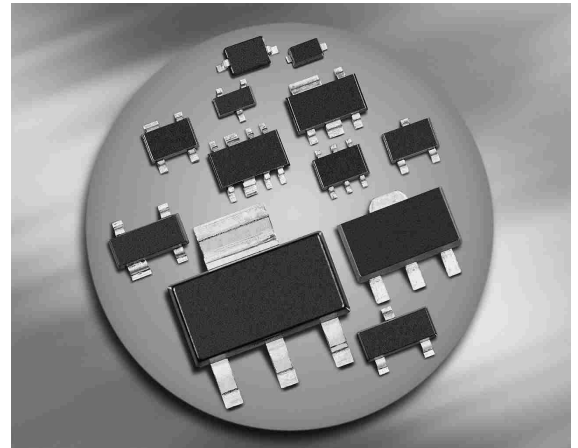
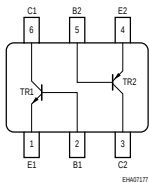


**NPN / PNP Silicon Switching Transistor Array**

- 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>$T_S \leq 115^\circ\text{C}$ , SMBT3904PN<br>$T_S \leq 105^\circ\text{C}$ , SMBT3904UPN | $P_{tot}$ | 250<br>330  | mW               |
| Junction temperature                                                                                                | $T_j$     | 150         |                  |
| Storage temperature                                                                                                 | $T_{stg}$ | -65 ... 150 | $^\circ\text{C}$ |

**Thermal Resistance**

| Parameter                                | Symbol     | Value      | Unit |
|------------------------------------------|------------|------------|------|
| Junction - soldering point <sup>1)</sup> | $R_{thJS}$ |            | K/W  |
| SMBT3904PN                               |            | $\leq 140$ |      |
| SMBT3904UPN                              |            | $\leq 135$ |      |

**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<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>2)</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>$I_C = 100\text{ mA}, V_{CE} = 1\text{ V}$ | $h_{FE}$      | 40<br>70<br>100<br>60<br>30 | -<br>-<br>-<br>-<br>- | -<br>-<br>300<br>-<br>- | -  |
| Collector-emitter saturation voltage <sup>2)</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>2)</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>For calculation of  $R_{thJA}$  please refer to Application Note AN077 (Thermal Resistance Calculation)

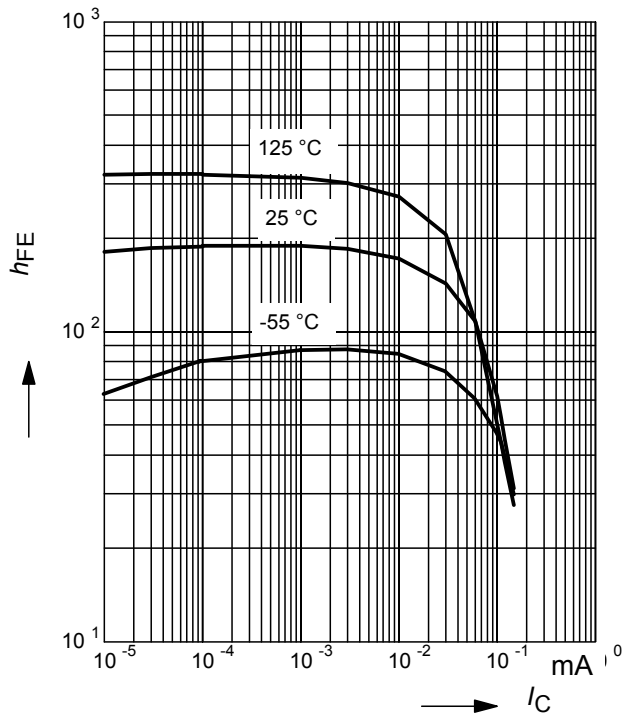
<sup>2)</sup>Pulse test:  $t < 300\text{ }\mu\text{s}$ ;  $D < 2\%$

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

| Parameter                                                                                                                                              | Symbol    | Values |      |      | Unit |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------|------|------|------|
|                                                                                                                                                        |           | min.   | typ. | max. |      |
| AC Characteristics                                                                                                                                     |           |        |      |      |      |
| Transition frequency<br>$I_C = 10\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 100\text{ MHz}$                                                            | $f_T$     | 250    | -    | -    | MHz  |
| Collector-base capacitance<br>$V_{CB} = 10\text{ V}$ , $f = 1\text{ MHz}$                                                                              | $C_{cb}$  | -      | -    | 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>$V_{BE(off)} = 0.5\text{ V}$                                  | $t_d$     | -      | -    | 35   | ns   |
| Rise time<br>$V_{CC} = 3\text{ V}$ , $I_C = 10\text{ mA}$ , $I_{B1} = 1\text{ mA}$ ,<br>$V_{BE(off)} = 0.5\text{ V}$                                   | $t_r$     | -      | -    | 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>$\Delta f = 200\text{ Hz}$ , $R_S = 1\text{ k}\Omega$ | $F$       | -      | -    | 5    | dB   |

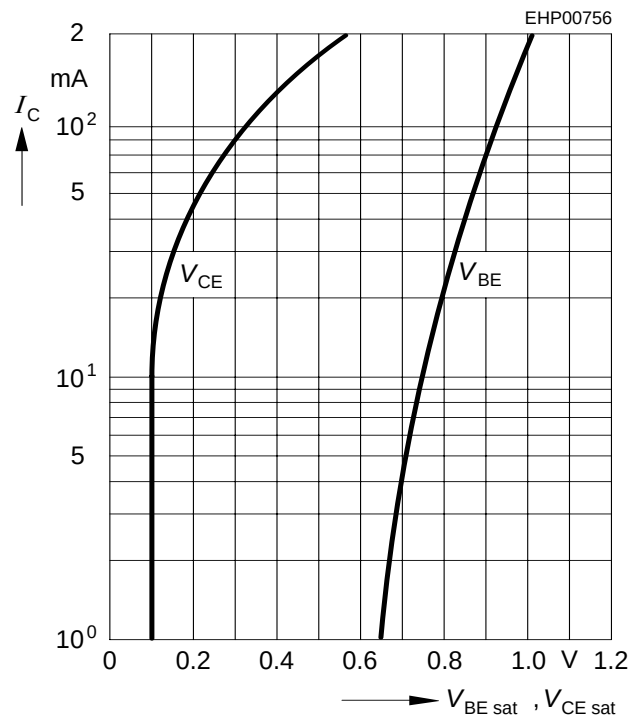
**DC current gain  $h_{FE} = f(I_C)$**

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



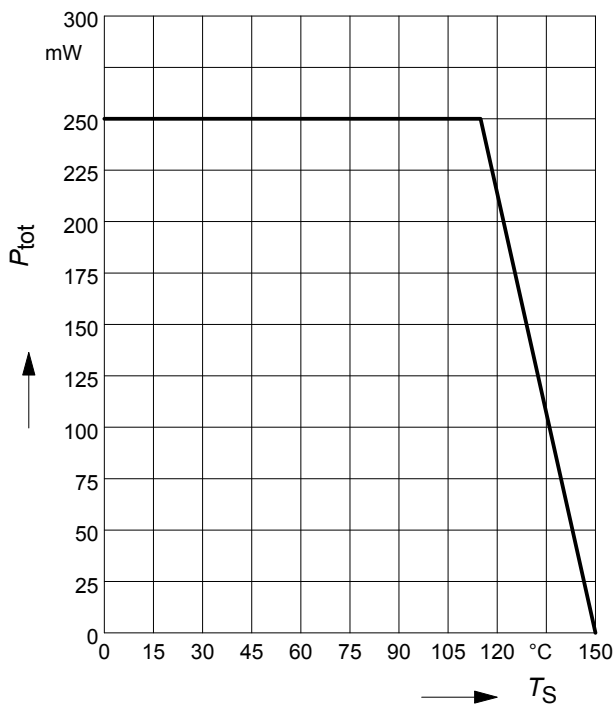
**Saturation voltage  $I_C = f(V_{BEsat}; V_{CEsat})$**

$h_{FE} = 10$



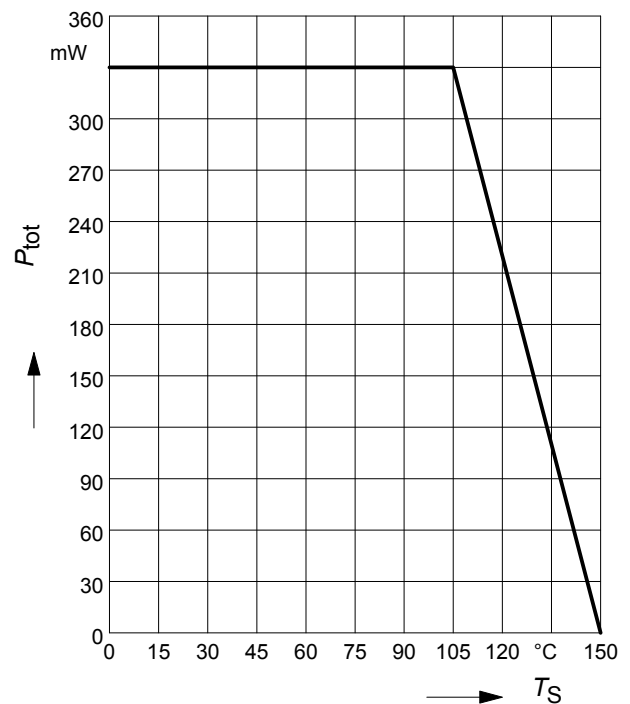
**Total power dissipation  $P_{tot} = f(T_S)$**

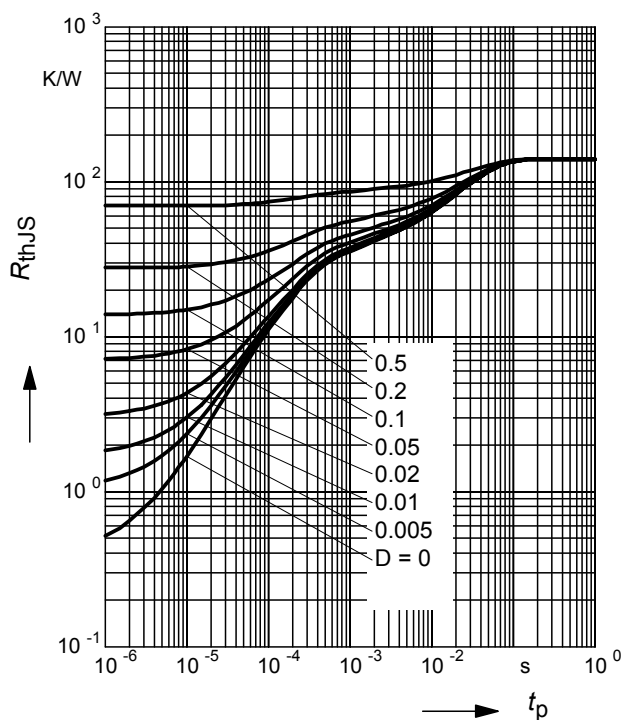
SMBT3904PN



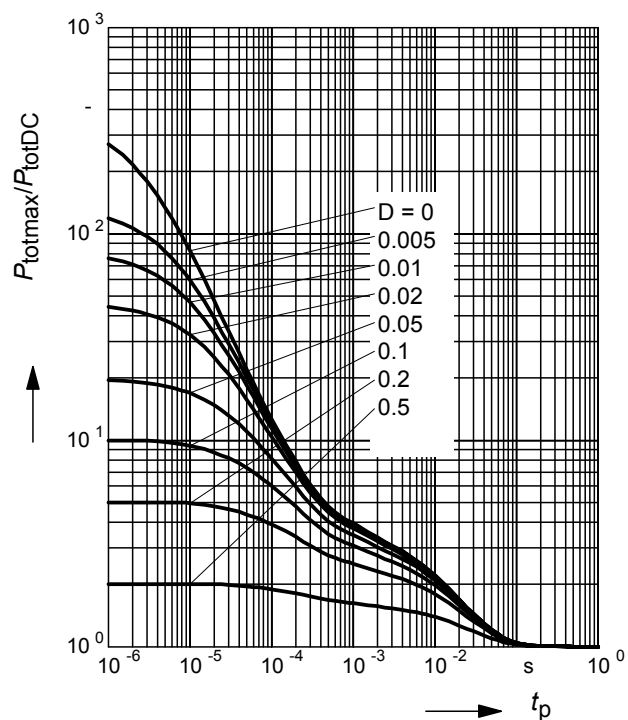
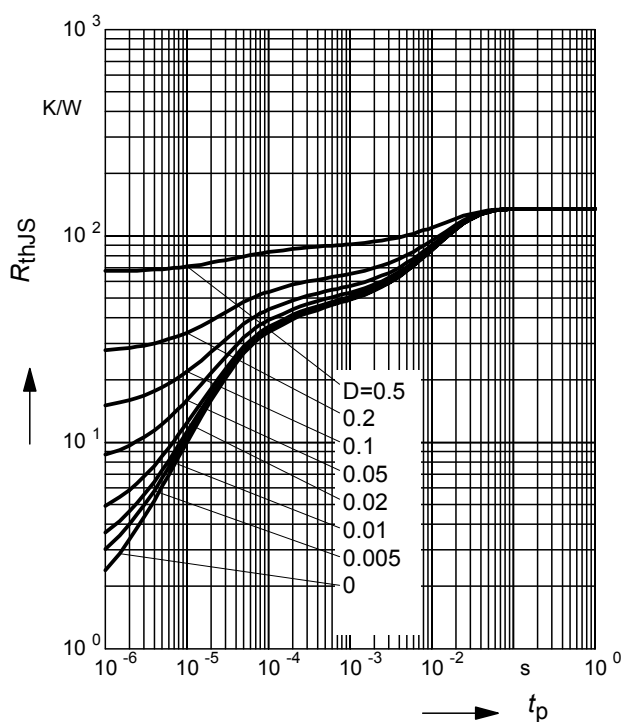
**Total power dissipation  $P_{tot} = f(T_S)$**

SMBT3904UPN

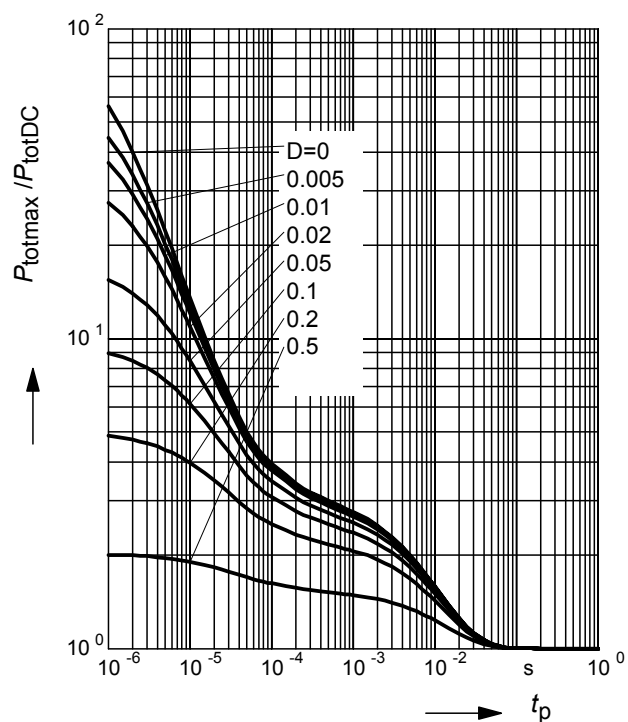


**Permissible Pulse Load  $R_{thJS} = f(t_p)$** 
**SMBT3904PN**

**Permissible Pulse Load**

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

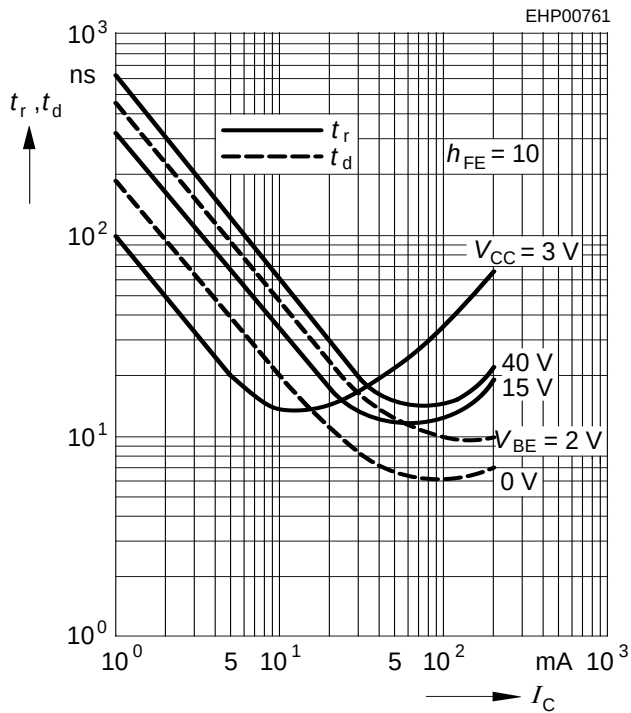
**SMBT3904PN**

**Permissible Puls Load  $R_{thJS} = f(t_p)$** 
**SMBT3904UPN**

**Permissible Pulse Load**

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

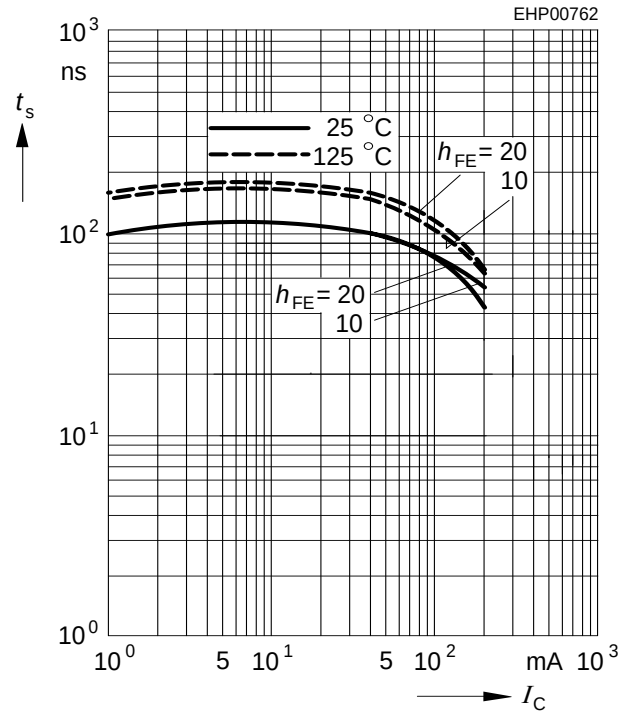
**SMBT3904UPN**


Delay time  $t_d = f(I_C)$

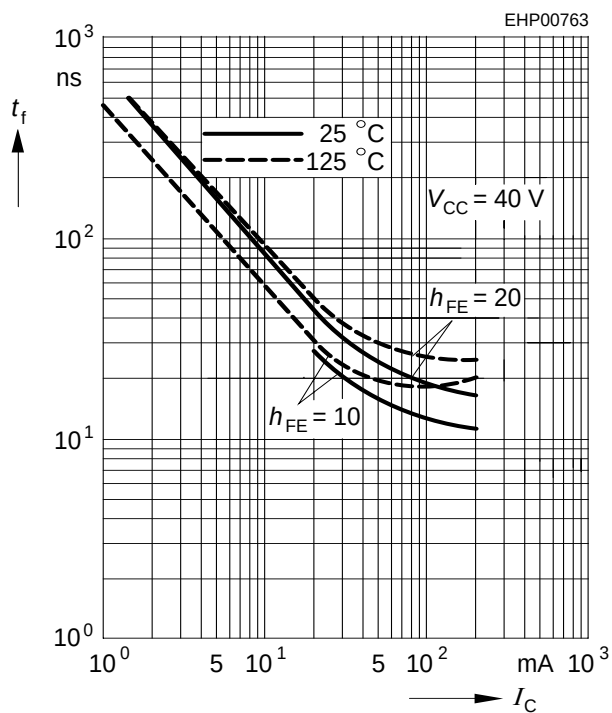
Rise time  $t_r = f(I_C)$



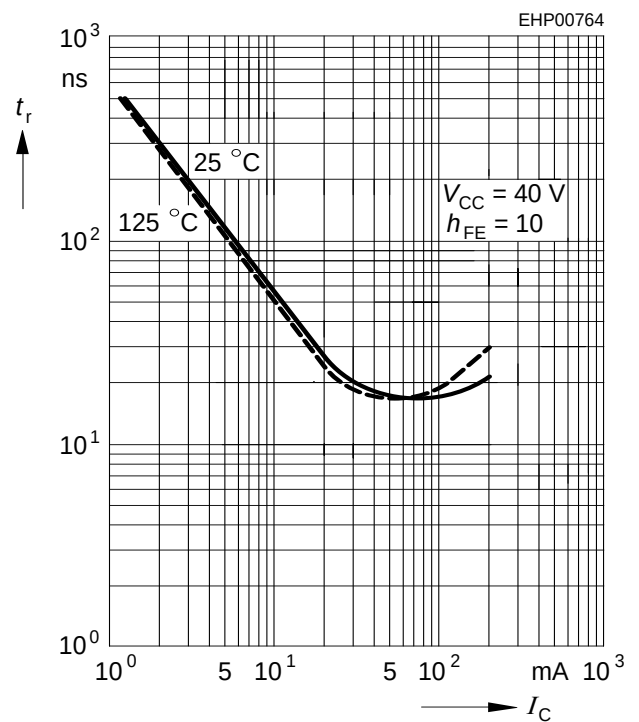
Storage time  $t_{stg} = f(I_C)$



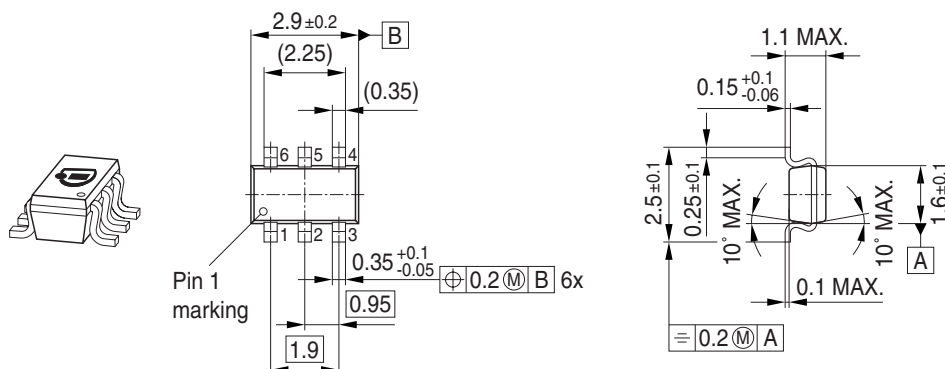
Fall time  $t_f = f(I_C)$



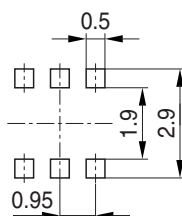
Rise time  $t_r = f(I_C)$



## Package Outline

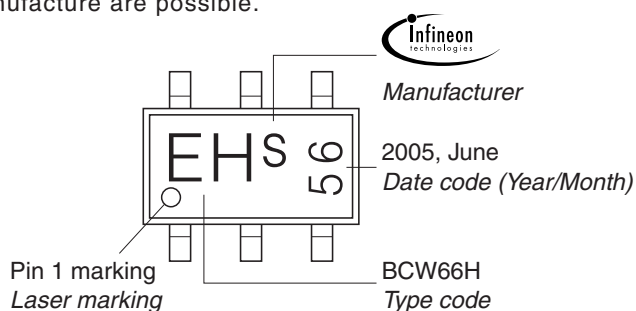


## Foot Print



## Marking Layout (Example)

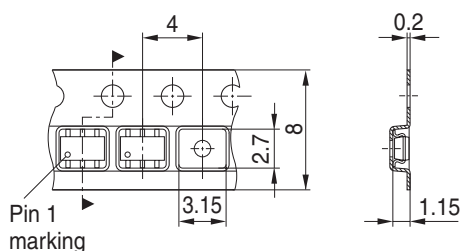
Small variations in positioning of Date code, Type code and Manufacture are possible.



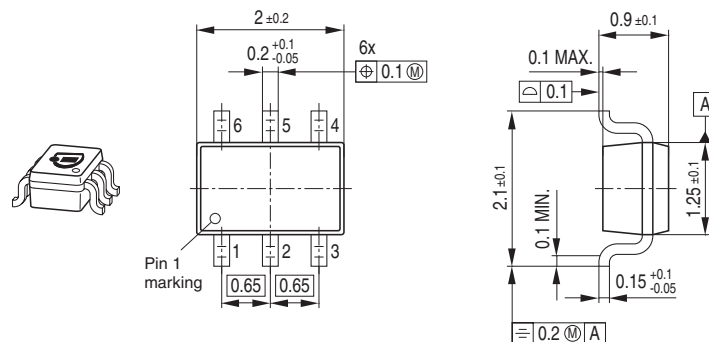
## Standard Packing

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

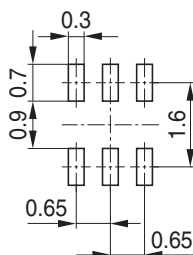
For symmetric types no defined Pin 1 orientation in reel.



## Package Outline

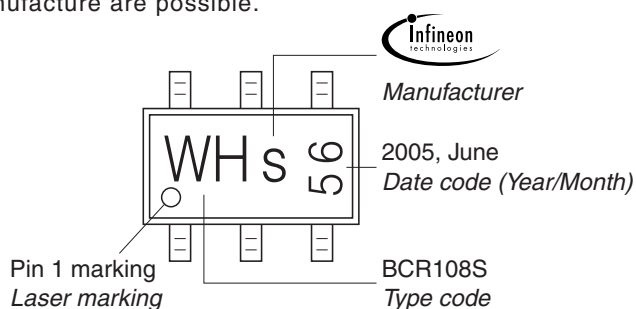


## Foot Print



## Marking Layout (Example)

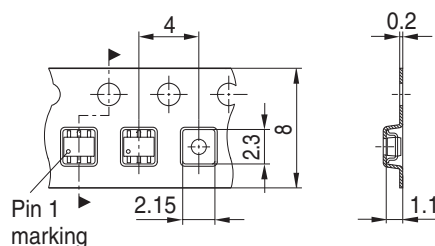
Small variations in positioning of Date code, Type code and Manufacture are possible.



## 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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