

**NEC**

# PNP SILICON DARLINGTON TRANSISTOR

## 2SB1093

**DESCRIPTION** The 2SB1093 is a darlington transistor including a dumper diode at C-E.

It is suitable for general driving use, such as hammer, solenoid, lamp or motor.

- FEATURES**
- High DC current gain.
  - High current capability, wide ASO and low collector saturation voltage.
  - Includes a dumper diode at C-E.
  - A complementary pair with NEC's 2SD1579.

### ABSOLUTE MAXIMUM RATINGS

Maximum Temperatures

Storage Temperature . . . . .  $-55$  to  $+150$  °C

Junction Temperature . . . . .  $150$  °C Maximum

Maximum Power Dissipation ( $T_a = 25$  °C)

Total Power Dissipation . . . . .  $1.0$  W

Maximum Voltages and Currents ( $T_a = 25$  °C)

$V_{CBO}$  Collector to Base Voltage . . . . .  $-80$  V

$V_{CEO}$  Collector to Emitter Voltage . . . . .  $-80$  V

$V_{EBO}$  Emitter to Base Voltage . . . . .  $-8.0$  V

$I_C$  Collector Current (DC) . . . . .  $\pm 1.5$  A

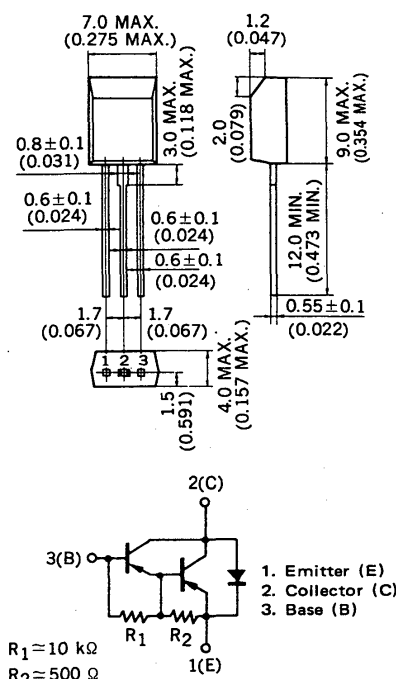
$I_C$  Collector Current (Pulse)\* . . . . .  $\pm 3.0$  A

$I_B$  Base Current (DC) . . . . .  $-0.15$  A

\*PW  $\leq 300$   $\mu$ s, Duty Cycle  $\leq 10$  %

### PACKAGE DIMENSIONS

in millimeters (inches)



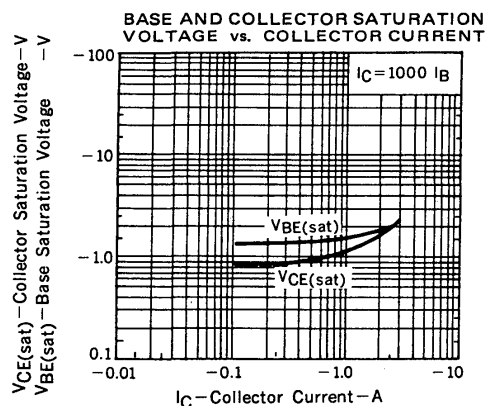
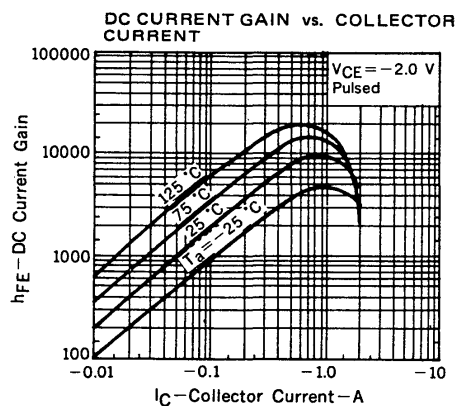
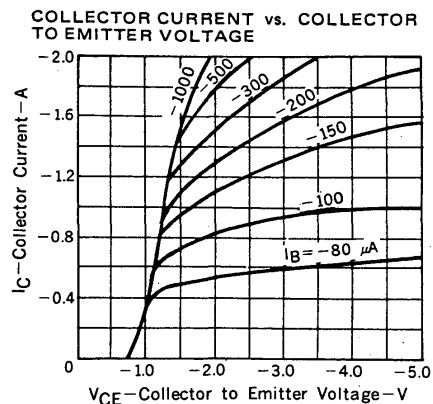
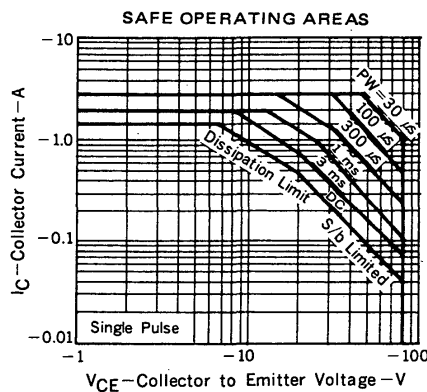
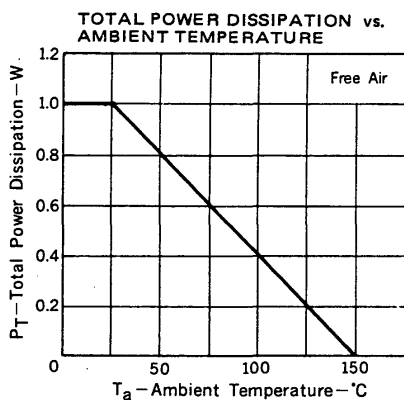
### ELECTRICAL CHARACTERISTICS ( $T_a = 25$ °C)

| SYMBOL        | CHARACTERISTIC               | MIN. | TYP. | MAX.  | UNIT    | TEST CONDITIONS                                                                                           |
|---------------|------------------------------|------|------|-------|---------|-----------------------------------------------------------------------------------------------------------|
| $h_{FE1}$     | DC Current Gain              | 1000 |      |       | —       | $V_{CE} = -2.0$ V, $I_C = -0.5$ A                                                                         |
| $h_{FE2}$     | DC Current Gain              | 2000 |      | 30000 | —       | $V_{CE} = -2.0$ V, $I_C = -1.0$ A                                                                         |
| $t_{on}$      | Turn-On Time                 |      | 0.5  |       | $\mu$ s | $I_C = -1.0$ A, $R_L = 50$ $\Omega$<br>$I_{B1} = -I_{B2} = -1.0$ mA, $V_{CC} = -50$ V<br>See Test Circuit |
| $t_{stg}$     | Storage Time                 |      | 1.0  |       | $\mu$ s |                                                                                                           |
| $t_f$         | Fall Time                    |      | 1.0  |       | $\mu$ s |                                                                                                           |
| $I_{CBO}$     | Collector Cutoff Current     |      |      | -10   | $\mu$ A | $V_{CB} = -80$ V, $I_E = 0$                                                                               |
| $I_{CER}$     | Collector Cutoff Current     |      |      | -1.0  | mA      | $V_{CE} = -80$ V, $R_{BE} = 51$ $\Omega$ , $T_a = 125$ °C                                                 |
| $I_{CEX1}$    | Collector Cutoff Current     |      |      | -10   | $\mu$ A | $V_{CE} = -80$ V, $V_{BE(off)} = -1.5$ V                                                                  |
| $I_{CEX2}$    | Collector Cutoff Current     |      |      | -1.0  | mA      | $V_{CE} = -80$ V, $V_{BE(off)} = -1.5$ V, $T_a = 125$ °C                                                  |
| $I_{EBO}$     | Emitter Cutoff Current       |      |      | -1.0  | mA      | $V_{EB} = -5.0$ V, $I_C = 0$                                                                              |
| $V_{CE(sat)}$ | Collector Saturation Voltage |      |      | -1.5  | V       | $I_C = -1.0$ A, $I_B = -1.0$ mA                                                                           |
| $V_{BE(sat)}$ | Base Saturation Voltage      |      |      | -2.0  | V       |                                                                                                           |
| $f_T$         | Gain Bandwidth Product       |      | 80   |       | MHz     | $V_{CE} = -10$ V, $I_E = 1.0$ A                                                                           |

### Classification of $h_{FE2}$

| Rank  | M           | L            | K            |
|-------|-------------|--------------|--------------|
| Range | 2000 - 5000 | 4000 - 10000 | 8000 - 30000 |

Test Conditions:  $V_{CE} = -2.0$  V,  $I_C = -1.0$  A

**NEC****2SB1093****TYPICAL CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ )****SWITCHING TIME ( $t_{on}$ ,  $t_{stg}$ ,  $t_f$ ) TEST CIRCUIT**