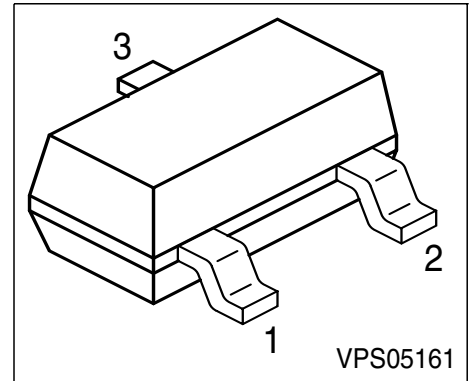


PNP Silicon Switching Transistor

- High DC current gain: 0.1mA to 500 mA
- Low collector-emitter saturation voltage
- Complementary type:
SMBT2222A/ MMBT2222A (NPN)



| Type | Marking | Pin Configuration | | | Package |
|---------------------|---------|-------------------|-----|-----|---------|
| SMBT2907A/MMBT2907A | s2F | 1=B | 2=E | 3=C | SOT23 |

Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---|-----------|-------------|------|
| Collector-emitter voltage | V_{CEO} | 60 | V |
| Collector-base voltage | V_{CBO} | 60 | |
| Emitter-base voltage | V_{EBO} | 5 | |
| DC collector current | I_C | 600 | mA |
| Total power dissipation, $T_S = 77\text{ °C}$ | P_{tot} | 330 | mW |
| Junction temperature | T_j | 150 | °C |
| Storage temperature | T_{stg} | -65 ... 150 | |

Thermal Resistance

| | | | |
|--|------------|------|-----|
| Junction - soldering point ¹⁾ | R_{thJS} | ≤220 | K/W |
|--|------------|------|-----|

¹⁾For calculation of R_{thJA} please refer to Application Note Thermal Resistance

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 $I_C = 10\text{ mA}, I_B = 0$ | $V_{(BR)CEO}$ | 60 | - | - | V |
| Collector-base breakdown voltage $I_C = 10\text{ }\mu\text{A}, I_E = 0$ | $V_{(BR)CBO}$ | 60 | - | - | |
| Emitter-base breakdown voltage $I_E = 10\text{ }\mu\text{A}, I_C = 0$ | $V_{(BR)EBO}$ | 5 | - | - | |
| Collector cutoff current $V_{CB} = 50\text{ V}, I_E = 0$ | I_{CBO} | - | - | 10 | nA |
| Collector cutoff current $V_{CB} = 50\text{ V}, I_E = 0, T_A = 150\text{ }^\circ\text{C}$ | I_{CBO} | - | - | 10 | μA |
| Emitter cutoff current $V_{EB} = 3\text{ V}, I_C = 0$ | I_{EBO} | - | - | 10 | nA |
| DC current gain 1) $I_C = 100\text{ }\mu\text{A}, V_{CE} = 10\text{ V}$ $I_C = 1\text{ mA}, V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}, V_{CE} = 10\text{ V}$ $I_C = 150\text{ mA}, V_{CE} = 10\text{ V}$ $I_C = 500\text{ mA}, V_{CE} = 10\text{ V}$ | h_{FE} | 75 100 100 100 50 | - - - - - | - - - 300 - | - |
| Collector-emitter saturation voltage1) $I_C = 150\text{ mA}, I_B = 15\text{ mA}$ $I_C = 500\text{ mA}, I_B = 50\text{ mA}$ | V_{CEsat} | - - | - - | 0.4 1.6 | V |
| Base-emitter saturation voltage 1) $I_C = 150\text{ mA}, I_B = 15\text{ mA}$ $I_C = 500\text{ mA}, I_B = 50\text{ mA}$ | V_{BEsat} | - - | - - | 1.3 2.6 | |

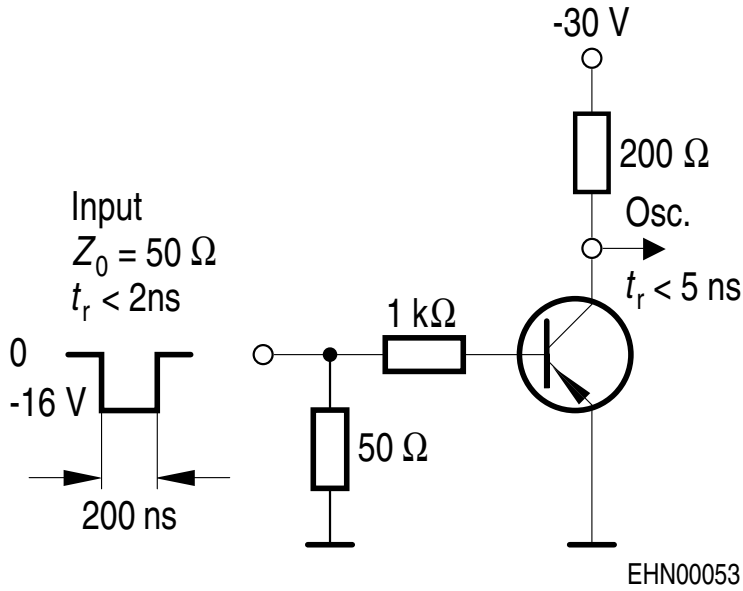
 1) Pulse test: $t \leq 300\mu\text{s}$, $D = 2\%$

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

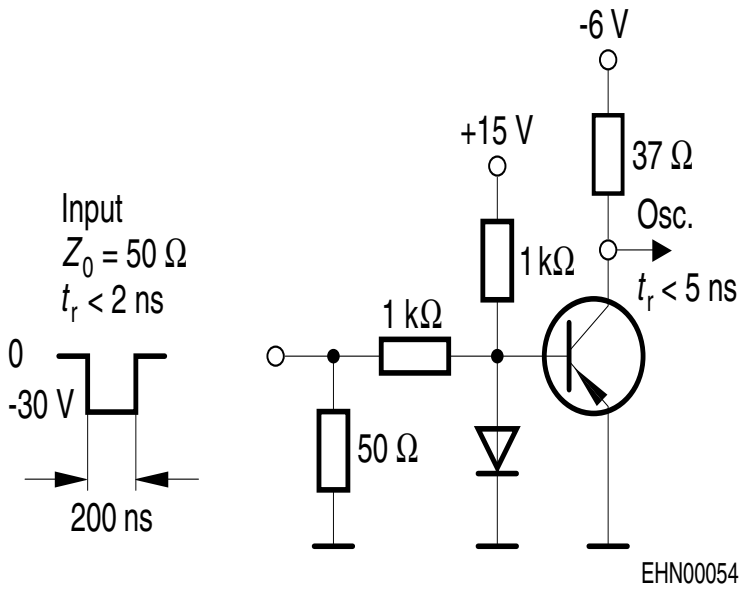
| Parameter | Symbol | Values | | | Unit |
|--|-----------|--------|------|------|------|
| | | min. | typ. | max. | |
| AC Characteristics | | | | | |
| Transition frequency $I_C = 20\text{ mA}, V_{CE} = 20\text{ V}, f = 100\text{ MHz}$ | f_T | 200 | - | - | MHz |
| Collector-base capacitance $V_{CB} = 10\text{ V}, f = 1\text{ MHz}$ | C_{cb} | - | - | 8 | pF |
| Emitter-base capacitance $V_{EB} = 0.5\text{ V}, f = 1\text{ MHz}$ | C_{eb} | - | - | 30 | |
| Delay time $V_{CC} = 30\text{ V}, I_C = 150\text{ mA}, I_{B1} = 15\text{ mA}, V_{BE(off)} = 0.5\text{ V}$ | t_d | - | - | 10 | ns |
| Rise time $V_{CC} = 30\text{ V}, I_C = 150\text{ mA}, I_{B1} = 15\text{ mA}, V_{BE(off)} = 0.5\text{ V}$ | t_r | - | - | 40 | |
| Storage time $V_{CC} = 30\text{ V}, I_C = 150\text{ mA}, I_{B1}=I_{B2} = 15\text{ mA}$ | t_{stg} | - | - | 80 | |
| Fall time $V_{CC} = 30\text{ V}, I_C = 150\text{ mA}, I_{B1}=I_{B2} = 15\text{ mA}$ | t_f | - | - | 30 | |

Test circuits

Delay and rise time

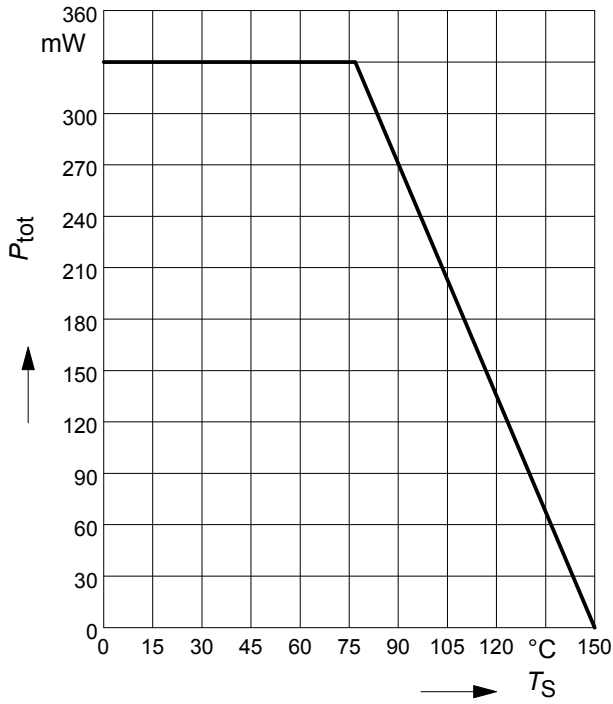


Storage and fall time

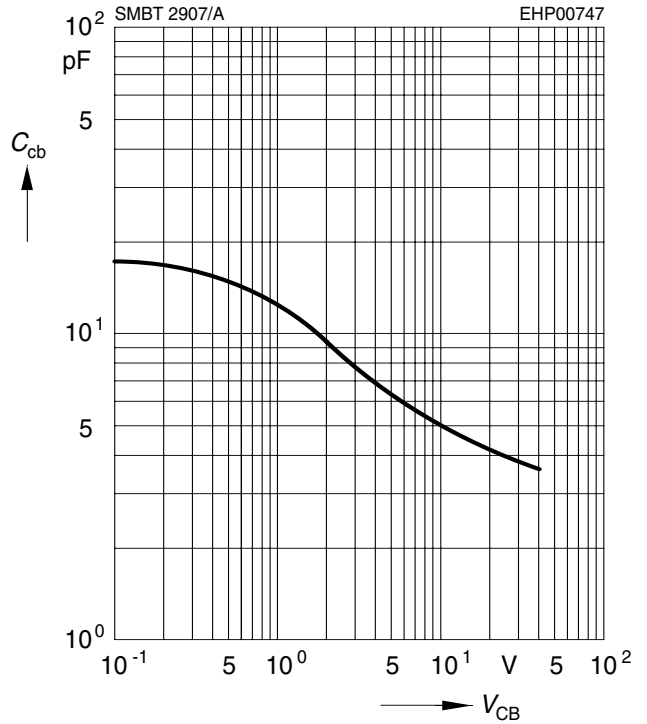


Oscilloscope: $R > 100 \Omega$, $C < 12 \text{ pF}$, $t_r < 5 \text{ ns}$

Total power dissipation $P_{tot} = f(T_S)$

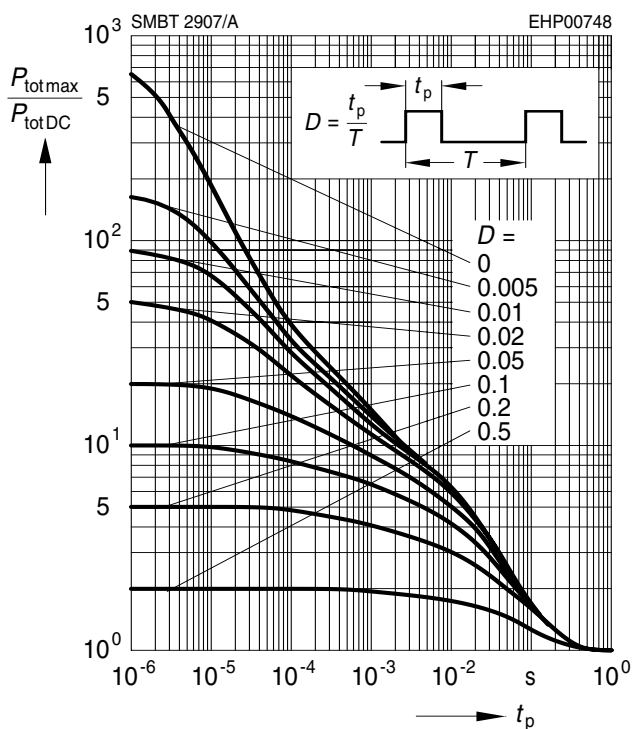


**Collector-base capacitance $C_{CB} = f(V_{CB})$
 $f = 1\text{MHz}$**



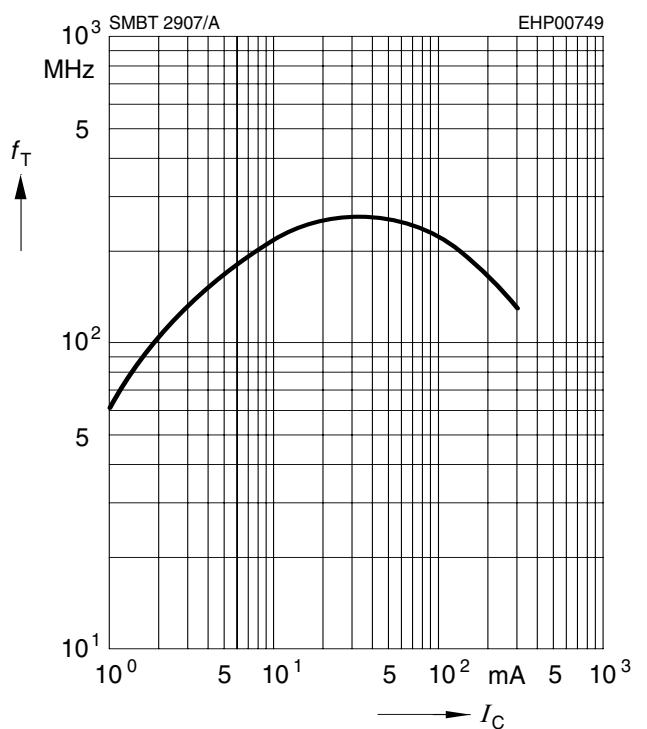
Permissible pulse load

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



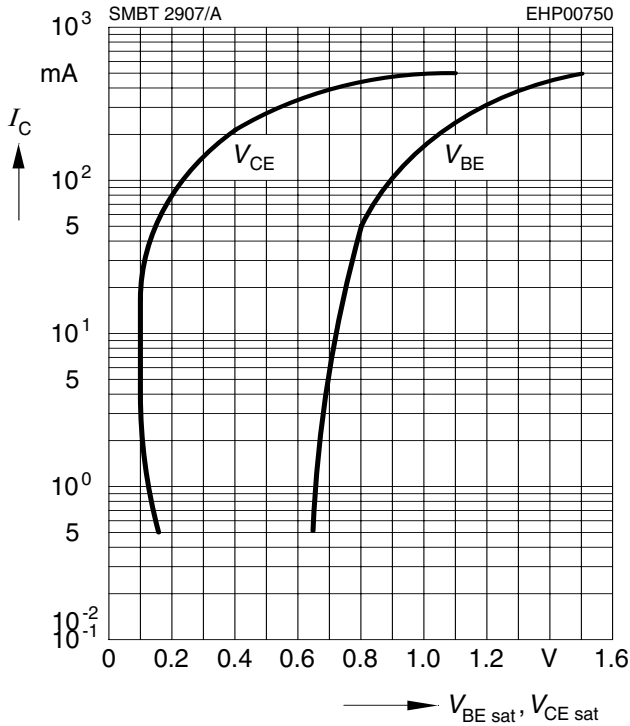
Transition frequency $f_T = f(I_C)$

$V_{CE} = 5\text{V}$



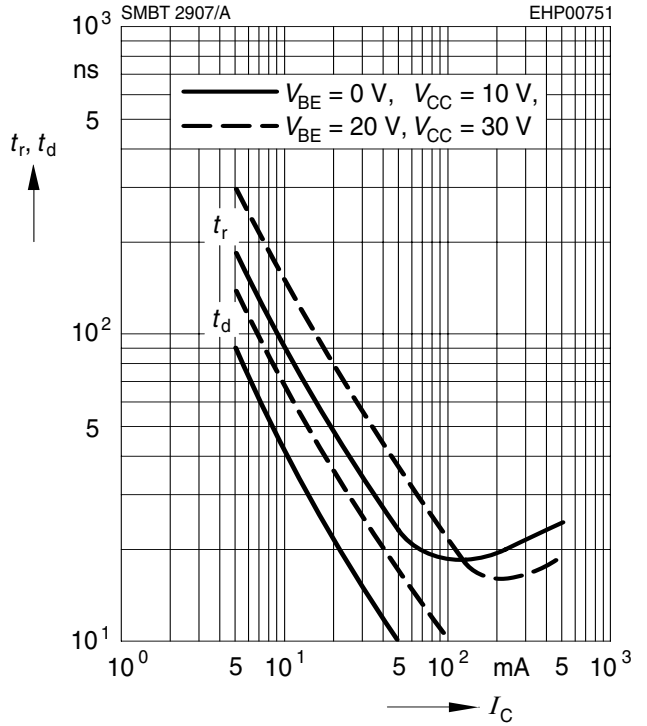
Saturation voltage $I_C = f(V_{BEsat}, V_{CEsat})$

$h_{FE} = 10$

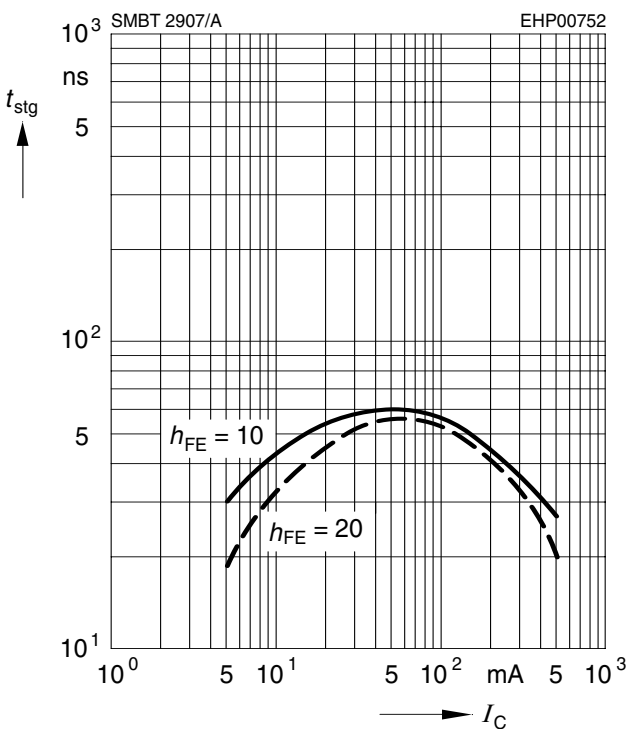


Delay time $t_d = f(I_C)$

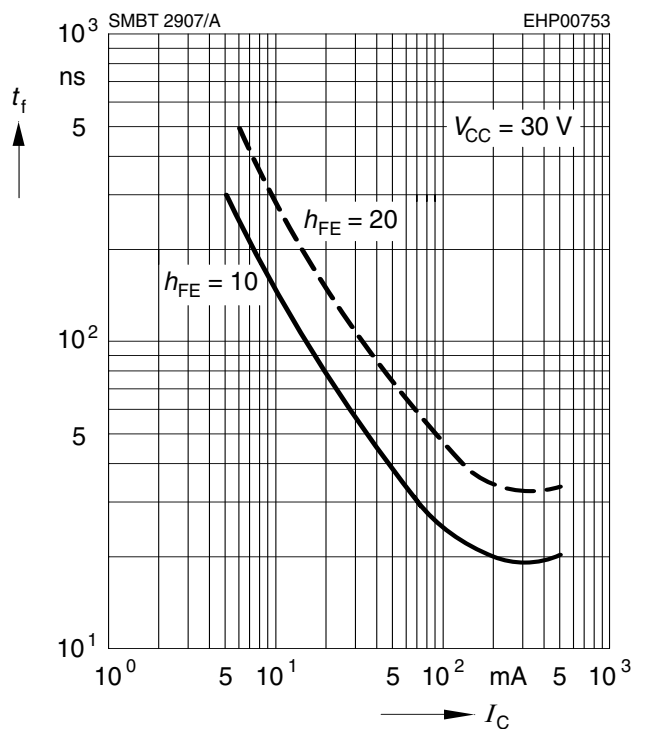
Rise time $t_r = f(I_C)$



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



Fall time $t_f = f(I_C)$



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

$V_{CE} = 5V$

