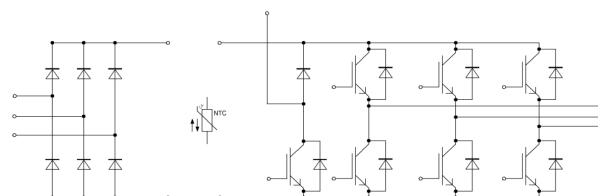
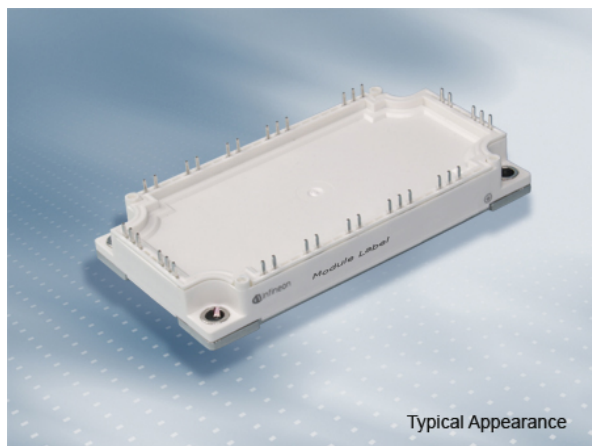


EconoPIM™3 Modul mit Trench/Feldstopp IGBT4 und Emitter Controlled Diode und NTC  
EconoPIM™3 module with trench/fieldstop IGBT4 and Emitter Controlled Diode and NTC

### Vorläufige Daten / Preliminary Data



$$V_{CES} = 650V$$

$$I_{C\ nom} = 150A / I_{CRM} = 300A$$

### Typische Anwendungen

- Motorantriebe

### Elektrische Eigenschaften

- Erhöhte Sperrspannungsfestigkeit auf 650V
- Hohe Kurzschlussrobustheit, selbstlimitierender Kurzschlussstrom
- Trench IGBT 4
- $T_{vj\ op} = 150^{\circ}C$
- $V_{CESat}$  mit positivem Temperaturkoeffizienten

### Mechanische Eigenschaften

- Integrierter NTC Temperatur Sensor
- Kupferbodenplatte
- Lötverbindungstechnik
- Standardgehäuse

### Typical Applications

- Motor Drives

### Electrical Features

- Increased blocking voltage capability to 650V
- High Short Circuit Capability, Self Limiting Short Circuit Current
- Trench IGBT 4
- $T_{vj\ op} = 150^{\circ}C$
- $V_{CESat}$  with positive Temperature Coefficient

### Mechanical Features

- Integrated NTC temperature sensor
- Copper Base Plate
- Solder Contact Technology
- Standard Housing

### 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: AS | date of publication: 2013-11-05 |                      |
| approved by: RS | revision: 2.0                   | 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>Continuous DC collector current            | $T_C = 55^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $I_{C\text{nom}}$ | 150   | A |
| Periodischer Kollektor-Spitzenstrom<br>Repetitive peak collector current | $t_P = 1\text{ ms}$                                          | $I_{CRM}$         | 300   | A |
| Gesamt-Verlustleistung<br>Total power dissipation                        | $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $P_{\text{tot}}$  | 430   | 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    | $I_C = 150\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 150\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 150\text{ A}, V_{GE} = 15\text{ V}$                                                      | $T_{vj} = 25^{\circ}\text{C}$<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                                | $I_C = 2,40\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                        |                                                                                                                     | $V_{GEth}$         | 5,0                  | 5,8  | 6,5 V                                           |
| Gateladung<br>Gate charge                                                       | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                                                                                                                  |                                                                                                                     | $Q_G$              | 1,50                 |      | $\mu\text{C}$                                   |
| Interner Gatewiderstand<br>Internal gate resistor                               | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                                                               |                                                                                                                     | $R_{Gint}$         | 2,0                  |      | $\Omega$                                        |
| Eingangskapazität<br>Input capacitance                                          | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                  |                                                                                                                     | $C_{ies}$          | 9,30                 |      | nF                                              |
| Rückwirkungskapazität<br>Reverse transfer capacitance                           | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                  |                                                                                                                     | $C_{res}$          | 0,285                |      | 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, induktive Last<br>Turn-on delay time, inductive load | $I_C = 150\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 3,3\ \Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $t_{don}$          | 0,12<br>0,14<br>0,14 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Anstiegszeit, induktive Last<br>Rise time, inductive load                       | $I_C = 150\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 3,3\ \Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<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 | $I_C = 150\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 3,3\ \Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $t_{doff}$         | 0,34<br>0,37<br>0,38 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Fallzeit, induktive Last<br>Fall time, inductive load                           | $I_C = 150\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 3,3\ \Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $t_f$              | 0,06<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               | $I_C = 150\text{ A}, V_{CE} = 300\text{ V}, L_S = 30\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, di/dt = 5400\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Gon} = 3,3\ \Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $E_{on}$           | 0,94<br>1,50<br>1,65 |      | mJ<br>mJ<br>mJ                                  |
| Abschaltverlustenergie pro Puls<br>Turn-off energy loss per pulse               | $I_C = 150\text{ A}, V_{CE} = 300\text{ V}, L_S = 30\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, du/dt = 3800\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Goff} = 3,3\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $E_{off}$          | 5,75<br>7,40<br>7,85 |      | 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>$t_P \leq 10\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ | $I_{SC}$           | 720<br>570           |      | A<br>A                                          |
| Wärmewiderstand, Chip bis Gehäuse<br>Thermal resistance, junction to case       | pro IGBT / per IGBT                                                                                                                                                                         |                                                                                                                     | $R_{thJC}$         |                      | 0,35 | K/W                                             |
| Wärmewiderstand, Gehäuse bis Kühlkörper<br>Thermal resistance, case to heatsink | pro IGBT / per IGBT<br>$\lambda_{Paste} = 1\text{ W}/(\text{m} \cdot \text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m} \cdot \text{K})$                                                   |                                                                                                                     | $R_{thCH}$         |                      | 0,14 | K/W                                             |
| Temperatur im Schaltbetrieb<br>Temperature under switching conditions           |                                                                                                                                                                                             |                                                                                                                     | $T_{vj\text{op}}$  | -40                  | 150  | $^{\circ}\text{C}$                              |

prepared by: AS

date of publication: 2013-11-05

approved by: RS

revision: 2.0

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>Continuous DC forward current                   |                                                                                                                                              | $I_F$     | 150          | A                                            |
| Periodischer Spitzenstrom<br>Repetitive peak forward current        | $t_P = 1\text{ ms}$                                                                                                                          | $I_{FRM}$ | 300          | A                                            |
| Grenzlastintegral<br>$I^2t$ - value                                 | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$<br>$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$    | 2050<br>1950 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

## Charakteristische Werte / Characteristic Values

|                                                                                 |                                                                                                                                            |                                                                                                   | min.       | typ.                 | max. |                                                 |
|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|------------|----------------------|------|-------------------------------------------------|
| Durchlassspannung<br>Forward voltage                                            | $I_F = 150\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 150\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 150\text{ A}, V_{GE} = 0\text{ V}$        | $T_{vj} = 25^{\circ}\text{C}$<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                                | $I_F = 150\text{ A}, -di_F/dt = 5400\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$   | 150<br>180<br>185    |      | A<br>A<br>A                                     |
| Sperrverzögerungsladung<br>Recovered charge                                     | $I_F = 150\text{ A}, -di_F/dt = 5400\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$      | 7,00<br>13,0<br>15,0 |      | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| Abschaltenergie pro Puls<br>Reverse recovery energy                             | $I_F = 150\text{ A}, -di_F/dt = 5400\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$  | 1,95<br>3,50<br>3,95 |      | mJ<br>mJ<br>mJ                                  |
| Wärmewiderstand, Chip bis Gehäuse<br>Thermal resistance, junction to case       | pro Diode / per diode                                                                                                                      |                                                                                                   | $R_{thJC}$ |                      | 0,60 | K/W                                             |
| Wärmewiderstand, Gehäuse bis Kühlkörper<br>Thermal resistance, case to heatsink | pro Diode / per diode<br>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$  |                                                                                                   | $R_{thCH}$ | 0,245                |      | 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   | $T_C = 80^{\circ}\text{C}$                                                                              | $I_{FRMSM}$ | 150          | A                                            |
| Gleichrichter Ausgang Grenzeffektivstrom<br>Maximum RMS current at rectifier output | $T_C = 80^{\circ}\text{C}$                                                                              | $I_{RMSM}$  | 150          | A                                            |
| Stoßstrom Grenzwert<br>Surge forward current                                        | $t_p = 10\text{ ms}, T_{vj} = 25^{\circ}\text{C}$<br>$t_p = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I_{FSM}$   | 1150<br>880  | A<br>A                                       |
| Grenzlastintegral<br>$I^2t$ - value                                                 | $t_p = 10\text{ ms}, T_{vj} = 25^{\circ}\text{C}$<br>$t_p = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$      | 6600<br>3850 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

## Charakteristische Werte / Characteristic Values

|                                                                                 |                                                                                                                                           |                    | min. | typ.  | max. |                    |
|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------|-------|------|--------------------|
| Durchlassspannung<br>Forward voltage                                            | $T_{vj} = 150^{\circ}\text{C}, I_F = 150\text{ A}$                                                                                        | $V_F$              |      | 1,10  |      | 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                                                                                                                     | $R_{thJC}$         |      |       | 0,40 | K/W                |
| Wärmewiderstand, Gehäuse bis Kühlkörper<br>Thermal resistance, case to heatsink | pro Diode / per diode<br>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$ | $R_{thCH}$         |      | 0,165 |      | K/W                |
| Temperatur im Schaltbetrieb<br>Temperature under switching conditions           |                                                                                                                                           | $T_{vj\text{ op}}$ | -40  |       | 150  | $^{\circ}\text{C}$ |

prepared by: AS

date of publication: 2013-11-05

approved by: RS

revision: 2.0

Vorläufige Daten  
Preliminary Data

## IGBT, Brems-Chopper / IGBT, Brake-Chopper

## Höchstzulässige Werte / Maximum Rated Values

|                                                                          |                                                              |                    |       |   |
|--------------------------------------------------------------------------|--------------------------------------------------------------|--------------------|-------|---|
| Kollektor-Emitter-Sperrspannung<br>Collector-emitter voltage             | $T_{vj} = 25^{\circ}\text{C}$                                | $V_{CES}$          | 650   | V |
| Kollektor-Dauergleichstrom<br>Continuous DC collector current            | $T_C = 70^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $I_{C\text{ nom}}$ | 100   | A |
| Periodischer Kollektor-Spitzenstrom<br>Repetitive peak collector current | $t_P = 1\text{ ms}$                                          | $I_{CRM}$          | 200   | A |
| Gesamt-Verlustleistung<br>Total power dissipation                        | $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $P_{\text{tot}}$   | 335   | 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    | $I_C = 100\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 100\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 100\text{ A}, V_{GE} = 15\text{ V}$                                                      | $T_{vj} = 25^{\circ}\text{C}$<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                                | $I_C = 1,60\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                        |                                                                                                                     | $V_{GEth}$          | 5,0                  | 5,8  | 6,5 V                                           |
| Gateladung<br>Gate charge                                                       | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                                                                                                                  |                                                                                                                     | $Q_G$               | 1,00                 |      | $\mu\text{C}$                                   |
| Interner Gatewiderstand<br>Internal gate resistor                               | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                                                               |                                                                                                                     | $R_{Gint}$          | 2,0                  |      | $\Omega$                                        |
| Eingangskapazität<br>Input capacitance                                          | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                  |                                                                                                                     | $C_{ies}$           | 6,20                 |      | nF                                              |
| Rückwirkungskapazität<br>Reverse transfer capacitance                           | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                  |                                                                                                                     | $C_{res}$           | 0,19                 |      | 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, induktive Last<br>Turn-on delay time, inductive load | $I_C = 100\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 3,3\ \Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $t_{d\text{ on}}$   | 0,07<br>0,08<br>0,08 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Anstiegszeit, induktive Last<br>Rise time, inductive load                       | $I_C = 100\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 3,3\ \Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $t_r$               | 0,02<br>0,02<br>0,02 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Abschaltverzögerungszeit, induktive Last<br>Turn-off delay time, inductive load | $I_C = 100\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 3,3\ \Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $t_{d\text{ off}}$  | 0,26<br>0,29<br>0,30 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Fallzeit, induktive Last<br>Fall time, inductive load                           | $I_C = 100\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 3,3\ \Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $t_f$               | 0,07<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               | $I_C = 100\text{ A}, V_{CE} = 300\text{ V}, L_S = 30\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, di/dt = 5100\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Gon} = 3,3\ \Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $E_{on}$            | 0,33<br>0,77<br>0,88 |      | mJ<br>mJ<br>mJ                                  |
| Abschaltverlustenergie pro Puls<br>Turn-off energy loss per pulse               | $I_C = 100\text{ A}, V_{CE} = 300\text{ V}, L_S = 30\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, du/dt = 4000\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Goff} = 3,3\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $E_{off}$           | 3,50<br>4,70<br>4,90 |      | mJ<br>mJ<br>mJ                                  |
| Kurzschlußverhalten<br>SC data                                                  | $V_{GE} \leq 15\text{ V}, V_{CC} = 360\text{ V}$<br>$V_{CE\text{ max}} = V_{CES} - L_{SCE} \cdot di/dt$                                                                                     | $t_P \leq 10\ \mu\text{s}, T_{vj} = 25^{\circ}\text{C}$<br>$t_P \leq 10\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ | $I_{SC}$            | 480<br>380           |      | A<br>A                                          |
| Wärmewiderstand, Chip bis Gehäuse<br>Thermal resistance, junction to case       | pro IGBT / per IGBT                                                                                                                                                                         |                                                                                                                     | $R_{thJC}$          |                      | 0,45 | K/W                                             |
| Wärmewiderstand, Gehäuse bis Kühlkörper<br>Thermal resistance, case to heatsink | pro IGBT / per IGBT<br>$\lambda_{\text{Paste}} = 1\text{ W}/(\text{m} \cdot \text{K}) / \lambda_{\text{grease}} = 1\text{ W}/(\text{m} \cdot \text{K})$                                     |                                                                                                                     | $R_{thCH}$          | 0,185                |      | K/W                                             |
| Temperatur im Schaltbetrieb<br>Temperature under switching conditions           |                                                                                                                                                                                             |                                                                                                                     | $T_{vj\text{ op}}$  | -40                  | 150  | $^{\circ}\text{C}$                              |

prepared by: AS

date of publication: 2013-11-05

approved by: RS

revision: 2.0

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

|                                                                     |                                                                                                                                              |           |            |                                              |
|---------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------|----------------------------------------------|
| Periodische Spitzensperrspannung<br>Repetitive peak reverse voltage | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                | $V_{RRM}$ | 650        | V                                            |
| Dauergleichstrom<br>Continuous DC forward current                   |                                                                                                                                              | $I_F$     | 50         | A                                            |
| Periodischer Spitzenstrom<br>Repetitive peak forward current        | $t_P = 1\text{ ms}$                                                                                                                          | $I_{FRM}$ | 100        | A                                            |
| Grenzlastintegral<br>$I^2t$ - value                                 | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$<br>$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$    | 330<br>300 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

## Charakteristische Werte / Characteristic Values

|                                                                                 |                                                                                                                                                     |                                                                                                   |                    | min. | typ.                 | max. |                                                 |
|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------|------|----------------------|------|-------------------------------------------------|
| Durchlassspannung<br>Forward voltage                                            | $I_F = 50\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 50\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 50\text{ A}, V_{GE} = 0\text{ V}$                    | $T_{vj} = 25^{\circ}\text{C}$<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                                | $I_F = 50\text{ A}, -di_F/dt = 2800\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300\text{ V}$                                      | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$           |      | 69,0<br>76,0<br>80,0 |      | A<br>A<br>A                                     |
| Sperrverzögerungsladung<br>Recovered charge                                     | $I_F = 50\text{ A}, -di_F/dt = 2800\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300\text{ V}$                                      | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$              |      | 1,90<br>3,40<br>3,95 |      | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| Abschaltenergie pro Puls<br>Reverse recovery energy                             | $I_F = 50\text{ A}, -di_F/dt = 2800\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300\text{ V}$                                      | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$          |      | 0,60<br>0,95<br>1,10 |      | mJ<br>mJ<br>mJ                                  |
| Wärmewiderstand, Chip bis Gehäuse<br>Thermal resistance, junction to case       | pro Diode / per diode                                                                                                                               |                                                                                                   | $R_{thJC}$         |      |                      | 1,20 | K/W                                             |
| Wärmewiderstand, Gehäuse bis Kühlkörper<br>Thermal resistance, case to heatsink | pro Diode / per diode<br>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K}) \quad / \quad \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$ |                                                                                                   | $R_{thCH}$         |      | 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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| prepared by: AS | date of publication: 2013-11-05 |
| approved by: RS | revision: 2.0                   |

Vorläufige Daten  
Preliminary Data

## Modul / Module

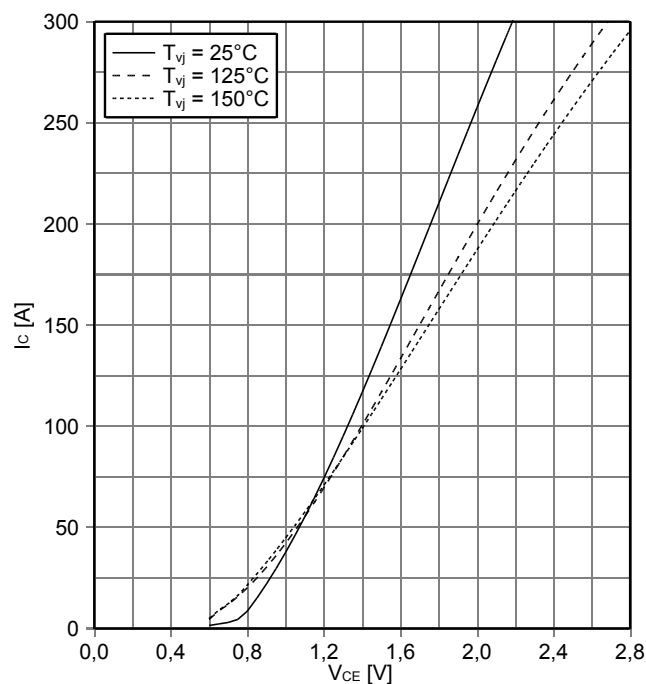
|                                                                                        |                                                                                                                                            |                                              |                                |                  |
|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|--------------------------------|------------------|
| 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>                             | 40                             | 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                |

bei Betrieb mit V<sub>ge</sub> = 0V/+15V empfehlen wir einen R<sub>gon,min</sub> von 24 Ohm und eine R<sub>goff,min</sub> von 24 Ohm (siehe AN 2006-01)  
for operation with V<sub>ge</sub> = 0V/+15V we recommend a R<sub>gon,min</sub> of 24 ohms and a R<sub>goff,min</sub> of 24 ohms (see AN 2006-01)

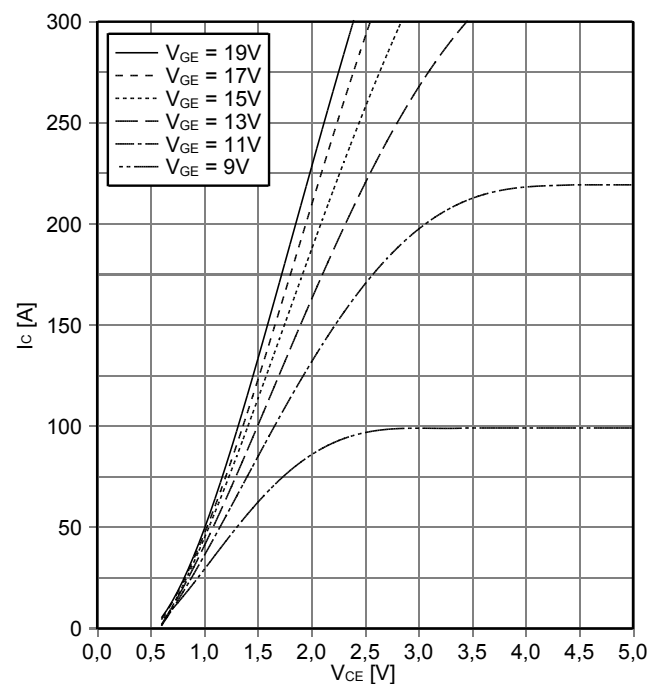
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| prepared by: AS | date of publication: 2013-11-05 |
| approved by: RS | revision: 2.0                   |

# Vorläufige Daten Preliminary Data

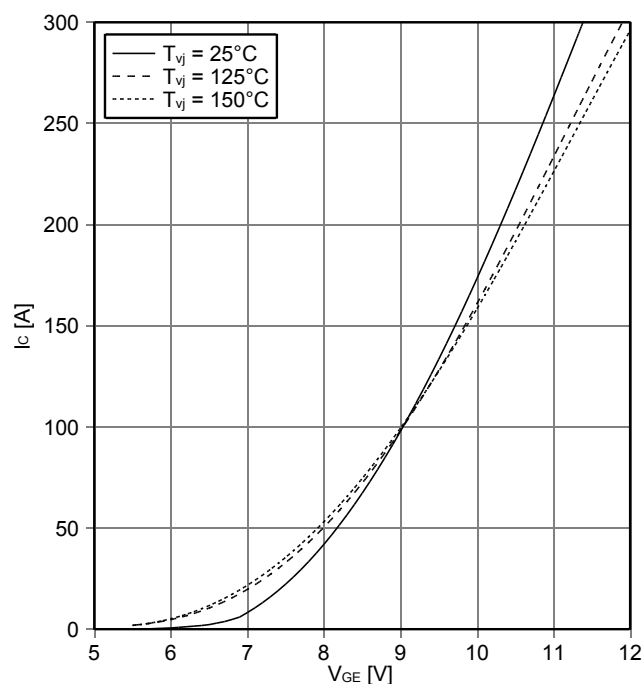
## Ausgangskennlinie IGBT, Wechselrichter (typisch) output characteristic IGBT, Inverter (typical)

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


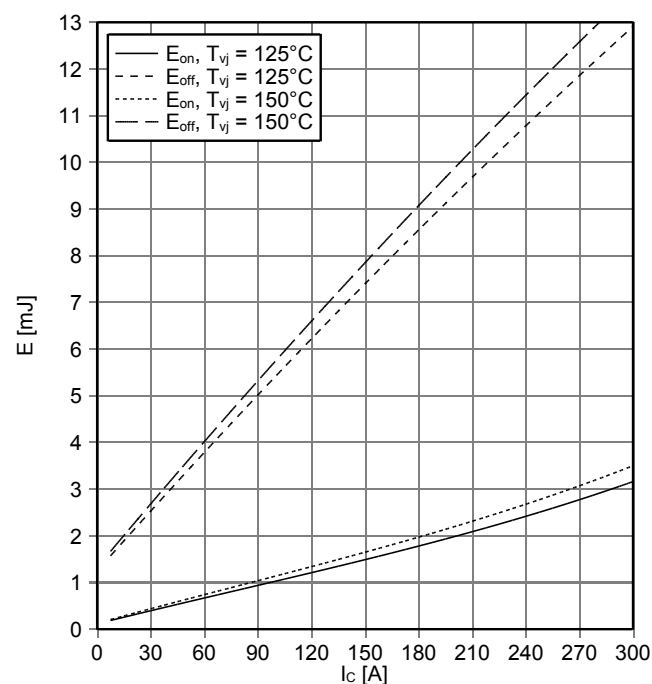
## Ausgangskennlinienfeld IGBT, Wechselrichter (typisch) output characteristic IGBT, Inverter (typical)

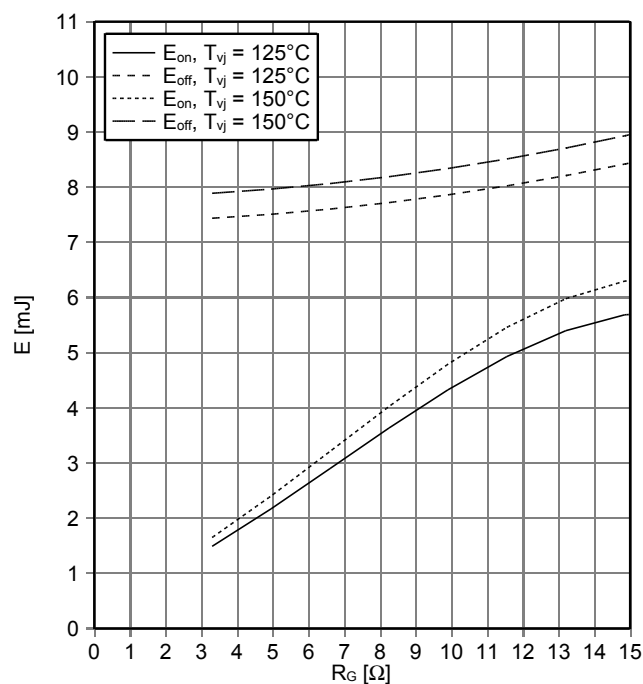
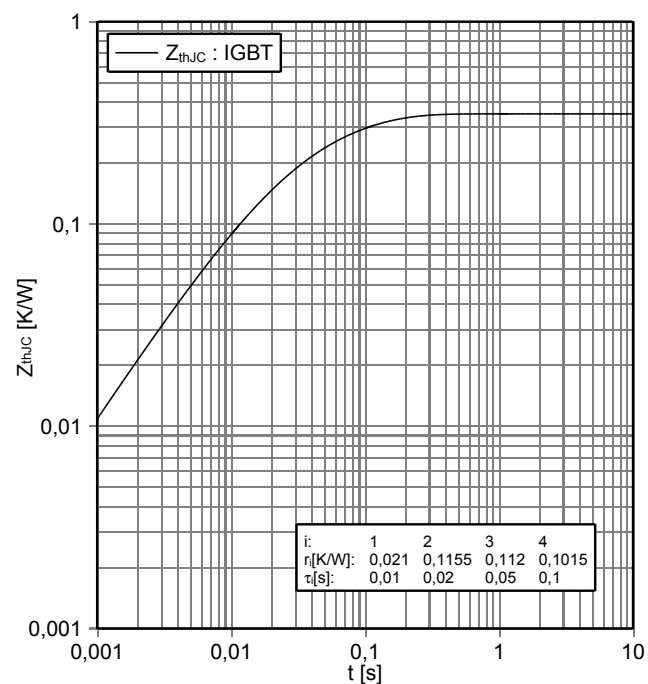
 $I_C = f(V_{CE})$   
 $T_{vj} = 150^\circ\text{C}$ 


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

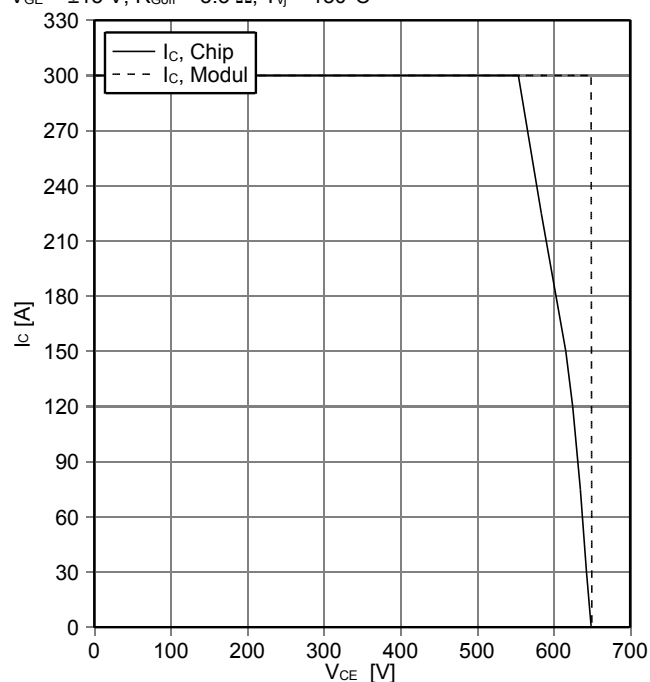
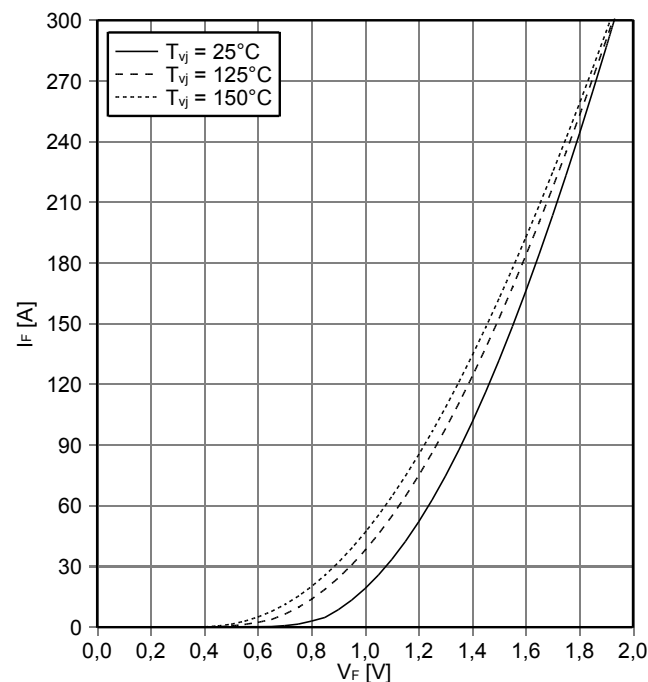
 $I_C = f(V_{GE})$   
 $V_{CE} = 20\text{ V}$ 


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

 $E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 3.3\ \Omega$ ,  $R_{Goff} = 3.3\ \Omega$ ,  $V_{CE} = 300\text{ V}$ 


Vorläufige Daten  
Preliminary DataSchaltverluste IGBT, Wechselrichter (typisch)  
switching losses IGBT, Inverter (typical)
 $E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $I_C = 150 \text{ A}$ ,  $V_{CE} = 300 \text{ V}$ 
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)

 $I_C = f(V_{CE})$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $R_{Goff} = 3.3 \Omega$ ,  $T_{vj} = 150^\circ\text{C}$ 
Durchlasskennlinie der Diode, Wechselrichter (typisch)  
forward characteristic of Diode, Inverter (typical) $I_F = f(V_F)$ 

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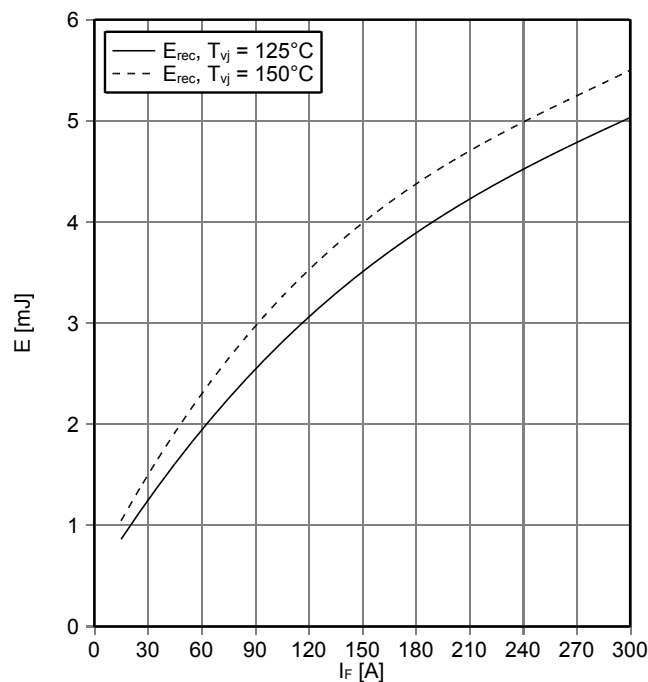
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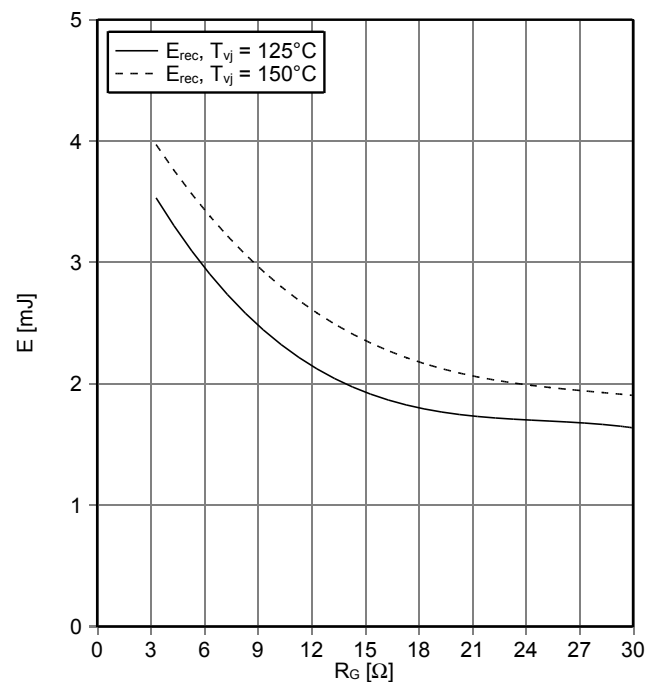
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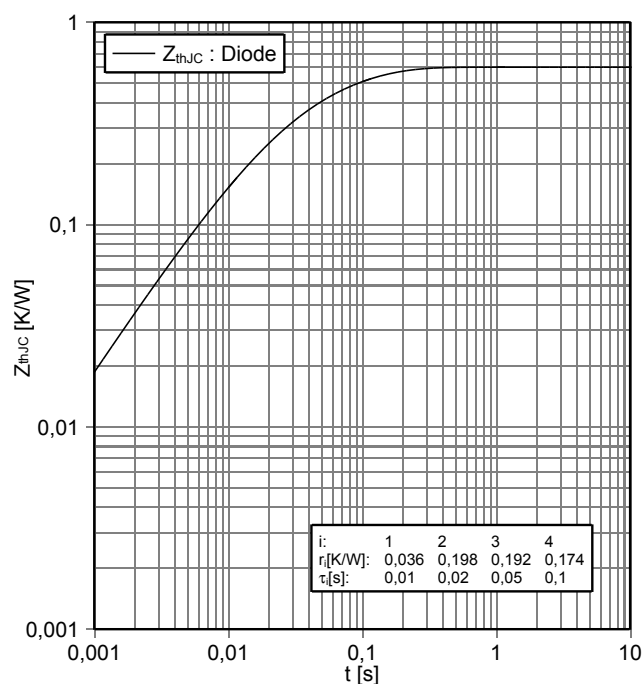
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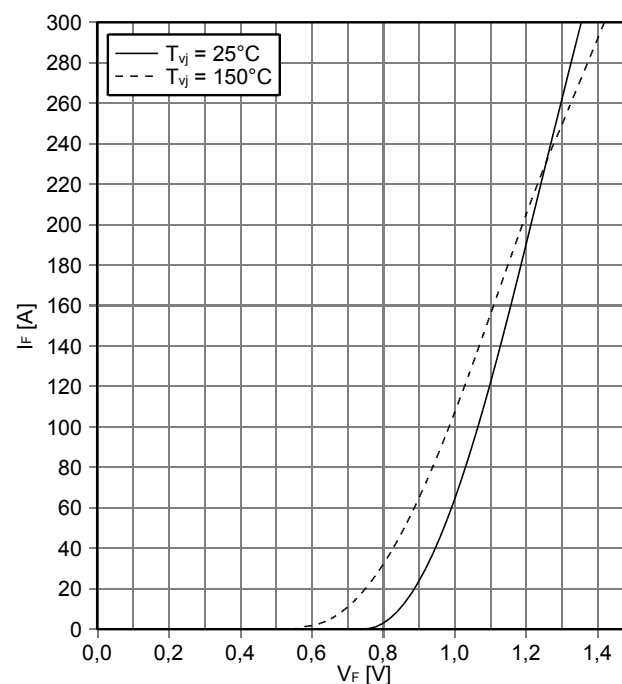
Vorläufige Daten  
Preliminary Data

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

 $E_{rec} = f(I_F)$   
 $R_{Gon} = 3.3 \Omega$ ,  $V_{CE} = 300 V$ 

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

 $E_{rec} = f(R_G)$   
 $I_F = 150 A$ ,  $V_{CE} = 300 V$ 

Transienter Wärmewiderstand Diode, Wechselrichter  
transient thermal impedance Diode, Inverter

 $Z_{thJC} = f(t)$ 

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

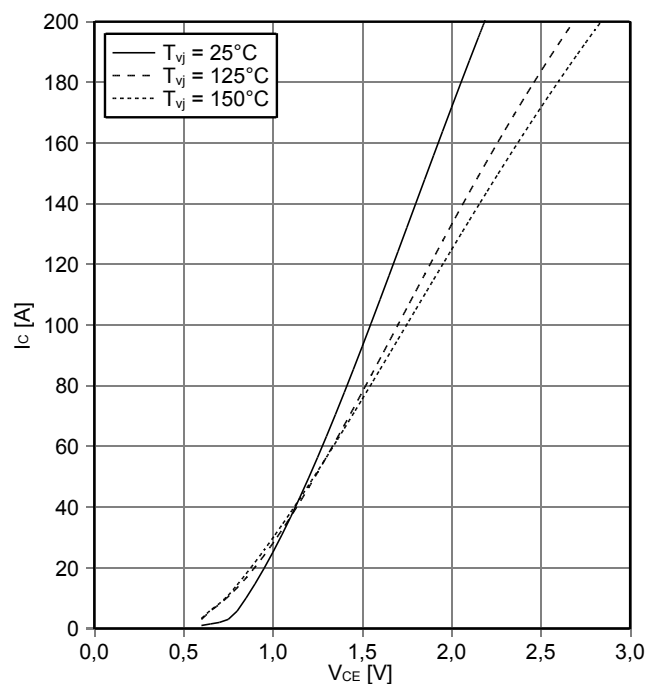
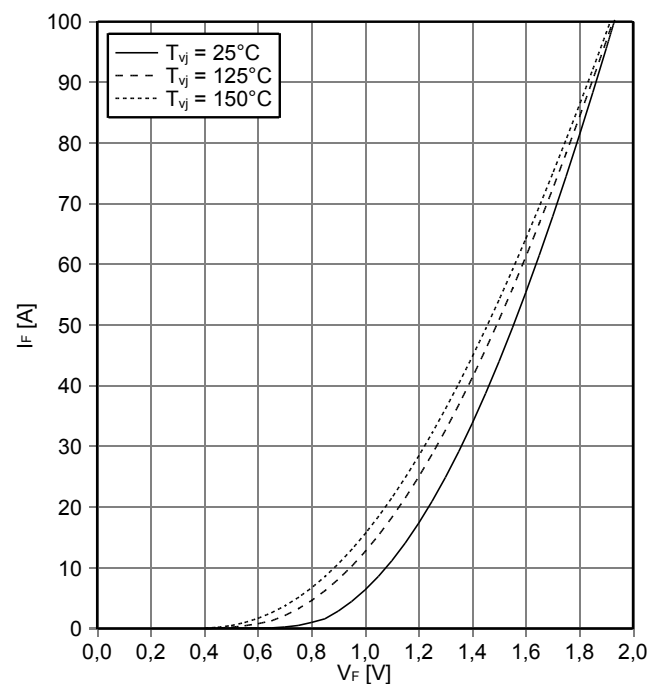
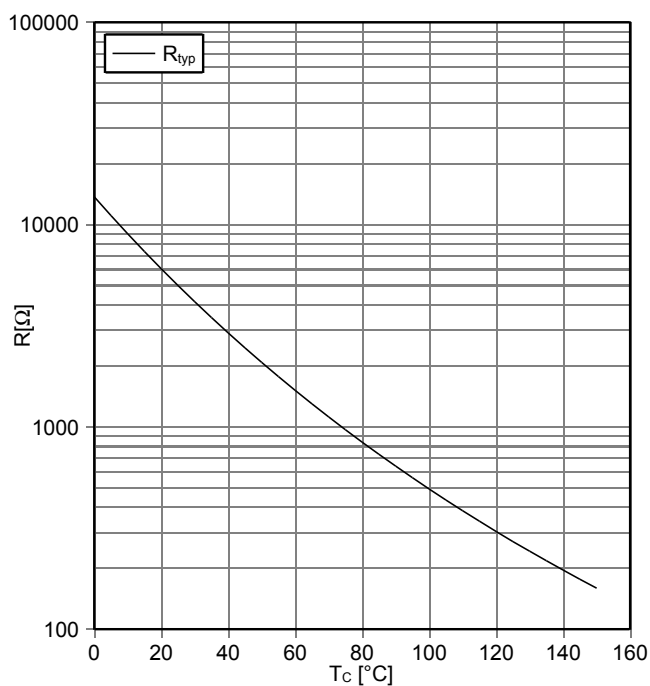
 $I_F = f(V_F)$ 


prepared by: AS

approved by: RS

date of publication: 2013-11-05

revision: 2.0

Vorläufige Daten  
Preliminary DataAusgangskennlinie 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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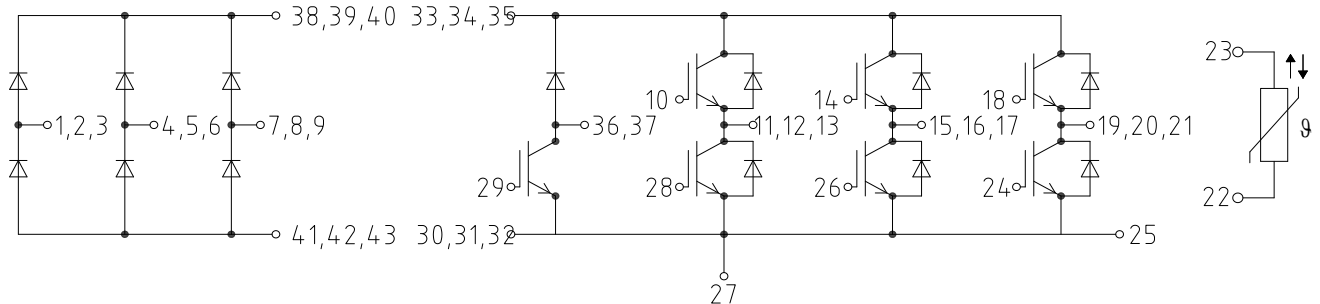
date of publication: 2013-11-05

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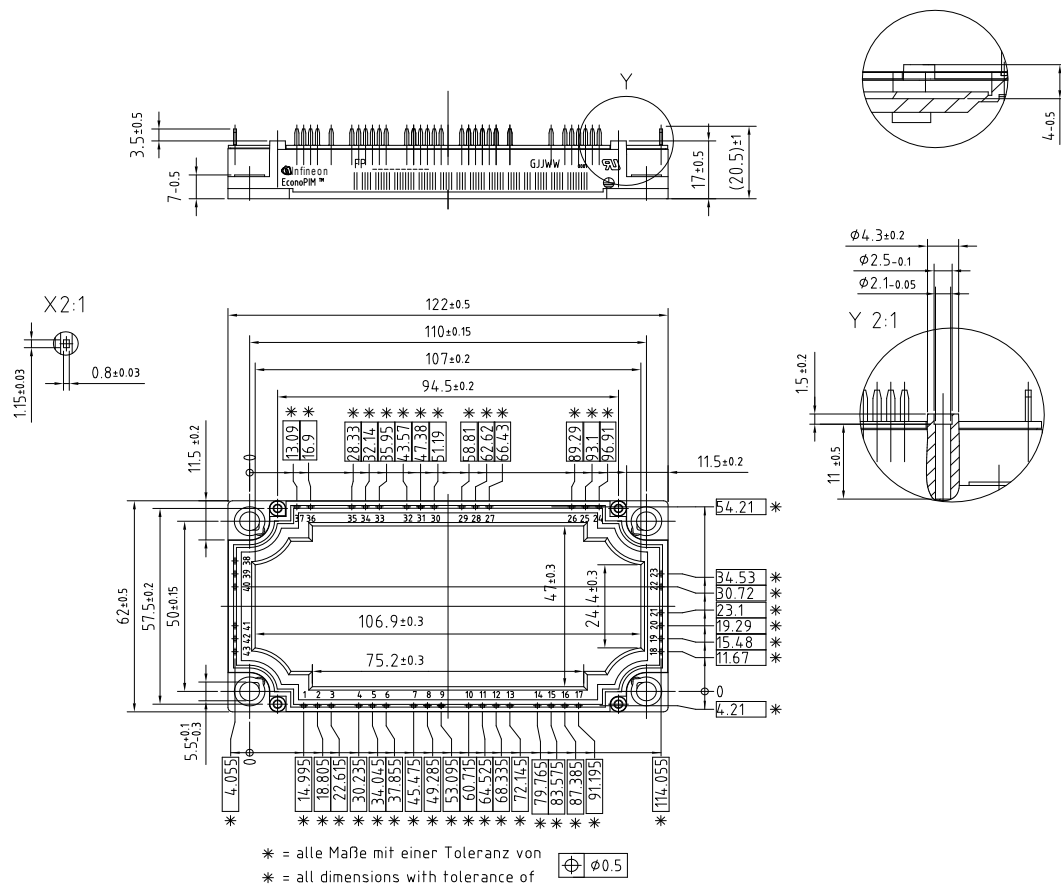
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Vorläufige Daten  
Preliminary Data

Schaltplan / circuit\_diagram\_headline



Gehäuseabmessungen / package outlines



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| prepared by: AS | date of publication: 2013-11-05 |
| approved by: RS | revision: 2.0                   |

## Vorläufige Daten Preliminary Data

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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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