



WHM0035AE

20 - 3000 MHz LOW NOISE WIDE BAND AMPLIFIER

REV E
November 2012

Key Features



- 20 – 3000 MHz
- 1.2 dB Noise Figure
- 24.0 dBm Output IP₃
- 15.0 dB Gain
- 13 dBm P_{1dB}
- 1.5:1 VSWR Fully Matched
- Single Power Supply
- RoHS Compliant
- MLS-1 Moisture Sensitivity Level

Product Description

WHM0035AE integrates WanTcom proprietary low noise amplifier technologies, high frequency micro electronic assembly techniques, and high reliability designs to realize optimum low noise figure, wideband, and high performances together. With single +5.0V DC operation, the amplifier has optimal input and output matching in the specified frequency range at 50-Ohm impedance system. The amplifier has standard 0.35" x 0.25" x 0.085" surface mount package.

The amplifier is designed to meet the rugged standard of MIL-STD-883.

Applications

- Mobile Infrastructures
- WiMAX
- C-Band
- Defense
- Security System
- Measurement
- Fixed Wireless

Specifications

Summary of the key electrical specifications at room temperature

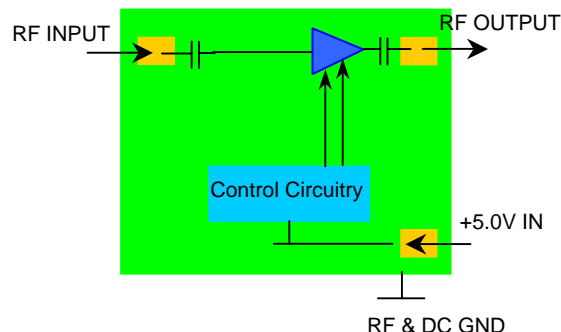
Index	Testing Item	Symbol	Test Constraints	Min	Nom	Max	Unit
1	Gain	S ₂₁	20 – 3000 MHz	14	15.5	17	dB
2	Gain Variation	ΔG	20 – 3000 MHz		+/- 0.5	+/- 1.0	dB
3	Input Return Loss	S ₁₁	20 – 3000 MHz	14	16		dB
4	Output Return Loss	S ₂₂	20 – 3000 MHz	14	16		dB
5	Reverse Isolation	S ₁₂	20 – 3000 MHz	16			dB
6	Noise Figure	NF	100 – 3000 MHz		1.2	1.5	dB
			20 – 100 MHz		1.5	2.5	
7	Output Power 1dB Compression Point	P _{1dB}	20 – 3000 MHz	9	12		dBm
8	Output-Third-Order Interception point	IP ₃	Two-Tone, P _{out} = 0 dBm each, 1 MHz separation	22	25		dBm
9	Current Consumption	I _{dd}	V _{dd} = +5.0 V	20	25	30	mA
10	Power Supply Operating Voltage	V _{dd}		+4.7	+5	+5.3	V
11	Thermal Resistance	R _{th,c}	Junction to case			220	°C/W
12	Operating Temperature	T _o		-40		+85	°C
13	Maximum Average RF Input Power	P _{IN, MAX}	DC – 6.0 GHz			13	dBm

Absolute Maximum Ratings

Parameters	Units	Ratings
DC Power Supply Voltage	V	6.0
Drain Current	mA	50
Total Power Dissipation	mW	400
RF Input Power	dBm	13
Channel Temperature	°C	150
Storage Temperature	°C	-65 ~ 150
Operating Temperature	°C	-40 ~ +85
Thermal Resistance	°C/W	220

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

Functional Block Diagram



Ordering Information

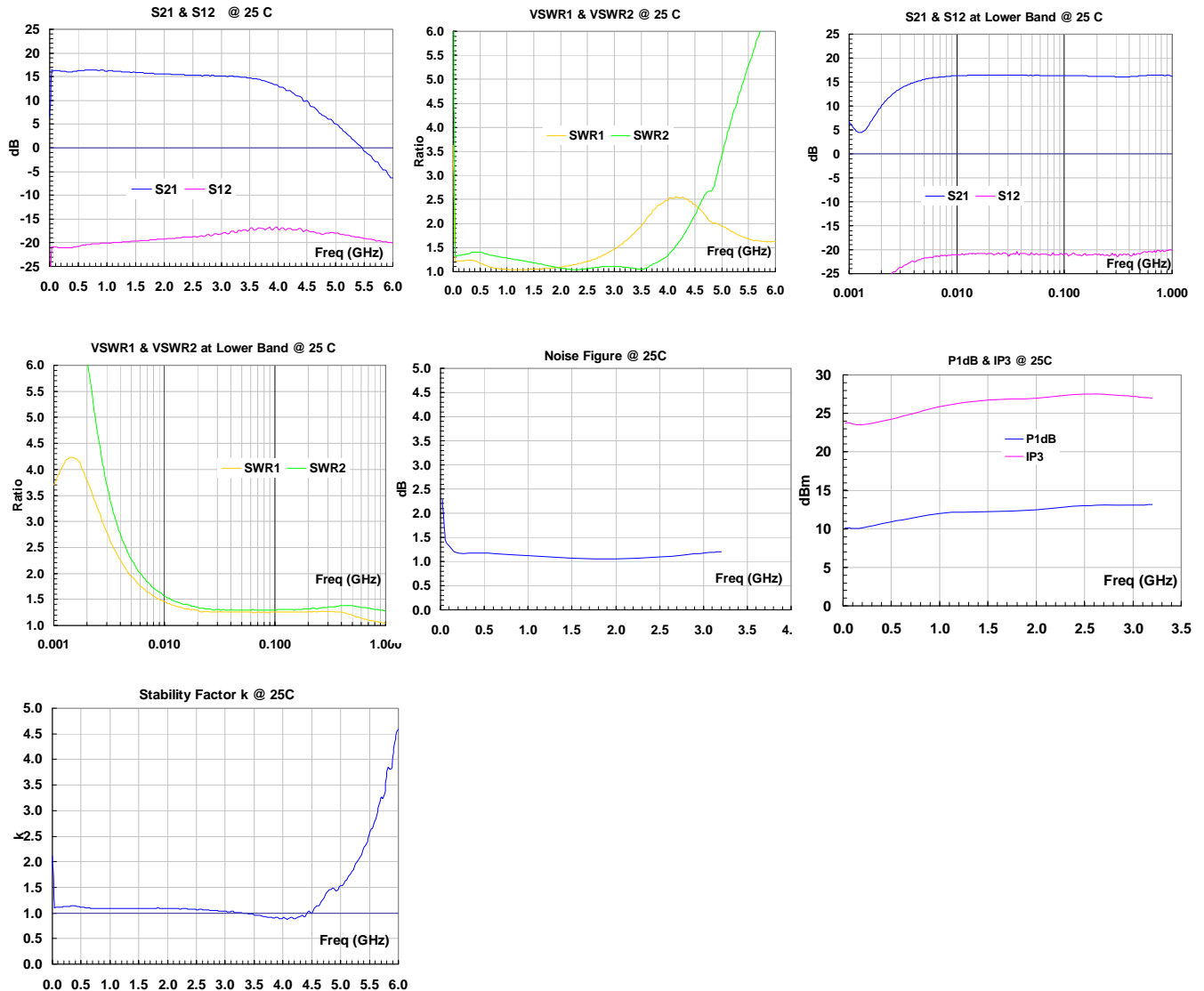
Model Number	WHM0035AE
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Specifications and information are subject to change without notice.



ESD resistance tube of 25 pieces is used for the packing. Contact factory for tape and reel packing option for higher volume order.

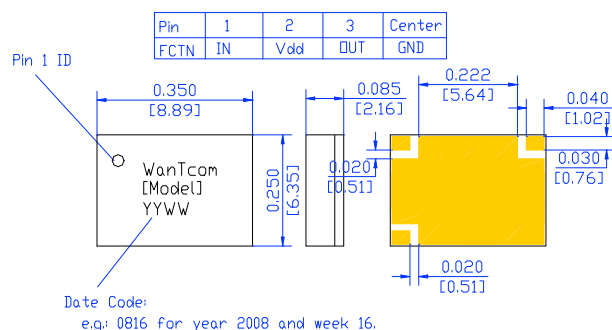
Typical Data



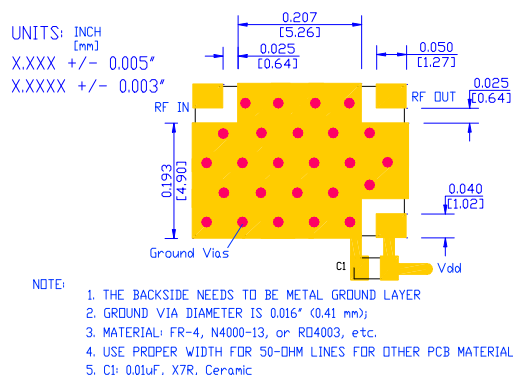
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Outline, WHM-5



Foot Print



Application Notes:

A. Motherboard Layout

The recommended motherboard layout is shown in **Figure 1**. Sufficient numbers of ground vias on the center pad are essential for the RF grounding. The width of the 50-Ohm microstrip lines at the input and output RF ports may be different for different property of the PCB substrate. The ground plane on the backside of the PCB substrate is needed to connect the center ground pad through the vias. The ground plane is also essential for the 50-Ohm microstrip line launches at the input and output ports.

The +5V DC voltage is applied to Pin 2. For +5V line trace length being longer than 6 inches without a decoupling capacitor, a 0.10 uF de-coupling capacitor, C₁, with minimum rating voltage of 10V is needed across the +5V pin to ground. The capacitor must be rated in the temperature range of -55 °C to 100 °C to ensure the entire circuit work in the specified temperature range.

No DC block capacitor is required at input and output RF ports. The amplifier has built-in DC block capacitors at the input and output ports.

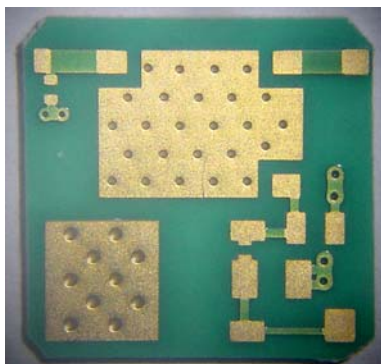


Fig. 1 Motherboard

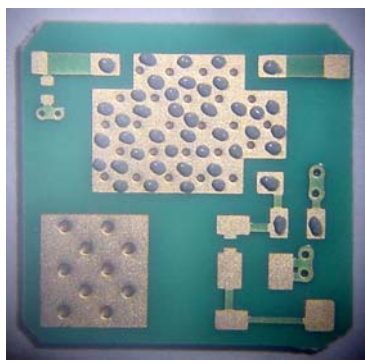


Fig. 2 Dispensed solder paste

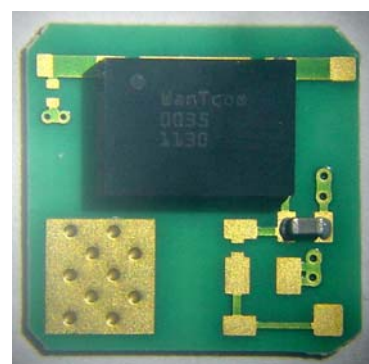


Fig. 3 Assembled part

B. Assembly

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The regular low temperature and no clean solder paste such as SN63 is recommended. The high temperature solder has been used internally for the WHM series amplifier assembly. The melting temperature point of the high temperature solder is around 217 ~ 220 °C. Thus, melting temperature of the solder paste should be below 217 °C for assembling WHM series amplifier on the test board to reduce the possible damage. The temperature melting point of the SN63 solder paste is around 183 °C and is suitable for the assembly purpose.

The SN63 solder paste can be dispensed by a needle manually or driven by a compressed air source. **Figure 2** shows the example of the dispensed solder paste pattern. Each solder paste dot is in the diameter of 0.005" ~ 0.010" (0.125 ~ 0.250 mm) range.

For volume assembly, a stencil with 0.004" to 0.006" (0.10 mm to 0.15 mm) thickness is recommended to print the solder paste on the circuit board.

Figure 3 illustrates the assembled LNA on the motherboard.

For more detail assembly process, refer to AN-109 at www.wantcominc.com website.

C. Electrical Testing and Fine Tuning

The amplifier is designed to be fully matched at the input and output ports. Any tuning is not needed. However, when connecting the assembled amplifier to a device such as a SMA connector or a filter, the connecting points or joint points could affect mainly the return losses at the ports due to the non-ideal 50-Ohm impedance of the devices connected to the amplifier. By varying the connection feature size such as the solder amount to get the optimum return losses or best matching result at the interface. This fine-tuning has little affect on the other performance such as gain, noise figure, P_{1dB} , or IP_3 .

During the fine-tuning process, a vector network analyzer can be used to monitoring the return losses at the ports while varying the feature size of the joint points. Varying the connection feature size until the optimum return losses are achieved.
