FAIRCHILD SEMICONDUCTOR®

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# RMPA19000

## 18–22 GHz Power Amplifier MMIC

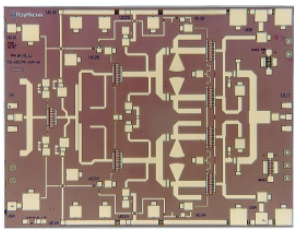
### General Description

The Fairchild Semiconductor RMPA19000 is a high efficiency driver amplifier designed for use in point to point and point to multi-point radios, and various communications applications. The RMPA19000 is a 3-stage GaAs MMIC amplifier utilizing our advanced 0.15µm gate length Power PHEMT process and can be used in conjunction with other driver or power amplifiers to achieve the required total power output.

### Features

- 28dB small signal gain (typ.)
- 29dBm saturated power out (typ.)
- Circuit contains individual source Vias
- Chip Size 4.45mm x 3.50mm

### Device



## Absolute Ratings

| Symbol | Parameter | Ratings | Units |
|---|---|---|---|
| Vd | Positive DC Voltage (+5V Typical) | +6 | V |
| Vg | Negative DC Voltage | -2 | V |
| Vdg | Simultaneous (Vd–Vg) | 8 | V |
| $I_D$ | Positive DC Current | 1092 | mA |
| $P_{IN}$ | RF Input Power (from 50Ω source) | +10 | dBm |
| $T_C$ | Operating Baseplate Temperature | -30 to +85 | °C |
| $T_{STG}$ | Storage Temperature Range | -55 to +125 | °C |
| $R_{JC}$ | Thermal Resistance (Channel to Backside) | 16 | °C/W |

## Electrical Characteristics (At 25°C), 50Ω system, Vd = +5V, Quiescent current (Idq) = 600mA

| Parameter | Min | Typ | Max | Units |
|---|---|---|---|---|
| Frequency Range | 18 | | 22 | GHz |
| Gain Supply Voltage (Vg)[1] | | -0.2 | | V |
| Gain Small Signal at Pin = -5dBm | 22 | 26 | | dB |
| Gain Variation vs. Frequency | | ±1 | | dB |
| Power Output at 1dB Compression | | 28 | | dBm |
| Power Output Saturated: (Pin = +5dBm) | 26 | 29 | | dBm |
| Drain Current at Pin = -5dBm | | 600 | | mA |
| Drain Current at P1dB Compression | | 660 | | mA |
| Power Added Efficiency (PAE): at P1dB | | 15 | | % |
| OIP3 | | 37 | | dBm |
| Input Return Loss (Pin = -5dBm) | | 8 | | dB |
| Output Return Loss (Pin = -5 dBm) | | 10 | | dB |

**Note:**
1. Typical range of negative gate voltage is -0.9V to 0.0V to set typical Idq of 600mA.

## 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 typical 2 mil gap between the chip and the substrate material.

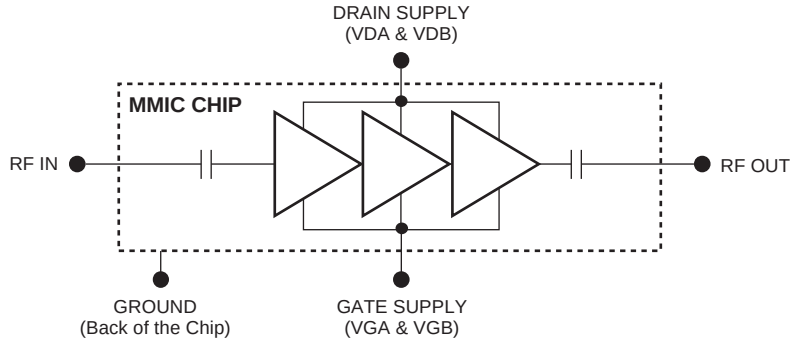
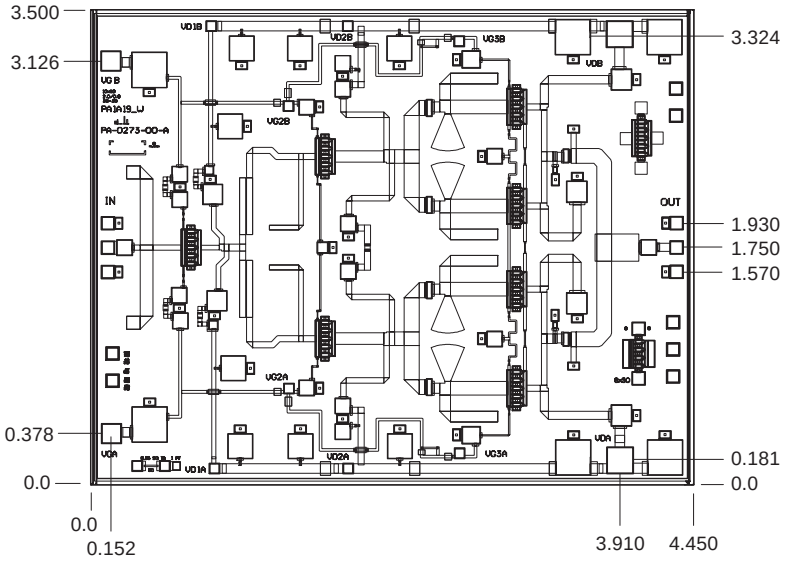



**Figure 1. Functional Block Diagram**




Dimensions in mm

**Figure 2. Chip Layout and Bond Pad Locations**
**(Chip Size is 4.450mm x 3.500mm x 50µm. Back of chip is RF and DC Ground)**

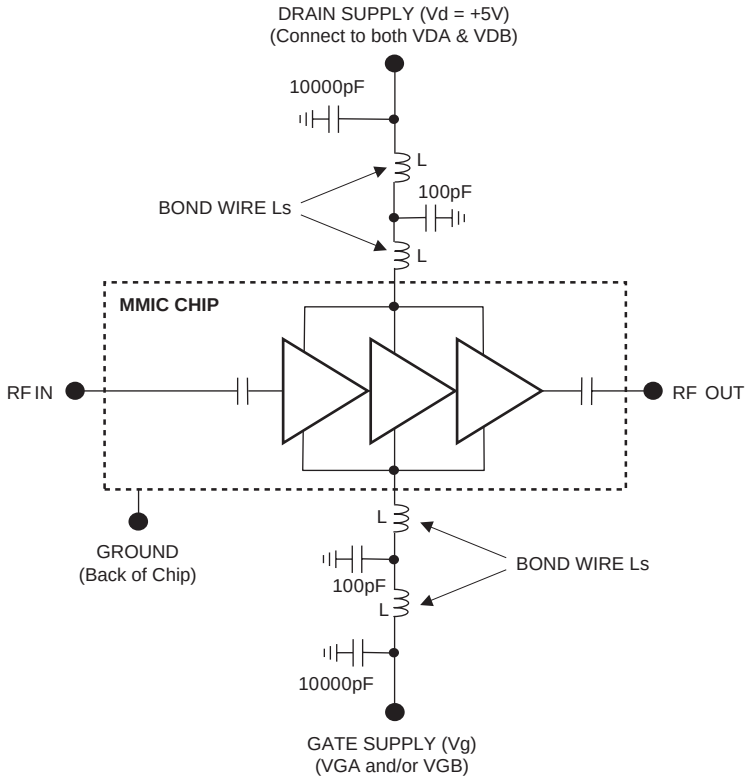
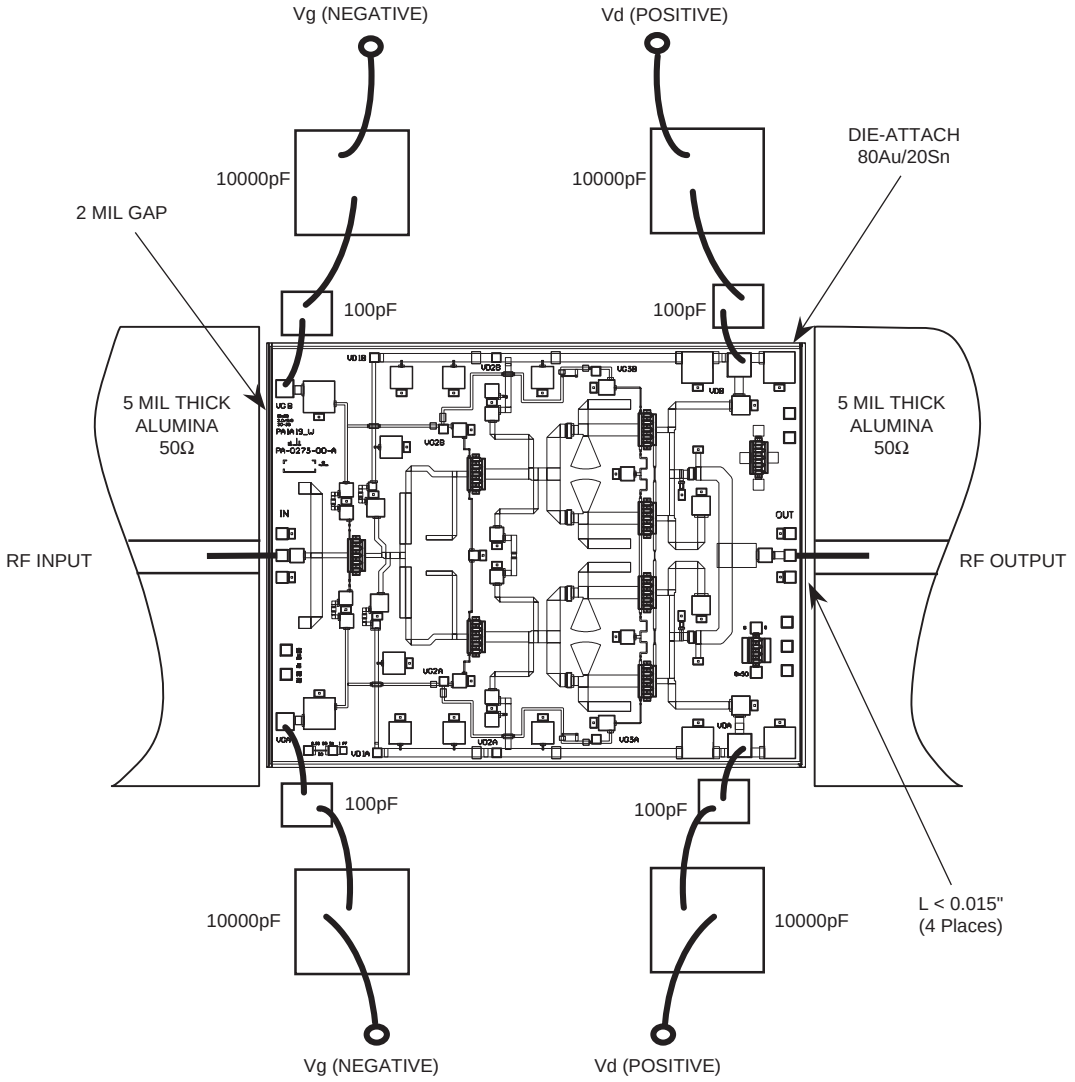



**Figure 3. Recommended Application Schematic Circuit Diagram**




**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. Vd should be biased from 1 supply as shown. Vg can be biased from either or both sides from 1 supply.

**Figure 4. Recommended Assembly and Bonding Diagram**

## Recommended Procedure for Biasing and Operation

**CAUTION: LOSS OF GATE VOLTAGE (Vg) WHILE DRAIN VOLTAGE (Vd) 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 ground of the chip carrier. Slowly apply negative gate bias supply voltage of -1.5V to Vg.

**Step 3:** Slowly apply positive drain bias supply voltage of +5V to Vd.

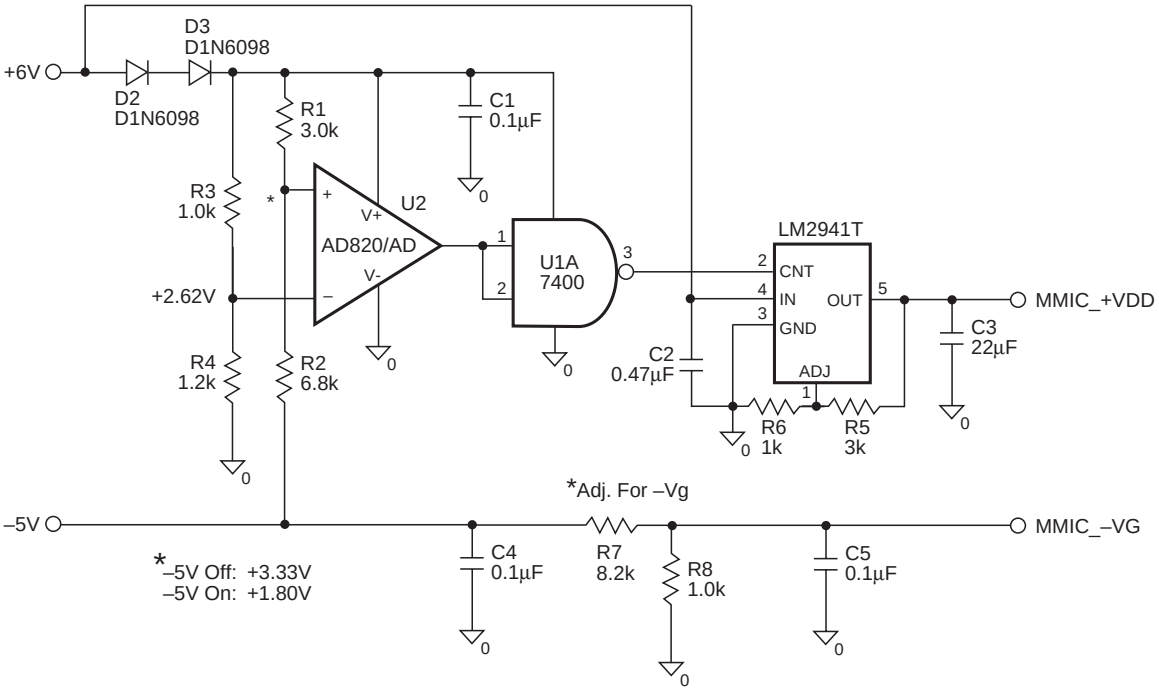
**Step 4:** Adjust gate bias voltage to set the quiescent current of Idq = 600mA.

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

**Step 6:** Follow turn-off sequence of:

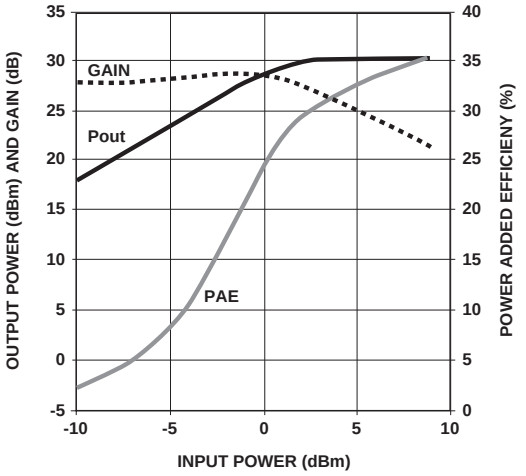
(i) Turn off RF input power,
(ii) Turn down and off drain voltage (Vd),
(iii) Turn down and off gate bias voltage (Vg).

An example auto bias sequencing circuit to apply negative gate voltage and positive drain voltage for the above procedure is shown below.

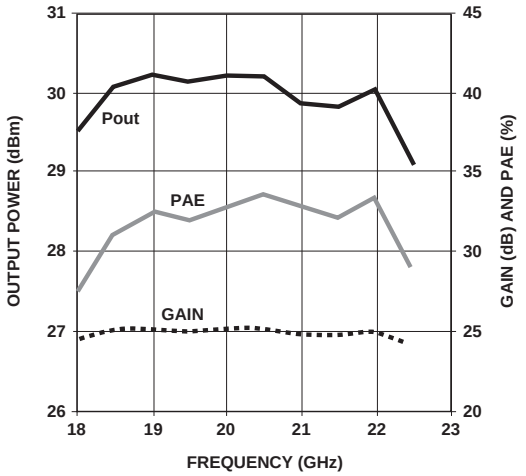


## Typical Characteristics

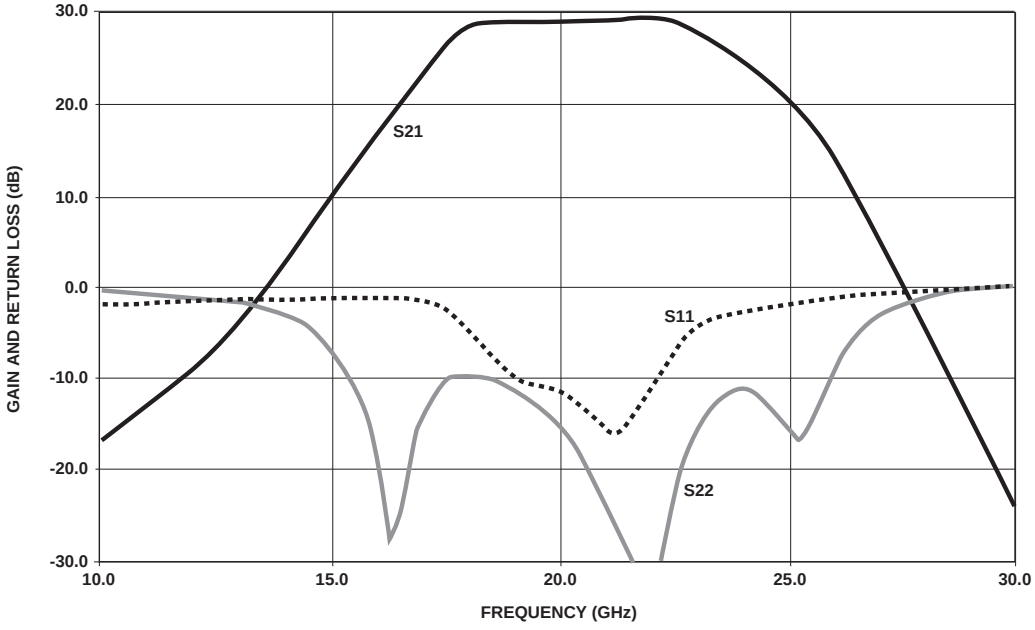
RMPA19000 Gain, Power Out vs. Power In
Frequency = 20GHz, Bias Vd = 5V, Id = 600mA, T = 25°C




RMPA19000 Pout, PAE, Gain vs. Frequency
Input Power Pin = 5.0dBm, Bias Vd = 5V, Id = 600mA, T = 25°C




RMPA19000 S21, S11, S22 Mag vs. Freq.
Bias Vd = 5V, Id = 600mA, T = 25°C



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**PRODUCT STATUS DEFINITIONS**

**Definition of Terms**

| Datasheet Identification | Product Status | Definition |
|---|---|---|
| Advance Information | Formative or In Design | This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. |
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