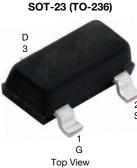
SQ2301CES

SHA www.vishay.com

Vishay Siliconix

Automotive P-Channel 20 V (D-S) 175 °C MOSFET



D 3			
		-	
	1		2 S

FEATURES

- TrenchFET[®] power MOSFET
- AEC-Q101 qualified
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

GC

P-Channel MOSFET



COMPLIANT HALOGEN FREE

PRODUCT SUMMARY				
V _{DS} (V)	-20			
$R_{DS(on)}(\Omega)$ at $V_{GS} = -4.5 V$	0.120			
$R_{DS(on)}(\Omega)$ at $V_{GS} = -2.5 V$	0.180			
I _D (A)	-3.9			
Configuration	Single			

ORDERING INFORMATION				
Package	SOT-23			
Lead (Pb)-free and halogen-free	SQ2301CES (for detailed order number please see www.vishay.com/doc?79771)			

ABSOLUTE MAXIMUM RATING	S (T _C = 25 °C, unless	s otherwise noted	ł)	
PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-source voltage	V _{DS}	-20	V	
Gate-source voltage		V _{GS}	± 8	v
Continuous drain current	T _C = 25 °C		-3.9	
	T _C = 125 °C	I _D	-2.2	
Continuous source current (diode conduction)		I _S	-3.7	А
Pulsed drain current ^a		I _{DM}	-15	
Single pulse avalanche current	L = 0.1 mH	I _{AS}	-9	
Single pulse avalanche energy		E _{AS}	4	mJ
NAL THE REPORT OF THE PARTY OF	T _C = 25 °C	D	3	W
Maximum power dissipation	T _C = 125 °C	P _D	1	vv
Operating junction and storage temperature	range	T _J , T _{stg}	-55 to + 175	°C

THERMAL RESISTANCE RATINGS						
PARAMETER		SYMBOL	LIMIT	UNIT		
Junction-to-ambient	PCB mount ^c	R _{thJA}	166	°C/W		
Junction-to-case (drain)		R _{thJF}	50	0/10		

Notes

a. Package limited

b. Pulse test; pulse width $\leq 300~\mu s,~duty~cycle \leq 2~\%$

c. When mounted on 1" square PCB (FR-4 material)

S23-1183-Rev. A, 08-Jan-2024

1

Document Number: 62454

www.vishay.com

SQ2301CES

Vishay Siliconix

PARAMETER	SYMBOL	TES	T CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Static						•		
Drain-source breakdown voltage	V _{DS}	$V_{GS} = 0, I_D = -250 \ \mu A$		-20	-	-	v	
Gate-source threshold voltage	V _{GS(th)}	$V_{DS} = V_{GS}, I_D = -250 \ \mu A$		-0.45	-	-1.5	v	
Gate-source leakage	I _{GSS}	$V_{DS}=0~V,~V_{GS}=\pm~8~V$		-	-	± 100	nA	
Zero gate voltage drain current		$V_{GS} = 0 V$	V _{DS} = -20 V	-	-	-1		
	I _{DSS}	$V_{GS} = 0 V$	$V_{DS} = -20 \text{ V}, \text{ T}_{J} = 125 ^{\circ}\text{C}$	-	-	-50	μA	
		$V_{GS} = 0 V$	$V_{DS} = -20 \text{ V}, \text{ T}_{J} = 175 ^{\circ}\text{C}$	-	-	-150		
On-state drain current ^a	I _{D(on)}	$V_{GS} = -4.5 V$	$V_{DS} \ge 5 V$	-8	-	-	А	
		$V_{GS} = -4.5 V$	I _D = -2.8 A	-	0.080	0.120	Ω	
Drain-source on-state resistance ^a	R _{DS(on)}	$V_{GS} = -2.5 V$	I _D = -2 A	-	0.110	0.180		
Forward transconductance ^a	g fs	V _{DS} = -1.6 V, I _D = -2.8 A		-	7	-	S	
Dynamic ^b		•				•		
Input capacitance	C _{iss}			-	369	425		
Output capacitance	Coss	V _{GS} = 0 V	V _{DS} = -10 V, f = 1 MHz	-	91	100	pF	
Reverse transfer capacitance	C _{rss}			-	64	70		
Total gate charge ^c	Qg	V _{GS} = -4.5 V	V V _{DS} = -10 V, I _D = -2.8 A	-	5.4	8	nC	
Gate-source charge ^c	Q _{gs}			-	0.81	-		
Gate-drain charge ^c	Q _{gd}			-	1.75	-		
Gate resistance	R _g		f = 1 MHz	3	6	14.5	Ω	
Turn-on delay time ^c	t _{d(on)}			-	10	22		
Rise time ^c	t _r		$V_{DD} = -10 \text{ V}, \text{ R}_{L} = 10 \Omega$		17	21	- ns	
Turn-off delay time ^c	t _{d(off)}	$I_D \cong -1$ A, $V_{GEN} = -4.5$ V, $R_g = 1 \Omega$		-	23	45		
Fall time ^c	t _f			-	9	15		
Source-Drain Diode Ratings and Charact	eristics ^b							
Pulsed current ^a	I _{SM}			-	-	-15	А	
Forward voltage	V _{SD}	I _F = -1.6 A, V _{GS} = 0		-	-0.8	-1.2	V	
Body diode reverse recovery time	t _{rr}	I _F = -1.2 A, di/dt = 100 A/μs		-	15	30	ns	
Body diode reverse recovery charge	Q _{rr}			-	6.5	13	nC	
Reverse recovery fall time	t _a			-	6	-	ns	
Reverse recovery rise time	t _b			-	9	-		
Body diode peak reverse recovery current	I _{RM(REC)}			-	-1	-	А	

Notes

a. Pulse test; pulse width $\leq 300~\mu\text{s},$ duty cycle $\leq 2~\%$

b. Guaranteed by design, not subject to production testing

c. Independent of operating temperature

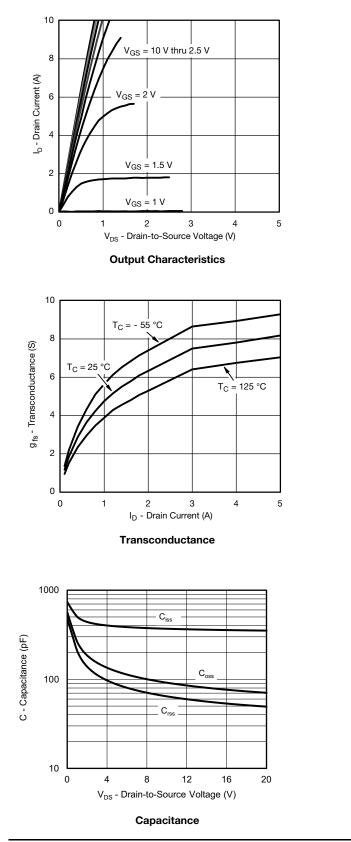
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

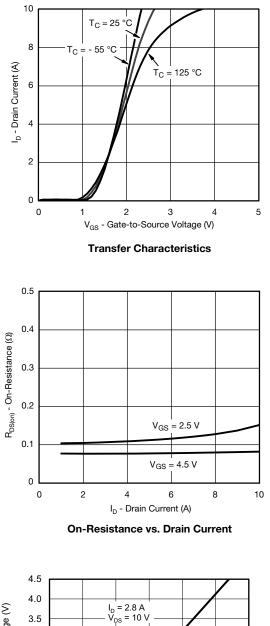
2

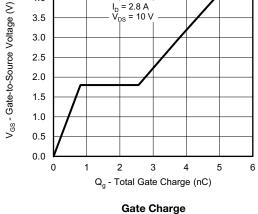


Vishay Siliconix

TYPICAL CHARACTERISTICS ($T_A = 25 \text{ °C}$, unless otherwise noted)







S23-1183-Rev. A, 08-Jan-2024

Document Number: 62454

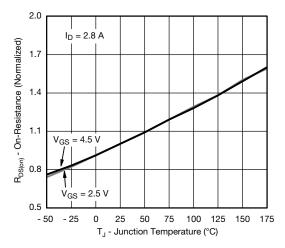
For technical questions, contact: <u>automostechsupport@vishay.com</u> THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT <u>www.vishay.com/doc?91000</u>



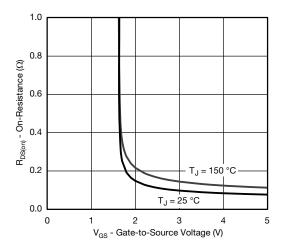
SQ2301CES

Vishay Siliconix

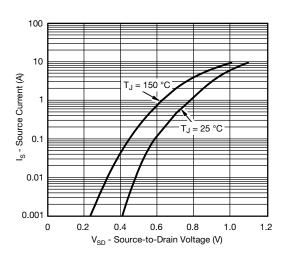
TYPICAL CHARACTERISTICS ($T_A = 25 \text{ °C}$, unless otherwise noted)



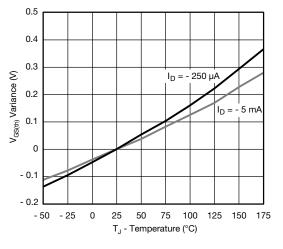
On-Resistance vs. Junction Temperature



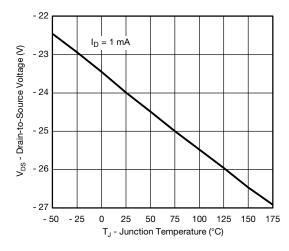
On-Resistance vs. Gate-to-Source Voltage



Source-Drain Diode Forward Voltage







Drain Source Breakdown vs. Junction Temperature

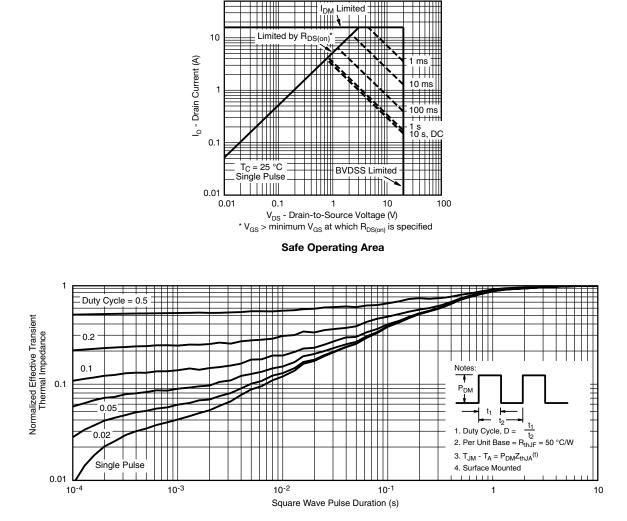
4

For technical questions, contact: <u>automostechsupport@vishay.com</u> THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT <u>www.vishay.com/doc?91000</u>



Vishay Siliconix

THERMAL RATINGS ($T_A = 25 \text{ °C}$, unless otherwise noted)



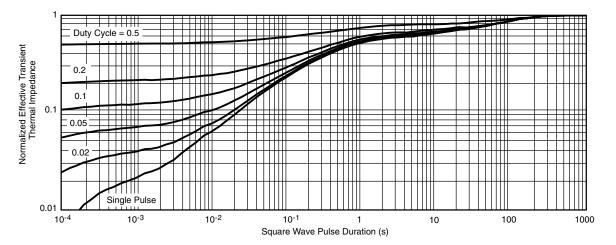
Normalized Thermal Transient Impedance, Junction-to-Foot



Vishay Siliconix

Document Number: 62454

THERMAL RATINGS ($T_A = 25 \text{ °C}$, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient

Note

The characteristics shown in the two graphs

S23-1183-Rev. A, 08-Jan-2024

- Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)

- Normalized Transient Thermal Impedance Junction-to-Foot (25 °C)

are given for general guidelines only to enable the user to get a "ball park" indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see www.vishay.com/ppg262454.

6



Vishay

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

© 2024 VISHAY INTERTECHNOLOGY, INC. ALL RIGHTS RESERVED

Revision: 01-Jan-2024