

Preliminary datasheet

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

Features

- Electrical features
 - $V_{DSS} = 1200\text{ V}$
 - $I_{DN} = 25\text{ A}$ / $I_{DRM} = 50\text{ A}$
 - High current density
 - Low inductive design
 - Low switching losses
- Mechanical features
 - Rugged mounting due to integrated mounting clamps
 - Integrated NTC temperature sensor
 - PressFIT contact technology



Potential applications

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

Product validation

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

Description

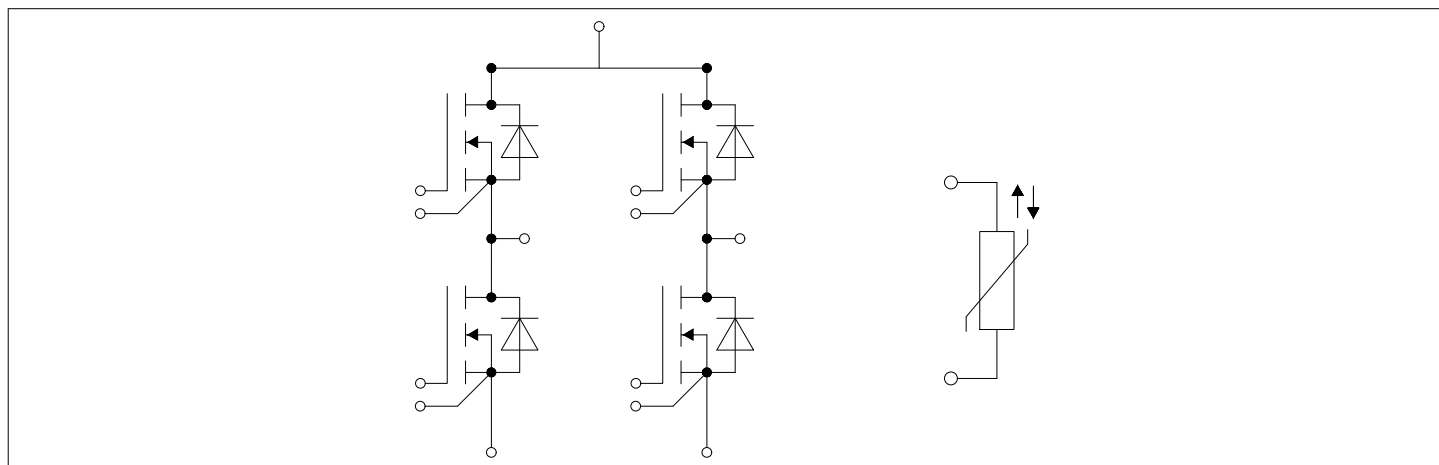


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1 Package

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}		25	A
Continuous DC drain current	I_{DDC}	$T_{vj} = 175 \text{ °C}$, $V_{GS} = 15 \text{ V}$ $T_H = 65 \text{ °C}$	25	A
Repetitive peak drain current	I_{DRM}	verified by design, t_p limited by T_{vjmax}	50	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	$R_{DS(on)}$	$I_D = 25\text{ A}$, $V_{GS} = 15\text{ V}$ $T_{vj} = 25\text{ °C}$ $T_{vj} = 125\text{ °C}$ $T_{vj} = 150\text{ °C}$		45		mΩ
				59		
				66		
Gate threshold voltage	$V_{GS(th)}$	$I_D = 10\text{ mA}$, $V_{DS} = V_{GS}$, $T_{vj} = 25\text{ °C}$, (tested after 1ms pulse at $V_{GS} = +20\text{ V}$)	3.45	4.5	5.55	V
Total gate charge	Q_G	$V_{DS} = 800\text{ V}$, $V_{GS} = -5/+15\text{ V}$		0.062		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\text{ °C}$		4		Ω
Input capacitance	C_{ISS}	$f = 1\text{ MHz}$, $V_{DS} = 800\text{ V}$, $V_{GS} = 0\text{ V}$, $T_{vj} = 25\text{ °C}$		1.84		nF
Output capacitance	C_{OSS}	$f = 1\text{ MHz}$, $V_{DS} = 800\text{ V}$, $V_{GS} = 0\text{ V}$, $T_{vj} = 25\text{ °C}$		0.11		nF
Reverse transfer capacitance	C_{rss}	$f = 1\text{ MHz}$, $V_{DS} = 800\text{ V}$, $V_{GS} = 0\text{ V}$, $T_{vj} = 25\text{ °C}$		0.014		nF
C_{OSS} stored energy	E_{OSS}	$V_{DS} = 800\text{ V}$, $V_{GS} = -5/+15\text{ V}$, $T_{vj} = 25\text{ °C}$		44		μJ
Drain-source leakage current	I_{DSS}	$V_{DS} = 1200\text{ V}$, $V_{GS} = -5\text{ V}$, $T_{vj} = 25\text{ °C}$		0.1	120	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)	$t_{d on}$	$I_D = 25\text{ A}$, $R_{Gon} = 7.5\text{ Ω}$, $V_{DS} = 600\text{ V}$, $V_{GS} = -5/+15\text{ V}$ $T_{vj} = 25\text{ °C}$ $T_{vj} = 125\text{ °C}$ $T_{vj} = 150\text{ °C}$		19		ns
				19		
				19		
Rise time (inductive load)	t_r	$I_D = 25\text{ A}$, $R_{Gon} = 7.5\text{ Ω}$, $V_{DS} = 600\text{ V}$, $V_{GS} = -5/+15\text{ V}$ $T_{vj} = 25\text{ °C}$ $T_{vj} = 125\text{ °C}$ $T_{vj} = 150\text{ °C}$		9		ns
				8		
				8		
Turn-off delay time (inductive load)	$t_{d off}$	$I_D = 25\text{ A}$, $R_{Goff} = 3.9\text{ Ω}$, $V_{DS} = 600\text{ V}$, $V_{GS} = -5/+15\text{ V}$ $T_{vj} = 25\text{ °C}$ $T_{vj} = 125\text{ °C}$ $T_{vj} = 150\text{ °C}$		39		ns
				42		
				43		
Fall time (inductive load)	t_f	$I_D = 25\text{ A}$, $R_{Goff} = 3.9\text{ Ω}$, $V_{DS} = 600\text{ V}$, $V_{GS} = -5/+15\text{ V}$ $T_{vj} = 25\text{ °C}$ $T_{vj} = 125\text{ °C}$ $T_{vj} = 150\text{ °C}$		16		ns
				16		
				16		
Turn-on energy loss per pulse	E_{on}	$I_D = 25\text{ A}$, $V_{DS} = 600\text{ V}$, $L_\sigma = 35\text{ nH}$, $V_{GS} = -5/+15\text{ V}$, $R_{Gon} = 7.5\text{ Ω}$, $di/dt = 2.3\text{ kA/μs}$ ($T_{vj} = 150\text{ °C}$) $T_{vj} = 25\text{ °C}$ $T_{vj} = 125\text{ °C}$ $T_{vj} = 150\text{ °C}$		0.313		mJ
				0.368		
				0.388		

Table 4 Characteristic Values (continued)

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Turn-off energy loss per pulse	E_{off}	$I_D = 25\text{ A}$, $V_{DS} = 600\text{ V}$, $T_{vj} = 25\text{ °C}$ $L_\sigma = 35\text{ nH}$, $T_{vj} = 125\text{ °C}$ $V_{GS} = -5/+15\text{ V}$, $T_{vj} = 150\text{ °C}$ $R_{Goff} = 3.9\text{ }\Omega$, $dv/dt = 38.2\text{ kV}/\mu\text{s}$ ($T_{vj} = 150\text{ °C}$)		0.07		mJ
				0.071		
				0.071		
Thermal resistance, junction to heatsink	R_{thJH}	per MOSFET		1.82		K/W
Temperature under switching conditions	$T_{vj\text{ op}}$		-40		150	°C

3 Body diode

Table 5 Maximum Rated Values

Parameter	Symbol	Note or test condition	Values	Unit
DC body diode forward current	I_{SD}	$T_{vj} = 175\text{ °C}$, $V_{GS} = -5\text{ V}$ $T_H = 65\text{ °C}$	8	A

Table 6 Characteristic Values

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

4 NTC-Thermistor

Table 7 Characteristic Values

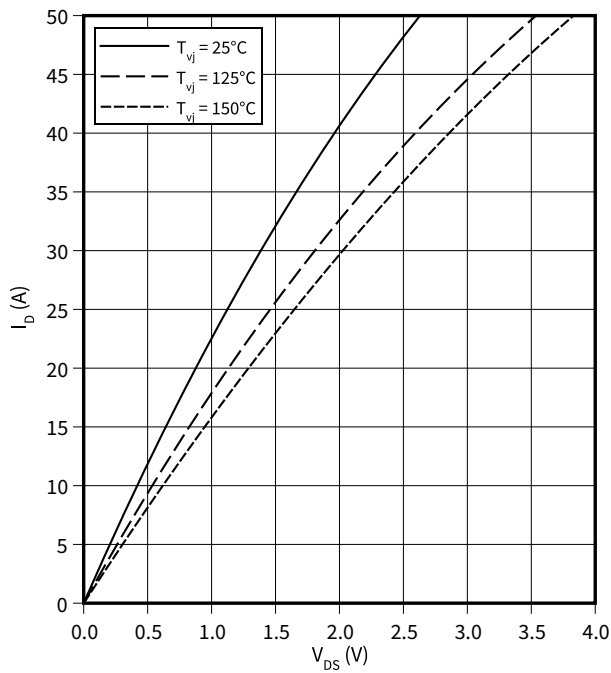
Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	R_{25}	$T_{NTC} = 25\text{ °C}$		5		k Ω
Deviation of R_{100}	$\Delta R/R$	$T_{NTC} = 100\text{ °C}$, $R_{100} = 493\text{ }\Omega$	-5		5	%
Power dissipation	P_{25}	$T_{NTC} = 25\text{ °C}$			20	mW
B-value	$B_{25/50}$	$R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298,15\text{ K}))]$		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

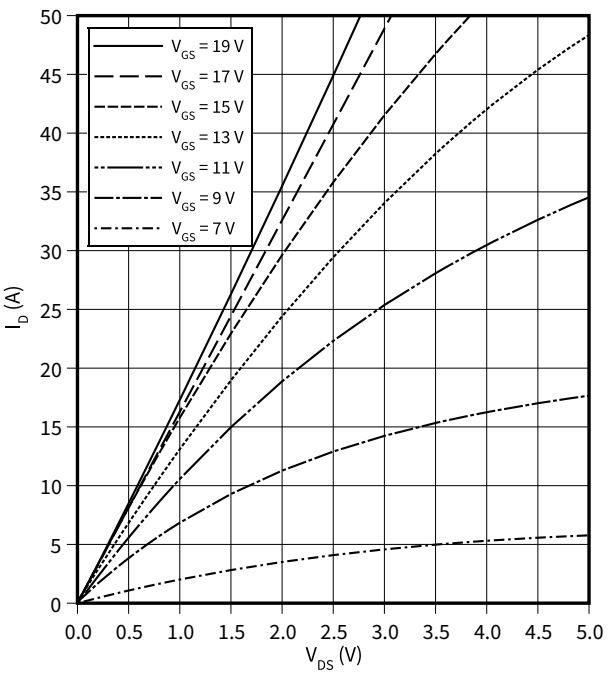
output characteristic (typical), MOSFET

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



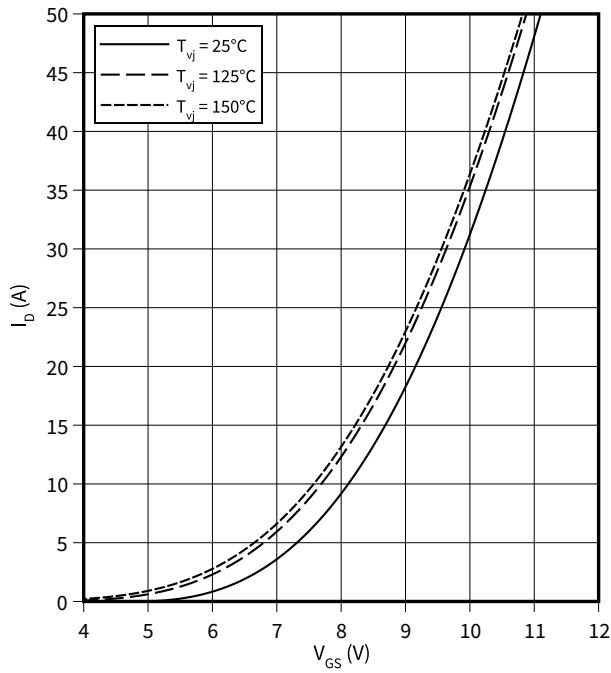
output characteristic (typical), MOSFET

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



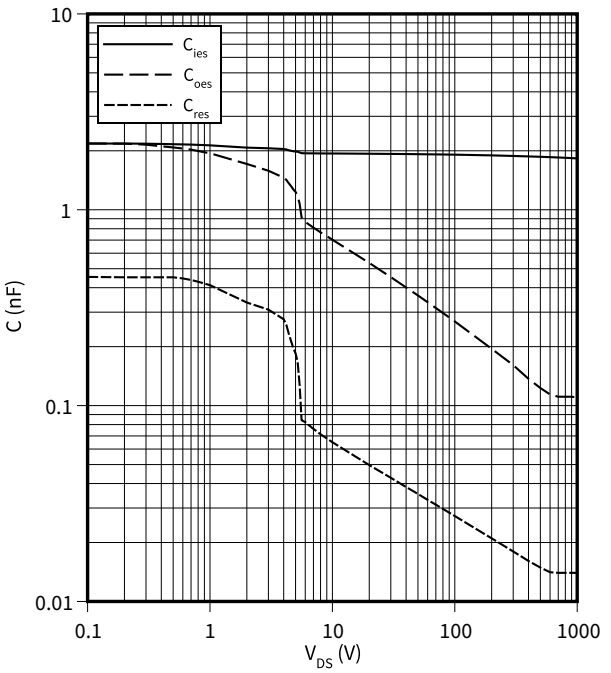
transfer characteristic (typical), MOSFET

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



capacity characteristic (typical), MOSFET

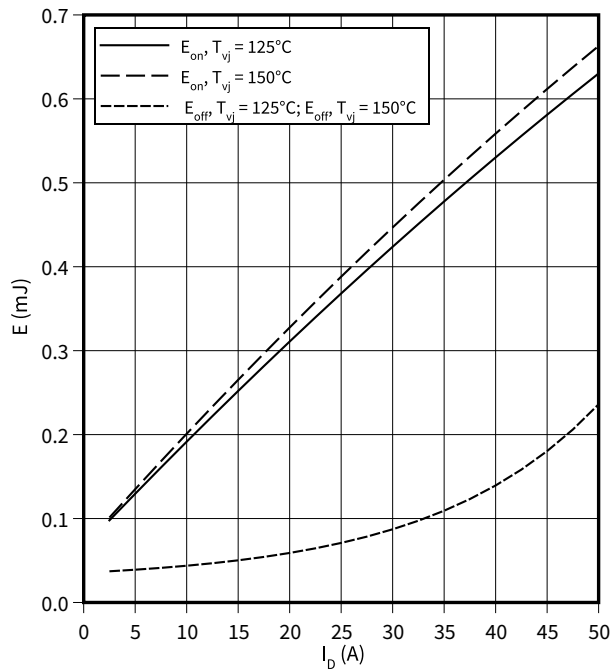
$C = f(V_{DS})$
 $f = 1\text{ MHz}$, $T_{vj} = 25^\circ\text{C}$, $V_{GS} = 0\text{ V}$



5 Characteristics diagrams

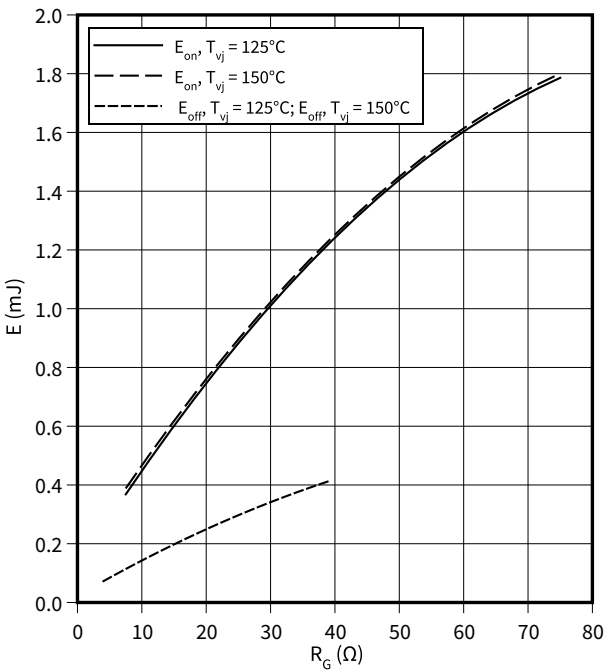
switching losses (typical), MOSFET

$E = f(I_D)$
 $R_{Goff} = 3.9 \, \Omega$, $R_{Gon} = 7.5 \, \Omega$, $V_{DS} = 600 \, V$, $V_{GS} = -5.0/15.0 \, V$



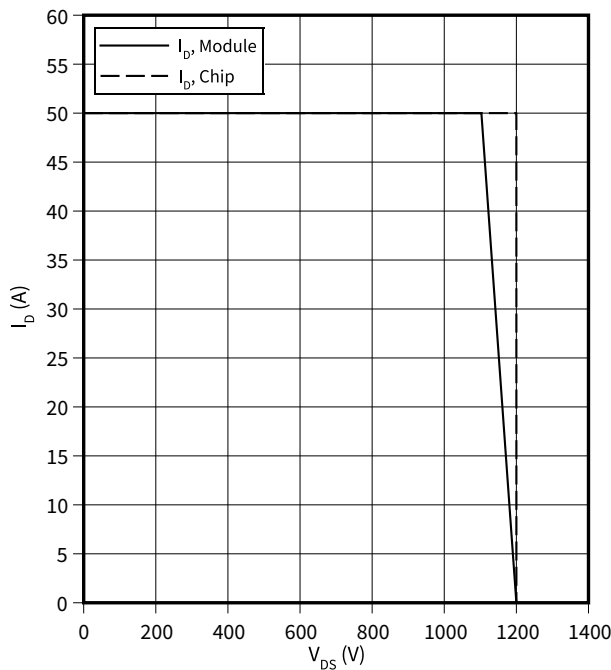
switching losses (typical), MOSFET

$E = f(R_G)$
 $V_{DS} = 600 \, V$, $I_D = 25 \, A$, $V_{GS} = -5.0/15.0 \, V$



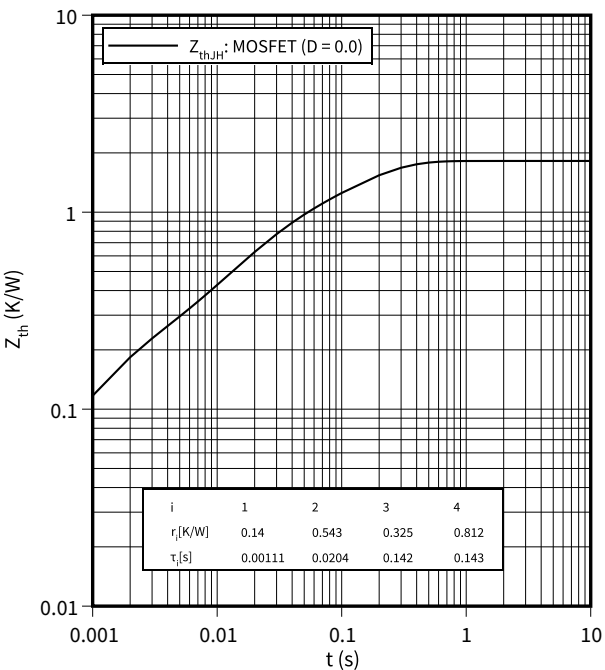
reverse bias safe operating area (RBSOA), MOSFET

$I_D = f(V_{DS})$
 $R_{Goff} = 3.9 \, \Omega$, $T_{vj} = 150 \, ^\circ C$, $V_{GS} = -5/15 \, V$



transient thermal impedance , MOSFET

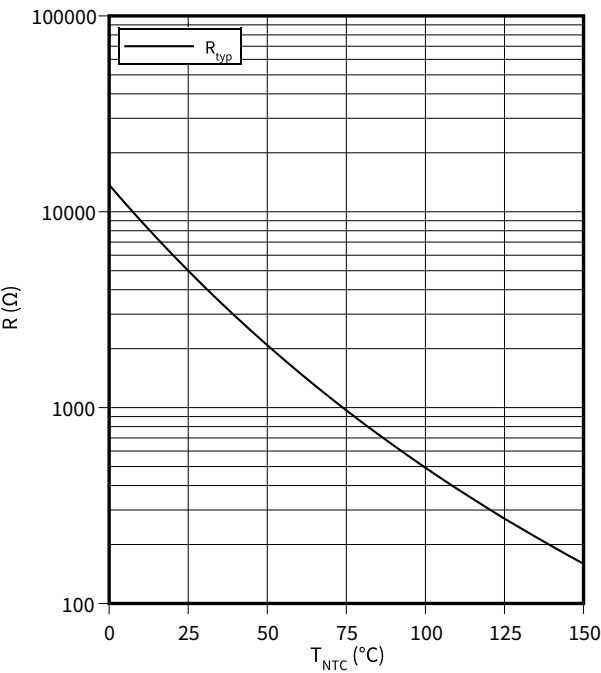
$Z_{th} = f(t)$



5 Characteristics diagrams

temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



6 Circuit diagram

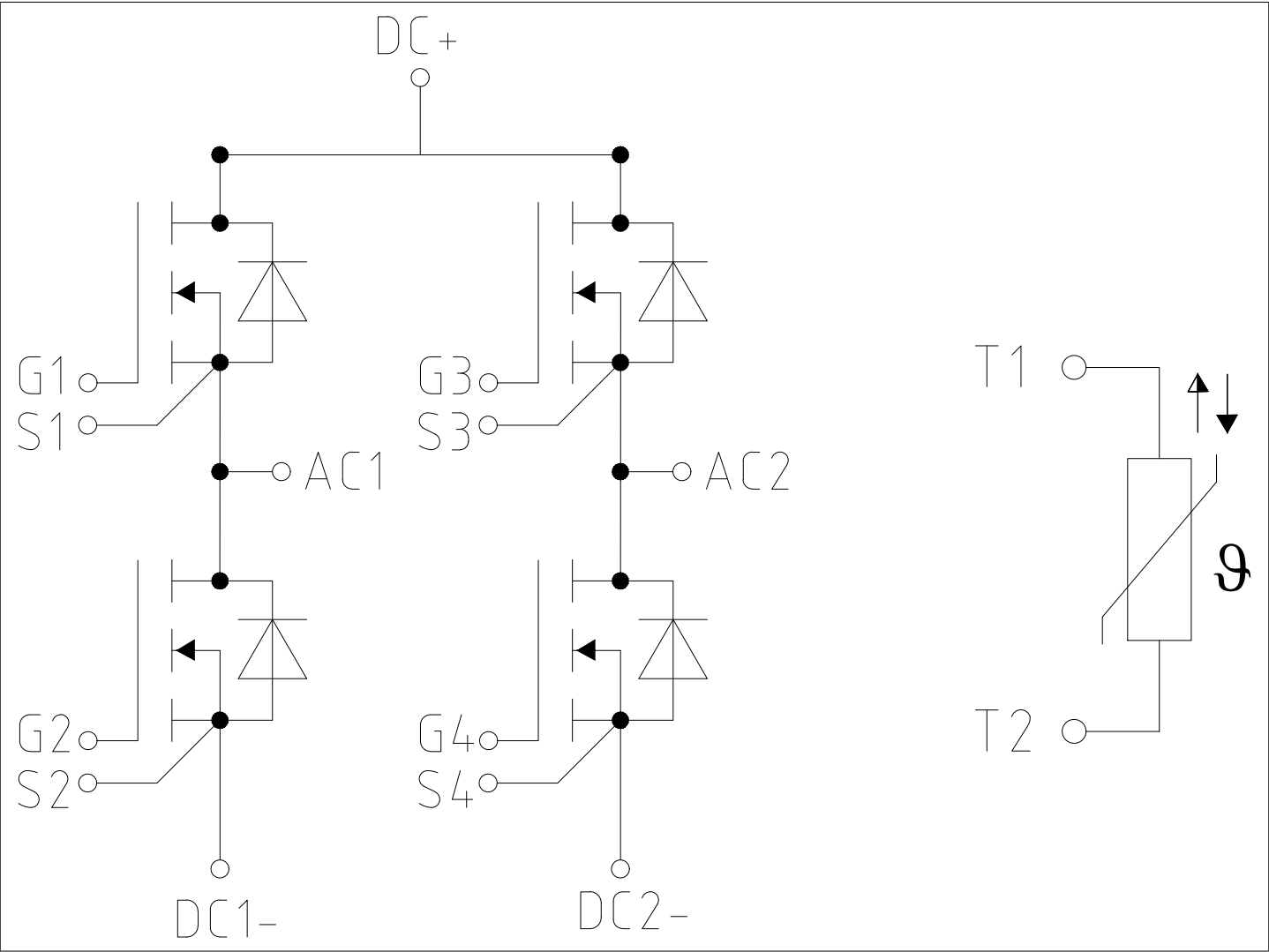


Figure 2

7 Package outlines

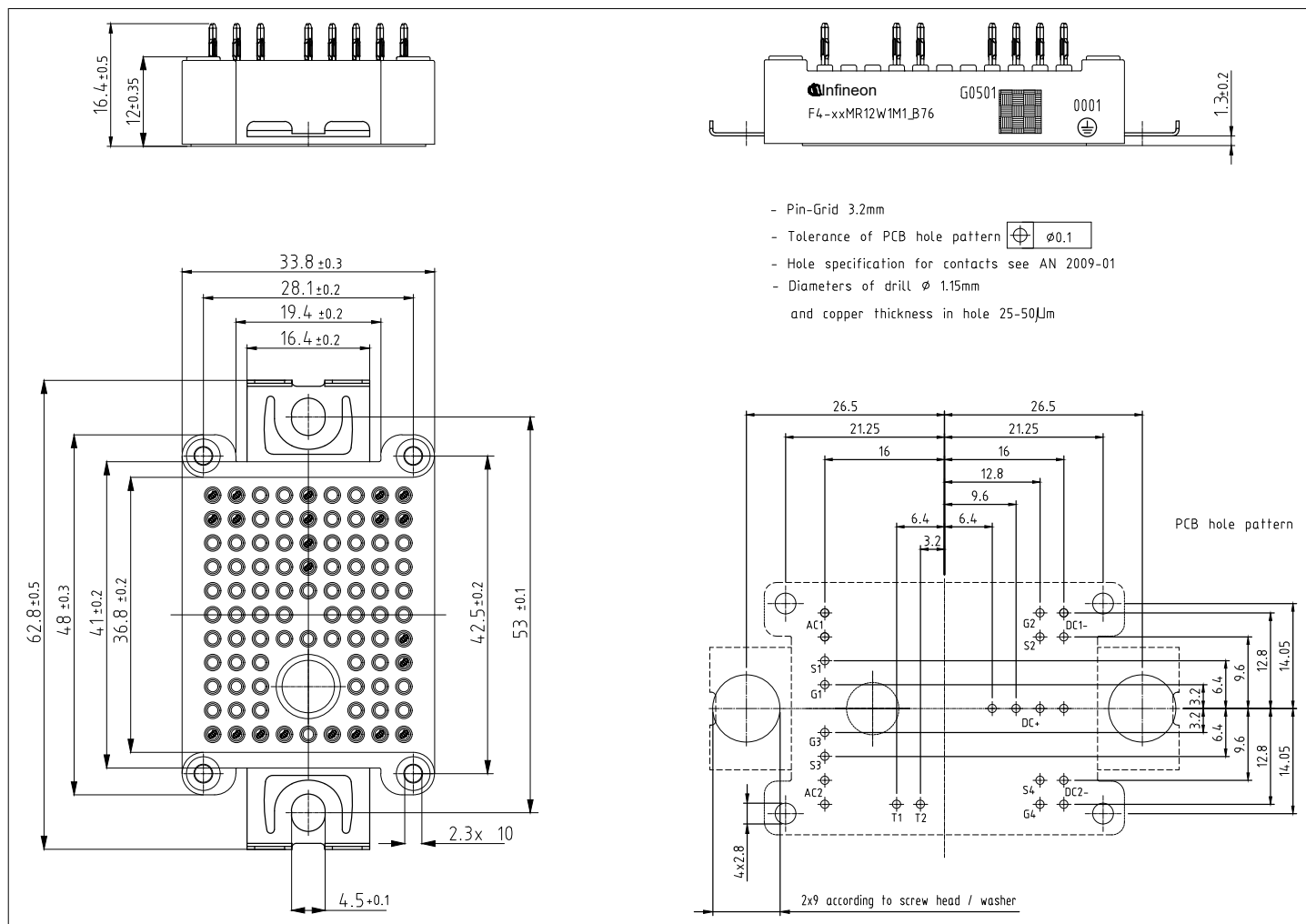


Figure 3

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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