Highly insulated module

Features

- Electrical features
  - V_{CES} = 4500 V
  - $I_{C\ nom}$ = 400 A / I_{CRM} = 800 A
  - High DC stability
  - High surge current capability
  - High dynamic robustness
- Mechanical features
  - High creepage and clearance distances
  - AlSiC base plate for increased thermal cycling capability
  - Package with enhanced insulation of 10.4 kV AC 60 s
  - Package with CTI > 600

Potential applications

- Motor drives
- Multi-level inverter
- Traction drives
- Wind turbines
- Medium-voltage converters
- High-power converters

Product validation

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

Description

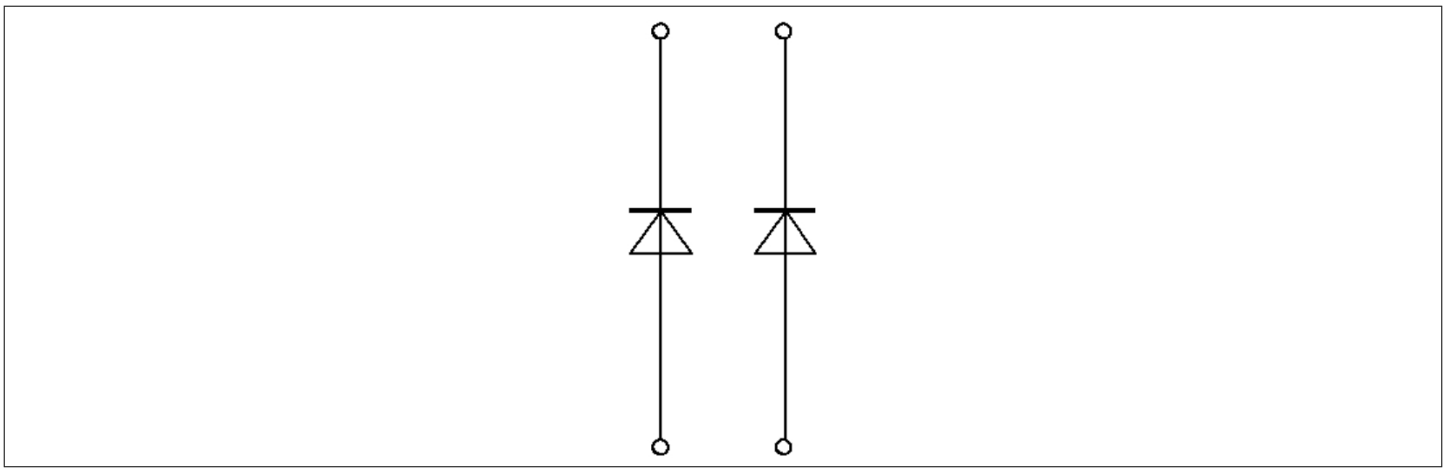


Table of contents

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	3.5	kV
DC stability	$V_{CE(D)}$	T_{vj}=25°C, 100 Fit	3000	V
Material of module baseplate			AlSiC	
Internal isolation		basic insulation (class 1, IEC 61140)	AlN	
Creepage distance	d_{Creep}	terminal to heatsink	64.0	mm
Creepage distance	d_{Creep}	terminal to terminal	56.0	mm
Clearance	d_{Clear}	terminal to heatsink	40.0	mm
Clearance	d_{Clear}	terminal to terminal	26.0	mm
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			0.37		mΩ
Storage temperature	T_{stg}			-55		125	°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	M8, Screw	8		10	Nm
Weight	*G*				1000		g

Note: Dynamic data valid in conjunction with FZ400R45KL3_B5 module

2 Diode, Inverter

Table 3 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		T_{vj} = -40 °C	4500	V
			T_{vj} = 25 °C	4500	
			T_{vj} = 125 °C	4500	

(table continues...)

Table 3 (continued) Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Continuous DC forward current	I_F			400	A
Repetitive peak forward current	I_{FRM}	t_P = 1 ms		800	A
I^2t - value	I^2t	t_P = 10 ms, V_R = 0 V	T_{vj} = 125 °C	65	kA^2s
Maximum power dissipation	P_{RQM}		T_{vj} = 125 °C	800	kW
Minimum turn-on time	t_{onmin}			10	µs

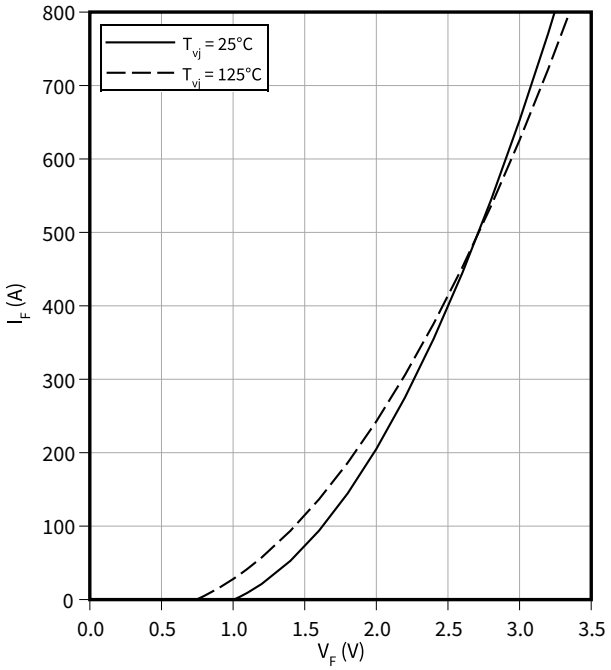
Table 4 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F = 400 A, V_{GE} = 0 V	T_{vj} = 25 °C		2.50	3.10	V
			T_{vj} = 125 °C		2.50	3.00	
Peak reverse recovery current	I_{RM}	V_R = 2800 V, I_F = 400 A, V_{GE} = -15 V, -di$_F$/dt = 1670 A/µs (T_{vj} = 125 °C)	T_{vj} = 25 °C		500		A
			T_{vj} = 125 °C		570		
Recovered charge	Q_r	V_R = 2800 V, I_F = 400 A, V_{GE} = -15 V, -di$_F$/dt = 1670 A/µs (T_{vj} = 125 °C)	T_{vj} = 25 °C		390		µC
			T_{vj} = 125 °C		700		
Reverse recovery energy	E_{rec}	V_R = 2800 V, I_F = 400 A, V_{GE} = -15 V, -di$_F$/dt = 1670 A/µs (T_{vj} = 125 °C)	T_{vj} = 25 °C		590		mJ
			T_{vj} = 125 °C		1200		
Thermal resistance, junction to case	R_{thJC}	per diode				51.0	K/kW
Thermal resistance, case to heat sink	R_{thCH}	per diode			42.0		K/kW
Temperature under switching conditions	$T_{vj\,op}$			-50		125	°C

3 Characteristics diagrams

Forward characteristic (typical), Diode, Inverter

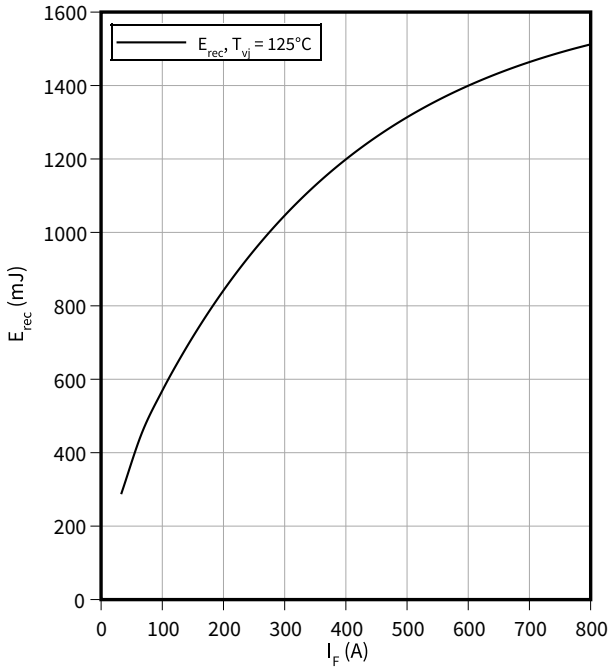
$I_F = f(V_F)$



Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$

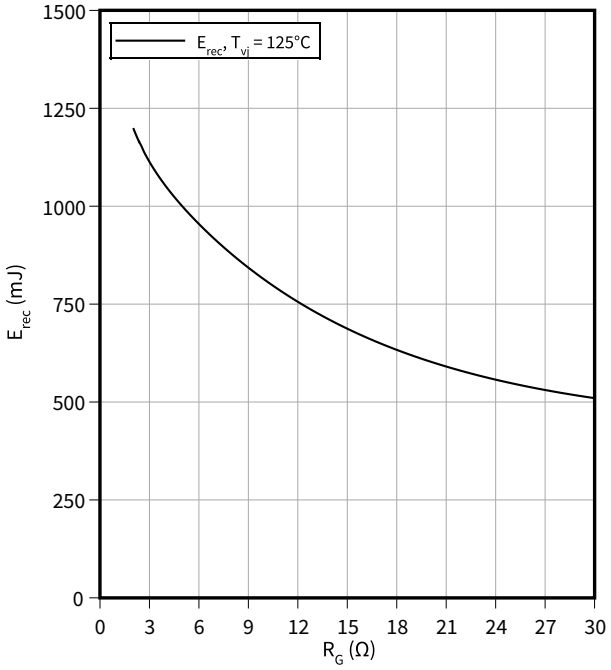
V_{CE} = 2800 V, $R_{Gon} = R_{Gon}$(IGBT)



Switching losses (typical), Diode, Inverter

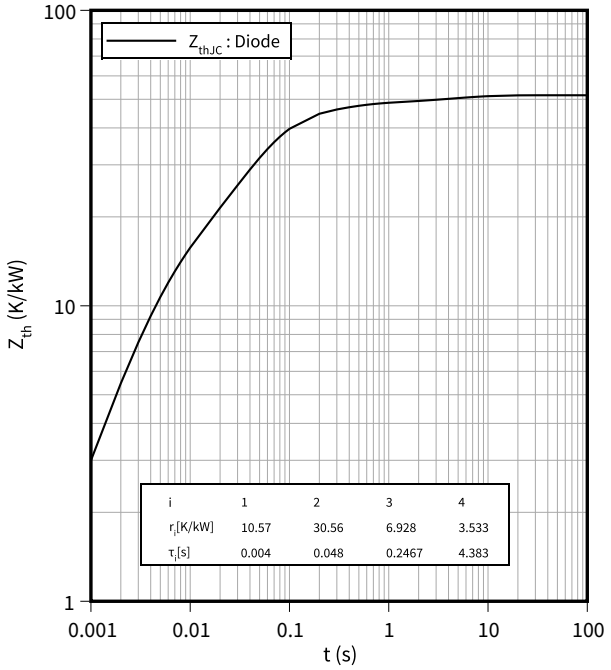
$E_{rec} = f(R_G)$

V_{CE} = 2800 V, I_F = 400 A



Transient thermal impedance, Diode, Inverter

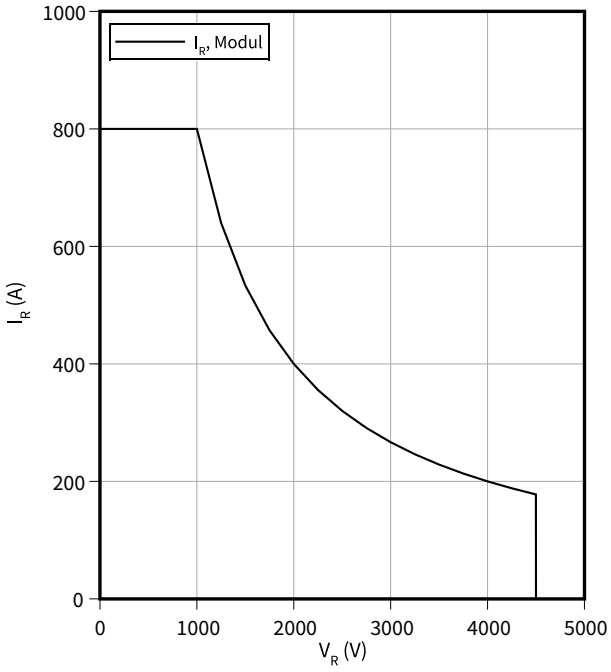
$Z_{th} = f(t)$



Safe operating area (SOA), Diode, Inverter

$I_R = f(V_R)$

$T_{vj} = 125\ °C$



4 Circuit diagram

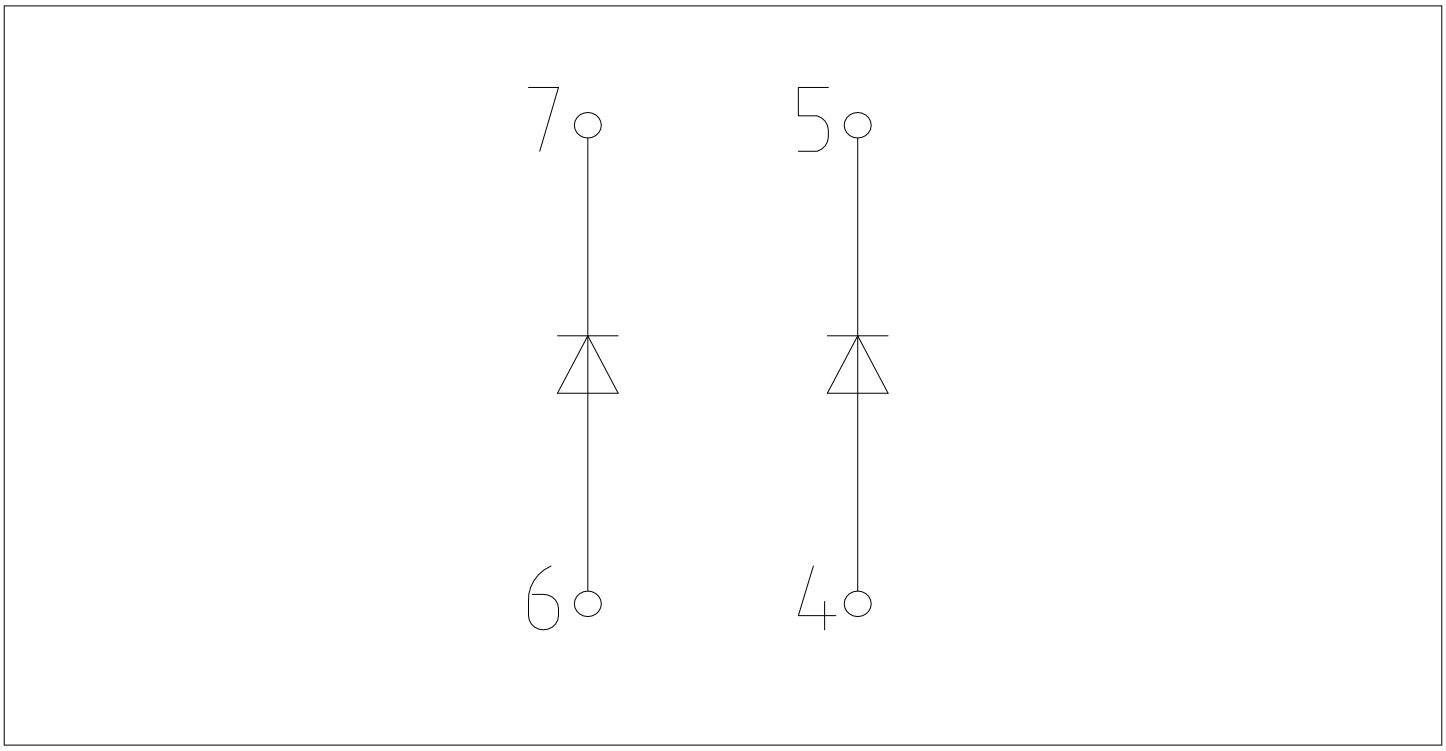


Figure 1

5 Package outlines

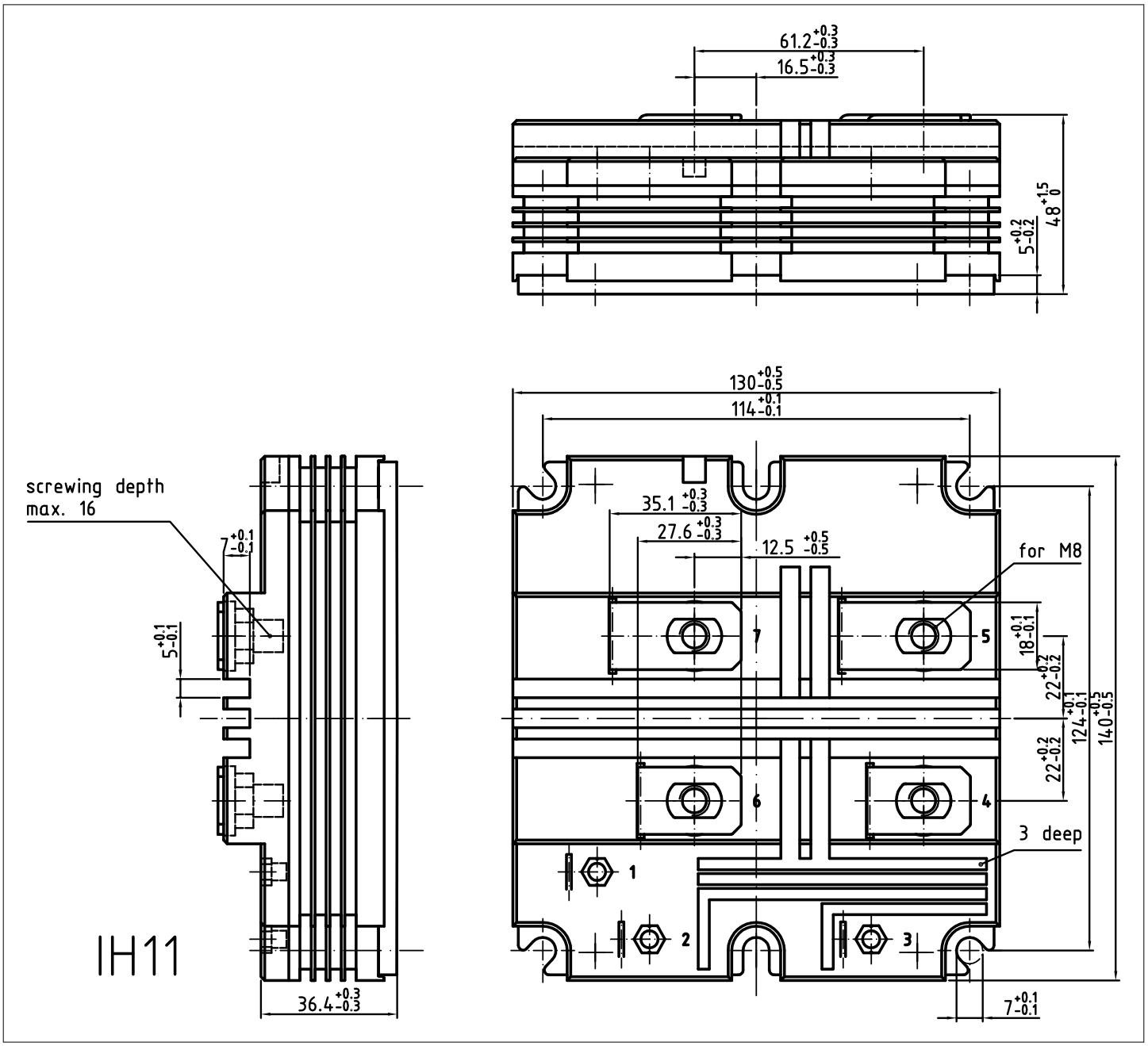


Figure 2

6 Module label code

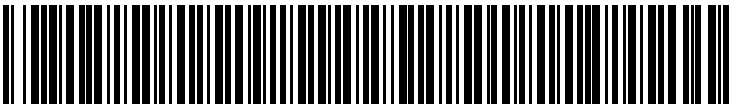
Module label code			
Code format	Data Matrix		Barcode Code128
Encoding	ASCII text		Code Set A
Symbol size	16x16		23 digits
Standard	IEC24720 and IEC16022		IEC8859-1
Code content	*Content* Module serial number Module material number Production order number Date code (production year) Date code (production 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
V1.0	2012-09-07	Target datasheet
V2.0	2013-06-12	Preliminary datasheet
V3.0	2013-07-29	Final datasheet
V3.1	2018-01-15	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	2022-04-12	Final datasheet

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