

# Complementary Silicon Plastic Power Transistors

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

## MAXIMUM RATINGS

| Rating                                                                                | Symbol         | TIP29B<br>TIP30B | TIP29C<br>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 @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 30<br>0.24       |                  | Watts<br>W/ $^\circ\text{C}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 2.0<br>0.016     |                  | Watts<br>W/ $^\circ\text{C}$ |
| Unclamped Inductive Load Energy<br>(See Note 3)                                       | E              | 32               |                  | mJ                           |
| Operating and Storage Junction<br>Temperature Range                                   | $T_J, T_{stg}$ | -65 to +150      |                  | $^\circ\text{C}$             |

## THERMAL CHARACTERISTICS

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

## ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic                                                                                                          | Symbol         | Min       | Max        | Unit            |
|-------------------------------------------------------------------------------------------------------------------------|----------------|-----------|------------|-----------------|
| <b>OFF CHARACTERISTICS</b>                                                                                              |                |           |            |                 |
| Collector-Emitter Sustaining Voltage (1)<br>( $I_C = 30\text{ mAdc}$ , $I_B = 0$ )                                      | $V_{CEO(sus)}$ | 80<br>100 | —<br>—     | Vdc             |
| Collector Cutoff Current ( $V_{CE} = 60\text{ Vdc}$ , $I_B = 0$ )                                                       | $I_{CEO}$      | —         | 0.3        | mAdc            |
| Collector Cutoff Current<br>( $V_{CE} = 80\text{ Vdc}$ , $V_{EB} = 0$ )<br>( $V_{CE} = 100\text{ Vdc}$ , $V_{EB} = 0$ ) | $I_{CES}$      | —<br>—    | 200<br>200 | $\mu\text{Adc}$ |
| Emitter Cutoff Current ( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ )                                                        | $I_{EBO}$      | —         | 1.0        | mAdc            |

## ON CHARACTERISTICS (1)

|                                                                                                                                  |               |          |         |     |
|----------------------------------------------------------------------------------------------------------------------------------|---------------|----------|---------|-----|
| DC Current Gain ( $I_C = 0.2\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )<br>( $I_C = 1.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ ) | $h_{FE}$      | 40<br>15 | —<br>75 | —   |
| Collector-Emitter Saturation Voltage ( $I_C = 1.0\text{ Adc}$ , $I_B = 125\text{ mAdc}$ )                                        | $V_{CE(sat)}$ | —        | 0.7     | Vdc |
| Base-Emitter On Voltage ( $I_C = 1.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )                                                   | $V_{BE(on)}$  | —        | 1.3     | Vdc |

## DYNAMIC CHARACTERISTICS

|                                                                                                                              |          |     |   |     |
|------------------------------------------------------------------------------------------------------------------------------|----------|-----|---|-----|
| Current-Gain — Bandwidth Product (2)<br>( $I_C = 200\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f_{test} = 1.0\text{ MHz}$ ) | $f_T$    | 3.0 | — | MHz |
| Small-Signal Current Gain ( $I_C = 0.2\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )                       | $h_{fe}$ | 20  | — | —   |

(1) Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

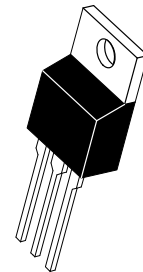
(2)  $f_T = |h_{fe}| \cdot f_{test}$ .

(3) This rating based on testing with  $L_C = 20\text{ mH}$ ,  $R_{BE} = 100\text{ }\Omega$ ,  $V_{CC} = 10\text{ V}$ ,  $I_C = 1.8\text{ A}$ , P.R.F = 10 Hz.

REV 1

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

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



**CASE 221A-06**  
**TO-220AB**

# TIP29B TIP29C TIP30B TIP30C

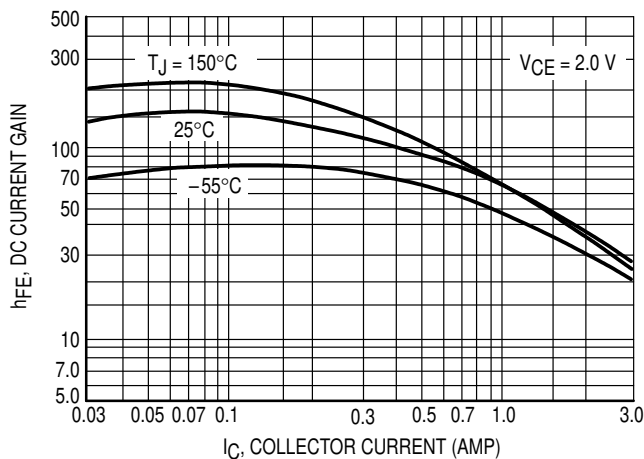


Figure 1. DC Current Gain

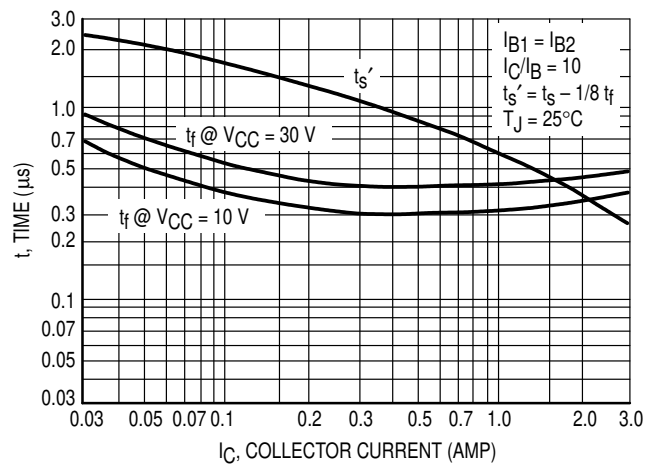


Figure 2. Turn-Off Time

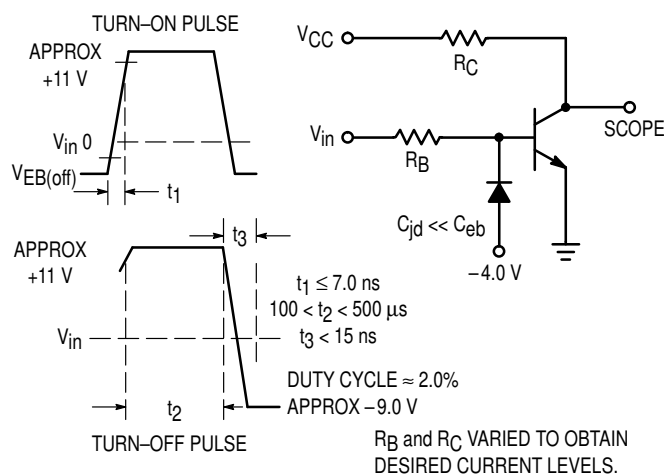


Figure 3. Switching Time Equivalent Circuit

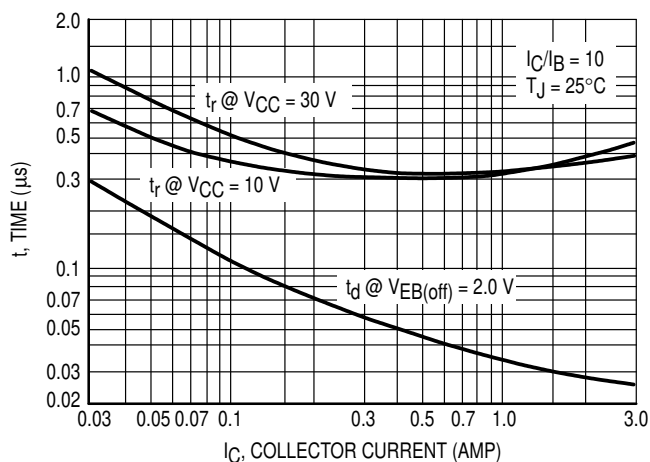


Figure 4. Turn-On Time

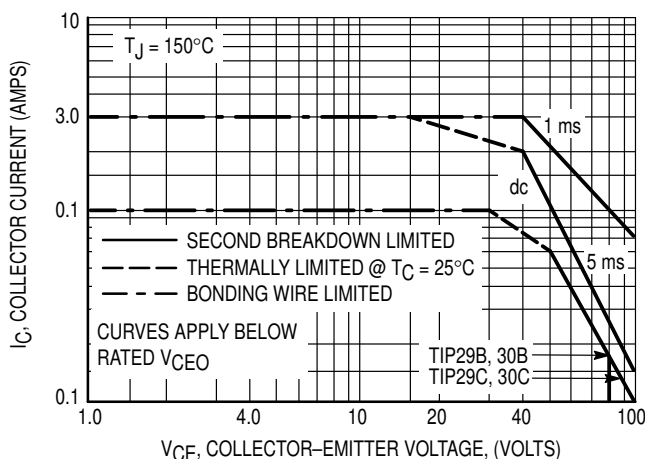
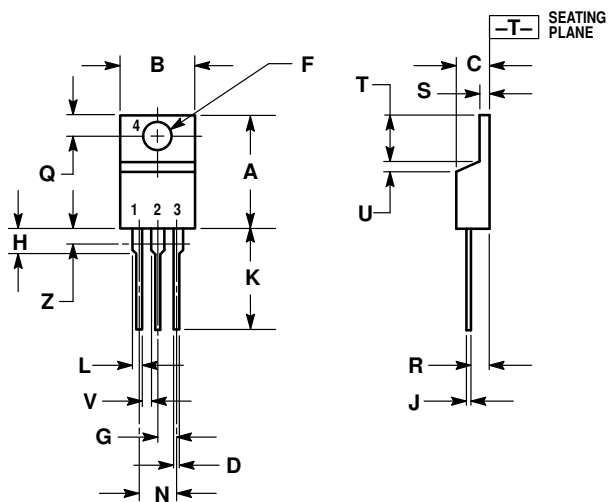


Figure 5. Active Region Safe Operating Area

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  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(pk)} \leq 150^\circ\text{C}$ . 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.

| DIM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | 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

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

**How to reach us:**

**USA / EUROPE:** Motorola Literature Distribution;  
P.O. Box 20912; Phoenix, Arizona 85036. 1-800-441-2447

**MFAX:** RMFAX0@email.sps.mot.com – TOUCHTONE (602) 244-6609  
**INTERNET:** <http://Design-NET.com>

**JAPAN:** Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, Toshikatsu Otsuki,  
6F Seibu-Butsuryu-Center, 3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 03-3521-8315

**HONG KONG:** Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,  
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298

