Preliminary datasheet

XHP™2 module with TRENCHSTOP™ IGBT8 and emitter controlled 8 diode and NTC

Features

- Electrical features
  - V_{CES} = 1700 V
  - $I_{C\ nom}$ = 2000 A / I_{CRM} = 4000 A
  - $T_{vj,op}$ = 175°C
  - Low switching losses
  - High current density
  - Low $V_{CE,sat}$
  - Low inductive design
- Mechanical features
  - High creepage and clearance distances
  - High power and thermal cycling capability
  - High power density
  - Package with CTI > 600

Potential applications

- High-power converters
- Wind turbines
- Motor drives
- Traction

Product validation

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

Description

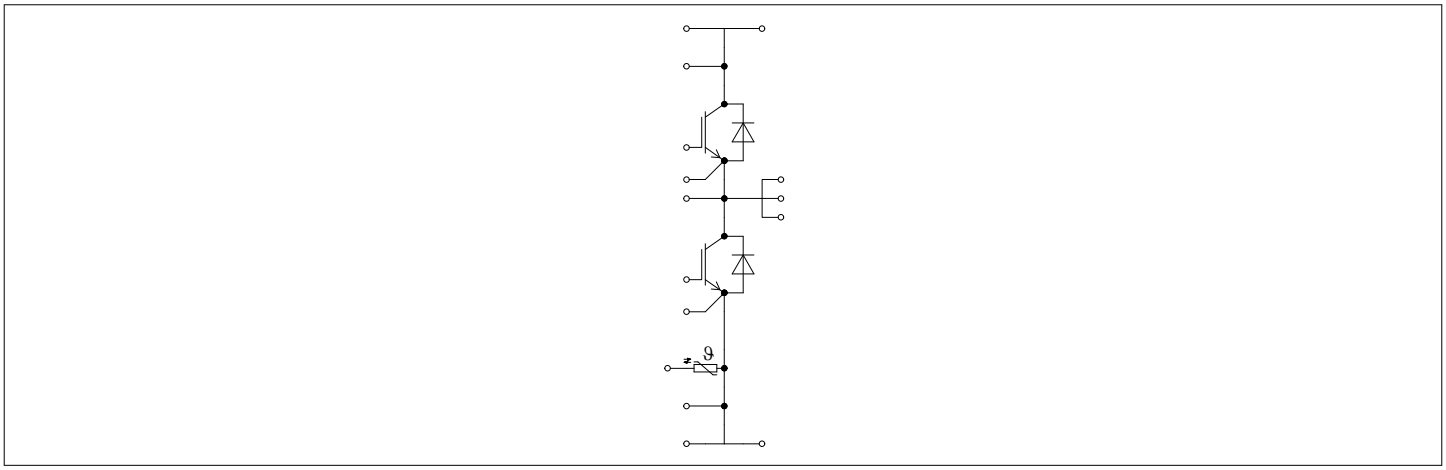


Table of contents

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	4.0	kV
Material of module baseplate			Cu	
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	$L_{s(E1\text{-}E1m)}$				1.5		nH
Main emitter inductance 2	$L_{s(E2\text{-}E2m)}$				3.5		nH
Module lead resistance, terminals - chip	$R_{AA'+CC'}$	T_C = 25 °C, per switch			0.27		mΩ
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	T_C = 25 °C, per switch			0.34		mΩ
Storage temperature	T_{stg}			-40		150	°C
Maximum baseplate operation temperature	T_{BPmax}					150	°C
Mounting torque for module mounting	*M*	- Mounting according to valid application note	M6, Screw	3		6	Nm
Terminal connection torque	*M*	- Mounting according to valid application note	M3, Screw	0.9		1.1	Nm
			M8, Screw	8		10	
Weight	*G*				1020		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	1700	V
Implemented collector current	I_{CN}			2000	A
Continuous DC collector current	I_{CDC}	$T_{vj\,max}$ = 175 °C	T_C = 95 °C	2000	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\,op}$		4000	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 = 2000 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.65	1.80	V
			T_{vj} = 125 °C		2.00	TBD	
			T_{vj} = 175 °C		2.17	TBD	
Gate threshold voltage	V_{GEth}	I_C = 42.6 mA, V_{CE} = V_{GE}, T_{vj} = 25 °C		5.15	5.80	6.45	V
Gate charge	Q_G	V_{GE} = ±15 V, V_{CC} = 900 V, T_{vj} = 25 °C			13		µC
Internal gate resistor	R_{Gint}	T_{vj} = 25 °C			0.66		Ω
Input capacitance	C_{ies}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			186		nF
Reverse transfer capacitance	C_{res}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			0.45		nF
Collector-emitter cut-off current	I_{CES}	V_{CE} = 1700 V, V_{GE} = 0 V	T_{vj} = 25 °C			5	mA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25 °C				200	nA
Turn-on delay time (inductive load)	t_{don}	I_C = 2000 A, V_{CC} = 900 V, V_{GE} = ±15 V, R_{Gon} = 0.39 Ω	T_{vj} = 25 °C		0.410		µs
			T_{vj} = 125 °C		0.470		
			T_{vj} = 175 °C		0.500		
Rise time (inductive load)	t_r	I_C = 2000 A, V_{CC} = 900 V, V_{GE} = ±15 V, R_{Gon} = 0.39 Ω	T_{vj} = 25 °C		0.090		µs
			T_{vj} = 125 °C		0.100		
			T_{vj} = 175 °C		0.115		
Turn-off delay time (inductive load)	t_{doff}	I_C = 2000 A, V_{CC} = 900 V, V_{GE} = ±15 V, R_{Goff} = 5.1 Ω	T_{vj} = 25 °C		1.310		µs
			T_{vj} = 125 °C		1.360		
			T_{vj} = 175 °C		1.400		
Fall time (inductive load)	t_f	I_C = 2000 A, V_{CC} = 900 V, V_{GE} = ±15 V, R_{Goff} = 5.1 Ω	T_{vj} = 25 °C		0.360		µs
			T_{vj} = 125 °C		0.590		
			T_{vj} = 175 °C		0.700		
Turn-on energy loss per pulse	E_{on}	I_C = 2000 A, V_{CC} = 900 V, L_σ = 20 nH, V_{GE} = ±15 V, R_{Gon} = 0.39 Ω, di/dt = 13200 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		400		mJ
			T_{vj} = 125 °C		650		
			T_{vj} = 175 °C		840		
Turn-off energy loss per pulse	E_{off}	I_C = 2000 A, V_{CC} = 900 V, L_σ = 20 nH, V_{GE} = ±15 V, R_{Goff} = 5.1 Ω, dv/dt = 3300 V/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		540		mJ
			T_{vj} = 125 °C		680		
			T_{vj} = 175 °C		760		

(table continues...)

Table 4 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
SC data	I_{SC}	$V_{GE} \leq 15$ V, $V_{CC} = 1000$ V, $V_{CEmax}=V_{CES}-L_{sCE}*di/dt$	$t_P = 6$ µs, $T_{vj} = 175$ °C		6350		A
			$t_P = 8$ µs, $T_{vj} = 150$ °C		6450		
Thermal resistance, junction to case	R_{thJC}	per IGBT				16.0	K/kW
Thermal resistance, case to heat sink	R_{thCH}	per IGBT, $\lambda_{grease} = 5$ W/(m·K)			5.30		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}		$T_{vj} = 25$ °C	1700	V
Continuous DC forward current	I_F			2000	A
Repetitive peak forward current	I_{FRM}	$t_P = 1$ ms		4000	A
I^2t - value	I^2t	$t_P = 10$ ms, $V_R = 0$ V	$T_{vj} = 125$ °C	350	kA^2s
			$T_{vj} = 175$ °C	295	

Table 6 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 2000$ A, $V_{GE} = 0$ V	$T_{vj} = 25$ °C		1.95	2.20	V
			$T_{vj} = 125$ °C		1.95	TBD	
			$T_{vj} = 175$ °C		1.90	TBD	
Peak reverse recovery current	I_{RM}	$V_{CC} = 900$ V, $I_F = 2000$ A, $V_{GE} = -15$ V, $-di_F/dt = 12500$ A/µs ($T_{vj} = 175$ °C)	$T_{vj} = 25$ °C		1480		A
			$T_{vj} = 125$ °C		1560		
			$T_{vj} = 175$ °C		1560		
Recovered charge	Q_r	$V_{CC} = 900$ V, $I_F = 2000$ A, $V_{GE} = -15$ V, $-di_F/dt = 12500$ A/µs ($T_{vj} = 175$ °C)	$T_{vj} = 25$ °C		325		µC
			$T_{vj} = 125$ °C		570		
			$T_{vj} = 175$ °C		740		

(table continues...)

Table 6 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Reverse recovery energy	E_{rec}	V_{CC} = 900 V, I_F = 2000 A, V_{GE} = -15 V, -di$_F$/dt = 12500 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		160		mJ
			T_{vj} = 125 °C		290		
			T_{vj} = 175 °C		375		
Thermal resistance, junction to case	R_{thJC}	per diode				32.6	K/kW
Thermal resistance, case to heat sink	R_{thCH}	per diode, λ_{grease} = 5 W/(m·K)			5.30		K/kW
Temperature under switching conditions	$T_{vj\,op}$			-40		175	°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 °C		5		kΩ
Deviation of R_{100}	$\Delta R/R$	T_{NTC} = 100 °C, R_{100} = 493 Ω	-5		5	%
Power dissipation	P_{25}	T_{NTC} = 25 °C			20	mW
B-value	$B_{25/50}$	$R_2 = R_{25} \exp[B_{25/50}(1/T_2-1/(298{,}15\ K))]$		3375		K
B-value	$B_{25/80}$	$R_2 = R_{25} \exp[B_{25/80}(1/T_2-1/(298{,}15\ K))]$		3411		K
B-value	$B_{25/100}$	$R_2 = R_{25} \exp[B_{25/100}(1/T_2-1/(298{,}15\ K))]$		3433		K

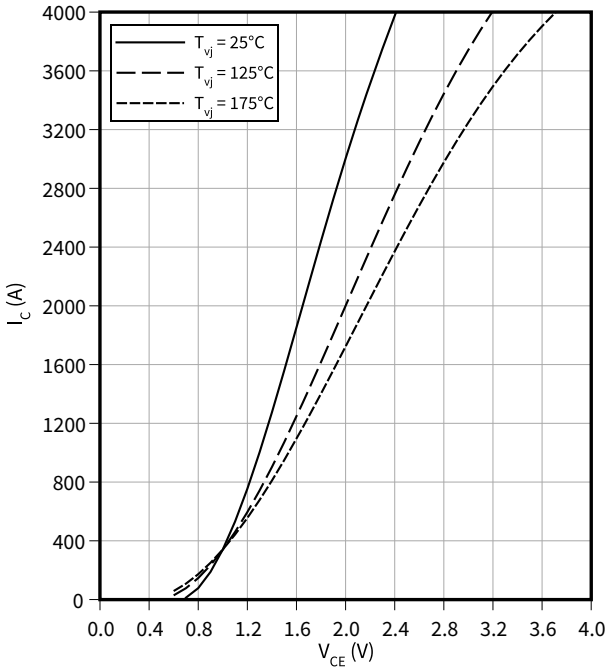
***Note**: For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4.*

5 Characteristics diagrams

Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

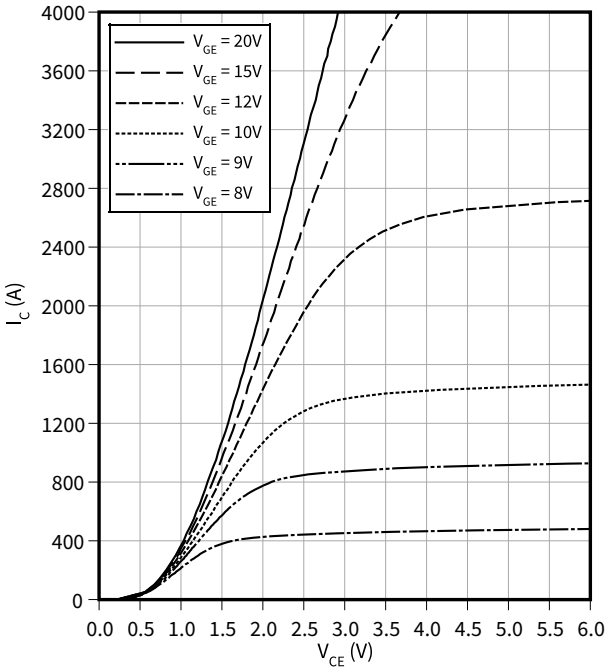
V_{GE} = 15 V



Output characteristic field (typical), IGBT, Inverter

$I_C = f(V_{CE})$

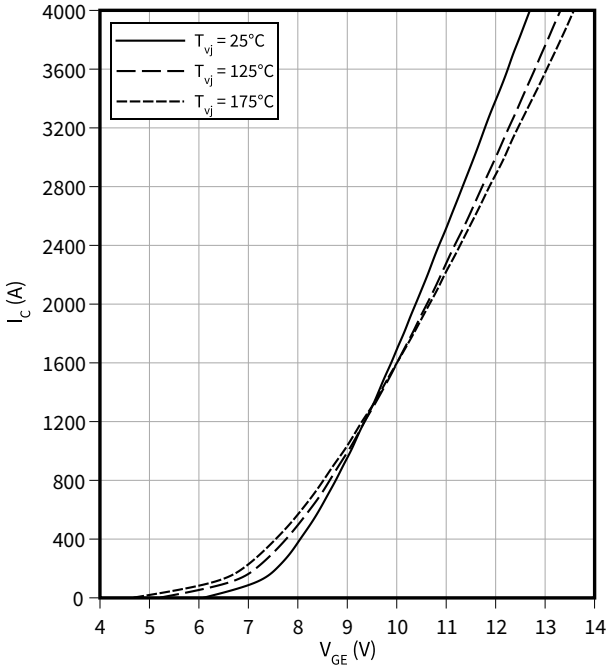
T_{vj} = 175 °C



Transfer characteristic (typical), IGBT, Inverter

$I_C = f(V_{GE})$

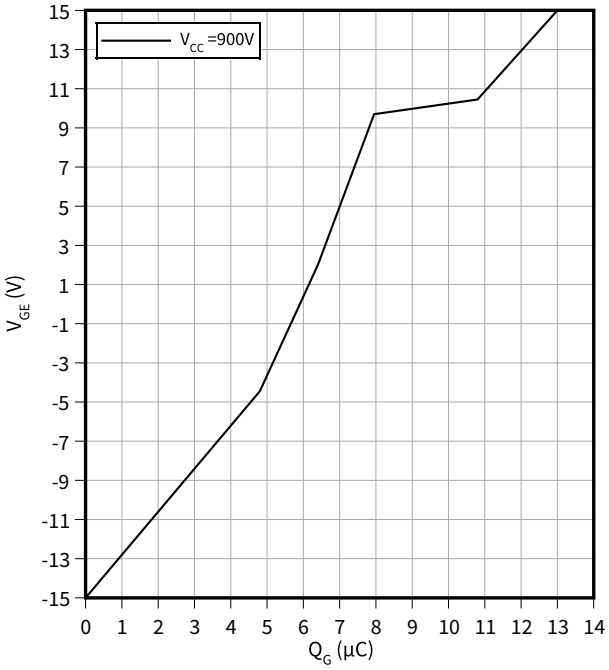
V_{CE} = 20 V



Gate charge characteristic (typical), IGBT, Inverter

$V_{GE} = f(Q_G)$

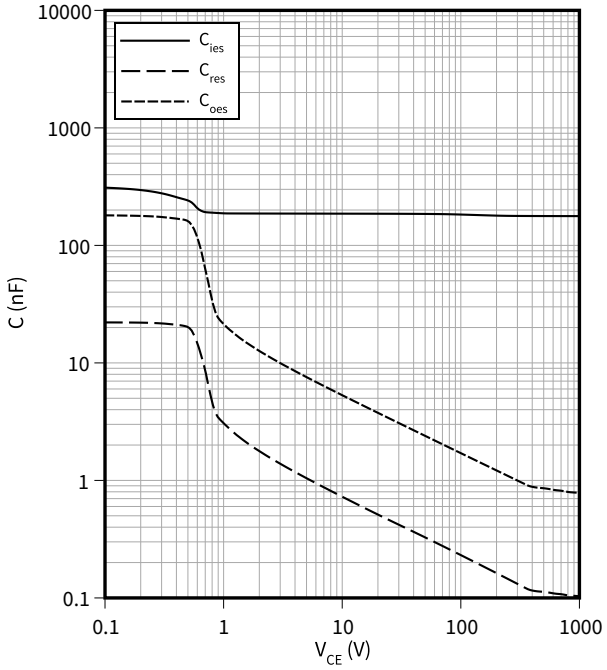
I_C = 2000 A, T_{vj} = 25 °C



Capacity characteristic (typical), IGBT, Inverter

$C = f(V_{CE})$

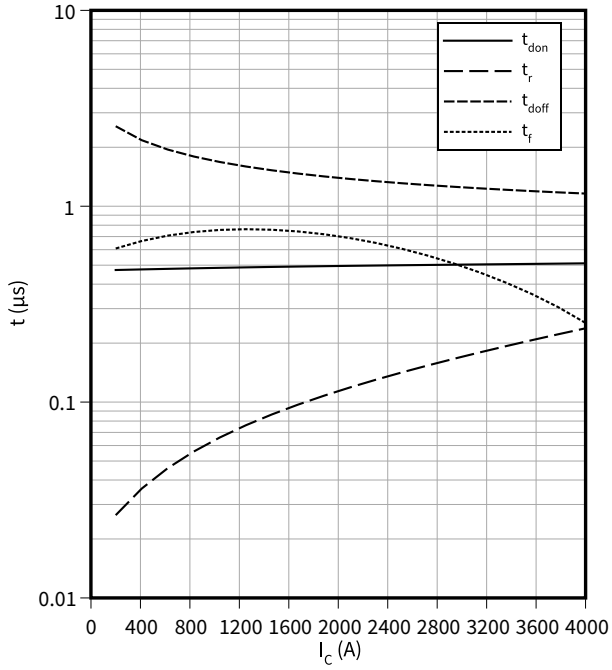
$f = 100\ kHz$, $V_{GE} = 0\ V$, $T_{vj} = 25\ °C$



Switching times (typical), IGBT, Inverter

$t = f(I_C)$

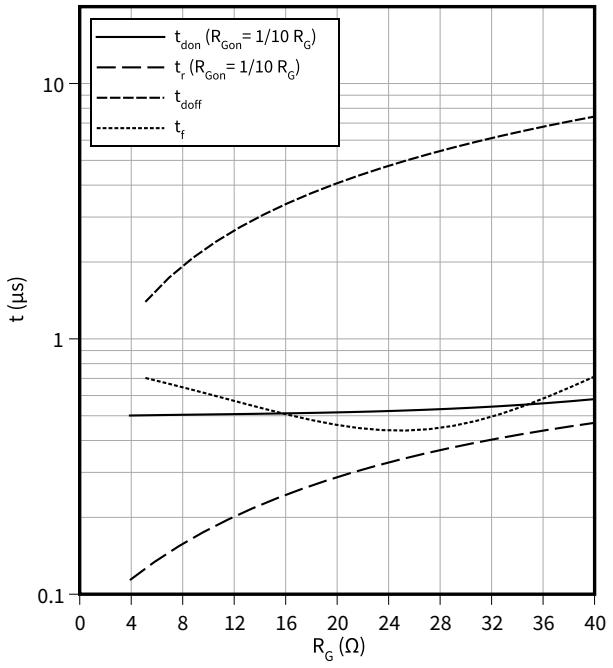
$R_{Goff} = 5.1\ \Omega$, $R_{Gon} = 0.39\ \Omega$, $V_{GE} = \pm 15\ V$, $V_{CC} = 900\ V$, $T_{vj} = 175\ °C$



Switching times (typical), IGBT, Inverter

$t = f(R_G)$

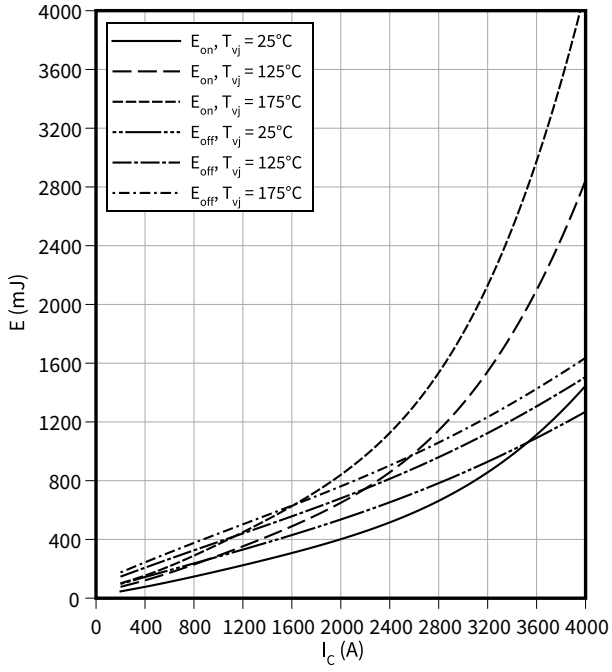
$V_{GE} = \pm 15\ V$, $I_C = 2000\ A$, $V_{CC} = 900\ V$, $T_{vj} = 175\ °C$



Switching losses (typical), IGBT, Inverter

$E = f(I_C)$

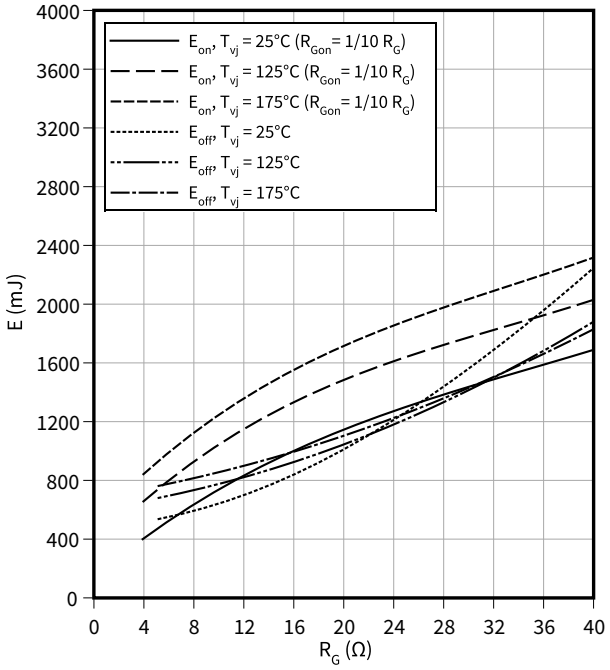
$R_{Goff} = 5.1\ \Omega$, $R_{Gon} = 0.39\ \Omega$, $V_{CC} = 900\ V$, $\pm\ 15\ V$



Switching losses (typical), IGBT, Inverter

$E = f(R_G)$

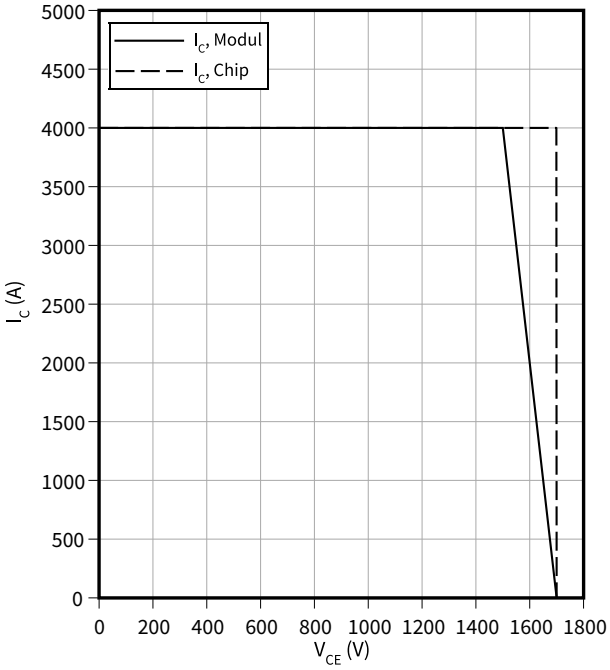
$V_{GE} = \pm 15$ V, $I_C = 2000$ A, $V_{CC} = 900$ V



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

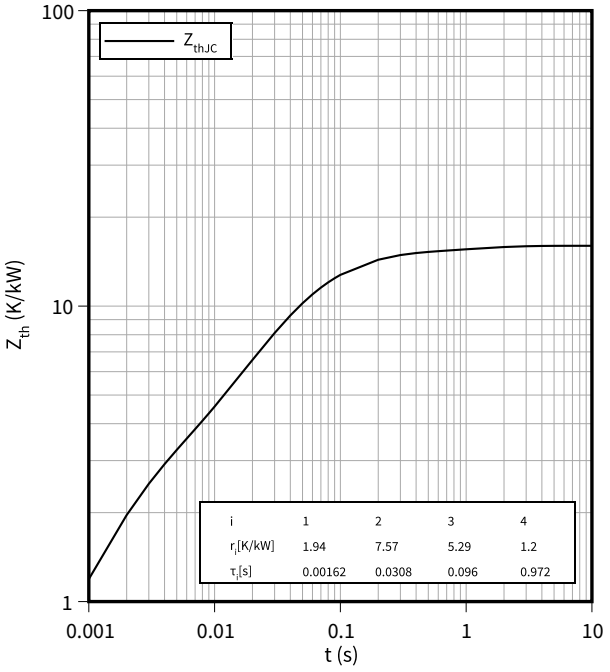
$I_C = f(V_{CE})$

$R_{Goff} \geq 5.1\ \Omega$, $V_{GE} = \pm 15$ V, $T_{vj} = 175$ °C



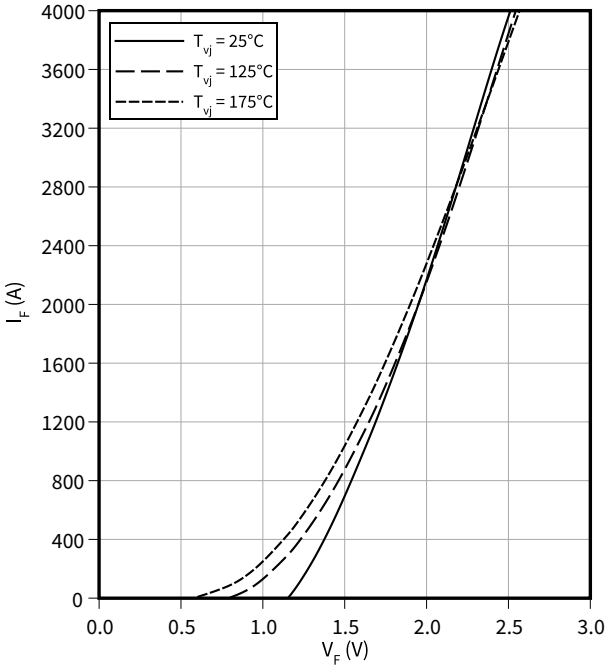
Transient thermal impedance, IGBT, Inverter

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, Inverter

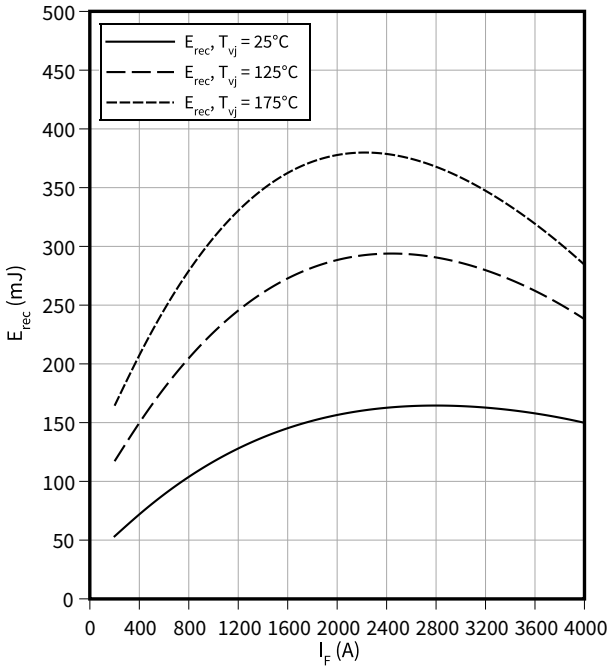
$I_F = f(V_F)$



Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$

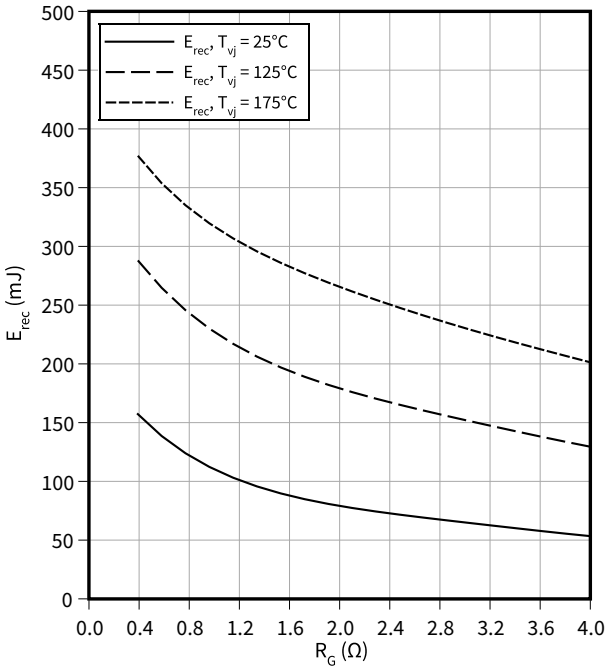
V_{CE} = 900 V, $R_{Gon} = R_{Gon}$(IGBT)



Switching losses (typical), Diode, Inverter

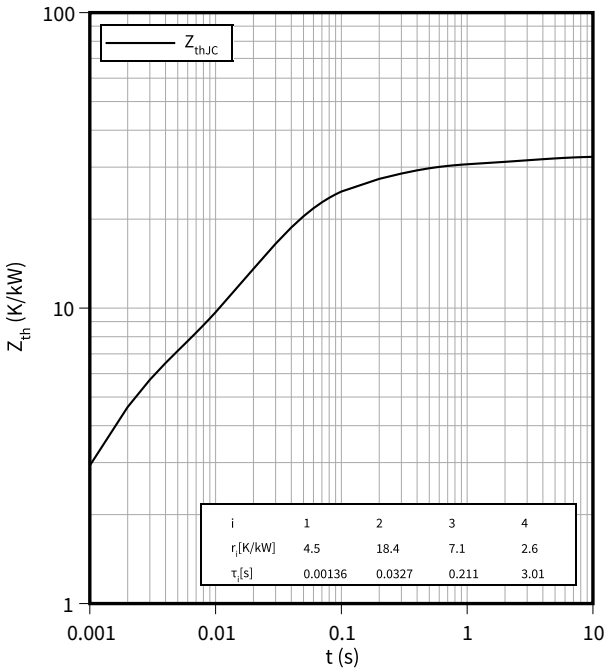
$E_{rec} = f(R_G)$

I_F = 2000 A, V_{CC} = 900 V



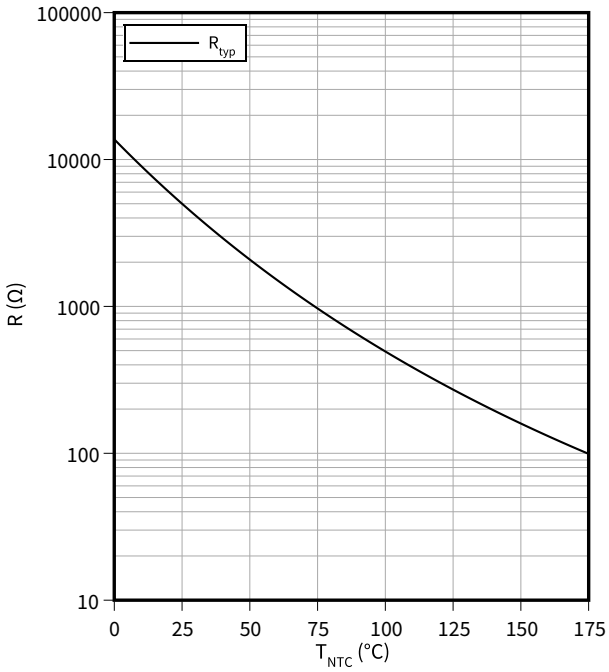
Transient thermal impedance, Diode, Inverter

$Z_{th} = f(t)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



6 Circuit diagram

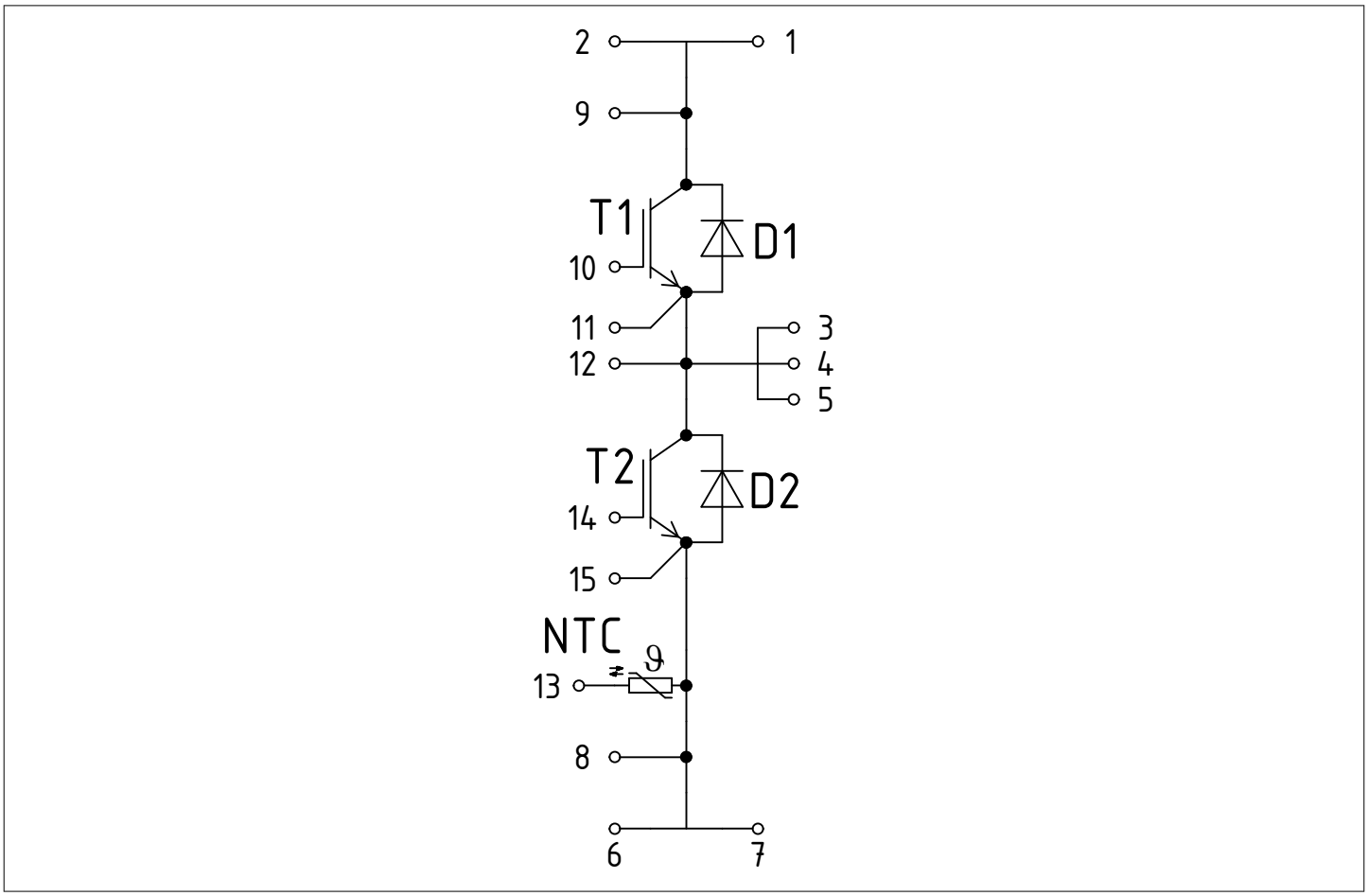


Figure 1

7 Package outlines

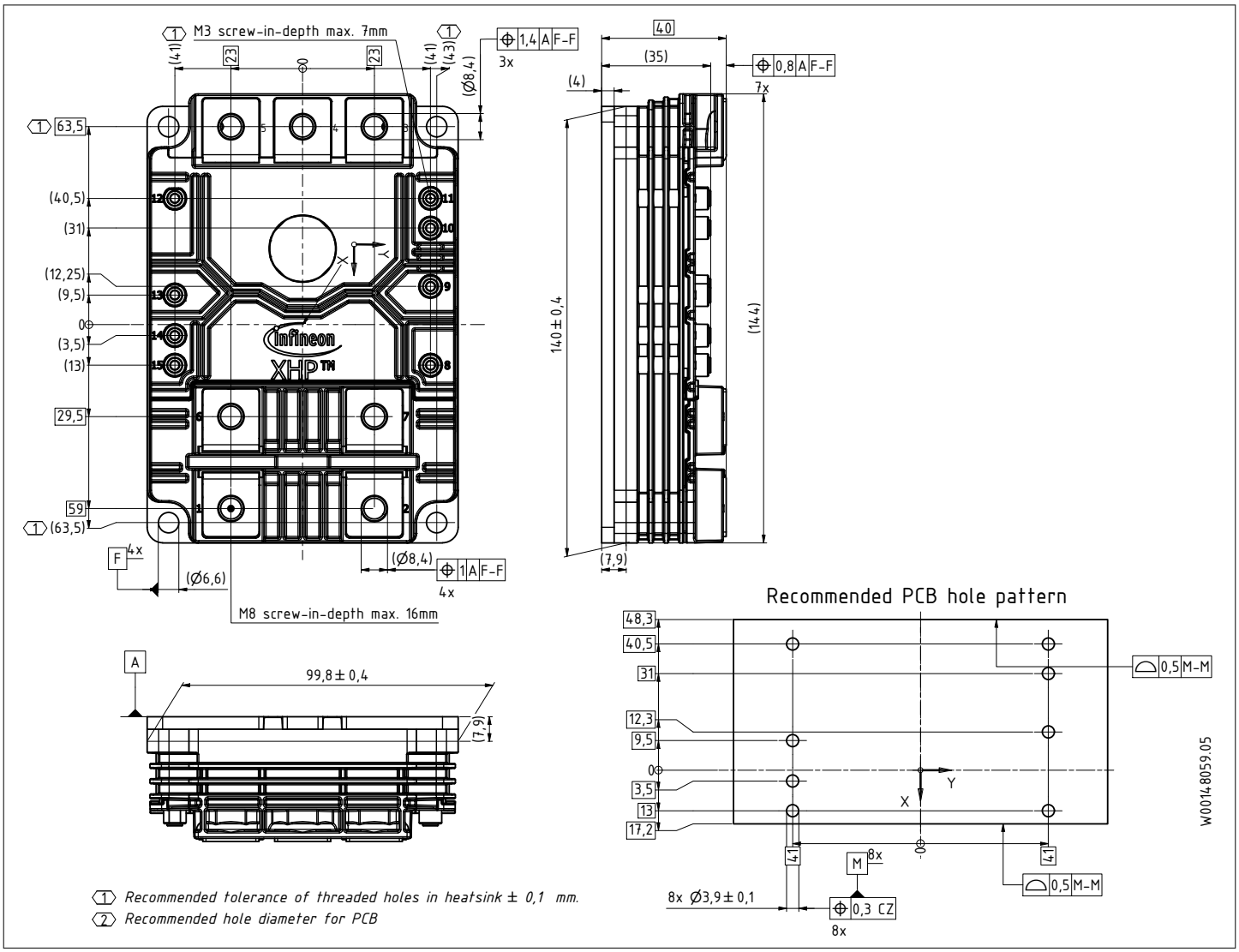


Figure 2

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	*Content* Module serial number Module material number Production order number Date code (production year) Date code (production week)	*Digit* 1 – 5 6 - 11 12 - 19 20 – 21 22 – 23	*Example* 71549 142846 55054991 15 30
Example	7154914284655054991530		7154914284655054991530

Figure 3

Revision history

Document revision	Date of release	Description of changes
0.10	2025-03-31	Target datasheet
0.20	2025-12-10	Preliminary datasheet

Trademarks

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

Edition 2025-12-10

Published by

Infineon Technologies AG

81726 Munich, Germany

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

Email: erratum@infineon.com

Document reference
IFX-ABN616-002

Important notice

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

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.

Please note that this product is not qualified according to the AEC Q100 or AEC Q101 documents of the Automotive Electronics Council.

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.