



Micro Commercial Components



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

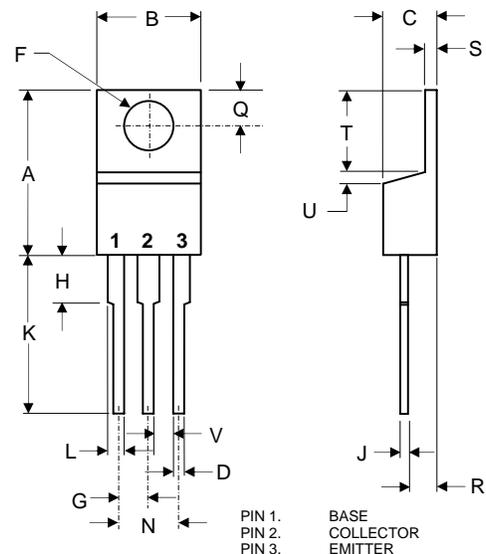
| Symbol    | Rating   | Value    | Unit |
|-----------|--|----------|------|
| $V_{CBO}$ | Collector-Base Voltage ( $I_E=0$ )   |          |      |
|           | BDX33  | 45       | V    |
|           | BDX33A   | 60       |      |
|           | BDX33B   | 80       |      |
|           | BDX33C   | 100      |      |
| BDX33D    | 100  |          |      |
| $V_{CEO}$ | Collector-Emitter Voltage ( $I_B=0$ )  |          |      |
|           | BDX33  | 45       | V    |
|           | BDX33A   | 60       |      |
|           | BDX33B   | 80       |      |
|           | BDX33C   | 100      |      |
| BDX33D    | 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   |     |     |     | V    |
|               | ( $I_C=100mA$ , $I_B=0$ , see note 3) |     |     |     |      |
|               | BDX33                                 | 45  |     |     |      |
|               | 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<br>( $V_{CE}=30V, I_B=0$ )      | 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<br>( $V_{CB}=45V, I_E=0$ )              | 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<br>( $V_{EB}=5.0V, I_C=0$ )               |        |     | 10  | mA   |
| $h_{FE}$                                  | Forward Current Transfer Ratio<br>( $V_{CE}=3.0V, I_C=4.0A$ )     | 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<br>( $V_{CE}=3.0V, I_C=4.0A$ )               | 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<br>( $I_B=8.0mA, I_C=4.0A$ ) | 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<br>( $I_E=8.0A, I_B=0$ )           |        |     | 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**

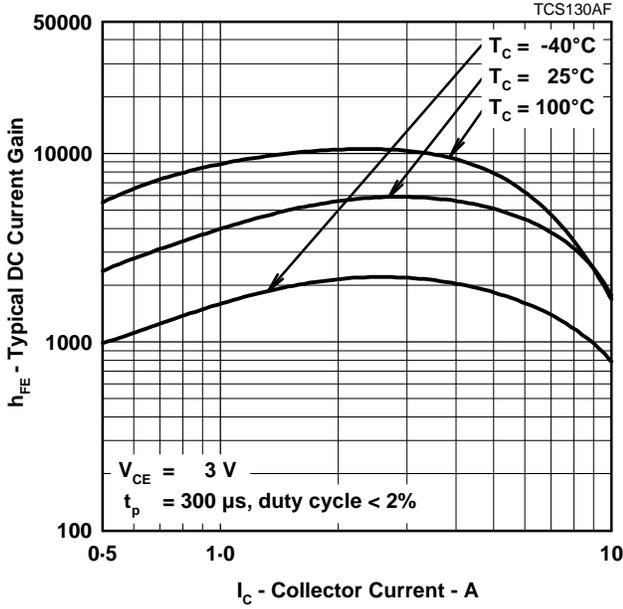


Figure 1.

**COLLECTOR-EMITTER SATURATION VOLTAGE**  
**VS**  
**COLLECTOR CURRENT**

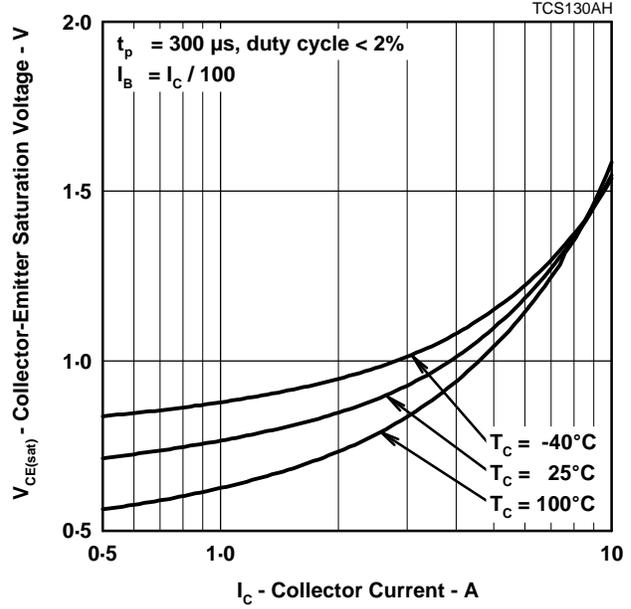


Figure 2.

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

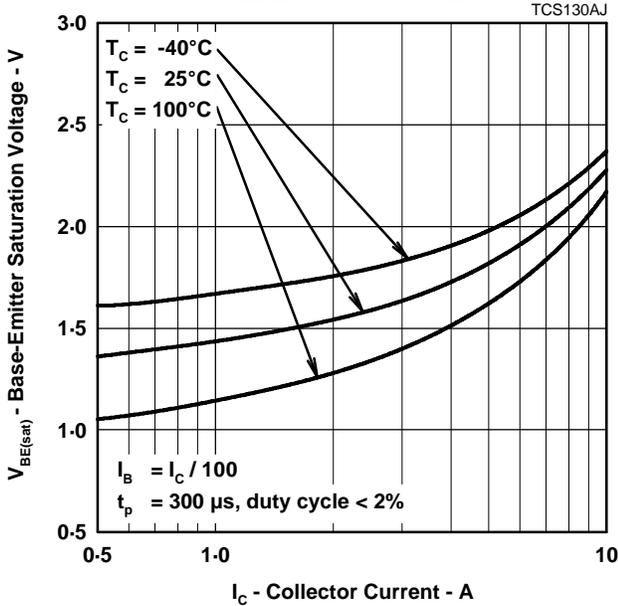


Figure 3.

## THERMAL INFORMATION

**MAXIMUM POWER DISSIPATION**  
**VS**  
**CASE TEMPERATURE**

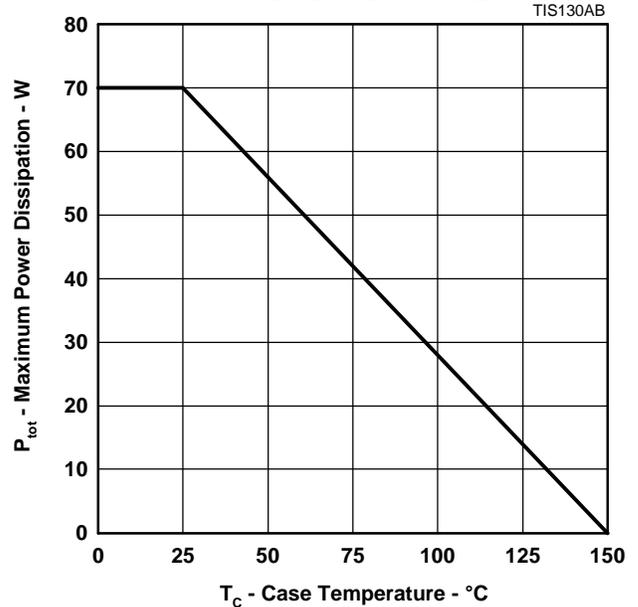


Figure 4.



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### Ordering Information :

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

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

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