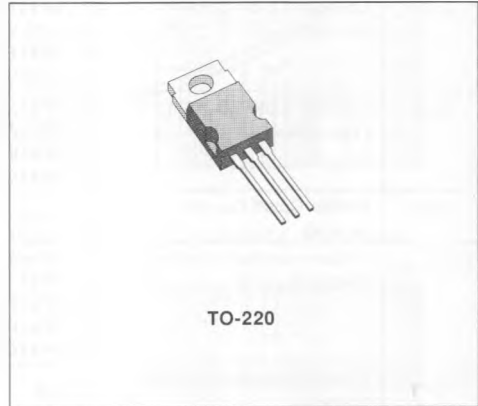


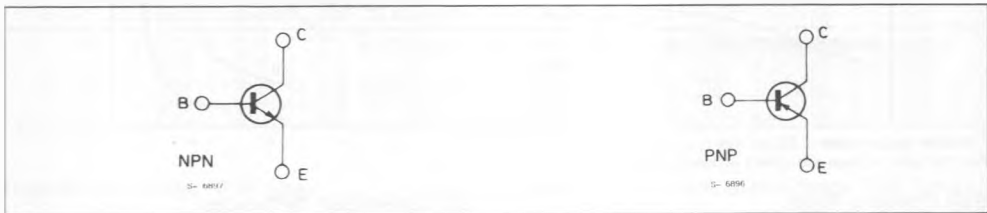
## MEDIUM POWER LINEAR AND SWITCHING APPLICATIONS

### DESCRIPTION

The TIP31, TIP31A, TIP31B and TIP31C are silicon epitaxial-base power NPN transistors in Jedec TO-220 plastic package, intended for use in medium power linear and switching applications. The complementary PNP types are the TIP32, TIP32A, TIP32B and TIP32C.



### INTERNAL SCHEMATIC DIAGRAMS



### ABSOLUTE MAXIMUM RATINGS

| Symbol    | Parameter  | NPN<br>PNP* | Value          |                  |                  |                  | Unit |
|-----------|--|-------------|----------------|------------------|------------------|------------------|------|
|           |  |             | TIP31<br>TIP32 | TIP31A<br>TIP32A | TIP31B<br>TIP32B | TIP31C<br>TIP32C |      |
| $V_{CBO}$ | Collector-base Voltage ( $I_E = 0$ )   |             | 40             | 60               | 80               | 100              | V    |
| $V_{CEO}$ | Collector-emitter Voltage ( $I_B = 0$ )  |             | 40             | 60               | 80               | 100              | V    |
| $V_{EBO}$ | Emitter-base Voltage ( $I_C = 0$ )   |             | 5              |                  |                  | V                |      |
| $I_C$     | Collector Current  |             | 3              |                  |                  | A                |      |
| $I_{CM}$  | Collector Peak Current   |             | 5              |                  |                  | A                |      |
| $I_B$     | Base Current   |             | 1              |                  |                  | A                |      |
| $P_{tot}$ | Total Power Dissipation at $T_{case} \leq 25^\circ\text{C}$<br>$T_{amb} \leq 25^\circ\text{C}$ |             | 40             |                  |                  | W                |      |
|           |  |             | 2              |                  |                  | W                |      |
| $T_{stg}$ | 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**

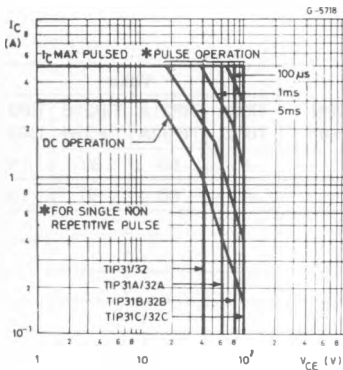
|                  |                                     |     |      |               |
|------------------|-------------------------------------|-----|------|---------------|
| $R_{th(j-case)}$ | Thermal Resistance Junction-case    | Max | 3.12 | $^{\circ}C/W$ |
| $R_{th(j-amb)}$  | Thermal Resistance Junction-ambient | Max | 62.5 | $^{\circ}C/W$ |

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

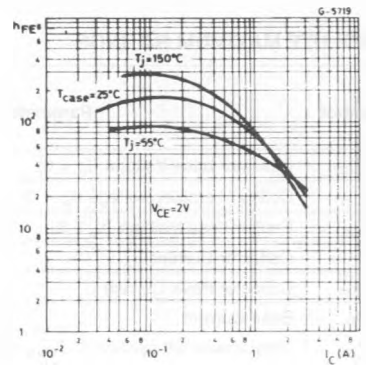
| Symbol           | Parameter  | Test Conditions   | Min. | Typ. | Max. | Unit |
|------------------|--|---|------|------|------|------|
| $I_{CEO}$        | Collector Cutoff Current ( $I_B = 0$ )             | for TIP31/31A/32/32A<br>$V_{CE} = 30 V$<br>for TIP31B/31C/32B/32C<br>$V_{CE} = 60 V$  |      |      | 0.3  | mA   |
| $I_{CES}$        | Collector Cutoff Current ( $V_{BE} = 0$ )          | for TIP31/32 $V_{CE} = 40 V$<br>for TIP31A/32A $V_{CE} = 60 V$<br>for TIP31B/32B $V_{CE} = 80 V$<br>for TIP31C/32C $V_{CE} = 100 V$ |      |      | 0.2  | mA   |
| $I_{EBO}$        | Emitter Cutoff Current ( $I_C = 0$ )               | $V_{EB} = 5 V$  |      |      | 1    | mA   |
| $V_{CEO(sus)}^*$ | Collector-emitter Sustaining Voltage ( $I_B = 0$ ) | $I_C = 30 mA$<br>for TIP31/32<br>for TIP31A/32A<br>for TIP31B/32B<br>for TIP31C/32C   | 40   |      |      | V    |
| $V_{CE(sat)}^*$  | Collector-emitter Saturation Voltage               | $I_C = 3 A$ $I_B = 375 mA$  |      |      | 1.2  | V    |
| $V_{BE(on)}^*$   | Base-emitter Voltage                               | $I_C = 3 A$ $V_{CE} = 4 A$  |      |      | 1.8  | V    |
| $h_{FE}^*$       | DC current Gain                                    | $I_C = 1 A$ $V_{CE} = 4 V$<br>$I_C = 3 A$ $V_{CE} = 4 V$  | 25   |      | 50   |      |
| $h_{ie}$         | Small Signal Current Gain                          | $I_C = 0.5 A$ $V_{CE} = 10 V$<br>$f = 1 KHz$<br>$I_C = 0.5 A$ $V_{CE} = 10 V$<br>$f = 1 MHz$  | 20   |      |      |      |
|                  |  |   | 3    |      |      |      |

\* Pulsed : pulse duration = 300  $\mu s$ , duty cycle  $\leq 2\%$ .  
For PNP types voltage and current values are negative.

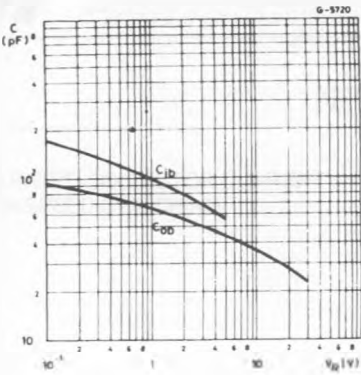
**Safe Operating Areas.**



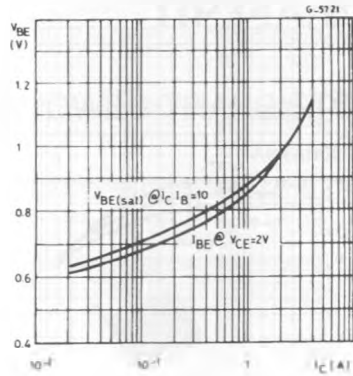
**DC Current Gain (NPN types).**



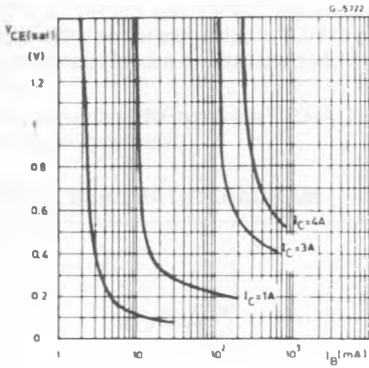
Input and Output Capacitance (NPN types).



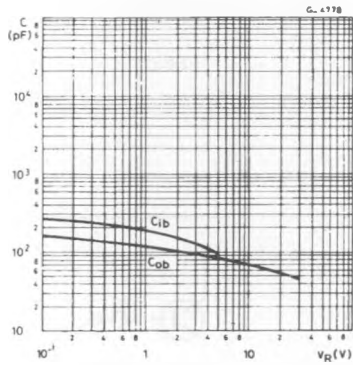
Base-emitter Voltage (NPN types).



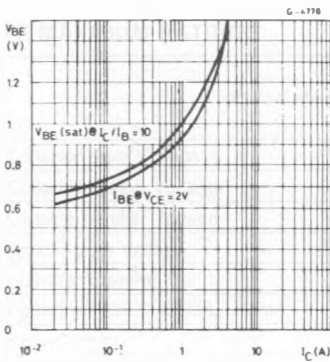
Collector-emitter Saturation Voltage (NPN types).



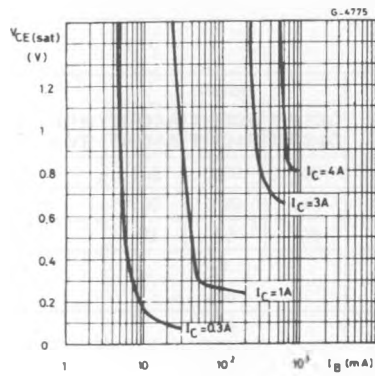
Input and Output Capacitance (PNP types).



Base-emitter Voltage (PNP types).



Collector-emitter Saturation Voltage (PNP types).



DC Current Gain (PNP types).

