

RMWL05001

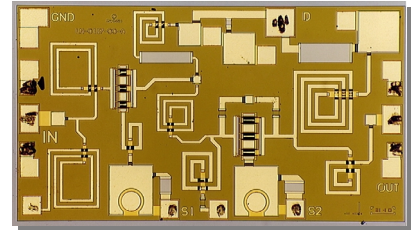
5 GHz Low Noise Amplifier MMIC

Description

The RMWL05001 is a 2-stage GaAs MMIC amplifier designed as a 4.7 to 5.2 GHz Low Noise Amplifier for use in point to point radios, point to multi-point communications, LMDS, and other millimeter wave applications. In conjunction with other Raytheon amplifiers, multipliers and mixers it forms part of a complete 38 GHz transmit/receive chipset. The RMWL05001 utilizes Raytheon's 0.25µm power PHEMT process and is sufficiently versatile to serve in a variety of low noise amplifier applications.

Features

- ◆ Single positive supply operation
- ◆ 4 mil substrate
- ◆ Noise figure 1.4 dB (typ.)
- ◆ Small-signal gain 18 dB (typ.)
- ◆ 1dB compressed Pout 14 dBm (typ.)
- ◆ Chip size 2.0 mm x 1.15 mm



Absolute Maximum Ratings

Parameter	Symbol	Value	Units
Positive DC voltage (+4 V Typical)	V _d	+6	Volts
Positive DC current	I _D	113	mA
RF Input Power (from 50 Ω source)	P _{IN}	+8	dBm
Operating Baseplate Temperature	T _C	-30 to +85	°C
Storage Temperature Range	T _{stg}	-55 to +125	°C
Thermal Resistance (Channel to Backside)	R _{JC}	112	°C /W

Electrical Characteristics

(At 25°C),
50 Ω system,
V_d=+4 V
Single Bias Supply

Parameter	Min	Typ	Max	Unit
Frequency Range	4.7		5.2	GHz
Noise Figure		1.4	2.3	dB
Gain Small Signal at Pin=-20 dBm	14	18	20	dB
Gain Variation vs. Frequency		1		dB
Gain at 1dB Compression		17		dB
Power Output at 1dB Compression		14		dBm

Parameter	Min	Typ	Max	Unit
Drain Current at Pin=-20 dBm		50		mA
Input Return Loss (Pin=-15 dBm)		15		dB
Output Return Loss (Pin=-15 dBm)		15		dB

Characteristic performance data and specifications are subject to change without notice.

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Application Information

CAUTION: THIS IS AN ESD SENSITIVE DEVICE.

Chip carrier material should be selected to have GaAs compatible thermal coefficient of expansion and high thermal conductivity such as copper molybdenum or copper tungsten. The chip carrier should be machined, finished flat, plated with gold over nickel and should be capable of withstanding 325°C for 15 minutes.

Die attachment should utilize Gold/Tin (80/20) eutectic alloy solder and should avoid hydrogen environment for PHEMT devices. Note that the backside of the chip is gold plated and is used as RF and DC ground.

These GaAs devices should be handled with care and stored in dry nitrogen environment to prevent contamination of bonding surfaces. These are ESD sensitive devices and should be handled with appropriate precaution including the use of wrist grounding straps. All die attach and wire/ribbon bond equipment must be well grounded to prevent static discharges through the device.

Recommended wire bonding uses 3 mils wide and 0.5 mil thick gold ribbon with lengths as short as practical allowing for appropriate stress relief. The RF input and output bonds should be typically 0.012" long corresponding to a typically 2 mil between the chip and the substrate material.

Figure 1
Functional Block Diagram

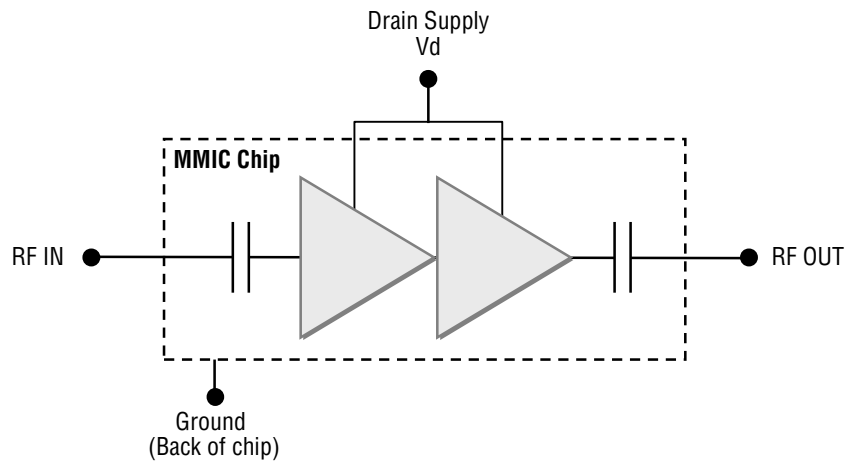
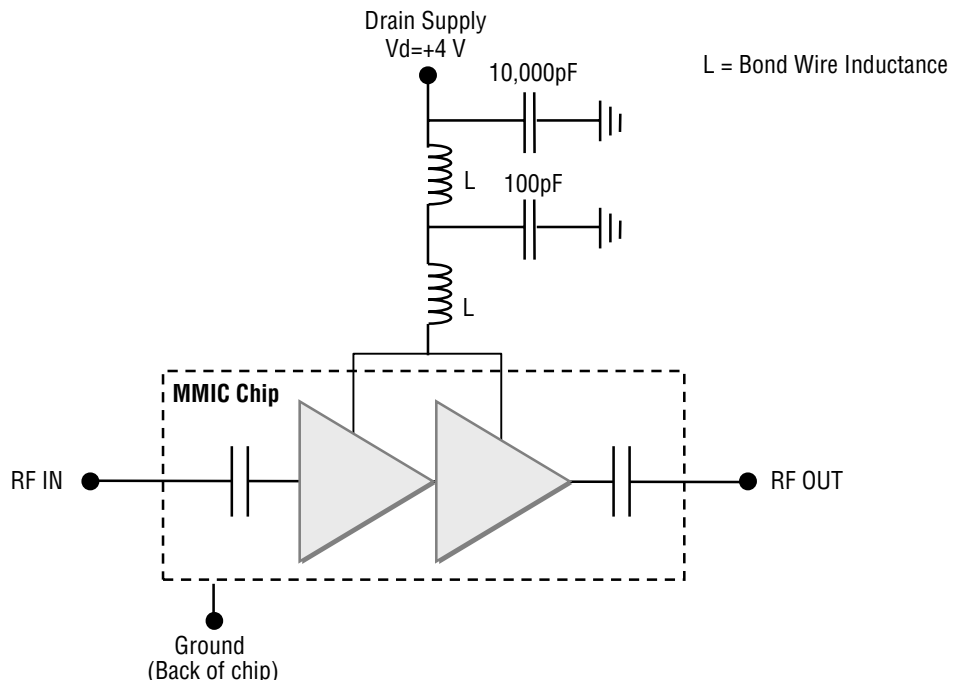


Figure 2
Schematic of Application Circuit
Amplifier is self-biased.
No gate supply is required.



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Figure 3
Layout and Bond Pad Locations

Chip Size is 2.0 mm x 1.15 mm x 100µm. Back of chip is RF and DC ground

Dimensions in mm

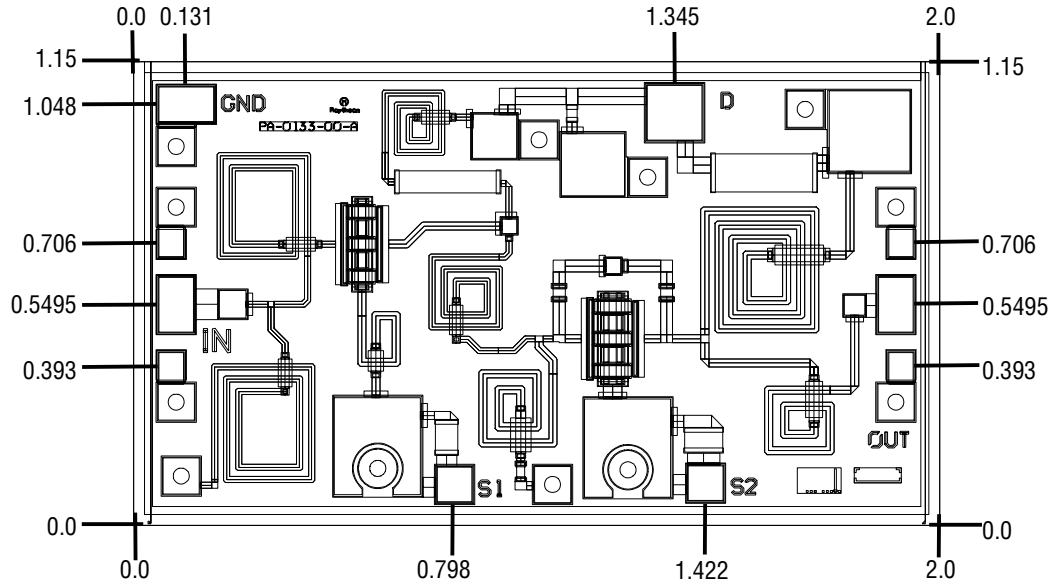
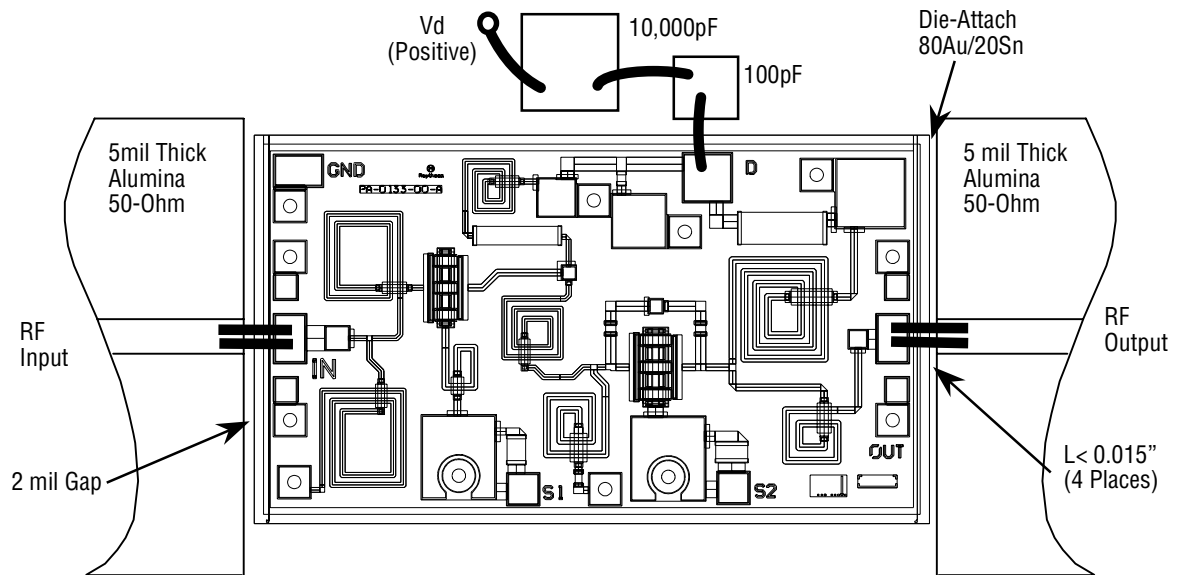


Figure 4
Recommended Assembly Diagram



Notes:

1. Use 0.003" by 0.0005" Gold Ribbon for bonding. RF input and output bonds should be less than 0.015" long with stress relief.
2. Amplifier is self-biased so no gate supply is required.

Test Procedure
for Biasing and Operation

CAUTION: LOSS OF GATE VOLTAGES (VG1, VG2) WHILE CORRESPONDING DRAIN VOLTAGE (Vd) IS PRESENT CAN DAMAGE THE AMPLIFIER.

The following sequence must be followed to properly test the amplifier.

- Step 1:** Turn off RF input power.
- Step 2:** Connect the DC supply grounds to the grounds of the chip carrier.
- Step 3:** Slowly apply positive drain bias supply voltage of +4 V to Vd.

- Step 4:** After the bias condition is established, RF input signal may now be applied at the appropriate frequency band.
- Step 5:** Follow turn-off sequence of:
 - (i) Turn off RF input power,
 - (ii) Turn down and off drain voltage (Vd).

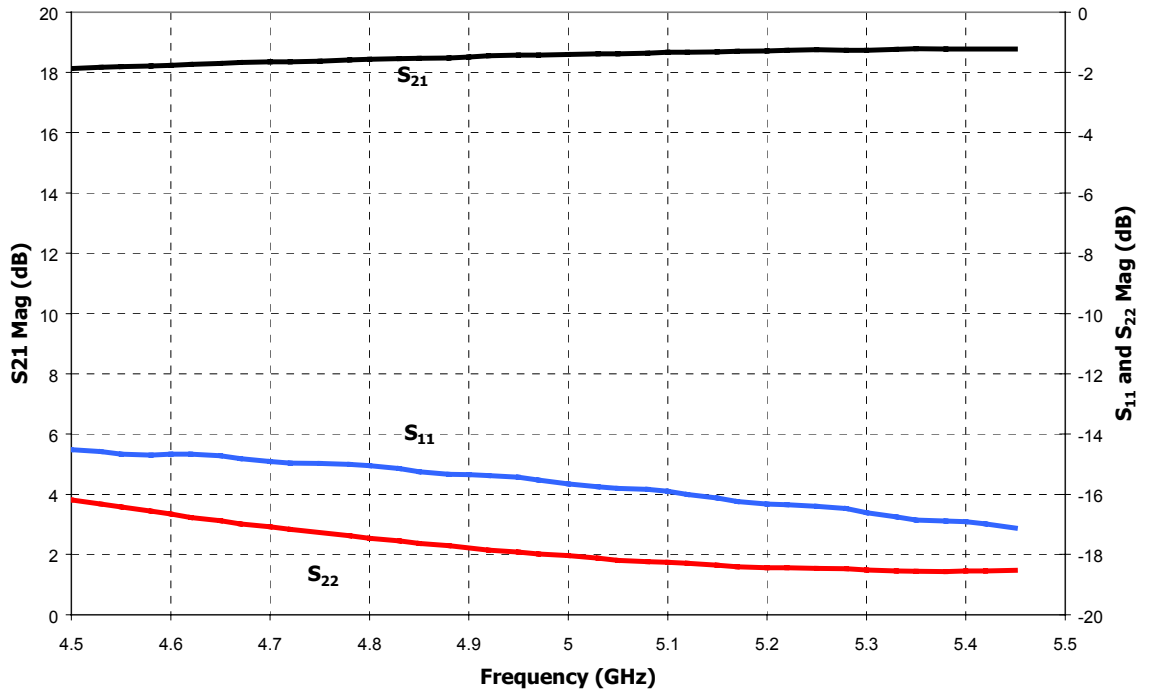
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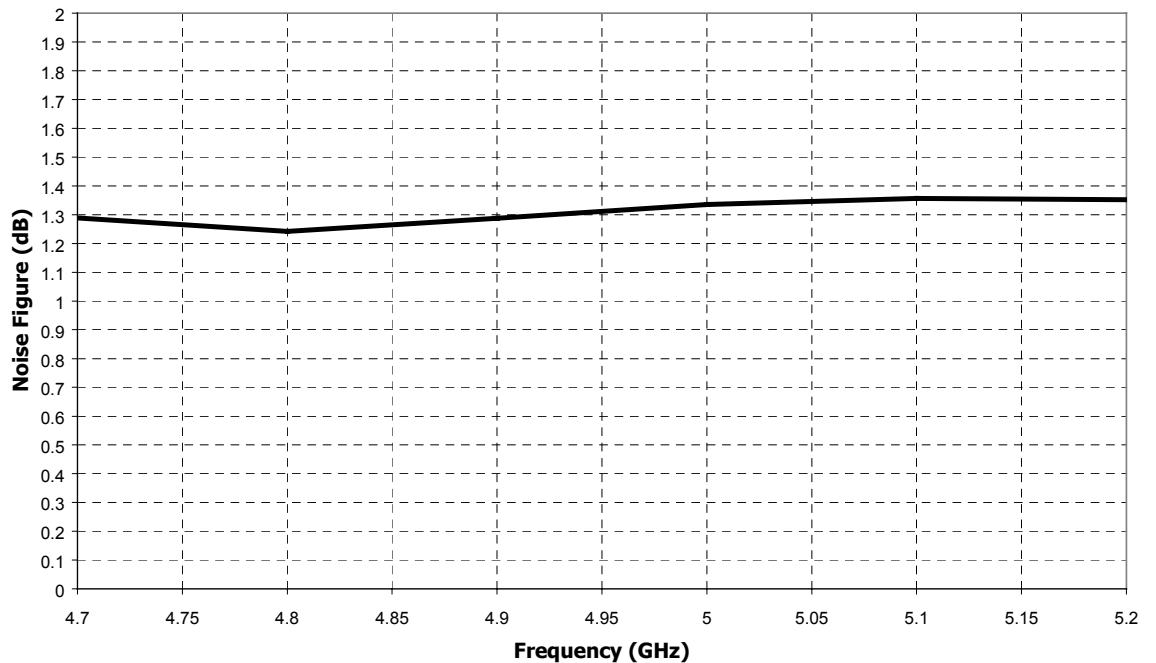
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Performance Data

RMWL05001 5 GHz LNA Typical On-Wafer Measurements.
 $I_{DQ} = 76 \text{ mA}$, $V_{DD} = 4 \text{ V}$ (Self Biased)



RMWL05001 5 GHz LNA Typical On-Wafer Noise Figure Measurements.
 $I_{DQ} = 53 \text{ mA}$, $V_{DD} = 4 \text{ V}$ (Self Biased)



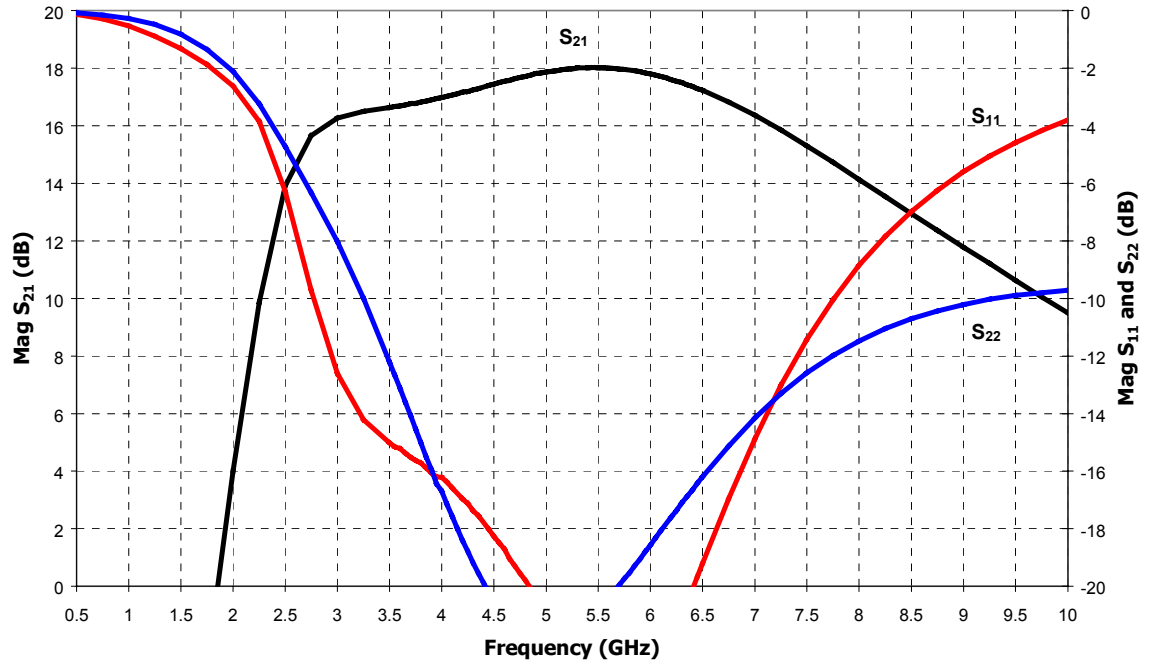
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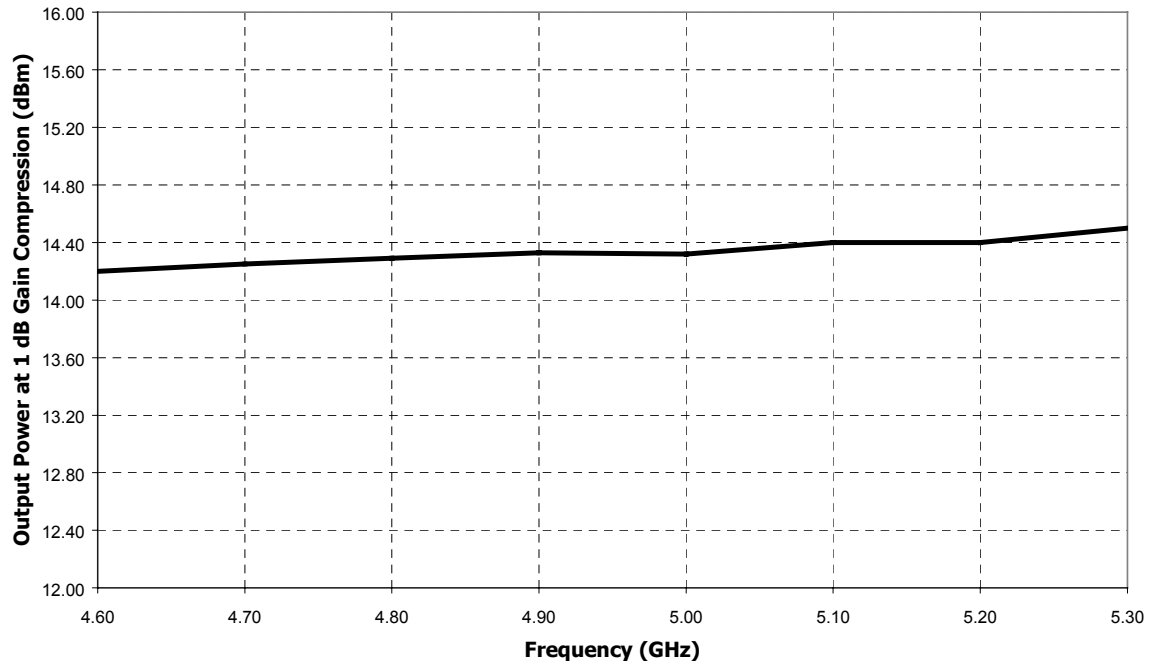
5 GHz Low Noise Amplifier MMIC

Performance Data

RMWL05001 5 GHz LNA Typical On-Wafer Noise Figure Measurements.
 $I_{DQ} = 76 \text{ mA}$, $V_{DD} = 4 \text{ V}$ (Self Biased). 50 Ohm Test Fixture Included



RMWL05001 5 GHz LNA Typical Output Power Measurements.
 $I_{DQ} = 70 \text{ mA}$, $V_{DD} = 4 \text{ V}$ (Self Biased) 50 Ohm Test Fixture Included



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