Ultra Low Noise Amplifier
18 - 26 GHz

CGY2121XUH/C2
Rev. V1

Features

- Noise Figure:
  <1.5 dB on overall bandwidth
  (1.2 dB @ 22 GHz)
- Flat Gain:
  19 dB on overall bandwidth (±0.4 dB)
- P1dB:
  >5 dBm
  (7 dBm @ 22 GHz)
- Single Supply: -1.5 V & +1.5V
- Low Consumption: <92 mW
- Robust CW Input Power: 19 dBm Max.
- Input Output Matched: 50 Ω
- Input Return Loss: >12 dB @ 22 GHz
- Output Return Loss: >11 dB @ 22 GHz
- 100% RF Tested, Inspected Known Good Die
- Samples & Demonstration Boards Available
- RoHS* Compliant

Applications

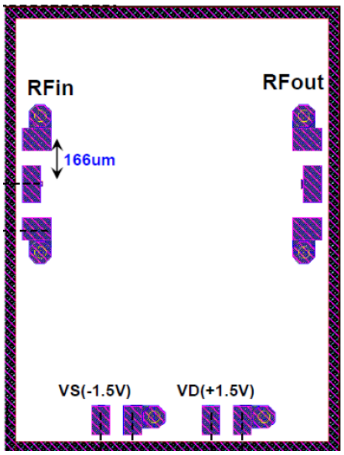
- Radar
- Telecommunication
- Instrumentation

Description

The CGY2121XUH/C2 is a high performance GaAs Low Noise Amplifier MMIC designed to operate in the K band.

This device has an exceptionally low noise figure of 1.2 dB with a very flat 19 dB of gain (+/-0.4 dB). The on chip matching provides 12 dB of input return loss and 11 dB of output return loss. Thanks to the DC regulation the gain and noise are very stable with regards to temperature change. It can be used in Radar, Telecommunication and Instrumentation applications.

The die is manufactured using an advanced 70 nm gate length high Indium content MHEMT Technology. The MMIC uses gold bond pads and backside metallization and is fully protected with Silicon Nitride passivation to obtain the highest level of reliability.



Pad Configuration

Pad	Function
RFin	RF Input
VS (VD2)	Negative Supply Voltage
VD (VD1)	Positive Supply Voltage
RFout	RF Output
GND[1]	Backside

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

Ordering Information

Part Number	Package
CGY2121XUH/C2	Die

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

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Electrical Specifications[2]: Freq. = 18 - 26 GHz, T_A = +25°C, Vd = +1.5 V, Vs = -1.5 V

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Gain	VD = 1.3 V / 1.5 V / 1.7 V	dB	18.4	19.0	19.7
Noise Figure	—	dB	1.2	1.3	1.7
Supply Voltage	—	dB	1.3	1.5	1.7
Supply Current	—	dB	44	61	78
Reverse Isolation	RF_{OUT} / RF_{IN}	dB	-50	—	-32
Output P1dB	20 GHz 22 GHz 24 GHz	dBm	—	6.0 7.0 8.5	—
Input Return Loss	50 Ω	dB	—	-12	-10
Output Return Loss	50 Ω	dB	—	-12	-10

1. Performance on Reference Board with o.25 nH bonding parasitic inductor at input and output.

Absolute Maximum Ratings[4,5]

Parameter	Absolute Maximum
RF CW Input Power	19 dBm
Gate Voltage	-3 to 0 V
Drain Voltage	0 to +3 V
Drain Current	10/100 mA
Junction Temperature	+150°C
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to +150°C

4. Exceeding any one or combination of these limits may cause permanent damage to this device.
5. 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.

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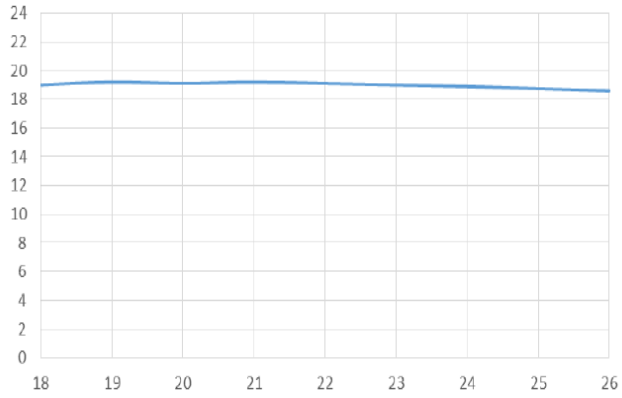
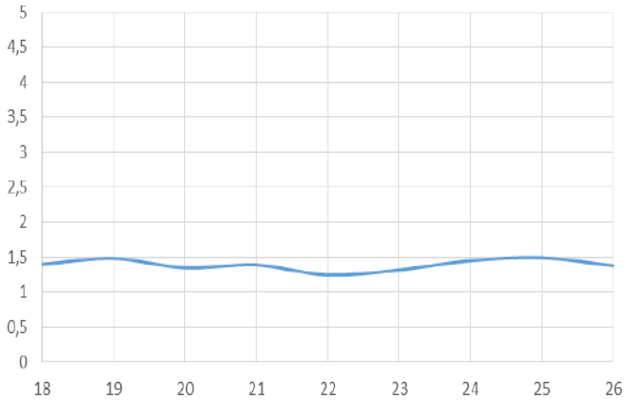
Typical Performance Curves: On Carrier Measurements, 0.25 nH Bonding
V_D = 1.5 V, V_S = -1.5 V, T_A = +25°C

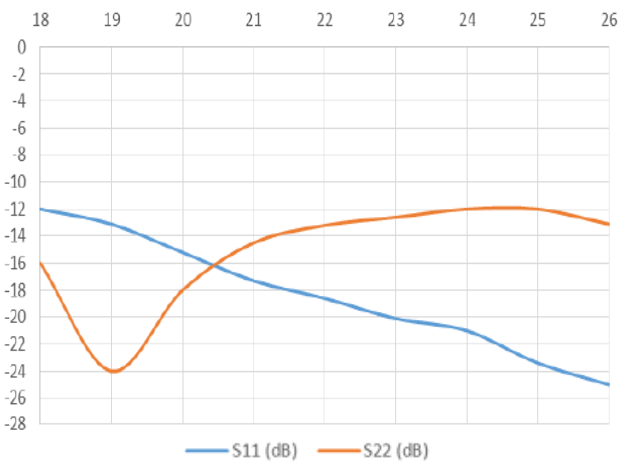
Gain vs. Frequency



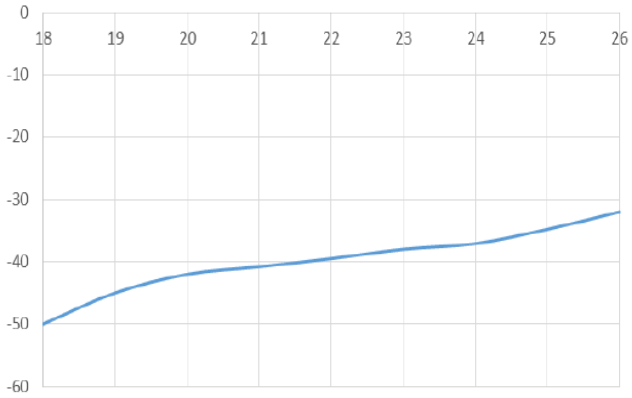
Noise Figure vs. Frequency



Return Loss vs. Frequency



Reverse Isolation vs. Frequency



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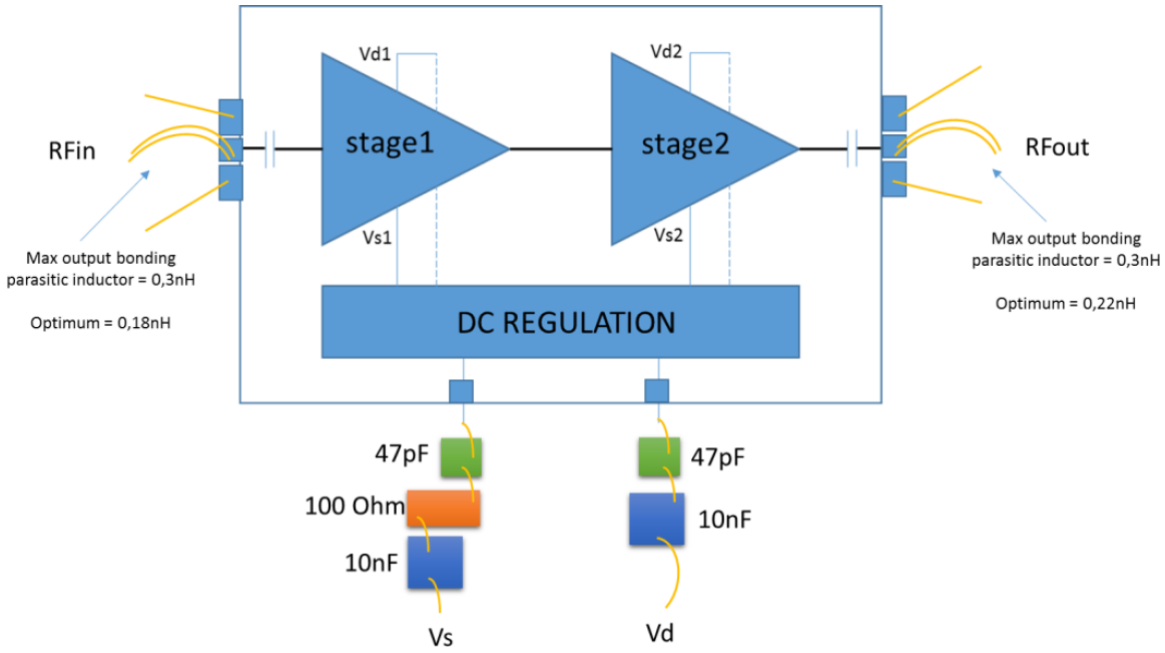
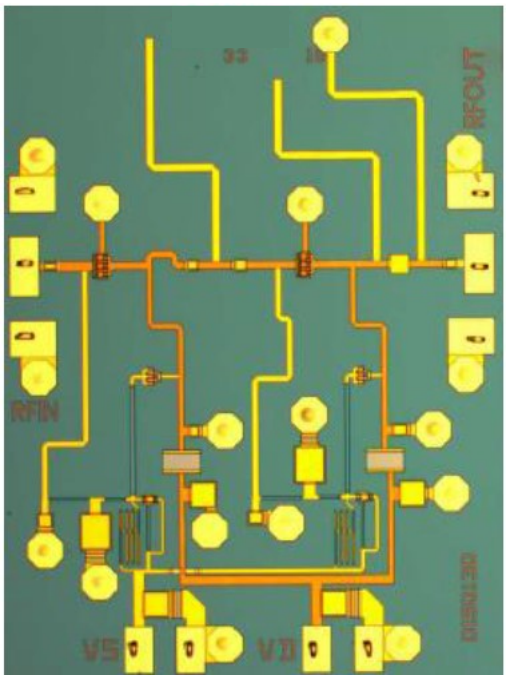
Application Schematic[3]



3. 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's as short as possible. Additionally, a 10 nF capacitor can be added on a drain connection. In the gate circuitry, a 500 Ω resistor may be added in series to improve gate isolation and prevent unwanted oscillations. The resistors are introducing some low pass filtering in case of fast power switching using gate control architecture.

Die Photograph



Soldering

To avoid permanent damages or impact on reliability during soldering process, die temperature should never exceed 330°C.

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

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

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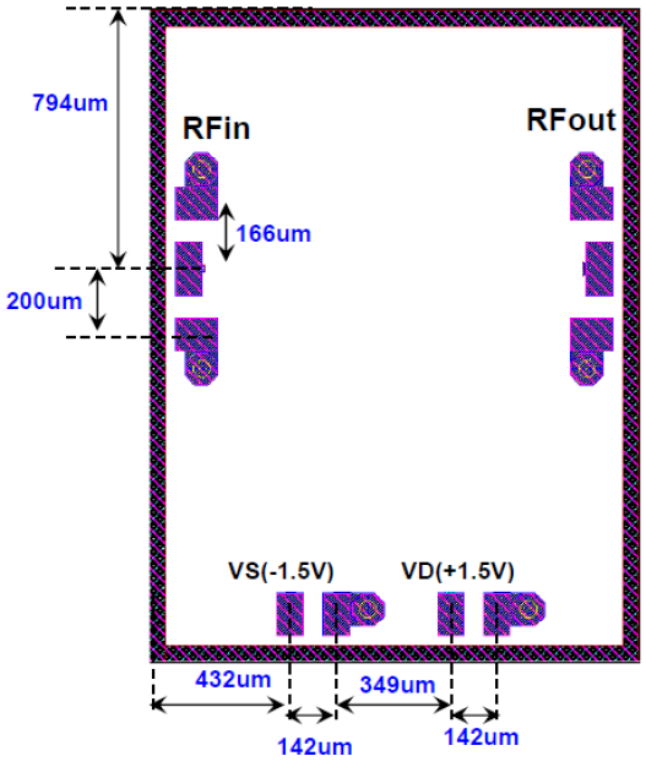
Die Layout



Bonding Pad Coordinates

Pad	X Coordinate	Y Coordinate
GND	100	1406
RFin	100	1206
GND	100	1006
VS	432	100
GND	574	100
VD	923	100
GND	1065	100
GND	1400	1006
RF_{OUT}	1400	1206
GND	1400	1406

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