

BDX33B, BDX33C (NPN) BDX34B, BDX34C (PNP)



ON Semiconductor®

www.onsemi.com

Darlington Complementary Silicon Power Transistors

These devices are designed for general purpose and low speed switching applications.

Features

- High DC Current Gain – $h_{FE} = 2500$ (typ.) at $I_C = 4.0$
- Collector–Emitter Sustaining Voltage at 100 mAdc
 $V_{CEO(sus)} = 80$ Vdc (min) – BDX33B, BDX334B
 $= 100$ Vdc (min) – BDX33C, BDX334C
- Low Collector–Emitter Saturation Voltage
 $V_{CE(sat)} = 2.5$ Vdc (max) at $I_C = 3.0$ Adc
– BDX33B, 33C/34B, 34C
- Monolithic Construction with Build–In Base–Emitter Shunt Resistors
- These Devices are Pb–Free and are RoHS Compliant*

MAXIMUM RATINGS

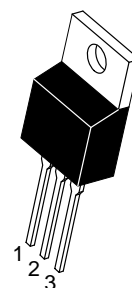
| Rating | Symbol | Value | Unit |
|--|----------------|-------------|--------------------------|
| Collector–Emitter Voltage BDX33B, BDX34B BDX33C, BDX34C | V_{CEO} | 80 100 | Vdc |
| Collector–Base Voltage BDX33B, BDX34B BDX33C, BDX34C | V_{CB} | 80 100 | Vdc |
| Emitter–Base Voltage | V_{EB} | 5.0 | Vdc |
| Collector Current Continuous Peak | I_C | 10 15 | Adc |
| Base Current | I_B | 0.25 | Adc |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 70 0.56 | W W/ $^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range | T_J, T_{stg} | –65 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

| Characteristics | Symbol | Max | Unit |
|--------------------------------------|-----------------|------|---------------------------|
| Thermal Resistance, Junction–to–Case | $R_{\theta JC}$ | 1.78 | $^\circ\text{C}/\text{W}$ |

DARLINGTON 10 AMPERE COMPLEMENTARY SILICON POWER TRANSISTORS 80–100 VOLTS, 65 WATTS



TO-220
CASE 221A
STYLE 1

MARKING DIAGRAM



BDX3xy = Device Code
x = 3 or 4
y = B or C
A = Assembly Location
Y = Year
WW = Work Week
G = Pb–Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 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.

BDX33B, BDX33C (NPN) BDX34B, BDX34C (PNP)

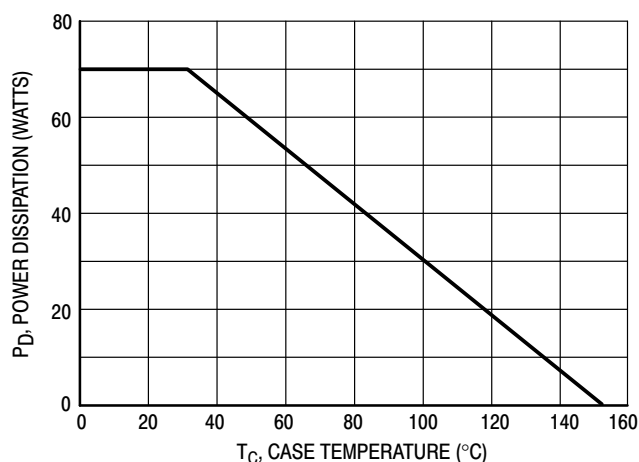


Figure 1. Power Derating

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

| Characteristic | Symbol | Min | Max | Unit | |
|---|---|-----------------------|-----------|------------|------|
| OFF CHARACTERISTICS | | | | | |
| Collector–Emitter Sustaining Voltage (Note 1) (I _C = 100 mAdc, I _B = 0) | BDX33B/BDX34B BDX33C/BDX34C | V _{CEO(sus)} | 80 100 | – – | Vdc |
| Collector–Emitter Sustaining Voltage (Note 1) (I _C = 100 mAdc, I _B = 0, R _{BE} = 100) | BDX33B/BDX34B BDX33C/BDX33C | V _{CER(sus)} | 80 100 | – – | Vdc |
| Collector–Emitter Sustaining Voltage (Note 1) (I _C = 100 mAdc, I _B = 0, V _{BE} = 1.5 Vdc) | BDX33B/BDX34B BDX33C/BDX34C | V _{CEX(sus)} | 80 100 | – – | Vdc |
| Collector Cutoff Current (V _{CE} = 1/2 rated V _{CEO} , I _B = 0) | T _C = 25°C T _C = 100°C | I _{CEO} | – – | 0.5 10 | mAdc |
| Collector Cutoff Current (V _{CB} = rated V _{CBO} , I _E = 0) | T _C = 25°C T _C = 100°C | I _{CBO} | – – | 1.0 5.0 | mAdc |
| Emitter Cutoff Current (V _{BE} = 5.0 Vdc, I _C = 0) | | I _{EBO} | – | 10 | mAdc |
| ON CHARACTERISTICS | | | | | |
| DC Current Gain (Note 1) (I _C = 3.0 Adc, V _{CE} = 3.0 Vdc) | BDX33B, 33C/34B, 34C | h _{FE} | 750 | – | – |
| Collector–Emitter Saturation Voltage (I _C = 3.0 Adc, I _B = 6.0 mAdc) | BDX33B, 33C/34B, 34C | V _{CE(sat)} | – | 2.5 | Vdc |
| Base–Emitter On Voltage (I _C = 3.0 Adc, V _{CE} = 3.0 Vdc) | BDX33B, 33C/34B, 34C | V _{BE(on)} | – | 2.5 | Vdc |
| Diode Forward Voltage (I _C = 8.0 Adc) | | V _F | – | 4.0 | Vdc |

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 ≤ 300 μs, Duty Cycle ≤ 2.0%.
2. Pulse Test non repetitive: Pulse Width = 0.25 seconds.

BDX33B, BDX33C (NPN) BDX34B, BDX34C (PNP)

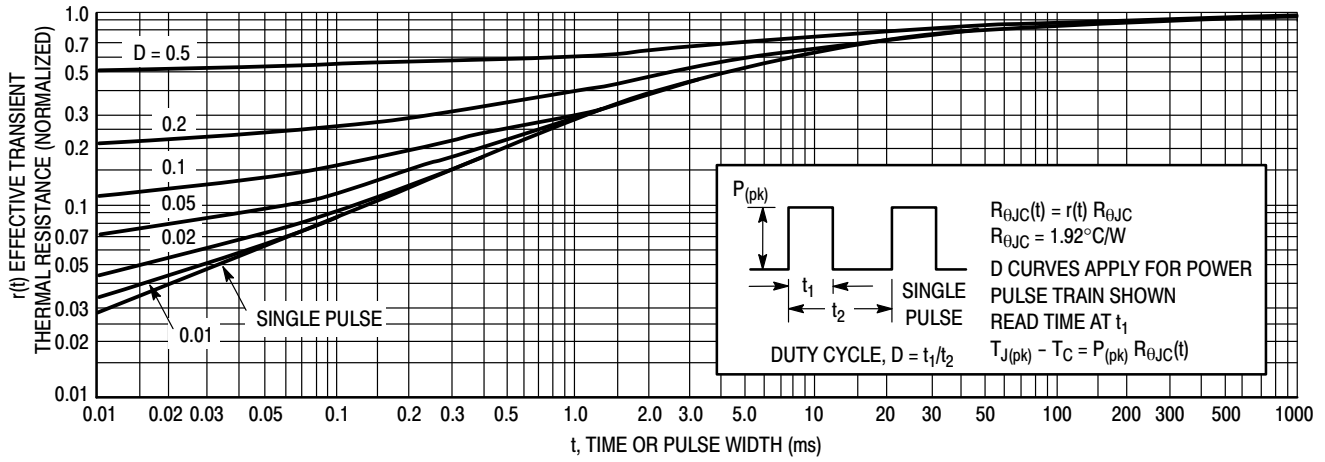


Figure 1. Thermal Response

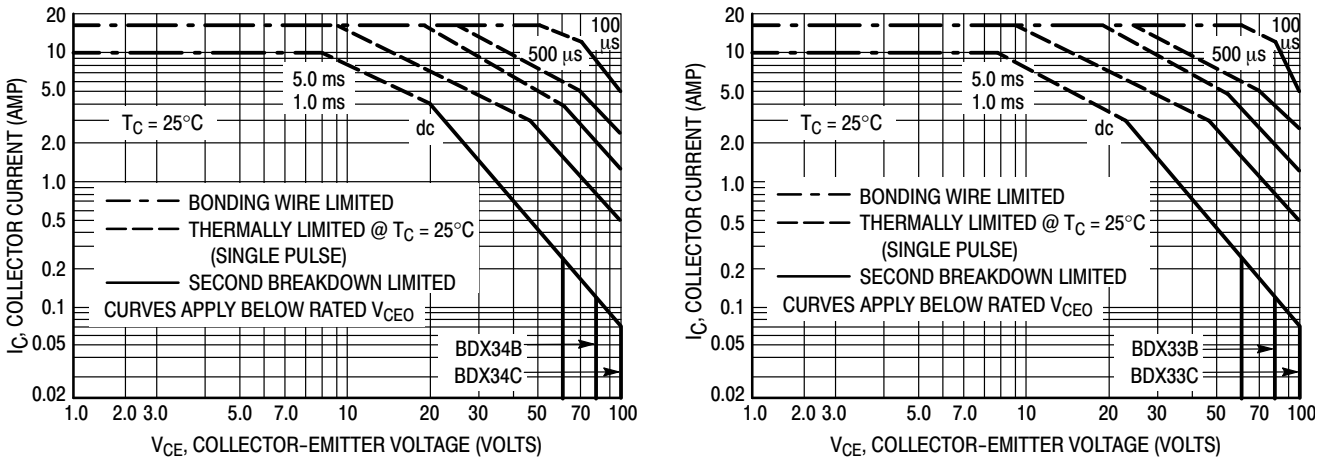


Figure 2. Active-Region Safe Operating Area

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate $I_C - V_{CE}$ limits of the transistor that must be observed for reliable operation, i.e., the transistor must not be subjected to greater dissipation than the curves indicate. The data of Figure 3 is based on $T_{J(pk)}$

= 150°C ; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} = 150^\circ\text{C}$. $T_{J(pk)}$ may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

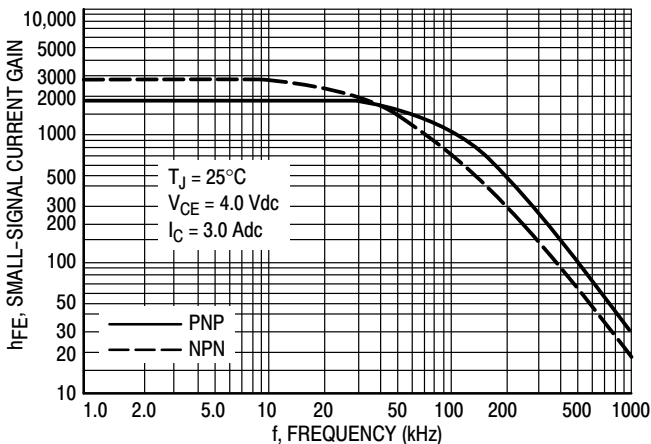


Figure 3. Small-Signal Current Gain

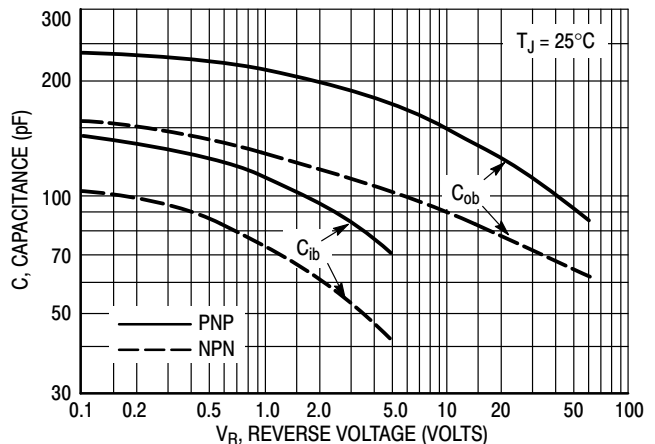


Figure 4. Capacitance

BDX33B, BDX33C (NPN) BDX34B, BDX34C (PNP)

NPN
BDX33B, 33C

PNP
BDX34B, 34C

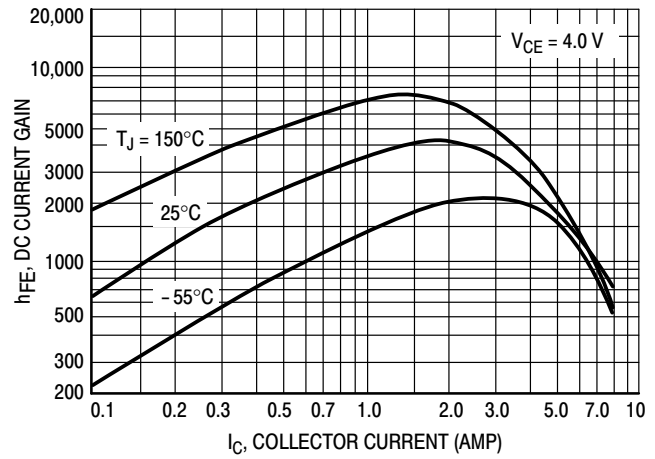
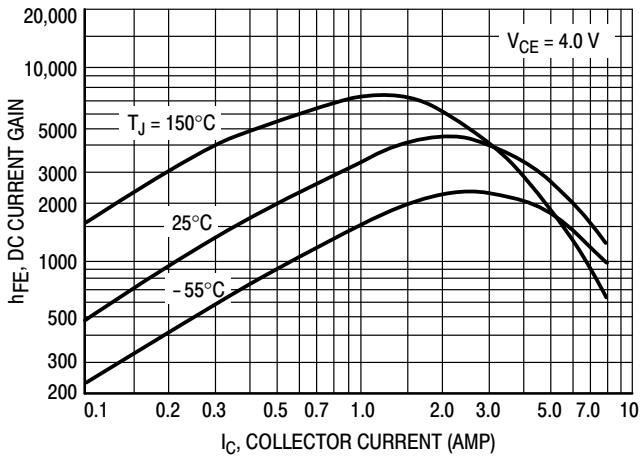


Figure 5. DC Current Gain

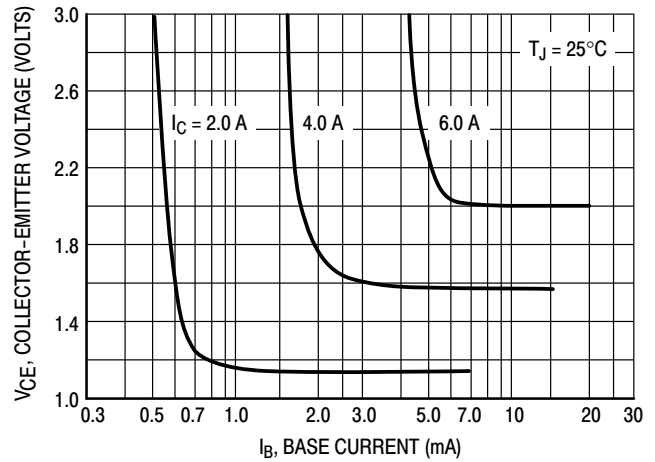
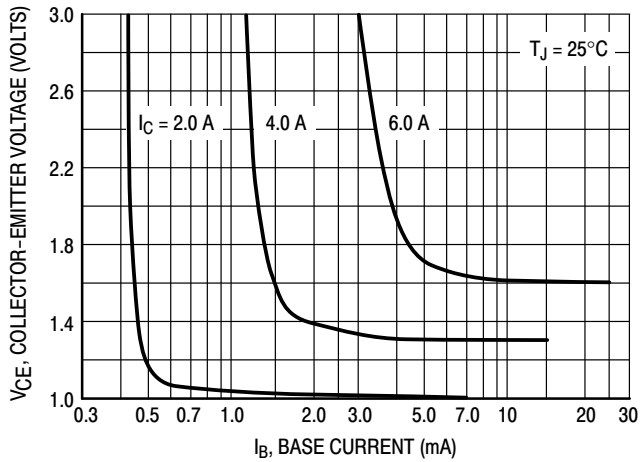


Figure 6. Collector Saturation Region

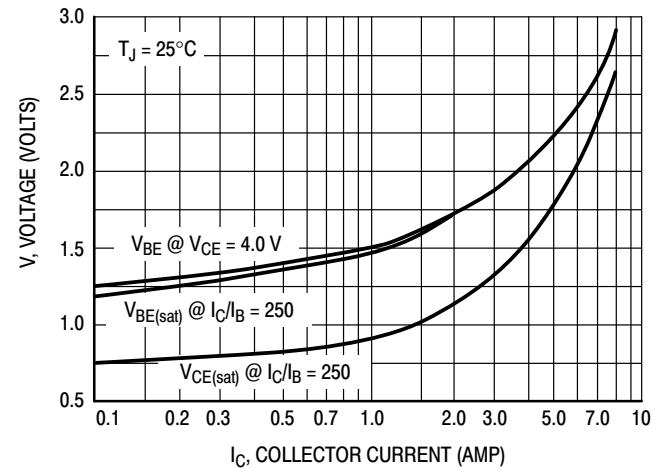
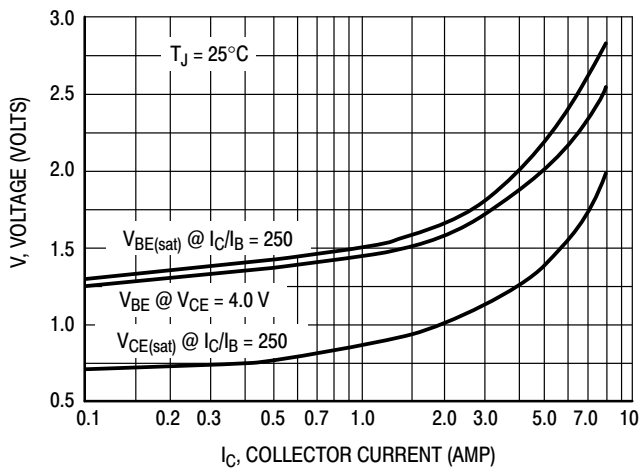


Figure 7. "On" Voltages

BDX33B, BDX33C (NPN) BDX34B, BDX34C (PNP)

ORDERING INFORMATION

| Device | Package | Shipping† |
|---------|---------------------|-----------------|
| BDX33BG | TO-220 (Pb-Free) | 50 Units / Rail |
| BDX33CG | TO-220 (Pb-Free) | 50 Units / Rail |
| BDX34BG | TO-220 (Pb-Free) | 50 Units / Rail |
| BDX34CG | TO-220 (Pb-Free) | 50 Units / Rail |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



TO-220 CASE 221A ISSUE AK

DATE 13 JAN 2022



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 2009.
 2. CONTROLLING DIMENSION: INCHES
 3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.
 4. MAX WIDTH FOR F102 DEVICE = 1.35MM

| DIM | INCHES | | MILLIMETERS | |
|-----|--------|-------|-------------|-------|
| | MIN. | MAX. | MIN. | MAX. |
| A | 0.570 | 0.620 | 14.48 | 15.75 |
| B | 0.380 | 0.415 | 9.66 | 10.53 |
| C | 0.160 | 0.190 | 4.07 | 4.83 |
| D | 0.025 | 0.038 | 0.64 | 0.96 |
| F | 0.142 | 0.161 | 3.60 | 4.09 |
| G | 0.095 | 0.105 | 2.42 | 2.66 |
| H | 0.110 | 0.161 | 2.80 | 4.10 |
| J | 0.014 | 0.024 | 0.36 | 0.61 |
| K | 0.500 | 0.562 | 12.70 | 14.27 |
| L | 0.045 | 0.060 | 1.15 | 1.52 |
| N | 0.190 | 0.210 | 4.83 | 5.33 |
| Q | 0.100 | 0.120 | 2.54 | 3.04 |
| R | 0.080 | 0.110 | 2.04 | 2.79 |
| S | 0.045 | 0.055 | 1.15 | 1.41 |
| T | 0.235 | 0.255 | 5.97 | 6.47 |
| U | 0.000 | 0.050 | 0.00 | 1.27 |
| V | 0.045 | --- | 1.15 | --- |
| Z | --- | 0.080 | --- | 2.04 |

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

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

STYLE 3:
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE

STYLE 4:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. MAIN TERMINAL 2

STYLE 5:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

STYLE 6:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE

STYLE 7:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. ANODE

STYLE 8:
PIN 1. CATHODE
2. ANODE
3. EXTERNAL TRIP/DELAY
4. ANODE

STYLE 9:
PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 10:
PIN 1. GATE
2. SOURCE
3. DRAIN
4. SOURCE

STYLE 11:
PIN 1. DRAIN
2. SOURCE
3. GATE
4. SOURCE

STYLE 12:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. NOT CONNECTED

| | | |
|------------------|-------------|--|
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| DESCRIPTION: | TO-220 | PAGE 1 OF 1 |

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