2	0.57	18.3	8.20	-67.0	0.0350	-115.1	0.26	-112.6
1.3	0.44	-10.3	8.35	-103.7	0.0370	-149.5	0.16	-174.5
1.4	0.32	-40.6	8.16	-136.5	0.0400	179.2	0.13	130.2
1.5	0.22	-76.0	8.02	-167.7	0.0450	150.0	0.11	85.9
1.6	0.15	-119.8	7.81	160.8	0.0470	122.3	0.10	61.5
1.65	0.12	-146.1	7.71	144.4	0.0490	108.5	0.08	54.7
1.7	0.11	-171.3	7.52	128.7	0.0510	92.7	0.08	58.5
1.75	0.10	159.6	7.40	113.2	0.0500	75.0	0.07	67.2
1.8	0.08	140.1	7.22	97.5	0.0520	63.8	0.07	69.5
1.85	0.07	115.9	6.98	82.5	0.0520	48.5	0.08	71.3
1.9	0.05	97.3	6.84	67.1	0.0530	34.3	0.08	75.8
1.95	0.01	102.1	6.62	51.9	0.0530	21.6	0.08	65.6
2	0.02	-102.8	6.39	36.9	0.0530	6.5	0.08	64.8
2.05	0.07	-130.0	6.24	22.3	0.0530	-8.5	0.07	65.7
2.1	0.11	-143.4	5.99	7.2	0.0530	-20.5	0.07	59.9
2.15	0.15	-156.8	5.80	-7.7	0.0540	-38.4	0.07	74.3
2.2	0.21	-171.0	5.52	-22.5	0.0560	-52.2	0.07	80.9
2.3	0.30	163.0	5.11	-52.7	0.0540	-77.7	0.10	86.9
2.4	0.38	139.8	4.74	-81.7	0.0530	-106.7	0.11	92.5
2.5	0.44	119.1	4.26	-110.1	0.0480	-135.6	0.15	104.9
2.6	0.48	101.3	3.69	-140.0	0.0450	-168.8	0.25	103.7
2.7	0.51	87.1	3.15	-172.0	0.0450	164.3	0.37	88.0
2.8	0.54	73.9	2.78	158.6	0.0390	139.2	0.51	69.5
2.9	0.58	59.5	2.30	133.3	0.0330	119.5	0.63	47.5
3	0.62	44.3	1.84	109.4	0.0300	91.2	0.74	25.5
3.2	0.64	18.7	1.36	69.0	0.0240	59.0	0.81	-13.6
3.4	0.81	-12.4	1.06	29.8	0.0240	15.8	0.86	-51.1
3.6	0.82	-54.8	0.80	-10.3	0.0200	-13.8	0.89	-85.0
3.8	0.80	-103.2	0.81	-45.8	0.0180	-59.9	0.88	-124.1
4	0.76	-166.5	0.80	-95.9	0.0190	-100.9	0.84	-164.5
4.2	0.70	111.1	0.68	-165.4	0.0120	-156.8	0.76	143.4
4.4	0.61	40.5	0.30	132.2	0.0220	-65.3	0.62	73.7
4.6	0.63	-22.6	0.09	93.8	0.0160	-141.3	0.49	-7.0
4.8	0.56	-69.5	0.06	164.7	0.0160	-173.0	0.44	-80.0
5	0.46	-109.9	0.14	147.4	0.0150	159.7	0.38	-118.6
5.2	0.32	-142.2	0.21	106.0	0.0140	136.7	0.27	-136.9
5.4	0.15	-166.1	0.27	59.1	0.0120	88.9	0.37	-131.2
5.6	0.09	-82.5	0.31	13.8	0.0190	33.8	0.52	-146.2
5.8	0.28	-97.6	0.33	-31.9	0.0400	-37.8	0.62	-172.8
6	0.42	-114.6	0.33	-68.9	0.0170	-95.0	0.70	165.2
