

Automotive MOSFET

OptiMOS™-5 Power-Transistor

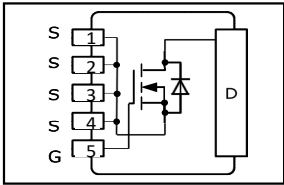


Features

- OptiMOS™ power MOSFET for automotive applications
- N-channel – Enhancement mode – Normal Level
- Extended qualification beyond AEC-Q101
- Enhanced electrical testing
- Robust design
- MSL3 up to 260°C peak reflow
- 175°C operating temperature
- Green product (RoHS compliant)
- 100% Avalanche tested

Potential applications

General automotive applications.



Product Summary

V_{DS}	100	V
$R_{DS(on)}$	2.9	mΩ
I_D (chip limited)	180	A

Type	Package	Marking
IAUA180N10S5N029	PG-HSOF-5-4	5N10029



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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⁾	180	A
		$V_{GS}=10\text{V}$, DC current ²⁾	180	
		$T_a=85\text{ °C}$, $V_{GS}=10\text{ V}$, R_{thJA} on 2s2p ^{2,3)}	24	
Pulsed drain current ²⁾	$I_{D,pulse}$	$T_C=25\text{ °C}$, $t_p=100\text{ }\mu\text{s}$	561	
Avalanche energy, single pulse ²⁾	E_{AS}	$I_D=90\text{ A}$	220	mJ
Avalanche current, single pulse	I_{AS}	-	150	A
Gate source voltage	V_{GS}	-	± 20	V
Power dissipation	P_{tot}	$T_C=25\text{ °C}$	221	W
Operating and storage temperature	T_j, T_{stg}	-	-55 ... +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}	-	-	-	0.68	K/W
Thermal resistance, junction - ambient ³⁾	R_{thJA}	-	-	22.8	-	

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	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$	100	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$, $I_D=130\text{ }\mu\text{A}$	2.2	3	3.8	
Zero gate voltage drain current	I_{DSS}	$V_{DS}=100\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$	-	0.1	1	μA
		$V_{DS}=100\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=100\text{ °C}^{2)}$	-	1	100	
Gate-source leakage current	I_{GSS}	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$	-	-	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=6\text{ V}$, $I_D=45\text{ A}$	-	2.8	3.4	m Ω
		$V_{GS}=10\text{ V}$, $I_D=90\text{ A}$	-	2.3	2.9	
Gate resistance ²⁾	R_G	-	-	1.4	-	Ω

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic characteristics²⁾

Input capacitance	C_{iss}	$V_{GS}=0\text{ V}, V_{DS}=50\text{ V}, f=1\text{ MHz}$	-	5902	7673	pF
Output capacitance	C_{oss}		-	947	1231	
Reverse transfer capacitance	C_{rss}		-	37	55	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=50\text{ V}, V_{GS}=10\text{ V},$ $I_D=90\text{ A}, R_G=3.5\ \Omega$	-	14	-	ns
Rise time	t_r		-	7	-	
Turn-off delay time	$t_{d(off)}$		-	28	-	
Fall time	t_f		-	17	-	

Gate Charge Characteristics²⁾

Gate to source charge	Q_{gs}	$V_{DD}=50\text{ V}, I_D=90\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	28	36	nC
Gate to drain charge	Q_{gd}		-	16	24	
Gate charge total	Q_g		-	81	105	
Gate plateau voltage	$V_{plateau}$		-	4.7	-	V

Reverse Diode

Diode continuous forward current ²⁾	I_S	$T_C=25\text{ °C}$	-	-	180	A
Diode pulse current ²⁾	$I_{S,pulse}$	$T_C=25\text{ °C}, t_p=100\ \mu\text{s}$	-	-	561	
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=90\text{ A},$ $T_J=25\text{ °C}$	-	0.9	1.2	V
Reverse recovery time ²⁾	t_{rr}	$V_R=50\text{ V}, I_F=50\text{ A},$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	62	-	ns
Reverse recovery charge ²⁾	Q_{rr}		-	99	-	nC

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

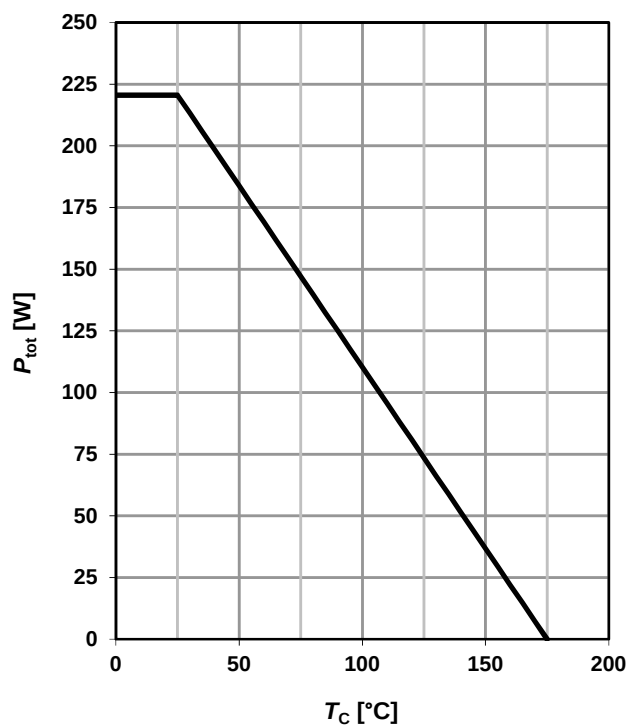
²⁾ The parameter is not subject to production testing – specified by design.

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

Electrical characteristics diagrams

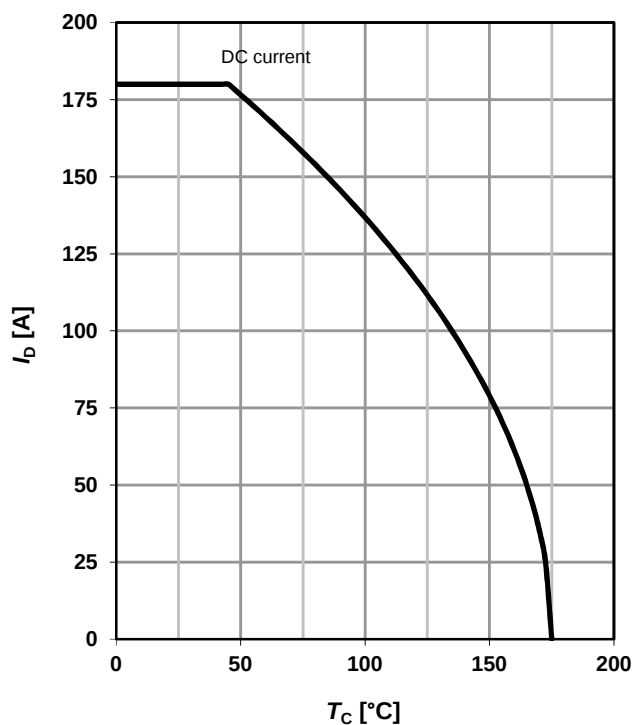
1 Power dissipation

$$P_{\text{tot}} = f(T_C); V_{\text{GS}} \geq 6 \text{ V}$$



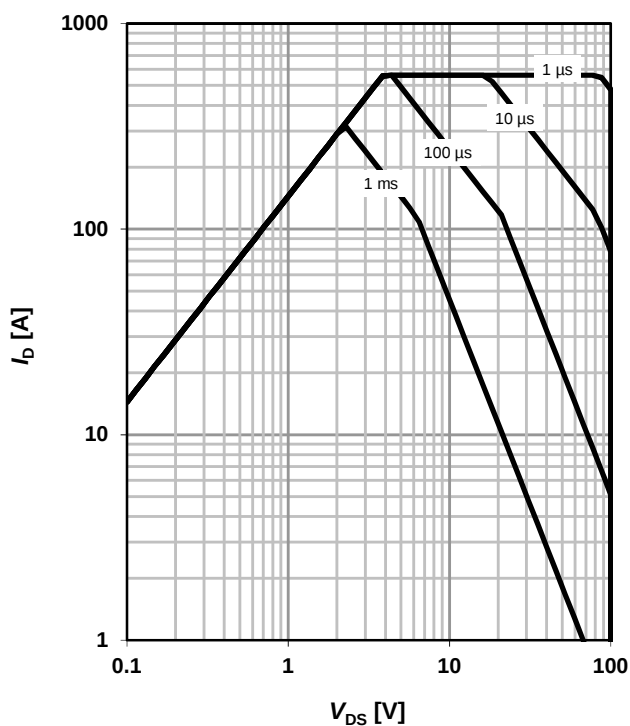
2 Drain current

$$I_D = f(T_C); V_{\text{GS}} \geq 6 \text{ V}$$



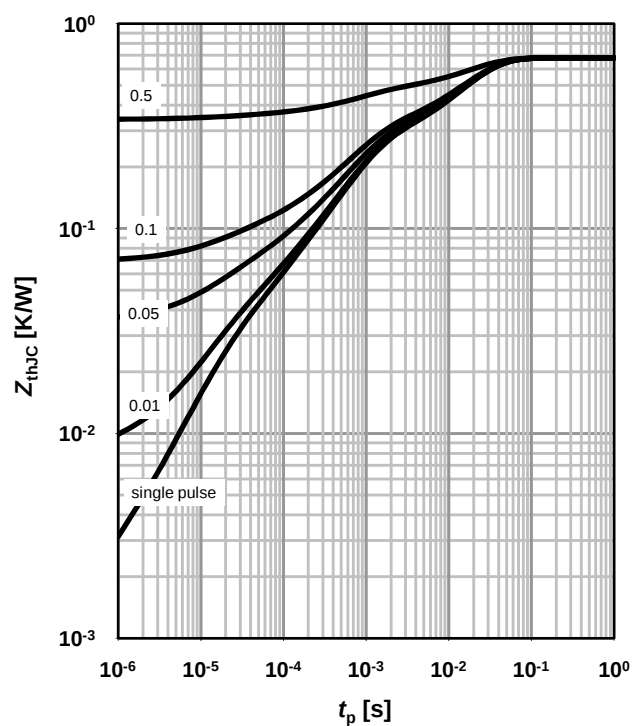
3 Safe operating area

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



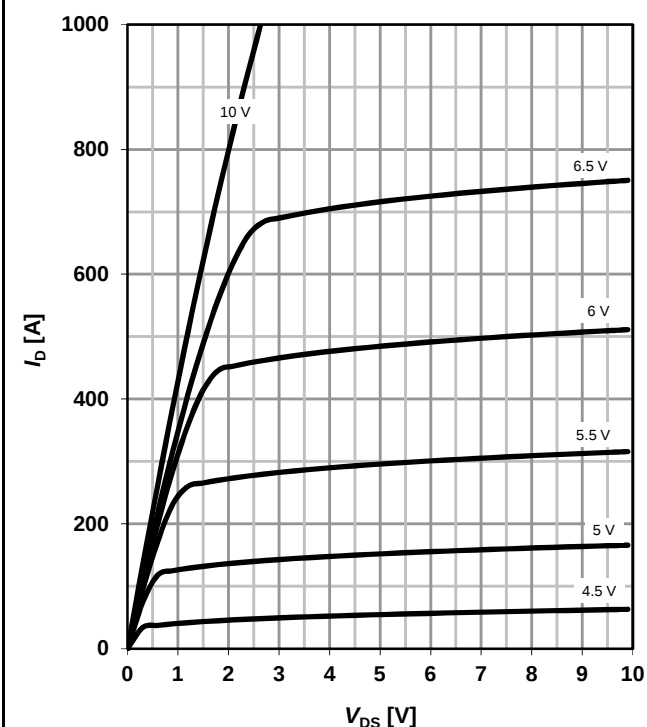
4 Max. transient thermal impedance

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



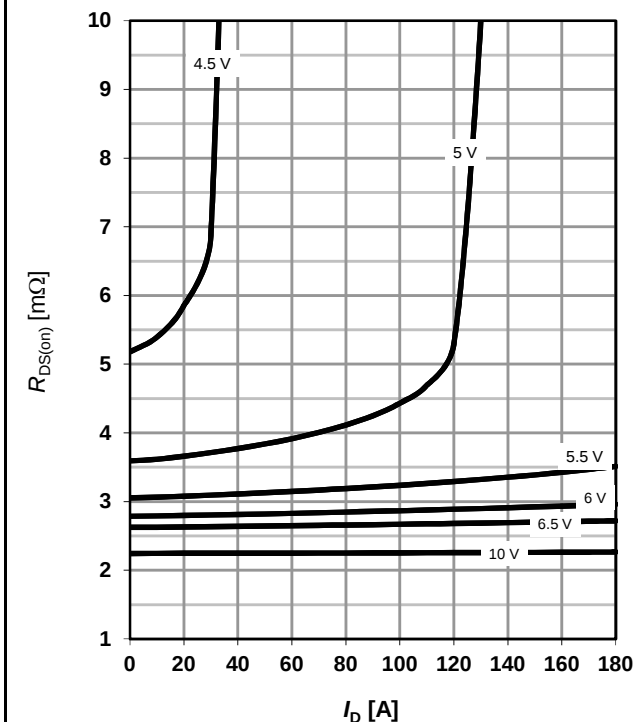
5 Typ. output characteristics

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



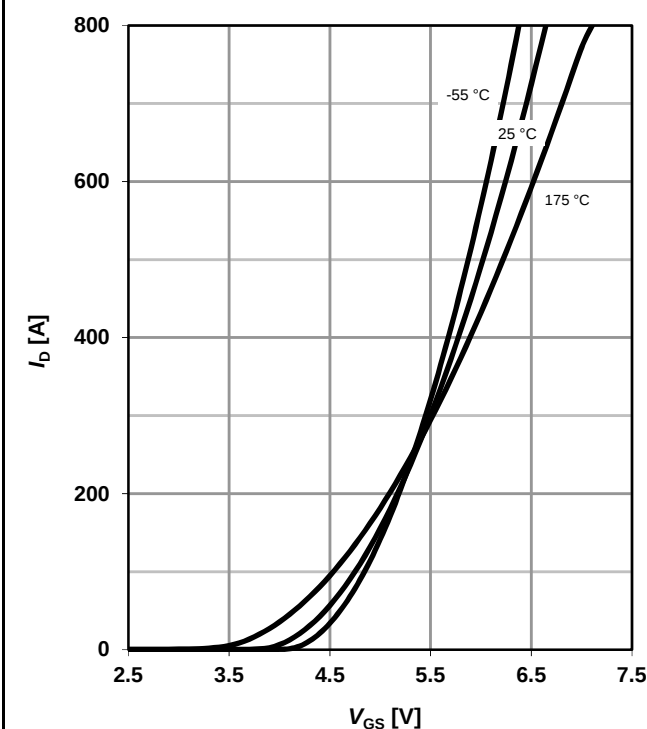
6 Typ. drain-source on-state resistance

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



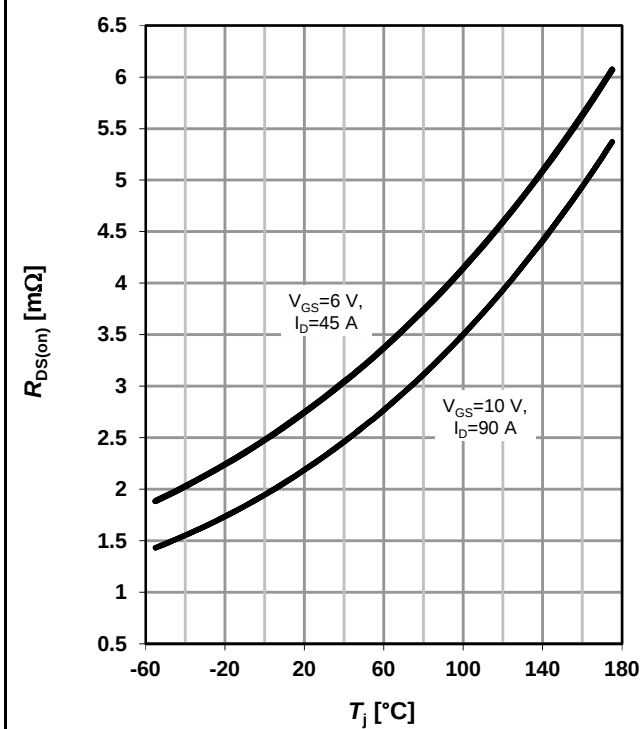
7 Typ. transfer characteristics

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



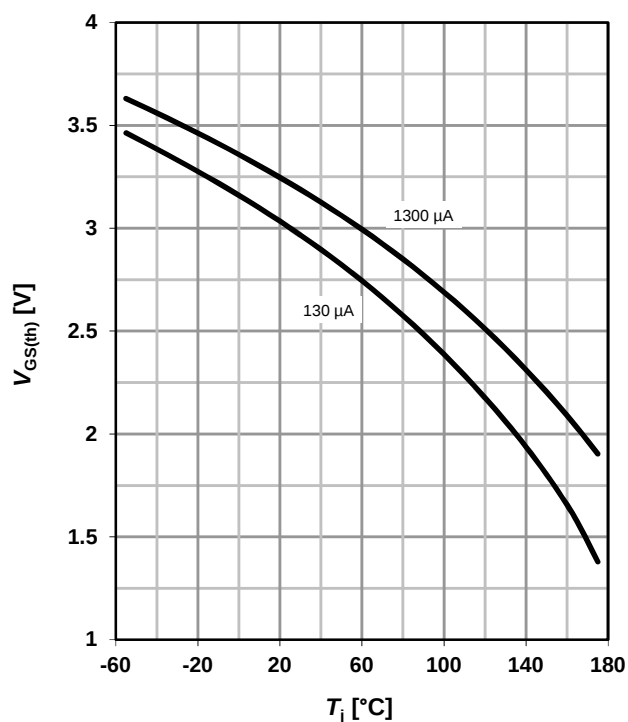
8 Typ. drain-source on-state resistance

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



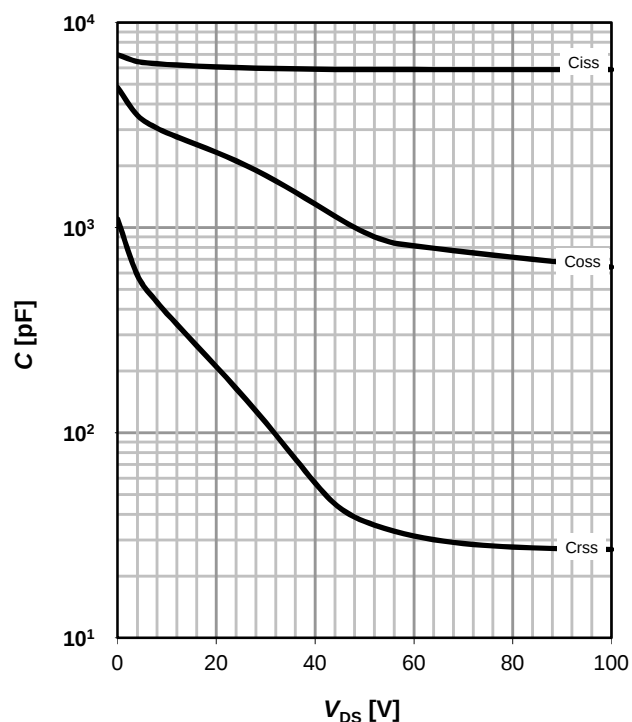
9 Typ. gate threshold voltage

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



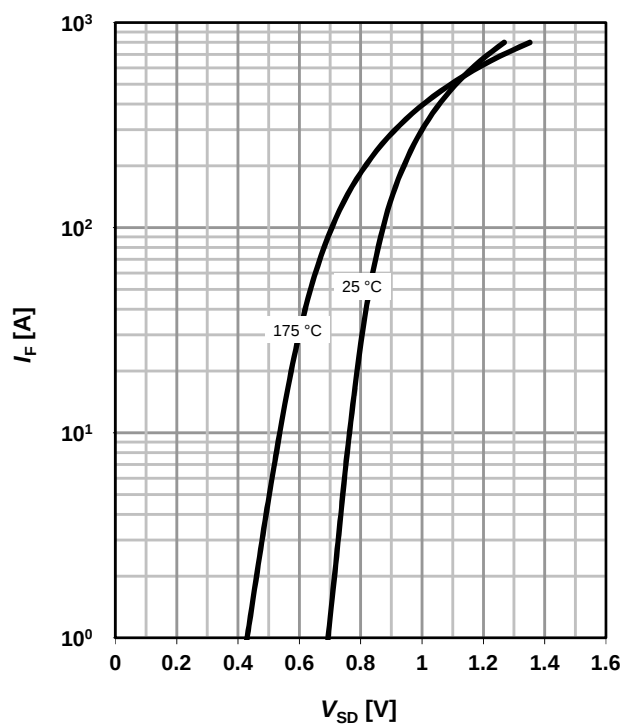
10 Typ. capacitances

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



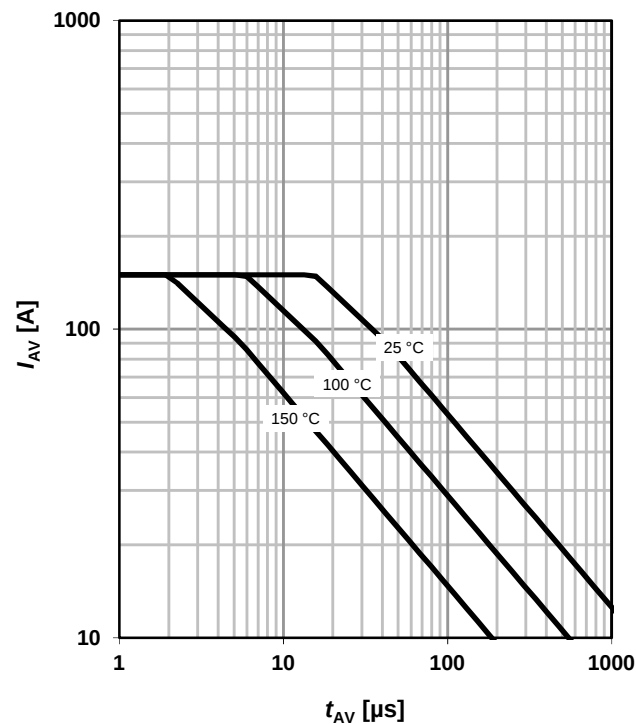
11 Typical forward diode characteristics

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



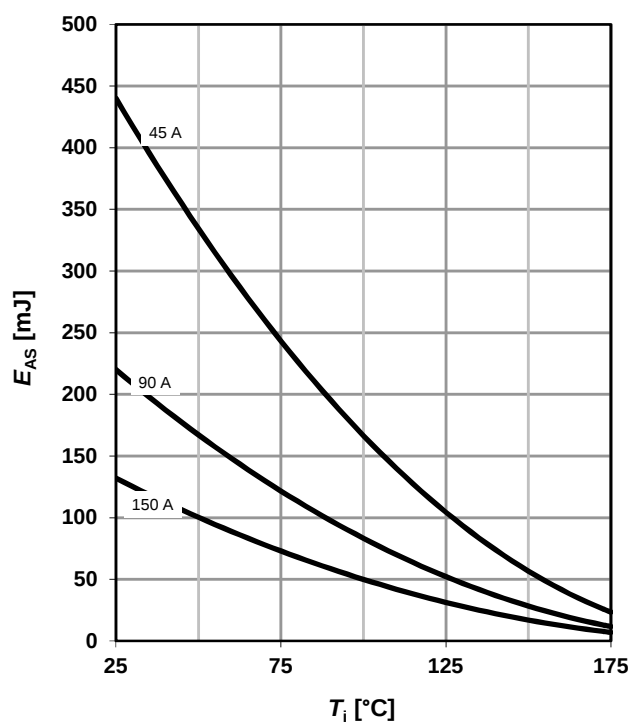
12 Typ. avalanche characteristics

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



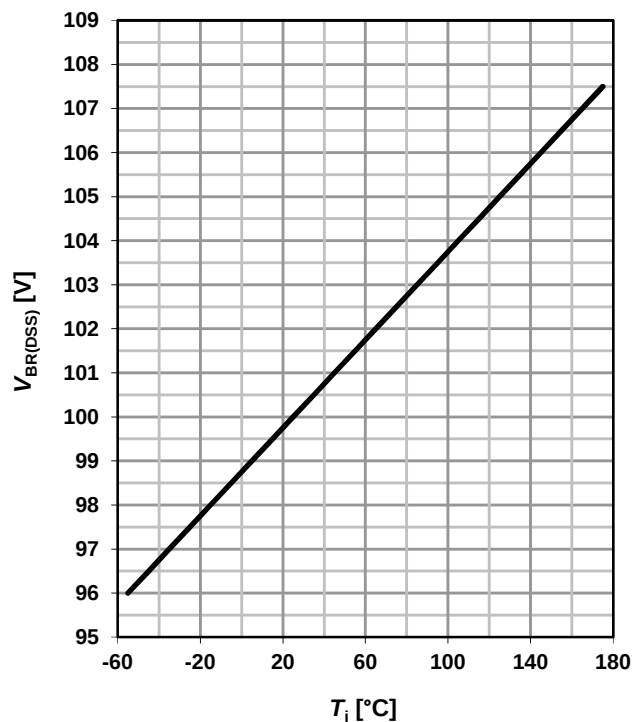
13 Typical avalanche energy

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



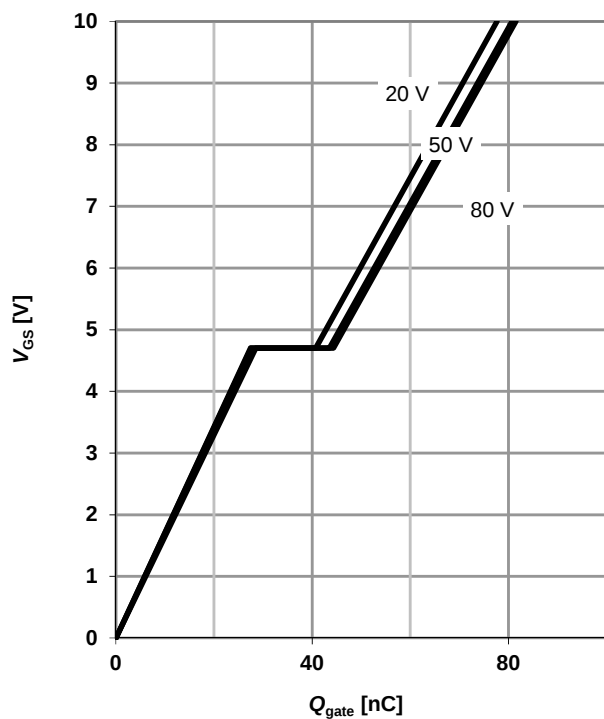
14 Drain-source breakdown voltage

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

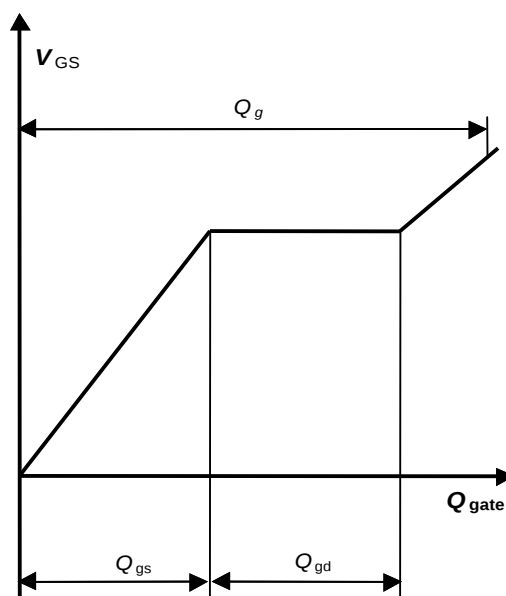


15 Typ. gate charge

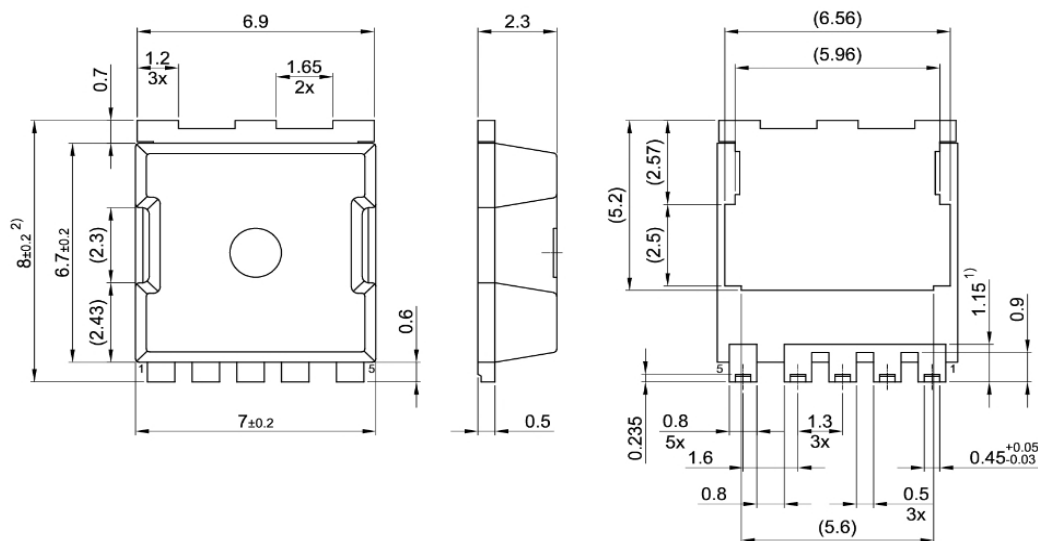
$V_{GS} = f(Q_{gate})$; $I_D = 90$ A pulsed; parameter: V_{DD}



16 Gate charge waveforms



Package Outline



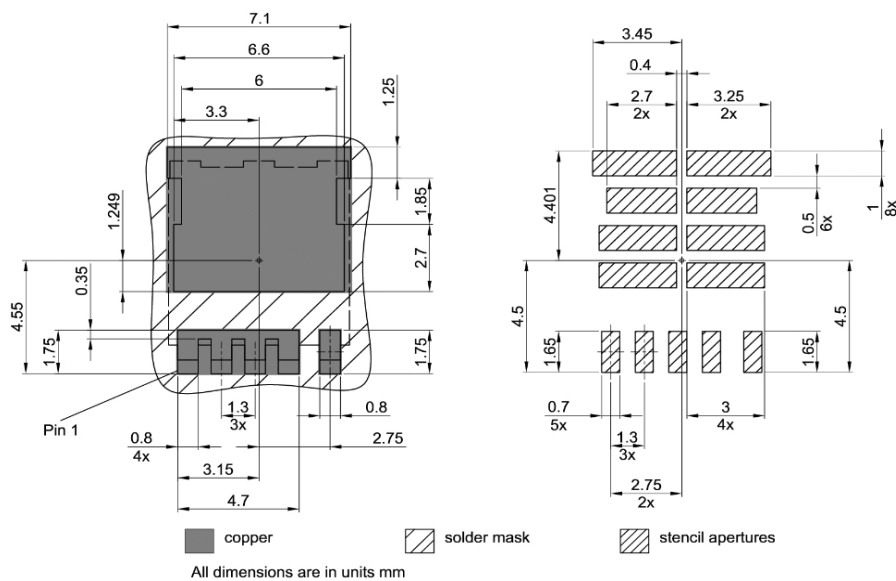
1) Lead length up to anti flash profile; mold flashes excluded

2) Excluding burr

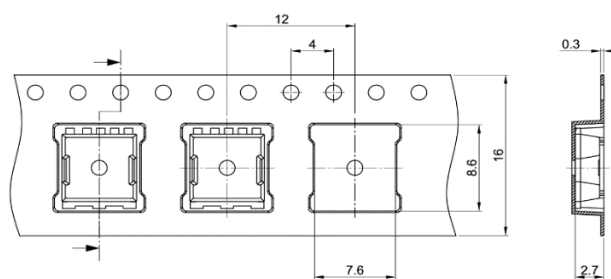
All dimensions are in units mm

The drawing is in compliance with ISO 128-30, Projection Method 1 [⊥]

Footprint



Packaging



All dimensions are in units mm

The drawing is in compliance with ISO 128-30, Projection Method 1 [⊥]

Revision History

Revision	Date	Changes
Revision 1.0	17.03.2021	Final Datasheet
Revision 1.1	12.11.2021	Corrected figure 14

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Email: erratum@infineon.com

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