

N-Channel 60 V (D-S) MOSFET

PRODUCT SUMMARY

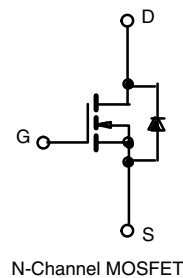
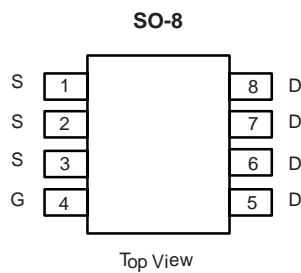
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^d	Q_g (Typ.)
60	0.010 at $V_{GS} = 10$ V	12	10.5 nC
	0.015 at $V_{GS} = 4.5$ V		

FEATURES

- DT-Trench Power MOSFET
- 100 % R_g and UIS tested

APPLICATIONS

- DC/DC converters
- Power supplies
- Motor drive control
- Battery and load switch


RoHS
 COMPLIANT


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)	$T_C = 25$ °C	I_D	12	A
	$T_C = 70$ °C		9.2	
	$T_A = 25$ °C		8.8 a, b	
	$T_A = 70$ °C		6.3 a, b	
Pulsed drain current ($t = 100$ μ s)		I_{DM}	48	
Continuous source-drain diode current	$T_C = 25$ °C	I_S	12	
	$T_A = 25$ °C		2.5 a, b	
Single pulse avalanche current	$L = 0.1$ mH	I_{AS}	45	
Single pulse avalanche energy		E_{AS}	65	mJ
Maximum power dissipation	$T_C = 25$ °C	P_D	5.9	W
	$T_C = 70$ °C		3.8	
	$T_A = 25$ °C		2.7 a, b	
	$T_A = 70$ °C		1.9 a, b	
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 ^a	$t \leq 10$ s	R_{thJA}	32	50	°C/W
Maximum junction-to-foot (drain)	Steady state	R_{thJF}	20	28	

Notes

- Surface mounted on 1" x 1" FR4 board
- $t = 10$ s
- Maximum under steady state conditions is 85 °C/W

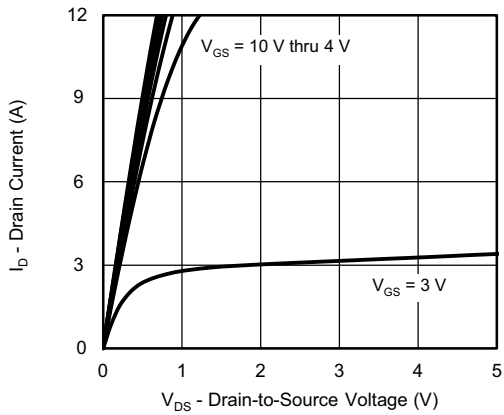
SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	60	-	-	V
V _{DS} temperature coefficient	ΔV _{DS} /T _J	I _D = 250 μA	-	33	-	mV/°C
V _{GS(th)} temperature coefficient	ΔV _{GS(th)} /T _J		-	-4.8	-	
Gate-source threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1	-	3	V
Gate-source leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V	-	-	100	nA
Zero gate voltage drain current	I _{DSS}	V _{DS} = 48 V, V _{GS} = 0 V	-	-	1	μA
		V _{DS} = 48 V, V _{GS} = 0 V, T _J = 70 °C	-	-	10	
On-state drain current ^a	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 10 V	12	-	-	
Drain-source on-state resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 10 A	-	0.0100	0.0130	Ω
		V _{GS} = 4.5 V, I _D = 5 A	-	0.0150	0.0190	
Forward transconductance ^a	g _{fs}	V _{DS} = 10 V, I _D = 10 A	-	39	-	S
Dynamic ^b						
Input capacitance	C _{iss}	V _{DS} = 48 V, V _{GS} = 0 V, f = 1 MHz	-	1090	-	pF
Output capacitance	C _{oss}		-	530	-	
Reverse transfer capacitance	C _{rss}		-	25	-	
Total gate charge	Q _g	V _{DS} = 48 V, V _{GS} = 10 V, I _D = 5 A	-	10.5	-	nC
		V _{DS} = 48 V, V _{GS} = 4.5 V, I _D = 5 A	-	5.2	8	
Gate-source charge	Q _{gs}		-	2.2	-	
Gate-drain charge	Q _{gd}	-	1.1	-		
Gate resistance	R _g	f = 1 MHz	-	3	-	Ω
Turn-on delay time	t _{d(on)}	V _{DD} = 48 V, R _L = 6 Ω, I _D ≅ 5 A, V _{GEN} = 10 V, R _g = 1 Ω	-	7	15	ns
Rise time	t _r		-	21	40	
Turn-off delay time	t _{d(off)}		-	10	20	
Fall time	t _f		-	10	20	
Turn-on delay time	t _{d(on)}	V _{DD} = 48 V, R _L = 6 Ω, I _D ≅ 5 A, V _{GEN} = 4.5 V, R _g = 1 Ω	-	13	25	
Rise time	t _r		-	25	50	
Turn-off delay time	t _{d(off)}		-	10	20	
Fall time	t _f		-	22	45	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I _S	T _C = 25 °C	-	-	12	A
Pulse diode forward current	I _{SM}		-	-	48	
Body diode voltage	V _{SD}	I _S = 5 A, V _{GS} = 0 V	-	0.70	1.2	V
Body diode reverse recovery time	t _{rr}	I _F = 5 A, di/dt = 100 A/μs, T _J = 25 °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

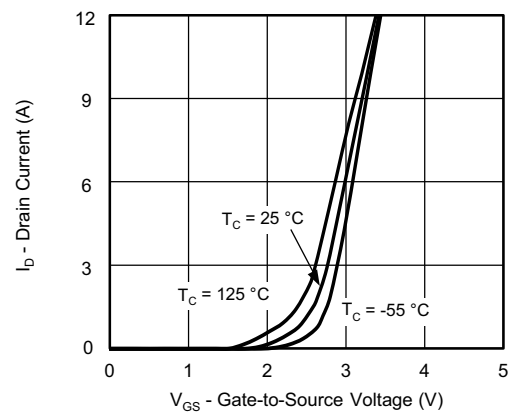
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
 b. Guaranteed by design, not subject to production testing

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.

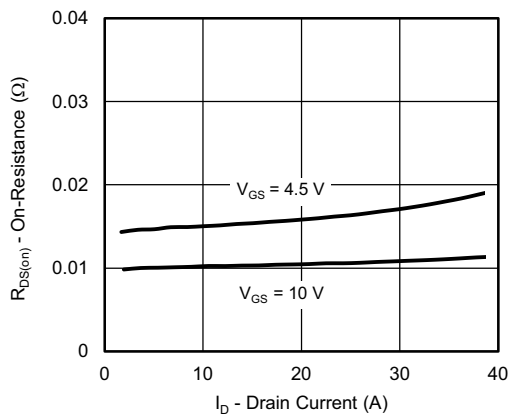
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



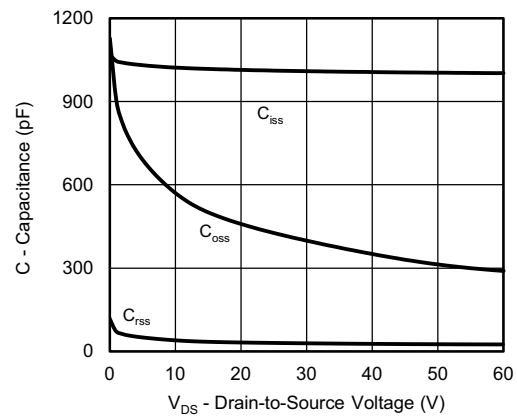
Output Characteristics



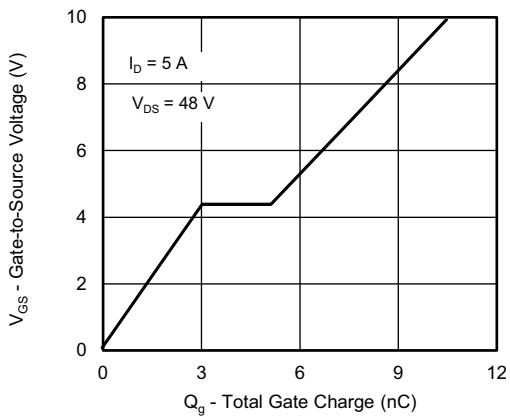
Transfer Characteristics



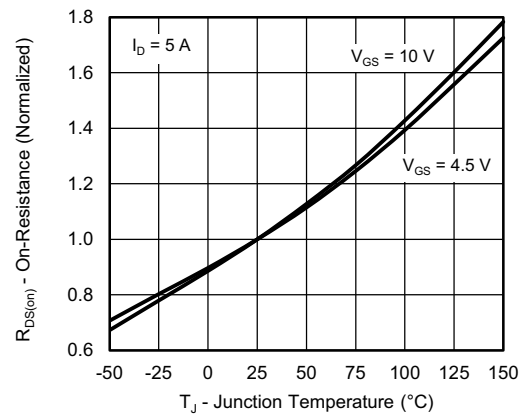
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

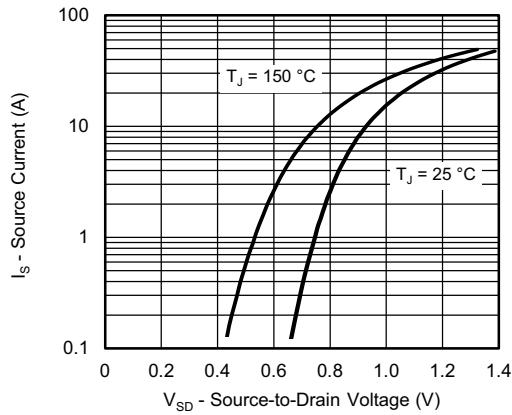


Gate Charge

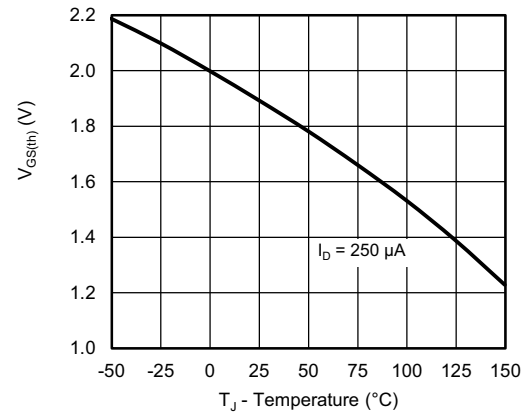


On-Resistance vs. Junction Temperature

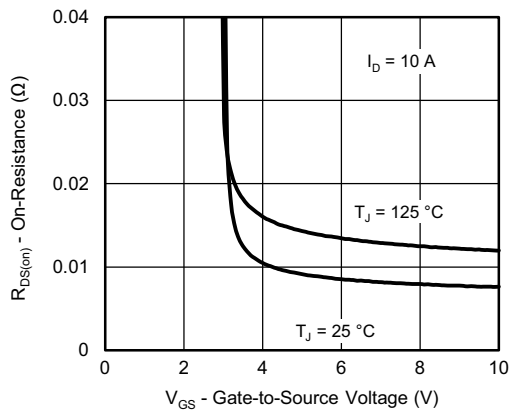
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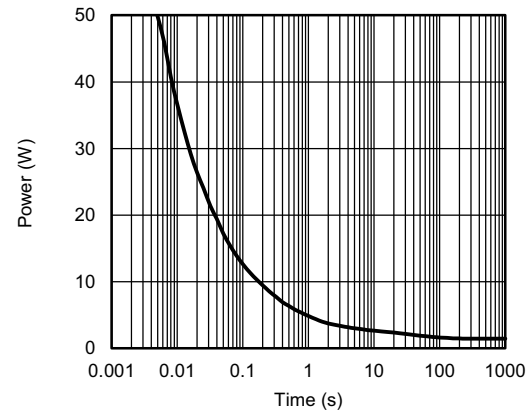
Source-Drain Diode Forward Voltage



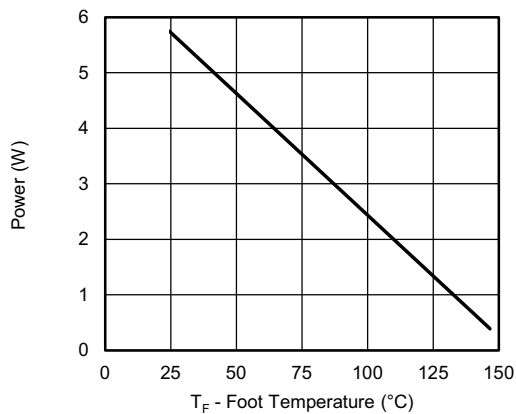
Threshold Voltage



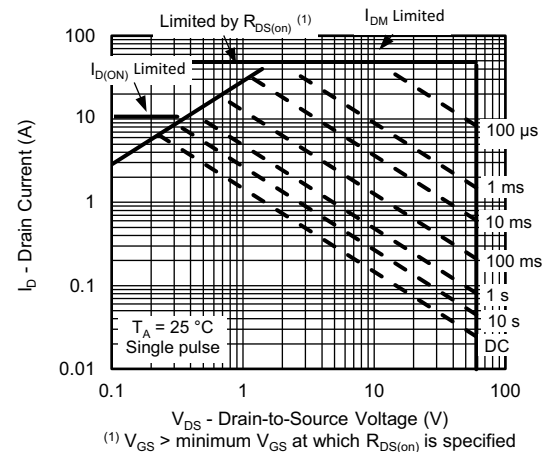
On-Resistance vs. Gate-to-Source Voltage



Single Pulse Power, Junction-to-Ambient

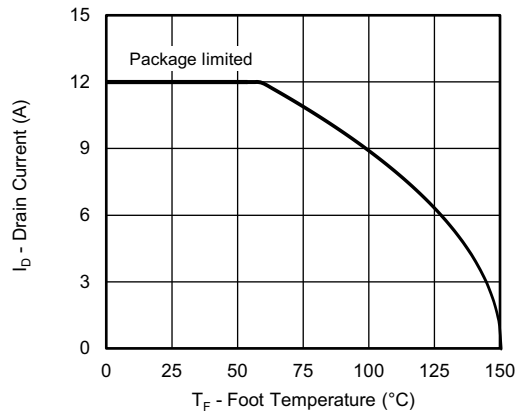


Power, Junction-to-Foot

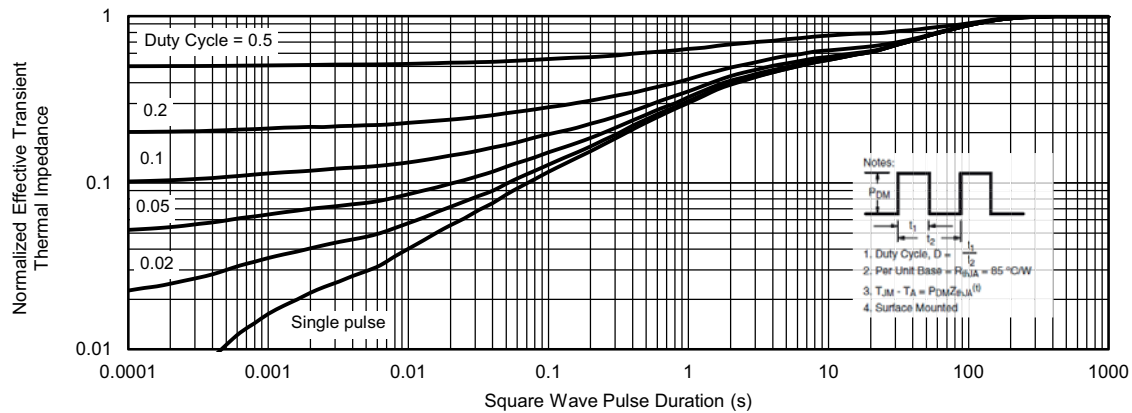


Safe Operating Area, Junction-to-Ambient

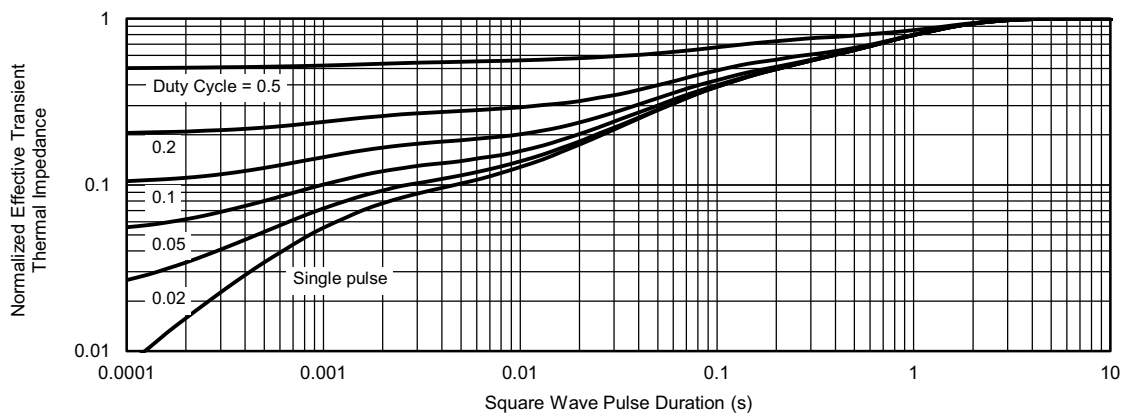
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating ^a



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

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