

N-Channel 20 V (D-S) MOSFET



PRODUCT SUMMARY					
V _{DS} (V)	20				
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 10 \text{ V}$	0.0020				
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 4.5 \text{ V}$	0.0025				
Q _g typ. (nC)	34				
I _D (A) ^a	46 ^a				
Configuration	Single				

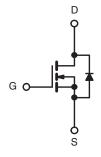
FEATURES

- TrenchFET® power MOSFET
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishav.com/doc?99912



APPLICATIONS

- OR-ing
- DC/DC



N-Channel MOSFET

ORDERING INFORMATION				
Package	SO-8			
Lead (Pb)-free and halogen-free	Si4136DY-T1-GE3			

ABSOLUTE MAXIMUM RATING	IO (IA – 20 O, C			
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V_{DS}	20	V
Gate-source voltage		V _{GS}	± 20	
Continuous drain current (T _J = 150 °C)	T _C = 25 °C		46	
	T _C = 70 °C		37	
	T _A = 25 °C	I _D	31 b, c	
	T _A = 70 °C		24.7 ^{b, c}	
Pulsed drain current		I _{DM}	70	Α
	T _C = 25 °C		7	
Continuous source-drain diode current	T _A = 25 °C	I _S	3.1 ^{b, c}	
Single pulse avalanche current	1 0111	I _{AS}	30	
Avalanche energy	L = 0.1 mH	E _{AS}	45	mJ
Maximum power dissipation	T _C = 25 °C		7.8	
	T _C = 70 °C		5	14/
	T _A = 25 °C	P _D	3.5 b, c	W
	T _A = 70 °C		2.2 ^{b, c}	
Operating junction and storage temperature range		T _J , T _{stg}	-55 to +150	°C

THERMAL RESISTANCE RATINGS							
PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT			
Maximum junction-to-ambient b, d	t ≤ 10 s	R_{thJA}	29	35	°C/W		
Maximum junction-to-foot (drain)	Steady state	R_{thJF}	13	16	C/VV		

Notes

- a. Based on T_C = 25 °C
- b. Surface mounted on 1" x 1" FR4 board
- c. t = 10 s
- d. Maximum under steady state conditions is 80 $^{\circ}\text{C/W}$

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PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Static							
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	20	-	-	V	
V _{DS} temperature coefficient	$\Delta V_{DS}/T_{J}$	J 050 A	-	19	-		
V _{GS(th)} temperature coefficient	$\Delta V_{GS(th)}/T_J$	- I _D = 250 μA		-6	-	mV/°C	
Gate-source threshold voltage	V _{GS(th)}	$V_{DS} = V_{GS}, I_D = 250 \mu A$	1	-	2.2	٧	
Gate-source leakage	I _{GSS}	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$	-	-	± 100	nA	
		V _{DS} = 20 V, V _{GS} = 0 V	-	-	1	uА	
Zero gate voltage drain current	I _{DSS}	V _{DS} = 20 V, V _{GS} = 0 V, T _J = 55 °C	-	-	10		
On-state drain current ^a	I _{D(on)}	$V_{DS} \ge 5 \text{ V}, V_{GS} = 10 \text{ V}$	30	-	-	Α	
5		$V_{GS} = 10 \text{ V}, I_D = 15 \text{ A}$	-	0.00155	0.00200	Ω	
Drain-source on-state resistance a	R _{DS(on)}	$V_{GS} = 4.5 \text{ V}, I_D = 10 \text{ A}$	-	0.00195	0.00250		
Forward transconductance a	9 _{fs}	$V_{DS} = 10 \text{ V}, I_D = 15 \text{ A}$	-	85	-	S	
Dynamic ^b		-			<u> </u>		
Input capacitance	C _{iss}		-	4560	-	pF	
Output capacitance	C _{oss}	$V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	-	1285	-		
Reverse transfer capacitance	C _{rss}		-	545	-		
	Q _g	V _{DS} = 10 V, V _{GS} = 10 V, I _D = 20 A	-	73	110	nC	
Total gate charge			-	34	50		
Gate-source charge	Q _{as}	$V_{DS} = 10 \text{ V}, V_{GS} = 4.5 \text{ V}, I_{D} = 20 \text{ A}$	-	11	-		
Gate-drain charge	Q _{ad}		-	9	-		
Gate resistance	R_g	f = 1 MHz	0.3	1.5	3	Ω	
Turn-on delay time	t _{d(on)}		-	34	60		
Rise time	t _r	$V_{DD} = 10 \text{ V}, R_L = 1 \Omega$	-	26	45	1	
Turn-off delay time	t _{d(off)}	$I_D \cong 10 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$	-	50	90		
Fall time	t _f		-	23	40		
Turn-on delay time	t _{d(on)}		-	13	25	ns	
Rise time	t _r	$V_{DD} = 10 \text{ V}, R_{I} = 1 \Omega$	-	11	22		
Turn-off delay time	t _{d(off)}	$I_D \cong 10 \text{ A}, V_{GEN} = 10 \text{ V}, R_g = 1 \Omega$	-	43	70		
Fall time	t _f		_	9	18		
Drain-Source Body Diode Characterist	ics				<u> </u>		
Continuous source-drain diode current	I _S	T _C = 25 °C	-	-	7	_	
Pulse diode forward current ^a	I _{SM}	-	-	-	70	Α	
Body diode voltage	V _{SD}	I _S = 2 A	-	0.69	1.1	٧	
Body diode reverse recovery time	t _{rr}	-	-	31	47	ns	
Body diode reverse recovery charge	Q _{rr}	$I_F = 10 \text{ A}, \text{ di/dt} = 100 \text{ A/}\mu\text{s},$	-	24	36	nC	
Reverse recovery fall time	t _a	$T_{\rm J} = 25 ^{\circ}{\rm C}$	-	15.5	- 1		
Reverse recovery rise time	t _b		_	15.5	_	ns	

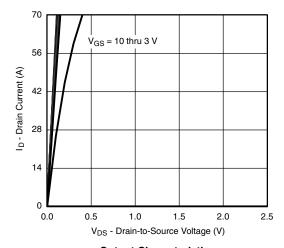
Notes

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

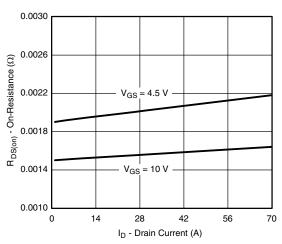
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



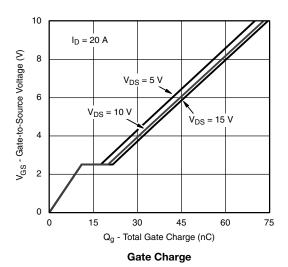
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

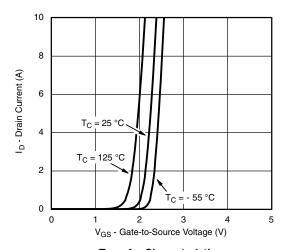


Output Characteristics

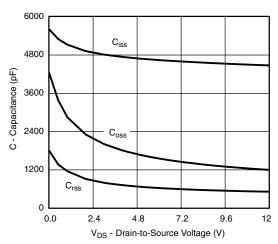


On-Resistance vs. Drain Current and Gate Voltage

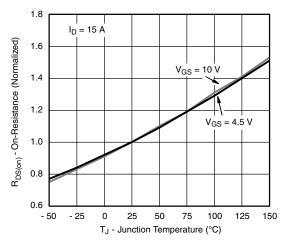




Transfer Characteristics



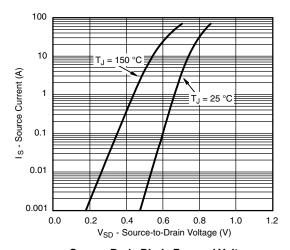
Capacitance



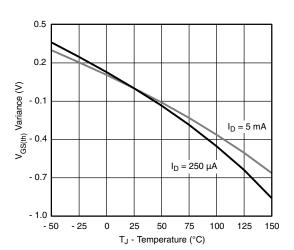
On-Resistance vs. Junction Temperature



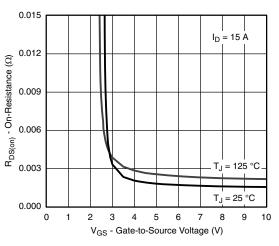
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



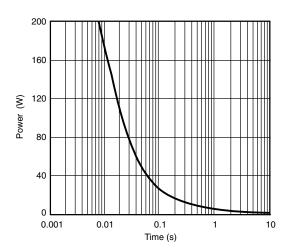
Source-Drain Diode Forward Voltage



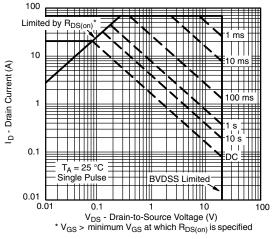
Threshold Voltage



On-Resistance vs. Gate-to-Source Voltage



Single Pulse Power, Junction-to-Ambient

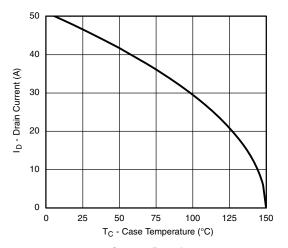


Safe Operating Area, Junction-to-Ambient

150



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

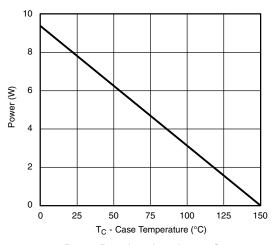


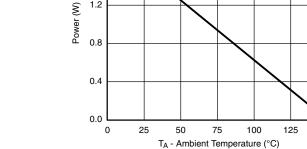
Current Derating a

2.0

1.6

1.2





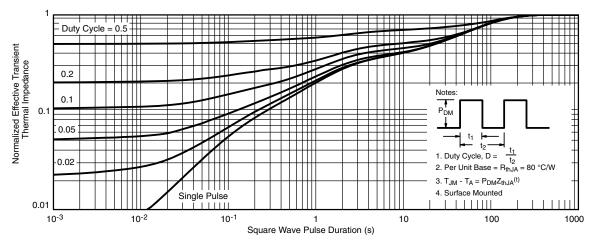
Power Derating, Junction-to-Case

Power Derating, Junction-to-Ambient

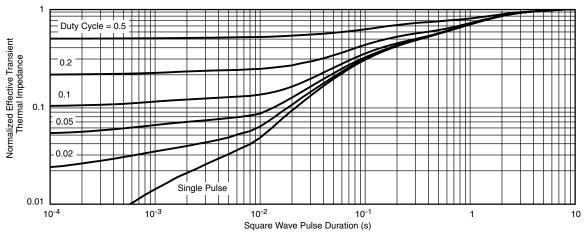
a. The power dissipation P_D is based on T_J max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit



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	HES	
DIM	Min	Max	Min	Max	
Α	1.35	1.75	0.053	0.069	
A ₁	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

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RECOMMENDED MINIMUM PADS FOR SO-8



Recommended Minimum Pads Dimensions in Inches/(mm)

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