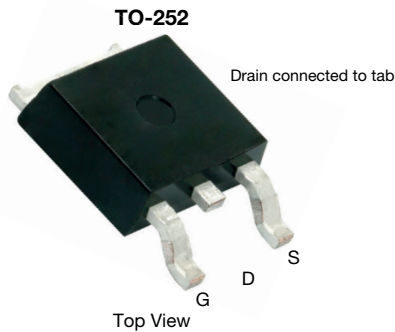


## N-Channel 200 V (D-S) 175 °C MOSFET



### FEATURES

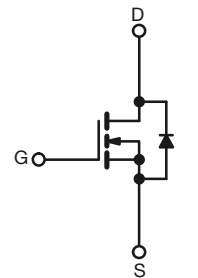
- ThunderFET® power MOSFET
- Low  $R_{DS}$  -  $Q_g$  figure-of-merit (FOM)
- Maximum 175 °C junction temperature
- 100 %  $R_g$  and UIS tested
- Material categorization:  
for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

### APPLICATIONS

- Synchronous rectification
- Power supplies
- DC/AC inverter
- DC/DC converter
- Solar micro inverter
- Motor drive switch



N-Channel MOSFET

### PRODUCT SUMMARY

$V_{DS}$ (V)	200
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 10$ V	0.0375
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 7.5$ V	0.0422
$Q_g$ typ. (nC)	21
$I_D$ (A)	35.1
Configuration	Single

### ORDERING INFORMATION

Package	TO-252
Lead (Pb)-free and halogen-free	SUD90330E-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	$V_{GS}$	$\pm 20$	
Continuous drain current	$I_D$	$T_C = 25$ °C	35.8
		$T_C = 125$ °C	20.7
Pulsed drain current ( $t = 100$ $\mu$ s)	$I_{DM}$	70	A
Continuous source-drain diode current	$I_S$	12.5	
Single pulse avalanche current <sup>a</sup>	$I_{AS}$	33	mJ
Single pulse avalanche energy <sup>a</sup>			
Maximum power dissipation	$P_D$	$T_C = 25$ °C	125 <sup>b</sup>
		$T_C = 125$ °C	41.7 <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)	$R_{thJC}$	1.2	

#### Notes

- Duty cycle  $\leq 1$  %
- 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	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	20	-	-	A
Drain-source on-state resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 12.2 A	-	0.0312	0.0375	Ω
		V <sub>GS</sub> = 7.5 V, I <sub>D</sub> = 11.5 A	-	0.0337	0.0422	
Forward transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 10 A	-	28	-	S
<b>Dynamic <sup>b</sup></b>						
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V, f = 1 MHz	-	1172	-	pF
Output capacitance	C <sub>oss</sub>		-	150	-	
Reverse transfer capacitance	C <sub>rss</sub>		-	11	-	
Total gate charge	Q <sub>g</sub>	V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 12.2 A	-	21	32	nC
Gate-source charge	Q <sub>gs</sub>		-	6	-	
Gate-drain charge	Q <sub>gd</sub>		-	5.3	-	
Gate resistance	R <sub>g</sub>	f = 1 MHz	0.76	3.8	7.6	Ω
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> = 100 V, R <sub>L</sub> = 14.2 Ω, I <sub>D</sub> ≅ 7 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 1 Ω	-	12	24	ns
Rise time	t <sub>r</sub>		-	25	50	
Turn-off delay time	t <sub>d(off)</sub>		-	30	50	
Fall time	t <sub>f</sub>		-	22	44	
<b>Drain-Source Body Diode Characteristics</b>						
Pulse diode forward current (t = 100 μs)	I <sub>SM</sub>		-	-	70	A
Body diode voltage	V <sub>SD</sub>	I <sub>F</sub> = 7 A, V <sub>GS</sub> = 0 V	-	0.8	1.5	V
Body diode reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 7 A, di/dt = 100 A/μs	-	111	170	ns
Body diode reverse recovery charge	Q <sub>rr</sub>		-	0.51	1	μC
Reverse recovery fall time	t <sub>a</sub>		-	94	-	ns
Reverse recovery rise time	t <sub>b</sub>		-	17	-	
Body diode peak reverse recovery charge	I <sub>RM(REC)</sub>		-	8.5	17	A

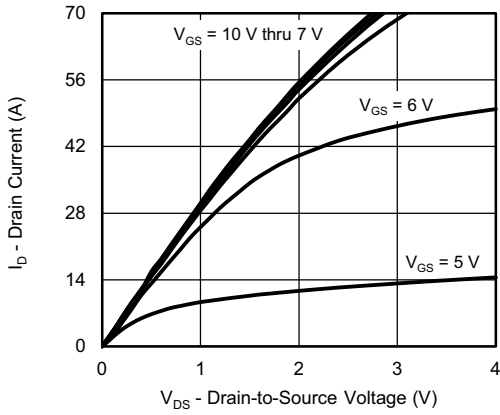
**Notes**

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

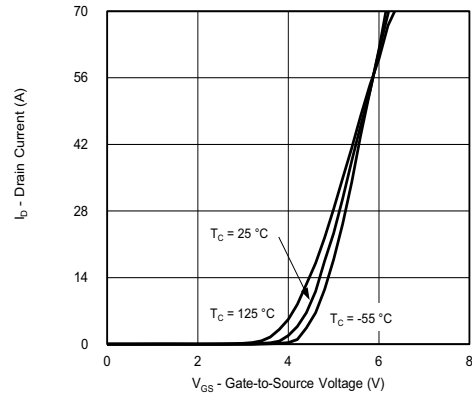
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



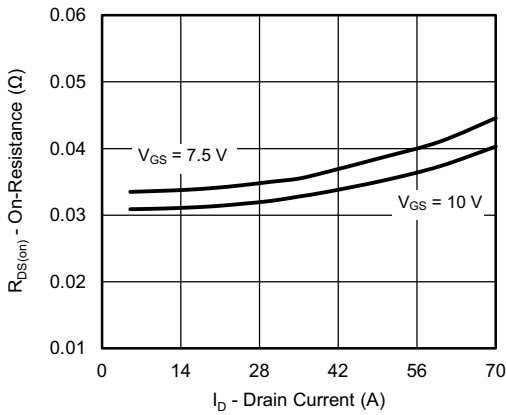
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



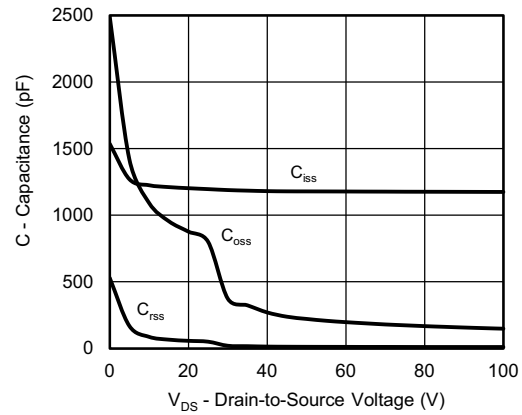
Output Characteristics



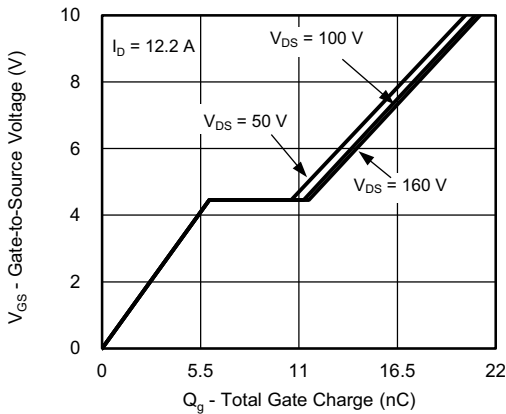
Transfer Characteristics



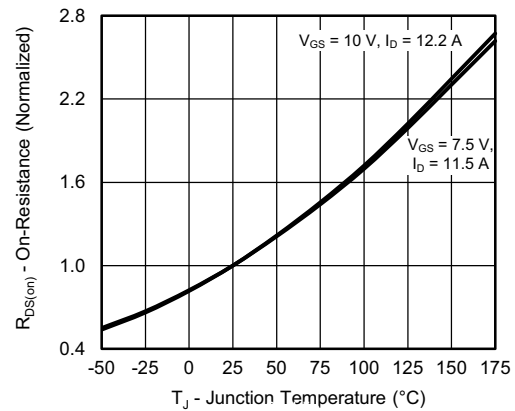
On-Resistance vs. Drain Current and Gate Voltage



Capacitance



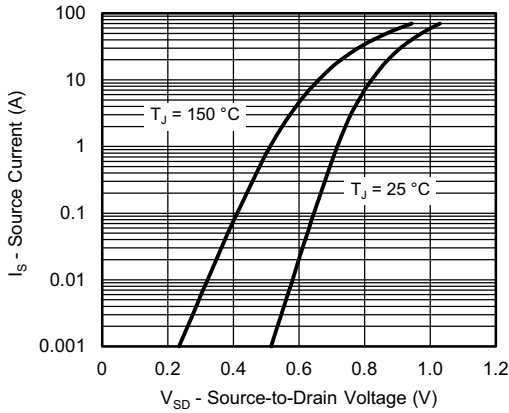
Gate Charge



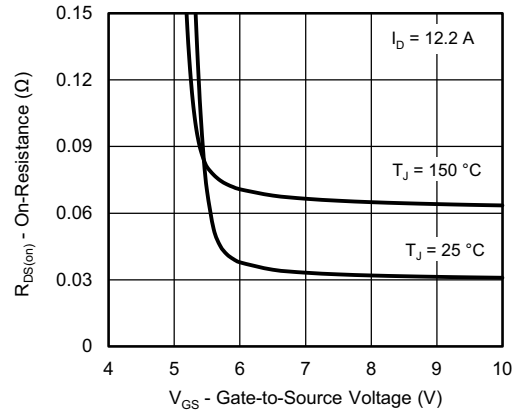
On-Resistance vs. Junction Temperature



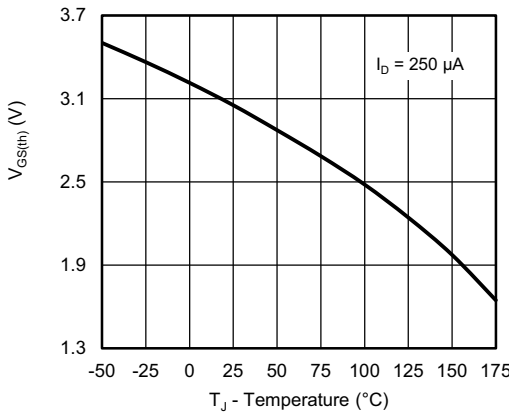
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



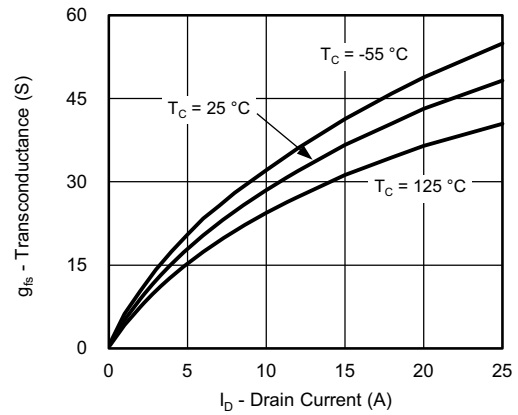
Source-Drain Diode Forward Voltage



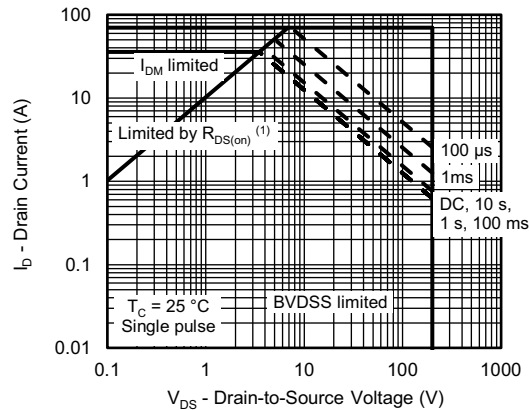
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



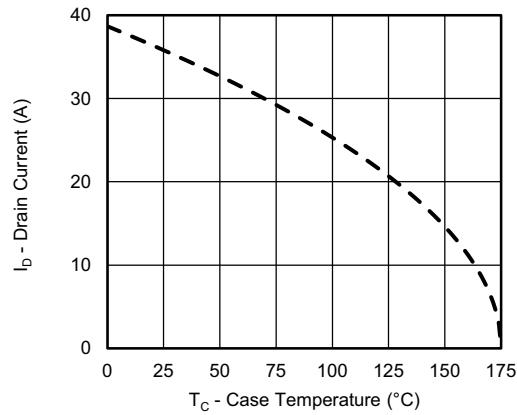
Transconductance



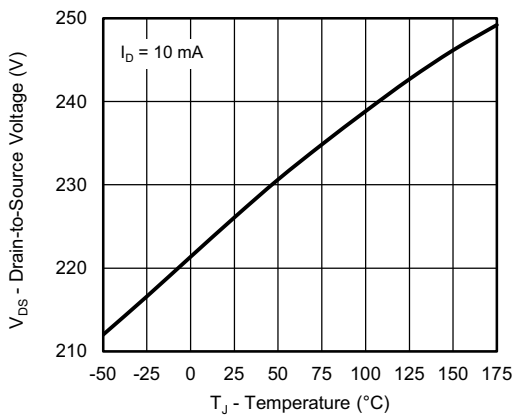
Safe Operating Area, Junction-to-Ambient



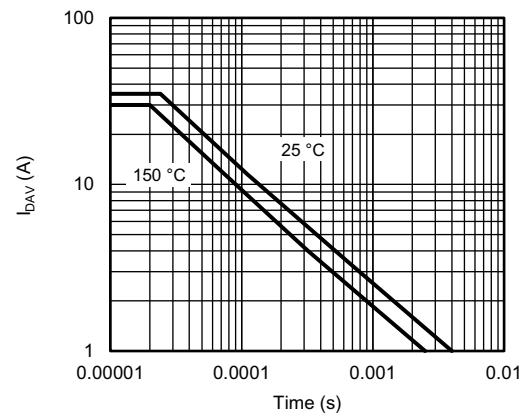
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



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



**Drain Source Breakdown vs. Junction Temperature**



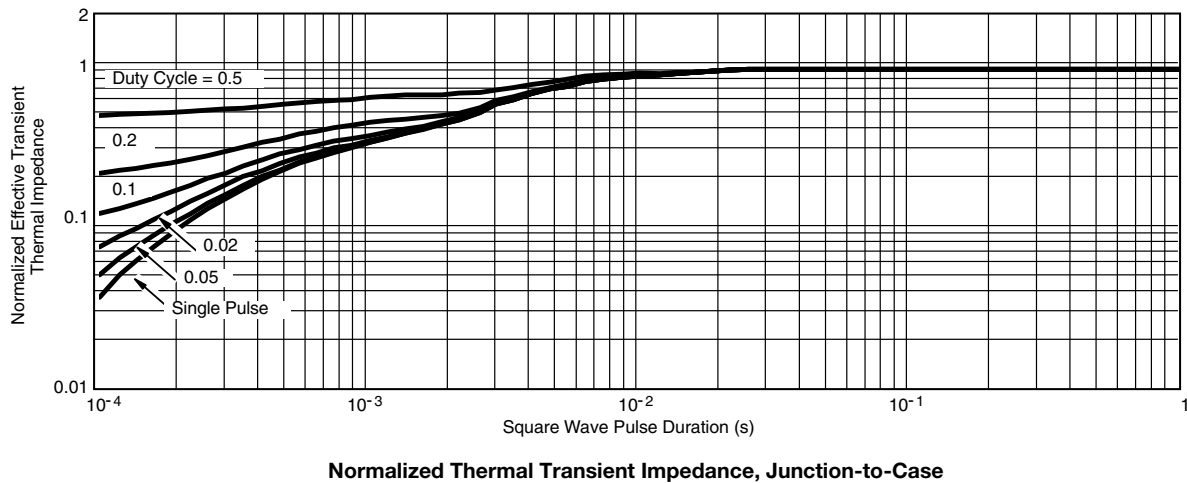
**Avalanche vs. Time**

**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)



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# TO-252AA Case Outline

## VERSION 1: FACILITY CODE = Y



MILLIMETERS		
DIM.	MIN.	MAX.
A	2.18	2.38
A1	-	0.127
b	0.64	0.88
b2	0.76	1.14
b3	4.95	5.46
C	0.46	0.61
C2	0.46	0.89
D	5.97	6.22
D1	4.10	-
E	6.35	6.73
E1	4.32	-
H	9.40	10.41
e	2.28 BSC	
e1	4.56 BSC	
L	1.40	1.78
L3	0.89	1.27
L4	-	1.02
L5	1.01	1.52

### Note

- Dimension L3 is for reference only



VERSION 2: FACILITY CODE = N



DIM.	MILLIMETERS	
	MIN.	MAX.
A	2.18	2.39
A1	-	0.13
b	0.65	0.89
b1	0.64	0.79
b2	0.76	1.13
b3	4.95	5.46
c	0.46	0.61
c1	0.41	0.56
c2	0.46	0.60
D	5.97	6.22
D1	5.21	-
E	6.35	6.73
E1	4.32	-
e	2.29 BSC	
H	9.94	10.34

DIM.	MILLIMETERS	
	MIN.	MAX.
L	1.50	1.78
L1	2.74 ref.	
L2	0.51 BSC	
L3	0.89	1.27
L4	-	1.02
L5	1.14	1.49
L6	0.65	0.85
θ	0°	10°
θ1	0°	15°
θ2	25°	35°

Notes

- Dimensioning and tolerance confirm to ASME Y14.5M-1994
- All dimensions are in millimeters. Angles are in degrees
- Heat sink side flash is max. 0.8 mm
- Radius on terminal is optional

ECN: E19-0649-Rev. Q, 16-Dec-2019  
DWG: 5347



## RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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