MOTOROLA
SEMICONDUCTOR TECHNICAL DATA

Order this document
by BD789/D

NPN
BD789

BD791*
PNP
BD790

BD792*

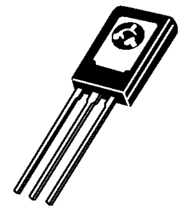
*Motorola Preferred Device

Complementary Plastic Silicon Power Transistors

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

- High Collector–Emitter Sustaining Voltage —
  $V_{CEO(sus)}$ = 80 Vdc (Min) — BD789, BD790
  = 100 Vdc (Min) — BD791, BD792
- High DC Current Gain @ I_C = 200 mAdc
  h_{FE} = 40–250
- Low Collector–Emitter Saturation Voltage —
  $V_{CE(sat)}$ = 0.5 Vdc (Max) @ I_C = 500 mAdc
- High Current Gain — Bandwidth Product —
  f_T = 40 MHz (Min) @ I_C = 100 mAdc)

4 AMPERE
POWER TRANSISTORS
COMPLEMENTARY
SILICON
80, 100 VOLTS
15 WATTS



CASE 77–08
TO–225AA TYPE

*MAXIMUM RATINGS

Rating	Symbol	BD789 BD790	BD791 BD792	Unit
Collector–Emitter Voltage	V_{CEO}	80	100	Vdc
Collector–Base Voltage	V_{CB}	80	100	Vdc
Emitter–Base Voltage	V_{EBO}	6.0		Vdc
Collector Current — Continuous — Peak	I_C	4.0 8.0		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

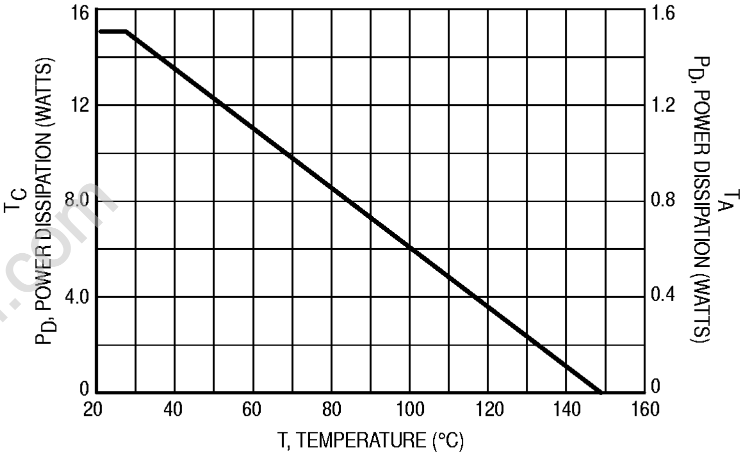


Figure 1. Power Derating

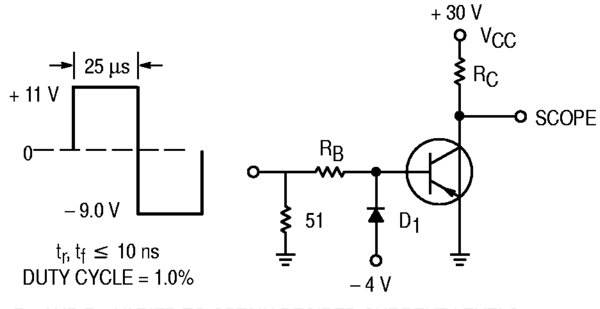
Preferred devices are Motorola recommended choices for future use and best overall value.

REV 7

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Sustaining Voltage (1)	$V_{CEO(sus)}$			Vdc
(I_C = 10 mAdc, I_B = 0) BD789, BD790		80	—	
BD791, BD792		100	—	
Collector Cutoff Current	I_{CEO}			µAdc
(V_{CE} = 40 Vdc, I_B = 0) BD789, BD790		—	100	
(V_{CE} = 50 Vdc, I_B = 0) BD791, BD792		—	100	
Collector Cutoff Current	I_{CEX}			
(V_{CE} = 80 Vdc, $V_{BE(off)}$ = 1.5 Vdc) BD789, BD790		—	1.0	µAdc
(V_{CE} = 100 Vdc, $V_{BE(off)}$ = 1.5 Vdc) BD791, BD792		—	1.0	
(V_{CE} = 40 Vdc, $V_{BE(off)}$ = 1 5 Vdc, T_C = 125°C) BD789, BD790		—	0.1	mAdc
(V_{CE} = 50 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 125°C) BD791, BD792		—	0.1	
Emitter Cutoff Current (V_{EB} = 6.0 Vdc, I_C = 0)	I_{EBO}	—	1.0	µAdc
ON CHARACTERISTICS (1)				
DC Current Gain	h_{FE}			—
(I_C = 200 mAdc, V_{CE} = 3 0 Vdc)		40	250	
(I_C = 1.0 Adc, V_{CE} = 3.0 Vdc)		20	—	
(I_C = 2.0 Adc, V_{CE} = 3.0 Vdc)		10	—	
(I_C = 4.0 Adc, V_{CE} = 3.0 Vdc)		5.0	—	
Collector Emitter Saturation Voltage	$V_{CE(sat)}$			Vdc
(I_C = 500 mAdc, I_B = 50 mAdc)		—	0.5	
(I_C = 1.0 Adc, I_B = 100 mAdc)		—	1.0	
(I_C = 2.0 Adc, I_B = 200 mAdc)		—	2.5	
(I_C = 4.0 Adc, I_B = 800 mAdc)		—	3.0	
Base–Emitter Saturation Voltage (I_C = 2.0 Adc, I_B = 200 mAdc)	$V_{BE(sat)}$	—	1.8	Vdc
Base–Emitter On Voltage (I_C = 200 mAdc, V_{CE} = 3.0 Vdc)	$V_{BE(on)}$	—	1.5	Vdc
DYNAMIC CHARACTERISTICS				
Current–Gain — Bandwidth Product (I_C = 100 mAdc, V_{CE} = 10 Vdc, f = 10 MHz)	f_T	40	—	MHz
Output Capacitance	C_{ob}			pF
(V_{CB} = 10 Vdc, I_C = 0, f = 0.1 MHz) BD789, BD791		—	50	
BD790, BD792		—	70	
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%.



R_B AND R_C VARIED TO OBTAIN DESIRED CURRENT LEVELS
D_1 MUST BE FAST RECOVERY TYPE, eg
MBR340 USED ABOVE I_B ≈ 100 mA
MSD6100 USED BELOW I_B ≈ 100 mA
FOR PNP TEST CIRCUIT, REVERSE ALL POLARITIES.

Figure 2. Switching Time Test Circuit

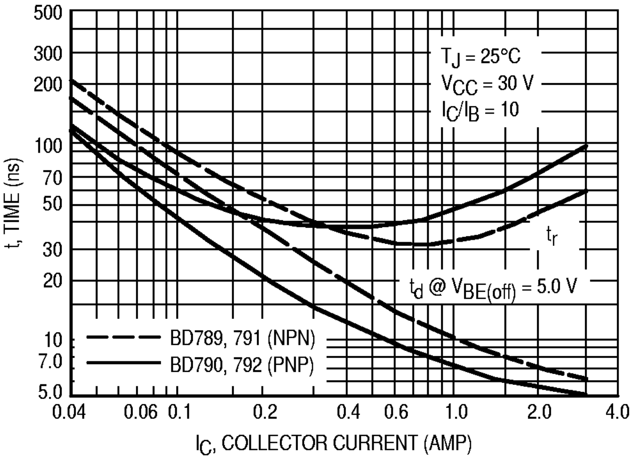


Figure 3. Turn–On Time

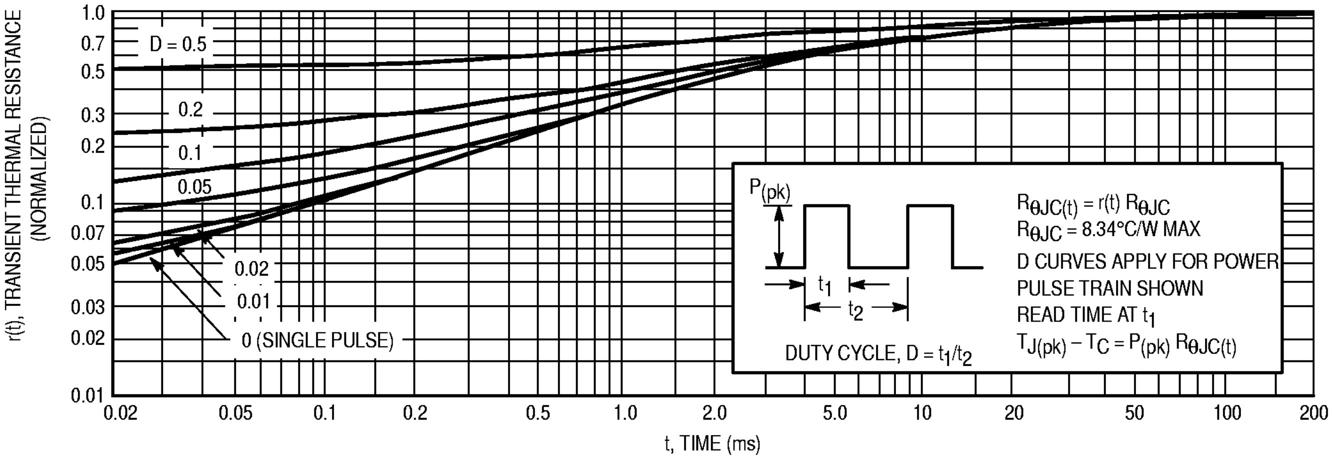


Figure 4. Thermal Response

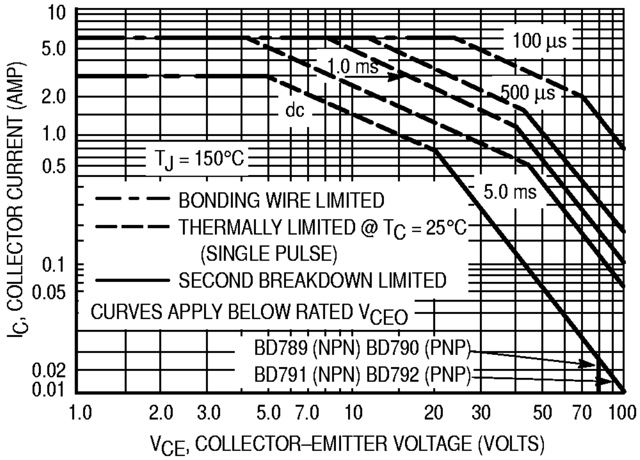


Figure 5. Active Region Safe Operating Area

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 $T_{J(pk)} \leq 150°C$, $T_{J(pk)}$ 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.

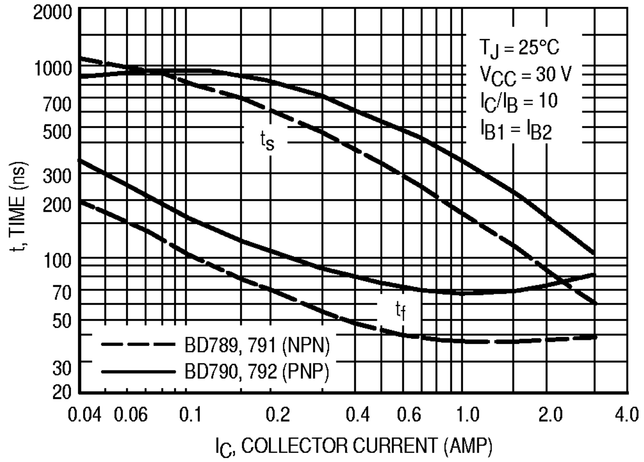


Figure 6. Turn–Off Time

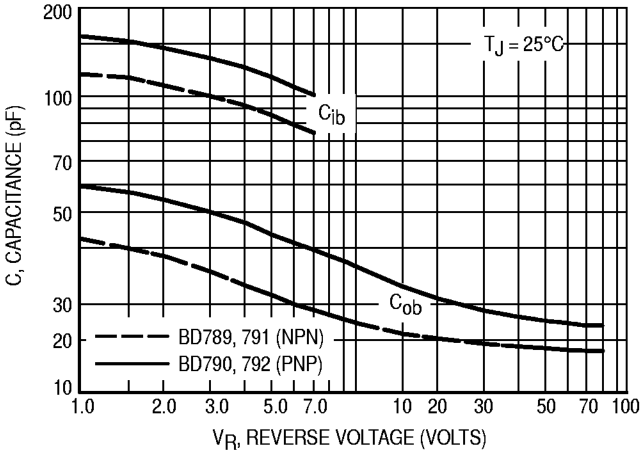


Figure 7. Capacitance

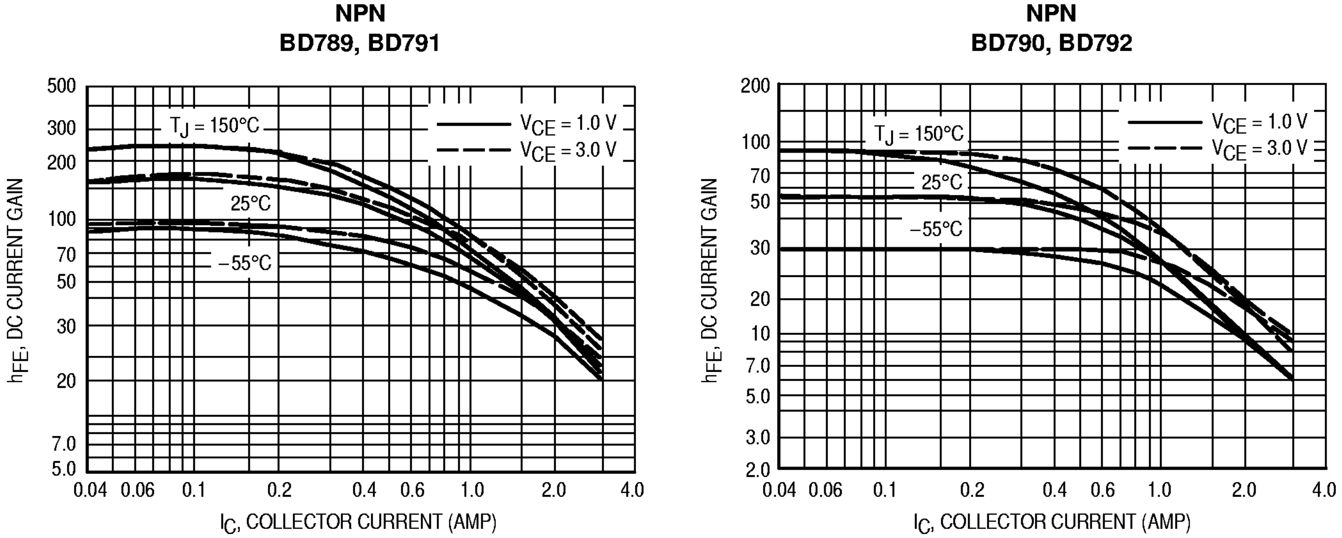


Figure 8. DC Current Gain

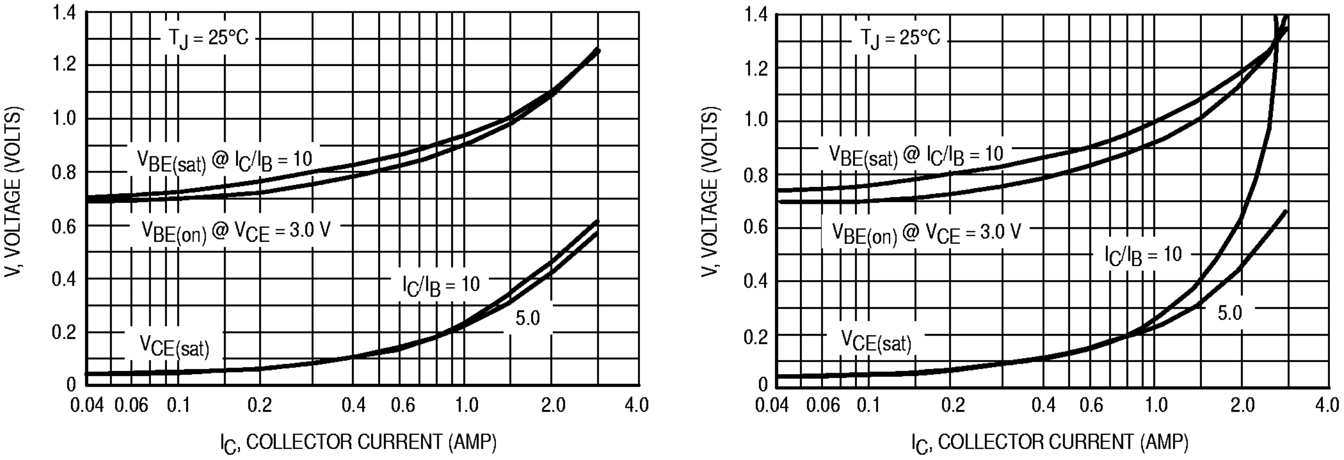


Figure 9. “On” Voltages

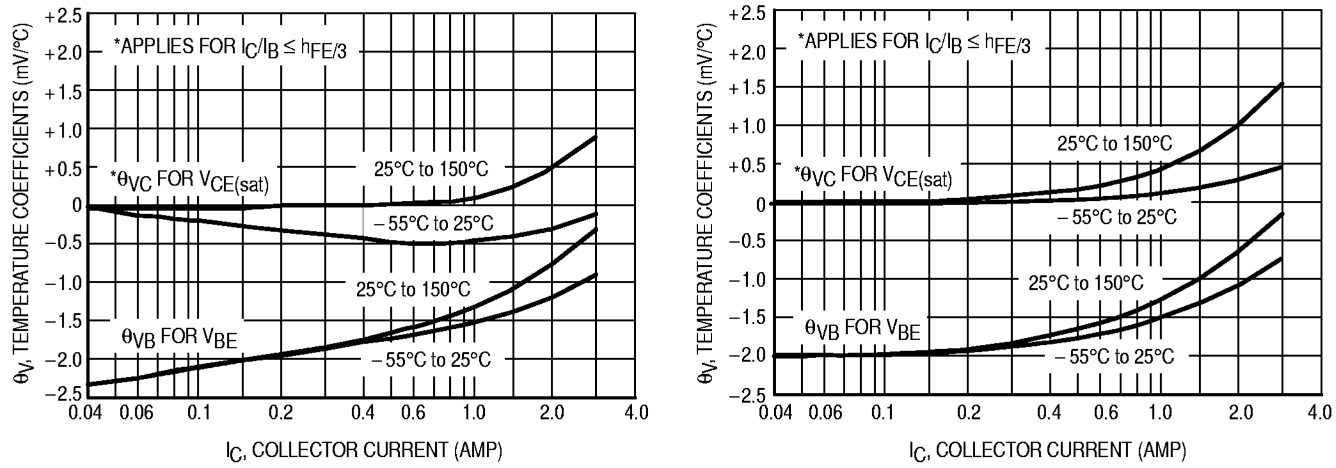
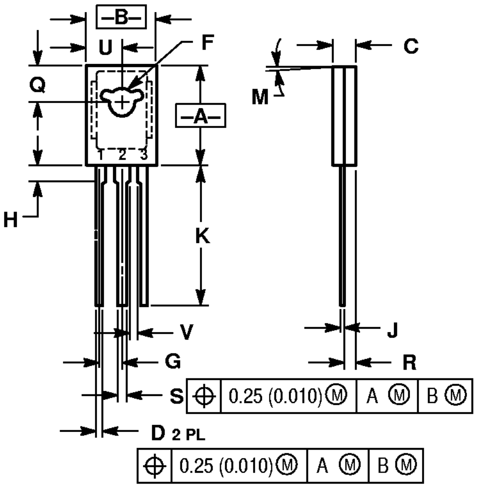


Figure 10. Temperature Coefficients

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