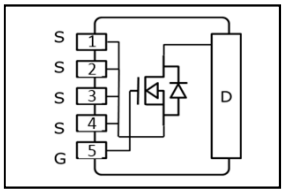
Automotive MOSFET

OptiMOS™ 5 Power-Transistor

Infineon Automotive Quality

PG-HSOF-5-2



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 validation

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

Product Summary

V_{DS}	40	V
$R_{DS(on),max}$	1.16	mΩ
I_D (chip limited)	180	A

Type	Package	Marking
IAUA180N04S5N012	PG-HSOF-5-2	5N04N012

Table of Contents

Maximum ratings

at Tj=25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	T_C = 25 °C, V_{GS} = 10 V[1)]	180	A
		T_C = 100 °C, V_{GS} = 10 V[2)]	180	
Pulsed drain current[2)]	$I_{D,pulse}$	T_C = 25 °C	720	
Avalanche energy, single pulse[2)]	E_{AS}	I_D = 90 A	175	mJ
Avalanche current, single pulse	I_{AS}	–	180	A
Gate source voltage	V_{GS}	–	±20	V
Power dissipation	P_{tot}	T_C = 25 °C	150	W
Operating and storage temperature	T_j, T_{stg}	–	-55 ... +175	°C

Thermal characteristics[2)]

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal resistance, junction - case	R_{thJC}	–	–	–	1.00	K/W
Thermal resistance, junction - ambient	R_{thJA}	6 cm² cooling area[3)]	–	–	60	

Electrical characteristics

at Tj=25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 1 mA	40	–	–	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 70 µA	2.2	2.8	3.4	
Zero gate voltage drain current	I_{DSS}	V_{DS} = 40 V, V_{GS} = 0 V, T_j = 25 °C	–	–	1	µA
		V_{DS} = 40 V, V_{GS} = 0 V, T_j = 125 °C[2)]	–	–	100	
Gate-source leakage current	I_{GSS}	V_{GS} = 20 V, V_{DS} = 0 V	–	–	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS} = 7 V, I_D = 90 A	–	1.20	1.40	mΩ
		V_{GS} = 10 V, I_D = 90 A	–	1.00	1.16	

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	–	4630	6158	pF
Output capacitance	C_{oss}		–	1230	1636	
Reverse transfer capacitance	C_{rss}		–	56	84	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 20 V, V_{GS} = 10 V, I_D = 180 A, R_G = 3.5 Ω	–	9	–	ns
Rise time	t_r		–	5	–	
Turn-off delay time	$t_{d(off)}$		–	19	–	
Fall time	t_f		–	10	–	
Gate Charge Characteristics[2]						
Gate to source charge	Q_{gs}	V_{DD} = 32 V, I_D = 180 A, V_{GS} = 0 to 10 V	–	21	28	nC
Gate to drain charge	Q_{gd}		–	16	24	
Gate charge total	Q_g		–	75	100	
Gate plateau voltage	$V_{plateau}$		–	4.7	–	V
Reverse Diode						
Diode continous forward current[2]	I_S	T_C = 25 °C	–	–	180	A
Diode pulse current[2]	$I_{S,pulse}$		–	–	720	
Diode forward voltage	V_{SD}	V_{GS} = 0 V, I_F = 90 A, T_j = 25 °C	–	0.8	1.1	V
Reverse recovery time[2]	t_{rr}	V_R = 20 V, I_F = 50 A, di_F/dt = 100 A/µs	–	50	–	ns
Reverse recovery charge[2]	Q_{rr}		–	50	–	nC

[1] Current is limited by package; with a Rthjc = 1.0 K/W the chip is able to carry 260 A at 25°C.

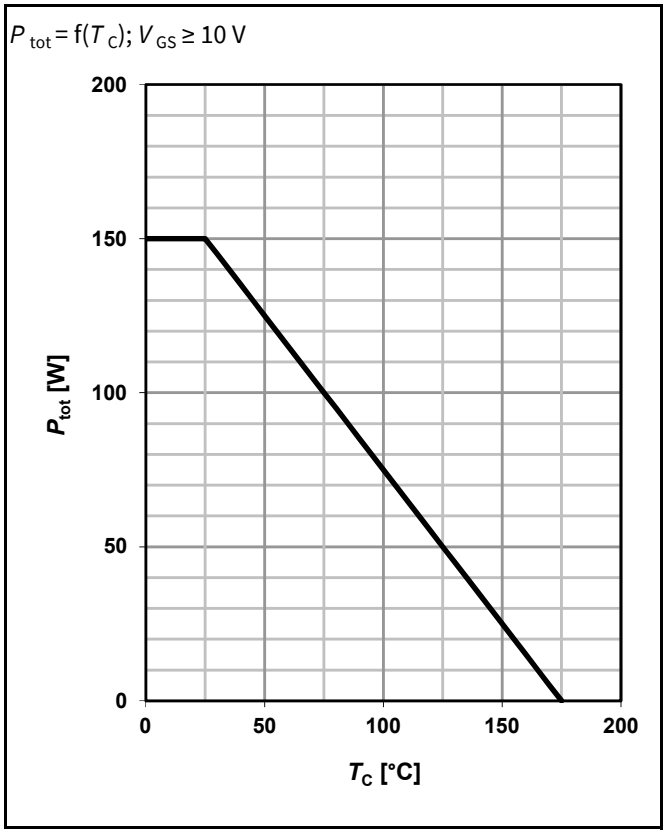
[2] The parameter is not subject to production test- verified by design/characterization.

[3] Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm^2 (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

Electrical characteristics diagrams

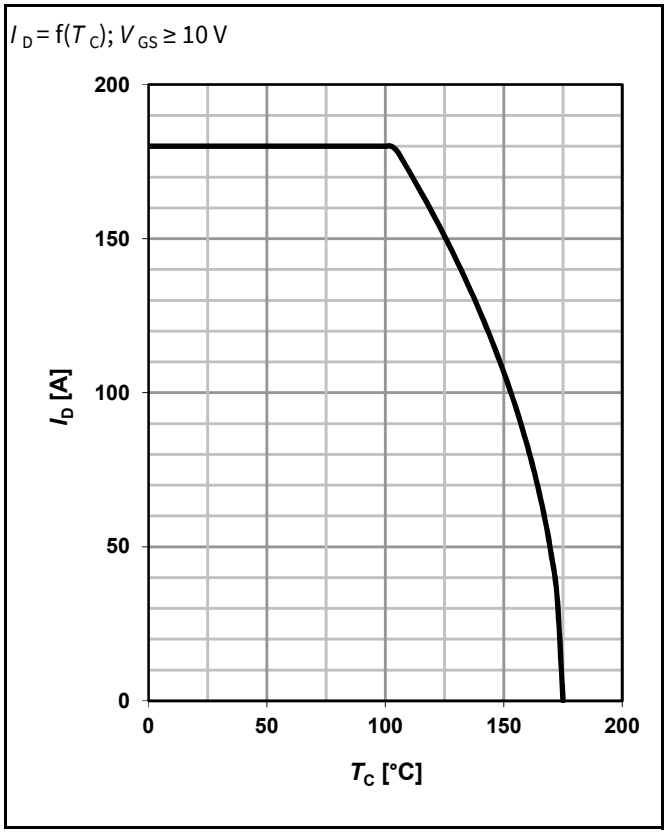
1 Power dissipation

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



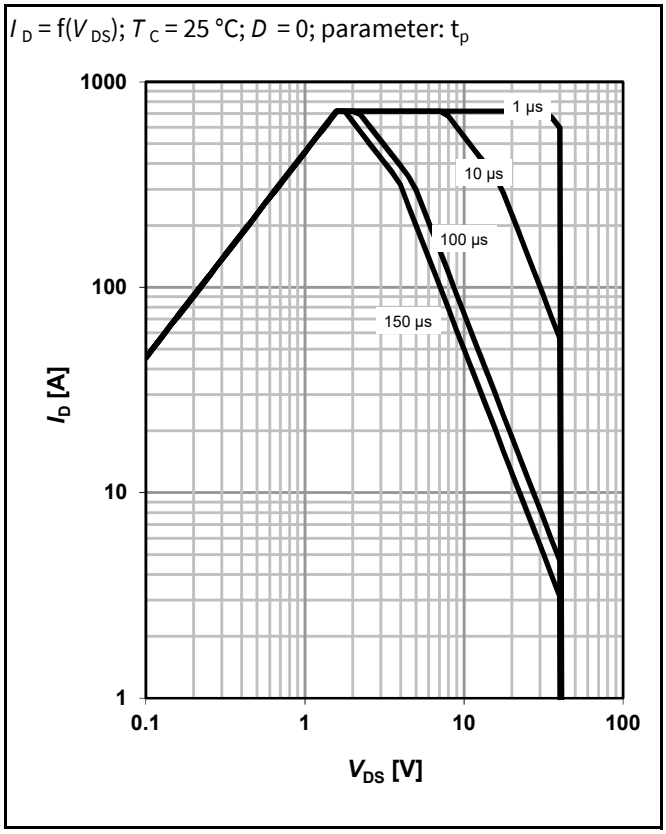
2 Drain current

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



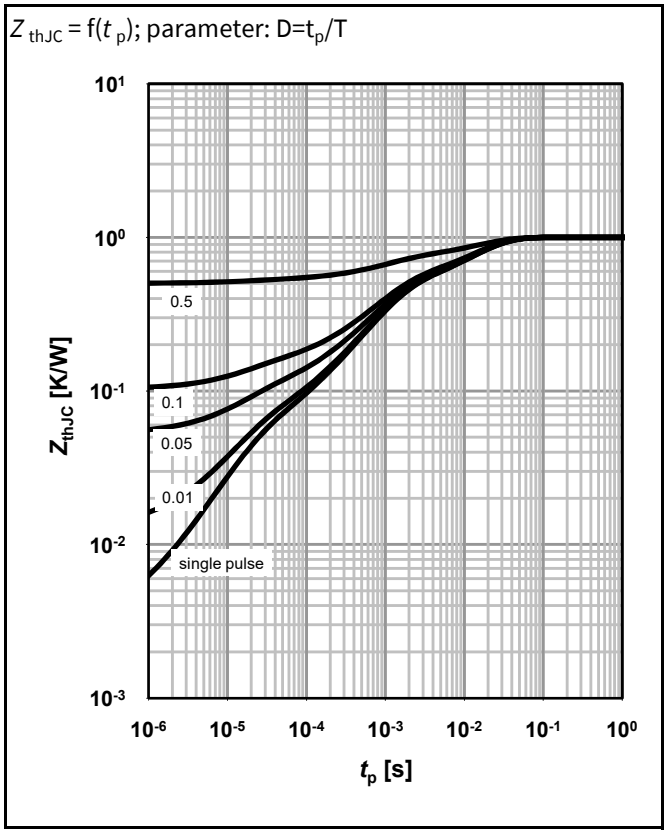
3 Safe operating area

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



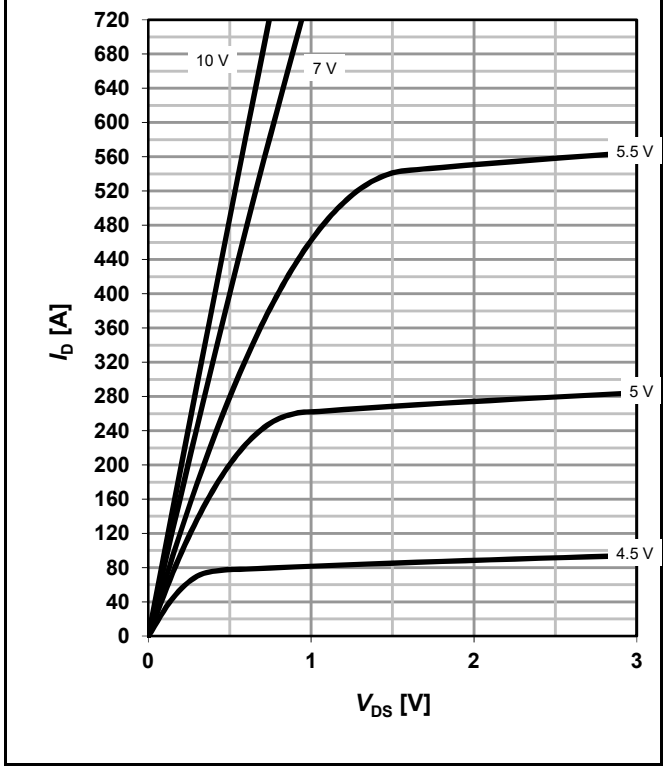
4 Max. transient thermal impedance

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



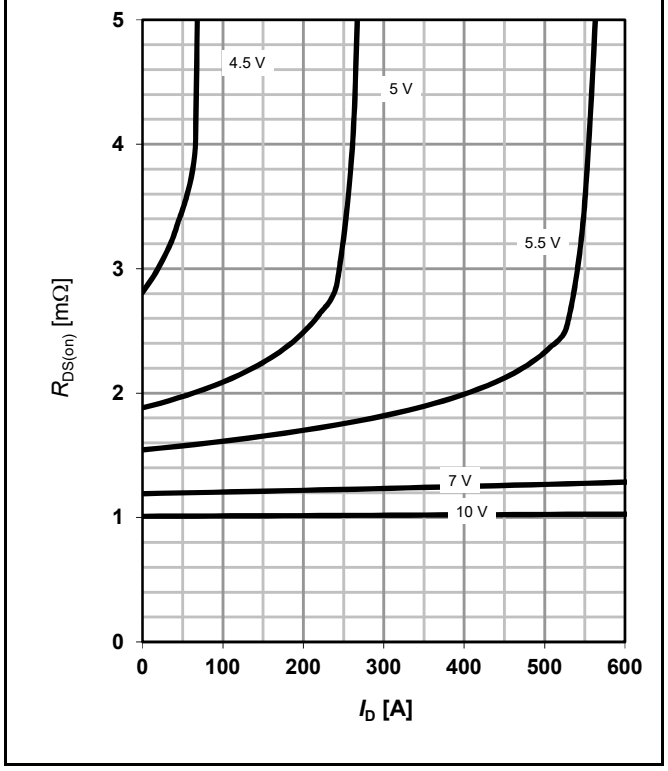
5 Typ. output characteristics

$I_D = f(V_{DS})$; $T_j = 25$ °C; parameter: V_{GS}



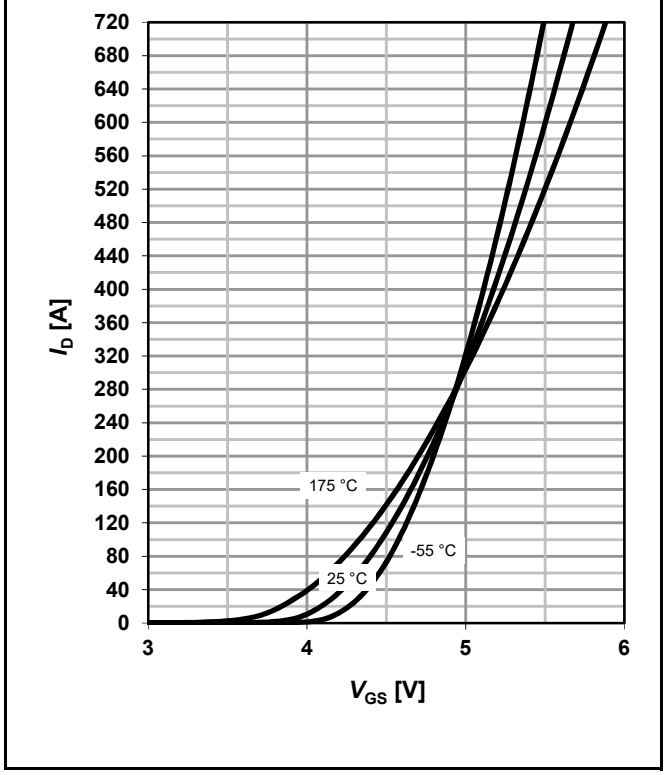
6 Typ. drain-source on-state resistance

$R_{DS(on)} = f(I_D)$; $T_j = 25$ °C; parameter: V_{GS}



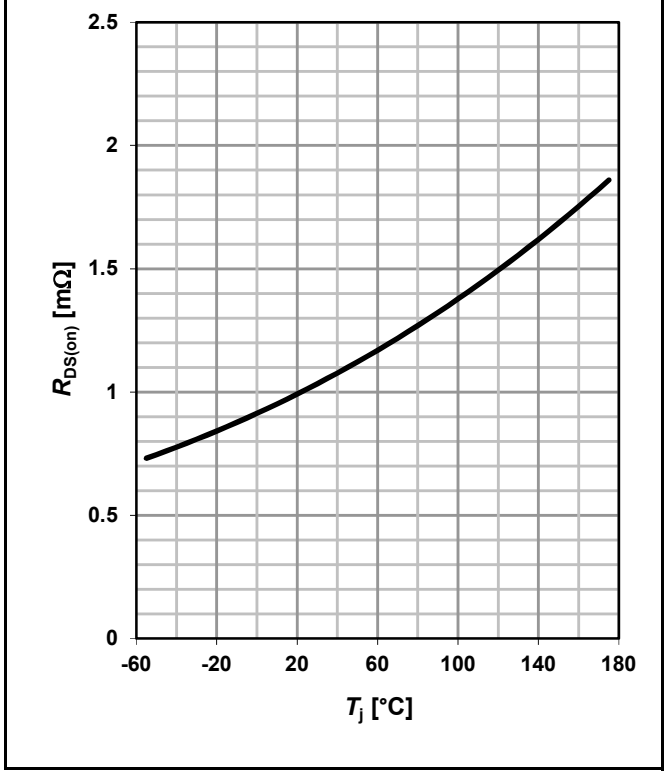
7 Typ. transfer characteristics

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



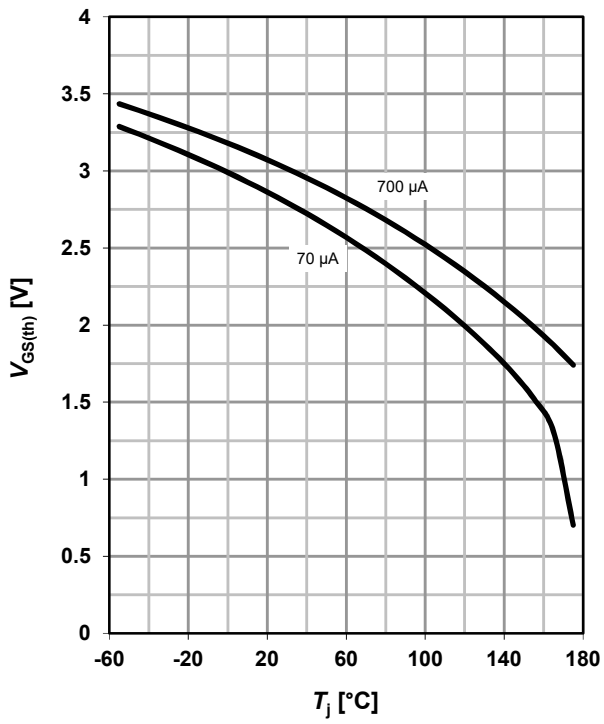
8 Typ. drain-source on-state resistance

$R_{DS(on)} = f(T_j)$; $I_D = 90$ A, $V_{GS} = 10$ V



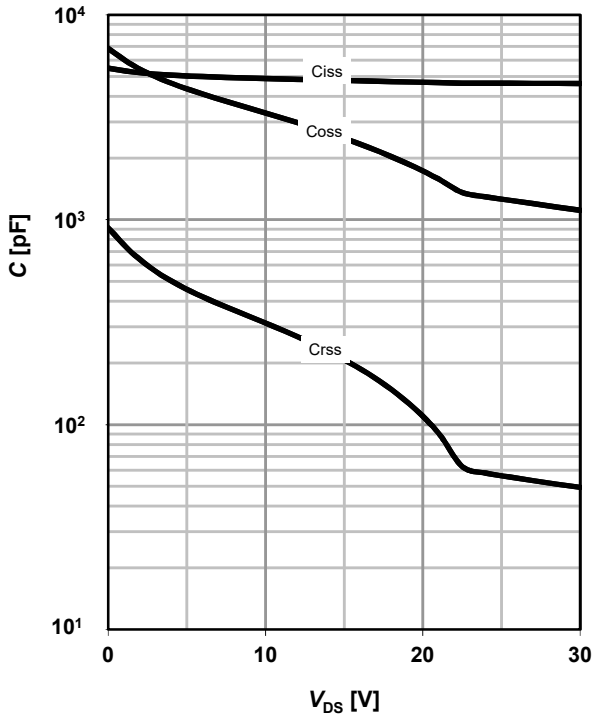
9 Typ. gate threshold voltage

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



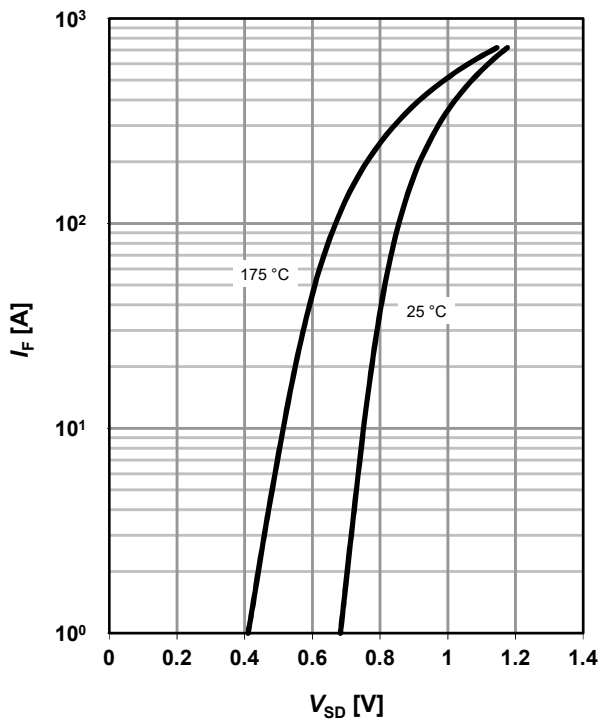
10 Typ. capacitances

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



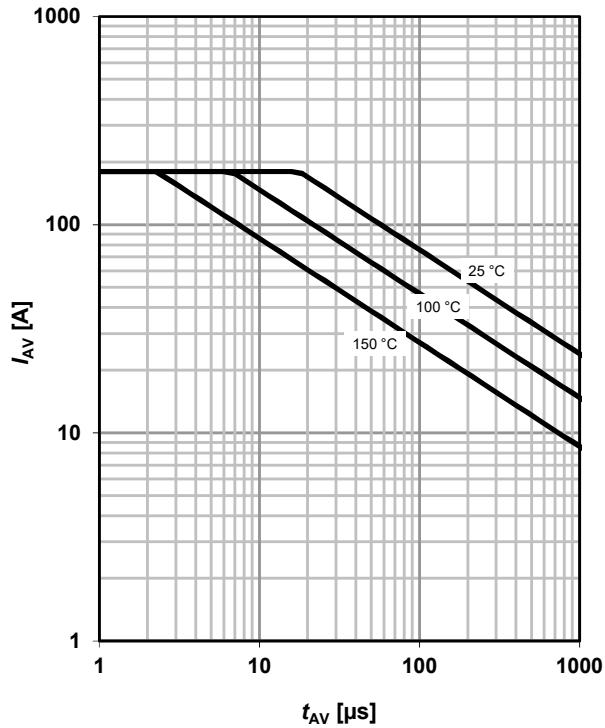
11 Typical forward diode characteristics

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



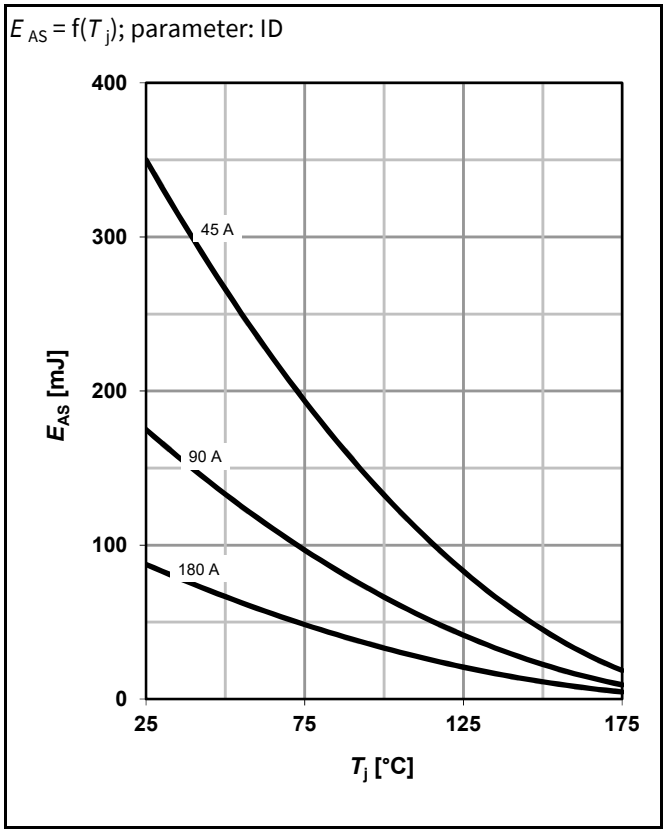
12 Typ. avalanche characteristics

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



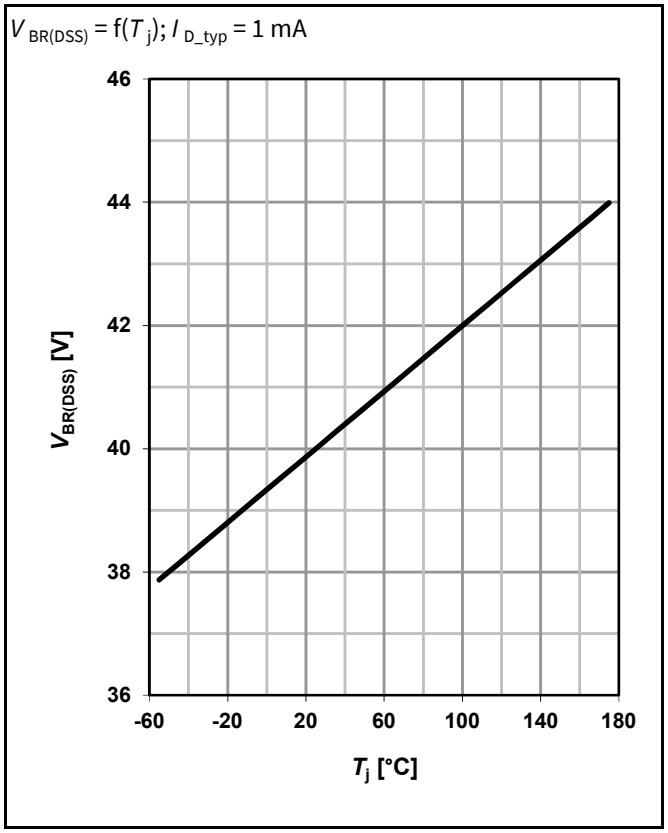
13 Typical avalanche energy

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



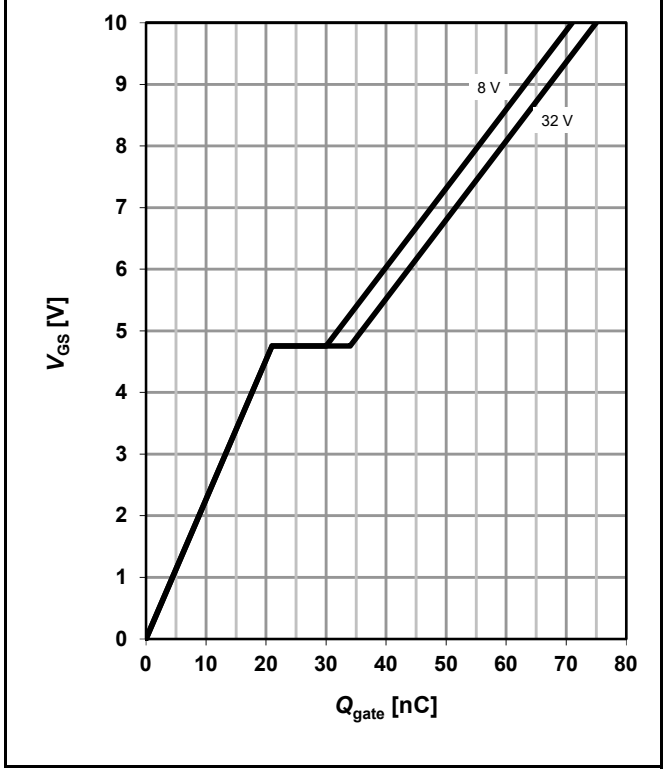
14 Drain-source breakdown voltage

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

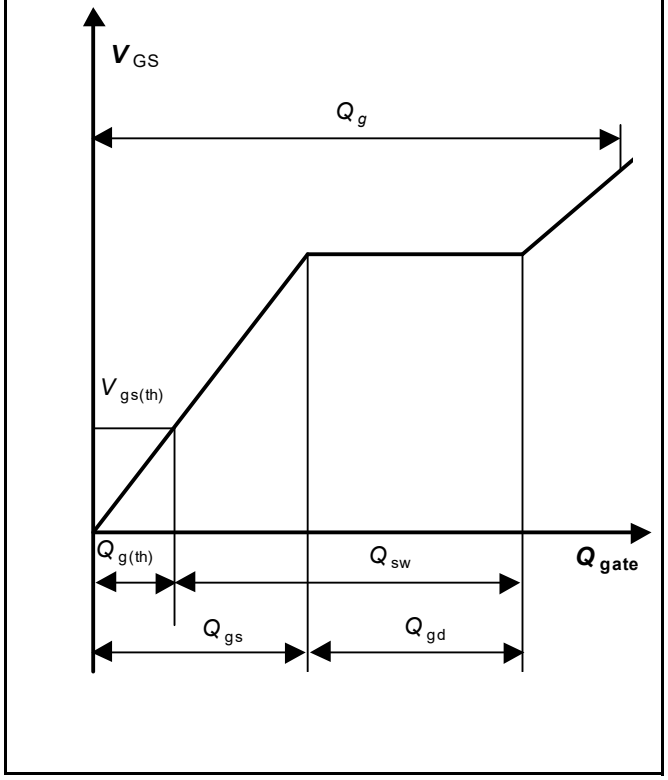


15 Typ. gate charge

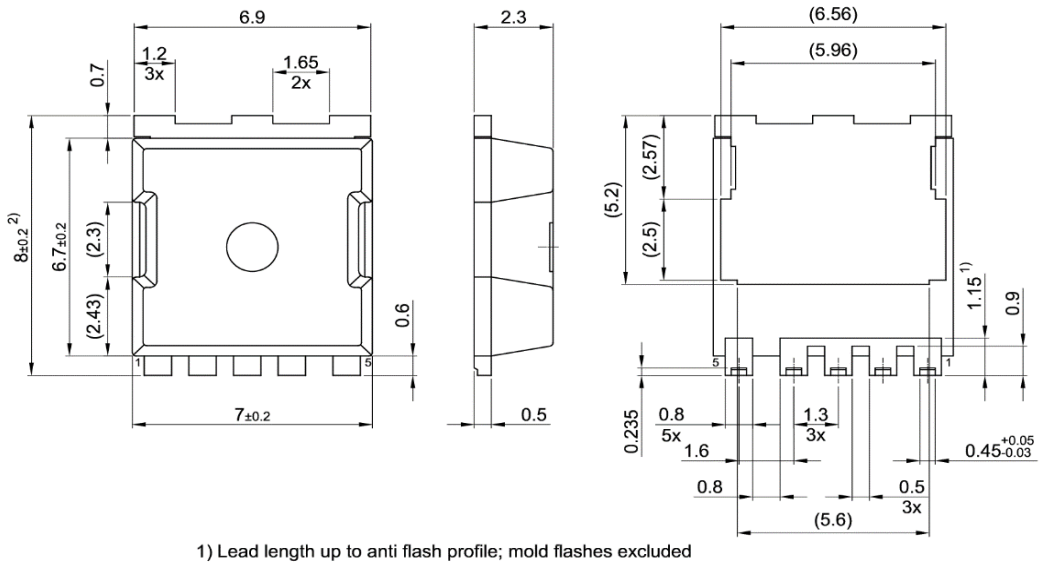
$V_{GS} = f(Q_{gate})$; I_D = 180 A pulsed; parameter: V_{DD}



16 Gate charge waveforms

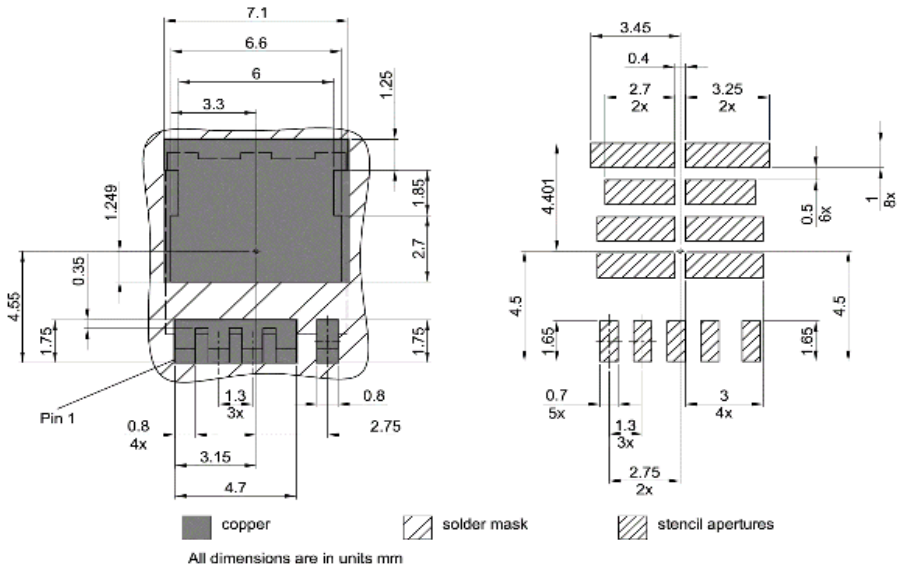


Package Outline



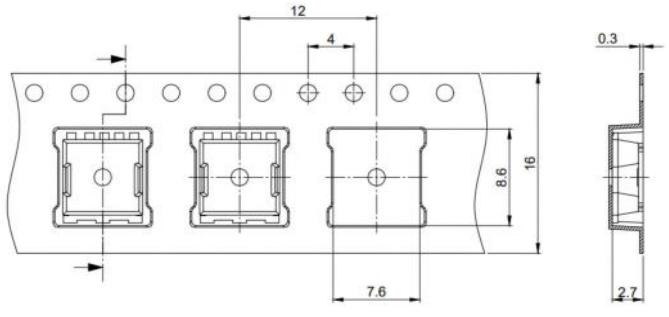
1) Lead length up to anti flash profile; mold flashes excluded
2) Excluding burr
All dimensions are in units mm
The drawing is in compliance with ISO 128-30, Projection Method 1 [⊲⊕]

Footprint



All dimensions are in units mm

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	11.04.2019	Final Data Sheet
Revision 1.1	14.04.2021	RDS(on) improved
Revision 1.2	24.01.2022	Editorial changes, package drawing added
Revision 1.3	28.08.2023	Corrected Ptot, ID condition for Fig. 15

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