

EconoPIM™3 Modul mit Trench/Feldstopp IGBT4 und Emitter Controlled 4 Diode  
EconoPIM™3 module with trench/fieldstop IGBT4 and Emitter Controlled 4 diode

### Vorläufige Daten Preliminary Data

### IGBT, Wechselrichter / IGBT, Inverter

#### Höchstzulässige Werte / Maximum Rated Values

|                                                                          |                                                              |                    |       |   |
|--------------------------------------------------------------------------|--------------------------------------------------------------|--------------------|-------|---|
| Kollektor-Emitter-Sperrspannung<br>Collector-emitter voltage             | $T_{vj} = 25^{\circ}\text{C}$                                | $V_{CES}$          | 1200  | V |
| Kollektor-Dauergleichstrom<br>Continuous DC collector current            | $T_C = 95^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $I_{C\text{ nom}}$ | 75    | A |
| Periodischer Kollektor-Spitzenstrom<br>Repetitive peak collector current | $t_P = 1\text{ ms}$                                          | $I_{CRM}$          | 150   | A |
| Gesamt-Verlustleistung<br>Total power dissipation                        | $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $P_{\text{tot}}$   | 385   | W |
| Gate-Emitter-Spitzenspannung<br>Gate-emitter peak voltage                |                                                              | $V_{GES}$          | +/-20 | V |

#### Charakteristische Werte / Characteristic Values

|                                                                                 |                                                                                                                                                                                            |                                                                                                   | min.                | typ.                 | max. |                                                 |
|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------|----------------------|------|-------------------------------------------------|
| Kollektor-Emitter-Sättigungsspannung<br>Collector-emitter saturation voltage    | $I_C = 75\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 75\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 75\text{ A}, V_{GE} = 15\text{ V}$                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_{CE\text{ sat}}$ | 1,85<br>2,15<br>2,25 | 2,15 | V<br>V<br>V                                     |
| Gate-Schwellenspannung<br>Gate threshold voltage                                | $I_C = 2,40\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                       |                                                                                                   | $V_{GEth}$          | 5,2                  | 5,8  | 6,4 V                                           |
| Gateladung<br>Gate charge                                                       | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                                                                                                                 |                                                                                                   | $Q_G$               | 0,57                 |      | $\mu\text{C}$                                   |
| Interner Gatewiderstand<br>Internal gate resistor                               | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                                                              |                                                                                                   | $R_{Gint}$          | 10                   |      | $\Omega$                                        |
| Eingangskapazität<br>Input capacitance                                          | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                 |                                                                                                   | $C_{ies}$           | 4,30                 |      | nF                                              |
| Rückwirkungskapazität<br>Reverse transfer capacitance                           | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                 |                                                                                                   | $C_{res}$           | 0,16                 |      | nF                                              |
| Kollektor-Emitter-Reststrom<br>Collector-emitter cut-off current                | $V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                 |                                                                                                   | $I_{CES}$           |                      | 1,0  | mA                                              |
| Gate-Emitter-Reststrom<br>Gate-emitter leakage current                          | $V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                   |                                                                                                   | $I_{GES}$           |                      | 100  | nA                                              |
| Einschaltverzögerungszeit, induktive Last<br>Turn-on delay time, inductive load | $I_C = 75\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 1,1\ \Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{d\text{ on}}$   | 0,16<br>0,17<br>0,17 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Anstiegszeit, induktive Last<br>Rise time, inductive load                       | $I_C = 75\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 1,1\ \Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_r$               | 0,03<br>0,04<br>0,04 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Abschaltverzögerungszeit, induktive Last<br>Turn-off delay time, inductive load | $I_C = 75\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 1,1\ \Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{d\text{ off}}$  | 0,34<br>0,43<br>0,45 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Fallzeit, induktive Last<br>Fall time, inductive load                           | $I_C = 75\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 1,1\ \Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_f$               | 0,08<br>0,15<br>0,17 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Einschaltverlustenergie pro Puls<br>Turn-on energy loss per pulse               | $I_C = 75\text{ A}, V_{CE} = 600\text{ V}, L_S = 40\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, di/dt = 2500\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Gon} = 1,1\ \Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{on}$            | 3,10<br>6,60<br>7,65 |      | mJ<br>mJ<br>mJ                                  |
| Abschaltverlustenergie pro Puls<br>Turn-off energy loss per pulse               | $I_C = 75\text{ A}, V_{CE} = 600\text{ V}, L_S = 40\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, du/dt = 3600\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Goff} = 1,1\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{off}$           | 4,20<br>6,40<br>7,20 |      | mJ<br>mJ<br>mJ                                  |
| Kurzschlußverhalten<br>SC data                                                  | $V_{GE} \leq 15\text{ V}, V_{CC} = 800\text{ V}$<br>$V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$<br>$t_P \leq 10\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$                                |                                                                                                   | $I_{SC}$            | 270                  |      | A                                               |
| Wärmewiderstand, Chip bis Gehäuse<br>Thermal resistance, junction to case       | pro IGBT / per IGBT                                                                                                                                                                        |                                                                                                   | $R_{thJC}$          |                      | 0,39 | K/W                                             |
| Wärmewiderstand, Gehäuse bis Kühlkörper<br>Thermal resistance, case to heatsink | pro IGBT / per IGBT<br>$\lambda_{Paste} = 1\text{ W}/(\text{m} \cdot \text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m} \cdot \text{K})$                                                  |                                                                                                   | $R_{thCH}$          |                      | 0,13 | K/W                                             |
| Temperatur im Schaltbetrieb<br>Temperature under switching conditions           |                                                                                                                                                                                            |                                                                                                   | $T_{vj\text{ op}}$  | -40                  | 150  | $^{\circ}\text{C}$                              |

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Vorläufige Daten  
Preliminary Data

## Diode, Wechselrichter / Diode, Inverter

## Höchstzulässige Werte / Maximum Rated Values

|                                                                     |                                                                            |           |      |                      |
|---------------------------------------------------------------------|----------------------------------------------------------------------------|-----------|------|----------------------|
| Periodische Spitzensperrspannung<br>Repetitive peak reverse voltage | $T_{vj} = 25^{\circ}\text{C}$                                              | $V_{RRM}$ | 1200 | V                    |
| Dauergleichstrom<br>Continuous DC forward current                   |                                                                            | $I_F$     | 75   | A                    |
| Periodischer Spitzenstrom<br>Repetitive peak forward current        | $t_P = 1\text{ ms}$                                                        | $I_{FRM}$ | 150  | A                    |
| Grenzlastintegral<br>$I^2t$ - value                                 | $V_R = 0\text{ V}$ , $t_P = 10\text{ ms}$ , $T_{vj} = 125^{\circ}\text{C}$ | $I^2t$    | 960  | $\text{A}^2\text{s}$ |

## Charakteristische Werte / Characteristic Values

|                                                                                 |                                                                                                                                                  |                                                                                                   |                    | min. | typ.                 | max. |                                                 |
|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------|------|----------------------|------|-------------------------------------------------|
| Durchlassspannung<br>Forward voltage                                            | $I_F = 75\text{ A}$ , $V_{GE} = 0\text{ V}$<br>$I_F = 75\text{ A}$ , $V_{GE} = 0\text{ V}$<br>$I_F = 75\text{ A}$ , $V_{GE} = 0\text{ V}$        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_F$              |      | 1,70<br>1,65<br>1,65 | 2,15 | V<br>V<br>V                                     |
| Rückstromspitze<br>Peak reverse recovery current                                | $I_F = 75\text{ A}$ , $-di_F/dt = 2500\text{ A}/\mu\text{s}$ ( $T_{vj}=150^{\circ}\text{C}$ )<br>$V_R = 600\text{ V}$<br>$V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$           |      | 88,0<br>89,0<br>90,0 |      | A<br>A<br>A                                     |
| Sperrverzögerungsladung<br>Recovered charge                                     | $I_F = 75\text{ A}$ , $-di_F/dt = 2500\text{ A}/\mu\text{s}$ ( $T_{vj}=150^{\circ}\text{C}$ )<br>$V_R = 600\text{ V}$<br>$V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$              |      | 7,30<br>13,0<br>14,5 |      | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| Abschaltenergie pro Puls<br>Reverse recovery energy                             | $I_F = 75\text{ A}$ , $-di_F/dt = 2500\text{ A}/\mu\text{s}$ ( $T_{vj}=150^{\circ}\text{C}$ )<br>$V_R = 600\text{ V}$<br>$V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$          |      | 2,65<br>4,60<br>5,65 |      | mJ<br>mJ<br>mJ                                  |
| Wärmewiderstand, Chip bis Gehäuse<br>Thermal resistance, junction to case       | pro Diode / per diode                                                                                                                            |                                                                                                   | $R_{thJC}$         |      |                      | 0,62 | K/W                                             |
| Wärmewiderstand, Gehäuse bis Kühlkörper<br>Thermal resistance, case to heatsink | pro Diode / per diode<br>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$        |                                                                                                   | $R_{thCH}$         |      | 0,205                |      | K/W                                             |
| Temperatur im Schaltbetrieb<br>Temperature under switching conditions           |                                                                                                                                                  |                                                                                                   | $T_{vj\text{ op}}$ | -40  |                      | 150  | $^{\circ}\text{C}$                              |

## Diode, Gleichrichter / Diode, Rectifier

## Höchstzulässige Werte / Maximum Rated Values

|                                                                                     |                                                                                                               |             |              |                                              |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|-------------|--------------|----------------------------------------------|
| Periodische Spitzensperrspannung<br>Repetitive peak reverse voltage                 | $T_{vj} = 25^{\circ}\text{C}$                                                                                 | $V_{RRM}$   | 1600         | V                                            |
| Durchlassstrom Grenzeffektivwert pro Chip<br>Maximum RMS forward current per chip   | $T_C = 80^{\circ}\text{C}$                                                                                    | $I_{FRMSM}$ | 80           | A                                            |
| Gleichrichter Ausgang Grenzeffektivstrom<br>Maximum RMS current at rectifier output | $T_C = 80^{\circ}\text{C}$                                                                                    | $I_{RMSM}$  | 140          | A                                            |
| Stoßstrom Grenzwert<br>Surge forward current                                        | $t_p = 10\text{ ms}$ , $T_{vj} = 25^{\circ}\text{C}$<br>$t_p = 10\text{ ms}$ , $T_{vj} = 150^{\circ}\text{C}$ | $I_{FSM}$   | 600<br>470   | A<br>A                                       |
| Grenzlastintegral<br>$I^2t$ - value                                                 | $t_p = 10\text{ ms}$ , $T_{vj} = 25^{\circ}\text{C}$<br>$t_p = 10\text{ ms}$ , $T_{vj} = 150^{\circ}\text{C}$ | $I^2t$      | 1800<br>1100 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

## Charakteristische Werte / Characteristic Values

|                                                                                 |                                                                                                                                           |  |                    | min. | typ.  | max. |                    |
|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------|------|-------|------|--------------------|
| Durchlassspannung<br>Forward voltage                                            | $T_{vj} = 150^{\circ}\text{C}$ , $I_F = 75\text{ A}$                                                                                      |  | $V_F$              |      | 1,15  |      | V                  |
| Sperrstrom<br>Reverse current                                                   | $T_{vj} = 150^{\circ}\text{C}$ , $V_R = 1600\text{ V}$                                                                                    |  | $I_R$              |      | 1,00  |      | mA                 |
| Wärmewiderstand, Chip bis Gehäuse<br>Thermal resistance, junction to case       | pro Diode / per diode                                                                                                                     |  | $R_{thJC}$         |      |       | 0,65 | K/W                |
| Wärmewiderstand, Gehäuse bis Kühlkörper<br>Thermal resistance, case to heatsink | pro Diode / per diode<br>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$ |  | $R_{thCH}$         |      | 0,215 |      | K/W                |
| Temperatur im Schaltbetrieb<br>Temperature under switching conditions           |                                                                                                                                           |  | $T_{vj\text{ op}}$ | -40  |       | 150  | $^{\circ}\text{C}$ |

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Vorläufige Daten  
Preliminary DataIGBT, Brems-Chopper / IGBT, Brake-Chopper  
Höchstzulässige Werte / Maximum Rated Values

|                                                                          |                                                               |                    |       |   |
|--------------------------------------------------------------------------|---------------------------------------------------------------|--------------------|-------|---|
| Kollektor-Emitter-Sperrspannung<br>Collector-emitter voltage             | $T_{vj} = 25^{\circ}\text{C}$                                 | $V_{CES}$          | 1200  | V |
| Kollektor-Dauergleichstrom<br>Continuous DC collector current            | $T_C = 100^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $I_{C\text{ nom}}$ | 35    | A |
| Periodischer Kollektor-Spitzenstrom<br>Repetitive peak collector current | $t_P = 1\text{ ms}$                                           | $I_{CRM}$          | 70    | A |
| Gesamt-Verlustleistung<br>Total power dissipation                        | $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$  | $P_{\text{tot}}$   | 210   | W |
| Gate-Emitter-Spitzenspannung<br>Gate-emitter peak voltage                |                                                               | $V_{GES}$          | +/-20 | V |

## Charakteristische Werte / Characteristic Values

|                                                                                 |                                                                                                                                                                           |                                                                                                   | min.                | typ.                 | max. |                                                 |
|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------|----------------------|------|-------------------------------------------------|
| Kollektor-Emitter-Sättigungsspannung<br>Collector-emitter saturation voltage    | $I_C = 35\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 35\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 35\text{ A}, V_{GE} = 15\text{ V}$                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_{CE\text{ sat}}$ | 1,85<br>2,15<br>2,25 | 2,15 | V<br>V<br>V                                     |
| Gate-Schwellenspannung<br>Gate threshold voltage                                | $I_C = 1,20\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                                                                                                      |                                                                                                   | $V_{GEth}$          | 5,2                  | 5,8  | 6,4 V                                           |
| Gateladung<br>Gate charge                                                       | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                                                                                                |                                                                                                   | $Q_G$               | 0,27                 |      | $\mu\text{C}$                                   |
| Interner Gatewiderstand<br>Internal gate resistor                               | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                                             |                                                                                                   | $R_{Gint}$          | 0,0                  |      | $\Omega$                                        |
| Eingangskapazität<br>Input capacitance                                          | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                |                                                                                                   | $C_{ies}$           | 2,00                 |      | nF                                              |
| Rückwirkungskapazität<br>Reverse transfer capacitance                           | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                |                                                                                                   | $C_{res}$           | 0,07                 |      | nF                                              |
| Kollektor-Emitter-Reststrom<br>Collector-emitter cut-off current                | $V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                |                                                                                                   | $I_{CES}$           |                      | 1,0  | mA                                              |
| Gate-Emitter-Reststrom<br>Gate-emitter leakage current                          | $V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                  |                                                                                                   | $I_{GES}$           |                      | 100  | nA                                              |
| Einschaltverzögerungszeit, induktive Last<br>Turn-on delay time, inductive load | $I_C = 35\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 27\text{ }\Omega$                                                                  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{d\text{ on}}$   | 0,16<br>0,17<br>0,17 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Anstiegszeit, induktive Last<br>Rise time, inductive load                       | $I_C = 35\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 27\text{ }\Omega$                                                                  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_r$               | 0,03<br>0,04<br>0,04 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Abschaltverzögerungszeit, induktive Last<br>Turn-off delay time, inductive load | $I_C = 35\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 27\text{ }\Omega$                                                                 | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{d\text{ off}}$  | 0,33<br>0,43<br>0,45 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Fallzeit, induktive Last<br>Fall time, inductive load                           | $I_C = 35\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 27\text{ }\Omega$                                                                 | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_f$               | 0,08<br>0,15<br>0,17 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Einschaltverlustenergie pro Puls<br>Turn-on energy loss per pulse               | $I_C = 35\text{ A}, V_{CE} = 600\text{ V}, L_S = 40\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 27\text{ }\Omega$                                              | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{on}$            | 3,90<br>5,10<br>5,60 |      | mJ<br>mJ<br>mJ                                  |
| Abschaltverlustenergie pro Puls<br>Turn-off energy loss per pulse               | $I_C = 35\text{ A}, V_{CE} = 600\text{ V}, L_S = 40\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 27\text{ }\Omega$                                             | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{off}$           | 2,10<br>3,10<br>3,40 |      | mJ<br>mJ<br>mJ                                  |
| Kurzschlußverhalten<br>SC data                                                  | $V_{GE} \leq 15\text{ V}, V_{CC} = 800\text{ V}$<br>$V_{CE\text{ max}} = V_{CES} - L_{SCE} \cdot di/dt$<br>$t_P \leq 10\text{ }\mu\text{s}, T_{vj} = 125^{\circ}\text{C}$ |                                                                                                   | $I_{SC}$            | 130                  |      | A                                               |
| Wärmewiderstand, Chip bis Gehäuse<br>Thermal resistance, junction to case       | pro IGBT / per IGBT                                                                                                                                                       |                                                                                                   | $R_{thJC}$          |                      | 0,72 | K/W                                             |
| Wärmewiderstand, Gehäuse bis Kühlkörper<br>Thermal resistance, case to heatsink | pro IGBT / per IGBT<br>$\lambda_{\text{Paste}} = 1\text{ W/(m}\cdot\text{K)} / \lambda_{\text{grease}} = 1\text{ W/(m}\cdot\text{K)}$                                     |                                                                                                   | $R_{thCH}$          | 0,235                |      | K/W                                             |
| Temperatur im Schaltbetrieb<br>Temperature under switching conditions           |                                                                                                                                                                           |                                                                                                   | $T_{vj\text{ op}}$  | -40                  | 150  | $^{\circ}\text{C}$                              |

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Vorläufige Daten  
Preliminary DataDiode, Brems-Chopper / Diode, Brake-Chopper  
Höchstzulässige Werte / Maximum Rated Values

|                                                                     |                                                                            |           |      |                      |
|---------------------------------------------------------------------|----------------------------------------------------------------------------|-----------|------|----------------------|
| Periodische Spitzensperrspannung<br>Repetitive peak reverse voltage | $T_{vj} = 25^{\circ}\text{C}$                                              | $V_{RRM}$ | 1200 | V                    |
| Dauergleichstrom<br>Continuous DC forward current                   |                                                                            | $I_F$     | 15   | A                    |
| Periodischer Spitzenstrom<br>Repetitive peak forward current        | $t_P = 1\text{ ms}$                                                        | $I_{FRM}$ | 30   | A                    |
| Grenzlastintegral<br>$I^2t$ - value                                 | $V_R = 0\text{ V}$ , $t_P = 10\text{ ms}$ , $T_{vj} = 125^{\circ}\text{C}$ | $I^2t$    | 48,0 | $\text{A}^2\text{s}$ |

## Charakteristische Werte / Characteristic Values

|                                                                                 |                                                                                                                                           |                                                                                                   |                    | min. | typ.                 | max. |                                                 |
|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------|------|----------------------|------|-------------------------------------------------|
| Durchlassspannung<br>Forward voltage                                            | $I_F = 15\text{ A}$ , $V_{GE} = 0\text{ V}$<br>$I_F = 15\text{ A}$ , $V_{GE} = 0\text{ V}$<br>$I_F = 15\text{ A}$ , $V_{GE} = 0\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_F$              |      | 1,75<br>1,75<br>1,75 | 2,15 | V<br>V<br>V                                     |
| Rückstromspitze<br>Peak reverse recovery current                                | $I_F = 15\text{ A}$ , $-di_F/dt = 1000\text{ A}/\mu\text{s}$ ( $T_{vj}=150^{\circ}\text{C}$ )<br>$V_R = 600\text{ V}$                     | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$           |      | 20,0<br>22,0<br>23,0 |      | A<br>A<br>A                                     |
| Sperrverzögerungsladung<br>Recovered charge                                     | $I_F = 15\text{ A}$ , $-di_F/dt = 1000\text{ A}/\mu\text{s}$ ( $T_{vj}=150^{\circ}\text{C}$ )<br>$V_R = 600\text{ V}$                     | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$              |      | 1,50<br>2,50<br>2,70 |      | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| Abschaltenergie pro Puls<br>Reverse recovery energy                             | $I_F = 15\text{ A}$ , $-di_F/dt = 1000\text{ A}/\mu\text{s}$ ( $T_{vj}=150^{\circ}\text{C}$ )<br>$V_R = 600\text{ V}$                     | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$          |      | 0,55<br>0,90<br>1,00 |      | mJ<br>mJ<br>mJ                                  |
| Wärmewiderstand, Chip bis Gehäuse<br>Thermal resistance, junction to case       | pro Diode / per diode                                                                                                                     |                                                                                                   | $R_{thJC}$         |      |                      | 1,50 | K/W                                             |
| Wärmewiderstand, Gehäuse bis Kühlkörper<br>Thermal resistance, case to heatsink | pro Diode / per diode<br>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$ |                                                                                                   | $R_{thCH}$         |      | 0,49                 |      | K/W                                             |
| Temperatur im Schaltbetrieb<br>Temperature under switching conditions           |                                                                                                                                           |                                                                                                   | $T_{vj\text{ op}}$ | -40  |                      | 150  | $^{\circ}\text{C}$                              |

## NTC-Widerstand / NTC-Thermistor

## Charakteristische Werte / Characteristic Values

|                                          |                                                               |              |    | min. | typ. | max. |                  |
|------------------------------------------|---------------------------------------------------------------|--------------|----|------|------|------|------------------|
| Nennwiderstand<br>Rated resistance       | $T_C = 25^{\circ}\text{C}$                                    | $R_{25}$     |    |      | 5,00 |      | $\text{k}\Omega$ |
| Abweichung von R100<br>Deviation of R100 | $T_C = 100^{\circ}\text{C}$ , $R_{100} = 493\text{ }\Omega$   | $\Delta R/R$ | -5 |      |      | 5    | %                |
| Verlustleistung<br>Power dissipation     | $T_C = 25^{\circ}\text{C}$                                    | $P_{25}$     |    |      |      | 20,0 | mW               |
| B-Wert<br>B-value                        | $R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15\text{ K}))]$  | $B_{25/50}$  |    |      | 3375 |      | K                |
| B-Wert<br>B-value                        | $R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15\text{ K}))]$  | $B_{25/80}$  |    |      | 3411 |      | K                |
| B-Wert<br>B-value                        | $R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15\text{ K}))]$ | $B_{25/100}$ |    |      | 3433 |      | K                |

Angaben gemäß gültiger Application Note.  
Specification according to the valid application note.

|                 |                                 |
|-----------------|---------------------------------|
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**Vorläufige Daten**  
**Preliminary Data**
**Modul / Module**

|                                                                                        |                                                                                                                                            |                                              |                                |                  |
|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|--------------------------------|------------------|
| Isolations-Prüfspannung<br>Isolation test voltage                                      | RMS, f = 50 Hz, t = 1 min.                                                                                                                 | V <sub>ISOL</sub>                            | 2,5                            | kV               |
| Material Modulgrundplatte<br>Material of module baseplate                              |                                                                                                                                            |                                              | Cu                             |                  |
| Innere Isolation<br>Internal isolation                                                 | Basisisolation (Schutzklasse 1, EN61140)<br>basic insulation (class 1, IEC 61140)                                                          |                                              | Al <sub>2</sub> O <sub>3</sub> |                  |
| Kriechstrecke<br>Creepage distance                                                     | Kontakt - Kühlkörper / terminal to heatsink<br>Kontakt - Kontakt / terminal to terminal                                                    |                                              | 10,0                           | mm               |
| Luftstrecke<br>Clearance                                                               | Kontakt - Kühlkörper / terminal to heatsink<br>Kontakt - Kontakt / terminal to terminal                                                    |                                              | 7,5                            | mm               |
| Vergleichszahl der Kriechwegbildung<br>Comperative tracking index                      |                                                                                                                                            | CTI                                          | > 200                          |                  |
|                                                                                        |                                                                                                                                            | min.    typ.    max.                         |                                |                  |
| Wärmewiderstand, Gehäuse bis Kühlkörper<br>Thermal resistance, case to heatsink        | pro Modul / per module<br>$\lambda_{\text{Paste}} = 1 \text{ W/(m}\cdot\text{K)} / \lambda_{\text{grease}} = 1 \text{ W/(m}\cdot\text{K)}$ | R <sub>thCH</sub>                            | 0,009                          | K/W              |
| Modulstreuinduktivität<br>Stray inductance module                                      |                                                                                                                                            | L <sub>sCE</sub>                             | 60                             | nH               |
| Modulleitungswiderstand, Anschlüsse - Chip<br>Module lead resistance, terminals - chip | T <sub>c</sub> = 25°C, pro Schalter / per switch                                                                                           | R <sub>CC'+EE'</sub><br>R <sub>AA'+CC'</sub> | 4,00<br>2,00                   | mΩ               |
| Höchstzulässige Sperrschichttemperatur<br>Maximum junction temperature                 | Wechselrichter, Brems-Chopper / inverter, brake-chopper<br>Gleichrichter / rectifier                                                       | T <sub>vj max</sub>                          |                                | 175 °C<br>150 °C |
| Temperatur im Schaltbetrieb<br>Temperature under switching conditions                  | Wechselrichter, Brems-Chopper / inverter, brake-chopper<br>Gleichrichter / rectifier                                                       | T <sub>vj op</sub>                           | -40<br>-40                     | 150 °C<br>150 °C |
| Lagertemperatur<br>Storage temperature                                                 |                                                                                                                                            | T <sub>stg</sub>                             | -40                            | 125 °C           |
| Anzugsdrehmoment f. Modulmontage<br>Mounting torque for modul mounting                 | Schraube M5 - Montage gem. gültiger Applikationsschrift<br>Screw M5 - Mounting according to valid application note                         | M                                            | 3,00                           | - 6,00 Nm        |
| Gewicht<br>Weight                                                                      |                                                                                                                                            | G                                            | 300                            | g                |

prepared by: AS

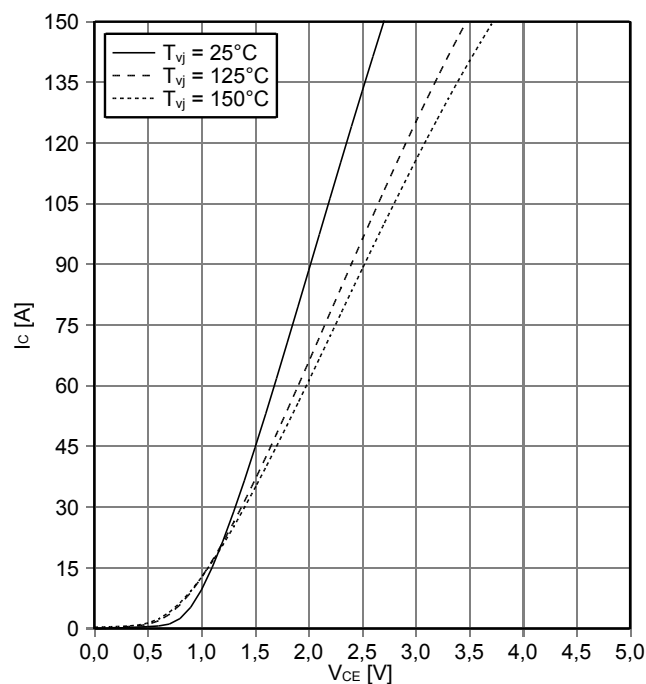
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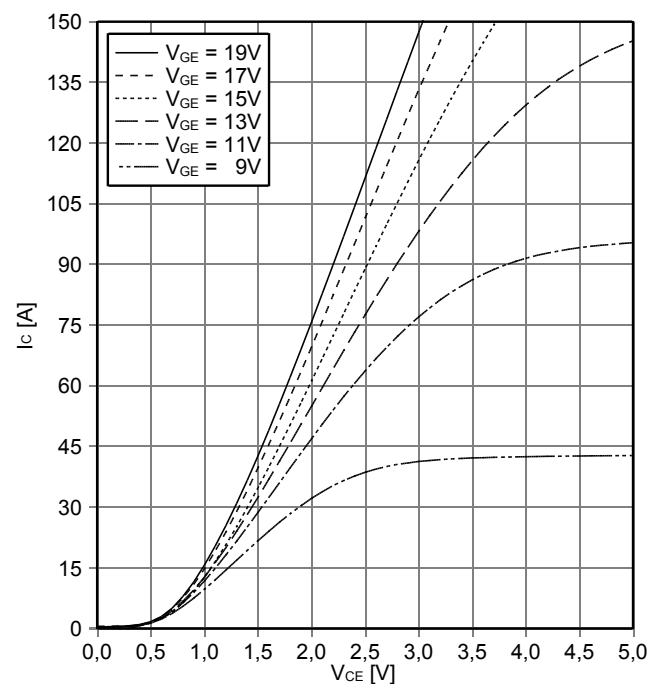
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# Vorläufige Daten Preliminary Data

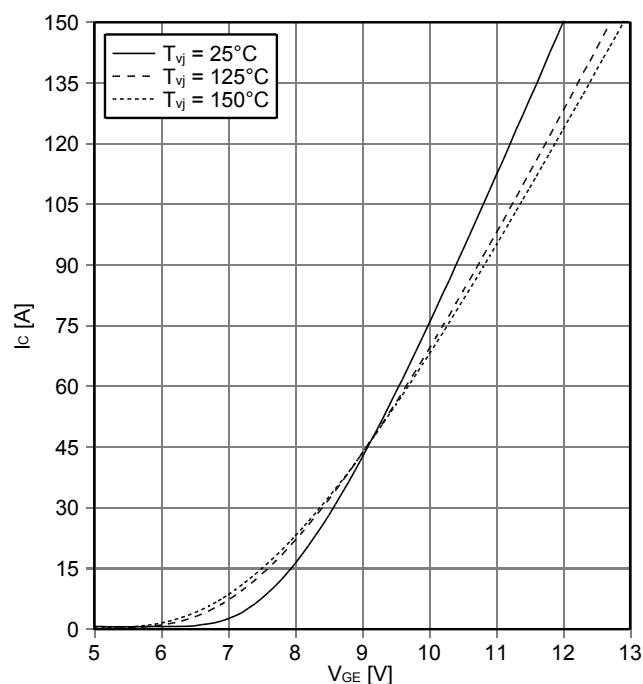
## Ausgangskennlinie IGBT, Wechselrichter (typisch) output characteristic IGBT, Inverter (typical)

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


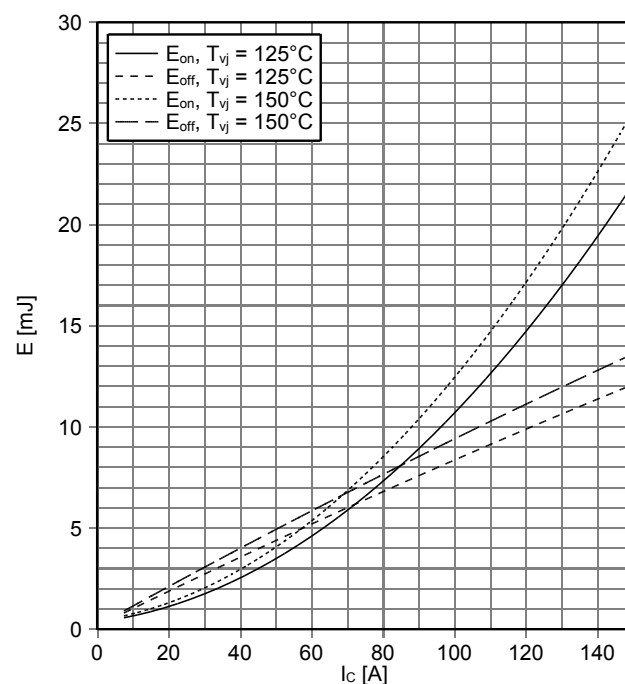
## Ausgangskennlinienfeld IGBT, Wechselrichter (typisch) output characteristic IGBT, Inverter (typical)

 $I_C = f(V_{CE})$   
 $T_{vj} = 150^\circ\text{C}$ 


## Übertragungscharakteristik IGBT, Wechselrichter (typisch) transfer characteristic IGBT, Inverter (typical)

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


## Schaltverluste IGBT, Wechselrichter (typisch) switching losses IGBT, Inverter (typical)

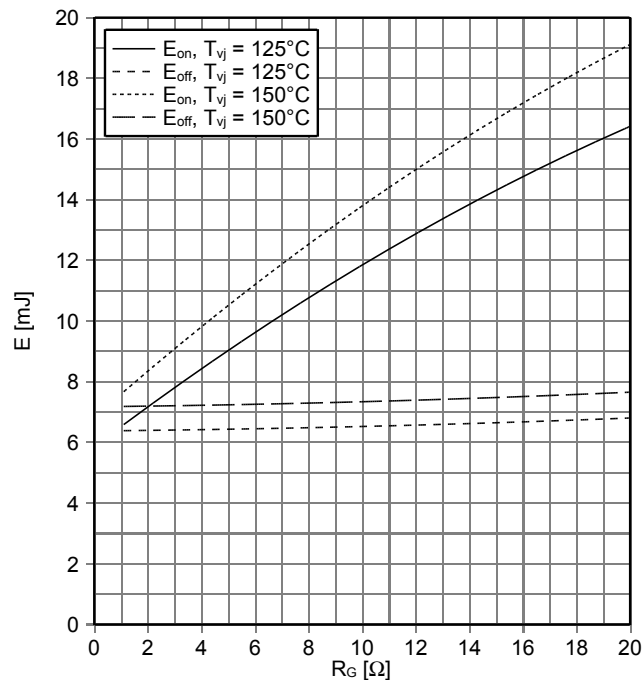
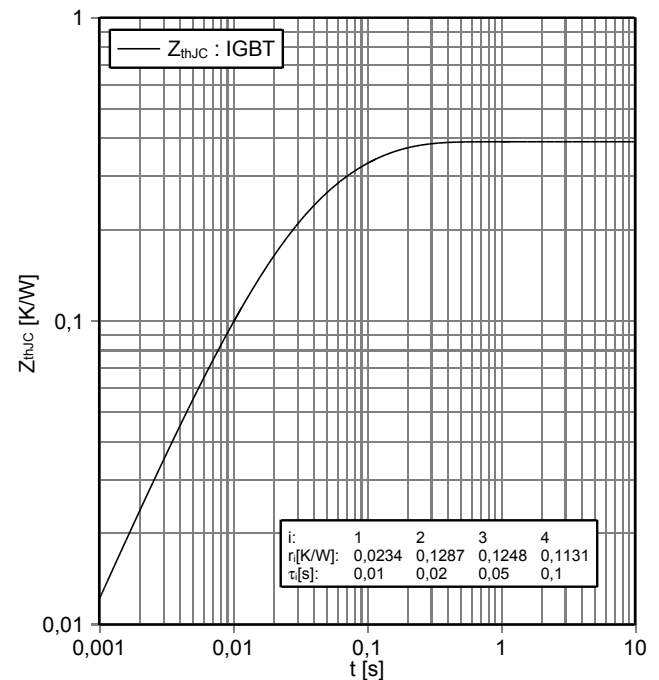
 $E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 1.1\ \Omega$ ,  $R_{Goff} = 1.1\ \Omega$ ,  $V_{CE} = 600\text{ V}$ 


prepared by: AS

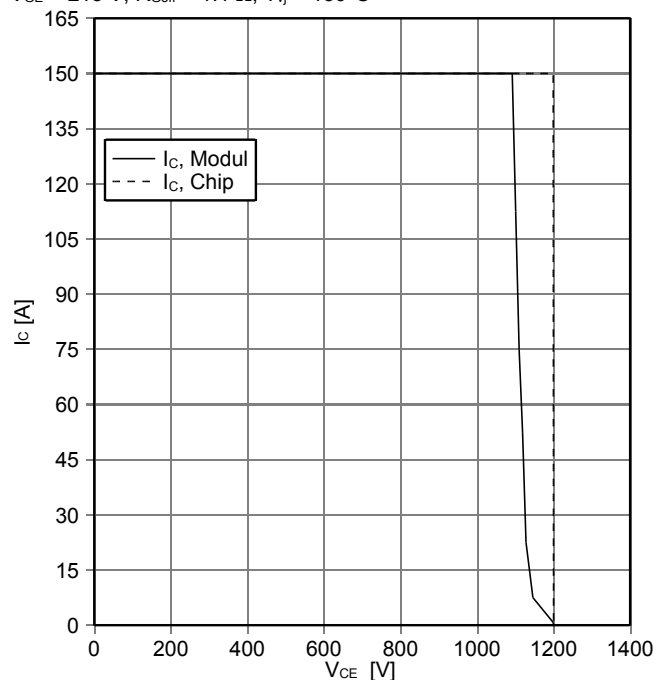
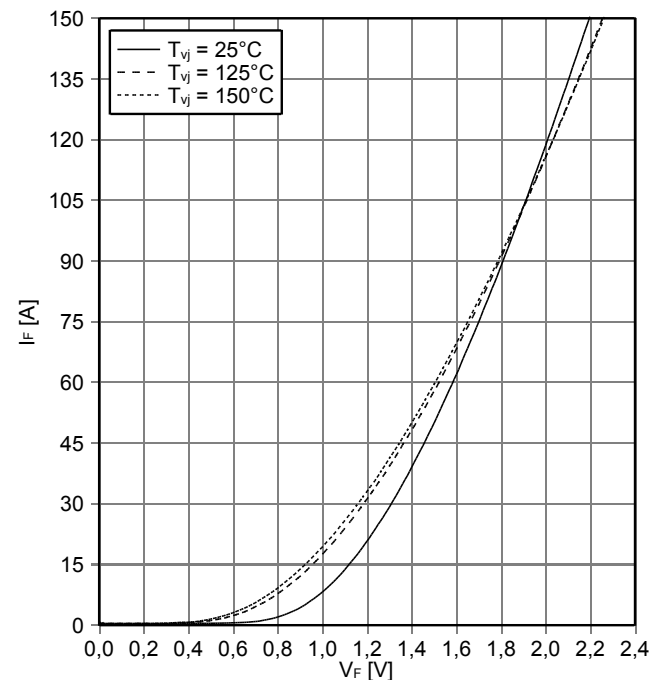
date of publication: 2013-11-04

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revision: 2.0

Vorläufige Daten  
Preliminary DataSchaltverluste IGBT, Wechselrichter (typisch)  
switching losses IGBT, Inverter (typical) $E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$  $V_{GE} = \pm 15 \text{ V}$ ,  $I_C = 75 \text{ A}$ ,  $V_{CE} = 600 \text{ V}$ Transienter Wärmewiderstand IGBT, Wechselrichter  
transient thermal impedance IGBT, Inverter $Z_{thJC} = f(t)$ Sicherer Rückwärts-Arbeitsbereich IGBT, Wechselrichter  
(RBSOA)

## reverse bias safe operating area IGBT, Inverter (RBSOA)

 $I_C = f(V_{CE})$  $V_{GE} = \pm 15 \text{ V}$ ,  $R_{Goff} = 1.1 \Omega$ ,  $T_{vj} = 150^\circ\text{C}$ Durchlasskennlinie der Diode, Wechselrichter (typisch)  
forward characteristic of Diode, Inverter (typical) $I_F = f(V_F)$ 

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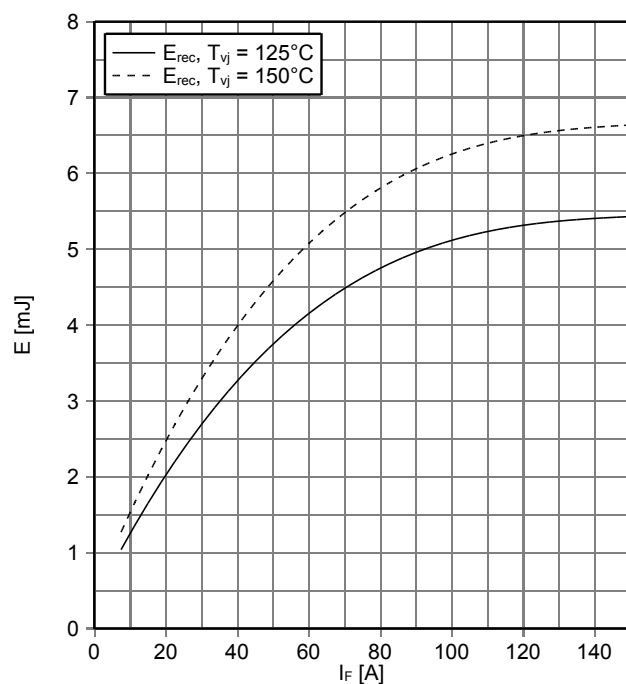
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Vorläufige Daten  
Preliminary Data

Schaltverluste Diode, Wechselrichter (typisch)  
switching losses Diode, Inverter (typical)

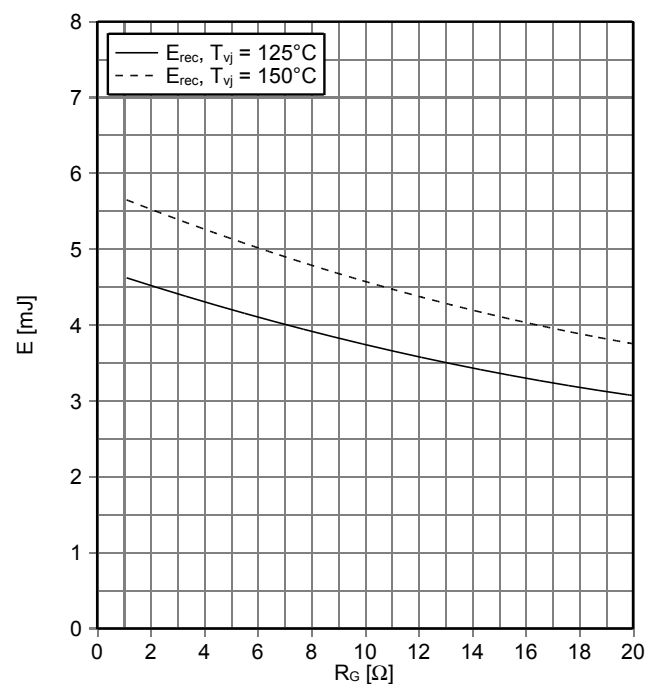
$$E_{rec} = f(I_F)$$

$$R_{Gon} = 1.1 \Omega, V_{CE} = 600 V$$

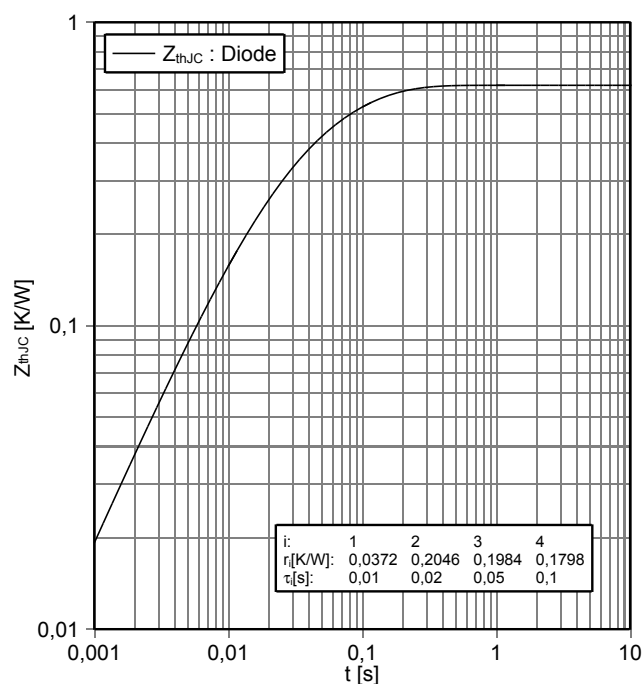

Schaltverluste Diode, Wechselrichter (typisch)  
switching losses Diode, Inverter (typical)

$$E_{rec} = f(R_G)$$

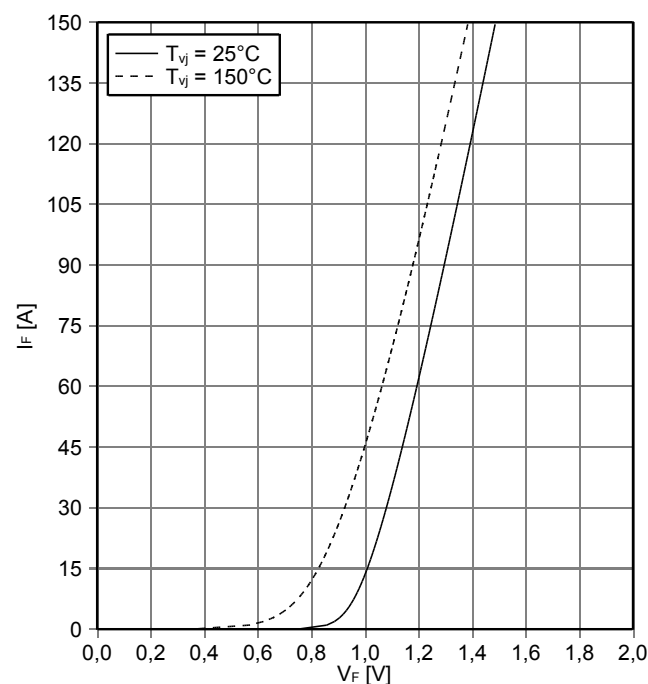
$$I_F = 75 A, V_{CE} = 600 V$$


Transienter Wärmewiderstand Diode, Wechselrichter  
transient thermal impedance Diode, Inverter

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


Durchlasskennlinie der Diode, Gleichrichter (typisch)  
forward characteristic of Diode, Rectifier (typical)

$$I_F = f(V_F)$$



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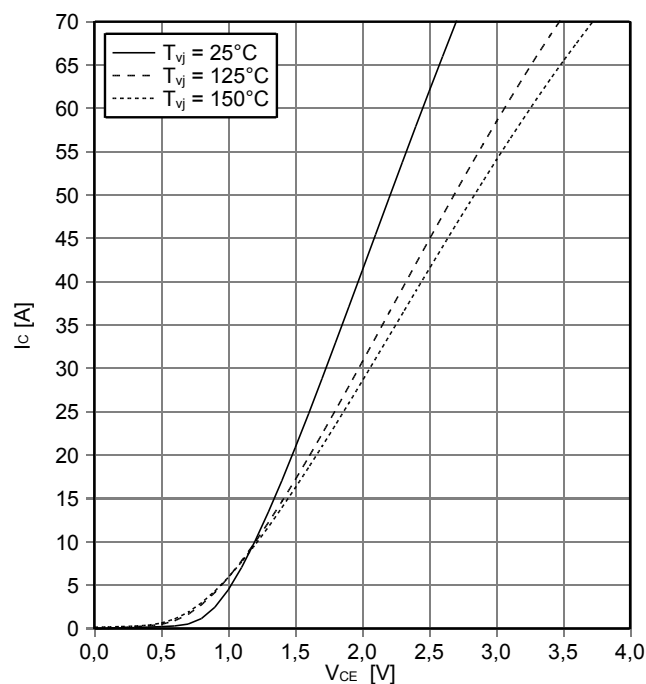
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# Vorläufige Daten Preliminary Data

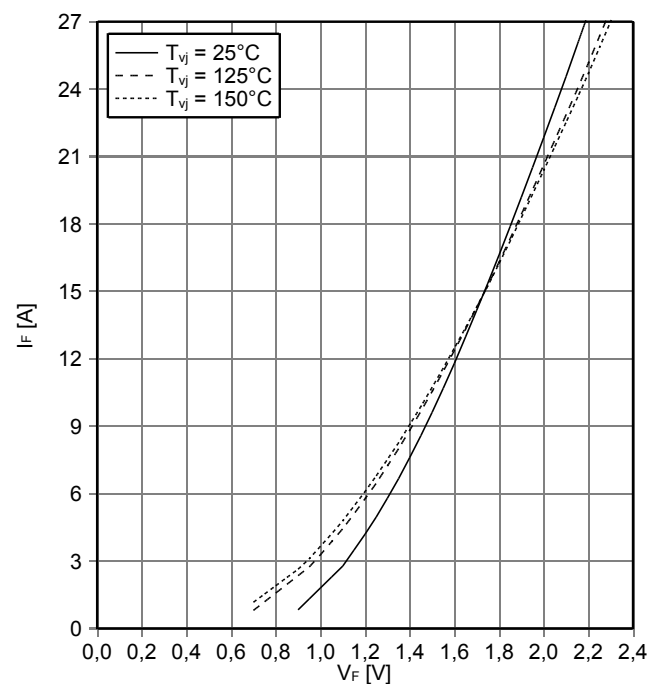
**Ausgangskennlinie IGBT, Brems-Chopper (typisch)**  
**output characteristic IGBT, Brake-Chopper (typical)**

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



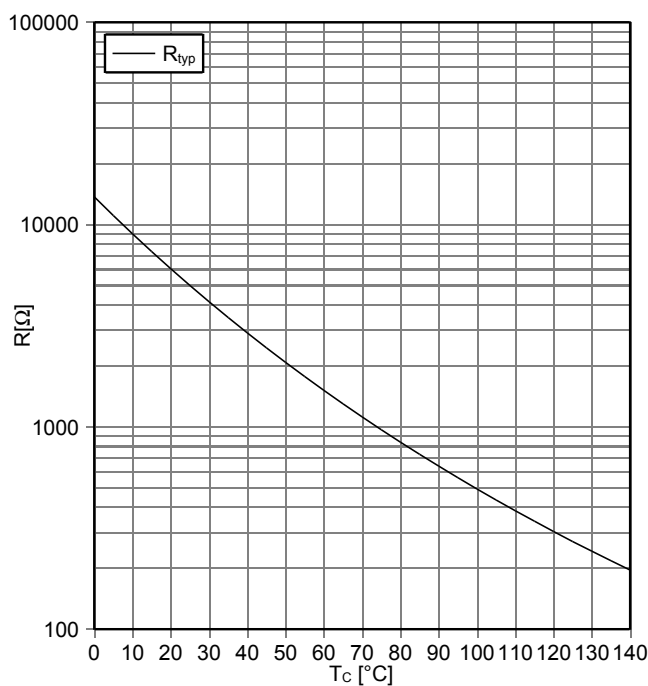
**Durchlasskennlinie der Diode, Brems-Chopper (typisch)**  
**forward characteristic of Diode, Brake-Chopper (typical)**

$I_F = f(V_F)$



**NTC-Widerstand-Temperaturkennlinie (typisch)**  
**NTC-Thermistor-temperature characteristic (typical)**

$R = f(T)$



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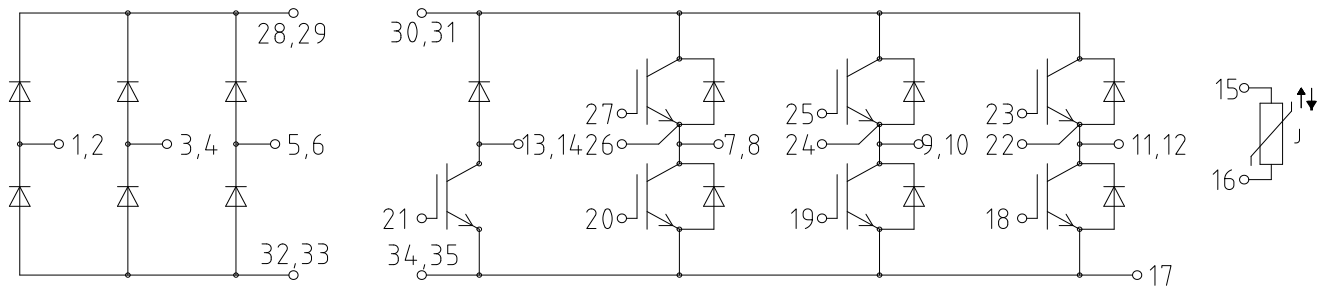
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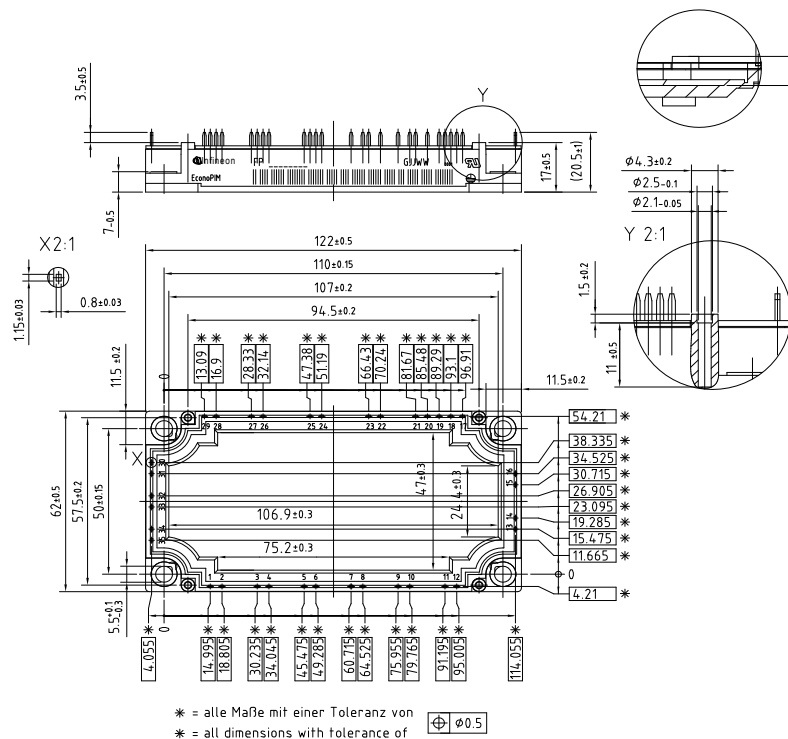
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**Vorläufige Daten**  
**Preliminary Data**

## Schaltplan / circuit\_diagram\_headline



## Gehäuseabmessungen / package outlines



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## Vorläufige Daten Preliminary Data

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- the conclusion of Quality Agreements;
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