

**MOTOROLA SEMICONDUCTOR TECHNICAL DATA**

**NPN D44E Series PNP D45E Series**

**COMPLEMENTARY SILICON POWER DARLINGTON TRANSISTORS**

... for general purpose power amplification and switching such as output or driver stages in applications such as switching regulators, converters and power amplifiers.

- Low Collector-Emitter Saturation Voltage —  $V_{CE(sat)} = 2.0 \text{ V (Max) @ } 10 \text{ A}$
- High DC Current Gain — 1000 (Min) @ 5.0 Adc
- Complementary Pairs Simplifies Designs

**DARLINGTON 10 AMPERE**

**COMPLEMENTARY SILICON POWER TRANSISTORS**

**40-80 VOLTS  
50 WATTS**

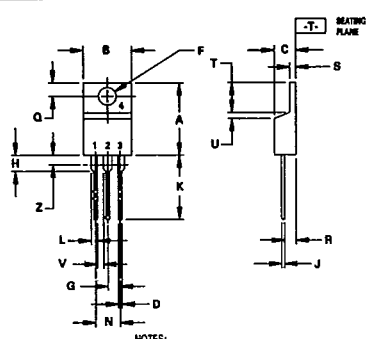
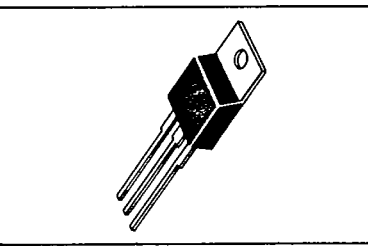
**MAXIMUM RATINGS**

| Rating  | Symbol         | D44E or D45E |    |    | Unit             |
|---|----------------|--------------|----|----|------------------|
|   |                | 1            | 2  | 3  |                  |
| Collector-Emitter Voltage   | $V_{CEO}$      | 40           | 60 | 80 | Vdc              |
| Emitter Base Voltage  | $V_{EB}$       | 7.0          |    |    | Vdc              |
| Collector Current — Continuous Peak (1)                                       | $I_C$          | 10<br>20     |    |    | Adc              |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ @ $T_A = 25^\circ\text{C}$ | $P_D$          | 50<br>1.67   |    |    | Watts            |
| Operating and Storage Junction Temperature Range                              | $T_J, T_{stg}$ | -55 to 150   |    |    | $^\circ\text{C}$ |

**THERMAL CHARACTERISTICS**

| Characteristic  | Symbol          | Max | Unit               |
|---|-----------------|-----|--------------------|
| Thermal Resistance, Junction to Case  | $R_{\theta JC}$ | 2.5 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Ambient                                       | $R_{\theta JA}$ | 75  | $^\circ\text{C/W}$ |
| Maximum Lead Temperature for Soldering Purposes: 1/8" from Case for 5 Seconds | $T_L$           | 275 | $^\circ\text{C}$   |

(1) Pulse Width  $\leq 60 \text{ ms}$ , Duty Cycle  $\leq 50\%$ .



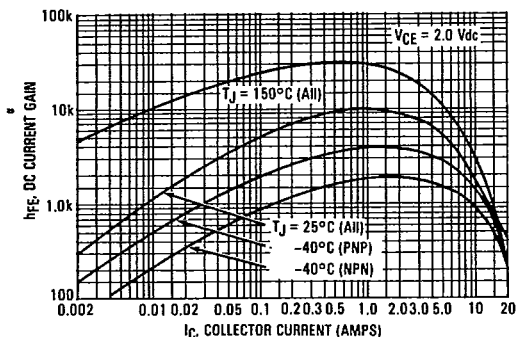
NOTES:  
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
2. CONTROLLING DIMENSION INCH  
3. DIM Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED

| DIM | MILLIMETERS |       | INCHES |       |
|-----|-------------|-------|--------|-------|
|     | MIN         | MAX   | MIN    | MAX   |
| A   | 14.48       | 15.75 | 0.570  | 0.620 |
| B   | 9.65        | 10.26 | 0.380  | 0.405 |
| C   | 4.07        | 4.82  | 0.160  | 0.190 |
| D   | 0.64        | 0.88  | 0.025  | 0.035 |
| F   | 3.61        | 3.73  | 0.142  | 0.147 |
| G   | 2.42        | 2.66  | 0.095  | 0.105 |
| H   | 2.80        | 3.93  | 0.110  | 0.155 |
| J   | 0.46        | 0.71  | 0.018  | 0.028 |
| K   | 12.70       | 14.27 | 0.500  | 0.562 |
| L   | 1.15        | 1.30  | 0.045  | 0.055 |
| M   | 4.83        | 5.33  | 0.190  | 0.210 |
| Q   | 2.54        | 3.04  | 0.100  | 0.120 |
| R   | 2.04        | 2.79  | 0.080  | 0.110 |
| S   | 1.15        | 1.25  | 0.045  | 0.055 |
| T   | 5.97        | 6.47  | 0.235  | 0.255 |
| U   | 0.00        | 1.27  | 0.000  | 0.050 |
| V   | 1.15        | —     | 0.045  | —     |
| Z   | —           | 2.04  | —      | 0.080 |

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

CASE 221A-04  
TO-220AB

**FIGURE 1 — TYPICAL DC CURRENT GAIN**



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**D44E Series NPN, D45 Series PNP**

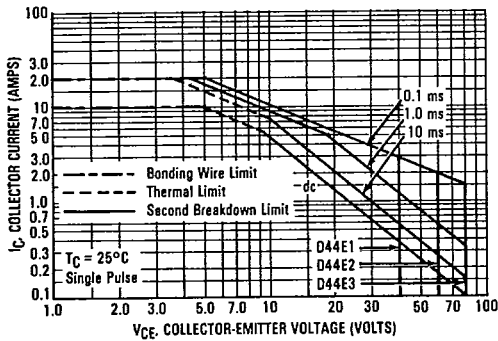
T-33-33

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

| Characteristic  | Symbol                     | Min       | Typ | Max        | Unit          |
|---|----------------------------|-----------|-----|------------|---------------|
| <b>OFF CHARACTERISTICS</b>  |                            |           |     |            |               |
| Collector Cutoff Current<br>( $V_{CE} = \text{Rated } V_{CEO}, V_{BE} = 0$ )  | $I_{CES}$                  | —         | —   | 10         | $\mu\text{A}$ |
| Emitter Cutoff Current<br>( $V_{EB} = 7.0 \text{ Vdc}$ )  | $I_{EBO}$                  | —         | —   | 1.0        | $\mu\text{A}$ |
| <b>ON CHARACTERISTICS (1)</b>   |                            |           |     |            |               |
| DC Current Gain<br>( $I_C = 5.0 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$ )  | $h_{FE}$                   | 1000      | —   | —          | —             |
| Collector-Emitter Saturation Voltage<br>( $I_C = 5.0 \text{ Adc}, I_B = 10 \text{ mAdc}$ )<br>( $I_C = 10 \text{ Adc}, I_B = 20 \text{ mAdc}$ ) | $V_{CE(sat)}$              | —         | —   | 1.5<br>2.0 | Vdc           |
| Base-Emitter Saturation Voltage<br>( $I_C = 5.0 \text{ Adc}, I_B = 10 \text{ mAdc}$ )   | $V_{BE(sat)}$              | —         | —   | 2.5        | Vdc           |
| <b>DYNAMIC CHARACTERISTICS</b>  |                            |           |     |            |               |
| Collector Capacitance<br>( $V_{CB} = 10 \text{ Vdc}, f_{test} = 1.0 \text{ MHz}$ )  | D44E Series<br>D45E Series | $C_{CBO}$ | —   | —          | pF            |
| <b>SWITCHING CHARACTERISTICS</b>  |                            |           |     |            |               |
| Delay and Rise Times<br>( $I_C = 10 \text{ Adc}, I_{B1} = 20 \text{ mAdc}$ )  | $t_d + t_r$                | —         | 0.6 | —          | $\mu\text{s}$ |
| Storage Time<br>( $I_C = 10 \text{ Adc}, I_{B1} = I_{B2} = 20 \text{ mAdc}$ )   | $t_s$                      | —         | 2.0 | —          | $\mu\text{s}$ |
| Fall Time<br>( $I_C = 10 \text{ Adc}, I_{B1} = I_{B2} = 20 \text{ mAdc}$ )  | $t_f$                      | —         | 0.5 | —          | $\mu\text{s}$ |

**SAFE OPERATING AREA INFORMATION**

**FIGURE 2 — MAXIMUM RATED FORWARD BIAS SAFE OPERATING AREA (NPN)**



**FIGURE 3 — MAXIMUM RATED FORWARD BIAS SAFE OPERATING AREA (PNP)**

