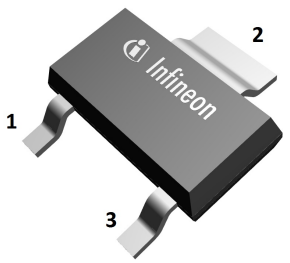
MOSFET

OptiMOS™ Small Signal Transistor, -60 V

PG-SOT223-3



Features

- P-Channel
- Very low on-resistance $R_{DS(on)}$ @ V_{GS}=4.5 V
- 100% avalanche tested
- Logic Level
- Enhancement mode
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

Product validation

Qualified according to JEDEC Standard

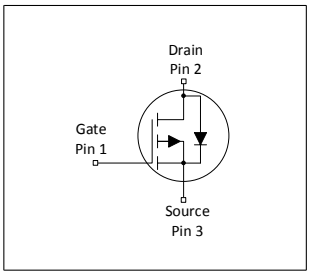


Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	-60	V
$R_{DS(on),max}$	250	mΩ
I_D	-1.9	A

Type / Ordering Code	Package	Marking	Related Links
ISP25DP06LMS	PG-SOT223-3	25DP06LS	-

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1 Maximum ratings

at T_A=25 °C, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current[1]	I_D	-	-	-1.9	A	V_{GS}=-10 V, T_A=25 °C, R_{THJA}=70 °C/W
Continuous drain current[1]	I_D	- - -	- - -	-1.2 -1.7 -1.1	A	V_{GS}=-10 V, T_A=100 °C, R_{THJA}=70 °C/W V_{GS}=-4.5 V, T_A=25 °C, R_{THJA}=70 °C/W V_{GS}=-4.5 V, T_A=100 °C, R_{THJA}=70 °C/W
Pulsed drain current[2]	$I_{D,pulse}$	-	-	-7.6	A	T_A=25 °C
Avalanche energy, single pulse[3]	E_{AS}	-	-	257	mJ	I_D=-1.9 A, R_{GS}=25 Ω
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	- -	- -	5.0 1.8	W	T_S=25 °C T_A=25 °C, R_{THJA}=70 °C/W[1]
Operating and storage temperature	T_j, T_{stg}	-55	-	150	°C	IEC climatic category; DIN IEC 68-1: 55/150/56

2 Thermal characteristics

Table 3 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - soldering point, bottom	R_{thJS}	-	-	25	°C/W	-
Device on PCB, 6 cm² cooling area[1]	R_{thJA}	-	-	70	°C/W	-

[1] Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm² (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.
[2] See Diagram 3 for more detailed information
[3] See Diagram 13 for more detailed information

3 Electrical characteristics

at T_j=25 °C, unless otherwise specified

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	-60	-	-	V	V_{GS}=0 V, I_D=-250 µA
Gate threshold voltage	$V_{GS(th)}$	-1	-1.5	-2	V	V_{DS}=V_{GS}, I_D=-270 µA
Zero gate voltage drain current	I_{DSS}	- -	-0.1 -10	1 -100	µA	V_{DS}=-60 V, V_{GS}=0 V, T_j=25 °C V_{DS}=-60 V, V_{GS}=0 V, T_j=125 °C
Gate-source leakage current	I_{GSS}	-	-10	-100	nA	V_{GS}=-20 V, V_{DS}=0 V
Drain-source on-state resistance	$R_{DS(on)}$	- -	177 211	250 310	mΩ	V_{GS}=-10 V, I_D=-1.9 A V_{GS}=-4.5 V, I_D=-1.7 A
Gate resistance	R_G	-	5	-	Ω	-
Transconductance	g_{fs}	-	4.4	-	S	$\|V_{DS}\|\geq 2\|I_D\|R_{DS(on)max}$, I_D=-1.9 A

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	420	-	pF	V_{GS}=0 V, V_{DS}=-30 V, f=1 MHz
Output capacitance	C_{oss}	-	60	-	pF	V_{GS}=0 V, V_{DS}=-30 V, f=1 MHz
Reverse transfer capacitance	C_{rss}	-	15	-	pF	V_{GS}=0 V, V_{DS}=-30 V, f=1 MHz
Turn-on delay time	$t_{d(on)}$	-	3	-	ns	V_{DD}=-30 V, V_{GS}=-10 V, I_D=-1.9 A, $R_{G,ext}$=1.6 Ω
Rise time	t_r	-	6	-	ns	V_{DD}=-30 V, V_{GS}=-10 V, I_D=-1.9 A, $R_{G,ext}$=1.6 Ω
Turn-off delay time	$t_{d(off)}$	-	23	-	ns	V_{DD}=-30 V, V_{GS}=-10 V, I_D=-1.9 A, $R_{G,ext}$=1.6 Ω
Fall time	t_f	-	3	-	ns	V_{DD}=-30 V, V_{GS}=-10 V, I_D=-1.9 A, $R_{G,ext}$=1.6 Ω

Table 6 Gate charge characteristics[1)]

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	-1.2	-	nC	V_{DD}=-30 V, I_D=-1.9 A, V_{GS}=0 to -10 V
Gate charge at threshold	$Q_{g(th)}$	-	-0.6	-	nC	V_{DD}=-30 V, I_D=-1.9 A, V_{GS}=0 to -10 V
Gate to drain charge	Q_{gd}	-	-3.3	-	nC	V_{DD}=-30 V, I_D=-1.9 A, V_{GS}=0 to -10 V
Switching charge	Q_{sw}	-	-3.9	-	nC	V_{DD}=-30 V, I_D=-1.9 A, V_{GS}=0 to -10 V
Gate charge total	Q_g	-	-13.9	-	nC	V_{DD}=-30 V, I_D=-1.9 A, V_{GS}=0 to -10 V
Gate plateau voltage	$V_{plateau}$	-	-2.9	-	V	V_{DD}=-30 V, I_D=-1.9 A, V_{GS}=0 to -10 V
Output charge	Q_{oss}	-	-4.4	-	nC	V_{DD}=-30 V, V_{GS}=0 V

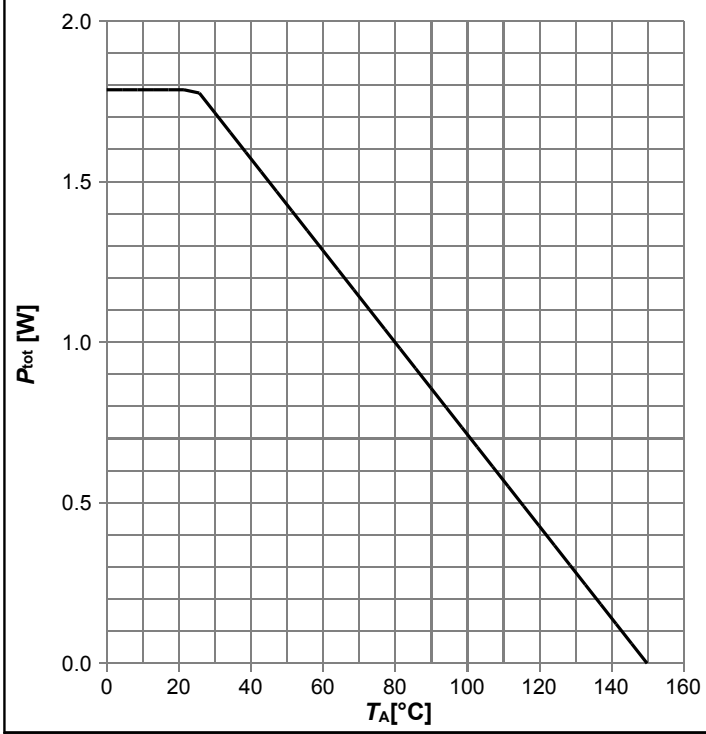
[1)] See diagram, Gate charge waveform, for gate charge parameter definition

Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	-1.5	A	T_A=25 °C
Diode pulse current	$I_{S,pulse}$	-	-	-6	A	T_A=25 °C
Diode forward voltage	V_{SD}	-	-0.8	-1.2	V	V_{GS}=0 V, I_F=-1.5 A, T_j=25 °C
Reverse recovery time	t_{rr}	-	29	-	ns	V_R=-30 V, I_F=-1.5 A, di_F/dt=-100 A/µs
Reverse recovery charge	Q_{rr}	-	-43	-	nC	V_R=-30 V, I_F=-1.5 A, di_F/dt=-100 A/µs

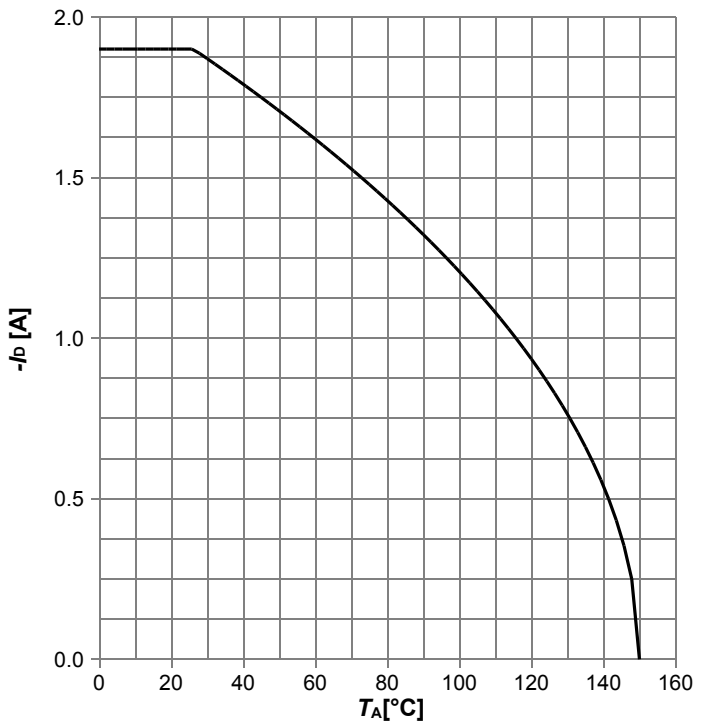
4 Electrical characteristics diagrams

Diagram 1: Power dissipation



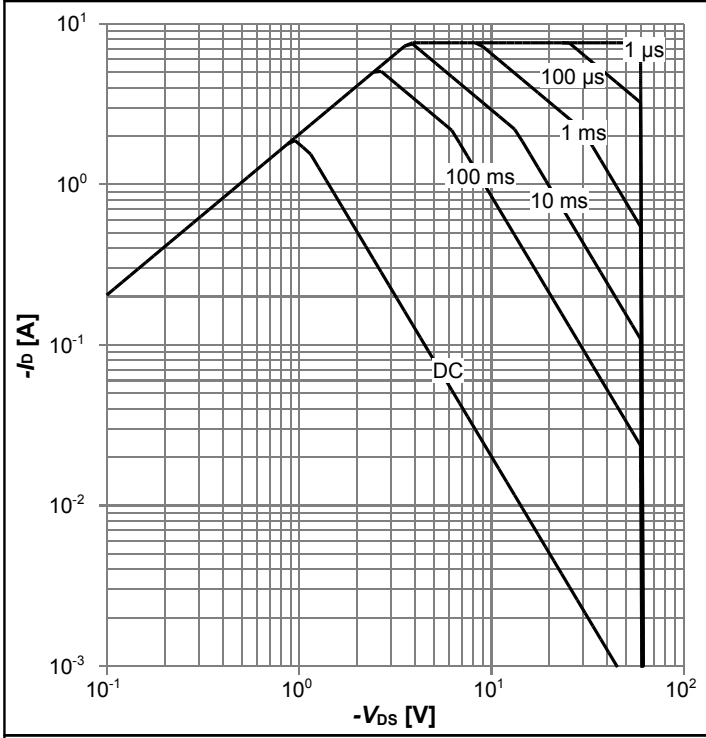
$P_{tot}=f(T_A)$

Diagram 2: Drain current



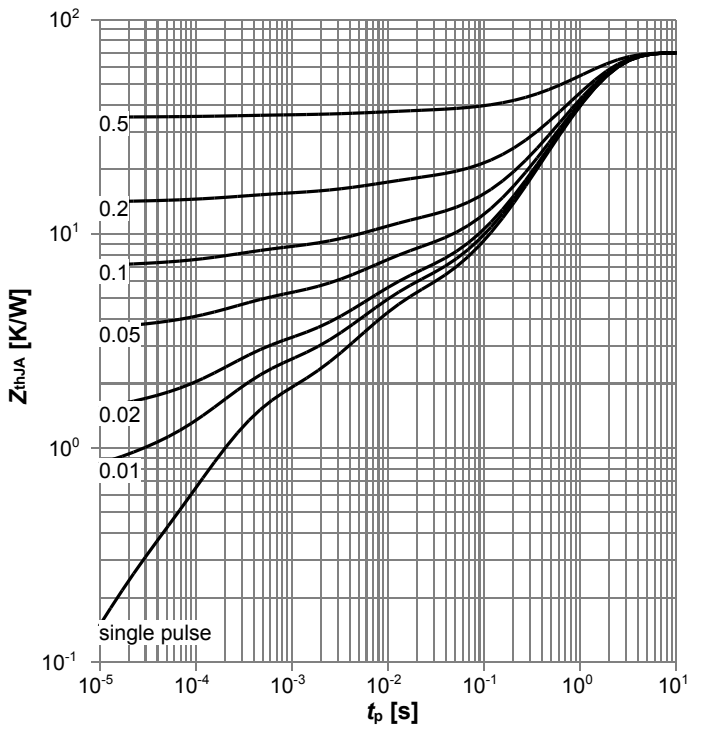
$I_D=f(T_A)$; $|V_{GS}|\geq 10$ V

Diagram 3: Safe operating area



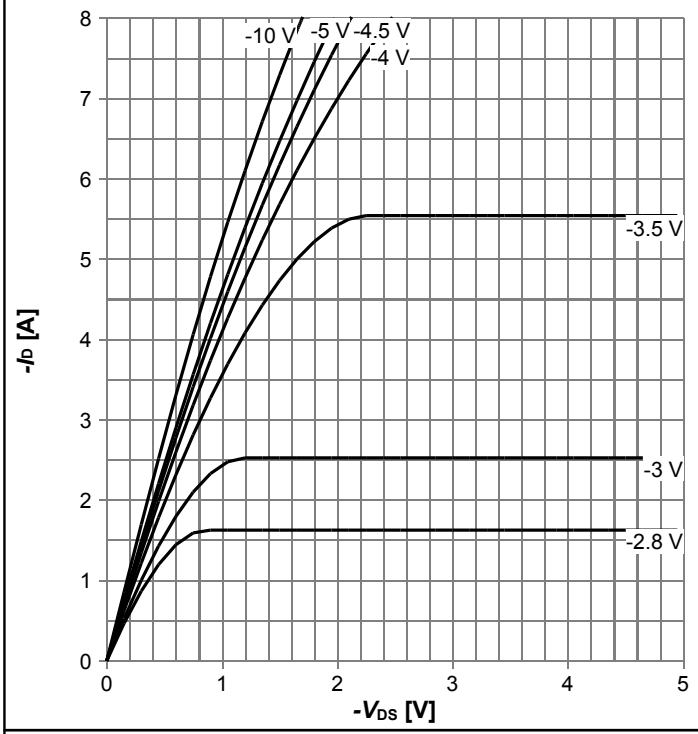
$I_D=f(V_{DS})$; $T_A=25$ °C; $D=0$; parameter: t_p

Diagram 4: Max. transient thermal impedance



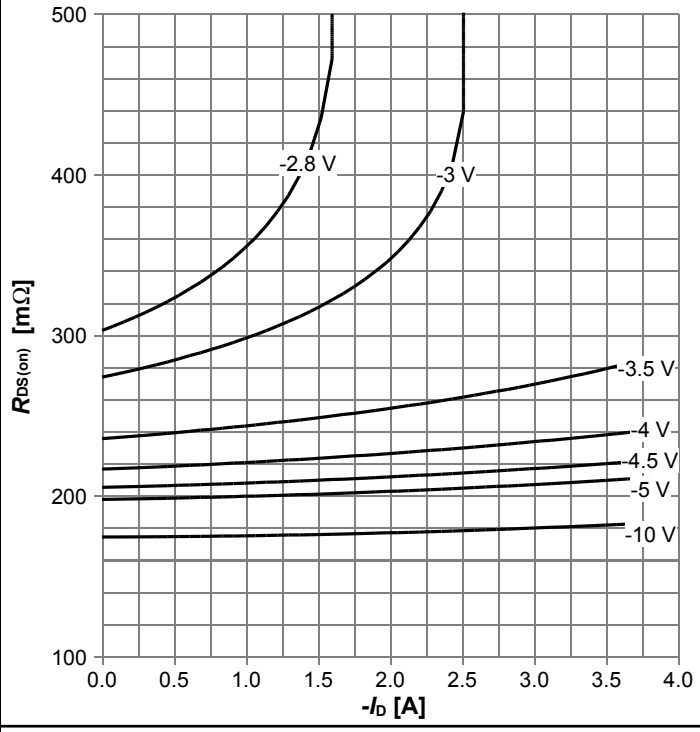
$Z_{thJA}=f(t_p)$; parameter: $D=t_p/T$

Diagram 5: Typ. output characteristics



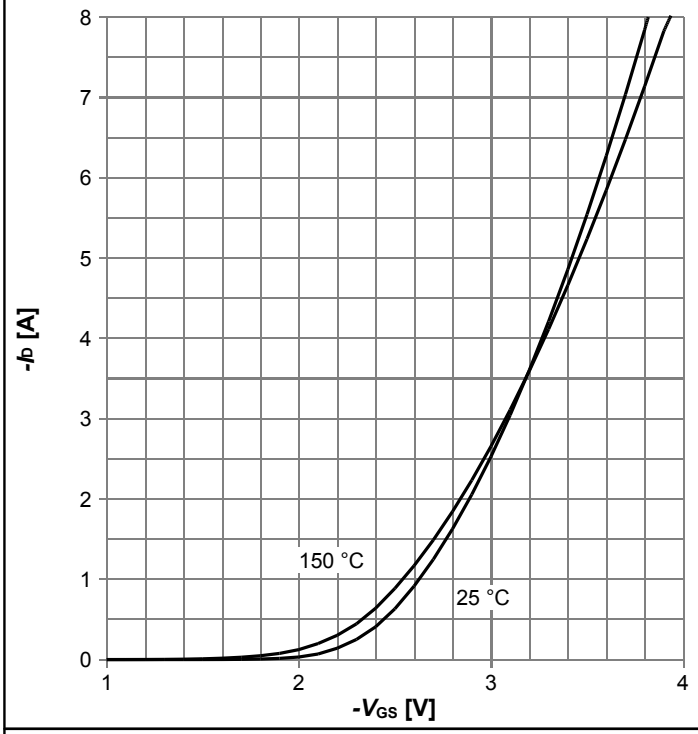
I_D=f(V_{DS}), T_j=25 °C; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



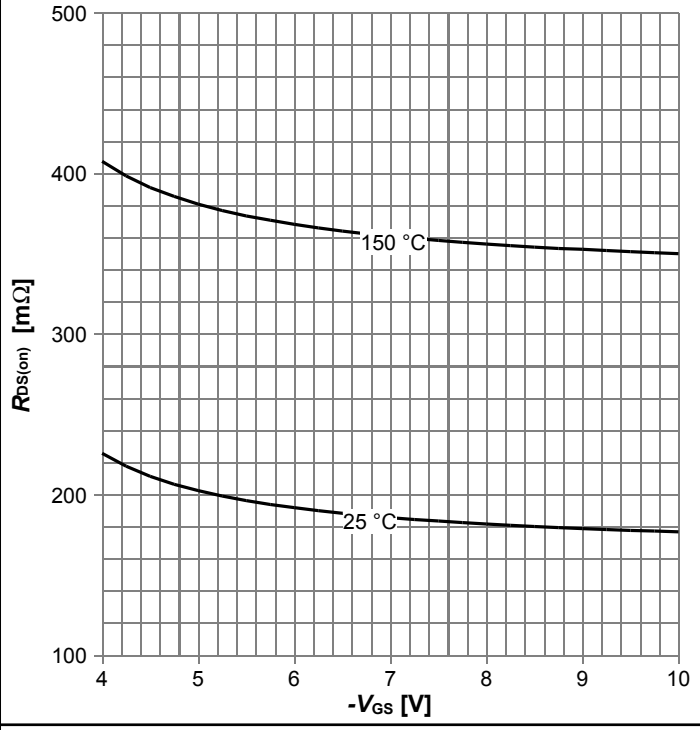
$R_{DS(on)}$=f(I_D), T_j=25 °C; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



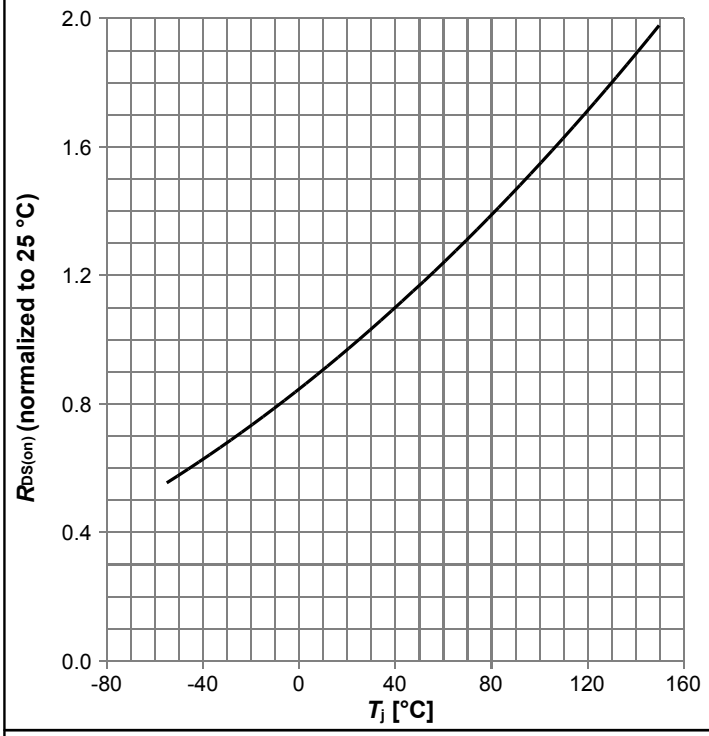
I_D=f(V_{GS}), |V_{DS}|>2|I_D|$R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. drain-source on resistance



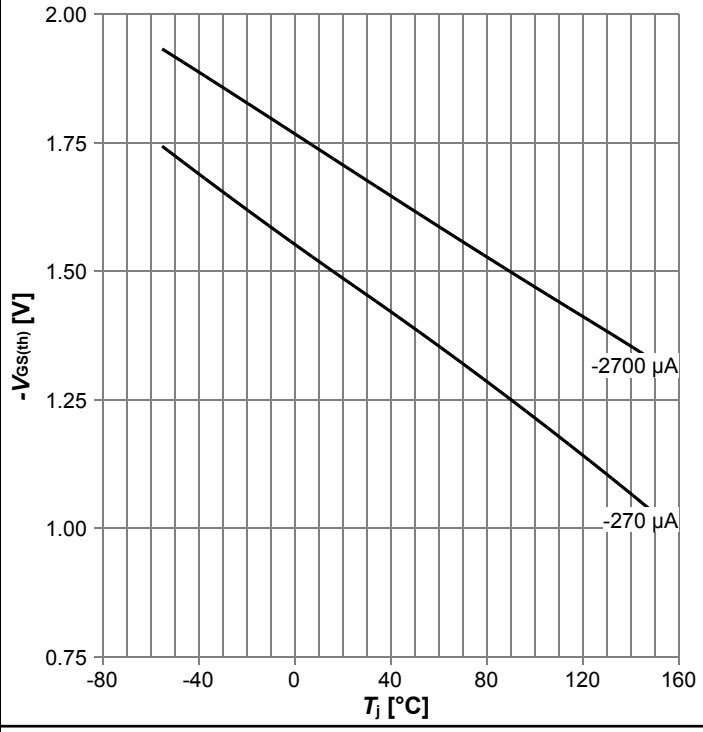
$R_{DS(on)}$=f(V_{GS}), I_D=-1.9 A; parameter: T_j

Diagram 9: Normalized drain-source on resistance



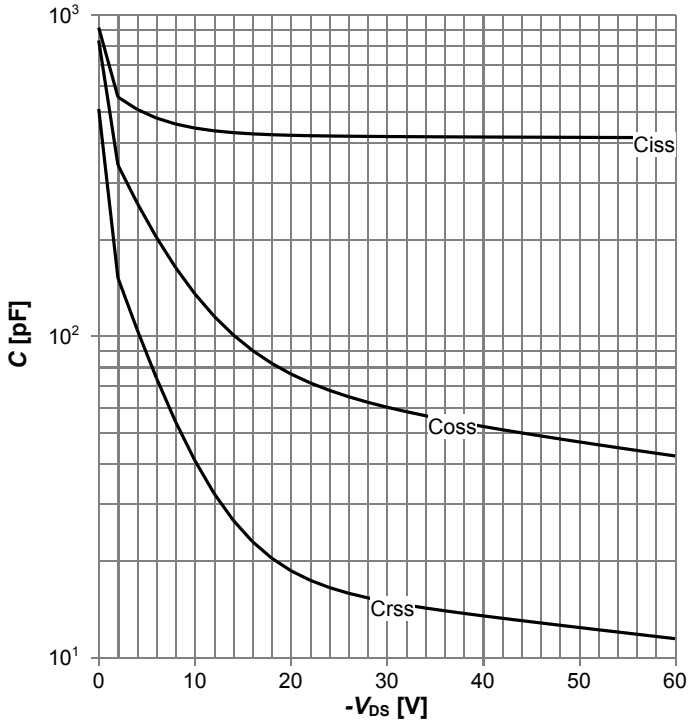
$R_{DS(on)}$=f(T_j), I_D=-1.9 A, V_{GS}=-10 V

Diagram 10: Typ. gate threshold voltage



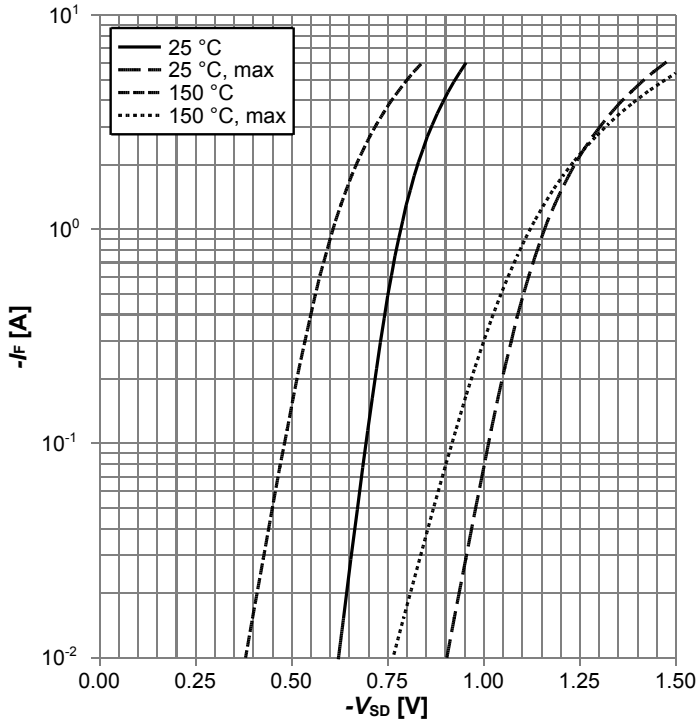
$V_{GS(th}$=f(T_j), V_{GS}=V_{DS}; parameter: I_D

Diagram 11: Typ. capacitances



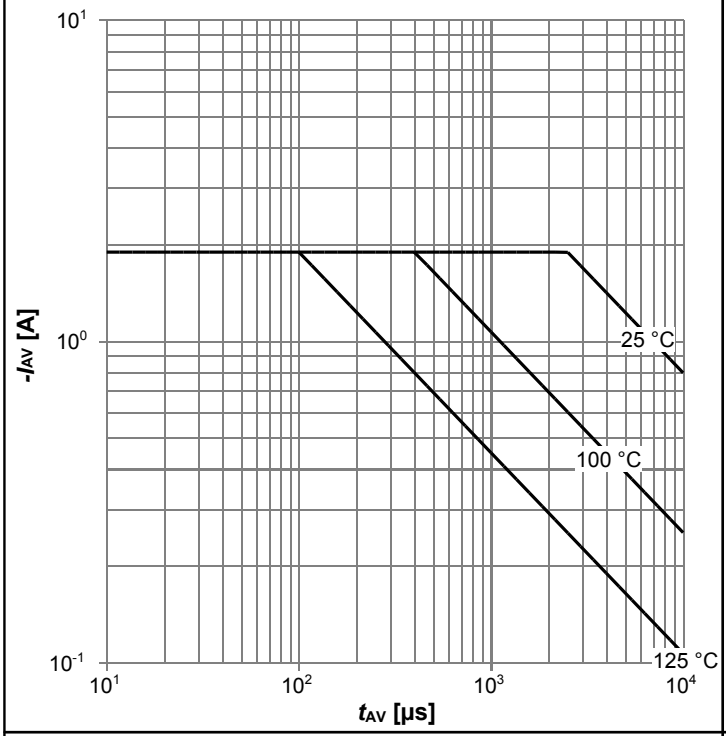
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz

Diagram 12: Forward characteristics of reverse diode



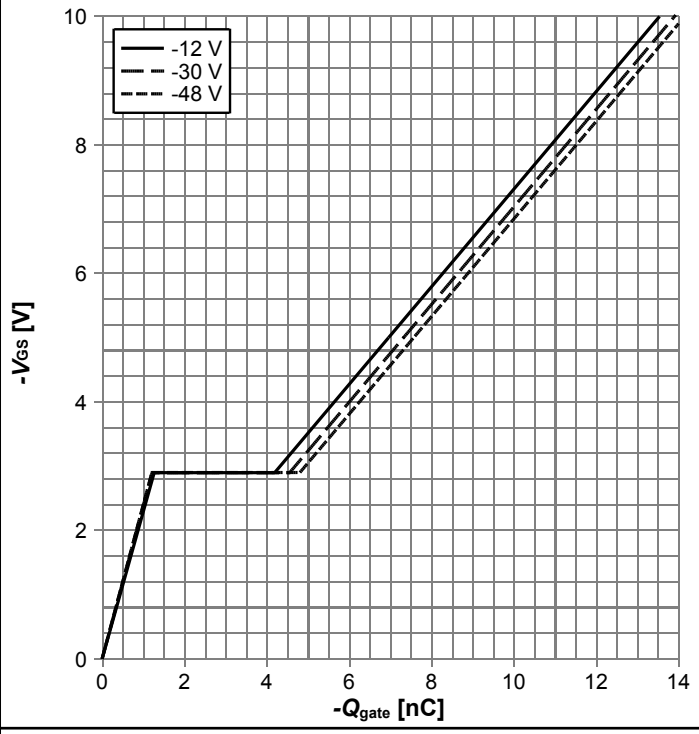
I_F=f(V_{SD}); parameter: T_j

Diagram 13: Avalanche characteristics



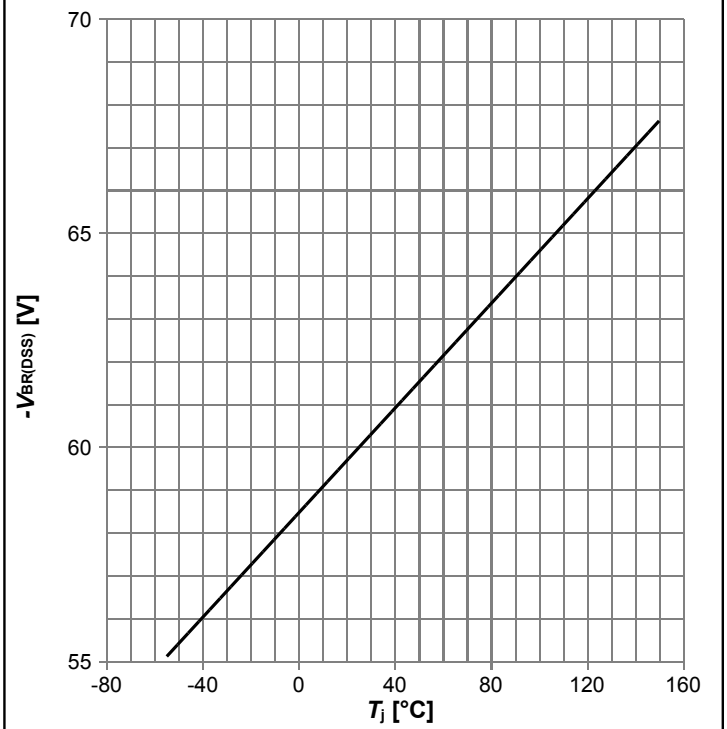
I_{AS}=f(t_{AV}); R_{GS}=25 Ω; parameter: $T_{j,start}$

Diagram 14: Typ. gate charge



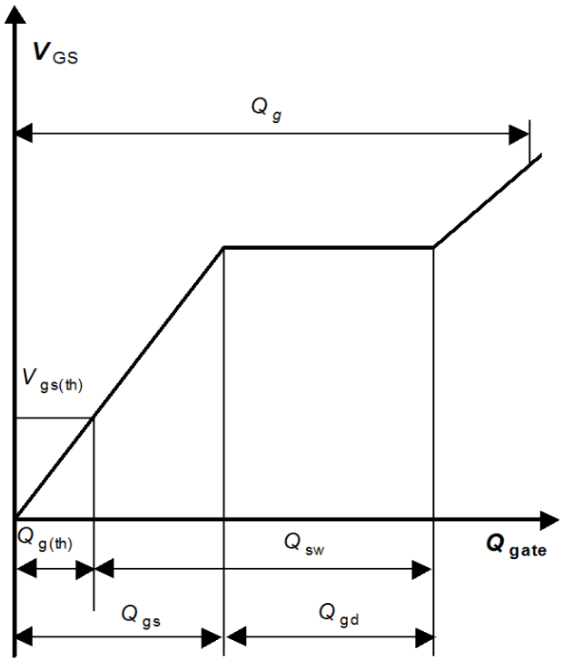
V_{GS}=f(Q_{gate}), I_D=-1.9 A pulsed, T_j=25 °C; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage

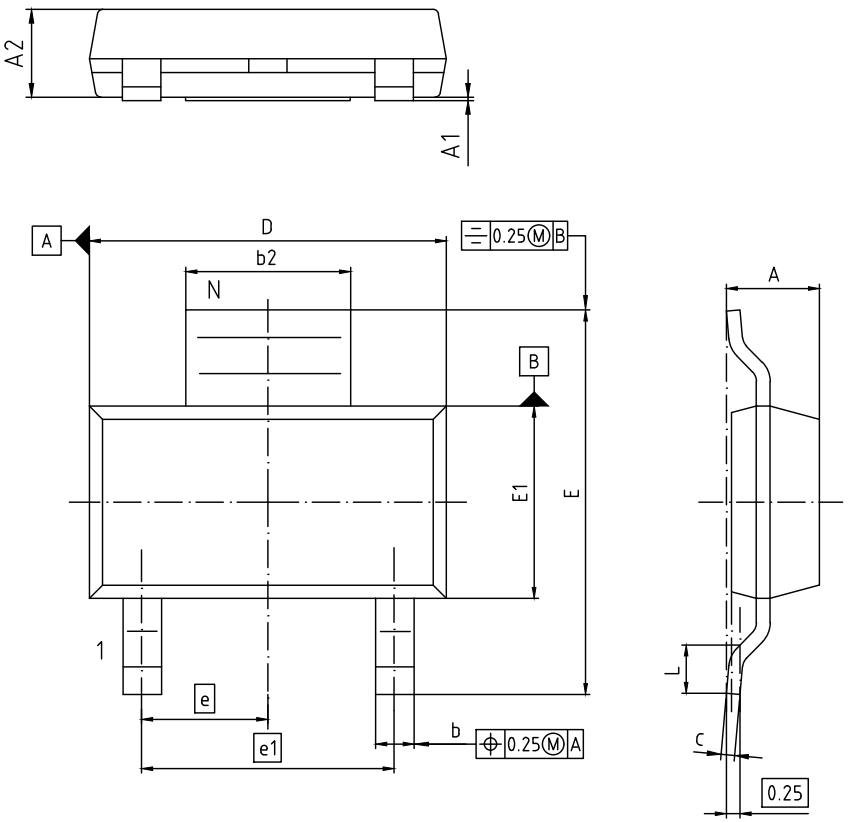


$V_{BR(DSS)}$=f(T_j); I_D=-250 µA

Diagram Gate charge waveforms



5 Package Outlines



NOTES:

1. ALL DIMENSIONS REFER TO JEDEC STANDARD TO-261

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.52	1.80	0.060	0.071
A1	-	0.10	-	0.004
A2	1,50	1.70	0.059	0.067
b	0.60	0.80	0.024	0.031
b2	2.95	3.10	0.116	0.122
c	0.24	0.32	0.009	0.013
D	6.30	6.70	0.248	0.264
E	6.70	7.30	0.264	0.287
E1	3.30	3.70	0.130	0.146
e	2.3 BASIC		0.091 BASIC	
e1	4.6 BASIC		0.181 BASIC	
L	0.75	1.10	0.030	0.043
N	3		3	
O	0°	10°	0°	10°

DOCUMENT NO.
Z8B00180553

SCALE
0 2.5 5mm

EUROPEAN PROJECTION

ISSUE DATE
24-02-2016

REVISION
01

Figure 1 Outline PG-SOT223-3, dimensions in mm/inches

Revision History

ISP25DP06LMS

Revision: 2019-01-30, Rev. 2.1

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2019-01-22	Release of final version
2.1	2019-01-30	Update package drawings

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