

Final datasheet

XHP™2 module with TRENCHSTOP™ IGBT7 and emitter controlled 7 diode and NTC / pre-applied thermal interface material

Features

- Electrical features
 - $V_{CES} = 2300\text{ V}$
 - $I_{C\text{ nom}} = 1400\text{ A} / I_{CRM} = 2800\text{ A}$
 - $T_{vj,op} = 175^{\circ}\text{C}$
 - Low $V_{CE,sat}$
 - Low switching losses
 - High current density
 - Low inductive design
- Mechanical features
 - High power density
 - High creepage and clearance distances
 - Package with CTI > 600
 - 6kV AC insulation
 - Pre-applied thermal interface material



Potential applications

- High-power converters
- Motor drives
- Wind turbines

Product validation

- Qualified for commercial applications based on the test conditions in the relevant tests of IEC 60747, 60749 and 60068

Description

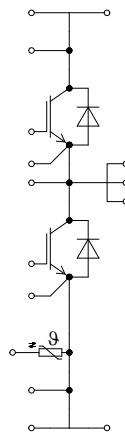


Table of contents

	Description	1
	Features	1
	Potential applications	1
	Product validation	1
	Table of contents	2
1	Package	3
2	IGBT, Inverter	3
3	Diode, Inverter	5
4	NTC-Thermistor	6
5	Characteristics diagrams	7
6	Circuit diagram	12
7	Package outlines	13
8	Module label code	14
	Revision history	15
	Disclaimer	16

1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, $f = 50$ Hz	6.0	kV
Partial discharge extinction voltage	V_{isol}	RMS, $f = 50$ Hz, $Q_{PD} < 10$ pC	2.6	kV
Material of module baseplate			AlSiC	
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}				10		nH
Main emitter inductance 1	$L_{s(E1-E1m)}$				1.5		nH
Main emitter inductance 2	$L_{s(E2-E2m)}$				3.5		nH
Module lead resistance, terminals - chip	$R_{AA'+CC'}$	$T_H = 25\text{ }^{\circ}\text{C}$, per switch			0.33		mΩ
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_H = 25\text{ }^{\circ}\text{C}$, per switch			0.38		mΩ
Storage temperature	T_{stg}			-40		150	$^{\circ}\text{C}$
Maximum baseplate operation temperature	T_{BPmax}					150	$^{\circ}\text{C}$
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	M3, Screw	0.9		1.1	Nm
			M8, Screw	8		10	
Weight	G				720		g

2 IGBT, Inverter

Table 3 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage	V_{CES}		$T_{vj} = 25$ °C	2300	V
Implemented collector current	I_{CN}			1400	A
Continuous DC collector current	I_{CDC}	$T_{vj\ max} = 175$ °C	$T_H = 50$ °C	1050	A

(table continues...)

Table 3 (continued) Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\ op}$	2800	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	$V_{CE\ sat}$	$I_C = 1400\ A, V_{GE} = 15\ V$	$T_{vj} = 25\ ^\circ C$	1.85	2.30	V
			$T_{vj} = 125\ ^\circ C$	2.25	3.05	
			$T_{vj} = 175\ ^\circ C$	2.50	3.50	
Gate threshold voltage	V_{GEth}	$I_C = 36\ mA, V_{CE} = V_{GE}, T_{vj} = 25\ ^\circ C$	5.15	5.80	6.45	V
Gate charge	Q_G	$V_{GE} = \pm 15\ V, V_{CC} = 1500\ V$		10.5		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\ ^\circ C$		0.67		Ω
Input capacitance	C_{ies}	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$		162		nF
Reverse transfer capacitance	C_{res}	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$		0.39		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 2300\ V, V_{GE} = 0\ V$	$T_{vj} = 125\ ^\circ C$		30	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}	$I_C = 1400\ A, V_{CC} = 1500\ V, V_{GE} = \pm 15\ V, R_{Gon} = 0.5\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.380		μs
			$T_{vj} = 125\ ^\circ C$	0.420		
			$T_{vj} = 175\ ^\circ C$	0.450		
Rise time (inductive load)	t_r	$I_C = 1400\ A, V_{CC} = 1500\ V, V_{GE} = \pm 15\ V, R_{Gon} = 0.5\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.055		μs
			$T_{vj} = 125\ ^\circ C$	0.065		
			$T_{vj} = 175\ ^\circ C$	0.075		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 1400\ A, V_{CC} = 1500\ V, V_{GE} = \pm 15\ V, R_{Goff} = 18\ \Omega$	$T_{vj} = 25\ ^\circ C$	3.550		μs
			$T_{vj} = 125\ ^\circ C$	3.600		
			$T_{vj} = 175\ ^\circ C$	3.650		
Fall time (inductive load)	t_f	$I_C = 1400\ A, V_{CC} = 1500\ V, V_{GE} = \pm 15\ V, R_{Goff} = 18\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.340		μs
			$T_{vj} = 125\ ^\circ C$	0.710		
			$T_{vj} = 175\ ^\circ C$	0.880		
Turn-on time (resistive load)	t_{on_R}	$I_C = 500\ A, V_{CC} = 2000\ V, V_{GE} = \pm 15\ V, R_{Gon} = 0.5\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.66		μs

(table continues...)

Table 4 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Turn-on energy loss per pulse	E_{on}	$I_C = 1400\text{ A}$, $V_{CC} = 1500\text{ V}$, $L_\sigma = 20\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 0.5\ \Omega$, $di/dt = 17000\text{ A}/\mu\text{s}$ ($T_{vj} = 175\text{ °C}$)	$T_{vj} = 25\text{ °C}$	495		mJ
			$T_{vj} = 125\text{ °C}$	795		
			$T_{vj} = 175\text{ °C}$	1100		
Turn-off energy loss per pulse	E_{off}	$I_C = 1400\text{ A}$, $V_{CC} = 1500\text{ V}$, $L_\sigma = 20\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 18\ \Omega$, $dv/dt = 2350\text{ V}/\mu\text{s}$ ($T_{vj} = 175\text{ °C}$)	$T_{vj} = 25\text{ °C}$	990		mJ
			$T_{vj} = 125\text{ °C}$	1240		
			$T_{vj} = 175\text{ °C}$	1400		
SC data	I_{SC}	$V_{GE} \leq 15\text{ V}$, $V_{CC} = 1200\text{ V}$, $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	$t_P = 7\ \mu\text{s}$, $T_{vj} = 150\text{ °C}$	5800		A
SC data	I_{SC}	$V_{CC} = 1500\text{ V}$, $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	$t_P = 5\ \mu\text{s}$, $T_{vj} = 175\text{ °C}$	5600		A
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, Valid with IFX pre-applied Thermal Interface Material			40.2	K/kW
Temperature under switching conditions	$T_{vj\ op}$		-40		175	°C

3 Diode, Inverter

Table 5 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Repetitive peak reverse voltage	V_{RRM}	$T_{vj} = 25\text{ °C}$	2300	V
Continuous DC forward current	I_F		1400	A
Repetitive peak forward current	I_{FRM}	$t_P = 1\text{ ms}$	2800	A
I^2t - value	I^2t	$t_P = 10\text{ ms}$, $V_R = 0\text{ V}$	$T_{vj} = 125\text{ °C}$	kA ² s
			$T_{vj} = 175\text{ °C}$	
Maximum power dissipation	P_{RQM}	$T_{vj} = 175\text{ °C}$	2400	kW

Table 6 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 1400\text{ A}$, $V_{GE} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$	3.05	3.45	V
			$T_{vj} = 125\text{ °C}$	2.80	3.10	
			$T_{vj} = 175\text{ °C}$	2.60	2.85	

(table continues...)

Table 6 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Peak reverse recovery current	I_{RM}	$V_{CC} = 1500 \text{ V}$, $I_F = 1400 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 17000 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ }^\circ\text{C}$)	$T_{vj} = 25 \text{ }^\circ\text{C}$	1750		A
			$T_{vj} = 125 \text{ }^\circ\text{C}$	1850		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	1880		
Recovered charge	Q_r	$V_{CC} = 1500 \text{ V}$, $I_F = 1400 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 17000 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ }^\circ\text{C}$)	$T_{vj} = 25 \text{ }^\circ\text{C}$	310		μC
			$T_{vj} = 125 \text{ }^\circ\text{C}$	570		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	790		
Reverse recovery energy	E_{rec}	$V_{CC} = 1500 \text{ V}$, $I_F = 1400 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 17000 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ }^\circ\text{C}$)	$T_{vj} = 25 \text{ }^\circ\text{C}$	305		mJ
			$T_{vj} = 125 \text{ }^\circ\text{C}$	565		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	785		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, Valid with IFX pre-applied Thermal Interface Material			62.8	K/kW
Temperature under switching conditions	$T_{vj\text{op}}$		-40		175	$^\circ\text{C}$

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

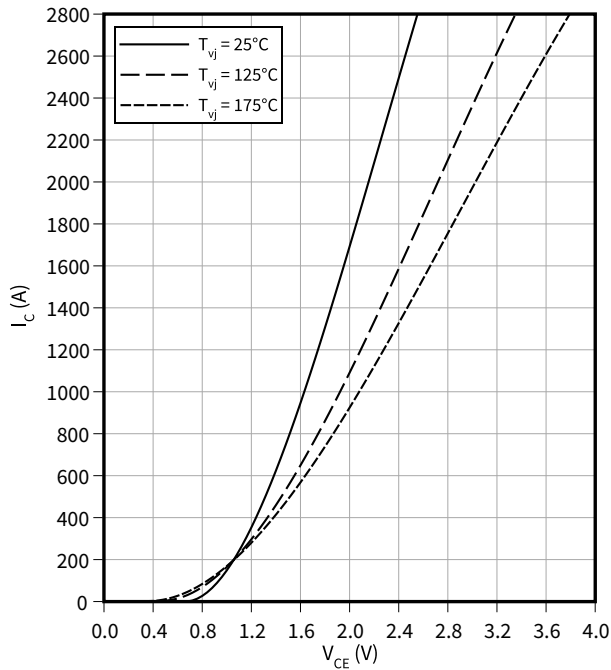
Note: For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4.

5 Characteristics diagrams

Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

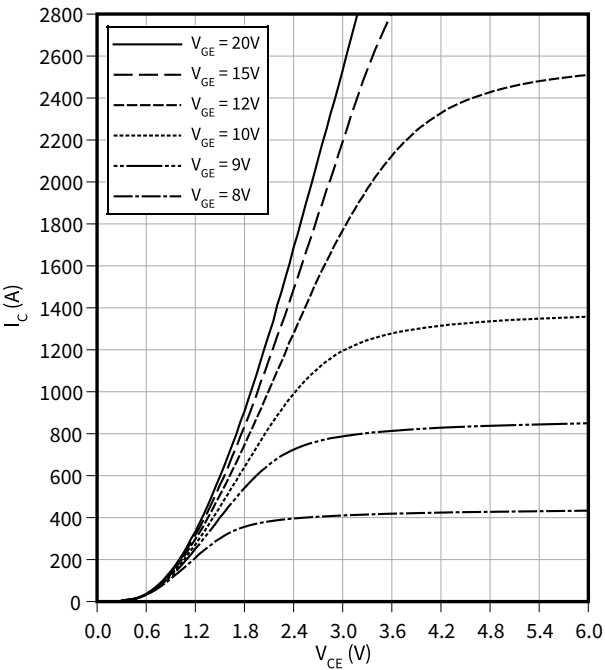
$V_{GE} = 15\text{ V}$



Output characteristic field (typical), IGBT, Inverter

$I_C = f(V_{CE})$

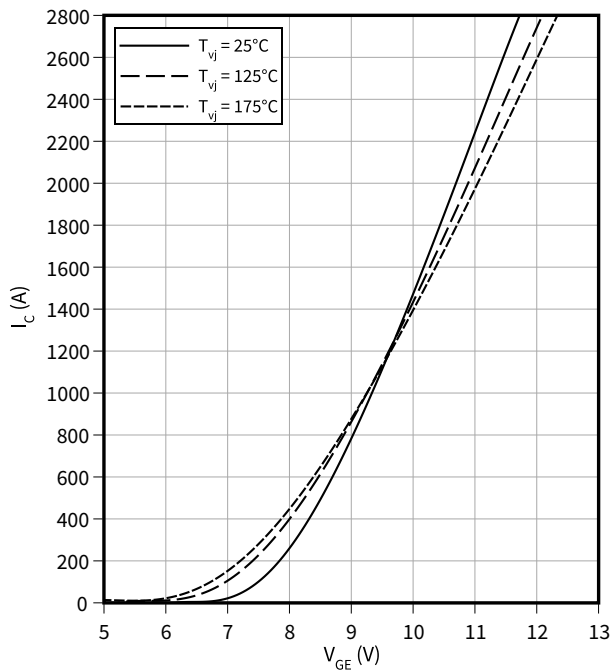
$T_{vj} = 175\text{ °C}$



Transfer characteristic (typical), IGBT, Inverter

$I_C = f(V_{GE})$

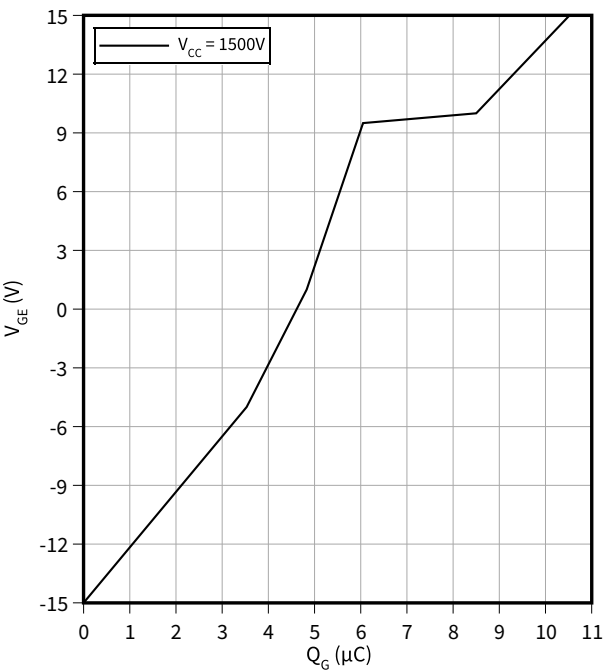
$V_{CE} = 20\text{ V}$



Gate charge characteristic (typical), IGBT, Inverter

$V_{GE} = f(Q_G)$

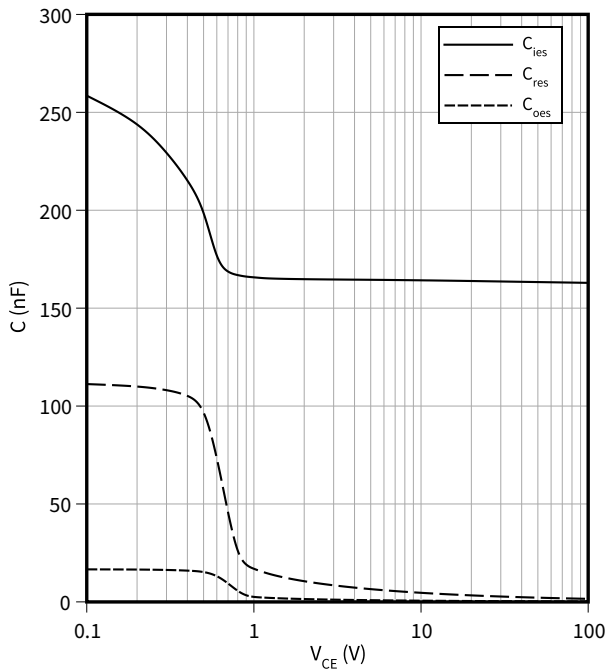
$I_C = 1400\text{ A}, T_{vj} = 25\text{ °C}$



5 Characteristics diagrams

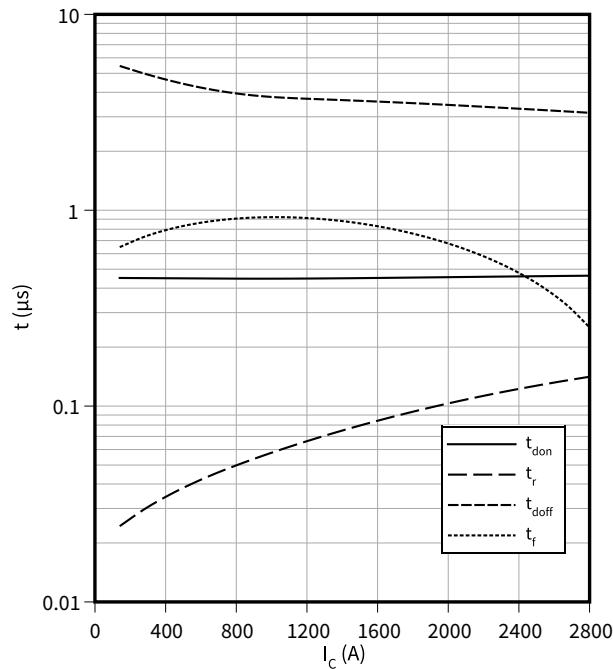
Capacity characteristic (typical), IGBT, Inverter

$C = f(V_{CE})$
 $f = 100 \text{ kHz}$, $V_{GE} = 0 \text{ V}$, $T_{vj} = 25 \text{ }^{\circ}\text{C}$



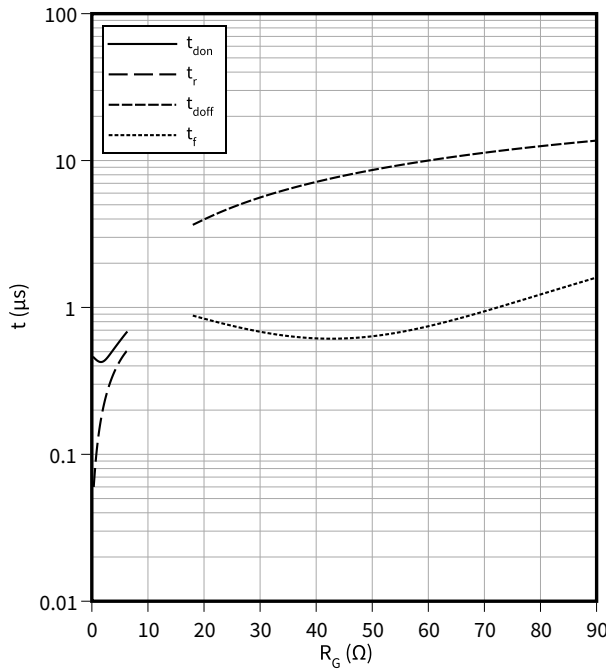
Switching times (typical), IGBT, Inverter

$t = f(I_C)$
 $R_{Goff} = 18 \text{ } \Omega$, $R_{Gon} = 0.5 \text{ } \Omega$, $V_{GE} = \pm 15 \text{ V}$, $V_{CC} = 1500 \text{ V}$, $T_{vj} = 175 \text{ }^{\circ}\text{C}$



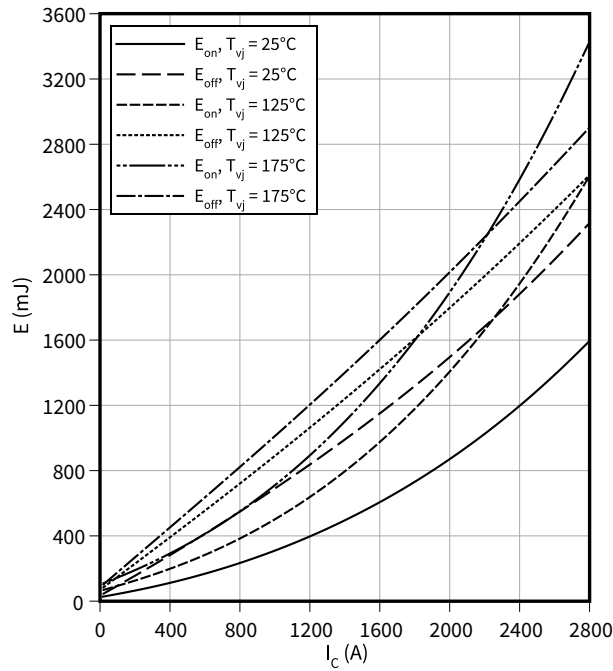
Switching times (typical), IGBT, Inverter

$t = f(R_G)$
 $V_{GE} = \pm 15 \text{ V}$, $I_C = 1400 \text{ A}$, $V_{CC} = 1500 \text{ V}$, $T_{vj} = 175 \text{ }^{\circ}\text{C}$



Switching losses (typical), IGBT, Inverter

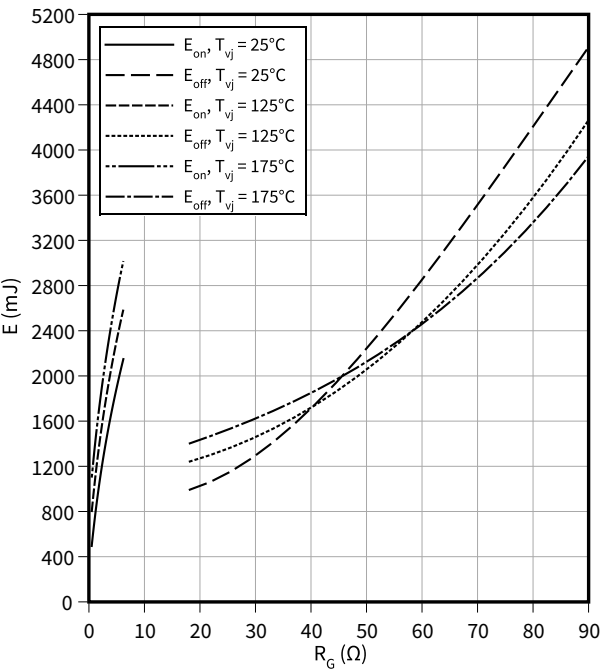
$E = f(I_C)$
 $R_{Goff} = 18 \text{ } \Omega$, $R_{Gon} = 0.5 \text{ } \Omega$, $V_{GE} = \pm 15 \text{ V}$, $V_{CC} = 1500 \text{ V}$



5 Characteristics diagrams

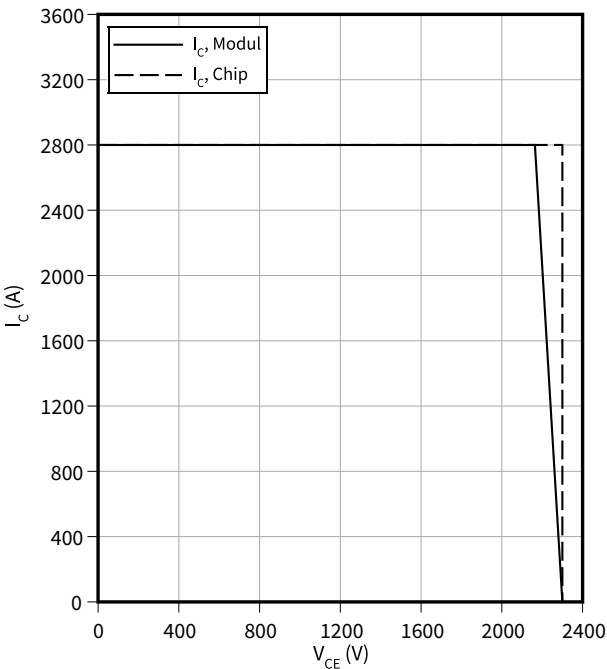
Switching losses (typical), IGBT, Inverter

$E = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $I_C = 1400\text{ A}$, $V_{CC} = 1500\text{ V}$



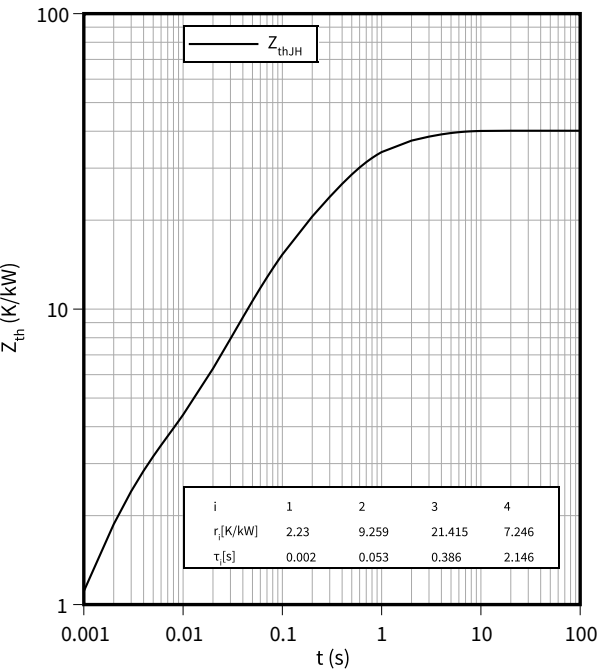
Reverse bias safe operating area (RBSOA), IGBT, Inverter

$I_C = f(V_{CE})$
 $R_{Goff} = 18\text{ }\Omega$, $V_{GE} = \pm 15\text{ V}$, $T_{vj} = 175\text{ }^\circ\text{C}$



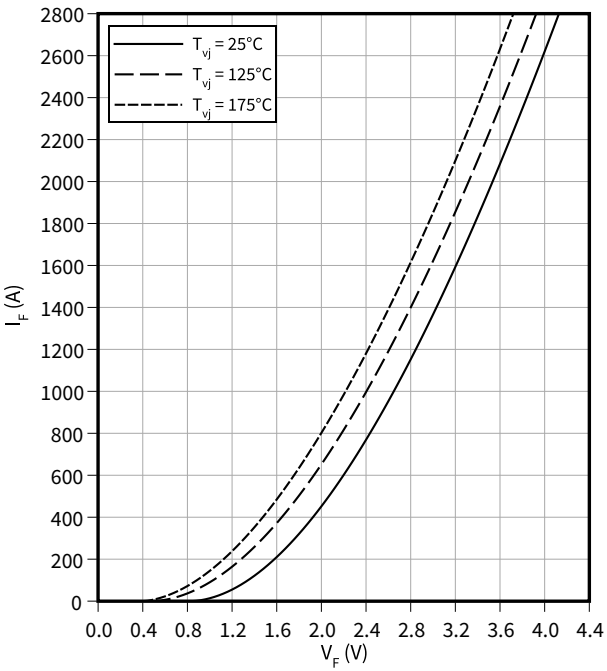
Transient thermal impedance, IGBT, Inverter

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, Inverter

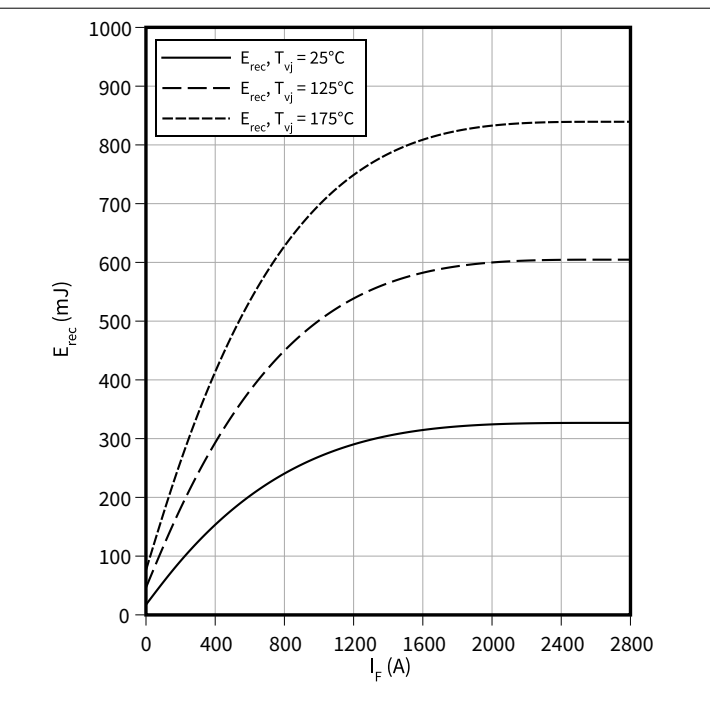
$I_F = f(V_F)$



5 Characteristics diagrams

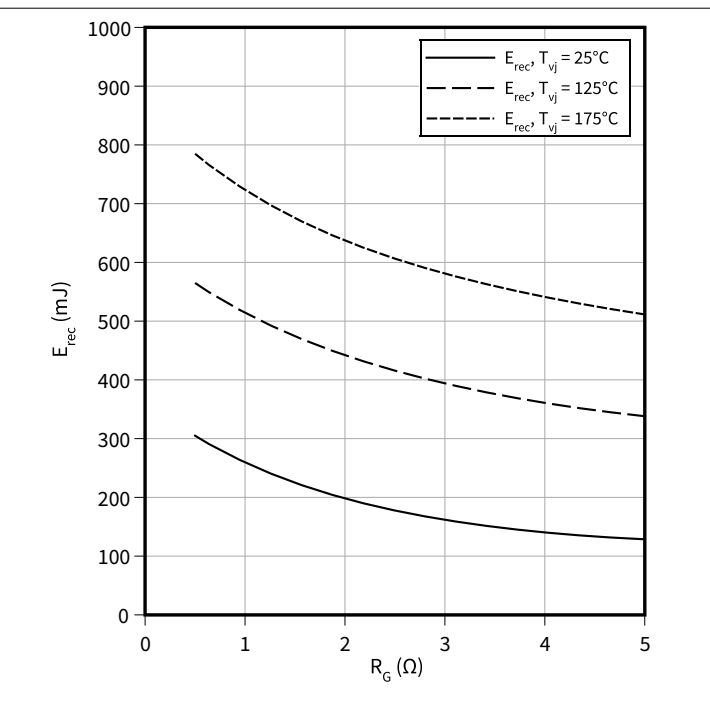
Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$
 $V_{CE} = 1500\text{ V}, R_{Gon} = R_{Gon}(IGBT)$



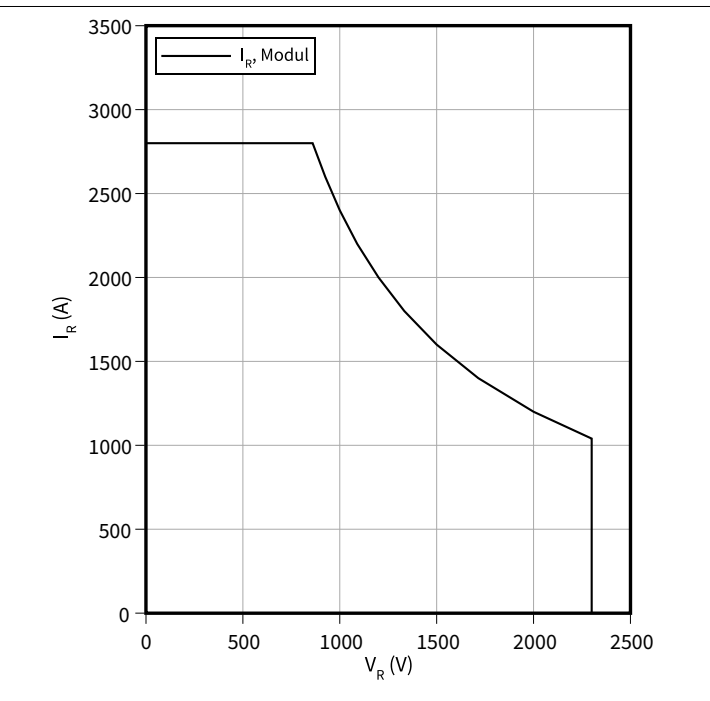
Switching losses (typical), Diode, Inverter

$E_{rec} = f(R_G)$
 $V_{CE} = 1500\text{ V}, I_F = 1400\text{ A}$



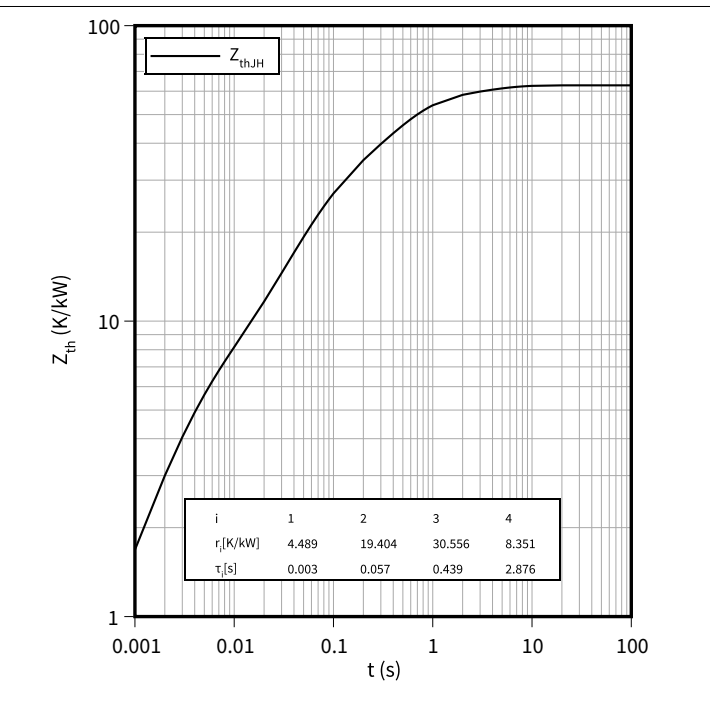
Safe operating area (SOA), Diode, Inverter

$I_R = f(V_R)$
 $T_{vj} = 175\text{ °C}$



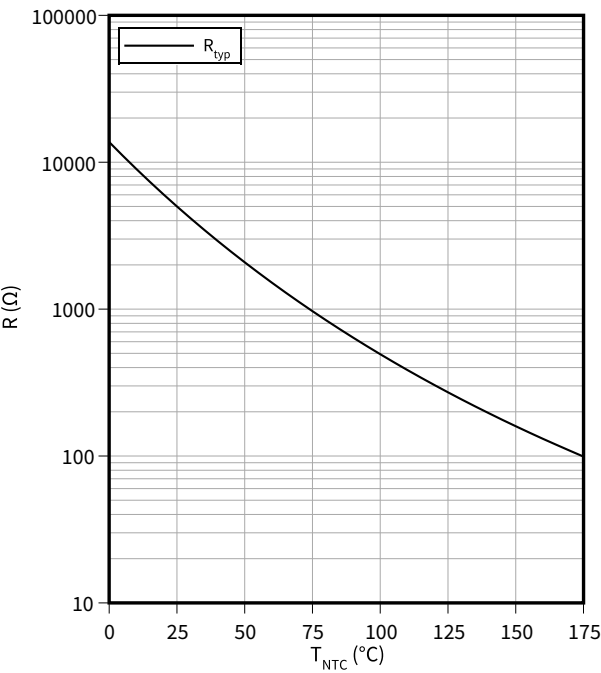
Transient thermal impedance, Diode, Inverter

$Z_{th} = f(t)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



6 Circuit diagram

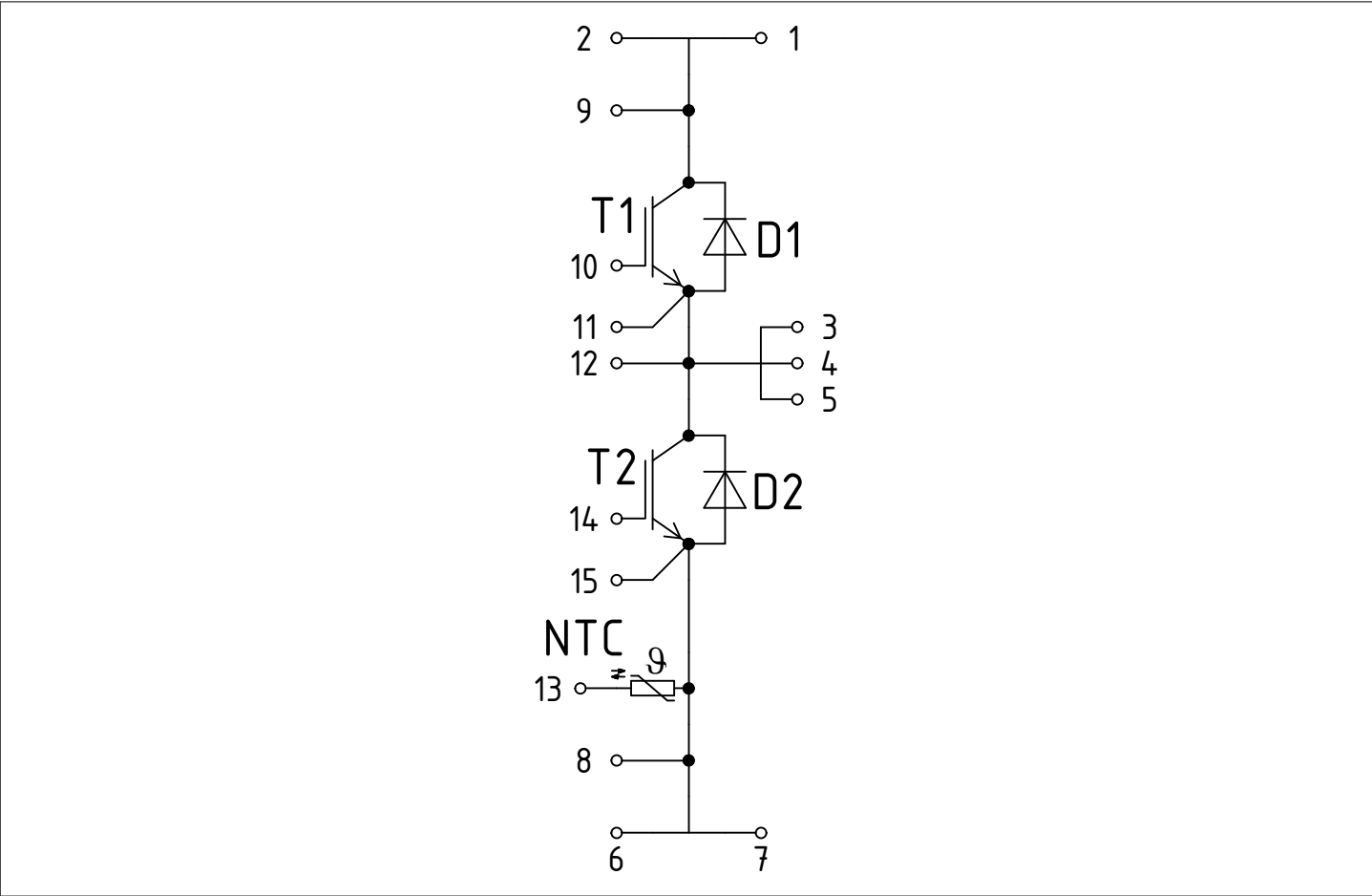


Figure 1

7 Package outlines

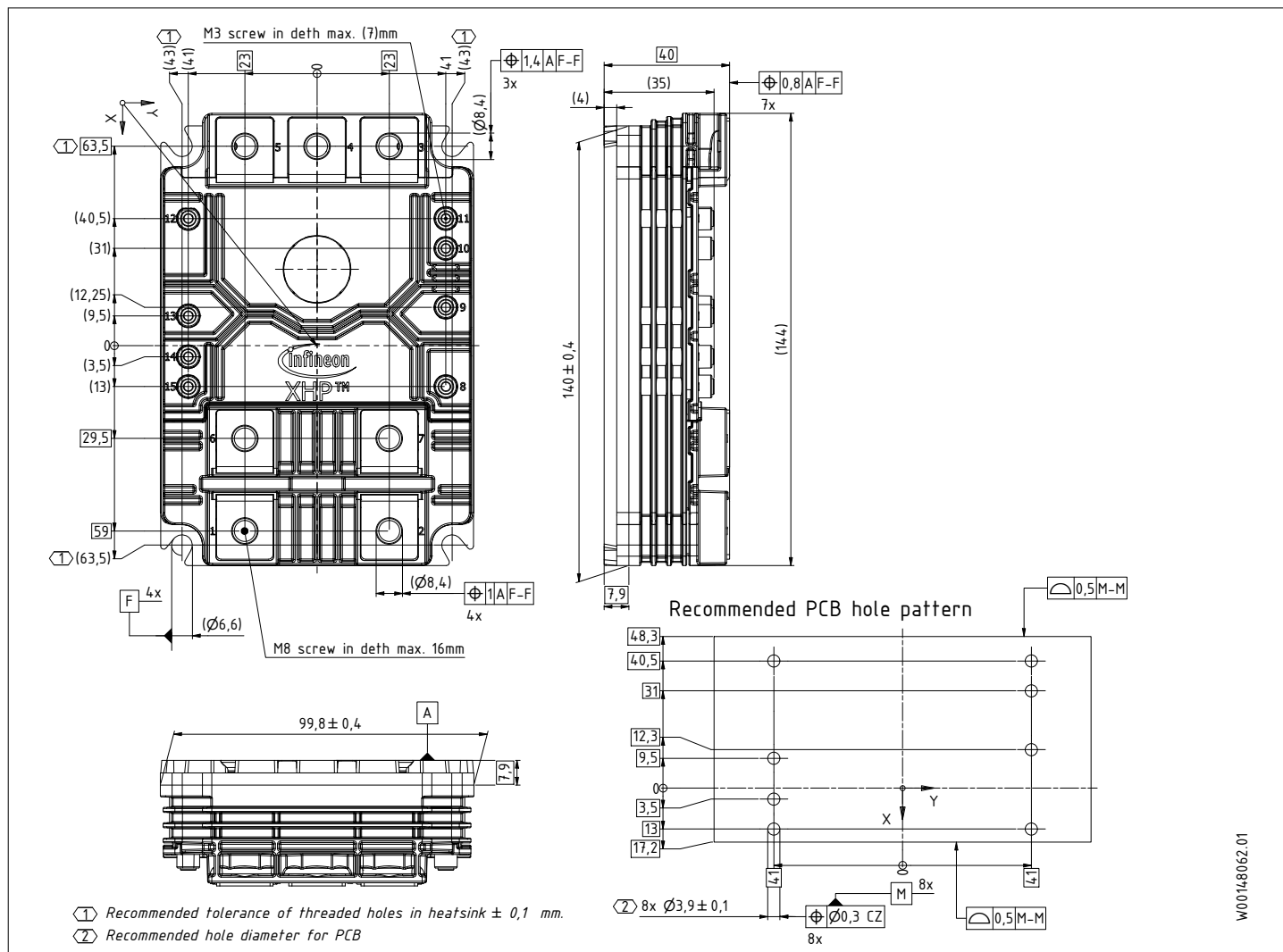


Figure 2

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>	<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

Revision history

Document revision	Date of release	Description of changes
0.10	2025-06-05	Preliminary datasheet
1.00	2025-07-01	Final datasheet
1.10	2025-07-29	Final datasheet

Trademarks

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

Edition 2025-07-29

Published by

Infineon Technologies AG
81726 Munich, Germany

© 2025 Infineon Technologies AG
All Rights Reserved.

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

Email: erratum@infineon.com

Document reference
IFX-ABO384-003

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.