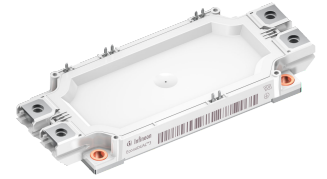


Final datasheet

EconoDUAL™3 module with Trench/Fieldstop IGBT4 and emitter controlled diode and NTC

Features

- Electrical features
 - $V_{CES} = 1700\text{ V}$
 - $I_{C\text{ nom}} = 600\text{ A} / I_{CRM} = 1200\text{ A}$
 - High current density
 - Low $V_{CE,sat}$
 - $T_{vj,op} = 150^\circ\text{C}$
 - $V_{CE,sat}$ with positive temperature coefficient
- Mechanical features
 - High power density
 - Isolated base plate
 - Standard housing



Potential applications

- High-power converters
- Wind turbines

Product validation

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

Description

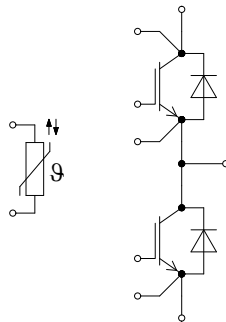


Table of contents

| | | |
|----------|---------------------------------------|----|
| | Description | 1 |
| | Features | 1 |
| | Potential applications | 1 |
| | Product validation | 1 |
| | Table of contents | 2 |
| 1 | Package | 3 |
| 2 | IGBT, Inverter | 4 |
| 3 | Diode, Inverter | 5 |
| 4 | NTC-Thermistor | 6 |
| 5 | Characteristics diagrams | 7 |
| 6 | Circuit diagram | 10 |
| 7 | Package outlines | 11 |
| 8 | 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, $f = 50$ Hz, $t = 1$ min | 3.4 | kV |
| Isolation test voltage NTC | $V_{ISOL(NTC)}$ | RMS, $f = 50$ Hz, $t = 1$ min | 3.4 | kV |
| Material of module baseplate | | | Cu | |
| Internal isolation | | basic insulation (class 1, IEC 61140) | Al_2O_3 | |
| Creepage distance | $d_{Creep\ nom}$ | terminal to baseplate, nom., (PD2, IEC 60664-1, Ed. 3.0) | > 15 | mm |
| Creepage distance | $d_{Creep\ min}$ | terminal to baseplate, min., (PD2, IEC 60664-1, Ed. 3.0) | 14.7 | mm |
| Creepage distance | $d_{Creep\ nom}$ | terminal to terminal, nom., (PD2, IEC 60664-1, Ed. 3.0) | 12.1 | mm |
| Creepage distance | $d_{Creep\ min}$ | terminal to terminal, min., (PD2, IEC 60664-1, Ed. 3.0) | 11.5 | mm |
| Clearance | $d_{Clear\ nom}$ | terminal to baseplate, nom. | > 12.5 | mm |
| Clearance | $d_{Clear\ min}$ | terminal to baseplate, min. | 12.5 | mm |
| Clearance | $d_{Clear\ nom}$ | terminal to terminal, nom. | 10.0 | mm |
| Clearance | $d_{Clear\ min}$ | terminal to terminal, min. | 9.6 | mm |
| Comparative tracking index | CTI | | > 200 | |
| Relative thermal index (electrical) | RTI | housing | 140 | °C |

Table 2 Characteristic values

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|--|---------------|--|-----------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Stray inductance module | L_{sCE} | | | 20 | | nH |
| Module lead resistance, terminals - chip | $R_{CC'+EE'}$ | $T_C = 25$ °C, per switch | | 1.1 | | mΩ |
| Storage temperature | T_{stg} | | -40 | | 125 | °C |
| Mounting torque for module mounting | M | - Mounting according to valid application note | M5, Screw | 3 | 6 | Nm |
| Terminal connection torque | M | - Mounting according to valid application note | M6, Screw | 3 | 6 | Nm |
| Weight | G | | | 345 | | g |

2 IGBT, Inverter

Table 3 Maximum rated values

| Parameter | Symbol | Note or test condition | Values | Unit |
|-----------------------------------|-----------|-------------------------------------|-------------------------|------------|
| Collector-emitter voltage | V_{CES} | | $T_{vj} = 25\text{ °C}$ | 1700 V |
| Continuous DC collector current | I_{CDC} | $T_{vj\text{ max}} = 175\text{ °C}$ | $T_C = 108\text{ °C}$ | 600 A |
| Repetitive peak collector current | I_{CRM} | t_p limited by $T_{vj\text{ op}}$ | | 1200 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 | $V_{CE\text{ sat}}$ | $I_C = 600\text{ A}, V_{GE} = 15\text{ V}$ | $T_{vj} = 25\text{ °C}$ | 1.95 | 2.30 | V |
| | | | $T_{vj} = 125\text{ °C}$ | 2.35 | | |
| | | | $T_{vj} = 150\text{ °C}$ | 2.45 | | |
| Gate threshold voltage | V_{GETh} | $I_C = 24\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25\text{ °C}$ | 5.20 | 5.80 | 6.40 | V |
| Gate charge | Q_G | $V_{GE} = \pm 15\text{ V}$ | | 6.15 | | μC |
| Internal gate resistor | R_{Gint} | $T_{vj} = 25\text{ °C}$ | | 1.2 | | Ω |
| Input capacitance | C_{ies} | $f = 1000\text{ kHz}, T_{vj} = 25\text{ °C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$ | | 48 | | nF |
| Reverse transfer capacitance | C_{res} | $f = 1000\text{ kHz}, T_{vj} = 25\text{ °C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$ | | 1.55 | | nF |
| Collector-emitter cut-off current | I_{CES} | $V_{CE} = 1700\text{ V}, V_{GE} = 0\text{ V}$ | $T_{vj} = 25\text{ °C}$ | | | 1 mA |
| Gate-emitter leakage current | I_{GES} | $V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25\text{ °C}$ | | | | 100 nA |
| Turn-on delay time (inductive load) | t_{don} | $I_C = 600\text{ A}, V_{CC} = 900\text{ V}, V_{GE} = \pm 15\text{ V}, R_{Gon} = 1\text{ }\Omega$ | $T_{vj} = 25\text{ °C}$ | 0.200 | | μs |
| | | | $T_{vj} = 125\text{ °C}$ | 0.210 | | |
| | | | $T_{vj} = 150\text{ °C}$ | 0.240 | | |
| Rise time (inductive load) | t_r | $I_C = 600\text{ A}, V_{CC} = 900\text{ V}, V_{GE} = \pm 15\text{ V}, R_{Gon} = 1\text{ }\Omega$ | $T_{vj} = 25\text{ °C}$ | 0.070 | | μs |
| | | | $T_{vj} = 125\text{ °C}$ | 0.080 | | |
| | | | $T_{vj} = 150\text{ °C}$ | 0.080 | | |
| Turn-off delay time (inductive load) | t_{doff} | $I_C = 600\text{ A}, V_{CC} = 900\text{ V}, V_{GE} = \pm 15\text{ V}, R_{Goff} = 1\text{ }\Omega$ | $T_{vj} = 25\text{ °C}$ | 0.620 | | μs |
| | | | $T_{vj} = 125\text{ °C}$ | 0.750 | | |
| | | | $T_{vj} = 150\text{ °C}$ | 0.800 | | |

(table continues...)

Table 4 (continued) **Characteristic values**

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|--|-------------|---|--|--------|--------|------------------|
| | | | Min. | Typ. | Max. | |
| Fall time (inductive load) | t_f | $I_C = 600 \text{ A}, V_{CC} = 900 \text{ V}, V_{GE} = \pm 15 \text{ V}, R_{Goff} = 1 \Omega$ | $T_{vj} = 25 \text{ }^\circ\text{C}$ | 0.110 | | μs |
| | | | $T_{vj} = 125 \text{ }^\circ\text{C}$ | 0.160 | | |
| | | | $T_{vj} = 150 \text{ }^\circ\text{C}$ | 0.180 | | |
| Turn-on energy loss per pulse | E_{on} | $I_C = 600 \text{ A}, V_{CC} = 900 \text{ V}, L_\sigma = 35 \text{ nH}, V_{GE} = \pm 15 \text{ V}, R_{Gon} = 1 \Omega, di/dt = 6500 \text{ A}/\mu\text{s} (T_{vj} = 150 \text{ }^\circ\text{C})$ | $T_{vj} = 25 \text{ }^\circ\text{C}$ | 140 | | mJ |
| | | | $T_{vj} = 125 \text{ }^\circ\text{C}$ | 210 | | |
| | | | $T_{vj} = 150 \text{ }^\circ\text{C}$ | 225 | | |
| Turn-off energy loss per pulse | E_{off} | $I_C = 600 \text{ A}, V_{CC} = 900 \text{ V}, L_\sigma = 35 \text{ nH}, V_{GE} = \pm 15 \text{ V}, R_{Goff} = 1 \Omega, dv/dt = 3000 \text{ V}/\mu\text{s} (T_{vj} = 150 \text{ }^\circ\text{C})$ | $T_{vj} = 25 \text{ }^\circ\text{C}$ | 115 | | mJ |
| | | | $T_{vj} = 125 \text{ }^\circ\text{C}$ | 180 | | |
| | | | $T_{vj} = 150 \text{ }^\circ\text{C}$ | 205 | | |
| SC data | I_{SC} | $V_{GE} \leq 15 \text{ V}, V_{CC} = 1000 \text{ V}, V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$ | $t_p \leq 10 \mu\text{s}, T_{vj} = 150 \text{ }^\circ\text{C}$ | 2300 | | A |
| Thermal resistance, junction to case | R_{thJC} | per IGBT | | | 0.0369 | K/W |
| Thermal resistance, case to heat sink | R_{thCH} | per IGBT, $\lambda_{grease} = 1 \text{ W}/(\text{m}\cdot\text{K})$ | | 0.0328 | | K/W |
| Temperature under switching conditions | $T_{vj op}$ | | -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} | $T_{vj} = 25 \text{ }^\circ\text{C}$ | 1700 | V | |
| Continuous DC forward current | I_F | | 600 | A | |
| Repetitive peak forward current | I_{FRM} | $t_p = 1 \text{ ms}$ | 1200 | A | |
| I^2t - value | I^2t | $t_p = 10 \text{ ms}, V_R = 0 \text{ V}$ | $T_{vj} = 125 \text{ }^\circ\text{C}$ | 32000 | A^2s |
| | | | $T_{vj} = 150 \text{ }^\circ\text{C}$ | 30500 | |

Table 6 Characteristic values

| Parameter | Symbol | Note or test condition | Values | | | Unit | |
|--|-------------------|--|---------------------------------------|------|--------|--------|------------------|
| | | | Min. | Typ. | Max. | | |
| Forward voltage | V_F | $I_F = 600 \text{ A}, V_{GE} = 0 \text{ V}$ | $T_{vj} = 25 \text{ }^\circ\text{C}$ | | 1.80 | 2.20 | V |
| | | | $T_{vj} = 125 \text{ }^\circ\text{C}$ | | 1.90 | | |
| | | | $T_{vj} = 150 \text{ }^\circ\text{C}$ | | 1.95 | | |
| Peak reverse recovery current | I_{RM} | $V_{CC} = 900 \text{ V}, I_F = 600 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 6500 \text{ A}/\mu\text{s} (T_{vj} = 150 \text{ }^\circ\text{C})$ | $T_{vj} = 25 \text{ }^\circ\text{C}$ | | 580 | | A |
| | | | $T_{vj} = 125 \text{ }^\circ\text{C}$ | | 650 | | |
| | | | $T_{vj} = 150 \text{ }^\circ\text{C}$ | | 670 | | |
| Recovered charge | Q_r | $V_{CC} = 900 \text{ V}, I_F = 600 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 6500 \text{ A}/\mu\text{s} (T_{vj} = 150 \text{ }^\circ\text{C})$ | $T_{vj} = 25 \text{ }^\circ\text{C}$ | | 150 | | μC |
| | | | $T_{vj} = 125 \text{ }^\circ\text{C}$ | | 250 | | |
| | | | $T_{vj} = 150 \text{ }^\circ\text{C}$ | | 285 | | |
| Reverse recovery energy | E_{rec} | $V_{CC} = 900 \text{ V}, I_F = 600 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 6500 \text{ A}/\mu\text{s} (T_{vj} = 150 \text{ }^\circ\text{C})$ | $T_{vj} = 25 \text{ }^\circ\text{C}$ | | 75 | | mJ |
| | | | $T_{vj} = 125 \text{ }^\circ\text{C}$ | | 145 | | |
| | | | $T_{vj} = 150 \text{ }^\circ\text{C}$ | | 165 | | |
| Thermal resistance, junction to case | R_{thJC} | per diode | | | | 0.0730 | K/W |
| Thermal resistance, case to heat sink | R_{thCH} | per diode, $\lambda_{grease} = 1 \text{ W}/(\text{m}\cdot\text{K})$ | | | 0.0378 | | K/W |
| Temperature under switching conditions | $T_{vj\text{op}}$ | | -40 | | 150 | | $^\circ\text{C}$ |

4 NTC-Thermistor

Table 7 Characteristic values

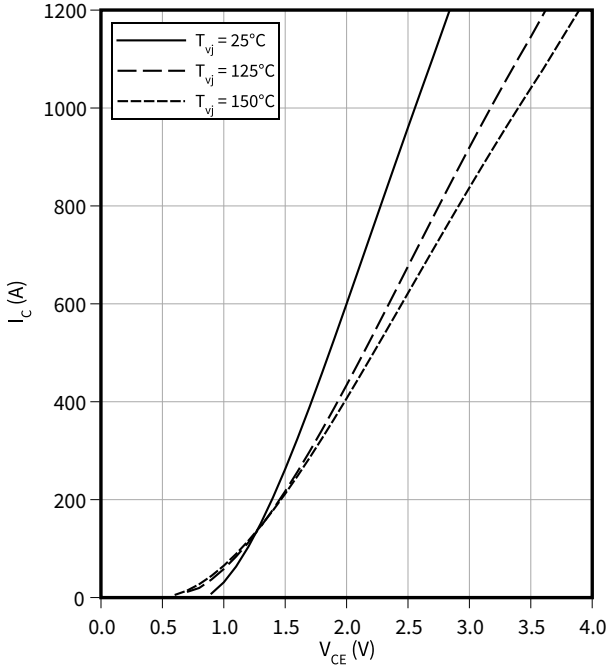
| Parameter | Symbol | Note or test condition | Values | | | Unit |
|------------------------|--------------|---|--------|------|------|------------|
| | | | Min. | Typ. | Max. | |
| Rated resistance | R_{25} | $T_{NTC} = 25 \text{ }^\circ\text{C}$ | | 5 | | k Ω |
| Deviation of R_{100} | $\Delta R/R$ | $T_{NTC} = 100 \text{ }^\circ\text{C}, R_{100} = 493 \text{ } \Omega$ | -5 | | 5 | % |
| Power dissipation | P_{25} | $T_{NTC} = 25 \text{ }^\circ\text{C}$ | | | 20 | mW |
| B-value | $B_{25/50}$ | $R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298,15 \text{ K}))]$ | | 3375 | | K |
| B-value | $B_{25/80}$ | $R_2 = R_{25} \exp[B_{25/80}(1/T_2 - 1/(298,15 \text{ K}))]$ | | 3411 | | K |
| B-value | $B_{25/100}$ | $R_2 = R_{25} \exp[B_{25/100}(1/T_2 - 1/(298,15 \text{ K}))]$ | | 3433 | | K |

Note: For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4.

5 Characteristics diagrams

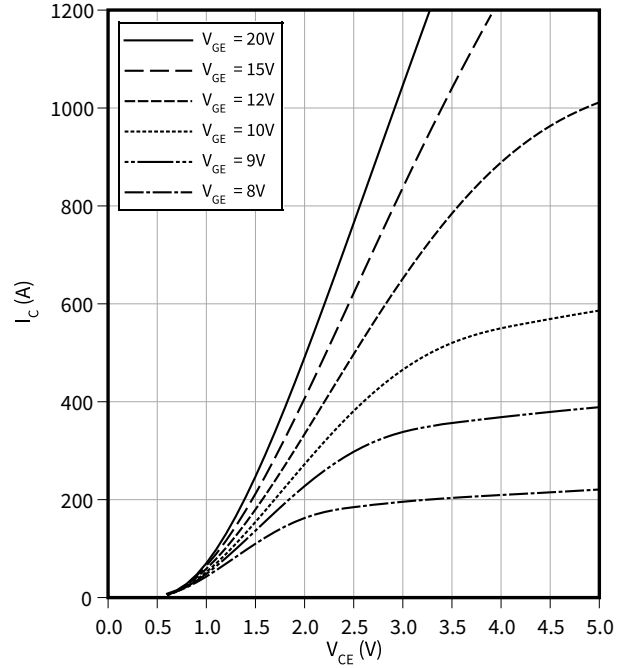
Output characteristic (typical), IGBT, Inverter

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



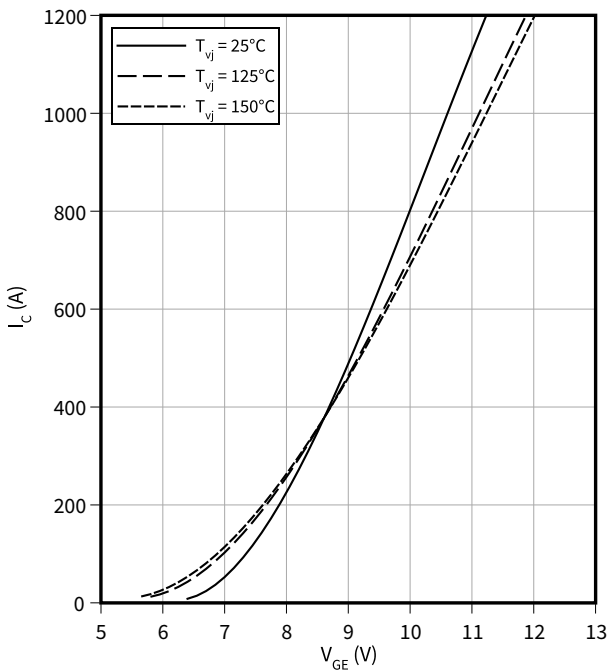
Output characteristic field (typical), IGBT, Inverter

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



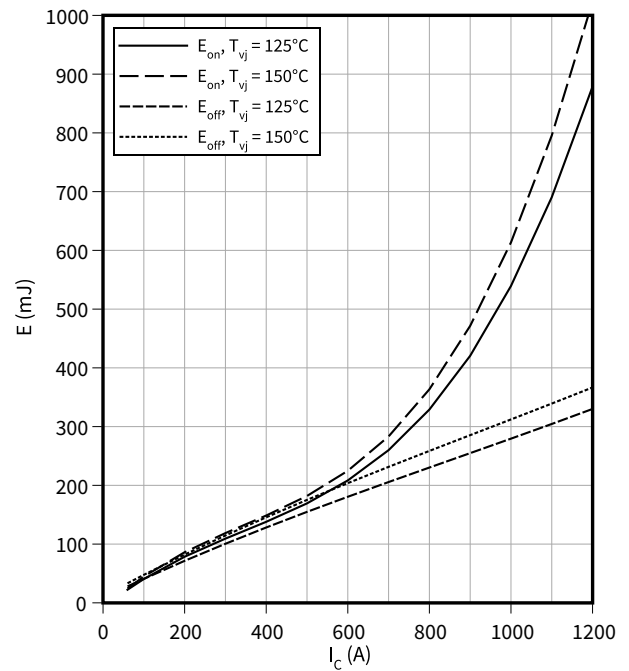
Transfer characteristic (typical), IGBT, Inverter

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



Switching losses (typical), IGBT, Inverter

$E = f(I_C)$
 $R_{Goff} = 1 \text{ } \Omega$, $R_{Gon} = 1 \text{ } \Omega$, $V_{GE} = \pm 15 \text{ V}$, $V_{CC} = 900 \text{ V}$

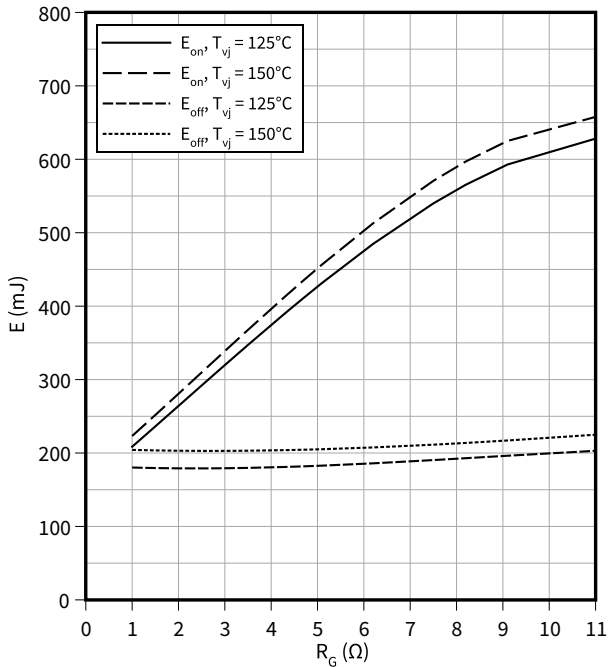


5 Characteristics diagrams

Switching losses (typical), IGBT, Inverter

$E = f(R_G)$

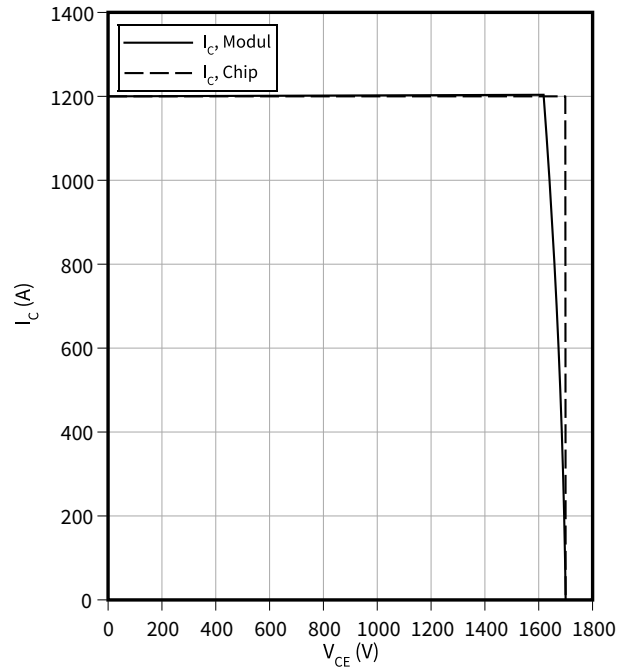
$V_{GE} = \pm 15 \text{ V}, I_C = 600 \text{ A}, V_{CC} = 900 \text{ V}$



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

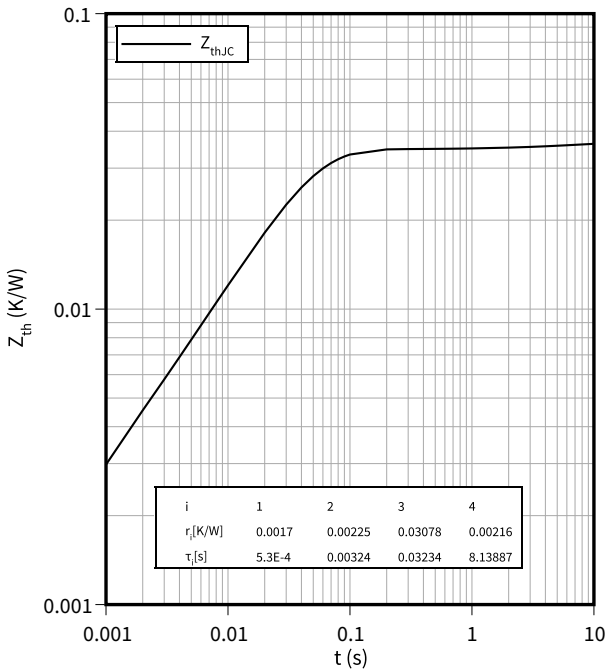
$I_C = f(V_{CE})$

$R_{Goff} = 1 \Omega, V_{GE} = \pm 15 \text{ V}, T_{vj} = 150 \text{ °C}$



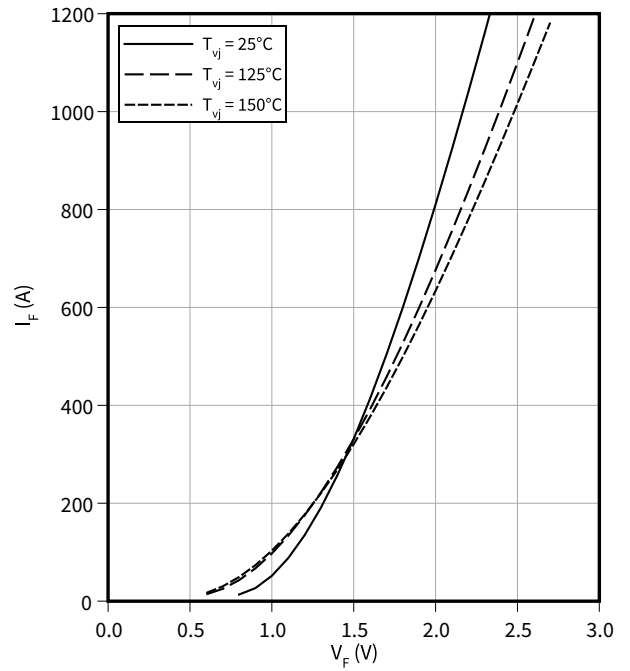
Transient thermal impedance, IGBT, Inverter

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, Inverter

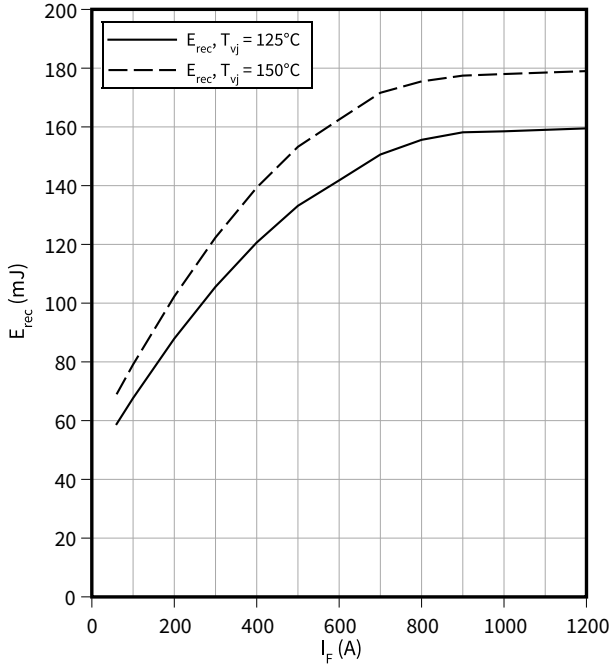
$I_F = f(V_F)$



5 Characteristics diagrams

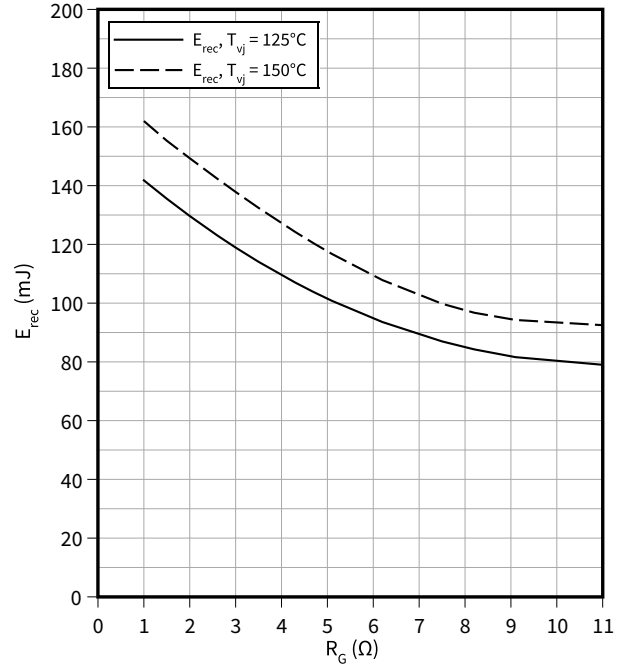
Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$
 $R_{Gon} = 1 \Omega, V_{CC} = 900 V$



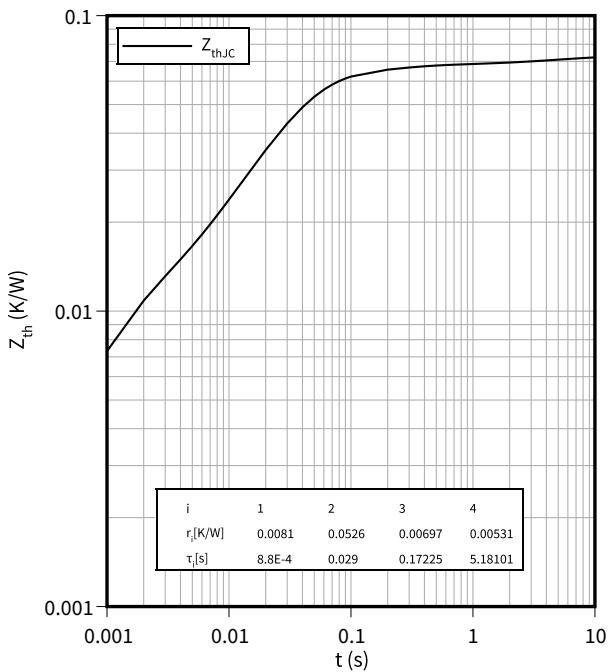
Switching losses (typical), Diode, Inverter

$E_{rec} = f(R_G)$
 $I_F = 600 A, V_{CC} = 900 V$



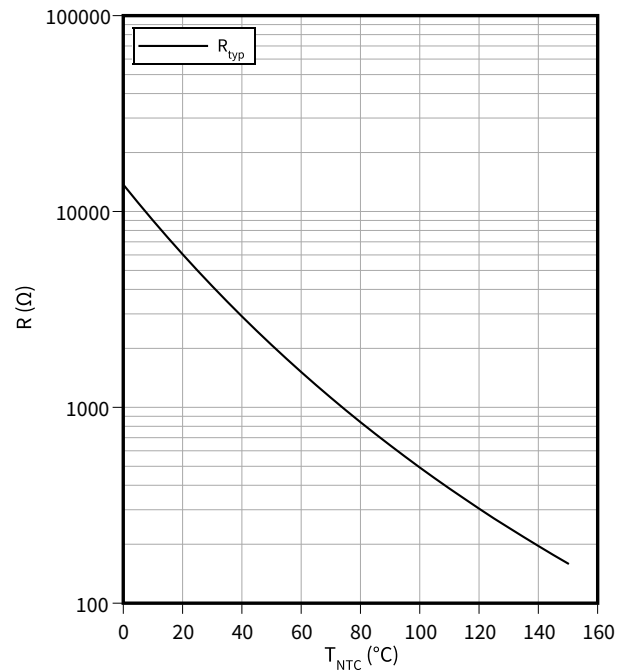
Transient thermal impedance, Diode, Inverter

$Z_{th} = f(t)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



6 Circuit diagram

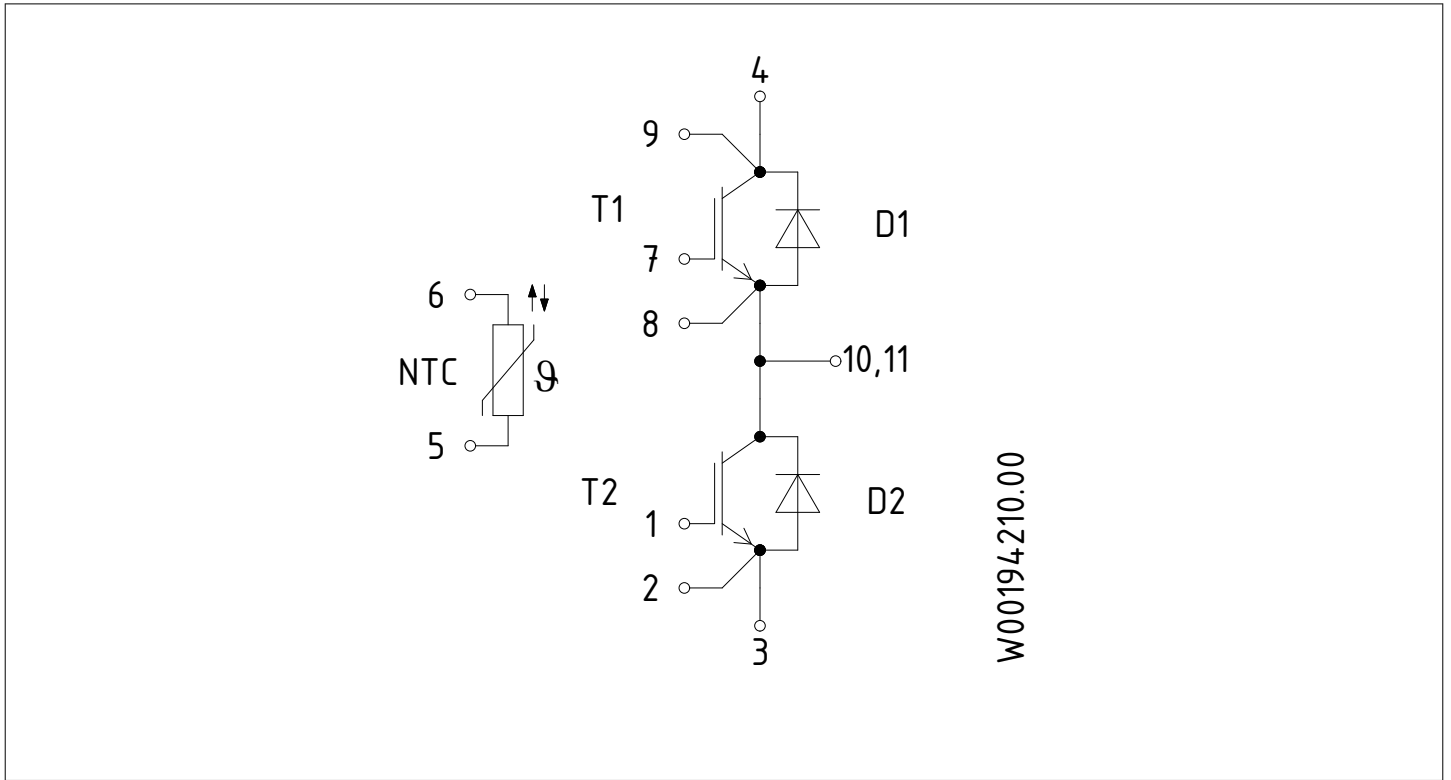


Figure 1

7 Package outlines

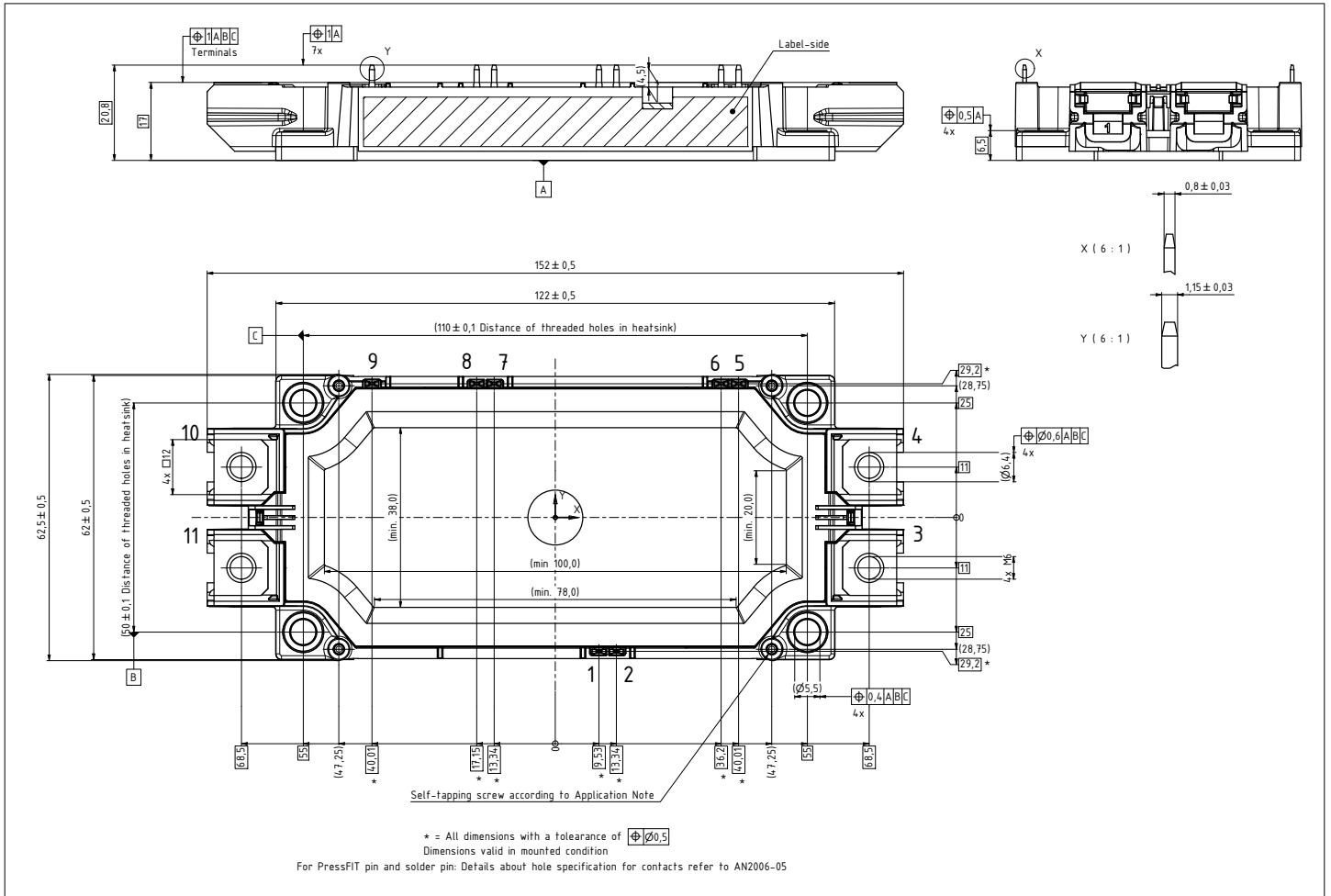


Figure 2

8 Module label code


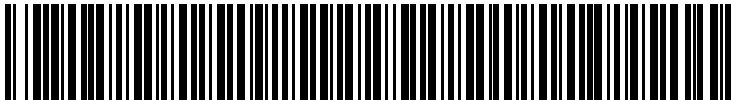
| Module label code | | | |
|-------------------|--|--|---|
| Code format | Data Matrix | Barcode Code128 | |
| Encoding | ASCII text | Code Set A | |
| Symbol size | 16x16 | 23 digits | |
| Standard | IEC24720 and IEC16022 | IEC8859-1 | |
| Code content | <i>Content</i> Module serial number Module material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

Figure 3

Revision history

| Document revision | Date of release | Description of changes |
|-------------------|-----------------|---|
| V1.0 | 2011-01-27 | Target datasheet |
| V1.1 | 2011-03-02 | Target datasheet |
| V1.2 | 2011-04-01 | Target datasheet |
| V2.0 | 2011-11-18 | Preliminary datasheet |
| V2.1 | 2011-12-01 | Preliminary datasheet |
| V2.2 | 2011-12-07 | Preliminary datasheet |
| V2.3 | 2014-05-28 | Preliminary datasheet |
| V3.0 | 2016-11-08 | 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 | 2024-03-18 | Final datasheet |

Trademarks

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

Edition 2024-03-18

Published by

Infineon Technologies AG
81726 Munich, Germany

© 2024 Infineon Technologies AG
All Rights Reserved.

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

Email: erratum@infineon.com

Document reference
IFX-AAW775-009

Important notice

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

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.