

Automotive MOSFET

OptiMOS™ 5 Power-Transistor



Features

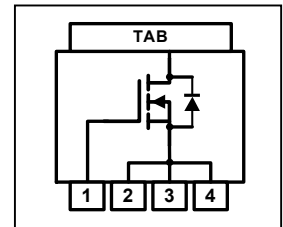
- OptiMOS™ power MOSFET for automotive applications
- N-channel – Enhancement mode – Normal Level
- Extended qualification beyond AEC-Q101
- Enhanced electrical testing
- Robust design
- MSL2 up to 260°C peak reflow
- 175°C operating temperature
- RoHS compliant
- 100% Avalanche tested

Potential applications

General automotive applications.

Product validation

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



Product Summary

V_{DS}	100	V
$R_{DS(on)}$	1.6	mΩ
I_D (chip limited)	310	A

Type	Package	Marking
IAUMN10S5N016G	PG-HSOG-4-1	5N10N016



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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)}	310	A
		$V_{GS}=10\text{V}$, DC current ³⁾	220	
		$T_a=100\text{ °C}$, $V_{GS}=10\text{ V}$, R_{thJA} on 2s2p ^{2,4)}	64	
Pulsed drain current ²⁾	$I_{D,pulse}$	$T_C=25\text{ °C}$, $t_p=100\text{ }\mu\text{s}$	1100	
Avalanche energy, single pulse ²⁾	E_{AS}	$I_D=110\text{ A}$	617	mJ
Avalanche current, single pulse	I_{AS}	–	220	A
Gate source voltage	V_{GS}	–	± 20	V
Power dissipation	P_{tot}	$T_C=25\text{ °C}$	325	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}	–	–	–	0.46	K/W
Thermal resistance, junction - ambient ³⁾	R_{thJA}	–	–	7.8	–	

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	$V_{GS(th)}$	$V_{DS}=V_{GS}$, $I_D=230\text{ }\mu\text{A}$	2.2	3	3.8	
Zero gate voltage drain current	I_{DSS}	$V_{DS}=100\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$	–	–	1	μA
		$V_{DS}=100\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=100\text{ °C}^{2)}$	–	–	100	
Gate-source leakage current	I_{GSS}	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$	–	–	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=6\text{ V}$, $I_D=50\text{ A}$	–	1.6	2.1	m Ω
		$V_{GS}=10\text{ V}$, $I_D=100\text{ A}$	–	1.2	1.6	
Gate resistance ²⁾	R_G	–	–	1.3	–	Ω

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic characteristics²⁾

Input capacitance	C_{iss}	$V_{GS}=0\text{ V}, V_{DS}=50\text{ V}, f=1\text{ MHz}$	-	10439	13570	pF
Output capacitance	C_{oss}		-	1674	2180	
Reverse transfer capacitance	C_{rss}		-	71	90	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=50\text{ V}, V_{GS}=10\text{ V},$ $I_D=100\text{ A}, R_G=3.5\ \Omega$	-	25	-	ns
Rise time	t_r		-	13	-	
Turn-off delay time	$t_{d(off)}$		-	55	-	
Fall time	t_f		-	50	-	

Gate Charge Characteristics²⁾

Gate to source charge	Q_{gs}	$V_{DD}=50\text{ V}, I_D=100\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	47	60	nC
Gate to drain charge	Q_{gd}		-	28	42	
Gate charge total	Q_g		-	142	190	
Gate plateau voltage	$V_{plateau}$		-	4.5	-	V

Reverse Diode

Diode continuous forward current ²⁾	I_S	$T_C=25\text{ °C}$	-	-	220	A
Diode pulse current ²⁾	$I_{S,pulse}$	$T_C=25\text{ °C}, t_p=100\ \mu\text{s}$	-	-	1100	
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=110\text{ A}, T_j=25\text{ °C}$	-	0.9	1.2	V
Reverse recovery time ²⁾	t_{rr}	$V_R=50\text{ V}, I_F=50\text{ A},$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	79	119	ns
Reverse recovery charge ²⁾	Q_{rr}		-	175	350	

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.

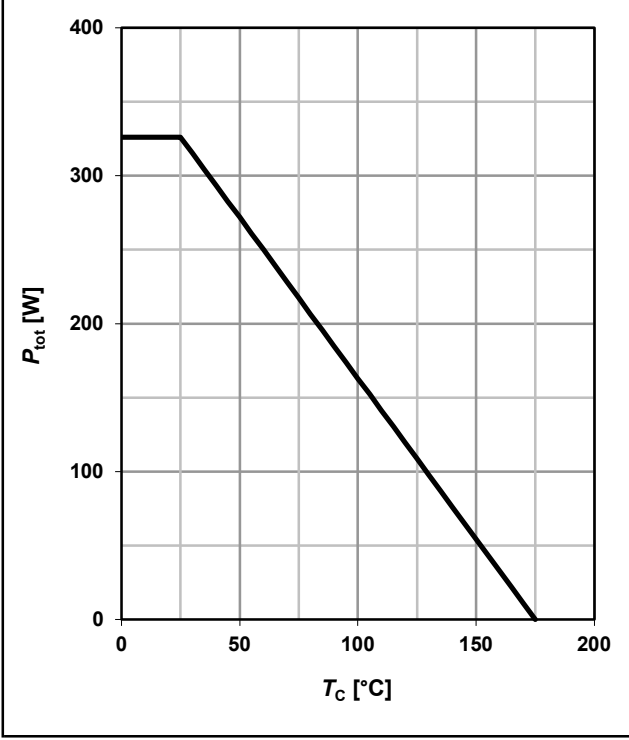
³⁾ Current is limited by package.

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

Electrical characteristics diagrams

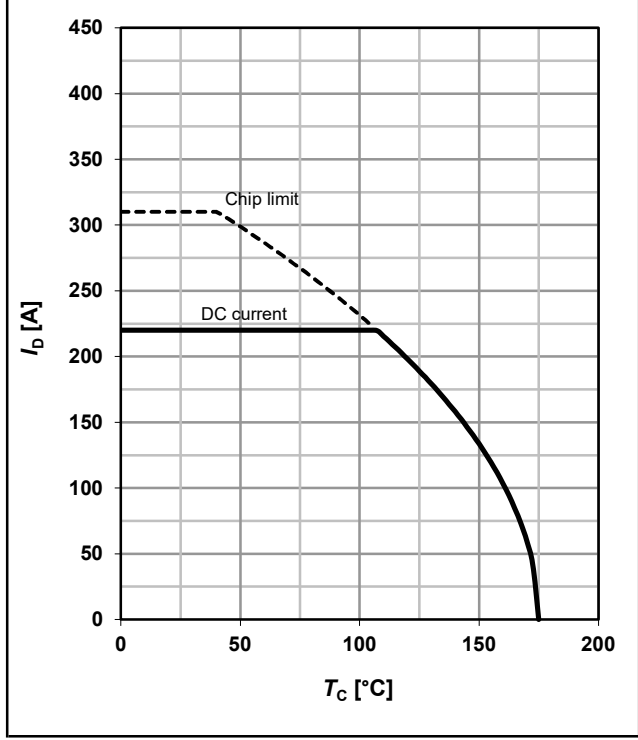
1 Power dissipation

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



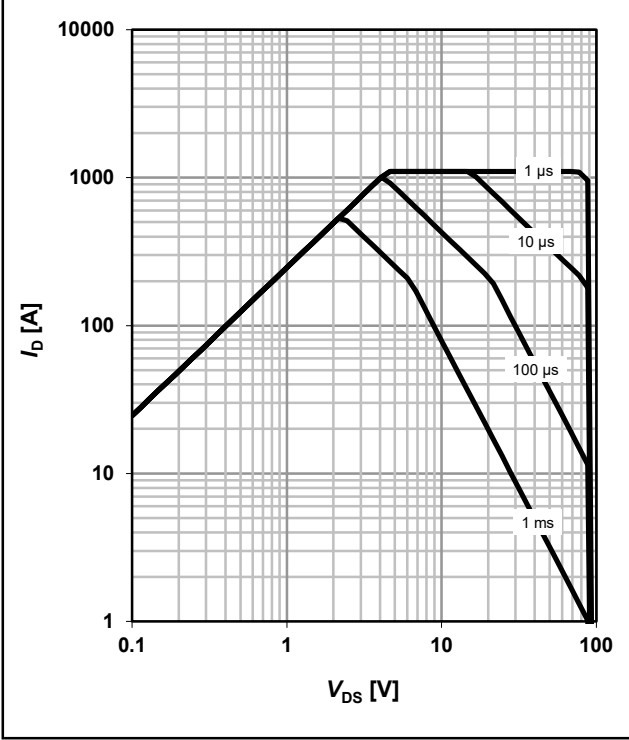
2 Drain current

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



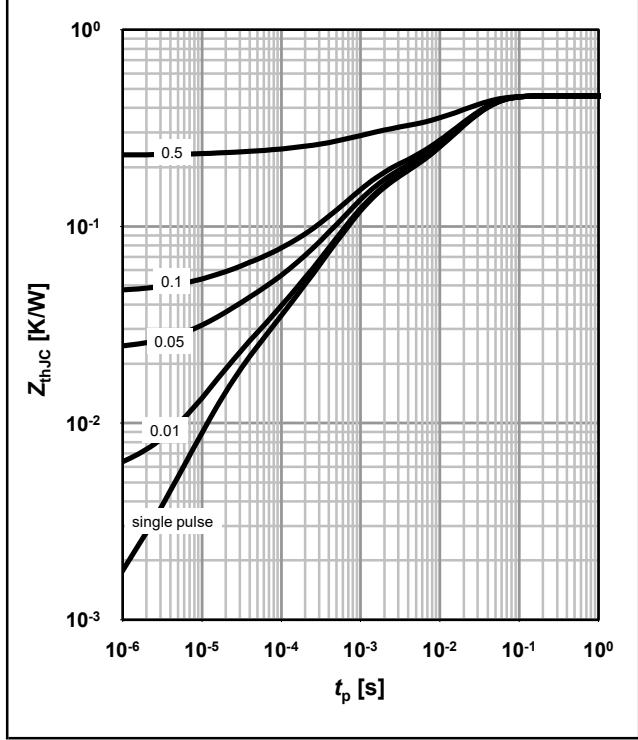
3 Safe operating area

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

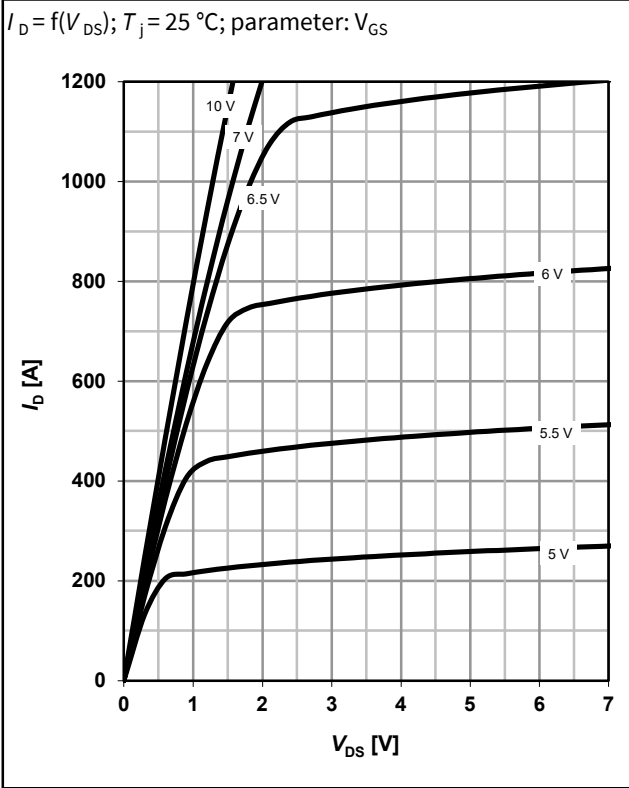


4 Max. transient thermal impedance

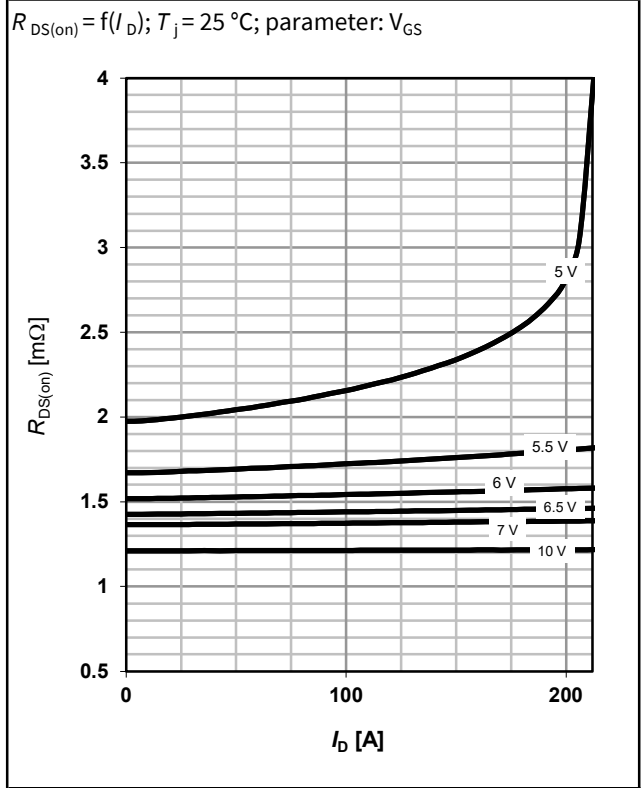
$Z_{thJC} = f(t_p); \text{parameter: } D = t_p/T$



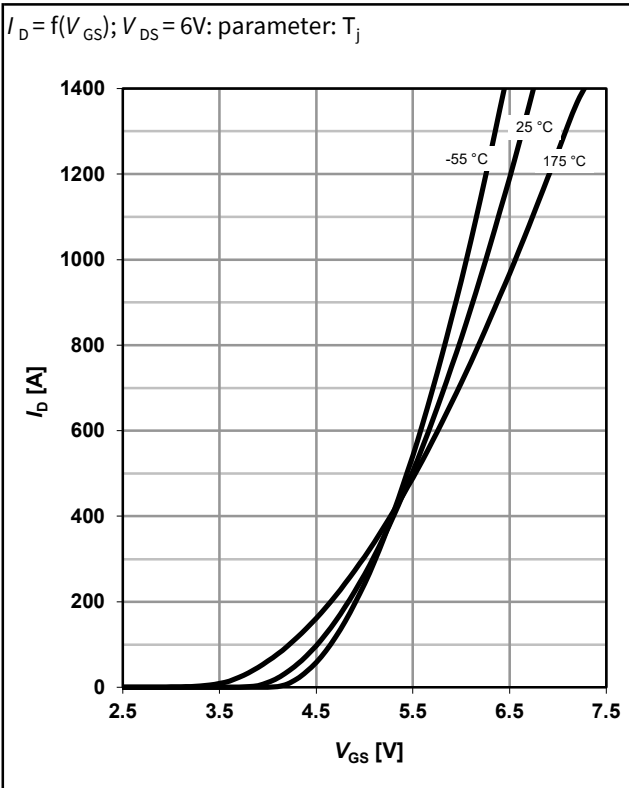
5 Typ. output characteristics



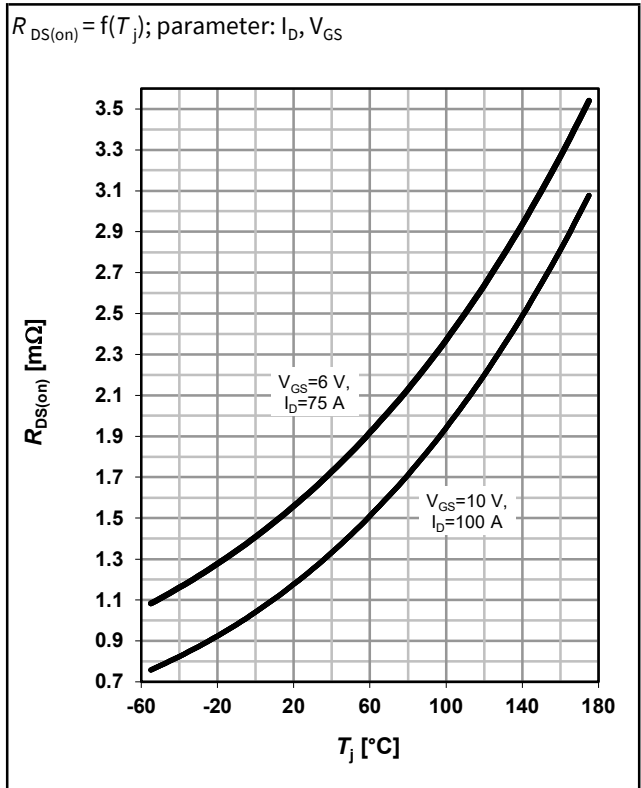
6 Typ. drain-source on-state resistance



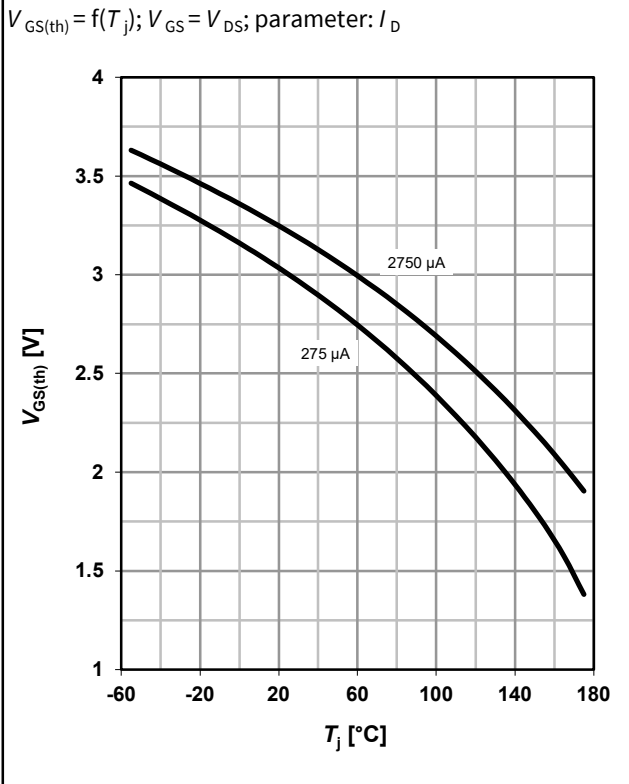
7 Typ. transfer characteristics



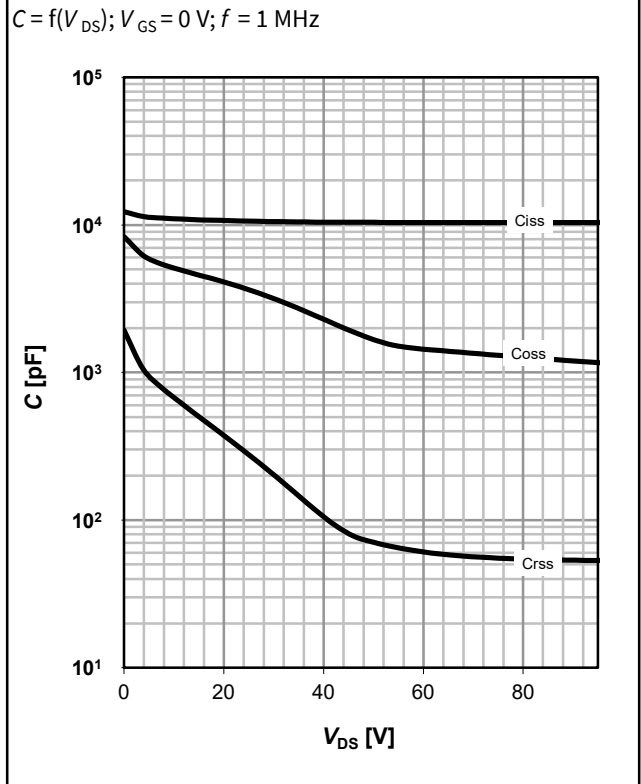
8 Typ. drain-source on-state resistance



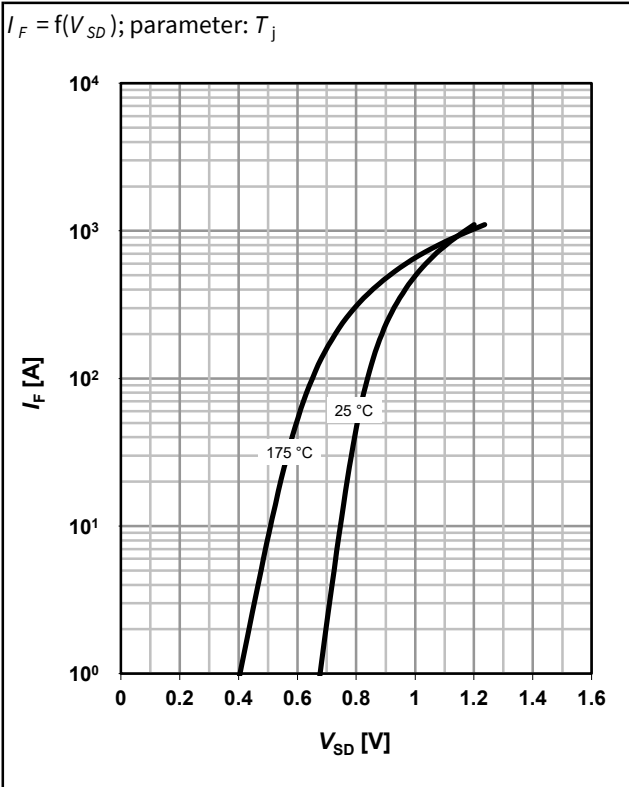
9 Typ. gate threshold voltage



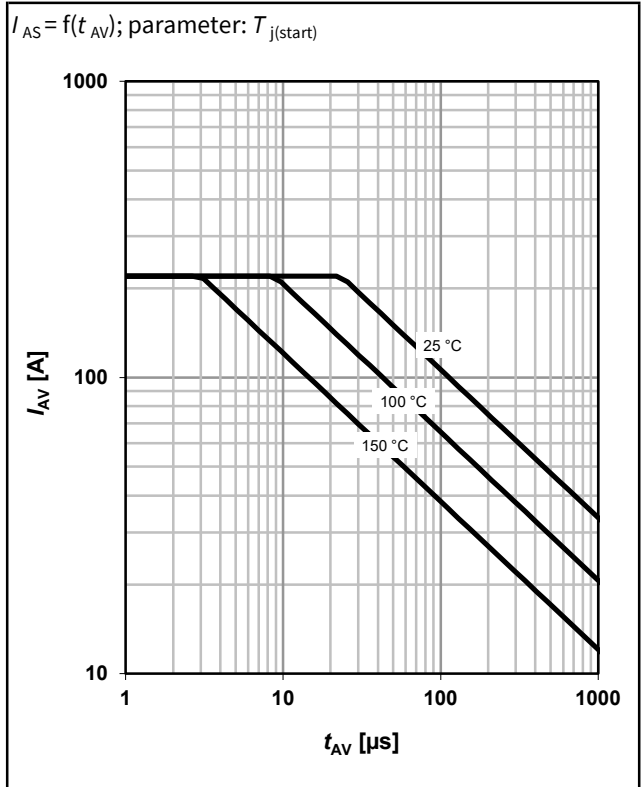
10 Typ. capacitances



11 Typical forward diode characteristics

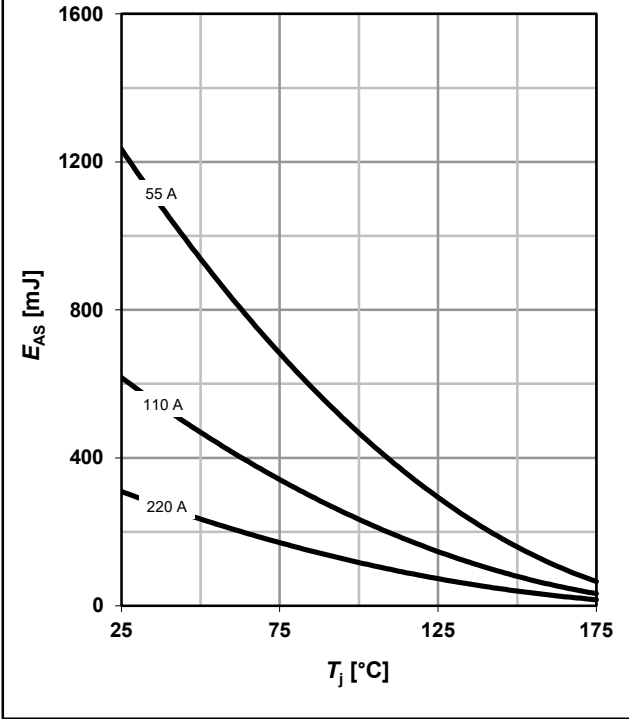


12 Typ. avalanche characteristics



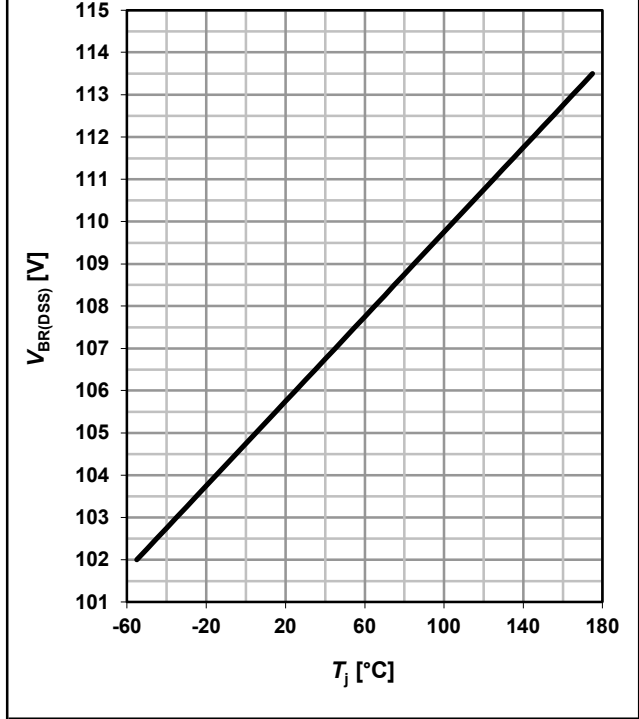
13 Typical avalanche energy

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



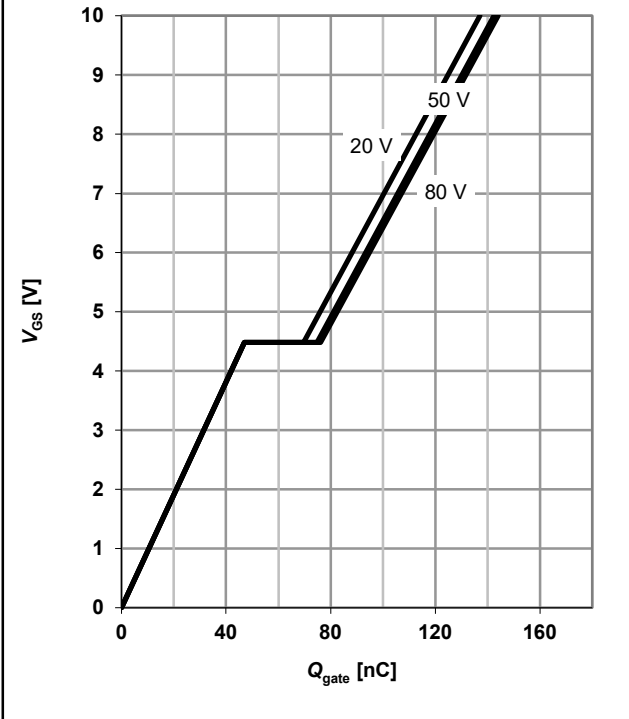
14 Drain-source breakdown voltage

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

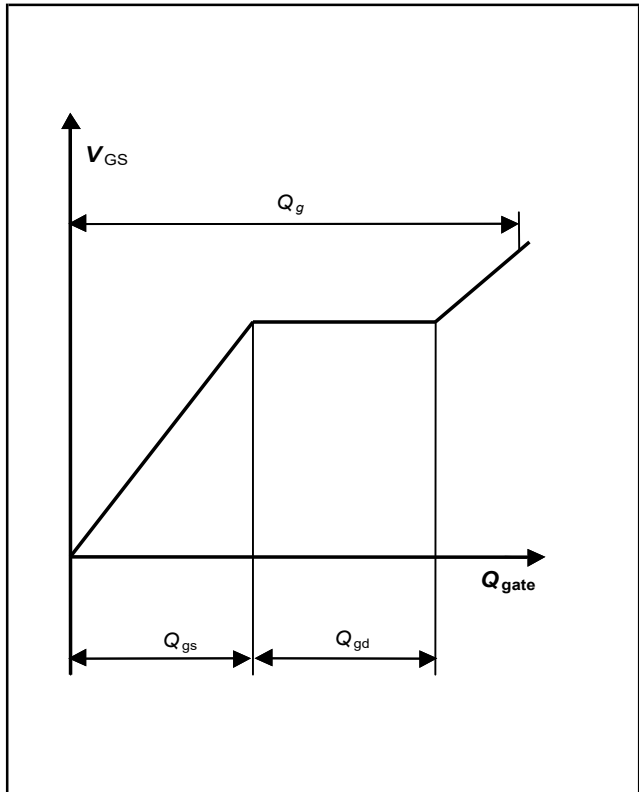


15 Typ. gate charge

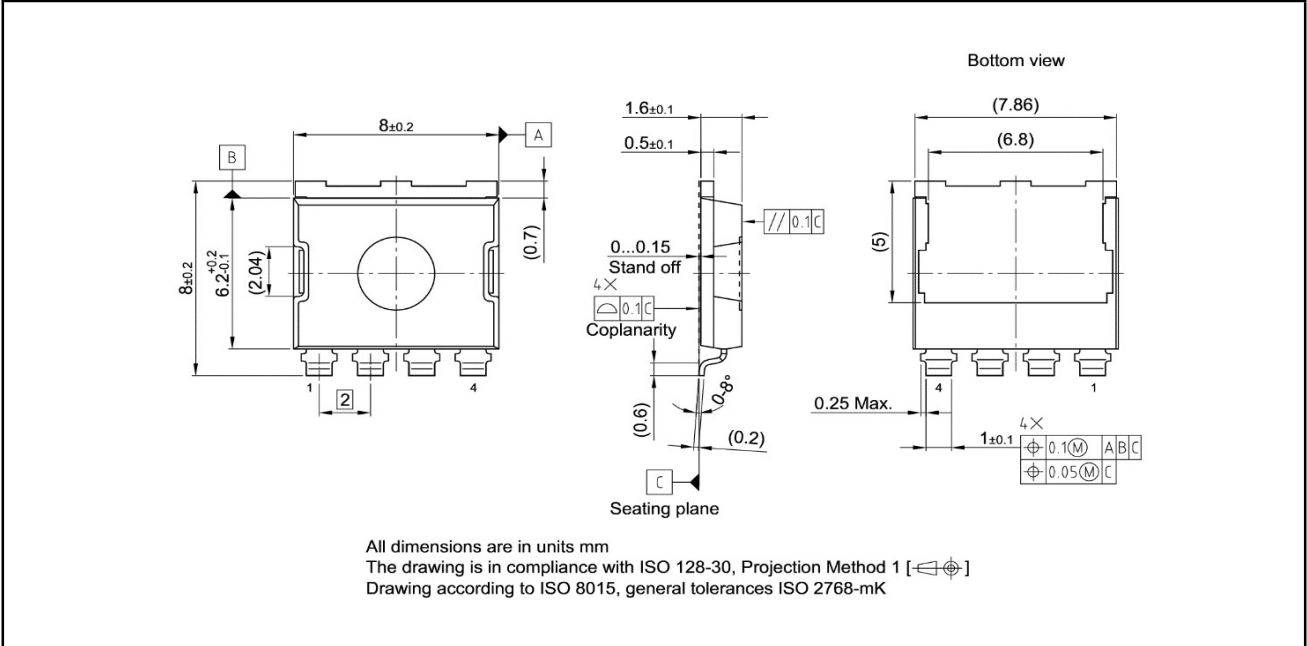
$V_{GS} = f(Q_{gate})$; $I_D = 100$ A pulsed; parameter: V_{DD}



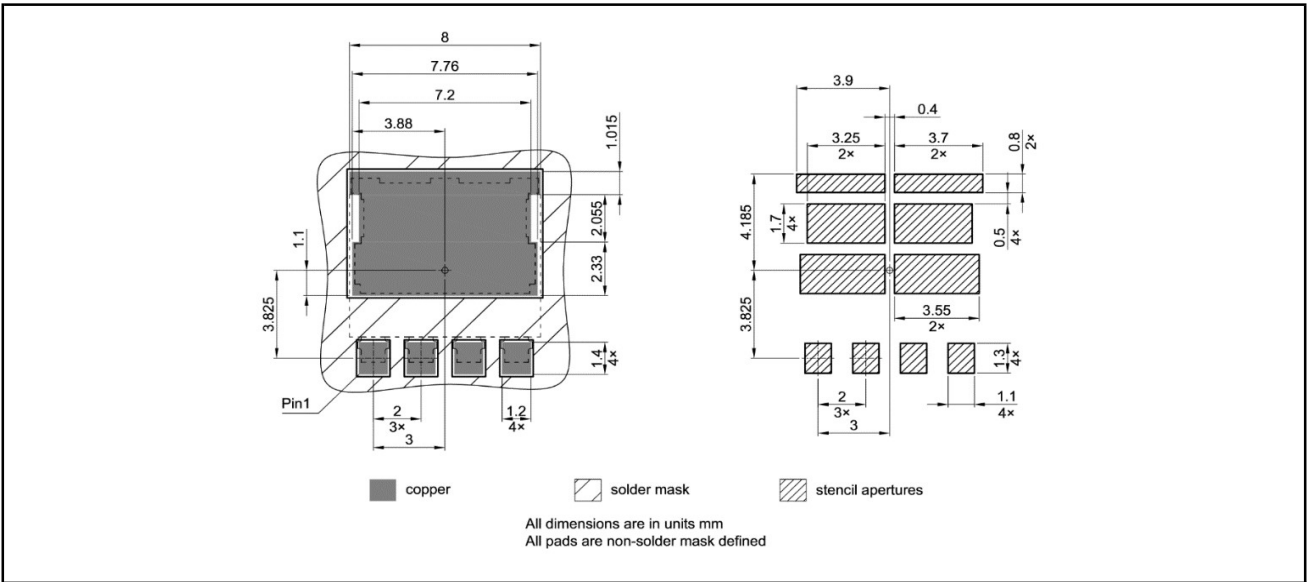
16 Gate charge waveforms



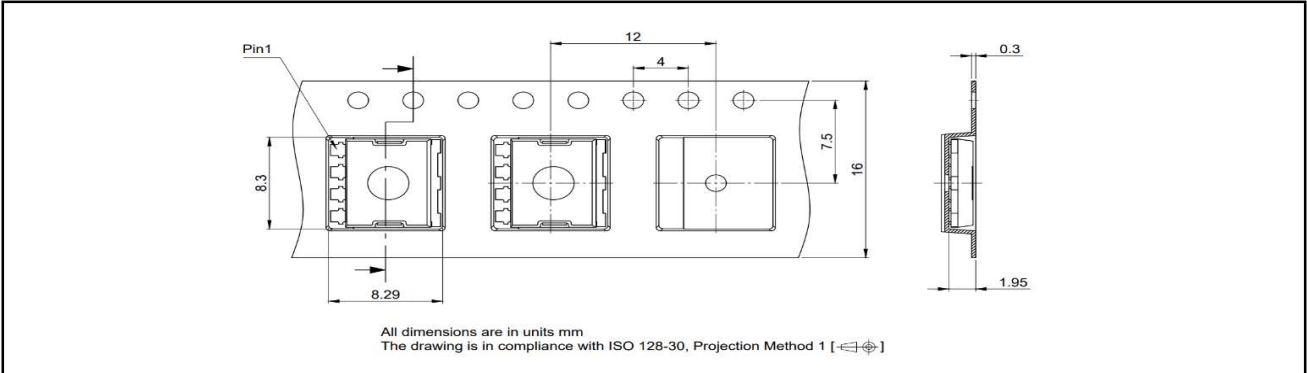
Package Outline



Footprint



Packaging





Revision History

Revision	Date	Changes
Revision 1.0	02.05.2024	Final Data Sheet

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