

# CMT-BA1

## 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
  - 0.005 to 1.5 GHz
- Gain
  - 32 dB  $\pm$  1 dB
- Noise temperature
  - < 2.0 K @ 30MHz
  - < 4.3 K @ 1.5GHz
- Optimum DC Power
  - Vd = 2.0 V
  - Id = 13.1 mA



### Description

- The CMT-BA1, a SiGe low noise amplifier, is intended for extremely low noise cryogenic applications. This amplifier is an upgrade from our LF1 amplifier. The optimum frequency range is 0.005 GHz to 1.5 GHz. The typical noise temperature is 2.0K from 30 to 500 MHz and 4.3K @ 1.5 GHz. The typical gain of the amplifier is 32 dB with a gain flatness of +/-1 dB.
- The amplifier is powered from a single positive DC power supply which is optimum at 2.0 V, but can be reduced to as low as 1.5 V for low power dissipation. Application of up to 3 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.

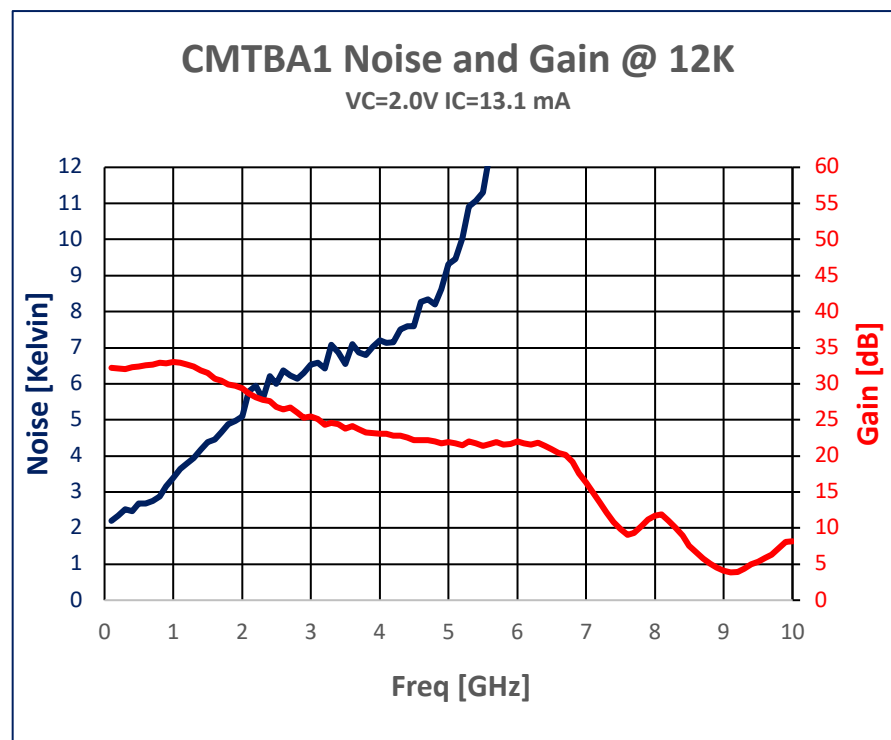
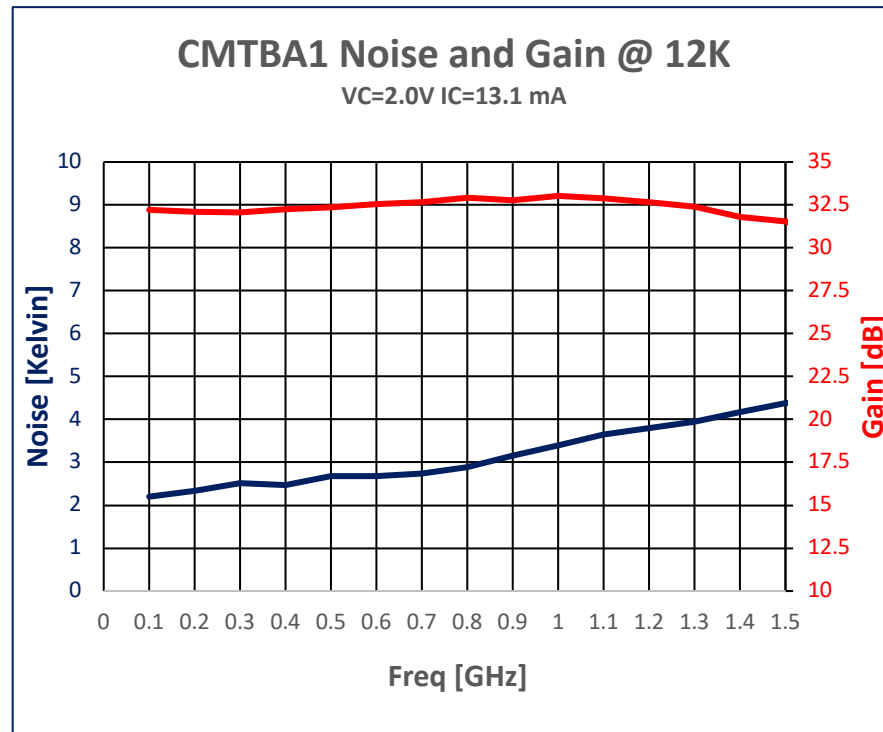
## Electrical Specifications @ 12 K

Description	Typical	Minimum	Maximum
RF Frequency		0.005 GHz	1.5 GHz
Gain		32 dB $\pm$ 5 dB	
Noise Temperature	< 4.3K	2.0 K	4.5 K
IRL (-20log S <sub>11</sub>  )		< -15 dB	
ORL (-20log S <sub>22</sub>  )		< -10 dB	
DC Voltage	2.0 V	1.5 V	3 V
DC Current	13.1 mA	6.5 mA	25 mA

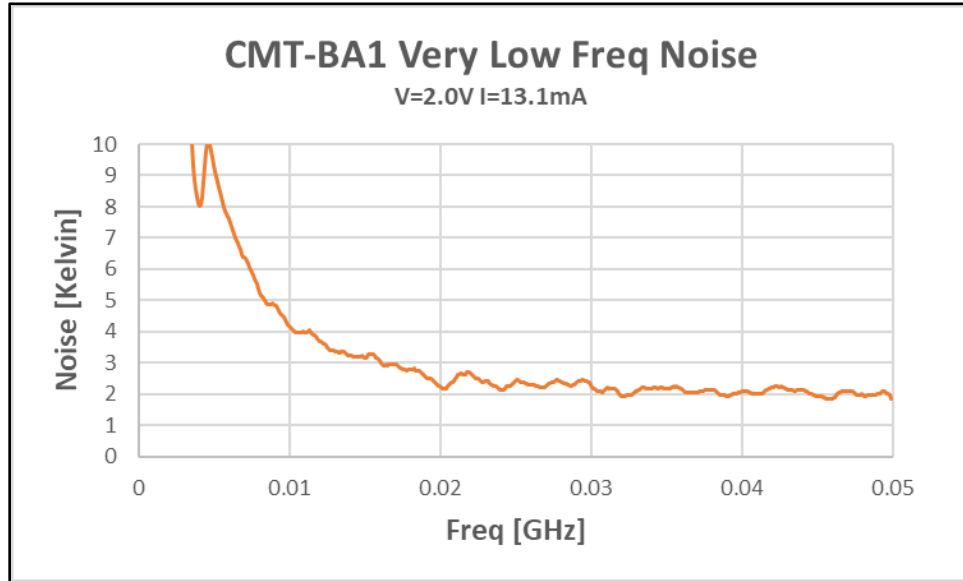
## Electrical Specifications @ 300 K

Description	Typical	Minimum	Maximum
RF Frequency		0.001 GHz	1.5 GHz
Gain	35 dB	35 dB $\pm$ 2 dB	
Noise Temperature	< 80K	60K	80K
IRL (-20log S <sub>11</sub>  )		< -10 dB	
ORL (-20log S <sub>22</sub>  )		< -15 dB	
DC Voltage	2.5 V	1.1 V	5 V
DC Current	10.6 mA	2.2 mA	2.6 mA

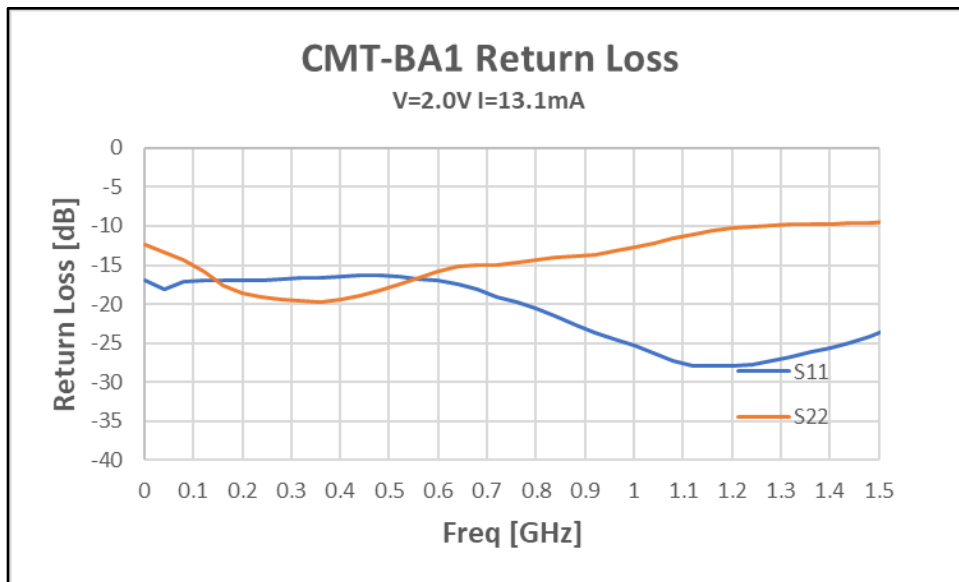
# Typical Test Results – Optimum DC Bias @ 12 K



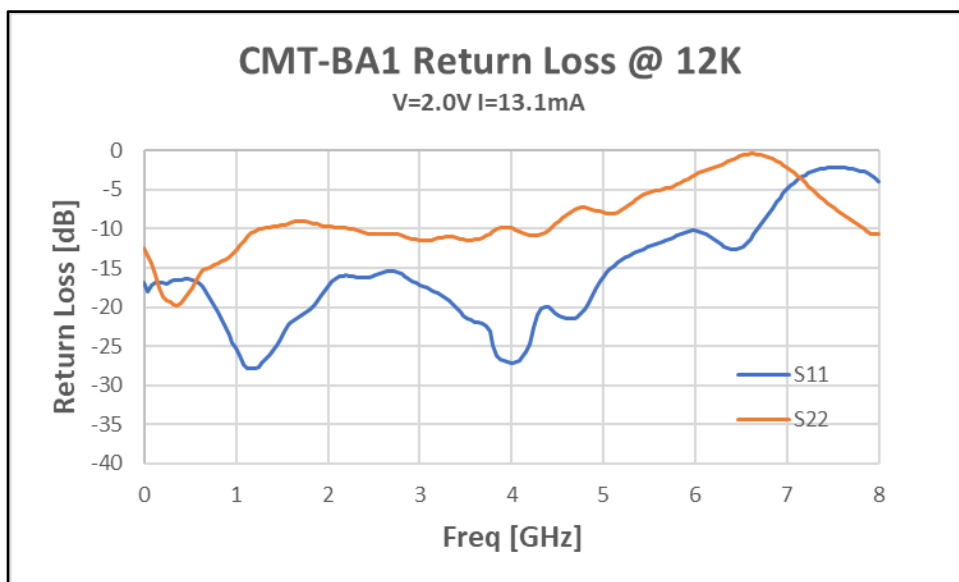
# CMT-BA1 Very Low Frequency Noise



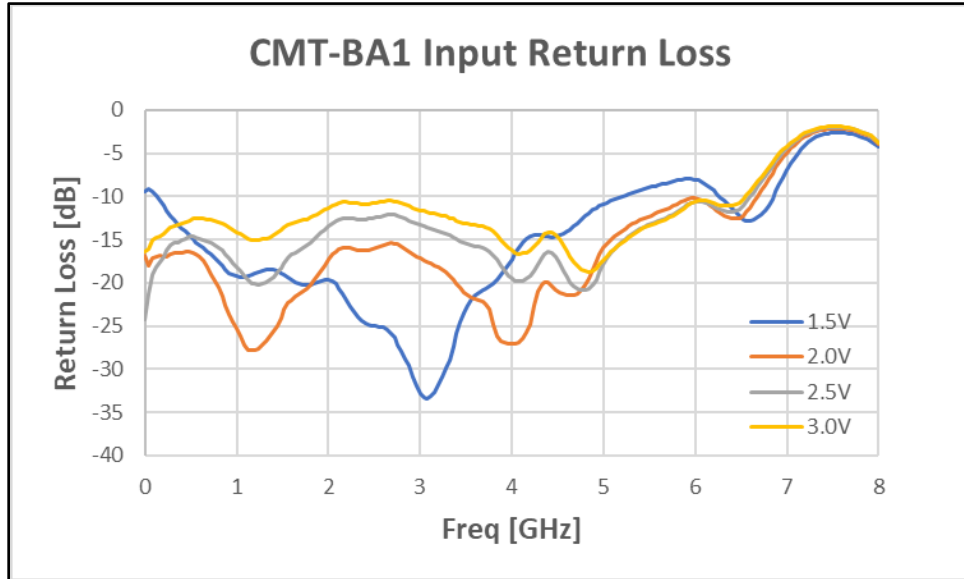
# CMT-BA1 Return Loss



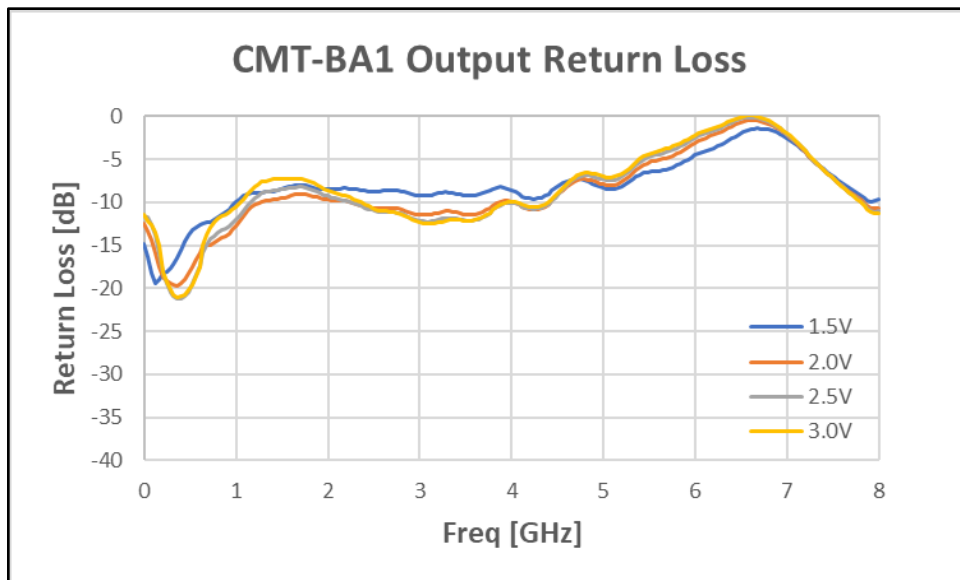
# CMT-BA1 Return Loss @ 12K



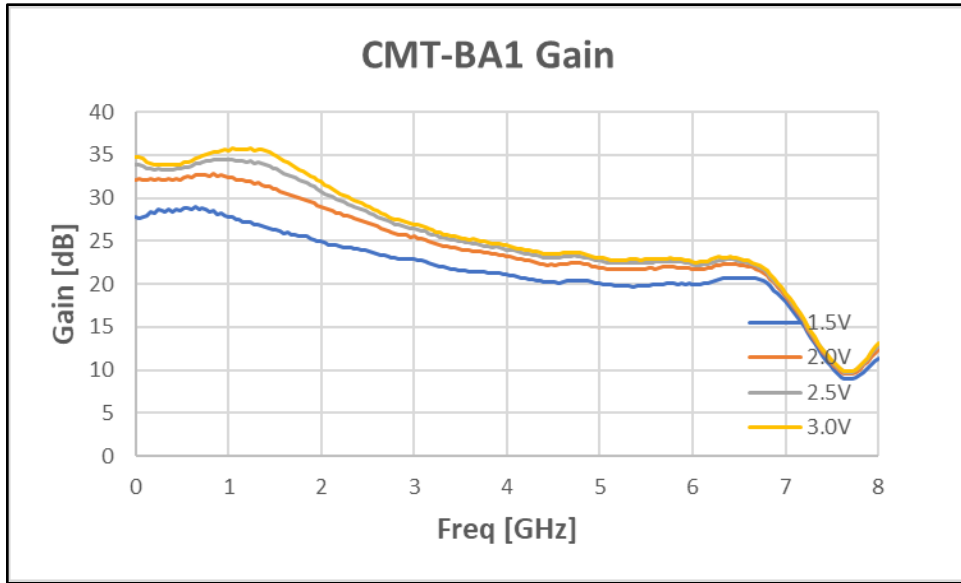
## CMT-BA1 Input Return Loss



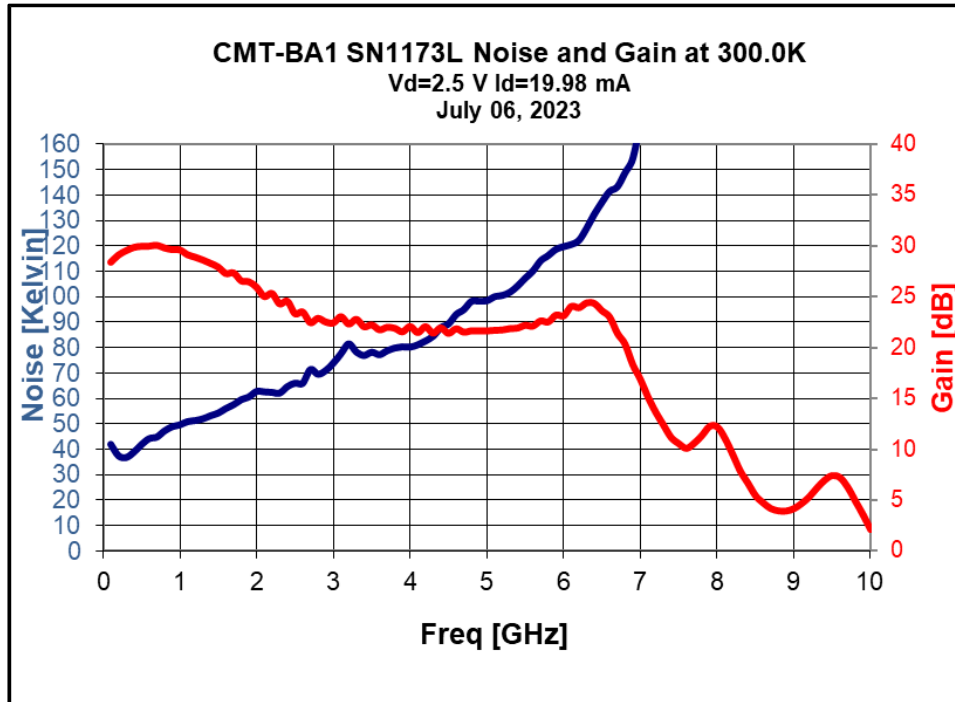
## CMT-BA1 Output Return Loss



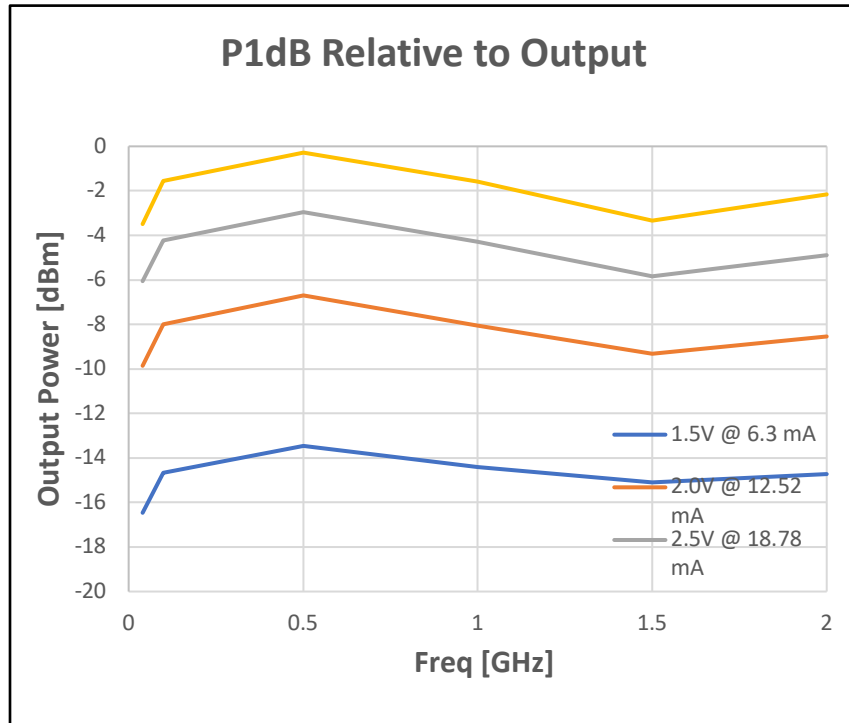
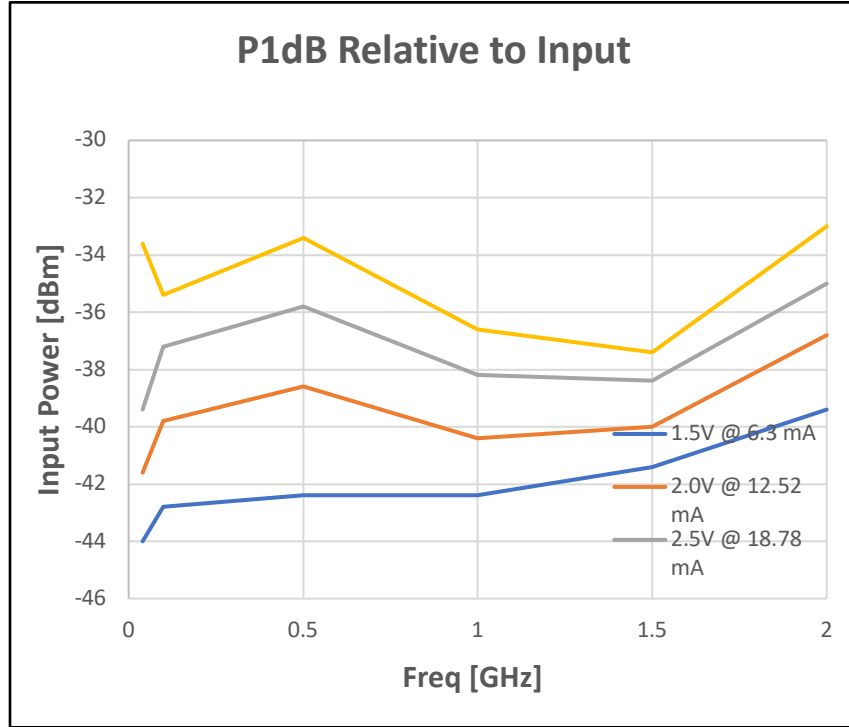
# CMT-BA1 Gain



## Typical Test Results – Optimum DC Bias @ 300 K

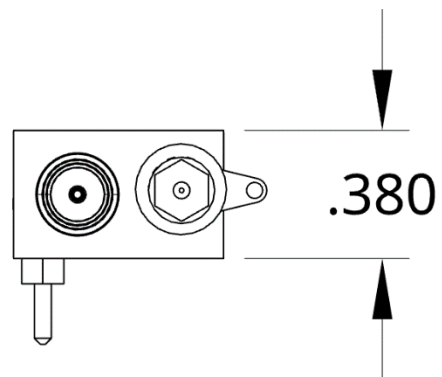
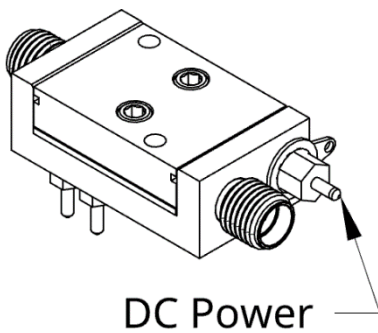
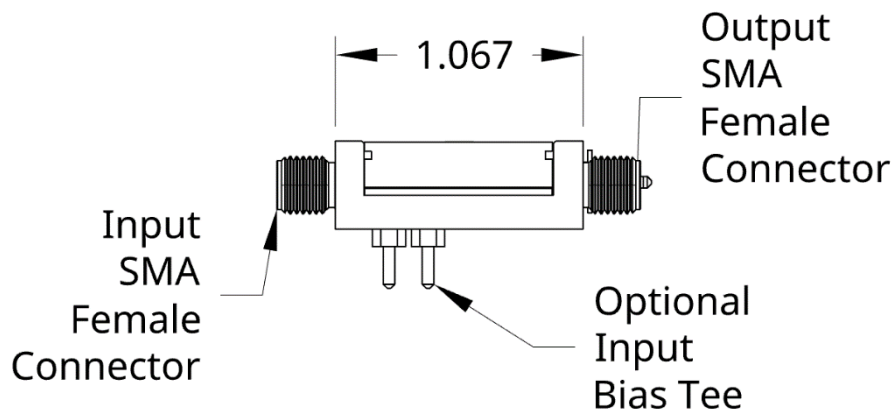
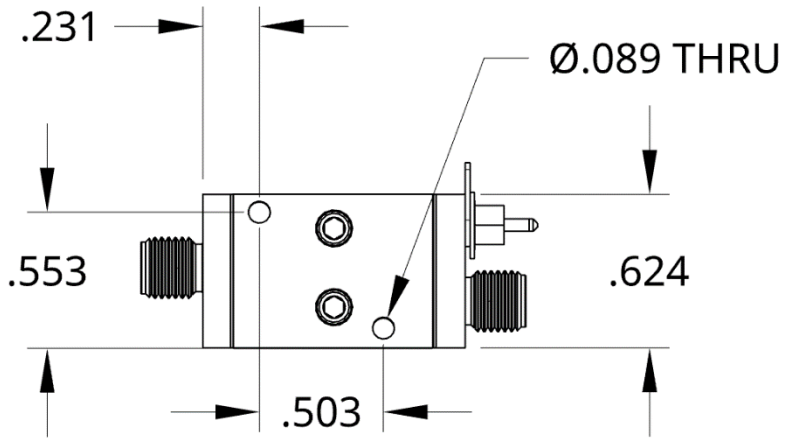


# CMT-BA1 P1dB Compression





# 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 KΩ resistors increase noise by 0.5 K.

To order an amplifier with internal bias resistors, add the resistance to the part #. For instance, CMT-BA1-20K.

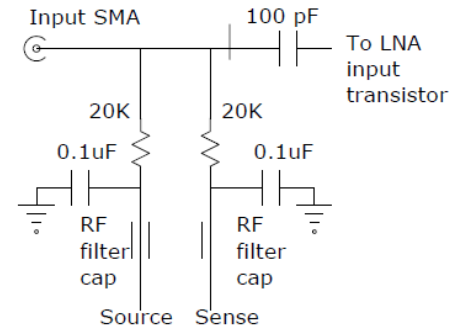
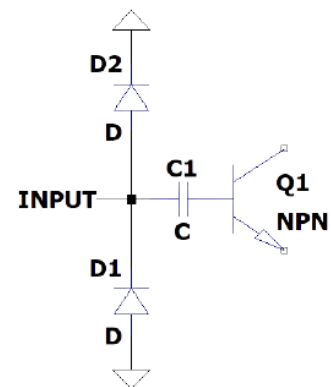


Figure 1. Bias Tee Schematic

## 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, CMT-BA1-12D-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.

## Contact Information

### Sales & Quotes

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