

**Highly insulated module****Features**

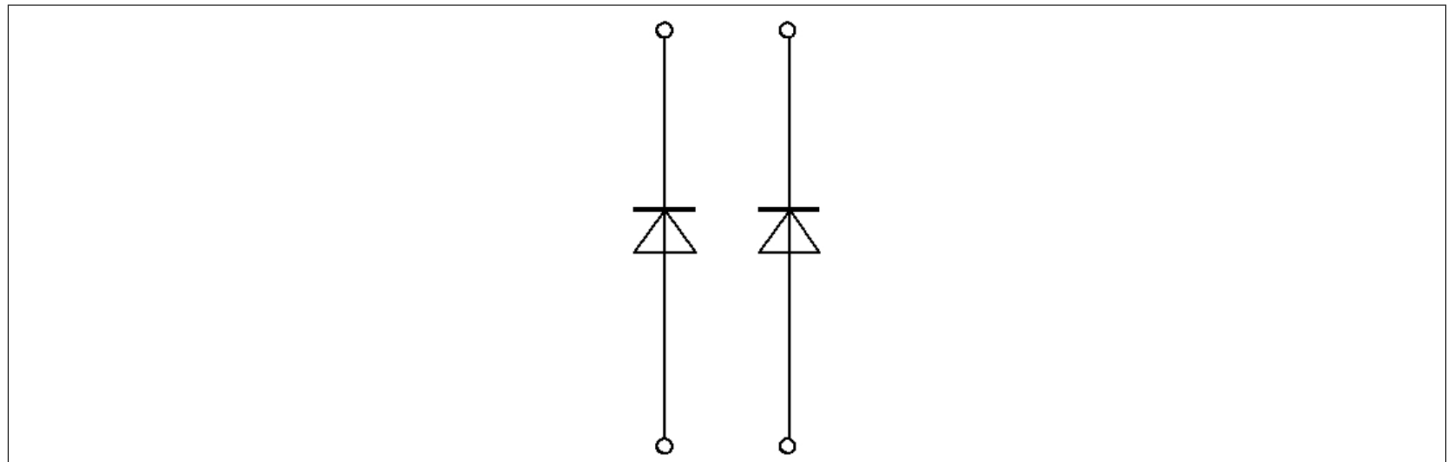
- Electrical features
  - $V_{CES} = 6500\text{ V}$
  - $I_{C\text{nom}} = 250\text{ A} / I_{CRM} = 500\text{ A}$
- Mechanical features
  - ALSiC base plate for increased thermal cycling capability
  - Extended storage temperature down to  $T_{stg} = -55\text{ °C}$
  - Package with enhanced insulation of 10.4 kV AC 60 s
  - Package with CTI > 600
  - High creepage and clearance distances

**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, $f = 50$ Hz, $t = 60$ s	10.4	kV
Partial discharge extinction voltage	$V_{isol}$	RMS, $f = 50$ 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		0.36		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	$G$			500		g	

Note: Dynamic data valid in conjunction with FZ250R65KE3 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	$I_F$		250	A	
Repetitive peak forward current	$I_{FRM}$	$t_P = 1 \text{ ms}$	500	A	
$I^2t$ - value	$I^2t$	$t_P = 10 \text{ ms}, V_R = 0 \text{ V}$	$T_{vj} = 125 \text{ }^\circ\text{C}$	52	$\text{kA}^2\text{s}$
Maximum power dissipation	$P_{RQM}$		$T_{vj} = 125 \text{ }^\circ\text{C}$	1000	kW
Minimum turn-on time	$t_{onmin}$		10	$\mu\text{s}$	

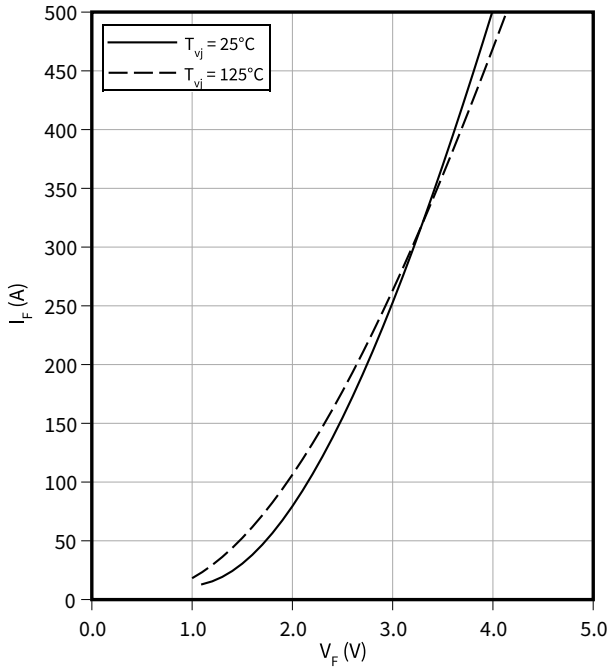
**Table 4 Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	$V_F$	$I_F = 250 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$	3.00	3.50	V
			$T_{vj} = 125 \text{ }^\circ\text{C}$	2.95	3.50	
Peak reverse recovery current	$I_{RM}$	$V_R = 3600 \text{ V}, I_F = 250 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 1000 \text{ A}/\mu\text{s} (T_{vj} = 125 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$	370		A
			$T_{vj} = 125 \text{ }^\circ\text{C}$	400		
Recovered charge	$Q_r$	$V_R = 3600 \text{ V}, I_F = 250 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 1000 \text{ A}/\mu\text{s} (T_{vj} = 125 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$	290		$\mu\text{C}$
			$T_{vj} = 125 \text{ }^\circ\text{C}$	540		
Reverse recovery energy	$E_{rec}$	$V_R = 3600 \text{ V}, I_F = 250 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 1000 \text{ A}/\mu\text{s} (T_{vj} = 125 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$	470		mJ
			$T_{vj} = 125 \text{ }^\circ\text{C}$	1000		
Thermal resistance, junction to case	$R_{thJC}$	per diode			55.8	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	$^\circ\text{C}$

### 3 Characteristics diagrams

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

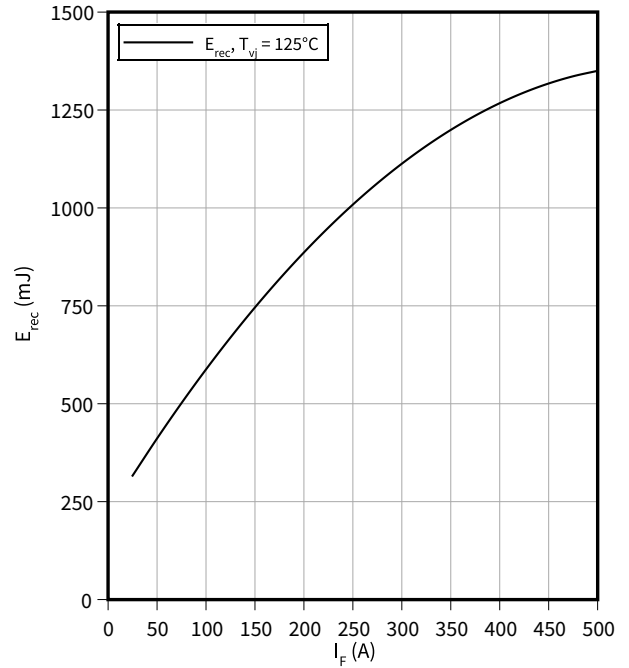
$$I_F = f(V_F)$$



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

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

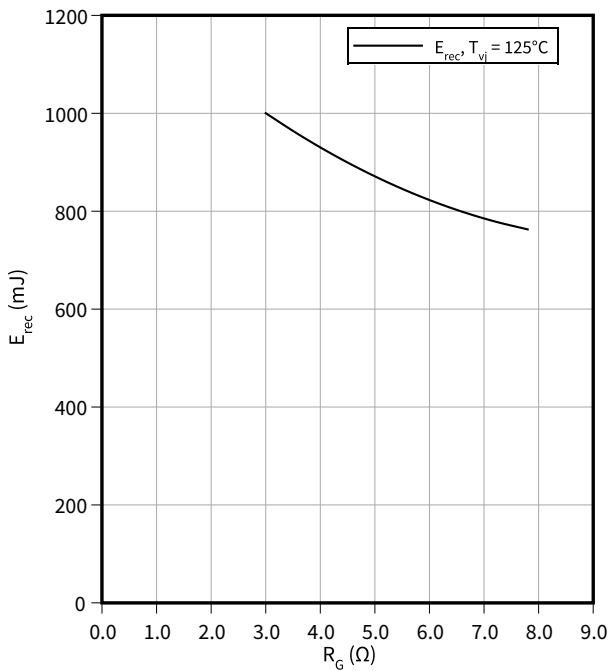
$$V_{CE} = 3600 \text{ V}, R_{Gon} = R_{Gon}(\text{IGBT})$$



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

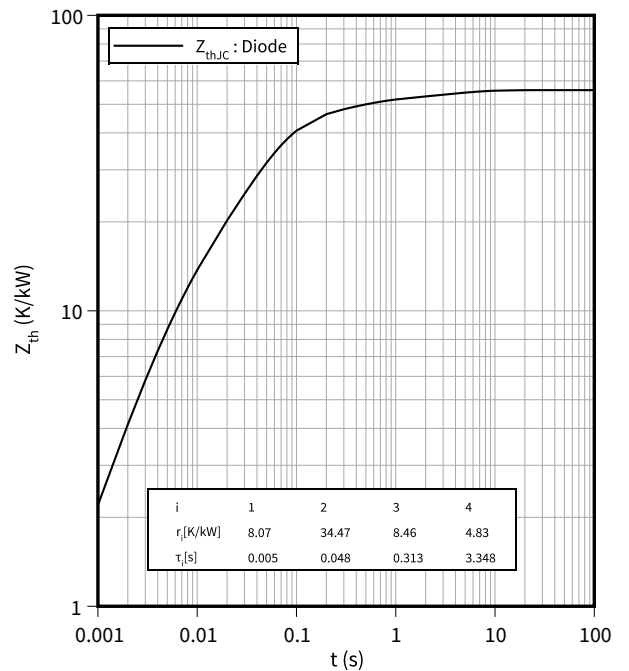
$$E_{rec} = f(R_G)$$

$$V_{CE} = 3600 \text{ V}, I_F = 250 \text{ A}$$



**Transient thermal impedance, Diode, Inverter**

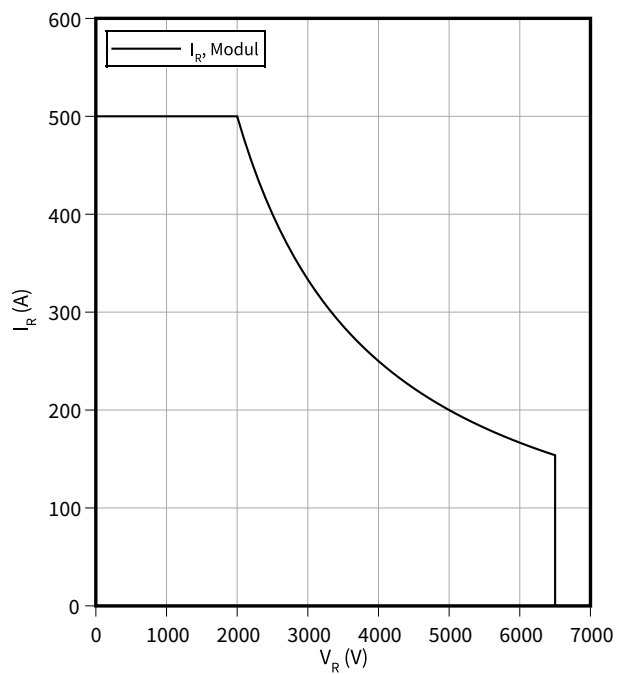
$$Z_{th} = f(t)$$



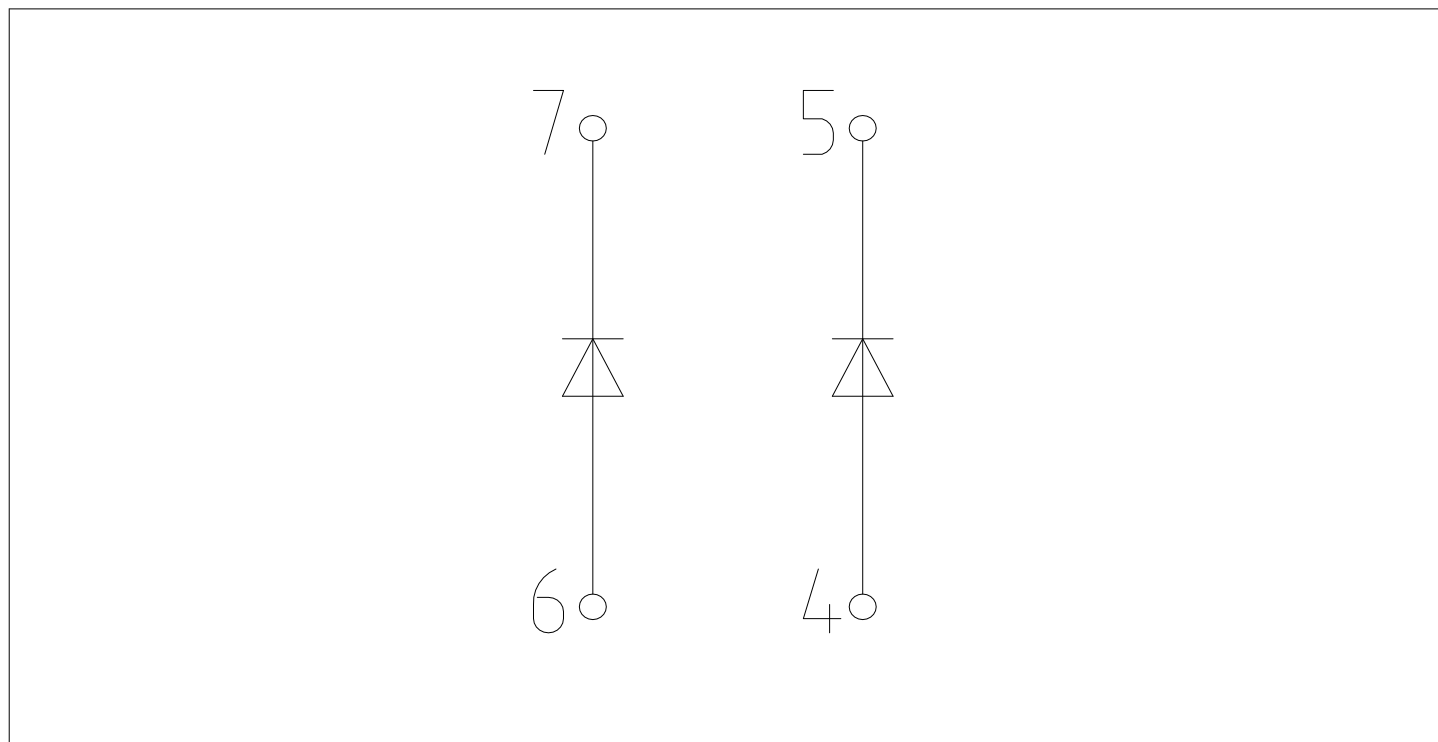
**Safe operating area (SOA), Diode, Inverter**

$$I_R = f(V_R)$$

$$T_{vj} = 125\text{ °C}$$

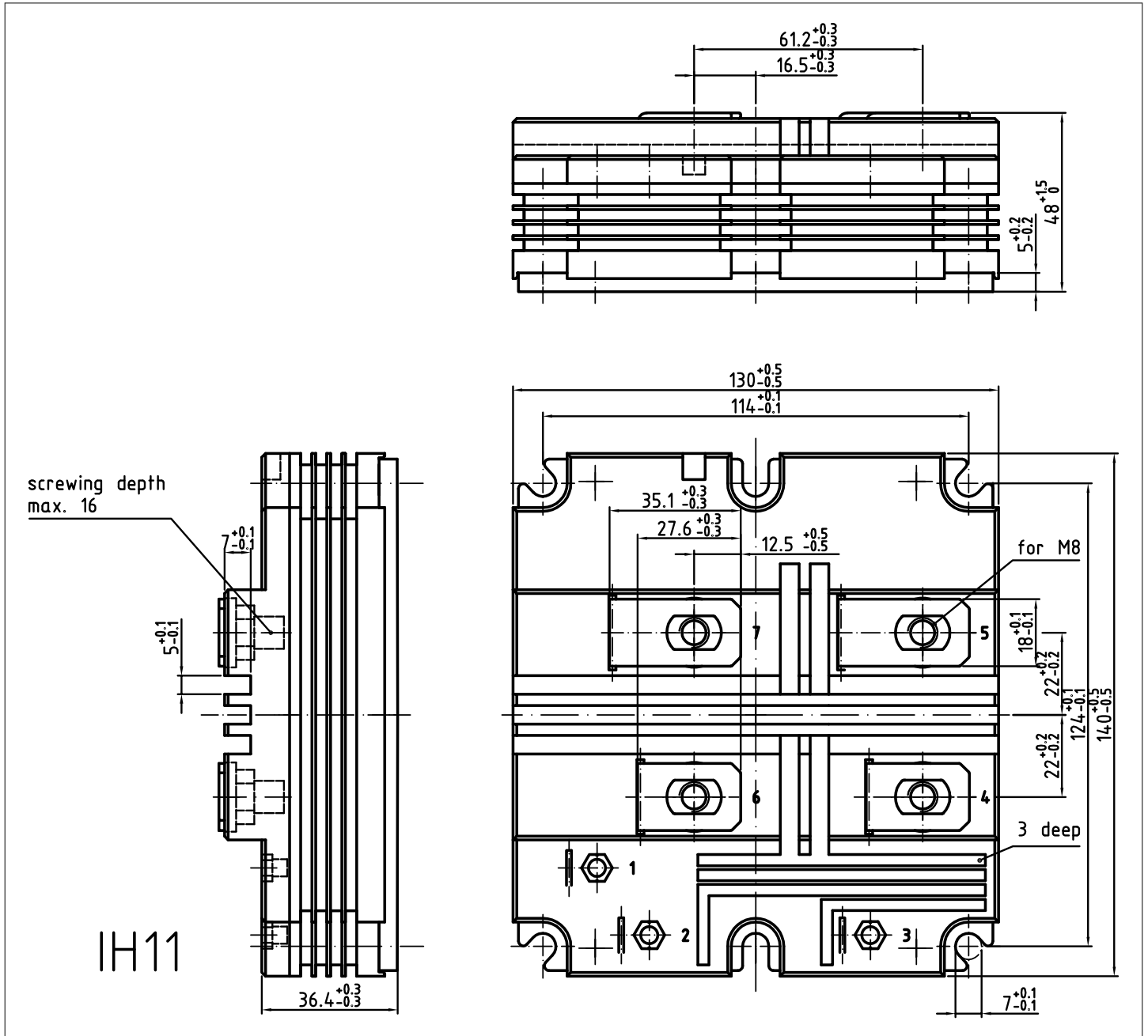


## 4 Circuit diagram




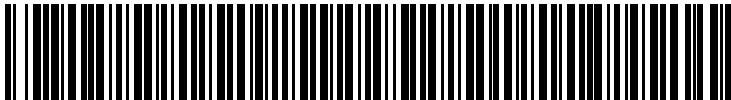
**Figure 1**

**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	 		
	71549142846550549911530		71549142846550549911530

**Figure 3**

## Revision history

Document revision	Date of release	Description of changes
V1.0	2012-07-13	Target datasheet
V2.0	2012-07-16	Preliminary datasheet
V3.0	2014-06-16	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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