

# BD676G, BD676AG, BD678G, BD678AG, BD680G, BD680AG, BD682G, BD682TG



ON Semiconductor®

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## Plastic Medium-Power Silicon PNP Darlington

This series of plastic, medium-power silicon PNP Darlington transistors can be used as output devices in complementary general-purpose amplifier applications.

### Features

- High DC Current Gain
- Monolithic Construction
- BD676, 676A, 678, 678A, 680, 680A, 682 are complementary with BD675, 675A, 677, 677A, 679, 679A, 681
- BD678, 678A, 680, 680A are equivalent to MJE 700, 701, 702, 703
- These Devices are Pb-Free and are RoHS Compliant\*

### MAXIMUM RATINGS

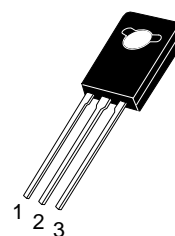
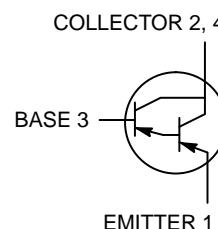
Rating	Symbol	Value	Unit
Collector-Emitter Voltage BD676G, BD676AG BD678G, BD678AG BD680G, BD680AG BD682G, BD682TG	$V_{CEO}$	45 60 80 100	Vdc
Collector-Base Voltage BD676G, BD676AG BD678G, BD678AG BD680G, BD680AG BD682G, BD682TG	$V_{CB}$	45 60 80 100	Vdc
Emitter-Base Voltage	$V_{EB}$	5.0	Vdc
Collector 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	W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL CHARACTERISTICS

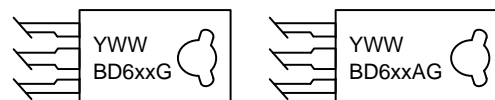
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	3.13	$^\circ\text{C}/\text{W}$

## 4.0 AMP DARLINGTON POWER TRANSISTORS PNP SILICON 45, 60, 80, 100 VOLT, 40 WATT



TO-225  
CASE 77-09  
STYLE 1

### MARKING DIAGRAMS



Y = Year  
WW = Work Week  
BD6xx = Device Code  
xx = 76, 78, 80, 82, or 82T  
G = Pb-Free Package

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 3 of this data sheet.

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# BD676G, BD676AG, BD678G, BD678AG, BD680G, BD680AG, BD682G, BD682TG

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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Breakdown Voltage (Note 1) ( $I_C = 50\text{ mAdc}$ , $I_B = 0$ ) BD676G, BD676AG BD678G, BD678AG BD680G, BD680AG BD682G, BD682TG	$BV_{CEO}$	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 (Note 1) ( $I_C = 1.5\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ ) BD676G, BD678G, BD680G, BD682G ( $I_C = 2.0\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ ) BD676AG, BD678AG, BD680AG	$h_{FE}$	750 750	–	–
Collector-Emitter Saturation Voltage (Note 1) ( $I_C = 1.5\text{ Adc}$ , $I_B = 30\text{ mAdc}$ ) BD678G, BD680G, BD682G ( $I_C = 2.0\text{ Adc}$ , $I_B = 40\text{ mAdc}$ ) BD676AG, BD678AG, BD680AG	$V_{CE(sat)}$	– –	2.5 2.8	Vdc
Base-Emitter On Voltage (Note 1) ( $I_C = 1.5\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ ) BD678G, BD680G, BD682G ( $I_C = 2.0\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ ) BD676AG, BD678AG, BD680AG	$V_{BE(on)}$	– –	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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Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

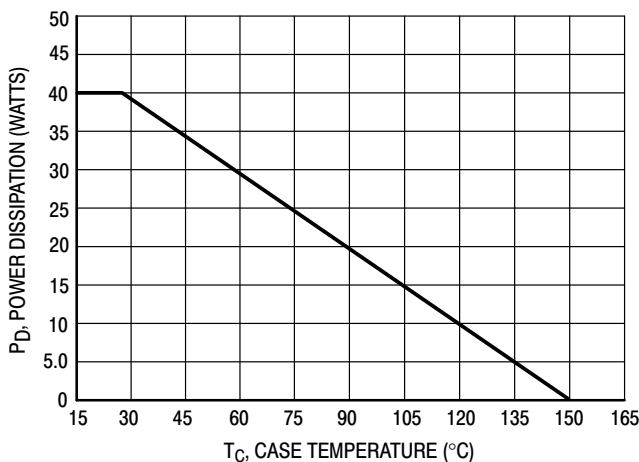


Figure 1. Power Temperature Derating

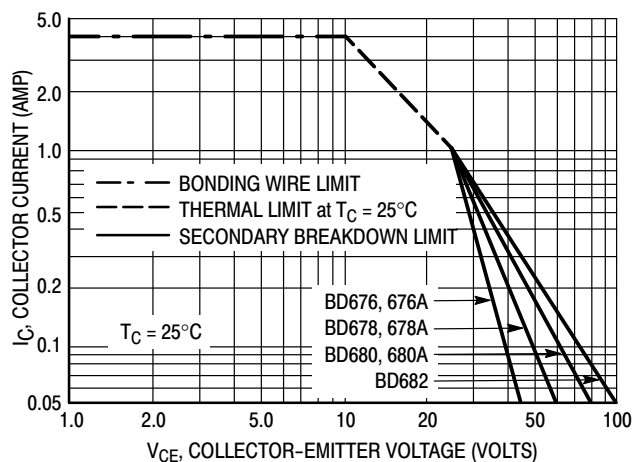


Figure 2. DC Safe Operating Area

# BD676G, BD676AG, BD678G, BD678AG, BD680G, BD680AG, BD682G, BD682TG

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.

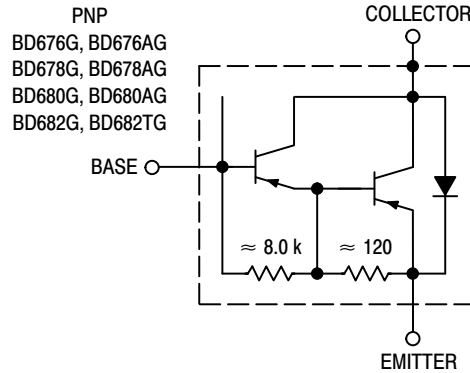


Figure 3. Darlington Circuit Schematic

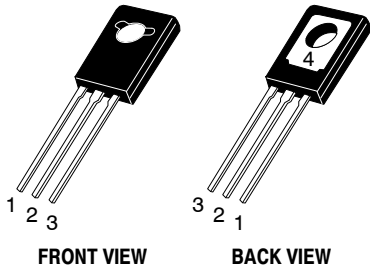
## ORDERING INFORMATION

Device	Package	Shipping
BD676G	TO-225 (Pb-Free)	500 Units / Box
BD676AG	TO-225 (Pb-Free)	500 Units / Box
BD678G	TO-225 (Pb-Free)	500 Units / Box
BD678AG	TO-225 (Pb-Free)	500 Units / Box
BD680G	TO-225 (Pb-Free)	500 Units / Box
BD680AG	TO-225 (Pb-Free)	500 Units / Box
BD682G	TO-225 (Pb-Free)	500 Units / Box
BD682TG	TO-225 (Pb-Free)	50 Units / Rail

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

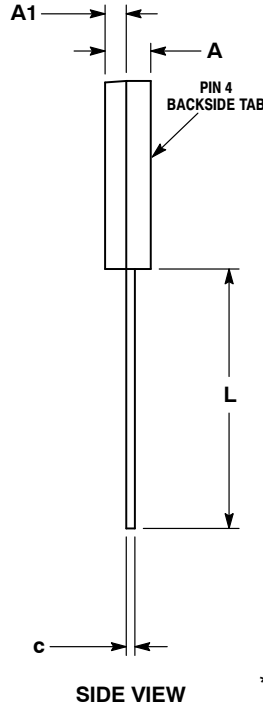
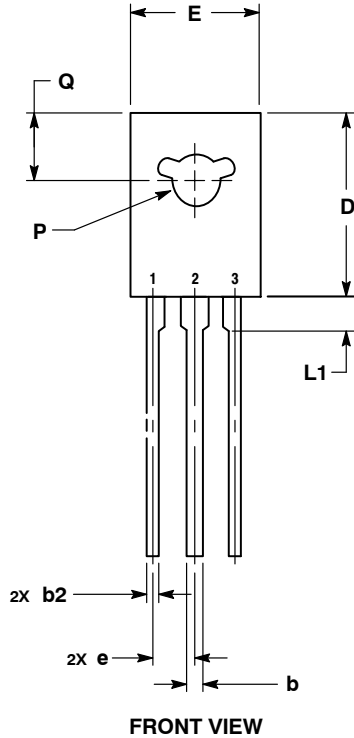
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**TO-225**  
CASE 77-09  
ISSUE AD

DATE 25 MAR 2015

SCALE 1:1

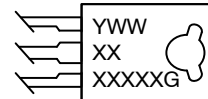


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. NUMBER AND SHAPE OF LUGS OPTIONAL.

DIM	MILLIMETERS	
	MIN	MAX
A	2.40	3.00
A1	1.00	1.50
b	0.60	0.90
b2	0.51	0.88
c	0.39	0.63
D	10.60	11.10
E	7.40	7.80
e	2.04	2.54
L	14.50	16.63
L1	1.27	2.54
P	2.90	3.30
Q	3.80	4.20

**GENERIC MARKING DIAGRAM\***



- Y = Year
- WW = Work Week
- XXXXX = Device Code
- G = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "μ", may or may not be present.

- |   |   |   |   |   |
|---|---|---|---|---|
| <p>STYLE 1:<br/>PIN 1. EMITTER<br/>2., 4. COLLECTOR<br/>3. BASE</p> | <p>STYLE 2:<br/>PIN 1. CATHODE<br/>2., 4. ANODE<br/>3. GATE</p> | <p>STYLE 3:<br/>PIN 1. BASE<br/>2., 4. COLLECTOR<br/>3. EMITTER</p> | <p>STYLE 4:<br/>PIN 1. ANODE 1<br/>2., 4. ANODE 2<br/>3. GATE</p> | <p>STYLE 5:<br/>PIN 1. MT 1<br/>2., 4. MT 2<br/>3. GATE</p>     |
| <p>STYLE 6:<br/>PIN 1. CATHODE<br/>2., 4. GATE<br/>3. ANODE</p>     | <p>STYLE 7:<br/>PIN 1. MT 1<br/>2., 4. GATE<br/>3. MT 2</p>     | <p>STYLE 8:<br/>PIN 1. SOURCE<br/>2., 4. GATE<br/>3. DRAIN</p>      | <p>STYLE 9:<br/>PIN 1. GATE<br/>2., 4. DRAIN<br/>3. SOURCE</p>    | <p>STYLE 10:<br/>PIN 1. SOURCE<br/>2., 4. DRAIN<br/>3. GATE</p> |

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<b>DESCRIPTION:</b>	<b>TO-225</b>	<b>PAGE 1 OF 1</b>

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