

Darlington Complementary Silicon Power Transistors

... designed for general purpose and low speed switching applications.

- 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, 34B
 100 Vdc (min.) — BDX33C, 34C
- 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
- TO–220AB Compact Package

MAXIMUM RATINGS

Rating	Symbol	BDX33B BDX34B	BDX33C BDX34C	Unit
Collector–Emitter Voltage	V_{CEO}	80	100	Vdc
Collector–Base Voltage	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		Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–65 to +150		$^\circ\text{C}$

THERMAL CHARACTERISTICS

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

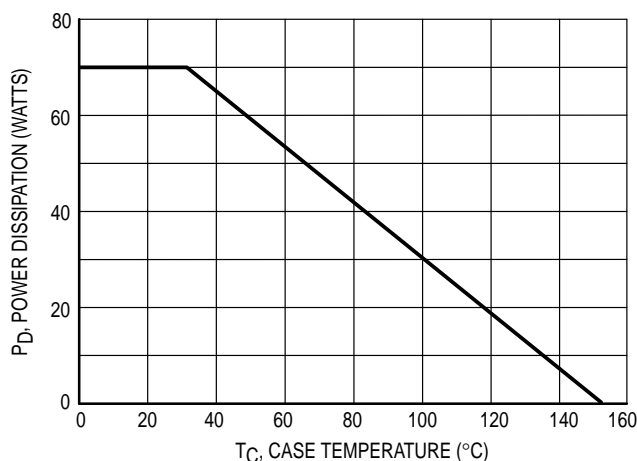


Figure 1. Power Derating

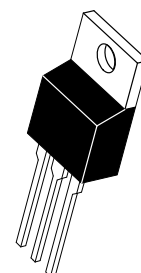
Preferred devices are Motorola recommended choices for future use and best overall value.

REV 7

NPN
BDX33B
BDX33C*
PNP
BDX34B
BDX34C*

*Motorola Preferred Device

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



CASE 221A–06
TO–220AB

BDX33B BDX33C BDX34B BDX34C

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Sustaining Voltage ¹ ($I_C = 100\text{ mAdc}$, $I_B = 0$)	BDX33B/BDX34B BDX33C/BDX34C	$V_{CEO(sus)}$	80 100	— —	Vdc
Collector–Emitter Sustaining Voltage 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 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 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 s.

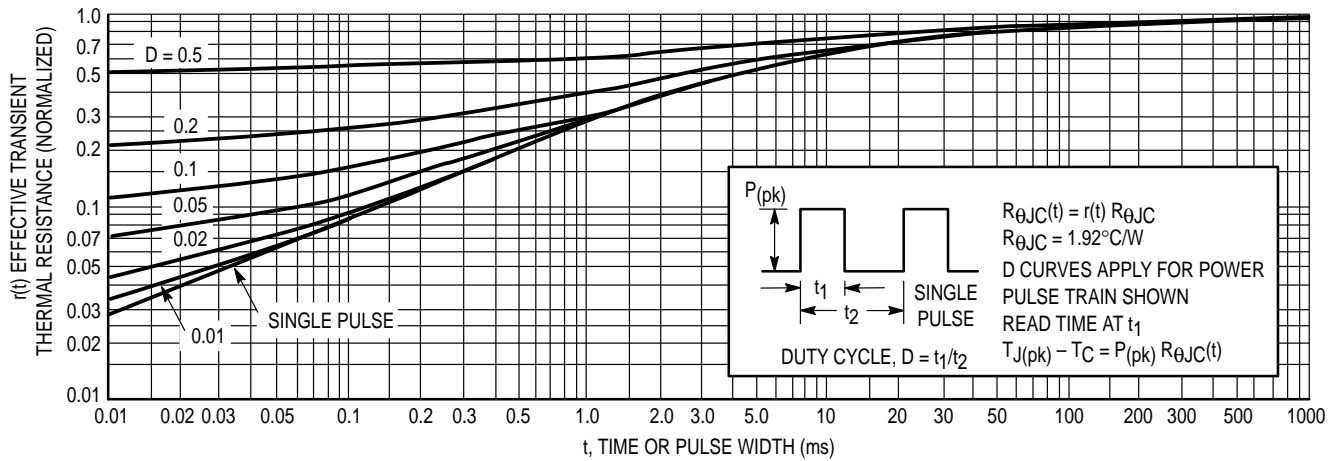


Figure 1. Thermal Response

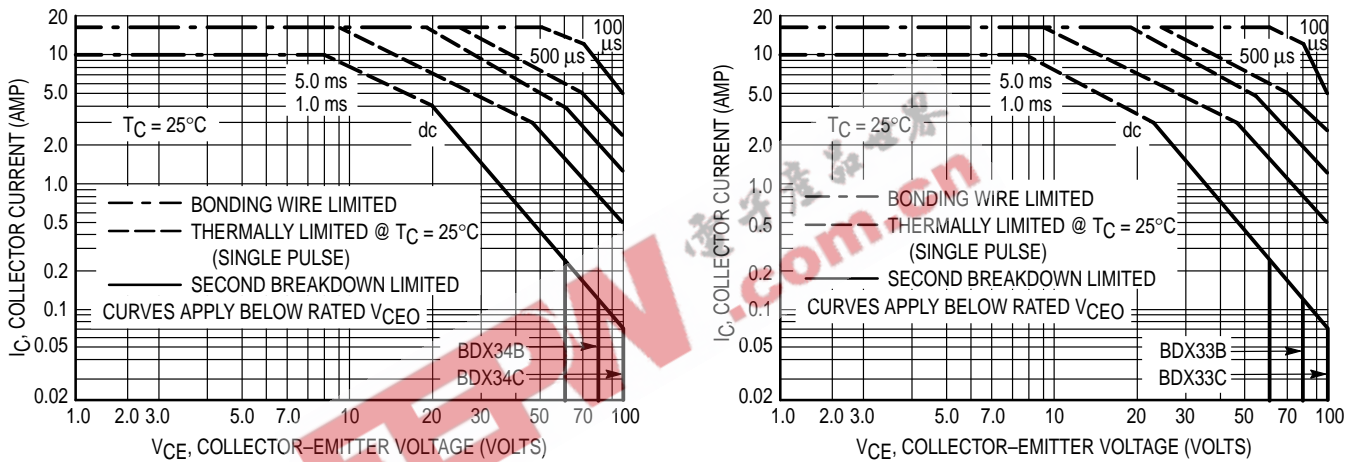


Figure 2. Active-Region Safe Operating Area

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 Fig. 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 Fig. . At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

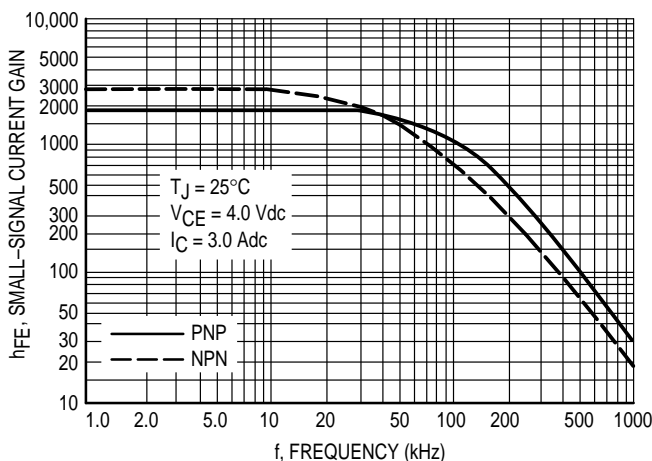


Figure 3. Small-Signal Current Gain

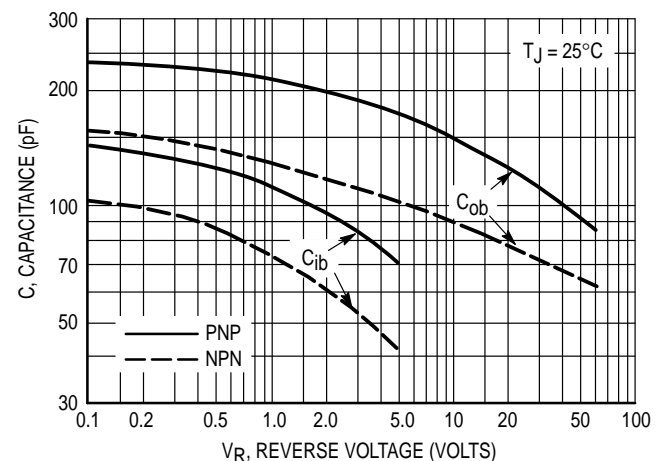


Figure 4. Capacitance

BDX33B BDX33C BDX34B BDX34C

**NPN
BDX33B, 33C**

**PNP
BDX34B, 34C**

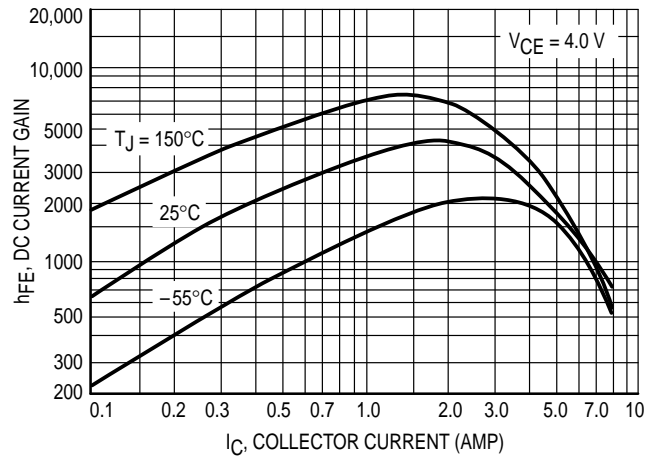
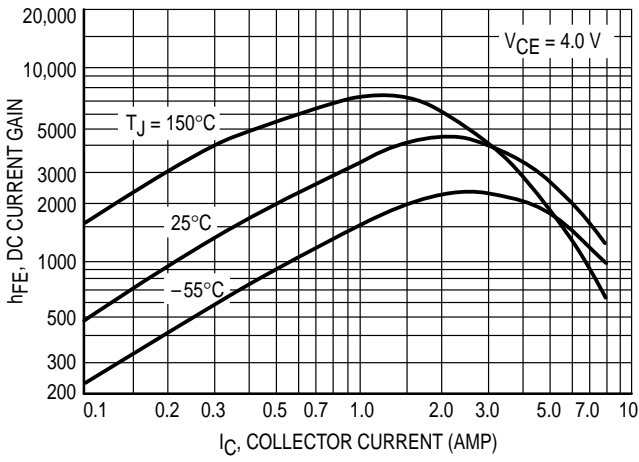


Figure 5. DC Current Gain

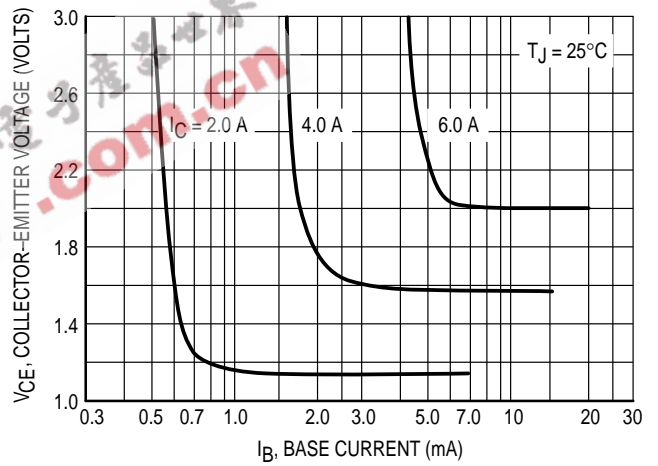
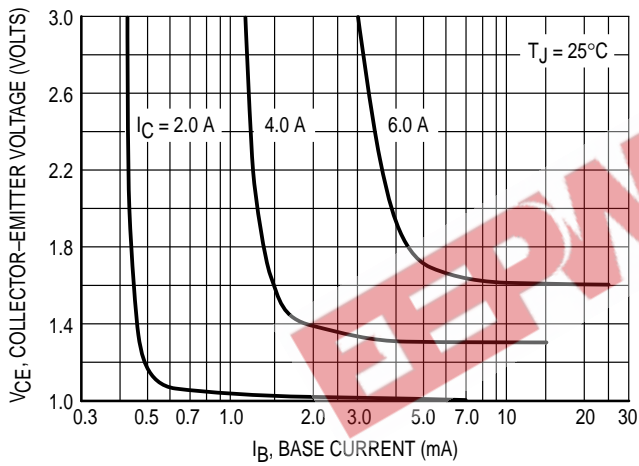


Figure 6. Collector Saturation Region

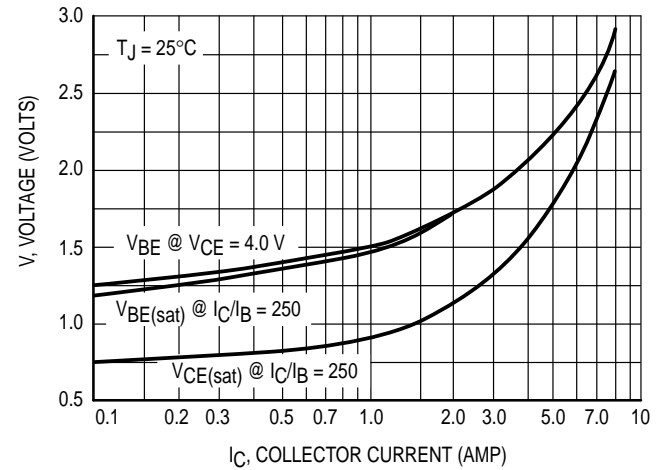
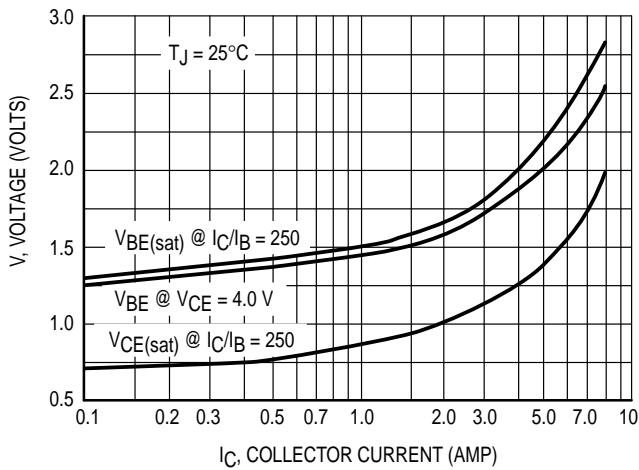
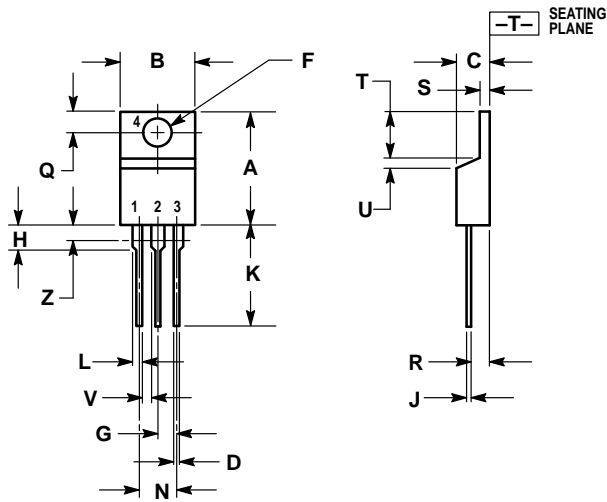


Figure 7. "On" Voltages

BDX33B BDX33C BDX34B BDX34C

PACKAGE DIMENSIONS



- 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	0.035	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

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**CASE 221A-06
 TO-220AB
 ISSUE Y**

BDX33B BDX33C BDX34B BDX34C

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BDX33B/D

