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Vishay Siliconix

# N-Channel 80 V (D-S) MOSFET

PRODUCT SUMMARY					
V <sub>DS</sub> (V)	$R_{DS(on)}$ ( $\Omega$ ) MAX.	I <sub>D</sub> (A) <sup>d</sup> Q <sub>g</sub> (TYP			
80	0.0034 at V <sub>GS</sub> = 10 V	120	94		
	0.0036 at V <sub>GS</sub> = 7.5 V	120	94		



### **Ordering Information:**

SUP60030E-GE3 (lead (Pb)-free and halogen-free)

### **FEATURES**

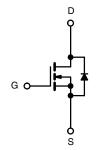
- TrenchFET® power MOSFET
- Maximum 175 °C junction temperature



- $\bullet$  Very low  $Q_{gd}$  reduces power loss from passing through  $V_{plateau}$
- 100 % R<sub>a</sub> and UIS tested
- Material categorization: for definitions of compliance please see <a href="https://www.vishay.com/doc?99912">www.vishay.com/doc?99912</a>

### **APPLICATIONS**

- Power supply
  - Secondary synchronous rectification
- DC/DC converter
- Power tools
- · Motor drive switch
- DC/AC inverter
- · Battery management



N-Channel MOSFET

<b>ABSOLUTE MAXIMUM RATINGS</b> (T <sub>C</sub> = 25 °C, unless otherwise noted)					
PARAMETER	SYMBOL	LIMIT	UNIT		
Drain-Source Voltage	V <sub>DS</sub>	80	V		
Gate-Source Voltage	V <sub>GS</sub>	± 20	v		
Continuous Dunis Comment (T. 150 °C)	T <sub>C</sub> = 25 °C		120 <sup>d</sup>		
Continuous Drain Current (T <sub>J</sub> = 150 °C)	T <sub>C</sub> = 70 °C	I <sub>D</sub>	120 <sup>d</sup>		
Pulsed Drain Current (t = 100 μs)	I <sub>DM</sub>	250	A		
Avalanche Current	I <sub>AS</sub>	70			
Single Avalanche Energy <sup>a</sup>	L = 0.1 mH	E <sub>AS</sub>	245	mJ	
Maximum Dawar Dissipation 8	T <sub>C</sub> = 25 °C	В	375 b	10/	
Maximum Power Dissipation <sup>a</sup>	T <sub>C</sub> = 125 °C	P <sub>D</sub>	125 b	W	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	-55 to +175	°C	

THERMAL RESISTANCE RATINGS					
PARAMETER	SYMBOL	LIMIT	UNIT		
Junction-to-Ambient (PCB Mount) <sup>c</sup>	R <sub>thJA</sub>	40	°C/W		
Junction-to-Case (Drain)	R <sub>thJC</sub>	0.4			

### 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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PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Static							
Drain-Source Breakdown Voltage	V <sub>DS</sub>	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	80	-	-	V	
Gate Threshold Voltage	V <sub>GS(th)</sub>	$V_{GS(th)}$ $V_{DS} = V_{GS}$ , $I_D = 250 \mu A$		-	4	V	
Gate-Body Leakage	I <sub>GSS</sub>	$V_{DS} = 0 V$ , $V_{GS} = \pm 20 V$	-	-	± 250	nA	
		$V_{DS} = 80 \text{ V}, V_{GS} = 0 \text{ V}$	-	-	1		
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	$V_{DS}$ = 80 V, $V_{GS}$ = 0 V, $T_J$ = 125 °C	-	-	150	- μΑ	
		$V_{DS}$ = 80 V, $V_{GS}$ = 0 V, $T_J$ = 175 °C	-	-	5	mA	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	$V_{DS} \ge 10 \text{ V}, V_{GS} = 10 \text{ V}$	120	-	-	Α	
Drain Source On State Resistance 8	D	$V_{GS} = 10 \text{ V}, I_D = 30 \text{ A}$	-	0.0028	0.0034	0	
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	$V_{GS} = 7.5 \text{ V}, I_D = 20 \text{ A}$	-	0.0030	0.0036	Ω	
Forward Transconductance <sup>a</sup>	9 <sub>fs</sub>	$V_{DS} = 15 \text{ V}, I_D = 30 \text{ A}$	-	82	-	S	
Dynamic <sup>b</sup>							
Input Capacitance	C <sub>iss</sub>		-	7910	-	pF	
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 40 V, f = 1 MHz	-	3250	-		
Reverse Transfer Capacitance	C <sub>rss</sub>		-	348	-		
Total Gate Charge <sup>c</sup>	Qg		-	94	141	nC	
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>	$V_{DS} = 40 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 20 \text{ A}$	-	31	-		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$		-	10	-		
Gate Resistance	$R_g$	f = 1 MHz	0.28	1.4	2.8	Ω	
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>		-	24	40		
Rise Time <sup>c</sup>	t <sub>r</sub>	$V_{DD}$ = 40 V, $R_L$ = 4 $\Omega$	-	24	40	nc	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>	$I_D \cong 10 \text{ A}, V_{GEN} = 10 \text{ V}, R_g = 1 \Omega$	-	34	60	ns	
Fall Time <sup>c</sup>	t <sub>f</sub>		-	14	28		
Drain-Source Body Diode Ratings an	nd Characteris	stics <sup>b</sup> (T <sub>C</sub> = 25 °C)					
Pulsed Current (t = 100 μs)	I <sub>SM</sub>		-	-	250	Α	
Forward Voltage <sup>a</sup>	V <sub>SD</sub>	I <sub>F</sub> = 10 A, V <sub>GS</sub> = 0 V	-	0.8	1.5	V	
Reverse Recovery Time	t <sub>rr</sub>		-	126	190	ns	
Peak Reverse Recovery Charge	I <sub>RM(REC)</sub>	$I_F = 34 \text{ A}, \text{ di/dt} = 100 \text{ A/}\mu\text{s}$	-	5	10	Α	
Reverse Recovery Charge	Q <sub>rr</sub>		-	0.315	0.475	μC	

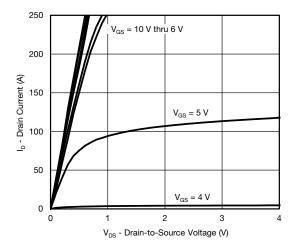
#### **Notes**

- 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.

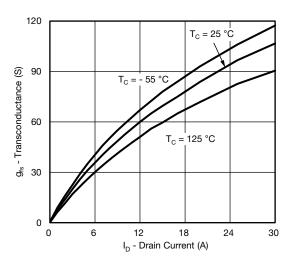
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



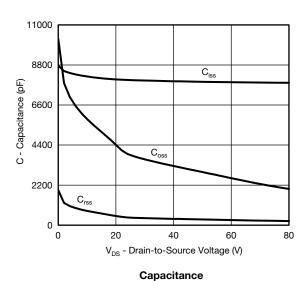
### **TYPICAL CHARACTERISTICS** (T<sub>A</sub> = 25 °C, unless otherwise noted)



### **Output Characteristics**



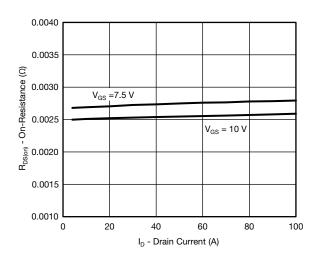
### Transconductance



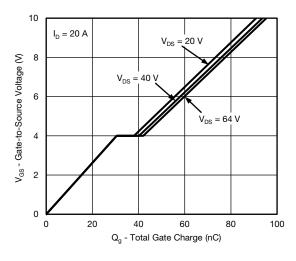
S15-1869-Rev. A, 10-Aug-15

100 80 I<sub>D</sub> - Drain Current (A) 60 125 °C 40 55 °C 20 0 0 2 V<sub>GS</sub> - Gate-to-Source Voltage (V)

#### **Transfer Characteristics**

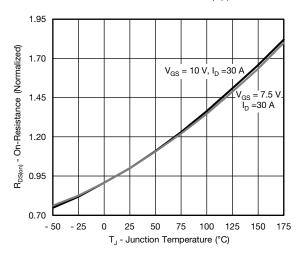


### On-Resistance vs. Drain Current

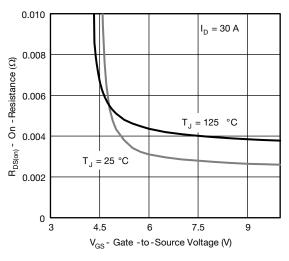




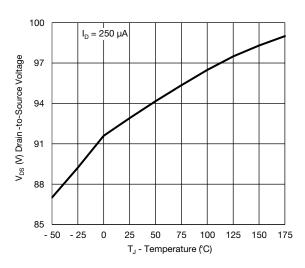
### **TYPICAL CHARACTERISTICS** (T<sub>A</sub> = 25 °C, unless otherwise noted)



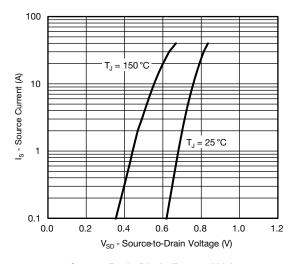
### On-Resistance vs. Junction Temperature



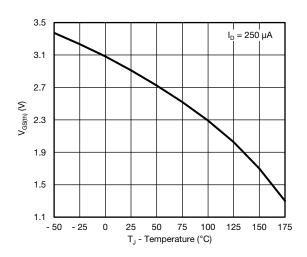
On-Resistance vs. Gate-to-Source Voltage



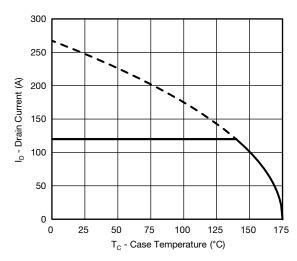
Drain Source Breakdown vs. Junction Temperature



### Source Drain Diode Forward Voltage



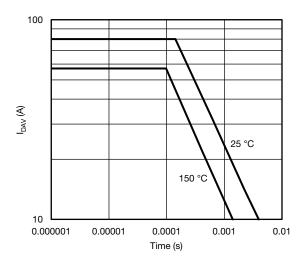
### **Threshold Voltage**



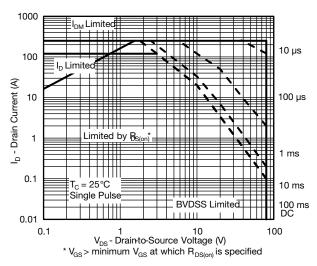
**Current De-rating** 



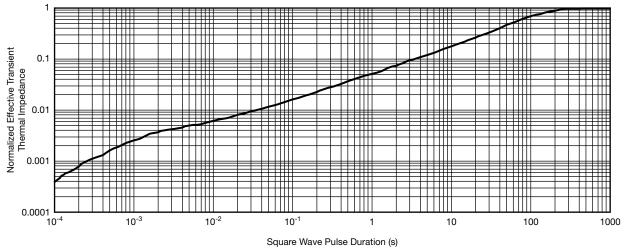
### **THERMAL RATINGS** (T<sub>A</sub> = 25 °C, unless otherwise noted)



Single Pulse Avalanche Current Capability vs. Time



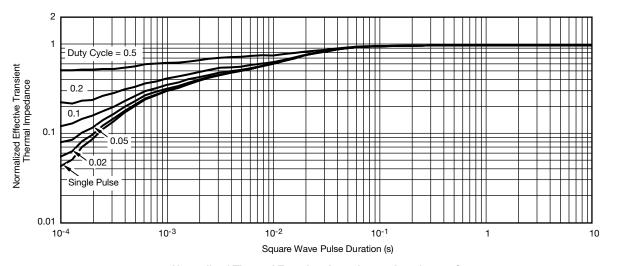
Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient



### THERMAL RATINGS (T<sub>A</sub> = 25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Case

#### Note

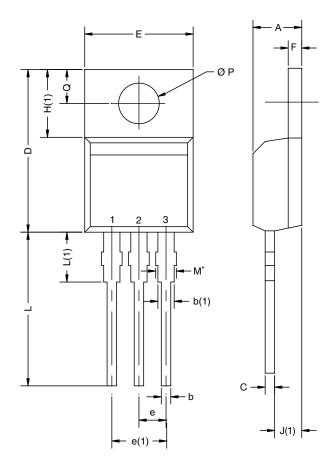
- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction to Ambient (25 °C)
  - Normalized Transient Thermal Impedance Junction to Case (25 °C) are given for general guidelines only to enable the user to get a "ball park" indication of part capabilities. The data 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 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 <a href="https://www.vishay.com/ppg268293">www.vishay.com/ppg268293</a>.





## **TO-220AB**



	D2

	MILLIMETERS		INC	HES
DIM.	MIN.	MAX.	MIN.	MAX.
А	4.25	4.65	0.167	0.183
b	0.69	1.01	0.027	0.040
b(1)	1.20	1.73	0.047	0.068
С	0.36	0.61	0.014	0.024
D	14.85	15.49	0.585	0.610
D2	12.19	12.70	0.480	0.500
Е	10.04	10.51	0.395	0.414
е	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	6.09	6.48	0.240	0.255
J(1)	2.41	2.92	0.095	0.115
L	13.35	14.02	0.526	0.552
L(1)	3.32	3.82	0.131	0.150
ØΡ	3.54	3.94	0.139	0.155
Q	2.60	3.00	0.102	0.118
ECN: T14-0413-Rev. P, 16-Jun-14 DWG: 5471				

### Note

 $<sup>^{\</sup>star}$  M = 1.32 mm to 1.62 mm (dimension including protrusion) Heatsink hole for HVM



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