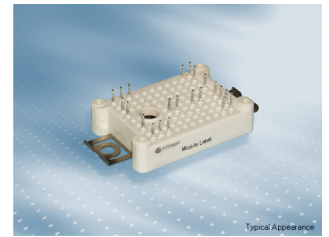


Preliminary datasheet

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

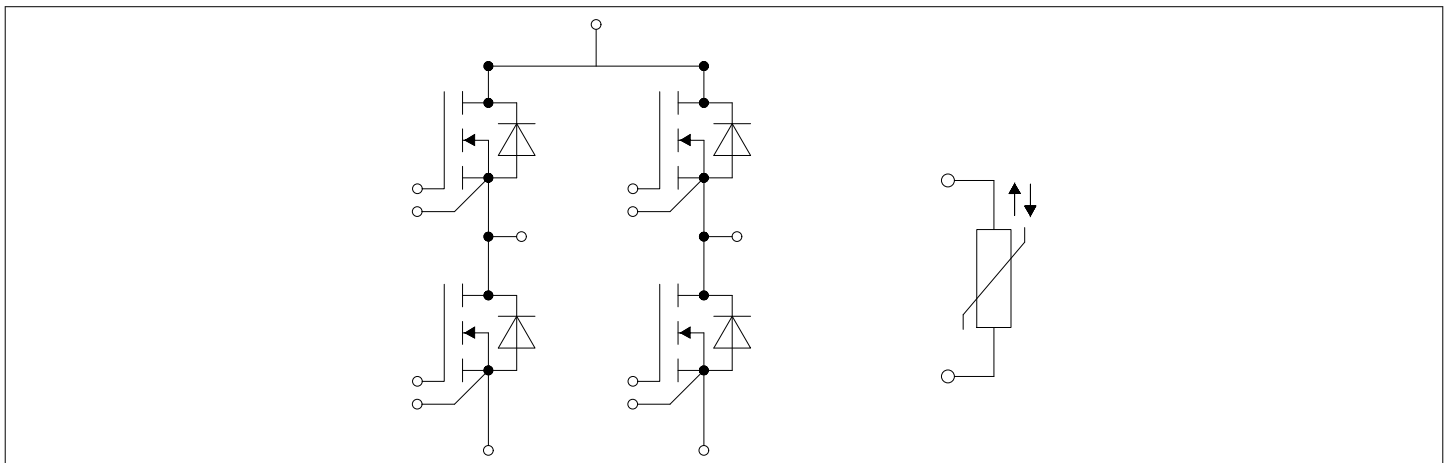


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1 Package

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	$T_{vj\text{op}}$		-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

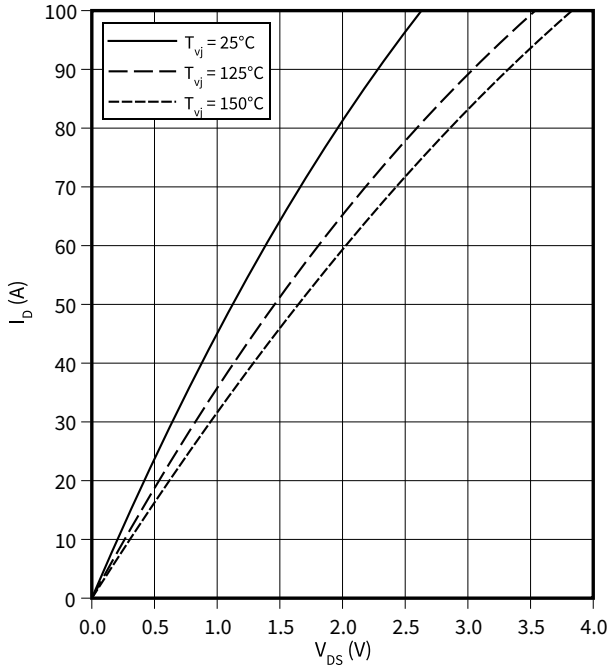
Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	R_{25}	$T_{NTC} = 25\text{ }^\circ\text{C}$		5		k Ω
Deviation of R_{100}	$\Delta R/R$	$T_{NTC} = 100\text{ }^\circ\text{C}$, $R_{100} = 493\ \Omega$	-5		5	%
Power dissipation	P_{25}	$T_{NTC} = 25\text{ }^\circ\text{C}$			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

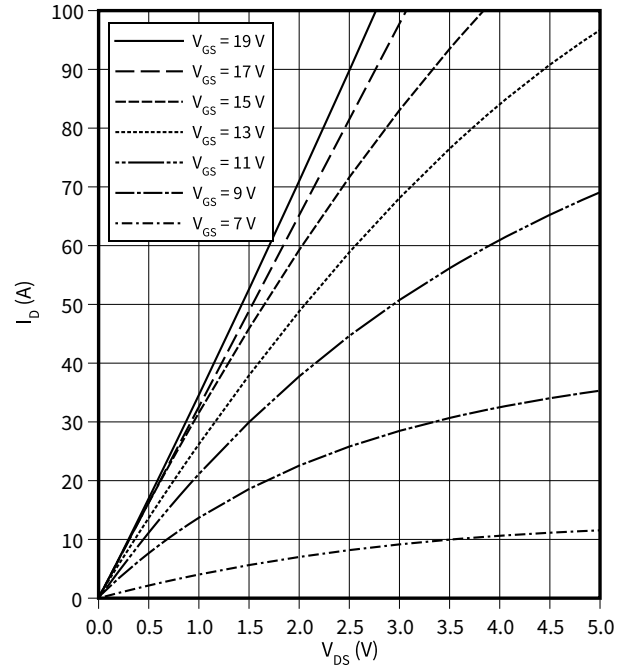
output characteristic (typical), MOSFET

$I_D = f(V_{DS})$
 $V_{GS} = 15\text{ V}$



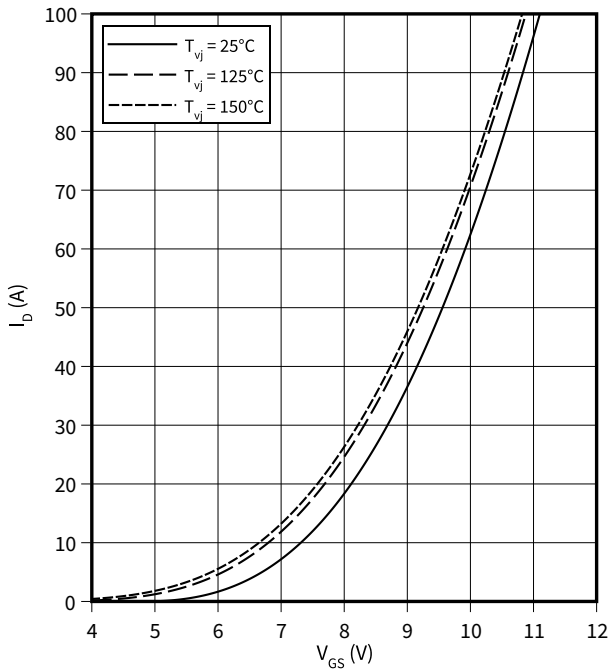
output characteristic (typical), MOSFET

$I_D = f(V_{DS})$
 $T_{vj} = 150^\circ\text{C}$



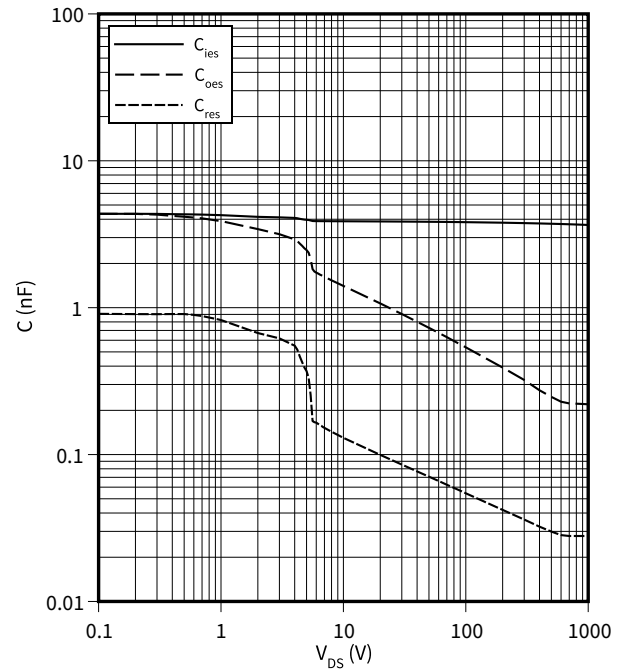
transfer characteristic (typical), MOSFET

$I_D = f(V_{GS})$
 $V_{DS} = 20\text{ V}$



capacity characteristic (typical), MOSFET

$C = f(V_{DS})$
 $f = 1\text{ MHz}$, $T_{vj} = 25^\circ\text{C}$, $V_{GS} = 0\text{ V}$

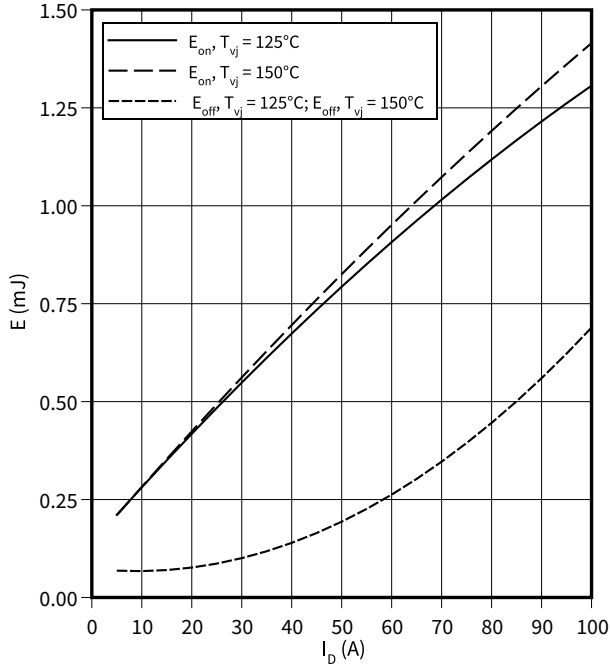


5 Characteristics diagrams

switching losses (typical), MOSFET

$E = f(I_D)$

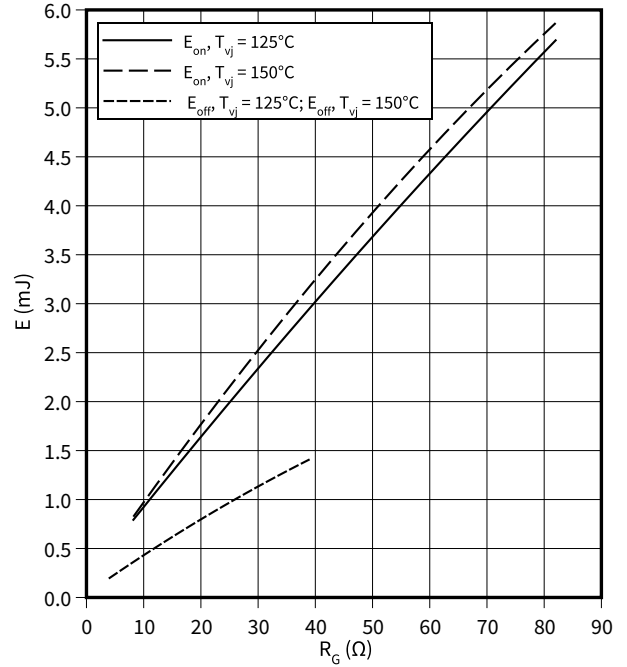
$R_{Goff} = 3.9 \Omega$, $R_{Gon} = 8.2 \Omega$, $V_{DS} = 600 \text{ V}$, $V_{GS} = -5/15 \text{ V}$



switching losses (typical), MOSFET

$E = f(R_G)$

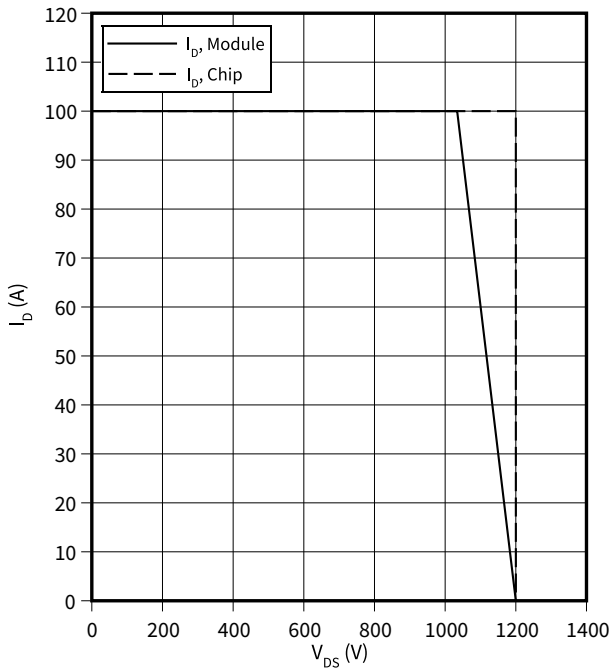
$V_{DS} = 600 \text{ V}$, $I_D = 50 \text{ A}$, $V_{GS} = -5/15 \text{ V}$



reverse bias safe operating area (RBSOA), MOSFET

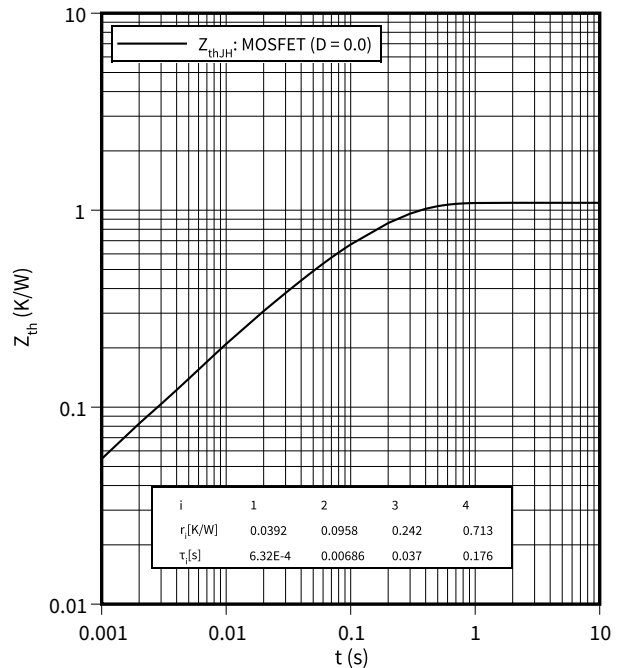
$I_D = f(V_{DS})$

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



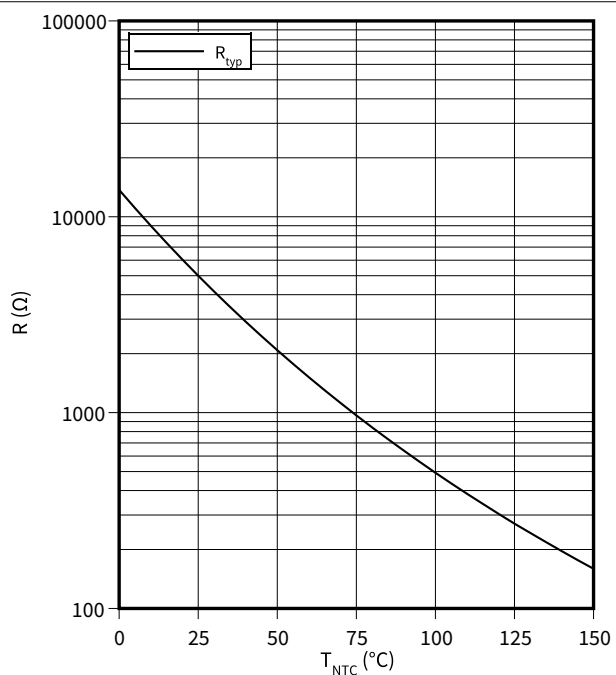
transient thermal impedance, MOSFET

$Z_{th} = f(t)$



temperature characteristic (typical), NTC-Thermistor

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



6 Circuit diagram

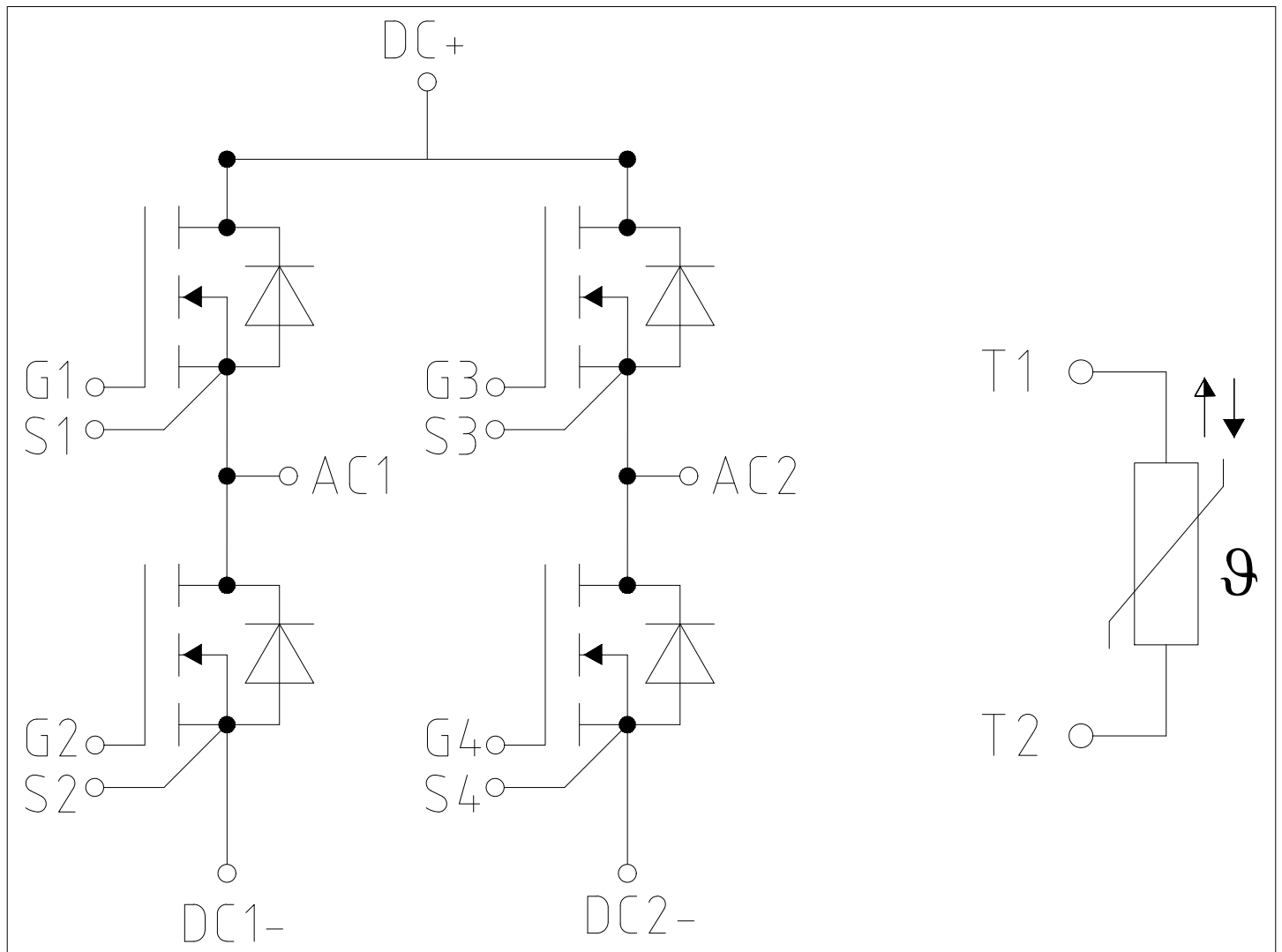


Figure 2

7 Package outlines

7 Package outlines

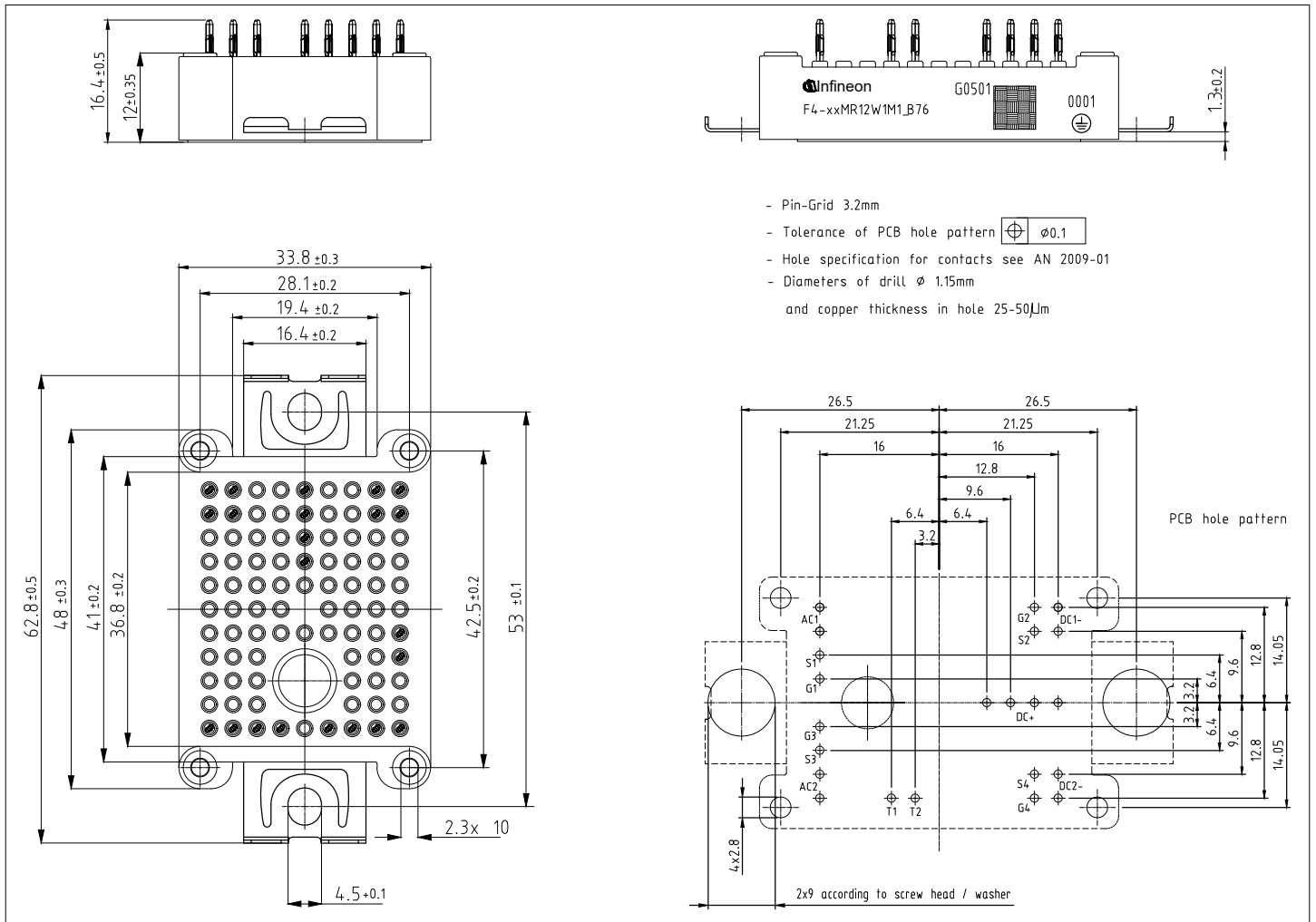


Figure 3

8 Module label code


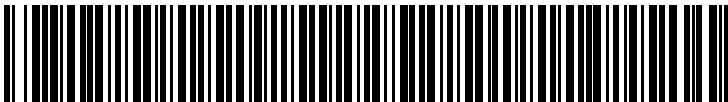
Module label code			
Code format	Data Matrix	Barcode Code128	
Encoding	ASCII text	Code Set A	
Symbol size	16x16	23 digits	
Standard	IEC24720 and IEC16022	IEC8859-1	
Code content	<i>Content</i>	<i>Digit</i>	<i>Example</i>
	Module serial number	1 - 5	71549
	Module material number	6 - 11	142846
	Production 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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