

## Automotive MOSFET

### OptiMOS™ 7 Power-Transistor



#### Features

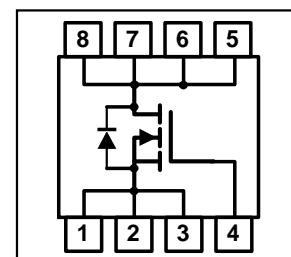
- OptiMOS™ power MOSFET for automotive applications
- N-channel – Enhancement mode – Normal Level
- Extended qualification beyond AEC-Q101
- Enhanced electrical testing
- Robust design
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- RoHS compliant
- 100% Avalanche tested

#### Potential applications

General automotive applications.

#### Product validation

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



#### Product Summary

$V_{DS}$	40	V
$R_{DS(on)}$	0.55	mΩ
$I_D$ (chip limited)	414	A

Type	Package	Marking
IAUCN04S7N005	PG-TDSON-8-43	7N04N005



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## 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>	414	A
		$V_{GS}=10\text{ V}$ , DC current <sup>3)</sup>	175	
		$T_a=100\text{ °C}$ , $V_{GS}=10\text{ V}$ , $R_{thJA}$ on 2s2p <sup>2,4)</sup>	53	
Pulsed drain current <sup>2)</sup>	$I_{D,pulse}$	$T_C=25\text{ °C}$ , $t_p=100\text{ }\mu\text{s}$	1400	
Avalanche energy, single pulse <sup>2)</sup>	$E_{AS}$	$I_D=75\text{ A}$	332	mJ
Avalanche current, single pulse	$I_{AS}$	–	150	A
Gate source voltage	$V_{GS}$	–	$\pm 20$	V
Power dissipation	$P_{tot}$	$T_C=25\text{ °C}$	179	W
Operating and storage temperature	$T_j, T_{stg}$	–	-55 ... +175	°C

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal resistance, junction - case	$R_{thJC}$	–	–	0.42	0.84	K/W
Thermal resistance, junction - ambient <sup>4)</sup>	$R_{thJA}$	–	–	26.9	–	

## 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	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}$ , $I_D=1\text{ mA}$	40	–	–	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$ , $I_D=95\text{ }\mu\text{A}$	2.2	2.6	3.0	
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=40\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=25\text{ °C}$	–	–	1	$\mu\text{A}$
		$V_{DS}=40\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=100\text{ °C}^{2)}$	–	–	24	
Gate-source leakage current	$I_{GSS}$	$V_{GS}=20\text{ V}$ , $V_{DS}=0\text{ V}$	–	–	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=7\text{ V}$ , $I_D=44\text{ A}$	–	0.61	0.70	m $\Omega$
		$V_{GS}=10\text{ V}$ , $I_D=88\text{ A}$	–	0.50	0.55	
Gate resistance <sup>2)</sup>	$R_G$	–	–	1.1	–	$\Omega$

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
<b>Dynamic characteristics<sup>2)</sup></b>						
Input capacitance	$C_{iss}$	$V_{GS}=0\text{ V}, V_{DS}=20\text{ V}, f=1\text{ MHz}$	-	6400	8320	pF
Output capacitance	$C_{oss}$		-	3700	4810	
Reverse transfer capacitance	$C_{rss}$		-	125	188	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=20\text{ V}, V_{GS}=10\text{ V}, I_D=88\text{ A}, R_G=3.5\ \Omega$	-	16	-	ns
Rise time	$t_r$		-	9	-	
Turn-off delay time	$t_{d(off)}$		-	34	-	
Fall time	$t_f$		-	21	-	

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

Gate to source charge	$Q_{gs}$	$V_{DD}=20\text{ V}, I_D=88\text{ A}, V_{GS}=0\text{ to }10\text{ V}$	-	26	34	nC
Gate to drain charge	$Q_{gd}$		-	20	30	
Gate charge total	$Q_g$		-	98	127	
Gate plateau voltage	$V_{plateau}$		-	4	-	V

**Reverse Diode**

Diode continuous forward current <sup>2)</sup>	$I_S$	$T_C=25\text{ °C}$	-	-	175	A
Diode pulse current <sup>2)</sup>	$I_{S,pulse}$	$T_C=25\text{ °C}, t_p=100\ \mu\text{s}$	-	-	1400	
Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=88\text{ A}, T_j=25\text{ °C}$	-	0.8	0.95	V
Reverse recovery time <sup>2)</sup>	$t_{rr}$	$V_R=20\text{ V}, I_F=50\text{ A}, di_f/dt=100\text{ A}/\mu\text{s}$	-	49	74	ns
Reverse recovery charge <sup>2)</sup>	$Q_{rr}$		-	46	92	

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

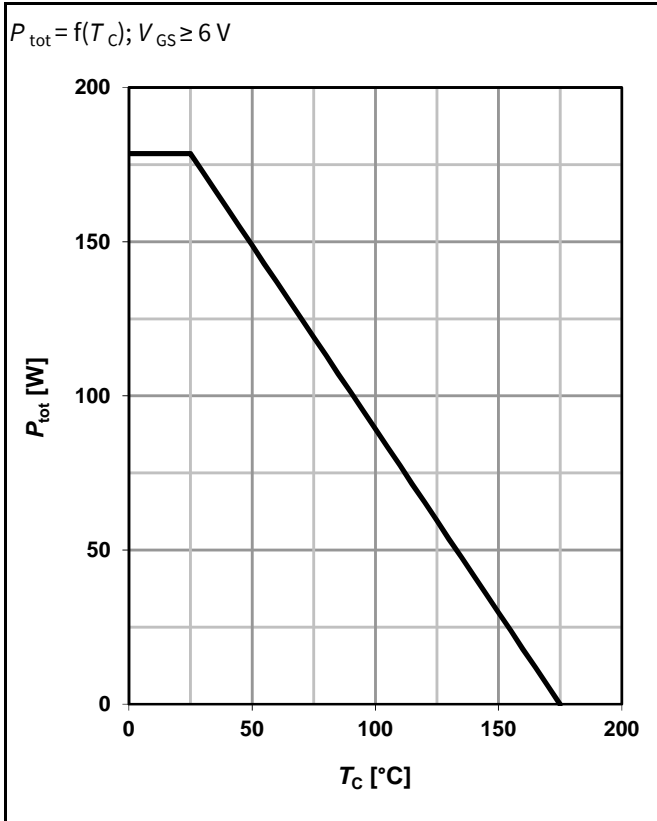
<sup>2)</sup> The parameter is not subject to production testing – specified by design.

<sup>3)</sup> Current is not limited by chip.

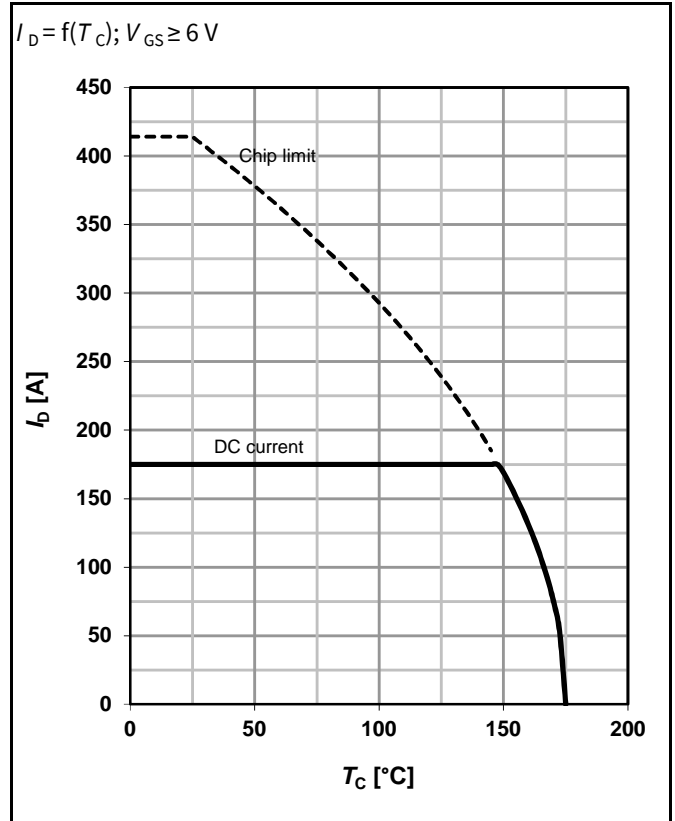
<sup>4)</sup> Device on 2s2p FR4 PCB defined in accordance with JEDEC standards (JESD51-5, -7). PCB is vertical in still air.

## Electrical characteristics diagrams

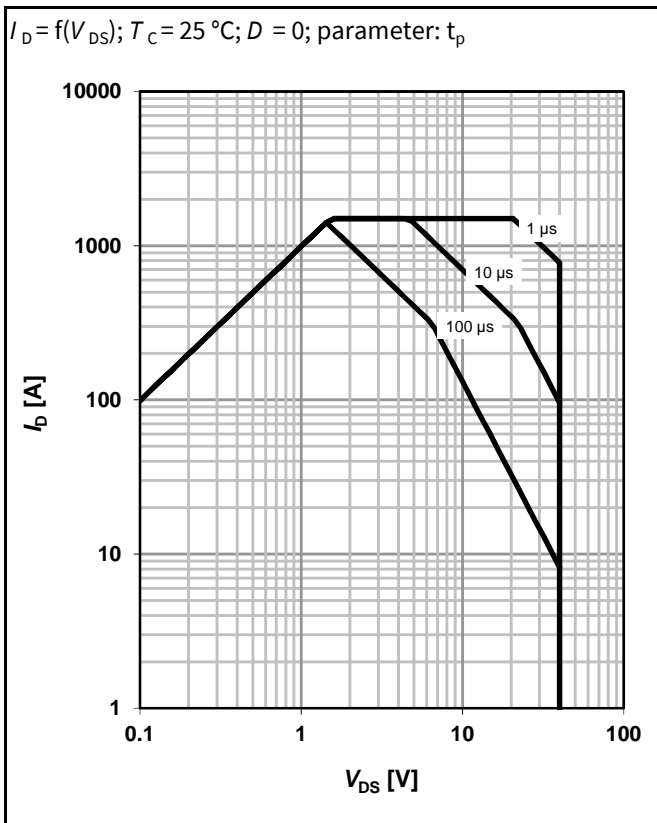
### 1 Power dissipation



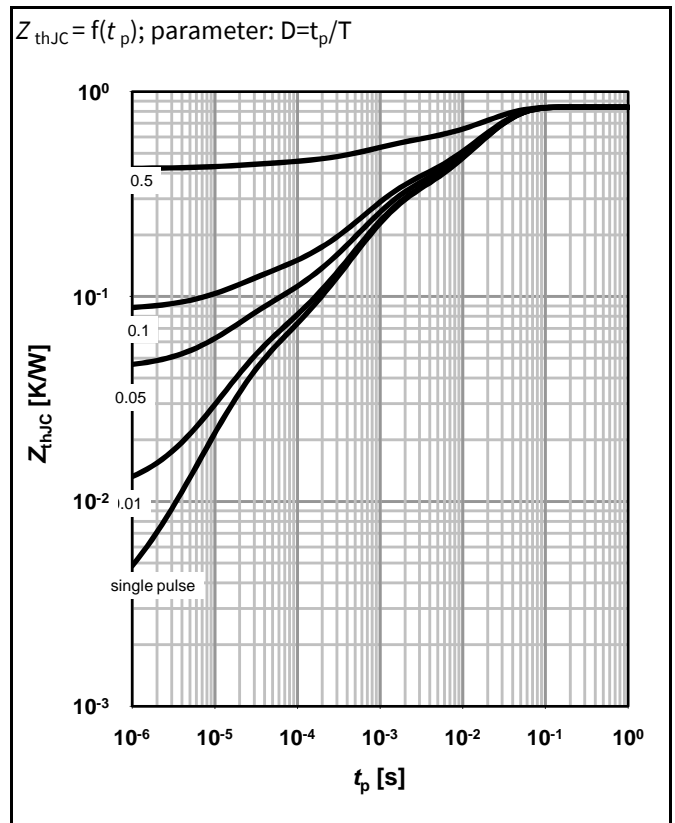
### 2 Drain current



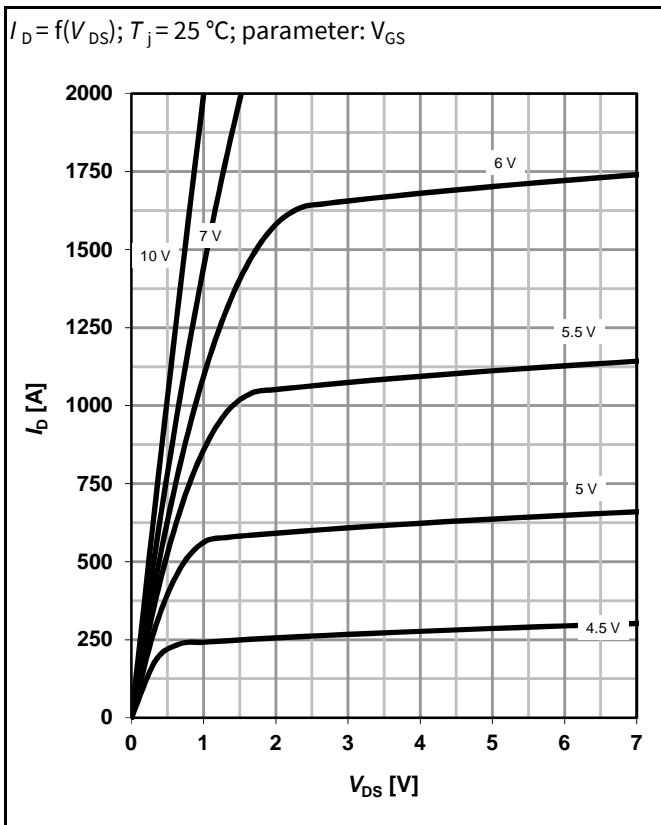
### 3 Safe operating area



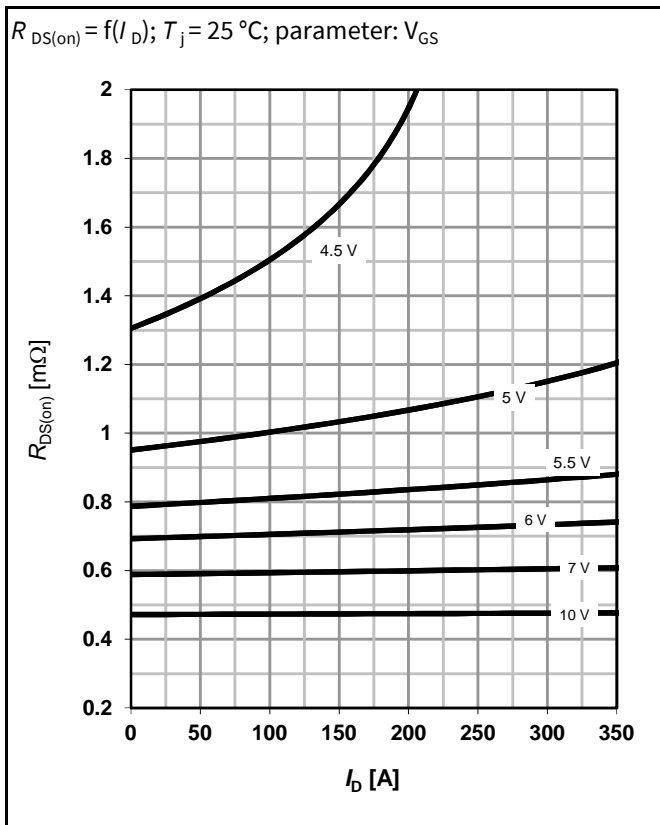
### 4 Max. transient thermal impedance



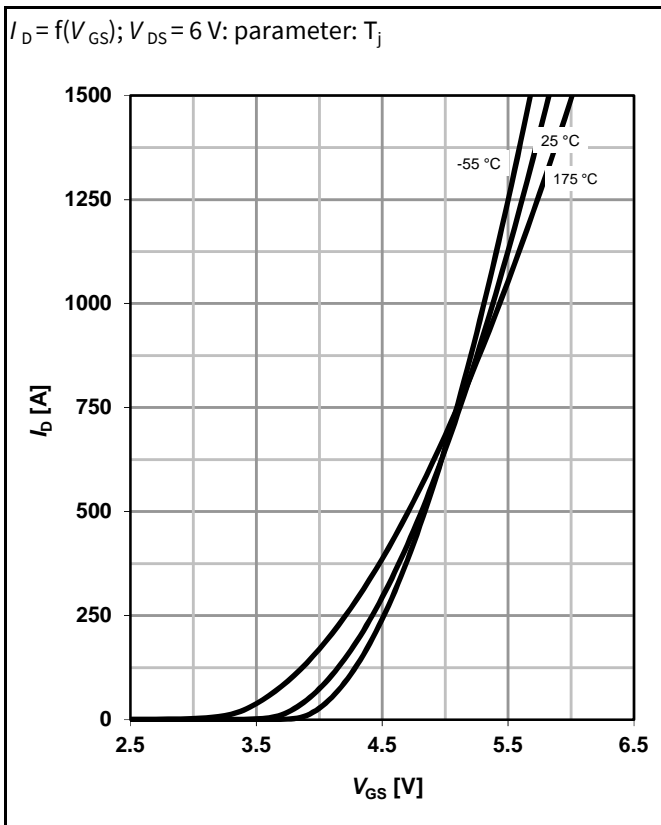
5 Typ. output characteristics



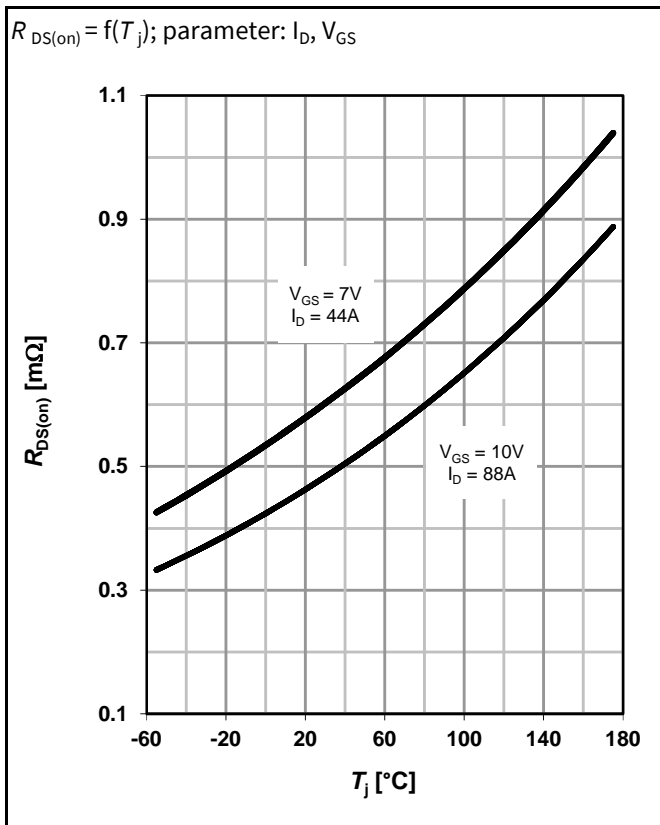
6 Typ. drain-source on-state resistance



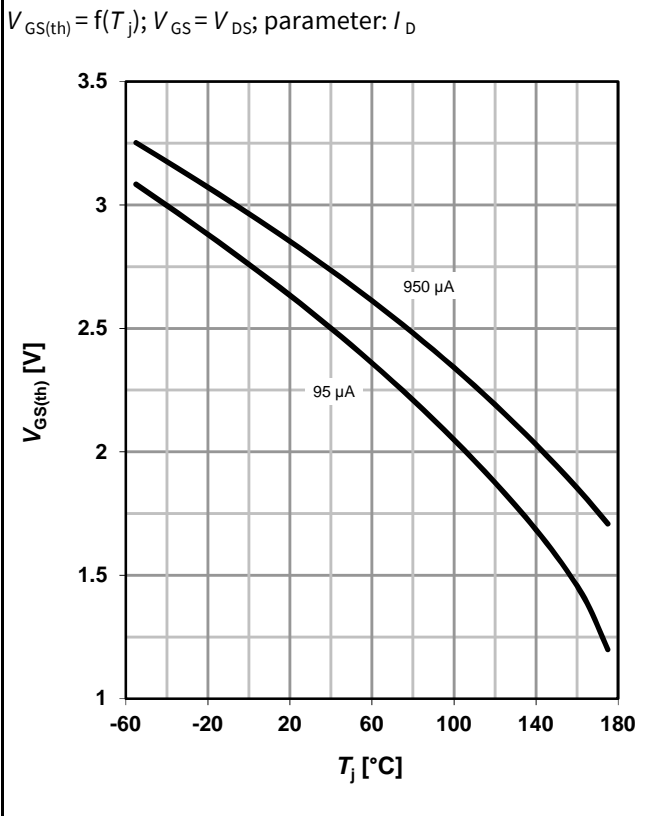
7 Typ. transfer characteristics



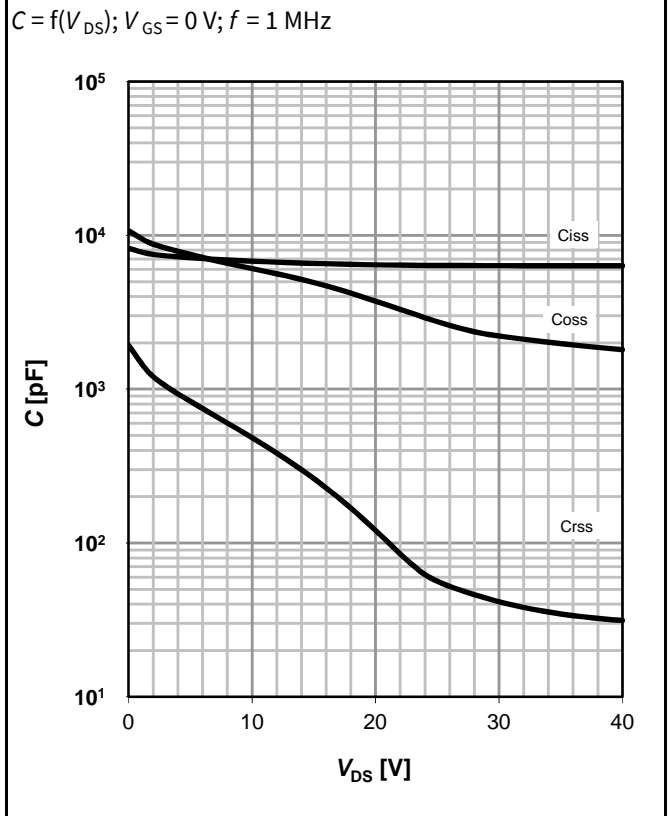
8 Typ. drain-source on-state resistance



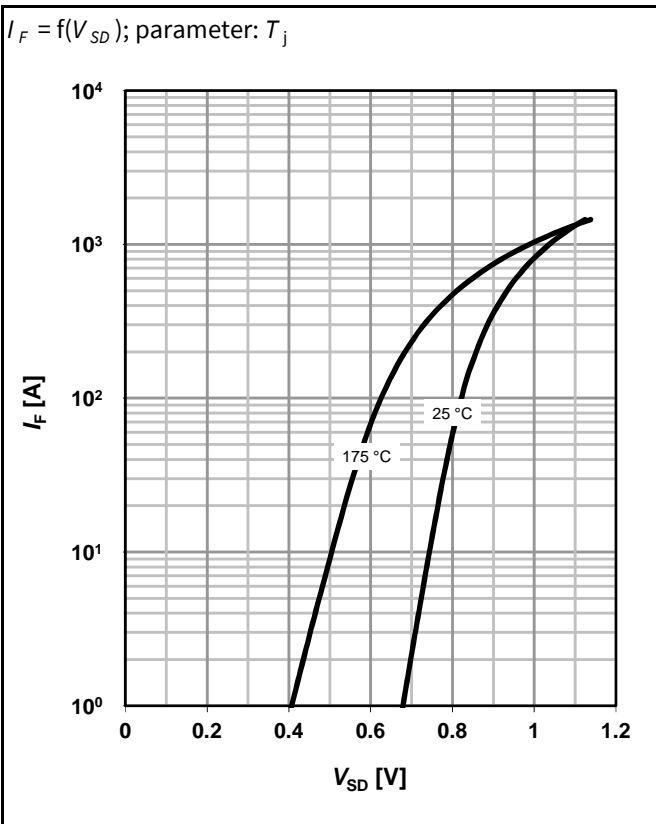
9 Typ. gate threshold voltage



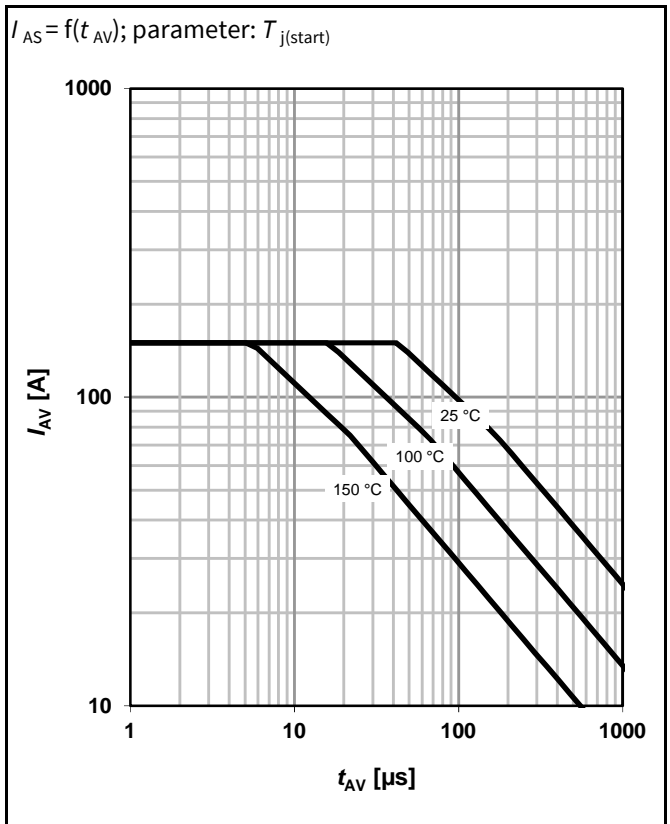
10 Typ. capacitances



11 Typical forward diode characteristics

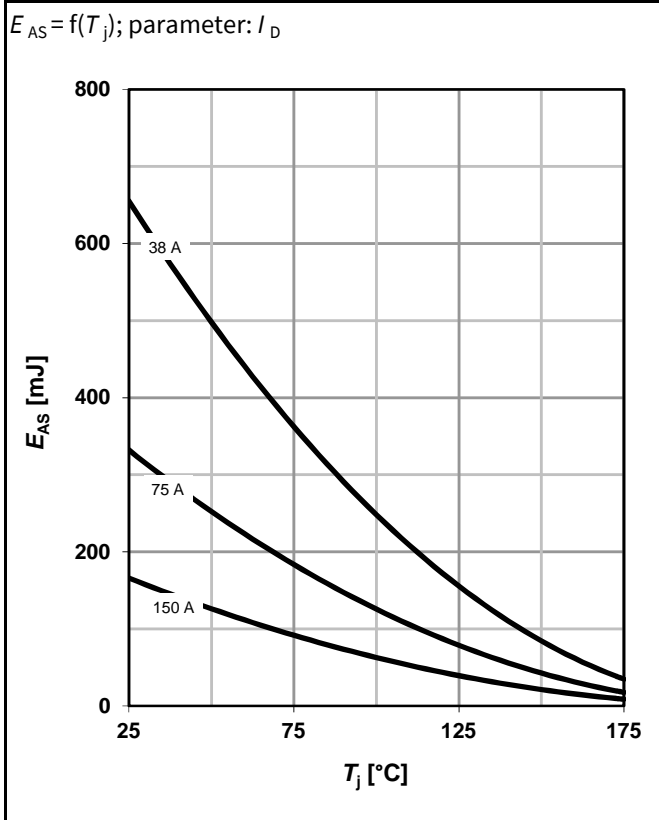


12 Typ. avalanche characteristics

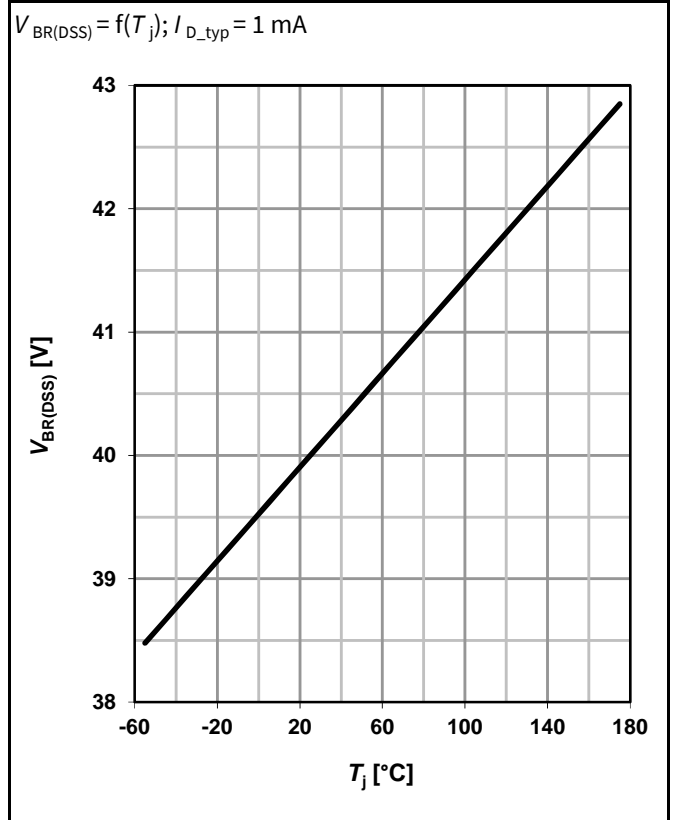




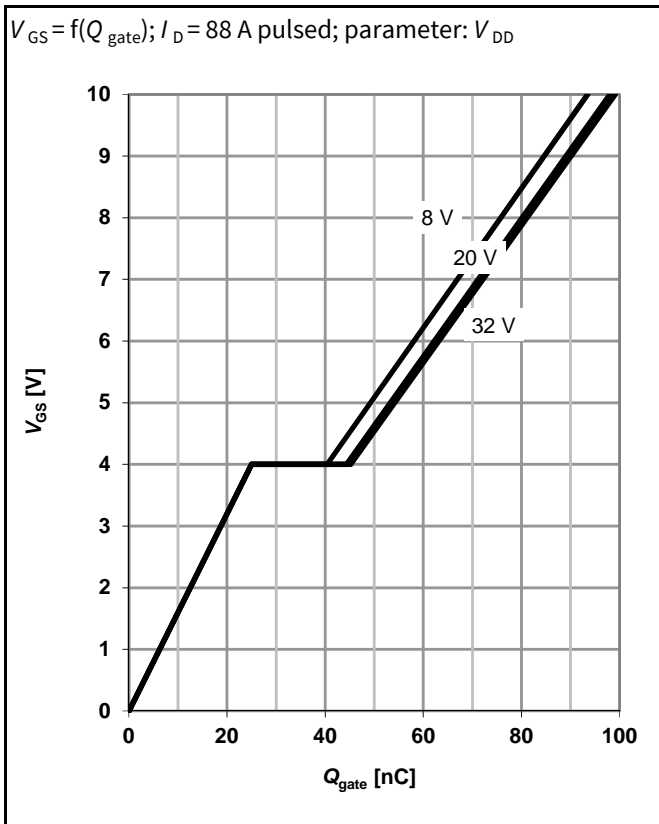
13 Typical avalanche energy



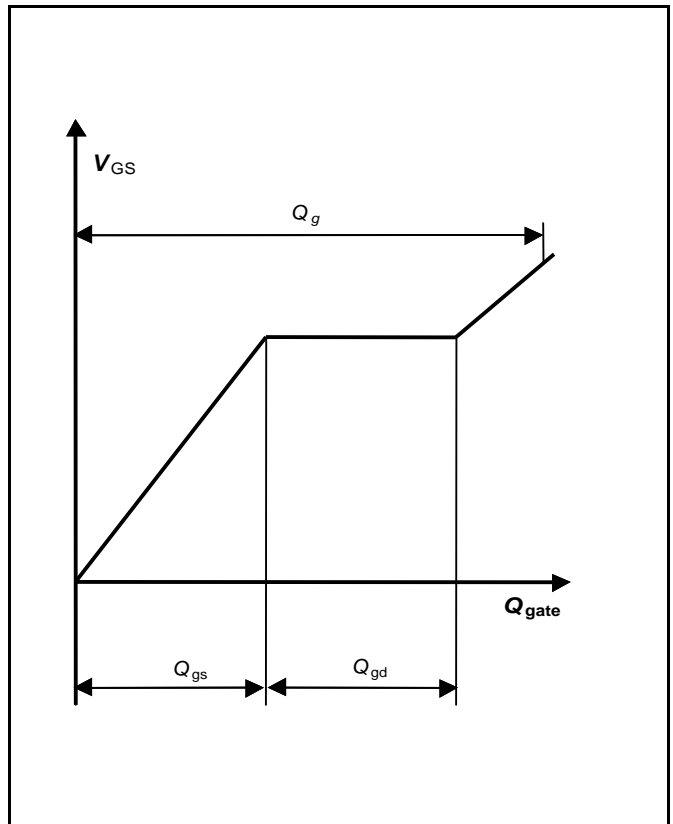
14 Drain-source breakdown voltage



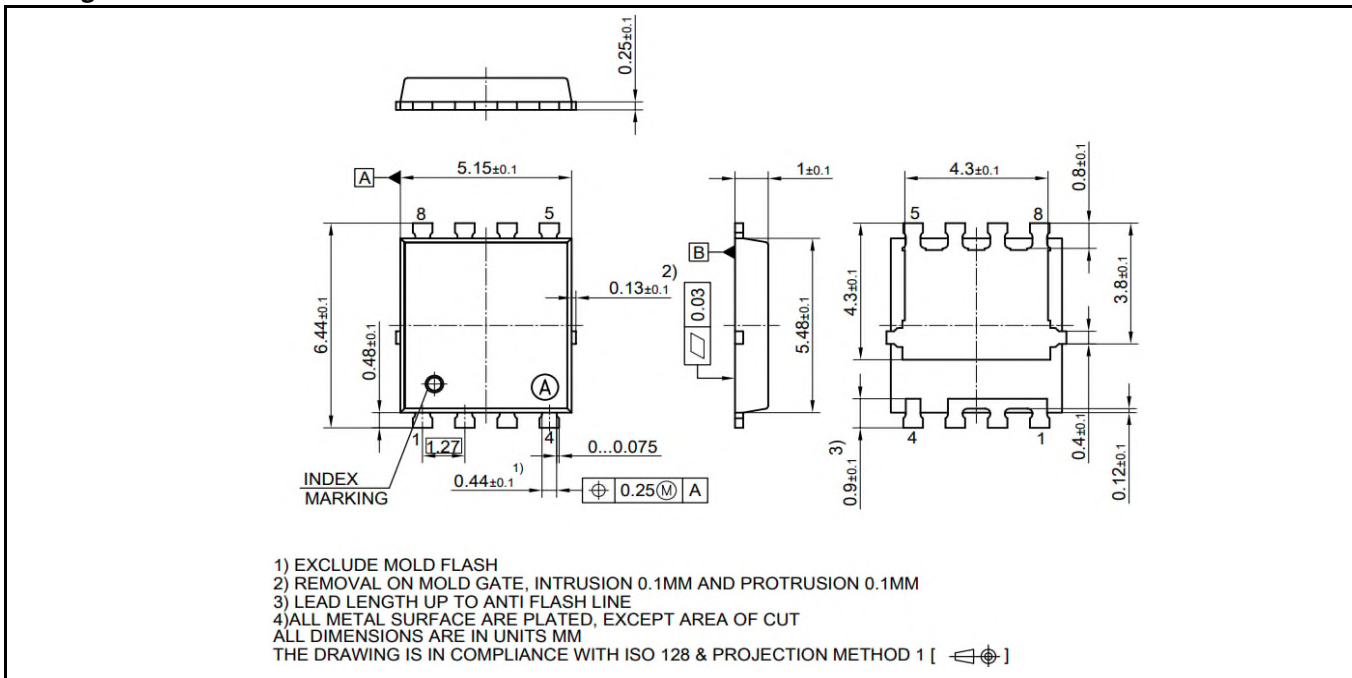
15 Typ. gate charge



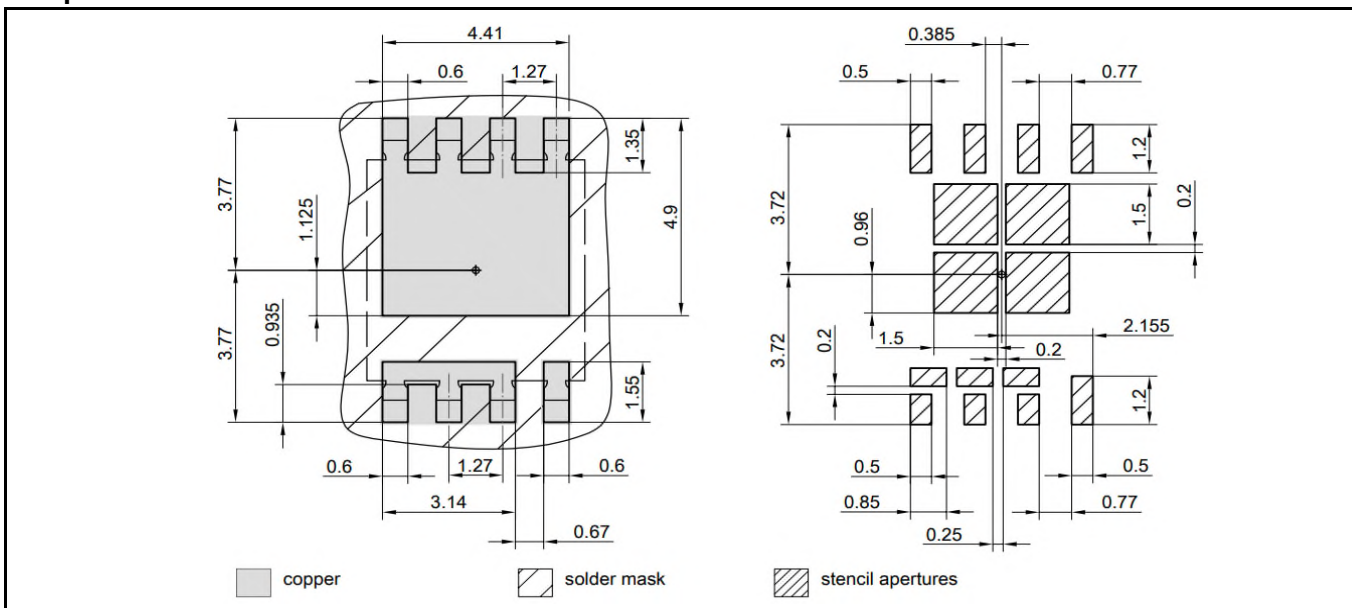
16 Gate charge waveforms



## Package Outline

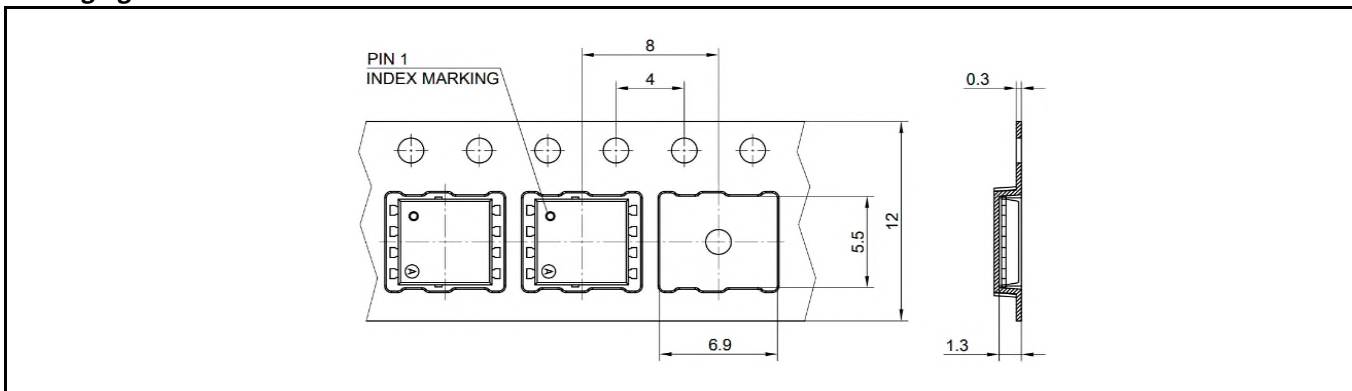


## Footprint



all dimensions in mm

## Packaging



all dimensions in mm



## Revision History

Revision	Date	Changes
Revision 1.0	30.05.2023	Final data sheet

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