

Automotive MOSFET

OptiMOS™ 6 Power-Transistor



RoHS



Features

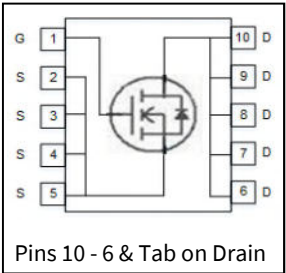
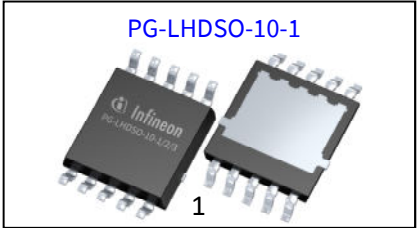
- OptiMOS™ power MOSFET for automotive applications
- N-channel – Enhancement mode – Normal Level
- Extended qualification beyond AEC-Q101
- Enhanced electrical testing
- Robust design
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- RoHS compliant
- 100% Avalanche tested
- Top Side Cooling

Potential applications

General automotive applications.

Product validation

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



Product Summary

V_{DS}	40	V
$R_{DS(on)}$	1.32	mΩ
I_D (chip limited)	230	A

Type	Package	Marking
IAUCN04S6N013T	PG-LHDSO-10-1	6C4



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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)}	230	A
		$V_{GS}=10\text{ V}$, DC current	120	
		$T_a=85\text{ °C}$, $V_{GS}=10\text{ V}$, R_{thJH} on 2s2p ^{2,4)}	68	
Pulsed drain current ²⁾	$I_{D,pulse}$	$T_C=25\text{ °C}$, $t_p=100\text{ }\mu\text{s}$	700	
Avalanche energy, single pulse ²⁾	E_{AS}	$I_D=60\text{ A}$	184	mJ
Avalanche current, single pulse	I_{AS}	–	60	A
Gate source voltage	V_{GS}	–	± 20	V
Power dissipation	P_{tot}	$T_C=25\text{ °C}$	133	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	$R_{thJC-Top}$	–	–	0.6	1.12	K/W
Thermal characterization parameter, source pin ⁵⁾	ψ_{source}		–	5.3	–	
Thermal characterization parameter, drain pin ⁶⁾	ψ_{drain}		–	5.2	–	
Thermal resistance, junction - heatsink ⁴⁾	R_{thJH}		–	7.2	–	
Thermal resistance, junction - ambient ³⁾	R_{thJA}	–	–	49	–	

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	$V_{GS(th)}$	$V_{DS}=V_{GS}$, $I_D=60\text{ }\mu\text{A}$	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
		$V_{DS}=40\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$ ²⁾	–	–	15	
Gate-source leakage current	I_{GSS}	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$	–	–	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=7\text{ V}$, $I_D=60\text{ A}$	–	1.43	1.68	m Ω
		$V_{GS}=10\text{ V}$, $I_D=60\text{ A}$	–	1.21	1.32	
Gate resistance ²⁾	R_G	–	–	1.04	–	Ω

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic characteristics ²⁾						
Input capacitance	C _{iss}	V _{GS} =0 V, V _{DS} =25 V, f=1 MHz	–	3700	4810	pF
Output capacitance	C _{oss}		–	1080	1404	
Reverse transfer capacitance	C _{rss}		–	51	77	
Turn-on delay time	t _{d(on)}	V _{DD} =20 V, V _{GS} =10 V, I _D =120 A, R _G =3.5 Ω	–	7	–	ns
Rise time	t _r		–	4	–	
Turn-off delay time	t _{d(off)}		–	17	–	
Fall time	t _f		–	8	–	

Gate Charge Characteristics²⁾

Gate to source charge	Q_{gs}	$V_{DD}=32\text{ V}, I_D=120\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	–	14	19	nC
Gate to drain charge	Q_{gd}		–	11	17	
Gate charge total	Q_g		–	52	69	
Gate plateau voltage	$V_{plateau}$		–	4.2	–	V

Reverse Diode

Diode continuous forward current ²⁾	I_S	$T_C=25\text{ }^\circ\text{C}$	–	–	120	A
Diode pulse current ²⁾	$I_{S,pulse}$	$T_C=25\text{ }^\circ\text{C}, t_p=100\text{ }\mu\text{s}$	–	–	700	
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=60\text{ A}, T_j=25\text{ }^\circ\text{C}$	–	0.8	1.1	V
Reverse recovery time ²⁾	t_{rr}	$V_R=20\text{ V}, I_F=50\text{ A},$ $di_F/dt=100\text{ A}/\mu\text{s}$	–	33	–	ns
Reverse recovery charge ²⁾	Q_{rr}		–	20	–	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.

⁴⁾ Device on 2s2p FR4 PCB defined in accordance with JEDEC standards (JESD51-5, -7) without thermal vias, heatsink of 71x110x2 mm is attached through 3 W/(m²K) 400μm to top side pad. Heatsink fixed to 85°C ambient temperature.

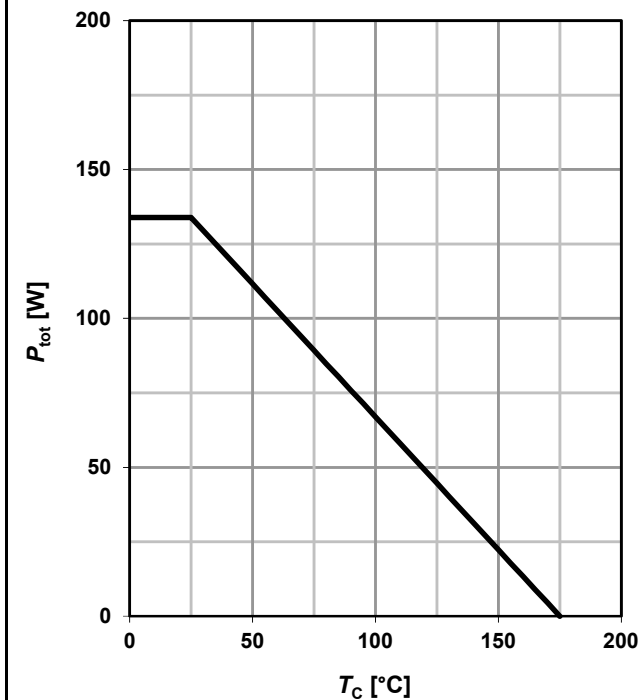
⁵⁾ Thermal characterization parameter, calculated as $\psi_{source} = (T_{source} - T_{ambient})/P_{dis}$ in condition of 4). Used to determine PCB temperature at source pins for given power.

⁶⁾ Thermal characterization parameter, calculated as $\psi_{drain} = (T_{drain} - T_{ambient})/P_{dis}$ in condition of 4). Used to determine PCB temperature at drain pins for given power.

Electrical characteristics diagrams

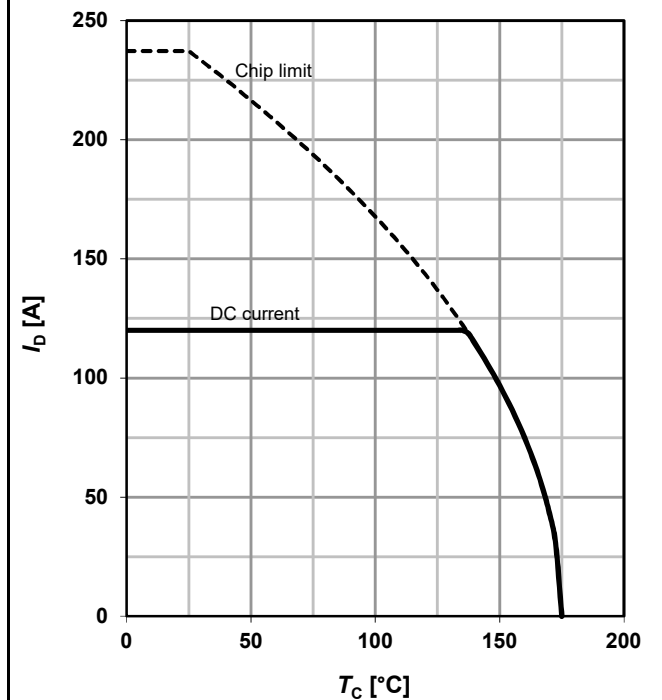
1 Power dissipation

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



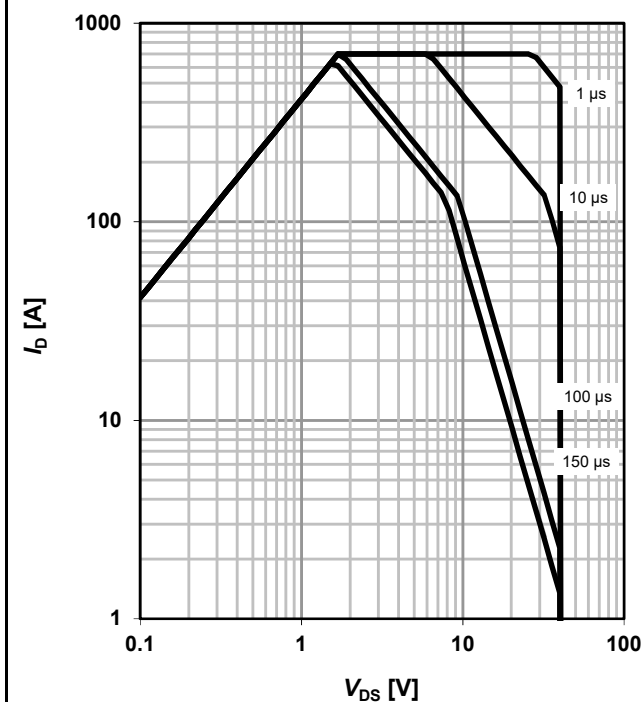
2 Drain current

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



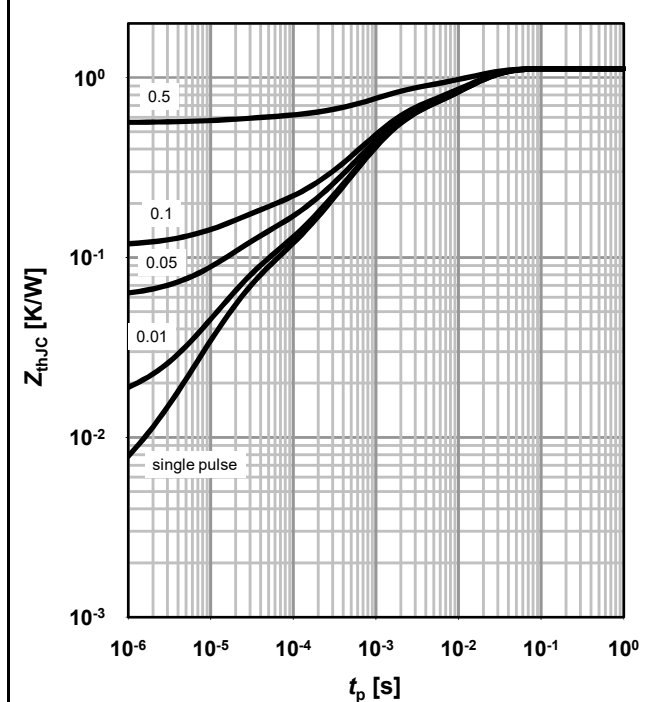
3 Safe operating area

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



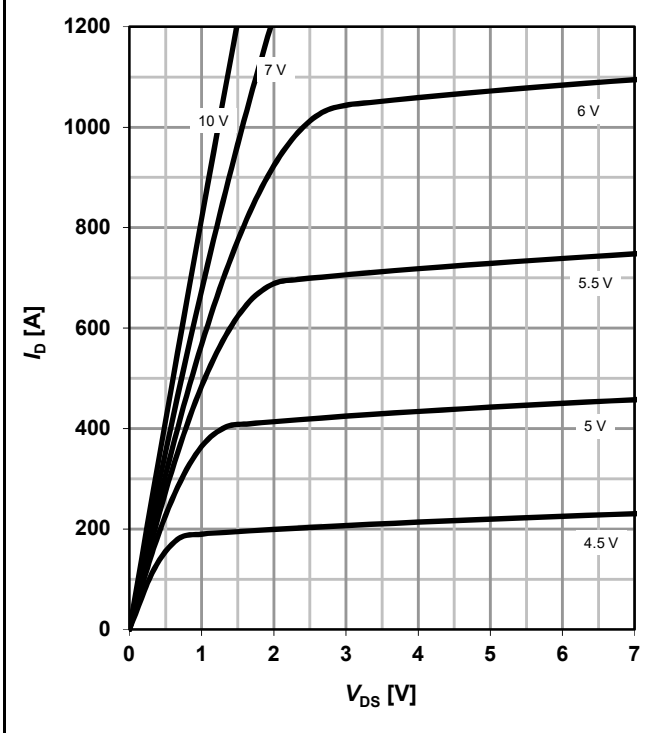
4 Max. transient thermal impedance

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



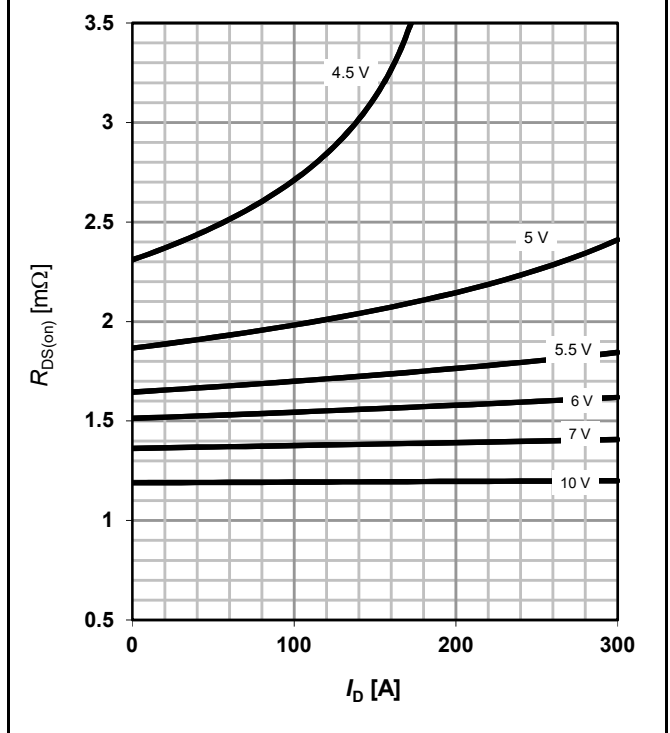
5 Typ. output characteristics

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



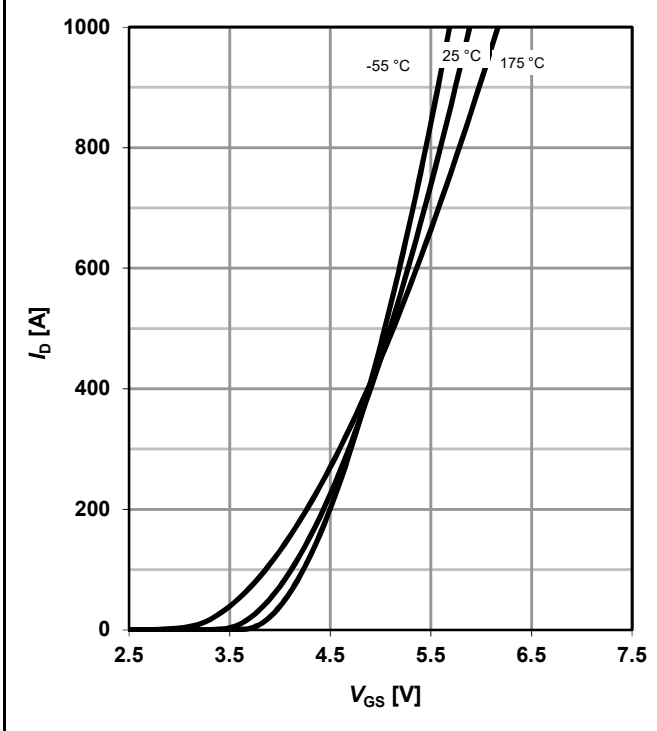
6 Typ. drain-source on-state resistance

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



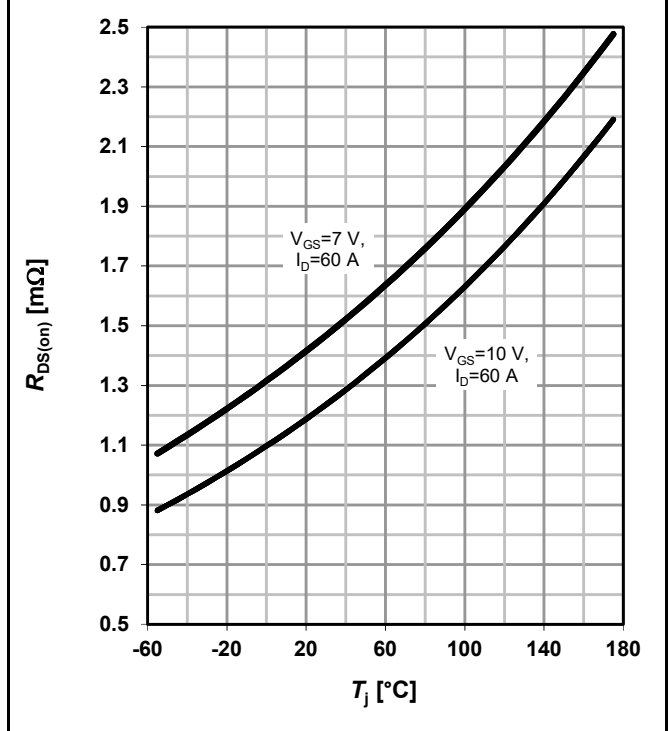
7 Typ. transfer characteristics

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



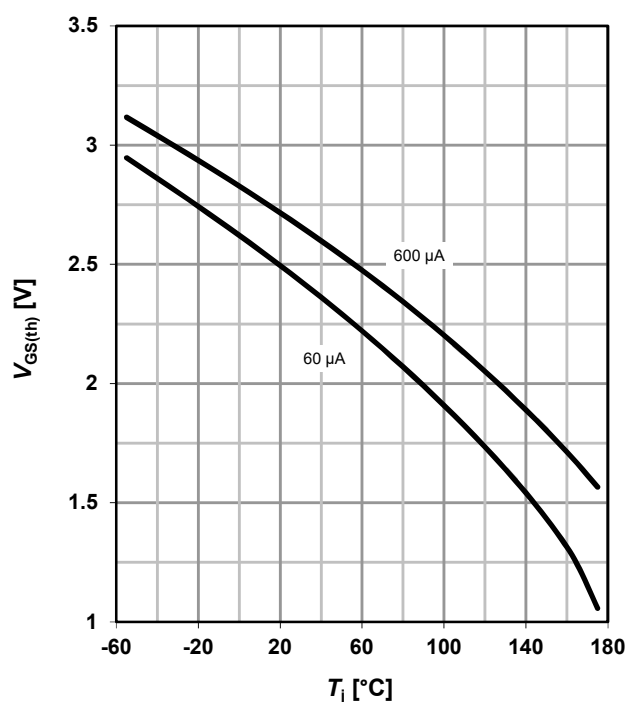
8 Typ. drain-source on-state resistance

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



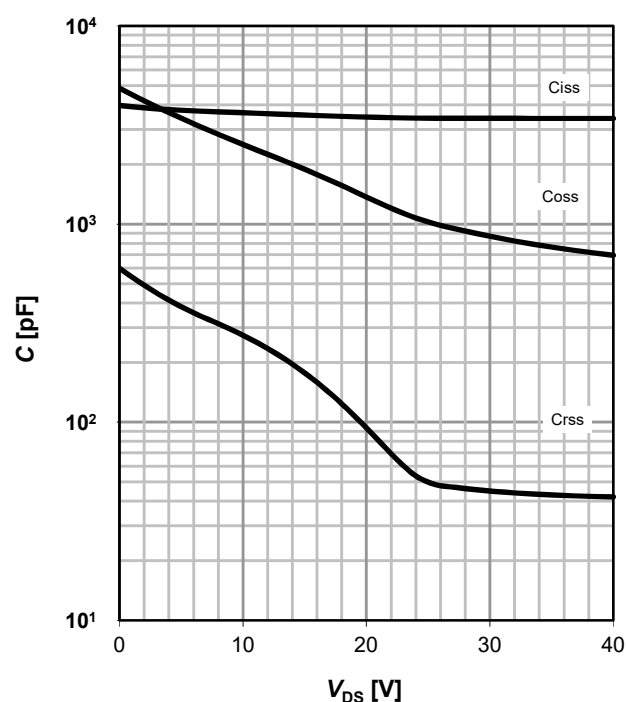
9 Typ. gate threshold voltage

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



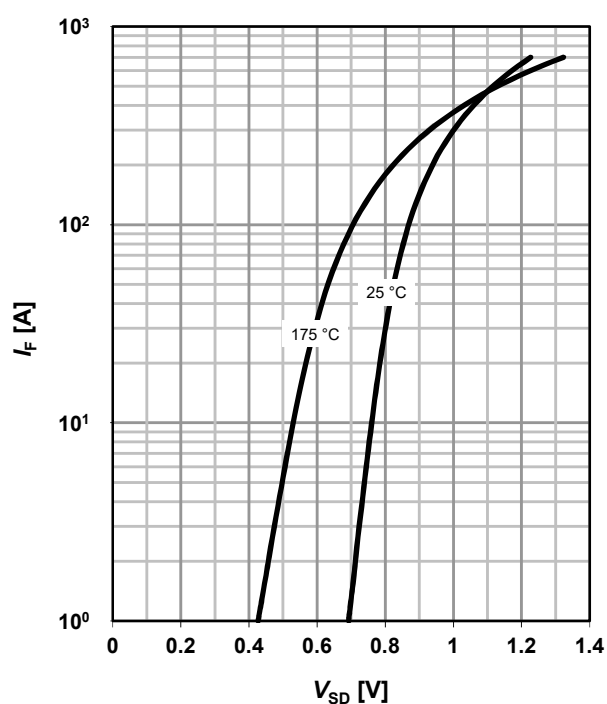
10 Typ. capacitances

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



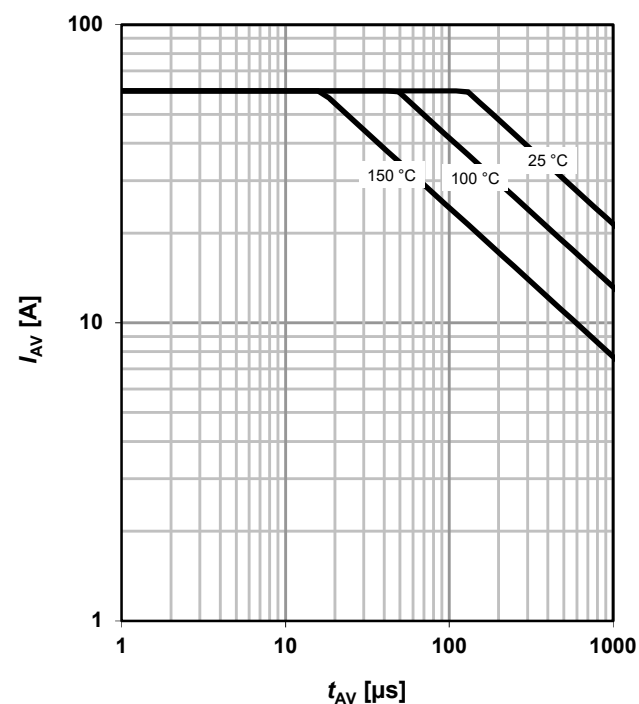
11 Typical forward diode characteristics

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



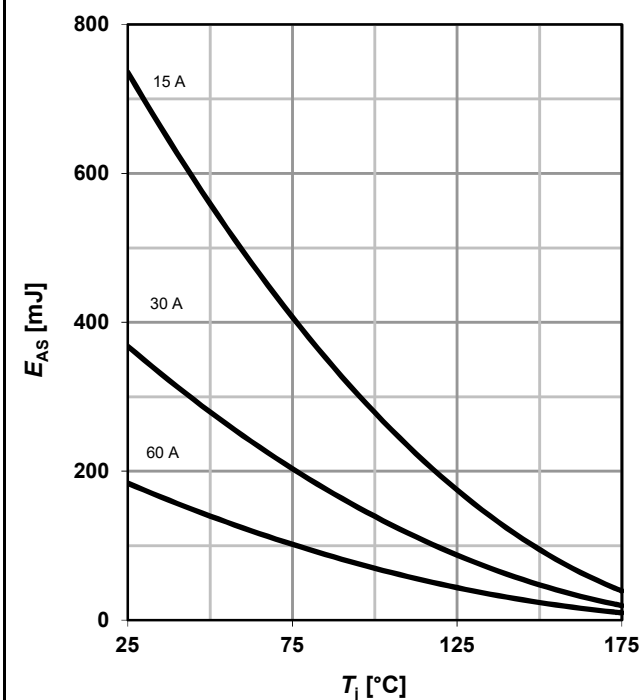
12 Typ. avalanche characteristics

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



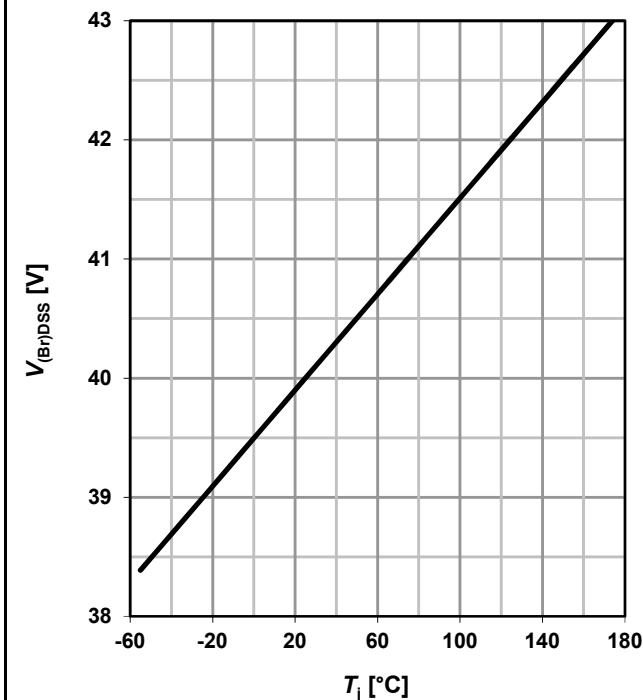
13 Typical avalanche energy

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



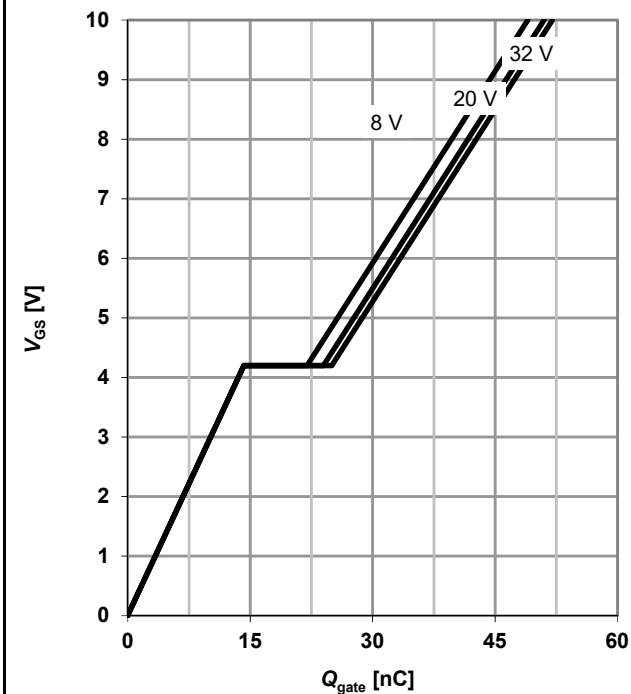
14 Drain-source breakdown voltage

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

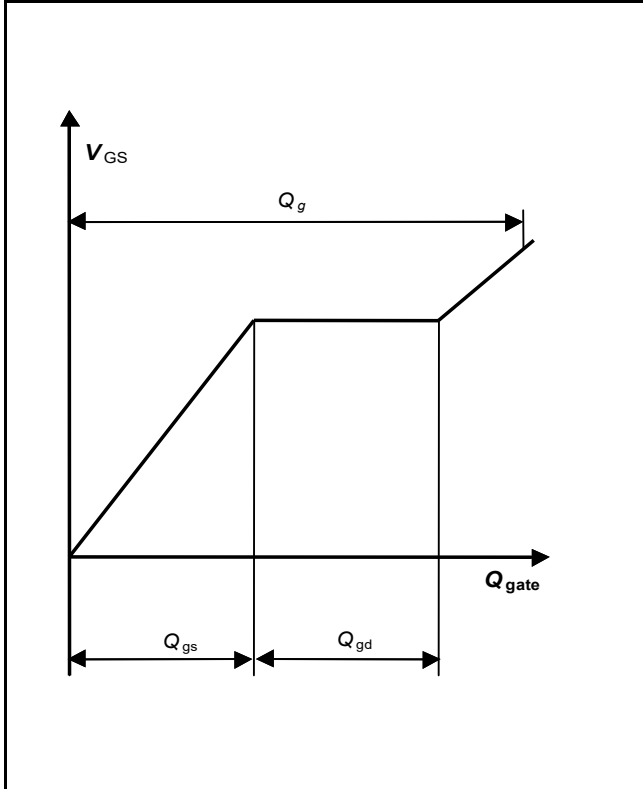


15 Typ. gate charge

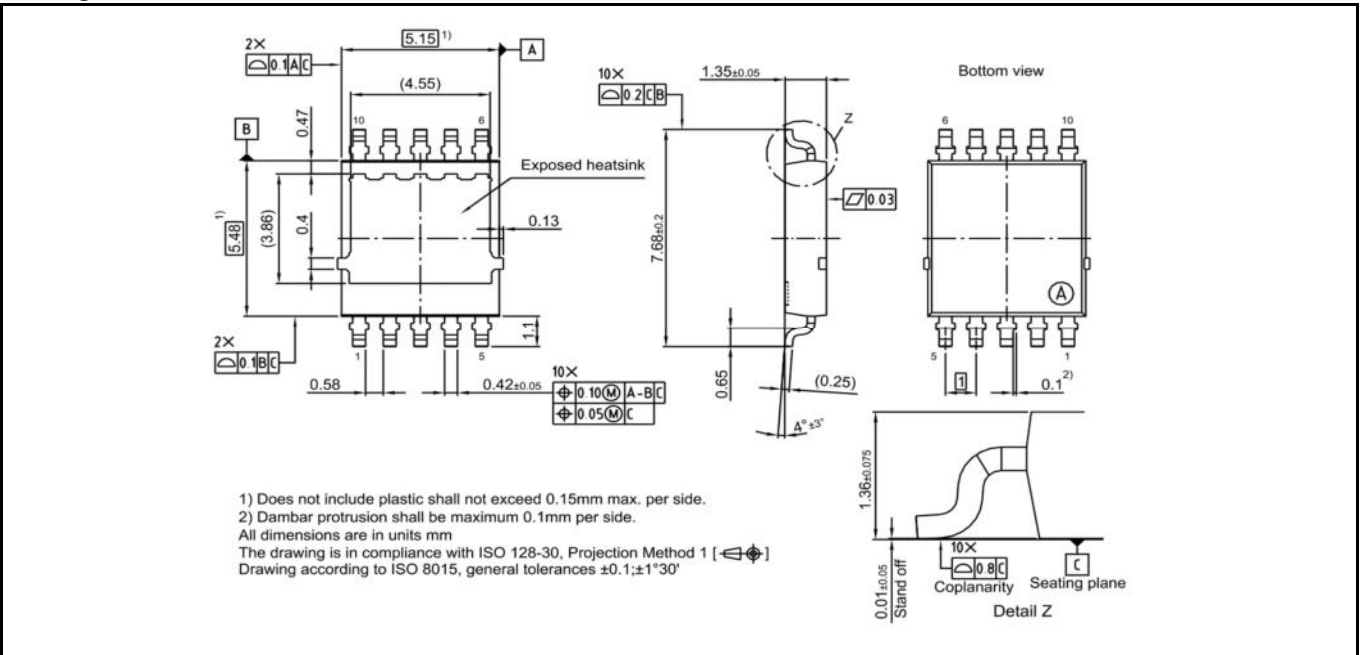
$V_{GS} = f(Q_{gate})$; $I_D = 120\text{ A}$ pulsed; parameter: V_{DD}



16 Gate charge waveforms

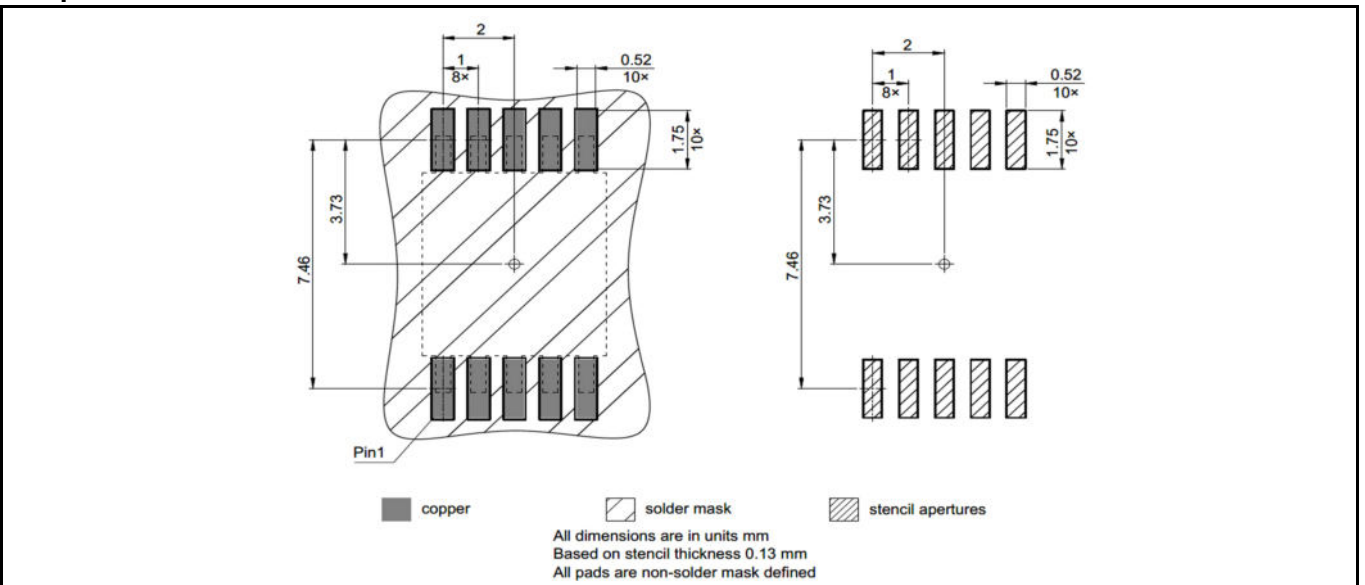


Package Outline

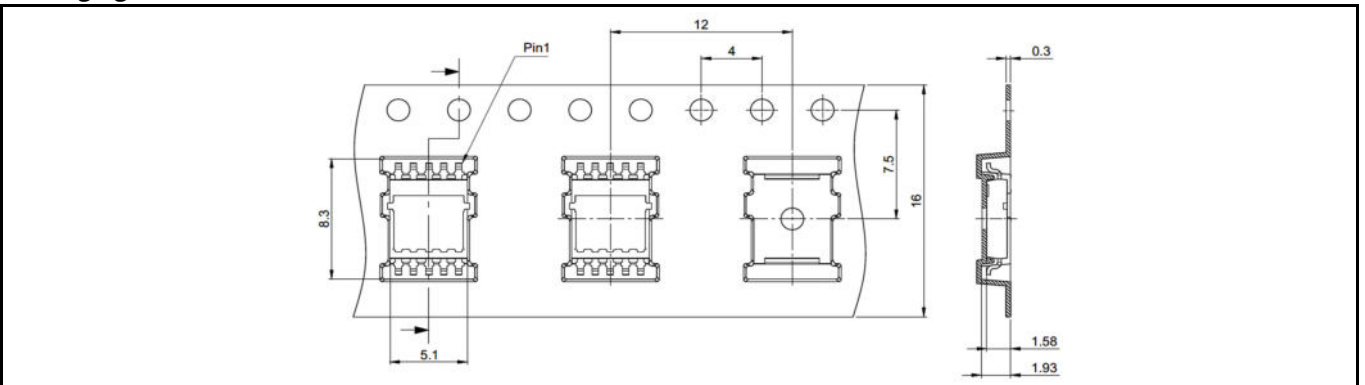


<https://www.infineon.com/cms/en/product/packages/PG-LHDSO/PG-LHDSO-10-1>

Footprint



Packaging



dimensions in mm



Revision History

Revision	Date	Changes
Revision 1.1	21.08.2023	Final Data Sheet

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