

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

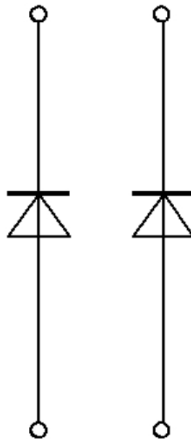
Description

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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	$t_P = 10 \text{ ms}, V_R = 0 \text{ V}$	$T_{vj} = 125 \text{ }^\circ\text{C}$	210	kA^2s
Maximum power dissipation	P_{RQM}		$T_{vj} = 125 \text{ }^\circ\text{C}$	2000	kW
Minimum turn-on time	t_{onmin}		10	μs	

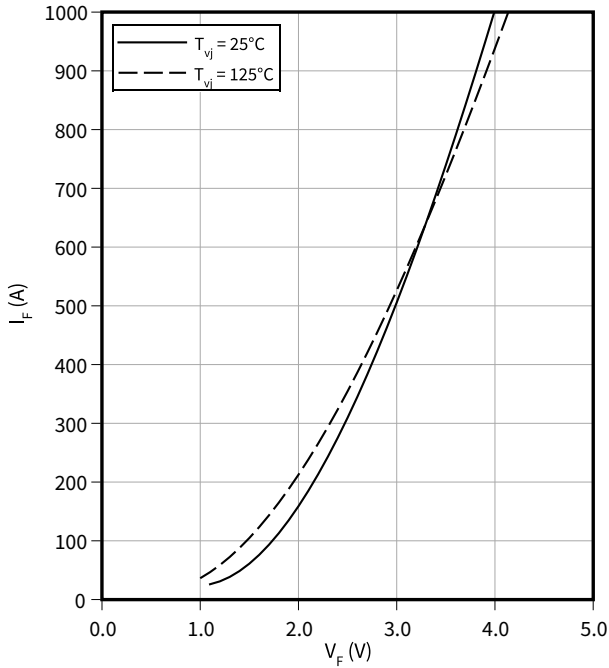
Table 4 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 500 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$	3.00	3.50	V
			$T_{vj} = 125 \text{ }^\circ\text{C}$	2.95	3.50	
Peak reverse recovery current	I_{RM}	$V_R = 3600 \text{ V}, I_F = 500 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 2000 \text{ A}/\mu\text{s} (T_{vj} = 125 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$	730		A
			$T_{vj} = 125 \text{ }^\circ\text{C}$	800		
Recovered charge	Q_r	$V_R = 3600 \text{ V}, I_F = 500 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 2000 \text{ A}/\mu\text{s} (T_{vj} = 125 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$	570		μC
			$T_{vj} = 125 \text{ }^\circ\text{C}$	1050		
Reverse recovery energy	E_{rec}	$V_R = 3600 \text{ V}, I_F = 500 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 2000 \text{ A}/\mu\text{s} (T_{vj} = 125 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$	930		mJ
			$T_{vj} = 125 \text{ }^\circ\text{C}$	2000		
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

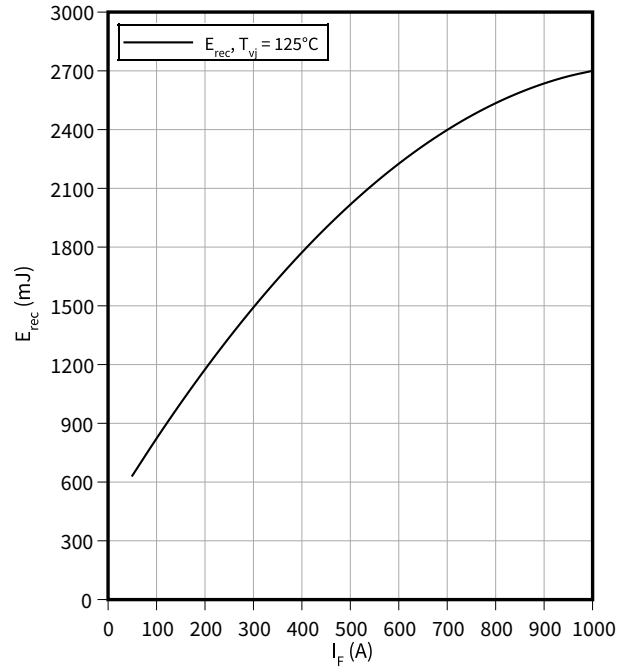
$$I_F = f(V_F)$$



Switching losses (typical), Diode, Inverter

$$E_{rec} = f(I_F)$$

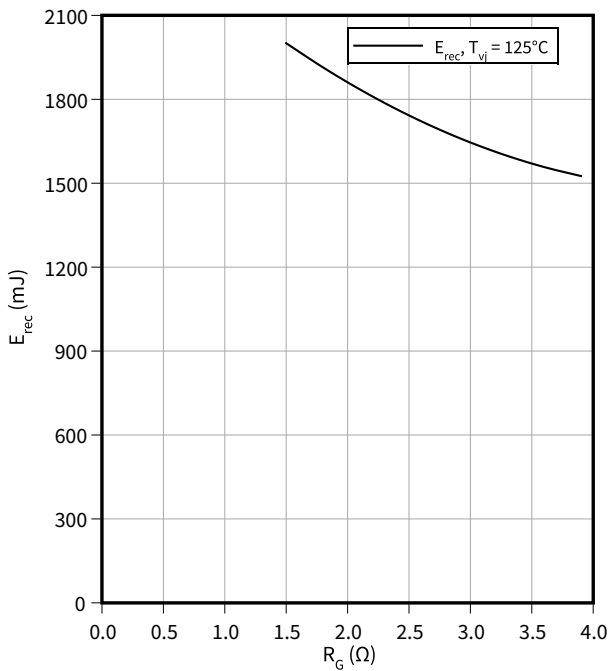
$$V_{CE} = 3600 \text{ V}, R_{Gon} = R_{Gon}(\text{IGBT})$$



Switching losses (typical), Diode, Inverter

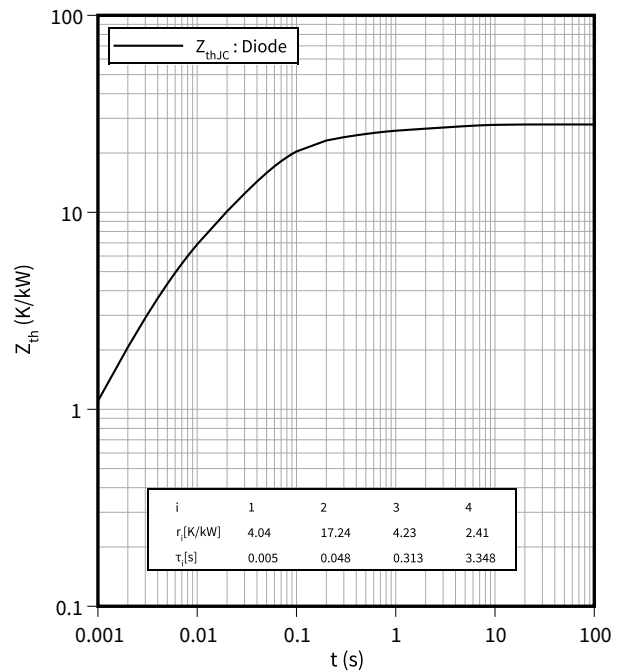
$$E_{rec} = f(R_G)$$

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



Transient thermal impedance, Diode, Inverter

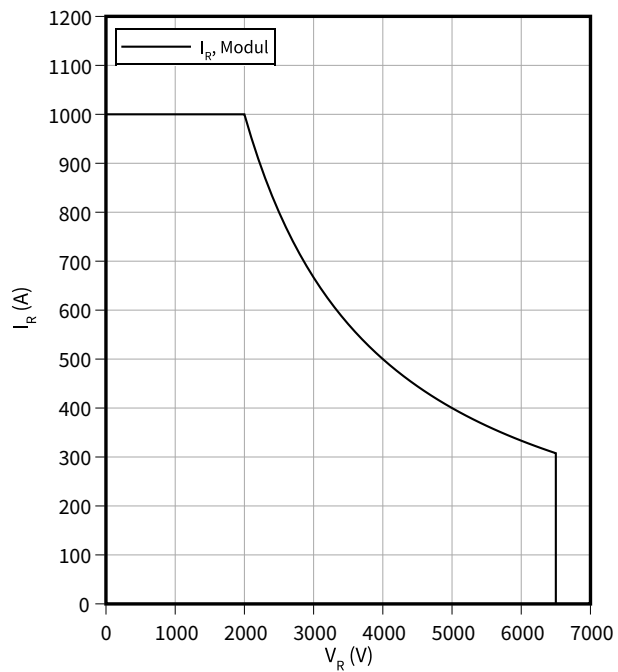
$$Z_{th} = f(t)$$



Safe operating area (SOA), Diode, Inverter

$$I_R = f(V_R)$$

$$T_{vj} = 125\text{ °C}$$



4 Circuit diagram

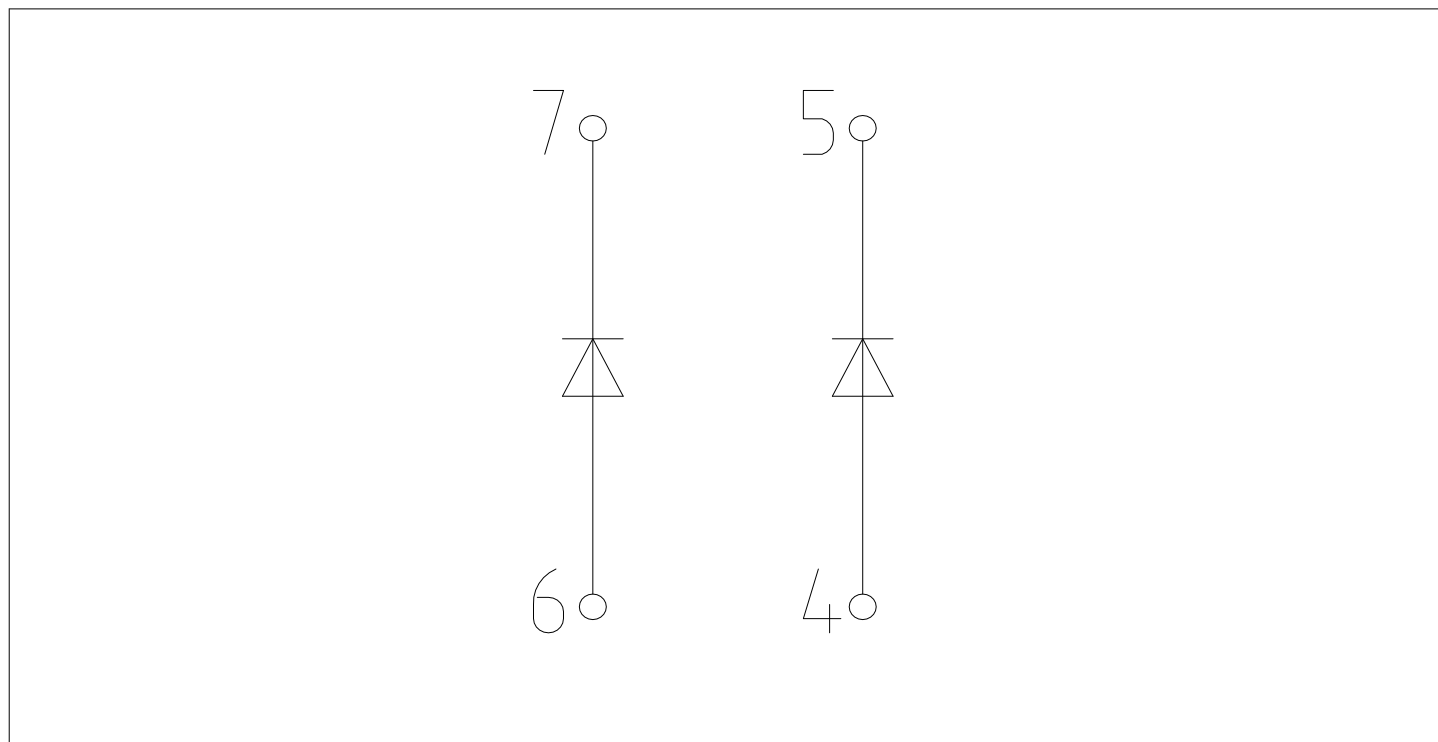


Figure 1

5 Package outlines

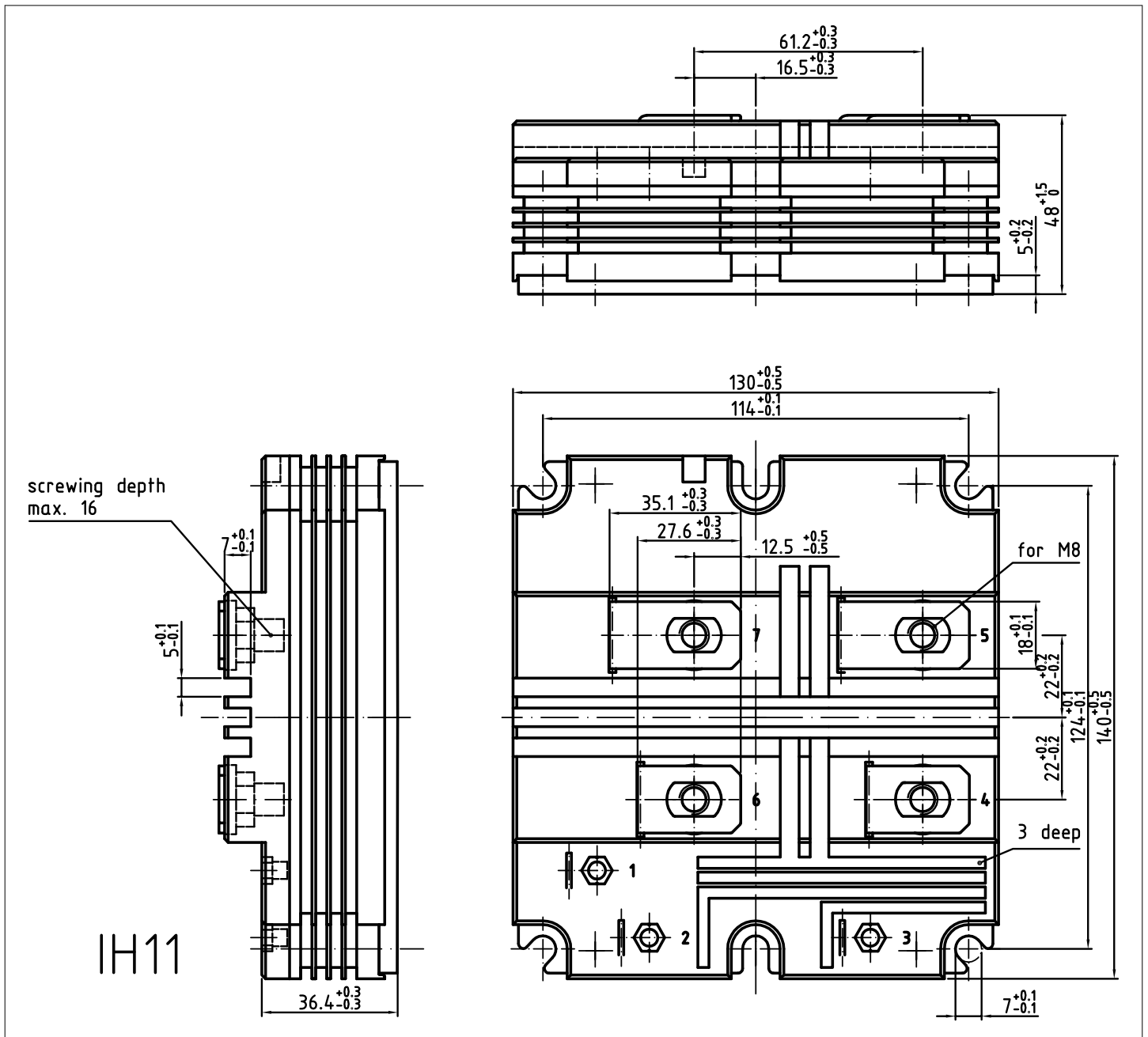


Figure 2

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> 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
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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Edition 2022-04-04

Published by

Infineon Technologies AG

81726 Munich, Germany

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Document reference

IFX-AAX218-005

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