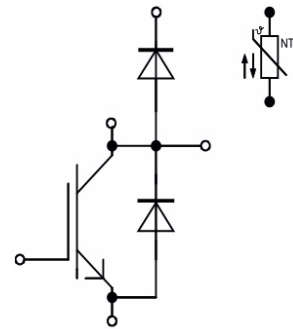
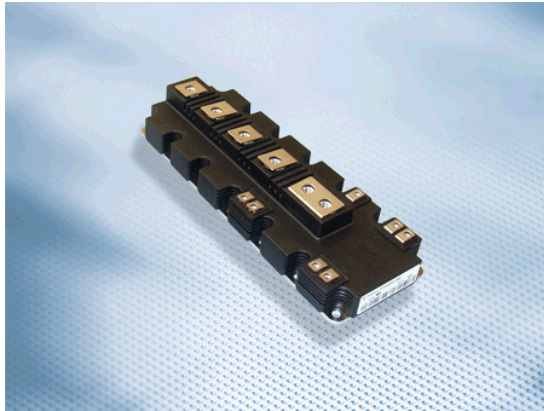


PrimePACK™3 Modul mit Trench/Feldstopp IGBT4, größerer Emitter Controlled 4 Diode  
PrimePACK™3 module with Trench/Fieldstop IGBT4, increased Emitter Controlled 4 diode

### Vorläufige Daten / preliminary data


 $V_{CES} = 1200V$ 
 $I_{C\ nom} = 1400A / I_{CRM} = 2800A$ 

### Typische Anwendungen

- Chopper-Anwendungen

### Typical Applications

- Chopper Applications

### Elektrische Eigenschaften

- Erweiterte Sperrschichttemperatur  $T_{vj\ op}$
- Große DC-Festigkeit
- Hohe Kurzschlussrobustheit, selbstlimitierender Kurzschlussstrom
- $V_{CEsat}$  mit positivem Temperaturkoeffizienten
- niedriges  $V_{CEsat}$

### Electrical Features

- Extended Operation Temperature  $T_{vj\ op}$
- High DC Stability
- High Short Circuit Capability, Self Limiting Short Circuit Current
- $V_{CEsat}$  with positive Temperature Coefficient
- Low  $V_{CEsat}$

### Mechanische Eigenschaften

- 4kV AC 1min Isolationsfestigkeit
- Gehäuse mit CTI > 400
- Große Luft- und Kriechstrecken
- Hohe Last- und thermische Wechselfestigkeit
- Hohe Leistungsdichte
- Substrat für kleinen thermischen Widerstand

### Mechanical Features

- 4kV AC 1min Insulation
- Package with CTI > 400
- High Creepage and Clearance Distances
- High Power and Thermal Cycling Capability
- High Power Density
- Substrate for Low Thermal Resistance

### Module Label Code

Barcode Code 128



DMX - Code



### Content of the 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: AC | date of publication: 2009-08-14 | material no: 33825   |
| approved by: MS | revision: 2.2                   | UL approved (E83335) |

Vorläufige Daten  
preliminary data

## IGBT-Chopper / IGBT-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>DC-collector current                       | $T_C = 100^{\circ}\text{C}, T_{vj} = 175^{\circ}\text{C}$ | $I_{Cnom}$ | 1400  | A  |
| Periodischer Kollektor Spitzenstrom<br>repetitive peak collector current | $t_P = 1 \text{ ms}$                                      | $I_{CRM}$  | 2800  | A  |
| Gesamt-Verlustleistung<br>total power dissipation                        | $T_C = 25^{\circ}\text{C}, T_{vj} = 175^{\circ}\text{C}$  | $P_{tot}$  | 7,70  | kW |
| 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 | $I_C = 1400 \text{ A}, V_{GE} = 15 \text{ V}$<br>$I_C = 1400 \text{ A}, V_{GE} = 15 \text{ V}$<br>$I_C = 1400 \text{ A}, V_{GE} = 15 \text{ V}$                                                | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_{CE sat}$ | 1,75<br>2,05<br>2,15 | 2,10 | V<br>V<br>V                                     |
| Gate-Schwellenspannung<br>gate threshold voltage                             | $I_C = 49,0 \text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                          |                                                                                                   | $V_{GEth}$   | 5,0                  | 5,8  | 6,5 V                                           |
| Gateladung<br>gate charge                                                    | $V_{GE} = -15 \text{ V} \dots +15 \text{ V}$                                                                                                                                                   |                                                                                                   | $Q_G$        | 9,60                 |      | $\mu\text{C}$                                   |
| Interner Gatewiderstand<br>internal gate resistor                            | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                                                                  |                                                                                                   | $R_{Gint}$   | 0,80                 |      | $\Omega$                                        |
| Eingangskapazität<br>input capacitance                                       | $f = 1 \text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}$                                                                                                  |                                                                                                   | $C_{ies}$    | 82,0                 |      | nF                                              |
| Rückwirkungskapazität<br>reverse transfer capacitance                        | $f = 1 \text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}$                                                                                                  |                                                                                                   | $C_{res}$    | 4,60                 |      | nF                                              |
| Kollektor-Emitter Reststrom<br>collector-emitter cut-off current             | $V_{CE} = 1200 \text{ V}, V_{GE} = 0 \text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                   |                                                                                                   | $I_{CES}$    |                      | 5,0  | 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) | $I_C = 1400 \text{ A}, V_{CE} = 600 \text{ V}$<br>$V_{GE} = \pm 15 \text{ V}$<br>$R_{Gon} = 1,0 \Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{d on}$   | 0,20<br>0,21<br>0,21 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Anstiegszeit (induktive Last)<br>rise time (inductive load)                  | $I_C = 1400 \text{ A}, V_{CE} = 600 \text{ V}$<br>$V_{GE} = \pm 15 \text{ V}$<br>$R_{Gon} = 1,0 \Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_r$        | 0,12<br>0,13<br>0,13 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Abschaltverzögerungszeit (ind. Last)<br>turn-off delay time (inductive load) | $I_C = 1400 \text{ A}, V_{CE} = 600 \text{ V}$<br>$V_{GE} = \pm 15 \text{ V}$<br>$R_{Goff} = 1,0 \Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{d off}$  | 0,87<br>0,95<br>0,97 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Fallzeit (induktive Last)<br>fall time (inductive load)                      | $I_C = 1400 \text{ A}, V_{CE} = 600 \text{ V}$<br>$V_{GE} = \pm 15 \text{ V}$<br>$R_{Goff} = 1,0 \Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_f$        | 0,20<br>0,23<br>0,23 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Einschaltverlustenergie pro Puls<br>turn-on energy loss per pulse            | $I_C = 1400 \text{ A}, V_{CE} = 600 \text{ V}, L_S = 30 \text{ nH}$<br>$V_{GE} = \pm 15 \text{ V}, di/dt = 8600 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$R_{Gon} = 1,0 \Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{on}$     | 65,0<br>80,0<br>95,0 |      | mJ<br>mJ<br>mJ                                  |
| Abschaltverlustenergie pro Puls<br>turn-off energy loss per pulse            | $I_C = 1400 \text{ A}, V_{CE} = 600 \text{ V}, L_S = 30 \text{ nH}$<br>$V_{GE} = \pm 15 \text{ V}, du/dt = 2700 \text{ V}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$R_{Goff} = 1,0 \Omega$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{off}$    | 180<br>250<br>280    |      | 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>$t_P \leq 10 \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$                                   |                                                                                                   | $I_{SC}$     | 5600                 |      | A                                               |
| Innerer Wärmewiderstand<br>thermal resistance, junction to case              | pro IGBT / per IGBT                                                                                                                                                                            |                                                                                                   | $R_{thJC}$   |                      | 19,5 | K/kW                                            |
| Übergangs-Wärmewiderstand<br>thermal resistance, case to heatsink            | pro IGBT / per IGBT<br>$\lambda_{Paste} = 1 \text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1 \text{ W}/(\text{m}\cdot\text{K})$                                                        |                                                                                                   | $R_{thCH}$   | 9,30                 |      | K/kW                                            |

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revision: 2.2

Vorläufige Daten  
preliminary data

## Diode-Chopper / Diode-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>DC forward current                              |                                                                                                                                                  | $I_F$     | 1400       | A                                              |
| Periodischer Spitzenstrom<br>repetitive peak forw. current          | $t_p = 1 \text{ ms}$                                                                                                                             | $I_{FRM}$ | 2800       | A                                              |
| Grenzlastintegral<br>$I^2t$ - value                                 | $V_R = 0 \text{ V}, t_p = 10 \text{ ms}, T_{vj} = 125^{\circ}\text{C}$<br>$V_R = 0 \text{ V}, t_p = 10 \text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$    | 270<br>260 | $\text{kA}^2\text{s}$<br>$\text{kA}^2\text{s}$ |

## Charakteristische Werte / characteristic values

|                                                                   |                                                                                                                                                         |                                                                                                   |            | min. | typ.                 | max. |                                                 |
|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|------------|------|----------------------|------|-------------------------------------------------|
| Durchlassspannung<br>forward voltage                              | $I_F = 1400 \text{ A}, V_{GE} = 0 \text{ V}$<br>$I_F = 1400 \text{ A}, V_{GE} = 0 \text{ V}$<br>$I_F = 1400 \text{ A}, V_{GE} = 0 \text{ V}$            | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_F$      |      | 1,65<br>1,55<br>1,55 | 2,15 | V<br>V<br>V                                     |
| Rückstromspitze<br>peak reverse recovery current                  | $I_F = 1400 \text{ A}, -di_F/dt = 8600 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$   |      | 1000<br>1200<br>1250 |      | A<br>A<br>A                                     |
| Sperrverzögerungsladung<br>recovered charge                       | $I_F = 1400 \text{ A}, -di_F/dt = 8600 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$      |      | 170<br>300<br>330    |      | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| Abschaltenergie pro Puls<br>reverse recovery energy               | $I_F = 1400 \text{ A}, -di_F/dt = 8600 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$  |      | 80,0<br>140<br>160   |      | mJ<br>mJ<br>mJ                                  |
| Innerer Wärmewiderstand<br>thermal resistance, junction to case   | pro Diode / per diode                                                                                                                                   |                                                                                                   | $R_{thJC}$ |      |                      | 25,0 | K/kW                                            |
| Übergangs-Wärmewiderstand<br>thermal resistance, case to heatsink | pro Diode / per diode<br>$\lambda_{\text{Paste}} = 1 \text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1 \text{ W}/(\text{m}\cdot\text{K})$ |                                                                                                   | $R_{thCH}$ |      | 17,0                 |      | K/kW                                            |

## Diode-Revers / diode-reverse

## Höchstzulässige Werte / maximum rated values

|                                                                     |                                                                        |           |      |                       |
|---------------------------------------------------------------------|------------------------------------------------------------------------|-----------|------|-----------------------|
| Periodische Spitzensperrspannung<br>repetitive peak reverse voltage | $T_{vj} = 25^{\circ}\text{C}$                                          | $V_{RRM}$ | 1200 | V                     |
| Dauergleichstrom<br>DC forward current                              |                                                                        | $I_F$     | 180  | A                     |
| Periodischer Spitzenstrom<br>repetitive peak forw. current          | $t_p = 1 \text{ ms}$                                                   | $I_{FRM}$ | 360  | A                     |
| Grenzlastintegral<br>$I^2t$ - value                                 | $V_R = 0 \text{ V}, t_p = 10 \text{ ms}, T_{vj} = 125^{\circ}\text{C}$ | $I^2t$    | 0,23 | $\text{kA}^2\text{s}$ |

## Charakteristische Werte / characteristic values

|                                                                   |                                                                                                                                                         |                                                                 |            | min. | typ.         | max. |        |
|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|------------|------|--------------|------|--------|
| Durchlassspannung<br>forward voltage                              | $I_F = 180 \text{ A}, V_{GE} = 0 \text{ V}$<br>$I_F = 180 \text{ A}, V_{GE} = 0 \text{ V}$                                                              | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $V_F$      |      | 1,65<br>1,65 | 2,15 | V<br>V |
| Innerer Wärmewiderstand<br>thermal resistance, junction to case   | pro Diode / per diode                                                                                                                                   |                                                                 | $R_{thJC}$ |      |              | 225  | K/kW   |
| Übergangs-Wärmewiderstand<br>thermal resistance, case to heatsink | pro Diode / per diode<br>$\lambda_{\text{Paste}} = 1 \text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1 \text{ W}/(\text{m}\cdot\text{K})$ |                                                                 | $R_{thCH}$ |      | 120          |      | K/kW   |

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

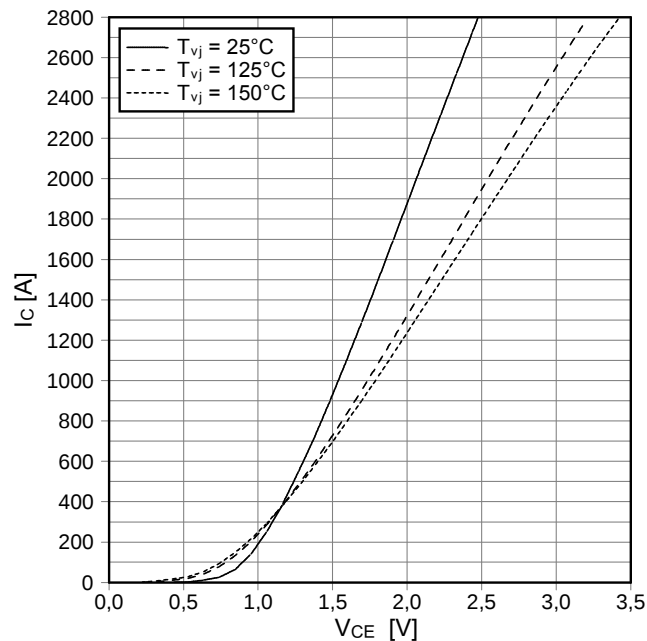
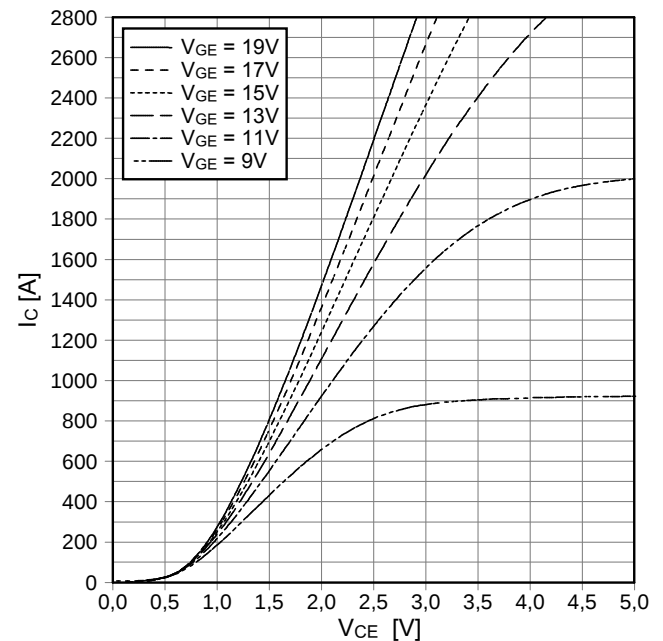
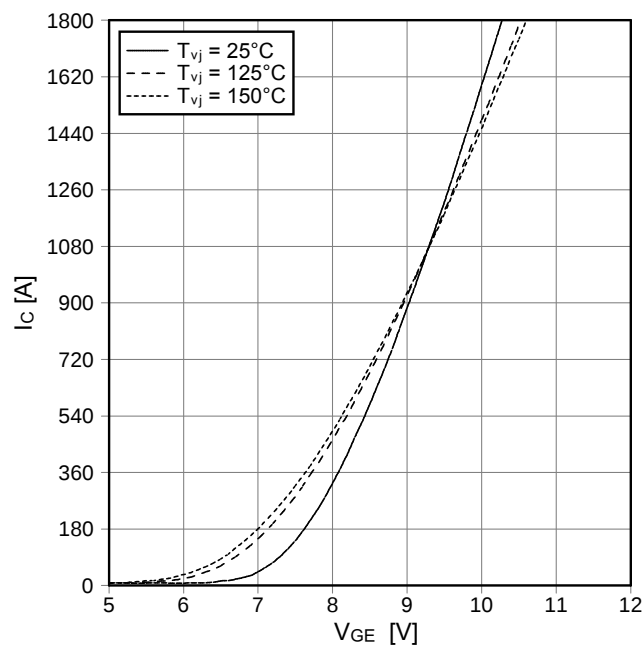
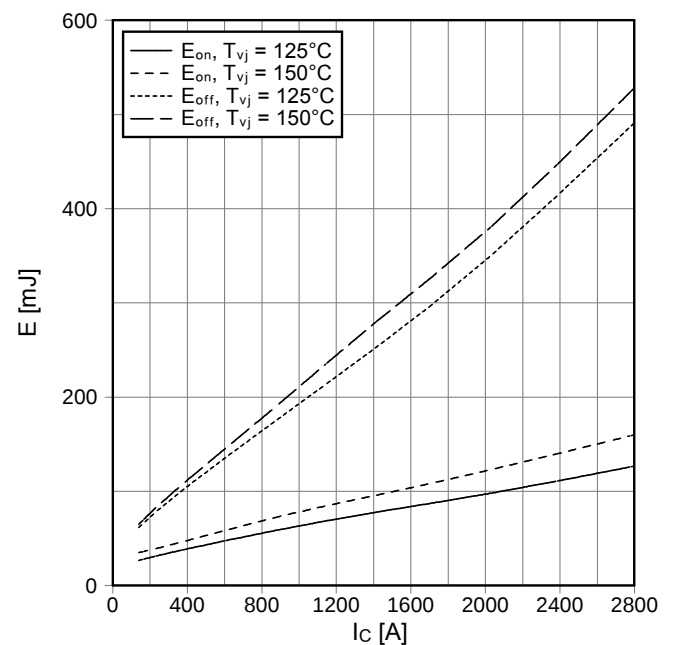
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|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------------|-------------------------|-----------|------------------|
| 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                                                                                                                                            |                             |            | 33,0<br>33,0            |           | mm               |
| Luftstrecke<br>clearance distance                                                            | Kontakt - Kühlkörper / terminal to heatsink<br>Kontakt - Kontakt / terminal to terminal                                                                                                                                            |                             |            | 19,0<br>19,0            |           | mm               |
| Vergleichszahl der Kriechwegbildung<br>comparative tracking index                            |                                                                                                                                                                                                                                    | CTI                         |            | > 400                   |           |                  |
|                                                                                              |                                                                                                                                                                                                                                    |                             | min.       | typ.                    | max.      |                  |
| Modulinduktivität<br>stray inductance module                                                 |                                                                                                                                                                                                                                    | $L_{\text{SCE}}$            |            | 10                      |           | nH               |
| Modulleitungswiderstand,<br>Anschlüsse - Chip<br>module lead resistance,<br>terminals - chip | $T_C = 25^\circ\text{C}$ , pro Schalter / per switch                                                                                                                                                                               | $R_{\text{CC}'+\text{EE}'}$ |            | 0,20                    |           | m $\Omega$       |
| 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        |                         | 150       | $^\circ\text{C}$ |
| 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 M4 - Montage gem. gültiger Applikation Note<br>screw M4 - mounting according to valid application note<br>Schraube M8 - Montage gem. gültiger Applikation Note<br>screw M8 - mounting according to valid application note | M                           | 1,8<br>8,0 | -<br>-                  | 2,1<br>10 | Nm<br>Nm         |
| Gewicht<br>weight                                                                            |                                                                                                                                                                                                                                    | G                           |            | 1200                    |           | g                |

prepared by: AC

date of publication: 2009-08-14

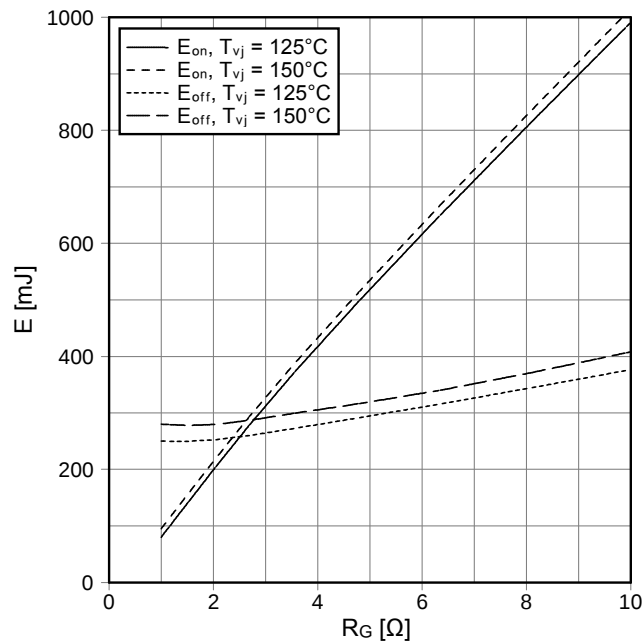
approved by: MS

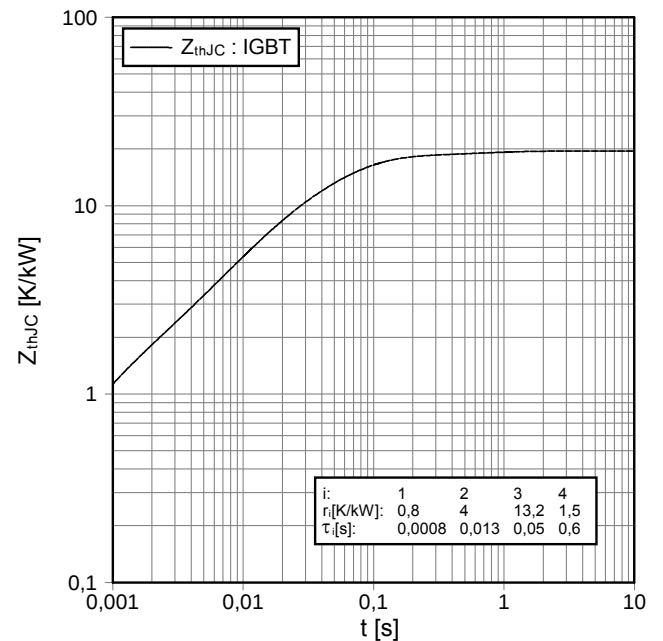
revision: 2.2

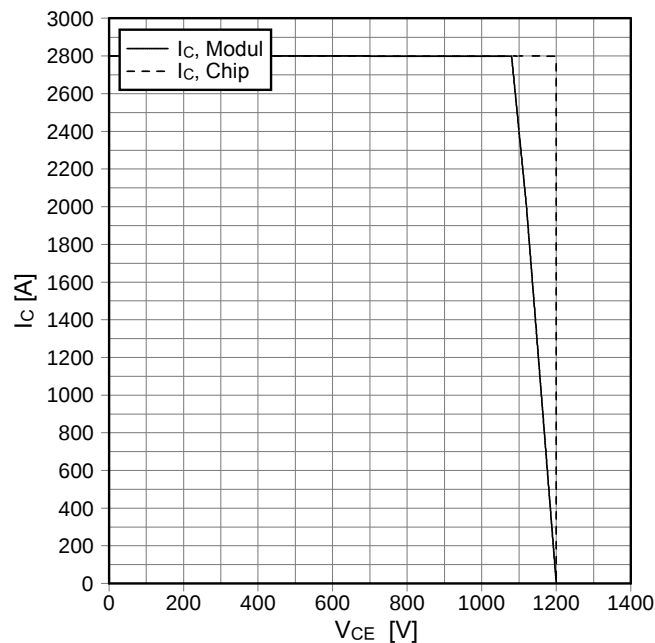
Vorläufige Daten  
preliminary dataAusgangskennlinie IGBT-Chopper  
output characteristic IGBT-chopper
 $I_C = f(V_{CE})$   
 $V_{GE} = 15\text{ V}$ 
Ausgangskennlinienfeld IGBT-Chopper  
output characteristic IGBT-chopper
 $I_C = f(V_{CE})$   
 $T_{vj} = 150^\circ\text{C}$ 
Übertragungscharakteristik IGBT-Chopper  
transfer characteristic IGBT-chopper
 $I_C = f(V_{GE})$   
 $V_{CE} = 20\text{ V}$ 
Schaltverluste IGBT-Chopper  
switching losses IGBT-chopper
 $E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 1\ \Omega$ ,  $R_{Goff} = 1\ \Omega$ ,  $V_{CE} = 600\text{ V}$ 


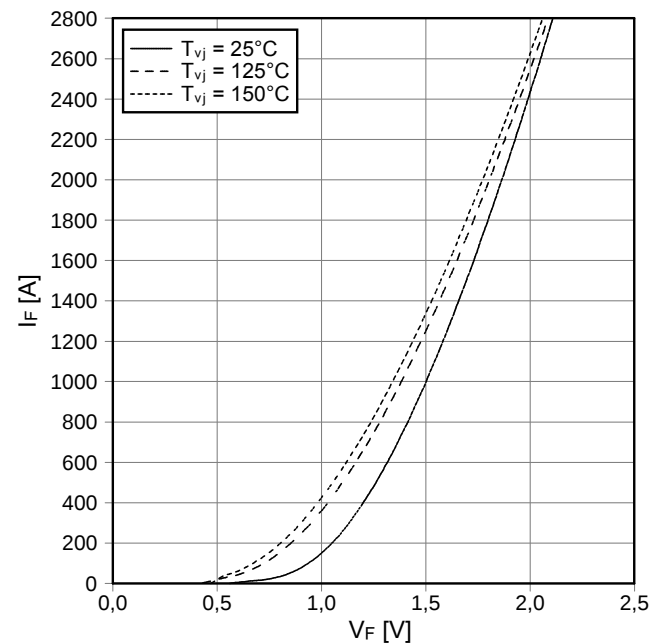
Vorläufige Daten  
preliminary data

Schaltverluste IGBT-Chopper  
switching losses IGBT-chopper

 $E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $I_C = 1400 \text{ A}$ ,  $V_{CE} = 600 \text{ V}$ 

Transienter Wärmewiderstand IGBT-Chopper  
transient thermal impedance IGBT-chopper

 $Z_{thJC} = f(t)$ 

Sicherer Rückwärts-Arbeitsbereich IGBT-Chopper  
reverse bias safe operating area IGBT-chopper

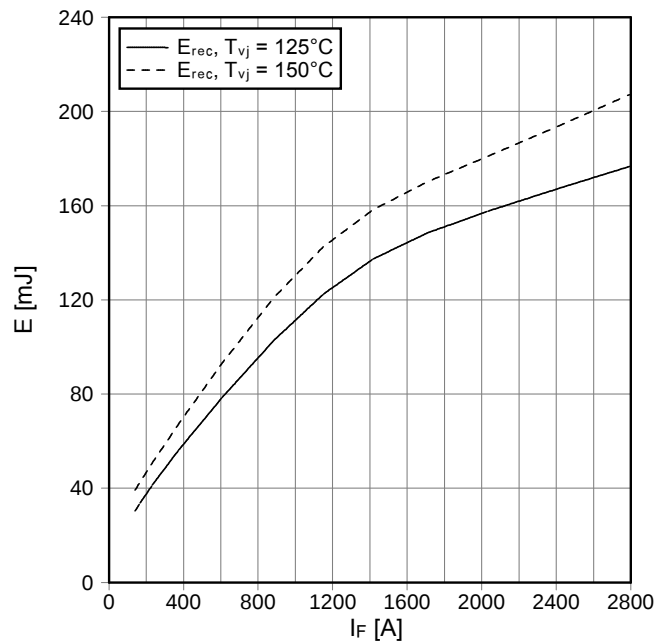
 $I_C = f(V_{CE})$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $R_{Goff} = 1 \Omega$ ,  $T_{vj} = 150^\circ\text{C}$ 

Durchlasskennlinie der Diode-Chopper  
forward characteristic of Diode-chopper

 $I_F = f(V_F)$ 


**Vorläufige Daten**  
**preliminary data**

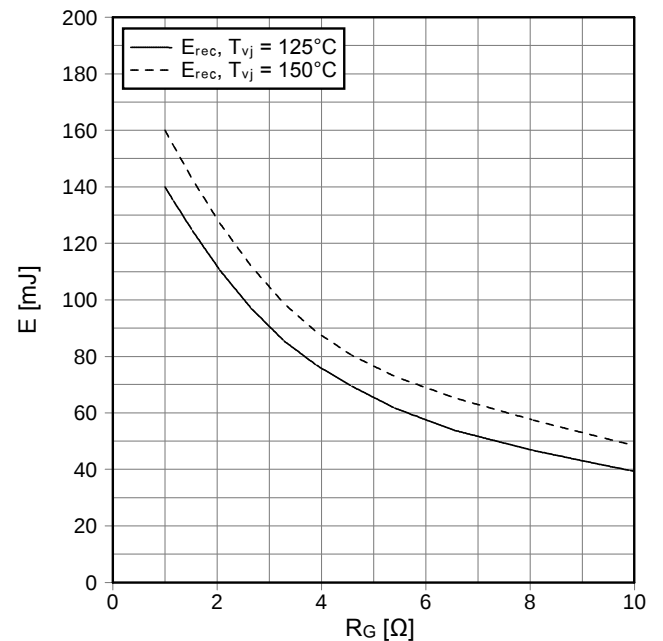
**Schaltverluste Diode-Chopper**  
**switching losses Diode-chopper**

$E_{rec} = f(I_F)$   
 $R_{Gon} = 1 \Omega$ ,  $V_{CE} = 600 V$



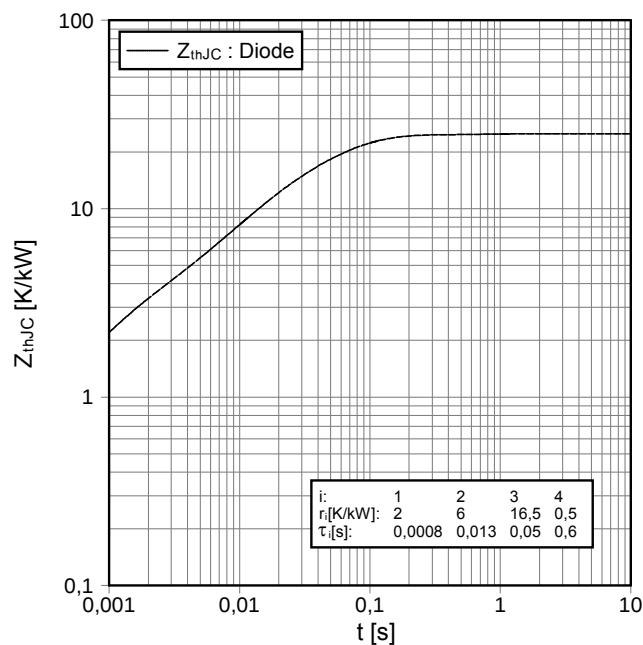
**Schaltverluste Diode-Chopper**  
**switching losses Diode-chopper**

$E_{rec} = f(R_G)$   
 $I_F = 1400 A$ ,  $V_{CE} = 600 V$



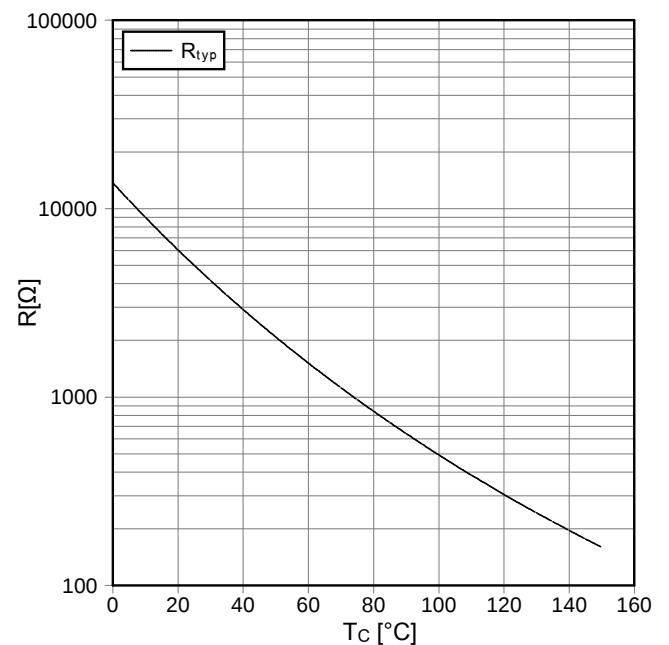
**Transienter Wärmewiderstand Diode-Chopper**  
**transient thermal impedance Diode-chopper**

$Z_{thJC} = f(t)$



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

$R = f(T)$





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- den Abschluss von speziellen Qualitätssicherungsvereinbarungen;
- die gemeinsame Einführung von Maßnahmen zu einer laufenden Produktbeobachtung dringend empfehlen und gegebenenfalls die Belieferung von der Umsetzung solcher Maßnahmen abhängig machen.

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- the conclusion of Quality Agreements;
- to establish joint measures of an ongoing product survey, and that we may make delivery depended on the realization of any such measures.

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|-----------------|---------------------------------|
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