

## Preliminary datasheet

### EasyPACK™ module with CoolSiC™ Trench MOSFET and PressFIT / NTC

#### Features

- Electrical features
  - $V_{DSS} = 1200\text{ V}$
  - $I_{DN} = 50\text{ A} / I_{DRM} = 100\text{ A}$
  - Low switching losses
  - High current density
  - Low inductive design
- Mechanical features
  - Integrated NTC temperature sensor
  - PressFIT contact technology
  - Rugged mounting due to integrated mounting clamps



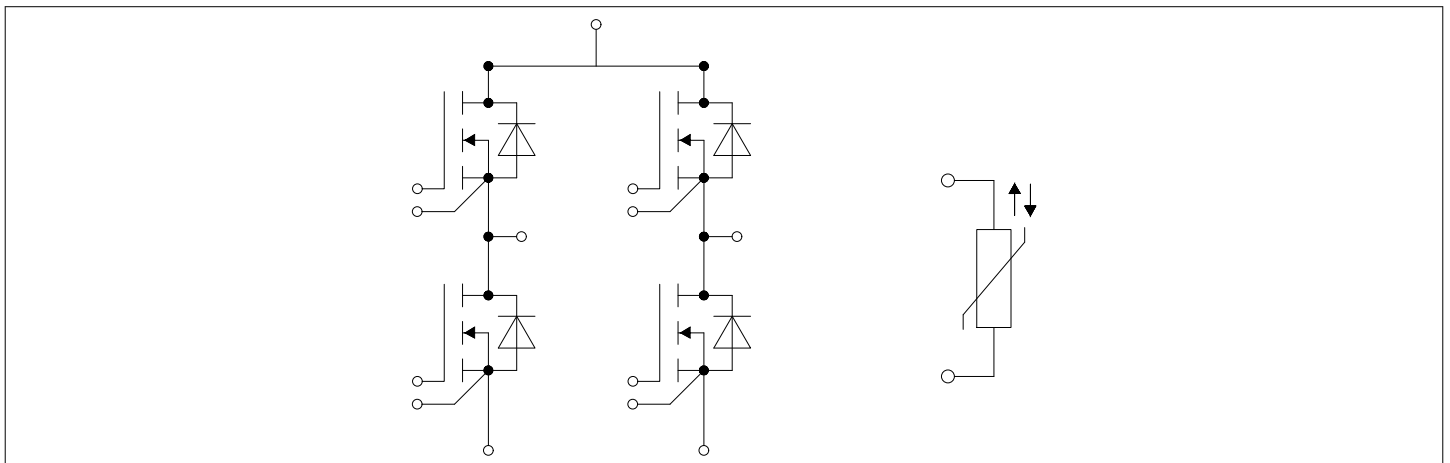
#### Potential applications

- Welding
- DC charger for EV
- DC/DC converter
- High Frequency Switching application

#### 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, $f = 50 \text{ Hz}$ , $t = 1 \text{ min}$	3.0	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	
RTI Elec.	$RTI$	housing	140	°C

**Table 2 Characteristic Values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Stray inductance module	$L_{SCE}$			14		nH
Storage temperature	$T_{stg}$		-40		125	°C
Mounting force per clamp	$F$		20		50	N
Weight	$G$			24		g

Note: The current under continuous operation is limited to 25 A rms per connector pin.

Important note: The selection of positive and negative gate-source voltages impacts the long-term behavior of the device. The design guidelines described in Application Note AN 2018-09 must be considered to ensure sound operation of the device over the planned lifetime.

## 2 MOSFET

**Table 3 Maximum Rated Values**

Parameter	Symbol	Note or test condition	Values	Unit
Drain-source voltage	$V_{DSS}$	$T_{vj} = 25 \text{ °C}$	1200	V
Implemented drain current	$I_{DN}$		50	A
Continuous DC drain current	$I_{DDC}$	$T_{vj} = 175 \text{ °C}$ , $V_{GS} = 15 \text{ V}$ $T_H = 65 \text{ °C}$	45	A
Repetitive peak drain current	$I_{DRM}$	verified by design, $t_p$ limited by $T_{vjmax}$	100	A
Gate-source voltage	$V_{GSS}$		-10/+20	V

**Table 4 Characteristic Values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Drain-source on resistance	$R_{DS(on)}$	$I_D = 50\text{ A}, V_{GS} = 15\text{ V}$ $T_{vj} = 25\text{ °C}$ $T_{vj} = 125\text{ °C}$ $T_{vj} = 150\text{ °C}$		22.5		mΩ
				29.5		
				33		
Gate threshold voltage	$V_{GS(th)}$	$I_D = 20\text{ mA}, V_{DS} = V_{GS}, T_{vj} = 25\text{ °C}$ , (tested after 1ms pulse at $V_{GS} = +20\text{ V}$ )	3.45	4.5	5.55	V
Total gate charge	$Q_G$	$V_{DS} = 800\text{ V}, V_{GS} = -5/+15\text{ V}$		0.124		μC
Internal gate resistor	$R_{Gint}$	$T_{vj} = 25\text{ °C}$		2		Ω
Input capacitance	$C_{ISS}$	$f = 1\text{ MHz}, V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}$ $T_{vj} = 25\text{ °C}$		3.68		nF
Output capacitance	$C_{OSS}$	$f = 1\text{ MHz}, V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}$ $T_{vj} = 25\text{ °C}$		0.22		nF
Reverse transfer capacitance	$C_{rss}$	$f = 1\text{ MHz}, V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}$ $T_{vj} = 25\text{ °C}$		0.028		nF
$C_{OSS}$ stored energy	$E_{OSS}$	$V_{DS} = 800\text{ V}, V_{GS} = -5/+15\text{ V}, T_{vj} = 25\text{ °C}$		88		μJ
Drain-source leakage current	$I_{DSS}$	$V_{DS} = 1200\text{ V}, V_{GS} = -5\text{ V}$ $T_{vj} = 25\text{ °C}$		0.2	210	μA
Gate-source leakage current	$I_{GSS}$	$V_{DS} = 0\text{ V}, T_{vj} = 25\text{ °C}$ $V_{GS} = 20\text{ V}$			400	nA
Turn-on delay time (inductive load)	$t_{don}$	$I_D = 50\text{ A}, R_{Gon} = 8.2\text{ Ω}, V_{DS} = 600\text{ V}, V_{GS} = -5/+15\text{ V}$ $T_{vj} = 25\text{ °C}$ $T_{vj} = 125\text{ °C}$ $T_{vj} = 150\text{ °C}$		23		ns
				22		
				22		
Rise time (inductive load)	$t_r$	$I_D = 50\text{ A}, R_{Gon} = 8.2\text{ Ω}, V_{DS} = 600\text{ V}, V_{GS} = -5/+15\text{ V}$ $T_{vj} = 25\text{ °C}$ $T_{vj} = 125\text{ °C}$ $T_{vj} = 150\text{ °C}$		15		ns
				14		
				14		
Turn-off delay time (inductive load)	$t_{doff}$	$I_D = 50\text{ A}, R_{Goff} = 3.9\text{ Ω}, V_{DS} = 600\text{ V}, V_{GS} = -5/+15\text{ V}$ $T_{vj} = 25\text{ °C}$ $T_{vj} = 125\text{ °C}$ $T_{vj} = 150\text{ °C}$		48		ns
				52		
				52		
Fall time (inductive load)	$t_f$	$I_D = 50\text{ A}, R_{Goff} = 3.9\text{ Ω}, V_{DS} = 600\text{ V}, V_{GS} = -5/+15\text{ V}$ $T_{vj} = 25\text{ °C}$ $T_{vj} = 125\text{ °C}$ $T_{vj} = 150\text{ °C}$		19		ns
				18		
				18		
Turn-on energy loss per pulse	$E_{on}$	$I_D = 50\text{ A}, V_{DS} = 600\text{ V}, L_\sigma = 35\text{ nH}, V_{GS} = -5/+15\text{ V}, R_{Gon} = 8.2\text{ Ω}, di/dt = 3\text{ kA/}\mu\text{s}$ ( $T_{vj} = 150\text{ °C}$ ) $T_{vj} = 25\text{ °C}$ $T_{vj} = 125\text{ °C}$ $T_{vj} = 150\text{ °C}$		0.717		mJ
				0.793		
				0.825		

**Table 4 Characteristic Values (continued)**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Turn-off energy loss per pulse	$E_{off}$	$I_D = 50\text{ A}$ , $V_{DS} = 600\text{ V}$ , $L_\sigma = 35\text{ nH}$ , $V_{GS} = -5/+15\text{ V}$ , $R_{Goff} = 3.9\ \Omega$ , $dv/dt = 37.2\text{ kV}/\mu\text{s}$ ( $T_{vj} = 150\text{ }^\circ\text{C}$ )		$T_{vj} = 25\text{ }^\circ\text{C}$	0.192	mJ
				$T_{vj} = 125\text{ }^\circ\text{C}$	0.194	
				$T_{vj} = 150\text{ }^\circ\text{C}$	0.194	
Thermal resistance, junction to heatsink	$R_{thJH}$	per MOSFET		1.09		K/W
Temperature under switching conditions	$T_{vjop}$		-40		150	$^\circ\text{C}$

### 3 Body diode

**Table 5 Maximum Rated Values**

Parameter	Symbol	Note or test condition	Values	Unit
DC body diode forward current	$I_{SD}$	$T_{vj} = 175\text{ }^\circ\text{C}$ , $V_{GS} = -5\text{ V}$ $T_H = 65\text{ }^\circ\text{C}$	16	A

**Table 6 Characteristic Values**

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Forward voltage	$V_{SD}$	$I_{SD} = 50\text{ A}$ , $V_{GS} = -5\text{ V}$		$T_{vj} = 25\text{ }^\circ\text{C}$	4.6	5.65	V
				$T_{vj} = 125\text{ }^\circ\text{C}$	4.35		
				$T_{vj} = 150\text{ }^\circ\text{C}$	4.3		

### 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 $\Omega$
Deviation of $R_{100}$	$\Delta R/R$	$T_{NTC} = 100\text{ }^\circ\text{C}$ , $R_{100} = 493\ \Omega$	-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

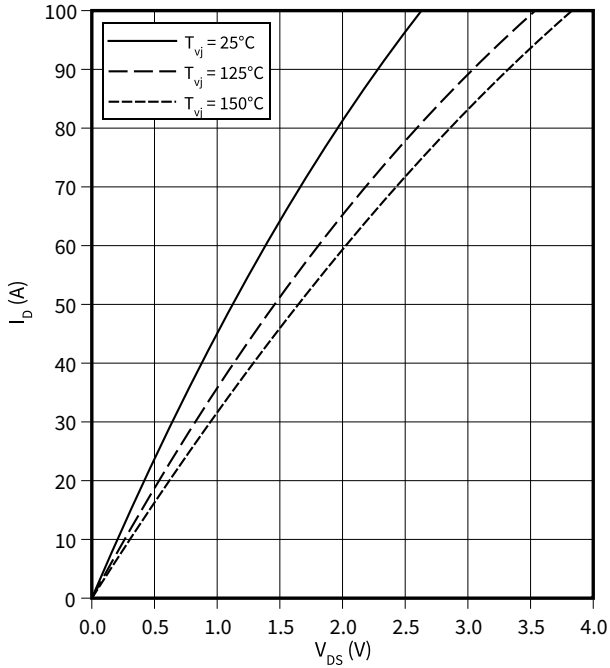
Note: Specification according to the valid application note.

## 5 Characteristics diagrams

### output characteristic (typical), MOSFET

$$I_D = f(V_{DS})$$

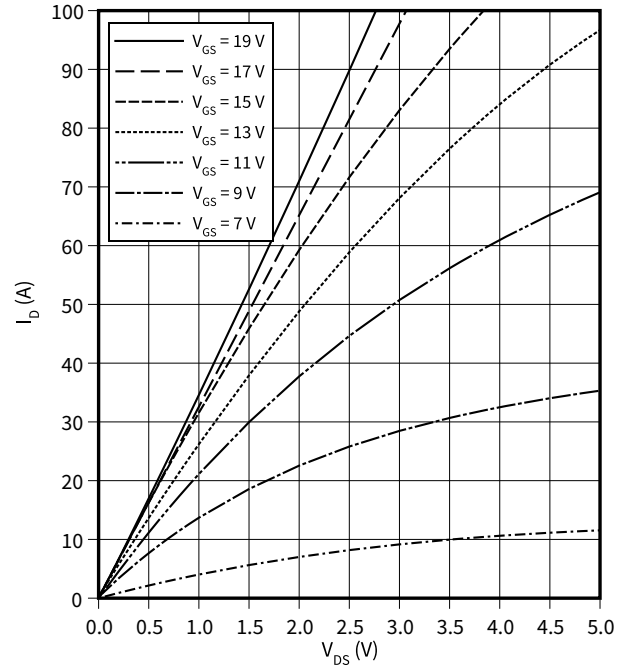
$$V_{GS} = 15 \text{ V}$$



### output characteristic (typical), MOSFET

$$I_D = f(V_{DS})$$

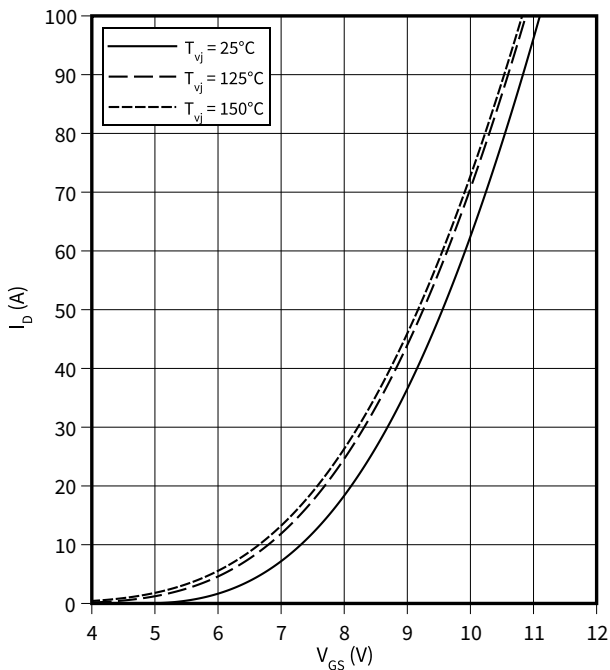
$$T_{vj} = 150 \text{ °C}$$



### transfer characteristic (typical), MOSFET

$$I_D = f(V_{GS})$$

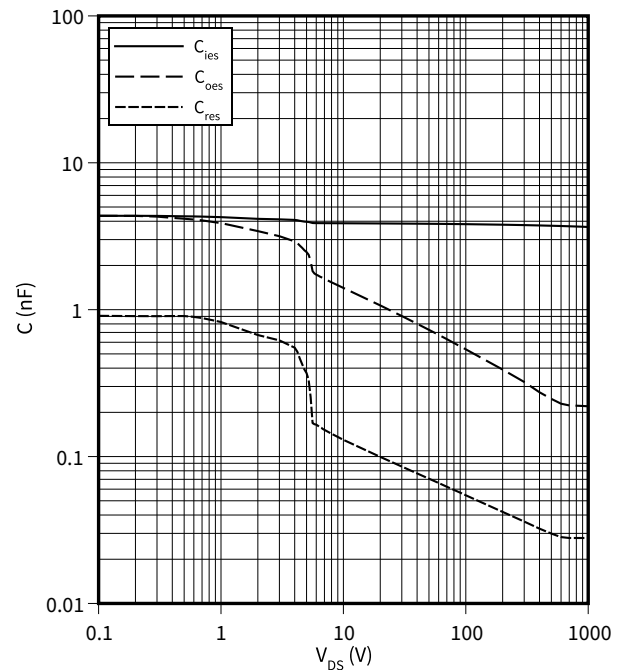
$$V_{DS} = 20 \text{ V}$$



### capacity characteristic (typical), MOSFET

$$C = f(V_{DS})$$

$$f = 1 \text{ MHz}, T_{vj} = 25 \text{ °C}, V_{GS} = 0 \text{ V}$$

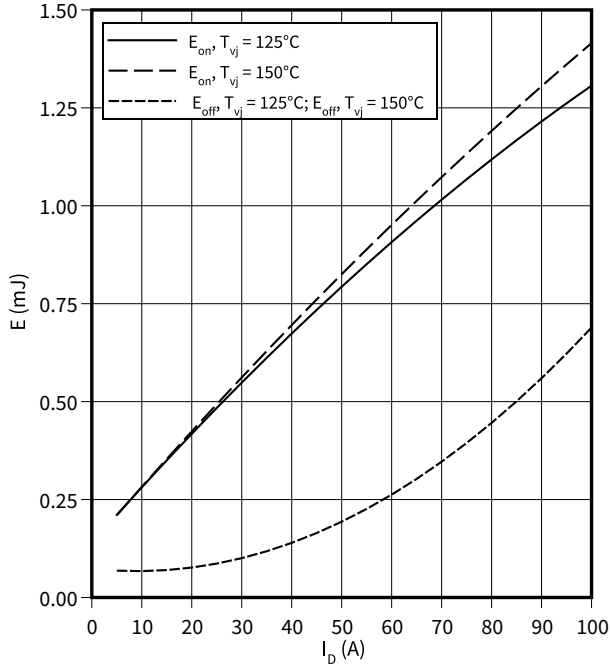


5 Characteristics diagrams

**switching losses (typical), MOSFET**

$E = f(I_D)$

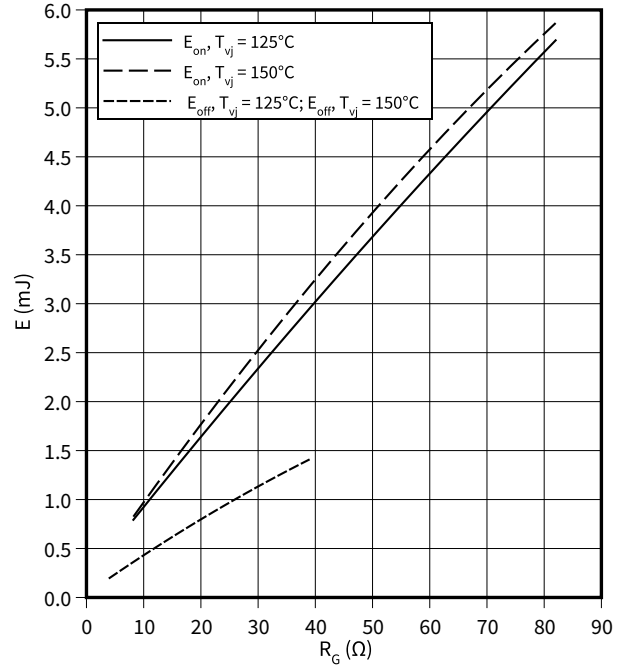
$R_{Goff} = 3.9 \Omega$ ,  $R_{Gon} = 8.2 \Omega$ ,  $V_{DS} = 600 \text{ V}$ ,  $V_{GS} = -5/15 \text{ V}$



**switching losses (typical), MOSFET**

$E = f(R_G)$

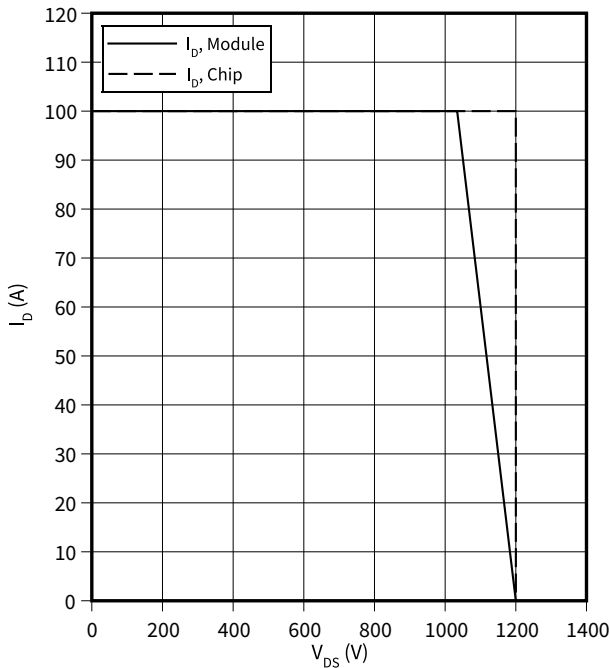
$V_{DS} = 600 \text{ V}$ ,  $I_D = 50 \text{ A}$ ,  $V_{GS} = -5/15 \text{ V}$



**reverse bias safe operating area (RBSOA), MOSFET**

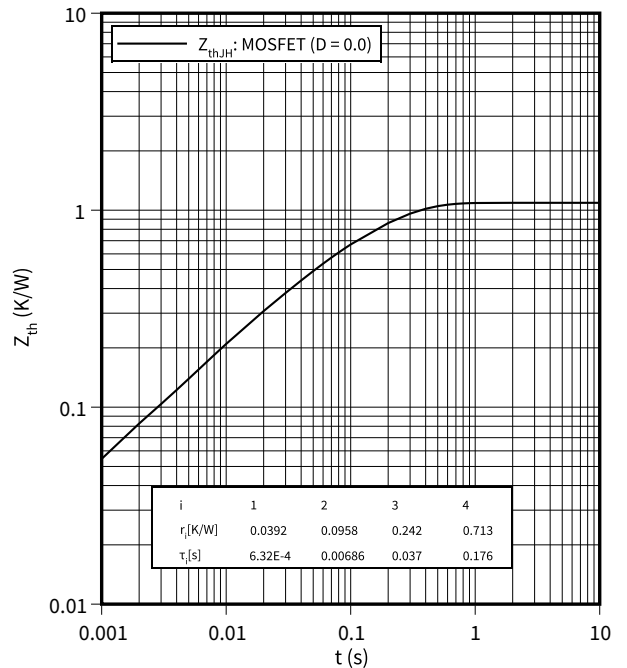
$I_D = f(V_{DS})$

$R_{Goff} = 3.9 \Omega$ ,  $T_{vj} = 150 \text{ °C}$ ,  $V_{GS} = -5/15 \text{ V}$



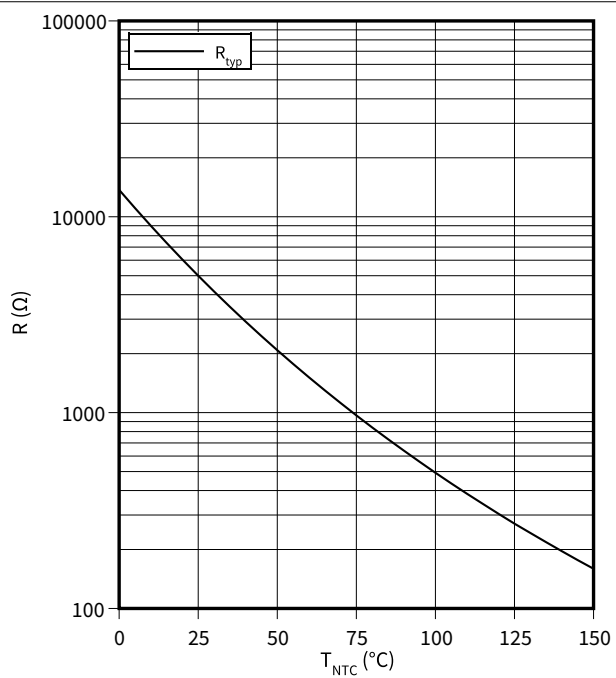
**transient thermal impedance, MOSFET**

$Z_{th} = f(t)$



temperature characteristic (typical), NTC-Thermistor

$$R = f(T_{NTC})$$





6 Circuit diagram

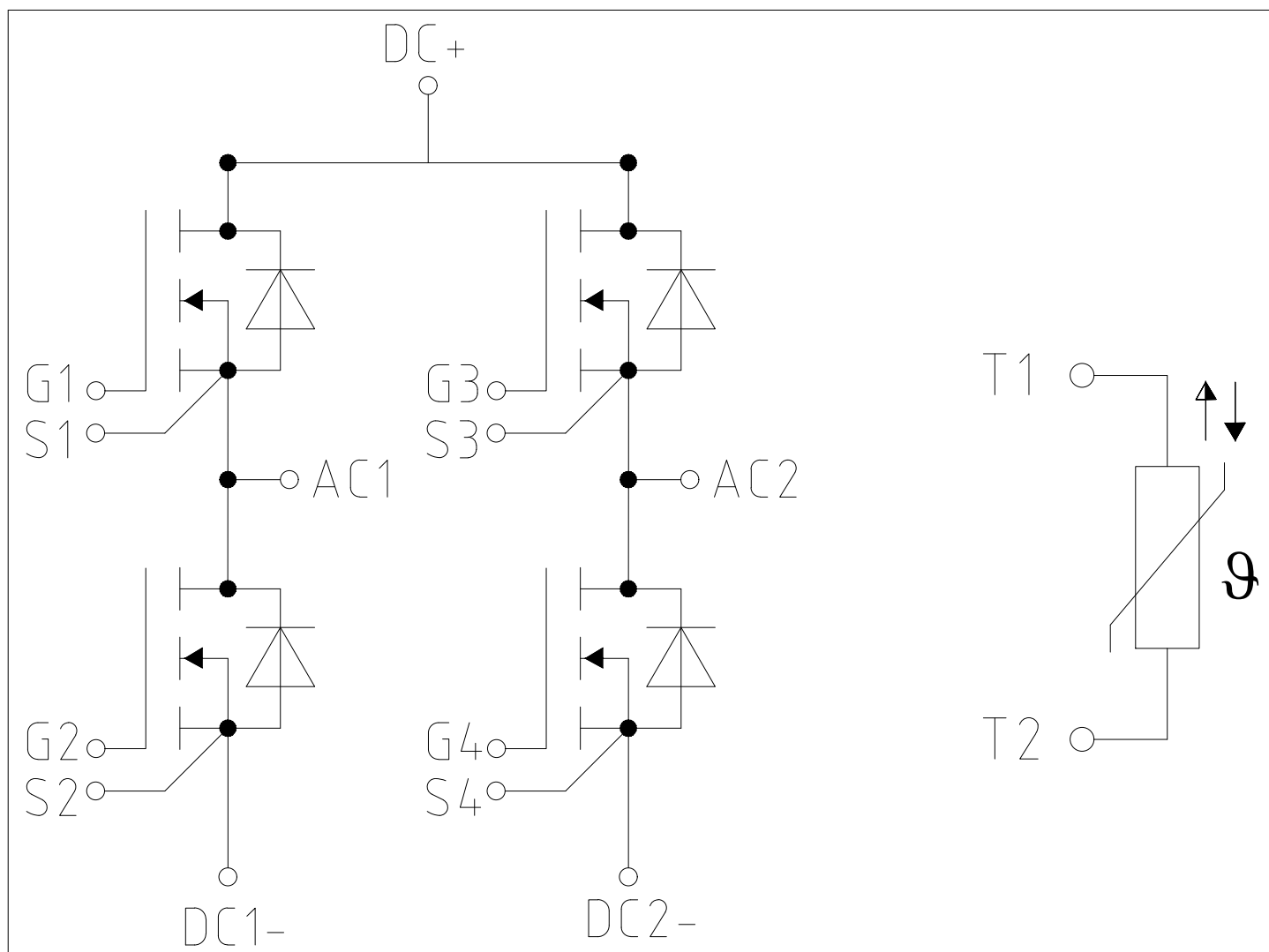


Figure 2

7 Package outlines

7 Package outlines

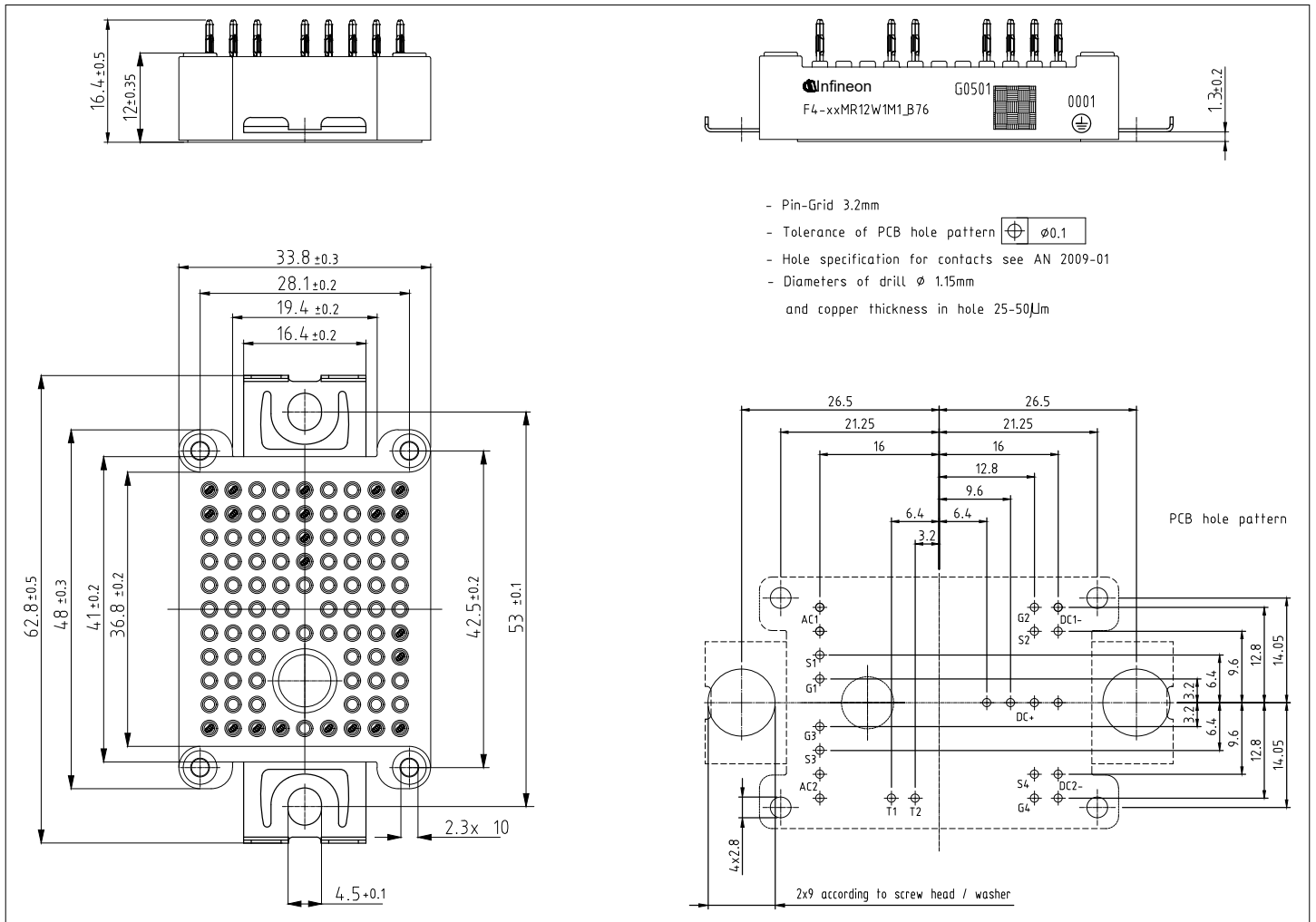


Figure 3

## 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 4

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