

Vishay Siliconix

# N-Channel 20 V (D-S) MOSFET

# SOT-23 (TO-236)

Top View

Marking code: C7

PRODUCT SUMMARY					
V <sub>DS</sub> (V)	20				
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 4.5 \text{ V}$	0.057				
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 2.5 \text{ V}$	0.075				
Q <sub>g</sub> typ. (nC)	3.5				
I <sub>D</sub> (A)	2.9				
Configuration	Single				

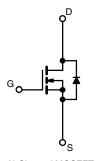
#### **FEATURES**

- TrenchFET® power MOSFET
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



#### **APPLICATIONS**

- Load switching for portable devices
- DC/DC converter



N-Channel MOSFET

ORDERING INFORMATION	
Package	SOT-23 (TO-236)
Lead (Pb)-free and halogen-free	Si2302HDS-T1-GE3

<b>ABSOLUTE MAXIMUM RATINGS</b>	$(T_A = 25  ^{\circ}C,  unless)$	otherwise no	oted)		
PARAMETER		SYMBOL	5 S	STEADY STATE	UNIT
Drain-source voltage		V <sub>DS</sub>	20	20	V
Gate-source voltage		$V_{GS}$	± 8	± 8	
Continuous drain current (T <sub>J</sub> = 150 °C) <sup>a</sup>	T <sub>A</sub> = 25 °C	- I <sub>D</sub>	2.9	2.6	۸
	T <sub>A</sub> = 70 °C		2.3	2.1	
Pulsed drain current <sup>b</sup>		I <sub>DM</sub>	10	10	A
Continuous source current (diode conduction) <sup>a</sup>		Is	0.72	0.6	
Power dissipation <sup>a</sup>	T <sub>A</sub> = 25 °C	P <sub>D</sub>	0.86	0.71	W
	T <sub>A</sub> = 70 °C		0.55	0.46	
Operating junction and storage temperature range		T <sub>.I</sub> , T <sub>sta</sub>	-55 to +150	-55 to +150	°C

THERMAL RESISTANCE RATINGS					
PARAMETER		SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient <sup>a</sup>	t ≤ 5 s	R <sub>thJA</sub>	120	145	
	Steady state		140	175	°C/W
Maximum junction-to-foot	Steady state	R <sub>thJF</sub>	62	78	

#### Notes

- a. Surface mounted on 1" x 1" FR4 board
- b. Pulse width limited by maximum junction temperature

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				LIMITS			
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Static							
Drain-source breakdown voltage	V <sub>DS</sub>	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	20	-	-	V	
Gate-threshold voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}, I_D = 250 \mu A$	0.40	-	0.85	1 v	
Gate-body leakage	I <sub>GSS</sub>	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 8 \text{ V}$	-	-	± 100	nA	
Zero gate voltage drain current		V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V	-	-	0.1	μΑ	
	I <sub>DSS</sub>	V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 50 °C	-	-	4		
		V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 70 °C	-	-	15		
On-state drain current <sup>a</sup>	I <sub>D(on)</sub>	$V_{DS} \ge 10 \text{ V}, V_{GS} = 4.5 \text{ V}$	6	-	-	Α	
Drain-source on-resistance <sup>a</sup>		$V_{GS} = 4.5 \text{ V}, I_D = 3.6 \text{ A}$	-	0.045	0.057		
	R <sub>DS(on)</sub>	V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 3.1 A	-	0.056	0.075	Ω	
Forward transconductance <sup>a</sup>	9 <sub>fs</sub>	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 3.6 A	-	13	-	S	
Diode forward voltage	V <sub>SD</sub>	I <sub>S</sub> = 0.95 A, V <sub>GS</sub> = 0 V	-	0.7	1.2	V	
Dynamic <sup>b</sup>							
Total gate charge	Qg		-	3.5	5.5		
Gate-source charge	Q <sub>gs</sub>	$V_{DS} = 10 \text{ V}, V_{GS} = 4.5 \text{ V}, I_D = 3.6 \text{ A}$	-	0.6	-	nC	
Gate-drain charge	$Q_{gd}$		-	0.45	-		
Gate resistance	$R_g$	f = 1 MHz	2	4	8	Ω	
Switching							
Turn-on delay time	t <sub>d(on)</sub>	$V_{DD} = 10 \text{ V}, R_L = 2.78 \Omega$	-	8	15		
Rise time	t <sub>r</sub>		-	7	15		
Turn-off delay time	t <sub>d(off)</sub>	$I_D\cong 3.6$ A, $V_{GEN}=4.5$ V, $R_g=1~\Omega$	-	30	45	ns	
Fall time	t <sub>f</sub>		-	7	15		
Source-drain reverse recovery time	t <sub>rr</sub>	1 0 6 A di/d+ 100 A/:	-	8.5	15		
Body diode reverse recovery charge	Q <sub>rr</sub>	$I_F = 3.6 \text{ A}, \text{ di/dt} = 100 \text{ A/}\mu\text{s}$	_	2	4	nC	

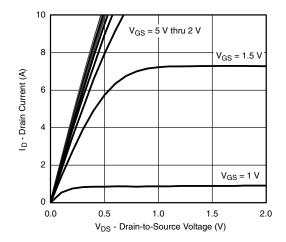
#### **Notes**

- a. Pulse test: Pulse width  $\leq 300~\mu s,\,duty~cycle \leq 2~\%$
- b. Guaranteed by design, not subject to production testing

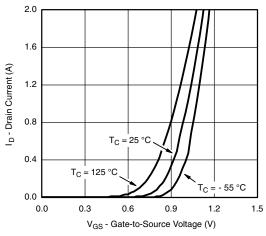
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



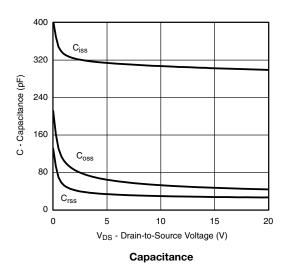
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

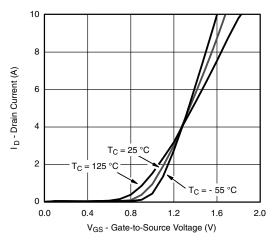


#### **Output Characteristics**

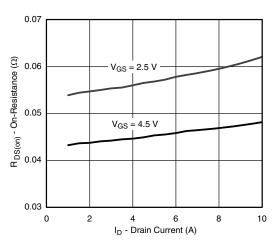


**Transfer Characteristics** 

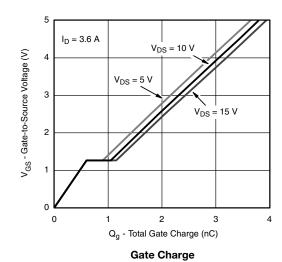




**Transfer Characteristics** 

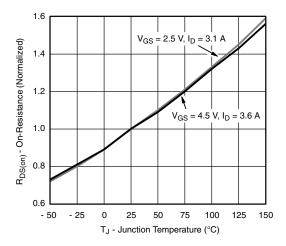


On-Resistance vs. Drain Current

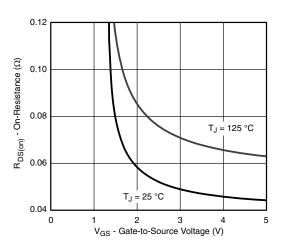




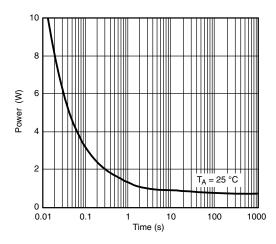
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



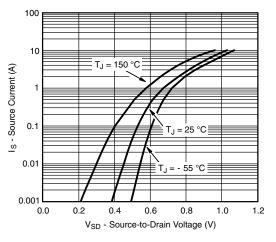
#### On-Resistance vs. Junction Temperature



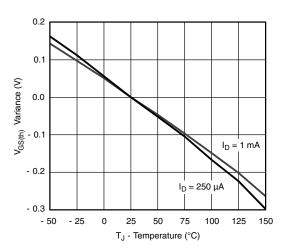
On-Resistance vs. Gate-to-Source Voltage



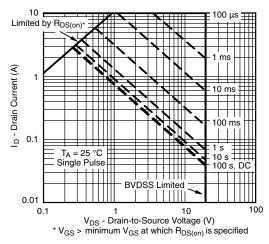
Single Pulse Power



Source-Drain Diode Forward Voltage



Threshold Voltage

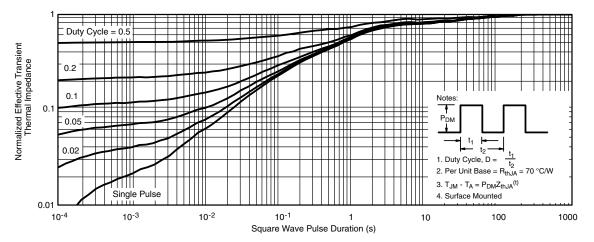


Safe Operating Area, Junction-to-Ambient

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## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient

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