

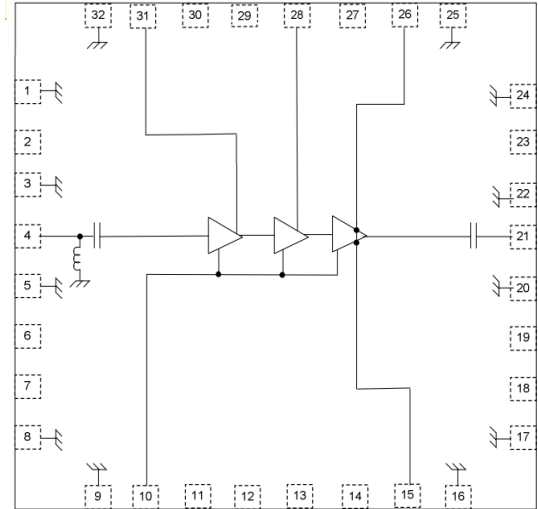
MMA-172135-M5 17 - 21 GHz, 3 W Power Amplifier

Features:

- Frequency Range: 17 – 21 GHz
- P1dB: 35 dBm
- IM3 Level - 45dBc @Po = 20dBm/tone
- Gain: 27 dB
- Vdd = 6 V
- Ids = 1500 to 2800 mA
- Input and Output Fully Matched to 50 Ω

Applications:

- Communication systems
- Microwave instrumentations
- Point to Point Radios



Functional Block Diagram

Description:

The MMA-172135 is a broadband GaAs MMIC Power amplifier with 3-Watt output power and high gain of 27dB over full 17 to 21GHz frequency range. This amplifier was optimally designed for high linearity applications at 12dB back-off from P-1 condition.

Absolute Maximum Ratings: (Ta= 25 °C)*

SYMBOL	PARAMETERS	UNITS	Min.	Max.
Vds	Drain-Source Voltage	V		6.5
Vg	Gate-Source Voltage	V	-2.1	0
Ig	First Gate Current	mA	-17	17
Pd	Power Dissipation	W		16.8
Pin max	RF Input Power	dBm		20
Tch	Channel Temperature	°C		+150
Tstg	Storage Temperature	°C		-55 to +150
Tmax	Max. Assembly Temp (20 sec max)	°C		+260

*Operation of this device above any one of these parameters may cause permanent damage.

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Electrical Specifications: $V_{ds}=6V, V_g=-0.85V, I_{ds}=2000mA, T_a=25^{\circ}C, Z_0=50\ \Omega$

Parameter	Units	Typical Data
Frequency Range	GHz	17 - 21
Gain (Typ / Min)	dB	27 / 26
Gain Flatness (Typ / Max)	+/-dB	1 / 1.5
Input RL(Typ/Max)	dB	12/10
Output RL(Typ/Max)	dB	12/10
Output P1dB(Typ/Min)	dBm	34.5/33.5
IM3 Level @Po=20dBm/tone	dBc	-45
Output Psat(Typ/Min)	dBm	36/35.5
Operating Current at P1dB (Typ/Max)	mA	2000 / 2500
Thermal Resistance	$^{\circ}C/W$	3.8

(1) Output IM3 is measured with two tones at output power of 20 dBm/tone separated by 20 MHz.

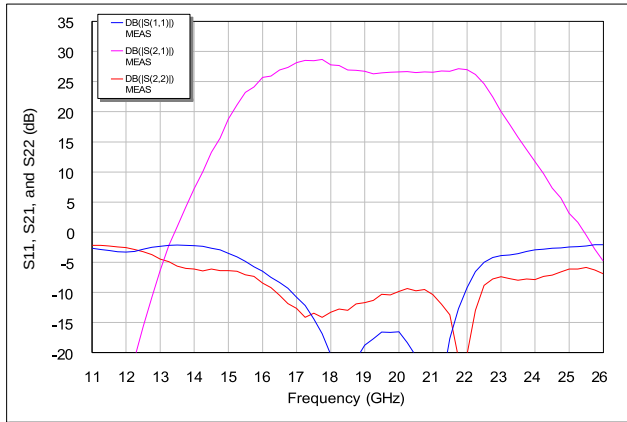
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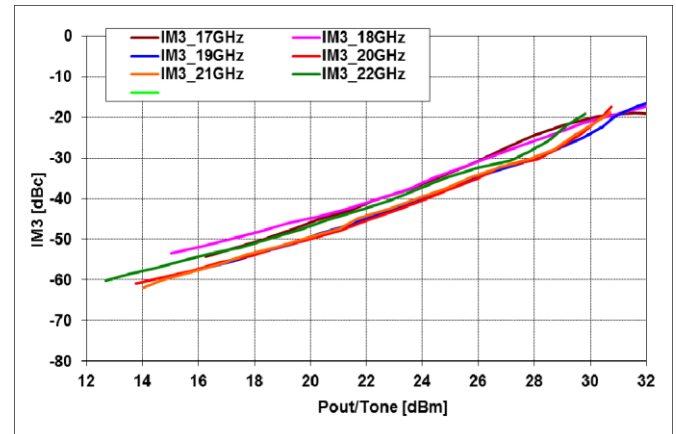
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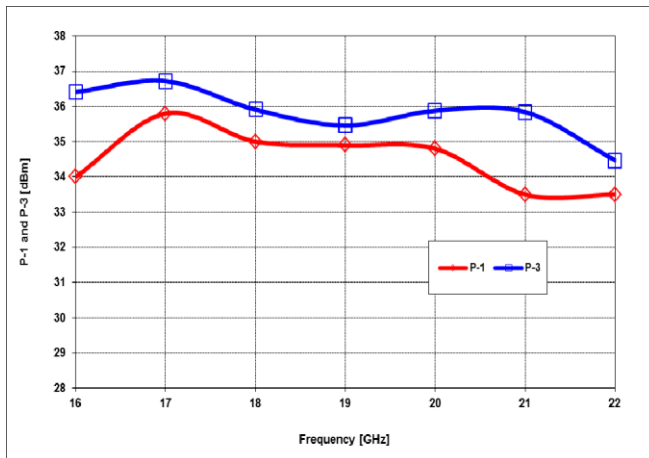
Typical RF Performance: $V_{ds}=6V$, $V_g=-0.85V$, $I_{ds}=2000mA$, $Z_0=50\ \Omega$, $T_a=25\ ^\circ C$



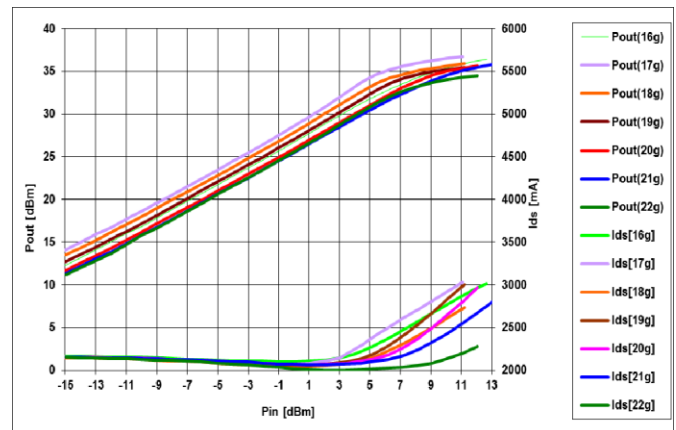
S11[dB], S21[dB], and S22[dB] vs. Frequency



IM3 Level [dBc] vs. output power/ tone [dBm]

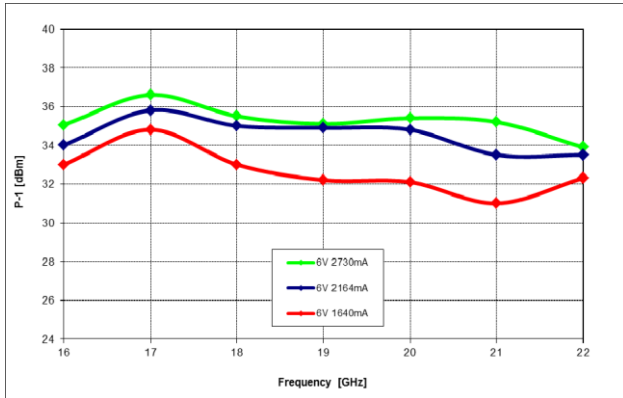


P-1 and Psat vs. Frequency

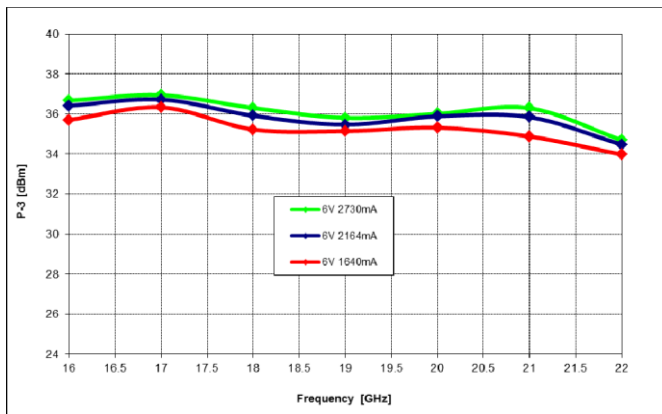


Pout[dBm], and Ids[mA] vs. Input power [dBm]

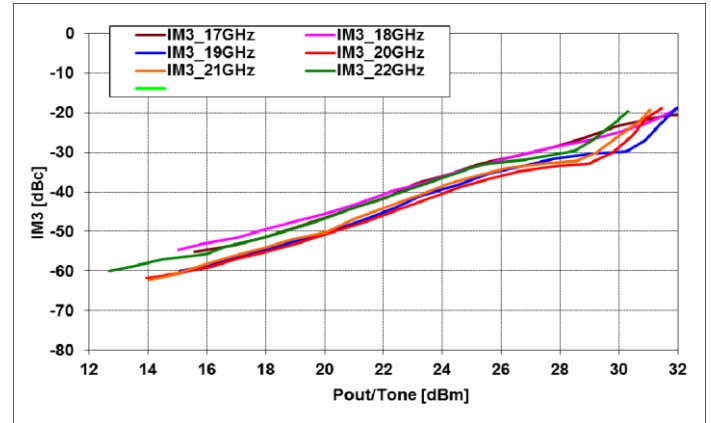
Typical Bias dependent RF Performance:



Bias dependent P1 vs. Frequency

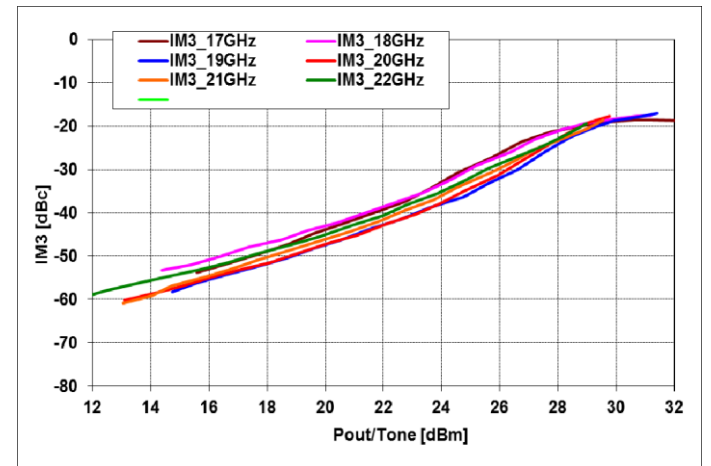


Bias dependent P-3 vs. Frequency



IM3 Level [dBc] vs. output power/tone [dBm]

@Vds=6V, Idsq=2.5A



Pout[dBm], and Ids[mA] vs. Input power [dBm]

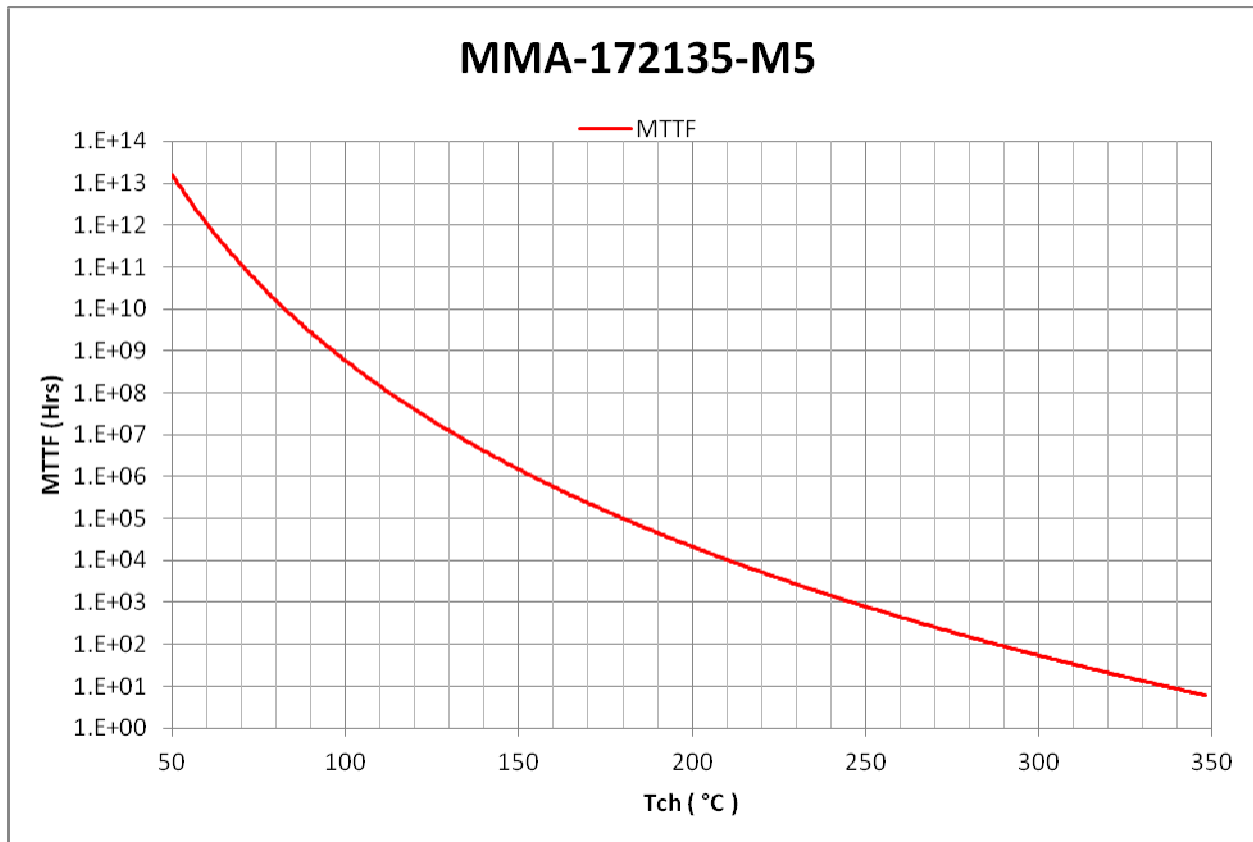
@Vds=6V, Idsq=1.5A

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This plot is based on MTTF data provided by wafer foundry and is scaled to the size of this MMIC size.

Applications

The **MMA172135** MMIC power amplifier is designed for use as a power stage amplifier in microwave transmitters. It is ideally suited for 17 to 21GHz band point to point radio applications requiring a flat gain response and excellent linearity performance. This amplifier is provided as a 5x5mm QFN package, and the packaged amplifier is fully compatible with industry standard high volume surface mount PCB assembly processes.

Biasing and Operation

The recommended bias conditions for best performance for the **MMA172135** are $V_{DD} = 6.0V$, $I_{dsq} = 2000mA$. Performance improvements are possible depending on applications. The drain bias voltage range is 5 to 6V and the quiescent drain current biasing range is 1500mA to 2800mA. A single DC gate supply connected to V_g will bias all the amplifier stages. Muting can be accomplished by setting V_g to the pinch-off voltage ($V_p = -2V$). The gate voltage (V_g) should be applied prior to the drain voltages (V_{d1} , V_{d2} , V_{d3}) during power up and removed after the drain voltages during power down. The RF input and output ports are DC decoupled internally. Typical DC supply connection with bi-passing capacitors for the **MMA172135** is shown in following pages.

Assembly Techniques

GaAs MMICs are ESD sensitive. ESD preventive measures must be employed in all aspects of storage, handling, and assembly. MMIC ESD precautions, handling considerations, die attach and bonding methods are critical factors in successful GaAs MMIC performance and reliability.

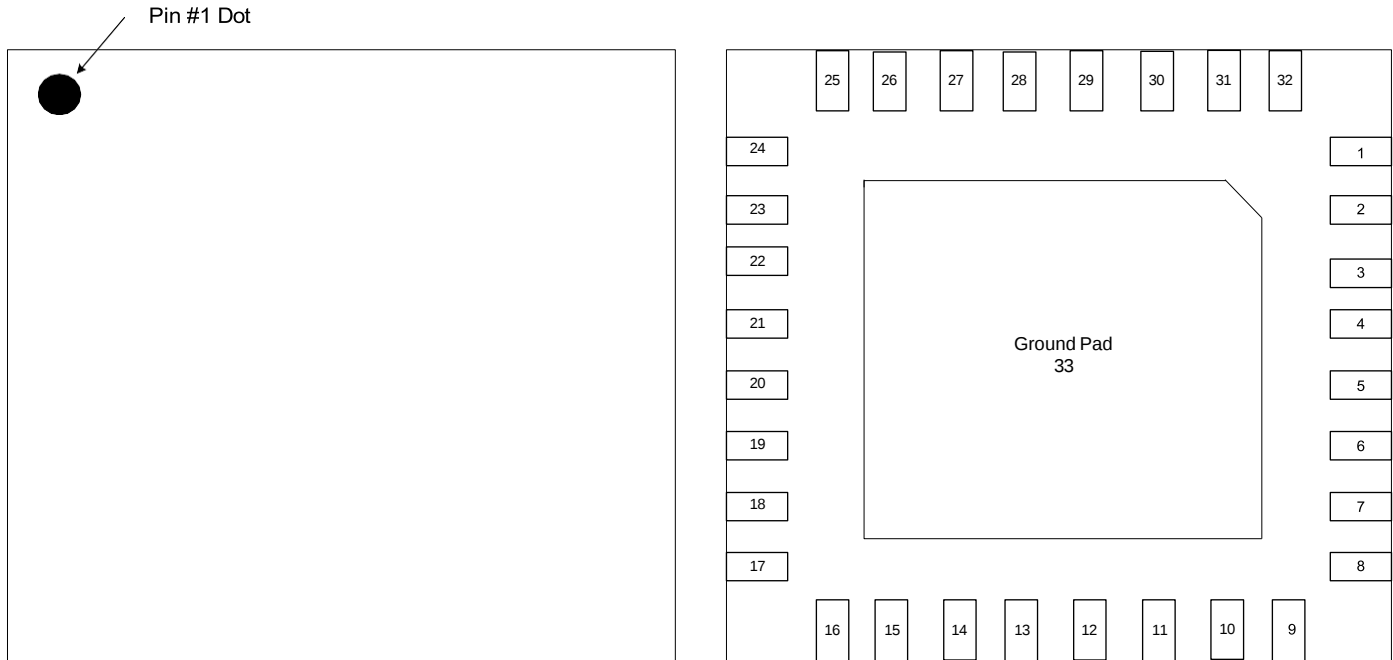
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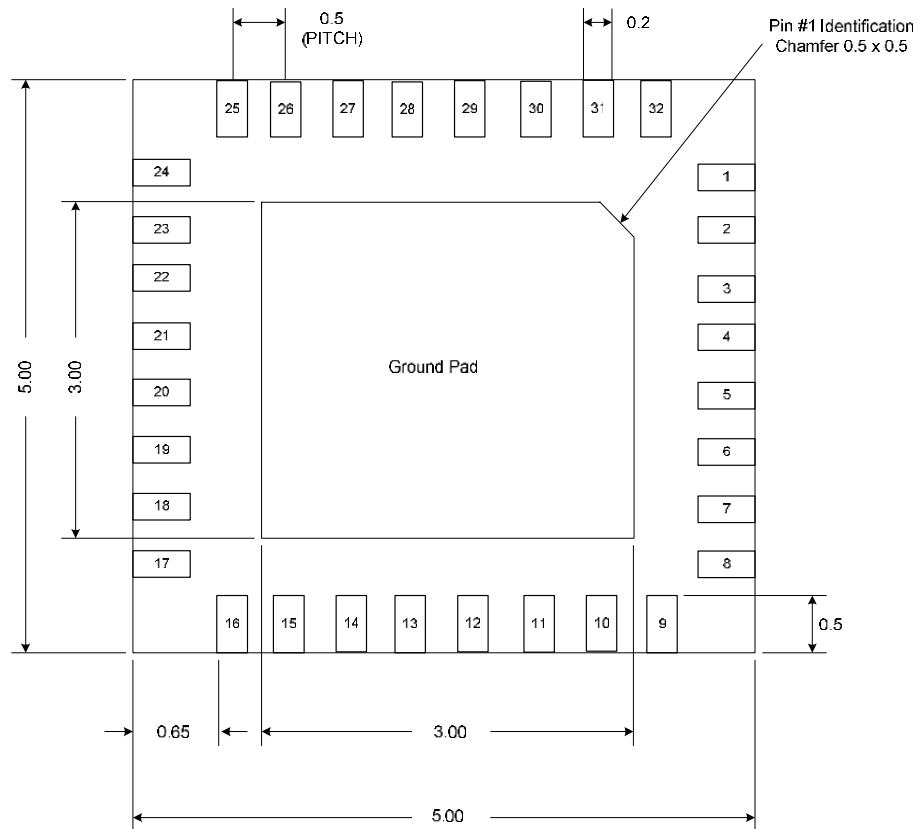
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Package Pin-out:

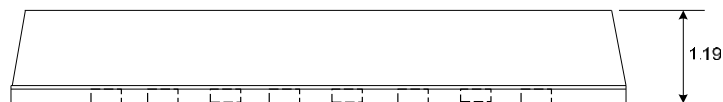


Pin	Description
4	RF Input
21	RF Output
10	Vg
31	Vd1
28	Vd2
15, 26	Vd3
1, 3, 5, 8, 9, 16, 17, 20, 22, 24, 25, 32, 33	Ground
2, 6, 7, 11, 12, 13, 14, 18, 19, 23, 27, 29, 30	N/C

Mechanical Information:



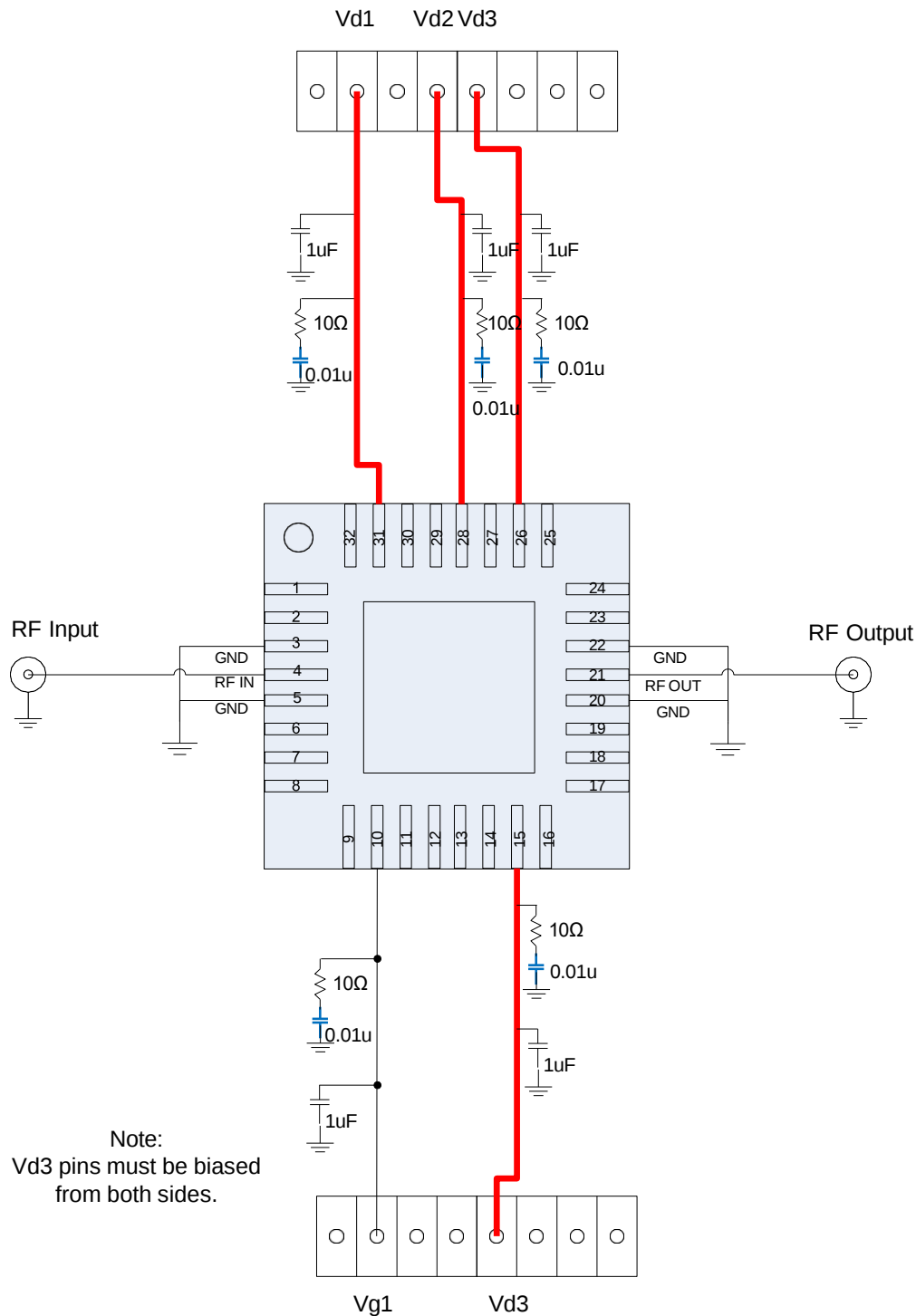
BOTTOM VIEW



SIDE VIEW

The units are in [mm].

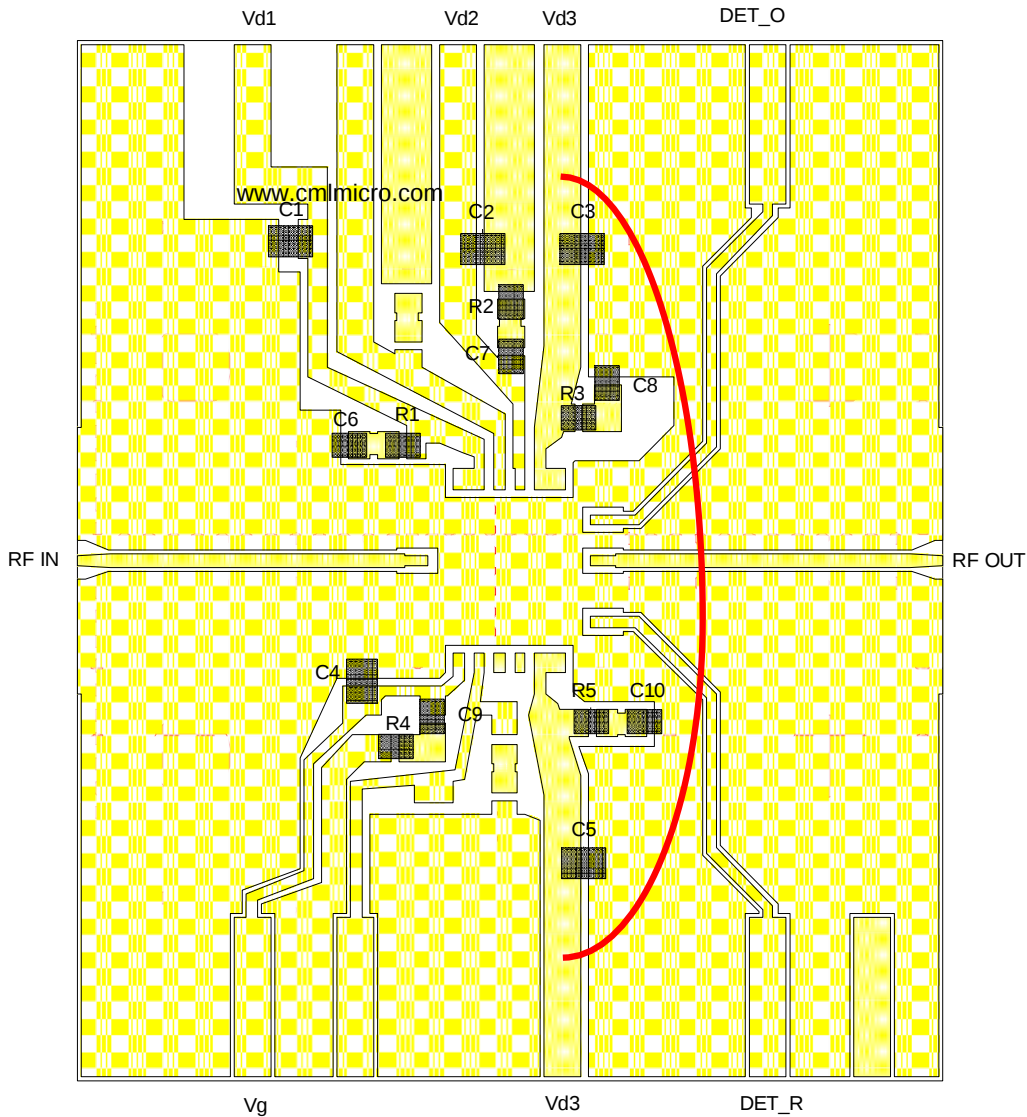
Application Circuit:



Recommended Application Board Design:

Board Material is 10mil (Dielectric) thickness Rogers 4350B with 0.5oz copper clads.

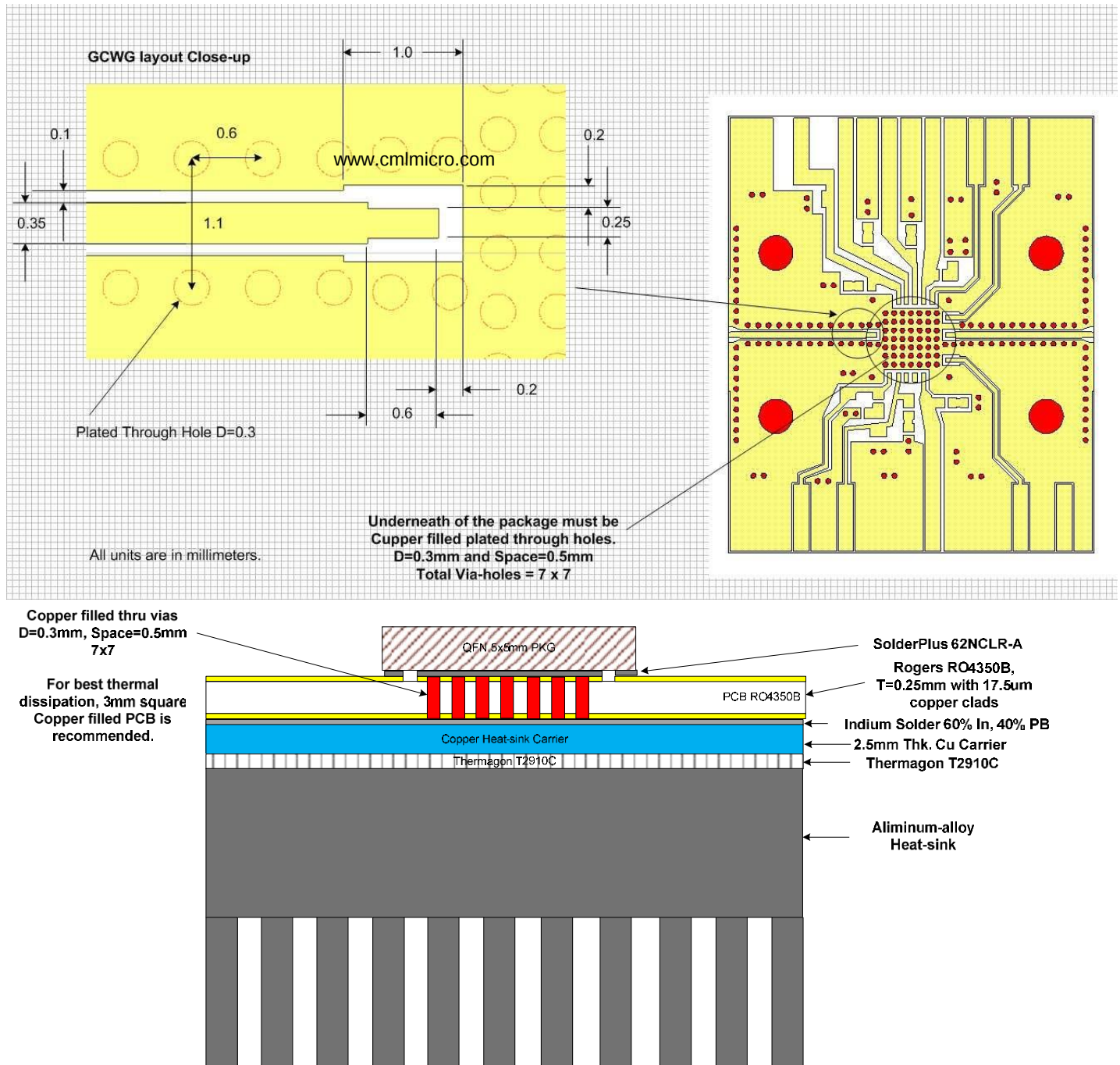
Board is soldered on a gold plated solid copper block and adequate heat-sinking is required for 16.8W total power dissipation.



Part	Description
C1, C2, C3, C4, C5	1uF capacitor (0603)
C6, C7, C8, C9, C10	0.01uF Capacitor (0402)
R1, R2, R3, R4, R5	10Ω Resistor (0402)

Recommended Application Board Design:

Board Material is 10mil (Dielectric) thickness Rogers 4350B with 0.5oz copper clads. The board material and mounting pattern, as defined in the data sheet, optimizes RF performance and is strongly recommended. An electronic drawing of the land pattern is available upon request from CML Sales & Application Engineering.



Handling precautions:

This product includes input protection, however, precautions should be taken to prevent device damage from electro-static discharge. CML does not assume any responsibility for the use of any circuitry described. No IPR or circuit patent licences are implied. CML reserves the right at any time without notice to change the said circuitry and this product specification. CML has a policy of testing every product shipped using calibrated test equipment to ensure compliance with this product specification. Specific testing of all circuit parameters is not necessarily performed.

Contact information

For further information please contact your local CML sales representative.

Contact details can be found at www.cmlmicro.com