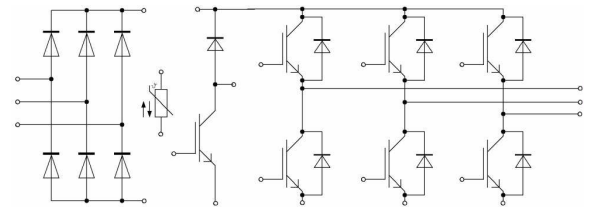


EasyPIM™ Modul mit Trench/Feldstopp IGBT3 und Emitter Controlled 3 Diode und PressFIT / NTC  
EasyPIM™ module with Trench/Fieldstop IGBT3 and Emitter Controlled 3 diode and PressFIT / NTC

**Vorläufige Daten / preliminary data****V<sub>CEs</sub> = 600V****I<sub>C nom</sub> = 20A / I<sub>CRM</sub> = 40A****Typische Anwendungen**

- Hilfsumrichter
- Klimaanlage
- Motorantriebe

**Typical Applications**

- Auxiliary Inverters
- Air Conditioning
- Motor Drives

**Elektrische Eigenschaften**

- Niedrige Schaltverluste
- Niedriges V<sub>CEsat</sub>
- Trench IGBT 3
- V<sub>CEsat</sub> mit positivem Temperaturkoeffizienten

**Electrical Features**

- Low Switching Losses
- Low V<sub>CEsat</sub>
- Trench IGBT 3
- V<sub>CEsat</sub> with positive Temperature Coefficient

**Mechanische Eigenschaften**

- Al<sub>2</sub>O<sub>3</sub> Substrat mit kleinem thermischen Widerstand
- Kompaktes Design
- PressFIT Verbindungstechnik
- Robuste Montage durch integrierte Befestigungsklammern

**Mechanical Features**

- Al<sub>2</sub>O<sub>3</sub> Substrate with Low Thermal Resistance
- Compact design
- PressFIT Contact Technology
- Rugged mounting due to integrated mounting clamps

**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 |

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UL approved (E83335)

Vorläufige Daten  
preliminary data

## IGBT-Wechselrichter / IGBT-inverter

## Höchstzulässige Werte / maximum rated values

|                                                                          |                                                                                                                      |                             |          |        |
|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-----------------------------|----------|--------|
| Kollektor-Emitter-Sperrspannung<br>collector-emitter voltage             | $T_{vj} = 25^{\circ}\text{C}$                                                                                        | $V_{CES}$                   | 600      | V      |
| Kollektor-Dauergleichstrom<br>DC-collector current                       | $T_C = 80^{\circ}\text{C}, T_{vj} = 175^{\circ}\text{C}$<br>$T_C = 25^{\circ}\text{C}, T_{vj} = 175^{\circ}\text{C}$ | $I_{C\text{ nom}}$<br>$I_C$ | 20<br>27 | A<br>A |
| Periodischer Kollektor Spitzenstrom<br>repetitive peak collector current | $t_P = 1\text{ ms}$                                                                                                  | $I_{CRM}$                   | 40       | A      |
| Gesamt-Verlustleistung<br>total power dissipation                        | $T_C = 25^{\circ}\text{C}, T_{vj} = 175^{\circ}\text{C}$                                                             | $P_{tot}$                   | 94,0     | 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 | $I_C = 20\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 20\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 20\text{ A}, V_{GE} = 15\text{ V}$                                                           | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $V_{CE\text{ sat}}$ | 1,55<br>1,70<br>1,80    | 2,00 | V<br>V<br>V                                     |
| Gate-Schwellenspannung<br>gate threshold voltage                             | $I_C = 0,30\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                          |                                                                                                                               | $V_{GEth}$          | 4,9                     | 5,8  | 6,5 V                                           |
| Gateladung<br>gate charge                                                    | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                                                                                                                    |                                                                                                                               | $Q_G$               | 0,20                    |      | $\mu\text{C}$                                   |
| Interner Gatewiderstand<br>internal gate resistor                            | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                                                                 |                                                                                                                               | $R_{Gint}$          | 0,0                     |      | $\Omega$                                        |
| Eingangskapazität<br>input capacitance                                       | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                    |                                                                                                                               | $C_{ies}$           | 1,10                    |      | nF                                              |
| Rückwirkungskapazität<br>reverse transfer capacitance                        | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                    |                                                                                                                               | $C_{res}$           | 0,034                   |      | nF                                              |
| Kollektor-Emitter Reststrom<br>collector-emitter cut-off current             | $V_{CE} = 600\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                     |                                                                                                                               | $I_{CES}$           |                         | 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) | $I_C = 20\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 18\text{ }\Omega$                                                                                      | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $t_{d\text{ on}}$   | 0,02<br>0,02<br>0,02    |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Anstiegszeit (induktive Last)<br>rise time (inductive load)                  | $I_C = 20\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 18\text{ }\Omega$                                                                                      | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $t_r$               | 0,013<br>0,016<br>0,017 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Abschaltverzögerungszeit (ind. Last)<br>turn-off delay time (inductive load) | $I_C = 20\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 18\text{ }\Omega$                                                                                     | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $t_{d\text{ off}}$  | 0,12<br>0,14<br>0,15    |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Fallzeit (induktive Last)<br>fall time (inductive load)                      | $I_C = 20\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 18\text{ }\Omega$                                                                                     | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $t_f$               | 0,07<br>0,095<br>0,10   |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Einschaltverlustenergie pro Puls<br>turn-on energy loss per pulse            | $I_C = 20\text{ A}, V_{CE} = 300\text{ V}, L_S = 50\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, di/dt = 1800\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$R_{Gon} = 18\text{ }\Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $E_{on}$            | 0,32<br>0,44<br>0,49    |      | mJ<br>mJ<br>mJ                                  |
| Abschaltverlustenergie pro Puls<br>turn-off energy loss per pulse            | $I_C = 20\text{ A}, V_{CE} = 300\text{ V}, L_S = 50\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, du/dt = 4100\text{ V}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$R_{Goff} = 18\text{ }\Omega$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $E_{off}$           | 0,44<br>0,56<br>0,59    |      | mJ<br>mJ<br>mJ                                  |
| Kurzschlussverhalten<br>SC data                                              | $V_{GE} \leq 15\text{ V}, V_{CC} = 360\text{ V}$<br>$V_{CEmax} = V_{CES} - L_{SC} \cdot di/dt$                                                                                                | $t_P \leq 8\text{ }\mu\text{s}, T_{vj} = 25^{\circ}\text{C}$<br>$t_P \leq 6\text{ }\mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ | $I_{SC}$            | 140<br>100              |      | A<br>A                                          |
| Innerer Wärmewiderstand<br>thermal resistance, junction to case              | pro IGBT / per IGBT                                                                                                                                                                           |                                                                                                                               | $R_{thJC}$          | 1,45                    | 1,60 | K/W                                             |
| Übergangs-Wärmewiderstand<br>thermal resistance, case to heatsink            | pro IGBT / per IGBT<br>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$                                                         |                                                                                                                               | $R_{thCH}$          | 1,25                    |      | K/W                                             |

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revision: 2.0

Vorläufige Daten  
preliminary data

## Diode-Wechselrichter / diode-inverter

## Höchstzulässige Werte / maximum rated values

|                                                                     |                                                                                                                                              |           |              |                                              |
|---------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------|----------------------------------------------|
| Periodische Spitzensperrspannung<br>repetitive peak reverse voltage | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                | $V_{RRM}$ | 600          | V                                            |
| Dauergleichstrom<br>DC forward current                              |                                                                                                                                              | $I_F$     | 20           | A                                            |
| Periodischer Spitzenstrom<br>repetitive peak forward current        | $t_p = 1\text{ ms}$                                                                                                                          | $I_{FRM}$ | 40           | A                                            |
| Grenzlastintegral<br>$I^2t$ - value                                 | $V_R = 0\text{ V}, t_p = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$<br>$V_R = 0\text{ V}, t_p = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$    | 49,0<br>45,0 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

## Charakteristische Werte / characteristic values

|                                                                   |                                                                                                                                                         |                                                                                                   | min.       | typ.                 | max. |                                                 |
|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|------------|----------------------|------|-------------------------------------------------|
| Durchlassspannung<br>forward voltage                              | $I_F = 20\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 20\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 20\text{ A}, V_{GE} = 0\text{ V}$                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_F$      | 1,60<br>1,55<br>1,50 | 2,00 | V<br>V<br>V                                     |
| Rückstromspitze<br>peak reverse recovery current                  | $I_F = 20\text{ A}, -di_F/dt = 1800\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$   | 34,0<br>38,0<br>40,0 |      | A<br>A<br>A                                     |
| Sperrverzögerungsladung<br>recovered charge                       | $I_F = 20\text{ A}, -di_F/dt = 1800\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$      | 1,00<br>1,75<br>2,20 |      | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| Abschaltenergie pro Puls<br>reverse recovery energy               | $I_F = 20\text{ A}, -di_F/dt = 1800\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$  | 0,21<br>0,37<br>0,47 |      | mJ<br>mJ<br>mJ                                  |
| Innerer Wärmewiderstand<br>thermal resistance, junction to case   | pro Diode / per diode                                                                                                                                   |                                                                                                   | $R_{thJC}$ | 1,95                 | 2,15 | K/W                                             |
| Übergangs-Wärmewiderstand<br>thermal resistance, case to heatsink | pro Diode / per diode<br>$\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$ |                                                                                                   | $R_{thCH}$ | 1,35                 |      | K/W                                             |

## Diode-Gleichrichter / diode-rectifier

## Höchstzulässige Werte / maximum rated values

|                                                                                     |                                                                                                         |             |            |                                              |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------|------------|----------------------------------------------|
| Periodische Rückw. Spitzensperrspannung<br>repetitive peak reverse voltage          | $T_{vj} = 25^{\circ}\text{C}$                                                                           | $V_{RRM}$   | 1600       | V                                            |
| Durchlassstrom Grenzeffektivwert pro Dio.<br>forward current RMS maximum per diode  | $T_C = 80^{\circ}\text{C}$                                                                              | $I_{FRMSM}$ | 30         | A                                            |
| Gleichrichter Ausgang Grenzeffektivstrom<br>maximum RMS current at Rectifier output | $T_C = 80^{\circ}\text{C}$                                                                              | $I_{RMSM}$  | 30         | A                                            |
| Stoßstrom Grenzwert<br>surge forward current                                        | $t_p = 10\text{ ms}, T_{vj} = 25^{\circ}\text{C}$<br>$t_p = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I_{FSM}$   | 300<br>245 | A<br>A                                       |
| Grenzlastintegral<br>$I^2t$ - value                                                 | $t_p = 10\text{ ms}, T_{vj} = 25^{\circ}\text{C}$<br>$t_p = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$      | 450<br>300 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

## Charakteristische Werte / characteristic values

|                                                                   |                                                                                                                                                         |            | min. | typ. | max. |     |
|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------|------|------|-----|
| Durchlassspannung<br>forward voltage                              | $T_{vj} = 150^{\circ}\text{C}, I_F = 20\text{ A}$                                                                                                       | $V_F$      |      | 0,90 |      | V   |
| Sperrstrom<br>reverse current                                     | $T_{vj} = 150^{\circ}\text{C}, V_R = 1600\text{ V}$                                                                                                     | $I_R$      |      | 2,00 |      | mA  |
| Innerer Wärmewiderstand<br>thermal resistance, junction to case   | pro Diode<br>per diode                                                                                                                                  | $R_{thJC}$ |      | 1,20 | 1,35 | K/W |
| Übergangs-Wärmewiderstand<br>thermal resistance, case to heatsink | pro Diode / per diode<br>$\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$ | $R_{thCH}$ |      | 1,15 |      | K/W |

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Vorläufige Daten  
preliminary data

## IGBT-Brems-Chopper / IGBT-brake-chopper

## Höchstzulässige Werte / maximum rated values

|                                                                          |                                                                                                                      |                     |          |        |
|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|---------------------|----------|--------|
| Kollektor-Emitter-Sperrspannung<br>collector-emitter voltage             | $T_{vj} = 25^{\circ}\text{C}$                                                                                        | $V_{CES}$           | 600      | V      |
| Kollektor-Dauergleichstrom<br>DC-collector current                       | $T_C = 80^{\circ}\text{C}, T_{vj} = 175^{\circ}\text{C}$<br>$T_C = 25^{\circ}\text{C}, T_{vj} = 175^{\circ}\text{C}$ | $I_{Cnom}$<br>$I_C$ | 20<br>27 | A<br>A |
| Periodischer Kollektor Spitzenstrom<br>repetitive peak collector current | $t_p = 1 \text{ ms}$                                                                                                 | $I_{CRM}$           | 40       | A      |
| Gesamt-Verlustleistung<br>total power dissipation                        | $T_C = 25^{\circ}\text{C}, T_{vj} = 175^{\circ}\text{C}$                                                             | $P_{tot}$           | 94,0     | 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 | $I_C = 20 \text{ A}, V_{GE} = 15 \text{ V}$<br>$I_C = 20 \text{ A}, V_{GE} = 15 \text{ V}$<br>$I_C = 20 \text{ A}, V_{GE} = 15 \text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$               | $V_{CE sat}$ | 1,55<br>1,70<br>1,80   | 2,00 | V<br>V<br>V                                     |
| Gate-Schwellenspannung<br>gate threshold voltage                             | $I_C = 0,30 \text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                                                                     |                                                                                                                 | $V_{GEth}$   | 4,9                    | 5,8  | 6,5 V                                           |
| Gateladung<br>gate charge                                                    | $V_{GE} = -15 \text{ V} \dots +15 \text{ V}$                                                                                              |                                                                                                                 | $Q_G$        | 0,20                   |      | $\mu\text{C}$                                   |
| Interner Gatewiderstand<br>internal gate resistor                            | $T_{vj} = 25^{\circ}\text{C}$                                                                                                             |                                                                                                                 | $R_{Gint}$   | 0,00                   |      | $\Omega$                                        |
| Eingangskapazität<br>input capacitance                                       | $f = 1 \text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}$                                             |                                                                                                                 | $C_{ies}$    | 1,10                   |      | nF                                              |
| Rückwirkungskapazität<br>reverse transfer capacitance                        | $f = 1 \text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}$                                             |                                                                                                                 | $C_{res}$    | 0,034                  |      | nF                                              |
| Kollektor-Emitter Reststrom<br>collector-emitter cut-off current             | $V_{CE} = 600 \text{ V}, V_{GE} = 0 \text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                               |                                                                                                                 | $I_{CES}$    |                        | 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) | $I_C = 20 \text{ A}, V_{CE} = 300 \text{ V}$<br>$V_{GE} = \pm 15 \text{ V}$<br>$R_{Gon} = 30 \Omega$                                      | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$               | $t_{d on}$   | 0,03<br>0,03<br>0,03   |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Anstiegszeit (induktive Last)<br>rise time (inductive load)                  | $I_C = 20 \text{ A}, V_{CE} = 300 \text{ V}$<br>$V_{GE} = \pm 15 \text{ V}$<br>$R_{Gon} = 30 \Omega$                                      | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$               | $t_r$        | 0,022<br>0,028<br>0,03 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Abschaltverzögerungszeit (ind. Last)<br>turn-off delay time (inductive load) | $I_C = 20 \text{ A}, V_{CE} = 300 \text{ V}$<br>$V_{GE} = \pm 15 \text{ V}$<br>$R_{Goff} = 30 \Omega$                                     | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$               | $t_{d off}$  | 0,20<br>0,24<br>0,25   |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Fallzeit (induktive Last)<br>fall time (inductive load)                      | $I_C = 20 \text{ A}, V_{CE} = 300 \text{ V}$<br>$V_{GE} = \pm 15 \text{ V}$<br>$R_{Goff} = 30 \Omega$                                     | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$               | $t_f$        | 0,07<br>0,11<br>0,12   |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Einschaltverlustenergie pro Puls<br>turn-on energy loss per pulse            | $I_C = 20 \text{ A}, V_{CE} = 300 \text{ V}, L_s = \text{t.b.d. nH}$<br>$V_{GE} = \pm 15 \text{ V}$<br>$R_{Gon} = 30 \Omega$              | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$               | $E_{on}$     | 0,45<br>0,55<br>0,60   |      | mJ<br>mJ<br>mJ                                  |
| Abschaltverlustenergie pro Puls<br>turn-off energy loss per pulse            | $I_C = 20 \text{ A}, V_{CE} = 300 \text{ V}, L_s = \text{t.b.d. nH}$<br>$V_{GE} = \pm 15 \text{ V}$<br>$R_{Goff} = 30 \Omega$             | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$               | $E_{off}$    | 0,50<br>0,56<br>0,60   |      | mJ<br>mJ<br>mJ                                  |
| Kurzschlussverhalten<br>SC data                                              | $V_{GE} \leq 15 \text{ V}, V_{CC} = 360 \text{ V}$<br>$V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$                                         | $t_p \leq 8 \mu\text{s}, T_{vj} = 25^{\circ}\text{C}$<br>$t_p \leq 6 \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ | $I_{SC}$     | 140<br>100             |      | A<br>A                                          |
| Innerer Wärmewiderstand<br>thermal resistance, junction to case              | pro IGBT / per IGBT                                                                                                                       |                                                                                                                 | $R_{thJC}$   | 1,45                   | 1,60 | K/W                                             |
| Übergangs-Wärmewiderstand<br>thermal resistance, case to heatsink            | pro IGBT / per IGBT<br>$\lambda_{Paste} = 1 \text{ W/(m}\cdot\text{K)} / \lambda_{grease} = 1 \text{ W/(m}\cdot\text{K)}$                 |                                                                                                                 | $R_{thCH}$   | 1,25                   |      | K/W                                             |

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Vorläufige Daten  
preliminary data

## Diode-Brems-Chopper / Diode-brake-chopper

## Höchstzulässige Werte / maximum rated values

|                                                                      |                                                                                                                                              |           |              |                                              |
|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------|----------------------------------------------|
| Periodische Spitzensperrschaltung<br>repetitive peak reverse voltage | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                | $V_{RRM}$ | 600          | V                                            |
| Dauergleichstrom<br>DC forward current                               |                                                                                                                                              | $I_F$     | 10           | A                                            |
| Periodischer Spitzenstrom<br>repetitive peak forw. current           | $t_p = 1\text{ ms}$                                                                                                                          | $I_{FRM}$ | 20           | A                                            |
| Grenzlastintegral<br>$I^2t$ - value                                  | $V_R = 0\text{ V}, t_p = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$<br>$V_R = 0\text{ V}, t_p = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$    | 12,5<br>9,50 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

## Charakteristische Werte / characteristic values

|                                                                   |                                                                                                                                                       |                                                                                                   |            | min. | typ.                 | max. |                                                 |
|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|------------|------|----------------------|------|-------------------------------------------------|
| Durchlassspannung<br>forward voltage                              | $I_F = 10\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 10\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 10\text{ A}, V_{GE} = 0\text{ V}$                      | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_F$      |      | 1,60<br>1,55<br>1,50 | 2,00 | V<br>V<br>V                                     |
| Rückstromspitze<br>peak reverse recovery current                  | $I_F = 10\text{ A}, -di_F/dt = 1500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$   |      | 18,0<br>19,0<br>21,0 |      | A<br>A<br>A                                     |
| Sperrverzögerungsladung<br>recovered charge                       | $I_F = 10\text{ A}, -di_F/dt = 1500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$      |      | 0,50<br>0,85<br>1,10 |      | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| Abschaltenergie pro Puls<br>reverse recovery energy               | $I_F = 10\text{ A}, -di_F/dt = 1500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$  |      | 0,11<br>0,20<br>0,26 |      | mJ<br>mJ<br>mJ                                  |
| Innerer Wärmewiderstand<br>thermal resistance, junction to case   | pro Diode / per diode                                                                                                                                 |                                                                                                   | $R_{thJC}$ |      | 2,90                 | 3,20 | K/W                                             |
| Übergangs-Wärmewiderstand<br>thermal resistance, case to heatsink | pro Diode / per diode<br>$\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$ |                                                                                                   | $R_{thCH}$ |      | 1,40                 |      | K/W                                             |

## 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 $R_{100}$ | $T_C = 100^{\circ}\text{C}, R_{100} = 493\text{ }\Omega$      | $\Delta R/R$ |  | -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.

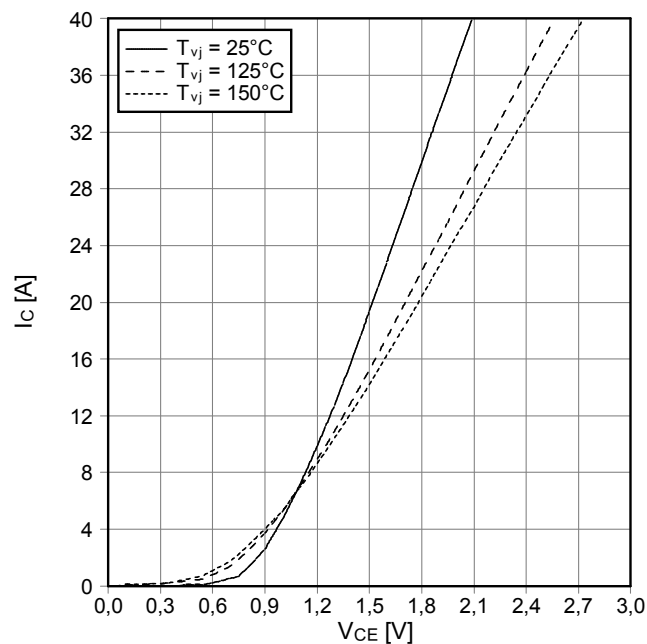
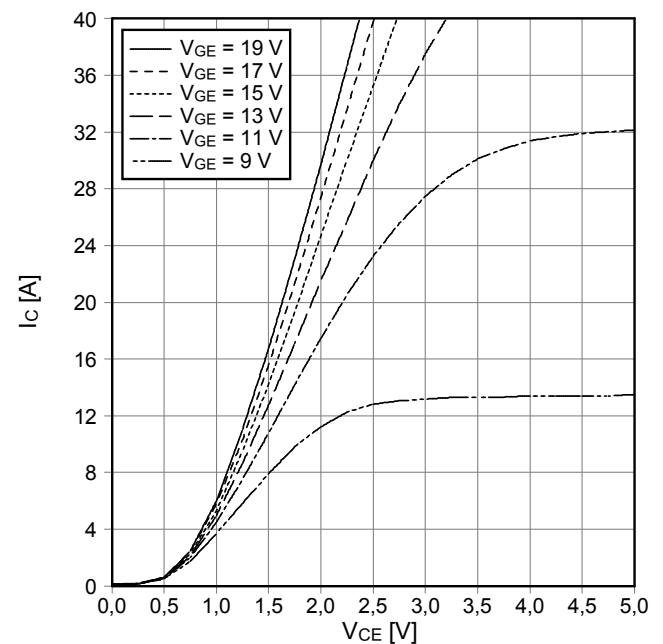
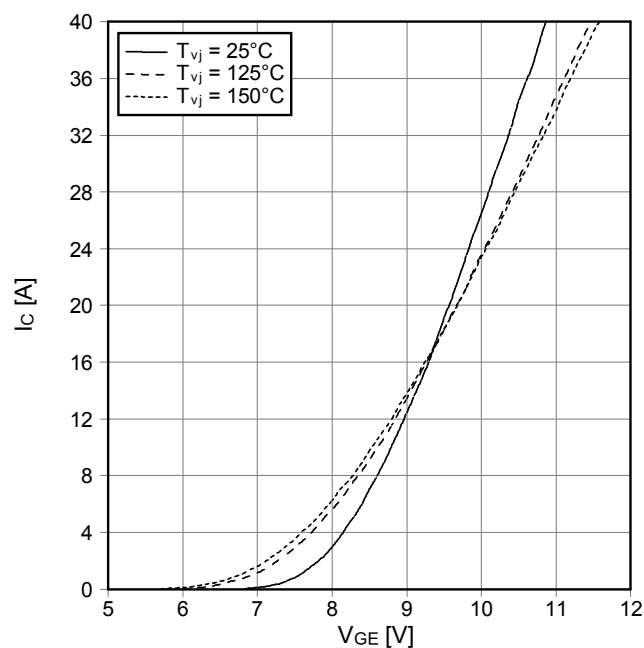
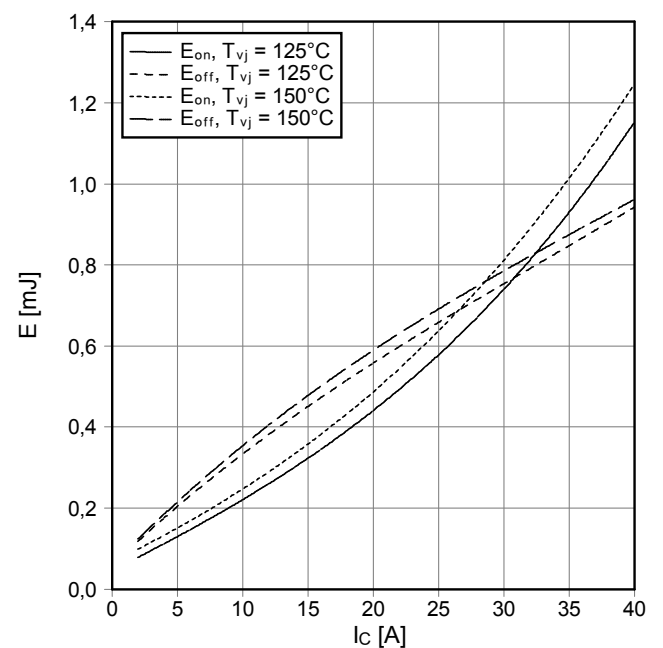
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|-----------------|---------------------------------|
| prepared by: DK | date of publication: 2010-07-29 |
| approved by: MB | revision: 2.0                   |

**Vorläufige Daten**  
**preliminary data**
**Modul / module**

|                                                                                              |                                                                                         |                                              |                                |              |     |    |
|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------------------------|--------------------------------|--------------|-----|----|
| Isolations-Prüfspannung<br>insulation test voltage                                           | RMS, f = 50 Hz, t = 1 min.                                                              | V <sub>ISO</sub>                             | 2,5                            |              |     | kV |
| Material für innere Isolation<br>material for internal insulation                            |                                                                                         |                                              | Al <sub>2</sub> O <sub>3</sub> |              |     |    |
| Kriechstrecke<br>creepage distance                                                           | Kontakt - Kühlkörper / terminal to heatsink<br>Kontakt - Kontakt / terminal to terminal |                                              | 11,5<br>6,3                    |              |     | mm |
| Luftstrecke<br>clearance distance                                                            | Kontakt - Kühlkörper / terminal to heatsink<br>Kontakt - Kontakt / terminal to terminal |                                              | 10,0<br>5,0                    |              |     | mm |
| Vergleichszahl der Kriechwegbildung<br>comparative tracking index                            |                                                                                         | CTI                                          | > 200                          |              |     |    |
| min.    typ.    max.                                                                         |                                                                                         |                                              |                                |              |     |    |
| Modulinduktivität<br>stray inductance module                                                 |                                                                                         | L <sub>sCE</sub>                             |                                | 30           |     | nH |
| Modulleitungswiderstand,<br>Anschlüsse - Chip<br>module lead resistance,<br>terminals - chip | T <sub>C</sub> = 25°C, pro Schalter / per switch                                        | R <sub>CC'+EE'</sub><br>R <sub>AA'+CC'</sub> |                                | 8,00<br>6,00 |     | mΩ |
| Höchstzulässige Sperrschichttemperatur<br>maximum junction temperature                       | Wechselrichter, Brems-Chopper / Inverter, Brake-Chopper                                 | T <sub>vj max</sub>                          |                                |              | 175 | °C |
| Temperatur im Schaltbetrieb<br>temperature under switching conditions                        | Wechselrichter, Brems-Chopper / Inverter, Brake-Chopper                                 | T <sub>vj op</sub>                           | -40                            |              | 150 | °C |
| Lagertemperatur<br>storage temperature                                                       |                                                                                         | T <sub>stg</sub>                             | -40                            |              | 125 | °C |
| Anpresskraft für mech. Bef. pro Feder<br>mounting force per clamp                            |                                                                                         | F                                            | 20                             | -            | 50  | N  |
| Gewicht<br>weight                                                                            |                                                                                         | G                                            |                                | 24           |     | g  |

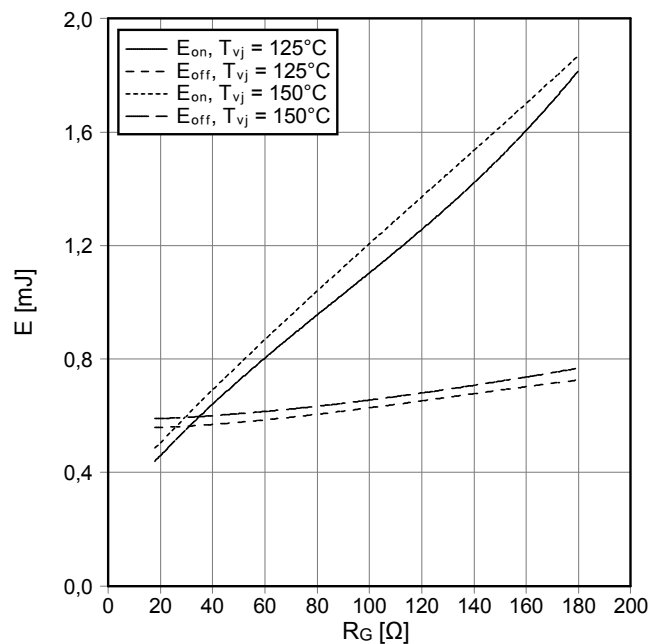
Der Strom im Dauerbetrieb ist auf 25 A effektiv pro Anschlusspin begrenzt.  
The current under continuous operation is limited to 25 A rms per connector pin.

|                 |                                 |
|-----------------|---------------------------------|
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| approved by: MB | revision: 2.0                   |

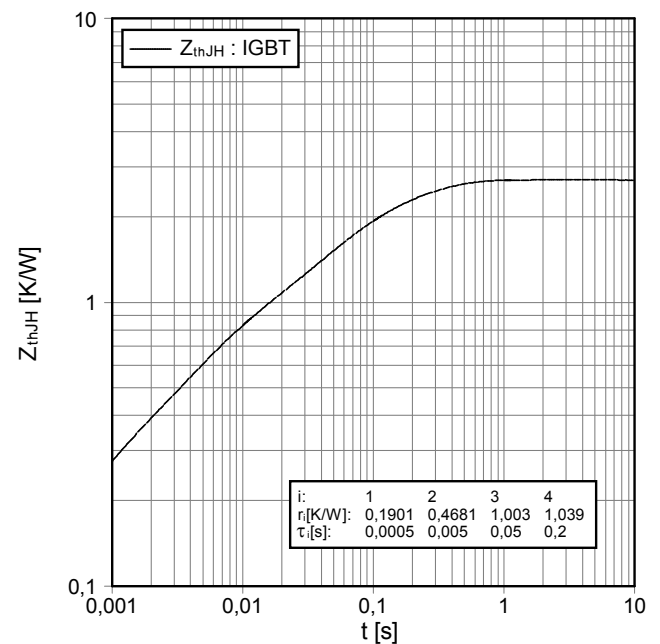
Vorläufige Daten  
preliminary dataAusgangskennlinie IGBT-Wechselr. (typisch)  
output characteristic IGBT-inverter (typical) $I_C = f(V_{CE})$   
 $V_{GE} = 15 \text{ V}$ Ausgangskennlinienfeld IGBT-Wechselr. (typisch)  
output characteristic IGBT-inverter (typical) $I_C = f(V_{CE})$   
 $T_{vj} = 150^\circ\text{C}$ 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) $E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $R_{Gon} = 18 \Omega$ ,  $R_{Goff} = 18 \Omega$ ,  $V_{CE} = 300 \text{ V}$ 

Vorläufige Daten  
preliminary data

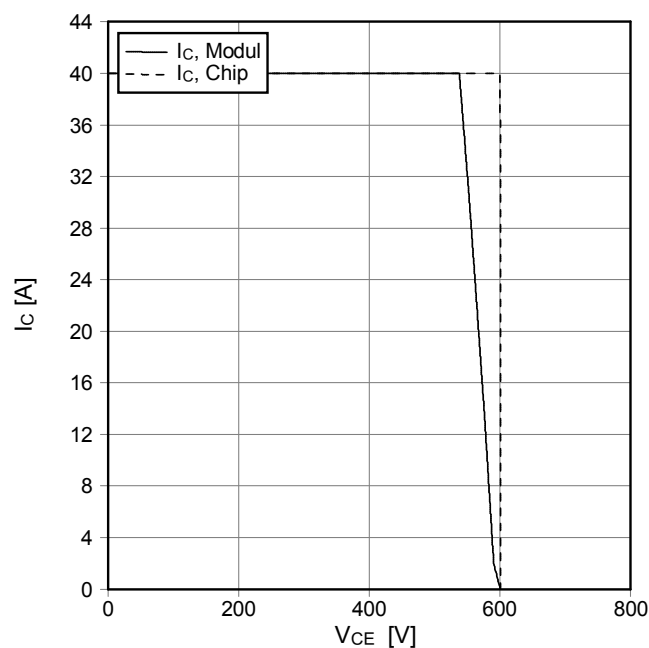
Schaltverluste IGBT-Wechselr. (typisch)  
switching losses IGBT-Inverter (typical)  
 $E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $I_C = 20 \text{ A}$ ,  $V_{CE} = 300 \text{ V}$



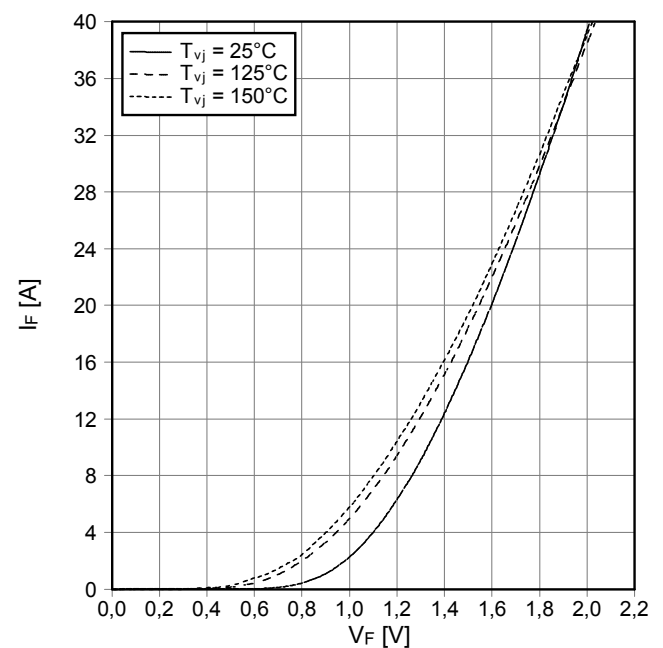
Transienter Wärmewiderstand IGBT-Wechselr.  
transient thermal impedance IGBT-inverter  
 $Z_{thJH} = f(t)$



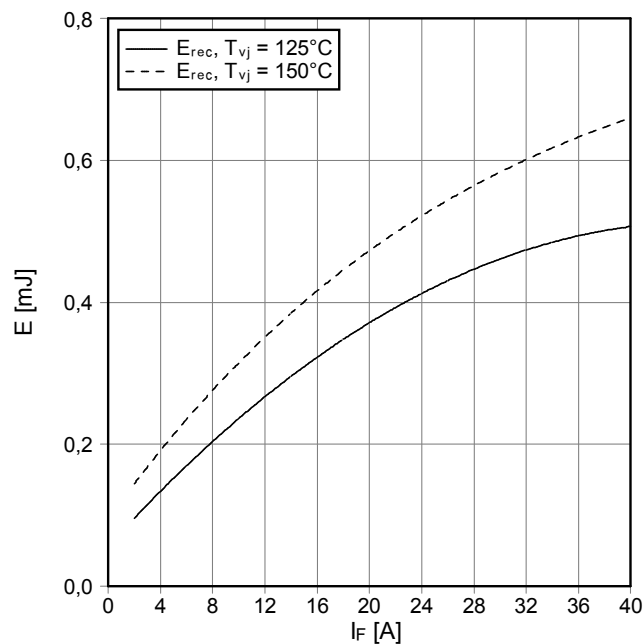
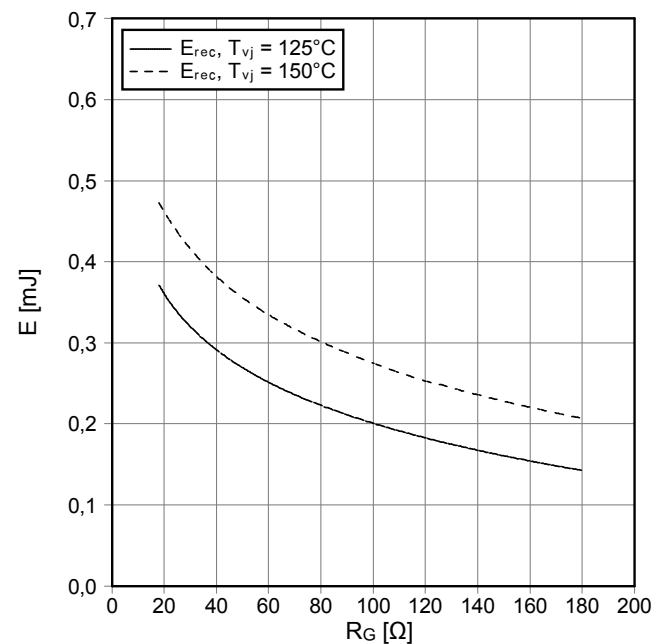
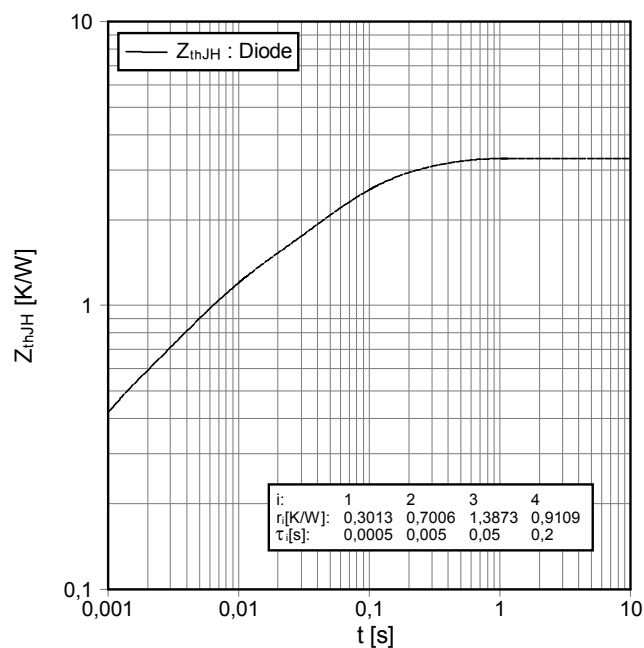
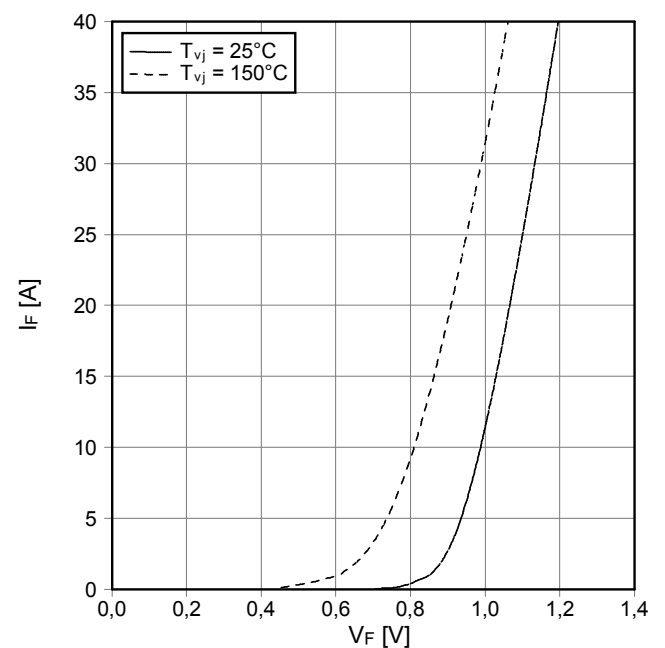
Sicherer Rückwärts-Arbeitsbereich IGBT-Wr. (RBSOA)  
reverse bias safe operating area IGBT-inv. (RBSOA)  
 $I_C = f(V_{CE})$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $R_{Goff} = 18 \Omega$ ,  $T_{vj} = 150^\circ\text{C}$

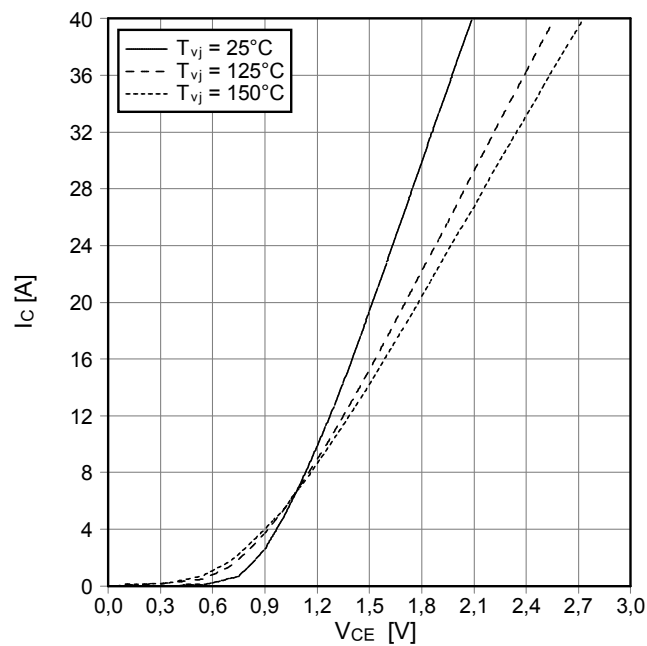
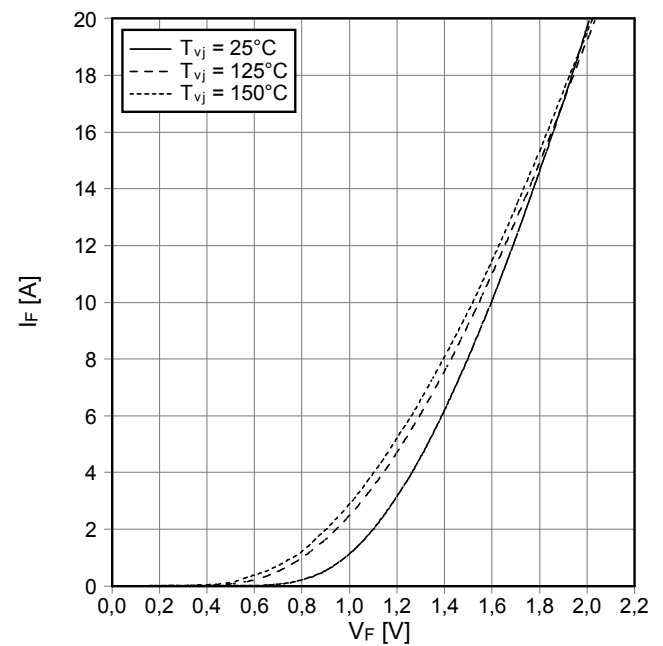
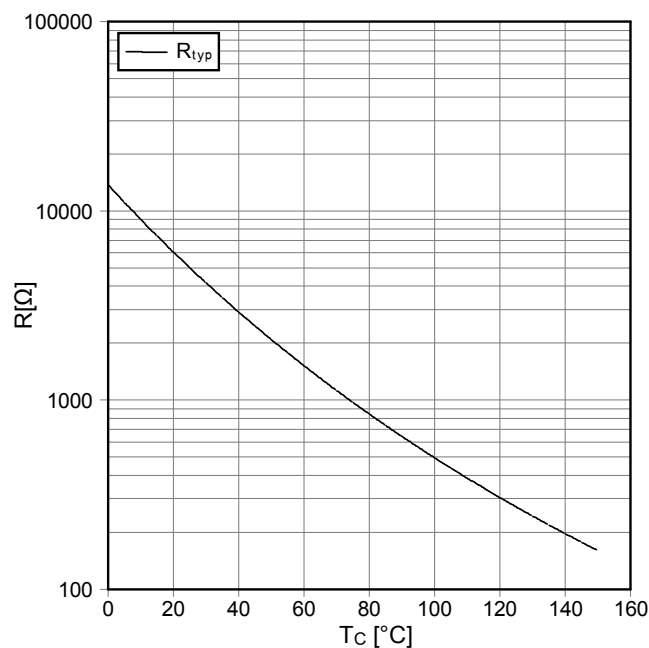


Durchlasskennlinie der Diode-Wechselr. (typisch)  
forward characteristic of diode-inverter (typical)  
 $I_F = f(V_F)$





Vorläufige Daten  
preliminary dataSchaltverluste Diode-Wechselr. (typisch)  
switching losses diode-inverter (typical)
 $E_{rec} = f(I_F)$   
 $R_{Gon} = 18 \Omega$ ,  $V_{CE} = 300 V$ 
Schaltverluste Diode-Wechselr. (typisch)  
switching losses diode-inverter (typical)
 $E_{rec} = f(R_G)$   
 $I_F = 20 A$ ,  $V_{CE} = 300 V$ 
Transienter Wärmewiderstand Diode-Wechselr.  
transient thermal impedance diode-inverter $Z_{thJH} = f(t)$ Durchlasskennlinie der Diode-Gleichrichter (typisch)  
forward characteristic of diode-rectifier (typical) $I_F = f(V_F)$ 

Vorläufige Daten  
preliminary dataAusgangskennlinie IGBT-Brems-Copper (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-Temperaturkennlinie (typisch)  
NTC-temperature characteristic (typical) $R = f(T)$ 

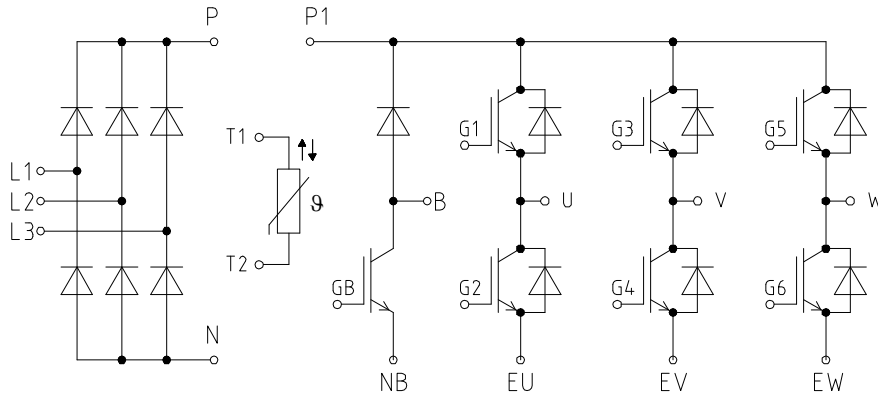
prepared by: DK

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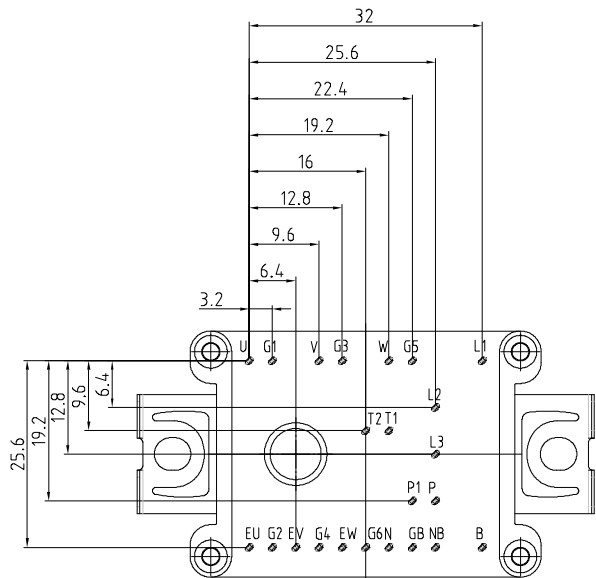
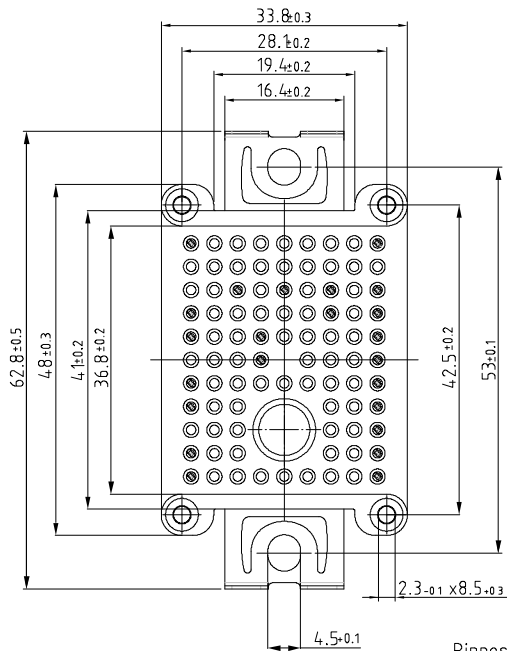
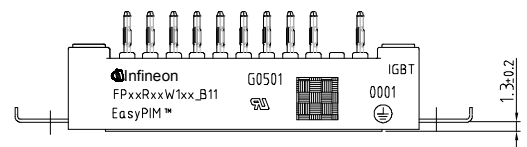
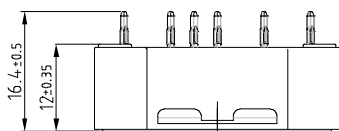
approved by: MB

revision: 2.0

Schaltplan / circuit diagram



Gehäuseabmessungen / package outlines



- Pinpositions typ.  $\phi 0.4$

## Vorläufige Daten preliminary data

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