

## OptiMOS™ -5 Power Transistor


**RoHS**

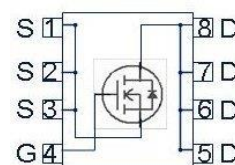
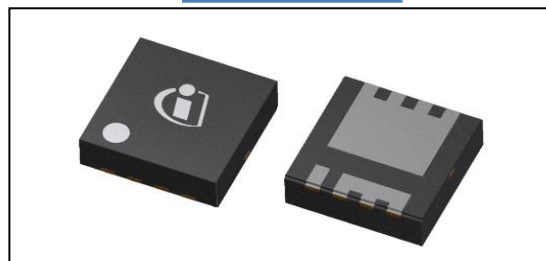
### Features

- OptiMOS™ power MOSFET for automotive applications
- N-channel - Enhancement mode - Normal level
- MSL1 up to 260°C peak reflow
- 175 °C operating temperature
- Green product (RoHS compliant)
- 100% Avalanche tested

### Product Summary

$V_{DS}$	60	V
$R_{DS(on),max}$	5	mΩ
$I_D$	40	A

### PG-TSDSON-8-33



Type	Package	Marking
IAUZ40N06S5N050	<a href="#">PG-TSDSON-8-33</a>	5N06050

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

Parameter	Symbol	Conditions	Value	Unit
Drain current	$I_D$	$V_{GS}=10\text{ V}$ , Chip limitation <sup>1,2)</sup>	86	A
		$V_{GS}=10\text{ V}$ , DC current <sup>3)</sup>	40	
		$T_a=85\text{ °C}$ , $V_{GS}=10\text{ V}$ , $R_{thJA}$ on 2s2p <sup>2,4)</sup>	14	
Pulsed drain current <sup>2)</sup>	$I_{D,pulse}$	$T_C=25\text{ °C}$ , $t_p=100\text{ }\mu\text{s}$	241	
Avalanche energy, single pulse <sup>2)</sup>	$E_{AS}$	$I_D=20\text{ A}$	115	mJ
Avalanche current, single pulse	$I_{AS}$	-	40	A
Gate source voltage	$V_{GS}$	-	$\pm 20$	V
Power dissipation	$P_{tot}$	$T_C=25\text{ °C}$	71	W
Operating and storage temperature	$T_j, T_{stg}$	-	-55 ... +175	°C

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

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

Thermal resistance, junction - case	$R_{thJC}$	-	-	-	2.1	K/W
Thermal resistance, junction - ambient <sup>4)</sup>	$R_{thJA}$	-	-	35.5	-	

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

#### Static characteristics

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=1mA$	60	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=29\mu A$	2.2	2.8	3.4	
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V, T_j=25^\circ\text{C}$	-	-	1	$\mu A$
		$V_{DS}=60V, V_{GS}=0V, T_j=125^\circ\text{C}^{1)}$	-	-	100	
Gate-source leakage current	$I_{GSS}$	$V_{GS}=20V, V_{DS}=0V$	-	-	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=7V, I_D=10A$	-	5.0	6.0	$m\Omega$
		$V_{GS}=10V, I_D=20A$	-	4.0	5.0	
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	$C_{iss}$	$V_{GS}=0V, V_{DS}=30V,$ $f=1MHz$	-	1692	2200	pF
Output capacitance	$C_{oss}$		-	373	485	
Reverse transfer capacitance	$C_{rss}$		-	18	26	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=30V, V_{GS}=10V,$ $I_D=20A, R_{G,ext}=3.5\Omega$	-	3.8	-	ns
Turn-off delay time	$t_{d(off)}$		-	8.9	-	
Rise time	$t_r$		-	1.0	-	
Fall time	$t_f$		-	4.6	-	

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

Gate to source charge	$Q_{gs}$	$V_{DD}=30V, I_D=20A,$ $V_{GS}=0 \text{ to } 10V$	-	7.7	10.0	nC
Gate to drain charge	$Q_{gd}$		-	4.4	6.6	
Gate charge total	$Q_g$		-	23.5	30.5	
Gate plateau voltage	$V_{plateau}$		-	4.5	-	V

**Reverse Diode**

Diode continuous forward current <sup>2)</sup>	$I_S$	$T_C=25^\circ C$	-	-	40	A
Diode pulse current <sup>2)</sup>	$I_{S,pulse}$	$T_C=25^\circ C, t_p=100\mu s$	-	-	241	
Diode forward voltage	$V_{SD}$	$V_{GS}=0V, I_F=20A,$ $T_J=25^\circ C$	-	0.8	1.1	V
Reverse recovery time <sup>2)</sup>	$t_{rr}$	$V_R=30V, I_F=40A,$ $di_F/dt=100A/\mu s$	-	30	-	ns
Reverse recovery charge <sup>2)</sup>	$Q_{rr}$		-	22	-	nC

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

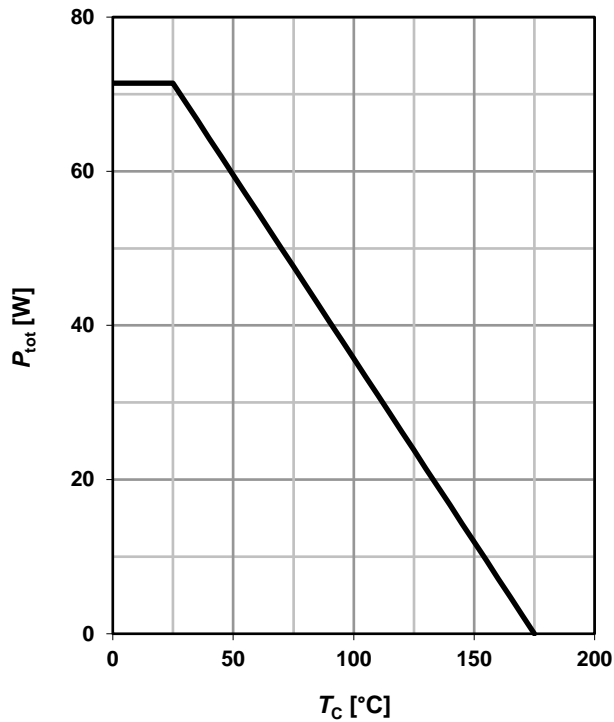
<sup>2)</sup> The parameter is not subject to production test - verified by design/characterization.

<sup>3)</sup> The product can operate at a 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 a four-layer 2s2p FR4 PCB defined in accordance with JEDEC standards (JESD51-5-7). PCB is vertical in still air.

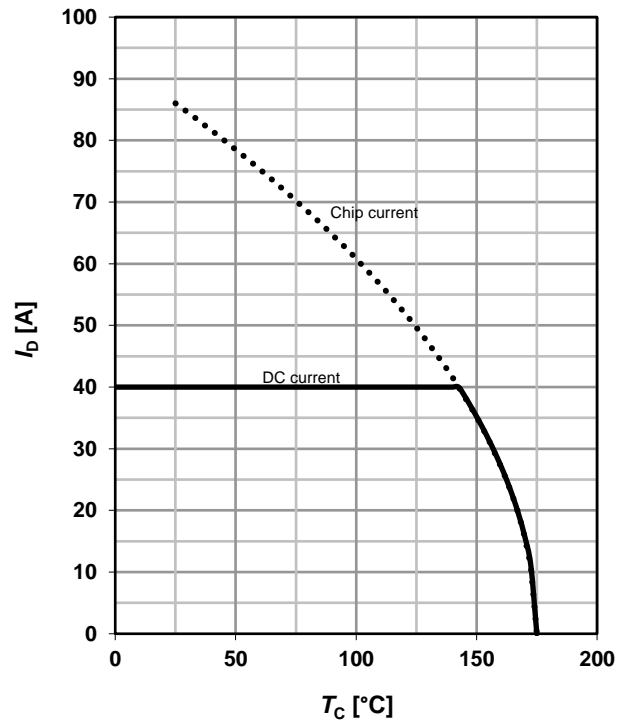
### 1 Power dissipation

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



### 2 Drain current

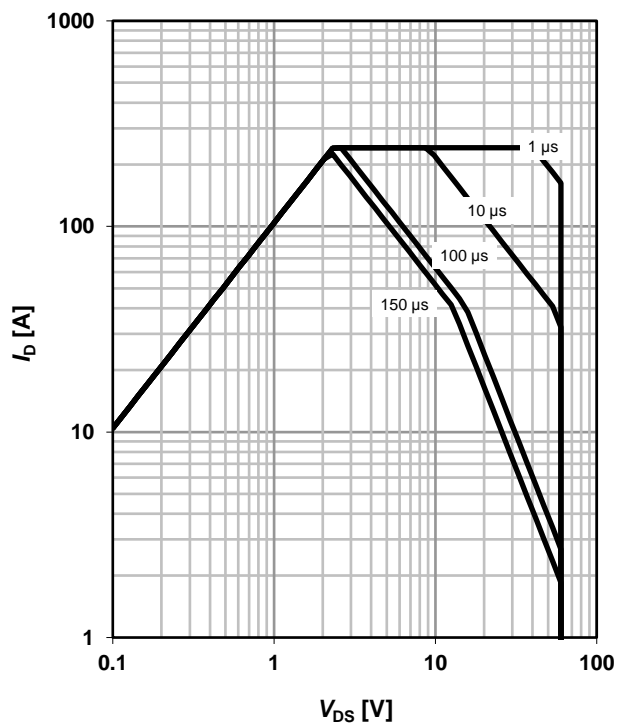
$$I_D = f(T_C); V_{\text{GS}} = 10 \text{ V}$$



### 3 Safe operating area

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

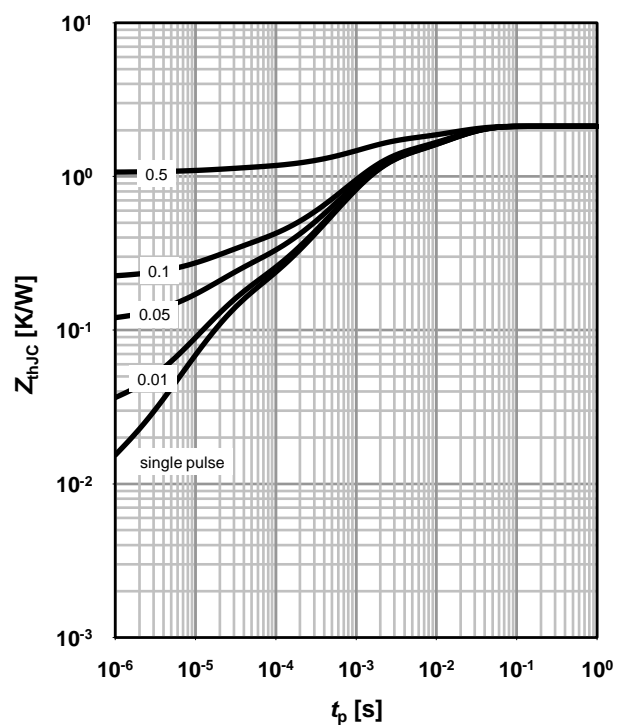
parameter:  $t_p$



### 4 Max. transient thermal impedance

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

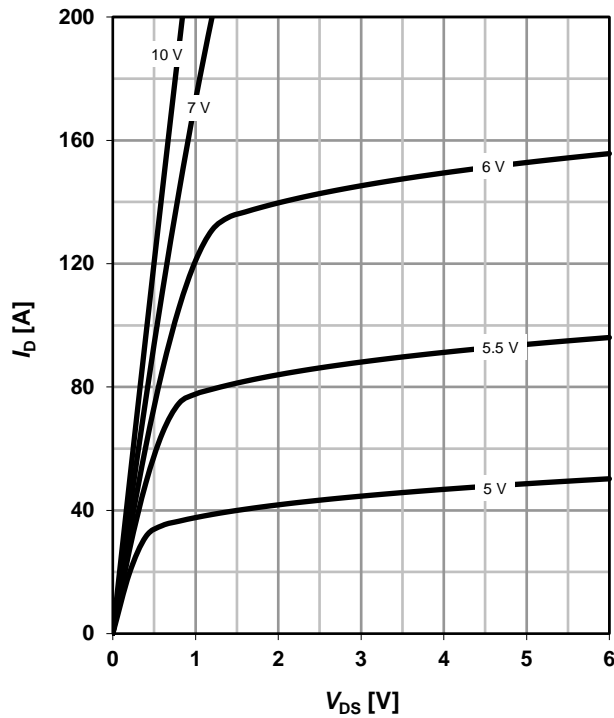
parameter:  $D = t_p/T$



### 5 Typ. output characteristics

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

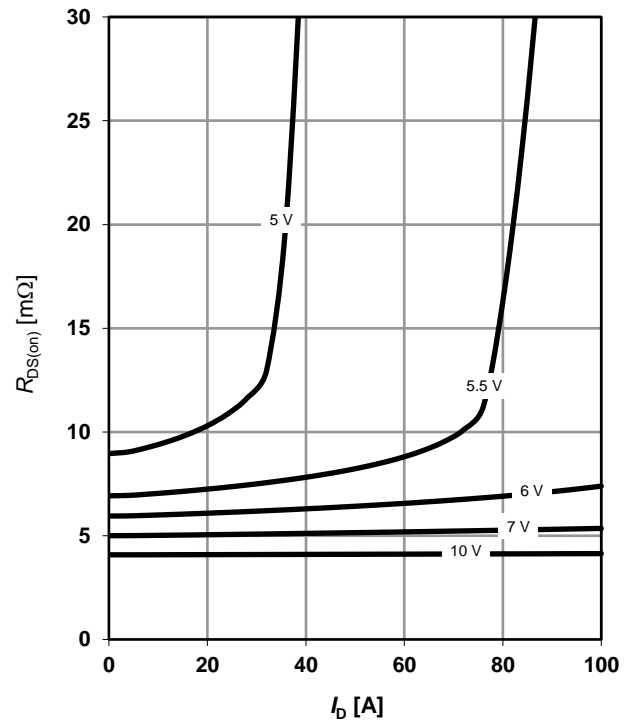
parameter:  $V_{GS}$



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

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

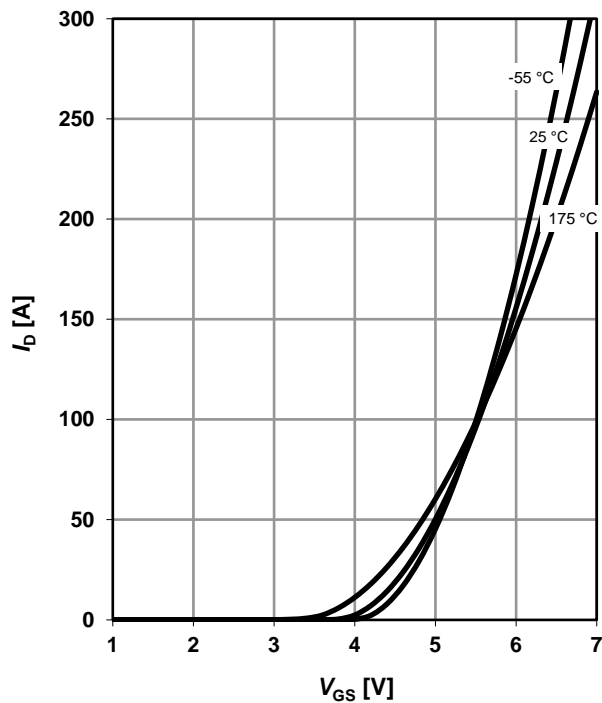
parameter:  $V_{GS}$



### 7 Typ. transfer characteristics

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

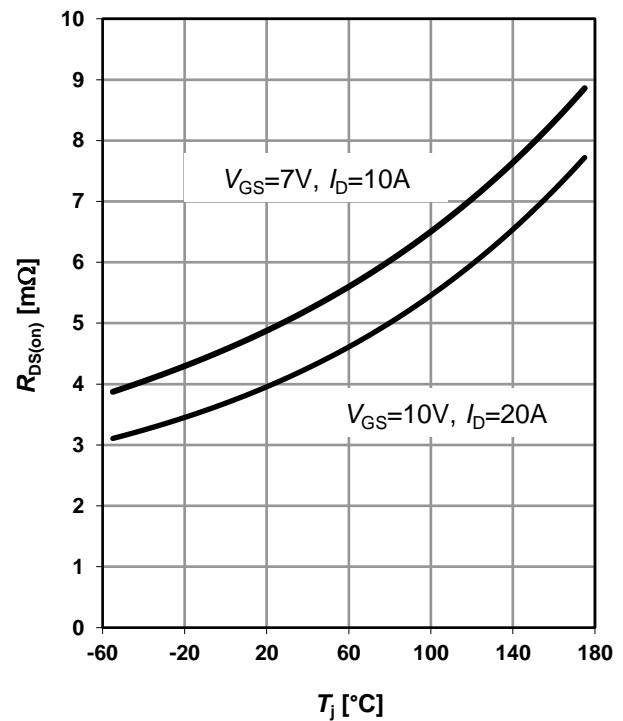
parameter:  $T_j$



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

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

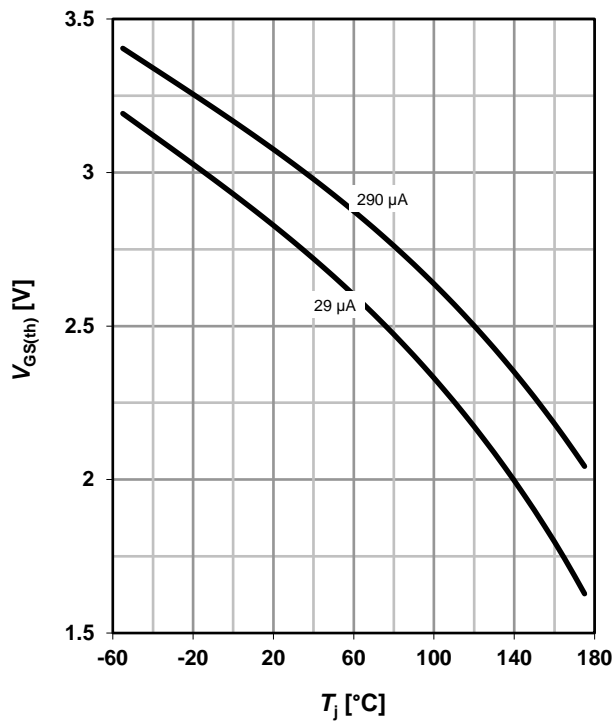
parameter:  $I_D, V_{GS}$



## 9 Typ. gate threshold voltage

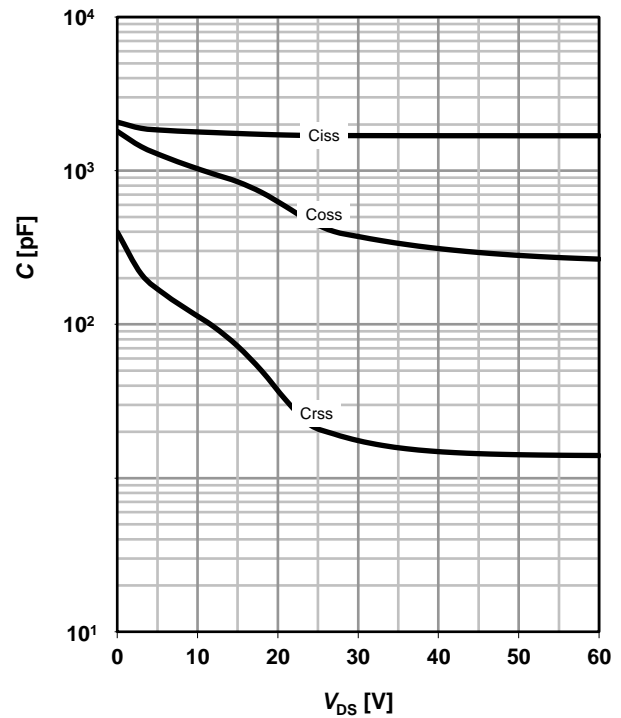
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$$

parameter:  $I_D$



## 10 Typ. capacitances

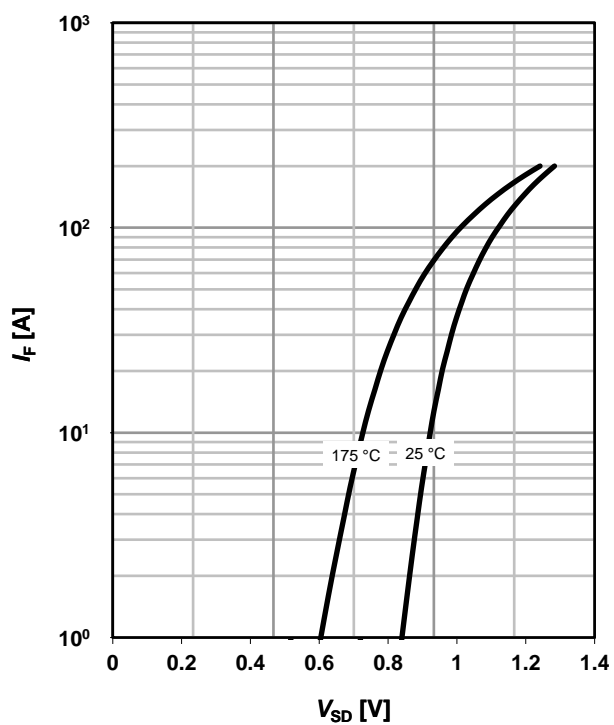
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



## 11 Typical forward diode characteristics

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

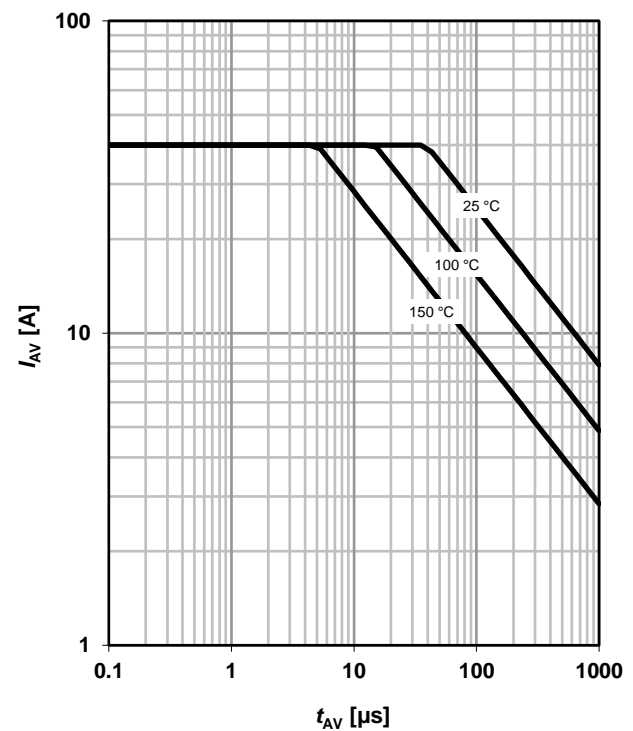
parameter:  $T_j$



## 12 Avalanche characteristics

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

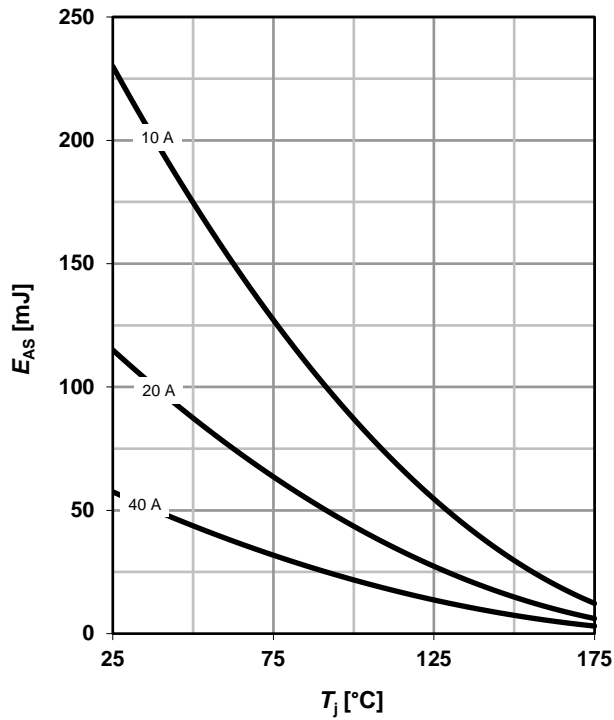
parameter:  $T_{j(start)}$



### 13 Avalanche energy

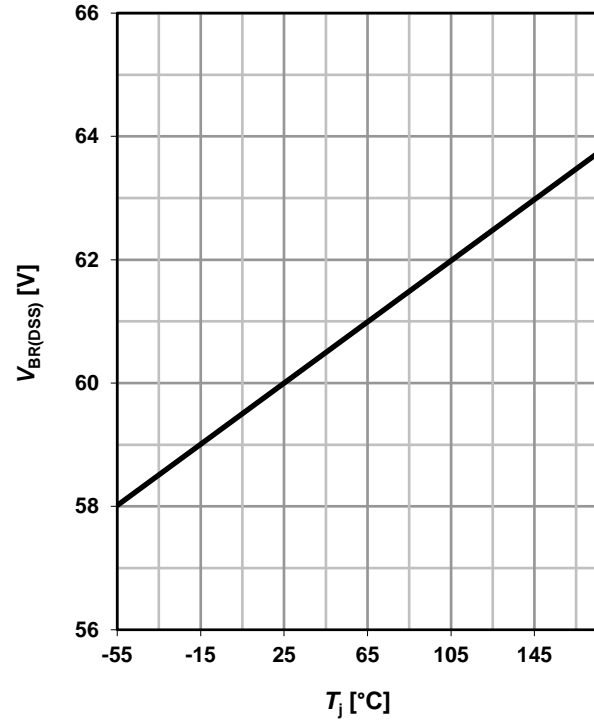
$$E_{AS} = f(T_j)$$

parameter:  $I_D$



### 14 Drain-source breakdown voltage

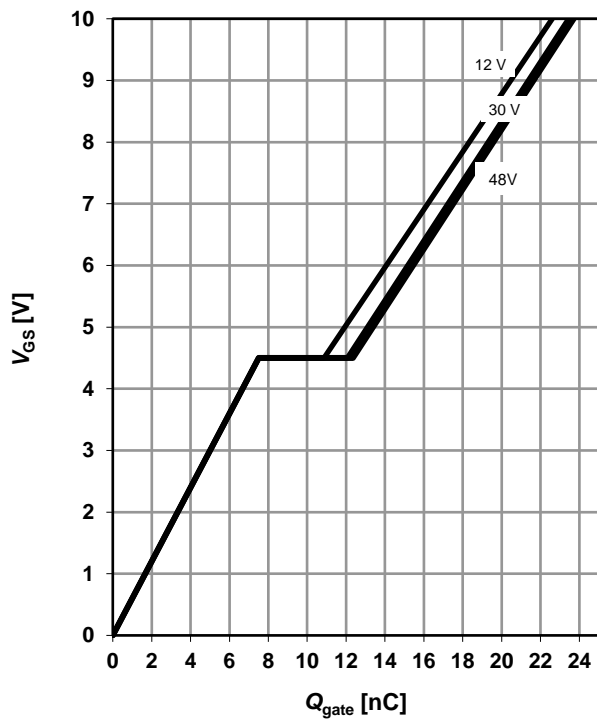
$$V_{BR(DSS)} = f(T_j); I_D = 1 \text{ mA}$$



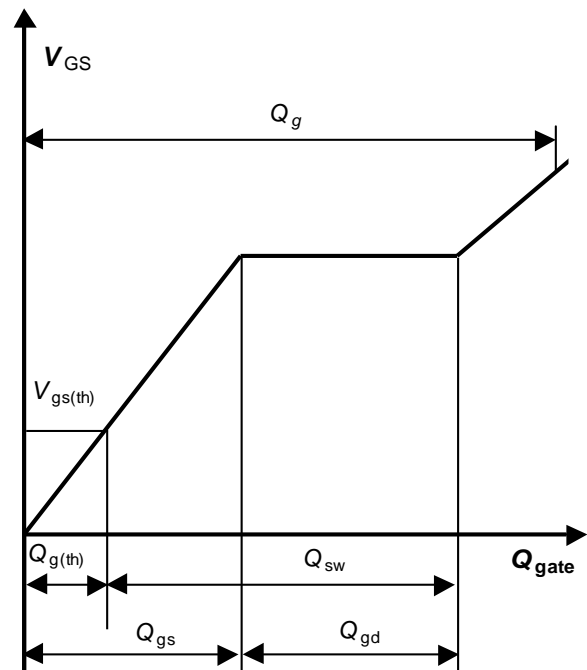
### 15 Typ. gate charge

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

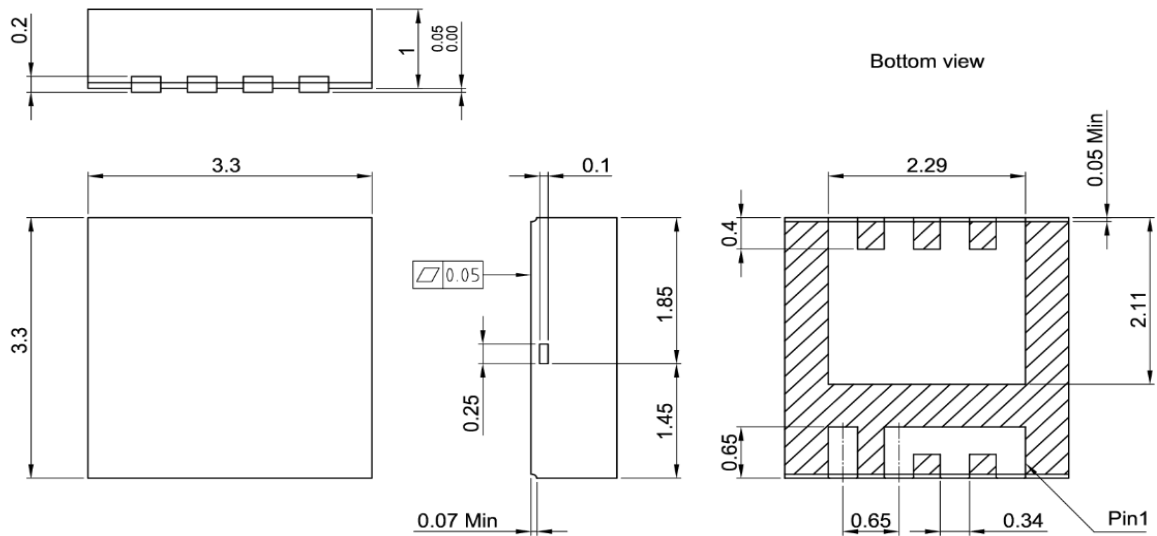
parameter:  $V_{DD}$



### 16 Gate charge waveforms

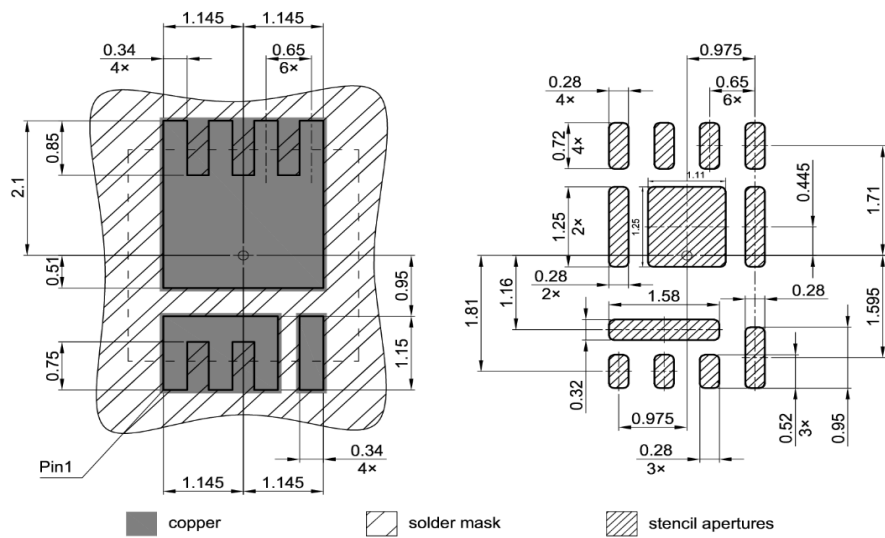


## Package Outline



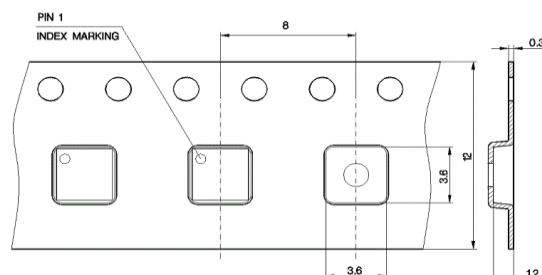
All dimensions are in units mm  
The drawing is in compliance with ISO 128-30, Projection Method 1 [ ]

## Footprint



All undimensioned radii is 0.075  
Based on stencil thickness 0.13 mm  
All dimensions are in units mm

## Packaging





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

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**Revision History**

Version	Date	Changes
Revision 1.0	05.05.2020	Final Data Sheet
Revision 1.1	18.03.2021	Modified package outline and footprint