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MOSFET

Small-Signal Transistor

SOT-223-4



Features

- N-channel
- Depletion mode
- d*v*/d*t* rated
- Halogen-free according to IEC61249-2-21
- Pb-free lead plating; RoHS compliant

Product validation

Fully qualified according to JEDEC for Industrial Applications

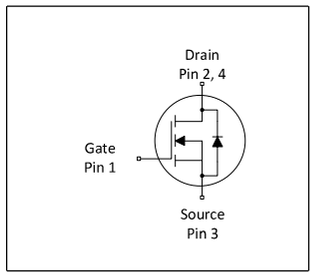


Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	600	V
$R_{DS(on),max}$	60	Ω
$I_{DSS,min}$	0.02	A
ESD Sensitivity, JESD22-A114 (HBM)	Class1A (>250V,<500V)	

Type / Ordering Code	Package	Marking	Related Links
BSP135I	PG-SOT223	SP135I	-

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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	I_D	- -	- -	0.12 0.10	A	T_A=25 °C T_A=70 °C
Pulsed drain current	$I_{D,pulse}$	-	-	0.48	A	T_A=25 °C
Reverse diode d*v*/d*t*	d*v*/d*t*	-	-	6	kV/µs	I_D=0.12 A, V_{DS}=20 V, d*i*/d*t*=200 A/µs, $T_{j,max}$=150 °C
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	1.8	W	T_A=25 °C
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 (pin 4)	R_{thJS}	-	-	25	K/W	-
SMD version, device on PCB, minimal footprint	R_{thJA}	-	-	115	K/W	-
SMD version, device on PCB, 6 cm^2 cooling area[1)]	R_{thJA}	-	-	70	K/W	-

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	$V_{(BR)DSS}$	600	-	-	V	V_{GS}=-3 V, I_D=250 µA
Gate threshold voltage	$V_{GS(th)}$	-2.1	-1.4	-1	V	V_{DS}=3 V, I_D=94 µA
Drain-source cutoff current	$I_{D(off)}$	- -	- -	0.1 10	µA	V_{DS}=600 V, V_{GS}=-3 V, T_j=25 °C V_{DS}=600 V, V_{GS}=-3 V, T_j=125 °C
Gate-source leakage current	I_{GSS}	-	-	100	nA	V_{GS}=20 V, V_{DS}=0 V
On-state drain current	I_{DSS}	20	-	-	mA	V_{GS}=0 V, V_{DS}=10 V
Drain-source on-state resistance	$R_{DS(on)}$	- -	30 25	60 45	Ω	V_{GS}=0 V, I_D=0.01A V_{GS}=10 V, I_D=0.12 A
Transconductance	g_{fs}	0.08	0.16	-	S	$\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, I_D=0.1 A

[1)] Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm^2 (single layer, 70 µm thick) copper area for

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Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	98	-	pF	V_{GS}=-3 V, V_{DS}=25 V, f=1 MHz
Output capacitance	C_{oss}	-	8.5	-	pF	V_{GS}=-3 V, V_{DS}=25 V, f=1 MHz
Reverse transfer capacitance	C_{rss}	-	3.4	-	pF	V_{GS}=-3 V, V_{DS}=25 V, f=1 MHz
Turn-on delay time	$t_{d(on)}$	-	5.4	-	ns	V_{DD}=300 V, V_{GS}=-3 to 5 V, I_D=0.1 A, R_G=6 Ω
Rise time	t_r	-	5.6	-	ns	V_{DD}=300 V, V_{GS}=-3 to 5 V, I_D=0.1 A, R_G=6 Ω
Turn-off delay time	$t_{d(off)}$	-	28	-	ns	V_{DD}=300 V, V_{GS}=-3 to 5 V, I_D=0.1 A, R_G=6 Ω
Fall time	t_f	-	182	-	ns	V_{DD}=300 V, V_{GS}=-3 to 5 V, I_D=0.1 A, R_G=6 Ω

Table 6 Gate charge characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	0.24	-	nC	V_{DD}=400 V, I_D=0.1 A, V_{GS}=-3 to 5 V
Gate to drain charge	Q_{gd}	-	2.0	-	nC	V_{DD}=400 V, I_D=0.1 A, V_{GS}=-3 to 5 V
Gate charge total	Q_g	-	3.7	-	nC	V_{DD}=400 V, I_D=0.1 A, V_{GS}=-3 to 5 V
Gate plateau voltage	$V_{plateau}$	-	0.20	-	V	V_{DD}=400 V, I_D=0.1 A, V_{GS}=-3 to 5 V

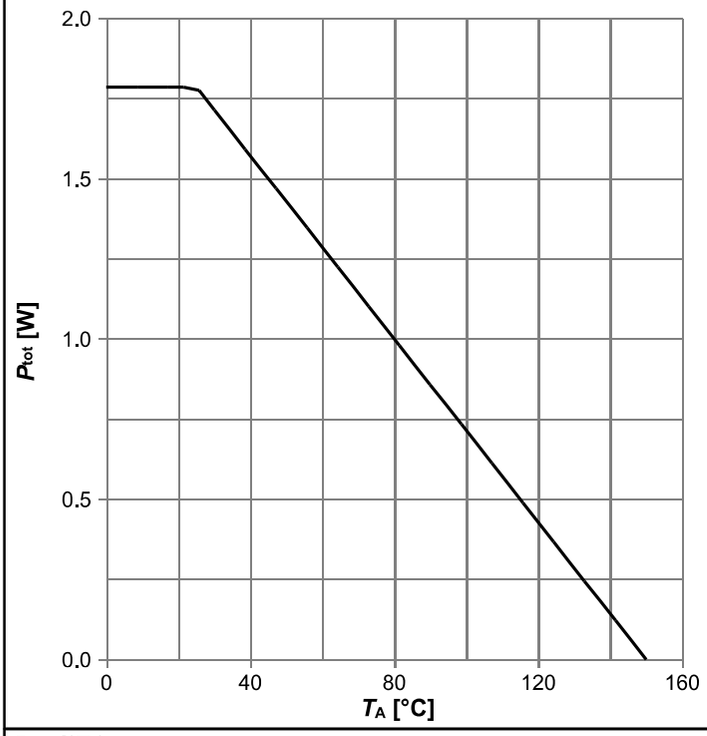
Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continous forward current	I_S	-	-	0.12	A	T_A=25 °C
Diode pulse current	$I_{S,pulse}$	-	-	0.48	A	T_A=25 °C
Diode forward voltage	V_{SD}	-	0.78	1.2	V	V_{GS}=-3 V, I_F=0.12 A, T_j=25 °C
Reverse recovery time	t_{rr}	-	87	130	ns	V_R=300 V, I_F=0.1 A, di_F/dt=100 A/µs
Reverse recovery charge	Q_{rr}	-	70	104	nC	V_R=300 V, I_F=0.1 A, di_F/dt=100 A/µs

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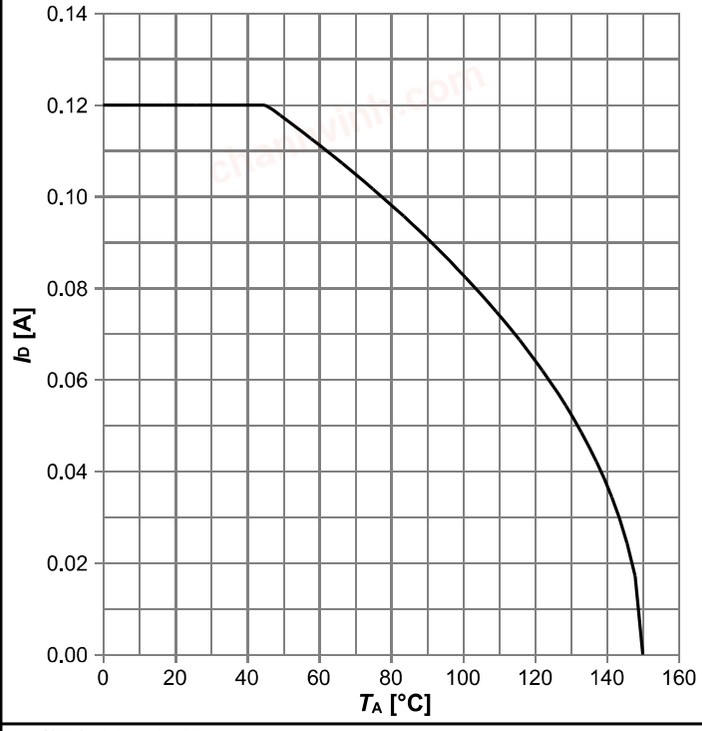
4 Electrical characteristics diagrams

Diagram 1: Power dissipation



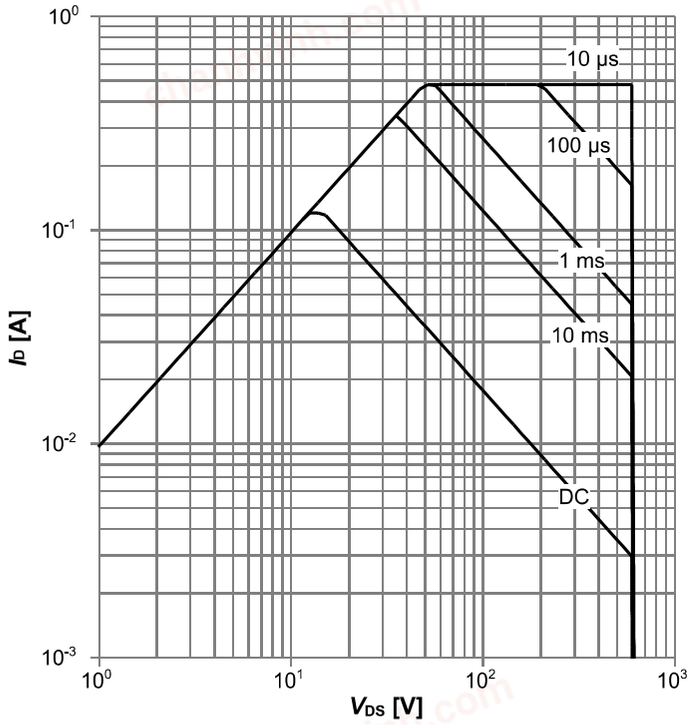
$P_{tot}=f(T_A)$

Diagram 2: Drain current



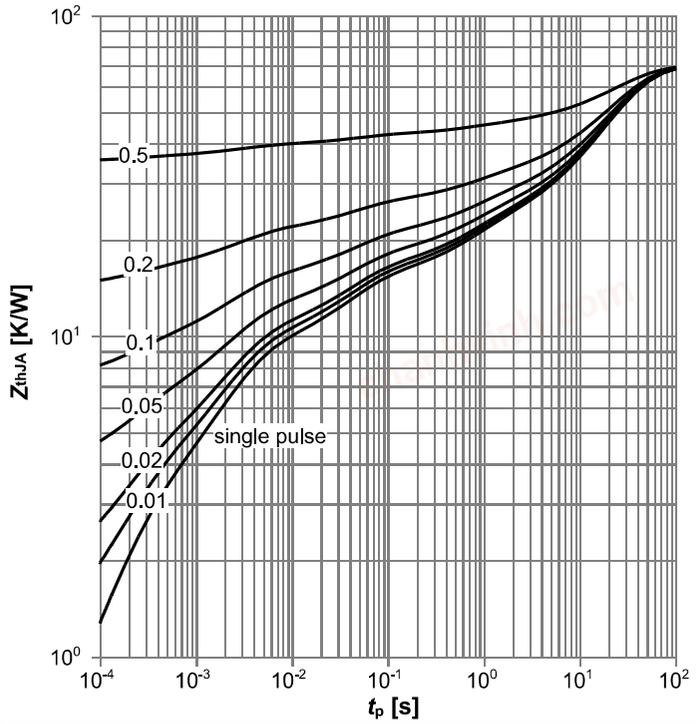
$I_D=f(T_A)$; $V_{GS}\geq 10$ V

Diagram 3: Safe operating area



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

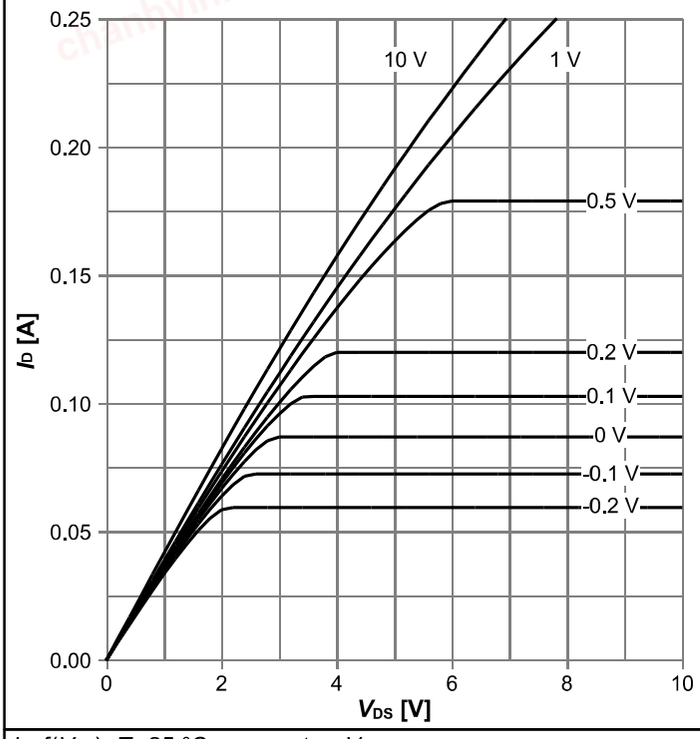
Diagram 4: Max. transient thermal impedance



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

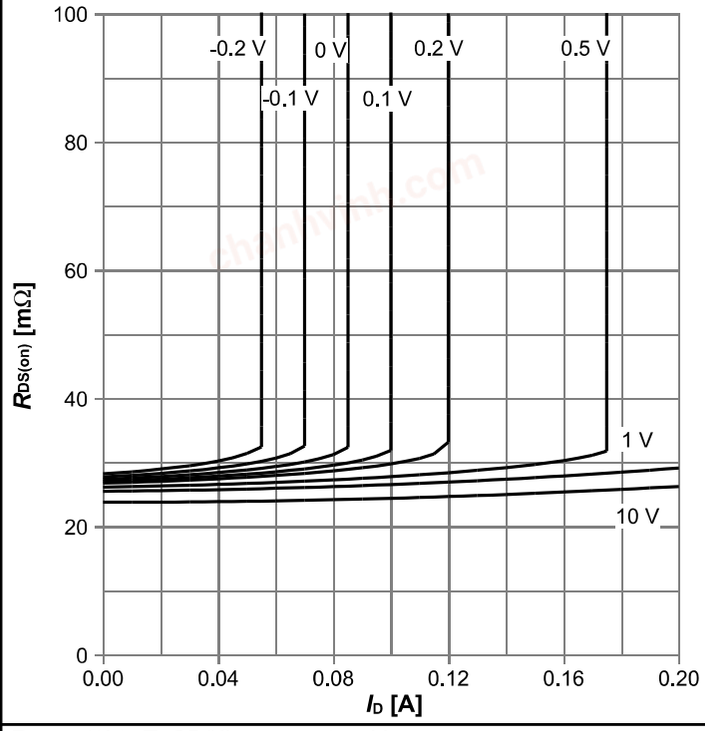
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Diagram 5: Typ. output characteristics



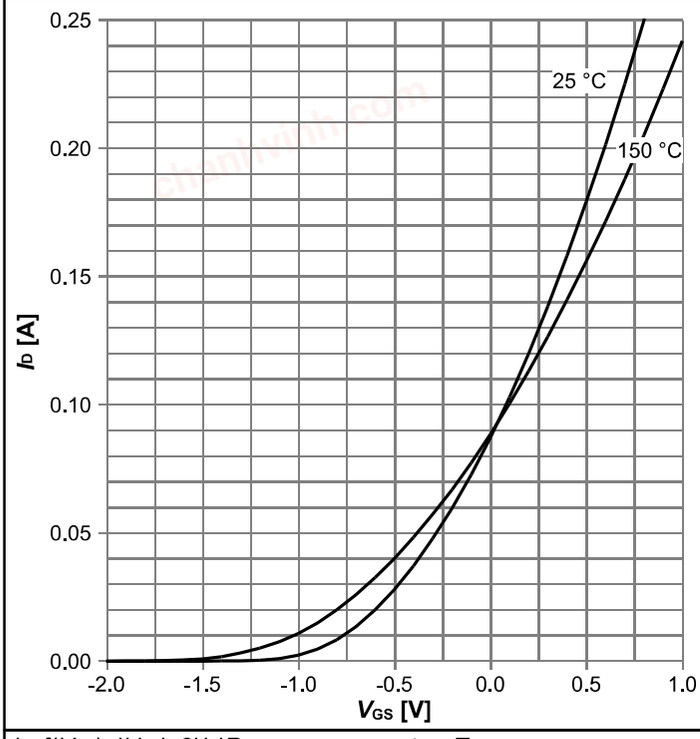
$I_D=f(V_{DS})$, $T_j=25$ °C; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



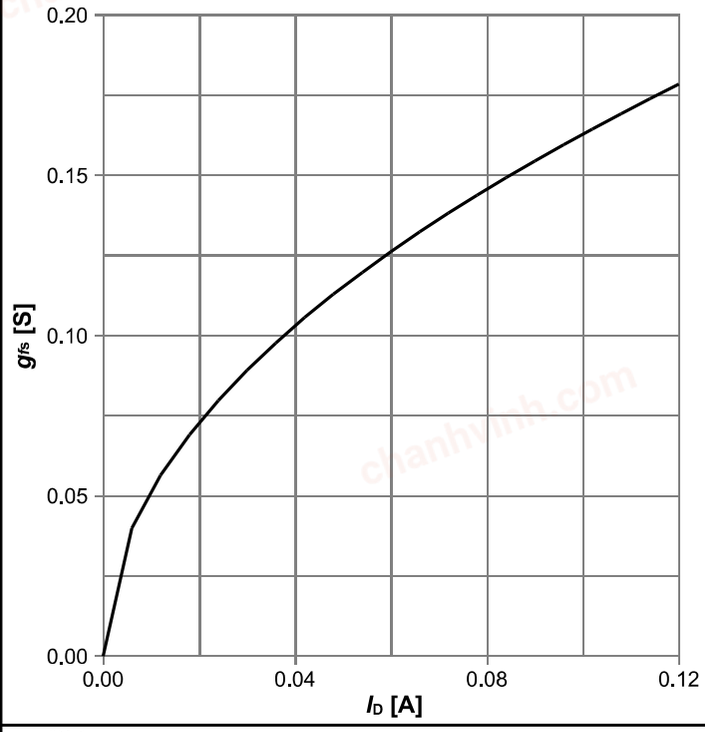
$R_{DS(on)}=f(I_D)$, $T_j=25$ °C; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



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

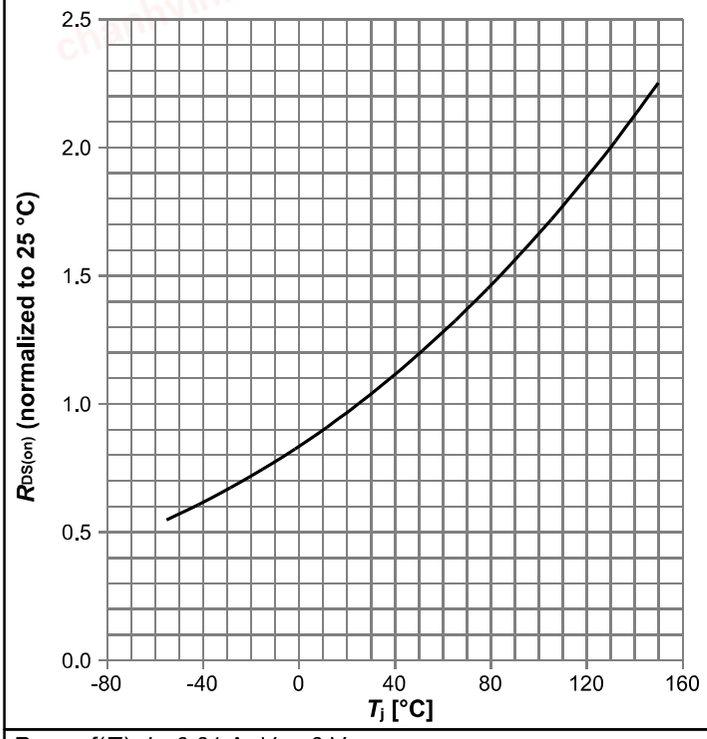
Diagram 8: Typ. transconductance



$g_{fs}=f(I_D)$

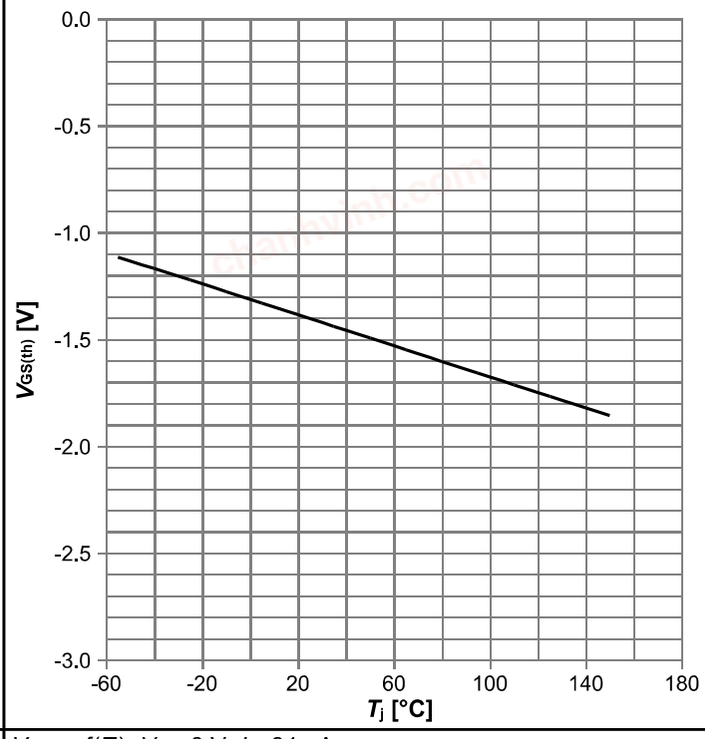
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Diagram 9: Normalized drain-source on resistance



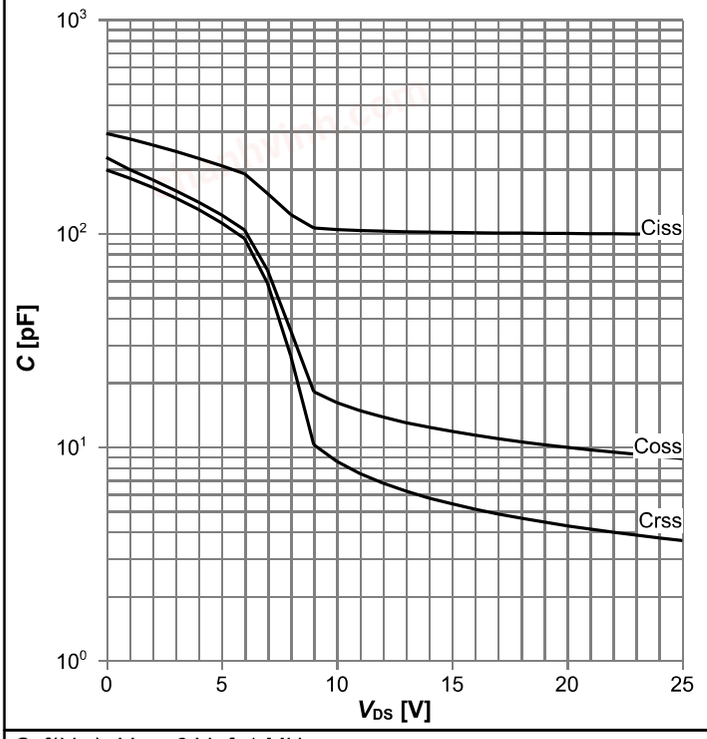
$R_{DS(on)}$=f(T_j), I_D=0.01 A, V_{GS}=0 V

Diagram 10: Typ. gate threshold voltage



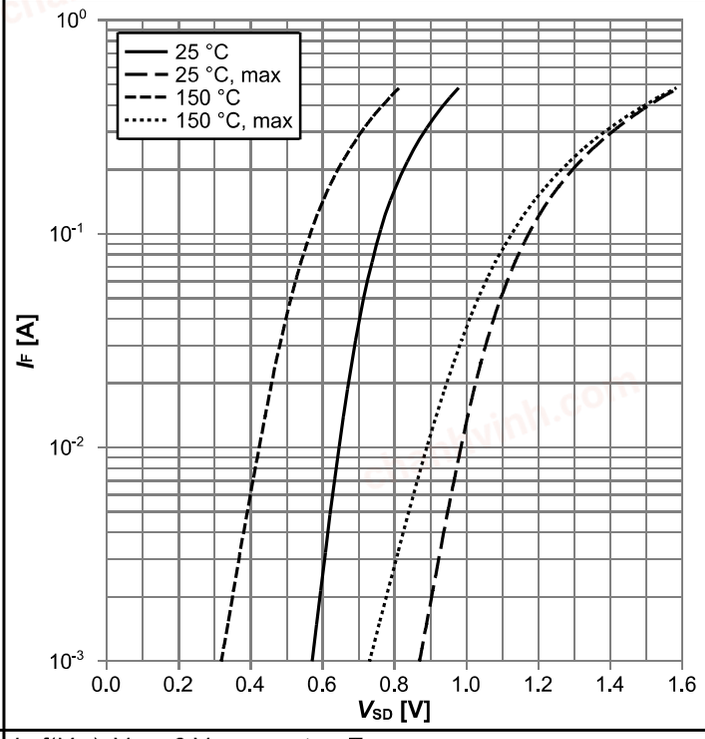
$V_{GS(th)}$=f(T_j), V_{DS}=3 V; I_D=94 µA

Diagram 11: Typ. capacitances



C=f(V_{DS}); V_{GS}=-3 V; f=1 MHz

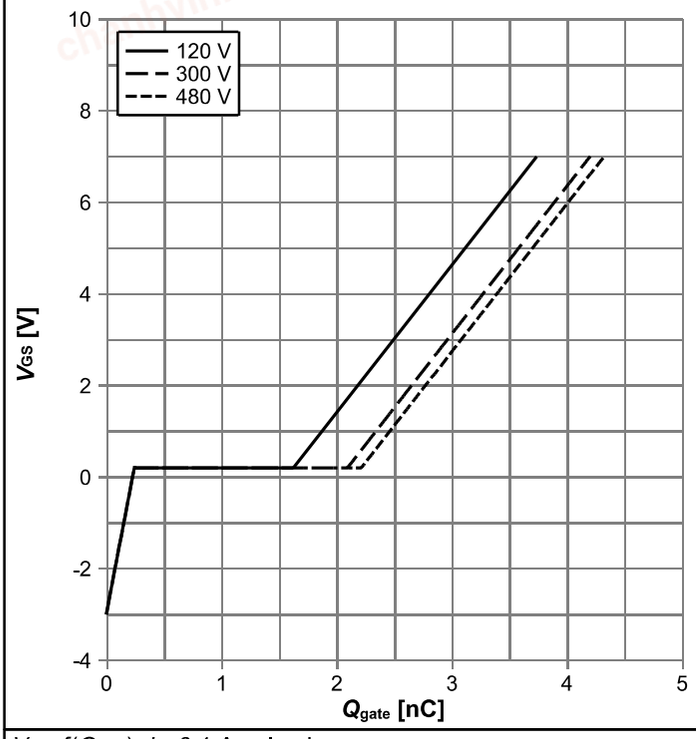
Diagram 12: Forward characteristics of reverse diode



I_F=f(V_{SD}), V_{GS}=-3 V; parameter: T_j

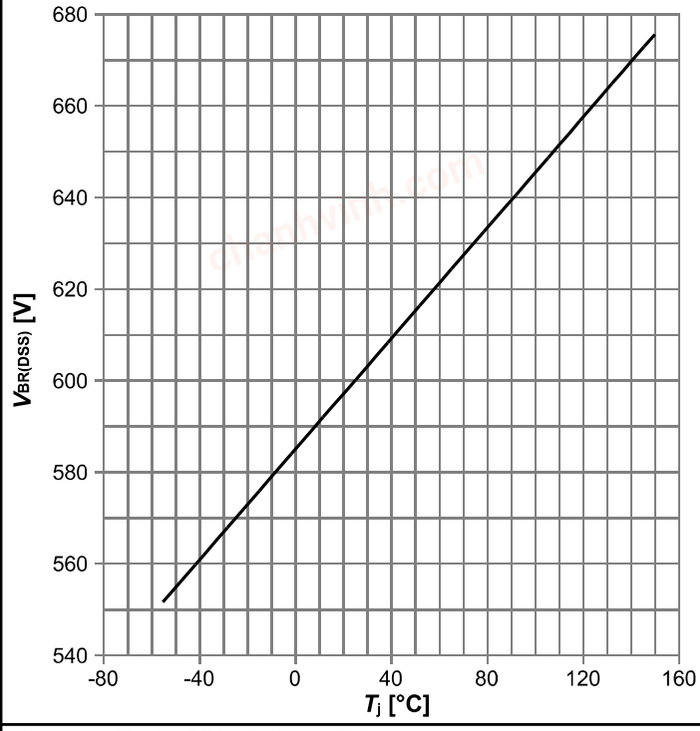
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Diagram 13: Typ. gate charge



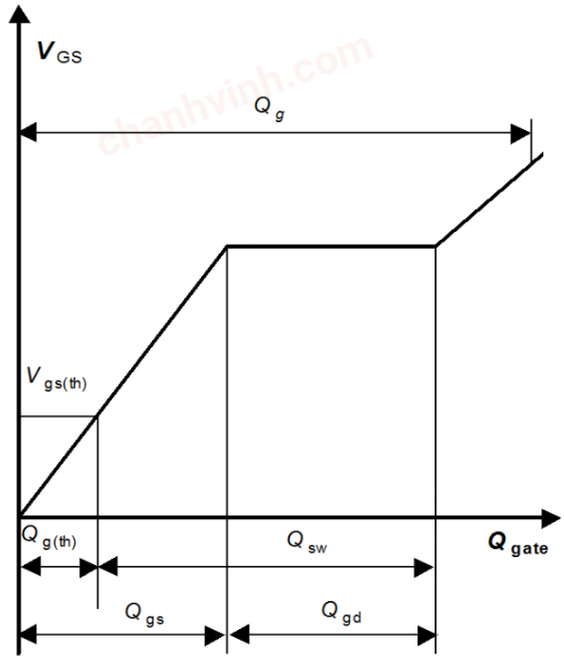
V_{GS}=f(Q_{gate}); I_D=0.1 A pulsed

Diagram 14: Drain-source breakdown voltage



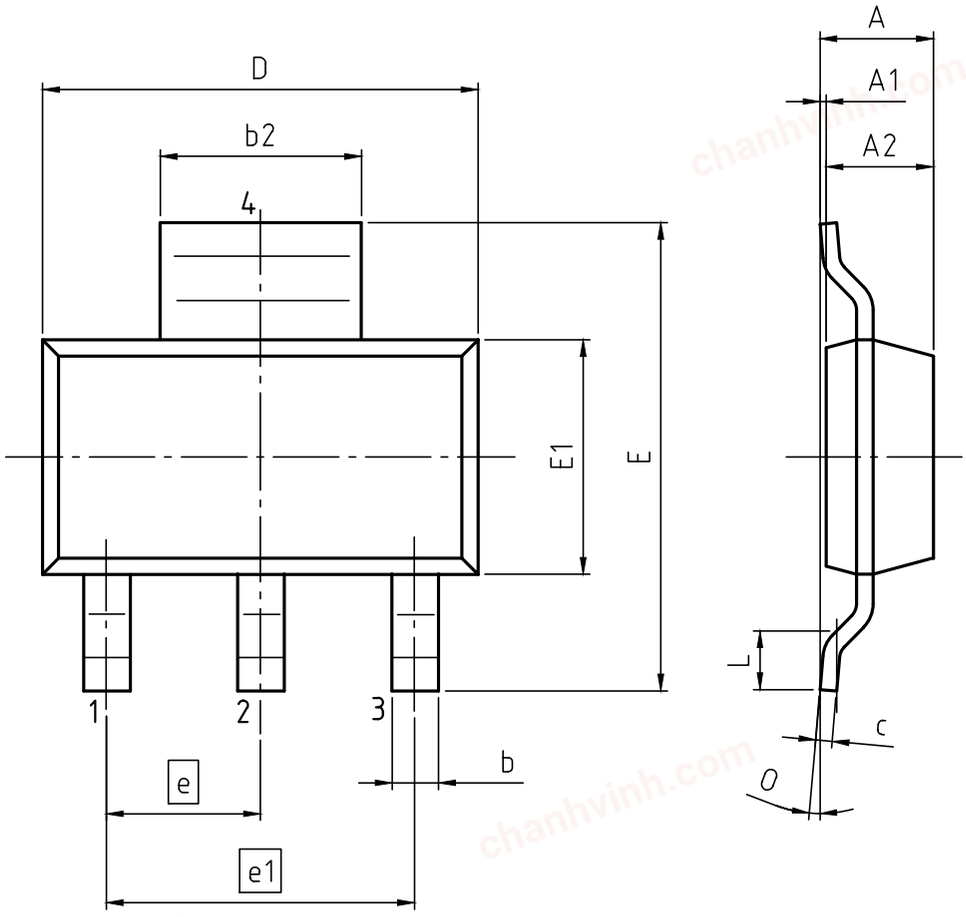
$V_{BR(DSS)}$=f(T_j); I_D=250 µA, V_{GS}=-3V

Diagram Gate charge waveforms



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5 Package Outlines



PACKAGE - GROUP NUMBER:	PG-SOT223-4-U01	
REVISION: 01	DATE: 07.12.2020	
DIMENSIONS	**MILLIMETERS**	
	MIN.	MAX.
A	1.60	1.80
A1	-	0.10
A2	1.50	1.70
b	0.60	0.80
b1	0.61	1.45
b2	2.90	3.10
c	0.24	0.35
D	6.30	6.70
E	6.70	7.30
E1	3.30	3.70
e	2.30	
e1	4.60	
L	MIN. 0,75	
O	0°	10°

Figure 1 Outline PG-SOT223, dimensions in mm

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Revision History

BSP135I

Revision: 2021-03-16, Rev. 2.1

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2021-01-25	Release of final version
2.1	2021-03-16	Update technology naming

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