

# 10-Ampere P-N-P Darlington Power Transistors

45-60-80-100-120 Volts, 70 Watts  
 Gain of 750 at 4 A (BDX34, BDX34A)  
 Gain of 750 at 3 A (BDX34B, BDX34C, BDX34D)

- |   |  |
|---|--|
| <b>Features:</b>  | <b>Applications:</b>   |
| <ul style="list-style-type: none"> <li>■ Operates from IC without predriver</li> <li>■ Low leakage at high temperature</li> </ul> | <ul style="list-style-type: none"> <li>■ Power switching</li> <li>■ Hammer drivers</li> <li>■ Series and shunt regulators</li> <li>■ Audio amplifiers</li> </ul> |

The BDX34, BDX34A, BDX34B, BDX43C, and BDX34D are monolithic p-n-p silicon Darlington transistors designed for low and medium-frequency power applications. The high gain of these devices makes it possible for them to be driven directly from integrated circuits. They are complementary to the BDX33, BDX33A, BDX33B, BDX33C, and BDX33D described in Data Sheet File No. 693.

These devices are supplied in the JEDEC TO-220AB (VERSAWATT) plastic package.

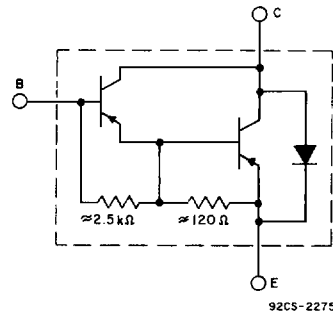
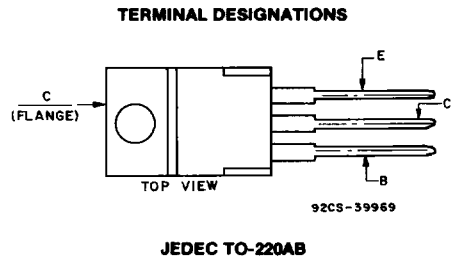


Fig. 1 - Schematic diagram for all types.

**2**  
POWER TRANSISTORS

**MAXIMUM RATINGS, Absolute-Maximum Values:**

	BDX34	BDX34A	BDX34B	BDX34C	BDX34D	
V <sub>CB0</sub> .....	-45	-60	-80	-100	-120	V
V <sub>CER(sus)</sub> (R <sub>BE</sub> )=100 Ω .....	-45	-60	-80	-100	-120	V
V <sub>CEO(sus)</sub> .....	-45	-60	-80	-100	-120	V
V <sub>CEx(sus)</sub> V <sub>BE</sub> =-1.5 V .....	-45	-60	-80	-100	-120	V
V <sub>EBO</sub> .....	-5					V
I <sub>C</sub> .....	-10					A
I <sub>B</sub> .....	-0.25					A
P <sub>T</sub> T <sub>C</sub> ≤ 25°C .....	70					W
T <sub>C</sub> > 25°C .....	Derate linearly 0.56					W/°C
T <sub>stg</sub> , T <sub>J</sub> .....	-65 to +150					°C
T <sub>L</sub> At distances ≥ 1/8 in. (3.17 mm) from case for 10 s max. ....	235					°C

# BDX34, BDX34A, BDX34B, BDX34C, BDX34D

**ELECTRICAL CHARACTERISTICS, At Case Temperature ( $T_C$ )=25°C Unless Otherwise Specified**

CHARACTERISTIC	TEST CONDITIONS				LIMITS						UNITS
	VOLTAGE V dc			CUR- RENT A dc	BDX34		BDX34A		BDX34B		
	V <sub>CB</sub>	V <sub>CE</sub>	V <sub>BE</sub>	I <sub>C</sub>	Min.	Max.	Min.	Max.	Min.	Max.	
I <sub>CEO</sub>		-40			—	—	—	—	—	-0.5	mA
		-30			—	—	—	-0.5	—	—	
		-20			—	-0.5	—	—	—	—	
T <sub>C</sub> =100°C		-40			—	—	—	—	—	-10	
		-30			—	—	—	-10	—	—	
		-20			—	-10	—	—	—	—	
I <sub>CBO</sub>	-80				—	—	—	—	—	-1	
	-60				—	—	—	-1	—	—	
	-45				—	-1	—	—	—	—	
T <sub>C</sub> =100°C	-80				—	—	—	—	—	-5	
	-60				—	—	—	-5	—	—	
	-45				—	-5	—	—	—	—	
I <sub>EBO</sub>			5	0	—	-10	—	-10	—	-10	
V <sub>CEO</sub> (sus)				-0.1 <sup>a</sup>	-45	—	-60	—	-80	—	V
V <sub>CER</sub> (sus) (R <sub>BE</sub> )=100 Ω				-0.1 <sup>a</sup>	-45	—	-60	—	-80	—	
V <sub>CEV</sub> (sus)			1.5	-1.0 <sup>a</sup>	-45	—	-60	—	-80	—	
h <sub>FE</sub>		-3		-3 <sup>a</sup>	—	—	—	—	750	—	V
		-3		-4 <sup>a</sup>	750	—	750	—	—	—	
V <sub>BE</sub>		-3		-3 <sup>a</sup>	—	—	—	—	—	-2.5	
		-3		-4 <sup>a</sup>	—	-2.5	—	-2.5	—	—	
V <sub>CE</sub> (sat) I <sub>B</sub> =-0.006 A I <sub>E</sub> =-0.008 A				-3 <sup>a</sup> -4 <sup>a</sup>	— —	— -2.5	— —	— -2.5	— —	-2.5 —	
V <sub>F</sub>				-8	—	-4	—	-4	—	-4	
h <sub>fe</sub> (f=1.0 kHz)		-5		-1	1000	—	1000	—	1000	—	
h <sub>fe</sub>   (f=1.0 MHz)		-5		-1	20	—	20	—	20	—	
I <sub>S</sub> /b t <sub>p</sub> =0.5s non-rep.		-20 -33			-3.5 -1	— —	-3.5 -1	— —	-3.5 -1	— —	A
R <sub>θJC</sub>					—	1.78	—	1.78	—	1.78	°C/W

<sup>a</sup>Pulsed: Pulse duration=300 μs, duty factor=1.8%.

# BDX34, BDX34A, BDX34B, BDX34C, BDX34D

ELECTRICAL CHARACTERISTICS, At Case Temperature ( $T_C$ )=25°C Unless Otherwise Specified

CHARACTERISTIC	TEST CONDITIONS				LIMITS				UNITS
	VOLTAGE			CURRENT	BDX34C		BDX34D		
	V dc			A dc	Min.	Max.	Min.	Max.	
	V <sub>CB</sub>	V <sub>CE</sub>	V <sub>BE</sub>	I <sub>C</sub>					
I <sub>CEO</sub>		-60			—	—	—	-0.5	mA
		-50			—	-0.5	—	—	
T <sub>C</sub> =100°C		-60			—	—	—	-10	
		-50			—	-10	—	—	
I <sub>CBO</sub>	-120				—	—	—	-1	
T <sub>C</sub> =100°C	-120				—	—	—	-5	
	-100				—	-5	—	—	
I <sub>EBO</sub>			5	0	—	-10	—	-10	
V <sub>CEO(sus)</sub>				-0.1 <sup>a</sup>	-100	—	-120	—	V
V <sub>CER(sus)</sub> (R <sub>BE</sub> )=100 Ω				-0.1 <sup>a</sup>	-100	—	-120	—	
V <sub>CEV(sus)</sub>			1.5	-1.0 <sup>a</sup>	-100	—	-120	—	
h <sub>FE</sub>		-3		-3 <sup>a</sup>	750	—	750	—	
V <sub>BE</sub>		-3		-3 <sup>a</sup>	—	-2.5	—	-2.5	V
V <sub>CE(sat)</sub>					—	-2.5	—	-2.5	
I <sub>B</sub> =-0.006 A				-3 <sup>a</sup>	—	-2.5	—	-2.5	
V <sub>F</sub>				-8	—	-4	—	-4	
h <sub>fe</sub> (f=1.0 kHz)		-5		-1	1000	—	1000	—	
h <sub>fe</sub>   (f=1.0 MHz)		-5		-1	20	—	20	—	
I <sub>S/b</sub> t <sub>p</sub> =0.5 s non-rep.		-20			-3.5	—	-3.5	—	A
		-33			-1	—	-1	—	
R <sub>θJC</sub>					—	1.78	—	1.78	°C/W

<sup>a</sup>Pulsed: Pulse duration=300 μs. duty factor=1.8%.

# BDX34, BDX34A, BDX34B, BDX34C, BDX34D

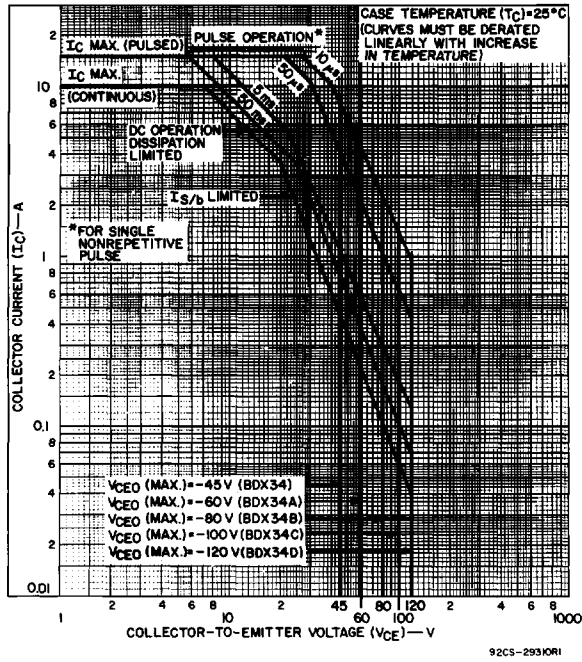


Fig. 2 - Maximum operating areas for BDX34-series types.

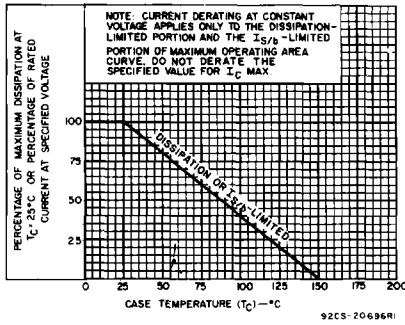


Fig. 3 - Current derating curve for all types.

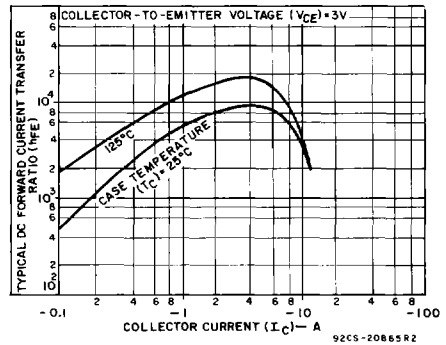


Fig. 4 - Typical dc beta characteristics for all types.

# BDX34, BDX34A, BDX34B, BDX34C, BDX34D

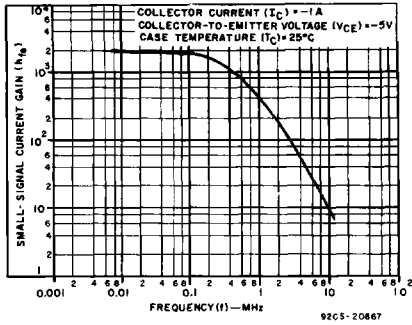


Fig. 5 — Typical small-signal gain for all types.

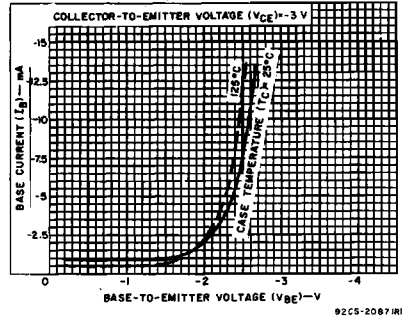


Fig. 6 — Typical input characteristics for all types.

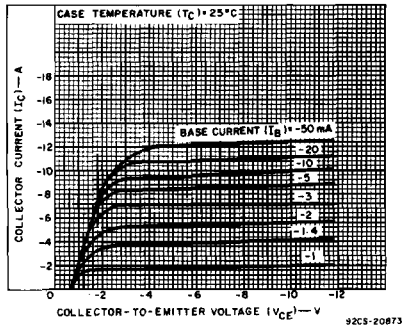


Fig. 7 — Typical output characteristics for all types.

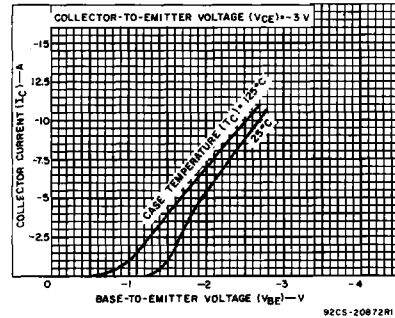


Fig. 8 — Typical transfer characteristics for all types.

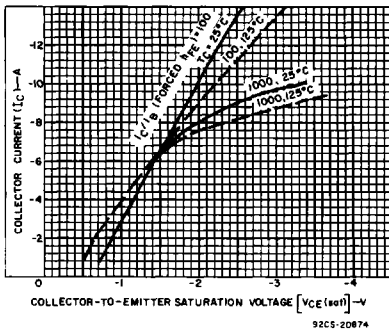


Fig. 9 — Typical saturation characteristics for all types.

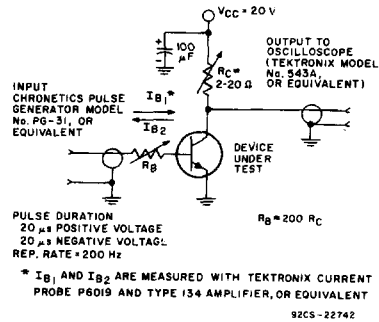


Fig. 10 — Circuit used to measure saturated switching times.

# BDX34, BDX34A, BDX34B, BDX34C, BDX34D

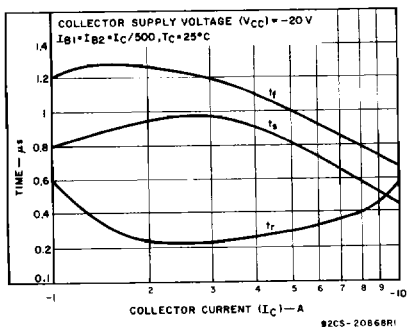


Fig. 11 — Typical saturated switching-time characteristics for all types.

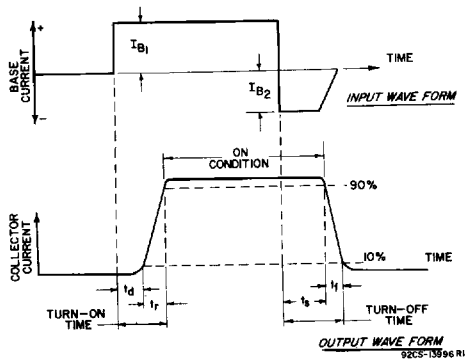


Fig. 12 — Phase relationship between input current and output current showing reference points for specifications of switching