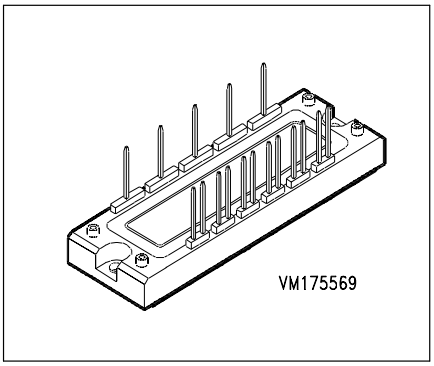
## IGBT Power Module




- 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 25 GD 120 DN2 | 1200V | 35A | ECONOPACK 2 | C67076-A2505-A67 |
| BSM 25 GD120DN2E3224 | 1200V | 35A | ECONOPACK 2K | C67070-A2505-A67 |

### Maximum Ratings

| Parameter | Symbol | Values | Unit |
|---|---|---|---|
| Collector-emitter voltage | $V_{CE}$ | 1200 | V |
| Collector-gate voltage | $V_{CGR}$ | | |
| $R_{GE}$ = 20 kΩ | | 1200 | |
| Gate-emitter voltage | $V_{GE}$ | ± 20 | |
| DC collector current | $I_C$ | | A |
| $T_C$ = 25 °C | | 35 | |
| $T_C$ = 80 °C | | 25 | |
| Pulsed collector current, $t_p$ = 1 ms | $I_{Cpuls}$ | | |
| $T_C$ = 25 °C | | 70 | |
| $T_C$ = 80 °C | | 50 | |
| Power dissipation per IGBT | $P_{tot}$ | | W |
| $T_C$ = 25 °C | | 200 | |
| Chip temperature | $T_j$ | + 150 | °C |
| Storage temperature | $T_{stg}$ | -40 ... + 125 | |
| Thermal resistance, chip case | $R_{thJC}$ | ≤ 0.6 | K/W |
| Diode thermal resistance, chip case | $R_{thJCD}$ | ≤ 1 | |
| Insulation test voltage, $t$ = 1min. | $V_{is}$ | 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 | |



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

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Static Characteristics** | | | | | |
| Gate threshold voltage<br>$V_{GE} = V_{CE}$, $I_C$ = 1 mA | $V_{GE(th)}$ | 4.5 | 5.5 | 6.5 | V |
| Collector-emitter saturation voltage<br>$V_{GE}$ = 15 V, $I_C$ = 25 A, $T_j$ = 25 °C<br>$V_{GE}$ = 15 V, $I_C$ = 25 A, $T_j$ = 125 °C | $V_{CE(sat)}$ | -<br>- | 2.5<br>3.1 | 3<br>3.7 | |
| Zero gate voltage collector current<br>$V_{CE}$ = 1200 V, $V_{GE}$ = 0 V, $T_j$ = 25 °C<br>$V_{CE}$ = 1200 V, $V_{GE}$ = 0 V, $T_j$ = 125 °C | $I_{CES}$ | -<br>- | 0.5<br>2 | 0.8<br>- | mA |
| Gate-emitter leakage current<br>$V_{GE}$ = 20 V, $V_{CE}$ = 0 V | $I_{GES}$ | - | - | 180 | nA |
| **AC Characteristics** | | | | | |
| Transconductance<br>$V_{CE}$ = 20 V, $I_C$ = 25 A | $g_{fs}$ | 10 | - | - | S |
| Input capacitance<br>$V_{CE}$ = 25 V, $V_{GE}$ = 0 V, $f$ = 1 MHz | $C_{iss}$ | - | 1650 | - | pF |
| Output capacitance<br>$V_{CE}$ = 25 V, $V_{GE}$ = 0 V, $f$ = 1 MHz | $C_{oss}$ | - | 250 | - | |
| Reverse transfer capacitance<br>$V_{CE}$ = 25 V, $V_{GE}$ = 0 V, $f$ = 1 MHz | $C_{rss}$ | - | 110 | - | |



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

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Switching Characteristics, Inductive Load at $T_j$ = 125 °C** | | | | | |
| Turn-on delay time<br>$V_{CC}$ = 600 V, $V_{GE}$ = 15 V, $I_C$ = 25 A<br>$R_{Gon}$ = 47 Ω | $t_{d(on)}$ | - | 75 | 150 | ns |
| Rise time<br>$V_{CC}$ = 600 V, $V_{GE}$ = 15 V, $I_C$ = 25 A<br>$R_{Gon}$ = 47 Ω | $t_r$ | - | 65 | 130 | |
| Turn-off delay time<br>$V_{CC}$ = 600 V, $V_{GE}$ = -15 V, $I_C$ = 25 A<br>$R_{Goff}$ = 47 Ω | $t_{d(off)}$ | - | 400 | 600 | |
| Fall time<br>$V_{CC}$ = 600 V, $V_{GE}$ = -15 V, $I_C$ = 25 A<br>$R_{Goff}$ = 47 Ω | $t_f$ | - | 50 | 100 | |
| **Free-Wheel Diode** | | | | | |
| Diode forward voltage<br>$I_F$ = 25 A, $V_{GE}$ = 0 V, $T_j$ = 25 °C<br>$I_F$ = 25 A, $V_{GE}$ = 0 V, $T_j$ = 125 °C | $V_F$ | -<br>- | 2.3<br>1.8 | 2.8<br>- | V |
| Reverse recovery time<br>$I_F$ = 25 A, $V_R$ = -600 V, $V_{GE}$ = 0 V<br>$di_F/dt$ = -800 A/µs, $T_j$ = 125 °C | $t_{rr}$ | - | 0.13 | - | µs |
| Reverse recovery charge<br>$I_F$ = 25 A, $V_R$ = -600 V, $V_{GE}$ = 0 V<br>$di_F/dt$ = -800 A/µs<br>$T_j$ = 25 °C<br>$T_j$ = 125 °C | $Q_{rr}$ | -<br>- | 2.3<br>6 | -<br>- | µC |



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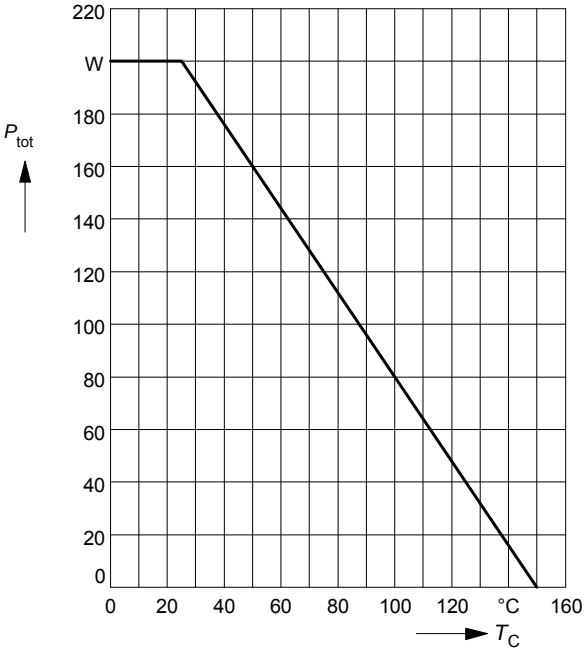
Power dissipation

$P_{tot} = f(T_C)$

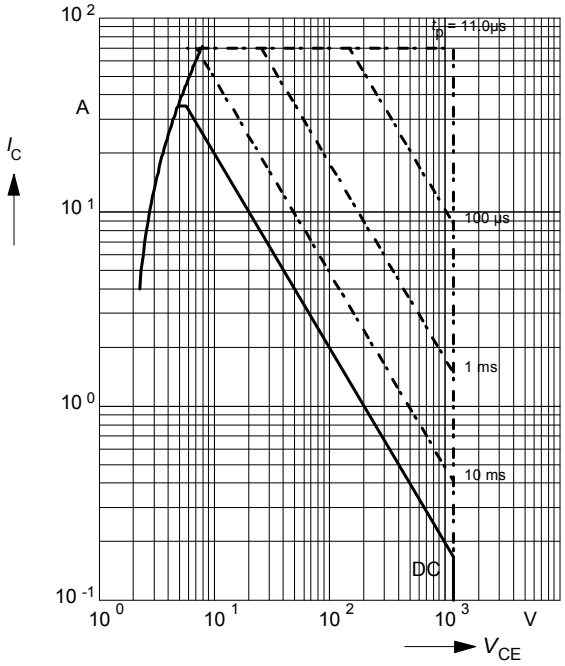
parameter: $T_j \leq 150$ °C




Safe operating area

$I_C = f(V_{CE})$

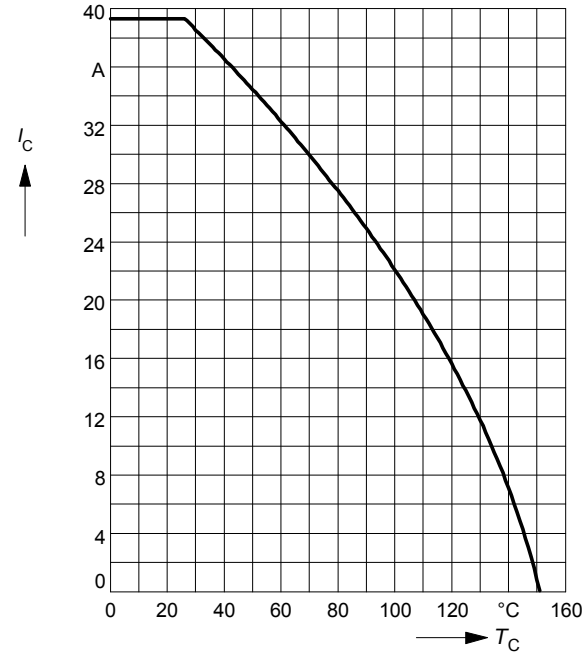
parameter: $D = 0$, $T_C = 25$°C , $T_j \leq 150$ °C




Collector current

$I_C = f(T_C)$

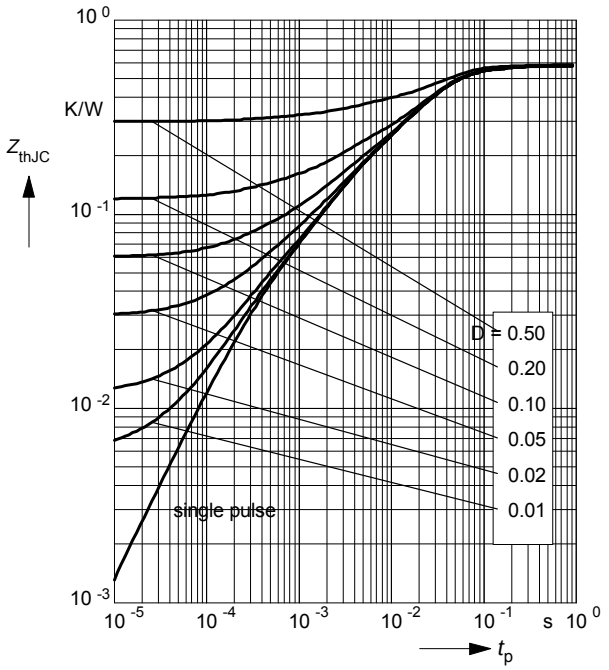
parameter: $V_{GE} \geq 15$ V , $T_j \leq 150$ °C




Transient thermal impedance IGBT

$Z_{th\,JC} = f(t_p)$

parameter: $D = t_p / T$



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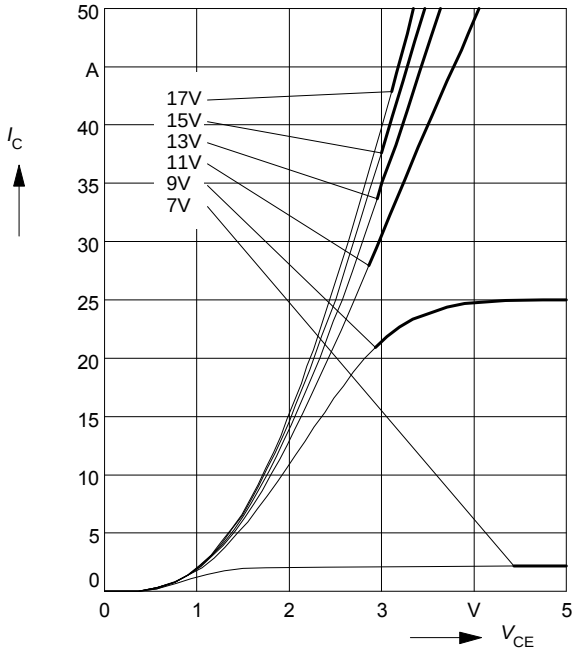
### Typ. output characteristics

$I_C = f(V_{CE})$

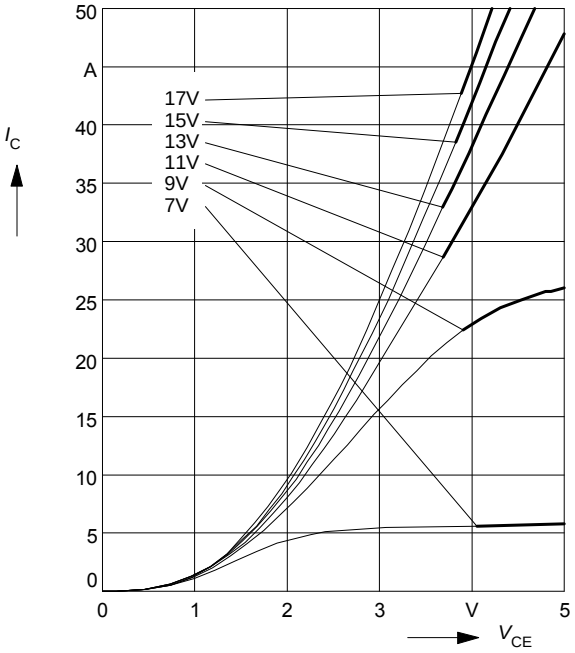
parameter: $t_p$ = 80 µs, $T_j$ = 25 °C




### Typ. output characteristics

$I_C = f(V_{CE})$

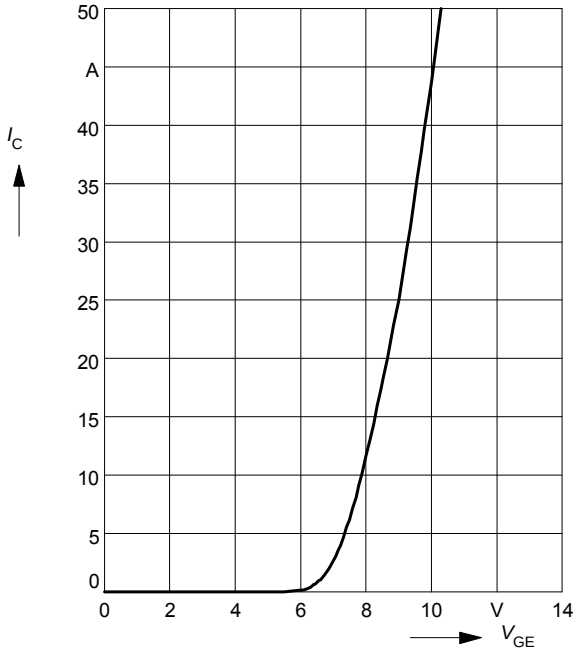
parameter: $t_p$ = 80 µs, $T_j$ = 125 °C




### Typ. transfer characteristics

$I_C = f(V_{GE})$

parameter: $t_p$ = 80 µs, $V_{CE}$ = 20 V



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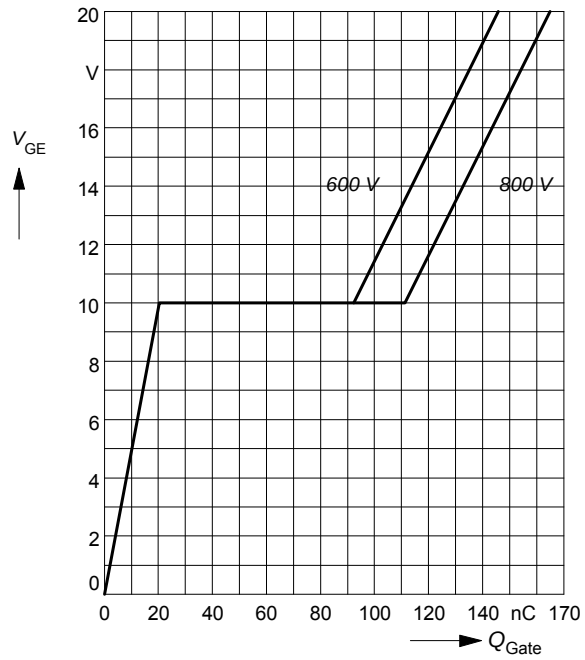
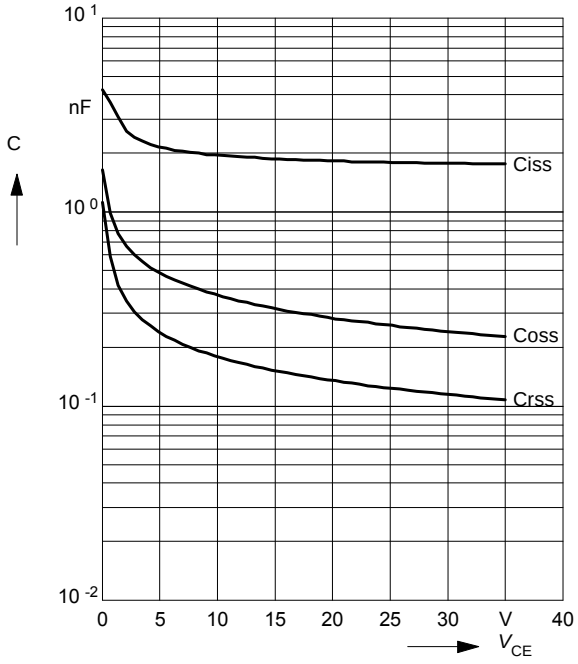
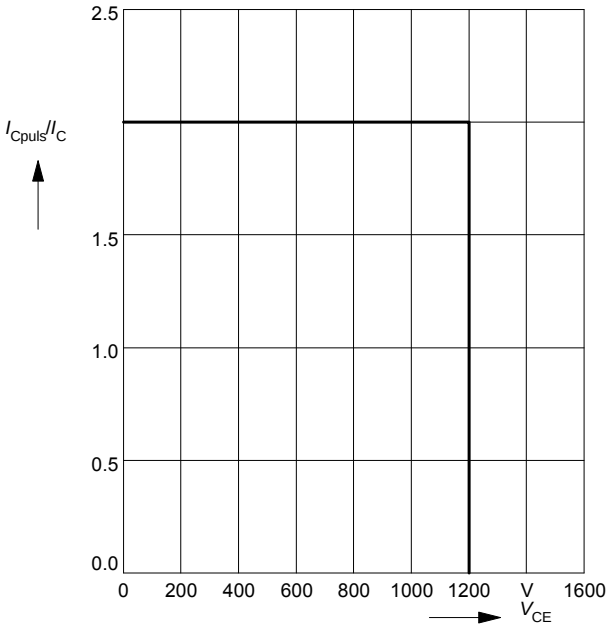
Typ. gate charge
$V_{GE} = f(Q_{Gate})$
parameter: $I_{C\ puls}$ = 25 A



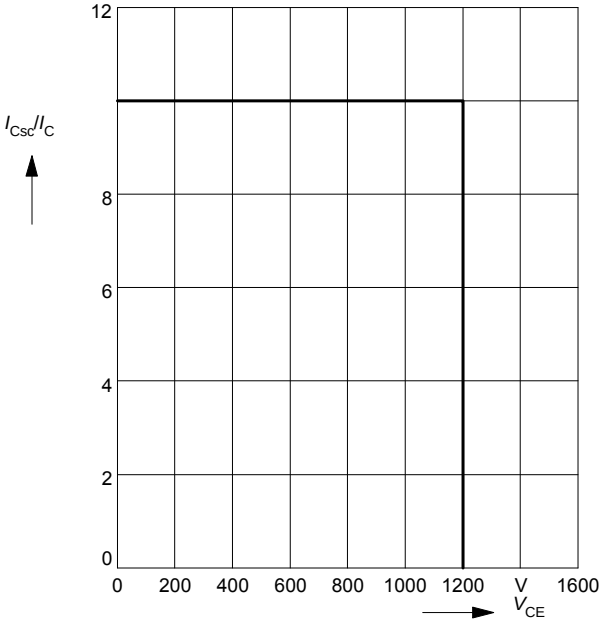

**Typ. capacitances**
$C = f(V_{CE})$
parameter: $V_{GE}$ = 0 V, f = 1 MHz




**Reverse biased safe operating area**
$I_{Cpuls} = f(V_{CE})$ , $T_j$ = 150°C
parameter: $V_{GE}$ = 15 V




**Short circuit safe operating area**
$I_{Csc} = f(V_{CE})$ , $T_j$ = 150°C
parameter: $V_{GE}$ = ± 15 V, $t_{SC}$ ≤ 10 µs, L < 50 nH



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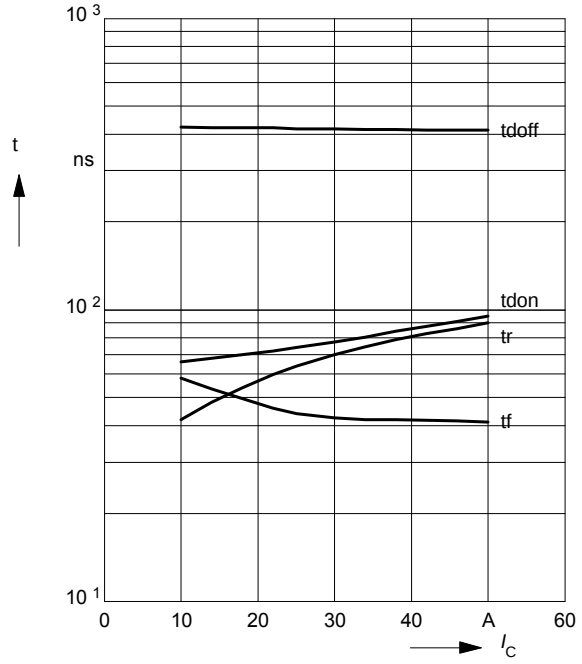
**Typ. switching time**

$I = f(I_C)$ , inductive load , $T_j$ = 125°C

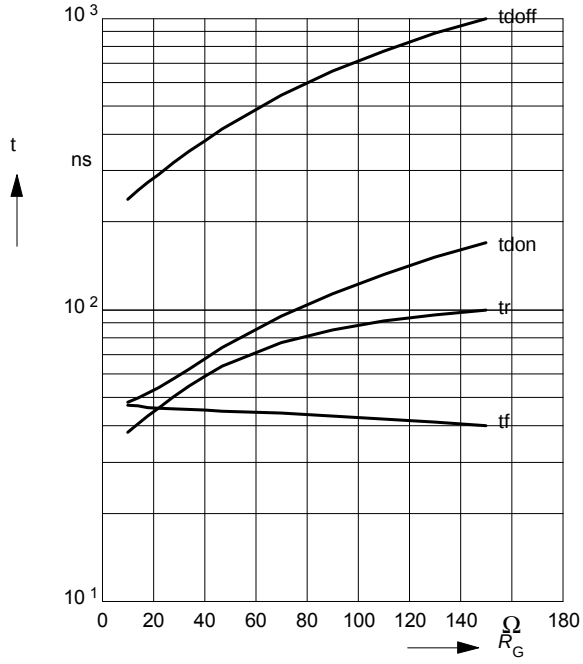
par.: $V_{CE}$ = 600 V, $V_{GE}$ = ± 15 V, $R_G$ = 47 Ω




**Typ. switching time**

$t = f(R_G)$ , inductive load , $T_j$ = 125°C

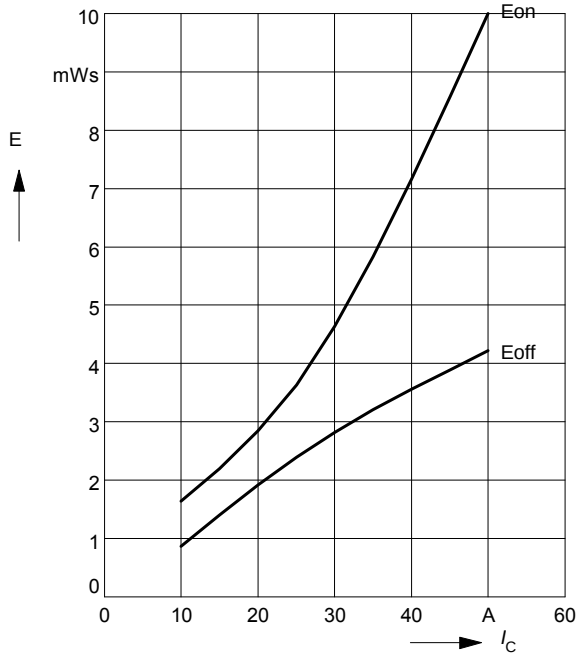
par.: $V_{CE}$ = 600 V, $V_{GE}$ = ± 15 V, $I_C$ = 25 A




**Typ. switching losses**

$E = f(I_C)$ , inductive load , $T_j$ = 125°C

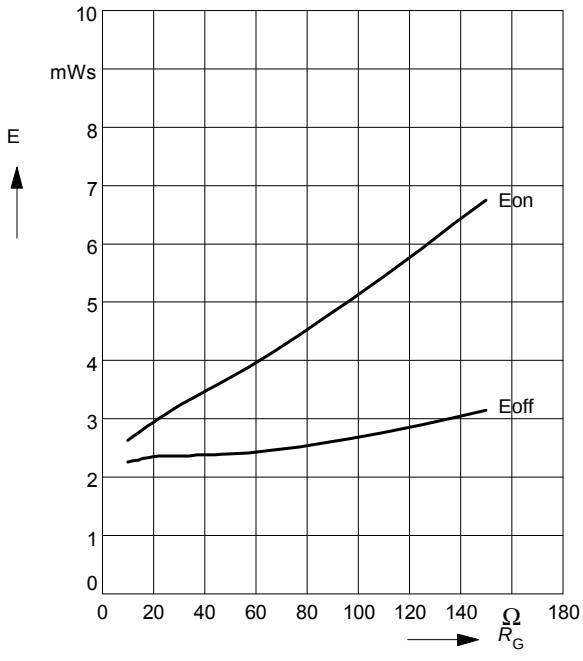
par.: $V_{CE}$ = 600 V, $V_{GE}$ = ± 15 V, $R_G$ = 47 Ω




**Typ. switching losses**

$E = f(R_G)$ , inductive load , $T_j$ = 125°C

par.: $V_{CE}$ = 600V, $V_{GE}$ = ± 15 V, $I_C$ = 25 A



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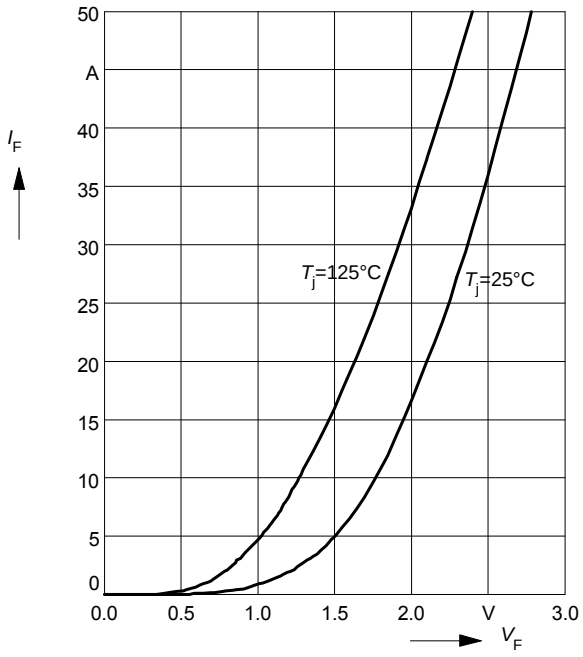
**Forward characteristics of fast recovery reverse diode** $I_F = f(V_F)$

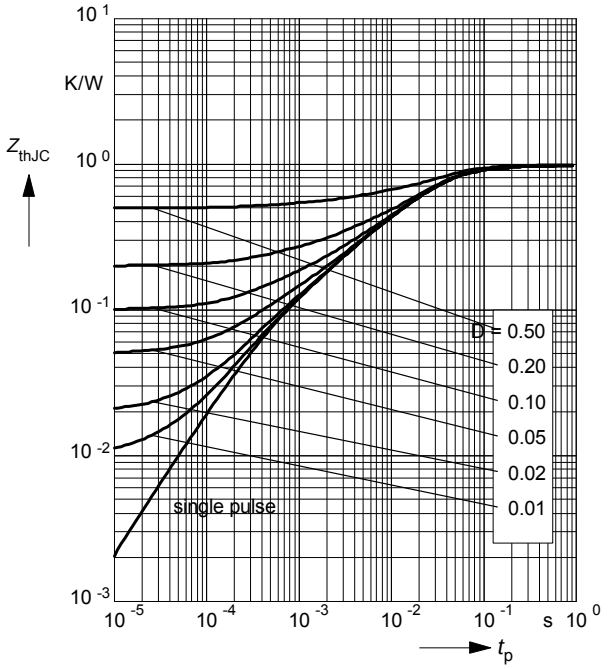
parameter: $T_j$




Transient thermal impedance Diode

$Z_{th\,JC} = f(t_p)$

parameter: $D = t_p / T$



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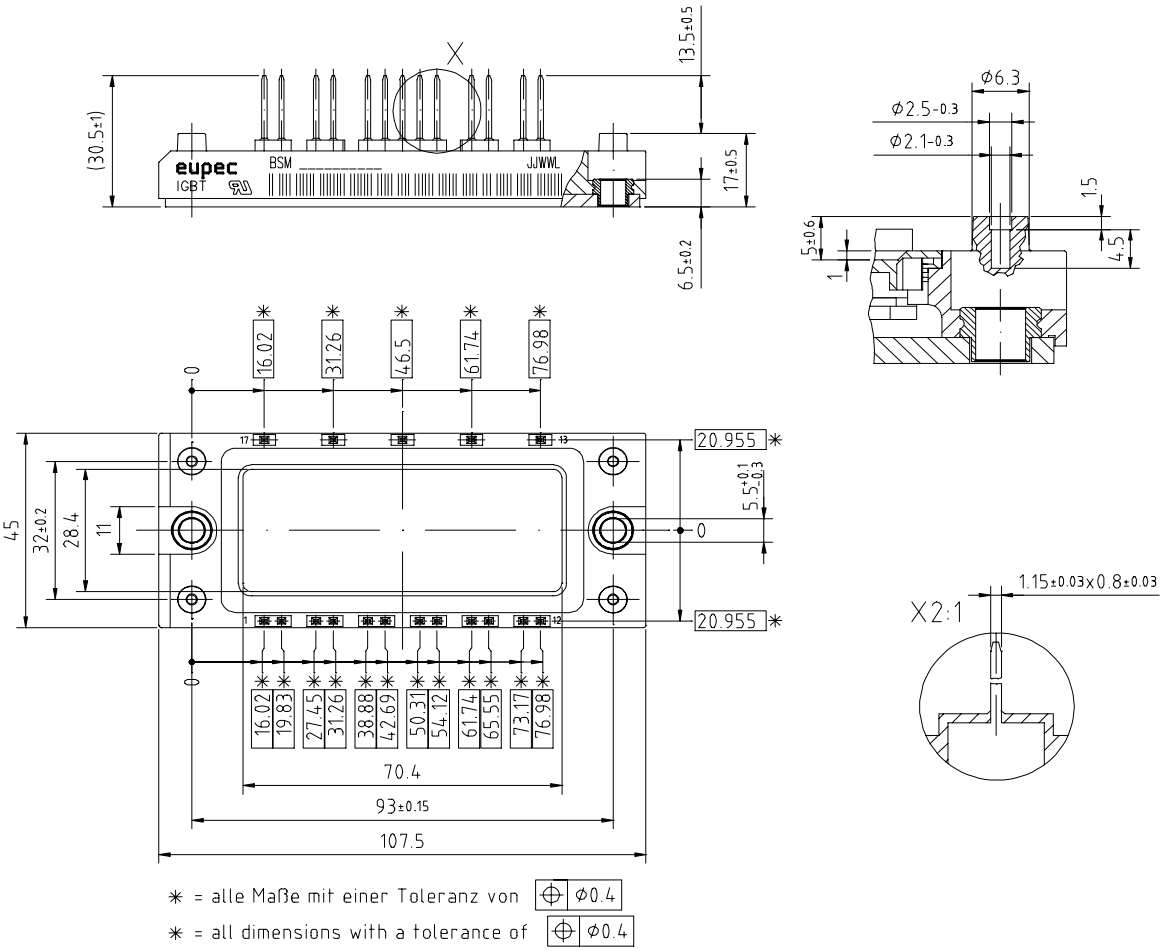
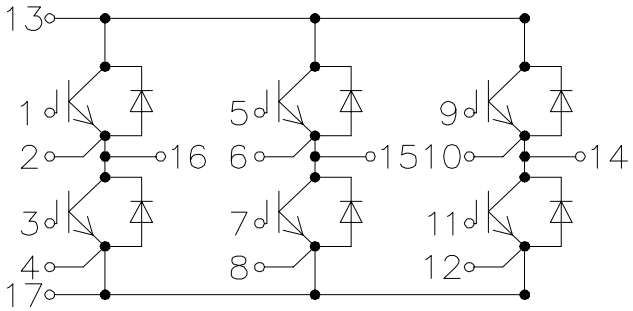
**Gehäusemaße / Schaltbild**
**Package outline / Circuit diagramm**



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