

Preliminary datasheet

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

Features

- Electrical features
 - $V_{DS} = 1200\text{ V}$
 - $I_{DN} = 25\text{ A}$ / $I_{DRM} = 50\text{ A}$
 - Low inductive design
 - Low switching losses
 - Suitable Infineon gate drivers can be found under <https://www.infineon.com/gdfinder>
- Mechanical features
 - Rugged mounting due to integrated mounting clamps
 - PressFIT contact technology
 - Integrated NTC temperature sensor
 - AlN substrate with low thermal resistance



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

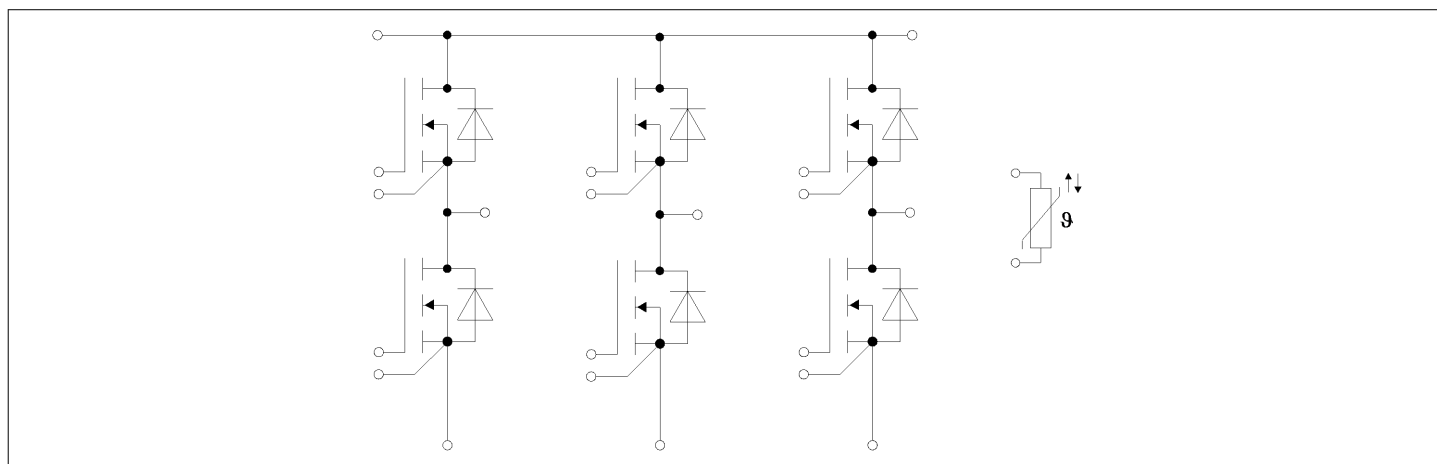


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1 Package

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)	AIN	
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}			18		nH
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_H = 25 \text{ °C}$, per switch		5.35		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}		$T_{vj} = 25 \text{ °C}$	1200	V
Continuous DC drain current	I_{DDC}	$T_{vj} = 175 \text{ °C}$, $V_{GS} = 18 \text{ V}$	$T_H = 120 \text{ °C}$	25	A
Repetitive peak drain current	I_{DRM}	verified by design, t_p limited by T_{vjmax}		50	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	$R_{DS(on)}$	$I_D = 25 \text{ A}$	$V_{GS} = 18 \text{ V}, T_{vj} = 25 \text{ °C}$		32.3		mΩ
			$V_{GS} = 18 \text{ V}, T_{vj} = 125 \text{ °C}$		52.2		
			$V_{GS} = 18 \text{ V}, T_{vj} = 150 \text{ °C}$		60.2		
			$V_{GS} = 15 \text{ V}, T_{vj} = 25 \text{ °C}$		38.8		
Gate threshold voltage	$V_{GS(th)}$	$I_D = 10 \text{ mA}, V_{DS} = V_{GS}, T_{vj} = 25 \text{ °C}, (\text{tested after } 1\text{ms pulse at } V_{GS} = +20 \text{ V})$		3.45	4.3	5.15	V
Total gate charge	Q_G	$V_{DD} = 800 \text{ V}, V_{GS} = -3/18 \text{ V}$			0.074		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25 \text{ °C}$			8.2		Ω
Input capacitance	C_{ISS}	$f = 100 \text{ kHz}, V_{DS} = 800 \text{ V}, V_{GS} = 0 \text{ V}$	$T_{vj} = 25 \text{ °C}$		2.2		nF
Output capacitance	C_{OSS}	$f = 100 \text{ kHz}, V_{DS} = 800 \text{ V}, V_{GS} = 0 \text{ V}$	$T_{vj} = 25 \text{ °C}$		0.105		nF
Reverse transfer capacitance	C_{rss}	$f = 100 \text{ kHz}, V_{DS} = 800 \text{ V}, V_{GS} = 0 \text{ V}$	$T_{vj} = 25 \text{ °C}$		0.007		nF
C_{OSS} stored energy	E_{OSS}	$V_{DS} = 800 \text{ V}, V_{GS} = -3/18 \text{ V}, T_{vj} = 25 \text{ °C}$			43		μJ
Drain-source leakage current	I_{DSS}	$V_{DS} = 1200 \text{ V}, V_{GS} = -3 \text{ V}$	$T_{vj} = 25 \text{ °C}$		0.015	110	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)	$t_{d on}$	$I_D = 25 \text{ A}, R_{Gon} = 4.7 \text{ Ω}, V_{DD} = 600 \text{ V}, V_{GS} = -3/18 \text{ V}$	$T_{vj} = 25 \text{ °C}$		28		ns
			$T_{vj} = 125 \text{ °C}$		28		
			$T_{vj} = 150 \text{ °C}$		28		
Rise time (inductive load)	t_r	$I_D = 25 \text{ A}, R_{Gon} = 4.7 \text{ Ω}, V_{DD} = 600 \text{ V}, V_{GS} = -3/18 \text{ V}$	$T_{vj} = 25 \text{ °C}$		23		ns
			$T_{vj} = 125 \text{ °C}$		24		
			$T_{vj} = 150 \text{ °C}$		25		
Turn-off delay time (inductive load)	$t_{d off}$	$I_D = 25 \text{ A}, R_{Goff} = 2.4 \text{ Ω}, V_{DD} = 600 \text{ V}, V_{GS} = -3/18 \text{ V}$	$T_{vj} = 25 \text{ °C}$		50		ns
			$T_{vj} = 125 \text{ °C}$		54		
			$T_{vj} = 150 \text{ °C}$		55		
Fall time (inductive load)	t_f	$I_D = 25 \text{ A}, R_{Goff} = 2.4 \text{ Ω}, V_{DD} = 600 \text{ V}, V_{GS} = -3/18 \text{ V}$	$T_{vj} = 25 \text{ °C}$		13		ns
			$T_{vj} = 125 \text{ °C}$		13		
			$T_{vj} = 150 \text{ °C}$		13		

(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}	$I_D = 25\text{ A}$, $V_{DD} = 600\text{ V}$, $L_\sigma = 3\text{ nH}$, $V_{GS} = -3/18\text{ V}$, $R_{Gon} = 4.7\text{ }\Omega$, $di/dt = 2.54\text{ kA}/\mu\text{s}$ ($T_{vj} = 150\text{ }^\circ\text{C}$)	$T_{vj} = 25\text{ }^\circ\text{C}$	0.278		mJ
			$T_{vj} = 125\text{ }^\circ\text{C}$	0.359		
			$T_{vj} = 150\text{ }^\circ\text{C}$	0.383		
Turn-off energy loss per pulse	E_{off}	$I_D = 25\text{ A}$, $V_{DD} = 600\text{ V}$, $L_\sigma = 3\text{ nH}$, $V_{GS} = -3/18\text{ V}$, $R_{Goff} = 2.4\text{ }\Omega$, $dv/dt = 36.9\text{ kV}/\mu\text{s}$ ($T_{vj} = 150\text{ }^\circ\text{C}$)	$T_{vj} = 25\text{ }^\circ\text{C}$	0.074		mJ
			$T_{vj} = 125\text{ }^\circ\text{C}$	0.075		
			$T_{vj} = 150\text{ }^\circ\text{C}$	0.075		
SC data	I_{SC}	$V_{GS} = -5/15\text{ V}$, $V_{DD} = 800\text{ V}$, $V_{DSmax} = V_{DSS} - L_{SDS} \cdot di/dt$, $R_G = 10\text{ }\Omega$	$t_P = 2\text{ }\mu\text{s}$, $T_{vj} = 25\text{ }^\circ\text{C}$	210		A
			$t_P = 2\text{ }\mu\text{s}$, $T_{vj} = 150\text{ }^\circ\text{C}$	205		
Thermal resistance, junction to heat sink	R_{thJH}	per MOSFET, $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$		0.971		K/W
Temperature under switching conditions	$T_{vj\text{ op}}$		-40		150	$^\circ\text{C}$

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.

3 Body diode (MOSFET)

Table 6 **Maximum rated values**

Parameter	Symbol	Note or test condition	Values	Unit
DC body diode forward current	I_{SD}	$T_{vj} = 175\text{ }^\circ\text{C}$, $V_{GS} = -3\text{ V}$ $T_H = 120\text{ }^\circ\text{C}$	10	A

Table 7 **Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_{SD}	$I_{SD} = 25\text{ A}$, $V_{GS} = -3\text{ V}$	$T_{vj} = 25\text{ }^\circ\text{C}$	4.2	5.35	V
			$T_{vj} = 125\text{ }^\circ\text{C}$	3.9		
			$T_{vj} = 150\text{ }^\circ\text{C}$	3.85		

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}	$\Delta R/R$	$T_{NTC} = 100\text{ °C}, R_{100} = 493\text{ Ω}$	-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

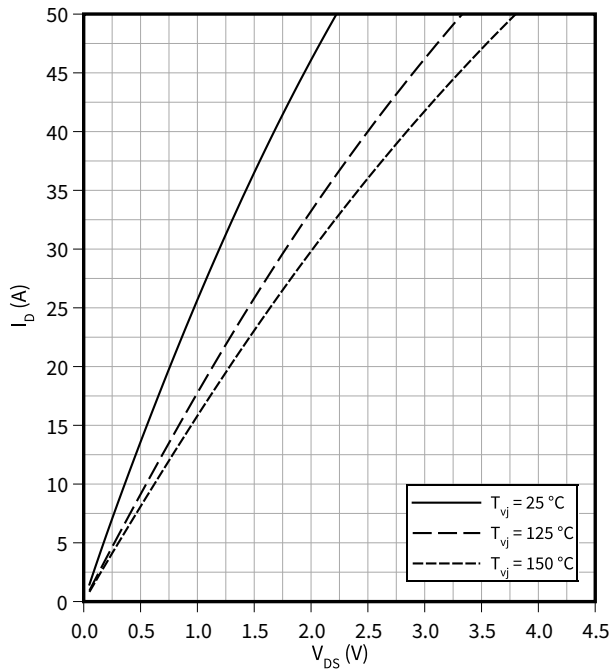
Note: For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4.

5 Characteristics diagrams

output characteristic (typical), MOSFET

$I_D = f(V_{DS})$

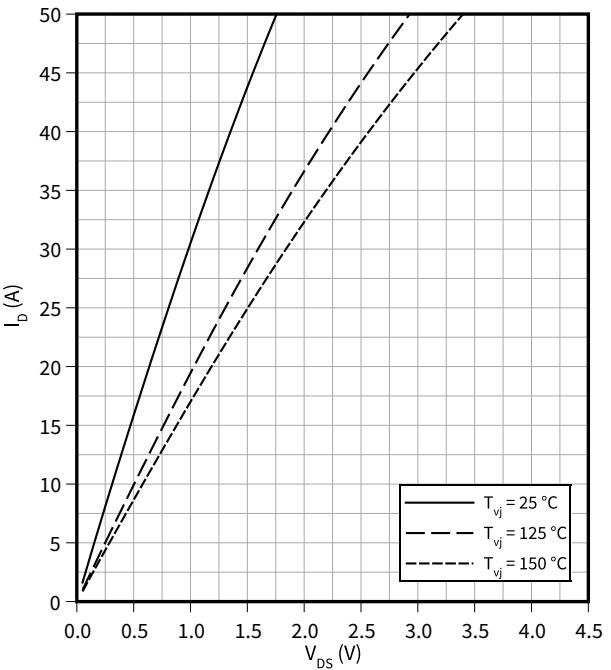
$V_{GS} = 15\text{ V}$



output characteristic (typical), MOSFET

$I_D = f(V_{DS})$

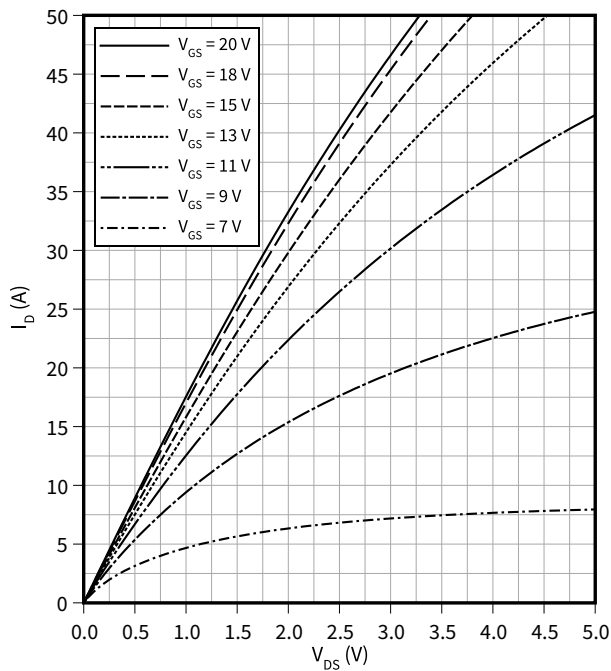
$V_{GS} = 18\text{ V}$



Output characteristic field (typical), MOSFET

$I_D = f(V_{DS})$

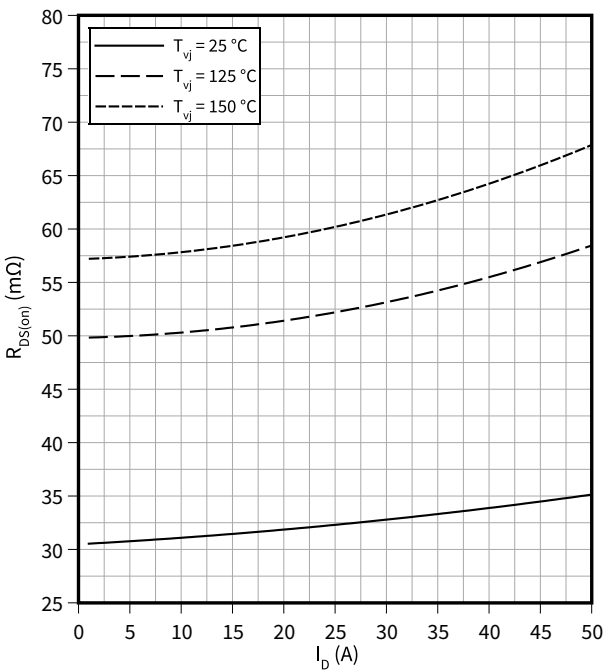
$T_{vj} = 150\text{ °C}$



Drain source on-resistance (typical), MOSFET

$R_{DS(on)} = f(I_D)$

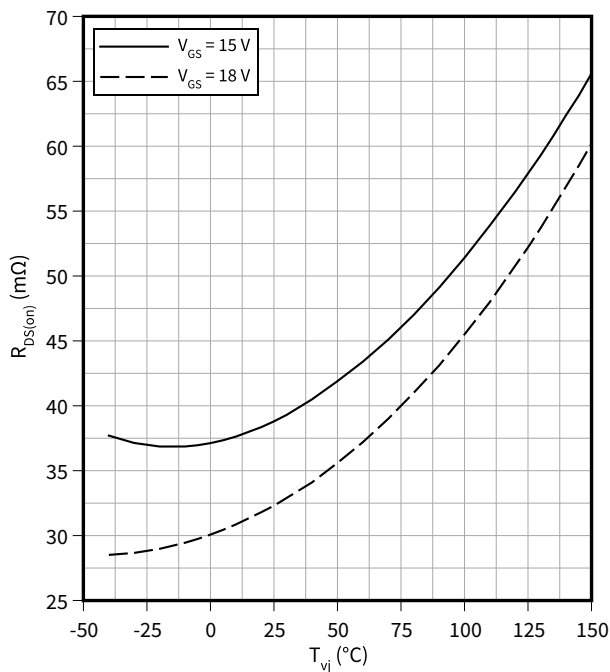
$V_{GS} = 18\text{ V}$



5 Characteristics diagrams

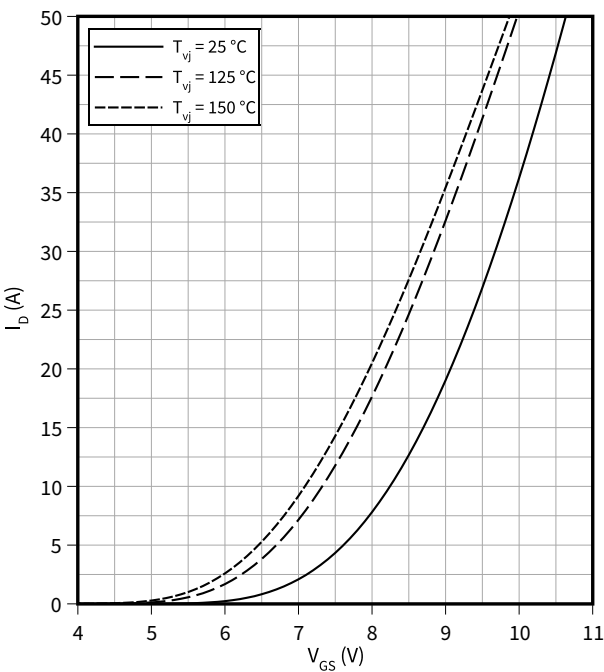
Drain source on-resistance (typical), MOSFET

$R_{DS(on)} = f(T_{vj})$
 $I_D = 25\text{ A}$



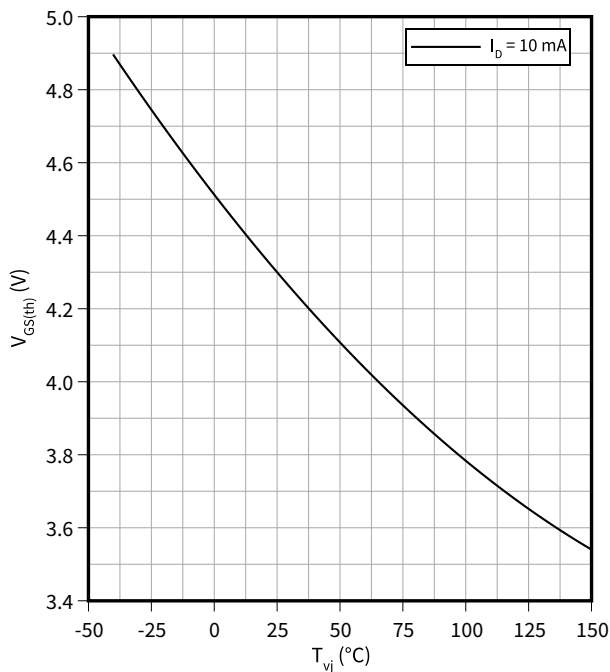
Transfer characteristic (typical), MOSFET

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



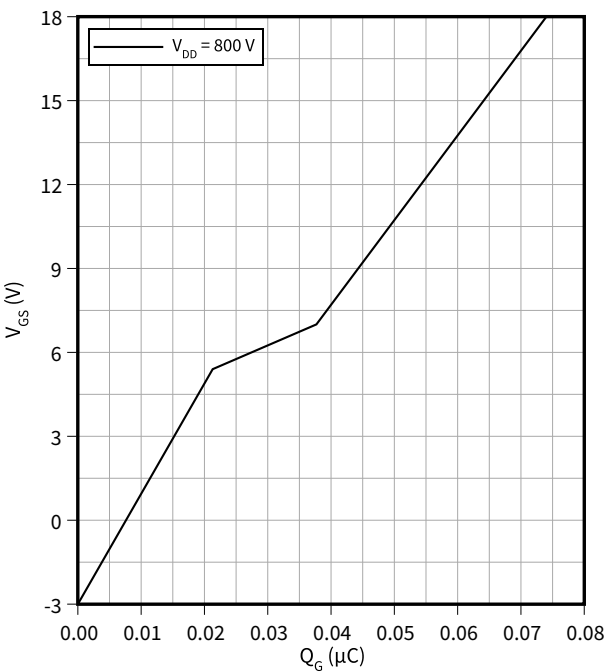
Gate-source threshold voltage (typical), MOSFET

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



Gate charge characteristic (typical), MOSFET

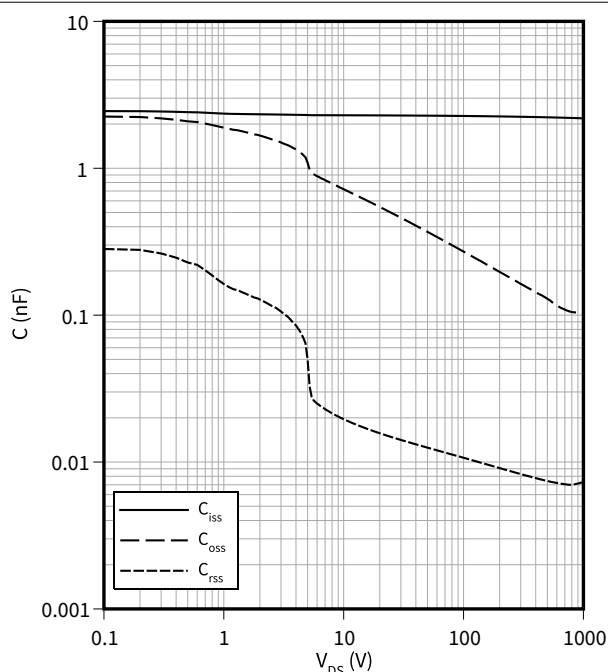
$V_{GS} = f(Q_G)$
 $I_D = 25\text{ A}, T_{vj} = 25\text{ °C}$



Capacity characteristic (typical), MOSFET

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

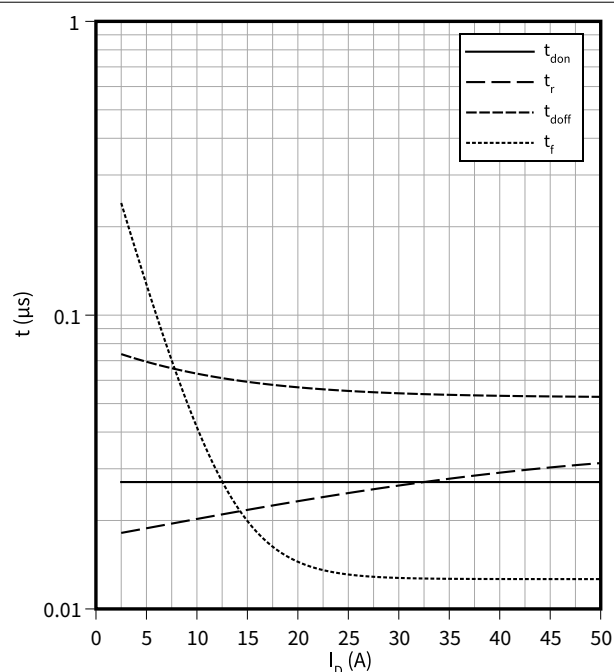
$f = 100 \text{ kHz}$, $T_{vj} = 25^\circ\text{C}$, $V_{GS} = 0 \text{ V}$



Switching times (typical), MOSFET

$$t = f(I_D)$$

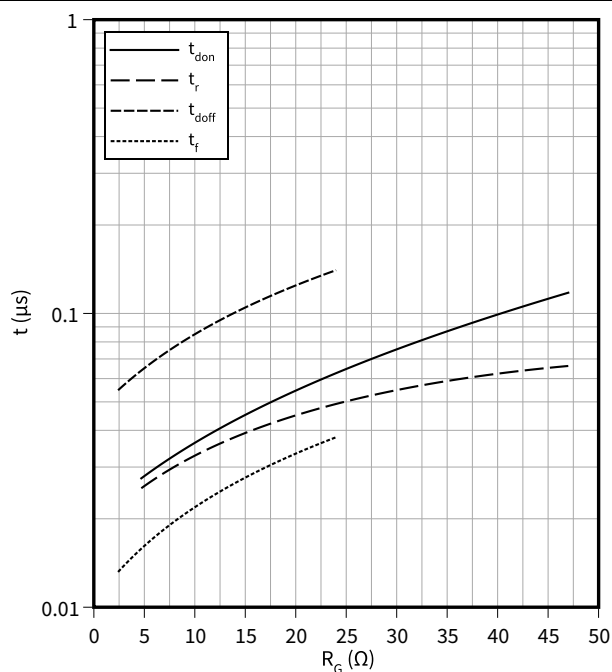
$R_{Goff} = 2.4 \Omega$, $R_{Gon} = 4.7 \Omega$, $V_{DD} = 600 \text{ V}$, $T_{vj} = 150^\circ\text{C}$, $V_{GS} = -3/18 \text{ V}$



Switching times (typical), MOSFET

$$t = f(R_G)$$

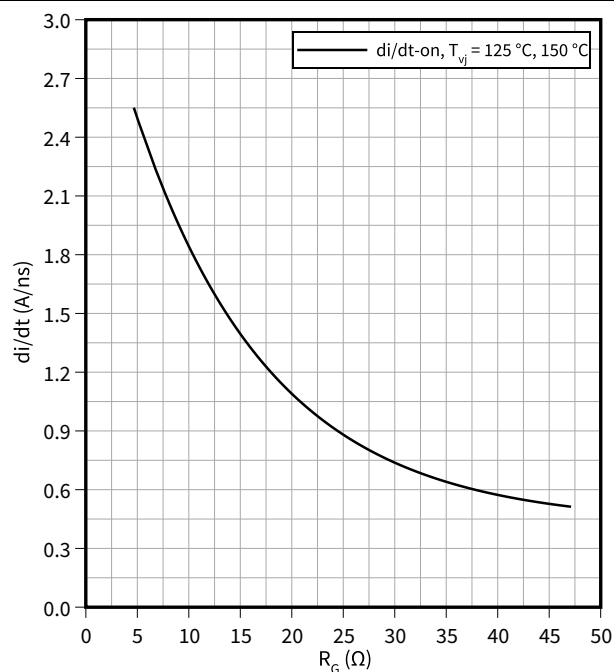
$V_{DD} = 600 \text{ V}$, $I_D = 25 \text{ A}$, $T_{vj} = 150^\circ\text{C}$, $V_{GS} = -3/18 \text{ V}$



Current slope (typical), MOSFET

$$di/dt = f(R_G)$$

$V_{DD} = 600 \text{ V}$, $I_D = 25 \text{ A}$, $V_{GS} = -3/18 \text{ V}$

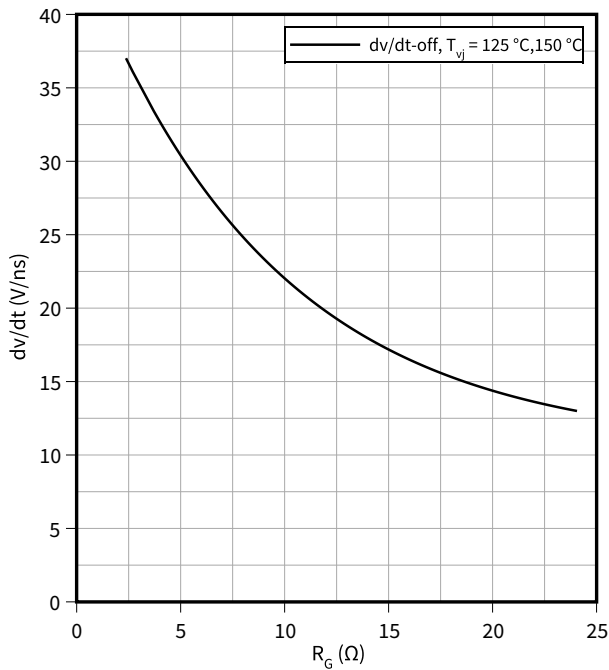


5 Characteristics diagrams

Voltage slope (typical), MOSFET

$dv/dt = f(R_G)$

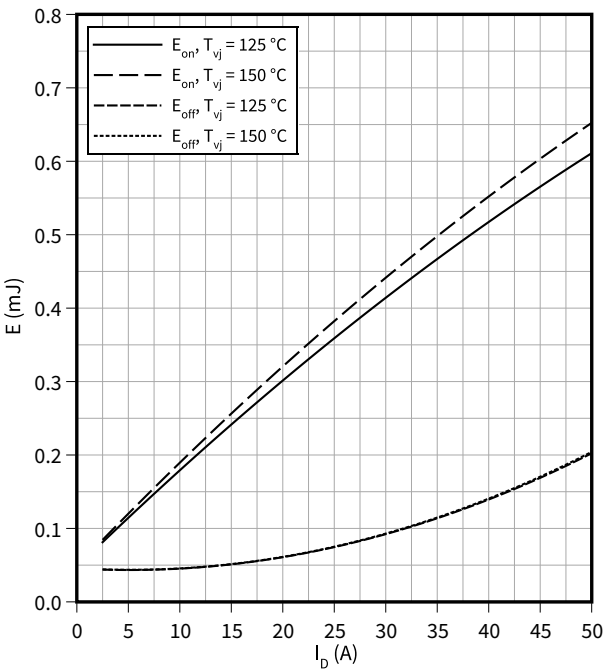
$V_{DD} = 600\text{ V}$, $I_D = 25\text{ A}$, $V_{GS} = -3/18\text{ V}$



Switching losses (typical), MOSFET

$E = f(I_D)$

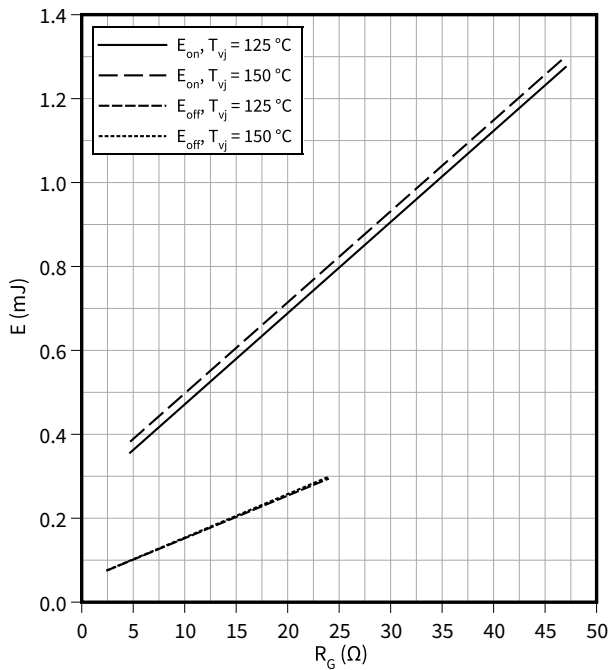
$R_{Goff} = 2.4\ \Omega$, $R_{Gon} = 4.7\ \Omega$, $V_{DD} = 600\text{ V}$, $V_{GS} = -3/18\text{ V}$



Switching losses (typical), MOSFET

$E = f(R_G)$

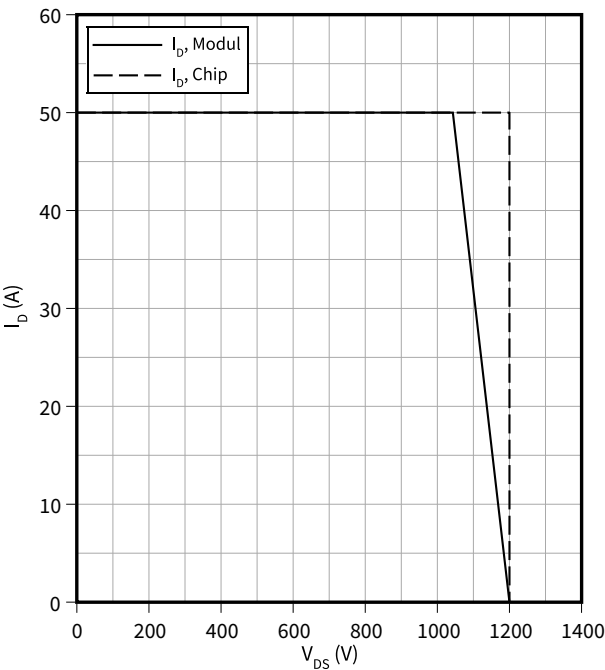
$V_{DD} = 600\text{ V}$, $I_D = 25\text{ A}$, $V_{GS} = -3/18\text{ V}$



Reverse bias safe operating area (RBSOA), MOSFET

$I_D = f(V_{DS})$

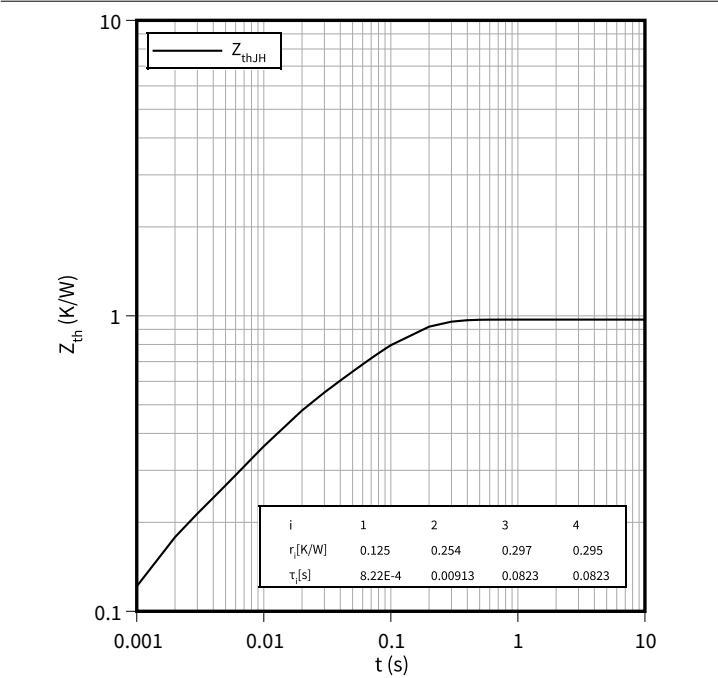
$R_{Goff} = 2.4\ \Omega$, $T_{vj} = 150^\circ\text{C}$, $V_{GS} = -3/18\text{ V}$



5 Characteristics diagrams

Transient thermal impedance, MOSFET

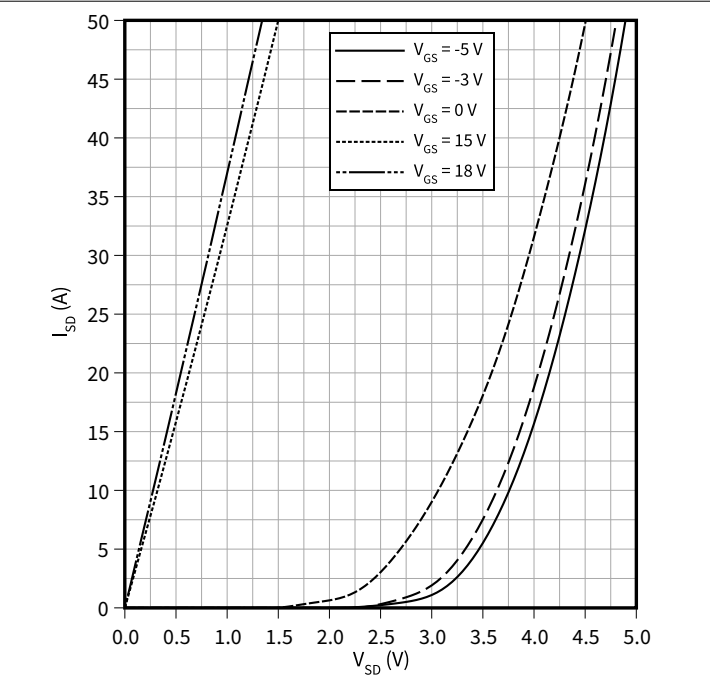
$Z_{th} = f(t)$



Forward characteristic body diode (typical), MOSFET

$I_{SD} = f(V_{SD})$

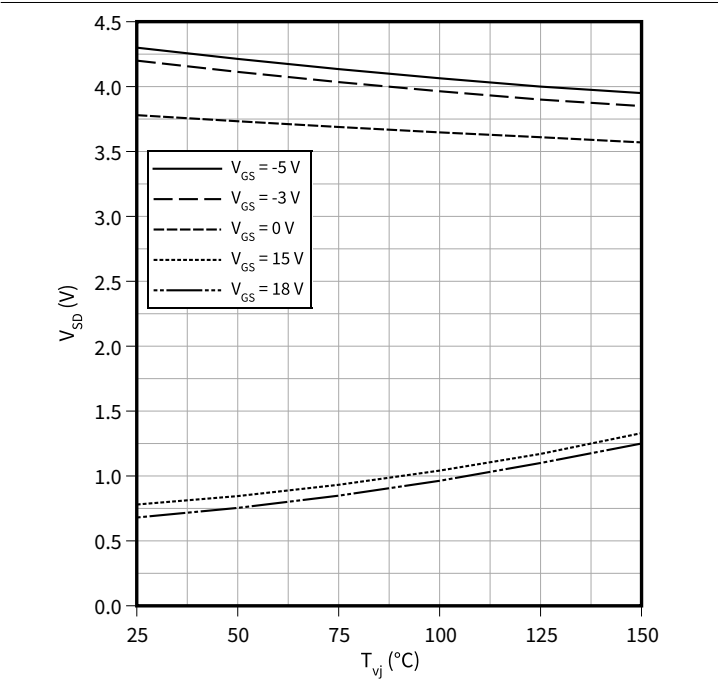
$T_{vj} = 25\text{ }^{\circ}\text{C}$



Forward voltage of body diode (typical), MOSFET

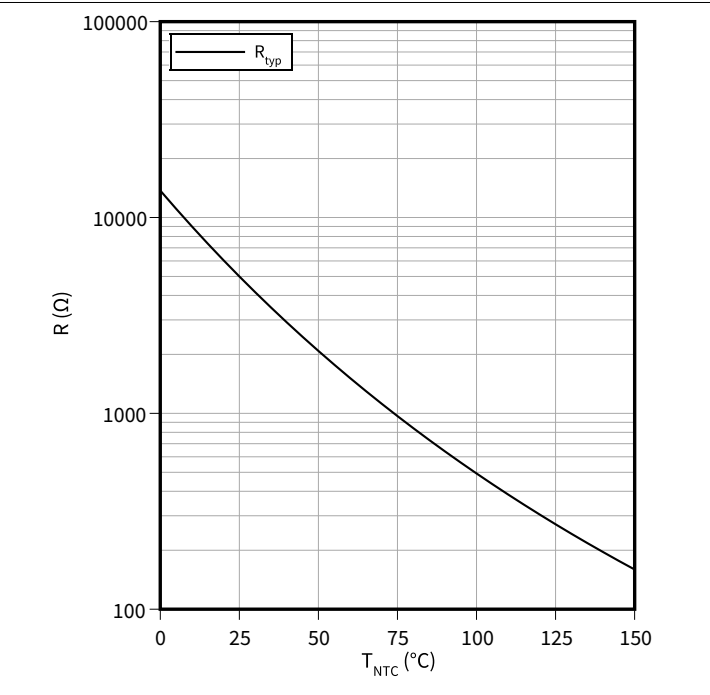
$V_{SD} = f(T_{vj})$

$I_{SD} = 25\text{ A}$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



6 **Circuit diagram**

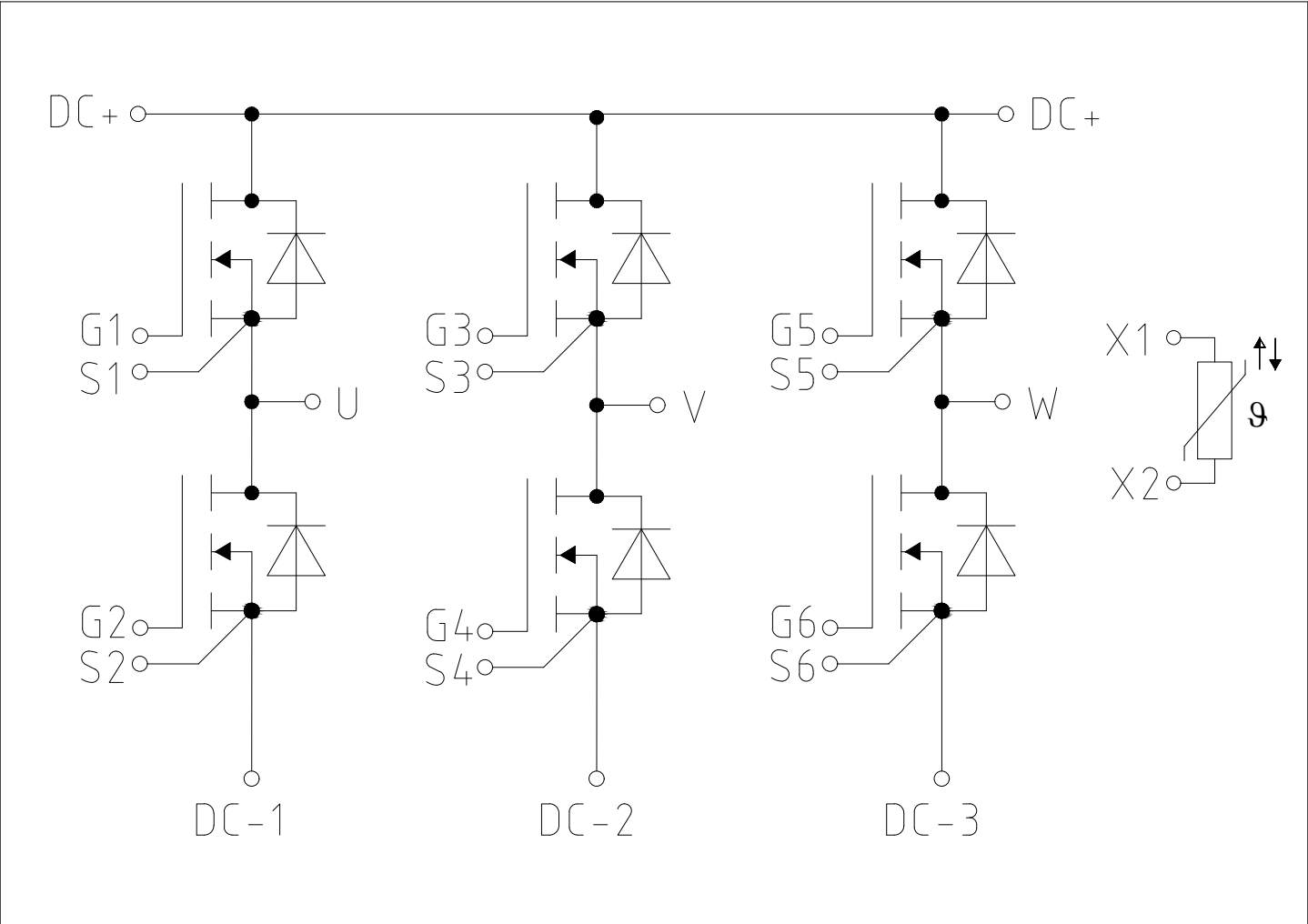


Figure 1

7 Package outlines

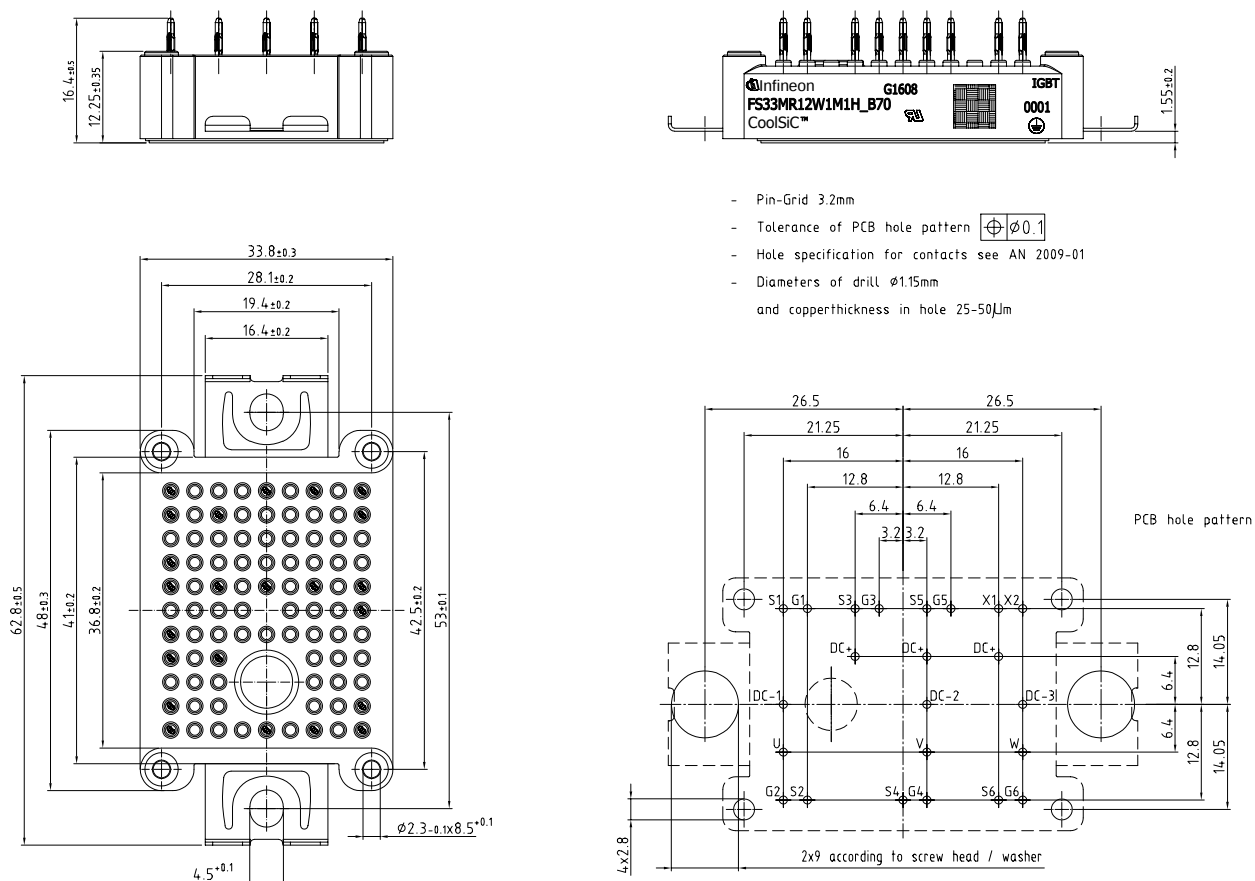


Figure 2

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>	<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	2023-06-06	Initial version
0.20	2023-08-16	Preliminary datasheet

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Edition 2023-08-16

Published by

Infineon Technologies AG
81726 Munich, Germany

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Document reference
IFX-ABH327-002

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