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

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°C Derate above 25°C	P_D	70 0.56	W W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +150	°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	°C/W

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

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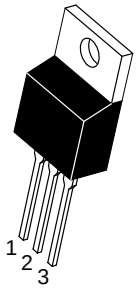
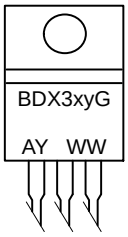
DARLINGTON
10 AMPERE
COMPLEMENTARY SILICON
POWER TRANSISTORS
80−100 VOLTS, 65 WATTS



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.

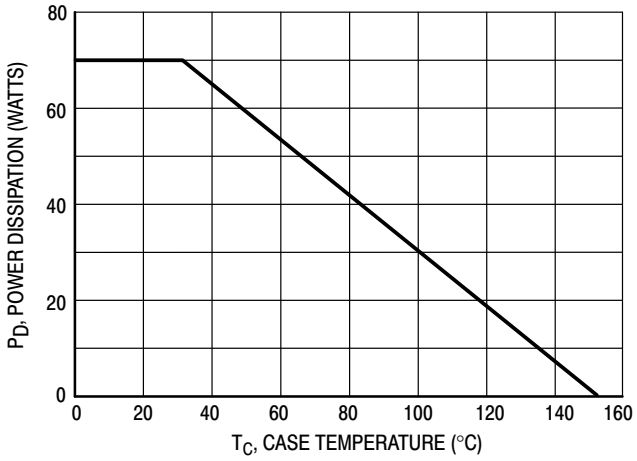


Figure 1. Power Derating

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.

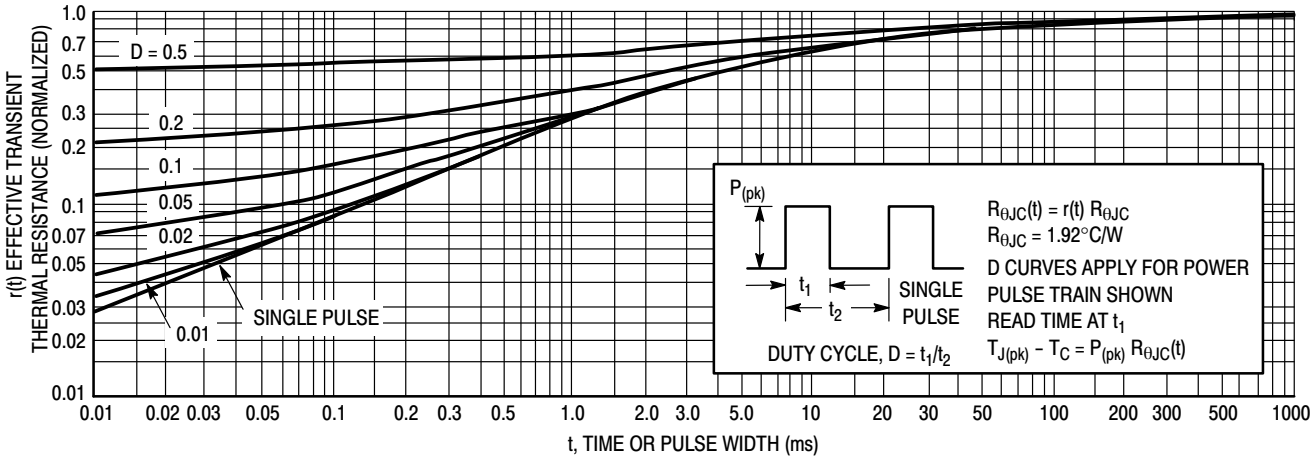


Figure 1. Thermal Response

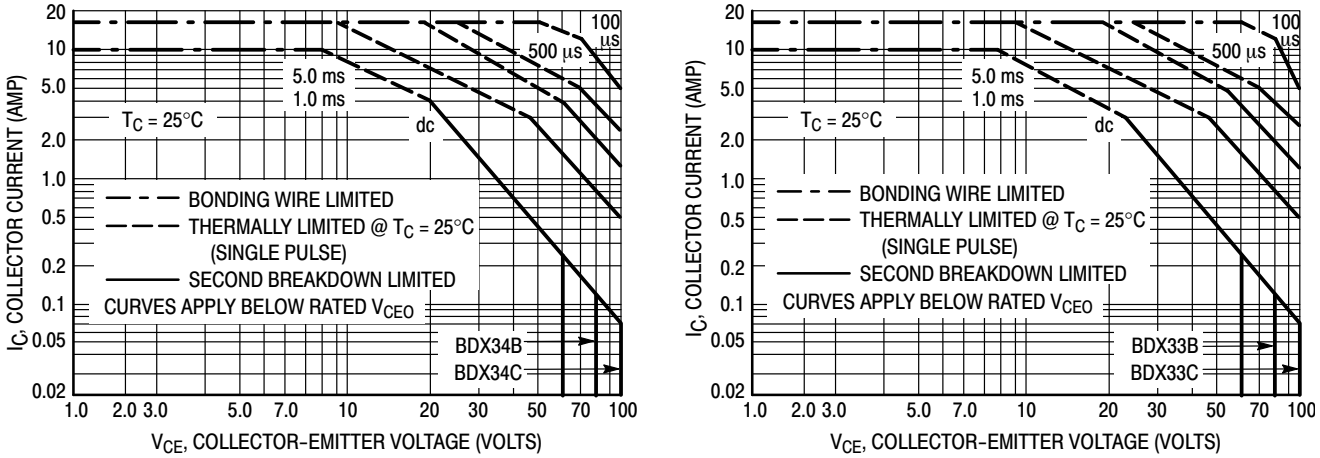


Figure 2. Active−Region Safe Operating Area

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°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.

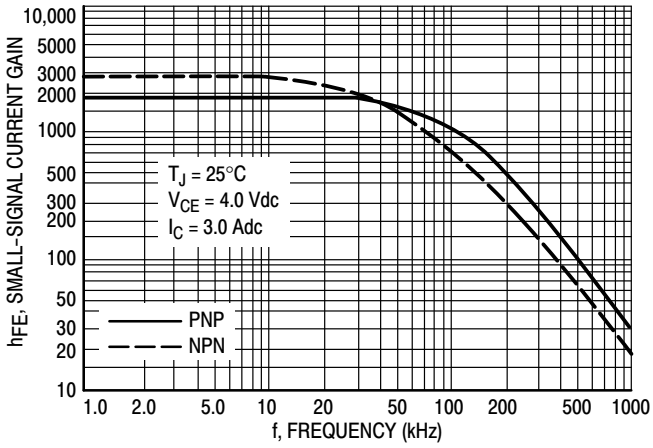


Figure 3. Small−Signal Current Gain

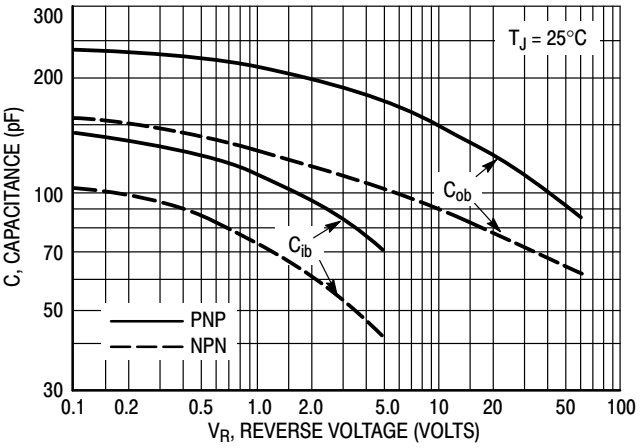


Figure 4. Capacitance

NPN
BDX33B, 33C

PNP
BDX34B, 34C

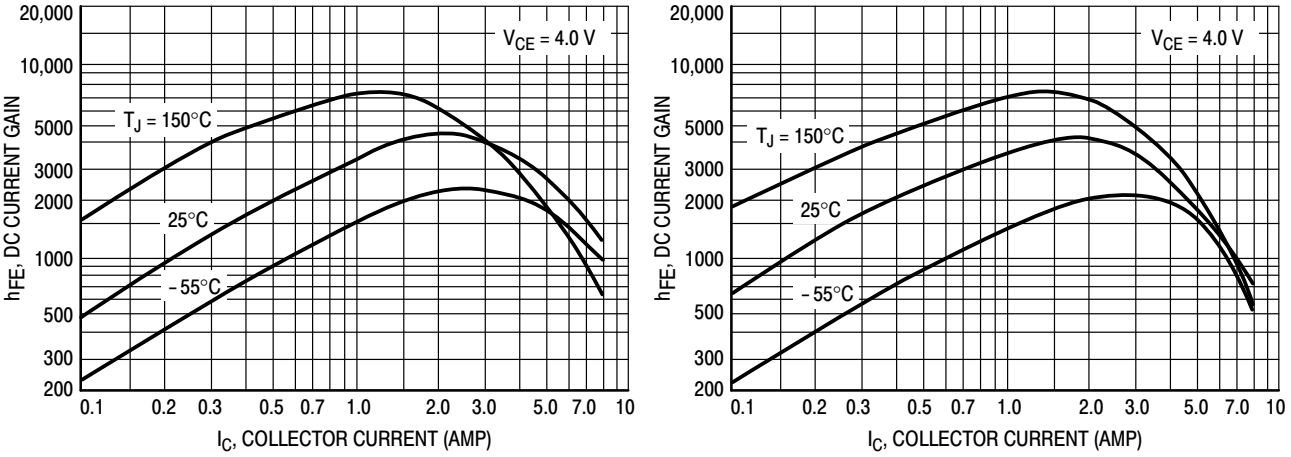


Figure 5. DC Current Gain

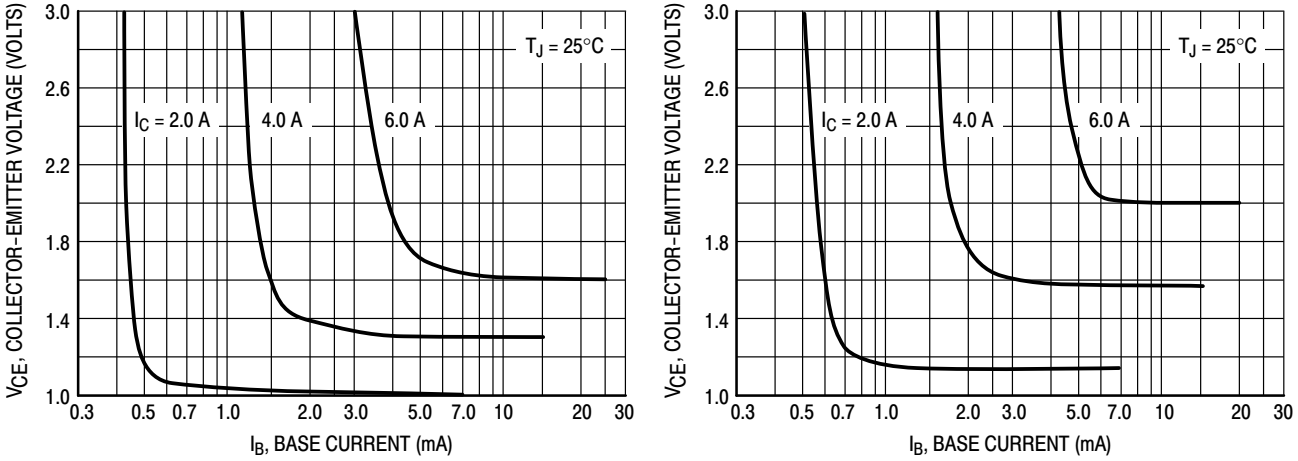


Figure 6. Collector Saturation Region

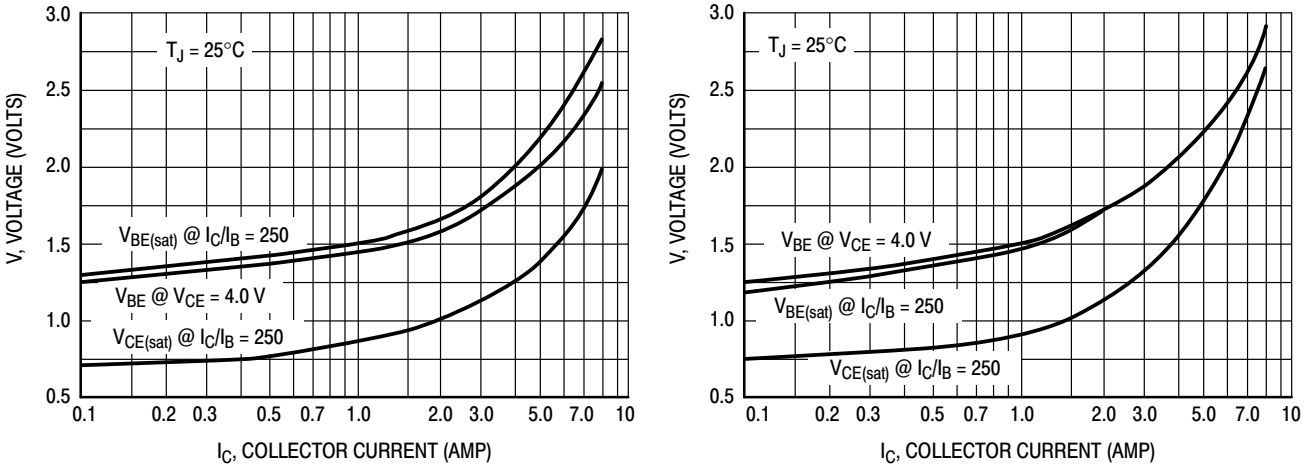


Figure 7. “On” Voltages

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

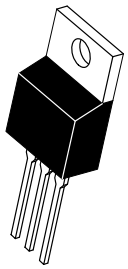
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

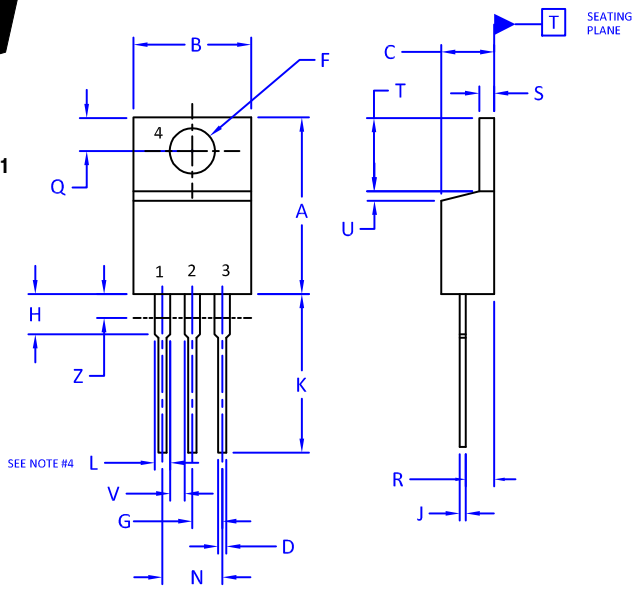
ON Semiconductor®

TO−220
CASE 221A−09
ISSUE AJ

DATE 05 NOV 2019



SCALE 1:1



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

	INCHES		MILLIMETERS	
DIM	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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PUBLICATION ORDERING INFORMATION

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