



CITCRYO4-12A

Cryogenic HEMT Low Noise Amplifier

KEY FEATURES

- Very low noise, average 3K, over 4 to 12 GHz.
- Operates with wide range of DC supply voltage.
- Provides usable gain and noise at DC power as low as 4 mW.
- Input return loss >15 dB.
- Output return loss >20 dB.
- Operating temperature 4.2 K to 320 K

PERFORMANCE

FEATURES

- RF Frequency
 - 4 to 12 GHz
- Gain @ 15k
 - 32 dB \pm 2 dB
- Average noise temperature @ 15 K
 - <5 Kelvin
- Average noise figure @ 15 K
 - 0.08 dB

APPLICATIONS

- ✓ Radio astronomy arrays
- ✓ Satellite and Space Communication
- ✓ Research & development
- ✓ Quantum computing



Description

The CITCRYO4-12A is a cryogenic, low noise, broadband amplifier. In its standard configuration it comes with female SMA connectors on the RF-input and output and a 4-pin 2 mm pitch header for the DC. The amplifier requires three separate DC-voltages, DC power @ 15 K is 1.2 Vdc, 20 mA.

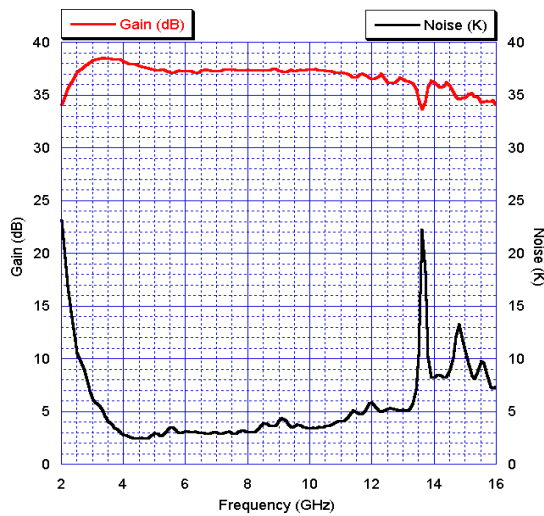
Performance Characteristics ($T_a = 15K$)

Parameter	Min	Typ	Max	Unit
Linear Gain				
4 GHz	30	32		dB
8 GHz	30	32		dB
12 GHz	30	32		dB
Noise Temp				
4 GHz		4.	6.0	K
8 GHz		4	6	K
12 GHz		7	11	K

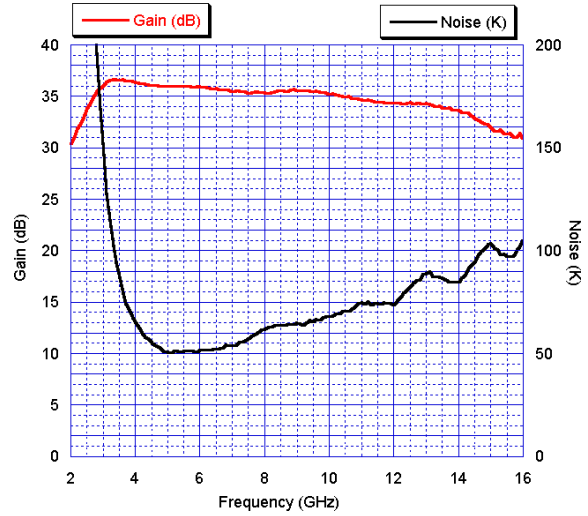
Parameter	Min	Typ	Max	Unit
IRL				
4 GHz	20	25		dB
8 GHz	15	18		dB
12 GHz	19	21		dB
ORL				
4 GHz	20	30		dB
8 GHz	20	27		dB
12 GHz	20	25		dB

Measured typical performance characteristics ($T_a=297\text{K}$ unless otherwise indicated)

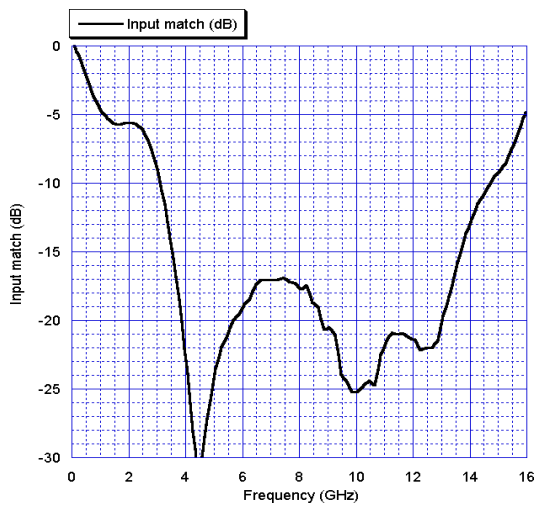
Gain and Noise versus Frequency ($T_a=11\text{K}$)



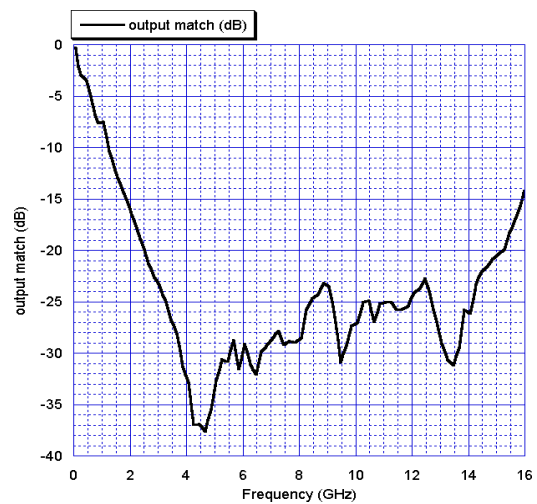
Gain and Noise versus Frequency



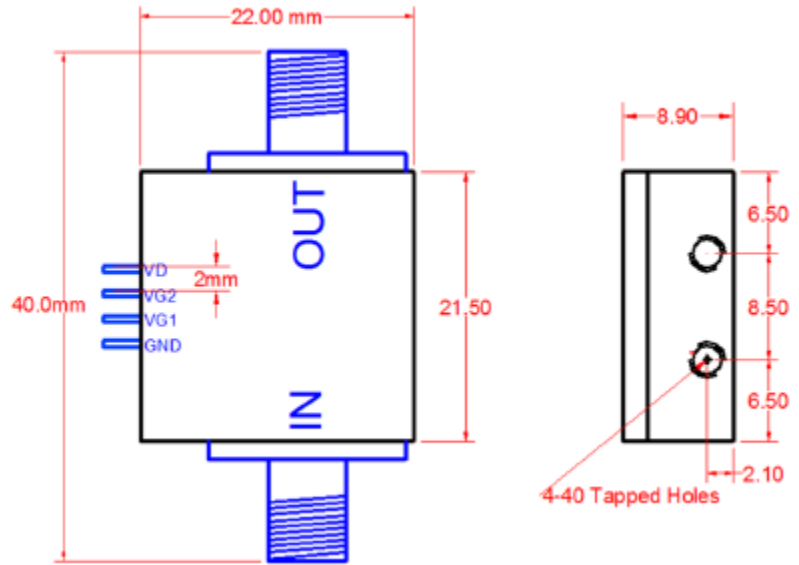
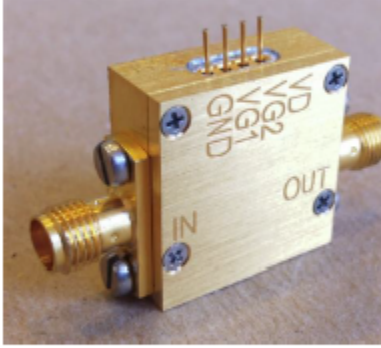
Input Match



Output Match



CAD Housing Drawing



*Dimensions are in mm

Optional Input Bias Tee

As an option, the amplifier can be supplied with a DC bias tee for an external device connected to the amplifier input. The bias tee is formed by two (2) resistors connected to the input; as shown in Figure 1. One (1) resistor can be used as a source of current and the other senses the voltage across the external device. Voltages applied to the bias tee have a small effect on amplifier operation. At 12 K, 20 KΩ resistors increase noise by 0.5 K.

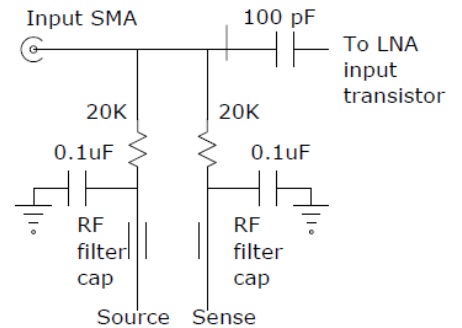
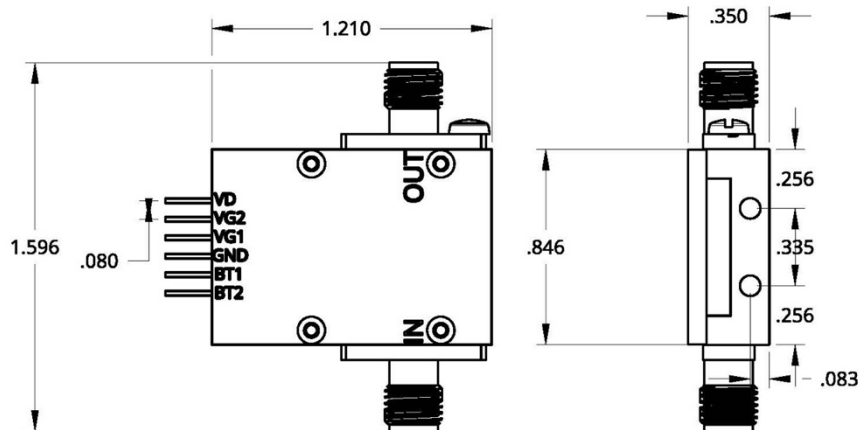


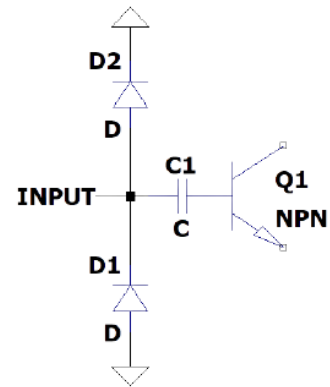
Figure 1. Bias Tee Schematic



Optional Input Protection Diodes

As an option, the amplifier can be supplied with ESD protection & voltage spike protection at the RF input to the amplifier. There will be a slight degradation of the amplifier performance. Please note that the optional input protection diodes cannot be used if DC voltages are applied to the RF line using input bias tees.

To order an amplifier with internal bias resistors, add the resistance to the part #. For instance, CITCRYO4-12A-PD.



D1 & D2 = Input Protection Diodes

Figure 2. Protection Diodes Schematic

Product Care and Maintenance

- Use care to not bend (and break) the DC bias pin when tightening the output SMA connector.
- The amplifier should not be connected to the power supply when connecting the input connector.
- Set the power of Port 1 in your VNA to be less than -45 dB when testing the amplifier. Otherwise, the amplifier may saturate, and the data obtained will be incorrect.
- Do not attempt to open the amplifier.
- Electrostatic discharge may damage the amplifier.

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