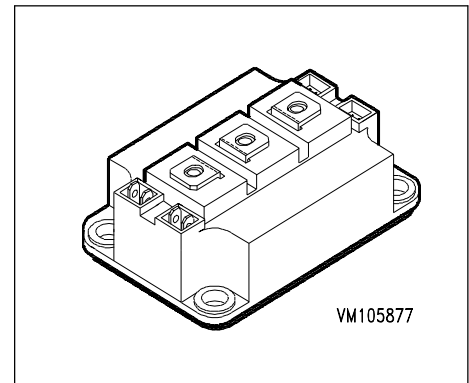


## IGBT Power Module

- Half-bridge
- Including fast free-wheeling diodes
- Enlarged diode area
- Package with insulated metal base plate
- $R_{G\ on,min} = 10\ \Omega$



| Type                 | $V_{CE}$ | $I_C$ | Package       | Ordering Code    |
|----------------------|----------|-------|---------------|------------------|
| BSM150GB170DN2 E3166 | 1700V    | 220A  | HALF-BRIDGE 2 | C67070-A2709-A67 |

## Maximum Ratings

| Parameter                               | Symbol      | Values        | Unit       |
|-----------------------------------------|-------------|---------------|------------|
| Collector-emitter voltage               | $V_{CE}$    | 1700          | V          |
| Collector-gate voltage                  | $V_{CGR}$   | 1700          |            |
| $R_{GE} = 20\ k\Omega$                  |             |               |            |
| Gate-emitter voltage                    | $V_{GE}$    | $\pm 20$      |            |
| DC collector current                    | $I_C$       | 220           | A          |
| $T_C = 25\ ^\circ C$                    |             |               |            |
| $T_C = 80\ ^\circ C$                    |             | 150           |            |
| Pulsed collector current, $t_p = 1\ ms$ | $I_{Cpuls}$ | 440           |            |
| $T_C = 25\ ^\circ C$                    |             |               |            |
| $T_C = 80\ ^\circ C$                    |             | 300           |            |
| Power dissipation per IGBT              | $P_{tot}$   | 1250          | W          |
| $T_C = 25\ ^\circ C$                    |             |               |            |
| Chip temperature                        | $T_j$       | + 150         | $^\circ C$ |
| Storage temperature                     | $T_{stg}$   | -40 ... + 125 |            |
| Thermal resistance, chip case           | $R_{thJC}$  | $\leq 0.1$    | K/W        |
| Diode thermal resistance, chip case     | $R_{thJCD}$ | $\leq 0.21$   |            |
| Insulation test voltage, $t = 1min.$    | $V_{is}$    | 4000          | Vac        |
| Creepage distance                       | -           | 20            | mm         |
| Clearance                               | -           | 11            |            |
| DIN humidity category, DIN 40 040       | -           | F             | sec        |
| IEC climatic category, DIN IEC 68-1     | -           | 40 / 125 / 56 |            |

Electrical Characteristics, at  $T_j = 25\text{ °C}$ , unless otherwise specified

| Parameter | Symbol | Values |      |      | Unit |
|-----------|--------|--------|------|------|------|
|           |        | min.   | typ. | max. |      |

### Static Characteristics

|                                                                                                                                                                                |               |        |            |            |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------|------------|------------|----|
| Gate threshold voltage<br>$V_{GE} = V_{CE}, I_C = 10\text{ mA}$                                                                                                                | $V_{GE(th)}$  | 4.8    | 5.5        | 6.2        | V  |
| Collector-emitter saturation voltage<br>$V_{GE} = 15\text{ V}, I_C = 150\text{ A}, T_j = 25\text{ °C}$<br>$V_{GE} = 15\text{ V}, I_C = 150\text{ A}, T_j = 125\text{ °C}$      | $V_{CE(sat)}$ | -<br>- | 3.4<br>4.6 | 3.9<br>5.3 |    |
| Zero gate voltage collector current<br>$V_{CE} = 1700\text{ V}, V_{GE} = 0\text{ V}, T_j = 25\text{ °C}$<br>$V_{CE} = 1700\text{ V}, V_{GE} = 0\text{ V}, T_j = 125\text{ °C}$ | $I_{CES}$     | -<br>- | 1<br>4     | 1.5<br>-   | mA |
| Gate-emitter leakage current<br>$V_{GE} = 20\text{ V}, V_{CE} = 0\text{ V}$                                                                                                    | $I_{GES}$     | -      | -          | 400        |    |

### AC Characteristics

|                                                                                               |           |    |      |   |    |
|-----------------------------------------------------------------------------------------------|-----------|----|------|---|----|
| Transconductance<br>$V_{CE} = 20\text{ V}, I_C = 150\text{ A}$                                | $g_{fs}$  | 54 | -    | - | S  |
| Input capacitance<br>$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$            | $C_{iss}$ | -  | 20   | - | nF |
| Output capacitance<br>$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$           | $C_{oss}$ | -  | 2    | - |    |
| Reverse transfer capacitance<br>$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$ | $C_{rss}$ | -  | 0.55 | - |    |

**Electrical Characteristics, at  $T_j = 25\text{ °C}$ , unless otherwise specified**

| Parameter | Symbol | Values |      |      | Unit |
|-----------|--------|--------|------|------|------|
|           |        | min.   | typ. | max. |      |

**Switching Characteristics, Inductive Load at  $T_j = 125\text{ °C}$** 

|                                                                                                                                   |              |   |      |      |    |
|-----------------------------------------------------------------------------------------------------------------------------------|--------------|---|------|------|----|
| Turn-on delay time<br>$V_{CC} = 1200\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 150\text{ A}$<br>$R_{Gon} = 10\text{ }\Omega$    | $t_{d(on)}$  | - | 520  | 1000 | ns |
| Rise time<br>$V_{CC} = 1200\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 150\text{ A}$<br>$R_{Gon} = 10\text{ }\Omega$             | $t_r$        | - | 200  | 400  |    |
| Turn-off delay time<br>$V_{CC} = 1200\text{ V}$ , $V_{GE} = -15\text{ V}$ , $I_C = 150\text{ A}$<br>$R_{Goff} = 10\text{ }\Omega$ | $t_{d(off)}$ | - | 1200 | 1800 |    |
| Fall time<br>$V_{CC} = 1200\text{ V}$ , $V_{GE} = -15\text{ V}$ , $I_C = 150\text{ A}$<br>$R_{Goff} = 10\text{ }\Omega$           | $t_f$        | - | 110  | 160  |    |

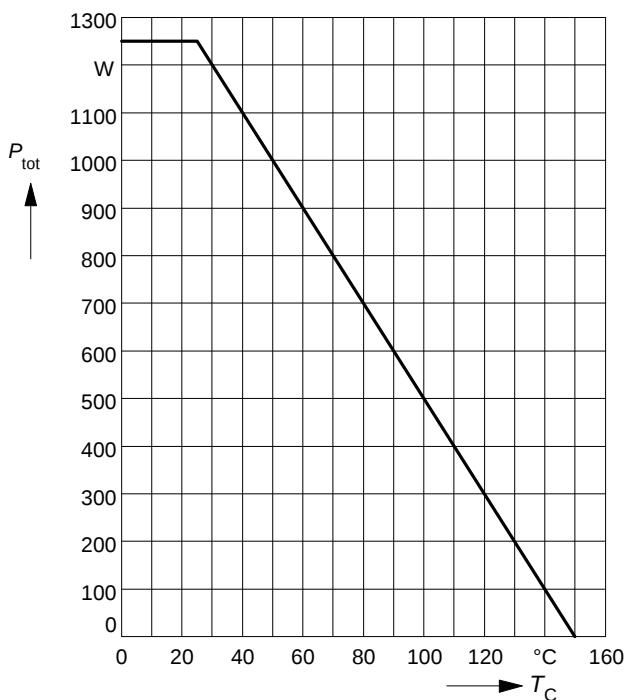
**Free-Wheel Diode**

|                                                                                                                                                                                             |          |   |          |          |               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---|----------|----------|---------------|
| Diode forward voltage<br>$I_F = 150\text{ A}$ , $V_{GE} = 0\text{ V}$ , $T_j = 25\text{ °C}$<br>$I_F = 150\text{ A}$ , $V_{GE} = 0\text{ V}$ , $T_j = 125\text{ °C}$                        | $V_F$    | - | 2<br>1.8 | 2.5<br>- | V             |
| Reverse recovery time<br>$I_F = 150\text{ A}$ , $V_R = -1200\text{ V}$ , $V_{GE} = 0\text{ V}$<br>$di_F/dt = -1200\text{ A}/\mu\text{s}$ , $T_j = 125\text{ °C}$                            | $t_{rr}$ | - | 0.7      | -        |               |
| Reverse recovery charge<br>$I_F = 150\text{ A}$ , $V_R = -1200\text{ V}$ , $V_{GE} = 0\text{ V}$<br>$di_F/dt = -1200\text{ A}/\mu\text{s}$<br>$T_j = 25\text{ °C}$<br>$T_j = 125\text{ °C}$ | $Q_{rr}$ | - | 14<br>50 | -<br>-   | $\mu\text{C}$ |
|                                                                                                                                                                                             |          | - |          |          |               |

**Power dissipation**

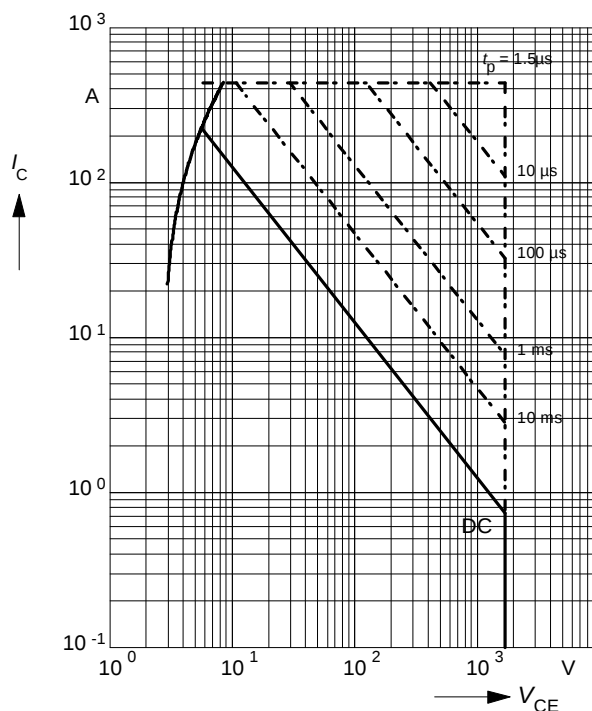
$$P_{\text{tot}} = f(T_C)$$

parameter:  $T_j \leq 150^\circ\text{C}$

**Safe operating area**

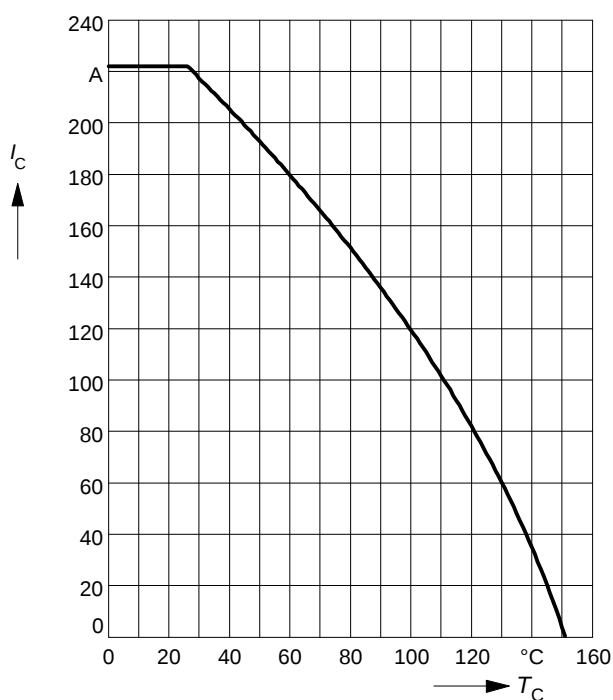
$$I_C = f(V_{CE})$$

parameter:  $D = 0$ ,  $T_C = 25^\circ\text{C}$ ,  $T_j \leq 150^\circ\text{C}$

**Collector current**

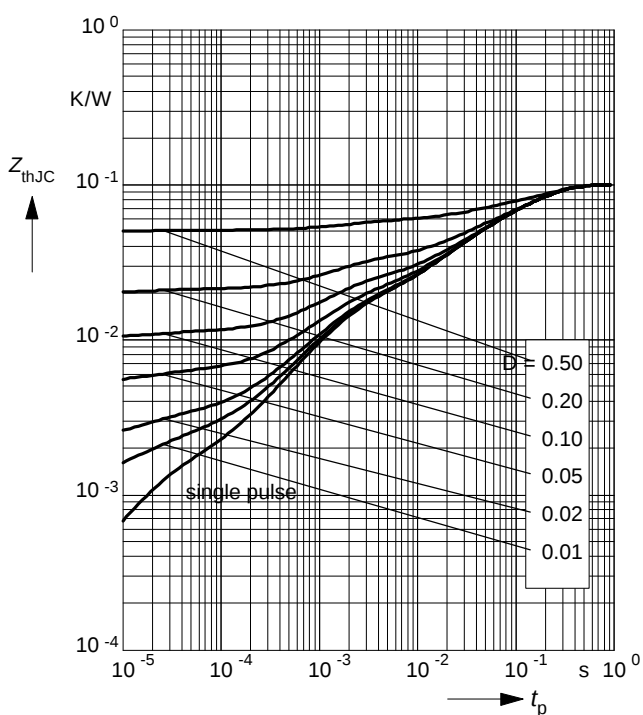
$$I_C = f(T_C)$$

parameter:  $V_{GE} \geq 15\text{ V}$ ,  $T_j \leq 150^\circ\text{C}$

**Transient thermal impedance IGBT**

$$Z_{\text{thJC}} = f(t_p)$$

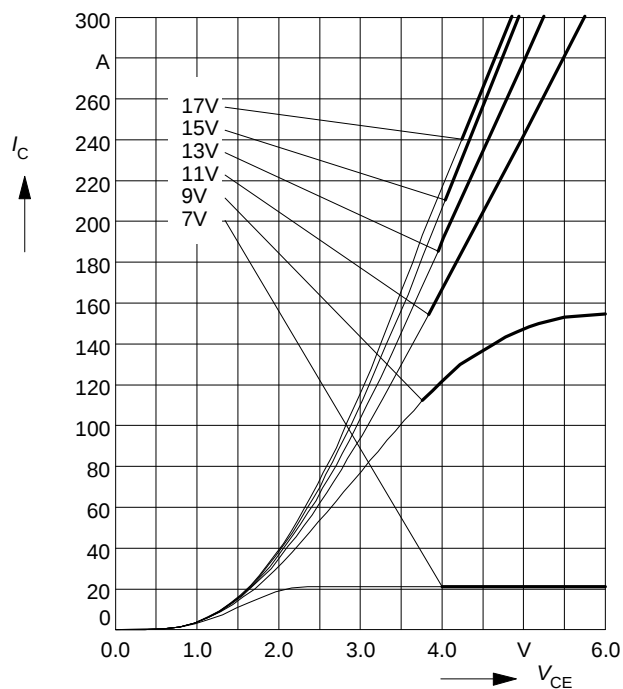
parameter:  $D = t_p / T$



**Typ. output characteristics**

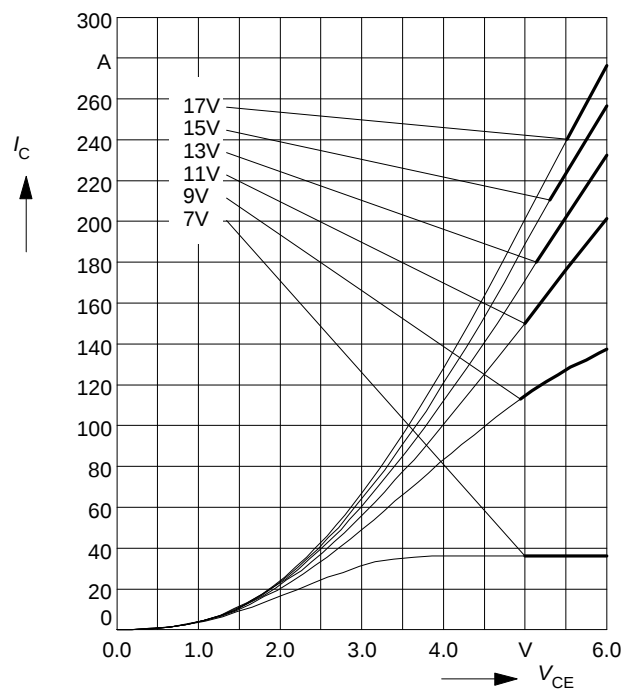
$$I_C = f(V_{CE})$$

parameter:  $t_p = 80 \mu s$ ,  $T_j = 25^\circ C$

**Typ. output characteristics**

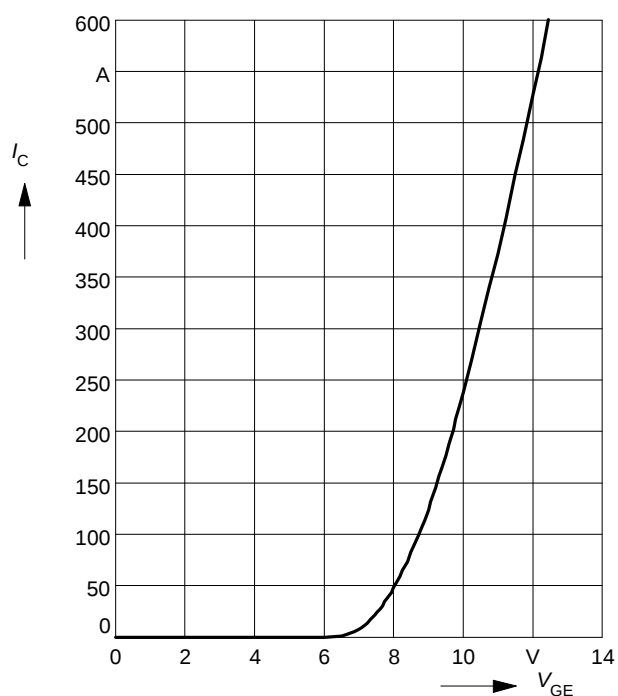
$$I_C = f(V_{CE})$$

parameter:  $t_p = 80 \mu s$ ,  $T_j = 125^\circ C$

**Typ. transfer characteristics**

$$I_C = f(V_{GE})$$

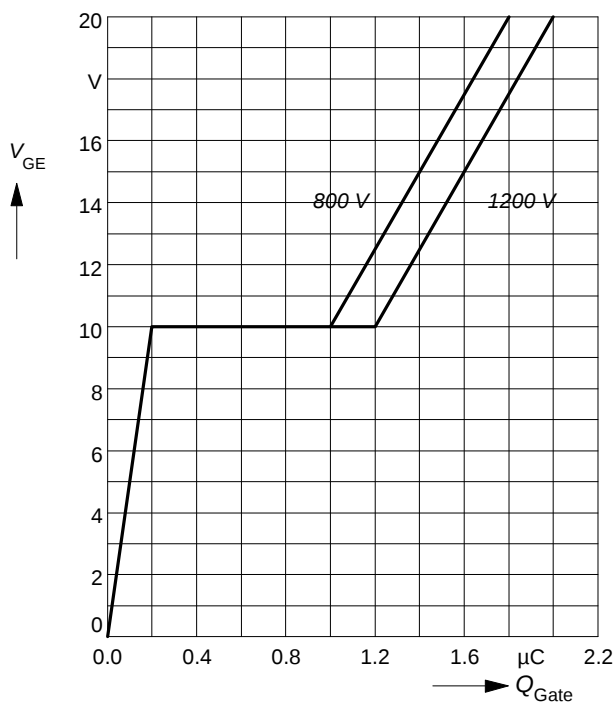
parameter:  $t_p = 80 \mu s$ ,  $V_{CE} = 20 V$



**Typ. gate charge**

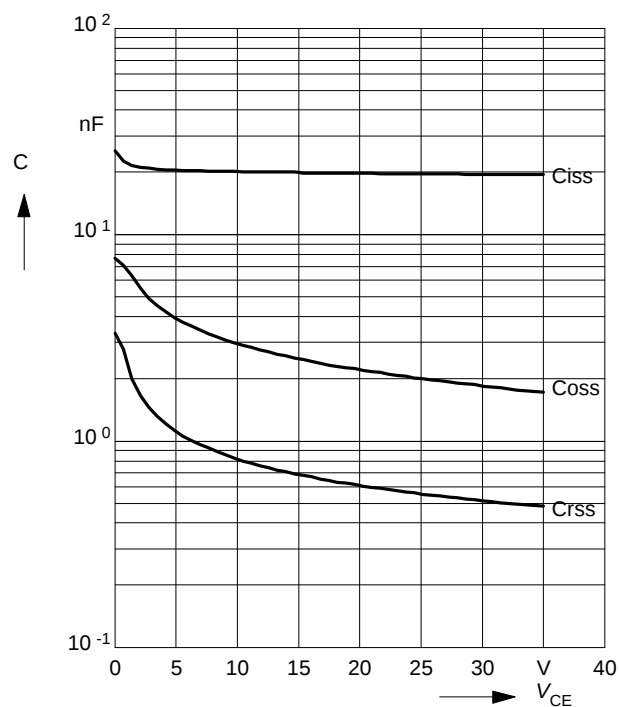
$$V_{GE} = f(Q_{Gate})$$

parameter:  $I_{C\ puls} = 150\ A$

**Typ. capacitances**

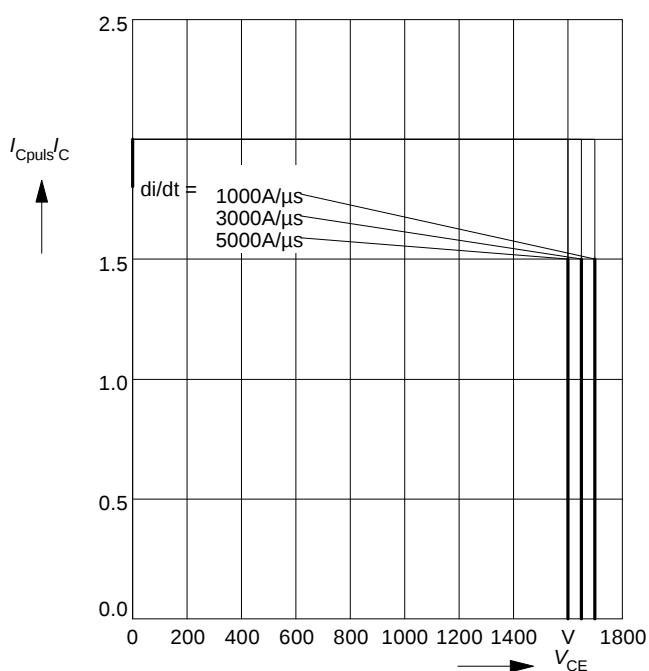
$$C = f(V_{CE})$$

parameter:  $V_{GE} = 0, f = 1\ MHz$

**Reverse biased safe operating area**

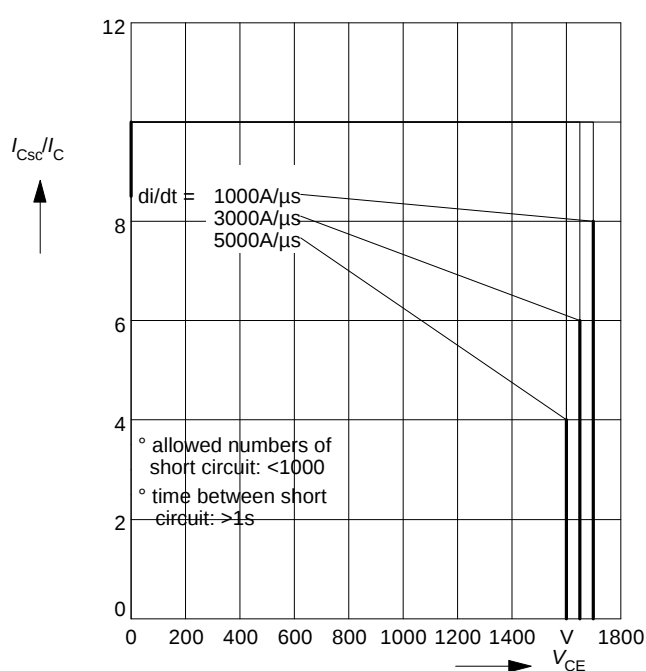
$$I_{C\ puls} = f(V_{CE}), T_j = 150^\circ C$$

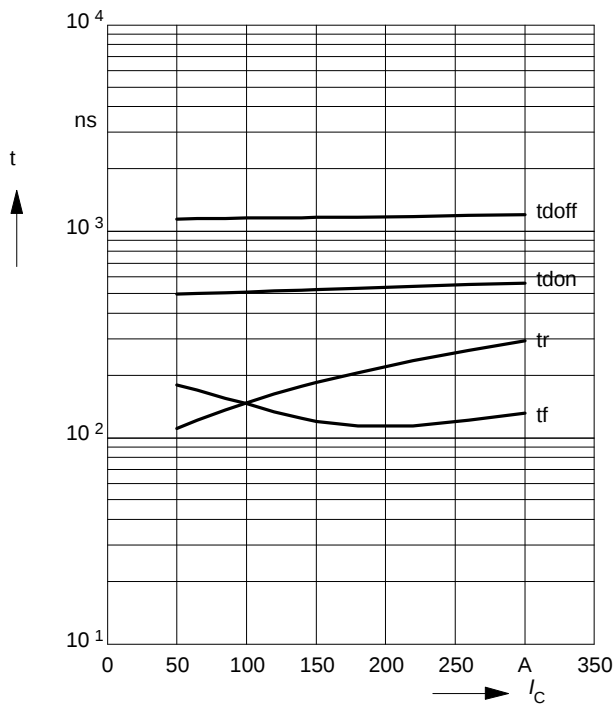
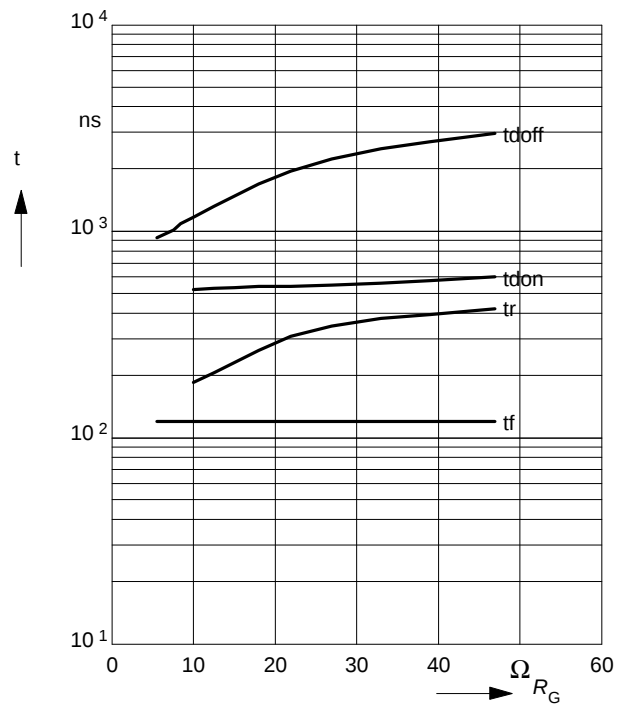
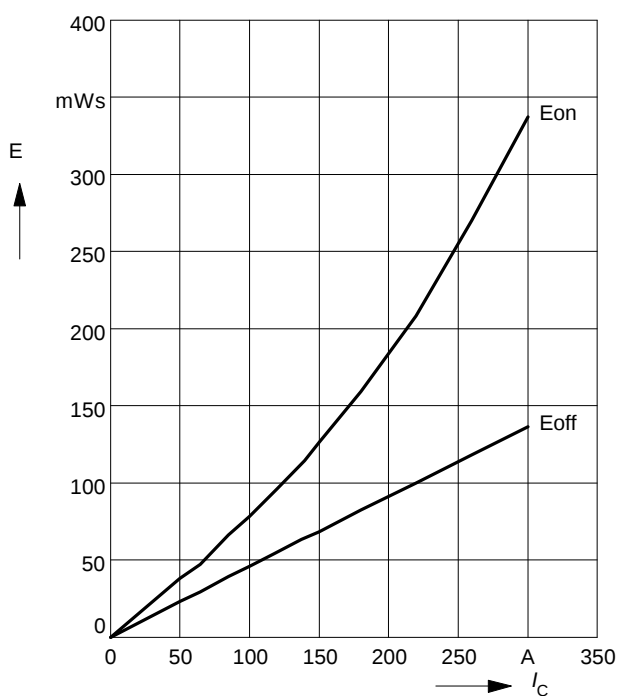
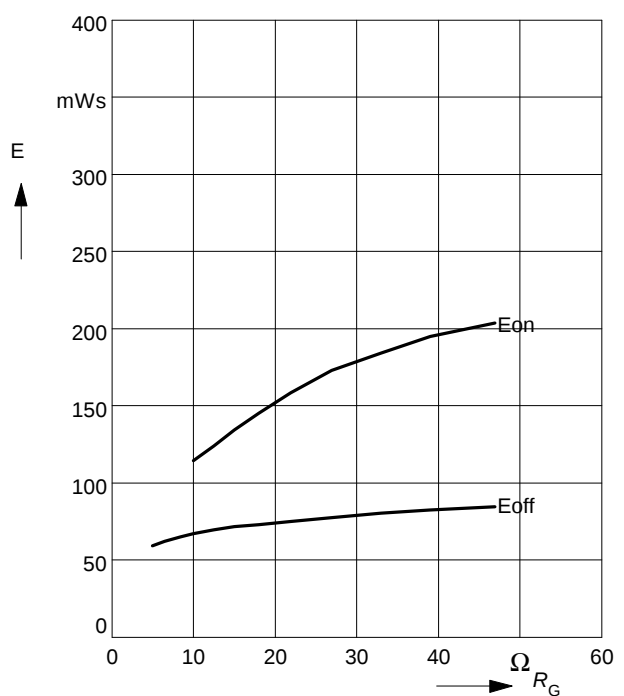
parameter:  $V_{GE} = \pm 15\ V, t_p \leq 1\ ms, L < 25\ nH$

**Short circuit safe operating area**

$$I_{C\ sc} = f(V_{CE}), T_j = 150^\circ C$$

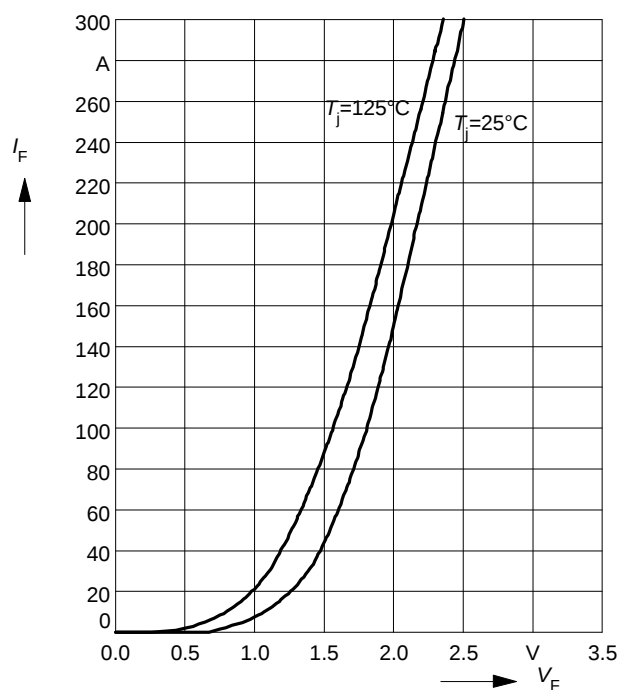
parameter:  $V_{GE} = \pm 15\ V, t_p \leq 10\ \mu s, L < 25\ nH$



**Typ. switching time** $I = f(I_C)$ , inductive load,  $T_j = 125^\circ\text{C}$ par.:  $V_{CE} = 1200\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $R_G = 10\ \Omega$ **Typ. switching time** $t = f(R_G)$ , inductive load,  $T_j = 125^\circ\text{C}$ par.:  $V_{CE} = 1200\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 150\text{ A}$ **Typ. switching losses** $E = f(I_C)$ , inductive load,  $T_j = 125^\circ\text{C}$ par.:  $V_{CE} = 1200\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $R_G = 10\ \Omega$ **Typ. switching losses** $E = f(R_G)$ , inductive load,  $T_j = 125^\circ\text{C}$ par.:  $V_{CE} = 1200\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 150\text{ A}$ 

### Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$

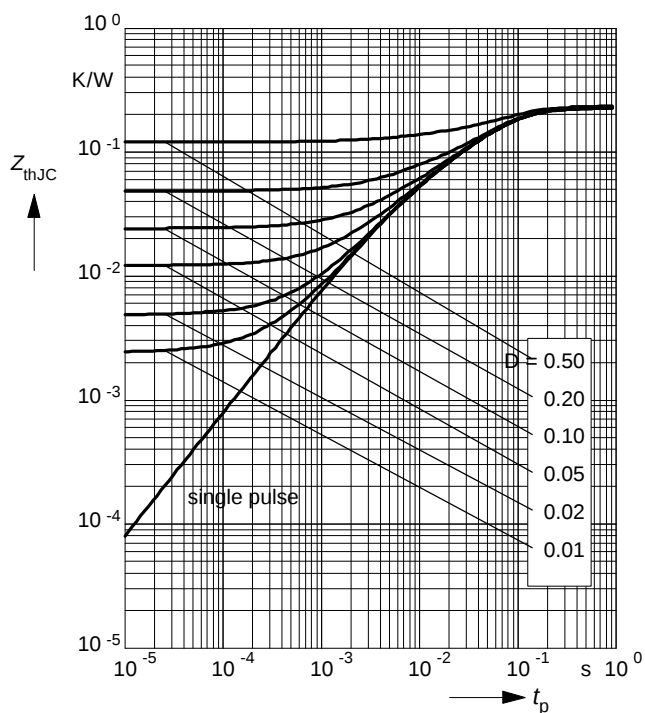
parameter:  $T_j$

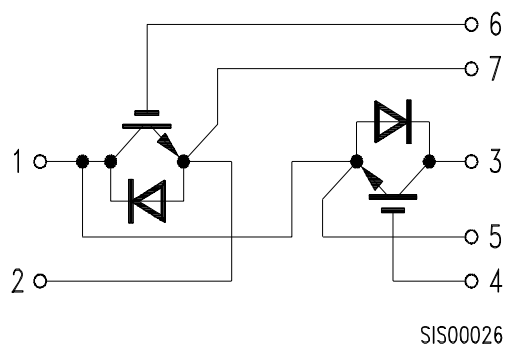


### Transient thermal impedance Diode

$$Z_{thJC} = f(t_p)$$

parameter:  $D = t_p / T$



**Circuit Diagram****Package Outlines**

Dimensions in mm

Weight: 420 g

