

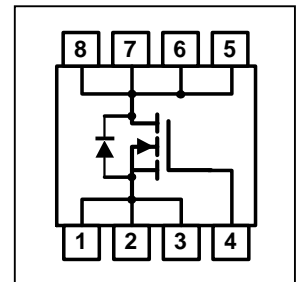
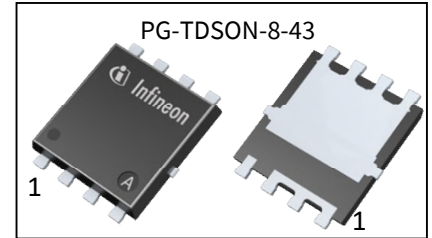
## Automotive MOSFET

### OptiMOS™ 7 Power-Transistor



#### Features

- OptiMOS™ power MOSFET for automotive applications
- N-channel – Enhancement mode – Logic 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
$R_{DS(on)}$	0.60	mΩ
$I_D$ (chip limited)	380	A

Type	Package	Marking
IAUCN04S7L006	PG-TDSON-8-43	7N04L006



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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>	380	A
		$V_{GS}=10\text{V}$ , DC current	175	
		$T_a=100\text{ °C}$ , $V_{GS}=10\text{ V}$ , $R_{thJA}$ on 2s2p <sup>2,3)</sup>	49	
Pulsed drain current <sup>2)</sup>	$I_{D,pulse}$	$T_c=25\text{ °C}$ , $t_p=100\text{ }\mu\text{s}$	1270	
Avalanche energy, single pulse <sup>2)</sup>	$E_{AS}$	$I_D=85\text{ A}$	230	mJ
Avalanche current, single pulse	$I_{AS}$	–	169	A
Gate source voltage	$V_{GS}$	–	$\pm 16$	V
		limited to duty factor of 1%	+20	V
Power dissipation	$P_{tot}$	$T_c=25\text{ °C}$	164	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	$R_{thJC}$	–	–	0.46	0.91	K/W
Thermal resistance, junction - ambient <sup>3)</sup>	$R_{thJA}$	–	–	27	–	

## 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	$V_{GS(th)}$	$V_{DS}=V_{GS}$ , $I_D=85\text{ }\mu\text{A}$	1.2	1.5	1.8	
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=40\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=25\text{ °C}$	–	–	1	$\mu\text{A}$
		$V_{DS}=40\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=100\text{ °C}^{2)}$	–	–	21	
Gate-source leakage current	$I_{GSS}$	$V_{GS}=16\text{ V}$ , $V_{DS}=0\text{ V}$	–	–	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=4.5\text{ V}$ , $I_D=88\text{ A}$	–	0.72	0.84	m $\Omega$
		$V_{GS}=10\text{ V}$ , $I_D=88\text{ A}$	–	0.51	0.60	
Gate resistance <sup>2)</sup>	$R_G$	–	–	1.0	–	$\Omega$

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
<b>Dynamic characteristics<sup>2)</sup></b>						
Input capacitance	$C_{iss}$	$V_{GS}=0\text{ V}, V_{DS}=20\text{ V}, f=1\text{ MHz}$	-	6367	8277	pF
Output capacitance	$C_{oss}$		-	3199	4160	
Reverse transfer capacitance	$C_{rss}$		-	107	160	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=20\text{ V}, V_{GS}=10\text{ V}, I_D=88\text{ A}, R_G=3.5\ \Omega$	-	7	-	ns
Rise time	$t_r$		-	7	-	
Turn-off delay time	$t_{d(off)}$		-	59	-	
Fall time	$t_f$		-	29	-	

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

Gate to source charge	$Q_{gs}$	$V_{DD}=20\text{ V}, I_D=88\text{ A}, V_{GS}=0\text{ to }10\text{ V}$	-	16	21	nC
Gate to drain charge	$Q_{gd}$		-	16	24	
Gate charge total	$Q_g$		-	95	124	
Gate plateau voltage	$V_{plateau}$		-	2.6	-	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>	$I_{S,pulse}$	$T_C=25\text{ °C}, t_p=100\ \mu\text{s}$	-	-	1270	
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>	$t_{rr}$	$V_R=20\text{ V}, I_F=50\text{ A}, di_f/dt=100\text{ A}/\mu\text{s}$	-	47	71	ns
Reverse recovery charge <sup>2)</sup>	$Q_{rr}$		-	44	87	

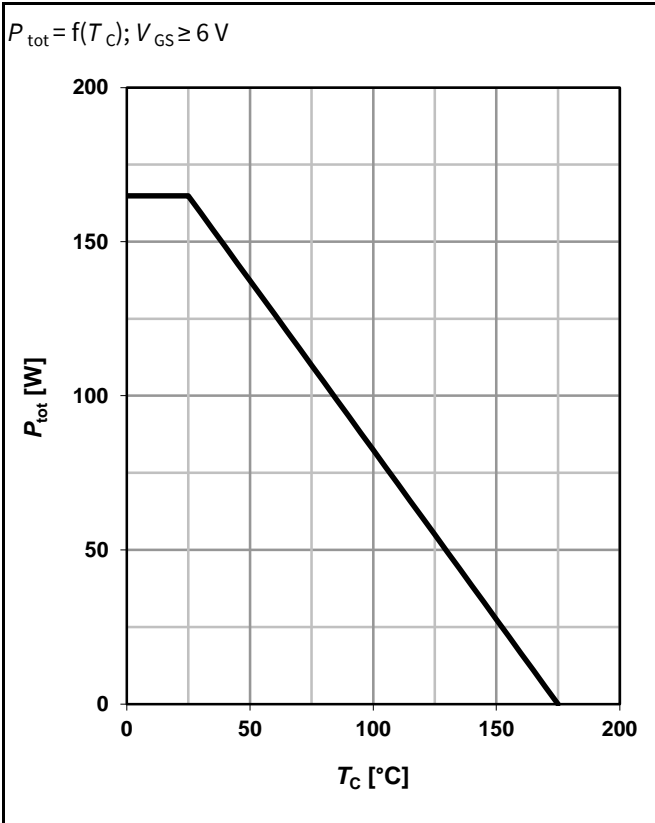
<sup>1)</sup> Practically the current is limited by the overall system design including the customer-specific PCB.

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

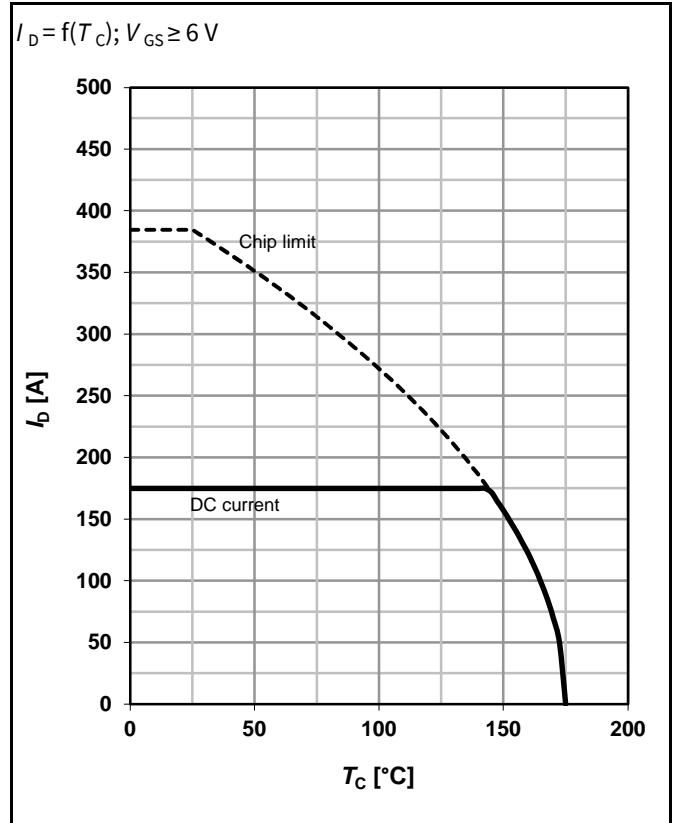
<sup>3)</sup> Device on 2s2p FR4 PCB defined in accordance with JEDEC standards (JESD51-5, -7). PCB is vertical in still air.

Electrical characteristics diagrams

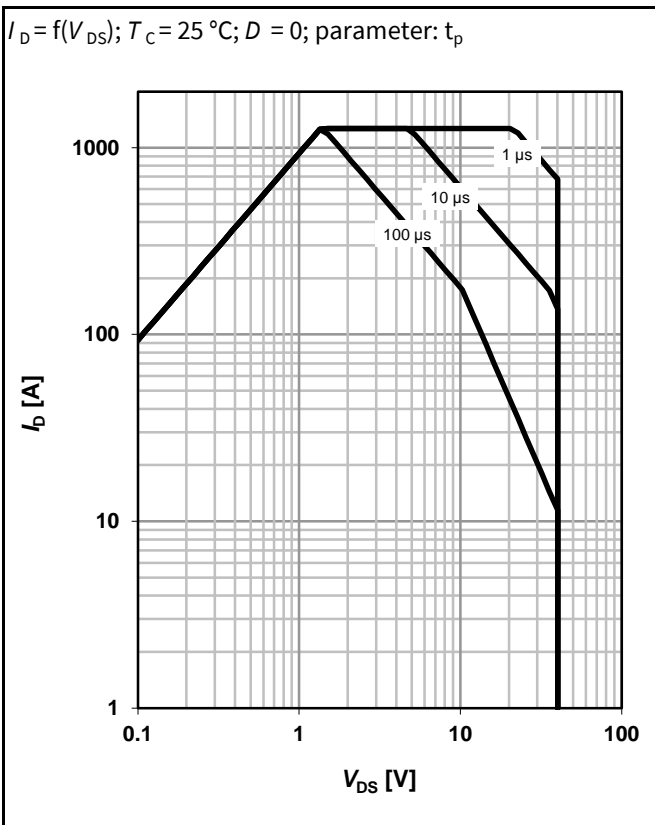
1 Power dissipation



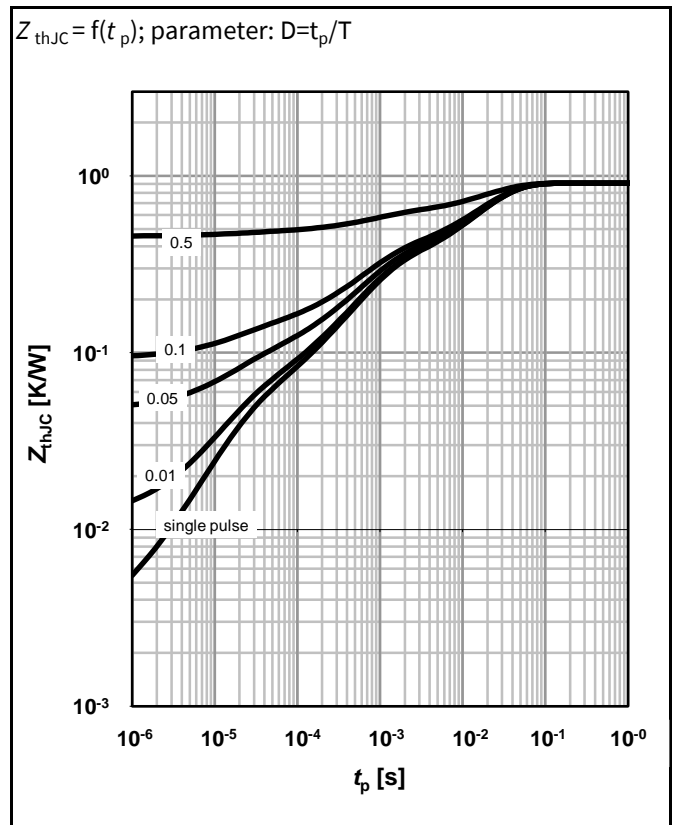
2 Drain current



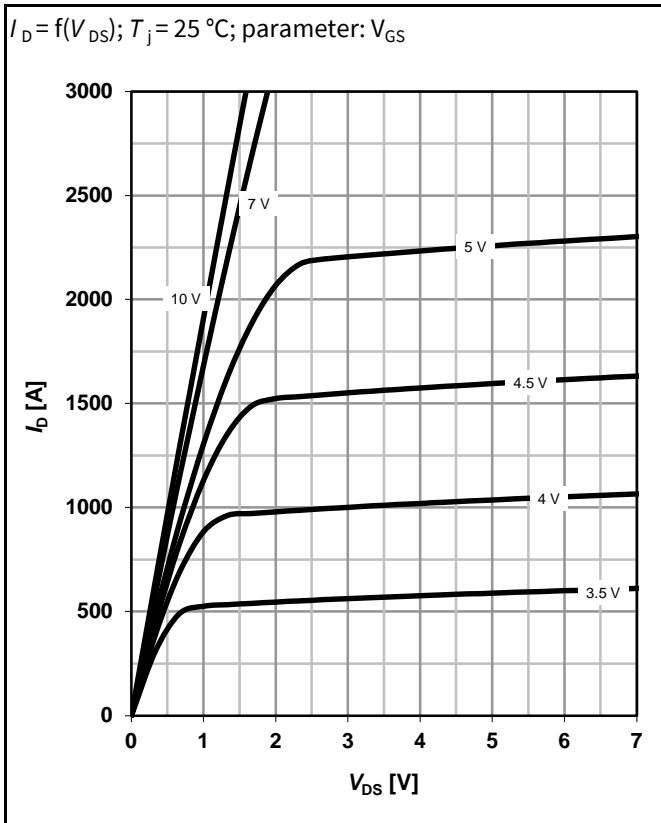
3 Safe operating area



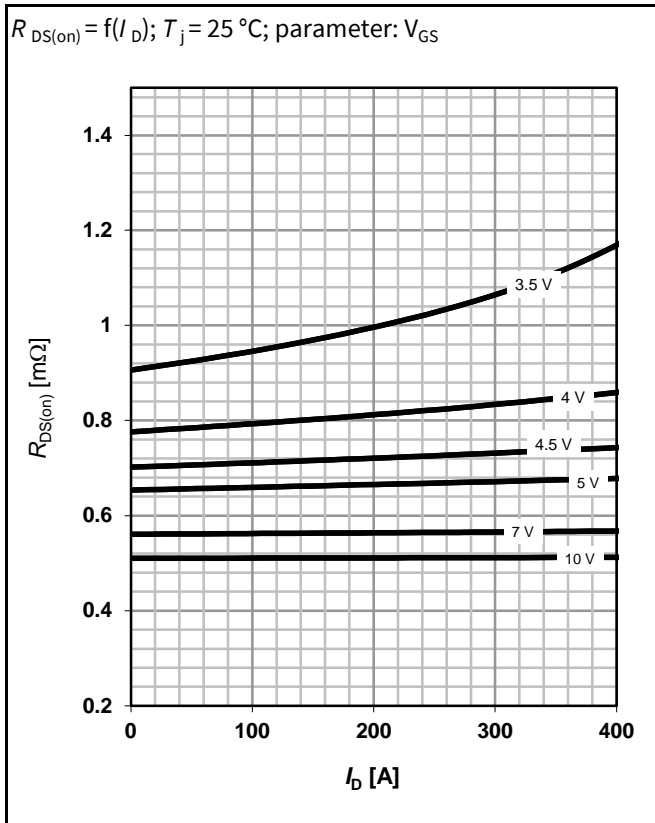
4 Max. transient thermal impedance



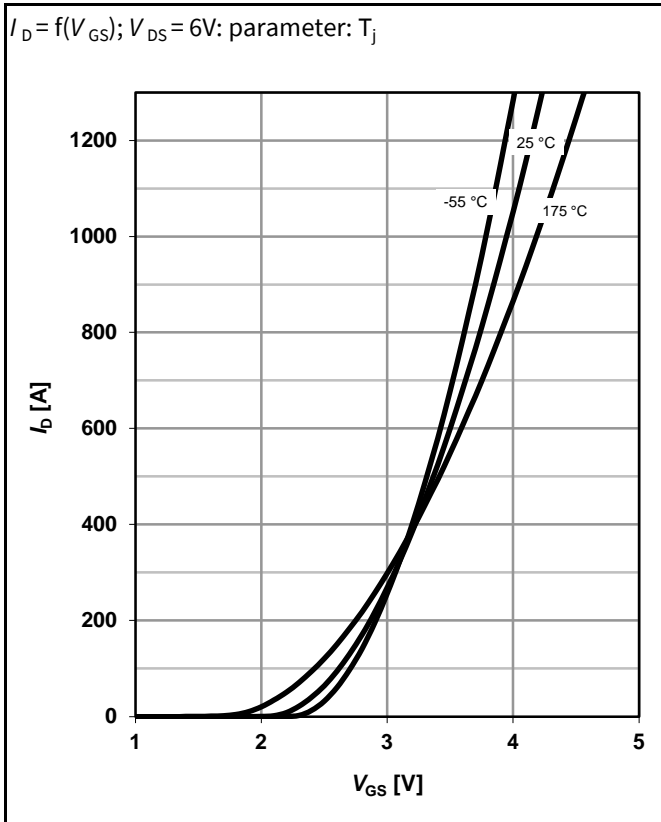
5 Typ. output characteristics



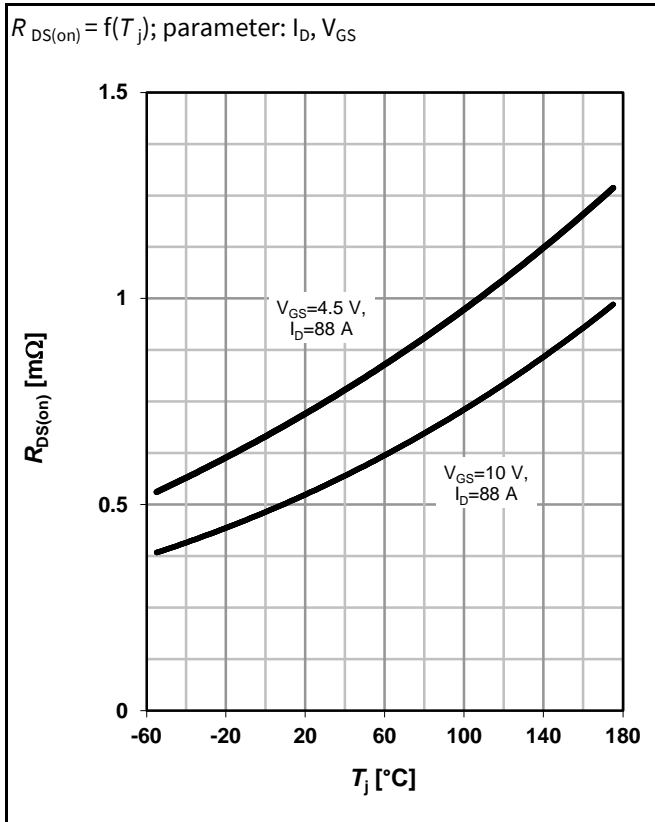
6 Typ. drain-source on-state resistance



7 Typ. transfer characteristics

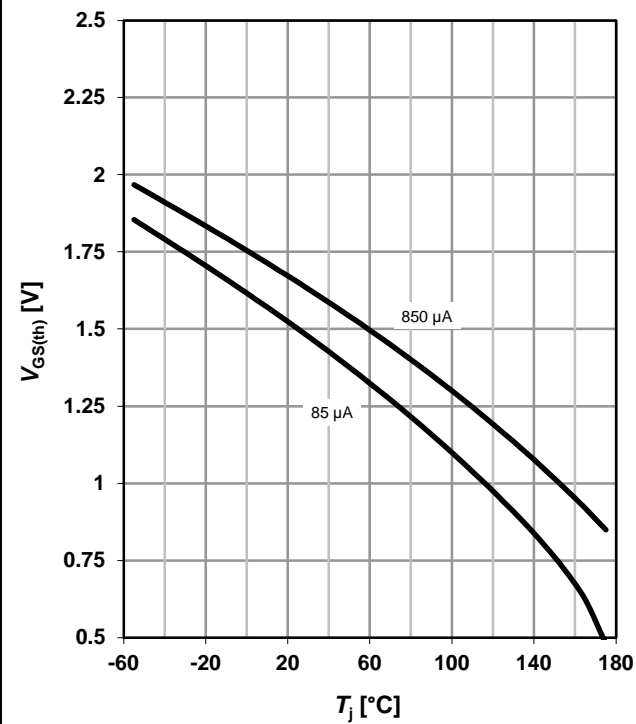


8 Typ. drain-source on-state resistance



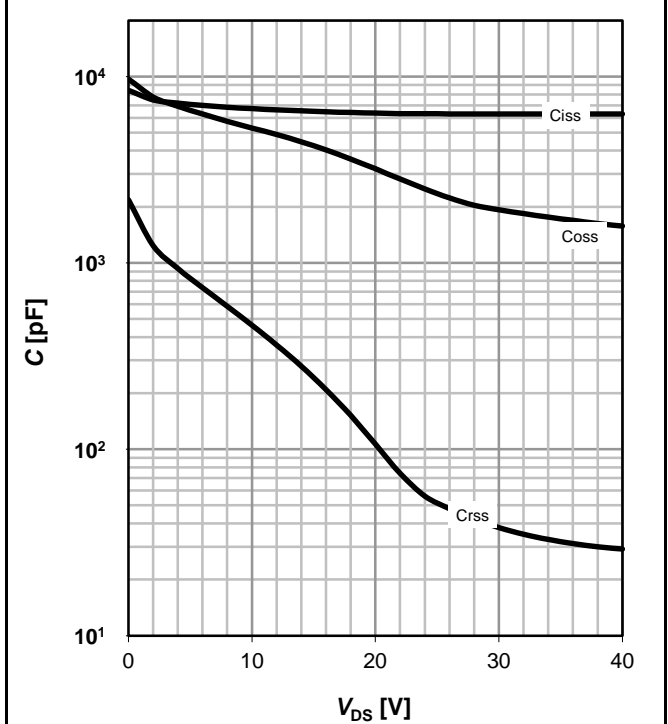
9 Typ. gate threshold voltage

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



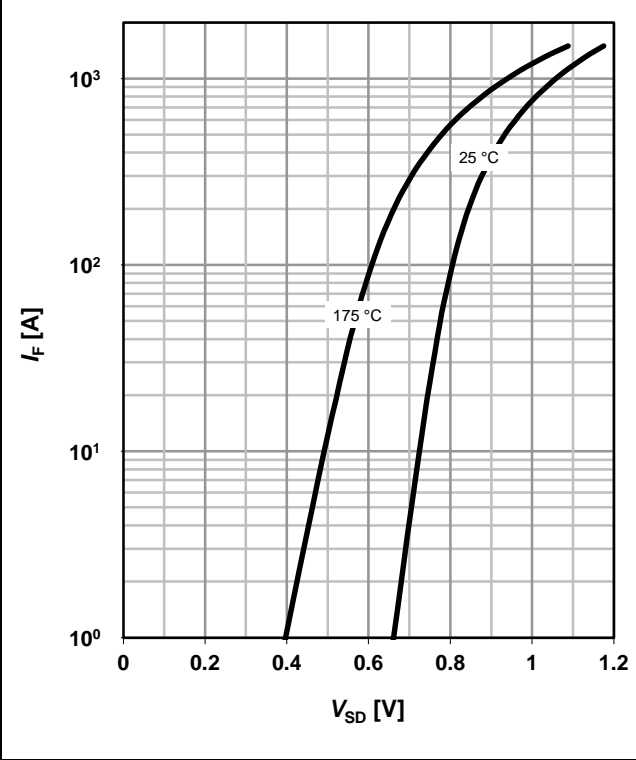
10 Typ. capacitances

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



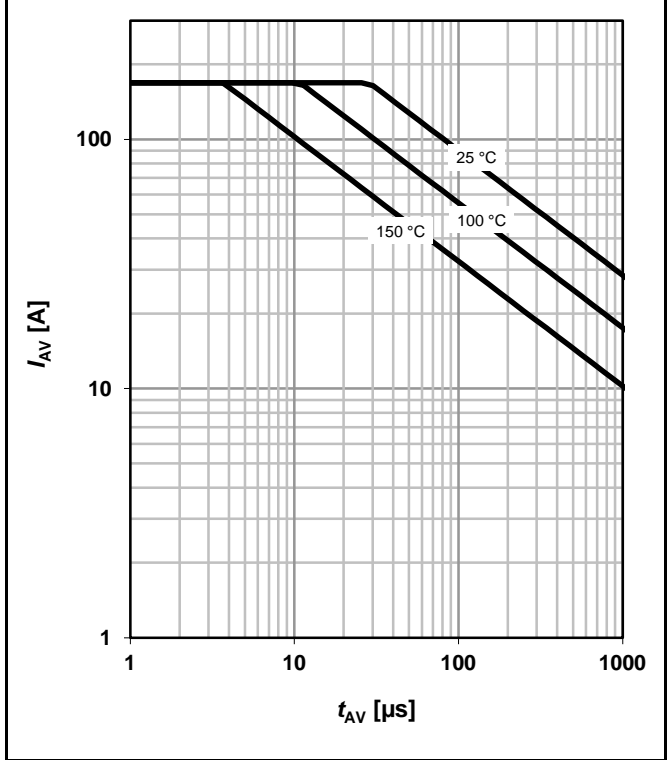
11 Typical forward diode characteristics

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



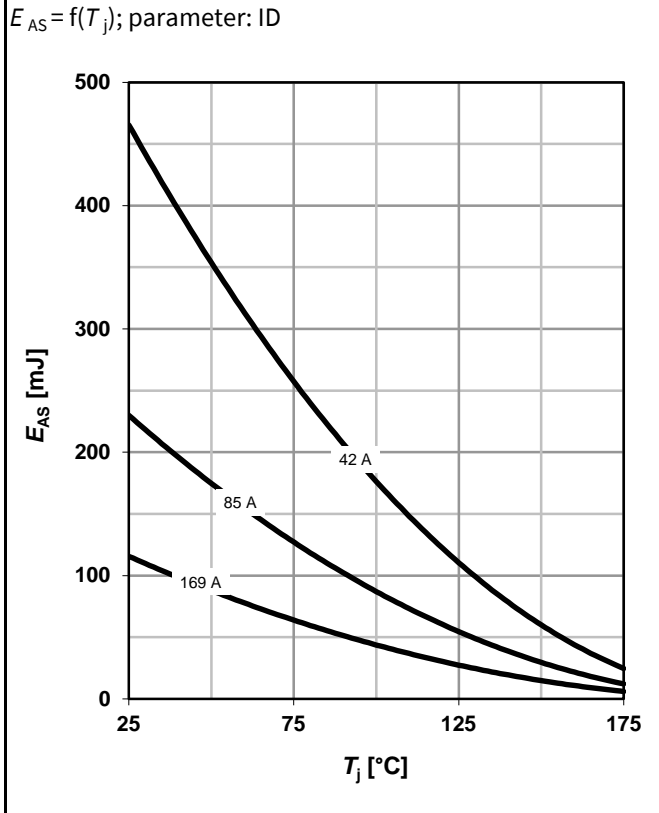
12 Typ. avalanche characteristics

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

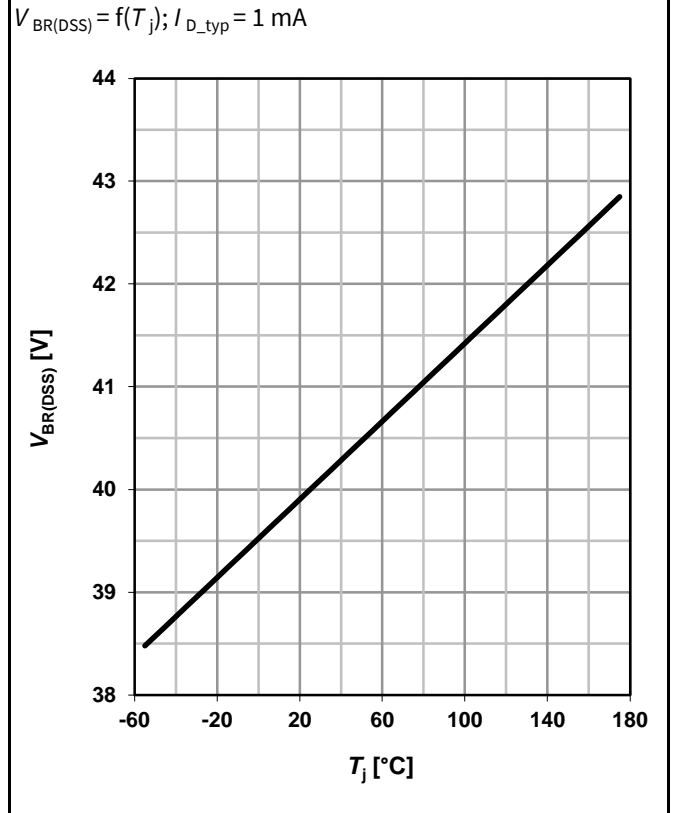




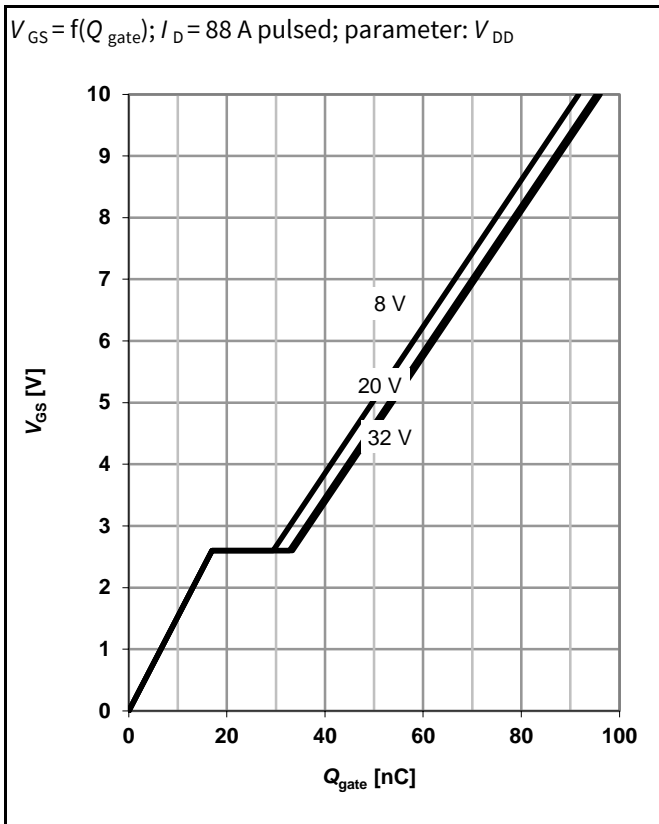
13 Typical avalanche energy



14 Drain-source breakdown voltage



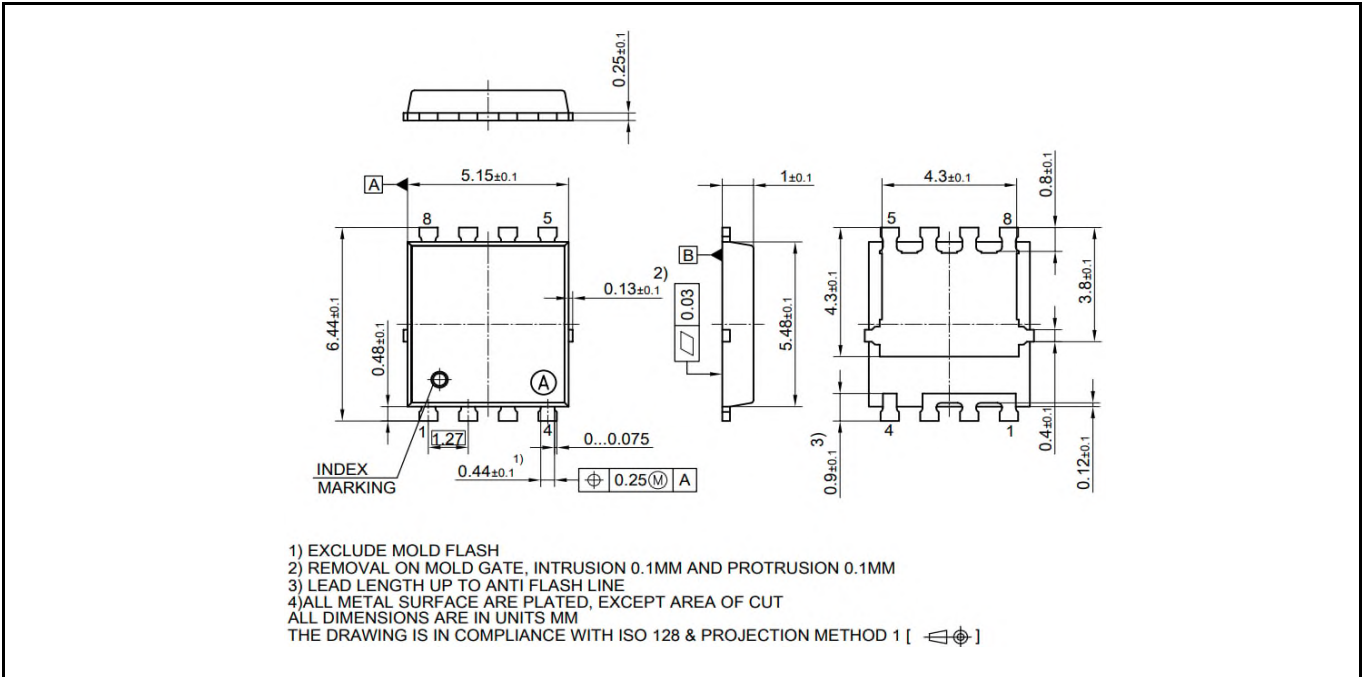
15 Typ. gate charge



16 Gate charge waveforms

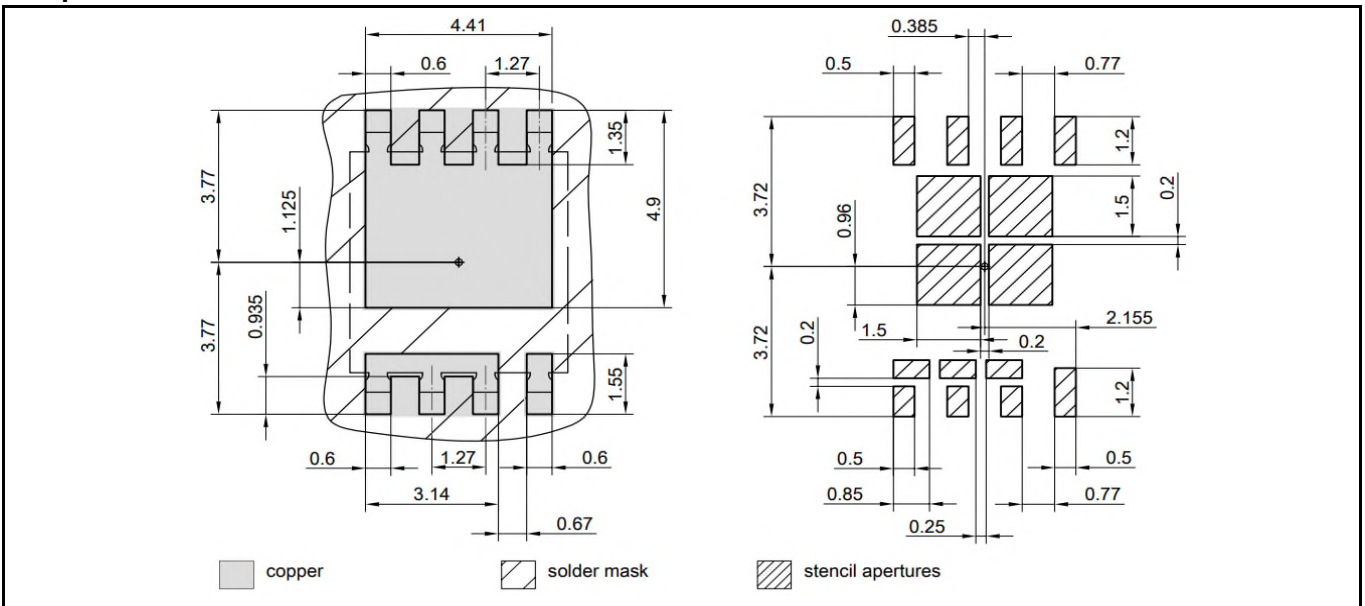


## Package Outline



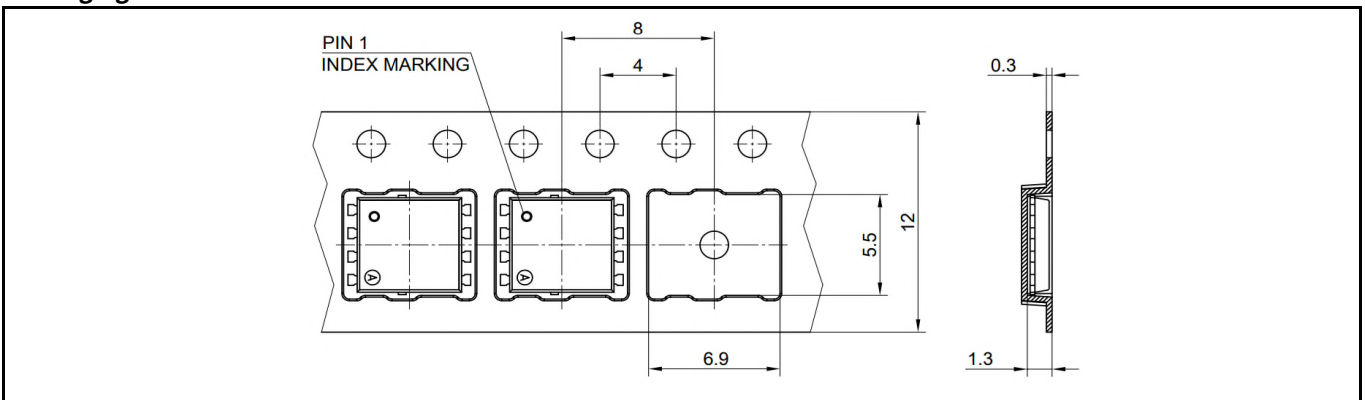
All dimensions are in units mm

## Footprint



All dimensions are in units mm

## Packaging



All dimensions are in units mm



**Revision History**

Revision	Date	Changes
Revision 1.0	15.11.2023	Final Data Sheet

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