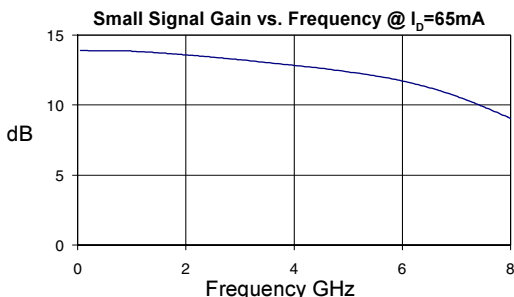


## Product Description

Stanford Microdevices' SNA-486 is a high performance Gallium Arsenide Heterojunction Bipolar Transistor MMIC Amplifier. A Darlington configuration is utilized for broadband performance up to 6.5 GHz. The heterojunction increases breakdown voltage and minimizes leakage current between junctions. Cancellation of emitter junction non-linearities results in higher suppression of intermodulation products. Typical IP3 at 850 MHz with 65mA is 32.3 dBm.

These unconditionally stable amplifiers provide 13.6 dB of gain and 17.5 dBm of 1dB compressed power and require only a single positive voltage supply. Only 2 DC-blocking capacitors, a bias resistor and an optional inductor are needed for operation. This MMIC is an ideal choice for wireless applications such as cellular, PCS, CDPD, wireless data and SONET.



## Electrical Specifications

| Symbol    | Parameters: Test Conditions:<br>$Z_0 = 50 \text{ Ohms}$ , $I_b = 65mA$ , $T = 25^\circ C$ |   | Units             | Min. | Typ.                 | Max. |
|-----------|---|---|-------------------|------|----------------------|------|
| $P_{1dB}$ | Output Power at 1dB Compression   | f = 850 MHz<br>f = 1950 MHz<br>f = 2400 MHz | dBm<br>dBm<br>dBm |      | 17.1<br>17.5<br>17.5 |      |
| $IP_3$    | Third Order Intercept Point<br>Power out per tone = 0 dBm                                 | f = 850 MHz<br>f = 1950 MHz<br>f = 2400 MHz | dBm<br>dBm<br>dBm |      | 32.3<br>30.9<br>30.6 |      |
| $S_{21}$  | Small Signal Gain   | f = 850 MHz<br>f = 1950 MHz<br>f = 2400 MHz | dB<br>dB<br>dB    | 12.5 | 13.9<br>13.6<br>13.5 |      |
| Bandwidth | (Determined by $S_{11}$ , $S_{22}$ Values)  |   | MHz               |      | 6500                 |      |
| $S_{11}$  | Input VSWR  | f = DC-6500 MHz                             | -                 |      | 1.7:1                |      |
| $S_{22}$  | Output VSWR   | f = DC-6500 MHz                             | -                 |      | 1.6:1                |      |
| $S_{12}$  | Reverse Isolation   | f = 850 MHz<br>f = 1950 MHz<br>f = 2400 MHz | dB<br>dB<br>dB    |      | 18.3<br>18.2<br>18.2 |      |
| NF        | Noise Figure, $Z_s = 50 \text{ Ohms}$   | f = 1950 MHz                                | dB                |      | 5.0                  |      |
| $V_D$     | Device Voltage  |   | V                 | 4.5  | 5.0                  | 5.5  |
| Rth,j-l   | Thermal Resistance (junction - lead)  |   | $^\circ C/W$      |      | 254                  |      |

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## SNA-486

### DC-6.5 GHz, Cascadable GaAs HBT MMIC Amplifier

#### NGA-486 Recommended for New Designs



## Product Features

- High Output IP3: 32.3 dBm @ 850 MHz
- Cascadable 50 Ohm Gain Block
- Patented GaAs HBT Technology
- Operates From Single Supply

## Applications

- Cellular, PCS, CDPD, Wireless Data, SONET

**Absolute Maximum Ratings**

Operation of this device above any one of these parameters may cause permanent damage.

Bias Conditions should also satisfy the following expression:

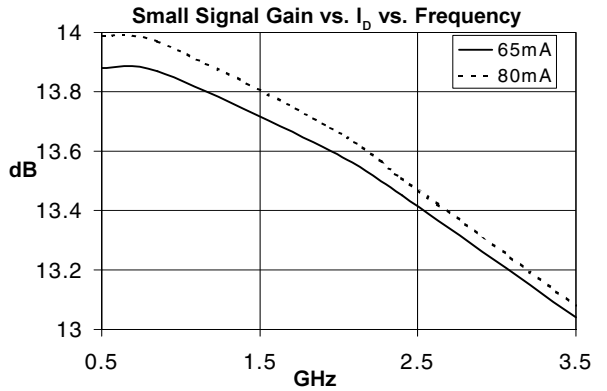
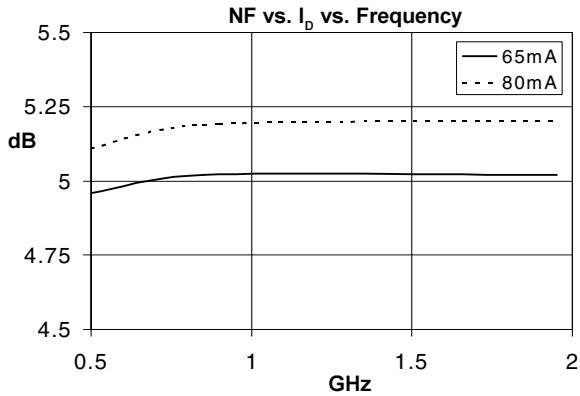
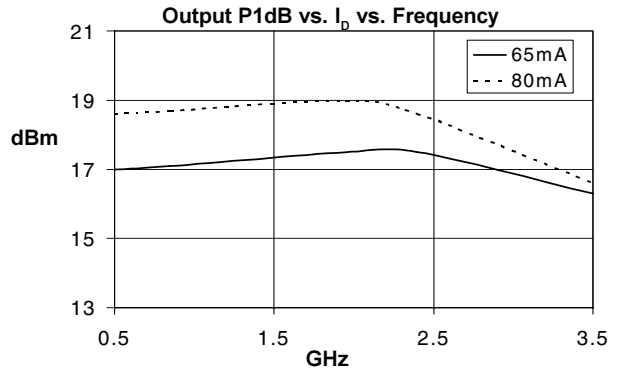
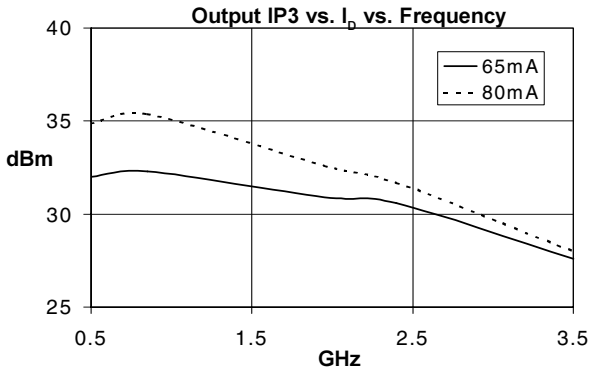
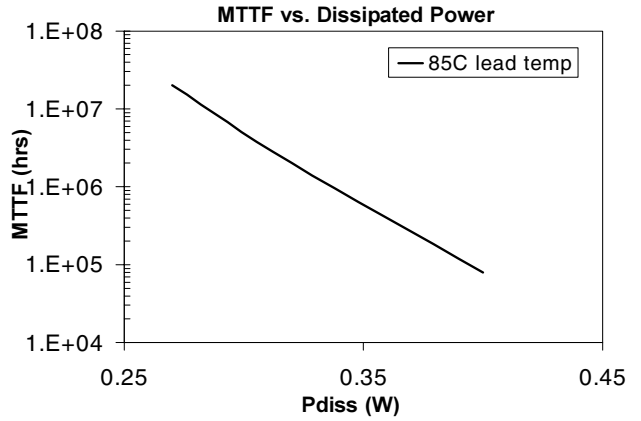
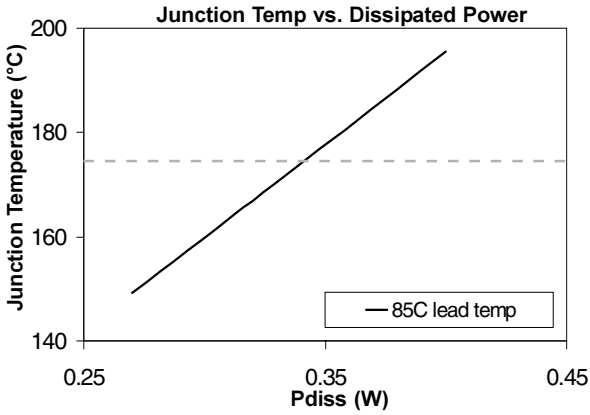
$$I_D V_D (\text{max}) < (T_J - T_{OP})/R_{th, j-l}$$

| Parameter                      | Value       | Unit |
|--------------------------------|-------------|------|
| Supply Current                 | 110         | mA   |
| Operating Temperature          | -40 to +85  | C    |
| Maximum Input Power            | 16          | dBm  |
| Storage Temperature Range      | -40 to +150 | C    |
| Operating Junction Temperature | +175        | C    |

| Parameter         | Typical |      | Test Condition<br>( $I_D = 65 \text{ mA}$ , unless otherwise noted)    |
|-------------------|---------|------|--|
|                   | 25°C    | Unit |  |
| <b>500 MHz</b>    |         |      |  |
| Gain              | 13.9    | dB   | $Z_S = 50 \text{ Ohms}$<br>Tone spacing = 1 MHz, Pout per tone = 0 dBm |
| Noise Figure      | 5.0     | dB   |  |
| Output IP3        | 32.0    | dBm  |  |
| Output P1dB       | 17.0    | dBm  |  |
| Input Return Loss | 11.6    | dB   |  |
| Isolation         | 18.3    | dB   |  |
| <b>850 MHz</b>    |         |      |  |
| Gain              | 13.9    | dB   | $Z_S = 50 \text{ Ohms}$<br>Tone spacing = 1 MHz, Pout per tone = 0 dBm |
| Noise Figure      | 5.0     | dB   |  |
| Output IP3        | 32.3    | dBm  |  |
| Output P1dB       | 17.1    | dBm  |  |
| Input Return Loss | 12.2    | dB   |  |
| Isolation         | 18.3    | dB   |  |
| <b>1950 MHz</b>   |         |      |  |
| Gain              | 13.6    | dB   | $Z_S = 50 \text{ Ohms}$<br>Tone spacing = 1 MHz, Pout per tone = 0 dBm |
| Noise Figure      | 5.0     | dB   |  |
| Output IP3        | 30.9    | dBm  |  |
| Output P1dB       | 17.5    | dBm  |  |
| Input Return Loss | 11.7    | dB   |  |
| Isolation         | 18.2    | dB   |  |
| <b>2400 MHz</b>   |         |      |  |
| Gain              | 13.5    | dB   | Tone spacing = 1 MHz, Pout per tone = 0 dBm                            |
| Output IP3        | 30.6    | dBm  |  |
| Output P1dB       | 17.5    | dBm  |  |
| Input Return Loss | 11.5    | dB   |  |
| Isolation         | 18.2    | dB   |  |

**\*NOTE:** While the SNA-486 can be operated at different bias currents, 65 mA is the recommended bias for lower junction temperature and longer life. This reflects typical operating conditions which we have found to be an optimal balance between high IP3 and MTTF. In general, MTTF is improved to more than 100,000 hours when biasing at 65 mA and operating up to 85°C ambient temperature.

## SNA-486 DC-6.5GHz Cascadable MMIC Amplifier

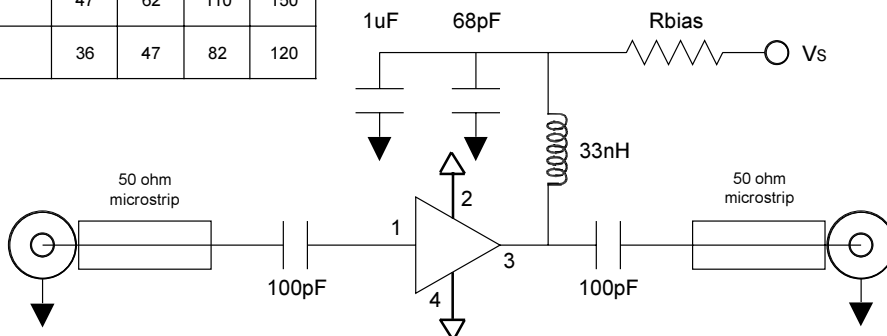


## SNA-486 DC-6.5GHz Cascadable MMIC Amplifier

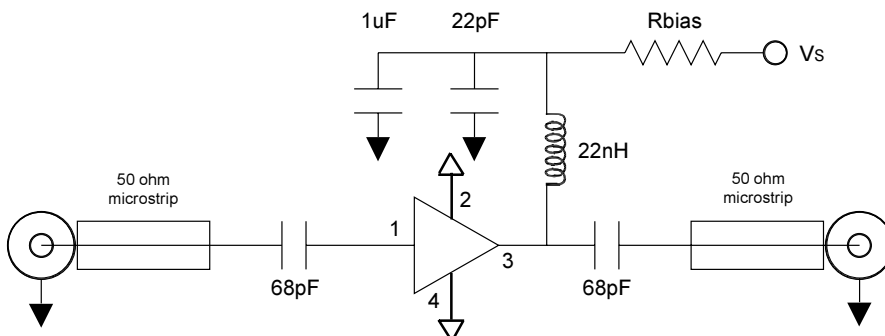
| Pin # | Function   | Description   |
|-------|------------|---|
| 1     | RF IN      | RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.   |
| 2     | GND        | Connection to ground. Use via holes for best performance to reduce lead inductance. Place vias as close to ground leads as possible.  |
| 3     | RF OUT/Vcc | RF output and bias pin. Bias should be supplied to this pin through an external series resistor and RF choke inductor. Because DC biasing is present on this pin, a DC blocking capacitor should be used in most applications (see application schematic). The supply side of the bias network should be well bypassed. |
| 4     | GND        | Same as Pin 2.  |

### Application Schematic for Operation at 850 MHz

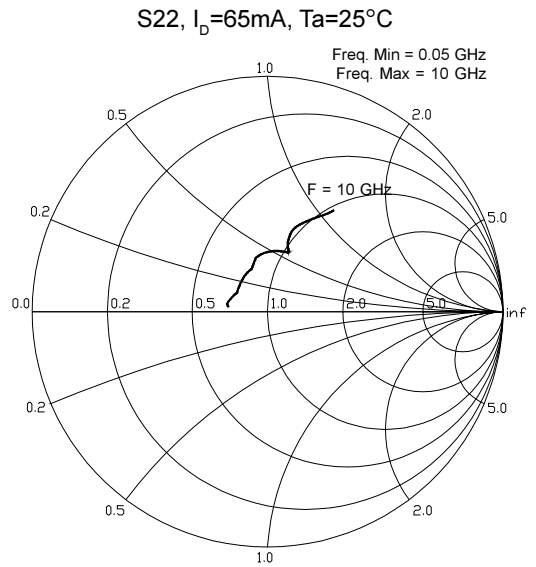
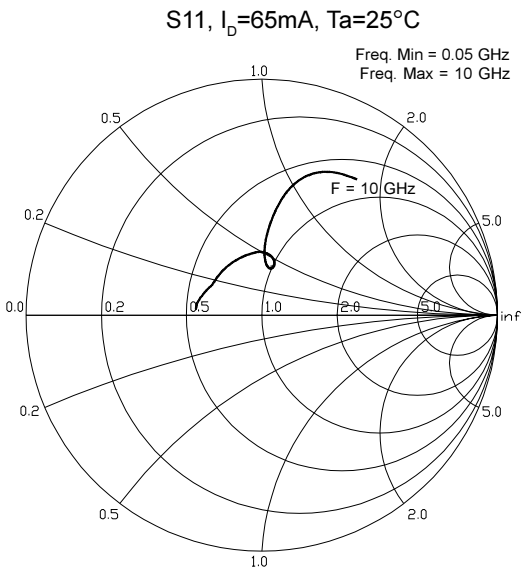
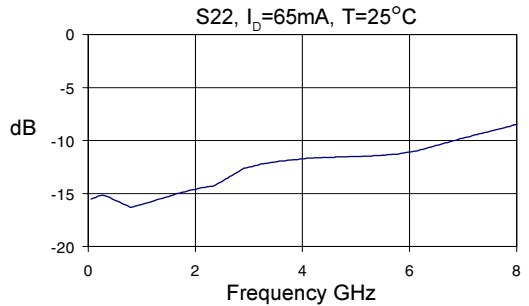
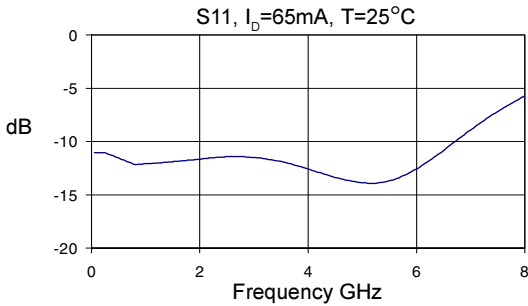
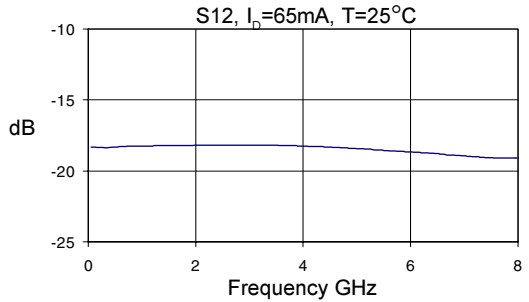
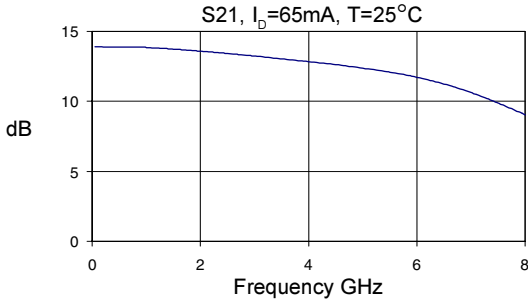
| Recommended Bias Resistor Values |    |    |     |     |
|----------------------------------|----|----|-----|-----|
| Supply Voltage(Vs)               | 8V | 9V | 12V | 15V |
| Rbias (Ohms)<br>@ 65 mA          | 47 | 62 | 110 | 150 |
| Rbias (Ohms)<br>@ 80 mA          | 36 | 47 | 82  | 120 |



### Application Schematic for Operation at 1950 MHz



## SNA-486 DC-6.5GHz Cascadable MMIC Amplifier



## SNA-486 DC-6.5GHz Cascadable MMIC Amplifier

### Part Number Ordering Information

| Part Number | Reel Size | Devices/Reel |
|-------------|-----------|--------------|
| SNA-486     | 7"        | 1000         |

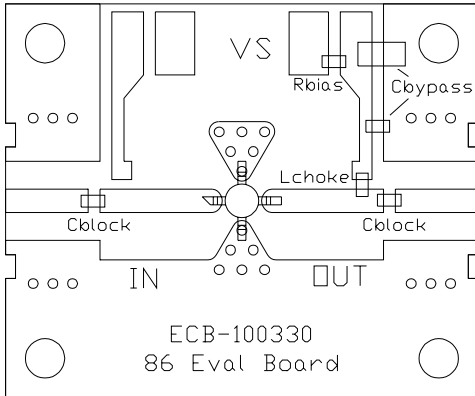


### Caution ESD Sensitive:

Appropriate precautions in handling, packaging and testing devices must be observed.

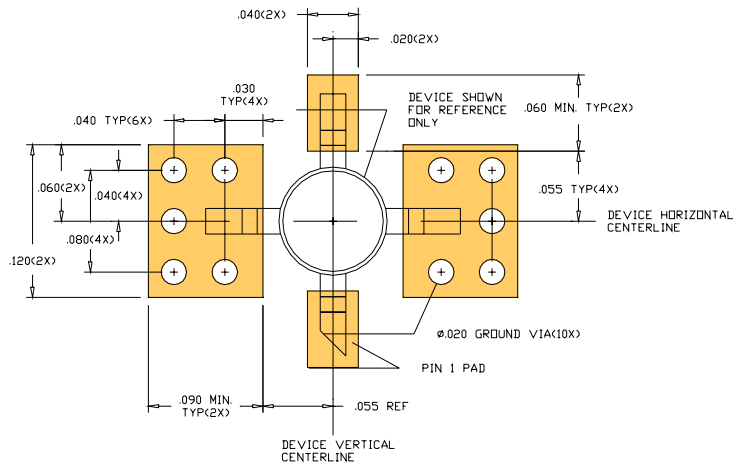
### Part Symbolization

The part will be symbolized with an "S4" designator on the top surface of the package.

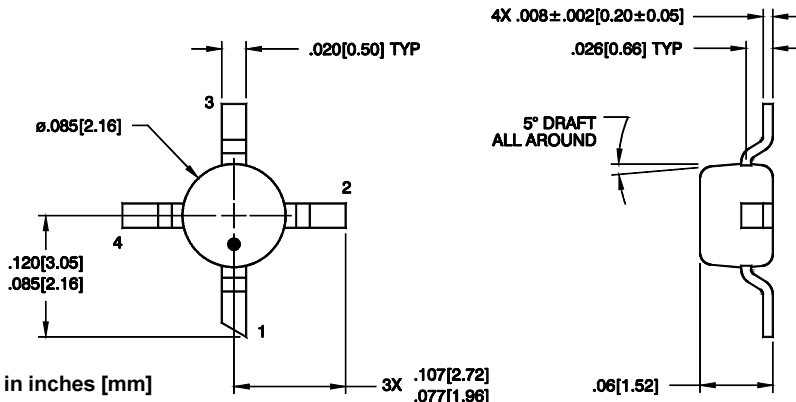


Evaluation Board Layout

### PCB Pad Layout



### Package Dimensions



Dimensions are in inches [mm]