
 vorläufige Daten
 preliminary data

Höchstzulässige Werte / maximum rated values

Elektrische Eigenschaften / electrical properties

| | | | | |
|--|--|------------------------------|------------|-------------------|
| Kollektor Emitter Sperrspannung collector emitter voltage | | V_{CES} | 1200 | V |
| Kollektor Dauergleichstrom DC collector current | $T_c = 80^\circ\text{C}$ $T_c = 25^\circ\text{C}$ | $I_{C, \text{nom}}$ I_C | 150 200 | A A |
| Periodischer Kollektor Spitzenstrom repetitive peak collector current | $t_p = 1\text{ms}$, $T_c = 80^\circ\text{C}$ | I_{CRM} | 300 | A |
| Gesamt Verlustleistung total power dissipation | $T_c = 25^\circ\text{C}$ | P_{tot} | 700 | W |
| Gate Emitter Spitzenspannung gate emitter peak voltage | | V_{GES} | +/- 20 | V |
| Dauergleichstrom DC forward current | | I_F | 150 | A |
| Periodischer Spitzenstrom repetitive peak forward current | $t_p = 1\text{ms}$ | I_{FRM} | 300 | A |
| Grenzlastintegral I^2t value | $V_R = 0\text{V}$, $t_p = 10\text{ms}$, $T_{vj} = 125^\circ\text{C}$ | I^2t | 4,6 | kA ² s |
| Isolations Prüfspannung 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 collector emitter saturation voltage | $V_{GE} = 15\text{V}$, $T_{vj} = 25^\circ\text{C}$, $I_C = I_{C, \text{nom}}$ | V_{CESat} | - | 1,7 | 2,1 | V |
| | $V_{GE} = 15\text{V}$, $T_{vj} = 125^\circ\text{C}$, $I_C = I_{C, \text{nom}}$ | | - | 2 | t.b.d. | V |
| Gate Schwellenspannung gate threshold voltage | $V_{CE} = V_{GE}$, $T_{vj} = 25^\circ\text{C}$, $I_C = 6\text{mA}$ | $V_{GE(th)}$ | 5 | 5,8 | 6,5 | V |
| Gateladung gate charge | $V_{GE} = -15\text{V} \dots +15\text{V}$ | Q_G | - | 1,4 | - | μC |
| Eingangskapazität 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 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 collector emitter cut 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 gate emitter leakage current | $V_{CE} = 0\text{V}$, $V_{GE} = 20\text{V}$, $T_{vj} = 25^\circ\text{C}$ | I_{GES} | - | - | 400 | nA |

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revision: 2



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Charakteristische Werte / characteristic values

Transistor Wechselrichter / transistor inverter

| | | min. | typ. | max. | | |
|---|--|-----------------|------|------|---|----|
| Einschaltverzögerungszeit (induktive Last) turn on delay time (inductive load) | $I_C = I_{C, nom}, V_{CC} = 600V$ $V_{GE} = \pm 15V, R_G = 8,2\Omega, T_{vj} = 25^\circ C$ | $t_{d,on}$ | - | 250 | - | ns |
| | $V_{GE} = \pm 15V, R_G = 8,2\Omega, T_{vj} = 125^\circ C$ | | - | 300 | - | ns |
| Anstiegszeit (induktive Last) rise time (inductive load) | $I_C = I_{C, nom}, V_{CC} = 600V$ $V_{GE} = \pm 15V, R_G = 8,2\Omega, T_{vj} = 25^\circ C$ | t_r | - | 90 | - | ns |
| | $V_{GE} = \pm 15V, R_G = 8,2\Omega, T_{vj} = 125^\circ C$ | | - | 95 | - | ns |
| Abschaltverzögerungszeit (induktive Last) turn off delay time (inductive load) | $I_C = I_{C, nom}, V_{CC} = 600V$ $V_{GE} = \pm 15V, R_G = 8,2\Omega, T_{vj} = 25^\circ C$ | $t_{d,off}$ | - | 550 | - | ns |
| | $V_{GE} = \pm 15V, R_G = 8,2\Omega, T_{vj} = 125^\circ C$ | | - | 650 | - | ns |
| Fallzeit (induktive Last) fall time (inductive load) | $I_C = I_{C, nom}, V_{CC} = 600V$ $V_{GE} = \pm 15V, R_G = 8,2\Omega, T_{vj} = 25^\circ C$ | t_f | - | 130 | - | ns |
| | $V_{GE} = \pm 15V, R_G = 8,2\Omega, T_{vj} = 125^\circ C$ | | - | 180 | - | ns |
| Einschaltverlustenergie pro Puls turn on energy loss per pulse | $I_C = I_{C, nom}, V_{CC} = 600V, L_\sigma = 80nH$ $V_{GE} = \pm 15V, R_G = 8,2\Omega, T_{vj} = 25^\circ C$ | E_{on} | - | 11 | - | mJ |
| Ausschaltverlustenergie pro Puls turn off energy loss per pulse | $I_C = I_{C, nom}, V_{CC} = 600V, L_\sigma = 80nH$ $V_{GE} = \pm 15V, R_G = 8,2\Omega, T_{vj} = 25^\circ C$ | E_{off} | - | 24 | - | mJ |
| Kurzschlussverhalten SC data | $t_p \leq 10\mu sec, V_{GE} \leq 15V, T_{vj} \leq 125^\circ C$ $V_{CC} = 900V, V_{CEmax} = V_{CES} - L_{\sigma CE} \cdot di/dt$ | I_{SC} | - | 600 | - | A |
| Modulinduktivität stray inductance module | | $L_{\sigma CE}$ | - | 20 | - | nH |
| Leitungswiderstand, Anschluss-Chip lead resistance, terminal-chip | $T_c = 25^\circ C$ | $R_{CC/EE}$ | - | 1,1 | - | mΩ |

Charakteristische Werte / characteristic values

Diode Wechselrichter / diode inverter

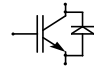
| | | | | | | |
|--|--|-----------|---|------|--------|----|
| Durchlassspannung forward voltage | $I_F = I_{C, nom}, V_{GE} = 0V, T_{vj} = 25^\circ C$ | V_F | - | 1,65 | 2,1 | V |
| | $I_F = I_{C, nom}, V_{GE} = 0V, T_{vj} = 125^\circ C$ | | - | 1,65 | t.b.d. | V |
| Rückstromspitze peak reverse recovery current | $I_F = I_{C, nom}, -di_F/dt = 1500A/\mu s$ $V_R = 600V, V_{GE} = -15V, T_{vj} = 25^\circ C$ | I_{RM} | - | 110 | - | A |
| | $V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$ | | - | 140 | - | A |
| Sperrverzögerungsladung recovered charge | $I_F = I_{C, nom}, -di_F/dt = 1500A/\mu s$ $V_R = 600V, V_{GE} = -15V, T_{vj} = 25^\circ C$ | Q_r | - | 15 | - | μQ |
| | $V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$ | | - | 28 | - | μQ |
| Ausschaltenergie pro Puls reverse recovery energy | $I_F = I_{C, nom}, -di_F/dt = 1500A/\mu s$ $V_R = 600V, V_{GE} = -15V, T_{vj} = 25^\circ C$ | E_{rec} | - | 7 | - | mJ |
| | $V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$ | | - | 14 | - | mJ |

Technische Information / technical information

eupec

IGBT-Module
IGBT-Modules

FS150R12KE3 G



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Charakteristische Werte / characteristic values

NTC-Widerstand / NTC-thermistor

| | | | min. | typ. | max. | |
|--|---|--------------|------|------|------|------------|
| Nennwiderstand rated resistance | $T_c = 25^\circ\text{C}$ | R_{25} | - | 5 | - | k Ω |
| Abweichung von R_{100} deviation of R_{100} | $T_c = 100^\circ\text{C}$, $R_{100} = 493\Omega$ | $\Delta R/R$ | -5 | - | 5 | % |
| Verlustleistung power dissipation | $T_c = 25^\circ\text{C}$ | P_{25} | - | - | 20 | mW |
| B-Wert 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 thermal resistance, junction to case; DC | Transistor Wechselr. / transistor inverter | R_{thJC} | - | - | 0,18 | K/W |
| | Diode Wechselrichter / diode inverter | | - | - | 0,34 | K/W |
| Übergangs Wärmewiderstand thermal resistance, case to heatsink | pro Modul / per module $\lambda_{paste} = 1\text{W/m}^2\text{K}$ / $\lambda_{grease} = 1\text{W/m}^2\text{K}$ | R_{thCK} | - | 0,005 | - | K/W |
| Höchstzulässige Sperrschichttemp. maximum junction temperature | | T_{vjmax} | - | - | 150 | $^\circ\text{C}$ |
| Betriebstemperatur operation temperature | | T_{vjop} | -40 | - | 125 | $^\circ\text{C}$ |
| Lagertemperatur storage temperature | | T_{stg} | -40 | - | 125 | $^\circ\text{C}$ |

Mechanische Eigenschaften / mechanical properties

| | | | | | | |
|--|-------------------------|---|---|-------------------------|---|----|
| Gehäuse, siehe Anlage case, see appendix | | | | | | |
| Innere Isolation internal insulation | | | | Al_2O_3 | | |
| CTI comperative tracking index | | | | 225 | | |
| Anzugsdrehmoment, mech. Befestigung mounting torque | Schraube M5 screw M5 | M | 3 | - | 6 | Nm |
| Anzugsdrehmoment, elektr. Anschlüsse terminal connection torque | Schraube M6 screw M6 | M | 3 | - | 6 | Nm |
| Gewicht weight | | G | | 800 | | g |

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

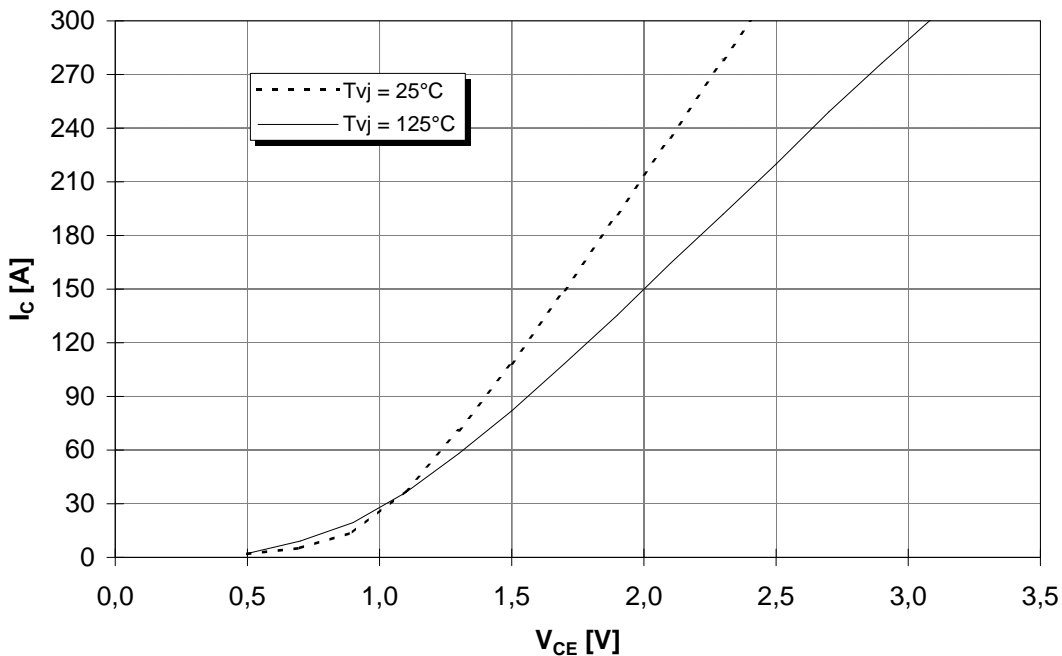
This technical information specifies semiconductor devices but promises no characteristics. It is valid with the belonging technical notes.



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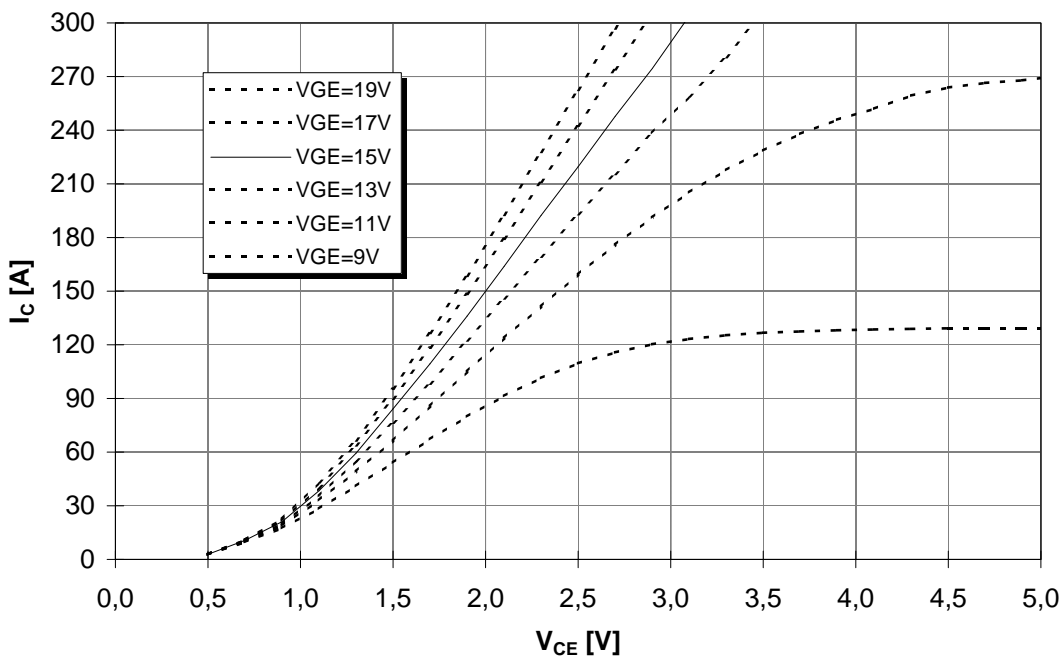
Ausgangskennlinie (typisch)
output characteristic (typical)

$I_C = f(V_{CE})$
 $V_{GE} = 15V$



Ausgangskennlinienfeld (typisch)
output characteristic (typical)

$I_C = f(V_{CE})$
 $T_{vj} = 125^\circ C$

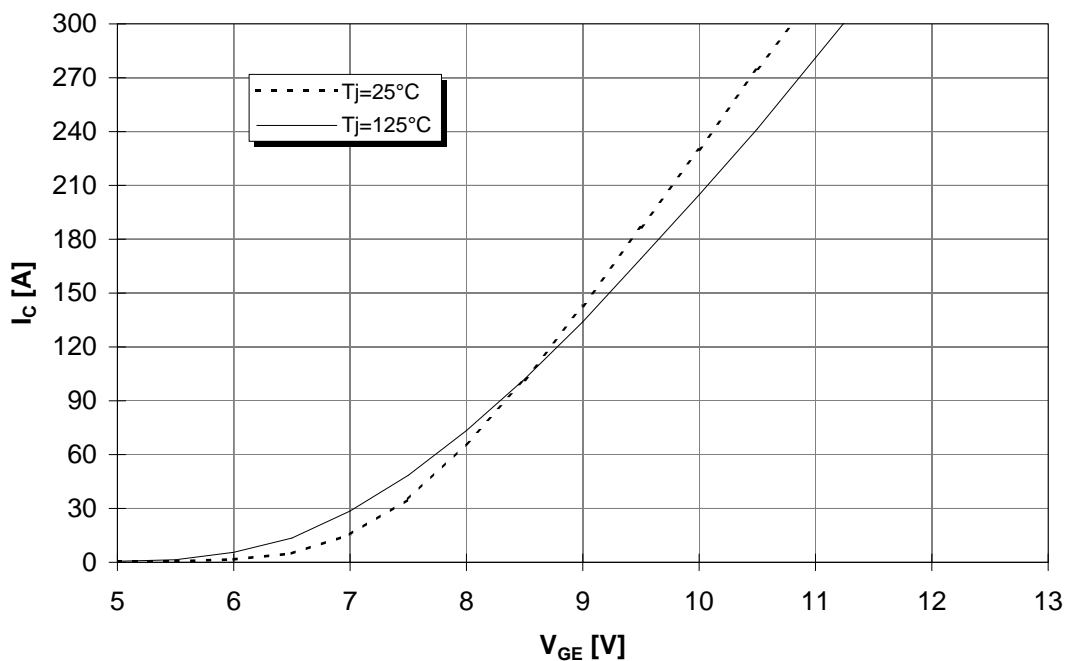




vorläufige Daten
preliminary data

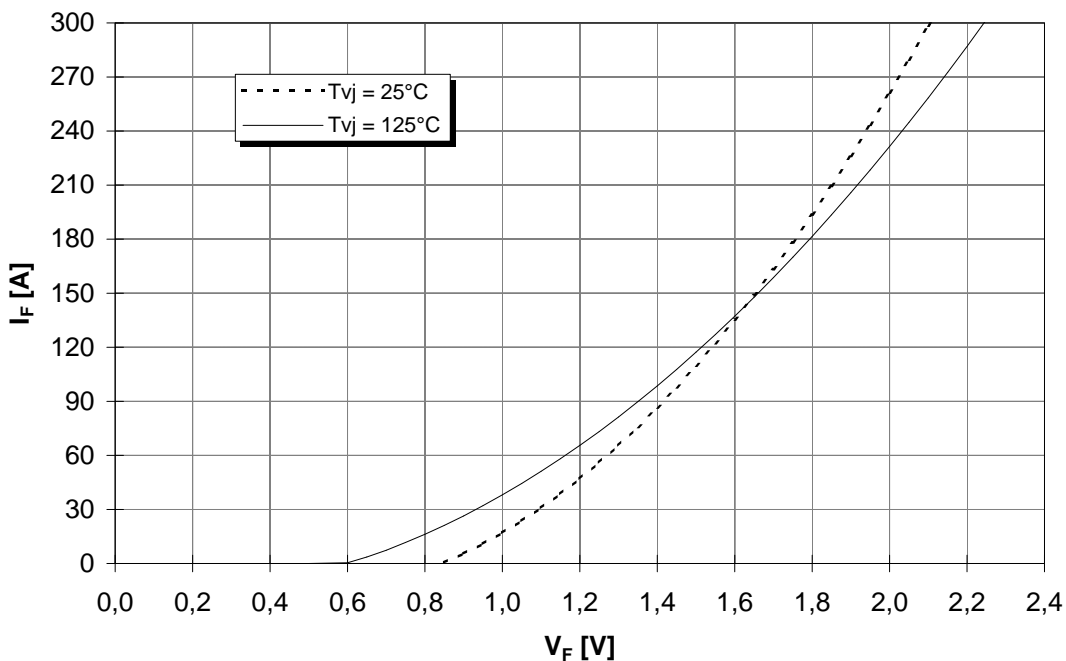
Übertragungscharakteristik (typisch)
transfer characteristic (typical)

$I_C = f(V_{GE})$
 $V_{CE} = 20V$



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

$I_F = f(V_F)$



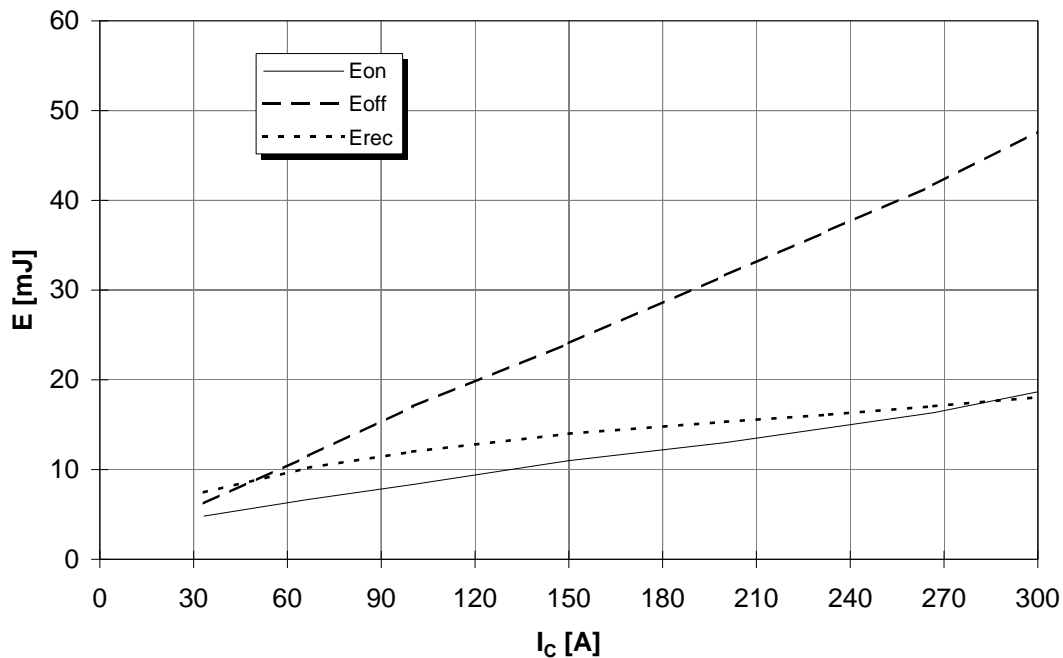


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Schaltverluste (typisch)
Switching losses (typical)

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

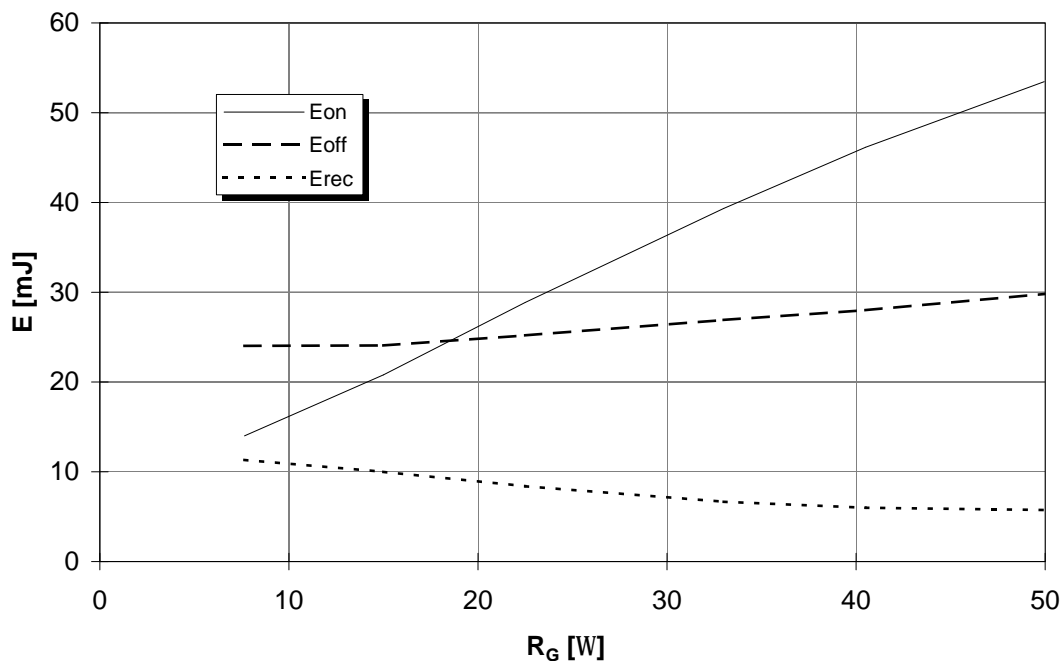
$V_{GE}=15V$, $R_{qon}=R_{qoff}=8,2W$, $V_{CE}=600V$, $T_i=125^\circ C$

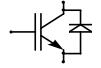


Schaltverluste (typisch)
Switching losses (typical)

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

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

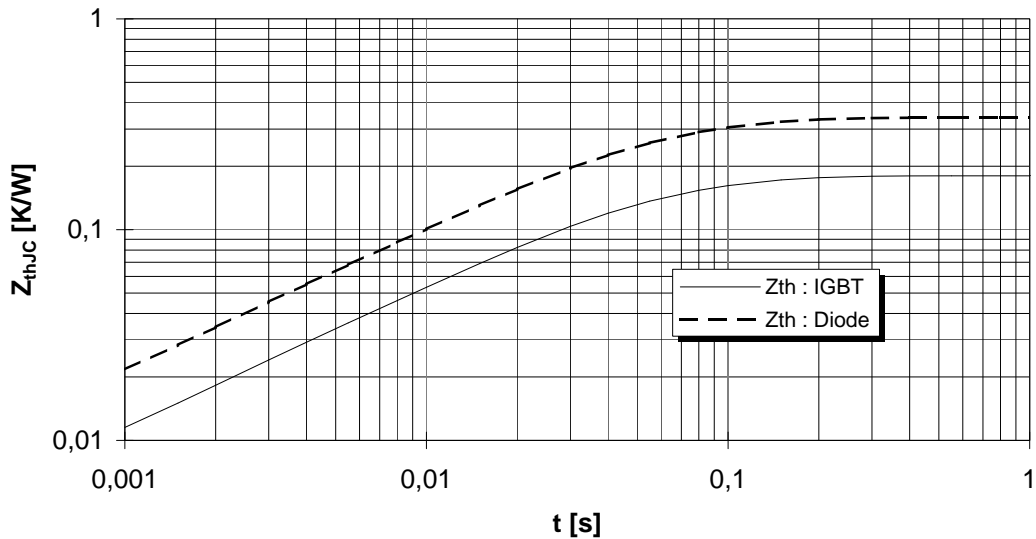




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Transienter Wärmewiderstand Transient thermal impedance

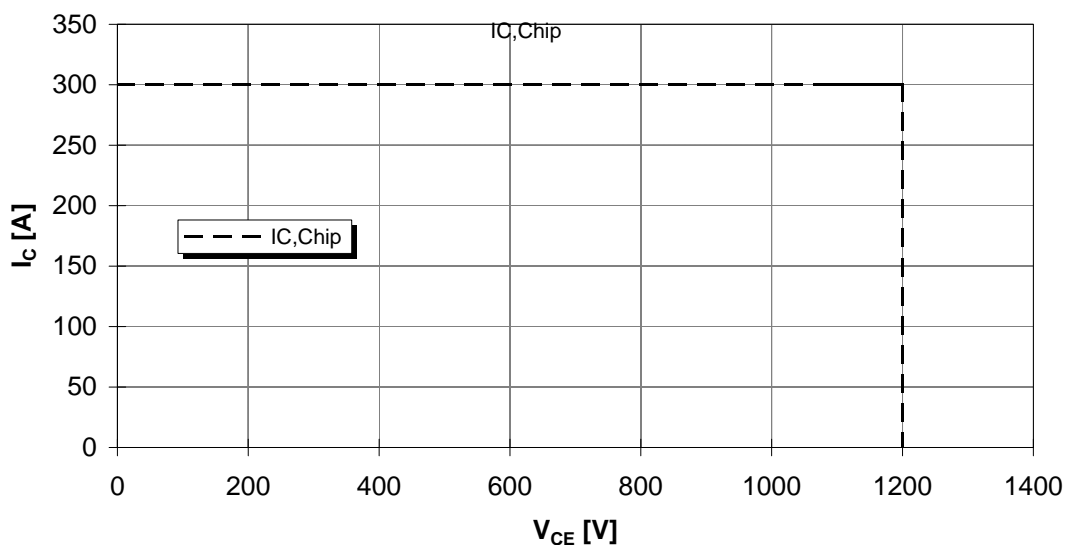
$$Z_{thJC} = f(t)$$



| i | 1 | 2 | 3 | 4 |
|----------------------|-----------|-----------|-----------|-----------|
| r_i [K/kW] : IGBT | 75,66 | 90,68 | 10,25 | 3,41 |
| t_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 |
| t_i [s] : Diode | 6,499E-02 | 2,601E-02 | 2,364E-03 | 1,187E-05 |

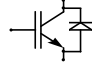
Sicherer Arbeitsbereich (RBSOA) Reverse bias safe operation area (RBSOA)

$$V_{GE}=15V, T_F=125^{\circ}C$$



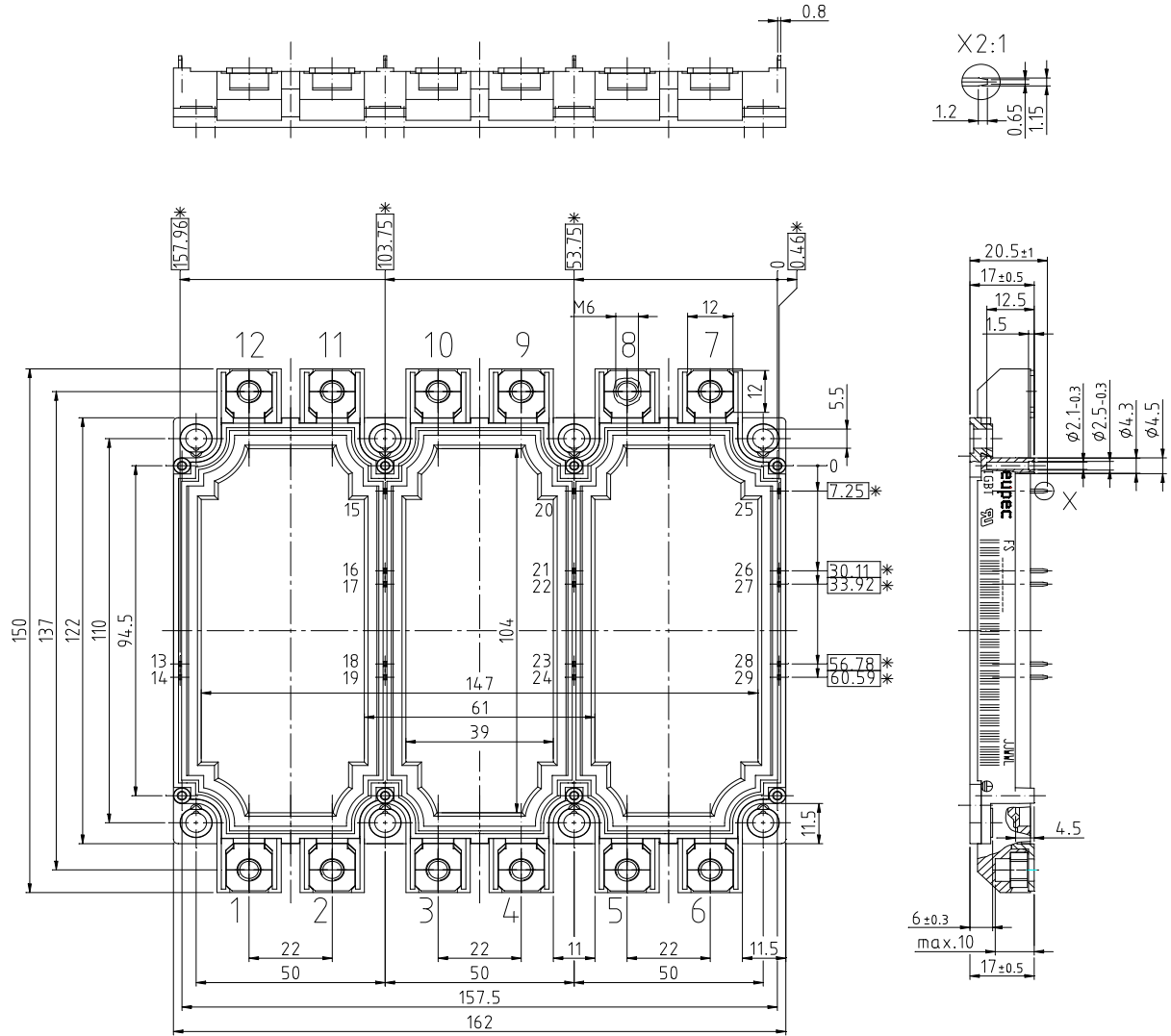
IGBT-Module
IGBT-Modules

FS150R12KE3 G



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Gehäusemaße / Schaltbild Package outline / Circuit diagram



* = alle Maße mit einer Toleranz von ± 0.05

