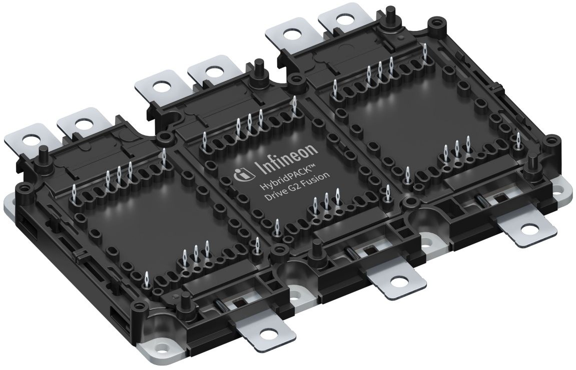
FS980R08A7F32B

HybridPACK™ Drive G2 module

Final datasheet

HybridPACK™ Drive G2 module with Si/SiC Fusion switch

Features



- Electrical features
  - Blocking voltage 750 V
  - Implemented current 980 A / Repetitive peak current 1960 A
  - Fusion Switch – EDT3 IGBT/Diode & CoolSiC™ Gen2 MOSFET
  - Optimized for simultaneous gate drive
  - High I^2t robustness
  - Low conduction losses
  - Low switching losses
  - Low inductive design
  - $T_{vj,op}$ = 175°C
  - Integrated on-chip temperature sensor
- 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
  - PressFIT contact technology
  - RoHS compliant, lead-free
  - UL 94 V0 module frame

Lead-free

RoHS

Green

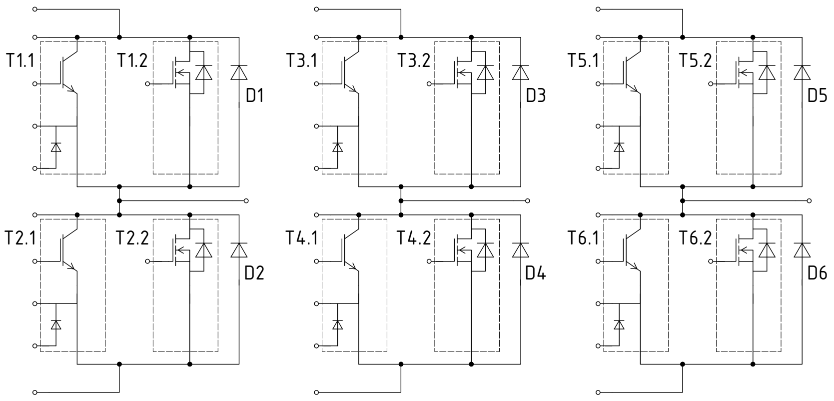
Potential applications

- 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



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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 = 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	9.0	mm
Creepage distance	d_{creep}	terminal to terminal	9.0	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	$I_{t,rms}$			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, $\Delta V/\Delta t = 10\ dm^3/min$, $T_f = 65\ °C$		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	$L_{s,CE}$			N/A[2]		nH
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_f = 25\ °C$, per switch		0.60		mΩ
Storage temperature	T_{stg}		-40		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	0.50	0.55	
Weight	G			760		g

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

2) $L_{s,CE}$ for Fusion switch not applicable. Please refer to SOA/RBOSA diagram
3) Screw types and torque according to application note AN-G2-ASSEMBLY

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2 Fusion transistor (IGBT + MOSFET)

Table 4 Maximum rated values

Parameter	**Symbol**	**Note or test condition**		**Values**	**Unit**
Blocking voltage	V_{CES}		$T_{vj} = 25\ °C$	750[1]	V
Implemented current	I_{CN}			980	A
Continuous DC current	$I_{C,nom}$	$T_f = 65\ °C$, $T_{vj,max} = 175\ °C$		600	A
Repetitive peak current	I_{CRM}	verified by design, t_p limited by $T_{vj,max}$		1960	A
Gate-emitter voltage, max. static voltage	V_{GE}			-6/19	V
Gate-emitter voltage, max. transient voltage	V_{GE}	Duty Cycle < 1 % (first transient maximum peak)		-10/23	V

1) 780 V for transient turn-off overshoot

Table 5 Recommended values

Parameter	**Symbol**	**Note or test condition**	**Values**	**Unit**
On-state gate voltage	$V_{GE(on)}$		15...18[1]	V
Off-state gate voltage	$V_{GE(off)}$		-5[1]	V

1) MOSFET and IGBT gate has to be shorted (Vge = Vgs)

Table 6 Characteristic values

Parameter	**Symbol**	**Note or test condition**		**Values**			**Unit**
				Min.	**Typ.**	**Max.**	
Output characteristic	$V_{CE,sat}$	$I_C = 600$ A, $V_{GE} = 18$ V	$T_{vj} = 25\ °C$		1.06	1.30	V
			$T_{vj} = 125\ °C$		1.17		
			$T_{vj} = 175\ °C$		1.25		
Output characteristic	$V_{CE,sat}$	$I_C = 980$ A, $V_{GE} = 18$ V	$T_{vj} = 25\ °C$		1.35		V
			$T_{vj} = 125\ °C$		1.56		
			$T_{vj} = 175\ °C$		1.71		
Gate charge	Q_G	$V_{CE} = 400$ V, $V_{GE} = -5/18$ V			1.95		µC
Output capacitance	C_{oes}	$f = 0.1$ MHz, $V_{CE} = 400$ V, $V_{GE} = 0$ V	$T_{vj} = 25\ °C$		1.2		nF
Collector-emitter leakage current	I_{CEX}	$V_{CE} = 750$ V, $V_{GE} = -5$ V	$T_{vj} = 25\ °C$			42	µA

(table continues...)

Table 6 **(continued) Characteristic values**

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Turn-on delay time, inductive load	$t_{d,on}$	$I_C = 600$ A, $V_{CE} = 400$ V, $V_{GE} = -5/18$ V, $R_{G,on} = 1.5\ \Omega$	$T_{vj} = 25$ °C		66.4		ns
			$T_{vj} = 125$ °C		62.3		
			$T_{vj} = 175$ °C		61.0		
Rise time, inductive load	t_r	$I_C = 600$ A, $V_{CE} = 400$ V, $V_{GE} = -5/18$ V, $R_{G,on} = 1.5\ \Omega$	$T_{vj} = 25$ °C		55.6		ns
			$T_{vj} = 125$ °C		57.2		
			$T_{vj} = 175$ °C		58.9		
Turn-off delay time, inductive load	$t_{d,off}$	$I_C = 600$ A, $V_{CE} = 400$ V, $V_{GE} = -5/18$ V, $R_{G,off} = 1.5\ \Omega$	$T_{vj} = 25$ °C		330		ns
			$T_{vj} = 125$ °C		384		
			$T_{vj} = 175$ °C		412		
Fall time, inductive load	t_f	$I_C = 600$ A, $V_{CE} = 400$ V, $V_{GE} = -5/18$ V, $R_{G,off} = 1.5\ \Omega$	$T_{vj} = 25$ °C		76.8		ns
			$T_{vj} = 125$ °C		153		
			$T_{vj} = 175$ °C		180		
Turn-on energy loss per pulse	E_{on}	$I_C = 600$ A, $V_{CE} = 400$ V, $L_\sigma = 6.5$ nH, $V_{GE} = -5/18$ V, $R_{G,on} = 1.5\ \Omega$	$T_{vj} = 25$ °C, $di/dt = 8790$ A/µs		4.4		mJ
			$T_{vj} = 125$ °C, $di/dt = 8620$ A/µs		5.6		
			$T_{vj} = 175$ °C, $di/dt = 8320$ A/µs		6.9		
Turn-off energy loss per pulse	E_{off}	$I_C = 600$ A, $V_{CE} = 400$ V, $L_\sigma = 6.5$ nH, $V_{GE} = -5/18$ V, $R_{G,off} = 1.5\ \Omega$	$T_{vj} = 25$ °C, $dv/dt = 7920$ V/µs		22.7		mJ
			$T_{vj} = 125$ °C, $dv/dt = 5830$ V/µs		29.5		
			$T_{vj} = 175$ °C, $dv/dt = 5120$ V/µs		31.6		
SC data	I_{SC}	$V_{CC} = 470$ V, $V_{GE} = -5/18$ V, $V_{CEmax} = V_{CES} - L_{s,CE} \cdot di/dt$	$T_{vj} = 25$ °C, $t_P = 1.5$ µs		10000		A
			$T_{vj} = 175$ °C, $t_P = 1.5$ µs		6100		

3 Fusion diode

Table 7 **Maximum rated values**

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		$T_{vj} = 25$ °C	750[1]	V

(table continues...)

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

Parameter	**Symbol**	**Note or test condition**		**Values**	**Unit**
Implemented forward current	I_{FN}			980	A
Continuous DC forward current	$I_{F,nom}$			600	A
I^2t - value	I^2t	$V_R = 0$ V, $t_P = 10$ ms	$T_{vj} = 175$ °C	14500[2]	A^2s

1) 780 V for transient turn-off overshoot
2) The load current can be applied in positive as well as in negative flow direction for condition Vge = Vgs = 18 V

Table 8 **Characteristic values**

Parameter	**Symbol**	**Note or test condition**		**Values**			**Unit**
				Min.	**Typ.**	**Max.**	
Forward voltage	V_F	$I_F = 600$ A, $V_{GE} = 18$ V	$T_{vj} = 25$ °C		1.54	1.95	V
			$T_{vj} = 125$ °C		1.74		
			$T_{vj} = 175$ °C		1.83		
Forward voltage	V_F	$I_F = 980$ A, $V_{GE} = 18$ V	$T_{vj} = 25$ °C		2.10		V
			$T_{vj} = 125$ °C		2.43		
			$T_{vj} = 175$ °C		2.56		
Peak reverse recovery current	I_{rm}	$I_F = 600$ A, $V_{GE} = -5/18$ V	$T_{vj} = 25$ °C		256		A
			$T_{vj} = 125$ °C		317		
			$T_{vj} = 175$ °C		350		
Recovered charge	Q_r	$I_F = 600$ A, $V_{GE} = -5/18$ V	$T_{vj} = 25$ °C		9.7		µC
			$T_{vj} = 125$ °C		18.0		
			$T_{vj} = 175$ °C		23.7		
Reverse recovery energy	E_{rec}	$I_F = 600$ A, $V_{GE} = -5/18$ V, $R_G = 1.5\ \Omega$	$T_{vj} = 25$ °C, $-di_F/dt = 12.6$ kA/µs		3.51		mJ
			$T_{vj} = 125$ °C, $-di_F/dt = 11.7$ kA/µs		6.50		
			$T_{vj} = 175$ °C, $-di_F/dt = 11.1$ A/µs		8.42		
Thermal resistance, junction to cooling fluid[1]	$R_{th,j-f}$	50% water / 50% ethylene glycol, $\Delta V/\Delta t = 10\ dm^3$/min, $T_f = 65$ °C, only Si diode			0.296		K/W
Standard deviation of thermal resistance, junction to cooling fluid[1]	$\sigma_{Rth,j-f}$	50% water / 50% ethylene glycol, $\Delta V/\Delta t = 10\ dm^3$/min, $T_f = 65$ °C, only Si diode			11		K/kW
Temperature under switching conditions	$T_{vj,op}$		continuous operation	-40		175	°C

1) Cooler design and flow direction according to application note AN-G2-ASSEMBLY. EoL criteria see AQG324, verified by characterization.

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4 IGBT, Inverter

Table 9 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage	V_{CES}		$T_{vj} = 25\ °C$	750[1]	V
Repetitive peak collector current	I_{CRM}	verified by design, t_p limited by $T_{vj,max}$		1150[2]	A
Gate-emitter peak voltage	V_{GES}			-10/23	V

1) 780 V for transient turn-off overshoot
2) Can be ignored in case of shorted IGBT + MOSFET gate: Please refer to Fusion transistor (IGBT + MOSFET) in this case.

Table 10 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{CE,sat}$	$I_C = 300\ A$, $V_{GE} = 18\ V$	$T_{vj} = 25\ °C$		1.20	1.33	V
			$T_{vj} = 125\ °C$		1.25		
			$T_{vj} = 175\ °C$		1.28		
Gate threshold voltage	$V_{GE,th}$	$I_C = 5.16\ mA$, $V_{CE} = V_{GE}$	$T_{vj} = 25\ °C$	5.05	5.85	6.6	V
Gate charge	Q_G	$V_{CE} = 400\ V$, $V_{GE} = -5/18\ V$			1.50		µC
Internal gate resistor	$R_{G,int}$		$T_{vj} = 25\ °C$		2.0		Ω
Input capacitance	C_{ies}	$f = 0.1\ MHz$, $V_{CE} = 400\ V$, $V_{GE} = 0\ V$	$T_{vj} = 25\ °C$		24		nF
Reverse transfer capacitance	C_{res}	$f = 0.1\ MHz$, $V_{CE} = 400\ V$, $V_{GE} = 0\ V$	$T_{vj} = 25\ °C$		0.036		nF
Gate-emitter leakage current	I_{GES}		$T_{vj} = 25\ °C$			100	nA
Thermal resistance, junction to cooling fluid[1]	$R_{th,j-f}$	50% water / 50% ethylene glycol, $\Delta V/\Delta t = 10\ dm^3/min$, $T_f = 65\ °C$			0.156		K/W
Standard deviation of thermal resistance, junction to cooling fluid[1]	$\sigma_{Rth,j-f}$	50% water / 50% ethylene glycol, $\Delta V/\Delta t = 10\ dm^3/min$, $T_f = 65\ °C$			5.0		K/kW
Temperature under switching conditions	$T_{vj,op}$		continuous operation	-40		175	°C

1) Cooler design and flow direction according to application note AN-G2-ASSEMBLY. EoL criteria see AQG324, verified by characterization.

5 MOSFET Inverter

Table 11 Maximum rated values

Parameter	**Symbol**	**Note or test condition**		**Values**	**Unit**
Drain-source voltage	V_{DSS}		$T_{vj} = 25\ °C$	750[1]	V
Pulsed drain current	$I_{D,pulse}$	verified by design, t_p limited by $T_{vj,max}$		400[2]	A
Gate-source voltage, max. static voltage	V_{GS}			-6/19	V
Gate-source voltage, max. transient voltage	V_{GS}	Duty Cycle < 1 % (first transient maximum peak)		-10/23	V

[1] 780 V for transient turn-off overshoot
[2] Can be ignored in case of shorted IGBT + MOSFET gate: Please refer to Fusion transistor (IGBT + MOSFET) in this case.

Table 12 Characteristic values

Parameter	**Symbol**	**Note or test condition**		**Values**			**Unit**
				Min.	**Typ.**	**Max.**	
Drain-source on-resistance	$R_{DS,on}$	$I_D = 186\ A$, $V_{GS} = 18\ V$	$T_{vj} = 25\ °C$		3.77	5.15	mΩ
			$T_{vj} = 125\ °C$		5.00		
			$T_{vj} = 175\ °C$		6.08		
Gate threshold voltage	$V_{GS,th}$	$I_D = 60\ mA$, $V_{GS} = V_{DS}$, (tested after 1ms pulse at $V_{GS} = +20\ V$)	$T_{vj} = 25\ °C$	3.20[1]	4.00	4.55	V
Total gate charge	Q_G	$V_{DS} = 400\ V$, $V_{GS} = -5/18\ V$			0.470		µC
Internal gate resistor	$R_{G,int}$		$T_{vj} = 25\ °C$		1.7		Ω
Input capacitance	C_{iss}	$f = 0.1\ MHz$, $V_{DS} = 400\ V$, $V_{GS} = 0\ V$	$T_{vj} = 25\ °C$		11		nF
Reverse transfer capacitance	C_{rss}	$f = 0.1\ MHz$, $V_{DS} = 400\ V$, $V_{GS} = 0\ V$	$T_{vj} = 25\ °C$		0.059		nF
Gate-source leakage current	I_{GSS}	$V_{GS} = 20\ V$, $V_{DS} = 0\ V$	$T_{vj} = 25\ °C$			400	nA
Thermal resistance, junction to cooling fluid[2]	$R_{th,j-f}$	50% water / 50% ethylene glycol, $\Delta V/\Delta t = 10\ dm^3/min$, $T_f = 65\ °C$			0.264		K/W
Standard deviation of thermal resistance, junction to cooling fluid[2]	$\sigma_{Rth,j-f}$	50% water / 50% ethylene glycol, $\Delta V/\Delta t = 10\ dm^3/min$, $T_f = 65\ °C$			7.8		K/kW
Temperature under switching conditions	$T_{vj,op}$		continuous operation	-40		175	°C

[1] At 0h operating time. During inverter operation the value can be lower depending on Tvj, VGS(off), (switching frequency) fsw over lifetime. For a final assessment of VGS,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.

6 Temperature sensor

Table 13 Characteristic values

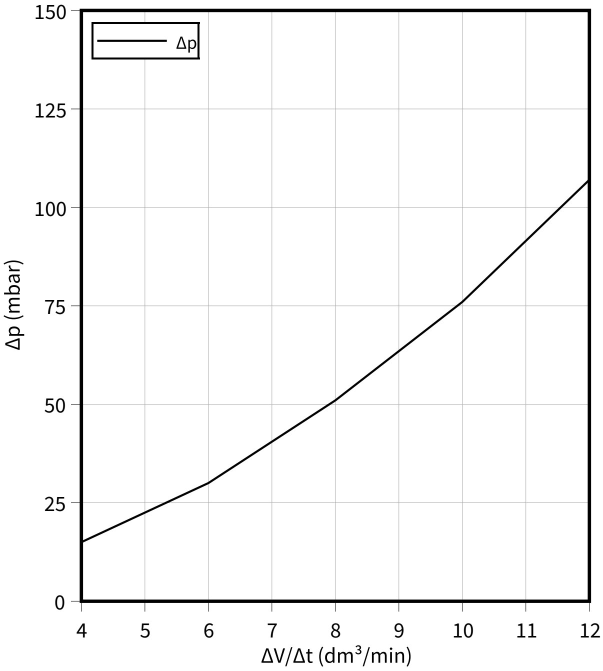
Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Transient sense current	I_{TS}				10	mA
Continuous sense current	I_{TS}				1	mA
Forward voltage	V_{TS}	I_{TS} = 0.2 mA, T_{vj} = 25 °C	2.230	2.280	2.320	V
Temperature coefficient (TCR)	TC_{TS}	I_{TS} = 0.2 mA		-5.50		mV/K

7 Characteristics diagrams

Pressure drop in cooling circuit (typical), Package

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

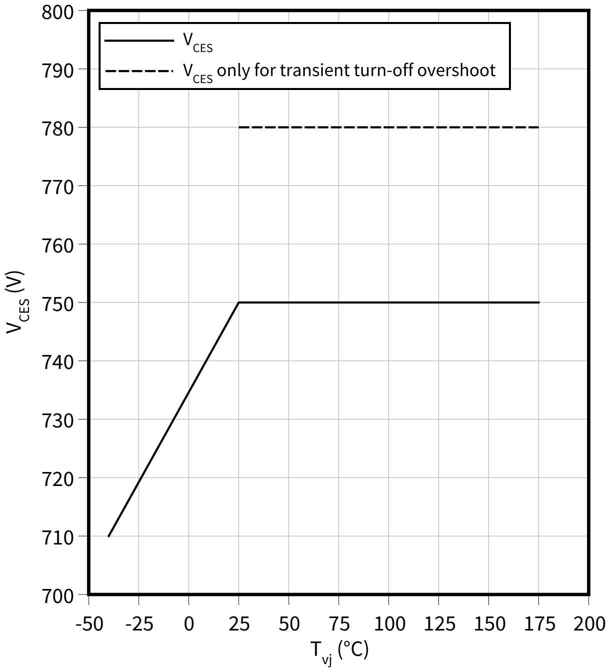
T_f = 65 °C, 50% water / 50% ethylene glycol



Maximum allowed blocking voltage, Fusion transistor (IGBT + MOSFET)

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

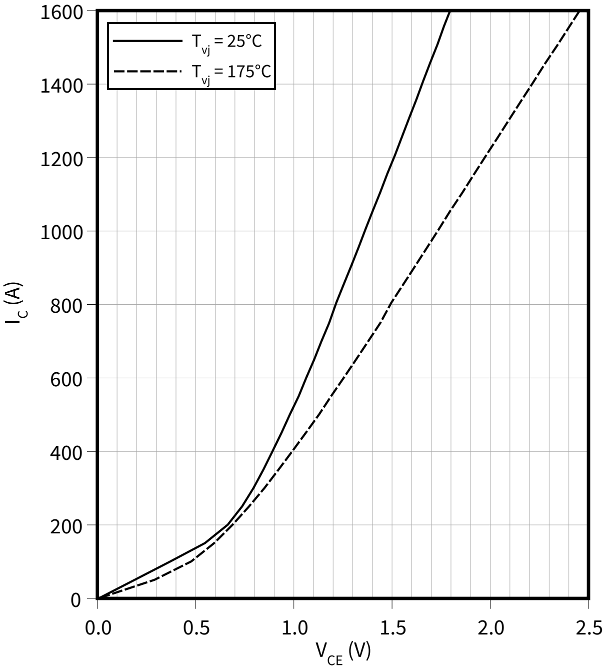
Verified by characterization / design, not by test.



Output characteristic (typical), Fusion transistor (IGBT + MOSFET)

$I_C = f(V_{CE})$

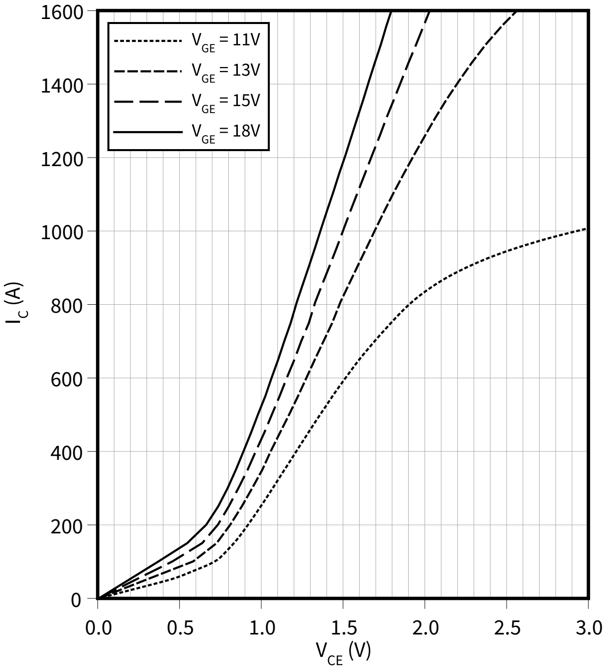
V_{GE} = 18 V



Output characteristic (typical), Fusion transistor (IGBT + MOSFET)

$I_C = f(V_{CE})$

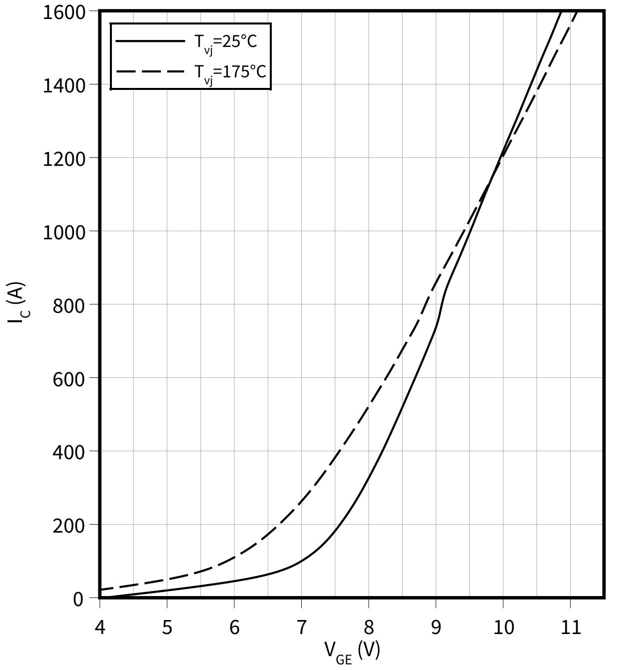
T_{vj} = 25 °C



Transfer characteristic (typical), Fusion transistor (IGBT + MOSFET)

$I_C = f(V_{GE})$

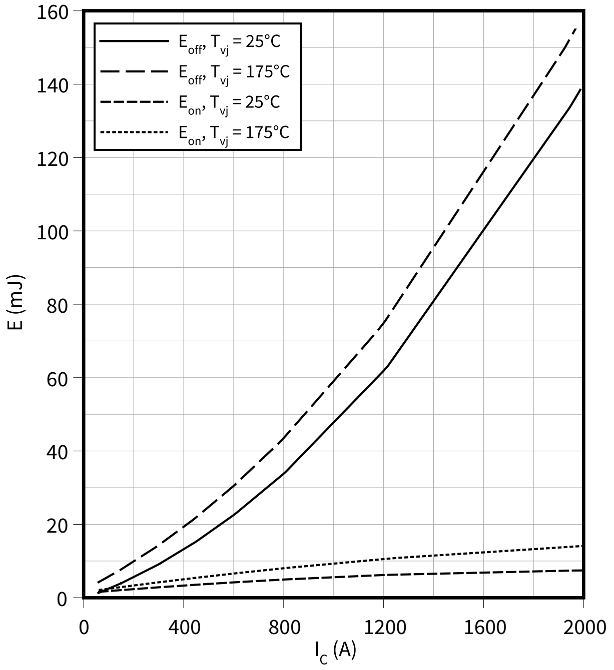
$V_{CE} = 20$ V



Switching losses (typical), Fusion transistor (IGBT + MOSFET)

$E = f(I_C)$

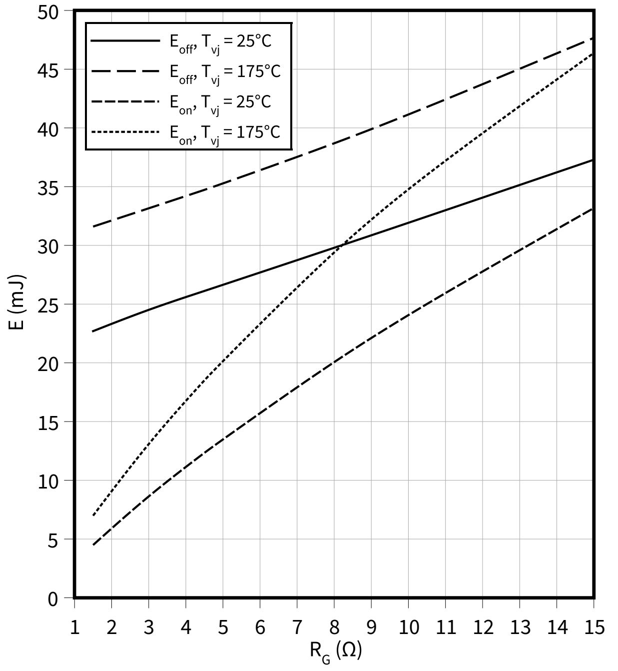
$V_{GE} = -5/18$ V, $R_{G,off} = 1.5$ Ω, $R_{G,on} = 1.5$ Ω, $V_{CE} = 400$ V



Switching losses (typical), Fusion transistor (IGBT + MOSFET)

$E = f(R_G)$

$V_{GE} = -5/18$ V, $V_{CE} = 400$ V, $I_C = 600$ A

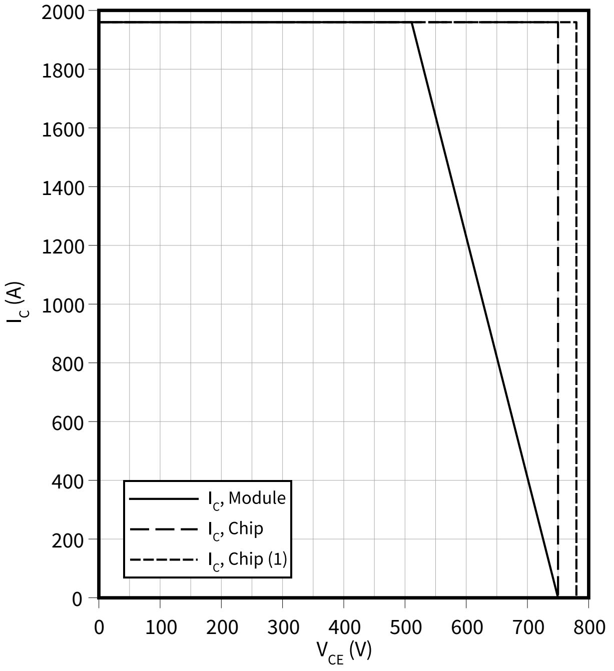


Reverse bias safe operating area (RBSOA), Fusion transistor (IGBT + MOSFET)

$I_C = f(V_{CE})$

$T_{vj} = 175$ °C, $R_{G,off} = 1.5$ Ω, $V_{GE} = -5/18$ V

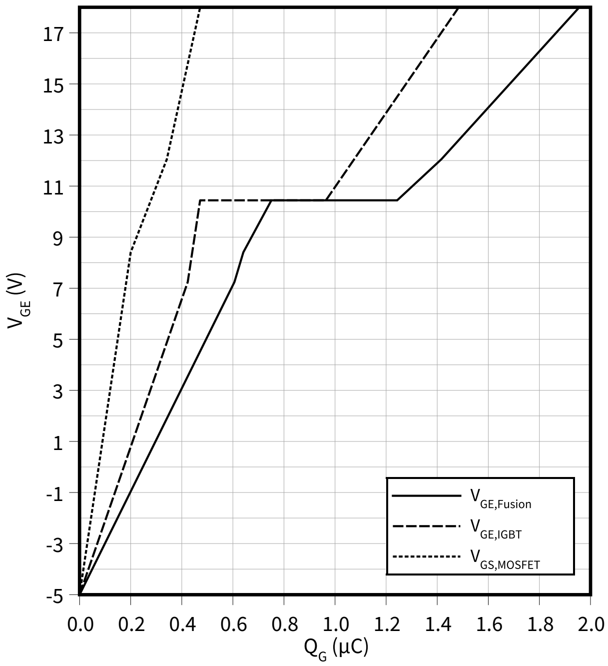
(1) only for transient overshoot



Gate charge characteristic (typical), Fusion transistor (IGBT + MOSFET)

$V_{GE} = f(Q_G)$

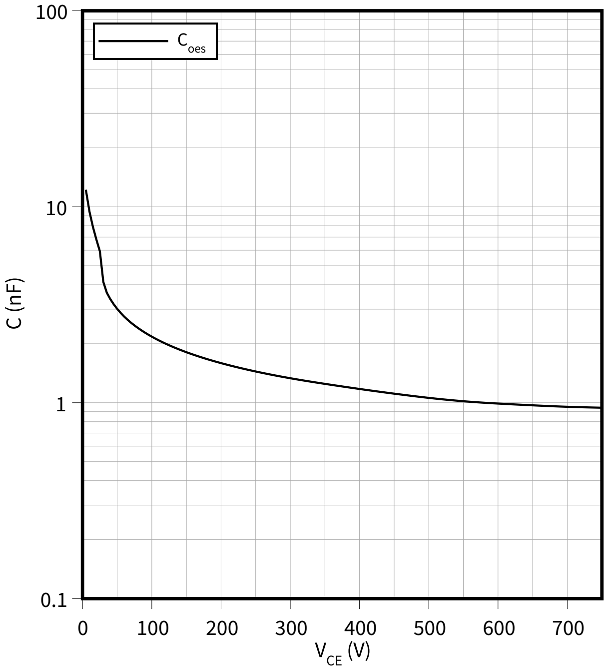
$T_{vj} = 25$ °C, $V_{CE} = 400$ V



Capacity characteristic (typical) Fusion transistor, Fusion transistor (IGBT + MOSFET)

$C = f(V_{CE})$

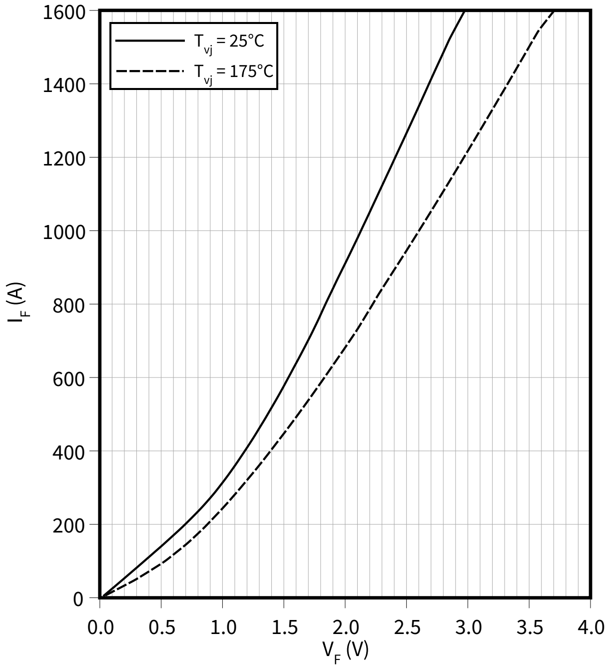
$V_{GE} = 0$ V, $T_{vj} = 25$ °C, f = 0.1 MHz



Forward characteristic (typical), Fusion diode

$I_F = f(V_F)$

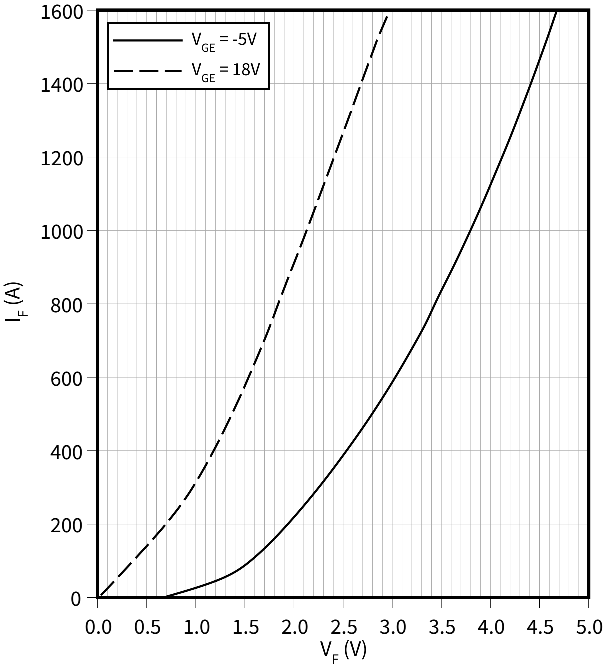
$V_{GE} = 18$ V



Forward characteristic (typical), Fusion diode

$I_F = f(V_F)$

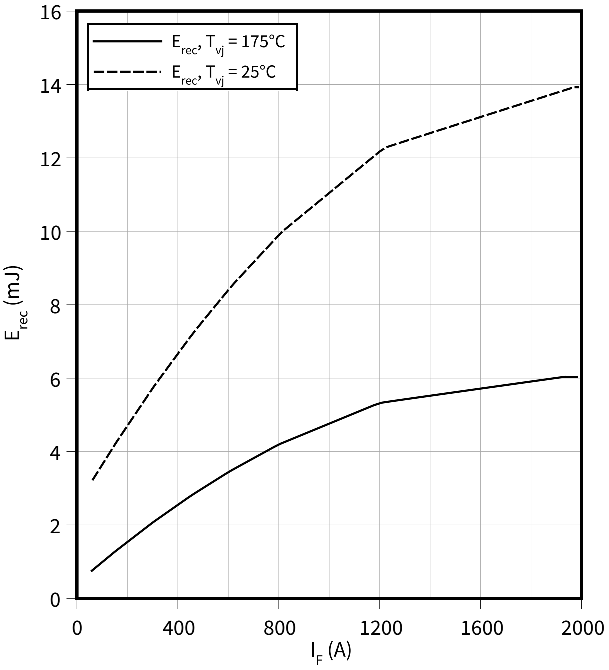
$T_{vj} = 25$ °C



Switching losses (typical), Fusion diode

$E_{rec} = f(I_F)$

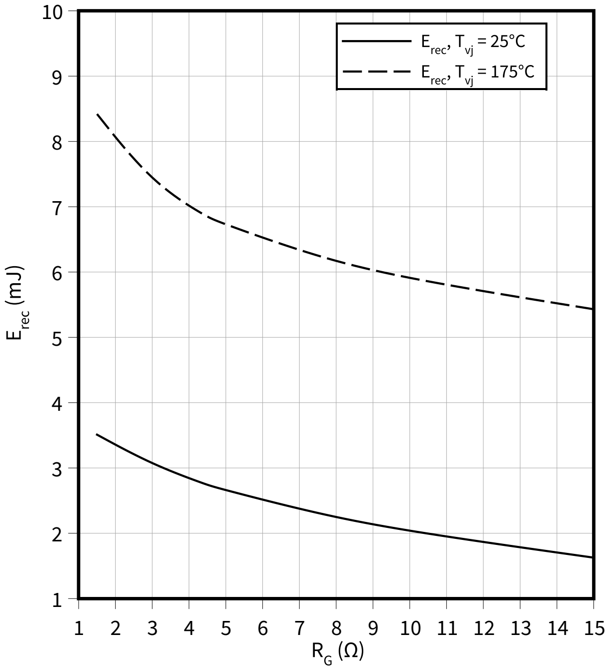
$V_{CE} = 400$ V, $V_{GE} = -5/18$ V, $R_G = 1.5\ \Omega$



Switching losses (typical), Fusion diode

$E_{rec} = f(R_G)$

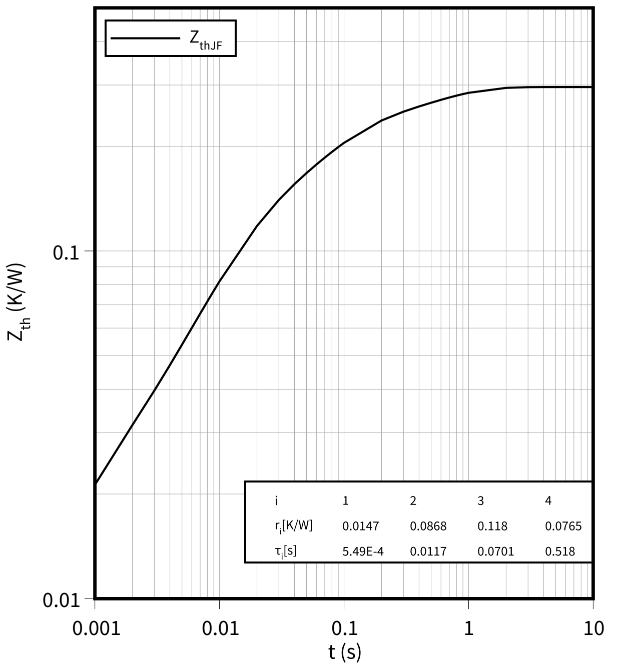
$V_{CE} = 400$ V, $V_{GE} = -5/18$ V, $I_F = 600$ A



Transient thermal impedance (typical), Fusion diode

$Z_{th} = f(t)$

$\Delta V/\Delta t = 10$ dm^3/min, 50% water/50% ethylene glycol , $T_f = 65$ °C

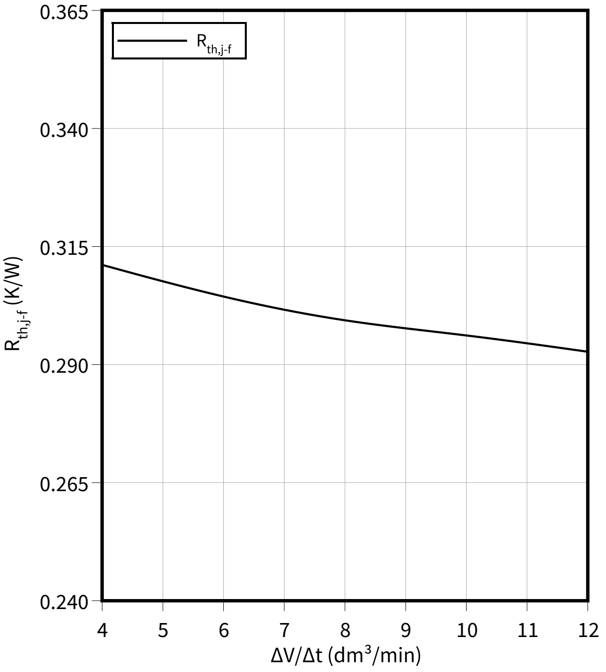


i	1	2	3	4
r_i[K/W]	0.0147	0.0868	0.118	0.0765
τ_i[s]	5.49E-4	0.0117	0.0701	0.518

Thermal resistance (typical), Fusion diode

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

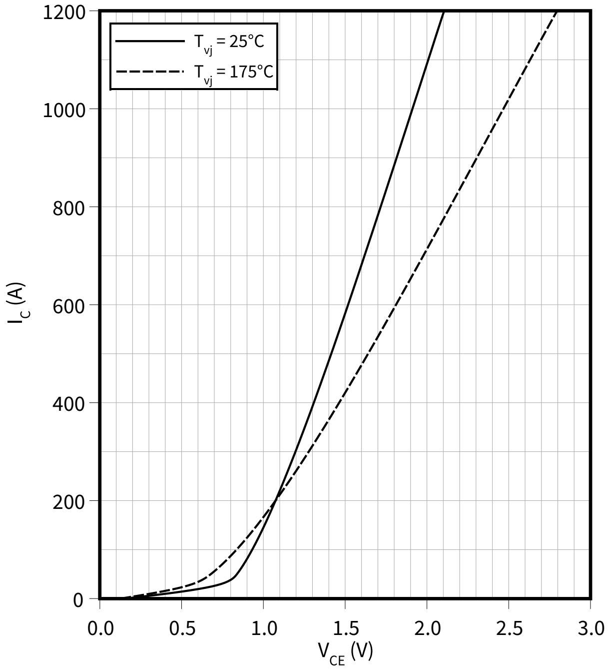
$T_f = 65$ °C, 50% water / 50% ethylene glycol



Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

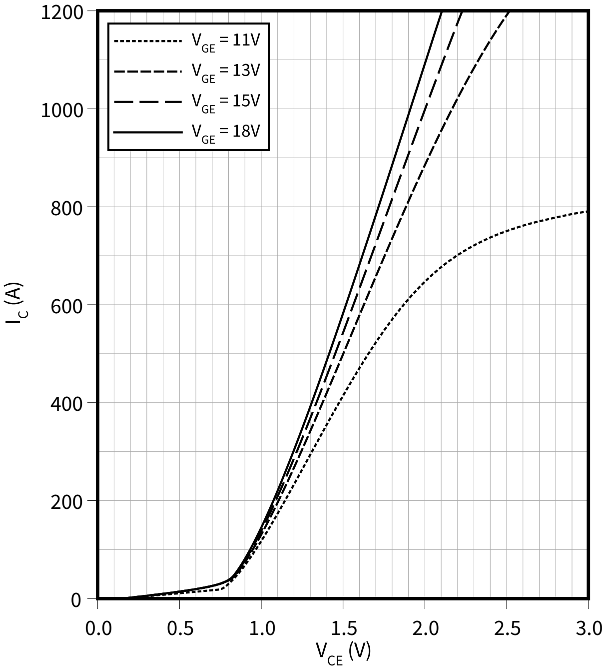
$V_{GE} = 18\ V$



Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

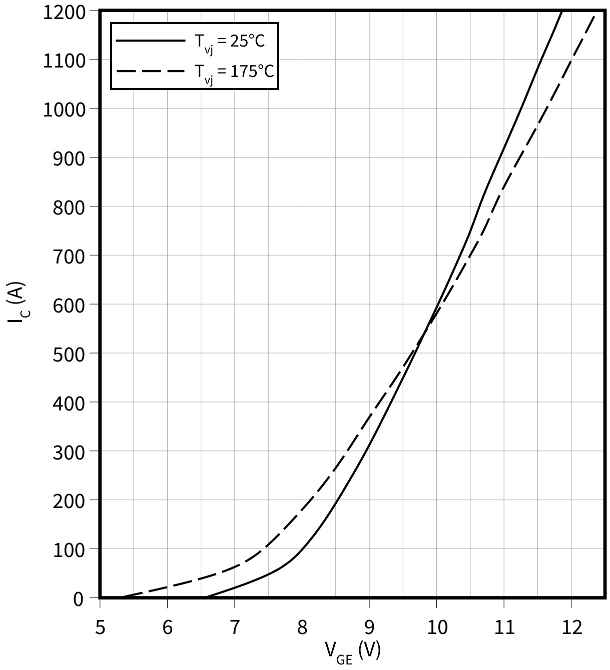
$T_{vj} = 25\ °C$



Transfer characteristic (typical), IGBT, Inverter

$I_C = f(V_{GE})$

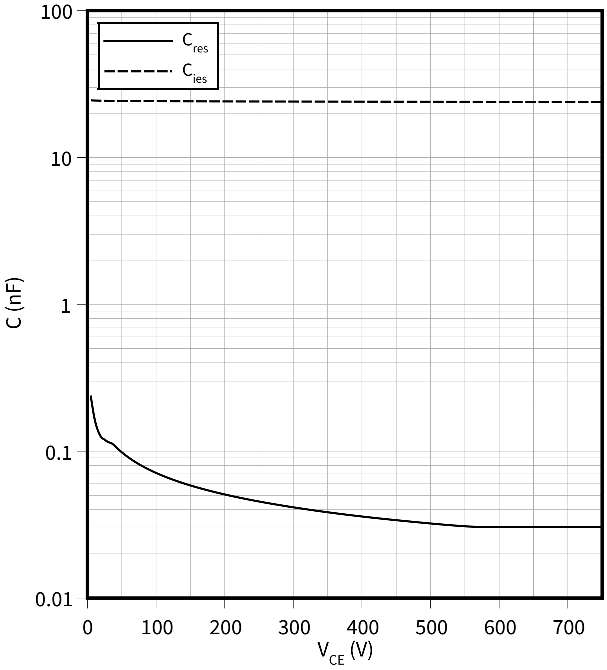
$V_{CE} = 20\ V$



Capacity characteristic (typical), IGBT, Inverter

$C = f(V_{CE})$

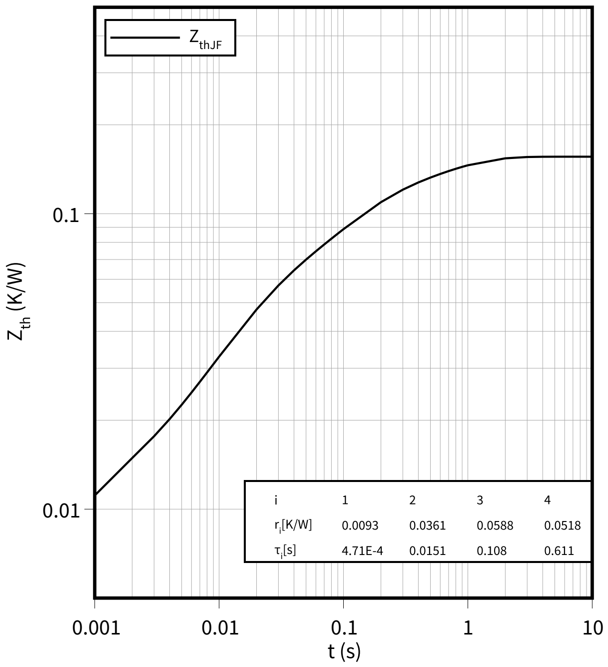
$V_{GE} = 0\ V, T_{vj} = 25\ °C, f = 0{,}1\ MHz$



Transient thermal impedance (typical), IGBT, Inverter

$Z_{th} = f(t)$

$\Delta V/\Delta t = 10\ dm^3/min$, $T_f = 65\ °C$,
50% water / 50% ethylene glycol

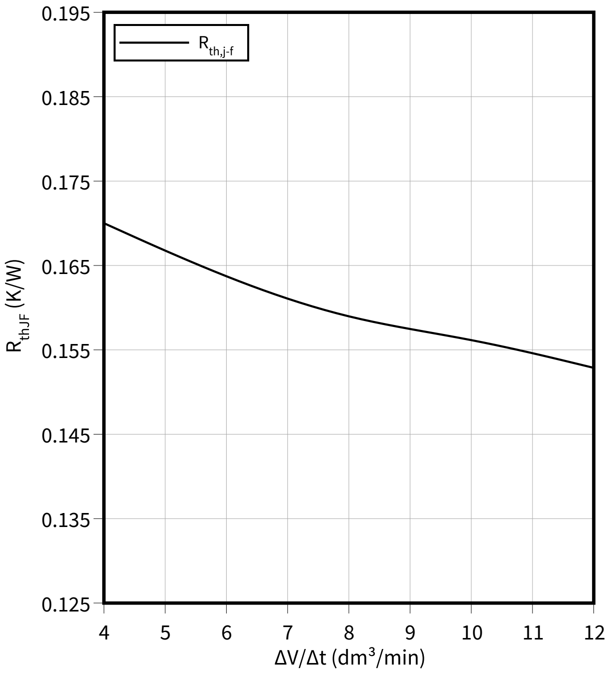


i	1	2	3	4
r_i[K/W]	0.0093	0.0361	0.0588	0.0518
τ_i[s]	4.71E-4	0.0151	0.108	0.611

Thermal resistance (typical), IGBT, Inverter

$R_{thJF} = f(\Delta V/\Delta t)$

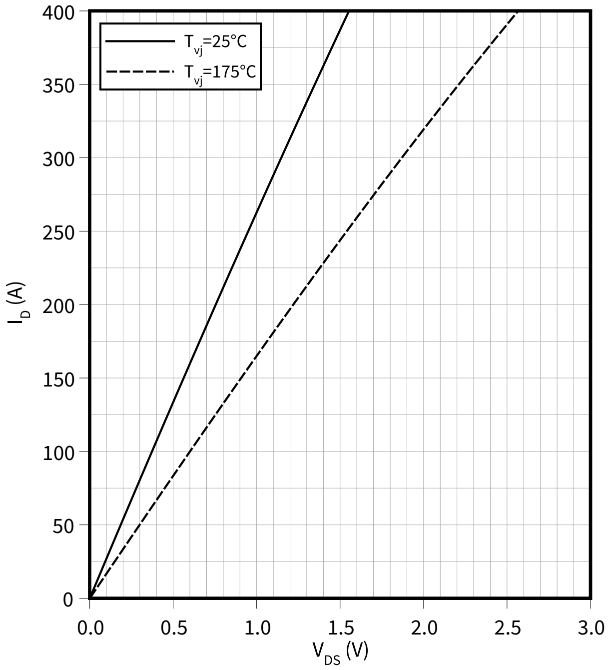
$T_f = 65\ °C$, 50% water / 50% ethylene glycol



Output characteristic (typical), MOSFET Inverter

$I_D = f(V_{DS})$

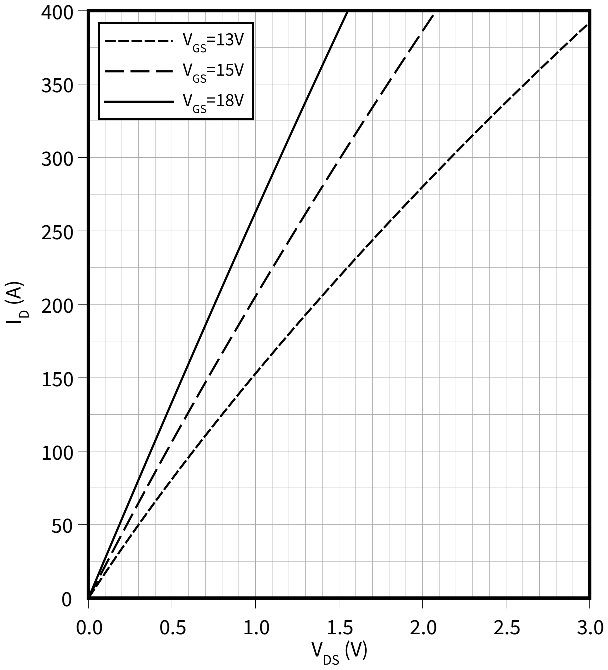
$V_{GS} = 18\ V$



Output characteristic (typical), MOSFET Inverter

$I_D = f(V_{DS})$

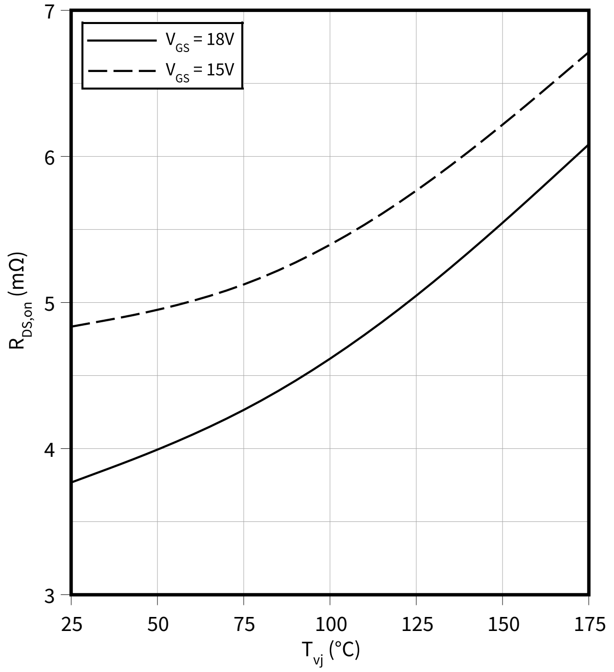
$T_{vj} = 25\ °C$



Drain-source on-resistance (typical), MOSFET Inverter

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

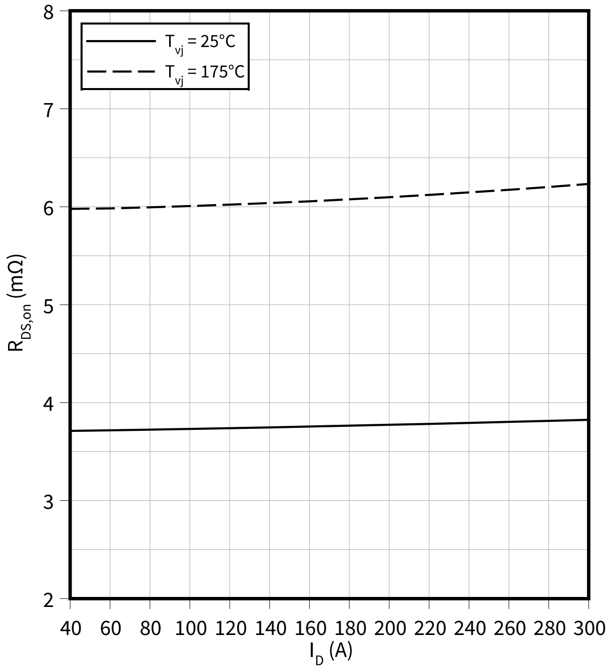
$I_D = 186$ A



Drain-source on-resistance (typical), MOSFET Inverter

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

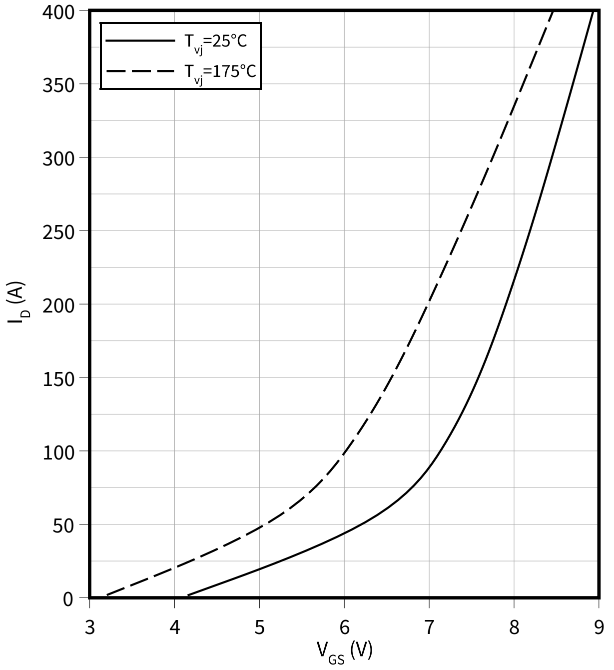
$V_{GS} = 18$ V



Transfer characteristic (typical), MOSFET Inverter

$I_D = f(V_{GS})$

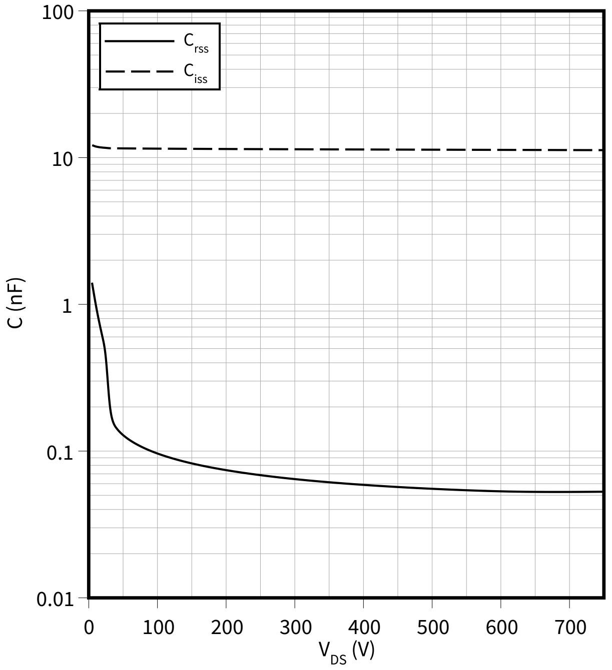
$V_{DS} = 20$ V



Capacity characteristic (typical), MOSFET Inverter

$C = f(V_{DS})$

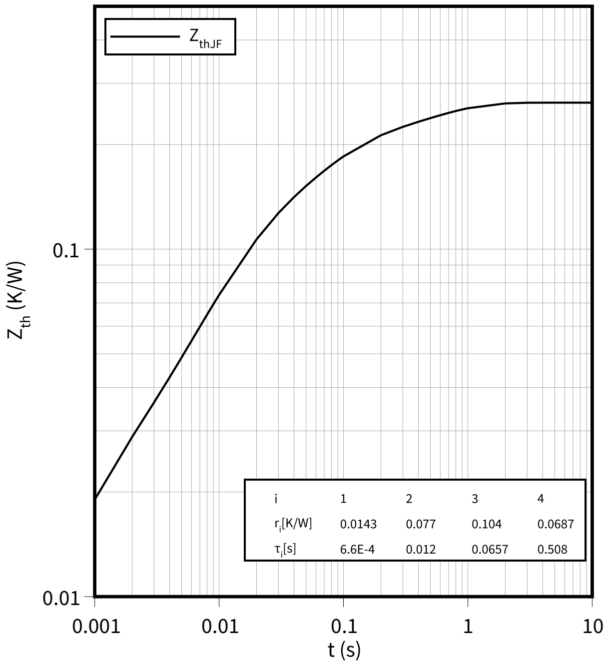
f = 0.1 MHz, $V_{GS} = 0$ V, $T_{vj} = 25$ °C



Transient thermal impedance (typical), MOSFET Inverter

$Z_{th} = f(t)$

$\Delta V/\Delta t = 10\ dm^3/min$, $T_f = 65\ °C$,
50% water / 50% ethylene glycol

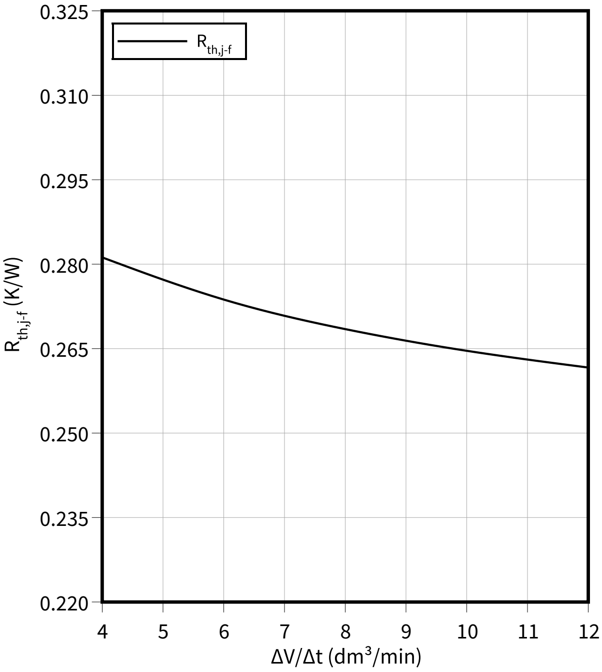


i	1	2	3	4
r_i[K/W]	0.0143	0.077	0.104	0.0687
τ_i[s]	6.6E-4	0.012	0.0657	0.508

Thermal resistance (typical), MOSFET Inverter

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

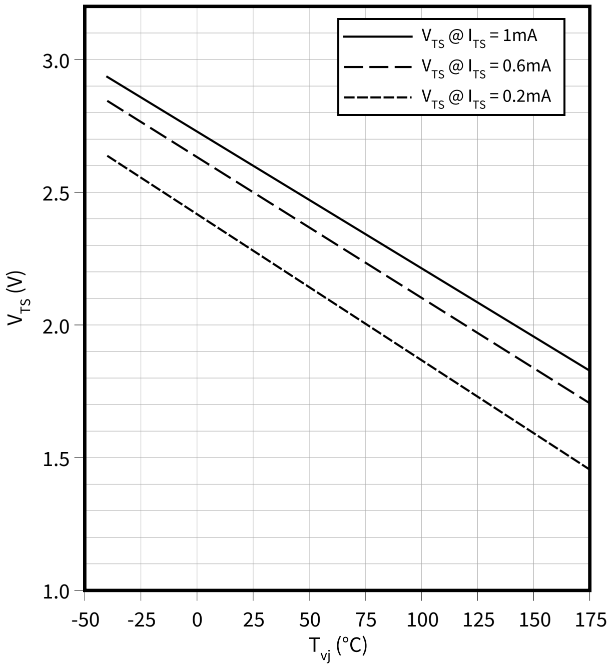
50% water / 50% ethylene glycol , $T_f = 65\ °C$



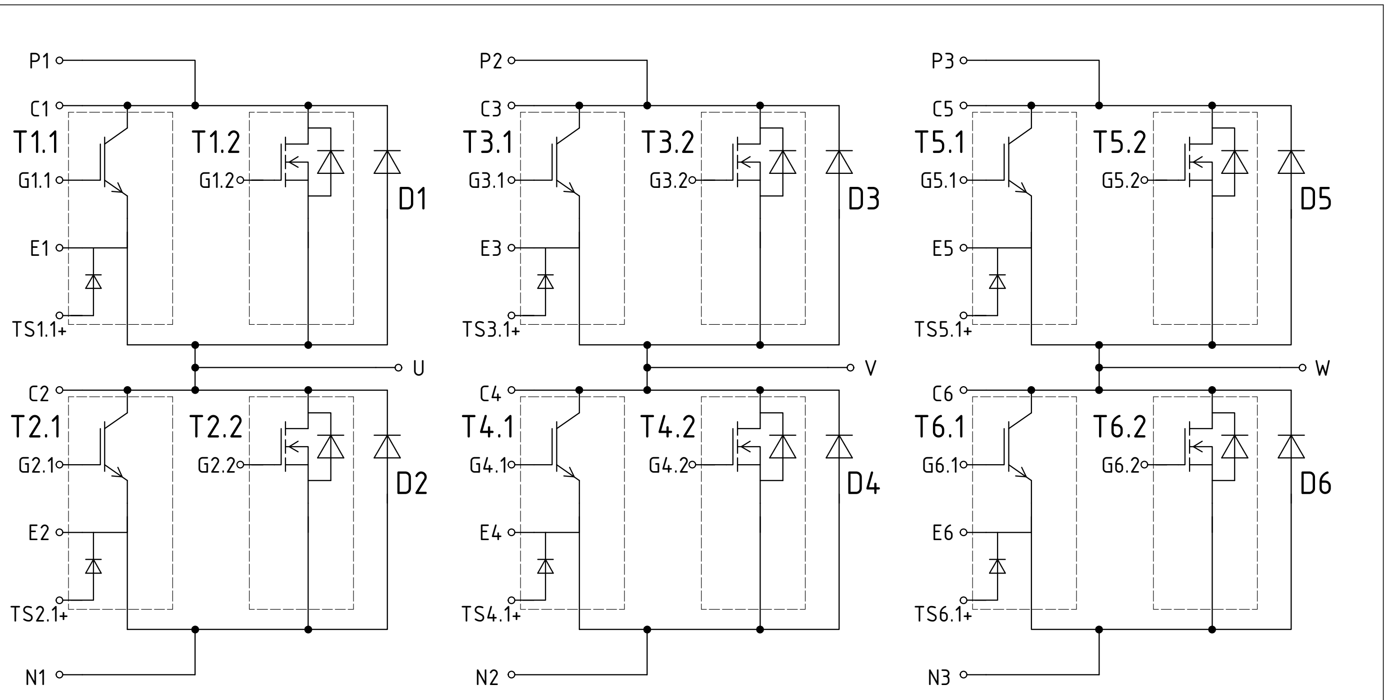
Temperature characteristic (typical), Temperature sensor

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

$I_{TS} = 0.2\ mA$



8 Circuit diagram



Notes:
1.) Collector (C) = Drain (D)
2.) Emitter (E) = Source (S)

Figure 1

9 Package outlines

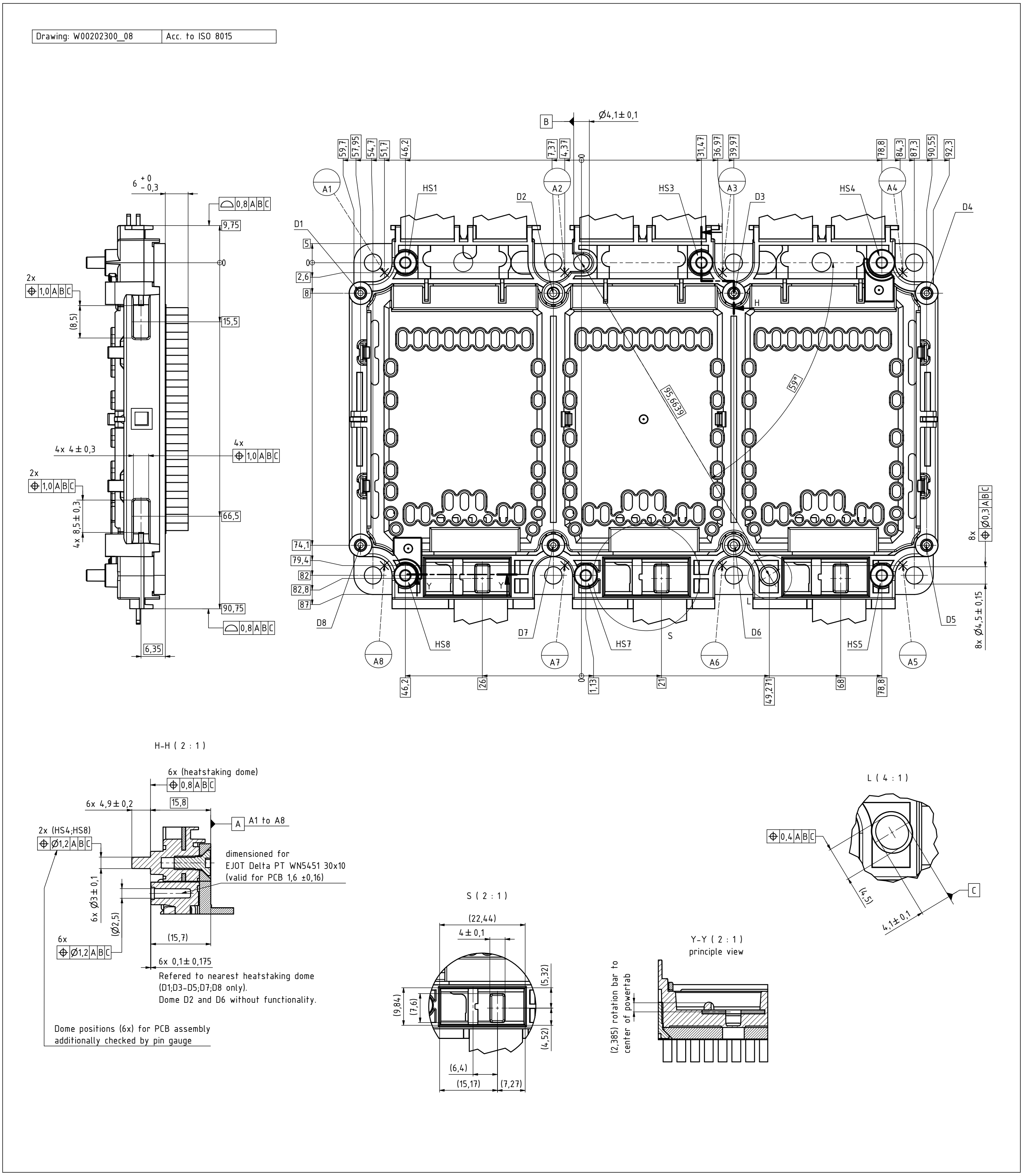


Figure 2

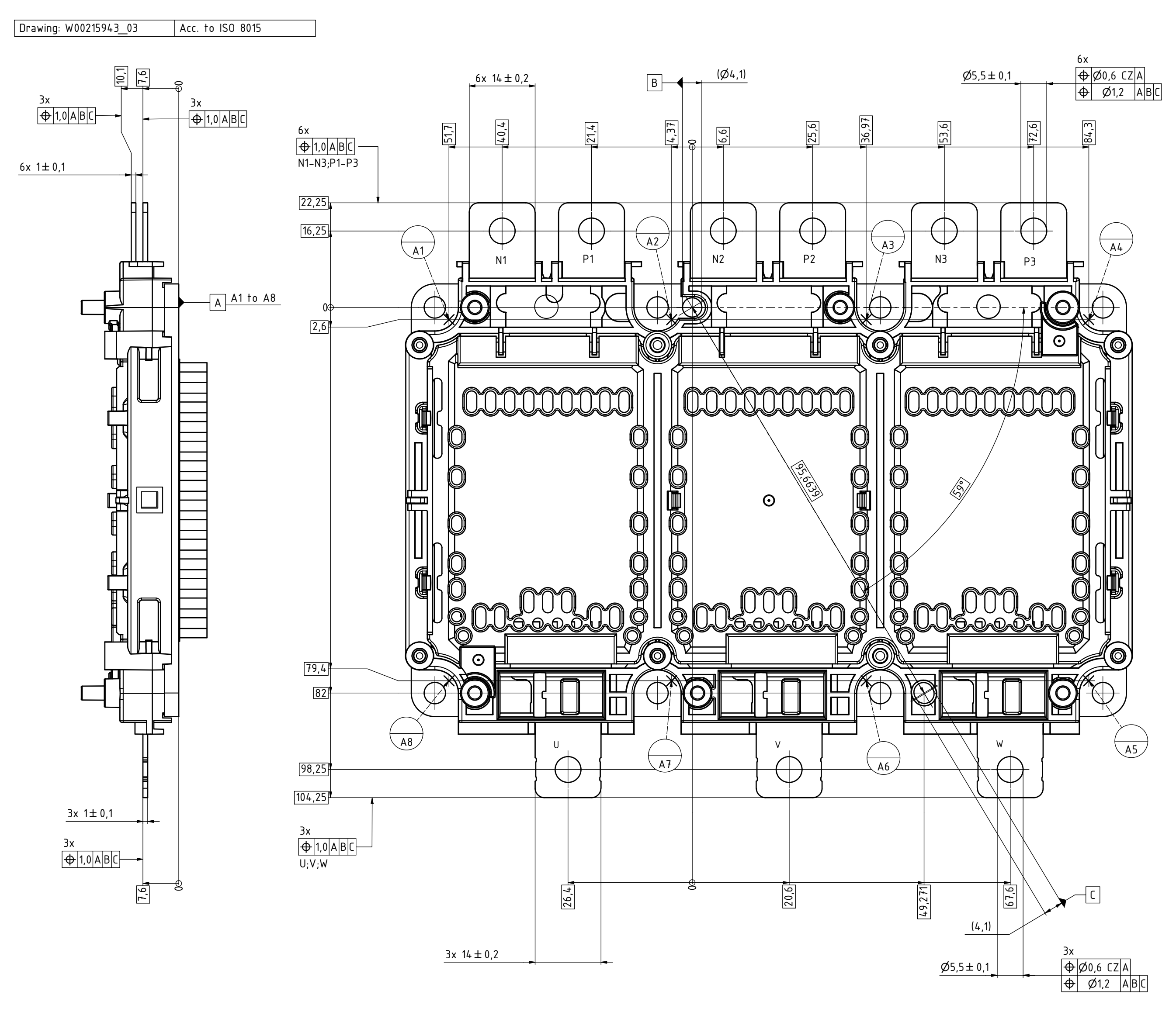

Drawing: W00215943_03
Acc. to ISO 8015
10,1
7,6
3x ⊕ 1,0 A B C
3x ⊕ 1,0 A B C
6x 1± 0,1
A A1 to A8
3x 1± 0,1
3x ⊕ 1,0 A B C
7,6
6x ⊕ 1,0 A B C
N1–N3;P1–P3
22,25
16,25
0
2,6
79,4
82
98,25
104,25
3x ⊕ 1,0 A B C
U;V;W
6x 14 ± 0,2
B
(Ø4,1)
Ø5,5 ± 0,1
6x ⊕ Ø0,6 CZ A
⊕ Ø1,2 A B C
51,7
40,4
21,4
4,37
0
6,6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

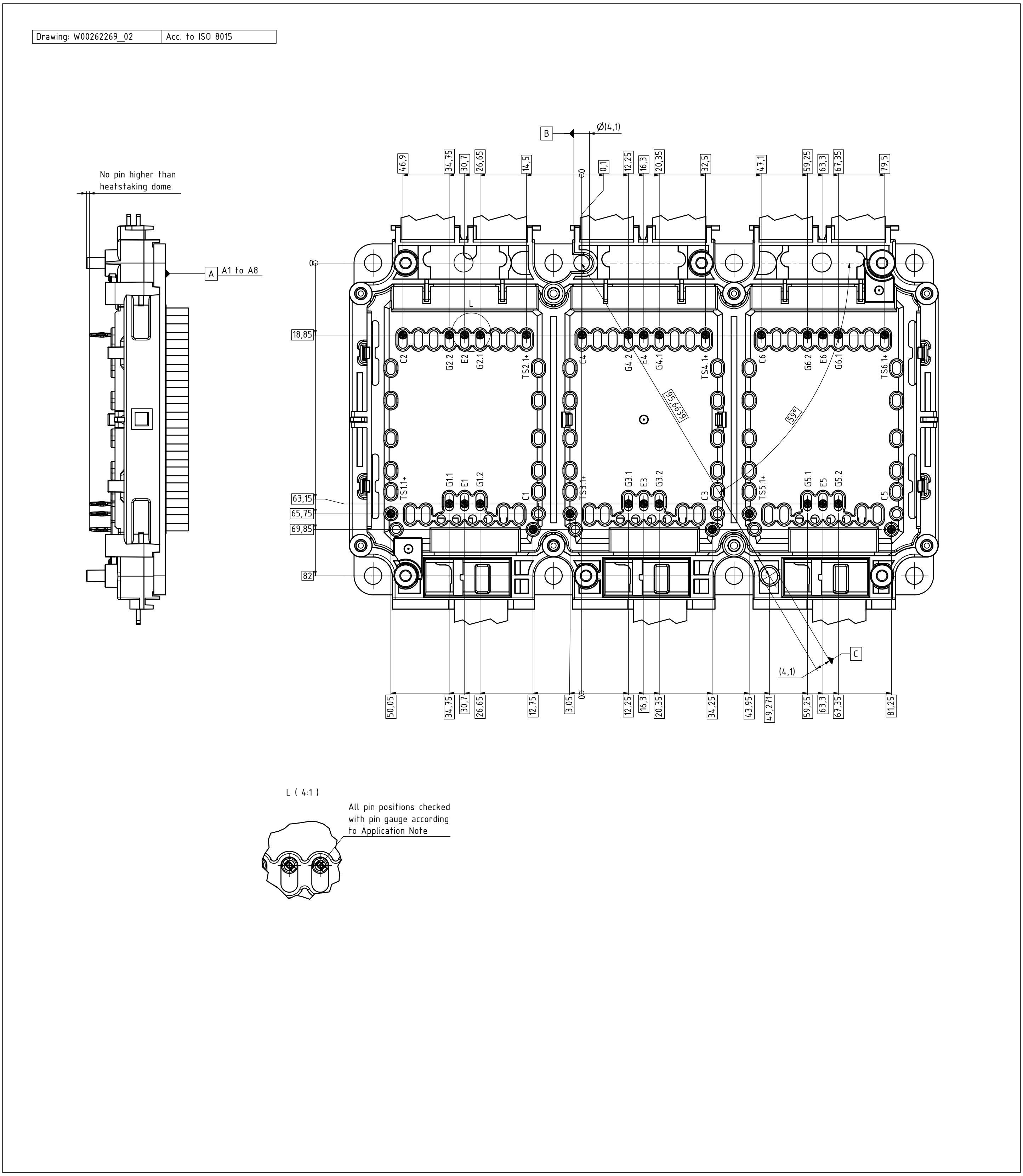

Drawing: W00262269_02
Acc. to ISO 8015
No pin higher than heatstaking dome
A
A1 to A8
B
Ø(4,1)
46,9
34,75
30,7
26,65
14,5
0
0,1
12,25
16,3
20,35
32,5
47,1
59,25
63,3
67,35
79,5
0
18,85
63,15
65,75
69,85
82
C2
G2.2
E2
G2.1
TS2.1+
C4
G4.2
E4
G4.1
TS4.1+
C6
G6.2
E6
G6.1
TS6.1+
L
95,8639
59°
TS1.1+
G1.1
E1
G1.2
C1
TS3.1+
G3.1
E3
G3.2
C3
TS5.1+
G5.1
E5
G5.2
C5
C
(4,1)
50,05
34,75
30,7
26,65
12,75
3,05
0
12,25
16,3
20,35
34,25
43,95
49,271
59,25
63,3
67,35
81,25
L (4:1)
All pin positions checked with pin gauge according to Application Note

Figure 4

10 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	2024-08-19	Initial version
0.20	2025-07-07	Target datasheet
0.30	2025-09-19	Preliminary datasheet
1.00	2026-02-19	Final datasheet

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Edition 2026-02-19

Published by

Infineon Technologies AG

81726 Munich, Germany

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Document reference
IFX-ABK585-004

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