Preliminary datasheet
EasyPACK™ 2B module with CoolSiC™ Trench MOSFET and PressFIT / NTC

Features


Typical appearance

- Electrical features
  - V_{DSS} = 1200 V
  - I_{DN} = 50 A / I_{DRM} = 100 A
  - Suitable Infineon gate drivers can be found under https://www.infineon.com/gdfinder
- Mechanical features
  - PressFIT contact technology
  - High power density
  - Compact design
  - Al_2O_3 substrate with low thermal resistance
  - 2.5 kV AC 1 minute insulation

Potential applications

- (Hybrid) electrical vehicles (H)EV
- Auxiliary inverters
- EV Auxiliaries

Product validation

- Qualified according to AQG 324, release no.: 03.1/2021

Description

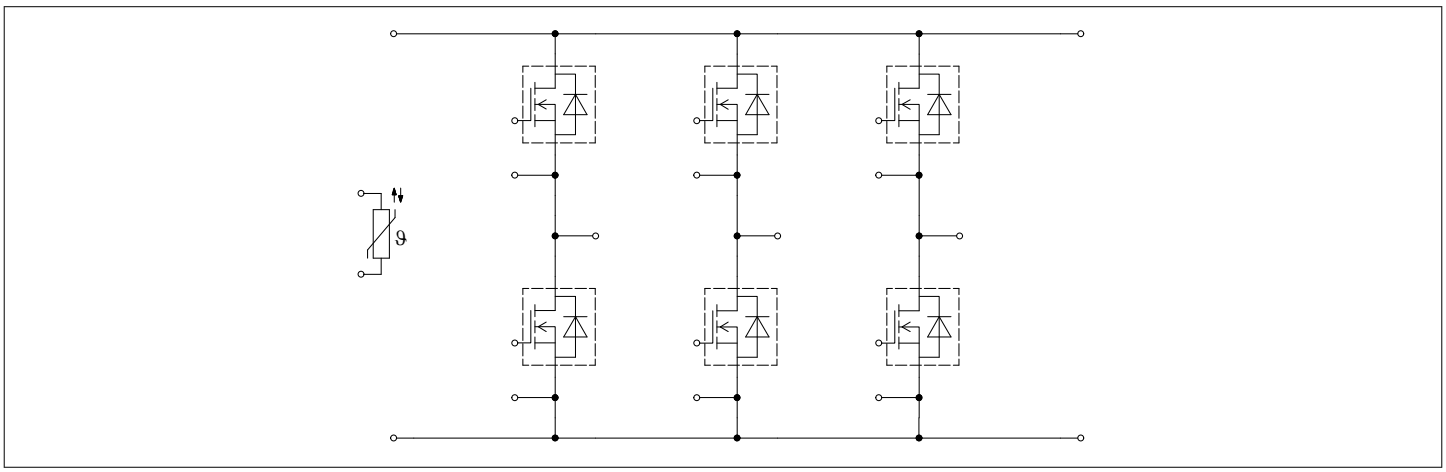

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Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, f = 50 Hz, *t* = 1 min	2.5	kV
Isolation test voltage NTC	$V_{ISOL(NTC)}$	RMS, f = 50 Hz, *t* = 1 min	2.5	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}			17		nH
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	T_H = 25 °C, per switch		2.7		mΩ
Storage temperature	T_{stg}		-40		125	°C
Mounting force per clamp	*F*		40		80	N
Weight	*G*			39		g

***Note**: The current under continuous operation is limited to 25A 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
Implemented drain current	I_{DN}			50	A
Continuous DC drain current	I_{DDC}	T_{vj} = 150 °C, V_{GS} = 18 V	T_H = 65 °C	40	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 A	V_{GS} = 18 V, T_{vj} = 25 °C		16.2	TBD	mΩ
			V_{GS} = 18 V, T_{vj} = 125 °C		26.1		
			V_{GS} = 18 V, T_{vj} = 150 °C		30.1		
			V_{GS} = 15 V, T_{vj} = 25 °C		19.4		
Gate threshold voltage	$V_{GS(th)}$	I_D = 20 mA, V_{DS} = V_{GS}, T_{vj} = 25 °C, (tested after 1ms pulse at V_{GS} = +20 V)		3.45	4.3	5.15	V
Total gate charge	Q_G	V_{DD} = 800 V, V_{GS} = -3/18 V, T_{vj} = 25 °C			0.149		µC
Internal gate resistor	R_{Gint}	T_{vj} = 25 °C			4.1		Ω
Input capacitance	C_{ISS}	f = 100 kHz, V_{DS} = 800 V, V_{GS} = 0 V	T_{vj} = 25 °C		4.4		nF
Output capacitance	C_{OSS}	f = 100 kHz, V_{DS} = 800 V, V_{GS} = 0 V	T_{vj} = 25 °C		0.21		nF
Reverse transfer capacitance	C_{rss}	f = 100 kHz, V_{DS} = 800 V, V_{GS} = 0 V	T_{vj} = 25 °C		0.014		nF
C_{OSS} stored energy	E_{OSS}	V_{DS} = 800 V, V_{GS} = -3/18 V, T_{vj} = 25 °C			86		µJ
Drain-source leakage current	I_{DSS}	V_{DS} = 1200 V, V_{GS} = -3 V	T_{vj} = 25 °C		0.03	210	µA
Gate-source leakage current	I_{GSS}	V_{DS} = 0 V, T_{vj} = 25 °C	V_{GS} = 20 V			400	nA
Turn-on delay time (inductive load)	$t_{d\,on}$	I_D = 50 A, R_{Gon} = 3.3 Ω, V_{DD} = 600 V, V_{GS} = -3/18 V, t_{dead} = 1000 ns	T_{vj} = 25 °C		32		ns
			T_{vj} = 125 °C		32		
			T_{vj} = 150 °C		32		
Rise time (inductive load)	t_r	I_D = 50 A, R_{Gon} = 3.3 Ω, V_{DD} = 600 V, V_{GS} = -3/18 V, t_{dead} = 1000 ns	T_{vj} = 25 °C		29		ns
			T_{vj} = 125 °C		29		
			T_{vj} = 150 °C		29		

(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} = 0.22 Ω, V_{DD} = 600 V, V_{GS} = -3/18 V	T_{vj} = 25 °C		39		ns
			T_{vj} = 125 °C		43		
			T_{vj} = 150 °C		44		
Fall time (inductive load)	t_f	I_D = 50 A, R_{Goff} = 0.22 Ω, V_{DD} = 600 V, V_{GS} = -3/18 V	T_{vj} = 25 °C		12		ns
			T_{vj} = 125 °C		12		
			T_{vj} = 150 °C		12		
Turn-on energy loss per pulse	E_{on}	I_D = 50 A, V_{DD} = 600 V, L_σ = 15 nH, V_{GS} = -3/18 V, R_{Gon} = 3.3 Ω, di/dt = 7.9 kA/µs (T_{vj} = 150 °C), t_{dead} = 1000 ns	T_{vj} = 25 °C		644		µJ
			T_{vj} = 125 °C		763		
			T_{vj} = 150 °C		816		
Turn-on energy loss per pulse, optimized	$E_{on,o}$	I_D = 50 A, V_{DD} = 600 V, L_σ = 15 nH, V_{GS} = -3/18 V, $R_{Gon,o}$ = 0 Ω, di/dt = 12 kA/µs (T_{vj} = 150 °C), t_{dead} = 100 ns	T_{vj} = 25 °C		397		µJ
			T_{vj} = 125 °C		414		
			T_{vj} = 150 °C		428		
Turn-off energy loss per pulse	E_{off}	I_D = 50 A, V_{DD} = 600 V, L_σ = 15 nH, V_{GS} = -3/18 V, R_{Goff} = 0.22 Ω, dv/dt = 40 kV/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		90		µJ
			T_{vj} = 125 °C		91		
			T_{vj} = 150 °C		104		
Thermal resistance, junction to heat sink	R_{thJH}	per MOSFET, λ_{grease} = 1 W/(m·K)			1.17	1.37	K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		150	°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.*

EoL criteria see AQG324, verified by characterisation with 4.5 sigma.

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} = 150 °C, V_{GS} = -3 V	T_H = 65 °C	16	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 °C		4.2	TBD	V
			T_{vj} = 125 °C		3.9		
			T_{vj} = 150 °C		3.8		
Peak reverse recovery current	I_{rrm}	I_{SD} = 50 A, di_s/dt = 7.9 kA/µs, V_{DD} = 600 V, V_{GS} = -3 V, t_{dead} = 1000 ns	T_{vj} = 25 °C		64		A
			T_{vj} = 125 °C		81		
			T_{vj} = 150 °C		87		
Recovered charge	Q_{rr}	I_{SD} = 50 A, di_s/dt = 7.9 kA/µs, V_{DD} = 600 V, V_{GS} = -3 V, t_{dead} = 1000 ns	T_{vj} = 25 °C		0.9		µC
			T_{vj} = 125 °C		1.2		
			T_{vj} = 150 °C		1.3		
Reverse recovery energy	E_{rec}	I_{SD} = 50 A, di_s/dt = 7.9 kA/µs (T_{vj} = 150 °C), V_{DD} = 600 V, V_{GS} = -3 V, t_{dead} = 1000 ns	T_{vj} = 25 °C		119		µJ
			T_{vj} = 125 °C		226		
			T_{vj} = 150 °C		280		
Reverse recovery energy, optimized	$E_{rec,o}$	I_{SD} = 50 A, di_s/dt = 12 kA/µs (T_{vj} = 150 °C), V_{DD} = 600 V, V_{GS} = -3 V, t_{dead} = 100 ns	T_{vj} = 25 °C		256		µJ
			T_{vj} = 125 °C		313		
			T_{vj} = 150 °C		326		

4 NTC-Thermistor

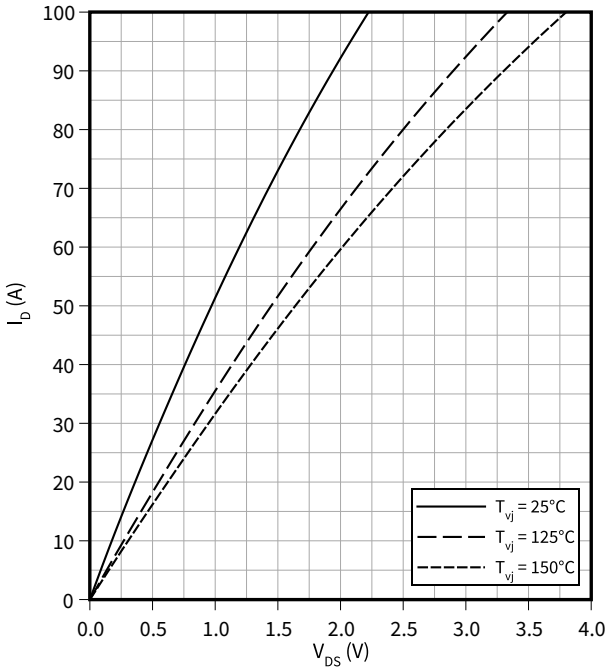
Table 8 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	R_{25}	T_{NTC} = 25 °C	9.7	10	10.3	kΩ
Power dissipation	P_{25}	T_{NTC} = 25 °C			20	mW
B-value	$B_{25/50}$	$R_2 = R_{25} \exp[B_{25/50}(1/T_2-1/(298{,}15\ K))]$		3447		K
B-value	$B_{25/80}$	$R_2 = R_{25} \exp[B_{25/80}(1/T_2-1/(298{,}15\ K))]$		3487		K
B-value	$B_{25/100}$	$R_2 = R_{25} \exp[B_{25/100}(1/T_2-1/(298{,}15\ K))]$		3510		K

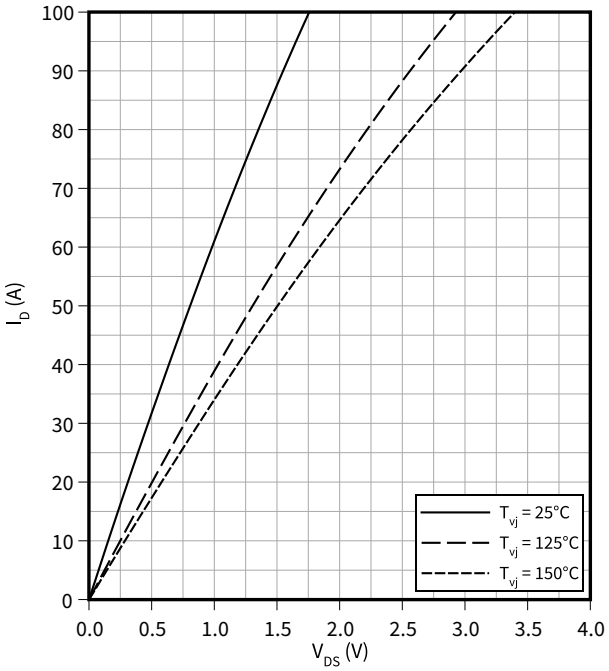
***Note**: Specification according to the valid application note AN2009-10.*

5 Characteristics diagrams

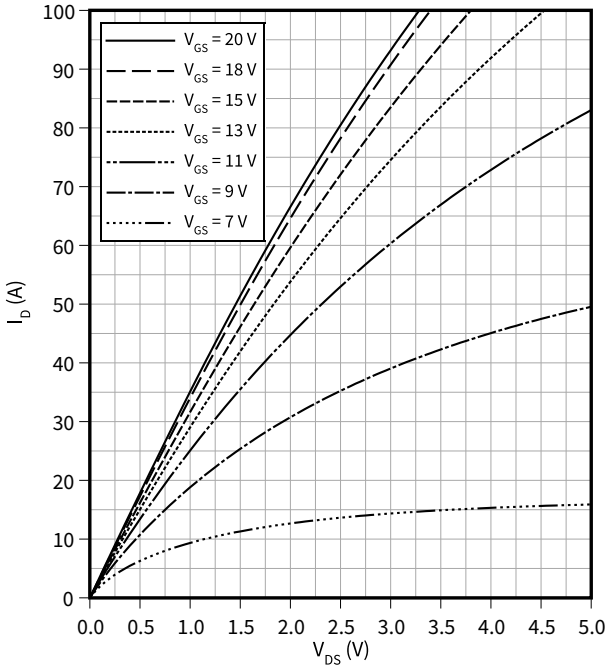
Output characteristic (typical), MOSFET
$I_D = f(V_{DS})$
V_{GS} = 15 V



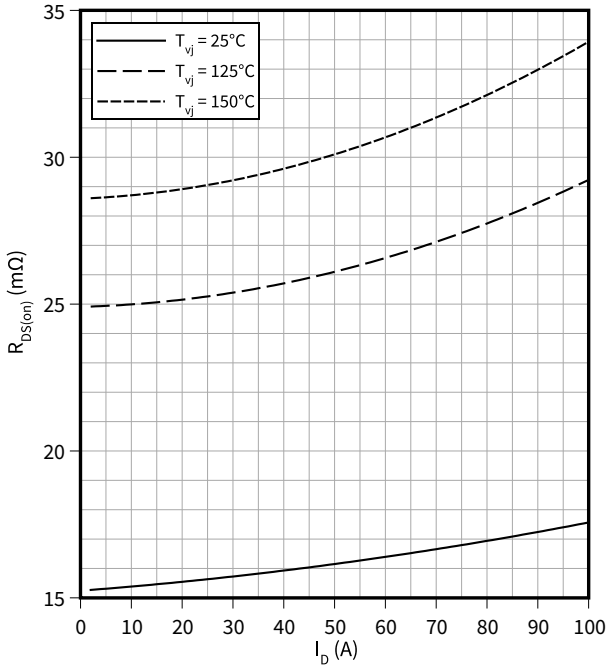
Output characteristic (typical), MOSFET
$I_D = f(V_{DS})$
V_{GS} = 18 V



Output characteristic field (typical), MOSFET
$I_D = f(V_{DS})$
T_{vj} = 150 °C

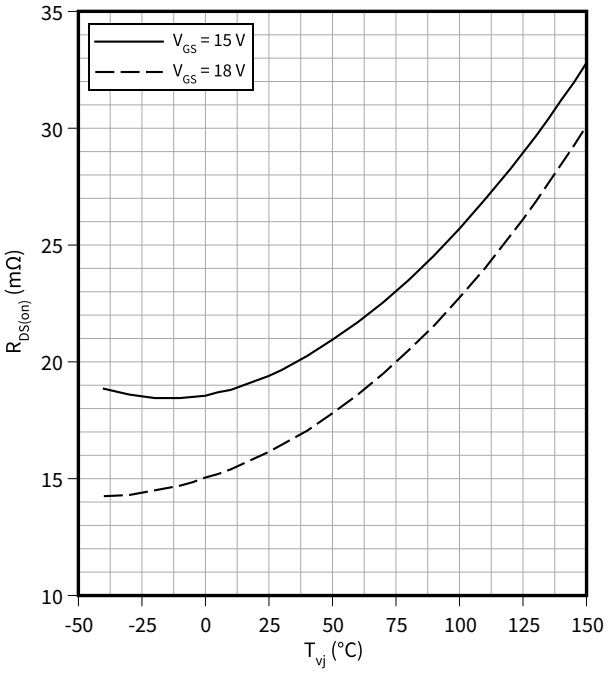


Drain source on-resistance (typical), MOSFET
$R_{DS(on)} = f(I_D)$
V_{GS} = 18 V



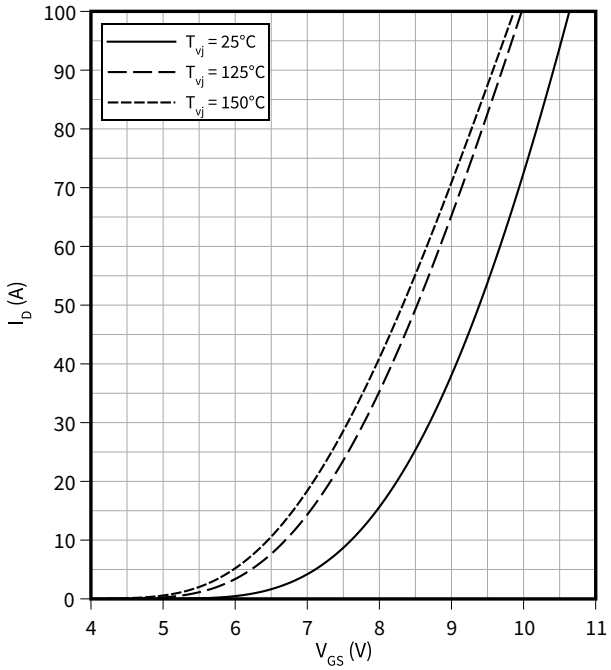
Drain source on-resistance (typical), MOSFET

$R_{DS(on)} = f(T_{vj})$
$V_{GS} = V_{DS}$, $I_D = 50$ A



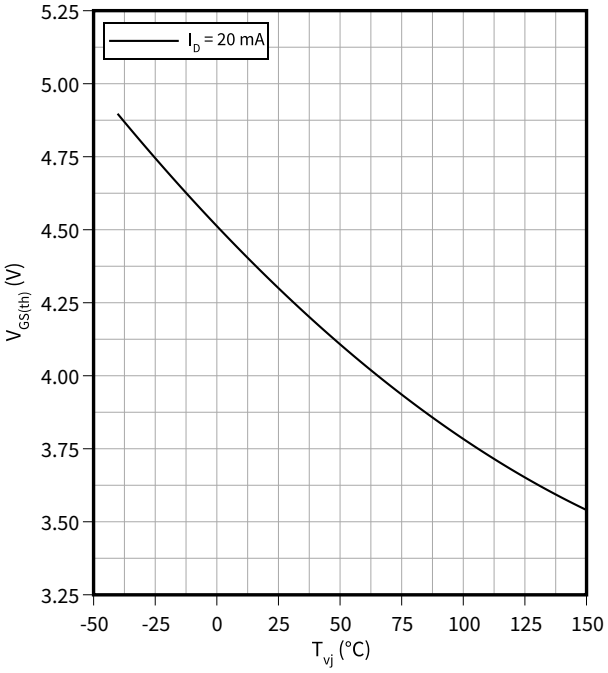
Transfer characteristic (typical), MOSFET

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



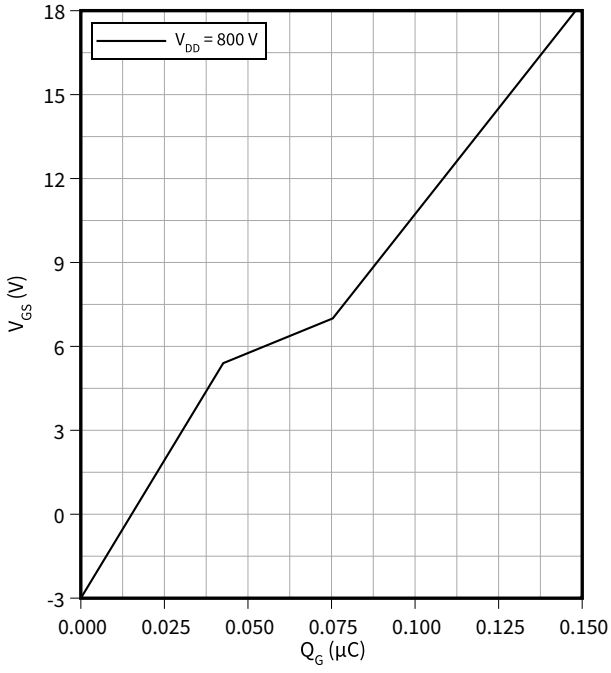
Gate-source threshold voltage (typical), MOSFET

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



Gate charge characteristic (typical), MOSFET

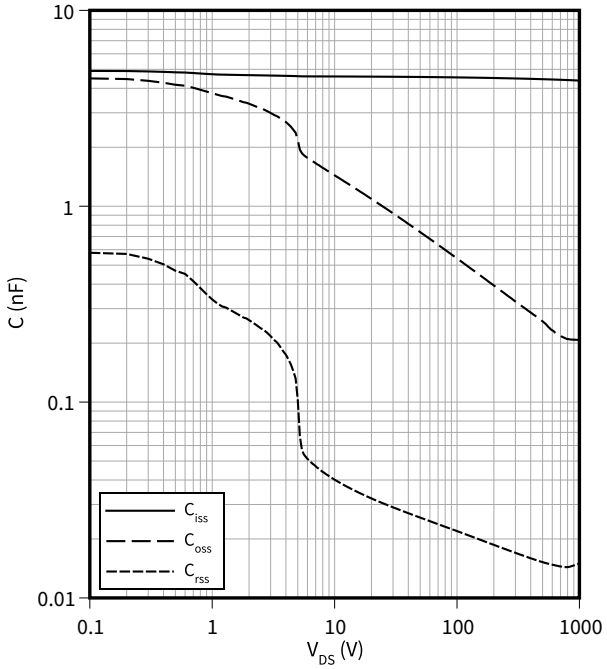
$V_{GS} = f(Q_G)$
$I_D = 50$ A, $T_{vj} = 25$ °C



Capacity characteristic (typical), MOSFET

$C = f(V_{DS})$

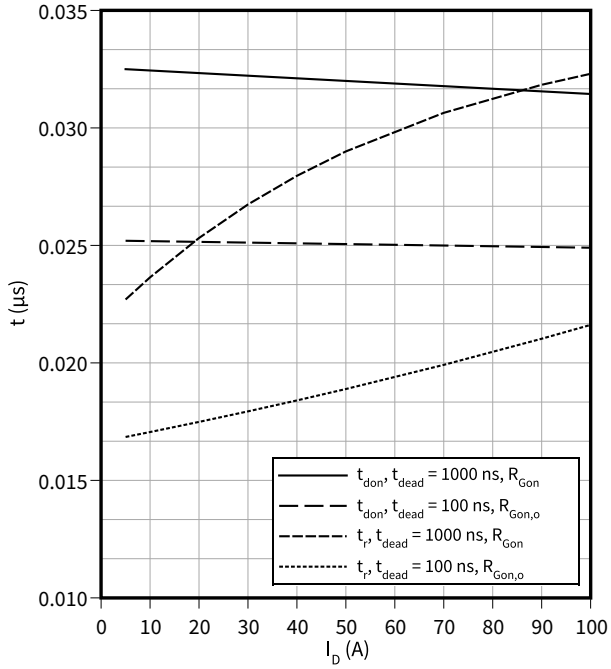
$f = 100\ kHz$, $T_{vj} = 25\ °C$, $V_{GS} = 0\ V$



Switching times (typical), MOSFET

$t = f(I_D)$

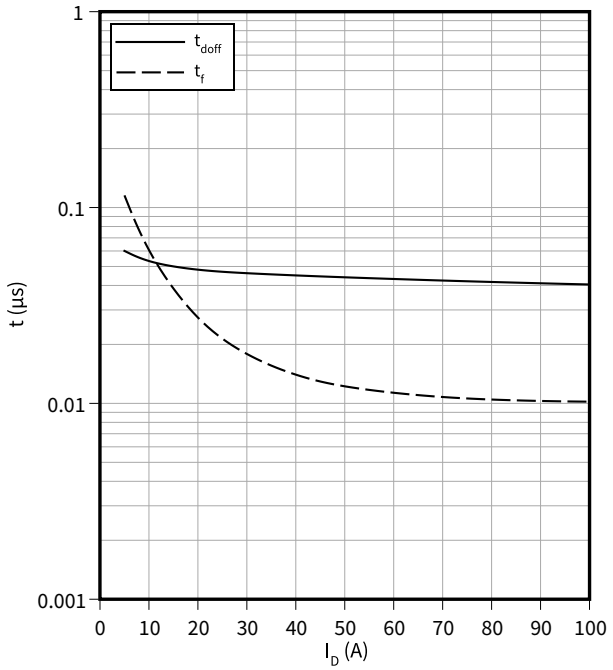
$R_{Gon} = 3.3\ \Omega$, $V_{DD} = 600\ V$, $R_{Gon,o} = 0\ \Omega$, $T_{vj} = 150\ °C$, $V_{GS} = -3/18\ V$



Switching times (typical), MOSFET

$t = f(I_D)$

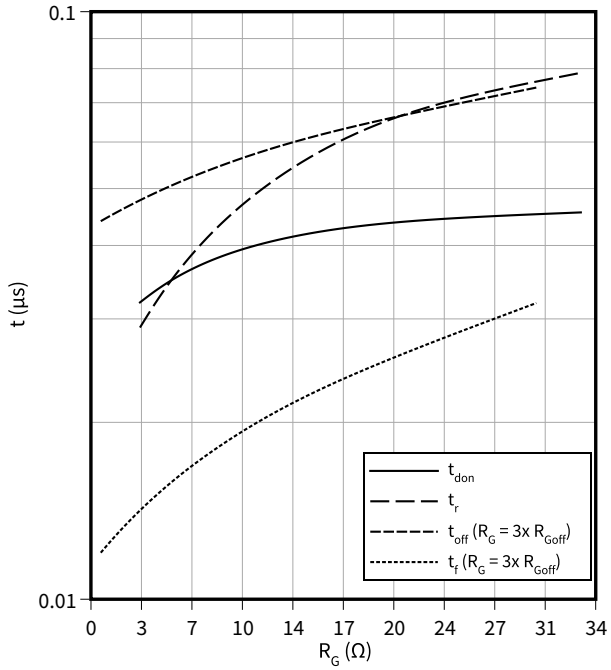
$R_{Goff} = 0.22\ \Omega$, $V_{DD} = 600\ V$, $T_{vj} = 150\ °C$, $V_{GS} = -3/18\ V$



Switching times (typical), MOSFET

$t = f(R_G)$

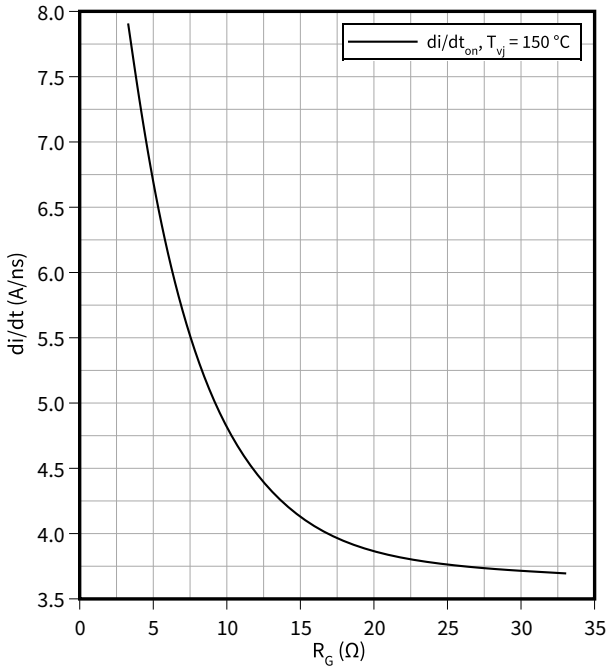
$V_{DD} = 600\ V$, $t_{dead} = 1000\ ns$, $I_D = 50\ A$, $T_{vj} = 150\ °C$, $V_{GS} = -3/18\ V$



Current slope (typical), MOSFET

di/dt = f(R_G)

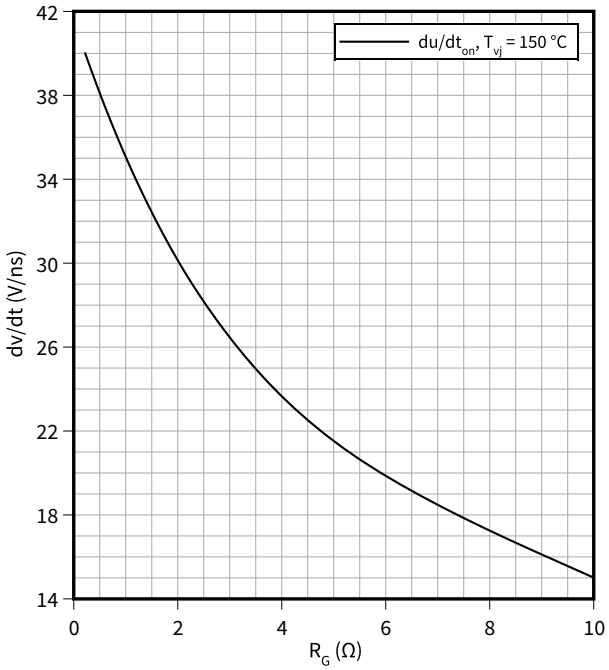
V_{DD} = 600 V, t_{dead} = 1000 ns, I_D = 50 A, V_{GS} = -3/18 V



Voltage slope (typical), MOSFET

dv/dt = f(R_G)

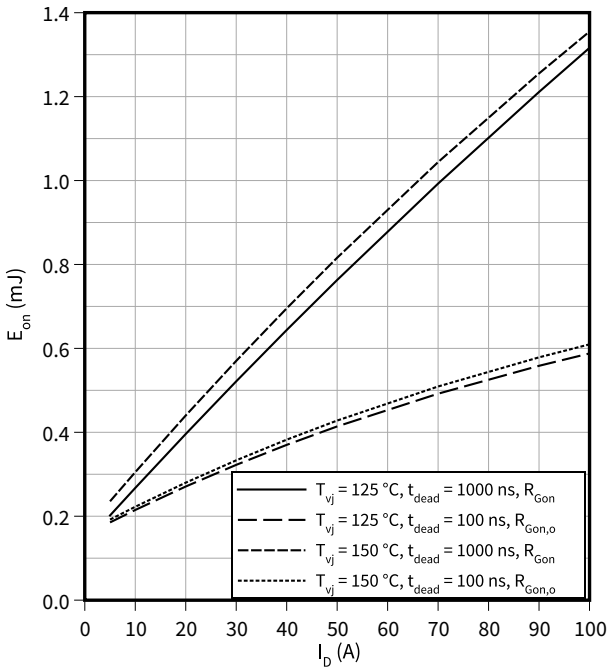
V_{DD} = 600 V, I_D = 50 A, V_{GS} = -3/18 V



Switching losses (typical), MOSFET

E_{on} = f(I_D)

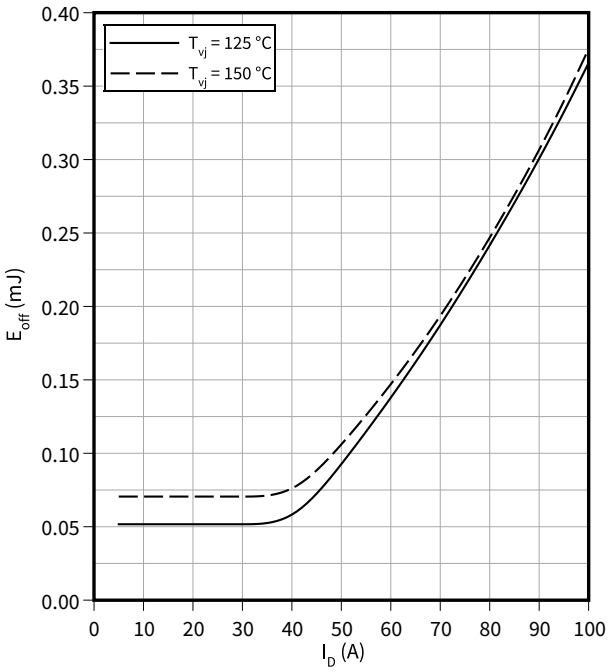
R_{Gon} = 3.3 Ω, V_{DD} = 600 V, $R_{Gon,o}$ = 0 Ω, V_{GS} = -3/18 V



Switching losses (typical), MOSFET

E_{off} = f(I_D)

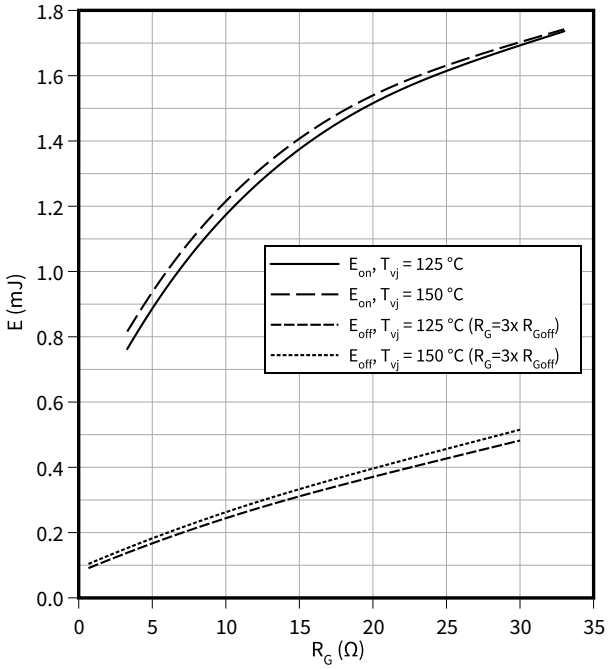
R_{Goff} = 0.22 Ω, V_{DD} = 600 V, V_{GS} = -3/18 V



Switching losses (typical), MOSFET

$E = f(R_G)$

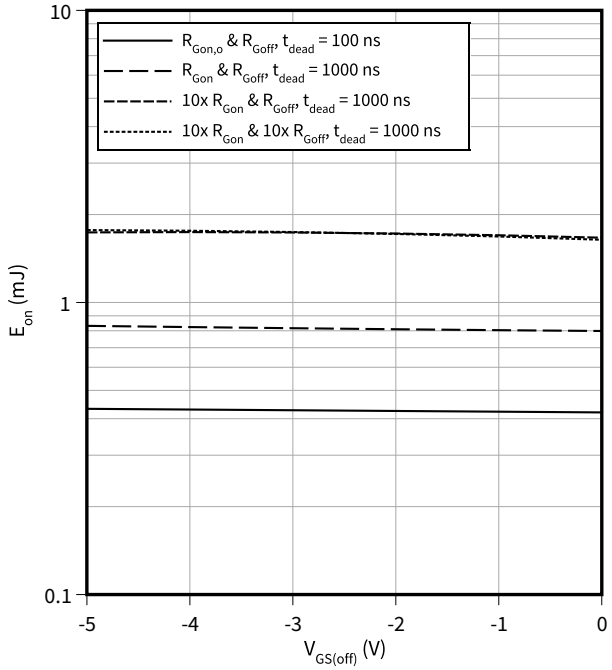
V_{DD} = 600 V, t_{dead} = 1000 ns, I_D = 50 A, V_{GS} = -3/18 V



Switching losses (typical), MOSFET

$E_{on} = f(V_{GS(off)})$

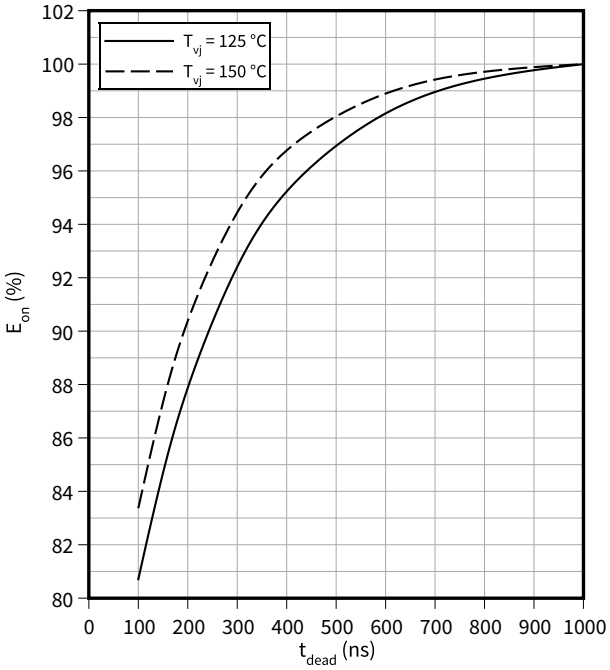
R_{Goff} = 0.22 Ω, V_{DD} = 600 V, R_{Gon} = 3.3 Ω, $V_{GS(on)}$ = 18 V, I_D = 50 A, $R_{Gon,o}$ = 0 Ω, T_{vj} = 150 °C



Switching losses (typical), MOSFET

$E_{on} = f(t_{dead})$

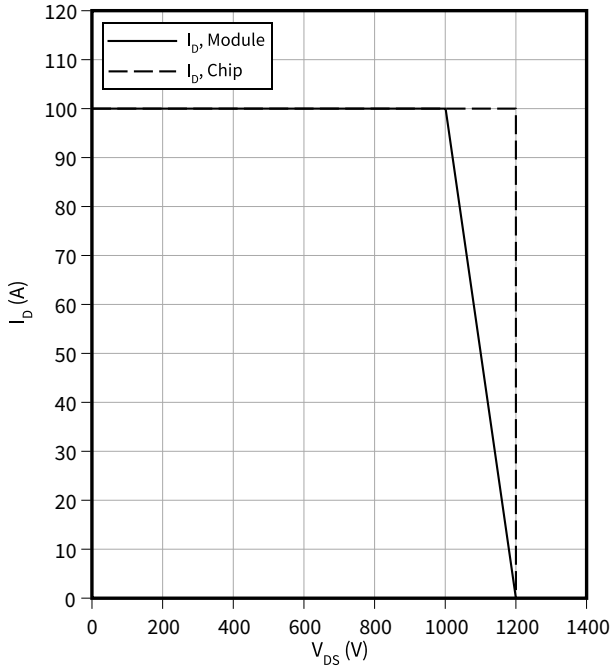
R_{Gon} = 3.3 Ω, I_D = 50 A, V_{DD} = 600 V, V_{GS} = -3/18 V



Reverse bias safe operating area (RBSOA), MOSFET

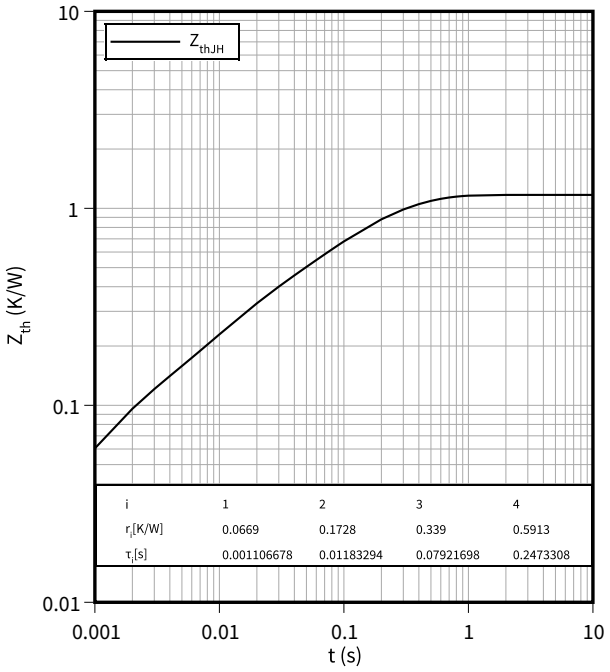
$I_D = f(V_{DS})$

R_{Goff} = 0.22 Ω, T_{vj} = 150 °C, V_{GS} = -3/18 V



Transient thermal impedance, MOSFET

$Z_{th} = f(t)$

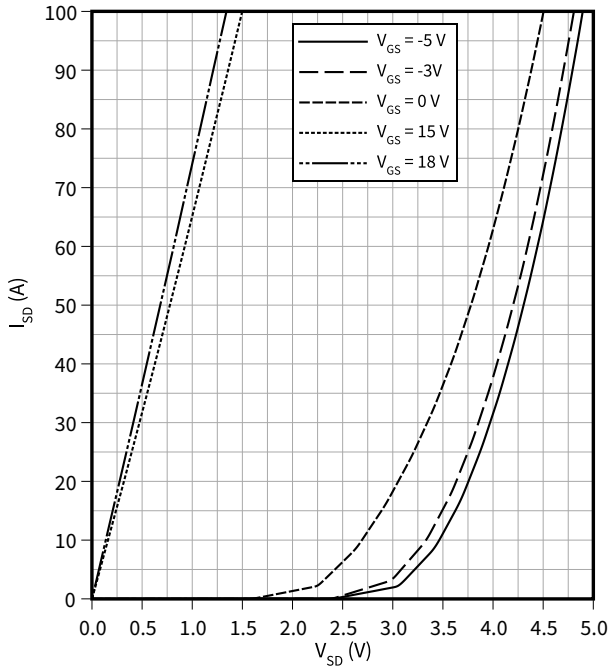


i	1	2	3	4
r_i[K/W]	0.0669	0.1728	0.339	0.5913
τ_i[s]	0.001106678	0.01183294	0.07921698	0.2473308

Forward characteristic body diode (typical), MOSFET

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

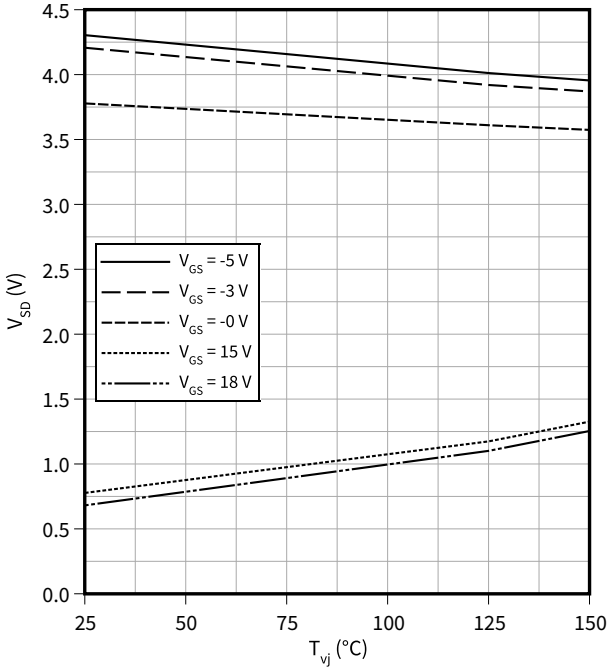
$T_{vj} = 25\ °C$



Forward voltage of body diode (typical), MOSFET

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

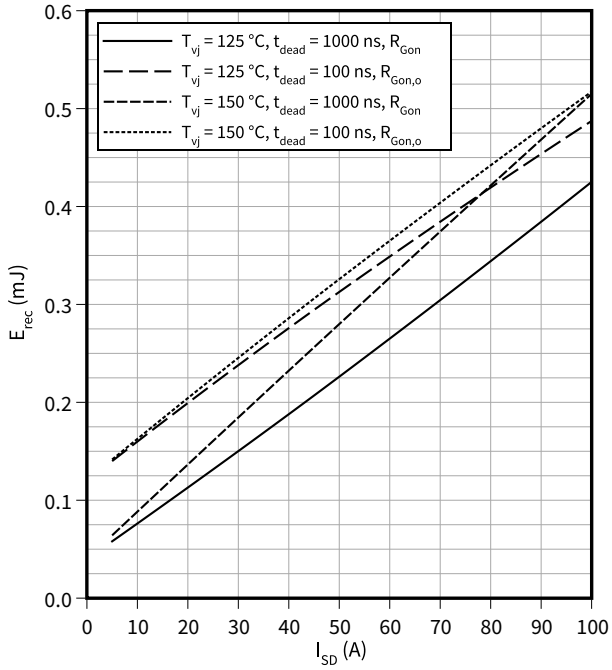
$I_{SD} = 50\ A$



Switching losses body diode (typical), MOSFET

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

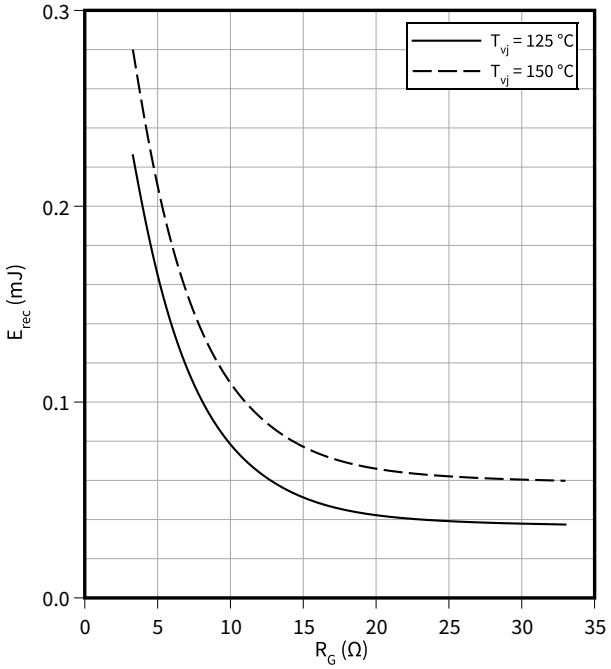
$R_{Gon} = 3.3\ \Omega$, $R_{Gon,o} = 0\ \Omega$, $V_{DD} = 600\ V$



Switching losses body diode (typical), MOSFET

$E_{rec} = f(R_G)$

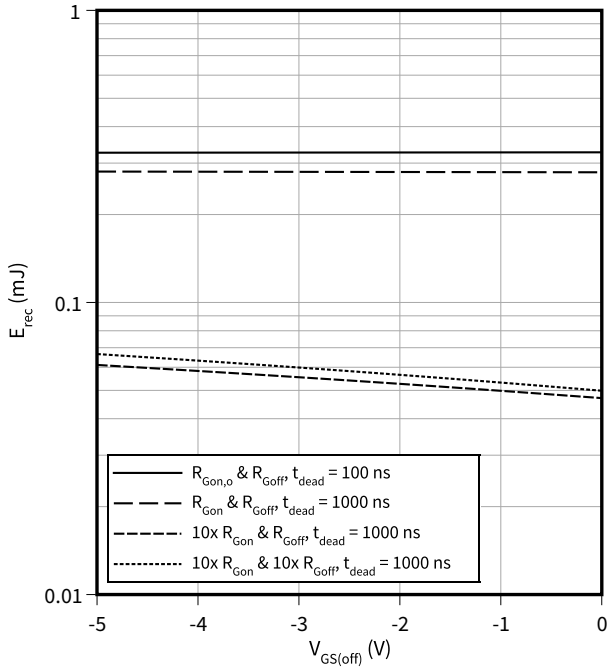
t_{dead} = 1000 ns, I_{SD} = 50 A, V_{DD} = 600 V



Switching losses body diode (typical), MOSFET

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

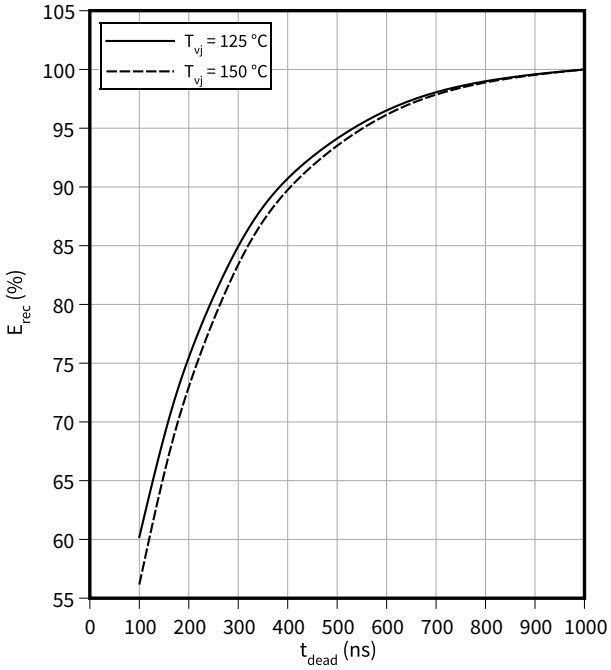
R_{Goff} = 0.22 Ω, R_{Gon} = 3.3 Ω, $V_{GS(on)}$ = 18 V, I_{SD} = 50 A, $R_{Gon,o}$ = 0 Ω, V_{DD} = 600 V, T_{vj} = 150 °C



Switching losses body diode (typical), MOSFET

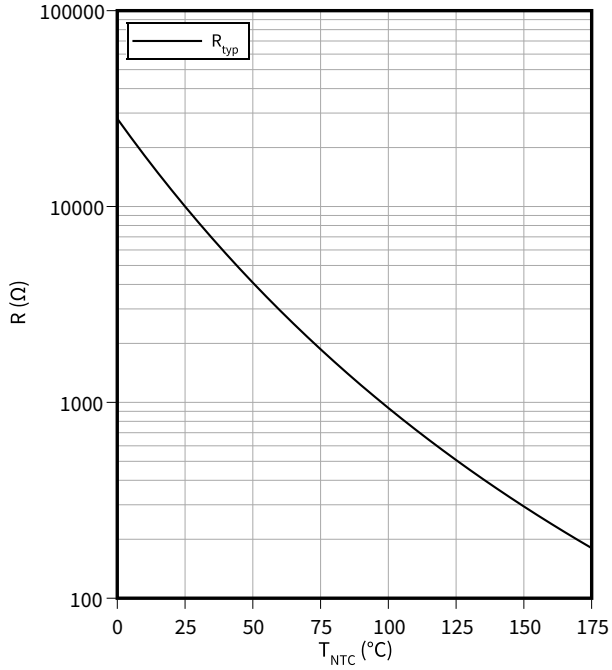
$E_{rec} = f(t_{dead})$

R_{Gon} = 3.3 Ω, I_D = 50 A, V_{DD} = 600 V, V_{GS} = -3/18 V



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



6 Circuit diagram

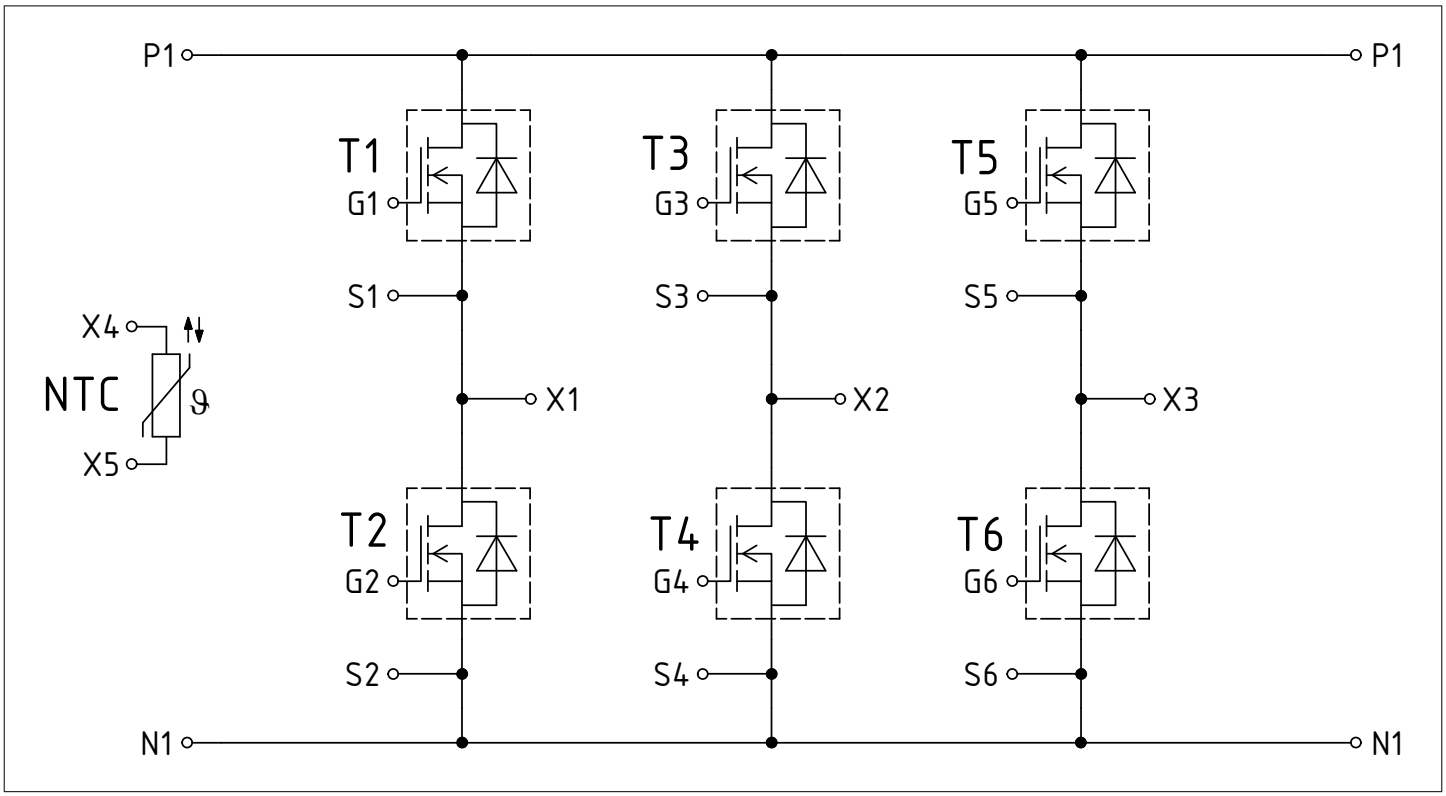


Figure 1

7 Package outlines

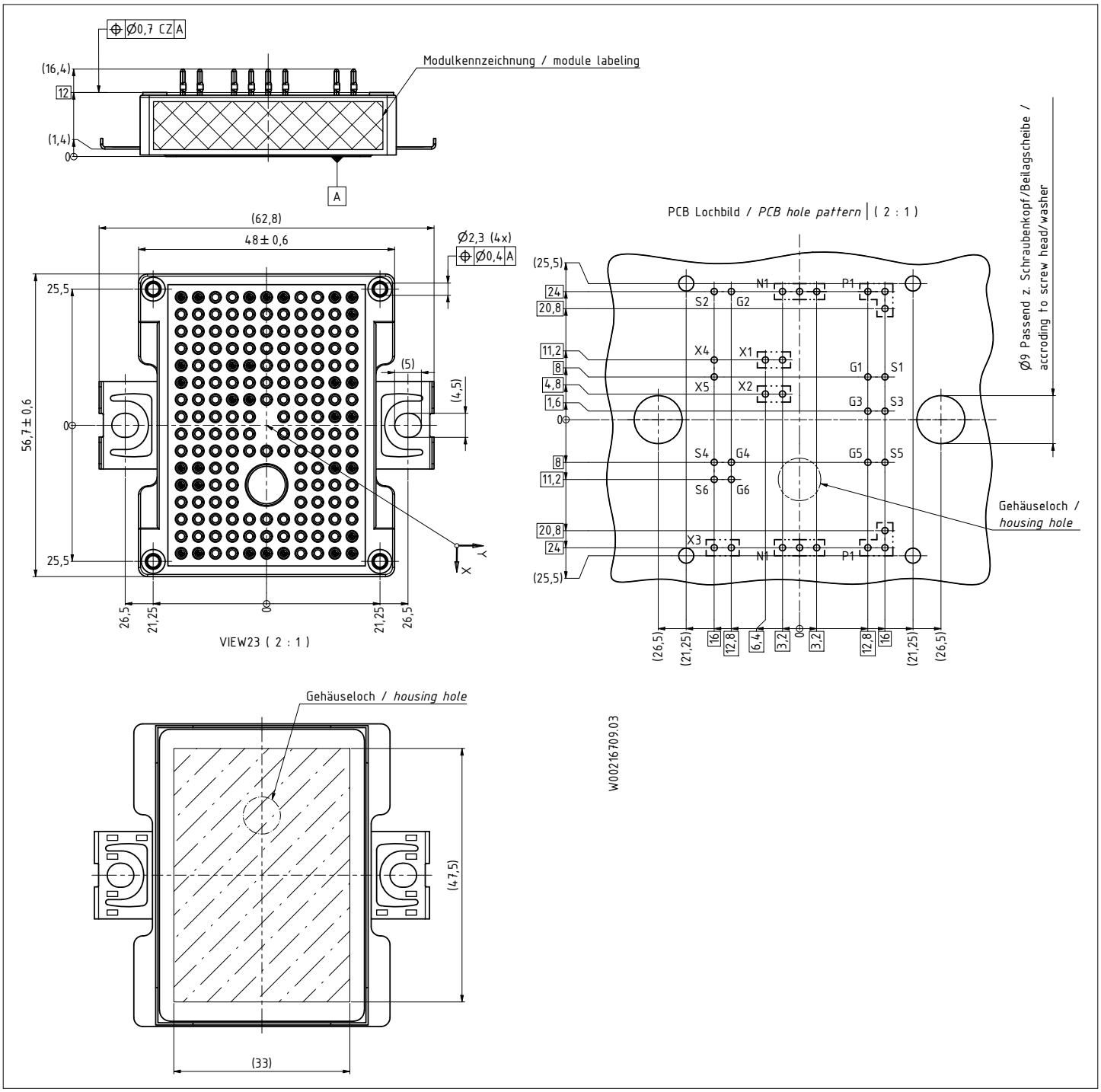


Figure 2

8 Module label code

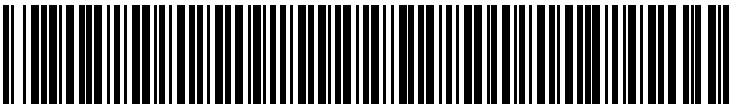
Module label code			
Code format	Data Matrix		Barcode Code128
Encoding	ASCII text		Code Set A
Symbol size	16x16		23 digits
Standard	IEC24720 and IEC16022		IEC8859-1
Code content	*Content* Module serial number Module material number Production order number Date code (production year) Date code (production week)	*Digit* 1 – 5 6 - 11 12 - 19 20 – 21 22 – 23	*Example* 71549 142846 55054991 15 30
Example	 715491428465505499115 30		 715491428465505499115 30

Figure 3

Revision history

Document revision	Date of release	Description of changes
0.10	2023-05-08	Initial version
0.20	2025-03-24	Preliminary datasheet

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