

## NPN SILICON POWER TRANSISTORS

...designed for use in audio frequency power amplifier applications

### FEATURES:

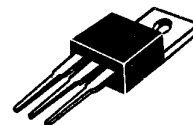
- \* Low Collector-Emitter Saturation Voltage  
 $V_{CE(sat)} = 1.0V(\text{Max}) @ I_C = 3.0A, I_B = 0.3A$
- \* DC Current Gain  
 $hFE = 60-300 @ I_C = 0.5A$
- \* Complementary to PNP 2SB834

**NPN**  
**2SD880**

**3 AMPERE**  
**POWER**  
**TRANSISTORS**  
**60 VOLTS**  
**30 WATTS**

### MAXIMUM RATINGS

| Characteristic                                     | Symbol         | 2SD880      | Unit                |
|--|----------------|-------------|---------------------|
| Collector-Emitter Voltage                          | $V_{CEO}$      | 60          | V                   |
| Collector-Base Voltage                             | $V_{CBO}$      | 60          | V                   |
| Emitter-Base Voltage                               | $V_{EBO}$      | 7.0         | V                   |
| Collector Current - Continuous                     | $I_C$          | 3.0         | A                   |
| - Peak   | $I_{CM}$       | 6.0         |                     |
| Base current                                       | $I_B$          | 0.5         | A                   |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ | $P_D$          | 30          | W                   |
| Derate above $25^\circ\text{C}$                    |                | 0.24        | W/ $^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range   | $T_J, T_{STG}$ | -55 to +150 | $^\circ\text{C}$    |

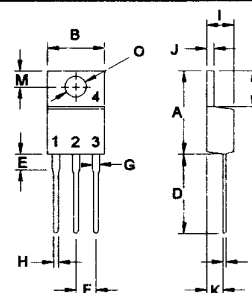
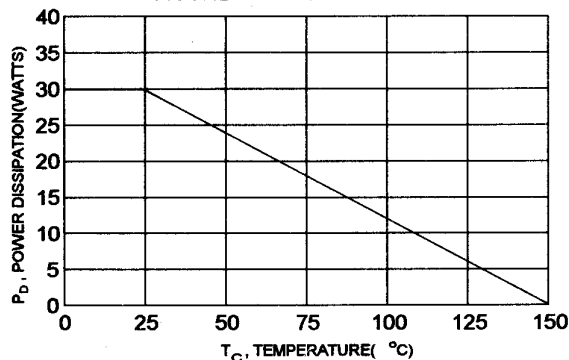


**TO-220**

### THERMAL CHARACTERISTICS

| Characteristic                      | Symbol          | Max  | Unit               |
|-------------------------------------|-----------------|------|--------------------|
| Thermal Resistance Junction to Case | $R_{\theta jc}$ | 4.16 | $^\circ\text{C/W}$ |

**FIGURE -1 POWER DERATING**



PIN 1.BASE  
2.COLLECTOR  
3.EMITTER  
4.COLLECTOR(CASE)

| DIM | MILLIMETERS |       |
|-----|-------------|-------|
|     | MIN         | MAX   |
| A   | 14.68       | 15.31 |
| B   | 9.78        | 10.42 |
| C   | 5.01        | 6.52  |
| D   | 13.06       | 14.62 |
| E   | 3.57        | 4.07  |
| F   | 2.42        | 3.66  |
| G   | 1.12        | 1.36  |
| H   | 0.72        | 0.96  |
| I   | 4.22        | 4.98  |
| J   | 1.14        | 1.38  |
| K   | 2.20        | 2.97  |
| L   | 0.33        | 0.55  |
| M   | 2.48        | 2.98  |
| O   | 3.70        | 3.90  |

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

| Characteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

**OFF CHARACTERISTICS**

|   |               |     |     |               |
|---|---------------|-----|-----|---------------|
| Collector-Emitter Breakdown Voltage<br>( $I_C = 50\text{ mA}$ , $I_E = 0$ ) | $V_{(BR)CEO}$ | 60  |     | V             |
| Emitter-Base Breakdown Voltage<br>( $I_B = 1.0\text{ mA}$ , $I_C = 0$ )     | $V_{(BR)EBO}$ | 7.0 |     | V             |
| Collector Cutoff Current<br>( $V_{CB} = 60\text{ V}$ , $I_E = 0$ )          | $I_{CBO}$     |     | 100 | $\mu\text{A}$ |
| Emitter Cutoff Current<br>( $V_{EB} = 7.0\text{ V}$ , $I_C = 0$ )           | $I_{EBO}$     |     | 100 | $\mu\text{A}$ |

**ON CHARACTERISTICS (1)**

|  |               |    |     |   |
|--|---------------|----|-----|---|
| DC Current Gain<br>( $I_C = 0.5\text{ A}$ , $V_{CE} = 5.0\text{ V}$ ) *                  | $h_{FE(2)}$   | 60 | 300 |   |
| Collector-Emitter Saturation Voltage<br>( $I_C = 3.0\text{ A}$ , $I_B = 300\text{ mA}$ ) | $V_{CE(sat)}$ |    | 1.0 | V |
| Base-Emitter On Voltage<br>( $I_C = 0.5\text{ A}$ , $V_{CE} = 5.0\text{ V}$ )            | $V_{BE(on)}$  |    | 1.0 | V |

**DYNAMIC CHARACTERISTICS**

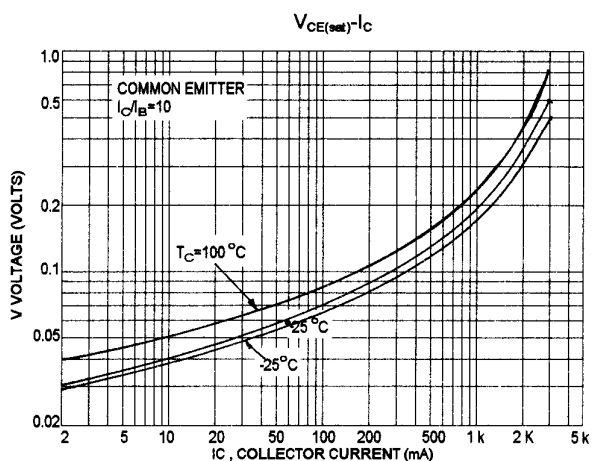
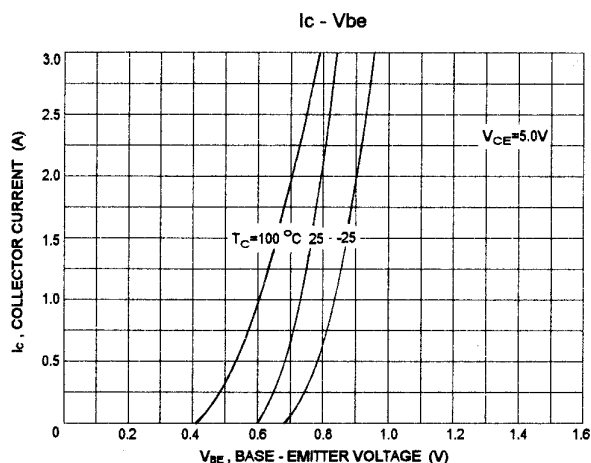
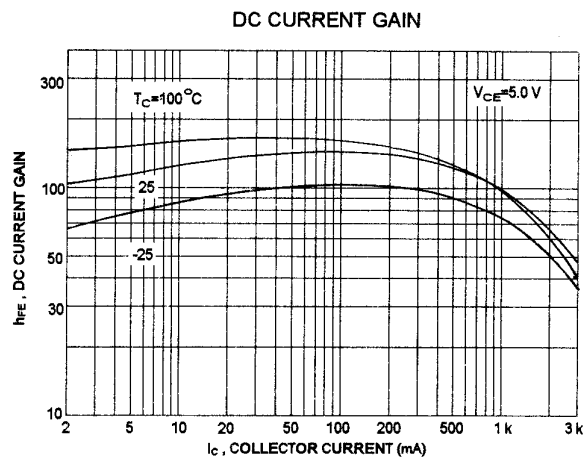
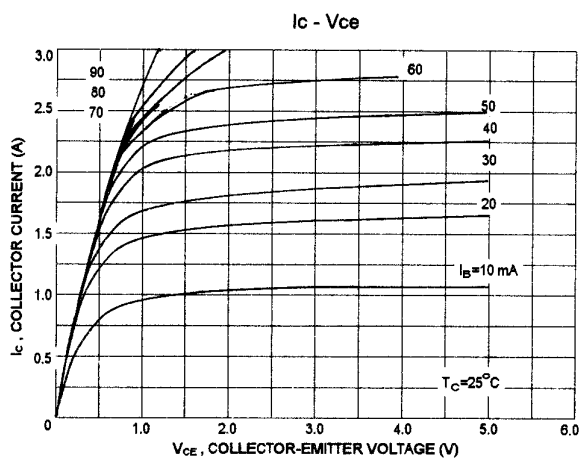
|   |       |          |  |     |
|---|-------|----------|--|-----|
| Current-Gain-Bandwidth Product<br>( $I_C = 0.5\text{ A}$ , $V_{CE} = 5.0\text{ V}$ , $f = 1.0\text{ MHz}$ ) | $f_T$ | 3.0(typ) |  | MHz |
|---|-------|----------|--|-----|

**SWITCHING CHARACTERISTICS**

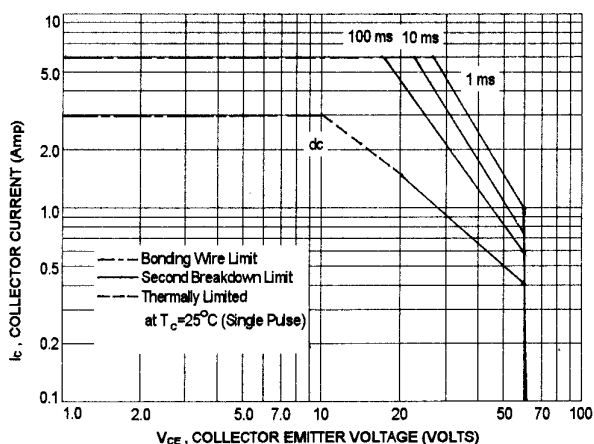
|              |   |          |     |               |
|--------------|---|----------|-----|---------------|
| Turn-on Time | $V_{CC} = 30\text{ V}$ , $I_C = 2.0\text{ A}$<br>$I_{B1} = -I_{B2} = 200\text{ mA}$<br>$PW = 20\text{ }\mu\text{s}$ | $t_{on}$ | 1.2 | $\mu\text{s}$ |
| Storage Time |   | $t_s$    | 2.0 | $\mu\text{s}$ |
| Fall Time    |   | $t_f$    | 1.1 | $\mu\text{s}$ |

(1) Pulse Test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ \*  $h_{FE(2)}$  Classification :

|    |   |     |     |   |     |     |    |     |
|----|---|-----|-----|---|-----|-----|----|-----|
| 60 | O | 120 | 100 | Y | 200 | 150 | GR | 300 |
|----|---|-----|-----|---|-----|-----|----|-----|



#### ACTIVE-REGION SAFE OPERATING AREA (SOA)



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 curves indicate.

The data of SOA curve 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 limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown.