

vorläufige Daten  
preliminary data

### Höchstzulässige Werte / maximum rated values

#### Elektrische Eigenschaften / electrical properties

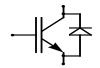
|                                                                          |                                                                    |                      |            |                        |
|--------------------------------------------------------------------------|--------------------------------------------------------------------|----------------------|------------|------------------------|
| Kollektor Emitter Sperrspannung<br>collector emitter voltage             | $T_{vj}=25^{\circ}\text{C}$                                        | $V_{CES}$            | 1200       | V                      |
| Kollektor Dauergleichstrom<br>DC collector current                       | $T_c=80^{\circ}\text{C}$<br>$T_c=25^{\circ}\text{C}$               | $I_{C,nom}$<br>$I_C$ | 150<br>200 | A<br>A                 |
| Periodischer Kollektor Spitzenstrom<br>repetitive peak collector current | $t_p=1\text{ms}$ , $T_c=80^{\circ}\text{C}$                        | $I_{CRM}$            | 300        | A                      |
| Gesamt Verlustleistung<br>total power dissipation                        | $T_c=25^{\circ}\text{C}$ ; Transistor                              | $P_{tot}$            | 700        | W                      |
| Gate Emitter Spitzenspannung<br>gate emitter peak voltage                |                                                                    | $V_{GES}$            | +/- 20     | V                      |
| Dauergleichstrom<br>DC forward current                                   |                                                                    | $I_F$                | 150        | A                      |
| Periodischer Spitzenstrom<br>repetitive peak forward current             | $t_p=1\text{ms}$                                                   | $I_{FRM}$            | 300        | A                      |
| Grenzlastintegral<br>$I^2t$ value                                        | $V_R=0\text{V}$ , $t_p=10\text{ms}$ , $T_{vj}=125^{\circ}\text{C}$ | $I^2t$               | 4,6        | $\text{k A}^2\text{s}$ |
| Isolations Prüfspannung<br>insulation test voltage                       | RMS, $f=50\text{Hz}$ , $t=1\text{min.}$                            | $V_{ISOL}$           | 2,5        | kV                     |

### Charakteristische Werte / characteristic values

#### Transistor Wechselrichter / transistor inverter

|                                                                              |                                                                                                                                                 |              | min.   | typ.       | max.           |               |
|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------|------------|----------------|---------------|
| Kollektor Emitter Sättigungsspannung<br>collector emitter saturation voltage | $I_C=150\text{A}$ , $V_{GE}=15\text{V}$ , $T_{vj}=25^{\circ}\text{C}$<br>$I_C=150\text{A}$ , $V_{GE}=15\text{V}$ , $T_{vj}=125^{\circ}\text{C}$ | $V_{CESat}$  | -<br>- | 1,7<br>2,0 | 2,15<br>t.b.d. | V<br>V        |
| Gate Schwellenspannung<br>gate threshold voltage                             | $I_C=6\text{mA}$ , $V_{CE}=V_{GE}$ , $T_{vj}=25^{\circ}\text{C}$                                                                                | $V_{GE(th)}$ | 5,0    | 5,8        | 6,5            | V             |
| Gateladung<br>gate charge                                                    | $V_{GE}=-15\text{V}...+15\text{V}$                                                                                                              | $Q_G$        | -      | 1,4        | -              | $\mu\text{C}$ |
| Eingangskapazität<br>input capacitance                                       | $f=1\text{MHz}$ , $T_{vj}=25^{\circ}\text{C}$ , $V_{CE}=25\text{V}$ , $V_{GE}=0\text{V}$                                                        | $C_{ies}$    | -      | 10,6       | -              | nF            |
| Rückwirkungskapazität<br>reverse transfer capacitance                        | $f=1\text{MHz}$ , $T_{vj}=25^{\circ}\text{C}$ , $V_{CE}=25\text{V}$ , $V_{GE}=0\text{V}$                                                        | $C_{res}$    | -      | 0,5        | -              | nF            |
| Kollektor Emitter Reststrom<br>collector emitter cutt off current            | $V_{GE}=0\text{V}$ , $T_{vj}=25^{\circ}\text{C}$ , $V_{CE}=600\text{V}$                                                                         | $I_{CES}$    | -      | -          | 5              | mA            |
| Gate Emitter Reststrom<br>gate emitter leakage current                       | $V_{CE}=0\text{V}$ , $V_{GE}=20\text{V}$ , $T_{vj}=25^{\circ}\text{C}$                                                                          | $I_{GES}$    | -      | -          | 400            | nA            |

|                                  |                                 |
|----------------------------------|---------------------------------|
| prepared by: MOD-D2; Mark Münzer | date of publication: 2002-10-28 |
| approved: SM TM; Wilhelm Rusche  | revision: 2.0                   |



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### Charakteristische Werte / characteristic values

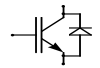
#### Transistor Wechselrichter / transistor inverter

|                                                                                   |                                                                                                                                  |                 | min. | typ. | max. |            |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------|------|------|------|------------|
| Einschaltverzögerungszeit (induktive Last)<br>turn on delay time (inductive load) | $I_C = 150A, V_{CC} = 600V$                                                                                                      | $t_{d,on}$      | -    | 0,25 | -    | $\mu s$    |
|                                                                                   | $V_{GE} = \pm 15V, R_G = 8,2\Omega, T_{vj} = 25^\circ C$                                                                         |                 |      |      |      |            |
|                                                                                   | $V_{GE} = \pm 15V, R_G = 8,2\Omega, T_{vj} = 125^\circ C$                                                                        |                 |      |      |      |            |
| Anstiegszeit (induktive Last)<br>rise time (inductive load)                       | $I_C = 150A, V_{CC} = 600V$                                                                                                      | $t_r$           | -    | 0,09 | -    | $\mu s$    |
|                                                                                   | $V_{GE} = \pm 15V, R_G = 8,2\Omega, T_{vj} = 25^\circ C$                                                                         |                 |      |      |      |            |
|                                                                                   | $V_{GE} = \pm 15V, R_G = 8,2\Omega, T_{vj} = 125^\circ C$                                                                        |                 |      |      |      |            |
| Abschaltverzögerungszeit (induktive Last)<br>turn off delay time (inductive load) | $I_C = 150A, V_{CC} = 600V$                                                                                                      | $t_{d,off}$     | -    | 0,55 | -    | $\mu s$    |
|                                                                                   | $V_{GE} = \pm 15V, R_G = 8,2\Omega, T_{vj} = 25^\circ C$                                                                         |                 |      |      |      |            |
|                                                                                   | $V_{GE} = \pm 15V, R_G = 8,2\Omega, T_{vj} = 125^\circ C$                                                                        |                 |      |      |      |            |
| Fallzeit (induktive Last)<br>fall time (inductive load)                           | $I_C = 150A, V_{CC} = 600V$                                                                                                      | $t_f$           | -    | 0,13 | -    | $\mu s$    |
|                                                                                   | $V_{GE} = \pm 15V, R_G = 8,2\Omega, T_{vj} = 25^\circ C$                                                                         |                 |      |      |      |            |
|                                                                                   | $V_{GE} = \pm 15V, R_G = 8,2\Omega, T_{vj} = 125^\circ C$                                                                        |                 |      |      |      |            |
| Einschaltverlustenergie pro Puls<br>turn on energy loss per pulse                 | $I_C = 150A, V_{CC} = 600V, L_\sigma = 80nH$<br>$V_{GE} = \pm 15V, R_G = 8,2\Omega, T_{vj} = 25^\circ C$                         | $E_{on}$        | -    | 11   | -    | mJ         |
| Ausschaltverlustenergie pro Puls<br>turn off energy loss per pulse                | $I_C = 150A, V_{CC} = 600V, L_\sigma = 80nH$<br>$V_{GE} = \pm 15V, R_G = 8,2\Omega, T_{vj} = 25^\circ C$                         | $E_{off}$       | -    | 24   | -    | mJ         |
| Kurzschlussverhalten<br>SC data                                                   | $t_p \leq 10\mu s, V_{GE} \leq 15V, T_{vj} \leq 125^\circ C$<br>$V_{CC} = 900V, V_{CEmax} = V_{CES} - L_{\sigma CE} \cdot di/dt$ | $I_{SC}$        | -    | 600  | -    | A          |
| Modulinduktivität<br>stray inductance module                                      |                                                                                                                                  | $L_{\sigma CE}$ | -    | 20   | -    | nH         |
| Leitungswiderstand, Anschluss-Chip<br>lead resistance, terminal-chip              | $T_C = 25^\circ C$                                                                                                               | $R_{CC/EE}$     | -    | 1,1  | -    | m $\Omega$ |

### Charakteristische Werte / characteristic values

#### Diode Wechselrichter / diode inverter

|                                                      |                                                   |           |   |      |        |         |
|------------------------------------------------------|---------------------------------------------------|-----------|---|------|--------|---------|
| Durchlassspannung<br>forward voltage                 | $I_F = 150A, V_{GE} = 0V, T_{vj} = 25^\circ C$    | $V_F$     | - | 1,65 | 2,15   | V       |
|                                                      | $I_F = 150A, V_{GE} = 0V, T_{vj} = 125^\circ C$   |           | - | 1,65 | t.b.d. | V       |
| Rückstromspitze<br>peak reverse recovery current     | $I_F = 150A, -di_F/dt = 1500A/\mu s$              | $I_{RM}$  | - | 110  | -      | A       |
|                                                      | $V_R = 600V, V_{GE} = -15V, T_{vj} = 25^\circ C$  |           |   |      |        |         |
|                                                      | $V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$ |           |   |      |        |         |
| Sperrverzögerungsladung<br>recovered charge          | $I_F = 150A, -di_F/dt = 1500A/\mu s$              | $Q_r$     | - | 15   | -      | $\mu C$ |
|                                                      | $V_R = 600V, V_{GE} = -15V, T_{vj} = 25^\circ C$  |           |   |      |        |         |
|                                                      | $V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$ |           |   |      |        |         |
| Ausschaltenergie pro Puls<br>reverse recovery energy | $I_F = 150A, -di_F/dt = 1500A/\mu s$              | $E_{rec}$ | - | 7    | -      | mJ      |
|                                                      | $V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$ |           |   |      |        |         |



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### Charakteristische Werte / characteristic values

NTC-Widerstand / NTC-thermistor

|                                                    |                                                   |              | min. | typ. | max. |            |
|----------------------------------------------------|---------------------------------------------------|--------------|------|------|------|------------|
| Nennwiderstand<br>rated resistance                 | $T_c = 25^\circ\text{C}$                          | $R_{25}$     | -    | 5    | -    | k $\Omega$ |
| Abweichung von $R_{100}$<br>deviation of $R_{100}$ | $T_c = 100^\circ\text{C}$ , $R_{100} = 493\Omega$ | $\Delta R/R$ | -5   | -    | 5    | %          |
| Verlustleistung<br>power dissipation               | $T_c = 25^\circ\text{C}$                          | $P_{25}$     | -    | -    | 20   | mW         |
| B-Wert<br>B-value                                  | $R_2 = R_1 \exp[B(1/T_2 - 1/T_1)]$                | $B_{25/50}$  | -    | 3375 | -    | K          |

### Thermische Eigenschaften / thermal properties

|                                                                         |                                                                                                                                |                      |     |       |                |                  |
|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|----------------------|-----|-------|----------------|------------------|
| Innerer Wärmewiderstand; DC<br>thermal resistance, junction to case; DC | Transistor Wecheln. / transistor inverter<br>Diode Wechselrichter / diode inverter                                             | $R_{thJC}$           | -   | -     | 0,180<br>0,340 | K/W<br>K/W       |
| Übergangs Wärmewiderstand<br>thermal resistance, case to heatsink       | pro Modul / per module<br>$\lambda_{\text{paste}} = 1\text{W/m}^2\text{K}$ / $\lambda_{\text{grease}} = 1\text{W/m}^2\text{K}$ | $R_{thCK}$           | -   | 0,005 | -              | K/W              |
| Höchstzulässige Sperrschichttemp.<br>maximum junction temperature       |                                                                                                                                | $T_{vj \text{ max}}$ | -   | -     | 150            | $^\circ\text{C}$ |
| Betriebstemperatur<br>operation temperature                             |                                                                                                                                | $T_{vj \text{ op}}$  | -40 | -     | 125            | $^\circ\text{C}$ |
| Lagertemperatur<br>storage temperature                                  |                                                                                                                                | $T_{stg}$            | -40 | -     | 125            | $^\circ\text{C}$ |

### Mechanische Eigenschaften / mechanical properties

|                                                                    |                           |   |   |                         |   |    |
|--------------------------------------------------------------------|---------------------------|---|---|-------------------------|---|----|
| Gehäuse, siehe Anlage<br>case, see appendix                        |                           |   |   |                         |   |    |
| Innere Isolation<br>internal insulation                            |                           |   |   | $\text{Al}_2\text{O}_3$ |   |    |
| Kriechstrecke<br>creepage distance                                 |                           |   |   | 12,7                    |   | mm |
| Luftstrecke<br>clearance distance                                  |                           |   |   | 10,0                    |   | mm |
| CTI<br>comperative tracking index                                  |                           |   |   | 225                     |   |    |
| Anzugsdrehmoment, mech. Befestigung<br>mounting torque             | Schraube / screw M5       | M | 3 | -                       | 6 | Nm |
| Anzugsdrehmoment, elektr. Anschlüsse<br>terminal connection torque | Anschlüsse / terminals M6 | M | 3 | -                       | 6 | Nm |
| Gewicht<br>weight                                                  |                           | G |   | 910                     |   | g  |

Mit dieser technischen Information werden Halbleiterbauelemente spezifiziert, jedoch keine Eigenschaften zugesichert. Sie gilt in Verbindung mit den zugehörigen technischen Erläuterungen.

This technical information specifies semiconductor devices but promises no characteristics. It is valid with the belonging technical notes.

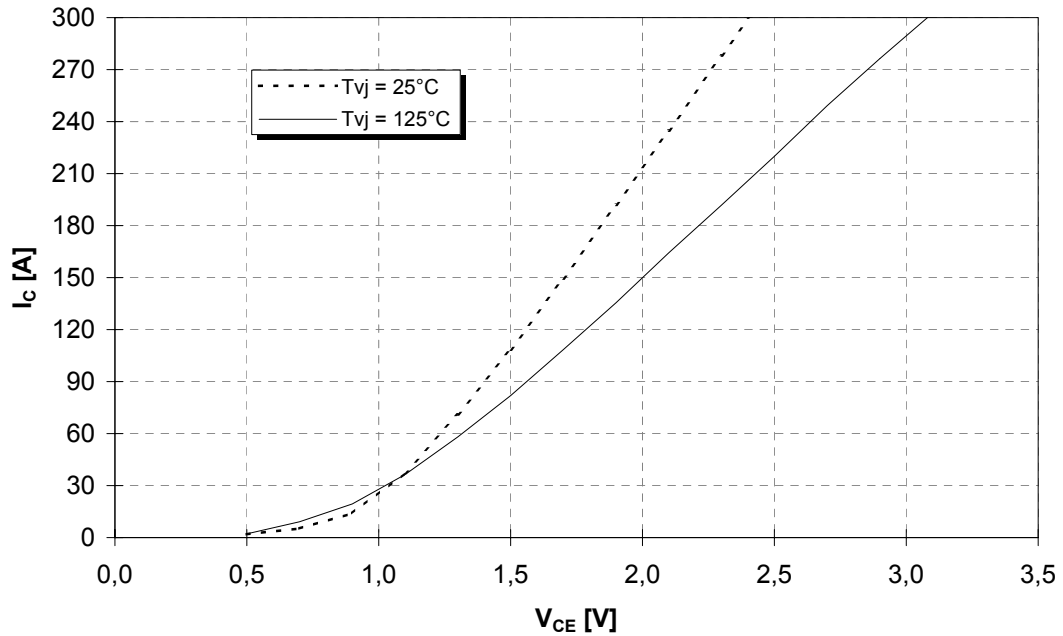


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### Ausgangskennlinie (typisch) output characteristic (typical)

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

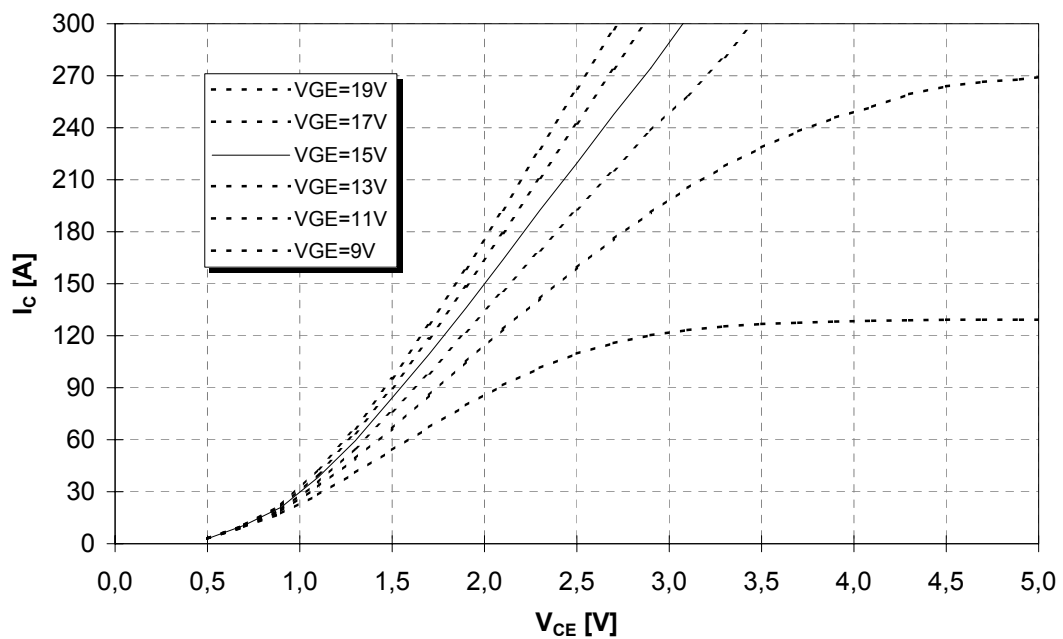
$$V_{GE} = 15V$$



### Ausgangskennlinienfeld (typisch) output characteristic (typical)

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

$$T_{vj} = 125^{\circ}C$$



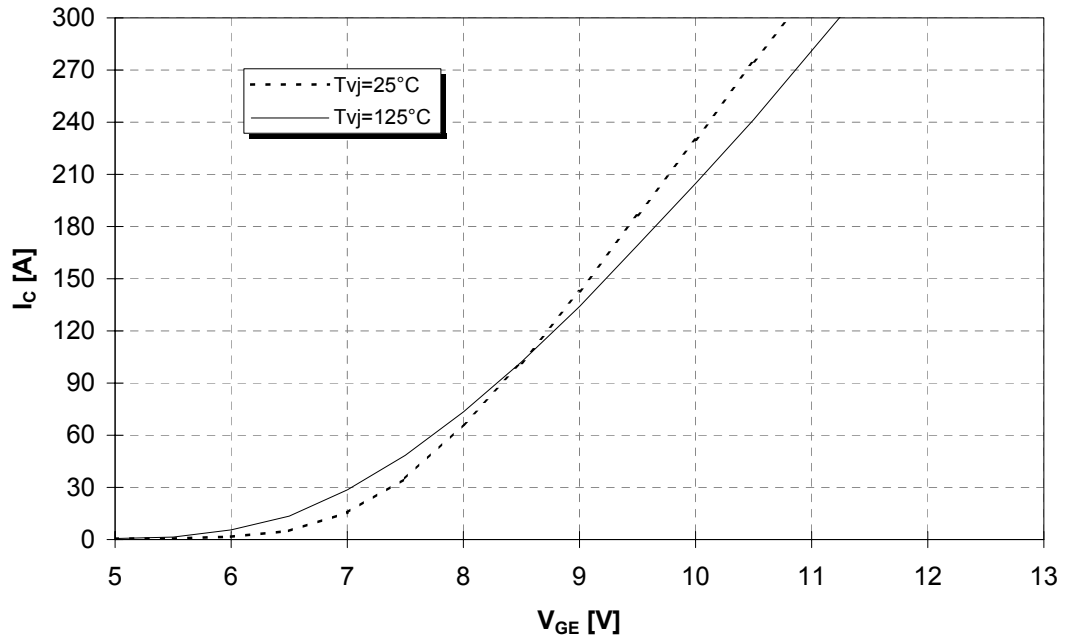


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### Übertragungscharakteristik (typisch) transfer characteristic (typical)

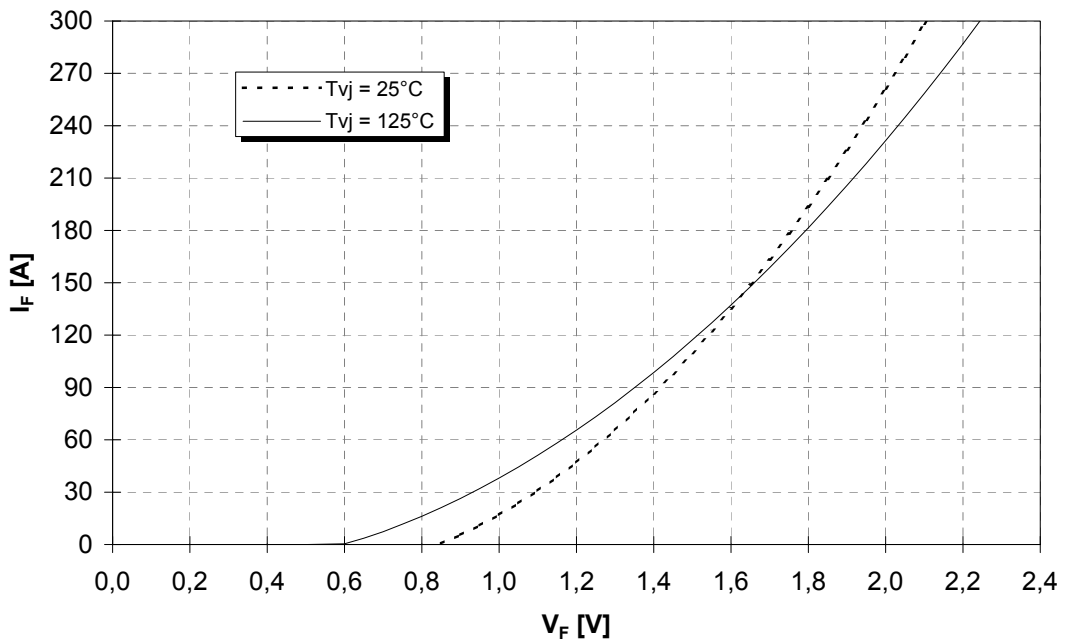
$$I_C = f(V_{GE})$$

$$V_{CE} = 20V$$



### Durchlasskennlinie der Inversdiode (typisch) forward characteristic of inverse diode (typical)

$$I_F = f(V_F)$$



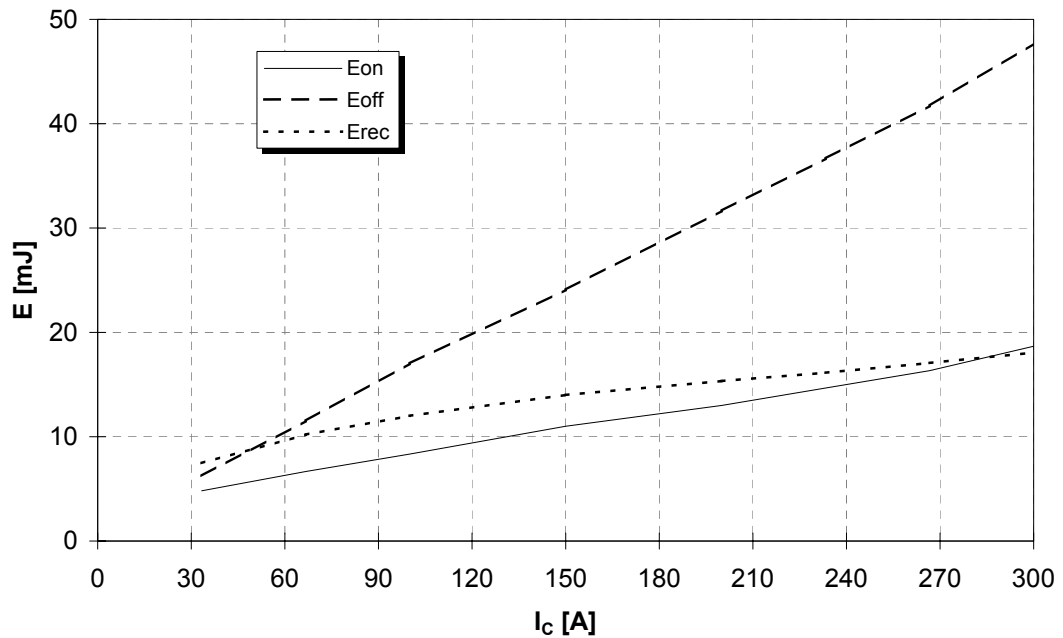


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### Schaltverluste (typisch) Switching losses (typical)

$$E_{on} = f(I_C), E_{off} = f(I_C), E_{rec} = f(I_C)$$

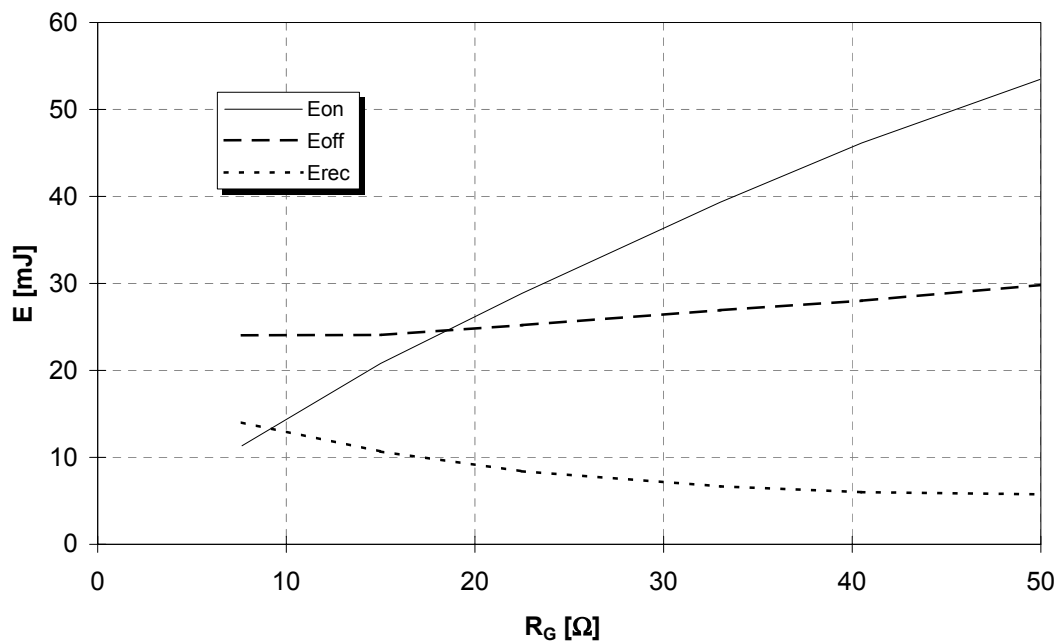
$V_{GE} = \pm 15V, R_G = 8,2\Omega, V_{CE} = 600V, T_{vj} = 125^\circ C$



### Schaltverluste (typisch) Switching losses (typical)

$$E_{on} = f(R_G), E_{off} = f(R_G), E_{rec} = f(R_G)$$

$V_{GE} = \pm 15V, I_C = 150A, V_{CE} = 600V, T_{vj} = 125^\circ C$

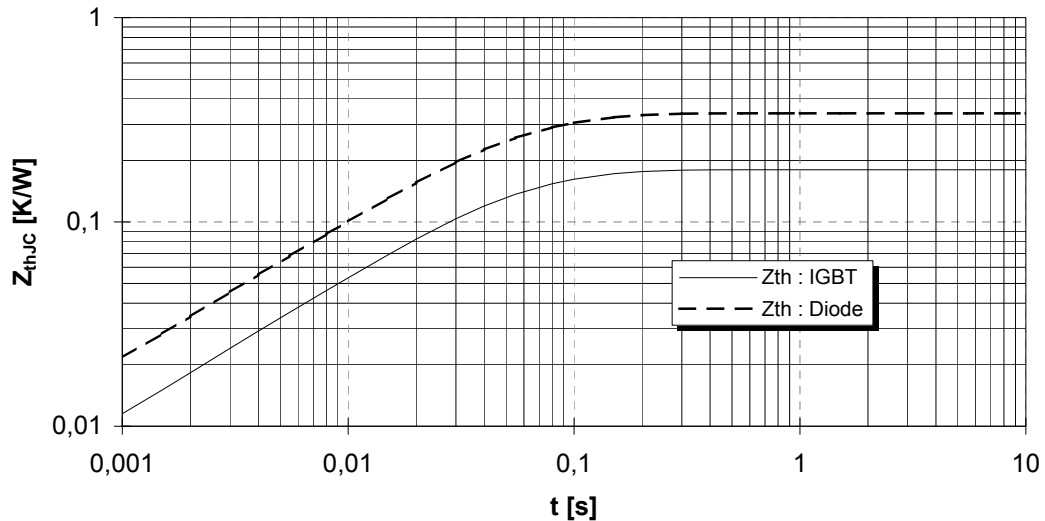




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### Transienter Wärmewiderstand Transient thermal impedance

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

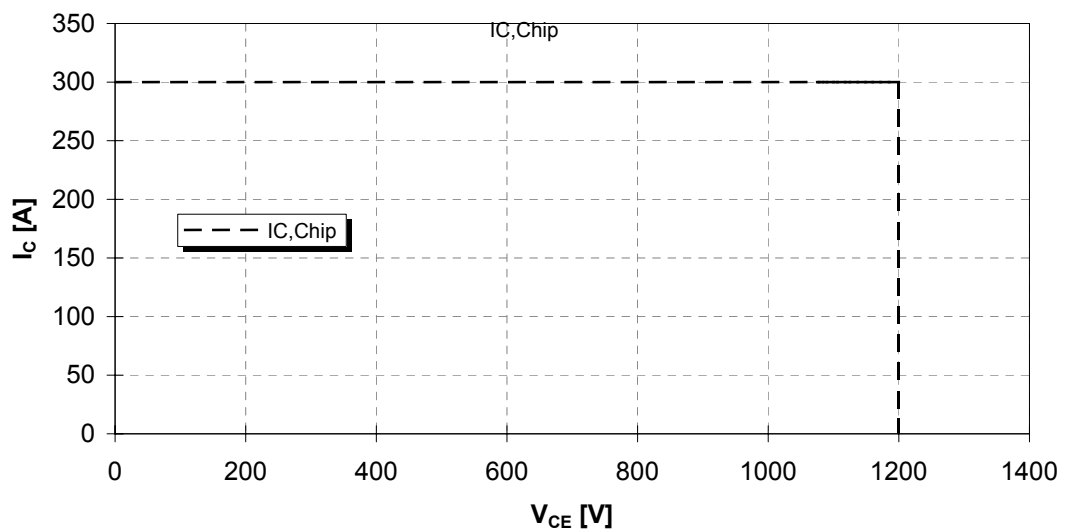


| i                    | 1         | 2         | 3         | 4         |
|----------------------|-----------|-----------|-----------|-----------|
| $r_i$ [K/kW] : IGBT  | 75,66     | 90,68     | 10,25     | 3,41      |
| $\tau_i$ [s] : IGBT  | 6,499E-02 | 2,601E-02 | 2,364E-03 | 1,187E-05 |
| $r_i$ [K/kW] : Diode | 142,85    | 171,43    | 19,31     | 6,41      |
| $\tau_i$ [s] : Diode | 6,499E-02 | 2,601E-02 | 2,364E-03 | 1,187E-05 |

### Sicherer Arbeitsbereich (RBSOA)

### Reverse bias safe operation area (RBSOA)

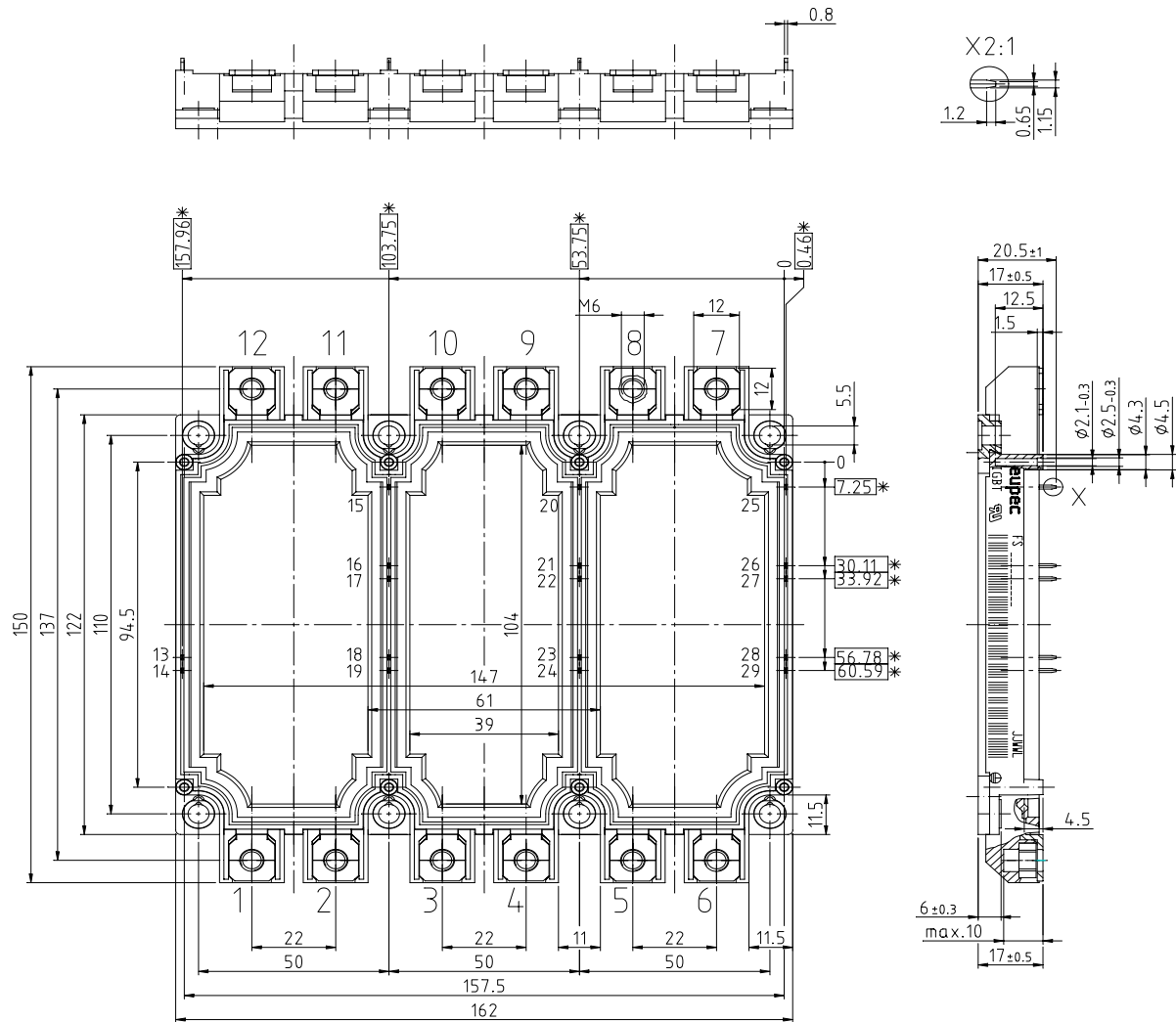
$$V_{GE} = \pm 15V, R_G = 8,2 \Omega, T_{vj} = 125^\circ C$$



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## Gehäusemaße / Schaltbild

## Package outline / Circuit diagram



\* = alle Maße mit einer Toleranz von  $\pm 0.5$

