

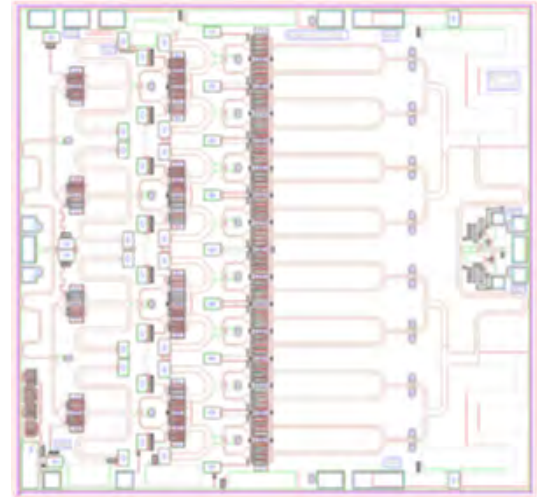
# MMA-172135D 17 - 21 GHz, 3 W Power Amplifier

## Features:

- Frequency Range: 17 – 21 GHz
- P1dB: 35 dBm
- IM3 Level -45 dBc @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



Die size: 2.95mm X 2.80mm X 0.05mm

## Description:

The MMA-172135D is a broadband GaAs MMIC Power amplifier with 3 watt output power and high gain of 27 dB over full 17 to 21 GHz 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          |
| Toper   | Operating Temperature           | °C    |      | -40 to +85  |
| Tch     | Channel Temperature             | °C    |      | +150        |
| Tstg    | Storage Temperature             | °C    |      | -55 to +150 |
| Tmax    | Max. Assembly Temp (20 sec max) | °C    |      | +250        |

\*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 = 20 dBm / 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.

## ESD Caution

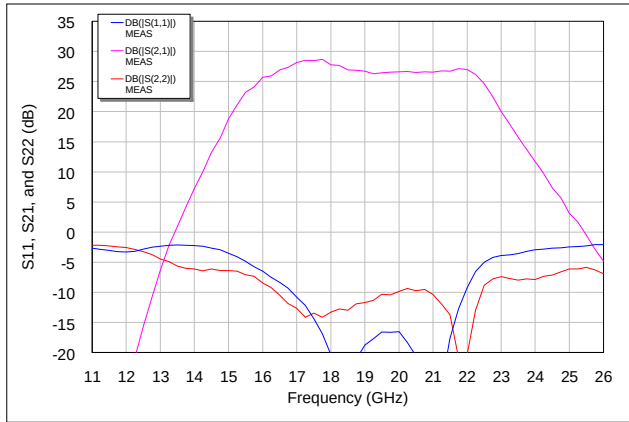


High-performance RF integrated circuits are highly sensitive to electrostatic discharge (ESD) and may contain unprotected inputs and outputs. Handling and assembly should be conducted in an ESD-controlled environment. It is recommended that ESD precautions and protocols are adopted to minimise the risk of electrostatic discharge and protect product integrity.

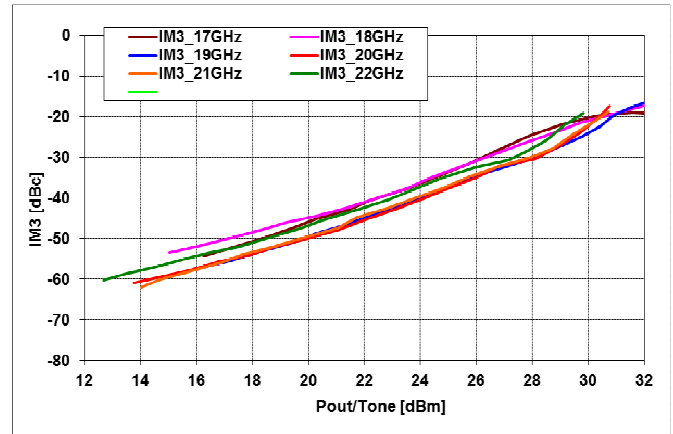
# MMA-172135D

## 17 - 21 GHz, 3 W Power Amplifier

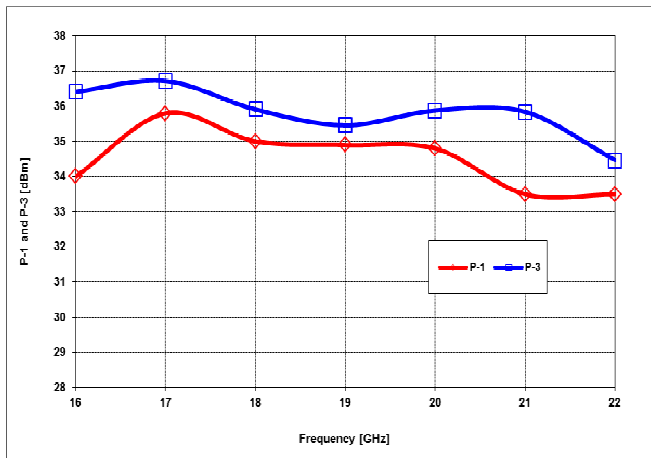
**Typical RF Performance:**  $V_{ds} = 6\text{ V}$ ,  $V_g = -0.85\text{ V}$ ,  $I_{ds} = 2000\text{ mA}$ ,  $Z_0 = 50\ \Omega$ ,  $T_a = 25\text{ }^\circ\text{C}$



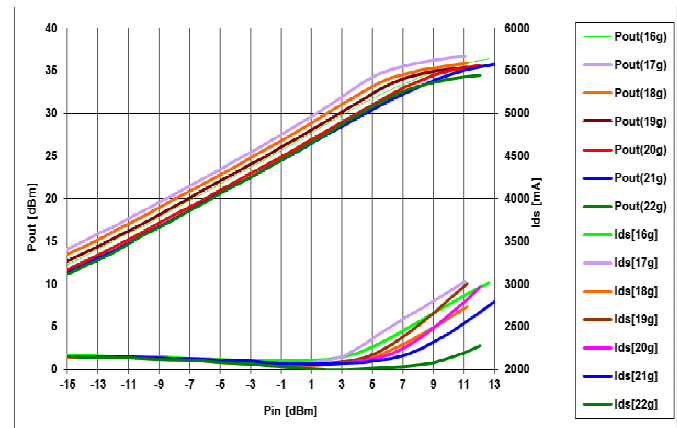
S11 [dB], S21 [dB], and S22 [dB] vs. Frequency



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



P-1 and Psat vs. Frequency

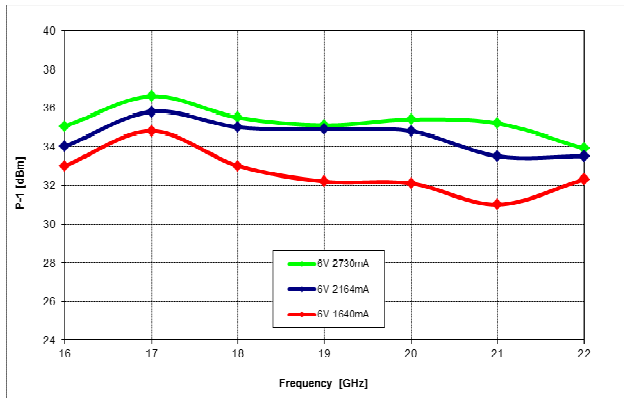


Pout [dBm], and Ids [mA] vs. Input power [dBm]

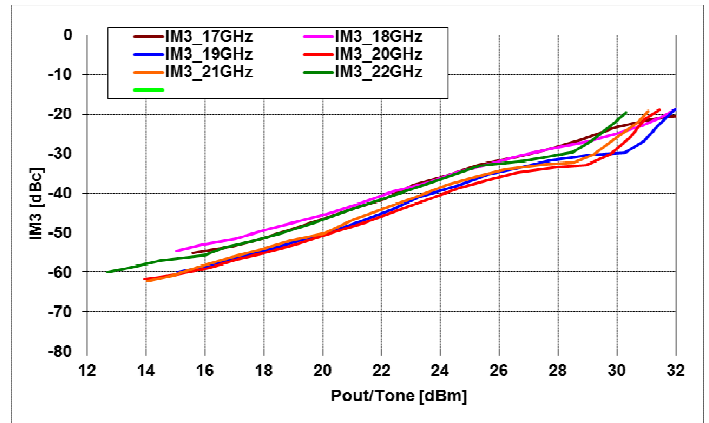
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## Typical Bias dependent RF Performance:

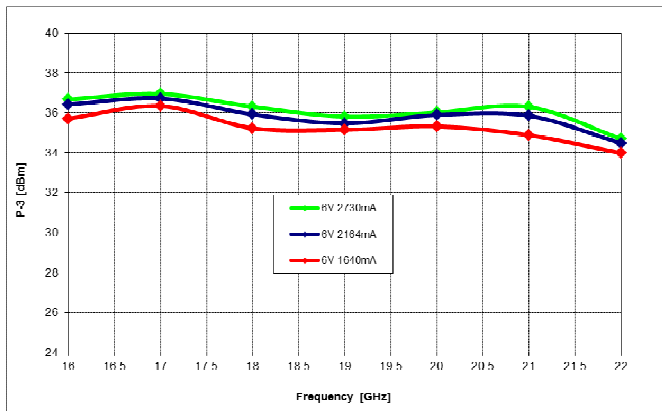


Bias dependent P1 vs. Frequency

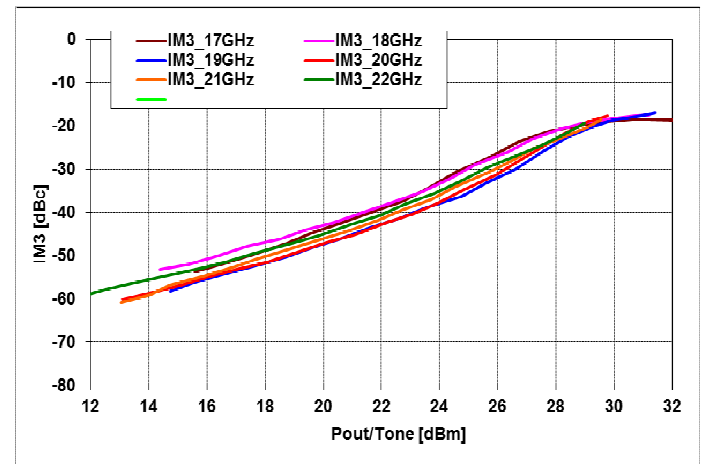


IM3 Level [dBc] vs. output power/tone [dBm]

@ Vds = 6 V, Idsq = 2.5 A



Bias dependent P-3 vs. Frequency

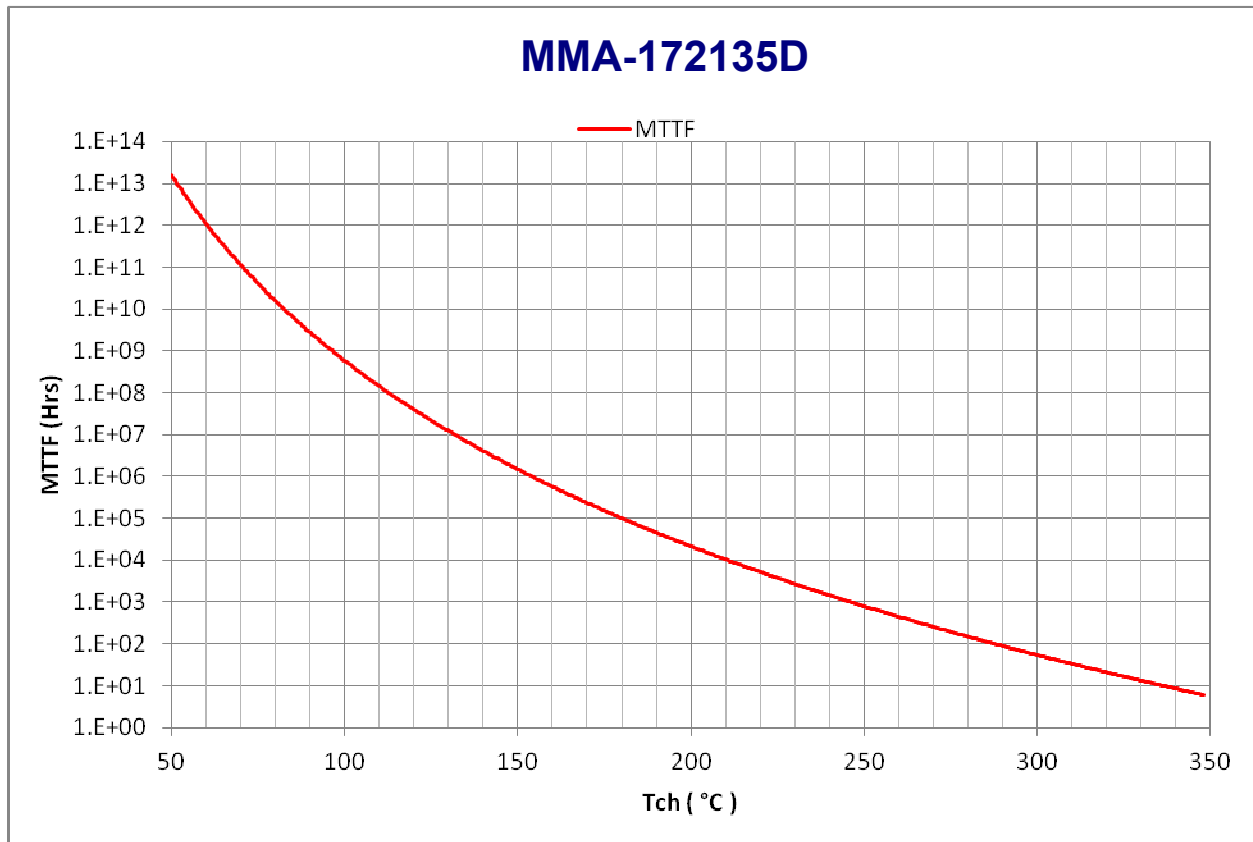


Pout [dBm], and Ids [mA] vs. Input power [dBm]

@ Vds = 6 V, Idsq = 1.5 A

# MMA-172135D

17 - 21 GHz, 3 W Power Amplifier



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

## Applications

The **MMA-172135D** MMIC power amplifier is designed for use as a power stage amplifier in microwave transmitters. It is ideally suited for 17 to 21 GHz band point to point radio applications requiring a flat gain response and excellent linearity performance.

## Biasing and Operation

The recommended bias conditions for best performance for the **MMA-172135D** are  $V_{DD} = 6.0V$ ,  $I_{dsq} = 2000$  mA. Performance improvements are possible depending on applications. The drain bias voltage range is 5 to 6 V and the quiescent drain current biasing range is 1500 mA to 2800 mA. 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 ( $V_p = -2$  V). 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 **MMA-172135D** is shown in following pages.

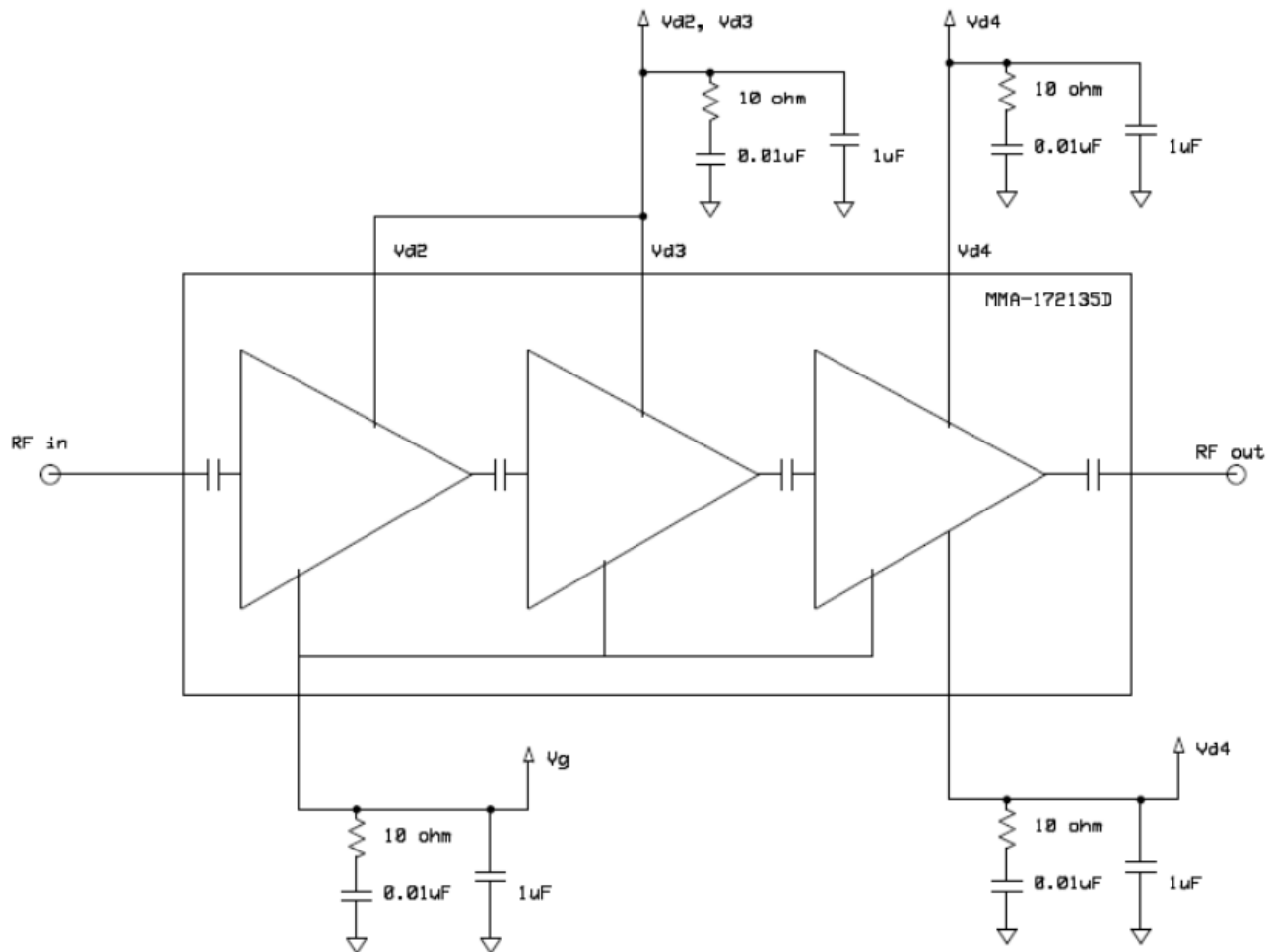
## Assembly Techniques

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.

# MMA-172135D

17 - 21 GHz, 3 W Power Amplifier

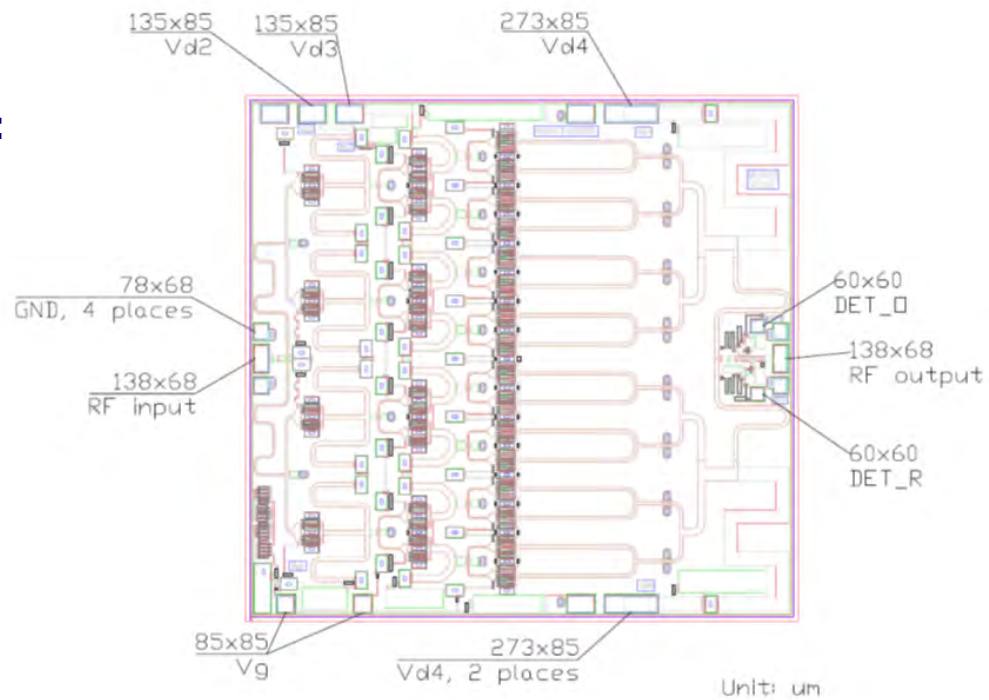
## Application Circuit:



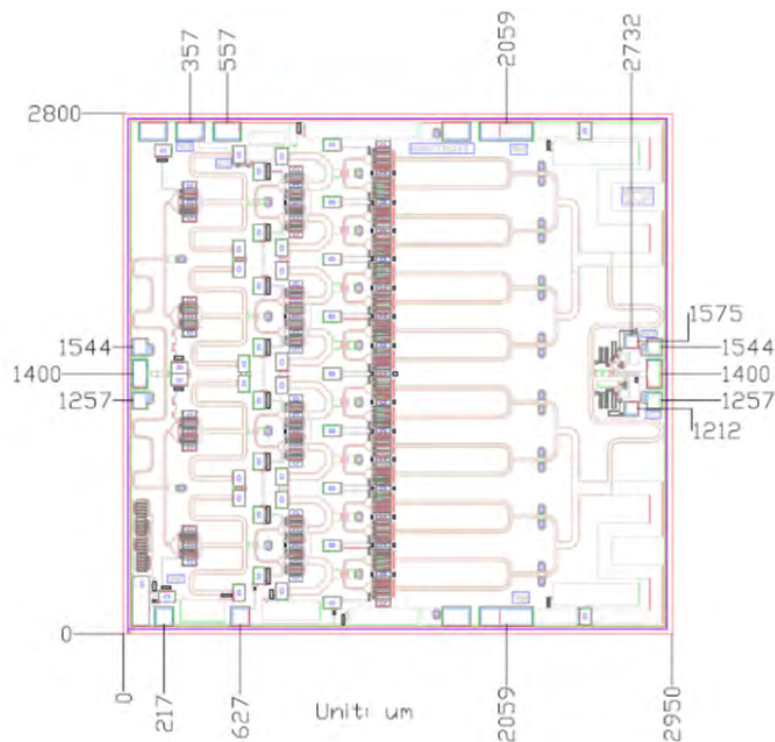
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## Pad Sizes:

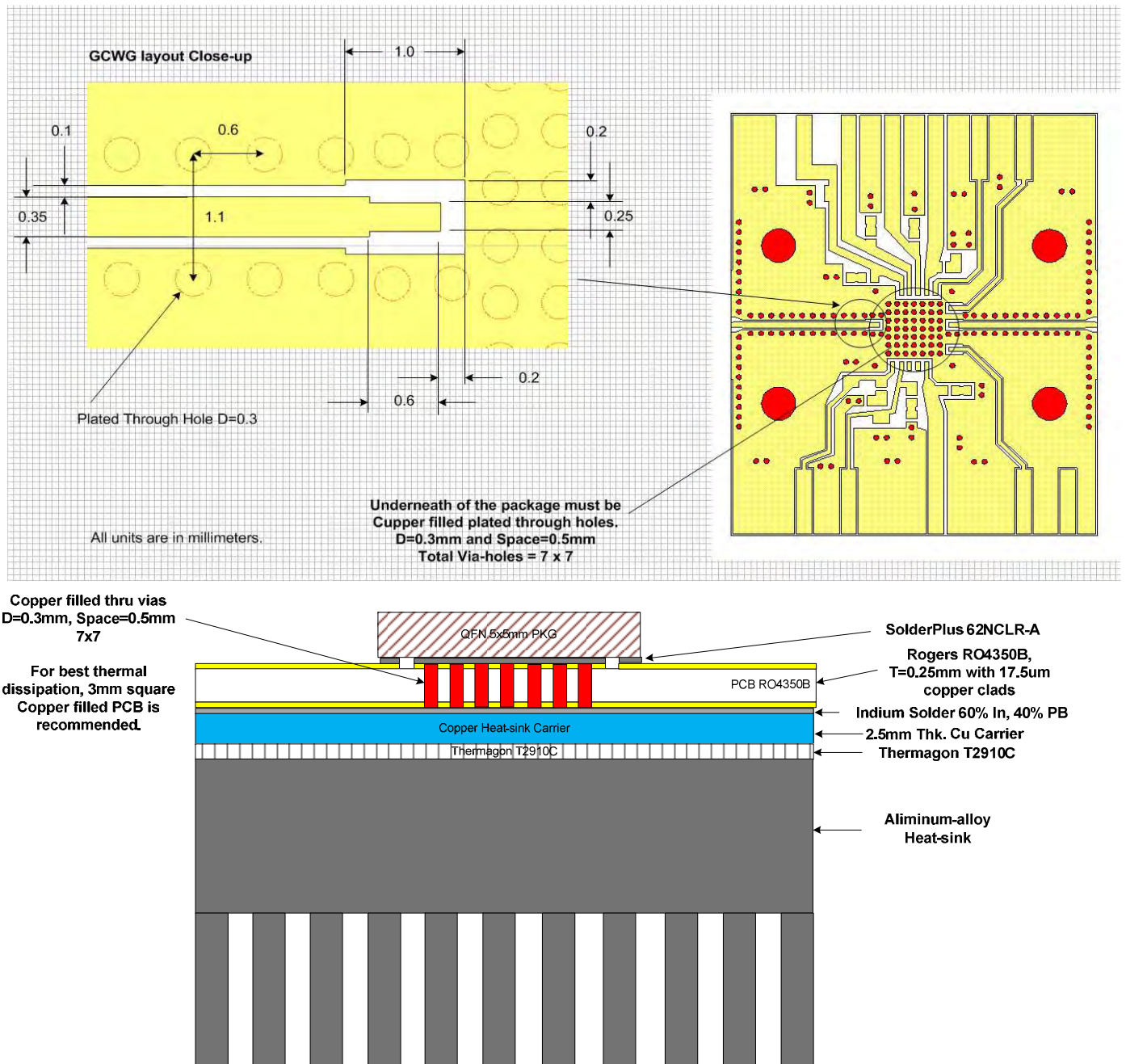


## Pad Locations:



## Recommended Application Board Design:

Board Material is 10 mil (Dielectric) thickness Rogers 4350B with 0.5 oz 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 & Tech Support.



## RoHS Compliance



CML Micro certifies, to the best of our knowledge, that its products comply with RoHS directive (2011/65/EU), as amended by Directive (EU) 2015/863.

## REACH Compliance



CML Micro certifies, to the best of our knowledge, that its products do not contain any of the banned substances specified in the SVHC list at <https://echa.europa.eu/candidate-list-table>. CML Micro are committed to ensuring the safety of products and the compliance with regulations. Publications will be updated in the event that REACH control is compromised.

## Contact Information

For further information please contact your local CML sales representative.  
Contact details can be found at [www.cmlmicro.com](http://www.cmlmicro.com).

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