FAIRCHILD SEMICONDUCTOR®

June 2004

RMWP26001

24–26.5 GHz Power Amplifier MMIC

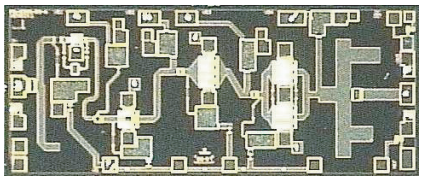
General Description

The RMWP26001 is a 4-stage GaAs MMIC amplifier designed as a 24 to 26.5 GHz Power Amplifier for use in point to point and point to multi-point radios, and various communications applications. In conjunction with other Fairchild Semiconductor amplifiers, multipliers and mixers it forms part of a complete 26 GHz transmit/receive chipset. The RMWP26001 utilizes our 0.25µm power PHEMT process and is sufficiently versatile to serve in a variety of power amplifier applications.

Features

- 4mil substrate
- Small-signal gain 23dB (typ.)
- 1dB compressed Pout 24dBm (typ.)
- Chip size 2.85mm x 1.2mm

Device



Absolute Ratings

Symbol	Parameter	Ratings	Units
Vd	Positive DC Voltage (+4V Typical)	+6	V
Vg	Negative DC Voltage	-2	V
Vdg	Simultaneous (Vd–Vg)	8	V
I_D	Positive DC Current	531	mA
P_{IN}	RF Input Power (from 50Ω source)	+8	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)	41.5	°C/W

Electrical Characteristics (At 25°C), 50Ω system, Vd = +4V, Quiescent Currrent Idq = 370mA

Parameter	Min	Typ	Max	Units
Frequency Range	24		26.5	GHz
Gate Supply Voltage (Vg)[1]		-0.3		V
Gain Small Signal at Pin = -8dBm	20	23		dB
Gain Variation vs. Frequency		1		dB
Gain at 1dB Compression		22		dB
Power Output at 1dB Compression		24		dBm
Power Output Saturated: Pin = +2dBm	22	25		dBm
Drain Current at Pin = -8dBm		370		mA
Drain Current at 1dB Compression		400		mA
Drain Current at Saturated: Pin = +2dBm		380		mA
Power Added Efficiency (PAE): at P1dB		16		%
Input Return Loss (Pin = -8dBm)		12		dB
Output Return Loss (Pin = -8dBm)		12		dB
OIP3		33		dBm

Note:
1. Typical range of gate voltage is -0.7 to -0.05V to set Idq of 370mA.

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.

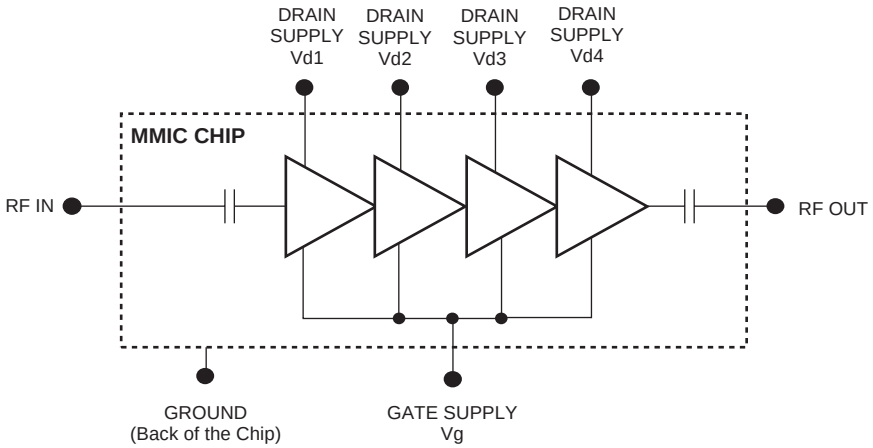


Figure 1. Functional Block Diagram

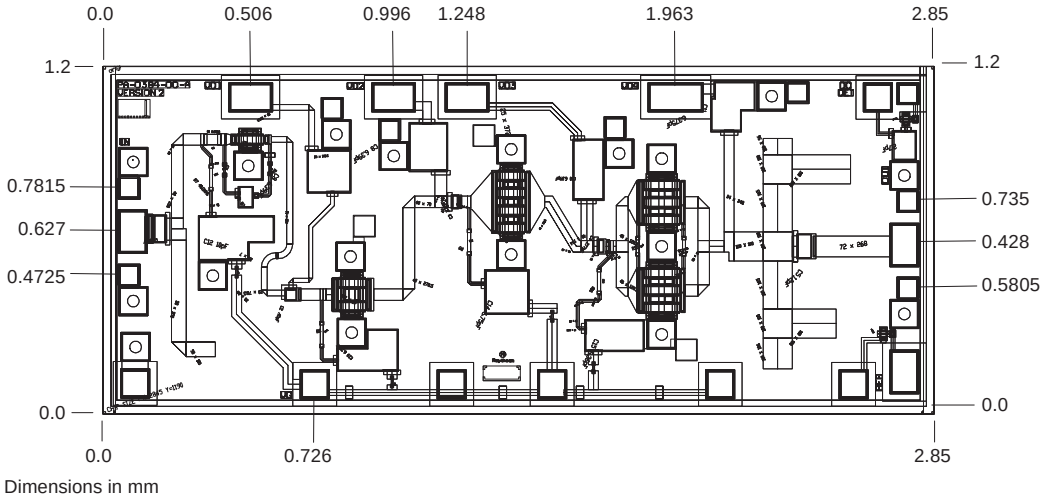


Figure 2. Chip Layout and Bond Pad Locations
(Chip Size is 2.85mm x 1.2mm x 100µm. Back of chip is RF and DC Ground)

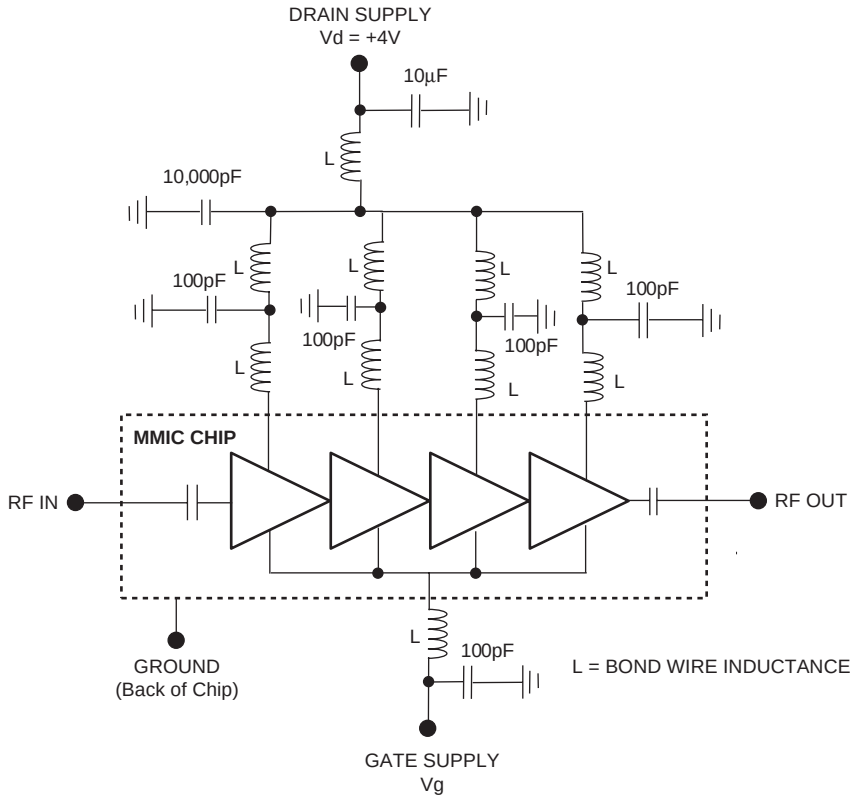
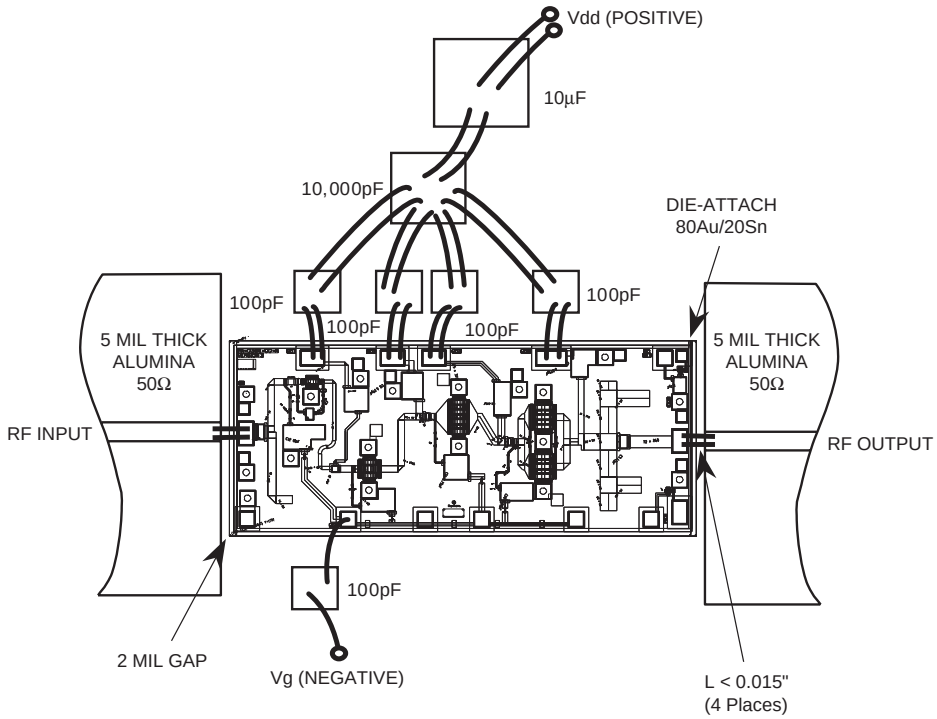


Figure 3. Recommended Application Schematic Circuit Diagram



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.

Figure 4. Recommended Assembly 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 +4V to Vd.

Step 4: Adjust gate bias voltage to set the quiescent current of Idq = 370mA.

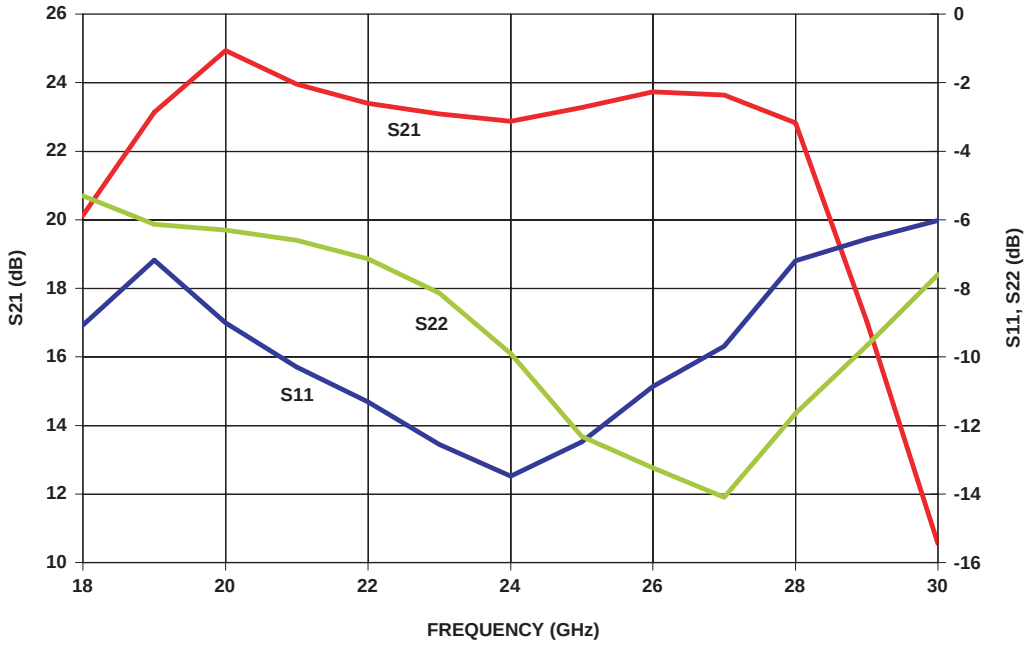
Step 5: After the bias condition is established, the RF input signal may now be applied at the appropriate frequency band.

Step 6: Follow turn-off sequence of:

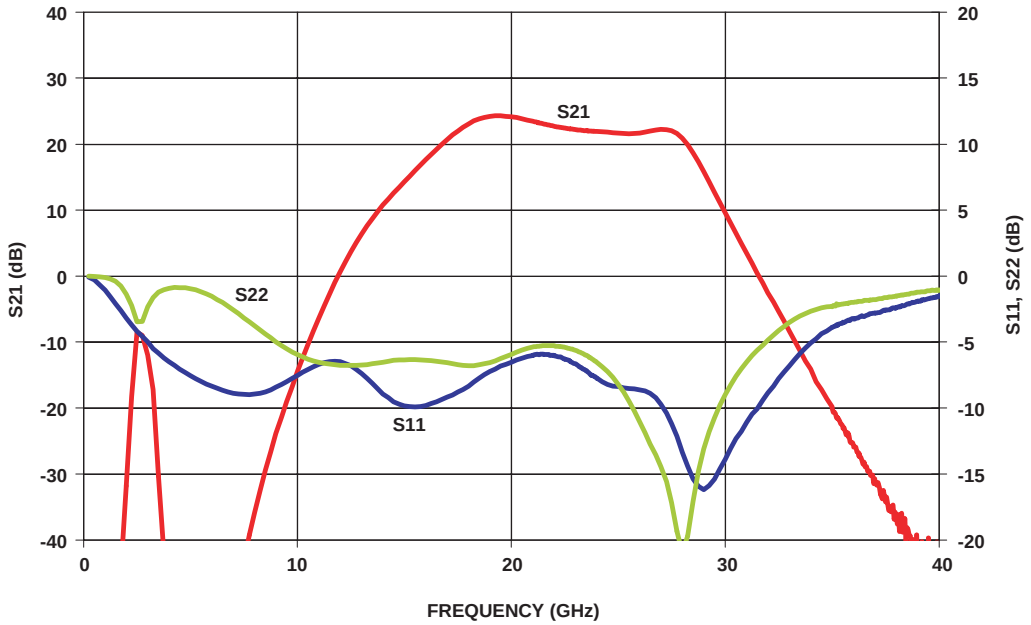
(i) Turn off RF input power,
(ii) Turn down and off drain voltage (Vd),
(iii) Turn down and off gate bias voltage (Vg).

Typical Characteristics

RMWP26001, 26 GHz Power Amplifier, Typical Performance,
On-Wafer Measurements, Vd = 4V, Idq = 370mA

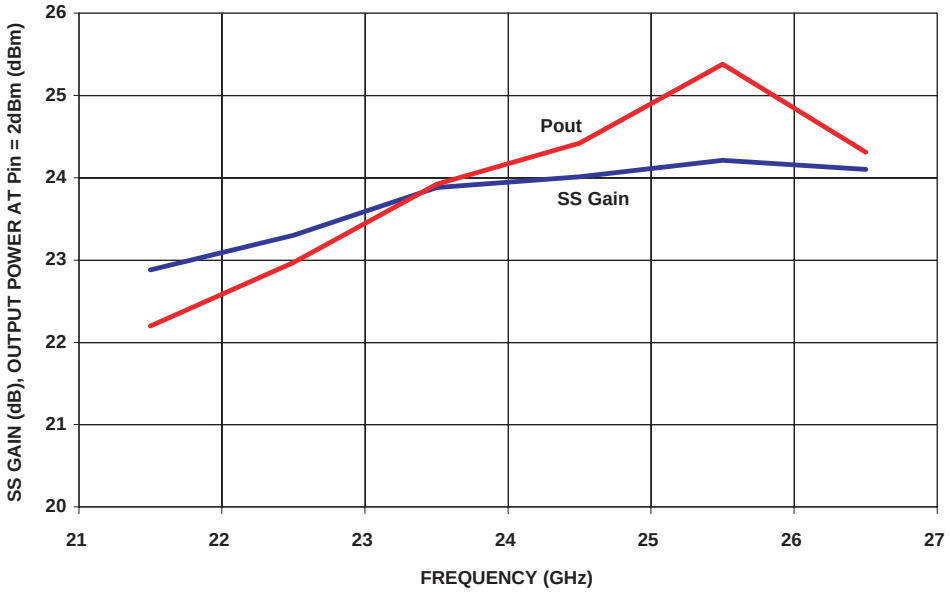


RMWP26001, 26 GHz Power Amplifier, Typical Performance,
Vd = 4V, Idq = 370mA, Chip Bonded into 50Ω Test Fixture



Typical Characteristics (Continued)

RMWP26001, 26 GHz Power Amplifier, Typical Performance,
On-Wafer Measurements, Vd = 4V, Idq = 370mA



TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™	FAST®	ISOPLANAR™	Power247™	SuperFET™
ActiveArray™	FASTr™	LittleFET™	PowerSaver™	SuperSOT™-3
Bottomless™	FPS™	MICROCOUPLER™	PowerTrench®	SuperSOT™-6
CoolFET™	FRFET™	MicroFET™	QFET®	SuperSOT™-8
CROSSVOLT™	GlobalOptoisolator™	MicroPak™	QS™	SyncFET™
DOME™	GTO™	MICROWIRE™	QT Optoelectronics™	TinyLogic®
EcoSPARK™	HiSeC™	MSX™	Quiet Series™	TINYOPTO™
E^2CMOS™	I^2C™	MSXPro™	RapidConfigure™	TruTranslation™
EnSigna™	*i-Lo*™	OCX™	RapidConnect™	UHC™
FACT™	ImpliedDisconnect™	OCXPro™	µSerDes™	UltraFET®
FACT Quiet Series™		OPTOLOGIC®	SILENT SWITCHER®	VCX™
Across the board. Around the world.™		OPTOPLANAR™	SMART START™	
The Power Franchise®		PACMAN™	SPM™	
Programmable Active Droop™		POP™	Stealth™	

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.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.