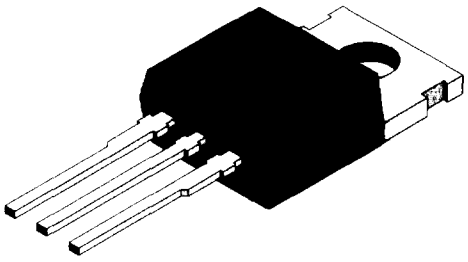
# TE13004 • TE13005

## Silicon NPN High Voltage Switching Transistor

### Features

- HIGH SPEED technology
- High reverse voltage
- Power dissipation $P_{tot}$ = 57 W
- Glass passivation
- Short switching times



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### Applications

Electronic lamp ballast circuits
Switch-mode power supplies

### Absolute Maximum Ratings

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

| Parameter | Test Conditions | Type | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Collector-emitter voltage | | TE13004 | $V_{CEO}$ | 300 | V |
| | | TE13005 | $V_{CEO}$ | 400 | V |
| | | TE13004 | $V_{CES}$ | 600 | V |
| | | TE13005 | $V_{CES}$ | 700 | V |
| Emitter-base voltage | | | $V_{EBO}$ | 9 | V |
| Collector current | | | $I_C$ | 6 | A |
| Collector peak current | | | $I_{CM}$ | 8 | A |
| Base current | | | $I_B$ | 2 | A |
| Base peak current | | | $I_{BM}$ | 4 | A |
| Total power dissipation | $T_{case} \leqq 25°C$ | | $P_{tot}$ | 57 | 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 | | $R_{thJC}$ | 2.2 | K/W |

# TE13004 • TE13005

## Electrical Characteristics

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

| Parameter | Test Conditions | Type | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Collector cut-off current | $V_{CE}$ = 600 V | TE13004 | $I_{CES}$ | | | 50 | µA |
| | $V_{CE}$ = 700 V | TE13005 | $I_{CES}$ | | | 50 | µA |
| | $V_{CE}$ = 600 V; $T_{case}$ = 150°C | TE13004 | $I_{CES}$ | | | 0.5 | mA |
| | $V_{CE}$ = 700 V; $T_{case}$ = 150°C | TE13005 | $I_{CES}$ | | | 0.5 | mA |
| Collector-emitter breakdown voltage (figure 1) | $I_C$ = 100 mA; L = 125 mH; $I_{measure}$ = 100 mA | TE13004 | $V_{(BR)CEO}$ | 300 | | | V |
| | | TE13005 | $V_{(BR)CEO}$ | 400 | | | V |
| Emitter-base breakdown voltage | $I_E$ = 1 mA | | $V_{(BR)EBO}$ | 9 | | | V |
| Collector-emitter saturation voltage | $I_C$ = 2 A; $I_B$ = 0.5 A | | $V_{CEsat}$ | | | 0.6 | V |
| Base-emitter saturation voltage | $I_C$ = 2 A; $I_B$ = 0.5 A | | $V_{BEsat}$ | | | 1.6 | V |
| DC forward current transfer ratio | $V_{CE}$ = 5 V; $I_C$ = 10 mA | | $h_{FE}$ | 10 | | | |
| | $V_{CE}$ = 5 V; $I_C$ = 1 A | | $h_{FE}$ | 10 | | | |
| | $V_{CE}$ = 5 V; $I_C$ = 4 A | | $h_{FE}$ | 4 | | | |
| Gain bandwidth product | $V_{CE}$ = 10 V; $I_C$ = 500 mA; f = 1 MHz | | $f_T$ | 4 | | | MHz |

## Switching Characteristics

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

| Parameter | Test Conditions | Type | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Resistive load (figure 2) | | | | | | | |
| Turn on time | $I_C$ = 2 A; $I_{B1}$ = $-I_{B2}$ = 0.4 A; $V_S$ = 125 V | | $t_{on}$ | | 0.25 | 0.4 | µs |
| Storage time | | | $t_s$ | | 1.5 | 2.5 | µs |
| Fall time | | | $t_f$ | | 0.2 | 0.3 | µs |
| Inductive load (figure 3) | | | | | | | |
| Storage time | $I_C$ = 2 A; $I_{B1}$ = 0.4 A; L = 200 µH; $V_{clamp}$ = 300 V; $-V_{BE}$ = 5 V; $T_{case}$ = 100°C | | $t_s$ | | 1.2 | 2 | µs |
| Cross over time | | | $t_c$ | | 0.4 | 0.7 | µs |

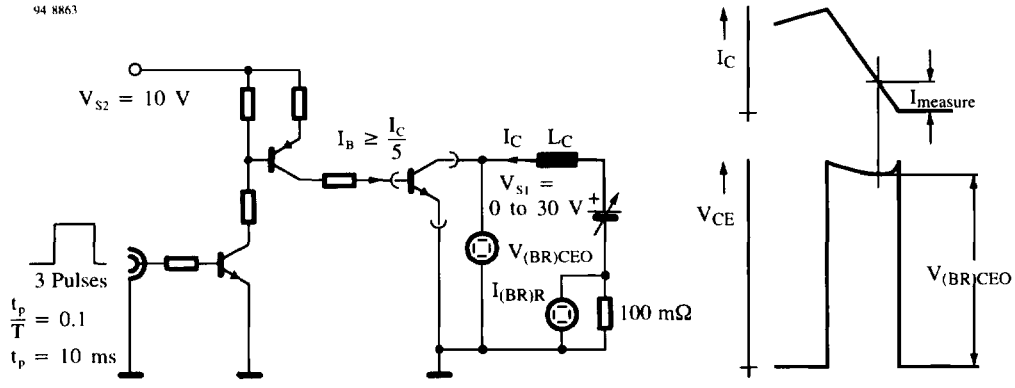
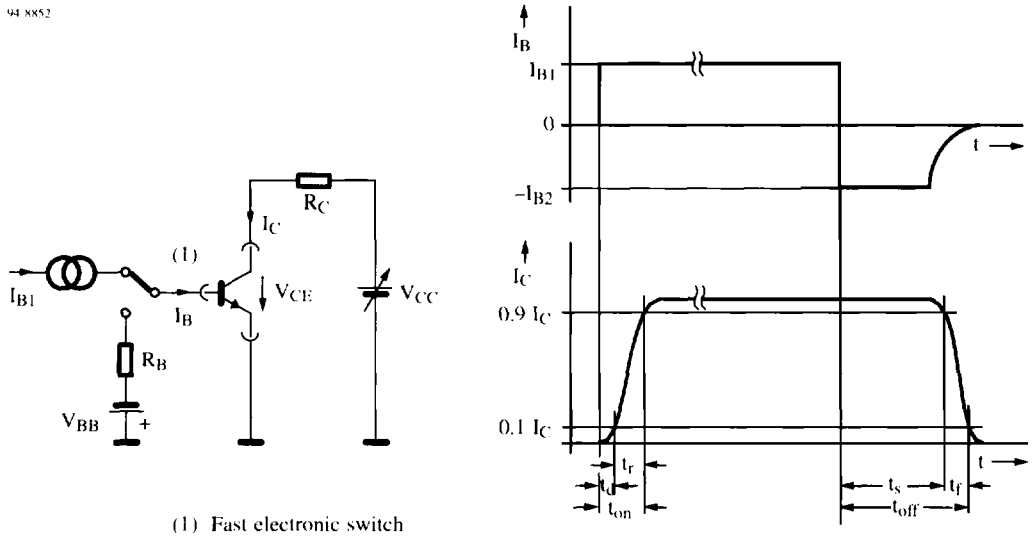
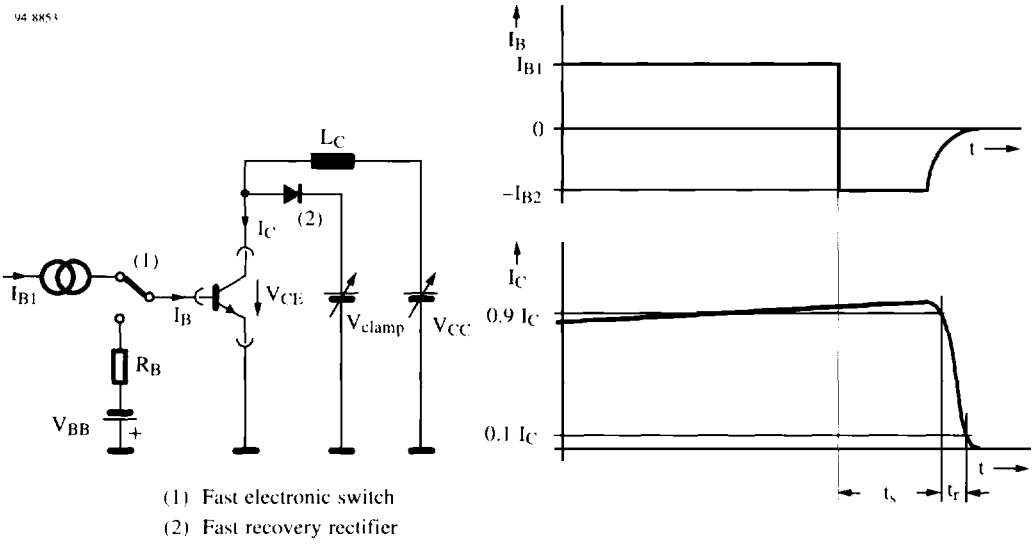



Figure 1. Test circuit for $V_{(BR)CEO}$




(1) Fast electronic switch

Figure 2. Test circuit for switching characteristics – resistive load




(1) Fast electronic switch
(2) Fast recovery rectifier

Figure 3. Test circuit for switching characteristics – inductive load

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

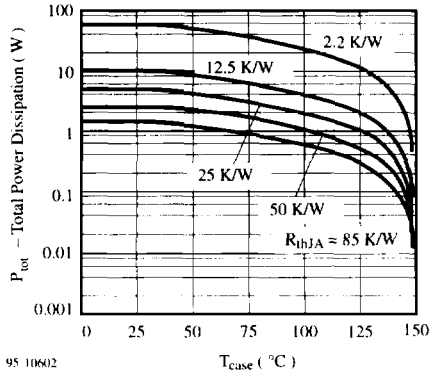



Figure 4. $P_{tot}$ vs.$T_{case}$

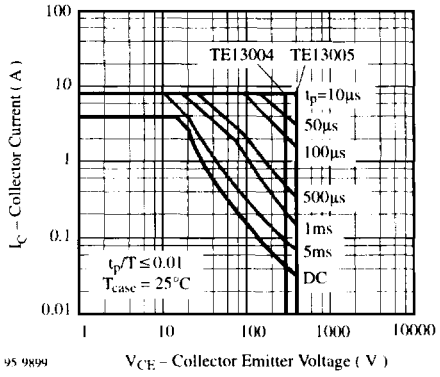



Figure 7. $I_C$ vs. $V_{CE}$

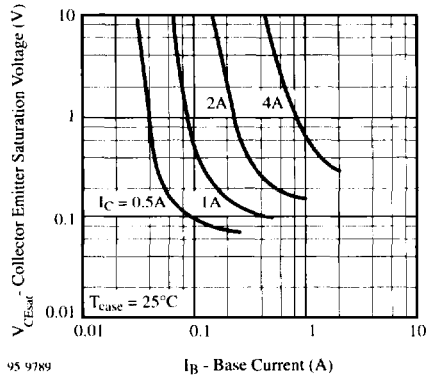



Figure 5. $V_{CEsat}$ vs. $I_B$

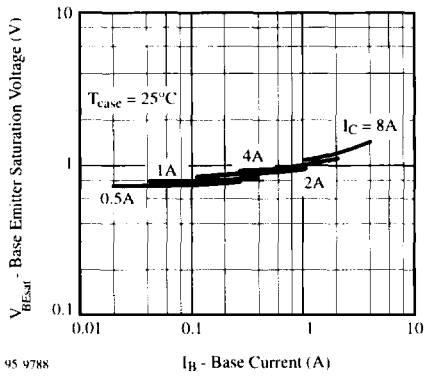



Figure 8. $V_{BEsat}$ vs. $I_B$

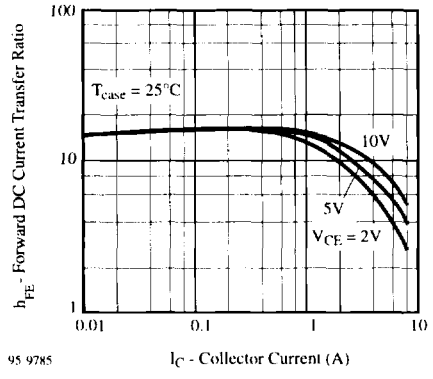



Figure 6. $h_{FE}$ vs. $I_C$

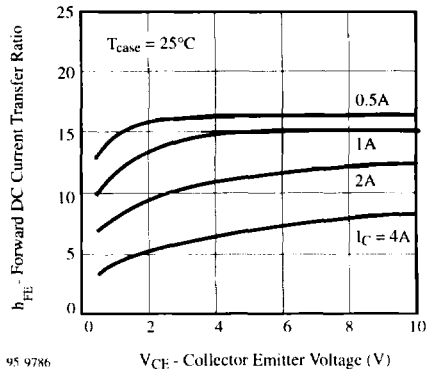



Figure 9. $h_{FE}$ vs. $V_{CE}$

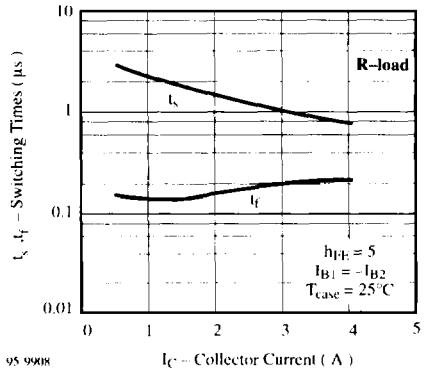



Figure 10. $t_s$, $t_f$ vs. $I_C$

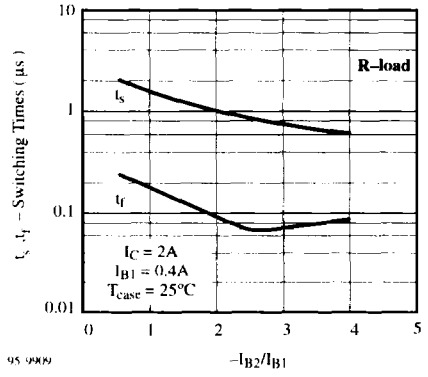



Figure 13. $t_s$, $t_f$ vs. $-I_{B2}/I_{B1}$

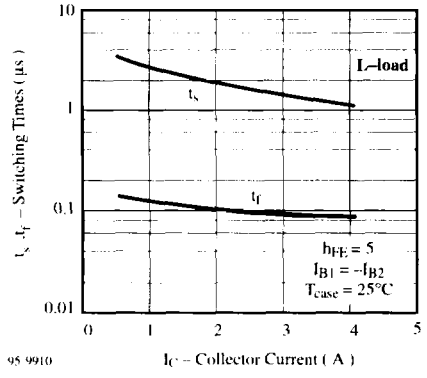



Figure 11. $t_s$, $t_f$ vs. $I_C$

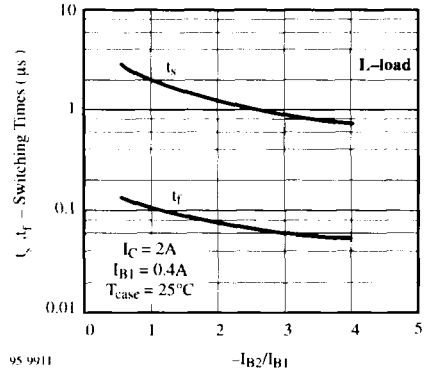



Figure 14. $t_s$, $t_f$ vs. $-I_{B2}/I_{B1}$

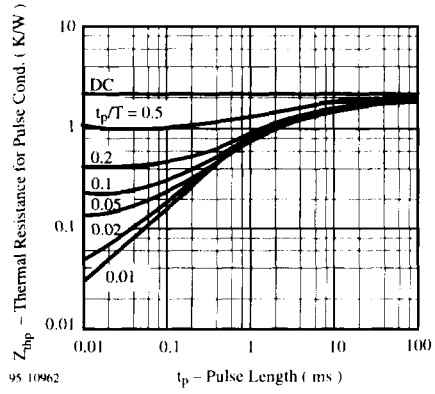
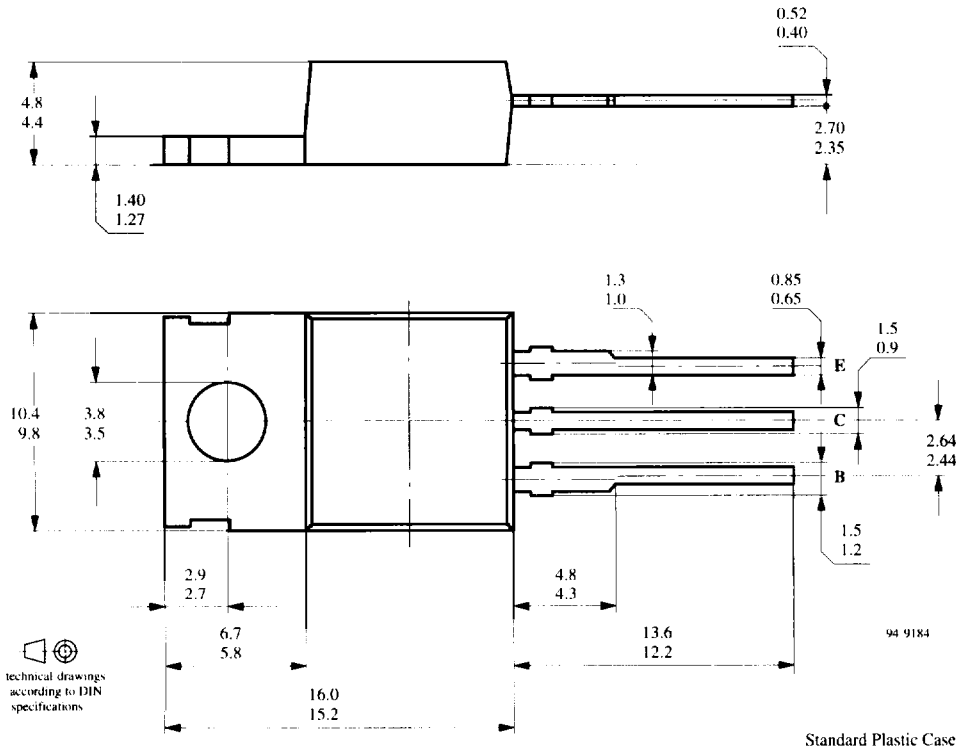



Figure 12. $Z_{thp}$ vs. $t_p$

## Dimensions in mm




Collector connected with metallic surface

Standard Plastic Case
14A 3 DIN 41 869
JEDEC TO 220