



IAUC120N04S6L005

## OptiMOS™ - 6 Power-Transistor



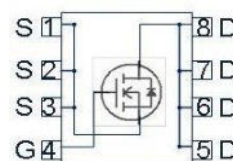
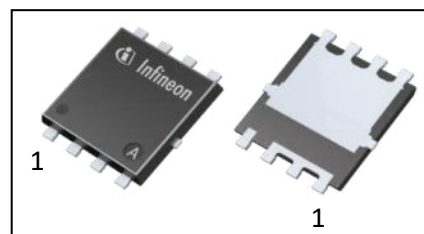
### Features

- OptiMOS™ - power MOSFET for automotive applications
- N-channel - Enhancement mode - Logic Level
- AEC Q101 qualified
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- Green Product (RoHS compliant)
- 100% Avalanche tested

### Product Summary

|                  |      |    |
|------------------|------|----|
| $V_{DS}$         | 40   | V  |
| $R_{DS(on),max}$ | 0.55 | mΩ |
| $I_D$            | 120  | A  |

PG-TDSON-8-53



| Type             | Package       | Marking  |
|------------------|---------------|----------|
| IAUC120N04S6L005 | PG-TDSON-8-53 | 6N04L005 |

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

| Parameter                                    | Symbol            | Conditions                                                                | Value        | Unit |
|----------------------------------------------|-------------------|---------------------------------------------------------------------------|--------------|------|
| Drain current                                | $I_D$             | $V_{GS}=10V$ ,<br>Chip Limitation <sup>1,2)</sup>                         | 435          | A    |
|                                              |                   | $V_{GS}=10V$ ,<br>DC current <sup>3)</sup>                                | 120          |      |
|                                              |                   | $T_a=85\text{ °C}$ , $V_{GS}=10V$ ,<br>$R_{thJA}$ on 2s2p <sup>4,5)</sup> | 60           |      |
| Pulsed drain current <sup>5)</sup>           | $I_{D,pulse}$     | $T_C=25\text{ °C}$ , $t_p=100\mu s$                                       | 1550         |      |
| Avalanche energy, single pulse <sup>2)</sup> | $E_{AS}$          | $I_D=60A$ , $R_G=25\Omega$                                                | 750          | mJ   |
| Avalanche current, single pulse              | $I_{AS}$          | $R_G=25\Omega$                                                            | 120          | A    |
| Gate source voltage                          | $V_{GS}$          | -                                                                         | $\pm 16$     | V    |
| Power dissipation                            | $P_{tot}$         | $T_C=25\text{ °C}$                                                        | 187          | W    |
| Operating and storage temperature            | $T_j$ , $T_{stg}$ | -                                                                         | -55 ... +175 | °C   |

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

#### Thermal characteristics

|                                                      |            |   |   |    |     |     |
|------------------------------------------------------|------------|---|---|----|-----|-----|
| Thermal resistance, junction - case <sup>5)</sup>    | $R_{thJC}$ | - | - | -  | 0.8 | K/W |
| Thermal resistance, junction - ambient <sup>4)</sup> | $R_{thJA}$ | - | - | 26 | -   |     |

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

#### Static characteristics

|                                  |               |                                                     |     |      |      |            |
|----------------------------------|---------------|-----------------------------------------------------|-----|------|------|------------|
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | $V_{GS}=0V, I_D=1mA$                                | 40  | -    | -    | V          |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=130\mu A$                       | 1.2 | 1.6  | 2.0  |            |
| Zero gate voltage drain current  | $I_{DSS}$     | $V_{DS}=40V, V_{GS}=0V, T_j=25^\circ\text{C}$       | -   | -    | 1    | $\mu A$    |
|                                  |               | $V_{DS}=40V, V_{GS}=0V, T_j=125^\circ\text{C}^{2)}$ | -   | -    | 33   |            |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=16V, V_{DS}=0V$                             | -   | -    | 100  | nA         |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=4.5V, I_D=60A$                              | -   | 0.57 | 0.80 | m $\Omega$ |
|                                  |               | $V_{GS}=10V, I_D=60A$                               | -   | 0.43 | 0.55 |            |



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

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

|                              |              |                                                        |   |      |       |    |
|------------------------------|--------------|--------------------------------------------------------|---|------|-------|----|
| Input capacitance            | $C_{iss}$    | $V_{GS}=0V, V_{DS}=25V,$<br>$f=1MHz$                   | - | 8423 | 11203 | pF |
| Output capacitance           | $C_{oss}$    |                                                        | - | 2294 | 2982  |    |
| Reverse transfer capacitance | $C_{rss}$    |                                                        | - | 117  | 175   |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=20V, V_{GS}=10V,$<br>$I_D=120A, R_G=3.5\Omega$ | - | 9    | -     | ns |
| Rise time                    | $t_r$        |                                                        | - | 8    | -     |    |
| Turn-off delay time          | $t_{d(off)}$ |                                                        | - | 57   | -     |    |
| Fall time                    | $t_f$        |                                                        | - | 28   | -     |    |

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

|                       |               |                                                       |   |     |     |    |
|-----------------------|---------------|-------------------------------------------------------|---|-----|-----|----|
| Gate to source charge | $Q_{gs}$      | $V_{DD}=32V, I_D=120A,$<br>$V_{GS}=0 \text{ to } 10V$ | - | 23  | 30  | nC |
| Gate to drain charge  | $Q_{gd}$      |                                                       | - | 25  | 38  |    |
| Gate charge total     | $Q_g$         |                                                       | - | 136 | 177 |    |
| Gate plateau voltage  | $V_{plateau}$ |                                                       | - | 2.8 | -   | V  |

**Reverse Diode**

|                                                |               |                                             |   |     |      |    |
|------------------------------------------------|---------------|---------------------------------------------|---|-----|------|----|
| Diode continuous forward current <sup>5)</sup> | $I_S$         | $T_C=25^\circ C$                            | - | -   | 257  | A  |
| Diode pulse current <sup>5)</sup>              | $I_{S,pulse}$ |                                             | - | -   | 1748 |    |
| Diode forward voltage                          | $V_{SD}$      | $V_{GS}=0V, I_F=60A,$<br>$T_J=25^\circ C$   | - | 0.8 | 1.1  | V  |
| Reverse recovery time <sup>2)</sup>            | $t_{rr}$      | $V_R=20V, I_F=50A,$<br>$di_F/dt=100A/\mu s$ | - | 71  | -    | ns |
| Reverse recovery charge <sup>2)</sup>          | $Q_{rr}$      |                                             | - | 98  | -    | nC |

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

<sup>2)</sup> The parameter is not subject to production test - verified by characterization.

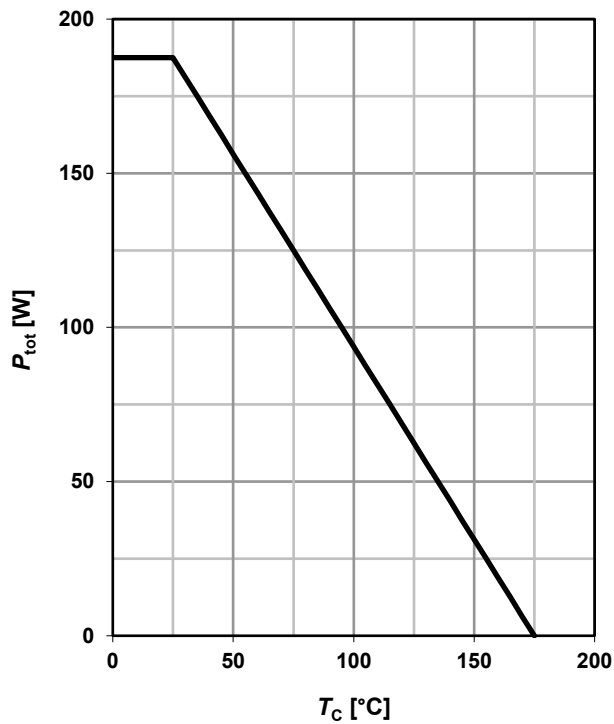
<sup>3)</sup> The product can operate at specified current based on best practice to minimize electromigration at the solder joint. For rare events and inrush currents the value may be exceeded.

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

<sup>5)</sup> The parameter is not subject to production test - verified by design.

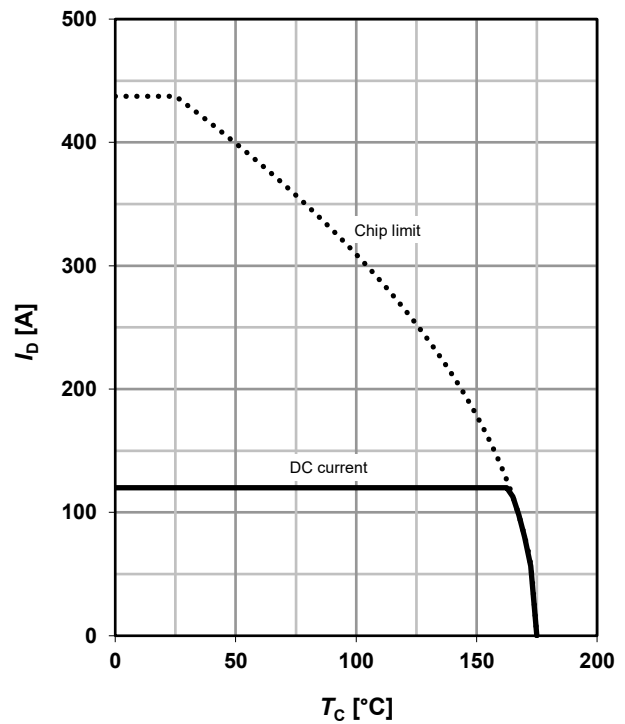
### 1 Power dissipation

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



### 2 Drain current

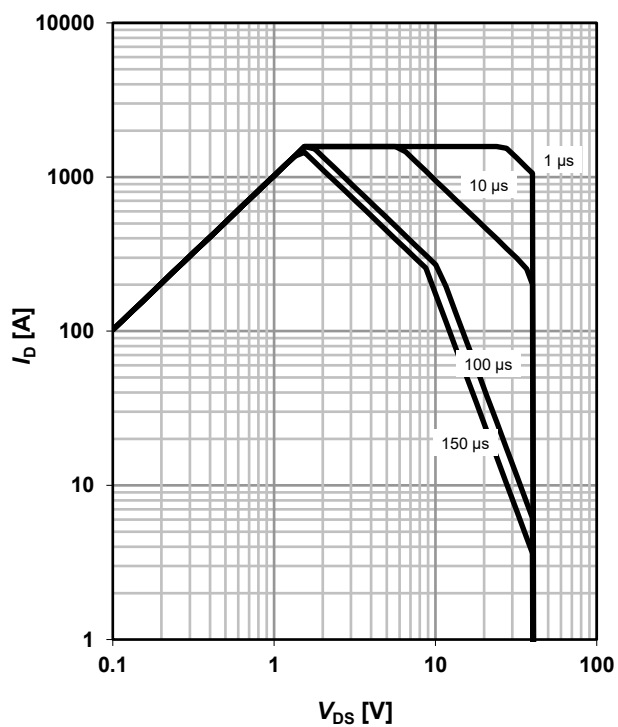
$$I_D = f(T_C); V_{\text{GS}} = 10 \text{ V}$$



### 3 Safe operating area

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

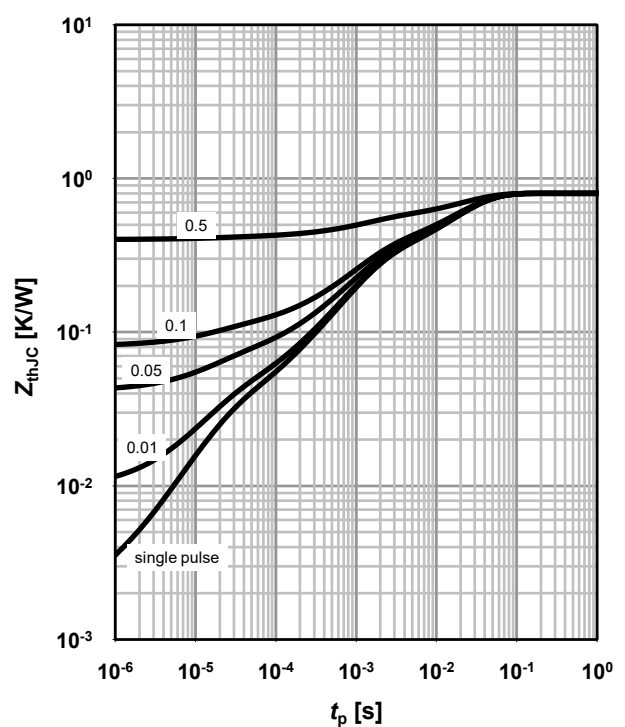
parameter:  $t_p$



### 4 Max. transient thermal impedance

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

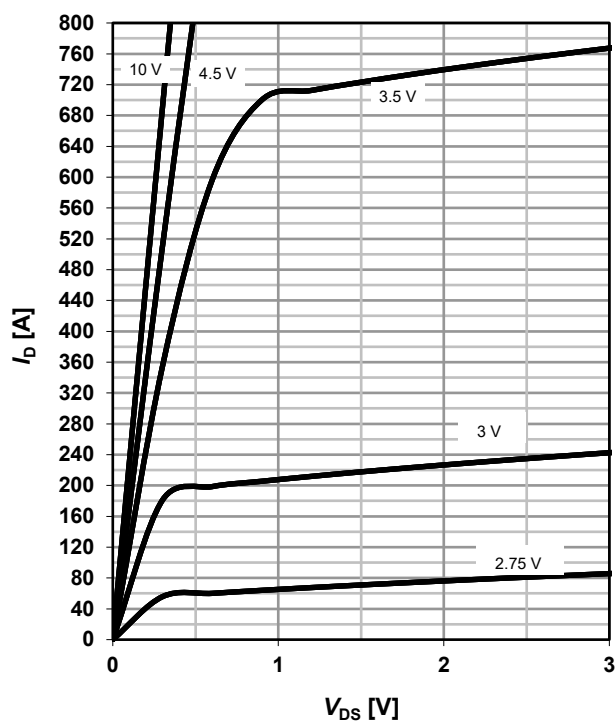
parameter:  $D = t_p/T$



## 5 Typ. output characteristics

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

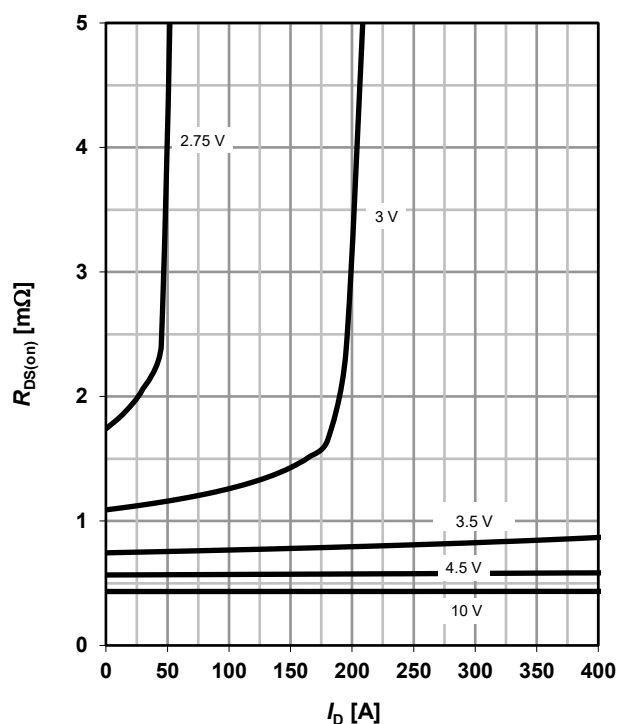
parameter:  $V_{GS}$



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

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

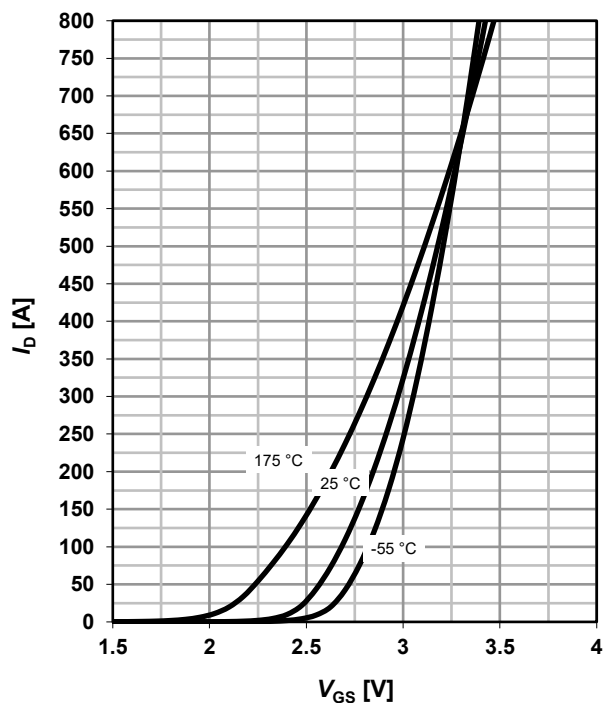
parameter:  $V_{GS}$



## 7 Typ. transfer characteristics

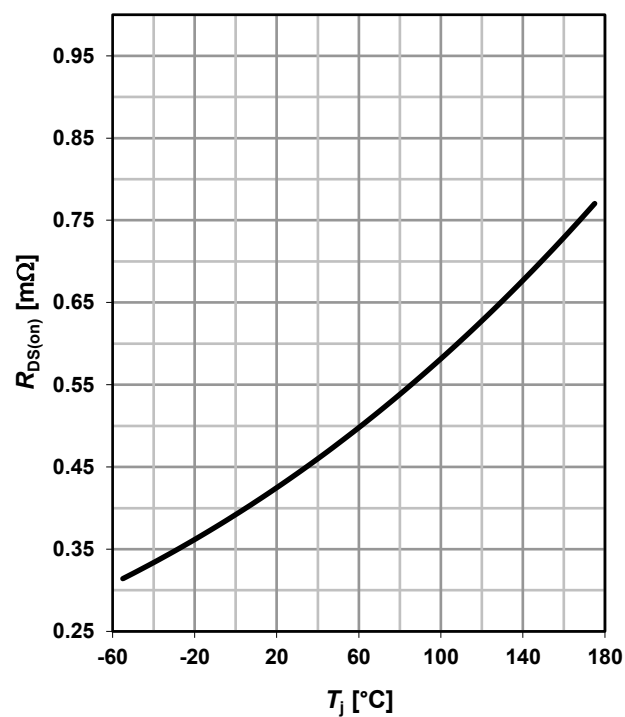
$I_D = f(V_{GS}); V_{DS} = 6\text{ V}$

parameter:  $T_j$



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

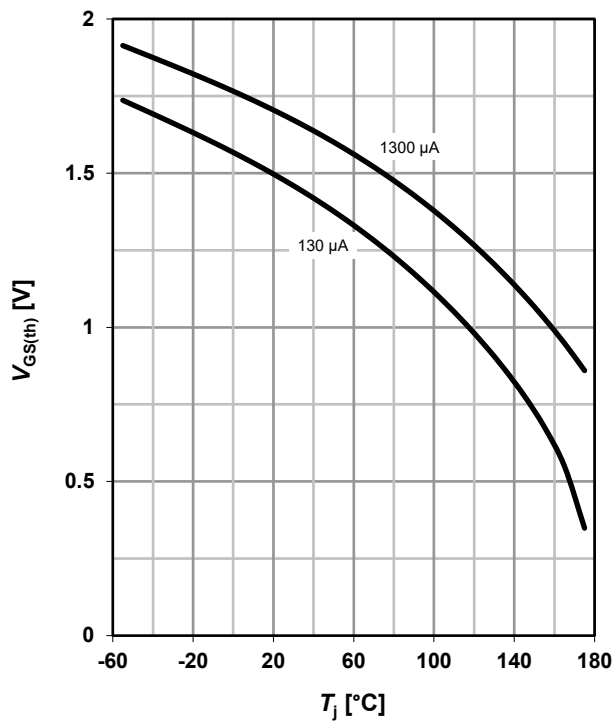
$R_{DS(on)} = f(T_j); I_D = 60\text{ A}; V_{GS} = 10\text{ V}$



## 9 Typ. gate threshold voltage

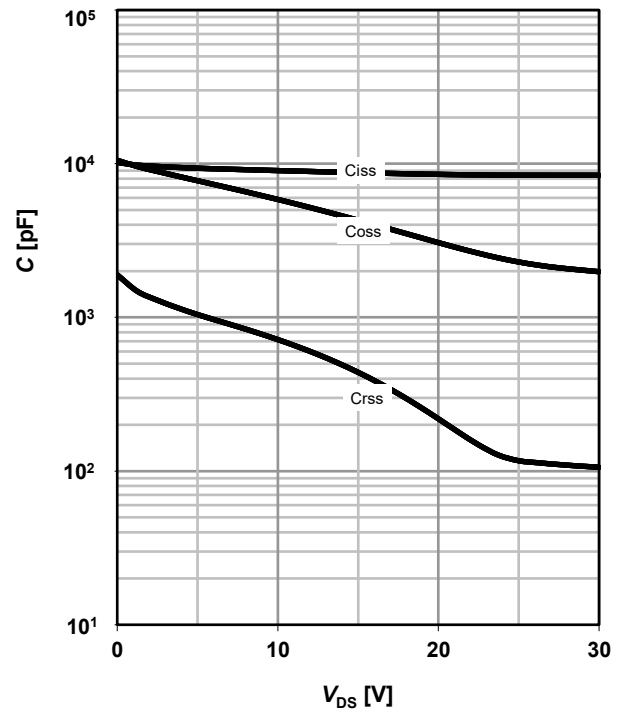
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$$

parameter:  $I_D$



## 10 Typ. capacitances

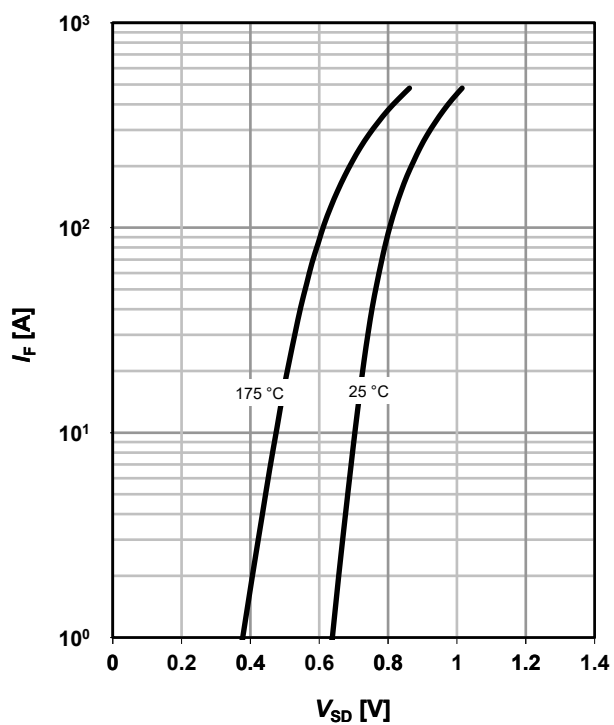
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



## 11 Typical forward diode characteristics

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

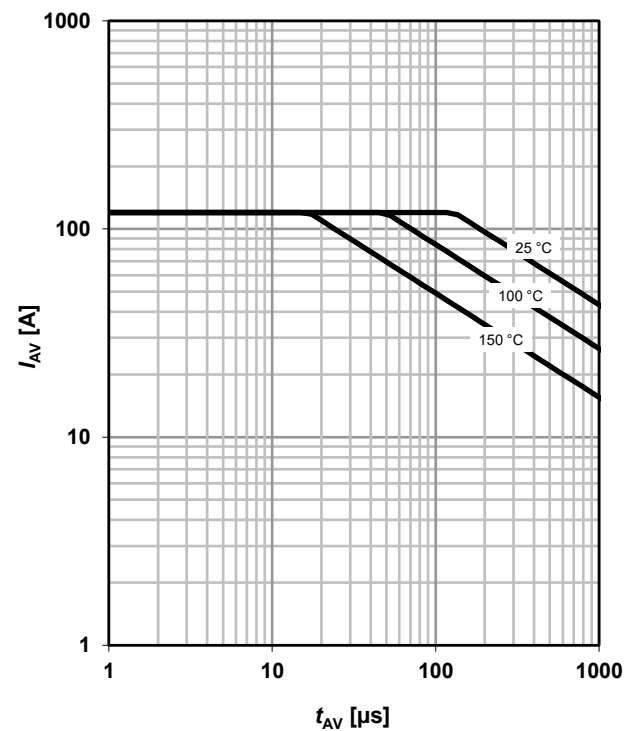
parameter:  $T_j$



## 12 Avalanche characteristics

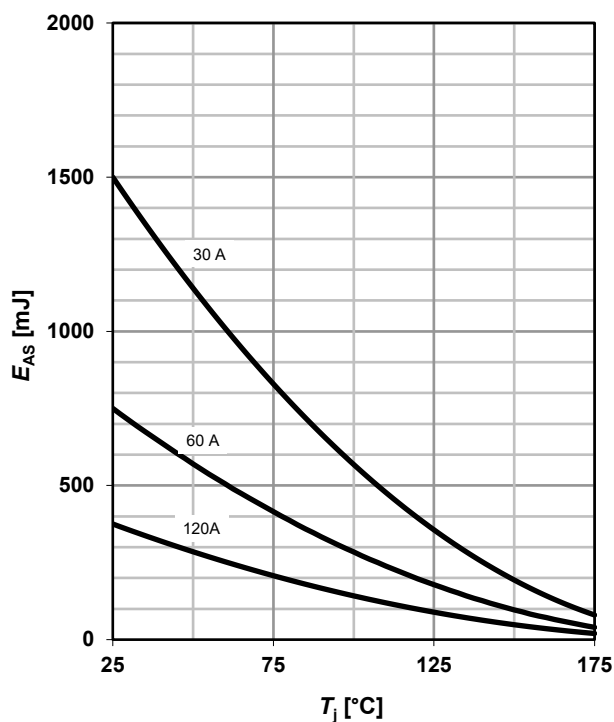
$$I_{AS} = f(t_{AV})$$

parameter:  $T_{j(start)} > 25^\circ\text{C}$



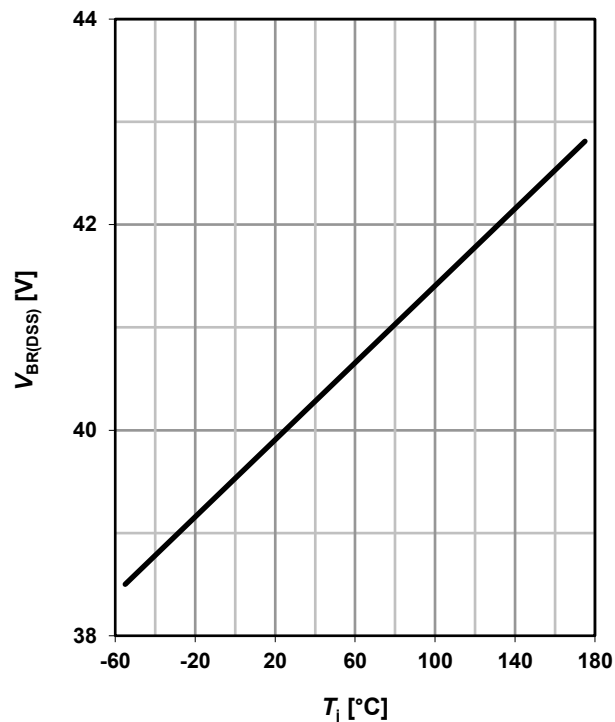
### 13 Avalanche energy

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



### 14 Drain-source breakdown voltage

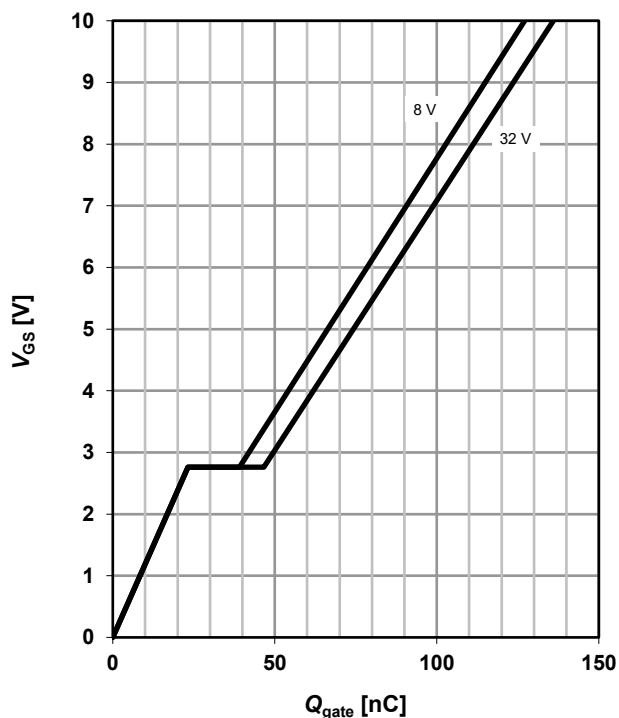
$$V_{BR(DSS)} = f(T_j); I_D = 1 \text{ mA}$$



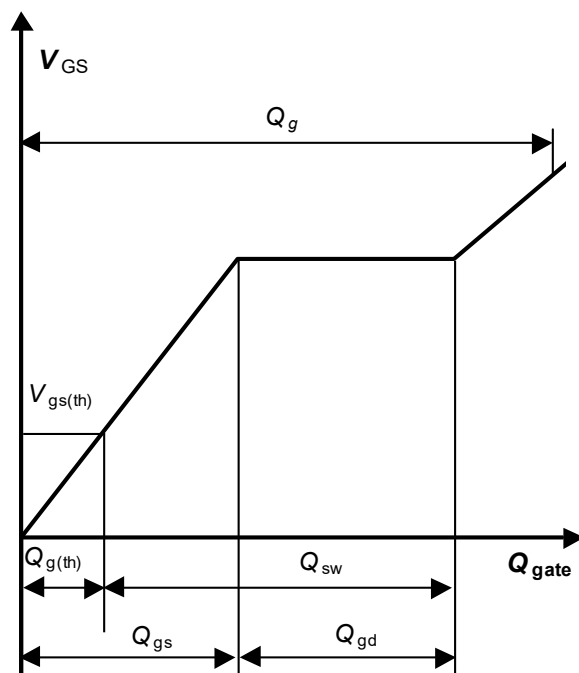
### 15 Typ. gate charge

$$V_{GS} = f(Q_{gate}); I_D = 120 \text{ A pulsed}$$

parameter:  $V_{DD}$



### 16 Gate charge waveforms



Technical drawing of a rectangular metal part, likely a component of a mechanical assembly. The drawing includes three views: a top view, a side view, and a front view.

**Top View:** Shows a rectangular part with overall dimensions of  $5.15 \pm 0.1$  mm (width) and  $6.44 \pm 0.1$  mm (height). The part features a central rectangular cutout with a width of  $0.48 \pm 0.1$  mm and a height of  $0.13 \pm 0.1$  mm. The cutout is positioned  $0.44 \pm 0.1$  mm from the bottom edge and  $1.27$  mm from the left edge. The part has a central hole with a diameter of  $0.25 \pm 0.075$  mm. The part is labeled with 'A' in the top left corner and 'A' in the bottom right corner. The part is also labeled with 'INDEX MARKING' and '0.25 (M) A'.

**Side View:** Shows the side profile of the part with a width of  $1 \pm 0.1$  mm and a height of  $5.48 \pm 0.1$  mm. The side view shows a central rectangular cutout with a width of  $0.03$  mm and a height of  $0.13 \pm 0.1$  mm. The side view is labeled with 'B' in the top left corner and '0.03' in the bottom left corner.

**Front View:** Shows the front profile of the part with a width of  $4.3 \pm 0.1$  mm and a height of  $3.8 \pm 0.1$  mm. The front view shows a central rectangular cutout with a width of  $0.4 \pm 0.1$  mm and a height of  $0.12 \pm 0.1$  mm. The front view is labeled with '3)' in the top left corner and '0.4 \pm 0.1' in the bottom left corner.

- 
- Figure 1 shows the dimensions of the PCB layout. The top view (a) includes dimensions for the copper layer, solder mask, and stencil apertures. The bottom view (b) includes dimensions for the solder mask and stencil apertures. The legend indicates: copper (solid grey), solder mask (hatched), and stencil apertures (diagonal lines).

[illegible]



**Published by**  
**Infineon Technologies AG**  
**81726 Munich, Germany**

**© Infineon Technologies AG 2020**  
**All Rights Reserved.**

### **Legal Disclaimer**

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, 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.

### **Information**

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, components may contain dangerous substances.

For information on the types in question, please contact the nearest Infineon Technologies Office.

Infineon Technologies components may be used in life-support devices or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life.

If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

## Revision History

| Version      | Date       | Changes          |
|--------------|------------|------------------|
| Revision 1.0 | 05.06.2020 | Final Data Sheet |
|              |            |                  |
|              |            |                  |
|              |            |                  |
|              |            |                  |
|              |            |                  |
|              |            |                  |
|              |            |                  |
|              |            |                  |
|              |            |                  |