



# WMA1T5AE

## 1.5T LOW NOISE PRE-AMPLIFIER

REV B  
June 2015

### Key Features



- 1.5T Frequency of 63.8 MHz
- 1.5 Ohm Input Impedance
- 0.5 dB Noise Figure
- 30.0 dBm Max P<sub>IN</sub>
- 24.0 dBm Output IP<sub>3</sub>
- 28.0 dB Gain
- 8.0 dBm P<sub>1dB</sub>
- 1.22:1 Output VSWR
- Unconditional Stable,  $k > 1$
- Single Power Supply
- None Magnetic

### Product Description

WMA1T5AE is integrated with 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 +10.0V DC operation, the amplifier has 1.5 Ohm input impedance and unconditional stable condition. The amplifier has 0.40" x 0.25" x 0.08" surface mount package.



### Applications

- Magnetic Resonance Imaging
- RF Measurement
- Medical
- Current Sensor



### Specifications

Summary of the key electrical specifications at room temperature, tested in the WanTcom fixture, 8000022

| Index | Testing Item                          | Symbol                | Test Constraints  | Min  | Nom     | Max     | Unit  |
|-------|---------------------------------------|-----------------------|---|------|---------|---------|-------|
| 1     | Gain                                  | S <sub>21</sub>       | 63.8 MHz, Factory test condition  |      | 28.0    |         | dB    |
| 2     | Gain Variation                        | ΔG                    | 63.8 +/- 1 MHz  |      | +/-0.03 | +/- 0.1 | dB    |
| 3     | Input Impedance                       | RE [Z <sub>in</sub> ] | 63.8 MHz  |      | 1.5     | 2.0     | Ohm   |
|       |                                       | IM [Z <sub>in</sub> ] | 63.8 MHz, with test fixture 8000022   | -6.0 | -3.0    | 0       | Ohm   |
| 4     | Output VSWR, 50 Ohm Impedance         | SWR <sub>2</sub>      | 63.8 MHz  |      |         | 1.22:1  | Ratio |
| 5     | Reverse Isolation                     | S <sub>12</sub>       | 63.8 MHz  | 60   | 70      |         | dB    |
| 6     | Noise Figure                          | NF                    | 63.8 MHz, with 6 dB precision pad   |      | 0.47    | 0.60    | dB    |
| 7     | Output Power 1dB Compression Point    | P <sub>1dB</sub>      | 63.8 MHz  | 7    | 9       |         | dBm   |
| 8     | Output-Third-Order Interception point | IP <sub>3</sub>       | Two-Tone, P <sub>out</sub> = 0 dBm each, f <sub>1</sub> -f <sub>2</sub> = 1 MHz | 20   | 24      |         | dBm   |
| 9     | Current Consumption                   | I <sub>dd</sub>       | V <sub>dd</sub> = +10.0 V, Factory test condition                               |      | 14      |         | mA    |
| 10    | Power Supply Operating Voltage        | V <sub>dd</sub>       |   | +7   | +10     | +13     | V     |
| 11    | Thermal Resistance                    | R <sub>th,c</sub>     | Junction to case  |      |         | 220     | °C/W  |
| 12    | Operating Temperature                 | T <sub>o</sub>        |   | +10  |         | +60     | °C    |
| 13    | Maximum RF Input Power                | P <sub>IN,MAX</sub>   | DC - 6.0 GHz, 10% Duty Cycle, 50 Ohm Z <sub>s</sub>                             |      |         | 30      | dBm   |
| 14    | Saturate Recover Time                 | t <sub>sr</sub>       | 10% to 90% from 30 dBm Pin  |      | 8       | 10      | uS    |
| 15    | ESD Protection, None Contact          | V <sub>ESDN</sub>     | Output Ports  |      |         | 16      | kV    |
| 16    | ESD Protection, Direct Contact        | V <sub>ESD</sub>      | Output Ports  |      |         | 6       | kV    |

### Absolute Maximum Ratings

| Parameters                      | Units | Ratings   |
|---------------------------------|-------|-----------|
| DC Power Supply Voltage         | V     | 13.0      |
| Drain Current                   | mA    | 30        |
| Total Power Dissipation         | mW    | 350       |
| RF Input Power, 10% Duty Cycle  | dBm   | 30        |
| Channel Temperature             | °C    | 150       |
| Storage Temperature             | °C    | -65 ~ 150 |
| Operating Temperature           | °C    | 0 ~ +70   |
| Thermal Resistance <sup>1</sup> | °C/W  | 215       |

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

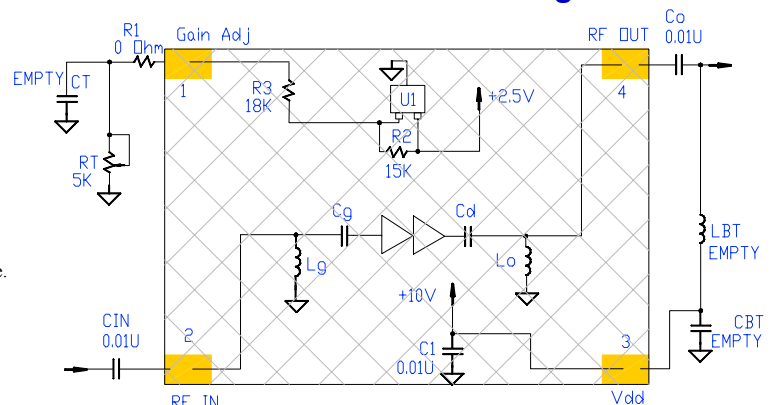
### Ordering Information

|              |          |
|--------------|----------|
| Model Number | WMA1T5AE |
|--------------|----------|

<sup>1</sup> The last stage transistor dominates the heat dissipation. The drain bias voltage is +6V and the drain current is 10.0 mA. The total power dissipation of the last stage transistor is thus 60 mW. The junction temperature rise 0.06 x 215 = 13 (°C).

Specifications and information are subject to change without notice.

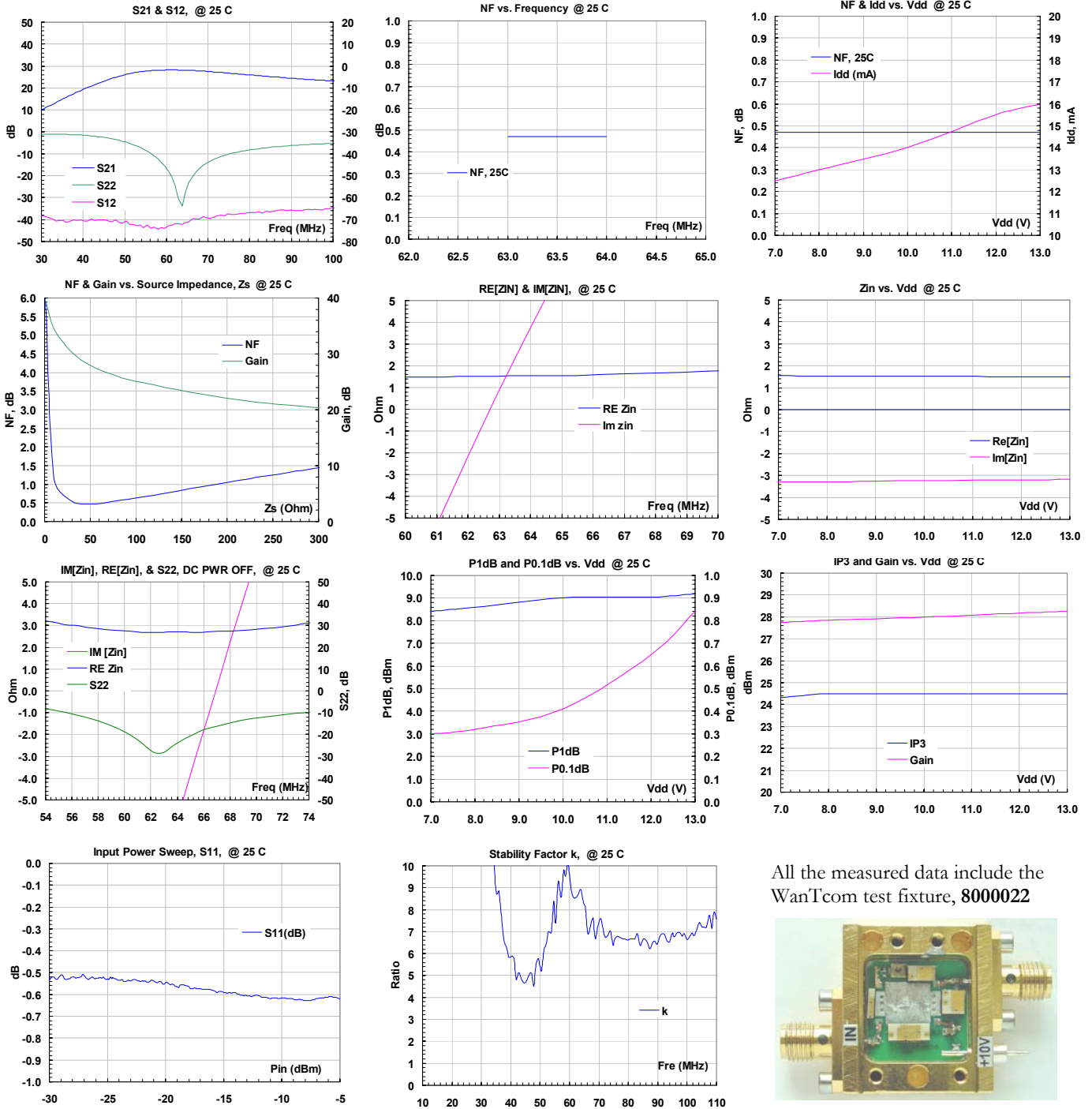
### Functional Block Diagram



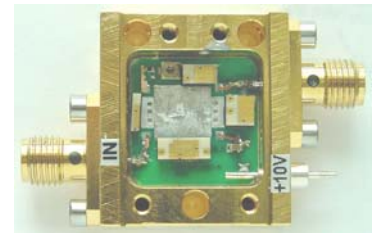


ESD tube is used for the packing. Contact factory for tape and reel packing option for higher volume order.

**Typical Data**



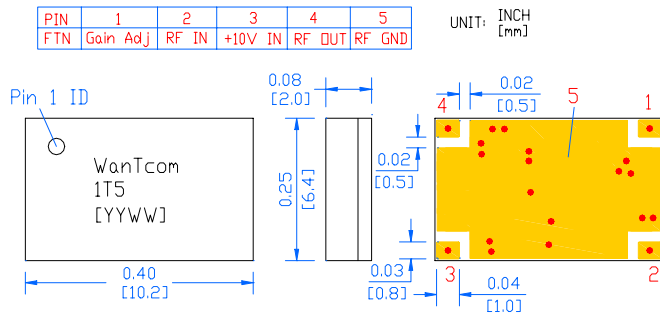
All the measured data include the WanTcom test fixture, 800022



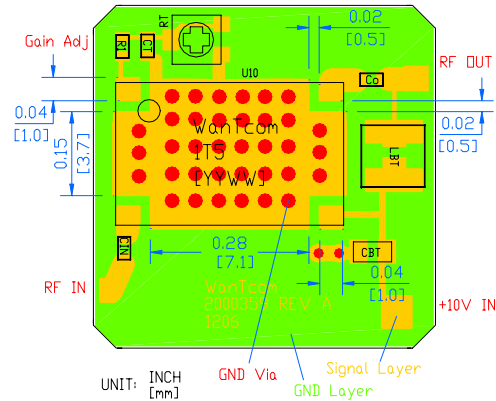
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**Outline**



**Foot Print/Mounting Layout**

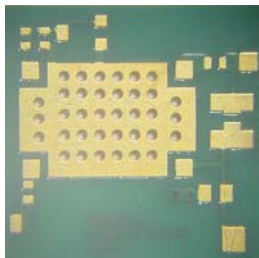


**Application Notes:**

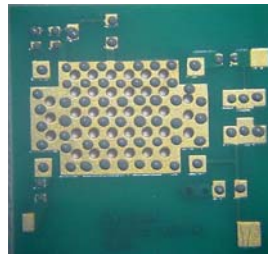
**A. Motherboard Layout**

The recommended motherboard layout is shown in diagram of **Foot Print/Mounting Layout**. Sufficient numbers of ground vias on center ground 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 substrate. The ground plane on the backside of the 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 +10V DC voltage is applied at Pin 3 or at the output Pin 4, which requires LBT inductor of 2.2 uH. DC block capacitors, CIN and Co of 0.01 uF, are required at input and output RF ports.



**Fig. 1** Example of the motherboard



**Fig. 2** Dispensed solder paste



**Fig. 3** Assembled part

**B. Assembly**

The regular low temperature and none 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 the 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. **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).

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

For more detail assembly process, refer to AN-109 at [www.wantcominc.com](http://www.wantcominc.com) website.

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