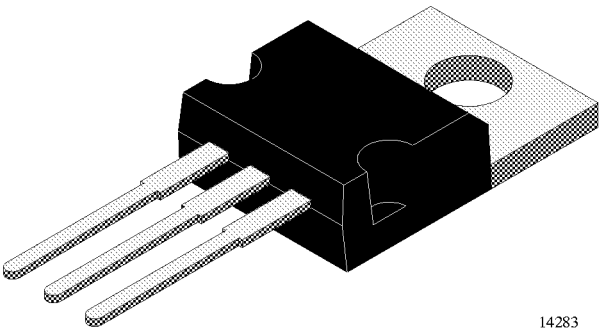
# Silicon NPN High Voltage Switching Transistor

## Features

- Simple-sWitch-Off Transistor (SWOT)
- HIGH SPEED technology
- Planar passivation
- 100 kHz switching rate
- Very low switching losses
- Very low dynamic saturation
- Very low operating temperature
- Optimized RBSOA
- High reverse voltage




## Applications

Electronic lamp ballast circuits
Switch-mode power supplies

## Absolute Maximum Ratings

$T_{case}$ = 25°C, unless otherwise specified

| Parameter | Test Conditions | Symbol | Value | Unit |
|---|---|---|---|---|
| Collector-emitter voltage | | $V_{CEO}$ | 500 | V |
| | | $V_{CEW}$ | 650 | V |
| | | $V_{CES}$ | 1000 | V |
| Emitter-base voltage | | $V_{EBO}$ | 11 | V |
| Collector current | | $I_C$ | 8 | A |
| Collector peak current | | $I_{CM}$ | 12 | A |
| Base current | | $I_B$ | 4 | A |
| Base peak current | | $I_{BM}$ | 6 | A |
| Total power dissipation | $T_{case}$ = 25°C | $P_{tot}$ | 75 | W |
| Junction temperature | | $T_j$ | 150 | °C |
| Storage temperature range | | $T_{stg}$ | –65 to +150 | °C |

## Maximum Thermal Resistance

$T_{case}$ = 25°C, unless otherwise specified

| Parameter | Test Conditions | Symbol | Value | Unit |
|---|---|---|---|---|
| Junction case | | $R_{thJC}$ | 1.67 | K/W |

## Electrical Characteristics

$T_{case}$ = 25°C, unless otherwise specified

| Parameter | Test Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Collector cut-off current | $V_{CE}$ = 1000 V | $I_{CES}$ | | | 10 | µA |
| | $V_{CE}$ = 1000 V; $T_{case}$ = 150°C | $I_{CES}$ | | | 1.0 | mA |
| Collector-emitter breakdown voltage (figure 1) | $I_C$ = 300 mA; L = 125 mH; $I_{measure}$ = 100 mA | $V_{(BR)CEO}$ | 500 | | | V |
| Emitter-base breakdown voltage | $I_E$ = 1 mA | $V_{(BR)EBO}$ | 11 | | | V |
| Collector-emitter saturation voltage | $I_C$ = 1.3 A; $I_B$ = 0.33 A | $V_{CEsat}$ | | | 0.2 | V |
| | $I_C$ = 4 A; $I_B$ = 1.3 A | $V_{CEsat}$ | | | 0.4 | V |
| Base-emitter saturation voltage | $I_C$ = 1.3 A; $I_B$ = 0.33 A | $V_{BEsat}$ | | | 1.0 | V |
| | $I_C$ = 4 A; $I_B$ = 1.3 A | $V_{BEsat}$ | | | 1.2 | V |
| DC forward current transfer ratio | $V_{CE}$ = 2 V; $I_C$ = 10 mA | $h_{FE}$ | 10 | | | |
| | $V_{CE}$ = 2 V; $I_C$ = 1.3 A | $h_{FE}$ | 10 | | | |
| | $V_{CE}$ = 2 V; $I_C$ = 4 A | $h_{FE}$ | 6 | | | |
| | $V_{CE}$ = 5 V; $I_C$ = 8 A | $h_{FE}$ | 4 | | | |
| Collector-emitter working voltage | $V_S$ = 50 V; L = 1 mH; $I_C$ = 8 A; $I_{B1}$ = 2.7 A; $-I_{B2}$ = 0.8 A; $-V_{BB}$ = 5 V | $V_{CEW}$ | 650 | | | V |
| Gain bandwidth product | $I_C$ = 500 mA; $V_{CE}$ = 10 V; f = 1 MHz | $f_T$ | 4 | | | MHz |
| Free-wheel diode | | | | | | |
| Forward voltage | $I_F$ = 1.3 A | $V_F$ | | | 1.5 | V |

## Switching Characteristics

$T_{case}$ = 25°C, unless otherwise specified

| Parameter | Test Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Resistive load (figure 2) | | | | | | |
| Turn on time | $I_C$ = 1.3 A; $I_{B1}$ = 0.35 A; | $t_{on}$ | | | 0.25 | µs |
| Storage time | $-I_{B2}$ = 0.7 A; $V_S$ = 250 V | $t_s$ | | | 4.0 | µs |
| Fall time | | $t_f$ | | | 0.5 | µs |
| Turn on time | $I_C$ = 4 A; $I_{B1}$ = 0.8 A; | $t_{on}$ | | | 1.0 | µs |
| Storage time | $-I_{B2}$ = 2 A; $V_S$ = 250 V | $t_s$ | | | 2.5 | µs |
| Fall time | | $t_f$ | | | 0.5 | µs |
| Inductive load (figure 3) | | | | | | |
| Storage time | $I_C$ = 1.3 A; $I_{B1}$ = 0.35 A; $-I_{B2}$ = 0.7 A; | $t_s$ | | | 4.5 | µs |
| Fall time | L = 200 µH; $V_{clamp}$ = 300 V; $-V_{BE}$ = 5 V | $t_f$ | | | 0.25 | µs |
| Storage time | $I_C$ = 4 A; $I_{B1}$ = 0.8 A; $-I_{B2}$ = 2 A; | $t_s$ | | | 2.5 | µs |
| Fall time | L = 200 µH; $V_{clamp}$ = 300 V; $-V_{BE}$ = 5 V | $t_f$ | | | 0.15 | µs |

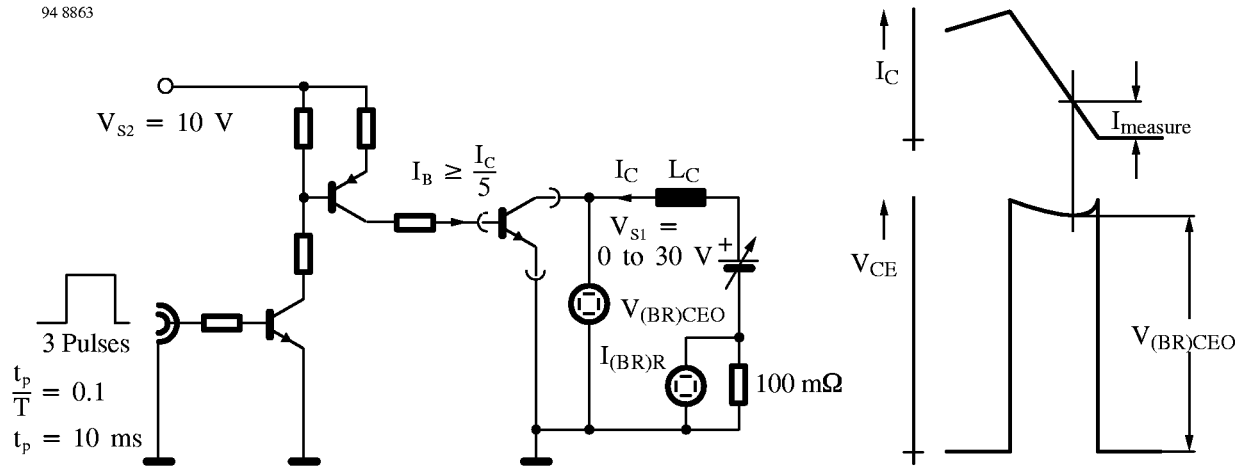



Figure 1. Test circuit for $V_{(BR)CE0}$

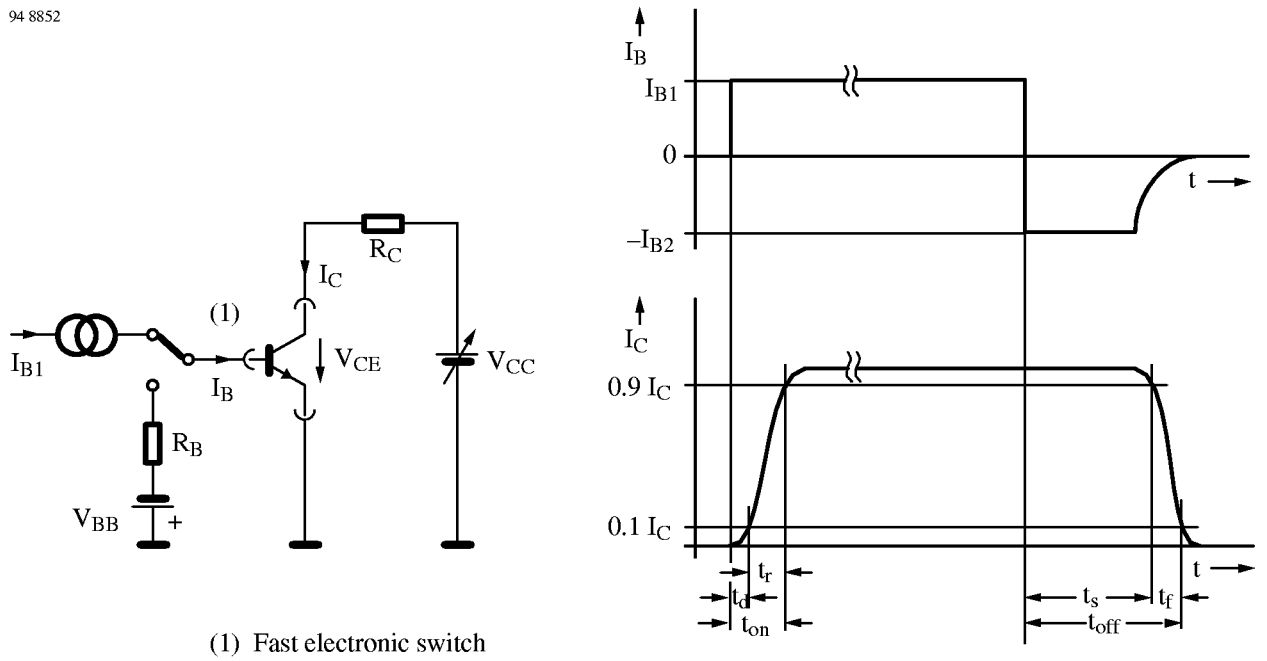



Figure 2. Test circuit for switching characteristics – resistive load

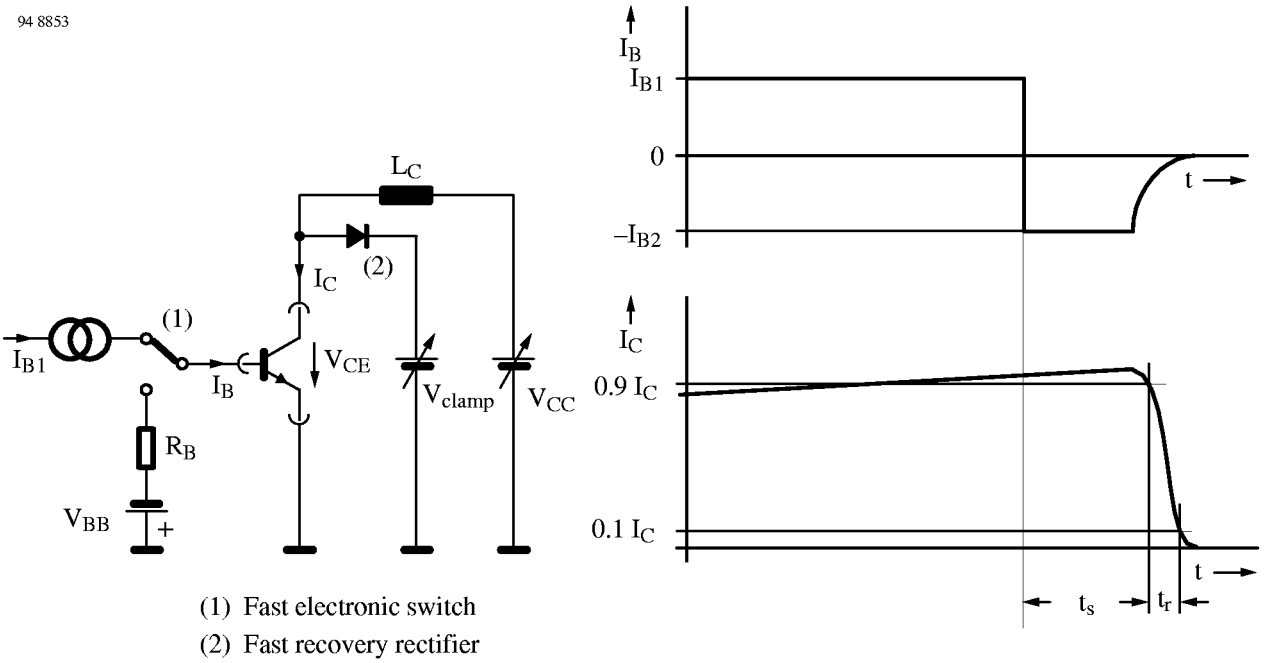



Figure 3. Test circuit for switching characteristics – inductive load

## Typical Characteristics ($T_{case}$ = 25_C unless otherwise specified)

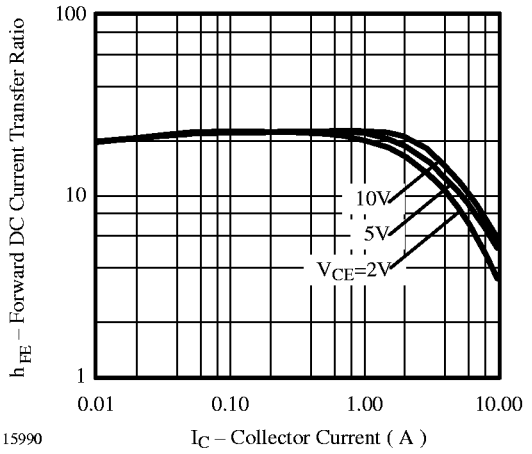



Figure 4. $h_{FE}$ vs. $I_C$

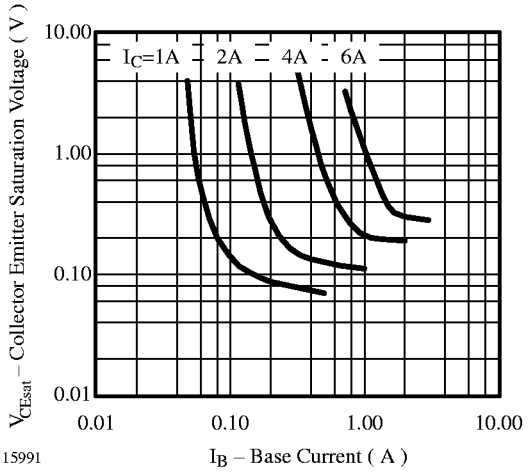



Figure 5. $V_{CEsat}$ vs. $I_B$

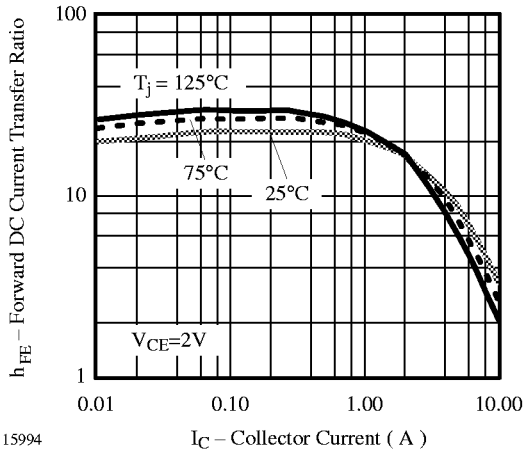



Figure 6. $h_{FE}$ vs. $I_C$

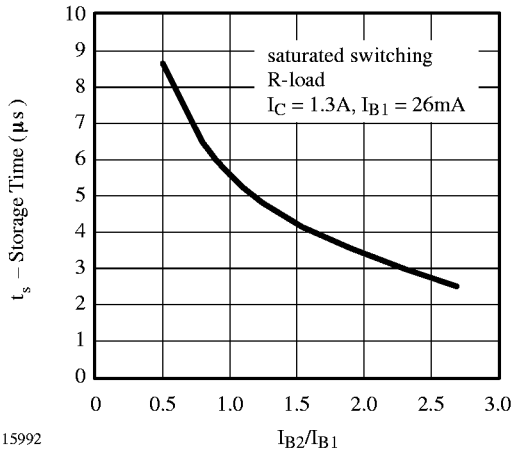



Figure 7. $t_s$ vs. $-I_{B2}/I_{B1}$

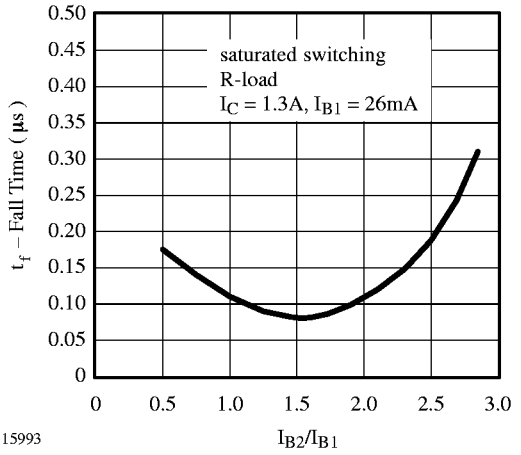
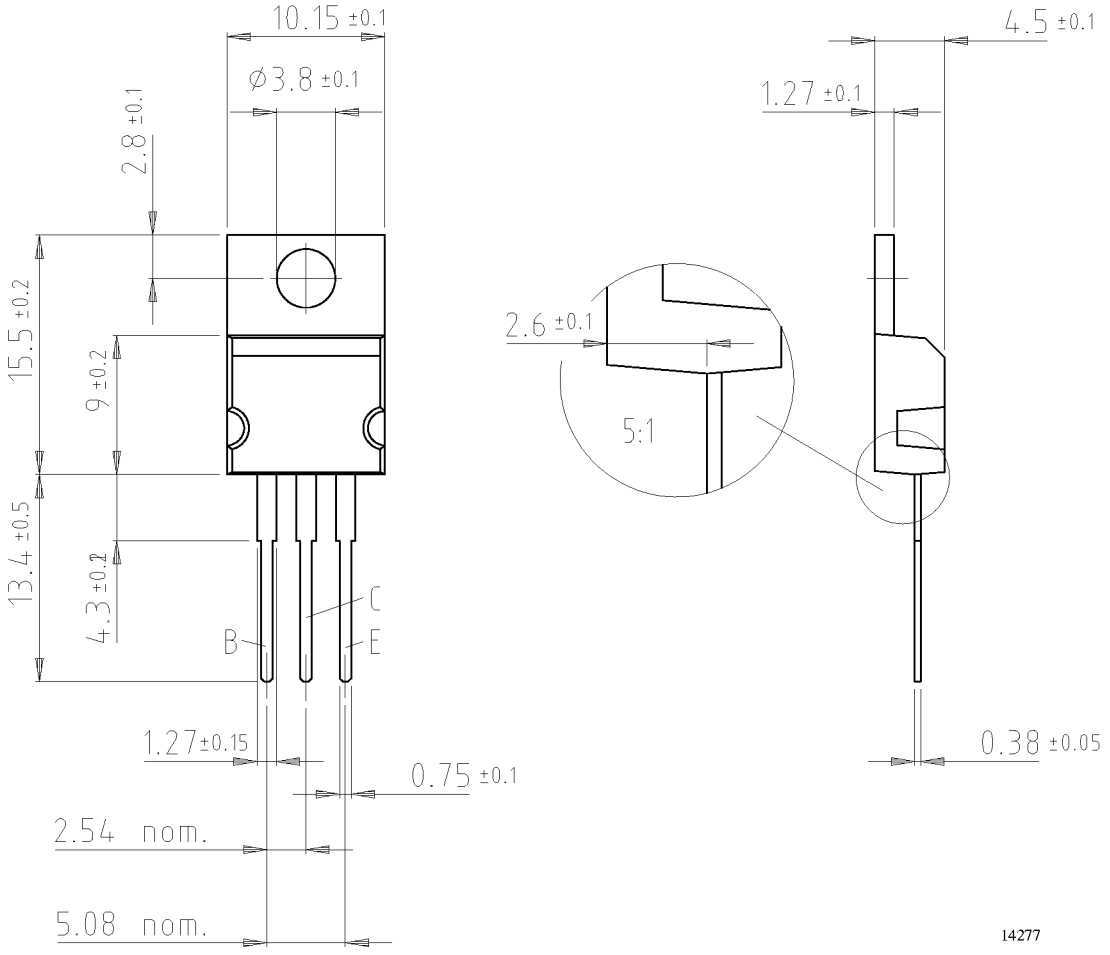



Figure 8. $t_f$ vs. $-I_{B2}/I_{B1}$

## Dimensions in mm




Plastic case JEDEC TO 220
Collector connected with metallic surface