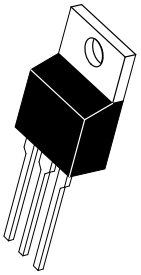
# Complementary Silicon Plastic Power Transistors

. . . designed for use in general purpose amplifier and switching applications. Compact TO–220 AB package.

**NPN**
**TIP29B**
**TIP29C**
**PNP**
**TIP30B**
**TIP30C**

**1 AMPERE**
**POWER TRANSISTORS**
**COMPLEMENTARY**
**SILICON**
**80–100 VOLTS**
**30 WATTS**



**CASE 221A–06**
**TO–220AB**

**MAXIMUM RATINGS**

| Rating | Symbol | TIP29B TIP30B | TIP29C TIP30C | Unit |
|---|---|---|---|---|
| Collector–Emitter Voltage | $V_{CEO}$ | 80 | 100 | Vdc |
| Collector–Base Voltage | $V_{CB}$ | 80 | 100 | Vdc |
| Emitter–Base Voltage | $V_{EB}$ | 5.0 | | Vdc |
| Collector Current — Continuous<br>Peak | $I_C$ | 1.0<br>3.0 | | Adc |
| Base Current | $I_B$ | 0.4 | | Adc |
| Total Power Dissipation @ $T_C$ = 25°C<br>Derate above 25°C | $P_D$ | 30<br>0.24 | | Watts<br>W/°C |
| Total Power Dissipation @ $T_A$ = 25°C<br>Derate above 25°C | $P_D$ | 2.0<br>0.016 | | Watts<br>W/°C |
| Unclamped Inductive Load Energy (See Note 3) | E | 32 | | mJ |
| Operating and Storage Junction Temperature Range | $T_J$, $T_{stg}$ | −65 to +150 | | °C |

**THERMAL CHARACTERISTICS**

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance, Junction to Ambient | $R_{\theta JA}$ | 62.5 | °C/W |
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 4.167 | °C/W |

**ELECTRICAL CHARACTERISTICS** ($T_C$ = 25°C unless otherwise noted)

| Characteristic | | Symbol | Min | Max | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Collector–Emitter Sustaining Voltage (1)<br>($I_C$ = 30 mAdc, $I_B$ = 0) | TIP29B, TIP30B<br>TIP29C, TIP30C | $V_{CEO(sus)}$ | 80<br>100 | —<br>— | Vdc |
| Collector Cutoff Current ($V_{CE}$ = 60 Vdc, $I_B$ = 0) | | $I_{CEO}$ | — | 0.3 | mAdc |
| Collector Cutoff Current<br>($V_{CE}$ = 80 Vdc, $V_{EB}$ = 0)<br>($V_{CE}$ = 100 Vdc, $V_{EB}$ = 0) | <br>TIP29B, TIP30B<br>TIP29C, TIP30C | $I_{CES}$ | <br>—<br>— | <br>200<br>200 | μAdc |
| Emitter Cutoff Current ($V_{BE}$ = 5.0 Vdc, $I_C$ = 0) | | $I_{EBO}$ | — | 1.0 | mAdc |
| **ON CHARACTERISTICS (1)** | | | | | |
| DC Current Gain ($I_C$ = 0.2 Adc, $V_{CE}$ = 4.0 Vdc)<br>($I_C$ = 1.0 Adc, $V_{CE}$ = 4.0 Vdc) | | $h_{FE}$ | 40<br>15 | —<br>75 | — |
| Collector–Emitter Saturation Voltage ($I_C$ = 1.0 Adc, $I_B$ = 125 mAdc) | | $V_{CE(sat)}$ | — | 0.7 | Vdc |
| Base–Emitter On Voltage ($I_C$ = 1.0 Adc, $V_{CE}$ = 4.0 Vdc) | | $V_{BE(on)}$ | — | 1.3 | Vdc |
| **DYNAMIC CHARACTERISTICS** | | | | | |
| Current–Gain — Bandwidth Product (2)<br>($I_C$ = 200 mAdc, $V_{CE}$ = 10 Vdc, $f_{test}$ = 1.0 MHz) | | $f_T$ | 3.0 | — | MHz |
| Small–Signal Current Gain ($I_C$ = 0.2 Adc, $V_{CE}$ = 10 Vdc, f = 1.0 kHz) | | $h_{fe}$ | 20 | — | — |

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.
(2) $f_T = |h_{fe}| \bullet f_{test}$.
(3) This rating based on testing with $L_C$ = 20 mH, $R_{BE}$ = 100 Ω, $V_{CC}$ = 10 V, $I_C$ = 1.8 A, P.R.F = 10 Hz.

**REV 1**

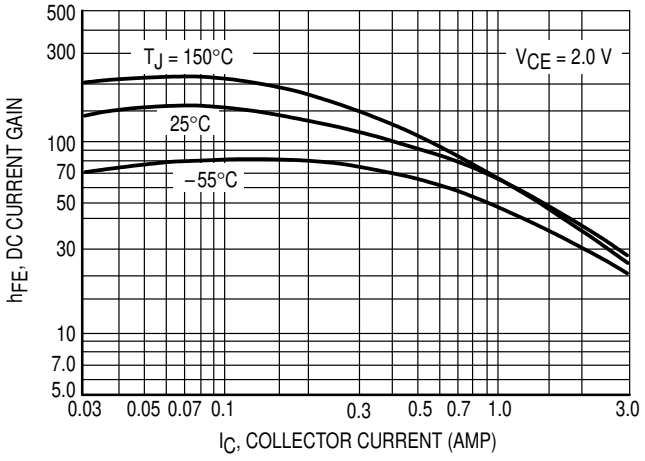



**Figure 1. DC Current Gain**

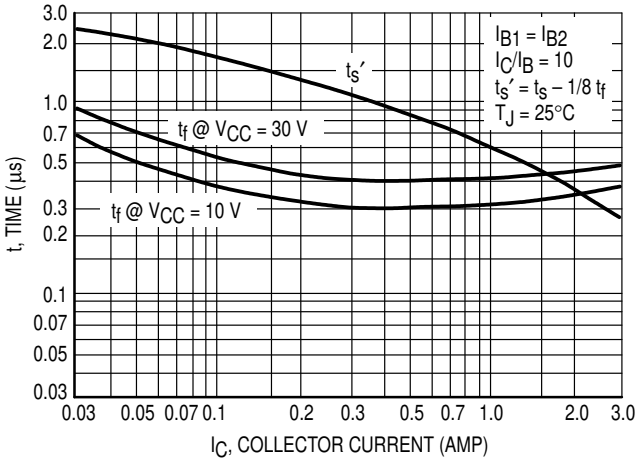



**Figure 2. Turn–Off Time**

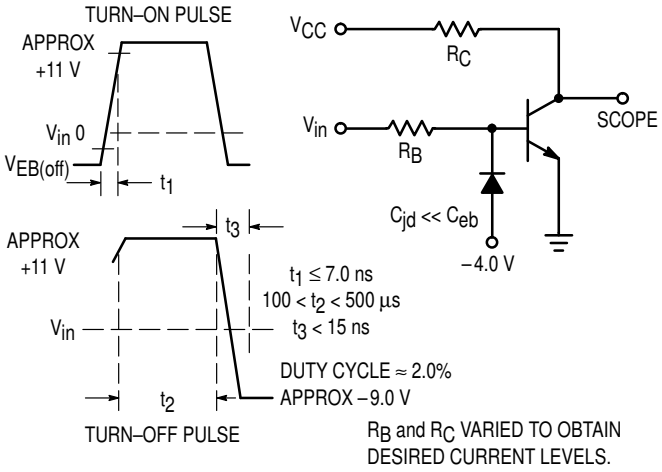



**Figure 3. Switching Time Equivalent Circuit**

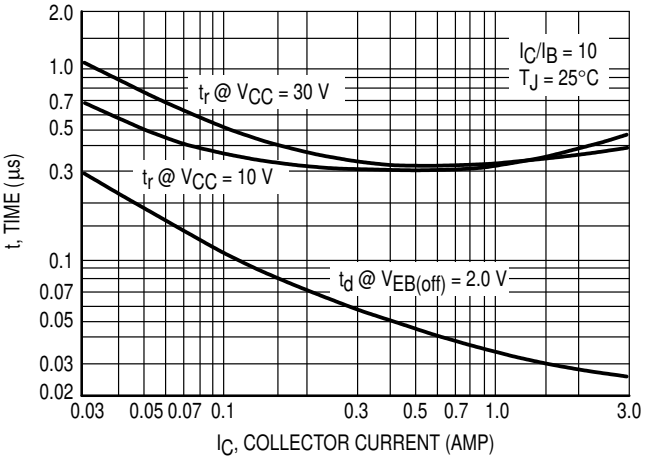



**Figure 4. Turn–On Time**

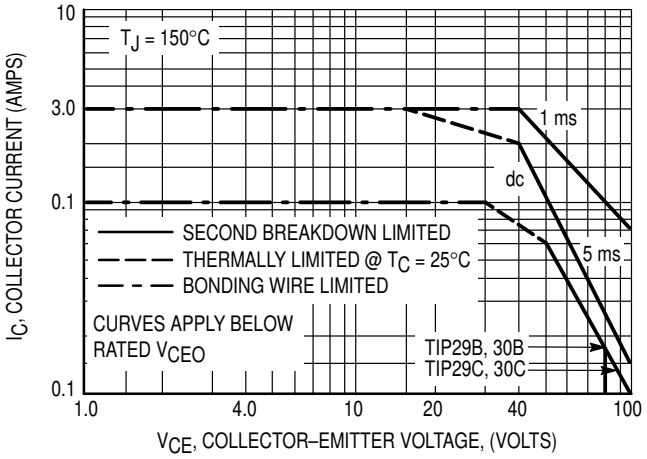
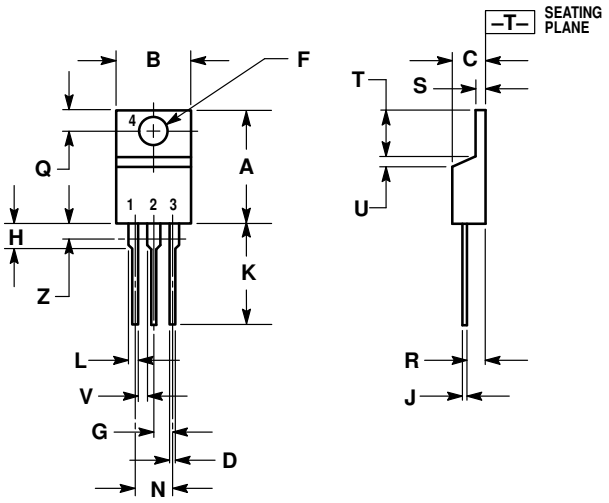



**Figure 5. Active Region Safe Operating Area**

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate $I_C - V_{CE}$ 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 $T_{J(pk)} \le$ 150°C. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

## PACKAGE DIMENSIONS




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 0.570 | 0.620 | 14.48 | 15.75 |
| B | 0.380 | 0.405 | 9.66 | 10.28 |
| C | 0.160 | 0.190 | 4.07 | 4.82 |
| D | 0.025 | 0.035 | 0.64 | 0.88 |
| F | 0.142 | 0.147 | 3.61 | 3.73 |
| G | 0.095 | 0.105 | 2.42 | 2.66 |
| H | 0.110 | 0.155 | 2.80 | 3.93 |
| J | 0.018 | 0.025 | 0.46 | 0.64 |
| K | 0.500 | 0.562 | 12.70 | 14.27 |
| L | 0.045 | 0.060 | 1.15 | 1.52 |
| N | 0.190 | 0.210 | 4.83 | 5.33 |
| Q | 0.100 | 0.120 | 2.54 | 3.04 |
| R | 0.080 | 0.110 | 2.04 | 2.79 |
| S | 0.045 | 0.055 | 1.15 | 1.39 |
| T | 0.235 | 0.255 | 5.97 | 6.47 |
| U | 0.000 | 0.050 | 0.00 | 1.27 |
| V | 0.045 | — | 1.15 | — |
| Z | — | 0.080 | — | 2.04 |

STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

**CASE 221A–06**
**TO–220AB**
**ISSUE Y**

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