



## OptiMOS™-5 Power-Transistor



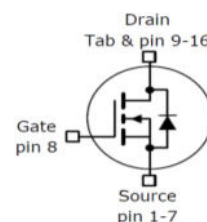
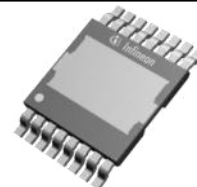
### Features

- 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

|              |     |    |
|--------------|-----|----|
| $V_{DS}$     | 100 | V  |
| $R_{DS(on)}$ | 1.5 | mΩ |
| $I_D$        | 300 | A  |

### [PG-HDSOP-16-2](#)



| Type              | Package                       | Marking |
|-------------------|-------------------------------|---------|
| IAUS300N10S5N015T | <a href="#">PG-HDSOP-16-2</a> | 5N10015 |

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

| Parameter                                    | Symbol         | Conditions                                                                     | Value        | Unit |
|----------------------------------------------|----------------|--------------------------------------------------------------------------------|--------------|------|
| Continuous drain current                     | $I_D$          | $V_{GS}=10\text{ V}$ , Chip limitation <sup>1,2)</sup>                         | 350          | 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> | 103          |      |
| Pulsed drain current <sup>2)</sup>           | $I_{D,pulse}$  | $T_C=25\text{ °C}$ , $t_p=100\text{ }\mu\text{s}$                              | 1272         |      |
| Avalanche energy, single pulse <sup>2)</sup> | $E_{AS}$       | $I_D=150\text{ A}$                                                             | 652          | 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                  | $R_{thJC}$ | Top                  | - | -   | 0.4 | K/W |
|                                                      |            | Bottom (Pin 1-7)     | - | 9   | -   |     |
|                                                      |            | Bottom (Pin 9-16)    | - | 3   | -   |     |
| Thermal resistance, junction - ambient <sup>4)</sup> | $R_{thJA}$ | Top                  | - | 2.8 | -   |     |
|                                                      |            | Bottom (through PCB) | - | 40  | -   |     |

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

|                                  |               |                                                                                       |     |     |     |               |
|----------------------------------|---------------|---------------------------------------------------------------------------------------|-----|-----|-----|---------------|
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}$ ,<br>$I_D=1\text{ mA}$                                            | 100 | -   | -   | V             |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=V_{GS}$ , $I_D=275\text{ }\mu\text{A}$                                        | 2.2 | 3.0 | 3.8 |               |
| Zero gate voltage drain current  | $I_{DSS}$     | $V_{DS}=100\text{ V}$ , $V_{GS}=0\text{ V}$ ,<br>$T_j=25\text{ }^{\circ}\text{C}$     | -   | 0.1 | 1   | $\mu\text{A}$ |
|                                  |               | $V_{DS}=50\text{ V}$ , $V_{GS}=0\text{ V}$ ,<br>$T_j=85\text{ }^{\circ}\text{C}^{2)}$ | -   | 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 | $R_{DS(on)}$  | $V_{GS}=6\text{ V}$ , $I_D=75\text{ A}$                                               | -   | 1.6 | 2.1 | m $\Omega$    |
|                                  |               | $V_{GS}=10\text{ V}$ , $I_D=100\text{ A}$                                             | -   | 1.3 | 1.5 |               |
| 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            | $C_{iss}$    | $V_{GS}=0\text{ V}, V_{DS}=50\text{ V},$<br>$f=1\text{ MHz}$                     | - | 12316 | 16011 | pF |
| Output capacitance           | $C_{oss}$    |                                                                                  | - | 1920  | 2496  |    |
| Reverse transfer capacitance | $C_{rss}$    |                                                                                  | - | 84    | 126   |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=50\text{ V}, V_{GS}=10\text{ V},$<br>$I_D=100\text{ A}, R_G=3.5\ \Omega$ | - | 29    | -     | ns |
| Rise time                    | $t_r$        |                                                                                  | - | 15    | -     |    |
| Turn-off delay time          | $t_{d(off)}$ |                                                                                  | - | 70    | -     |    |
| Fall time                    | $t_f$        |                                                                                  | - | 48    | -     |    |

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

|                       |               |                                                                             |   |     |     |    |
|-----------------------|---------------|-----------------------------------------------------------------------------|---|-----|-----|----|
| Gate to source charge | $Q_{gs}$      | $V_{DD}=50\text{ V}, I_D=100\text{ A},$<br>$V_{GS}=0\text{ to }10\text{ V}$ | - | 52  | 68  | nC |
| Gate to drain charge  | $Q_{gd}$      |                                                                             | - | 33  | 50  |    |
| Gate charge total     | $Q_g$         |                                                                             | - | 166 | 216 |    |
| Gate plateau voltage  | $V_{plateau}$ |                                                                             | - | 4.4 | -   | V  |

**Reverse Diode**

|                                                |               |                                                                           |   |     |      |    |
|------------------------------------------------|---------------|---------------------------------------------------------------------------|---|-----|------|----|
| Diode continuous forward current <sup>2)</sup> | $I_S$         | $T_C=25\text{ °C}$                                                        | - | -   | 300  | A  |
| Diode pulse current <sup>2)</sup>              | $I_{S,pulse}$ | $T_C=25\text{ °C}, t_p=100\ \mu\text{s}$                                  | - | -   | 2398 |    |
| Diode forward voltage                          | $V_{SD}$      | $V_{GS}=0\text{ V}, I_F=100\text{ A},$<br>$T_J=25\text{ °C}$              | - | 0.9 | 1.3  | V  |
| Reverse recovery time <sup>2)</sup>            | $t_{rr}$      | $V_R=50\text{ V}, I_F=50\text{ A},$<br>$di_F/dt=100\text{ A}/\mu\text{s}$ | - | 90  | -    | ns |
| Reverse recovery charge <sup>2)</sup>          | $Q_{rr}$      |                                                                           | - | 220 | -    | nC |

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

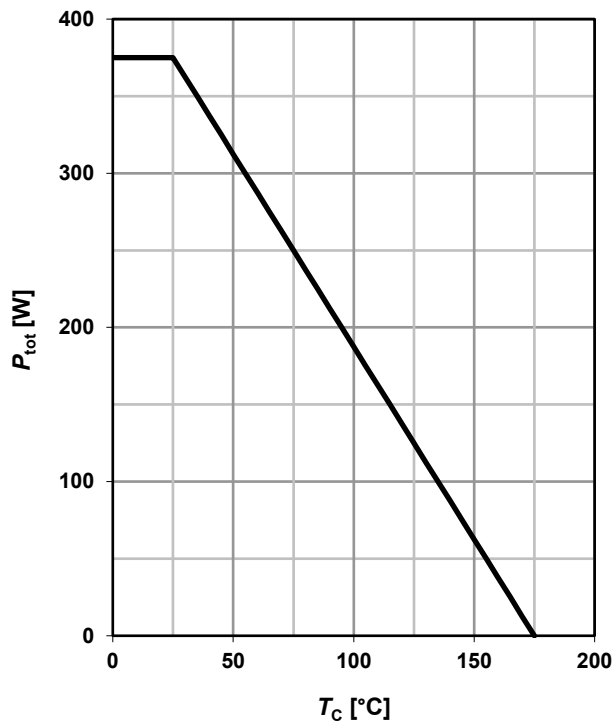
<sup>2)</sup> The parameter is not subject to production testing – specified by design.

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

<sup>4)</sup> Device on a four-layer 2s2p FR4 PCB with topside cooling. Thermal insulation material is 100  $\mu\text{m}$  thick and has a conductivity of 0.7 W/mK. Top surface of heat sink is fixed at ambient temperature. Bottom surface of PCB is left at free convection. Values may vary depending on the customer-specific design.

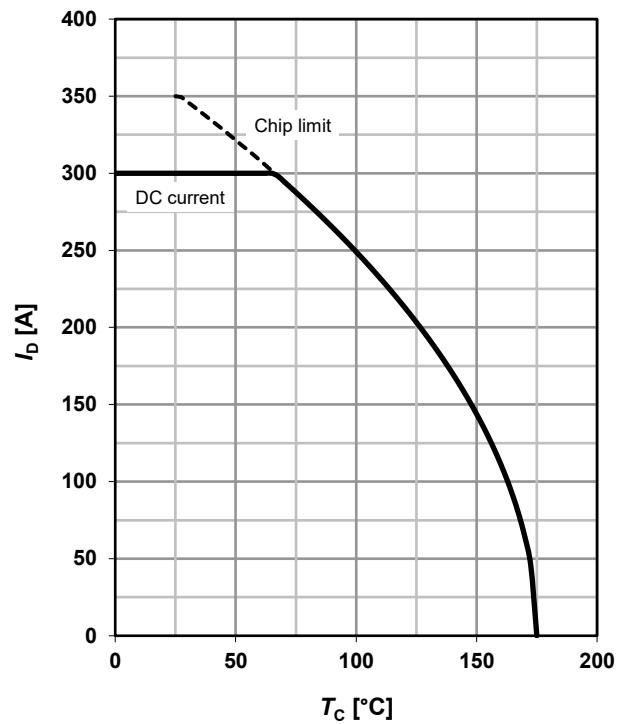
### 1 Power dissipation

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



### 2 Drain current

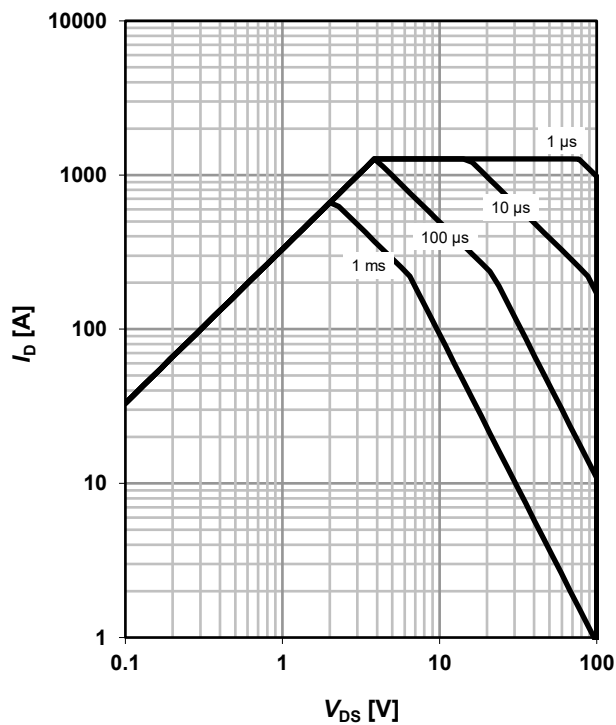
$$I_D = f(T_C); V_{\text{GS}} \geq 6 \text{ V}$$



### 3 Safe operating area

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

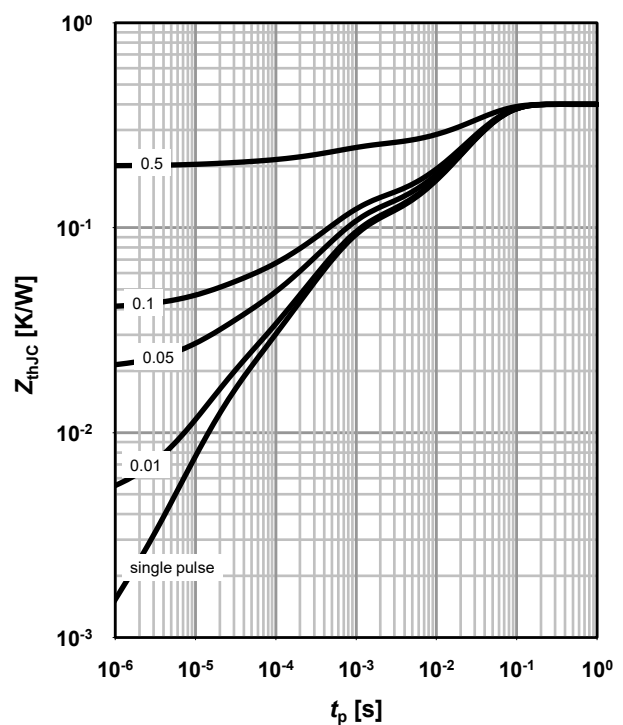
parameter:  $t_p$



### 4 Max. transient thermal impedance

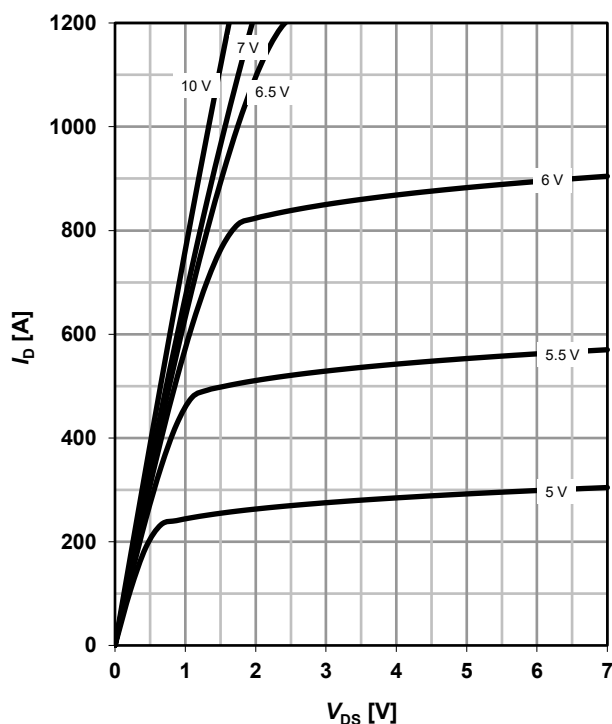
$$Z_{\text{thJC}} = f(t_p)$$

parameter:  $D = t_p/T$

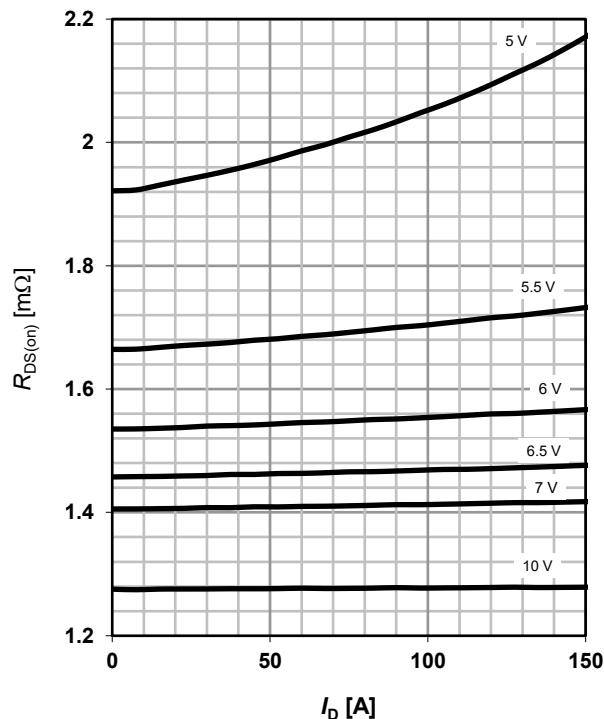


**5 Typ. output characteristics**

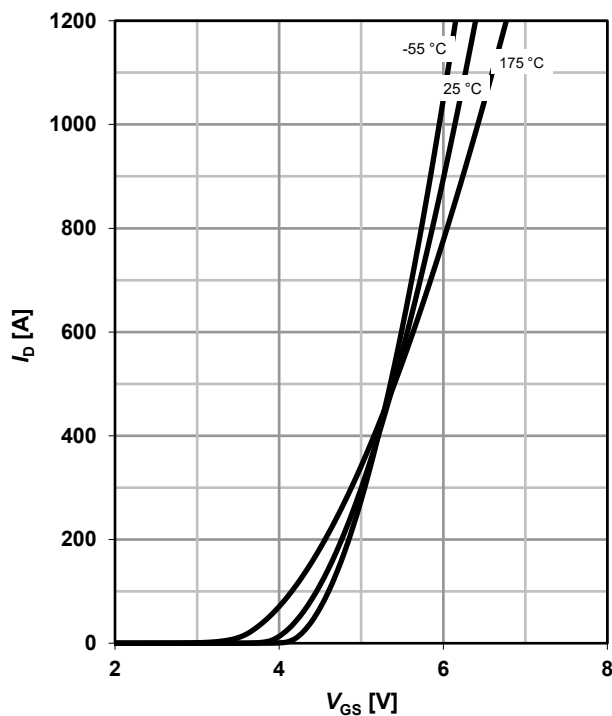
$$I_D = f(V_{DS}); T_j = 25^\circ\text{C}$$

parameter:  $V_{GS}$ **6 Typ. drain-source on-state resistance**

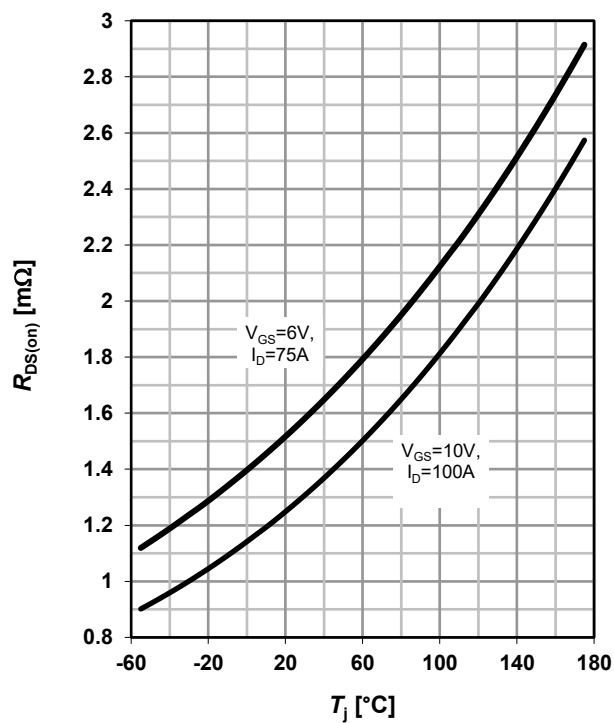
$$R_{DS(on)} = f(I_D); T_j = 25^\circ\text{C}$$

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**

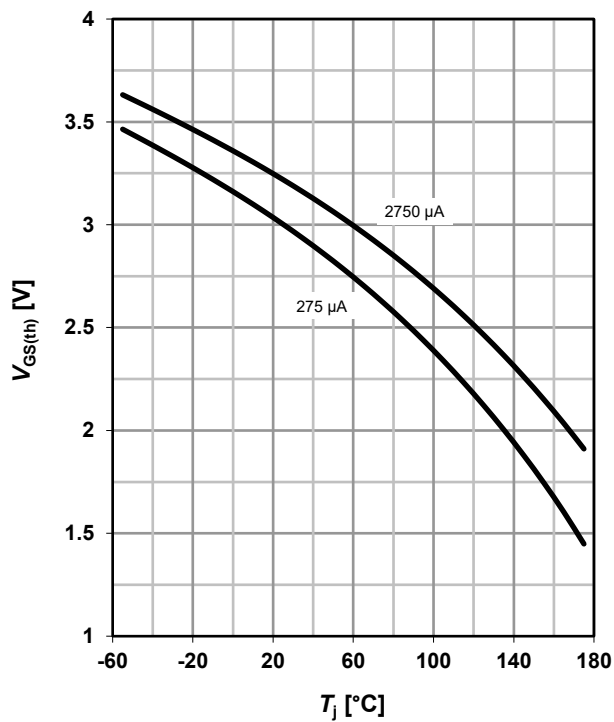
$$R_{DS(on)} = f(T_j)$$

parameter:  $I_D, V_{GS}$ 

## 9 Typ. gate threshold voltage

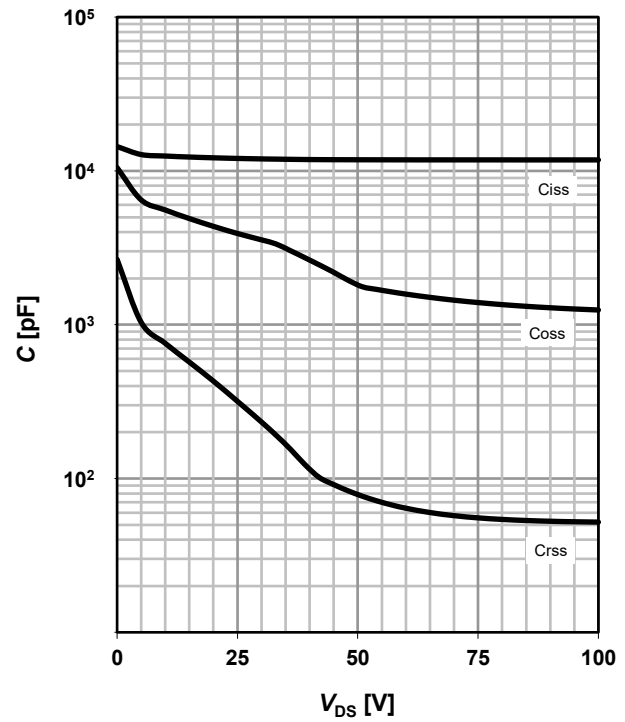
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$$

parameter:  $I_D$



## 10 Typ. capacitances

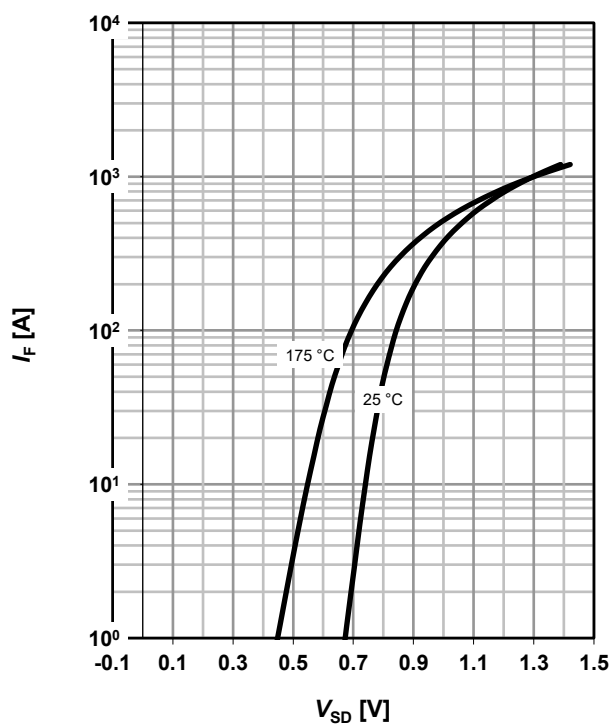
$$C = f(V_{DS}); V_{GS} = 0 V; f = 1 MHz$$



## 11 Typical forward diode characteristics

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

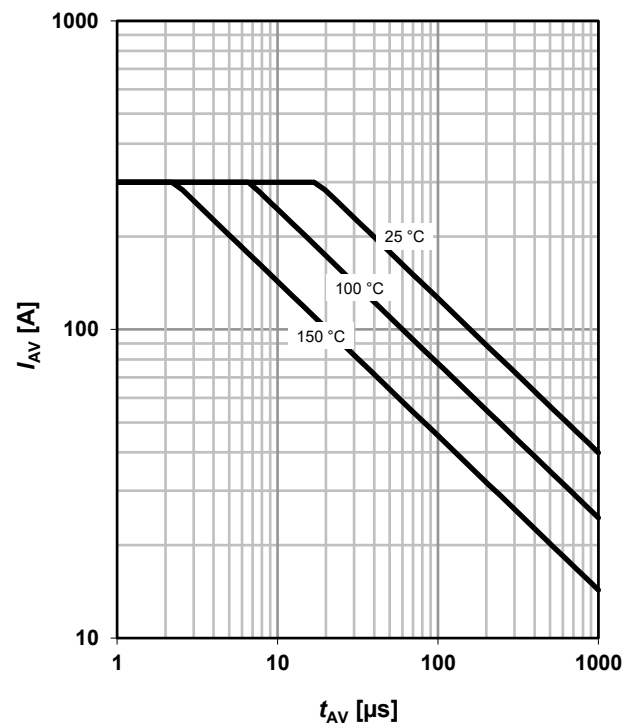
parameter:  $T_j$



## 12 Typ. avalanche characteristics

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

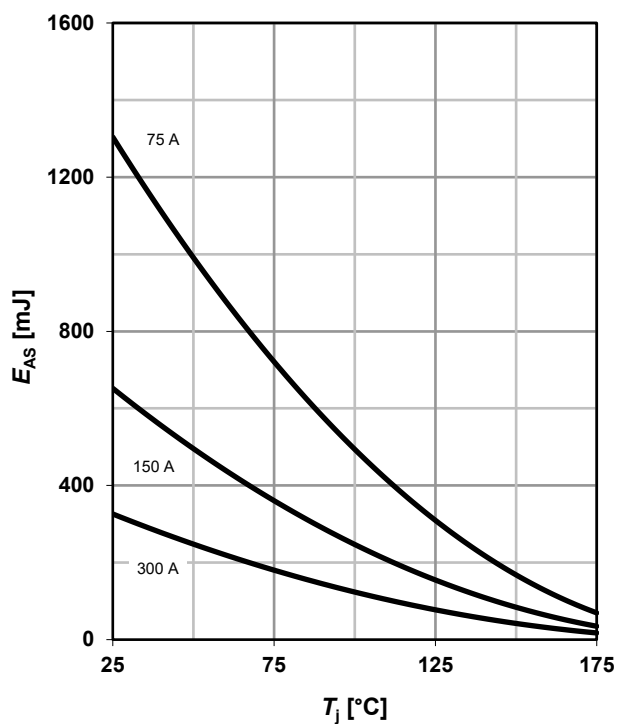
parameter:  $T_{j(start)}$



### 13 Typical avalanche energy

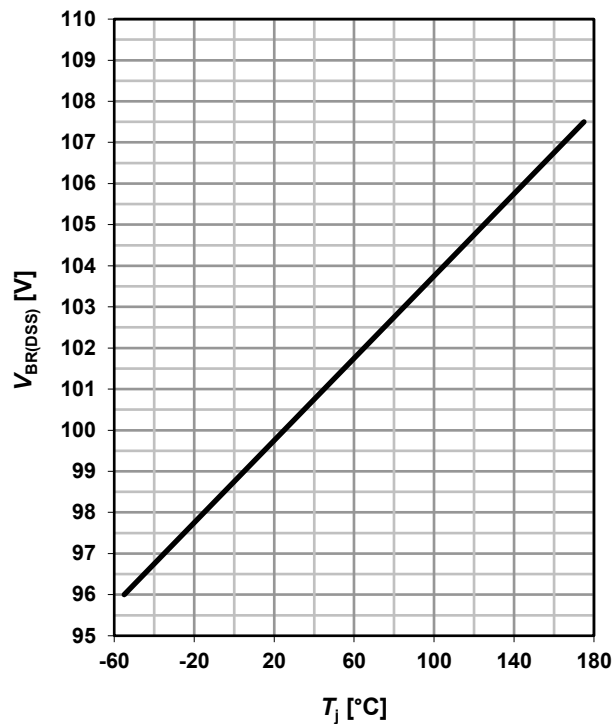
$$E_{AS} = f(T_j)$$

parameter:  $I_D$



### 14 Drain-source breakdown voltage

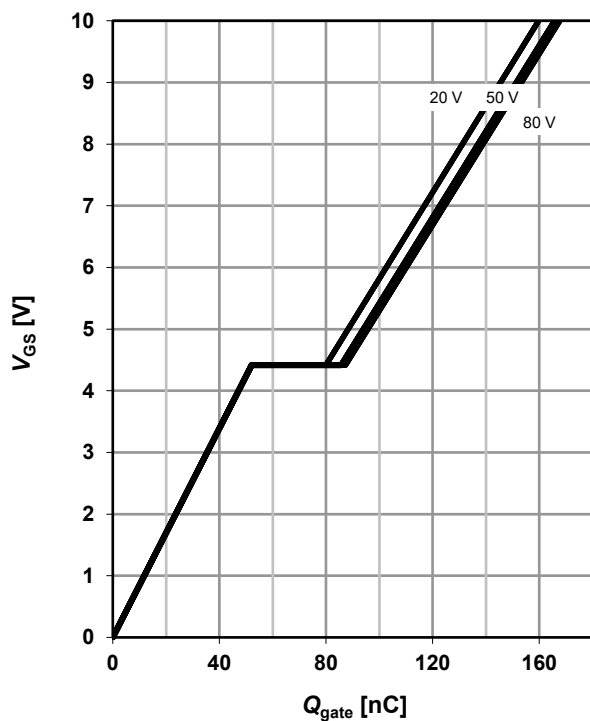
$$V_{BR(DSS)} = f(T_j); I_{D\_typ} = 1 \text{ mA}$$



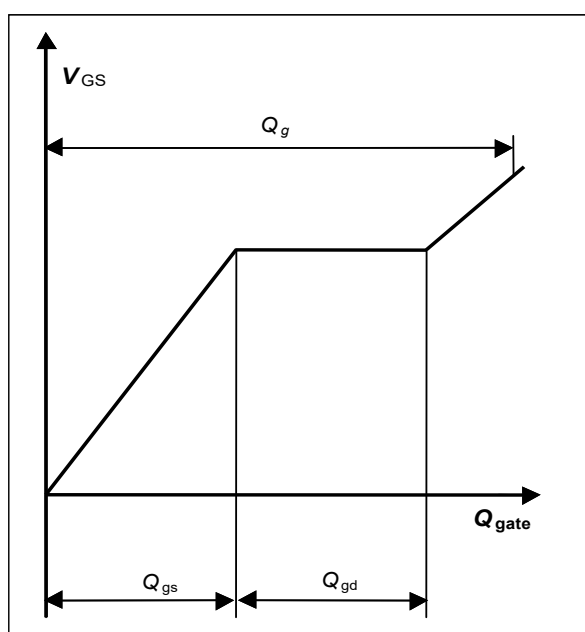
### 15 Typ. gate charge

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

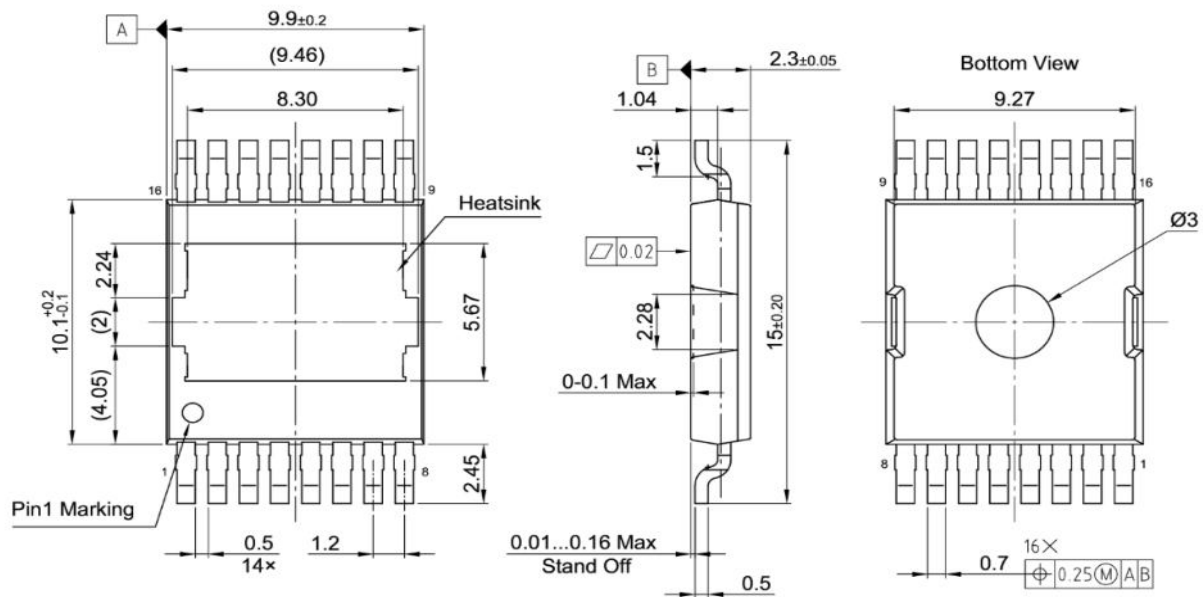
parameter:  $V_{DD}$



### 16 Gate charge waveforms



## Package Outline

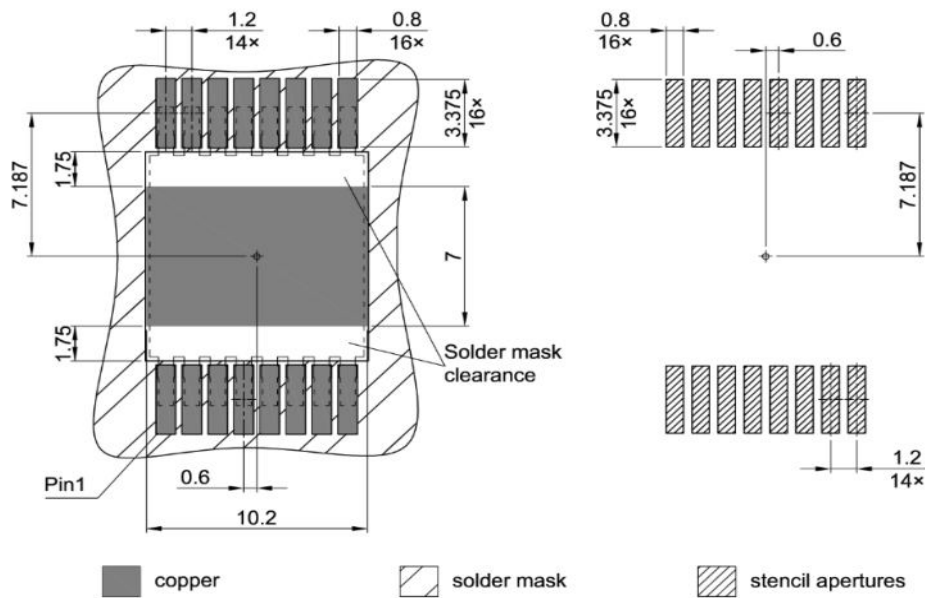


All metal surfaces tin plated except area of cut and heatsink

All dimensions are in units mm

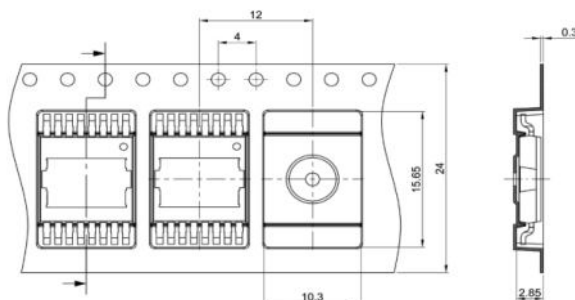
The drawing is in compliance with ISO 128-30, Projection Method 1 [ ]

## Footprint



Based on stencil thickness 0.20 mm  
All dimensions are in units mm

## Packaging







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Revision History

| Version     | Date       | Changes         |
|-------------|------------|-----------------|
| Version 1.0 | 01.10.2020 | Final Datasheet |