# Power Transistor

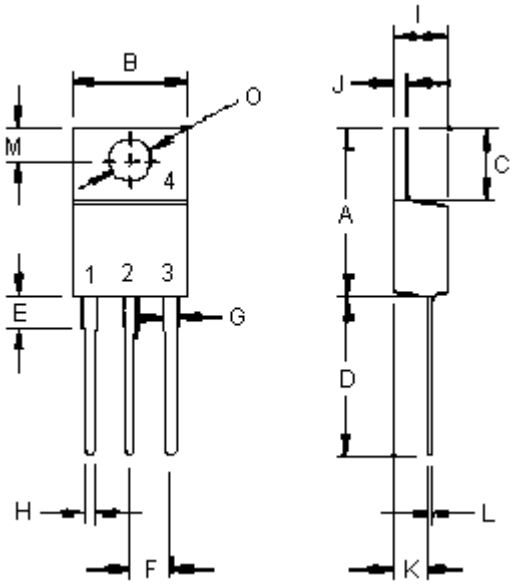
TO - 220

## Features:

- Complementary Silicon Plastic
- Collector - emitter sustaining voltage - $V_{CEO\ (sus)}$ = 100 V (minimum) - TIP41C
- Collector - emitter saturation voltage - $V_{CE\ (sat)}$ = 1.5 V (maximum) at $I_C$ = 6 A
- Current gain - bandwidth product $f_T$ = 3 MHz (minimum) at $I_C$ = 500 mA

**Application:**

Designed for use in general purpose power amplifier and switching applications




| Dimensions | Millimetres | |
|---|---|---|
| | Minimum | Maximum |
| A | 14.68 | 15.31 |
| B | 9.78 | 10.42 |
| C | 5.01 | 6.52 |
| D | 13.06 | 14.62 |
| E | 3.57 | 4.07 |
| F | 2.42 | 3.66 |
| G | 1.12 | 1.36 |
| H | 0.72 | 0.96 |
| I | 4.22 | 4.98 |
| J | 1.14 | 1.38 |
| K | 2.2 | 2.97 |
| L | 0.33 | 0.55 |
| M | 2.48 | 2.98 |
| O | 3.7 | 3.9 |

## Pin

1. Base
2. Collector
3. Emitter
4. Collector (Case)

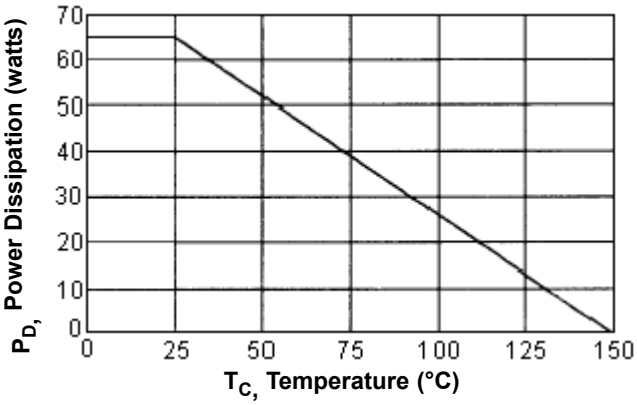
## Maximum Ratings

| Characteristics | Symbol | TIP41C | Unit |
|---|---|---|---|
| Collector - emitter voltage | $V_{CEO}$ | 100 | V |
| Collector - base voltage | $V_{CBO}$ | 100 | V |
| Emitter - base voltage | $V_{EBO}$ | 5 | V |
| Collector current - Continuous<br>- Peak | $I_C$ | 6<br>10 | A |
| Base current | $I_B$ | 2 | A |
| Total power dissipation at $T_c$ = 25°C<br>derate above 25°C | $P_D$ | 65<br>0.52 | W<br>W/°C |
| Operating and storage Junction temperature range | $T_J$, $T_{STG}$ | -65 to +150 | °C |

## Thermal Characteristics

| Characteristic | Symbol | Maximum | Unit |
|---|---|---|---|
| Thermal resistance junction to case | $R_{\theta jc}$ | 1.92 | °C/W |

**Power Derating**

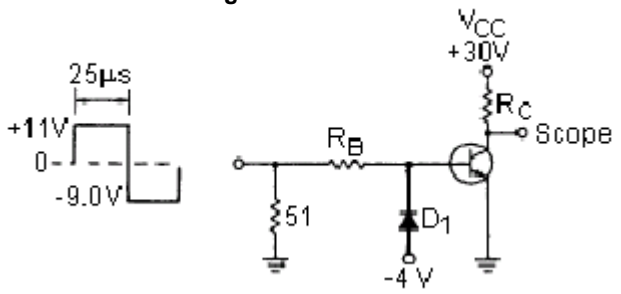



## Electrical Characteristics ($T_c$ = 25°C Unless Otherwise noted)

| Characteristics | Symbol | Minimum | Maximum | Units |
|---|---|---|---|---|
| **Off Characteristics** | | | | |
| Collector - emitter sustaining voltage (1) ($I_C$ = 30 mA, $I_B$ = 0) | $V_{CEO\ (SUS)}$ | 100 | - | V |
| Collector cut off current ($V_{CE}$ = 60 V, $I_B$ = 0) | $I_{CEO}$ | - | 0.7 | mA |
| Collector cut off current ($V_{CE}$ = 100 V, $V_{BE}$ = 0) | $I_{CES}$ | - | 0.4 | mA |
| Emitter cut off current ($V_{EB}$ = 5 V, $I_C$ = 0) | $I_{EBO}$ | - | 1 | mA |
| **On Characteristics (1)** | | | | |
| DC current gain ($I_C$ = 0.3 A; $V_{CE}$ = 4 V) ($I_C$ = 3 A; $V_{CE}$ = 4 V) | $h_{FE}$ | 30 15 | 75 | - |
| Collector - emitter saturation voltage ($I_C$ = 6 A; $I_B$ = 600 mA) | $V_{CE\ (sat)}$ | - | 1.5 | V |
| Base-emitter on voltage ($I_C$ = 6 A; $V_{CE}$ = 4 V) | $V_{BE\ (on)}$ | - | 2 | V |
| **Dynamic characteristics** | | | | |
| Current gain-bandwidth Product (2) ($I_C$ = 500 mA; $V_{CE}$ = 10 V, $f_{TEST}$ = 1 MHz) | $f_T$ | 3 | - | MHz |
| Small signal current gain ($I_C$ = 500 mA; $V_{CE}$ = 10 V, f = 1 kHz) | $h_{fe}$ | 20 | - | - |

(1) Pulse test: Pulse width ≤ 300 µs, duty cycle ≤ 2%
(2) $f_T = |h_{fe}| \bullet f_{TEST}$

**Switching Time Test Circuit**




$t_r$, $t_f$ ≤10 ns
Duty cycle = 1 %
$R_B$ and $R_C$ varied to obtain desired current levels
$D_1$ must be fast recovery type eg:
MBD5300 Used Above $I_B$ to 100 mA
MSD6100 Used Below $I_B$ to 100 mA

**Figure-3 Turn-on Time**

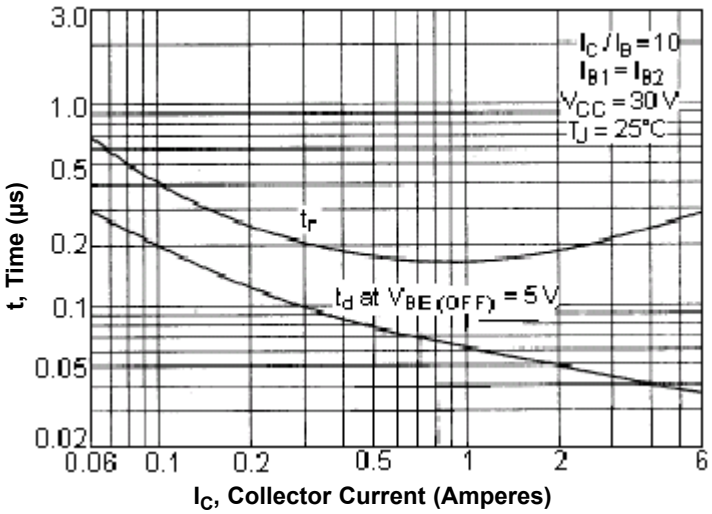



**Figure-4 DC Current Gain**

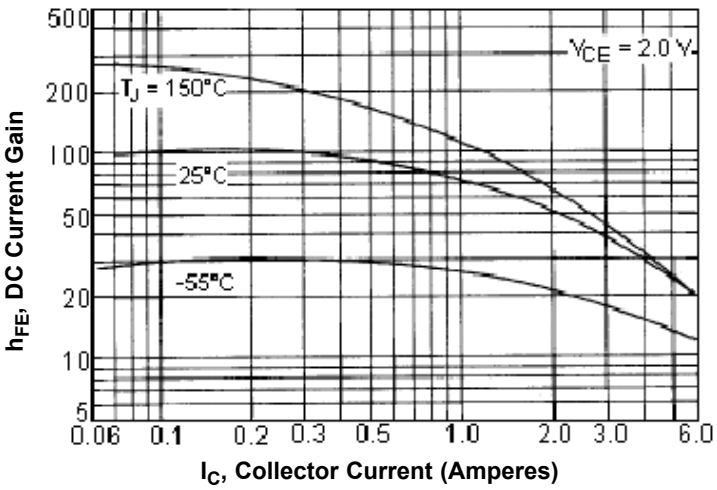



**Figure-5 Turn-off Time**

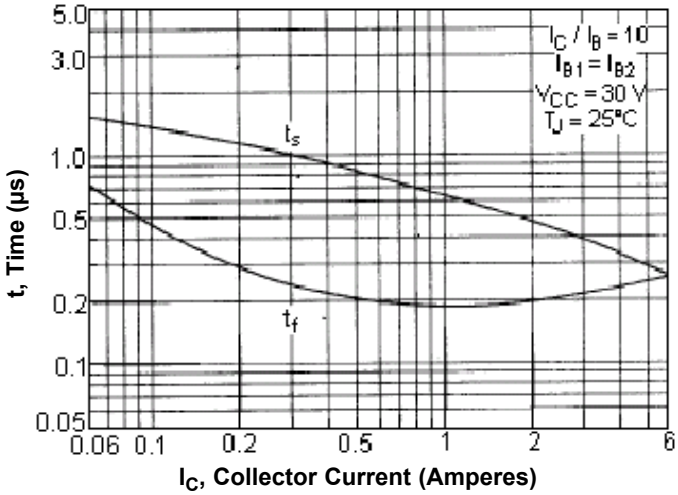
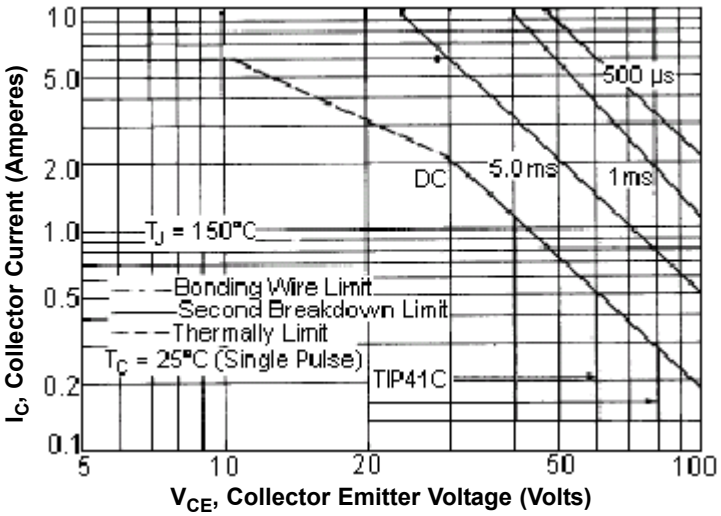



**Figure-6 Active Region Safe Operating Area**




There are two limitation on the power handling ability of a transistor: average junction temperature and second breakdown safe operating area curves indicate $I_C$-$V_{CE}$ limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater dissipation than curves indicate

The data of FIG-6 curve is base on $T_{j\,(pk)}$=150 °C; $T_c$ is variable depending on power level, second breakdown pulse limits are valid for duty cycles to 10% provided $T_{j\,(pk)}$ ≤150°C, At high case temperatures, thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown

Figure-7 Collector Saturation Region

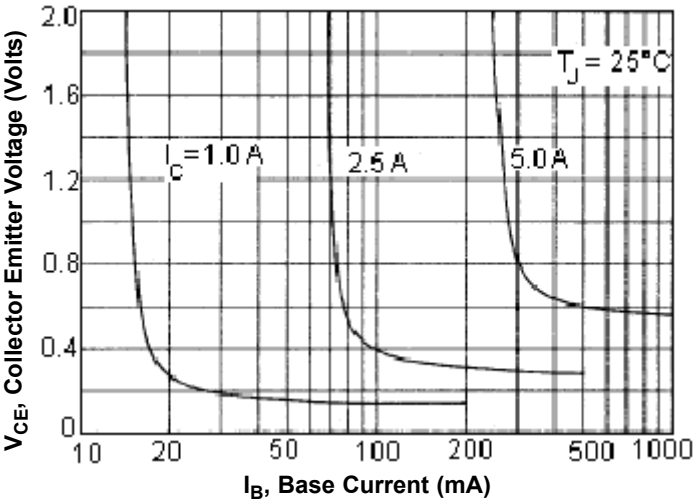



Figure-8 Capacitances

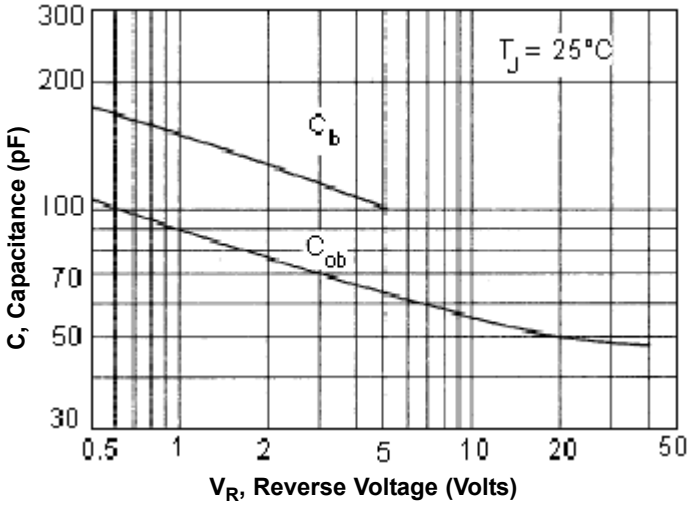



Figure-9 "ON" Voltage

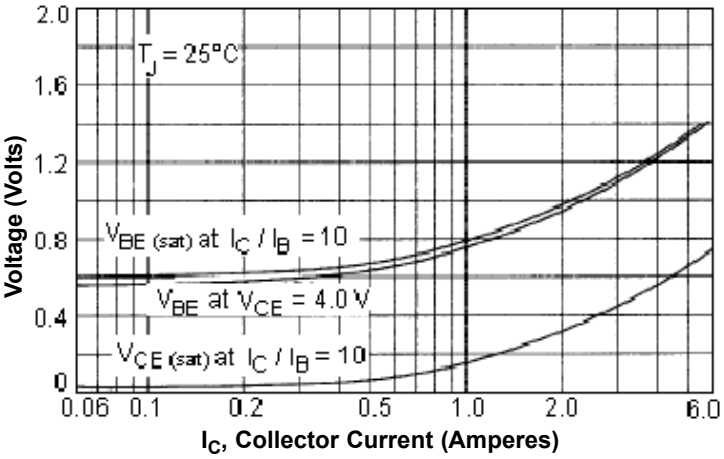
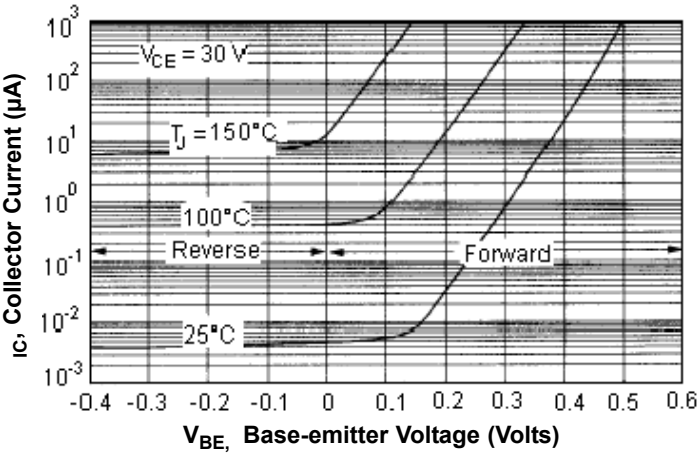



Figure-10 Collector Cut-off Region




## Part Number Table

| Description | Part Number |
|---|---|
| Silicon Plastic Power Transistor, NPN | TIP41C |