

# Plastic Darlington Complementary Silicon Power Transistors

... designed for general purpose amplifier and high-speed switching applications.

- High DC Current Gain  
 $h_{FE} = 1400$  (Typ) @  $I_C = 2.0$  Adc
- Collector-Emitter Sustaining Voltage — @ 10 mAdc  
 $V_{CEO(sus)} = 45$  Vdc (Min) — BD776  
 $= 60$  Vdc (Min) — BD777, 778  
 $= 80$  Vdc (Min) — BD780
- Reverse Voltage Protection Diode
- Monolithic Construction with Built-in Base-Emitter output Resistor

## MAXIMUM RATINGS

Rating	Symbol	BD776	BD777 BD778	BD780	Unit
Collector-Emitter Voltage	$V_{CEO}$	45	60	80	Vdc
Collector-Base Voltage	$V_{CB}$	45	60	80	Vdc
Emitter-Base Voltage	$V_{EB}$	5.0			Vdc
Collector Current — Continuous Peak	$I_C$	4.0 6.0			Adc
Base Current	$I_B$	100			mAdc
Total Device Dissipation $T_C = 25^\circ\text{C}$ — Derate above $25^\circ\text{C}$	$P_D$	15 0.12			Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +150			$^\circ\text{C}$

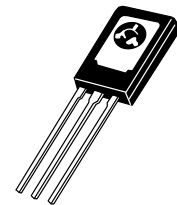
## THERMAL CHARACTERISTICS

Characteristics	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	8.34	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	83.3	$^\circ\text{C/W}$

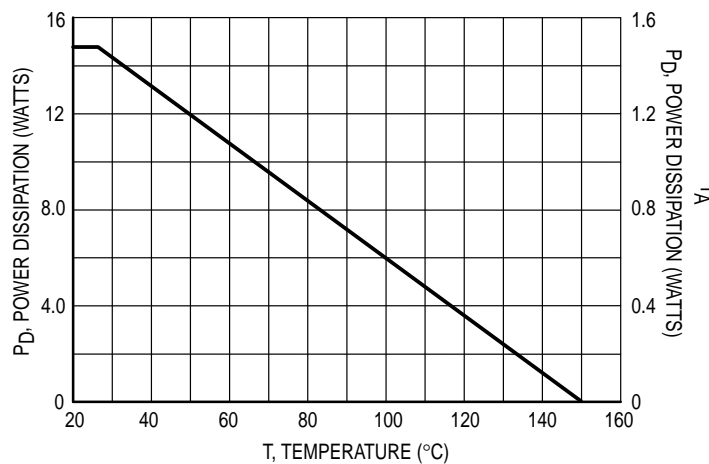
**NPN  
BD777  
PNP  
BD776  
BD778  
BD780\***

\*Motorola Preferred Device

**DARLINGTON  
4-AMPERE  
COMPLEMENTARY  
SILICON  
POWER TRANSISTORS  
45, 60, 80 VOLTS  
15 WATTS**



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



**Figure 1. Power Derating**

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

REV 7

# BD777 BD776 BD778 BD780

## 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) ( $I_O = 10\text{ mAdc}$ , $I_B = 0$ )	BD776 BD777, BD778 BD780	$V_{CEO(sus)}$	45 60 80	— — —	Vdc
Collector Cutoff Current ( $V_{CE} = 20\text{ Vdc}$ , $I_B = 0$ ) ( $V_{CE} = 30\text{ Vdc}$ , $I_B = 0$ ) ( $V_{CE} = 40\text{ Vdc}$ , $I_B = 0$ )	BD776 BD777, BD778 BD780	$I_{CEO}$	— — —	100 100 100	$\mu\text{A}$ dc
Collector Cutoff Current ( $V_{CB} = \text{Rated}$ , $V_{CEO(sus)}$ , $I_E = 0$ ) ( $V_{CB} = \text{Rated}$ , $V_{CEO(sus)}$ , $I_E = 0$ , $I_C = 100^\circ\text{C}$ )		$I_{CBO}$	— —	1.0 100	$\mu\text{A}$ dc
Emitter Cutoff Current ( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ )		$I_{EBO}$	—	1.0	$\mu\text{A}$ dc

## ON CHARACTERISTICS

DC Current Gain ( $I_C = 2.0\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ )	$H_{FE}$	750	—	
Collector–Emitter Saturation Voltage ( $I_C = 1.5\text{ Adc}$ , $I_B = 6\text{ mA}$ dc)	$V_{CE(Sat)}$	—	1.5	Vdc
Base Emitter Saturation Voltage ( $I_C = 1.5\text{ Adc}$ , $I_B = 6\text{ mA}$ dc)	$V_{BE(Sat)}$	—	2.5	Vdc
Base–Emitter On Voltage ( $I_C = 1.5\text{ Adc}$ , $V_{CE} = 3\text{ Vdc}$ )	$V_{BE(On)}$	—	2.3	Vdc
Output Diode Voltage Drop ( $I_{EC} = 2.0\text{ Adc}$ )	$V_{EC}$	—	2.0	Vdc

## DYNAMIC CHARACTERISTICS

Current Gain Bandwidth Product ( $I_C = 1.0\text{ Adc}$ , $V_{CE} = 2.0\text{ Vdc}$ )	$f_T$	20	—	MHz
	<b>Symbol</b>	<b>Min</b>	<b>Typ</b>	<b>Unit</b>
Turn–On Time ( $I_C = 250\text{ mA}$ , $V_{CE} = 2\text{ V}$ )	BD775–777 BD776–778–780	$t_{on}$	— 250 150	ns
Turn–Off Time ( $I_C = 250\text{ mA}$ , $V_{CE} = 2\text{ V}$ )	BD775–777 BD776–778–780	$t_{off}$	— 600 400	ns

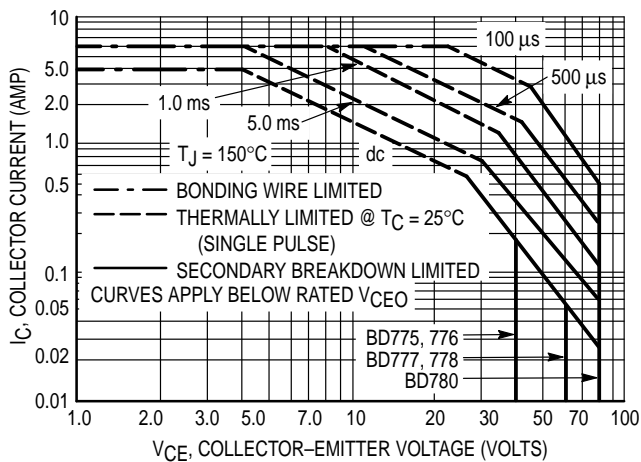


Figure 2. Active Region Safe Operating Area

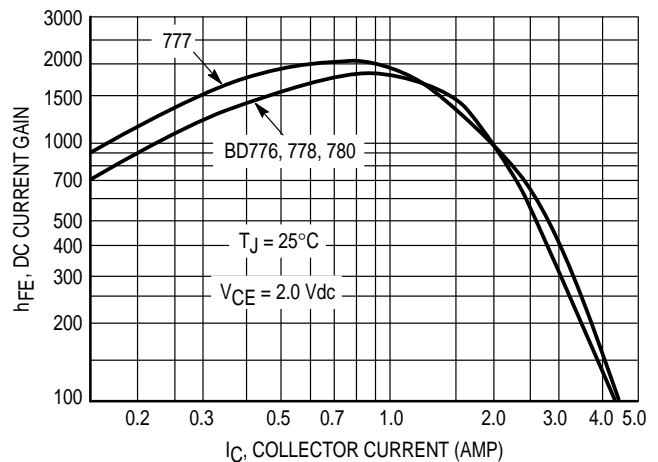


Figure 3. Typical DC Current Gain

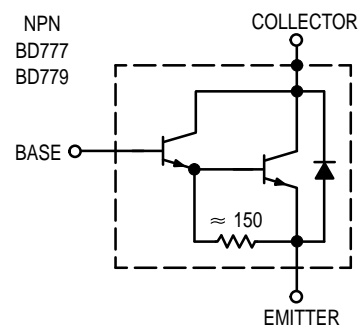
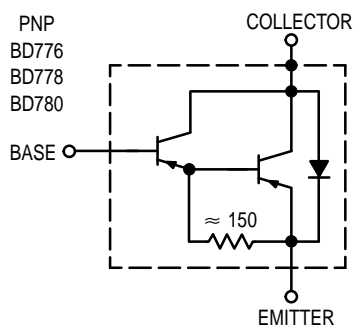
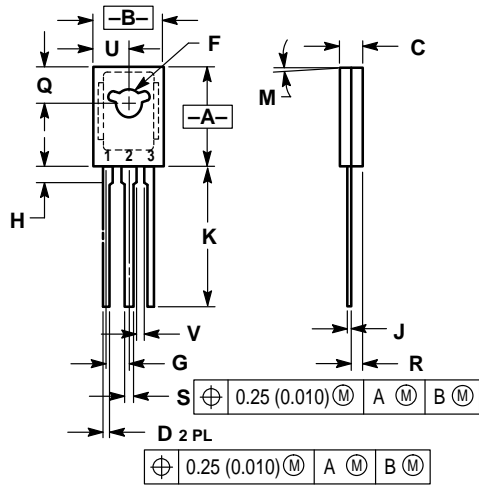


Figure 4. Darlington Circuit Schematic

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

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**BD777/D**

