

## OptiMOS™-5 Power-Transistor



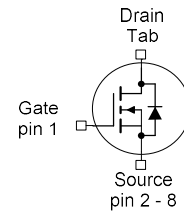
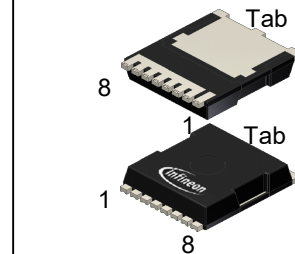
### Features

- OptiMOS™ power MOSFET for automotive applications
- N-channel – Enhancement mode – Normal Level
- Extended qualification beyond AEC-Q101
- Enhanced electrical testing
- Robust design
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- Green product (RoHS compliant)
- 100% Avalanche tested

### Product Summary

|              |     |    |
|--------------|-----|----|
| $V_{DS}$     | 80  | V  |
| $R_{DS(on)}$ | 1.1 | mΩ |
| $I_D$        | 300 | A  |

### PG-HSOF-8-1



| Type             | Package                     | Marking |
|------------------|-----------------------------|---------|
| IAUT300N08S5N011 | <a href="#">PG-HSOF-8-1</a> | 5N08011 |

**Maximum ratings**, at  $T_J=25\text{ °C}$ , unless otherwise specified

| Parameter                                    | Symbol         | Conditions                                                                     | Value        | Unit |
|----------------------------------------------|----------------|--------------------------------------------------------------------------------|--------------|------|
| Continuous drain current                     | $I_D$          | $T_C=25\text{ °C}$ , $V_{GS}=10\text{ V}$ , Chip limitation <sup>1,2)</sup>    | 410          | A    |
|                                              |                | $V_{GS}=10\text{ V}$ , DC current <sup>3)</sup>                                | 300          |      |
|                                              |                | $T_a=85\text{ °C}$ , $V_{GS}=10\text{ V}$ , $R_{thJA}$ on 2s2p <sup>2,4)</sup> | 52           |      |
| Pulsed drain current <sup>2)</sup>           | $I_{D,pulse}$  | $T_C=25\text{ °C}$ , $t_p=100\text{ μs}$                                       | 1505         |      |
| Avalanche energy, single pulse <sup>2)</sup> | $E_{AS}$       | $I_D=150\text{ A}$                                                             | 817          | mJ   |
| Avalanche current, single pulse              | $I_{AS}$       | -                                                                              | 300          | A    |
| Gate source voltage                          | $V_{GS}$       | -                                                                              | ±20          | V    |
| Power dissipation                            | $P_{tot}$      | $T_C=25\text{ °C}$                                                             | 375          | W    |
| Operating and storage temperature            | $T_j, T_{stg}$ | -                                                                              | -55 ... +175 | °C   |
| IEC climatic category; DIN IEC 68-1          | -              | -                                                                              | 55/175/56    |      |

| Parameter | Symbol | Conditions | Values |      |      | Unit |
|-----------|--------|------------|--------|------|------|------|
|           |        |            | min.   | typ. | max. |      |

### Thermal characteristics<sup>2)</sup>

|                                                      |            |  |   |      |     |     |
|------------------------------------------------------|------------|--|---|------|-----|-----|
| Thermal resistance, junction - case                  | $R_{thJC}$ |  | - | -    | 0.4 | K/W |
| Thermal resistance, junction - ambient <sup>4)</sup> | $R_{thJA}$ |  | - | 14.8 | -   |     |

### Electrical characteristics, at $T_j=25^\circ\text{C}$ , unless otherwise specified

#### Static characteristics

|                                  |               |                                                                             |     |     |     |               |
|----------------------------------|---------------|-----------------------------------------------------------------------------|-----|-----|-----|---------------|
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}$ ,<br>$I_D=1\text{ mA}$                                  | 80  | -   | -   | V             |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=V_{GS}$ , $I_D=275\text{ }\mu\text{A}$                              | 2.2 | 3   | 3.8 |               |
| Zero gate voltage drain current  | $I_{DSS}$     | $V_{DS}=80\text{ V}$ , $V_{GS}=0\text{ V}$ ,<br>$T_j=25^\circ\text{C}$      | -   | 0.1 | 1   | $\mu\text{A}$ |
|                                  |               | $V_{DS}=50\text{ V}$ , $V_{GS}=0\text{ V}$ ,<br>$T_j=85^\circ\text{C}^{2)}$ | -   | 1   | 20  |               |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=20\text{ V}$ , $V_{DS}=0\text{ V}$                                  | -   | -   | 100 | nA            |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=6\text{ V}$ , $I_D=75\text{ A}$                                     | -   | 1.3 | 1.7 | m $\Omega$    |
|                                  |               | $V_{GS}=10\text{ V}$ , $I_D=100\text{ A}$                                   | -   | 1.0 | 1.1 |               |
| Gate resistance <sup>2)</sup>    | $R_G$         | -                                                                           | -   | 1.5 | -   | $\Omega$      |

| Parameter | Symbol | Conditions | Values |      |      | Unit |
|-----------|--------|------------|--------|------|------|------|
|           |        |            | min.   | typ. | max. |      |

### Dynamic characteristics<sup>2)</sup>

|                              |              |                                                                                   |   |       |       |    |
|------------------------------|--------------|-----------------------------------------------------------------------------------|---|-------|-------|----|
| Input capacitance            | $C_{iss}$    | $V_{GS}=0\text{ V}, V_{DS}=40\text{ V}, f=1\text{ MHz}$                           | - | 12500 | 16250 | pF |
| Output capacitance           | $C_{oss}$    |                                                                                   | - | 2000  | 2600  |    |
| Reverse transfer capacitance | $C_{rss}$    |                                                                                   | - | 86    | 130   |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=40\text{ V}, V_{GS}=10\text{ V}, I_D=100\text{ A}, R_G=3.5\text{ }\Omega$ | - | 31    | -     | ns |
| Rise time                    | $t_r$        |                                                                                   | - | 19    | -     |    |
| Turn-off delay time          | $t_{d(off)}$ |                                                                                   | - | 69    | -     |    |
| Fall time                    | $t_f$        |                                                                                   | - | 55    | -     |    |

### Gate Charge Characteristics<sup>2)</sup>

|                       |               |                                                                        |   |     |     |    |
|-----------------------|---------------|------------------------------------------------------------------------|---|-----|-----|----|
| Gate to source charge | $Q_{gs}$      | $V_{DD}=40\text{ V}, I_D=100\text{ A}, V_{GS}=0\text{ to }10\text{ V}$ | - | 56  | 73  | nC |
| Gate to drain charge  | $Q_{gd}$      |                                                                        | - | 37  | 56  |    |
| Gate charge total     | $Q_g$         |                                                                        | - | 178 | 231 |    |
| Gate plateau voltage  | $V_{plateau}$ |                                                                        | - | 4.5 | -   | V  |

### Reverse Diode

|                                                |               |                                                                      |   |     |      |    |
|------------------------------------------------|---------------|----------------------------------------------------------------------|---|-----|------|----|
| Diode continuous forward current <sup>2)</sup> | $I_S$         | $T_C=25\text{ }^\circ\text{C}$                                       | - | -   | 300  | A  |
| Diode pulse current <sup>2)</sup>              | $I_{S,pulse}$ | $T_C=25\text{ }^\circ\text{C}$                                       | - | -   | 1505 |    |
| Diode forward voltage                          | $V_{SD}$      | $V_{GS}=0\text{ V}, I_F=100\text{ A}, T_J=25\text{ }^\circ\text{C}$  | - | 0.9 | 1.2  | V  |
| Reverse recovery time <sup>2)</sup>            | $t_{rr}$      | $V_R=40\text{ V}, I_F=50\text{ A}, di_F/dt=100\text{ A}/\mu\text{s}$ | - | 86  | -    | ns |
| Reverse recovery charge <sup>2)</sup>          | $Q_{rr}$      |                                                                      | - | 177 | -    | nC |

<sup>1)</sup> Practically the current is limited by the overall system design including the customer-specific PCB.

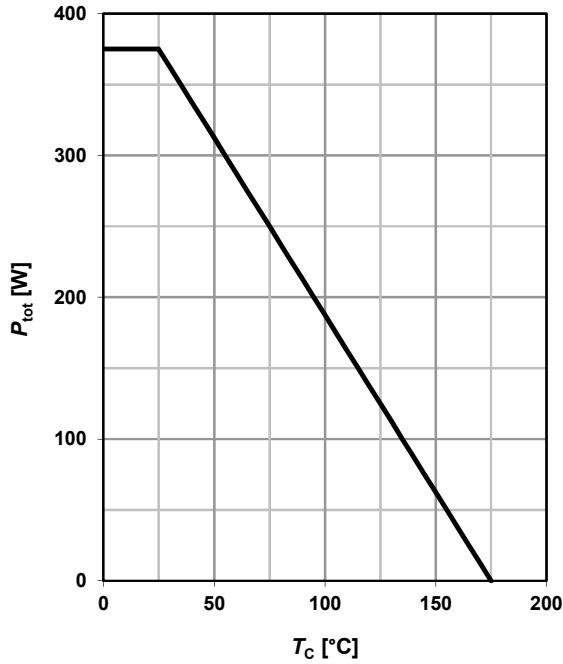
<sup>2)</sup> The parameter is not subject to production testing – specified by design.

<sup>3)</sup> Current is limited by the bondwires.

<sup>4)</sup> Device on 2s2p FR4 PCB defined in accordance with JEDEC standards (JESD51-5, -7). PCB is vertical in still air.

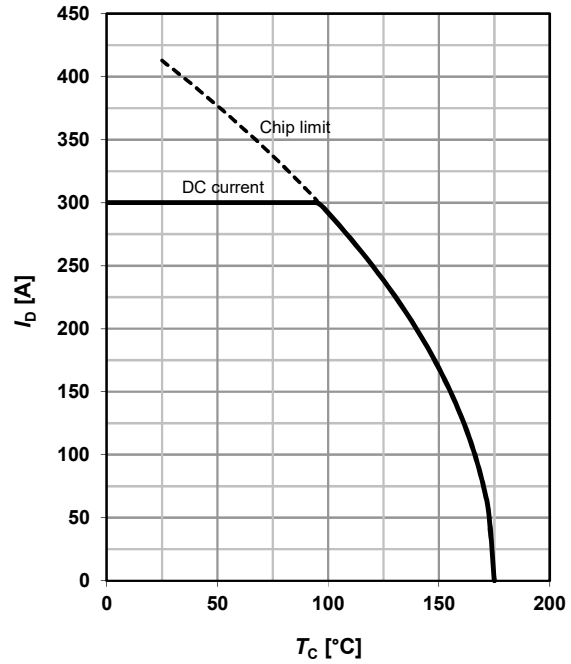
### 1 Power dissipation

$$P_{\text{tot}} = f(T_C); V_{\text{GS}} \geq 6 \text{ V}$$



### 2 Drain current

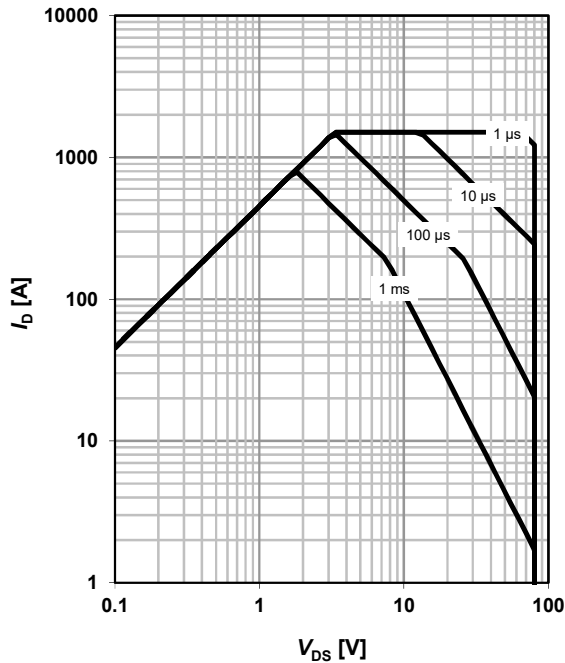
$$I_D = f(T_C); V_{\text{GS}} \geq 6 \text{ V}$$



### 3 Safe operating area

$$I_D = f(V_{\text{DS}}); T_C = 25^\circ\text{C}; D = 0$$

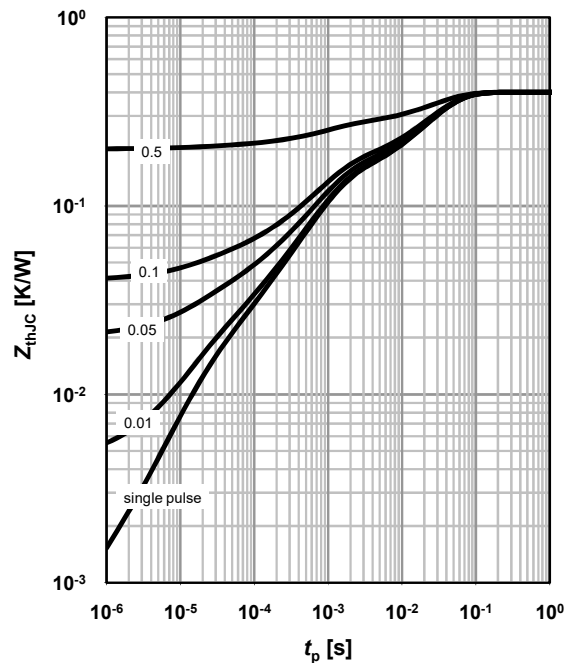
parameter:  $t_p$



### 4 Max. transient thermal impedance

$$Z_{\text{thJC}} = f(t_p)$$

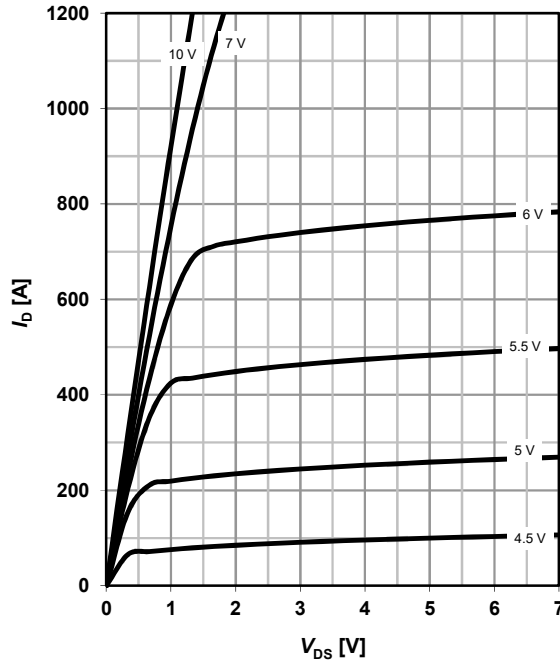
parameter:  $D = t_p/T$



### 5 Typ. output characteristics

$$I_D = f(V_{DS}); T_j = 25^\circ\text{C}$$

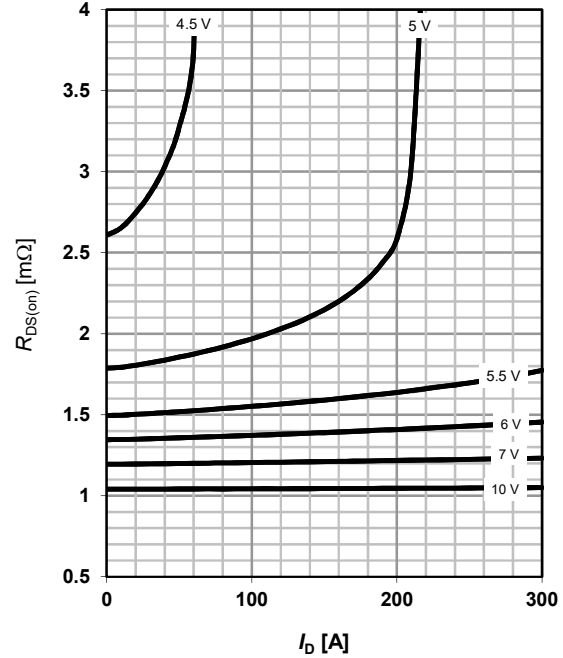
parameter:  $V_{GS}$



### 6 Typ. drain-source on-state resistance

$$R_{DS(on)} = f(I_D); T_j = 25^\circ\text{C}$$

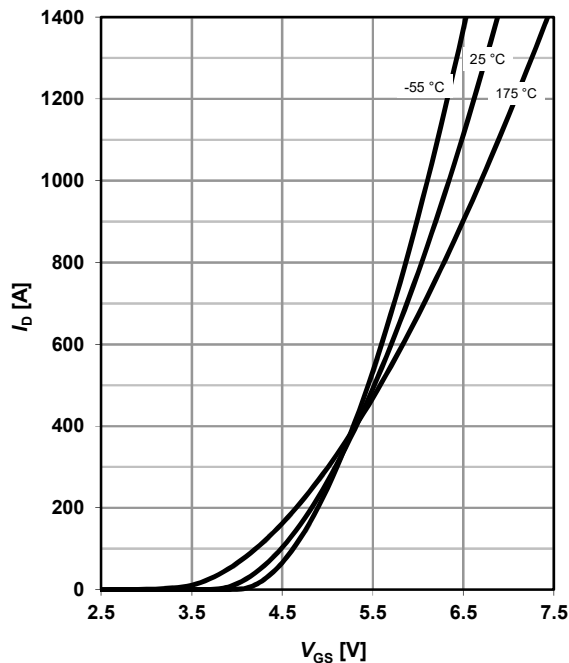
parameter:  $V_{GS}$



### 7 Typ. transfer characteristics

$$I_D = f(V_{GS}); V_{DS} = 6\text{ V}$$

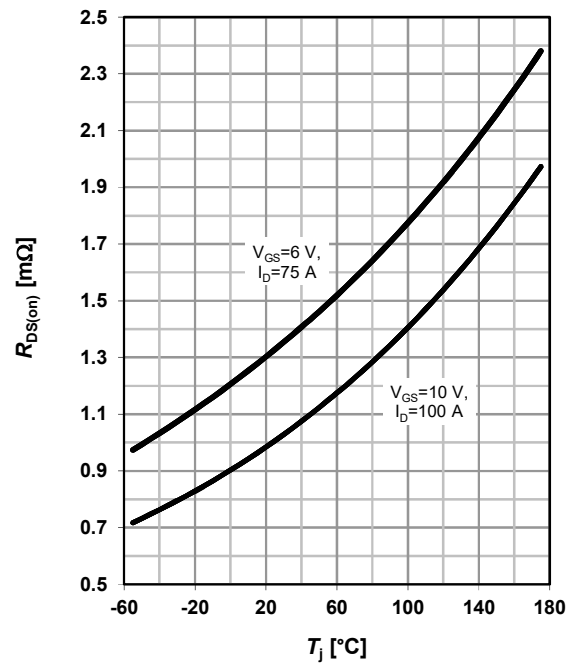
parameter:  $T_j$



### 8 Typ. drain-source on-state resistance

$$R_{DS(on)} = f(T_j)$$

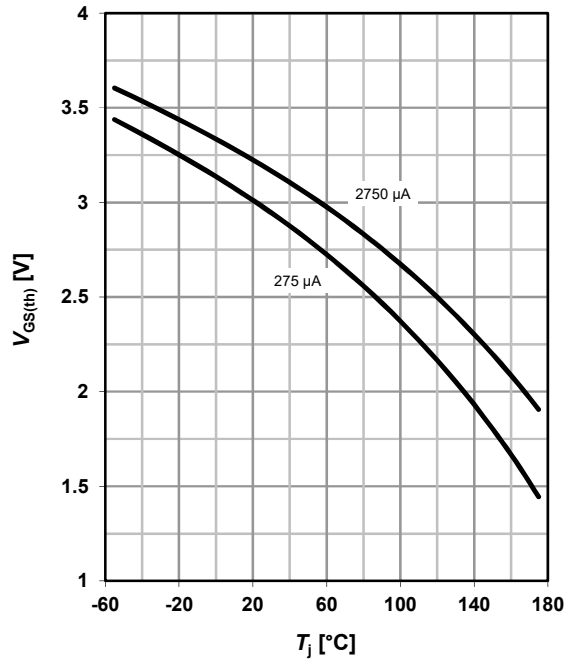
parameter:  $I_D, V_{GS}$



### 9 Typ. gate threshold voltage

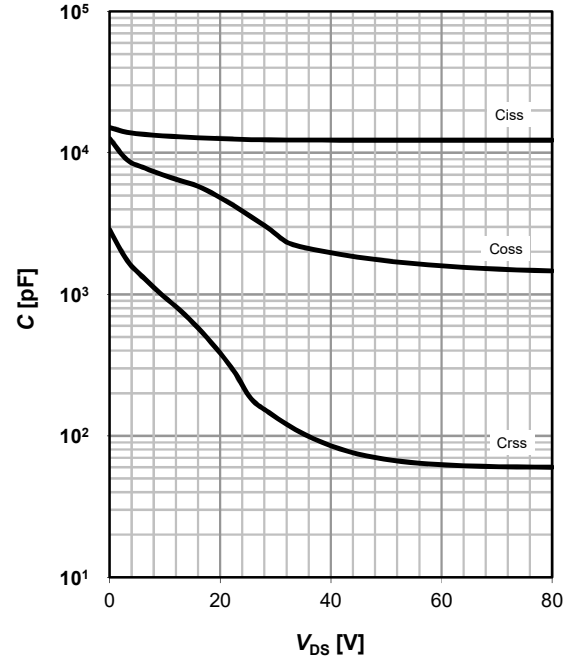
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$$

parameter:  $I_D$



### 10 Typ. capacitances

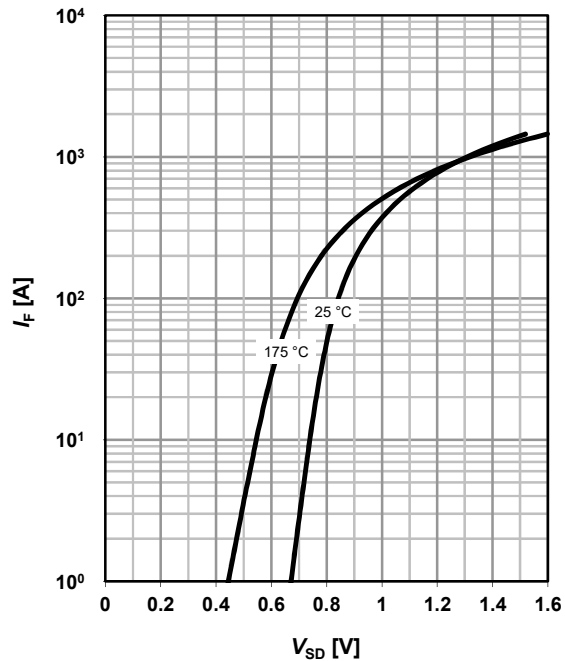
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



### 11 Typical forward diode characteristics

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

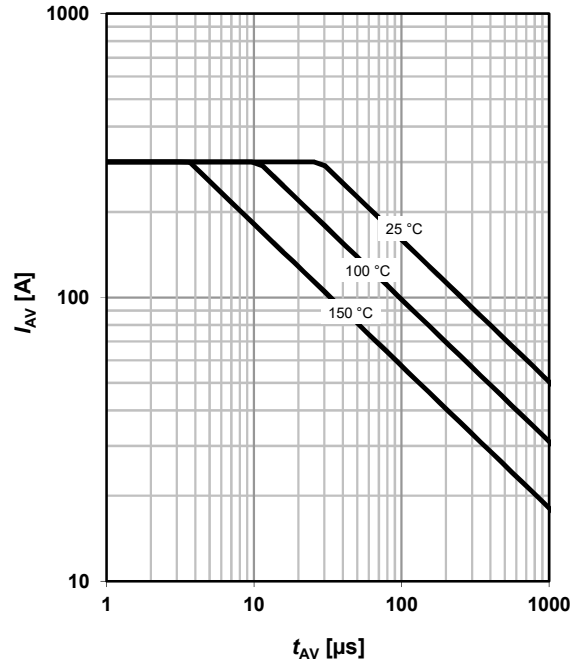
parameter:  $T_j$



### 12 Typ. avalanche characteristics

$$I_{AS} = f(t_{AV})$$

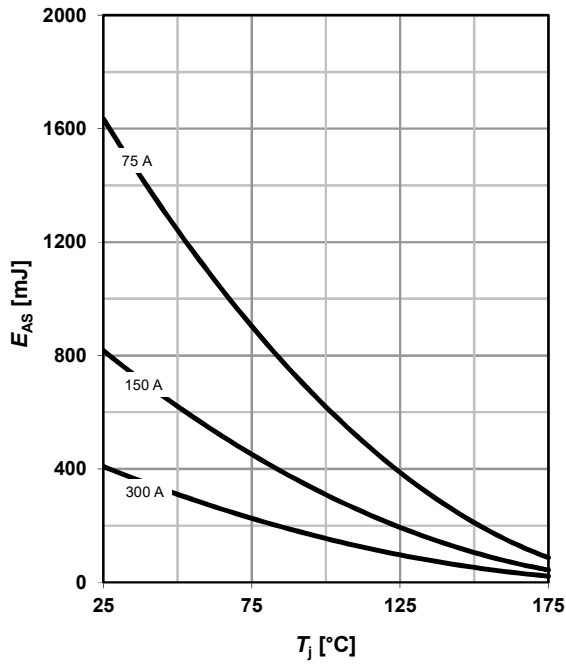
parameter:  $T_{j(start)}$



### 13 Typical avalanche energy

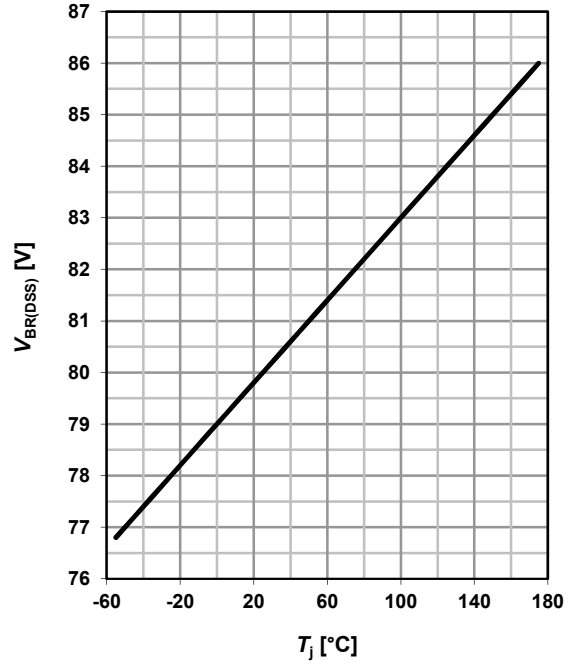
$$E_{AS} = f(T_j)$$

parameter:  $I_D$



### 14 Drain-source breakdown voltage

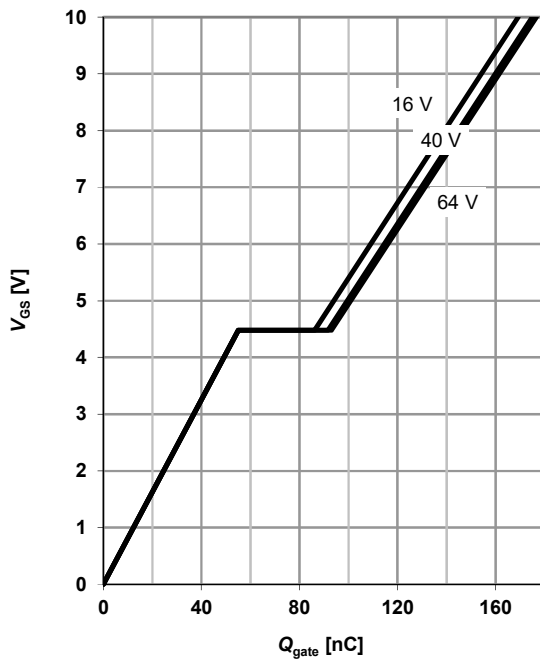
$$V_{BR(DSS)} = f(T_j); I_{D\_typ} = 1\text{ mA}$$



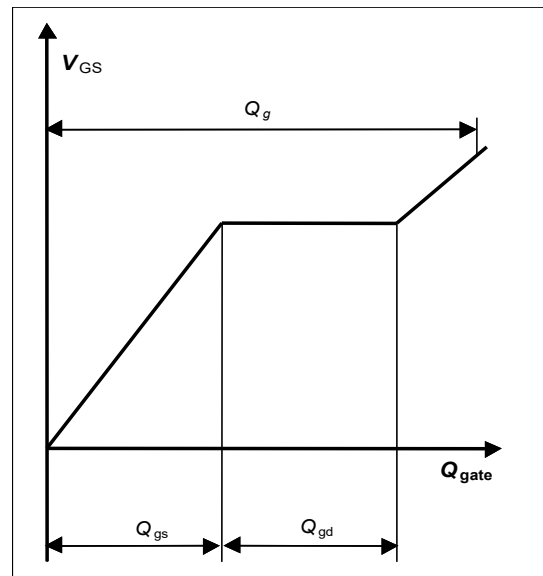
### 15 Typ. gate charge

$$V_{GS} = f(Q_{gate}); I_D = 100\text{ A pulsed}$$

parameter:  $V_{DD}$



### 16 Gate charge waveforms



Technical drawing of a rectangular component with dimensions in mm. The drawing includes a top view, a side view, and a detailed view of the bottom edge.

**Top View Dimensions:**

- Overall width:  $9.9 \pm 0.2$
- Overall height:  $11.675 \pm 0.2$
- Inner width:  $10.375^{+0.2}_{-0.1}$
- Inner height:  $10.375^{+0.2}_{-0.1}$
- Top flange width:  $3 \times 1.2 \pm 0.1$
- Top flange height:  $2 \times 3.1 \pm 0.1$
- Bottom flange width:  $3.26 \pm 0.1$
- Bottom flange height:  $0.5 \pm 0.1$
- Central hole diameter:  $7.5$
- Inner frame width:  $4.18$  (reference:  $3.3$ )
- Inner frame height:  $4.23$  (reference:  $3.3$ )
- Bottom edge feature width:  $0.45^{+0.05}_{-0.03}$
- Bottom edge feature height:  $1.9^{+0.2}_{-0.3}$
- Bottom edge feature pitch:  $0.4 \pm 0.1$
- Bottom edge feature count:  $6 \times 0.4 \pm 0.1$
- Bottom edge feature count:  $8 \times 0.8 \pm 0.1$

**Side View Dimensions:**

- Overall width:  $9.8 \pm 0.1$
- Overall height:  $7.15$
- Inner width:  $7.5$
- Inner height:  $6.65 \pm 0.1$  (reference:  $3.26$ ,  $3.59$ )
- Bottom flange width:  $8.5$
- Bottom flange height:  $0.23 \pm 0.1$
- Bottom edge feature width:  $0.4 \pm 0.1$
- Bottom edge feature height:  $1.2^{+0.1}_{-0.2}$
- Bottom edge feature count:  $6 \times 0.4 \pm 0.1$
- Bottom edge feature count:  $8 \times 0.8 \pm 0.1$

**Label:** A

PG-HSOF-8-1-PO V07

PG-HSOF-8-1-FP V01



Technical drawing of the 3000 Series 12, showing a top view and a side view. The top view is a rectangular plate with three square openings. The overall width is 12, and the overall height is 20. The distance between the centers of the square openings is 10.2. The distance from the left edge to the center of the first square opening is 4. The distance from the center of the first square opening to the center of the second square opening is 12. The distance from the center of the second square opening to the right edge is 4. The side view shows a cross-section of the plate with a thickness of 0.3 and a bottom flange with a height of 2.6.

The drawing is in compliance with ISO 128-30, Projection Method 1 [1st angle]

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**Revision History**

| <b>Version</b> | <b>Date</b> | <b>Changes</b>              |
|----------------|-------------|-----------------------------|
| Version 1.0    | 2021-01-19  | Final Datasheet             |
| Version 1.1    | 2021-01-26  | Part Marking Info corrected |