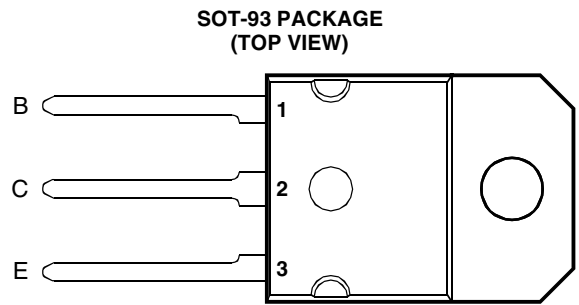




THE DATASHEET OF TIP33B-S



- Designed for Complementary Use with the TIP34 Series
- 80 W at 25°C Case Temperature
- 10 A Continuous Collector Current
- 15 A Peak Collector Current
- Customer-Specified Selections Available



Pin 2 is in electrical contact with the mounting base.

MDTRAAA

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

| RATING | | SYMBOL | VALUE | UNIT |
|--|--------|---------------------|-------------|------|
| Collector-base voltage ($I_E = 0$) | TIP33 | V_{CBO} | 80 | V |
| | TIP33A | | 100 | |
| | TIP33B | | 120 | |
| | TIP33C | | 140 | |
| Collector-emitter voltage ($I_B = 0$) | TIP33 | V_{CEO} | 40 | V |
| | TIP33A | | 60 | |
| | TIP33B | | 80 | |
| | TIP33C | | 100 | |
| Emitter-base voltage | | V_{EBO} | 5 | V |
| Continuous collector current | | I_C | 10 | A |
| Peak collector current (see Note 1) | | I_{CM} | 15 | A |
| Continuous base current | | I_B | 3 | A |
| Continuous device dissipation at (or below) 25°C case temperature (see Note 2) | | P_{tot} | 80 | W |
| Continuous device dissipation at (or below) 25°C free air temperature (see Note 3) | | P_{tot} | 3.5 | W |
| Unclamped inductive load energy (see Note 4) | | $\frac{1}{2}LI_C^2$ | 62.5 | 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 | 250 | °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 0.64 W/°C.
 3. Derate linearly to 150°C free air temperature at the rate of 28 mW/°C.
 4. This rating is based on the capability of the transistor to operate safely in a circuit of: $L = 20$ mH, $I_{B(on)} = 0.4$ A, $R_{BE} = 100 \Omega$, $V_{BE(off)} = 0$, $R_S = 0.1 \Omega$, $V_{CC} = 20$ V.

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electrical characteristics at 25°C case temperature

| PARAMETER | TEST CONDITIONS | | | MIN | TYP | MAX | UNIT |
|--|---|--|-------------------------------------|-----------------------|-----|--------------------------|------|
| $V_{(BR)CEO}$ Collector-emitter breakdown voltage | $I_C = 30 \text{ mA}$ (see Note 5) | $I_B = 0$ | TIP33 TIP33A TIP33B TIP33C | 40 60 80 100 | | | V |
| I_{CES} Collector-emitter cut-off current | $V_{CE} = 80 \text{ V}$ $V_{CE} = 100 \text{ V}$ $V_{CE} = 120 \text{ V}$ $V_{CE} = 140 \text{ V}$ | $V_{BE} = 0$ $V_{BE} = 0$ $V_{BE} = 0$ $V_{BE} = 0$ | TIP33 TIP33A TIP33B TIP33C | | | 0.4 0.4 0.4 0.4 | mA |
| I_{CEO} Collector cut-off current | $V_{CE} = 30 \text{ V}$ $V_{CE} = 60 \text{ V}$ | $I_B = 0$ $I_B = 0$ | TIP33/33A TIP33B/33C | | | 0.7 0.7 | mA |
| I_{EBO} Emitter cut-off current | $V_{EB} = 5 \text{ V}$ | $I_C = 0$ | | | | 1 | mA |
| h_{FE} Forward current transfer ratio | $V_{CE} = 4 \text{ V}$ $V_{CE} = 4 \text{ V}$ | $I_C = 1 \text{ A}$ $I_C = 3 \text{ A}$ | (see Notes 5 and 6) | 40 20 | | 100 | |
| $V_{CE(sat)}$ Collector-emitter saturation voltage | $I_B = 0.3 \text{ A}$ $I_B = 2.5 \text{ A}$ | $I_C = 3 \text{ A}$ $I_C = 10 \text{ A}$ | (see Notes 5 and 6) | | | 1 4 | V |
| V_{BE} Base-emitter voltage | $V_{CE} = 4 \text{ V}$ $V_{CE} = 4 \text{ V}$ | $I_C = 3 \text{ A}$ $I_C = 10 \text{ A}$ | (see Notes 5 and 6) | | | 1.6 3 | V |
| h_{fe} Small signal forward current transfer ratio | $V_{CE} = 10 \text{ V}$ | $I_C = 0.5 \text{ A}$ | $f = 1 \text{ kHz}$ | 20 | | | |
| $ h_{fe} $ Small signal forward current transfer ratio | $V_{CE} = 10 \text{ V}$ | $I_C = 0.5 \text{ A}$ | $f = 1 \text{ MHz}$ | 3 | | | |

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 | | | 1.56 | °C/W |
| $R_{\theta JA}$ Junction to free air thermal resistance | | | 35.7 | °C/W |

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

| PARAMETER | TEST CONDITIONS † | | | MIN | TYP | MAX | UNIT |
|-------------------------|------------------------------|-----------------------------|--|-----|-----|-----|---------------|
| t_{on} Turn-on time | $I_C = 6 \text{ A}$ | $I_{B(on)} = 0.6 \text{ A}$ | $I_{B(off)} = -0.6 \text{ A}$ | | 0.6 | | μs |
| t_{off} Turn-off time | $V_{BE(off)} = -4 \text{ V}$ | $R_L = 5 \Omega$ | $t_p = 20 \mu\text{s}$, dc $\leq 2\%$ | | 1 | | μs |

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

TYPICAL CHARACTERISTICS

**TYPICAL DC CURRENT GAIN
vs
COLLECTOR CURRENT**

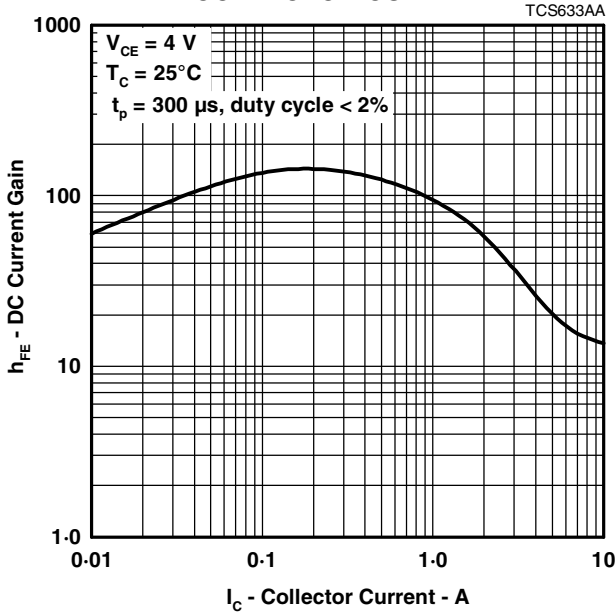


Figure 1.

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

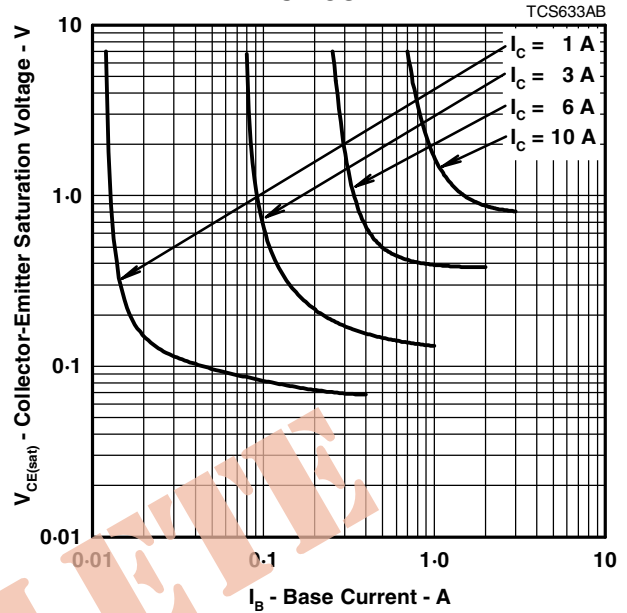


Figure 2.

**BASE-EMITTER VOLTAGE
vs
COLLECTOR CURRENT**

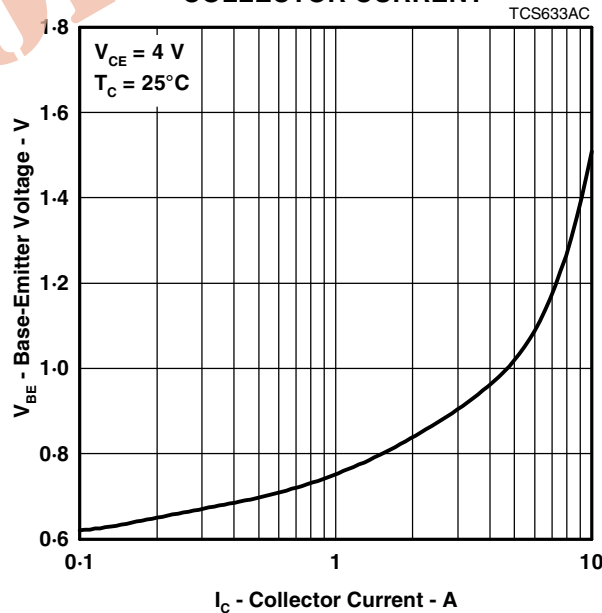
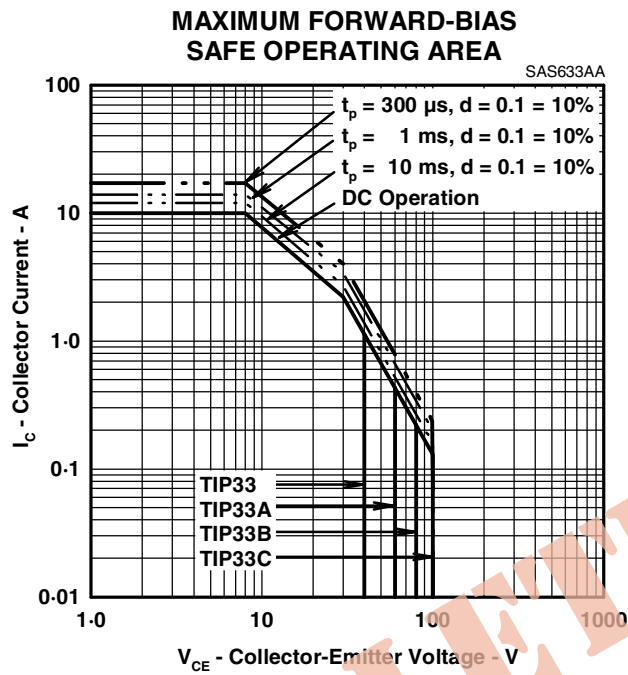


Figure 3.

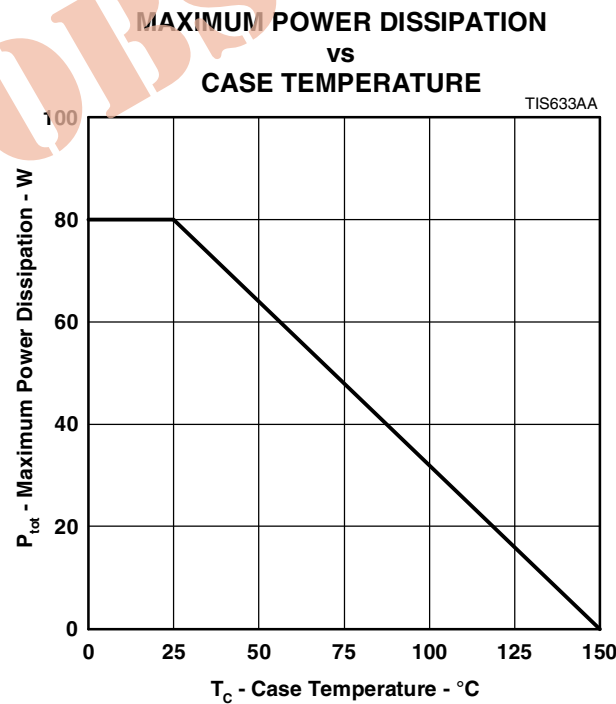
PRODUCT INFORMATION

JULY 1968 - REVISED SEPTEMBER 2002
 Specifications are subject to change without notice.

MAXIMUM SAFE OPERATING REGIONS



THERMAL INFORMATION



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