TIP120/TIP121/TIP122
NPN Epitaxial Darlington Transistor

- Medium Power Linear Switching Applications
- Complementary to TIP125/126/127

**Absolute Maximum Ratings**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Ratings</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{CBO}$</td>
<td>Collector-Base Voltage : TIP120</td>
<td>60</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>: TIP121</td>
<td>80</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>: TIP122</td>
<td>100</td>
<td>V</td>
</tr>
<tr>
<td>$V_{CEO}$</td>
<td>Collector-Emitter Voltage : TIP120</td>
<td>60</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>: TIP121</td>
<td>80</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>: TIP122</td>
<td>100</td>
<td>V</td>
</tr>
<tr>
<td>$V_{EBO}$</td>
<td>Emitter-Base Voltage</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>$I_C$</td>
<td>Collector Current (DC)</td>
<td>5</td>
<td>A</td>
</tr>
<tr>
<td>$I_{CP}$</td>
<td>Collector Current (Pulse)</td>
<td>8</td>
<td>A</td>
</tr>
<tr>
<td>$I_B$</td>
<td>Base Current (DC)</td>
<td>120</td>
<td>mA</td>
</tr>
<tr>
<td>$P_C$</td>
<td>Collector Dissipation ($T_J=25°C$)</td>
<td>2</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>Collector Dissipation ($T_J=25°C$)</td>
<td>65</td>
<td>W</td>
</tr>
<tr>
<td>$T_J$</td>
<td>Junction Temperature</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>$T_{STG}$</td>
<td>Storage Temperature</td>
<td>- 65 ~ 150</td>
<td>°C</td>
</tr>
</tbody>
</table>

* These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.
### Electrical Characteristics\(^*\) \(T_a=25^\circ\text{C}\) unless otherwise noted

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Condition</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>(V_{CEO}(\text{sus}))</td>
<td>Collector-Emitter Sustaining Voltage</td>
<td>: TIP120</td>
<td>60</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>: TIP121</td>
<td>: TIP122</td>
<td>80</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>(I_C = 100\text{mA}, I_B = 0)</td>
<td></td>
<td>100</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>(I_{CEO})</td>
<td>Collector Cut-off Current</td>
<td>: TIP120</td>
<td></td>
<td>0.5</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td>: TIP121</td>
<td>: TIP122</td>
<td></td>
<td>0.5</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td>(V_{CE} = 30\text{V}, I_B = 0)</td>
<td></td>
<td></td>
<td>0.5</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td>(V_{CE} = 40\text{V}, I_B = 0)</td>
<td></td>
<td></td>
<td>0.5</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td>(V_{CE} = 50\text{V}, I_B = 0)</td>
<td></td>
<td></td>
<td>0.5</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>(I_{CBO})</td>
<td>Collector Cut-off Current</td>
<td>: TIP120</td>
<td></td>
<td>0.2</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td>: TIP121</td>
<td>: TIP122</td>
<td></td>
<td>0.2</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td>(V_{CB} = 60\text{V}, I_E = 0)</td>
<td></td>
<td></td>
<td>0.2</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td>(V_{CB} = 80\text{V}, I_E = 0)</td>
<td></td>
<td></td>
<td>0.2</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td>(V_{CB} = 100\text{V}, I_E = 0)</td>
<td></td>
<td></td>
<td>0.2</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>(I_{EBO})</td>
<td>Emitter Cut-off Current</td>
<td>(V_{BE} = 5\text{V}, I_C = 0)</td>
<td>2</td>
<td></td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>(h_{FE})</td>
<td>* DC Current Gain</td>
<td>(V_{CE} = 3\text{V}, I_C = 0.5\text{A})</td>
<td>1000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(V_{CE} = 3\text{V}, I_C = 3\text{A})</td>
<td>1000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(V_{CE(\text{sat})})</td>
<td>* Collector-Emitter Saturation Voltage</td>
<td>(I_C = 3\text{A}, I_B = 12\text{mA})</td>
<td>2.0</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>(I_C = 5\text{A}, I_B = 20\text{mA})</td>
<td></td>
<td>4.0</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>(V_{BE(\text{on})})</td>
<td>* Base-Emitter On Voltage</td>
<td>(V_{CE} = 3\text{V}, I_C = 3\text{A})</td>
<td>2.5</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>(C_{ob})</td>
<td>Output Capacitance</td>
<td>(V_{CB} = 10\text{V}, I_E = 0, f = 0.1\text{MHz})</td>
<td>200</td>
<td></td>
<td></td>
<td>pF</td>
</tr>
</tbody>
</table>

\(^*\) Pulse Test: Pulse Width \(\leq 300\text{\mu s}\), Duty Cycle \(\leq 2\%\)
Typical characteristics

Figure 1. DC current Gain

Figure 2. Base-Emitter Saturation Voltage
Collector-Emitter Saturation Voltage

Figure 3. Output and Input Capacitance
vs. Reverse Voltage

Figure 4. Safe Operating Area

Figure 5. Power Derating
Mechanical Dimensions

TO220

Δ9.40
6.38

Δ4.09
6.00

Δ0.36
2.54

A

10.67
9.85

4.83
3.60

"A1"

7" 3"

16.51
14.22

6.88
5.94

8.89
6.86

Δ13.40
12.19

(1.91)

1.78
1.14

1.02
0.38

0.61
0.33

0.36

Δ9.40
6.38

2.03

2.54

5.06

5" 3"

5" 3"

NOTES: UNLESS OTHERWISE SPECIFIED
A) REFERENCE JEDEC, TO-220, ISSUE K, VARIATION AB, DATED APRIL, 2002.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1998
D) LOCATION OF THE PIN HOLE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE)
E) DOES NOT COMPLY JEDC2 STANDARD VALUE.
F) "A1" DIMENSIONS REPRESENT LIKE BELOW:
   SINGLE GAUGE = 0.51 - 0.61
   DUAL GAUGE = 1.14 - 1.40
G) DRAWING FILE NAME: TO220B03REV6
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SuperFET™
SuperSOT™-3
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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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Definition of Terms

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<th>Definition</th>
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