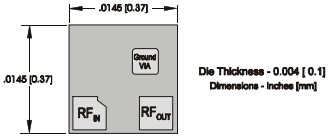
# SNA-600

## DC-6.5 GHz, Cascadable GaAs MMIC Amplifier




## Product Description

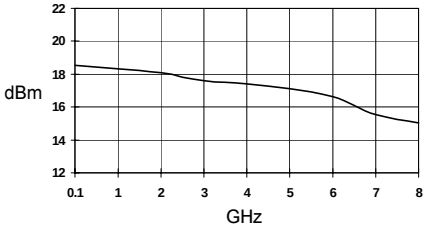
Sirenza Microdevices' SNA-600 is a high-performance GaAs Heterojunction Bipolar Transistor (MMIC) in die form. A Darlington configuration is utilized for broadband performance to 6.5 GHz.

These unconditionally stable amplifiers provide 11dB of gain and +18dBm of P1dB when biased at 65mA.

This MMIC requires only a single supply voltage. The use of an external resistor allows for bias flexibility and stability. Its small size (0.4mm x 0.4mm) and gold metallization make it an ideal choice for use in hybrid circuits.

The SNA-600 is available in gel paks at 100 devices per container. Also available in packaged form (SNA-676 & SNA-686).

**Output Power vs. Frequency**




## Product Features

- **Cascadable 50 Ohm Gain Block**
- **11dB Gain, +18dBm P1dB**
- **High Linearity, +36dBm TOIP Typ.**
- **1.5:1 Input and Output VSWR**
- **Chip Back Is Ground**

## Applications

- **PA Driver Amplifier**
- **Cellular, PCS, GSM, UMTS**
- **IF Amplifier**
- **Wireless Data, Satellite**

| Symbol | Parameter | Frequency | Units | Min. | Typ. | Max. |
|---|---|---|---|---|---|---|
| $P_{1dB}$ | Output Power at 1dB Compression | 850 MHz<br>1950 MHz<br>2400 MHz | dBm<br>dBm<br>dBm | | 17.6<br>17.7<br>17.4 | |
| $IP_3$ | Third Order Intercept Point | 850 MHz<br>1950 MHz<br>2400 MHz | dBm<br>dBm<br>dBm | | 34.0<br>32.1<br>30.0 | |
| $S_{21}$ | Small Signal Gain | 850 MHz<br>1950 MHz<br>2400 MHz | dB<br>dB<br>dB | | 11.1<br>11.2<br>11.3 | |
| Bandwidth | (Determined by $S_{11}$, $S_{22}$ Values) | | MHz | | 6000 | |
| $VSWR_{IN}$ | Input VSWR | DC-6000 MHz | - | | 1.3:1 | |
| $VSWR_{OUT}$ | Output VSWR | DC-6000 MHz | - | | 1.4:1 | |
| $S_{12}$ | Reverse Isolation | 850 MHz<br>1950 MHz<br>2400 MHz | dB<br>dB<br>dB | | 16.3<br>16.5<br>16.6 | |
| NF | Noise Figure | 1950 MHz | dB | | 7.3 | |
| $V_D$ | Device Operating Voltage | | V | 4.8 | 5.3 | 5.8 |
| $I_D$ | Device Operating Current | | mA | 58 | 65 | 72 |
| $R_{TH}$, j-b | Thermal Resistance (junction -backside) | | ° C/W | | 200 | |

**Test Conditions:** $V_S$ = 8 V, $I_D$ = 65 mA Typ., $OIP_3$ Tone Spacing = 1 MHz, Pout per tone = 0 dBm; $R_{BIAS}$ = 43 Ohms, $T_L$ = 25ºC, $Z_S = Z_L$ = 50 Ohms



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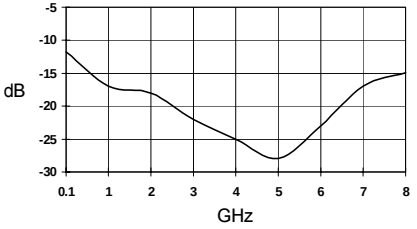
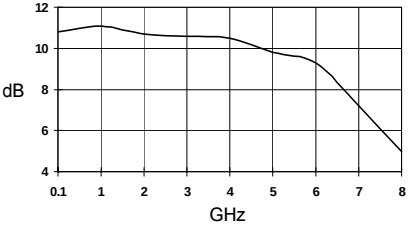
## *Typical Performance at 25° C (Vds = 5.3V, Ids = 65mA)*

|S11| vs. Frequency




|S21| vs. Frequency




|S12| vs. Frequency


|S22| vs. Frequency


Noise Figure vs. Frequency


TOIP vs. Frequency


## Absolute Maximum Ratings

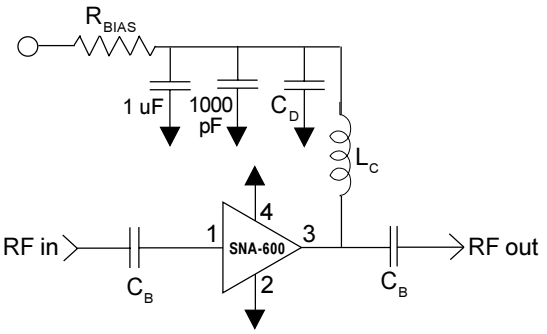
| Parameter | Absolute Limit |
|---|---|
| Max. Device Current ($I_D$) | 150 mA |
| Max. Device Voltage ($V_D$) | 7 V |
| Max. RF Input Power | +23 dBm |
| Max. Junction Temp. ($T_J$) | +200°C |
| Operating Temp. Range ($T_L$) | -40°C to +85°C |
| Max. Storage Temp. | +150°C |

Operation of this device beyond any one of these limits may cause permanent damage. For reliable continous operation, the device voltage and current must not exceed the maximum operating values specified in the table on page one.

Bias Conditions should also satisfy the following expression:

$I_D V_D < (T_J - T_L) / R_{TH}$, j-l

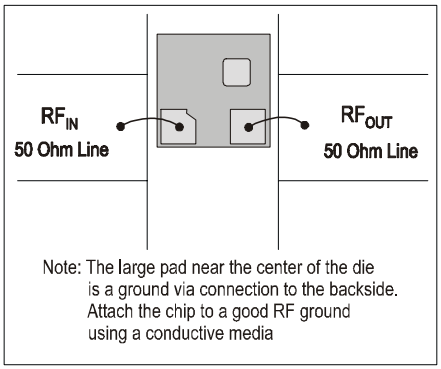
## Typical Application Circuit



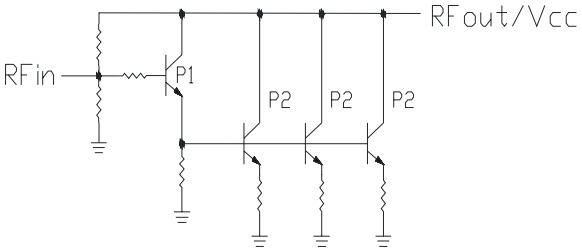

## Application Circuit Element Values

| Reference Designator | Frequency (Mhz) | | | | |
|---|---|---|---|---|---|
| | 500 | 850 | 1950 | 2400 | 3500 |
| $C_B$ | 220 pF | 100 pF | 68 pF | 56 pF | 39 pF |
| $C_D$ | 100 pF | 68 pF | 22 pF | 22 pF | 15 pF |
| $L_C$ | 68 nH | 33 nH | 22 nH | 18 nH | 15 nH |

| Recommended Bias Resistor Values for $I_D$=65mA $R_{BIAS}=(V_S-V_D)/I_D$ | | | | |
|---|---|---|---|---|
| Supply Voltage($V_S$) | 8 V | 9 V | 10 V | 12 V |
| $R_{BIAS}$ | 43 Ω | 56 Ω | 82 Ω | 100 Ω |
| Note: $R_{BIAS}$ provides DC bias stability over temperature. | | | | |




**Suggested Bonding Arrangement**
**(above configuration used for S-parameter data)**




**Simplified Schematic of MMIC**

For recommended handling, die attach, and bonding methods, see the following application note at ***www.sirenza.com.***

**AN-041 (PDF) Handling of Unpackaged Die**

**Caution: ESD sensitive**
Appropriate precautions in handling, packaging and testing devices must be observed.

**Part Number Ordering Information**

| Part Number | Gel Pack |
|---|---|
| SNA-600 | 100 pcs. per pack |

Die are shipped per Sirenza application note AN-039 Visual Criteria For Unpackaged Die