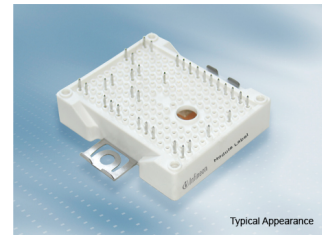


EasyPACK™ module with Trench/Fieldstop IGBT4 and emitter controlled 4 diode and PressFIT / NTC / TIM

Features

- Electrical features
 - $V_{CES} = 1700\text{ V}$
 - $I_{C\text{ nom}} = 75\text{ A} / I_{CRM} = 150\text{ A}$
 - Low switching losses
 - Low $V_{CE,sat}$
- Mechanical features
 - Al_2O_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

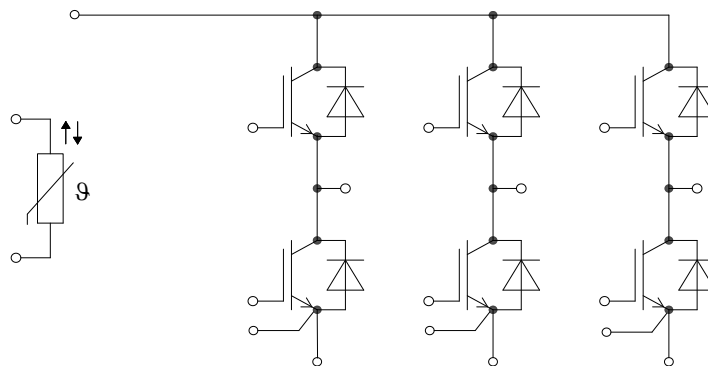


Table of contents

	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, $f = 50 \text{ Hz}$, $t = 1 \text{ min}$	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}	$T_{vj \max} = 150^\circ\text{C}$	$T_H = 65^\circ\text{C}$	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}		± 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		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\ ^\circ C$		8.5		Ω
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	μA
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		μs
			$T_{vj} = 125\ ^\circ C$	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		μs
			$T_{vj} = 125\ ^\circ C$	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		μs
			$T_{vj} = 125\ ^\circ C$	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		μs
			$T_{vj} = 125\ ^\circ C$	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}	$V_{GE} \leq 15 \text{ V}$, $V_{CC} = 1000 \text{ V}$, $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	$t_p \leq 10 \mu\text{s}$, $T_{vj} = 150 \text{ }^\circ\text{C}$	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	A^2s
			$T_{vj} = 150\text{ }^{\circ}\text{C}$	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		μC
			$T_{vj} = 125 \text{ }^\circ\text{C}$	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}	$V_{CC} = 900 \text{ V}$, $I_F = 50 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 1600 \text{ A}/\mu\text{s}$ ($T_{vj} = 150 \text{ }^\circ\text{C}$)		9.1		mJ
				15.8		
				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	$T_{vj op}$		-40		150	$^\circ\text{C}$

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

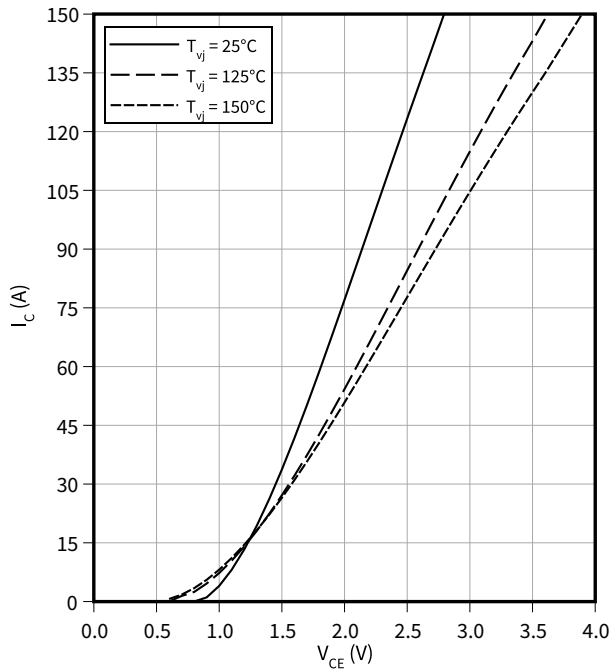
Note: Specification according to the valid application note.

5 Characteristics diagrams

Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

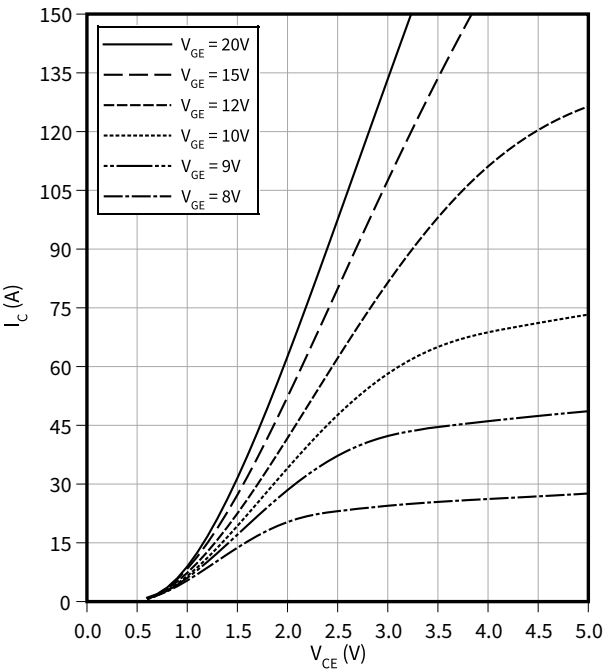
$V_{GE} = 15\text{ V}$



Output characteristic field (typical), IGBT, Inverter

$I_C = f(V_{CE})$

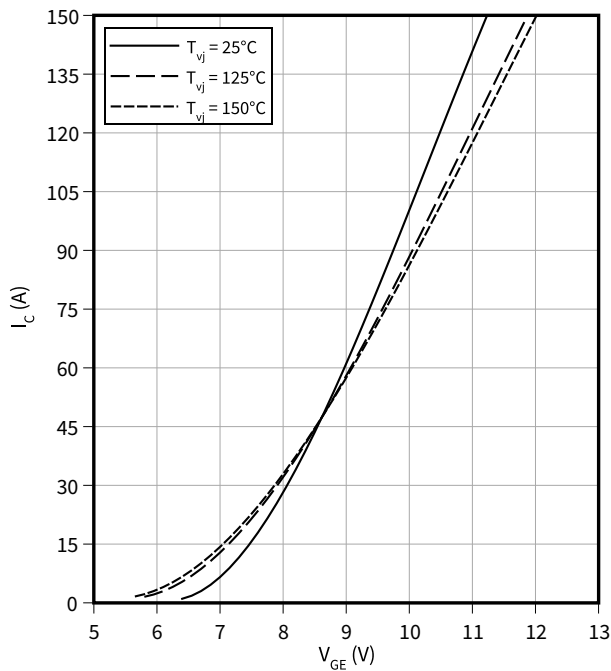
$T_{vj} = 150^\circ\text{C}$



Transfer characteristic (typical), IGBT, Inverter

$I_C = f(V_{GE})$

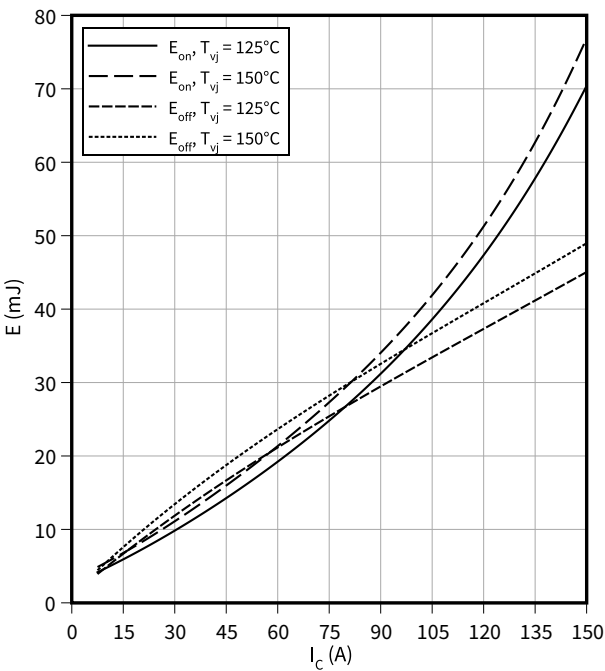
$V_{CE} = 20\text{ V}$



Switching losses (typical), IGBT, Inverter

$E = f(I_C)$

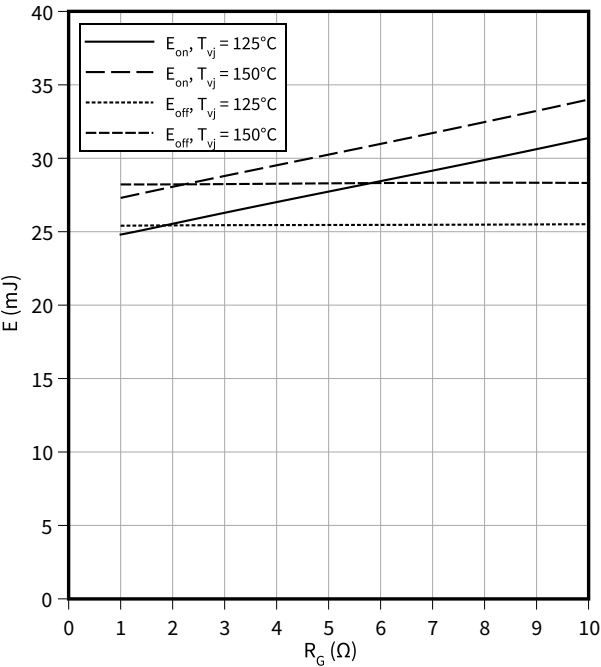
$R_{Goff} = 1\ \Omega$, $R_{Gon} = 1\ \Omega$, $V_{CC} = 900\text{ V}$, $V_{GE} = \pm 15\text{ V}$



5 Characteristics diagrams

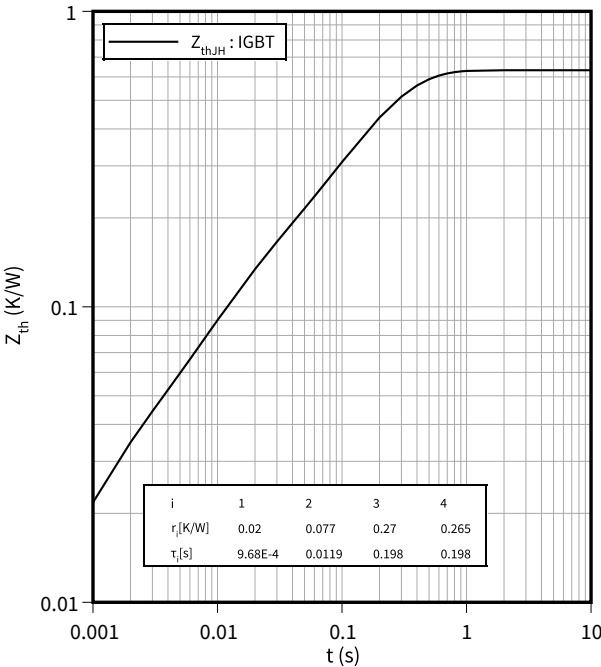
Switching losses (typical), IGBT, Inverter

$E = f(R_G)$
 $I_C = 75\text{ A}$, $V_{CC} = 900\text{ V}$, $V_{GE} = \pm 15\text{ V}$



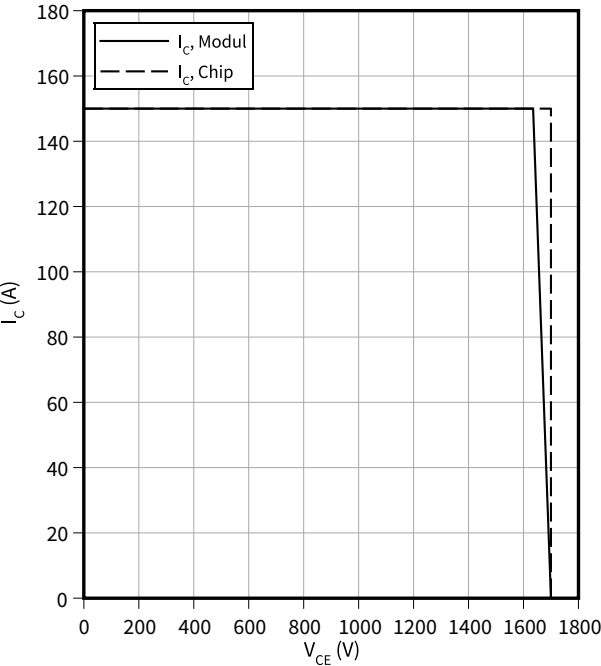
Transient thermal impedance , IGBT, Inverter

$Z_{th} = f(t)$



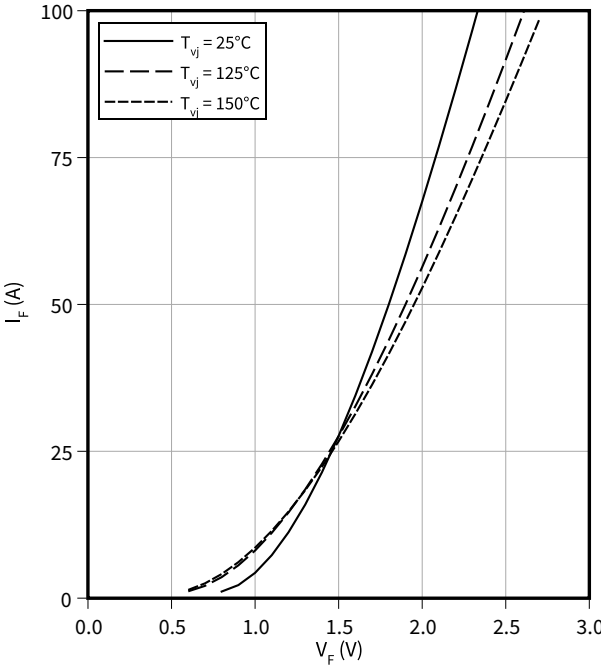
Reverse bias safe operating area (RBSOA), IGBT, Inverter

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



Forward characteristic (typical), Diode, Inverter

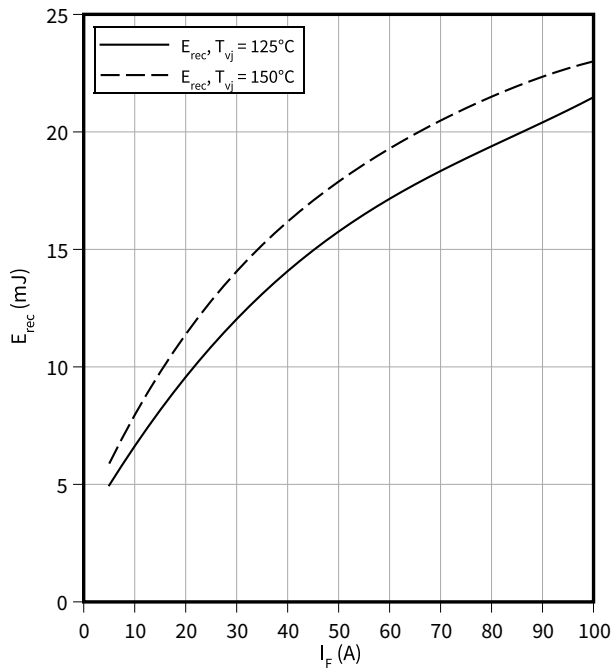
$I_F = f(V_F)$



5 Characteristics diagrams

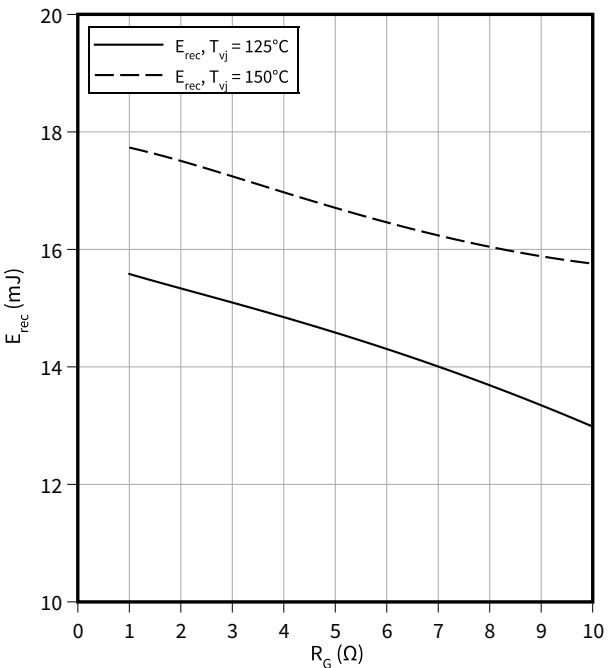
Switching losses (typical), Diode, Inverter

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



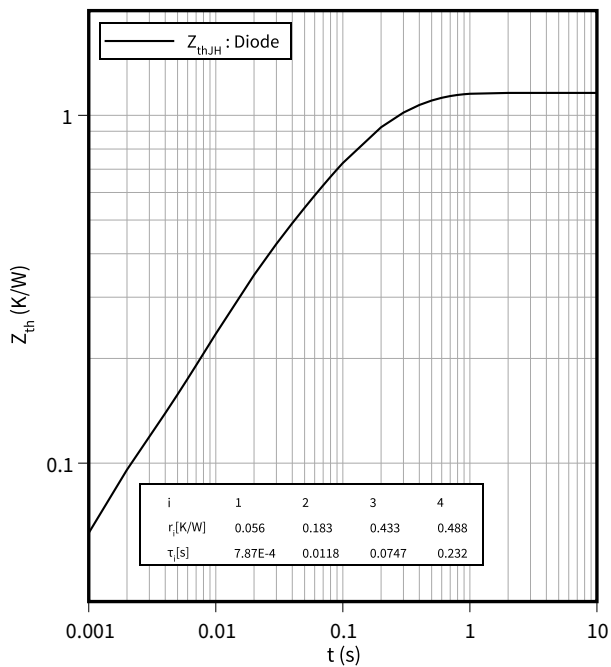
Switching losses (typical), Diode, Inverter

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



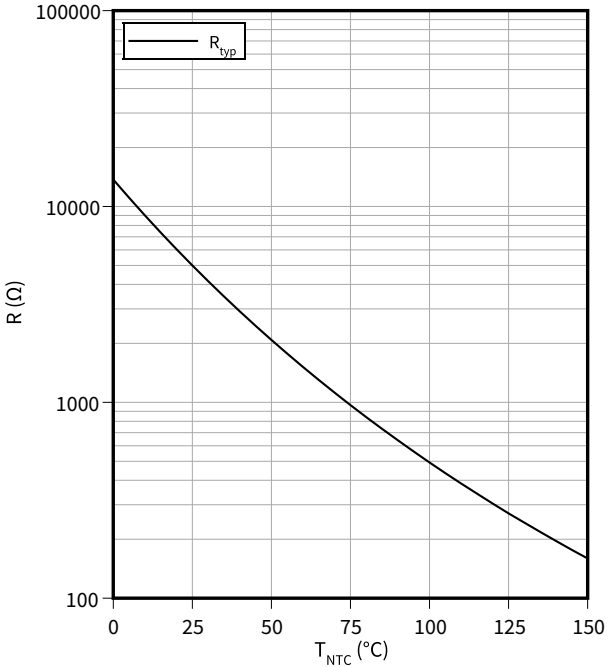
Transient thermal impedance, Diode, Inverter

$Z_{th} = f(t)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



6 Circuit diagram

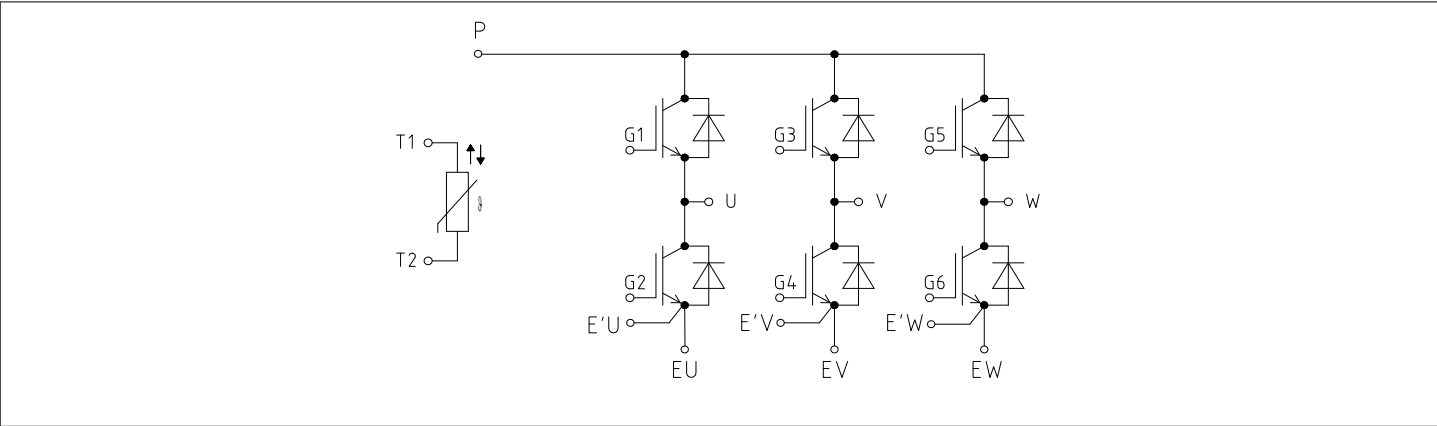


Figure 1

7 Package outlines

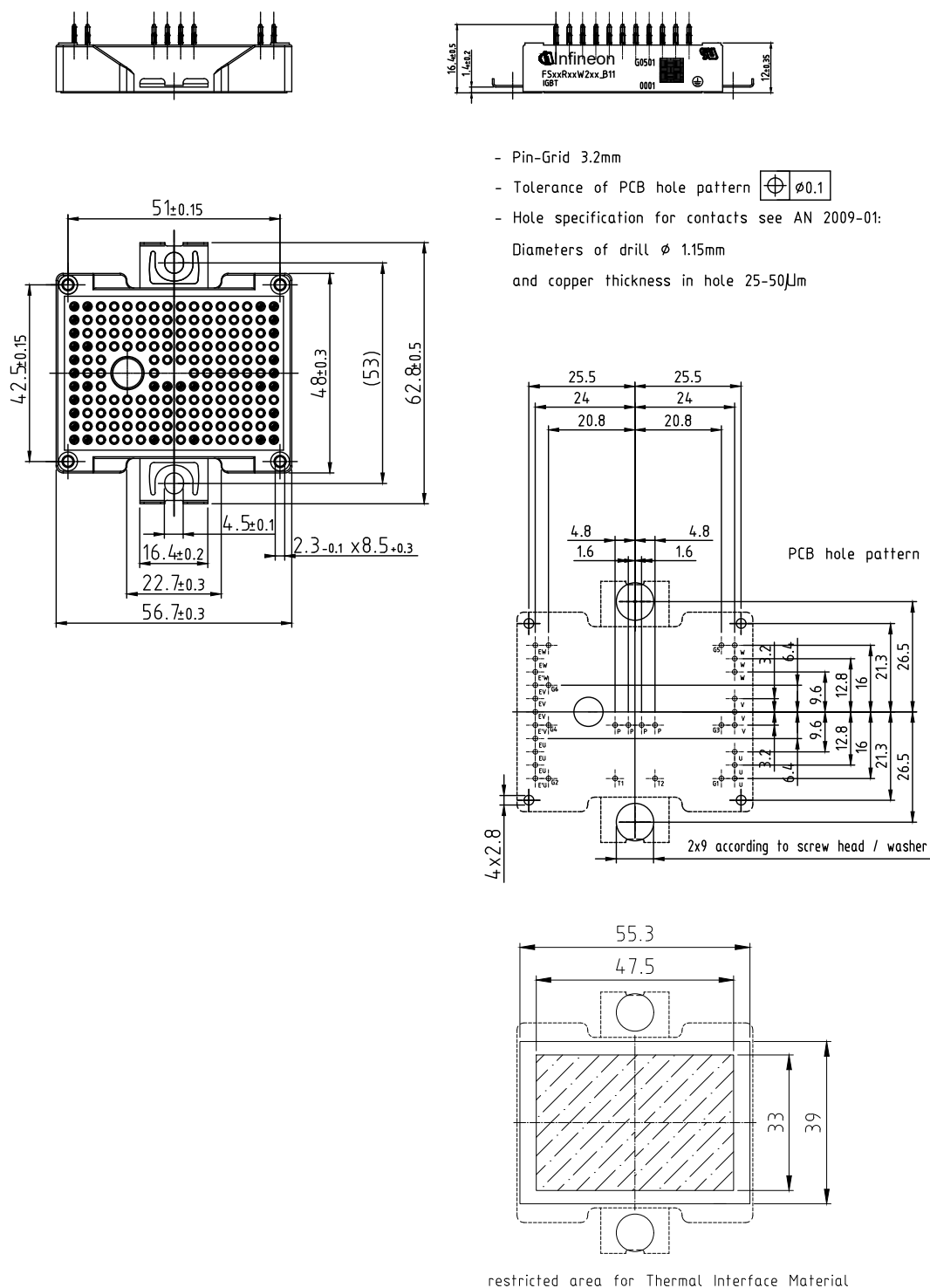


Figure 2

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>	<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

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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