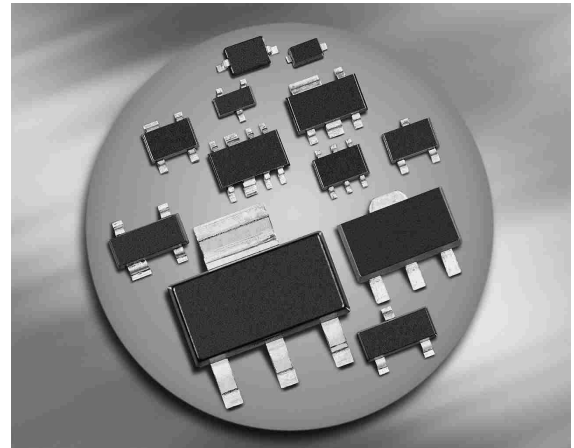


PNP Silicon Switching Transistors

- 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)
- SMBT3906S/ U: for orientation in reel
see package information below
- Pb-free (RoHS compliant) package
- Qualified according AEC Q101



| 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 |

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- | P_{tot} | | mW |
| $T_S \leq 71^\circ\text{C}$, SOT23, MMBT3906 | | 330 | |
| $T_S \leq 115^\circ\text{C}$, SOT363, MMBT3906S | | 250 | |
| $T_S \leq 107^\circ\text{C}$, SC74, MMBT3906U | | 330 | |
| Junction temperature | T_j | 150 | $^\circ\text{C}$ |
| Storage temperature | T_{stg} | -65 ... 150 | |

Thermal Resistance

| Parameter | Symbol | Value | Unit |
|--|------------|------------|------|
| Junction - soldering point ¹⁾ SMBT3906/ MMBT3906 | R_{thJS} | ≤ 240 | mW |
| SMBT3906S | | ≤ 140 | |
| SMBT3906U | | ≤ 130 | |

¹For calculation of R_{thJA} please refer to Application Note AN077 (Thermal Resistance Calculation)

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 $I_C = 10 \mu\text{A}, I_E = 0$ | $V_{(BR)CBO}$ | 40 | - | - | |
| Emitter-base breakdown voltage $I_E = 10 \mu\text{A}, I_C = 0$ | $V_{(BR)EBO}$ | 6 | - | - | |
| Collector-base cutoff current $V_{CB} = 30 \text{ V}, I_E = 0$ | I_{CBO} | - | - | 50 | nA |
| DC current gain ¹⁾ $I_C = 100 \mu\text{A}, V_{CE} = 1 \text{ V}$ $I_C = 1 \text{ mA}, V_{CE} = 1 \text{ V}$ $I_C = 10 \text{ mA}, V_{CE} = 1 \text{ V}$ $I_C = 50 \text{ mA}, V_{CE} = 1 \text{ V}$ $I_C = 100 \text{ mA}, V_{CE} = 1 \text{ V}$ | h_{FE} | 60 80 100 60 30 | - - - - - | - - 300 - - | - |
| Collector-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_{CEsat} | - - | - - | 0.25 0.4 | 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 | |

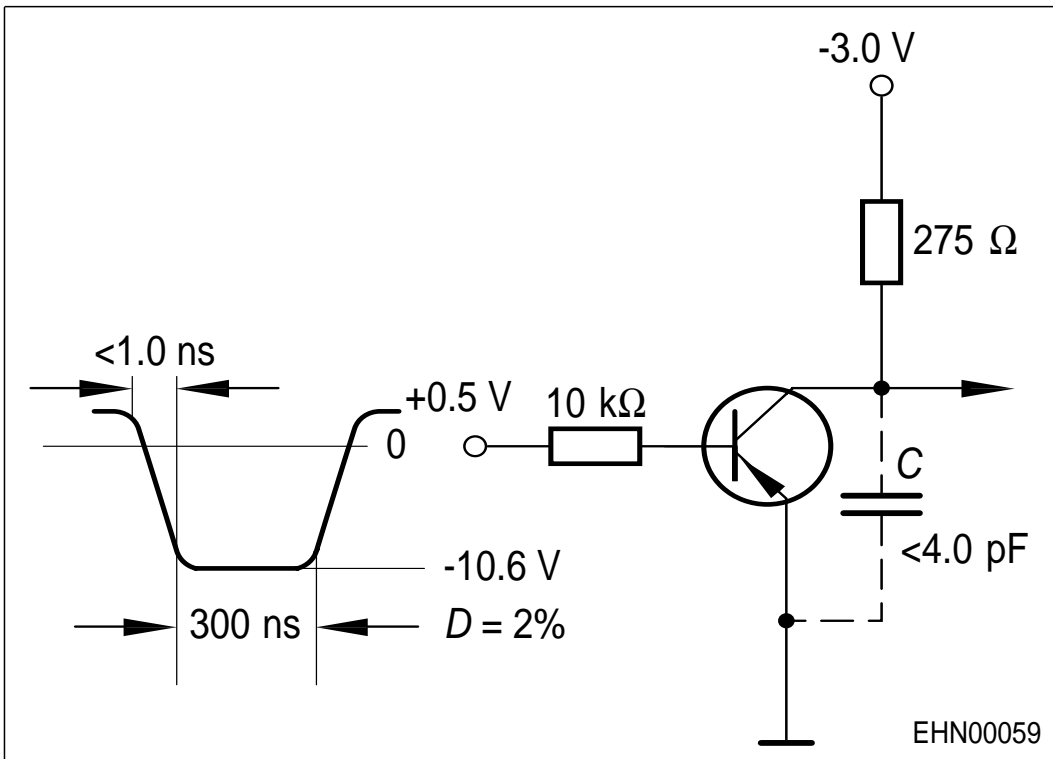
¹Pulse test: $t < 300\mu\text{s}$; $D < 2\%$

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

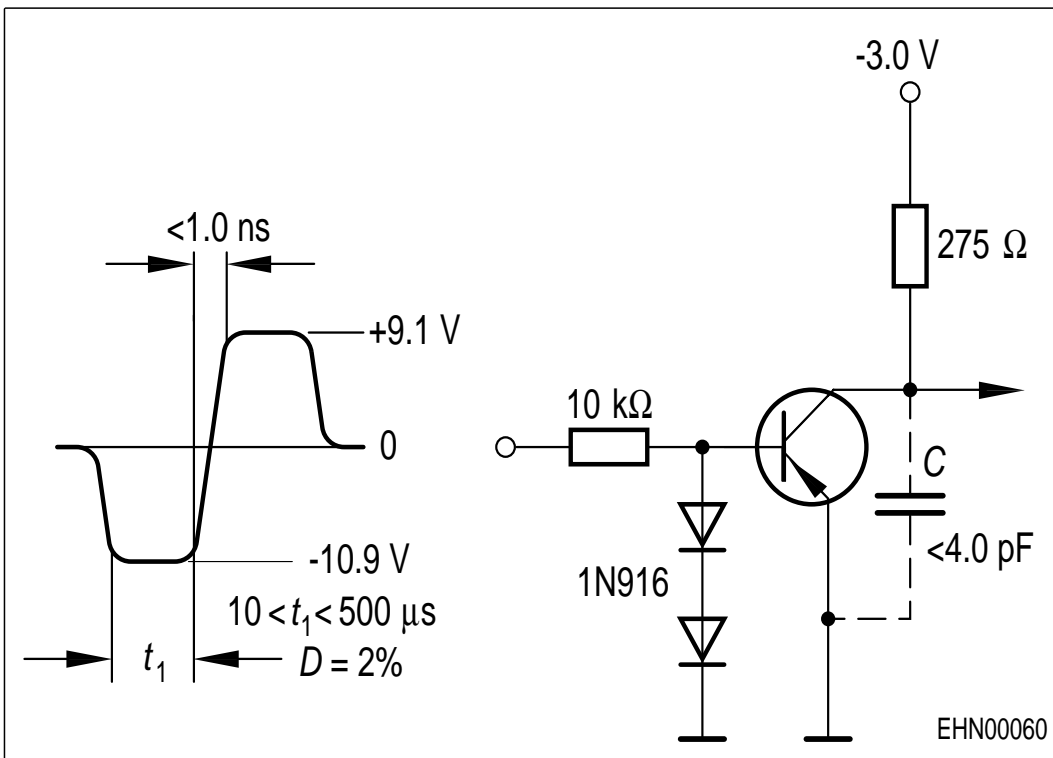
| Parameter | Symbol | Values | | | Unit |
|---|-----------|--------|------|------|------|
| | | min. | typ. | max. | |
| AC Characteristics | | | | | |
| Transition frequency $I_C = 10\text{ mA}, V_{CE} = 20\text{ V}, f = 100\text{ MHz}$ | f_T | 250 | - | - | MHz |
| Collector-base capacitance $V_{CB}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

Test circuit

Delay and rise time

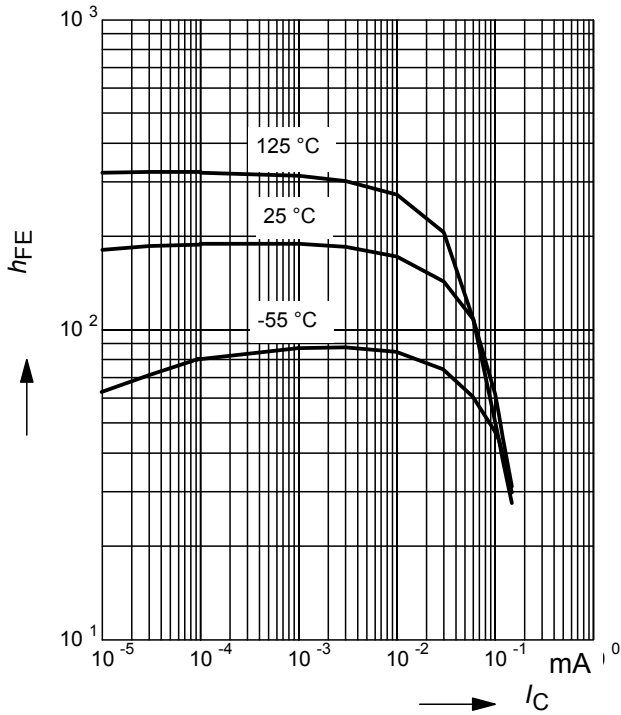


Storage and fall time



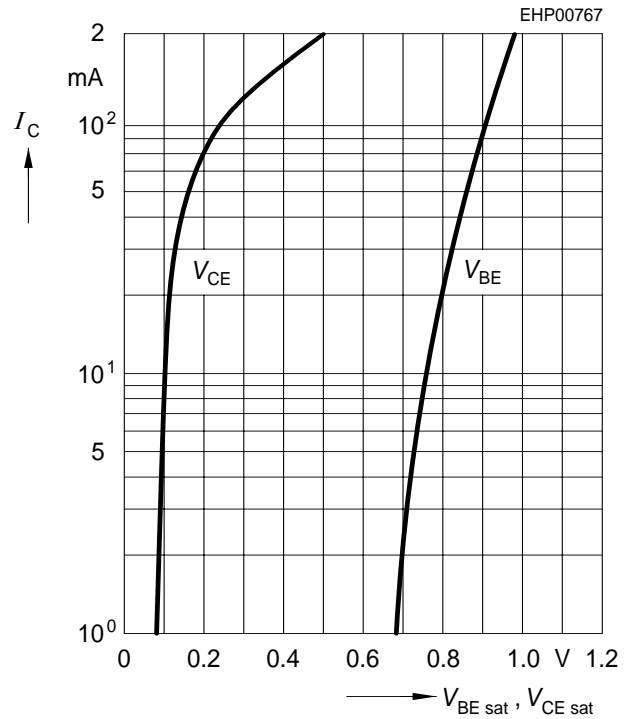
DC current gain $h_{FE} = f(I_C)$

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



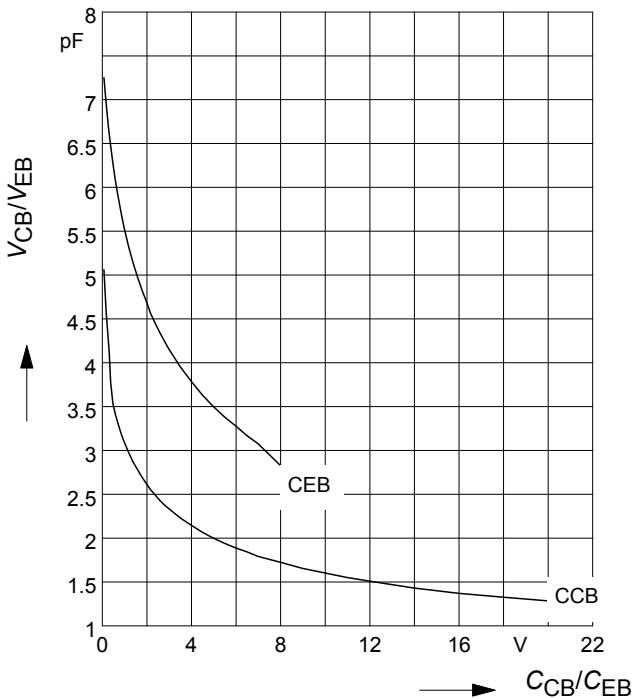
Saturation voltage $I_C = f(V_{BEsat}; V_{CEsat})$

$h_{FE} = 10$



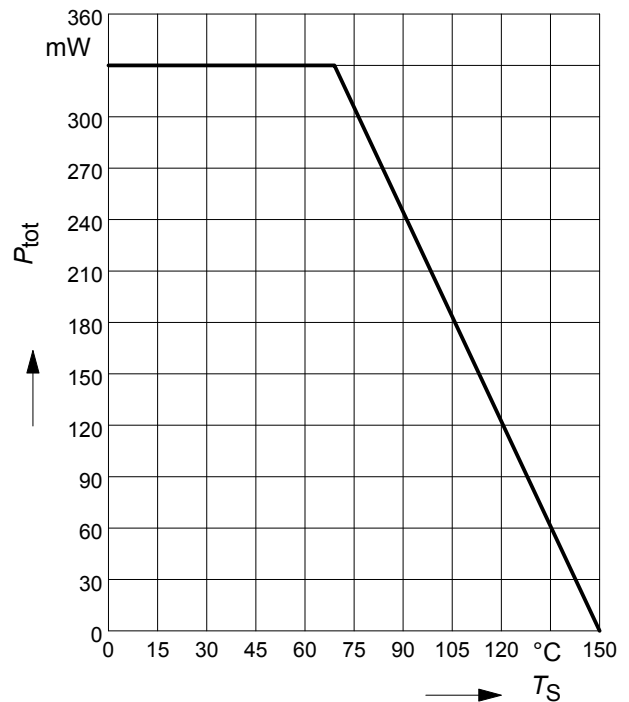
Collector-base capacitance $C_{cb} = f(V_{CB})$

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



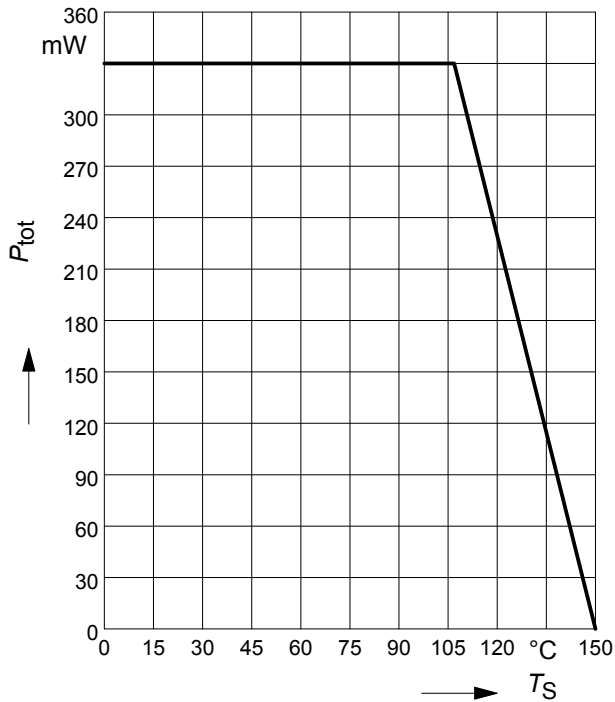
Total power dissipation $P_{tot} = f(T_S)$

SMBT3906



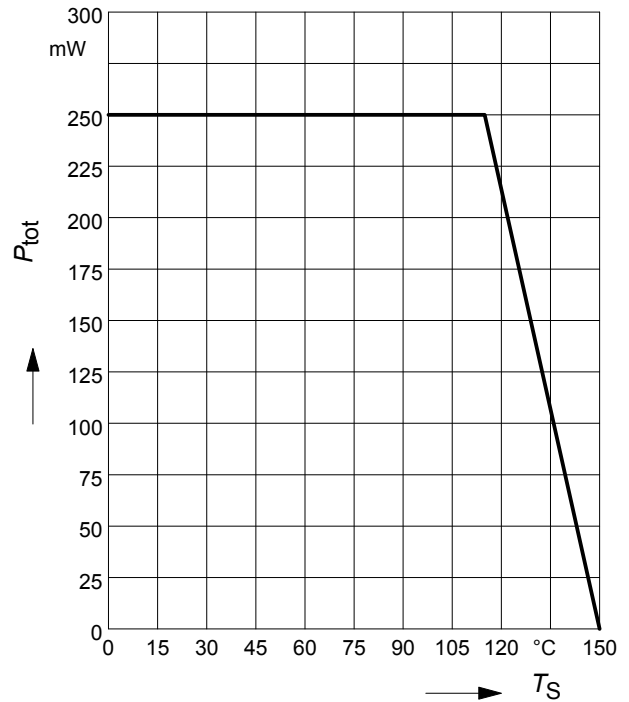
Total power dissipation $P_{tot} = f(T_S)$

SMBT3906U



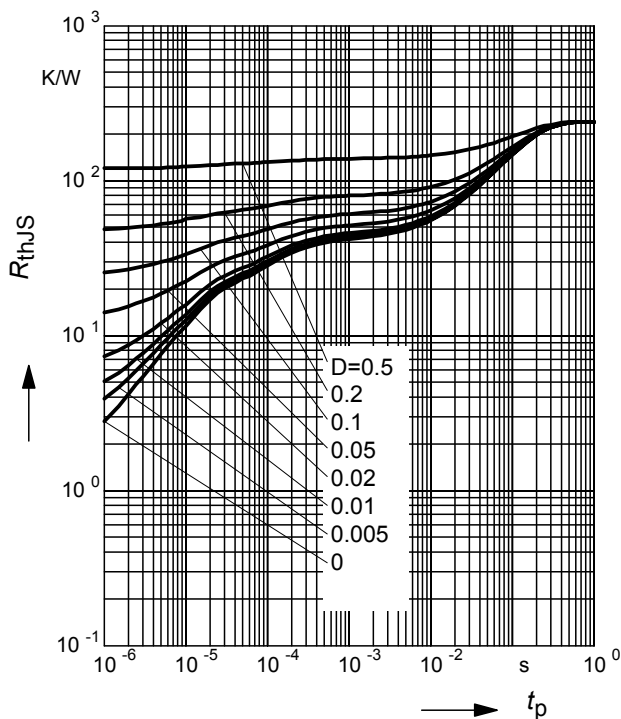
Total power dissipation $P_{tot} = f(T_S)$

SMBT3906S



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

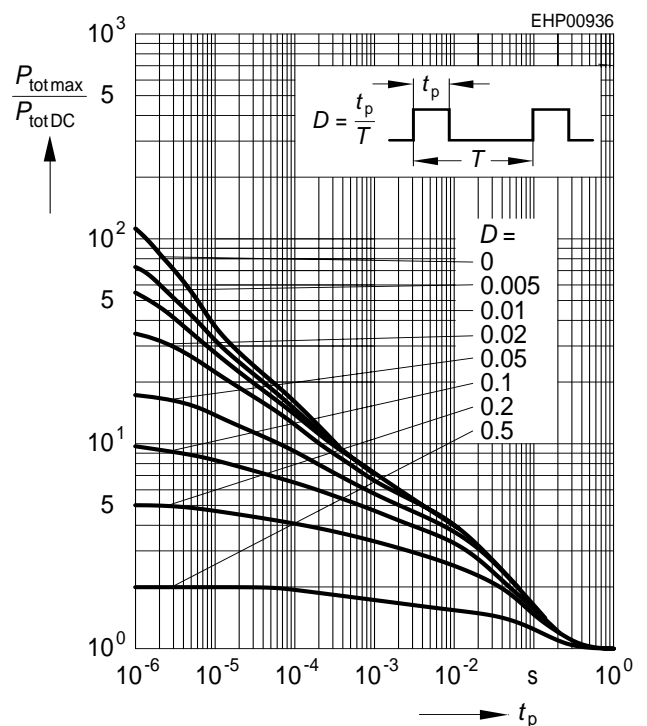
SMBT3906



Permissible Pulse Load

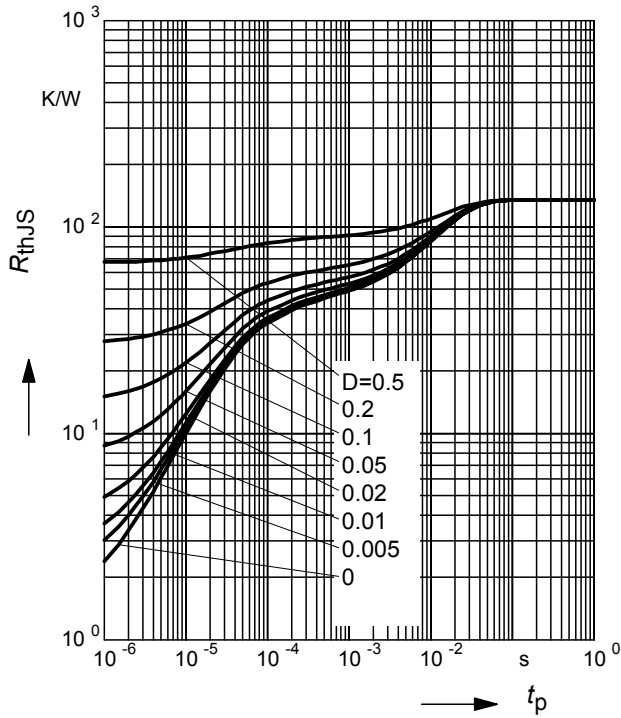
$P_{totmax}/P_{totDC} = f(t_p)$

SMBT3906



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

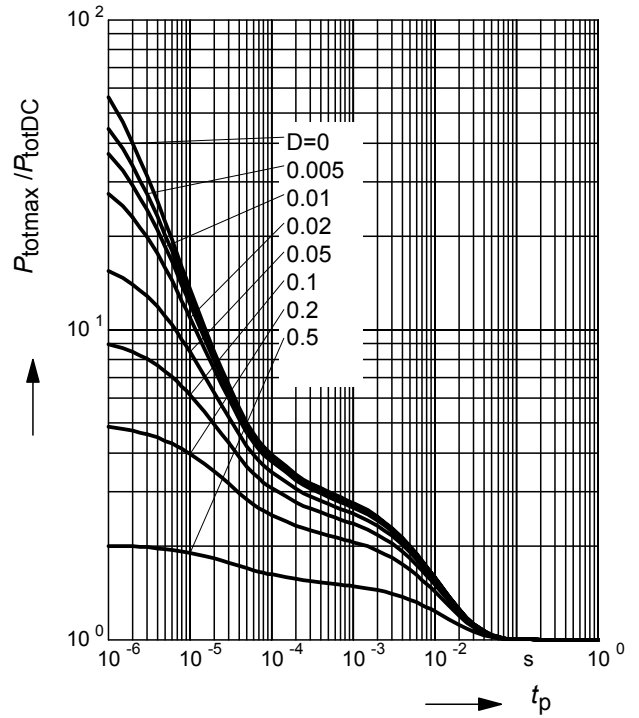
SMBT3906U



Permissible Pulse Load

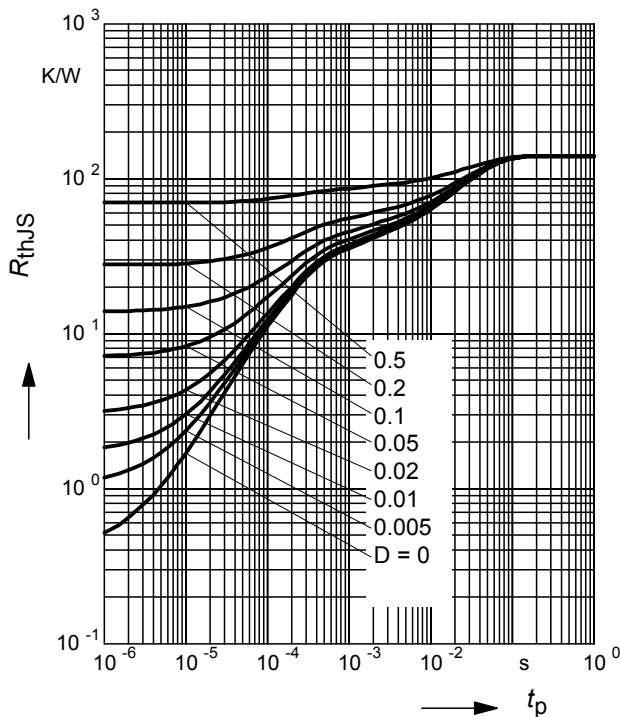
$P_{totmax}/P_{totDC} = f(t_p)$

SMBT3906U



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

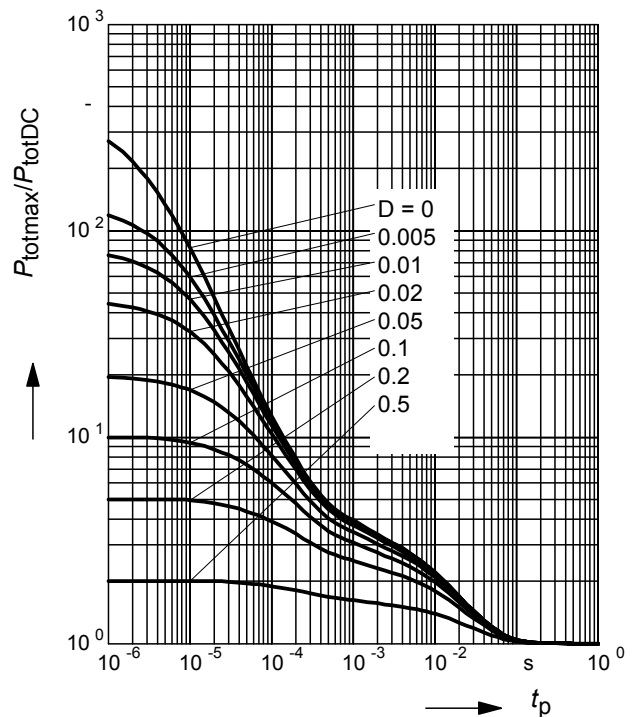
SMBT3906S



Permissible Pulse Load

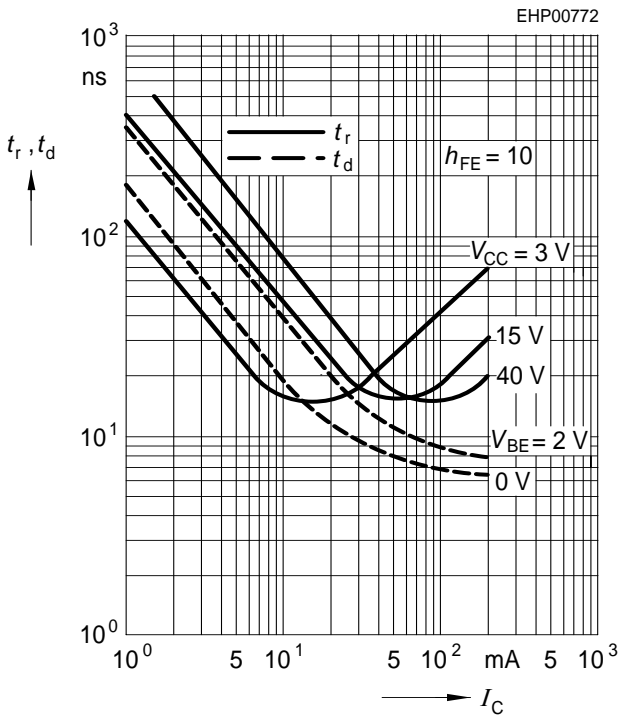
$P_{totmax}/P_{totDC} = f(t_p)$

SMBT3906S

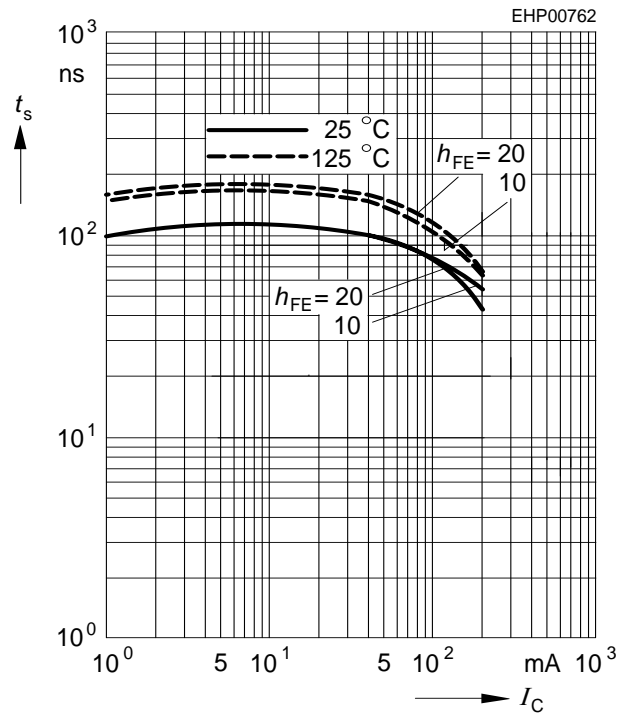


Delay time $t_d = f(I_C)$

Rise time $t_r = f(I_C)$

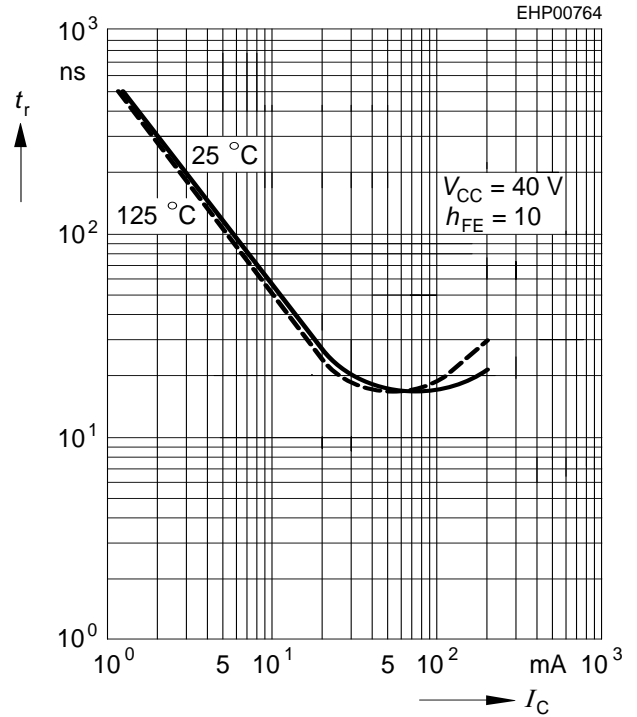
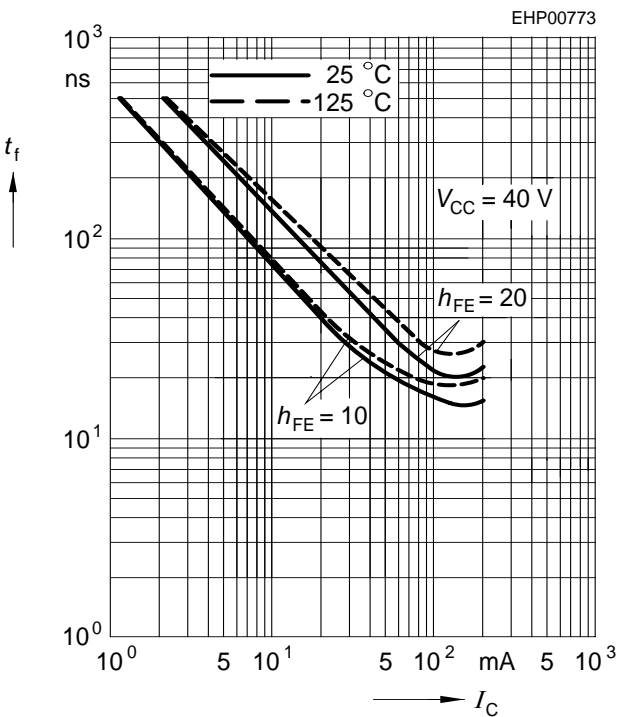


Storage time $t_{stg} = f(I_C)$

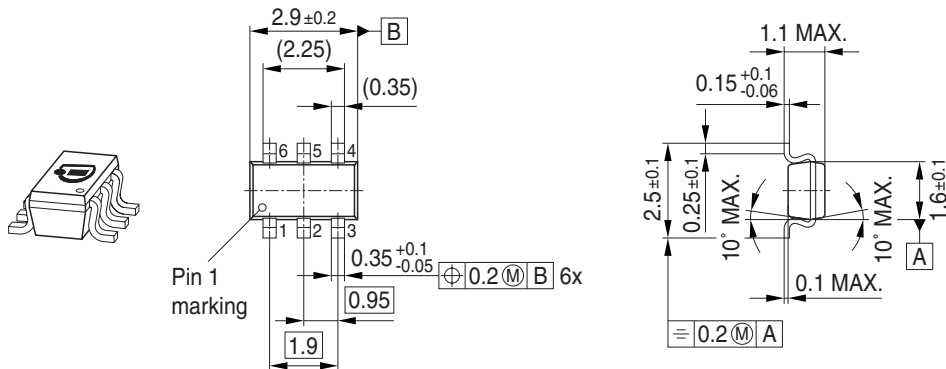


Fall time $t_f = f(I_C)$

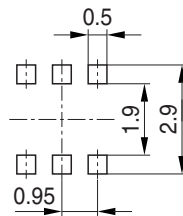
Rise time $t_r = f(I_C)$



Package Outline

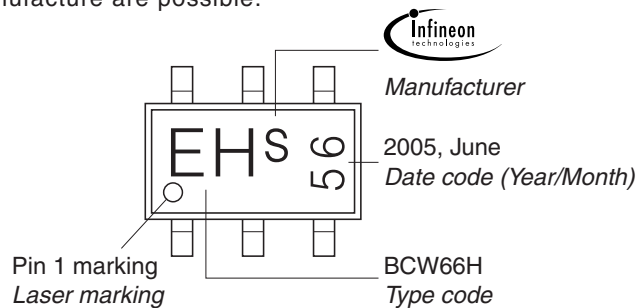


Foot Print



Marking Layout (Example)

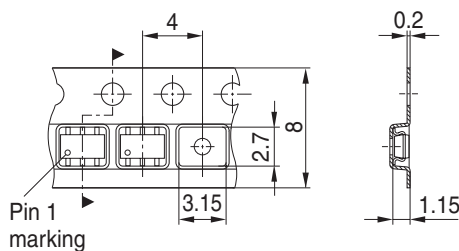
Small variations in positioning of Date code, Type code and Manufacture are possible.



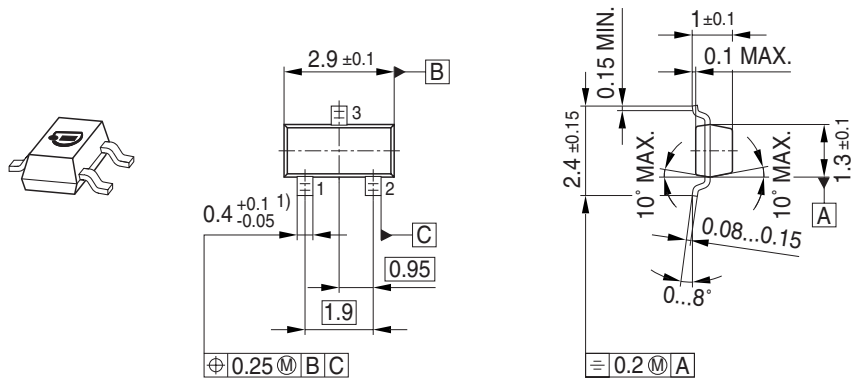
Standard Packing

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.

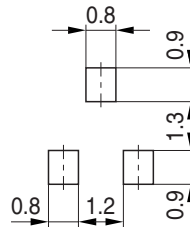


Package Outline

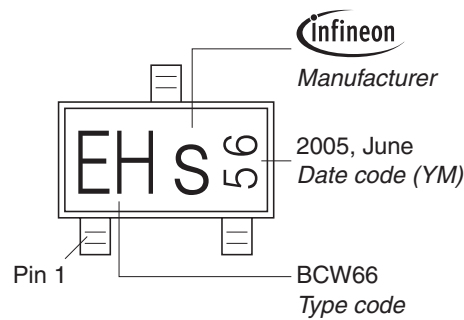


1) Lead width can be 0.6 max. in dambar area

Foot Print

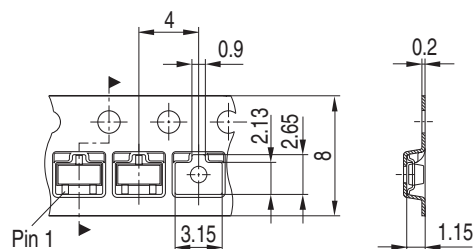


Marking Layout (Example)

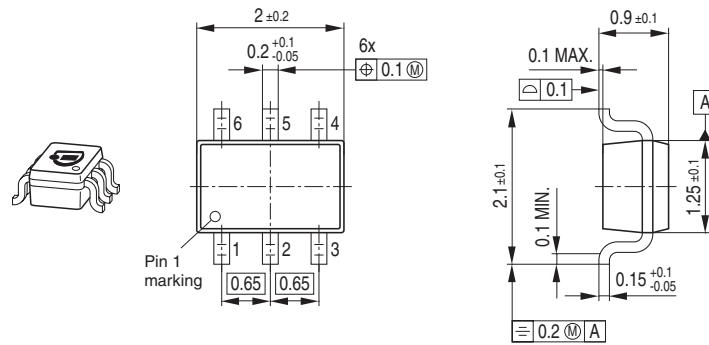


Standard Packing

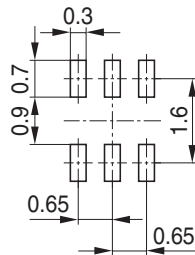
Reel \varnothing 180 mm = 3.000 Pieces/Reel
 Reel \varnothing 330 mm = 10.000 Pieces/Reel



Package Outline

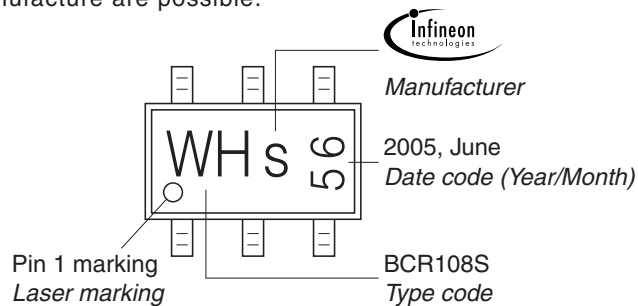


Foot Print



Marking Layout (Example)

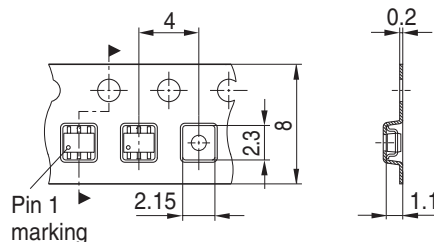
Small variations in positioning of Date code, Type code and Manufacture are possible.



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.



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