

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°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	$^\circ\text{C/W}$

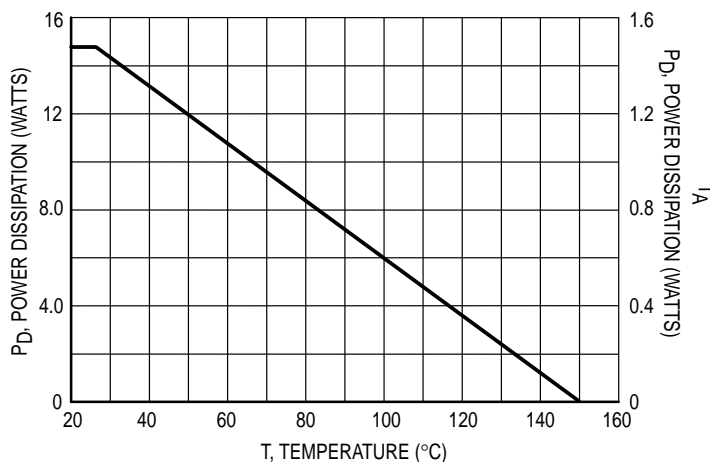


Figure 1. Power Derating

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

REV 7

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

BD777 BD776 BD778 BD780

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Sustaining Voltage (1) ($I_O = 10\text{ mA}$, $I_B = 0$)	$V_{CEO(sus)}$	45 60 80	— — —	Vdc
Collector Cutoff Current ($V_{CE} = 20\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 30\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 40\text{ Vdc}$, $I_B = 0$)	I_{CEO}	— — —	100 100 100	μAdc
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	μAdc
Emitter Cutoff Current ($V_{BE} = 5.0\text{ Vdc}$, $I_C = 0$)	I_{EBO}	—	1.0	μAdc

ON CHARACTERISTICS

DC Current Gain ($I_C = 2.0\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$)	H_{FE}	750	—	
Collector–Emitter Saturation Voltage ($I_C = 1.5\text{ Adc}$, $I_B = 6\text{ mA}$)	$V_{CE(Sat)}$	—	1.5	Vdc
Base Emitter Saturation Voltage ($I_C = 1.5\text{ Adc}$, $I_B = 6\text{ mA}$)	$V_{BE(Sat)}$	—	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
	Symbol	Min	Typ	Unit
Turn–On Time ($I_C = 250\text{ mA}$, $V_{CE} = 2\text{ V}$)	t_{on}	—	250 150	ns
Turn–Off Time ($I_C = 250\text{ mA}$, $V_{CE} = 2\text{ V}$)	t_{off}	—	600 400	ns

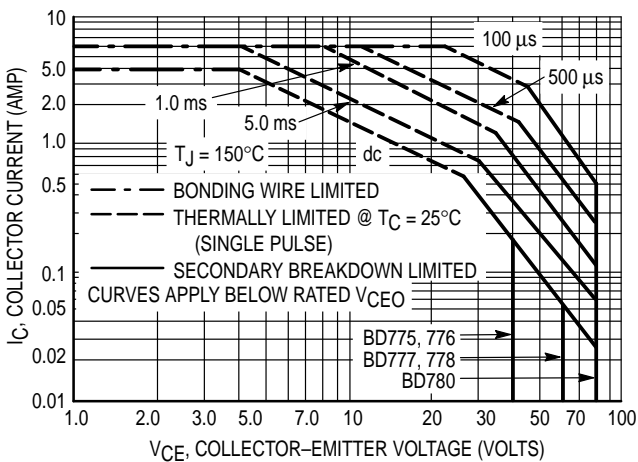


Figure 2. Active Region Safe Operating Area

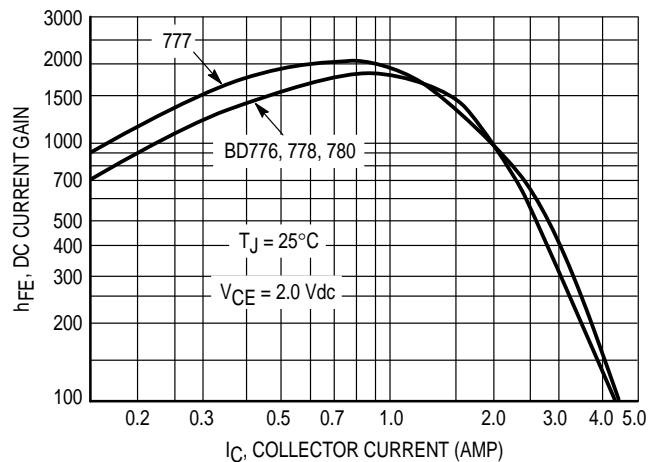


Figure 3. Typical DC Current Gain

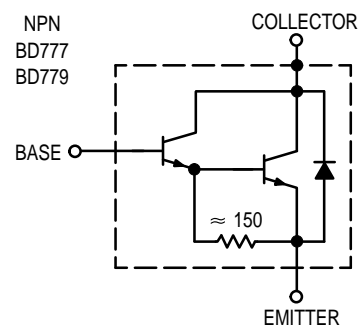
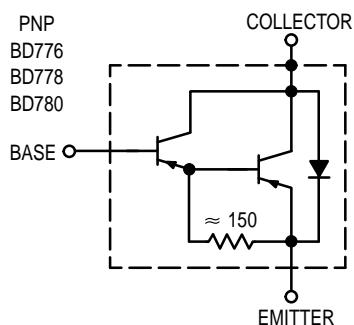
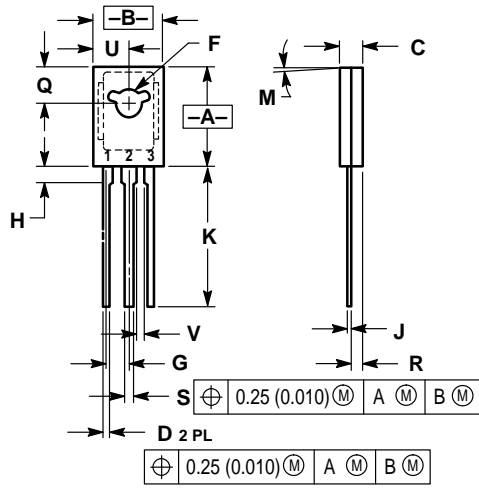


Figure 4. Darlington Circuit Schematic

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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