MOSFET

Small-Signal Transistor

PG-SOT23-3

Features

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

Product validation

Fully qualified according to JEDEC for Industrial Applications

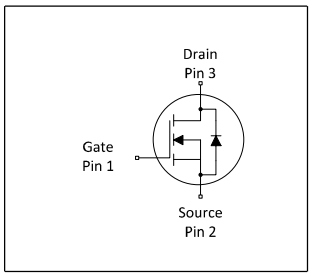


Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	60	V
$R_{DS(on),max}$	3.5	Ω
I_D	0.23	A
ESD Sensitivity, JESD22-A114 (HBM)	Class 0 (<250V)	

Type / Ordering Code	Package	Marking	Related Links
BSS138I	PG-SOT23	KIs	-

Table of Contents

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	- -	- -	0.23 0.18	A	T_A=25 °C T_A=70 °C
Pulsed drain current	$I_{D,pulse}$	-	-	0.92	A	T_A=25 °C
Reverse diode dv/dt	dv/dt	-	-	6	kV/µs	I_D=0.23 A, V_{DS}=48 V, di/dt=200 A/µs, $T_{j,max}$=150 °C
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	0.36	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 - minimal footprint	R_{thJA}	-	-	350	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	$V_{(BR)DSS}$	60	-	-	V	V_{GS}= 0 V, I_D=250 µA
Gate threshold voltage	$V_{GS(th)}$	0.6	1.0	1.4	V	V_{GS}=V_{DS}, I_D=26 µA
Drain-source leakage current	$I_{D\ (off)}$	- -	- -	0.1 5	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}	-	1	10	nA	V_{GS}=20 V, V_{DS}=0 V
Drain-source on-state resistance	$R_{DS(on)}$	- - -	3.3 3.5 2.2	4.0 6.0 3.5	Ω	V_{GS}=4.5 V, I_D=0.03 A V_{GS}=4.5 V, I_D=0.19 A V_{GS}=10 V, I_D=0.23 A
Transconductance	g_{fs}	0.1	0.2	-	S	|V_{DS}|>2|I_D|$R_{DS(on)max}$, I_D=0.18 A

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	32	-	pF	V_{GS}=0 V, V_{DS}=25 V, f=1 MHz
Output capacitance	C_{oss}	-	7.2	-	pF	V_{GS}=0 V, V_{DS}=25 V, f=1 MHz
Reverse transfer capacitance	C_{rss}	-	2.8	-	pF	V_{GS}=0 V, V_{DS}=25 V, f=1 MHz
Turn-on delay time	$t_{d(on)}$	-	2.3	-	ns	V_{DD}=30 V, V_{GS}=10 V, I_D=0.23 A, R_G=6 Ω
Rise time	t_r	-	3.0	-	ns	V_{DD}=30 V, V_{GS}=10 V, I_D=0.23 A, R_G=6 Ω
Turn-off delay time	$t_{d(off)}$	-	6.7	-	ns	V_{DD}=30 V, V_{GS}=10 V, I_D=0.23 A, R_G=6 Ω
Fall time	t_f	-	8.2	-	ns	V_{DD}=30 V, V_{GS}=10 V, I_D=0.23 A, R_G=6 Ω

Table 6 Gate charge characteristics

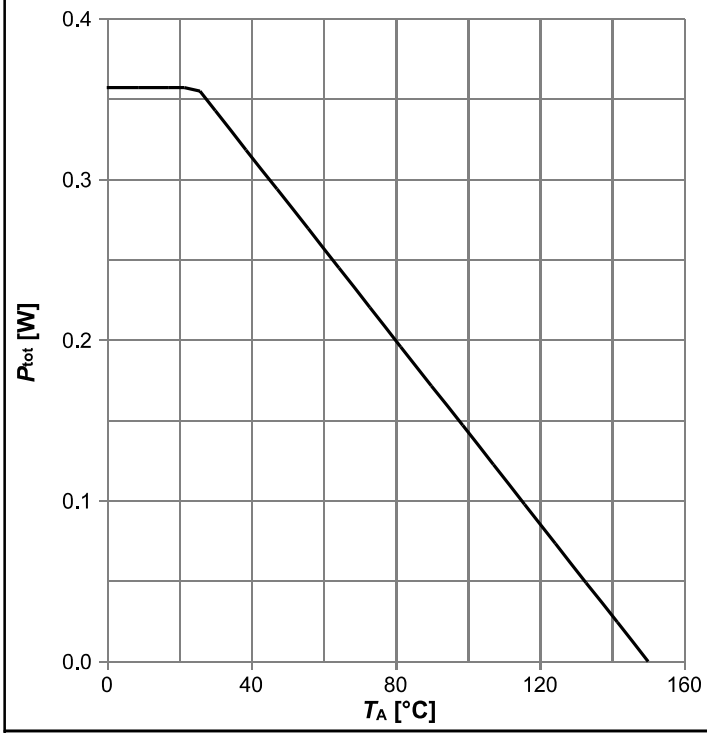
Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	0.10	-	nC	V_{DD}=48 V, I_D=0.23 A, V_{GS}=0 to 10 V
Gate to drain charge	Q_{gd}	-	0.3	-	nC	V_{DD}=48 V, I_D=0.23 A, V_{GS}=0 to 10 V
Gate charge total	Q_g	-	1.0	-	nC	V_{DD}=48 V, I_D=0.23 A, V_{GS}=0 to 10 V
Gate plateau voltage	$V_{plateau}$	-	3.3	-	V	V_{DD}=48 V, I_D=0.23 A, V_{GS}=0 to 10 V

Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continous forward current	I_S	-	-	0.23	A	T_A=25 °C
Diode pulse current	$I_{S,pulse}$	-	-	0.92	A	T_A=25 °C
Diode forward voltage	V_{SD}	-	0.83	1.2	V	V_{GS}=0 V, I_F=0.23 A, T_j=25 °C
Reverse recovery time	t_{rr}	-	9.1	14.5	ns	V_R=30 V, I_F=0.23 A, di_F/dt=100 A/µs
Reverse recovery charge	Q_{rr}	-	3.3	5	nC	V_R=30 V, I_F=0.23 A, di_F/dt=100 A/µs

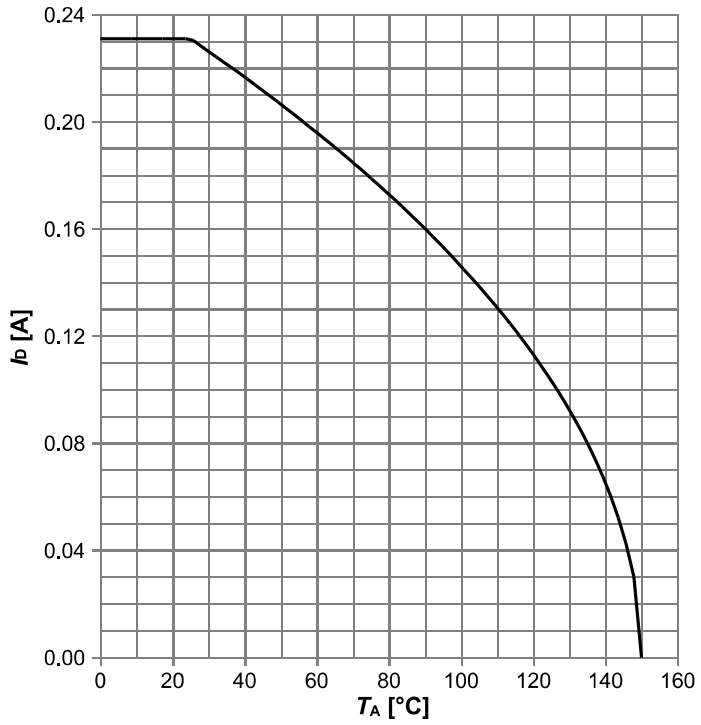
4 Electrical characteristics diagrams

Diagram 1: Power dissipation



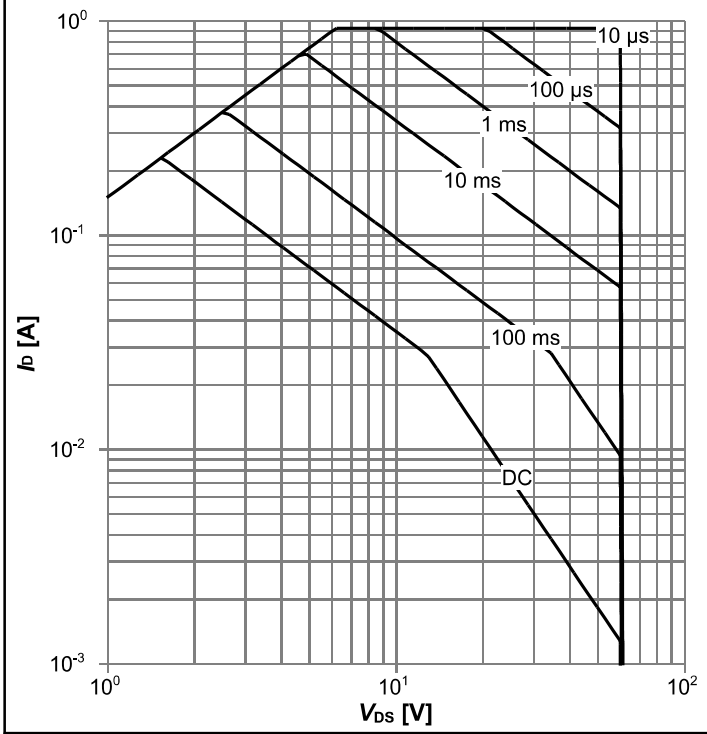
$P_{tot}=f(T_A)$

Diagram 2: Drain current



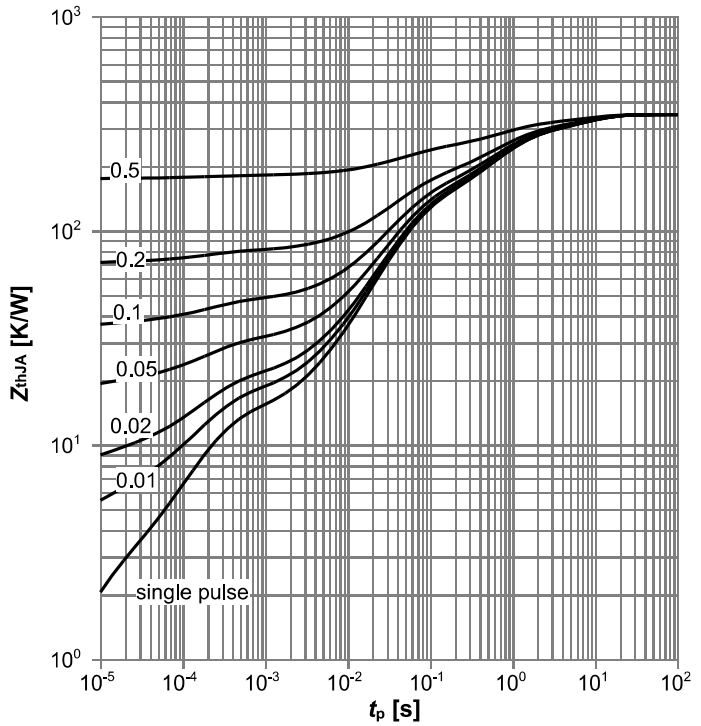
$I_D=f(T_A)$; $V_{GS}\geq 10$ V

Diagram 3: Safe operating area



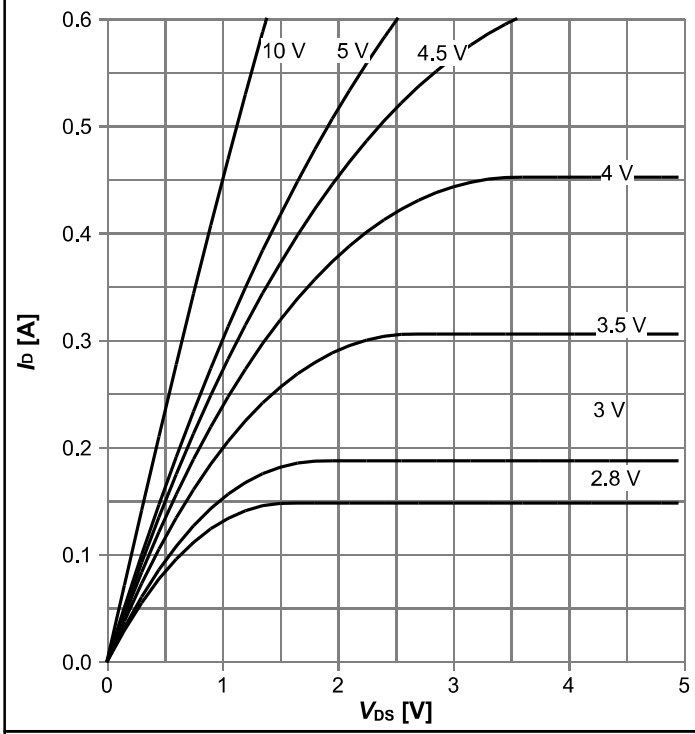
$I_D=f(V_{DS})$; $T_A=25$ °C; $D=0$; parameter: t_p

Diagram 4: Max. transient thermal impedance



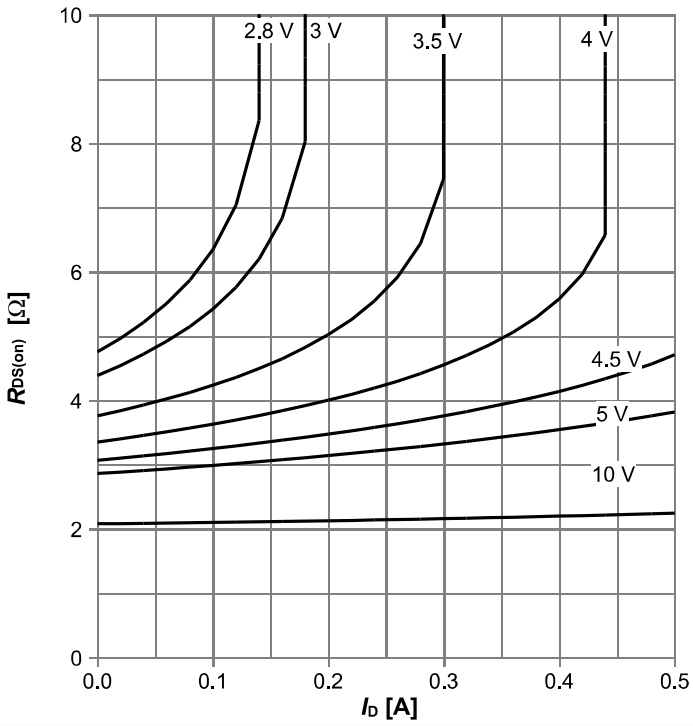
$Z_{thJA}=f(t_p)$; parameter: $D=t_p/T$

Diagram 5: Typ. output characteristics



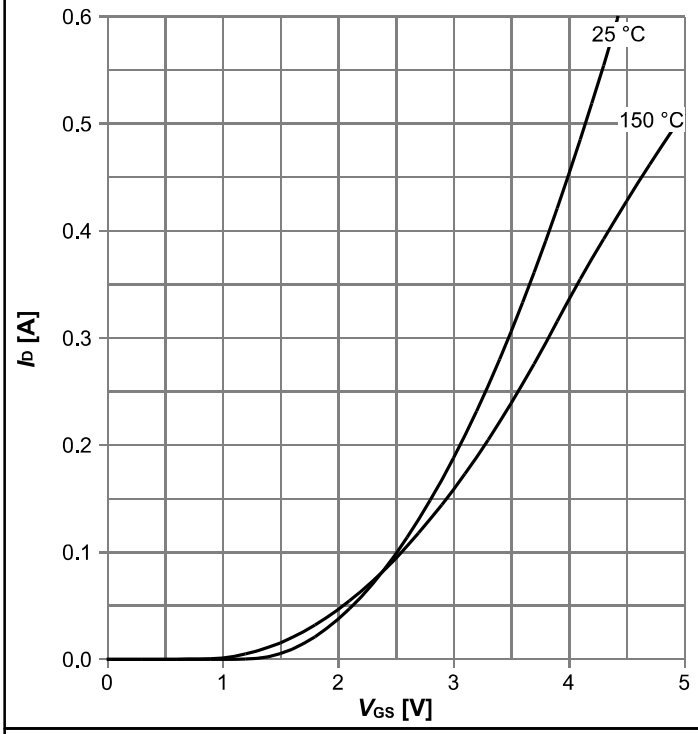
$I_D=f(V_{DS})$; $T_j=25$ °C; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



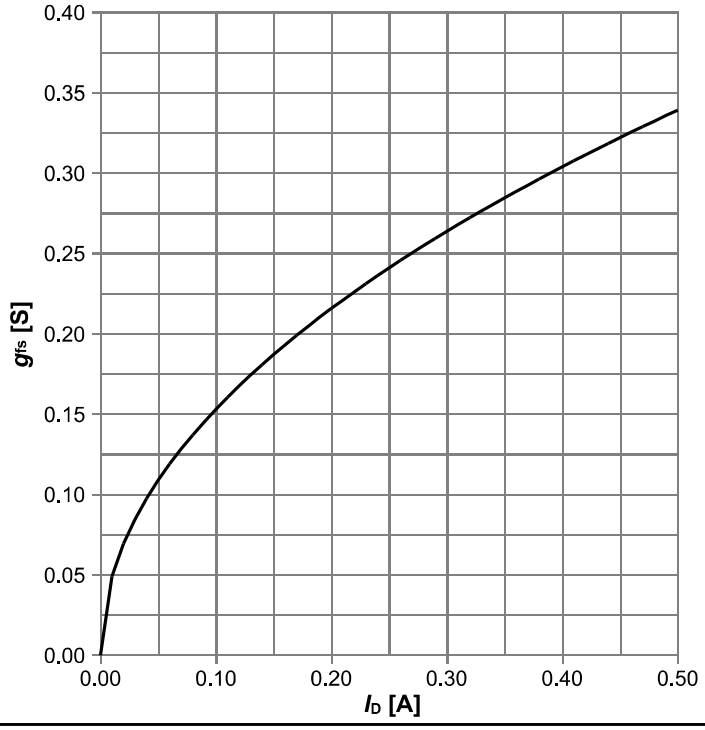
$R_{DS(on)}=f(I_D)$; $T_j=25$ °C; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



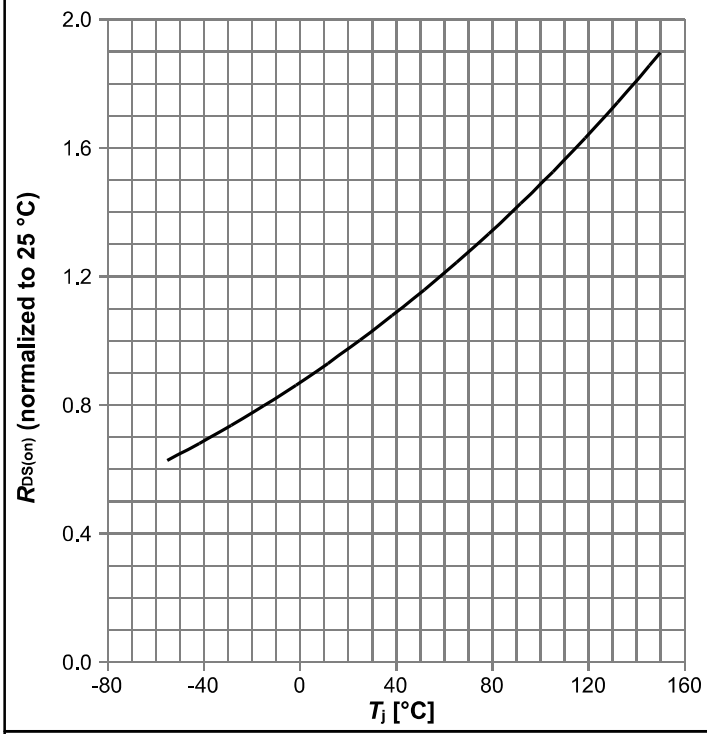
$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$

Diagram 8: Typ. forward transconductance



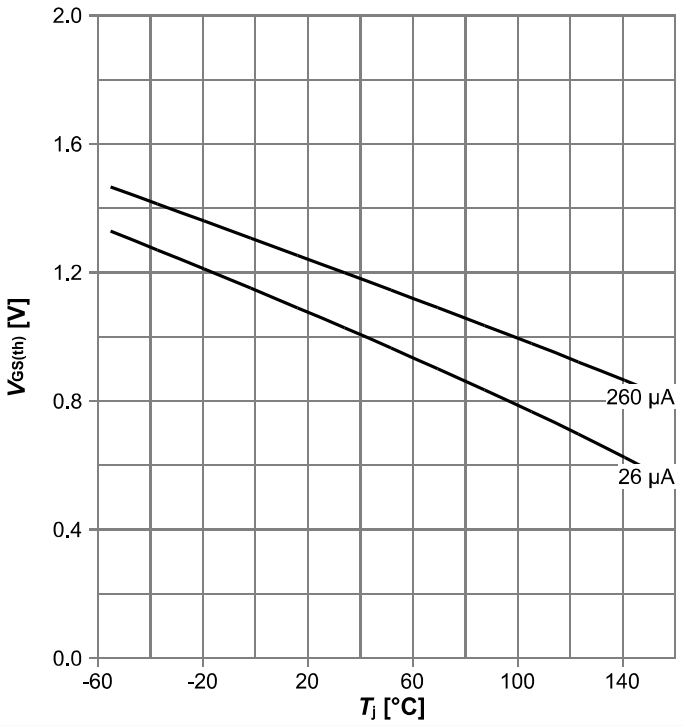
$g_{fs}=f(I_D)$; $T_j=25$ °C

Diagram 9: Drain-source on-state resistance



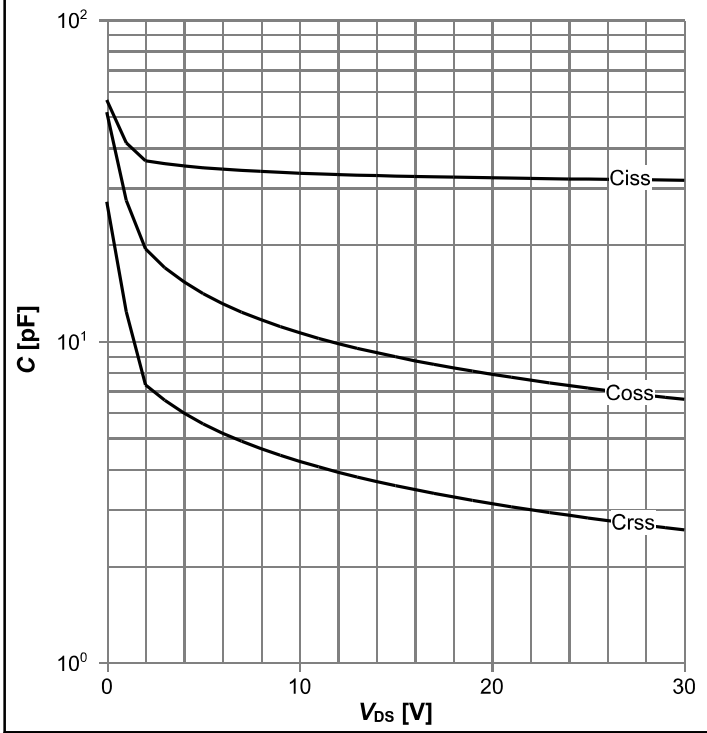
$R_{DS(on)}$=f(T_j), I_D=0.03 A, V_{GS}=10 V

Diagram 10: Typ. gate threshold voltage



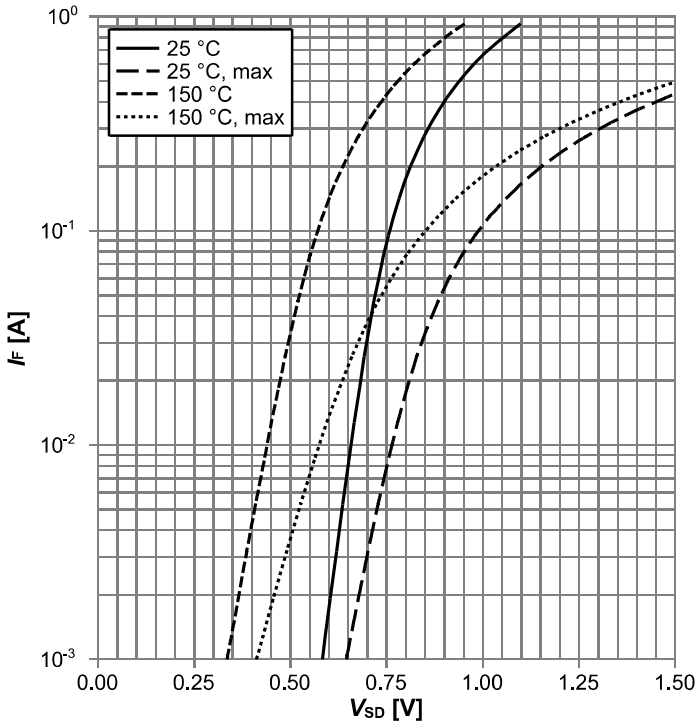
$V_{GS(th)}$=f(T_j); V_{DS}=V_{GS}; I_D=26 µA; parameter: I_D

Diagram 11: Typ. capacitances



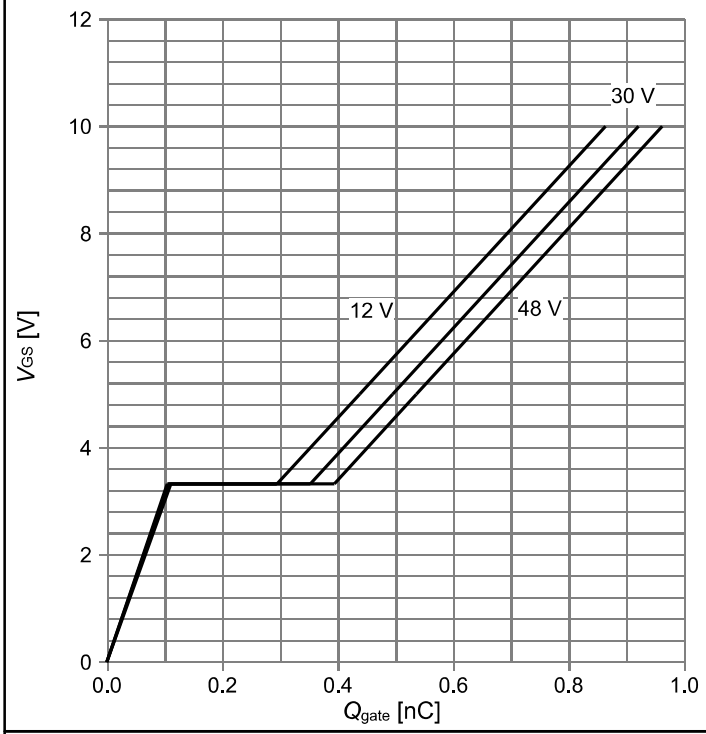
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz; T_j=25°C

Diagram 12: Forward characteristics of reverse diode



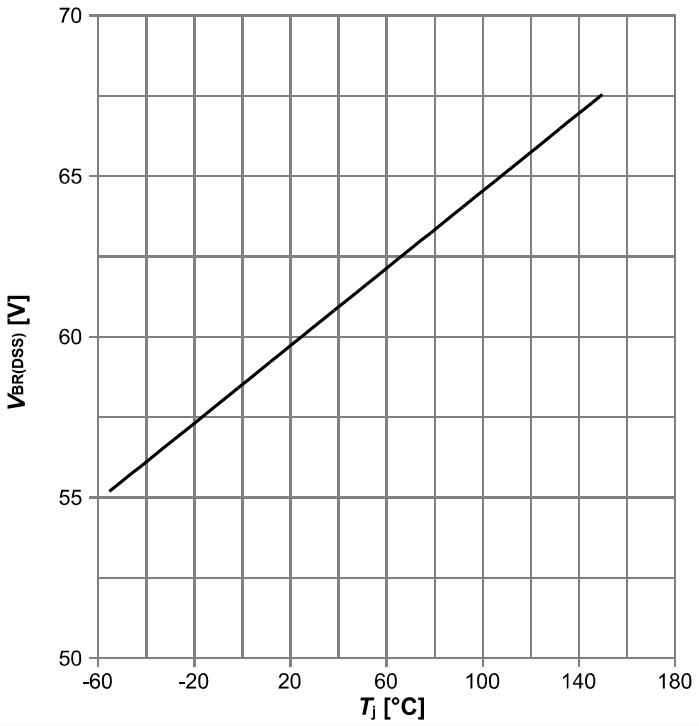
I_F=f(V_{SD}); parameter: T_j

Diagram 13: Typ. gate charge



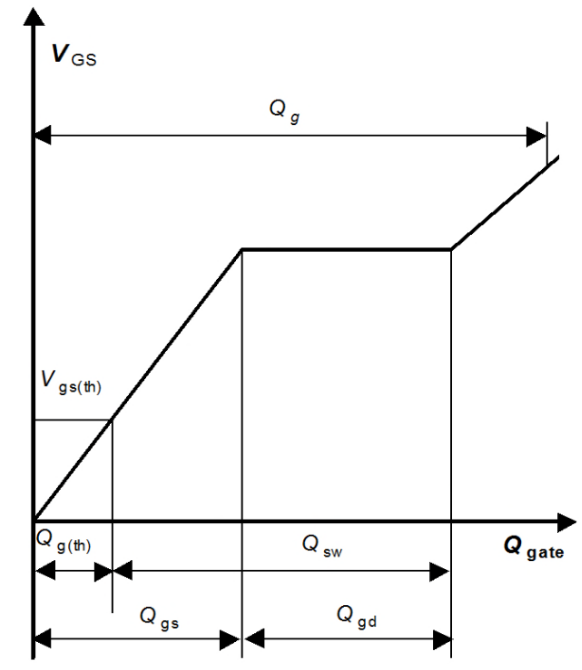
$V_{GS}=f(Q_{gate})$; I_D=0.23 A pulsed; parameter: V_{DD}

Diagram 14: Drain-source breakdown voltage

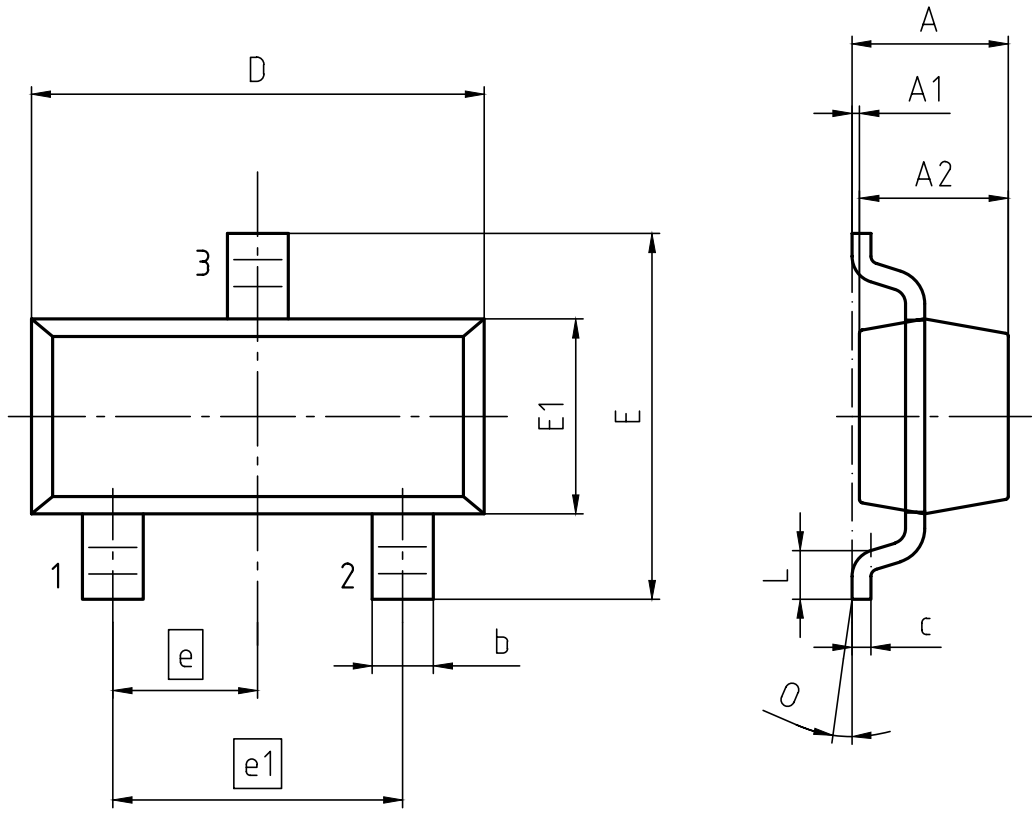


$V_{BR(DSS)}=f(T_j)$, I_D=250 µA

Diagram Gate charge waveforms



5 Package Outlines



PACKAGE - GROUP NUMBER:	PG-SOT23-3-U01	
REVISION: 01	DATE: 09.12.2020	
DIMENSIONS	**MILLIMETERS**	
	MIN.	MAX.
A	0.89	1.12
A1	0.01	0.10
A2	0.88	1.02
b	0.30	0.50
c	0.08	0.20
D	2.80	3.04
E	2.10	2.64
E1	1.20	1.40
e	0.95	
e1	1.90	
L	0.15	0.60
O	0°	8°

Figure 1 Outline PG-SOT23, dimensions in mm

Revision History

BSS138I

Revision: 2021-03-17, Rev. 2.1

Previous Revision		
Revision	Date	Subjects (major changes since last revision)
2.0	2021-01-26	Release of final version
2.1	2021-03-17	Update technology naming

We Listen to Your Comments
Any information within this document that you feel is wrong, unclear or missing at all? Your feedback will help us to continuously improve the quality of this document. Please send your proposal (including a reference to this document) to:
erratum@infineon.com

Published by
Infineon Technologies AG
81726 München, Germany

Legal Disclaimer
The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics (“Beschaffenheitsgarantie”) .

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.
In addition, any information given in this document is subject to customer’s compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer’s products and any use of the product of Infineon Technologies in customer’s applications.
The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer’s technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

Information
For further information on technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies Office (www.infineon.com).

Warnings
Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.
The Infineon Technologies component described in this Data Sheet may be used in life-support devices or systems and/or automotive, aviation and aerospace applications or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support, automotive, aviation and aerospace device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.