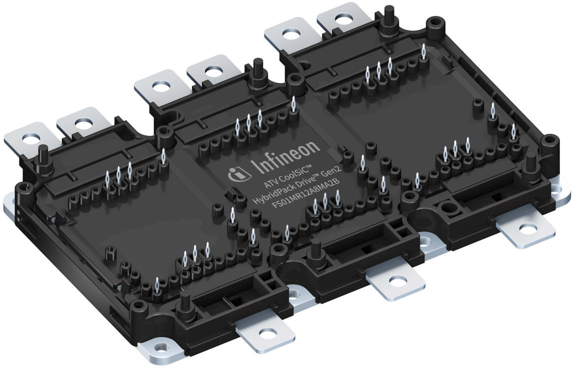
FS02MR08A7MA2B

HybridPACK™ Drive G2 module

Final datasheet
HybridPACK™ Drive G2 module with SiC MOSFET



Features

- Electrical features
  - V_{DSS} = 750 V
  - $I_{D,nom}$ = 430 A / $I_{D,pulse}$ = 1075 A
  - New semiconductor material - silicon carbide
  - Low $R_{DS,on}$
  - Low switching losses
  - Low Q_g and C_{rss}
  - Low inductive design
  - $T_{vj,op}$ = 175°C
  - Short-time extended operation temperature $T_{vj,op}$ = 200 °C
- Mechanical features
  - 4.25 kV DC 1 second insulation
  - High creepage and clearance distances
  - Compact design
  - High power density
  - Direct-cooled PinFin base plate
  - High-performance Si_3N_4 ceramic
  - Guiding elements for PCB and cooler assembly
  - Integrated temperature sensing diode
  - PressFIT contact technology
  - RoHS compliant, lead-free
  - UL 94 V0 module frame

Potential applications

- Automotive applications
- (Hybrid) electrical vehicles (H)EV
- Motor drives
- Commercial, construction and agricultural vehicles (CAV)

Product validation

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

Description

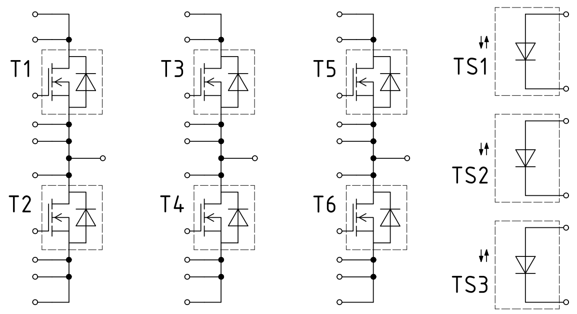


Table of contents

1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, f = 0 Hz, t = 1 sec	4.25	kV
Material of module baseplate			Cu+Ni[1]	
Internal insulation		basic insulation (class 1, IEC 61140)	Si_3N_4	
Creepage distance	d_{creep}	terminal to heatsink	9.5	mm
Creepage distance	d_{creep}	terminal to terminal	9.5	mm
Clearance	d_{clear}	terminal to heatsink	4.5	mm
Clearance	d_{clear}	terminal to terminal	4.5	mm
Comparative tracking index	*CTI*		> 175	

[1] Ni plated Cu baseplate

Table 2 Maximum rated values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Maximum RMS module terminal current	$I_{t,rms}$	$T_{Ct} = 125$ °C		800		A
Heat-staking dome temperature[1]	T_{HS}	$t_{staking} < 10s$			280	°C

[1] Heat-staking according to application note AN-G2-ASSEMBLY.

Table 3 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Pressure drop in cooling circuit	Δp	50% water / 50% ethylene glycol, $\Delta V/\Delta t = 10\ dm^3/min$, $T_f = 60$ °C		76[1]		mbar
Maximum pressure in cooling circuit	p	$T_{baseplate} < 40$ °C (relative pressure)			3.0	bar
		$T_{baseplate} \geq 40$ °C (relative pressure)			2.5	
Stray inductance module	$L_{s,DS}$			8.0		nH
Module lead resistance, terminals - chip	$R_{DD'+SS'}$	$T_f = 25$ °C, per switch		0.64		mΩ
Storage temperature	T_{stg}		-40[2]		125	°C
Mounting torque for module mounting[3]	M	Screw M4 baseplate to heatsink	1.8	2.0	2.2	Nm
		Screw EJOT Delta PCB to frame	0.45	0.5	0.55	
Weight	G			760		g

[1] Cooler design and flow direction according to application note AN-G2-ASSEMBLY

2) Verified by design, not by test
3) Screw types and torque according to application note AN-G2-ASSEMBLY

---

2 MOSFET

Table 4 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Drain-source voltage	V_{DSS}		continuous operation	750	V
			only for transient overshoot	900	
DC drain current	$I_{D,nom}$	V_{GS} = 18 V, T_f = 65 °C	$T_{vj,max}$ = 175 °C	430	A
Pulsed drain current	$I_{D,pulse}$	verified by design, t_p limited by $T_{vj,max}$		1075	A
Gate-source voltage, max. static voltage	V_{GS}			-5/19	V
Gate-source voltage, max. transient voltage	V_{GS}	Duty Cycle < 1 % (first transient maximum peak)		-10/23	V

Table 5 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	V

Table 6 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Drain-source on-resistance	$R_{DS,on}$	I_D = 430 A, V_{GS} = 18 V	T_{vj} = 25 °C		1.75	2.65	mΩ
			T_{vj} = 125 °C		2.47		
			T_{vj} = 175 °C		3.07		
			T_{vj} = 200 °C		3.43		
Drain-source on-resistance	$R_{DS,on}$	I_D = 430 A, V_{GS} = 15 V	T_{vj} = 25 °C		2.14	3.58	mΩ
			T_{vj} = 125 °C		2.75		
			T_{vj} = 175 °C		3.33		
			T_{vj} = 200 °C		3.69		
Gate threshold voltage	$V_{GS,th}$	I_D = 120 mA, V_{GS} = V_{DS}, (tested after 1ms pulse at V_{GS} = +20 V)	T_{vj} = 25 °C	3.20[1]	3.90	4.55	V
Total gate charge	Q_G	V_{DS} = 470 V, V_{GS} = -5/18 V			0.890		µC
Internal gate resistor	$R_{G,int}$		T_{vj} = 25 °C		0.88		Ω
Input capacitance	C_{iss}	f = 1 MHz, V_{DS} = 470 V	T_{vj} = 25 °C		26		nF

(table continues...)

Table 6 **(continued) Characteristic values**

Parameter	**Symbol**	**Note or test condition**		**Values**			**Unit**
				Min.	**Typ.**	**Max.**	
Output capacitance	C_{oss}	f = 1 MHz, V_{DS} = 470 V	T_{vj} = 25 °C		1.71		nF
Reverse transfer capacitance	C_{rss}	f = 1 MHz, V_{DS} = 470 V	T_{vj} = 25 °C		0.15		nF
C_{OSS} stored energy	E_{oss}	V_{DS} = 470 V	T_{vj} = 25 °C		750		µJ
Drain-source leakage current	I_{DSX}	V_{GS} = -5 V, V_{DSS} = 750 V	T_{vj} = 25 °C			530	µA
Gate-source leakage current	I_{GSS}	V_{GS} = 20 V, V_{DS} = 0 V	T_{vj} = 25 °C			100	nA
Turn-on delay time, inductive load	$t_{d,on}$	I_D = 430 A, $R_{G,on}$ = 11 Ω, V_{GS} = -5/18 V, V_{DS} = 470 V	T_{vj} = 25 °C		92		ns
			T_{vj} = 125 °C		77		
			T_{vj} = 175 °C		70		
			T_{vj} = 200 °C		68		
Rise time (inductive load)	t_r	I_D = 430 A, $R_{G,on}$ = 11 Ω, V_{GS} = -5/18 V, V_{DS} = 470 V	T_{vj} = 25 °C		77		ns
			T_{vj} = 125 °C		74		
			T_{vj} = 175 °C		73		
			T_{vj} = 200 °C		72		
Turn-off delay time, inductive load	$t_{d,off}$	I_D = 430 A, $R_{G,off}$ = 10 Ω, V_{GS} = -5/18 V, V_{DS} = 470 V	T_{vj} = 25 °C		325		ns
			T_{vj} = 125 °C		351		
			T_{vj} = 175 °C		363		
			T_{vj} = 200 °C		372		
Fall time (inductive load)	t_f	I_D = 430 A, $R_{G,off}$ = 10 Ω, V_{GS} = -5/18 V, V_{DS} = 470 V	T_{vj} = 25 °C		58		ns
			T_{vj} = 125 °C		65		
			T_{vj} = 175 °C		69		
			T_{vj} = 200 °C		72		
Turn-on energy loss per pulse	E_{on}	I_D = 430 A, $R_{G,on}$ = 11 Ω, V_{GS} = -5/18 V, V_{DS} = 470 V, L_σ = 6.5 nH	T_{vj} = 25 °C, di/dt = 4.48 kA/µs		14.9		mJ
			T_{vj} = 125 °C, di/dt = 4.68 kA/µs		14.6		
			T_{vj} = 175 °C, di/dt = 4.74 kA/µs		15.1		
			T_{vj} = 200 °C, di/dt = 4.8 kA/µs		15.3		

(table continues...)

Table 6 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Turn-off energy loss per pulse	E_{off}	$I_D = 430$ A, $R_{G,\mathrm{off}} = 10\ \Omega$, $V_{GS} = -5/18$ V, $V_{DS} = 470$ V, $L_\sigma = 6.5$ nH	$T_{vj} = 25$ °C, $dv/dt = 4.46$ kV/µs		17.9		mJ
			$T_{vj} = 125$ °C, $dv/dt = 4.34$ kV/µs		18.8		
			$T_{vj} = 175$ °C, $dv/dt = 4.31$ kV/µs		19.3		
			$T_{vj} = 200$ °C, $dv/dt = 4.3$ kV/µs		19.4		
Short circuit data	I_{SC}	$V_{DD} = 470$ V, $V_{GS} = -5/18$ V, $R_{G,\mathrm{on}} = 11\ \Omega$, $R_{G,\mathrm{off}} = 10\ \Omega$, $\mathrm{V_{DSmax}} = \mathrm{V_{DSS}} - \mathrm{L_{sDS}} \cdot \mathrm{di/dt}$	$t_{SC} = 1.2$ µs, $T_{vj} = 200$ °C		4700		A
Short circuit data	I_{SC}	$V_{DD} = 470$ V, $V_{GS} = -5/15$ V, $R_{G,\mathrm{on}} = 11\ \Omega$, $R_{G,\mathrm{off}} = 10\ \Omega$, $\mathrm{V_{DSmax}} = \mathrm{V_{DSS}} - \mathrm{L_{sDS}} \cdot \mathrm{di/dt}$	$t_{SC} = 2$ µs, $T_{vj} = 200$ °C		3700		A
Thermal resistance, junction to cooling fluid2)	$R_{th,j\text{-}f}$	per MOSFET, 50% water / 50% ethylene glycol, $\Delta V/\Delta t = 10\ \mathrm{dm}^3/\mathrm{min}$, $T_f = 60$ °C			0.139		K/W
Standard deviation of thermal resistance, junction to cooling fluid2)	$\sigma_{Rth,j\text{-}f}$	per MOSFET, 50% water / 50% ethylene glycol, $\Delta V/\Delta t = 10\ \mathrm{dm}^3/\mathrm{min}$			1.1		K/kW
Temperature under switching conditions	$T_{vj,op}$		continuous operation	-40		175	°C
			extended operation			2003)	

1) At 0h operating time. During inverter operation the value can be lower depending on T_{vj}, $V_{GS(off)}$, (switching frequency) f_{sw} over lifetime. For a final assessment of $V_{GS,th}$ Min. value depending on customer application please contact the Infineon sales office for the necessary technical support by Infineon.
2) Cooler design and flow direction according to application note AN-G2-ASSEMBLY. EoL criteria see AQG324, verified by characterization.
3) For limitation see QPAC documentation

3 Body diode (MOSFET)

Table 7 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Drain-source voltage	V_{DSS}		continuous operation	750	V
			only for transient overshoot	900	

(table continues...)

Table 7 **(continued) Maximum rated values**

Parameter	**Symbol**	**Note or test condition**		**Values**	**Unit**
DC body diode forward current	$I_{F,S}$	V_{GS} = -5 V, T_f = 65 °C	$T_{vj,max}$ = 175 °C	148	A
Pulsed body diode current	$I_{F,S,pulse}$	verified by design, t_p limited by $T_{vj,max}$		1075	A

Table 8 **Characteristic values**

Parameter	**Symbol**	**Note or test condition**		**Values**			**Unit**
				Min.	**Typ.**	**Max.**	
Forward voltage	$V_{F,SD}$	$I_{F,S}$ = 430 A, V_{GS} = -5 V	T_{vj} = 25 °C		4.57	7.33	V
			T_{vj} = 125 °C		4.13		
			T_{vj} = 175 °C		3.96		
			T_{vj} = 200 °C		3.87		
Peak reverse recovery current	I_{rrm}	$I_{F,S}$ = 430 A, V_{GS} = -5 V, $V_{R,DS}$ = 470 V	T_{vj} = 25 °C		114		A
			T_{vj} = 125 °C		152		
			T_{vj} = 175 °C		174		
			T_{vj} = 200 °C		189		
Recovered charge	Q_{rr}	$I_{F,S}$ = 430 A, V_{GS} = -5 V, $V_{R,DS}$ = 470 V	T_{vj} = 25 °C		1.89		µC
			T_{vj} = 125 °C		3.52		
			T_{vj} = 175 °C		4.81		
			T_{vj} = 200 °C		5.71		
Reverse recovery energy	E_{rec}	$I_{F,S}$ = 430 A, V_{GS} = -5 V, $V_{R,DS}$ = 470 V	T_{vj} = 25 °C, $-di/dt$ = 4.5 kA/µs		0.175		mJ
			T_{vj} = 125 °C, $-di/dt$ = 4.7 kA/µs		0.459		
			T_{vj} = 175 °C, $-di/dt$ = 4.7 kA/µs		0.693		
			T_{vj} = 200 °C, $-di/dt$ = 4.8 kA/µs		0.85		

4 Temperature sensor

Table 9 **Characteristic values**

Parameter	**Symbol**	**Note or test condition**	**Values**			**Unit**
			Min.	**Typ.**	**Max.**	
Transient sense current	I_{TS}				10	mA

(table continues...)

Table 9 (continued) Characteristic values

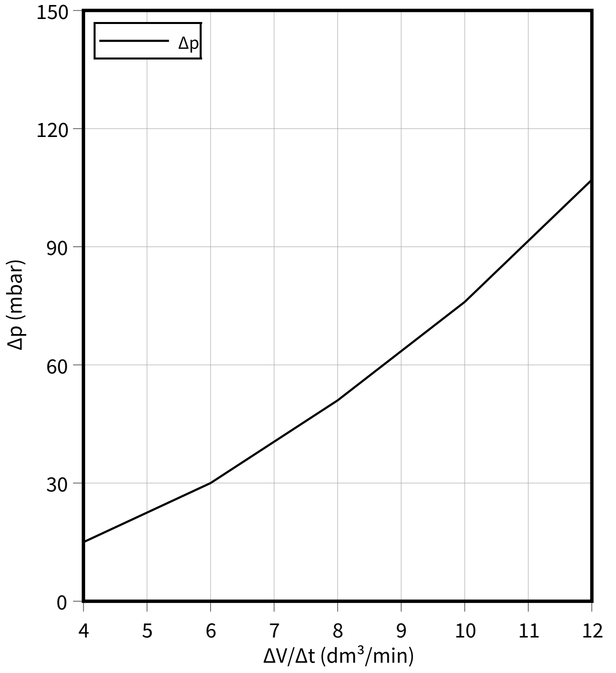
Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_{TS}		I_{TS} = 0.2 mA, T_{vj} = 25 °C	2.574	2.624	2.674	V
			I_{TS} = 0.2 mA, T_{vj} = 85 °C	2.169	2.234	2.299	

5 Characteristics diagrams

Pressure drop in cooling circuit (typical), Package

$\Delta p = f(\Delta V/\Delta t)$

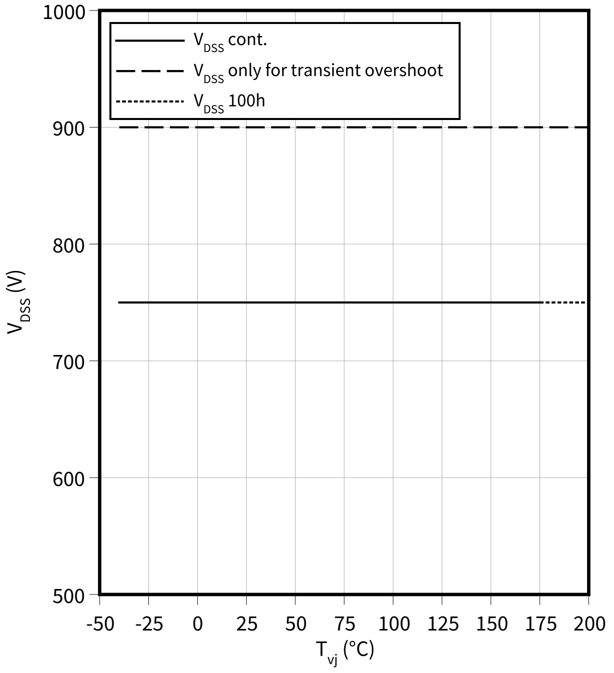
T_f = 60 °C, 50% water / 50% ethylene glycol



Maximum allowed drain-source voltage, MOSFET

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

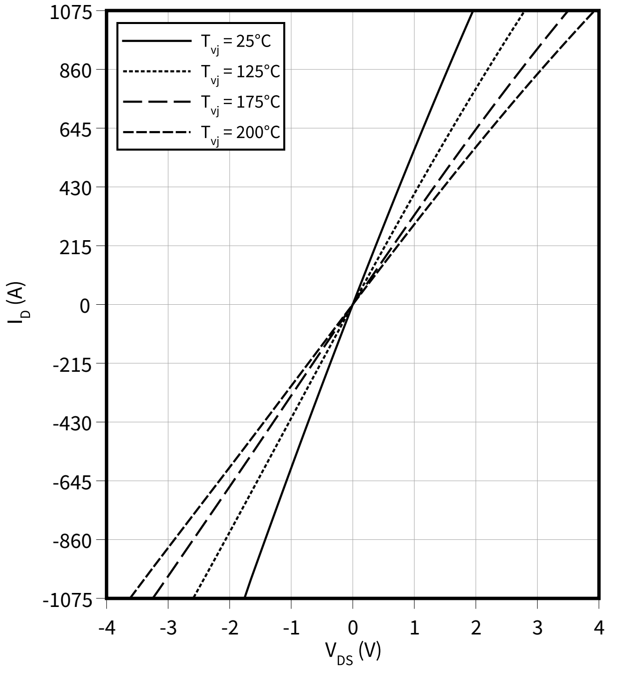
Verified by characterization / design, not by test



Output characteristic (typical), MOSFET

$I_D = f(V_{DS})$

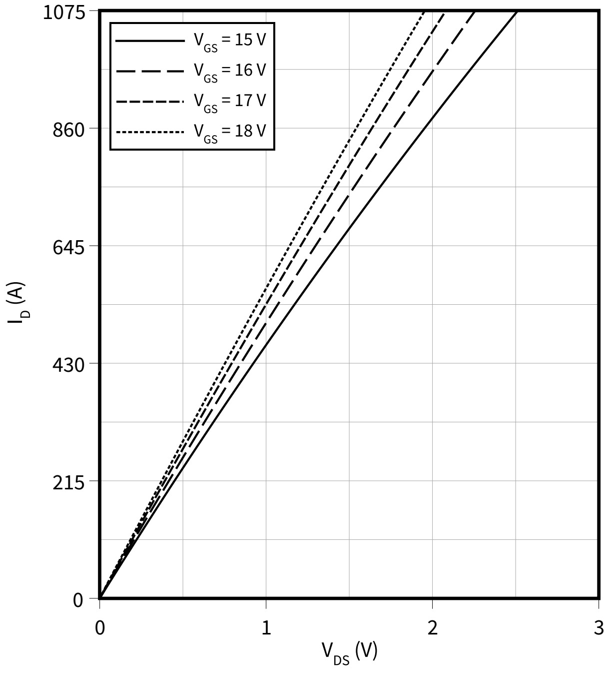
V_{GS} = 18 V



Output characteristic (typical), MOSFET

$I_D = f(V_{DS})$

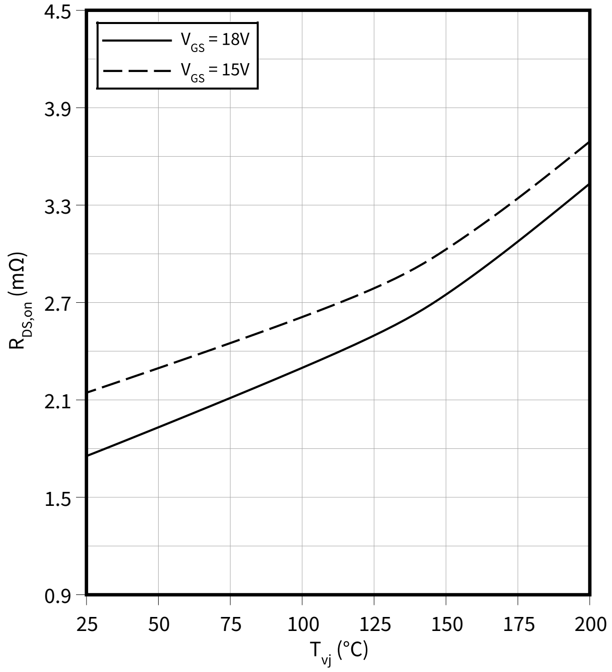
T_{vj} = 25 °C



Drain-source on-resistance (typical), MOSFET

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

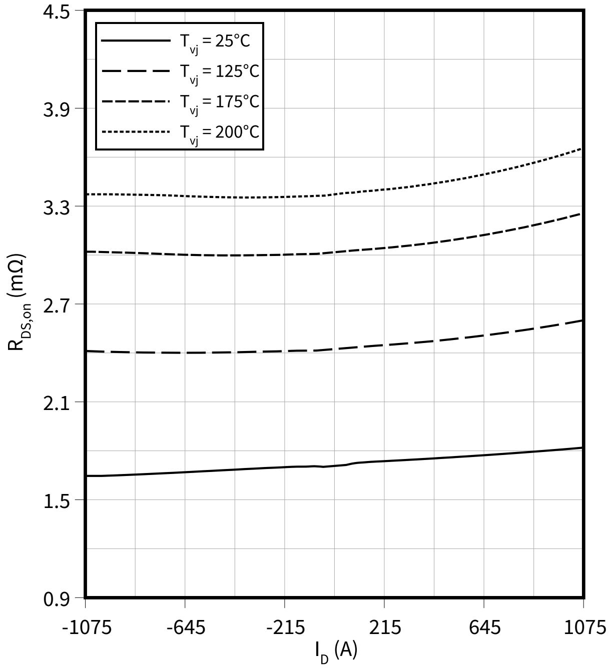
$I_D = 430$ A



Drain-source on-resistance (typical), MOSFET

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

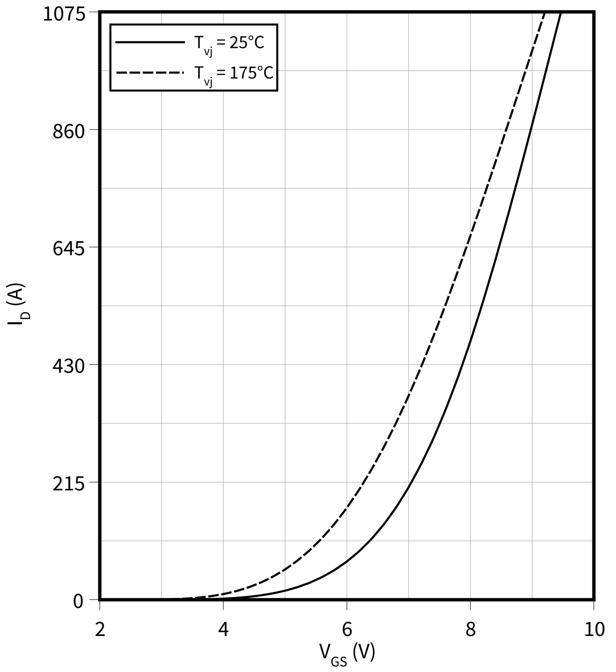
$V_{GS} = 18$ V



Transfer characteristic (typical), MOSFET

$I_D = f(V_{GS})$

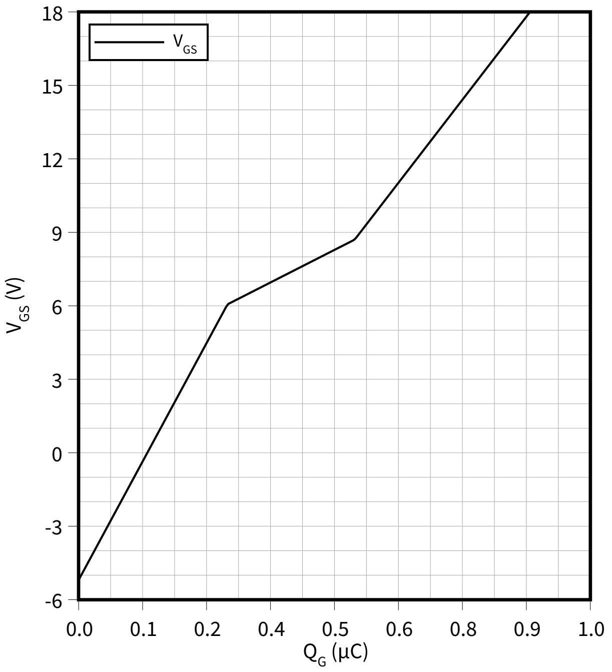
$V_{DS} = 20$ V



Gate charge characteristic (typical), MOSFET

$V_{GS} = f(Q_G)$

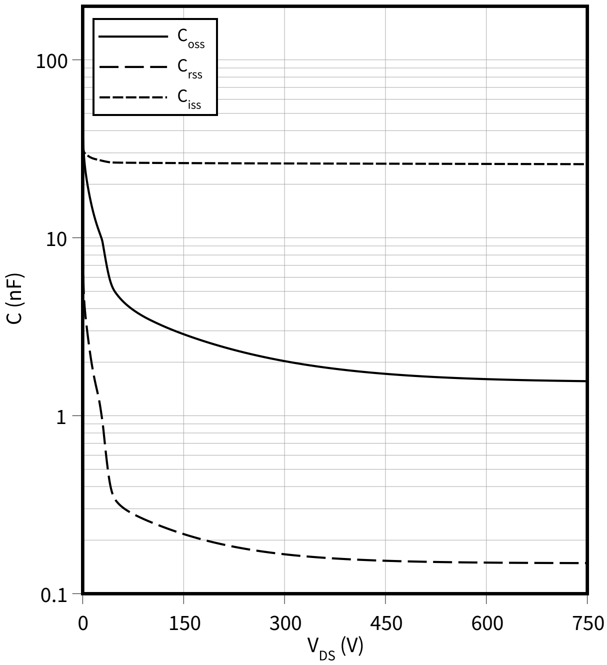
$V_{DD} = 470$ V, $T_{vj} = 25$ °C



Capacity characteristic (typical), MOSFET

$C = f(V_{DS})$

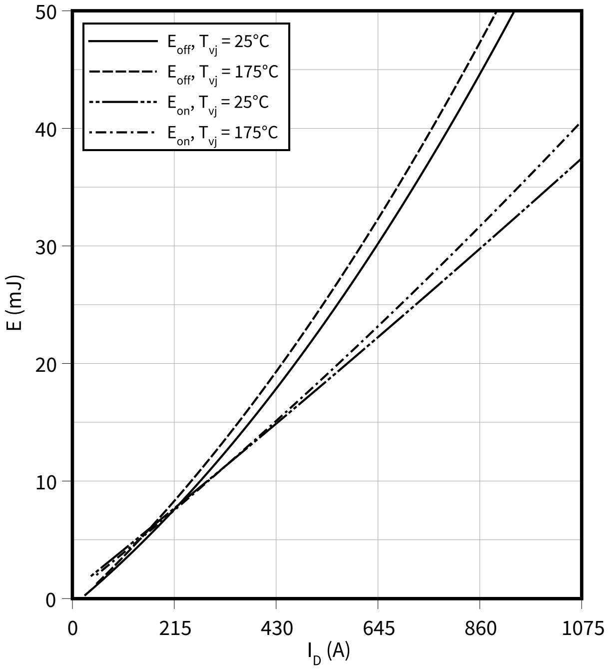
$f = 1$ MHz, $V_{GS} = -5/18$ V, $T_{vj} = 25$ °C



Switching losses (typical), MOSFET

$E = f(I_D)$

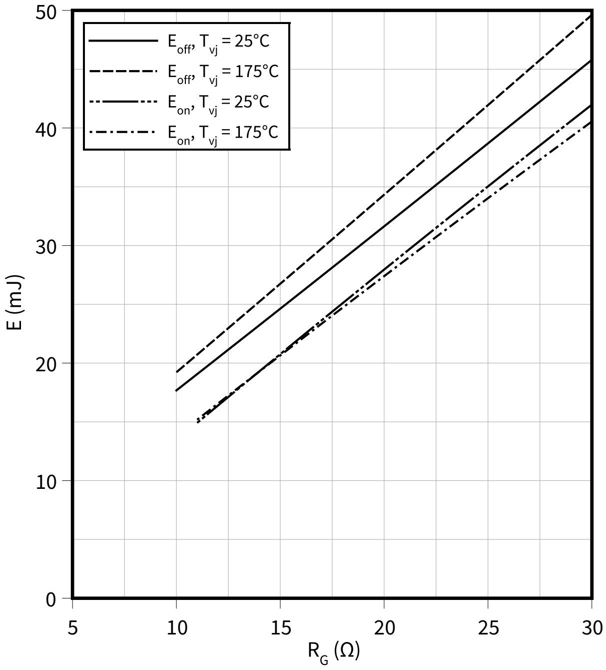
$V_{DS} = 470$ V, $R_{G,off} = 10$ Ω, $R_{G,on} = 11$ Ω, $V_{GS} = -5/18$ V



Switching losses (typical), MOSFET

$E = f(R_G)$

$V_{DS} = 470$ V, $I_D = 430$ A, $V_{GS} = -5/18$ V

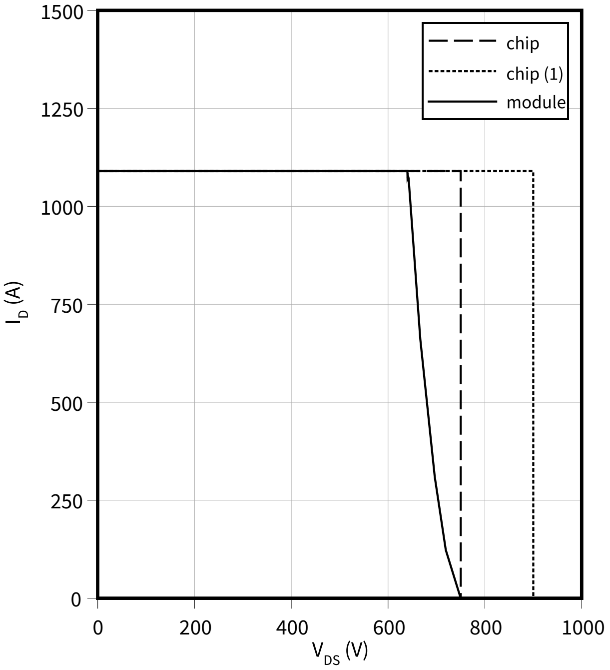


Reverse bias safe operating area (RBSOA), MOSFET

$I_D = f(V_{DS})$

$R_{G,off} = 10$ Ω, $V_{GS} = +18/-5$ V, $T_{vj} = 175$ °C

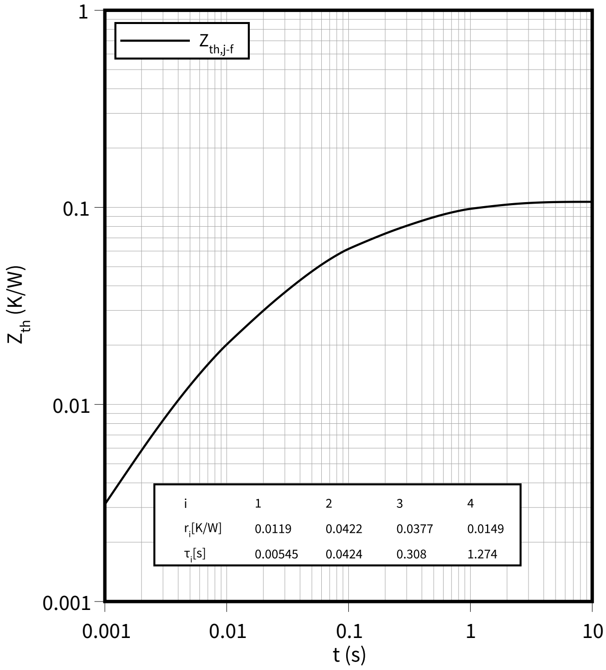
(1) for 10h over lifetime



Transient thermal impedance (typical), MOSFET

$Z_{th} = f(t)$

$\Delta V/\Delta t = 10\ dm^3/min$, $T_f = 60\ °C$,
per MOSFET, 50% water / 50% ethylenglycol

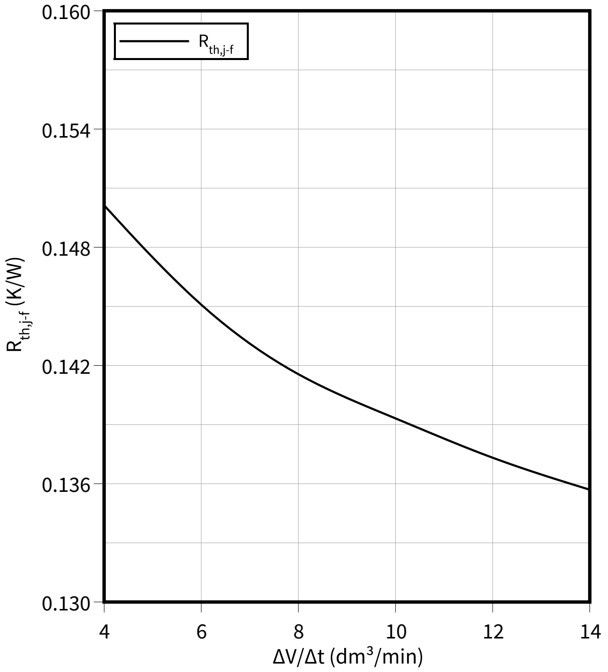


i	1	2	3	4
r_i[K/W]	0.0119	0.0422	0.0377	0.0149
τ_i[s]	0.00545	0.0424	0.308	1.274

Thermal resistance (typical), MOSFET

$R_{th,j-f} = f(\Delta V/\Delta t)$

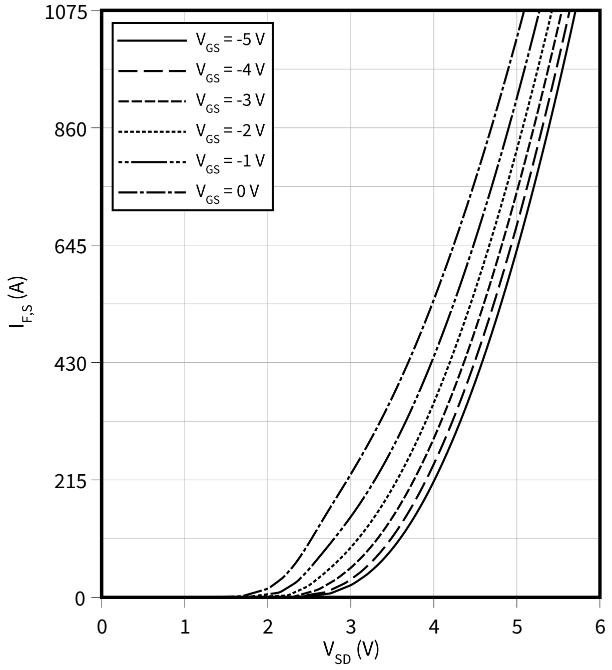
50% water / 50% ethylene glycol , $T_f = 60\ °C$



Forward characteristic body diode (typical), MOSFET

$I_{F,S} = f(V_{SD})$

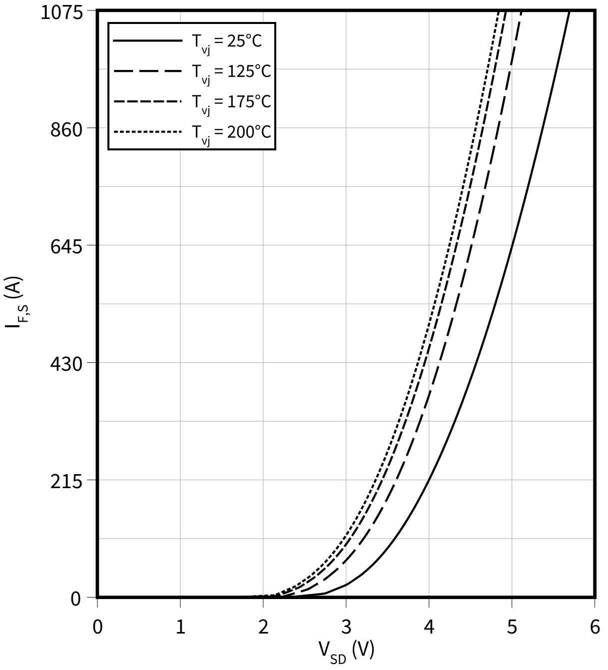
$T_{vj} = 25\ °C$



Forward characteristic body diode (typical), MOSFET

$I_{F,S} = f(V_{SD})$

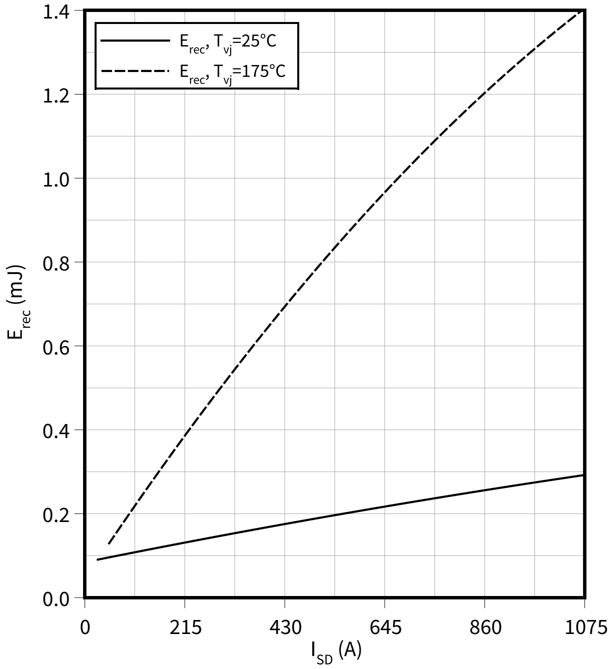
$V_{GS} = -5\ V$



Switching losses body diode (typical), MOSFET

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

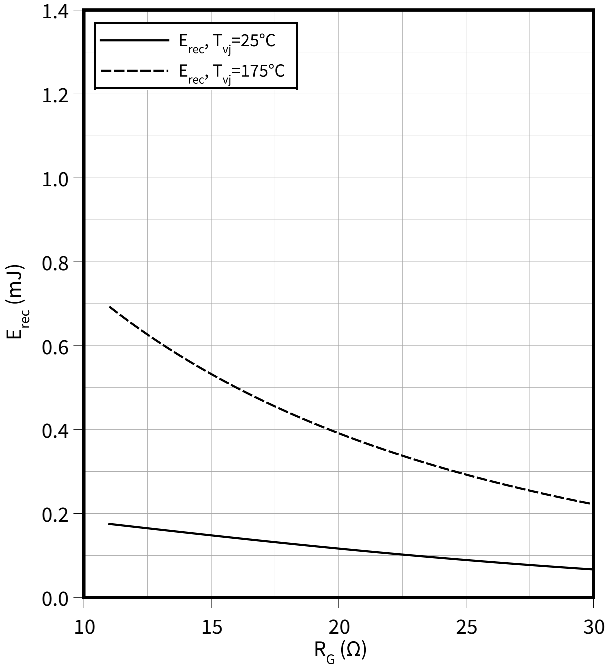
$V_R = 470$ V, $R_{G,on} = 11\ \Omega$



Switching losses body diode (typical), MOSFET

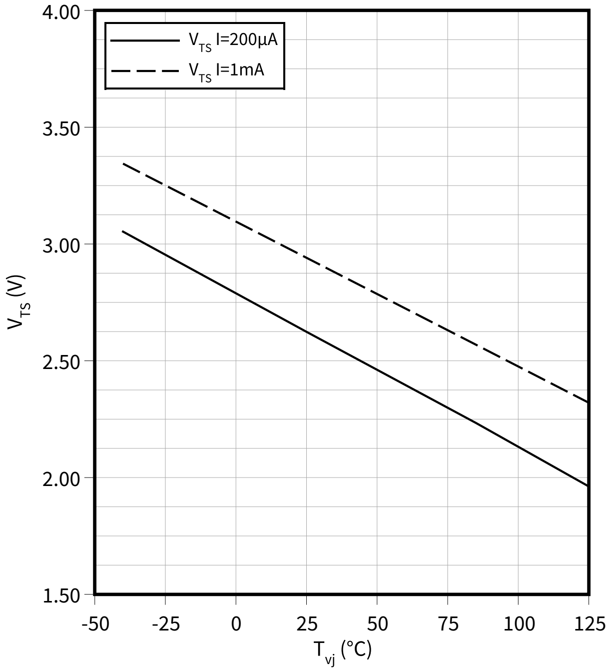
$E_{rec} = f(R_G)$

$V_R = 470$ V, $I_{F,S} = 430$ A



Temperature characteristic (typical), Temperature sensor

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



6 Circuit diagram

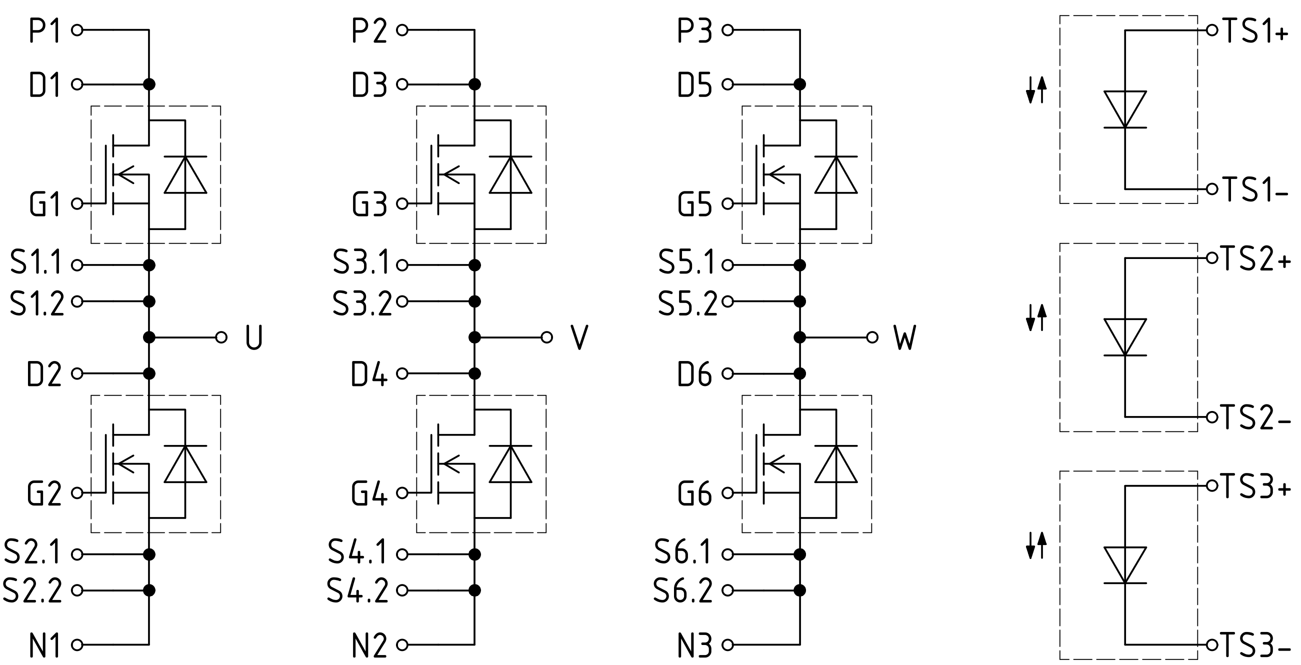


Figure 1

7 Package outlines

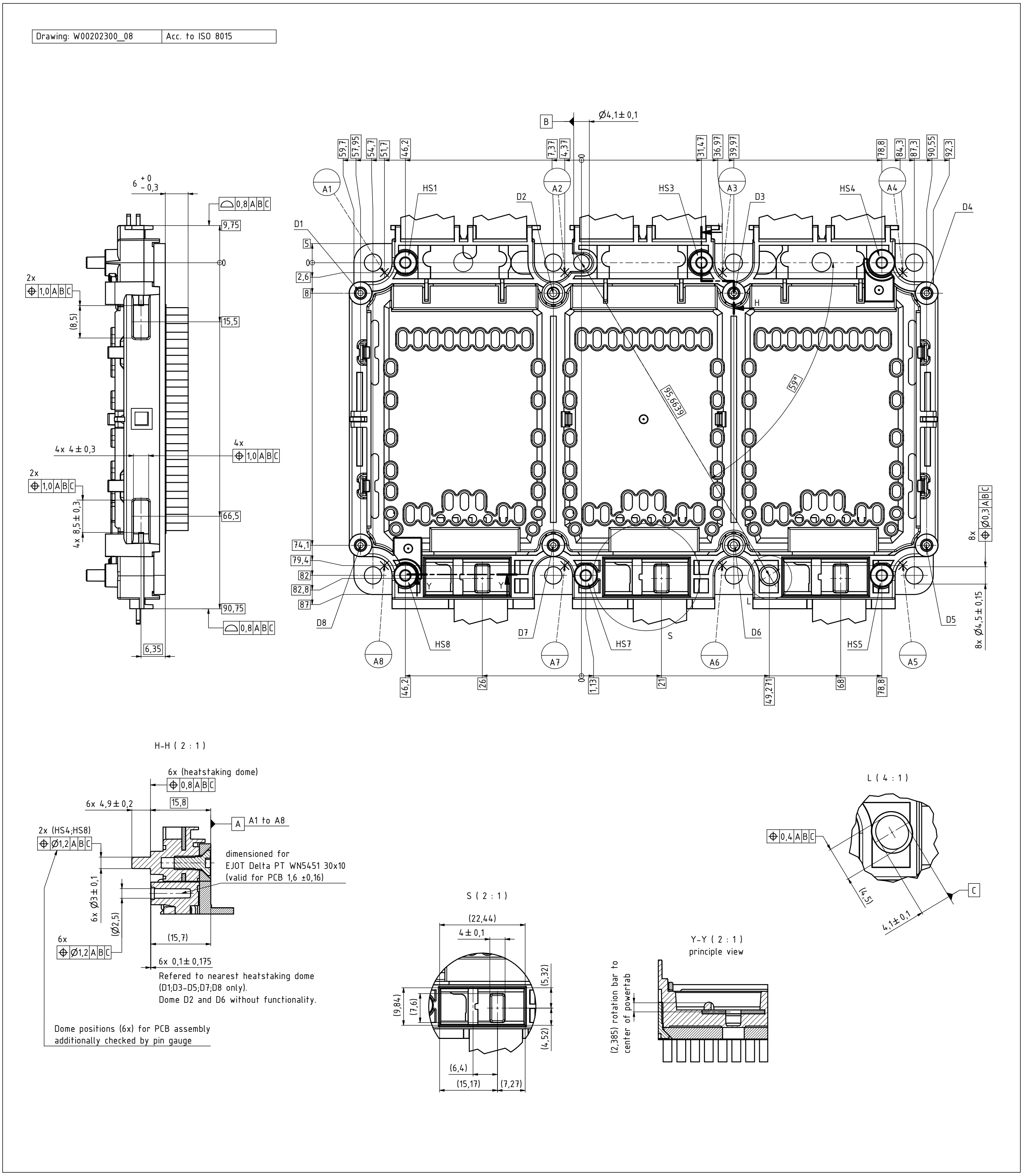


Figure 2

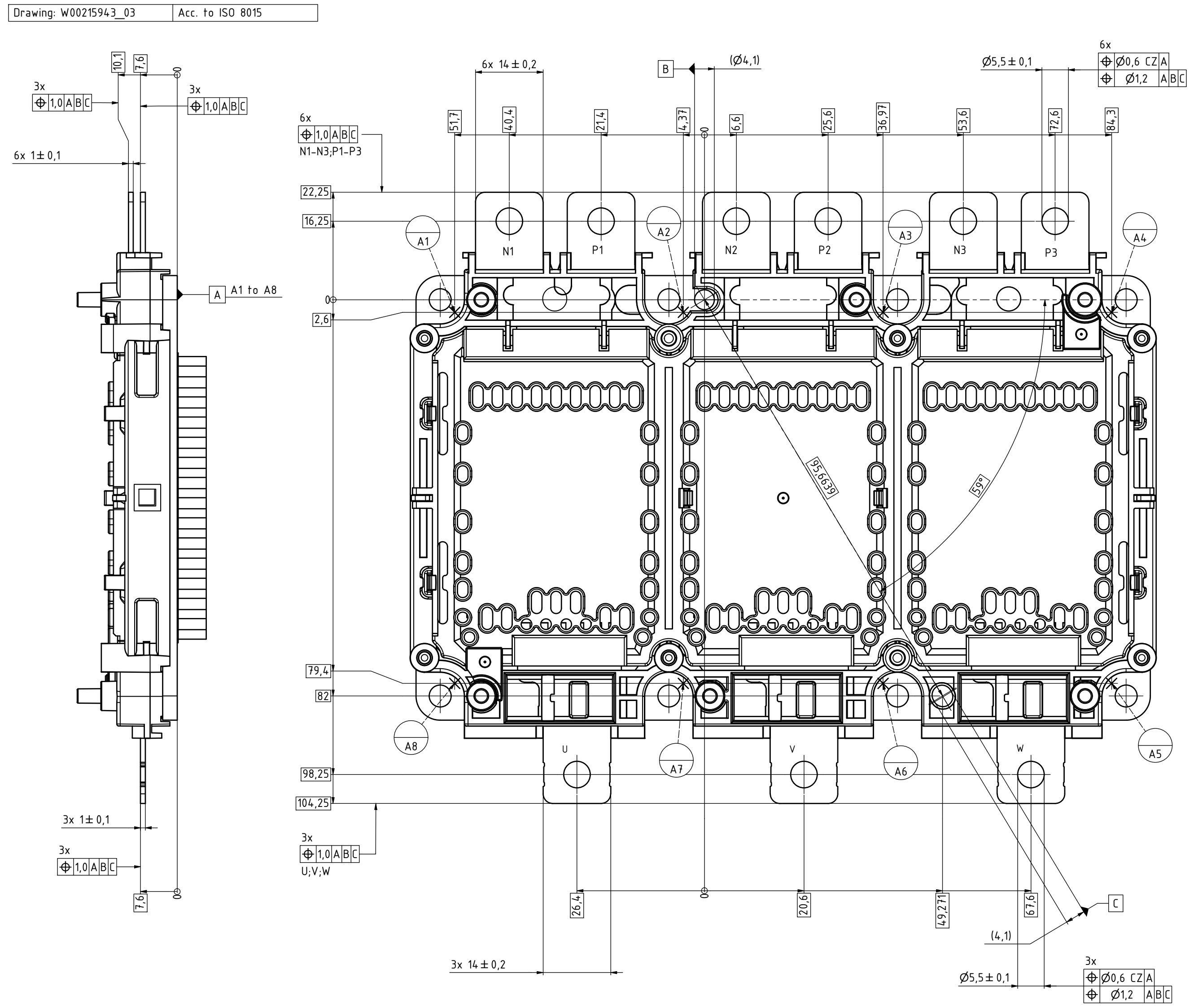

Drawing: W00215943_03
Acc. to ISO 8015
10,1
7,6
3x
1,0 A B C
6x 1± 0,1
A
A1 to A8
3x 1± 0,1
7,6
6x 14 ± 0,2
B
(Ø4,1)
Ø5,5 ± 0,1
6x
Ø0,6 CZ A
Ø1,2 A B C
N1-N3;P1-P3
51,7
40,4
21,4
4,37
0
6,6
25,6
36,97
53,6
72,6
84,3
22,25
16,25
0
2,6
79,4
82
98,25
104,25
U;V;W
N1
P1
N2
P2
N3
P3
A1
A2
A3
A4
A5
A6
A7
A8
U
V
W
95,6639
59°
26,4
20,6
49,271
67,6
C
(4,1)
3x 14 ± 0,2
Ø5,5 ± 0,1
3x
Ø0,6 CZ A
Ø1,2 A B C

Figure 3

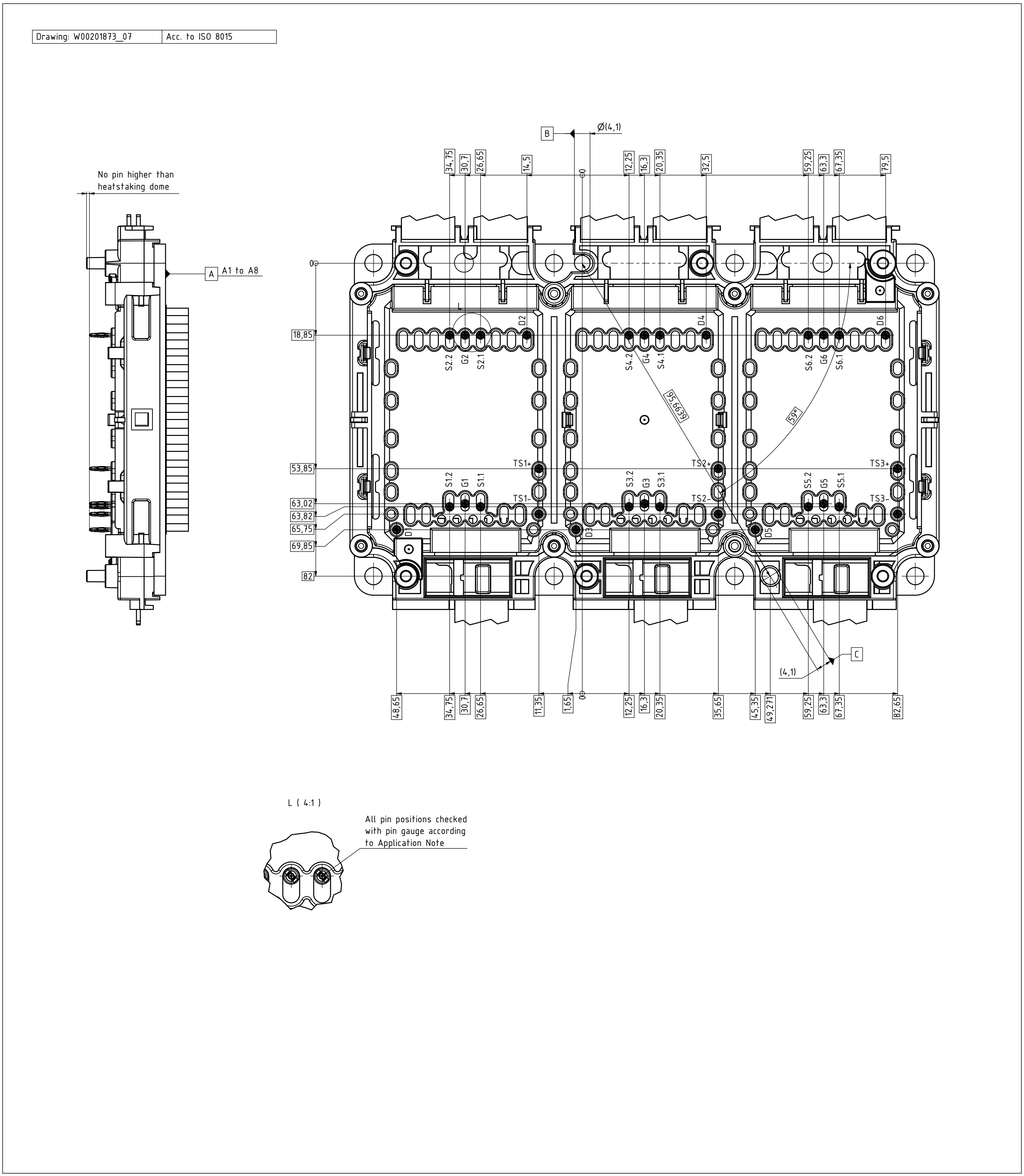

Drawing: W00201873_07
Acc. to ISO 8015
No pin higher than heatstaking dome
A
A1 to A8
B
Ø(4,1)
34,75
30,7
26,65
14,5
0
12,25
16,3
20,35
32,5
59,25
63,3
67,35
79,5
0
18,85
53,85
63,02
63,82
65,75
69,85
82
L
S2.2
G2
S2.1
D2
S4.2
G4
S4.1
D4
S6.2
G6
S6.1
D6
95,6639
59°
TS1+
TS2+
TS3+
S1.2
G1
S1.1
S3.2
G3
S3.1
S5.2
G5
S5.1
TS1-
TS2-
TS3-
D1
D3
D5
C
(4,1)
48,65
34,75
30,7
26,65
11,35
1,65
0
12,25
16,3
20,35
35,65
45,35
49,271
59,25
63,3
67,35
82,65
L (4:1)
All pin positions checked with pin gauge according to Application Note

Figure 4

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*	*Digit*	*Example*
	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

Packing label code

Code format	Barcode Code128
Encoding	Code Set A
Symbol size	34 digits
Standard	IEC8859-1

Code content	*Content*	*Identifier*	*Digit*	*Example*
	Backend Construction Number	X	2 – 9	95056609
	Production Lot Number	1T	12 – 19	2X0003E0
	Serial Number	S	21 – 25	754389
	Date code	9D	28 – 31	1139
	Box Quantity	Q	33 – 34	15

Example	X950566091T2X0003E0S754389D1139Q15

Figure 5

Revision history

Document revision	Date of release	Description of changes
0.10	2025-05-08	Target datasheet
1.00	2025-12-15	Final datasheet

Trademarks

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

Edition 2025-12-15
Published by
Infineon Technologies AG
81726 Munich, Germany

© 2025 Infineon Technologies AG
All Rights Reserved.

Do you have a question about any aspect of this document?
Email: erratum@infineon.com

Document reference
IFX-ABO224-002

Important notice

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

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.