

www.wantcominc.com

0.2-4.0 GHz LOW NOISE WIDE BAND AMPLIFIER WHM0242AE¹

WHM0242AE is a low noise figure, wideband, and high linearity amplifier. The amplifier offers typical 1.20 dB noise figure, 29.0 dB gain, +/- 0.50 dB exceptional gain flatness, 13.0 dB output P_{1dB} , and 26.0 dBm output IP₃ at the frequency range from 0.20 GHz to 4.0 GHz of FM, VHF, UHF, Cellular, GPS, DCS, PCS, 3G, ISM, and C bands.



WHM0242AE is most suitable for cellular base stations, wireless data communications, tower top receiver amplifiers, last-mile wireless communication systems, and wireless measurement applications.

WHM0242AE is designed to meet the rugged MIL-STD-883 standard. WHM0242AE is a RoHS complied product.

Key Features:

Impedance:	50 Ohm
MTBF ² :	>300,000 hrs (34 years)
Unconditional Stable:	k>1
Low Noise:	1.20 dB
Output IP ₃ :	26.0 dBm
Gain:	29.0 dB
P _{1dB} :	13.0 dBm
Single power supply:	50 mA @ +5V
Wide Bandwidth:	$0.2 \sim 4.0 \text{ GHz}$
Operating Temperature:	$-40 \sim +85 \text{ °C}$
Input & Output Return VSWR:	1.5:1
Small size:	WHM – 4 SMT 4-Pin package
Built-in Functions:	DC blocks at input and output, temperature compensation circuits, and auto DC bias circuitry.

Absolute Maximum Ratings³:

Symbol	Parameters	Units	Absolute Maximum		
V_{dd}	DC Power Supply Voltage	V	+6.0		
l _{dd}	Drain Current	mA	70		
P _{diss}	Total Power Dissipation	mW	400		
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	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.



www.wantcominc.com

Specifications:

a) Table 1 Summary of the electrical specifications WHM0242AE at room temperature

Index	Testing Item	Symbol	Test Constraints	Nom (RT)	Min	Max	Unit
1	Gain	S ₂₁	0.2 – 4.0 GHz	29	27	31	dB
2	Gain Variation	ΔG	0.2 – 4.0 GHz	+/- 0.5		+/-1.0	dB
3	Input VSWR	SWR ₁	0.2 – 4.0 GHz	1.5:1		1.8:1	
4	Output VSWR	SWR ₂	0.2 – 4.0 GHz	1.5:1		1.8:1	
5	Reverse Isolation	S ₁₂	0.2 – 4.0 GHz	42			dB
6	Noise figure	NF	0.2 – 4.0 GHz	1.20		1.40	dB
7	Output Power 1dB compression Point	P _{1dB}	0.2 – 4.0 GHz	13	12		dBm
8	Output-Third-Order Interception point	IP ₃	Two-Tone, P _{out} +0 dBm each, 1 MHz separation	26	24		dBm
9	Current Consumption	l _{dd}	V _{dd} = +5 V	50			mA
10	Power Supply Voltage	V _{dd}	WBA0242A	+5	+4.7	+5.3	V
			WBA0242B		+7.0	+25V	
11	Thermal Resistance	R _{th,c}	Junction to case			220	°C/W
12	Operating Temperature	To			-40	+85	°C
13	Maximum Average RF Input Power	P _{IN, MAX}	0.2 – 4.0 GHz			10	dBm

b) Passband Frequency Response

As shown in **Figure 1**, the typical gain of the WHM0242AE is 29.0 dB across the frequency range of 0.20 to 4.0 GHz. The amplifier provides excellent gain flatness across the passband. The typical input and output VSWR are 1.5:1 across the frequency range of 0.20 to 4.0 GHz, as shown in **Figure 2**. The amplifier works from the extended frequency from 100 MHz to 4.2 GHz.

Figure 3 illustrates the noise figure performance of WHM0242AE. The noise figure is 1.20 dB across the frequency range of 0.20 to 4.0 GHz at room temperature. At 85 $^{\circ}$ C, WHM0242AE only has 0.20 dB noise increases. At -40 $^{\circ}$ C, WHM0242AE offers approximately 0.20 dB less noise figure than that at room temperature.

Figure 4 is the plot of the stability factor k of WHM0242AE. The amplifier is unconditional stable at all temperature ranges since the stability factor k is great than 1 at all frequency ranges.

Figure 5 demonstrates P_{1dB} and IP_3 of the WHM0242AE. The typical P_{1dB} and IP_3 are 13.0 dBm and 26.0 dBm in the frequency range of 0.20 to 4.0 GHz, respectively.



FIG. 1 Gain and reverse isolation.





REV A

www.wantcominc.com



FIG. 5 P_{1dB} and IP₃ at full temperature.



Figure 6 is the block diagram of internal circuit of WHM0242AE. It is a two-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.

It may require one external decoupling capacitor of 1.0 uF at the +5.0 V DC power supply to build a LNA with WHM0242AE. The +5.0V DC is applied at Pin 3. No DC block capacitor is required at either input or output RF ports. The decoupling capacitor must be rated in the temperature range from -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 WHM0242AE. Plenty 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 characteristics of the substrate.



WHM0242AE LNA Mechanical Outline, WHM-4 Standard Package:



Figure 7 Mechanical outline of WHM0242AE and recommended motherboard layout.

Ordering Information

Model Number WHM0242AE
