

BD787 (NPN), BD788 (PNP)

Complementary Plastic Silicon Power Transistors

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

Features

- Low Collector-Emitter Sustaining Voltage
- High Current-Gain – Bandwidth Product
- These Devices are Pb-Free and are RoHS Compliant*

MAXIMUM RATINGS

Rating	Symbol	Value	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
Collector Current – Peak	I_{CM}	8.0	Adc
Base Current – Continuous	I_B	1.0	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	15 0.12	W mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +150	$^\circ\text{C}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

THERMAL CHARACTERISTICS

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

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

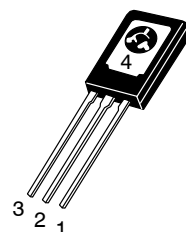
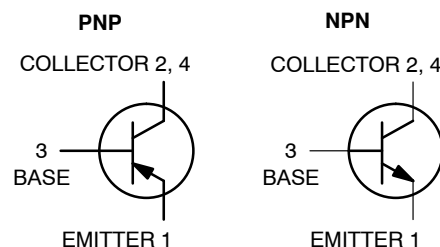


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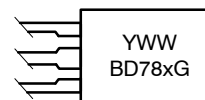
4 AMPERES POWER TRANSISTORS COMPLEMENTARY SILICON 60 VOLTS, 15 WATTS

SCHEMATIC



TO-225
CASE 77
STYLE 1

MARKING DIAGRAM



Y = Year
WW = Work Week
BD78x = Device Code
x = 7 or 8
G = Pb-Free Package

ORDERING INFORMATION

Device	Package	Shipping
BD787G	TO-225 (Pb-Free)	500 Units/Box
BD788G	TO-225 (Pb-Free)	500 Units/Box

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Sustaining Voltage (Note 1) ($I_C = 10\text{ mAdc}$, $I_B = 0$)	$V_{CE(sus)}$	60	–	Vdc
Collector Cutoff Current ($V_{CE} = 20\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 30\text{ Vdc}$, $I_B = 0$)	I_{CEO}	–	100	μAdc
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	μAdc mAdc
Emitter Cutoff Current ($V_{EB} = 6.0\text{ Vdc}$, $I_C = 0$)	I_{EBO}	–	1.0	μAdc
ON CHARACTERISTICS (Note 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 $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$.

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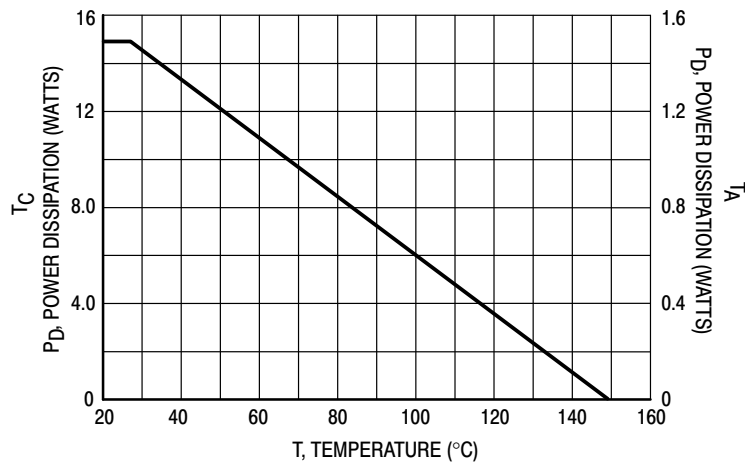


Figure 1. Power Derating

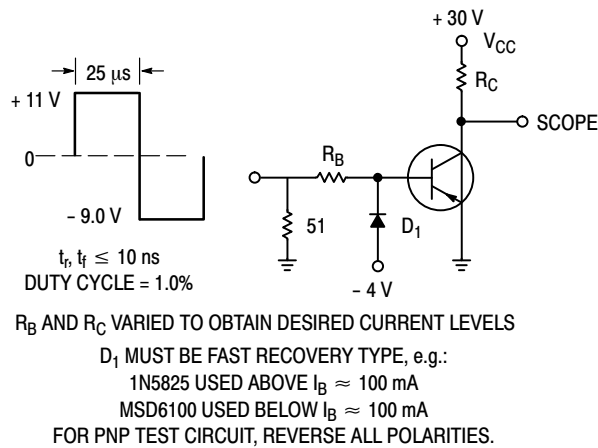


Figure 2. Switching Time Test Circuit

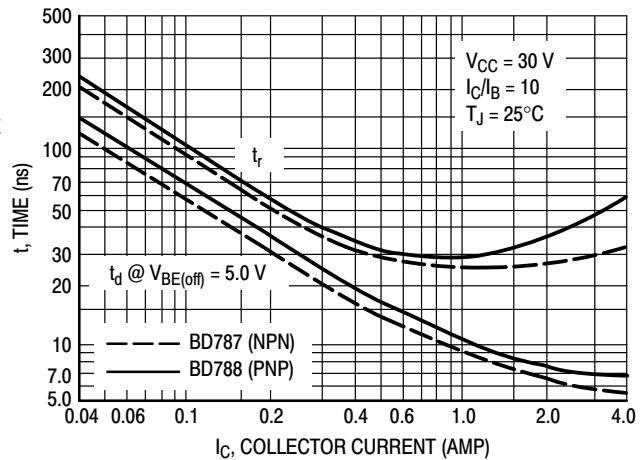


Figure 3. Turn-On Time

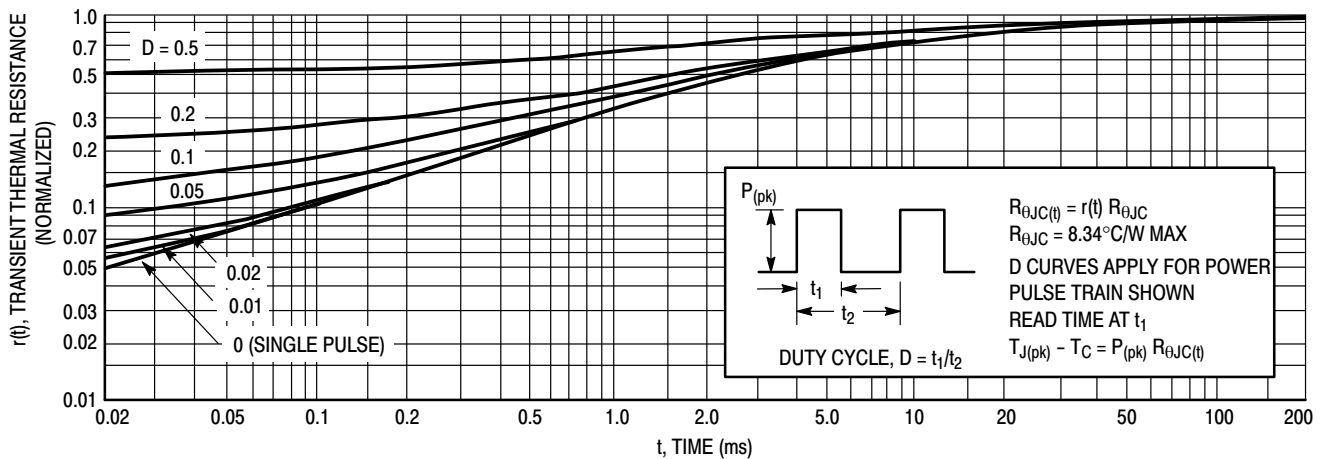


Figure 4. Thermal Response

BD787 (NPN), BD788 (PNP)

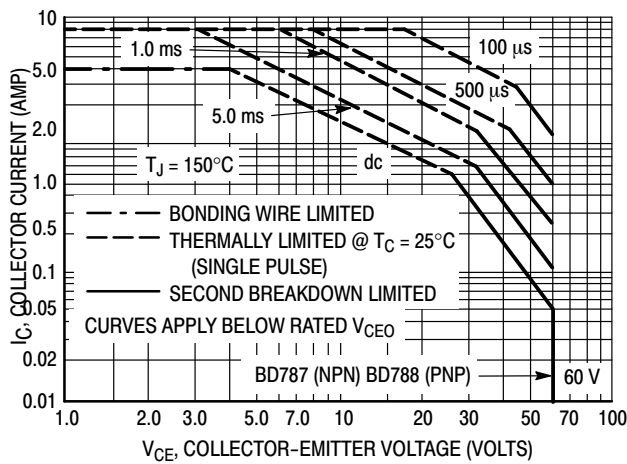


Figure 5. Active Region Safe Operating Area

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.

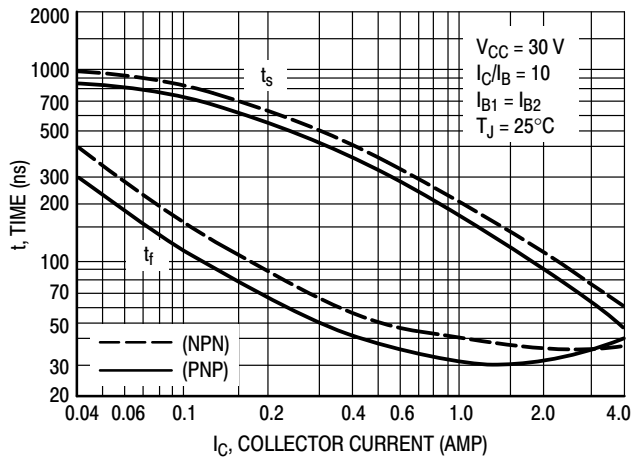


Figure 6. Turn-Off Time

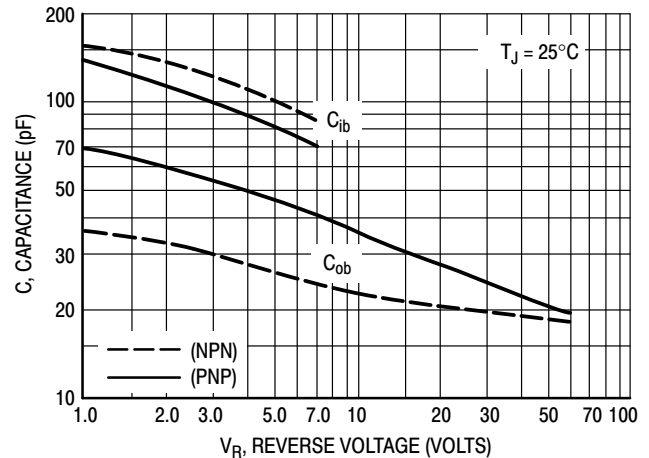


Figure 7. Capacitance

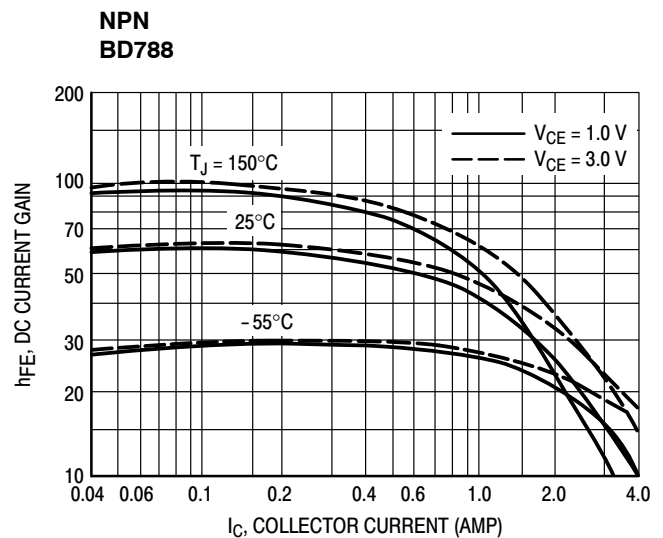
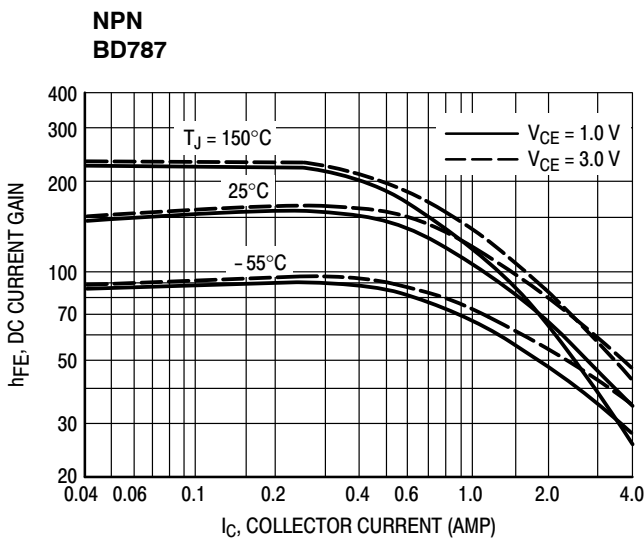


Figure 8. DC Current Gain

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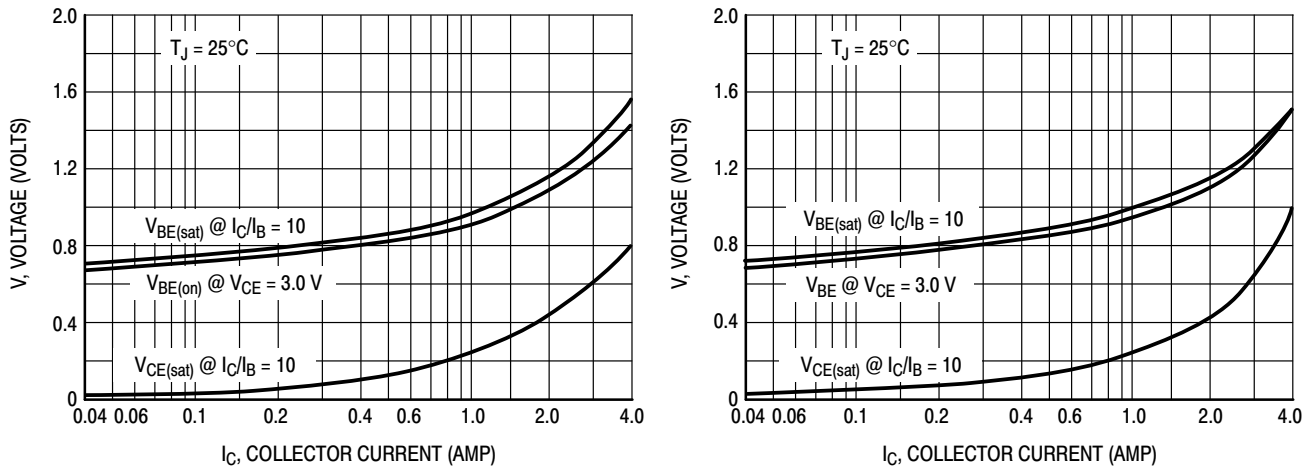


Figure 9. "On" Voltages

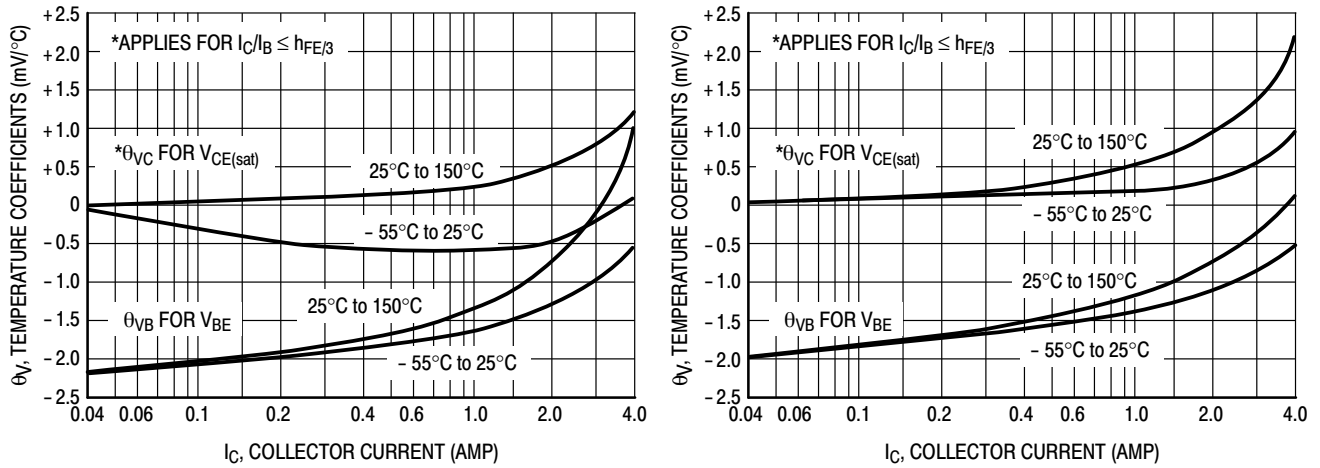
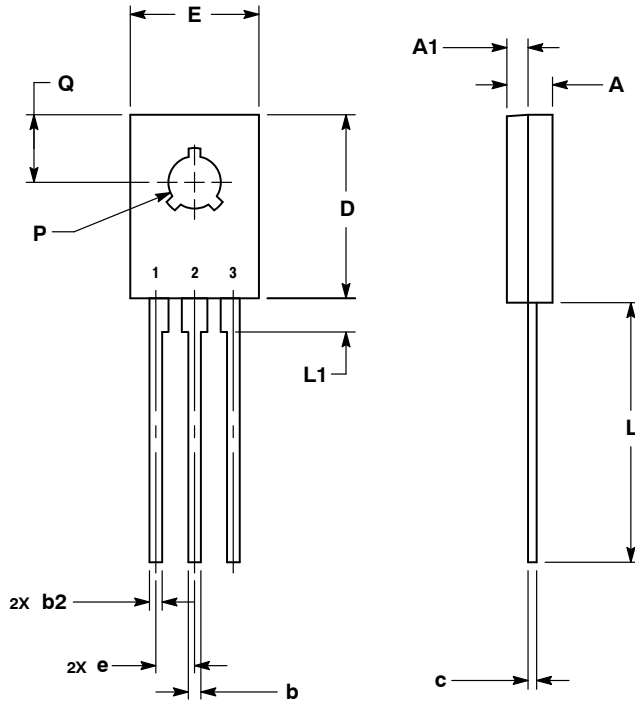


Figure 10. Temperature Coefficients

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PACKAGE DIMENSIONS


TO-225
CASE 77-09
ISSUE AA



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. NUMBER AND SHAPE OF LUGS OPTIONAL.

DIM	MILLIMETERS	
	MIN	MAX
A	2.40	3.00
A1	1.00	1.50
b	0.60	0.90
b2	0.51	0.88
c	0.39	0.63
D	10.60	11.10
E	7.40	7.80
e	2.04	2.54
L	14.50	16.63
L1	1.27	2.54
P	2.90	3.30
Q	3.80	4.20

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