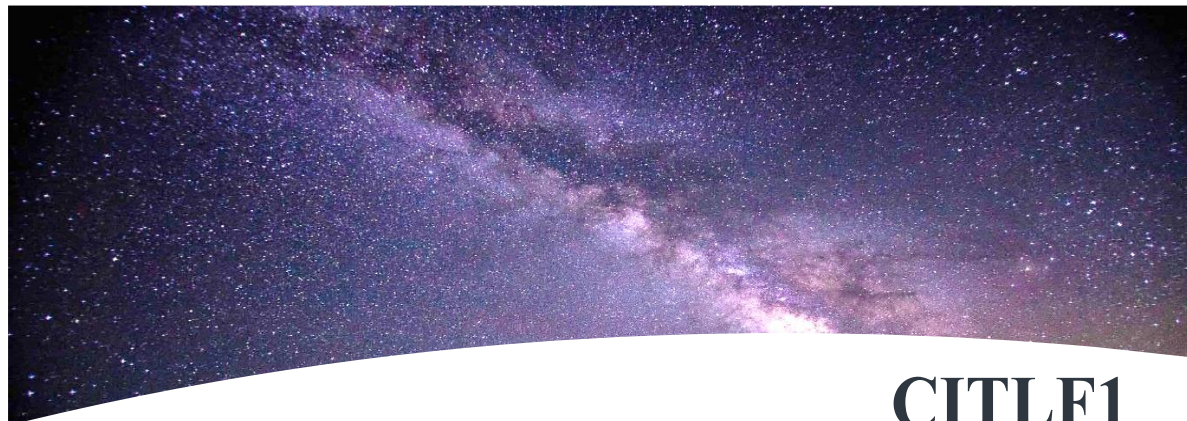




CITL F1

Cryogenic SiGe Low Noise Amplifier

KEY FEATURES

- ❖ Ideal for extremely low noise cryogenic applications
- ❖ Powered from a single positive DC supply
- ❖ Female SMA RF connectors
- ❖ 2-pin winchester DC connectors
- ❖ Optional DC bias tees
- ❖ Size 2.07 cm x 1.59 cm x 0.87 cm

PERFORMANCE FEATURES

- ❖ RF Frequency
 - 0.001 to 2.0 GHz
- ❖ Gain
 - 44 dB $\pm$ 1 dB
- ❖ Noise Temperature
 - < 6 K
- ❖ Noise Figure
 - < 0.09 dB
- ❖ Optimum DC Power
 - $V_d = 2.5$ V
 - $I_d = 9.6$ mA



Description

- The CITL F1, a SiGe low noise amplifier, is intended for extremely low noise cryogenic applications. The amplifier uses resistive feedback to achieve good input match (S11) and high gain stability. The amplifier is optimum for the frequency range of 0.01 GHz to 1.5 GHz. High gain and low noise is also achieved up to 5 GHz.
- It is powered from a single positive DC power supply which is optimum at 2.5 V, but can be reduced to as low as 1.1 V for low power dissipation. Application of up to 5 V will not damage the amplifier. It is recommended that the power supply for the amplifier to be current limited to 100 mA.
- The amplifier is 20.7 mm x 15.9 mm x 8.7 mm excluding connectors. Input and output female SMA connectors.

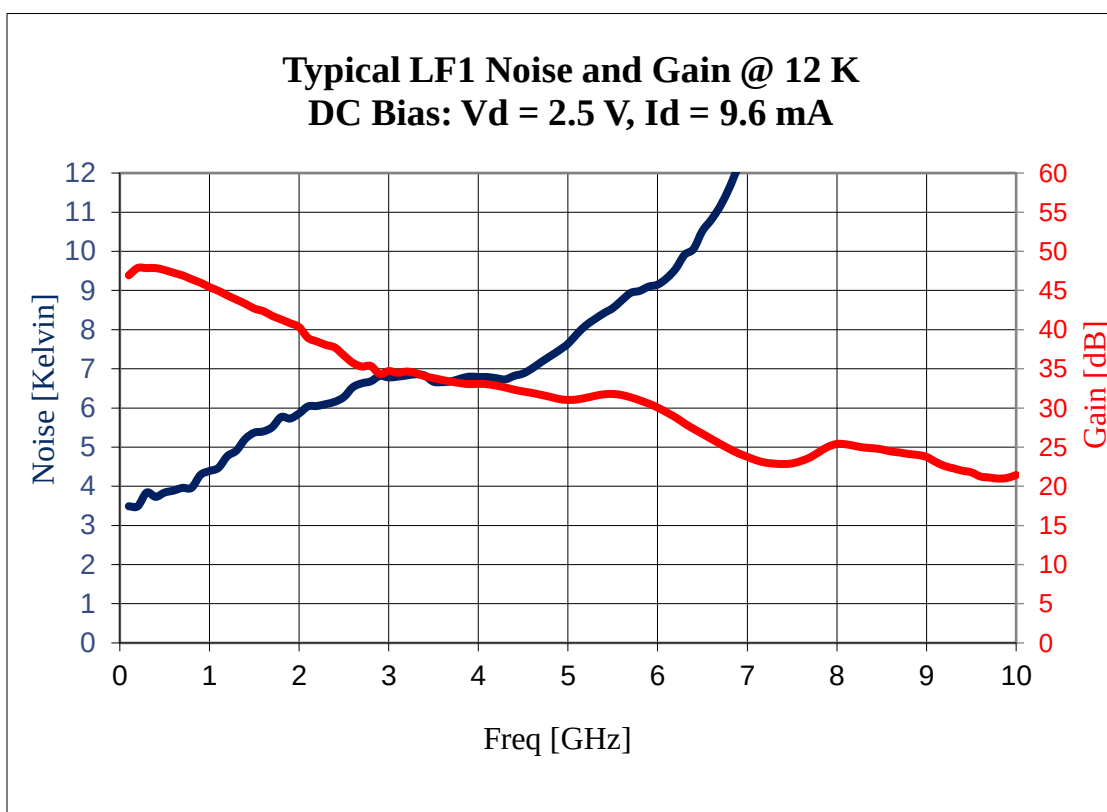
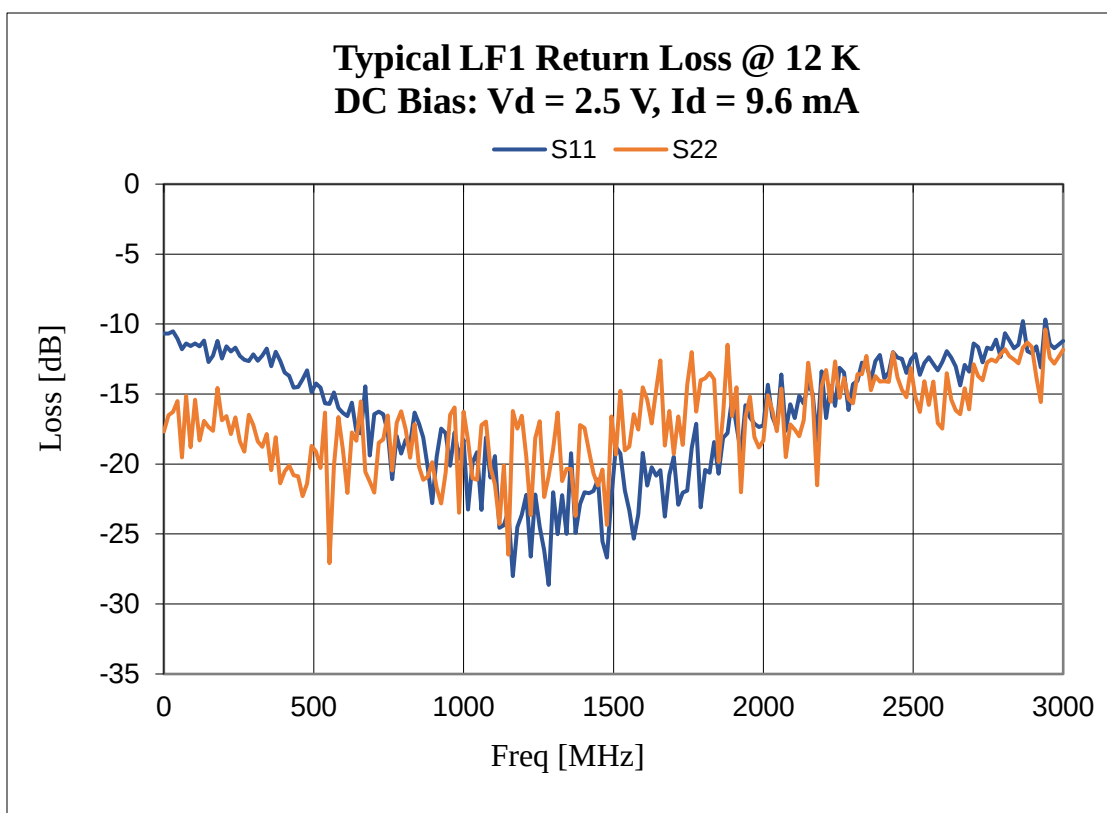
Electrical Specifications @ 12 K

Description	Typical	Minimum	Maximum
RF Frequency	2 GHz	0.01 GHz	5 GHz
Gain	45 dB	40 dB	50 dB
Noise Temperature	< 6 K	4 K	10 K
IRL ($-20\log S_{11} $)	< -10 dB	-25 dB	-10 dB
ORL ($-20\log S_{22} $)	< -15 dB	-25 dB	-15 dB
DC Voltage	2.5 V	1.1 V	5 V
DC Current	9.6 mA	0.6 mA	25 mA

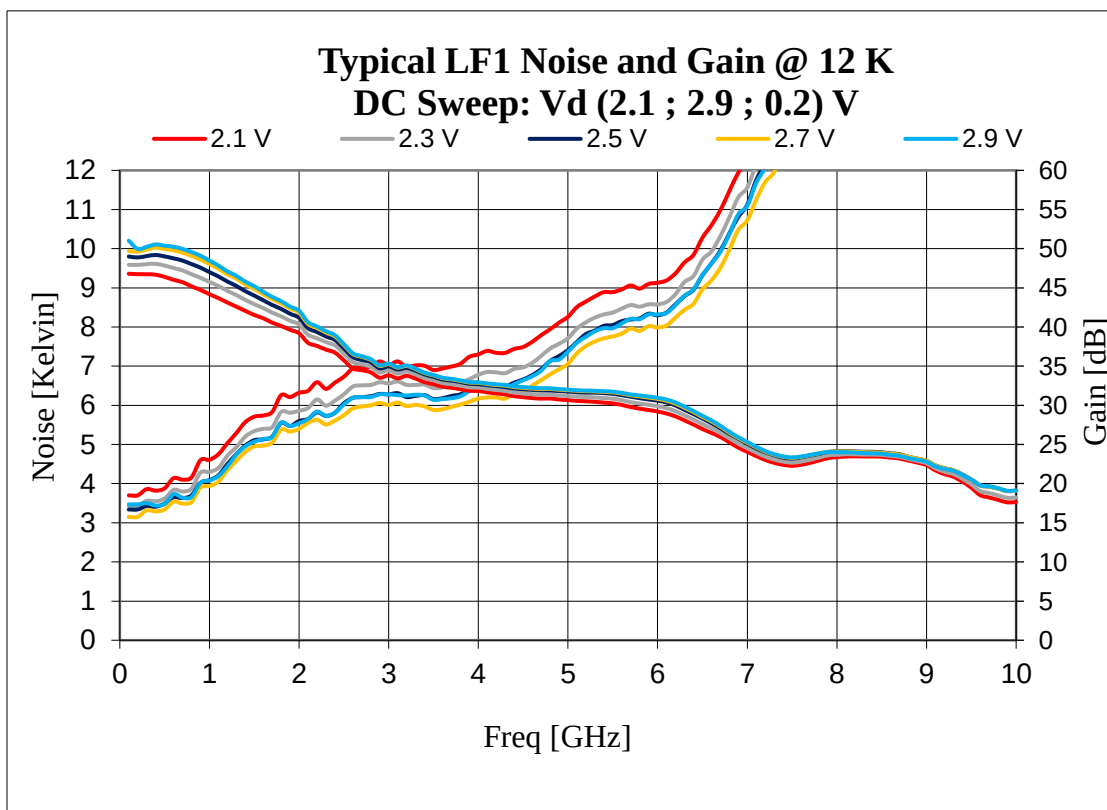
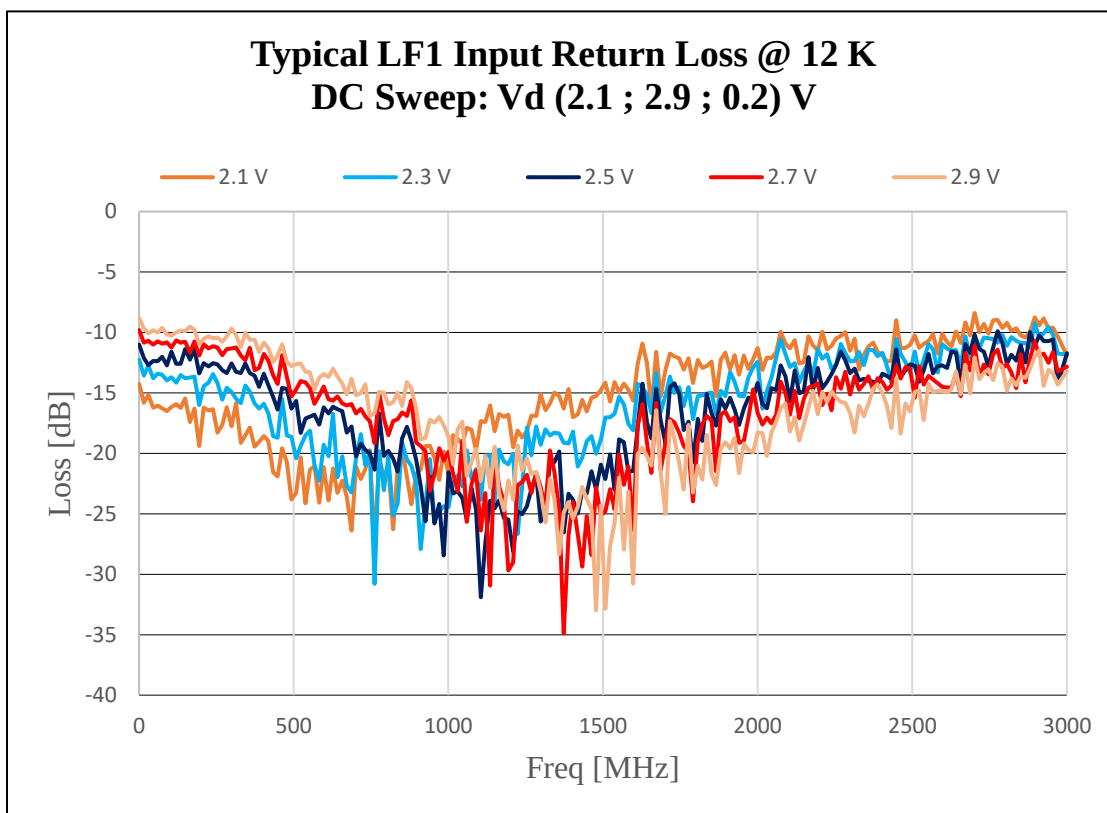
Electrical Specifications @ 300 K

Description	Typical	Minimum	Maximum
RF Frequency	2 GHz	0.01 GHz	5 GHz
Gain	35 dB	30 dB	40 dB
Noise Temperature	70 K	60 K	80 K
IRL ($-20\log S_{11} $)	-10 dB	-16 dB	-6 dB
ORL ($-20\log S_{22} $)	-15 dB	-20 dB	-10 dB
DC Voltage	2.5 V	1.1 V	5 V
DC Current	10.6 mA	2.2 mA	26 mA

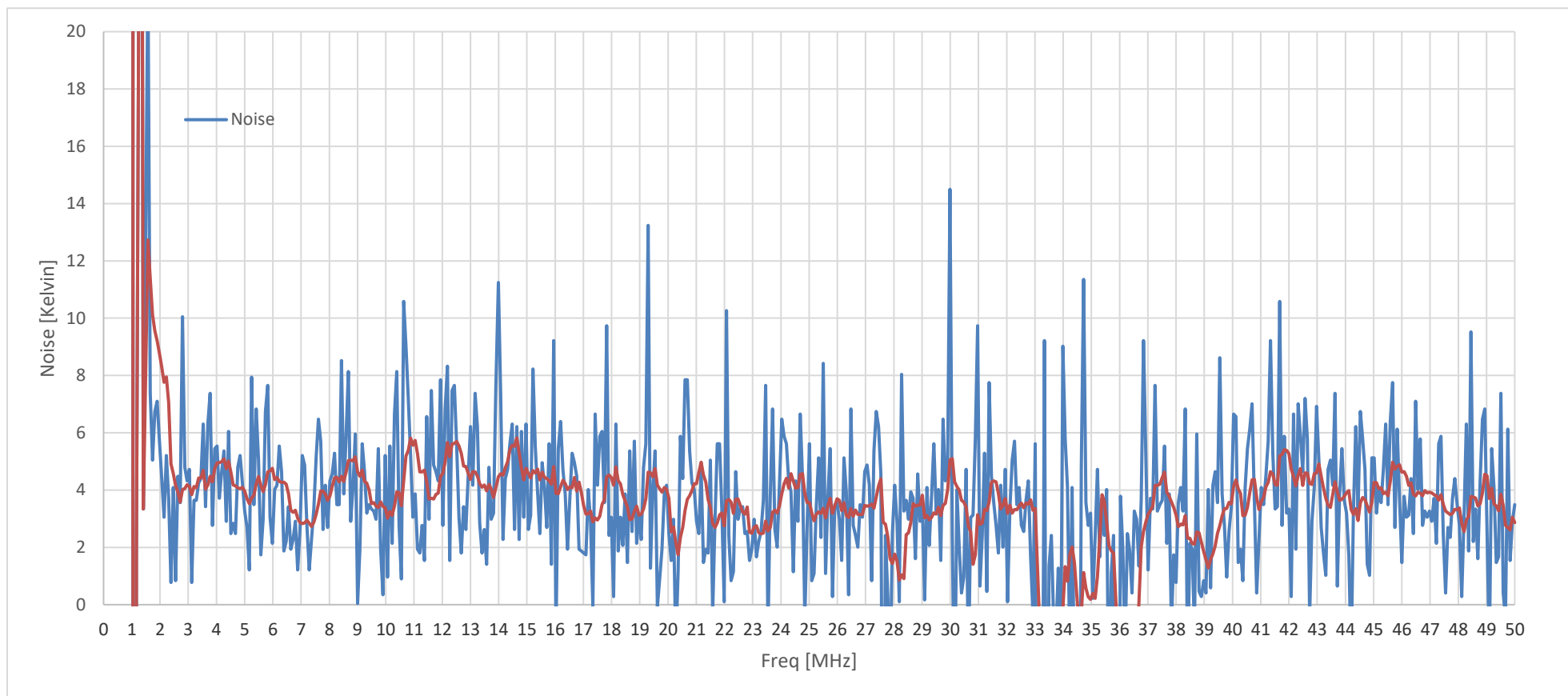
Typical Test Results – Optimum DC Bias @ 12 K



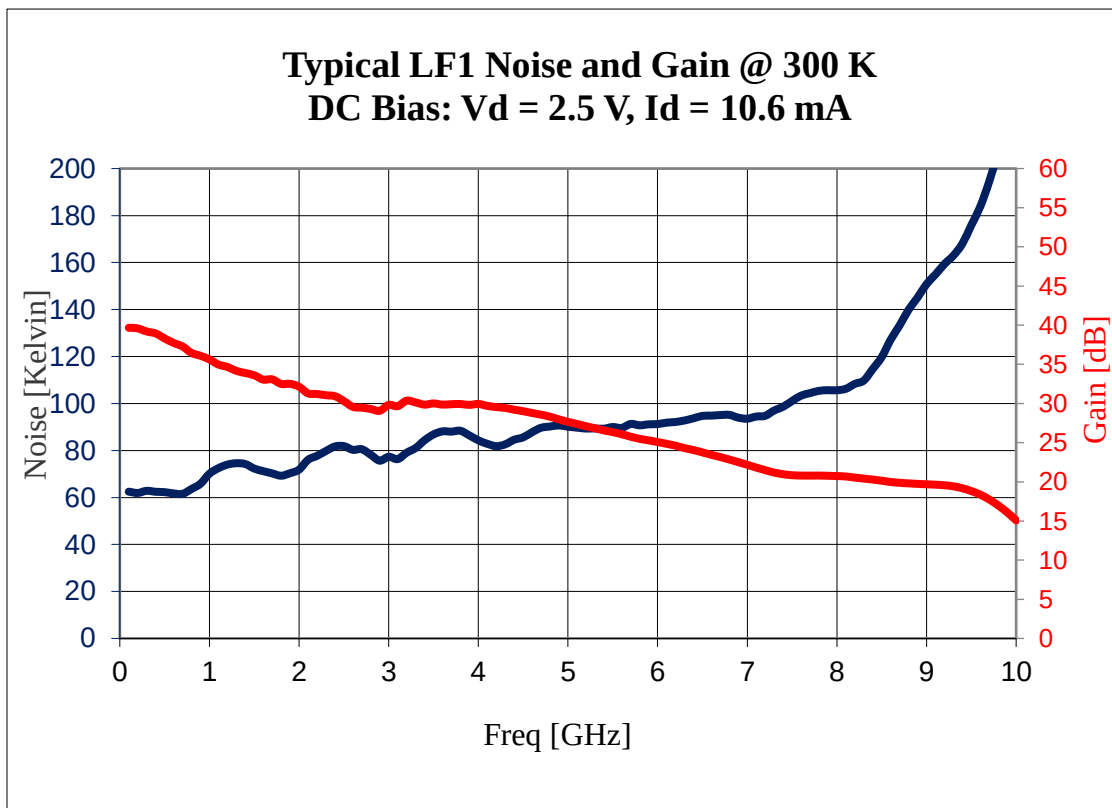
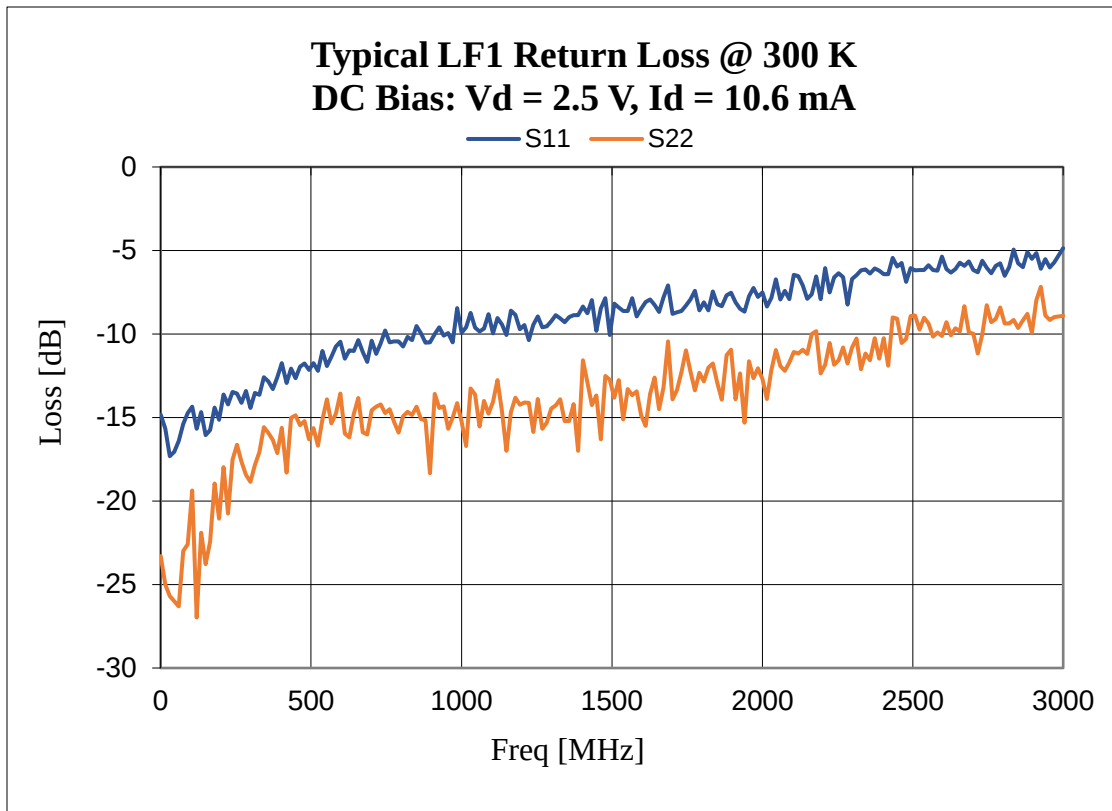
Typical Test Results – DC Bias Sweep @ 12 K



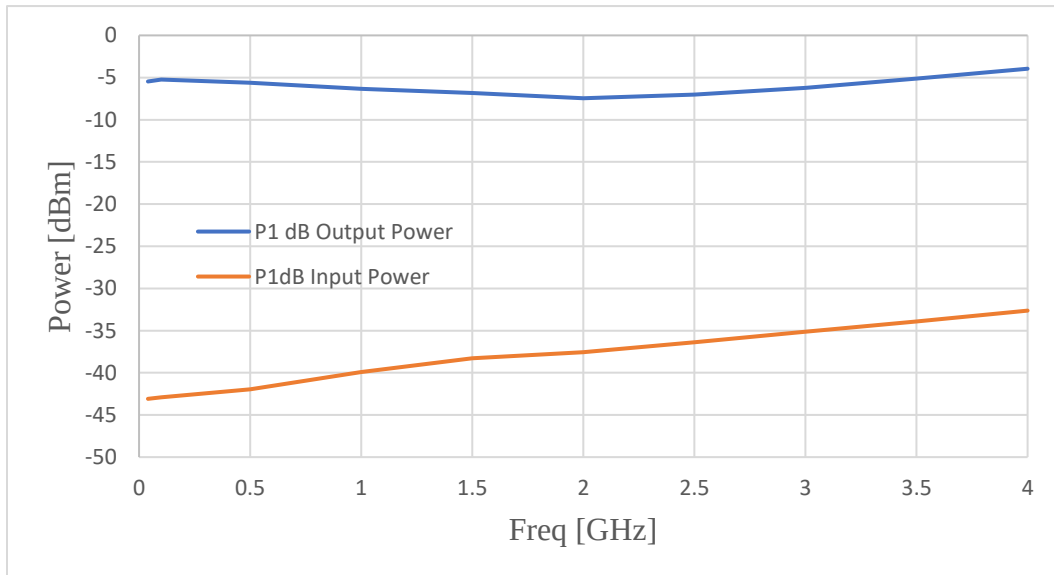
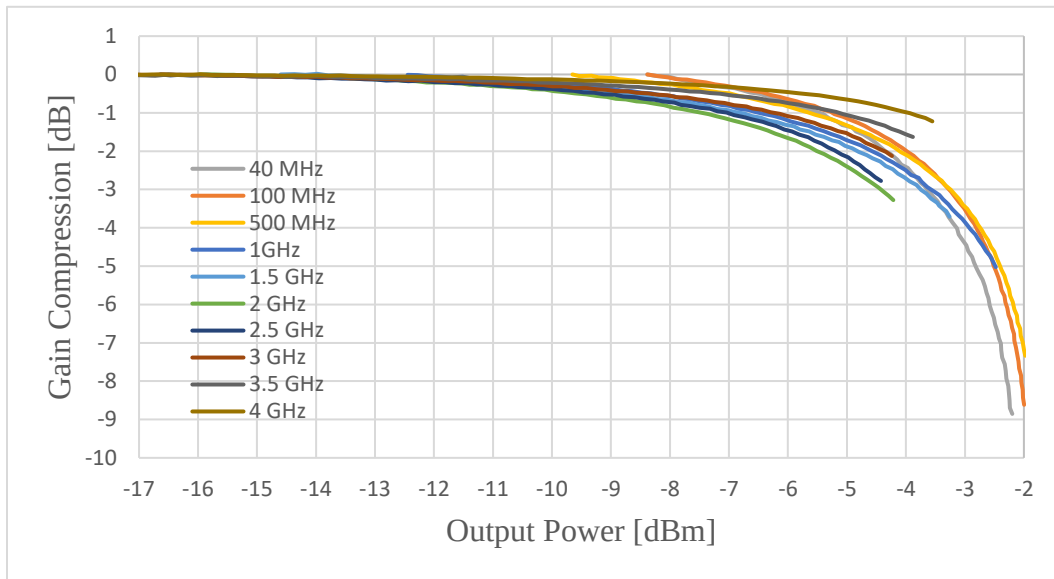
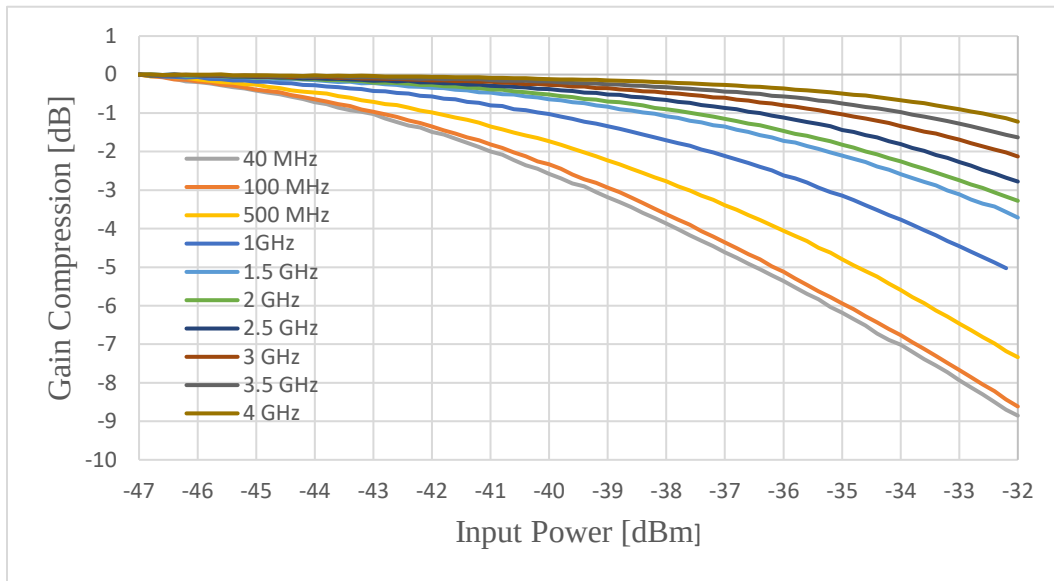
Typical Test Results – Low Frequency @ 12 K



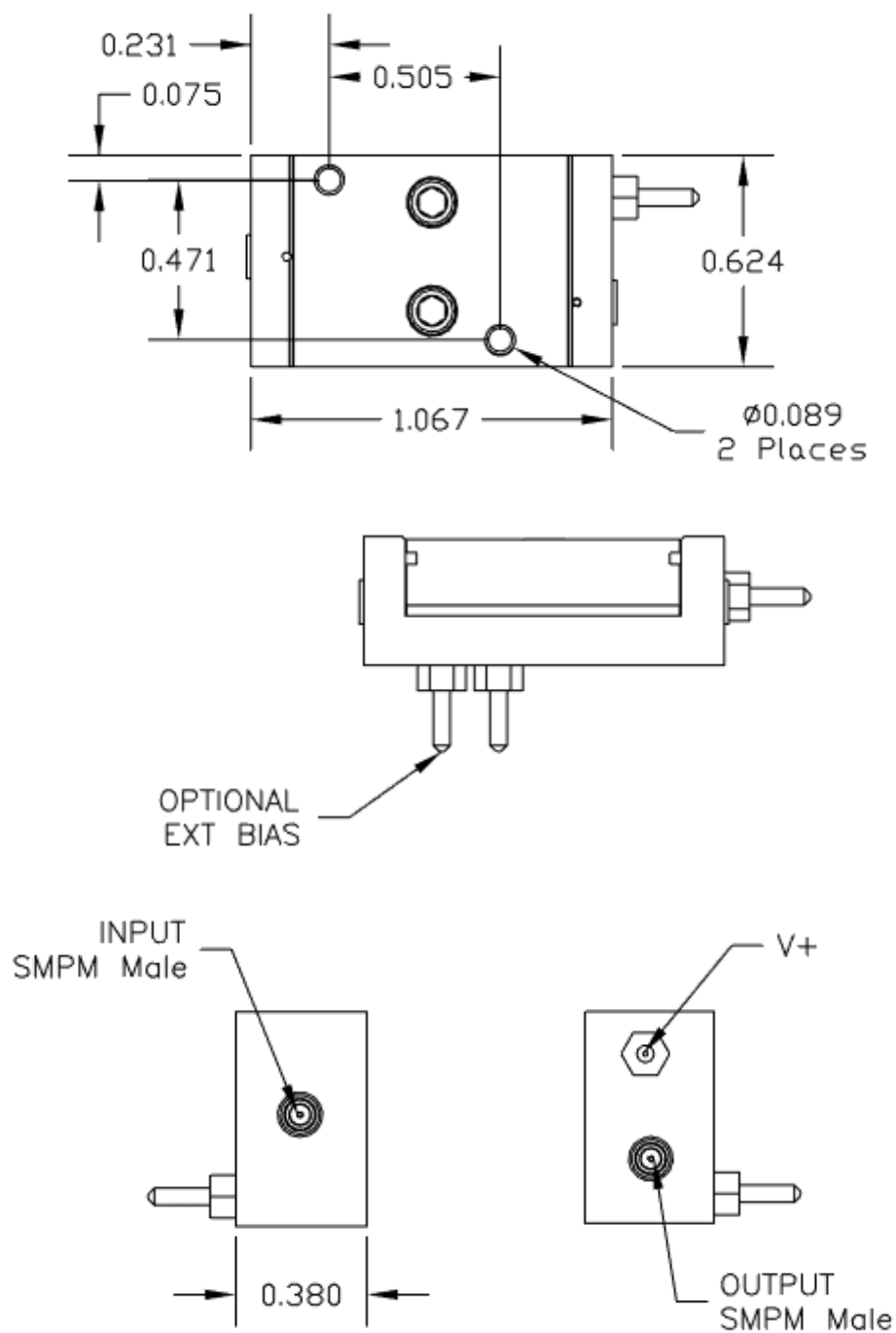
Typical Test Results – Optimum DC Bias @ 300 K



Typical Test Results – 1 dB-Compression Point



CAD Housing Drawing



*Dimensions are in inches

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.

To order an amplifier with internal bias resistors, add the resistance to the part #. For instance, CITLF1-20K.

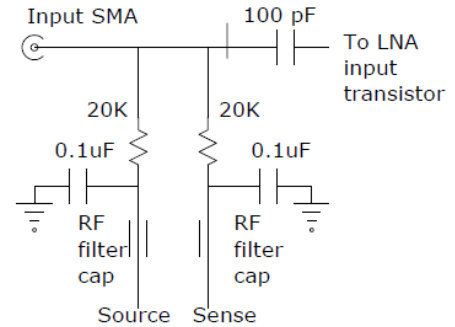


Figure 1. Bias Tee Schematic

Optional Input Diode Protection

As an option, the amplifier can be supplied with ESD voltage spike protection at the RF input to the amplifier.

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/disconnecting 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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