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



ON Semiconductor®

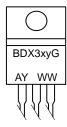
www.onsemi.com

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 4y = B or C

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.

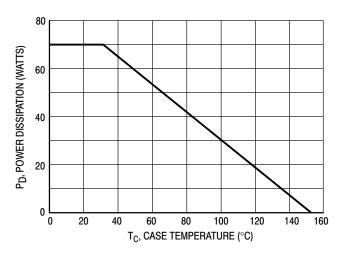


Figure 1. Power Derating

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

Characteristic	Symbol	Min	Max	Unit	
OFF CHARACTERISTICS					
Collector–Emitter Sustaining Voltage (Note 1) $(I_C = 100 \text{ mAdc}, I_B = 0)$	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) $(I_C = 100 \text{ mAdc}, I_B = 0, V_{BE} = 1.5 \text{ Vdc})$	BDX33B/BDX34B BDX33C/BDX34C	V _{CEX(sus)}	80 100	_ _	Vdc
Collector Cutoff Current $(V_{CE} = 1/2 \text{ rated } V_{CEO}, I_B = 0)$	$T_{C} = 25^{\circ}C$ $T_{C} = 100^{\circ}C$	I _{CEO}	- -	0.5 10	mAdc
Collector Cutoff Current $(V_{CB} = \text{rated } V_{CBO}, I_E = 0)$	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) $(I_C = 3.0 \text{ Adc}, V_{CE} = 3.0 \text{ Vdc})$	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 ($I_C = 3.0 \text{ Adc}$, $V_{CE} = 3.0 \text{ Vdc}$)	BDX33B, 33C/34B, 34C	V _{BE(on)}	_	2.5	Vdc
Diode Forward Voltage (I _C = 8.0 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 \leq 300 μ s, Duty Cycle \leq 2.0%.

^{2.} Pulse Test non repetitive: Pulse Width = 0.25 seconds.

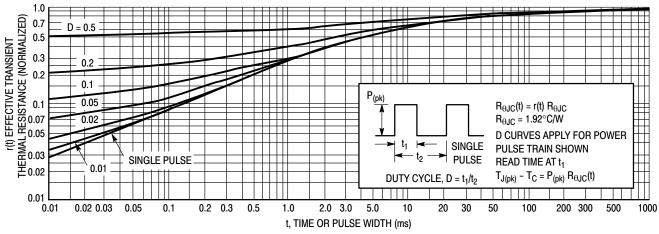


Figure 1. Thermal Response

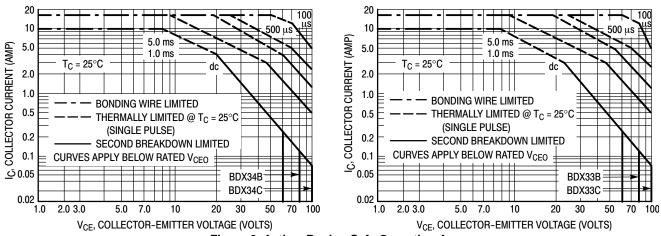
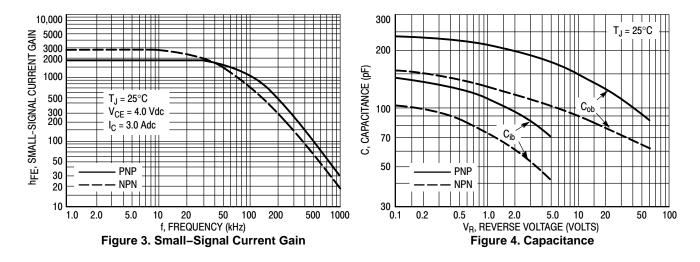


Figure 2. Active-Region Safe Operating Area

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 $T_{J(pk)} = 150^{\circ}$ 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.



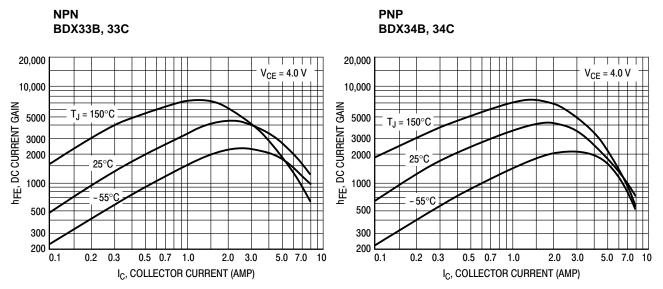


Figure 5. DC Current Gain

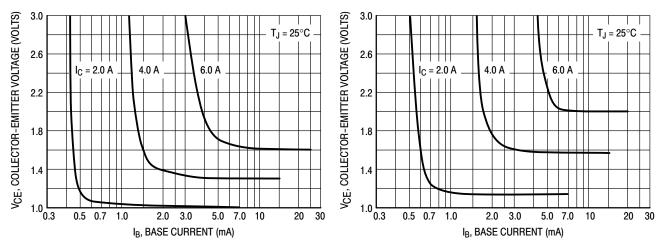


Figure 6. Collector Saturation Region

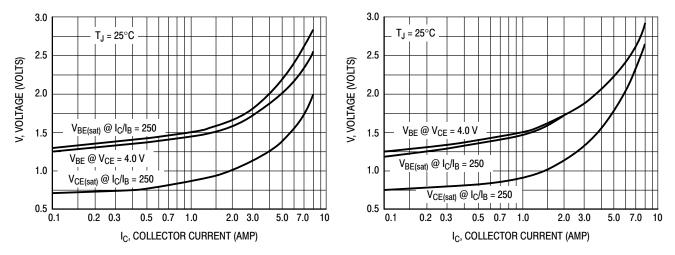


Figure 7. "On" Voltages

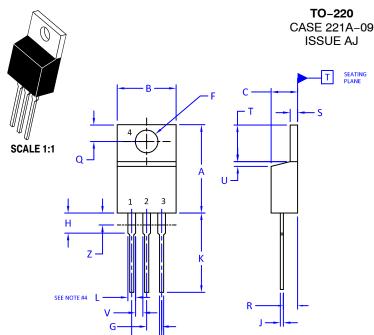
ORDERING INFORMATION

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





DATE 05 NOV 2019

- 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 2009.
- 2. CONTROLLING DIMENSION: INCHES

NOTES:

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.
Α	0.570	0.620	14.48	15.75
В	0.380	0.415	9.66	10.53
С	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
Н	0.110	0.161	2.80	4.10
J	0.014	0.024	0.36	0.61
К	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
Т	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:		STYLE 2:		STYLE 3:		STYLE 4:	
PIN 1.	BASE	PIN 1.	BASE	PIN 1.	CATHODE	PIN 1.	MAIN TERMINAL 1
2.	COLLECTOR	2.	EMITTER	2.	ANODE	2.	MAIN TERMINAL 2
3.	EMITTER	3.	COLLECTOR	3.	GATE	3.	GATE
4.	COLLECTOR	4.	EMITTER	4.	ANODE	4.	MAIN TERMINAL 2
STYLE 5:		STYLE 6:		STYLE 7:		STYLE 8:	
PIN 1.	GATE	PIN 1.	ANODE	PIN 1.	CATHODE	PIN 1.	CATHODE
2.	DRAIN	2.	CATHODE	2.	ANODE	2.	ANODE
3.	SOURCE	3.	ANODE	3.	CATHODE	3.	EXTERNAL TRIP/DELA
4.	DRAIN	4.	CATHODE	4.	ANODE	4.	ANODE
STYLE 9:		STYLE 10:		STYLE 11:		STYLE 12	:
PIN 1.	GATE	PIN 1.	GATE	PIN 1.	DRAIN	PIN 1.	MAIN TERMINAL 1
2.	COLLECTOR	2.	SOURCE	2.	SOURCE	2.	MAIN TERMINAL 2
3.	EMITTER	3.	DRAIN	3.	GATE	3.	GATE
4.	COLLECTOR	4.	SOURCE	4.	SOURCE	4.	NOT CONNECTED

DOCUMENT NUMBER:	98ASB42148B	Electronic versions are uncontrolled except when accessed directly from the Document Reposito Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.		
DESCRIPTION:	TO-220		PAGE 1 OF 1	

ON Semiconductor and III are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

ON Semiconductor and the are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor and see no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Email Requests to: orderlit@onsemi.com

ON Semiconductor Website: www.onsemi.com

TECHNICAL SUPPORT North American Technical Support: Voice Mail: 1 800-282-9855 Toll Free USA/Canada Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative