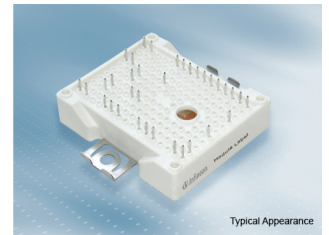


## EasyPACK™ module with Trench/Fieldstop IGBT4 and emitter controlled 4 diode and PressFIT / NTC / TIM

### Features

- Electrical features
  - $V_{CES} = 1700\text{ V}$
  - $I_{C\text{nom}} = 75\text{ A} / I_{CRM} = 150\text{ A}$
  - Low switching losses
  - Low  $V_{CE,\text{sat}}$
- Mechanical features
  - $\text{Al}_2\text{O}_3$  substrate with low thermal resistance
  - PressFIT contact technology
  - Rugged mounting due to integrated mounting clamps
  - Compact design
  - Pre-applied thermal interface material



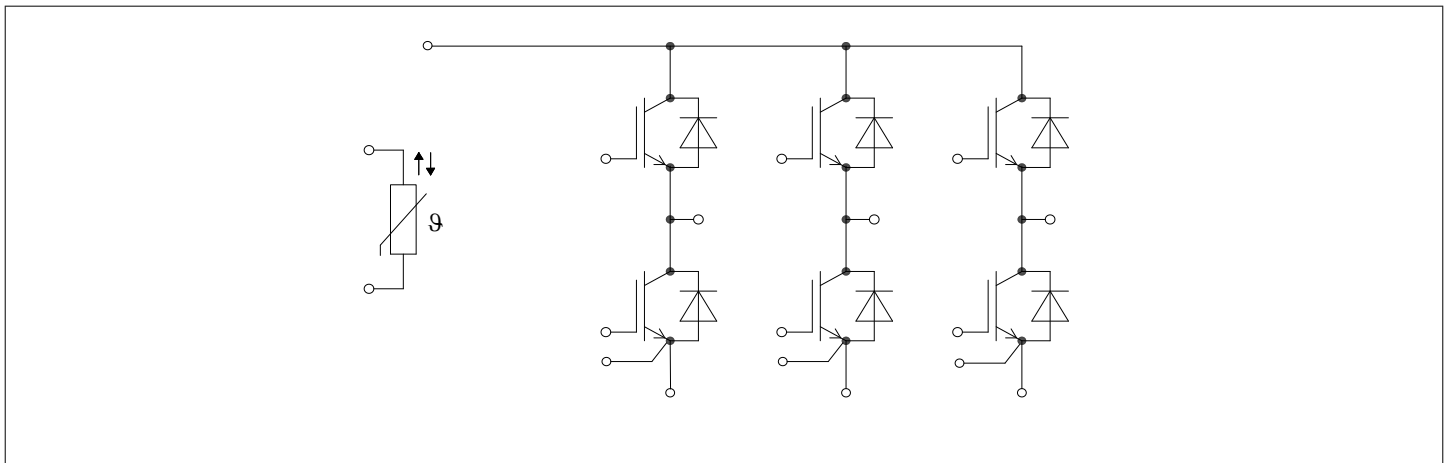
### Potential applications

- UPS systems
- Air conditioning
- Motor drives
- Servo drives

### Product validation

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

### Description



## Table of contents

	<b>Description</b> .....	1
	<b>Features</b> .....	1
	<b>Potential applications</b> .....	1
	<b>Product validation</b> .....	1
	<b>Table of contents</b> .....	2
<b>1</b>	<b>Package</b> .....	3
<b>2</b>	<b>IGBT, Inverter</b> .....	3
<b>3</b>	<b>Diode, Inverter</b> .....	5
<b>4</b>	<b>NTC-Thermistor</b> .....	6
<b>5</b>	<b>Characteristics diagrams</b> .....	7
<b>6</b>	<b>Circuit diagram</b> .....	10
<b>7</b>	<b>Package outlines</b> .....	11
<b>8</b>	<b>Module label code</b> .....	12
	<b>Revision history</b> .....	13
	<b>Disclaimer</b> .....	14

## 1 Package

**Table 1** Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	$V_{ISOL}$	RMS, $f = 50 \text{ Hz}$ , $t = 1 \text{ min}$	4.0	kV
Internal isolation		basic insulation (class 1, IEC 61140)	$Al_2O_3$	
Creepage distance	$d_{Creep}$	terminal to heatsink	11.5	mm
Creepage distance	$d_{Creep}$	terminal to terminal	6.3	mm
Clearance	$d_{Clear}$	terminal to heatsink	10.0	mm
Clearance	$d_{Clear}$	terminal to terminal	5.0	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	$L_{SCE}$			40		nH
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_H = 25^\circ\text{C}$ , per switch		4		mΩ
Storage temperature	$T_{stg}$		-40		125	°C
Maximum baseplate operation temperature	$T_{BPmax}$				125	°C
Mounting force per clamp	$F$		40		80	N
Weight	$G$			42		g

Note: The current under continuous operation is limited to  $25 A_{rms}$  per connector pin.  
Storage and shipment of modules with TIM => see AN2012-07.

## 2 IGBT, Inverter

**Table 3** Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage	$V_{CES}$		$T_{vj} = 25^\circ\text{C}$	1700	V
Implemented collector current	$I_{CN}$			75	A
Continuous DC collector current	$I_{CDC}$	$T_{vj \text{ max}} = 150^\circ\text{C}$	$T_H = 65^\circ\text{C}$	45	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 $T_{vj\ op}$	150	A
Gate-emitter peak voltage	$V_{GES}$		$\pm 20$	V

**Table 4 Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{CE\ sat}$	$I_C = 75\ A, V_{GE} = 15\ V$	$T_{vj} = 25\ ^\circ C$	1.95	2.30	V
			$T_{vj} = 125\ ^\circ C$	2.35		
			$T_{vj} = 150\ ^\circ C$	2.45		
Gate threshold voltage	$V_{GEth}$	$I_C = 3\ mA, V_{CE} = V_{GE}, T_{vj} = 25\ ^\circ C$	5.35	5.80	6.25	V
Gate charge	$Q_G$	$V_{GE} = \pm 15\ V, V_{CC} = 900\ V$		0.9		$\mu C$
Internal gate resistor	$R_{Gint}$	$T_{vj} = 25\ ^\circ C$		8.5		$\Omega$
Input capacitance	$C_{ies}$	$f = 1000\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$		6.8		nF
Reverse transfer capacitance	$C_{res}$	$f = 1000\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$		0.22		nF
Collector-emitter cut-off current	$I_{CES}$	$V_{CE} = 1700\ V, V_{GE} = 0\ V$	$T_{vj} = 25\ ^\circ C$		35	$\mu A$
Gate-emitter leakage current	$I_{GES}$	$V_{CE} = 0\ V, V_{GE} = 20\ V, T_{vj} = 25\ ^\circ C$			100	nA
Turn-on delay time (inductive load)	$t_{don}$	$I_C = 75\ A, V_{CC} = 900\ V, V_{GE} = \pm 15\ V, R_{Gon} = 1\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.170		$\mu s$
			$T_{vj} = 125\ ^\circ C$	0.188		
			$T_{vj} = 150\ ^\circ C$	0.193		
Rise time (inductive load)	$t_r$	$I_C = 75\ A, V_{CC} = 900\ V, V_{GE} = \pm 15\ V, R_{Gon} = 1\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.031		$\mu s$
			$T_{vj} = 125\ ^\circ C$	0.035		
			$T_{vj} = 150\ ^\circ C$	0.036		
Turn-off delay time (inductive load)	$t_{doff}$	$I_C = 75\ A, V_{CC} = 900\ V, V_{GE} = \pm 15\ V, R_{Goff} = 1\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.405		$\mu s$
			$T_{vj} = 125\ ^\circ C$	0.532		
			$T_{vj} = 150\ ^\circ C$	0.568		
Fall time (inductive load)	$t_f$	$I_C = 75\ A, V_{CC} = 900\ V, V_{GE} = \pm 15\ V, R_{Goff} = 1\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.288		$\mu s$
			$T_{vj} = 125\ ^\circ C$	0.526		
			$T_{vj} = 150\ ^\circ C$	0.598		
Turn-on energy loss per pulse	$E_{on}$	$I_C = 75\ A, V_{CC} = 900\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Gon} = 1\ \Omega, di/dt = 1800\ A/\mu s (T_{vj} = 150\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$	17.8		mJ
			$T_{vj} = 125\ ^\circ C$	24.8		
			$T_{vj} = 150\ ^\circ C$	27.3		

**(table continues...)**

**Table 4** (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Turn-off energy loss per pulse	$E_{off}$	$I_C = 75 \text{ A}, V_{CC} = 900 \text{ V}, L_\sigma = 35 \text{ nH}, V_{GE} = \pm 15 \text{ V}, R_{Goff} = 1 \Omega, dv/dt = 3050 \text{ V}/\mu\text{s} (T_{vj} = 150 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$	15.7		mJ	
			$T_{vj} = 125 \text{ }^\circ\text{C}$	25.4			
			$T_{vj} = 150 \text{ }^\circ\text{C}$	28.2			
SC data	$I_{SC}$	$V_{GE} \leq 15 \text{ V}, V_{CC} = 1000 \text{ V}, V_{CEmax} = V_{CES} - L_{SCE} * di/dt$	$t_p \leq 10 \mu\text{s}, T_{vj} = 150 \text{ }^\circ\text{C}$	350		A	
Thermal resistance, junction to heat sink	$R_{thJH}$	per IGBT, Valid with IFX pre-applied Thermal Interface Material				0.632	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	$I_F$		50	A	
Repetitive peak forward current	$I_{FRM}$	$t_p = 1 \text{ ms}$	100	A	
$I^2t$ - value	$I^2t$	$t_p = 10 \text{ ms}, V_R = 0 \text{ V}$	$T_{vj} = 125 \text{ }^\circ\text{C}$	425	$\text{A}^2\text{s}$
			$T_{vj} = 150 \text{ }^\circ\text{C}$	390	

**Table 6** Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	$V_F$	$I_F = 50 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$	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	$I_{RM}$	$V_{CC} = 900 \text{ V}, I_F = 50 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 1600 \text{ A}/\mu\text{s} (T_{vj} = 150 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$	145		A
			$T_{vj} = 125 \text{ }^\circ\text{C}$	152		
			$T_{vj} = 150 \text{ }^\circ\text{C}$	154		
Recovered charge	$Q_r$	$V_{CC} = 900 \text{ V}, I_F = 50 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 1600 \text{ A}/\mu\text{s} (T_{vj} = 150 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$	12.6		$\mu\text{C}$
			$T_{vj} = 125 \text{ }^\circ\text{C}$	19		
			$T_{vj} = 150 \text{ }^\circ\text{C}$	21.6		

(table continues...)

**Table 6 (continued) Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Reverse recovery energy	$E_{rec}$	$V_{CC} = 900\text{ V}$ , $I_F = 50\text{ A}$ , $V_{GE} = -15\text{ V}$ , $-di_F/dt = 1600\text{ A}/\mu\text{s}$ ( $T_{vj} = 150\text{ °C}$ )	$T_{vj} = 25\text{ °C}$	9.1		mJ
			$T_{vj} = 125\text{ °C}$	15.8		
			$T_{vj} = 150\text{ °C}$	17.9		
Thermal resistance, junction to heat sink	$R_{thJH}$	per diode, Valid with IFX pre-applied Thermal Interface Material			1.16	K/W
Temperature under switching conditions	$T_{vj\text{ op}}$		-40		150	°C

## 4 NTC-Thermistor

**Table 7 Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	$R_{25}$	$T_{NTC} = 25\text{ °C}$		5		kΩ
Deviation of $R_{100}$	$\Delta R/R$	$T_{NTC} = 100\text{ °C}$ , $R_{100} = 493\text{ }\Omega$	-5		5	%
Power dissipation	$P_{25}$	$T_{NTC} = 25\text{ °C}$			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

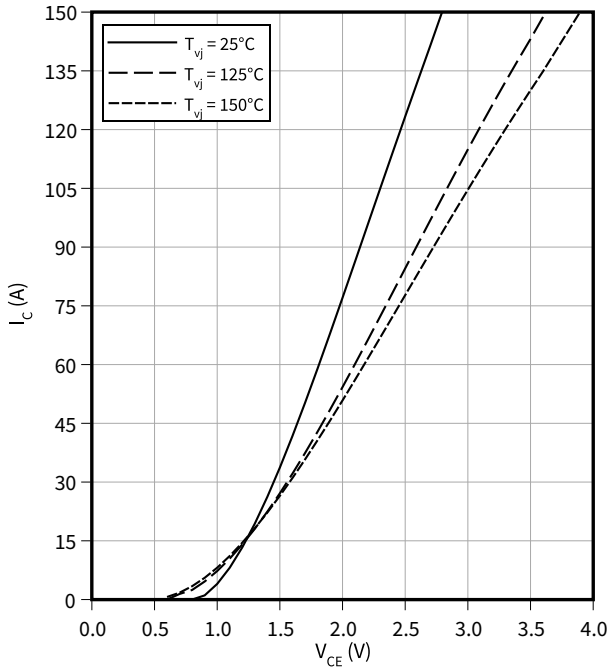
Note: Specification according to the valid application note.

## 5 Characteristics diagrams

### Output characteristic (typical), IGBT, Inverter

$$I_C = f(V_{CE})$$

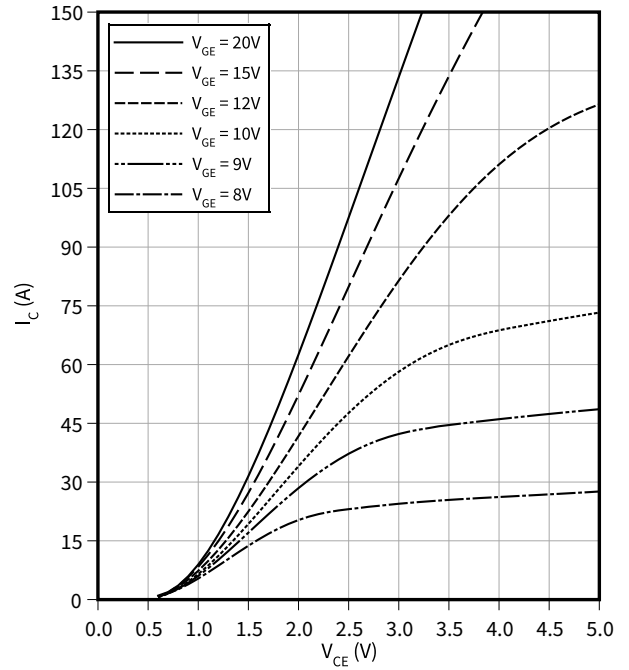
$$V_{GE} = 15 \text{ V}$$



### Output characteristic field (typical), IGBT, Inverter

$$I_C = f(V_{CE})$$

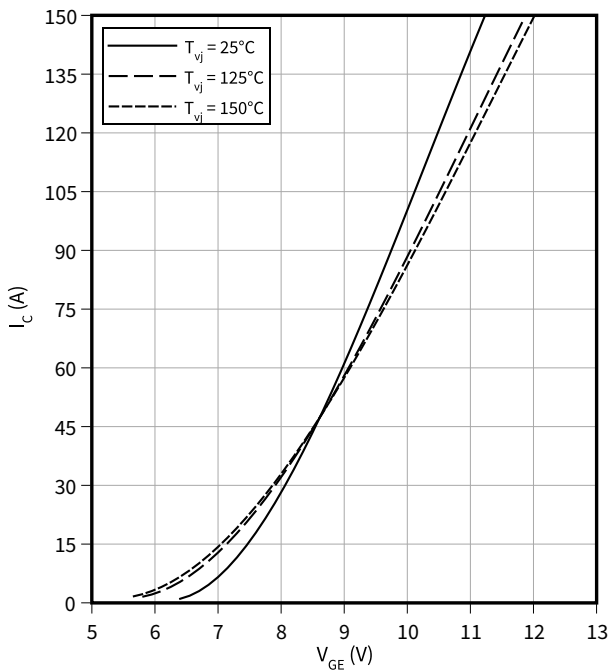
$$T_{vj} = 150 \text{ °C}$$



### Transfer characteristic (typical), IGBT, Inverter

$$I_C = f(V_{GE})$$

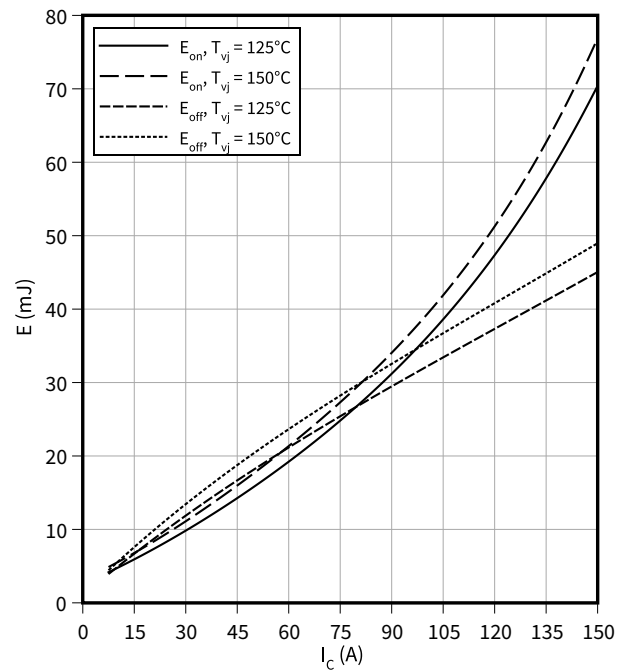
$$V_{CE} = 20 \text{ V}$$



### Switching losses (typical), IGBT, Inverter

$$E = f(I_C)$$

$$R_{Goff} = 1 \text{ } \Omega, R_{Gon} = 1 \text{ } \Omega, V_{CC} = 900 \text{ V}, V_{GE} = \pm 15 \text{ V}$$

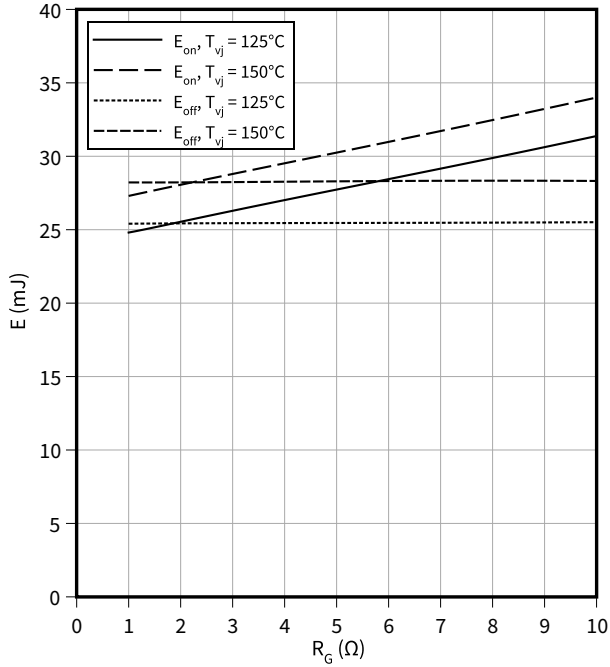


5 Characteristics diagrams

**Switching losses (typical), IGBT, Inverter**

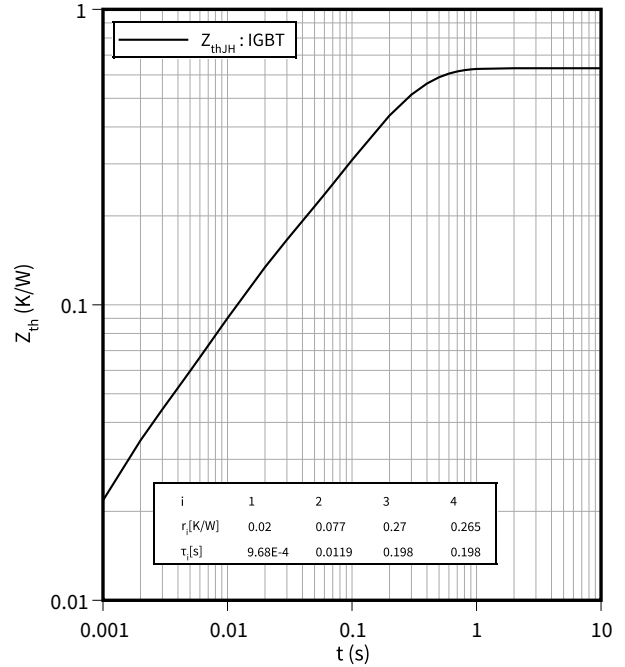
$E = f(R_G)$

$I_C = 75 \text{ A}, V_{CC} = 900 \text{ V}, V_{GE} = \pm 15 \text{ V}$



**Transient thermal impedance, IGBT, Inverter**

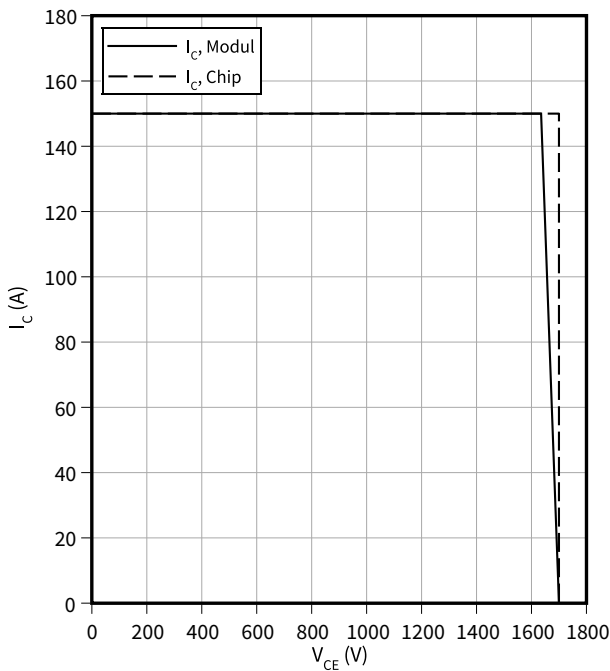
$Z_{th} = f(t)$



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

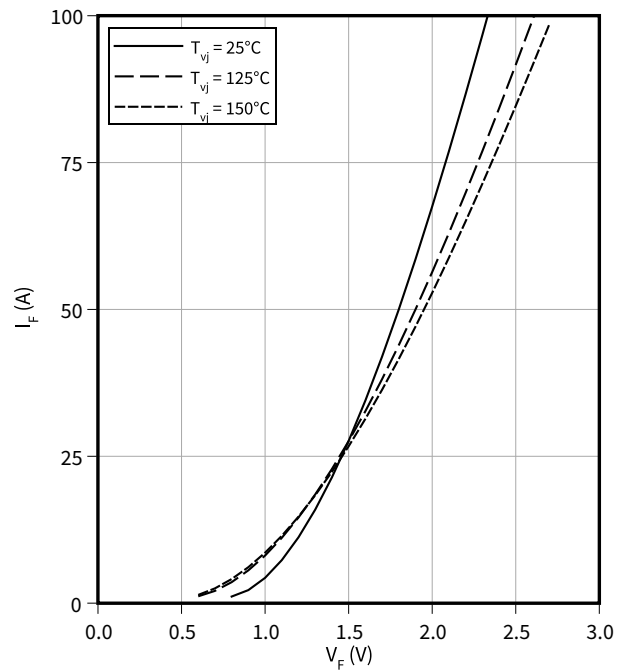
$I_C = f(V_{CE})$

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



**Forward characteristic (typical), Diode, Inverter**

$I_F = f(V_F)$

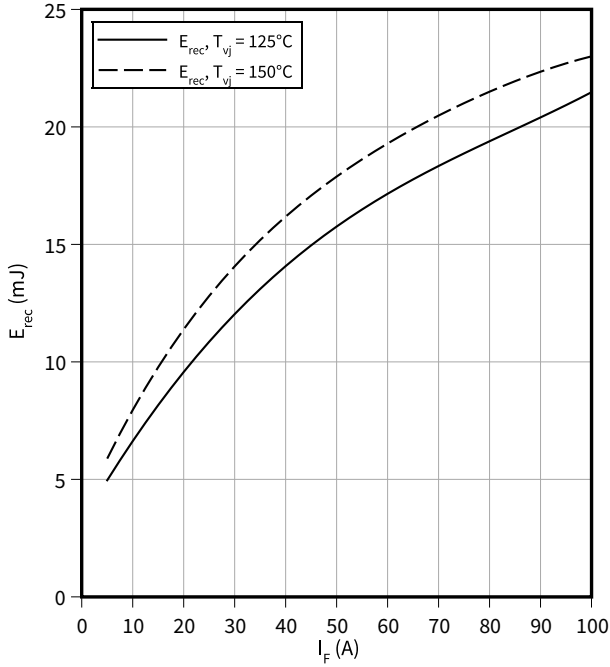




5 Characteristics diagrams

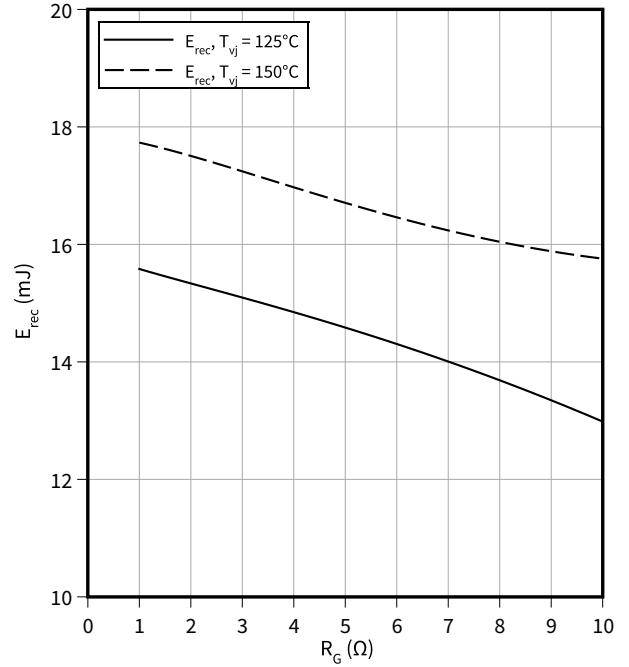
**Switching losses (typical), Diode, Inverter**

$E_{rec} = f(I_F)$   
 $V_{CE} = 900\text{ V}, R_G = 1\ \Omega$



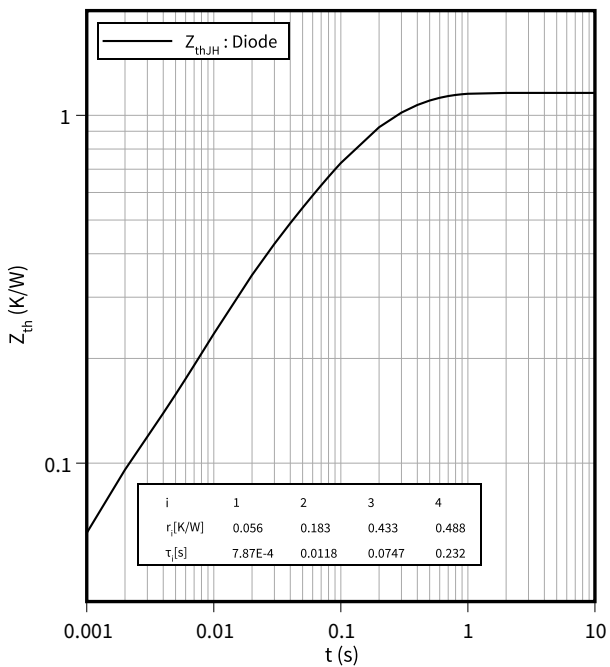
**Switching losses (typical), Diode, Inverter**

$E_{rec} = f(R_G)$   
 $V_{CE} = 900\text{ V}, I_F = 50\text{ A}$



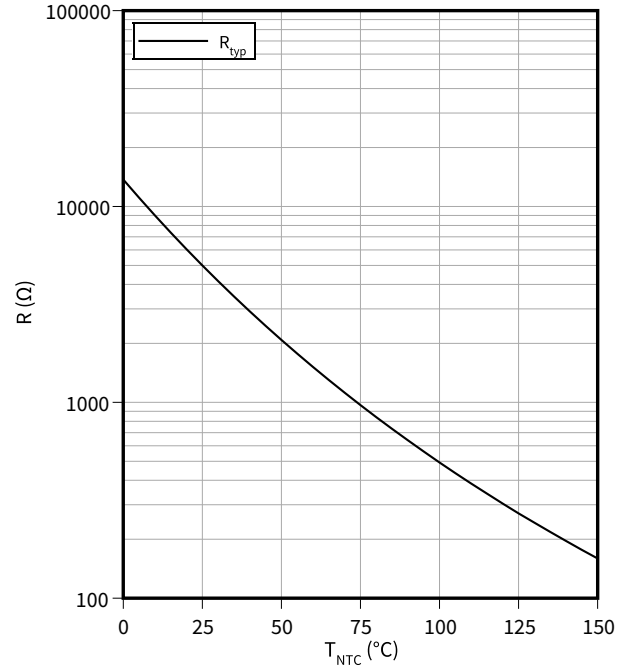
**Transient thermal impedance, Diode, Inverter**

$Z_{th} = f(t)$



**Temperature characteristic (typical), NTC-Thermistor**

$R = f(T_{NTC})$



## 6 Circuit diagram

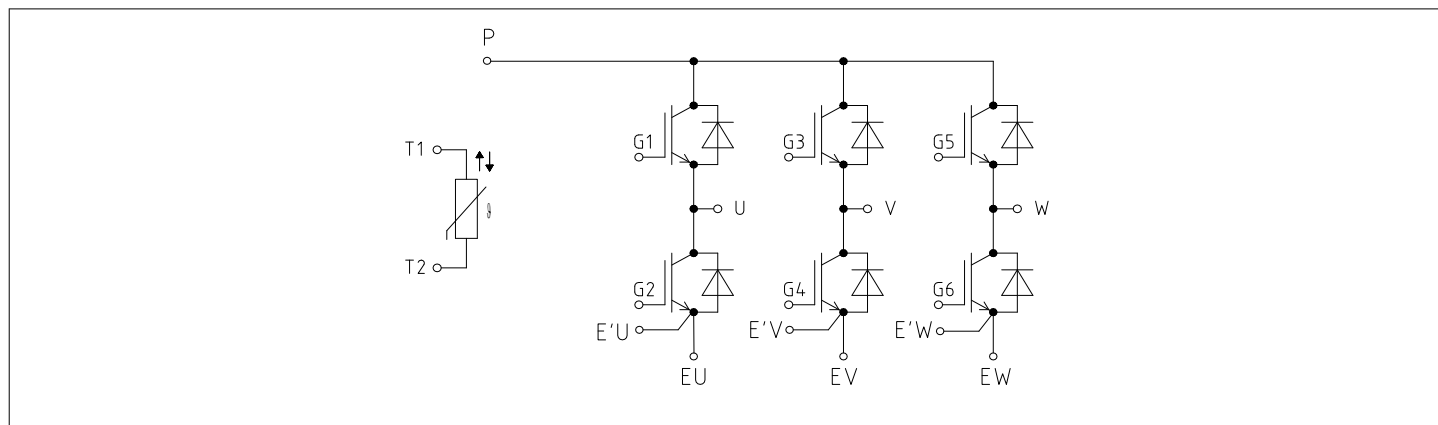


Figure 1

## 7 Package outlines

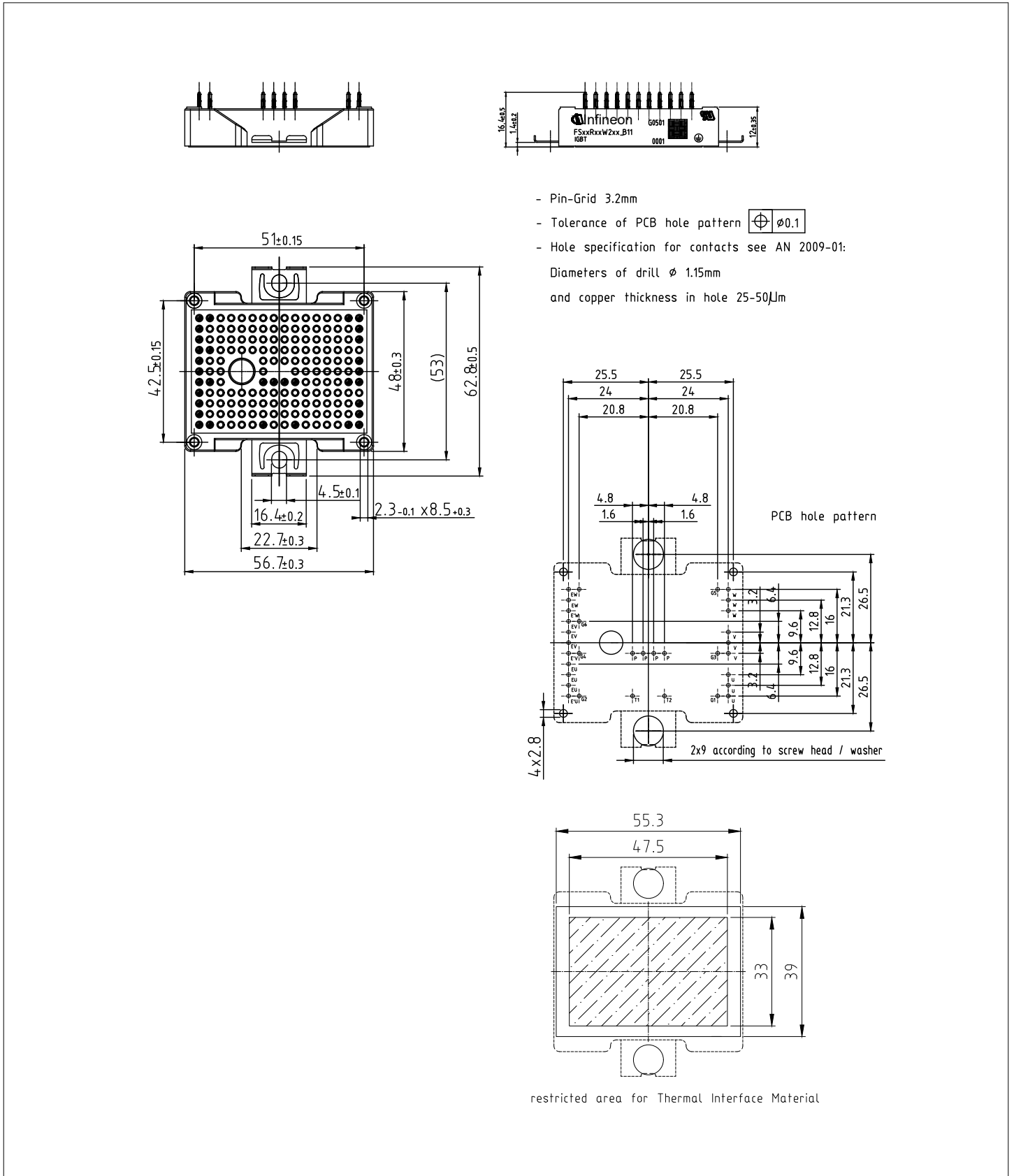

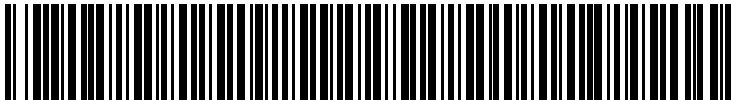


Figure 2

## 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
0.10	2021-09-21	Initial version
0.20	2022-04-12	Preliminary datasheet
1.00	2022-06-27	Final datasheet

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**Document reference**

**IFX-ABB291-003**

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