

**DARLINGTON COMPLEMENTARY  
SILICON-POWER TRANSISTORS**

...designed for general-purpose power amplifier and low frequency switching applications

**FEATURES:**

- \* Monolithic Construction with Built-in Base-Emitter Shunt Resistors.
- \* High DC Current Gain -  
hFE = 3500 (typ) @ I<sub>C</sub> = 5.0 A

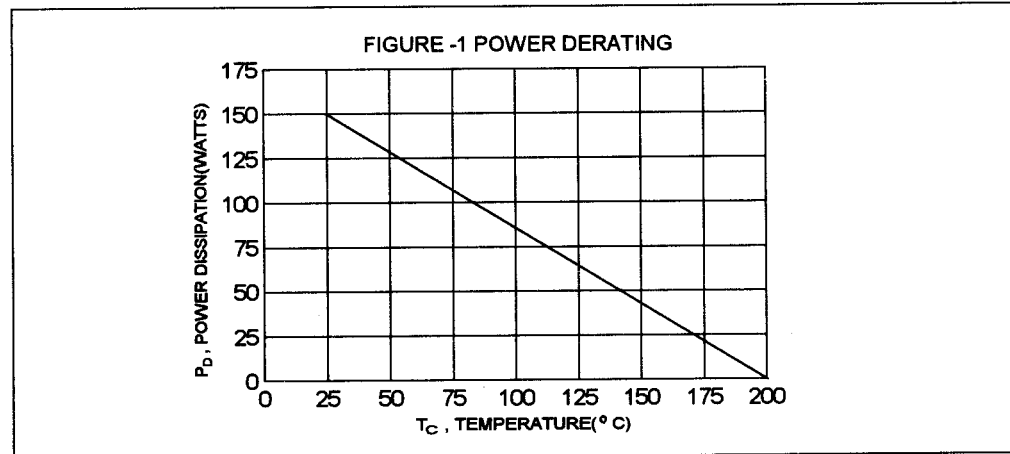
**Boca Semiconductor Corp.  
BSC**

**MAXIMUM RATINGS**

| Characteristic  | Symbol                            | 2N6050<br>2N6057 | 2N6051<br>2N6058 | 2N6052<br>2N6059 | Unit      |
|---|-----------------------------------|------------------|------------------|------------------|-----------|
| Collector-Emitter Voltage   | V <sub>CEO</sub>                  | 60               | 80               | 100              | V         |
| Collector-Base Voltage  | V <sub>CBO</sub>                  | 60               | 80               | 100              | V         |
| Emitter-Base Voltage  | V <sub>EBO</sub>                  | 5                |                  |                  | V         |
| Collector Current - Continuous<br>-Peak                               | I <sub>C</sub>                    | 12<br>20         |                  |                  | A         |
| Base Current  | I <sub>B</sub>                    | 0.2              |                  |                  | A         |
| Total Power Dissipation @ T <sub>C</sub> = 25°C<br>Derated above 25°C | P <sub>D</sub>                    | 150<br>0.857     |                  |                  | W<br>W/°C |
| Operating and Storage Junction<br>Temperature Range                   | T <sub>J</sub> , T <sub>STG</sub> | -65 to +200      |                  |                  | °C        |

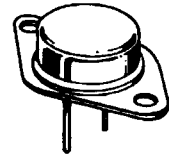
**THERMAL CHARACTERISTICS**

| Characteristic                      | Symbol           | Max  | Unit |
|-------------------------------------|------------------|------|------|
| Thermal Resistance Junction to Case | R <sub>θjc</sub> | 1.17 | °C/W |

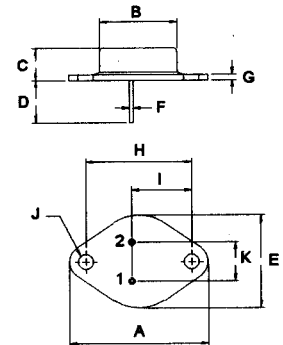


| PNP    | NPN    |
|--------|--------|
| 2N6050 | 2N6057 |
| 2N6051 | 2N6058 |
| 2N6052 | 2N6059 |

**DARLINGTON  
12 AMPERE  
COMPLEMENTARY SILICON  
POWER TRANSISTORS  
60-100 VOLTS  
150 WATTS**



**TO-3**



PIN 1.BASE  
2.EMITTER  
COLLECTOR(CASE)

| DIM | MILLIMETERS |       |
|-----|-------------|-------|
|     | MIN         | MAX   |
| A   | 38.75       | 39.96 |
| B   | 19.28       | 22.23 |
| C   | 7.96        | 9.28  |
| D   | 11.18       | 12.19 |
| E   | 25.20       | 26.67 |
| F   | 0.92        | 1.09  |
| G   | 1.38        | 1.62  |
| H   | 29.90       | 30.40 |
| I   | 16.64       | 17.30 |
| J   | 3.88        | 4.36  |
| K   | 10.67       | 11.18 |

**ELECTRICAL CHARACTERISTICS (  $T_c = 25^\circ\text{C}$  unless otherwise noted )**

| Characteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

**OFF CHARACTERISTICS**

|  |               |                 |                   |    |
|--|---------------|-----------------|-------------------|----|
| Collector - Emitter Sustaining Voltage (1)<br>( $I_C = 100\text{ mA}$ , $I_B = 0$ )<br>2N6050, 2N6057<br>2N6051, 2N6058<br>2N6052, 2N6059  | $V_{CE(sus)}$ | 60<br>80<br>100 |                   | V  |
| Collector Cutoff Current<br>( $V_{CE} = 30\text{ V}$ , $I_B = 0$ )<br>( $V_{CE} = 40\text{ V}$ , $I_B = 0$ )<br>( $V_{CE} = 50\text{ V}$ , $I_B = 0$ )<br>2N6050, 2N6057<br>2N6051, 2N6058<br>2N6052, 2N6059 | $I_{CEO}$     |                 | 1.0<br>1.0<br>1.0 | mA |
| Collector Cutoff Current<br>( $V_{CE} = \text{Rated } V_{CEO}$ , $V_{BE(off)} = 1.5\text{ V}$ )<br>( $V_{CE} = \text{Rated } V_{CEO}$ , $V_{BE(off)} = 1.5\text{ V}$ , $T_c = 150^\circ\text{C}$ )           | $I_{CEX}$     |                 | 0.5<br>5.0        | mA |
| Emitter Cutoff Current<br>( $V_{EB} = 5.0\text{ V}$ , $I_C = 0$ )  | $I_{EBO}$     |                 | 2.0               | mA |

**ON CHARACTERISTICS (1)**

|  |               |            |            |   |
|--|---------------|------------|------------|---|
| DC Current Gain<br>( $I_C = 6.0\text{ A}$ , $V_{CE} = 3.0\text{ V}$ )<br>( $I_C = 12\text{ A}$ , $V_{CE} = 3.0\text{ V}$ )                 | hFE           | 750<br>100 | 18000      |   |
| Collector-Emitter Saturation Voltage<br>( $I_C = 6.0\text{ A}$ , $I_B = 24\text{ mA}$ )<br>( $I_C = 12\text{ A}$ , $I_B = 120\text{ mA}$ ) | $V_{CE(sat)}$ |            | 2.0<br>3.0 | V |
| Base-Emitter On Voltage<br>( $I_C = 6.0\text{ A}$ , $V_{CE} = 3.0\text{ V}$ )  | $V_{BE(on)}$  |            | 2.8        | V |
| Base-Emitter Saturation Voltage<br>( $I_C = 12\text{ A}$ , $I_B = 120\text{ mA}$ )   | $V_{BE(sat)}$ |            | 4.0        | V |

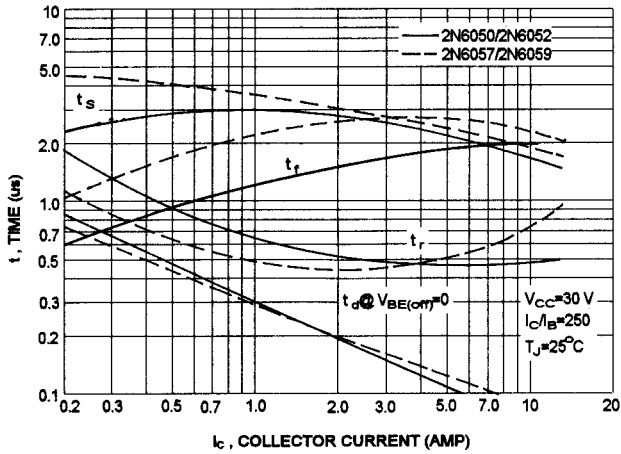
**DYNAMIC CHARACTERISTICS**

|   |          |     |  |     |
|---|----------|-----|--|-----|
| Current-Gain-Bandwidth Product (2)<br>( $I_C = 5.0\text{ A}$ , $V_{CE} = 3.0\text{ V}$ , $f = 1.0\text{ MHz}$ ) | $f_T$    | 4.0 |  | MHz |
| Small-Signal Current Gain<br>( $I_C = 5.0\text{ A}$ , $V_{CE} = 3.0\text{ V}$ , $f = 1.0\text{ KHZ}$ )          | $h_{fe}$ | 300 |  |     |

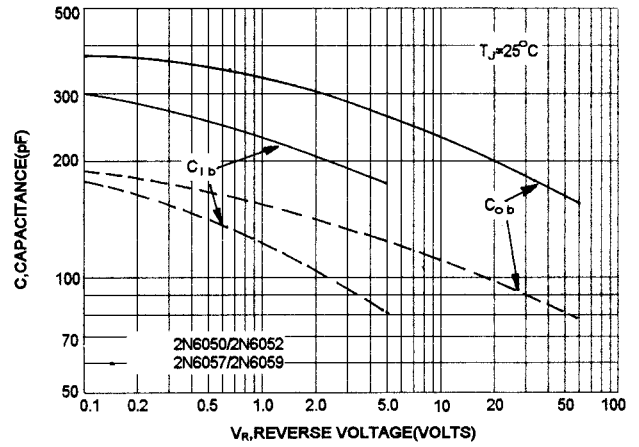
(1) Pulse Test: Pulse width  $\leq 300\text{ us}$ , Duty Cycle  $\leq 2.0\%$

(2)  $f_T = |h_{fe}| \cdot f_{test}$

SWITCHING TIME

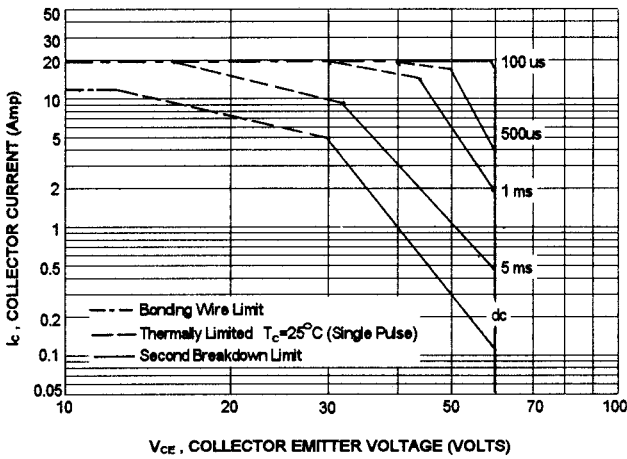


CAPACITANCES

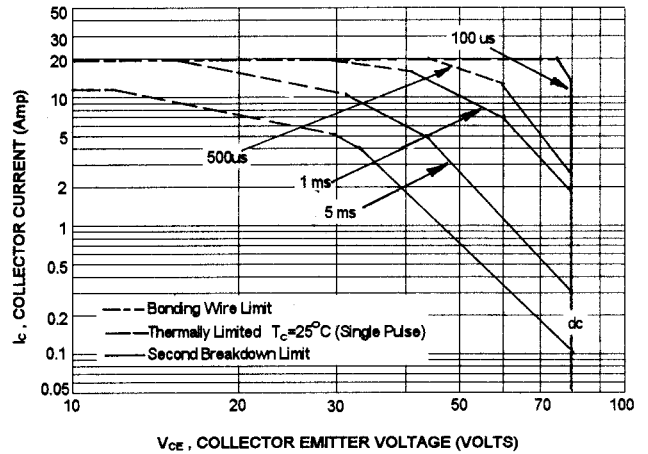


ACTIVE-REGION SAFE OPERATING AREA (SOA)

2N6050, 2N6057

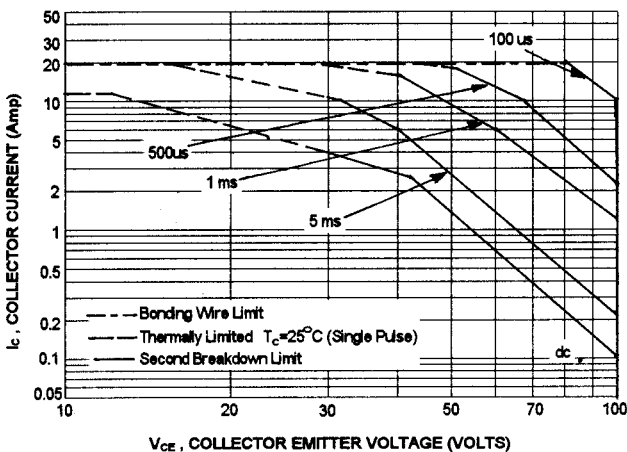


2N6051, 2N6058



ACTIVE-REGION SAFE OPERATING AREA (SOA)

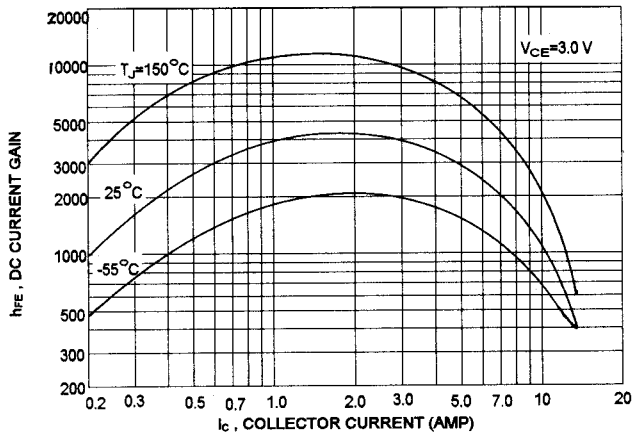
2N6052, 2N6059



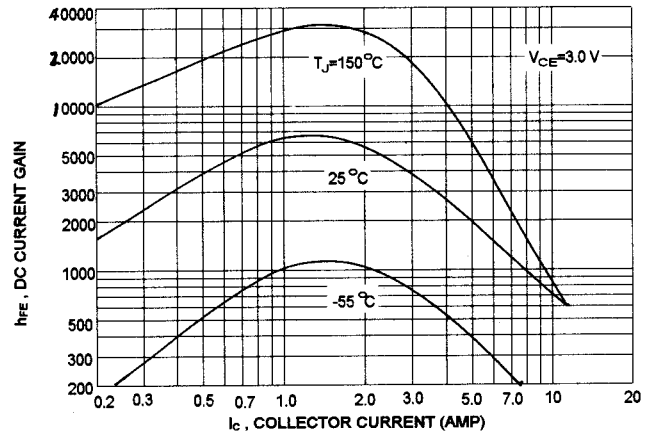
There are two limitation on the power handling ability of a transistor: average junction temperature and second breakdown safe operating area curves indicate  $I_c$ - $V_{CE}$  limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater dissipation than curves indicate.

The data of SOA curve is base on  $T_{J(PK)}=200^\circ C$ ;  $T_c$  is variable depending on conditions. second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(PK)} \leq 200^\circ C$ . At high case temperatures, thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

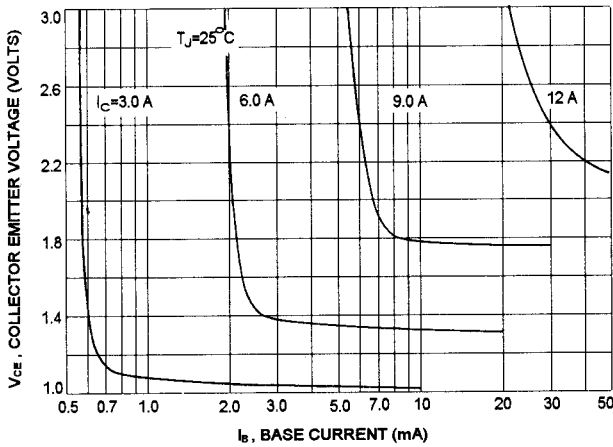
PNP 2N6050,2N6051,2N6052  
DC CURRENT GAIN



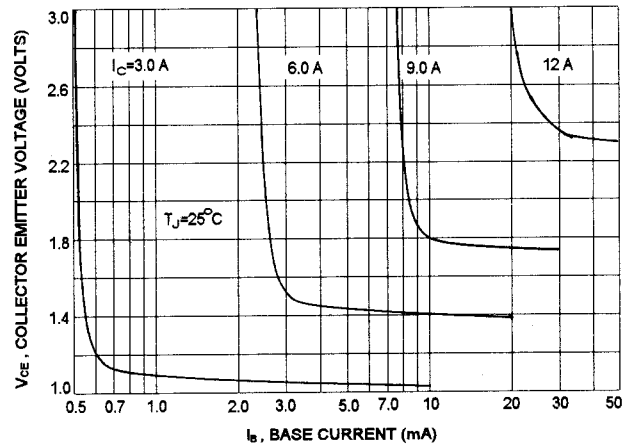
NPN 2N6057,2N6058,2N6059  
DC CURRENT GAIN



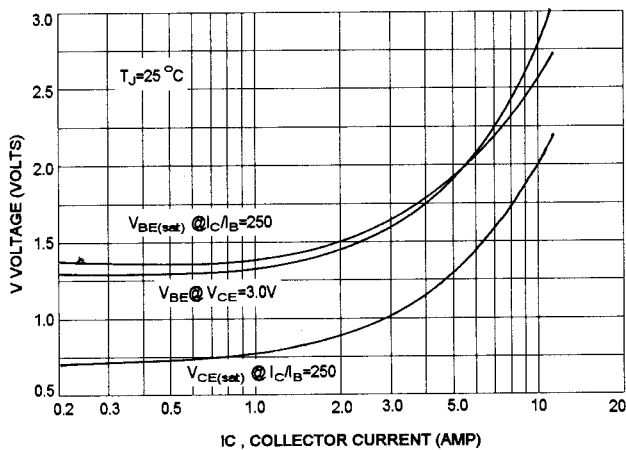
COLLECTOR SATURATION REGION



COLLECTOR SATURATION REGION



"ON" VOLTAGES



"ON" VOLTAGES

