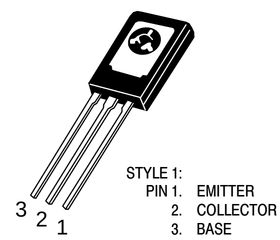
Complementary Plastic Silicon Power Transistors

NPN
BD787
PNP
BD788

. . . 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

4 AMPERE
POWER TRANSISTORS
COMPLEMENTARY
SILICON
60 VOLTS
15 WATTS



CASE 77–09
TO–225AA TYPE

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 — Peak	I_C	4.0 8.0	Adc Adc
Base Current	I_B	1.0	Adc
Total Power Dissipation @ T_C = 25°C Derate Above 25°C	P_D	15 0.12	Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	8.34	°C/W

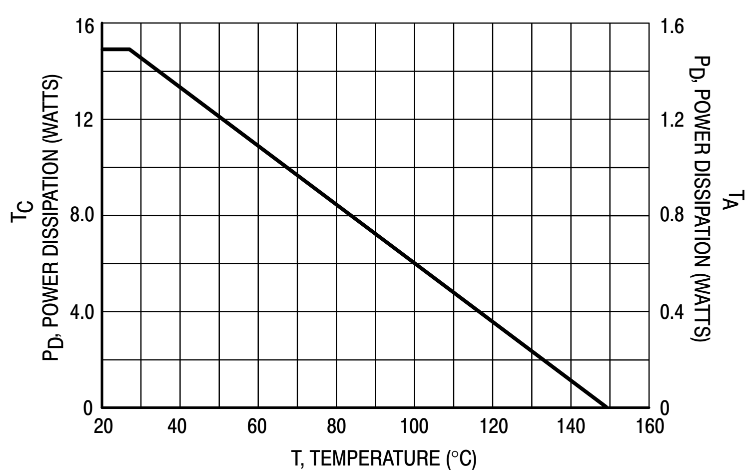


Figure 1. Power Derating

***ELECTRICAL CHARACTERISTICS** (T_C = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Sustaining Voltage (1) (I_C = 10 mAdc, I_B = 0)		$V_{CEO(sus)}$	60	—	Vdc
Collector Cutoff Current (V_{CE} = 20 Vdc, I_B = 0) (V_{CE} = 30 Vdc, I_B = 0)		I_{CEO}	—	100	μAdc
Collector Cutoff Current (V_{CE} = 80 Vdc, $V_{BE(off)}$ = 1.5 Vdc) (V_{CE} = 40 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 125°C)		I_{CEX}	 — —	 1.0 0.1	 μAdc mAdc
Emitter Cutoff Current (V_{EB} = 6.0 Vdc, I_C = 0)		I_{EBO}	—	1.0	μAdc
ON CHARACTERISTICS(1)					
DC Current Gain (I_C = 200 mAdc, V_{CE} = 3.0 Vdc) (I_C = 1.0 Adc, V_{CE} = 3.0 Vdc) (I_C = 2.0 Adc, V_{CE} = 3.0 Vdc) (I_C = 4.0 Adc, V_{CE} = 3.0 Vdc)		h_{FE}	 40 25 20 5.0	 250 — — —	—
Collector–Emitter Saturation Voltage (I_C = 500 mAdc, I_B = 50 mAdc) (I_C = 1.0 Adc, I_B = 100 mAdc) (I_C = 2.0 Adc, I_B = 200 mAdc) (I_C = 4.0 Adc, I_B = 800 mAdc)		$V_{CE(sat)}$	 — — — —	 0.4 0.6 0.8 2.5	Vdc
Base–Emitter Saturation Voltage (I_C = 2.0 Adc, I_B = 200 mAdc)		$V_{BE(sat)}$	—	2.0	Vdc
Base–Emitter On Voltage (I_C = 2.0 Adc, V_{CE} = 3.0 Vdc)		$V_{BE(on)}$	—	1.8	Vdc
DYNAMIC CHARACTERISTICS					
Current–Gain — Bandwidth Product (I_C = 100 mAdc, V_{CE} = 10 Vdc, f = 10 MHz)		f_T	50	—	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_C = 0) (f = 0.1 MHz)	 BD787 BD788	C_{ob}	 — —	 50 70	pF
Small–Signal Current Gain (I_C = 200 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)		h_{fe}	10	—	—

*Indicates JEDEC Registered Data
(1) Pulse Test; Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

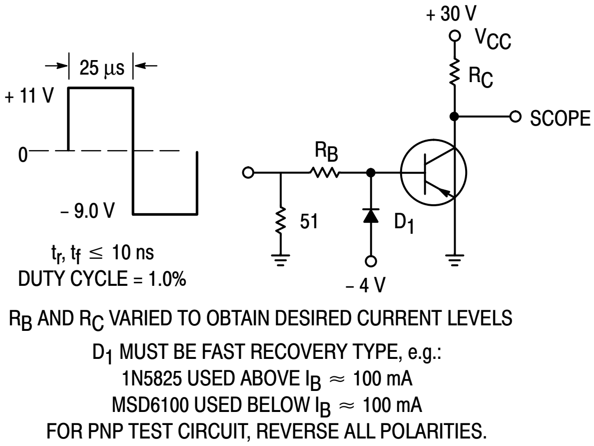


Figure 2. Switching Time Test Circuit

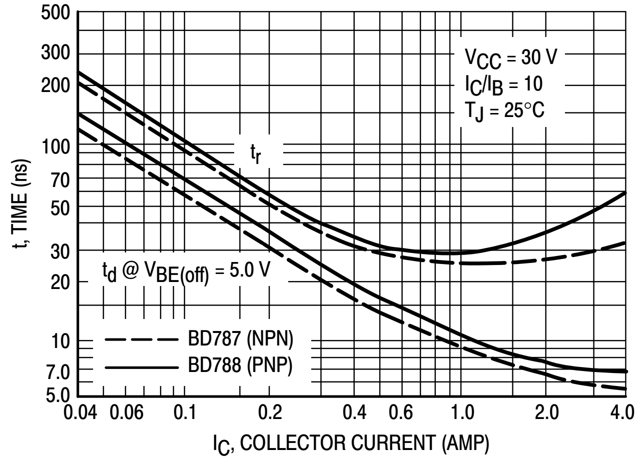


Figure 3. Turn–On Time

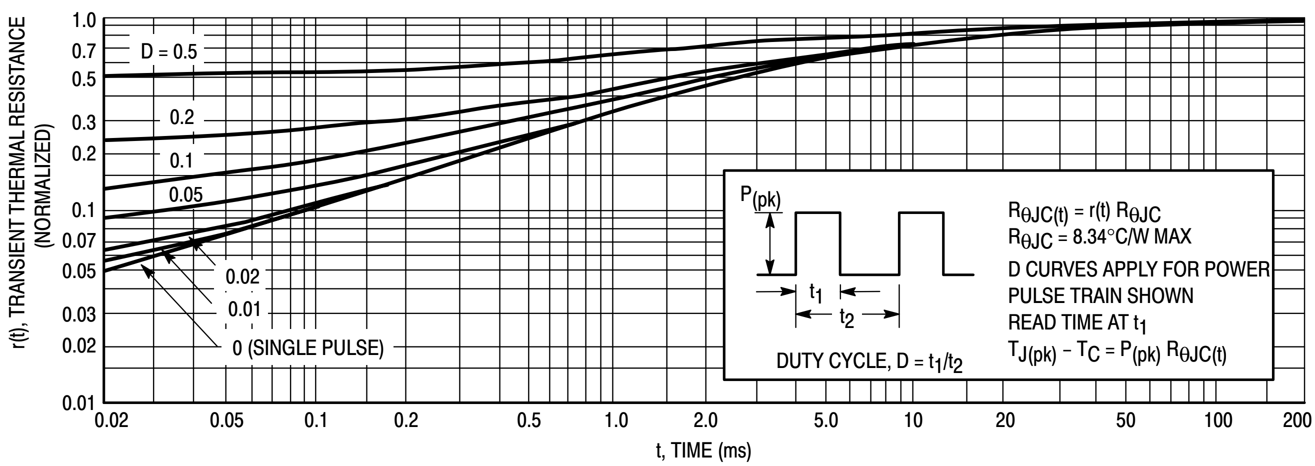


Figure 4. Thermal Response

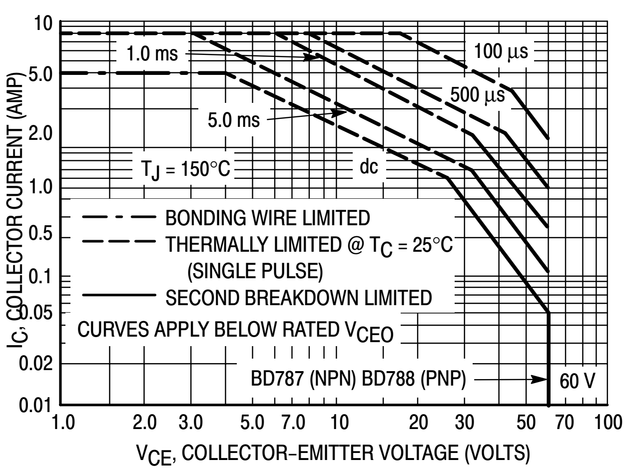


Figure 5. Active Region Safe Operating Area

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°C: T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \le$ 150°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.

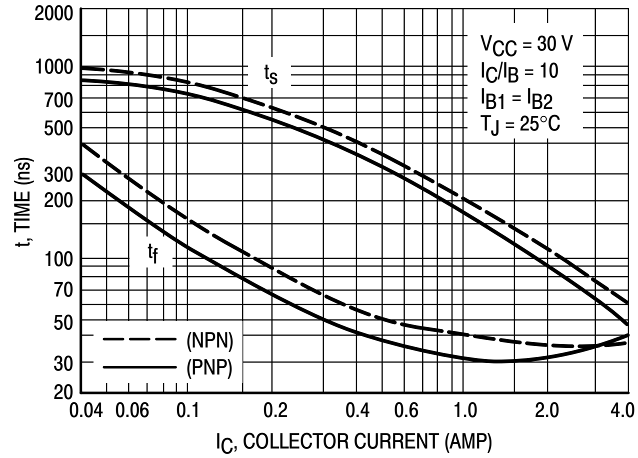


Figure 6. Turn–Off Time

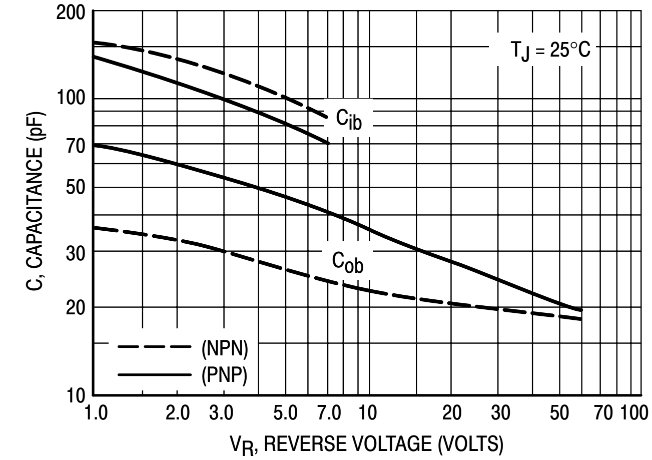


Figure 7. Capacitance

NPN
BD787

NPN
BD788

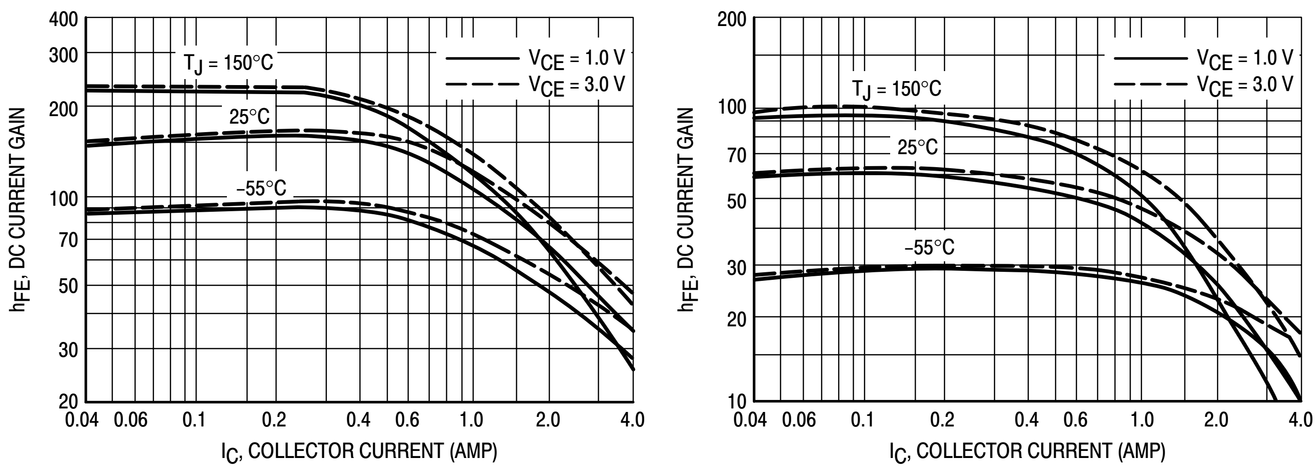


Figure 8. DC Current Gain

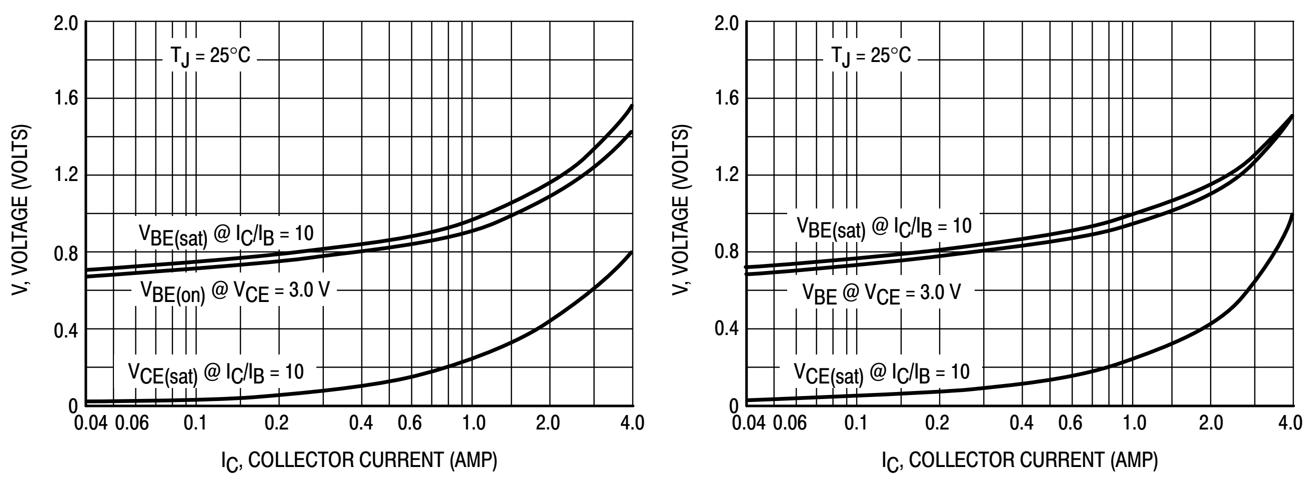
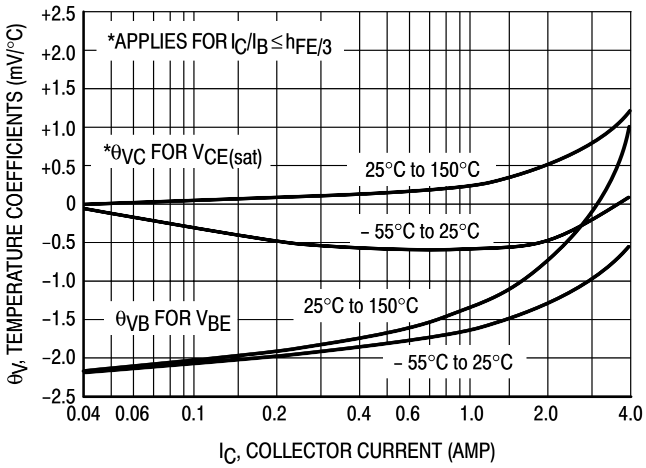


Figure 9. “On” Voltages



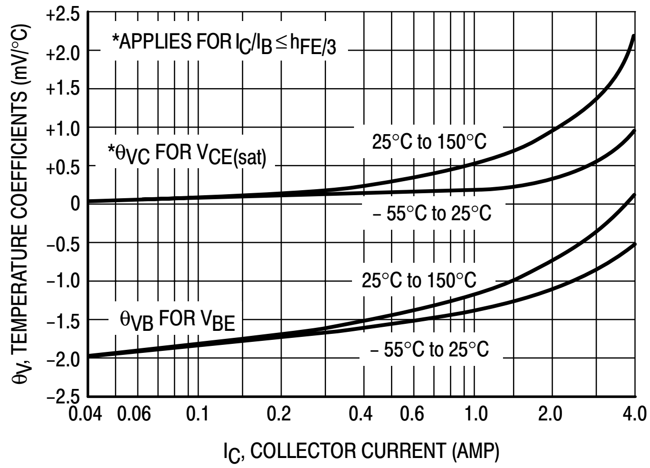
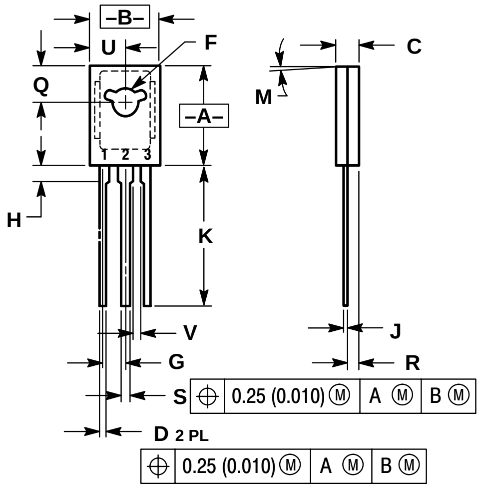


Figure 10. Temperature Coefficients

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 MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS 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

Notes

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