

CITLF3

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 @ 12 K

- ❖ RF Frequency
 - 0.001 to 2.0 GHz
- ❖ Gain
 - 35 dB \pm 1 dB
- ❖ Noise Temperature
 - < 4 K
- ❖ Noise Figure
 - < 0.06 dB
- ❖ Optimum DC Power
 - $V_d = 2.0$ V
 - $I_d = 13.6$ mA



Description

- The CITLF3, 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 2 GHz, but is usable to 5 GHz. Operates from below 4 K to 350 K.
- It is powered from a single positive DC power supply which is optimum at 2.0 V, but can be changed to tradeoff power dissipation and performance as shown in the table and graph on the following page. 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. A series resistor may be used. For instance, 220 Ohms to a + 5 V supply will provide 2.0 V and 13.6 mA when the amplifier is at 12 K. The maximum RF input power to be applied to the amplifier without damage is +10 dBm.
- The amplifier is 20.7 mm x 15.9 mm x 8.7 mm excluding connectors. Input and output female SMA connectors.

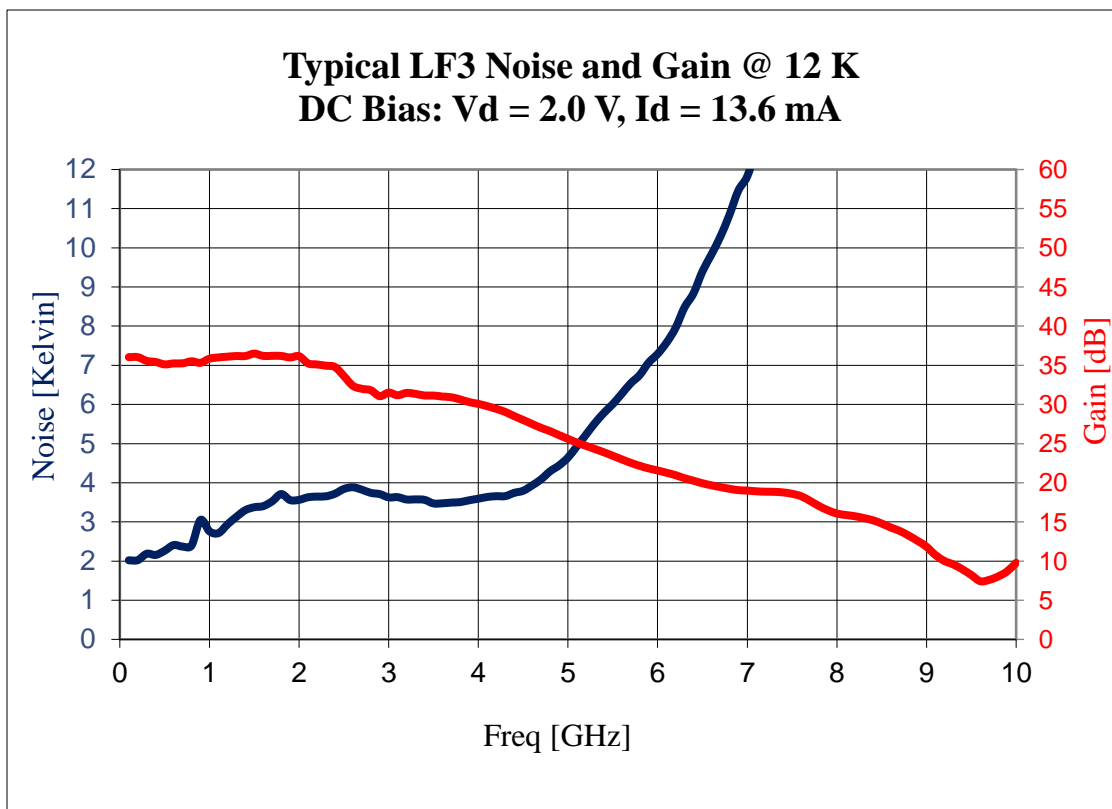
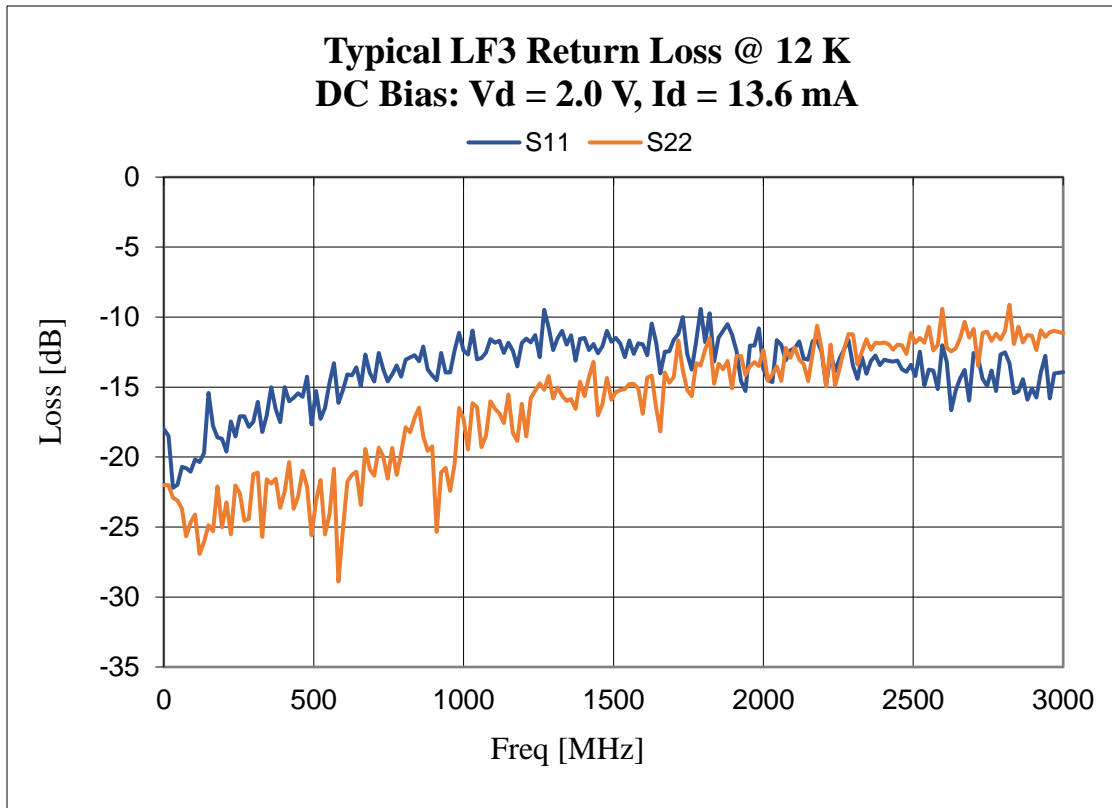
Electrical Specifications @ 12 K

Description	Typical	Minimum	Maximum
RF Frequency	2 GHz	0.01 GHz	5 GHz
Gain	35 dB	25 dB	36 dB
Noise Temperature	< 5 K	2 K	5 K
IRL ($-20\log S_{11} $)	-12 dB	-20 dB	-11 dB
ORL ($-20\log S_{22} $)	-15 dB	-25 dB	-12 dB
DC Voltage	2.0 V	1.1 V	5 V
DC Current	13.6 mA	1.5 mA	54 mA

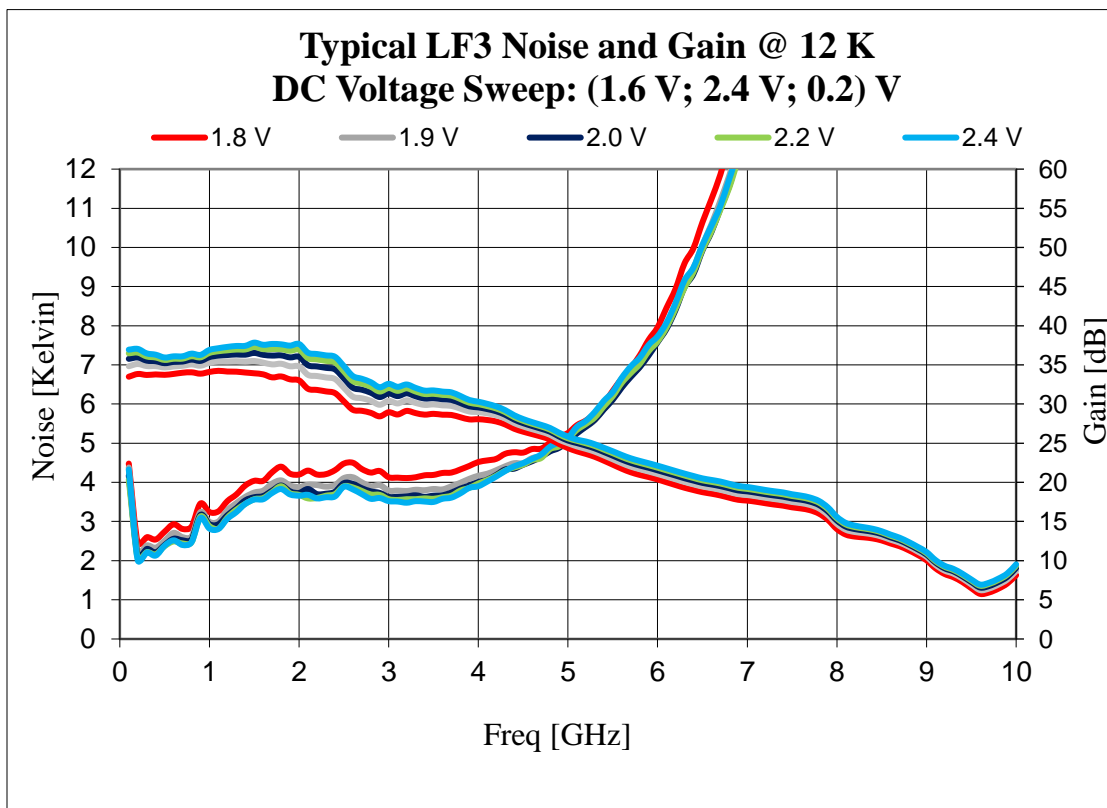
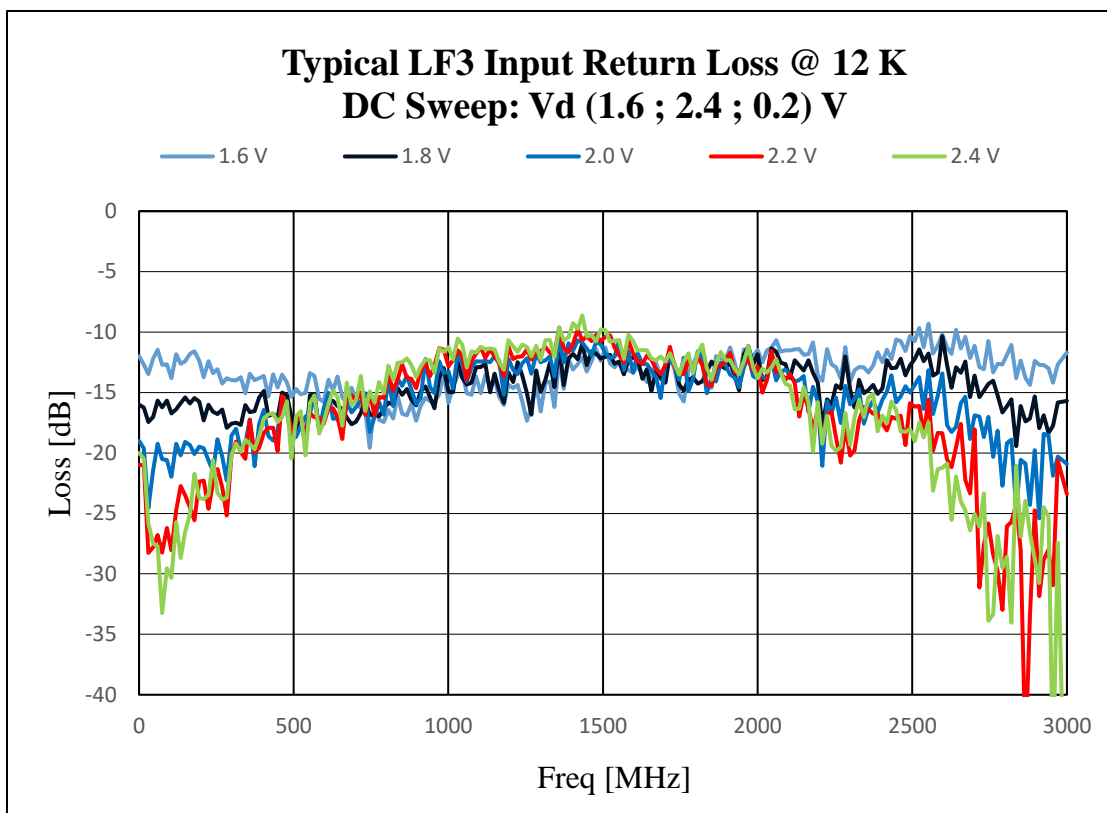
Electrical Specifications @ 300 K

Description	Typical	Minimum	Maximum
RF Frequency	2 GHz	0.01 GHz	5 GHz
Gain	30 dB	25 dB	31 dB
Noise Temperature	< 60 K	40 K	80 K
IRL ($-20\log S_{11} $)	-10 dB	-18 dB	-6 dB
ORL ($-20\log S_{22} $)	-20 dB	-30 dB	-10 dB
DC Voltage	2.0 V	1.1 V	5 V
DC Current	14.6 mA	4.5 mA	52 mA

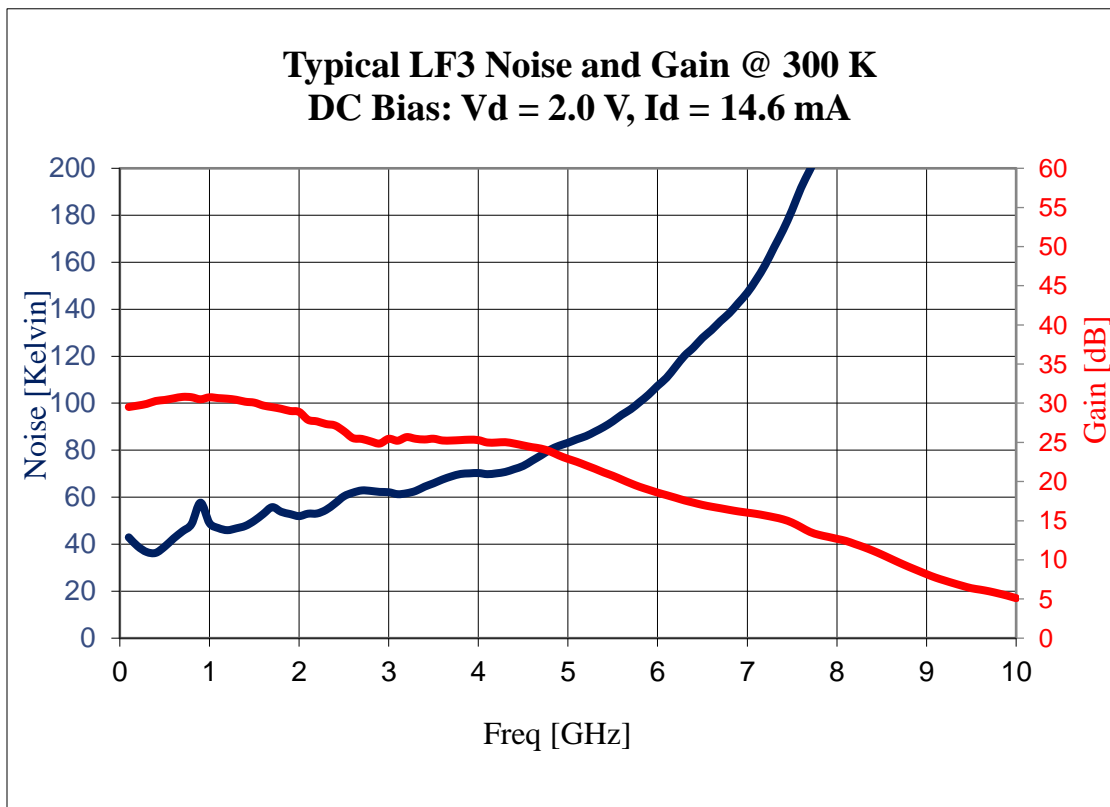
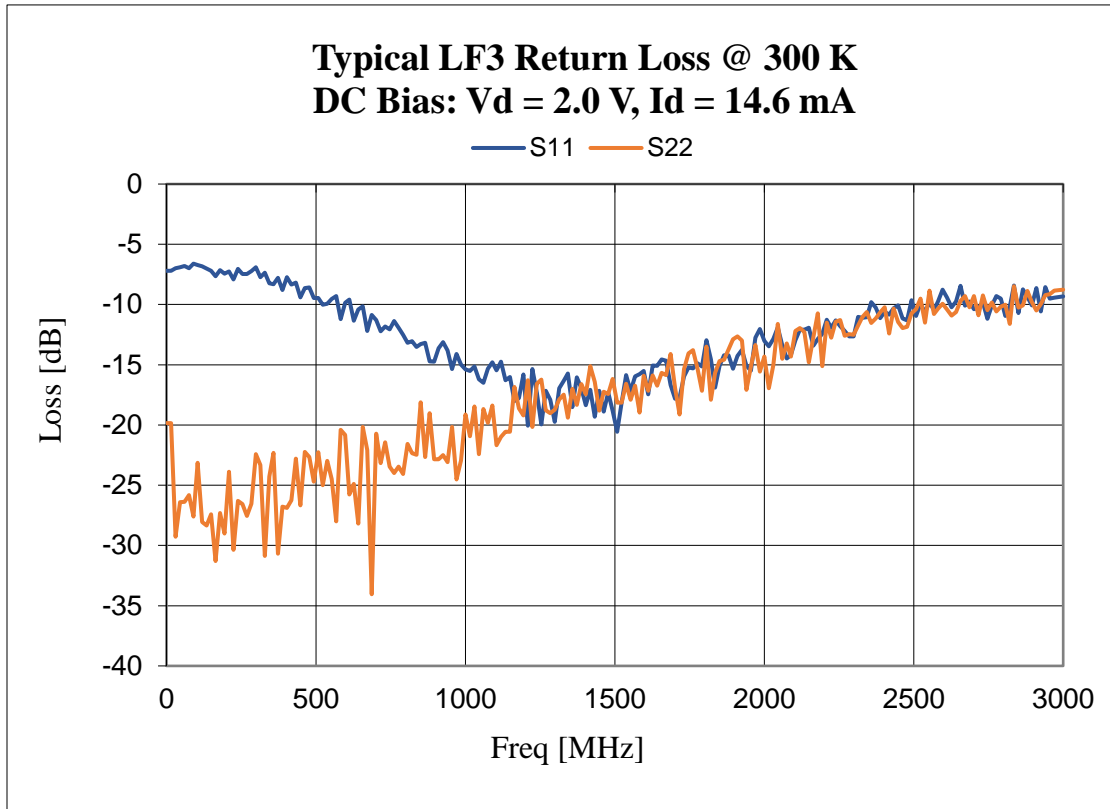
Typical Test Results – Optimum DC Bias @ 12 K



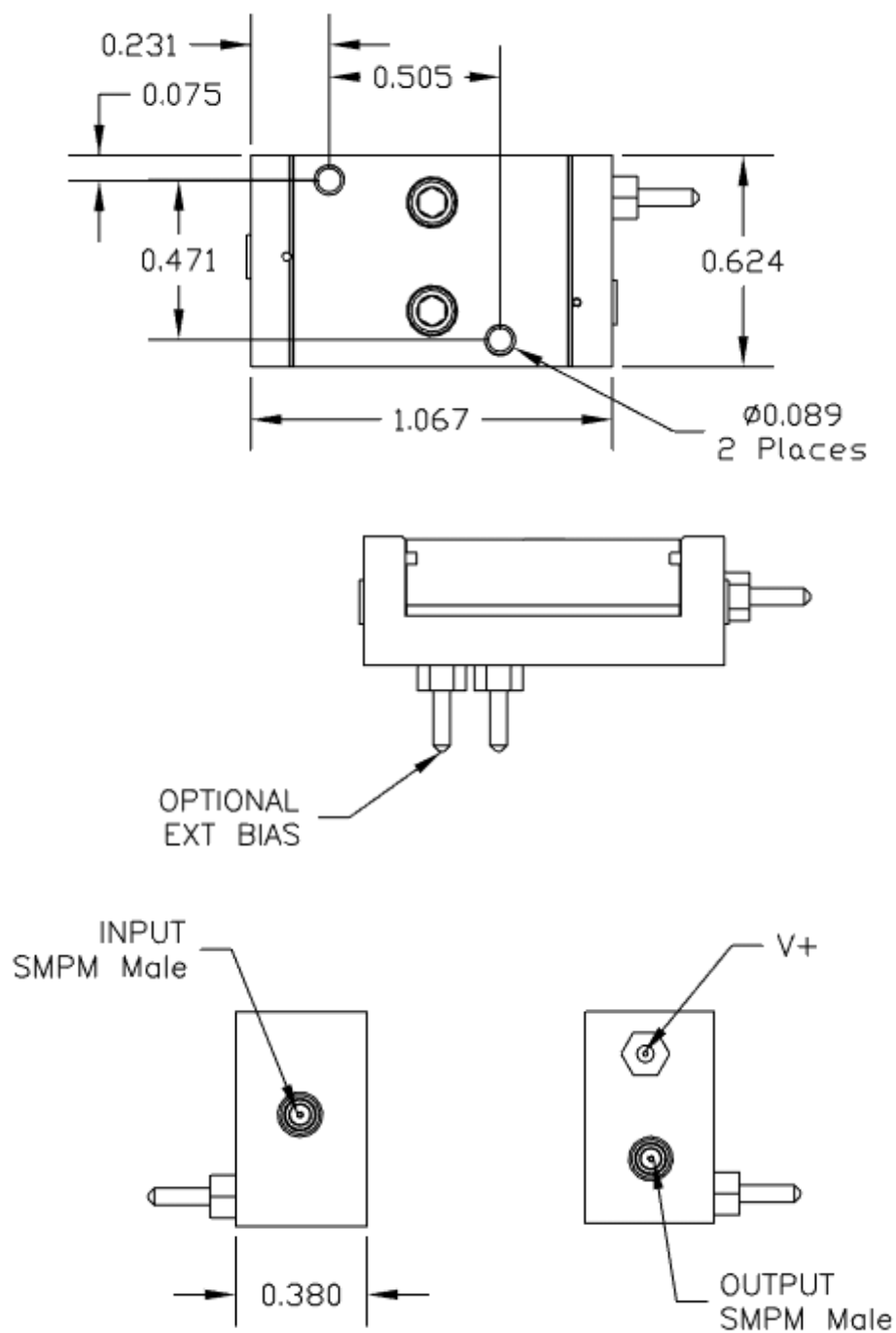
Typical Test Results – DC Bias Sweep @ 12 K



Typical Test Results – Optimum DC Bias @ 300 K



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.

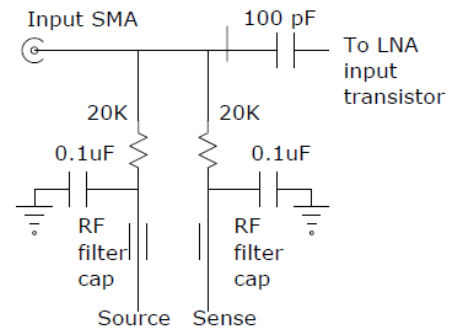


Figure 1. Bias Tee Schematic

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 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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