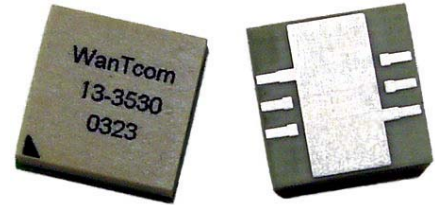




1100-1400 MHz LOW NOISE AMPLIFIER WHM13-3530A¹

WHM13-3530A LNA is a low noise figure, wideband, and high linearity amplifiers with SMT package design. The amplifier has 38.2 dB gain with exceptional gain flatness of +/- 0.15 dB. The amplifier offers typical noise figure of 0.80 dB and output IP3 of 27 dBm at the frequency range from 1100 MHz to 1400 MHz. WHM13-3530A LNA is most suitable for GPS applications.



Key Features:

Impedance:	50 Ohm
LGA (land grid array) package:	6-pin
Low Noise:	0.80 dB
Output IP ₃ :	27 dBm
Gain:	38.2 dB
Gain Flatness:	+/- 0.15 dB
P _{1dB} :	13 dBm Minimum
Single power supply:	55 mA @ +5V
Frequency Range:	1100 ~ 1400 MHz
Operating Temperature:	-40 ~ +85 °C
Return Losses:	20 dB typical
Small size:	0.350" x 0.350" x 0.098" (8.89 mm x 8.89 mm x 2.50 mm)

Specifications:

a) **Table 1** Summary of the electrical specifications WHM13-3530A at room temperature

Index	Testing Item	Symbol	Test Constraints	Nom (RT)	Min	Max	Unit
1	Gain	S ₂₁	1100 - 1400 MHz	38.2	38.0		dB
2	Gain Variation	ΔG	1100 - 1400 MHz			0.35	dB
3	Input Return Loss	S ₁₁	1100 - 1400 MHz	20	16		dB
4	Output Return Loss	S ₂₂	1100 - 1400 MHz	20	16		dB
5	Reverse Isolation	S ₁₂	1100 - 1400 MHz		40		dB
6	Noise figure	NF	1100 - 1400 MHz	0.80	0.70	0.90	dB
7	Output P _{1dB} compression	P _{1dB}	1100 - 1400 MHz		13.0		dBm
8	Output-Third-Order Interception point	IP ₃	Two-Tone, P _{out} +0 dBm each, 1 MHz separation		27.0		dBm
10	Current Consumption	I _{dd}	V _{dd} = +5 V	55			mA
11	Power Supply Voltage	V _{dd}		+5	+4.5	+5.5	V
12	Maximum RF Input Average Power	P _{in,MAX}				10	dBm
13	Thermal Resistance	R _{th,c}	Junction to case			215	°C/W
14	Operating Temperature	T _o			-40	+85	°C

¹ Specifications are subject to change without notice.



b) Passband Frequency Response

As shown in **Figure 1**, the typical gain of the WHM13-3530A is 38.2 dB across 1100 MHz to 1400MHz with the exceptional gain flatness of +/- 0.15 dB. The input and output return losses are better than 16 dB.

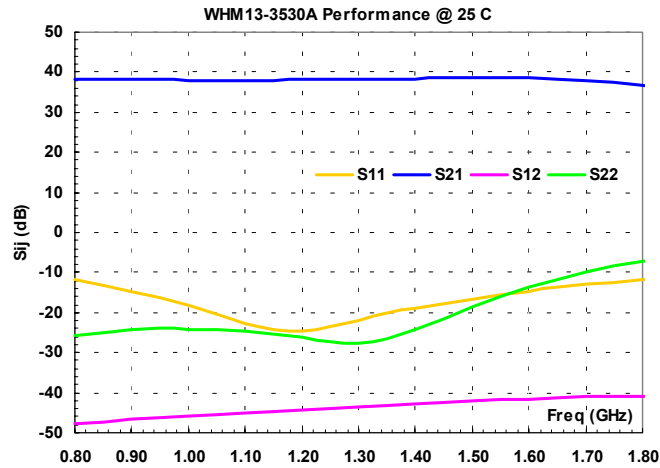
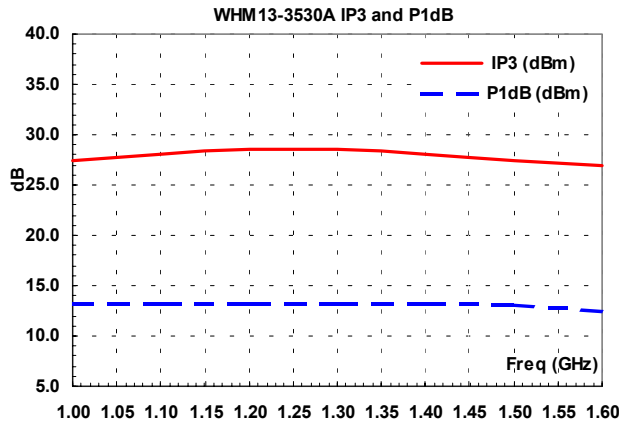


FIG. 1 Typical small signal performance of WHM13-3530A

c) Output Power and IP₃

Figure 2 shows the IP₃ and P_{1dB} of WHM13-3530A.



V_{dd}=+5.0V, I_{dd}=55 mA

FIG. 2 Typical output power and IP3 at room temperature.



d) Noise Figure

The noise figure of WHM13-3530A is 0.80 dB at room temperature and add 0.30 dB at +85 °C.

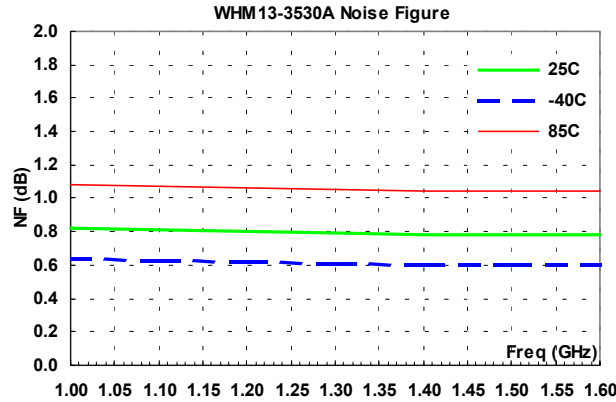
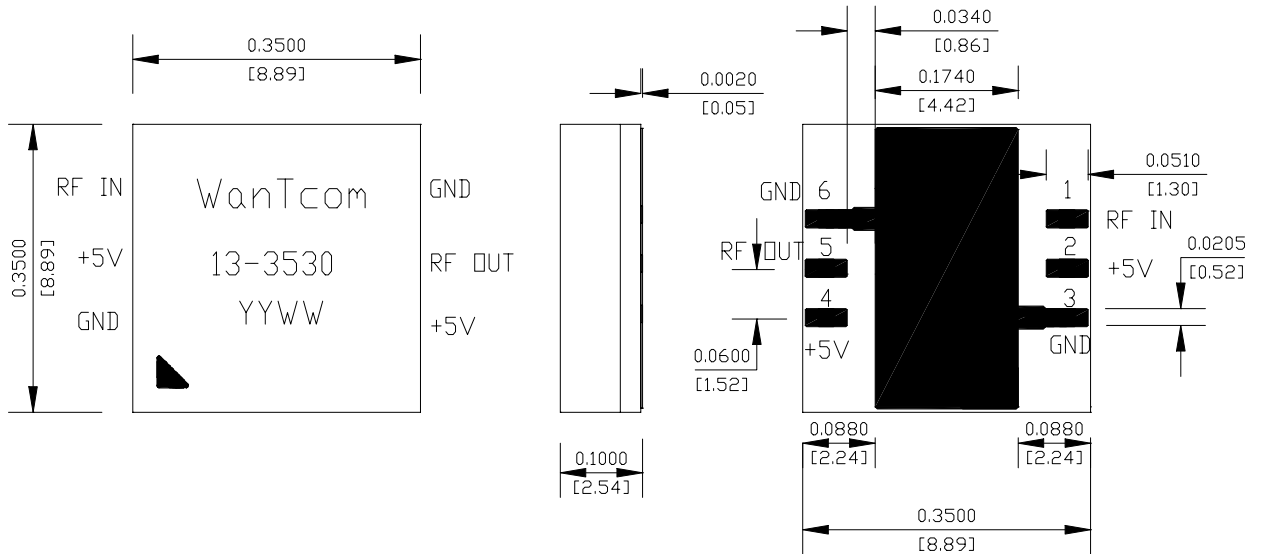


FIG. 3 WHM13-3530A noise figure performance at full temperature

e) WHM13-3530A Mechanical Outline:



NOTE:

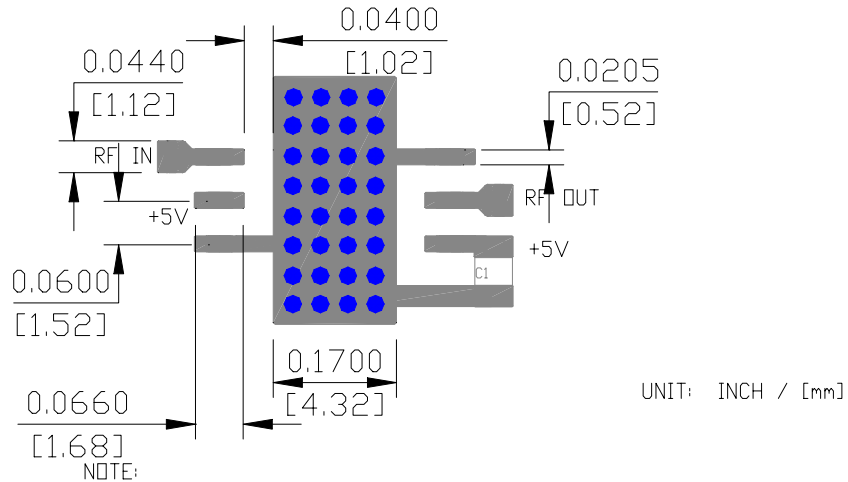
1. PACKAGE MATERIAL: FR-4 BASED
2. METAL PLATING: EMERSION GOLD
3. CENTER AREA IS RF AND DC GROUND

PIN	1	2	3	4	5	6
PIN FUNCTION	RFIN	+5V	GND	+5V	RFOUT	GND

FIG. 4 WHM13-3530A outline



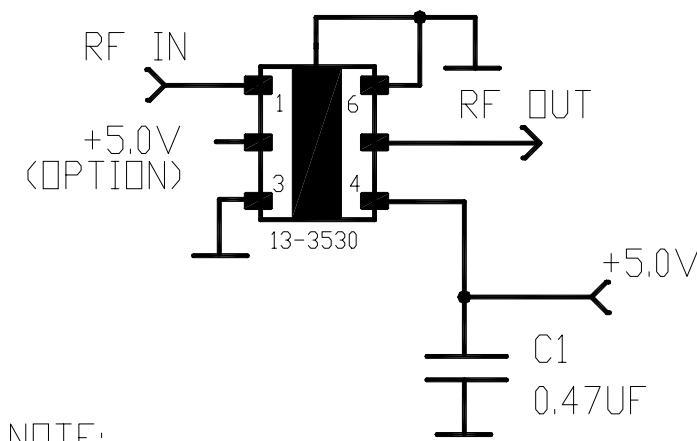
f) Motherboard layout:



1. THE BACKSIDE NEEDS TO BE METAL GROUND LAYER
2. GROUND VIA DIAMETER IS 0.024" (0.61 mm);
3. C1 IS 0.47 UF OR LARGER VALUE CAPACITOR
4. MATERIAL: FR-4, 4000-13, FROM NELCO
5. USE PROPER WIDTH FOR 50-OHM LINES FOR OTHER PCB MATERIAL

FIG. 5 WHM13-3530A motherboard layout

g) Typical application schematic:



- NOTE:
1. PIN 2 and 4 connected internally
 2. EITHER PIN 2 OR PIN 4 FOR +5v
 3. C1 MAYBE NEGLECTED IF +5V IS CLEAN

FIG. 6 Typical application schematic for WHM13-3530A



h) Ordering Information

Model Number	WHM13-3530A
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i) Small Signal S-Parameters:

!WHM13-3530A
!s-parameters at Vds=5V, Id=55 mA, including the test board.
!Last updated 12/20/03.

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	0.968	-51.6	0.011	32.5	0.0000	-120.2	0.992	-21.3
0.1	0.921	-85.2	0.029	101.8	0.0001	-160.4	0.977	-36.7
0.2	0.900	-166.0	1.885	64.8	0.0006	132.1	0.899	-85.2
0.3	0.814	119.7	20.563	-53.9	0.0017	43.2	0.349	168.3
0.4	0.593	59.6	55.132	-154.7	0.0027	-56.4	0.474	-60.6
0.5	0.421	27.0	84.346	120.8	0.0032	-134.3	0.300	-137.9
0.6	0.376	0.8	87.743	58.2	0.0035	171.1	0.096	-157.2
0.7	0.325	-28.2	85.318	12.5	0.0039	133.4	0.043	-116.5
0.8	0.257	-53.5	83.034	-24.1	0.0041	104.1	0.052	-90.3
0.9	0.186	-74.7	81.248	-55.5	0.0046	79.7	0.060	-87.9
1	0.121	-89.1	80.037	-84.2	0.0051	59.8	0.062	-91.3
1.1	0.074	-89.0	79.756	-111.3	0.0055	41.6	0.058	-98.3
1.2	0.060	-65.3	80.192	-137.3	0.0060	24.8	0.049	-99.5
1.3	0.081	-50.9	81.482	-163.1	0.0066	7.8	0.041	-85.9
1.4	0.115	-61.4	83.407	170.3	0.0072	-7.8	0.061	-65.2
1.5	0.149	-80.8	84.915	142.0	0.0079	-24.0	0.119	-72.7
1.6	0.185	-106.7	83.781	111.0	0.0084	-40.1	0.206	-95.5
1.7	0.223	-139.6	78.579	77.6	0.0088	-56.7	0.319	-127.5
1.8	0.259	-174.9	67.857	43.4	0.0089	-73.1	0.441	-162.5
1.9	0.288	149.5	53.600	10.9	0.0090	-87.2	0.549	163.0
2	0.319	116.5	39.453	-18.3	0.0091	-100.7	0.631	131.8
2.1	0.347	87.8	28.072	-43.5	0.0091	-114.1	0.693	104.3
2.2	0.378	63.4	19.886	-65.0	0.0090	-125.6	0.740	80.1
2.3	0.407	41.4	14.082	-83.8	0.0091	-138.0	0.775	59.0
2.4	0.436	22.1	9.906	-100.8	0.0090	-150.7	0.805	40.0
2.5	0.461	5.2	7.189	-116.6	0.0089	-161.2	0.826	23.3
2.6	0.482	-10.5	5.284	-130.0	0.0088	-171.6	0.845	7.7
2.7	0.503	-25.1	3.922	-140.4	0.0085	178.1	0.860	-6.3
2.8	0.520	-38.7	2.831	-149.4	0.0084	168.1	0.872	-19.3
2.9	0.534	-51.5	2.064	-157.8	0.0084	159.2	0.883	-31.4
3	0.542	-63.6	1.528	-164.3	0.0082	152.3	0.892	-42.9
3.1	0.557	-74.5	1.147	-168.9	0.0083	143.5	0.896	-53.5
3.2	0.564	-85.8	0.859	-171.4	0.0082	137.0	0.900	-63.4
3.3	0.571	-95.8	0.667	-172.9	0.0083	129.8	0.910	-73.1
3.4	0.575	-106.0	0.526	-171.2	0.0083	124.2	0.910	-82.5
3.5	0.577	-116.0	0.427	-167.1	0.0084	117.9	0.912	-91.4
3.6	0.580	-125.4	0.362	-162.3	0.0087	111.6	0.916	-100.2
3.7	0.584	-134.4	0.320	-158.3	0.0090	106.1	0.919	-108.6
3.8	0.584	-143.6	0.285	-152.6	0.0094	100.4	0.920	-116.7
3.9	0.581	-152.8	0.266	-148.5	0.0097	94.8	0.922	-124.5
4	0.582	-161.2	0.263	-145.7	0.0100	87.5	0.925	-132.6
4.1	0.582	-169.8	0.253	-142.6	0.0110	80.7	0.923	-140.3
4.2	0.576	-178.7	0.239	-139.5	0.0120	71.8	0.925	-147.9
4.3	0.580	173.0	0.245	-135.1	0.0120	58.2	0.924	-155.4
4.4	0.581	164.5	0.240	-132.2	0.0100	51.3	0.925	-163.1
4.5	0.573	155.9	0.246	-129.8	0.0100	52.5	0.924	-170.4
5	0.542	113.0	0.249	-121.5	0.0150	36.7	0.923	153.1
5.5	0.513	69.7	0.314	-115.5	0.0250	1.3	0.917	116.6
6	0.512	27.0	0.454	-124.7	0.0350	-43.0	0.914	79.6