

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



ON Semiconductor®

<http://onsemi.com>

Darlington Complementary Silicon Power Transistors

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

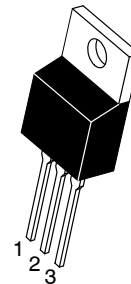
Features

- 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
- Pb–Free Packages are Available*

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

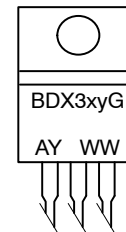
MAXIMUM RATINGS

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	A dc
Base Current	I_B	0.25	A dc
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	$^\circ\text{C}$



TO-220AB
CASE 221A-09
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

THERMAL CHARACTERISTICS

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

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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)

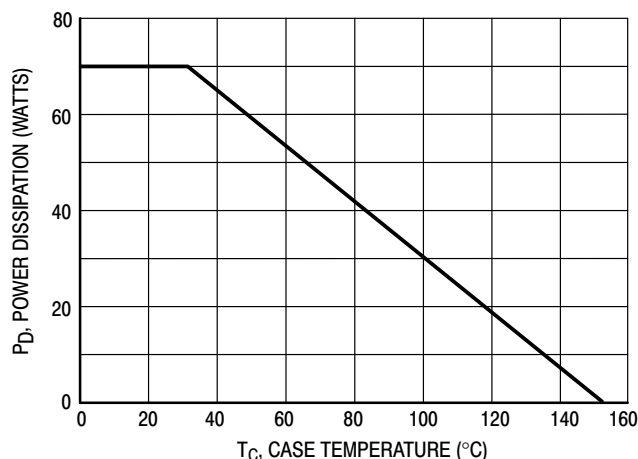


Figure 1. Power Derating

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

Characteristic	Symbol	Min	Max	Unit	
OFF CHARACTERISTICS					
Collector–Emitter Sustaining Voltage (Note 1) ($I_C = 100\text{ mAdc}$, $I_B = 0$)	BDX33B/BDX34B BDX33C/BDX34C	$V_{CEO(sus)}$	80 100	– –	Vdc
Collector–Emitter Sustaining Voltage (Note 1) ($I_C = 100\text{ mAdc}$, $I_B = 0$, $R_{BE} = 100$)	BDX33B/BDX34B BDX33C/BDX33C	$V_{CER(sus)}$	80 100	– –	Vdc
Collector–Emitter Sustaining Voltage (Note 1) ($I_C = 100\text{ mAdc}$, $I_B = 0$, $V_{BE} = 1.5\text{ Vdc}$)	BDX33B/BDX34B BDX33C/BDX34C	$V_{CEX(sus)}$	80 100	– –	Vdc
Collector Cutoff Current ($V_{CE} = 1/2$ rated V_{CEO} , $I_B = 0$)	$T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	I_{CEO}	– –	0.5 10	mAdc
Collector Cutoff Current ($V_{CB} =$ rated V_{CBO} , $I_E = 0$)	$T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	I_{CBO}	– –	1.0 5.0	mAdc
Emitter Cutoff Current ($V_{BE} = 5.0\text{ Vdc}$, $I_C = 0$)		I_{EBO}	–	10	mAdc
ON CHARACTERISTICS					
DC Current Gain (Note 1) ($I_C = 3.0\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$)	BDX33B, 33C/34B, 34C	h_{FE}	750	–	–
Collector–Emitter Saturation Voltage ($I_C = 3.0\text{ Adc}$, $I_B = 6.0\text{ mAdc}$)	BDX33B, 33C/34B, 34C	$V_{CE(sat)}$	–	2.5	Vdc
Base–Emitter On Voltage ($I_C = 3.0\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$)	BDX33B, 33C/34B, 34C	$V_{BE(on)}$	–	2.5	Vdc
Diode Forward Voltage ($I_C = 8.0\text{ Adc}$)		V_F	–	4.0	Vdc

1. Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2.0\%$.
2. Pulse Test non repetitive: Pulse Width = 0.25 seconds.

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

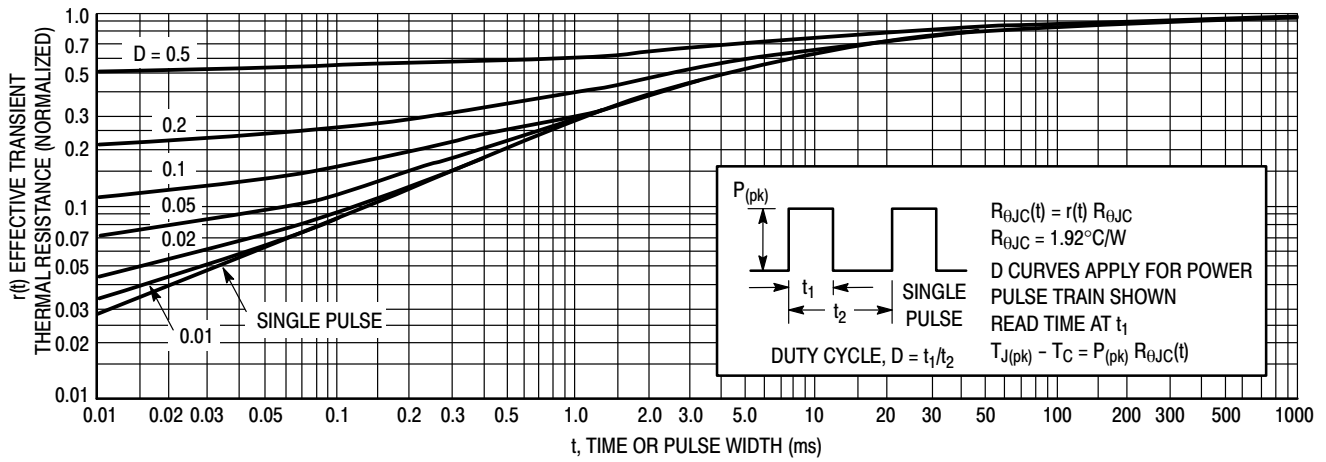


Figure 1. Thermal Response

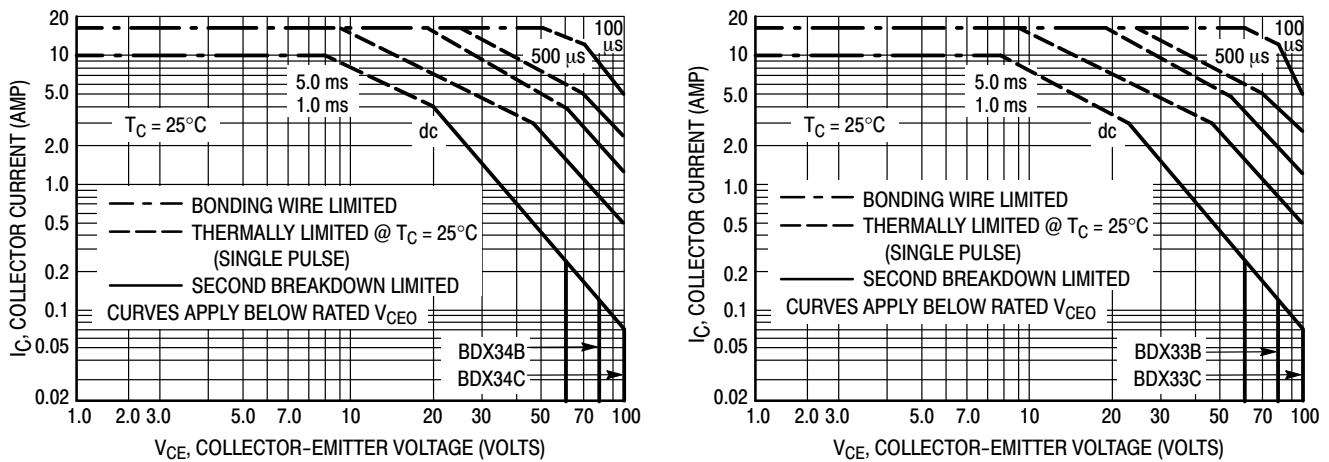


Figure 2. Active-Region Safe Operating Area

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 $T_{J(pk)}$

$= 150^\circ\text{C}$; 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.

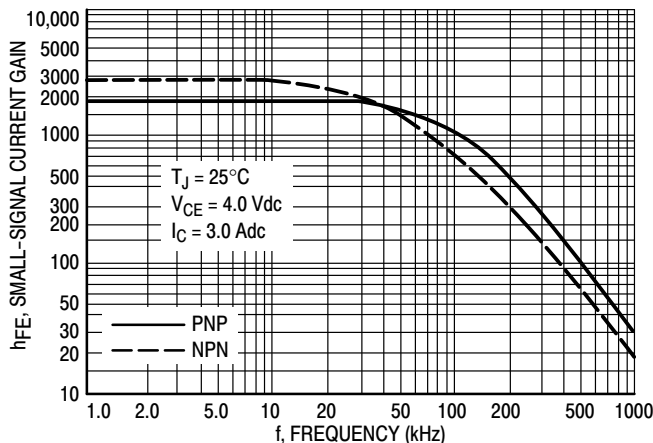


Figure 3. Small-Signal Current Gain

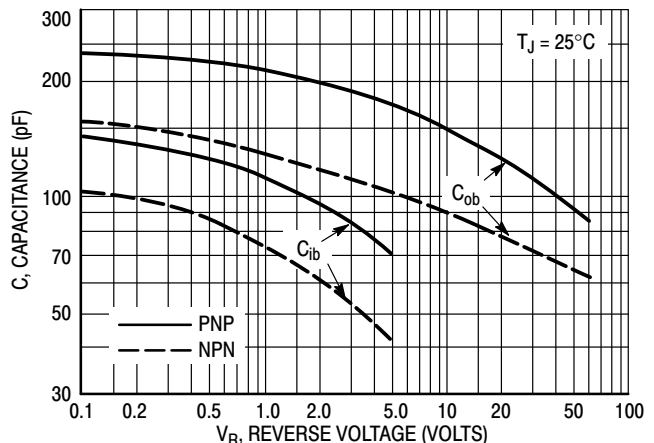


Figure 4. Capacitance

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

NPN
BDX33B, 33C

PNP
BDX34B, 34C

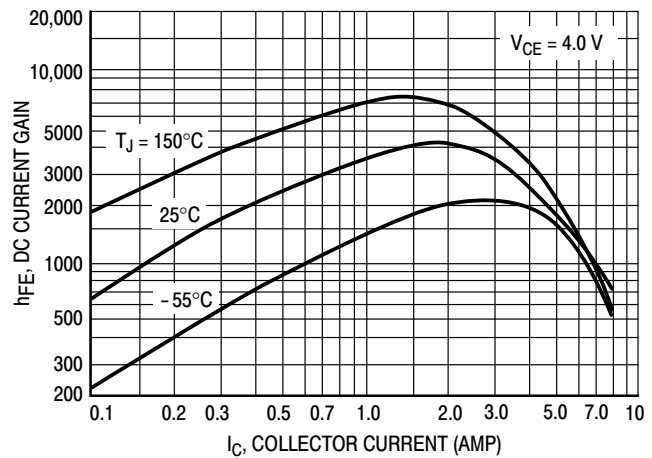
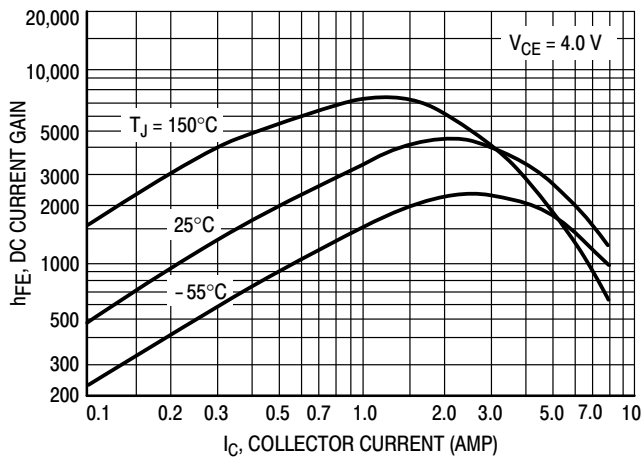


Figure 5. DC Current Gain

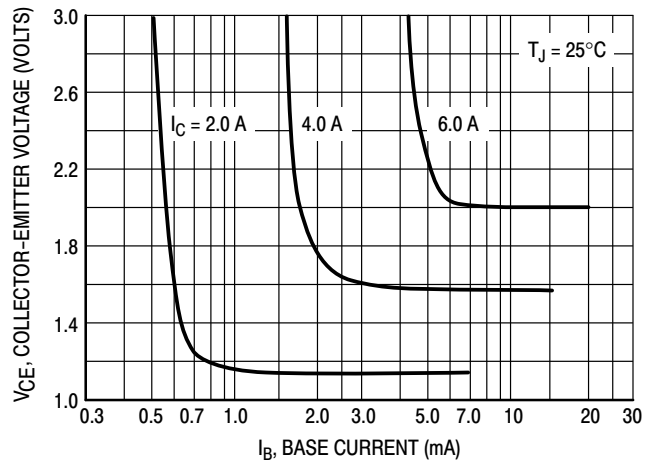
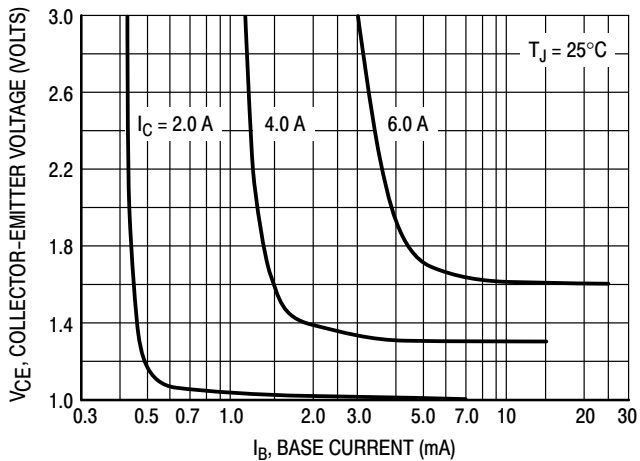


Figure 6. Collector Saturation Region

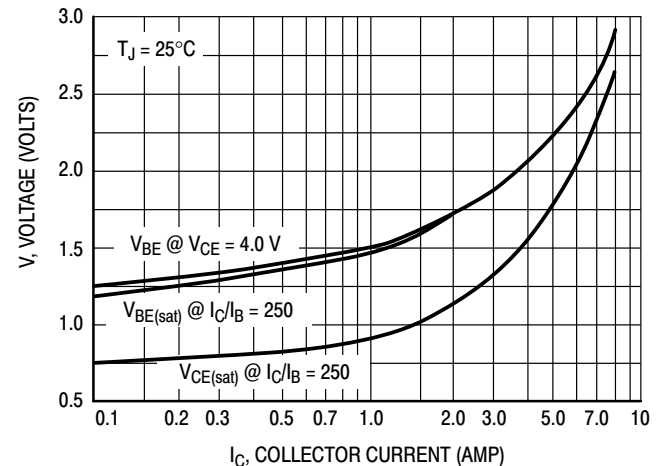
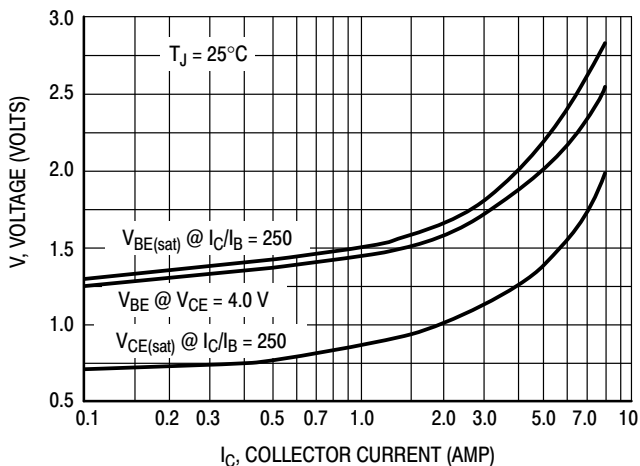


Figure 7. "On" Voltages

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

ORDERING INFORMATION

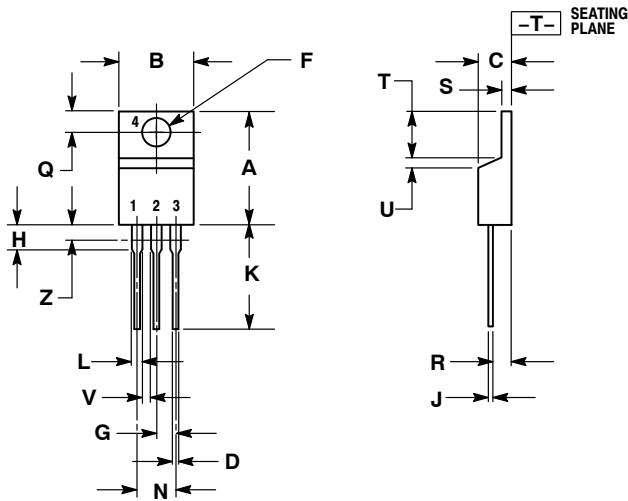
Device	Package	Shipping†
BDX33B	TO-220	50 Units / Rail
BDX33BG	TO-220 (Pb-Free)	
BDX33C	TO-220	50 Units / Rail
BDX33CG	TO-220 (Pb-Free)	
BDX34B	TO-220	50 Units / Rail
BDX34BG	TO-220 (Pb-Free)	
BDX34C	TO-220	50 Units / Rail
BDX34CG	TO-220 (Pb-Free)	

†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.

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

PACKAGE DIMENSIONS

TO-220
CASE 221A-09
ISSUE AG



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.036	0.64	0.91
F	0.142	0.161	3.61	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.161	2.80	4.10
J	0.014	0.025	0.36	0.64
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	1.39
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

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