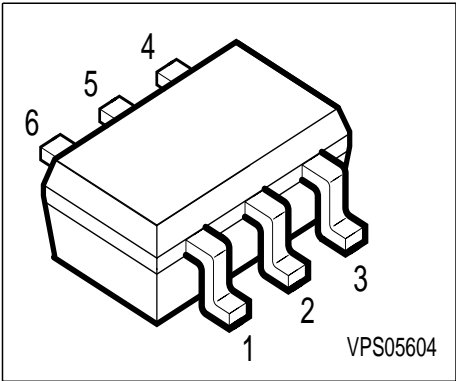
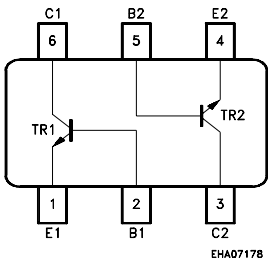


NPN Silicon Switching Transistor Array

- High DC current gain: 0.1mA to 100mA
- Low collector-emitter saturation voltage
- Two (galvanic) internal isolated Transistors with high matching in one package
- Complementary type: SMBT 3906S (PNP)



| Type | Marking | Ordering Code | Pin Configuration | | | Package |
|------------|---------|---------------|-------------------|-----------|-----------|---------|
| SMBT 3904S | s1A | Q62702-A1201 | 1/4=E1/E2 | 2/5=B1/B2 | 3/6=C2/C1 | SOT-363 |

Maximum Ratings

| Parameter | Symbol | Value | Unit |
|--|-----------|-------------|--------------------|
| Collector-emitter voltage | V_{CEO} | 40 | V |
| Collector-base voltage | V_{CBO} | 60 | |
| Emitter-base voltage | V_{EBO} | 6 | |
| DC collector current | I_C | 200 | mA |
| Total power dissipation, $T_S = 115\text{ }^{\circ}\text{C}$ | P_{tot} | 250 | mW |
| Junction temperature | T_j | 150 | $^{\circ}\text{C}$ |
| Storage temperature | T_{stg} | - 65...+150 | |

Thermal Resistance

| | | | |
|--------------------------------|------------|------------|-----|
| Junction ambient ¹⁾ | R_{thJA} | ≤ 275 | K/W |
| Junction - soldering point | R_{thJS} | ≤ 140 | |

1) Package mounted on pcb 40mm x 40mm x 1.5mm / 0.5cm² Cu

Electrical Characteristics at $T_A = 25^\circ\text{C}$, unless otherwise specified.

| Parameter | Symbol | Values | | | Unit |
|---|---------------|-----------------------------|-----------------------|-------------------------|------|
| | | min. | typ. | max. | |
| DC Characteristics | | | | | |
| Collector-emitter breakdown voltage $I_C = 1\text{ mA}, I_B = 0$ | $V_{(BR)CEO}$ | 40 | - | - | V |
| Collector-base breakdown voltage $I_C = 10\text{ }\mu\text{A}, I_B = 0$ | $V_{(BR)CBO}$ | 60 | - | - | |
| Emitter-base breakdown voltage $I_E = 10\text{ }\mu\text{A}, I_C = 0$ | $V_{(BR)EBO}$ | 6 | - | - | |
| Collector cutoff current $V_{CB} = 30\text{ V}, I_E = 0$ | I_{CBO} | - | - | 50 | nA |
| DC current gain 1) $I_C = 100\text{ }\mu\text{A}, V_{CE} = 1\text{ V}$ $I_C = 1\text{ mA}, V_{CE} = 1\text{ V}$ $I_C = 10\text{ mA}, V_{CE} = 1\text{ V}$ $I_C = 50\text{ mA}, V_{CE} = 1\text{ V}$ $I_C = 100\text{ mA}, V_{CE} = 1\text{ V}$ | h_{FE} | 40 70 100 60 30 | - - - - - | - - 300 - - | - |
| Collector-emitter saturation voltage1) $I_C = 10\text{ mA}, I_B = 1\text{ mA}$ $I_C = 50\text{ mA}, I_B = 5\text{ mA}$ | V_{CEsat} | - - | - - | 0.2 0.3 | V |
| Base-emitter saturation voltage 1) $I_C = 10\text{ mA}, I_B = 1\text{ mA}$ $I_C = 50\text{ mA}, I_B = 5\text{ mA}$ | V_{BEsat} | 0.65 - | - - | 0.85 0.95 | |

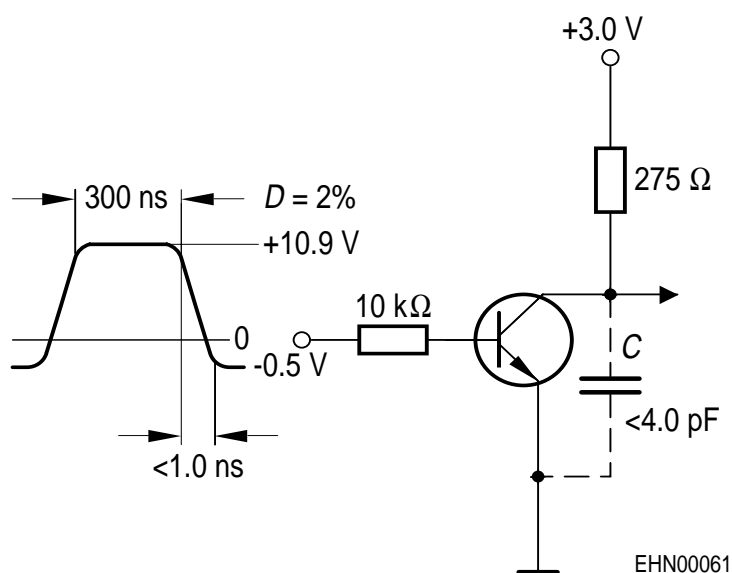
1) Pulse test: $t < 300\text{ }\mu\text{s}$; $D < 2\%$

Electrical Characteristics at $T_A = 25^\circ\text{C}$, unless otherwise specified.

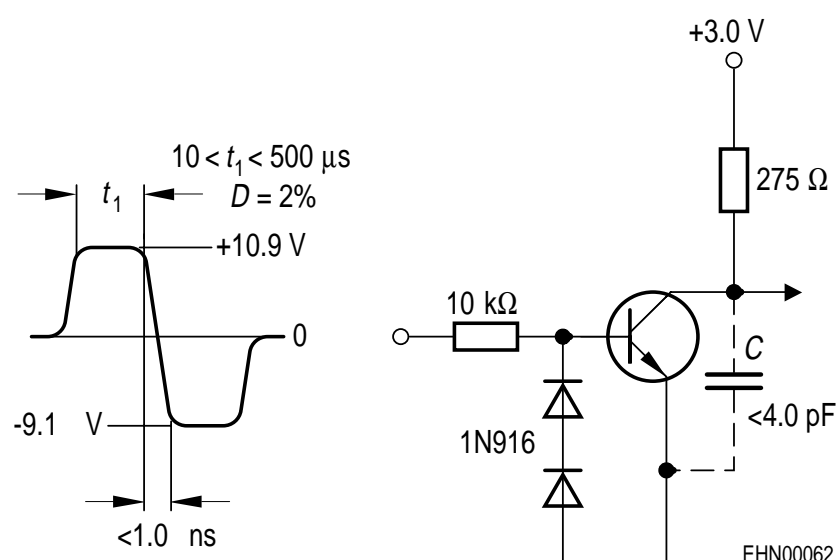
| Parameter | Symbol | Values | | | Unit |
|--|------------------|--------|------|------|-----------|
| | | min. | typ. | max. | |
| AC Characteristics | | | | | |
| Transition frequency $I_C = 10\text{ mA}$, $V_{CE} = 20\text{ V}$, $f = 100\text{ MHz}$ | f_T | 300 | - | - | MHz |
| Collector-base capacitance $V_{CB} = 5\text{ V}$, $f = 1\text{ MHz}$ | C_{cb} | - | - | 4 | pF |
| Emitter-base capacitance $V_{EB} = 0.5\text{ V}$, $f = 1\text{ MHz}$ | C_{eb} | - | - | 8 | |
| Short-circuit input impedance $I_C = 1\text{ mA}$, $V_{CE} = 10\text{ V}$, $f = 1\text{ kHz}$ | h_{11e} | 1 | - | 10 | kΩ |
| Open-circuit reverse voltage transfer ratio $I_C = 1\text{ mA}$, $V_{CE} = 10\text{ V}$, $f = 1\text{ kHz}$ | h_{12e} | 0.5 | - | 8 | 10^{-4} |
| Short-circuit forward current transfer ratio $I_C = 1\text{ mA}$, $V_{CE} = 10\text{ V}$, $f = 1\text{ kHz}$ | h_{21e} | 100 | - | 400 | - |
| Open-circuit output admittance $I_C = 1\text{ mA}$, $V_{CE} = 10\text{ V}$, $f = 1\text{ kHz}$ | h_{22e} | 1 | - | 40 | μs |
| Noise figure $I_C = 100\text{ }\mu\text{A}$, $V_{CE} = 5\text{ V}$, $R_S = 1\text{ k}\Omega$, $f = 1\text{ kHz}$, $\Delta f = 200\text{ Hz}$ | F | - | - | 5 | dB |
| Delay time $V_{CC} = 3\text{ V}$, $I_C = 10\text{ mA}$, $I_{B1} = 1\text{ mA}$, $V_{BE(\text{off})} = 0.5\text{ V}$ | t_d | - | - | 35 | ns |
| Rise time $V_{CC} = 3\text{ V}$, $I_C = 10\text{ mA}$, $I_{B1} = 1\text{ mA}$, $V_{BE(\text{off})} = 0.5\text{ V}$ | t_r | - | - | 35 | |
| Storage time $V_{CC} = 3\text{ V}$, $I_C = 10\text{ mA}$, $I_{B1}=I_{B2} = 1\text{mA}$ | t_{stg} | - | - | 200 | |
| Fall time $V_{CC} = 3\text{ V}$, $I_C = 10\text{ mA}$, $I_{B1}=I_{B2} = 1\text{mA}$ | t_f | - | - | 50 | |

Test circuit

Delay and rise time

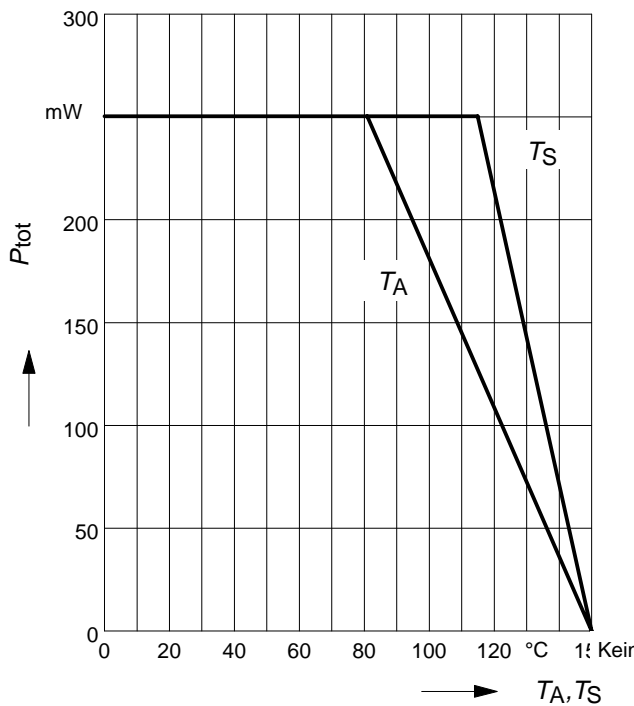


Storage time and fall time

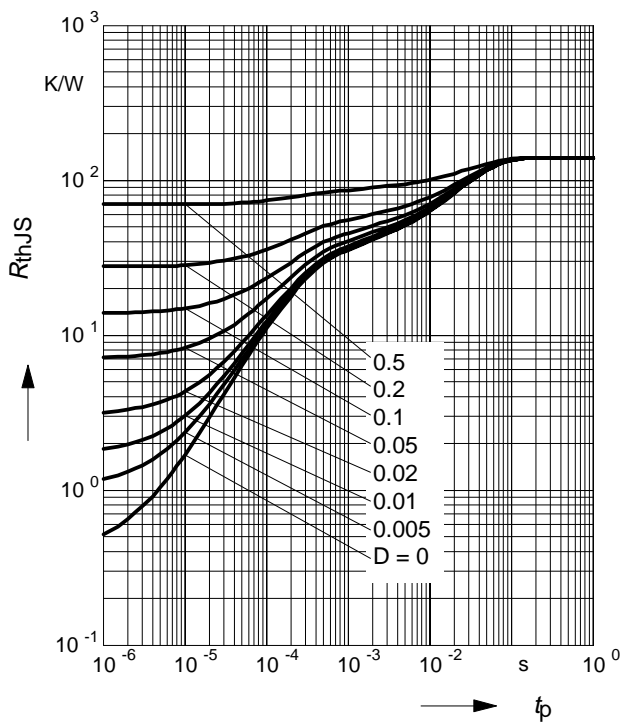


Total power dissipation $P_{\text{tot}} = f(T_A^*; T_S)$

* Package mounted on epoxy

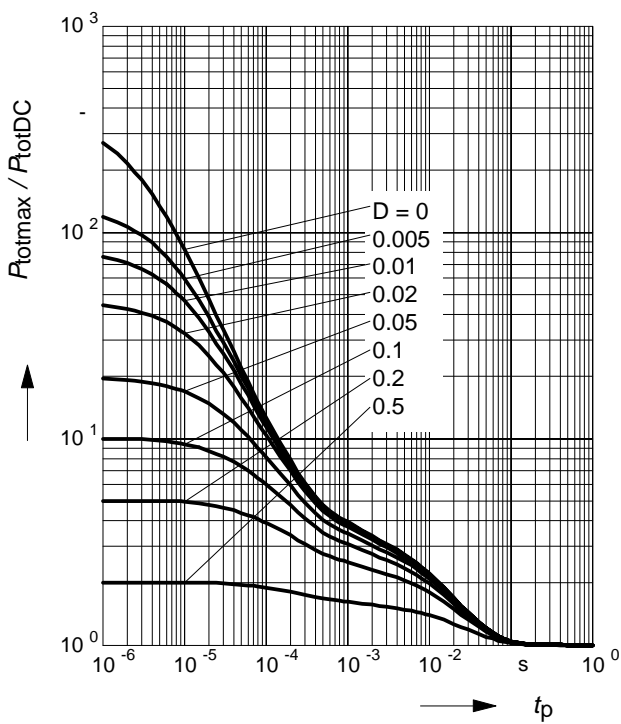


Permissible Pulse Load $R_{\text{thJS}} = f(t_p)$



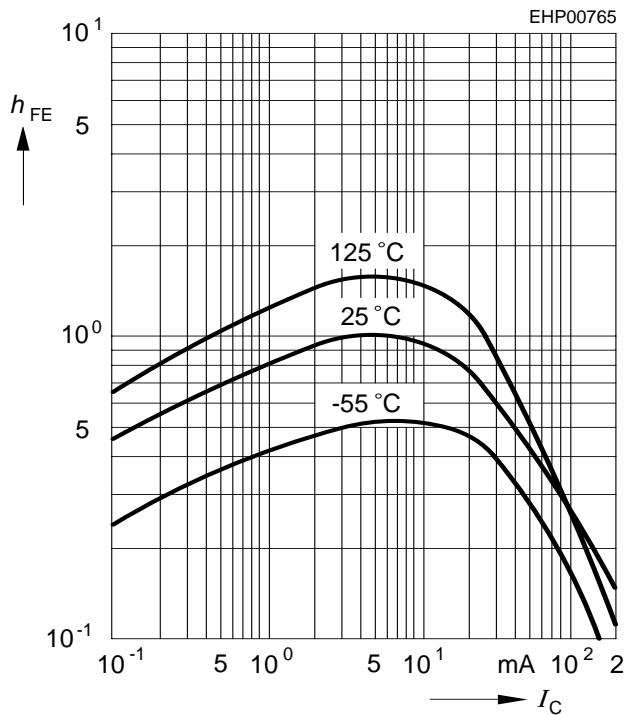
Permissible Pulse Load

$P_{\text{totmax}} / P_{\text{totDC}} = f(t_p)$



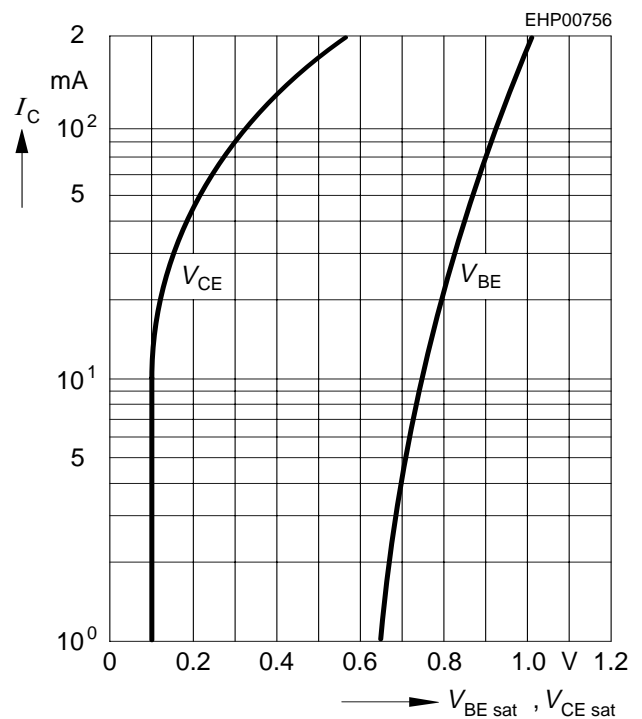
DC current gain $h_{FE} = f(I_C)$

$V_{CE} = 10V$, normalized



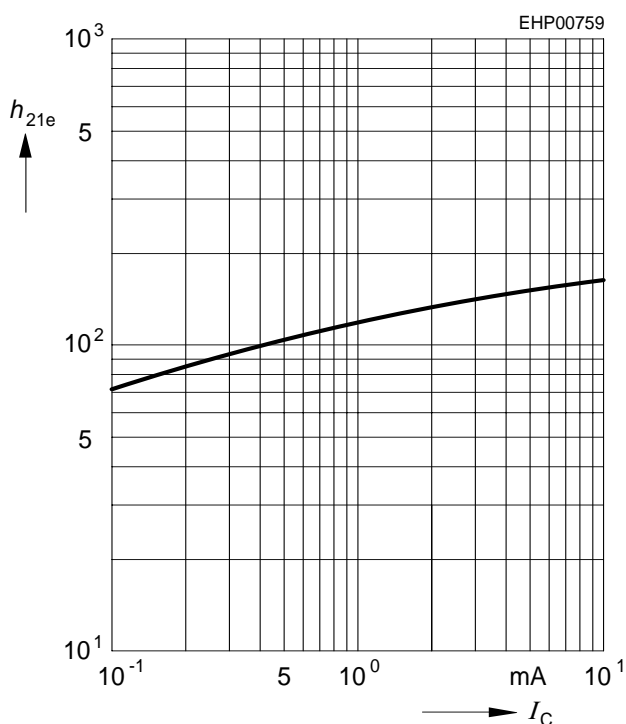
Saturation voltage $I_C = f(V_{BEsat}, V_{CEsat})$

$h_{FE} = 10$



Short-circuit forward current transfer ratio $h_{21e} = f(I_C)$

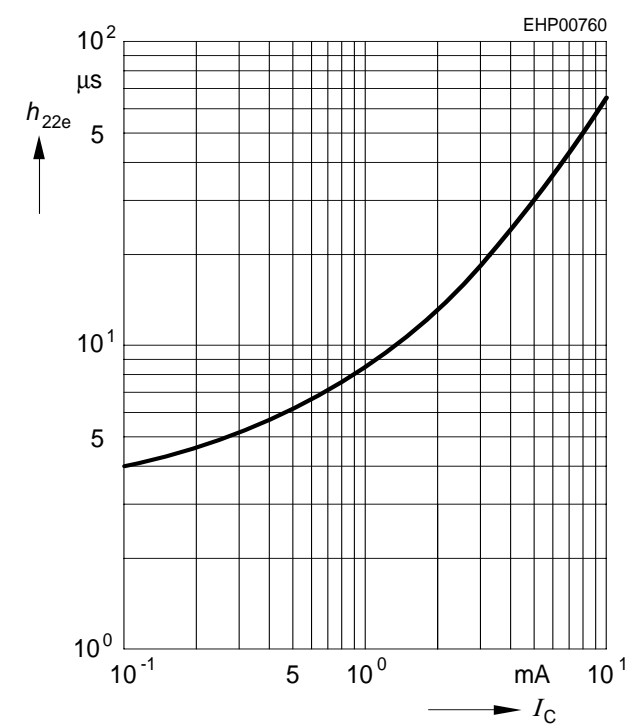
$V_{CE} = 10V$, $f = 1MHz$



Open-circuit output admittance $h_{22e} = f(I_C)$

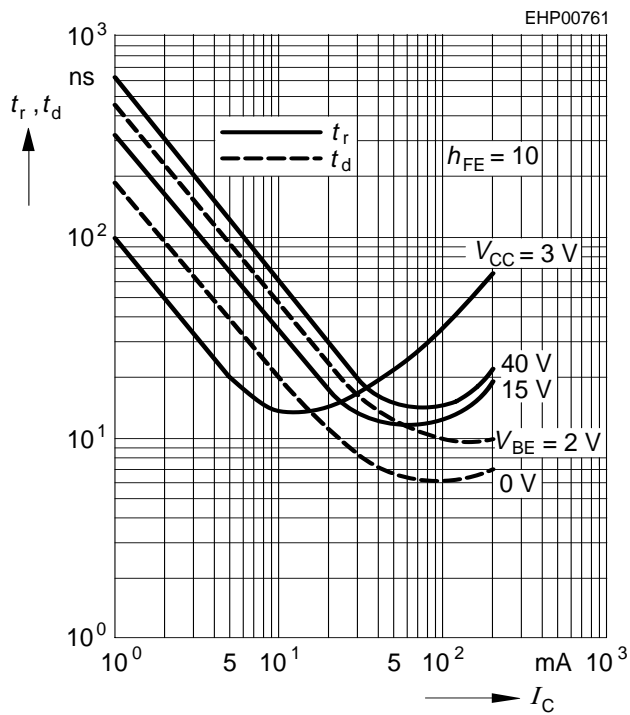
$h_{22e} = f(I_C)$

$V_{CE} = 10V$, $f = 1MHz$

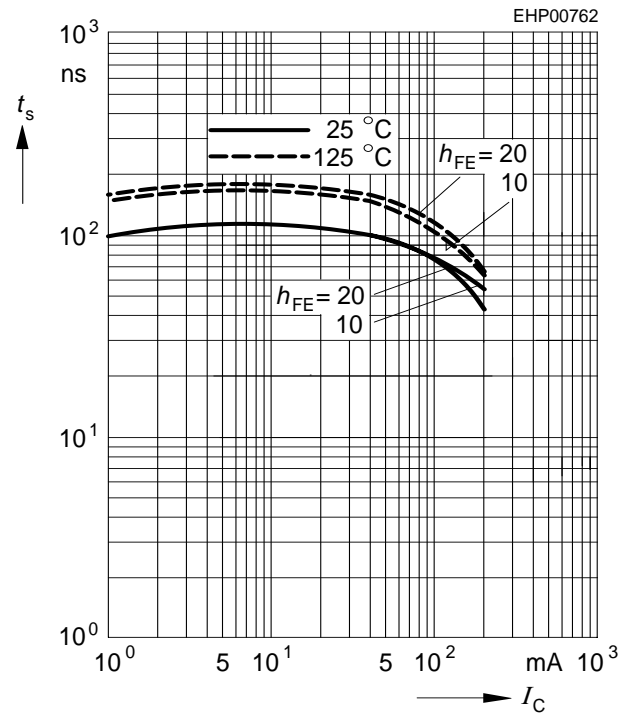


Delay time $t_d = f(I_C)$

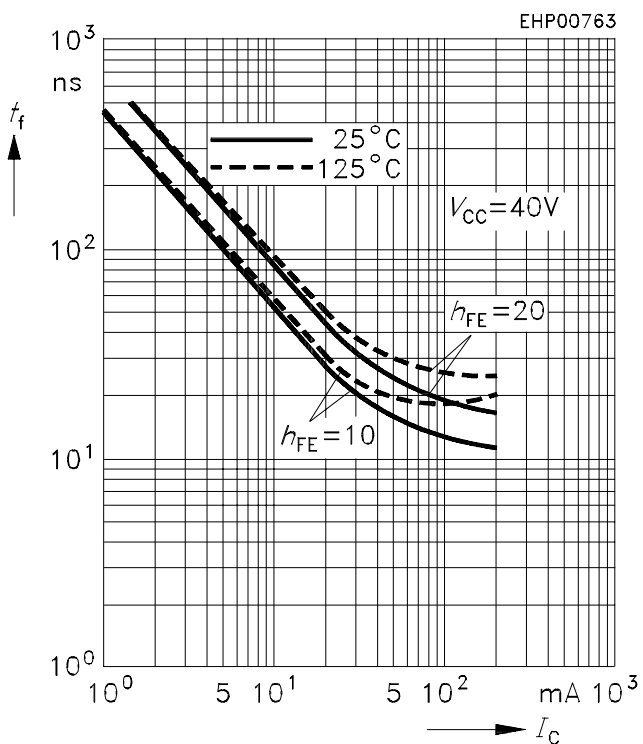
Rise time $t_r = f(I_C)$



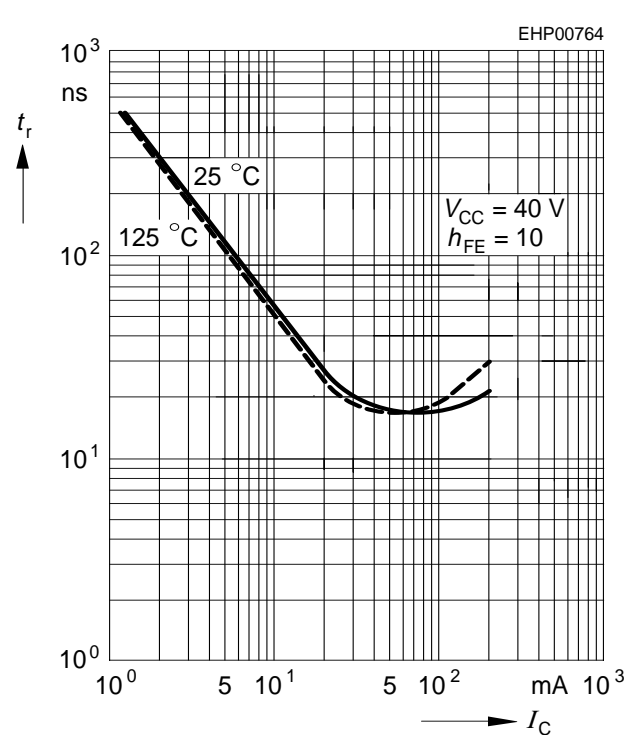
Storage time $t_{stg} = f(I_C)$



Fall time $t_f = f(I_C)$

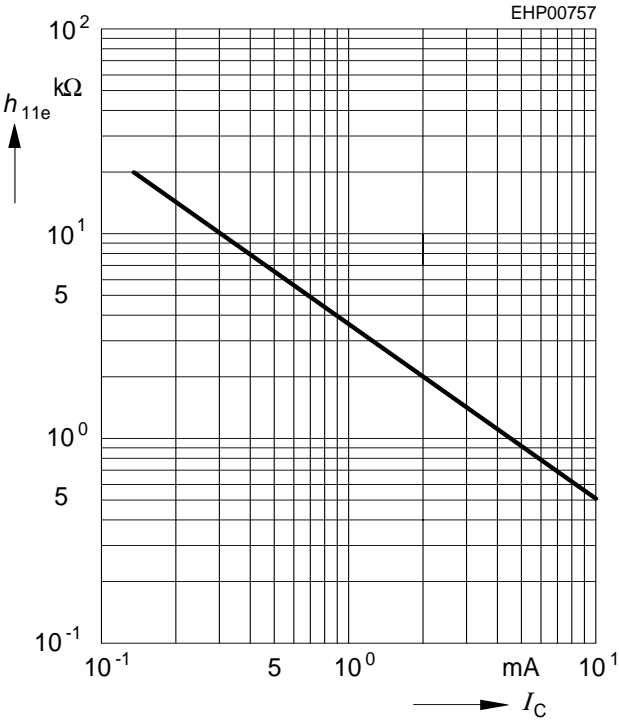


Rise time $t_r = f(I_C)$



Input impedance

$h_{11e} = f(I_C)$
 $V_{CE} = 10V, f = 1kHz$



Open-circuit reverse voltage

transfer ratio $h_{12e} = f(I_C)$
 $V_{CE} = 10V, f = 1kHz$

