

Automotive MOSFET

OptiMOS™-5 Power-Transistor



Features

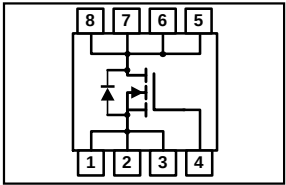
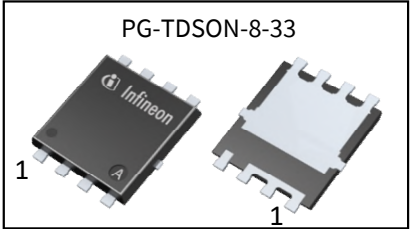
- OptiMOS™ power MOSFET for automotive applications
- N-channel – Enhancement mode – Normal Level
- Extended qualification beyond AEC-Q101
- Enhanced electrical testing
- Robust design
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- Green product (RoHS compliant)
- 100% Avalanche tested

Potential applications

General automotive applications.

Product validation

Qualified for automotive applications. Product validation according to AEC-Q101.



Product Summary

|                      |      |    |
|----------------------|------|----|
| $V_{DS}$             | 60   | V  |
| $R_{DS(on)}$         | 10.2 | mΩ |
| $I_D$ (chip limited) | 47   | A  |

| Type            | Package       | Marking  |
|-----------------|---------------|----------|
| IAUC41N06S5N102 | PG-TDSON-8-33 | 5N06N102 |



Table of Contents

Description ..... 1

Maximum ratings ..... 3

Thermal characteristics ..... 4

Electrical characteristics ..... 4

Electrical characteristics diagrams ..... 6

Package outline & footprint ..... 10

Revision history ..... 11

Disclaimer ..... 12

## 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>                         | 47               | A    |
|                                              |                | $V_{GS}=10\text{ V}$ , DC current                                              | 41               |      |
|                                              |                | $T_a=85\text{ °C}$ , $V_{GS}=10\text{ V}$ , $R_{thJA}$ on 2s2p <sup>2,4)</sup> | 13               |      |
| Pulsed drain current <sup>2)</sup>           | $I_{D,pulse}$  | $T_C=25\text{ °C}$ , $t_p=100\text{ }\mu\text{s}$                              | 121              |      |
| Avalanche energy, single pulse <sup>2)</sup> | $E_{AS}$       | $I_D=20\text{ A}$                                                              | 37               | mJ   |
| Avalanche current, single pulse              | $I_{AS}$       | –                                                                              | 41               | A    |
| Gate source voltage                          | $V_{GS}$       | –                                                                              | $\pm 20$         | V    |
| Power dissipation                            | $P_{tot}$      | $T_C=25\text{ °C}$                                                             | 42               | W    |
| Operating and storage temperature            | $T_j, T_{stg}$ | –                                                                              | $-55 \dots +175$ | °C   |
| IEC climatic category; DIN IEC 68-1          | –              | –                                                                              | 55/175/56        |      |

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

| Parameter                                            | Symbol     | Conditions | Values |      |      | Unit |
|------------------------------------------------------|------------|------------|--------|------|------|------|
|                                                      |            |            | min.   | typ. | max. |      |
| Thermal resistance, junction - case                  | $R_{thJC}$ | —          | —      | —    | 3.6  | K/W  |
| Thermal resistance, junction - ambient <sup>4)</sup> | $R_{thJA}$ | —          | —      | 25.6 | —    |      |

## Electrical characteristics

at  $T_j=25\text{ °C}$ , unless otherwise specified

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

### Static characteristics

|                                  |               |                                                                          |     |      |      |               |
|----------------------------------|---------------|--------------------------------------------------------------------------|-----|------|------|---------------|
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}$ ,<br>$I_D=1\text{ mA}$                               | 60  | —    | —    | V             |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=V_{GS}$ , $I_D=13\text{ }\mu\text{A}$                            | 2.2 | 2.8  | 3.4  |               |
| Zero gate voltage drain current  | $I_{DSS}$     | $V_{DS}=60\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=25\text{ °C}$          | —   | —    | 1    | $\mu\text{A}$ |
|                                  |               | $V_{DS}=60\text{ V}$ , $V_{GS}=0\text{ V}$ ,<br>$T_j=100\text{ °C}^{2)}$ | —   | —    | 100  |               |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=20\text{ V}$ , $V_{DS}=0\text{ V}$                               | —   | —    | 100  | nA            |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=7\text{ V}$ , $I_D=10\text{ A}$                                  | —   | 9.8  | 11.8 | m $\Omega$    |
|                                  |               | $V_{GS}=10\text{ V}$ , $I_D=20\text{ A}$                                 | —   | 8.4  | 10.2 |               |
| Gate resistance <sup>2)</sup>    | $R_G$         | —                                                                        | —   | 1.28 | —    | $\Omega$      |

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

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

|                              |              |                                                                            |   |     |      |    |
|------------------------------|--------------|----------------------------------------------------------------------------|---|-----|------|----|
| Input capacitance            | $C_{iss}$    | $V_{GS}=0\text{ V}, V_{DS}=30\text{ V}, f=1\text{ MHz}$                    | – | 855 | 1112 | pF |
| Output capacitance           | $C_{oss}$    |                                                                            | – | 184 | 239  |    |
| Reverse transfer capacitance | $C_{rss}$    |                                                                            | – | 12  | 18   |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=30\text{ V}, V_{GS}=10\text{ V}, I_D=20\text{ A}, R_G=3.5\ \Omega$ | – | 2.8 | –    | ns |
| Rise time                    | $t_r$        |                                                                            | – | 1.4 | –    |    |
| Turn-off delay time          | $t_{d(off)}$ |                                                                            | – | 3.9 | –    |    |
| Fall time                    | $t_f$        |                                                                            | – | 2.0 | –    |    |

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

|                       |               |                                                                       |   |      |      |    |
|-----------------------|---------------|-----------------------------------------------------------------------|---|------|------|----|
| Gate to source charge | $Q_{gs}$      | $V_{DD}=30\text{ V}, I_D=20\text{ A}, V_{GS}=0\text{ to }10\text{ V}$ | – | 4.1  | 5.3  | nC |
| Gate to drain charge  | $Q_{gd}$      |                                                                       | – | 2.7  | 4.1  |    |
| Gate charge total     | $Q_g$         |                                                                       | – | 12.5 | 16.3 |    |
| Gate plateau voltage  | $V_{plateau}$ |                                                                       | – | 4.8  | –    | V  |

**Reverse Diode**

|                                                |               |                                                                      |   |      |     |    |
|------------------------------------------------|---------------|----------------------------------------------------------------------|---|------|-----|----|
| Diode continuous forward current <sup>2)</sup> | $I_S$         | $T_C=25\text{ °C}$                                                   | – | –    | 41  | A  |
| Diode pulse current <sup>2)</sup>              | $I_{S,pulse}$ | $T_C=25\text{ °C}, t_p=100\ \mu\text{s}$                             | – | –    | 121 |    |
| Diode forward voltage                          | $V_{SD}$      | $V_{GS}=0\text{ V}, I_F=20\text{ A}, T_J=25\text{ °C}$               | – | 0.8  | 1.1 | V  |
| Reverse recovery time <sup>2)</sup>            | $t_{rr}$      | $V_R=30\text{ V}, I_F=41\text{ A}, di_F/dt=100\text{ A}/\mu\text{s}$ | – | 30.0 | –   | ns |
| Reverse recovery charge <sup>2)</sup>          | $Q_{rr}$      |                                                                      | – | 22.7 | –   | 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.

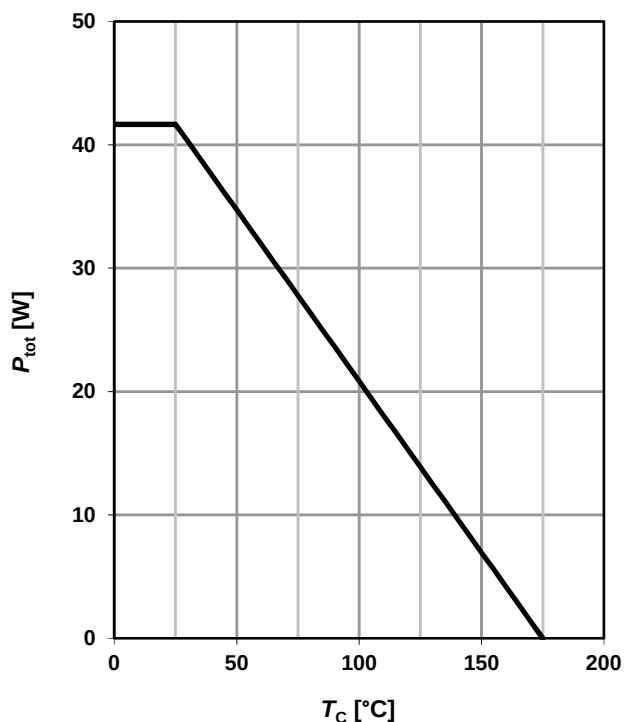
<sup>3)</sup> Current is limited by the package.

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

## Electrical characteristics diagrams

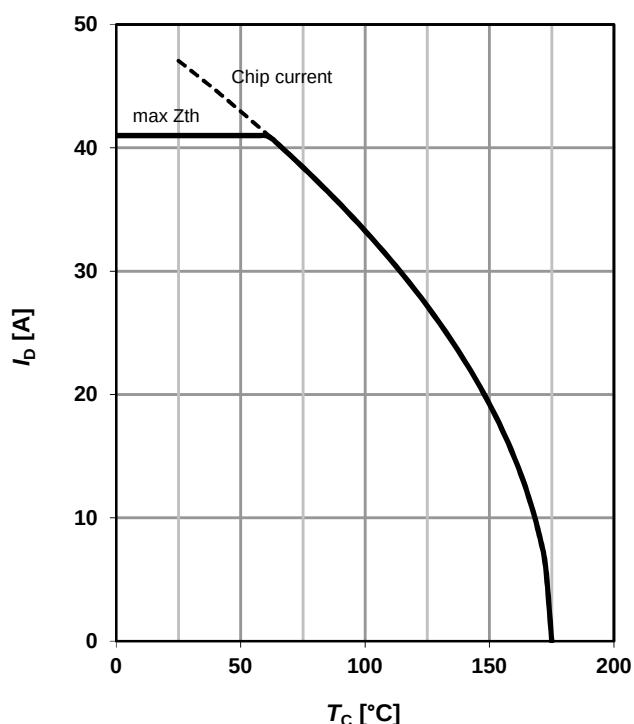
### 1 Power dissipation

$$P_{\text{tot}} = f(T_C); V_{\text{GS}} \geq 10 \text{ V}$$



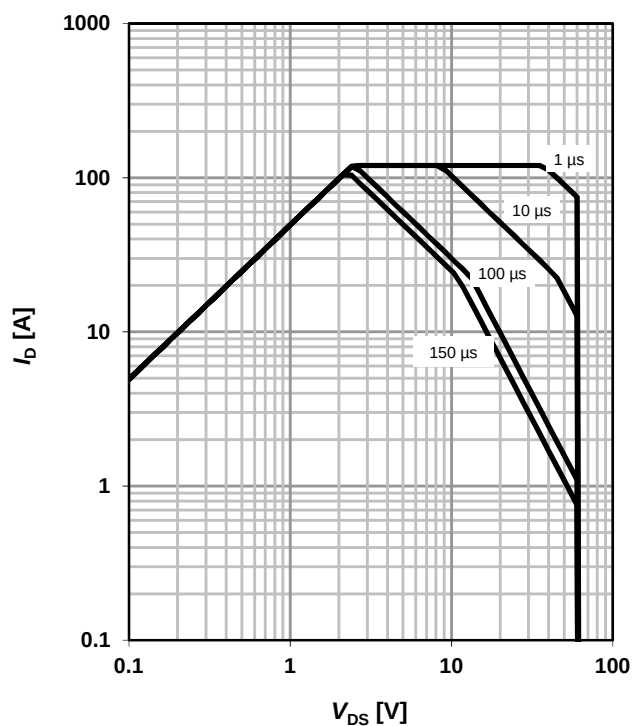
### 2 Drain current

$$I_D = f(T_C); V_{\text{GS}} \geq 10 \text{ V}$$



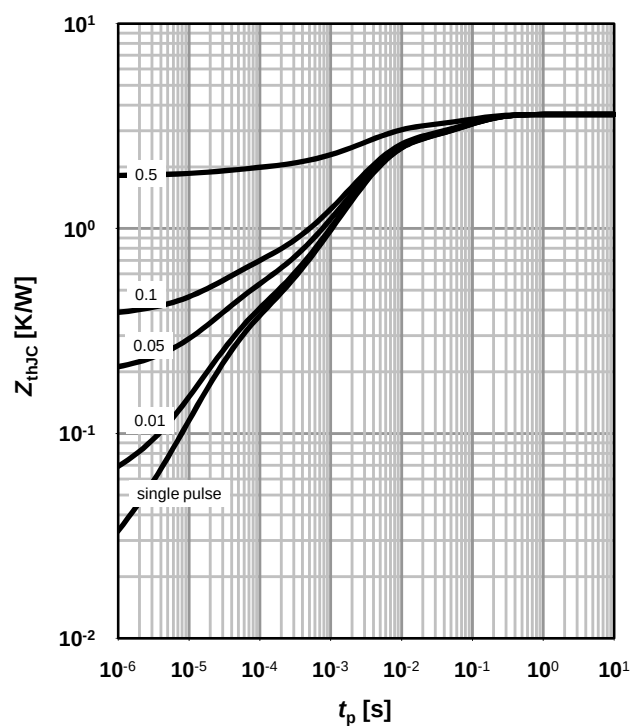
### 3 Safe operating area

$$I_D = f(V_{\text{DS}}); T_C = 25 \text{ °C}; D = 0; \text{parameter: } t_p$$



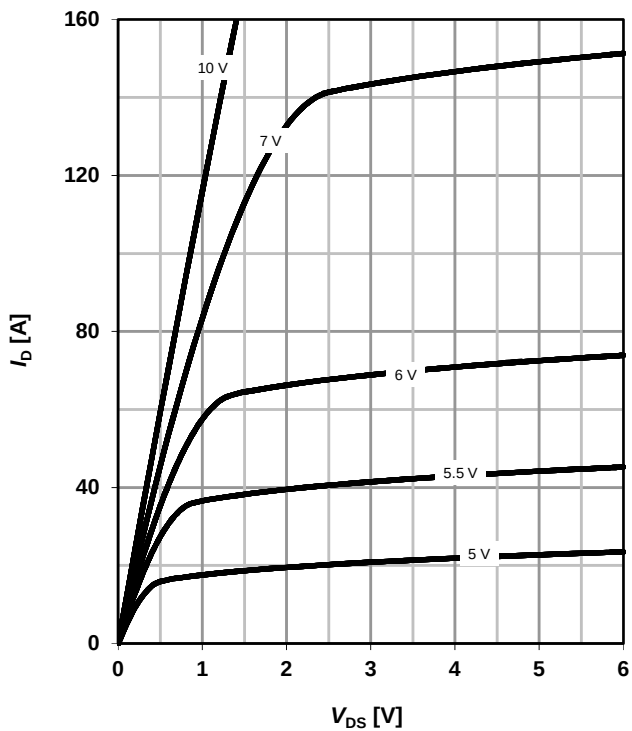
### 4 Max. transient thermal impedance

$$Z_{\text{thJC}} = f(t_p); \text{parameter: } D = t_p/T$$



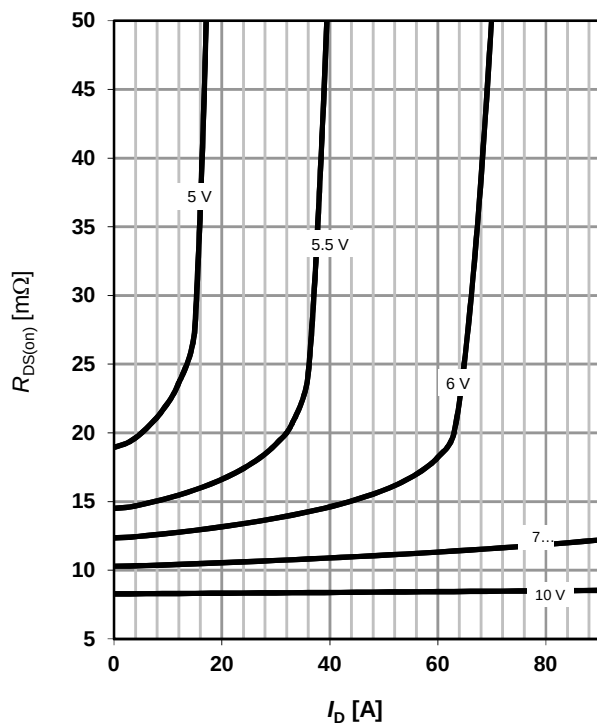
5 Typ. output characteristics

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



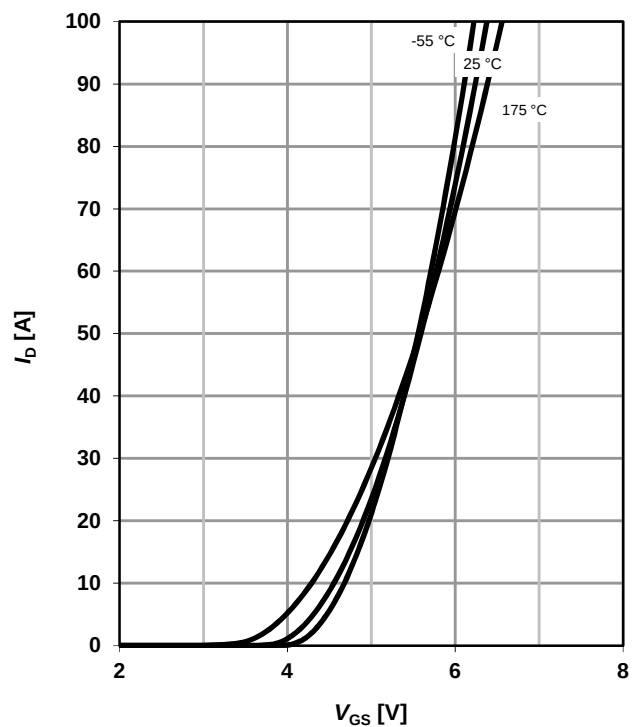
6 Typ. drain-source on-state resistance

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



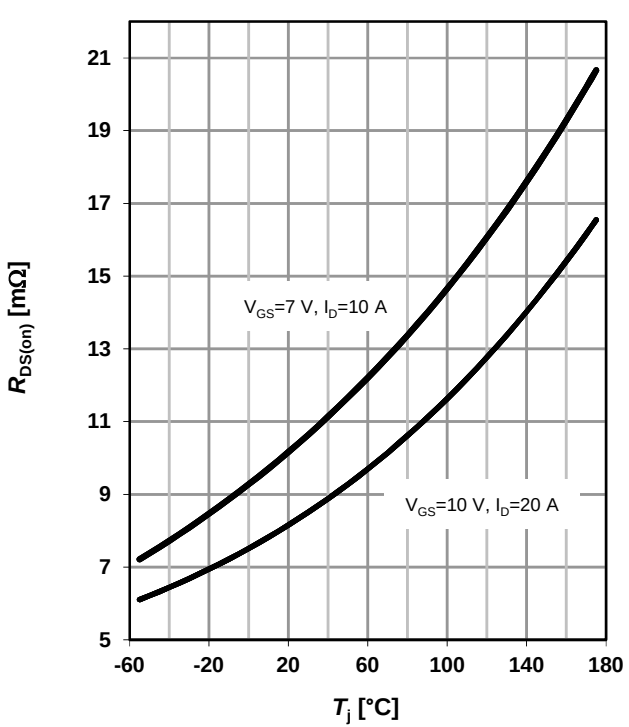
7 Typ. transfer characteristics

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



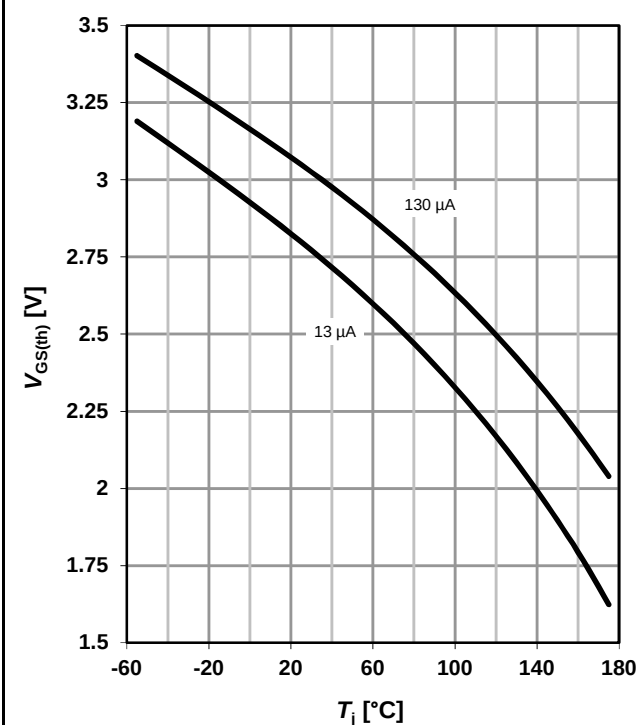
8 Typ. drain-source on-state resistance

$R_{DS(on)} = f(T_j); \text{parameter: } I_D, V_{GS}$



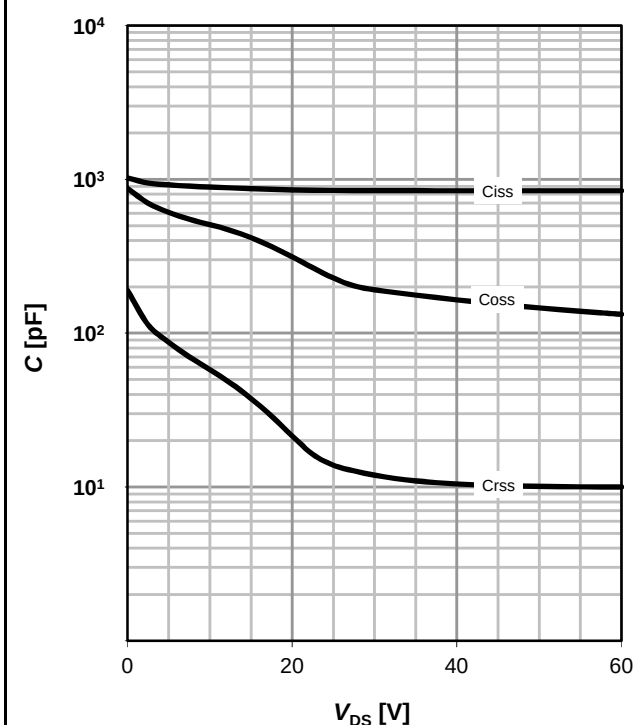
## 9 Typ. gate threshold voltage

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



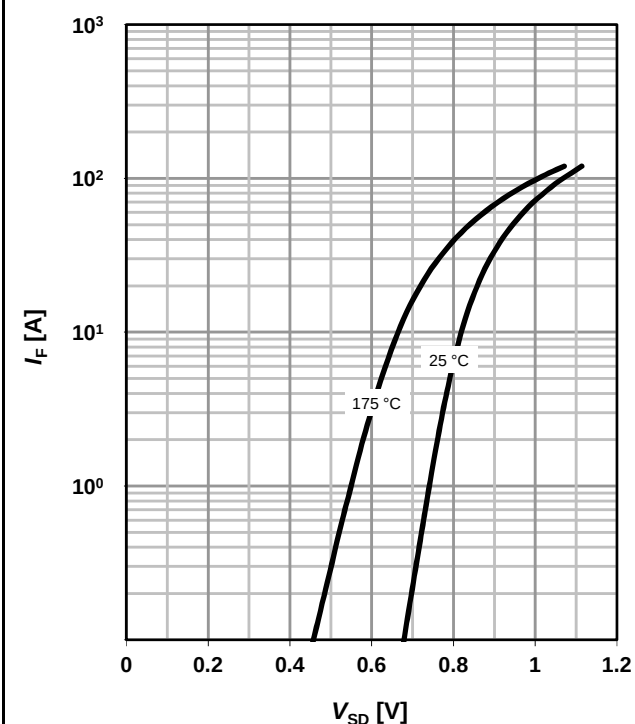
## 10 Typ. capacitances

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



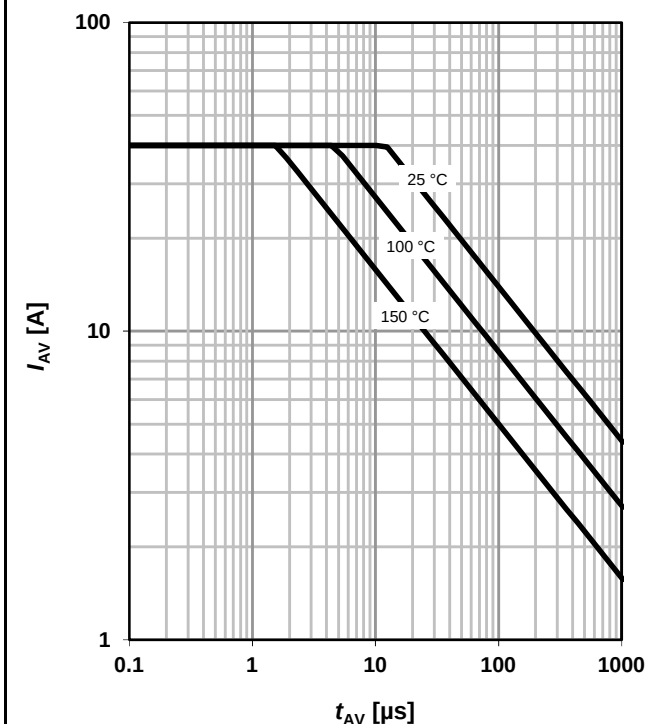
## 11 Typical forward diode characteristics

$I_F = f(V_{SD})$ ; parameter:  $T_j$



## 12 Typ. avalanche characteristics

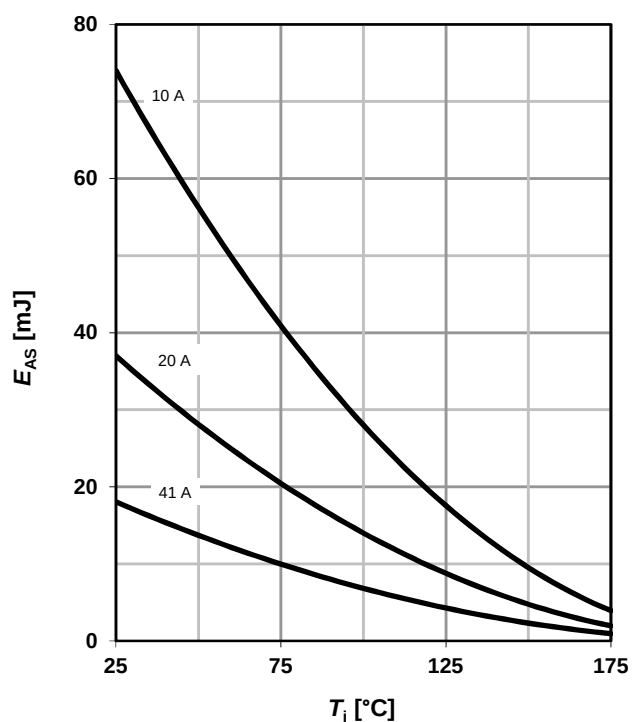
$I_{AS} = f(t_{AV})$ ; parameter:  $T_{j(start)}$





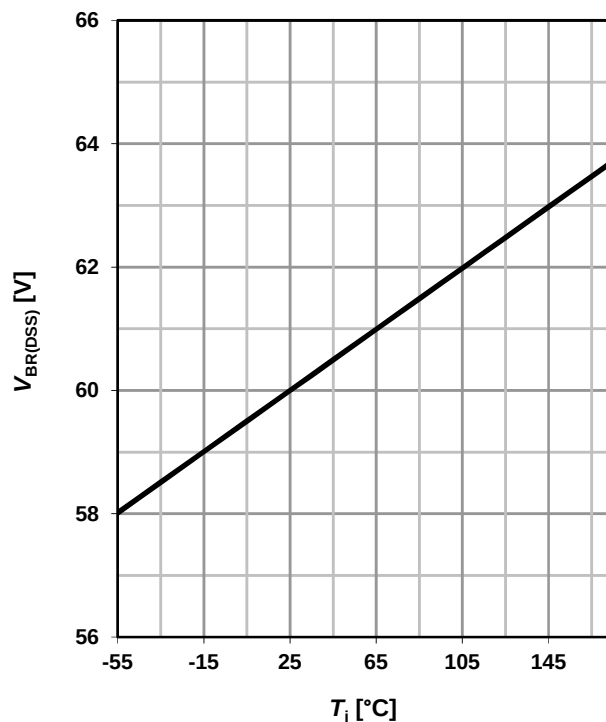
## 13 Typical avalanche energy

$E_{AS} = f(T_j)$ ; parameter:  $I_D$



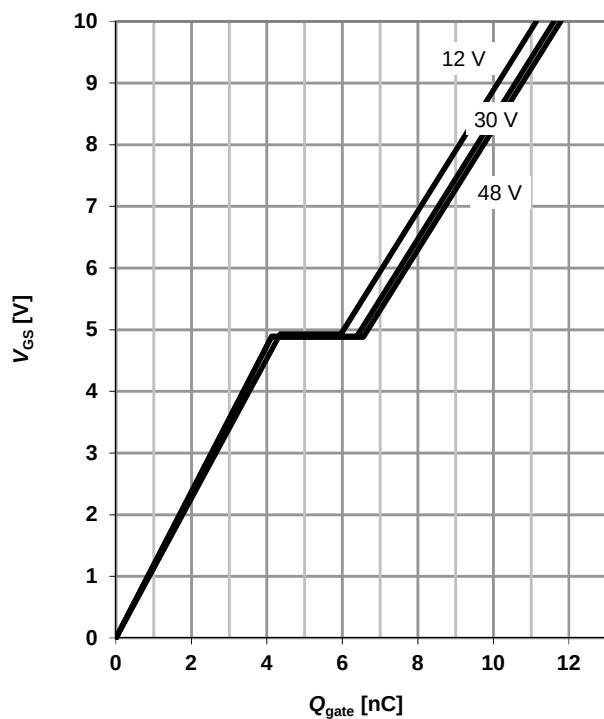
## 14 Drain-source breakdown voltage

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

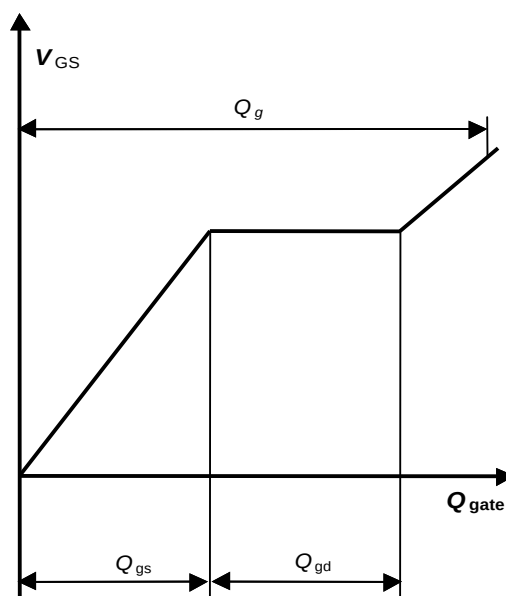


## 15 Typ. gate charge

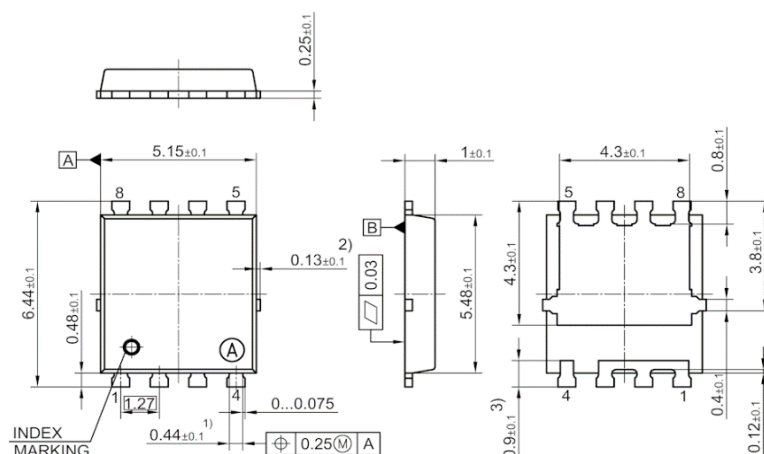
$V_{GS} = f(Q_{gate})$ ;  $I_D = 20\text{ A}$  pulsed; parameter:  $V_{DD}$



## 16 Gate charge waveforms

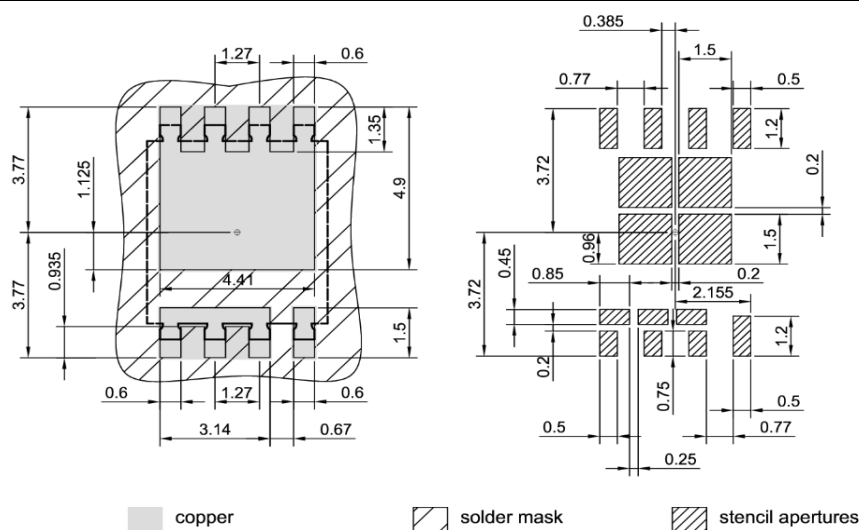


## Package Outline



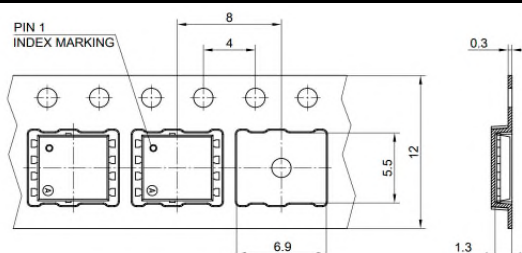
- 1) EXCLUDE MOLD FLASH  
2) REMOVAL ON MOLD GATE, INTRUSION 0.1MM AND PROTRUSION 0.1MM  
3) LEAD LENGTH UP TO ANTI FLASH LINE  
4) ALL METAL SURFACE ARE PLATED, EXCEPT AREA OF CUT  
ALL DIMENSIONS ARE IN UNITS MM  
THE DRAWING IS IN COMPLIANCE WITH ISO 128 & PROJECTION METHOD 1

## Footprint



All dimensions are in units mm

## Packaging



ALL DIMENSIONS ARE IN UNITS MM  
THE DRAWING IS IN COMPLIANCE WITH ISO 128 & PROJECTION METHOD 1 

**Revision History**

| Revision     | Date       | Changes                             |
|--------------|------------|-------------------------------------|
| Revision 1.0 | 04.05.2021 | final data sheet                    |
| Revision 1.1 | 14.02.2022 | update image of pin layout (page 1) |

**Trademarks**

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

**Edition 2021-05-04**

**Published by**

**Infineon Technologies AG**

**81726 Munich, Germany**

**© 2021 Infineon Technologies AG**

**All Rights Reserved.**

**Do you have any questions about any aspect of this document?**

**Email: [erratum@infineon.com](mailto:erratum@infineon.com)**

**IMPORTANT NOTICE**

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

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications. The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office ([www.infineon.com](http://www.infineon.com)).

**WARNINGS**

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact the nearest Infineon Technologies Office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.