



**THE DATASHEET OF
BD681G**



BD675G, BD675AG, BD677G, BD677AG, BD679G, BD679AG, BD681G

Plastic Medium-Power Silicon NPN Darlington

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

Features

- High DC Current Gain
- Monolithic Construction
- Complementary to BD676, 676A, 678, 678A, 680, 680A, 682
- BD677, 677A, 679, 679A are Equivalent to MJE 800, 801, 802, 803
- These Devices are Pb-Free and are RoHS Compliant*

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--|----------------|-----------------------|--------------------------|
| Collector-Emitter Voltage BD675G, BD675AG BD677G, BD677AG BD679G, BD679AG BD681G | V_{CEO} | 45 60 80 100 | Vdc |
| Collector-Base Voltage BD675G, BD675AG BD677G, BD677AG BD679G, BD679AG BD681G | V_{CBO} | 45 60 80 100 | Vdc |
| Emitter-Base Voltage | V_{EBO} | 5.0 | Vdc |
| Collector Current | I_C | 4.0 | Adc |
| Base Current | I_B | 1.0 | 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

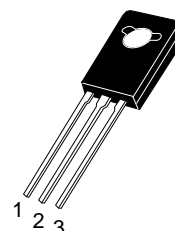
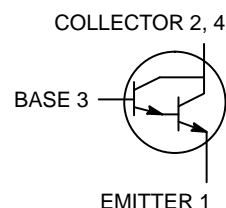
| Characteristic | Symbol | Max | Unit |
|--------------------------------------|-----------------|------|--------------------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 3.13 | $^\circ\text{C/W}$ |



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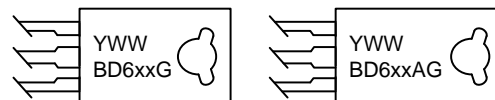
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**4.0 AMPERES
POWER TRANSISTORS
NPN SILICON
60, 80, 100 VOLTS, 40 WATTS**



TO-225
CASE 77-09
STYLE 1

MARKING DIAGRAMS



BD6xx/BD6xxA = Device Code
x = 75, 77, 79, 81
Y = Year
WW = Work Week
G = Pb-Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 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.

BD675G, BD675AG, BD677G, BD677AG, BD679G, BD679AG, BD681G

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

| Characteristic | Symbol | Min | Max | Unit |
|--|------------|-----------------------|------------|-----------------|
| OFF CHARACTERISTICS | | | | |
| Collector-Emitter Breakdown Voltage, (Note 1) ($I_C = 50\text{ mAdc}$, $I_B = 0$) BD675G, BD675AG BD677G, BD677AG BD679G, BD679AG BD681G | 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) ($I_C = 1.5\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$) BD675G, BD677G, BD679G, BD681G ($I_C = 2.0\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$) BD675AG, BD677AG, BD679AG | h_{FE} | 750 750 | - | - |
| Collector-Emitter Saturation Voltage, (Note 1) ($I_C = 1.5\text{ Adc}$, $I_B = 30\text{ mAdc}$) BD677G, BD679G, BD681G ($I_C = 2.0\text{ Adc}$, $I_B = 40\text{ mAdc}$) BD675AG, BD677AG, BD679AG | $V_{CE(sat)}$ | - | 2.5 2.8 | Vdc |
| Base-Emitter On Voltage, (Note 1) ($I_C = 1.5\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$) BD677G, BD679G, BD681G ($I_C = 2.0\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$) BD675AG, BD677AG, BD679AG | $V_{BE(on)}$ | - | 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 $\leq 2.0\%$.

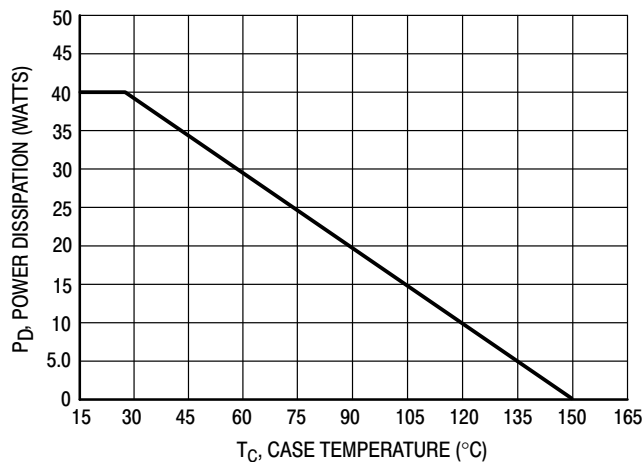


Figure 1. Power Temperature Derating

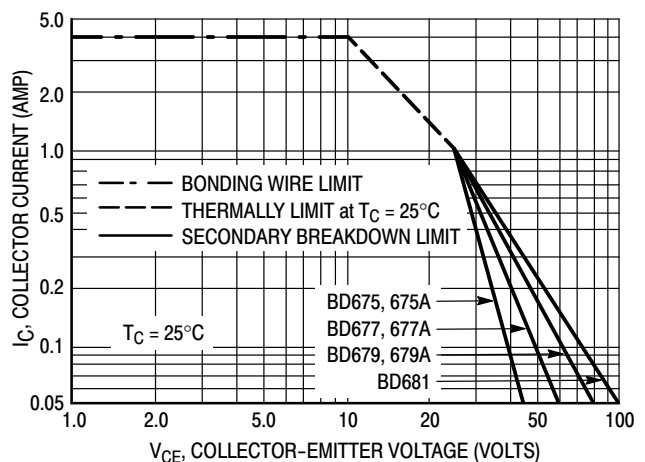


Figure 2. DC Safe Operating Area

BD675G, BD675AG, BD677G, BD677AG, BD679G, BD679AG, BD681G

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.

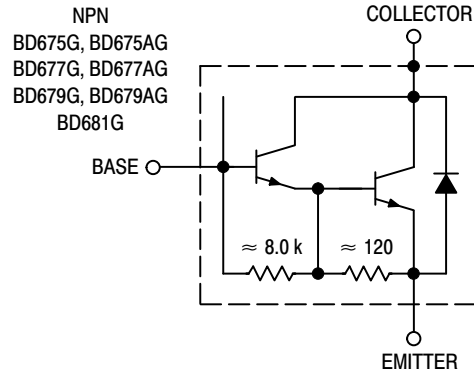


Figure 3. Darlington Circuit Schematic

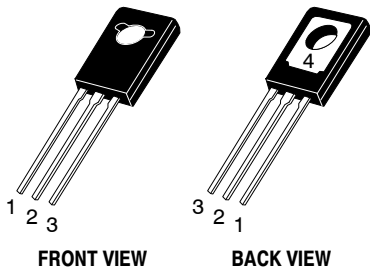
ORDERING INFORMATION

| Device | Package | Shipping |
|---------|---------------------|-----------------|
| BD675G | TO-225 (Pb-Free) | 500 Units / Box |
| BD675AG | TO-225 (Pb-Free) | 500 Units / Box |
| BD677G | TO-225 (Pb-Free) | 500 Units / Box |
| BD677AG | TO-225 (Pb-Free) | 500 Units / Box |
| BD679G | TO-225 (Pb-Free) | 500 Units / Box |
| BD679AG | TO-225 (Pb-Free) | 500 Units / Box |
| BD681G | TO-225 (Pb-Free) | 500 Units / Box |

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

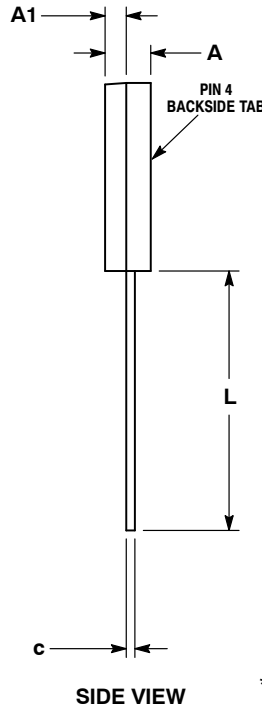
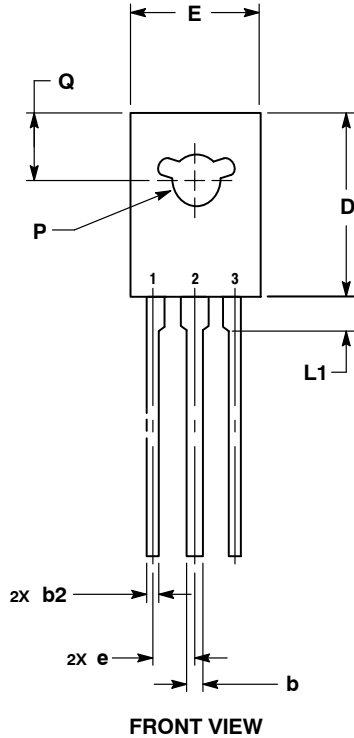
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CASE 77-09
ISSUE AD

DATE 25 MAR 2015

SCALE 1:1

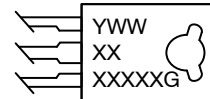


NOTES:

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 "•", may or may not be present.

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

| | | |
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| DESCRIPTION: | TO-225 | PAGE 1 OF 1 |

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