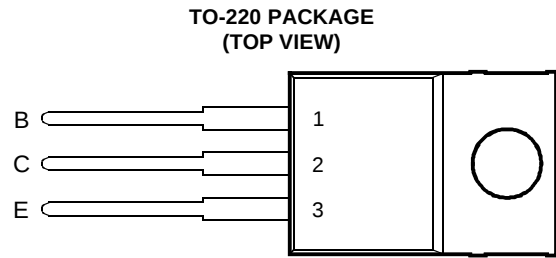


# BDX53, BDX53A, BDX53B, BDX53C NPN SILICON POWER DARLINGTONS

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MAY 1989 - REVISED MARCH 1997

- Designed for Complementary Use with BDX54, BDX54A, BDX54B and BDX54C
- 60 W at 25°C Case Temperature
- 8 A Continuous Collector Current
- Minimum  $h_{FE}$  of 750 at 3 V, 3 A



Pin 2 is in electrical contact with the mounting base.

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

| RATING                                                                             |        | SYMBOL    | VALUE       | UNIT |
|------------------------------------------------------------------------------------|--------|-----------|-------------|------|
| Collector-base voltage ( $I_E = 0$ )                                               | BDX53  | $V_{CBO}$ | 45          | V    |
|                                                                                    | BDX53A |           | 60          |      |
|                                                                                    | BDX53B |           | 80          |      |
|                                                                                    | BDX53C |           | 100         |      |
| Collector-emitter voltage ( $I_B = 0$ )                                            | BDX53  | $V_{CEO}$ | 45          | V    |
|                                                                                    | BDX53A |           | 60          |      |
|                                                                                    | BDX53B |           | 80          |      |
|                                                                                    | BDX53C |           | 100         |      |
| Emitter-base voltage                                                               |        | $V_{EBO}$ | 5           | V    |
| Continuous collector current                                                       |        | $I_C$     | 8           | A    |
| Continuous base current                                                            |        | $I_B$     | 0.2         | A    |
| Continuous device dissipation at (or below) 25°C case temperature (see Note 1)     |        | $P_{tot}$ | 60          | W    |
| Continuous device dissipation at (or below) 25°C free air temperature (see Note 2) |        | $P_{tot}$ | 2           | W    |
| Operating junction temperature range                                               |        | $T_j$     | -65 to +150 | °C   |
| Operating 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 0.48 W/°C.  
2. Derate linearly to 150°C free air temperature at the rate of 16 mW/°C.

## PRODUCT INFORMATION

Information is current as of publication date. Products conform to specifications in accordance with the terms of Power Innovations standard warranty. Production processing does not necessarily include testing of all parameters.



# BDX53, BDX53A, BDX53B, BDX53C

## NPN SILICON POWER DARLINGTONS

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### 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)<br>BDX53<br>BDX53A<br>BDX53B<br>BDX53C                                                                                                     | 45<br>60<br>80<br>100 |     |                          | V    |
| $I_{CEO}$ Collector-emitter cut-off current        | $V_{CE} = 30 \text{ V}$ $I_B = 0$<br>$V_{CE} = 30 \text{ V}$ $I_B = 0$<br>$V_{CE} = 40 \text{ V}$ $I_B = 0$<br>$V_{CE} = 50 \text{ V}$ $I_B = 0$<br>BDX53<br>BDX53A<br>BDX53B<br>BDX53C  |                       |     | 0.5<br>0.5<br>0.5<br>0.5 | mA   |
| $I_{CBO}$ Collector cut-off current                | $V_{CB} = 45 \text{ V}$ $I_E = 0$<br>$V_{CB} = 60 \text{ V}$ $I_E = 0$<br>$V_{CB} = 80 \text{ V}$ $I_E = 0$<br>$V_{CB} = 100 \text{ V}$ $I_E = 0$<br>BDX53<br>BDX53A<br>BDX53B<br>BDX53C |                       |     | 0.2<br>0.2<br>0.2<br>0.2 | mA   |
| $I_{EBO}$ Emitter cut-off current                  | $V_{EB} = 5 \text{ V}$ $I_C = 0$                                                                                                                                                         |                       |     | 2                        | mA   |
| $h_{FE}$ Forward current transfer ratio            | $V_{CE} = 3 \text{ V}$ $I_C = 3 \text{ A}$ (see Notes 3 and 4)                                                                                                                           | 750                   |     |                          |      |
| $V_{BE(sat)}$ Base-emitter saturation voltage      | $I_B = 12 \text{ mA}$ $I_C = 3 \text{ A}$ (see Notes 3 and 4)                                                                                                                            |                       |     | 2.5                      | V    |
| $V_{CE(sat)}$ Collector-emitter saturation voltage | $I_B = 12 \text{ mA}$ $I_C = 3 \text{ A}$ (see Notes 3 and 4)                                                                                                                            |                       |     | 2                        | V    |
| $V_{EC}$ Parallel diode forward voltage            | $I_E = 3 \text{ A}$ $I_B = 0$                                                                                                                                                            |                       |     | 2.5                      | 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.

### thermal characteristics

| PARAMETER                                               | MIN | TYP | MAX  | UNIT |
|---------------------------------------------------------|-----|-----|------|------|
| $R_{\theta JC}$ Junction to case thermal resistance     |     |     | 2.08 | °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 <sup>†</sup>                                                            | 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   |     | $\mu\text{s}$ |
| $t_{off}$ Turn-off time | $V_{BE(off)} = -4.5 \text{ V}$ $R_L = 10 \Omega$ $t_p = 20 \mu\text{s}$ , dc $\leq 2\%$ |     | 5   |     | $\mu\text{s}$ |

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

# TYPICAL CHARACTERISTICS

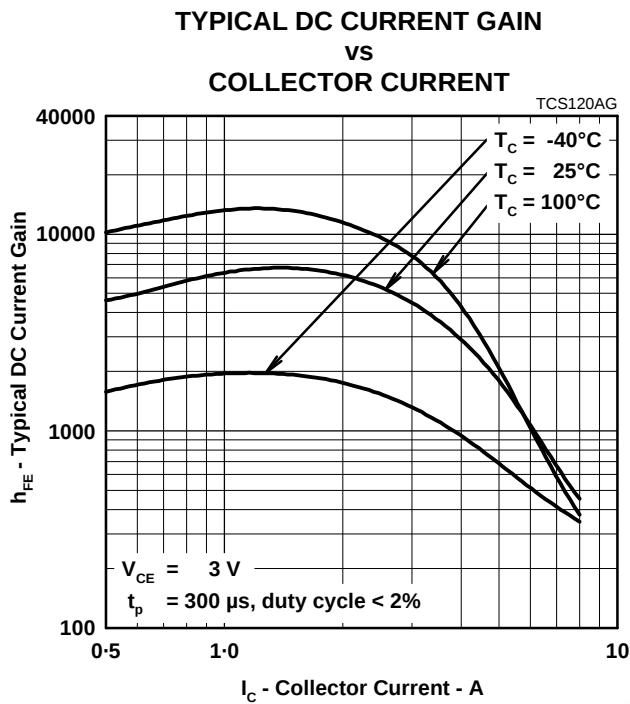


Figure 1.

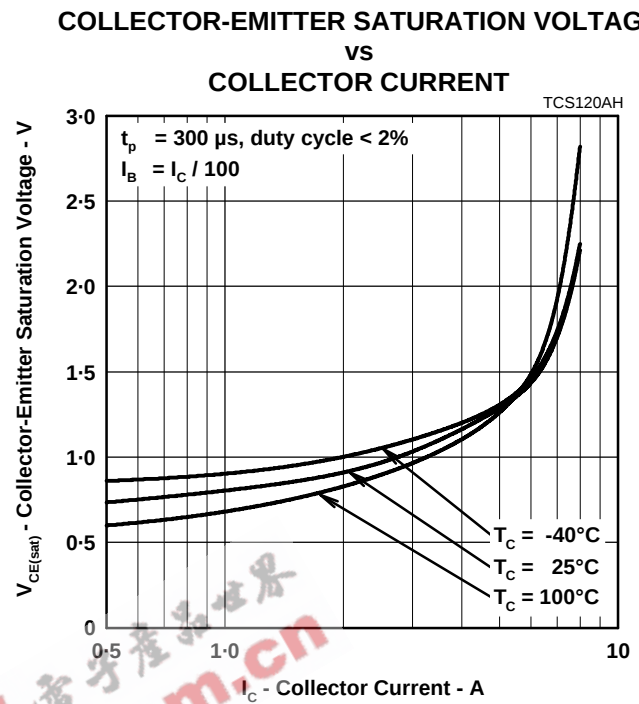


Figure 2.

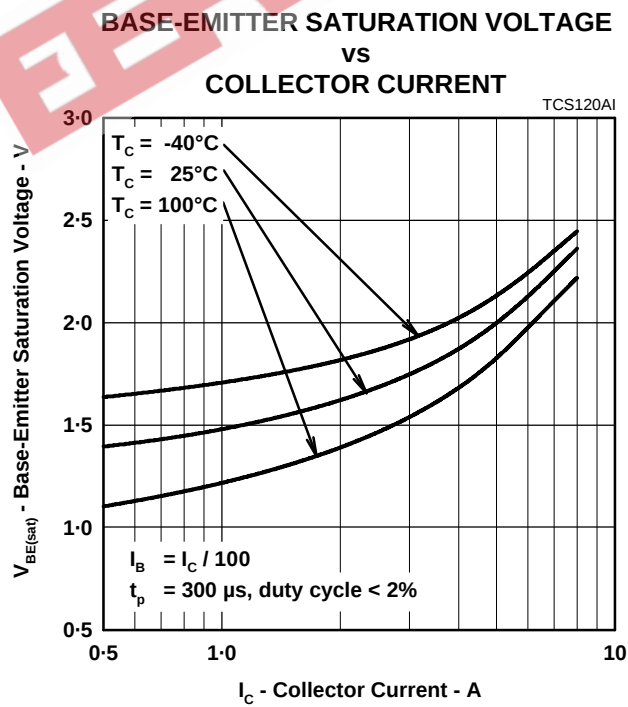


Figure 3.

BDX53, BDX53A, BDX53B, BDX53C  
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MAXIMUM SAFE OPERATING REGIONS

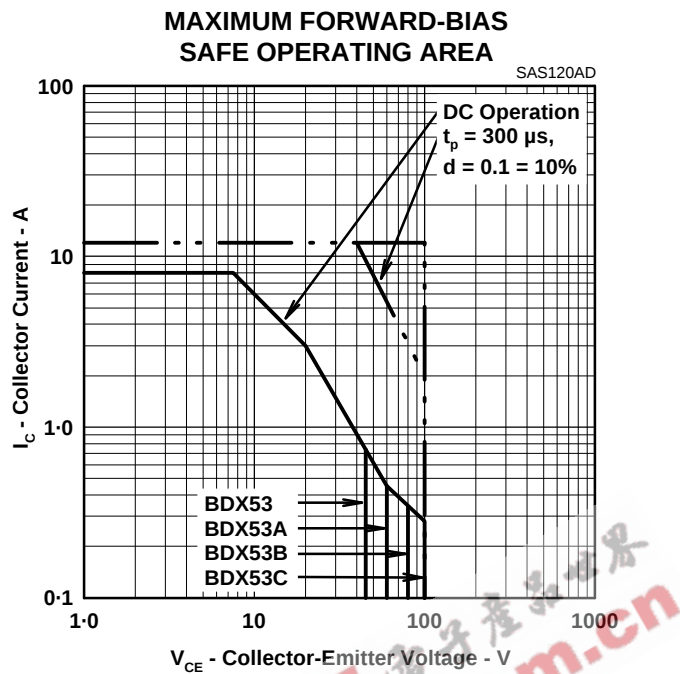


Figure 4.

THERMAL INFORMATION

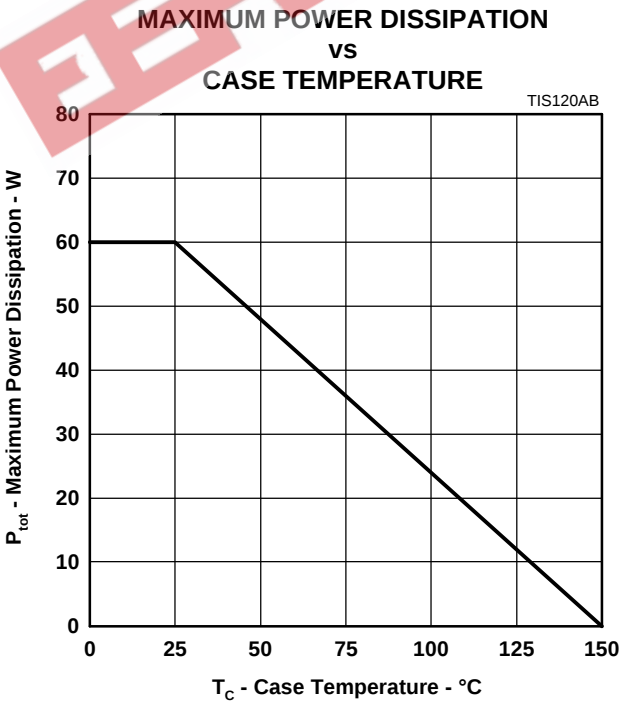


Figure 5.

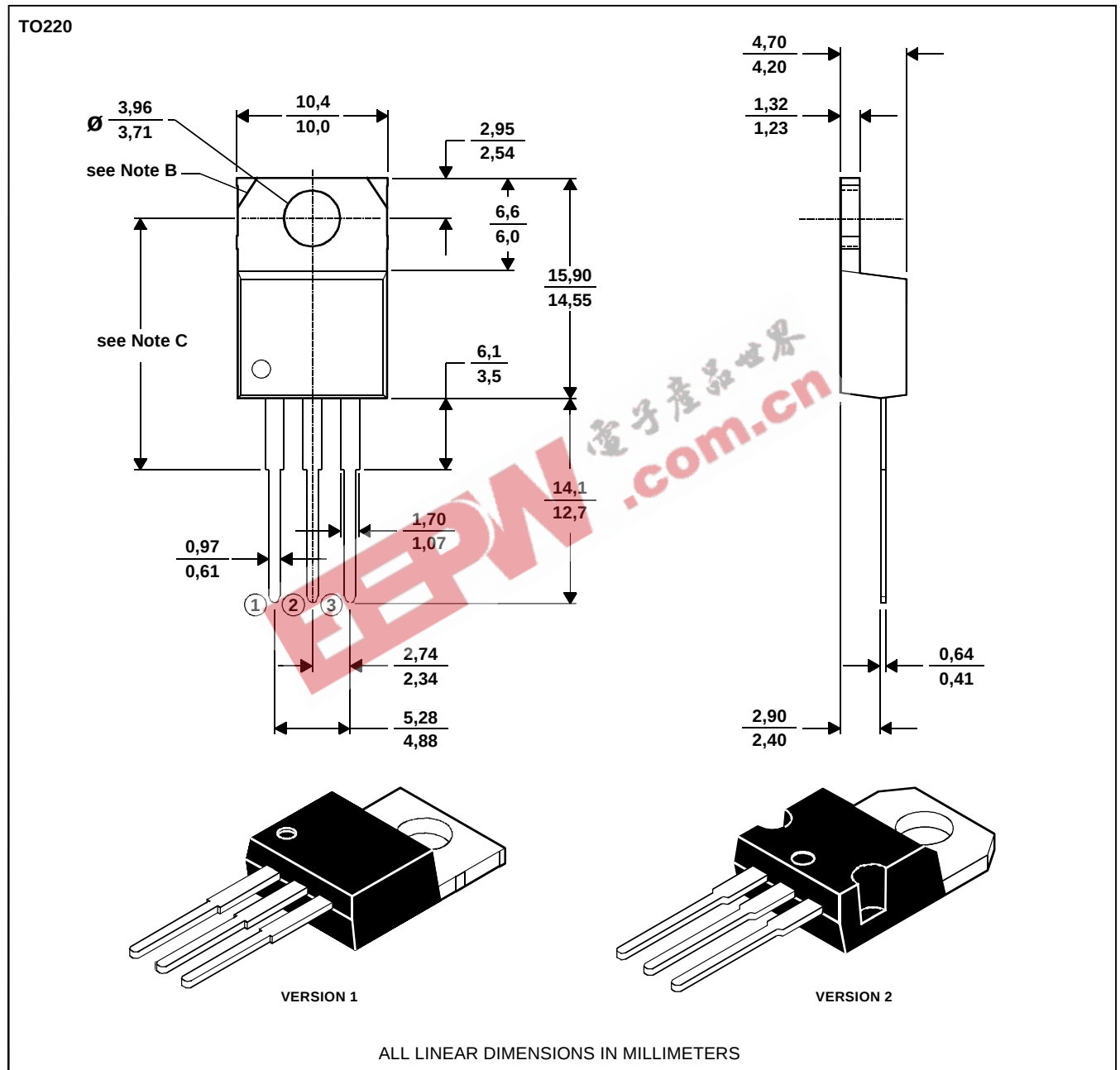
PRODUCT INFORMATION

## MECHANICAL DATA

### TO-220

#### 3-pin plastic flange-mount package

This single-in-line package consists of a circuit mounted on a lead frame and encapsulated within a plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high humidity conditions. Leads require no additional cleaning or processing when used in soldered assembly.



- NOTES: A. The centre pin is in electrical contact with the mounting tab.  
B. Mounting tab corner profile according to package version.  
C. Typical fixing hole centre stand off height according to package version.  
Version 1, 18.0 mm. Version 2, 17.6 mm.

MDXXBE

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