

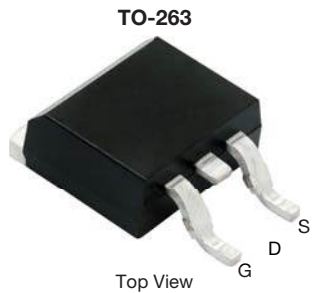


**THE DATASHEET OF  
SUM10250E-GE3**



## N-Channel 250 V (D-S) 175 °C MOSFET

PRODUCT SUMMARY			
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω) MAX.	I <sub>D</sub> (A)	Q <sub>g</sub> (TYP.)
250	0.031 at V <sub>GS</sub> = 10 V	63.5	57.6 nC
	0.032 at V <sub>GS</sub> = 7.5 V	62.5	


**Ordering Information:**

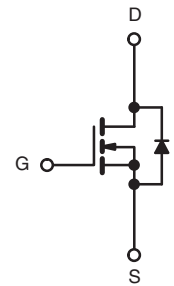
SUM10250E-GE3 (lead (Pb)-free and halogen-free)

**FEATURES**

- ThunderFET® power MOSFET
- Tuned for the lowest R<sub>DS-Coss</sub> FOM
- Maximum 175 °C junction temperature
- 100 % R<sub>g</sub> and UIS tested
- Material categorization:  
for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**
**APPLICATIONS**

- Power supplies:
  - Uninterruptible power supplies
  - AC/DC switch-mode power supplies
  - Lighting
- Synchronous rectification
- DC/DC converter
- Motor drive switch
- DC/AC inverter
- Solar micro inverter
- Class D audio amplifier



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> = 25 °C, unless otherwise noted)				
PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-Source Voltage	V <sub>DS</sub>	250	V	
Gate-Source Voltage	V <sub>GS</sub>	± 20		
Continuous Drain Current (T <sub>J</sub> = 150 °C)	I <sub>D</sub>	T <sub>C</sub> = 25 °C	A	
		T <sub>C</sub> = 70 °C		
Pulsed Drain Current (t = 100 μs)	I <sub>DM</sub>	150		
Avalanche Current	I <sub>AS</sub>	60		
Single Avalanche Energy <sup>a</sup>	E <sub>AS</sub>	180	mJ	
Maximum Power Dissipation <sup>a</sup>	P <sub>D</sub>	T <sub>C</sub> = 25 °C	W	
		T <sub>C</sub> = 125 °C		
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**

- Duty cycle ≤ 1 %.
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR4 material).



SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	250	-	-	V
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2	-	4	
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V	-	-	± 250	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 250 V, V <sub>GS</sub> = 0 V	-	-	1	μA
		V <sub>DS</sub> = 250 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C	-	-	150	
		V <sub>DS</sub> = 250 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 175 °C	-	-	5	mA
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> ≥ 10 V, V <sub>GS</sub> = 10 V	90	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 30 A	-	0.0247	0.0310	Ω
		V <sub>GS</sub> = 7.5 V, I <sub>D</sub> = 30 A	-	0.0255	0.0320	
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 30 A	-	63	-	S
<b>Dynamic <sup>b</sup></b>						
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 125 V, f = 1 MHz	-	3002	-	pF
Output Capacitance	C <sub>oss</sub>		-	184	-	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	18	-	
Total Gate Charge <sup>c</sup>	Q <sub>g</sub>	V <sub>DS</sub> = 125 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 60 A	-	57.6	88	nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>		-	15.1	-	
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>		-	18.4	-	
Gate Resistance	R <sub>g</sub>	f = 1 MHz	1.5	3.1	5	Ω
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = 125 V, R <sub>L</sub> = 2.08 Ω I <sub>D</sub> ≅ 60 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 1 Ω	-	13	26	ns
Rise Time <sup>c</sup>	t <sub>r</sub>		-	93	180	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>		-	30	60	
Fall Time <sup>c</sup>	t <sub>f</sub>		-	72	144	
<b>Drain-Source Body Diode Ratings and Characteristics <sup>b</sup> (T<sub>C</sub> = 25 °C)</b>						
Pulsed Current (t = 100 μs)	I <sub>SM</sub>		-	-	100	A
Forward Voltage <sup>a</sup>	V <sub>SD</sub>	I <sub>F</sub> = 10 A, V <sub>GS</sub> = 0 V	-	0.79	1.2	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 30 A, di/dt = 100 A/μs	-	212	420	ns
Peak Reverse Recovery Charge	I <sub>RM(REC)</sub>		-	14.5	29	A
Reverse Recovery Charge	Q <sub>rr</sub>		-	1.6	3.2	μC

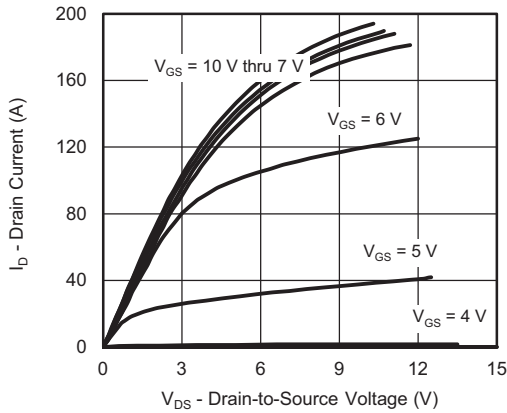
**Notes**

- Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

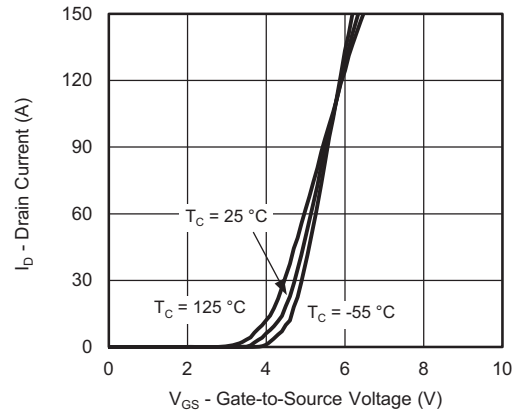
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



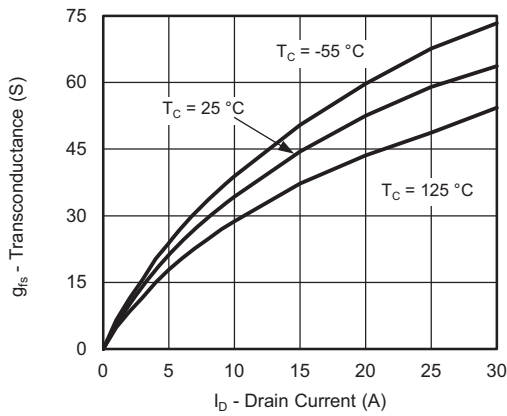
**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



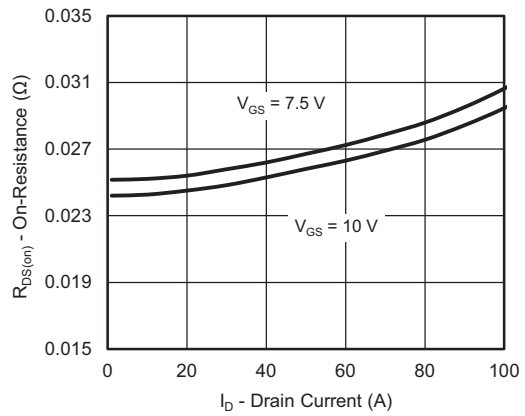
**Output Characteristics**



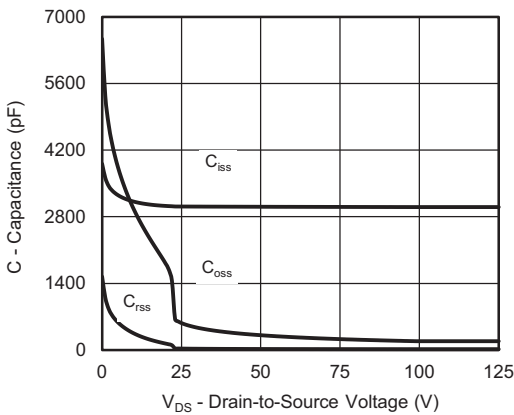
**Transfer Characteristics**



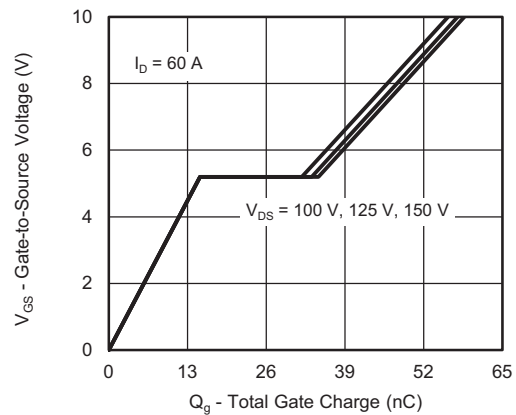
**Transconductance**



**On-Resistance vs. Drain Current**



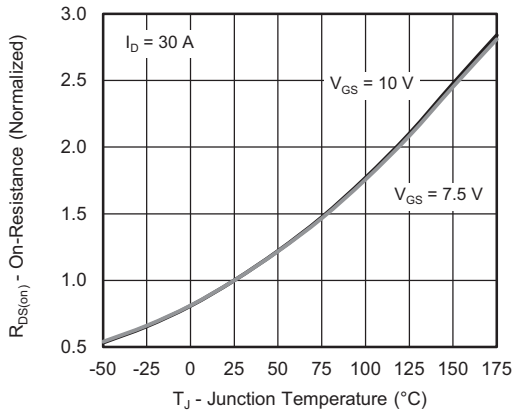
**Capacitance**



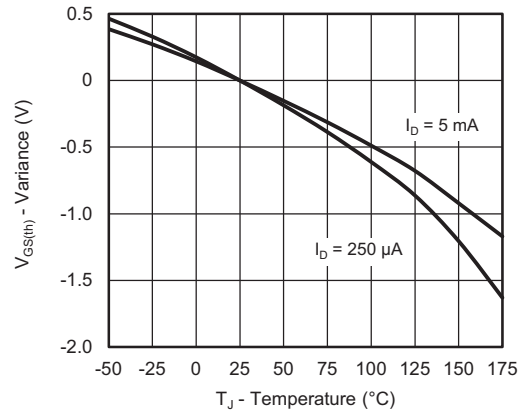
**Gate Charge**



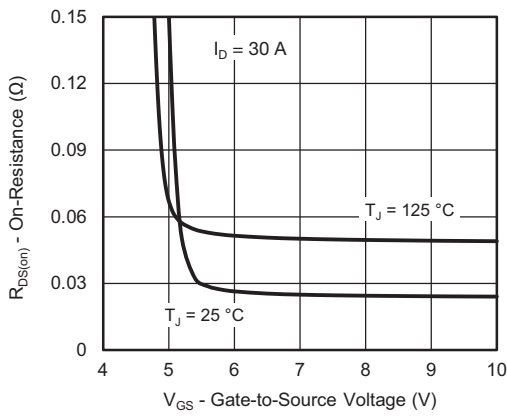
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C, unless otherwise noted)



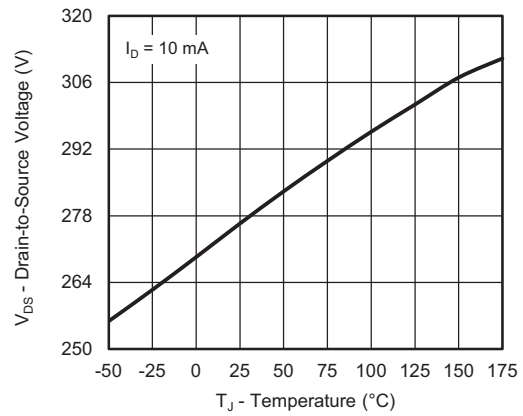
On-Resistance vs. Junction Temperature



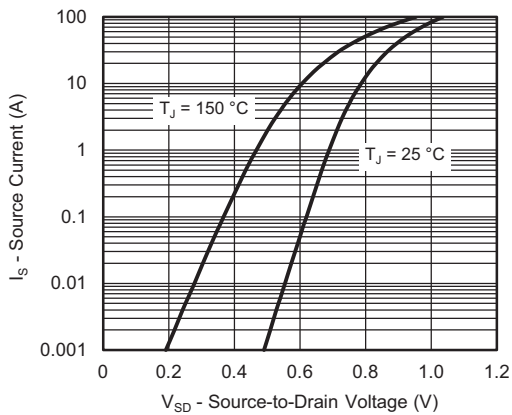
Threshold Voltage



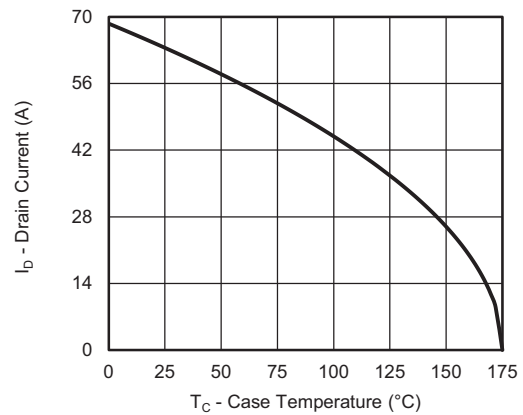
On-Resistance vs. Gate-to-Source Voltage



Drain Source Breakdown vs. Junction Temperature



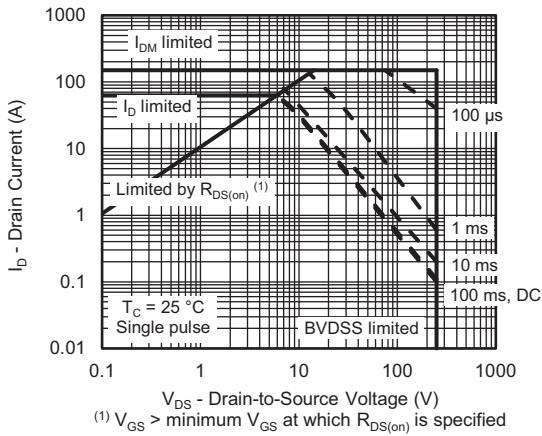
Source Drain Diode Forward Voltage



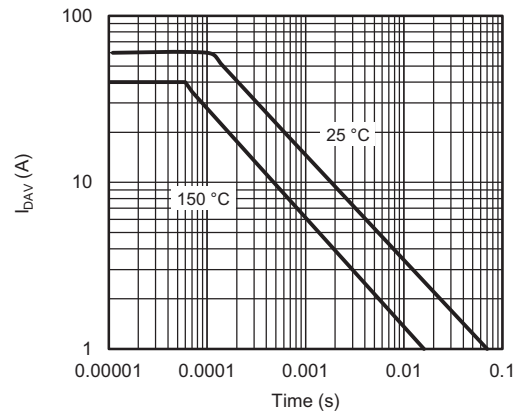
Current Derating



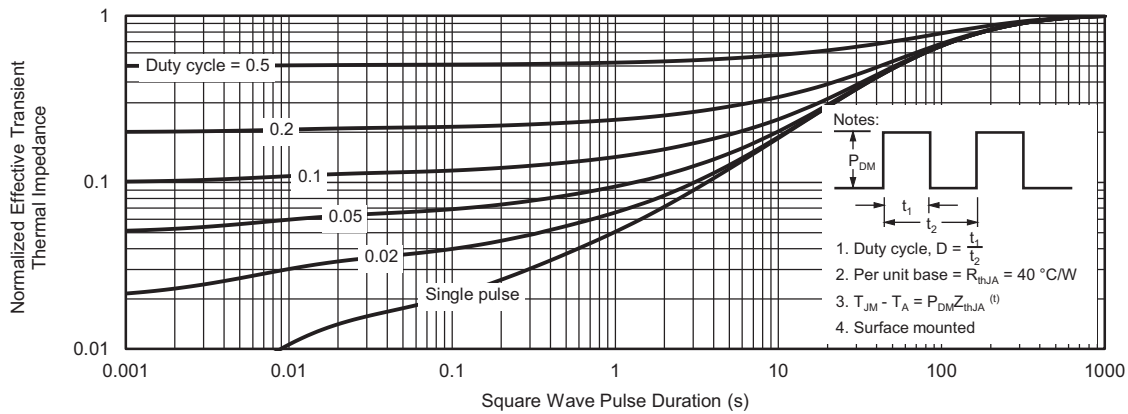
**THERMAL RATINGS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



**Safe Operating Area**



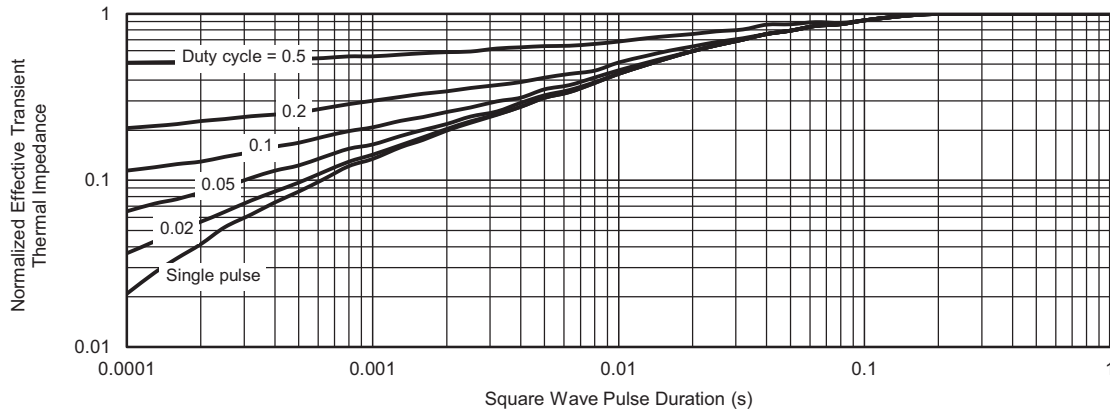
**Single Pulse Avalanche Current Capability vs. Time**



**Normalized Thermal Transient Impedance, Junction-to-Ambient**



**THERMAL RATINGS** ( $T_A = 25\text{ }^\circ\text{C}$ , 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 ( $25\text{ }^\circ\text{C}$ )
  - Normalized Transient Thermal Impedance Junction to Case ( $25\text{ }^\circ\text{C}$ )
 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.

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### TO-263 (D<sup>2</sup>PAK): 3-LEAD



DIM.	INCHES		MILLIMETERS		
	MIN.	MAX.	MIN.	MAX.	
A	0.160	0.190	4.064	4.826	
b	0.020	0.039	0.508	0.990	
b1	0.020	0.035	0.508	0.889	
b2	0.045	0.055	1.143	1.397	
c*	Thin lead	0.013	0.018	0.330	0.457
	Thick lead	0.023	0.028	0.584	0.711
c1	Thin lead	0.013	0.017	0.330	0.431
	Thick lead	0.023	0.027	0.584	0.685
c2	0.045	0.055	1.143	1.397	
D	0.340	0.380	8.636	9.652	
D1	0.220	0.240	5.588	6.096	
D2	0.038	0.042	0.965	1.067	
D3	0.045	0.055	1.143	1.397	
D4	0.044	0.052	1.118	1.321	
E	0.380	0.410	9.652	10.414	
E1	0.245	-	6.223	-	
E2	0.355	0.375	9.017	9.525	
E3	0.072	0.078	1.829	1.981	
e	0.100 BSC		2.54 BSC		
K	0.045	0.055	1.143	1.397	
L	0.575	0.625	14.605	15.875	
L1	0.090	0.110	2.286	2.794	
L2	0.040	0.055	1.016	1.397	
L3	0.050	0.070	1.270	1.778	
L4	0.010 BSC		0.254 BSC		
M	-	0.002	-	0.050	
ECN: T13-0707-Rev. K, 30-Sep-13					
DWG: 5843					

**Notes**

- Plane B includes maximum features of heat sink tab and plastic.
- No more than 25 % of L1 can fall above seating plane by max. 8 mils.
- Pin-to-pin coplanarity max. 4 mils.
- \*: Thin lead is for SUB, SYB.  
Thick lead is for SUM, SYM, SQM.
- Use inches as the primary measurement.
- This feature is for thick lead.

**RECOMMENDED MINIMUM PADS FOR D<sup>2</sup>PAK: 3-Lead**



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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