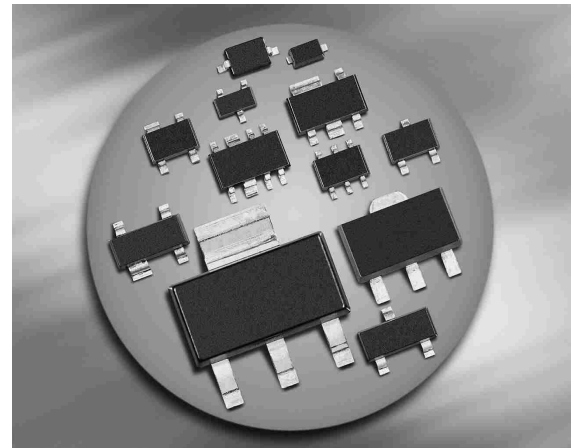
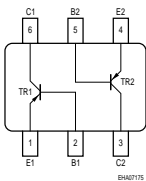


**PNP Silicon Switching Transistors**

- High DC current gain: 0.1 mA to 100 mA
- Low collector-emitter saturation voltage
- For SMBT3906S and SMBT3906U:  
Two (galvanic) internal isolated transistor with good matching in one package
- Complementary types:  
SMBT3904...MMBT3904 (NPN)
- SMBT3904S / U: for orientation in reel  
see package information below
- Pb-free (RoHS compliant) package <sup>1)</sup>
- Qualified according AEC Q101


**SMBT3906S/U**


| Type               | Marking | Pin Configuration |      |      |      |      |      | Package |
|--------------------|---------|-------------------|------|------|------|------|------|---------|
|                    |         | 1=B               | 2=E  | 3=C  | -    | -    | -    |         |
| SMBT3906/ MMBT3906 | s2A     | 1=B               | 2=E  | 3=C  | -    | -    | -    | SOT23   |
| SMBT3906S          | s2A     | 1=E1              | 2=B1 | 3=C2 | 4=E2 | 5=B2 | 6=C1 | SOT363  |
| SMBT3906U          | s2A     | 1=E1              | 2=B1 | 3=C2 | 4=E2 | 5=B2 | 6=C1 | SC74    |

<sup>1</sup>Pb-containing package may be available upon special request

**Maximum Ratings**

| Parameter   | Symbol    | Value                    | Unit |
|---|-----------|--------------------------|------|
| Collector-emitter voltage   | $V_{CEO}$ | 40                       | V    |
| Collector-base voltage  | $V_{CBO}$ | 40                       |      |
| Emitter-base voltage  | $V_{EBO}$ | 6                        |      |
| Collector current   | $I_C$     | 200                      | mA   |
| Total power dissipation-<br>$T_S \leq 71 \text{ }^\circ\text{C}$<br>$T_S \leq \text{tbd } ^\circ\text{C}$<br>$T_S \leq 115 \text{ }^\circ\text{C}$<br>$T_S \leq 105 \text{ }^\circ\text{C}$ | $P_{tot}$ | 330<br>250<br>250<br>330 | mW   |
| Junction temperature  | $T_j$     | 150                      |      |
| Storage temperature   | $T_{stg}$ | -65 ... 150              |      |
|   |           |                          |      |
|   |           |                          |      |

**Thermal Resistance**

| Parameter  | Symbol     | Value                                  | Unit |
|--|------------|--|------|
| Junction - soldering point <sup>1)</sup><br>SMBT3906/ MMBT3906<br>SMBT3906S<br>SMBT3906U | $R_{thJS}$ | $\leq 240$<br>$\leq 140$<br>$\leq 135$ | K/W  |

<sup>1</sup>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.                    |      |
| <b>DC Characteristics</b>  |               |                             |                       |                         |      |
| Collector-emitter breakdown voltage<br>$I_C = 1\text{ mA}, I_B = 0$  | $V_{(BR)CEO}$ | 40                          | -                     | -                       | V    |
| Collector-base breakdown voltage<br>$I_C = 10\text{ }\mu\text{A}, I_E = 0$   | $V_{(BR)CBO}$ | 40                          | -                     | -                       |      |
| Emitter-base breakdown voltage<br>$I_E = 10\text{ }\mu\text{A}, I_C = 0$   | $V_{(BR)EBO}$ | 6                           | -                     | -                       |      |
| Collector-base cutoff current<br>$V_{CB} = 30\text{ V}, I_E = 0$   | $I_{CBO}$     | -                           | -                     | 50                      | nA   |
| DC current gain <sup>1)</sup><br>$I_C = 100\text{ }\mu\text{A}, V_{CE} = 1\text{ V}$<br>$I_C = 1\text{ mA}, V_{CE} = 1\text{ V}$<br>$I_C = 10\text{ mA}, V_{CE} = 1\text{ V}$<br>$I_C = 50\text{ mA}, V_{CE} = 1\text{ V}$<br>$I_C = 100\text{ mA}, V_{CE} = 1\text{ V}$ | $h_{FE}$      | 60<br>80<br>100<br>60<br>30 | -<br>-<br>-<br>-<br>- | -<br>-<br>300<br>-<br>- | -    |
| Collector-emitter saturation voltage <sup>1)</sup><br>$I_C = 10\text{ mA}, I_B = 1\text{ mA}$<br>$I_C = 50\text{ mA}, I_B = 5\text{ mA}$   | $V_{CEsat}$   | -<br>-                      | -<br>-                | 0.25<br>0.4             | V    |
| Base emitter saturation voltage <sup>1)</sup><br>$I_C = 10\text{ mA}, I_B = 1\text{ mA}$<br>$I_C = 50\text{ mA}, I_B = 5\text{ mA}$  | $V_{BEsat}$   | 0.65<br>-                   | -<br>-                | 0.85<br>0.95            |      |

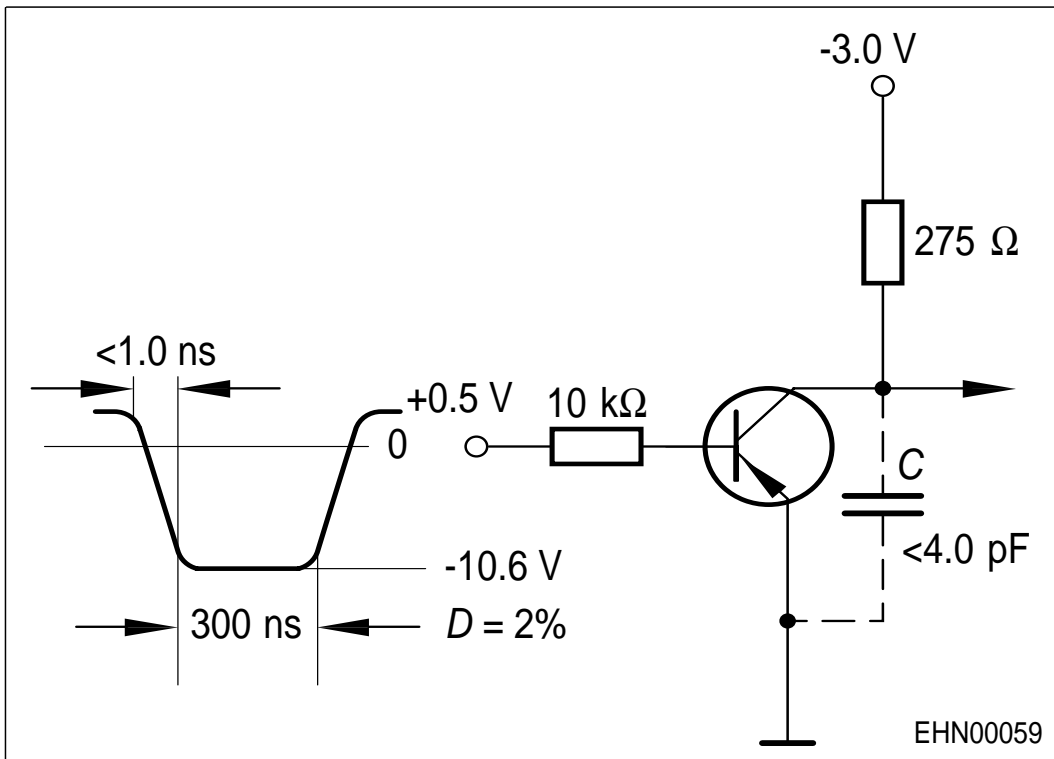
<sup>1)</sup>Pulse test:  $t < 300\mu\text{s}$ ;  $D < 2\%$

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

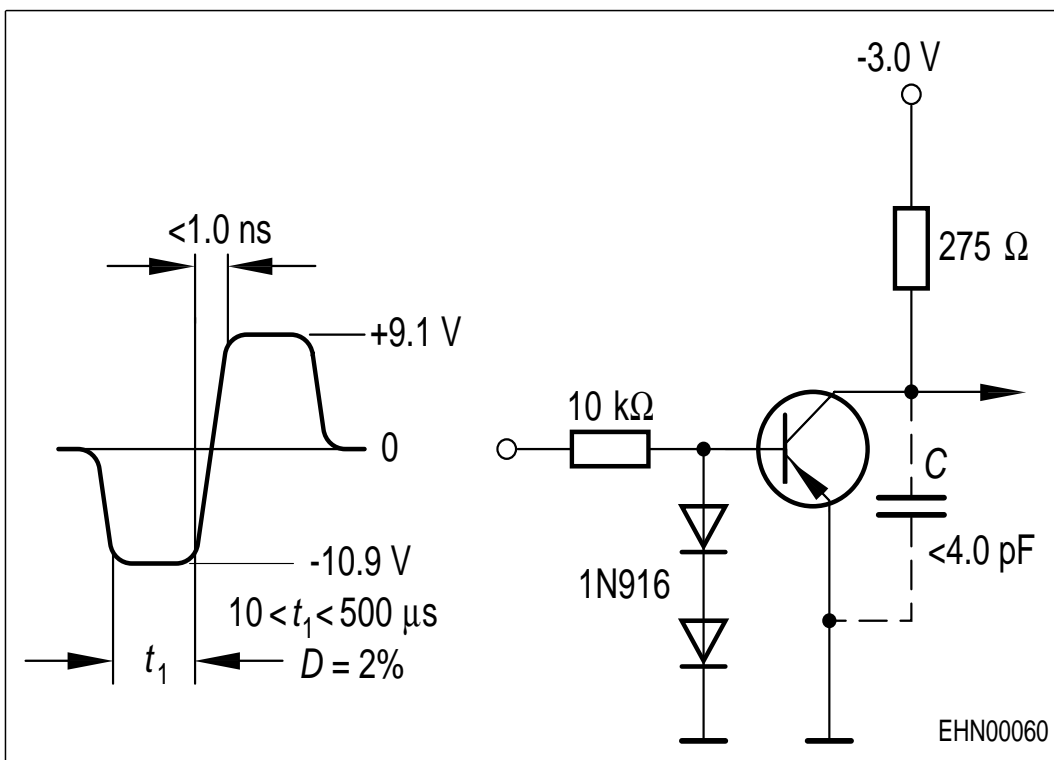
| Parameter  | Symbol    | Values |      |      | Unit |
|--|-----------|--------|------|------|------|
|  |           | min.   | typ. | max. |      |
| <b>AC Characteristics</b>  |           |        |      |      |      |
| Transition frequency<br>$I_C = 10\text{ mA}$ , $V_{CE} = 20\text{ V}$ , $f = 100\text{ MHz}$   | $f_T$     | 250    | -    | -    | MHz  |
| Collector-base capacitance<br>$V_{CB} = 5\text{ V}$ , $f = 1\text{ MHz}$   | $C_{cb}$  | -      | -    | 3.5  | pF   |
| Emitter-base capacitance<br>$V_{EB} = 0.5\text{ V}$ , $f = 1\text{ MHz}$   | $C_{eb}$  | -      | -    | 10   |      |
| Delay time<br>$V_{CC} = 3\text{ V}$ , $I_C = 10\text{ mA}$ , $I_{B1} = 1\text{ mA}$ ,<br>$V_{BE(\text{off})} = 0.5\text{ V}$                           | $t_d$     | -      | -    | 35   | ns   |
| Rise time<br>$V_{CC} = 3\text{ V}$ , $I_C = 10\text{ mA}$ , $I_{B1} = 1\text{ mA}$ ,<br>$V_{BE(\text{off})} = 0.5\text{ V}$                            | $t_r$     | -      | -    | 35   |      |
| Storage time<br>$V_{CC} = 3\text{ V}$ , $I_C = 10\text{ mA}$ , $I_{B1} = I_{B2} = 1\text{ mA}$   | $t_{stg}$ | -      | -    | 225  |      |
| Fall time<br>$V_{CC} = 3\text{ V}$ , $I_C = 10\text{ mA}$ , $I_{B1} = I_{B2} = 1\text{ mA}$  | $t_f$     | -      | -    | 75   |      |
| Noise figure<br>$I_C = 100\text{ }\mu\text{A}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$ ,<br>$\Delta f = 200\text{ Hz}$ , $R_S = 1\text{ k}\Omega$ | $F$       | -      | -    | 4    | dB   |

Test circuit

Delay and rise time

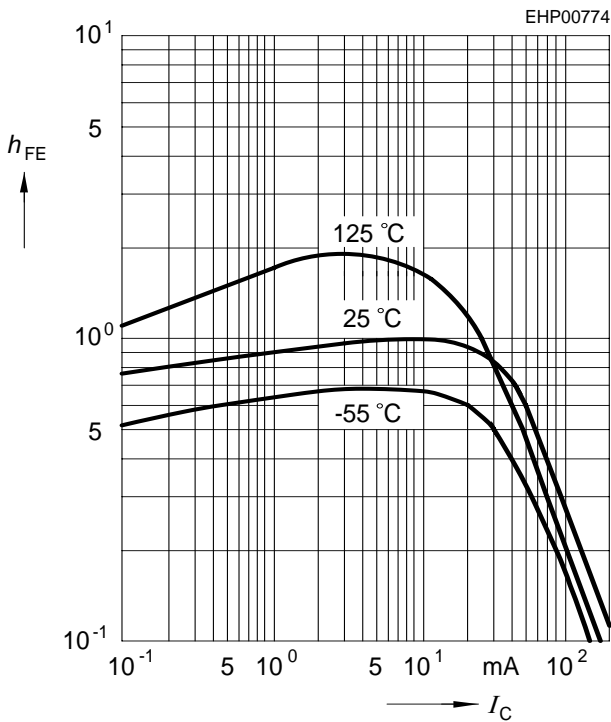


Storage and fall time



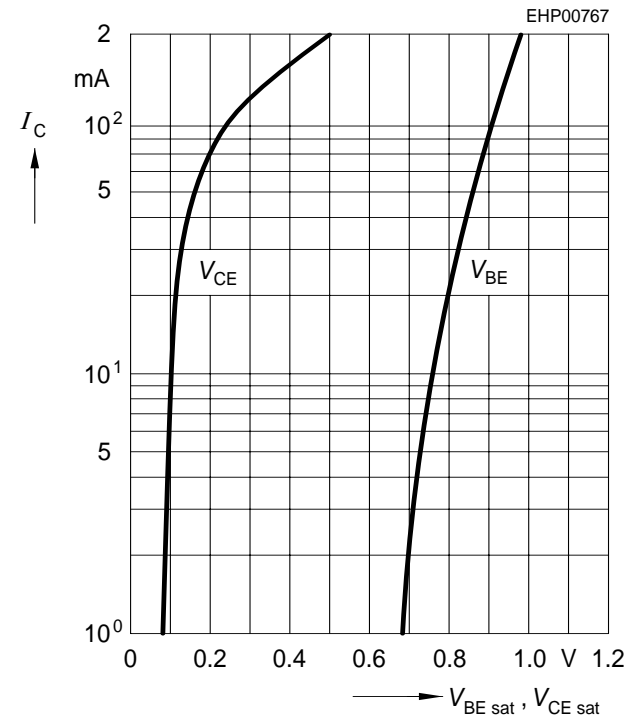
**DC current gain  $h_{FE} = f(I_C)$**

$V_{CE} = 1\text{ V}$



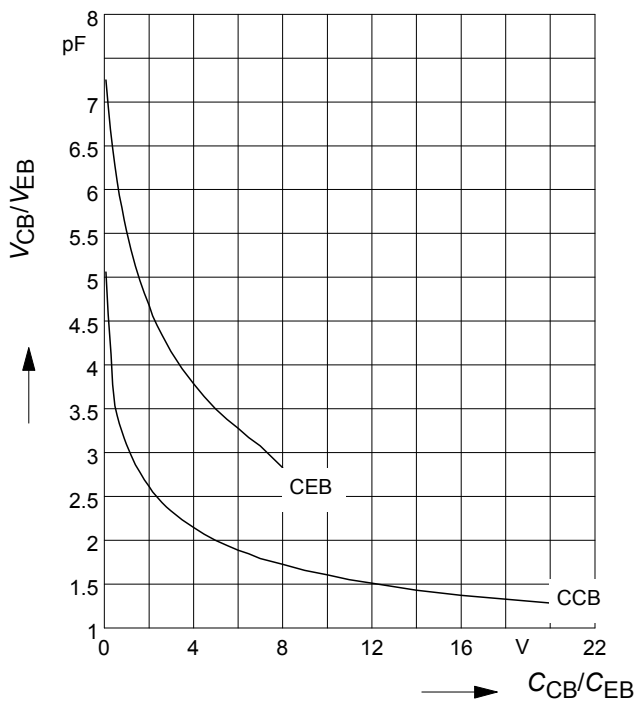
**Saturation voltage  $I_C = f(V_{BEsat}; V_{CEsat})$**

$h_{FE} = 10$



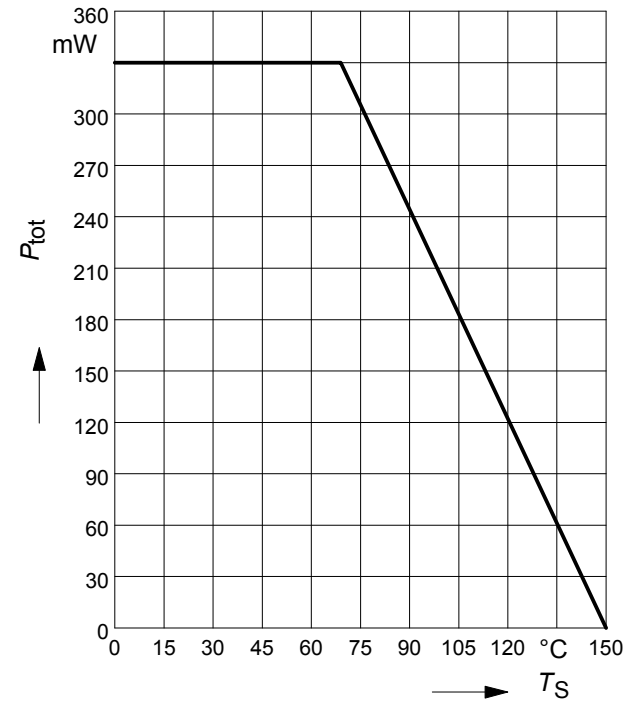
**Collector-base capacitance  $C_{cb} = f(V_{CB})$**

**Emitter-base capacitance  $C_{eb} = f(V_{EB})$**



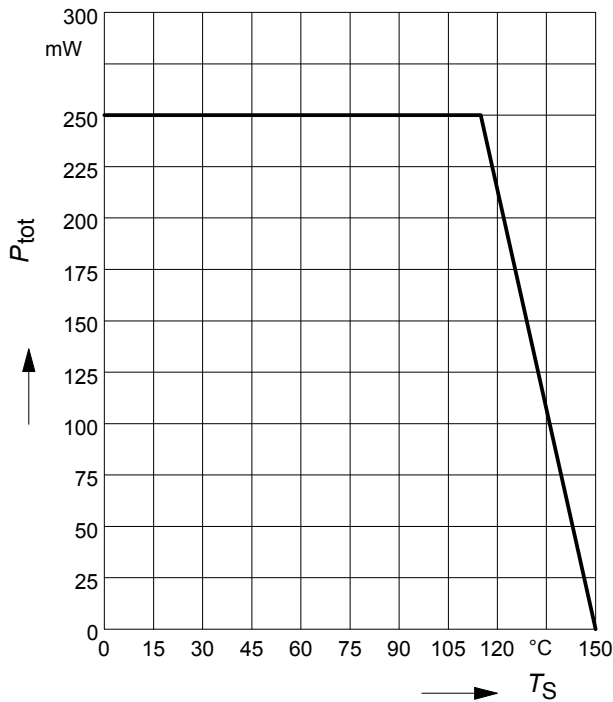
**Total power dissipation  $P_{tot} = f(T_S)$**

SMBT3906/ MMBT3906



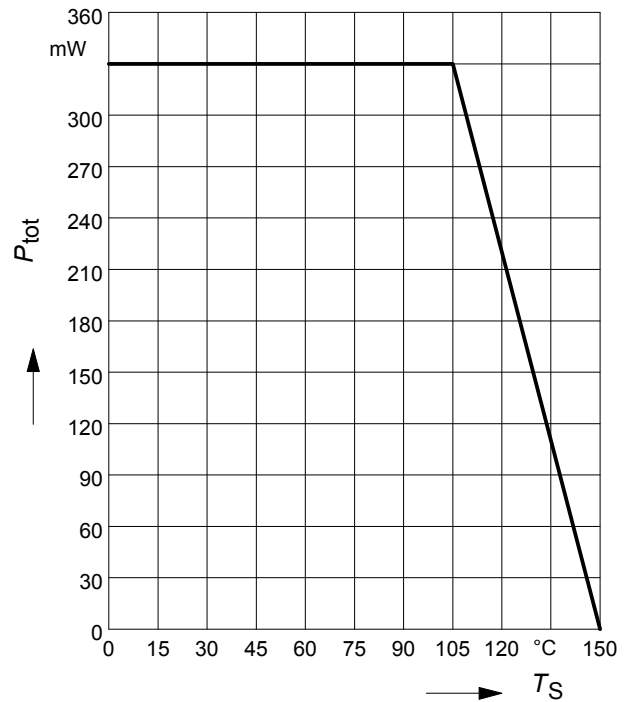
**Total power dissipation  $P_{tot} = f(T_S)$**

SMBT3906S



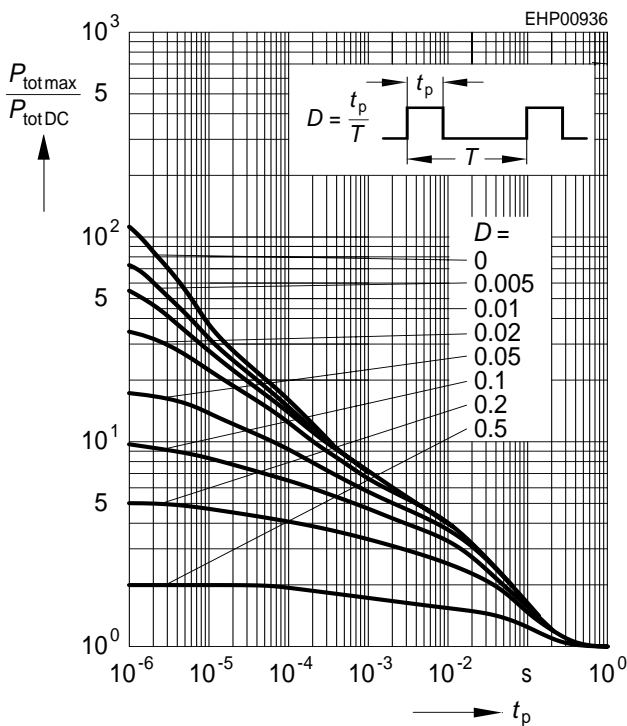
**Total power dissipation  $P_{tot} = f(T_S)$**

SMBT3906U



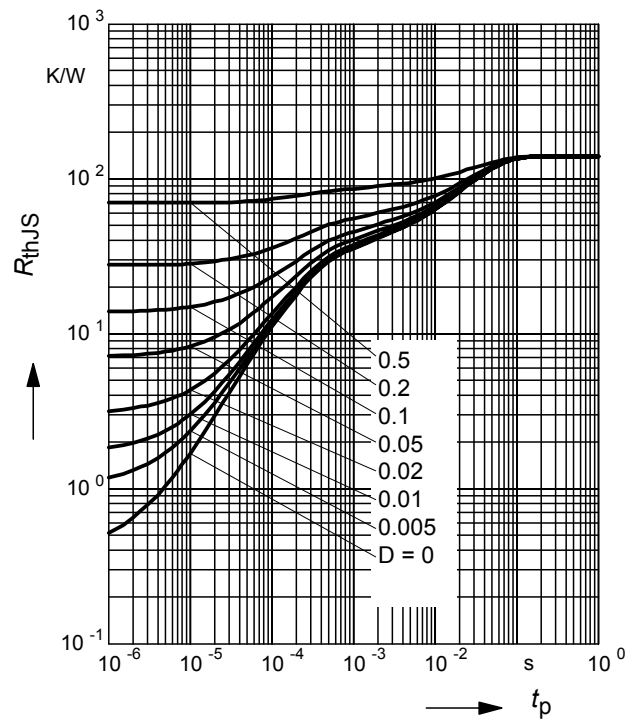
**Permissible Pulse Load**

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



**Permissible Puls Load  $R_{thJS} = f(t_p)$**

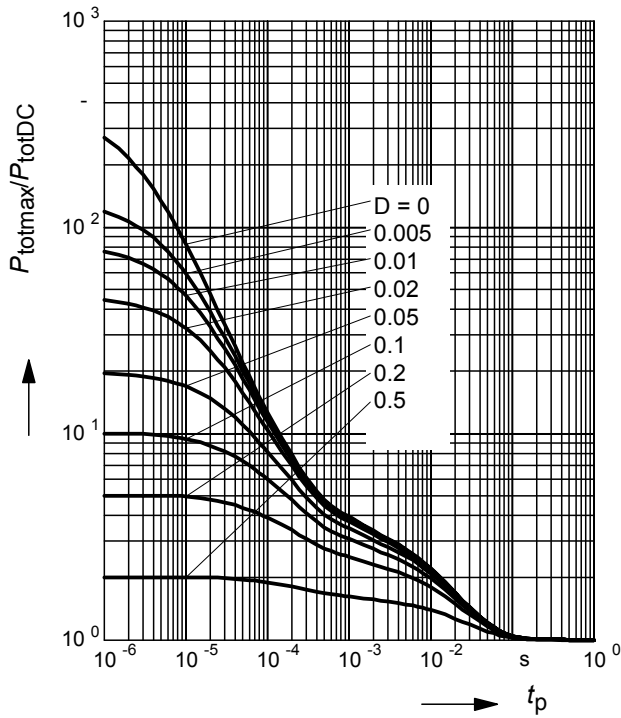
SMBT3906S



**Permissible Pulse Load**

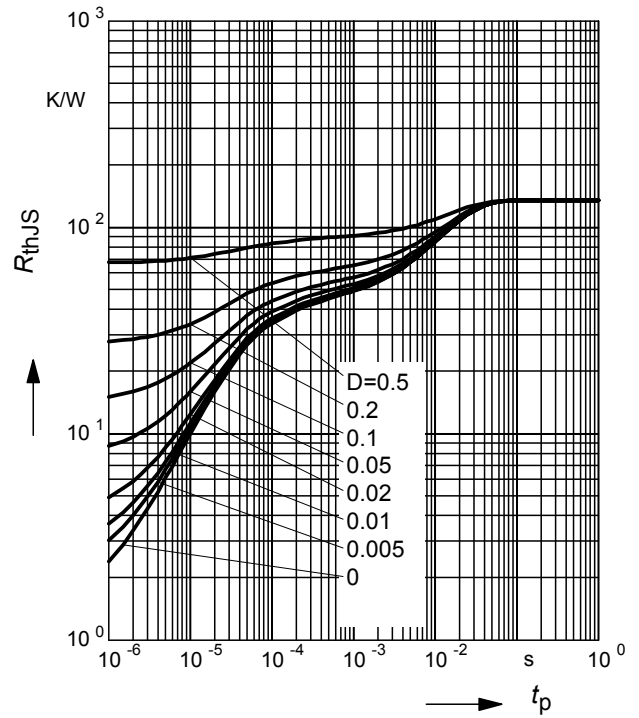
$$P_{\text{totmax}}/P_{\text{totDC}} = f(t_p)$$

SMBT3906S



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

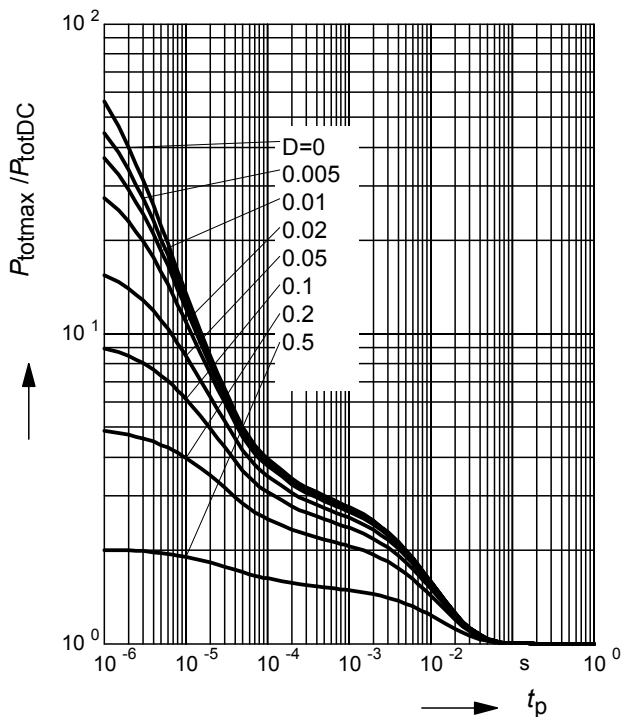
SMBT3906U



**Permissible Pulse Load**

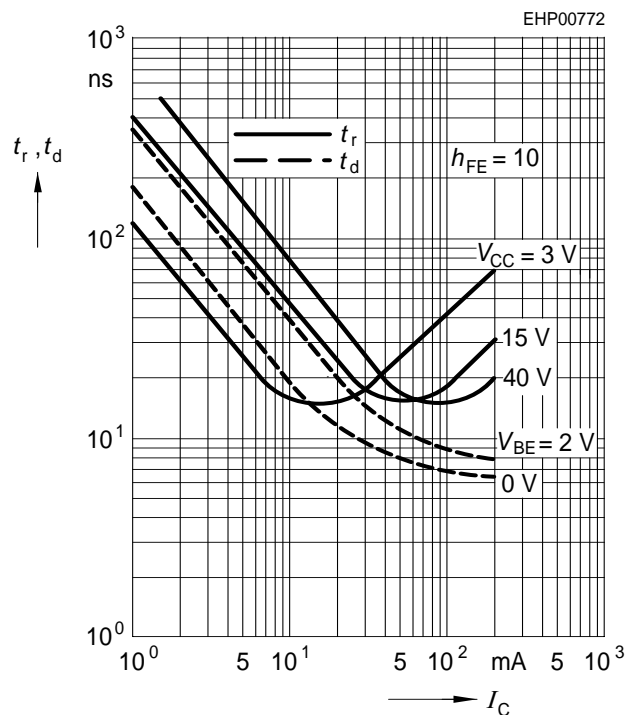
$$P_{\text{totmax}}/P_{\text{totDC}} = f(t_p)$$

SMBT3906U



**Delay time  $t_d = f(I_C)$**

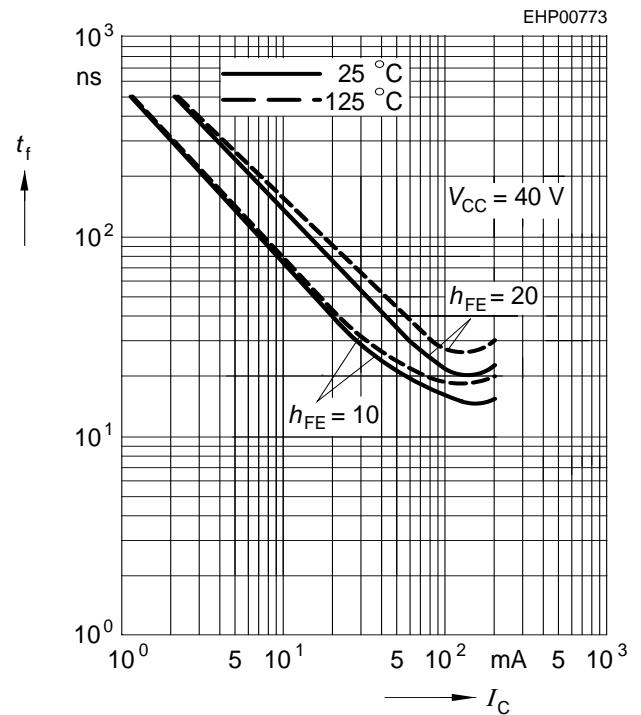
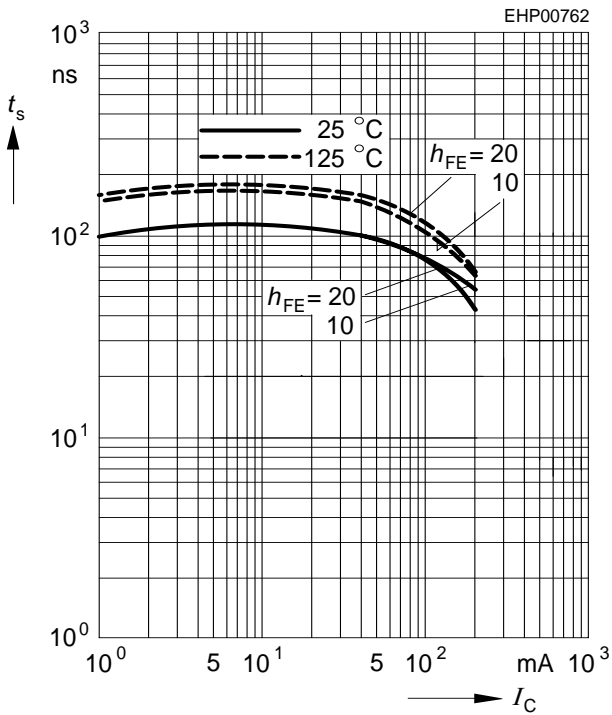
**Rise time  $t_r = f(I_C)$**



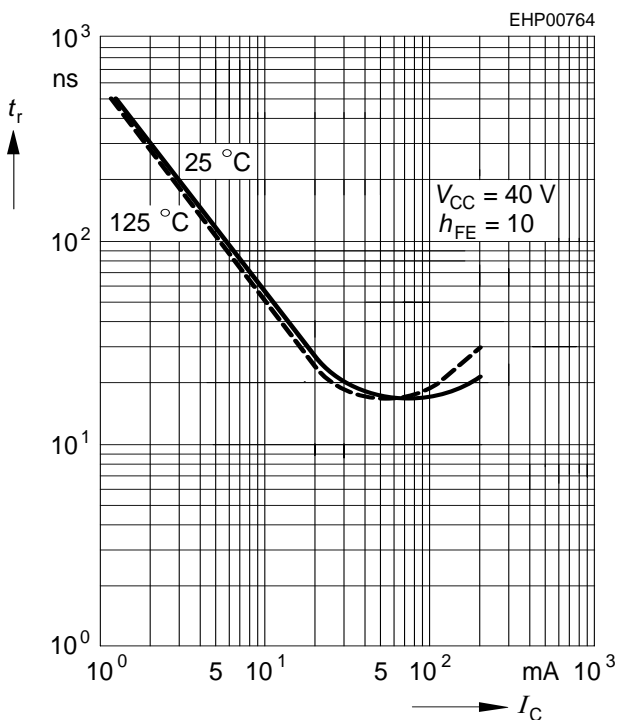


Storage time  $t_{stg} = f(I_C)$

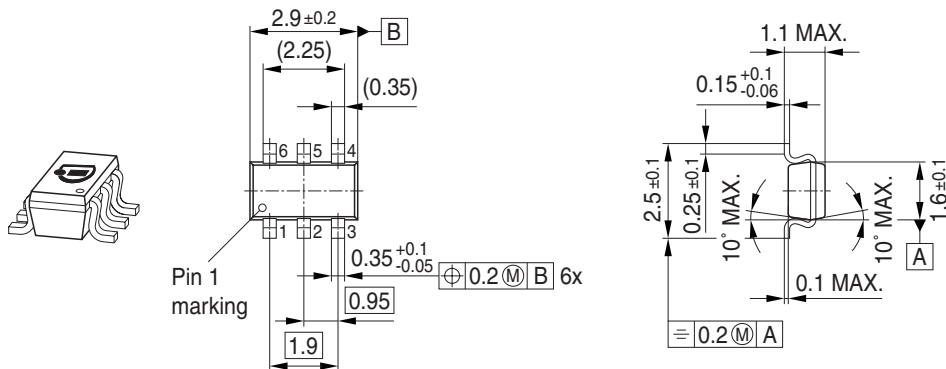
Fall time  $t_f = f(I_C)$



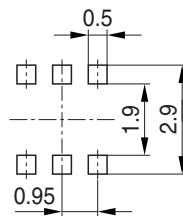
Rise time  $t_r = f(I_C)$



Package Outline

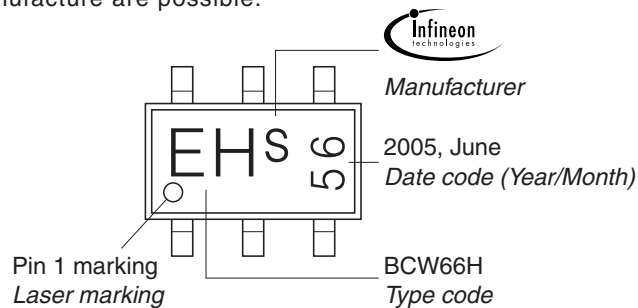


Foot Print



Marking Layout (Example)

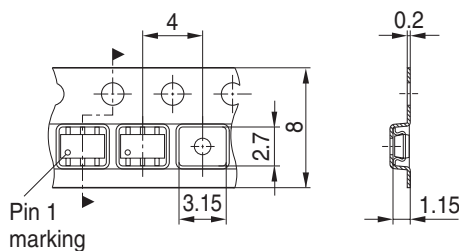
Small variations in positioning of Date code, Type code and Manufacture are possible.



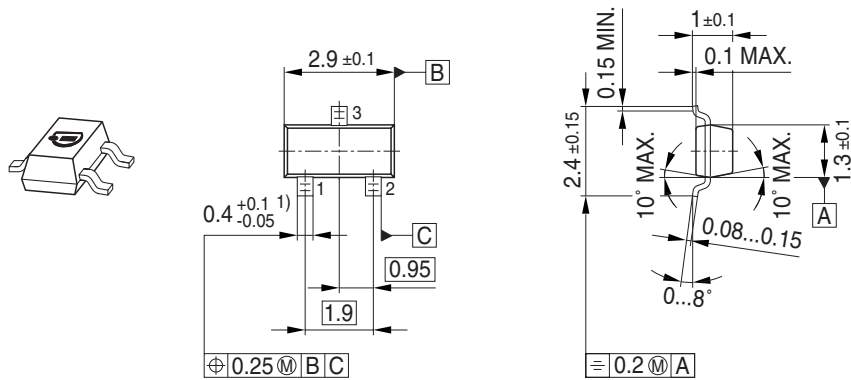
Standard Packing

Reel  $\varnothing$ 180 mm = 3.000 Pieces/Reel  
 Reel  $\varnothing$ 330 mm = 10.000 Pieces/Reel

For symmetric types no defined Pin 1 orientation in reel.

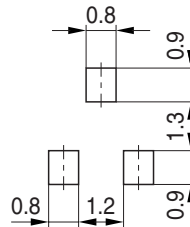


Package Outline

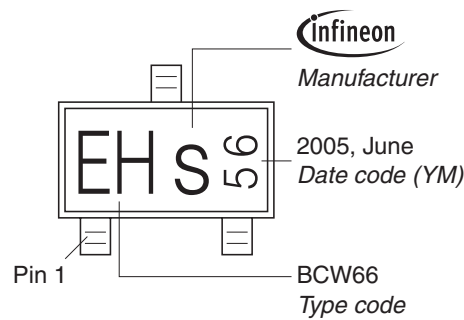


1) Lead width can be 0.6 max. in dambar area

Foot Print

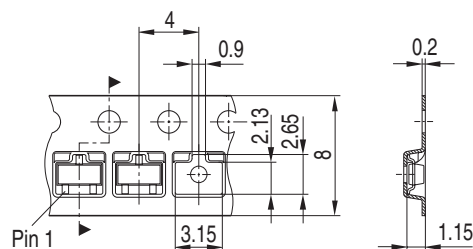


Marking Layout (Example)

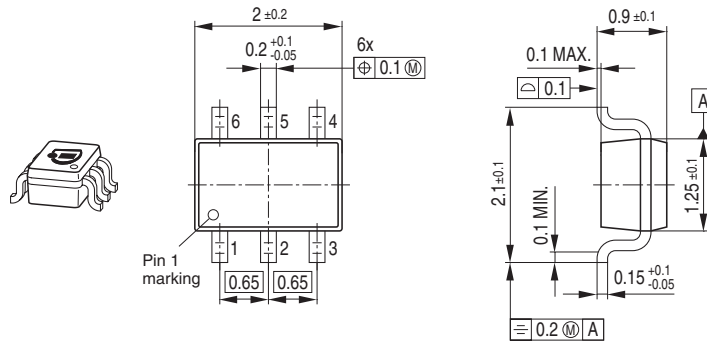


Standard Packing

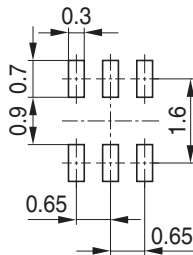
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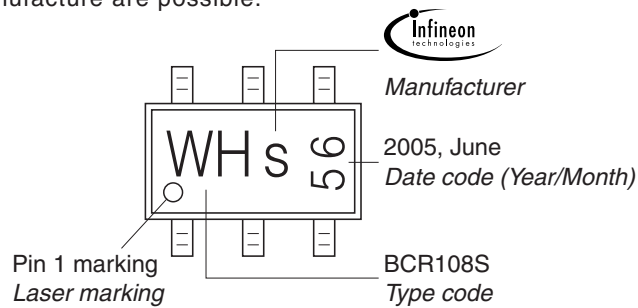


### Foot Print



### Marking Layout (Example)

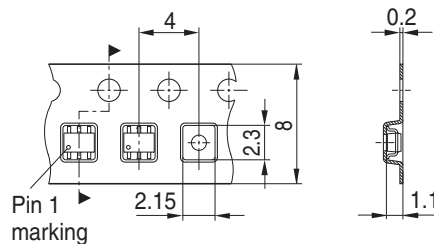
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### Standard Packing

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Edition 2006-02-01

Published by

Infineon Technologies AG

81726 München, Germany

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