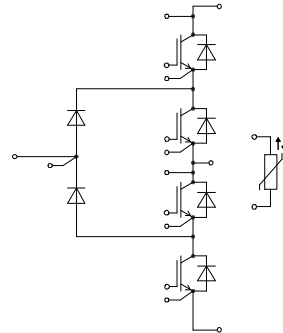
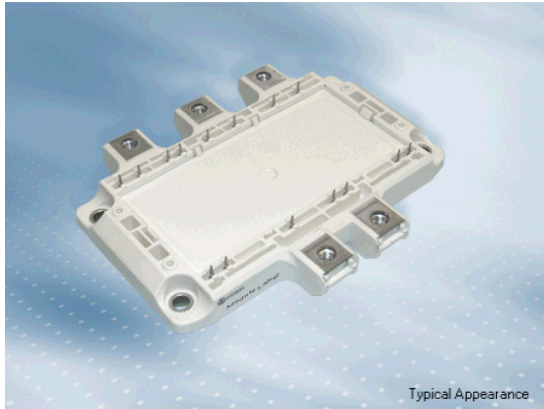


EconoPACK™4 Modul mit Trench/Feldstopp IGBT4 und Emitter Controlled 4 Diode und NTC  
EconoPACK™4 module with Trench/Fieldstop IGBT4 and Emitter Controlled 4 diode and NTC

**Vorläufige Daten / preliminary data**



**V<sub>CES</sub> = 650V**

**I<sub>C nom</sub> = 300A / I<sub>CRM</sub> = 600A**

**Typische Anwendungen**

- 3-Level-Applikationen

**Typical Applications**

- 3-Level-Applications

**Elektrische Eigenschaften**

- Erhöhte Sperrspannungsfestigkeit auf 650V
- Erweiterte Sperrschichttemperatur T<sub>vj op</sub>
- Trench IGBT 4
- T<sub>vj op</sub> = 150°C
- V<sub>CEsat</sub> mit positivem Temperaturkoeffizienten

**Electrical Features**

- Increased blocking voltage capability to 650V
- Extended Operation Temperature T<sub>vj op</sub>
- Trench IGBT 4
- T<sub>vj op</sub> = 150°C
- V<sub>CEsat</sub> with positive Temperature Coefficient

**Mechanische Eigenschaften**

- 4 kV AC 1min Isolationsfestigkeit
- Hohe mechanische Robustheit
- Integrierter NTC Temperatur Sensor
- Isolierte Bodenplatte
- Standardgehäuse

**Mechanical Features**

- 4 kV AC 1min Insulation
- High mechanical robustness
- Integrated NTC temperature sensor
- Isolated Base Plate
- Standard Housing

**Module Label Code**

Barcode Code 128



DMX - Code



**Content of the Code**

**Digit**

|                            |         |
|----------------------------|---------|
| Module Serial Number       | 1 - 5   |
| Module Material Number     | 6 - 11  |
| Production Order Number    | 12 - 19 |
| Datecode (Production Year) | 20 - 21 |
| Datecode (Production Week) | 22 - 23 |

|                 |                                 |                      |
|-----------------|---------------------------------|----------------------|
| prepared by: AS | date of publication: 2011-03-02 | material no: 34036   |
| approved by: MK | revision: 2.1                   | UL approved (E83335) |

Vorläufige Daten  
preliminary data

## IGBT-Wechselrichter / IGBT-inverter

## Höchstzulässige Werte / maximum rated values

|                                                                          |                                                          |                    |       |   |
|--------------------------------------------------------------------------|----------------------------------------------------------|--------------------|-------|---|
| Kollektor-Emitter-Sperrspannung<br>collector-emitter voltage             | $T_{vj} = 25^{\circ}\text{C}$                            | $V_{CES}$          | 650   | V |
| Kollektor-Dauergleichstrom<br>DC-collector current                       | $T_C = 70^{\circ}\text{C}, T_{vj} = 175^{\circ}\text{C}$ | $I_{C\text{ nom}}$ | 300   | A |
| Periodischer Kollektor Spitzenstrom<br>repetitive peak collector current | $t_P = 1\text{ ms}$                                      | $I_{CRM}$          | 600   | A |
| Gesamt-Verlustleistung<br>total power dissipation                        | $T_C = 25^{\circ}\text{C}, T_{vj} = 175^{\circ}\text{C}$ | $P_{tot}$          | 940   | 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 | $I_C = 300\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 300\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 300\text{ A}, V_{GE} = 15\text{ V}$                                                    | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $V_{CE\text{ sat}}$ | 1,55<br>1,70<br>1,75 | 1,95 | V<br>V<br>V                                     |
| Gate-Schwellenspannung<br>gate threshold voltage                             | $I_C = 4,80\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                      |                                                                                                                     | $V_{GEth}$          | 5,0                  | 5,8  | 6,5 V                                           |
| Gateladung<br>gate charge                                                    | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                                                                                                                |                                                                                                                     | $Q_G$               | 3,00                 |      | $\mu\text{C}$                                   |
| Interner Gatewiderstand<br>internal gate resistor                            | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                                                             |                                                                                                                     | $R_{Gint}$          | 1,0                  |      | $\Omega$                                        |
| Eingangskapazität<br>input capacitance                                       | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                |                                                                                                                     | $C_{ies}$           | 18,5                 |      | nF                                              |
| Rückwirkungskapazität<br>reverse transfer capacitance                        | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                |                                                                                                                     | $C_{res}$           | 0,57                 |      | nF                                              |
| Kollektor-Emitter Reststrom<br>collector-emitter cut-off current             | $V_{CE} = 650\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                 |                                                                                                                     | $I_{CES}$           |                      | 1,0  | mA                                              |
| Gate-Emitter Reststrom<br>gate-emitter leakage current                       | $V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                  |                                                                                                                     | $I_{GES}$           |                      | 400  | nA                                              |
| Einschaltverzögerungszeit (ind. Last)<br>turn-on delay time (inductive load) | $I_C = 300\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 2,0\ \Omega$                                                                                      | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $t_{d\text{ on}}$   | 0,11<br>0,12<br>0,13 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Anstiegszeit (induktive Last)<br>rise time (inductive load)                  | $I_C = 300\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 2,0\ \Omega$                                                                                      | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $t_r$               | 0,05<br>0,06<br>0,06 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Abschaltverzögerungszeit (ind. Last)<br>turn-off delay time (inductive load) | $I_C = 300\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 2,0\ \Omega$                                                                                     | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $t_{d\text{ off}}$  | 0,49<br>0,52<br>0,53 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Fallzeit (induktive Last)<br>fall time (inductive load)                      | $I_C = 300\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 2,0\ \Omega$                                                                                     | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $t_f$               | 0,05<br>0,07<br>0,07 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Einschaltverlustenergie pro Puls<br>turn-on energy loss per pulse            | $I_C = 300\text{ A}, V_{CE} = 300\text{ V}, L_S = 30\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, di/dt = 3400\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$R_{Gon} = 2,0\ \Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $E_{on}$            | 1,50<br>2,00<br>2,50 |      | mJ<br>mJ<br>mJ                                  |
| Abschaltverlustenergie pro Puls<br>turn-off energy loss per pulse            | $I_C = 300\text{ A}, V_{CE} = 300\text{ V}, L_S = 30\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, du/dt = 3300\text{ V}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$R_{Goff} = 2,0\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $E_{off}$           | 14,0<br>17,5<br>18,5 |      | mJ<br>mJ<br>mJ                                  |
| Kurzschlussverhalten<br>SC data                                              | $V_{GE} \leq 15\text{ V}, V_{CC} = 360\text{ V}$<br>$V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$                                                                                           | $t_P \leq 10\ \mu\text{s}, T_{vj} = 25^{\circ}\text{C}$<br>$t_P \leq 10\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ | $I_{SC}$            | 1500<br>1200         |      | A<br>A                                          |
| Innerer Wärmewiderstand<br>thermal resistance, junction to case              | pro IGBT / per IGBT                                                                                                                                                                       |                                                                                                                     | $R_{thJC}$          |                      | 0,16 | K/W                                             |
| Übergangs-Wärmewiderstand<br>thermal resistance, case to heatsink            | pro IGBT / per IGBT<br>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$                                                     |                                                                                                                     | $R_{thCH}$          | 0,063                |      | K/W                                             |

prepared by: AS

date of publication: 2011-03-02

approved by: MK

revision: 2.1

Vorläufige Daten  
preliminary data

## Diode-Wechselrichter / diode-inverter

## Höchstzulässige Werte / maximum rated values

|                                                                     |                                                                                                                                              |           |              |                                              |
|---------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------|----------------------------------------------|
| Periodische Spitzensperrspannung<br>repetitive peak reverse voltage | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                | $V_{RRM}$ | 650          | V                                            |
| Dauergleichstrom<br>DC forward current                              |                                                                                                                                              | $I_F$     | 300          | A                                            |
| Periodischer Spitzenstrom<br>repetitive peak forward current        | $t_p = 1\text{ ms}$                                                                                                                          | $I_{FRM}$ | 600          | A                                            |
| Grenzlastintegral<br>$I^2t$ - value                                 | $V_R = 0\text{ V}, t_p = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$<br>$V_R = 0\text{ V}, t_p = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$    | 6000<br>5600 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

## Charakteristische Werte / characteristic values

|                                                                   |                                                                                                                                                       |                                                                                                   | min.       | typ.                 | max. |                                                 |
|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|------------|----------------------|------|-------------------------------------------------|
| Durchlassspannung<br>forward voltage                              | $I_F = 300\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 300\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 300\text{ A}, V_{GE} = 0\text{ V}$                   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_F$      | 1,55<br>1,50<br>1,45 | 1,95 | V<br>V<br>V                                     |
| Rückstromspitze<br>peak reverse recovery current                  | $I_F = 300\text{ A}, -di_F/dt = 3400\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300\text{ V}$<br>$V_{GE} = -15\text{ V}$            | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$   | 145<br>195<br>210    |      | A<br>A<br>A                                     |
| Sperrverzögerungsladung<br>recovered charge                       | $I_F = 300\text{ A}, -di_F/dt = 3400\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300\text{ V}$<br>$V_{GE} = -15\text{ V}$            | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$      | 11,0<br>21,0<br>24,0 |      | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| Abschaltenergie pro Puls<br>reverse recovery energy               | $I_F = 300\text{ A}, -di_F/dt = 3400\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300\text{ V}$<br>$V_{GE} = -15\text{ V}$            | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$  | 3,50<br>6,10<br>7,00 |      | mJ<br>mJ<br>mJ                                  |
| Innerer Wärmewiderstand<br>thermal resistance, junction to case   | pro Diode / per diode                                                                                                                                 |                                                                                                   | $R_{thJC}$ |                      | 0,32 | K/W                                             |
| Übergangs-Wärmewiderstand<br>thermal resistance, case to heatsink | pro Diode / per diode<br>$\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$ |                                                                                                   | $R_{thCH}$ | 0,125                |      | K/W                                             |

## Diode-3-Level / Diode-3-level

## Höchstzulässige Werte / maximum rated values

|                                                                     |                                                                                                                                              |           |              |                                              |
|---------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------|----------------------------------------------|
| Periodische Spitzensperrspannung<br>repetitive peak reverse voltage | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                | $V_{RRM}$ | 650          | V                                            |
| Dauergleichstrom<br>DC forward current                              |                                                                                                                                              | $I_F$     | 300          | A                                            |
| Periodischer Spitzenstrom<br>repetitive peak forw. current          | $t_p = 1\text{ ms}$                                                                                                                          | $I_{FRM}$ | 600          | A                                            |
| Grenzlastintegral<br>$I^2t$ - value                                 | $V_R = 0\text{ V}, t_p = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$<br>$V_R = 0\text{ V}, t_p = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$    | 6000<br>5600 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

## Charakteristische Werte / characteristic values

|                                                                   |                                                                                                                                                       |                                                                                                   | min.       | typ.                 | max. |                                                 |
|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|------------|----------------------|------|-------------------------------------------------|
| Durchlassspannung<br>forward voltage                              | $I_F = 300\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 300\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 300\text{ A}, V_{GE} = 0\text{ V}$                   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_F$      | 1,55<br>1,50<br>1,45 | 1,95 | V<br>V<br>V                                     |
| Rückstromspitze<br>peak reverse recovery current                  | $I_F = 300\text{ A}, -di_F/dt = 3400\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300\text{ V}$<br>$V_{GE} = -15\text{ V}$            | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$   | 145<br>195<br>210    |      | A<br>A<br>A                                     |
| Sperrverzögerungsladung<br>recovered charge                       | $I_F = 300\text{ A}, -di_F/dt = 3400\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300\text{ V}$<br>$V_{GE} = -15\text{ V}$            | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$      | 11,0<br>21,0<br>24,0 |      | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| Abschaltenergie pro Puls<br>reverse recovery energy               | $I_F = 300\text{ A}, -di_F/dt = 3400\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300\text{ V}$<br>$V_{GE} = -15\text{ V}$            | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$  | 3,50<br>6,10<br>7,00 |      | mJ<br>mJ<br>mJ                                  |
| Innerer Wärmewiderstand<br>thermal resistance, junction to case   | pro Diode / per diode                                                                                                                                 |                                                                                                   | $R_{thJC}$ |                      | 0,32 | K/W                                             |
| Übergangs-Wärmewiderstand<br>thermal resistance, case to heatsink | pro Diode / per diode<br>$\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$ |                                                                                                   | $R_{thCH}$ | 0,125                |      | K/W                                             |

|                 |                                 |
|-----------------|---------------------------------|
| prepared by: AS | date of publication: 2011-03-02 |
| approved by: MK | revision: 2.1                   |

Vorläufige Daten  
preliminary data

## 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 |      | 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               | $T_C = 25^\circ\text{C}$                                       | $P_{25}$     |      |      | 20,0 | 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.

## Modul / module

|                                                                        |                                                                                                                                                            |                     |      |                         |      |                  |
|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------|-------------------------|------|------------------|
| Isolations-Prüfspannung<br>insulation test voltage                     | RMS, $f = 50 \text{ Hz}$ , $t = 1 \text{ min.}$                                                                                                            | $V_{\text{ISOL}}$   |      | 4,0                     |      | kV               |
| Material Modulgrundplatte<br>material of module baseplate              |                                                                                                                                                            |                     |      | Cu                      |      |                  |
| Material für innere Isolation<br>material for internal insulation      |                                                                                                                                                            |                     |      | $\text{Al}_2\text{O}_3$ |      |                  |
| Kriechstrecke<br>creepage distance                                     | Kontakt - Kühlkörper / terminal to heatsink<br>Kontakt - Kontakt / terminal to terminal                                                                    |                     |      | 25,0<br>12,5            |      | mm               |
| Luftstrecke<br>clearance distance                                      | Kontakt - Kühlkörper / terminal to heatsink<br>Kontakt - Kontakt / terminal to terminal                                                                    |                     |      | 11,0<br>7,0             |      | mm               |
| Vergleichszahl der Kriechwegbildung<br>comparative tracking index      |                                                                                                                                                            | CTI                 |      | > 200                   |      |                  |
|                                                                        |                                                                                                                                                            |                     | min. | typ.                    | max. |                  |
| Übergangs-Wärmewiderstand<br>thermal resistance, case to heatsink      | pro Modul / per module<br>$\lambda_{\text{Paste}} = 1 \text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1 \text{ W}/(\text{m}\cdot\text{K})$ | $R_{\text{thCH}}$   |      | 0,009                   |      | K/W              |
| Modulinduktivität<br>stray inductance module                           |                                                                                                                                                            | $L_{\text{sCE}}$    |      | 45                      |      | nH               |
| Höchstzulässige Sperrschichttemperatur<br>maximum junction temperature | Wechselrichter, Brems-Chopper / Inverter, Brake-Chopper                                                                                                    | $T_{\text{vj max}}$ |      |                         | 175  | $^\circ\text{C}$ |
| Temperatur im Schaltbetrieb<br>temperature under switching conditions  | Wechselrichter, Brems-Chopper / Inverter, Brake-Chopper                                                                                                    | $T_{\text{vj op}}$  | -40  |                         | 150  | $^\circ\text{C}$ |
| Lagertemperatur<br>storage temperature                                 |                                                                                                                                                            | $T_{\text{stg}}$    | -40  |                         | 125  | $^\circ\text{C}$ |
| Anzugsdrehmoment f. mech. Befestigung<br>mounting torque               | Schraube M5 - Montage gem. gültiger Applikation Note<br>screw M5 - mounting according to valid application note                                            | M                   | 3,00 | -                       | 6,00 | Nm               |
| Anzugsdrehmoment f. elektr. Anschlüsse<br>terminal connection torque   | Schraube M6 - Montage gem. gültiger Applikation Note<br>screw M6 - mounting according to valid application note                                            | M                   | 3,0  | -                       | 6,0  | Nm               |
| Gewicht<br>weight                                                      |                                                                                                                                                            | G                   |      | 400                     |      | g                |

prepared by: AS

date of publication: 2011-03-02

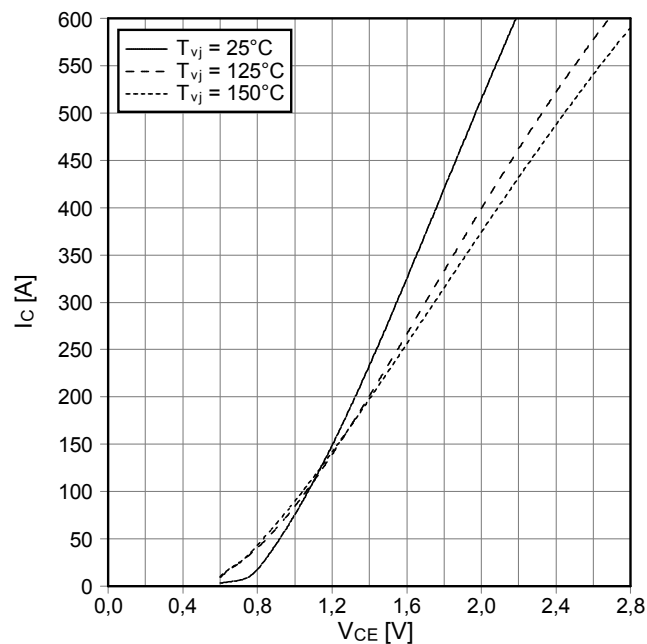
approved by: MK

revision: 2.1

Vorläufige Daten  
preliminary data

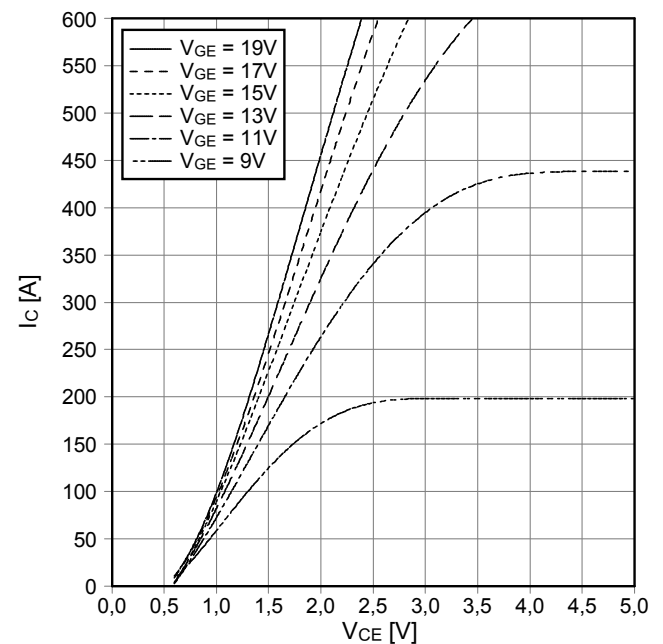
Ausgangskennlinie IGBT-Wechselr. (typisch)  
output characteristic IGBT-inverter (typical)

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



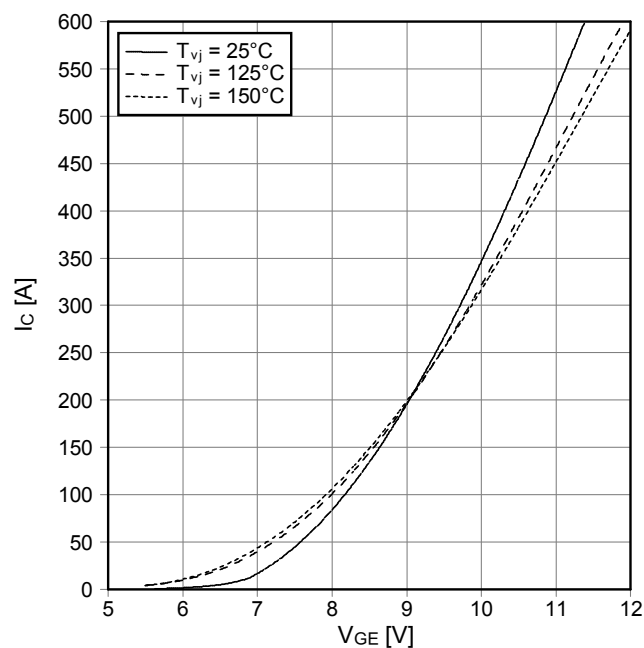
Ausgangskennlinienfeld IGBT-Wechselr. (typisch)  
output characteristic IGBT-inverter (typical)

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



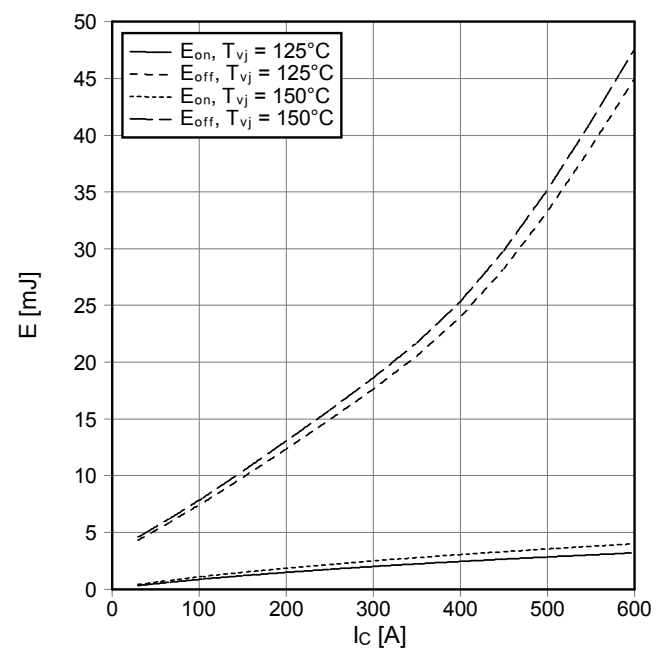
Übertragungscharakteristik IGBT-Wechselr. (typisch)  
transfer characteristic IGBT-inverter (typical)

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



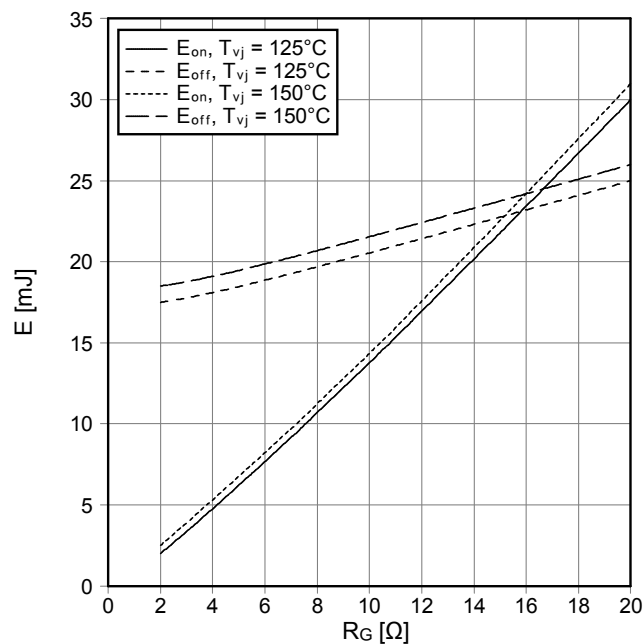
Schaltverluste IGBT-Wechselr. (typisch)  
switching losses IGBT-inverter (typical)

$E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $R_{Gon} = 2 \Omega$ ,  $R_{Goff} = 2 \Omega$ ,  $V_{CE} = 300 \text{ V}$

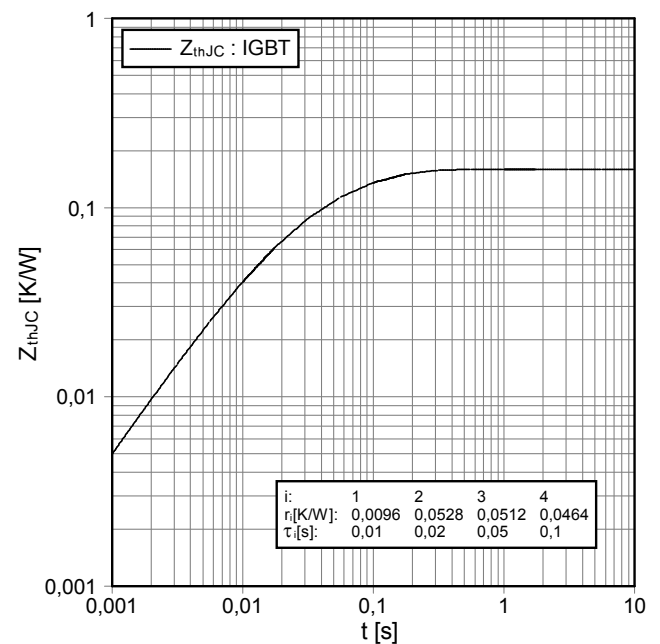


Vorläufige Daten  
preliminary data

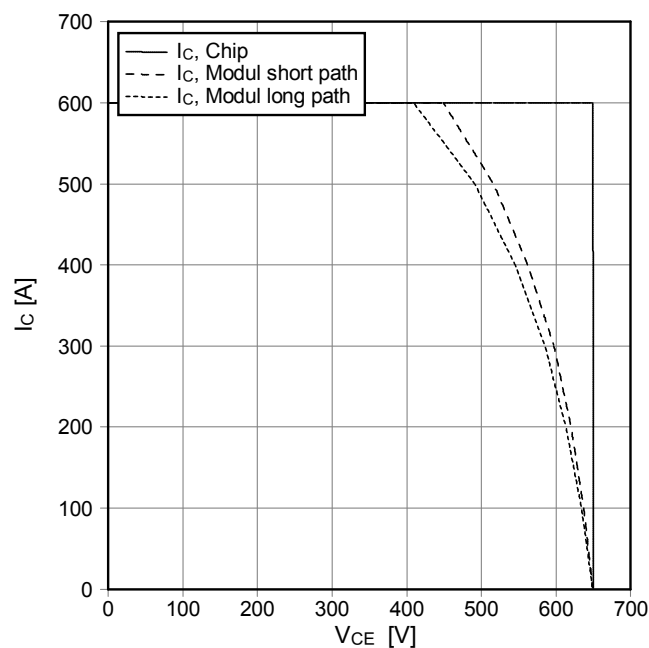
Schaltverluste IGBT-Wechselr. (typisch)  
switching losses IGBT-Inverter (typical)  
 $E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $I_C = 300 \text{ A}$ ,  $V_{CE} = 300 \text{ V}$



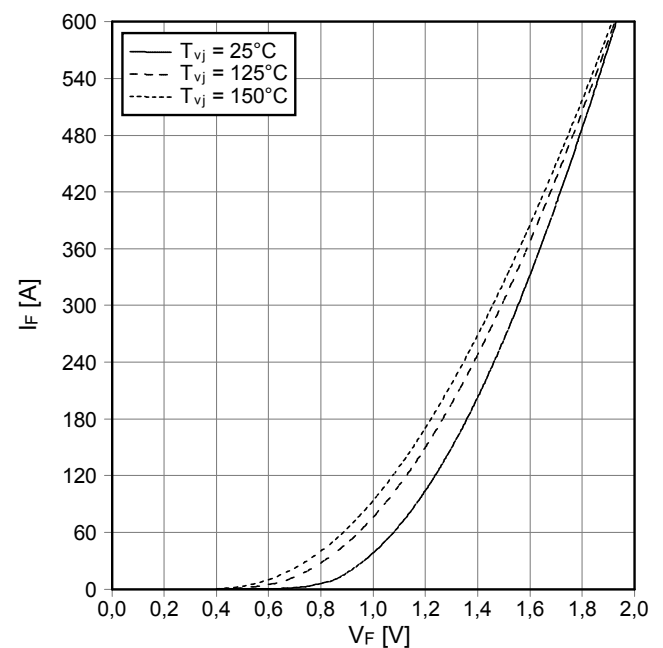
Transienter Wärmewiderstand IGBT-Wechselr.  
transient thermal impedance IGBT-inverter  
 $Z_{thJC} = f(t)$



Sicherer Rückwärts-Arbeitsbereich IGBT-Wr. (RBSOA)  
reverse bias safe operating area IGBT-inv. (RBSOA)  
 $I_C = f(V_{CE})$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $R_{Goff} = 2 \Omega$ ,  $T_{vj} = 150^\circ \text{C}$



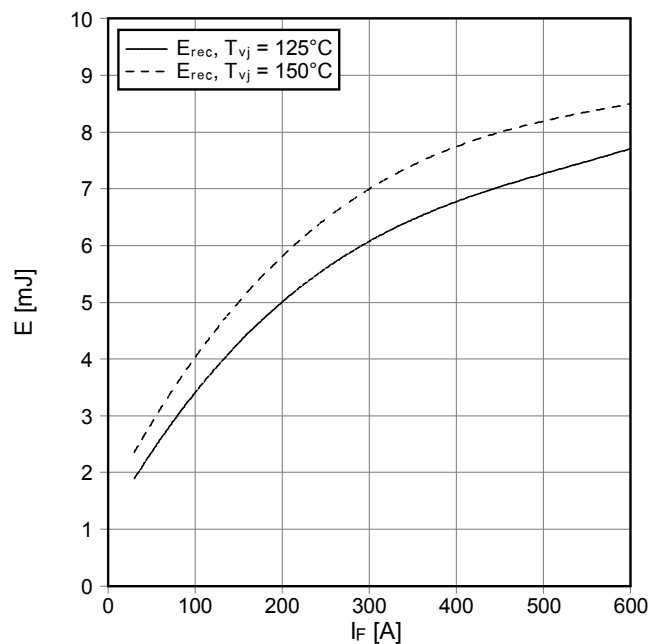
Durchlasskennlinie der Diode-Wechselr. (typisch)  
forward characteristic of diode-inverter (typical)  
 $I_F = f(V_F)$



Vorläufige Daten  
preliminary data

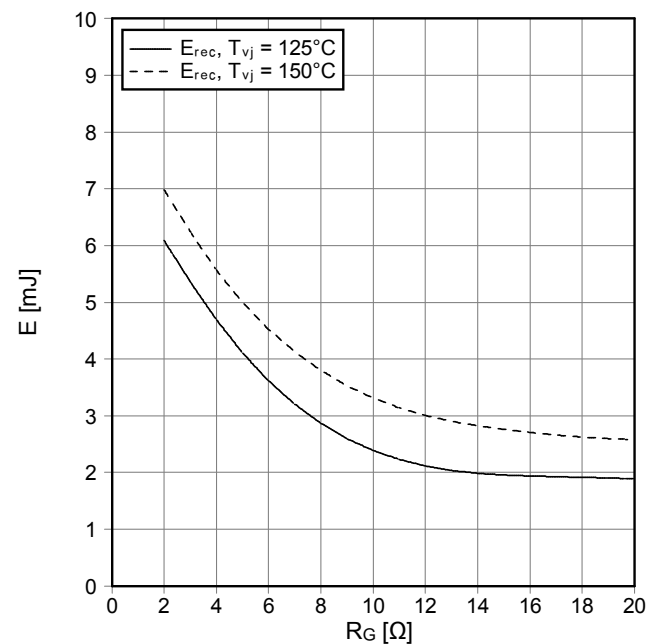
Schaltverluste Diode-Wechselr. (typisch)  
switching losses diode-inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 2 \Omega$ ,  $V_{CE} = 300 V$



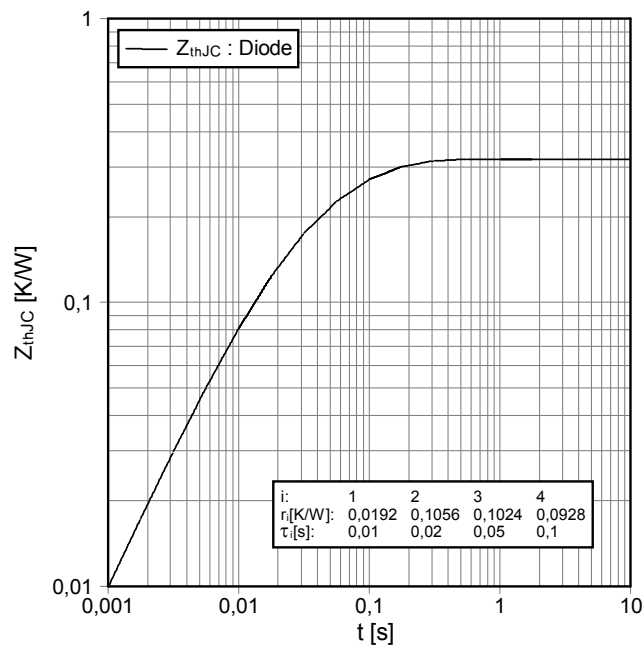
Schaltverluste Diode-Wechselr. (typisch)  
switching losses diode-inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 300 A$ ,  $V_{CE} = 300 V$



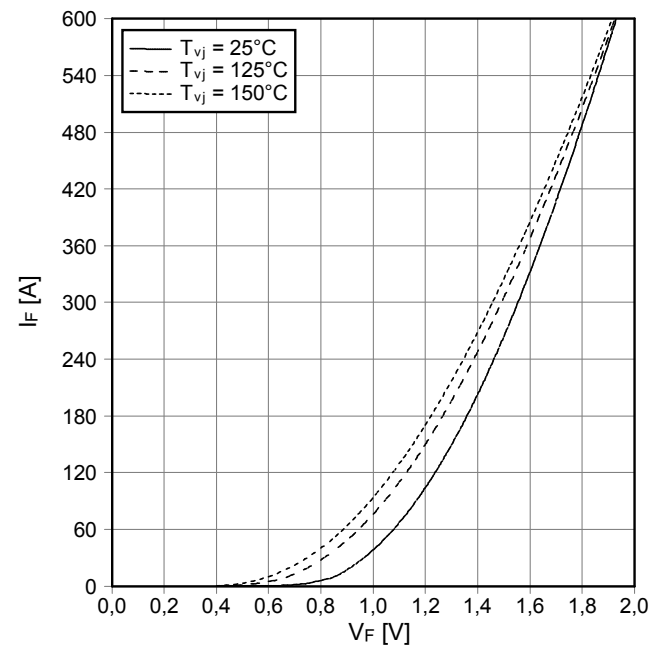
Transienter Wärmewiderstand Diode-Wechselr.  
transient thermal impedance diode-inverter

$Z_{thJC} = f(t)$



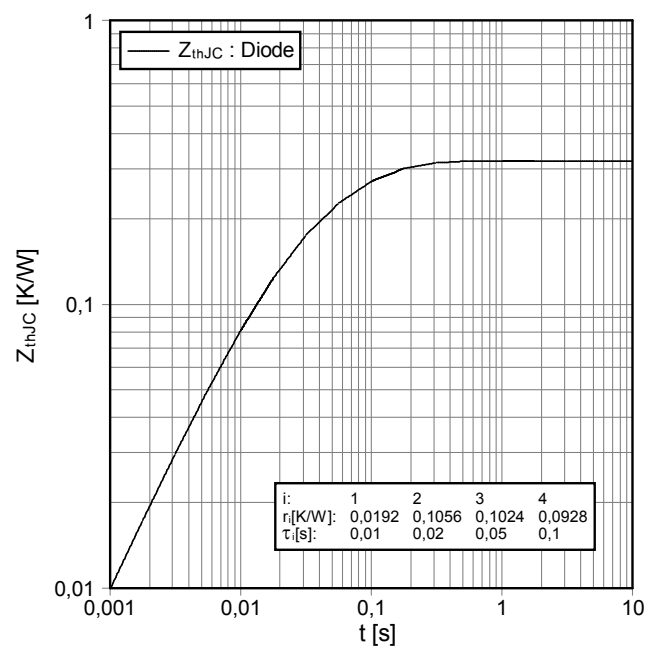
Durchlasskennlinie der Diode-3-Level  
forward characteristic of Diode-3-level

$I_F = f(V_F)$

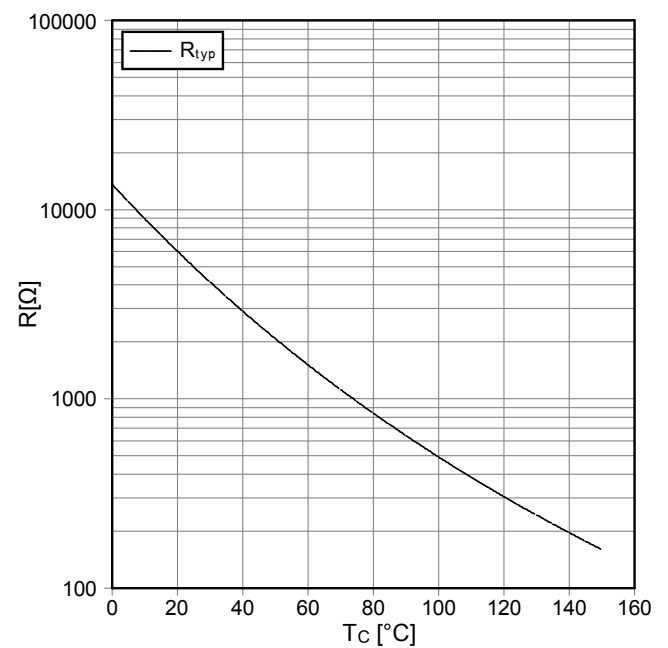


Vorläufige Daten  
preliminary data

Transienter Wärmewiderstand Diode-3-Level  
transient thermal impedance Diode-3-level  
 $Z_{thJC} = f(t)$



NTC-Temperaturkennlinie (typisch)  
NTC-temperature characteristic (typical)  
 $R = f(T)$



prepared by: AS

date of publication: 2011-03-02

approved by: MK

revision: 2.1



## Vorläufige Daten preliminary data

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| prepared by: AS | date of publication: 2011-03-02 |
| approved by: MK | revision: 2.1                   |