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

Features


Typical appearance

- Electrical features
  - V_{CES} = 650 V
  - $I_{C\ nom}$ = 150 A / I_{CRM} = 300 A
  - Increased blocking voltage capability up to 650 V
  - High short-circuit capability
  - $T_{vj,op}$ = 150°C
  - Trench IGBT 4
- Mechanical features
  - Integrated NTC temperature sensor
  - Copper base plate
  - PressFIT contact technology
  - Standard housing

Potential applications

- Motor drives

Product validation

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

Description

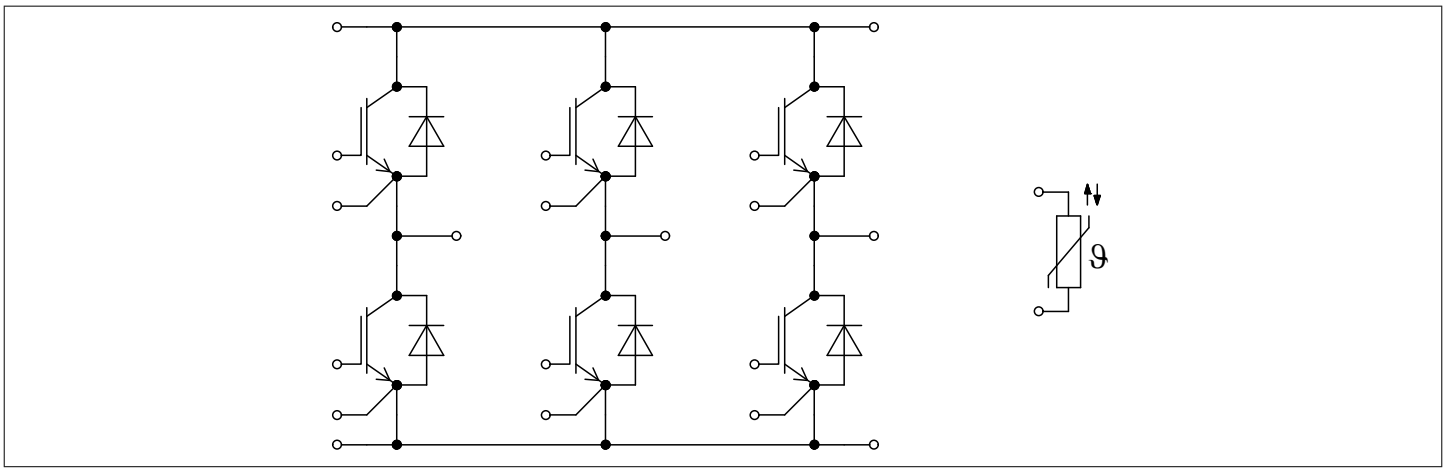


Table of contents

	Description	1
	Features	1
	Potential applications	1
	Product validation	1
	Table of contents	2
1	**Package**	3
2	**IGBT, Inverter**	3
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	2.5	kV
Material of module baseplate			Cu	
Internal isolation		basic insulation (class 1, IEC 61140)	Al_2O_3	
Creepage distance	d_{Creep}	terminal to heatsink	10.0	mm
Clearance	d_{Clear}	terminal to heatsink	7.5	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}				21		nH
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	T_C=25°C, per switch			1.8		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
Weight	*G*				300		g

***Note**: The current under continuous operation is limited to 50 A rms per connector pin.*

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	650	V
Continuous DC collector current	I_{CDC}	$T_{vj\,max}$ = 175 °C	T_C = 55 °C	150	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\,op}$		300	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 = 150 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.55	1.95	V
			T_{vj} = 125 °C		1.70		
			T_{vj} = 150 °C		1.75		
Gate threshold voltage	V_{GEth}	I_C = 2.4 mA, V_{CE} = V_{GE}, T_{vj} = 25 °C		5	5.80	6.5	V
Gate charge	Q_G	V_{GE} = ±15 V			1.5		µC
Internal gate resistor	R_{Gint}	T_{vj} = 25 °C			2		Ω
Input capacitance	C_{ies}	f = 1000 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			9.3		nF
Reverse transfer capacitance	C_{res}	f = 1000 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			0.285		nF
Collector-emitter cut-off current	I_{CES}	V_{CE} = 650 V, V_{GE} = 0 V	T_{vj} = 25 °C			1	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 = 150 A, V_{CC} = 300 V, V_{GE} = ±15 V, R_{Gon} = 3.3 Ω	T_{vj} = 25 °C		0.120		µs
			T_{vj} = 125 °C		0.140		
			T_{vj} = 150 °C		0.140		
Rise time (inductive load)	t_r	I_C = 150 A, V_{CC} = 300 V, V_{GE} = ±15 V, R_{Gon} = 3.3 Ω	T_{vj} = 25 °C		0.030		µs
			T_{vj} = 125 °C		0.040		
			T_{vj} = 150 °C		0.040		
Turn-off delay time (inductive load)	t_{doff}	I_C = 150 A, V_{CC} = 300 V, V_{GE} = ±15 V, R_{Goff} = 3.3 Ω	T_{vj} = 25 °C		0.340		µs
			T_{vj} = 125 °C		0.370		
			T_{vj} = 150 °C		0.380		
Fall time (inductive load)	t_f	I_C = 150 A, V_{CC} = 300 V, V_{GE} = ±15 V, R_{Goff} = 3.3 Ω	T_{vj} = 25 °C		0.060		µs
			T_{vj} = 125 °C		0.070		
			T_{vj} = 150 °C		0.070		
Turn-on energy loss per pulse	E_{on}	I_C = 150 A, V_{CC} = 300 V, L_σ = 30 nH, V_{GE} = ±15 V, R_{Gon} = 3.3 Ω, di/dt = 5400 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		0.94		mJ
			T_{vj} = 125 °C		1.5		
			T_{vj} = 150 °C		1.65		
Turn-off energy loss per pulse	E_{off}	I_C = 150 A, V_{CC} = 300 V, L_σ = 30 nH, V_{GE} = ±15 V, R_{Goff} = 3.3 Ω, dv/dt = 3800 V/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		5.75		mJ
			T_{vj} = 125 °C		7.4		
			T_{vj} = 150 °C		7.85		

(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, $V_{CC} = 360$ V, $V_{CEmax}=V_{CES}-L_{sCE}*di/dt$	$t_P \leq 10$ µs, $T_{vj}=25$ °C		720		A
			$t_P \leq 10$ µs, $T_{vj}=150$ °C		570		
Thermal resistance, junction to case	R_{thJC}	per IGBT				0.350	K/W
Thermal resistance, case to heat sink	R_{thCH}	per IGBT, $\lambda_{grease} = 1$ W/(m·K)			0.0850		K/W
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}		$T_{vj} = 25$ °C	650	V
Continuous DC forward current	I_F			150	A
Repetitive peak forward current	I_{FRM}	$t_P = 1$ ms		300	A
I^2t - value	I^2t	$t_P = 10$ ms, $V_R = 0$ V	$T_{vj} = 125$ °C	2050	A^2s
			$T_{vj} = 150$ °C	1950	

Table 6 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 150$ A, $V_{GE} = 0$ V	$T_{vj} = 25$ °C		1.55	1.95	V
			$T_{vj} = 125$ °C		1.50		
			$T_{vj} = 150$ °C		1.45		
Peak reverse recovery current	I_{RM}	$V_{CC} = 300$ V, $I_F = 150$ A, $V_{GE} = -15$ V, $-di_F/dt = 5400$ A/µs ($T_{vj} = 150$ °C)	$T_{vj} = 25$ °C		150		A
			$T_{vj} = 125$ °C		180		
			$T_{vj} = 150$ °C		185		
Recovered charge	Q_r	$V_{CC} = 300$ V, $I_F = 150$ A, $V_{GE} = -15$ V, $-di_F/dt = 5400$ A/µs ($T_{vj} = 150$ °C)	$T_{vj} = 25$ °C		7		µC
			$T_{vj} = 125$ °C		13		
			$T_{vj} = 150$ °C		15		

(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} = 300 V, I_F = 150 A, V_{GE} = -15 V, -di$_F$/dt = 5400 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		1.95		mJ
			T_{vj} = 125 °C		3.5		
			T_{vj} = 150 °C		3.95		
Thermal resistance, junction to case	R_{thJC}	per diode				0.600	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, λ_{grease} = 1 W/(m·K)			0.150		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		150	°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

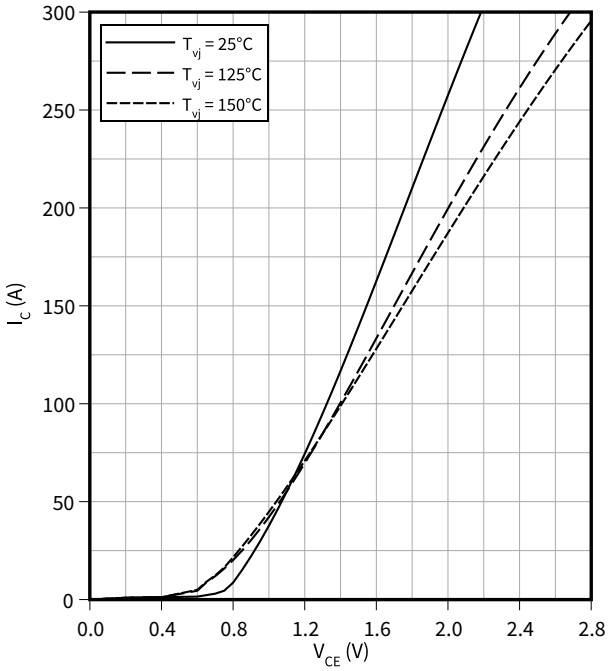
***Note**: Specification according to the valid application note.*

5 Characteristics diagrams

Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

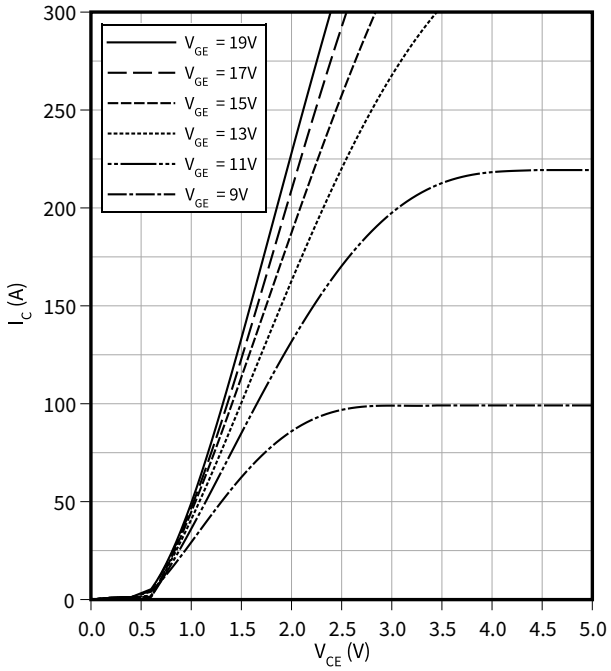
$V_{GE} = 15$ V



Output characteristic field (typical), IGBT, Inverter

$I_C = f(V_{CE})$

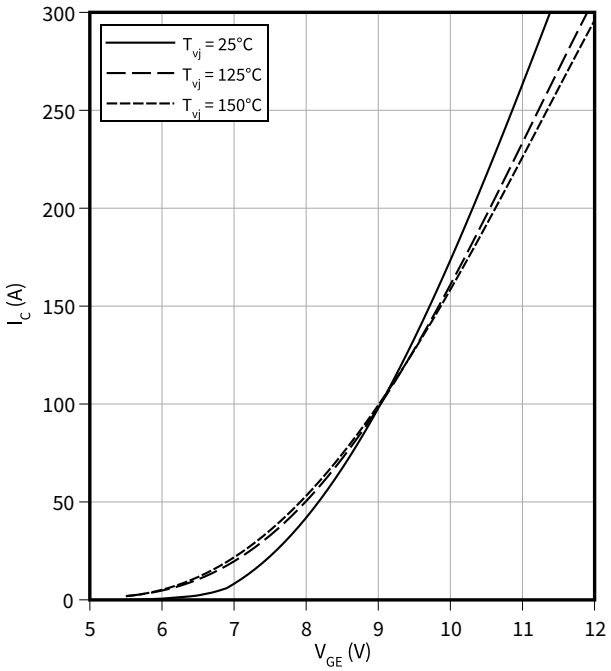
$T_{vj} = 150$ °C



Transfer characteristic (typical), IGBT, Inverter

$I_C = f(V_{GE})$

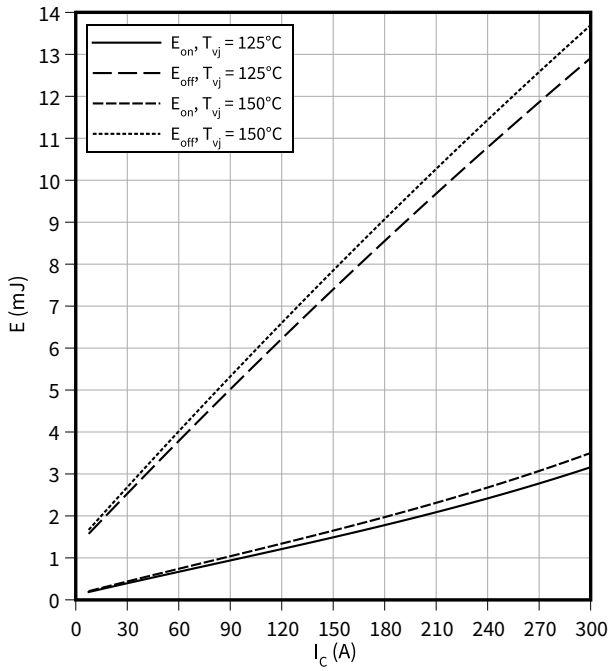
$V_{CE} = 20$ V



Switching losses (typical), IGBT, Inverter

$E = f(I_C)$

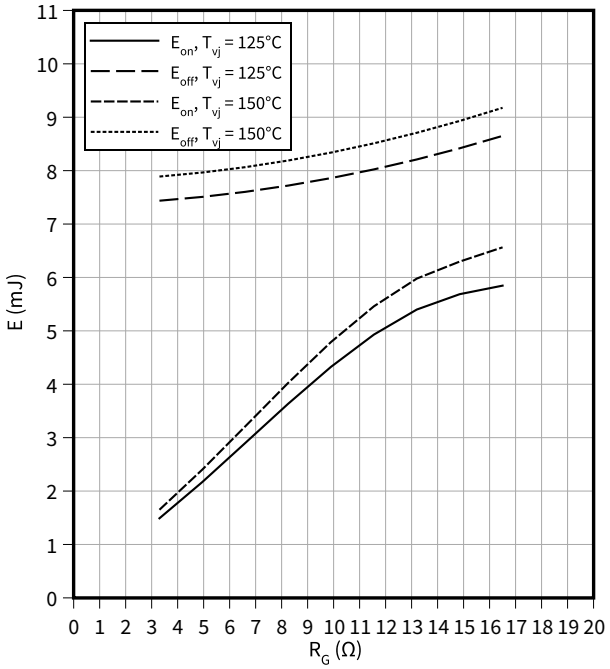
$R_{Goff} = 3.3\ \Omega$, $R_{Gon} = 3.3\ \Omega$, $V_{GE} = \pm 15$ V, $V_{CC} = 300$ V



Switching losses (typical), IGBT, Inverter

$E = f(R_G)$

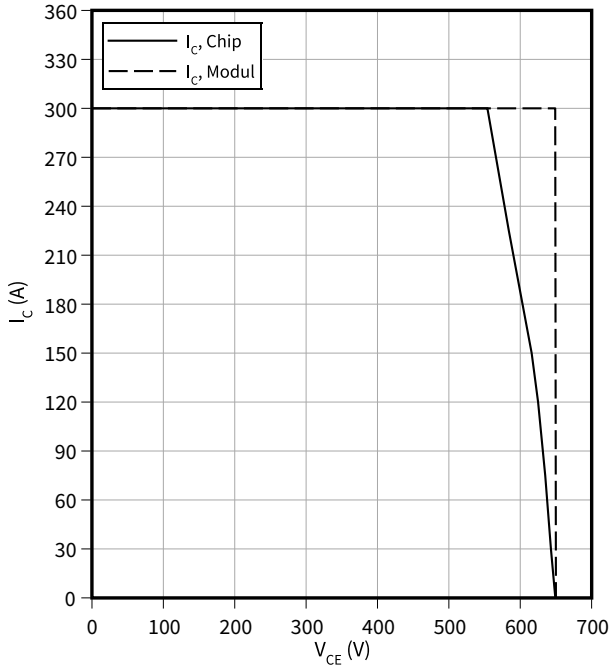
$V_{GE} = \pm 15$ V, $I_C = 150$ A, $V_{CC} = 300$ V



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

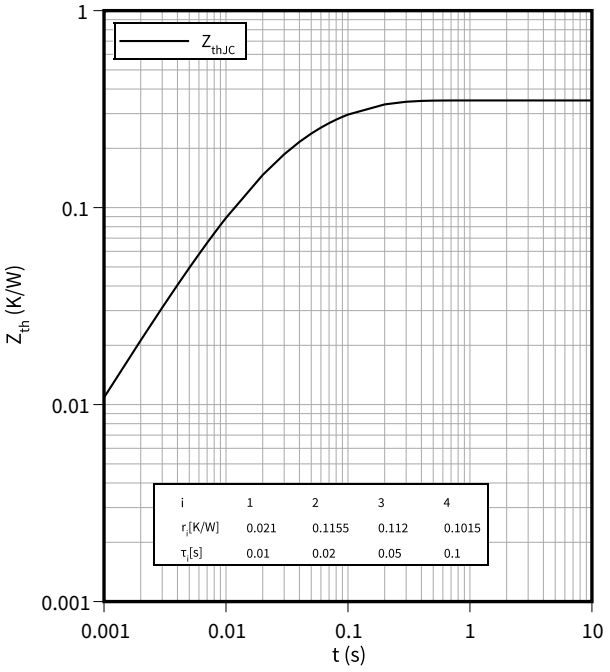
$I_C = f(V_{CE})$

$R_{Goff} = 3.3\ \Omega$, $V_{GE} = \pm 15$ V, $T_{vj} = 150$ °C



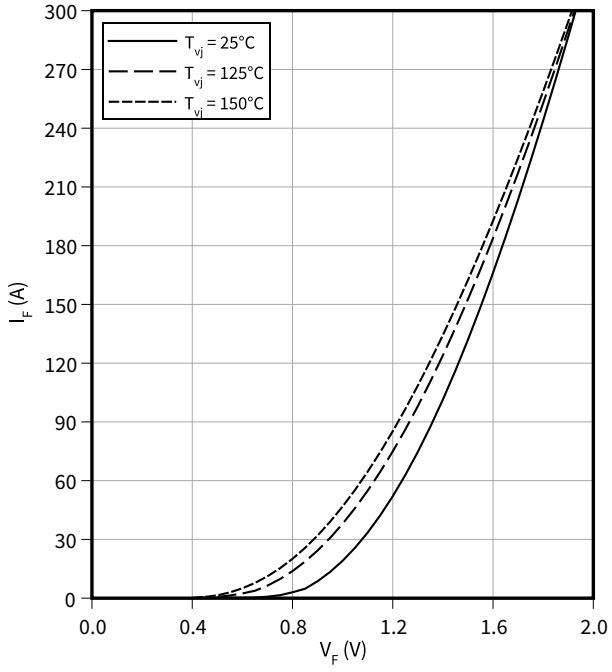
Transient thermal impedance, IGBT, Inverter

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, Inverter

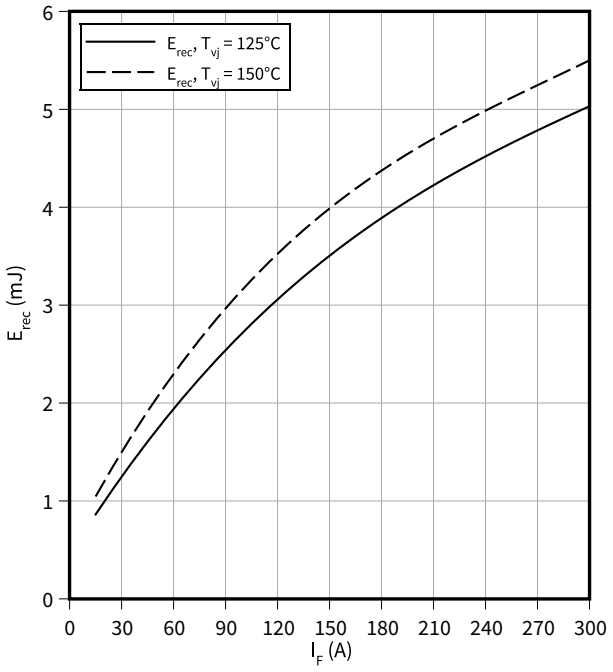
$I_F = f(V_F)$



Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$

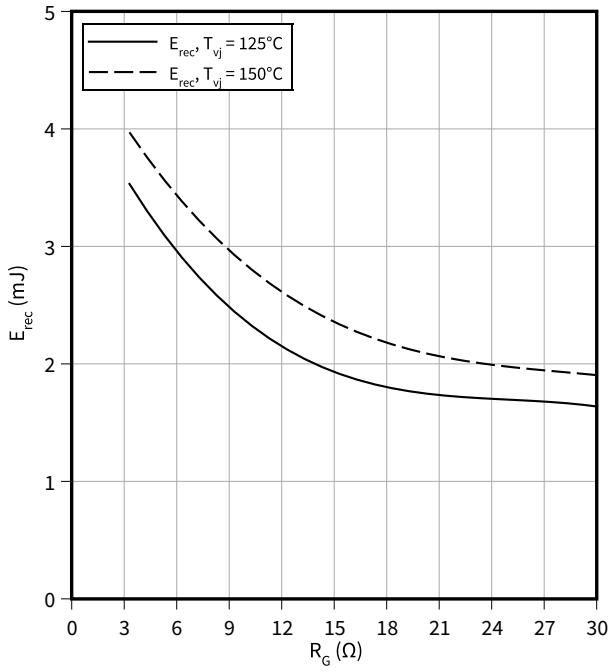
$R_{Gon} = 3.3\ \Omega$, $V_{CC} = 300\ V$



Switching losses (typical), Diode, Inverter

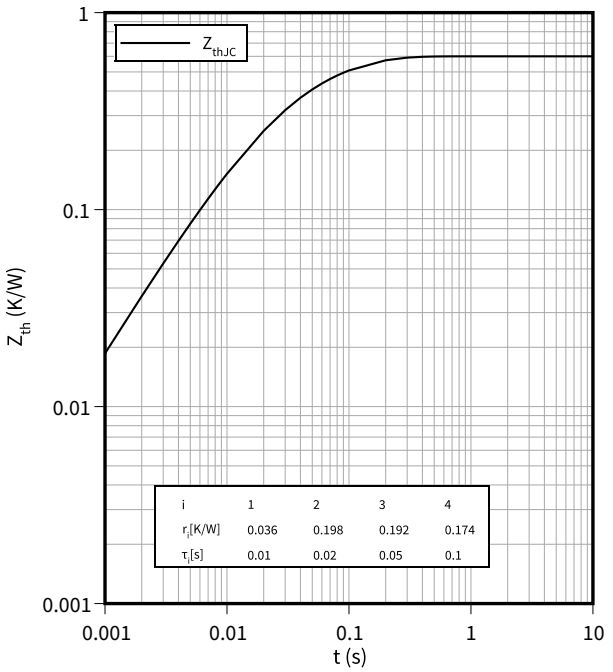
$E_{rec} = f(R_G)$

$I_F = 150\ A$, $V_{CC} = 300\ V$



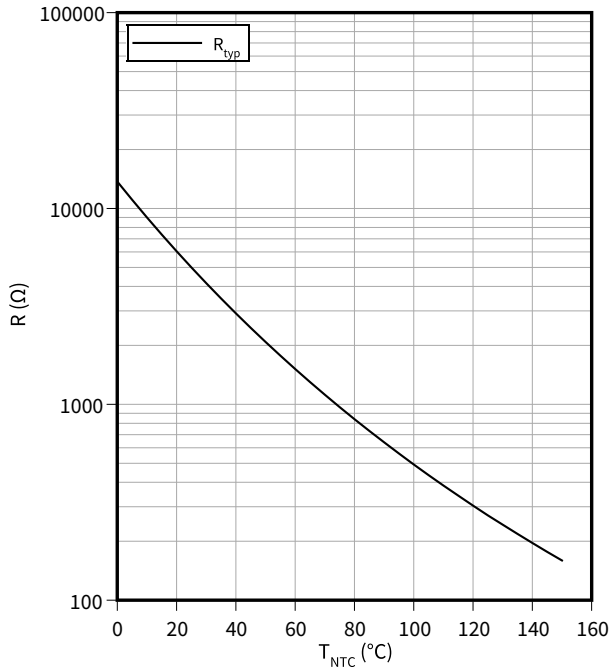
Transient thermal impedance, Diode, Inverter

$Z_{th} = f(t)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



6 Circuit diagram

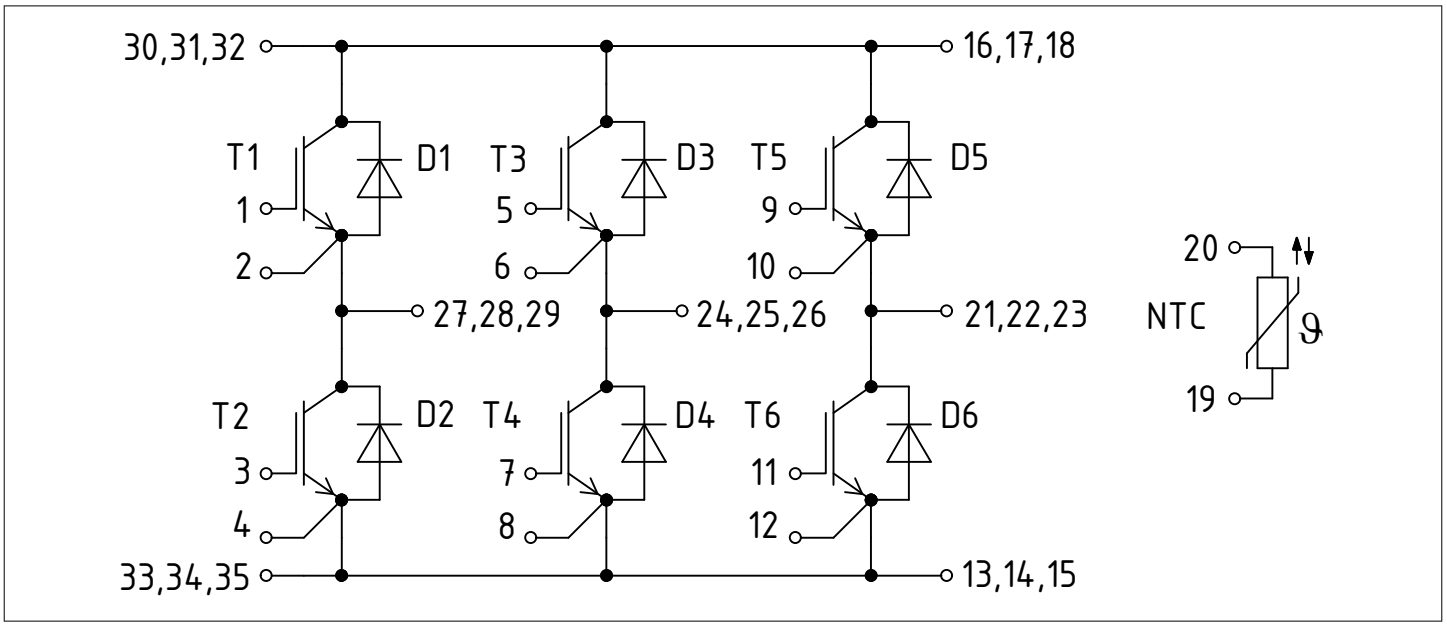


Figure 1

7 Package outlines

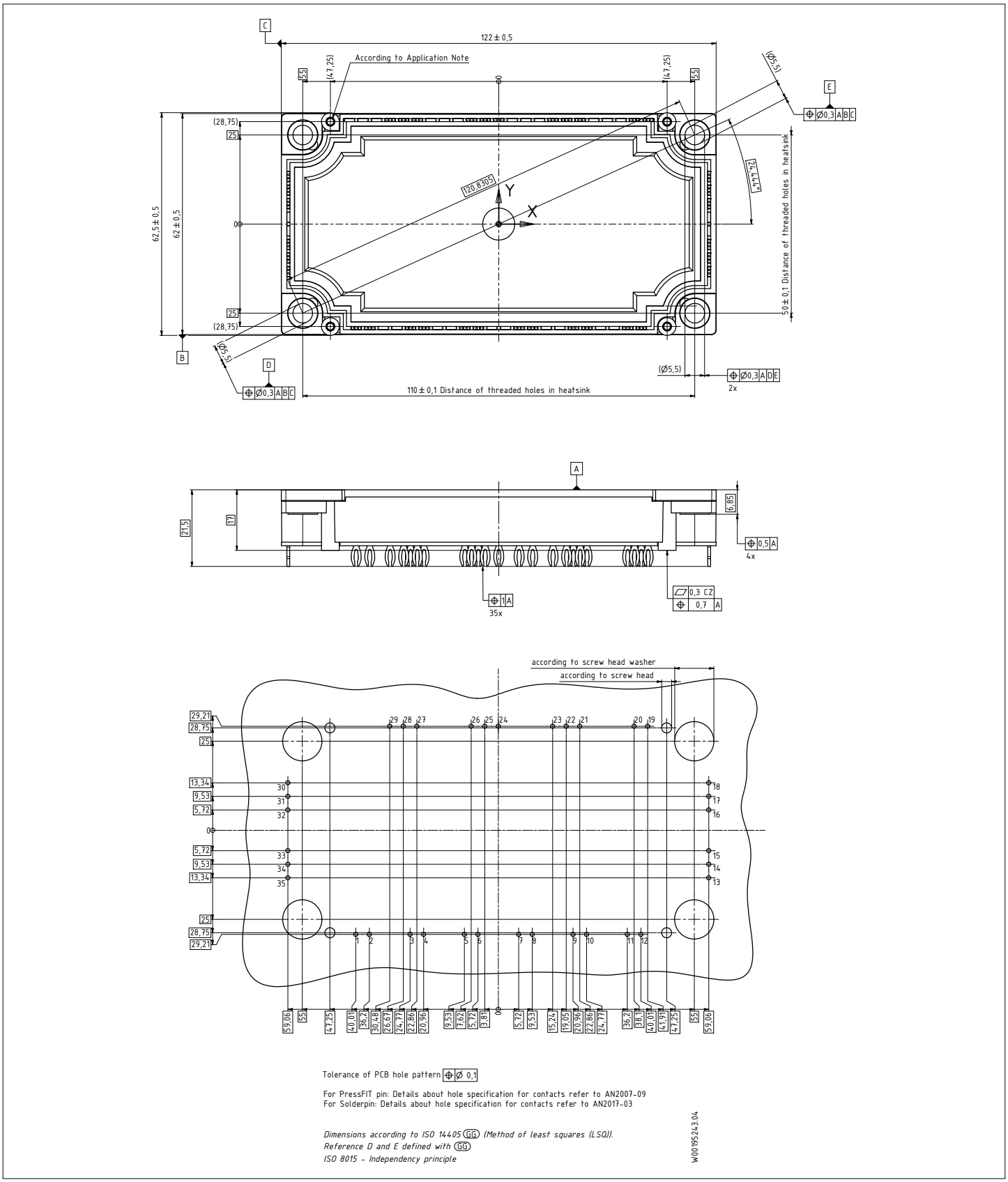


Figure 2

8 Module label code

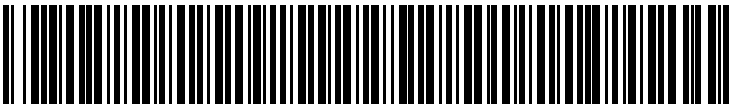
Module label code			
Code format	Data Matrix		Barcode Code128
Encoding	ASCII text		Code Set A
Symbol size	16x16		23 digits
Standard	IEC24720 and IEC16022		IEC8859-1
Code content	*Content* Module serial number Module material number Production order number Date code (production year) Date code (production 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
V2.0	2011-04-07	Preliminary 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
1.00	2024-08-27	Final datasheet

Trademarks

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

Edition 2024-08-27

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-AAW871-002

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.

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.