*Preliminary*

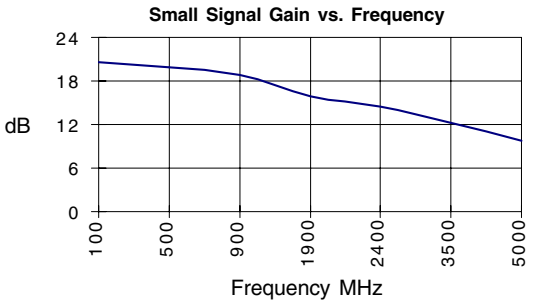
# SGA-4486

## DC-2000 MHz Silicon Germanium HBT Cascadeable Gain Block

## Product Description

Stanford Microdevices' SGA-4486 is a high performance cascadeable 50-ohm amplifier designed for operation at voltages as low as 3.2V. This RFIC uses the latest Silicon Germanium Heterostructure Bipolar Transistor (SiGe HBT) process featuring 1 micron emitters with $F_T$ up to 65 GHz.

This circuit uses a darlington pair topology with resistive feedback for broadband performance as well as stability over its entire temperature range. Internally matched to 50 ohm impedance, the SGA-4486 requires only DC blocking and bypass capacitors for external components.




## Product Features

- **DC-2000 MHz Operation**
- **Single Voltage Supply**
- **High Output Intercept: +28.2dBm typ. at 850 MHz**
- **Low Current Draw: 45mA at 3.2V typ.**
- **Excellent Noise Figure: 2.7dB typ. at 850 MHz**

## Applications

- **Oscillator Amplifiers**
- **PA for Low Power Applications**
- **IF/ RF Buffer Amplifier**
- **Drivers for CATV Amplifiers**

| Symbol | Parameters: Test Conditions: $Z_0$ = 50 Ohms, Id = 45 ma, T = 25ºC | | Units | Min. | Typ. | Max. |
|---|---|---|---|---|---|---|
| $P_{1dB}$ | Output Power at 1dB Compression | f = 850 MHz<br>f = 1950 MHz | dBm<br>dBm | | 15.4<br>12.8 | |
| $S_{21}$ | Small Signal Gain | f = DC - 1000 MHz<br>f = 1000 - 2000 MHz | dB<br>dB | 17.1 | 19.0<br>16.0 | |
| $S_{12}$ | Reverse Isolation | f = DC - 1000 MHz<br>f = 1000 - 2000 MHz | dB<br>dB | | 22.7<br>21.3 | |
| $S_{11}$ | Input VSWR | f = DC - 2000 MHz | - | | 1.41:1 | |
| $S_{22}$ | Output VSWR | f = DC - 2000 MHz | - | | 1.28:1 | |
| $IP_3$ | Third Order Intercept Point | f = 850 MHz<br>f = 1950 MHz | dBm<br>dBm | | 28.2<br>26.7 | |
| NF | Noise Figure | f = DC - 1000 MHz<br>f = 1000 - 2000 MHz | dB<br>dB | | 2.7<br>3.3 | |
| $T_D$ | Group Delay | f = 1000 MHz | pS | | 130.0 | |
| $V_D$ | Device Voltage | | V | 2.8 | 3.2 | 3.6 |



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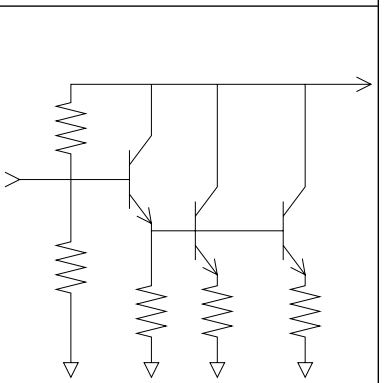
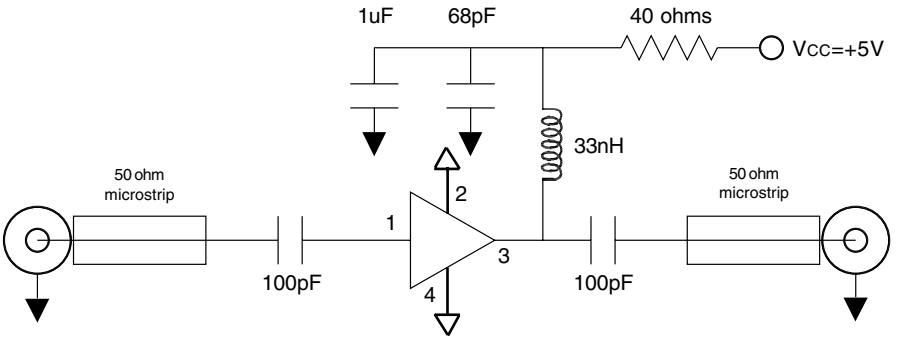
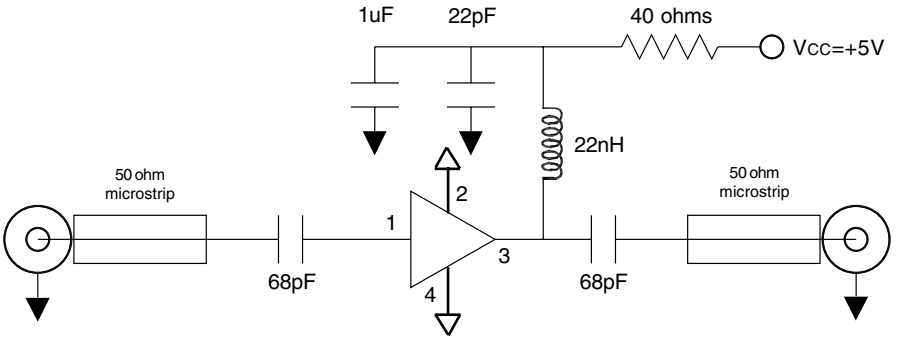
| Parameter | Specification | | | | Test Condition |
|---|---|---|---|---|---|
| | Min | Typ. | Max. | Unit | |
| **Device Bias** | | | | | T= 25C |
| Operating Voltage | | 3.2 | | V | |
| Operating Current | | 45.0 | | mA | |
| **500 MHz** | | | | | T= 25C |
| Gain | | 19.9 | | dB | |
| Noise Figure | | 2.6 | | dB | |
| Output IP3 | | 28.0 | | dBm | |
| Output P1dB | | 15.0 | | dBm | |
| Input Return Loss | | 14.2 | | dB | |
| Isolation | | 23.0 | | dB | |
| **850 MHz** | | | | | T= 25C |
| Gain | | 18.9 | | dB | |
| Noise Figure | | 2.7 | | dB | |
| Output IP3 | | 28.2 | | dBm | |
| Output P1dB | | 15.4 | | dBm | |
| Input Return Loss | | 15.4 | | dB | |
| Isolation | | 22.7 | | dB | |
| **1950 MHz** | | | | | T= 25C |
| Gain | | 15.9 | | dB | |
| Noise Figure | | 3.3 | | dB | |
| Output IP3 | | 26.7 | | dBm | |
| Output P1dB | | 12.8 | | dBm | |
| Input Return Loss | | 18.6 | | dB | |
| Isolation | | 21.3 | | dB | |
| **2400 MHz** | | | | | T= 25C |
| Gain | | 14.4 | | dB | |
| Noise Figure | | 3.4 | | dB | |
| Output IP3 | | 26.0 | | dBm | |
| Output P1dB | | 11.5 | | dBm | |
| Input Return Loss | | 31.3 | | dB | |
| Isolation | | 20.4 | | dB | |

| Pin # | Function | Description | Device Schematic |
|---|---|---|---|
| 1 | RF IN | RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation. |  |
| 2 | GND | Connection to ground. Use via holes for best performance to reduce lead inductance as close to ground leads as possible. | |
| 3 | RF OUT/ BIAS | RF output and bias pin. DC voltage is present on this pin, therefore a DC blocking capacitor is necessary for proper operation. | |
| 4 | GND | Sames as Pin 2 | |

## Application Schematic for +5V Operation at 900 MHz

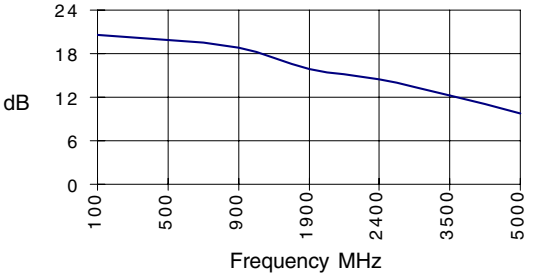



## Application Schematic for +5V Operation at 1900 MHz

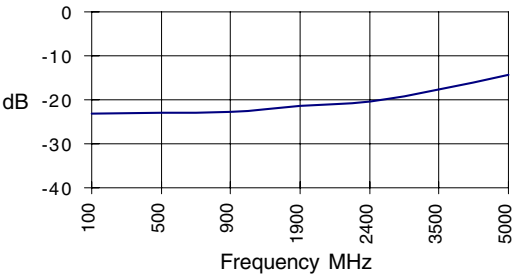


# SGA-4486 DC-2000 MHz 3.2V SiGe Amplifier

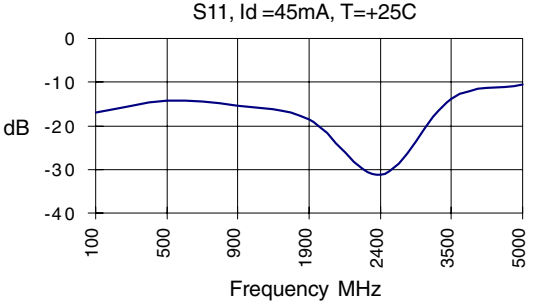
S21, Id =45mA, T=+25C



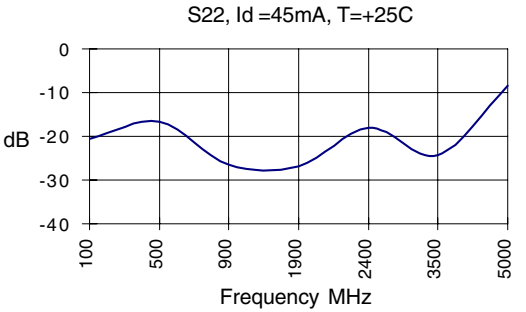

S12, Id =45mA, T=+25C



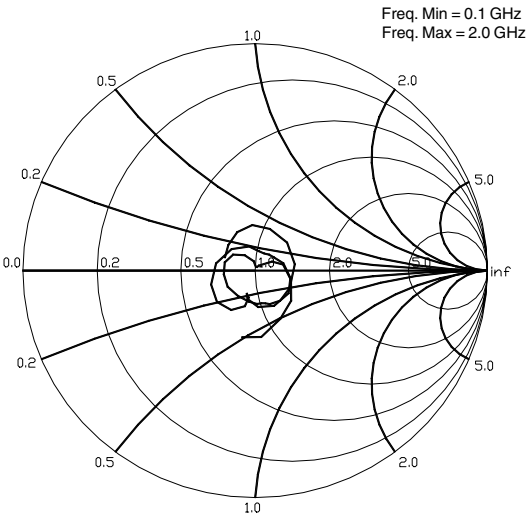

S11, Id =45mA, T=+25C



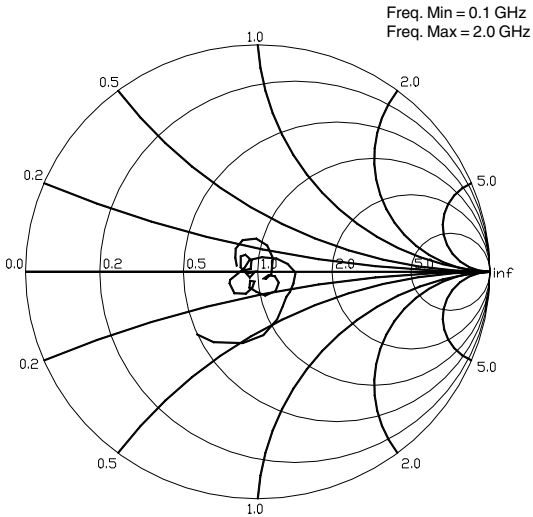

S22, Id =45mA, T=+25C




S11, Id=45mA, Ta= +25C




S22, Id=45mA, Ta= +25C



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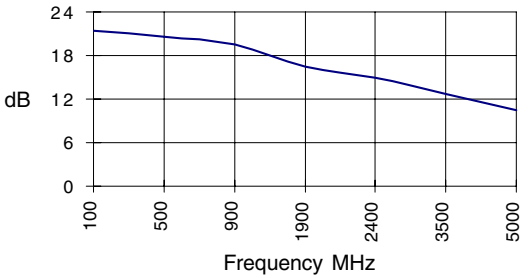
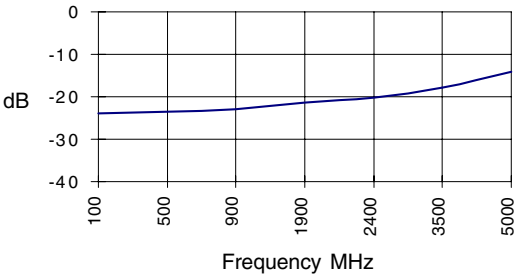
# SGA-4486 DC-2000 MHz 3.2V SiGe Amplifier

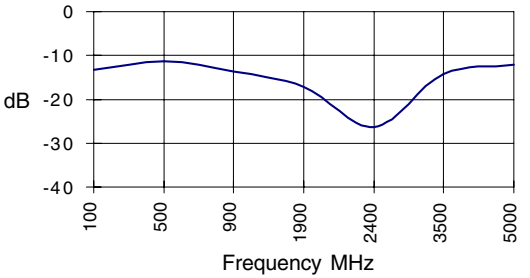
S21, Id =45mA, T=-40C



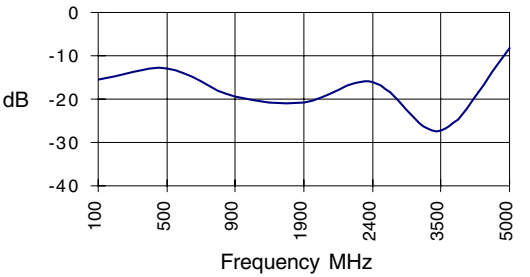

S12, Id =45mA, T=-40C



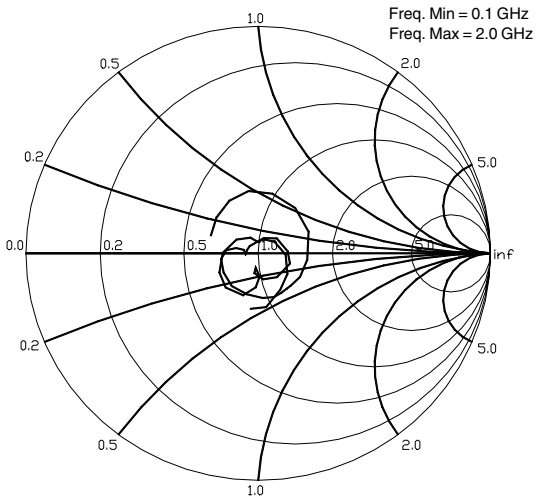

S11, Id =45mA, T=-40C



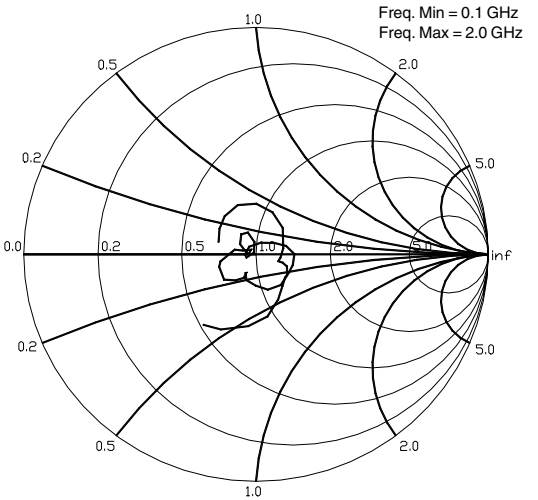

S22, Id =45mA, T=-40C




S11, Id=45mA, Ta= -40C




S22, Id=45mA, Ta= -40C



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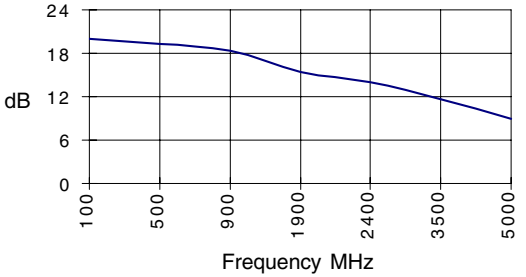
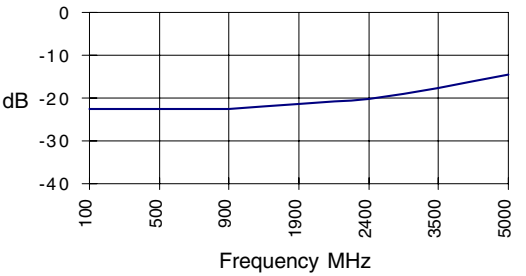
# SGA-4486 DC-2000 MHz 3.2V SiGe Amplifier

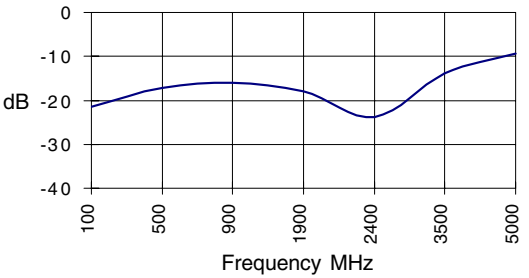
S21, Id =45mA, T=85C



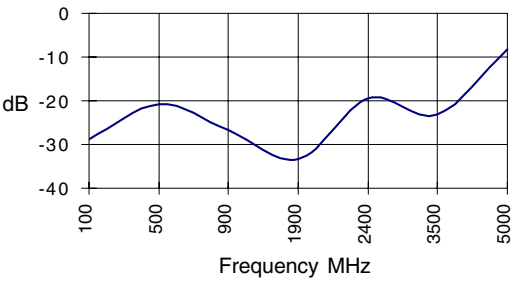

S12, Id =45mA, T=85C



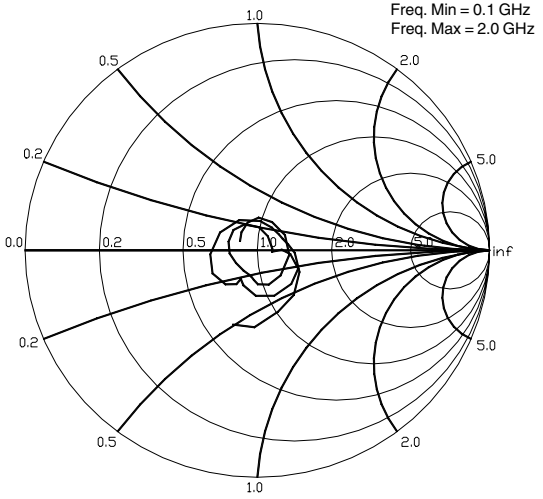

S11, Id =45mA, T=85C



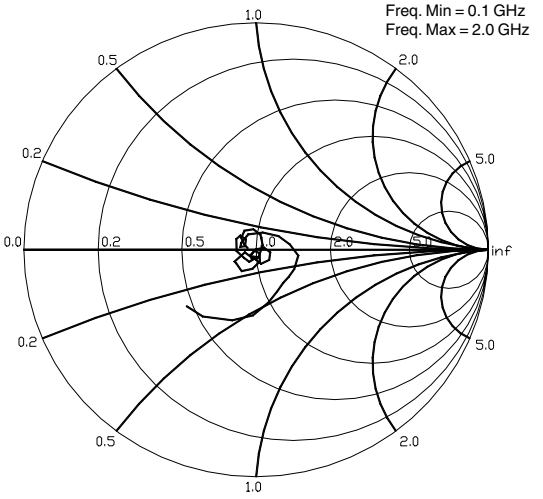

S22, Id =45mA, T=85C




S11, Id=45mA, Ta= 85C




S22, Id=45mA, Ta= 85C



STANFORD MICRODEVICES

*Preliminary*

# SGA-4486 DC-2000 MHz 3.2V SiGe Amplifier

## Absolute Maximum Ratings

| Parameter | Value | Unit |
|---|---|---|
| Supply Current | 90 | mA |
| Operating Temperature | -40 to +85 | C |
| Maximum Input Power | +10 | dBm |
| Storage Temperature Range | -40 to +85 | C |
| Operating Junction Temperature | +150 | C |

**Caution:**

Operation of this device above any one of these parameters may cause permanent damage. Appropriate precautions in handling, packaging and testing devices must be observed.

Thermal Resistance (Lead-Junction): 97° C/W

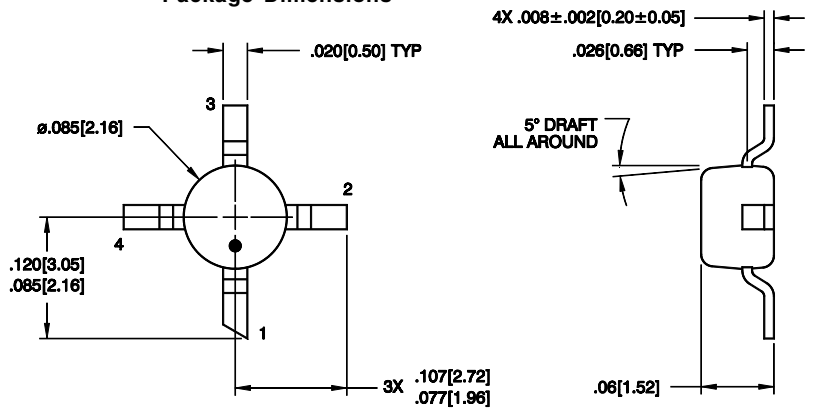
## Part Number Ordering Information

| Part Number | Reel Size | Devices/Reel |
|---|---|---|
| SGA-4486-TR1 | 7" | 1000 |
| SGA-4486-TR2 | 13" | 3000 |

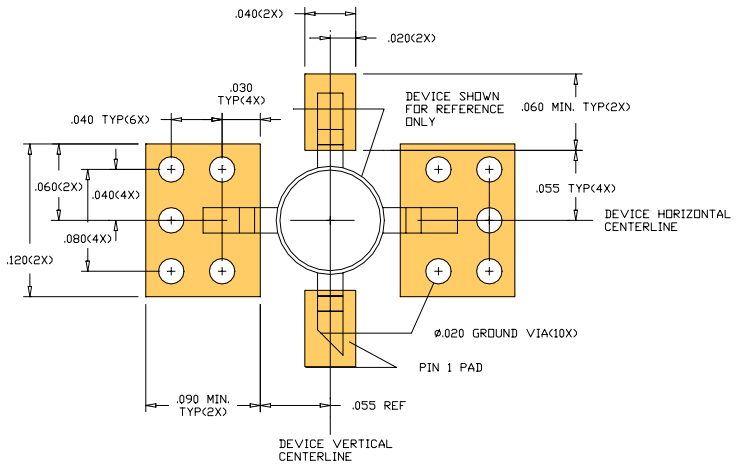
| Recommended Bias Resistor Values | | | | | |
|---|---|---|---|---|---|
| Supply Voltage(Vs) | 4V | 5V | 7.5V | 9V | 12V |
| Rbias (Ohms) | 18 | 40 | 96 | 129 | 196 |

## Package Dimensions

| Pin Designation | |
|---|---|
| 1 | RF in |
| 2 | GND |
| 3 | RF out and Bias |
| 4 | GND |




## PCB Pad Layout



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