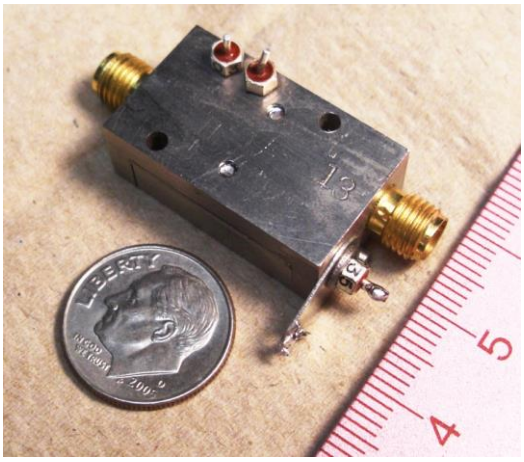
Cosmic Microwave Technology, Inc

CITLF4

Cryogenic SiGe Low Noise Amplifier

Sep 3, 2011

Features



RF Frequency:	0.5 to 4 GHz
Gain @ 20K:	36dB ± 3dB
Noise temperature @ 20 K:	<7K at 1.4 GHz, < 8K 0..5 to 4 GHz
Noise figure @ 20 K:	< 0.12 dB
Noise figure @ 300K	<1.5 dB
IRL (-20log | S11 |)	> 15 dB at 1 GHz, > 7dB 0.5 to 4 GHz
ORL (-20log | S22 |)	> 20 dB at 1 GHz, >9dB 0.5 to 4 GHz
Operating temperature:	4.2 K- 320 K
DC power @300K	1.5V, 12mA, 18mW
DC power @ 20 K:	1.5V, 8.5mA, 13 mW
Output power for 1 dB compression	-3 dBm
Safe input power level	< 0 dBm

Description

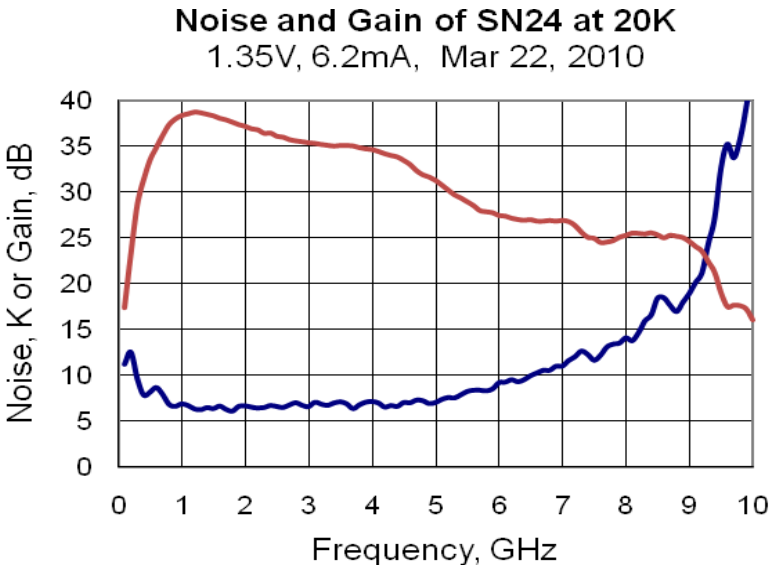
The CITLF4 a SiGe low noise amplifier intended for extremely low noise cryogenic applications. The amplifier utilizes resistive feedback to achieve good input match (S11) and high gain stability. The amplifier is optimum for the frequency range 0.5 to 4 GHz but is useful to 6 GHz.

It is powered from a single positive DC supply which is optimum at 1.5V but can be reduced to as low as 1.2V for low power dissipation. Application of up to 6V wil not damage the amplifier. It is recommended that the power supply for the amplifier be current limited to 100mA. A series resistor may be used. For example 360 ohms to a +5V supply will provide 1.5V, 9mA when the amplifier is at 20K.

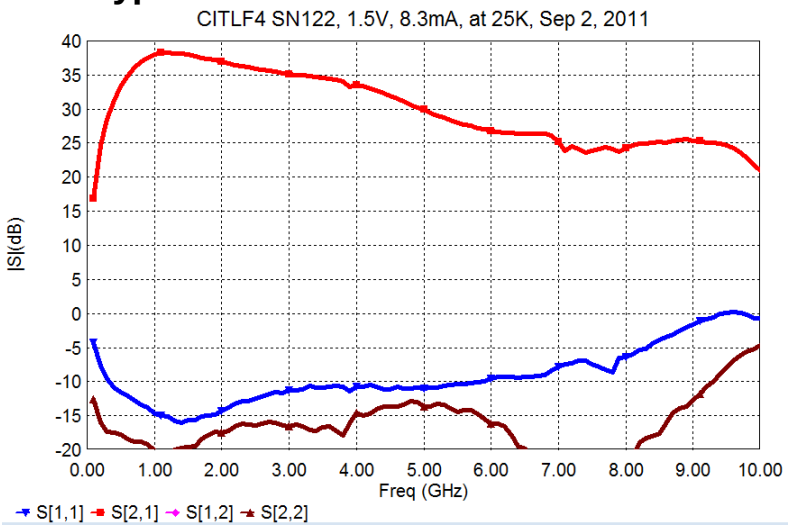
The amplifier includes a DC bias tee for an external device connected to the amplifier input. The bias tee is formed by two 20K resistors connected to the input; one can be used as a source of current and one the sense the voltage across the external device. Voltages applied to the bias tee have no effect on amplifier operation.

The amplifier is 20.7mm x 15.9mm x 8.7mm excluding connectors with input SMA at left and output SMA at right as shown above.

Typical Test Data

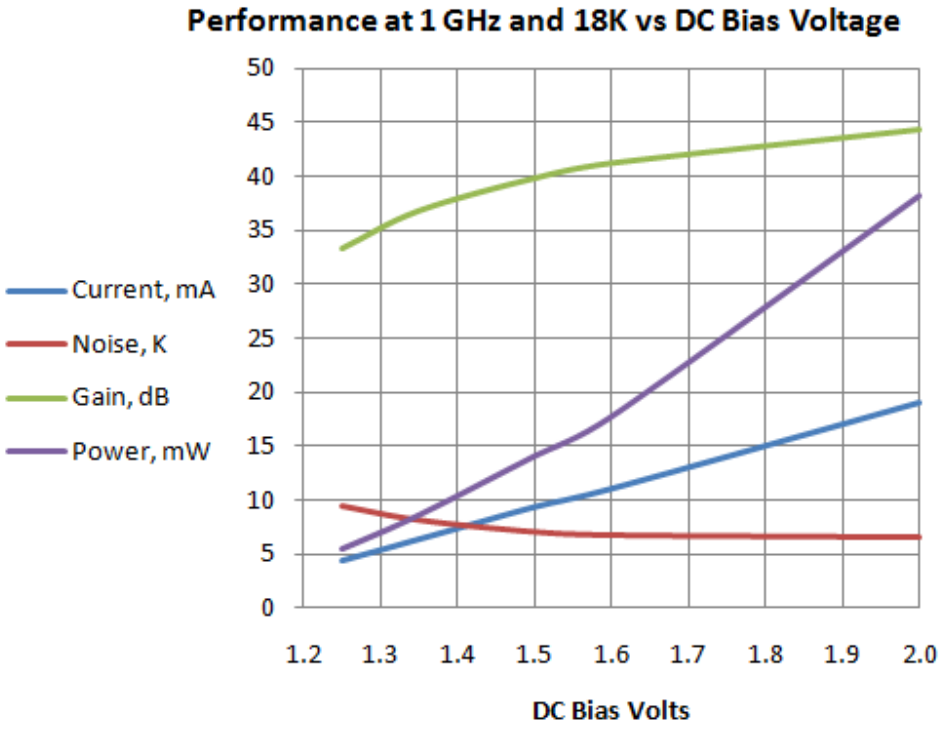


Typical S Parameters at 25K



S11 and S21 vs Bias at 25K

			S11			S21		
Vd	Id	P mW	1 GHz	3 GHz	5.5 GHz	1 GHz	3 GHz	5.5 GHz
1.1	1.7	1.9	-7.5	-2.9	-5.4	22.4	18.9	18.8
1.2	3.2	3.8						
1.3	5	6.5	-23	-7.6	-8.8	33.5	31.3	25.9
1.5	8.3	12.5	-14.6	-11.5	-10.5	38	35.2	28
1.7	11.8	20.1						

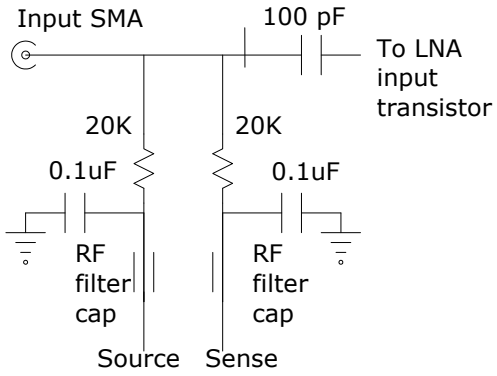


Note the sensitivity of gain to DC bias voltage. At 1.5V bias the slope is 1.4 dB per 0.1 volt bias change. This is a ΔG/ΔV of 5.7% per 1%. A .01% power supply gives a gain stability of .06% or .0026 dB.

Use care to not bend (and break) the DC bias pin when tightening the output SMA connector.

Bias Tee Schematic

To order amplifier with 5K bias resistors add -5K to model number



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