

0.8 – 1.4 GHz LOW NOISE AMPLIFIER WHM0814AE¹

WHM0814AE LNA is a low noise figure, wideband, and high linear packaged amplifier. The amplifier offers typical noise figure of 0.55 dB and output 17.0 dBm P_{1dB} at the frequency range from 0.8 GHz to 1.4 GHz of cellular, avionics, and GPS bands. The amplifier has excellent VSWR throughout the passband.

WHM0814AE LNA is most suitable for cellular base stations, wireless data communications, tower top receiver amplifiers, last-mile wireless communication systems, and wireless measurement applications.

 $WHM0814AE \ is \ designed \ to \ meet \ the \ rugged \ standards \ of \ MIL-STD-202G, \ and \ MIL-STD-883.$

50 Ohm

Key Features:

Impedance: $MTBF^2$: LGA (land grid array) package: Moisture Sensitivity Level: Low Noise: Output IP₃: Gain: Gain Phase Consistency Per Lot: P_{1dB} : Single power supply: Frequency Range: Operating Temperature: Return Losses: Small size: Built-in Functions:

>600,000 hrs (68 Years) WHM-4 MSL 1 0.55 dB 29 dBm 36.0 dB +/- 5.0 Degree 17.0 dBm 70 mA @ +5V 0.8 ~ 1.4 GHz, 0.7 ~ 1.6 GHz extended band -40 ~ +85 °C 20 dB Typical 0.50" x 0.50" x 0.080" (7.62 mm x 7.62 mm x 2.0 mm) 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	7.0		
l _{dd}	Drain Current	mA	100		
P _{diss}	Total Power Dissipation	mW	500		
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		-55 ~ 100		
R _{th,c}	Thermal Resistance	°C/W	215		

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Preliminary

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 WHM0814AE at room temperature

Index	Testing Item	Symbol	Test Constraints	Nom (RT)	Min	Мах	Unit
1	Gain	S ₂₁	0.8 – 1.4 GHz	36.5	35	38	dB
2	Gain Variation	ΔG	0.8 – 1.4 GHz	+/- 0.75		+/- 1.0	dB
3	S ₂₁ Phase Consistency	ANG S ₂₁	0.8 – 1.4 GHz, Each Lot			+/- 5.0	0
4	Input Return Loss	S ₁₁	0.8 – 1.4 GHz	20	16		dB
5	Output Return Loss	S ₂₂	0.8 – 1.4 GHz	20	16		dB
6	Reverse Isolation	S ₁₂	0.8 – 1.4 GHz	45	40		dB
7	Noise figure	NF	0.8 – 1.4 GHz	0.55		0.70	dB
8	Output Power 1dB compression Point	P _{1dB}	0.8 – 1.4 GHz	17.0	15		dBm
9	Output-Third-Order Interception point	IP ₃	Two-Tone, P _{out} +0 dBm each, 1 MHz separation	29	26		dBm
10	Current Consumption	l _{dd}	V _{dd} = +5 V	70	60	80	mA
11	Power Supply Voltage	V _{dd}		+5			V
12	Thermal Resistance	R _{th,c}	Junction to case			215	°C/W
13	Operating Temperature	To			-40	+85	°C
14	Maximum Average RF Input Power	PIN, MAX	0.8 – 1.4 GHz			10	dBm

b) Passband Frequency Response

As shown in **Figure 1**, the typical gain of the WHM0814AE is 36.0 dB across 0.8 to 1.4 GHz. The typical input and output return losses are 20 dB across the frequency of 0.8 to 1.4 GHz. The gain phase consistency is screened within ± 5.0 degree per each production lot or date code.

Figure 2 shows the measured P_{1dB} and IP_3 of the WHM0814AE. The typical P_{1dB} and IP_3 are 17.0 dBm and 29.0 dBm in the frequency range of 0.8 to 1.4 GHz, respectively.

Figure 3 illustrates the measured noise figure performance at full temperature. The measured results include the test fixture loss of approximately 0.05 dB. The noise figure is 0.55 dB across the frequency range of 0.8 to 1.4 GHz at room temperature.

Figure 4 shows the frequency response in the extended frequency band. The LNA works from 0.70 GHz to 1.60 GHz.

Figure 5 is the block diagram of internal circuit of WHM0814AE. It is a two-stage amplifier with the DC block capacitors at the input and output RF ports. All the RF matching networks, DC bias circuitries, and temperature compensation circuits are built in.

Figure 6 demonstrates the application schematic diagram of WHM0814AE. It may require one external decoupling capacitor of 0.01 uF to build a LNA with WHM0814AE. The +5V DC is applied at Pin 3. No DC block capacitor is required for both input and output RF ports. The NC pins connected to ground are recommended. For +5V line trace length being longer than 6 inch without a decoupling capacitor, an additional 0.01 \sim 0.1 uF de-coupling capacitor with minimum rating voltage of 10V may be needed across the +5V line to the ground. The capacitor must be rated in the temperature range of -40 $^{\circ}$ C to 85 $^{\circ}$ C to ensure the entire circuit working in the specified temperature range.

Figure 7 shows the mechanical outline and recommended motherboard layout of WHM0814AE. Plenty of ground vias on the motherboard are essential for the RF grounding. The width of the 50-Ohm lines at the input and output RF ports may be different for different property of the substrate.



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REV A











FIG. 5 Block diagram of internal circuit.



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



FIG. 4 Small signal performance at extended band



FIG. 6 Typical application schematic for WHM0814AE



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WHM0814AE Mechanical Outline, WHM-2:



FIG. 7 WHM0814AE outline

Ordering Information

Model Number WHN	M0814AE
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Waffle pack with the capacity of 81 pieces (9×9) is used for the packing. For small quantity ordering, an ESD safe tube is used. Contact factory for tape and reel packing option for higher volume requirements.
