BDX53B, BDX53C (NPN), BDX54B, BDX54C (PNP)

Plastic Medium-Power Complementary Silicon Transistors

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

Features

- High DC Current Gain −
  h_{FE} = 2500 (Typ) @ I_C = 4.0 Adc
- Collector Emitter Sustaining Voltage − @ 100 mAdc
  $V_{CEO(sus)}$ = 80 Vdc (Min) − BDX53B, 54B
  = 100 Vdc (Min) − BDX53C, 54C
- Low Collector−Emitter Saturation Voltage −
  $V_{CE(sat)}$ = 2.0 Vdc (Max) @ I_C = 3.0 Adc
  = 4.0 Vdc (Max) @ I_C = 5.0 Adc
- Monolithic Construction with Built−In Base−Emitter Shunt Resistors
- Pb−Free Packages are Available*

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector−Emitter Voltage BDX53B, BDX54B BDX53C, BDX54C	V_{CEO}	 80 100	Vdc
Collector−Base Voltage BDX53B, BDX54B BDX53C, BDX54C	V_{CB}	 80 100	Vdc
Emitter−Base Voltage	V_{EB}	5.0	Vdc
Collector Current − Continuous − Peak	I_C	8.0 12	Adc
Base Current	I_B	0.2	Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	65 0.48	W W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	70	°C/W
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	1.92	°C/W

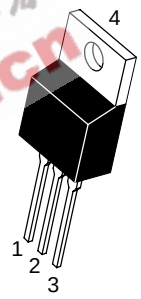
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

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

ON Semiconductor®

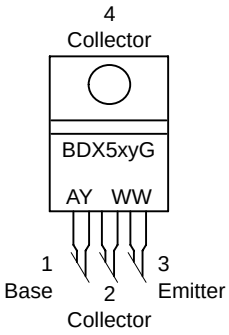
http://onsemi.com

DARLINGTON 8 AMPERE COMPLEMENTARY SILICON POWER TRANSISTORS 80−100 VOLTS, 65 WATTS



TO−220AB
CASE 221A
STYLE 1

MARKING DIAGRAM & PIN ASSIGNMENT



BDX5xy = 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 6 of this data sheet.

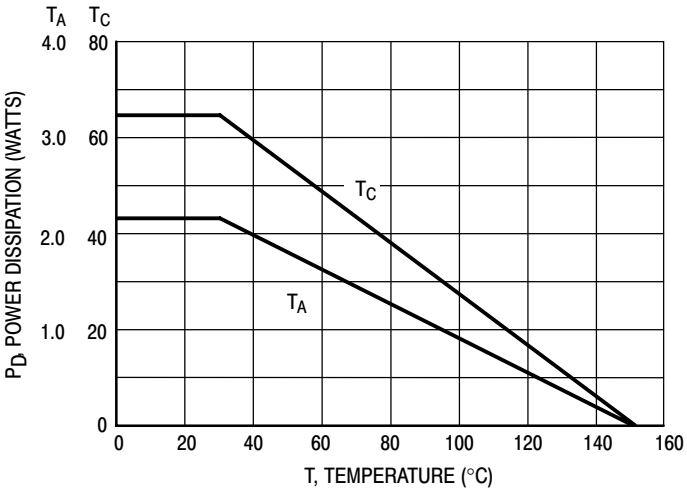


Figure 1. Power Derating

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)	BDX53B, BDX54B BDX53C, BDX54C	$V_{CEO(sus)}$	 80 100	 − −	Vdc
Collector Cutoff Current (V_{CE} = 40 Vdc, I_B = 0) (V_{CE} = 50 Vdc, I_B = 0)	 BDX53B, BDX54B BDX53C, BDX54C	I_{CEO}	 − −	 0.5 0.5	mAdc
Collector Cutoff Current (V_{CB} = 80 Vdc, I_E = 0) (V_{CB} = 100 Vdc, I_E = 0)	 BDX53B, BDX54B BDX53C, BDX54C	I_{CBO}	 − −	 0.2 0.2	mAdc
ON CHARACTERISTICS (Note 1)					
DC Current Gain (I_C = 3.0 Adc, V_{CE} = 3.0 Vdc)		h_{FE}	750	−	−
Collector−Emitter Saturation Voltage (I_C = 3.0 Adc, I_B = 12 mAdc)		$V_{CE(sat)}$	− −	2.0 4.0	Vdc
Base−Emitter Saturation Voltage (I_C = 3.0 Adc, I_C = 12 mA)		$V_{BE(sat)}$	−	2.5	Vdc
DYNAMIC CHARACTERISTICS					
Small−Signal Current Gain (I_C = 3.0 Adc, V_{CE} = 4.0 Vdc, f = 1.0 MHz)		h_{fe}	4.0	−	−
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 0.1 MHz)	 BDX53B, 53C BDX54B, 54C	C_{ob}	 − −	 300 200	pF

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

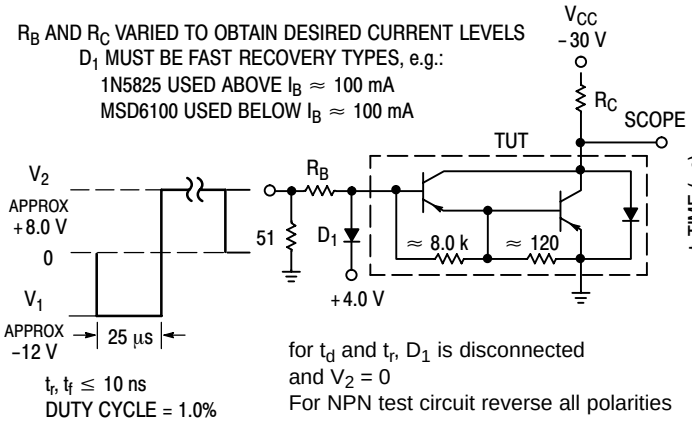


Figure 2. Switching Time Test Circuit

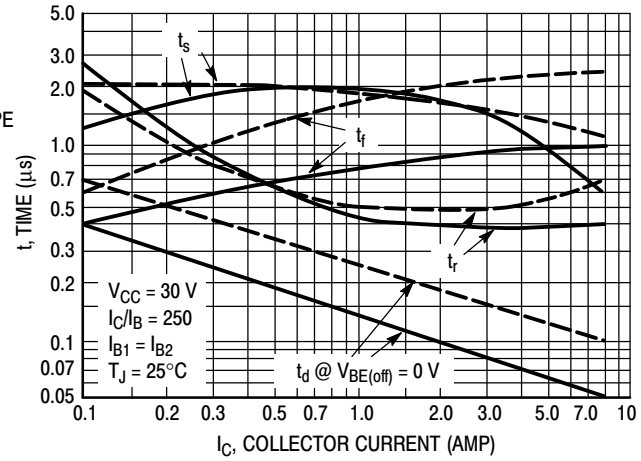


Figure 3. Switching Times

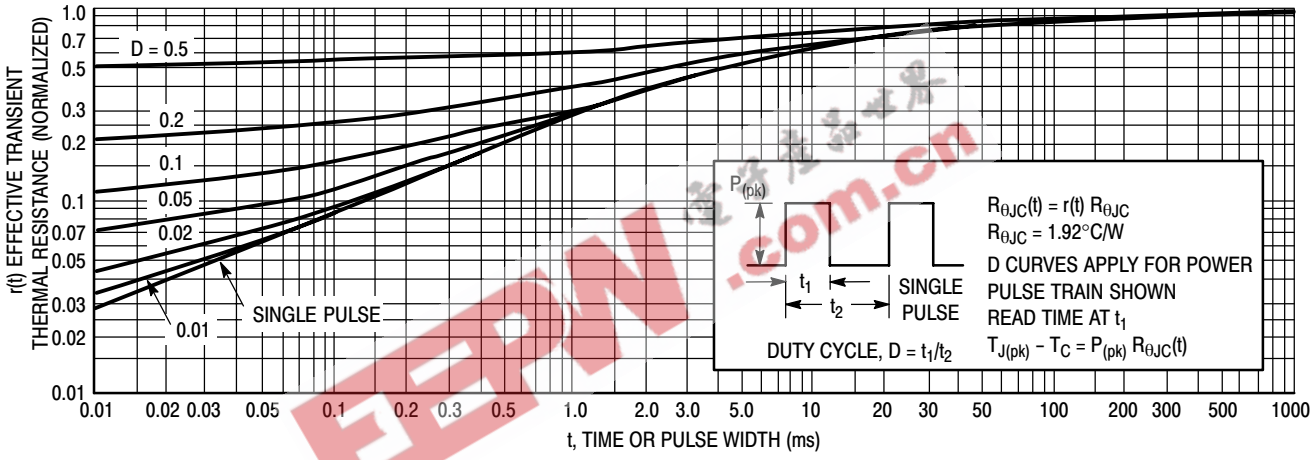


Figure 4. Thermal Response

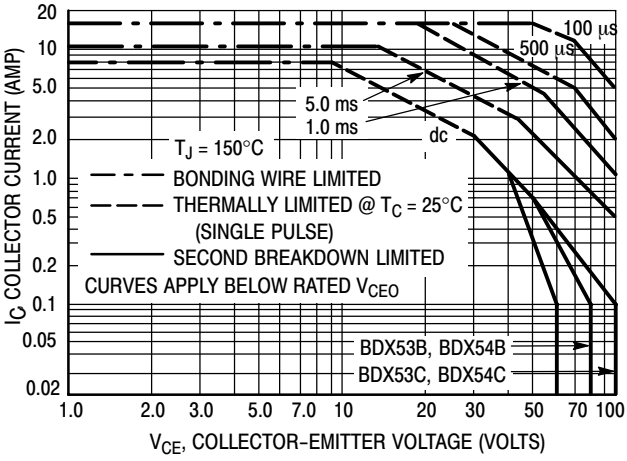


Figure 5. Active−Region Safe Operating Area

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 5 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.

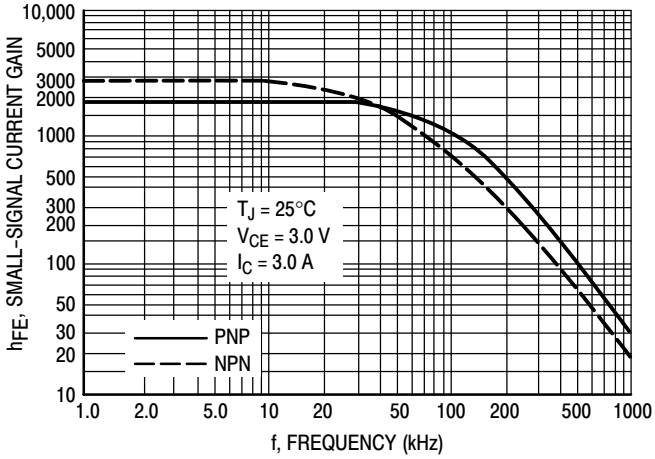


Figure 6. Small-Signal Current Gain

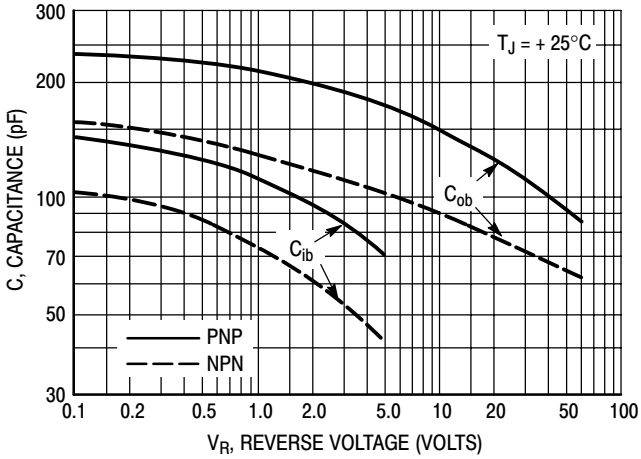


Figure 7. Capacitance

NPN
BDX53B, 53C

PNP
BDX54B, 54C

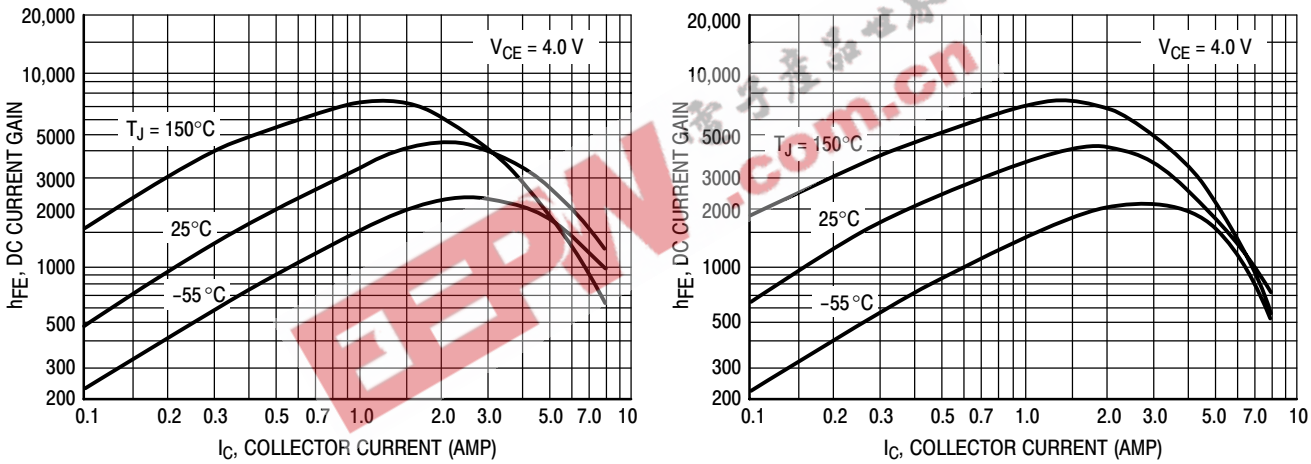


Figure 8. DC Current Gain

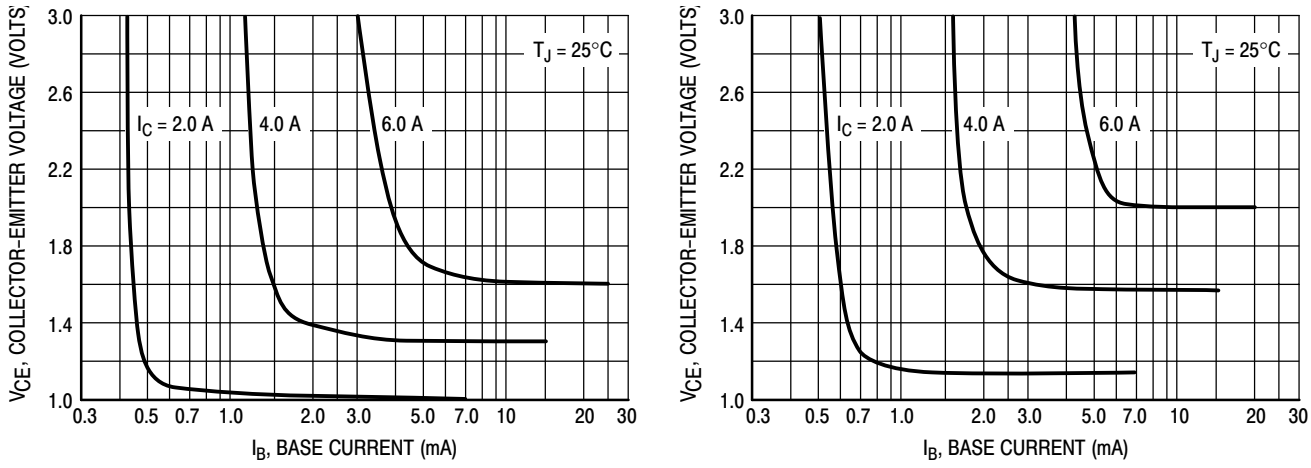


Figure 9. Collector Saturation Region

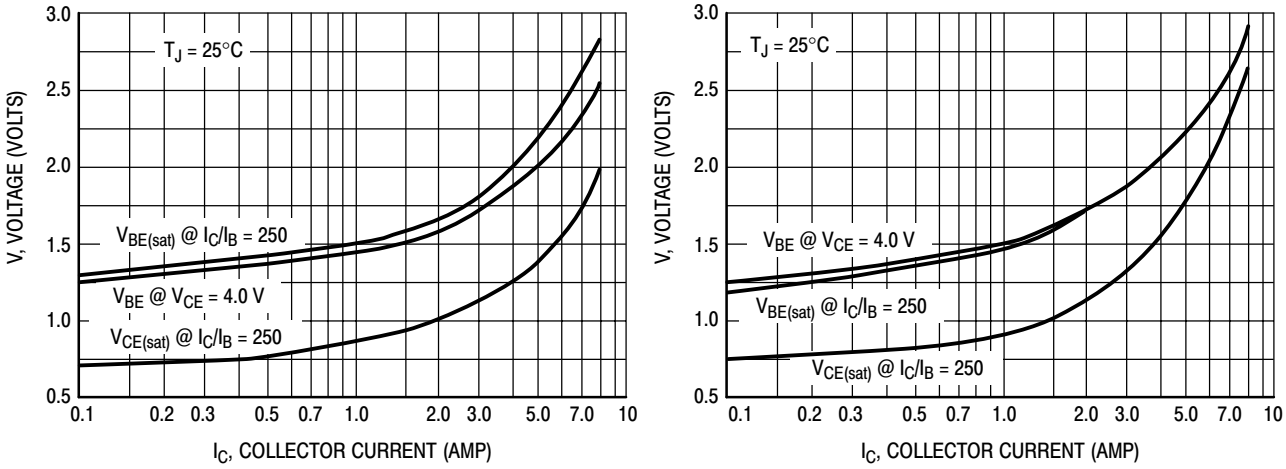


Figure 10. “On” Voltages

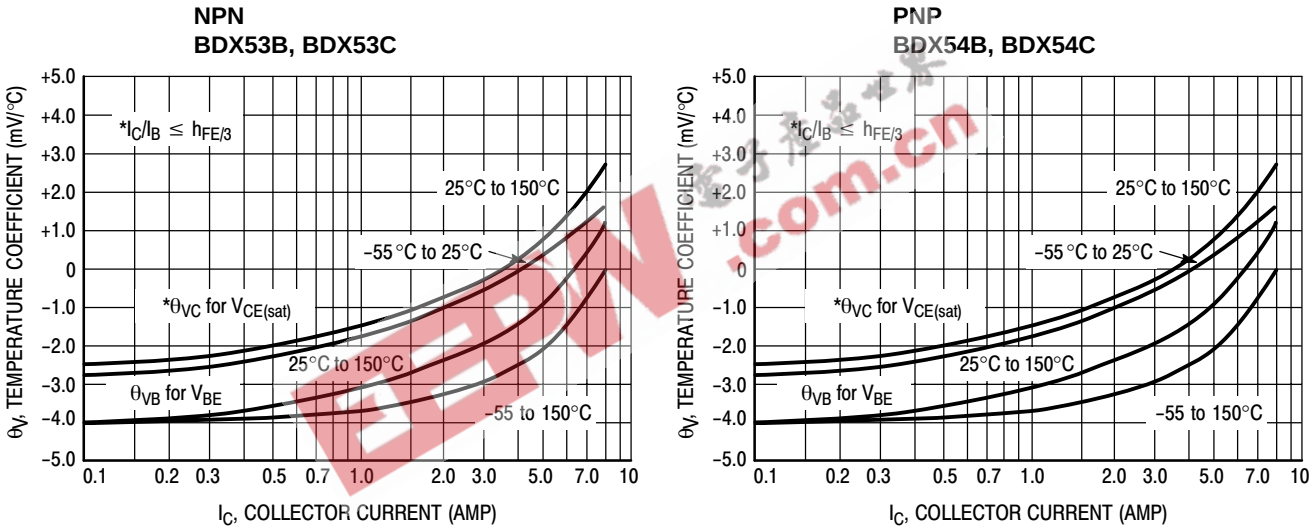


Figure 11. Temperature Coefficients

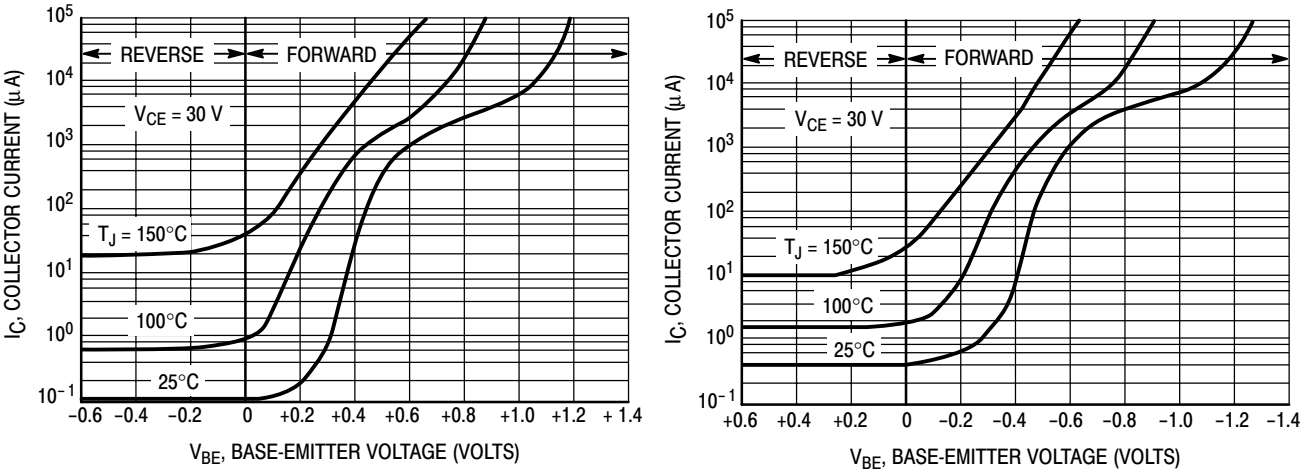


Figure 12. Collector Cut−Off Region

BDX53B, BDX53C (NPN), BDX54B, BDX54C (PNP)

Figure 13. Darlington Schematic

ORDERING INFORMATION

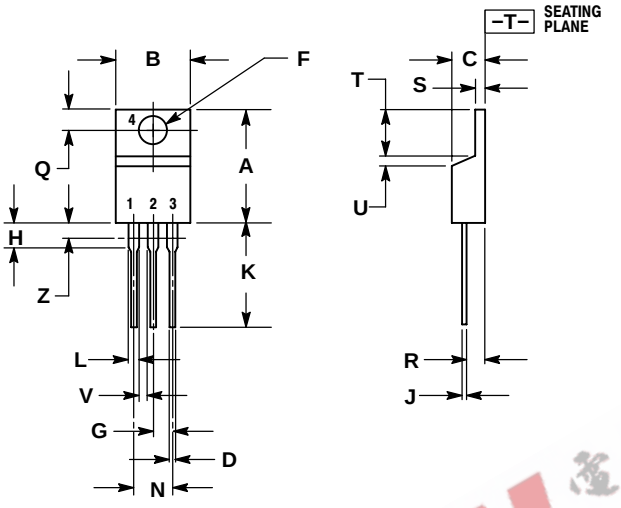
Device	Package	Shipping†
BDX53B	TO−220	50 Units / Rail
BDX53BG	TO−220 (Pb−Free)	
BDX53C	TO−220	50 Units / Rail
BDX53CG	TO−220 (Pb−Free)	
BDX54B	TO−220	50 Units / Rail
BDX54BG	TO−220 (Pb−Free)	
BDX54C	TO−220	50 Units / Rail
BDX54CG	TO−220 (Pb−Free)	

†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.

BDX53B, BDX53C (NPN), BDX54B, BDX54C (PNP)

PACKAGE DIMENSIONS

TO−220AB
CASE 221A−09
ISSUE AA



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.

	INCHES		MILLIMETERS	
DIM	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	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 61312, Phoenix, Arizona 85082−1312 USA
Phone: 480−829−7710 or 800−344−3860 Toll Free USA/Canada
Fax: 480−829−7709 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada

Japan: ON Semiconductor, Japan Customer Focus Center
2−9−1 Kamimeguro, Meguro−ku, Tokyo, Japan 153−0051
Phone: 81−3−5773−3850

ON Semiconductor Website: http://onsemi.com

Order Literature: http://www.onsemi.com/litorder

For additional information, please contact your local Sales Representative.