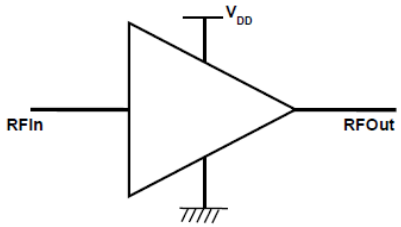
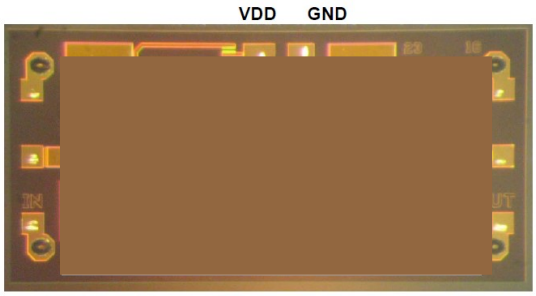
Low Noise Amplifier, X-Band 8 - 12 GHz

CGY2221UH/C1
Rev. V1

Features

- Suitable for X-Band Applications
- Frequency Range: 8 - 12 GHz
- Single Supply Architecture
- Gain: 16 dB
- Gain Flatness: ± 0.8 dB
- Noise Figure: 1.6 dB
- Input Return Loss: 12 dB
- Output Return Loss: 15 dB
- Maximum Input Power: 31 dBm
- Output P1dB: 17 dBm
- Output IP3: 29 dBm
- Power Supply: 82 mA @ 5 V
- Chip Size: 2 x 1 mm
- RoHS* Compliant





Applications

- Radar
- Telecommunications
- Instrumentations

Description

The CGY2221UH/C1 is a high performance GaAs single supply low noise amplifier MMIC designed to operate in the X-band with an extremely high maximum input RF power.

This device has an a low noise figure of 1.6 dB with minimum 16 dB of Gain. The on chip matching provides better than 12 dB of input and output return loss.

The die is manufactured using a 0.13 µm 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.

Pin Configuration[1]

Pin	Function
RFIN	RF Input
RFOUT	RF Output
GND	Ground
VDD	Single Supply Voltage

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

Ordering Information

Part Number	Package
CGY2221UH/C1	Die

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

Electrical Specifications: Measured On Wafer, Freq. = 8 - 12 GHz, V_{DD} = 5 V, T_A = +25°C

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Drain Voltage	—	V	—	5	—
Drain Supply Current	—	mA	72	82	92
Gain	—	dB	16	17	—
Noise Figure	—	dB	1.5	1.6	1.8
Input Return Loss	—	dB	—	12	—
Output Return Loss	—	dB	—	12	—
Reverse Isolation	RFOUT / RFIN	dB	—	-35	-30
P1dB	—	dBm	16	17	—
Output IP3	—	dBm	—	29	—

Absolute Maximum Ratings[2,3]

Parameter	Absolute Maximum
Input Power CW 10% Duty Cycle,10 µs pulse	 21 dBm 31 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

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

Thermal Characteristics

Parameter	Absolute Maximum
Thermal Resistance	TBD

Handling Procedures

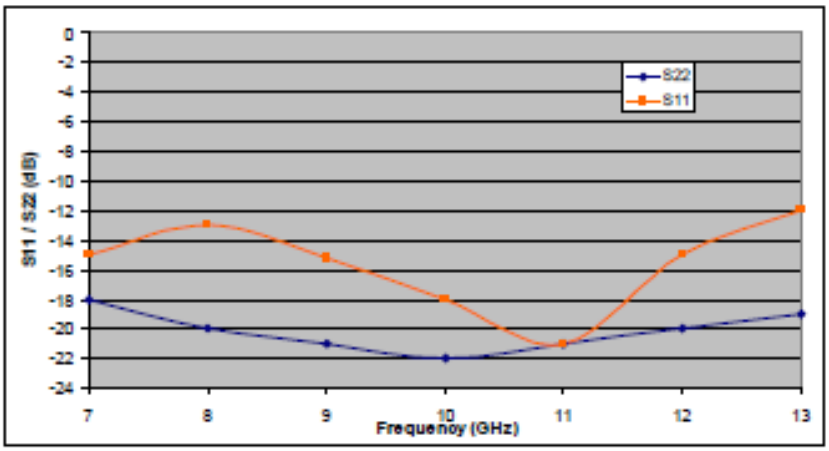
Please observe the following precautions to avoid damage:

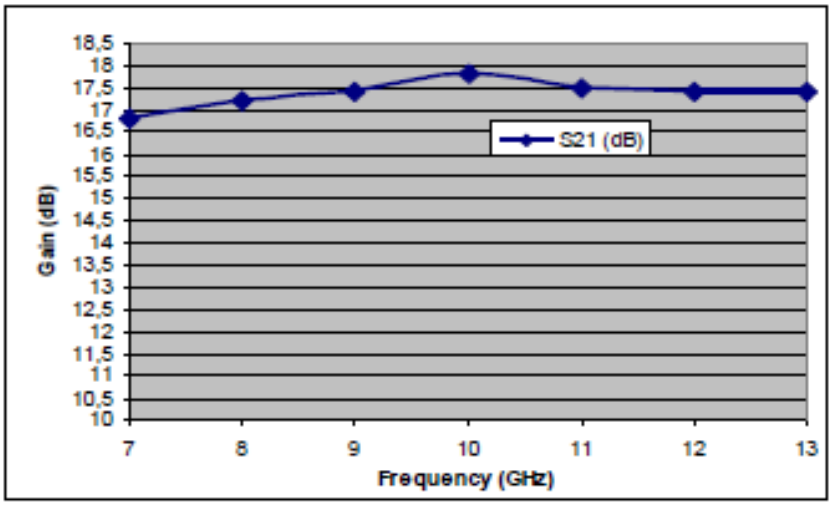
Static Sensitivity

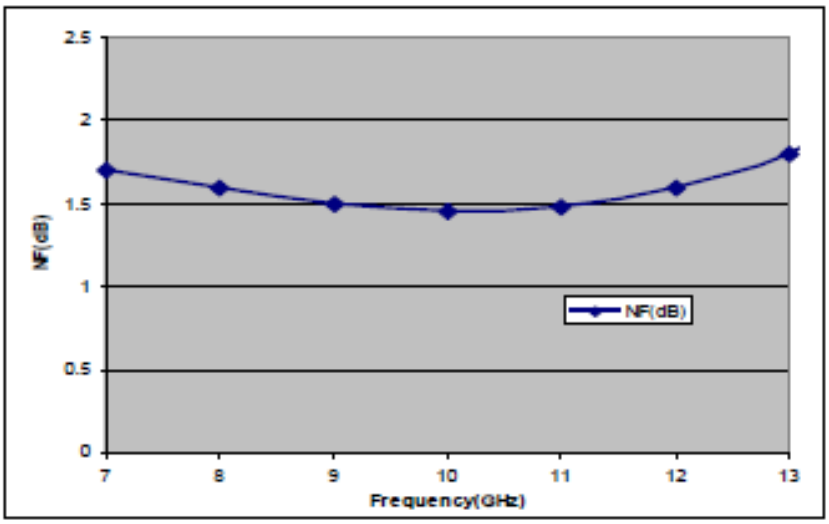
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

S-Parameters, Noise Figure, K

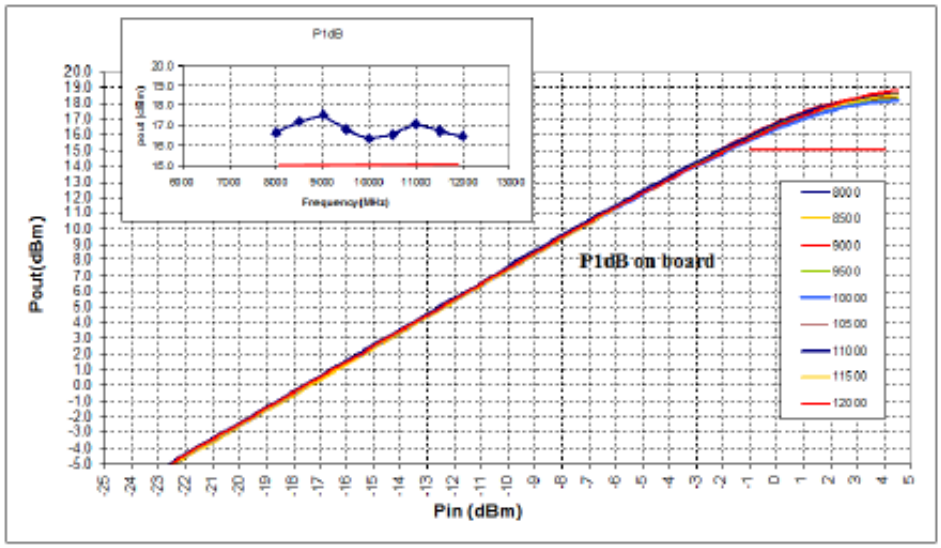
Measured at 25°C, VDD = 5V ID = 82mA ,Input bonding Inductance = 0.4nH, Out Bonding = 0.2nH



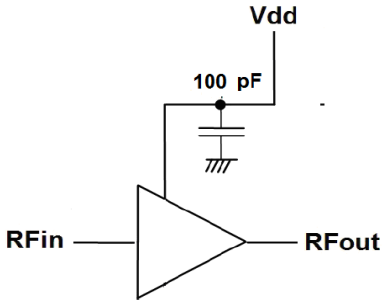




Output Power: Measured on Board with Wire inductances Lin = 0.4nH and Lout = 0.2nH



Application Schematic



Application Information

To prevent instability of the customer design it is highly recommended to place small chip capacitors as near as possible to the CGY2221HV/C1, here 100 pF recommended as placed in the demonstration board.

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 µF capacitors.

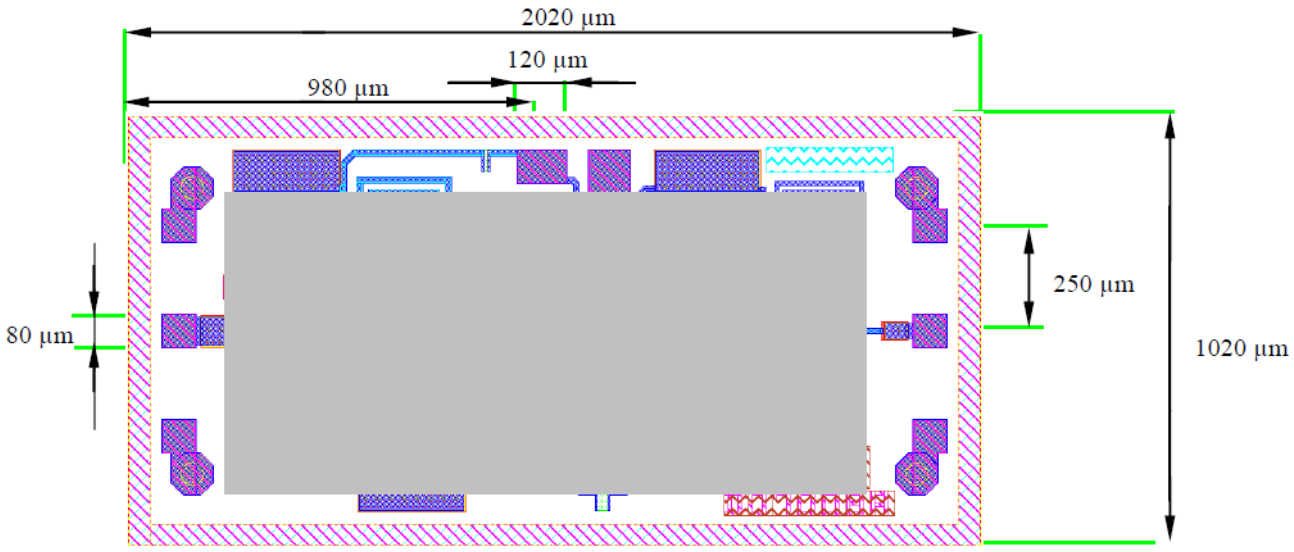
Soldering

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.

Pad Configuration



Pad Coordinates

Pad	Coordinates (µ)	
	X	Y
RF Input	90	510
Rf Output	1930	510
Ground	1100	930
Single Supply Voltage	980	930

In order to ensure good RF performances and stability It is key to connected to the ground the pad available on the backside of the die. Input bonding wire inductance should be between 0.2 nH and 0.6 nH and output bonding inductance between 0.15 nH and 0.5 nH. We recommend 25 µm gold wire bondings. Pad opening enables to connect two wires (wedge) on each RF pads.