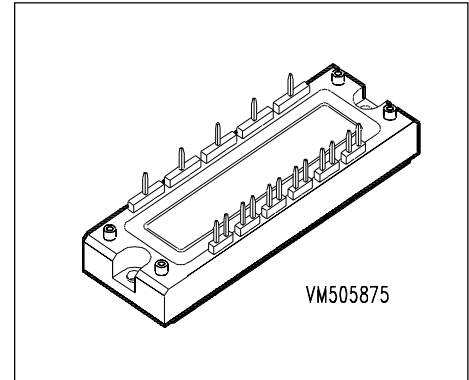


**BSM 15 GD 120 DN2 E3224****IGBT Power Module**

- Power module
- 3-phase full-bridge
- Including fast free-wheel diodes
- Package with insulated metal base plate



| Type                 | $V_{CE}$ | $I_C$ | Package      | Ordering Code    |
|----------------------|----------|-------|--------------|------------------|
| BSM 15 GD 120 DN2    | 1200V    | 25A   | ECONOPACK 2  | C67076-A2504-A67 |
| BSM 15 GD120DN2E3224 | 1200V    | 25A   | ECONOPACK 2K | C67070-A2504-A67 |

**Maximum Ratings**

| Parameter                                      | Symbol      | Values        | Unit             |
|------------------------------------------------|-------------|---------------|------------------|
| Collector-emitter voltage                      | $V_{CE}$    | 1200          | V                |
| Collector-gate voltage                         | $V_{CGR}$   | 1200          |                  |
| $R_{GE} = 20 \text{ k}\Omega$                  |             |               |                  |
| Gate-emitter voltage                           | $V_{GE}$    | $\pm 20$      | A                |
| DC collector current                           | $I_C$       | 25            |                  |
| $T_C = 25 \text{ }^\circ\text{C}$              |             | 15            |                  |
| $T_C = 80 \text{ }^\circ\text{C}$              |             |               |                  |
| Pulsed collector current, $t_p = 1 \text{ ms}$ | $I_{Cpuls}$ | 50            |                  |
| $T_C = 25 \text{ }^\circ\text{C}$              |             | 30            |                  |
| $T_C = 80 \text{ }^\circ\text{C}$              |             |               |                  |
| Power dissipation per IGBT                     | $P_{tot}$   | 145           | W                |
| $T_C = 25 \text{ }^\circ\text{C}$              |             |               |                  |
| Chip temperature                               | $T_j$       | + 150         | $^\circ\text{C}$ |
| Storage temperature                            | $T_{stg}$   | -40 ... + 125 |                  |
| Thermal resistance, chip case                  | $R_{thJC}$  | $\leq 0.86$   | K/W              |
| Diode thermal resistance, chip case            | $R_{thJCD}$ | $\leq 1.5$    |                  |
| Insulation test voltage, $t = 1\text{min.}$    | $V_{is}$    | 2500          | Vac              |
| Creepage distance                              | -           | 16            | 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>$V_{GE} = V_{CE}, I_C = 0.6\text{ mA}$                                                                                                               | $V_{GE(th)}$  | 4.5    | 5.5        | 6.5      | V  |
| Collector-emitter saturation voltage<br>$V_{GE} = 15\text{ V}, I_C = 15\text{ A}, T_j = 25\text{ °C}$<br>$V_{GE} = 15\text{ V}, I_C = 15\text{ A}, T_j = 125\text{ °C}$        | $V_{CE(sat)}$ | -<br>- | 2.5<br>3.1 | 3<br>3.7 |    |
| Zero gate voltage collector current<br>$V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_j = 25\text{ °C}$<br>$V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_j = 125\text{ °C}$ | $I_{CES}$     | -<br>- | 0.3<br>1.2 | 0.5<br>- |    |
| Gate-emitter leakage current<br>$V_{GE} = 20\text{ V}, V_{CE} = 0\text{ V}$                                                                                                    | $I_{GES}$     | -      | -          | 150      | nA |

**AC Characteristics**

|                                                                                               |           |     |      |   |    |
|-----------------------------------------------------------------------------------------------|-----------|-----|------|---|----|
| Transconductance<br>$V_{CE} = 20\text{ V}, I_C = 15\text{ A}$                                 | $g_{fs}$  | 5.5 | -    | - | S  |
| Input capacitance<br>$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$            | $C_{iss}$ | -   | 1000 | - | pF |
| Output capacitance<br>$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$           | $C_{oss}$ | -   | 150  | - |    |
| Reverse transfer capacitance<br>$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$ | $C_{rss}$ | -   | 70   | - |    |

**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>$V_{CC} = 600\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 15\text{ A}$<br>$R_{Gon} = 82\text{ }\Omega$    | $t_{d(on)}$  | - | 55  | 110 | ns |
| Rise time<br>$V_{CC} = 600\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 15\text{ A}$<br>$R_{Gon} = 82\text{ }\Omega$             | $t_r$        | - | 45  | 90  |    |
| Turn-off delay time<br>$V_{CC} = 600\text{ V}$ , $V_{GE} = -15\text{ V}$ , $I_C = 15\text{ A}$<br>$R_{Goff} = 82\text{ }\Omega$ | $t_{d(off)}$ | - | 400 | 600 |    |
| Fall time<br>$V_{CC} = 600\text{ V}$ , $V_{GE} = -15\text{ V}$ , $I_C = 15\text{ A}$<br>$R_{Goff} = 82\text{ }\Omega$           | $t_f$        | - | 70  | 100 |    |

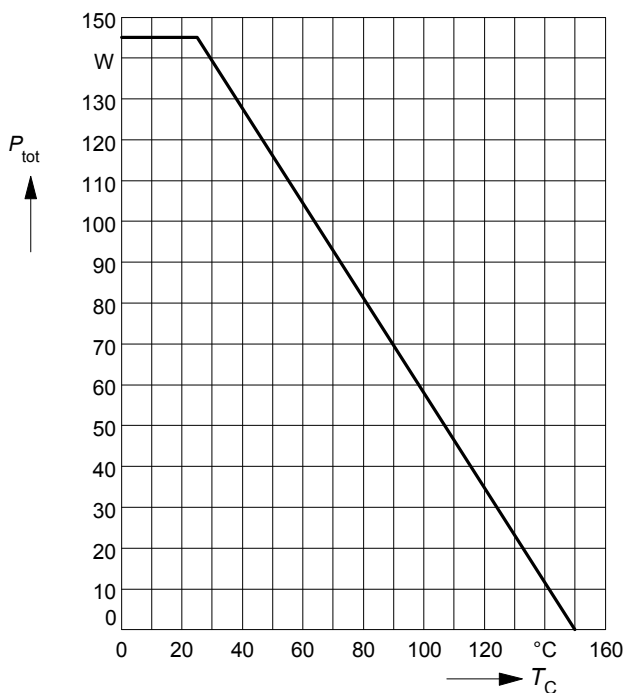
**Free-Wheel Diode**

|                                                                                                                                                                                          |          |        |            |          |               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------|------------|----------|---------------|
| Diode forward voltage<br>$I_F = 15\text{ A}$ , $V_{GE} = 0\text{ V}$ , $T_j = 25\text{ °C}$<br>$I_F = 15\text{ A}$ , $V_{GE} = 0\text{ V}$ , $T_j = 125\text{ °C}$                       | $V_F$    | -<br>- | 2.4<br>1.9 | 2.9<br>- | V             |
| Reverse recovery time<br>$I_F = 15\text{ A}$ , $V_R = -600\text{ V}$ , $V_{GE} = 0\text{ V}$<br>$di_F/dt = -800\text{ A}/\mu\text{s}$ , $T_j = 125\text{ °C}$                            | $t_{rr}$ | -      | 0.1        | -        |               |
| Reverse recovery charge<br>$I_F = 15\text{ A}$ , $V_R = -600\text{ V}$ , $V_{GE} = 0\text{ V}$<br>$di_F/dt = -800\text{ A}/\mu\text{s}$<br>$T_j = 25\text{ °C}$<br>$T_j = 125\text{ °C}$ | $Q_{rr}$ | -<br>- | 1<br>3     | -<br>-   | $\mu\text{C}$ |

## Power dissipation

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

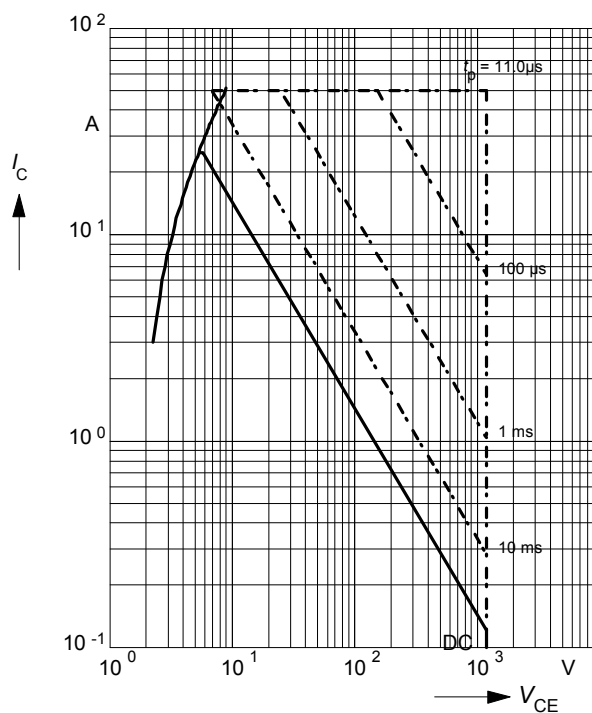
parameter:  $T_j \leq 150^\circ\text{C}$



## Safe operating area

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

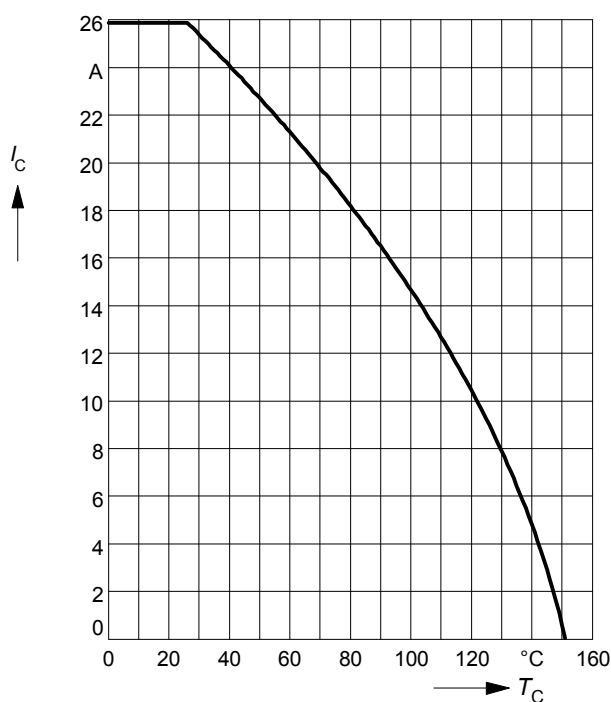
parameter:  $D = 0$ ,  $T_C = 25^\circ\text{C}$ ,  $T_j \leq 150^\circ\text{C}$



## Collector current

$$I_C = f(T_C)$$

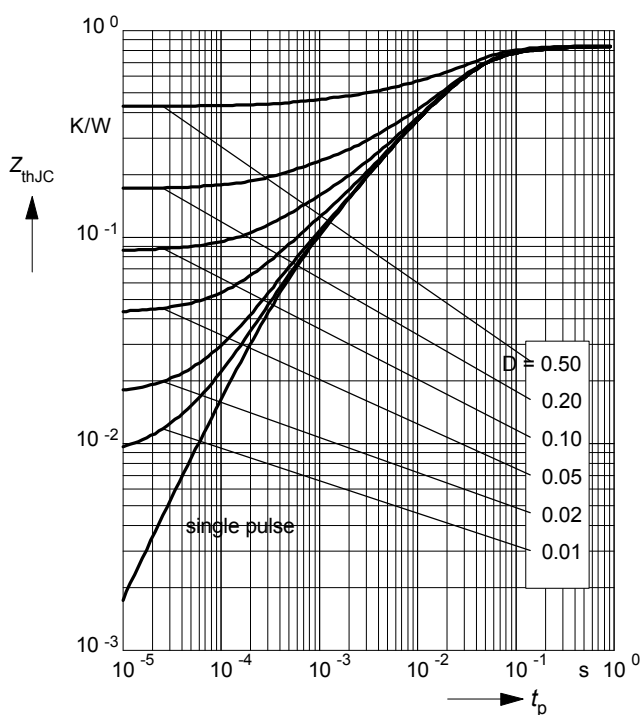
parameter:  $V_{GE} \geq 15\text{ V}$ ,  $T_j \leq 150^\circ\text{C}$



## Transient thermal impedance IGBT

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

parameter:  $D = t_p / T$

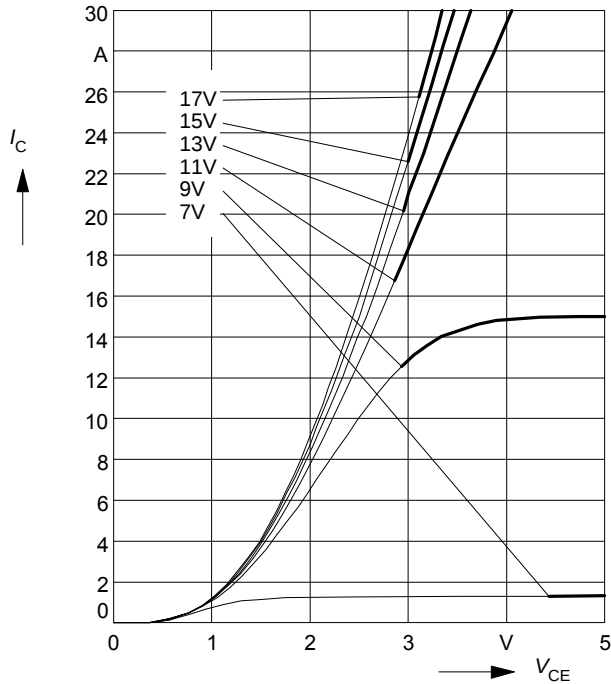


# BSM 15 GD 120 DN2 E3224

## Typ. output characteristics

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

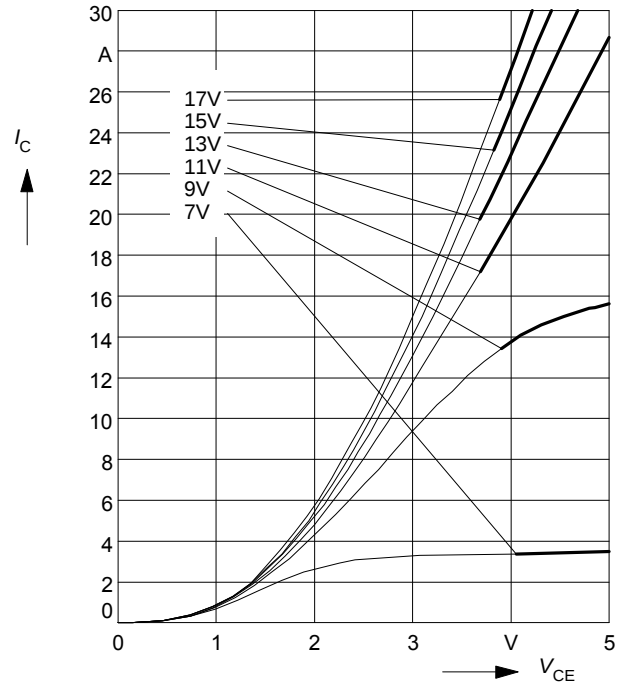
parameter:  $t_p = 80 \mu s$ ,  $T_j = 25^\circ C$



## Typ. output characteristics

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

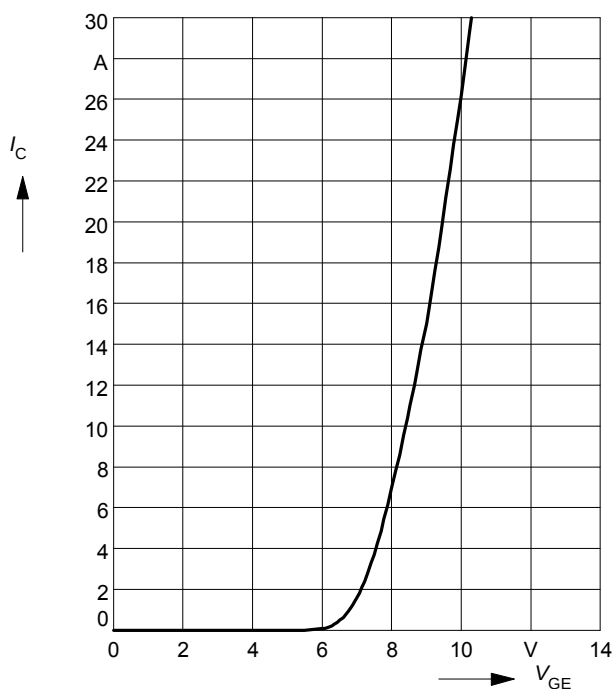
parameter:  $t_p = 80 \mu s$ ,  $T_j = 125^\circ C$



## Typ. transfer characteristics

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

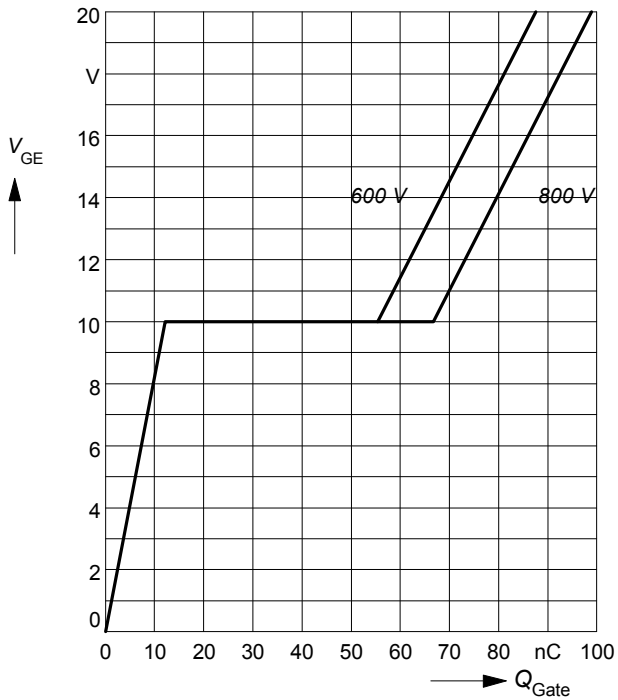
parameter:  $t_p = 80 \mu s$ ,  $V_{CE} = 20 V$



**Typ. gate charge**

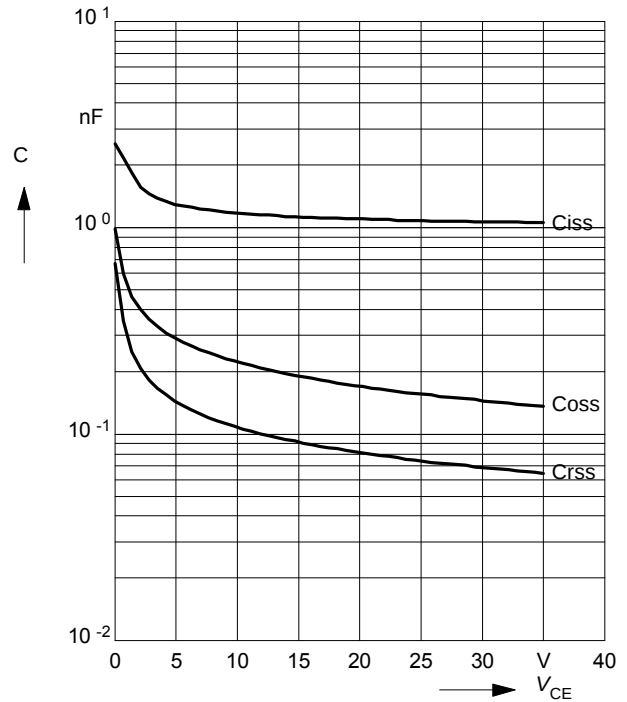
$$V_{GE} = f(Q_{Gate})$$

parameter:  $I_{C\ puls} = 15\ A$

**Typ. capacitances**

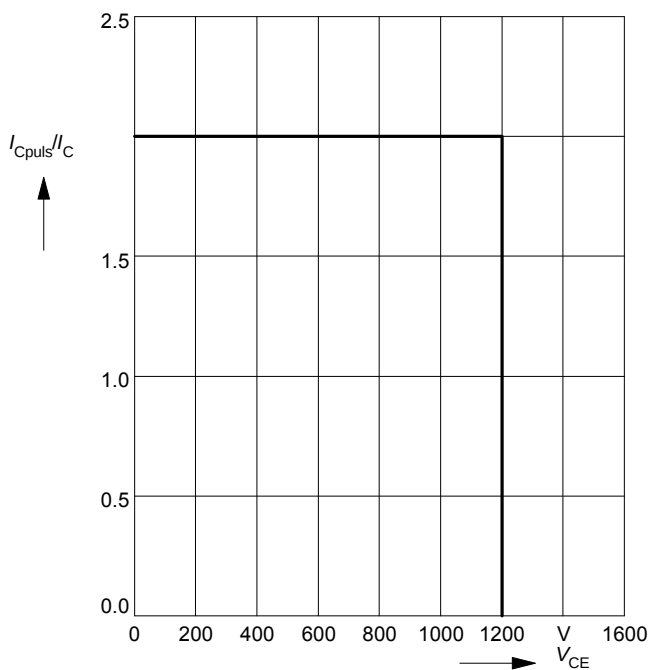
$$C = f(V_{CE})$$

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

**Reverse biased safe operating area**

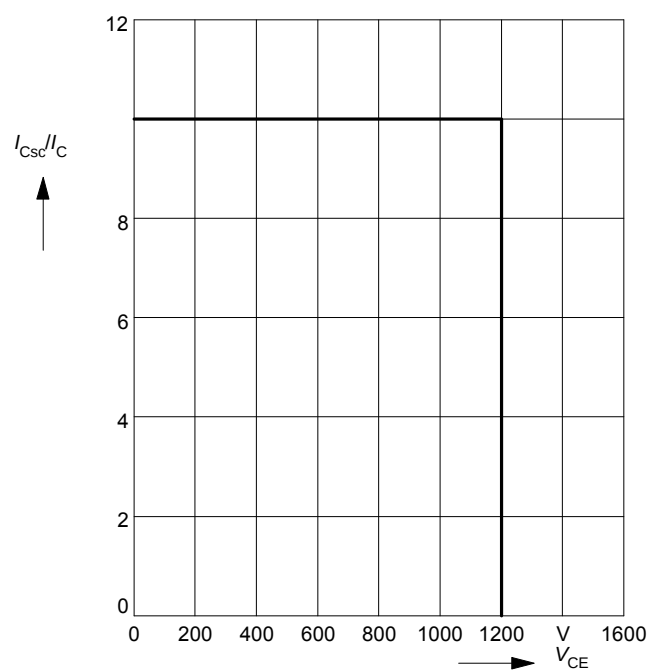
$$I_{C\ puls} = f(V_{CE}), T_j = 150^\circ C$$

parameter:  $V_{GE} = 15\ V$

**Short circuit safe operating area**

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

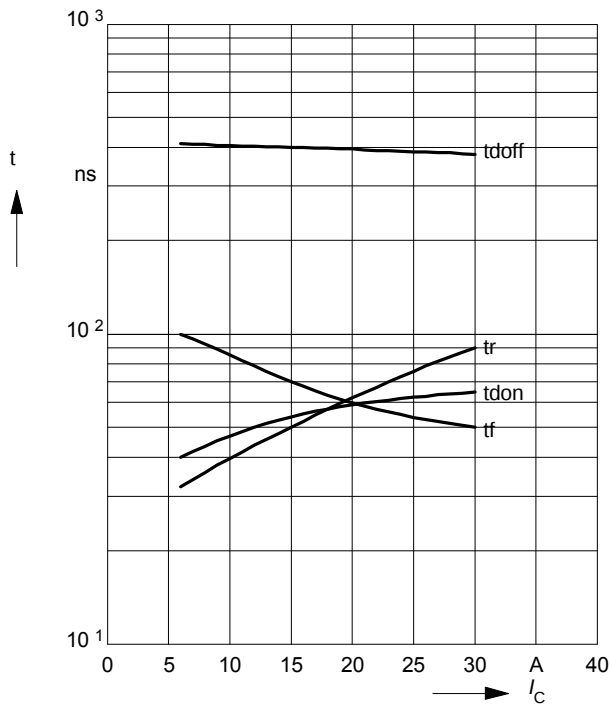
parameter:  $V_{GE} = \pm 15\ V$ ,  $t_{SC} \leq 10\ \mu s$ ,  $L < 50\ nH$



### Typ. switching time

$I = f(I_C)$ , inductive load,  $T_j = 125^\circ\text{C}$

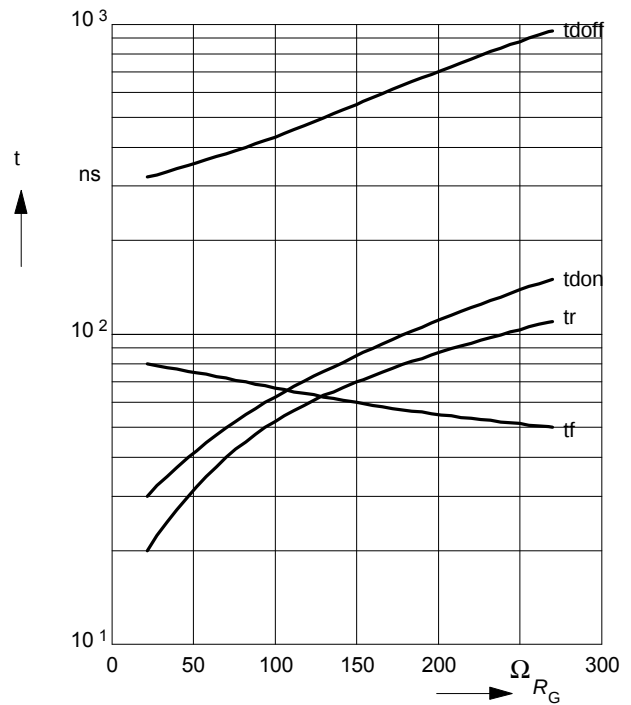
par.:  $V_{CE} = 600\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $R_G = 82\ \Omega$



### Typ. switching time

$t = f(R_G)$ , inductive load,  $T_j = 125^\circ\text{C}$

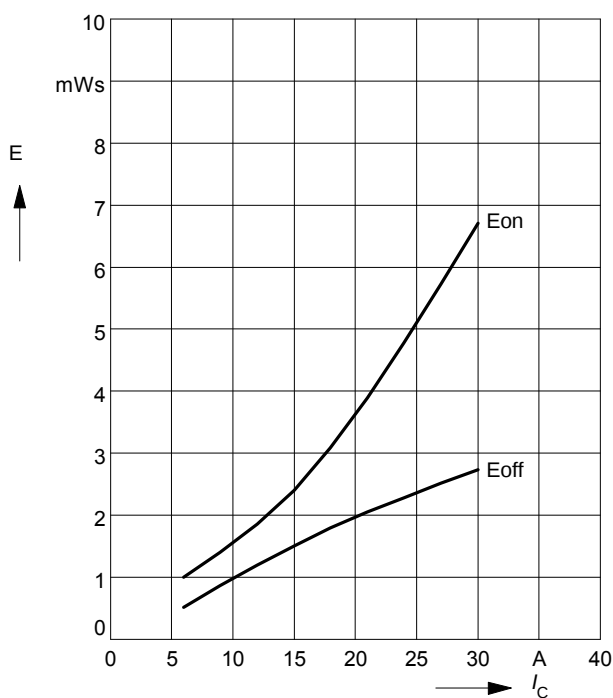
par.:  $V_{CE} = 600\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 15\text{ A}$



### Typ. switching losses

$E = f(I_C)$ , inductive load,  $T_j = 125^\circ\text{C}$

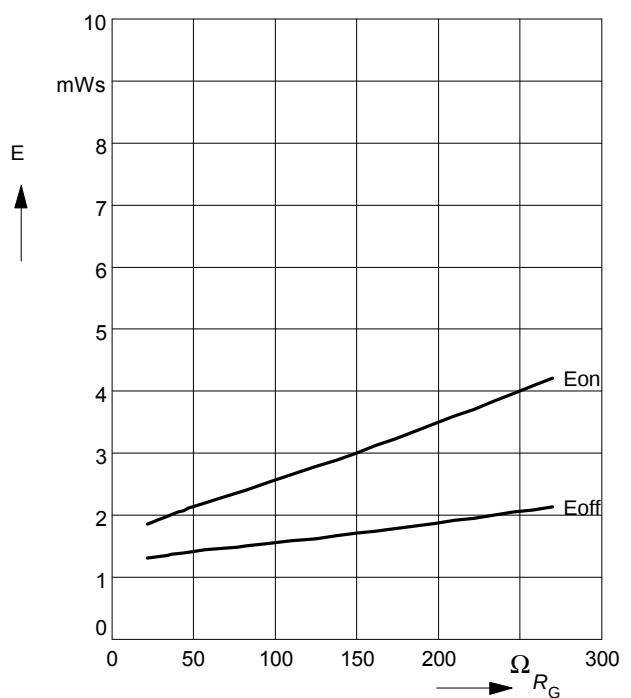
par.:  $V_{CE} = 600\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $R_G = 82\ \Omega$

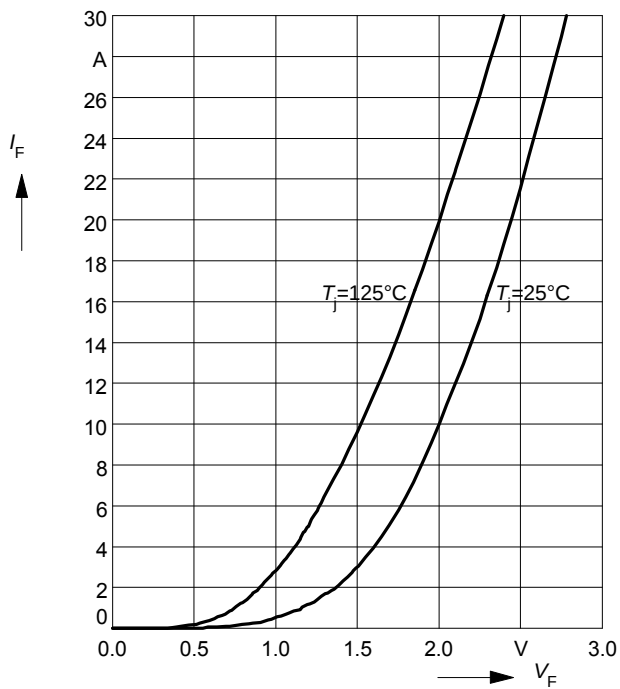
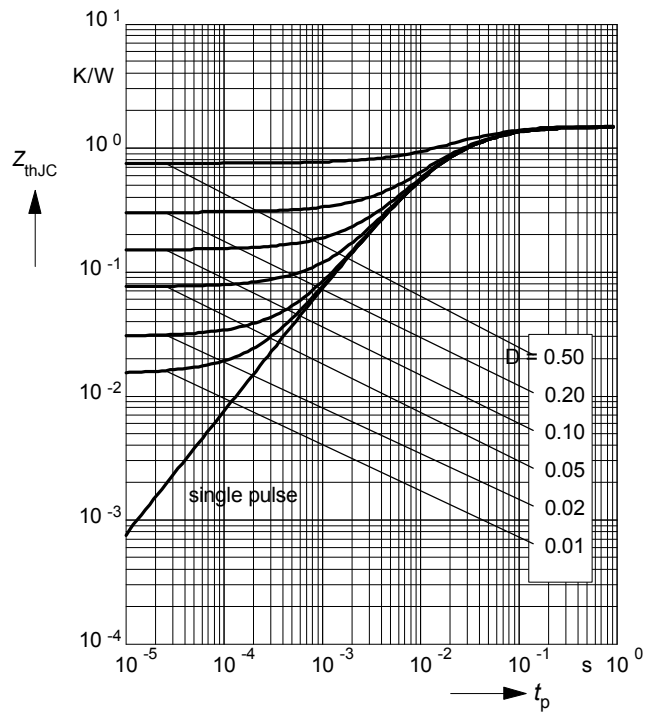


### Typ. switching losses

$E = f(R_G)$ , inductive load,  $T_j = 125^\circ\text{C}$

par.:  $V_{CE} = 600\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 15\text{ A}$



**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:  $D = t_p / T$ 



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