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TIP120 / TIP121 / TIP122
NPN Epitaxial Darlington Transistor

Features
- Medium Power Linear Switching Applications
- Complementary to TIP125 / TIP126 / TIP127

Ordering Information

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<th>Top Mark</th>
<th>Package</th>
<th>Packing Method</th>
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<td>TIP120</td>
<td>TIP120</td>
<td>TO-220 3L (Single Gauge)</td>
<td>Bulk</td>
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<tr>
<td>TIP120TU</td>
<td>TIP120</td>
<td>TO-220 3L (Single Gauge)</td>
<td>Rail</td>
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<tr>
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<td>TIP121</td>
<td>TO-220 3L (Single Gauge)</td>
<td>Bulk</td>
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<td>TIP121</td>
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<td>TIP122TU</td>
<td>TIP122</td>
<td>TO-220 3L (Single Gauge)</td>
<td>Rail</td>
</tr>
</tbody>
</table>

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at \( T_C = 25^\circ C \) unless otherwise noted.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{CBO} )</td>
<td>Collector-Base Voltage</td>
<td>TIP120</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TIP121</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TIP122</td>
<td>100</td>
</tr>
<tr>
<td>( V_{CEO} )</td>
<td>Collector-Emitter Voltage</td>
<td>TIP120</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TIP121</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TIP122</td>
<td>100</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>( T_J )</td>
<td>Junction Temperature</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>( T_{STG} )</td>
<td>Storage Temperature Range</td>
<td>-65 to 150</td>
<td>°C</td>
</tr>
</tbody>
</table>
### Thermal Characteristics

Values are at $T_C = 25^\circ$C unless otherwise noted.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_C$</td>
<td>Collector Dissipation ($T_A = 25^\circ$C)</td>
<td>2</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>Collector Dissipation ($T_C = 25^\circ$C)</td>
<td>65</td>
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</table>

### Electrical Characteristics

Values are at $T_C = 25^\circ$C unless otherwise noted.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min.</th>
<th>Max.</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td>$V_{CEO(sus)}$</td>
<td>Collector-Emitter Sustaining Voltage</td>
<td>TIP120</td>
<td>$I_C = 100$ mA, $I_B = 0$</td>
<td>60</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TIP121</td>
<td></td>
<td>80</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TIP122</td>
<td></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>$I_{CEO}$</td>
<td>Collector Cut-Off Current</td>
<td>TIP120</td>
<td>$V_{CE} = 30$ V, $I_B = 0$</td>
<td>0.5</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TIP121</td>
<td>$V_{CE} = 40$ V, $I_B = 0$</td>
<td>0.5</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>TIP122</td>
<td>$V_{CE} = 50$ V, $I_B = 0$</td>
<td>0.5</td>
<td></td>
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<tr>
<td>$I_{CBO}$</td>
<td>Collector Cut-Off Current</td>
<td>TIP120</td>
<td>$V_{CB} = 60$ V, $I_E = 0$</td>
<td>0.2</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TIP121</td>
<td>$V_{CB} = 80$ V, $I_E = 0$</td>
<td>0.2</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>TIP122</td>
<td>$V_{CB} = 100$ V, $I_E = 0$</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>$I_{EBO}$</td>
<td>Emitter Cut-Off Current</td>
<td>$V_{EB} = 5$ V, $I_C = 0$</td>
<td>2</td>
<td>mA</td>
<td></td>
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<tr>
<td>$h_{FE}$</td>
<td>DC Current Gain(1)</td>
<td>$V_{CE} = 3$ V, $I_C = 0.5$ A</td>
<td>1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CE} = 3$ V, $I_C = 3$ A</td>
<td>1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_{CE(sat)}$</td>
<td>Collector-Emitter Saturation Voltage(1)</td>
<td>$I_C = 3$ A, $I_B = 12$ mA</td>
<td>2.0</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_C = 5$ A, $I_B = 20$ mA</td>
<td>4.0</td>
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<td></td>
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<tr>
<td>$V_{BE(on)}$</td>
<td>Base-Emitter On Voltage(1)</td>
<td>$V_{CE} = 3$ V, $I_C = 3$ A</td>
<td>2.5</td>
<td>V</td>
<td></td>
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<tr>
<td>$C_{ob}$</td>
<td>Output Capacitance</td>
<td>$V_{CB} = 10$ V, $I_E = 0$, $f = 0.1$ MHz</td>
<td>200</td>
<td>pF</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**

1. Pulse test: $pw \leq 300$ $\mu$s, duty cycle $\leq 2\%$. 

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Typical Performance Characteristics

Figure 1. DC Current Gain

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

Figure 3. Output and Input Capacitance vs. Reverse Voltage

Figure 4. Safe Operating Area

Figure 5. Power Derating
Physical Dimensions

Figure 6. TO-220, MOLDED, 3 LEAD, JEDEC VARIATION AB

NOTES:
A) REFERENCE JEDEC, TO-220, VARIATION AB
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS COMMON TO ALL PACKAGE SUPPLIERS EXCEPT WHERE NOTED [. .].
D) LOCATION OF MOLDED FEATURE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE)
E) DOES NOT COMPLY JEDEC STANDARD VALUE.
F) "A1" DIMENSIONS AS BELOW:
   SINGLE GAUGE = 0.51 - 0.61
G) DRAWING FILE NAME: TO220B03REV
H) PRESENCE OF SUPPLIER DEPENDENT
   SUPPLIER DEPENDENT MOLD LOOKING HOLES IN HEATSINK
I) FAIRCHILD SEMICONDUCTOR
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<th>Product Status</th>
<th>Definition</th>
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<td>Formative / In Design</td>
<td>Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.</td>
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<td>Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.</td>
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