

Automotive MOSFET

OptiMOS™-5 Power-Transistor



Features

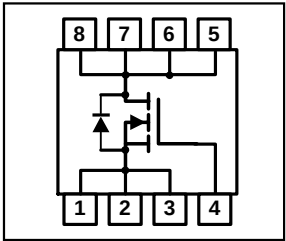
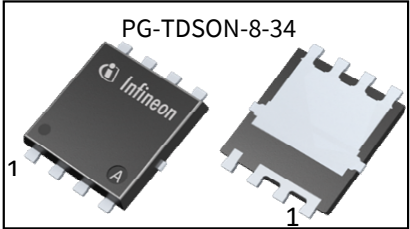
- OptiMOS™ power MOSFET for automotive applications
- N-channel – Enhancement mode – Logic Level
- Extended qualification beyond AEC-Q101
- Enhanced electrical testing
- Robust design
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- Green product (RoHS compliant)
- 100% Avalanche tested

Potential applications

General automotive applications.

Product validation

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



Product Summary

V_{DS}	60	V
$R_{DS(on)}$	2.20	mΩ
I_D (chip limited)	170	A

Type	Package	Marking
IAUC120N06S5L022	PG-TDSON-8-34	5N06L022

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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)}	170	A
		$V_{GS}=10\text{ V}$, DC current ³⁾	120	
		$T_a=85\text{ °C}$, $V_{GS}=10\text{ V}$, R_{thJA} on 2s2p ^{2,4)}	30	
Pulsed drain current ²⁾	$I_{D,pulse}$	$T_C=25\text{ °C}$, $t_p=100\text{ }\mu\text{s}$	571	
Avalanche energy, single pulse ²⁾	E_{AS}	$I_D=60\text{ A}$	174	mJ
Avalanche current, single pulse	I_{AS}	–	120	A
Gate source voltage	V_{GS}	–	± 20	V
Power dissipation	P_{tot}	$T_C=25\text{ °C}$	136	W
Operating and storage temperature	T_j, T_{stg}	–	$-55 \dots +175$	°C
IEC climatic category; DIN IEC 68-1	–	–	55/175/56	

Thermal characteristics²⁾

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal resistance, junction - case	R_{thJC}	—	—	—	1.10	K/W
Thermal resistance, junction - ambient ⁴⁾	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	$V_{GS(th)}$	$V_{DS}=V_{GS}$, $I_D=65\text{ }\mu\text{A}$	1.2	1.7	2.2	
Zero gate voltage drain current	I_{DSS}	$V_{DS}=60\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$	—	—	1	μA
		$V_{DS}=60\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=100\text{ °C}^{2)}$	—	—	100	
Gate-source leakage current	I_{GSS}	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$	—	—	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=4.5\text{ V}$, $I_D=60\text{ A}$	—	2.61	3.12	m Ω
		$V_{GS}=10\text{ V}$, $I_D=60\text{ A}$	—	1.84	2.20	
Gate resistance ²⁾	R_G	—	—	1.4	—	Ω

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic characteristics²⁾

Input capacitance	C_{iss}	$V_{GS}=0\text{ V}, V_{DS}=30\text{ V}, f=1\text{ MHz}$	–	4347	5651	pF
Output capacitance	C_{oss}		–	803	1044	
Reverse transfer capacitance	C_{rss}		–	38	57	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=30\text{ V}, V_{GS}=10\text{ V}, I_D=60\text{ A}, R_G=3.5\ \Omega$	–	7	–	ns
Rise time	t_r		–	5	–	
Turn-off delay time	$t_{d(off)}$		–	29	–	
Fall time	t_f		–	16	–	

Gate Charge Characteristics²⁾

Gate to source charge	Q_{gs}	$V_{DD}=30\text{ V}, I_D=60\text{ A}, V_{GS}=0\text{ to }10\text{ V}$	–	12	16	nC
Gate to drain charge	Q_{gd}		–	9	14	
Gate charge total	Q_g		–	59	77	
Gate plateau voltage	$V_{plateau}$		–	3.0	–	V

Reverse Diode

Diode continuous forward current ²⁾	I_S	$T_C=25\text{ °C}$	–	–	120	A
Diode pulse current ²⁾	$I_{S,pulse}$	$T_C=25\text{ °C}, t_p=100\ \mu\text{s}$	–	–	562	
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 ²⁾	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 ²⁾	Q_{rr}		–	40	–	nC

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.

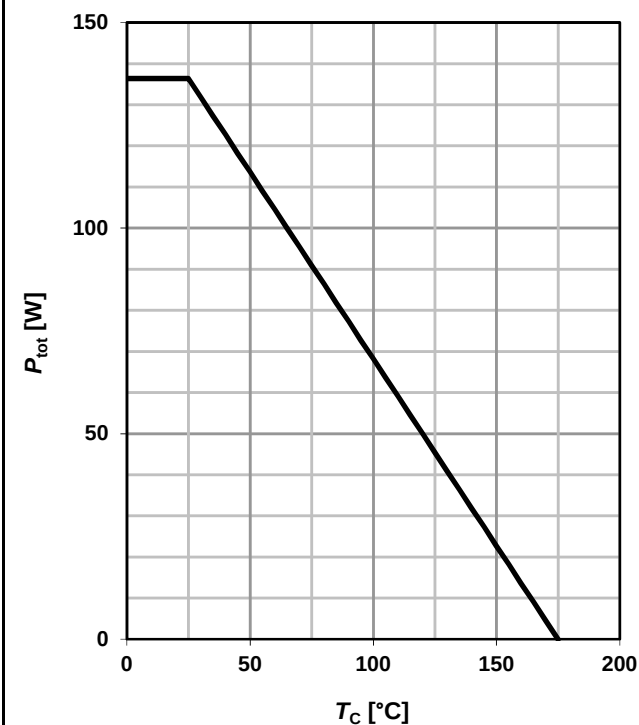
³⁾ Current is limited by package.

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

Electrical characteristics diagrams

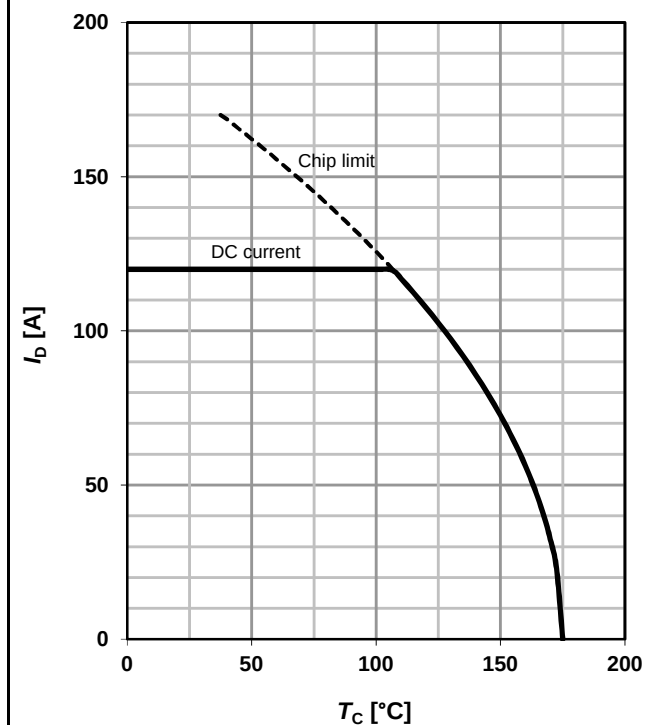
1 Power dissipation

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



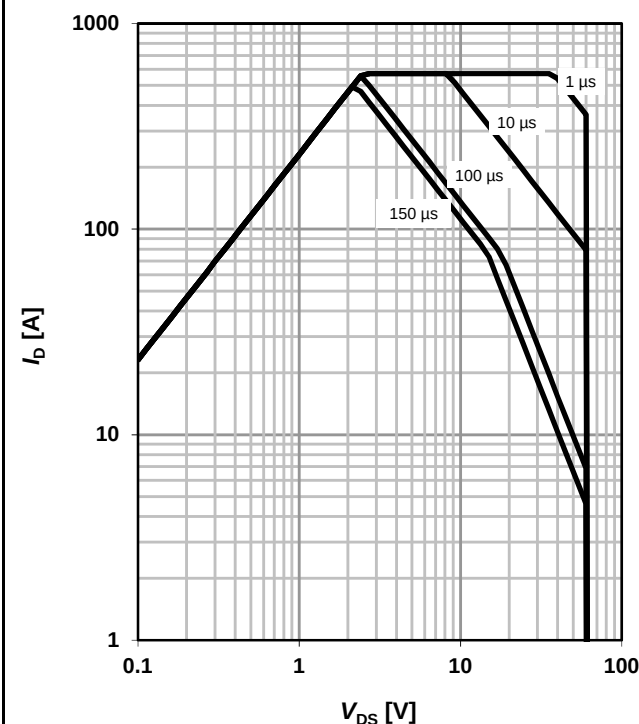
2 Drain current

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



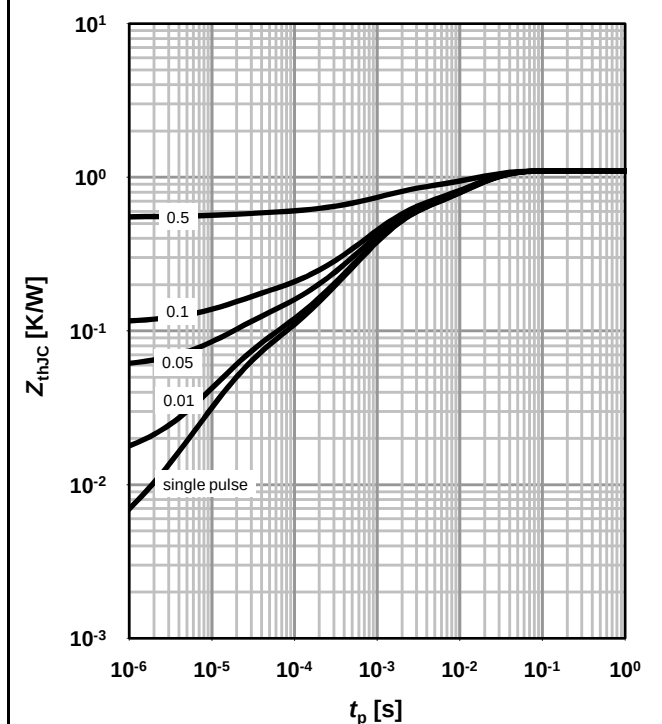
3 Safe operating area

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



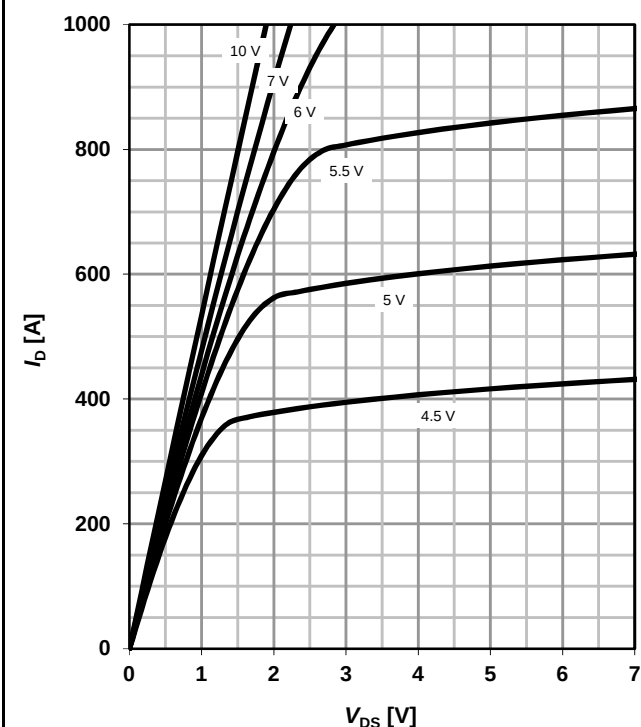
4 Max. transient thermal impedance

$$Z_{\text{thJC}} = f(t_p); \text{parameter: } D = t_p/T$$



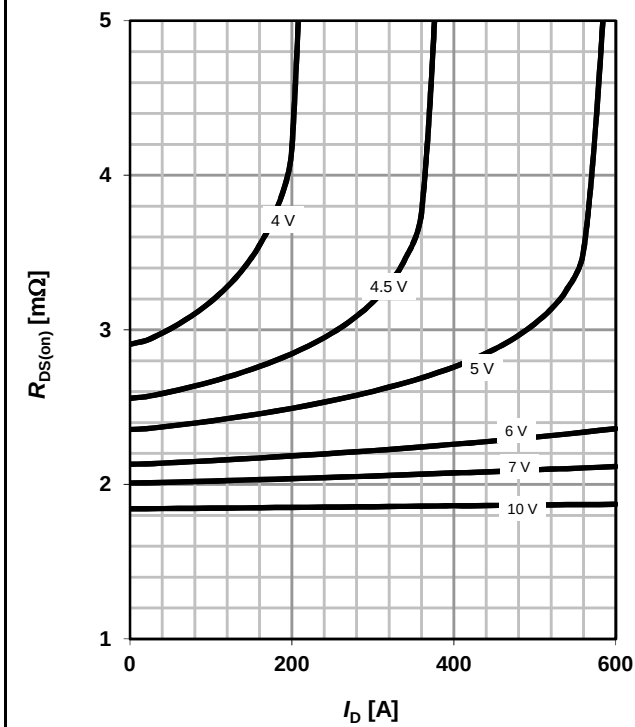
5 Typ. output characteristics

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



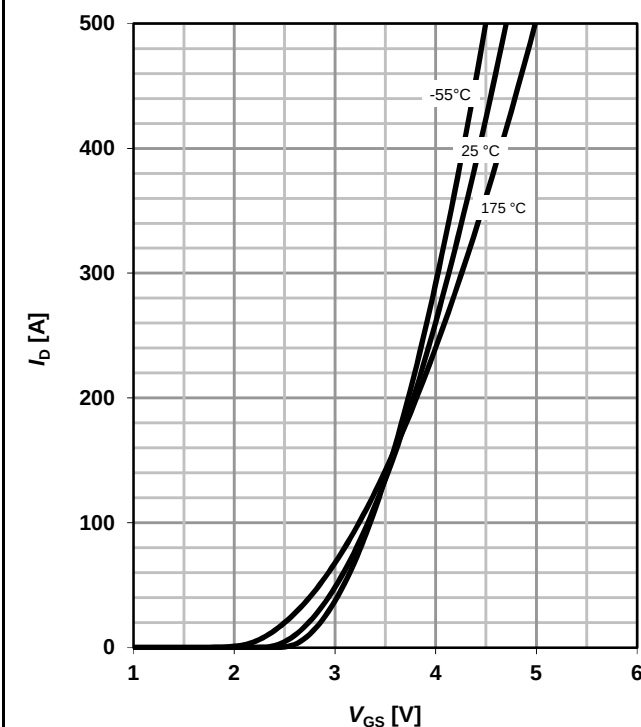
6 Typ. drain-source on-state resistance

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



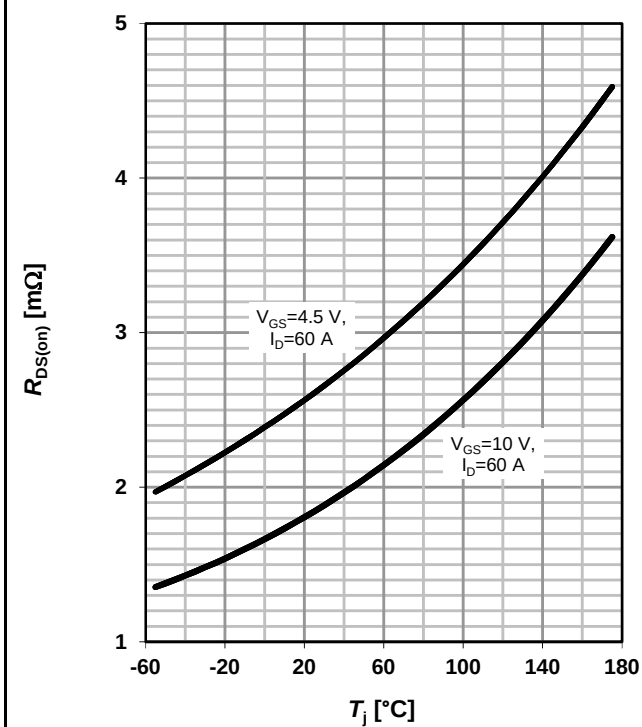
7 Typ. transfer characteristics

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



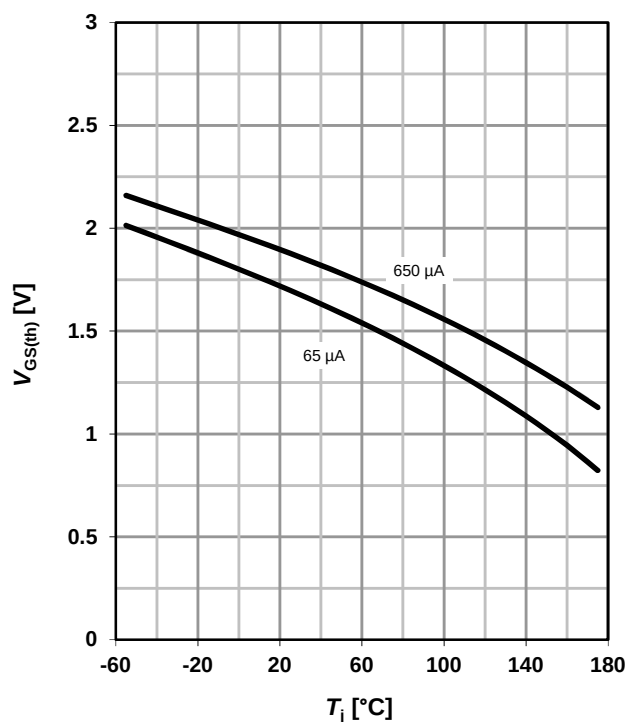
8 Typ. drain-source on-state resistance

$R_{DS(on)} = f(T_j); \text{parameter: } I_D, V_{GS}$



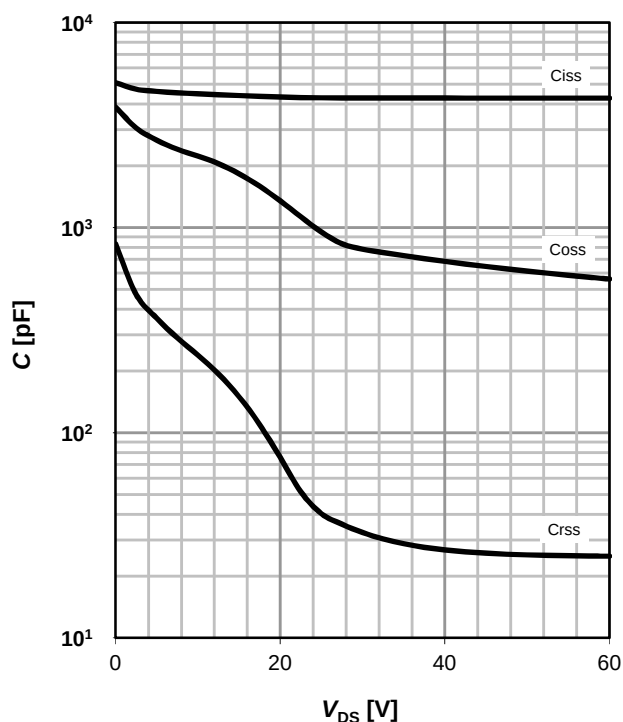
9 Typ. gate threshold voltage

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



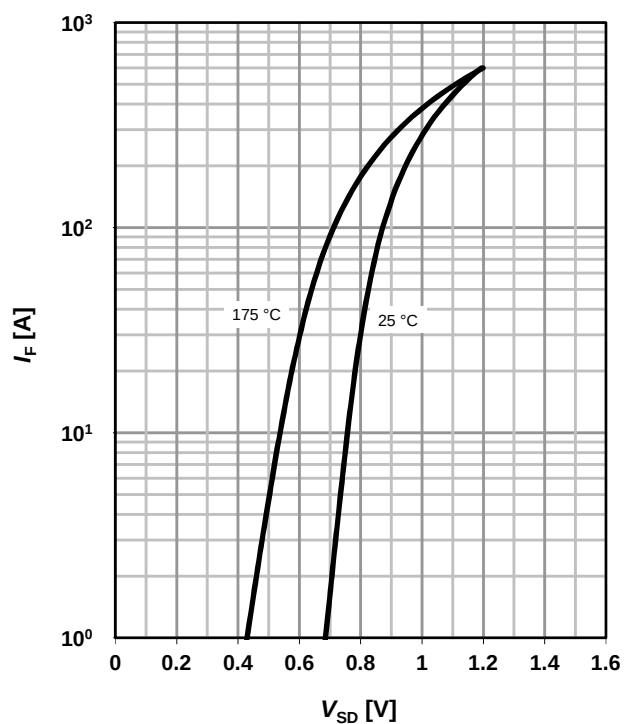
10 Typ. capacitances

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



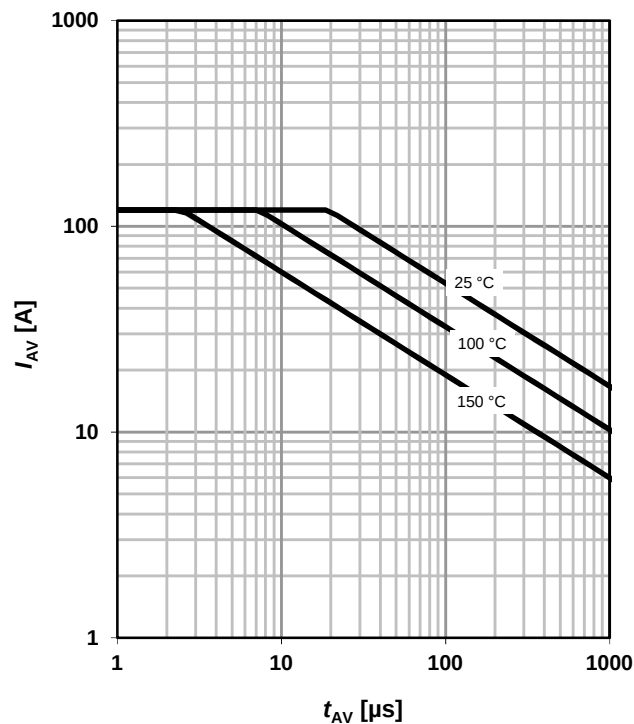
11 Typical forward diode characteristics

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



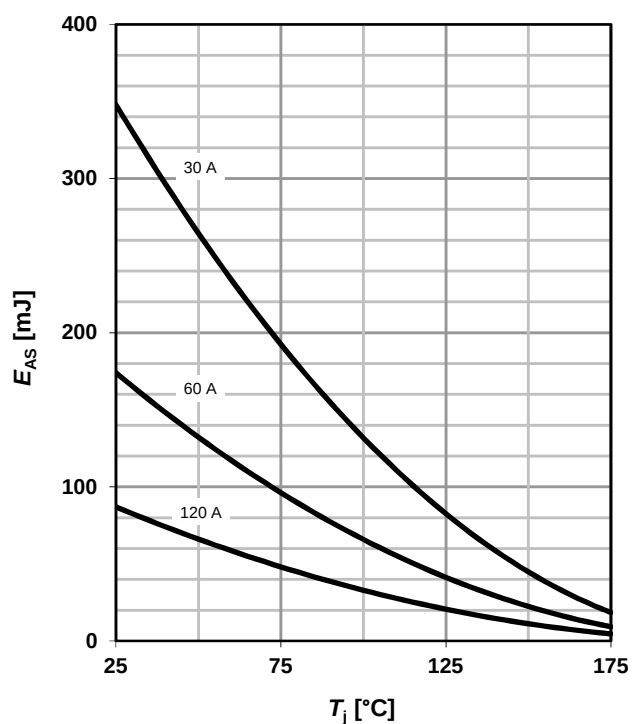
12 Typ. avalanche characteristics

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



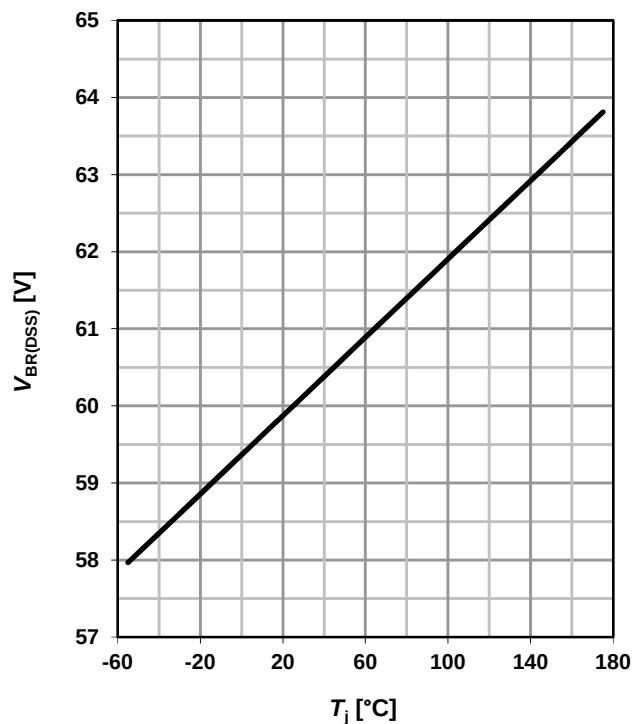
13 Typical avalanche energy

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



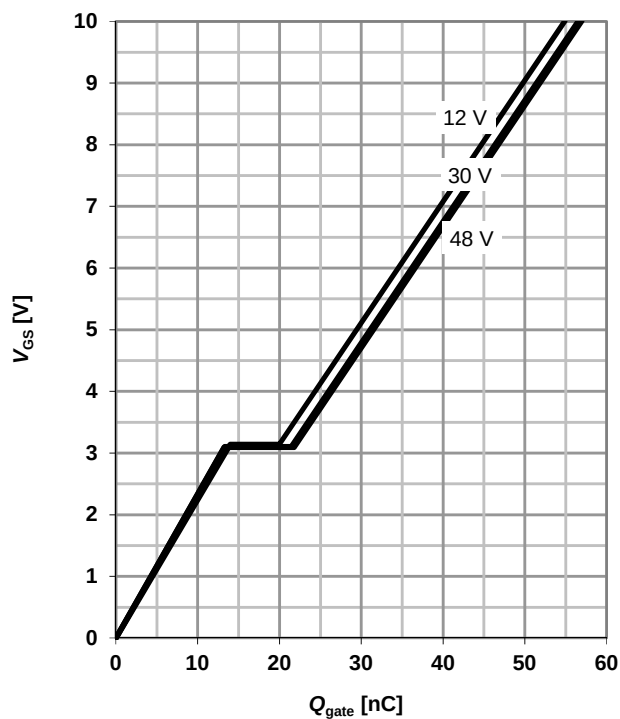
14 Drain-source breakdown voltage

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

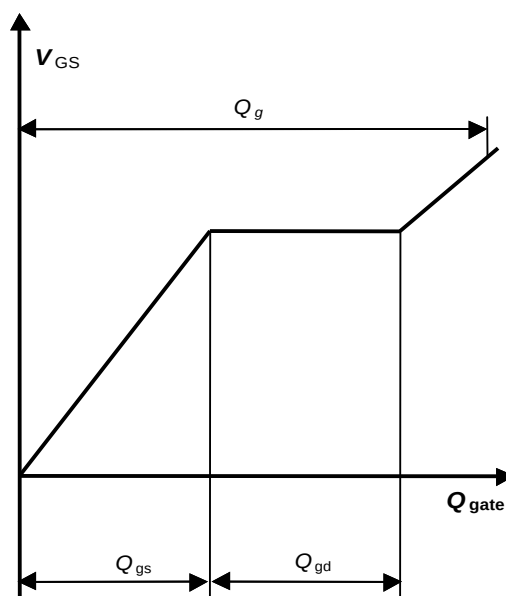


15 Typ. gate charge

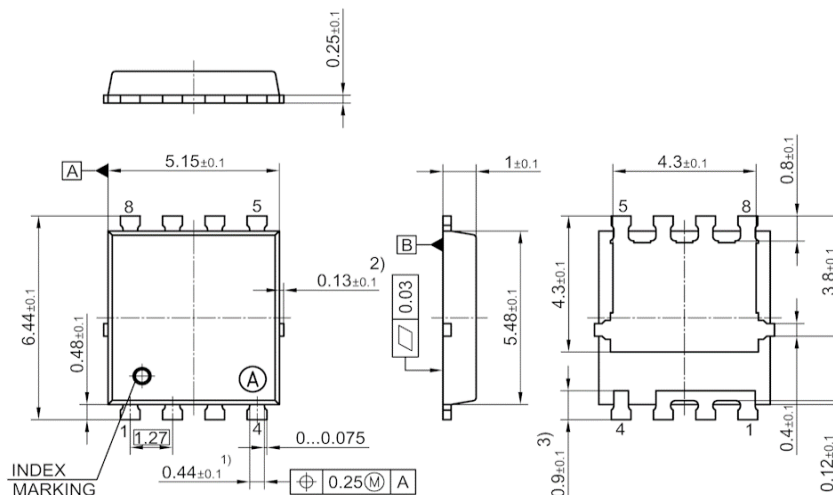
$V_{GS} = f(Q_{gate})$; $I_D = 60\text{ A}$ pulsed; parameter: V_{DD}



16 Gate charge waveforms

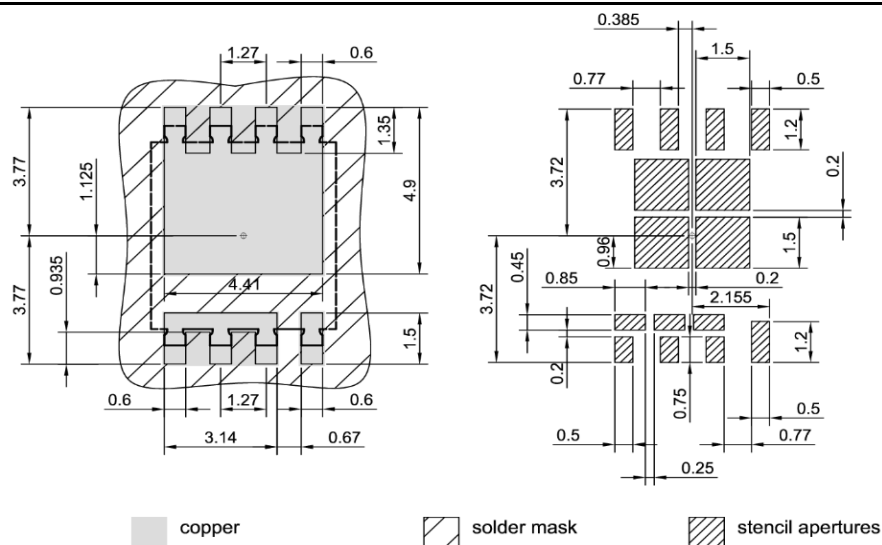


Package Outline



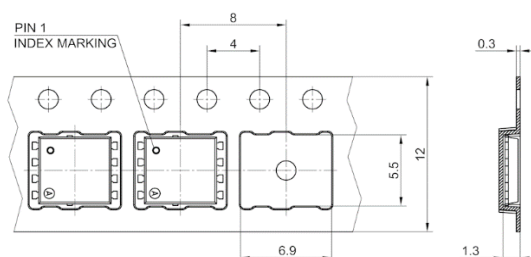
- 1) EXCLUDE MOLD FLASH
 - 2) REMOVAL ON MOLD GATE, INTRUSION 0.1MM AND PROTRUSION 0.1MM
 - 3) LEAD LENGTH UP TO ANTI FLASH LINE
 - 4) ALL METAL SURFACE ARE PLATED, EXCEPT AREA OF CUT
- ALL DIMENSIONS ARE IN UNITS MM
THE DRAWING IS IN COMPLIANCE WITH ISO 128 & PROJECTION METHOD 1 []

Footprint



All dimensions are in units mm

Packaging



ALL DIMENSIONS ARE IN UNITS MM
THE DRAWING IS IN COMPLIANCE WITH ISO 128 & PROJECTION METHOD 1 []

Revision History

Revision	Date	Changes
Revision 1.0	12.07.2022	Final Data Sheet

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Edition 2022-07-12

Published by

Infineon Technologies AG

81726 Munich, Germany

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