

Preliminary datasheet

EasyDUAL 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 inductive design
 - Low switching losses
 - Suitable Infineon gate drivers can be found under <https://www.infineon.com/gdfinder>
- Mechanical features
 - PressFIT contact technology
 - Integrated NTC temperature sensor
 - Rugged mounting due to integrated mounting clamps



Typical appearance

Potential applications

- High-frequency switching application
- DC/DC converter
- UPS systems
- DC charger for EV

Product validation

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

Description

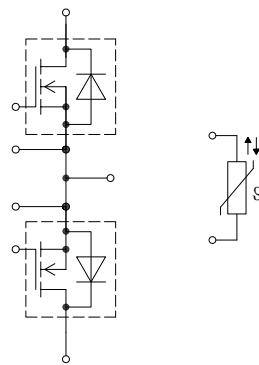


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1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, $f = 50$ Hz, $t = 1$ min	3.0	kV
Isolation test voltage NTC	$V_{ISOL(NTC)}$	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}			13		nH
Module lead resistance, terminals - chip	$R_{CC+EE'}$	$T_H = 25$ °C, per switch		2.3		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.
The electrical characterization was performed in NPC2 topology, which combines two FF17MR12W1M1H_B17 modules. It has to be considered, that the commutation in this configuration takes place between both modules.

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 $T_H = 75$ °C	50	A
Repetitive peak drain current	I_{DRM}	verified by design, t_p limited by T_{vjmax}	100	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	$R_{DS(on)}$	$I_D = 50\text{ A}$	$V_{GS} = 18\text{ V}$, $T_{vj} = 25\text{ °C}$		16.2		mΩ
			$V_{GS} = 18\text{ V}$, $T_{vj} = 125\text{ °C}$		26.1		
			$V_{GS} = 18\text{ V}$, $T_{vj} = 175\text{ °C}$		34.7		
			$V_{GS} = 15\text{ V}$, $T_{vj} = 25\text{ °C}$		19.4		
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	4.3	5.15	V	
Total gate charge	Q_G	$V_{DD} = 800\text{ V}$, $V_{GS} = -3/18\text{ V}$		0.149		μC	
Internal gate resistor	R_{Gint}	$T_{vj} = 25\text{ °C}$		4.1		Ω	
Input capacitance	C_{ISS}	$f = 100\text{ kHz}$, $V_{DS} = 800\text{ V}$, $V_{GS} = 0\text{ V}$		4.4		nF	
Output capacitance	C_{OSS}	$f = 100\text{ kHz}$, $V_{DS} = 800\text{ V}$, $V_{GS} = 0\text{ V}$		0.21		nF	
Reverse transfer capacitance	C_{rSS}	$f = 100\text{ kHz}$, $V_{DS} = 800\text{ V}$, $V_{GS} = 0\text{ V}$		0.014		nF	
C_{OSS} stored energy	E_{OSS}	$V_{DS} = 800\text{ V}$, $V_{GS} = -3/18\text{ V}$, $T_{vj} = 25\text{ °C}$		86		μJ	
Drain-source leakage current	I_{DSS}	$V_{DS} = 1200\text{ V}$, $V_{GS} = -3\text{ V}$		0.03	210	μA	
Gate-source leakage current	I_{GSS}	$V_{DS} = 0\text{ V}$, $T_{vj} = 25\text{ °C}$			400	nA	
Turn-on delay time (inductive load)	$t_{d on}$	$I_D = 50\text{ A}$, $R_{Gon} = 7.5\text{ Ω}$, $V_{DD} = 600\text{ V}$, $V_{GS} = -3/18\text{ V}$	$T_{vj} = 25\text{ °C}$		33		ns
			$T_{vj} = 125\text{ °C}$		33		
			$T_{vj} = 175\text{ °C}$		33		
Rise time (inductive load)	t_r	$I_D = 50\text{ A}$, $R_{Gon} = 7.5\text{ Ω}$, $V_{DD} = 600\text{ V}$, $V_{GS} = -3/18\text{ V}$	$T_{vj} = 25\text{ °C}$		52		ns
			$T_{vj} = 125\text{ °C}$		52		
			$T_{vj} = 175\text{ °C}$		52		

(table continues...)

Table 5 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Turn-off delay time (inductive load)	$t_{d\ off}$	$I_D = 50\ A, R_{Goff} = 5.1\ \Omega, V_{DD} = 600\ V, V_{GS} = -3/18\ V$	$T_{vj} = 25\ ^\circ C$		70	ns
			$T_{vj} = 125\ ^\circ C$		75	
			$T_{vj} = 175\ ^\circ C$		77	
Fall time (inductive load)	t_f	$I_D = 50\ A, R_{Goff} = 5.1\ \Omega, V_{DD} = 600\ V, V_{GS} = -3/18\ V$	$T_{vj} = 25\ ^\circ C$		21	ns
			$T_{vj} = 125\ ^\circ C$		21	
			$T_{vj} = 175\ ^\circ C$		21	
Turn-on energy loss per pulse	E_{on}	$I_D = 50\ A, V_{DD} = 600\ V, L_\sigma = 43\ nH, V_{GS} = -3/18\ V, R_{Gon} = 7.5\ \Omega, di/dt = 2.3\ kA/\mu s (T_{vj} = 175\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$		0.91	mJ
			$T_{vj} = 125\ ^\circ C$		1.06	
			$T_{vj} = 175\ ^\circ C$		1.18	
Turn-off energy loss per pulse	E_{off}	$I_D = 50\ A, V_{DD} = 600\ V, L_\sigma = 43\ nH, V_{GS} = -3/18\ V, R_{Goff} = 5.1\ \Omega, dv/dt = 22.8\ kV/\mu s (T_{vj} = 175\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$		0.302	mJ
			$T_{vj} = 125\ ^\circ C$		0.32	
			$T_{vj} = 175\ ^\circ C$		0.335	
Thermal resistance, junction to heat sink	R_{thJH}	per MOSFET, $\lambda_{grease} = 1\ W/(m \cdot K)$		0.844		K/W
Temperature under switching conditions	$T_{vj\ op}$		-40		175	$^\circ C$

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 Note AN 2018-09 and AN 2021-13 must be considered to ensure sound operation of the device over the planned lifetime.
 $T_{vj,op} > 150\ ^\circ C$ 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}	$T_{vj} = 175\ ^\circ C, V_{GS} = -3\ V, T_H = 75\ ^\circ C$	25	A

Table 7 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Forward voltage	V_{SD}	$I_{SD} = 50\ A, V_{GS} = -3\ V$	$T_{vj} = 25\ ^\circ C$		4.2	5.35	V
			$T_{vj} = 125\ ^\circ C$		3.9		
			$T_{vj} = 175\ ^\circ C$		3.8		

4 NTC-Thermistor

Table 8 Characteristic values

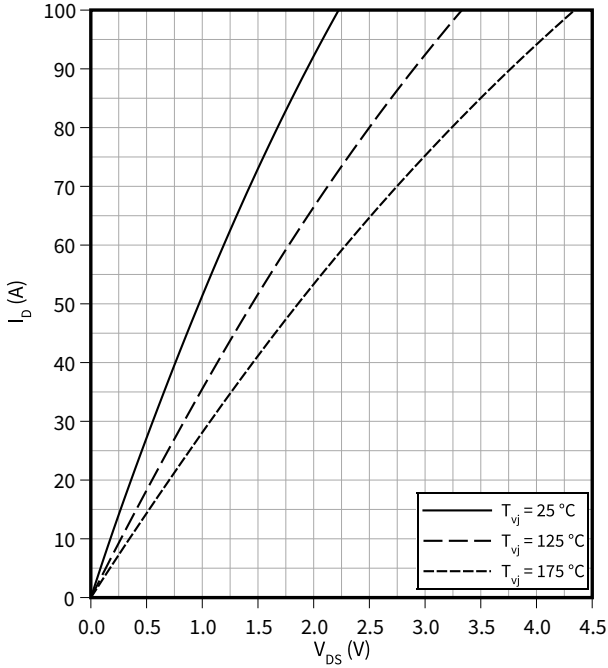
Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	R_{25}	$T_{NTC} = 25\text{ °C}$		5		k Ω
Deviation of R_{100}	$\Delta R/R$	$T_{NTC} = 100\text{ °C}, R_{100} = 493\ \Omega$	-5		5	%
Power dissipation	P_{25}	$T_{NTC} = 25\text{ °C}$			20	mW
B-value	$B_{25/50}$	$R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298,15\text{ K}))]$		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: For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4.

5 Characteristics diagrams

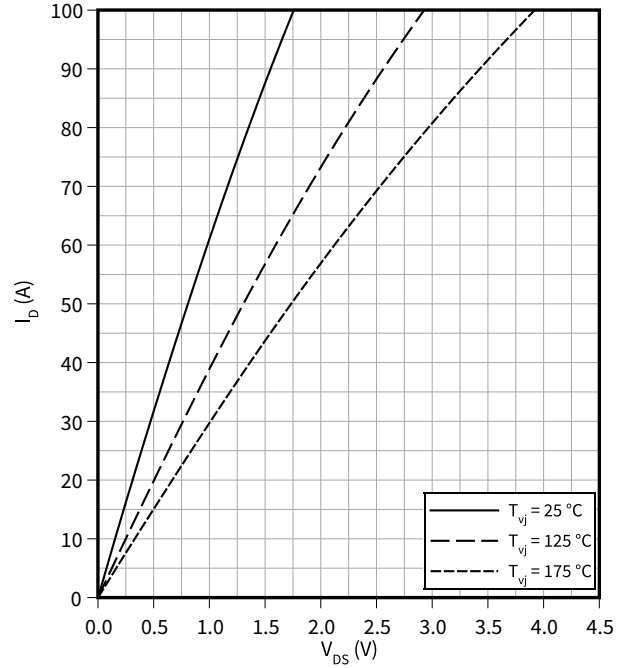
Output characteristic (typical), MOSFET

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



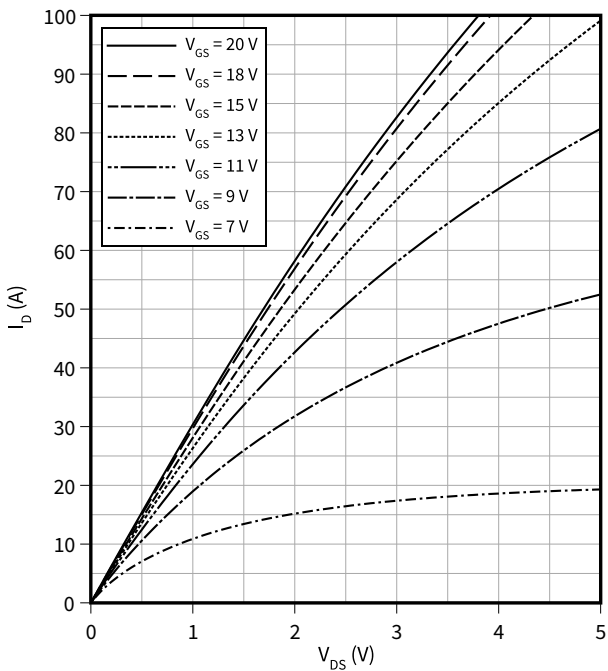
Output characteristic (typical), MOSFET

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



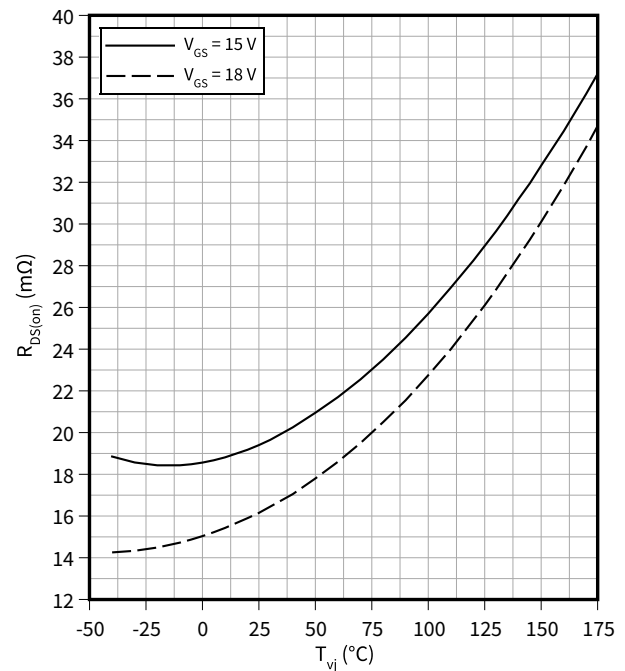
Output characteristic field (typical), MOSFET

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



Drain source on-resistance (typical), MOSFET

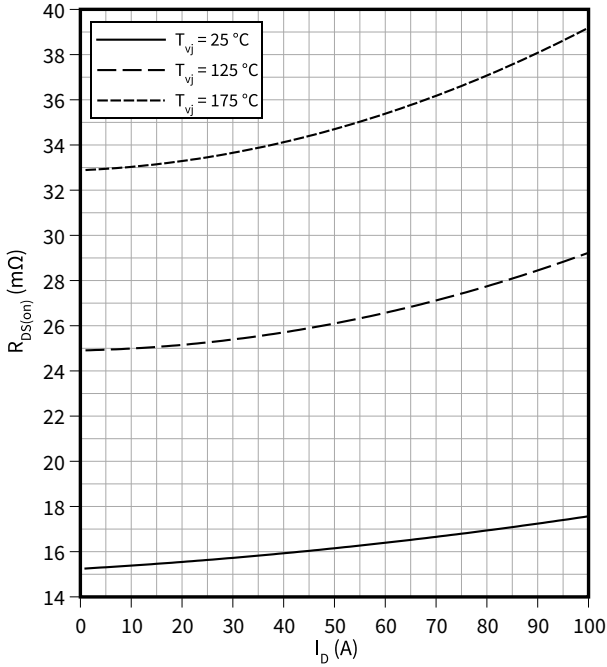
$R_{DS(on)} = f(T_{vj})$
 $I_D = 50\text{ A}$



5 Characteristics diagrams

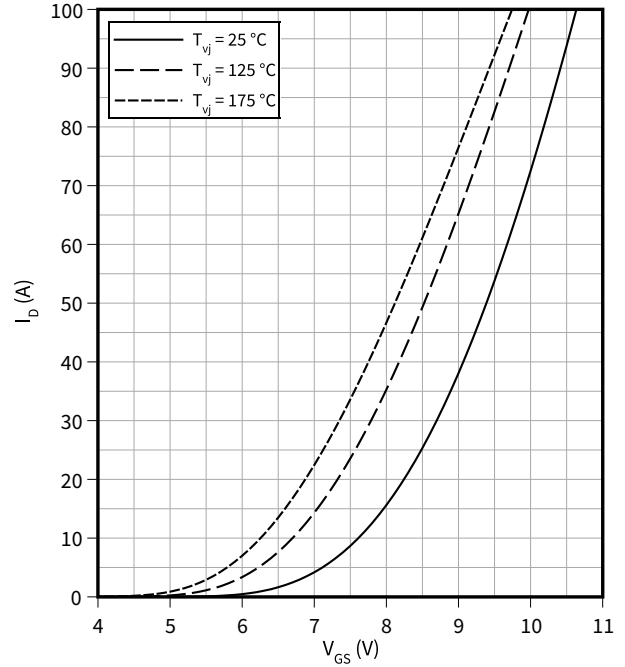
Drain source on-resistance (typical), MOSFET

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



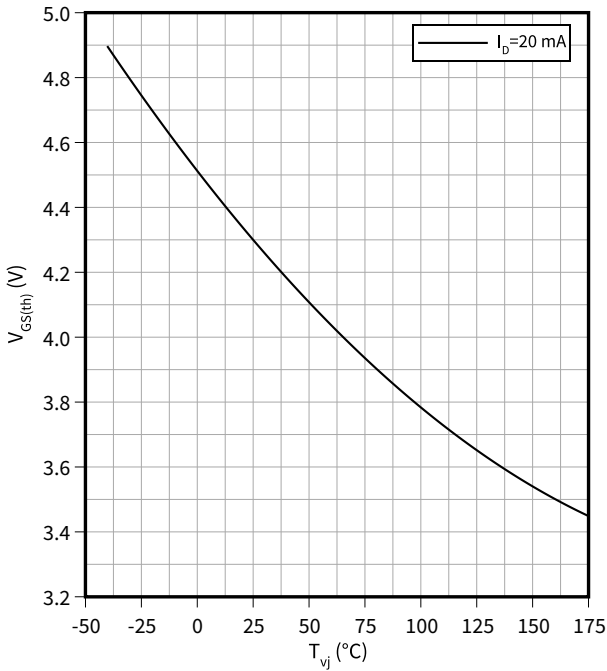
Transfer characteristic (typical), MOSFET

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



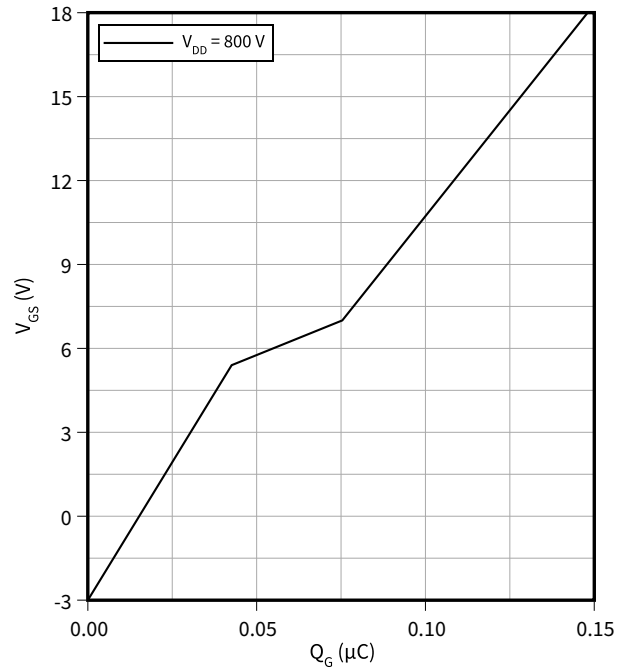
Gate-source threshold voltage (typical), MOSFET

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



Gate charge characteristic (typical), MOSFET

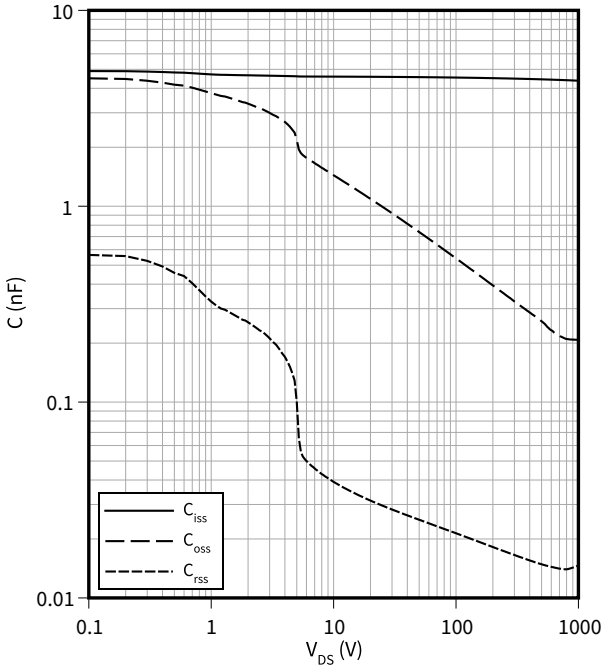
$V_{GS} = f(Q_G)$
 $I_D = 50\text{ A}, T_{vj} = 25\text{ °C}$



5 Characteristics diagrams

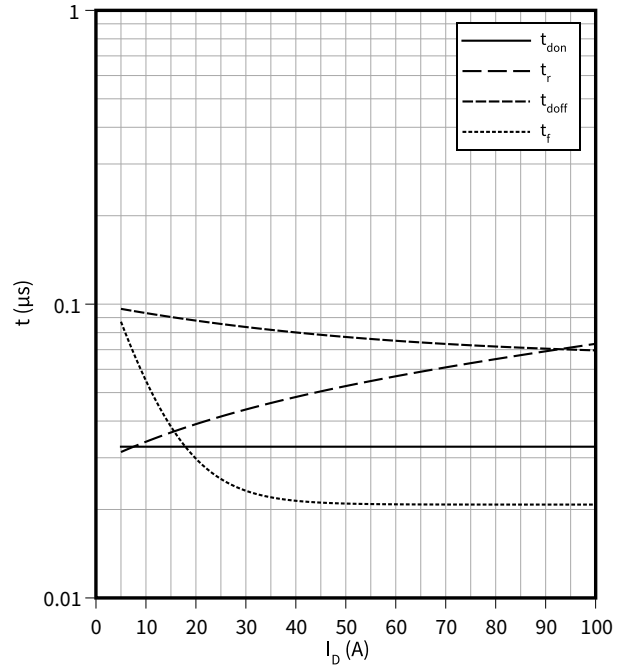
Capacity characteristic (typical), MOSFET

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



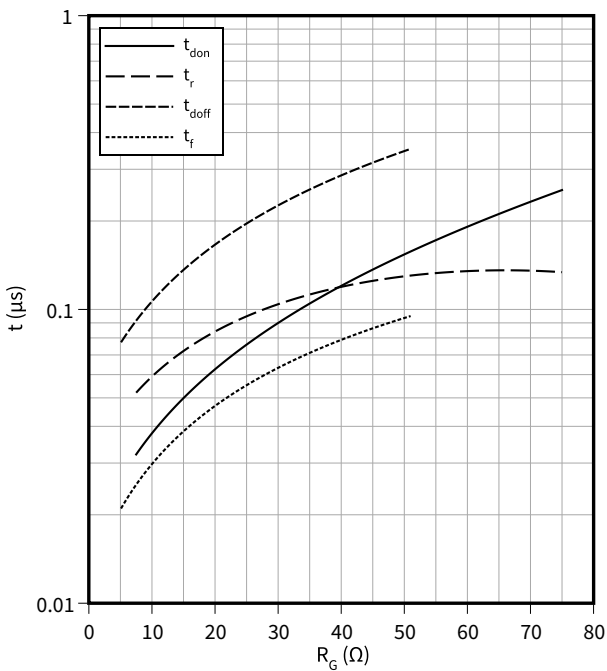
Switching times (typical), MOSFET

$t = f(I_D)$
 $R_{Goff} = 5.1 \text{ } \Omega, R_{Gon} = 7.5 \text{ } \Omega, V_{DD} = 600 \text{ V}, T_{vj} = 175 \text{ }^\circ\text{C}, V_{GS} = -3/18 \text{ V}$



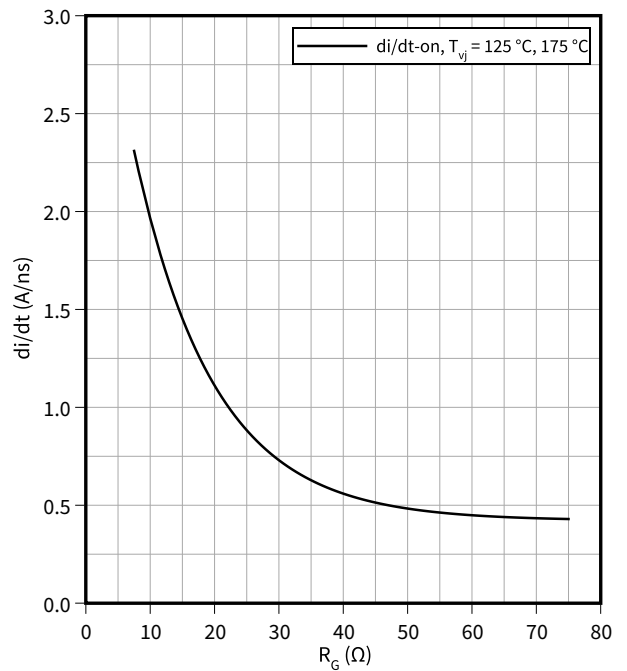
Switching times (typical), MOSFET

$t = f(R_G)$
 $V_{DD} = 600 \text{ V}, I_D = 50 \text{ A}, T_{vj} = 175 \text{ }^\circ\text{C}, V_{GS} = -3/18 \text{ V}$



Current slope (typical), MOSFET

$di/dt = f(R_G)$
 $V_{DD} = 600 \text{ V}, I_D = 50 \text{ A}, V_{GS} = -3/18 \text{ V}$

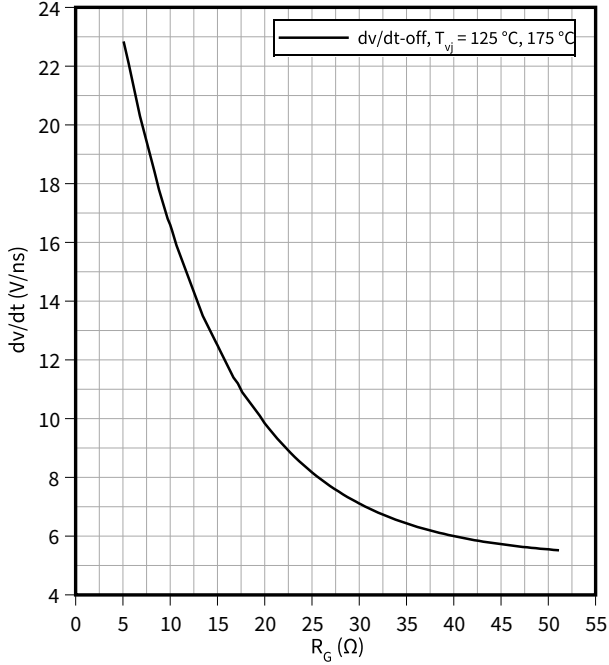


5 Characteristics diagrams

Voltage slope (typical), MOSFET

$dv/dt = f(R_G)$

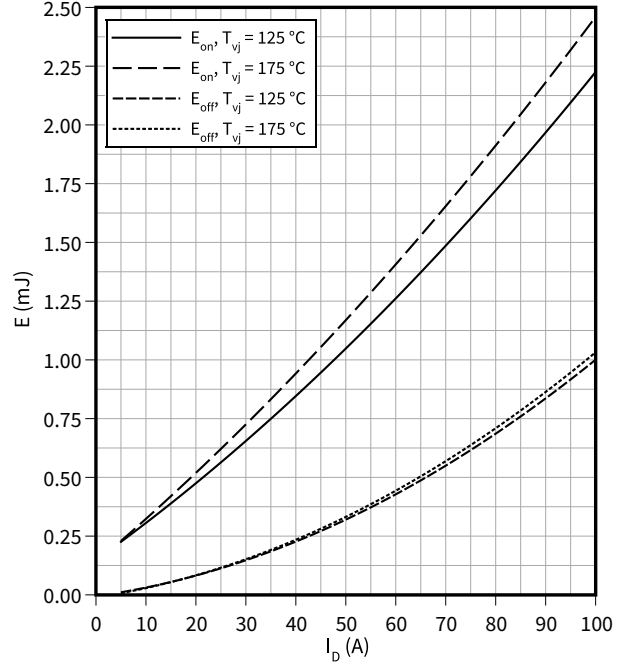
$V_{DD} = 600\text{ V}, I_D = 50\text{ A}, V_{GS} = -3/18\text{ V}$



Switching losses (typical), MOSFET

$E = f(I_D)$

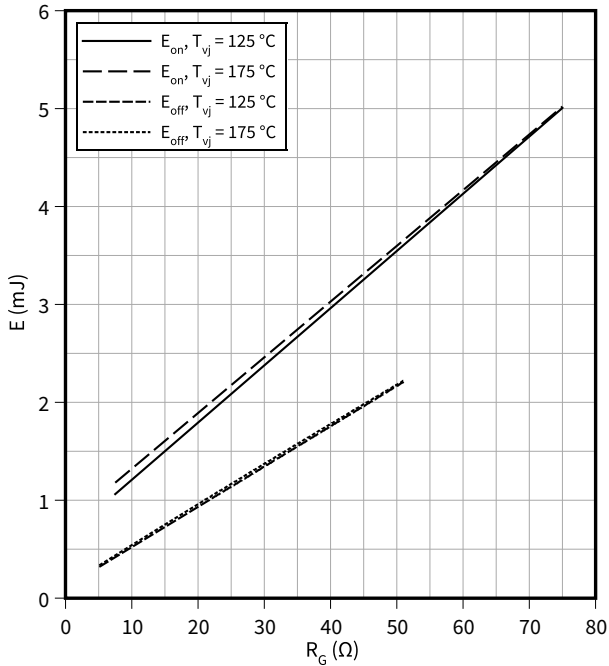
$R_{Goff} = 5.1\ \Omega, R_{Gon} = 7.5\ \Omega, V_{DD} = 600\text{ V}, V_{GS} = -3/18\text{ V}$



Switching losses (typical), MOSFET

$E = f(R_G)$

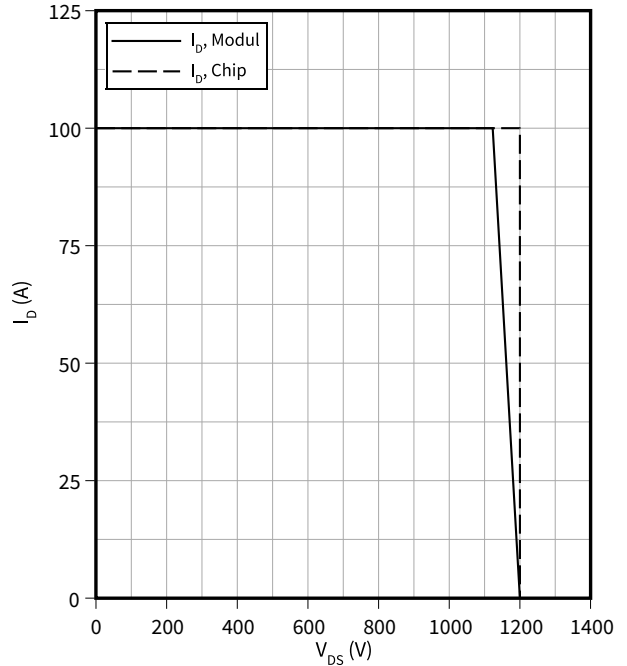
$V_{DD} = 600\text{ V}, I_D = 50\text{ A}, V_{GS} = -3/18\text{ V}$



Reverse bias safe operating area (RBSOA), MOSFET

$I_D = f(V_{DS})$

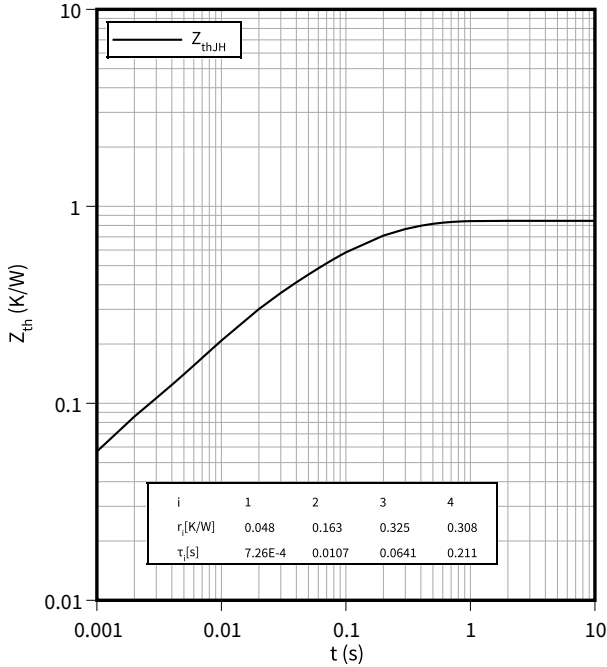
$R_{Goff} = 5.1\ \Omega, T_{vj} = 175\ \text{°C}, V_{GS} = -3/18\text{ V}$



5 Characteristics diagrams

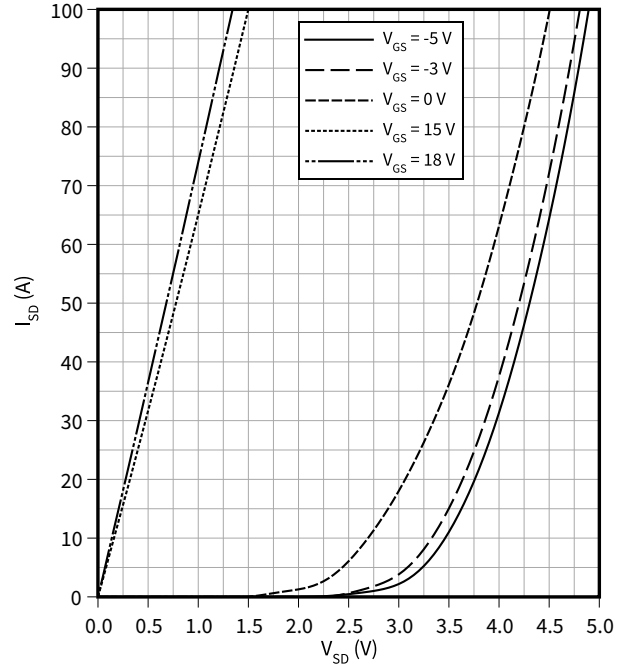
Transient thermal impedance, MOSFET

$Z_{th} = f(t)$



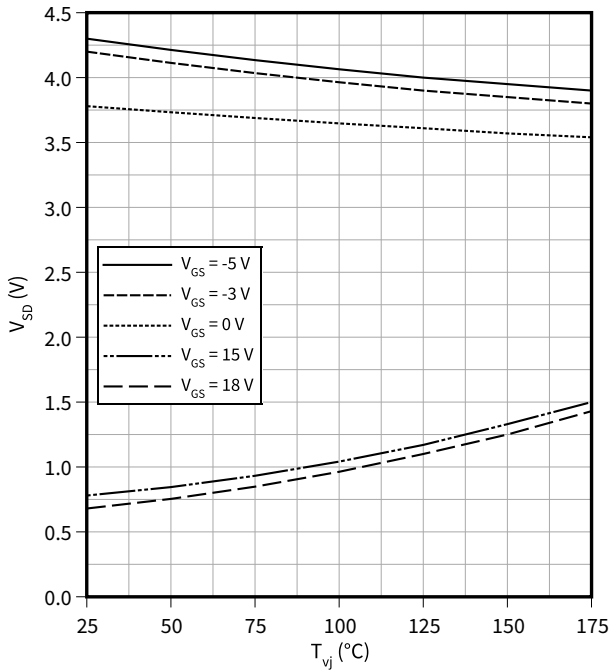
Forward characteristic body diode (typical), MOSFET

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



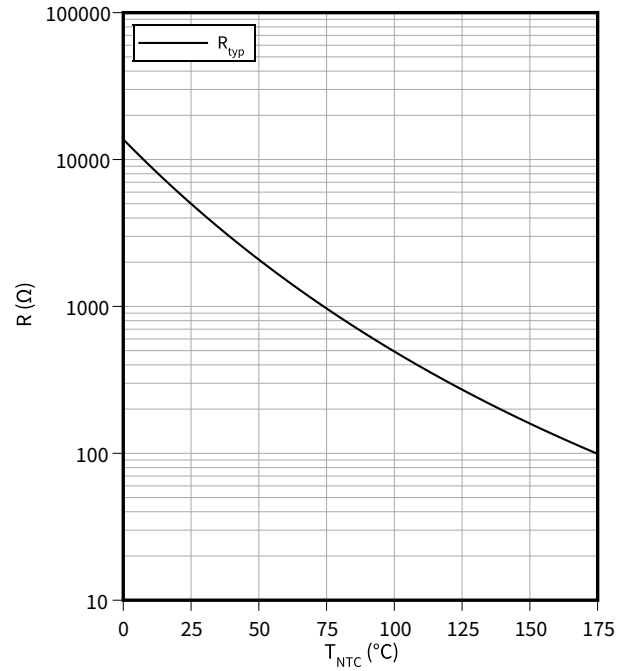
Forward voltage of body diode (typical), MOSFET

$V_{SD} = f(T_{vj})$
 $I_{SD} = 50\text{ A}$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



6 Circuit diagram

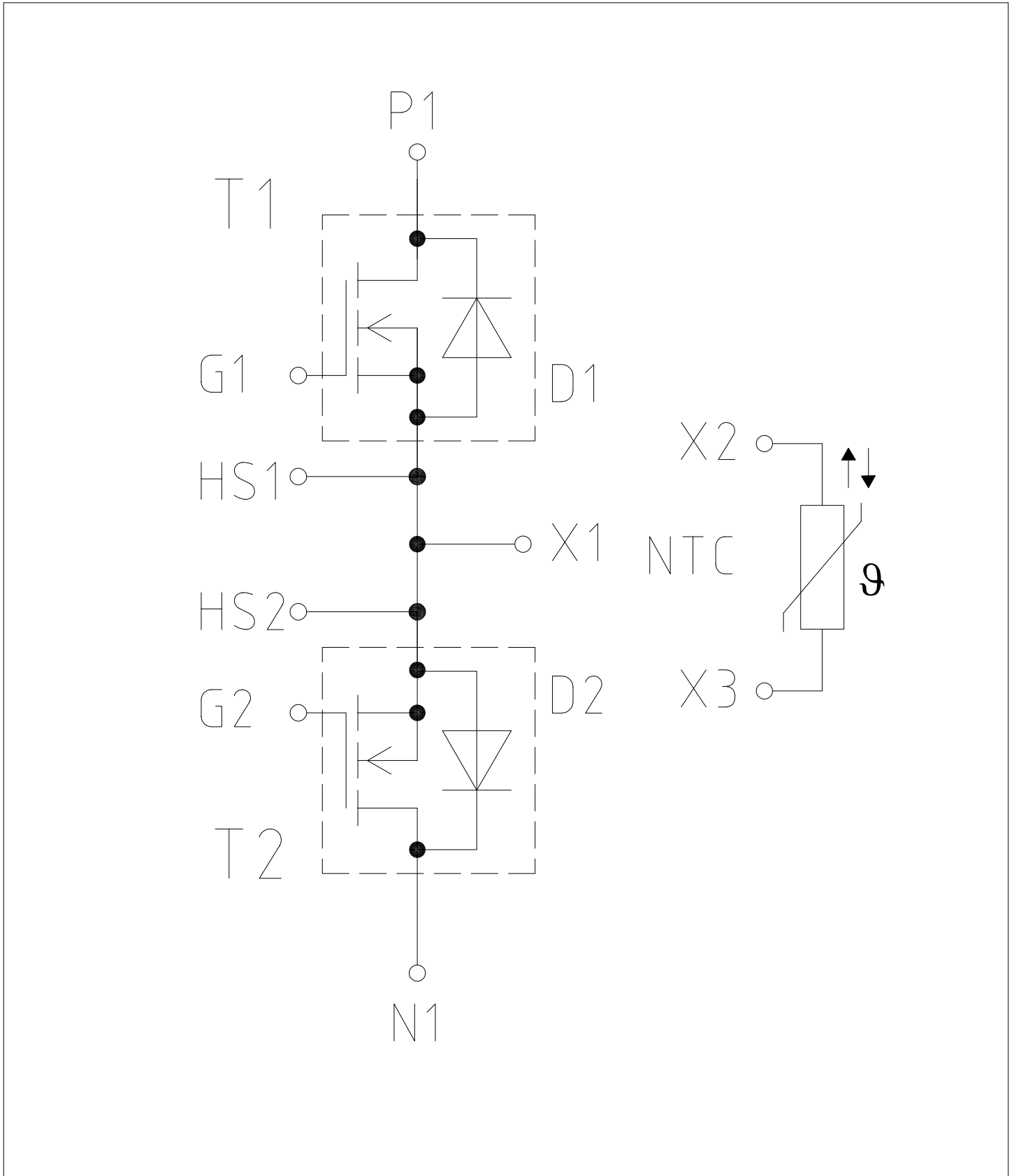


Figure 1

7 Package outlines

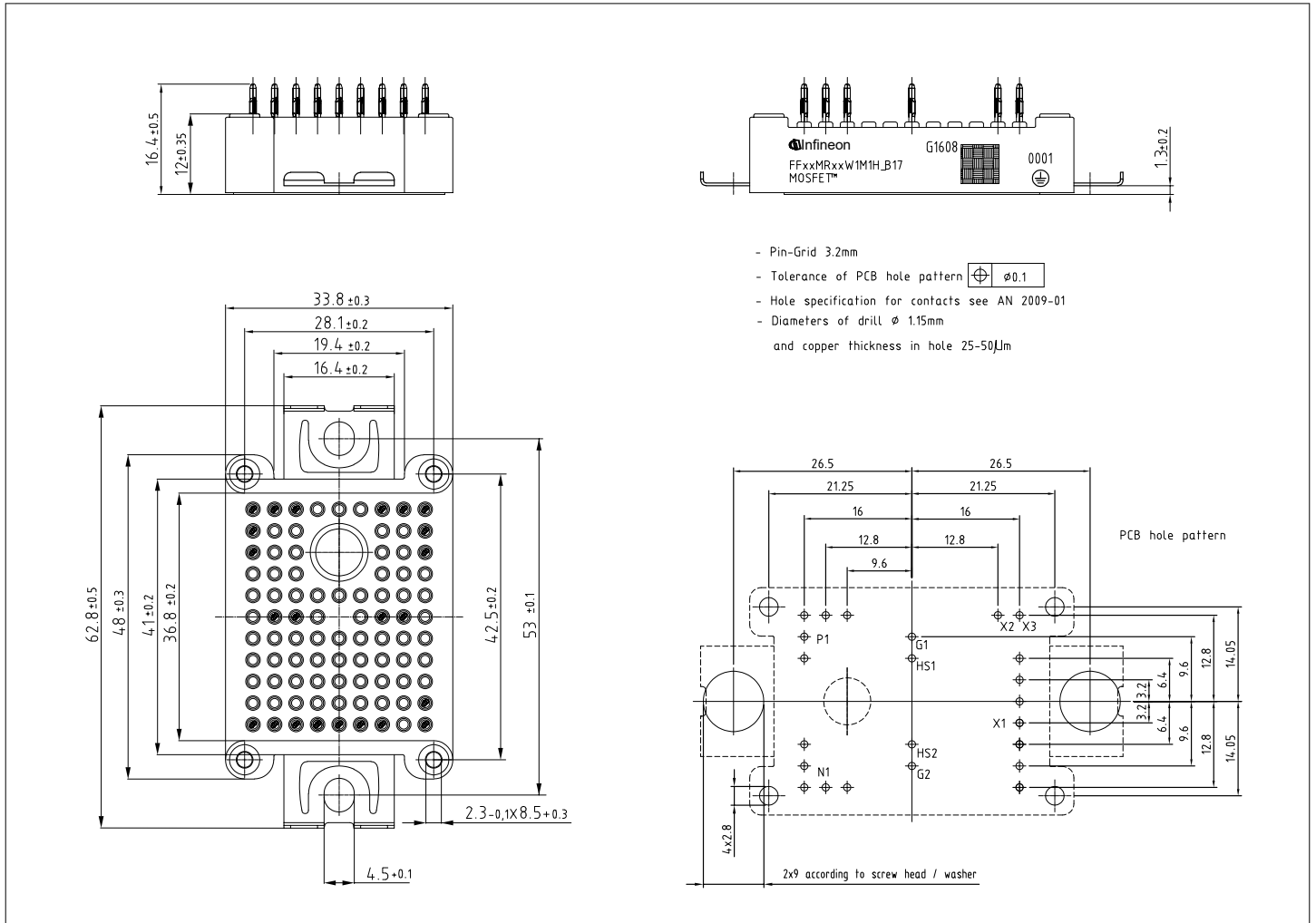


Figure 2

8 Module label code


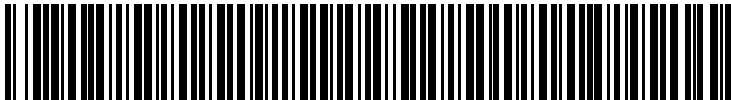
Module label code			
Code format	Data Matrix	Barcode Code128	
Encoding	ASCII text	Code Set A	
Symbol size	16x16	23 digits	
Standard	IEC24720 and IEC16022	IEC8859-1	
Code content	<i>Content</i> Module serial number Module material number Production order number Date code (production year) Date code (production week)	<i>Digit</i> 1 - 5 6 - 11 12 - 19 20 - 21 22 - 23	<i>Example</i> 71549 142846 55054991 15 30
Example	 		
	71549142846550549911530		71549142846550549911530

Figure 3

Revision history

Document revision	Date of release	Description of changes
0.10	2023-09-06	Initial version
0.20	2023-11-27	Preliminary datasheet

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Edition 2023-11-27

Published by

Infineon Technologies AG

81726 Munich, Germany

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Document reference

IFX-ABH885-002

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