

# Complementary Plastic Silicon Power Transistors

...designed for lower power audio amplifier and low current, high-speed switching applications.

- Low Collector-Emitter Sustaining Voltage —  
 $V_{CE(sus)}$  60 Vdc (Min) — BD787, BD788
- High Current-Gain — Bandwidth Product —  
 $f_T$  = 50 MHz (Min) @  $I_C$  = 100 mAdc
- Collector-Emitter Saturation Voltage Specified at 0.5, 1.0, 2.0 and 4.0 Adc

## MAXIMUM RATINGS

| Rating                                                                                | Symbol         | BD787<br>BD788 | Unit                         |
|---------------------------------------------------------------------------------------|----------------|----------------|------------------------------|
| Collector-Emitter Voltage                                                             | $V_{CEO}$      | 60             | Vdc                          |
| Collector-Base Voltage                                                                | $V_{CBO}$      | 80             | Vdc                          |
| Emitter-Base Voltage                                                                  | $V_{EBO}$      | 6.0            | Vdc                          |
| Collector Current — Continuous<br>— Peak                                              | $I_C$          | 4.0<br>8.0     | Adc                          |
| Base Current                                                                          | $I_B$          | 1.0            | Adc                          |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate Above $25^\circ\text{C}$ | $P_D$          | 15<br>0.12     | Watts<br>W/ $^\circ\text{C}$ |
| 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 Case | $R_{\theta JC}$ | 8.34 | $^\circ\text{C/W}$ |

**NPN**  
**BD787**  
**PNP**  
**BD788**

**4 AMPERE**  
**POWER TRANSISTORS**  
**COMPLEMENTARY**  
**SILICON**  
**60 VOLTS**  
**15 WATTS**

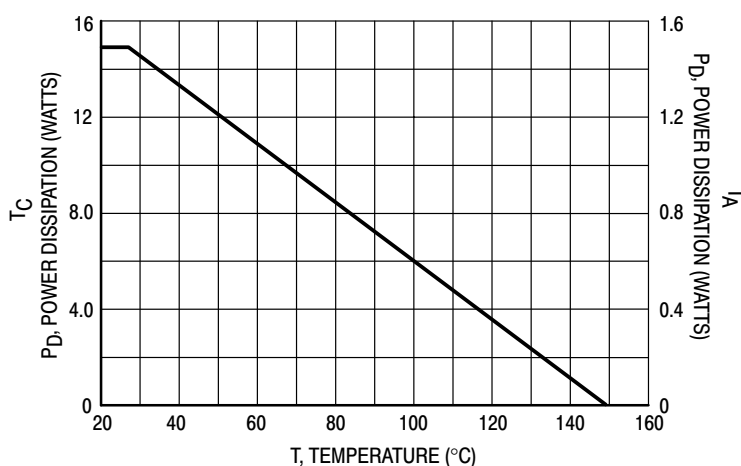
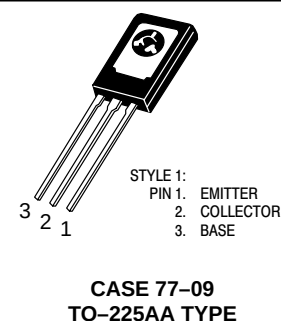


Figure 1. Power Derating

# BD787 BD788

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

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

## OFF CHARACTERISTICS

|                                                                                                                                                                                        |                |        |            |                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------|------------|-------------------------|
| Collector–Emitter Sustaining Voltage (1)<br>( $I_C = 10\text{ mAdc}$ , $I_B = 0$ )                                                                                                     | $V_{CEO(sus)}$ | 60     | —          | Vdc                     |
| Collector Cutoff Current<br>( $V_{CE} = 20\text{ Vdc}$ , $I_B = 0$ )<br>( $V_{CE} = 30\text{ Vdc}$ , $I_B = 0$ )                                                                       | $I_{CEO}$      | —      | 100        | $\mu\text{Adc}$         |
| Collector Cutoff Current<br>( $V_{CE} = 80\text{ Vdc}$ , $V_{BE(off)} = 1.5\text{ Vdc}$ )<br>( $V_{CE} = 40\text{ Vdc}$ , $V_{BE(off)} = 1.5\text{ Vdc}$ , $T_C = 125^\circ\text{C}$ ) | $I_{CEX}$      | —<br>— | 1.0<br>0.1 | $\mu\text{Adc}$<br>mAdc |
| Emitter Cutoff Current<br>( $V_{EB} = 6.0\text{ Vdc}$ , $I_C = 0$ )                                                                                                                    | $I_{EBO}$      | —      | 1.0        | $\mu\text{Adc}$         |

## ON CHARACTERISTICS(1)

|                                                                                                                                                                                                                                                                      |               |                       |                          |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|--------------------------|-----|
| DC Current Gain<br>( $I_C = 200\text{ mAdc}$ , $V_{CE} = 3.0\text{ Vdc}$ )<br>( $I_C = 1.0\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ )<br>( $I_C = 2.0\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ )<br>( $I_C = 4.0\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ )             | $h_{FE}$      | 40<br>25<br>20<br>5.0 | 250<br>—<br>—<br>—       | —   |
| Collector–Emitter Saturation Voltage<br>( $I_C = 500\text{ mAdc}$ , $I_B = 50\text{ mAdc}$ )<br>( $I_C = 1.0\text{ Adc}$ , $I_B = 100\text{ mAdc}$ )<br>( $I_C = 2.0\text{ Adc}$ , $I_B = 200\text{ mAdc}$ )<br>( $I_C = 4.0\text{ Adc}$ , $I_B = 800\text{ mAdc}$ ) | $V_{CE(sat)}$ | —<br>—<br>—<br>—      | 0.4<br>0.6<br>0.8<br>2.5 | Vdc |
| Base–Emitter Saturation Voltage<br>( $I_C = 2.0\text{ Adc}$ , $I_B = 200\text{ mAdc}$ )                                                                                                                                                                              | $V_{BE(sat)}$ | —                     | 2.0                      | Vdc |
| Base–Emitter On Voltage<br>( $I_C = 2.0\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ )                                                                                                                                                                                    | $V_{BE(on)}$  | —                     | 1.8                      | Vdc |

## DYNAMIC CHARACTERISTICS

|                                                                                                                  |          |        |          |     |
|------------------------------------------------------------------------------------------------------------------|----------|--------|----------|-----|
| Current–Gain — Bandwidth Product<br>( $I_C = 100\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 10\text{ MHz}$ ) | $f_T$    | 50     | —        | MHz |
| Output Capacitance<br>( $V_{CB} = 10\text{ Vdc}$ , $I_C = 0$ )<br>( $f = 0.1\text{ MHz}$ )                       | $C_{ob}$ | —<br>— | 50<br>70 | pF  |
| Small–Signal Current Gain<br>( $I_C = 200\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )       | $h_{fe}$ | 10     | —        | —   |

\*Indicates JEDEC Registered Data

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

## BD787 BD788

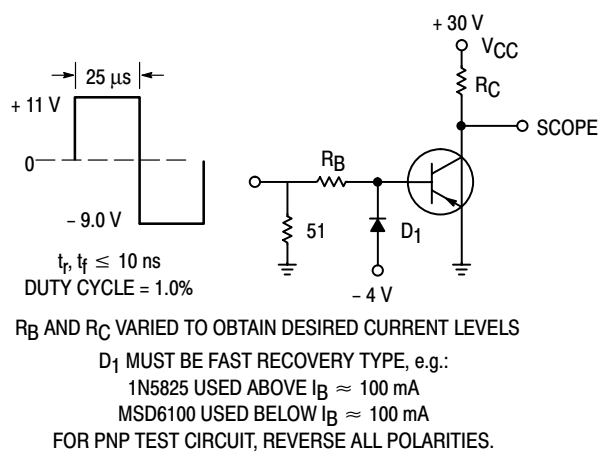


Figure 2. Switching Time Test Circuit

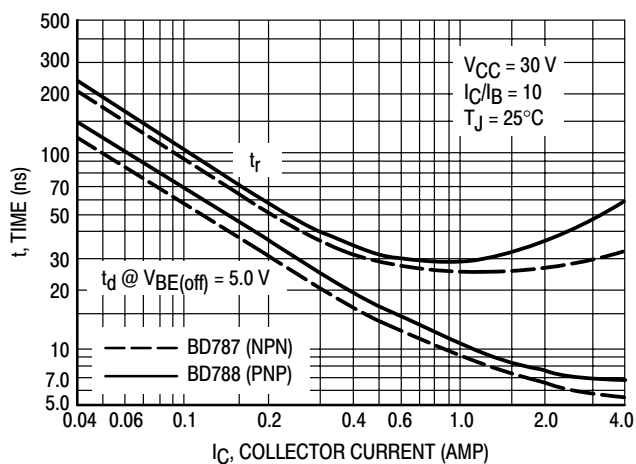


Figure 3. Turn-On Time

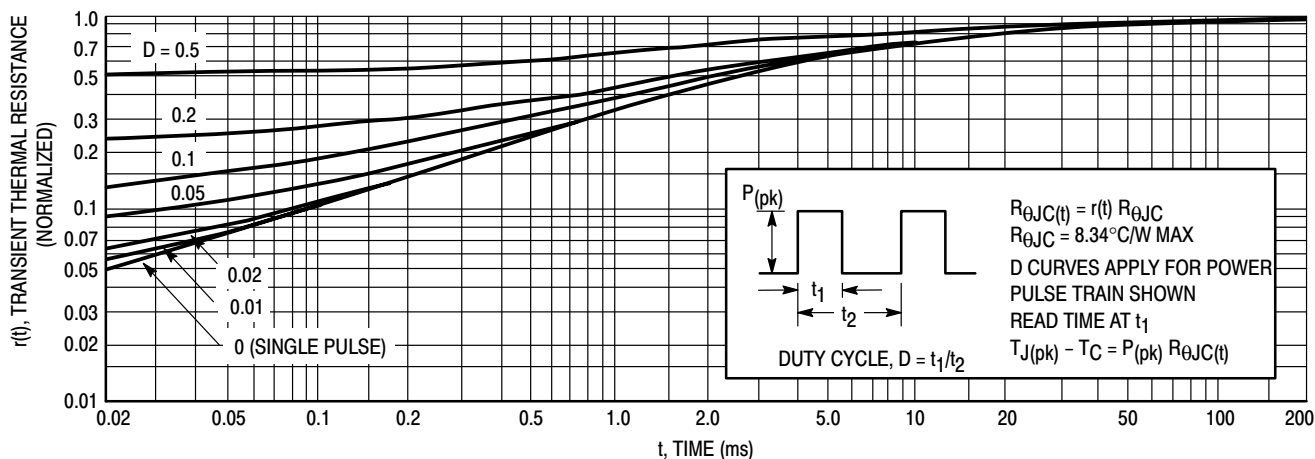


Figure 4. Thermal Response

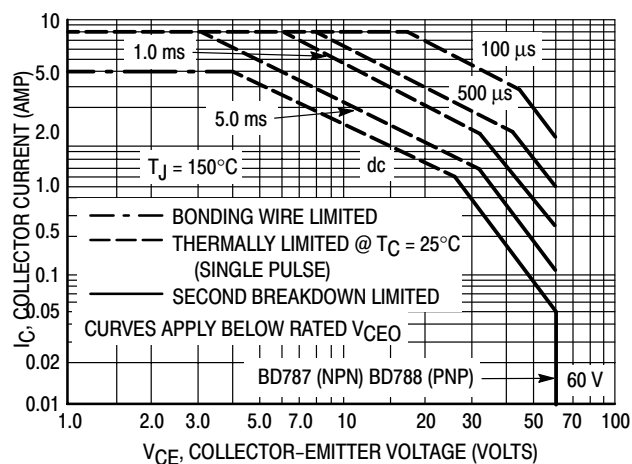


Figure 5. Active Region Safe Operating Area

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable 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  $T_{J(pk)} \leq 150^\circ\text{C}$ ,  $T_{J(pk)}$  may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

# BD787 BD788

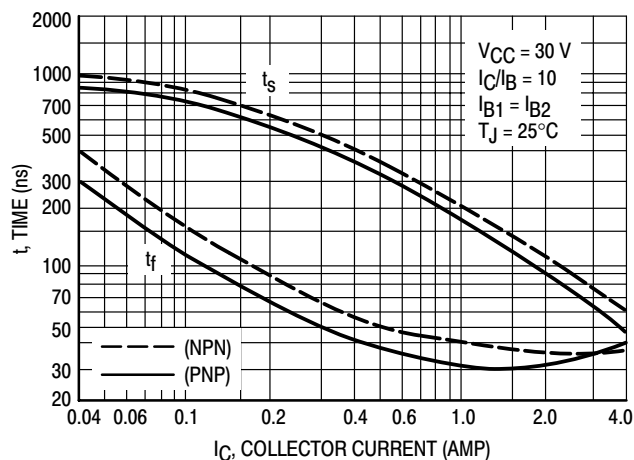


Figure 6. Turn-Off Time

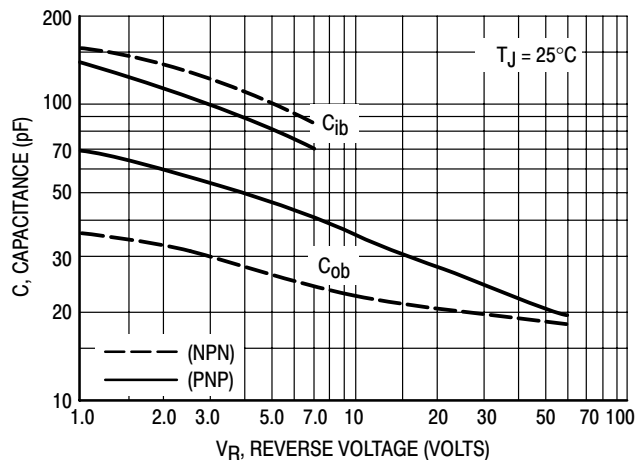


Figure 7. Capacitance

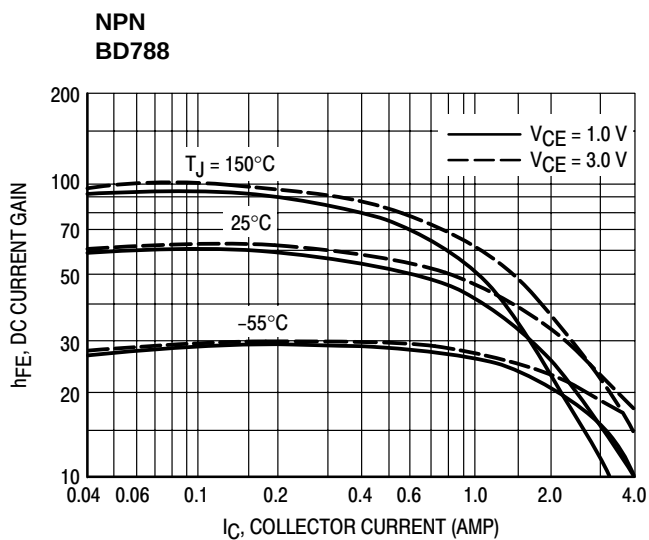
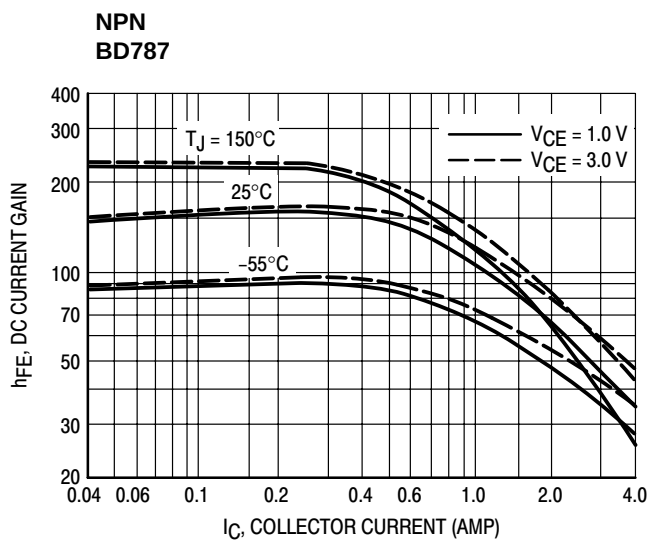


Figure 8. DC Current Gain

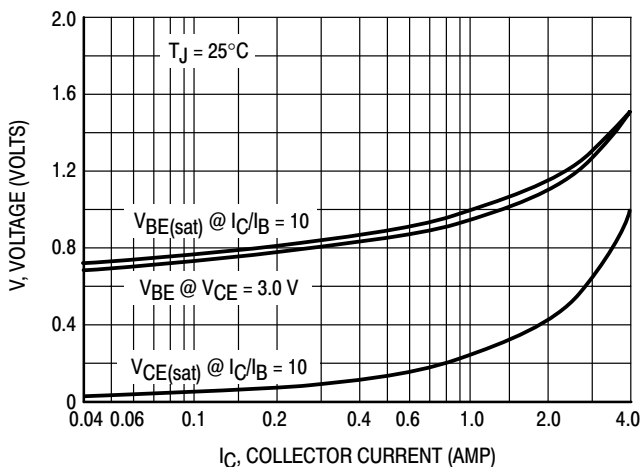
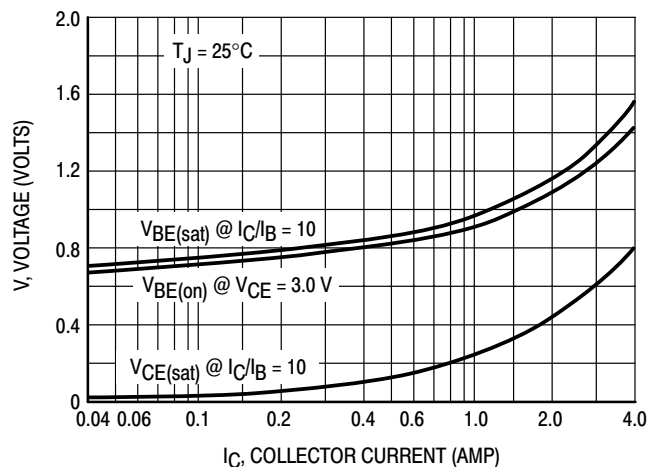


Figure 9. "On" Voltages

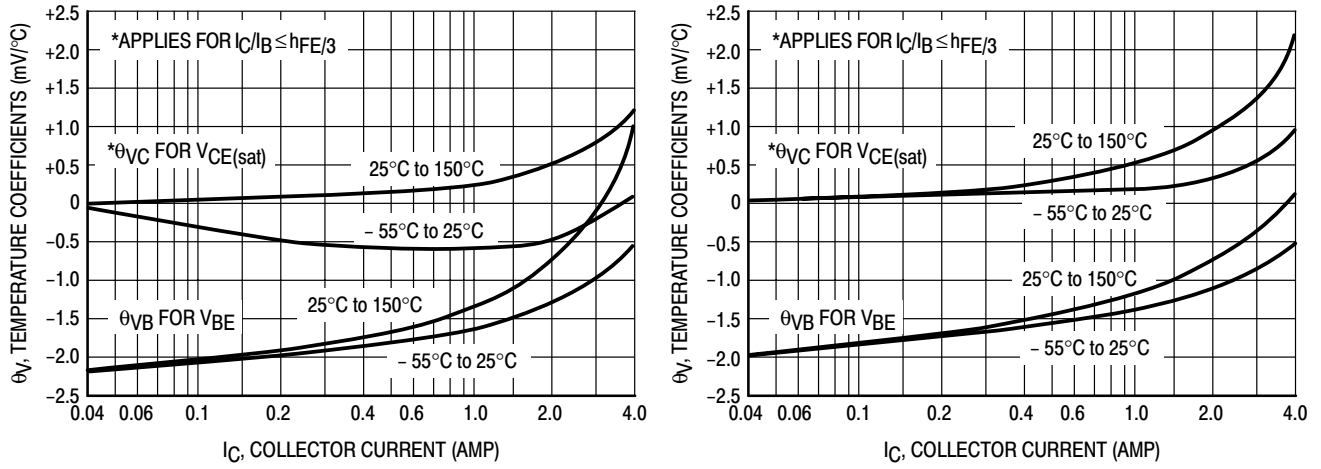
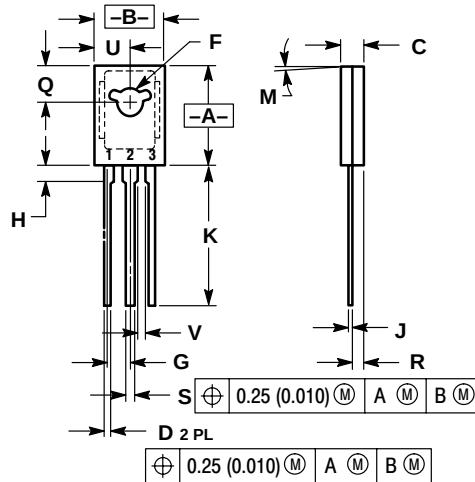


Figure 10. Temperature Coefficients

# BD787 BD788

## PACKAGE DIMENSIONS

TO-225AA  
CASE 77-09  
ISSUE W



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.425     | 0.435 | 10.80       | 11.04 |
| B   | 0.295     | 0.305 | 7.50        | 7.74  |
| C   | 0.095     | 0.105 | 2.42        | 2.66  |
| D   | 0.020     | 0.026 | 0.51        | 0.66  |
| F   | 0.115     | 0.130 | 2.93        | 3.30  |
| G   | 0.094 BSC |       | 2.39 BSC    |       |
| H   | 0.050     | 0.095 | 1.27        | 2.41  |
| J   | 0.015     | 0.025 | 0.39        | 0.63  |
| K   | 0.575     | 0.655 | 14.61       | 16.63 |
| M   | 5° TYP    |       | 5° TYP      |       |
| Q   | 0.148     | 0.158 | 3.76        | 4.01  |
| R   | 0.045     | 0.065 | 1.15        | 1.65  |
| S   | 0.025     | 0.035 | 0.64        | 0.88  |
| U   | 0.145     | 0.155 | 3.69        | 3.93  |
| V   | 0.040     | ---   | 1.02        | ---   |

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

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