

## Preliminary datasheet

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

#### Features

- Electrical features
  - $V_{DSS} = 1200\text{ V}$
  - $I_{DN} = 30\text{ A} / I_{DRM} = 60\text{ A}$
  - Low inductive design
  - Low switching losses
- Mechanical features
  - Rugged mounting due to integrated mounting clamps
  - PressFIT contact technology
  - Integrated NTC temperature sensor



Typical appearance

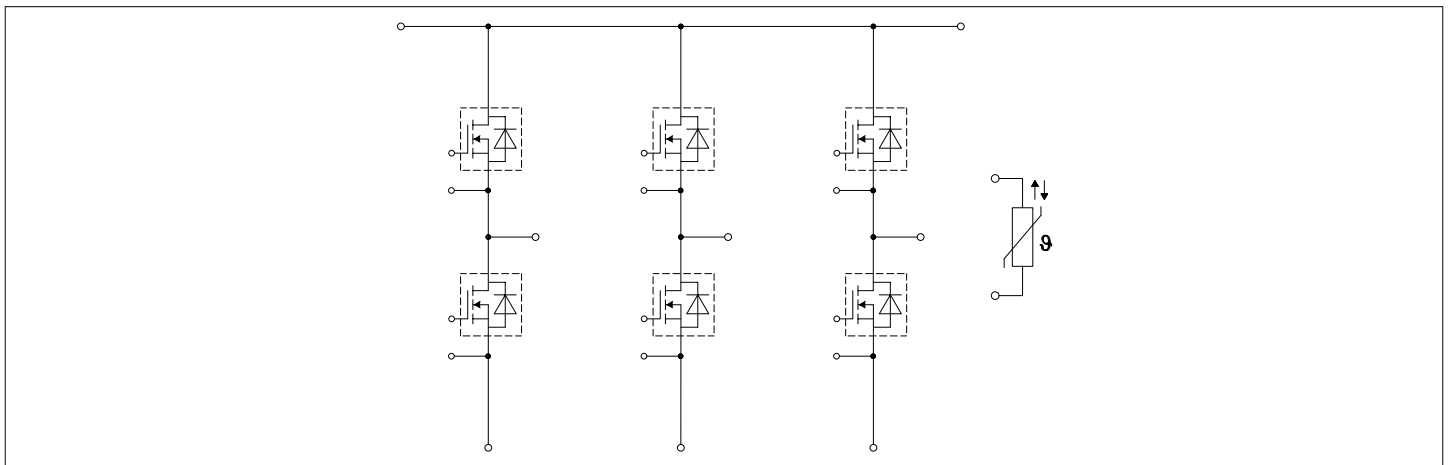
#### Potential applications

- High-frequency switching application
- DC/DC converter
- Motor drives
- UPS systems

#### Product validation

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

#### Description



## Table of contents

	<b>Description</b> .....	1
	<b>Features</b> .....	1
	<b>Potential applications</b> .....	1
	<b>Product validation</b> .....	1
	<b>Table of contents</b> .....	2
<b>1</b>	<b>Package</b> .....	3
<b>2</b>	<b>MOSFET</b> .....	3
<b>3</b>	<b>Body diode (MOSFET)</b> .....	5
<b>4</b>	<b>NTC-Thermistor</b> .....	6
<b>5</b>	<b>Characteristics diagrams</b> .....	7
<b>6</b>	<b>Circuit diagram</b> .....	12
<b>7</b>	<b>Package outlines</b> .....	13
<b>8</b>	<b>Module label code</b> .....	14
	<b>Revision history</b> .....	15
	<b>Disclaimer</b> .....	16

## 1 Package

**Table 1** Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	$V_{ISOL}$	RMS, $f = 50$ Hz, $t = 1$ min	3.0	kV
Internal isolation		basic insulation (class 1, IEC 61140)	$Al_2O_3$	
Comparative tracking index	$CTI$		> 200	
Relative thermal index (electrical)	$RTI$	housing	140	°C

**Table 2** Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Stray inductance module	$L_{sCE}$			19		nH
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_H = 25$ °C, per switch		5.3		mΩ
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.

## 2 MOSFET

**Table 3** Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Drain-source voltage	$V_{DSS}$	$T_{vj} = 25$ °C	1200	V
Continuous DC drain current	$I_{DDC}$	$T_{vj} = 175$ °C, $V_{GS} = 18$ V $T_H = 80$ °C	30	A
Repetitive peak drain current	$I_{DRM}$	verified by design, $t_p$ limited by $T_{vjmax}$	60	A
Gate-source voltage, max. transient voltage	$V_{GS}$	$D < 0.01$	-10/23	V
Gate-source voltage, max. static voltage	$V_{GS}$		-7/20	V

**Table 4** Recommended values

Parameter	Symbol	Note or test condition	Values	Unit
On-state gate voltage	$V_{GS(on)}$		15...18	V
Off-state gate voltage	$V_{GS(off)}$		-5...0	V

**Table 5 Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Drain-source on-resistance	$R_{DS(on)}$	$I_D = 30\text{ A}$	$V_{GS} = 18\text{ V}$ , $T_{vj} = 25\text{ °C}$		26.4		mΩ
			$V_{GS} = 18\text{ V}$ , $T_{vj} = 125\text{ °C}$		42.8		
			$V_{GS} = 18\text{ V}$ , $T_{vj} = 175\text{ °C}$		56.8		
			$V_{GS} = 15\text{ V}$ , $T_{vj} = 25\text{ °C}$		31.8		
Gate threshold voltage	$V_{GS(th)}$	$I_D = 12\text{ mA}$ , $V_{DS} = V_{GS}$ , $T_{vj} = 25\text{ °C}$ , (tested after 1ms pulse at $V_{GS} = +20\text{ V}$ )	3.45	4.3	5.15	V	
Total gate charge	$Q_G$	$V_{DD} = 800\text{ V}$ , $V_{GS} = -3/18\text{ V}$		0.09		μC	
Internal gate resistor	$R_{Gint}$	$T_{vj} = 25\text{ °C}$		3.8		Ω	
Input capacitance	$C_{ISS}$	$f = 100\text{ kHz}$ , $V_{DS} = 800\text{ V}$ , $V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$	2.7		nF	
Output capacitance	$C_{OSS}$	$f = 100\text{ kHz}$ , $V_{DS} = 800\text{ V}$ , $V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$	0.128		nF	
Reverse transfer capacitance	$C_{rSS}$	$f = 100\text{ kHz}$ , $V_{DS} = 800\text{ V}$ , $V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$	0.009		nF	
$C_{OSS}$ stored energy	$E_{OSS}$	$V_{DS} = 800\text{ V}$ , $V_{GS} = -3/18\text{ V}$ , $T_{vj} = 25\text{ °C}$		52.4		μJ	
Drain-source leakage current	$I_{DSS}$	$V_{DS} = 1200\text{ V}$ , $V_{GS} = -3\text{ V}$	$T_{vj} = 25\text{ °C}$	0.02	208	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)	$t_{d\ on}$	$I_D = 30\text{ A}$ , $R_{Gon} = 6.2\text{ Ω}$ , $V_{DD} = 600\text{ V}$ , $V_{GS} = -3/18\text{ V}$	$T_{vj} = 25\text{ °C}$	16		ns	
			$T_{vj} = 125\text{ °C}$	16			
			$T_{vj} = 175\text{ °C}$	16			
Rise time (inductive load)	$t_r$	$I_D = 30\text{ A}$ , $R_{Gon} = 6.2\text{ Ω}$ , $V_{DD} = 600\text{ V}$ , $V_{GS} = -3/18\text{ V}$	$T_{vj} = 25\text{ °C}$	30		ns	
			$T_{vj} = 125\text{ °C}$	30			
			$T_{vj} = 175\text{ °C}$	30			
Turn-off delay time (inductive load)	$t_{d\ off}$	$I_D = 30\text{ A}$ , $R_{Goff} = 5.1\text{ Ω}$ , $V_{DD} = 600\text{ V}$ , $V_{GS} = -3/18\text{ V}$	$T_{vj} = 25\text{ °C}$	47		ns	
			$T_{vj} = 125\text{ °C}$	52			
			$T_{vj} = 175\text{ °C}$	55			
Fall time (inductive load)	$t_f$	$I_D = 30\text{ A}$ , $R_{Goff} = 5.1\text{ Ω}$ , $V_{DD} = 600\text{ V}$ , $V_{GS} = -3/18\text{ V}$	$T_{vj} = 25\text{ °C}$	19		ns	
			$T_{vj} = 125\text{ °C}$	19			
			$T_{vj} = 175\text{ °C}$	19			

(table continues...)

**Table 5 (continued) Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Turn-on energy loss per pulse	$E_{on}$	$I_D = 30\text{ A}$ , $V_{DD} = 600\text{ V}$ , $L_\sigma = 35\text{ nH}$ , $V_{GS} = -3/18\text{ V}$ , $R_{Gon} = 6.2\ \Omega$ , $di/dt = 2.7\text{ kA}/\mu\text{s}$ ( $T_{vj} = 175\text{ }^\circ\text{C}$ )	$T_{vj} = 25\text{ }^\circ\text{C}$	0.47		mJ
			$T_{vj} = 125\text{ }^\circ\text{C}$	0.589		
			$T_{vj} = 175\text{ }^\circ\text{C}$	0.661		
Turn-off energy loss per pulse	$E_{off}$	$I_D = 30\text{ A}$ , $V_{DD} = 600\text{ V}$ , $L_\sigma = 35\text{ nH}$ , $V_{GS} = -3/18\text{ V}$ , $R_{Goff} = 5.1\ \Omega$ , $dv/dt = 25\text{ kV}/\mu\text{s}$ ( $T_{vj} = 175\text{ }^\circ\text{C}$ )	$T_{vj} = 25\text{ }^\circ\text{C}$	0.112		mJ
			$T_{vj} = 125\text{ }^\circ\text{C}$	0.121		
			$T_{vj} = 175\text{ }^\circ\text{C}$	0.123		
Thermal resistance, junction to heat sink	$R_{thJH}$	per MOSFET, $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$		1.4		K/W
Temperature under switching conditions	$T_{vj\text{op}}$		-40		175	$^\circ\text{C}$

*Note: The selection of positive and negative gate-source voltages impacts losses and the long-term behavior of the MOSFET and body diode. The design guidelines described in Application Notes AN 2018-09 and AN 2021-13 must be considered to ensure sound operation of the device over the planned lifetime.*

*$T_{vj,op} > 150\text{ }^\circ\text{C}$  is allowed for operation at overload conditions for MOSFET and body diode. For detailed specifications, please refer to AN 2021-13.*

### 3 Body diode (MOSFET)

**Table 6 Maximum rated values**

Parameter	Symbol	Note or test condition	Values	Unit
DC body diode forward current	$I_{SD}$	$T_{vj} = 175\text{ }^\circ\text{C}$ , $V_{GS} = -3\text{ V}$ $T_H = 80\text{ }^\circ\text{C}$	15	A

**Table 7 Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	$V_{SD}$	$I_{SD} = 30\text{ A}$ , $V_{GS} = -3\text{ V}$	$T_{vj} = 25\text{ }^\circ\text{C}$	4.2	5.35	V
			$T_{vj} = 125\text{ }^\circ\text{C}$	3.9		
			$T_{vj} = 175\text{ }^\circ\text{C}$	3.8		

## 4 NTC-Thermistor

**Table 8** Characteristic values

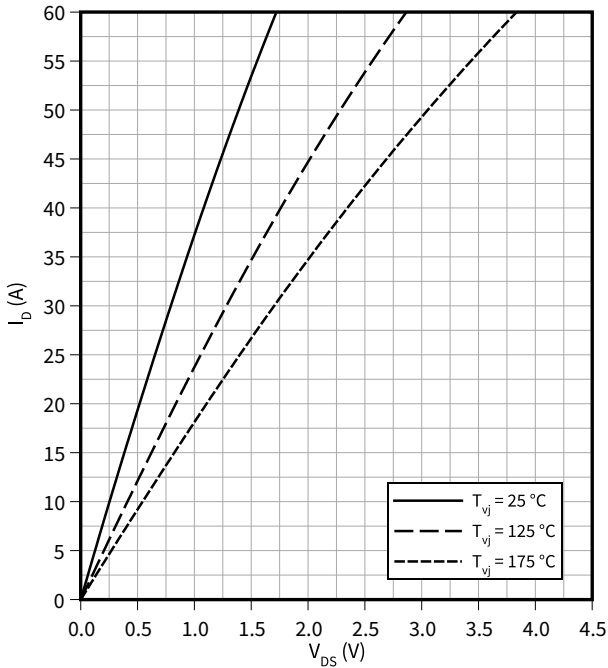
Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	$R_{25}$	$T_{NTC} = 25\text{ °C}$		5		kΩ
Deviation of $R_{100}$	$\Delta R/R$	$T_{NTC} = 100\text{ °C}, R_{100} = 493\ \Omega$	-5		5	%
Power dissipation	$P_{25}$	$T_{NTC} = 25\text{ °C}$			20	mW
B-value	$B_{25/50}$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

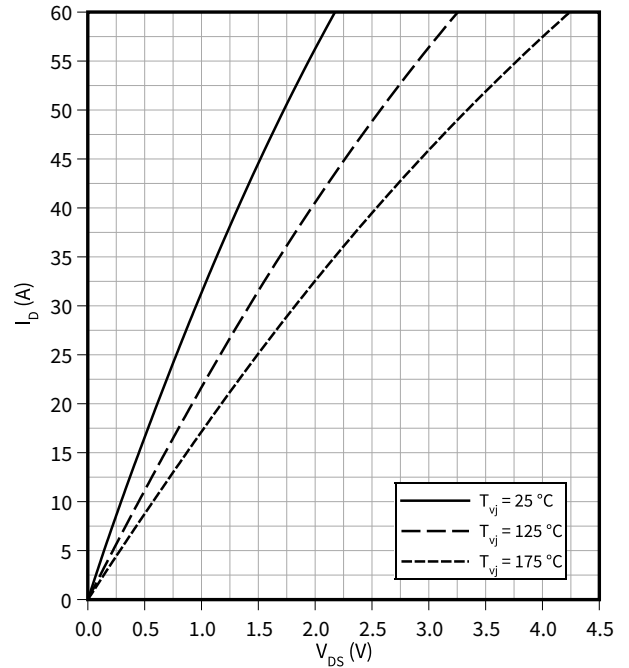
**Output characteristic (typical), MOSFET**

$I_D = f(V_{DS})$   
 $V_{GS} = 18\text{ V}$



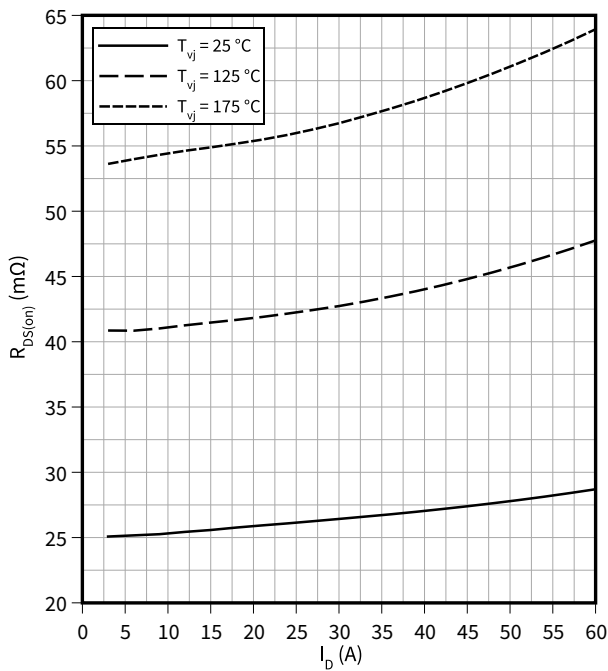
**Output characteristic (typical), MOSFET**

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



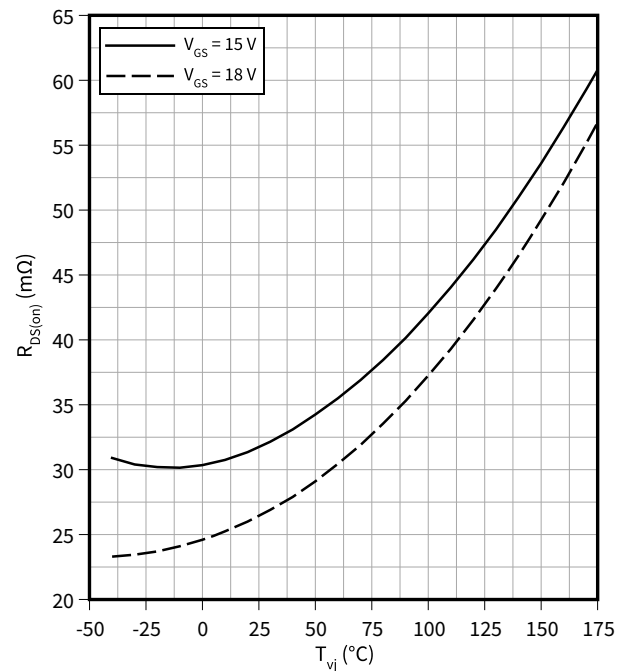
**Drain source on-resistance (typical), MOSFET**

$R_{DS(on)} = f(I_D)$   
 $V_{GS} = 18\text{ V}$



**Drain source on-resistance (typical), MOSFET**

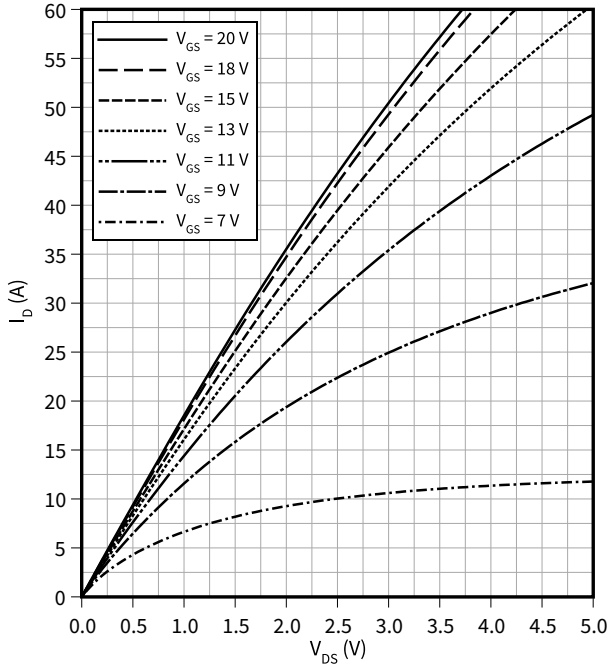
$R_{DS(on)} = f(T_{vj})$   
 $I_D = 30\text{ A}$



5 Characteristics diagrams

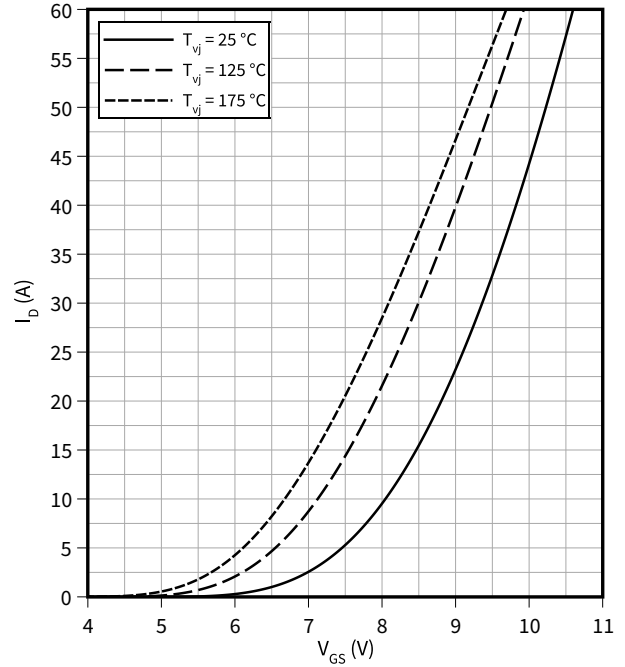
**Output characteristic field (typical), MOSFET**

$I_D = f(V_{DS})$   
 $T_{vj} = 175\text{ °C}$



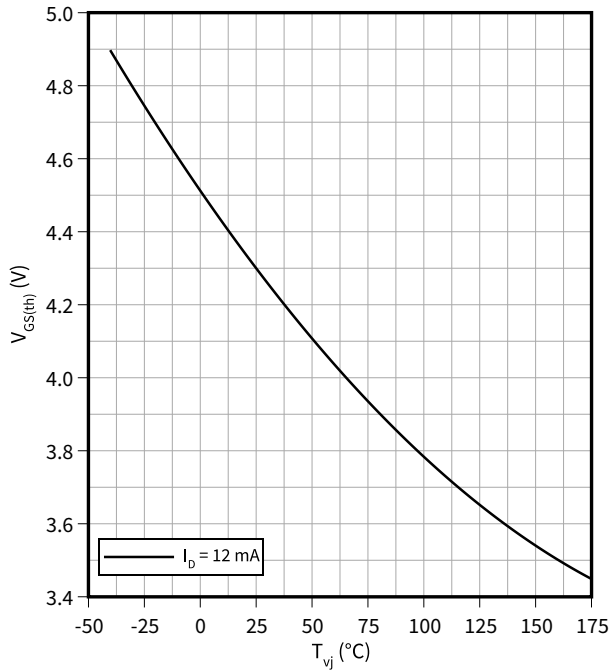
**Transfer characteristic (typical), MOSFET**

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



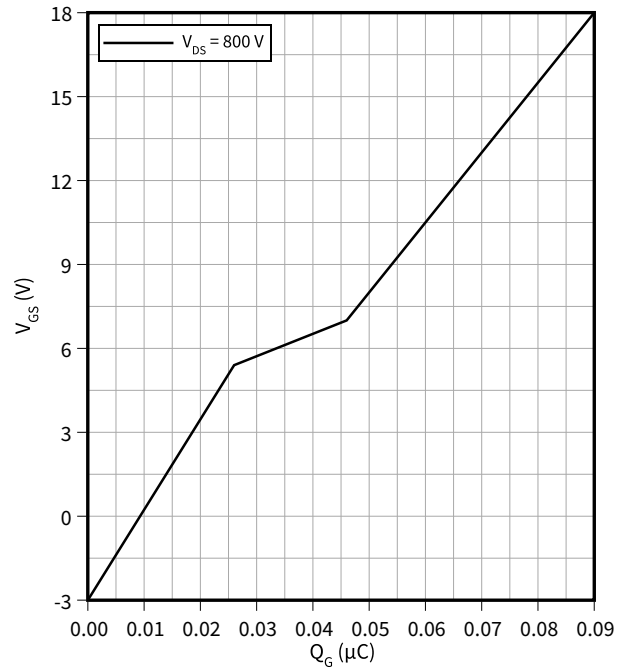
**Gate-source threshold voltage (typical), MOSFET**

$V_{GS(th)} = f(T_{vj})$   
 $V_{GS} = V_{DS}$



**Gate charge characteristic (typical), MOSFET**

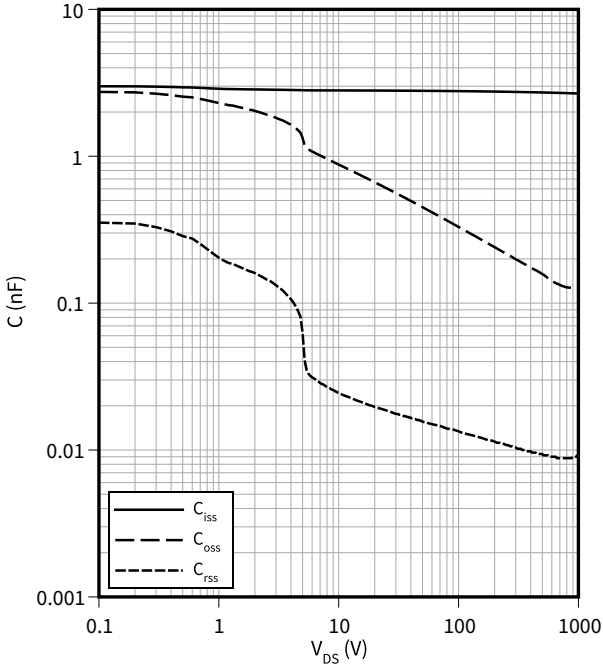
$V_{GS} = f(Q_G)$   
 $I_D = 30\text{ A}, T_{vj} = 25\text{ °C}$





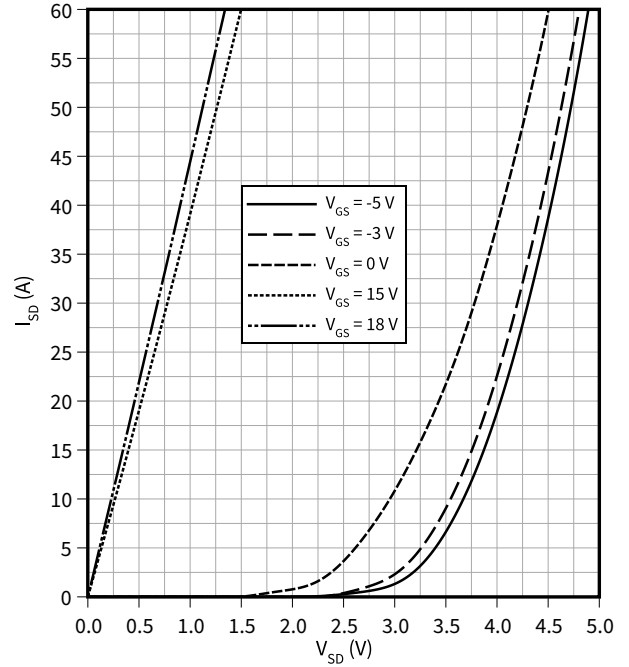
**Capacity characteristic (typical), MOSFET**

$C = f(V_{DS})$   
 $f = 100 \text{ kHz}, T_{vj} = 25 \text{ }^\circ\text{C}, V_{GS} = 0 \text{ V}$



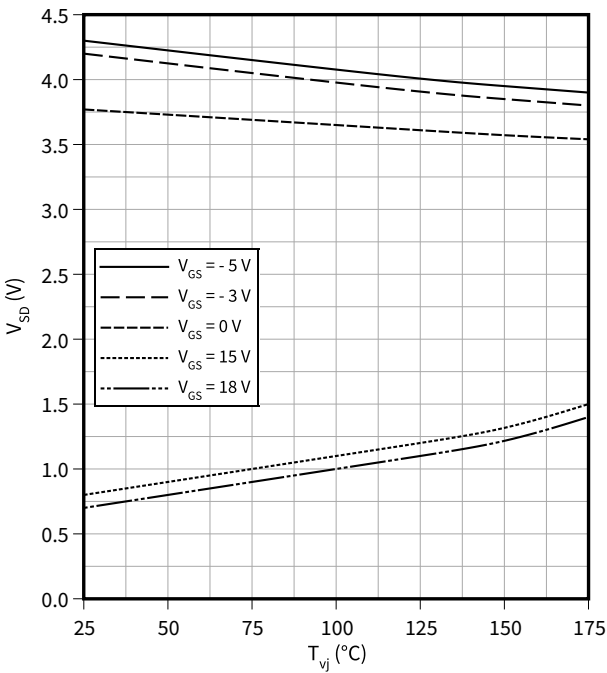
**Forward characteristic body diode (typical), MOSFET**

$I_{SD} = f(V_{SD})$   
 $T_{vj} = 25 \text{ }^\circ\text{C}$



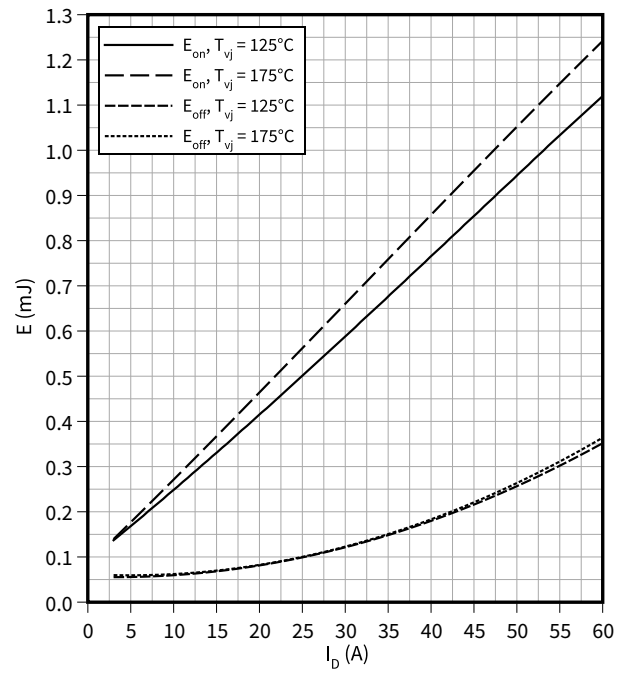
**Forward voltage of body diode (typical), MOSFET**

$V_{SD} = f(T_{vj})$   
 $I_{SD} = 30 \text{ A}$



**Switching losses (typical), MOSFET**

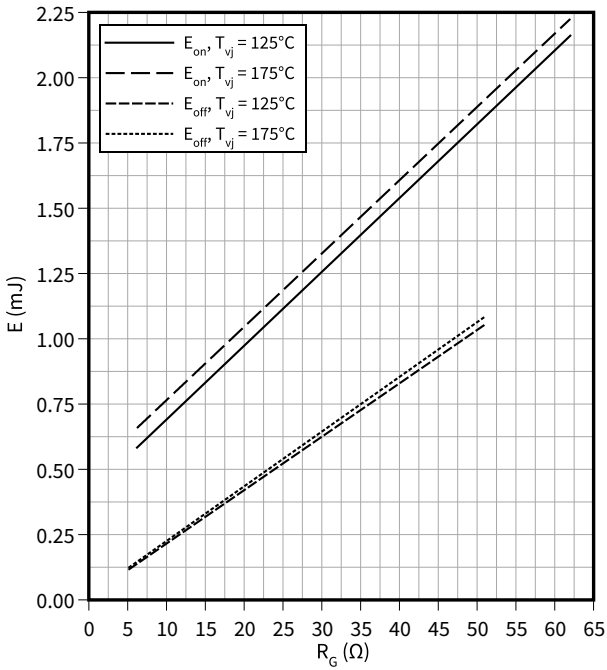
$E = f(I_D)$   
 $R_{Goff} = 5.1 \text{ } \Omega, R_{Gon} = 6.2 \text{ } \Omega, V_{DD} = 600 \text{ V}, V_{GS} = -3/18 \text{ V}$



**Switching losses (typical), MOSFET**

$E = f(R_G)$

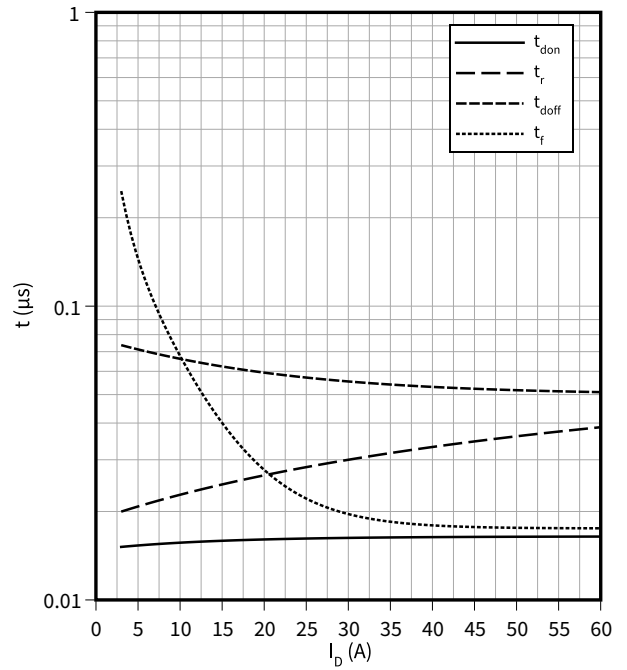
$V_{DD} = 600\text{ V}, I_D = 30\text{ A}, V_{GS} = -3/18\text{ V}$



**Switching times (typical), MOSFET**

$t = f(I_D)$

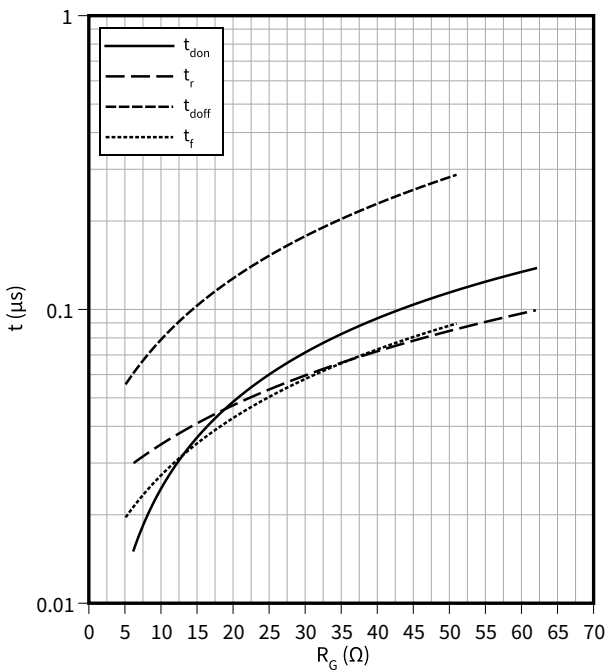
$R_{Goff} = 5.1\ \Omega, R_{Gon} = 6.2\ \Omega, V_{DD} = 600\text{ V}, T_{vj} = 175\text{ }^\circ\text{C}, V_{GS} = -3/18\text{ V}$



**Switching times (typical), MOSFET**

$t = f(R_G)$

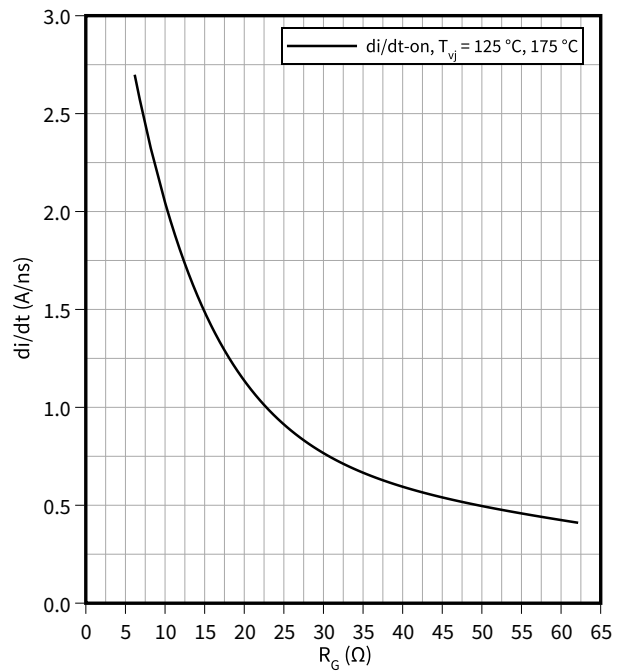
$V_{DD} = 600\text{ V}, I_D = 30\text{ A}, T_{vj} = 175\text{ }^\circ\text{C}, V_{GS} = -3/18\text{ V}$



**Current slope (typical), MOSFET**

$di/dt = f(R_G)$

$V_{DD} = 600\text{ V}, I_D = 30\text{ A}, V_{GS} = -3/18\text{ V}$

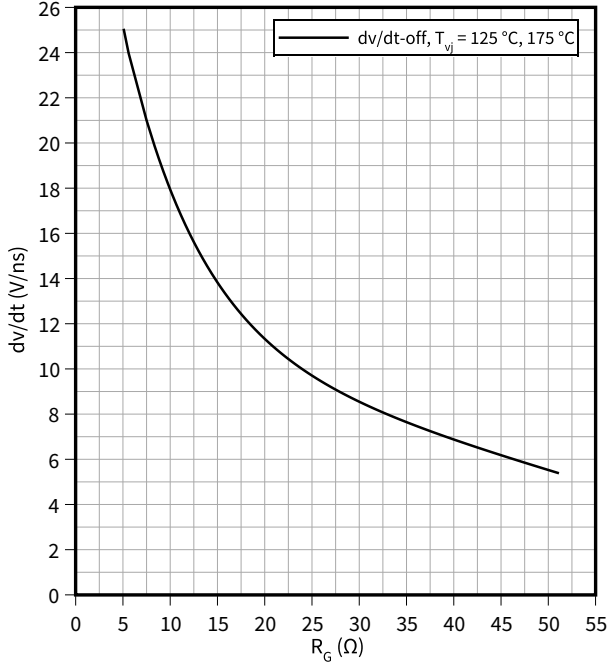


5 Characteristics diagrams

**Voltage slope (typical), MOSFET**

$dv/dt = f(R_G)$

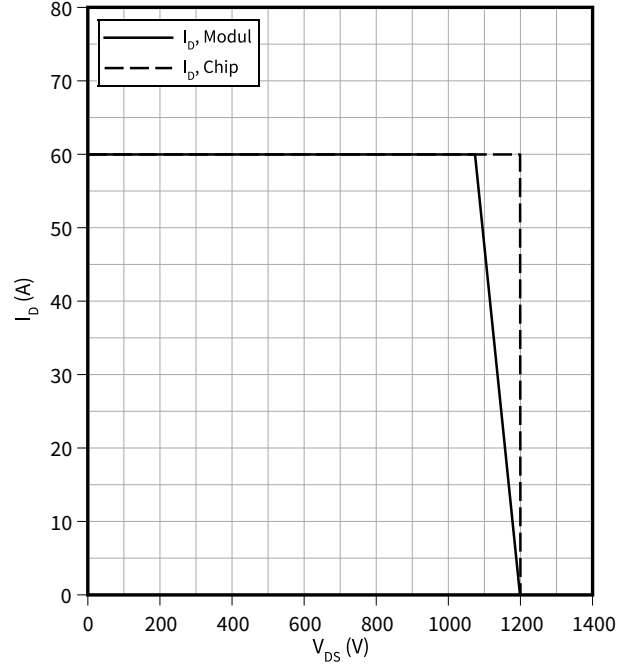
$V_{DD} = 600\text{ V}$ ,  $I_D = 30\text{ A}$ ,  $V_{GS} = -3/18\text{ V}$



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

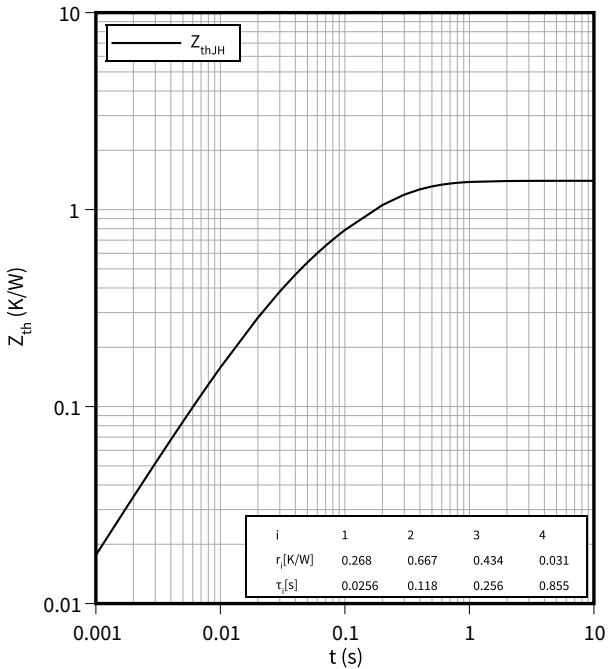
$I_D = f(V_{DS})$

$R_{Goff} = 5.1\ \Omega$ ,  $T_{vj} = 175\ ^\circ\text{C}$ ,  $V_{GS} = -3/18\text{ V}$



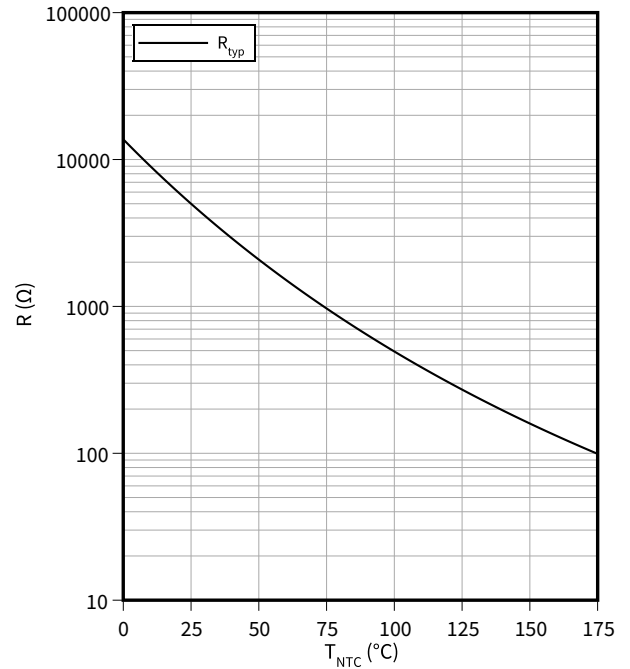
**Transient thermal impedance, MOSFET**

$Z_{th} = f(t)$

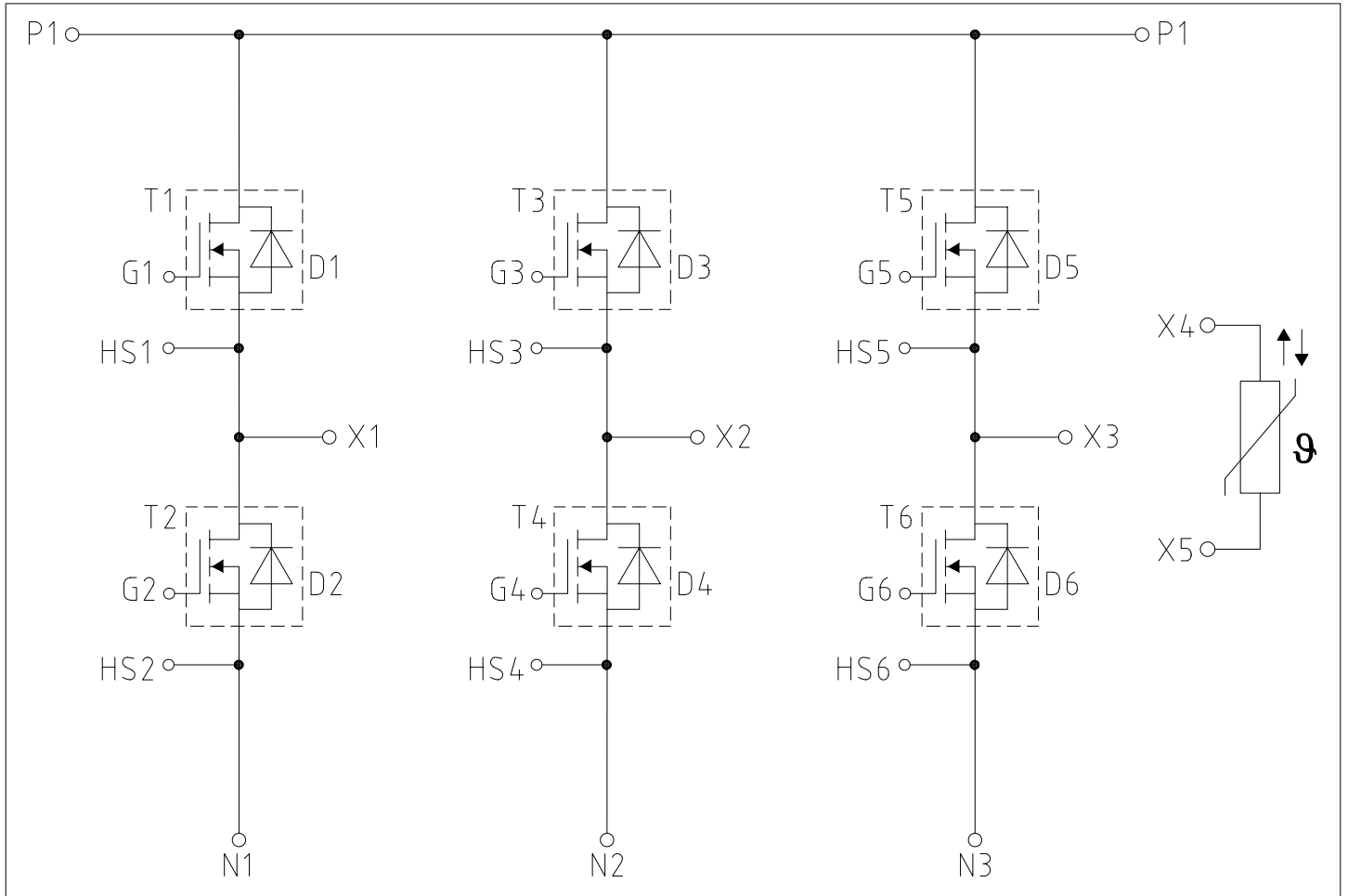


**Temperature characteristic (typical), NTC-Thermistor**

$R = f(T_{NTC})$



**6 Circuit diagram**



**Figure 1**

7 Package outlines

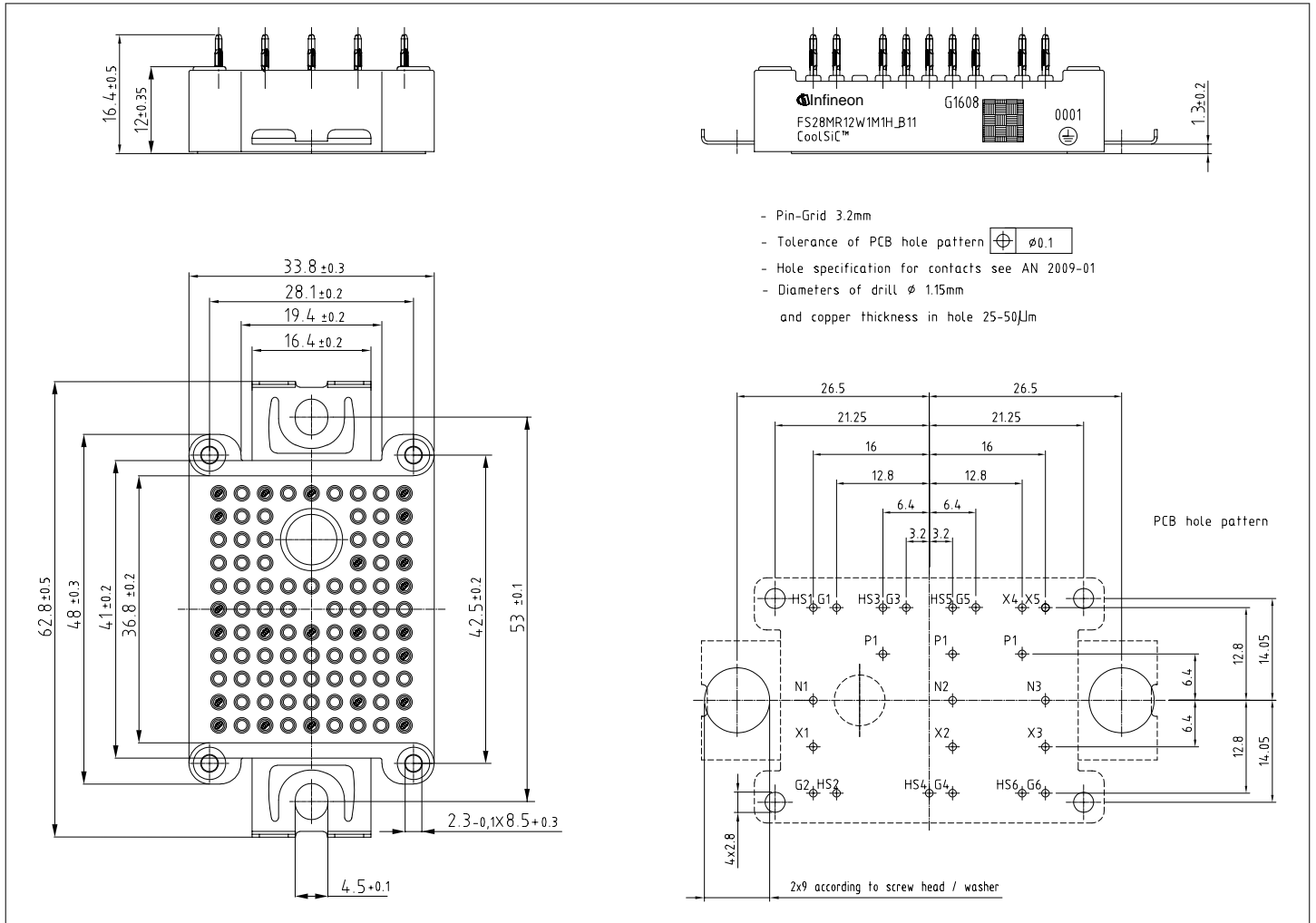

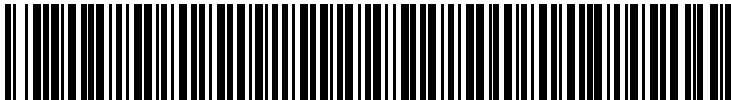


Figure 2

## 8 Module label code

<b>Module label code</b>			
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
0.10	2022-08-02	Initial version
0.20	2023-02-28	Preliminary datasheet

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[T554](#) [T582](#) [25.332.4353.1](#) [25.350.1653.0](#) [25.352.1453.0](#) [25.352.1653.0](#) [25.352.2453.0](#) [25.352.5453.1](#) [25.522.3353.0](#) [25.640.5053.0](#)  
[M252532V](#) [M252555](#) [M2550TB400](#) [M471B5673EH1-CH900](#) [M505012F-YEC](#) [TD330N16AOF](#) [B512-2T-YDA](#) [TT215N22KOF](#)  
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[TT425N18KOF](#)