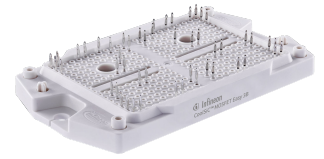


Final datasheet**EasyPACK™ module with CoolSiC™ Trench MOSFET and PressFIT / NTC****Features**

- Electrical features
 - $V_{DS} = 2000\text{ V}$
 - $I_{DN} = 120\text{ A}$ / $I_{DRM} = 240\text{ A}$
 - Overload operation up to 175°C
 - Suitable Infineon gate drivers can be found under <https://www.infineon.com/gdfinder>
- Mechanical features
 - Integrated NTC temperature sensor
 - PressFIT contact technology

**Potential applications**

- EV charging
- Energy storage systems (ESS)
- Solar applications
- DC/DC converter

Product validation

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

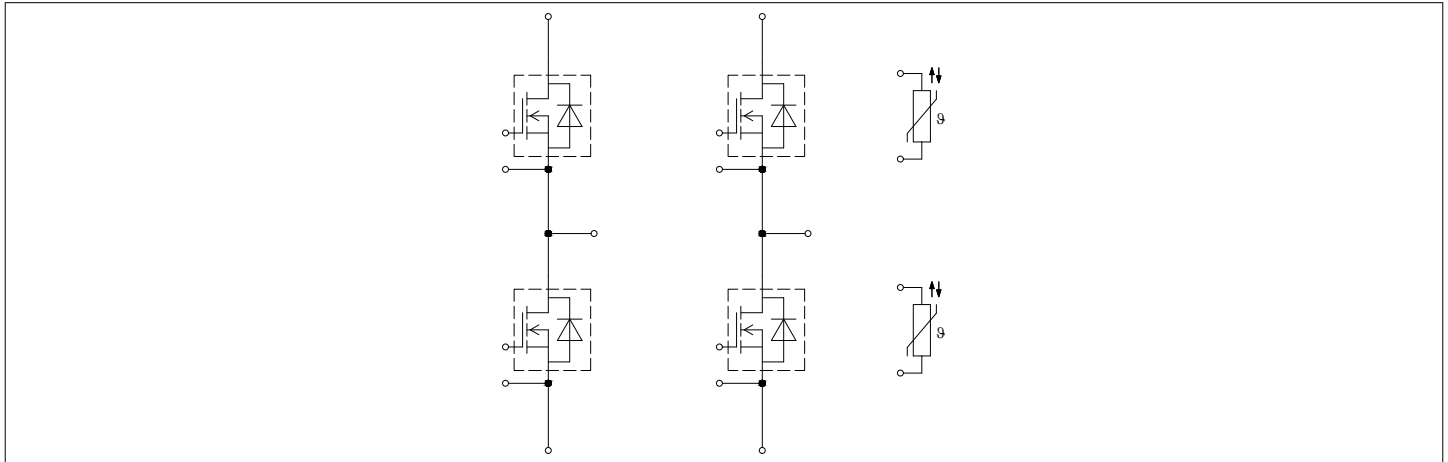
Description



Table of contents

	Description	1
	Features	1
	Potential applications	1
	Product validation	1
	Table of contents	2
1	Package	3
2	MOSFET, T1-T4	3
3	Body diode (MOSFET, T1-T4)	5
4	NTC-Thermistor	6
5	Characteristics diagrams	7
6	Circuit diagram	14
7	Package outlines	15
8	Module label code	16
	Revision history	17
	Disclaimer	18

1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, $f = 50 \text{ Hz}$, $t = 1 \text{ min}$	3.2	kV
Isolation test voltage NTC	$V_{ISOL(NTC)}$	RMS, $f = 50 \text{ Hz}$, $t = 1 \text{ min}$	3.2	kV
Internal isolation		basic insulation (class 1, IEC 61140)	Al_2O_3	
Comparative tracking index	CTI		> 400	
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}			26.3		nH
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_H = 25 \text{ °C}$, per switch		1.4		mΩ
Storage temperature	T_{stg}		-40		125	°C
Mounting torque for module mounting	M	- Mounting according to valid application note	M5, Screw	1.3	1.5	Nm
Weight	G			78		g

Note: The current under continuous operation is limited to 25A rms per connector pin.

2 MOSFET, T1-T4

Table 3 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Drain-source voltage	V_{DSS}	$T_{vj} = 25 \text{ °C}$	2000	V
Implemented drain current	I_{DN}		120	A
Continuous DC drain current	I_{DDC}	$T_{vj} = 175 \text{ °C}$, $V_{GS} = 18 \text{ V}$ $T_H = 65 \text{ °C}$	95	A
Repetitive peak drain current	I_{DRM}	verified by design, t_p limited by T_{vjmax}	240	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...-2	V

Table 5 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Drain-source on-resistance	$R_{DS(on)}$	$I_D = 120\text{ A}$	$V_{GS} = 18\text{ V}, T_{vj} = 25\text{ °C}$		8.6	13.3	mΩ
			$V_{GS} = 18\text{ V}, T_{vj} = 125\text{ °C}$		18.3		
			$V_{GS} = 18\text{ V}, T_{vj} = 175\text{ °C}$		25.9		
			$V_{GS} = 15\text{ V}, T_{vj} = 25\text{ °C}$		9.4		
Gate threshold voltage	$V_{GS(th)}$	$I_D = 68\text{ mA}, V_{DS} = V_{GS}, (\text{tested after 1ms pulse at } V_{GS} = +20\text{ V}), T_{vj} = 25\text{ °C}$		3.45	4.3	5.15	V
Total gate charge	Q_G	$V_{DD} = 1200\text{ V}, V_{GS} = -3\text{ V}, T_{vj} = 25\text{ °C}$			0.47		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\text{ °C}$			1.9		Ω
Input capacitance	C_{ISS}	$f = 100\text{ kHz}, V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$		14.5		nF
Output capacitance	C_{OSS}	$f = 100\text{ kHz}, V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$		0.338		nF
Reverse transfer capacitance	C_{rSS}	$f = 100\text{ kHz}, V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$		0.024		nF
C_{OSS} stored energy	E_{OSS}	$V_{DS} = 1200\text{ V}, V_{GS} = -3/18\text{ V}, T_{vj} = 25\text{ °C}$			308		μJ
Drain-source leakage current	I_{DSS}	$V_{DS} = 2000\text{ V}, V_{GS} = -3\text{ V}$	$T_{vj} = 25\text{ °C}$		0.02	378	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)	$t_{d on}$	$I_D = 120\text{ A}, R_{Gon} = 6.2\text{ Ω}, V_{DD} = 1200\text{ V}, V_{GS} = -3/18\text{ V}, t_{dead} = 1000\text{ ns}, 0.1\text{ }V_{GS}\text{ to }0.1\text{ }I_D$	$T_{vj} = 25\text{ °C}$		57		ns
			$T_{vj} = 125\text{ °C}$		56		
			$T_{vj} = 175\text{ °C}$		54		
Rise time (inductive load)	t_r	$I_D = 120\text{ A}, R_{Gon} = 6.2\text{ Ω}, V_{DD} = 1200\text{ V}, V_{GS} = -3/18\text{ V}, t_{dead} = 1000\text{ ns}, 0.1\text{ }I_D\text{ to }0.9\text{ }I_D$	$T_{vj} = 25\text{ °C}$		27		ns
			$T_{vj} = 125\text{ °C}$		27		
			$T_{vj} = 175\text{ °C}$		26		

(table continues...)

Table 5 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Turn-off delay time (inductive load)	$t_{d\ off}$	$I_D = 120\text{ A}$, $R_{Goff} = 2\ \Omega$, $V_{DD} = 1200\text{ V}$, $V_{GS} = -3/18\text{ V}$, $0.9\ V_{GS}$ to $0.9\ I_D$	$T_{vj} = 25\text{ °C}$	97		ns
			$T_{vj} = 125\text{ °C}$	106		
			$T_{vj} = 175\text{ °C}$	109		
Fall time (inductive load)	t_f	$I_D = 120\text{ A}$, $R_{Goff} = 2\ \Omega$, $V_{DD} = 1200\text{ V}$, $V_{GS} = -3/18\text{ V}$, $0.9\ I_D$ to $0.1\ I_D$	$T_{vj} = 25\text{ °C}$	33		ns
			$T_{vj} = 125\text{ °C}$	35		
			$T_{vj} = 175\text{ °C}$	37		
Turn-on energy loss per pulse	E_{on}	$I_D = 120\text{ A}$, $V_{DD} = 1200\text{ V}$, $L_\sigma = 15\text{ nH}$, $V_{GS} = -3/18\text{ V}$, $R_{Gon} = 6.2\ \Omega$, $di/dt = 3.8\text{ kA}/\mu\text{s}$ ($T_{vj} = 175\text{ °C}$), $t_{dead} = 1000\text{ ns}$	$T_{vj} = 25\text{ °C}$	7.2		mJ
			$T_{vj} = 125\text{ °C}$	9.4		
			$T_{vj} = 175\text{ °C}$	11		
Turn-on energy loss per pulse, optimized	$E_{on,o}$	$I_D = 120\text{ A}$, $V_{DD} = 1200\text{ V}$, $L_\sigma = 15\text{ nH}$, $V_{GS} = -3/18\text{ V}$, $R_{Gon,o} = 3.3\ \Omega$, $di/dt = 5.6\text{ kA}/\mu\text{s}$ ($T_{vj} = 175\text{ °C}$), $t_{dead} = 100\text{ ns}$	$T_{vj} = 25\text{ °C}$	4.5		mJ
			$T_{vj} = 125\text{ °C}$	5		
			$T_{vj} = 175\text{ °C}$	5.9		
Turn-off energy loss per pulse	E_{off}	$I_D = 120\text{ A}$, $V_{DD} = 1200\text{ V}$, $L_\sigma = 15\text{ nH}$, $V_{GS} = -3/18\text{ V}$, $R_{Goff} = 2\ \Omega$, $dv/dt = 38\text{ kV}/\mu\text{s}$ ($T_{vj} = 175\text{ °C}$)	$T_{vj} = 25\text{ °C}$	1.8		mJ
			$T_{vj} = 125\text{ °C}$	2.2		
			$T_{vj} = 175\text{ °C}$	2.2		
Thermal resistance, junction to heat sink	R_{thJH}	per MOSFET, $\lambda_{grease} = 3.3\text{ W}/(\text{m}\cdot\text{K})$		0.3		K/W
Temperature under switching conditions	$T_{vj\ op}$		-40		175	°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.

$T_{vj\ op} > 150\text{ °C}$ is allowed for operation at overload conditions. For detailed specifications, please refer to AN 2018-14.

3 Body diode (MOSFET, T1-T4)

Table 6 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
DC body diode forward current	I_{SD}	$T_{vj} = 175\text{ °C}$, $V_{GS} = -3\text{ V}$ $T_H = 65\text{ °C}$	75	A

Table 7 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_{SD}	$I_{SD} = 120 \text{ A}$, $V_{GS} = -3 \text{ V}$	$T_{vj} = 25 \text{ °C}$	4.6	6.15	V
			$T_{vj} = 125 \text{ °C}$	4.15		
			$T_{vj} = 175 \text{ °C}$	4		
Peak reverse recovery current	I_{rrm}	$I_{SD} = 120 \text{ A}$, $di_s/dt = 3.8 \text{ kA}/\mu\text{s}$, $V_{DD} = 1200 \text{ V}$, $V_{GS} = -3 \text{ V}$, $t_{dead} = 1000 \text{ ns}$	$T_{vj} = 25 \text{ °C}$	56		A
			$T_{vj} = 125 \text{ °C}$	100		
			$T_{vj} = 175 \text{ °C}$	133		
Recovered charge	Q_{rr}	$I_{SD} = 120 \text{ A}$, $di_s/dt = 3.8 \text{ kA}/\mu\text{s}$, $V_{DD} = 1200 \text{ V}$, $V_{GS} = -3 \text{ V}$, $t_{dead} = 1000 \text{ ns}$	$T_{vj} = 25 \text{ °C}$	1.5		μC
			$T_{vj} = 125 \text{ °C}$	5.5		
			$T_{vj} = 175 \text{ °C}$	6.6		
Reverse recovery energy	E_{rec}	$I_{SD} = 120 \text{ A}$, $di_s/dt = 3.8 \text{ kA}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$), $V_{DD} = 1200 \text{ V}$, $V_{GS} = -3 \text{ V}$, $t_{dead} = 1000 \text{ ns}$	$T_{vj} = 25 \text{ °C}$	1		mJ
			$T_{vj} = 125 \text{ °C}$	3.1		
			$T_{vj} = 175 \text{ °C}$	4.2		
Reverse recovery energy, optimized	$E_{rec,o}$	$I_{SD} = 120 \text{ A}$, $di_s/dt = 5.6 \text{ kA}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$), $V_{DD} = 1200 \text{ V}$, $V_{GS} = -3 \text{ V}$, $t_{dead} = 100 \text{ ns}$	$T_{vj} = 25 \text{ °C}$	0.8		mJ
			$T_{vj} = 125 \text{ °C}$	1.7		
			$T_{vj} = 175 \text{ °C}$	2.9		

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

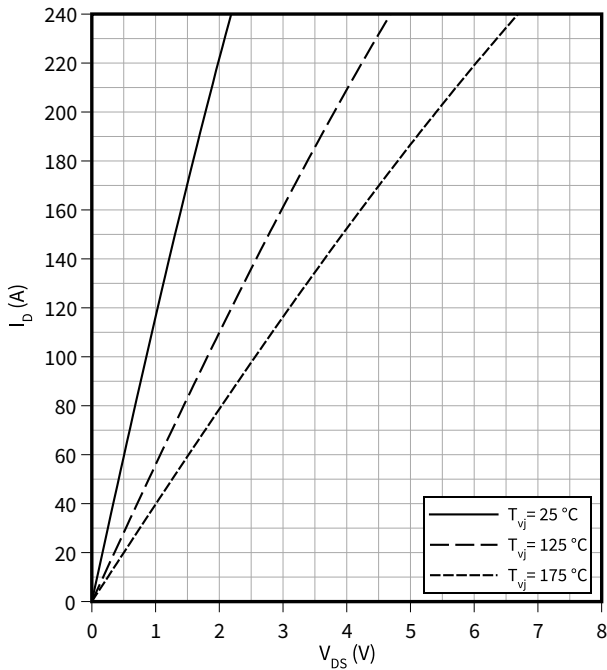
Note: For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4

5 Characteristics diagrams

Output characteristic (typical), MOSFET, T1-T4

$I_D = f(V_{DS})$

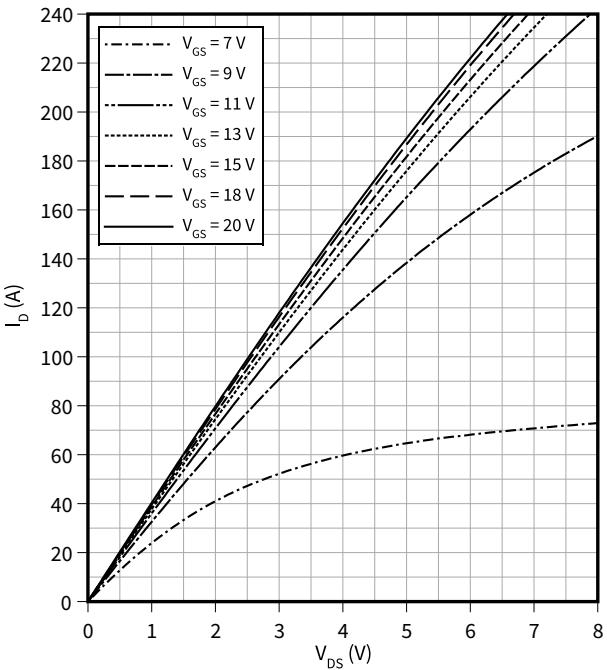
$V_{GS} = 18\text{ V}$



Output characteristic field (typical), MOSFET, T1-T4

$I_D = f(V_{DS})$

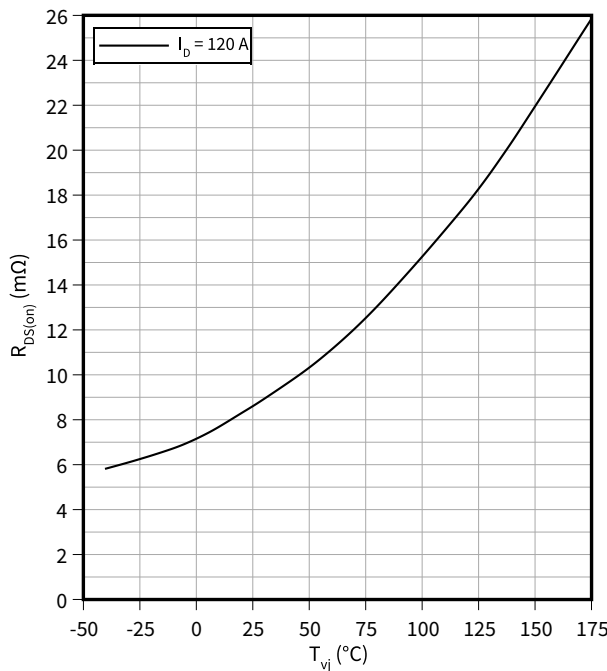
$T_{vj} = 175\text{ °C}$



Drain source on-resistance (typical), MOSFET, T1-T4

$R_{DS(on)} = f(T_{vj})$

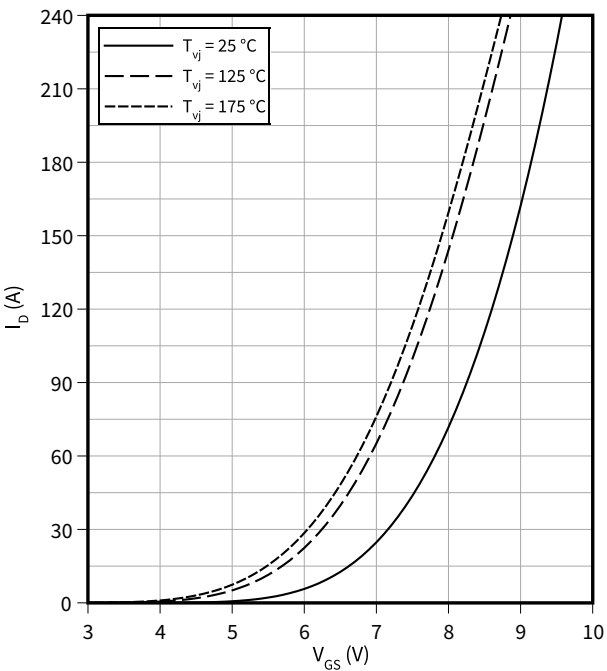
$V_{GS} = 18\text{ V}$



Transfer characteristic (typical), MOSFET, T1-T4

$I_D = f(V_{GS})$

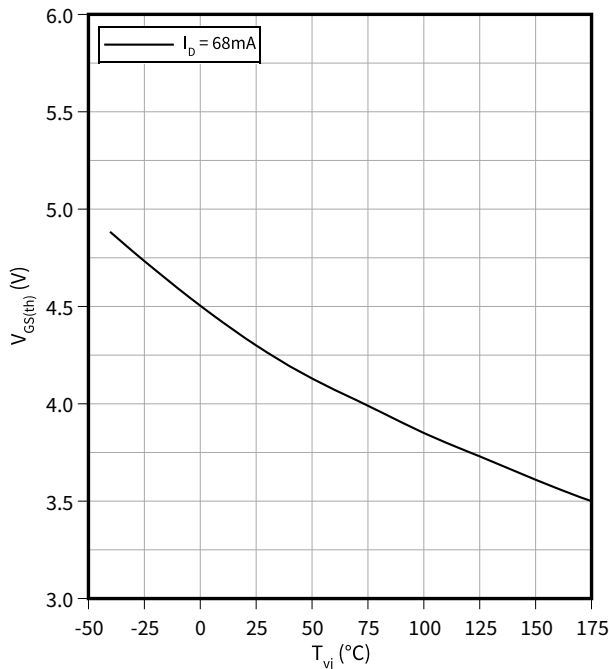
$V_{DS} = 20\text{ V}$



5 Characteristics diagrams

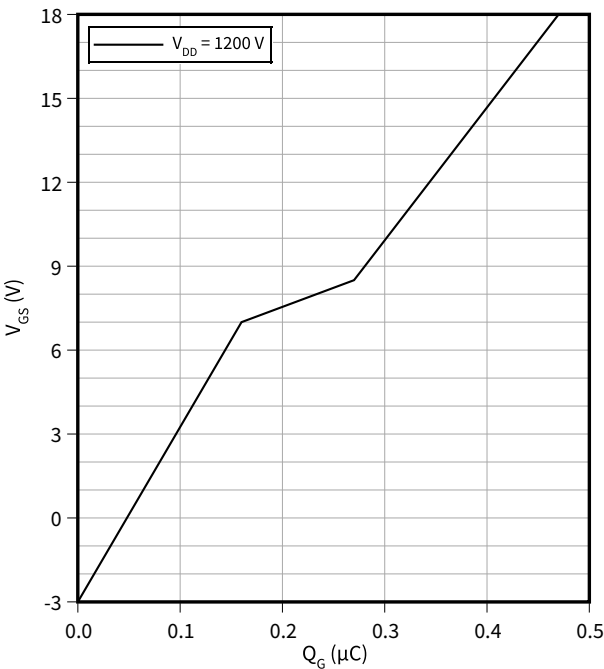
Gate-source threshold voltage (typical), MOSFET, T1-T4

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



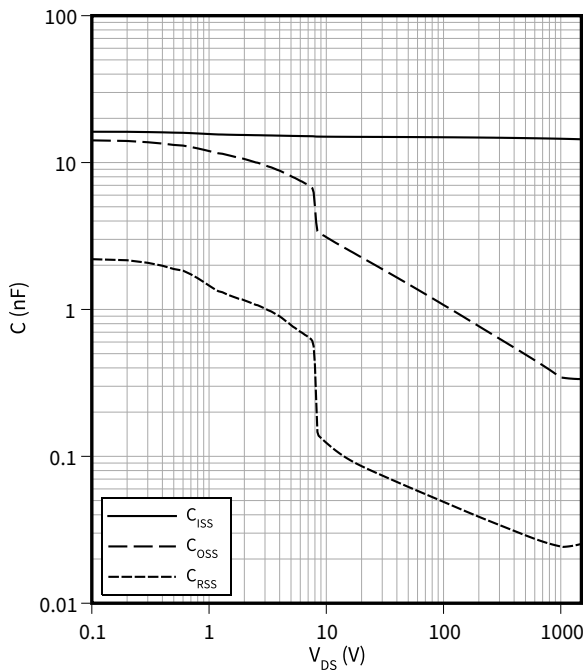
Gate charge characteristic (typical), MOSFET, T1-T4

$V_{GS} = f(Q_G)$
 $I_D = 120\text{ A}, T_{vj} = 25\text{ °C}$



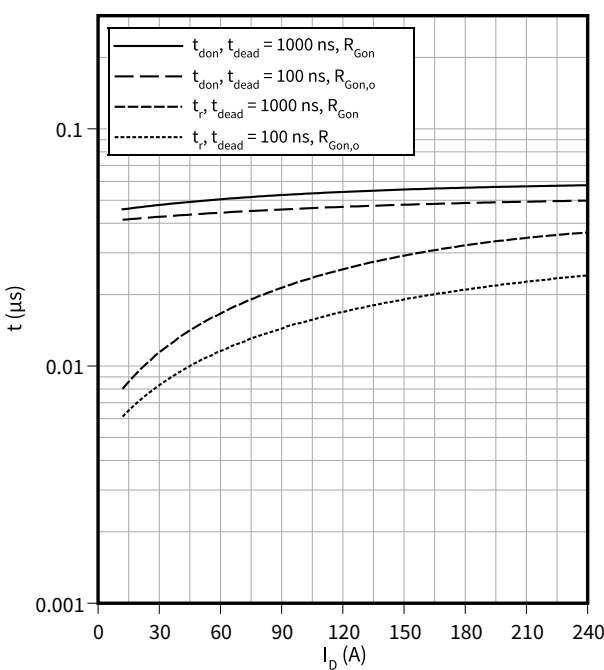
Capacity characteristic (typical), MOSFET, T1-T4

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



Switching times (typical), MOSFET, T1-T4

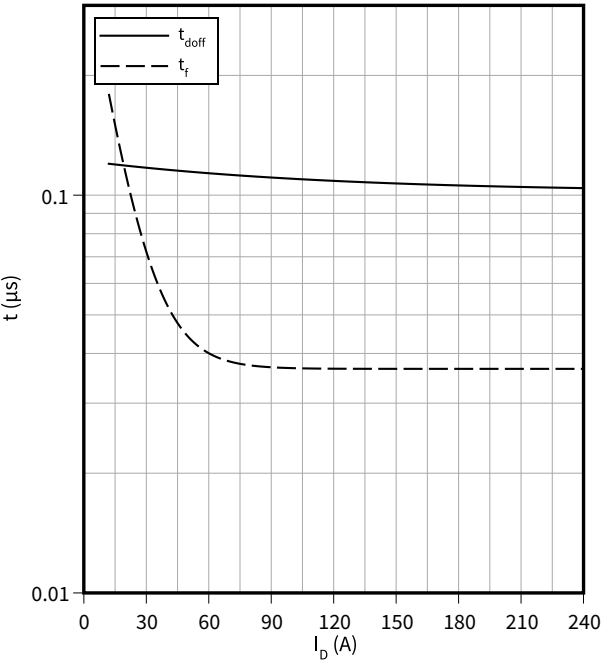
$t = f(I_D)$
 $V_{DD} = 1200\text{ V}, R_{Gon} = 6.2\text{ }\Omega, R_{Gon,o} = 3.3\text{ }\Omega, T_{vj} = 175\text{ °C}, V_{GS} = -3/18\text{ V}$



5 Characteristics diagrams

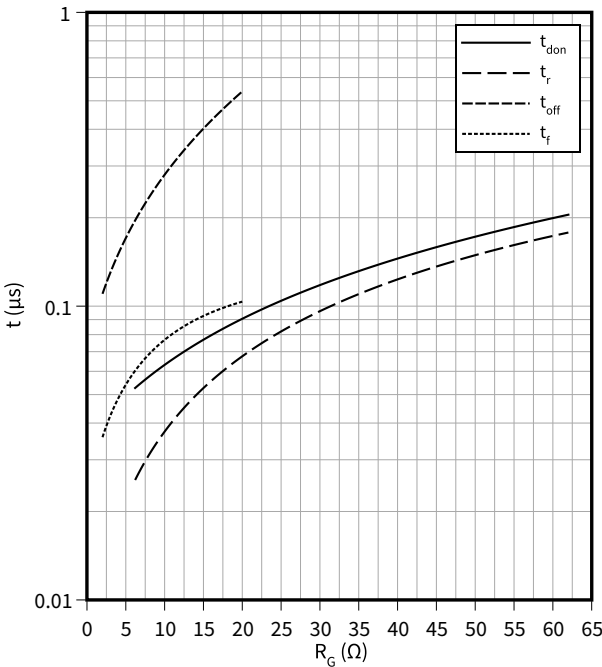
Switching times (typical), MOSFET, T1-T4

$t = f(I_D)$
 $R_{Goff} = 2 \Omega$, $V_{DD} = 1200 \text{ V}$, $T_{vj} = 175 \text{ }^\circ\text{C}$, $V_{GS} = -3/18 \text{ V}$



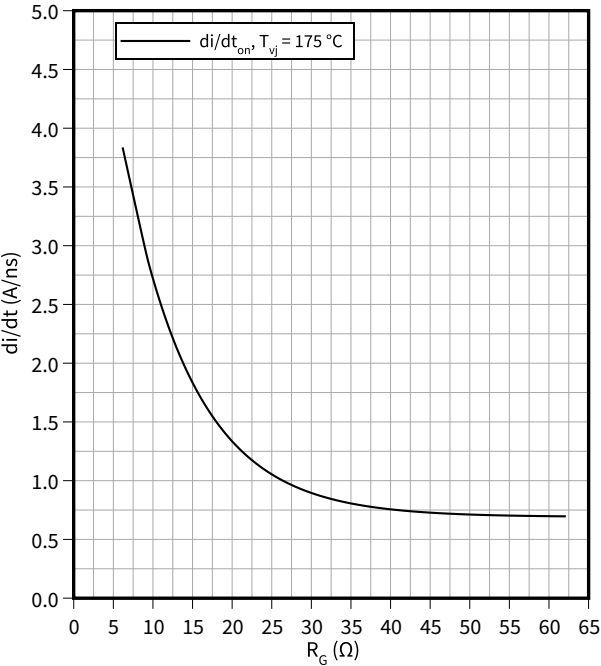
Switching times (typical), MOSFET, T1-T4

$t = f(R_G)$
 $V_{DD} = 1200 \text{ V}$, $t_{dead} = 1000 \text{ ns}$, $I_D = 120 \text{ A}$, $T_{vj} = 175 \text{ }^\circ\text{C}$, $V_{GS} = -3/18 \text{ V}$



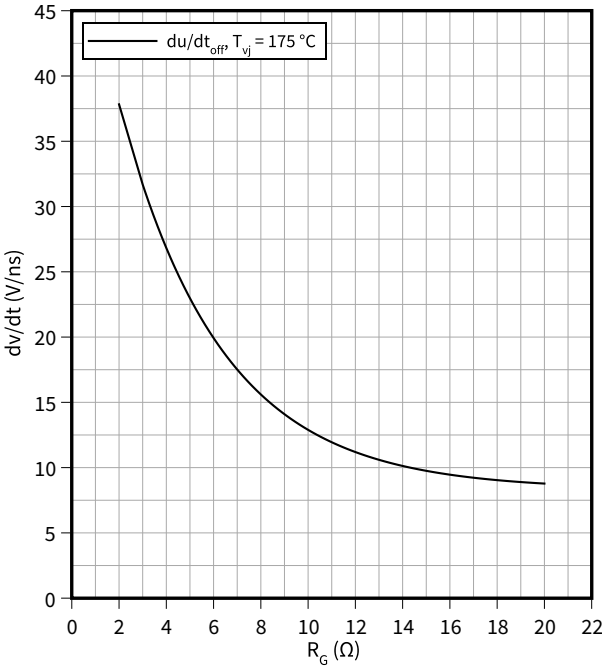
Current slope (typical), MOSFET, T1-T4

$di/dt = f(R_G)$
 $V_{DD} = 1200 \text{ V}$, $I_D = 120 \text{ A}$, $V_{GS} = -3/18 \text{ V}$



Voltage slope (typical), MOSFET, T1-T4

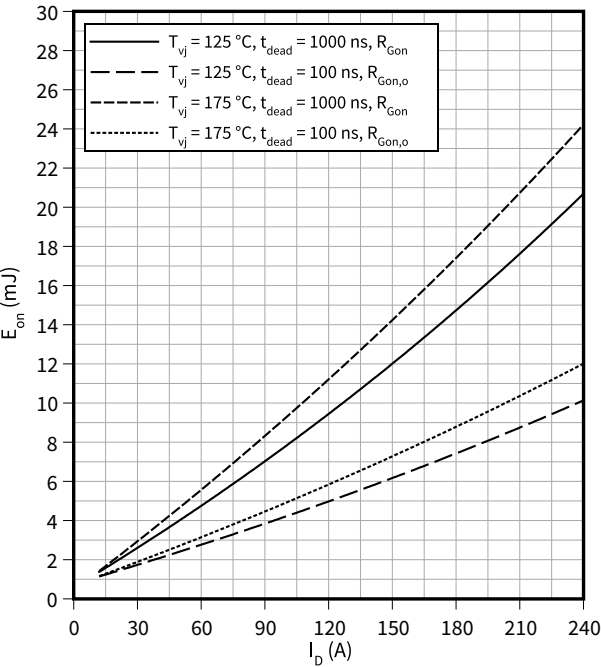
$dv/dt = f(R_G)$
 $V_{DD} = 1200 \text{ V}$, $I_D = 120 \text{ A}$, $V_{GS} = -3/18 \text{ V}$



5 Characteristics diagrams

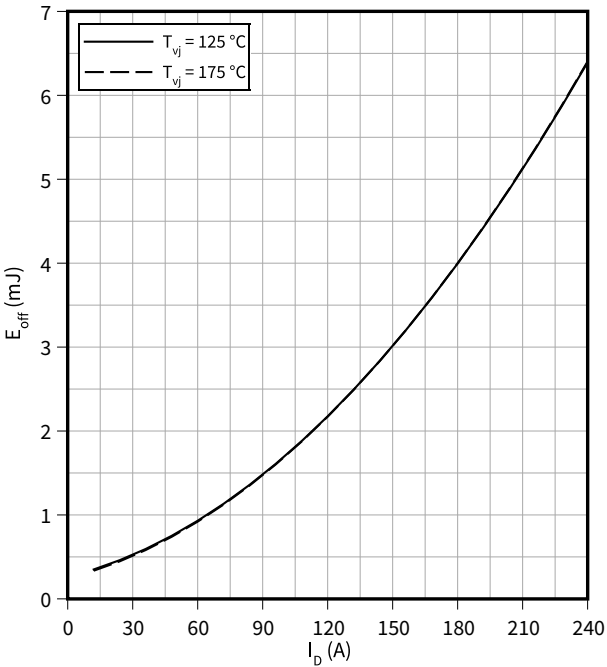
Switching losses (typical), MOSFET, T1-T4

$E_{on} = f(I_D)$
 $V_{DD} = 1200\text{ V}$, $R_{Gon} = 6.2\ \Omega$, $R_{Gon,o} = 3.3\ \Omega$, $V_{GS} = -3/18\text{ V}$



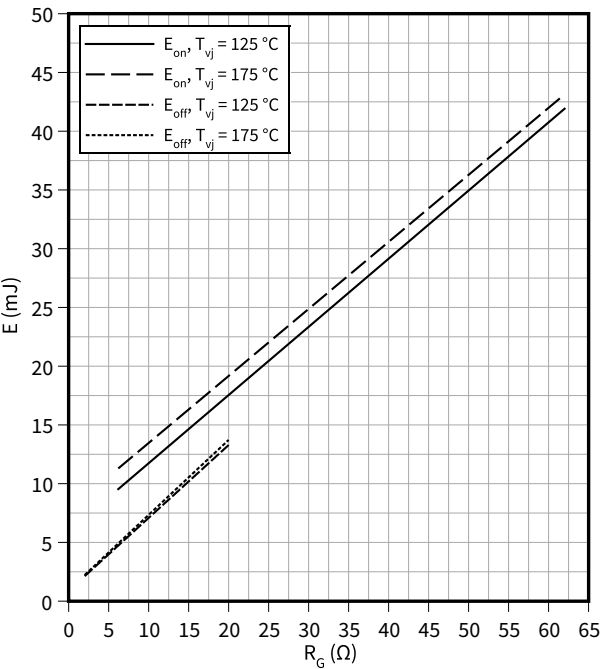
Switching losses (typical), MOSFET, T1-T4

$E_{off} = f(I_D)$
 $R_{Goff} = 2\ \Omega$, $V_{DD} = 1200\text{ V}$, $V_{GS} = -3/18\text{ V}$



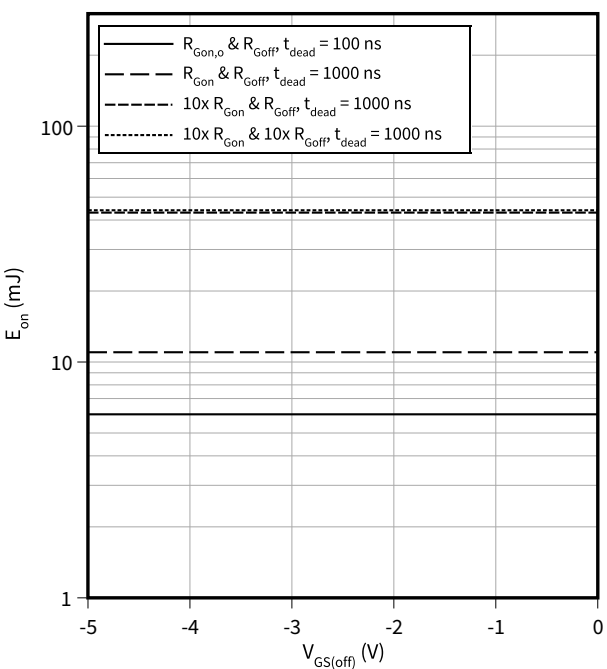
Switching losses (typical), MOSFET, T1-T4

$E = f(R_G)$
 $V_{DD} = 1200\text{ V}$, $t_{dead} = 1000\text{ ns}$, $I_D = 120\text{ A}$, $V_{GS} = -3/18\text{ V}$



Switching losses (typical), MOSFET, T1-T4

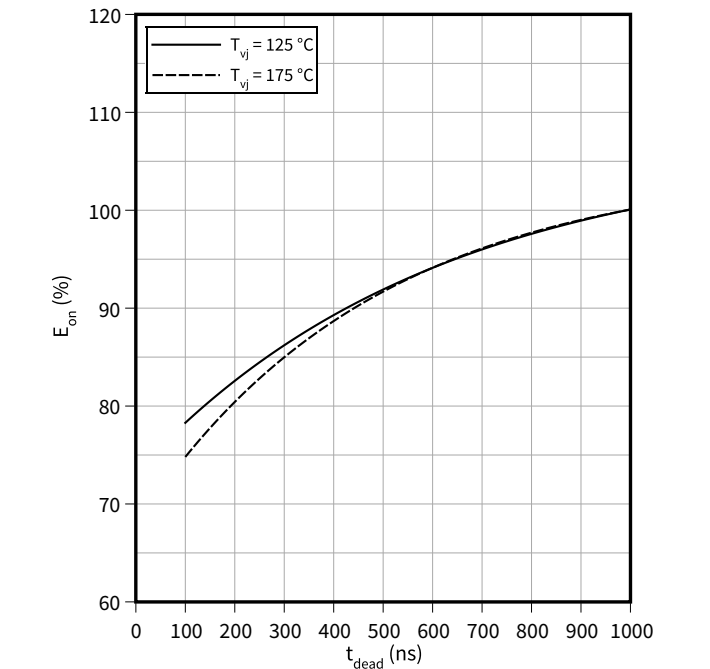
$E_{on} = f(V_{GS(off)})$
 $R_{Goff} = 2\ \Omega$, $V_{DD} = 1200\text{ V}$, $R_{Gon} = 6.2\ \Omega$, $V_{GS(on)} = 18\text{ V}$, $I_D = 120\text{ A}$, $R_{Gon,o} = 3.3\ \Omega$, $T_{vj} = 175\text{ °C}$



5 Characteristics diagrams

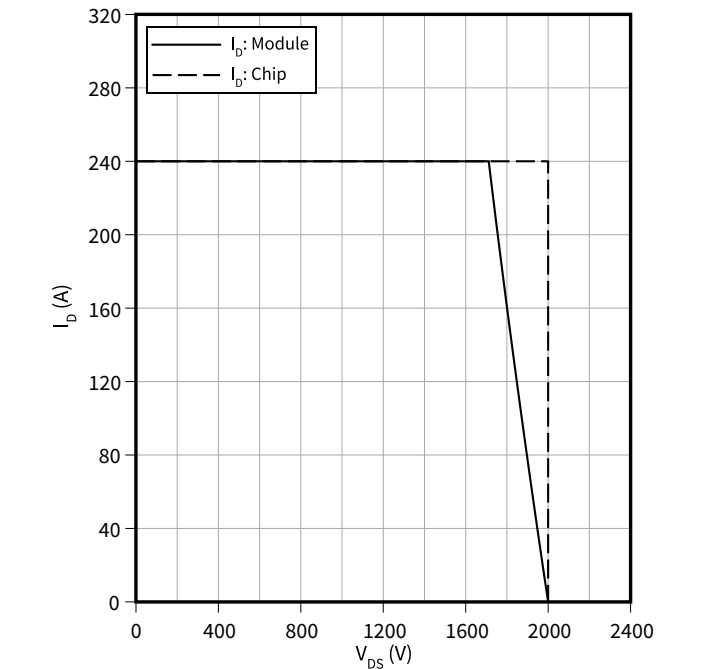
Switching losses (typical), MOSFET, T1-T4

$E_{on} = f(t_{dead})$
 $R_{Gon} = 6.2\ \Omega$, $I_D = 120\ A$, $V_{DD} = 1200\ V$, $V_{GS} = -3/18\ V$



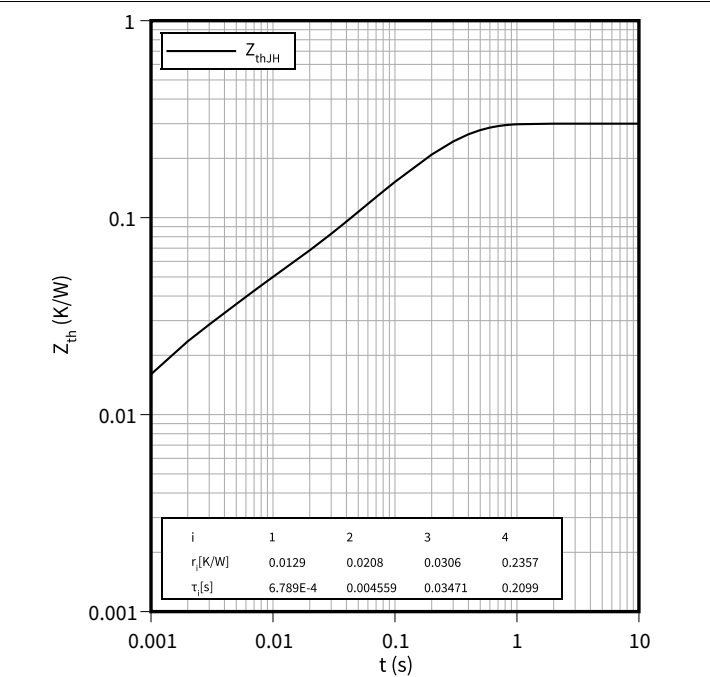
Reverse bias safe operating area (RBSOA), MOSFET, T1-T4

$I_D = f(V_{DS})$
 $R_{Goff} = 2\ \Omega$, $T_{vj} = 175\ ^\circ C$, $V_{GS} = -3/18\ V$



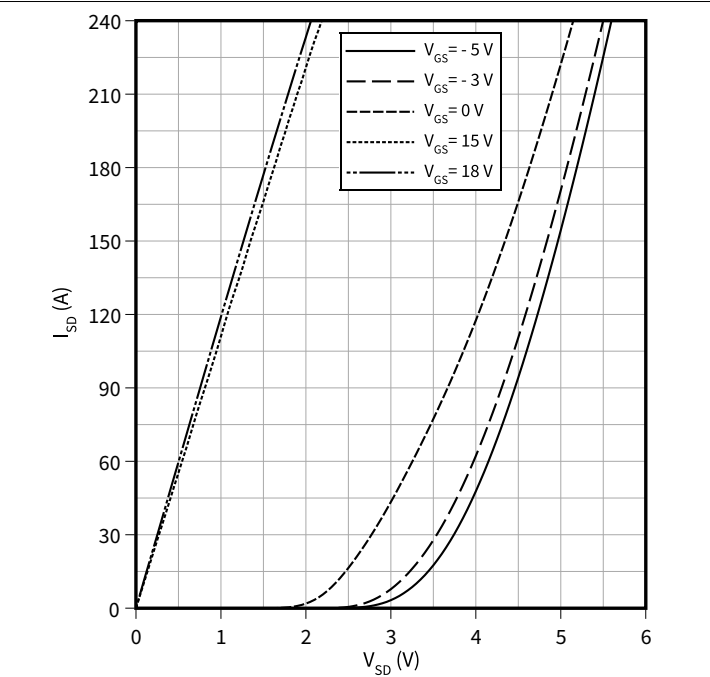
Transient thermal impedance, MOSFET, T1-T4

$Z_{th} = f(t)$



Forward characteristic body diode (typical), MOSFET, T1-T4

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

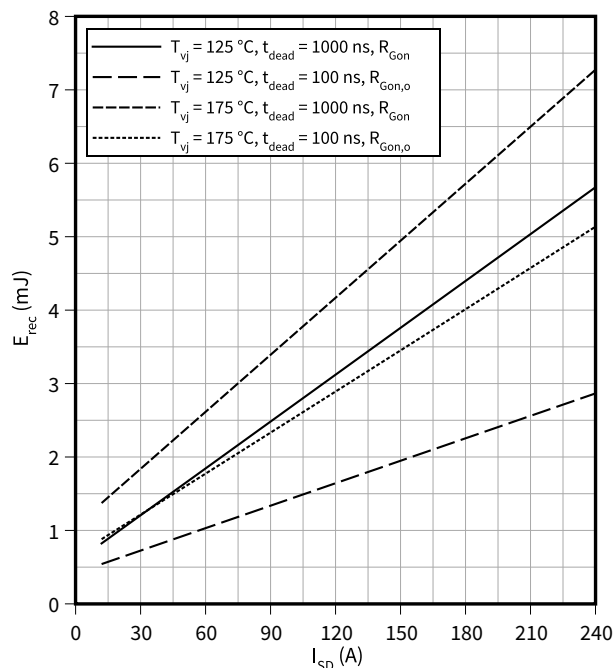


5 Characteristics diagrams

Switching losses body diode (typical), MOSFET, T1-T4

$$E_{\text{rec}} = f(I_{\text{SD}})$$

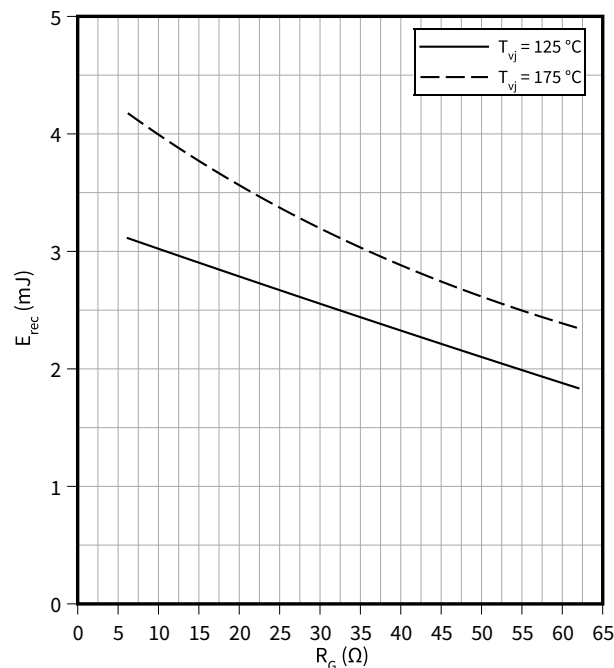
$$R_{\text{Gon}} = 6.2 \, \Omega, R_{\text{Gon,o}} = 3.3 \, \Omega, V_{\text{DD}} = 1200 \, \text{V}$$



Switching losses body diode (typical), MOSFET, T1-T4

$$E_{\text{rec}} = f(R_{\text{G}})$$

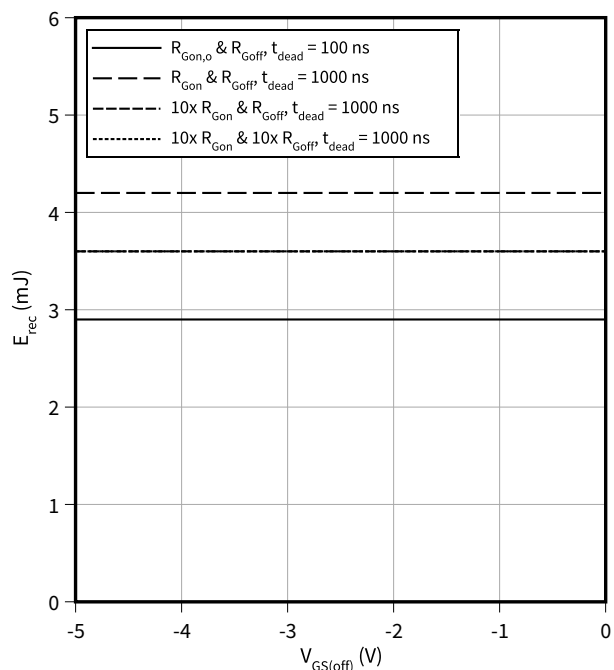
$$t_{\text{dead}} = 1000 \, \text{ns}, I_{\text{SD}} = 120 \, \text{A}, V_{\text{DD}} = 1200 \, \text{V}$$



Switching losses body diode (typical), MOSFET, T1-T4

$$E_{\text{rec}} = f(V_{\text{GS(off)}})$$

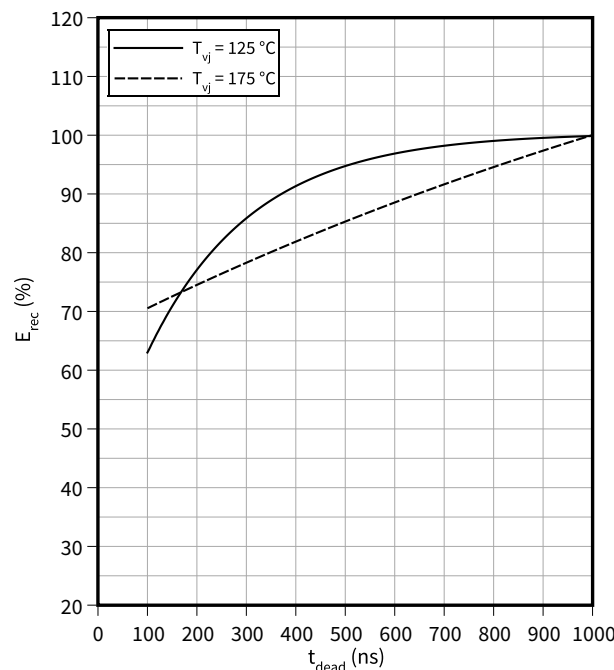
$$R_{\text{Goff}} = 2 \, \Omega, R_{\text{Gon}} = 6.2 \, \Omega, V_{\text{GS(on)}} = 18 \, \text{V}, I_{\text{SD}} = 120 \, \text{A}, R_{\text{Gon,o}} = 3.3 \, \Omega, V_{\text{DD}} = 1200 \, \text{V}, T_{\text{vj}} = 175 \, ^\circ\text{C}$$



Switching losses body diode (typical), MOSFET, T1-T4

$$E_{\text{rec}} = f(t_{\text{dead}})$$

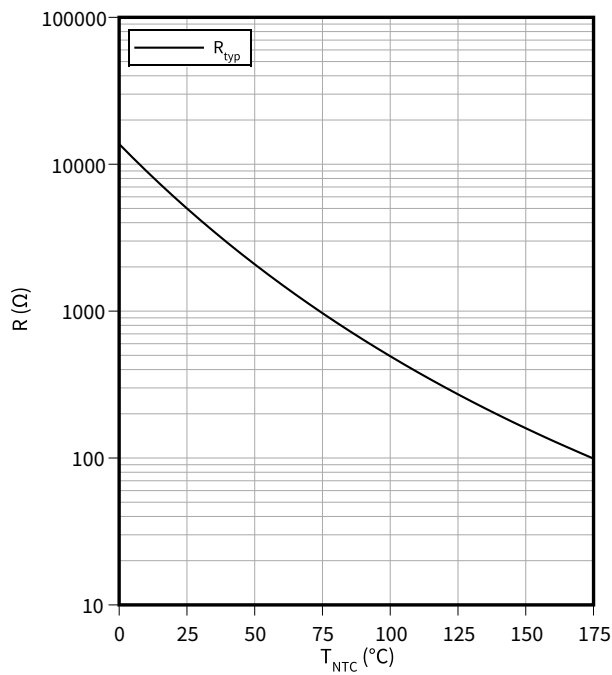
$$R_{\text{Gon}} = 6.2 \, \Omega, I_{\text{D}} = 120 \, \text{A}, V_{\text{DD}} = 1200 \, \text{V}, V_{\text{GS}} = -3/18 \, \text{V}$$



5 Characteristics diagrams

Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



6 Circuit diagram

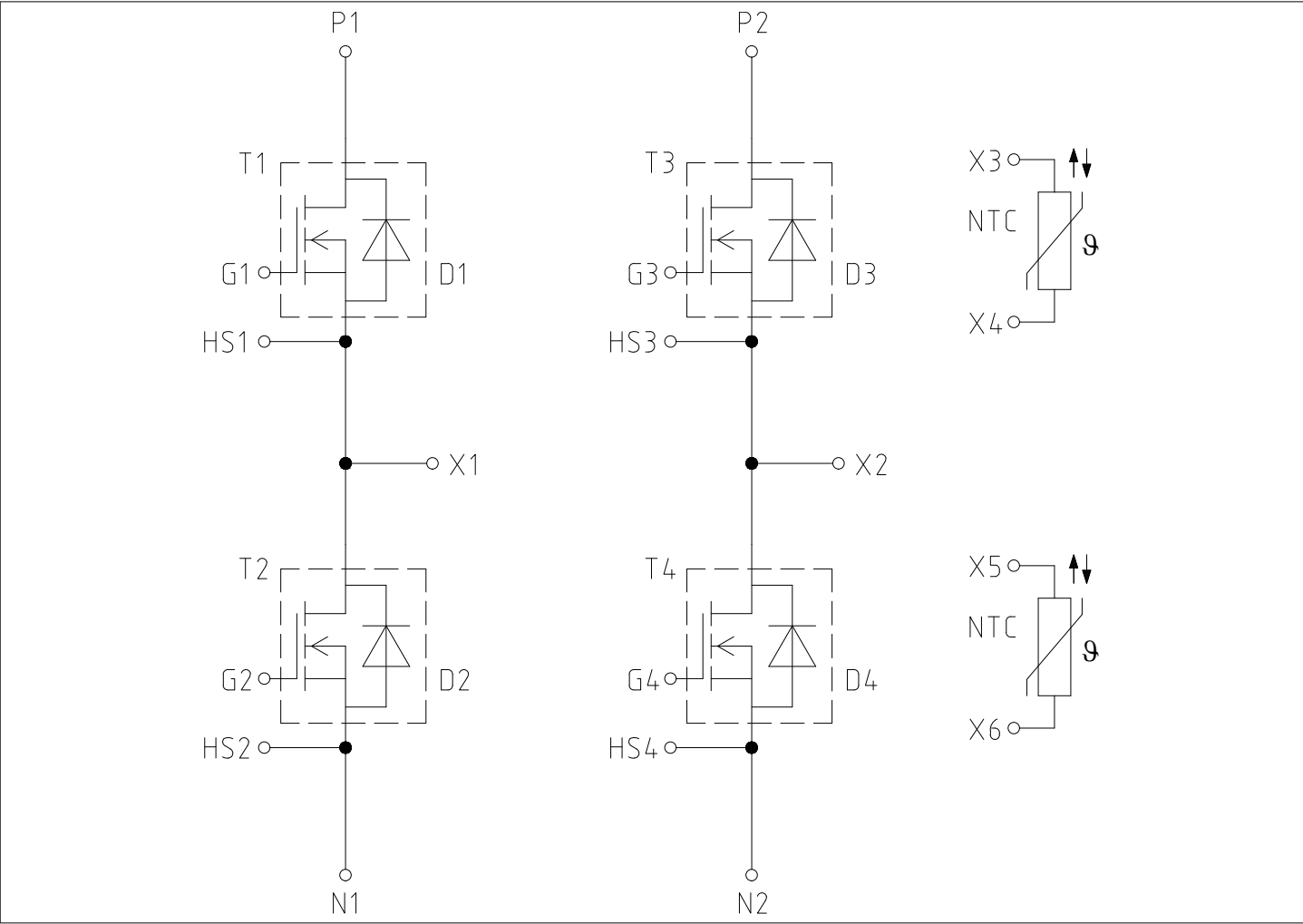
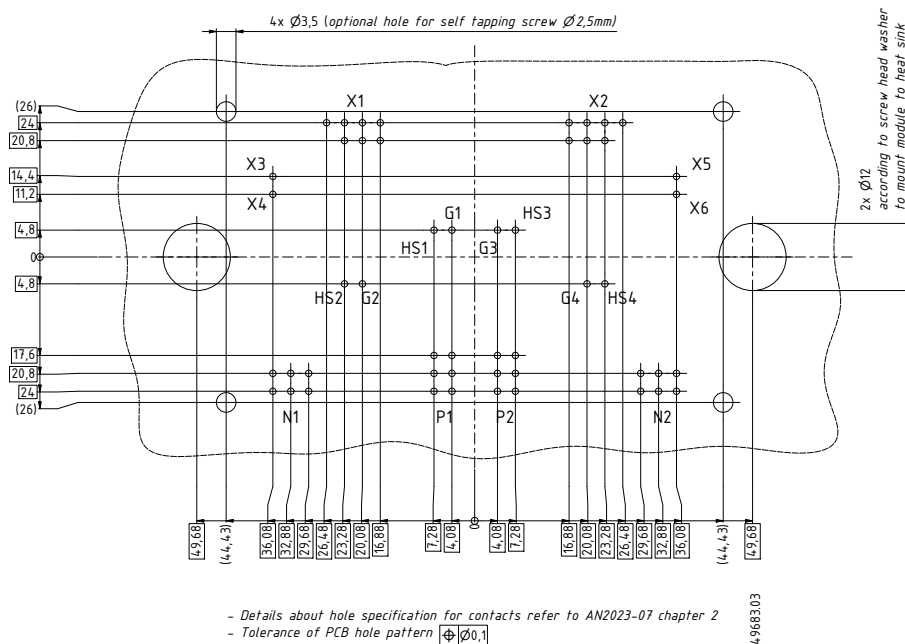


Figure 1

pcb hole pattern



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

Revision history

Document revision	Date of release	Description of changes
0.10	2024-08-12	Target datasheet
1.00	2024-11-11	Final datasheet

Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

Edition 2024-11-11

Published by

Infineon Technologies AG
81726 Munich, Germany

© 2024 Infineon Technologies AG
All Rights Reserved.

Do you have a question about any aspect of this document?

Email: erratum@infineon.com

Document reference
IFX-ABK605-002

Important notice

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenhheitsgarantie").

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

Warnings

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.