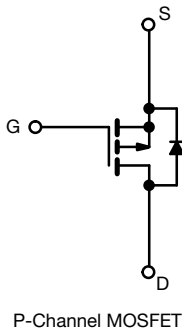
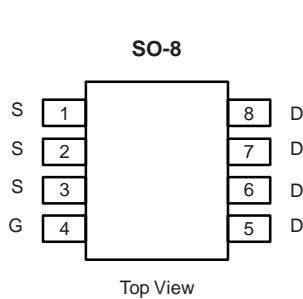


## P-Channel 20 V (D-S) MOSFET



**RoHS**  
COMPLIANT

PRODUCT SUMMARY			
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A) <sup>d</sup>	Q <sub>g</sub> (Typ.)
- 20	0.012 at V <sub>GS</sub> = - 4.5 V	- 12	36 nC
	0.0145 at V <sub>GS</sub> = - 2.5 V	- 11	



### FEATURES

- DT-Trench Power MOSFET
- 100 % R<sub>g</sub> Tested
- 100 % UIS Tested

### APPLICATIONS

- Adapter switch
- Load switch
- DC/DC converters
- High speed switching
- Power management in battery-operated, mobile and wearable devices

ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25 °C, unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	V <sub>DS</sub>	-20	V
Gate-source voltage	V <sub>GS</sub>	± 12	
Continuous drain current (T <sub>J</sub> = 150 °C)	T <sub>C</sub> = 25 °C	-12 <sup>e</sup>	A
	T <sub>C</sub> = 70 °C	-11	
	T <sub>A</sub> = 25 °C	-5.3 <sup>b, c</sup>	
	T <sub>A</sub> = 70 °C	-4.5 <sup>b, c</sup>	
Pulsed drain current (t = 100 μs)	I <sub>DM</sub>	-48 <sup>a</sup>	
Continuous source-drain diode current	T <sub>C</sub> = 25 °C	-12	
	T <sub>A</sub> = 70 °C	-5.5 <sup>b, c</sup>	
Maximum power dissipation	T <sub>C</sub> = 25 °C	3.0	W
	T <sub>C</sub> = 70 °C	1.92	
	T <sub>A</sub> = 25 °C	1.7 <sup>b, c</sup>	
	T <sub>A</sub> = 70 °C	1.1 <sup>b, c</sup>	
Operating junction and storage temperature range	T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C
Soldering recommendations (peak temperature)		260	

THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient <sup>b, d</sup>	t ≤ 10 s	R <sub>thJA</sub>	40	°C/W
Maximum junction-to-foot (drain)	Steady state	R <sub>thJF</sub>	15	
			20	

### Notes

- Package limited
- Surface mounted on 1" x 1" FR4 board
- t = 10 s
- Maximum under steady state conditions is 100 °C/W
- T<sub>C</sub> = 25 °C

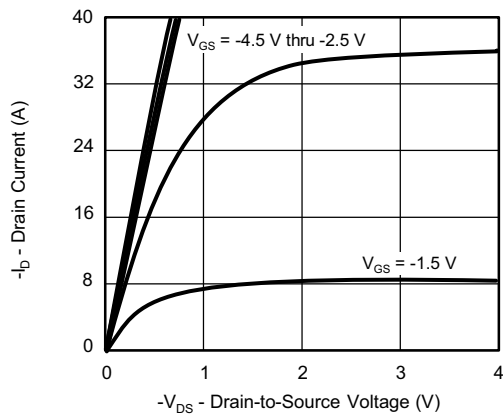
<b>SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-source breakdown voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-20	-	-	V
$V_{DS}$ temperature coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$	-	-11	-	mV/ $^\circ\text{C}$
$V_{GS(th)}$ temperature coefficient	$\Delta V_{GS(th)}/T_J$		-	23.5	-	
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-0.4	-	-1.2	V
Gate-source leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$	-	-	$\pm 100$	nA
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}$	-	-	-1	$\mu\text{A}$
		$V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$	-	-	-10	
On-state drain current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \leq -5\text{ V}, V_{GS} = 0\text{ V}$	-12	-	-	A
Drain-source on-state resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -10\text{ A}$	-	0.012	0.015	$\Omega$
		$V_{GS} = -2.5\text{ V}, I_D = -8\text{ A}$	-	0.0145	0.020	
Forward transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -10\text{ V}, I_D = -10\text{ A}$	-	35	-	S
<b>Dynamic <sup>b</sup></b>						
Input capacitance	$C_{ISS}$	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	2055	-	pF
Output capacitance	$C_{OSS}$		-	686	-	
Reverse transfer capacitance	$C_{RSS}$		-	135	-	
Total gate charge	$Q_g$	$V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -10\text{ A}$	-	36	-	nC
Gate-source charge	$Q_{gs}$		-	6.7	-	
Gate-drain charge	$Q_{gd}$		-	13	-	
Gate resistance	$R_g$	$f = 1\text{ MHz}$	-	5	-	$\Omega$
Turn-on delay time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 2\text{ }\Omega, I_D \cong -10\text{ A},$ $V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$	-	61	-	ns
Rise time	$t_r$		-	35	-	
Turn-off delay time	$t_{d(off)}$		-	110	-	
Fall time	$t_f$		-	203	-	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous source-drain diode current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$	-	-	-12	A
Pulse diode forward current	$I_{SM}$		-	-	-48	
Body diode voltage	$V_{SD}$	$I_S = -1\text{ A}, V_{GS} = 0\text{ V}$	-	-0.6	-1.2	V
Body diode reverse recovery time	$t_{rr}$	$I_F = -5\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$	-	51	-	ns
Body diode reverse recovery charge	$Q_{rr}$		-	68	-	nC
Reverse recovery fall time	$t_a$		-	22	-	ns
Reverse recovery rise time	$t_b$		-	39	-	

**Notes**

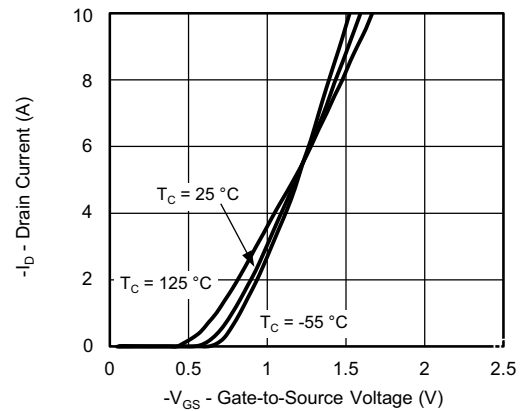
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$   
 b. Guaranteed by design, not subject to production testing

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.

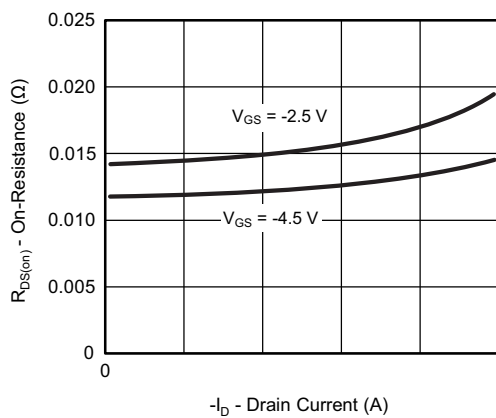
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



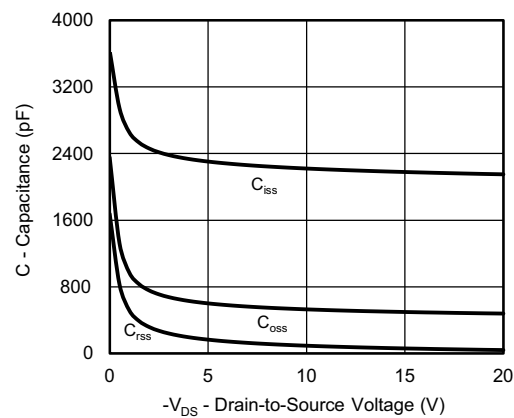
**Output Characteristics**



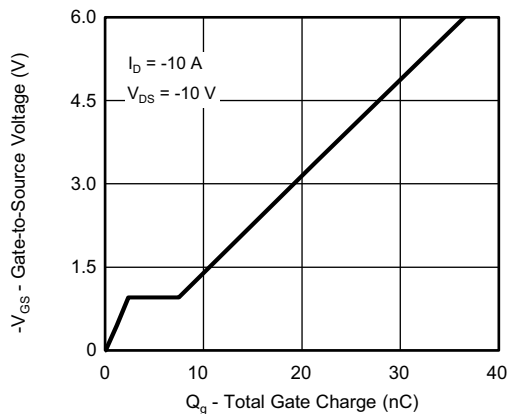
**Transfer Characteristics**



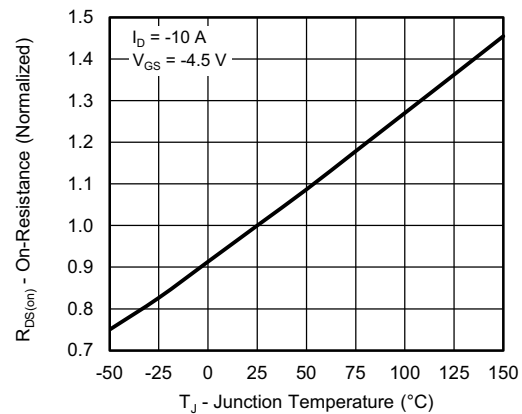
**On-Resistance vs. Drain Current and Gate Voltage**



**Capacitance**

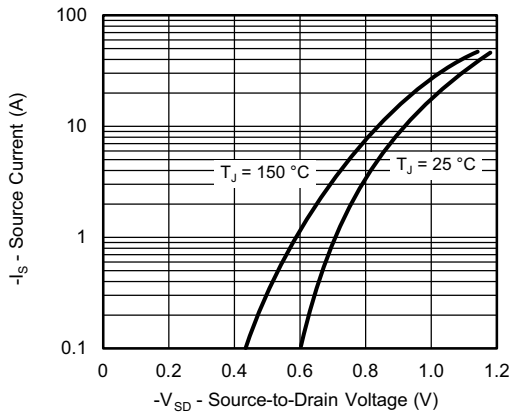


**Gate Charge**

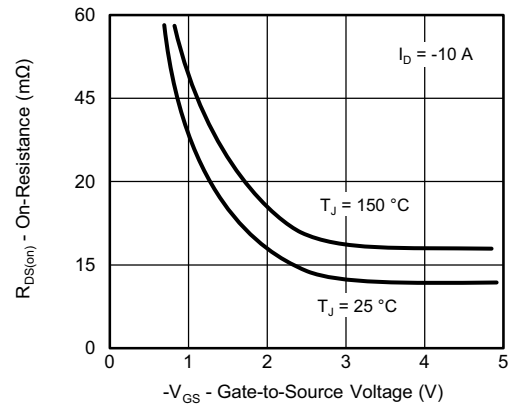


**On-Resistance vs. Junction Temperature**

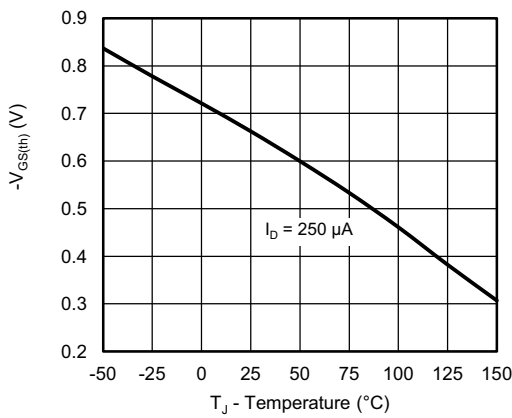
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



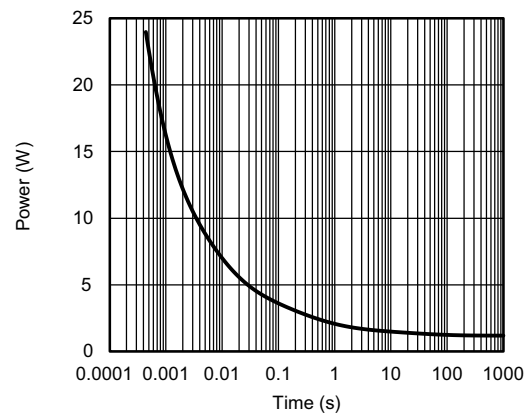
**Source-Drain Diode Forward Voltage**



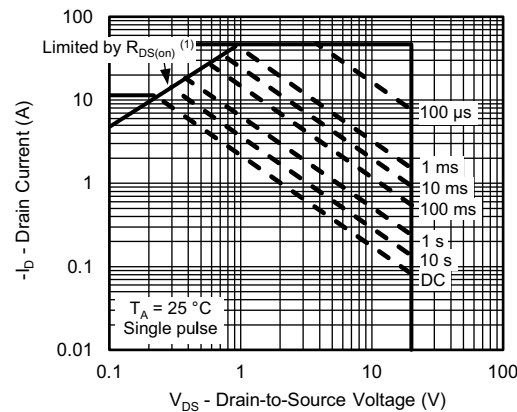
**On-Resistance vs. Gate-to-Source Voltage**



**Threshold Voltage**



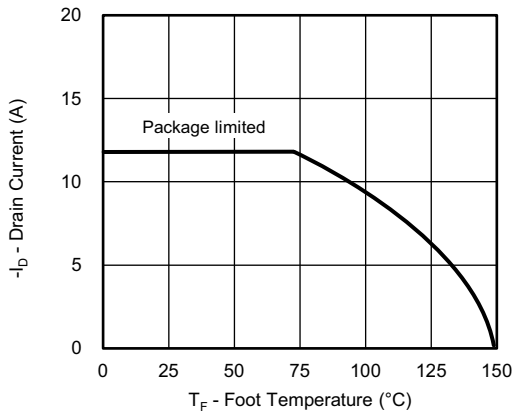
**Single Pulse Power, Junction-to-Ambient**



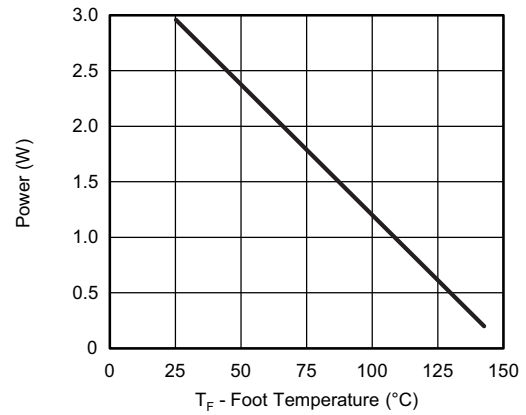
(1)  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

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

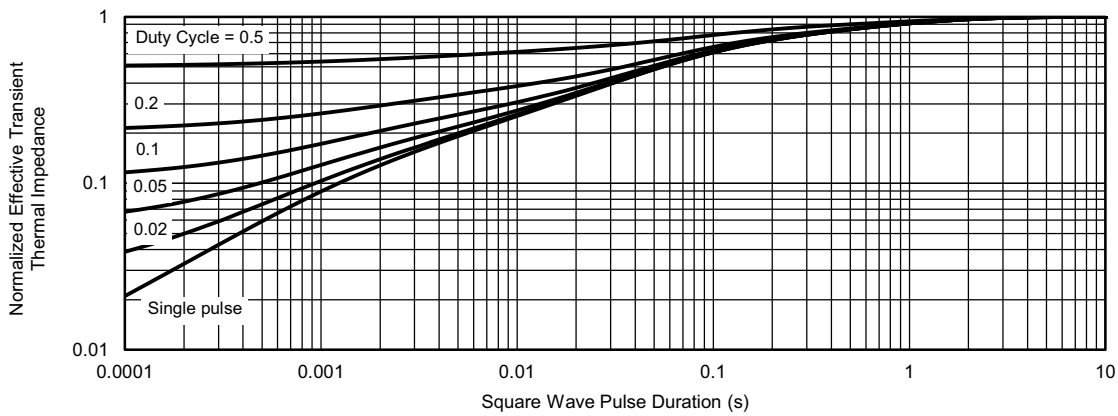
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



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



**Power, Junction-to-Foot**

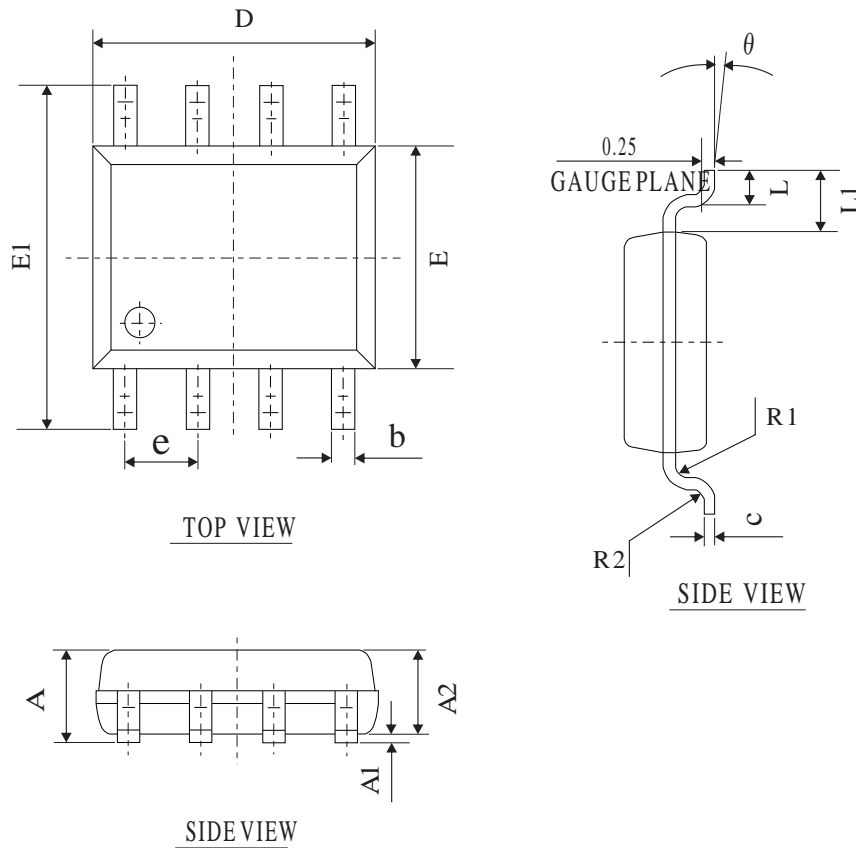


**Normalized Thermal Transient Impedance, Junction-to-Foot**

**Note**

- a. The power dissipation  $P_D$  is based on  $T_J \text{ max.} = 25 \text{ }^\circ\text{C}$ , 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.

## SOP-8 PACKAGE OUTLINE



COMMON DIMENSIONS  
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	TYP	MAX
A	1.30	1.60	1.85
A1	0.03	0.15	0.28
A2	1.20	1.45	1.70
b	0.26	0.40	0.54
C	0.132	0.203	0.273
D	4.50	4.90	5.30
E	3.50	3.00	4.30
E1	5.50	6.00	6.50
L	0.30	0.70	1.10
$\theta$	2°	4°	6°
L1	1.04REF		
e	1.27BSC		
R1	0.07TYP		
R2	0.07TYP		

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