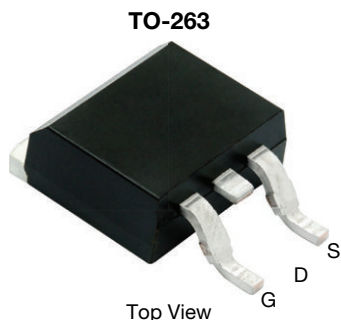


# N-Channel 200 V (D-S) 175 °C MOSFET



## FEATURES

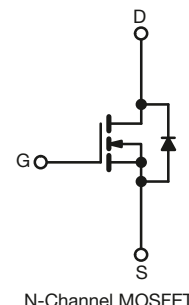
- ThunderFET® power MOSFET
- Maximum 175 °C junction temperature
- 100 %  $R_g$  and UIS tested
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**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

## PRODUCT SUMMARY

$V_{DS}$ (V)	200
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 10$ V	0.0150
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 7.5$ V	0.0165
$Q_g$ typ. (nC)	58
$I_D$ (A)	90
Configuration	Single

## ORDERING INFORMATION

Package	TO-263
Lead (Pb)-free and halogen-free	SUM90142E-GE3

## ABSOLUTE MAXIMUM RATINGS ( $T_A = 25$ °C, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	$V_{DS}$	200	V
Gate-source voltage	$V_{GS}$	$\pm 20$	V
Continuous drain current	$I_D$	$T_C = 25$ °C	90
		$T_C = 125$ °C	52
Pulsed drain current ( $t = 100$ $\mu$ s)	$I_{DM}$	240	A
Continuous source-drain diode current	$I_S$	90	A
Single pulse avalanche current <sup>a</sup>	$I_{AS}$	60	mJ
Single pulse avalanche energy <sup>a</sup>			
Maximum power dissipation	$P_D$	$T_C = 25$ °C	375 <sup>b</sup>
		$T_C = 125$ °C	125 <sup>b</sup>
Operating junction and storage temperature range	$T_J, T_{stg}$	-55 to +175	°C
Soldering recommendations (peak temperature) <sup>c</sup>		260	

## THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	MAXIMUM	UNIT
Maximum junction-to-ambient (PCB mount) <sup>c</sup>	$R_{thJA}$	40	°C/W
Maximum junction-to-case (drain)	$R_{thJC}$	0.4	

### Notes

- Duty cycle  $\leq 1$  %.
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR4 material).
- Package limited.



SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	200	-	-	V
Gate-source threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2	-	4	V
Gate-source 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> = 200 V, V <sub>GS</sub> = 0 V	-	-	1	μA
		V <sub>DS</sub> = 200 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C	-	-	150	
		V <sub>DS</sub> = 200 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	60	-	-	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	-	0.0123	0.0150	Ω
		V <sub>GS</sub> = 7.5 V, I <sub>D</sub> = 30 A	-	0.0130	0.0165	
Forward transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 30 A	-	63	-	S
Dynamic <sup>b</sup>						
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V, f = 1 MHz	-	3120	-	pF
Output capacitance	C <sub>oss</sub>		-	280	-	
Reverse transfer capacitance	C <sub>rss</sub>		-	24	-	
Total gate charge	Q <sub>g</sub>	V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 60 A	-	58	87	nC
Gate-source charge	Q <sub>gs</sub>		-	17.6	-	
Gate-drain charge	Q <sub>gd</sub>		-	17.2	-	
Output charge	Q <sub>oss</sub>	V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V	-	108	162	Ω
Gate resistance	R <sub>g</sub>	f = 1 MHz	1.5	3	5	
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> = 100 V, R <sub>L</sub> = 1.66 Ω, I <sub>D</sub> ≅ 60 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 1 Ω	-	14	28	
Rise time	t <sub>r</sub>		-	125	250	
Turn-off delay time	t <sub>d(off)</sub>		-	27	54	
Fall time	t <sub>f</sub>		-	80	150	
Drain-Source Body Diode Characteristics						
Pulse diode forward current (t = 100 μs)	I <sub>SM</sub>		-	-	240	A
Body diode voltage	V <sub>SD</sub>	I <sub>F</sub> = 30 A, V <sub>GS</sub> = 0 V	-	0.85	1.5	V
Body diode reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 30 A, dI/dt = 100 A/μs	-	150	300	ns
Body diode reverse recovery charge	Q <sub>rr</sub>		-	0.9	1.8	nC
Reverse recovery fall time	t <sub>a</sub>		-	125	-	ns
Reverse recovery rise time	t <sub>b</sub>		-	25	-	
Body diode peak reverse recovery charge	I <sub>RM(REC)</sub>		-	11.5	20	A

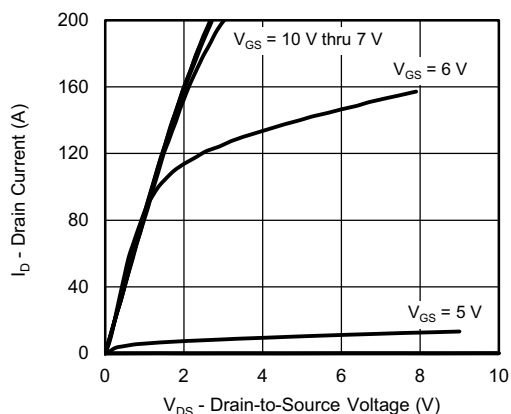
**Notes**

- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
b. Guaranteed by design, not subject to production testing.  
c. Independent of operating temperature.

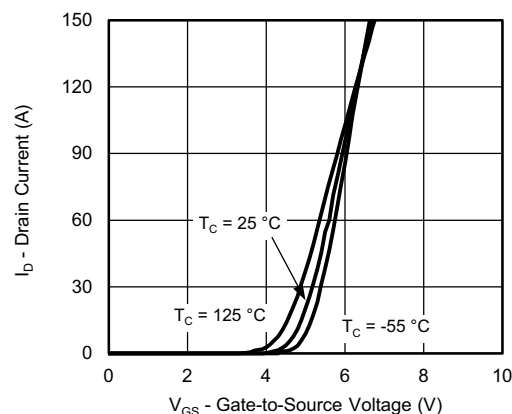
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



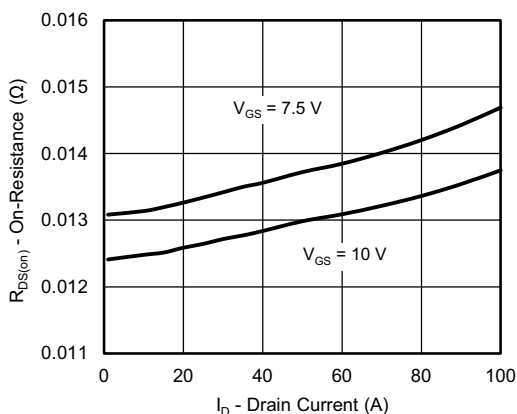
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



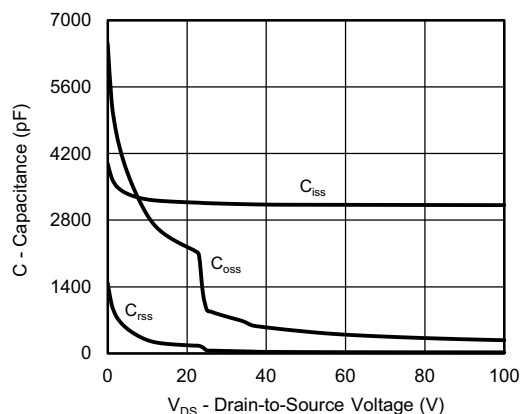
**Output Characteristics**



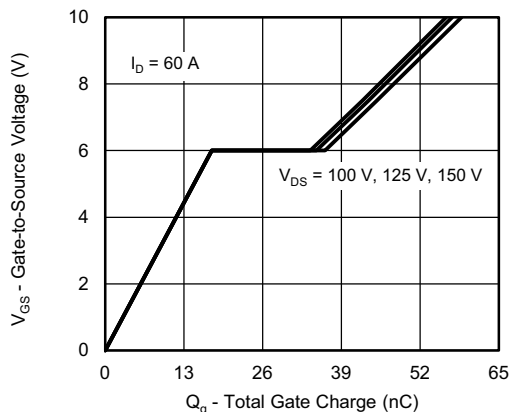
**Transfer Characteristics**



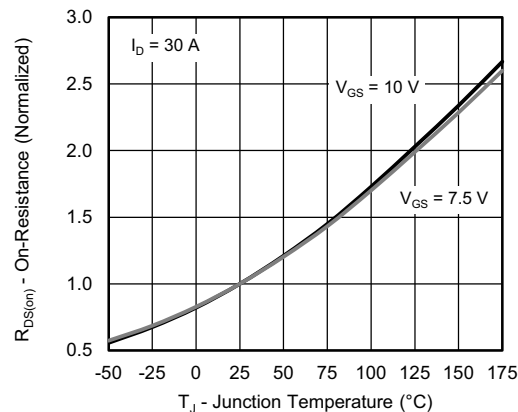
**On-Resistance vs. Drain Current and Gate Voltage**



**Capacitance**



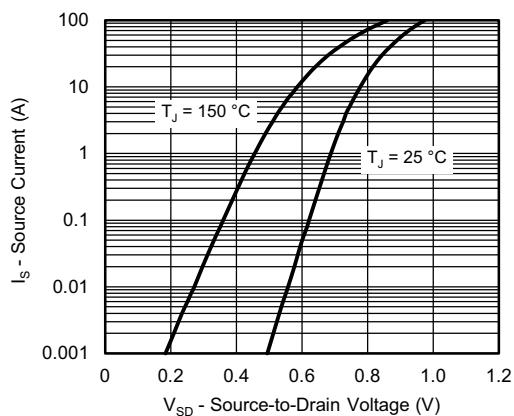
**Gate Charge**



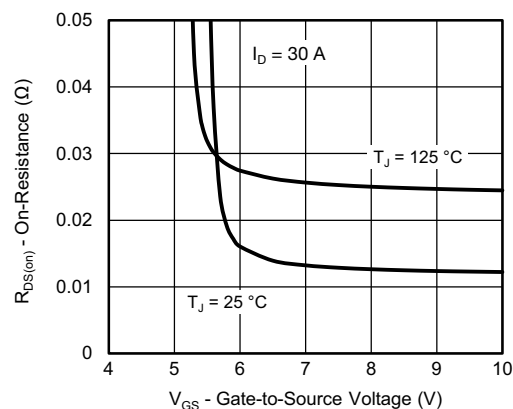
**On-Resistance vs. Junction Temperature**



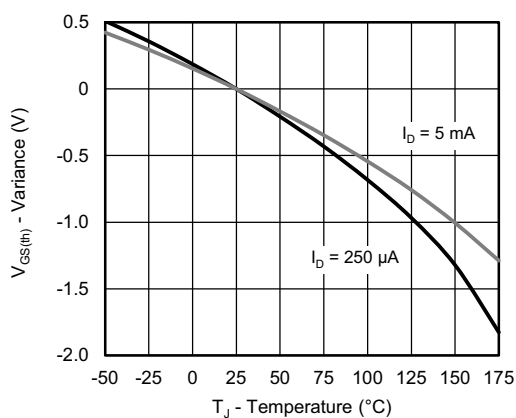
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



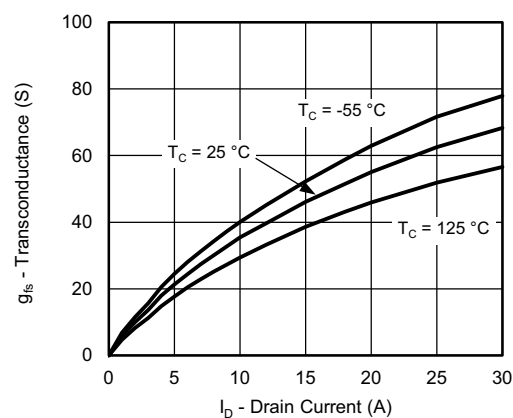
**Source-Drain Diode Forward Voltage**



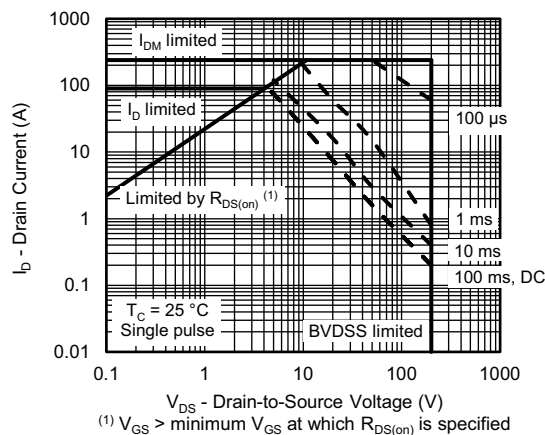
**On-Resistance vs. Gate-to-Source Voltage**



**Threshold Voltage**



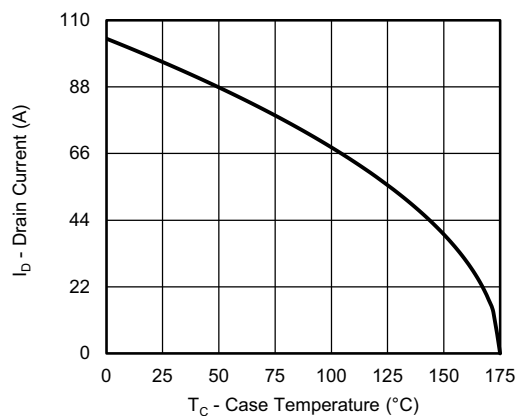
**Transconductance**



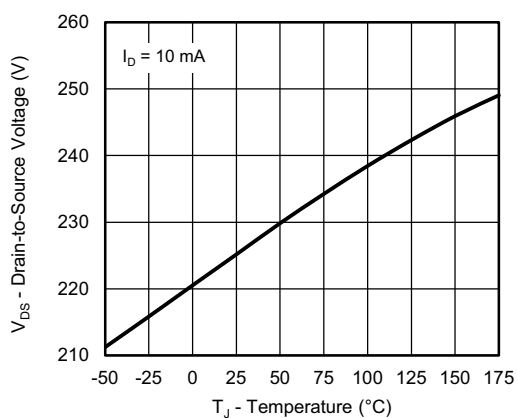
**Safe Operating Area, Junction-to-Ambient**



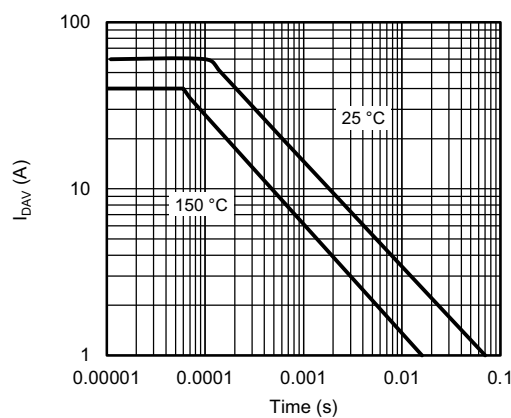
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



**Current Derating <sup>a</sup>**



**Drain Source Breakdown vs. Junction Temperature**



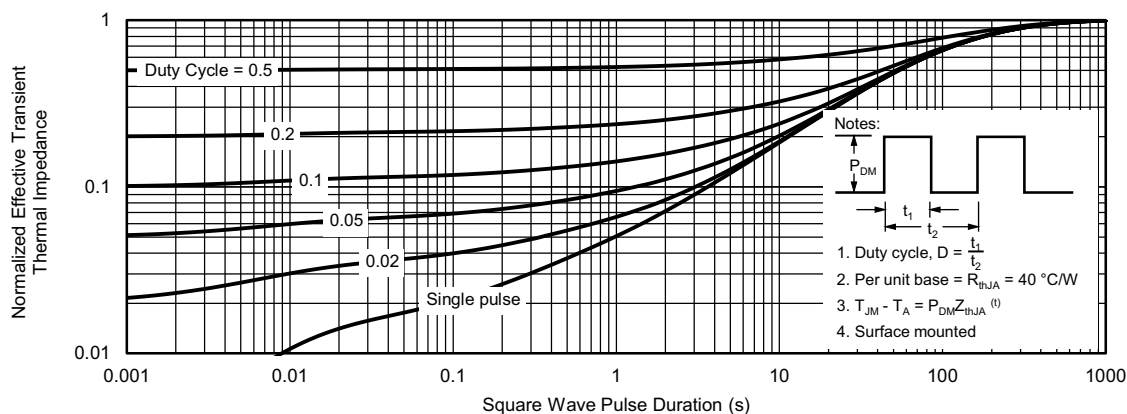
**$I_{DAV}$  vs. Time**

**Note**

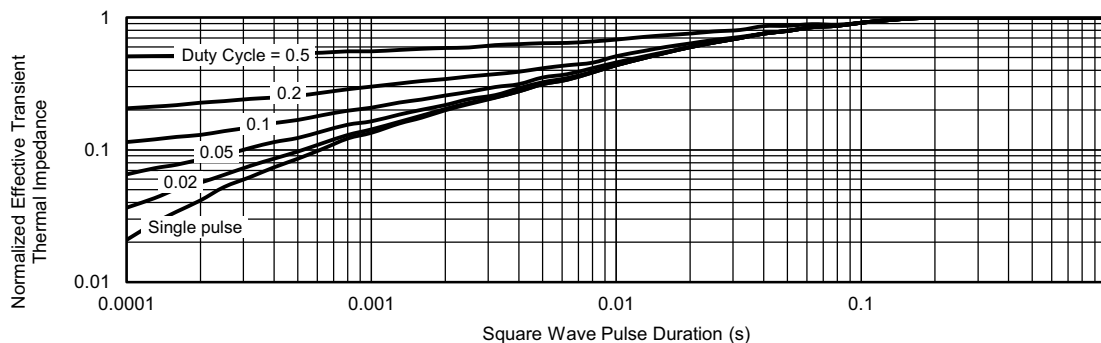
- a. The power dissipation  $P_D$  is based on  $T_J$  max. = 25 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



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



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



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

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



DETAIL A (ROTATED 90°)



SECTION A-A

### 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.

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					

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



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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