

N-Channel 60-V (D-S) MOSFET


RoHS
 COMPLIANT

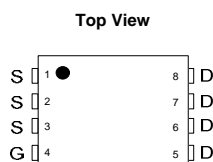
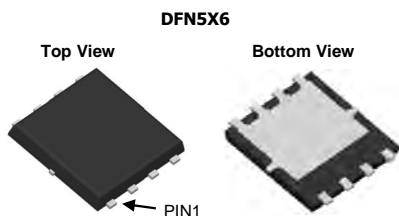
PRODUCT SUMMARY	
V_{DS} (V)	60
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 10$ V	0.024
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 4.5$ V	0.028
Q_g typ. (nC)	5.2
I_D (A)	15 ^{a, g}
Configuration	Single

FEATURES

- Halogen-free According to IEC 61249-2-21 Available
- TrenchFET[®] Power MOSFET
- 100 % R_g Tested
- 100 % UIS Tested

APPLICATIONS

- Battery Switch
- DC/DC Converter



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_A = 25$ °C, unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	V_{DS}	60	V
Gate-source voltage	V_{GS}	± 20	
Continuous drain current ($T_J = 150$ °C)	I_D	$T_C = 25$ °C	15 ^a
		$T_C = 70$ °C	9 ^a
		$T_A = 25$ °C	10.3 ^{b, c}
		$T_A = 70$ °C	8.1 ^{b, c}
Pulsed drain current ($t = 100$ μ s)	I_{DM}	40	A
Continuous source-drain diode current	I_S	$T_C = 25$ °C	
		$T_A = 25$ °C	3 ^{b, c}
Single pulse avalanche current	I_{AS}	15	mJ
Single pulse avalanche energy	E_{AS}	11.3	
Maximum power dissipation	P_D	$T_C = 25$ °C	35.7
		$T_C = 70$ °C	22.9
		$T_A = 25$ °C	3.6 ^{b, c}
		$T_A = 70$ °C	2.3 ^{b, c}
Operating junction and storage temperature range	T_J, T_{stg}	-55 to +150	°C
Soldering recommendations (peak temperature) ^c		260	

THERMAL RESISTANCE RATINGS					
PARAMETER		SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient ^b	$t \leq 10$ s	R_{thJA}	25	35	°C/W
Maximum junction-to-case (drain)	Steady state	R_{thJC}	2.7	3.5	

Notes

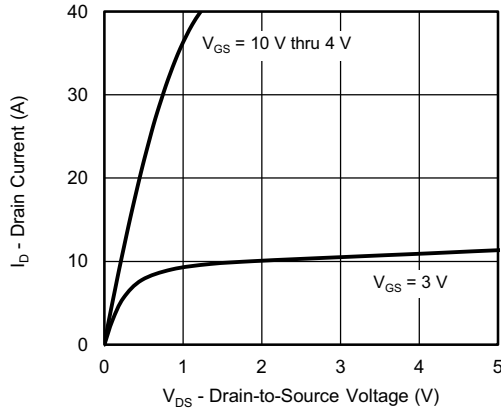
- Package limited
- Surface mounted on 1" x 1" FR4 board
- $t = 10$ s

SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Static							
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	60	-	-	V	
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$	-	33	-	mV/ $^\circ\text{C}$	
$V_{GS(th)}$ temperature coefficient	$\Delta V_{GS(th)}/T_J$		-	-4.8	-		
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1	-	2.8	V	
Gate-source leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$	-	-	100	nA	
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$	-	-	1	μA	
		$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}, T_J = 70\text{ }^\circ\text{C}$	-	-	10		
On-state drain current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	10	-	-	A	
Drain-source on-state resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 10\text{ A}$	-	0.024	-	Ω	
		$V_{GS} = 4.5\text{ V}, I_D = 5\text{ A}$	-	0.028	-		
Forward transconductance ^a	g_{fs}	$V_{DS} = 10\text{ V}, I_D = 10\text{ A}$	-	39	-	S	
Dynamic ^b							
Input capacitance	C_{iss}	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	790	-	μF	
Output capacitance	C_{oss}		-	330	-		
Reverse transfer capacitance	C_{rss}		-	14	-		
Total gate charge	Q_g	$V_{DS} = 30\text{ V}, V_{GS} = 10\text{ V}, I_D = 5\text{ A}$	-	11.1	17	nC	
Gate-source charge	Q_{gs}	$V_{DS} = 30\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 5\text{ A}$	-	5.2	8		
Gate-drain charge	Q_{gd}		-	2.2	-		
Gate resistance	R_g		-	1.1	-		
Turn-on delay time	$t_{d(on)}$	$f = 1\text{ MHz}$	0.1	0.6	1.2	Ω	
Rise time	t_r		$V_{DD} = 30\text{ V}, R_L = 6\text{ }\Omega, I_D \cong 5\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$	-	7	15	ns
Turn-off delay time	$t_{d(off)}$			-	21	40	
Fall time	t_f	-		10	20		
Turn-on delay time	$t_{d(on)}$	-		10	20		
Rise time	t_r	-		13	25		
Turn-off delay time	$t_{d(off)}$	-		25	50		
Fall time	t_f	$V_{DD} = 30\text{ V}, R_L = 6\text{ }\Omega, I_D \cong 5\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$	-	10	20		
Turn-on delay time	$t_{d(on)}$		-	22	45		
Rise time	t_r		-	-	-		
Turn-off delay time	$t_{d(off)}$		-	-	-		
Fall time	t_f		-	-	-		
Fall time	t_f		-	-	-		
Drain-Source Body Diode Characteristics							
Continuous source-drain diode current	I_S	$T_C = 25\text{ }^\circ\text{C}$	-	15	-	A	
Pulse diode forward current	I_{SM}		-	-	40		
Body diode voltage	V_{SD}	$I_S = 5\text{ A}, V_{GS} = 0\text{ V}$	-	0.79	1.2	V	
Body diode reverse recovery time	t_{rr}	$I_F = 5\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$	-	30	60	ns	
Body diode reverse recovery charge	Q_{rr}		-	60	120	nC	
Reverse recovery fall time	t_a		-	15	-	ns	
Reverse recovery rise time	t_b		-	15	-		

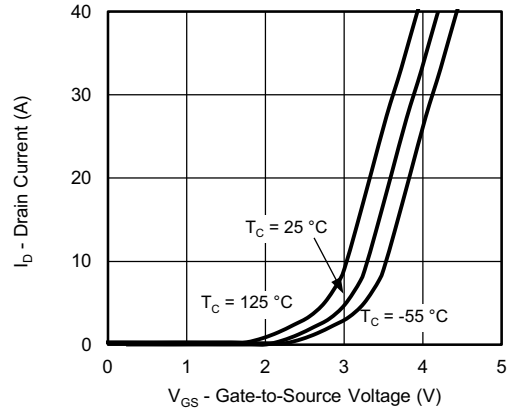
Notes

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

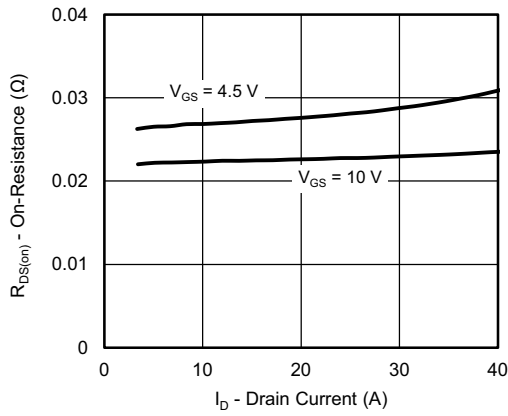
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



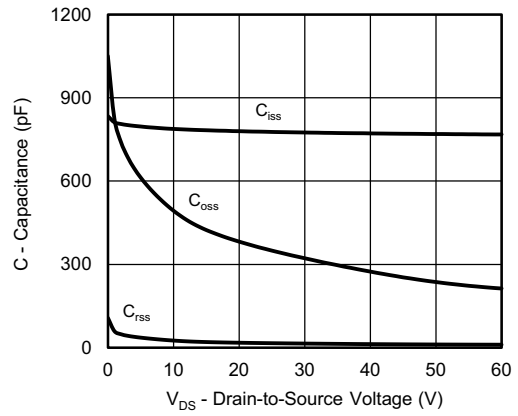
Output Characteristics



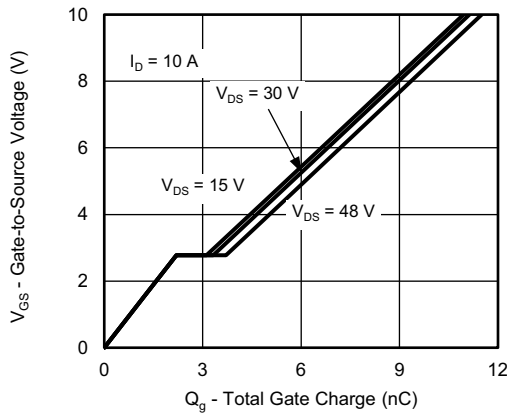
Transfer Characteristics



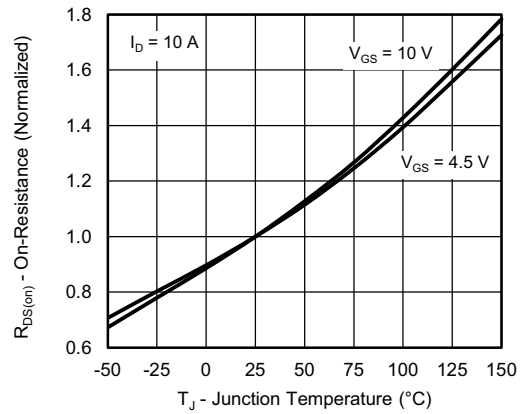
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

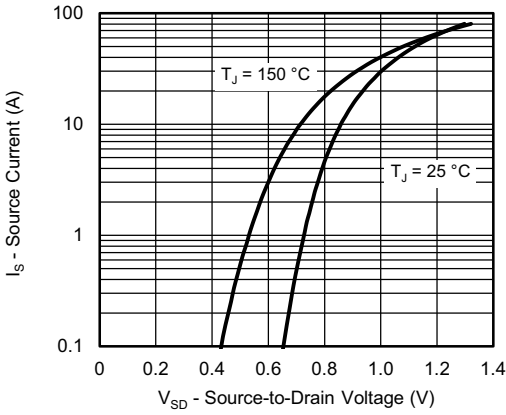


Gate Charge

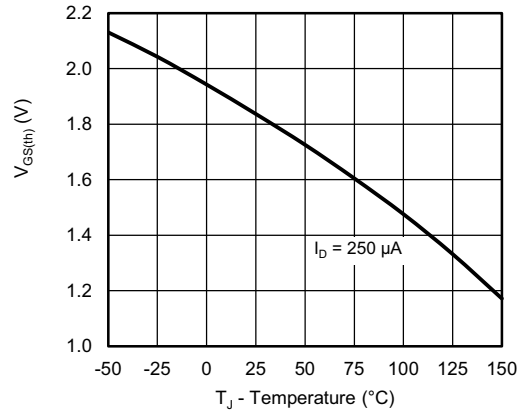


On-Resistance vs. Junction Temperature

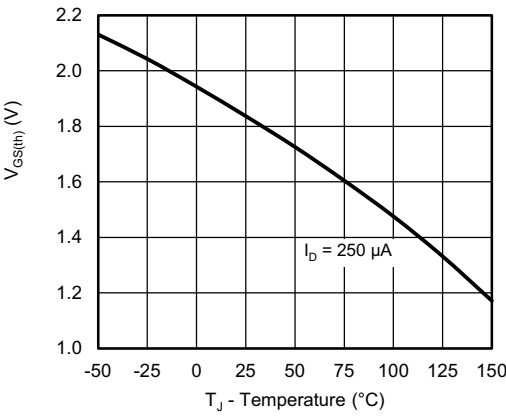
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



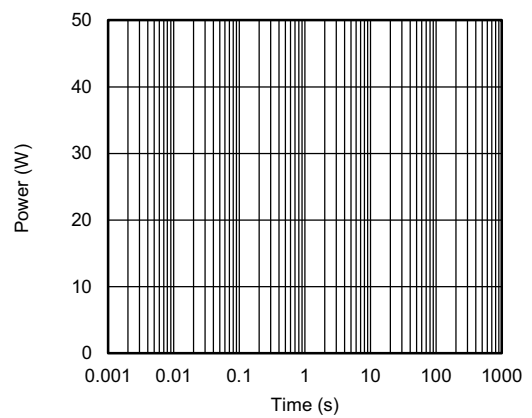
Source-Drain Diode Forward Voltage



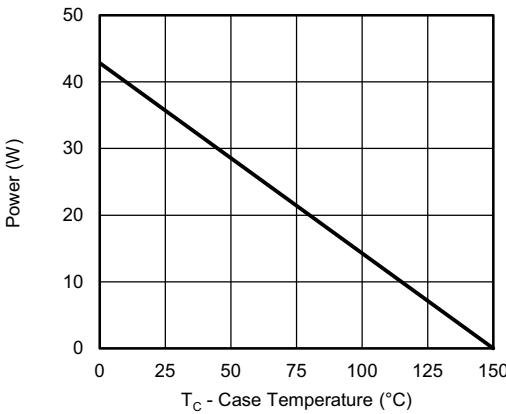
Threshold Voltage



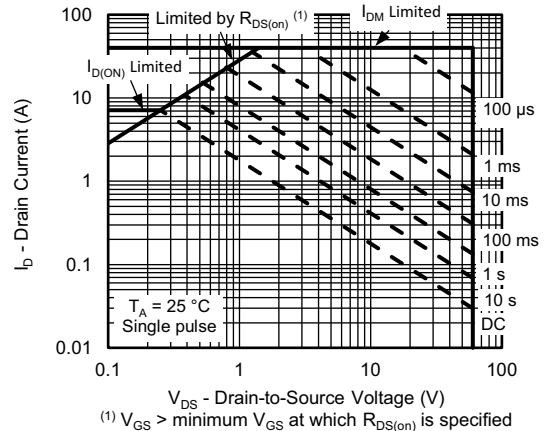
Threshold Voltage



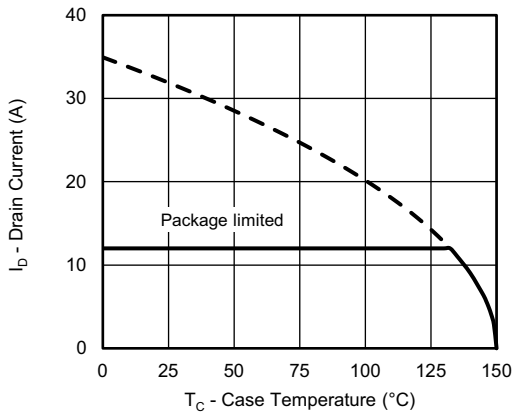
Single Pulse Power, Junction-to-Ambient



Power, Junction-to-Case



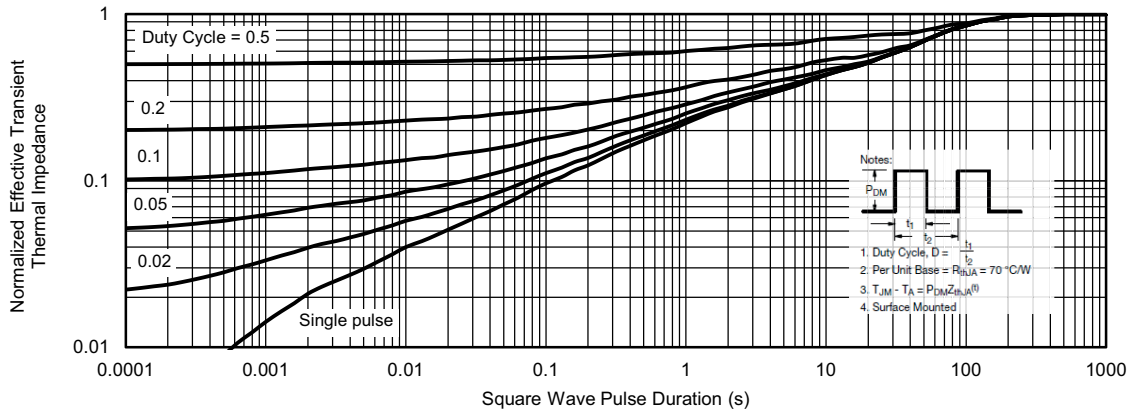
Safe Operating Area, Junction-to-Ambient



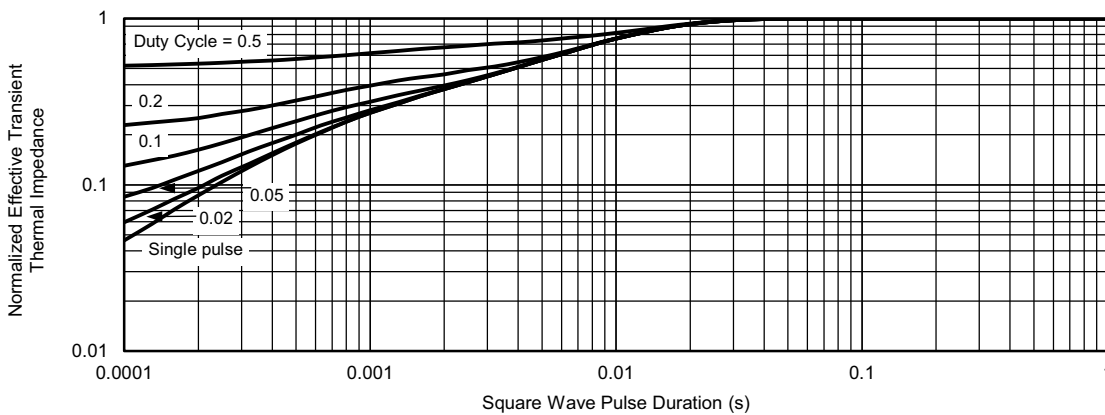
Note

- a. The power dissipation P_D is based on T_J max. = 150 °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

Current Derating ^a



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

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DFN5x6_8L_EP1_P PACKAGE OUTLIN



RECOMMENDED LAND PATTERN



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.85	0.95	1.00	0.033	0.037	0.039
A1	0.00	---	0.05	0.000	---	0.002
b	0.30	0.40	0.50	0.012	0.016	0.020
c	0.15	0.20	0.25	0.006	0.008	0.010
D	5.10	5.20	5.30	0.201	0.205	0.209
D1	4.25	4.35	4.45	0.167	0.171	0.175
E	5.45	5.55	5.65	0.215	0.219	0.222
E1	5.95	6.05	6.15	0.234	0.238	0.242
E2	3.525	3.625	3.725	0.139	0.143	0.147
E3	1.175	1.275	1.375	0.046	0.050	0.054
e	1.27 BSC			0.050 BSC		
L	0.45	0.55	0.65	0.018	0.022	0.026
L1	0	---	0.15	0	---	0.006
L2	0.68 REF			0.027 REF		
θ	0°	---	10°	0°	---	10°

NOTE

UNIT: mm

1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 6 MILS EACH.
2. CONTROLLING DIMENSION IS MILLIMETER.
CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT

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