



Micro Commercial Components



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# BDX33 THRU BDX33D

## NPN Silicon Power Darlington

### Features

- Halogen free available upon request by adding suffix "-HF"
- Lead Free Finish/RoHS Compliant(Note 1) ("P" Suffix designates RoHS Compliant. See ordering information)
- Designed For Complementary Use with BDX34, BDX34A, BDX34B, BDX34C and BDX34D
- 70W at 25°C Cass Temperature
- 10A Continuous Collector Current
- Minimum  $h_{FE}$  of 750 at 3.0V, 3.0A
- Epoxy meets UL 94 V-0 flammability rating
- Moisture Sensitivity Level 1
- Mounting Torque: 5 in-lbs Maximum

### Absolute Maximum Ratings @ 25°C Unless Otherwise Noted

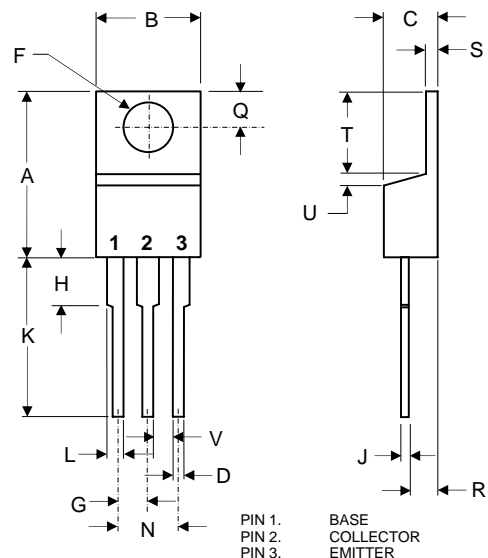
Symbol	Rating	Value	Unit
$V_{CBO}$	Collector-Base Voltage ( $I_E=0$ )		
	BDX33	45	V
	BDX33A	60	
	BDX33B	80	
	BDX33C	100	
$V_{CEO}$	Collector-Emitter Voltage ( $I_B=0$ )		
	BDX33	45	V
	BDX33A	60	
	BDX33B	80	
	BDX33C	100	
$V_{EBO}$	Emitter-Base Voltage	5.0	V
$I_C$	Continuous Collector Current	10	A
$I_B$	Continuous Base Current	0.3	A
$P_{TOT}$	Continuous Device Dissipation at (or below) 25°C Case Temperature (see Note2)	70	W
$P_{TOT}$	Continuous Device Dissipation at (or below) 25°C Free Air Temperature (see Note 3)	2.0	W
$T_J$	Operating Free Air Temperature Range	-55~+150	°C
$T_{STG}$	Storage Temperature Range	-55~+150	°C
$T_A$	Operating Free-Air Temperature Range	-55~+150	°C

- Notes: 1. High Temperature Solder Exemption Applied, see EU Directive Annex 7.  
 2. Derate Linearly to 150°C Case Temperature at the Rate of 0.56 W/°C  
 3. Derate Linearly to 150°C Free Air Temperature at the Rate of 16m W/°C

### Electrical Characteristics @ 25°C Unless Otherwise Specified

Symbol	Parameter	Min	Typ	Max	Unit
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage ( $I_C=100mA, I_B=0$ , see note 3)				
	BDX33	45			V
	BDX33A	60			
	BDX33B	80			
	BDX33C	100			
	BDX33D	100			

### TO-220



DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	.560	.625	14.22	15.88	
B	.380	.420	9.65	10.67	
C	.140	.190	3.56	4.82	
D	.020	.045	0.51	1.14	
F	.139	.161	3.53	4.09	Ø
G	.190	.110	2.29	2.79	
H	---	.250	---	6.35	
J	.012	.025	0.30	0.64	
K	.500	.580	12.70	14.73	
L	.045	.060	1.14	1.52	
N	.190	.210	4.83	5.33	
Q	.100	.135	2.54	3.43	
R	.080	.115	2.04	2.92	
S	.045	.055	1.14	1.39	
T	.230	.270	5.84	6.86	
U	-----	.050	-----	1.27	
V	.045	-----	1.15	-----	

## BDX33 thru BDX33D

Symbol	Parameter	Min	Typ	Max	Unit
$I_{CEO}$	Collector-Emitter Cut-Off Current ( $V_{CE}=30V, I_B=0$ )	BDX33		0.5	mA
	( $V_{CE}=30V, I_B=0$ )	BDX33A		0.5	
	( $V_{CE}=40V, I_B=0$ )	BDX33B		0.5	
	( $V_{CE}=50V, I_B=0$ )	BDX33C		0.5	
	( $V_{CE}=60V, I_B=0$ )	BDX33D		0.5	
	( $V_{CE}=30V, I_B=0, T_C=100^\circ C$ )	BDX33		10	
	( $V_{CE}=30V, I_B=0, T_C=100^\circ C$ )	BDX33A		10	
	( $V_{CE}=40V, I_B=0, T_C=100^\circ C$ )	BDX33B		10	
	( $V_{CE}=50V, I_B=0, T_C=100^\circ C$ )	BDX33C		10	
( $V_{CE}=60V, I_B=0, T_C=100^\circ C$ )	BDX33D		10		
$I_{CBO}$	Collector Cut-Off Current ( $V_{CB}=45V, I_E=0$ )	BDX33		1.0	mA
	( $V_{CB}=60V, I_E=0$ )	BDX33A		1.0	
	( $V_{CB}=80V, I_E=0$ )	BDX33B		1.0	
	( $V_{CB}=100V, I_E=0$ )	BDX33C		1.0	
	( $V_{CB}=100V, I_E=0$ )	BDX33D		1.0	
	( $V_{CB}=45V, I_E=0, T_C=100^\circ C$ )	BDX33		5.0	
	( $V_{CB}=60V, I_E=0, T_C=100^\circ C$ )	BDX33A		5.0	
	( $V_{CB}=80V, I_E=0, T_C=100^\circ C$ )	BDX33B		5.0	
	( $V_{CB}=100V, I_E=0, T_C=100^\circ C$ )	BDX33C		5.0	
( $V_{CB}=120V, I_E=0, T_C=100^\circ C$ )	BDX33D		5.0		
$I_{EBO}$	Emitter Cut-Off Current ( $V_{EB}=5.0V, I_C=0$ )			10	mA
$h_{FE}$	Forward Current Transfer Ratio ( $V_{CE}=3.0V, I_C=4.0A$ )	BDX33	750		
	( $V_{CE}=3.0V, I_C=4.0A$ )	BDX33A	750		
	( $V_{CE}=3.0V, I_C=3.0A$ ) (see notes 4 and 5)	BDX33B	750		
	( $V_{CE}=3.0V, I_C=3.0A$ )	BDX33C	750		
	( $V_{CE}=3.0V, I_C=3.0A$ )	BDX33D	750		
$V_{BE(ON)}$	Base-Emitter Voltage ( $V_{CE}=3.0V, I_C=4.0A$ )	BDX33		2.5	V
	( $V_{CE}=3.0V, I_C=4.0A$ )	BDX33A		2.5	
	( $V_{CE}=3.0V, I_C=3.0A$ ) (see notes 4 and 5)	BDX33B		2.5	
	( $V_{CE}=3.0V, I_C=3.0A$ )	BDX33C		2.5	
	( $V_{CE}=3.0V, I_C=3.0A$ )	BDX33D		2.5	
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage ( $I_B=8.0mA, I_C=4.0A$ )	BDX33		2.5	V
	( $I_B=8.0mA, I_C=4.0A$ )	BDX33A		2.5	
	( $I_B=6.0mA, I_C=3.0A$ ) (see notes 4 and 5)	BDX33B		2.5	
	( $I_B=6.0mA, I_C=3.0A$ )	BDX33C		2.5	
	( $I_B=6.0mA, I_C=3.0A$ )	BDX33D		2.5	
$V_{EC}$	Parallel Diode Forward Voltage ( $I_E=8.0A, I_B=0$ )			4.0	V

 NOTES: 4. These parameters must be measured using pulse techniques,  $t_p=300\mu s$ , duty cycle  $\leq 2\%$ .

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

**Thermal Characteristics**

Symbol	Parameter	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction to Case Thermal Resistance			1.78	$^\circ C/W$
$R_{\theta JA}$	Junction to Free Air Thermal Resistance			62.5	$^\circ C/W$

**Resistive-Load-Switching Characteristics at 25 °C Case Temperature**

Symbol	Parameter	Test Conditions <sup>†</sup>	Min	Typ	Max	Unit
$t_{on}$	Turn-On Time	$I_C=3.0A, I_{B(on)}=12mA, I_{B(off)}=-12mA$		1.0		$\mu s$
$t_{off}$	Turn-Off Time	$V_{BE(off)}=-3.5V, R_L=10\Omega, t_p=20\mu s, dc \leq 2\%$		5.0		$\mu s$

<sup>†</sup> Voltage and current values shown are nominal; exact values vary slightly with transistor parameters.

# BDX33 thru BDX33D

**TYPICAL DC CURRENT GAIN  
vs  
COLLECTOR CURRENT**

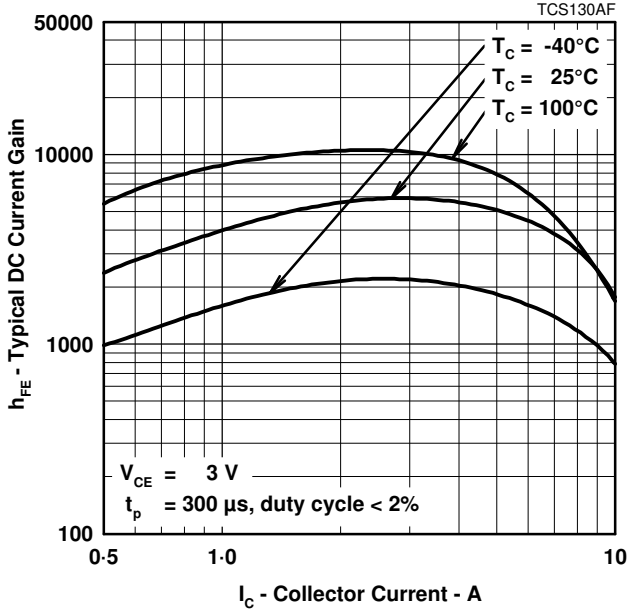


Figure 1.

**COLLECTOR-EMITTER SATURATION VOLTAGE  
vs  
COLLECTOR CURRENT**

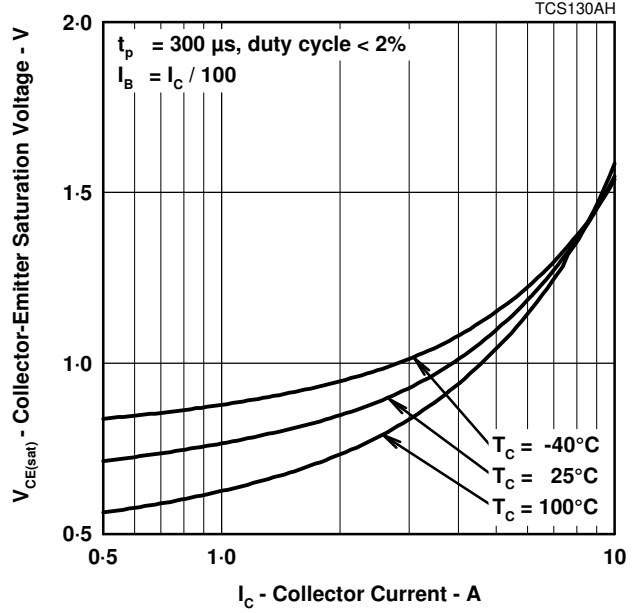


Figure 2.

**BASE-EMITTER SATURATION VOLTAGE  
vs  
COLLECTOR CURRENT**

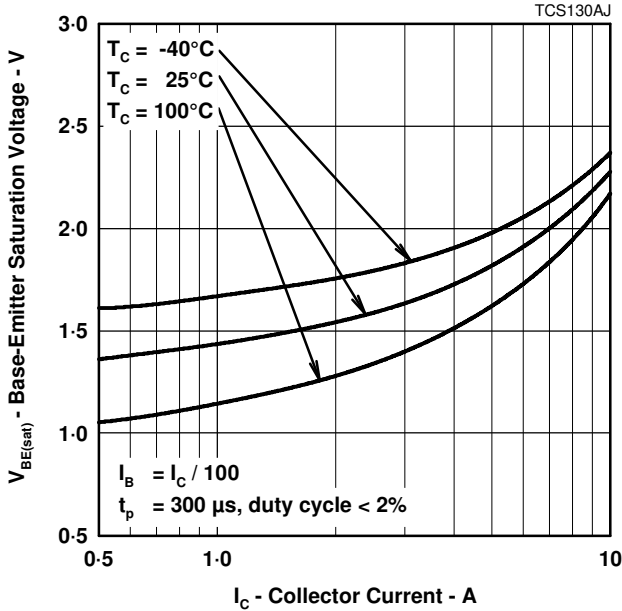


Figure 3.

## THERMAL INFORMATION

**MAXIMUM POWER DISSIPATION  
vs  
CASE TEMPERATURE**

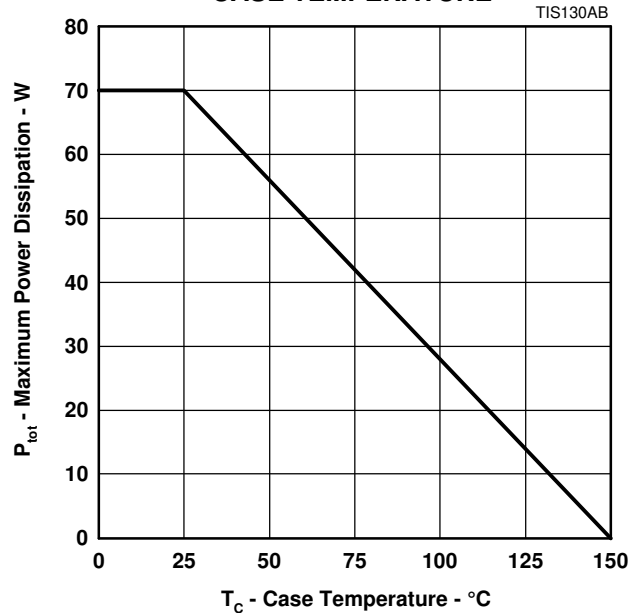


Figure 4.



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### Ordering Information :

Device	Packing
Part Number-BP	Bulk; 1 Kpcs/Box

Note : Adding "-HF" suffix for halogen free, eg. Part Number-BP-HF

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