

## Final datasheet

### HybridPACK™ Drive G2 module with SiC MOSFET

#### Features

- Electrical features
  - $V_{DS} = 1200\text{ V}$
  - $I_{DN} = 310\text{ A}$
  - New semiconductor material - silicon carbide
  - Low  $R_{DS,on}$
  - Low switching losses
  - Low  $Q_g$  and  $C_{rss}$
  - Low inductive design
  - $T_{vj,op} = 175^\circ\text{C}$
  - Short-time extended operation temperature  $T_{vj,op} = 200^\circ\text{C}$
- Mechanical features
  - 4.2 kV DC 1 second insulation
  - High creepage and clearance distances
  - Compact design
  - High power density
  - Direct-cooled PinFin base plate
  - High-performance  $\text{Si}_3\text{N}_4$  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

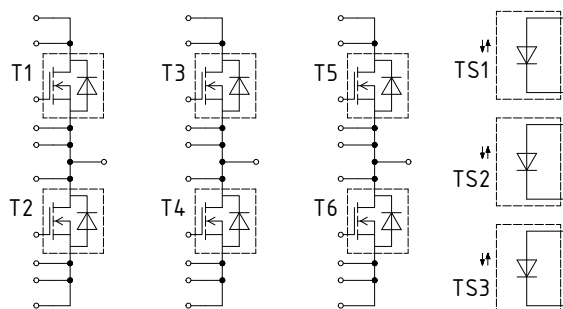


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**1 Package**

**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          | 4.20                | kV   |
| Material of module baseplate |             |                                       | Cu+Ni <sup>1)</sup> |      |
| Internal isolation           |             | basic insulation (class 1, IEC 61140) | $Si_3N_4$           |      |
| Creepage distance            | $d_{creep}$ | terminal to heatsink                  | 10.6                | mm   |
| Creepage distance            | $d_{creep}$ | terminal to terminal                  | 10.6                | 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         | $I_{t,rms}$ |                        | 600    |      |      | A    |
| Heat-staking dome temperature <sup>1)</sup> | $T_{HS}$    | $t_{steking} < 10s$    |        |      | 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                  | $\Delta p$    | 50% water / 50% ethylenglycol, $\Delta V / \Delta t = 10 \text{ dm}^3/\text{min}$ , $T_f = 60 \text{ °C}$ |                   | 76 <sup>1)</sup> |      | mbar |
| Maximum pressure in cooling circuit               | $p$           | $T_{baseplate} < 40 \text{ °C}$                                                                           |                   |                  | 3.0  | bar  |
|                                                   |               | $T_{baseplate} \geq 40 \text{ °C}$ (relative pressure)                                                    |                   |                  | 2.5  |      |
| Stray inductance module                           | $L_{s,DS}$    |                                                                                                           |                   | 8.0              |      | nH   |
| Module lead resistance, terminals - chip          | $R_{DD'+SS'}$ | $T_f = 25 \text{ °C}$ , per switch                                                                        |                   | 0.64             |      | mΩ   |
| Storage temperature                               | $T_{stg}$     |                                                                                                           | -40 <sup>2)</sup> |                  | 125  | °C   |
| Mounting torque for module mounting <sup>3)</sup> | $M$           | 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) 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                        | $V_{DS}$      |                                                   | continuous operation         | 1200   | V    |
|                                             |               |                                                   | 10h over life time           | 1400   |      |
| DC drain current                            | $I_{D,nom}$   | $V_{GS} = 18\text{ V}$ , $T_f = 65\text{ °C}$     | $T_{vj,max} = 175\text{ °C}$ | 310    | A    |
| Pulsed drain current                        | $I_{D,pulse}$ | verified by design, $t_p$ limited by $T_{vj,max}$ |                              | 620    | 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...-3 | V    |

**Table 6 Characteristic values**

| Parameter                  | Symbol      | Note or test condition                                                                                 |                          | Values             |      |      | Unit |
|----------------------------|-------------|--------------------------------------------------------------------------------------------------------|--------------------------|--------------------|------|------|------|
|                            |             |                                                                                                        |                          | Min.               | Typ. | Max. |      |
| Drain-source on-resistance | $R_{DS,on}$ | $I_D = 310\text{ A}$ , $V_{GS} = 18\text{ V}$                                                          | $T_{vj} = 25\text{ °C}$  |                    | 2.54 |      | mΩ   |
|                            |             |                                                                                                        | $T_{vj} = 125\text{ °C}$ |                    | 4.28 |      |      |
|                            |             |                                                                                                        | $T_{vj} = 175\text{ °C}$ |                    | 5.64 |      |      |
|                            |             |                                                                                                        | $T_{vj} = 200\text{ °C}$ |                    | 6.49 |      |      |
| Drain-source on-resistance | $R_{DS,on}$ | $I_D = 310\text{ A}$ , $V_{GS} = 15\text{ V}$                                                          | $T_{vj} = 25\text{ °C}$  |                    | 3.16 |      | mΩ   |
|                            |             |                                                                                                        | $T_{vj} = 125\text{ °C}$ |                    | 4.94 |      |      |
|                            |             |                                                                                                        | $T_{vj} = 175\text{ °C}$ |                    | 6.39 |      |      |
|                            |             |                                                                                                        | $T_{vj} = 200\text{ °C}$ |                    | 7.31 |      |      |
| Gate threshold voltage     | $V_{GS,th}$ | $I_D = 120\text{ mA}$ , $V_{GS} = V_{DS}$ ,<br>(tested after 1ms pulse<br>at $V_{GS} = +20\text{ V}$ ) | $T_{vj} = 25\text{ °C}$  | 3.20 <sup>1)</sup> | 3.98 | 4.55 | V    |
| Total gate charge          | $Q_G$       | $V_{DS} = 750\text{ V}$ , $V_{GS} = -5/18\text{ V}$                                                    |                          |                    | 0.87 |      | μC   |
| Internal gate resistor     | $R_{G,int}$ |                                                                                                        | $T_{vj} = 25\text{ °C}$  |                    | 0.88 |      | Ω    |
| Input capacitance          | $C_{iss}$   | $f = 1\text{ MHz}$ , $V_{DS} = 750\text{ V}$                                                           | $T_{vj} = 25\text{ °C}$  |                    | 25.9 |      | nF   |

(table continues...)

**Table 6** (continued) Characteristic values

| Parameter                           | Symbol      | Note or test condition                                                                                                                               | Values                                                                           |       |      | Unit |
|-------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-------|------|------|
|                                     |             |                                                                                                                                                      | Min.                                                                             | Typ.  | Max. |      |
| Output capacitance                  | $C_{oss}$   | $f = 1 \text{ MHz}$ , $V_{DS} = 750 \text{ V}$                                                                                                       |                                                                                  | 0.95  |      | nF   |
| Reverse transfer capacitance        | $C_{rss}$   | $f = 1 \text{ MHz}$ , $V_{DS} = 750 \text{ V}$                                                                                                       |                                                                                  | 0.08  |      | nF   |
| $C_{oss}$ stored energy             | $E_{oss}$   | $V_{DS} = 750 \text{ V}$                                                                                                                             |                                                                                  | 1002  |      | μJ   |
| Drain-source leakage current        | $I_{DSX}$   | $V_{GS} = -5 \text{ V}$ , $V_{DSS} = 1200 \text{ V}$                                                                                                 |                                                                                  |       | 530  | μA   |
| Gate-source leakage current         | $I_{GSS}$   | $V_{GS} = 20 \text{ V}$ , $V_{DS} = 0 \text{ V}$                                                                                                     |                                                                                  |       | 100  | nA   |
| Turn-on delay time, inductive load  | $t_{d,on}$  | $I_D = 310 \text{ A}$ , $R_{G,on} = 8.2 \text{ } \Omega$ ,<br>$V_{GS} = -5/18 \text{ V}$ , $V_{DS} = 750 \text{ V}$                                  | $T_{vj} = 25 \text{ } ^\circ\text{C}$                                            | 75    |      | ns   |
|                                     |             |                                                                                                                                                      | $T_{vj} = 125 \text{ } ^\circ\text{C}$                                           | 67    |      |      |
|                                     |             |                                                                                                                                                      | $T_{vj} = 175 \text{ } ^\circ\text{C}$                                           | 63    |      |      |
|                                     |             |                                                                                                                                                      | $T_{vj} = 200 \text{ } ^\circ\text{C}$                                           | 62    |      |      |
| Rise time (inductive load)          | $t_r$       | $I_D = 310 \text{ A}$ , $R_{G,on} = 8.2 \text{ } \Omega$ ,<br>$V_{GS} = -5/18 \text{ V}$ , $V_{DS} = 750 \text{ V}$                                  | $T_{vj} = 25 \text{ } ^\circ\text{C}$                                            | 52    |      | ns   |
|                                     |             |                                                                                                                                                      | $T_{vj} = 125 \text{ } ^\circ\text{C}$                                           | 48    |      |      |
|                                     |             |                                                                                                                                                      | $T_{vj} = 175 \text{ } ^\circ\text{C}$                                           | 47    |      |      |
|                                     |             |                                                                                                                                                      | $T_{vj} = 200 \text{ } ^\circ\text{C}$                                           | 47    |      |      |
| Turn-off delay time, inductive load | $t_{d,off}$ | $I_D = 310 \text{ A}$ , $R_{G,off} = 2.3 \text{ } \Omega$ ,<br>$V_{GS} = -5/18 \text{ V}$ , $V_{DS} = 750 \text{ V}$                                 | $T_{vj} = 25 \text{ } ^\circ\text{C}$                                            | 134   |      | ns   |
|                                     |             |                                                                                                                                                      | $T_{vj} = 125 \text{ } ^\circ\text{C}$                                           | 143   |      |      |
|                                     |             |                                                                                                                                                      | $T_{vj} = 175 \text{ } ^\circ\text{C}$                                           | 149   |      |      |
|                                     |             |                                                                                                                                                      | $T_{vj} = 200 \text{ } ^\circ\text{C}$                                           | 153   |      |      |
| Fall time (inductive load)          | $t_f$       | $I_D = 310 \text{ A}$ , $R_{G,off} = 2.3 \text{ } \Omega$ ,<br>$V_{GS} = -5/18 \text{ V}$ , $V_{DS} = 750 \text{ V}$                                 | $T_{vj} = 25 \text{ } ^\circ\text{C}$                                            | 40    |      | ns   |
|                                     |             |                                                                                                                                                      | $T_{vj} = 125 \text{ } ^\circ\text{C}$                                           | 43    |      |      |
|                                     |             |                                                                                                                                                      | $T_{vj} = 175 \text{ } ^\circ\text{C}$                                           | 44    |      |      |
|                                     |             |                                                                                                                                                      | $T_{vj} = 200 \text{ } ^\circ\text{C}$                                           | 45    |      |      |
| Turn-on energy loss per pulse       | $E_{on}$    | $I_D = 310 \text{ A}$ , $R_{G,on} = 8.2 \text{ } \Omega$ ,<br>$V_{GS} = -5/18 \text{ V}$ , $V_{DS} = 750 \text{ V}$ ,<br>$L_\sigma = 6.5 \text{ nH}$ | $T_{vj} = 25 \text{ } ^\circ\text{C}$ ,<br>$di/dt = 4.8 \text{ kA}/\mu\text{s}$  | 14.50 |      | mJ   |
|                                     |             |                                                                                                                                                      | $T_{vj} = 125 \text{ } ^\circ\text{C}$ ,<br>$di/dt = 5.2 \text{ kA}/\mu\text{s}$ | 14.90 |      |      |
|                                     |             |                                                                                                                                                      | $T_{vj} = 175 \text{ } ^\circ\text{C}$ ,<br>$di/dt = 5.4 \text{ kA}/\mu\text{s}$ | 16.40 |      |      |
|                                     |             |                                                                                                                                                      | $T_{vj} = 200 \text{ } ^\circ\text{C}$ ,<br>$di/dt = 5.4 \text{ kA}/\mu\text{s}$ | 16.60 |      |      |

(table continues...)

**Table 6** (continued) Characteristic values

| Parameter                                                   | Symbol       | Note or test condition                                                                                                                                              | Values |                                                                    |                     | Unit              |
|-------------------------------------------------------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------------------------------------------------------------|---------------------|-------------------|
|                                                             |              |                                                                                                                                                                     | Min.   | Typ.                                                               | Max.                |                   |
| Turn-off energy loss per pulse                              | $E_{off}$    | $I_D = 310\text{ A}$ , $R_{G,off} = 2.3\ \Omega$ ,<br>$V_{GS} = -5/18\text{ V}$ , $V_{DS} = 750\text{ V}$ ,<br>$L_\sigma = 6.5\text{ nH}$                           |        | $T_{vj} = 25\text{ °C}$ ,<br>$dv/dt = 23.4\text{ kV}/\mu\text{s}$  | 5.90                | mJ                |
|                                                             |              |                                                                                                                                                                     |        | $T_{vj} = 125\text{ °C}$ ,<br>$dv/dt = 22.3\text{ kV}/\mu\text{s}$ | 6.30                |                   |
|                                                             |              |                                                                                                                                                                     |        | $T_{vj} = 175\text{ °C}$ ,<br>$dv/dt = 21.7\text{ kV}/\mu\text{s}$ | 6.50                |                   |
|                                                             |              |                                                                                                                                                                     |        | $T_{vj} = 200\text{ °C}$ ,<br>$dv/dt = 21.4\text{ kV}/\mu\text{s}$ | 6.60                |                   |
| Short circuit data                                          | $I_{SC}$     | $V_{DD} = 750\text{ V}$ , $V_{GS} = -5/18\text{ V}$ ,<br>$R_{G,on} = 8.2\ \Omega$ ,<br>$R_{G,off} = 2.3\ \Omega$ , $V_{DSmax} =$<br>$V_{DSS} - L_{SDS} \cdot di/dt$ |        | $t_{SC} < 1.2\ \mu\text{s}$ ,<br>$T_{vj} = 200\text{ °C}$          | 5300                | A                 |
| Short circuit data                                          | $I_{SC}$     | $V_{DD} = 750\text{ V}$ , $V_{GS} = -5/15\text{ V}$ ,<br>$R_{G,on} = 8.2\ \Omega$ ,<br>$R_{G,off} = 2.3\ \Omega$ , $V_{DSmax} =$<br>$V_{DSS} - L_{SDS} \cdot di/dt$ |        | $t_{SC} < 2\ \mu\text{s}$ ,<br>$T_{vj} = 200\text{ °C}$            | 3800                | A                 |
| Thermal resistance, junction to cooling fluid <sup>2)</sup> | $R_{th,j-f}$ | per MOSFET, 50% water / 50% ethylenglycol,<br>$\Delta V/\Delta t = 10\text{ dm}^3/\text{min}$ , $T_f = 60\text{ °C}$                                                |        | 0.139                                                              | 0.144 <sup>3)</sup> | K/W               |
| Temperature under switching conditions                      | $T_{vj,op}$  |                                                                                                                                                                     |        | continuous operation                                               | -40                 | °C                |
|                                                             |              |                                                                                                                                                                     |        | extended operation                                                 |                     |                   |
|                                                             |              |                                                                                                                                                                     |        |                                                                    |                     | 175               |
|                                                             |              |                                                                                                                                                                     |        |                                                                    |                     | 200 <sup>4)</sup> |

- 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
- 3) EoL criteria see AQG324, verified by characterization with 4.5 sigma
- 4) For 100h cumulated over life time

### 3 Body diode (MOSFET)

**Table 7** Maximum rated values

| Parameter                     | Symbol          | Note or test condition                                                 |                                    | Values | Unit |
|-------------------------------|-----------------|------------------------------------------------------------------------|------------------------------------|--------|------|
| Drain-source voltage          | $V_{DSS}$       |                                                                        | continuous operation               | 1200   | V    |
|                               |                 |                                                                        | 10h over lifetime                  | 1400   |      |
| DC body diode forward current | $I_{F,S}$       | $T_{vj,max} = 175\text{ }^{\circ}\text{C}$ ,<br>$V_{GS} = -5\text{ V}$ | $T_f = 65\text{ }^{\circ}\text{C}$ | 142    | A    |
| Pulsed body diode current     | $I_{F,S,pulse}$ | verified by design, $t_p$ limited by $T_{vj,max}$                      |                                    | 620    | A    |

**Table 8** Characteristic values

| Parameter                     | Symbol     | Note or test condition                                                              | Values                                                               |      |      | Unit          |
|-------------------------------|------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------|------|------|---------------|
|                               |            |                                                                                     | Min.                                                                 | Typ. | Max. |               |
| Forward voltage               | $V_{F,SD}$ | $I_{F,S} = 310 \text{ A}$ , $V_{GS} = -5 \text{ V}$                                 | $T_{vj} = 25 \text{ °C}$                                             | 4.65 | 6.03 | V             |
|                               |            |                                                                                     | $T_{vj} = 125 \text{ °C}$                                            | 4.26 |      |               |
|                               |            |                                                                                     | $T_{vj} = 175 \text{ °C}$                                            | 4.10 |      |               |
|                               |            |                                                                                     | $T_{vj} = 200 \text{ °C}$                                            | 4.05 |      |               |
| Peak reverse recovery current | $I_{rrm}$  | $I_{F,S} = 310 \text{ A}$ , $V_{GS} = -5 \text{ V}$ ,<br>$V_{R,DS} = 750 \text{ V}$ | $T_{vj} = 25 \text{ °C}$                                             | 107  |      | A             |
|                               |            |                                                                                     | $T_{vj} = 125 \text{ °C}$                                            | 166  |      |               |
|                               |            |                                                                                     | $T_{vj} = 175 \text{ °C}$                                            | 204  |      |               |
|                               |            |                                                                                     | $T_{vj} = 200 \text{ °C}$                                            | 219  |      |               |
| Recovered charge              | $Q_{rr}$   | $I_{F,S} = 310 \text{ A}$ , $V_{GS} = -5 \text{ V}$ ,<br>$V_{R,DS} = 750 \text{ V}$ | $T_{vj} = 25 \text{ °C}$                                             | 1.69 |      | $\mu\text{C}$ |
|                               |            |                                                                                     | $T_{vj} = 125 \text{ °C}$                                            | 4.30 |      |               |
|                               |            |                                                                                     | $T_{vj} = 175 \text{ °C}$                                            | 6.50 |      |               |
|                               |            |                                                                                     | $T_{vj} = 200 \text{ °C}$                                            | 7.50 |      |               |
| Reverse recovery energy       | $E_{rec}$  | $I_{F,S} = 310 \text{ A}$ , $V_{GS} = -5 \text{ V}$ ,<br>$V_{R,DS} = 750 \text{ V}$ | $T_{vj} = 25 \text{ °C}$ ,<br>$-di/dt = 7.2 \text{ kA}/\mu\text{s}$  | 0.3  |      | mJ            |
|                               |            |                                                                                     | $T_{vj} = 125 \text{ °C}$ ,<br>$-di/dt = 7.5 \text{ kA}/\mu\text{s}$ | 0.9  |      |               |
|                               |            |                                                                                     | $T_{vj} = 175 \text{ °C}$ ,<br>$-di/dt = 7.6 \text{ kA}/\mu\text{s}$ | 1.5  |      |               |
|                               |            |                                                                                     | $T_{vj} = 200 \text{ °C}$ ,<br>$-di/dt = 7.7 \text{ kA}/\mu\text{s}$ | 1.8  |      |               |

## 4 Temperature sensor

**Table 9** Characteristic values

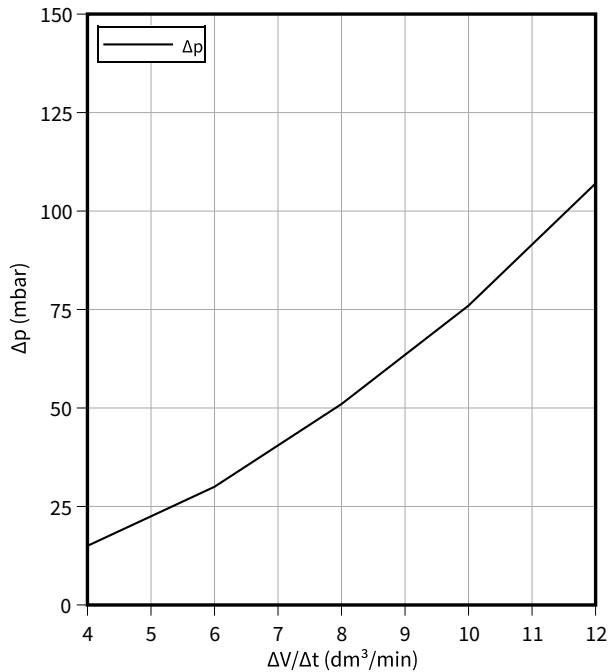
| Parameter               | Symbol   | Note or test condition                                 | Values |       |       | Unit |
|-------------------------|----------|--------------------------------------------------------|--------|-------|-------|------|
|                         |          |                                                        | Min.   | Typ.  | Max.  |      |
| Transient sense current | $I_{TS}$ |                                                        |        |       | 10    | mA   |
| Forward voltage         | $V_{TS}$ | $I_{TS} = 1 \text{ mA}$ ,<br>$T_{vj} = 25 \text{ °C}$  | 2.891  | 2.941 | 2.991 | V    |
|                         |          | $I_{TS} = 1 \text{ mA}$ ,<br>$T_{vj} = 105 \text{ °C}$ | 2.393  | 2.453 | 2.513 |      |

5 Characteristics diagrams

Pressure drop in cooling circuit (typical), Package

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

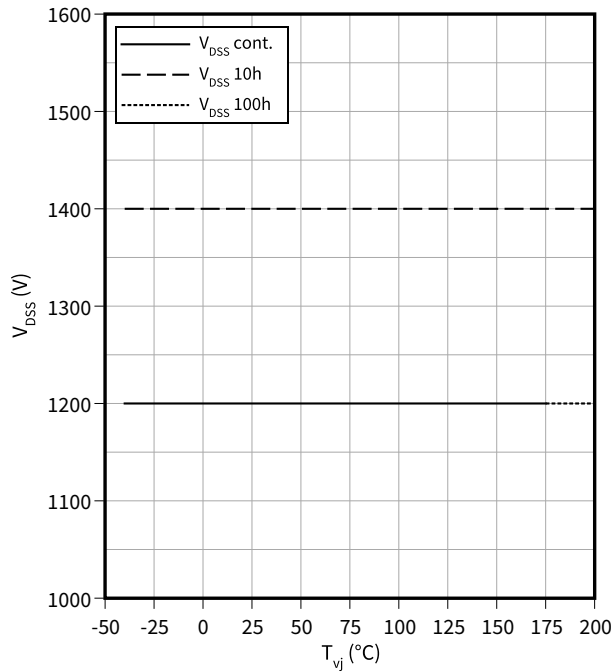
$T_f = 60\text{ }^{\circ}\text{C}$ , fluid = 50% water / 50% ethylenglycol



Maximum allowed drain-source voltage, MOSFET

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

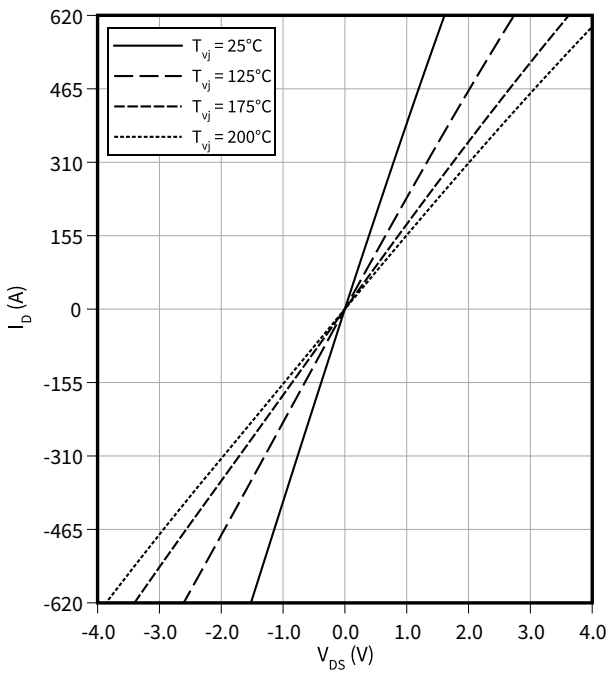
verified by characterization / design, not by test



Output characteristic (typical), MOSFET

$I_D = f(V_{DS})$

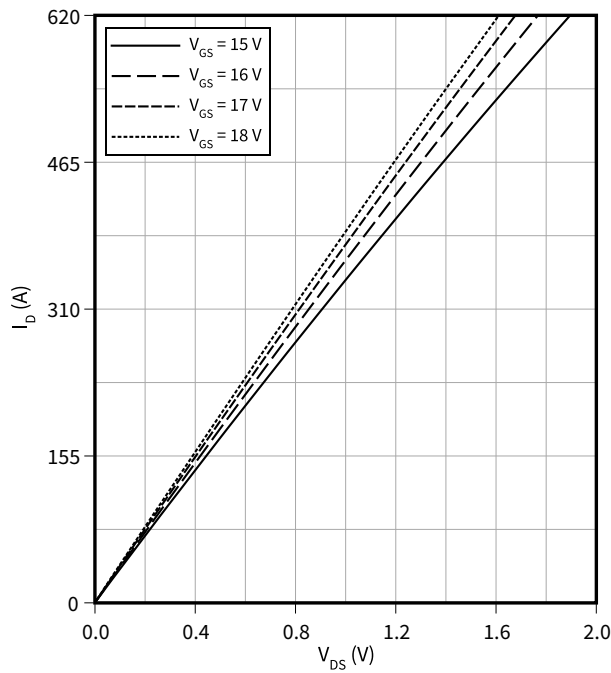
$V_{GS} = 18\text{ V}$



Output characteristic (typical), MOSFET

$I_D = f(V_{DS})$

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

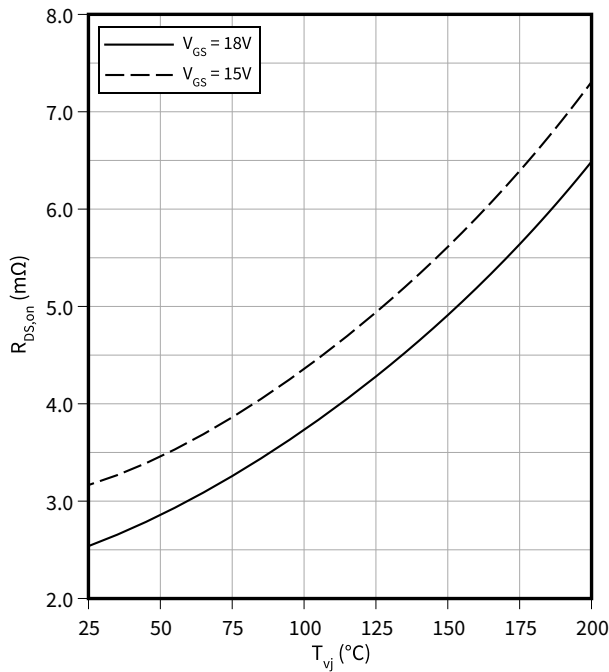




5 Characteristics diagrams

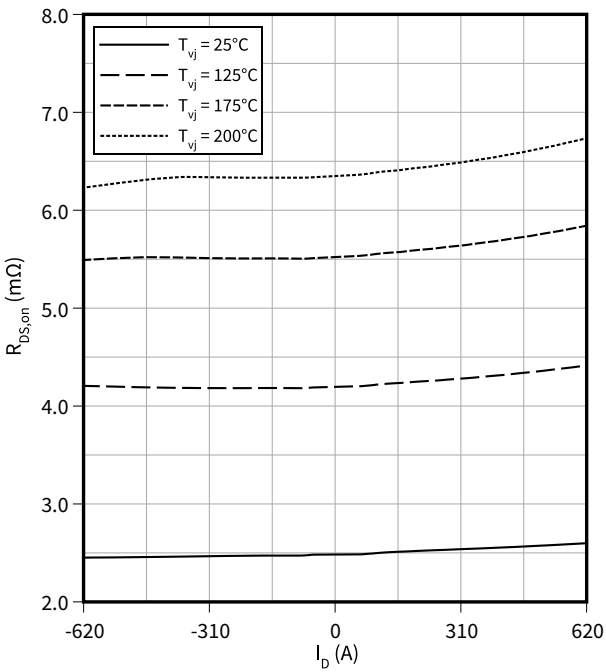
Drain-source on-resistance (typical), MOSFET

$R_{DS,on} = f(T_{vj})$   
 $I_D = 310\text{ A}, V_{GS} = 18\text{ V}$



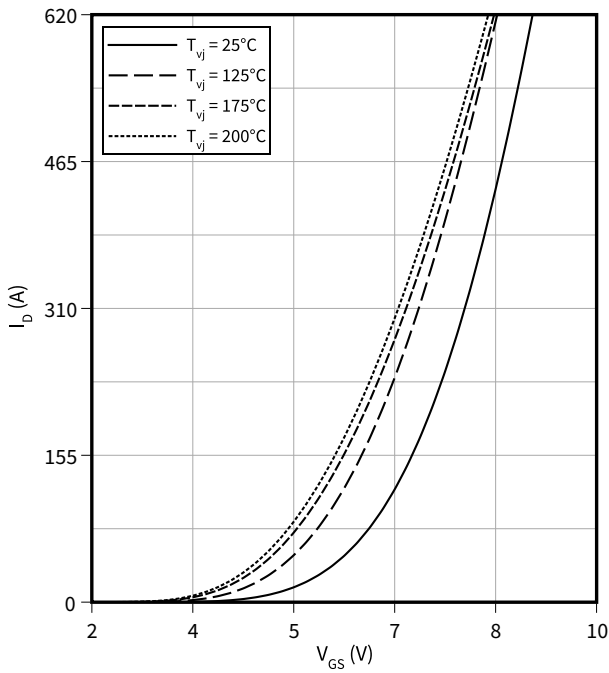
Drain-source on-resistance (typical), MOSFET

$R_{DS,on} = f(I_D)$   
 $V_{GS} = 18\text{ V}$



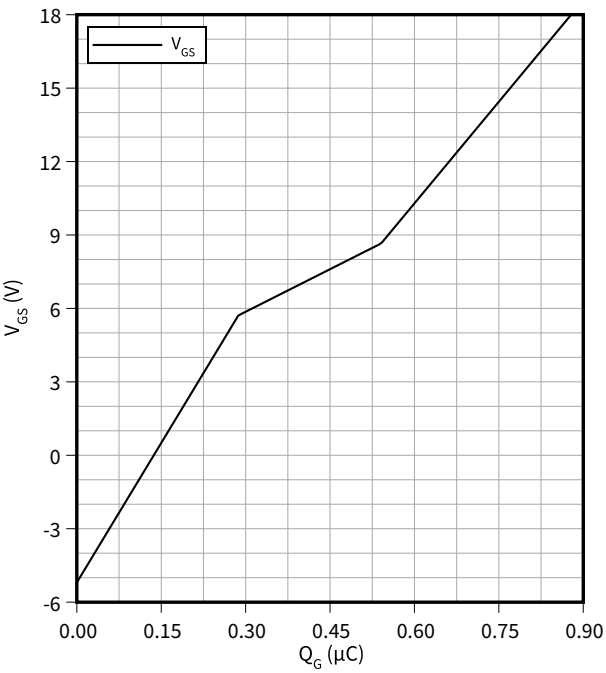
Transfer characteristic (typical), MOSFET

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



Gate charge characteristic (typical), MOSFET

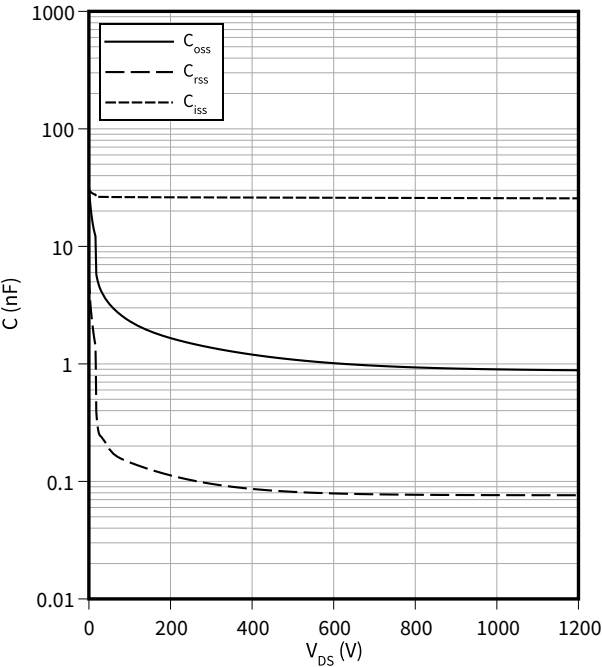
$V_{GS} = f(Q_G)$   
 $V_{DD} = 750\text{ V}, T_{vj} = 25^\circ\text{C}$



5 Characteristics diagrams

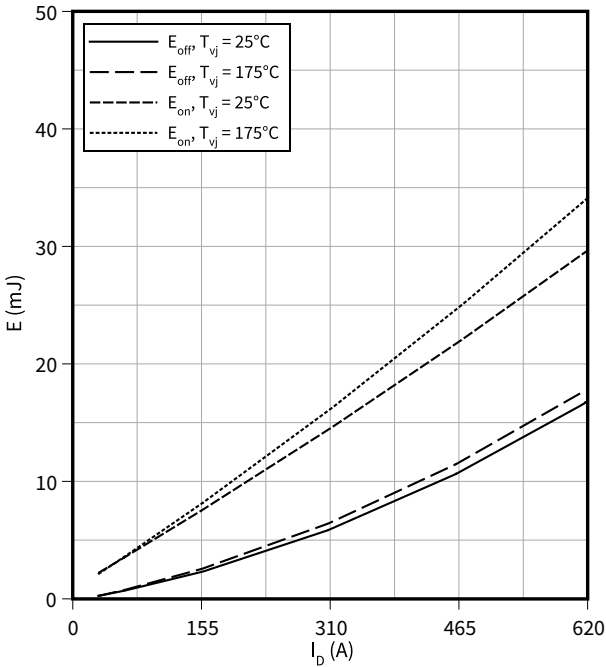
Capacity characteristic (typical), MOSFET

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



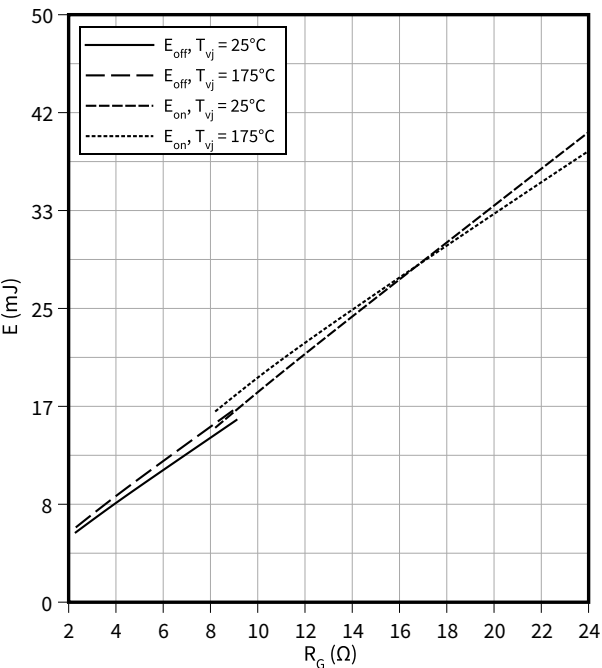
Switching losses (typical), MOSFET

$E = f(I_D)$   
 $V_{DS} = 750\text{ V}$ ,  $R_{G,off} = 2.3\text{ }\Omega$ ,  $R_{G,on} = 8.2\text{ }\Omega$ ,  $V_{GS} = -5/18\text{ V}$



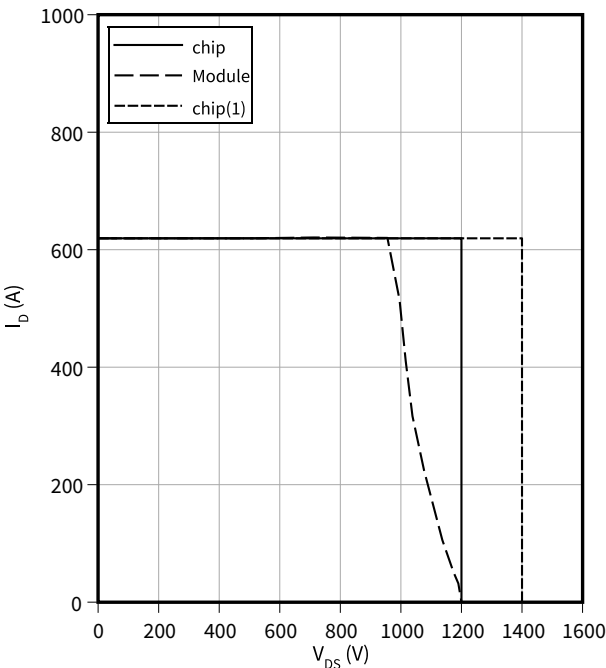
Switching losses (typical), MOSFET

$E = f(R_G)$   
 $V_{DS} = 750\text{ V}$ ,  $I_D = 310\text{ A}$ ,  $V_{GS} = -5/18\text{ V}$



Reverse bias safe operating area (RBSOA), MOSFET

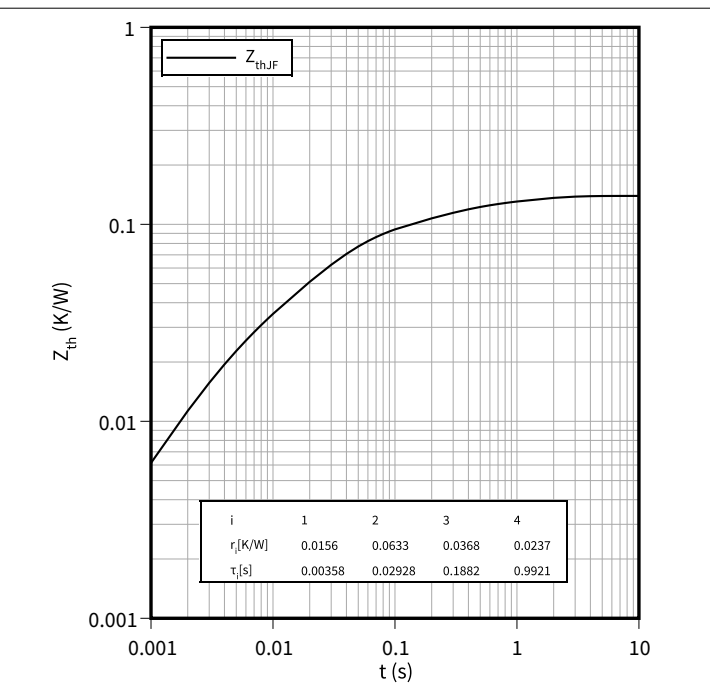
$I_D = f(V_{DS})$   
 $R_{G,off} = 2.3\text{ }\Omega$ ,  $V_{GS} = +18/-5\text{ V}$ ,  $T_{vj} = 25\text{ °C}$   
(1) for 10h over lifetime



5 Characteristics diagrams

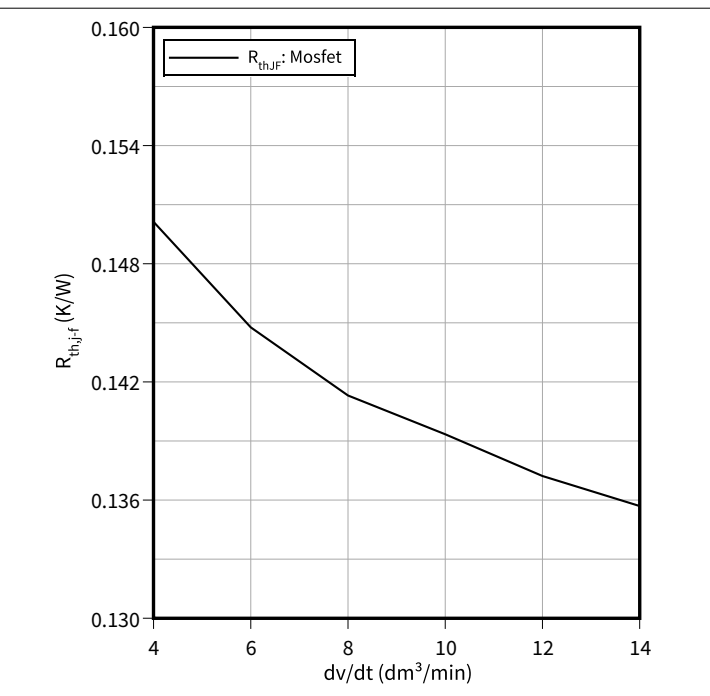
Transient thermal impedance, MOSFET

$Z_{th} = f(t)$   
fluid = 50% water/50% ethylenglycol ,  $T_f = 60\text{ °C}$



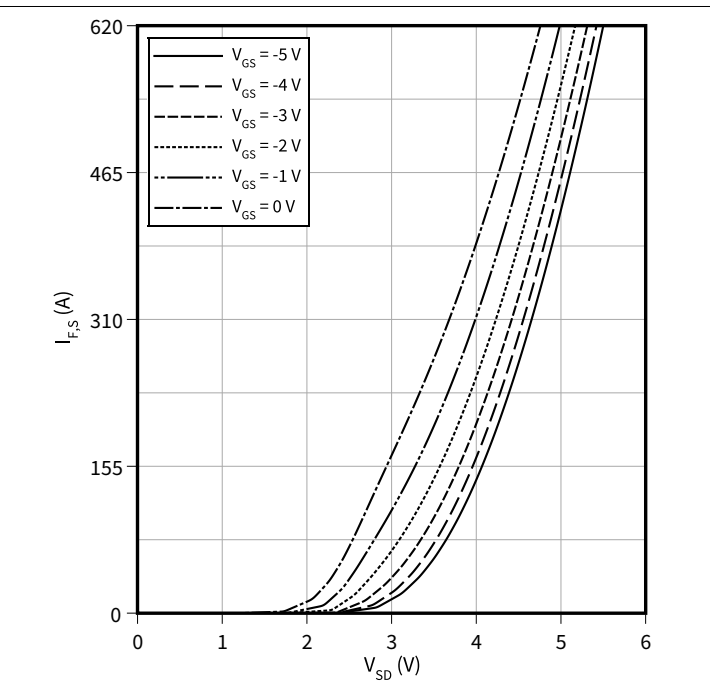
Thermal impedance, MOSFET

$R_{th,j-f} = f(dv/dt)$   
fluid = 50% water/50% ethylenglycol ,  $T_f = 60\text{ °C}$



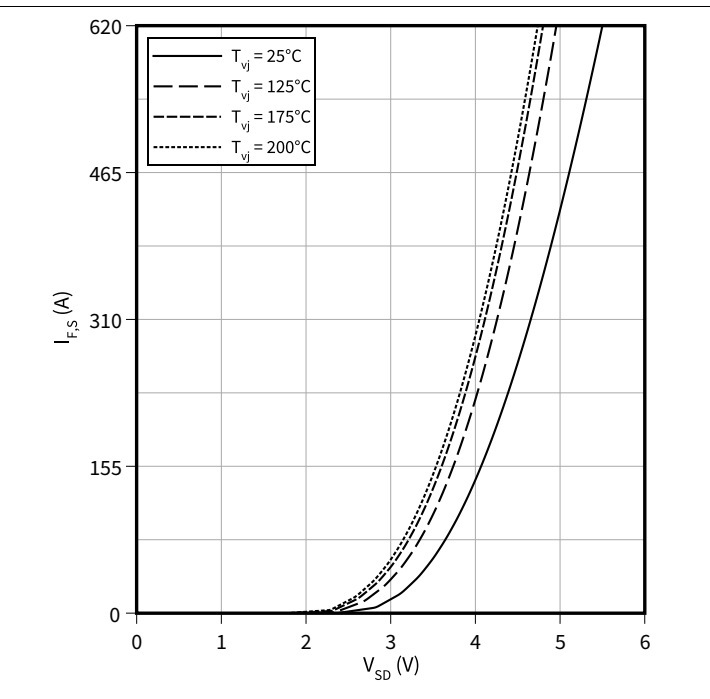
Forward characteristic body diode (typical), MOSFET

$I_{F,S} = f(V_{SD})$   
 $T_{vj} = 25\text{ °C}$



Forward characteristic body diode (typical), MOSFET

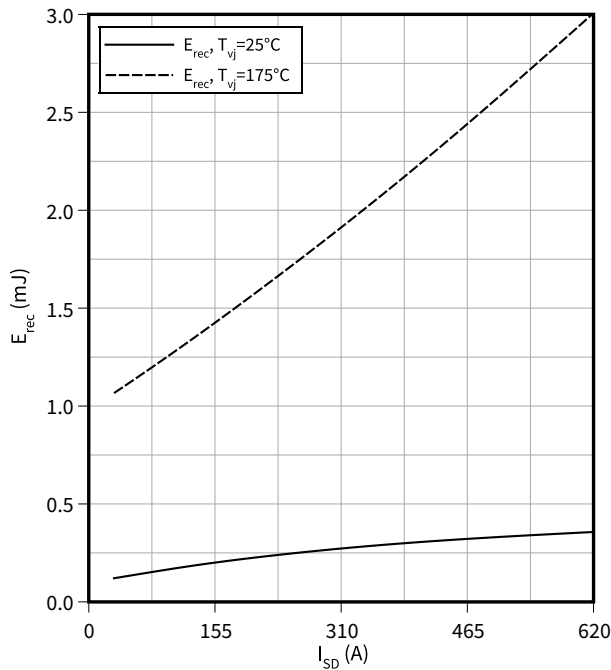
$I_{F,S} = f(V_{SD})$   
 $V_{GS} = -5\text{ V}$



5 Characteristics diagrams

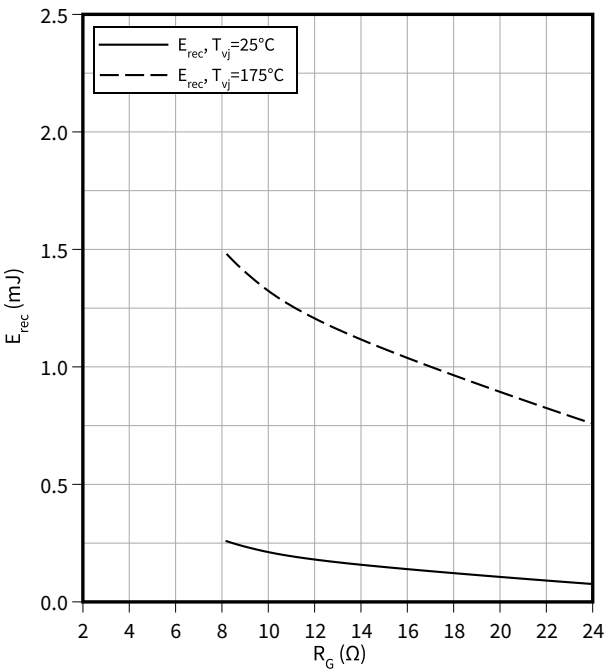
Switching losses body diode (typical), MOSFET

$E_{rec} = f(I_{SD})$   
 $V_r = 750\text{ V}, R_{G,on} = 8.2\ \Omega$



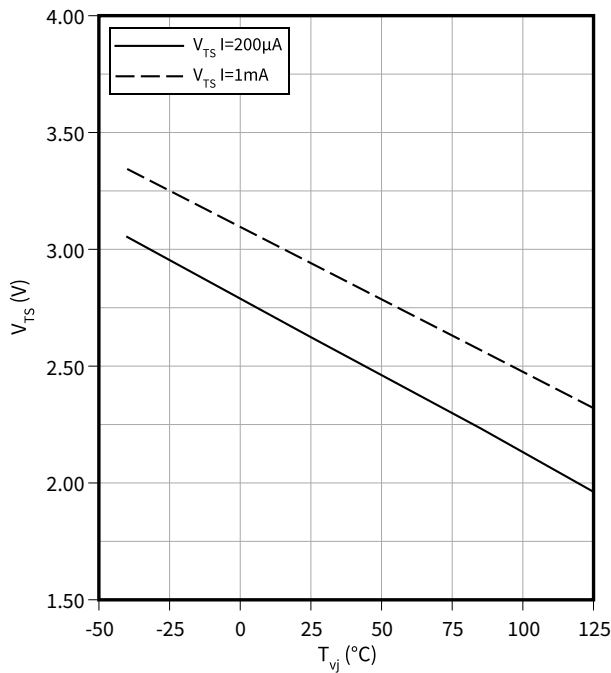
Switching losses body diode (typical), MOSFET

$E_{rec} = f(R_G)$   
 $V_r = 750\text{ V}, I_{F,S} = 310\text{ A}$



Temperature characteristic (typical), Temperature sensor

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



6 Circuit diagram

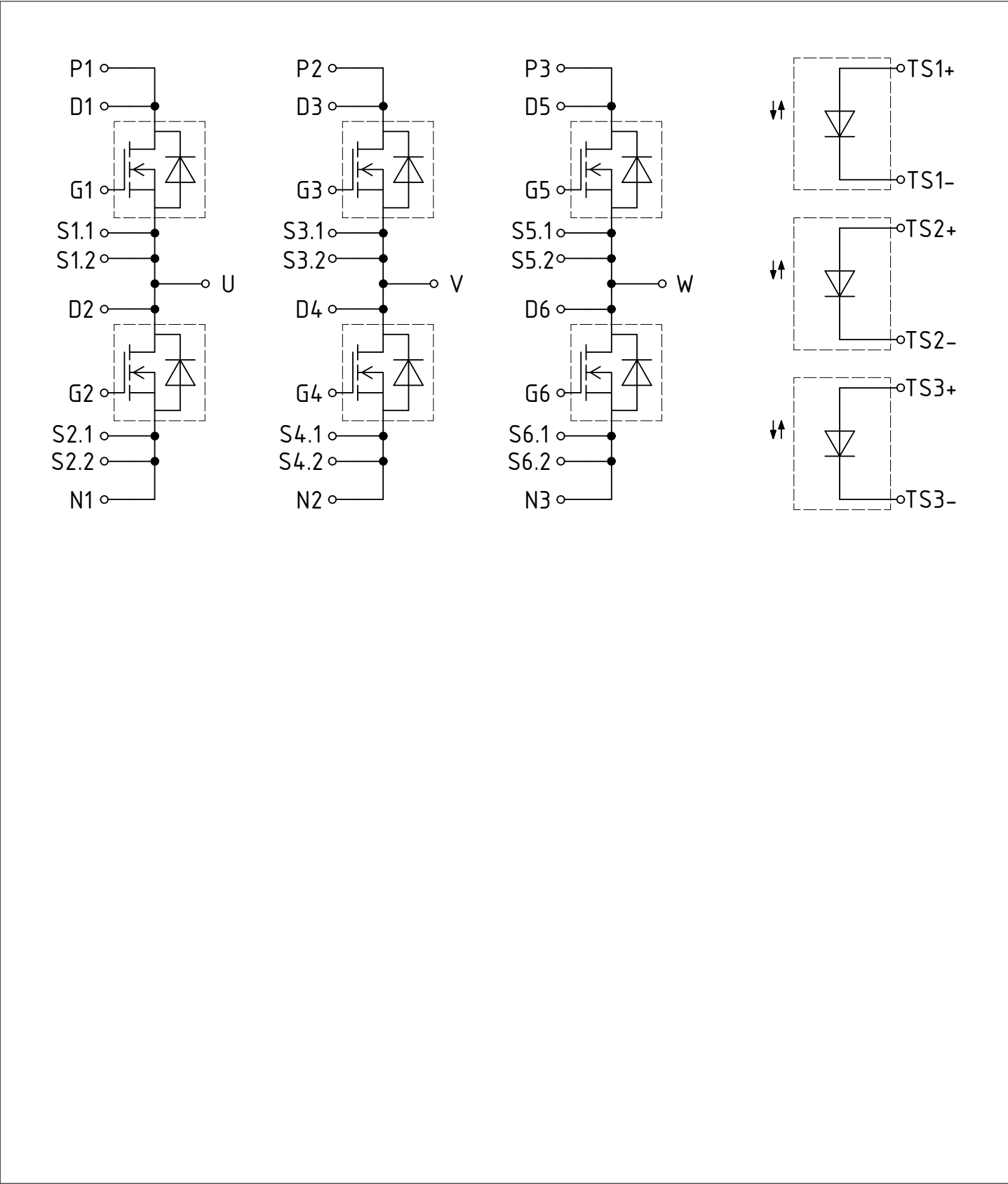


Figure 1

## 7 Package outlines



7 Package outlines

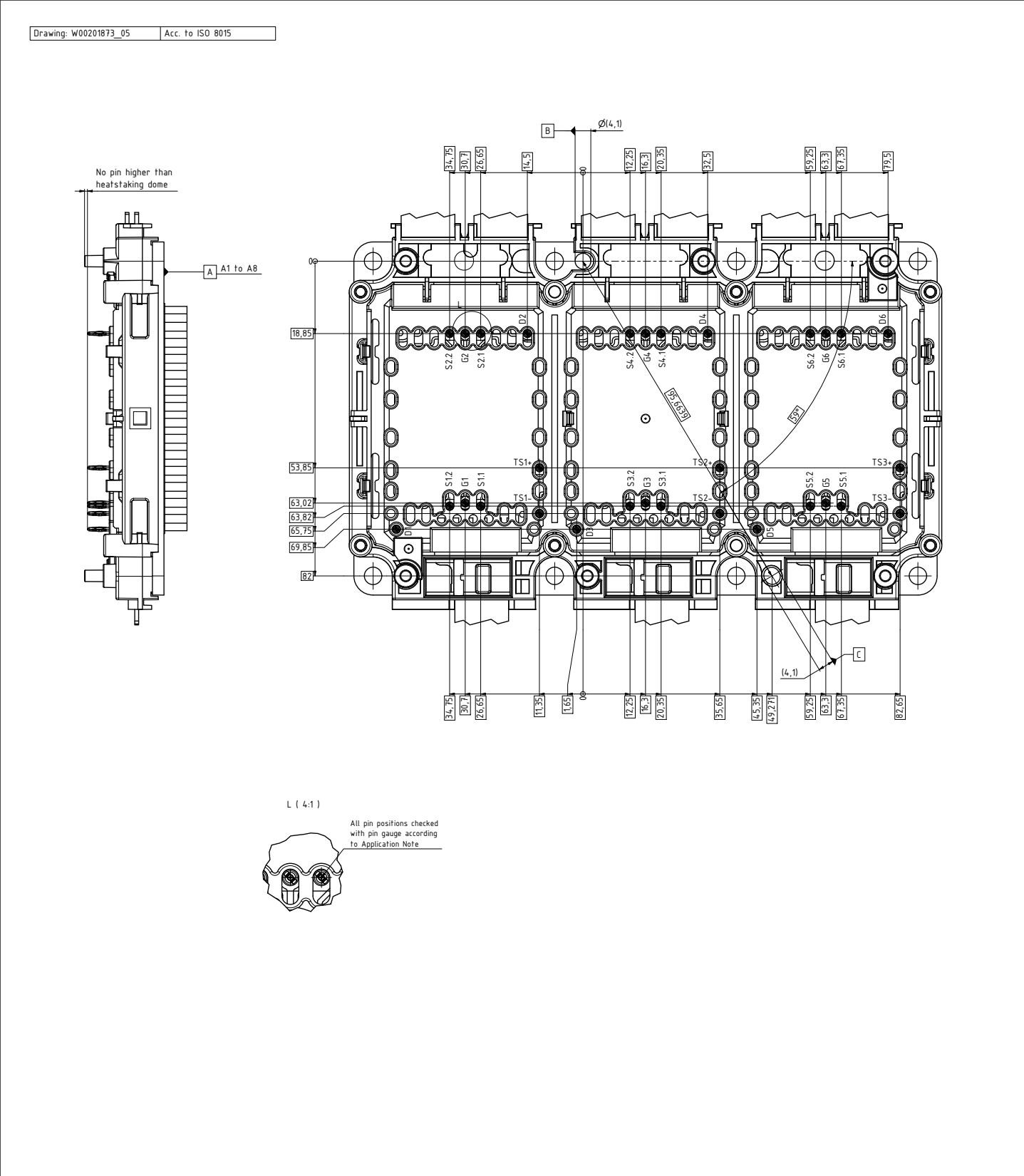


Figure 4



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           | <div></div> <div>7154914284655054991153071549142846550549911530</div> |         |                 |

| Packing label code |                                                                                                                                               |            |         |          |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------------|---------|----------|
| Code format        | Barcode Code128                                                                                                                               |            |         |          |
| Encoding           | Code Set A                                                                                                                                    |            |         |          |
| Symbol size        | 34 digits                                                                                                                                     |            |         |          |
| Standard           | IEC8859-1                                                                                                                                     |            |         |          |
| Code content       | Content                                                                                                                                       | Identifier | Digit   | Example  |
|                    | Module serial number                                                                                                                          | X          | 2 – 9   | 95056609 |
|                    | Module material number                                                                                                                        | 1T         | 12 – 19 | 2X0003E0 |
|                    | Production order number                                                                                                                       | S          | 21 – 25 | 754389   |
|                    | Date code (production year)                                                                                                                   | 9D         | 28 – 31 | 1139     |
|                    | Date code (production week)                                                                                                                   | Q          | 33 – 34 | 15       |
| Example            | <div></div> <div>X950566091T2X0003E0S754389D1139Q15</div> |            |         |          |

Figure 5



Revision history

Revision history

| Document revision | Date of release | Description of changes |
|-------------------|-----------------|------------------------|
| 0.10              | 2023-04-05      | Initial version        |
| 0.20              | 2023-12-18      | Preliminary datasheet  |
| 1.00              | 2024-07-02      | Final datasheet        |

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