

# ANTREX Electronics

Electronic Components Sourcing Information

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## Product Reference Information

**Part Number:** FS450R12OE4PBOSA1  
**Manufacturer:** Infineon Technologies  
**Package:** Module  
**Availability:** Please confirm with sales

**Product Page:**

<https://antrexco.com/product/details/infineon-technologies/fs450r12oe4pbosa1.html>

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## Contact Information

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## Quality & Trust

New & Original Components

Supplier verification and packaging condition review

CoC / RoHS / REACH documents available on request

Secure sourcing support for OEM / EMS projects

**Note:**

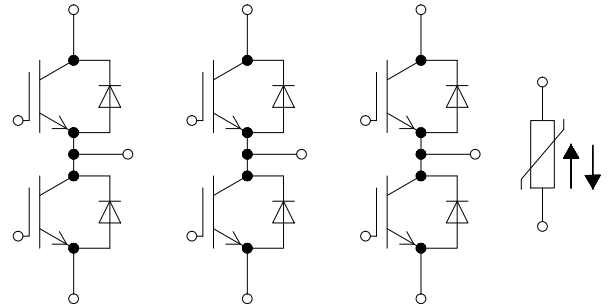
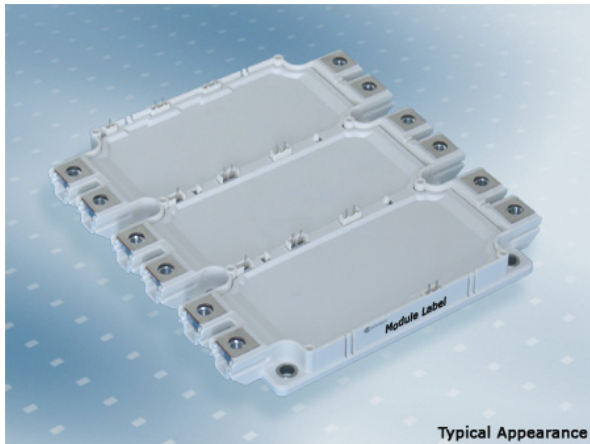
This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.

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EconoPACK™+ Modul mit Trench/Feldstopp IGBT4 und Emitter Controlled HE Diode und PressFIT / bereits aufgetragenem Thermal Interface Material

EconoPACK™+ module with Trench/Fieldstop IGBT4 and Emitter Controlled HE diode and PressFIT / pre-applied Thermal Interface Material



$V_{CES} = 1200V$

$I_{C\ nom} = 450A / I_{CRM} = 900A$

## Typische Anwendungen

- Hochleistungsumrichter
- Hybrid-Nutzfahrzeuge
- Motorantriebe
- Solar Anwendungen
- USV-Systeme

## Elektrische Eigenschaften

- Hohe Kurzschlussrobustheit
- Hohe Stoßstromfestigkeit
- Sehr große Robustheit
- $T_{vj\ op} = 150^{\circ}C$
- Trench IGBT 4

## Mechanische Eigenschaften

- Hohe mechanische Robustheit
- Integrierter NTC Temperatur Sensor
- PressFIT Verbindungstechnik
- RoHS konform
- Thermisches Interface Material bereits aufgetragen

## Typical Applications

- High power converters
- Commercial Agriculture Vehicles
- Motor drives
- Solar applications
- UPS systems

## Electrical Features

- High short-circuit capability
- High surge current capability
- Unbeatable robustness
- $T_{vj\ op} = 150^{\circ}C$
- Trench IGBT 4

## Mechanical Features

- High mechanical robustness
- Integrated NTC temperature sensor
- PressFIT contact technology
- RoHS compliant
- 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            | $T_H = 60^{\circ}\text{C}, T_{vj\text{ max}} = 175^{\circ}\text{C}$ | $I_{C\text{ nom}}$ | 450   | A |
| Periodischer Kollektor-Spitzenstrom<br>Repetitive peak collector current | $t_P = 1\text{ ms}$                                                 | $I_{CRM}$          | 900   | 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     | $I_C = 450\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 450\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 450\text{ A}, V_{GE} = 15\text{ V}$                                                      | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_{CE\text{ sat}}$ | 1,75<br>2,00<br>2,05 | 2,10  | V<br>V<br>V                                     |
| Gate-Schwellenspannung<br>Gate threshold voltage                                 | $I_C = 17,0\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                        |                                                                                                   | $V_{GEth}$          | 5,20                 | 5,80  | 6,40 V                                          |
| Gateladung<br>Gate charge                                                        | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                                                                                                                  |                                                                                                   | $Q_G$               | 3,30                 |       | $\mu\text{C}$                                   |
| Interner Gatewiderstand<br>Internal gate resistor                                | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                                                               |                                                                                                   | $R_{Gint}$          | 1,7                  |       | $\Omega$                                        |
| Eingangskapazität<br>Input capacitance                                           | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                  |                                                                                                   | $C_{ies}$           | 28,0                 |       | nF                                              |
| Rückwirkungskapazität<br>Reverse transfer capacitance                            | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                  |                                                                                                   | $C_{res}$           | 1,55                 |       | nF                                              |
| Kollektor-Emitter-Reststrom<br>Collector-emitter cut-off current                 | $V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                  |                                                                                                   | $I_{CES}$           |                      | 3,0   | mA                                              |
| Gate-Emitter-Reststrom<br>Gate-emitter leakage current                           | $V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                    |                                                                                                   | $I_{GES}$           |                      | 400   | nA                                              |
| Einschaltverzögerungszeit, induktive Last<br>Turn-on delay time, inductive load  | $I_C = 450\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 1,0\ \Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{d\text{ on}}$   | 0,19<br>0,22<br>0,22 |       | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Anstiegszeit, induktive Last<br>Rise time, inductive load                        | $I_C = 450\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 1,0\ \Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_r$               | 0,06<br>0,06<br>0,07 |       | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Abschaltverzögerungszeit, induktive Last<br>Turn-off delay time, inductive load  | $I_C = 450\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 1,0\ \Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{d\text{ off}}$  | 0,44<br>0,55<br>0,57 |       | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Fallzeit, induktive Last<br>Fall time, inductive load                            | $I_C = 450\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 1,0\ \Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_f$               | 0,06<br>0,10<br>0,11 |       | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| Einschaltverlustenergie pro Puls<br>Turn-on energy loss per pulse                | $I_C = 450\text{ A}, V_{CE} = 600\text{ V}, L_S = 35\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, di/dt = 6300\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Gon} = 1,0\ \Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{on}$            | 25,0<br>40,5<br>44,0 |       | mJ<br>mJ<br>mJ                                  |
| Abschaltverlustenergie pro Puls<br>Turn-off energy loss per pulse                | $I_C = 450\text{ A}, V_{CE} = 600\text{ V}, L_S = 35\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, du/dt = 3100\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Goff} = 1,0\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{off}$           | 37,0<br>56,5<br>63,0 |       | mJ<br>mJ<br>mJ                                  |
| Kurzschlußverhalten<br>SC data                                                   | $V_{GE} \leq 15\text{ V}, V_{CC} = 800\text{ V}$<br>$V_{CE\text{ max}} = V_{CES} - L_{SCE} \cdot di/dt$                                                                                     | $t_P \leq 10\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$                                          | $I_{SC}$            | 1800                 |       | A                                               |
| Wärmewiderstand, Chip bis Kühlkörper<br>Thermal resistance, junction to heatsink | pro IGBT / per IGBT<br>valid with IFX pre-applied thermal interface material                                                                                                                |                                                                                                   | $R_{thJH}$          |                      | 0,104 | 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                   |                                                                                                                                              | $I_F$     | 450            | A                                            |
| Periodischer Spitzenstrom<br>Repetitive peak forward current        | $t_P = 1\text{ ms}$                                                                                                                          | $I_{FRM}$ | 900            | A                                            |
| Grenzlastintegral<br>$I^2t$ - value                                 | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$<br>$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$    | 30000<br>27500 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

**Charakteristische Werte / Characteristic Values**

|                                                                                  |                                                                                                                                            |                                                                                                   | min.               | typ.                 | max.  |                                                 |
|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------|----------------------|-------|-------------------------------------------------|
| Durchlassspannung<br>Forward voltage                                             | $I_F = 450\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 450\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 450\text{ A}, V_{GE} = 0\text{ V}$        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_F$              | 1,65<br>1,65<br>1,65 | 2,10  | V<br>V<br>V                                     |
| Rückstromspitze<br>Peak reverse recovery current                                 | $I_F = 450\text{ A}, -di_F/dt = 6300\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$           | 415<br>470<br>505    |       | A<br>A<br>A                                     |
| Sperrverzögerungsladung<br>Recovered charge                                      | $I_F = 450\text{ A}, -di_F/dt = 6300\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$              | 48,0<br>89,0<br>105  |       | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| Abschaltenergie pro Puls<br>Reverse recovery energy                              | $I_F = 450\text{ A}, -di_F/dt = 6300\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$          | 22,5<br>39,5<br>45,5 |       | 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                                                             |                                                                                                   | $R_{thJH}$         |                      | 0,146 | 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.

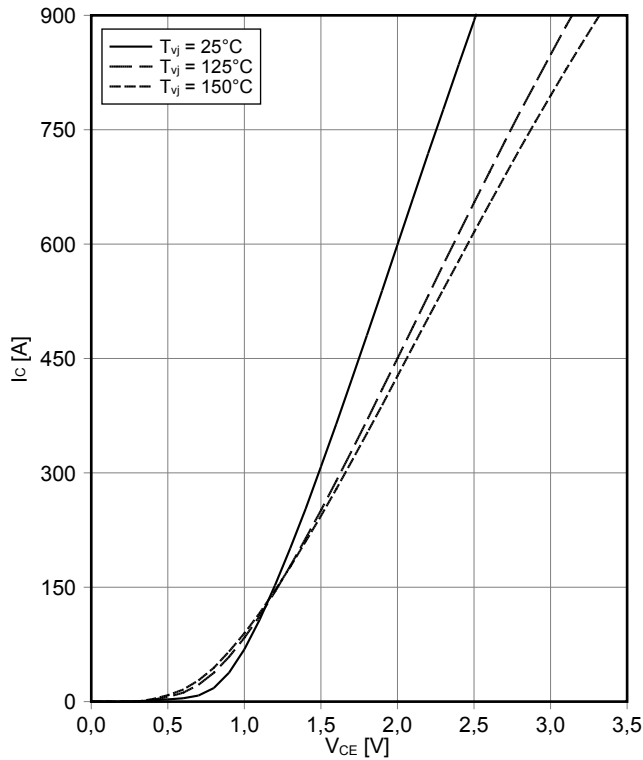
## Modul / Module

|                                                                                              |                                                                                                                    |                      |                                |      |         |
|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------------|------|---------|
| 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                            |                      | 18,5<br>12,6                   |      | mm      |
| Luftstrecke<br>Clearance                                                                     | Kontakt - Kühlkörper / terminal to heatsink<br>Kontakt - Kontakt / terminal to terminal                            |                      | 16,0<br>10,0                   |      | mm      |
| Vergleichszahl der Kriechwegbildung<br>Comperative tracking index                            |                                                                                                                    | CTI                  | > 200                          |      |         |
|                                                                                              |                                                                                                                    |                      |                                |      |         |
|                                                                                              |                                                                                                                    |                      | min.                           | typ. | max.    |
| Modulstreuinduktivität<br>Stray inductance module                                            |                                                                                                                    | L <sub>sCE</sub>     |                                | 20   | 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> |                                | 1,10 | 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  |
| Anzugsdrehmoment f. Modulmontage<br>Mounting torque for modul mounting                       | Schraube M5 - Montage gem. gültiger Applikationsschrift<br>Screw M5 - Mounting according to valid application note | M                    | 3,00                           |      | 6,00 Nm |
| Anzugsdrehmoment f. elektr. Anschlüsse<br>Terminal connection torque                         | Schraube M6 - Montage gem. gültiger Applikationsschrift<br>Screw M6 - Mounting according to valid application note | M                    | 3,0                            | -    | 6,0 Nm  |
| Gewicht<br>Weight                                                                            |                                                                                                                    | G                    |                                | 924  | g       |

Lagerung und Transport von Modulen mit TIM => siehe AN 2012-07  
Storage and shipment of modules with TIM => see AN 2012-07

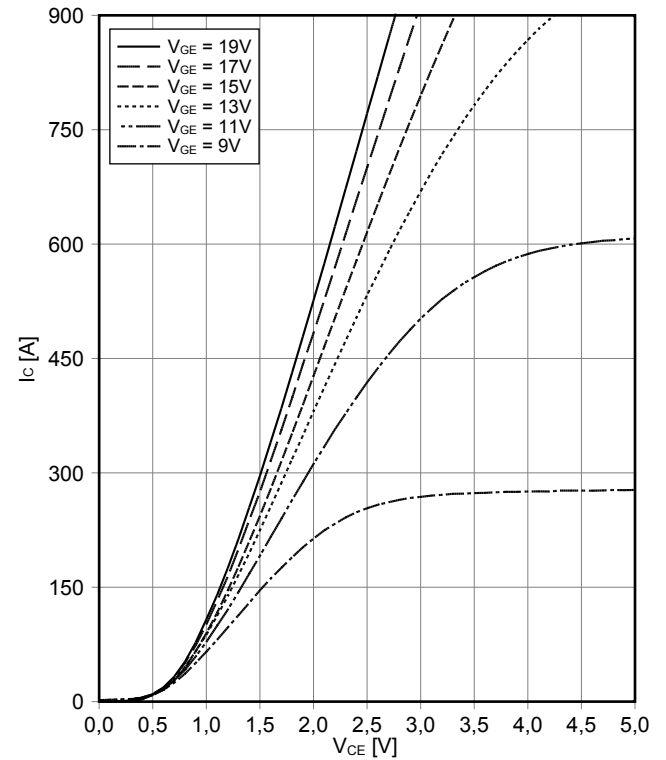
**Ausgangskennlinie IGBT, Wechselrichter (typisch)**  
**output characteristic IGBT, Inverter (typical)**

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



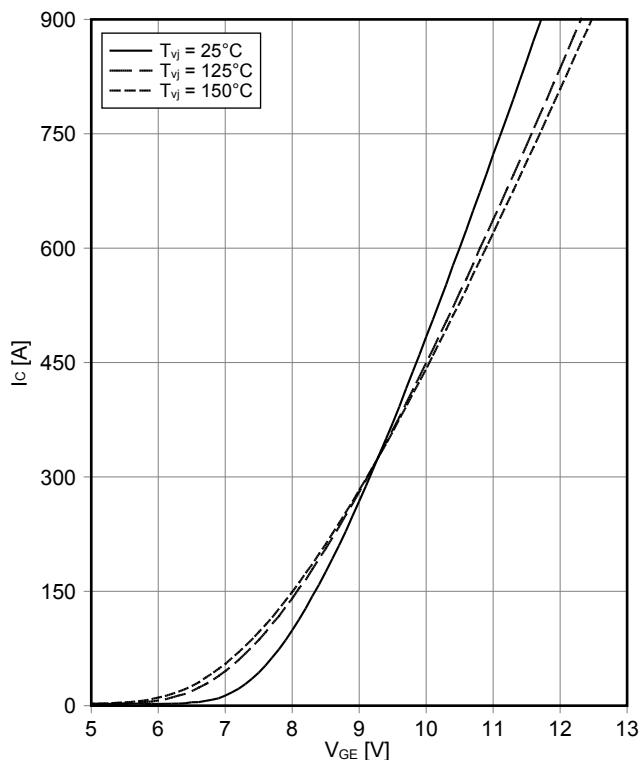
**Ausgangskennlinienfeld IGBT, Wechselrichter (typisch)**  
**output characteristic IGBT, Inverter (typical)**

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



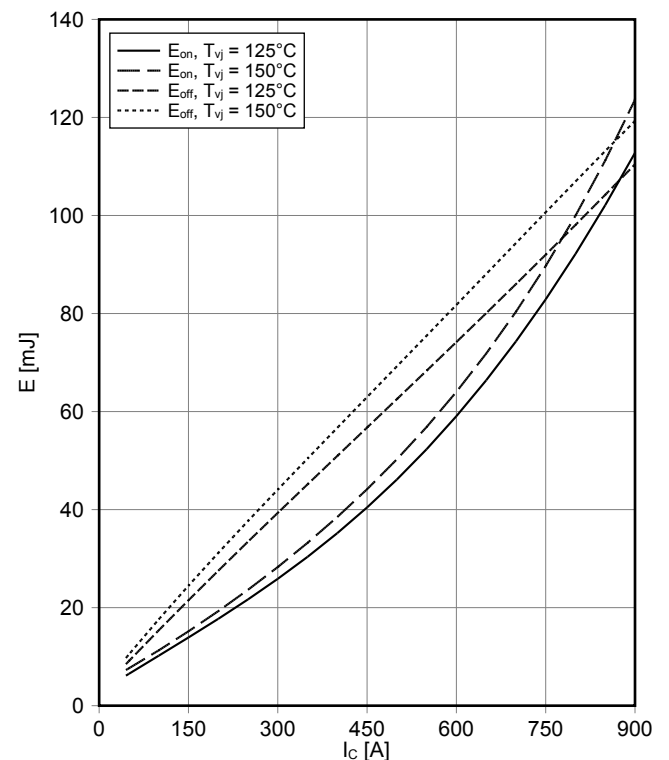
**Übertragungscharakteristik IGBT, Wechselrichter (typisch)**  
**transfer characteristic IGBT, Inverter (typical)**

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



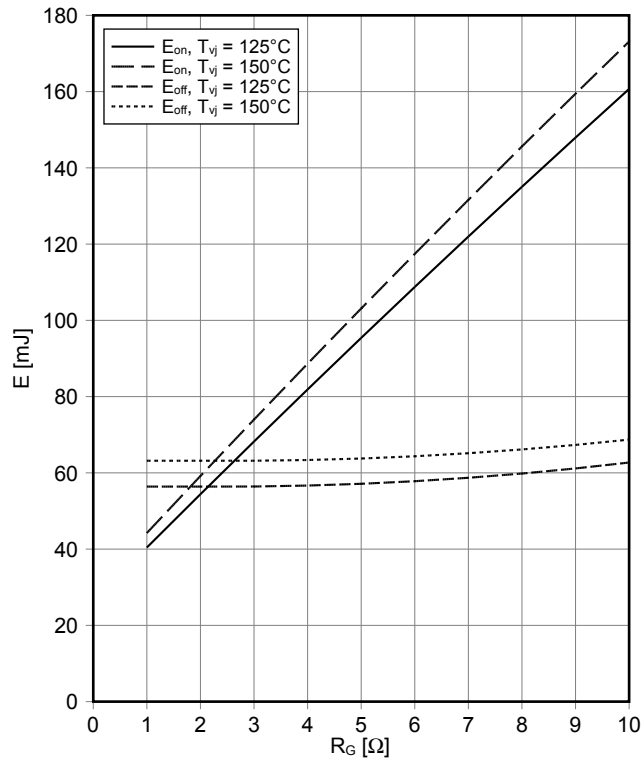
**Schaltverluste IGBT, Wechselrichter (typisch)**  
**switching losses IGBT, Inverter (typical)**

$E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $R_{Gon} = 1 \Omega$ ,  $R_{Goff} = 1 \Omega$ ,  $V_{CE} = 600 \text{ V}$



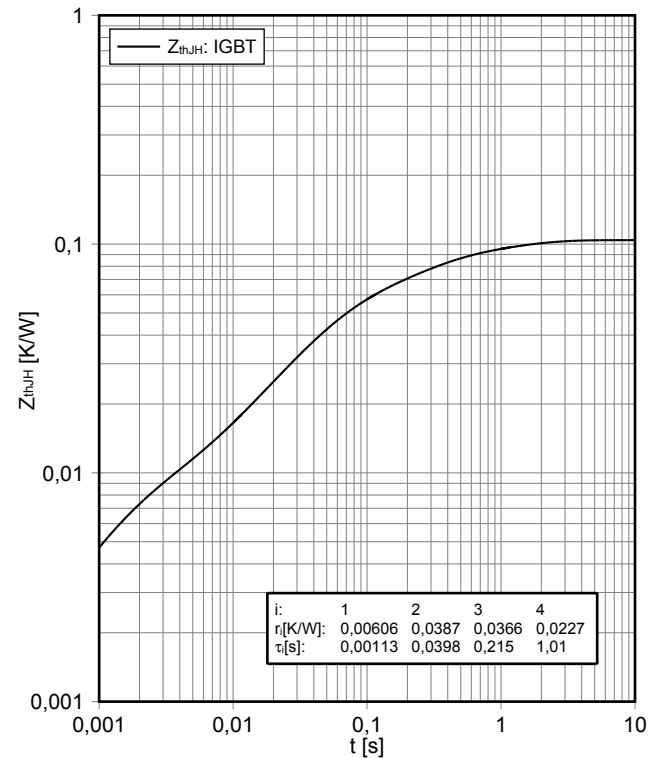
## Schaltverluste IGBT, Wechselrichter (typisch) switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $I_C = 450 \text{ A}$ ,  $V_{CE} = 600 \text{ V}$



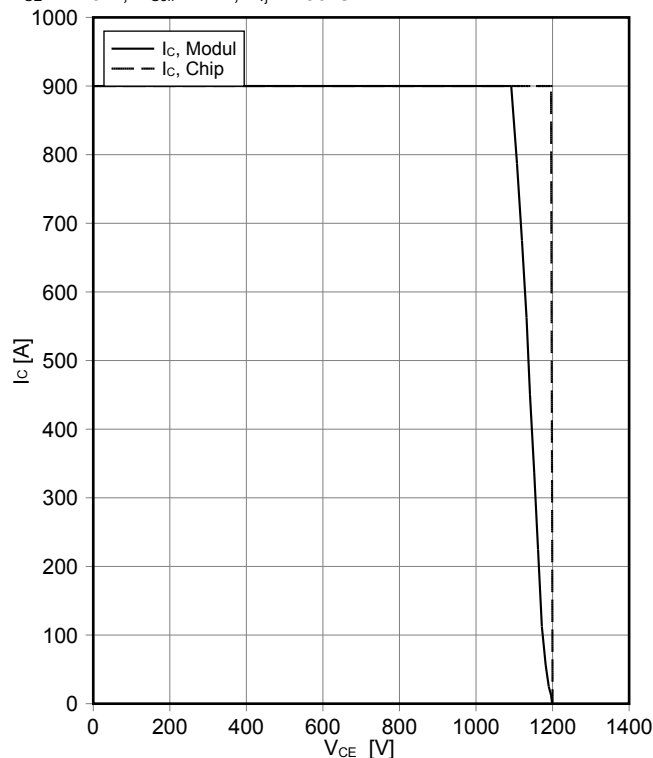
## Transienter Wärmewiderstand IGBT, Wechselrichter transient thermal impedance IGBT, Inverter

$Z_{thJH} = f(t)$



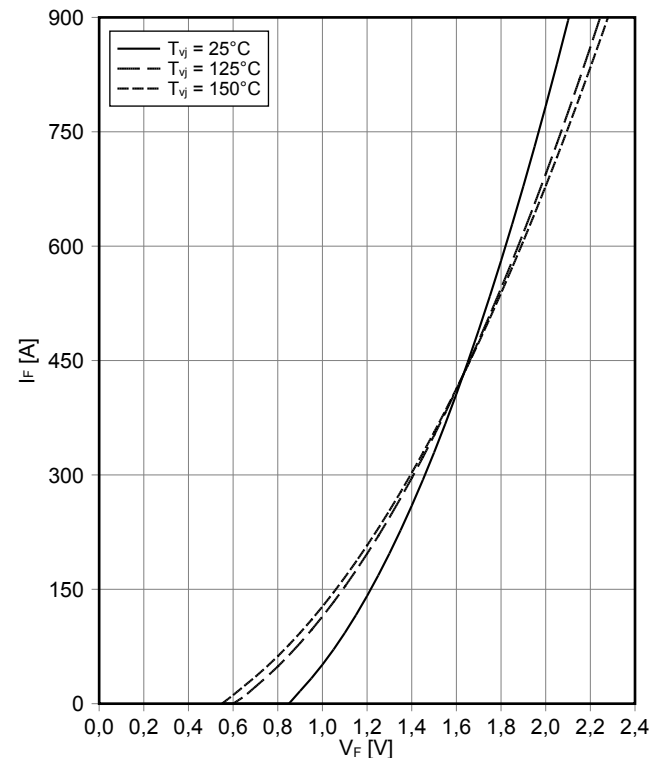
## Sicherer Rückwärts-Arbeitsbereich IGBT, Wechselrichter (RBSOA) reverse bias safe operating area IGBT, Inverter (RBSOA)

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



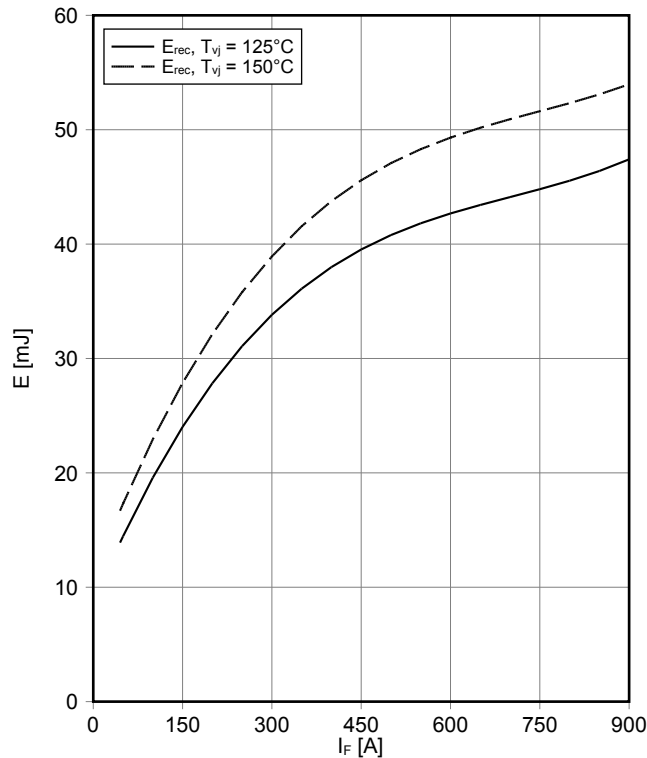
## Durchlasskennlinie der Diode, Wechselrichter (typisch) forward characteristic of Diode, Inverter (typical)

$I_F = f(V_F)$



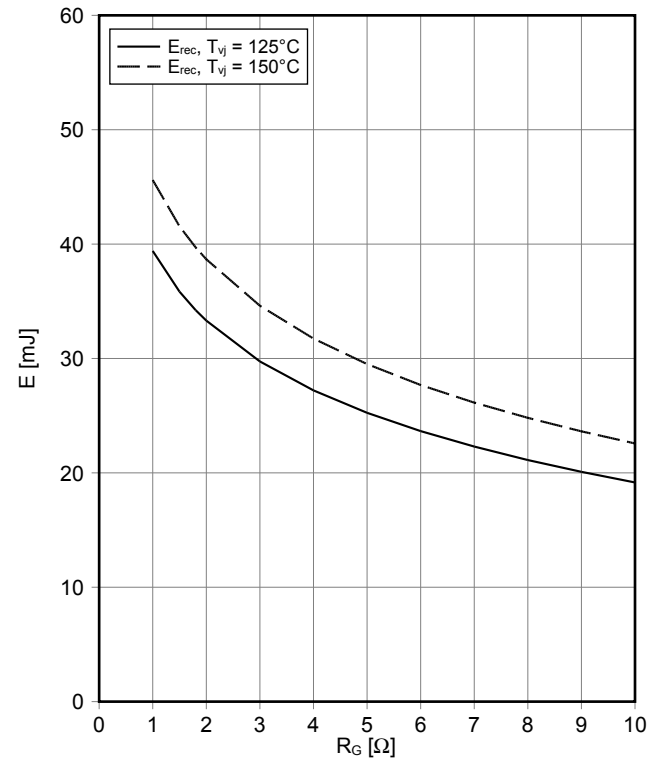
## Schaltverluste Diode, Wechselrichter (typisch) switching losses Diode, Inverter (typical)

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



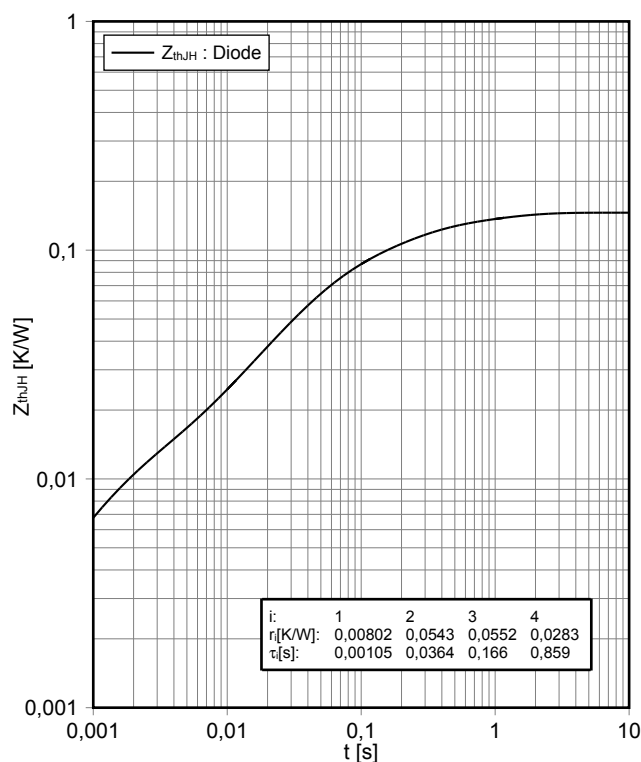
## Schaltverluste Diode, Wechselrichter (typisch) switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 450 A$ ,  $V_{CE} = 600 V$



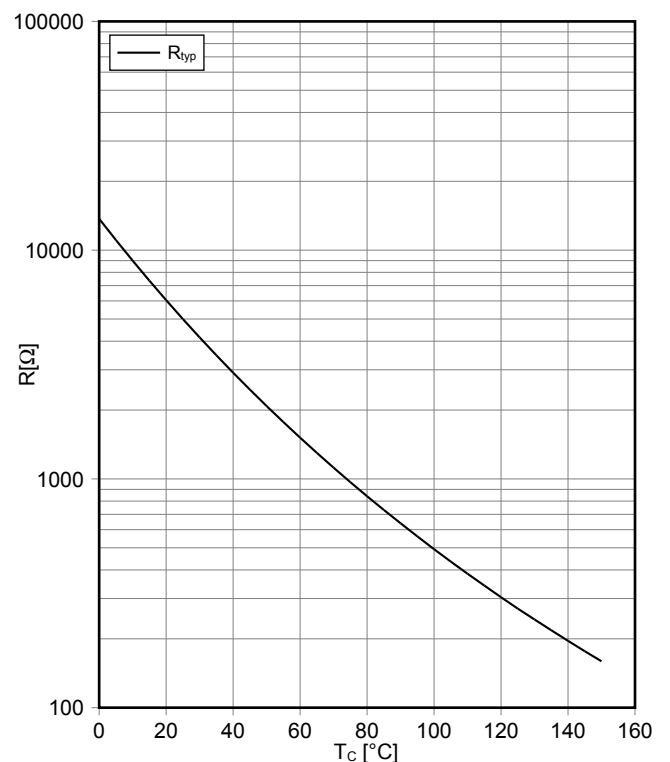
## Transienter Wärmewiderstand Diode, Wechselrichter transient thermal impedance Diode, Inverter

$Z_{thJH} = f(t)$

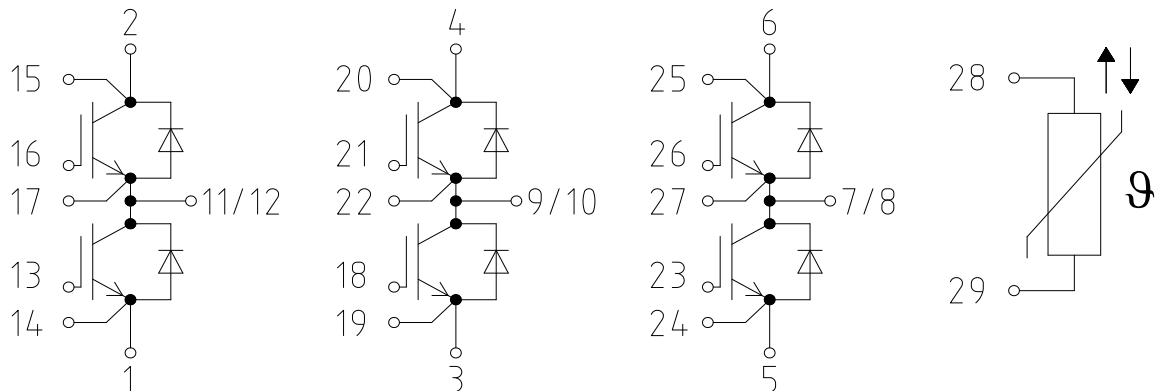


## NTC-Widerstand-Temperaturkennlinie (typisch) NTC-Thermistor-temperature characteristic (typical)

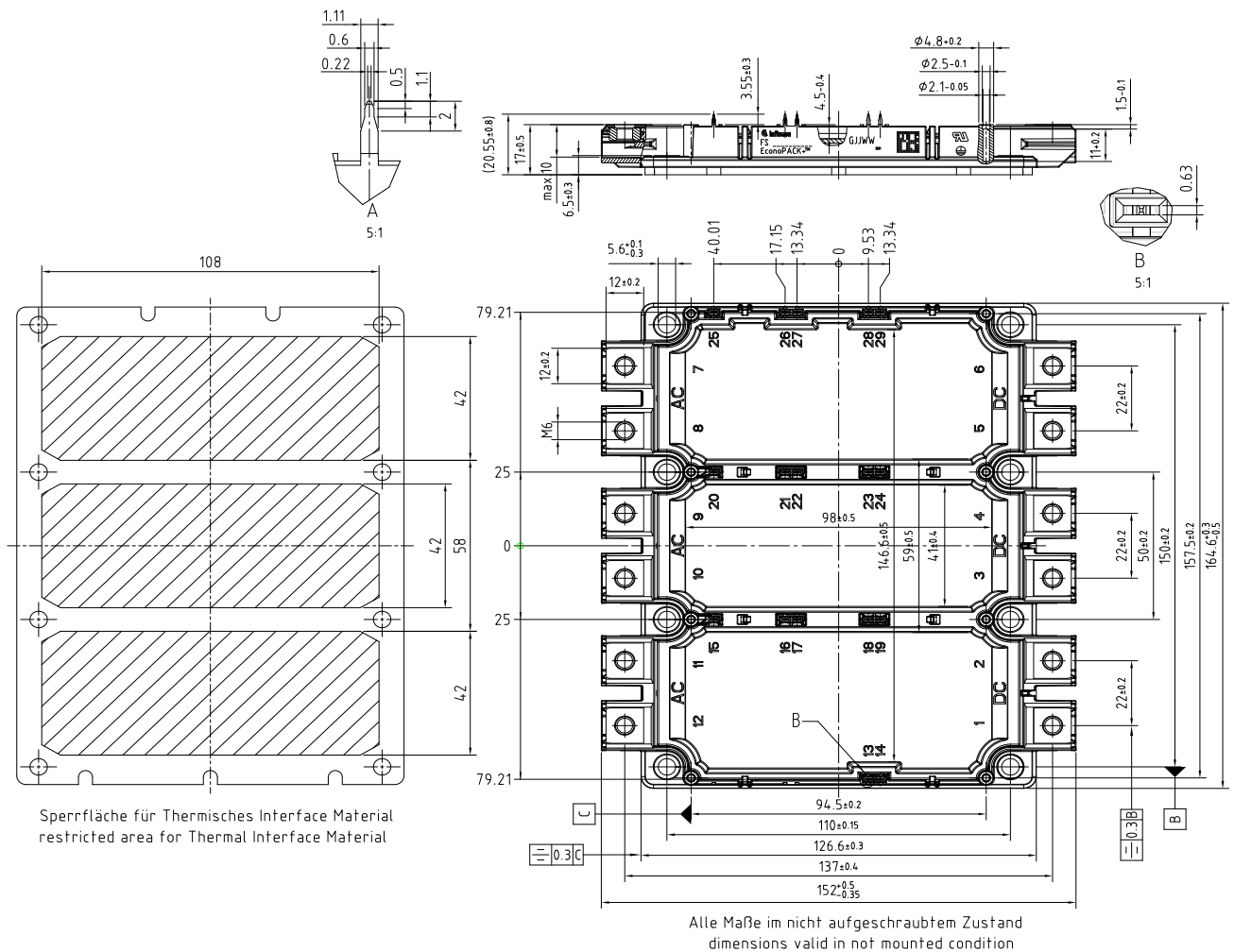
$R = f(T)$



## Schaltplan / Circuit diagram



## Gehäuseabmessungen / Package outlines



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Edition 2016-11-09

Published by  
Infineon Technologies AG  
81726 München, Germany

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