ANTREX Electronics

Electronic Components Sourcing Information

Product Reference Information

Part Number: FF450R33T3E3B5P2BPSA1

Manufacturer: Infineon Technologies

Package: Module

Availability: Please confirm with sales

Product Page:

https://antrexco.com/product/details/infineon-technologies/ff450r33t3e3b5p2bpsa1.html

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Note:

This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.

Final datasheet

XHP™3 module with Trench/Fieldstop IGBT3 and emitter controlled 3 diode

Features

- Electrical features
  - V_{CES} = 3300 V
  - $I_{C\,nom}$ = 450 A / I_{CRM} = 900 A
  - High DC stability
  - High short-circuit capability
  - Low switching losses
  - Low $V_{CE,sat}$
  - $T_{vj,op}$ = 150°C
  - Unbeatable robustness
- Mechanical features
  - AlSiC base plate for increased thermal cycling capability
  - Isolated base plate
  - Package with CTI > 600
  - Package with enhanced insulation of 10.4 kV AC 60 s

Potential applications

- Traction drives
- Medium-voltage converters
- Motor drives

Product validation

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

Description

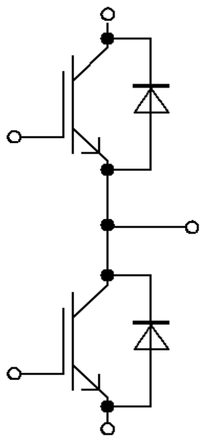


Table of contents

1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, f = 50 Hz, t = 60 s	10.4	kV
Partial discharge extinction voltage	V_{isol}	RMS, f = 50 Hz, Q_{PD} typ 10 pC	5.1	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}				25		nH
Module lead resistance, terminals - chip	$R_{AA'+CC'}$	T_C = 25 °C, per switch			0.31		mΩ
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	T_C = 25 °C, per switch			0.41		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	M3, Screw	0.9		1.1	Nm
			M8, Screw	8		10	
Weight	*G*				700		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 °C	3300	V
			T_{vj} = 150 °C	3300	
Continuous DC collector current	I_{CDC}	$T_{vj\,max}$ = 150 °C	T_C = 100 °C	450	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\,op}$		900	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 = 450 A, V_{GE} = 15 V	T_{vj} = 25 °C		2.50	2.75	V
			T_{vj} = 125 °C		2.90		
			T_{vj} = 150 °C		3.00	3.30	
Gate threshold voltage	V_{GEth}	I_C = 21 mA, V_{CE} = V_{GE}, T_{vj} = 25 °C		5.20	5.80	6.40	V
Gate charge	Q_G	V_{GE} = ±15 V, V_{CC} = 1800 V, T_{vj} = 25 °C			12.5		µC
Internal gate resistor	R_{Gint}	T_{vj} = 25 °C			1.3		Ω
Input capacitance	C_{ies}	f = 1000 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			84		nF
Reverse transfer capacitance	C_{res}	f = 1000 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			2		nF
Collector-emitter cut-off current	I_{CES}	V_{CE} = 3300 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				400	nA
Turn-on delay time (inductive load)	t_{don}	I_C = 450 A, V_{CC} = 1800 V, V_{GE} = ±15 V, R_{Gon} = 0.7 Ω	T_{vj} = 25 °C		0.530		µs
			T_{vj} = 125 °C		0.570		
			T_{vj} = 150 °C		0.580		
Rise time (inductive load)	t_r	I_C = 450 A, V_{CC} = 1800 V, V_{GE} = ±15 V, R_{Gon} = 0.7 Ω	T_{vj} = 25 °C		0.100		µs
			T_{vj} = 125 °C		0.130		
			T_{vj} = 150 °C		0.130		
Turn-off delay time (inductive load)	t_{doff}	I_C = 450 A, V_{CC} = 1800 V, V_{GE} = ±15 V, R_{Goff} = 3.3 Ω	T_{vj} = 25 °C		1.710		µs
			T_{vj} = 125 °C		1.860		
			T_{vj} = 150 °C		1.920		
Fall time (inductive load)	t_f	I_C = 450 A, V_{CC} = 1800 V, V_{GE} = ±15 V, R_{Goff} = 3.3 Ω	T_{vj} = 25 °C		0.130		µs
			T_{vj} = 125 °C		0.240		
			T_{vj} = 150 °C		0.270		
Turn-on time (resistive load)	t_{on_R}	I_C = 500 A, V_{CC} = 2000 V, V_{GE} = ±15 V, R_{Gon} = 0.7 Ω	T_{vj} = 25 °C	1.15			µs
Turn-on energy loss per pulse	E_{on}	I_C = 450 A, V_{CC} = 1800 V, L_σ = 85 nH, V_{GE} = ±15 V, R_{Gon} = 0.7 Ω, di/dt = 3650 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		500		mJ
			T_{vj} = 125 °C		765		
			T_{vj} = 150 °C		845		
Turn-off energy loss per pulse	E_{off}	I_C = 450 A, V_{CC} = 1800 V, L_σ = 85 nH, V_{GE} = ±15 V, R_{Goff} = 3.3 Ω, dv/dt = 2850 V/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		415		mJ
			T_{vj} = 125 °C		610		
			T_{vj} = 150 °C		670		

(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, $V_{CC} = 2500$ V, $V_{CEmax}=V_{CES}-L_{sCE}*di/dt$	$t_P \leq 10$ µs, $T_{vj} \leq 150$ °C		1800		A
Thermal resistance, junction to case	R_{thJC}	per IGBT				28.4	K/kW
Thermal resistance, case to heat sink	R_{thCH}	per IGBT, $\lambda_{grease} = 1$ W/(m·K)			17.4		K/kW
Temperature under switching conditions	$T_{vj\ op}$			-40		150	°C

3 Diode, Inverter

Table 5 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		$T_{vj} = -40$ °C	3300	V
			$T_{vj} = 150$ °C	3300	
Continuous DC forward current	I_F			450	A
Repetitive peak forward current	I_{FRM}	$t_P = 1$ ms		900	A
I²t - value	I^2t	$t_P = 10$ ms, $V_R = 0$ V	$T_{vj} = 125$ °C	82.9	kA²s
			$T_{vj} = 150$ °C	68	
Maximum power dissipation	P_{RQM}		$T_{vj} = 150$ °C	1000	kW
Minimum turn-on time	t_{onmin}			10	µs

Table 6 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 450$ A, $V_{GE} = 0$ V	$T_{vj} = 25$ °C		3.10	3.50	V
			$T_{vj} = 125$ °C		2.75		
			$T_{vj} = 150$ °C		2.65	2.95	
Peak reverse recovery current	I_{RM}	$V_{CC} = 1800$ V, $I_F = 450$ A, $V_{GE} = -15$ V, $-di_F/dt = 3650$ A/µs ($T_{vj} = 150$ °C)	$T_{vj} = 25$ °C		680		A
			$T_{vj} = 125$ °C		680		
			$T_{vj} = 150$ °C		680		

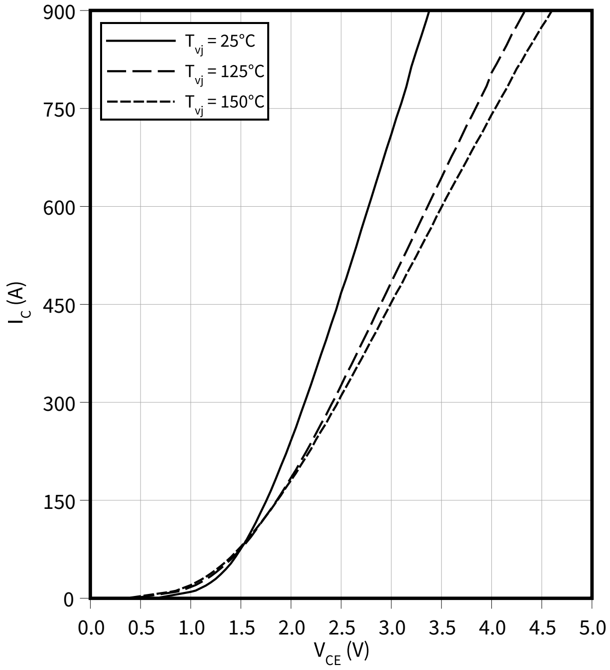
(table continues...)

Table 6 **(continued) Characteristic values**

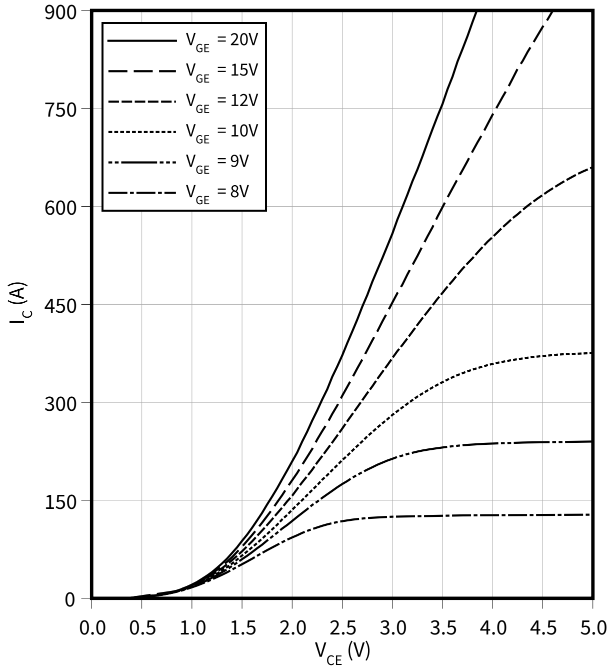
Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Recovered charge	Q_r	V_{CC} = 1800 V, I_F = 450 A, V_{GE} = -15 V, -di_F/dt = 3650 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		230		µC
			T_{vj} = 125 °C		445		
			T_{vj} = 150 °C		525		
Reverse recovery energy	E_{rec}	V_{CC} = 1800 V, I_F = 450 A, V_{GE} = -15 V, -di_F/dt = 3650 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		220		mJ
			T_{vj} = 125 °C		490		
			T_{vj} = 150 °C		595		
Thermal resistance, junction to case	R_{thJC}	per diode				45.5	K/kW
Thermal resistance, case to heat sink	R_{thCH}	per diode, λ_{grease} = 1 W/(m·K)			19.3		K/kW
Temperature under switching conditions	$T_{vj\,op}$			-40		150	°C

4 Characteristics diagrams

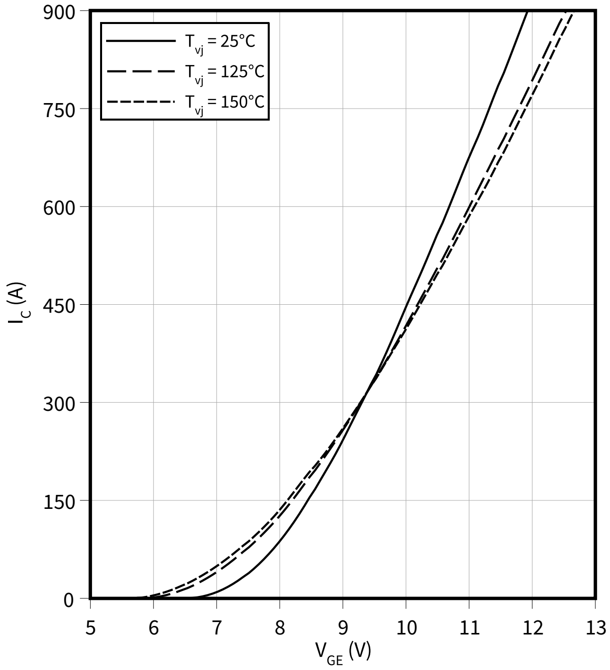
Output characteristic (typical), IGBT, Inverter
$I_C = f(V_{CE})$
$V_{GE} = 15$ V



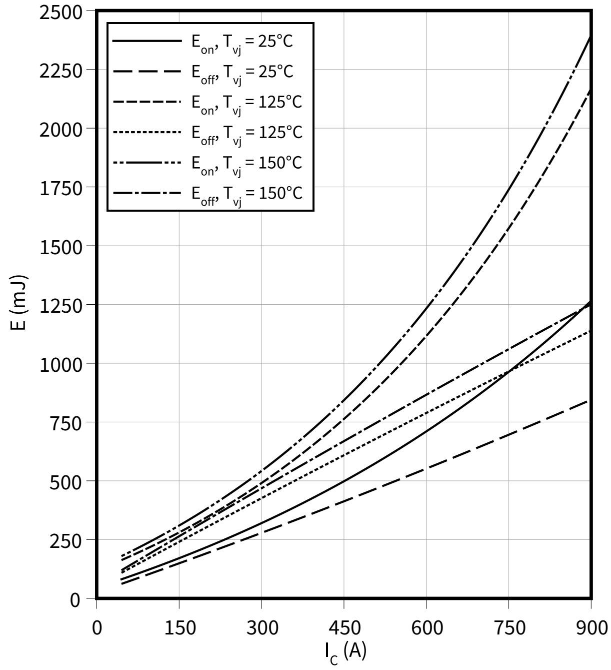
Output characteristic field (typical), IGBT, Inverter
$I_C = f(V_{CE})$
$T_{vj} = 150$ °C



Transfer characteristic (typical), IGBT, Inverter
$I_C = f(V_{GE})$
$V_{CE} = 20$ V



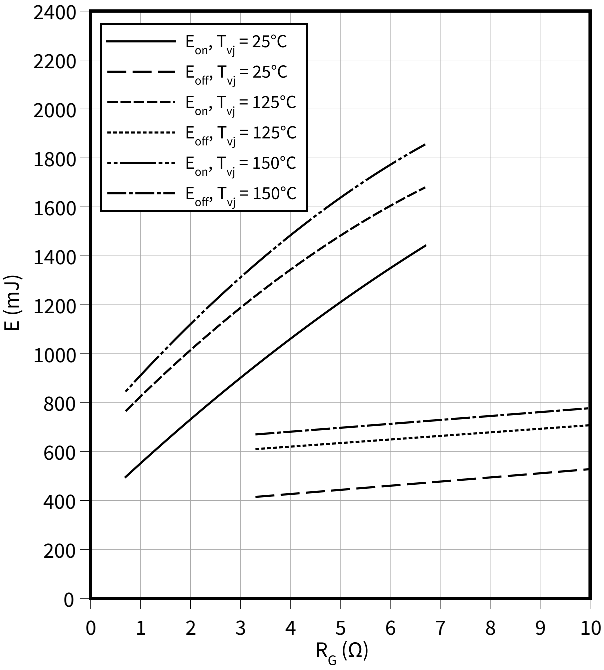
Switching losses (typical), IGBT, Inverter
$E = f(I_C)$
$R_{Goff} = 3.3\ \Omega$, $R_{Gon} = 0.7\ \Omega$, $V_{GE} = \pm15$ V, $V_{CC} = 1800$ V



Switching losses (typical), IGBT, Inverter

$E = f(R_G)$

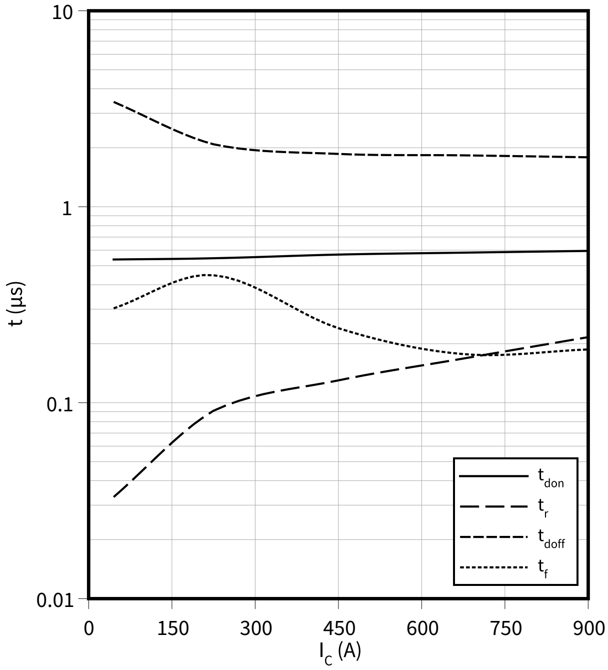
$V_{GE} = \pm 15$ V, $I_C = 450$ A, $V_{CC} = 1800$ V



Switching times (typical), IGBT, Inverter

$t = f(I_C)$

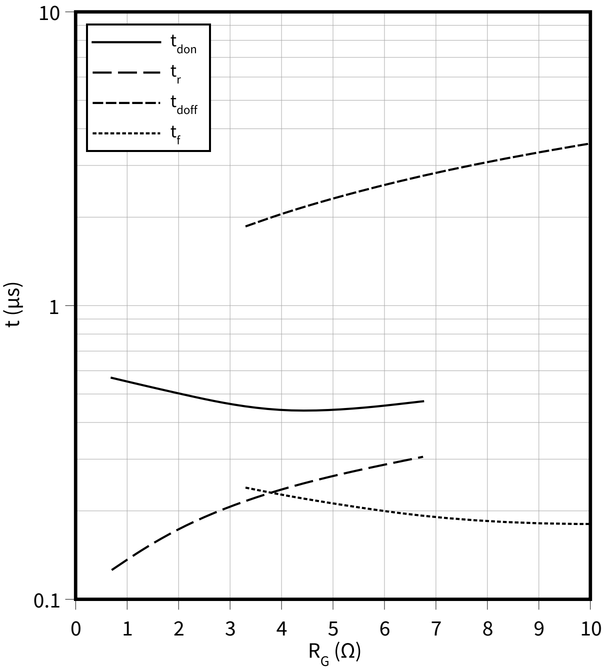
$V_{CC} = 1800$ V, $T_{vj} = 150$ °C, $R_{Goff} = 3.3$ Ω, $R_{Gon} = 0.7$ Ω, $V_{GE} = \pm 15$ V



Switching times (typical), IGBT, Inverter

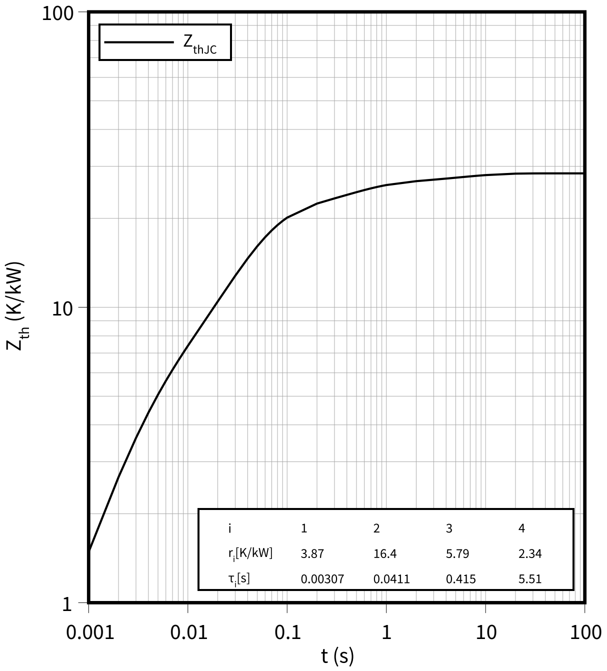
$t = f(R_G)$

$V_{GE} = \pm 15$ V, $I_C = 450$ A, $V_{CC} = 1800$ V, $T_{vj} = 150$ °C



Transient thermal impedance, IGBT, Inverter

$Z_{th} = f(t)$

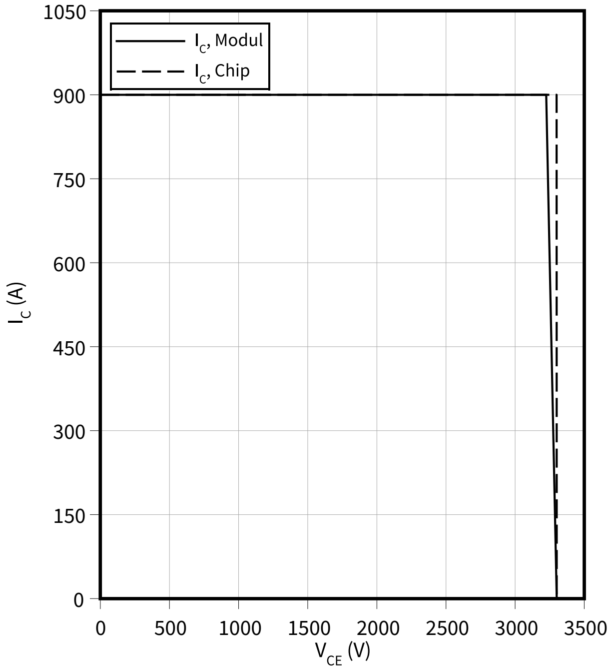


i	1	2	3	4
r_i[K/kW]	3.87	16.4	5.79	2.34
τ_i[s]	0.00307	0.0411	0.415	5.51

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

$I_C = f(V_{CE})$

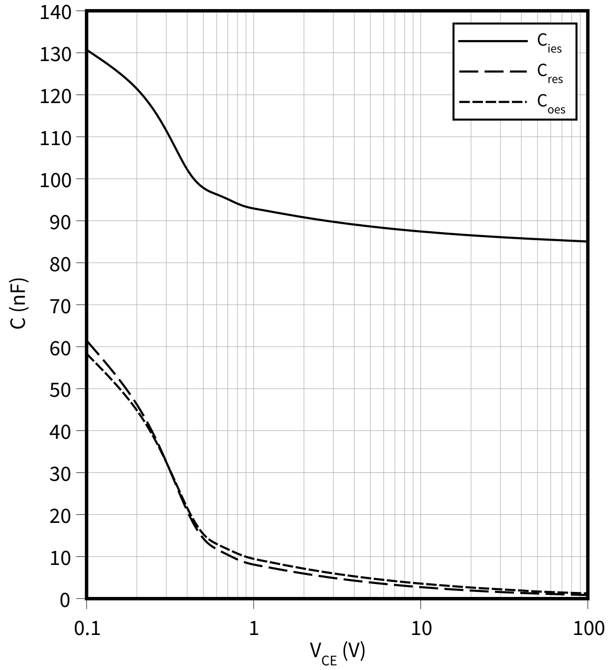
$R_{Goff} = 3.3\ \Omega$, $V_{GE} = \pm15$ V, $T_{vj} = 150$ °C



Capacity characteristic (typical), IGBT, Inverter

$C = f(V_{CE})$

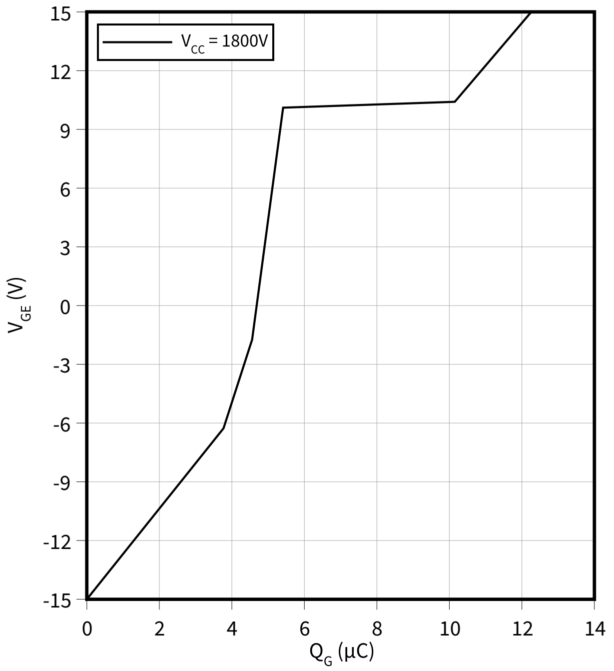
$f = 1000$ kHz, $V_{GE} = 0$ V, $T_{vj} = 25$ °C



Gate charge characteristic (typical), IGBT, Inverter

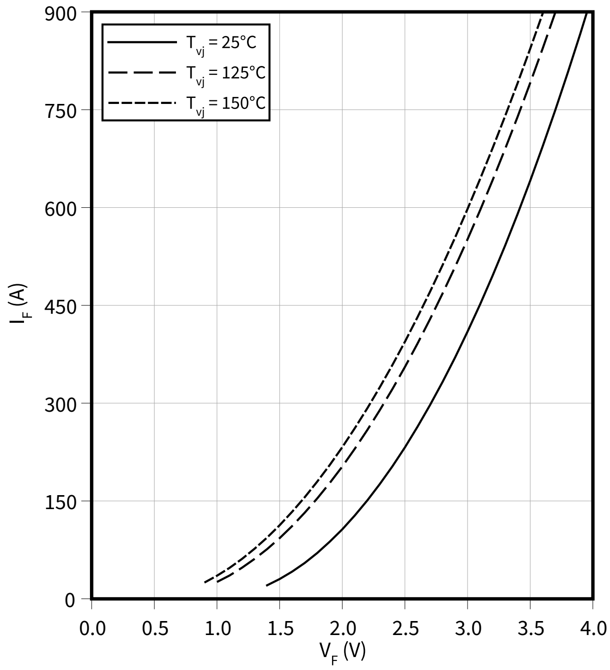
$V_{GE} = f(Q_G)$

$I_C = 450$ A, $T_{vj} = 25$ °C

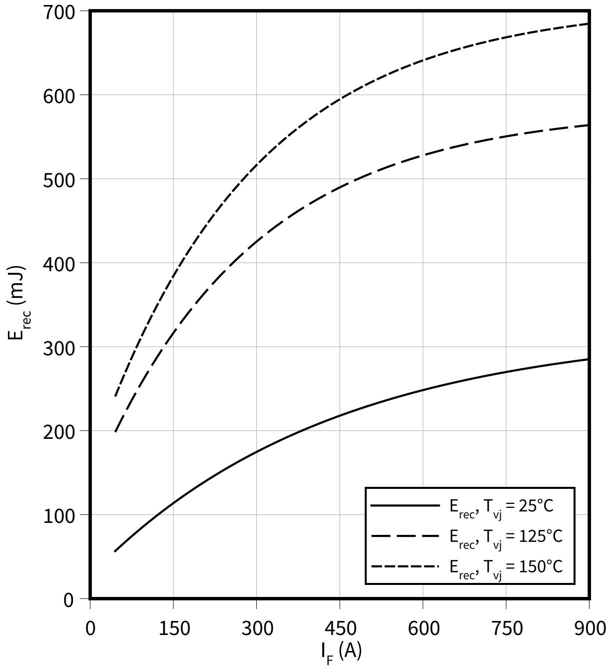


Forward characteristic (typical), Diode, Inverter

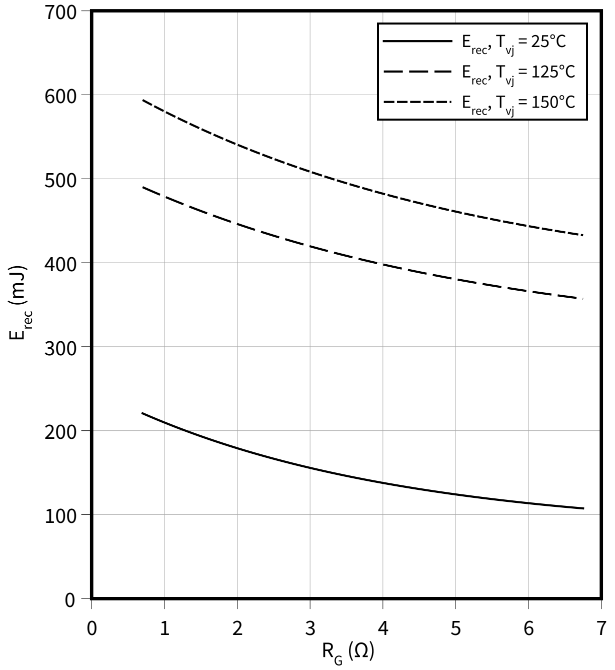
$I_F = f(V_F)$



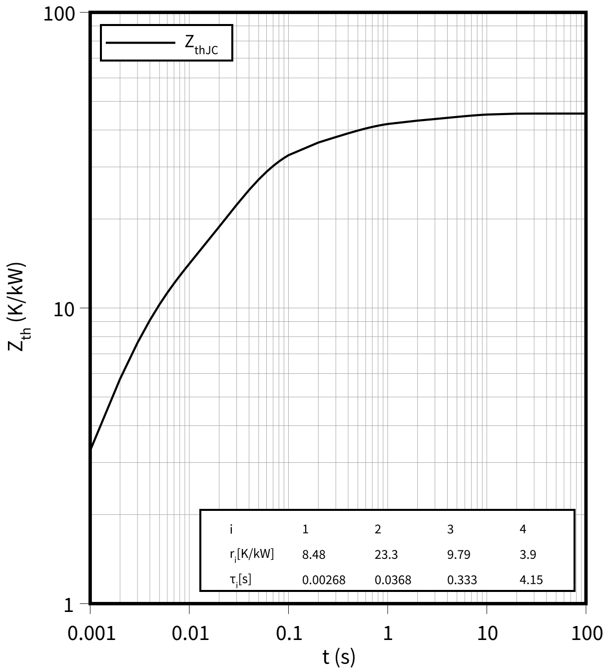
Switching losses (typical), Diode, Inverter
$E_{rec} = f(I_F)$
$V_{CE} = 1800$ V, $R_{Gon} = R_{Gon}$(IGBT)



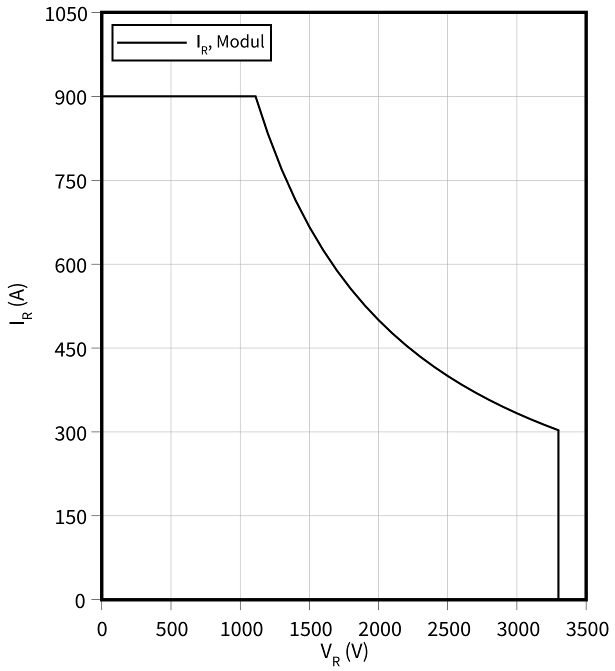
Switching losses (typical), Diode, Inverter
$E_{rec} = f(R_G)$
$V_{CE} = 1800$ V, $I_F = 450$ A



Transient thermal impedance, Diode, Inverter
$Z_{th} = f(t)$



Safe operating area (SOA), Diode, Inverter
$I_R = f(V_R)$
$T_{vj} = 150$ °C



5 Circuit diagram

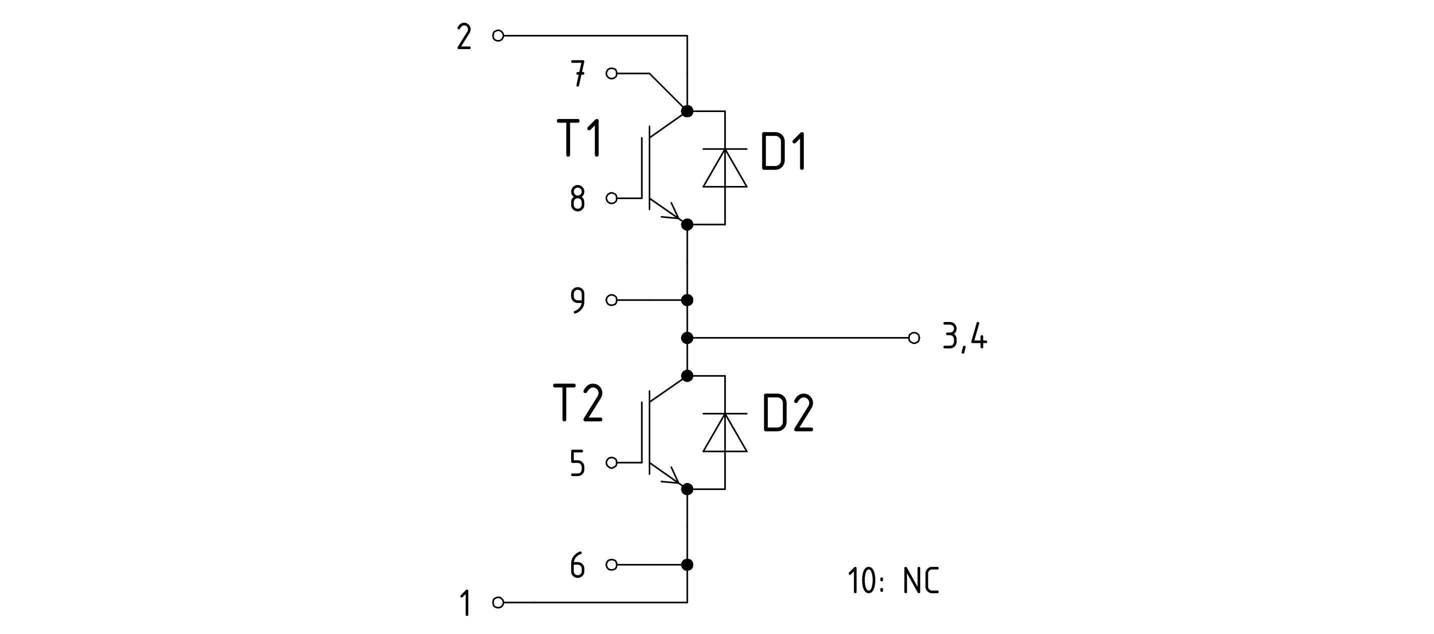


Figure 1

6 Package outlines

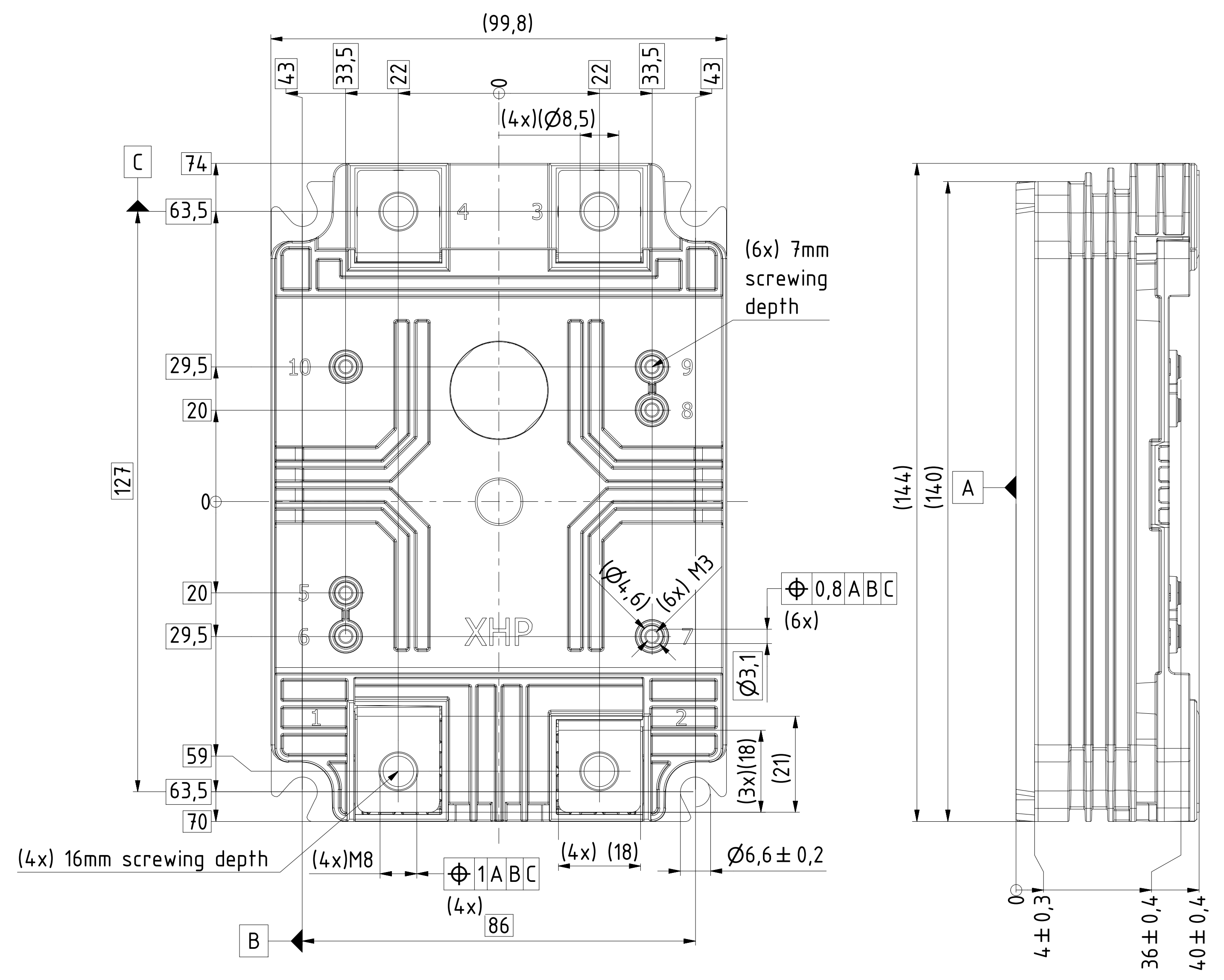


Figure 2

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	*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	71549142846550549911530	71549142846550549911530	

Figure 3

Revision history

Document revision	Date of release	Description of changes
V2.0	2018-10-08	Preliminary datasheet
V3.0	2019-01-28	Final datasheet
V3.1	2020-01-27	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	2021-11-04	Final datasheet
1.20	2022-04-06	Final datasheet
1.30	2026-03-24	Typo correction for Ic condition at Vgeth and harmonization of insulation coordination information

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