



KEY FEATURES

- Very low noise, approximately $<8\text{K}$, over 1 to 12 GHz.
- Operates with wide range of DC supply voltage.
- Provides usable gain and noise at DC power as low as 10 mW.
- Input return loss is <-10 dB from 4.5-12 GHz.

PERFORMANCE FEATURES

- RF frequency
 - 1 to 12 GHz
- Gain
 - $35\text{ dB} \pm 2\text{ dB}$
- Average noise temperature
 - $< 3\text{ Kelvin}$
- Average noise figure
 - 0.05 dB

APPLICATIONS

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



CITCRYO1-12D

Cryogenic HEMT Low Noise Amplifier



Description

The CITCRYO1-12D 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.

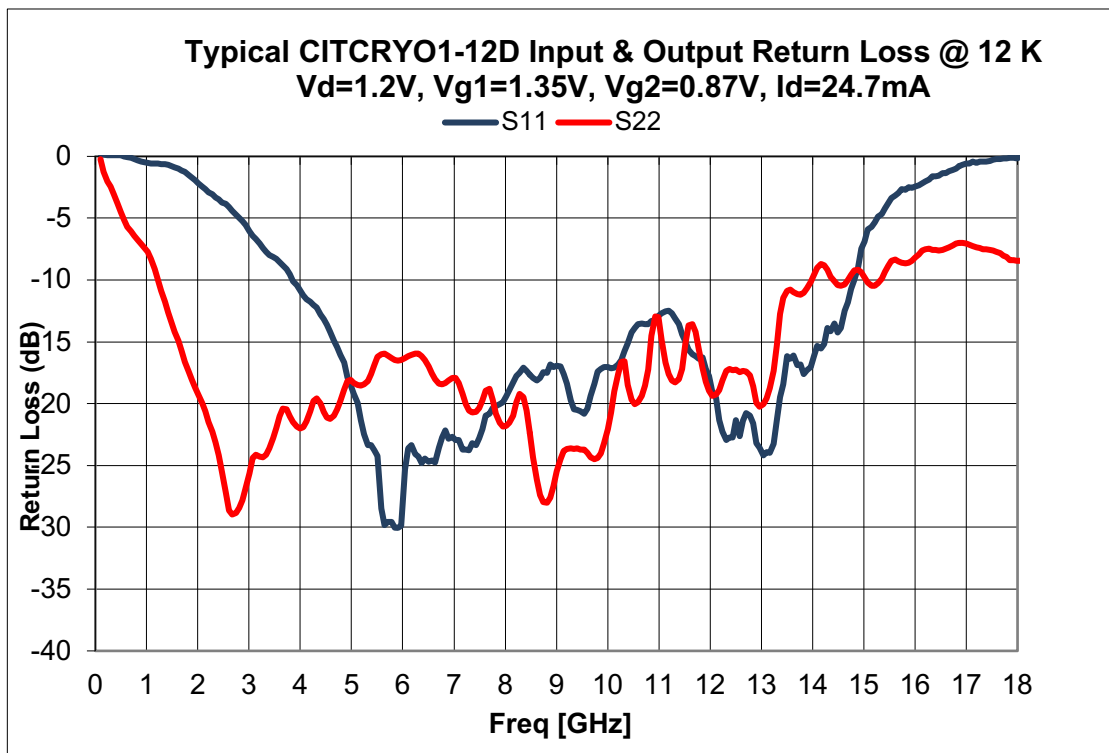
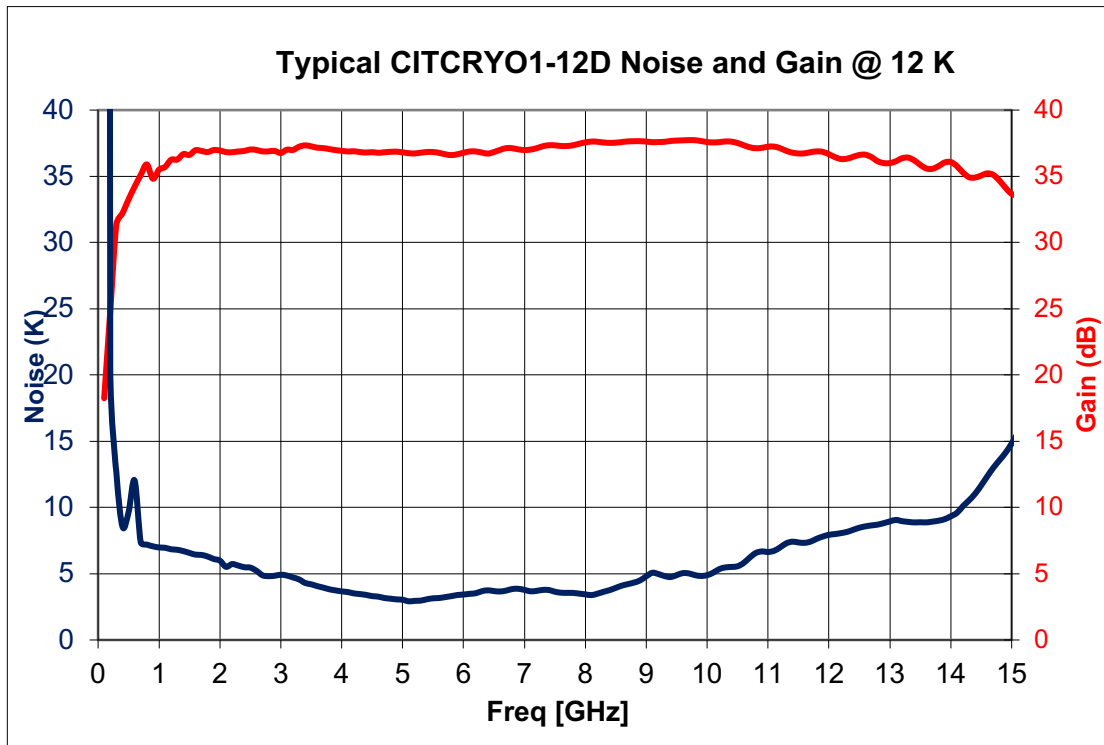
Electrical Specifications @ 12 K

Description	Typical	Minimum	Maximum
RF Frequency		1 GHz	12 GHz
Gain	35 dB	35 dB \pm 2 dB	
Noise Temperature	< 3K		
IRL (-20log S ₁₁)		< -10 dB (4.5-12 GHz)	
ORL (-20log S ₂₂)		< -15 dB (2-12 GHz)	
Drain Voltage	1.2 V	0.8 V	1.6 V

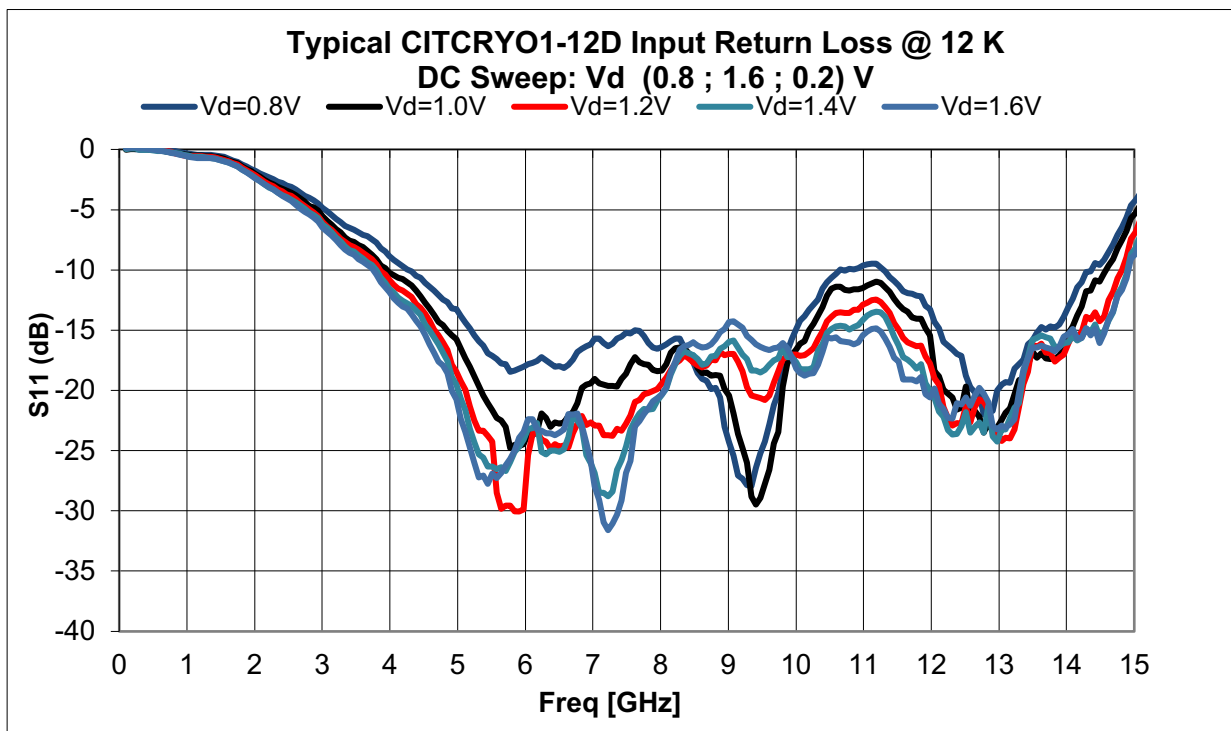
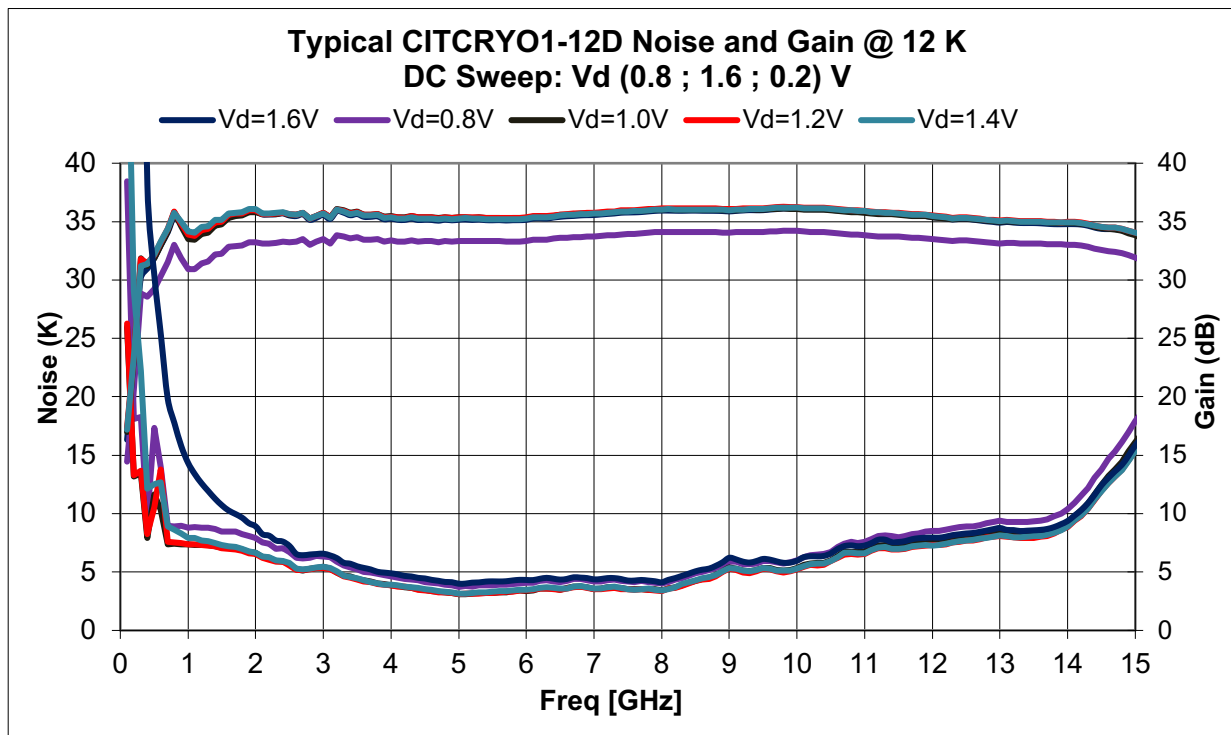
Electrical Specifications @ 300 K

Description	Typical	Minimum	Maximum
RF Frequency		1 GHz	12 GHz
Gain	35 dB	35 dB \pm 2 dB	
Noise Temperature	60K		
IRL (-20log S ₁₁)		< -10 dB (4.5-12 GHz)	
ORL (-20log S ₂₂)		< -15 dB (2-12 GHz)	
DC Voltage	1.8 V	0.8 V	1.6 V

Typical Test Results – Optimum DC Bias @ 12 K

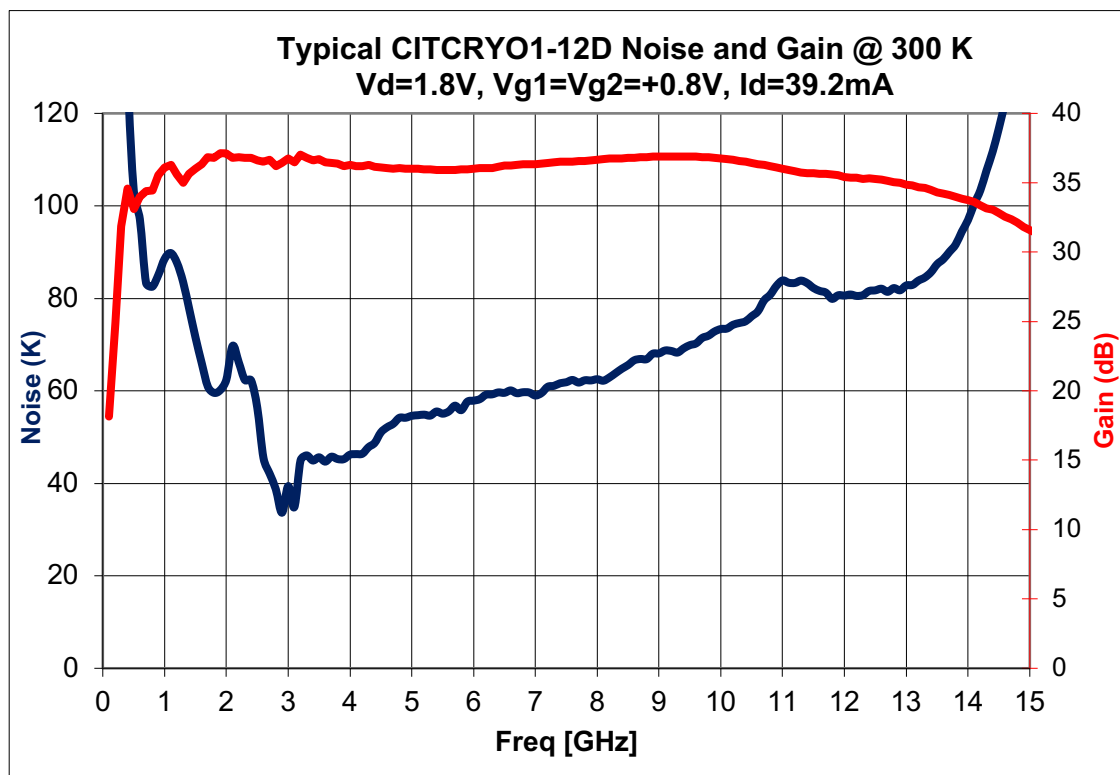


Typical Test Results – DC Bias Sweep @ 12 K

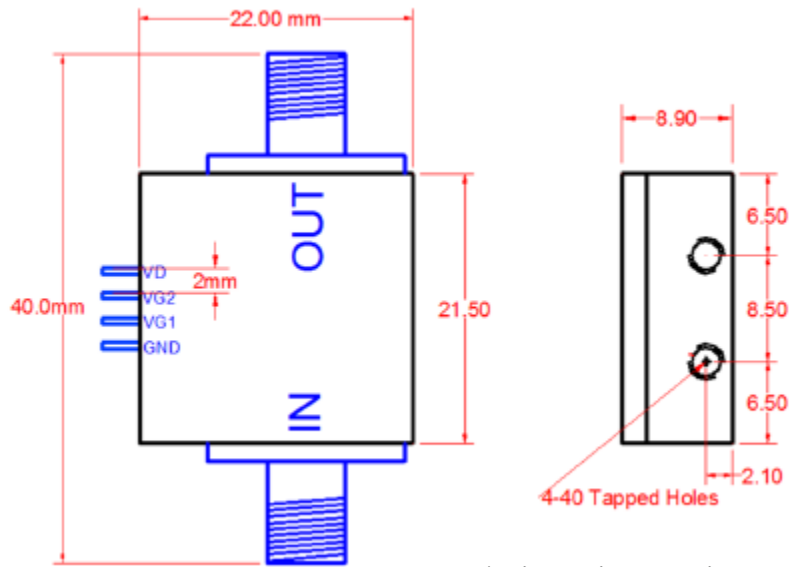
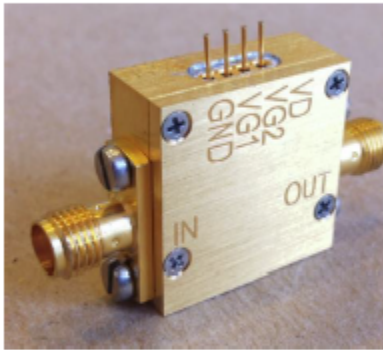


Vd (V)	Vg1 (V)	Vg2 (V)	Id (mA)
0.8	1.27	1.18	19.4
1.0	1.43	1.15	24.6
1.2	1.35	0.87	24.7
1.4	1.42	0.58	25.9
1.6	1.36	0.34	27.0

Typical Test Results – Optimum DC Bias @ 300 K



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 K Ω resistors increase noise by 0.5 K.

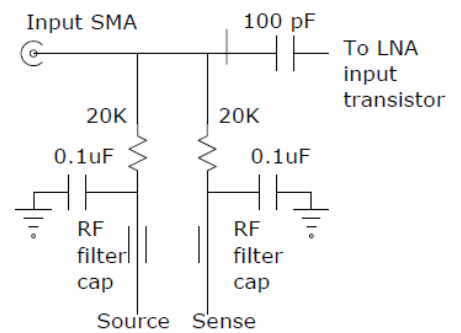
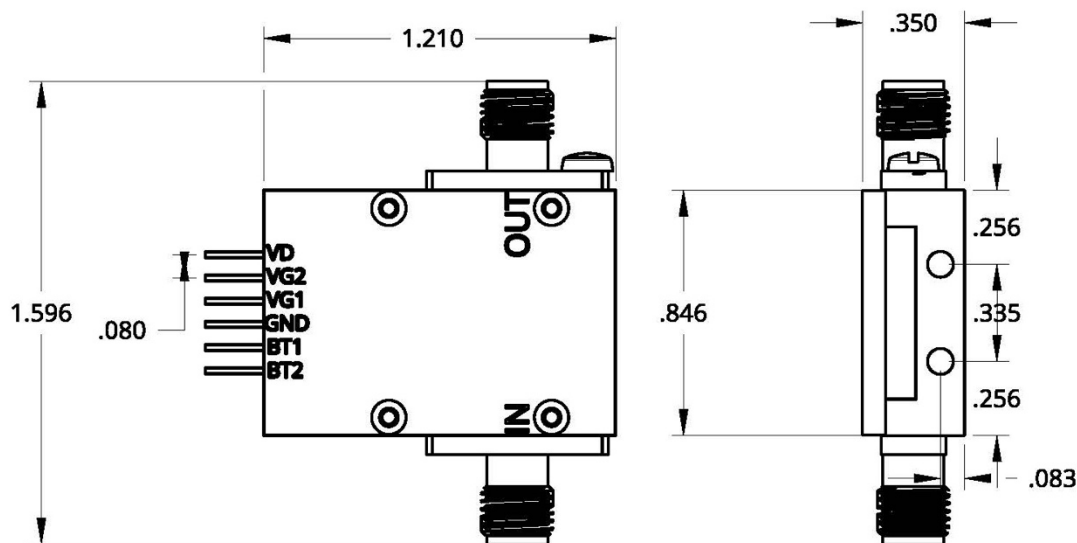


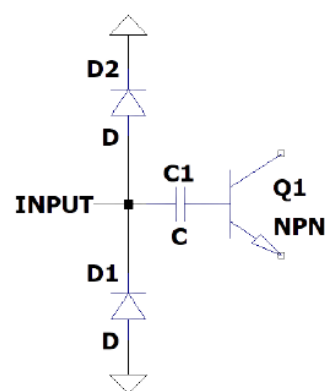
Figure 1. Bias Tee Schematic



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, CITCRYO1-12D-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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