WMA3TAE

3T LOW NOISE PRE-AMPLIFIER

REV B
December 2019

Key Features

- For 50 Ohm Source Impedance
- 3T Frequency of 127.73 MHz
- 1.5 Ohm Input Impedance
- 0.45 dB Noise Figure
- 30.0 dBm Max P_{IN}
- 22.0 dBm Output IP_3
- 28.0 dB Gain
- 8.0 dBm P_{1dB}
- 1.22:1 Output VSWR
- Unconditional Stable, *k*>1
- Single Power Supply
- None Magnetic

Product Description

With its low input impedance, WMA3TAE is designed for 50 Ohm source impedance multi-channel coil applications. The pre-amp maintains excellent noise figure performance over source impedance variation that either comes from the different loads to the coils or not ideal design implementation of the coils. Moreover, the pre-amp allows higher source impedance design to increase the blocking impedance while maintaining superior SNR due to large equal noise circles.

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

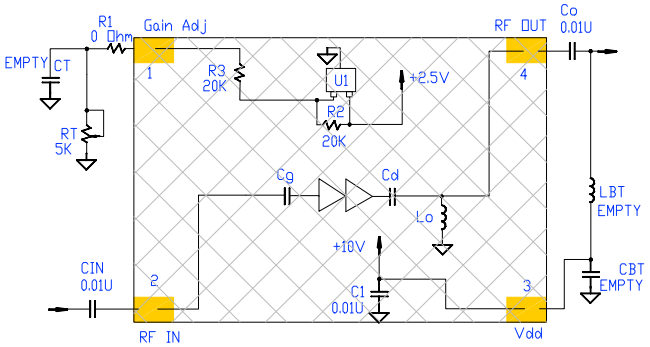
Index	Testing Item	Symbol	Test Constraints	Min	Nom	Max	Unit
1	Gain	S_{21}	127.73 MHz, Factory test condition		28.0		dB
2	Gain Variation	ΔG	127.73 +/- 1 MHz		+/-0.05	+/- 0.10	dB
3	Input Impedance	RE [Zin]	127.73 MHz		1.5	2.0	Ohm
		IM [Zin]	127.73 MHz, with test fixture 8000022	-8.0	-5.0	0	Ohm
4	Output VSWR, 50 Ohm Impedance	SWR_2	127.73 MHz			1.22:1	Ratio
5	Reverse Isolation	S_{12}	127.73 MHz	60	70		dB
6	Noise Figure	NF	127.73 MHz, with 6 dB precision pad		0.45	0.55	dB
7	Output 1dB Gain Compression Point	P_{1dB}	127.73 MHz	7	9		dBm
8	Output-Third-Order Interception Point	IP_3	Two-Tone, P_{out} = 0 dBm each, 1 MHz separation	20	22		dBm
9	Current Consumption	I_{dd}	V_{dd}= +10.0 V, Factory test condition		14		mA
10	Power Supply Operating Voltage	V_{dd}		+7	+10	+13	V
11	Thermal Resistance	$R_{th,c}$	Junction to case			220	°C/W
12	Operating Temperature	T_o		+10		+60	°C
13	Maximum RF Input Power	$P_{IN, MAX}$	DC – 6.0 GHz, 10% Duty Cycle, 50 Ohm Zs			30	dBm
14	Saturate Recover Time	t_{sr}	10% to 90% from 30 dBm Pin		8	10	uS
15	ESD Protection, None Contact	V_{ESDN}	Output Port			16	kV
16	ESD Protection, Direct Contact	V_{ESD}	Output Port			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
Junction Temperature	°C	150
Storage Temperature	°C	-65 ~ 150
Operating Temperature	°C	0 ~ +70
Thermal Resistance[1]	°C/W	215

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

Functional Block Diagram



[1] 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 arise 0.06 x 215 = 13 (°C).

Specifications and information are subject to change without notice.

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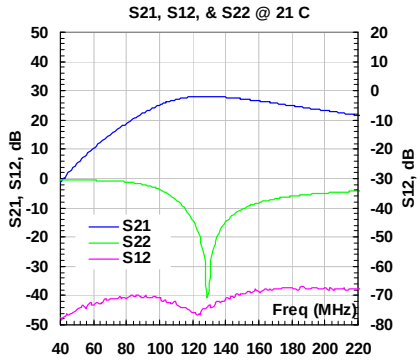
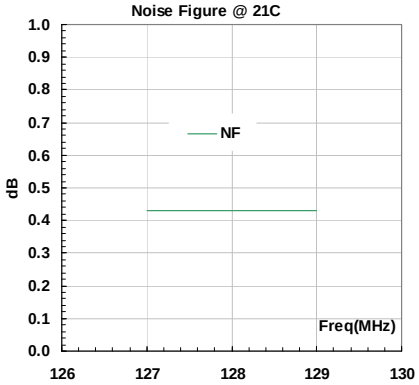
Ordering Information

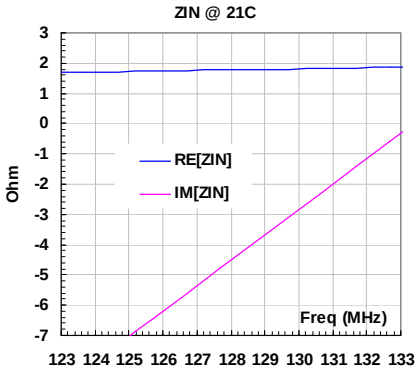
Model Number	WMA3TAE

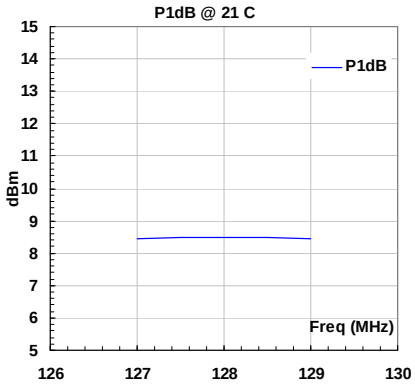
Waffle shell or tube is used for the packing. Contact factory for tape and reel packing option for higher volume order.

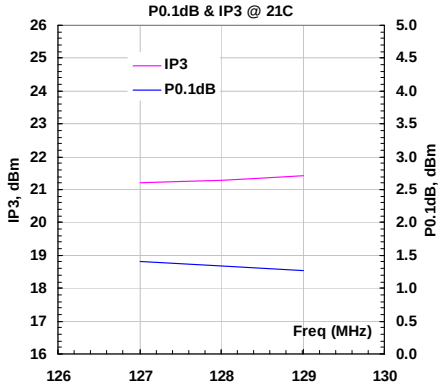
Typical Data

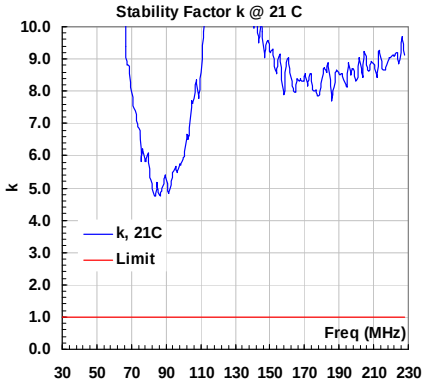


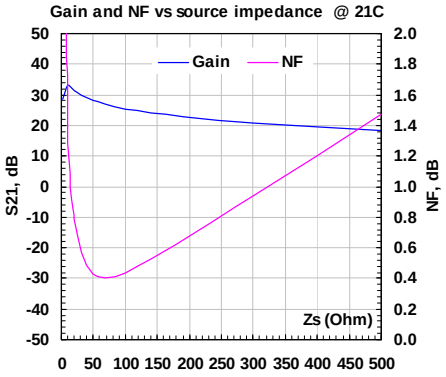




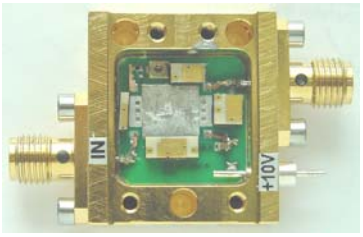








All the measured data include the WanTcom test fixture, **8000022**



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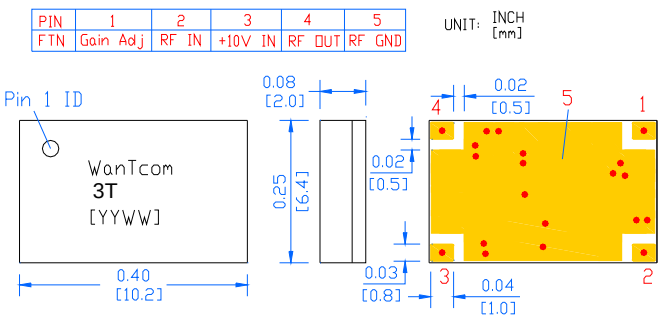
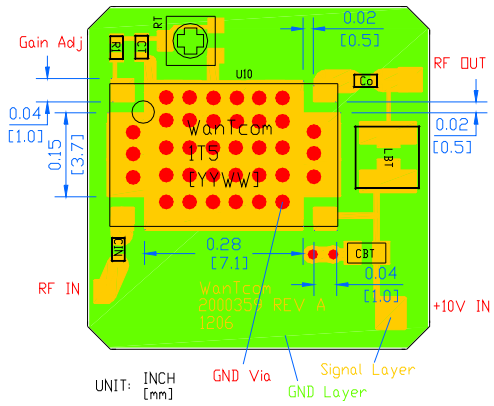
Outline



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.

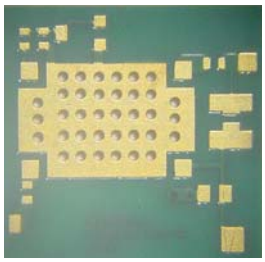


Fig. 1 Example of the motherboard

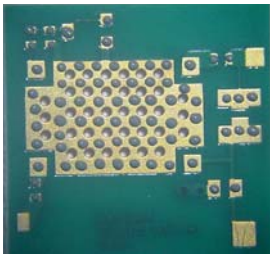


Fig. 2 Dispensed solder paste

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 ^{0}C. Thus, melting temperature of the solder paste should be below 217 ^{0}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 ^{0}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 website.
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