

# Complementary Plastic Silicon Power Transistors

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

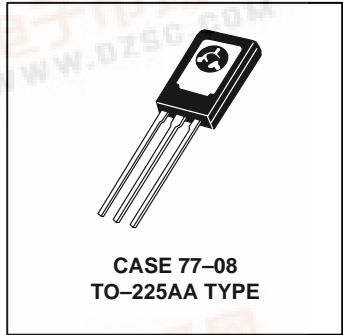
- Low Collector-Emitter Sustaining Voltage —  $V_{CEO(sus)}$  60 Vdc (Min) — BD787, BD788
- High Current-Gain — Bandwidth Product —  $f_T = 50$  MHz (Min) @  $I_C = 100$  mAdc
- Collector-Emitter Saturation Voltage Specified at 0.5, 1.0, 2.0 and 4.0 Adc

**NPN  
 BD787  
 PNP  
 BD788**

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

## MAXIMUM RATINGS

Rating	Symbol	BD787 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	$I_C$	4.0	Adc
— Peak		8.0	Adc
Base Current	$I_B$	1.0	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate Above $25^\circ\text{C}$	$P_D$	15	Watts
		0.12	W/ $^\circ\text{C}$
Operating and Storage Junction 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	$^\circ\text{C}/\text{W}$

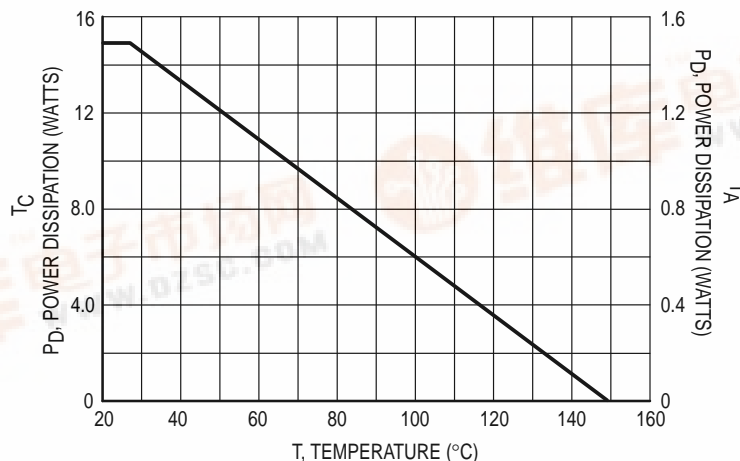


Figure 1. Power Derating



## BD787 BD788

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

### ON CHARACTERISTICS(1)

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

### DYNAMIC CHARACTERISTICS

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

\* Indicates JEDEC Registered Data

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

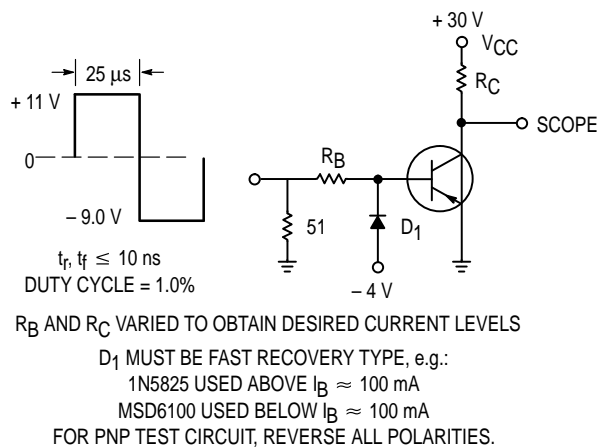


Figure 2. Switching Time Test Circuit

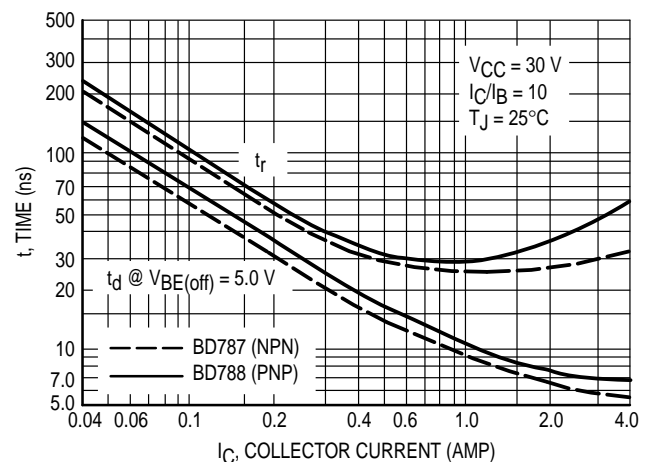


Figure 3. Turn–On Time

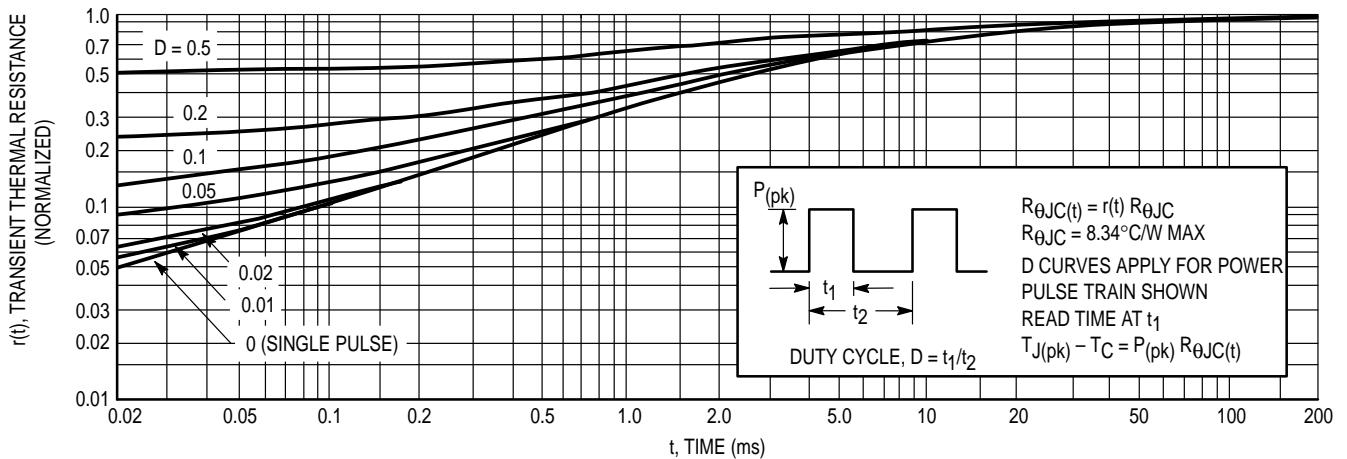


Figure 4. Thermal Response

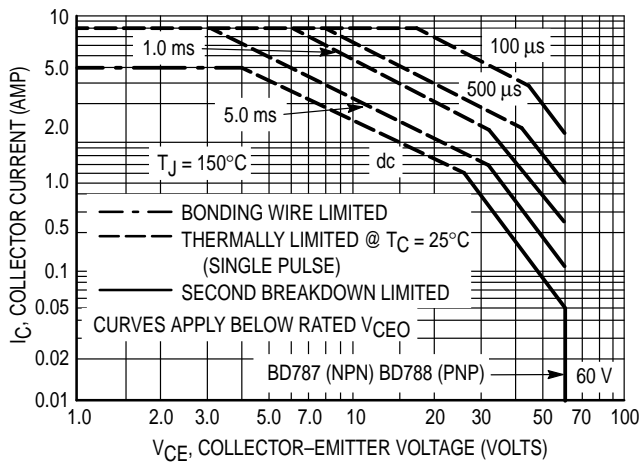


Figure 5. Active Region Safe Operating Area

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.

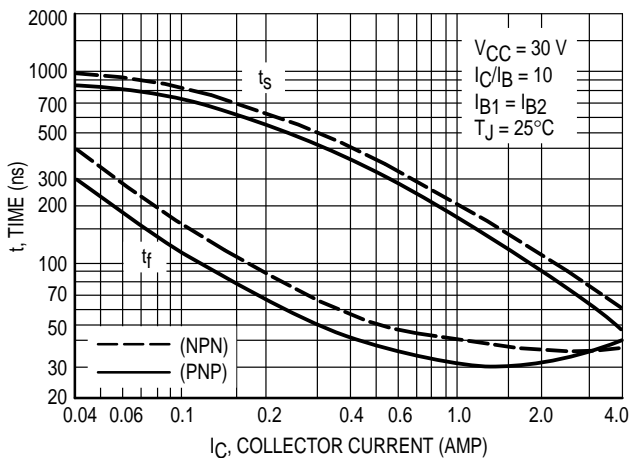


Figure 6. Turn-Off Time

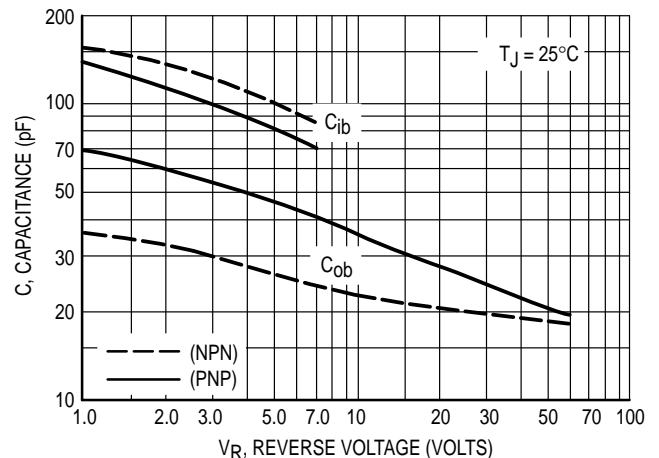
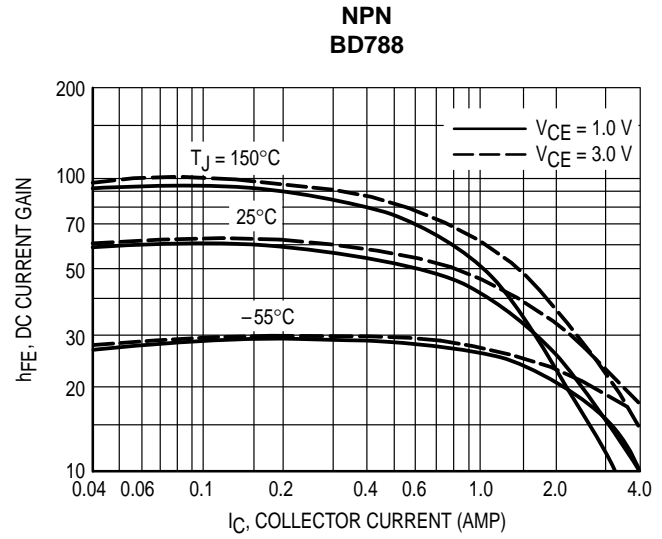
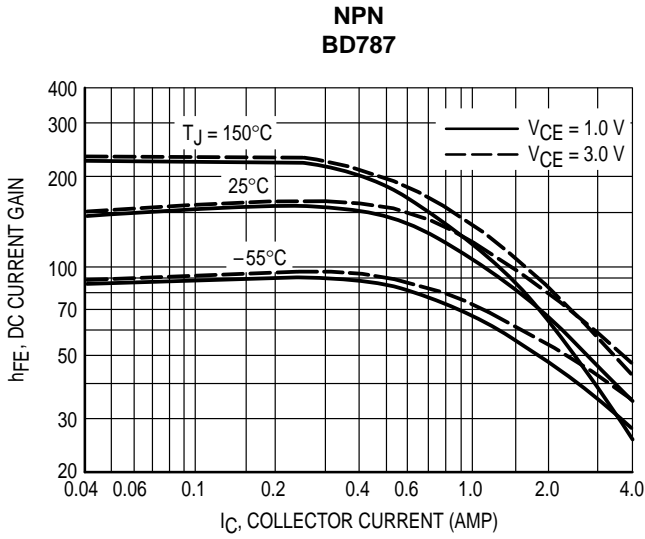
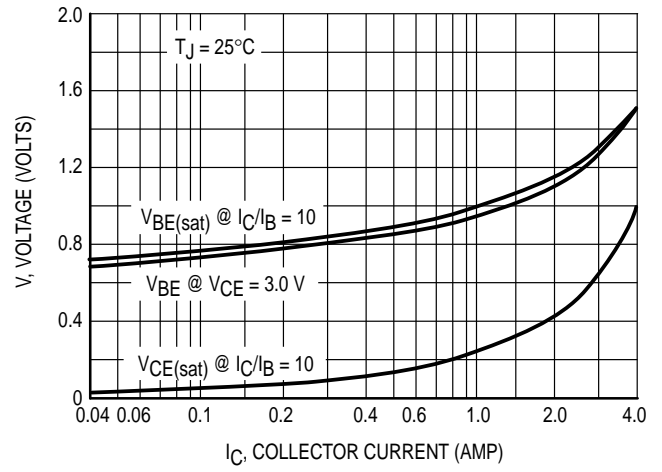
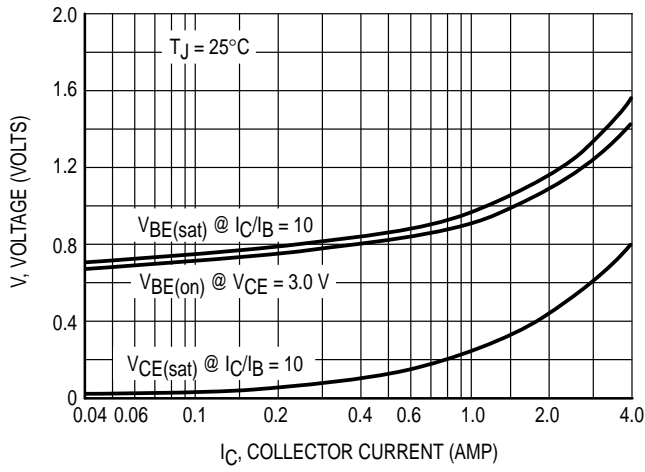


Figure 7. Capacitance

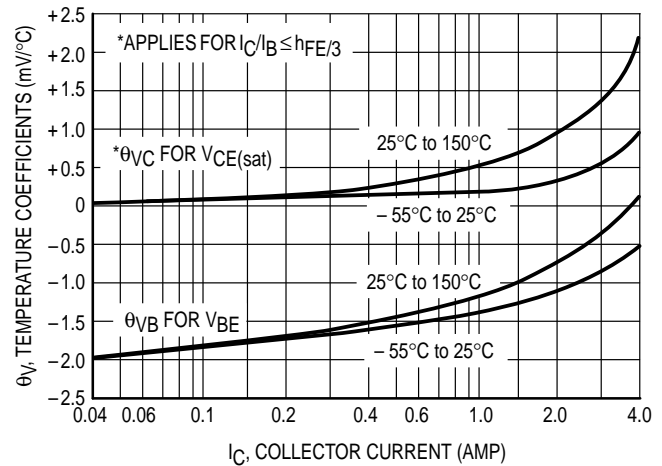
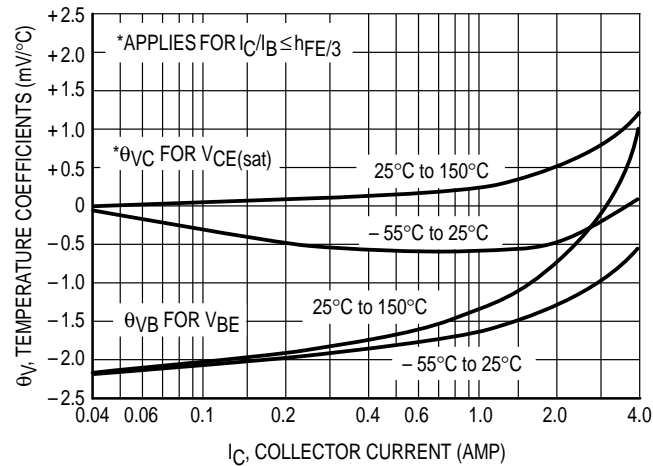
**BD787 BD788**



**Figure 8. DC Current Gain**

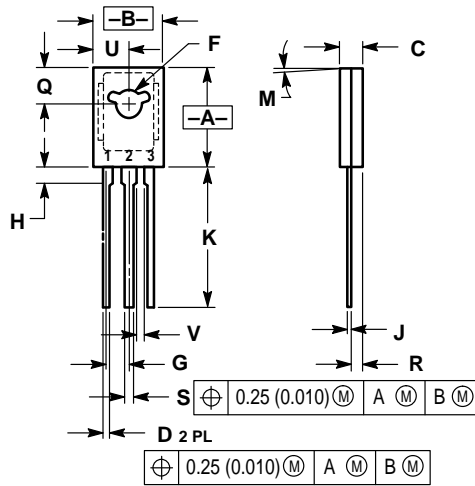


**Figure 9. "On" Voltages**



**Figure 10. Temperature Coefficients**

**PACKAGE DIMENSIONS**




- 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	0.055	1.15	1.39
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

**CASE 77-08  
 TO-225AA TYPE  
 ISSUE V**

## BD787 BD788

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