

## Automotive MOSFET

## OptiMOS™-5 Power-Transistor



## Features

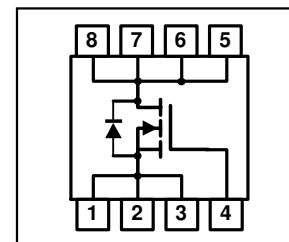
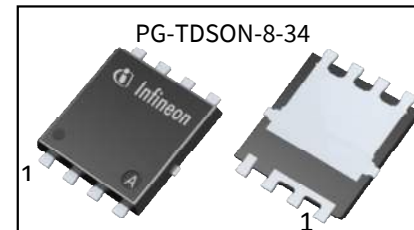
- OptiMOS™ power MOSFET for automotive applications
- N-channel – Enhancement mode – Normal Level
- Extended qualification beyond AEC-Q101
- Enhanced electrical testing
- Robust design
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- Green product (RoHS compliant)
- 100% Avalanche tested

## Potential applications

General automotive applications.

## Product validation

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



## Product Summary

$V_{DS}$	60	V
$R_{DS(on)}$	2.24	mΩ
$I_D$ (chip limited)	170	A

Type	Package	Marking
IAUC120N06S5N022	PG-TDSON-8-34	5N06N022



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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>	170	A
		$V_{GS}=10\text{ V}$ , DC current <sup>3)</sup>	120	
		$T_a=85\text{ °C}$ , $V_{GS}=10\text{ V}$ , $R_{thJA}$ on 2s2p <sup>2,4)</sup>	30	
Pulsed drain current <sup>2)</sup>	$I_{D,pulse}$	$T_C=25\text{ °C}$ , $t_p=100\text{ }\mu\text{s}$	568	
Avalanche energy, single pulse <sup>2)</sup>	$E_{AS}$	$I_D=60\text{ A}$	174	mJ
Avalanche current, single pulse	$I_{AS}$	–	120	A
Gate source voltage	$V_{GS}$	–	$\pm 20$	V
Power dissipation	$P_{tot}$	$T_C=25\text{ °C}$	136	W
Operating and storage temperature	$T_j, T_{stg}$	–	-55 ... +175	°C
IEC climatic category; DIN IEC 68-1	–	–	55/175/56	

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal resistance, junction - case	$R_{thJC}$	–	–	–	1.10	K/W
Thermal resistance, junction - ambient <sup>4)</sup>	$R_{thJA}$	–	–	23.7	–	

**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	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}$ , $I_D=1\text{ mA}$	60	–	–	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$ , $I_D=65\text{ }\mu\text{A}$	2.2	2.8	3.4	
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=60\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=25\text{ °C}$	–	–	1	$\mu\text{A}$
		$V_{DS}=60\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=100\text{ °C}^{2)}$	–	–	100	
Gate-source leakage current	$I_{GSS}$	$V_{GS}=20\text{ V}$ , $V_{DS}=0\text{ V}$	–	–	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=7\text{ V}$ , $I_D=30\text{ A}$	–	2.32	2.80	m $\Omega$
		$V_{GS}=10\text{ V}$ , $I_D=60\text{ A}$	–	1.90	2.24	
Gate resistance <sup>2)</sup>	$R_G$	–	–	1.4	–	$\Omega$

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
<b>Dynamic characteristics<sup>2)</sup></b>						
Input capacitance	$C_{iss}$	$V_{GS}=0\text{ V}, V_{DS}=30\text{ V}, f=1\text{ MHz}$	-	3792	4930	pF
Output capacitance	$C_{oss}$		-	803	1044	
Reverse transfer capacitance	$C_{rss}$		-	38	57	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=30\text{ V}, V_{GS}=10\text{ V}, I_D=60\text{ A}, R_G=3.5\ \Omega$	-	9	-	ns
Rise time	$t_r$		-	5	-	
Turn-off delay time	$t_{d(off)}$		-	16	-	
Fall time	$t_f$		-	11	-	

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

Gate to source charge	$Q_{gs}$	$V_{DD}=30\text{ V}, I_D=60\text{ A}, V_{GS}=0\text{ to }10\text{ V}$	-	16	21	nC
Gate to drain charge	$Q_{gd}$		-	9	14	
Gate charge total	$Q_g$		-	52	68	
Gate plateau voltage	$V_{plateau}$		-	4.7	-	V

**Reverse Diode**

Diode continuous forward current <sup>2)</sup>	$I_S$	$T_C=25\text{ °C}$	-	-	120	A
Diode pulse current <sup>2)</sup>	$I_{S,pulse}$	$T_C=25\text{ °C}, t_p=100\ \mu\text{s}$	-	-	558	
Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=60\text{ A}, T_j=25\text{ °C}$	-	0.8	1.1	V
Reverse recovery time <sup>2)</sup>	$t_{rr}$	$V_R=30\text{ V}, I_F=50\text{ A}, di_f/dt=100\text{ A}/\mu\text{s}$	-	43	-	ns
Reverse recovery charge <sup>2)</sup>	$Q_{rr}$		-	40	-	nC

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

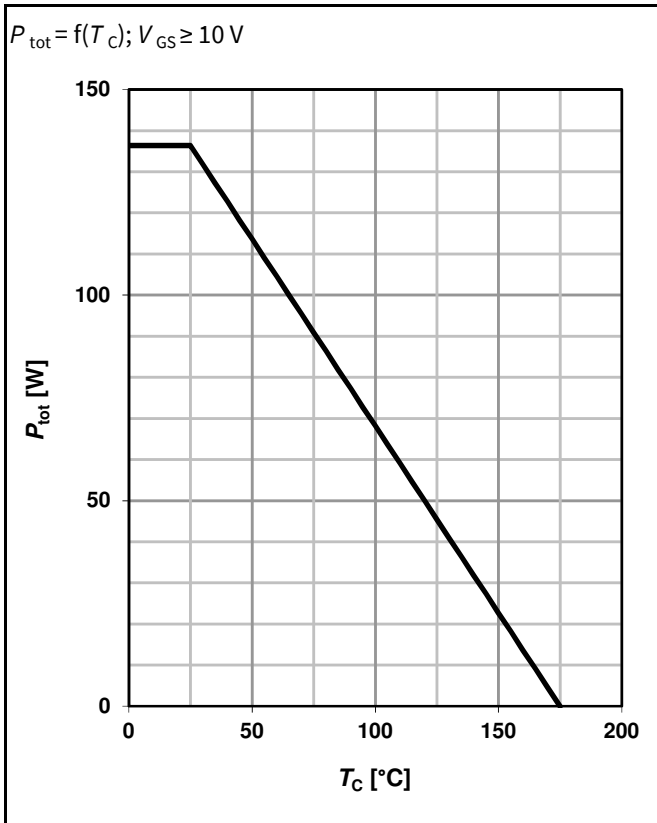
<sup>2)</sup> The parameter is not subject to production testing – specified by design.

<sup>3)</sup> Current is limited by package.

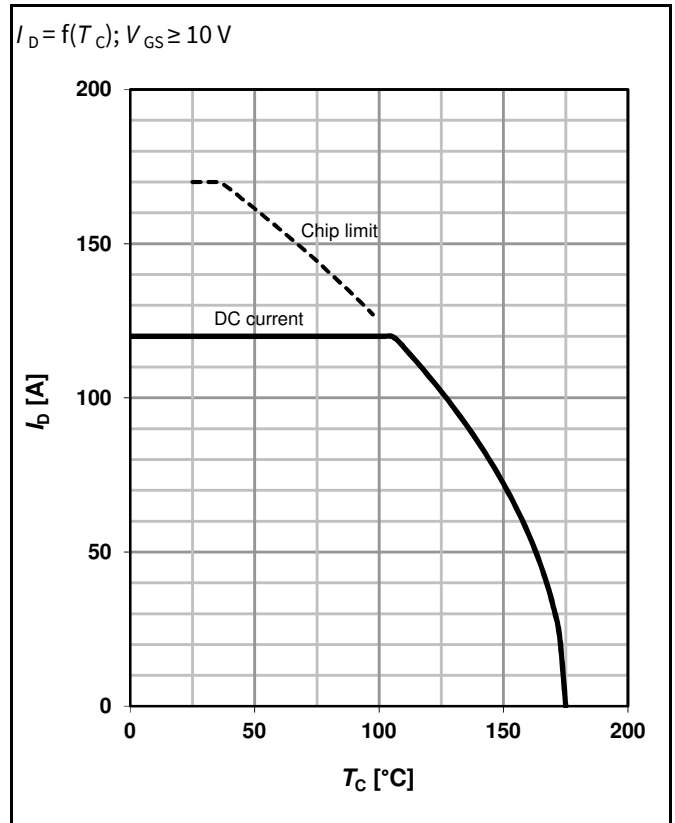
<sup>4)</sup> Device on 2s2p FR4 PCB defined in accordance with JEDEC standards (JESD51-5, -7). PCB is vertical in still air.

## Electrical characteristics diagrams

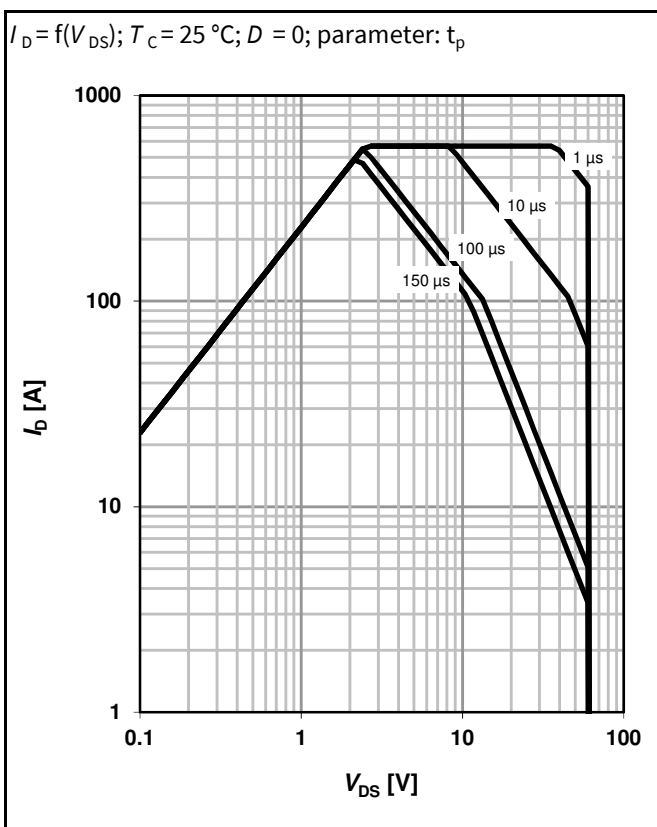
### 1 Power dissipation



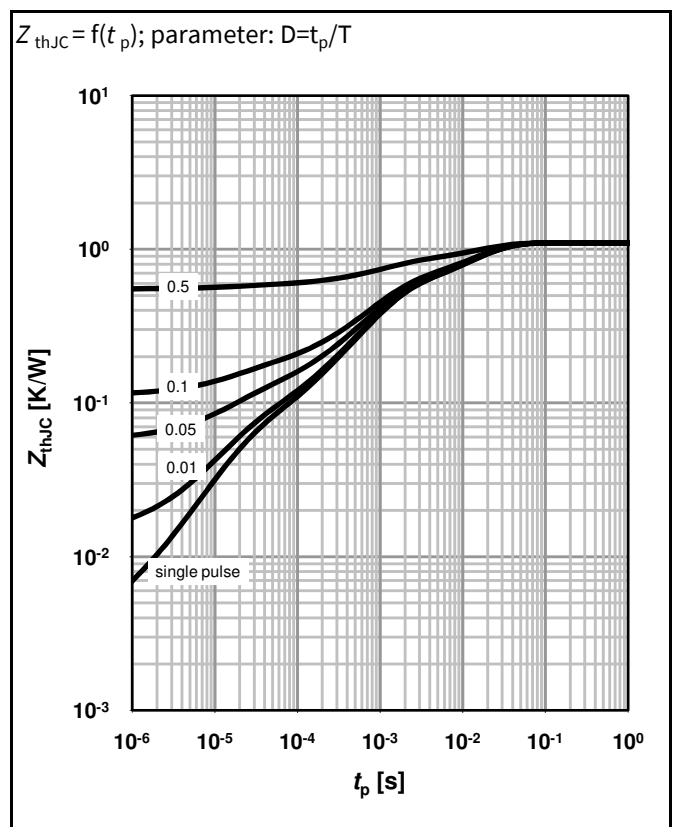
### 2 Drain current



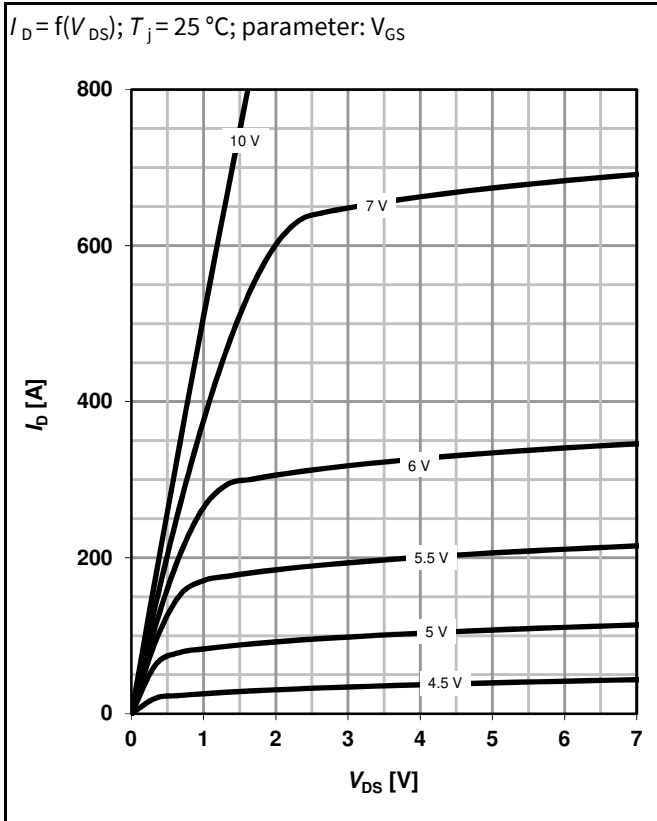
### 3 Safe operating area



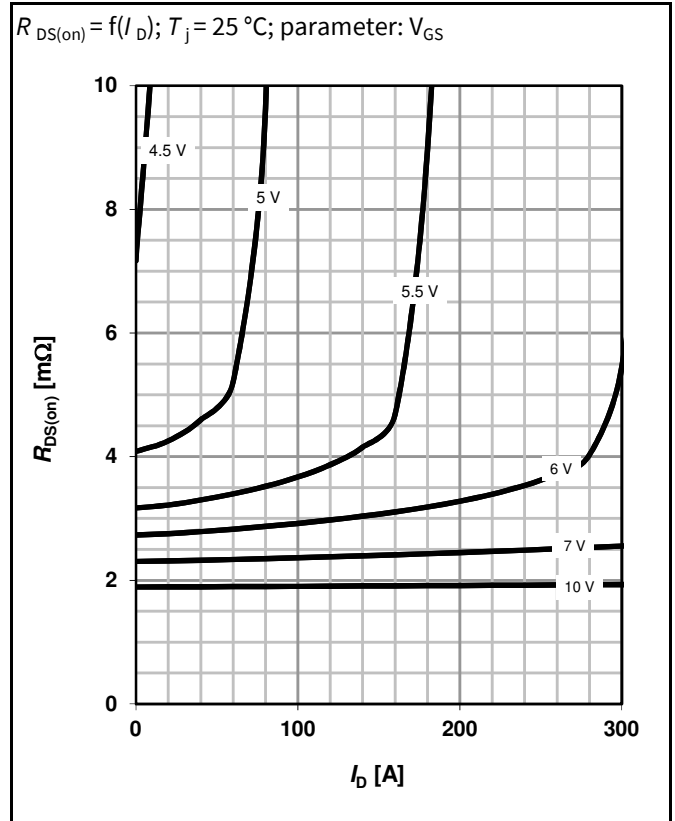
### 4 Max. transient thermal impedance



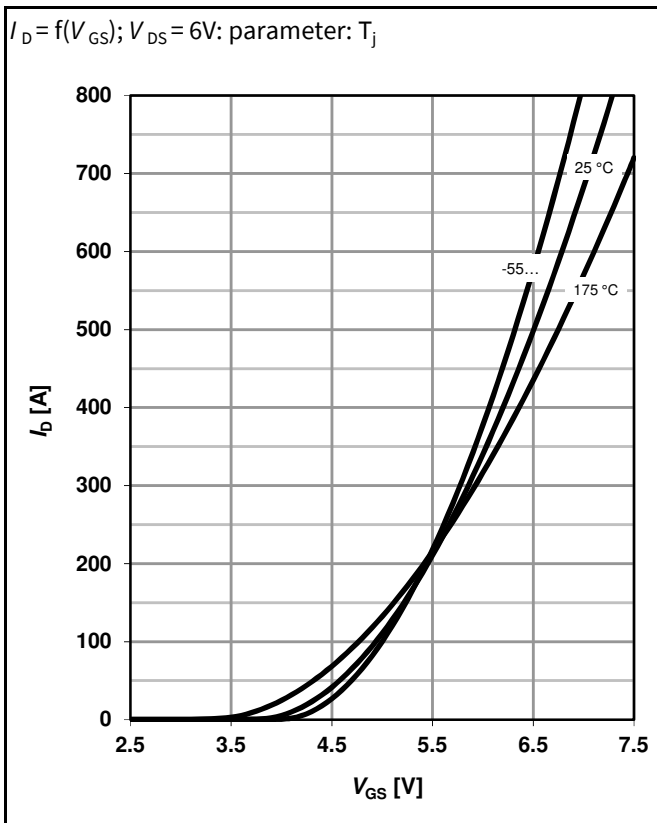
5 Typ. output characteristics



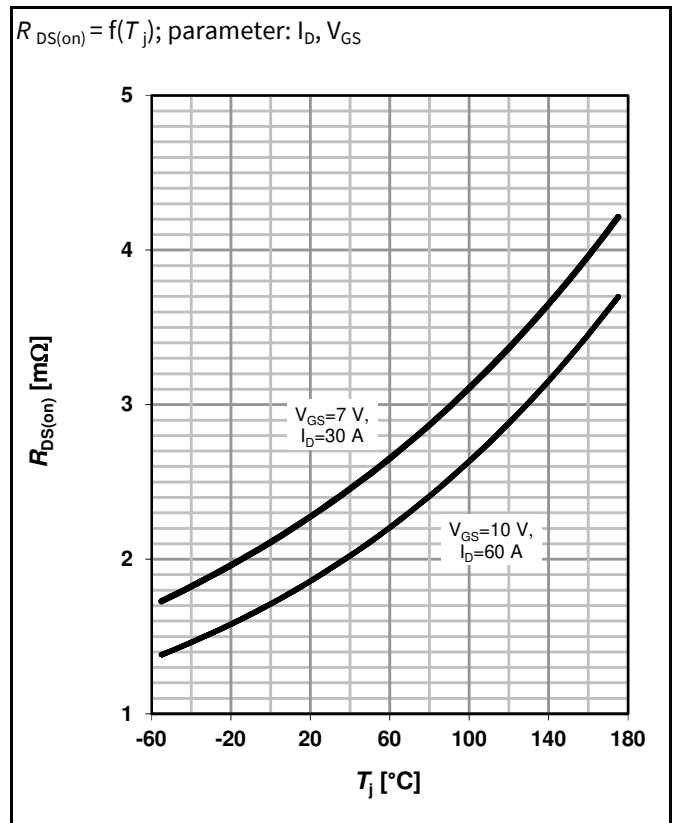
6 Typ. drain-source on-state resistance



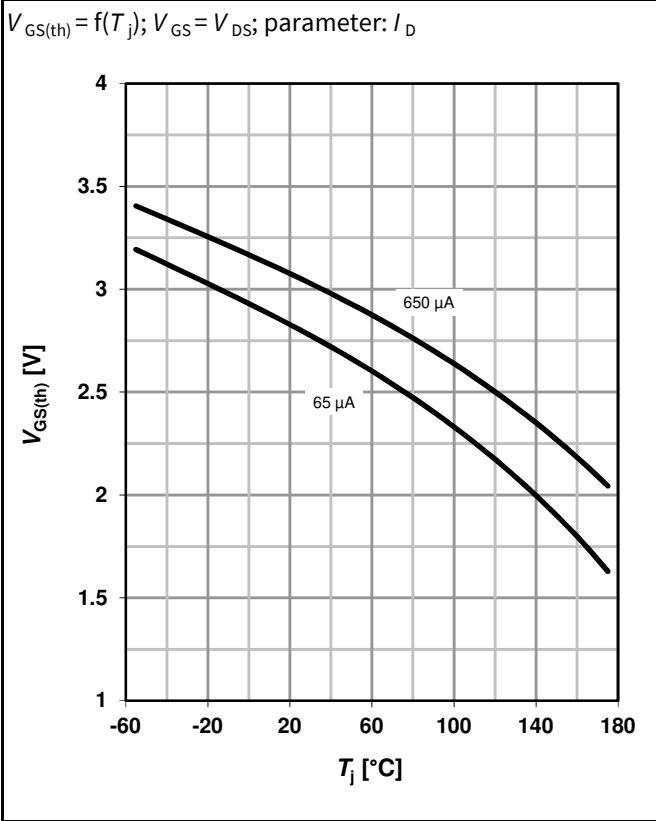
7 Typ. transfer characteristics



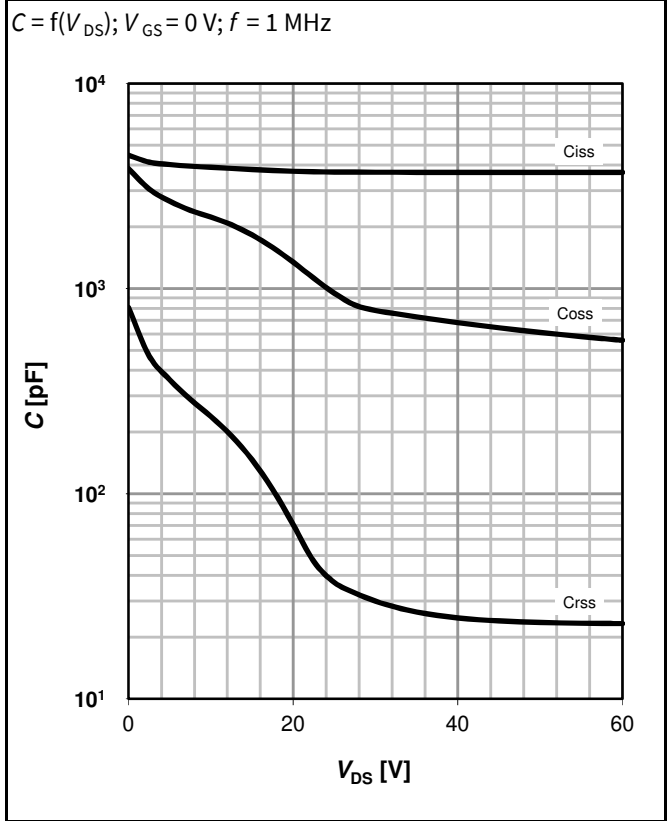
8 Typ. drain-source on-state resistance



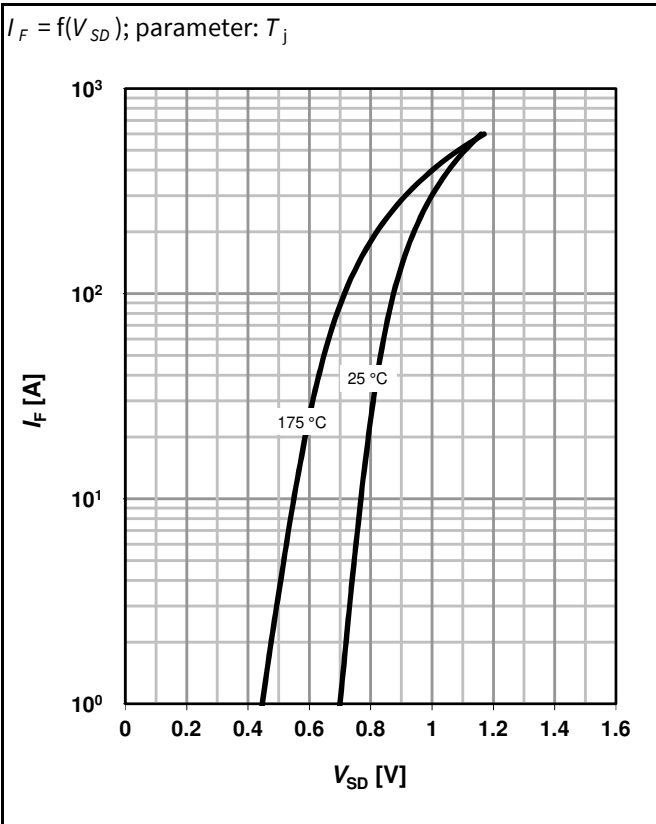
9 Typ. gate threshold voltage



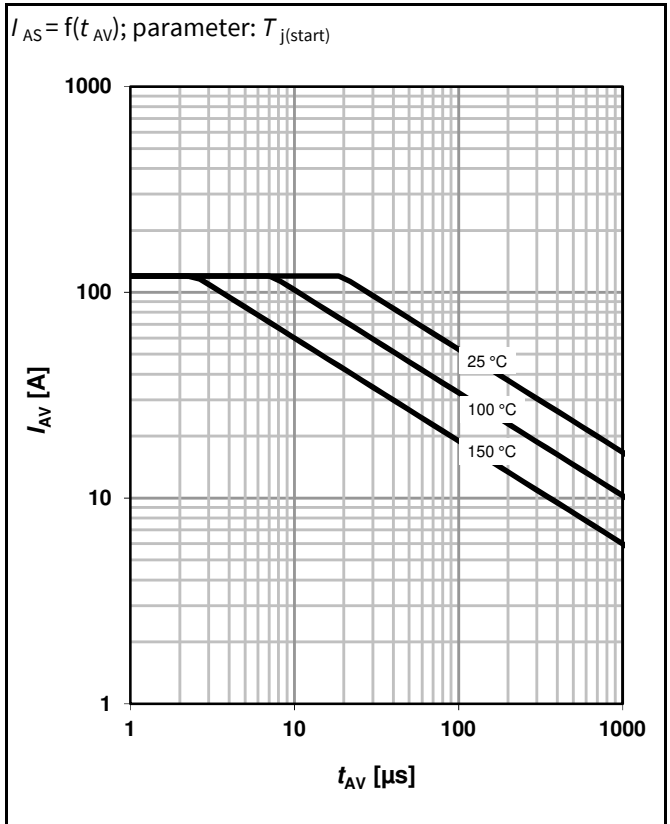
10 Typ. capacitances



11 Typical forward diode characteristics



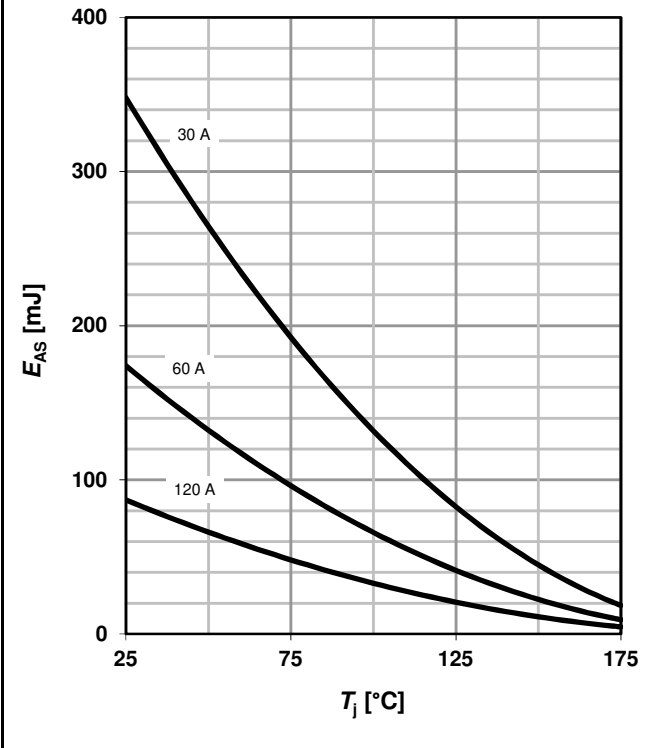
12 Typ. avalanche characteristics





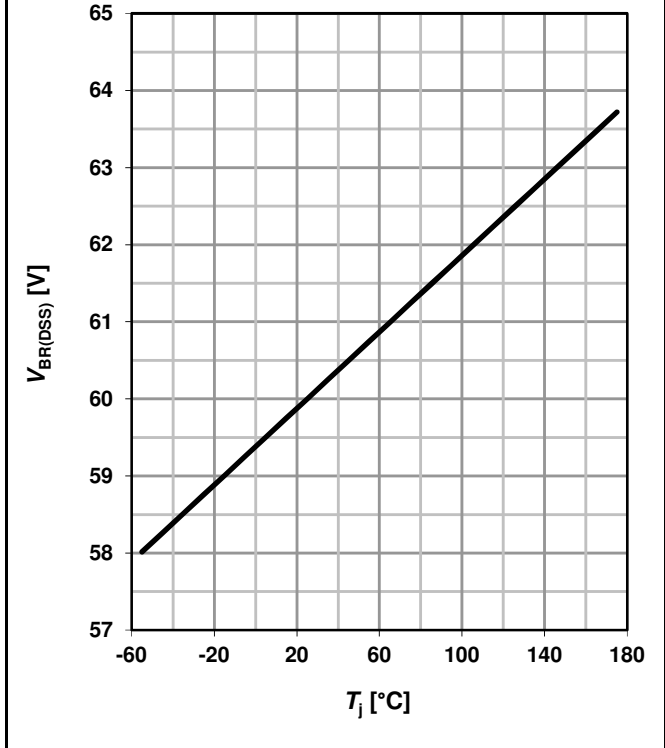
13 Typical avalanche energy

$E_{AS} = f(T_j)$ ; parameter: ID



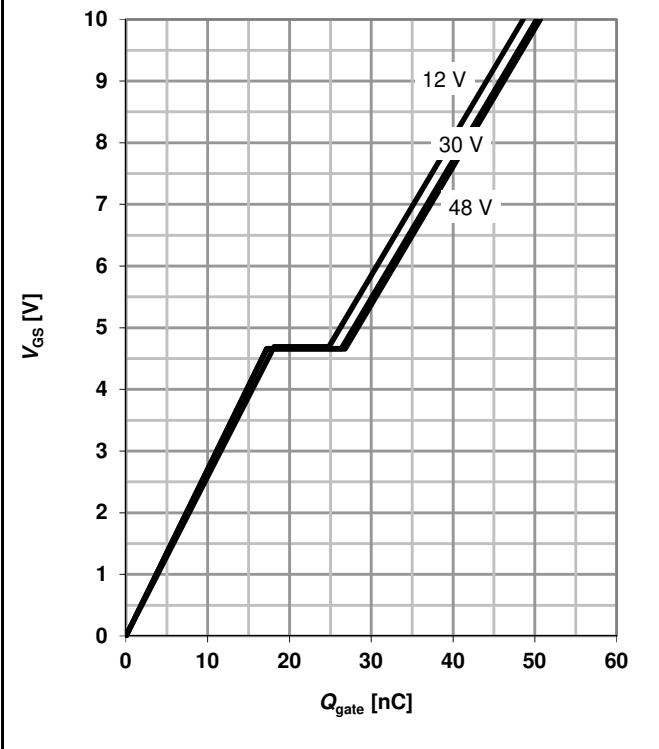
14 Drain-source breakdown voltage

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

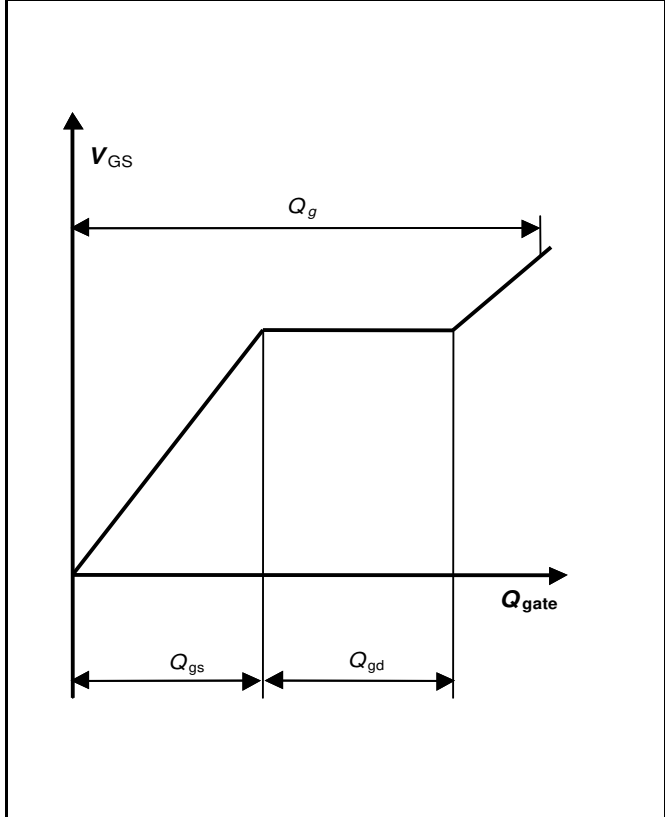


15 Typ. gate charge

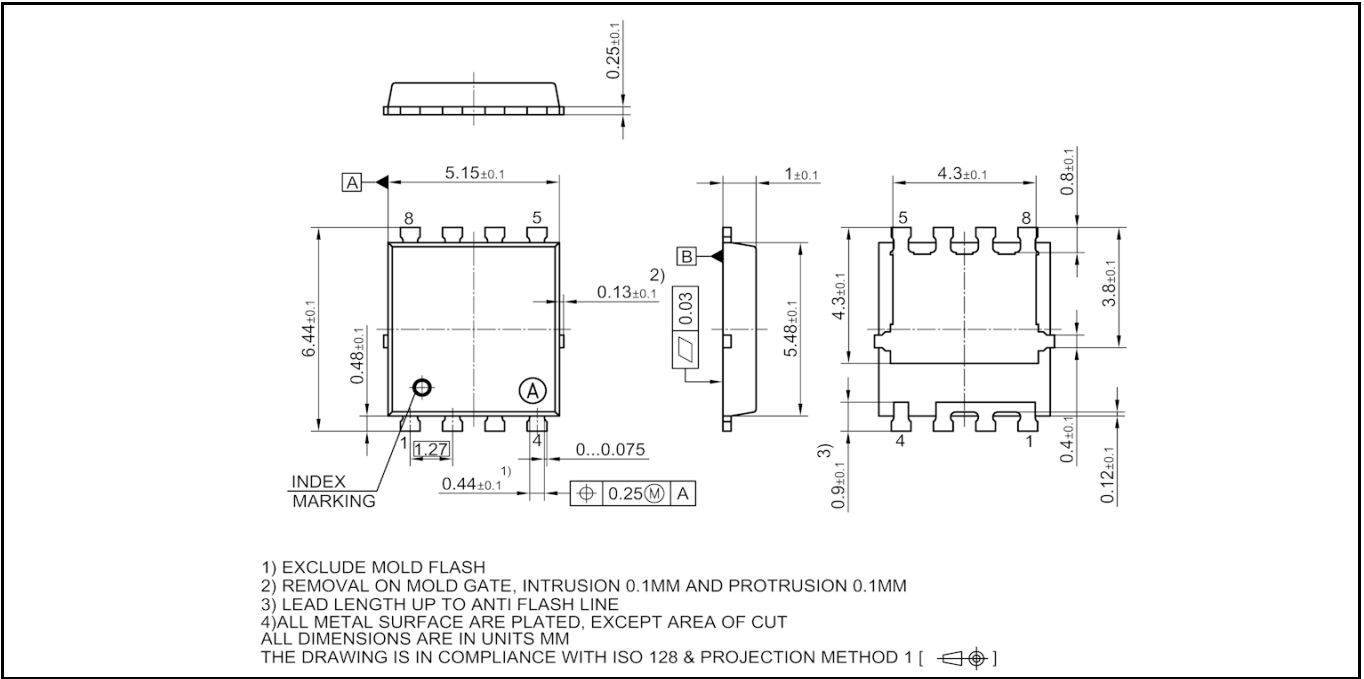
$V_{GS} = f(Q_{gate})$ ;  $I_D = 60 \text{ A}$  pulsed; parameter:  $V_{DD}$



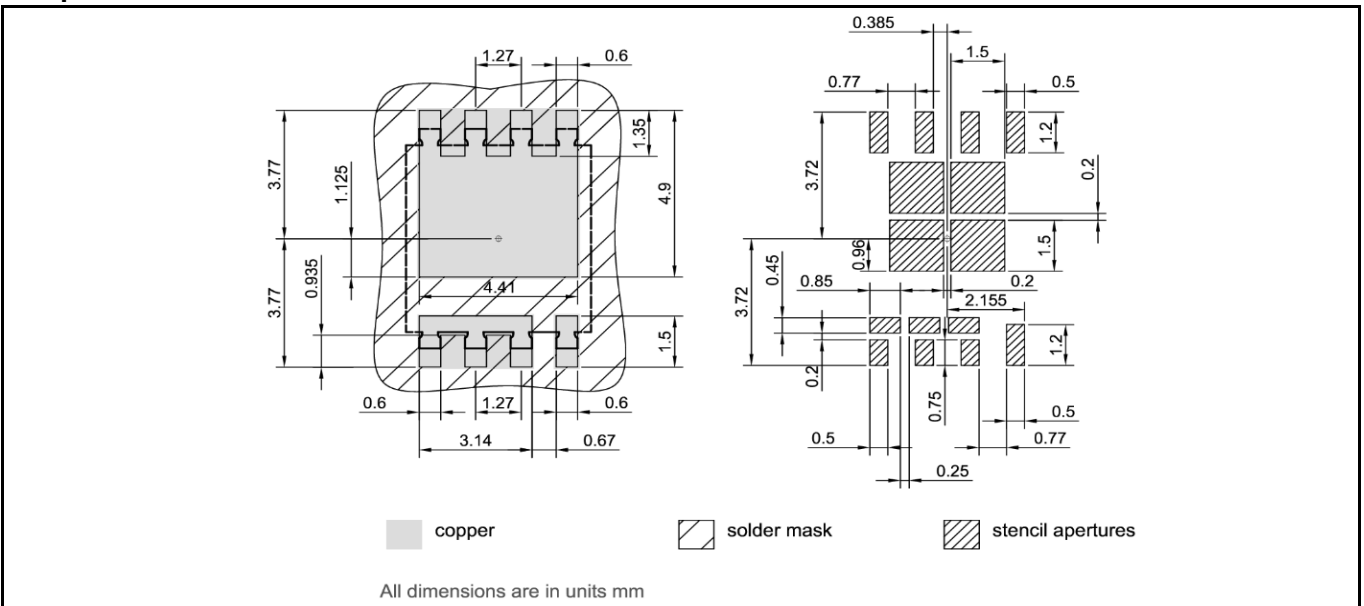
16 Gate charge waveforms



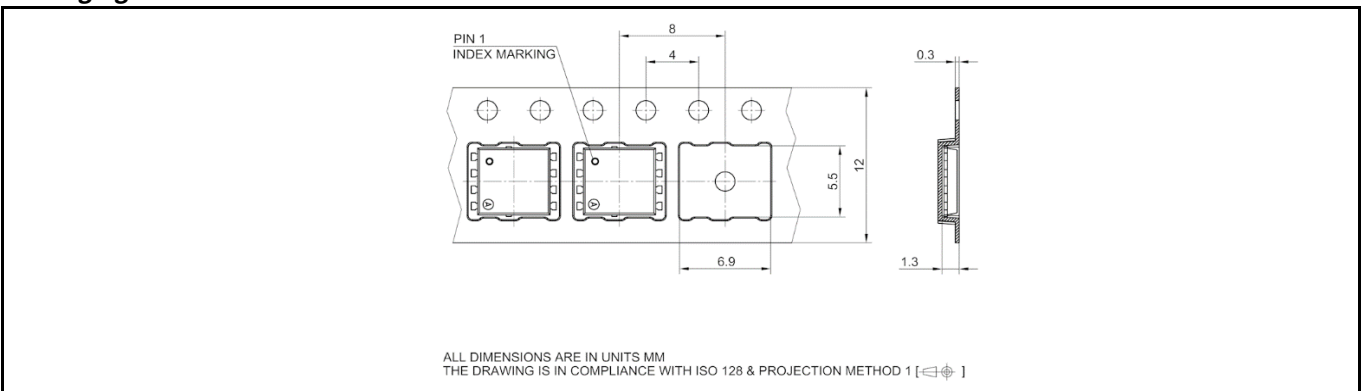
## Package Outline



## Footprint



## Packaging



**Revision History**

Revision	Date	Changes
Revision 1.0	21.06.2022	Final Data Sheet

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