TIP31, TIP31A, TIP31B, TIP31C
NPN SILICON POWER TRANSISTORS

- Designed for Complementary Use with the TIP32 Series
- 40 W at 25°C Case Temperature
- 3 A Continuous Collector Current
- 5 A Peak Collector Current
- Customer Specified Selections Available

Absolute Maximum Ratings at 25°C Case Temperature (unless otherwise noted)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>TIP31</th>
<th>TIP31A</th>
<th>TIP31B</th>
<th>TIP31C</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCEO</td>
<td>80 V</td>
<td>100 V</td>
<td>120 V</td>
<td>140 V</td>
</tr>
<tr>
<td>VCES</td>
<td>40 V</td>
<td>60 V</td>
<td>80 V</td>
<td>100 V</td>
</tr>
<tr>
<td>IC</td>
<td>5 V</td>
<td>5 V</td>
<td>5 V</td>
<td>5 V</td>
</tr>
<tr>
<td>ICM</td>
<td>3 A</td>
<td>3 A</td>
<td>3 A</td>
<td>3 A</td>
</tr>
<tr>
<td>IB</td>
<td>1 A</td>
<td>1 A</td>
<td>1 A</td>
<td>1 A</td>
</tr>
<tr>
<td>PDM</td>
<td>40 W</td>
<td>40 W</td>
<td>40 W</td>
<td>40 W</td>
</tr>
<tr>
<td>PDM</td>
<td>2 W</td>
<td>2 W</td>
<td>2 W</td>
<td>2 W</td>
</tr>
<tr>
<td>LDM</td>
<td>32 mJ</td>
<td>32 mJ</td>
<td>32 mJ</td>
<td>32 mJ</td>
</tr>
</tbody>
</table>

T & TSTG: Operating junction and storage temperature range

- T = -55°C to 150°C
- TSTG = 25°C

NOTES:
1. This value applies for \( \mu = 0.3 \) ms duty cycle < 10%.
2. Denotes the VCEO or VCES at the case temperature.
3. Denotes the VCEO or VCES at the case temperature at the rate of 0 to 25°C.
4. This rating is based on the capability of the transistor to operate safely in a circuit of
   \( V_{CE} = 150 \) V, \( I_{CE} = 0 \) A, \( V_{BE} = 0 \) V, \( V_{CE} = 150 \) V, \( I_{CE} = 0 \) A,
   \( V_{BE} = 0 \) V.

Electrical Characteristics at 25°C Case Temperature (unless otherwise noted)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCEdss</td>
<td>30 mA</td>
<td>30 mA</td>
<td>30 mA</td>
<td>mA</td>
</tr>
<tr>
<td>IC</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>mA</td>
</tr>
<tr>
<td>VCES</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>mA</td>
</tr>
<tr>
<td>ICc</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>mA</td>
</tr>
<tr>
<td>IcBO</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>mA</td>
</tr>
<tr>
<td>IcBO</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>mA</td>
</tr>
<tr>
<td>HFE</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>mA</td>
</tr>
<tr>
<td>VCE(sat)</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>V</td>
</tr>
<tr>
<td>VBE</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
<td>V</td>
</tr>
<tr>
<td>IF(f)</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>mA</td>
</tr>
<tr>
<td>IF(f)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>kHz</td>
</tr>
</tbody>
</table>

Texas Instruments
TIP31, TIP31A, TIP31B, TIP31C
NPN SILICON POWER TRANSISTORS

Thermal Characteristics

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>R(jc)</td>
<td>3.125</td>
<td></td>
<td></td>
<td>°C/W</td>
</tr>
<tr>
<td>R(ja)</td>
<td>62.5</td>
<td></td>
<td></td>
<td>°C/W</td>
</tr>
</tbody>
</table>

Resistive Load Switching Characteristics at 25°C Case Temperature (unless otherwise noted)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITIONS1</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>t(on)</td>
<td>VCE = 4 V</td>
<td>0.5</td>
<td></td>
<td></td>
<td>µs</td>
</tr>
<tr>
<td>t(off)</td>
<td>VCE = 4.3 V</td>
<td>2</td>
<td></td>
<td></td>
<td>µs</td>
</tr>
<tr>
<td>Ic (max)</td>
<td>-40 V, I = 0.1 A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iq (max)</td>
<td>0.1 A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ube (min)</td>
<td>0.1 A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Voltage and current values shown are nominal, exact values vary slightly with transistor parameters.

NOTES: 1. These parameters must be measured using base terminal, VCE = 500 V, duty cycle = 2%.
2. These parameters must be measured using voltage sensing contacts separate from the current carrying contacts.
3. The combination of maximum voltage and current may be achieved only when selecting optimum junctions with a defined inductive load.

TYPICAL CHARACTERISTICS

FORWARD CURRENT TRANSFER RATIO

VS COLLECTOR CURRENT

MAXIMUM FORWARD-BIAS

MAXIMUM SAFE OPERATING AREA

TIP31
TIP31A
TIP31B
TIP31C

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