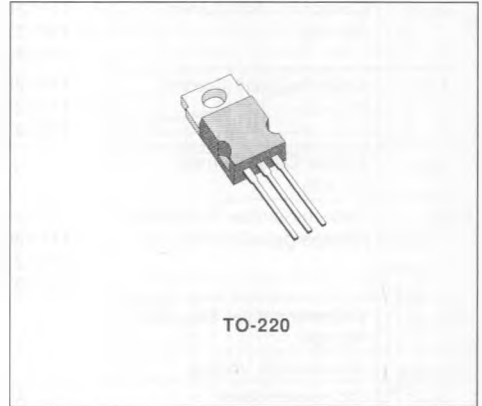


**POWER DARLINGTONS**
**DESCRIPTION**

The TIP120, TIP121 and TIP122 are silicon epitaxial-base NPN transistors in monolithic Darlington configuration in Jedec TO-220 plastic package, intended for use in power linear and switching applications. The complementary PNP types are the TIP125, TIP126 and TIP127 respectively.


**INTERNAL SCHEMATIC DIAGRAMS**

**ABSOLUTE MAXIMUM RATINGS**

| Symbol    | Parameter  | NPN<br>PNP* | Value            |                  |                  | Unit             |
|-----------|--|-------------|------------------|------------------|------------------|------------------|
|           |  |             | TIP120<br>TIP125 | TIP121<br>TIP126 | TIP122<br>TIP127 |                  |
| $V_{CBO}$ | Collector-base Voltage ( $I_E = 0$ )   |             | 60               | 80               | 100              | V                |
| $V_{CEO}$ | Collector-emitter Voltage ( $I_B = 0$ )  |             | 60               | 80               | 100              | V                |
| $V_{EBO}$ | Emitter-base Voltage ( $I_C = 0$ )   |             | 5                |                  |                  | V                |
| $I_C$     | Collector Current  |             | 5                |                  |                  | A                |
| $I_{CM}$  | Collector Peak Current   |             | 8                |                  |                  | A                |
| $I_B$     | Base Current   |             | 0.1              |                  |                  | A                |
| $P_{101}$ | Total Power Dissipation at $T_{case} \leq 25^\circ\text{C}$<br>$T_{amb} \leq 25^\circ\text{C}$ |             | 65               |                  |                  | W                |
| $T_{sig}$ | Storage Temperature  |             | - 65 to 150      |                  |                  | $^\circ\text{C}$ |
| $T_j$     | Junction Temperature   |             | 150              |                  |                  | $^\circ\text{C}$ |

\* For PNP types voltage and current values are negative

**THERMAL DATA**

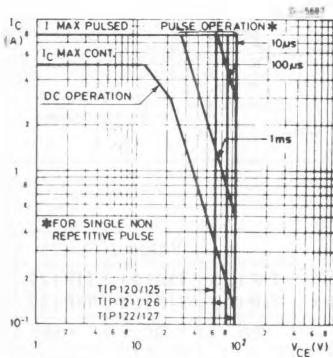
|                 |                                     |     |      |               |
|-----------------|-------------------------------------|-----|------|---------------|
| $R_{th(j)case}$ | Thermal Resistance Junction-case    | Max | 1.92 | $^{\circ}C/W$ |
| $R_{th(j)amb}$  | Thermal Resistance Junction-ambient | Max | 62.5 | $^{\circ}C/W$ |

**ELECTRICAL CHARACTERISTICS** ( $T_{case} = 25^{\circ}C$  unless otherwise specified)

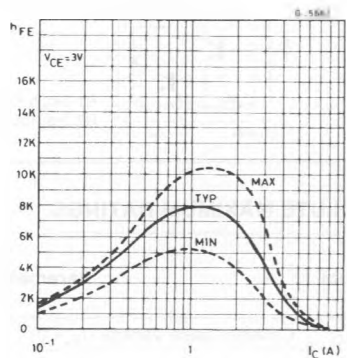
| Symbol          | Parameter  | Test Conditions   | Min.            | Typ. | Max.              | Unit           |
|-----------------|--|---|-----------------|------|-------------------|----------------|
| $I_{CEO}$       | Collector Cutoff Current ( $I_B = 0$ )             | for <b>TIP120/5</b> $V_{CE} = 30V$<br>for <b>TIP121/6</b> $V_{CE} = 40V$<br>for <b>TIP122/7</b> $V_{CE} = 50V$  |                 |      | 0.5<br>0.5<br>0.5 | mA<br>mA<br>mA |
| $I_{CBO}$       | Collector Cutoff Current ( $I_E = 0$ )             | for <b>TIP120/5</b> $V_{CB} = 60V$<br>for <b>TIP121/6</b> $V_{CB} = 80V$<br>for <b>TIP122/7</b> $V_{CB} = 100V$ |                 |      | 0.2<br>0.2<br>0.2 | mA<br>mA<br>mA |
| $I_{EBO}$       | Emitter Cutoff Current ( $I_C = 0$ )               | $V_{EB} = 5V$   |                 |      | 2                 | mA             |
| $V_{CE(sus)}^*$ | Collector-emitter Sustaining Voltage ( $I_B = 0$ ) | $I_C = 30mA$<br>for <b>TIP120/5</b><br>for <b>TIP121/6</b><br>for <b>TIP122/7</b>                               | 60<br>80<br>100 |      |                   | V<br>V<br>V    |
| $V_{CE(sat)}^*$ | Collector-emitter Saturation Voltage               | $I_C = 3A$ $I_B = 12mA$<br>$I_C = 5A$ $I_B = 20mA$  |                 |      | 2<br>4            | V<br>V         |
| $V_{BE(on)}^*$  | Base-emitter Voltage                               | $I_C = 3A$ $V_{CE} = 3V$  |                 |      | 2.5               | V              |
| $h_{FE}^*$      | DC current Gain                                    | $I_C = 0.5A$ $V_{CE} = 3V$<br>$I_C = 3A$ $V_{CE} = 3V$  | 1000<br>1000    |      |                   |                |

\* Pulsed : pulse duration = 300  $\mu s$ , duty cycle < 2 %.

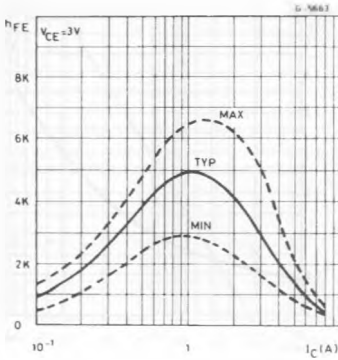
**Safe Operating Areas.**



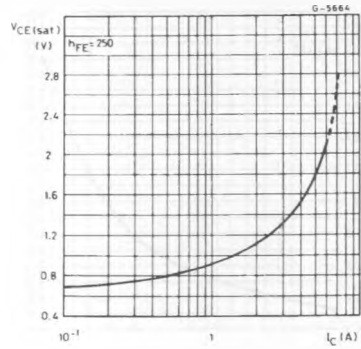
**DC Current Gain (NPN types).**



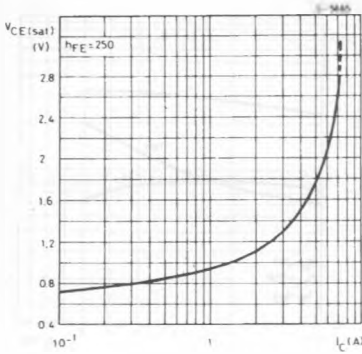
DC Current Gain (PNP types).



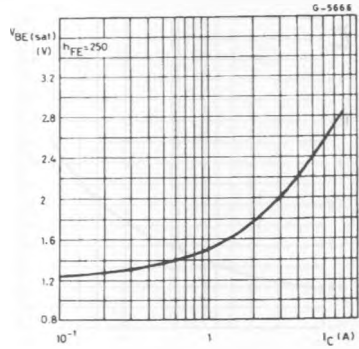
Collector-emitter Saturation Voltage (NPN types).



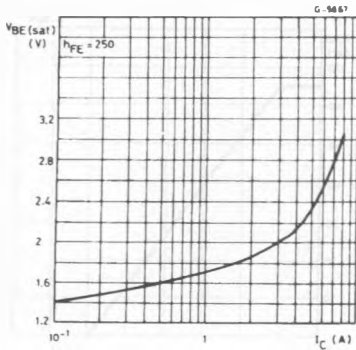
Collector-emitter Saturation Voltage (NPN types).



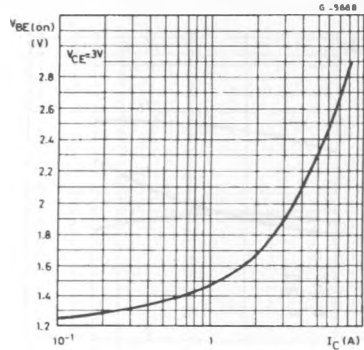
Base-emitter Saturation Voltage (NPN types).



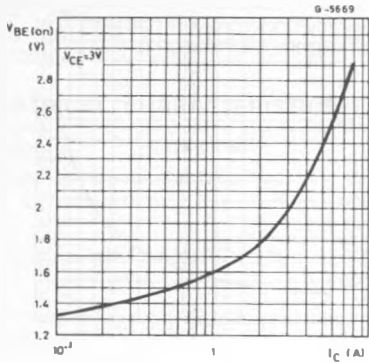
Base-emitter Saturation Voltage (PNP types).



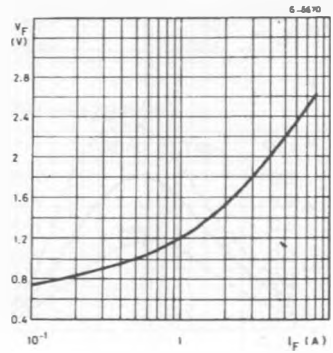
Base-emitter Voltage (NPN types).



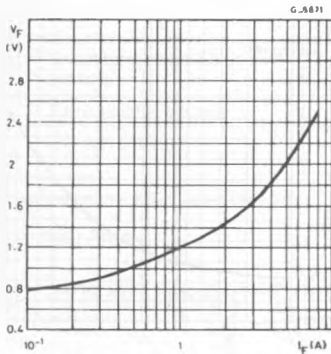
Base-emitter Voltage (PNP types).



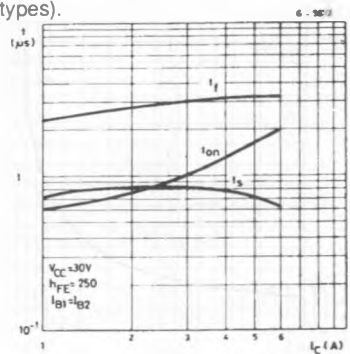
Freewheel Diode Forward Voltage (NPN types).



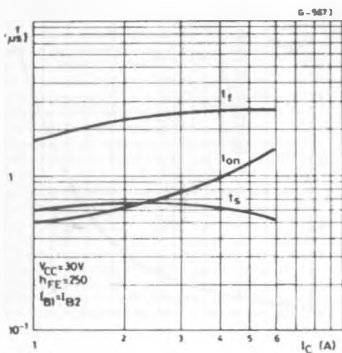
Freewheel Diode Forward Voltage (PNP types).



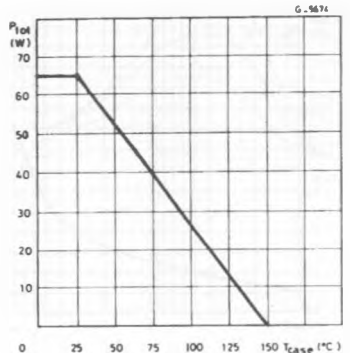
Switching Times vs.  $T_{case}$  Resistive Load (NPN types).



Switching Times vs.  $T_{case}$  Resistive Load (PNP types).



Derating Curve.



## Free-air Temperature Derating Curve.

