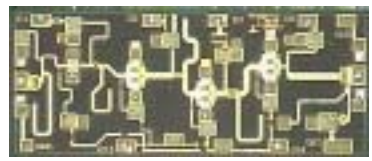
RMWD24001
21 to 26.5 GHz Driver Amplifier MMIC

Description

The RMWD24001 is a 4-stage GaAs MMIC amplifier designed as a 21 to 26.5 GHz Driver 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 23 and 26 GHz transmit/receive chipset. The RMWD24001 utilizes Raytheon's 0.25µm power PHEMT process and is sufficiently versatile to serve in a variety of driver amplifier applications.

Features

- 4 mil substrate
- Small-signal gain 23 dB (typ.)
- 1dB compressed Pout 17 dBm (typ.)
- Voltage detector included to monitor Pout
- Chip size 2.85 mm x 1.2 mm



Maximum Ratings

Parameter	Symbol	Value	Unit
Positive DC voltage (+4 V Typical)	Vd	+6	Volts
Negative DC voltage	Vg	-2	Volts
Simultaneous (Vd - Vg)	Vdg	8	Volts
Positive DC Current	I_D	345	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}	42	°C/W

Electrical Characteristics (At 25°C), 50 Ω system, Vd=+4 V, Quiescent Current Idq=240 mA

Parameter	Min	Typ	Max	Unit
Frequency Range	21		26.5	GHz
Gate Supply Voltage (Vg) (Note 1)		-0.4		V
Gain Small Signal at Pin=-12 dBm	20	23		dB
Gain Variation vs. Frequency		3		dB
Gain at 1dB Compression		22		dB
Power Output at P1dB (Pin=-6 dBm)	13	17		dBm
Drain Current at Pin=-12 dBm		240		mA
Drain Current at 1dB Compression		265		mA
Input Return Loss (Pin=-12 dBm)		10		dB
Output Return Loss (Pin=-12 dBm)		12		dB
OIP3		TBD		dBm
Noise Figure		TBD		dB
Detector Voltage		TBD		V

Note 1: Typical range of gate voltage is -0.7 to -0.1 V to set Idq of 240 mA.

Tel: 978-684-8663
Fax: 978-684-8646
www.raytheon.com/micro

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Raytheon RF Components
362 Lowell Street
Andover, MA 01810

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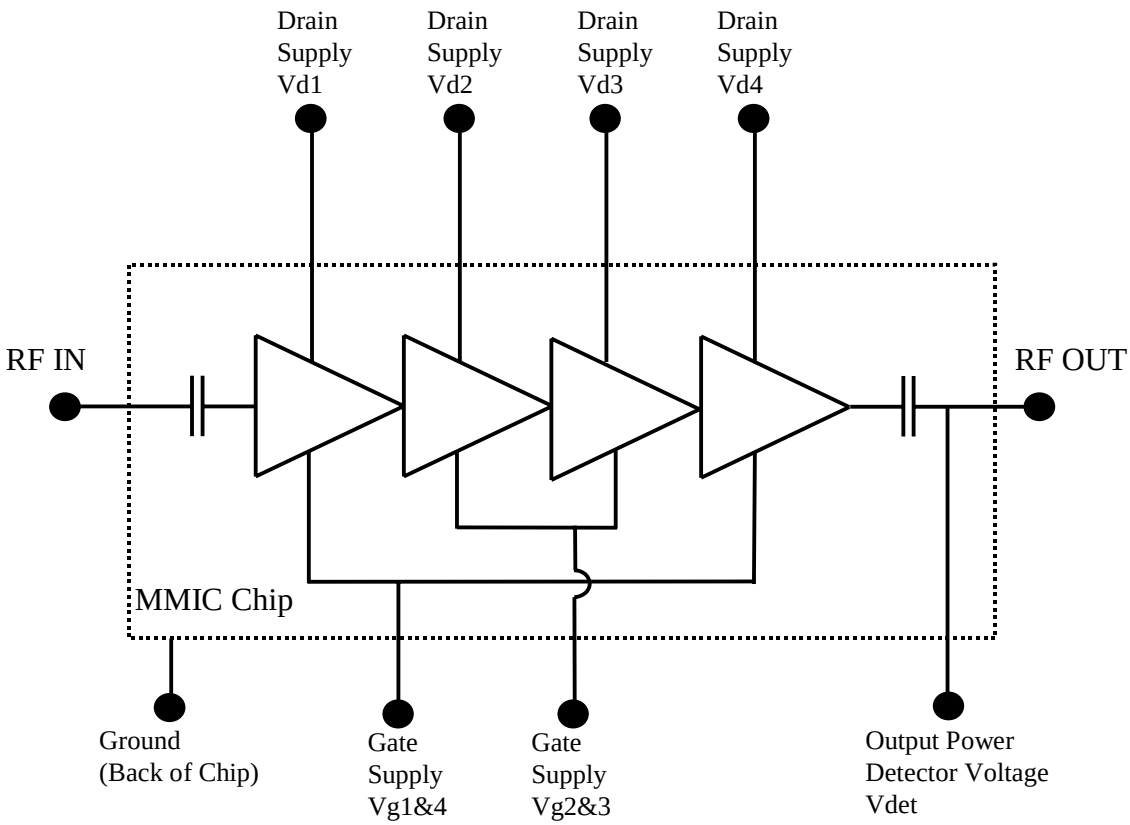
Functional Block Diagram



Note: Detector delivers 0.1 V DC into 3k Ω load resistor for >+7 dBm output power.
If output power level detection is not desired, do not make connection to detector bond pad.

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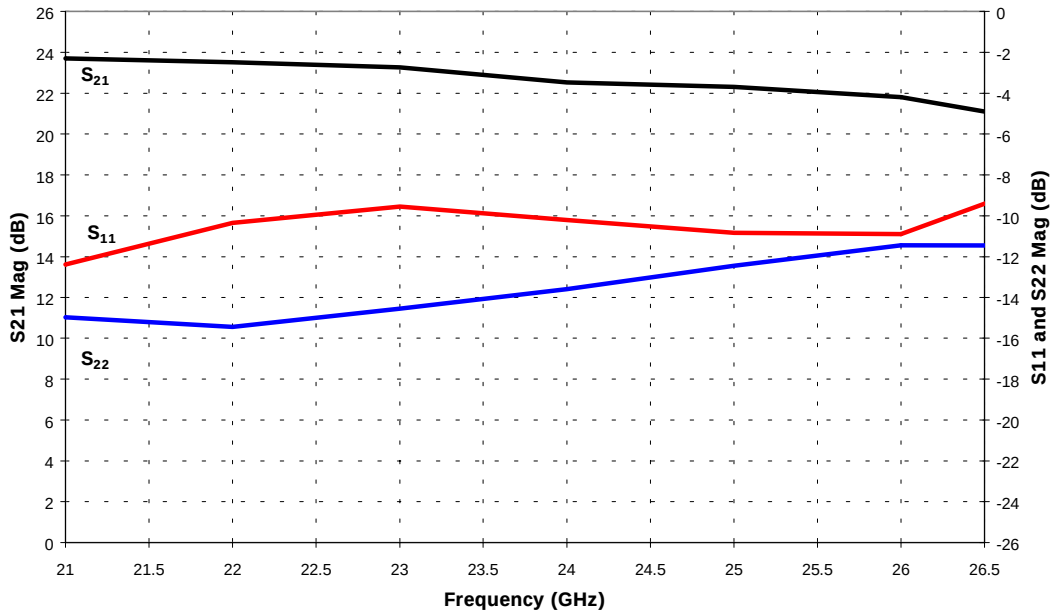
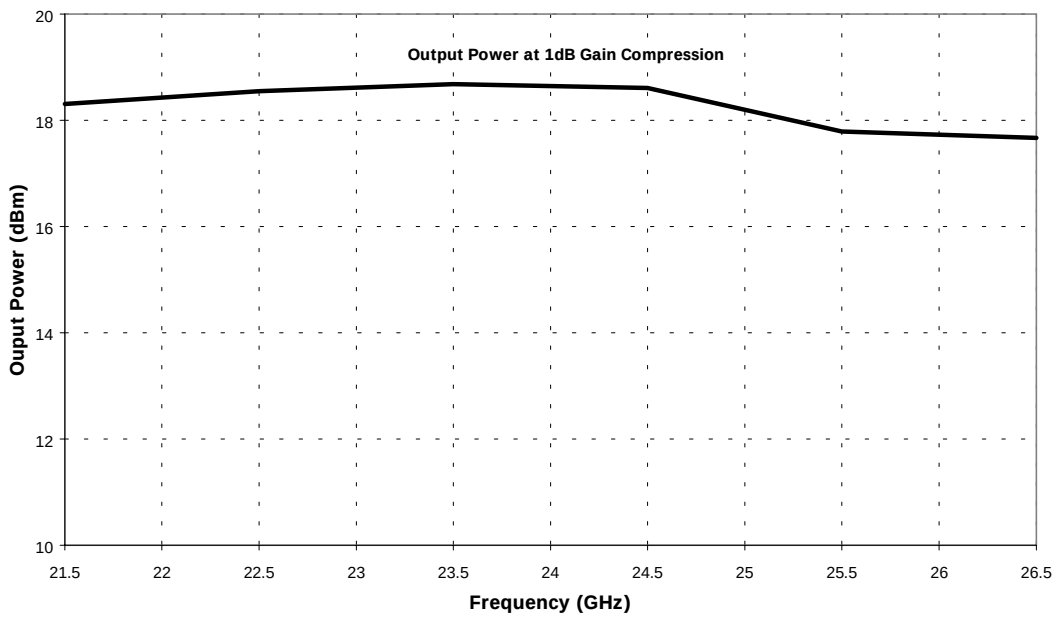
Performance Data

RMWD24001 26 GHz Driver Amplifier. Typical On-Wafer Performance.
I_{DQ} = 210 mA V_{DD} = 4 V



RMWD24001 26 GHz Driver Typical Output Power at 1 dB Gain Compression.
Measured On-Wafer I_{DQ} = 240 mA V_{DD} = 4 V



Raytheon reserves the right to update or change specifications without notice.

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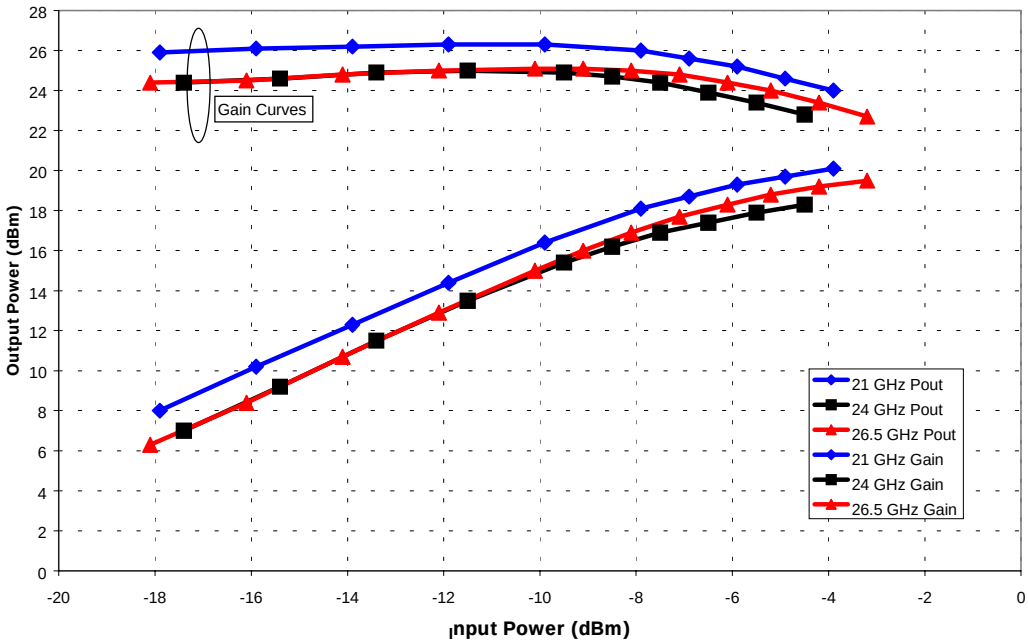
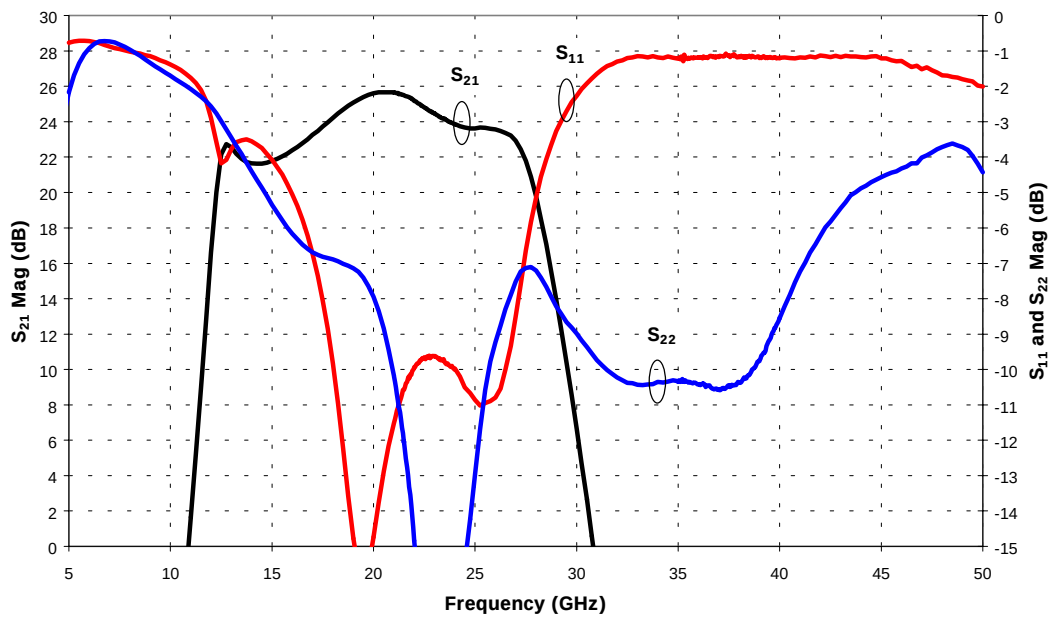
Performance Data

RMWL24001 Typical Power Saturation Curves. Measurements Include 50 Ohm Test Fixture. I_{DQ} = 240 mA V_{DD} = 4.0 V



RMWL24001 Driver Amplfier Typical WideBand S-Parameters. Measurements Include 50 Ohm Test Fixture. I_{DQ} = 240 mA V_{DD} = 4 V



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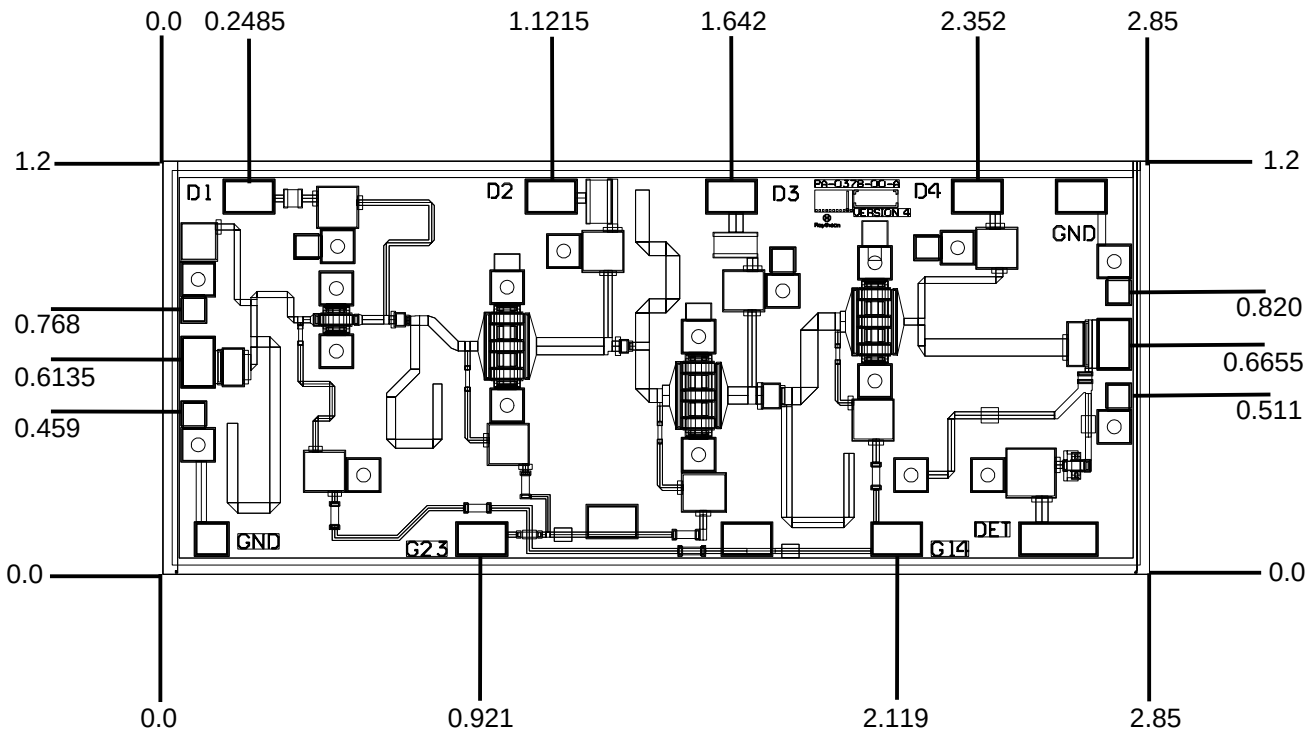
Application Information

Caution: **This is an ESD sensitive device**

Chip Layout and Bond Pad Locations
Chip Size is 2.85 mm x 1.2 mm Typical. Back of chip is RF and DC ground



Dimensions in mm

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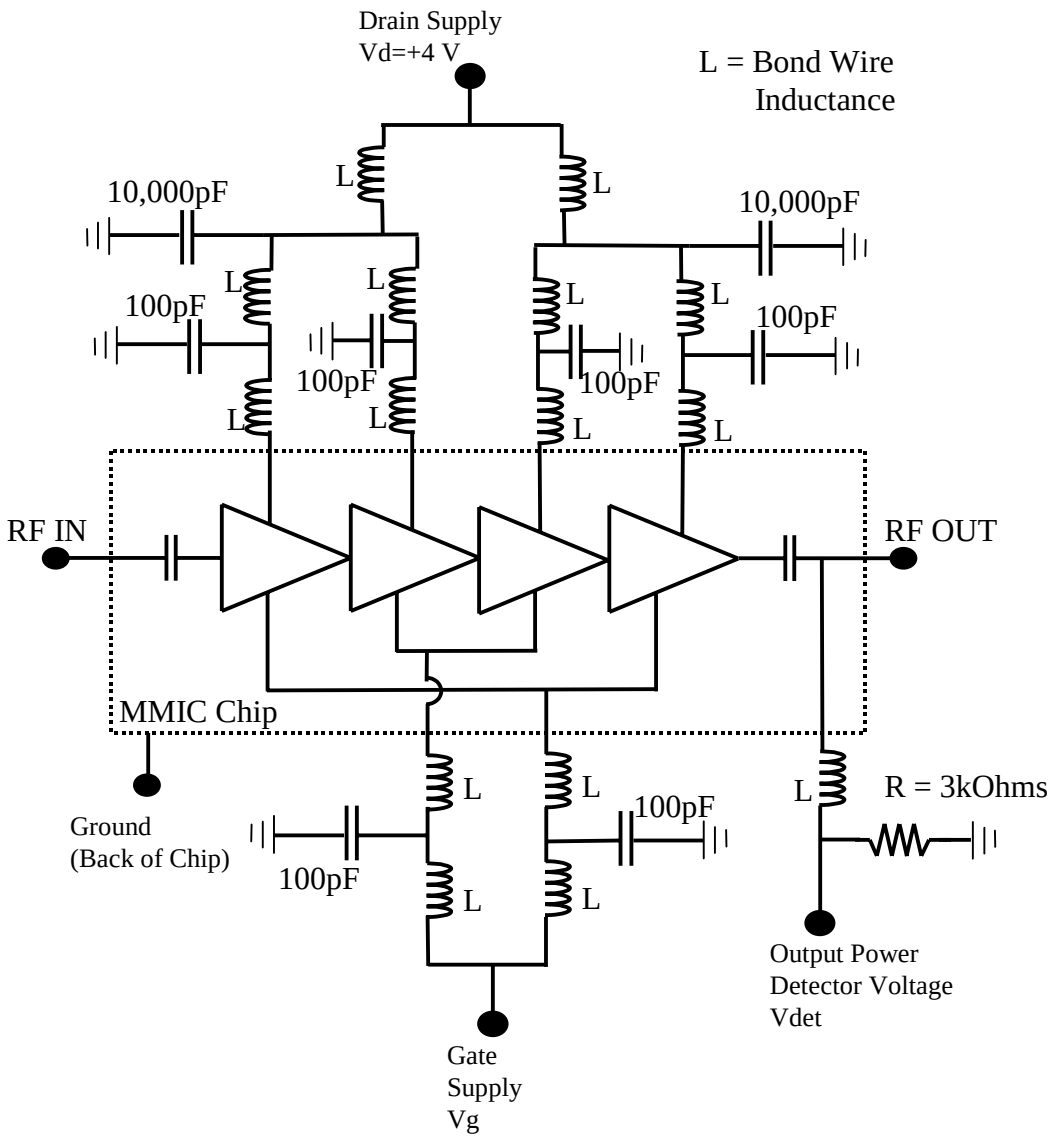
Application Information

Recommended Application Schematic Circuit Diagram



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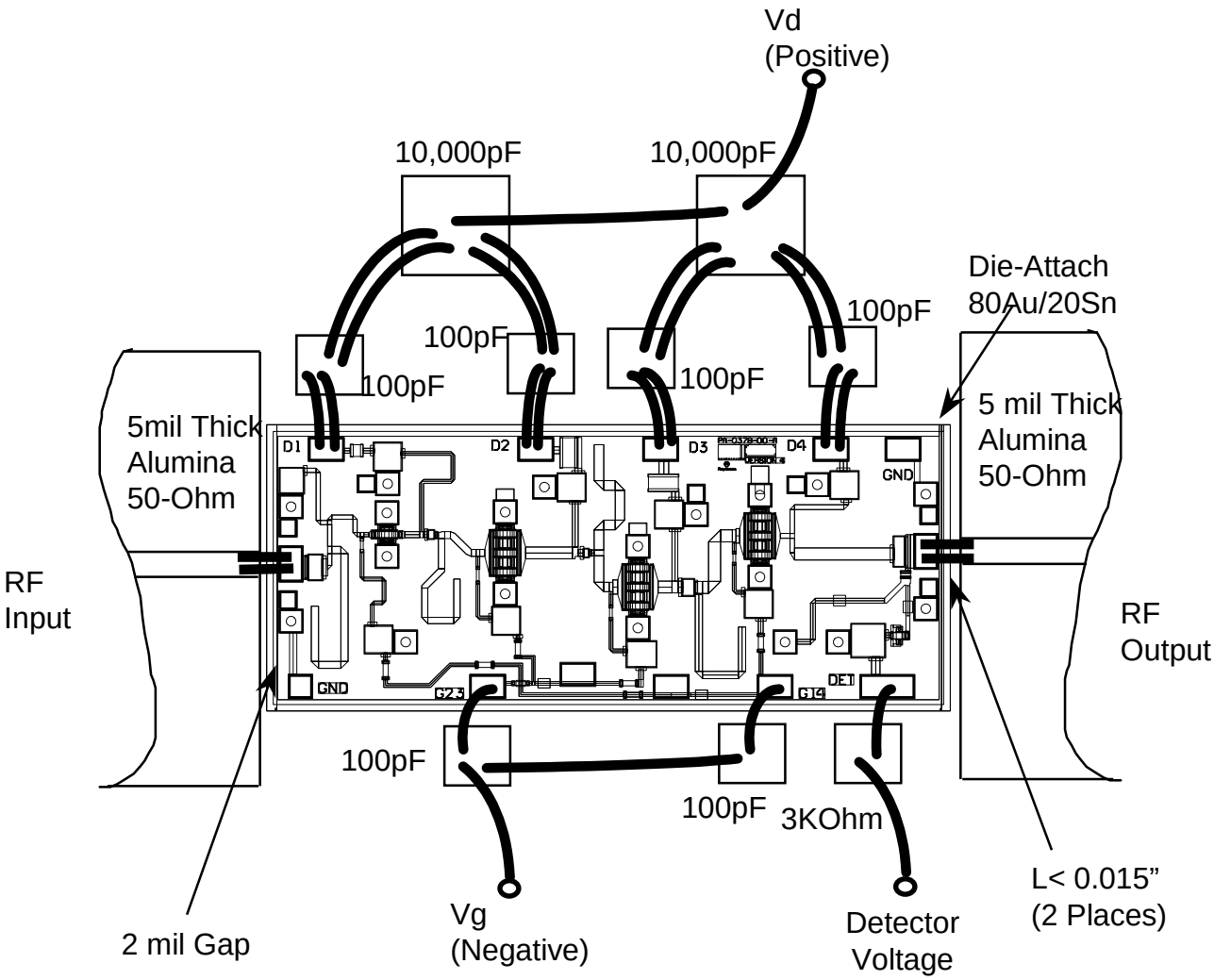
Application Information

Recommended Assembly Diagram



Note: 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.

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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.

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Application Information

Recommended Procedure for Biasing and Operation

Caution: This is an ESD sensitive device

Caution: Loss of gate voltage (Vgs) while drain voltage (Vds) is present may damage the amplifier chip.

The following sequence of steps 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.
Slowly apply negative gate bias supply voltage of -1.5 V to Vgs.

Step 3: Slowly apply positive drain bias supply voltage of +4 V to Vds.

Step 4: Adjust gate bias voltage to set the quiescent current of Idq=240 mA.

Step 5: After the bias condition is established, RF input signal may now be applied at the appropriate frequency band.

Step 6: Follow turn-off sequence of:
(i) Turn off RF input power, (ii) Turn down and off drain voltage (Vds), (iii) Turn down and off gate bias voltage (Vgs).