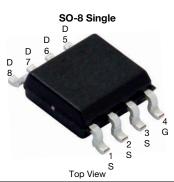
Vishay Siliconix

# N-Channel 100 V (D-S) MOSFET



PRODUCT SUMMARY						
V <sub>DS</sub> (V)	100					
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS}$ = 10 V	0.0100					
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 7.5 \text{ V}$	0.0106					
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 6 \text{ V}$	0.0113					
Q <sub>g</sub> typ. (nC)	28					
I <sub>D</sub> (A) <sup>a</sup>	18.7					
Configuration	Single					

#### **FEATURES**

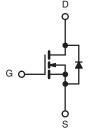
- TrenchFET® power MOSFET
- 100 % R<sub>g</sub> and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



ROHS COMPLIANT HALOGEN FREE

#### **APPLICATIONS**

- DC/DC primary side switch
- Telecom / server
- Motor drive control
- Synchronous rectification



N-Channel MOSFET

ORDERING INFORMATION			
Package	SO-8		
Lead (Pb)-free and halogen-free	SI4090BDY-T1-GE3		

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V <sub>DS</sub>	100	V
Gate-source voltage		V <sub>GS</sub>	± 20	V
	T <sub>C</sub> = 25 °C		18.7	
Continuous drain surrent /T 150 °C\	T <sub>C</sub> = 70 °C		15	
Continuous drain current (T <sub>J</sub> = 150 °C)	T <sub>A</sub> = 25 °C	I <sub>D</sub>	12.2 <sup>b, c</sup>	
	T <sub>A</sub> = 70 °C		9.8 b, c	
Pulsed drain current (t = 300 µs)		I <sub>DM</sub>	80	A
Continuous source-drain diode current	T <sub>C</sub> = 25 °C		6.7	
	T <sub>A</sub> = 25 °C	I <sub>S</sub>	2.8 b, c	
Single pulse avalanche current	. 0.1!!	I <sub>AS</sub>	35	
Avalanche energy	L = 0.1 mH	E <sub>AS</sub>	61.25	mJ
Maximum power dissipation	T <sub>C</sub> = 25 °C		7.4	
	T <sub>C</sub> = 70 °C		4.7	14/
	T <sub>A</sub> = 25 °C	P <sub>D</sub>	3.1 b, c	W
	T <sub>A</sub> = 70 °C		2.0 b, c	
Operating junction and storage temperature range		T <sub>J</sub> , T <sub>sta</sub>	-55 to +150	°C

THERMAL RESISTANCE RATINGS							
PARAMETER		SYMBOL	TYPICAL	MAXIMUM	UNIT		
Maximum junction-to-ambient b, d	t ≤ 10 s	R <sub>thJA</sub>	33	40	°C/W		
Maximum junction-to-foot (drain)	Steady state	R <sub>th.IF</sub>	15	17	]		

#### Notes

- a. Based on  $T_C = 25\ ^{\circ}C$
- b. Surface mounted on 1" x 1" FR4 board
- c. t = 10 s
- d. Maximum under steady state conditions is 90 °C/W

# Vishay Siliconix

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Static			•				
Drain-source breakdown voltage	$V_{DS}$	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	100	-	-	V	
V <sub>DS</sub> temperature coefficient	$\Delta V_{DS}/T_{J}$	I <sub>D</sub> = 10 mA	-	70	-	mV/°C	
V <sub>GS(th)</sub> temperature coefficient	$\Delta V_{GS(th)}/T_J$	I <sub>D</sub> = 250 μA	-	-7.6	-		
Gate-source threshold voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}, I_D = 250 \mu A$	2	-	4	V	
Gate-source leakage	I <sub>GSS</sub>	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$	-	-	± 100	nA	
Zero esta alta esta della consul		V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V	-	-	1	1 .	
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C -		-	10	μA	
On-state drain current a	I <sub>D(on)</sub>	$V_{DS} \ge 5 \text{ V}, V_{GS} = 10 \text{ V}$	20	-	-	Α	
	, ,	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 12.2 A	-	0.0084	0.0100		
Drain-source on-state resistance a	R <sub>DS(on)</sub>	V <sub>GS</sub> = 7.5 V, I <sub>D</sub> = 11.8 A	-	0.0088	0.0106		
	. ,	V <sub>GS</sub> = 6 V, I <sub>D</sub> = 11.5 A	-	0.0094	0.0113		
Forward transconductance <sup>a</sup>	9 <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 12.2 A	-	98	-	S	
Dynamic <sup>b</sup>			•				
Input capacitance	C <sub>iss</sub>		-	3570	-		
Output capacitance	Coss	$V_{DS} = 50 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	-	250	-	pF	
Reverse transfer capacitance	C <sub>rss</sub>		-	10	-		
Tatal asta shawa	0	V <sub>DS</sub> = 50 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 12.2 A		46.5	70		
Total gate charge	$Q_g$		-	28	42	nC	
Gate-source charge	Q <sub>gs</sub>	$V_{DS} = 50 \text{ V}, V_{GS} = 6 \text{ V}, I_{D} = 12.2 \text{ A}$	-	17	-		
Gate-drain charge	Q <sub>gd</sub>		-	5	-		
Gate resistance	R <sub>g</sub>	f = 1 MHz	0.12	0.6	1.2	Ω	
Turn-on delay time	t <sub>d(on)</sub>		-	18	36		
Rise time	t <sub>r</sub>	$V_{DD} = 50 \text{ V}, R_L = 5 \Omega$	-	6	12		
Turn-off delay time	t <sub>d(off)</sub>	$I_D \cong 10 \text{ A}, V_{GEN} = 7.5 \text{ V}, R_g = 1 \Omega$	-	30	60		
Fall time	t <sub>f</sub>		-	8	16		
Turn-on delay time	t <sub>d(on)</sub>		-	22	44	ns	
Rise time	t <sub>r</sub>	$V_{DD} = 50 \text{ V}, R_{L} = 5 \Omega$	-	8	16		
Turn-off delay time	t <sub>d(off)</sub>	$I_D \cong 10 \text{ A}, V_{GEN} = 10 \text{ V}, R_g = 1 \Omega$	-	32	64		
Fall time	t <sub>f</sub>		-	10	20		
<b>Drain-source Body Diode Characteristi</b>	cs						
Continuous source-drain diode current	I <sub>S</sub>	T <sub>C</sub> = 25 °C	-	-	7	۸	
Pulse diode forward current <sup>a</sup>	I <sub>SM</sub>		-	-	70	Α	
Body diode voltage	$V_{SD}$	I <sub>S</sub> = 5 A	-	0.75	1.1	V	
Body diode reverse recovery time	t <sub>rr</sub>		-	44	88	ns	
Body diode reverse recovery charge	Q <sub>rr</sub>	I <sub>F</sub> = 10 A, di/dt = 100 A/μs,	-	90	180	nC	
Reverse recovery fall time	ta	T <sub>J</sub> = 25 °C	-	37	-		
Reverse recovery rise time	t <sub>b</sub>		-	7	-	ns	

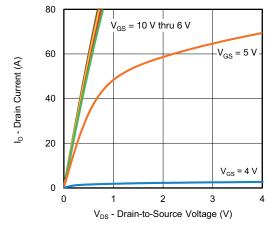
#### Notes

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

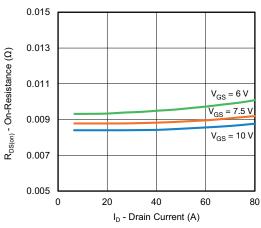
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



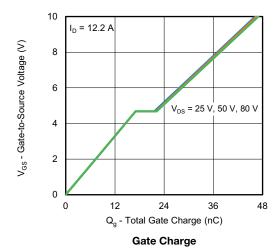
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

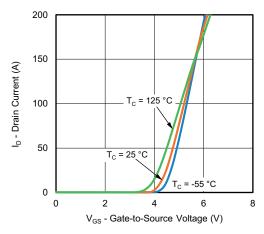


#### **Output Characteristics**

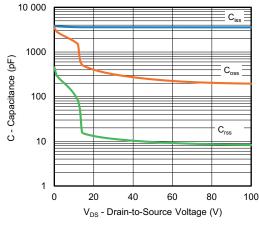


On-Resistance vs. Drain Current

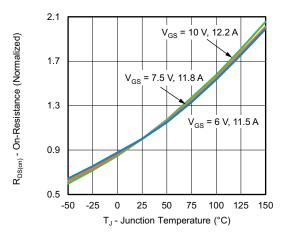




**Transfer Characteristics** 



Capacitance

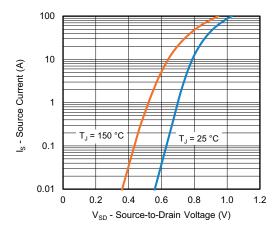


On-Resistance vs. Junction Temperature

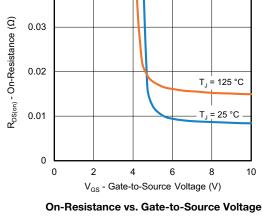
I<sub>D</sub> = 12.2 A



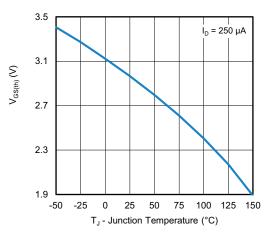
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



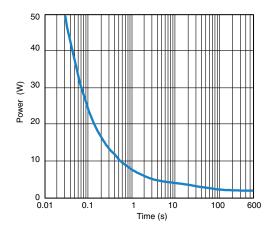
Source-Drain Diode Forward Voltage



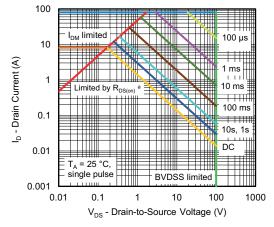
0.04



**Threshold Voltage** 



Single Pulse Power, Junction-to-Ambient



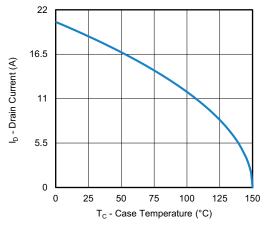
Safe Operating Area, Junction-to-Ambient

#### Note

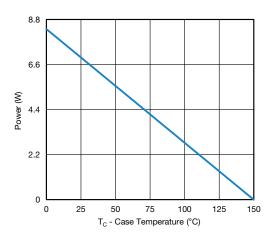
a.  $V_{GS}$  > minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

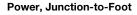


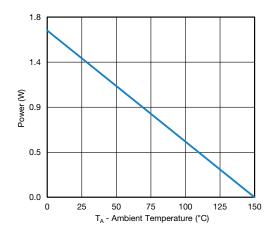
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)











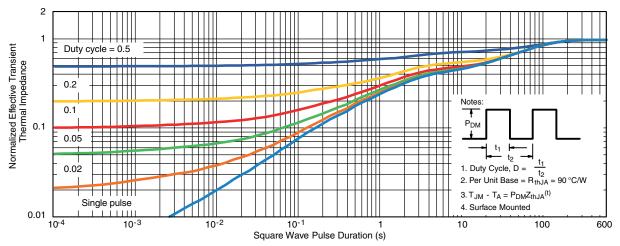
Power, Junction-to-Ambient

#### Note

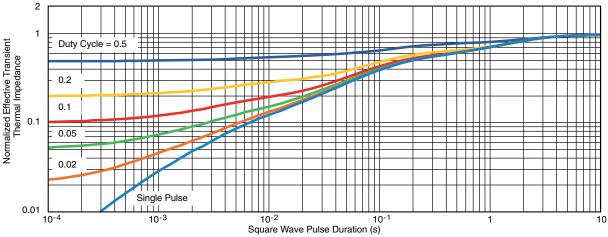
a. The power dissipation  $P_D$  is based on  $T_J$  max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit



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



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

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SOIC (NARROW): 8-LEAD JEDEC Part Number: MS-012







	MILLIM	IETERS	INC	INCHES		
DIM	Min	Max	Min	Max		
Α	1.35	1.75	0.053	0.069		
A <sub>1</sub>	0.10	0.20	0.004	0.008		
В	0.35	0.51	0.014	0.020		
С	0.19	0.25	0.0075	0.010		
D	4.80	5.00	0.189	0.196		
Е	3.80	4.00	0.150	0.157		
е	1.27	BSC	0.050 BSC			
Н	5.80	6.20	0.228	0.244		
h	0.25	0.50	0.010	0.020		
L	0.50	0.93	0.020	0.037		
q	0°	8°	0°	8°		
S	0.44	0.64	0.018	0.026		
ECN: C-06527-Rev. I. 11-Sep-06						

DWG: 5498

Document Number: 71192 www.vishay.com 11-Sep-06



### **RECOMMENDED MINIMUM PADS FOR SO-8**



Recommended Minimum Pads Dimensions in Inches/(mm)

Return to Index

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