

## Plastic Medium-Power Silicon NPN Darlington

... for use as output devices in complementary general-purpose amplifier applications.

- High DC Current Gain —  
 $h_{FE} = 750$  (Min) @  $I_C = 1.5$  and  $2.0$  Adc
- Monolithic Construction
- BD675, 675A, 677, 677A, 679, 679A, 681 are complementary with BD676, 676A, 678, 678A, 680, 680A, 682
- BD 677, 677A, 679, 679A are equivalent to MJE 800, 801, 802, 803

### MAXIMUM RATINGS

Rating	Symbol	BD675 BD675A	BD677 BD677A	BD679 BD679A	BD681	Unit
Collector-Emitter Voltage	$V_{CEO}$	45	60	80	100	Vdc
Collector-Base Voltage	$V_{CB}$	45	60	80	100	Vdc
Emitter-Base Voltage	$V_{EB}$	5.0				Vdc
Collector Current	$I_C$	4.0				Adc
Base Current	$I_B$	0.1				Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	40 0.32				Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperating Range	$T_J, T_{stg}$	-55 to +150				$^\circ\text{C}$

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$\theta_{JC}$	3.13	$^\circ\text{C}/\text{W}$

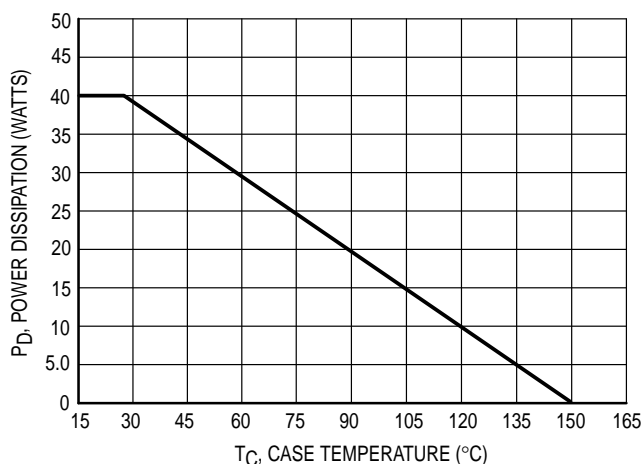


Figure 1. Power Temperature Derating

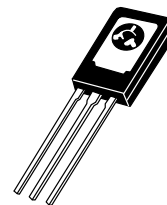
Preferred devices are Motorola recommended choices for future use and best overall value.

REV 7

**BD675**  
**BD675A**  
**BD677**  
**BD677A**  
**BD679**  
**BD679A**  
**BD681\***

\*Motorola Preferred Device

**4.0 AMPERE**  
**DARLINGTON**  
**POWER TRANSISTORS**  
**NPN SILICON**  
**60, 80, 100 VOLTS**  
**40 WATTS**



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

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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector–Emitter Breakdown Voltage <sup>(1)</sup> ( $I_C = 50\text{ mAdc}$ , $I_B = 0$ )	$BV_{CEO}$	45 60 80 100	—	Vdc
Collector Cutoff Current ( $V_{CE} = \text{Half Rated } BV_{CEO}$ , $I_B = 0$ )	$I_{CEO}$	—	500	$\mu\text{Adc}$
Collector Cutoff Current ( $V_{CB} = \text{Rated } BV_{CEO}$ , $I_E = 0$ ) ( $V_{CB} = \text{Rated } BV_{CEO}$ , $I_E = 0$ , $T_C = 100^\circ\text{C}$ )	$I_{CBO}$	— —	0.2 2.0	mAdc
Emitter Cutoff Current ( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	—	2.0	mAdc

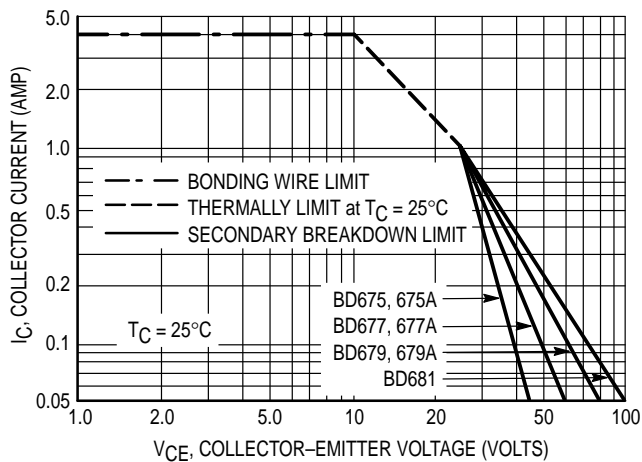
**ON CHARACTERISTICS**

DC Current Gain <sup>(1)</sup> ( $I_C = 1.5\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ ) ( $I_C = 2.0\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ )	BD675, 677, 679, 681 BD675A, 677A, 679A	$h_{FE}$	750 750	—	—
Collector–Emitter Saturation Voltage <sup>(1)</sup> ( $I_C = 1.5\text{ Adc}$ , $I_B = 30\text{ mAdc}$ ) ( $I_C = 2.0\text{ Adc}$ , $I_B = 40\text{ mAdc}$ )	BD677, 679, 681 BD675A, 677A, 679A	$V_{CE(sat)}$	— —	2.5 2.8	Vdc
Base–Emitter On Voltage <sup>(1)</sup> ( $I_C = 1.5\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ ) ( $I_C = 2.0\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ )	BD677, 679, 681 BD675A, 677A, 679A	$V_{BE(on)}$	— —	2.5 2.5	Vdc

**DYNAMIC CHARACTERISTICS**

Small Signal Current Gain ( $I_C = 1.5\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ , $f = 1.0\text{ MHz}$ )	$h_{fe}$	1.0	—	—
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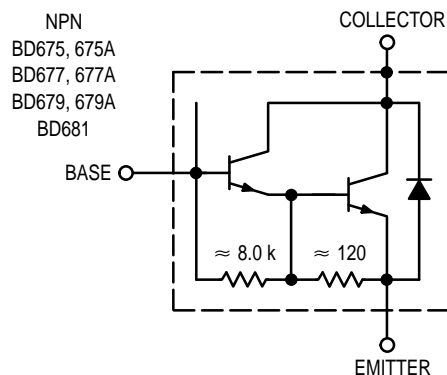
(1) Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .



**Figure 2. DC Safe Operating Area**

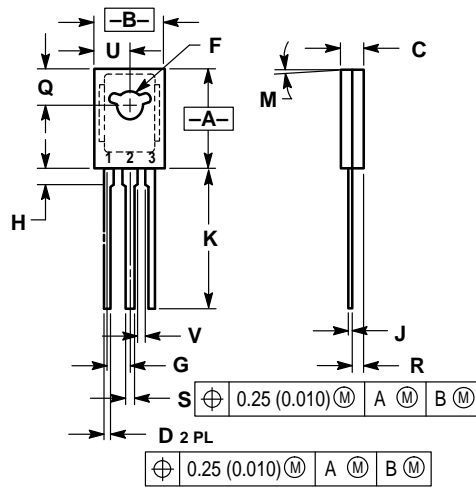
There are two limitations on the power handling ability of a transistor average junction temperature and secondary breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation; e.g., the transistor must not be subjected to greater dissipation than the curves indicate.

At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by secondary breakdown.



**Figure 3. Darlington Circuit Schematic**

**BD675 BD675A BD677 BD677A BD679 BD679A BD681**  
**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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