

# 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  
 $V_{CE(sus)} = 45$  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			$^\circ\text{C}$

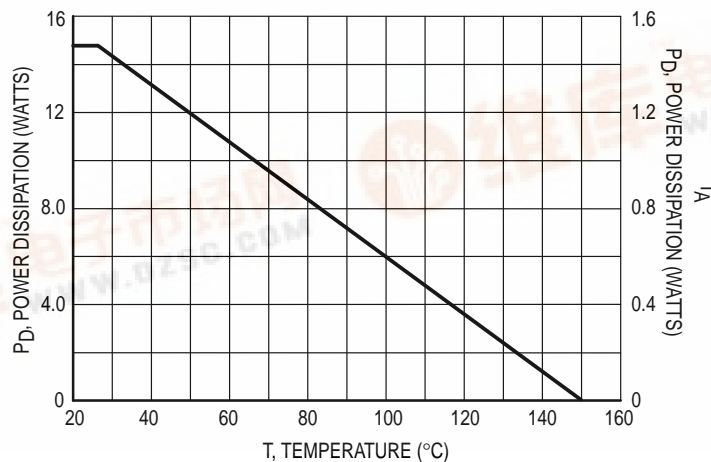
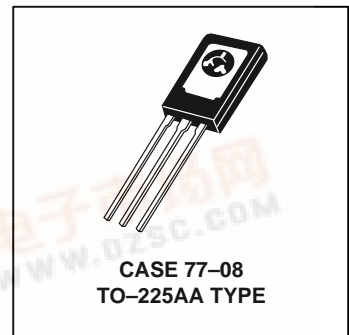
## THERMAL CHARACTERISTICS

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**



**Figure 1. Power Derating**

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

# BD777 BD776 BD778 BD780

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit	
<b>OFF CHARACTERISTICS</b>					
Collector–Emitter Sustaining Voltage (1) (I <sub>O</sub> = 10 mA <sub>dc</sub> , I <sub>B</sub> = 0)	BD776 BD777, BD778 BD780	V <sub>CEO(sus)</sub>	45 60 80	— — —	V <sub>dc</sub>
Collector Cutoff Current (V <sub>CE</sub> = 20 V <sub>dc</sub> , I <sub>B</sub> = 0) (V <sub>CE</sub> = 30 V <sub>dc</sub> , I <sub>B</sub> = 0) (V <sub>CE</sub> = 40 V <sub>dc</sub> , I <sub>B</sub> = 0)	BD776 BD777, BD778 BD780	I <sub>CEO</sub>	— — —	100 100 100	μA <sub>dc</sub>
Collector Cutoff Current (V <sub>CB</sub> = Rated, V <sub>CEO(sus)</sub> , I <sub>E</sub> = 0) (V <sub>CB</sub> = Rated, V <sub>CEO(sus)</sub> , I <sub>E</sub> = 0, I <sub>C</sub> = 100°C)		I <sub>CBO</sub>	— —	1.0 100	μA <sub>dc</sub>
Emitter Cutoff Current (V <sub>BE</sub> = 5.0 V <sub>dc</sub> , I <sub>C</sub> = 0)		I <sub>EBO</sub>	—	1.0	μA <sub>dc</sub>
<b>ON CHARACTERISTICS</b>					
DC Current Gain (I <sub>C</sub> = 2.0 A <sub>dc</sub> , V <sub>CE</sub> = 3.0 V <sub>dc</sub> )		H <sub>FE</sub>	750	—	
Collector–Emitter Saturation Voltage (I <sub>C</sub> = 1.5 A <sub>dc</sub> , I <sub>B</sub> = 6 mA <sub>dc</sub> )		V <sub>CE(Sat)</sub>	—	1.5	V <sub>dc</sub>
Base–Emitter Saturation Voltage (I <sub>C</sub> = 1.5 A <sub>dc</sub> , I <sub>B</sub> = 6 mA <sub>dc</sub> )		V <sub>BE(Sat)</sub>	—	2.5	V <sub>dc</sub>
Base–Emitter On Voltage (I <sub>C</sub> = 1.5 A <sub>dc</sub> , V <sub>CE</sub> = 3 V <sub>dc</sub> )		V <sub>BE(On)</sub>	—	2.3	V <sub>dc</sub>
Output Diode Voltage Drop (I <sub>EC</sub> = 2.0 A <sub>dc</sub> )		V <sub>EC</sub>	—	2.0	V <sub>dc</sub>
<b>DYNAMIC CHARACTERISTICS</b>					
Current Gain Bandwidth Product (I <sub>C</sub> = 1.0 A <sub>dc</sub> , V <sub>CE</sub> = 2.0 V <sub>dc</sub> )		f <sub>T</sub>	20	—	MHz
		<b>Symbol</b>	<b>Min</b>	<b>Typ</b>	<b>Unit</b>
Turn–On Time (I <sub>C</sub> = 250 mA/V <sub>CE</sub> = 2 V)	BD775–777 BD776–778–780	t <sub>on</sub>	— —	250 150	ns
Turn–Off Time (I <sub>C</sub> = 250 mA, V <sub>CE</sub> = 2 V)	BD775–777 BD776–778–780	t <sub>off</sub>	— —	600 400	ns

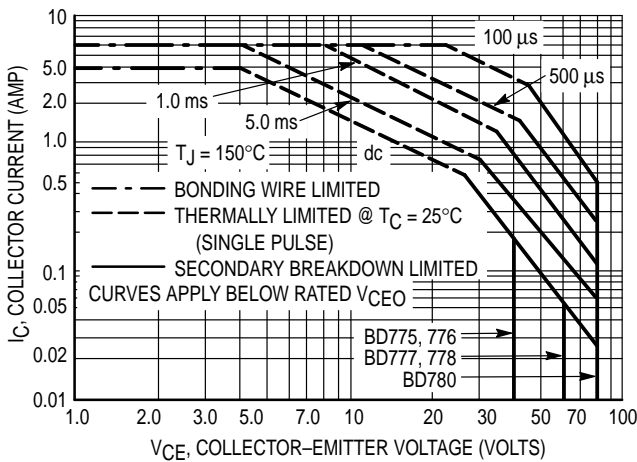


Figure 2. Active Region Safe Operating Area

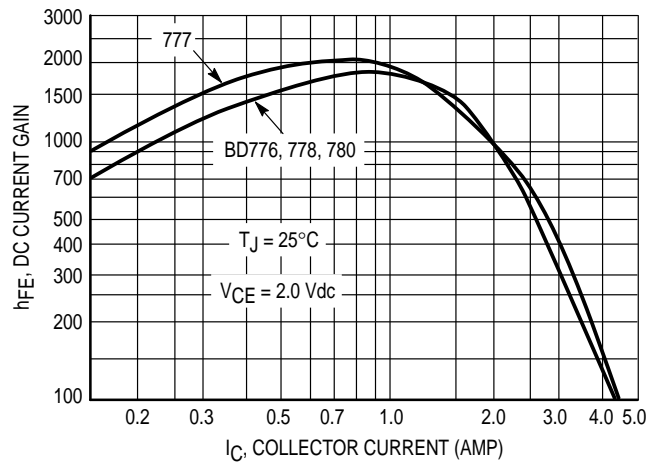


Figure 3. Typical DC Current Gain

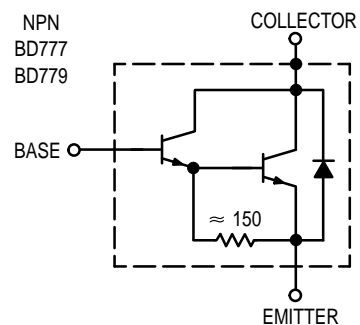
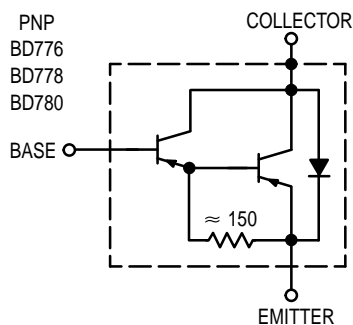
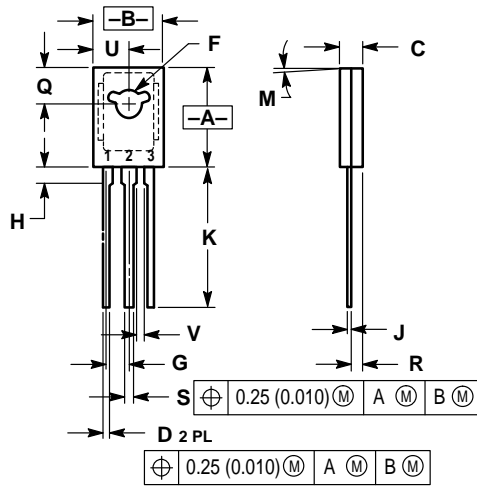


Figure 4. Darlington Circuit Schematic

**BD777 BD776 BD778 BD780**

**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**

## **BD777 BD776 BD778 BD780**

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