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

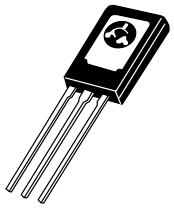
NPN
BD777
PNP
BD776

BD778

BD780*

***Motorola Preferred Device**

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



CASE 77–08
TO–225AA TYPE

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°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

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

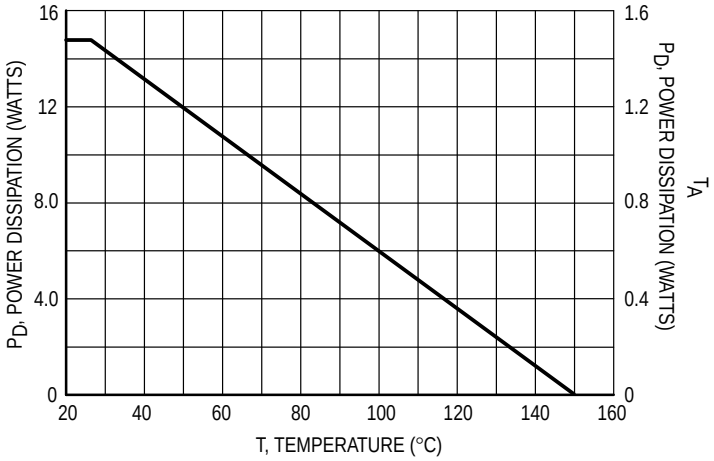


Figure 1. Power Derating

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) (I_O = 10 mAdc, I_B = 0)	BD776 BD777, BD778 BD780	$V_{CEO(sus)}$	45 60 80	— — —	Vdc
Collector Cutoff Current		I_{CEO}			μAdc
(V_{CE} = 20 Vdc, I_B = 0)	BD776		—	100	
(V_{CE} = 30 Vdc, I_B = 0)	BD777, BD778		—	100	
(V_{CE} = 40 Vdc, I_B = 0)	BD780		—	100	
Collector Cutoff Current		I_{CBO}			μAdc
(V_{CB} = Rated, $V_{CEO(sus)}$, I_E = 0)			—	1.0	
(V_{CB} = Rated, $V_{CEO(sus)}$, I_E = 0, I_C = 100°C)			—	100	
Emitter Cutoff Current (V_{BE} = 5.0 Vdc, I_C = 0)		I_{EBO}	—	1.0	μAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 2.0 Adc, V_{CE} = 3.0 Vdc)		H_{FE}	750	—	
Collector–Emitter Saturation Voltage (I_C = 1.5 Adc, I_B = 6 mAdc)		$V_{CE(Sat)}$	—	1.5	Vdc
Base Emitter Saturation Voltage (I_C = 1.5 Adc, I_B = 6 mAdc)		$V_{BE(Sat)}$	—	2.5	Vdc
Base–Emitter On Voltage (I_C = 1.5 Adc,V_{CE} = 3 Vdc)		$V_{BE(On)}$	—	2.3	Vdc
Output Diode Voltage Drop (I_{EC} = 2.0 Adc)		V_{EC}	—	2.0	Vdc
DYNAMIC CHARACTERISTICS					
Current Gain Bandwidth Product (I_C = 1.0 Adc, V_{CE} = 2.0 Vdc)		f_T	20	—	MHz
		Symbol	**Min**	**Typ**	**Unit**
Turn–On Time (I_C = 250 mA/V_{CE} = 2 V)	BD775–777 BD776–778–780	t_{on}	— —	250 150	ns
Turn–Off Time (I_C = 250 mA, V_{CE} = 2 V)	BD775–777 BD776–778–780	t_{off}	— —	600 400	ns

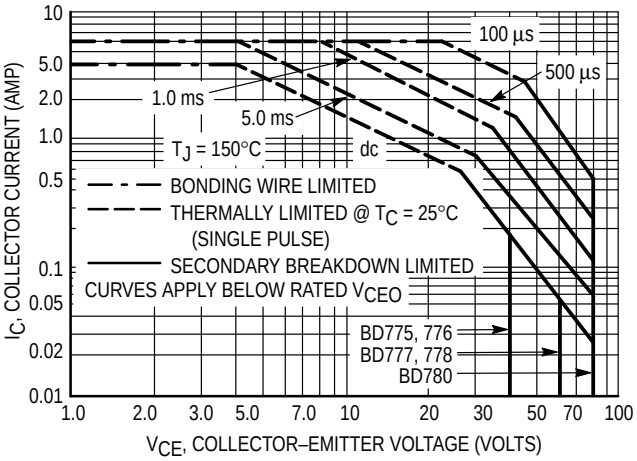


Figure 2. Active Region Safe Operating Area

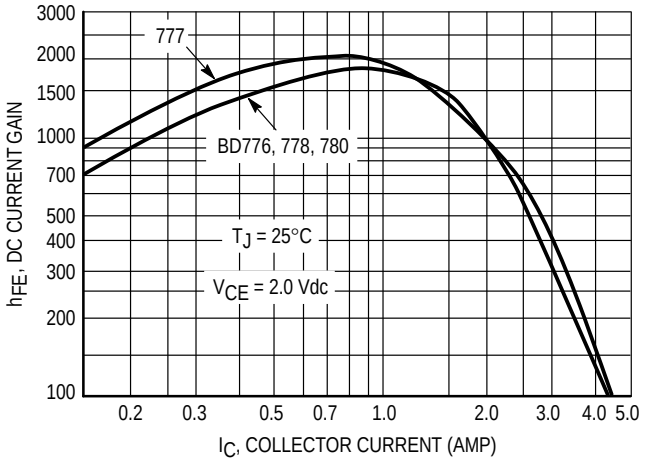
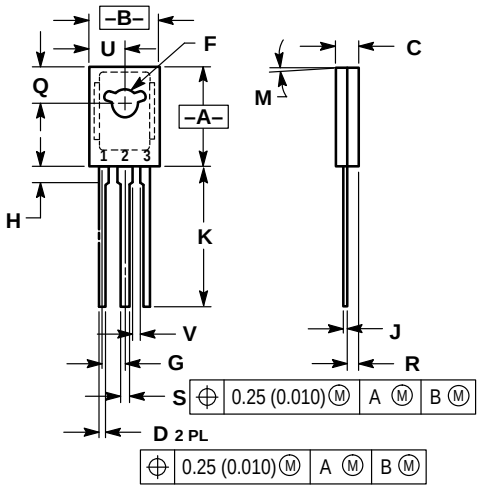


Figure 3. Typical DC Current Gain

Figure 4. Darlington Circuit Schematic

PACKAGE DIMENSIONS



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	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

How to reach us:
USA / EUROPE: Motorola Literature Distribution;
P.O. Box 20912; Phoenix, Arizona 85036. 1–800–441–2447

MFAX: RMFAX0@email.sps.mot.com – TOUCHTONE (602) 244–6609
INTERNET: http://Design–NET.com

JAPAN: Nippon Motorola Ltd.; Tatsumi–SPD–JLDC, Toshikatsu Otsuki,
6F Seibu–Butsuryu–Center, 3–14–2 Tatsumi Koto–Ku, Tokyo 135, Japan. 03–3521–8315

HONG KONG: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852–26629298