

Automotive MOSFET

OptiMOS™ 7 Power-Transistor



Features

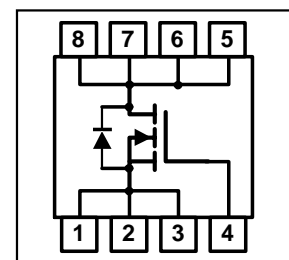
- OptiMOS™ power MOSFET for automotive applications
- N-channel – Enhancement mode – Normal Level
- Extended qualification beyond AEC-Q101
- Enhanced electrical testing
- Robust design
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- RoHS compliant
- 100% Avalanche tested

Potential applications

General automotive applications.

Product validation

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



Product Summary

V_{DS}	40	V
$R_{DS(on)}$	0.44	mΩ
I_D (chip limited)	518	A

Type	Package	Marking
IAUCN04S7N004	PG-TDSON-8-53	7N04N004



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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 ^{1,2)}	518	A
		$V_{GS}=10\text{V}$, DC current ³⁾	175	
		$T_a=100\text{ °C}$, $V_{GS}=10\text{ V}$, R_{thJA} on 2s2p ^{2,4)}	60	
Pulsed drain current ²⁾	$I_{D,pulse}$	$T_C=25\text{ °C}$, $t_p=100\text{ }\mu\text{s}$	1800	
Avalanche energy, single pulse ²⁾	E_{AS}	$I_D=88\text{ A}$	510	mJ
Avalanche current, single pulse	I_{AS}	–	175	A
Gate source voltage	V_{GS}	–	± 20	V
Power dissipation	P_{tot}	$T_C=25\text{ °C}$	219	W
Operating and storage temperature	T_j, T_{stg}	–	-55 ... +175	°C

Thermal characteristics²⁾

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal resistance, junction - case	R_{thJC}	–	–	0.34	0.69	K/W
Thermal resistance, junction - ambient ⁴⁾	R_{thJA}	–	–	26.7	–	

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	$V_{GS(th)}$	$V_{DS}=V_{GS}$, $I_D=130\text{ }\mu\text{A}$	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	μA
		$V_{DS}=40\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=100\text{ °C}^{2)}$	–	–	32	
Gate-source leakage current	I_{GSS}	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$	–	–	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=7\text{ V}$, $I_D=44\text{ A}$	–	0.48	0.55	m Ω
		$V_{GS}=10\text{ V}$, $I_D=88\text{ A}$	–	0.40	0.44	
Gate resistance ²⁾	R_G	–	–	0.9	–	Ω

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic characteristics²⁾

Input capacitance	C_{iss}	$V_{GS}=0\text{ V}, V_{DS}=20\text{ V}, f=1\text{ MHz}$	-	8700	11310	pF
Output capacitance	C_{oss}		-	5100	6630	
Reverse transfer capacitance	C_{rss}		-	165	250	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=20\text{ V}, V_{GS}=10\text{ V}, I_D=88\text{ A}, R_G=3.5\ \Omega$	-	20	-	ns
Rise time	t_r		-	12	-	
Turn-off delay time	$t_{d(off)}$		-	45	-	
Fall time	t_f		-	24	-	

Gate Charge Characteristics²⁾

Gate to source charge	Q_{gs}	$V_{DD}=20\text{ V}, I_D=88\text{ A}, V_{GS}=0\text{ to }10\text{ V}$	-	35	46	nC
Gate to drain charge	Q_{gd}		-	26	39	
Gate charge total	Q_g		-	130	169	
Gate plateau voltage	$V_{plateau}$		-	4.0	-	V

Reverse Diode

Diode continuous forward current ²⁾	I_S	$T_C=25\text{ °C}$	-	-	175	A
Diode pulse current ²⁾	$I_{S,pulse}$	$T_C=25\text{ °C}, t_p=100\ \mu\text{s}$	-	-	1800	
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 ²⁾	t_{rr}	$V_R=20\text{ V}, I_F=50\text{ A}, di_f/dt=100\text{ A}/\mu\text{s}$	-	58	87	ns
Reverse recovery charge ²⁾	Q_{rr}		-	69	138	

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

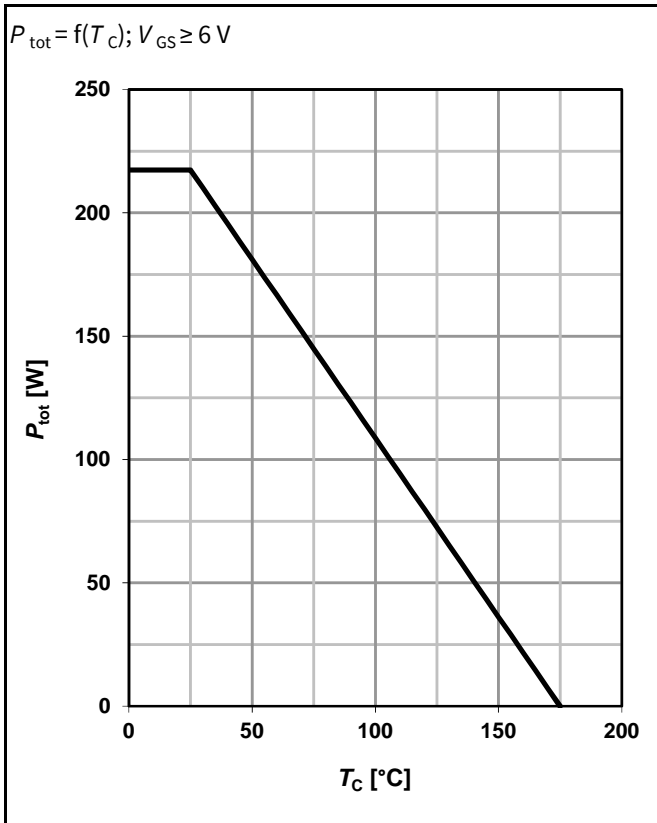
²⁾ The parameter is not subject to production testing – specified by design.

³⁾ Current is not limited by chip.

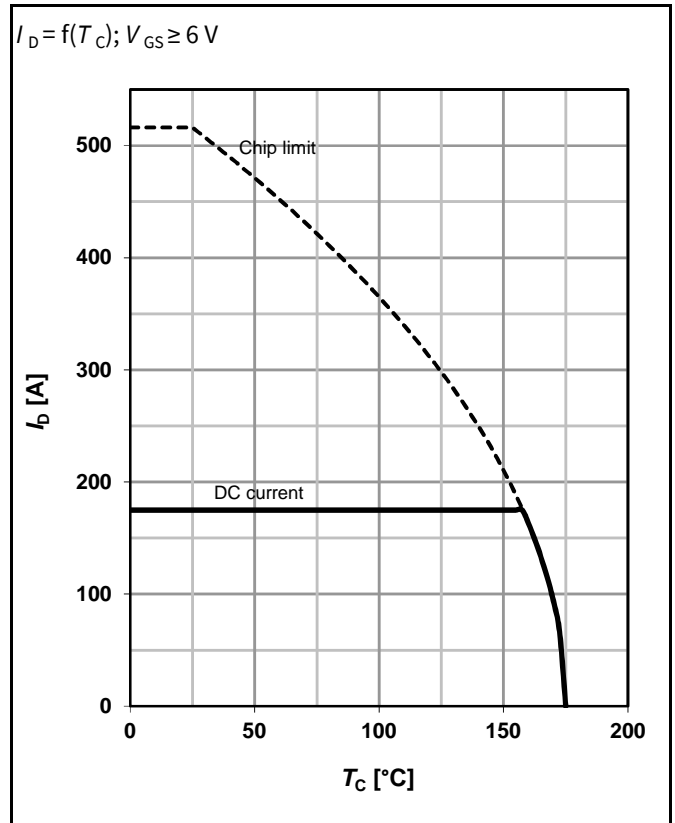
⁴⁾ Device on 2s2p FR4 PCB defined in accordance with JEDEC standards (JESD51-5, -7). PCB is vertical in still air.

Electrical characteristics diagrams

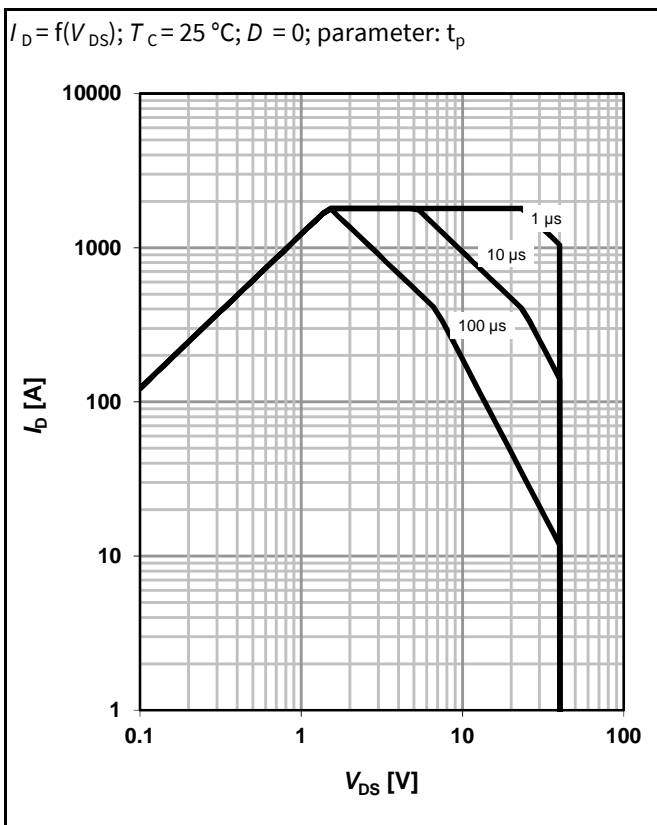
1 Power dissipation



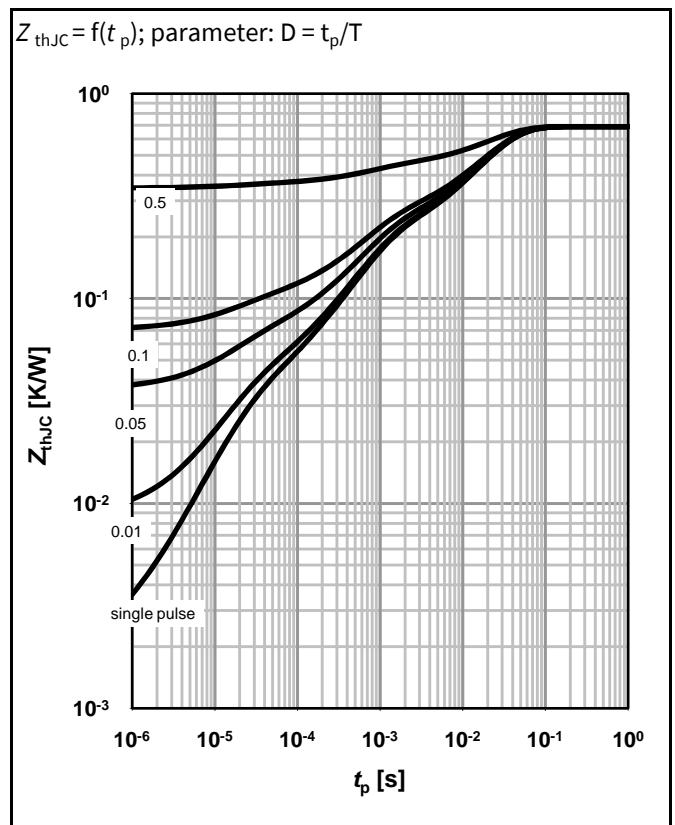
2 Drain current



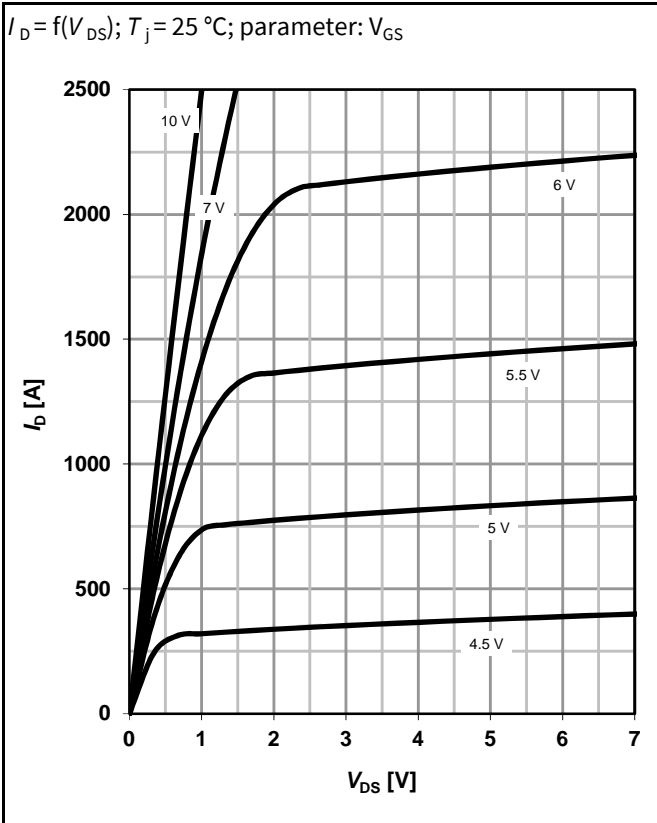
3 Safe operating area



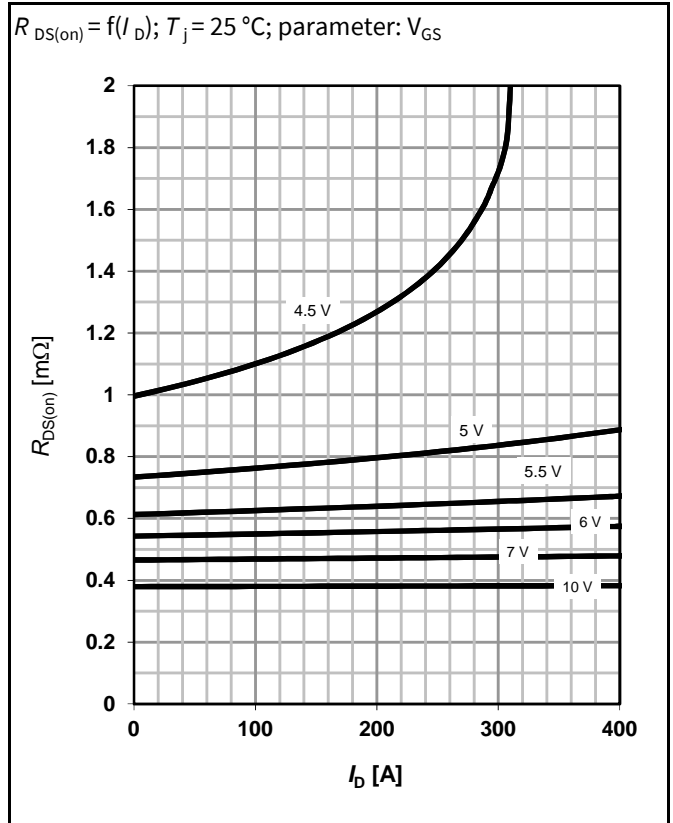
4 Max. transient thermal impedance



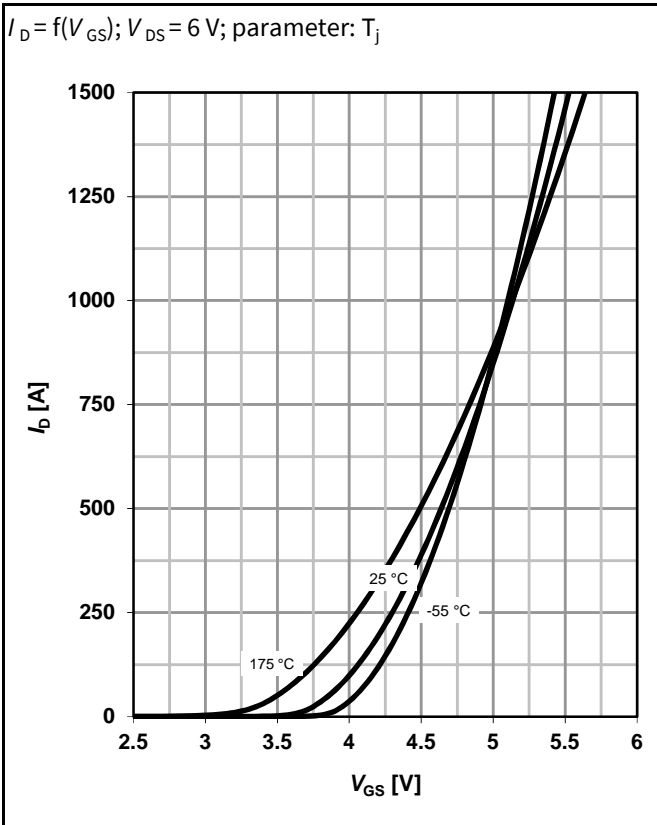
5 Typ. output characteristics



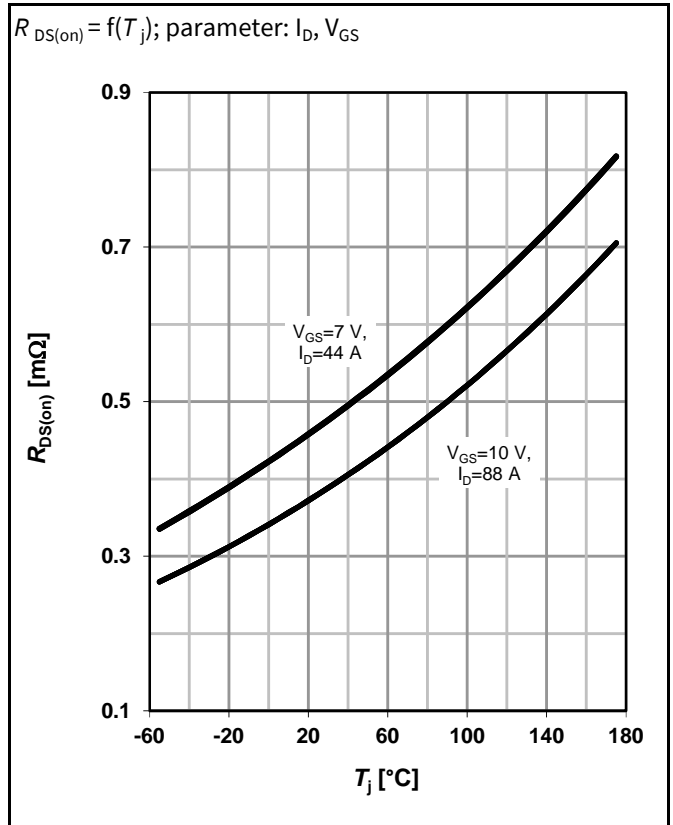
6 Typ. drain-source on-state resistance



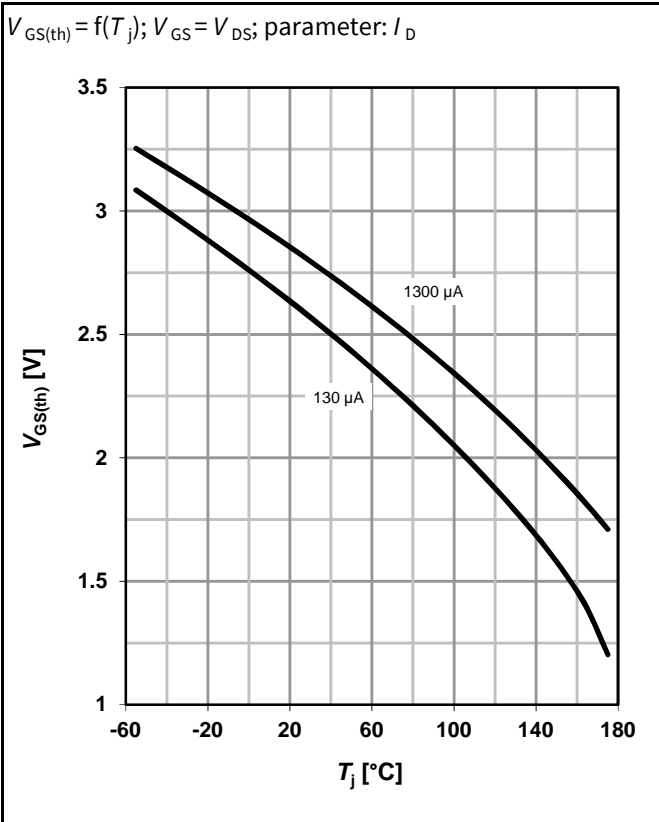
7 Typ. transfer characteristics



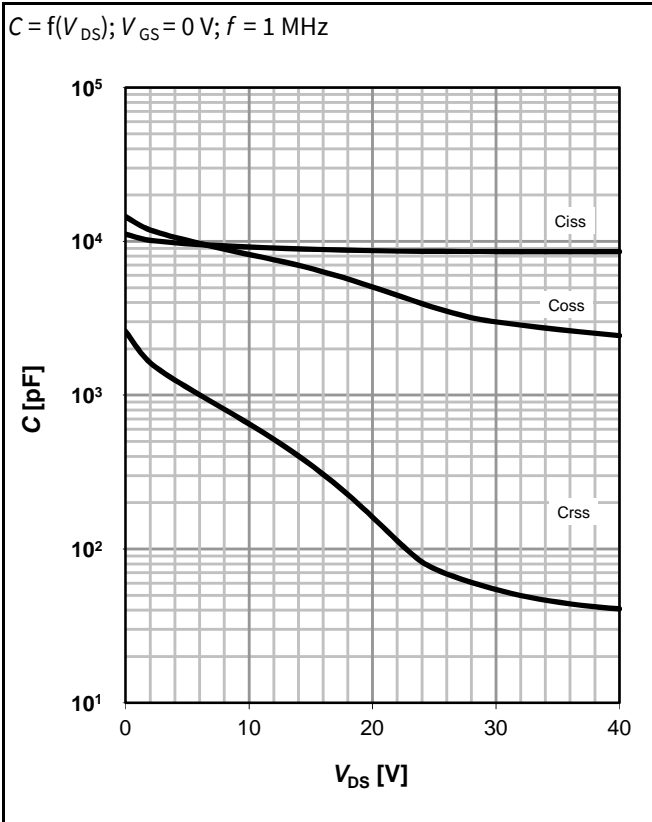
8 Typ. drain-source on-state resistance



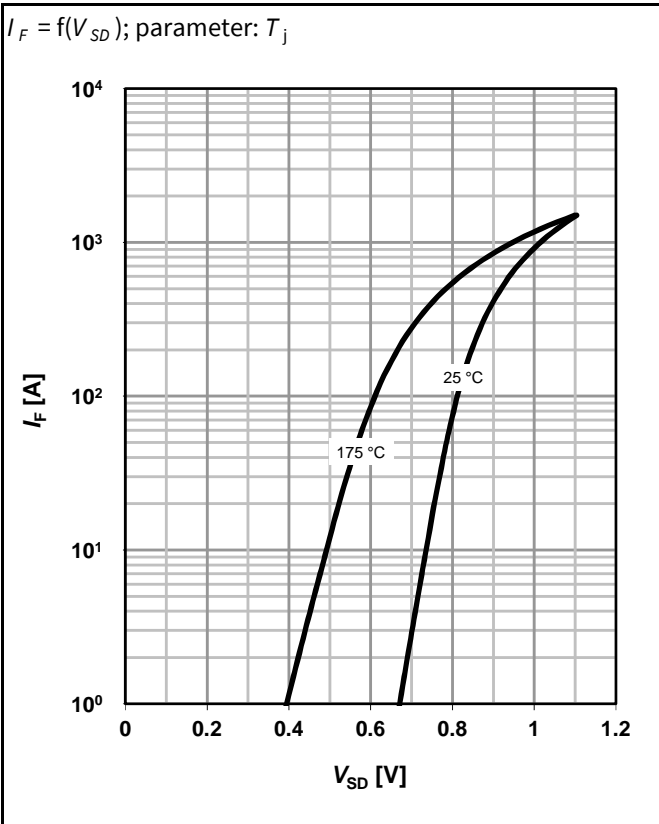
9 Typ. gate threshold voltage



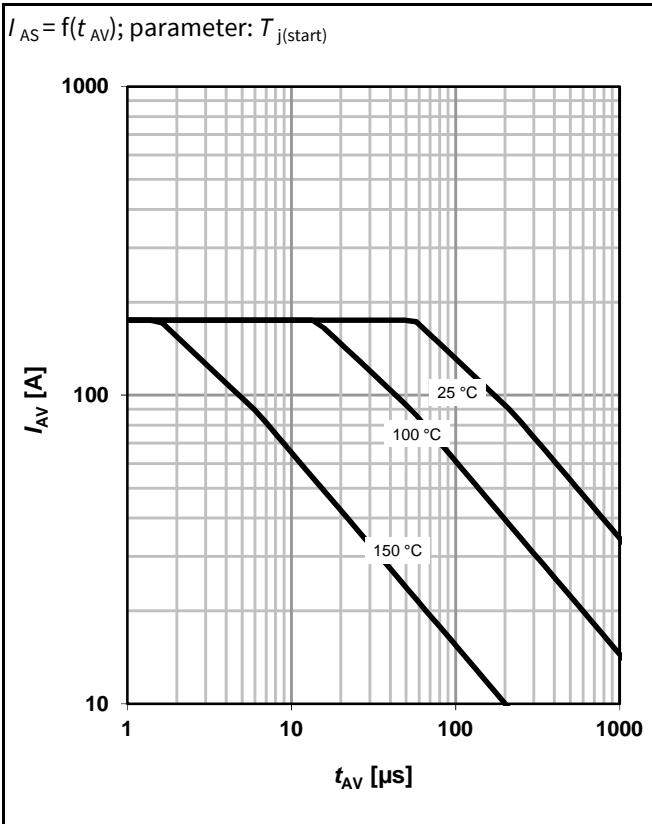
10 Typ. capacitances



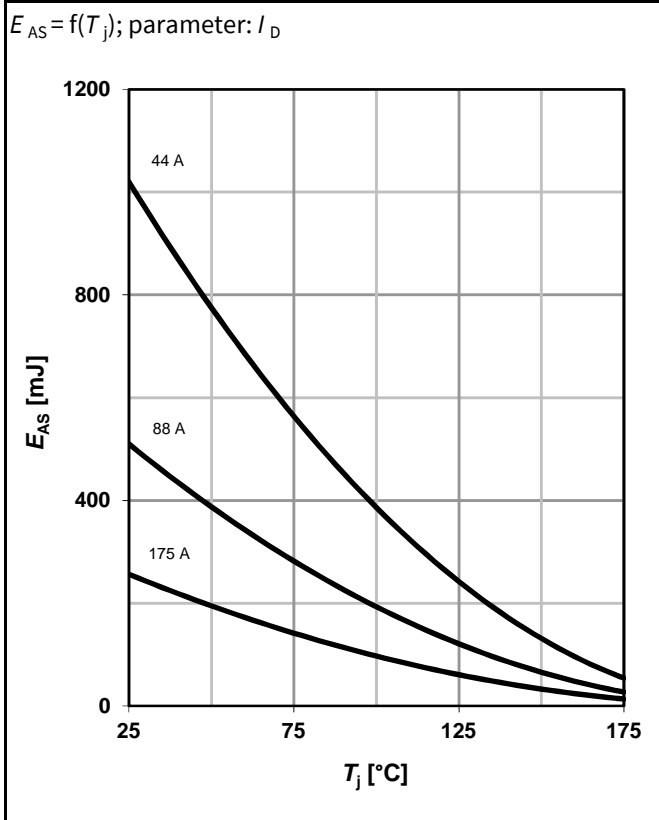
11 Typical forward diode characteristics



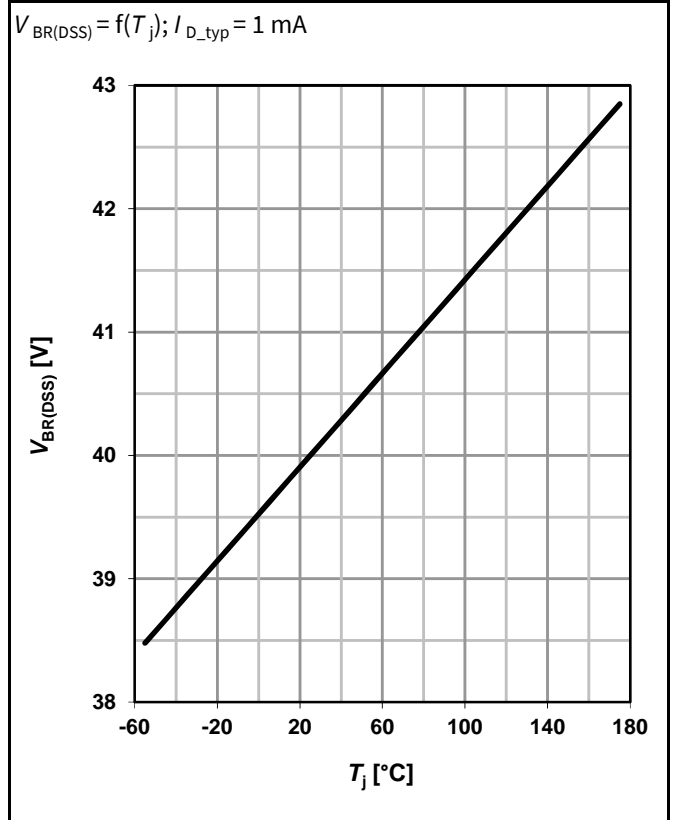
12 Typ. avalanche characteristics



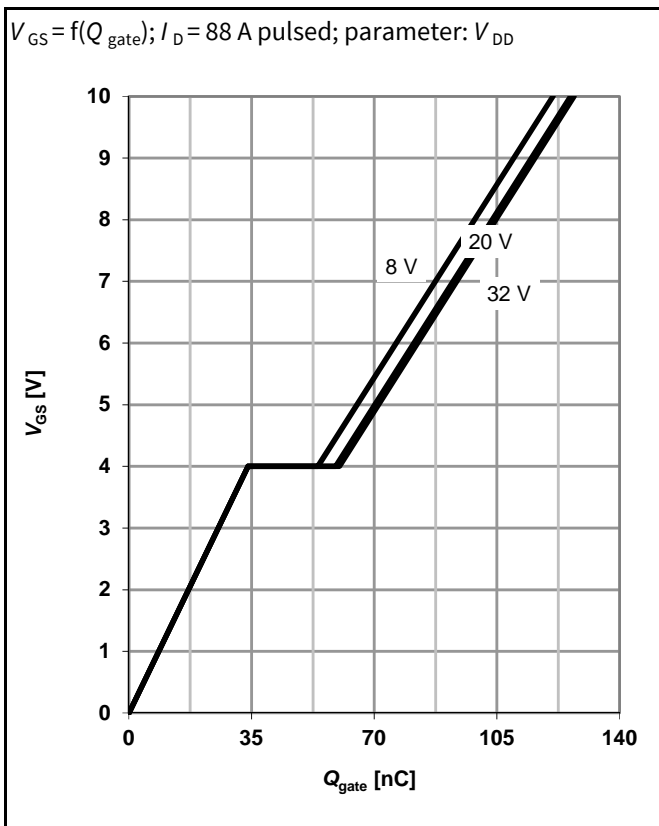
13 Typical avalanche energy



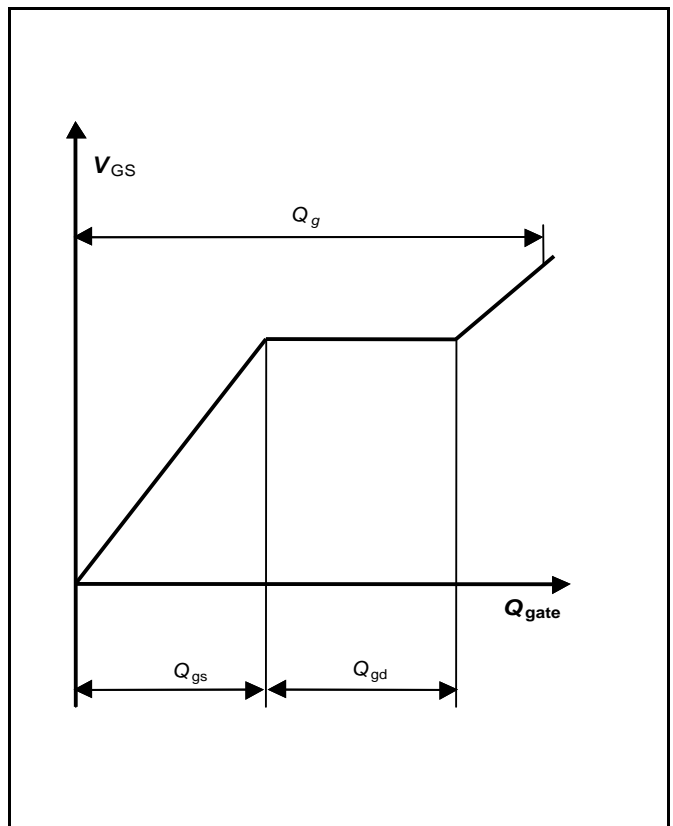
14 Drain-source breakdown voltage



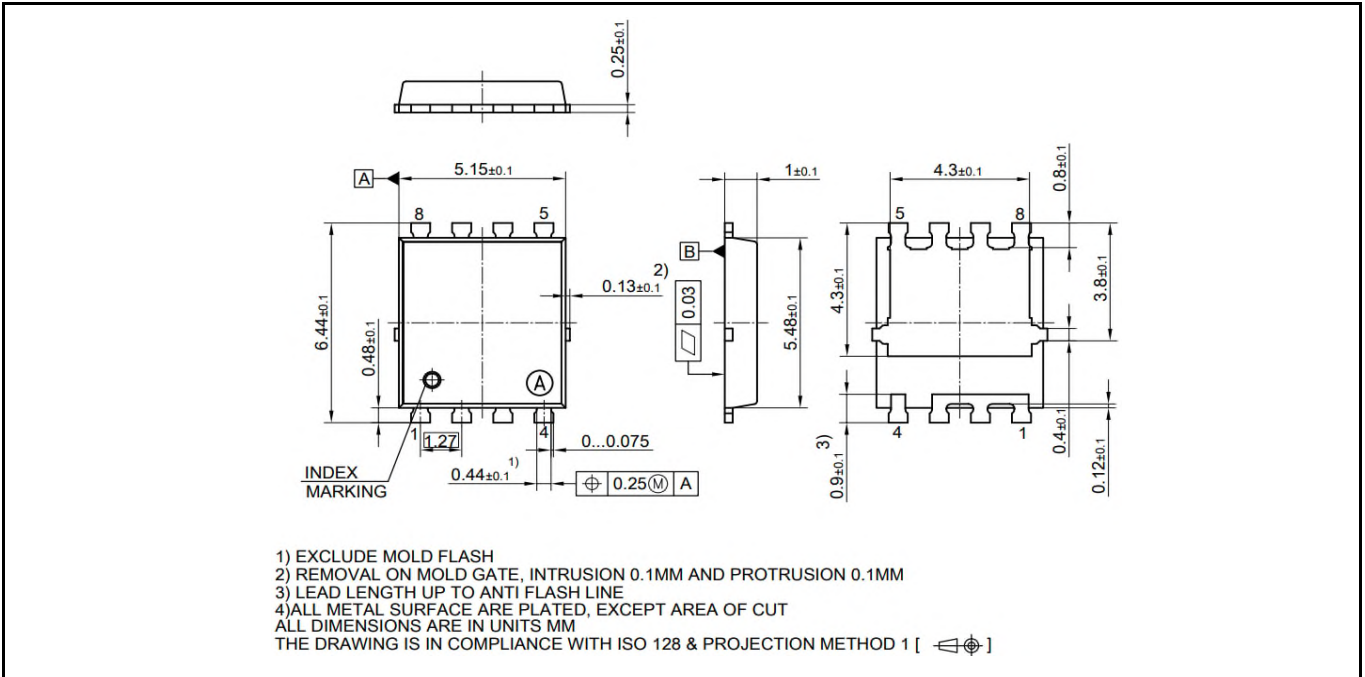
15 Typ. gate charge



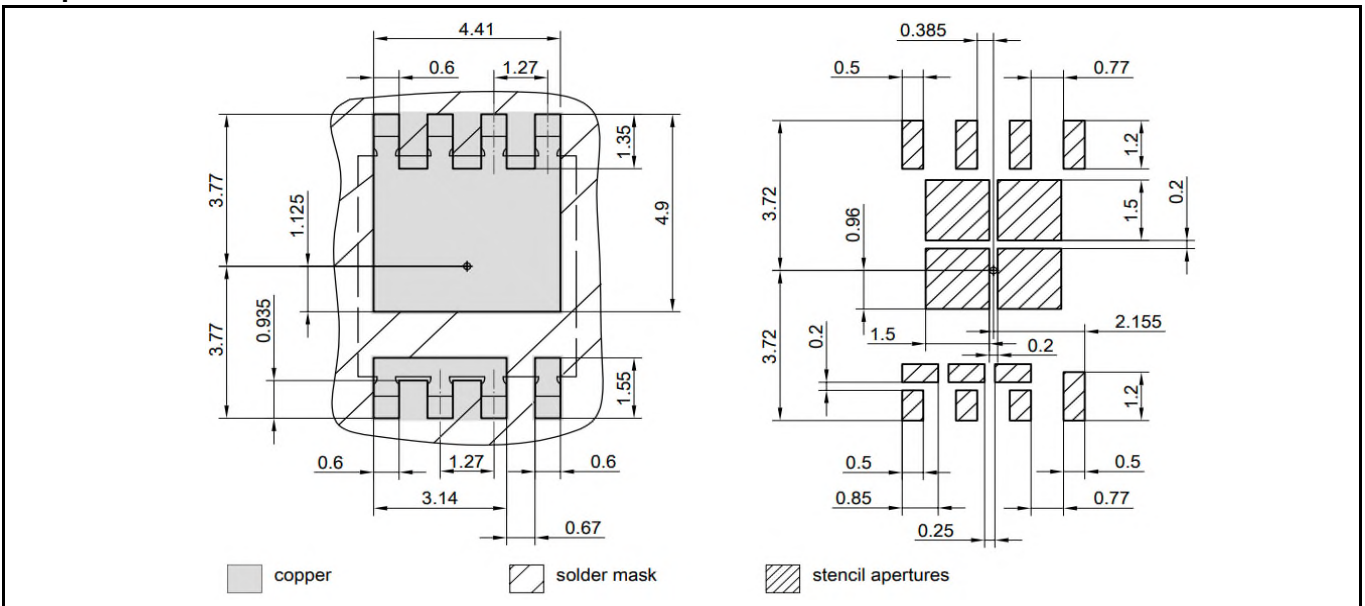
16 Gate charge waveforms



Package Outline

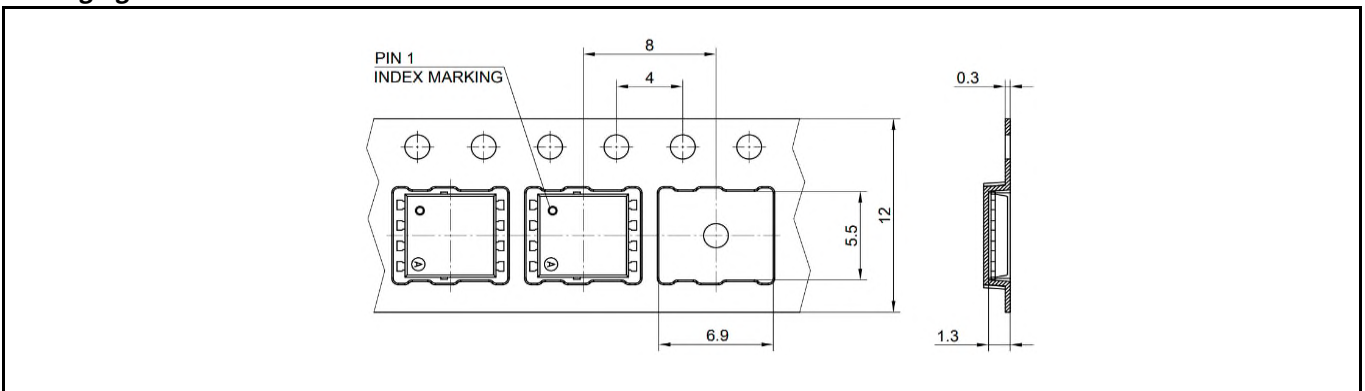


Footprint



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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Edition 2023-05-30

Published by

Infineon Technologies AG

81726 Munich, Germany

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Document reference

IAUCN04S7N004-Data-Sheet-10-Infineon

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