

# X-Band Low Noise Amplifier

## 8 - 12 GHz



CGY2124UH/C1

Rev. V1

### Features

- Single Supply Architecture
- Noise Figure: 1.1 dB
- Gain: 32 dB
- Gain Flatness:  $\pm 0.8$  dB
- OIP3: 20 dBm
- P1dB: 10 dBm
- Return Loss: 12 dB
- Power Supply: 55 mA @ 5 V
- Chip Size: 2.4 x 1.56 mm
- 100% RF Tested, Known Good Die
- Demonstration Boards Available
- Space & MIL-STD Available
- RoHS\* Compliant

### Applications

- Radar
- Telecommunication
- Instrumentation

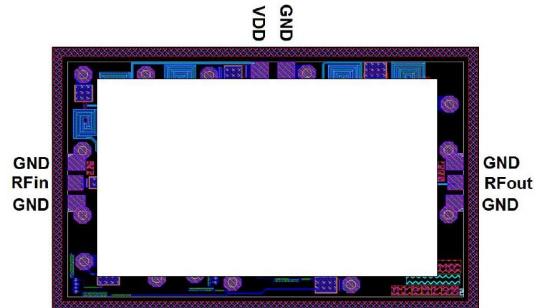
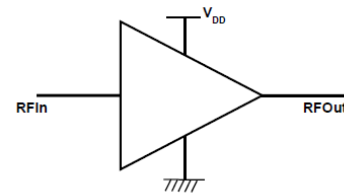
### Description

The CGY2124UH/C1 is a high performance GaAs single supply low noise amplifier MMIC designed to operate in the X band.

This device has an ultra-low noise figure of 1.1 dB with minimum 32 dB of gain. The on chip matching provides better than 12 dB of input and output return loss. It can be used in Radar, Telecommunication and Instrumentation applications.

The die is manufactured using a 0.13  $\mu\text{m}$  gate length pHEMT technology. The MMIC uses gold bonding pads and backside metallization and is fully protected with Silicon Nitride passivation to obtain the highest level of reliability.

This technology has been evaluated for Space applications and is on the European Preferred Parts List of the European Space Agency.



### Pad Configuration

| Pad              | Function          |
|------------------|-------------------|
| RFOUT            | RF Output         |
| RFIN             | RF Input          |
| VDD              | Single Supply Pad |
| GND <sup>1</sup> | Ground            |

1. The exposed pad centered on the package bottom must be connected to RF, DC and thermal ground.

### Ordering Information

| Part Number  | Package |
|--------------|---------|
| CGY2124UH/C1 | Die     |

\* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

# X-Band Low Noise Amplifier

## 8 - 12 GHz



CGY2124UH/C1

Rev. V1

### Electrical Specifications<sup>2</sup>: Freq. = 8 - 12 GHz, $T_A = +25^\circ\text{C}$ , $V_{DD} = 5\text{ V}$

| Parameter            | Test Conditions      | Units | Min. | Typ. | Max. |
|----------------------|----------------------|-------|------|------|------|
| Gain                 | —                    | dB    | 32   | 33   | 34   |
| Noise Figure         | —                    | dB    | —    | 1.1  | 1.3  |
| Drain Supply Voltage | —                    | dB    | —    | 5    | —    |
| Drain Supply Current | —                    | dB    | 45   | 55   | —    |
| Reverse Isolation    | $RF_{OUT} / RF_{IN}$ | dB    | -50  | -55  | —    |
| P1dB                 | —                    | dBm   | —    | 10   | —    |
| Output IP3           | —                    | dBm   | 19.0 | 20.0 | 21.2 |
| Input Return Loss    | 50 $\Omega$          | dB    | —    | -12  | —    |
| Output Return Loss   | 50 $\Omega$          | dB    | —    | -12  | —    |

2. Measured reference plane are the input and output planes of the MMIC.

### Absolute Maximum Ratings<sup>3,4</sup>

| Parameter             | Absolute Maximum |
|-----------------------|------------------|
| RF Input Power        | 10 dBm           |
| Drain Voltage         | 0 to 6 V         |
| Drain Current         | 100 mA           |
| Junction Temperature  | +150°C           |
| Operating Temperature | -55°C to +85°C   |
| Storage Temperature   | -55°C to +150°C  |

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- MACOM does not recommend sustained operation near these survivability limits.

### Thermal Characteristics

| Parameter          | Absolute Maximum |
|--------------------|------------------|
| Thermal Resistance | TBD°C/W          |

### Handling Procedures

Please observe the following precautions to avoid damage:

### Static Sensitivity

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

# X-Band Low Noise Amplifier

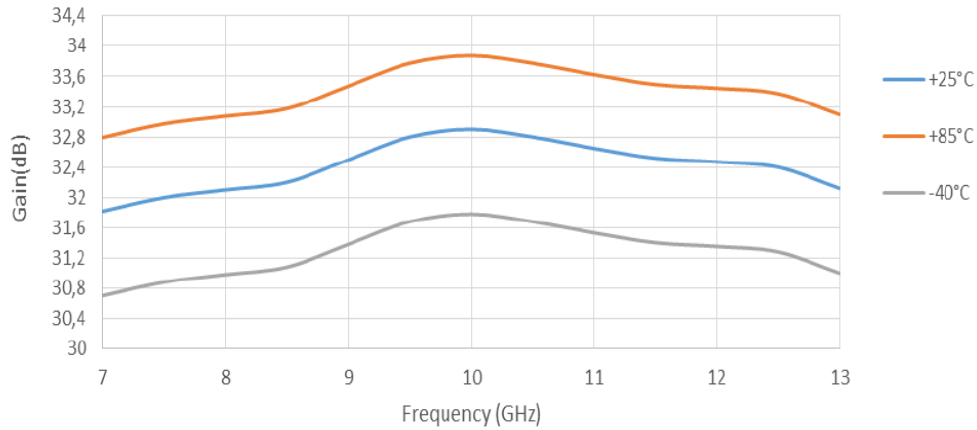
## 8 - 12 GHz



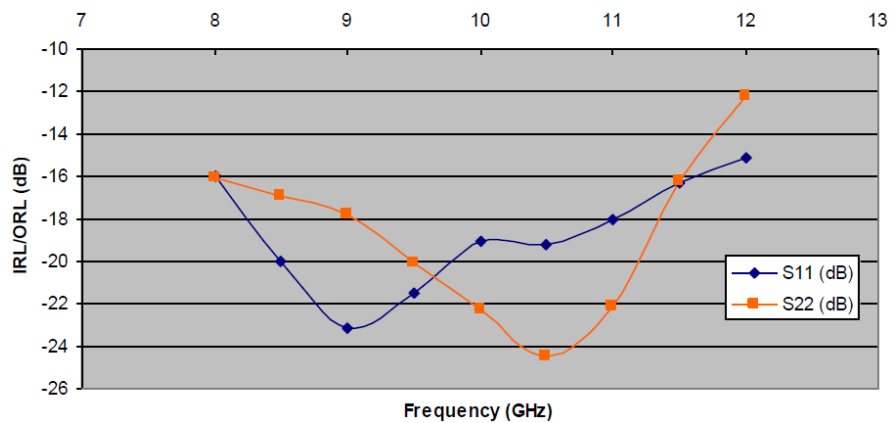
CGY2124UH/C1  
Rev. V1

Typical Performance Curves:  $V_{DD} = 5\text{ V}$ ,  $I_D = 55\text{ mA}$ ,  $T_A = +25^\circ\text{C}$

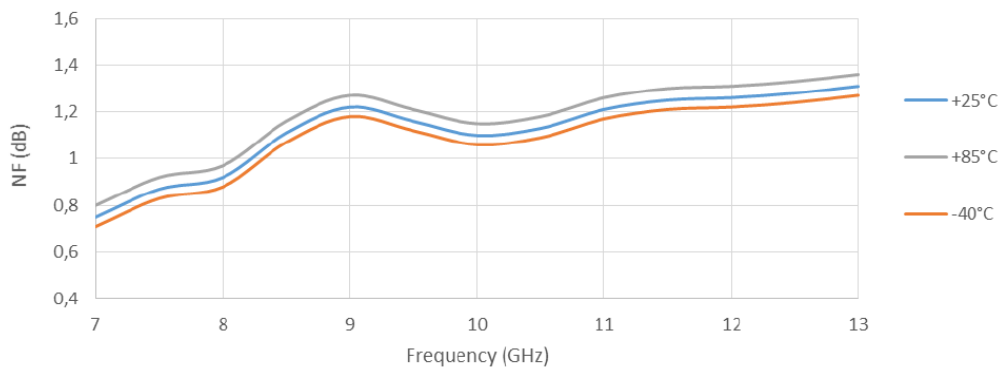
Gain vs. Frequency



Return Loss vs. Frequency



Noise Figure vs. Frequency



# X-Band Low Noise Amplifier

## 8 - 12 GHz



CGY2124UH/C1

Rev. V1

### Application Schematic

To prevent instability of the customer design it is highly recommended to place small chip capacitors as near as possible to the die and to connect them with bonding as short as possible.

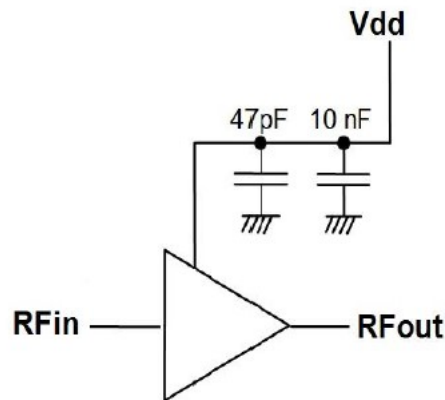
Additionally, a 10 nF capacitor can be added on a drain connection to insure low frequency decoupling, the power supply decoupling could be complemented with 1  $\mu$ F capacitors.

### Soldering

To avoid permanent damages or impact on reliability during soldering process, die temperature should never exceed 300°C.

Temperature in excess of 300°C should not be applied to the die longer than 1mn.

Toxic fumes will be generated at temperatures higher than 400°C.



# X-Band Low Noise Amplifier

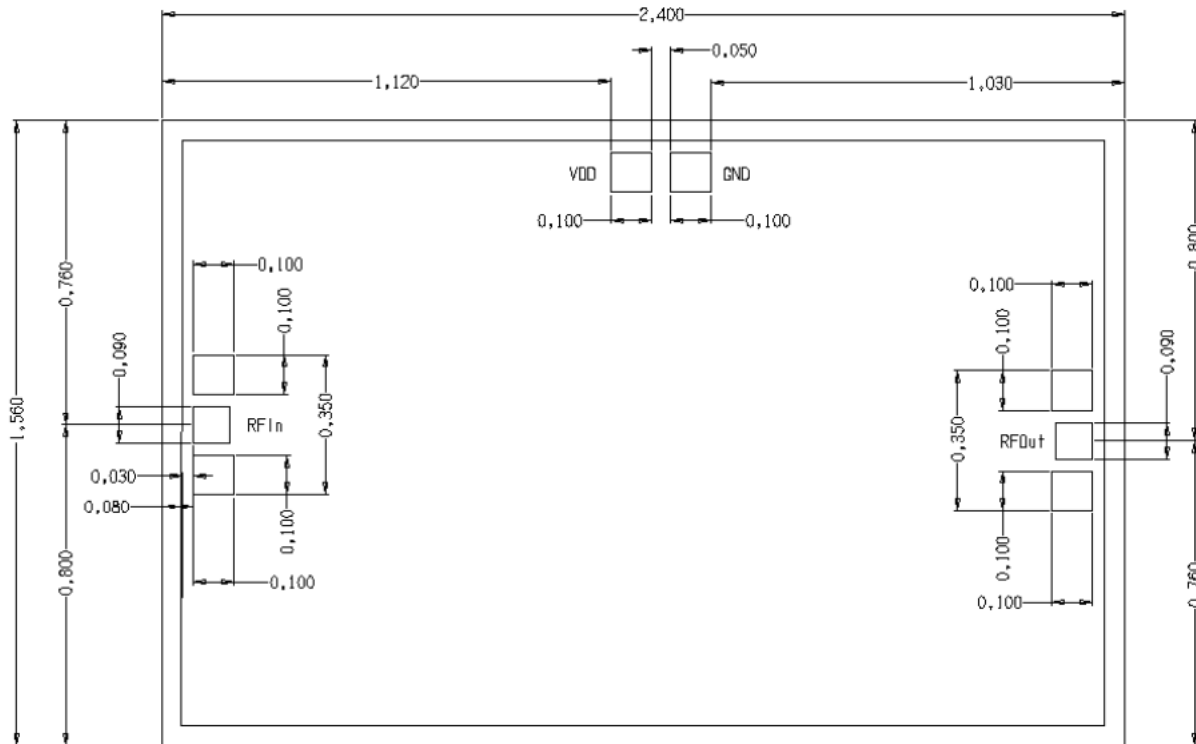
## 8 - 12 GHz



CGY2124UH/C1

Rev. V1

### Mechanical Information



### Pad Position<sup>9,10</sup>

| Pad Name    | Pad Coordinate |      | Pad Size  | Description                           |
|-------------|----------------|------|-----------|---------------------------------------|
|             | X              | Y    |           |                                       |
| VDD         | 1170           | 1430 | 100 x 100 |                                       |
| GND         | 1320           | 1430 | 100 x 100 |                                       |
| RFIN GND N  | 130            | 925  | 100 x 100 | RF in Ground North                    |
| RFIN        | 125            | 800  | 90 x 90   | RF in Signal - spacing to GND pad 30  |
| RFIN GND S  | 130            | 675  | 100 x 100 | RF in Ground South                    |
| RFOUT GND N | 2270           | 635  | 100 x 100 | RF out Ground North                   |
| RFOUT       | 2275           | 760  | 90 x 90   | RF out Signal - spacing to GND pad 30 |
| RFOUT GND S | 2270           | 885  | 100 x 100 | RF out Ground South                   |

# X-Band Low Noise Amplifier

## 8 - 12 GHz



CGY2124UH/C1

Rev. V1

MACOM Technology Solutions Inc. ("MACOM"). All rights reserved.

These materials are provided in connection with MACOM's products as a service to its customers and may be used for informational purposes only. Except as provided in its Terms and Conditions of Sale or any separate agreement, MACOM assumes no liability or responsibility whatsoever, including for (i) errors or omissions in these materials; (ii) failure to update these materials; or (iii) conflicts or incompatibilities arising from future changes to specifications and product descriptions, which MACOM may make at any time, without notice. These materials grant no license, express or implied, to any intellectual property rights.

THESE MATERIALS ARE PROVIDED "AS IS" WITH NO WARRANTY OR LIABILITY, EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHT, ACCURACY OR COMPLETENESS, OR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.