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Vishay Siliconix



PRODUCT SUMMARY					
V _{DS} (V)	60				
$R_{DS(on)}$ max. (Ω) at V_{GS} = 10 V	0.00200				
$R_{DS(on)}$ max. (Ω) at V_{GS} = 7.5 V	0.00250				
Q _g typ. (nC)	141				
I _D (A)	150 ^d				
Configuration	Single				

FEATURES

N-Channel 60 V (D-S) MOSFET

- TrenchFET[®] power MOSFET
- Maximum 175 °C junction temperature
- Very low Q_{gd} reduces power loss from passing through $V_{plateau}$
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see <u>www.vishay.com/doc?99912</u>

APPLICATIONS

- Power supply
 Secondary synchronous rectification
- DC/DC converter
- Power tools
- Motor drive switch
- DC/AC inverter
- Battery management
- OR-ing / e-fuse

N-Channel MOSFET

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ORDERING INFORMATION	
Package	TO-220
Lead (Pb)-free and halogen-free	SUP50010E-GE3

ABSOLUTE MAXIMUM RATING	S (T _C = 25 °C, unles	ss otherwise note	d)		
PARAMETER		SYMBOL	LIMIT	UNIT	
Drain-source voltage	V _{DS}	60	v		
Gate-source voltage		V _{GS} ± 20		V	
Continuous drain current ($T_J = 150 \ ^\circ C$)	T _C = 25 °C	1	150 ^d		
	T _C = 70 °C	I _D	150 ^d	А	
Pulsed drain current (t = 100 µs)		I _{DM}	500	A	
Avalanche current		I _{AS}	60		
Single avalanche energy ^a	L = 0.1 mH	E _{AS}	180	mJ	
Marian and disain ation a	T _C = 25 °C	D	375 ^b	w	
Maximum power dissipation ^a	T _C = 125 °C	P _D	125 ^b	7 **	
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}	40	°C/W	
Junction-to-case (drain)	R _{thJC}	0.4	0/11	

Notes

a. Duty cycle ≤ 1 %

b. See SOA curve for voltage derating

c. When mounted on 1" square PCB (FR4 material)

d. Package limited

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RoHS COMPLIANT

HALOGEN

FREE

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SUP50010E

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PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Static			•	•			
Drain-source breakdown voltage	V _{DS}	V_{GS} = 0 V, I_D = 250 μ A	60	-	-	V	
Gate threshold voltage	V _{GS(th)}	$V_{DS} = V_{GS}, I_D = 250 \ \mu A$	2	-	- 4		
Gate-body leakage	I _{GSS}	$V_{DS} = 0 V, V_{GS} = \pm 20 V$	-	-	± 250	nA	
		$V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}$	-	-	1	μA	
Zero gate voltage drain current	I _{DSS}	$V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}, T_{J} = 125 ^{\circ}\text{C}$	-	-	150		
		$V_{DS} = 60 \text{ V}, \text{ V}_{GS} = 0 \text{ V}, \text{ T}_{J} = 175 ^{\circ}\text{C}$	-	-	5	mA	
On-state drain current ^a	I _{D(on)}	$V_{DS} \! \geq \! 10$ V, $V_{GS} \! = \! 10$ V	120	-	-	А	
D	_	$V_{GS} = 10 \text{ V}, \text{ I}_{D} = 30 \text{ A}$	-	0.00166	0.00200	1	
Drain-source on-state resistance ^a	R _{DS(on)}	$V_{GS} = 7.5 \text{ V}, \text{ I}_{D} = 20 \text{ A}$	-	0.00208	0.00250	Ω	
Forward transconductance a	g _{fs}	$V_{DS} = 15 \text{ V}, \text{ I}_{D} = 30 \text{ A}$	-	120	-	S	
Dynamic ^b			I	•	I		
Input capacitance	C _{iss}		-	10 895	-	pF	
Output capacitance	C _{oss}	V_{GS} = 0 V, V_{DS} = 30 V, f = 1 MHz	-	2420	-		
Reverse transfer capacitance	C _{rss}		-	85	-		
Total gate charge ^c	Qg		-	141	212		
Gate-source charge ^c	Q _{gs}	$V_{DS} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 20 \text{ A}$	-	43.6	-	-	
Gate-drain charge ^c	Q _{gd}		-	19.1	-	nC	
Output charge	Q _{oss}	$V_{DS} = 50 \text{ V}, \text{ V}_{GS} = 0 \text{ V}$	-	143	215		
Gate resistance	R _g	f = 1 MHz	0.24	1.2	2.4	Ω	
Turn-on delay time ^c	t _{d(on)}		-	28	56		
Rise time ^c	tr	V_{DD} = 30 V, R_L = 3 Ω	-	12	24		
Turn-off delay time ^c	t _{d(off)}	$I_D \cong 10$ Å, $V_{GEN} = 10$ V, $R_g = 1$ Ω	-	50	100	ns	
Fall time ^c	t _f		-	13	26		
Drain-Source Body Diode Ratings	and Characte	ristics ^b (T _C = 25 °C)			I		
Pulsed current (t = 100 µs)	I _{SM}		-	-	250	А	
Forward voltage ^a	V _{SD}	$I_{F} = 10 \text{ A}, V_{GS} = 0 \text{ V}$	-	0.8	1.5	V	
Reverse recovery time	t _{rr}		-	75	150	ns	
Peak reverse recovery charge	I _{RM(REC)}		-	2.8	5.6	А	
Reverse recovery charge	Q _{rr}	I _F = 34 A, di/dt = 100 A/µs	-	0.12	0.24	μC	
Reverse recovery fall time	t _a		-	38	-		
Reverse recovery rise time	t _b		-	37	-	ns	

Notes

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

b. Guaranteed by design, not subject to production testing

c. Independent of operating temperature

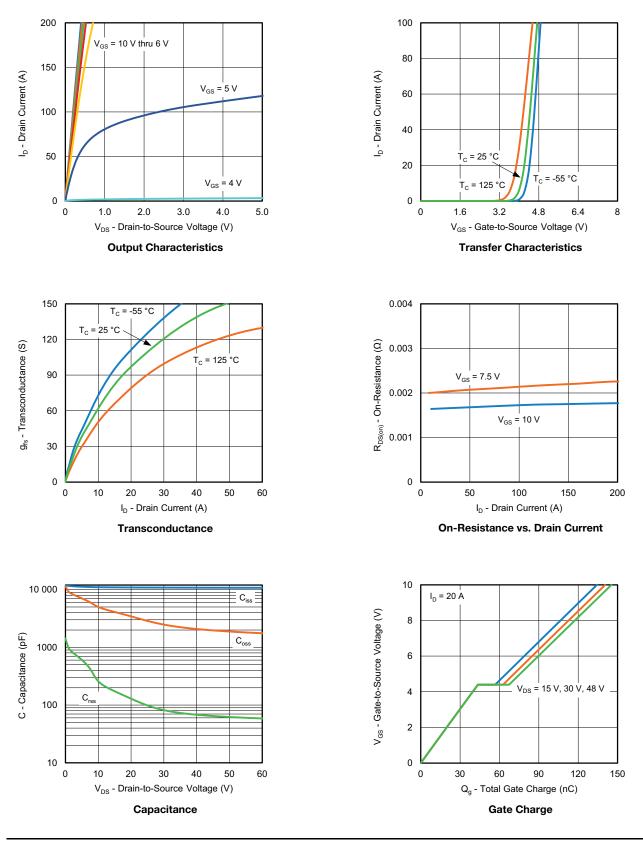
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



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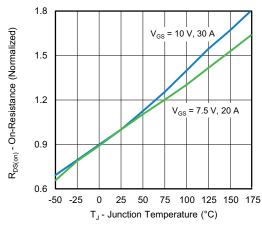
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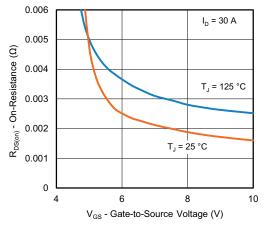


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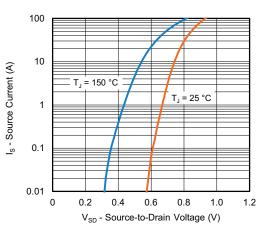
TYPICAL CHARACTERISTICS ($T_A = 25 \text{ °C}$, unless otherwise noted)



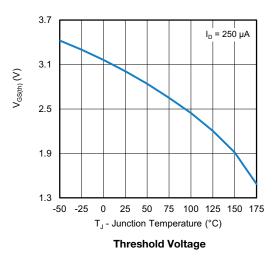
On-Resistance vs. Junction Temperature

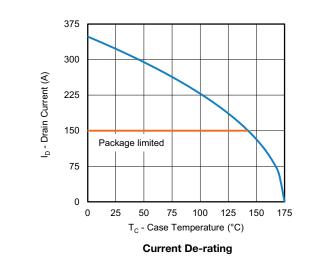


On-Resistance vs. Gate-to-Source Voltage



Source Drain Diode Forward Voltage





(2) (3)

Drain Source Breakdown vs. Junction Temperature

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 $I_{D} = 250 \ \mu A$

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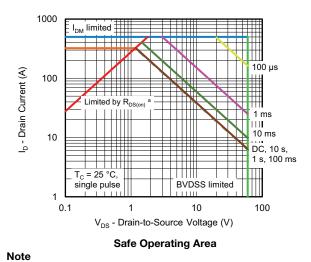
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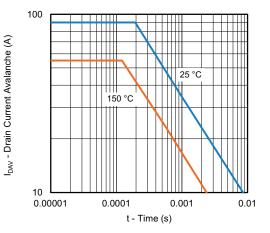


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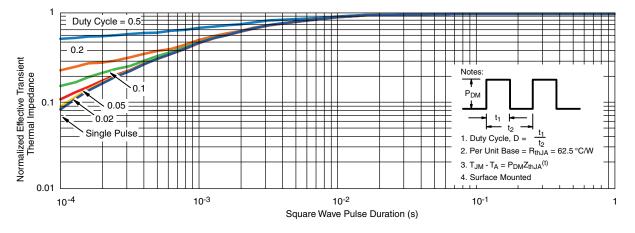
THERMAL RATINGS ($T_A = 25$ °C, unless otherwise noted)





Single Pulse Avalanche Current Capability vs. Time

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



Normalized Thermal Transient Impedance, Junction-to-Case

Note

- The characteristics shown in the two graphs
- Normalized Transient Thermal Impedance Junction to Ambient (25 °C)
- Normalized Transient Thermal Impedance Junction to Case (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 pplication 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/ppg?79578.

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