

N- Channel 40 V and P- Channel 30 V (D-S) MOSFET

PRODUCT SUMMARY				
	V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
N-Channel	40	0.023 at $V_{GS} = 10$ V	6.8	4.9
		0.030 at $V_{GS} = 4.5$ V	5.5	
P-Channel	- 30	0.039 at $V_{GS} = - 10$ V	- 6.0	11.8
		0.065 at $V_{GS} = - 4.5$ V	- 5.0	

FEATURES

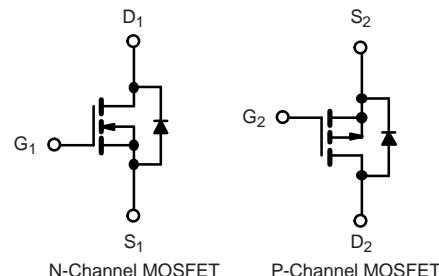
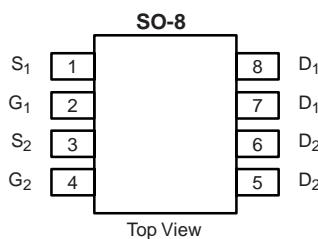
- DT-Trench Power MOSFET
- 100 % R_g Tested
- 100 % UIs Tested



RoHS
COMPLIANT

APPLICATIONS

- Backlight Inverter for LCD Display
- Full Bridge Converter



ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted				
Parameter	Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage	V_{DS}	30	- 30	V
Gate-Source Voltage	V_{GS}	± 20		
Continuous Drain Current ($T_J = 150$ °C)	I_D	6.8	- 6.0	A
		5.6	- 4.7	
		5.8 ^{b, c}	- 4.7 ^{b, c}	
		4.6 ^{b, c}	- 3.7 ^{b, c}	
Pulsed Drain Current	I_{DM}	21	- 20	A
Source-Drain Current Diode Current	I_S	2.5	- 2.5	
		1.6 ^{b, c}	- 1.6 ^{b, c}	
Pulsed Source-Drain Current	I_{SM}	21	- 20	
Single Pulse Avalanche Current	I_{AS}	7.2	- 10	mJ
Single Pulse Avalanche Energy	E_{AS}	2.65	5	
Maximum Power Dissipation	P_D	3.5	3.1	
		2.24	2	
		2.3 ^{b, c}	2.0 ^{b, c}	
		1.472 ^{b, c}	1.25 ^{b, c}	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150		°C

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	N-Channel		P-Channel	Unit
		Typ.	Max.		
Maximum Junction-to-Ambient ^{b, d}	R_{thJA}	50	62	49	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	30	40	

Notes:

- a. Based on $T_C = 25$ °C.
- b. Surface Mounted on 1" x 1" FR4 board.
- c. $t = 10$ s.
- d. Maximum under Steady State conditions is 120 °C/W.

SPECIFICATIONS $T_J = 25^\circ\text{C}$, unless otherwise noted									
Parameter	Symbol	Test Conditions			Min.	Typ. ^a	Max.	Unit	
Static									
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	N-Ch	40				V	
		$V_{GS} = 0 \text{ V}, I_D = -250 \mu\text{A}$	P-Ch	-30					
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250 \mu\text{A}$	N-Ch		44			mV/ $^\circ\text{C}$	
		$I_D = -250 \mu\text{A}$	P-Ch		-42				
$V_{GS(\text{th})}$ Temperature Coefficient	$\Delta V_{GS(\text{th})}/T_J$	$I_D = 250 \mu\text{A}$	N-Ch		-5.5				
		$I_D = -250 \mu\text{A}$	P-Ch		4.6				
Gate Threshold Voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	N-Ch	1.4		3.0		V	
		$V_{DS} = V_{GS}, I_D = -250 \mu\text{A}$	P-Ch	-1.2		-2.5			
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$	N-Ch			100		nA	
			P-Ch			-100			
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 32 \text{ V}, V_{GS} = 0 \text{ V}$	N-Ch			1		μA	
		$V_{DS} = -30 \text{ V}, V_{GS} = 0 \text{ V}$	P-Ch			-1			
		$V_{DS} = 32 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 55^\circ\text{C}$	N-Ch			10			
		$V_{DS} = -30 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 55^\circ\text{C}$	P-Ch			-10			
On-State Drain Current ^b	$I_{D(on)}$	$V_{DS} = 5 \text{ V}, V_{GS} = 10 \text{ V}$	N-Ch	10				A	
		$V_{DS} = -5 \text{ V}, V_{GS} = -10 \text{ V}$	P-Ch	-10					
Drain-Source On-State Resistance ^b	$R_{DS(on)}$	$V_{GS} = 10 \text{ V}, I_D = 3 \text{ A}$	N-Ch		0.023	0.028		Ω	
		$V_{GS} = -10 \text{ V}, I_D = -3 \text{ A}$	P-Ch		0.039	0.047			
		$V_{GS} = 4.5 \text{ V}, I_D = 2 \text{ A}$	N-Ch		0.030	0.036			
		$V_{GS} = -4.5 \text{ V}, I_D = -2 \text{ A}$	P-Ch		0.065	0.075			
Forward Transconductance ^b	g_{fs}	$V_{DS} = 15 \text{ V}, I_D = 5 \text{ A}$	N-Ch		21			S	
		$V_{DS} = -15 \text{ V}, I_D = -5 \text{ A}$	P-Ch		14				
Dynamic^a									
Input Capacitance	C_{iss}	N-Channel $V_{DS} = 20 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	N-Ch		720			pF	
			P-Ch		970				
Output Capacitance	C_{oss}		N-Ch		81				
			P-Ch		120				
Reverse Transfer Capacitance	C_{rss}		N-Ch		21				
			P-Ch		95				
Total Gate Charge	Q_g	N-Channel $V_{DS} = 20 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 5 \text{ A}$	N-Ch		10.3	20		nC	
			P-Ch		25	38			
Gate-Source Charge	Q_{gs}		N-Ch		4.9	9			
			P-Ch		11.8	18			
	P-Channel $V_{DS} = 20 \text{ V}, V_{GS} = 4.5 \text{ V}, I_D = 5 \text{ A}$	N-Ch		1.5					
		P-Ch		3.0					
Gate-Drain Charge		Q_{gd}		N-Ch		1.7			Ω
				P-Ch		5.2			
Gate Resistance	R_g	$f = 1 \text{ MHz}$	N-Ch	0.5	2.0	4.5		Ω	
			P-Ch	1.0	5.5	11			

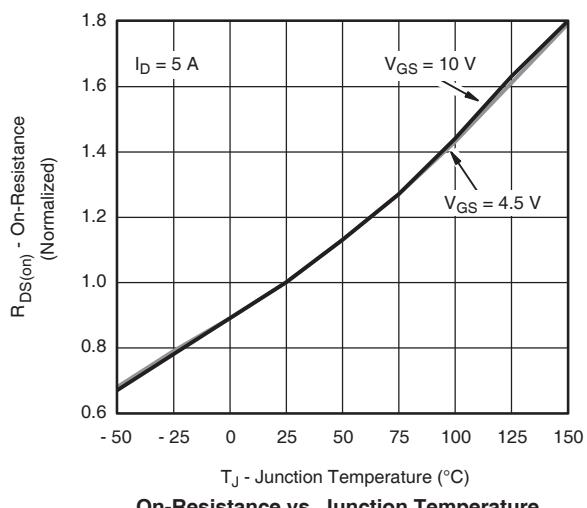
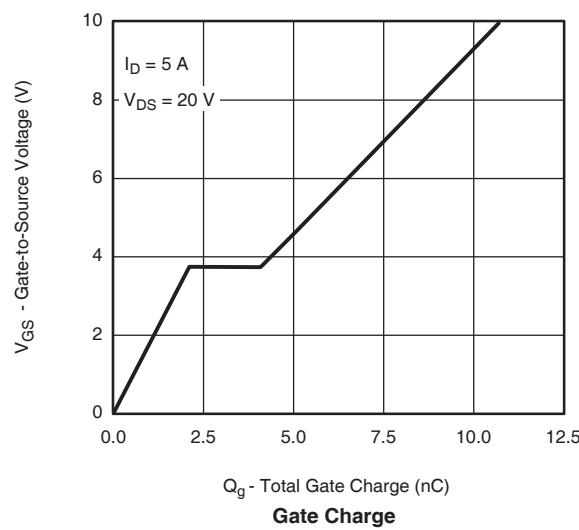
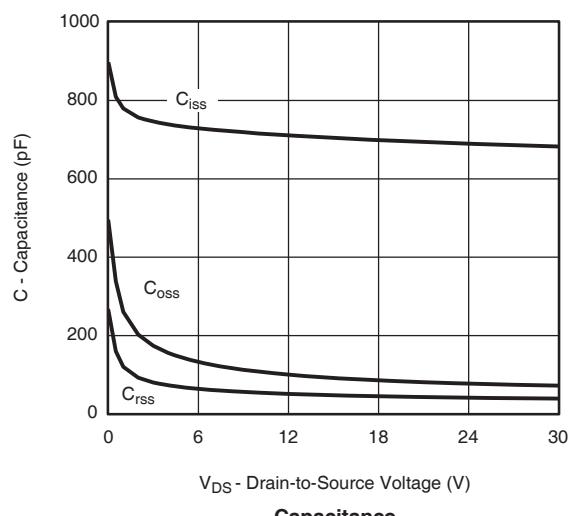
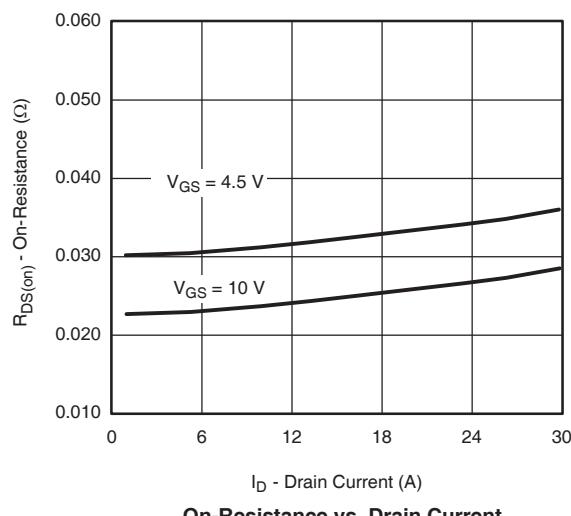
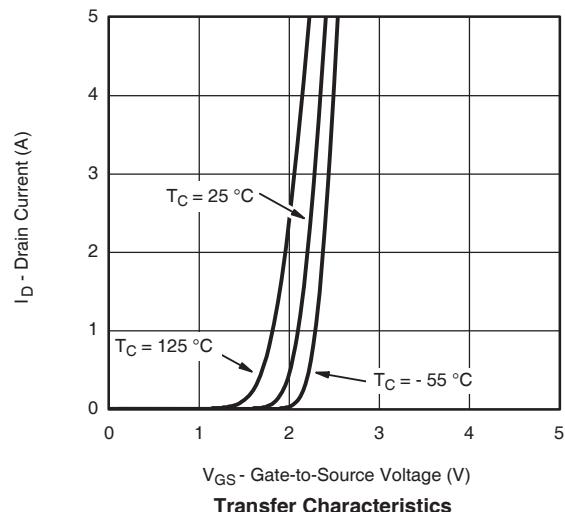
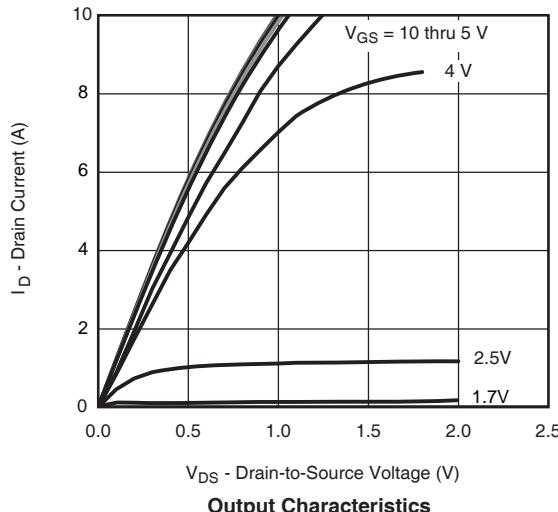
SPECIFICATIONS $T_J = 25^\circ\text{C}$, unless otherwise noted								
Parameter	Symbol	Test Conditions			Min.	Typ. ^a	Max.	Unit
Dynamic^a								
Turn-On Delay Time	$t_{d(on)}$	N-Channel $V_{DD} = 20 \text{ V}$, $R_L = 4 \Omega$ $I_D \geq 5 \text{ A}$, $V_{GEN} = 10 \text{ V}$, $R_g = 1 \Omega$	N-Ch		8	15		ns
Rise Time	t_r		P-Ch		7	14		
Turn-Off Delay Time	$t_{d(off)}$		N-Ch		11	20		
Fall Time	t_f		P-Ch		12	24		
Turn-On Delay Time	$t_{d(on)}$		N-Ch		17	30		
Rise Time	t_r		P-Ch		30	60		
Turn-Off Delay Time	$t_{d(off)}$		N-Ch		10	18		
Fall Time	t_f		P-Ch		9	18		
Drain-Source Body Diode Characteristics								
Continuous Source-Drain Diode Current	I_S	$T_C = 25^\circ\text{C}$	N-Ch			2.5		A
Pulse Diode Forward Current ^a	I_{SM}		P-Ch			- 2.5		
Body Diode Voltage	V_{SD}	$I_S = 1.6 \text{ A}$	N-Ch		0.75	1.2		V
Body Diode Reverse Recovery Time	t_{rr}	$I_S = - 1.6 \text{ A}$	P-Ch		- 0.76	- 1.2		
Body Diode Reverse Recovery Charge	Q_{rr}	N-Channel $I_F = 2 \text{ A}$, $dI/dt = 100 \text{ A}/\mu\text{s}$, $T_J = 25^\circ\text{C}$	N-Ch		20	30		ns
Reverse Recovery Fall Time	t_a		P-Ch		26	50		
Reverse Recovery Rise Time	t_b		N-Ch		14	25		nC
			P-Ch		18.5	35		
			N-Ch		15			ns
			P-Ch		12.5			
			N-Ch		6			ns
			P-Ch		13.5			

Notes:

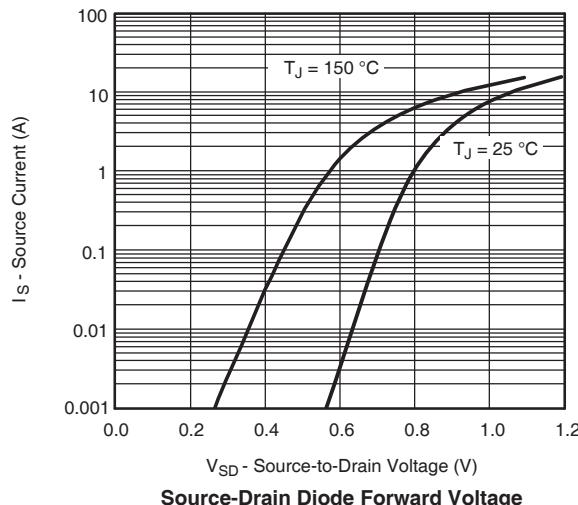
- a. Guaranteed by design, not subject to production testing.
- b. Pulse test; pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$.

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.

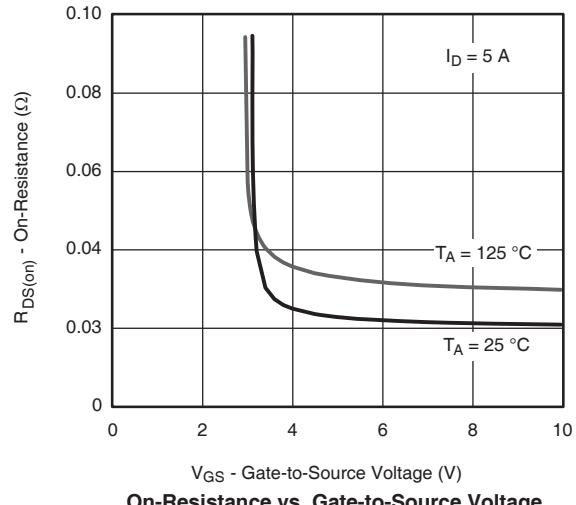
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



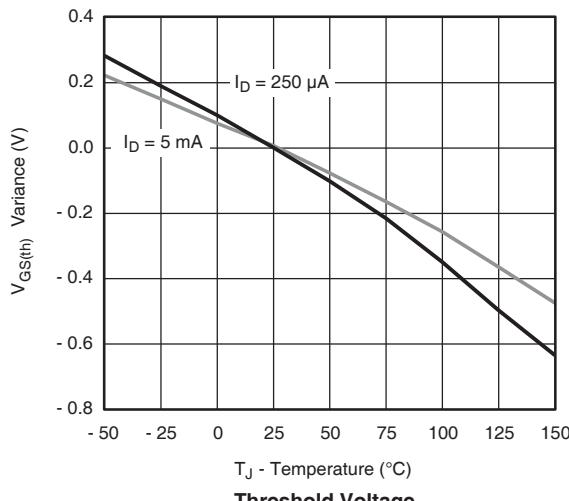
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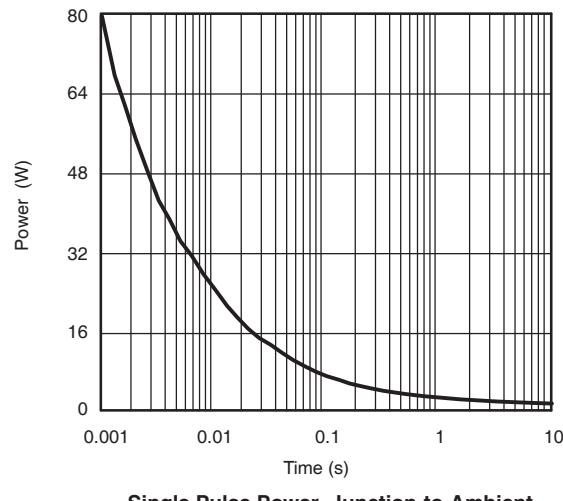
Source-Drain Diode Forward Voltage



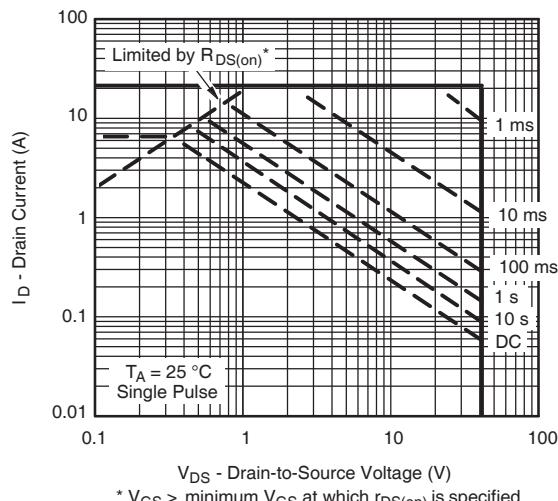
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



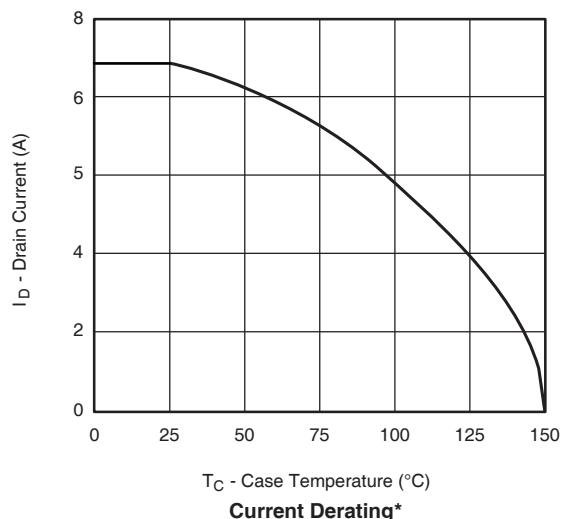
Single Pulse Power, Junction-to-Ambient



* $V_{GS} >$ minimum V_{GS} at which $r_{DS(on)}$ is specified

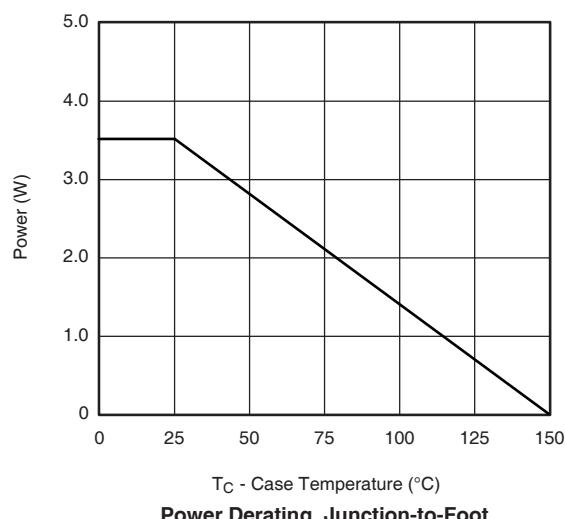
Safe Operating Area, Junction-to-Ambient

N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



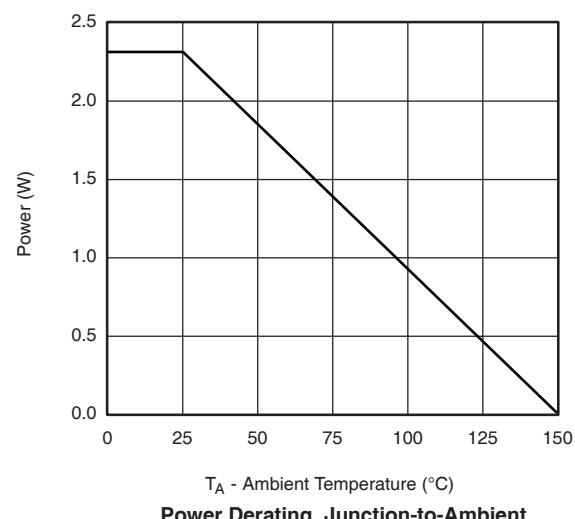
T_C - Case Temperature (°C)

Current Derating*



T_C - Case Temperature (°C)

Power Derating, Junction-to-Foot

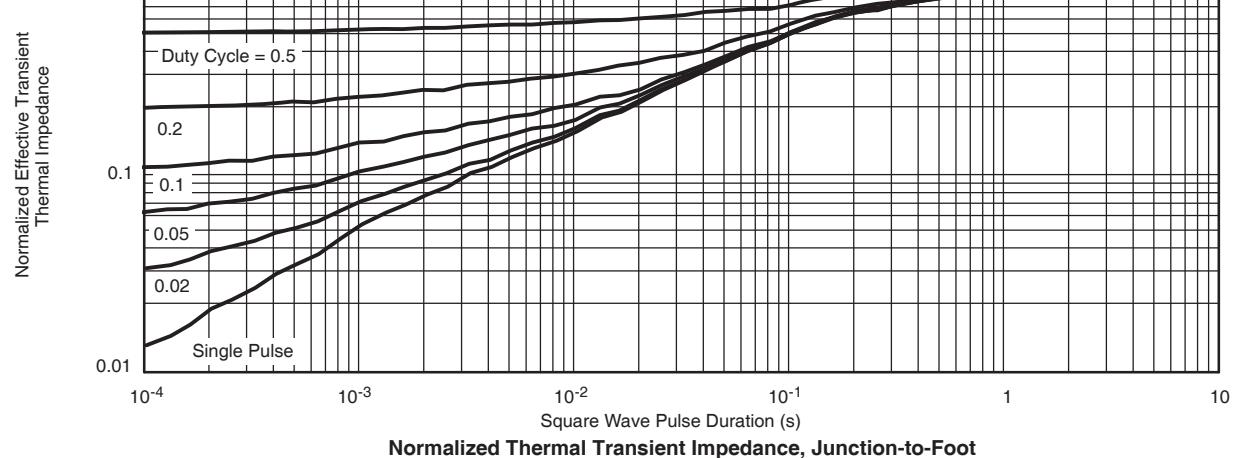
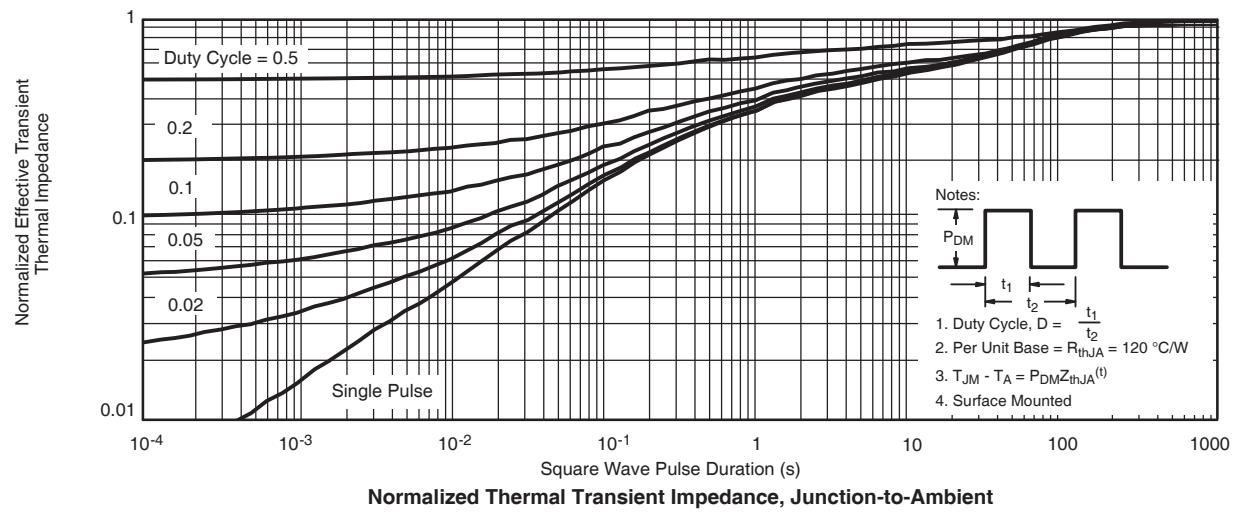


T_A - Ambient Temperature (°C)

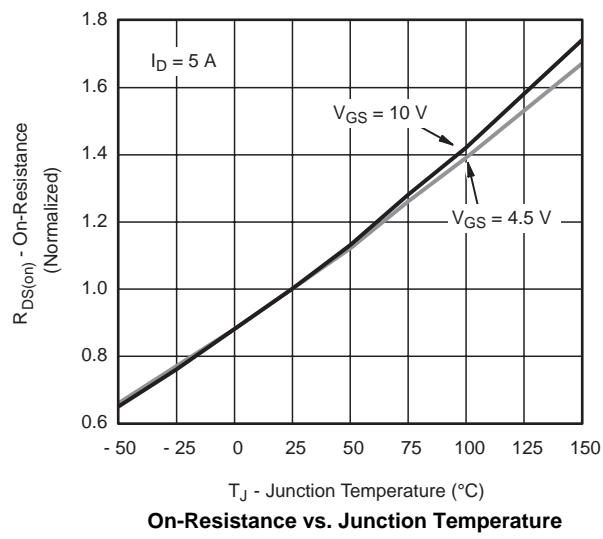
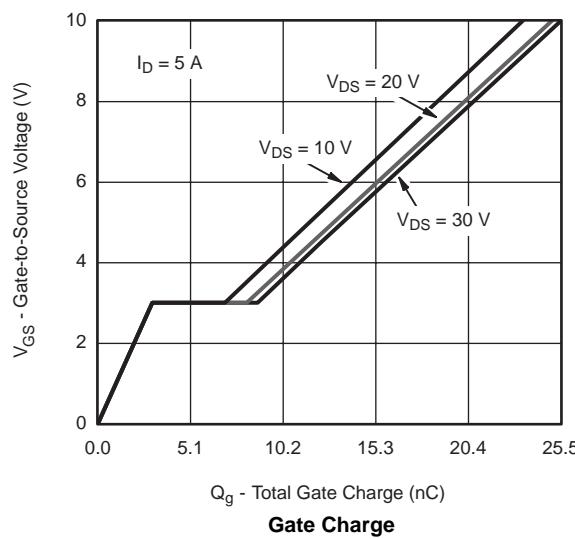
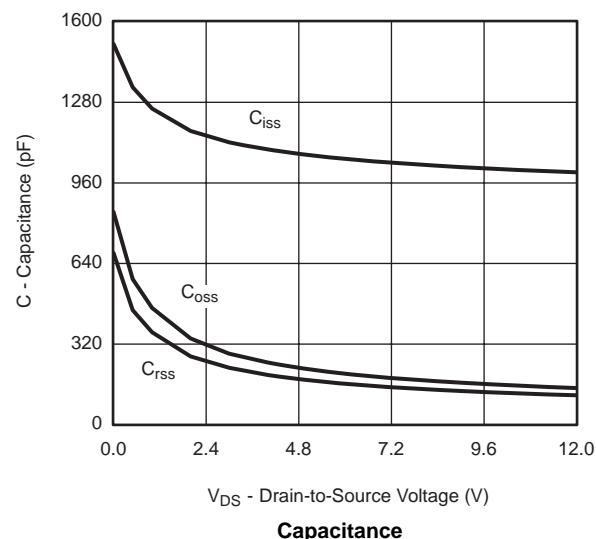
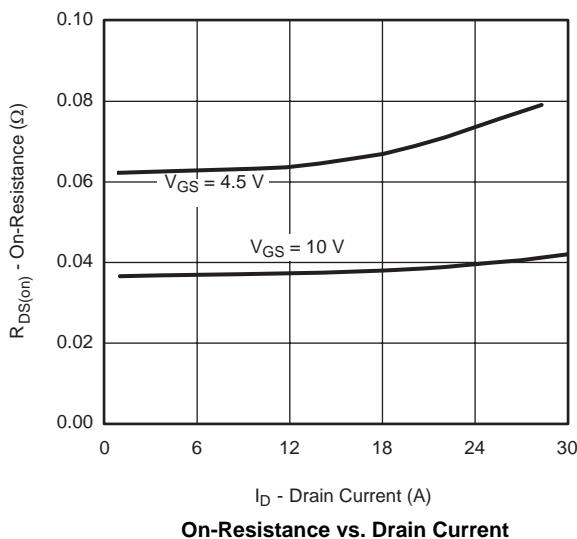
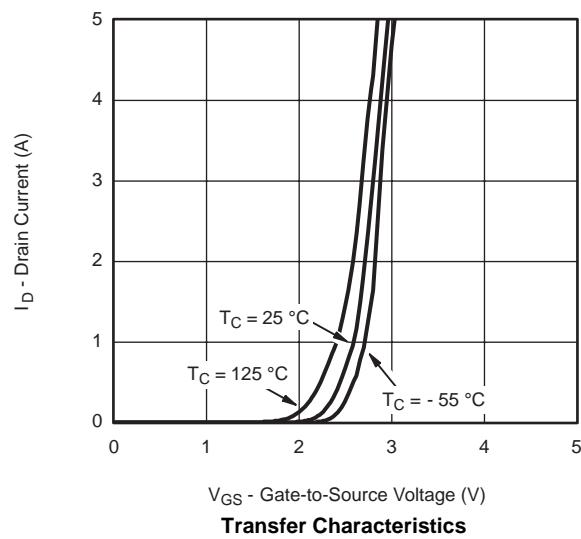
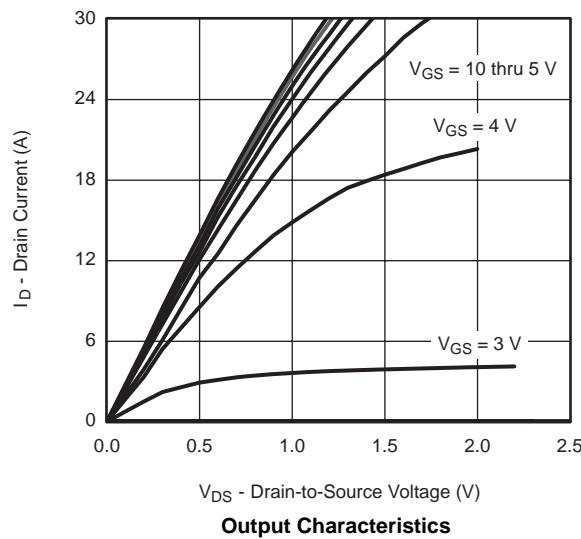
Power Derating, Junction-to-Ambient

* 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.

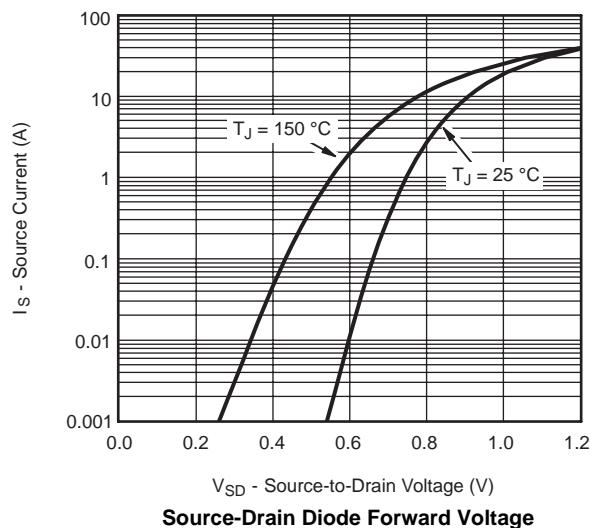
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



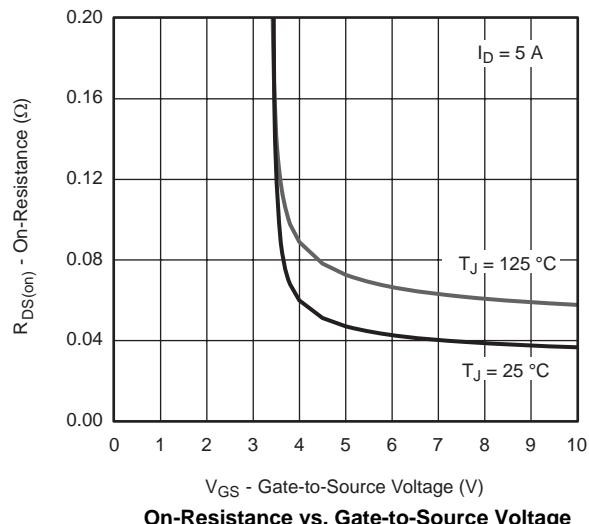
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



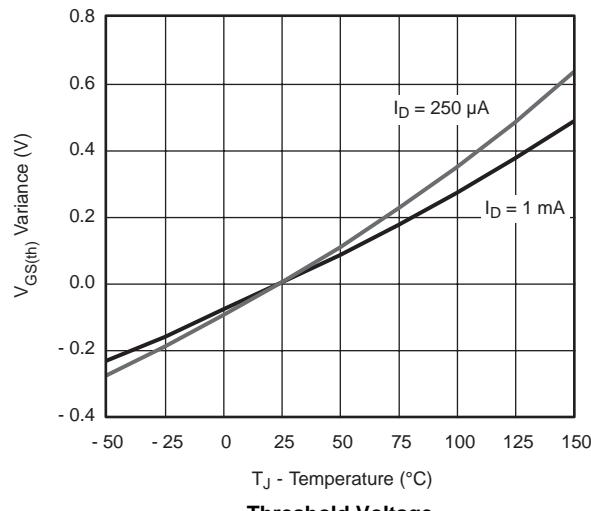
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



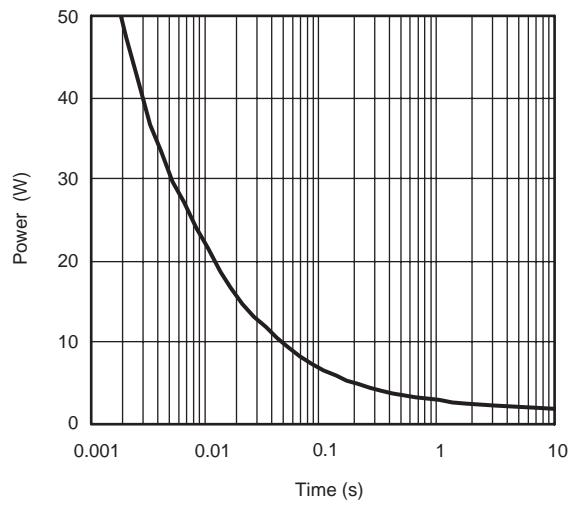
Source-Drain Diode Forward Voltage



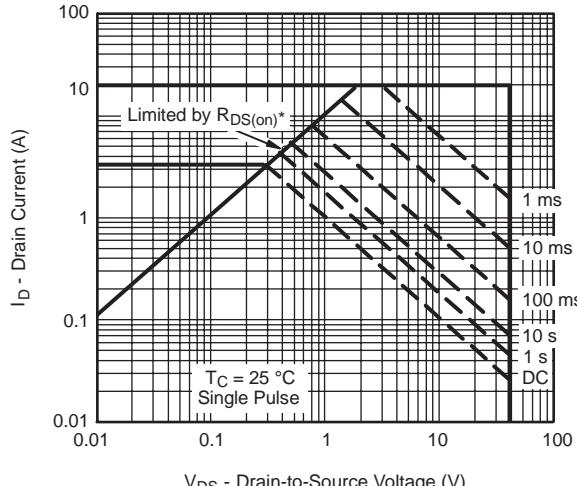
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



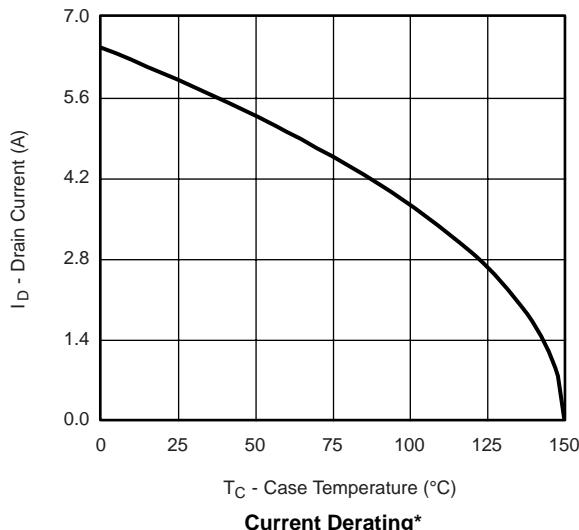
Single Pulse Power, Junction-to-Ambient



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

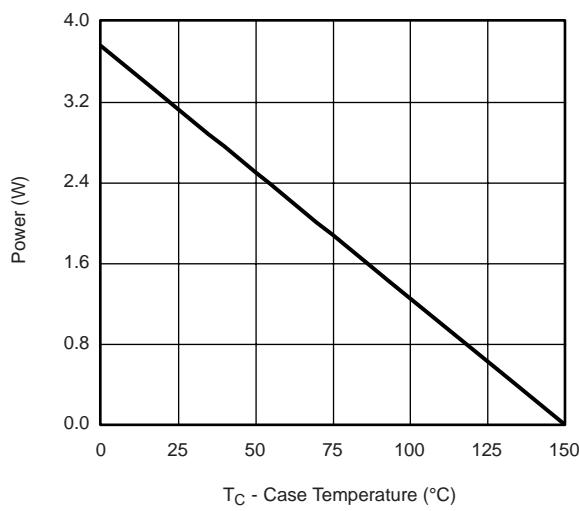
Safe Operating Area, Junction-to-Ambient

P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



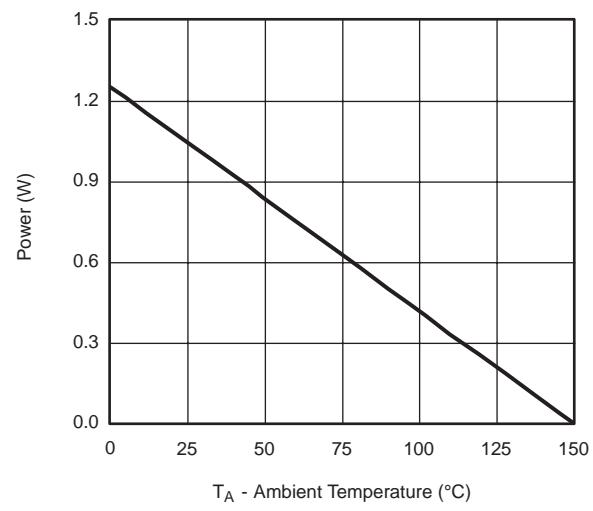
T_C - Case Temperature (°C)

Current Derating*



T_C - Case Temperature (°C)

Power Derating, Junction-to-Foot

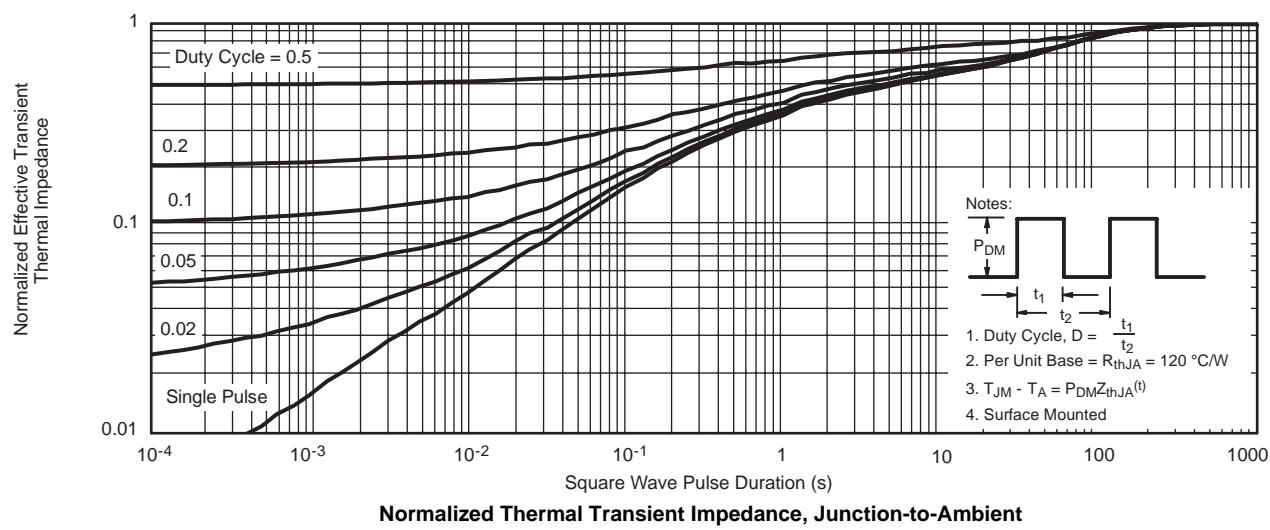


T_A - Ambient Temperature (°C)

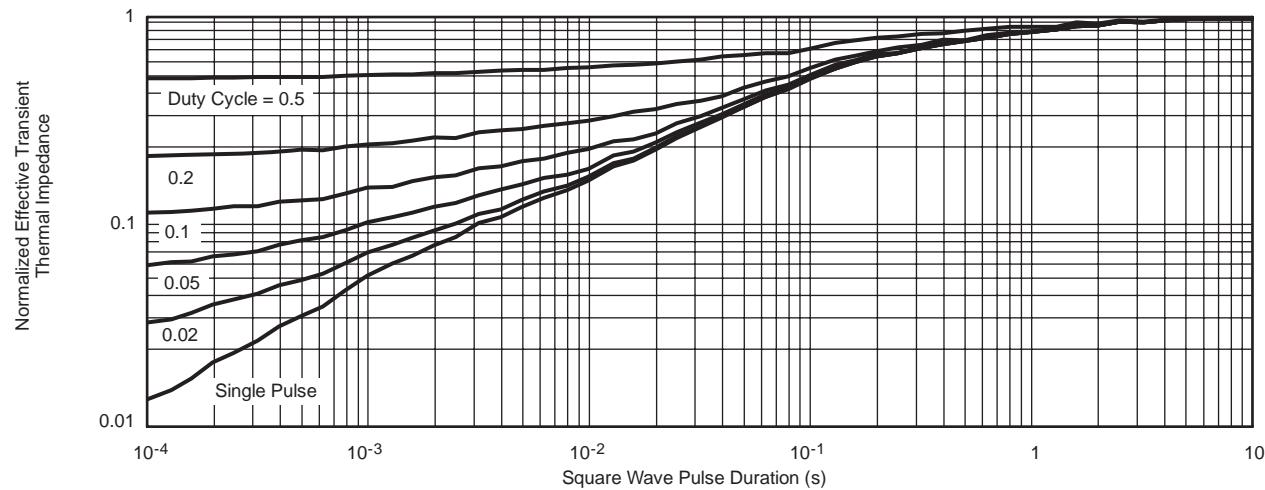
Power Derating, Junction-to-Ambient

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P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

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