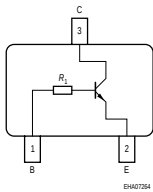


**NPN Silicon Digital Transistor**

- Switching circuit, inverter, interface circuit, driver circuit
- Built in bias resistor ( $R_1=22k\Omega$ )


**BCR139/F/L3**  
**BCR139T**


| Type     | Marking | Pin Configuration |     |     |   |   |   | Package  |
|----------|---------|-------------------|-----|-----|---|---|---|----------|
| BCR139   | WYs     | 1=B               | 2=E | 3=C | - | - | - | SOT23    |
| BCR139F  | WYs     | 1=B               | 2=E | 3=C | - | - | - | TSFP-3   |
| BCR139L3 | WY      | 1=B               | 2=E | 3=C | - | - | - | TSLP-3-4 |
| BCR139T  | WYs     | 1=B               | 2=E | 3=C | - | - | - | SC75     |

**Maximum Ratings**

| Parameter                                                                                                                                                                                    | Symbol      | Value                    | Unit |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------------|------|
| Collector-emitter voltage                                                                                                                                                                    | $V_{CEO}$   | 50                       | V    |
| Collector-base voltage                                                                                                                                                                       | $V_{CBO}$   | 50                       |      |
| Emitter-base voltage                                                                                                                                                                         | $V_{EBO}$   | 5                        |      |
| Input on voltage                                                                                                                                                                             | $V_{I(on)}$ | 30                       |      |
| Collector current                                                                                                                                                                            | $I_C$       | 100                      | mA   |
| Total power dissipation-<br>BCR139, $T_S \leq 102^\circ\text{C}$<br>BCR139F, $T_S \leq 128^\circ\text{C}$<br>BCR139L3, $T_S \leq 135^\circ\text{C}$<br>BCR139T, $T_S \leq 109^\circ\text{C}$ | $P_{tot}$   | 200<br>250<br>250<br>250 | mW   |
| Junction temperature                                                                                                                                                                         | $T_j$       | 150                      |      |
| Storage temperature                                                                                                                                                                          | $T_{stg}$   | -65 ... 150              |      |
|                                                                                                                                                                                              |             |                          |      |

**Thermal Resistance**

| Parameter                                | Symbol     | Value      | Unit |
|------------------------------------------|------------|------------|------|
| Junction - soldering point <sup>1)</sup> | $R_{thJS}$ |            | K/W  |
| BCR139                                   |            | $\leq 240$ |      |
| BCR139F                                  |            | $\leq 90$  |      |
| BCR139L3                                 |            | $\leq 60$  |      |
| BCR139T                                  |            | $\leq 165$ |      |

<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

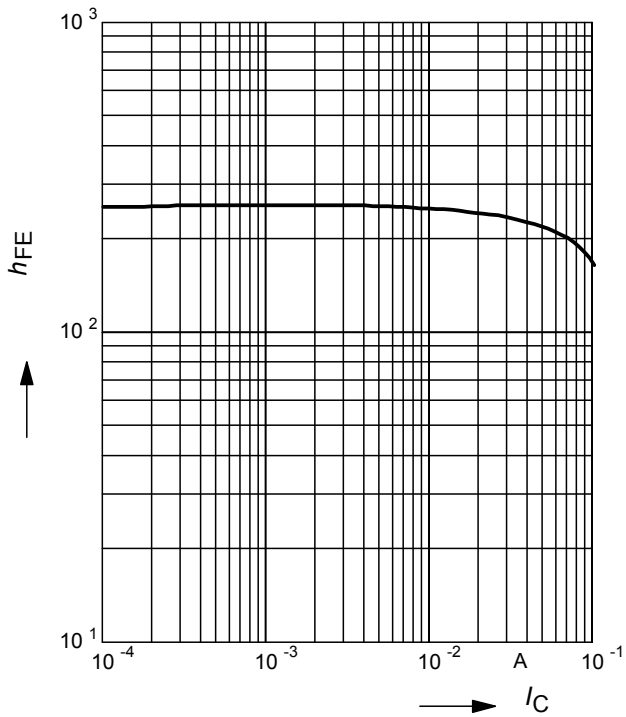
| Parameter                                                                                         | Symbol                      | Values |      |      | Unit |
|---------------------------------------------------------------------------------------------------|-----------------------------|--------|------|------|------|
|                                                                                                   |                             | min.   | typ. | max. |      |
| DC Characteristics                                                                                |                             |        |      |      |      |
| Collector-emitter breakdown voltage<br>$I_C = 100\ \mu\text{A}, I_B = 0$                          | $V_{(\text{BR})\text{CEO}}$ | 50     | -    | -    | V    |
| Collector-base breakdown voltage<br>$I_C = 10\ \mu\text{A}, I_E = 0$                              | $V_{(\text{BR})\text{CBO}}$ | 50     | -    | -    |      |
| Emitter-base breakdown voltage<br>$I_E = 10\ \mu\text{A}, I_C = 0$                                | $V_{(\text{BR})\text{EBO}}$ | 5      | -    | -    |      |
| Collector-base cutoff current<br>$V_{\text{CB}} = 40\ \text{V}, I_E = 0$                          | $I_{\text{CBO}}$            | -      | -    | 100  | nA   |
| DC current gain <sup>1)</sup><br>$I_C = 5\ \text{mA}, V_{\text{CE}} = 5\ \text{V}$                | $h_{\text{FE}}$             | 120    | -    | 630  | -    |
| Collector-emitter saturation voltage <sup>1)</sup><br>$I_C = 10\ \text{mA}, I_B = 0.5\ \text{mA}$ | $V_{\text{CEsat}}$          | -      | -    | 0.3  | V    |
| Input off voltage<br>$I_C = 100\ \mu\text{A}, V_{\text{CE}} = 5\ \text{V}$                        | $V_{\text{i(off)}}$         | 0.4    | -    | 0.8  |      |
| Input on voltage<br>$I_C = 2\ \text{mA}, V_{\text{CE}} = 0.3\ \text{V}$                           | $V_{\text{i(on)}}$          | 0.5    | -    | 1.1  |      |
| Input resistor                                                                                    | $R_1$                       | 15     | 22   | 29   | kΩ   |

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

|                                                                                                |          |   |     |   |     |
|------------------------------------------------------------------------------------------------|----------|---|-----|---|-----|
| Transition frequency<br>$I_C = 10\ \text{mA}$ , $V_{CE} = 5\ \text{V}$ , $f = 100\ \text{MHz}$ | $f_T$    | - | 150 | - | MHz |
| Collector-base capacitance<br>$V_{CB} = 10\ \text{V}$ , $f = 1\ \text{MHz}$                    | $C_{cb}$ | - | 3   | - | pF  |

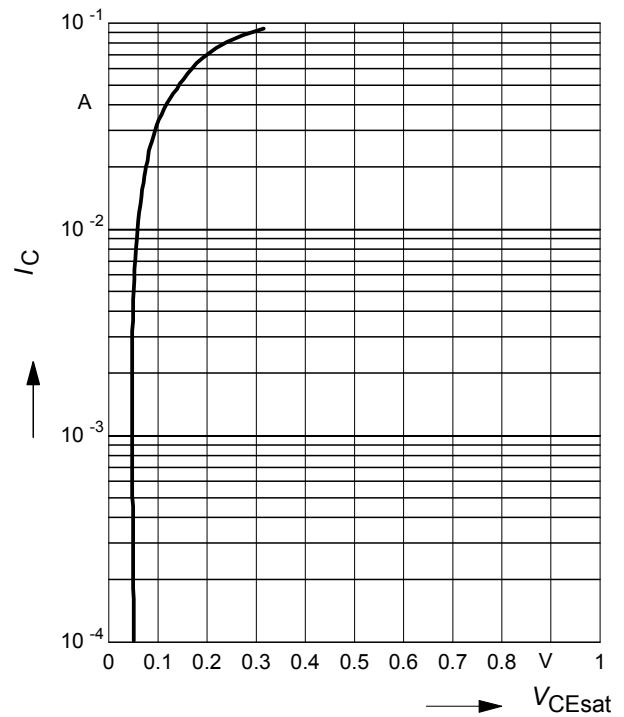
**DC current gain  $h_{FE} = f(I_C)$**

$V_{CE} = 5V$  (common emitter configuration)



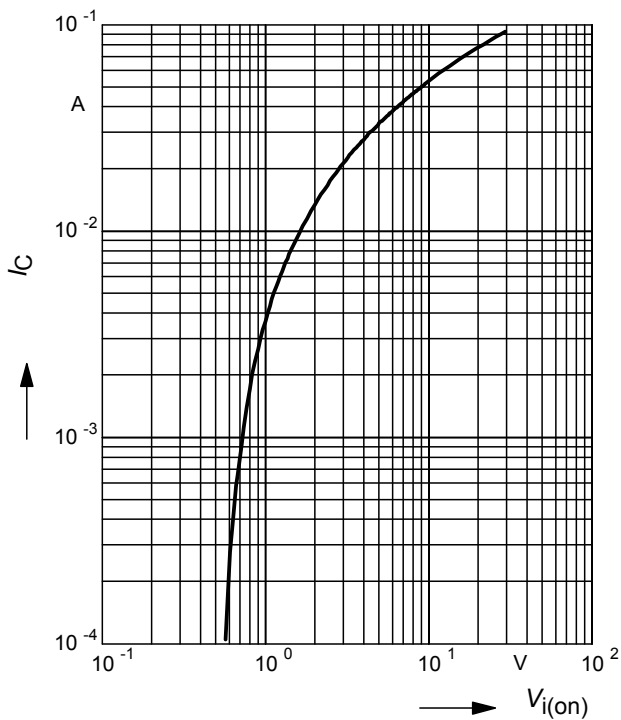
**Collector-emitter saturation voltage**

$V_{CEsat} = f(I_C), h_{FE} = 20$



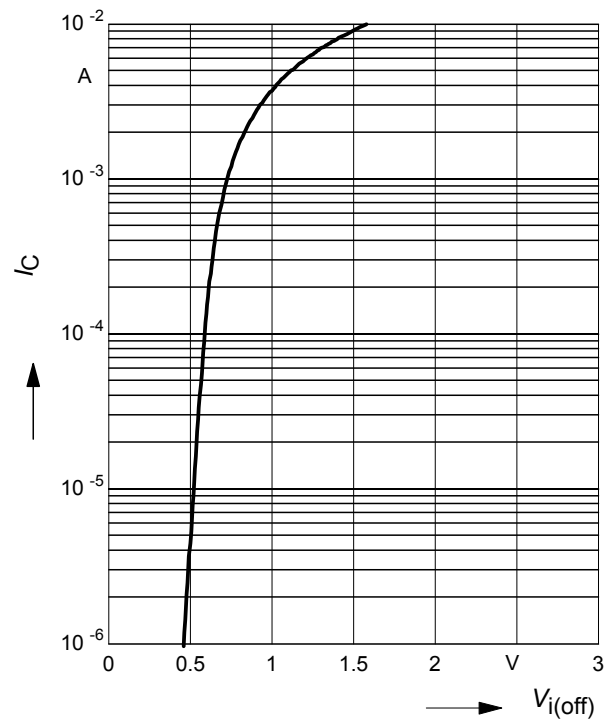
**Input on Voltage  $V_{i(on)} = f(I_C)$**

$V_{CE} = 0.3V$  (common emitter configuration)



**Input off voltage  $V_{i(off)} = f(I_C)$**

$V_{CE} = 5V$  (common emitter configuration)



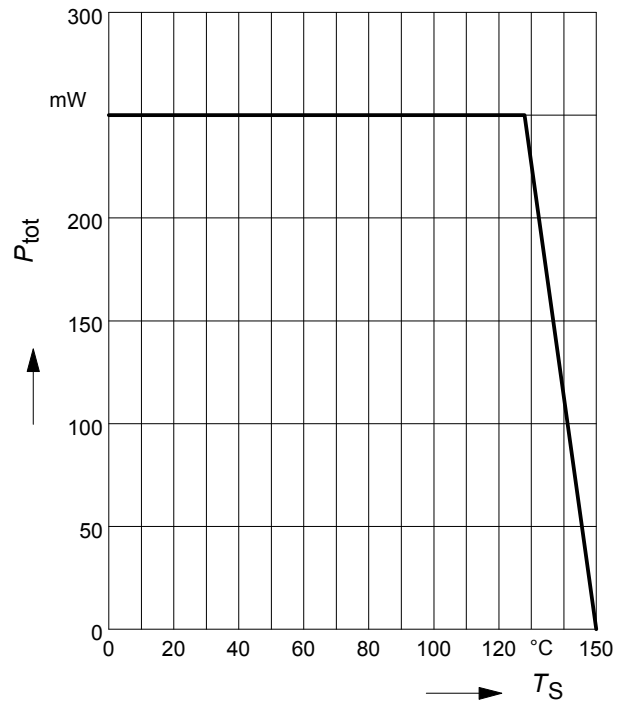
**Total power dissipation  $P_{\text{tot}} = f(T_S)$**

BCR139



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

BCR139F



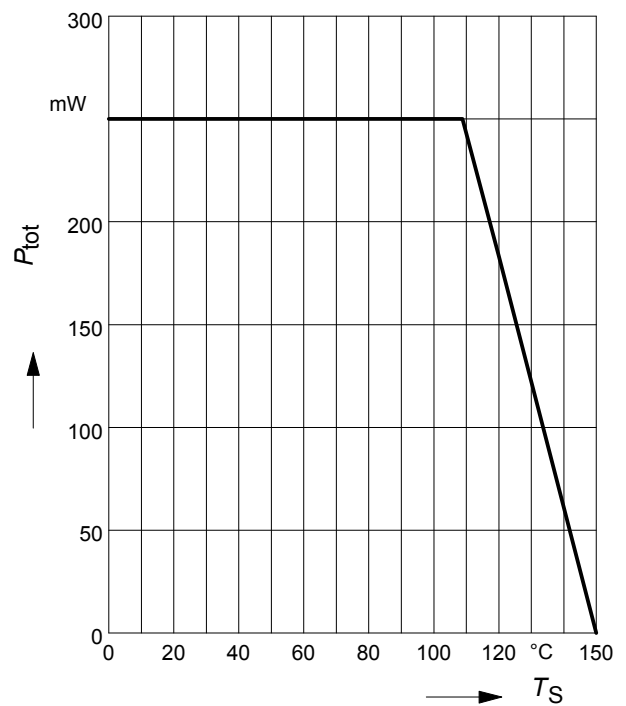
**Total power dissipation  $P_{\text{tot}} = f(T_S)$**

BCR139L3



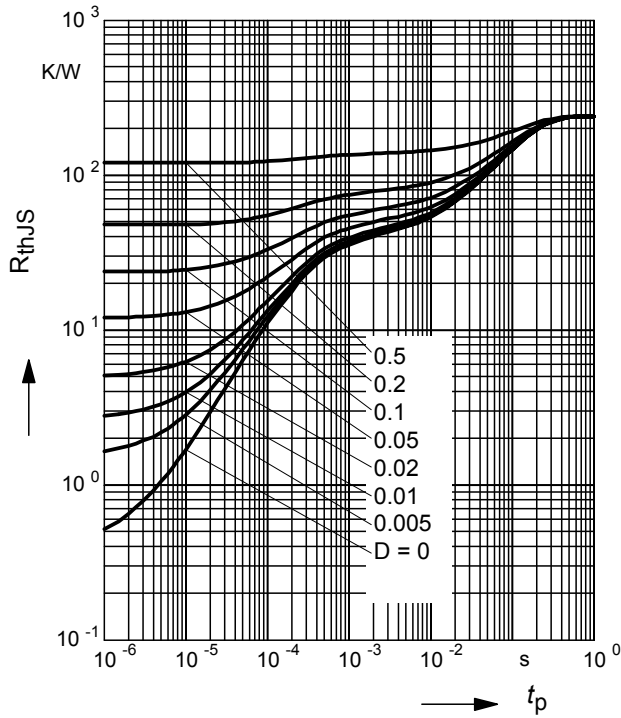
**Total power dissipation  $P_{\text{tot}} = f(T_S)$**

BCR139T



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

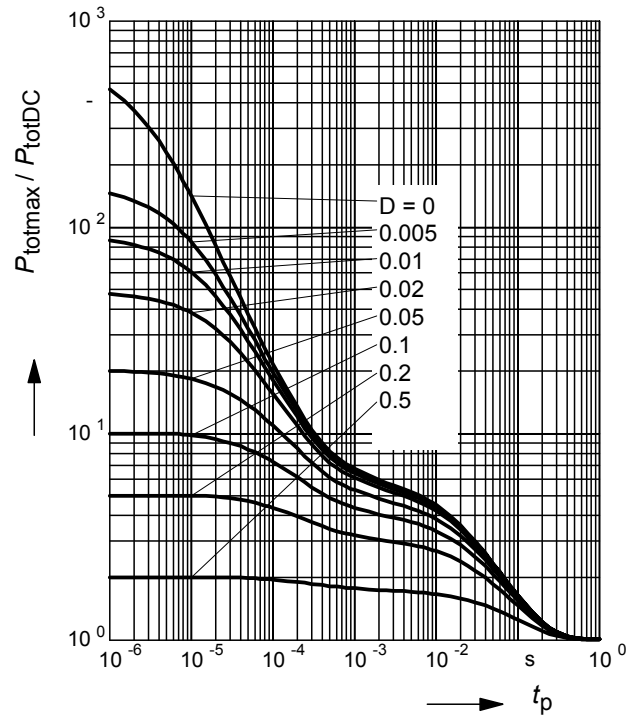
BCR139



**Permissible Pulse Load**

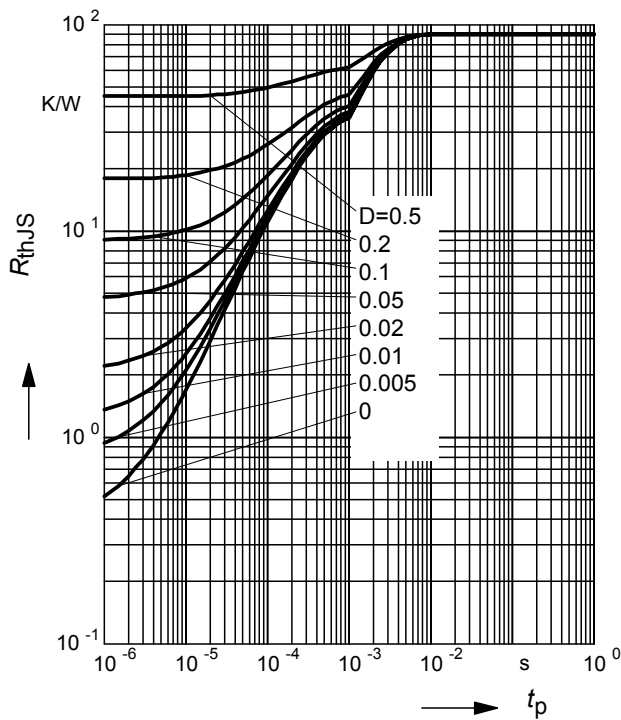
$$P_{totmax}/P_{totDC} = f(t_p)$$

BCR139



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

BCR139F



**Permissible Pulse Load**

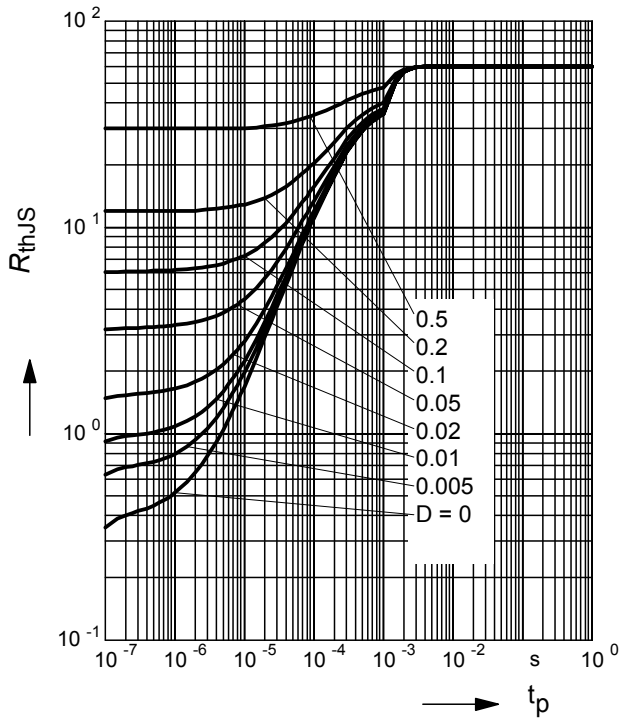
$$P_{totmax}/P_{totDC} = f(t_p)$$

BCR139F



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

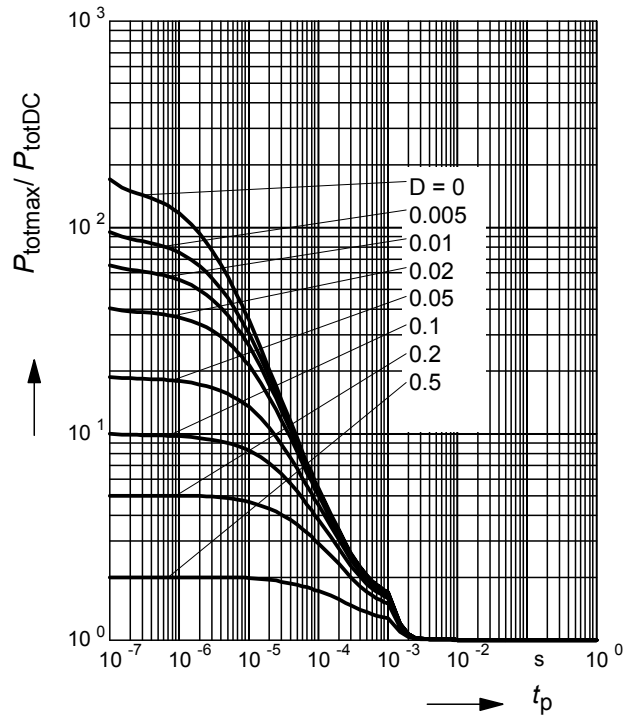
BCR139L3



**Permissible Pulse Load**

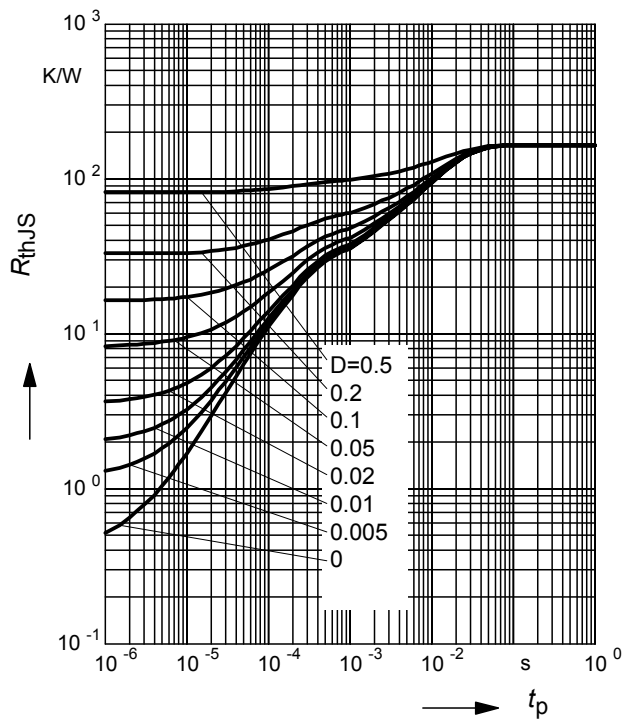
$$P_{totmax}/P_{totDC} = f(t_p)$$

BCR139L3



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

BCR139T



**Permissible Pulse Load**

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

BCR139T

