



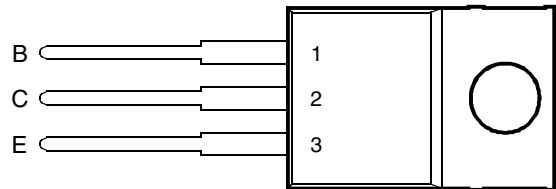
THE DATASHEET OF BDX33A-S

BDX33, BDX33A, BDX33B, BDX33C, BDX33D NPN SILICON POWER DARLINGTONS

BOURNS®

- Designed for Complementary Use with BDX34, BDX34A, BDX34B, BDX34C and BDX34D
- 70 W at 25°C Case Temperature
- 10 A Continuous Collector Current
- Minimum h_{FE} of 750 at 3V, 3 A

TO-220 PACKAGE
(TOP VIEW)



This series is obsolete and not recommended for new designs.

Pin 2 is in electrical contact with the mounting base.

MDTRACA

absolute maximum ratings at 25°C case temperature (unless otherwise noted)

RATING		SYMBOL	VALUE	UNIT
Collector-base voltage ($I_E = 0$)	BDX33	V_{CBO}	45	V
	BDX33A		60	
	BDX33B		80	
	BDX33C		100	
	BDX33D		120	
Collector-emitter voltage ($I_B = 0$)	BDX33	V_{CEO}	45	V
	BDX33A		60	
	BDX33B		80	
	BDX33C		100	
	BDX33D		120	
Emitter-base voltage		V_{EBO}	5	V
Continuous collector current		I_C	10	A
Continuous base current		I_B	0.3	A
Continuous device dissipation at (or below) 25°C case temperature (see Note 1)		P_{tot}	70	W
Continuous device dissipation at (or below) 25°C free air temperature (see Note 2)		P_{tot}	2	W
Operating free air temperature range		T_J	-65 to +150	°C
Storage temperature range		T_{stg}	-65 to +150	°C
Operating free-air temperature range		T_A	-65 to +150	°C

NOTES: 1. Derate linearly to 150°C case temperature at the rate of 0.56 W/°C.
2. Derate linearly to 150°C free air temperature at the rate of 16 mW/°C.

PRODUCT INFORMATION

AUGUST 1993 - REVISED SEPTEMBER 2002
Specifications are subject to change without notice.

BDX33, BDX33A, BDX33B, BDX33C, BDX33D
NPN SILICON POWER DARLINGTONS

BOURNS®

electrical characteristics at 25°C case temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS			MIN	TYP	MAX	UNIT
$V_{(BR)CEO}$ Collector-emitter breakdown voltage	$I_C = 100 \text{ mA}$	$I_B = 0$	(see Note 3)	BDX33 BDX33A BDX33B BDX33C BDX33D	45 60 80 100 120		V
I_{CEO} Collector-emitter cut-off current	$V_{CE} = 30 \text{ V}$ $V_{CE} = 30 \text{ V}$ $V_{CE} = 40 \text{ V}$ $V_{CE} = 50 \text{ V}$ $V_{CE} = 60 \text{ V}$ $V_{CE} = 30 \text{ V}$ $V_{CE} = 30 \text{ V}$ $V_{CE} = 40 \text{ V}$ $V_{CE} = 50 \text{ V}$ $V_{CE} = 60 \text{ V}$	$I_B = 0$ $I_B = 0$ $I_B = 0$ $I_B = 0$ $I_B = 0$ $I_B = 0$ $I_B = 0$ $I_B = 0$ $I_B = 0$ $I_B = 0$	$T_C = 100^\circ\text{C}$ $T_C = 100^\circ\text{C}$ $T_C = 100^\circ\text{C}$ $T_C = 100^\circ\text{C}$ $T_C = 100^\circ\text{C}$	BDX33 BDX33A BDX33B BDX33C BDX33D BDX33 BDX33A BDX33B BDX33C BDX33D		0.5 0.5 0.5 0.5 0.5 10 10 10 10 10	mA
I_{CBO} Collector cut-off current	$V_{CB} = 45 \text{ V}$ $V_{CB} = 60 \text{ V}$ $V_{CB} = 80 \text{ V}$ $V_{CB} = 100 \text{ V}$ $V_{CB} = 120 \text{ V}$ $V_{CB} = 45 \text{ V}$ $V_{CB} = 60 \text{ V}$ $V_{CB} = 80 \text{ V}$ $V_{CB} = 100 \text{ V}$ $V_{CB} = 120 \text{ V}$	$I_E = 0$ $I_E = 0$ $I_E = 0$ $I_E = 0$ $I_E = 0$ $I_E = 0$ $I_E = 0$ $I_E = 0$ $I_E = 0$ $I_E = 0$	$T_C = 100^\circ\text{C}$ $T_C = 100^\circ\text{C}$ $T_C = 100^\circ\text{C}$ $T_C = 100^\circ\text{C}$ $T_C = 100^\circ\text{C}$	BDX33 BDX33A BDX33B BDX33C BDX33D BDX33 BDX33A BDX33B BDX33C BDX33D		1 1 1 1 1 5 5 5 5 5	mA
I_{EBO} Emitter cut-off current	$V_{EB} = 5 \text{ V}$	$I_C = 0$				10	mA
h_{FE} Forward current transfer ratio	$V_{CE} = 3 \text{ V}$ $V_{CE} = 3 \text{ V}$ $V_{CE} = 3 \text{ V}$ $V_{CE} = 3 \text{ V}$ $V_{CE} = 3 \text{ V}$	$I_C = 4 \text{ A}$ $I_C = 4 \text{ A}$ $I_C = 3 \text{ A}$ $I_C = 3 \text{ A}$ $I_C = 3 \text{ A}$	(see Notes 3 and 4)	BDX33 BDX33A BDX33B BDX33C BDX33D	750 750 750 750 750		
$V_{BE(on)}$ Base-emitter voltage	$V_{CE} = 3 \text{ V}$ $V_{CE} = 3 \text{ V}$ $V_{CE} = 3 \text{ V}$ $V_{CE} = 3 \text{ V}$ $V_{CE} = 3 \text{ V}$	$I_C = 4 \text{ A}$ $I_C = 4 \text{ A}$ $I_C = 3 \text{ A}$ $I_C = 3 \text{ A}$ $I_C = 3 \text{ A}$	(see Notes 3 and 4)	BDX33 BDX33A BDX33B BDX33C BDX33D		2.5 2.5 2.5 2.5 2.5	V
$V_{CE(sat)}$ Collector-emitter saturation voltage	$I_B = 8 \text{ mA}$ $I_B = 8 \text{ mA}$ $I_B = 6 \text{ mA}$ $I_B = 6 \text{ mA}$ $I_B = 6 \text{ mA}$	$I_C = 4 \text{ A}$ $I_C = 4 \text{ A}$ $I_C = 3 \text{ A}$ $I_C = 3 \text{ A}$ $I_C = 3 \text{ A}$	(see Notes 3 and 4)	BDX33 BDX33A BDX33B BDX33C BDX33D		2.5 2.5 2.5 2.5 2.5	V
V_{EC} Parallel diode forward voltage	$I_E = 8 \text{ A}$	$I_B = 0$				4	V

NOTES: 3. These parameters must be measured using pulse techniques, $t_p = 300 \mu\text{s}$, duty cycle $\leq 2\%$.

4. These parameters must be measured using voltage-sensing contacts, separate from the current carrying contacts.

PRODUCT INFORMATION



thermal characteristics

PARAMETER	MIN	TYP	MAX	UNIT
$R_{\theta JC}$ Junction to case thermal resistance			1.78	°C/W
$R_{\theta JA}$ Junction to free air thermal resistance			62.5	°C/W

resistive-load-switching characteristics at 25°C case temperature

PARAMETER	TEST CONDITIONS [†]			MIN	TYP	MAX	UNIT
t_{on} Turn-on time	$I_C = 3\text{ A}$	$I_{B(on)} = 12\text{ mA}$	$I_{B(off)} = -12\text{ mA}$		1		μs
t_{off} Turn-off time	$V_{BE(off)} = -3.5\text{ V}$	$R_L = 10\ \Omega$	$t_p = 20\ \mu\text{s}$, dc ≤ 2%		5		μs

[†] Voltage and current values shown are nominal; exact values vary slightly with transistor parameters.

OBSOLETE

PRODUCT INFORMATION

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TYPICAL CHARACTERISTICS

TYPICAL DC CURRENT GAIN
vs
COLLECTOR CURRENT

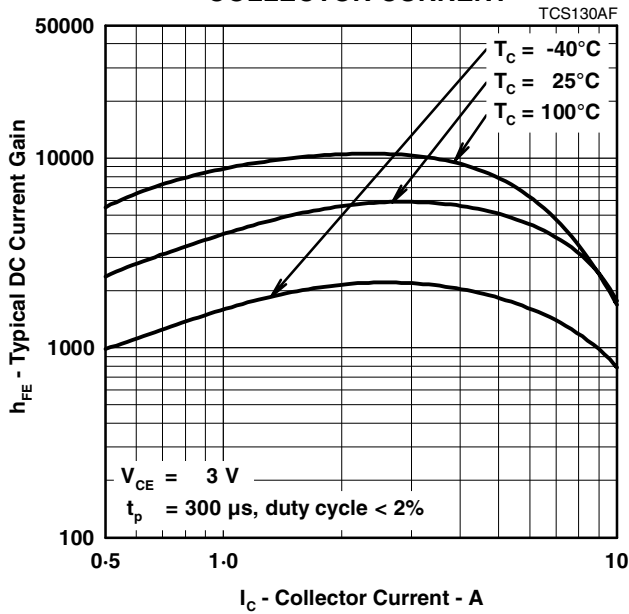


Figure 1.

COLLECTOR-EMITTER SATURATION VOLTAGE
vs
COLLECTOR CURRENT

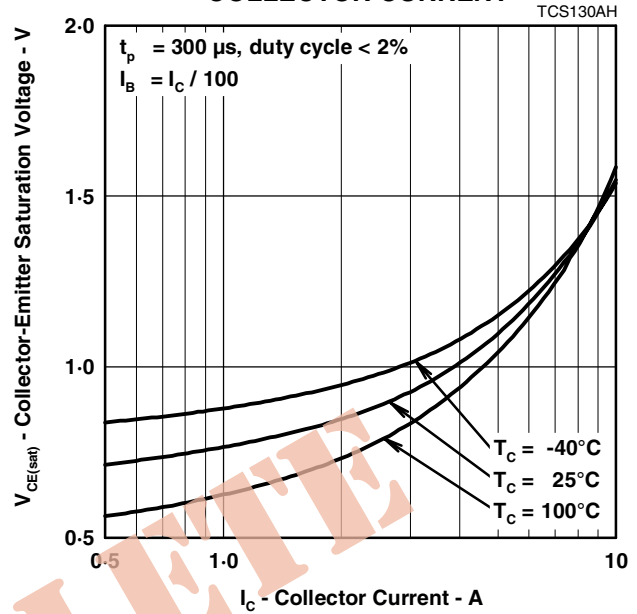


Figure 2.

BASE-EMITTER SATURATION VOLTAGE
vs
COLLECTOR CURRENT

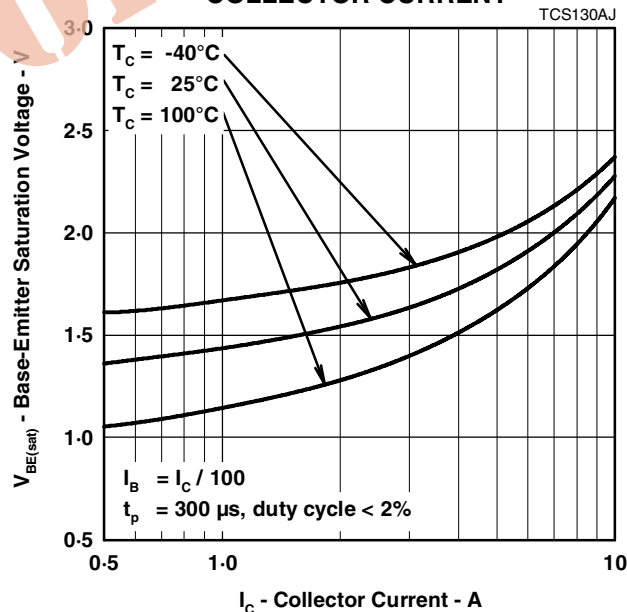


Figure 3.

PRODUCT INFORMATION

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THERMAL INFORMATION

MAXIMUM POWER DISSIPATION
vs
CASE TEMPERATURE

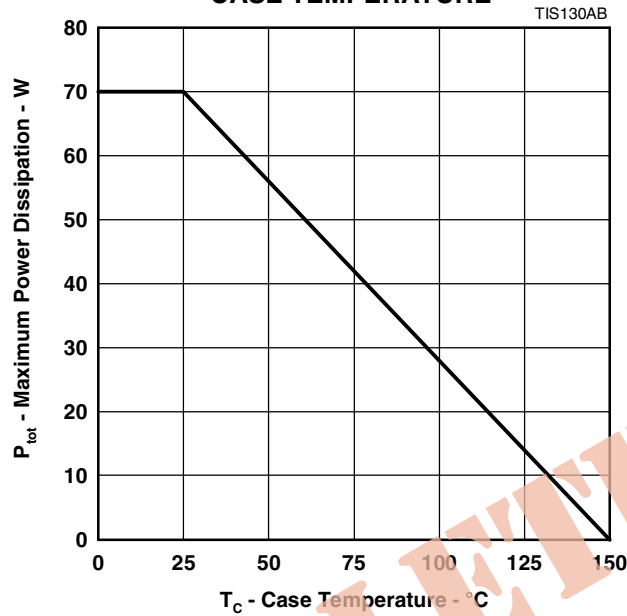


Figure 4.

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