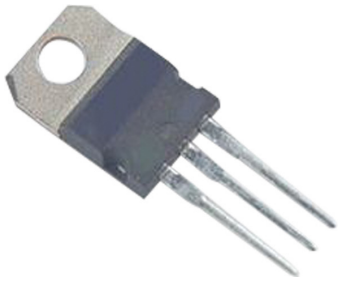
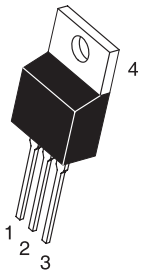
# Complementary Silicon
## Plastic Power Transistor

multicomp PRO






**Pin Configuration**
1. Base
2. Collector
3. Emitter
4. Collector

### Description:

These devices are designed for use in general−purpose amplifier and switching applications.

### Features:

- DC Current Gain Specified to 7A
  $h_{FE}$ = 30−150 @ $I_C$
- Collector−Emitter Sustaining Voltage − $V_{CEO}$(sus) = 50 V DC (Min)
- High Current Gain − Bandwidth Product − $f_T$ = 10MHz (Min) @ $I_C$ = 500mA DC
- TO−220AB Compact Package

### Maximum Ratings

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Emitter Voltage | $V_{CEO}$ | 50 | V DC |
| Collector-Base Voltage | $V_{CBO}$ | 60 | |
| Emitter-Base Voltage | $V_{EBO}$ | 5 | |
| Collector Current-Continuous<br>-Peak | $I_C$ | 7<br>10 | A DC |
| Base Current | $I_B$ | 3 | |
| Total Power Dissipation at $T_C$ = 25°C<br>Derate above 25°C | $P_D$ | 40<br>0.32 | W<br>W/°C |
| Operation and Storage Junction<br>Temperature Range | $T_J$, $T_{STG}$ | -65 to +150 | °C |

### Thermal Characteristics

| Characteristic | Symbol | Max. | Unit |
|---|---|---|---|
| Thermal Resistance Junction to Case | $R_{\theta jc}$ | 3.125 | °C/W |

### Electrical Characteristics ($T_C$ = 25°C unless otherwise noted)

| Characteristic | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|
| **Off Characteristics** | | | | |
| Collector-Emitter Sustaining Voltage (1*)<br>$I_C$ = 100mA DC, $I_B$ = 0 | $V_{CEO\ (sus)}$ | 50 | - | V DC |
| Collector Cut off Current<br>$V_{CE}$ = 40V DC, $I_B$ = 0 | $I_{CEO}$ | - | 1 | mA DC |
| Collector Cut off Current<br>$V_{CE}$ = 60V DC, $V_{EB(off)}$ = 1.5V DC<br>($V_{CE}$ = 50V DC, $V_{EB(off)}$ = 1.5V DC, $T_C$ = 150°C) | $I_{CEX}$ | - | 100<br>2 | µA DC<br>mA DC |
| Emitter Cut off Current<br>$V_{EB}$ = 5V DC, $I_C$ = 0 | $I_{EBO}$ | - | 1 | mA DC |
| **On Characteristics (1*)** | | | | |
| DC Current Gain<br>$I_C$ = 2.5A DC, $V_{CE}$ = 4V DC<br>$I_C$ = 7A DC, $V_{CE}$ = 4V DC | $h_{FE}$ | 30<br>2.3 | 150<br>- | - |
| Collector-Emitter Saturation Voltage<br>$I_C$ = 7A DC, $I_B$ = 3A DC | $V_{CE\ (sat)}$ | - | 3.5 | V DC |
| Base-Emitter On Voltage<br>$I_C$ = 7A DC, $V_{CE}$ = 4V DC | $V_{BE\ (on)}$ | - | 3 | |
| **Dynamic Characteristics** | | | | |
| Current Gain - Bandwidth Product (2*)<br>$I_C$ = 500mA DC, $V_{CE}$ = 4V DC, $f_{test}$ = 1MHz | $f_T$ | 10 | - | MHz |
| Output Capacitance ($V_{CB}$ = 10V DC, $I_E$ = 0, f = 1MHz) | $C_{ob}$ | - | 250 | pF |
| Small-Signal Current Gain<br>($I_C$ = 0.5A DC, $V_{CE}$ = 4V DC, f = 50kHz) | $h_{fe}$ | 20 | - | - |

**1*** = Pulse Test: Pulse Width ≤ 300µs, Duty Cycle ≤ 2%.

**2*** = $f_T$ = |hfe| • $f_{test}$

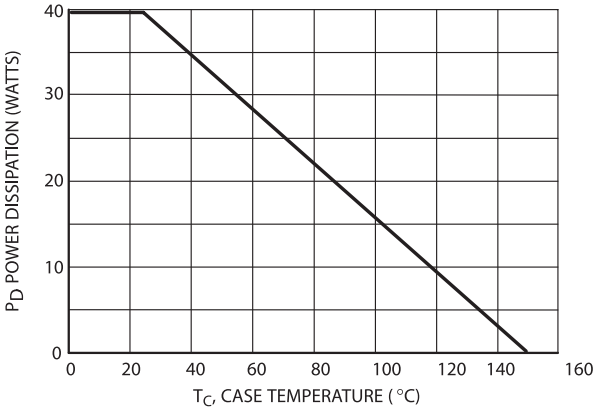



**Figure 1. Power Derating**

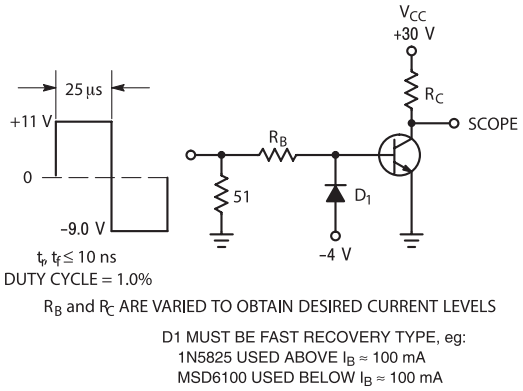



**Figure 2. Switching Time Test Circuit**

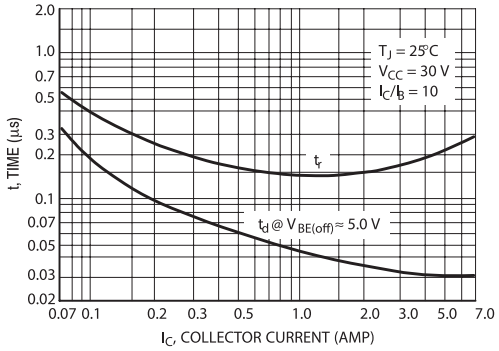



**Figure 3. Turn–On Time**

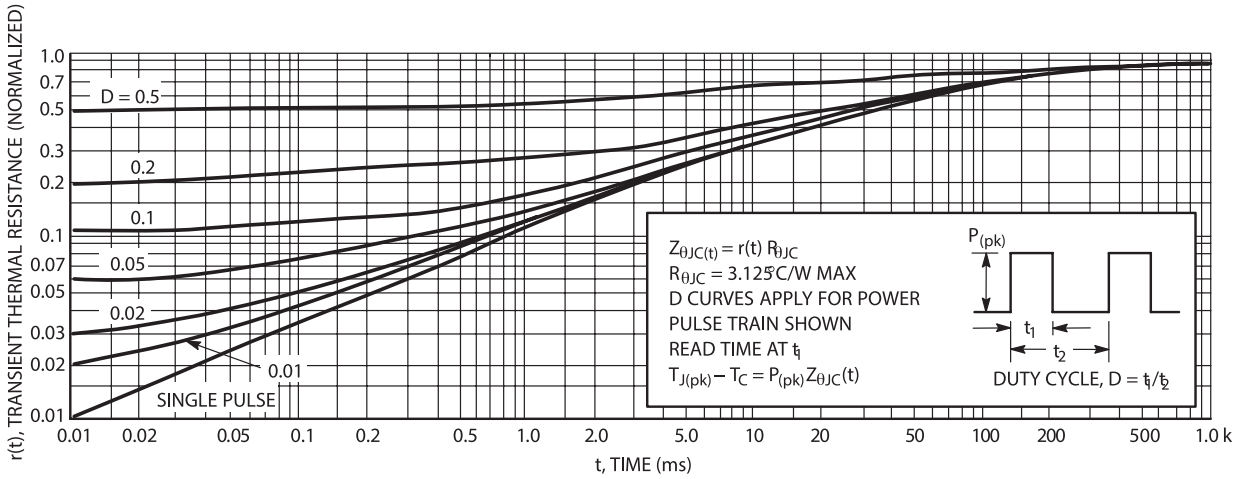



**Figure 4. Thermal Response**

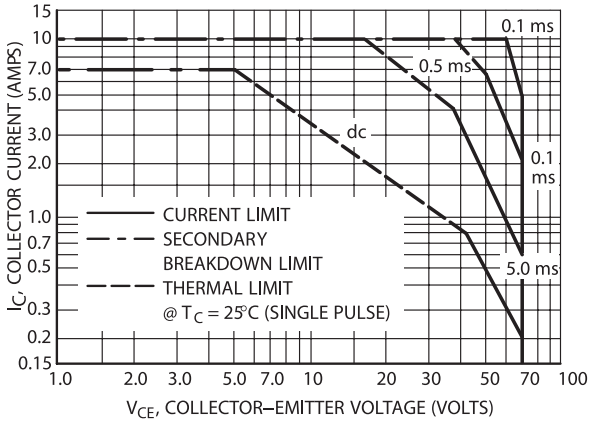



**Figure 5. Active–Region Safe Operating Area**

There are two limitations 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 the curves indicate.

The data of Figure 5 is based on $T_{J(pk)}$ = 150°C; $T_C$ is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 150°C$. $T_{J(pk)}$ may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown

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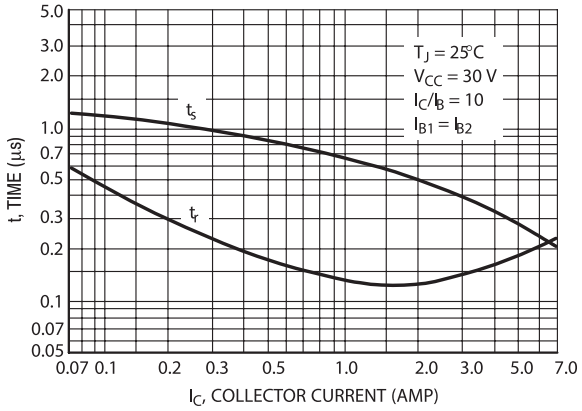



**Figure 6. Turn–Off Time**

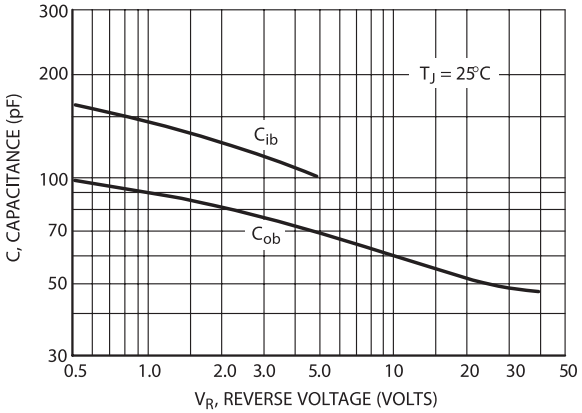
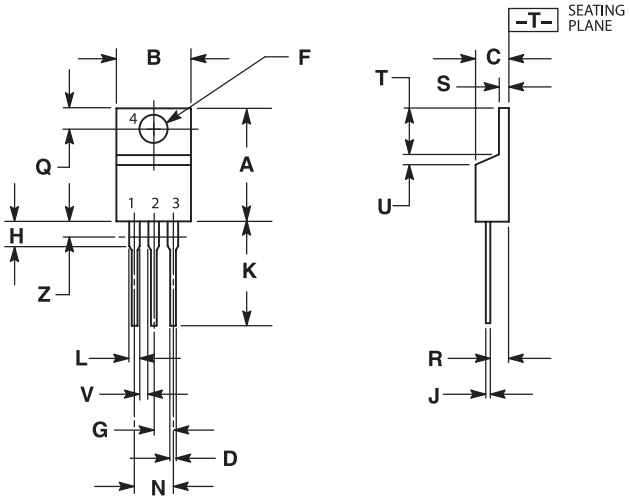



**Figure 7. Capacitance**




| Dimensions | Min. | Max. |
|---|---|---|
| A | 14.48 | 15.75 |
| B | 9.66 | 10.28 |
| C | 4.07 | 4.82 |
| D | 0.64 | 0.88 |
| F | 3.61 | 3.73 |
| G | 2.42 | 2.66 |
| H | 2.8 | 3.93 |
| J | 0.46 | 0.64 |
| K | 12.7 | 14.27 |
| L | 1.15 | 1.52 |
| N | 4.83 | 5.33 |
| Q | 2.54 | 3.04 |
| R | 2.04 | 2.79 |
| S | 1.15 | 1.39 |
| T | 5.97 | 6.47 |
| U | 0 | 1.27 |
| V | 1.15 | - |
| Z | - | 2.04 |

**Pin Configuration**
1. Base
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## Part Number Table

| Description | Part Number |
|---|---|
| Transistor, PNP, TO-220 | 2N6109 |