FAIRCHILD SEMICONDUCTOR®

RMWD38001
37-40 GHz Driver Amplifier MMIC

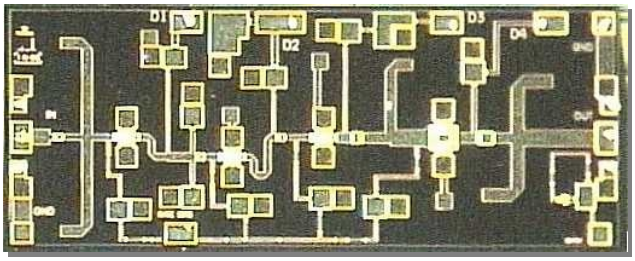
PRODUCT INFORMATION

Description

The RMWD38001 is a 4-stage GaAs MMIC amplifier designed as a 37 to 40 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 Fairchild Semiconductor amplifiers, multipliers and mixers it forms part of a complete 38 GHz transmit/receive chipset. The RMWD38001 utilizes Fairchild Semiconductor's 0.25µm power PHEMT proceoss and is sufficiently versatile to serve in a variety of driver amplifier applications.

Features

- 4 mil substrate
- Small-signal gain 25 dB (typ.)
- 1dB compressed Pout 18 dBm (typ.)
- Voltage detector included to monitor Pout
- Chip size 3.0 mm x 1.2 mm



Absolute Ratings

Parameter	Symbol	Value	Units
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	173	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}	126	°C/W

Electrical Characteristics

(At 25 °C 50Ω system, Vd=+4 V, Quiescent Current (Idq)= 105 mA

Parameter	Min	Typ	Max	Unit
Frequency Range	37		40	GHz
Gate Supply Voltage (Vg)[1]		-0.4		V
Gain Small Signal at Pin = -10 dBm	21	25		dB
Gain Variation vs Frequency		2		dB
Gain at 1dB Compression		24		dB
Power Output at 1 dB Compression		18		dBm
Power Output Saturated: Pin = -5.5 dBm	15.5	19		dBm
Drain Current at Pin = -10 dBm		105		mA
Drain Current at 1 dB Compression		120		mA

Parameter	Min	Typ	Max	Unit
Drain Current at Saturated: Pin = -5.5 dBm		120		mA
Power Added Efficiency (PAE): at P1 dB		13		%
Input Return Loss (Pin = -10 dBm)		15		dB
Output Return Loss (Pin = -10 dBm)		9		dB
OIP3		28		dBm
Noise Figure		6		dB
Detector Voltage (Pout = +17 dBm)		0.1		V

Note:

1. Typical range of gate voltage is -0.7 to -0.1 V to set Idq of 105 mA.

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

Revised March 14, 2001

Application Information

CAUTION: THIS IS AN ESD SENSITIVE DEVICE.

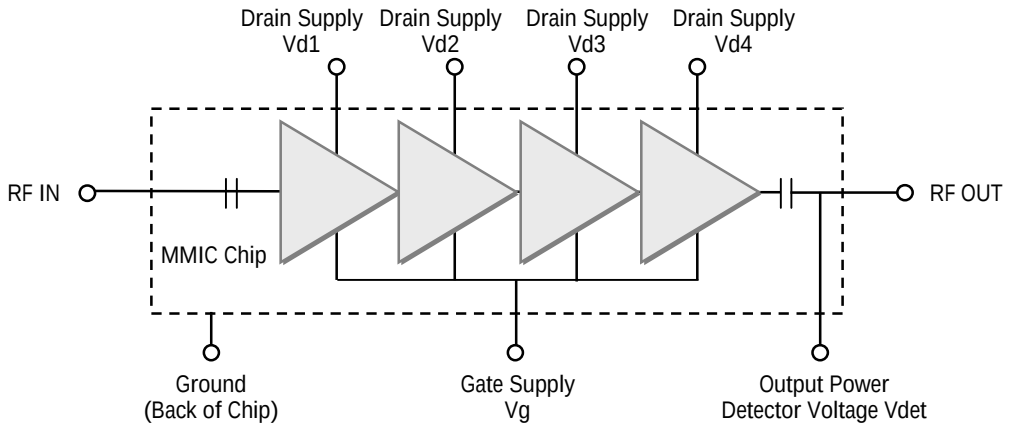
Chip carrier material should be selected to have GaAs compatible thermal coefficient of expansion and high thermal conductivity such as copper molybdenum or copper tungsten. The chip carrier should be machined, finished flat, plated with gold over nickel and should be capable of withstanding 325°C for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



Note:
Detector delivers 0.1 V DC into 3k Ω load resistor for >+17 dBm output power. If output power level detection is not desired, do not make connection to detector bond pad.

Figure 2
Chip Layout and Bond Pad Locations

Chip Size is 3.0 mm x 1.2 mm. Back of chip is RF and DC ground

Dimensions in mm

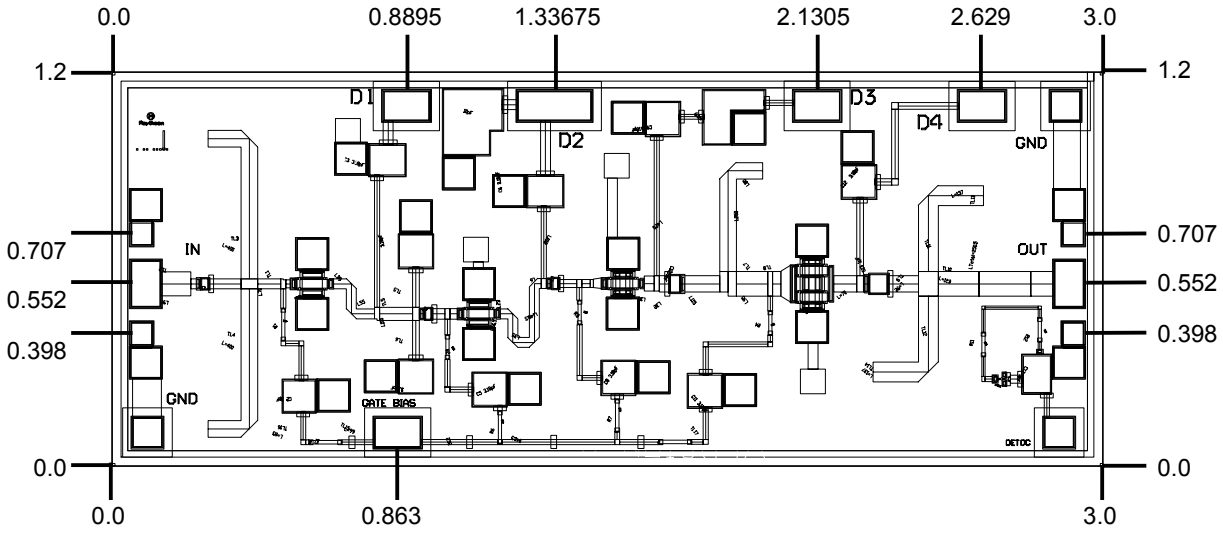


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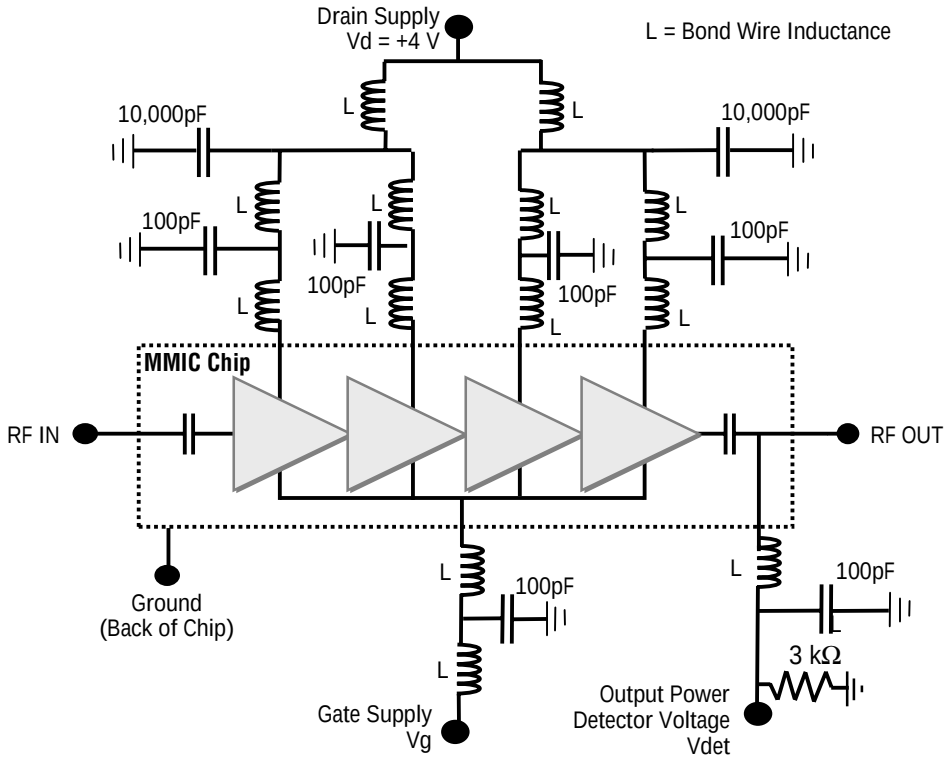
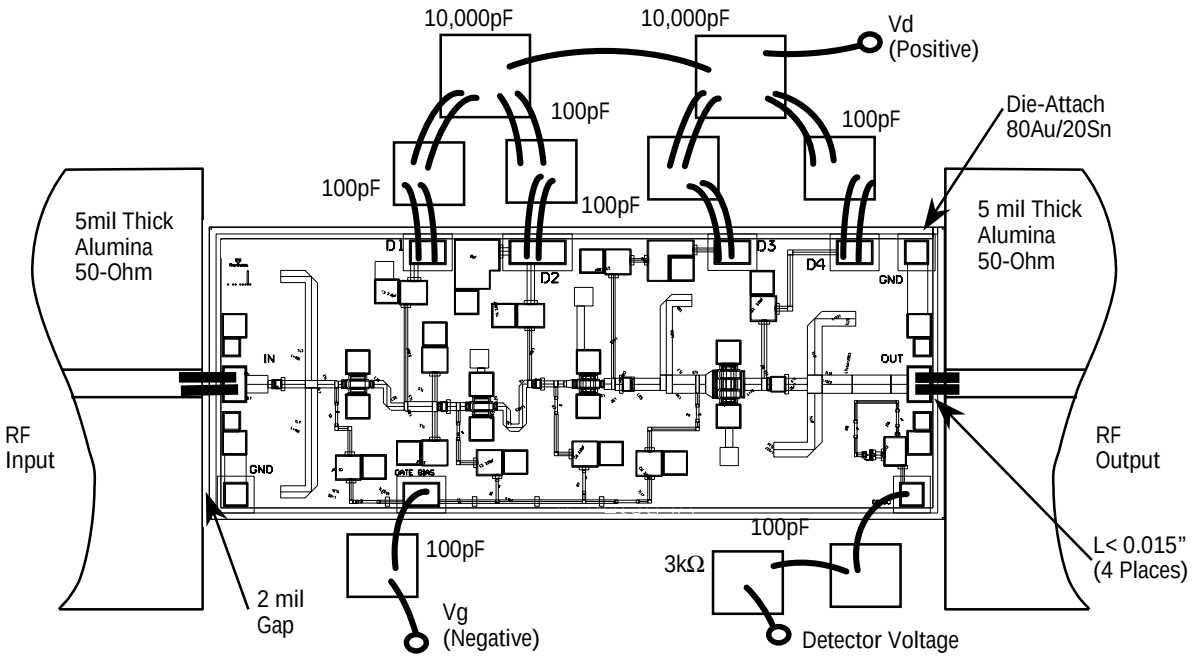
Figure 3
Recommended Application Schematic Circuit Diagram



Note:
Detector delivers 0.1 V DC into 3k Ω load resistor for >+17 dBm output power. If output power level detection is not desired, do not make connection to detector bond pad.

Figure 4
Recommended Assembly Diagram



Notes:
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.
Detector delivers 0.1V DC into 3k Ω load resistor for >+17 dBm output power. If output power level detection is not desired, do not make connection to detector bond pad

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Recommended Procedure for Biasing and Operation

CAUTION: LOSS OF GATE VOLTAGES (Vg) WHILE DRAIN VOLTAGES (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 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 voltages of +4 V to Vd.

Step 4: Adjust gate bias voltage to set the quiescent current of Idq=105 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:

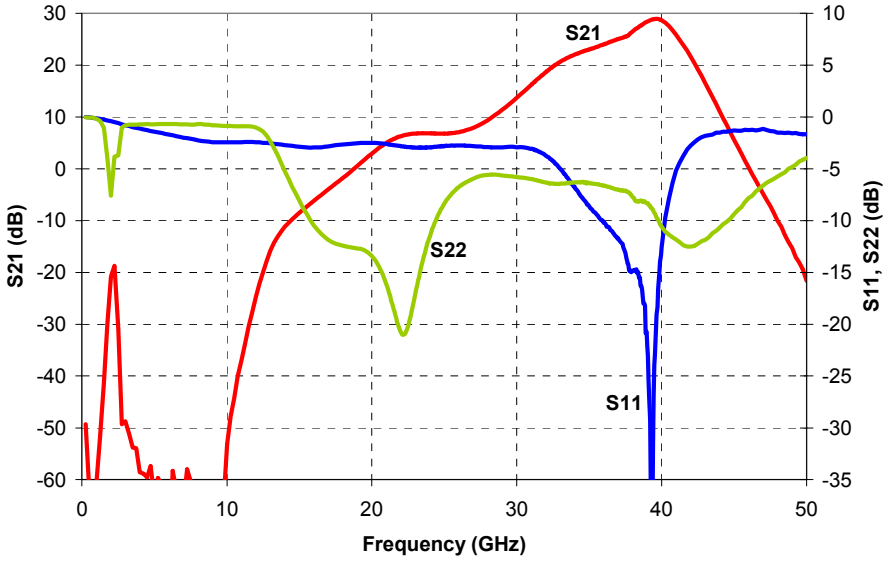
(i) Turn off RF Input Power

(ii) Turn down and off drain voltage (Vd).

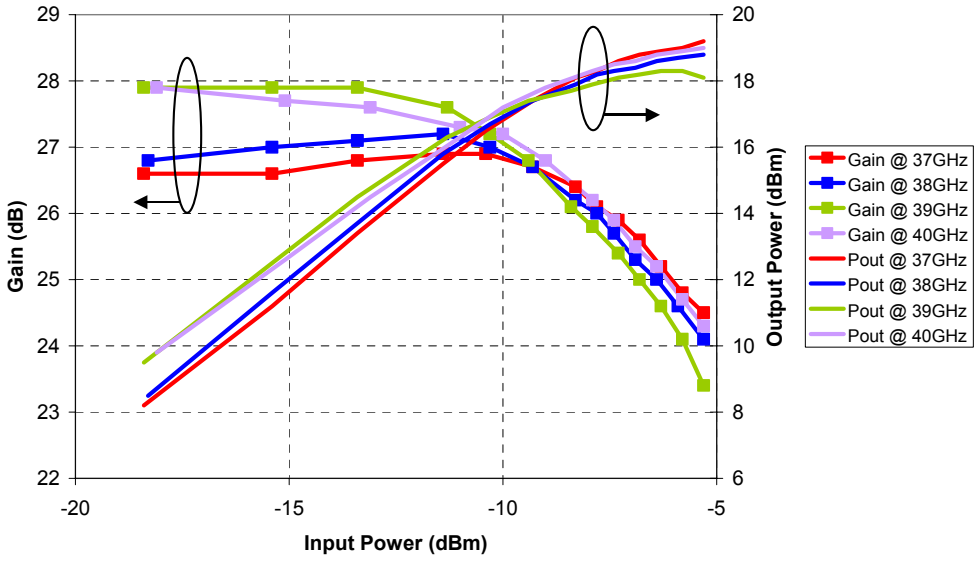
(iii) Turn down and off gate voltage (Vg).

Performance Data

RMWD38001, 37-40GHz Driver Amplifier, Typical Performance, Vd=4V, Idq=105mA, Chip Bonded into 50 ohm Test Fixture



RMWD38001, 37-40GHz Driver Amplifier, Typical Performance, On-Wafer Measurements, Vd=4V, Idq=105mA



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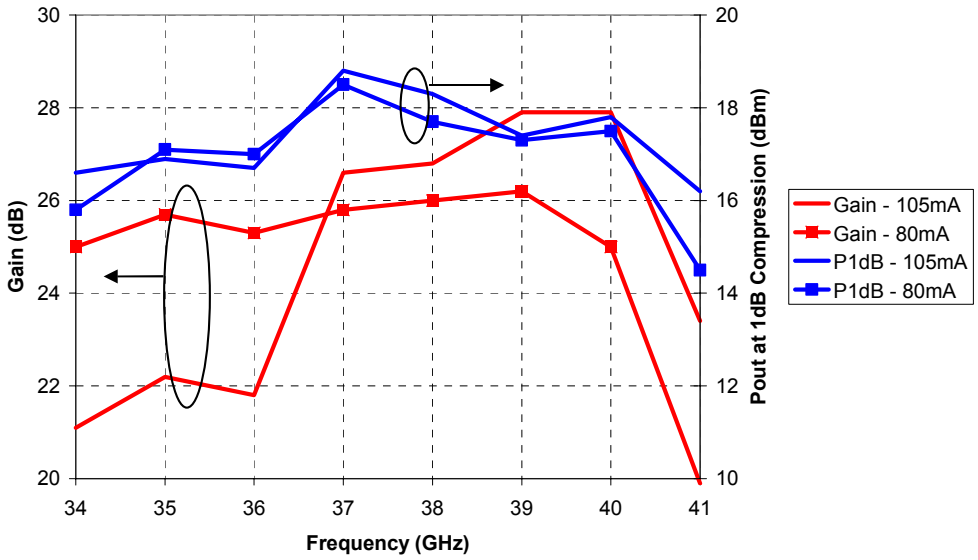
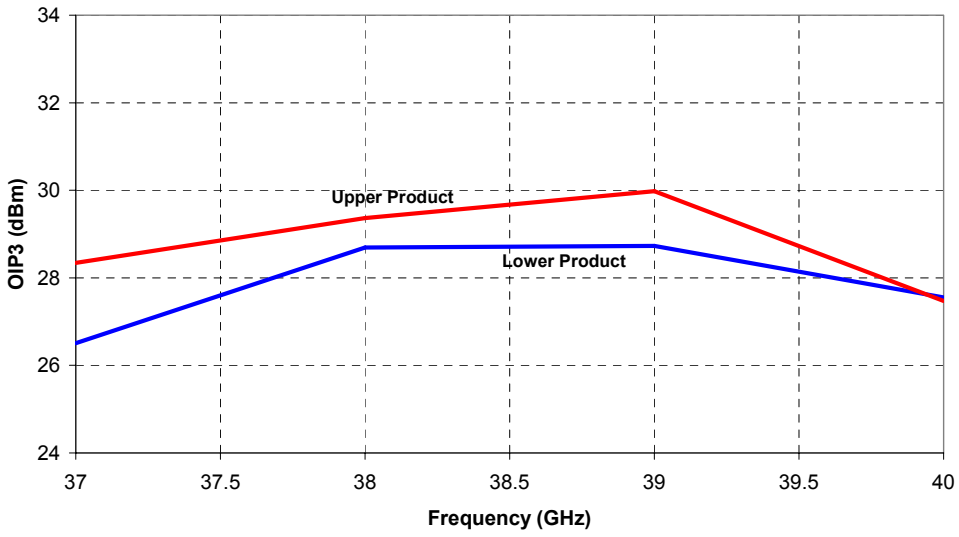
Performance Data

**RMWD38001, 37-40GHz Driver Amplifier, Typical Performance,
On-Wafer Measurements, Vd=4V, Idq=80 and 105mA**



**RMWD38001, 37-40GHz Driver Amplifier, Typical Intermodulation Performance,
Vd=4V, Idq=105mA, Chip Bonded into 50 ohm Test Fixture
Tone Spacing 1MHz, Pout per tone +6dBm approx**



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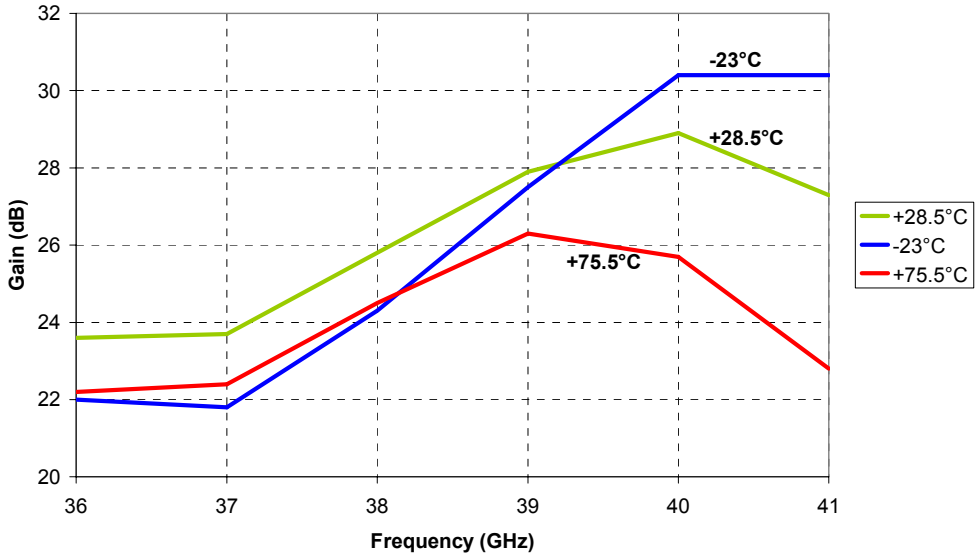
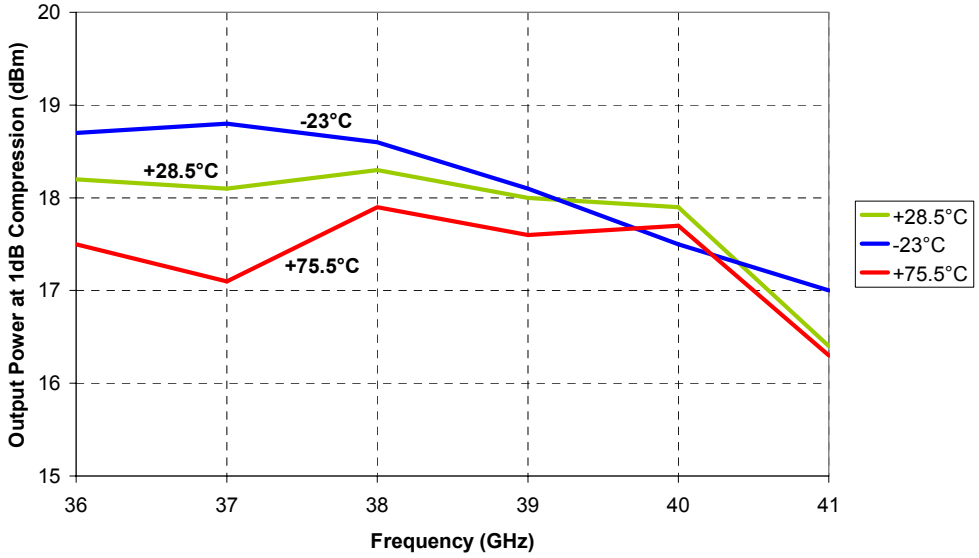
Performance Data

RMWD38001, Typical Performance over Temperature,
Vd=4V, Idq=105mA, Chip Bonded into 50 ohm Test Fixture



RMWD38001, Typical Performance over Temperature,
Vd=4V, Idq=105mA, Chip Bonded into 50 ohm Test Fixture



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