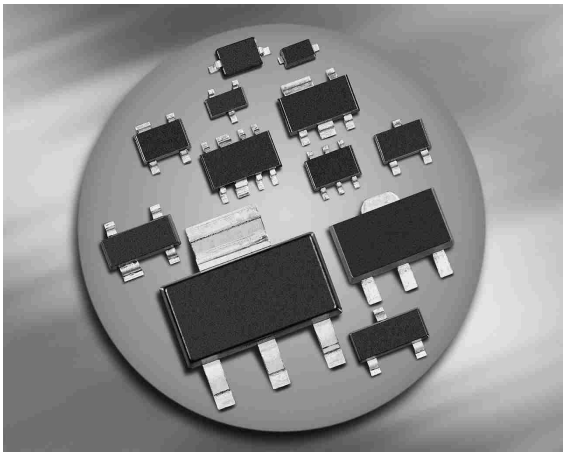
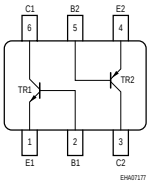
**NPN / PNP Silicon Switching Transistor Array**

- High current gain
- Low collector-emitter saturation voltage
- Two (galvanic) internal isolated NPN / PNP transistor in one package
- Pb-free (RoHS compliant) package
- Qualified according AEC Q101



**SMBT3904PN**
**SMBT3904UPN**




| Type | Marking | Pin Configuration | | | | | | Package |
|---|---|---|---|---|---|---|---|---|
| SMBT3904PN | s3P | 1=E | 2=B | 3=C | 4=E | 5=B | 6=C | SOT363 |
| SMBT3904UPN | s3P | 1=E | 2=B | 3=C | 4=E | 5=B | 6=C | 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-<br>$T_S \leq 115$ °C, SMBT3904PN<br>$T_S \leq 105$ °C, SMBT3904UPN | $P_{tot}$ | <br>250<br>330 | mW |
| Junction temperature | $T_j$ | 150 | °C |
| Storage temperature | $T_{stg}$ | -65 ... 150 | |

**Thermal Resistance**

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Junction - soldering point[1)] | $R_{thJS}$ | | K/W |
| SMBT3904PN | | ≤ 140 | |
| SMBT3904UPN | | ≤ 135 | |

**Electrical Characteristics** at $T_A$ = 25°C, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **DC Characteristics** | | | | | |
| Collector-emitter breakdown voltage<br>$I_C$ = 1 mA, $I_B$ = 0 | $V_{(BR)CEO}$ | 40 | - | - | V |
| Collector-base breakdown voltage<br>$I_C$ = 10 µA, $I_E$ = 0 | $V_{(BR)CBO}$ | 40 | - | - | |
| Emitter-base breakdown voltage<br>$I_E$ = 10 µA, $I_C$ = 0 | $V_{(BR)EBO}$ | 6 | - | - | |
| Collector-base cutoff current<br>$V_{CB}$ = 30 V, $I_E$ = 0 | $I_{CBO}$ | - | - | 50 | nA |
| DC current gain[2)]<br>$I_C$ = 100 µA, $V_{CE}$ = 1 V<br>$I_C$ = 1 mA, $V_{CE}$ = 1 V<br>$I_C$ = 10 mA, $V_{CE}$ = 1 V<br>$I_C$ = 50 mA, $V_{CE}$ = 1 V<br>$I_C$ = 100 mA, $V_{CE}$ = 1 V | $h_{FE}$ | <br>40<br>70<br>100<br>60<br>30 | <br>-<br>-<br>-<br>-<br>- | <br>-<br>-<br>300<br>-<br>- | - |
| Collector-emitter saturation voltage[2)]<br>$I_C$ = 10 mA, $I_B$ = 1 mA<br>$I_C$ = 50 mA, $I_B$ = 5 mA | $V_{CEsat}$ | <br>-<br>- | <br>-<br>- | <br>0.25<br>0.4 | V |
| Base emitter saturation voltage[2)]<br>$I_C$ = 10 mA, $I_B$ = 1 mA<br>$I_C$ = 50 mA, $I_B$ = 5 mA | $V_{BEsat}$ | <br>0.65<br>- | <br>-<br>- | <br>0.85<br>0.95 | |

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

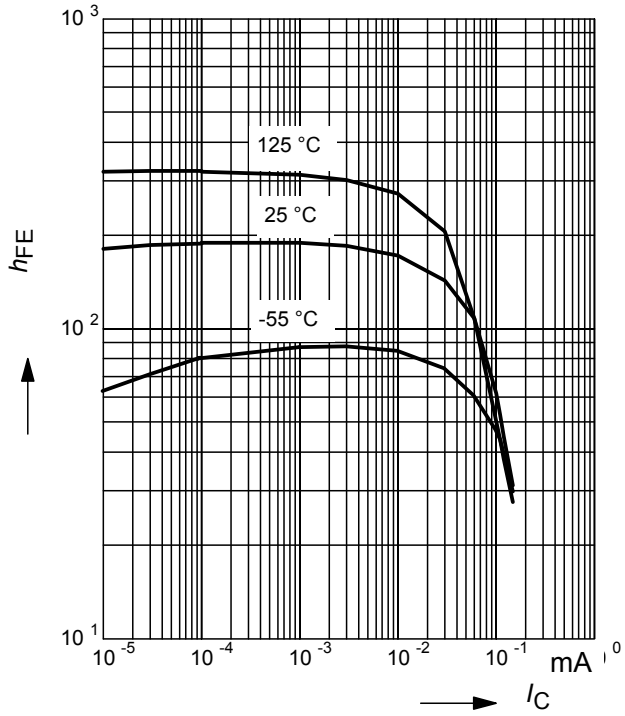
[2]Pulse test: t < 300µs; D < 2%

**Electrical Characteristics** at $T_A$ = 25°C, unless otherwise specified

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

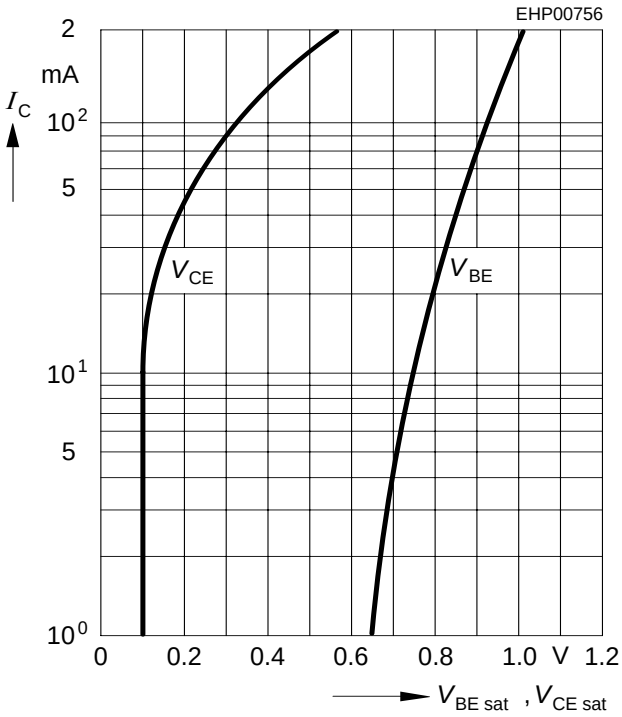
**DC current gain** $h_{FE} = f(I_C)$

$V_{CE}$ = 1 V, normalized



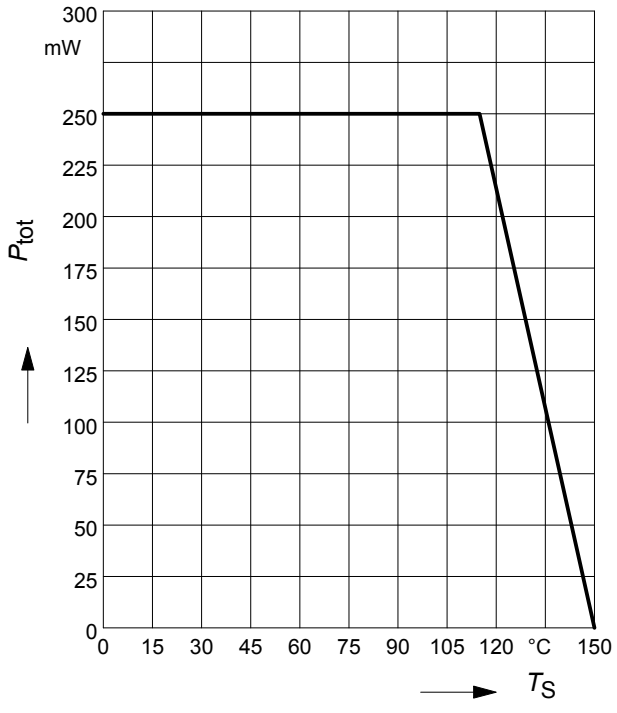

**Saturation voltage** $I_C = f(V_{BEsat}; V_{CEsat})$

$h_{FE}$ = 10



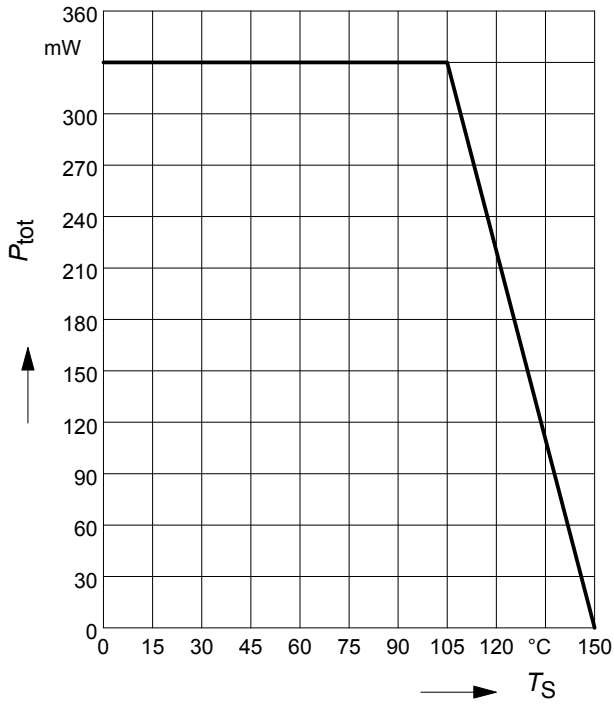

**Total power dissipation** $P_{tot} = f(T_S)$

SMBT3904PN



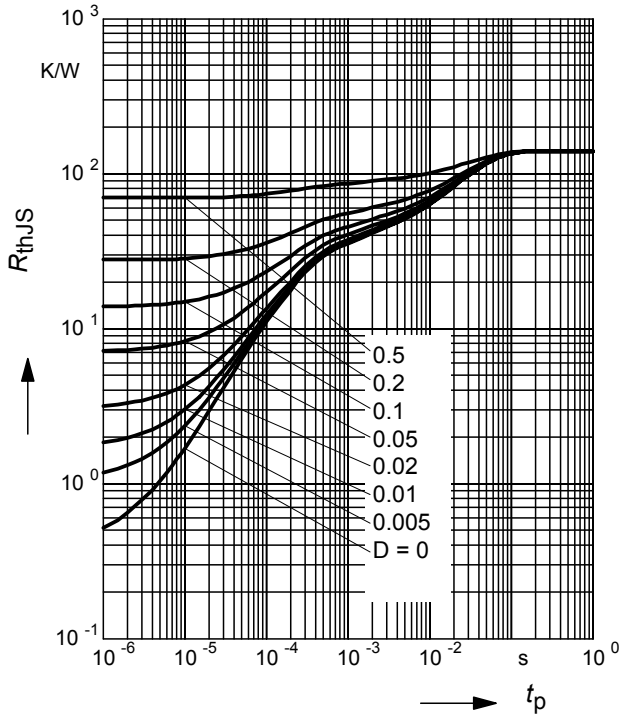

**Total power dissipation** $P_{tot} = f(T_S)$

SMBT3904UPN



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

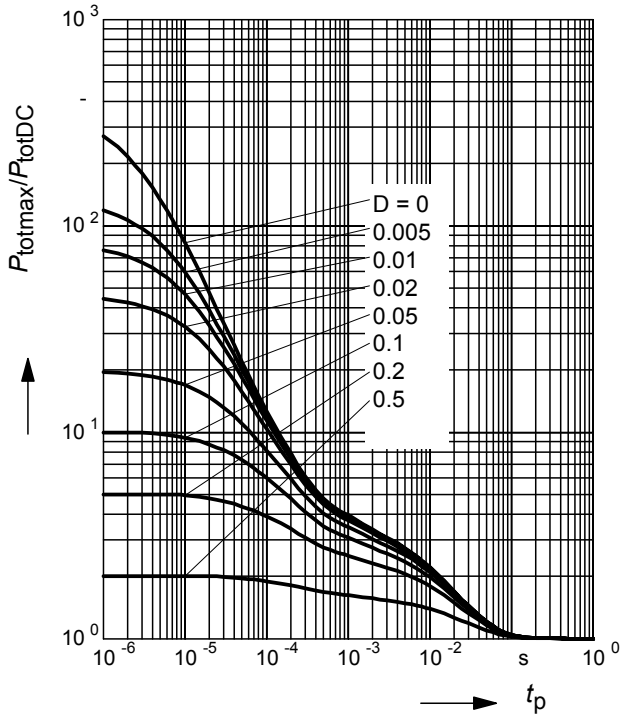
SMBT3904PN




**Permissible Pulse Load**

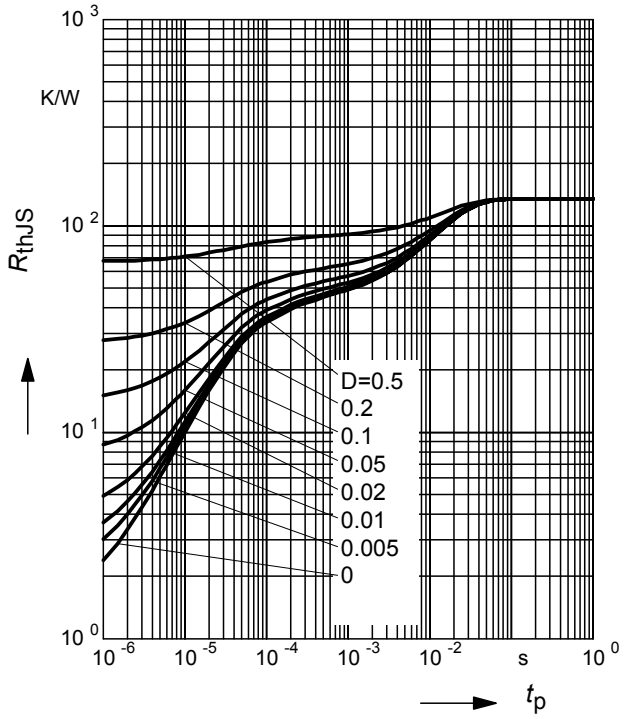
$P_{totmax}/P_{totDC} = f(t_p)$

SMBT3904PN




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

SMBT3904UPN

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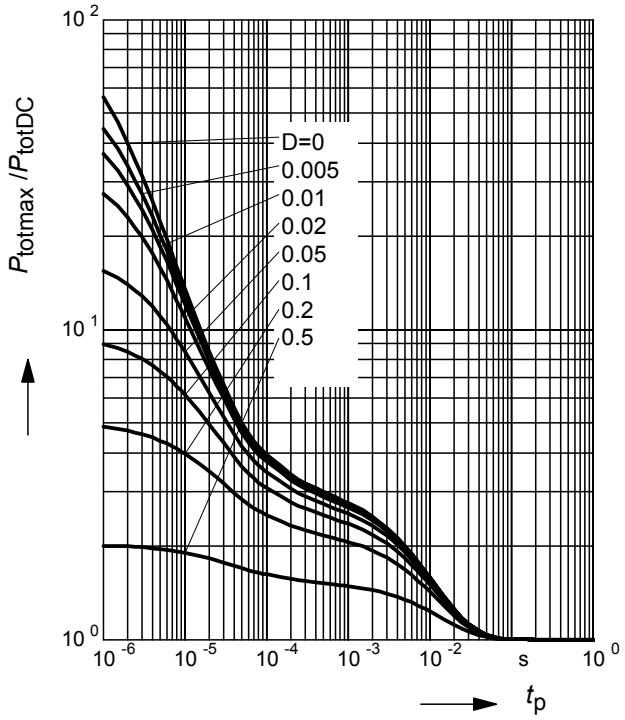
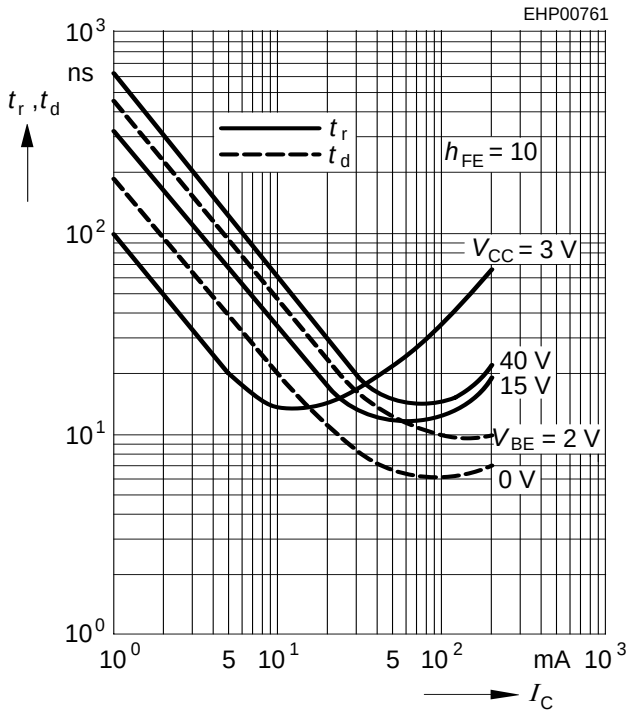
$P_{totmax}/P_{totDC} = f(t_p)$

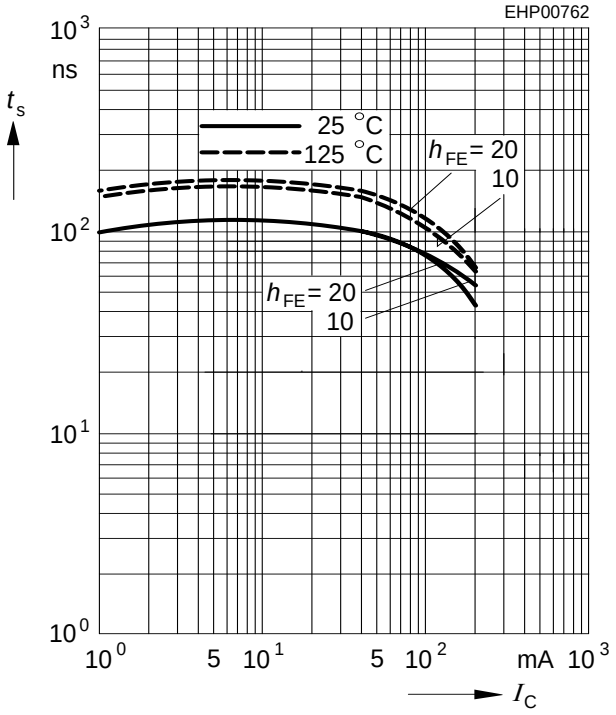
SMBT3904UPN



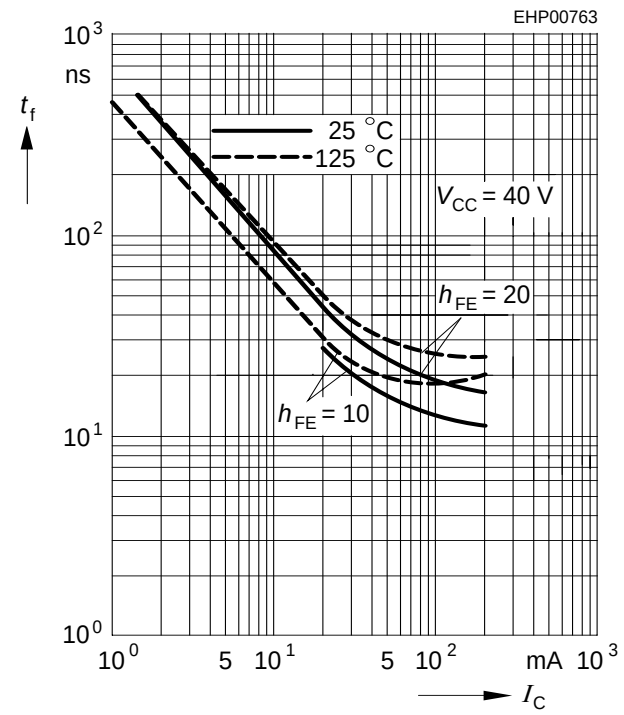
**Delay time $t_d$ = $f(I_C)$**
**Rise time $t_r$ = $f(I_C)$**



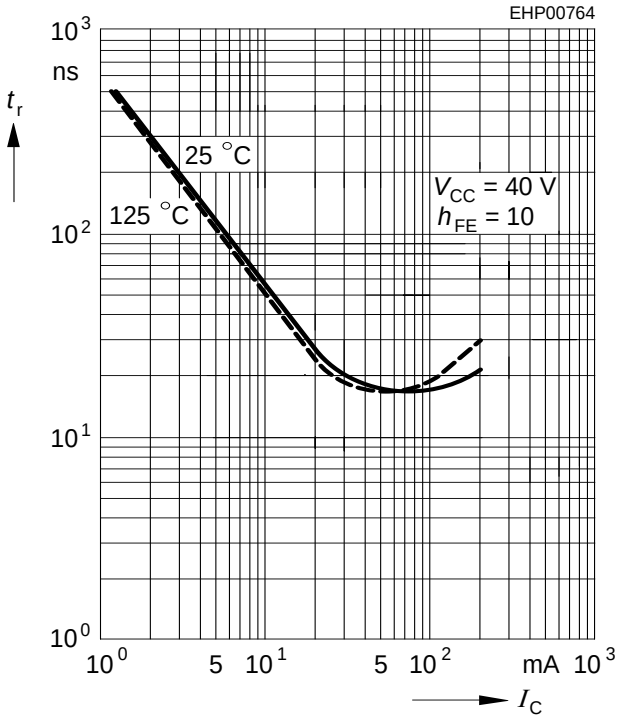

**Storage time $t_{stg}$ = $f(I_C)$**



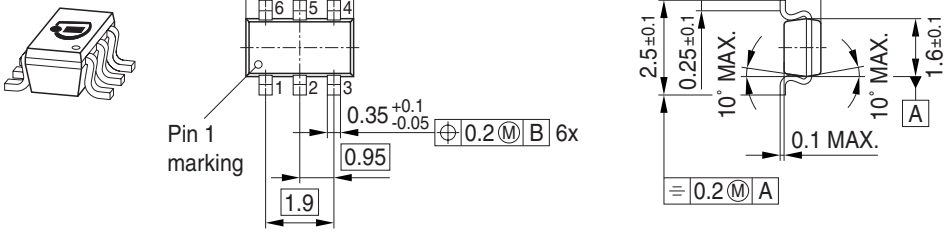

**Fall time $t_f$ = $f(I_C)$**



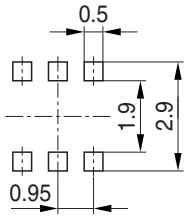

**Rise time $t_r$ = $f(I_C)$**



## Package Outline

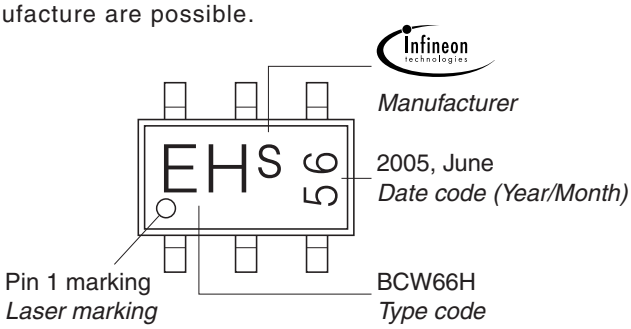



## Foot Print




## Marking Layout (Example)

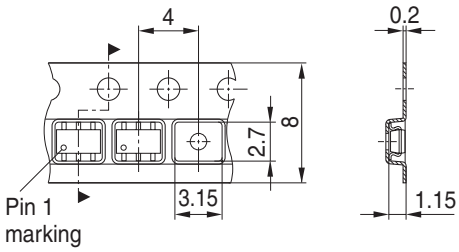
Small variations in positioning of
Date code, Type code and Manufacture are possible.




## Standard Packing

Reel ø180 mm = 3.000 Pieces/Reel
Reel ø330 mm = 10.000 Pieces/Reel

For symmetric types no defined Pin 1 orientation in reel.



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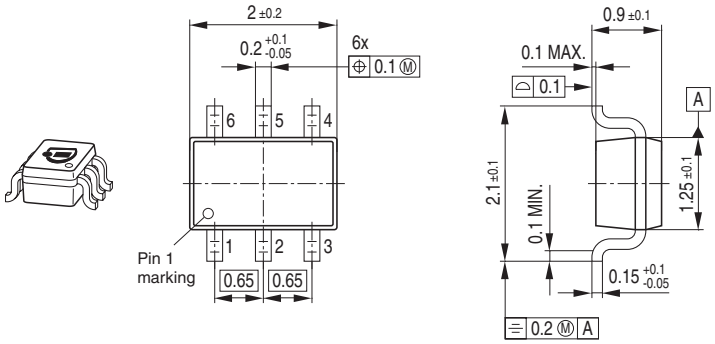


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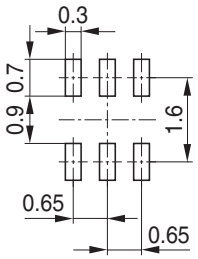


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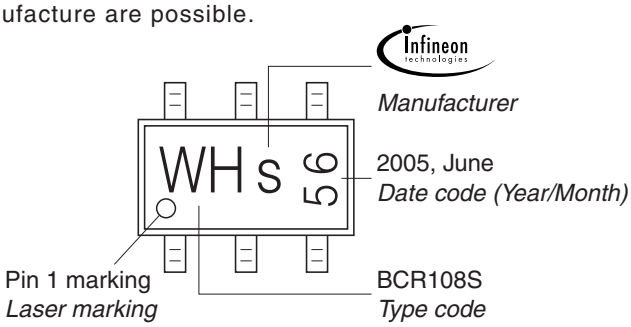


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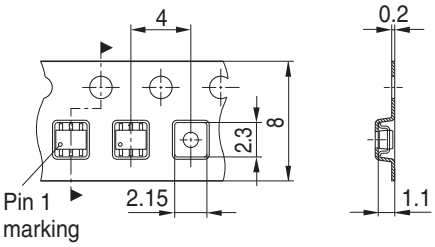

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