

## Plastic Medium-Power Silicon NPN Darlingtontons

... 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	$^\circ\text{C/W}$

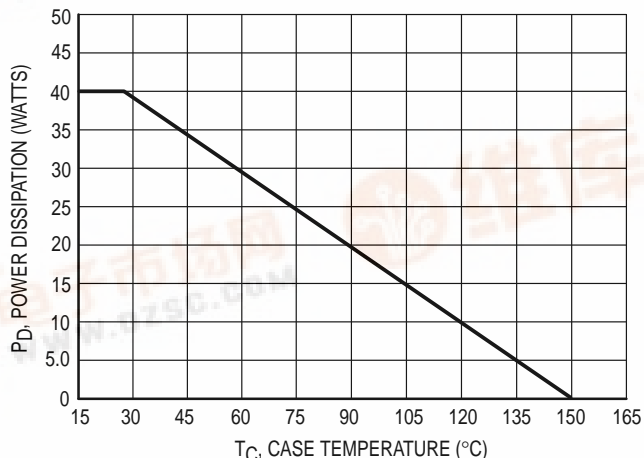
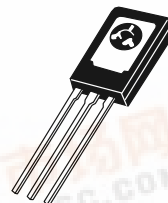


Figure 1. Power Temperature Derating

**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**

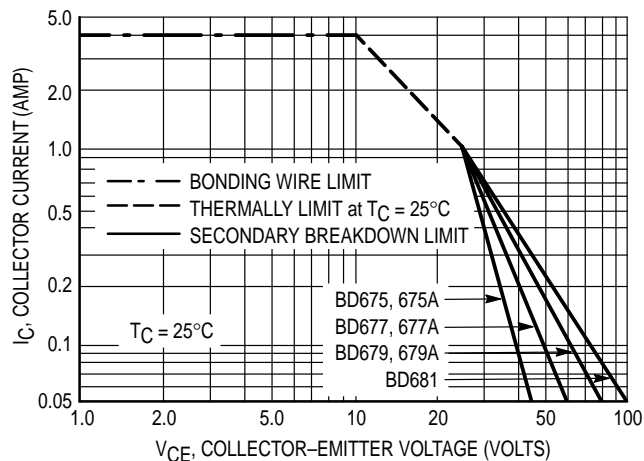


**BD675 BD675A BD677 BD677A BD679 BD679A BD681**

**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> ( $I_C = 50\text{ mAdc}$ , $I_B = 0$ )	BD675, 675A BD677, 677A BD679, 679A BD681	$BV_{CEO}$	45 60 80 100	—	Vdc
Collector Cutoff Current ( $V_{CE} = \text{Half Rated } V_{CEO}$ , $I_B = 0$ )		$I_{CEO}$	—	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
<b>ON CHARACTERISTICS</b>					
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
<b>DYNAMIC CHARACTERISTICS</b>					
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	—	—

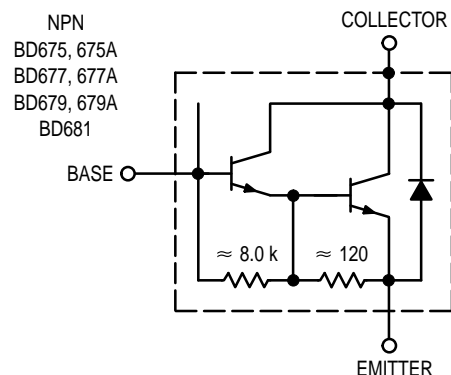
(1) Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .



**Figure 2. DC Safe Operating Area**

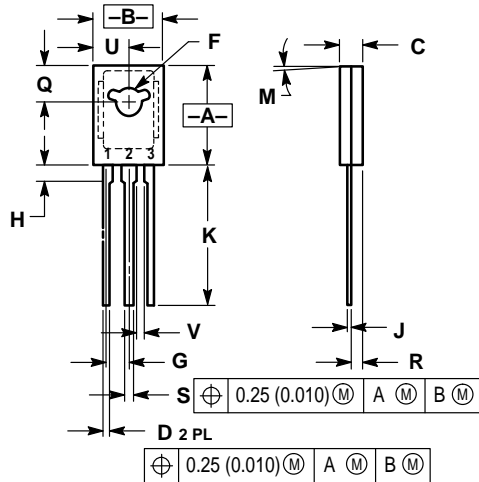
There are two limitations on the power handling ability of a transistor average junction temperature and secondary breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation; e.g., the transistor must not be subjected to greater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

**BD675 BD675A BD677 BD677A BD679 BD679A BD681**

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

**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



**MOTOROLA**