

# Plastic Medium-Power Silicon PNP 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
- BD676, 676A, 678, 678A, 680, 680A, 682 are complementary with BD675, 675A, 677, 677A, 679, 679A, 681
- BD 678, 678A, 680, 680A are equivalent to MJE 700, 701, 702, 703

## MAXIMUM RATING

Rating	Symbol	BD676 BD676A	BD678 BD678A	BD680 BD680A	BD682	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	$^\circ\text{C}/\text{W}$

**BD676  
BD676A  
BD678  
BD678A  
BD680  
BD680A  
BD682**

**4.0 AMPERE  
DARLINGTON  
POWER TRANSISTORS  
PNP SILICON  
45, 60, 80, 100 VOLTS  
40 WATTS**

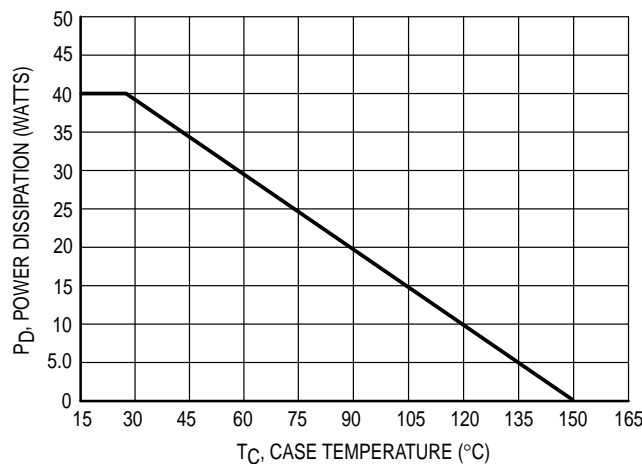
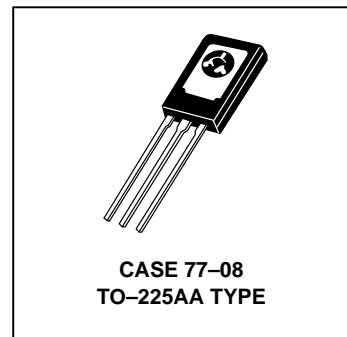


Figure 1. Power Temperature Derating

**BD676 BD676A BD678 BD678A BD680 BD680A BD682**

**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> ( $I_C = 50\text{ mAdc}$ , $I_B = 0$ )	BD676, 676A BD678, 678A BD680, 680A BD682	$BV_{CEO}$	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

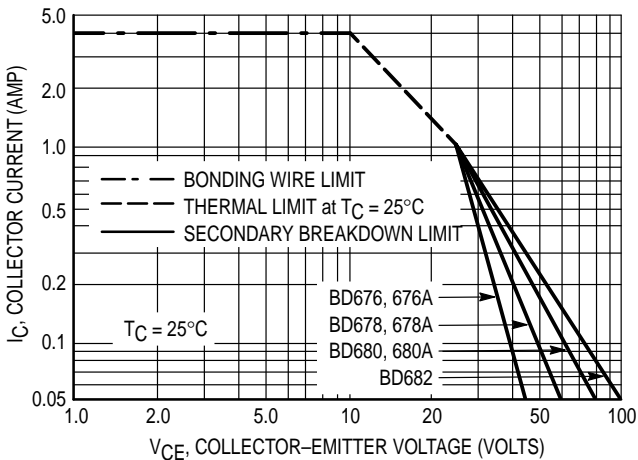
**ON CHARACTERISTICS**

DC Current Gain <sup>(1)</sup> ( $I_C = 1.5\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ ) ( $I_C = 2.0\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ )	BD676, 678, 680, 682 BD676A, 678A, 680A	$h_{FE}$	750 750	— —	
Collector–Emitter Saturation Voltage <sup>(1)</sup> ( $I_C = 1.5\text{ Adc}$ , $I_B = 30\text{ mAdc}$ ) ( $I_C = 2.0\text{ Adc}$ , $I_B = 40\text{ mAdc}$ )	BD678, 680, 682 BD676A, 678A, 680A	$V_{CE(sat)}$	— —	2.5 2.8	Vdc
Base–Emitter On Voltage <sup>(1)</sup> ( $I_C = 1.5\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ ) ( $I_C = 2.0\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ )	BD678, 680, 682 BD676A, 678A, 680A	$V_{BE(on)}$	— —	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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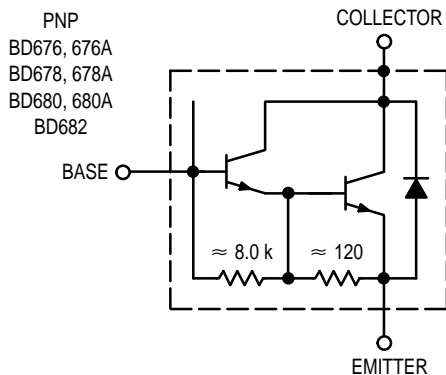
(1) Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .



**Figure 2. DC Safe Operating Area**

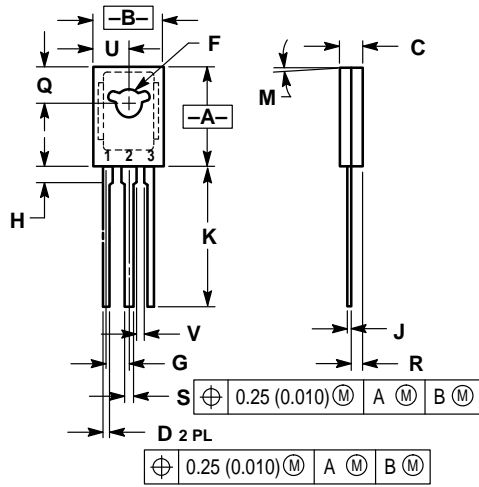
There are two limitations on the power handling ability of a transistor average junction temperature and secondary breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation; e.g., the transistor must not be subjected to greater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

**BD676 BD676A BD678 BD678A BD680 BD680A BD682**  
**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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