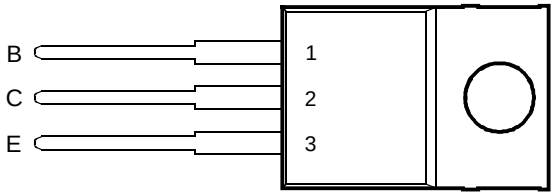
 AUGUST 1978 - REVISED MARCH 1997

- **7 A Continuous Collector Current**
- **15 A Peak Collector Current**
- **60 W at 25°C Case Temperature**

**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) | BU406<br>BU407 | $V_{CBO}$ | 400<br>330 | V |
| Collector-emitter voltage ($V_{BE}$ = -2 V) | BU406<br>BU407 | $V_{CEX}$ | 400<br>330 | V |
| Collector-emitter voltage ($I_B$ = 0) | BU406<br>BU407 | $V_{CEO}$ | 200<br>150 | V |
| Emitter-base voltage | | $V_{EB}$ | 6 | V |
| Continuous collector current | | $I_C$ | 7 | A |
| Peak collector current (see Note 1) | | $I_{CM}$ | 15 | A |
| Continuous base current | | $I_B$ | 4 | A |
| Continuous device dissipation at (or below) 25°C case temperature | | $P_{tot}$ | 60 | W |
| Operating junction temperature range | | $T_j$ | -55 to +150 | °C |
| Storage temperature range | | $T_{stg}$ | -55 to +150 | °C |

NOTE 1: This value applies for $t_p \leq 10$ ms, duty cycle $\leq 2\%$.

## 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 mA | $I_B$ = 0 | | | 140 | | | V |
| $I_{CES}$ | Collector-emitter cut-off current | $V_{CE}$ = 400 V | $V_{BE}$ = 0 | | BU406 | | | 5 | mA |
| | | $V_{CE}$ = 330 V | $V_{BE}$ = 0 | | BU407 | | | 5 | |
| | | $V_{CE}$ = 250 V | $V_{BE}$ = 0 | | BU406 | | | 0.1 | |
| | | $V_{CE}$ = 200 V | $V_{BE}$ = 0 | | BU407 | | | 0.1 | |
| | | $V_{CE}$ = 250 V | $V_{BE}$ = 0 | $T_C$ = 150°C | BU406 | | | 1 | |
| | | $V_{CE}$ = 200 V | $V_{BE}$ = 0 | $T_C$ = 150°C | BU407 | | | 1 | |
| $I_{EBO}$ | Emitter cut-off current | $V_{EB}$ = 6 V | $I_C$ = 0 | | | | | 1 | mA |
| $h_{FE}$ | Forward current transfer ratio | $V_{CE}$ = 10 V | $I_C$ = 4 A | (see Notes 2 and 3) | | 12 | | | |
| | | $V_{CE}$ = 10 V | $I_C$ = 0.5 A | (see Notes 2 and 3) | | 20 | | | |
| $V_{CE(sat)}$ | Collector-emitter saturation voltage | $I_B$ = 0.5 A | $I_C$ = 5 A | (see Notes 2 and 3) | | | | 1 | V |
| $V_{BE(sat)}$ | Base-emitter saturation voltage | $I_B$ = 0.5 A | $I_C$ = 5 A | (see Notes 2 and 3) | | | | 1.2 | V |
| $f_t$ | Current gain bandwidth product | $V_{CE}$ = 5 V | $I_C$ = 0.5 A | f = 1 MHz | (see Note 4) | | 6 | | MHz |
| $C_{ob}$ | Output capacitance | $V_{CB}$ = 20 V | $I_E$ = 0 | f = 1 MHz | | | 60 | | pF |

NOTES: 2. These parameters must be measured using pulse techniques, $t_p$ = 300 µs, duty cycle ≤ 2%.
3. These parameters must be measured using voltage-sensing contacts, separate from the current carrying contacts.
4. To obtain $f_t$ the [$h_{FE}$] response is extrapolated at the rate of -6 dB per octave from f = 1 MHz to the frequency at which [$h_{FE}$] = 1.

## 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 | | | 70 | °C/W |

## inductive-load-switching characteristics at 25°C case temperature (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS † | | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| $t_s$ | Storage time | $I_C$ = 5 A | $I_{B(end)}$ = 0.5A | (see Figures 1 and 2) | | 2.7 | | µs |
| $t_{(off)}$ | Turn off time | | | | | | 750 | ns |

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

## PARAMETER MEASUREMENT INFORMATION

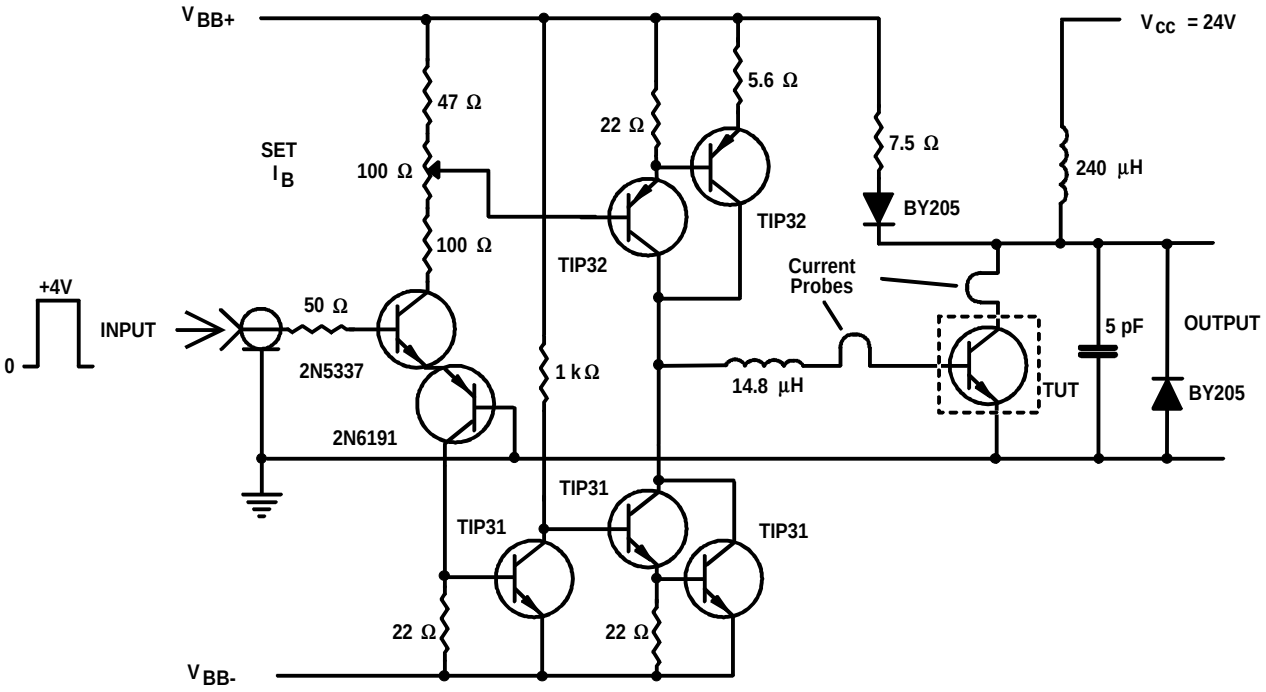
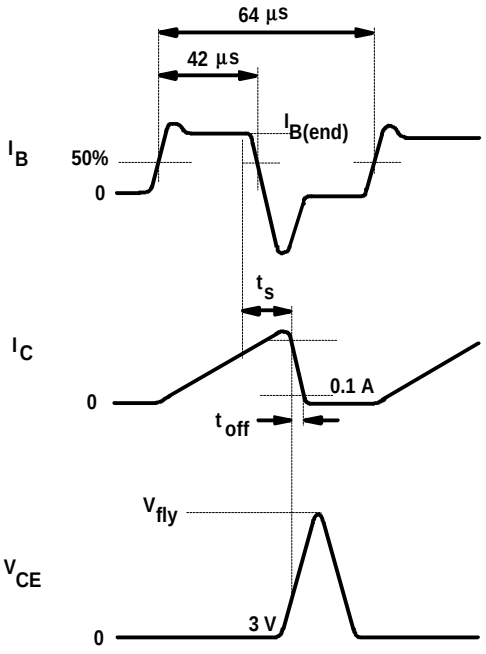



**Figure 1. Inductive-Load Switching Test Circuit**




$t_{off}$ is the time for the collector current $I_C$ to decrease to 0.1 A after the collector to emitter voltage $V_{CE}$ has risen 3 V into its flyback excursion.

**Figure 2. Inductive-Load Switching Waveforms**

## TYPICAL CHARACTERISTICS

**TYPICAL DC CURRENT GAIN vs COLLECTOR CURRENT**

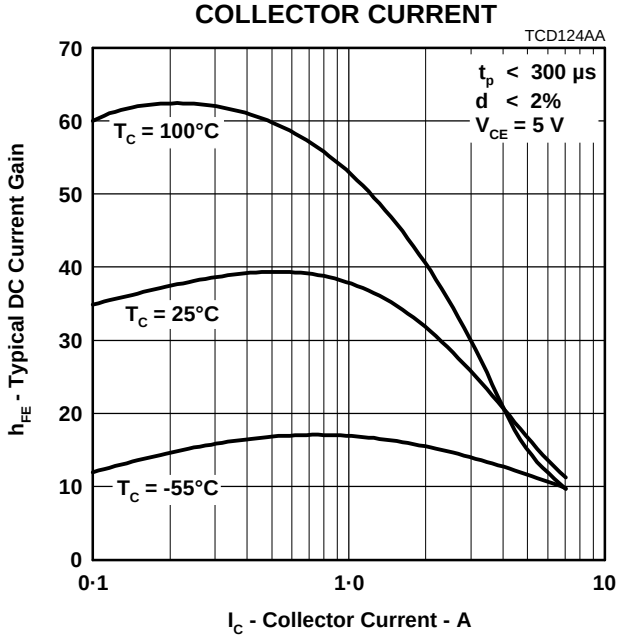



**Figure 3.**

**TYPICAL DC CURRENT GAIN vs COLLECTOR CURRENT**

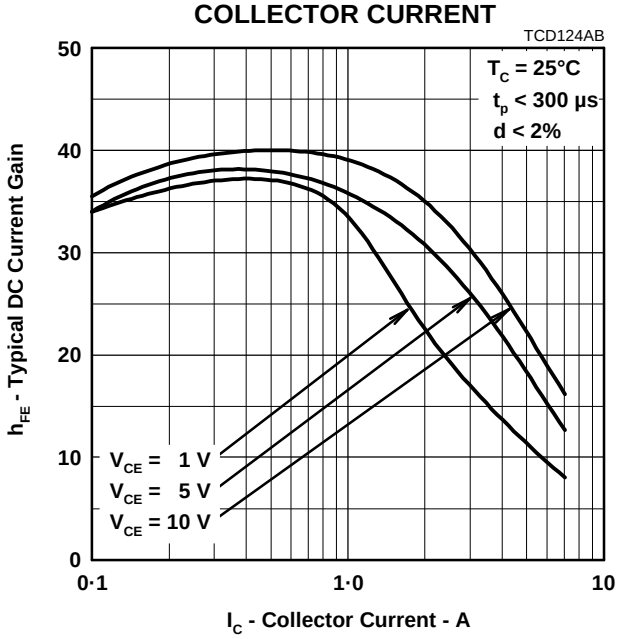



**Figure 4.**

**COLLECTOR-EMITTER SATURATION VOLTAGE vs CASE TEMPERATURE**

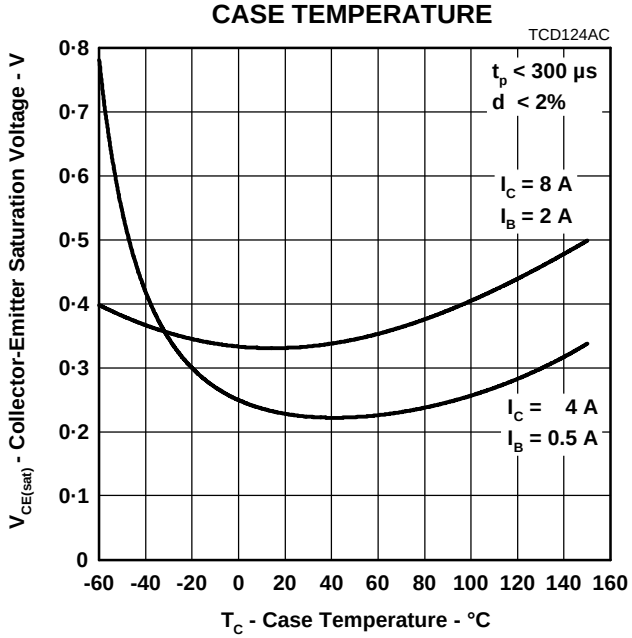



**Figure 5.**

## MAXIMUM SAFE OPERATING REGIONS

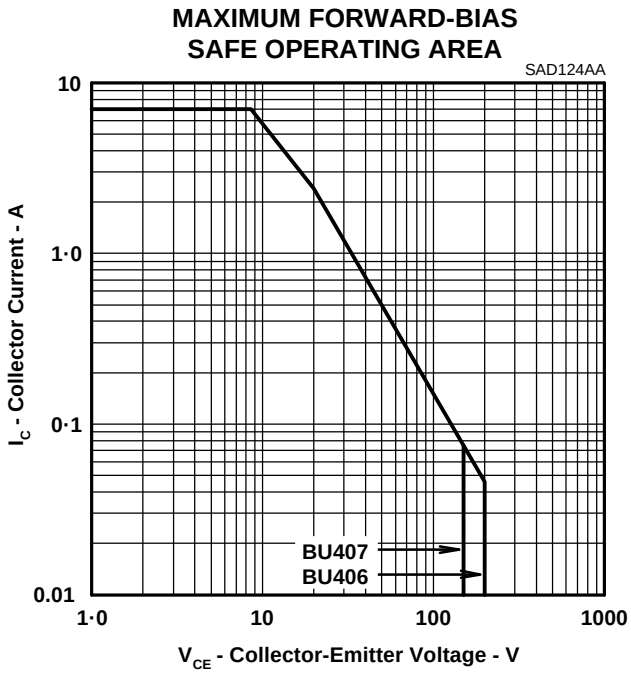



**Figure 6.**

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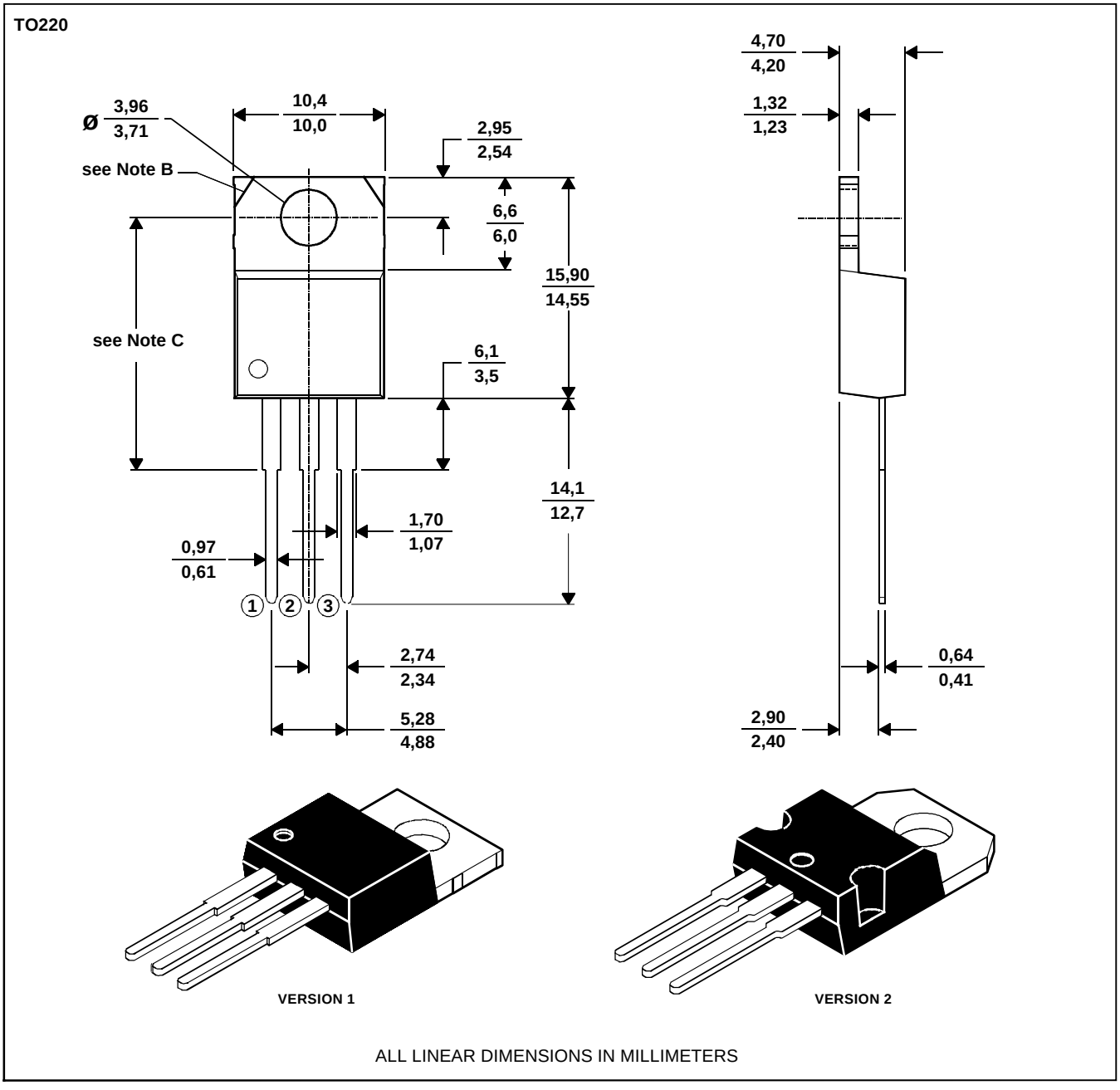
## MECHANICAL DATA

### 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. MDXXBE
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.

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