

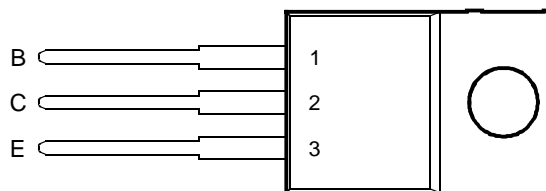
BDW54, BDW54A, BDW54B, BDW54C, BDW54D PNP SILICON POWER DARLINGTONS

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- **Designed for Complementary Use with BDW53, BDW53A, BDW53B, BDW53C and BDW53D**
- **40 W at 25°C Case Temperature**
- **4 A Continuous Collector Current**
- **Minimum h_{FE} of 750 at 3 V, 1.5 A**

TO-220 PACKAGE
(TOP VIEW)



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 ($I_E = 0$) | BDW54 | V_{CBO} | -45 | V |
| | BDW54A | | -60 | |
| | BDW54B | | -80 | |
| | BDW54C | | -100 | |
| | BDW54D | | -120 | |
| Collector-emitter voltage ($I_B = 0$) (see Note 1) | BDW54 | V_{CEO} | -45 | V |
| | BDW54A | | -60 | |
| | BDW54B | | -80 | |
| | BDW54C | | -100 | |
| | BDW54D | | -120 | |
| Emitter-base voltage | | V_{EBO} | -5 | V |
| Continuous collector current | | I_C | -4 | A |
| Continuous base current | | I_B | -50 | mA |
| Continuous device dissipation at (or below) 25°C case temperature (see Note 2) | | P_{tot} | 40 | W |
| Continuous device dissipation at (or below) 25°C free air temperature (see Note 3) | | P_{tot} | 2 | W |
| Unclamped inductive load energy (see Note 4) | | $\frac{1}{2}LI_C^2$ | 25 | mJ |
| 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. These values apply when the base-emitter diode is open circuited.
 2. Derate linearly to 150°C case temperature at the rate of 0.32 W/°C.
 3. Derate linearly to 150°C free air temperature at the rate of 16 mW/°C.
 4. This rating is based on the capability of the transistor to operate safely in a circuit of: $L = 20$ mH, $I_{B(on)} = -5$ mA, $R_{BE} = 100 \Omega$, $V_{BE(off)} = 0$, $R_S = 0.1 \Omega$, $V_{CC} = -20$ V.

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.

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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 | $I_C = -30 \text{ mA}$ | $I_B = 0$ | (see Note 5) | BDW54 BDW54A BDW54B BDW54C BDW54D | | -45 -60 -80 -100 -120 | V |
| I_{CEO} Collector-emitter cut-off current | $V_{CE} = -30 \text{ V}$ $V_{CE} = -30 \text{ V}$ $V_{CE} = -40 \text{ V}$ $V_{CE} = -50 \text{ V}$ $V_{CE} = -60 \text{ V}$ | $I_B = 0$ $I_B = 0$ $I_B = 0$ $I_B = 0$ $I_B = 0$ | | BDW54 BDW54A BDW54B BDW54C BDW54D | | -0.5 -0.5 -0.5 -0.5 -0.5 | mA |
| I_{CBO} Collector cut-off current | $V_{CB} = -45 \text{ V}$ $V_{CB} = -60 \text{ V}$ $V_{CB} = -80 \text{ V}$ $V_{CB} = -100 \text{ V}$ $V_{CB} = -120 \text{ V}$ $V_{CB} = -45 \text{ V}$ $V_{CB} = -60 \text{ V}$ $V_{CB} = -80 \text{ V}$ $V_{CB} = -100 \text{ V}$ $V_{CB} = -120 \text{ V}$ | $I_E = 0$ $I_E = 0$ $I_E = 0$ $I_E = 0$ $I_E = 0$ $I_E = 0$ $I_E = 0$ $I_E = 0$ $I_E = 0$ $I_E = 0$ | $T_C = 150^\circ\text{C}$ $T_C = 150^\circ\text{C}$ $T_C = 150^\circ\text{C}$ $T_C = 150^\circ\text{C}$ $T_C = 150^\circ\text{C}$ | BDW54 BDW54A BDW54B BDW54C BDW54D BDW54 BDW54A BDW54B BDW54C BDW54D | | -0.2 -0.2 -0.2 -0.2 -0.2 -5 -5 -5 -5 -5 | mA |
| I_{EBO} Emitter cut-off current | $V_{EB} = -5 \text{ V}$ | $I_C = 0$ | | | | -2 | mA |
| h_{FE} Forward current transfer ratio | $V_{CE} = -3 \text{ V}$ $V_{CE} = -3 \text{ V}$ | $I_C = -1.5 \text{ A}$ $I_C = -4 \text{ A}$ | (see Notes 5 and 6) | 750 100 | | 20000 | |
| $V_{BE(on)}$ Base-emitter voltage | $V_{CE} = -3 \text{ V}$ | $I_C = -1.5 \text{ A}$ | (see Notes 5 and 6) | | | -2.5 | V |
| $V_{CE(sat)}$ Collector-emitter saturation voltage | $I_B = -30 \text{ mA}$ $I_B = -40 \text{ mA}$ | $I_C = -1.5 \text{ A}$ $I_C = -4 \text{ A}$ | (see Notes 5 and 6) | | | -2.5 -4 | V |
| V_{EC} Parallel diode forward voltage | $I_E = -4 \text{ A}$ | $I_B = 0$ | | | | -3.5 | V |

NOTES: 5. These parameters must be measured using pulse techniques, $t_p = 300 \mu\text{s}$, duty cycle $\leq 2\%$.

6. 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 | | | 3.125 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ Junction to free air thermal resistance | | | 62.5 | $^\circ\text{C/W}$ |

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

| PARAMETER | TEST CONDITIONS † | | | MIN | TYP | MAX | UNIT |
|-------------------------|-----------------------------|-----------------------------|--|-----|-----|-----|---------------|
| t_{on} Turn-on time | $I_C = -2 \text{ A}$ | $I_{B(on)} = -8 \text{ mA}$ | $I_{B(off)} = 8 \text{ mA}$ | | 1 | | μs |
| t_{off} Turn-off time | $V_{BE(off)} = 5 \text{ V}$ | $R_L = 15 \Omega$ | $t_p = 20 \mu\text{s}$, dc $\leq 2\%$ | | 4.5 | | μs |

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

TYPICAL CHARACTERISTICS

TYPICAL DC CURRENT GAIN
VS
COLLECTOR CURRENT

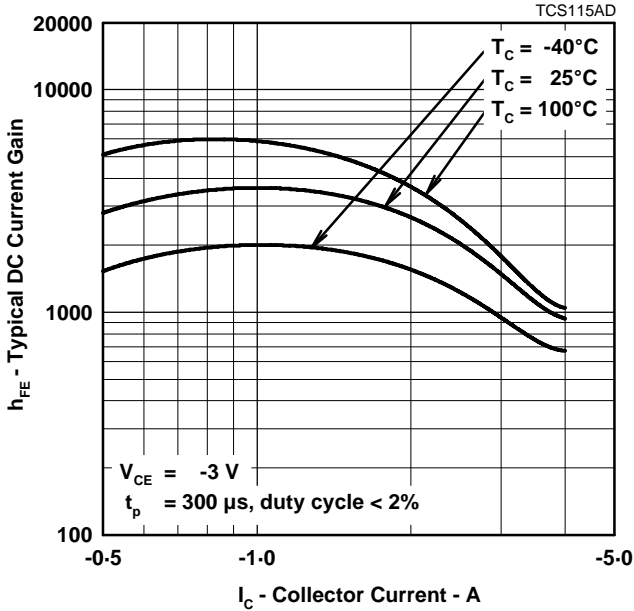


Figure 1.

COLLECTOR-EMITTER SATURATION VOLTAGE
VS
COLLECTOR CURRENT

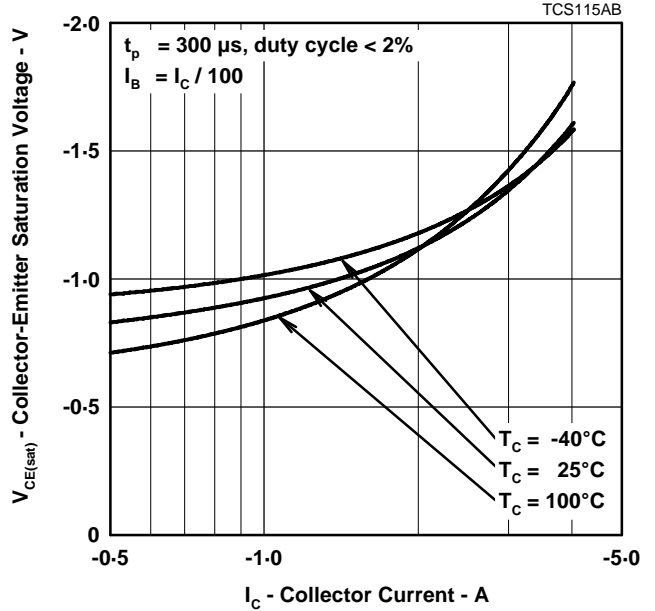


Figure 2.

BASE-EMITTER SATURATION VOLTAGE
VS
COLLECTOR CURRENT

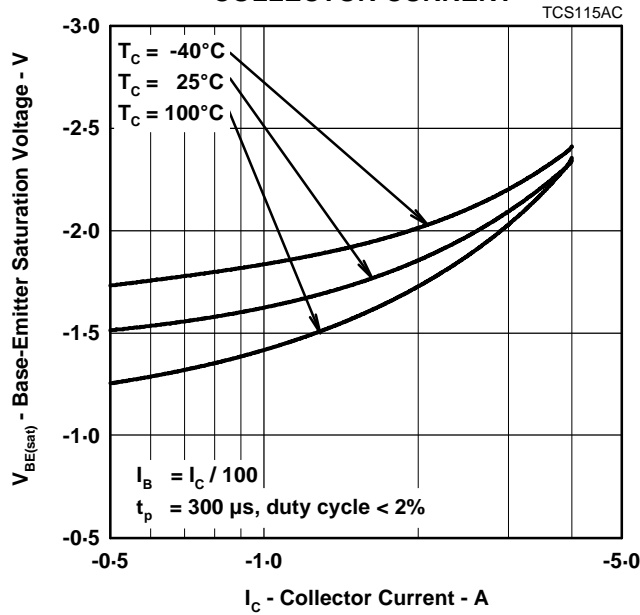


Figure 3.

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MAXIMUM SAFE OPERATING REGIONS

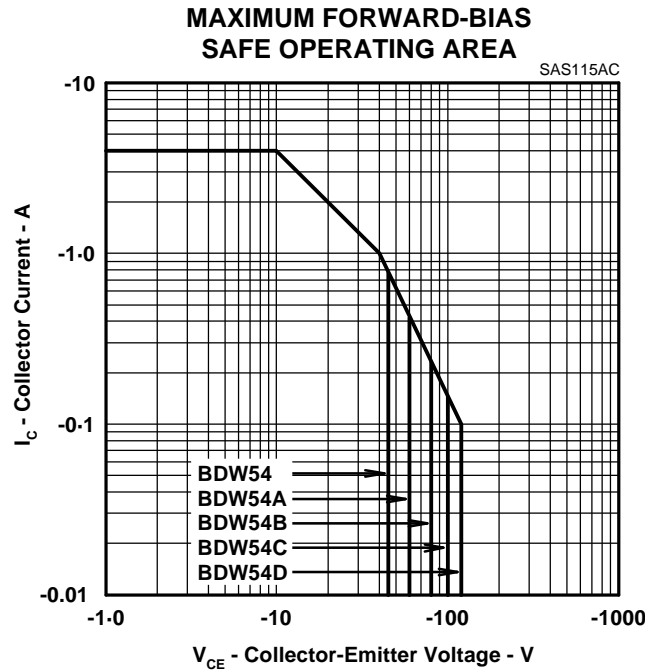


Figure 4.

THERMAL INFORMATION

MAXIMUM POWER DISSIPATION VS CASE TEMPERATURE

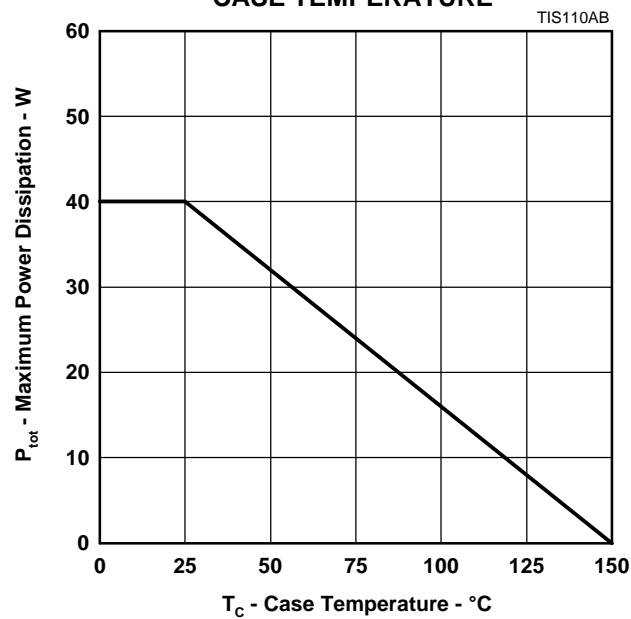


Figure 5.

BDW54, BDW54A, BDW54B, BDW54C, BDW54D PNP SILICON POWER DARLINGTONS

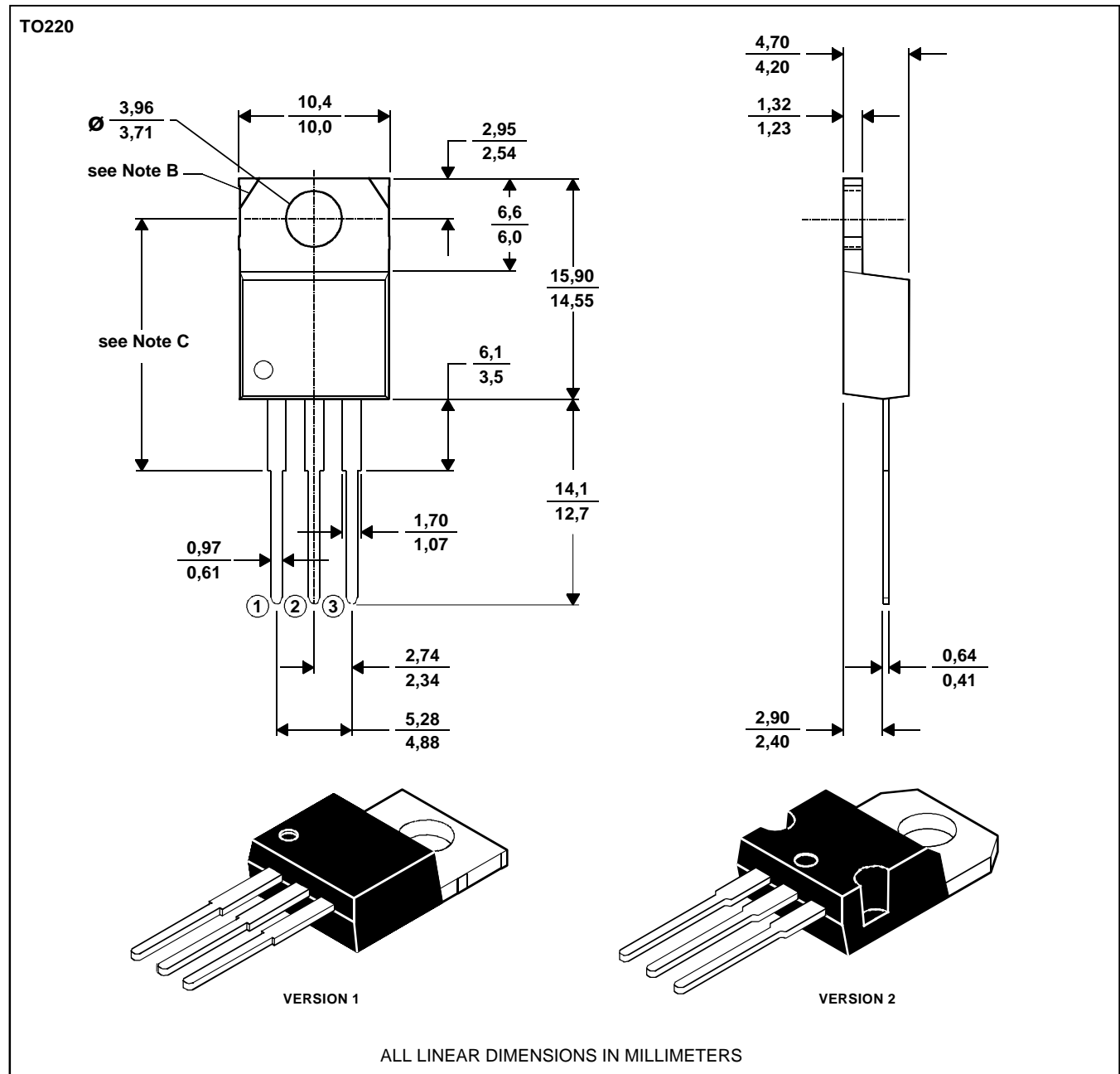
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MECHANICAL DATA

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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