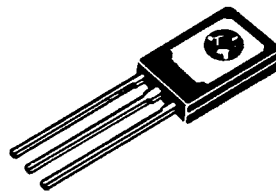


MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA
NPN
BD785, BD787
PNP
BD786, BD788
COMPLEMENTARY PLASTIC SILICON ANNULAR
POWER TRANSISTORS

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

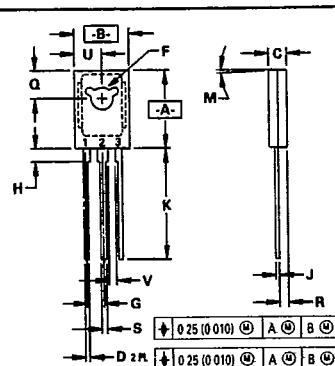
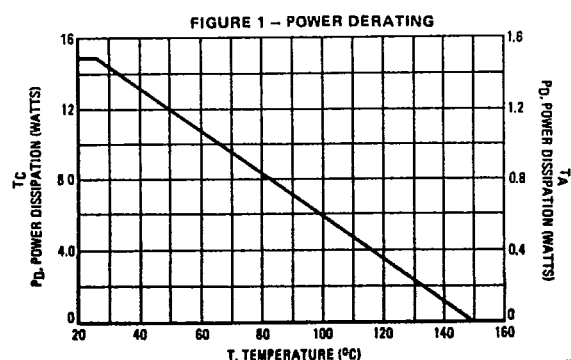
- Low Collector-Emitter Sustaining Voltage –
 V_{CEO} (sus) 45 Vdc (Min) – BD785, BD786
 60 Vdc (Min) – BD787, BD788
- High Current-Gain – Bandwidth Product –
 $f_T = 50$ MHz (Min) @ $I_C = 100$ mAdc
- DC Current Gain Specified at 0.2, 1.0, 2.0 and 4.0 Adc
- Collector-Emitter Saturation Voltage Specified at 0.5, 1.0, 2.0 and 4.0 Adc

4 AMPERE
POWER TRANSISTORS
COMPLEMENTARY SILICON
45, 60VOLTS
15 WATTS

***MAXIMUM RATINGS**

Rating	Symbol	BD785 BD786	BD787 BD788	Unit
Collector-Emitter Voltage	V_{CEO}	45	60	Vdc
Collector-Base Voltage	V_{CBO}	60	80	Vdc
Emitter-Base Voltage	V_{EBO}	6.0		Vdc
Collector Current – Continuous – Peak	I_C	4.0	Adc	Adc
		8.0	Adc	
Base Current	I_B	1.0	Adc	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate Above 25°C	P_D	15	0.12	Watts 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	$^\circ\text{C/W}$


NOTES:

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

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.80	11.04	0.425	0.433
B	7.50	7.74	0.295	0.305
C	2.42	2.66	0.095	0.105
D	0.51	0.66	0.020	0.026
F	2.93	3.17	0.115	0.125
G	2.39 BSC		0.094 BSC	
H	1.27	2.41	0.050	0.095
J	0.39	0.63	0.015	0.025
K	14.61	16.63	0.575	0.655
M	3° TYP		3° TYP	
Q	3.76	4.01	0.148	0.158
R	1.15	1.39	0.045	0.055
S	0.64	0.88	0.025	0.035
U	3.69	3.93	0.145	0.155
V	1.02	—	0.040	—

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

CASE 77-06
 TO-225AA TYPE

BD785, BD787 NPN
BD786, BD788 PNP

T-33-07
T-33-17

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Sustaining Voltage (1) ($I_C = 10\text{ mA}$, $I_B = 0$)	$V_{CE(sus)}$	45 60	— —	Vdc
Collector Cutoff Current ($V_{CE} = 20\text{ Vdc}$, $I_B = 0$)	I_{CEO}	—	100	μA
Collector Cutoff Current ($V_{CE} = 30\text{ Vdc}$, $I_B = 0$)		—	100	
Collector Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$)	I_{CEX}	—	1.0	μA
($V_{CE} = 80\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$)		—	1.0	
($V_{CE} = 30\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$, $T_C = 125^\circ\text{C}$)		—	0.1	mA
($V_{CE} = 40\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$, $T_C = 125^\circ\text{C}$)		—	0.1	
Emitter Cutoff Current ($V_{EB} = 6.0\text{ Vdc}$, $I_C = 0$)	I_{EBO}	—	1.0	μA
ON CHARACTERISTICS (1)				
DC Current Gain ($I_C = 200\text{ mA}$, $V_{CE} = 3.0\text{ Vdc}$)	h_{FE}	40	250	—
($I_C = 1.0\text{ A}$, $V_{CE} = 3.0\text{ Vdc}$)		25	—	
($I_C = 2.0\text{ A}$, $V_{CE} = 3.0\text{ Vdc}$)		20	—	
($I_C = 4.0\text{ A}$, $V_{CE} = 3.0\text{ Vdc}$)		5.0	—	
Collector-Emitter Saturation Voltage ($I_C = 500\text{ mA}$, $I_B = 50\text{ mA}$)	$V_{CE(sat)}$	—	0.4	Vdc
($I_C = 1.0\text{ A}$, $I_B = 100\text{ mA}$)		—	0.6	
($I_C = 2.0\text{ A}$, $I_B = 200\text{ mA}$)		—	0.8	
($I_C = 4.0\text{ A}$, $I_B = 800\text{ mA}$)		—	2.5	
Base-Emitter Saturation Voltage ($I_C = 2.0\text{ A}$, $I_B = 200\text{ mA}$)	$V_{BE(sat)}$	—	2.0	Vdc
Base-Emitter on Voltage ($I_C = 2.0\text{ A}$, $V_{CE} = 3.0\text{ Vdc}$)	$V_{BE(on)}$	—	1.8	Vdc
DYNAMIC CHARACTERISTICS				
Current-Gain – Bandwidth Product ($I_C = 100\text{ mA}$, $V_{CE} = 10\text{ Vdc}$, $f = 10\text{ MHz}$)	f_T	50	—	MHz
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_C = 0$)	C_{ob}	—	50	pF
($f = 0.1\text{ MHz}$)		—	70	
Small-Signal Current Gain ($I_C = 200\text{ mA}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$)	h_{fe}	10	—	—

*Indicates JEDEC Registered Data.

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

FIGURE 2 – SWITCHING TIME TEST CIRCUIT

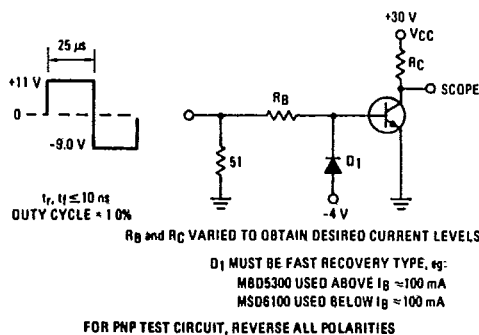
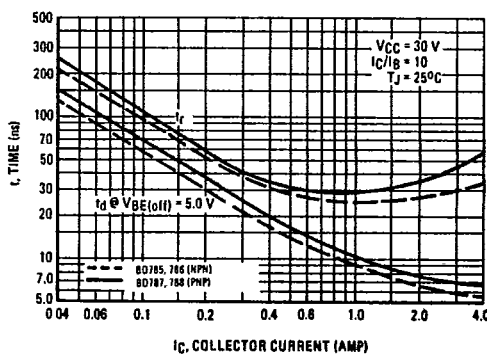


FIGURE 3 – TURN-ON TIME



BD785, BD787 NPN
BD786, BD788 PNP

T-33-07

T-33-17

FIGURE 4 - THERMAL RESPONSE

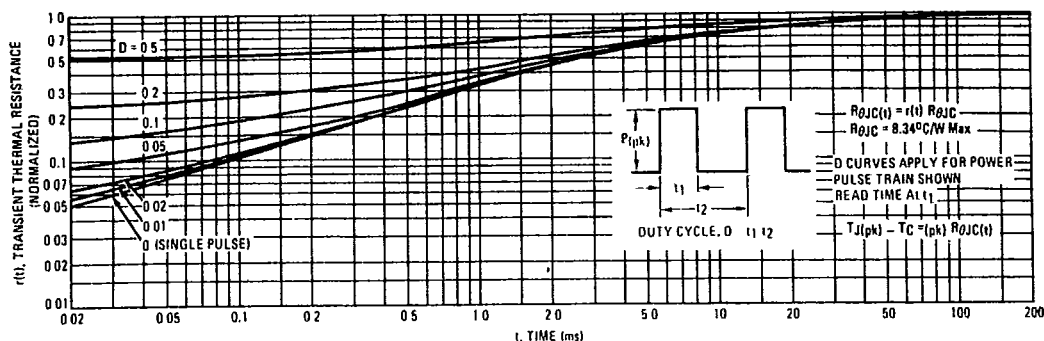
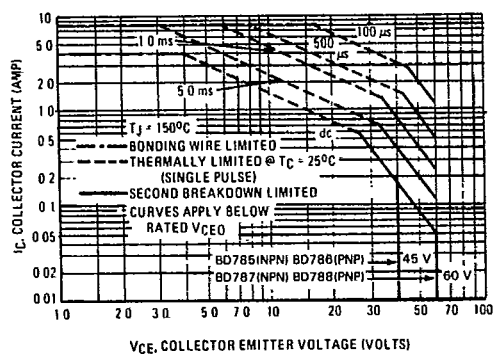


FIGURE 5 - ACTIVE-REGION SAFE OPERATING AREA



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 (See AN 415A).

FIGURE 6 - TURN-OFF TIME

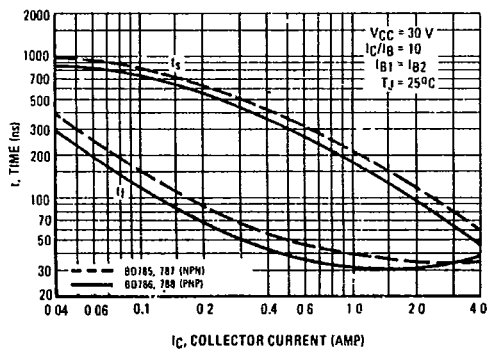
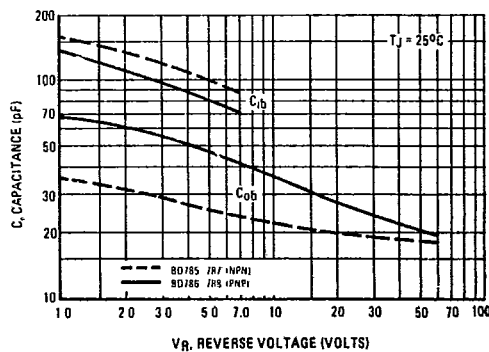


FIGURE 7 - CAPACITANCE



BD785, BD787 NPN
BD786, BD788 PNP

T-33-07
T-33-17

NPN
BD785, BD787

PNP
BD786, BD788

FIGURE 8 - DC CURRENT GAIN

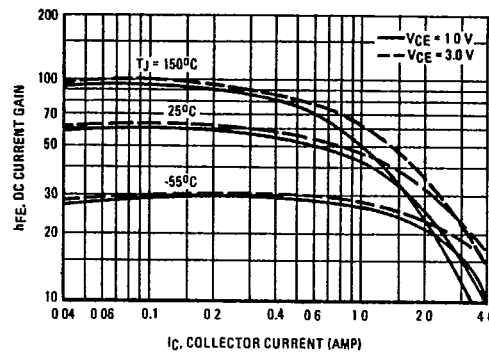
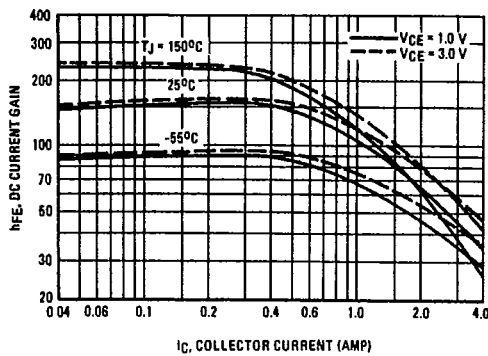
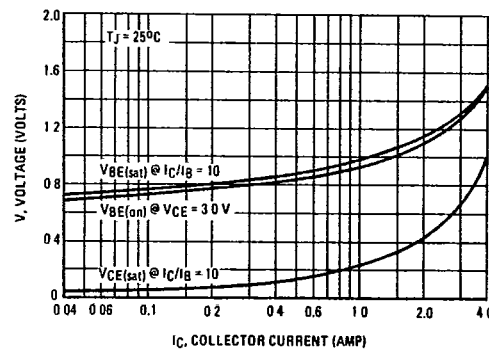
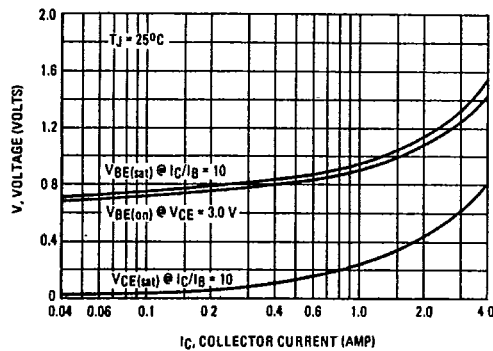


FIGURE 9 - "ON" VOLTAGES



3

FIGURE 10 - TEMPERATURE COEFFICIENTS

