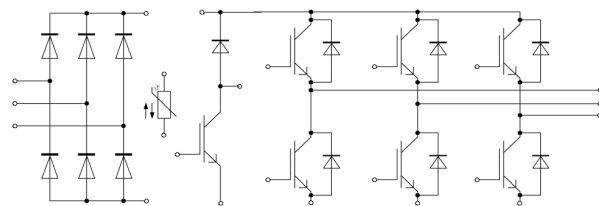
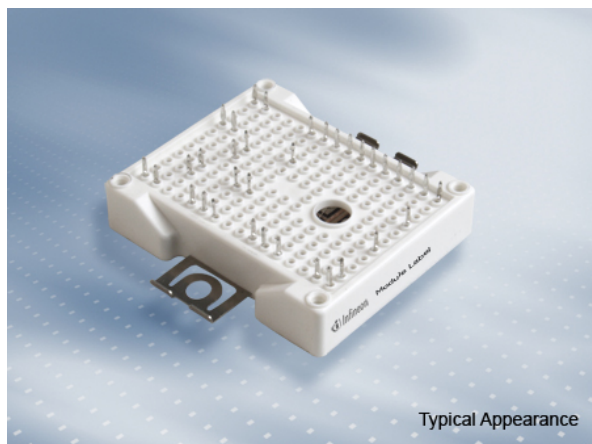


EasyPIM™ Modul mit Trench/Feldstopp IGBT4 und Emitter Controlled 4 Diode und PressFIT / bereits aufgetragenem Thermal Interface Material

EasyPIM™ module with Trench/Fieldstop IGBT4 and Emitter Controlled 4 diode and PressFIT / pre-applied Thermal Interface Material



$V_{CES} = 1200V$

$I_{C\ nom} = 35A / I_{CRM} = 70A$

## Typische Anwendungen

- Hilfsumrichter
- Klimaanlage
- Motorantriebe

## Elektrische Eigenschaften

- Niedrige Schaltverluste
- Niedriges  $V_{CEsat}$
- Trench IGBT 4
- $V_{CEsat}$  mit positivem Temperaturkoeffizienten

## Mechanische Eigenschaften

- $Al_2O_3$  Substrat mit kleinem thermischen Widerstand
- Kompaktes Design
- PressFIT Verbindungstechnik
- Robuste Montage durch integrierte Befestigungsklammern
- Thermisches Interface Material bereits aufgetragen

## Typical Applications

- Auxiliary inverters
- Air conditioning
- Motor drives

## Electrical Features

- Low switching losses
- Low  $V_{CEsat}$
- Trench IGBT 4
- $V_{CEsat}$  with positive temperature coefficient

## Mechanical Features

- $Al_2O_3$  substrate with low thermal resistance
- Compact design
- PressFIT contact technology
- Rugged mounting due to integrated mounting clamps
- Pre-applied Thermal Interface Material

## 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 |

**IGBT, Wechselrichter / IGBT, Inverter****Höchstzulässige Werte / Maximum Rated Values**

|                                                                          |                                                                        |                    |       |   |
|--------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------|-------|---|
| Kollektor-Emitter-Sperrspannung<br>Collector-emitter voltage             | $T_{vj} = 25^{\circ}\text{C}$                                          | $V_{CES}$          | 1200  | V |
| Kollektor-Dauergleichstrom<br>Continuous DC collector current            | $T_H = 80^{\circ}\text{C}$ , $T_{vj\text{ max}} = 175^{\circ}\text{C}$ | $I_{C\text{ nom}}$ | 35    | A |
| Periodischer Kollektor-Spitzenstrom<br>Repetitive peak collector current | $t_P = 1\text{ ms}$                                                    | $I_{CRM}$          | 70    | A |
| Gate-Emitter-Spitzenspannung<br>Gate-emitter peak voltage                |                                                                        | $V_{GES}$          | +/-20 | V |

**Charakteristische Werte / Characteristic Values**

|                                                                                  |                                                                                                                                                                                                                                                                                                    |                     | min. | typ.                    | max. |                                                 |
|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------|-------------------------|------|-------------------------------------------------|
| Kollektor-Emitter-Sättigungsspannung<br>Collector-emitter saturation voltage     | $I_C = 35\text{ A}$ , $V_{GE} = 15\text{ V}$ $T_{vj} = 25^{\circ}\text{C}$<br>$I_C = 35\text{ A}$ , $V_{GE} = 15\text{ V}$ $T_{vj} = 125^{\circ}\text{C}$<br>$I_C = 35\text{ A}$ , $V_{GE} = 15\text{ V}$ $T_{vj} = 150^{\circ}\text{C}$                                                           | $V_{CE\text{ sat}}$ |      | 1,85<br>2,15<br>2,25    | 2,25 | V<br>V<br>V                                     |
| Gate-Schwellenspannung<br>Gate threshold voltage                                 | $I_C = 1,20\text{ mA}$ , $V_{CE} = V_{GE}$ , $T_{vj} = 25^{\circ}\text{C}$                                                                                                                                                                                                                         | $V_{GEth}$          | 5,20 | 5,80                    | 6,40 | V                                               |
| Gateladung<br>Gate charge                                                        | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                                                                                                                                                                                                                         | $Q_G$               |      | 0,27                    |      | $\mu\text{C}$                                   |
| Interner Gatewiderstand<br>Internal gate resistor                                | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                                                                                                                                                                      | $R_{Gint}$          |      | 0,0                     |      | $\Omega$                                        |
| Eingangskapazität<br>Input capacitance                                           | $f = 1\text{ MHz}$ , $T_{vj} = 25^{\circ}\text{C}$ , $V_{CE} = 25\text{ V}$ , $V_{GE} = 0\text{ V}$                                                                                                                                                                                                | $C_{ies}$           |      | 2,00                    |      | nF                                              |
| Rückwirkungskapazität<br>Reverse transfer capacitance                            | $f = 1\text{ MHz}$ , $T_{vj} = 25^{\circ}\text{C}$ , $V_{CE} = 25\text{ V}$ , $V_{GE} = 0\text{ V}$                                                                                                                                                                                                | $C_{res}$           |      | 0,07                    |      | nF                                              |
| Kollektor-Emitter-Reststrom<br>Collector-emitter cut-off current                 | $V_{CE} = 1200\text{ V}$ , $V_{GE} = 0\text{ V}$ , $T_{vj} = 25^{\circ}\text{C}$                                                                                                                                                                                                                   | $I_{CES}$           |      |                         | 1,0  | mA                                              |
| Gate-Emitter-Reststrom<br>Gate-emitter leakage current                           | $V_{CE} = 0\text{ V}$ , $V_{GE} = 20\text{ V}$ , $T_{vj} = 25^{\circ}\text{C}$                                                                                                                                                                                                                     | $I_{GES}$           |      |                         | 100  | nA                                              |
| Einschaltverzögerungszeit, induktive Last<br>Turn-on delay time, inductive load  | $I_C = 35\text{ A}$ , $V_{CE} = 600\text{ V}$ $T_{vj} = 25^{\circ}\text{C}$<br>$V_{GE} = \pm 15\text{ V}$ $T_{vj} = 125^{\circ}\text{C}$<br>$R_{Gon} = 12\ \Omega$ $T_{vj} = 150^{\circ}\text{C}$                                                                                                  | $t_{d\text{ on}}$   |      | 0,025<br>0,025<br>0,025 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Anstiegszeit, induktive Last<br>Rise time, inductive load                        | $I_C = 35\text{ A}$ , $V_{CE} = 600\text{ V}$ $T_{vj} = 25^{\circ}\text{C}$<br>$V_{GE} = \pm 15\text{ V}$ $T_{vj} = 125^{\circ}\text{C}$<br>$R_{Gon} = 12\ \Omega$ $T_{vj} = 150^{\circ}\text{C}$                                                                                                  | $t_r$               |      | 0,013<br>0,016<br>0,018 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Abschaltverzögerungszeit, induktive Last<br>Turn-off delay time, inductive load  | $I_C = 35\text{ A}$ , $V_{CE} = 600\text{ V}$ $T_{vj} = 25^{\circ}\text{C}$<br>$V_{GE} = \pm 15\text{ V}$ $T_{vj} = 125^{\circ}\text{C}$<br>$R_{Goff} = 12\ \Omega$ $T_{vj} = 150^{\circ}\text{C}$                                                                                                 | $t_{d\text{ off}}$  |      | 0,24<br>0,295<br>0,31   |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Fallzeit, induktive Last<br>Fall time, inductive load                            | $I_C = 35\text{ A}$ , $V_{CE} = 600\text{ V}$ $T_{vj} = 25^{\circ}\text{C}$<br>$V_{GE} = \pm 15\text{ V}$ $T_{vj} = 125^{\circ}\text{C}$<br>$R_{Goff} = 12\ \Omega$ $T_{vj} = 150^{\circ}\text{C}$                                                                                                 | $t_f$               |      | 0,115<br>0,17<br>0,20   |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Einschaltverlustenergie pro Puls<br>Turn-on energy loss per pulse                | $I_C = 35\text{ A}$ , $V_{CE} = 600\text{ V}$ , $L_S = 35\text{ nH}$ $T_{vj} = 25^{\circ}\text{C}$<br>$V_{GE} = \pm 15\text{ V}$ , $di/dt = 2500\text{ A}/\mu\text{s}$ ( $T_{vj} = 150^{\circ}\text{C}$ ) $T_{vj} = 125^{\circ}\text{C}$<br>$R_{Gon} = 12\ \Omega$ $T_{vj} = 150^{\circ}\text{C}$  | $E_{on}$            |      | 1,90<br>2,90<br>3,15    |      | mJ<br>mJ<br>mJ                                  |
| Abschaltverlustenergie pro Puls<br>Turn-off energy loss per pulse                | $I_C = 35\text{ A}$ , $V_{CE} = 600\text{ V}$ , $L_S = 35\text{ nH}$ $T_{vj} = 25^{\circ}\text{C}$<br>$V_{GE} = \pm 15\text{ V}$ , $du/dt = 3600\text{ V}/\mu\text{s}$ ( $T_{vj} = 150^{\circ}\text{C}$ ) $T_{vj} = 125^{\circ}\text{C}$<br>$R_{Goff} = 12\ \Omega$ $T_{vj} = 150^{\circ}\text{C}$ | $E_{off}$           |      | 2,00<br>2,90<br>3,20    |      | mJ<br>mJ<br>mJ                                  |
| Kurzschlußverhalten<br>SC data                                                   | $V_{GE} \leq 15\text{ V}$ , $V_{CC} = 800\text{ V}$<br>$V_{CE\text{ max}} = V_{CES} - L_{SCE} \cdot di/dt$ $t_P \leq 10\ \mu\text{s}$ , $T_{vj} = 150^{\circ}\text{C}$                                                                                                                             | $I_{SC}$            |      | 130                     |      | A                                               |
| Wärmewiderstand, Chip bis Kühlkörper<br>Thermal resistance, junction to heatsink | pro IGBT / per IGBT<br>valid with IFX pre-applied thermal interface material                                                                                                                                                                                                                       | $R_{thJH}$          |      |                         | 1,00 | K/W                                             |
| Temperatur im Schaltbetrieb<br>Temperature under switching conditions            |                                                                                                                                                                                                                                                                                                    | $T_{vj\text{ op}}$  | -40  |                         | 150  | $^{\circ}\text{C}$                              |

**Diode, Wechselrichter / Diode, Inverter****Höchstzulässige Werte / Maximum Rated Values**

|                                                                     |                                                                                                                                              |           |            |                                              |
|---------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------|----------------------------------------------|
| Periodische Spitzensperrspannung<br>Repetitive peak reverse voltage | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                | $V_{RRM}$ | 1200       | V                                            |
| Dauergleichstrom<br>Continuous DC forward current                   |                                                                                                                                              | $I_F$     | 35         | A                                            |
| Periodischer Spitzenstrom<br>Repetitive peak forward current        | $t_P = 1\text{ ms}$                                                                                                                          | $I_{FRM}$ | 70         | A                                            |
| Grenzlastintegral<br>$I^2t$ - value                                 | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$<br>$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$    | 240<br>220 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

**Charakteristische Werte / Characteristic Values**

|                                                                                  |                                                                                                                                           |                                                                                                   | min.               | typ. | max.                 |                                                 |
|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------|------|----------------------|-------------------------------------------------|
| Durchlassspannung<br>Forward voltage                                             | $I_F = 35\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 35\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 35\text{ A}, V_{GE} = 0\text{ V}$          | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_F$              |      | 1,65<br>1,65<br>1,65 | 2,15<br>V<br>V<br>V                             |
| Rückstromspitze<br>Peak reverse recovery current                                 | $I_F = 35\text{ A}, -di_F/dt = 2500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 600\text{ V}$<br>$V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$           |      | 81,0<br>85,0<br>88,0 | A<br>A<br>A                                     |
| Sperrverzögerungsladung<br>Recovered charge                                      | $I_F = 35\text{ A}, -di_F/dt = 2500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 600\text{ V}$<br>$V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$              |      | 3,95<br>6,80<br>7,50 | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| Abschaltenergie pro Puls<br>Reverse recovery energy                              | $I_F = 35\text{ A}, -di_F/dt = 2500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 600\text{ V}$<br>$V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$          |      | 1,50<br>2,70<br>2,95 | mJ<br>mJ<br>mJ                                  |
| Wärmewiderstand, Chip bis Kühlkörper<br>Thermal resistance, junction to heatsink | pro Diode / per diode<br>valid with IFX pre-applied thermal interface material                                                            |                                                                                                   | $R_{thJH}$         |      |                      | 1,29<br>K/W                                     |
| Temperatur im Schaltbetrieb<br>Temperature under switching conditions            |                                                                                                                                           |                                                                                                   | $T_{vj\text{ op}}$ | -40  |                      | 150<br>$^{\circ}\text{C}$                       |

**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   | $T_H = 80^{\circ}\text{C}$                                                                              | $I_{FRMSM}$ | 50          | A                                            |
| Gleichrichter Ausgang Grenzeffektivstrom<br>Maximum RMS current at rectifier output | $T_H = 80^{\circ}\text{C}$                                                                              | $I_{RMSM}$  | 50          | A                                            |
| Stoßstrom Grenzwert<br>Surge forward current                                        | $t_p = 10\text{ ms}, T_{vj} = 25^{\circ}\text{C}$<br>$t_p = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I_{FSM}$   | 450<br>370  | A<br>A                                       |
| Grenzlastintegral<br>$I^2t$ - value                                                 | $t_p = 10\text{ ms}, T_{vj} = 25^{\circ}\text{C}$<br>$t_p = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$      | 1000<br>685 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

**Charakteristische Werte / Characteristic Values**

|                                                                                  |                                                                                |  | min.               | typ. | max. |                           |
|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------|--|--------------------|------|------|---------------------------|
| Durchlassspannung<br>Forward voltage                                             | $T_{vj} = 150^{\circ}\text{C}, I_F = 35\text{ A}$                              |  | $V_F$              |      | 0,95 | V                         |
| Sperrstrom<br>Reverse current                                                    | $T_{vj} = 150^{\circ}\text{C}, V_R = 1600\text{ V}$                            |  | $I_R$              |      | 1,00 | mA                        |
| Wärmewiderstand, Chip bis Kühlkörper<br>Thermal resistance, junction to heatsink | pro Diode / per diode<br>valid with IFX pre-applied thermal interface material |  | $R_{thJH}$         |      |      | 1,42<br>K/W               |
| Temperatur im Schaltbetrieb<br>Temperature under switching conditions            |                                                                                |  | $T_{vj\text{ op}}$ | -40  |      | 150<br>$^{\circ}\text{C}$ |

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

### Höchstzulässige Werte / Maximum Rated Values

|                                                                          |                                                                        |                    |       |   |
|--------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------|-------|---|
| Kollektor-Emitter-Sperrspannung<br>Collector-emitter voltage             | $T_{vj} = 25^{\circ}\text{C}$                                          | $V_{CES}$          | 1200  | V |
| Kollektor-Dauergleichstrom<br>Continuous DC collector current            | $T_H = 80^{\circ}\text{C}$ , $T_{vj\text{ max}} = 175^{\circ}\text{C}$ | $I_{C\text{ nom}}$ | 35    | A |
| Periodischer Kollektor-Spitzenstrom<br>Repetitive peak collector current | $t_P = 1\text{ ms}$                                                    | $I_{CRM}$          | 70    | A |
| Gate-Emitter-Spitzenspannung<br>Gate-emitter peak voltage                |                                                                        | $V_{GES}$          | +/-20 | V |

### Charakteristische Werte / Characteristic Values

|                                                                                  |                                                                                                                                                                                                        |                                                                                                   | min.                | typ.                    | max. |                                                 |
|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------|-------------------------|------|-------------------------------------------------|
| Kollektor-Emitter-Sättigungsspannung<br>Collector-emitter saturation voltage     | $I_C = 35\text{ A}$ , $V_{GE} = 15\text{ V}$<br>$I_C = 35\text{ A}$ , $V_{GE} = 15\text{ V}$<br>$I_C = 35\text{ A}$ , $V_{GE} = 15\text{ V}$                                                           | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_{CE\text{ sat}}$ | 1,85<br>2,15<br>2,25    | 2,25 | V<br>V<br>V                                     |
| Gate-Schwellenspannung<br>Gate threshold voltage                                 | $I_C = 1,20\text{ mA}$ , $V_{CE} = V_{GE}$ , $T_{vj} = 25^{\circ}\text{C}$                                                                                                                             |                                                                                                   | $V_{GEth}$          | 5,20                    | 5,80 | 6,40 V                                          |
| Gateladung<br>Gate charge                                                        | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                                                                                                                             |                                                                                                   | $Q_G$               | 0,27                    |      | $\mu\text{C}$                                   |
| Interner Gatewiderstand<br>Internal gate resistor                                | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                                                                          |                                                                                                   | $R_{Gint}$          | 0,0                     |      | $\Omega$                                        |
| Eingangskapazität<br>Input capacitance                                           | $f = 1\text{ MHz}$ , $T_{vj} = 25^{\circ}\text{C}$ , $V_{CE} = 25\text{ V}$ , $V_{GE} = 0\text{ V}$                                                                                                    |                                                                                                   | $C_{ies}$           | 2,00                    |      | nF                                              |
| Rückwirkungskapazität<br>Reverse transfer capacitance                            | $f = 1\text{ MHz}$ , $T_{vj} = 25^{\circ}\text{C}$ , $V_{CE} = 25\text{ V}$ , $V_{GE} = 0\text{ V}$                                                                                                    |                                                                                                   | $C_{res}$           | 0,07                    |      | nF                                              |
| Kollektor-Emitter-Reststrom<br>Collector-emitter cut-off current                 | $V_{CE} = 1200\text{ V}$ , $V_{GE} = 0\text{ V}$ , $T_{vj} = 25^{\circ}\text{C}$                                                                                                                       |                                                                                                   | $I_{CES}$           |                         | 1,0  | mA                                              |
| Gate-Emitter-Reststrom<br>Gate-emitter leakage current                           | $V_{CE} = 0\text{ V}$ , $V_{GE} = 20\text{ V}$ , $T_{vj} = 25^{\circ}\text{C}$                                                                                                                         |                                                                                                   | $I_{GES}$           |                         | 100  | nA                                              |
| Einschaltverzögerungszeit, induktive Last<br>Turn-on delay time, inductive load  | $I_C = 35\text{ A}$ , $V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 47\ \Omega$                                                                                                  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{d\text{ on}}$   | 0,07<br>0,07<br>0,07    |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Anstiegszeit, induktive Last<br>Rise time, inductive load                        | $I_C = 35\text{ A}$ , $V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 47\ \Omega$                                                                                                  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_r$               | 0,045<br>0,05<br>0,057  |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Abschaltverzögerungszeit, induktive Last<br>Turn-off delay time, inductive load  | $I_C = 35\text{ A}$ , $V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 47\ \Omega$                                                                                                 | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{d\text{ off}}$  | 0,28<br>0,44<br>0,45    |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Fallzeit, induktive Last<br>Fall time, inductive load                            | $I_C = 35\text{ A}$ , $V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 47\ \Omega$                                                                                                 | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_f$               | 0,115<br>0,175<br>0,205 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Einschaltverlustenergie pro Puls<br>Turn-on energy loss per pulse                | $I_C = 35\text{ A}$ , $V_{CE} = 600\text{ V}$ , $L_S = 35\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}$ , $di/dt = 350\text{ A}/\mu\text{s}$ ( $T_{vj} = 150^{\circ}\text{C}$ )<br>$R_{Gon} = 47\ \Omega$   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{on}$            | 5,00<br>6,50<br>7,00    |      | mJ<br>mJ<br>mJ                                  |
| Abschaltverlustenergie pro Puls<br>Turn-off energy loss per pulse                | $I_C = 35\text{ A}$ , $V_{CE} = 600\text{ V}$ , $L_S = 35\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}$ , $du/dt = 3500\text{ V}/\mu\text{s}$ ( $T_{vj} = 150^{\circ}\text{C}$ )<br>$R_{Goff} = 47\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{off}$           | 2,10<br>3,05<br>3,35    |      | mJ<br>mJ<br>mJ                                  |
| Kurzschlußverhalten<br>SC data                                                   | $V_{GE} \leq 15\text{ V}$ , $V_{CC} = 800\text{ V}$<br>$V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$                                                                                                     | $t_P \leq 10\ \mu\text{s}$ , $T_{vj} = 150^{\circ}\text{C}$                                       | $I_{SC}$            | 130                     |      | A                                               |
| Wärmewiderstand, Chip bis Kühlkörper<br>Thermal resistance, junction to heatsink | pro IGBT / per IGBT<br>valid with IFX pre-applied thermal interface material                                                                                                                           |                                                                                                   | $R_{thJH}$          |                         | 1,00 | K/W                                             |
| Temperatur im Schaltbetrieb<br>Temperature under switching conditions            |                                                                                                                                                                                                        |                                                                                                   | $T_{vj\text{ op}}$  | -40                     | 150  | $^{\circ}\text{C}$                              |

## Diode, Brems-Chopper / Diode, Brake-Chopper

### Höchstzulässige Werte / Maximum Rated Values

|                                                                     |                                                                                                                                              |           |              |                                              |
|---------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------|----------------------------------------------|
| Periodische Spitzensperrspannung<br>Repetitive peak reverse voltage | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                | $V_{RRM}$ | 1200         | V                                            |
| Dauergleichstrom<br>Continuous DC forward current                   |                                                                                                                                              | $I_F$     | 10           | A                                            |
| Periodischer Spitzenstrom<br>Repetitive peak forward 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>$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$    | 16,0<br>14,0 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

### Charakteristische Werte / Characteristic Values

|                                                                                  |                                                                                                                                  |                                                                                                   | min.               | typ.                 | max. |                                                 |
|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------|----------------------|------|-------------------------------------------------|
| Durchlassspannung<br>Forward voltage                                             | $I_F = 10\text{ A}, V_{GE} = 0\text{ V}$<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>$T_{vj} = 150^{\circ}\text{C}$ | $V_F$              | 1,75<br>1,75<br>1,75 | 2,25 | V<br>V<br>V                                     |
| Rückstromspitze<br>Peak reverse recovery current                                 | $I_F = 10\text{ A}, -di_F/dt = 350\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 600\text{ V}$                    | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$           | 12,0<br>10,0<br>8,00 |      | A<br>A<br>A                                     |
| Sperrverzögerungsladung<br>Recovered charge                                      | $I_F = 10\text{ A}, -di_F/dt = 350\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 600\text{ V}$                    | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$              | 0,90<br>1,70<br>1,90 |      | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| Abschaltenergie pro Puls<br>Reverse recovery energy                              | $I_F = 10\text{ A}, -di_F/dt = 350\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 600\text{ V}$                    | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$          | 0,24<br>0,52<br>0,59 |      | mJ<br>mJ<br>mJ                                  |
| Wärmewiderstand, Chip bis Kühlkörper<br>Thermal resistance, junction to heatsink | pro Diode / per diode<br>valid with IFX pre-applied thermal interface material                                                   |                                                                                                   | $R_{thJH}$         |                      | 2,69 | 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       | $T_{NTC} = 25^{\circ}\text{C}$                                | $R_{25}$     |      | 5,00 |      | k $\Omega$ |
| Abweichung von R100<br>Deviation of R100 | $T_{NTC} = 100^{\circ}\text{C}, R_{100} = 493\text{ }\Omega$  | $\Delta R/R$ | -5   |      | 5    | %          |
| Verlustleistung<br>Power dissipation     | $T_{NTC} = 25^{\circ}\text{C}$                                | $P_{25}$     |      |      | 20,0 | mW         |
| B-Wert<br>B-value                        | $R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15\text{ K}))]$  | $B_{25/50}$  |      | 3375 |      | K          |
| B-Wert<br>B-value                        | $R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15\text{ K}))]$  | $B_{25/80}$  |      | 3411 |      | K          |
| B-Wert<br>B-value                        | $R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15\text{ K}))]$ | $B_{25/100}$ |      | 3433 |      | K          |

Angaben gemäß gültiger Application Note.

Specification according to the valid application note.

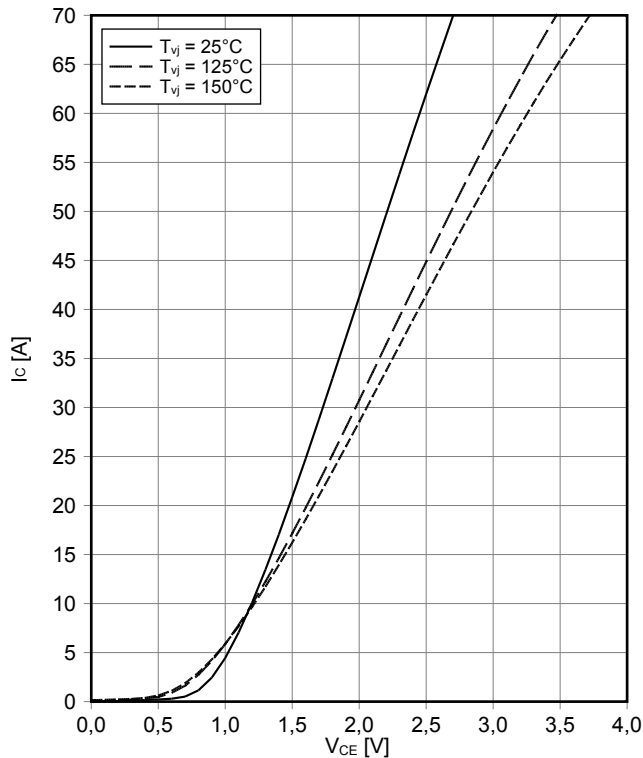
**Modul / Module**

|                                                                                              |                                                                                         |                                              |                                |              |        |
|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------------------------|--------------------------------|--------------|--------|
| Isolations-Prüfspannung<br>Isolation test voltage                                            | RMS, f = 50 Hz, t = 1 min.                                                              | V <sub>ISOL</sub>                            | 2,5                            | kV           |        |
| Innere Isolation<br>Internal isolation                                                       | Basisisolierung (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 |                                              | 11,5<br>6,3                    | mm           |        |
| Luftstrecke<br>Clearance                                                                     | Kontakt - Kühlkörper / terminal to heatsink<br>Kontakt - Kontakt / terminal to terminal |                                              | 10,0<br>5,0                    | mm           |        |
| Vergleichszahl der Kriechwegbildung<br>Comperative tracking index                            |                                                                                         | CTI                                          | > 200                          |              |        |
|                                                                                              |                                                                                         |                                              |                                |              |        |
|                                                                                              |                                                                                         |                                              | min.                           | typ.         | max.   |
| Modulstreuinduktivität<br>Stray inductance module                                            |                                                                                         | L <sub>sCE</sub>                             |                                | 30           | nH     |
| Modulleitungswiderstand, Anschlüsse - Chip<br>Module lead resistance, terminals - chip       | T <sub>H</sub> = 25°C, pro Schalter / per switch                                        | R <sub>CC'+EE'</sub><br>R <sub>AA'+CC'</sub> |                                | 5,00<br>6,00 | mΩ     |
| Lagertemperatur<br>Storage temperature                                                       |                                                                                         | T <sub>stg</sub>                             | -40                            |              | 125 °C |
| Höchstzulässige<br>Bodenplattenbetriebstemperatur<br>Maximum baseplate operation temperature |                                                                                         | T <sub>BPmax</sub>                           |                                |              | 125 °C |
| Anpresskraft für mech. Bef. pro Feder<br>mounting force per clamp                            |                                                                                         | F                                            | 40                             | -            | 80 N   |
| Gewicht<br>Weight                                                                            |                                                                                         | G                                            |                                | 39           | g      |

Der Strom im Dauerbetrieb ist auf 25A effektiv pro Anschlusspin begrenzt.  
The current under continuous operation is limited to 25A rms per connector pin.  
Lagerung und Transport von Modulen mit TIM => siehe AN2012-07  
Storage and shipment of modules with TIM => see AN2012-07

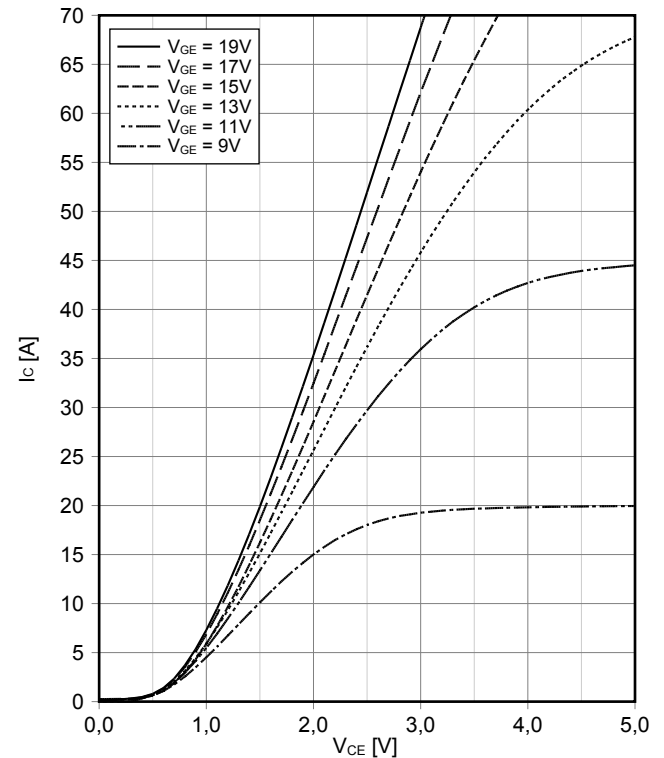
**Ausgangskennlinie IGBT, Wechselrichter (typisch)**  
output characteristic IGBT, Inverter (typical)

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



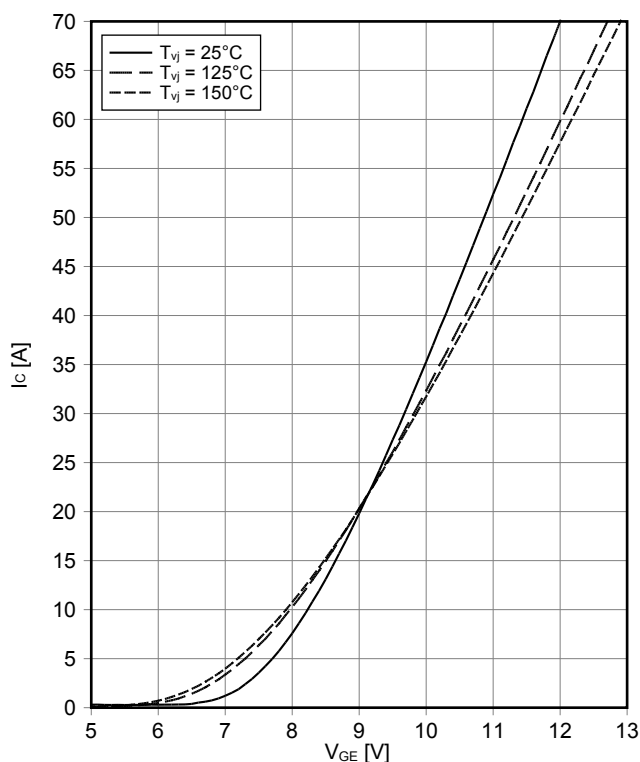
**Ausgangskennlinienfeld IGBT, Wechselrichter (typisch)**  
output characteristic IGBT, Inverter (typical)

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



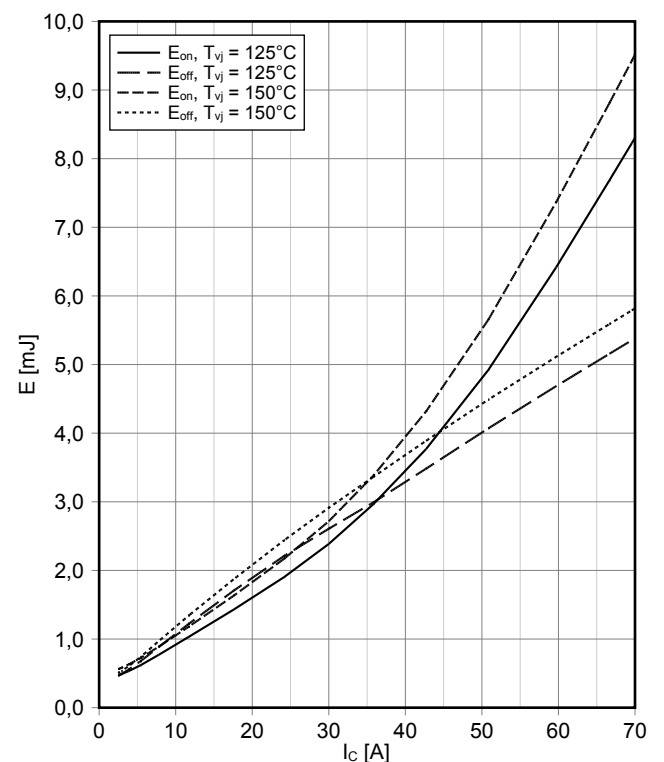
**Übertragungscharakteristik IGBT, Wechselrichter (typisch)**  
transfer characteristic IGBT, Inverter (typical)

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



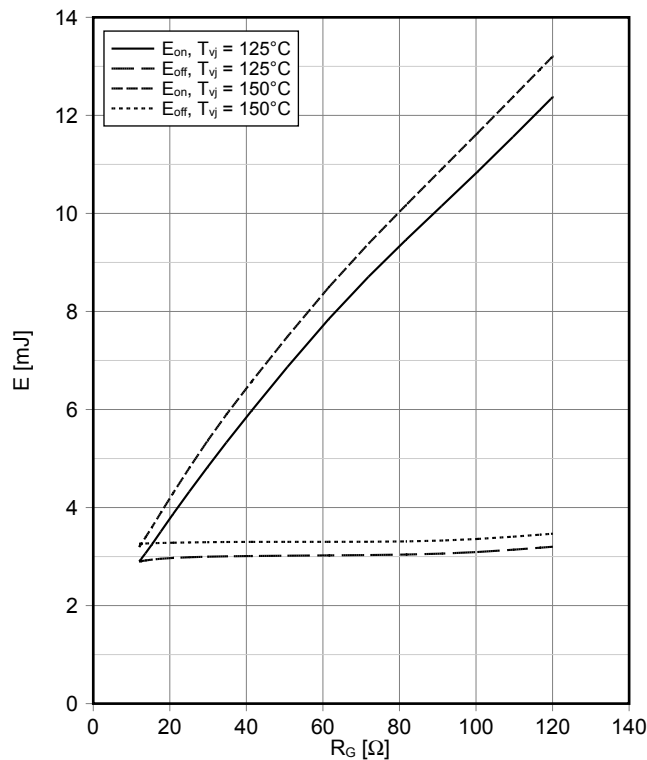
**Schaltverluste IGBT, Wechselrichter (typisch)**  
switching losses IGBT, Inverter (typical)

$E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $R_{Gon} = 12 \Omega$ ,  $R_{Goff} = 12 \Omega$ ,  $V_{CE} = 600 \text{ V}$



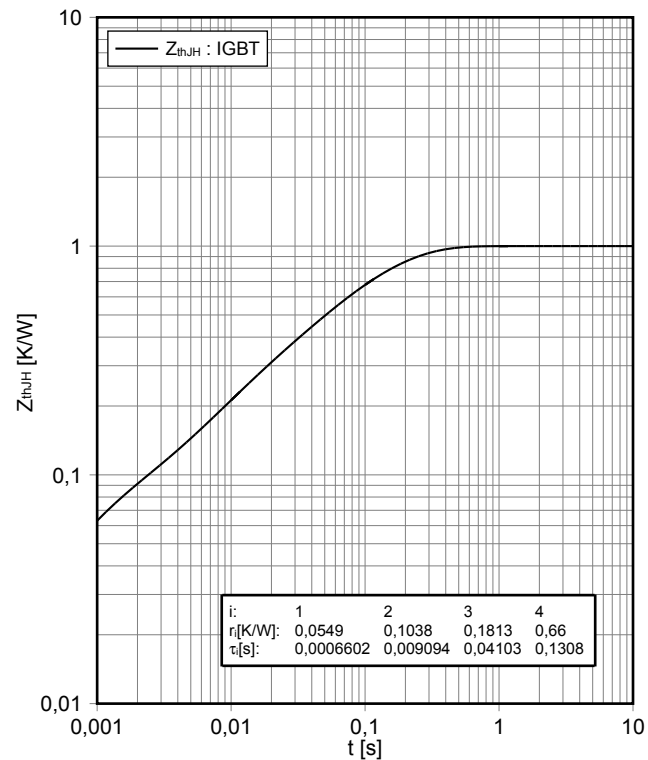
## Schaltverluste IGBT, Wechselrichter (typisch) switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $I_C = 35 \text{ A}$ ,  $V_{CE} = 600 \text{ V}$



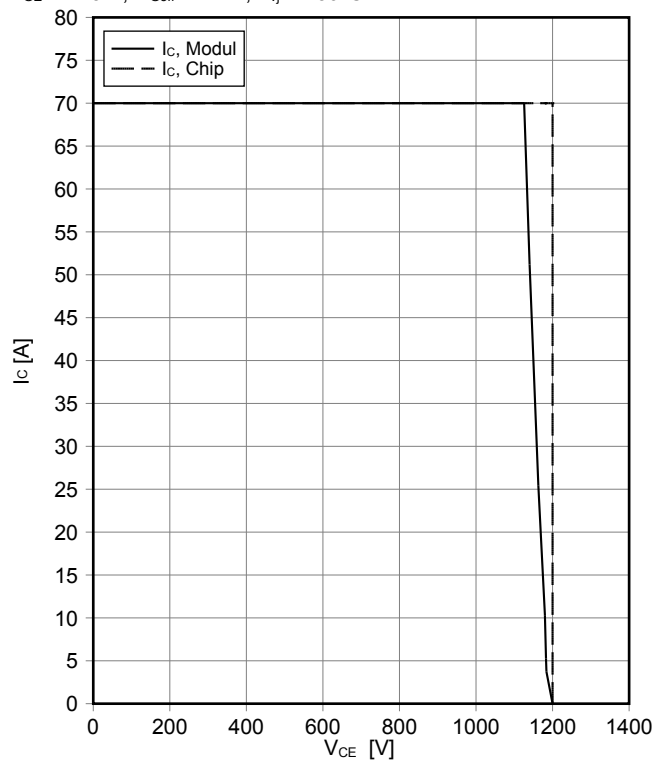
## Transienter Wärmewiderstand IGBT, Wechselrichter transient thermal impedance IGBT, Inverter

$Z_{thJH} = f(t)$



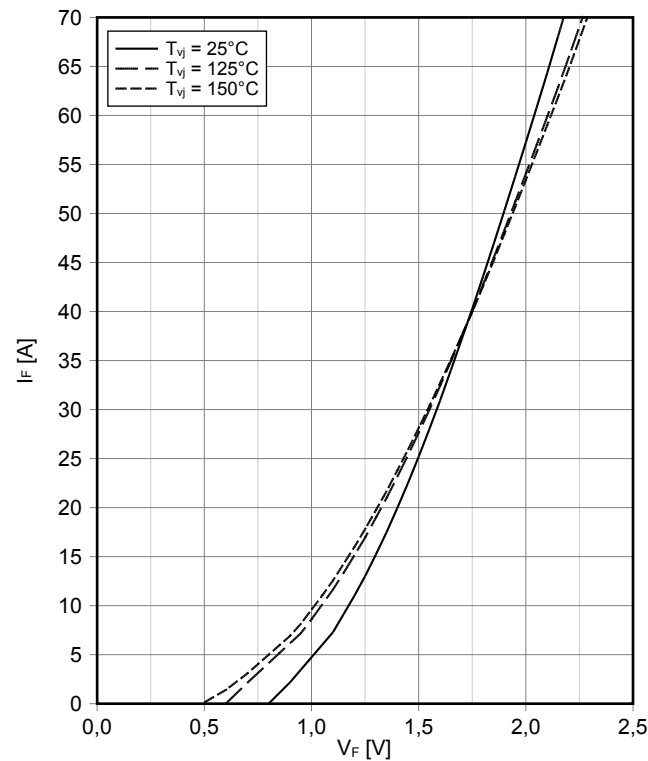
## Sicherer Rückwärts-Arbeitsbereich IGBT, Wechselrichter (RBSOA) reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $R_{Goff} = 12 \Omega$ ,  $T_{vj} = 150^\circ\text{C}$



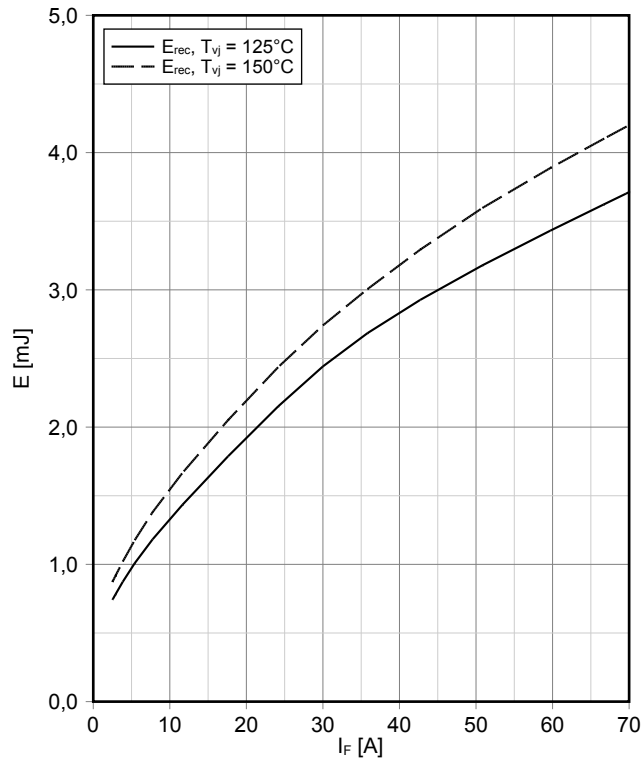
## Durchlasskennlinie der Diode, Wechselrichter (typisch) forward characteristic of Diode, Inverter (typical)

$I_F = f(V_F)$



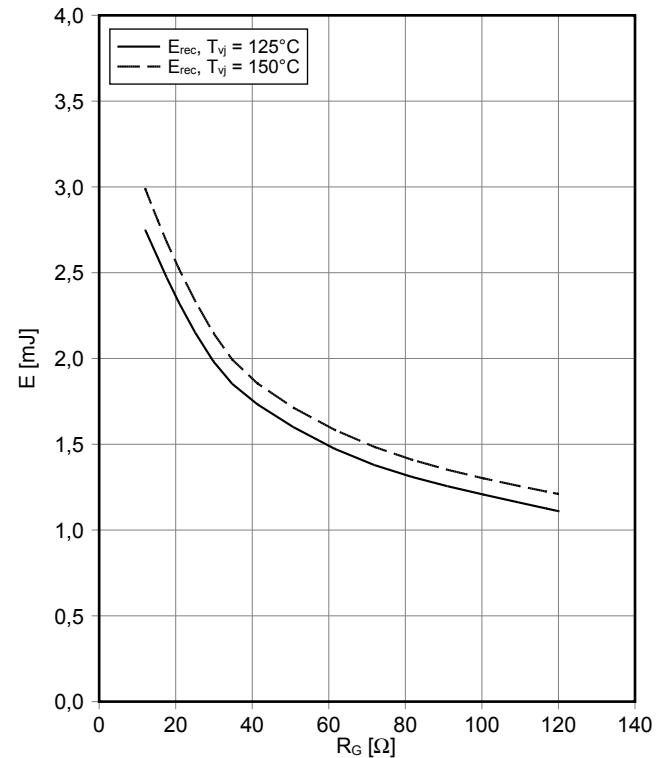
## Schaltverluste Diode, Wechselrichter (typisch) switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 12 \Omega$ ,  $V_{CE} = 600 V$



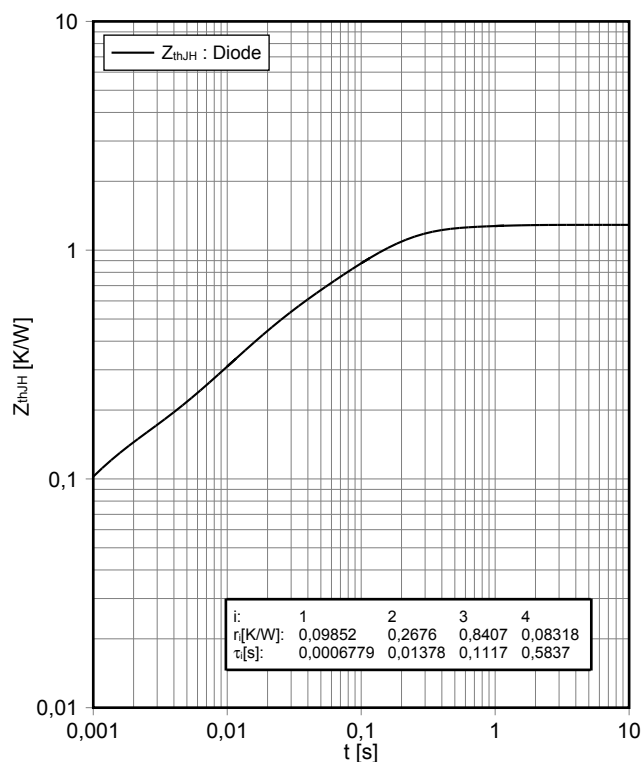
## Schaltverluste Diode, Wechselrichter (typisch) switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 35 A$ ,  $V_{CE} = 600 V$



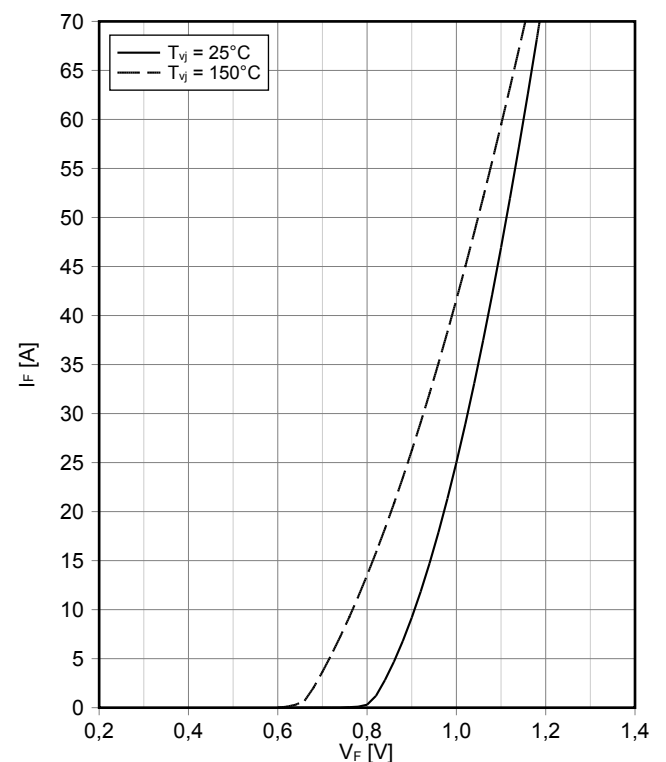
## Transienter Wärmewiderstand Diode, Wechselrichter transient thermal impedance Diode, Inverter

$Z_{thJH} = f(t)$



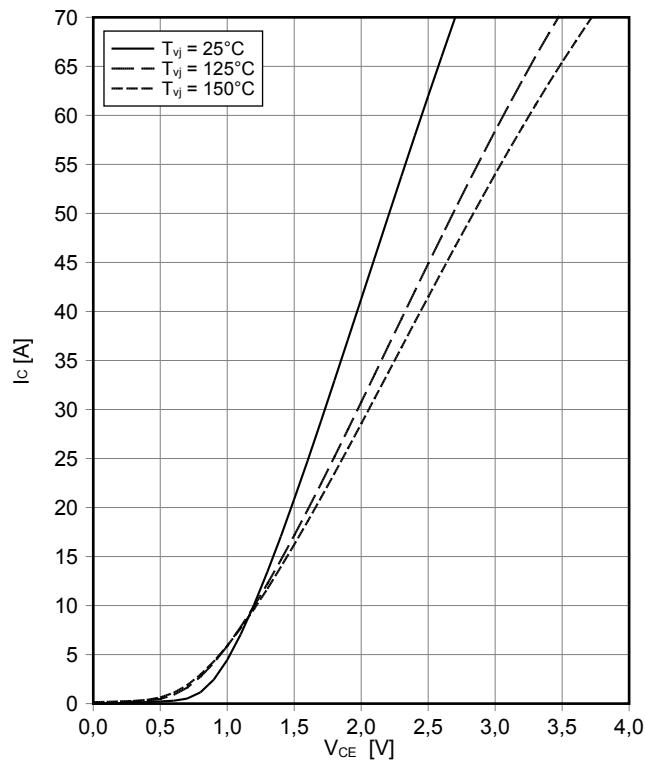
## Durchlasskennlinie der Diode, Gleichrichter (typisch) forward characteristic of Diode, Rectifier (typical)

$I_F = f(V_F)$



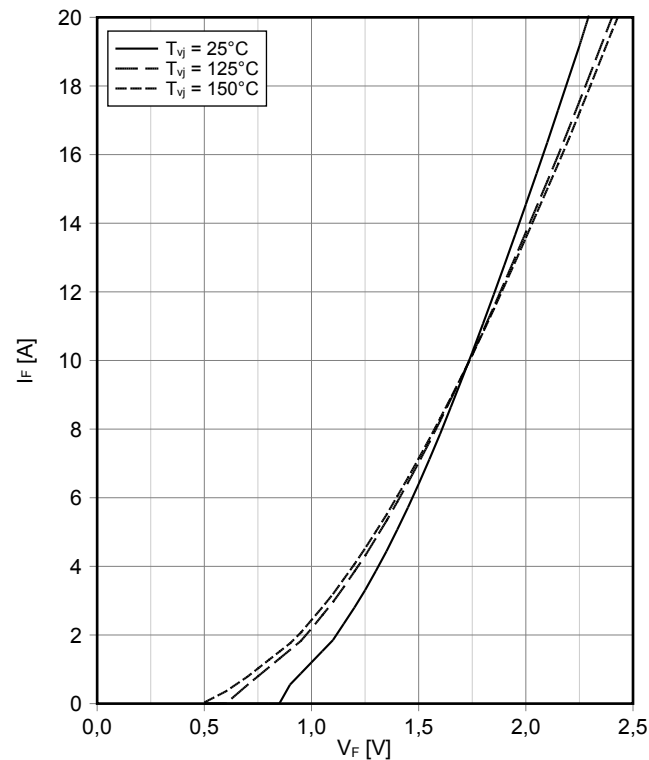
**Ausgangskennlinie IGBT, Brems-Chopper (typisch)**  
**output characteristic IGBT, Brake-Chopper (typical)**

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



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

$I_F = f(V_F)$

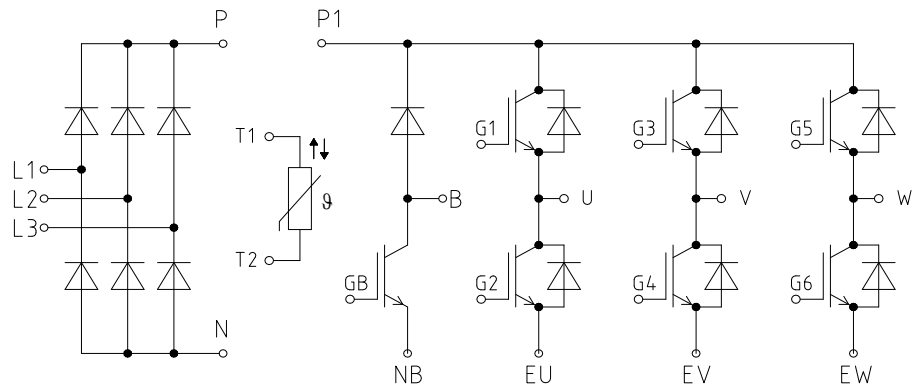


**NTC-Widerstand-Temperaturkennlinie (typisch)**  
**NTC-Thermistor-temperature characteristic (typical)**

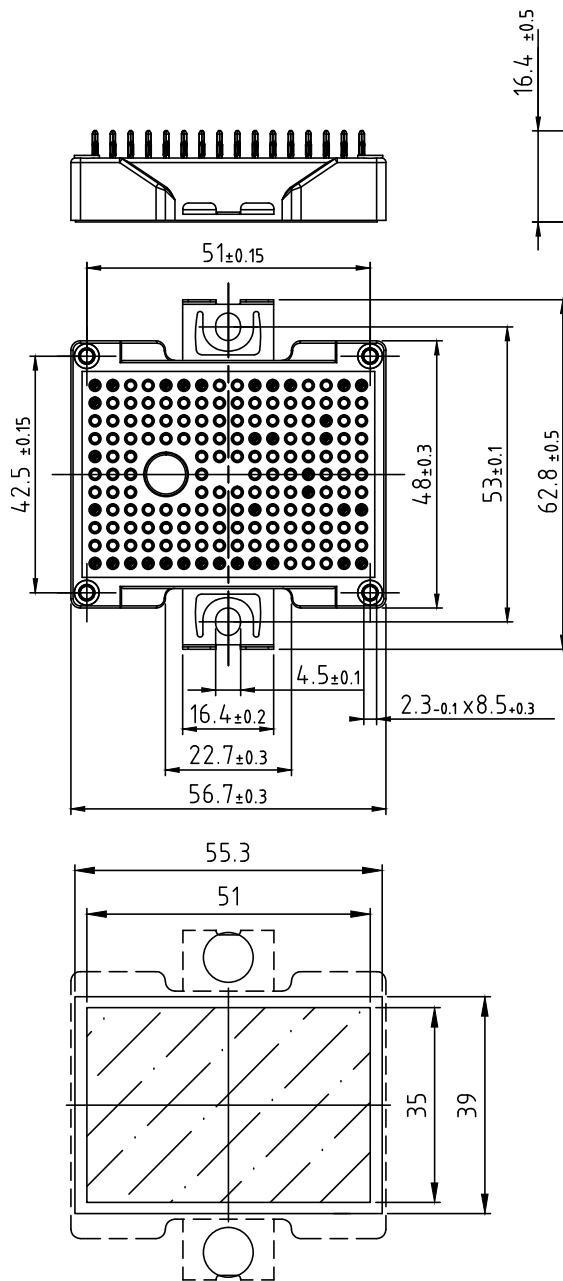
$R = f(T)$



## Schaltplan / Circuit diagram

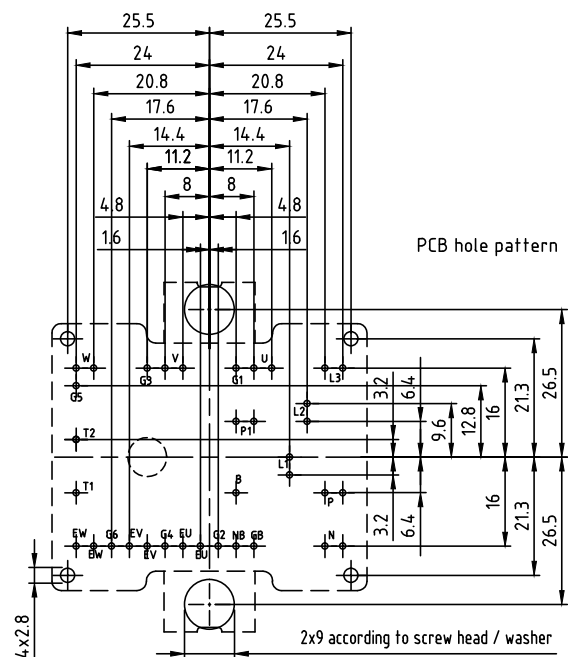


## Gehäuseabmessungen / Package outlines



restricted area for Thermal Interface Material

- Pin-Grid 3.2mm
  - Tolerance of PCB hole pattern  $\pm 0.1$
  - Hole specification for contacts see AN 2009-01:
- Diameters of drill  $\varnothing 1.15\text{mm}$   
and copper thickness in hole 25-50 $\mu\text{m}$



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