

## IHM-B module with fast Trench/Fieldstop IGBT3 and emitter controlled 3 diode

### Features

- Electrical features
  - $V_{CES} = 3300\text{ V}$
  - $I_{C\text{ nom}} = 1200\text{ A} / I_{CRM} = 2400\text{ A}$
  - Unbeatable robustness
  - High DC stability
  - High short-circuit capability
  - Low switching losses
  - Low  $V_{CE,sat}$
  - $T_{vj,op} = 150^{\circ}\text{C}$
  - $V_{CE,sat}$  with positive temperature coefficient
- Mechanical features
  - AlSiC base plate for increased thermal cycling capability
  - Package with CTI > 600
  - IHM B housing
  - Isolated base plate



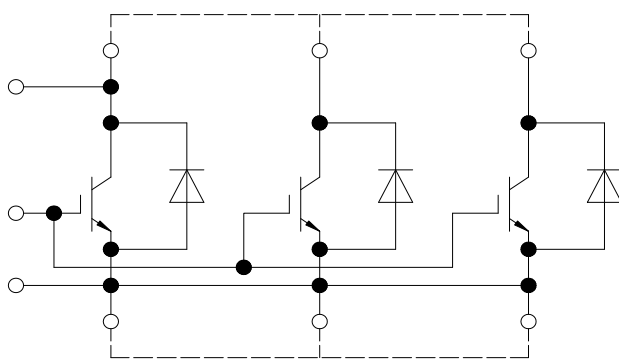
### Potential applications

- Chopper applications
- Medium-voltage converters
- Motor drives
- Traction drives
- UPS systems
- Wind turbines

### Product validation

- Qualified for industrial applications according to the relevant tests of IEC 60747, 60749 and 60068

### Description



external connection  
(to be done)

Table of contents

|   |                                |    |
|---|--------------------------------|----|
|   | Description .....              | 1  |
|   | Features .....                 | 1  |
|   | Potential applications .....   | 1  |
|   | Product validation .....       | 1  |
|   | Table of contents .....        | 2  |
| 1 | Package .....                  | 3  |
| 2 | IGBT, Inverter .....           | 3  |
| 3 | Diode, Inverter .....          | 5  |
| 4 | Characteristics diagrams ..... | 7  |
| 5 | Circuit diagram .....          | 10 |
| 6 | Package outlines .....         | 11 |
| 7 | Module label code .....        | 12 |
|   | Revision history .....         | 13 |
|   | Disclaimer .....               | 14 |

## 1 Package

**Table 1** Insulation coordination

| Parameter                            | Symbol      | Note or test condition                                 | Values | Unit |
|--------------------------------------|-------------|--------------------------------------------------------|--------|------|
| Isolation test voltage               | $V_{ISOL}$  | RMS, $f = 50 \text{ Hz}$ , $t = 1 \text{ min}$         | 6.0    | kV   |
| Partial discharge extinction voltage | $V_{isol}$  | RMS, $f = 50 \text{ Hz}$ , $Q_{PD} \leq 10 \text{ pC}$ | 2.6    | kV   |
| DC stability                         | $V_{CE(D)}$ | $T_{vj}=25^{\circ}\text{C}$ , 100 Fit                  | 2100   | V    |
| Material of module baseplate         |             |                                                        | AlSiC  |      |
| Creepage distance                    | $d_{Creep}$ | terminal to heatsink                                   | 32.2   | mm   |
| Clearance                            | $d_{Clear}$ | terminal to heatsink                                   | 19.1   | mm   |
| Comparative tracking index           | $CTI$       |                                                        | >600   |      |

**Table 2** Characteristic values

| Parameter                                | Symbol        | Note or test condition                         | Values    |      |      | Unit |
|------------------------------------------|---------------|------------------------------------------------|-----------|------|------|------|
|                                          |               |                                                | Min.      | Typ. | Max. |      |
| Stray inductance module                  | $L_{SCE}$     |                                                |           | 6    |      | nH   |
| Module lead resistance, terminals - chip | $R_{CC'+EE'}$ | $T_C=25^{\circ}\text{C}$ , per switch          |           | 0.12 |      | mΩ   |
| Storage temperature                      | $T_{stg}$     |                                                | -40       |      | 150  | °C   |
| Mounting torque for module mounting      | $M$           | - Mounting according to valid application note | M6, Screw | 4.25 | 5.75 | Nm   |
| Terminal connection torque               | $M$           | - Mounting according to valid application note | M4, Screw | 1.8  | 2.1  | Nm   |
|                                          |               |                                                | M8, Screw | 8    | 10   |      |
| Weight                                   | $G$           |                                                |           | 1200 |      | g    |

## 2 IGBT, Inverter

**Table 3** Maximum rated values

| Parameter                         | Symbol    | Note or test condition                     |                                | Values | Unit |
|-----------------------------------|-----------|--------------------------------------------|--------------------------------|--------|------|
| Collector-emitter voltage         | $V_{CES}$ |                                            | $T_{vj} = -40^{\circ}\text{C}$ | 3300   | V    |
|                                   |           |                                            | $T_{vj} = 150^{\circ}\text{C}$ | 3300   |      |
| Continuous DC collector current   | $I_{CDC}$ | $T_{vj \text{ max}} = 150^{\circ}\text{C}$ | $T_C = 95^{\circ}\text{C}$     | 1200   | A    |
| Repetitive peak collector current | $I_{CRM}$ | $t_p = 1 \text{ ms}$                       |                                | 2400   | A    |
| Gate-emitter peak voltage         | $V_{GES}$ |                                            |                                | ±20    | V    |

**Table 4** Characteristic values

| Parameter                            | Symbol        | Note or test condition                                                                                                                                             |                          | Values |       |      | Unit     |
|--------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------|-------|------|----------|
|                                      |               |                                                                                                                                                                    |                          | Min.   | Typ.  | Max. |          |
| Collector-emitter saturation voltage | $V_{CE\ sat}$ | $I_C = 1200\ A, V_{GE} = 15\ V$                                                                                                                                    | $T_{vj} = 25\ ^\circ C$  |        | 2.70  | 3.20 | V        |
|                                      |               |                                                                                                                                                                    | $T_{vj} = 125\ ^\circ C$ |        | 3.15  | 3.60 |          |
|                                      |               |                                                                                                                                                                    | $T_{vj} = 150\ ^\circ C$ |        | 3.30  |      |          |
| Gate threshold voltage               | $V_{GEth}$    | $I_C = 54\ mA, V_{CE} = V_{GE}, T_{vj} = 25\ ^\circ C$                                                                                                             |                          | 5.20   | 5.80  | 6.40 | V        |
| Gate charge                          | $Q_G$         | $V_{GE} = \pm 15\ V, V_{CE} = 1800\ V$                                                                                                                             |                          |        | 32    |      | $\mu C$  |
| Internal gate resistor               | $R_{Gint}$    | $T_{vj} = 25\ ^\circ C$                                                                                                                                            |                          |        | 0.44  |      | $\Omega$ |
| Input capacitance                    | $C_{ies}$     | $f = 1000\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$                                                                                              |                          |        | 210   |      | nF       |
| Reverse transfer capacitance         | $C_{res}$     | $f = 1000\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$                                                                                              |                          |        | 4.5   |      | nF       |
| Collector-emitter cut-off current    | $I_{CES}$     | $V_{CE} = 3300\ V, V_{GE} = 0\ V$                                                                                                                                  | $T_{vj} = 25\ ^\circ C$  |        |       | 5    | mA       |
| Gate-emitter leakage current         | $I_{GES}$     | $V_{CE} = 0\ V, V_{GE} = 20\ V, T_{vj} = 25\ ^\circ C$                                                                                                             |                          |        |       | 400  | nA       |
| Turn-on delay time (inductive load)  | $t_{don}$     | $I_C = 1200\ A, V_{CE} = 1800\ V, V_{GE} = \pm 15\ V, R_{Gon} = 0.62\ \Omega, C_{GE} = 220\ nF$                                                                    | $T_{vj} = 25\ ^\circ C$  |        | 0.350 |      | $\mu s$  |
|                                      |               |                                                                                                                                                                    | $T_{vj} = 125\ ^\circ C$ |        | 0.380 |      |          |
|                                      |               |                                                                                                                                                                    | $T_{vj} = 150\ ^\circ C$ |        | 0.380 |      |          |
| Rise time (inductive load)           | $t_r$         | $I_C = 1200\ A, V_{CE} = 1800\ V, V_{GE} = \pm 15\ V, R_{Gon} = 0.62\ \Omega, C_{GE} = 220\ nF$                                                                    | $T_{vj} = 25\ ^\circ C$  |        | 0.350 |      | $\mu s$  |
|                                      |               |                                                                                                                                                                    | $T_{vj} = 125\ ^\circ C$ |        | 0.380 |      |          |
|                                      |               |                                                                                                                                                                    | $T_{vj} = 150\ ^\circ C$ |        | 0.380 |      |          |
| Turn-off delay time (inductive load) | $t_{doff}$    | $I_C = 1200\ A, V_{CE} = 1800\ V, V_{GE} = \pm 15\ V, R_{Goff} = 2.4\ \Omega, C_{GE} = 220\ nF$                                                                    | $T_{vj} = 25\ ^\circ C$  |        | 3.000 |      | $\mu s$  |
|                                      |               |                                                                                                                                                                    | $T_{vj} = 125\ ^\circ C$ |        | 3.200 |      |          |
|                                      |               |                                                                                                                                                                    | $T_{vj} = 150\ ^\circ C$ |        | 3.200 |      |          |
| Fall time (inductive load)           | $t_f$         | $I_C = 1200\ A, V_{CE} = 1800\ V, V_{GE} = \pm 15\ V, R_{Goff} = 2.4\ \Omega, C_{GE} = 220\ nF$                                                                    | $T_{vj} = 25\ ^\circ C$  |        | 0.300 |      | $\mu s$  |
|                                      |               |                                                                                                                                                                    | $T_{vj} = 125\ ^\circ C$ |        | 0.350 |      |          |
|                                      |               |                                                                                                                                                                    | $T_{vj} = 150\ ^\circ C$ |        | 0.350 |      |          |
| Turn-on time (resistive load)        | $t_{on\_R}$   | $I_C = 500\ A, V_{CE} = 2000\ V, V_{GE} = \pm 15\ V, R_{Gon} = 0.62\ \Omega, C_{GE} = 220\ nF$                                                                     | $T_{vj} = 25\ ^\circ C$  | 1.11   |       |      | $\mu s$  |
| Turn-on energy loss per pulse        | $E_{on}$      | $I_C = 1200\ A, V_{CE} = 1800\ V, L_\sigma = 85\ nH, V_{GE} = \pm 15\ V, R_{Gon} = 0.62\ \Omega, C_{GE} = 220\ nF, di/dt = 4300\ A/\mu s (T_{vj} = 150\ ^\circ C)$ | $T_{vj} = 25\ ^\circ C$  |        | 1400  |      | mJ       |
|                                      |               |                                                                                                                                                                    | $T_{vj} = 125\ ^\circ C$ |        | 1950  |      |          |
|                                      |               |                                                                                                                                                                    | $T_{vj} = 150\ ^\circ C$ |        | 2200  |      |          |

(table continues...)

**Table 4 (continued) Characteristic values**

| Parameter                              | Symbol             | Note or test condition                                                                                                                                                                                                                                  | Values                                                               |      |      | Unit             |
|----------------------------------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|------|------|------------------|
|                                        |                    |                                                                                                                                                                                                                                                         | Min.                                                                 | Typ. | Max. |                  |
| Turn-off energy loss per pulse         | $E_{off}$          | $I_C = 1200\text{ A}$ , $V_{CE} = 1800\text{ V}$ ,<br>$L_\sigma = 85\text{ nH}$ , $V_{GE} = \pm 15\text{ V}$ ,<br>$R_{Goff} = 2.4\ \Omega$ ,<br>$C_{GE} = 220\text{ nF}$ , $dv/dt = 2100\text{ V}/\mu\text{s}$ ( $T_{vj} = 150\text{ }^\circ\text{C}$ ) | $T_{vj} = 25\text{ }^\circ\text{C}$                                  | 1350 |      | mJ               |
|                                        |                    |                                                                                                                                                                                                                                                         | $T_{vj} = 125\text{ }^\circ\text{C}$                                 | 1800 |      |                  |
|                                        |                    |                                                                                                                                                                                                                                                         | $T_{vj} = 150\text{ }^\circ\text{C}$                                 | 1950 |      |                  |
| SC data                                | $I_{SC}$           | $V_{GE} \leq 15\text{ V}$ , $V_{CC} = 2500\text{ V}$ ,<br>$V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$                                                                                                                                                   | $t_P \leq 10\ \mu\text{s}$ ,<br>$T_{vj} = 150\text{ }^\circ\text{C}$ | 4800 |      | A                |
| Thermal resistance, junction to case   | $R_{thJC}$         | per IGBT                                                                                                                                                                                                                                                |                                                                      |      | 9.55 | K/kW             |
| Thermal resistance, case to heat sink  | $R_{thCH}$         | per IGBT, $\lambda_{grease} = 1\text{ W}/(\text{m}^2\text{K})$                                                                                                                                                                                          |                                                                      | 10.0 |      | K/kW             |
| Temperature under switching conditions | $T_{vj\text{ op}}$ |                                                                                                                                                                                                                                                         | -40                                                                  |      | 150  | $^\circ\text{C}$ |

### 3 Diode, Inverter

**Table 5 Maximum rated values**

| Parameter                       | Symbol      | Note or test condition                    | Values                               | Unit          |
|---------------------------------|-------------|-------------------------------------------|--------------------------------------|---------------|
| Repetitive peak reverse voltage | $V_{RRM}$   | $T_{vj} = -40\text{ }^\circ\text{C}$      | 3300                                 | V             |
|                                 |             | $T_{vj} = 150\text{ }^\circ\text{C}$      | 3300                                 |               |
| Continuous DC forward current   | $I_F$       |                                           | 1200                                 | A             |
| Repetitive peak forward current | $I_{FRM}$   | $t_P = 1\text{ ms}$                       | 2400                                 | A             |
| $I^2t$ - value                  | $I^2t$      | $t_P = 10\text{ ms}$ , $V_R = 0\text{ V}$ | $T_{vj} = 125\text{ }^\circ\text{C}$ | 330           |
|                                 |             |                                           | $T_{vj} = 150\text{ }^\circ\text{C}$ | 310           |
| Maximum power dissipation       | $P_{RQM}$   | $T_{vj} = 150\text{ }^\circ\text{C}$      | 1800                                 | kW            |
| Minimum turn-on time            | $t_{onmin}$ |                                           | 10                                   | $\mu\text{s}$ |

**Table 6 Characteristic values**

| Parameter       | Symbol | Note or test condition                        | Values                               |      |      | Unit |
|-----------------|--------|-----------------------------------------------|--------------------------------------|------|------|------|
|                 |        |                                               | Min.                                 | Typ. | Max. |      |
| Forward voltage | $V_F$  | $I_F = 1200\text{ A}$ , $V_{GE} = 0\text{ V}$ | $T_{vj} = 25\text{ }^\circ\text{C}$  | 3.25 | 3.95 | V    |
|                 |        |                                               | $T_{vj} = 125\text{ }^\circ\text{C}$ | 2.90 | 3.35 |      |
|                 |        |                                               | $T_{vj} = 150\text{ }^\circ\text{C}$ | 2.80 |      |      |

(table continues...)

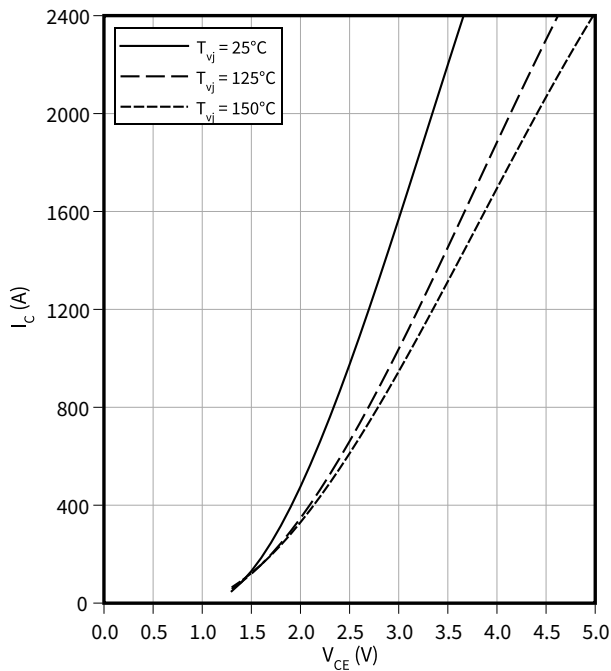
**Table 6** (continued) **Characteristic values**

| Parameter                              | Symbol             | Note or test condition                                                                                                                                       | Values                               |      |      | Unit             |
|----------------------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|------|------|------------------|
|                                        |                    |                                                                                                                                                              | Min.                                 | Typ. | Max. |                  |
| Peak reverse recovery current          | $I_{RM}$           | $V_R = 1800\text{ V}$ , $I_F = 1200\text{ A}$ ,<br>$V_{GE} = -15\text{ V}$ , $-di_F/dt = 4300\text{ A}/\mu\text{s}$ ( $T_{vj} = 150\text{ }^\circ\text{C}$ ) | $T_{vj} = 25\text{ }^\circ\text{C}$  | 1250 |      | A                |
|                                        |                    |                                                                                                                                                              | $T_{vj} = 125\text{ }^\circ\text{C}$ | 1400 |      |                  |
|                                        |                    |                                                                                                                                                              | $T_{vj} = 150\text{ }^\circ\text{C}$ | 1450 |      |                  |
| Recovered charge                       | $Q_r$              | $V_R = 1800\text{ V}$ , $I_F = 1200\text{ A}$ ,<br>$V_{GE} = -15\text{ V}$ , $-di_F/dt = 4300\text{ A}/\mu\text{s}$ ( $T_{vj} = 150\text{ }^\circ\text{C}$ ) | $T_{vj} = 25\text{ }^\circ\text{C}$  | 550  |      | $\mu\text{C}$    |
|                                        |                    |                                                                                                                                                              | $T_{vj} = 125\text{ }^\circ\text{C}$ | 1100 |      |                  |
|                                        |                    |                                                                                                                                                              | $T_{vj} = 150\text{ }^\circ\text{C}$ | 1300 |      |                  |
| Reverse recovery energy                | $E_{rec}$          | $V_R = 1800\text{ V}$ , $I_F = 1200\text{ A}$ ,<br>$V_{GE} = -15\text{ V}$ , $-di_F/dt = 4300\text{ A}/\mu\text{s}$ ( $T_{vj} = 150\text{ }^\circ\text{C}$ ) | $T_{vj} = 25\text{ }^\circ\text{C}$  | 550  |      | mJ               |
|                                        |                    |                                                                                                                                                              | $T_{vj} = 125\text{ }^\circ\text{C}$ | 1250 |      |                  |
|                                        |                    |                                                                                                                                                              | $T_{vj} = 150\text{ }^\circ\text{C}$ | 1500 |      |                  |
| Thermal resistance, junction to case   | $R_{thJC}$         | per diode                                                                                                                                                    |                                      |      | 17.0 | K/kW             |
| Thermal resistance, case to heat sink  | $R_{thCH}$         | per diode, $\lambda_{grease} = 1\text{ W}/(\text{m}^\circ\text{K})$                                                                                          |                                      | 11.5 |      | K/kW             |
| Temperature under switching conditions | $T_{vj\text{ op}}$ |                                                                                                                                                              | -40                                  |      | 150  | $^\circ\text{C}$ |

4 Characteristics diagrams

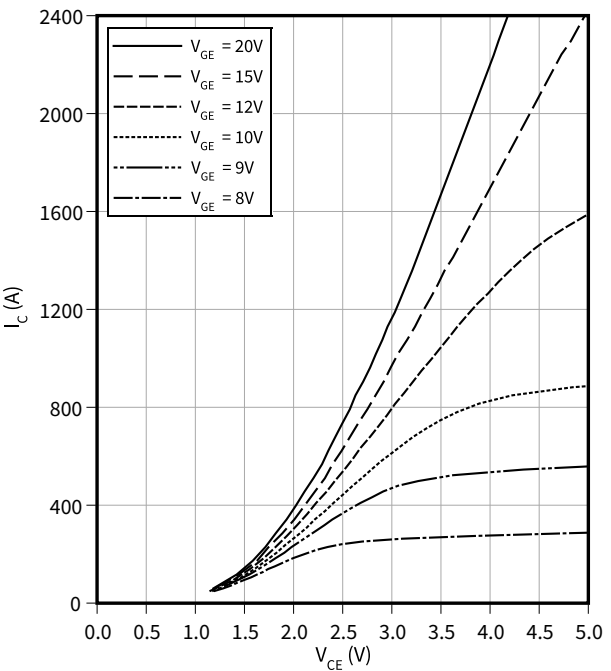
output characteristic (typical), IGBT, Inverter

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



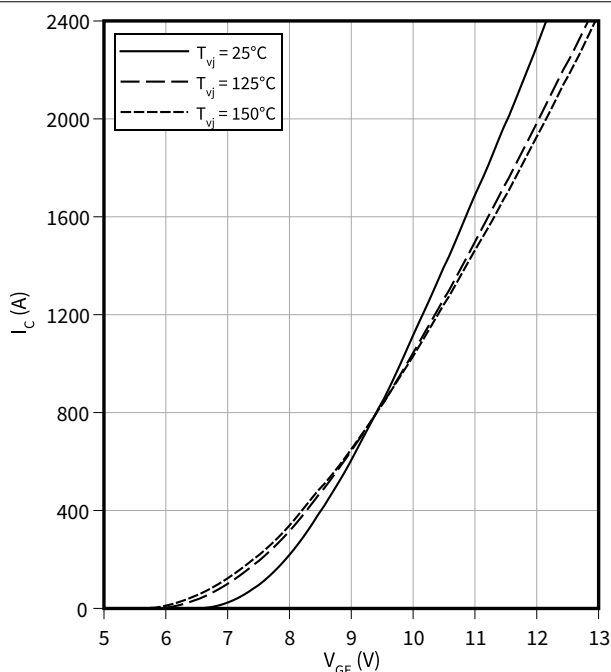
output characteristic (typical), IGBT, Inverter

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



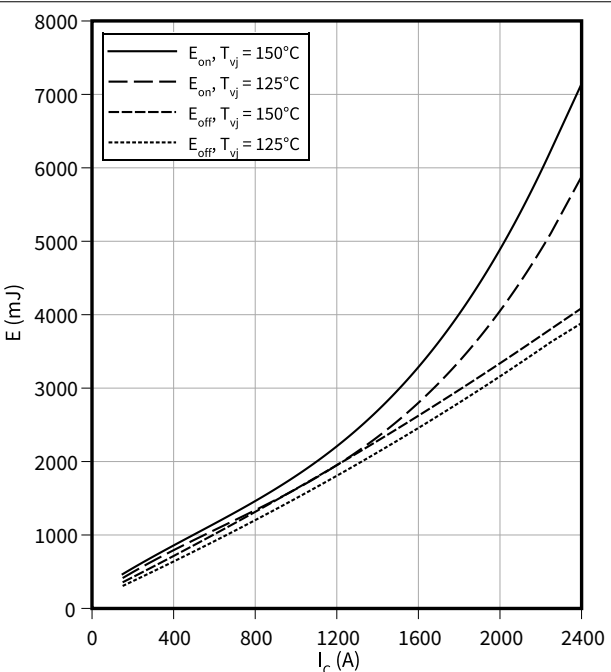
transfer characteristic (typical), IGBT, Inverter

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



switching losses (typical), IGBT, Inverter

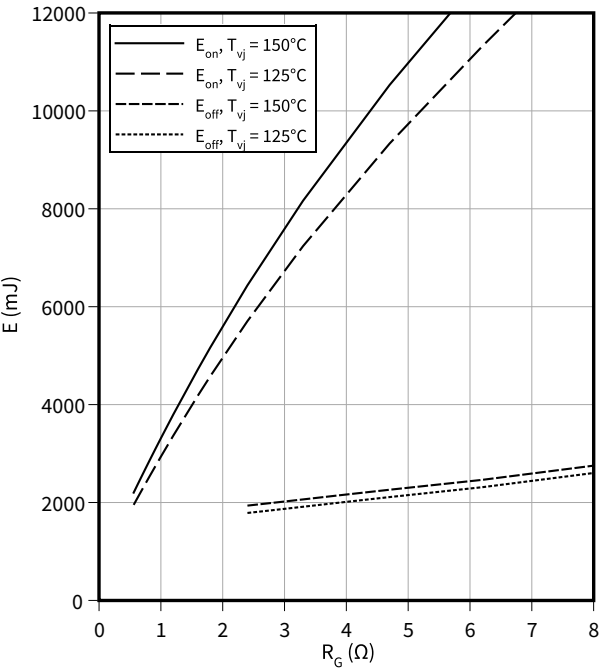
$E = f(I_C)$   
 $R_{Goff} = 2.4\text{ }\Omega$ ,  $R_{Gon} = 0.62\text{ }\Omega$ ,  $C_{GE} = 220\text{ nF}$ ,  $V_{CE} = 1800\text{ V}$ ,  $V_{GE} = -15 / 15\text{ V}$



4 Characteristics diagrams

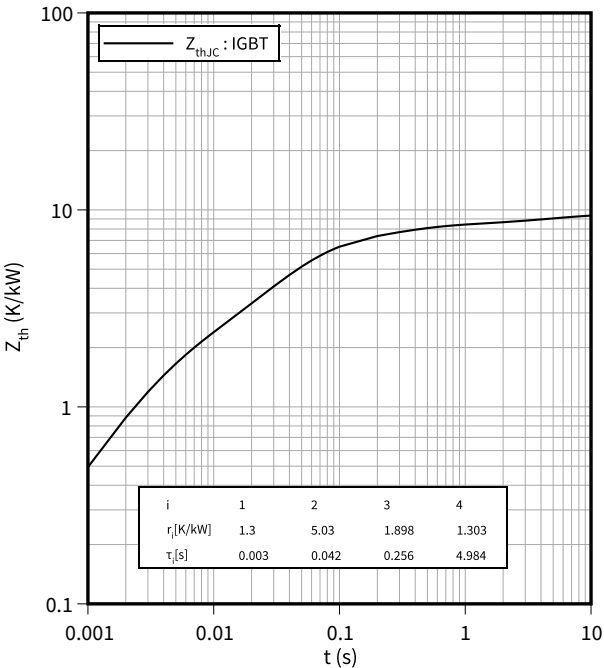
switching losses (typical), IGBT, Inverter

$E = f(R_G)$   
 $I_C = 1200\text{ A}$ ,  $C_{GE} = 220\text{ nF}$ ,  $V_{CE} = 1800\text{ V}$ ,  $V_{GE} = -15 / 15\text{ V}$



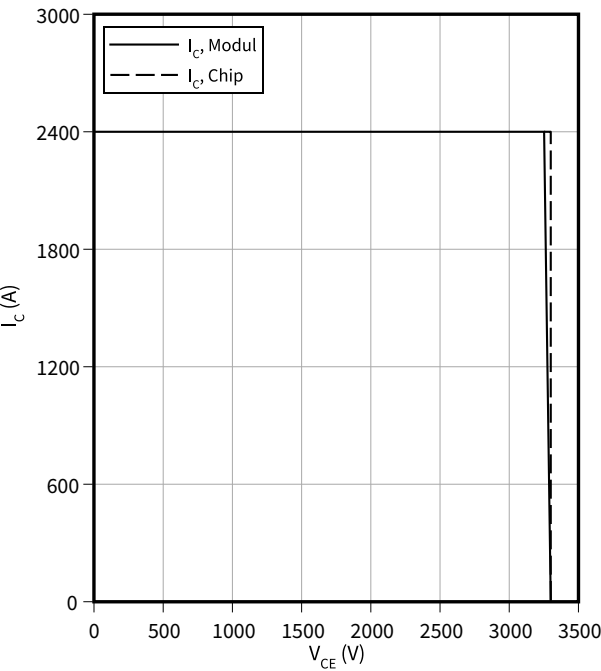
transient thermal impedance , IGBT, Inverter

$Z_{th} = f(t)$



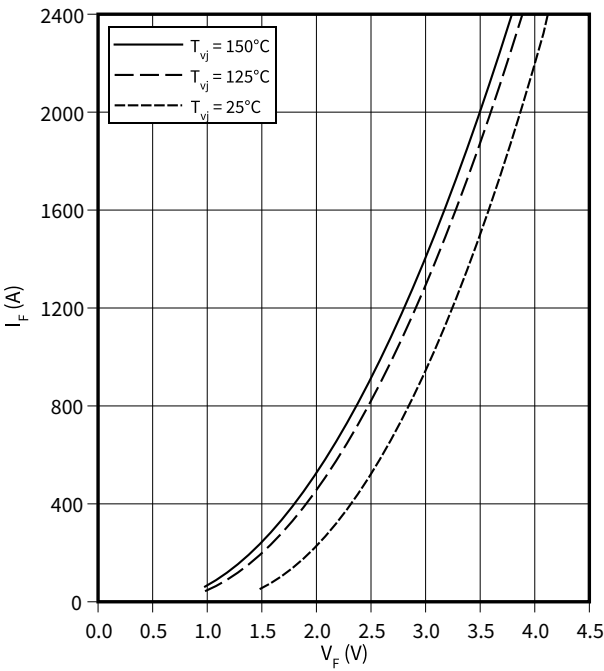
reverse bias safe operating area (RBSOA), IGBT, Inverter

$I_C = f(V_{CE})$   
 $R_{Goff} = 2.4\ \Omega$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $C_{GE} = 220\text{ nF}$ ,  $T_{vj} = 150\ ^\circ\text{C}$



forward characteristic (typical), Diode, Inverter

$I_F = f(V_F)$

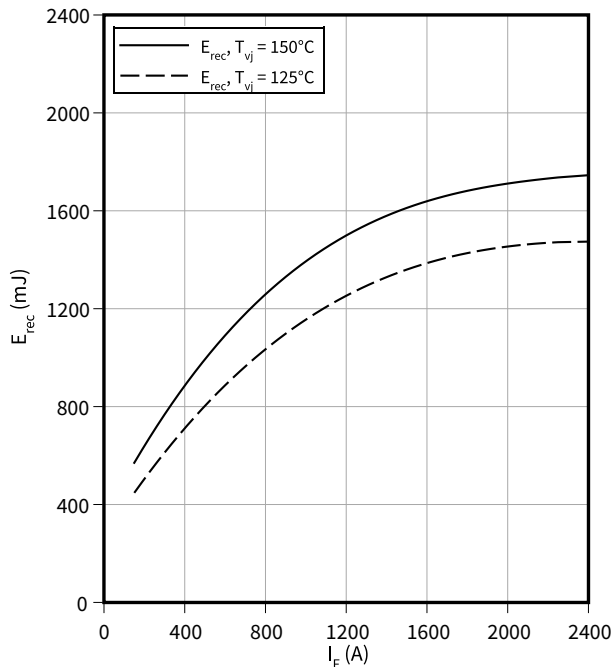




4 Characteristics diagrams

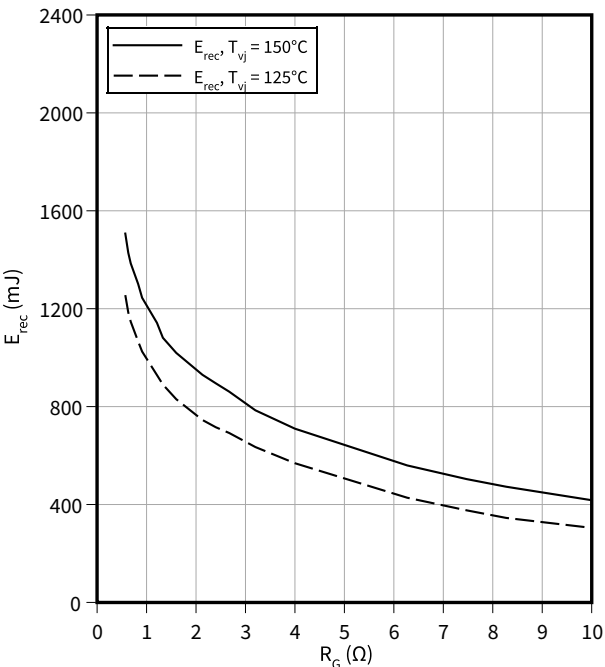
switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$   
 $V_{CE} = 1800\text{ V}, R_{Gon} = R_{Gon}(IGBT)$



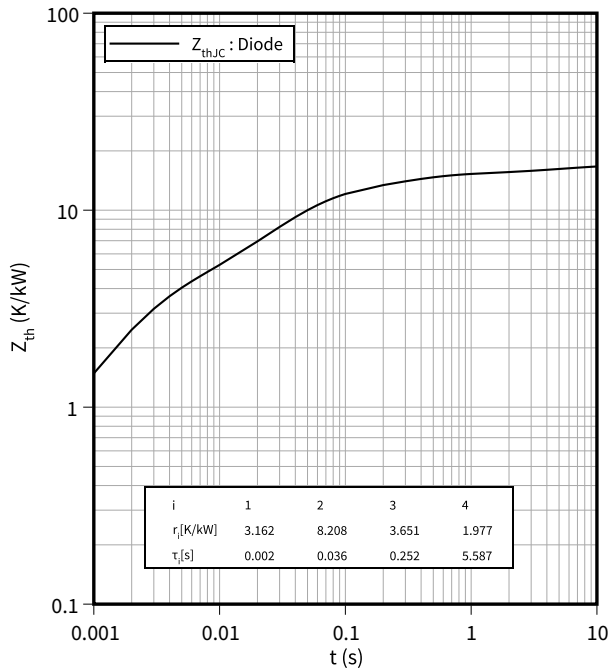
switching losses (typical), Diode, Inverter

$E_{rec} = f(R_G)$   
 $V_{CE} = 1800\text{ V}, I_F = 1200\text{ A}$



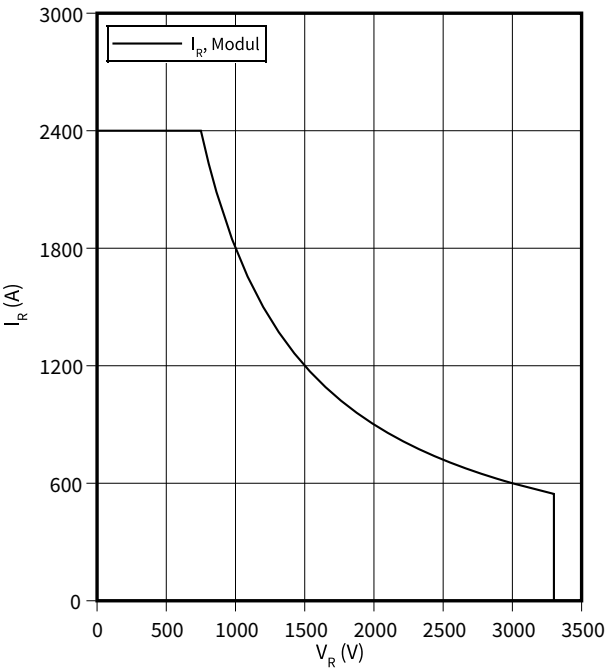
transient thermal impedance , Diode, Inverter

$Z_{th} = f(t)$

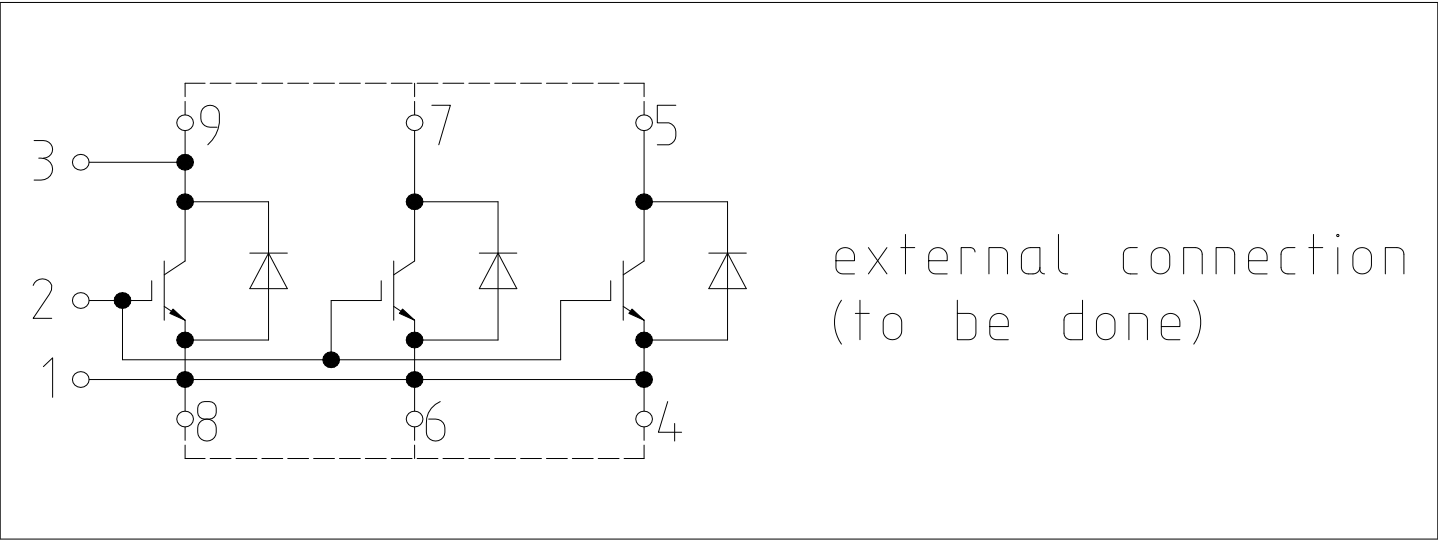


safe operation area (SOA), Diode, Inverter

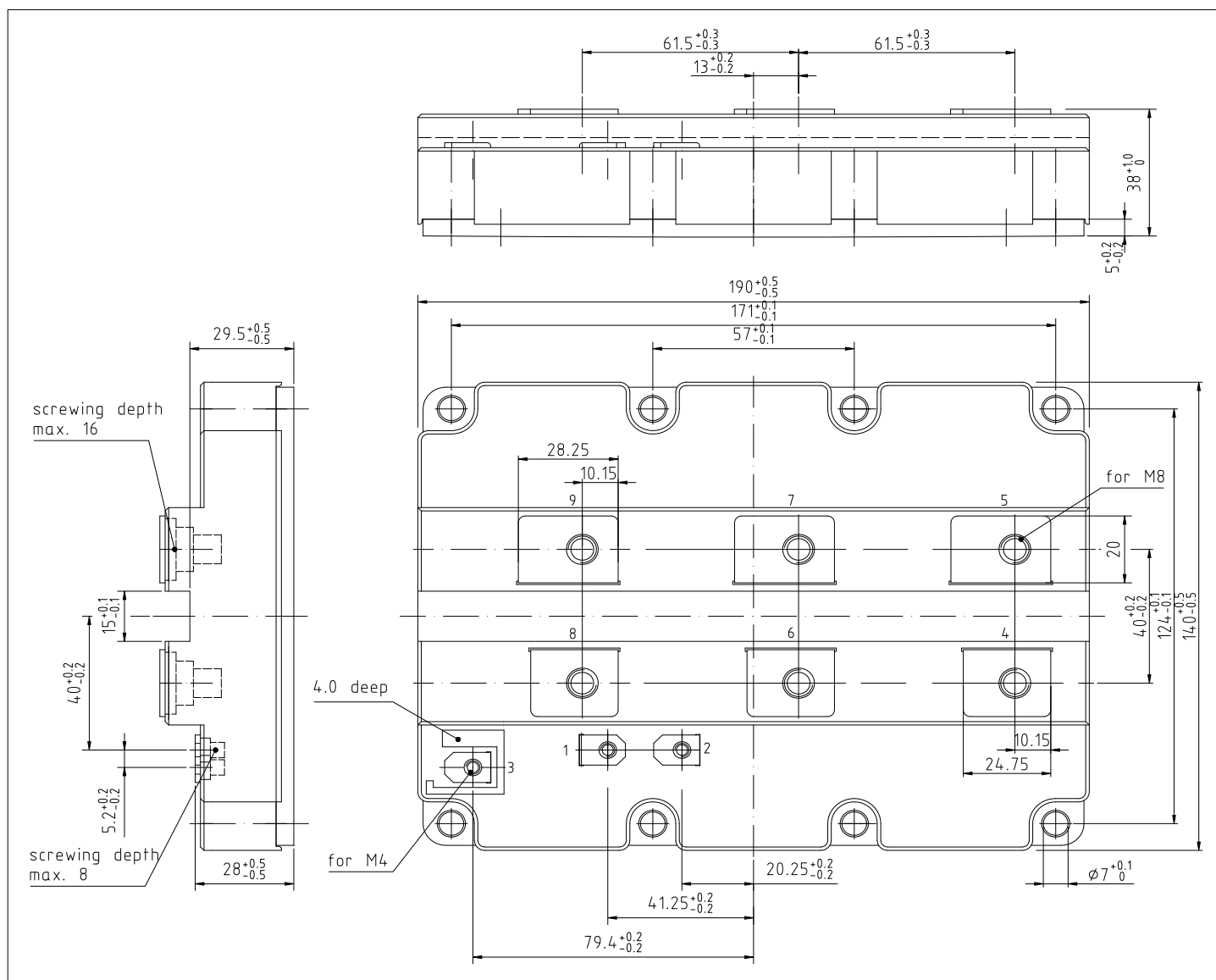
$I_R = f(V_R)$   
 $T_{vj} = 150\text{ }^\circ\text{C}$



5      **Circuit diagram**



**Figure 1**



### Figure 2

7 Module label code

| Module label code       |                                                                                                                                                                        |                         |                 |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------------|
| Code format             | Data Matrix                                                                                                                                                            |                         | Barcode Code128 |
| Encoding                | ASCII text                                                                                                                                                             |                         | Code Set A      |
| Symbol size             | 16x16                                                                                                                                                                  |                         | 23 digits       |
| Standard                | IEC24720 and IEC16022                                                                                                                                                  |                         | IEC8859-1       |
| Code content            | <i>Content</i>                                                                                                                                                         | <i>Digit</i>            | <i>Example</i>  |
|                         | Module serial number                                                                                                                                                   | 1 – 5                   | 71549           |
|                         | Module material number                                                                                                                                                 | 6 - 11                  | 142846          |
|                         | Production order number                                                                                                                                                | 12 - 19                 | 55054991        |
|                         | Date code (production year)                                                                                                                                            | 20 – 21                 | 15              |
|                         | Date code (production week)                                                                                                                                            | 22 – 23                 | 30              |
| Example                 |                                                                                                                                                                        |                         |                 |
|                         |   |                         |                 |
| 71549142846550549911530 |                                                                                                                                                                        | 71549142846550549911530 |                 |

Figure 3

## Revision history

| Document revision | Date of release | Description of changes                                                                                                                              |
|-------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| V1.0              | 2009-09-15      | Target datasheet                                                                                                                                    |
| V2.0              | 2010-04-26      | Preliminary datasheet                                                                                                                               |
| V2.1              | 2010-07-16      | Preliminary datasheet                                                                                                                               |
| V3.0              | 2013-08-12      | Final datasheet                                                                                                                                     |
| V3.1              | 2013-12-11      | Final datasheet                                                                                                                                     |
| V3.2              | 2018-07-12      | Final datasheet                                                                                                                                     |
| V3.3              | 2019-07-24      | Final datasheet                                                                                                                                     |
| n/a               | 2020-09-01      | Datasheet migrated to a new system with a new layout and new revision number schema: target or preliminary datasheet = 0.xy; final datasheet = 1.xy |
| 1.10              | 2021-10-29      | Final datasheet                                                                                                                                     |

## Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

**Edition 2021-10-29**

**Published by**

**Infineon Technologies AG**  
**81726 Munich, Germany**

**© 2021 Infineon Technologies AG**  
**All Rights Reserved.**

**Do you have a question about any**  
**aspect of this document?**

**Email:** [erratum@infineon.com](mailto:erratum@infineon.com)

**Document reference**  
**IFX-AAW134-008**

## IMPORTANT NOTICE

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenhheitsgarantie").

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

## WARNINGS

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.