

BD676, BD676A, BD678, BD678A, BD680, BD680A, BD682, BD682T



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 –
 $h_{FE} = 750$ (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
- BD678, 678A, 680, 680A are equivalent to MJE 700, 701, 702, 703
- Pb-Free Package are Available*

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|----------------|-----------------------|--------------------------|
| Collector-Emitter Voltage BD676, BD676A BD678, BD678A BD680, BD680A BD682 | V_{CEO} | 45 60 80 100 | Vdc |
| Collector-Base Voltage BD676, BD676A BD678, BD678A BD680, BD680A BD682 | 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 | $^\circ\text{C}$ |

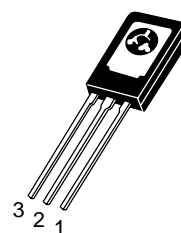
THERMAL CHARACTERISTICS

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

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

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

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



TO-225AA
CASE 77
STYLE 1

MARKING DIAGRAMS



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

ORDERING INFORMATION

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

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

| Characteristic | | Symbol | Min | Max | Unit |
|--|--|------------|-----------------------|------------------|-----------------|
| OFF CHARACTERISTICS | | | | | |
| Collector–Emitter Breakdown Voltage (Note 1) ($I_C = 50\text{ mAdc}$, $I_B = 0$) | 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 | 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) ($I_C = 1.5\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$) ($I_C = 2.0\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$) | BD676, 678, 680, 682 BD676A, 678A, 680A | h_{FE} | 750 750 | – – | – – |
| Collector–Emitter Saturation Voltage (Note 1) ($I_C = 1.5\text{ Adc}$, $I_B = 30\text{ mAdc}$) ($I_C = 2.0\text{ Adc}$, $I_B = 40\text{ mAdc}$) | BD678, 680, 682 BD676A, 678A, 680A | $V_{CE(sat)}$ | – – | 2.5 2.8 | Vdc |
| Base–Emitter On Voltage (Note 1) ($I_C = 1.5\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$) ($I_C = 2.0\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$) | 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 | – | – |
|---|--|----------|-----|---|---|

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

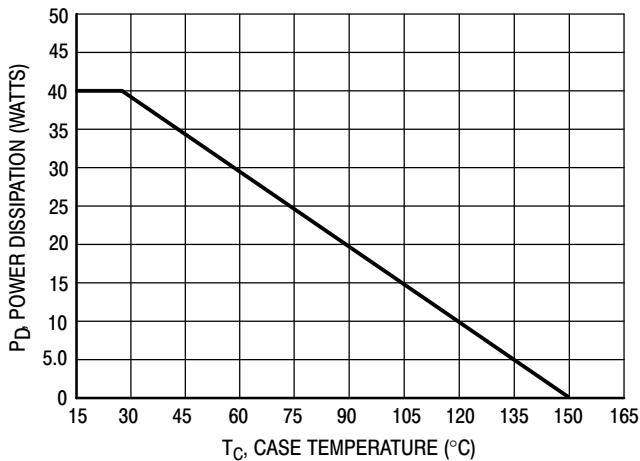


Figure 1. Power Temperature Derating

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.

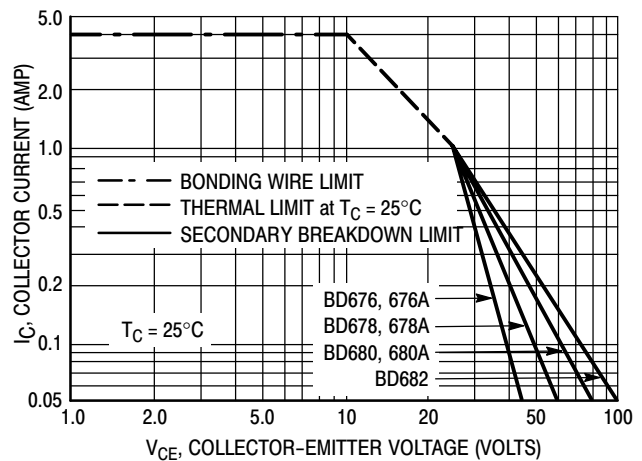


Figure 2. DC Safe Operating Area

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

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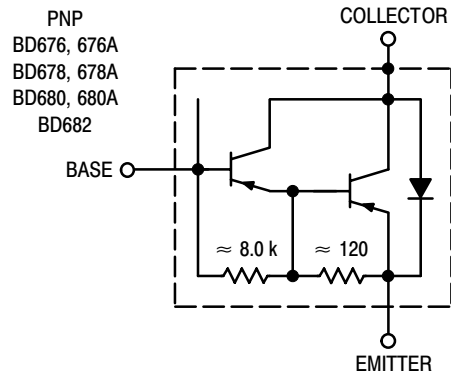


Figure 3. Darlington Circuit Schematic

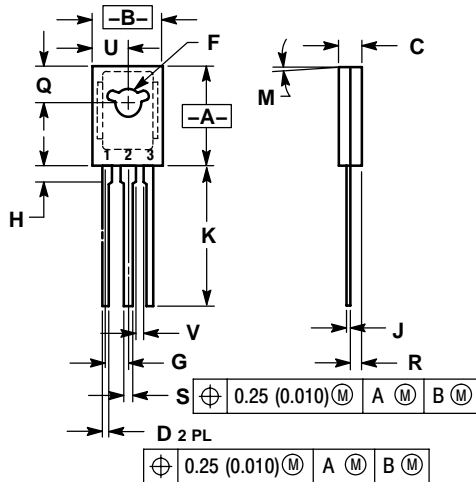
ORDERING INFORMATION

| Device | Package | Shipping |
|---------|-----------------------|-----------------|
| BD676 | TO-225AA | 500 Units / Box |
| BD676G | TO-225AA (Pb-Free) | 500 Units / Box |
| BD676A | TO-225AA | 500 Units / Box |
| BD676AG | TO-225AA (Pb-Free) | 500 Units / Box |
| BD678 | TO-225AA | 500 Units / Box |
| BD678G | TO-225AA (Pb-Free) | 500 Units / Box |
| BD678A | TO-225AA | 500 Units / Box |
| BD678AG | TO-225AA (Pb-Free) | 500 Units / Box |
| BD680 | TO-225AA | 500 Units / Box |
| BD680G | TO-225AA (Pb-Free) | 500 Units / Box |
| BD680A | TO-225AA | 500 Units / Box |
| BD680AG | TO-225AA (Pb-Free) | 500 Units / Box |
| BD682 | TO-225AA | 500 Units / Box |
| BD682G | TO-225AA (Pb-Free) | 500 Units / Box |
| BD682T | TO-225AA | 50 Units / Rail |
| BD682TG | TO-225AA (Pb-Free) | 50 Units / Rail |

BD676, BD676A, BD678, BD678A, BD680, BD680A, BD682, BD682T

PACKAGE DIMENSIONS

TO-225AA
CASE 77-09
ISSUE Z



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 077-01 THRU -08 OBSOLETE, NEW STANDARD 077-09.

| 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 | 0.065 | 1.15 | 1.65 |
| 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
- COLLECTOR
- BASE

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