



**THE DATASHEET OF
BD678G**



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



ON Semiconductor®

<http://onsemi.com>

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

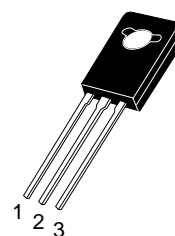
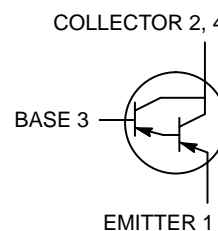
| Rating | Symbol | Value | Unit |
|---|----------------|-----------------------|--------------------------|
| Collector-Emitter Voltage BD676G, BD676AG BD678G, BD678AG BD680G, BD680AG BD682G, BD682TG | V_{CEO} | 45 60 80 100 | Vdc |
| Collector-Base Voltage BD676G, BD676AG BD678G, BD678AG BD680G, BD680AG 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°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

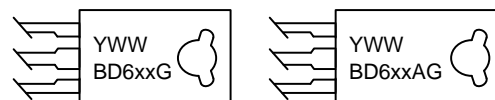
| Characteristic | Symbol | Max | Unit |
|---|-----------------|------|---------------------------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 3.13 | $^\circ\text{C}/\text{W}$ |

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 |
|--|------------|-----------------------|------------|-----------------|
| OFF CHARACTERISTICS | | | | |
| 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 | μAdc |
| 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 | – | – |
|--|----------|-----|---|---|

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 $\leq 2.0\%$.

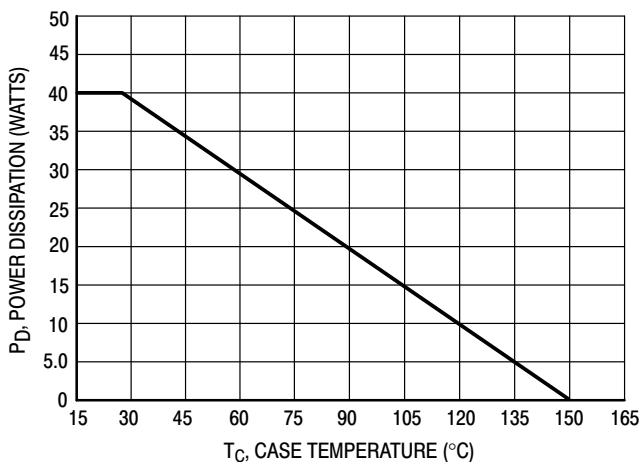


Figure 1. Power Temperature Derating

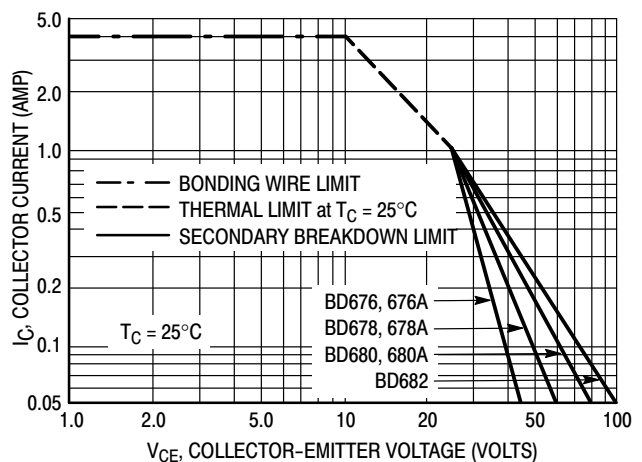


Figure 2. DC Safe Operating Area

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.

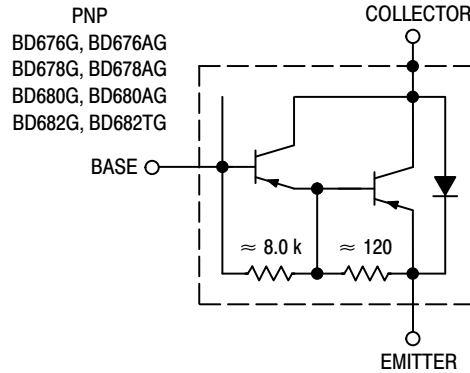
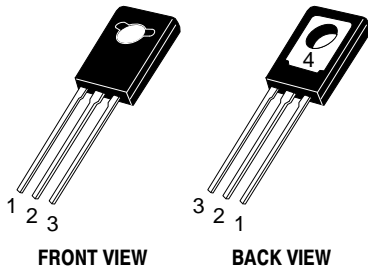


Figure 3. Darlington Circuit Schematic

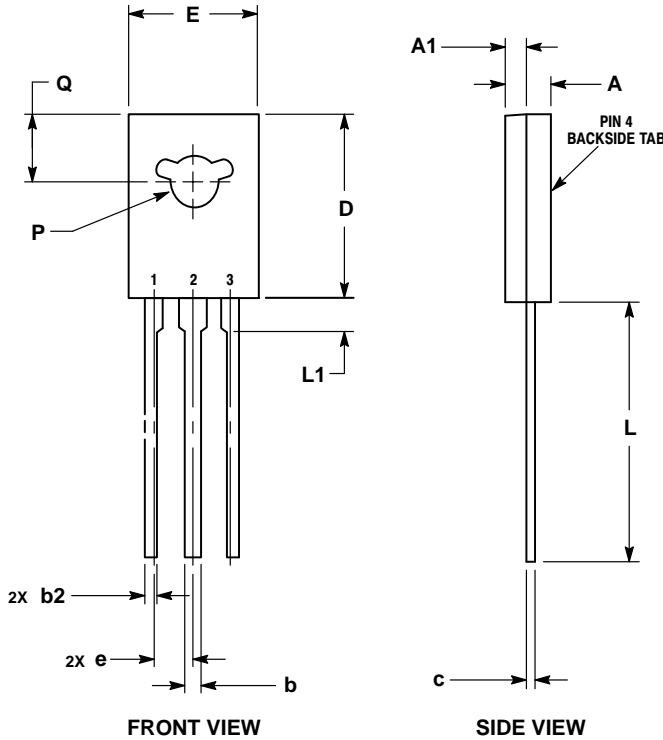
ORDERING INFORMATION

| 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 |

PACKAGE DIMENSIONS



TO-225
CASE 77-09
ISSUE AC



- 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 |

- STYLE 1:
PIN 1. EMITTER
2., 4. COLLECTOR
3. BASE

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