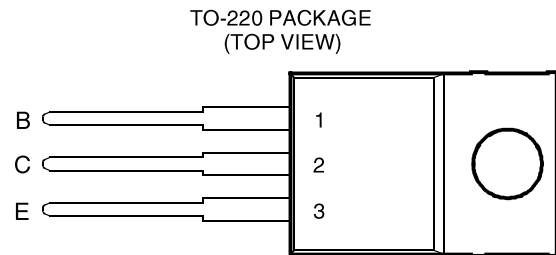


- Designed for Complementary Use with BD645, BD647, BD649 and BD651
- 62.5 W at 25°C Case Temperature
- 8 A Continuous Collector Current
- Minimum h_{FE} of 750 at 3 V, 3 A



Pin 2 is in electrical contact with the mounting base.

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

| RATING | | SYMBOL | VALUE | UNIT |
|--|-------|---------------------|-------------|------|
| Collector-base voltage ($I_E = 0$) | BD646 | V_{CBO} | -80 | V |
| | BD648 | | -100 | |
| | BD650 | | -120 | |
| | BD652 | | -140 | |
| Collector-emitter voltage ($I_B = 0$) | BD646 | V_{CEO} | -60 | V |
| | BD648 | | -80 | |
| | BD650 | | -100 | |
| | BD652 | | -120 | |
| Emitter-base voltage | | V_{EBO} | -5 | V |
| Continuous collector current | | I_C | -8 | A |
| Peak collector current (see Note 1) | | I_{CM} | -12 | A |
| Continuous base current | | I_B | -0.3 | A |
| Continuous device dissipation at (or below) 25°C case temperature (see Note 2) | | P_{tot} | 62.5 | 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) | | $\frac{1}{2}LI_C^2$ | 50 | mJ |
| Operating junction temperature range | | T_j | -65 to +150 | °C |
| Storage temperature range | | T_{stg} | -65 to +150 | °C |
| Lead temperature 3.2 mm from case for 10 seconds | | T_L | 260 | °C |

- NOTES: 1. This value applies for $t_p \leq 0.3$ ms, duty cycle $\leq 10\%$.
 2. Derate linearly to 150°C case temperature at the rate of 0.4 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.

BD646, BD648, BD650, BD652

PNP SILICON POWER DARLINGTONS

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) | BD646 -60 BD648 -80 BD650 -100 BD652 -120 | | | V |
| I_{CEO} Collector-emitter cut-off current | $V_{CE} = -30 \text{ V}$ $I_B = 0$ $V_{CE} = -40 \text{ V}$ $I_B = 0$ $V_{CE} = -50 \text{ V}$ $I_B = 0$ $V_{CE} = -60 \text{ V}$ $I_B = 0$ | BD646 BD648 BD650 BD652 | | -0.5 -0.5 -0.5 -0.5 | mA |
| I_{CBO} Collector cut-off current | $V_{CB} = -60 \text{ V}$ $I_E = 0$ $V_{CB} = -80 \text{ V}$ $I_E = 0$ $V_{CB} = -100 \text{ V}$ $I_E = 0$ $V_{CB} = -120 \text{ V}$ $I_E = 0$ $V_{CB} = -40 \text{ V}$ $I_E = 0$ $T_C = 150^\circ\text{C}$ $V_{CB} = -50 \text{ V}$ $I_E = 0$ $T_C = 150^\circ\text{C}$ $V_{CB} = -60 \text{ V}$ $I_E = 0$ $T_C = 150^\circ\text{C}$ $V_{CB} = -70 \text{ V}$ $I_E = 0$ $T_C = 150^\circ\text{C}$ | BD646 BD648 BD650 BD652 BD646 BD648 BD650 BD652 | | -0.2 -0.2 -0.2 -0.2 -2.0 -2.0 -2.0 -2.0 | mA |
| I_{EBO} Emitter cut-off current | $V_{EB} = -5 \text{ V}$ $I_C = 0$ (see Notes 5 and 6) | | | -5 | mA |
| h_{FE} Forward current transfer ratio | $V_{CE} = -3 \text{ V}$ $I_C = -3 \text{ A}$ (see Notes 5 and 6) | 750 | | | |
| $V_{CE(sat)}$ Collector-emitter saturation voltage | $I_B = -12 \text{ mA}$ $I_C = -3 \text{ A}$ $I_B = -50 \text{ mA}$ $I_C = -5 \text{ A}$ (see Notes 5 and 6) | | | -2 -2.5 | V |
| $V_{BE(sat)}$ Base-emitter saturation voltage | $I_B = -50 \text{ mA}$ $I_C = -5 \text{ A}$ (see Notes 5 and 6) | | | -3 | V |
| $V_{BE(on)}$ Base-emitter voltage | $V_{CE} = -3 \text{ V}$ $I_C = -3 \text{ A}$ (see Notes 5 and 6) | | | -2.5 | 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 | | | 2.0 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ Junction to free air thermal resistance | | | 62.5 | $^\circ\text{C/W}$ |

TYPICAL CHARACTERISTICS

TYPICAL DC CURRENT GAIN
vs
COLLECTOR CURRENT

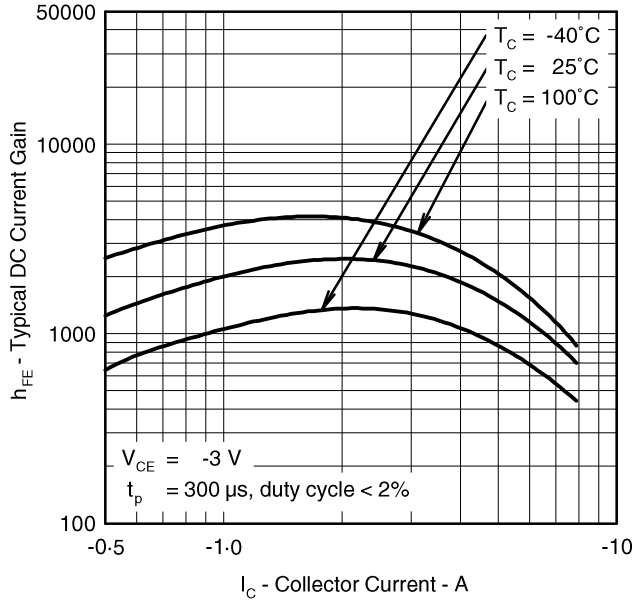


Figure 1.

COLLECTOR-EMITTER SATURATION VOLTAGE
vs
COLLECTOR CURRENT

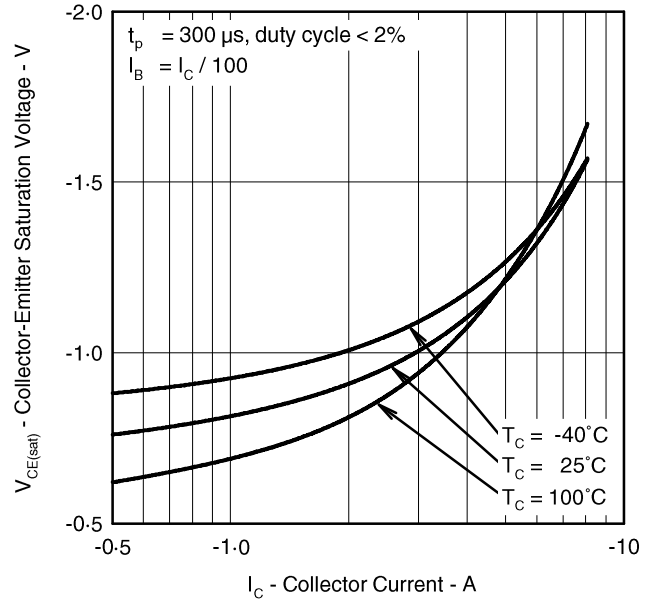


Figure 2.

BASE-EMITTER SATURATION VOLTAGE
vs
COLLECTOR CURRENT

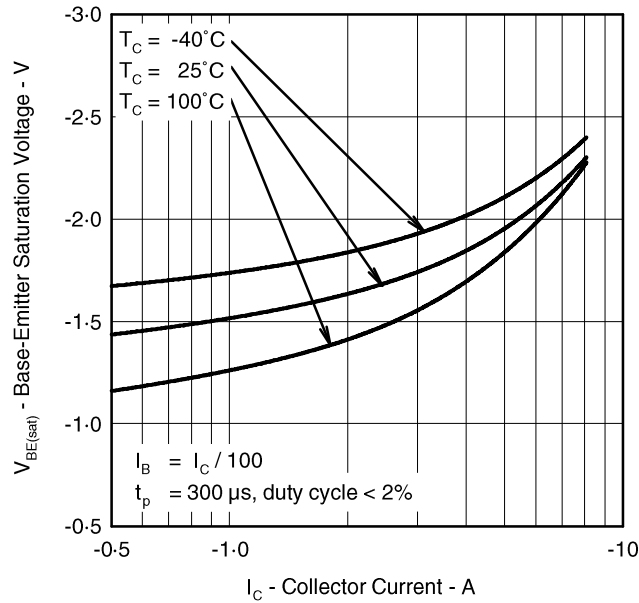


Figure 3.

BD646, BD648, BD650, BD652
PNP SILICON POWER DARLINGTONS

MAXIMUM SAFE OPERATING REGIONS

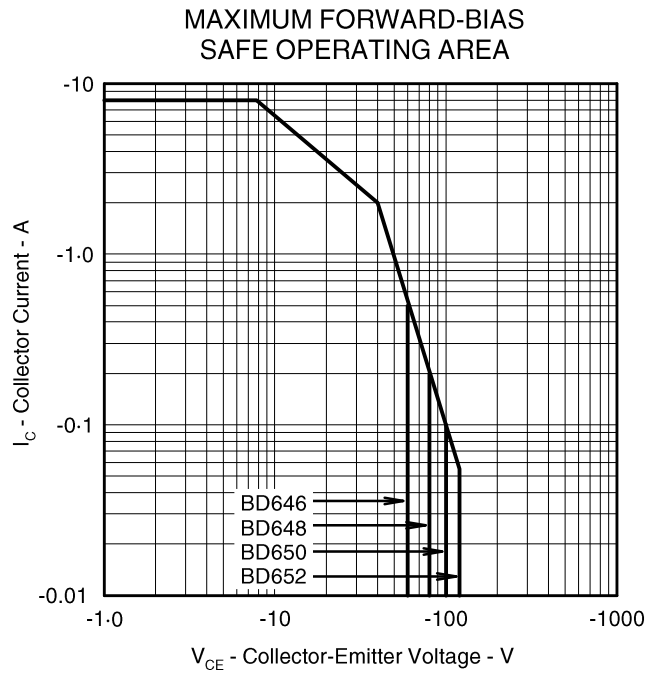


Figure 4.

THERMAL INFORMATION

MAXIMUM POWER DISSIPATION
vs
CASE TEMPERATURE

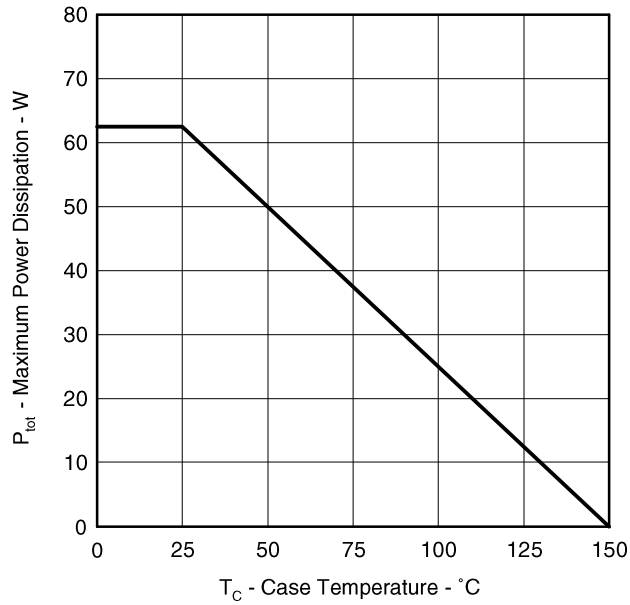


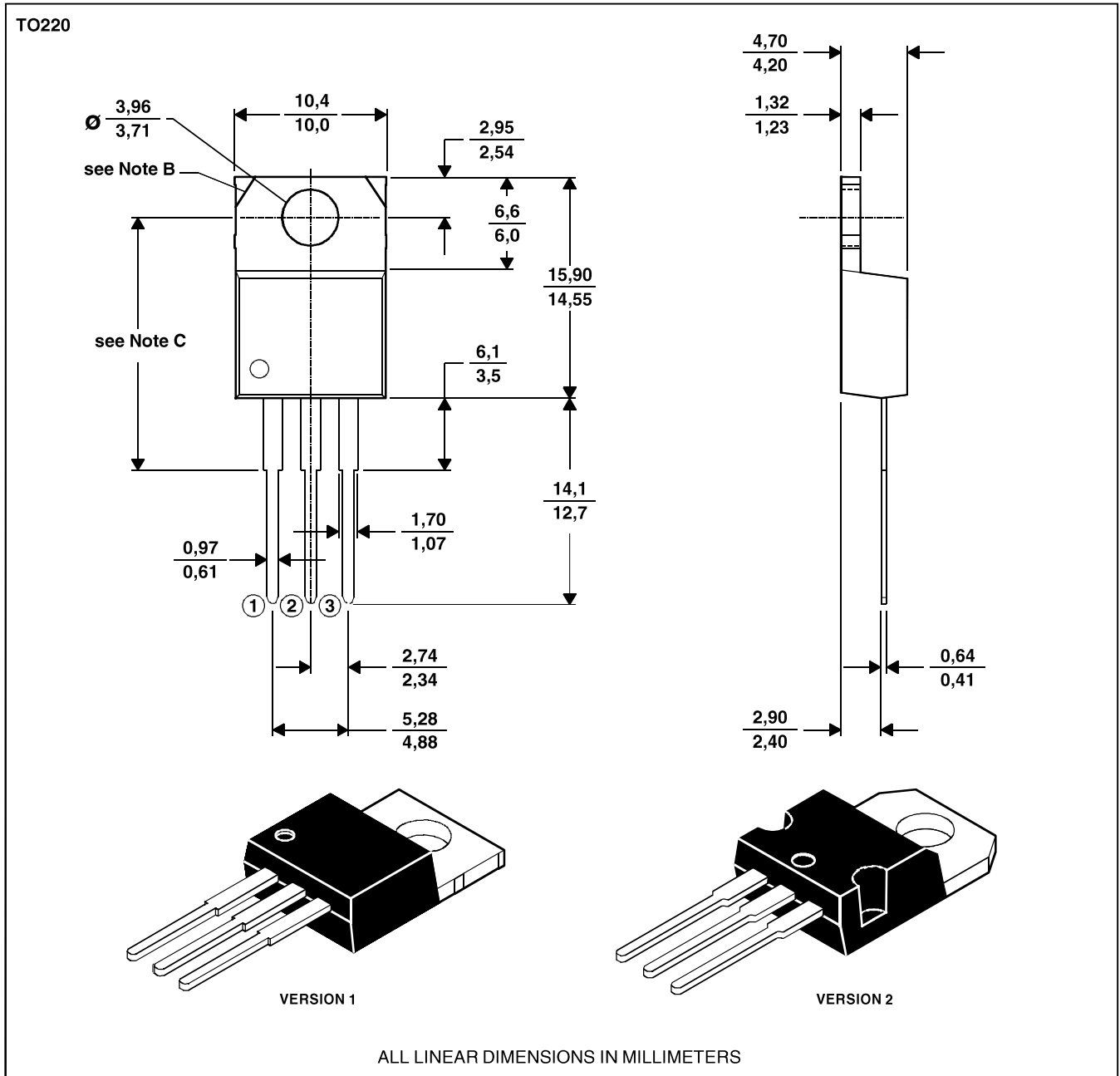
Figure 5.

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.