

Highly insulated module

Features

- Electrical features
 - $V_{CES} = 6500\text{ V}$
 - $I_{C\text{ nom}} = 500\text{ A} / I_{CRM} = 1000\text{ A}$
- Mechanical features
 - AlSiC base plate for increased thermal cycling capability
 - Extended storage temperature down to $T_{stg} = -55\text{ °C}$
 - High creepage and clearance distances
 - Package with CTI > 600
 - Package with enhanced insulation of 10.4 kV AC 60 s



Potential applications

- Traction drives
- Medium-voltage converters

Product validation

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

Description

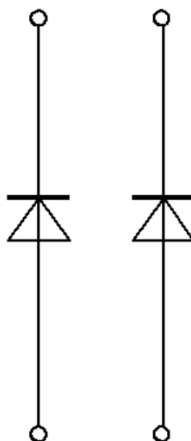


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1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, $f = 50 \text{ Hz}$, $t = 60 \text{ s}$	10.4	kV
Partial discharge extinction voltage	V_{isol}	RMS, $f = 50 \text{ Hz}$, Q_{PD} typ. 10 pC	5.1	kV
DC stability	$V_{CE(D)}$	$T_{vj}=25^{\circ}\text{C}$, 100 Fit	3800	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	$R_{AA'+CC'}$	$T_C=25^{\circ}\text{C}$, 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 FZ500R65KE3 module

2 Diode, Inverter

Table 3 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Repetitive peak reverse voltage	V_{RRM}	$T_{vj} = -50^{\circ}\text{C}$	5900	V
		$T_{vj} = 25^{\circ}\text{C}$	6500	
		$T_{vj} = 125^{\circ}\text{C}$	6500	

(table continues...)

Table 3 (continued) Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Continuous DC forward current	I_F			500	A
Repetitive peak forward current	I_{FRM}	$t_P = 1 \text{ ms}$		1000	A
I^2t - value	I^2t	$t_P = 10 \text{ ms}$, $V_R = 0 \text{ V}$	$T_{vj} = 125 \text{ °C}$	210	kA^2s
Maximum power dissipation	P_{RQM}		$T_{vj} = 125 \text{ °C}$	2000	kW
Minimum turn-on time	t_{onmin}			10	μs

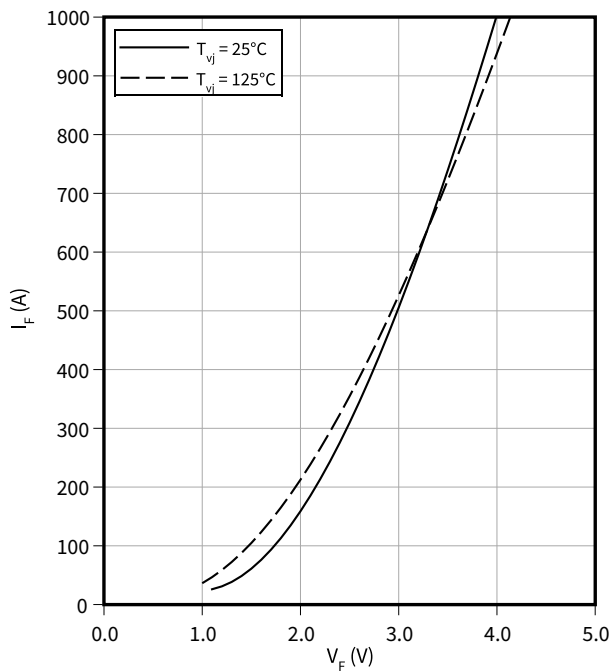
Table 4 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 500 \text{ A}$, $V_{GE} = 0 \text{ V}$		$T_{vj} = 25 \text{ °C}$		V
				$T_{vj} = 125 \text{ °C}$		
Peak reverse recovery current	I_{RM}	$V_R = 3600 \text{ V}$, $I_F = 500 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 2000 \text{ A}/\mu\text{s}$ ($T_{vj} = 125 \text{ °C}$)		$T_{vj} = 25 \text{ °C}$		A
				$T_{vj} = 125 \text{ °C}$		
Recovered charge	Q_r	$V_R = 3600 \text{ V}$, $I_F = 500 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 2000 \text{ A}/\mu\text{s}$ ($T_{vj} = 125 \text{ °C}$)		$T_{vj} = 25 \text{ °C}$		μC
				$T_{vj} = 125 \text{ °C}$		
Reverse recovery energy	E_{rec}	$V_R = 3600 \text{ V}$, $I_F = 500 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 2000 \text{ A}/\mu\text{s}$ ($T_{vj} = 125 \text{ °C}$)		$T_{vj} = 25 \text{ °C}$		mJ
				$T_{vj} = 125 \text{ °C}$		
Thermal resistance, junction to case	R_{thJC}	per diode			27.9	K/kW
Thermal resistance, case to heat sink	R_{thCH}	per diode, $\lambda_{grease} = 1 \text{ W}/(\text{m}^2\text{K})$		23.0		K/kW
Temperature under switching conditions	$T_{vj op}$		-50		125	$^{\circ}\text{C}$

3 Characteristics diagrams

Forward characteristic (typical), Diode, Inverter

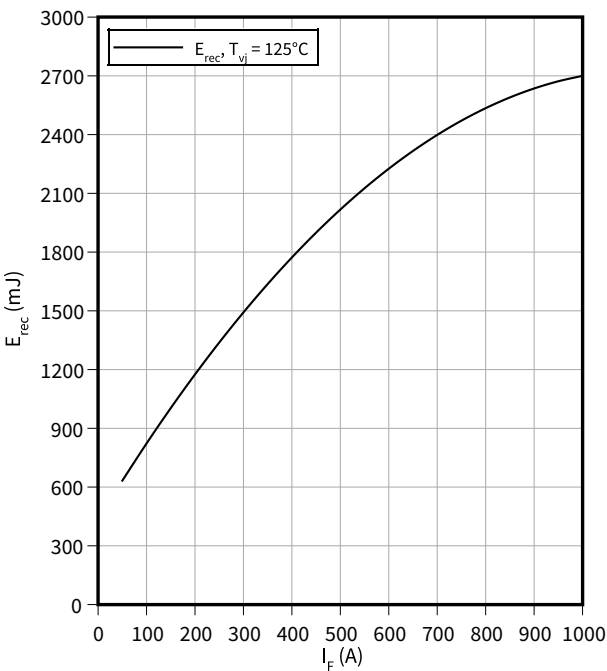
$I_F = f(V_F)$



Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$

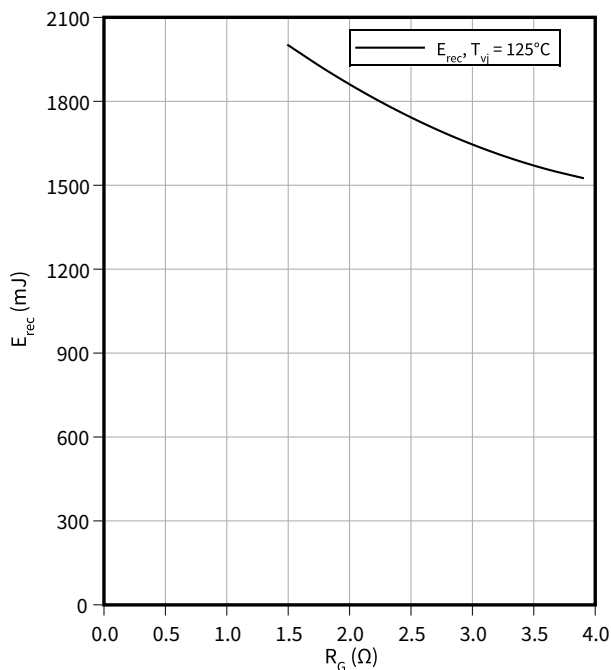
$V_{CE} = 3600\text{ V}, R_{Gon} = R_{Gon}(\text{IGBT})$



Switching losses (typical), Diode, Inverter

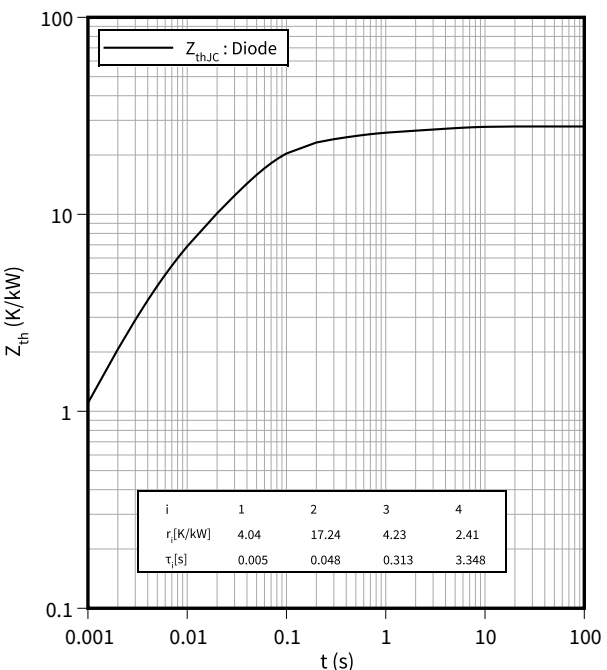
$E_{rec} = f(R_G)$

$V_{CE} = 3600\text{ V}, I_F = 500\text{ A}$



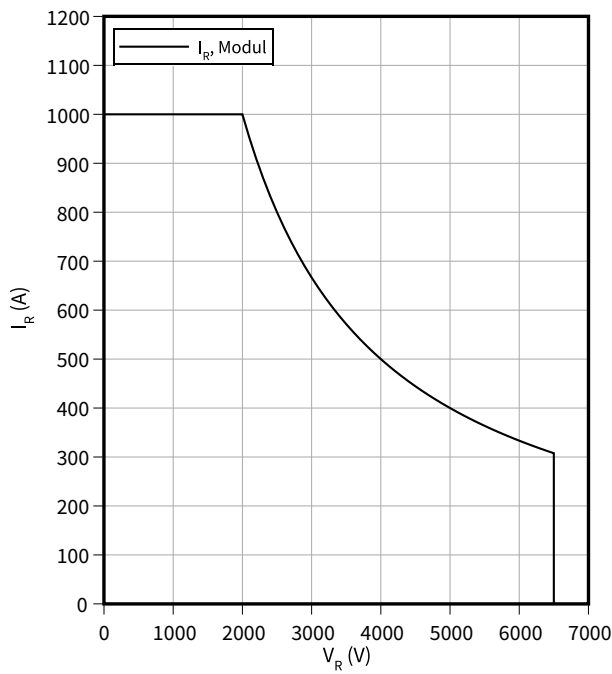
Transient thermal impedance, Diode, Inverter

$Z_{th} = f(t)$



Safe operating area (SOA), Diode, Inverter

$I_R = f(V_R)$
 $T_{vj} = 125\text{ °C}$



4 **Circuit diagram**

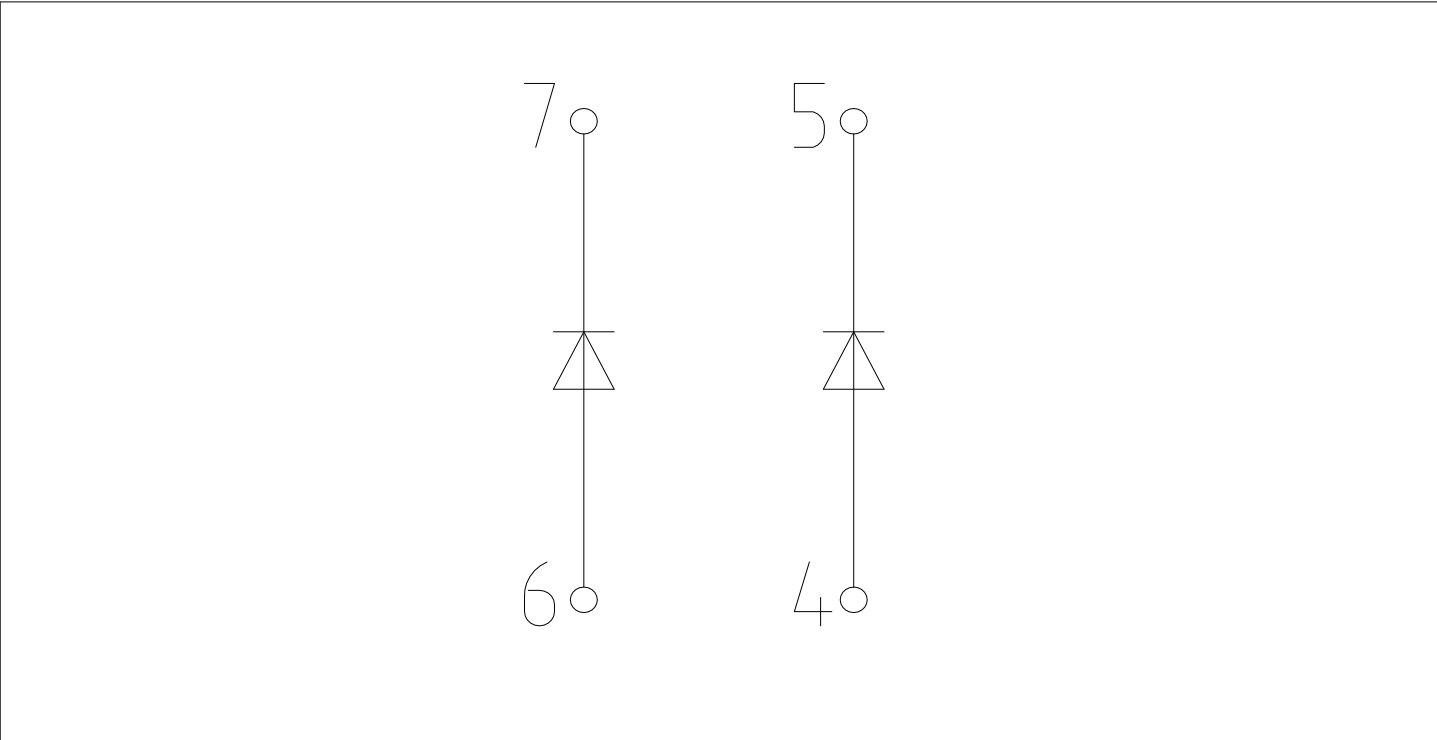


Figure 1

5 Package outlines

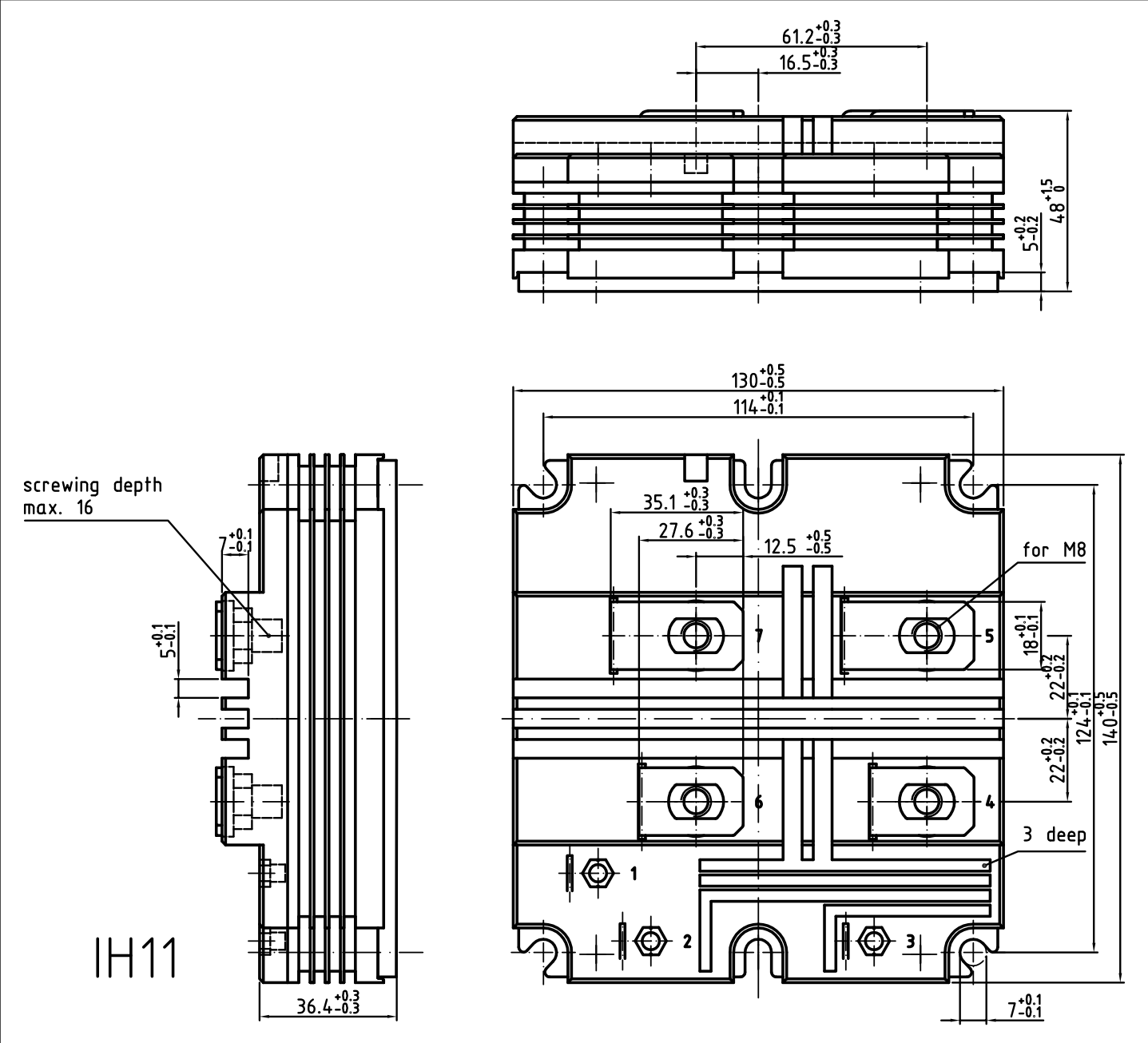


Figure 2

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	<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	 7154914284655054991153071549142846550549911530		

Figure 3

Revision history

Document revision	Date of release	Description of changes
V2.0	2012-08-07	Preliminary datasheet
V3.0	2014-06-16	Final datasheet
V3.1	2014-06-17	Final datasheet
V3.2	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	2022-04-04	Final datasheet

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