

N- and P-Channel 20-V (D-S) MOSFET

PRODUCT SUMMARY			
	V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)
N-Channel	20	0.060 at $V_{GS} = 4.5$ V	3.4
		0.070 at $V_{GS} = 2.5$ V	3.2
		0.100 at $V_{GS} = 1.8$ V	2.5
P-Channel	- 20	0.110 at $V_{GS} = - 4.5$ V	- 2.5
		0.145 at $V_{GS} = - 2.5$ V	- 2.0
		0.220 at $V_{GS} = - 1.8$ V	- 1.0

FEATURES

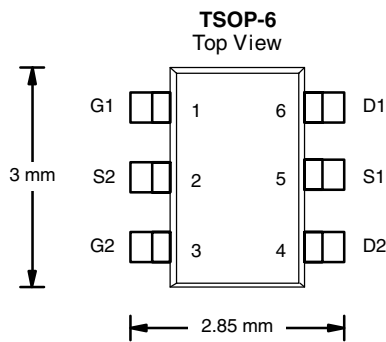
- TrenchFET[®] Power MOSFET
- Fast Switching In Small Footprint
- Very Low $r_{DS(on)}$ for Increased Efficiency



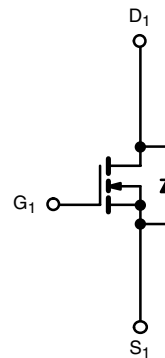
RoHS
COMPLIANT

APPLICATIONS

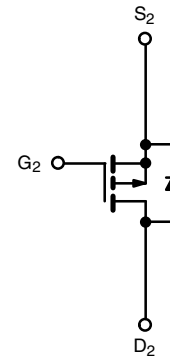
- Load Switch for Portable Devices



Ordering Information: Si3586DV-T1-E3 (Lead (Pb)-free)



N-Channel MOSFET



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted							
Parameter	Symbol	N-Channel		P-Channel		Unit	
		5 sec	Steady State	5 sec	Steady State		
Drain-Source Voltage	V_{DS}	20		- 20		V	
Gate-Source Voltage	V_{GS}	± 8					
Continuous Drain Current ($T_J = 150$ °C) ^a	I_D	$T_A = 25$ °C	3.4	2.9	- 2.5	- 2.1	A
		$T_A = 70$ °C	2.7	2.3	- 2.0	- 1.7	
Pulsed Drain Current	I_{DM}	± 8				W	
Continuous Source Current (Diode Conduction) ^a	I_S	1.05	0.75	- 1.05	- 0.75		
Maximum Power Dissipation ^a	P_D	$T_A = 25$ °C	1.15	0.83	1.15	0.83	W
		$T_A = 70$ °C	0.73	0.53	0.73	0.53	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150				°C	

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^a	$t \leq 5$ sec	R_{thJA}	93	110	°C/W
	Steady State		130	150	
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	90	90	

Notes:

a. Surface Mounted on 1" x 1" FR4 Board.

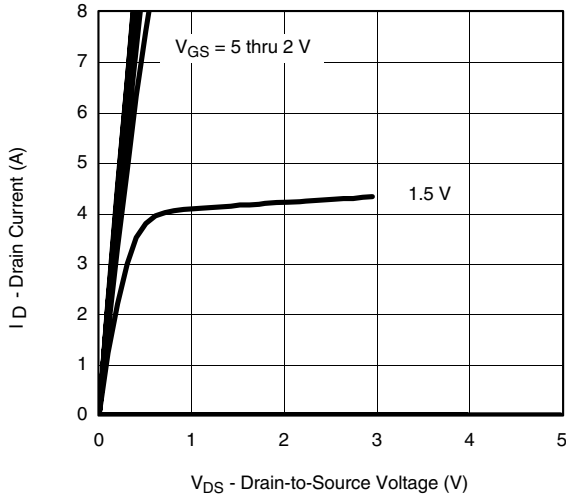
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted							
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
Static							
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	N-Ch	0.40		1.1	V
		$V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	P-Ch	-0.40		-1.1	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\ \text{V}, V_{GS} = \pm 8\ \text{V}$	N-Ch			± 100	nA
		$V_{DS} = 0\ \text{V}, V_{GS} = \pm 8\ \text{V}$	P-Ch			± 100	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 20\ \text{V}, V_{GS} = 0\ \text{V}$	N-Ch			1	μA
		$V_{DS} = -20\ \text{V}, V_{GS} = 0\ \text{V}$	P-Ch			-1	
		$V_{DS} = 20\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 85\text{ }^\circ\text{C}$	N-Ch			10	
		$V_{DS} = -20\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 85\text{ }^\circ\text{C}$	P-Ch			-10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\ \text{V}, V_{GS} = 4.5\ \text{V}$	N-Ch	5			A
		$V_{DS} \leq -5\ \text{V}, V_{GS} = -4.5\ \text{V}$	P-Ch	-5			
Drain-Source On-State Resistance ^a	$r_{DS(on)}$	$V_{GS} = 4.5\ \text{V}, I_D = 3.4\ \text{A}$	N-Ch		0.047	0.060	Ω
		$V_{GS} = -4.5\ \text{V}, I_D = -2.5\ \text{A}$	P-Ch		0.086	0.110	
		$V_{GS} = 2.5\ \text{V}, I_D = 3.2\ \text{A}$	N-Ch		0.054	0.070	
		$V_{GS} = -2.5\ \text{V}, I_D = -2.0\ \text{A}$	P-Ch		0.116	0.145	
		$V_{GS} = -1.8\ \text{V}, I_D = -2.5\ \text{A}$	N-Ch		0.075	0.100	
		$V_{GS} = -1.8\ \text{V}, I_D = -1.0\ \text{A}$	P-Ch		0.170	0.220	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 5\ \text{V}, I_D = 3.4\ \text{A}$	N-Ch		13		S
		$V_{DS} = -5\ \text{V}, I_D = -2.5\ \text{A}$	P-Ch		6		
Diode Forward Voltage ^a	V_{SD}	$I_S = 1.05\ \text{A}, V_{GS} = 0\ \text{V}$	N-Ch		0.8	1.1	V
		$I_S = -1.05\ \text{A}, V_{GS} = 0\ \text{V}$	P-Ch		-0.8	-1.1	
Dynamic^b							
Total Gate Charge	Q_g	N-Channel $V_{DS} = 10\ \text{V}, V_{GS} = 4.5\ \text{V}, I_D = 3.4\ \text{A}$	N-Ch		4.1	6.0	nC
Gate-Source Charge	Q_{gs}		P-Ch		5	7.5	
Gate-Drain Charge	Q_{gd}	P-Channel $V_{DS} = -10\ \text{V}, V_{GS} = -4.5\ \text{V}, I_D = -2.5\ \text{A}$	N-Ch		0.65		
			P-Ch		0.68		
Gate Resistance	R_g		N-Ch		2.6		Ω
			P-Ch		9.8		
Turn-On Delay Time	$t_{d(on)}$	N-Channel $V_{DD} = 10\ \text{V}, R_L = 10\ \Omega$ $I_D \cong 1\ \text{A}, V_{GEN} = 4.5\ \text{V}, R_G = 6\ \Omega$	N-Ch		30	45	ns
Rise Time	t_r		P-Ch		28	45	
Turn-Off Delay Time	$t_{d(off)}$	P-Channel $V_{DD} = -10\ \text{V}, R_L = 10\ \Omega$ $I_D \cong -1\ \text{A}, V_{GEN} = -4.5\ \text{V}, R_G = 6\ \Omega$	N-Ch		52	85	
			P-Ch		55	85	
Fall Time	t_f		N-Ch		25	40	
			P-Ch		55	85	
Source-Drain Reverse Recovery Time	t_{rr}		N-Ch		20	30	
			P-Ch		32	50	
			N-Ch		25	40	
			P-Ch		25	40	

Notes:

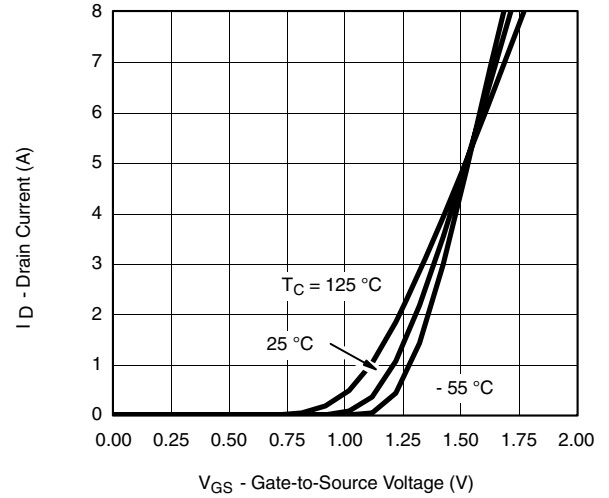
- a. Pulse test; pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

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.

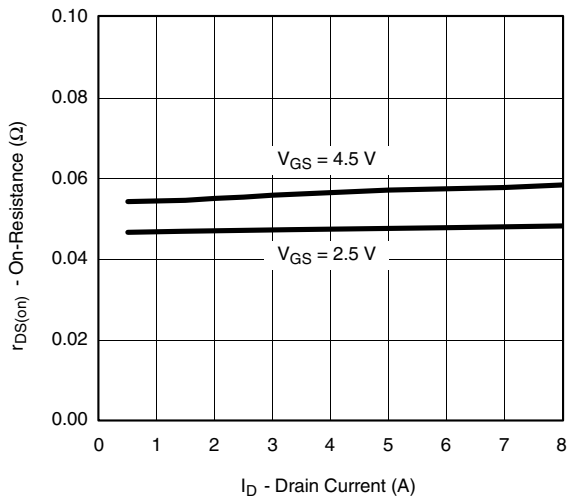
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C unless noted



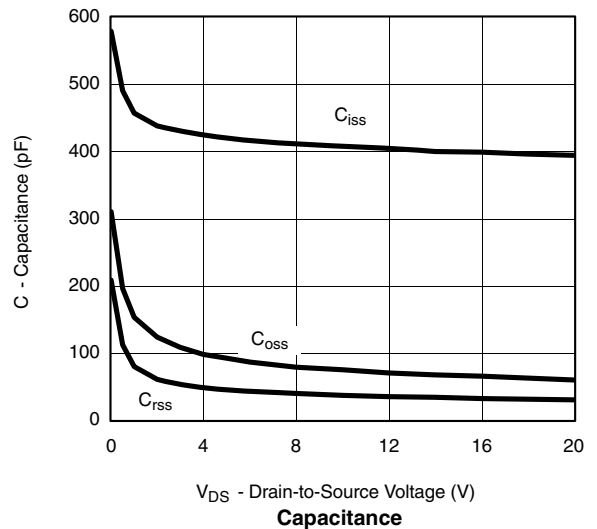
Output Characteristics



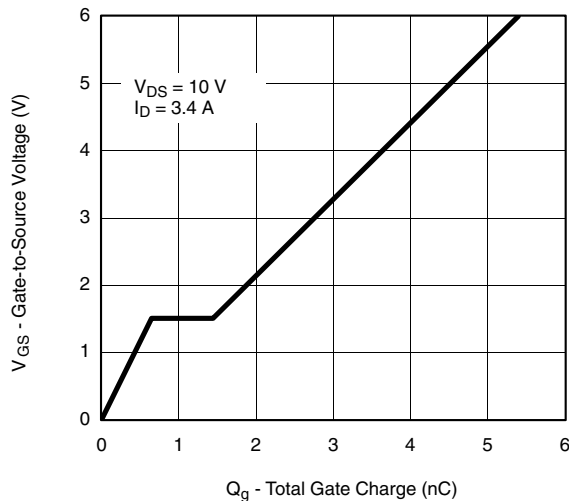
Transfer Characteristics



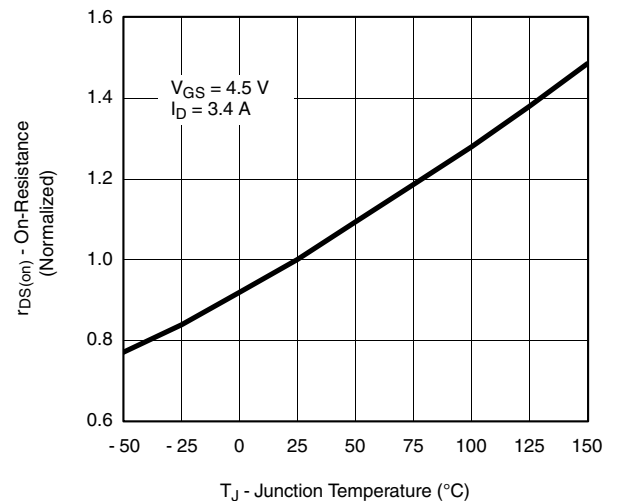
On-Resistance vs. Drain Current



Capacitance



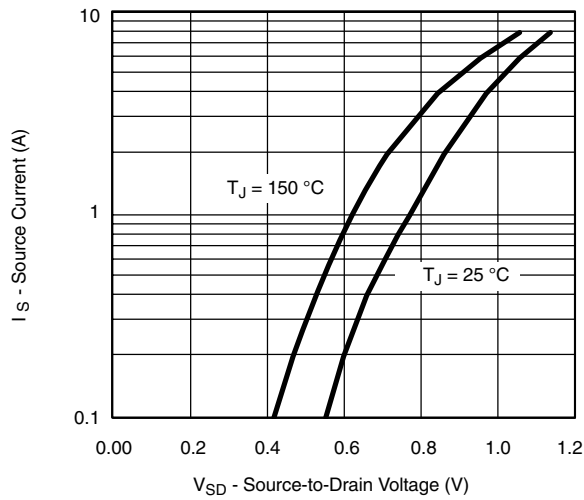
Gate Charge



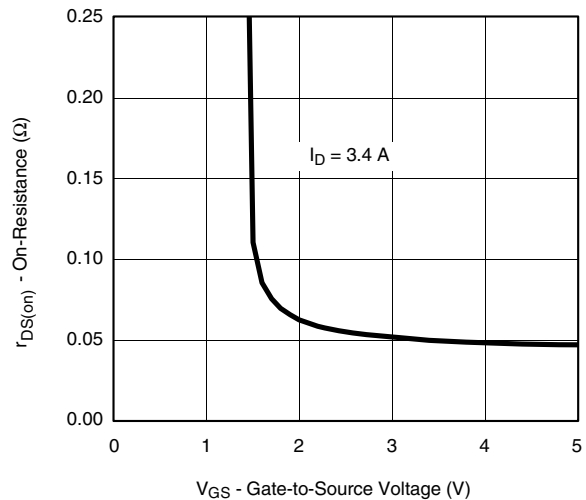
On-Resistance vs. Junction Temperature



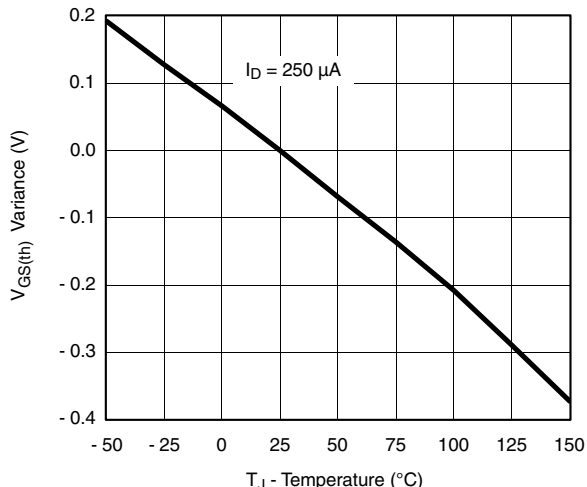
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C unless noted



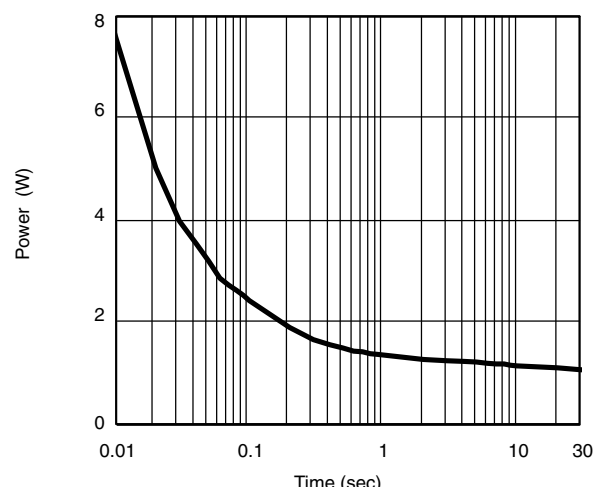
Source-Drain Diode Forward Voltage



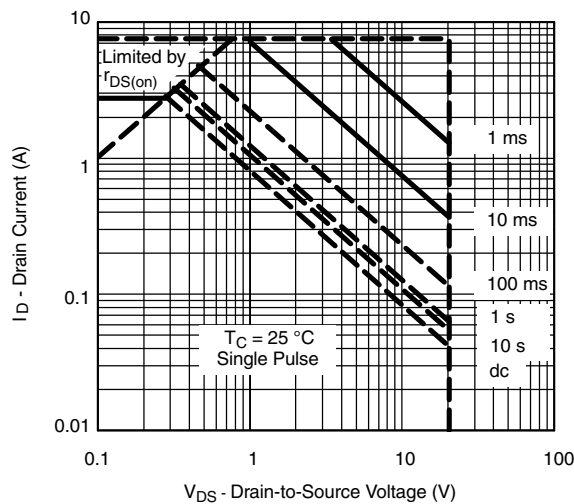
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power (Junction-to-Ambient)

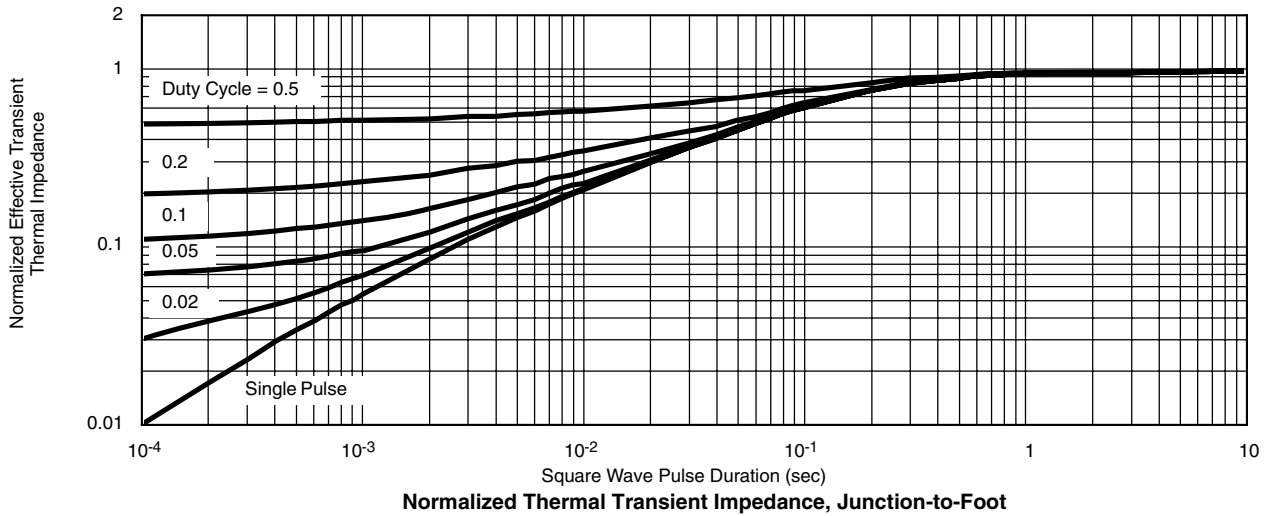
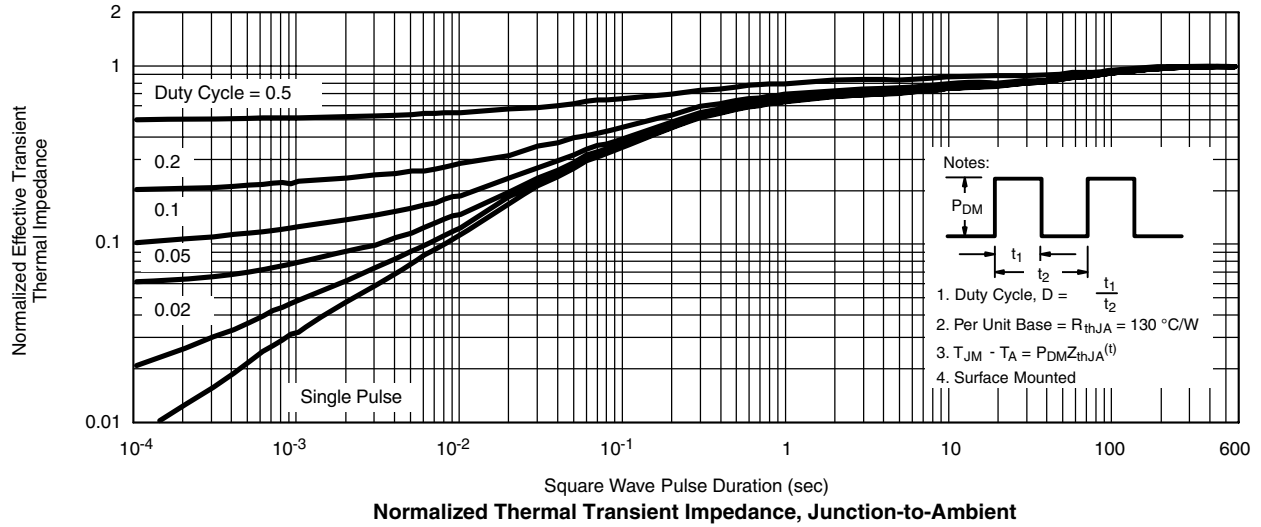


* $V_{GS} >$ minimum V_{GS} at which $r_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Case

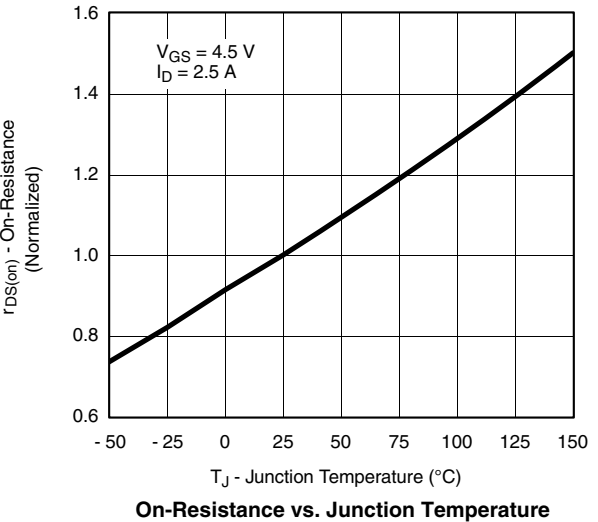
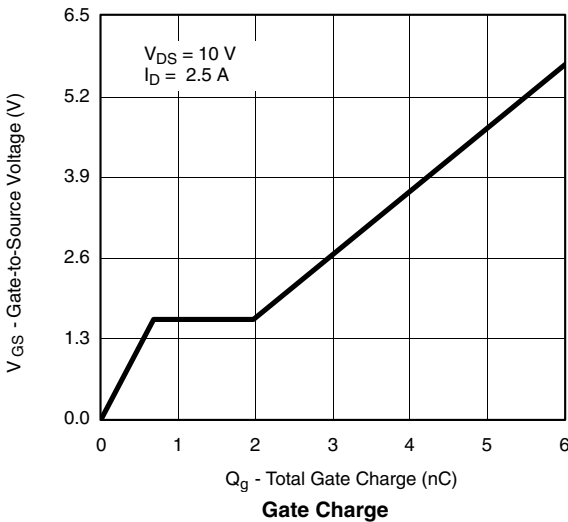
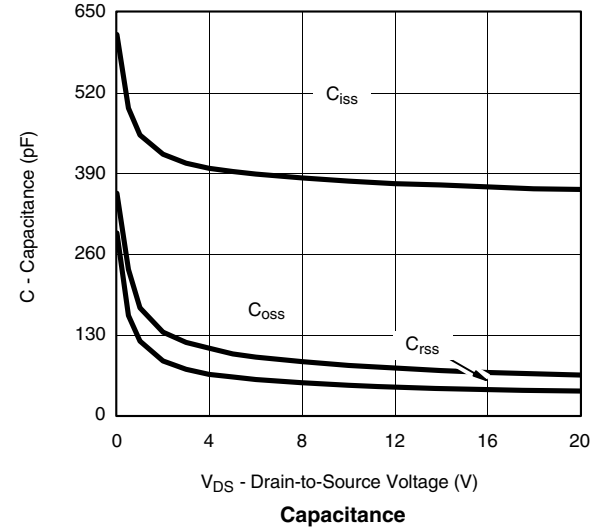
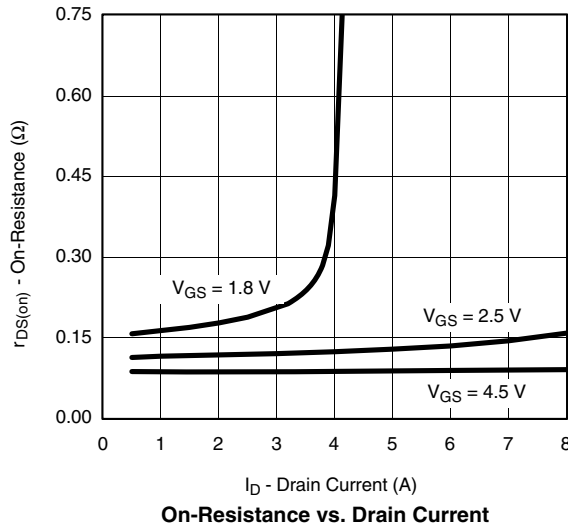
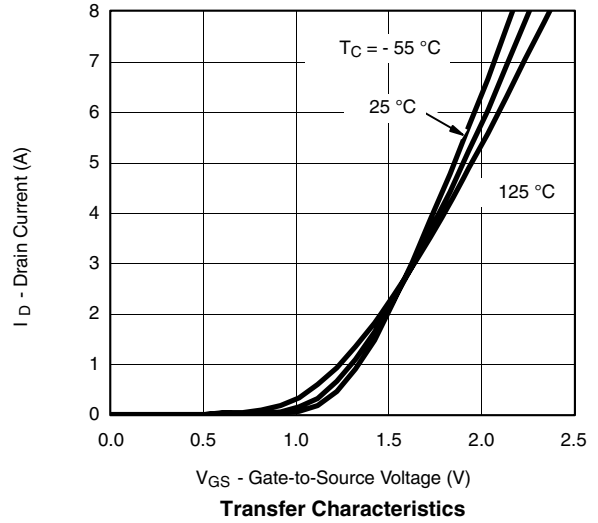
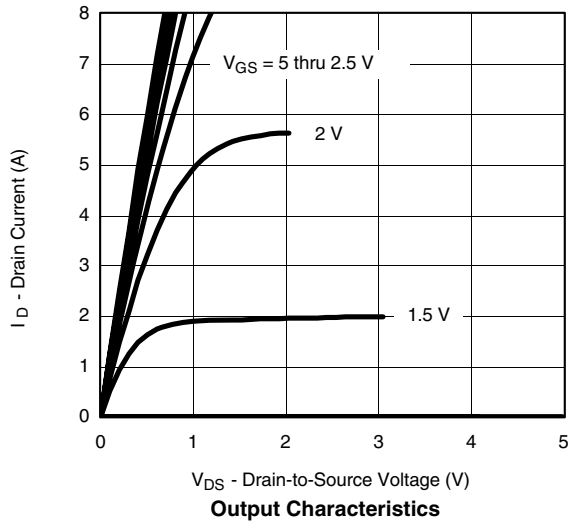


N-CHANNEL TYPICAL CHARACTERISTICS 25 °C unless noted

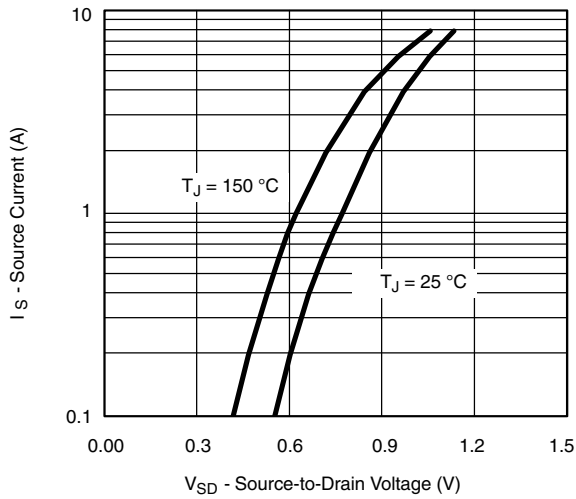




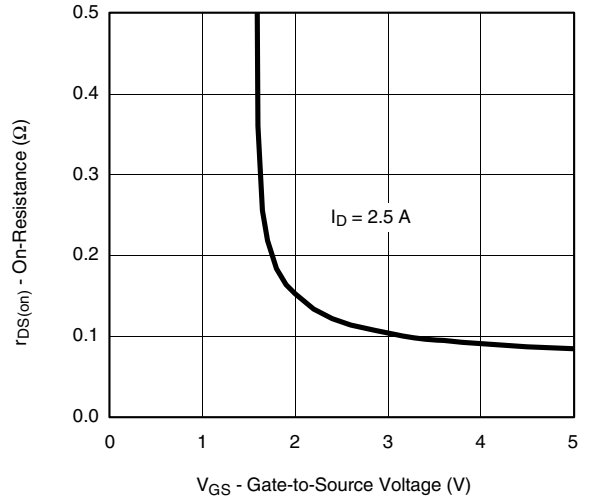
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C unless noted



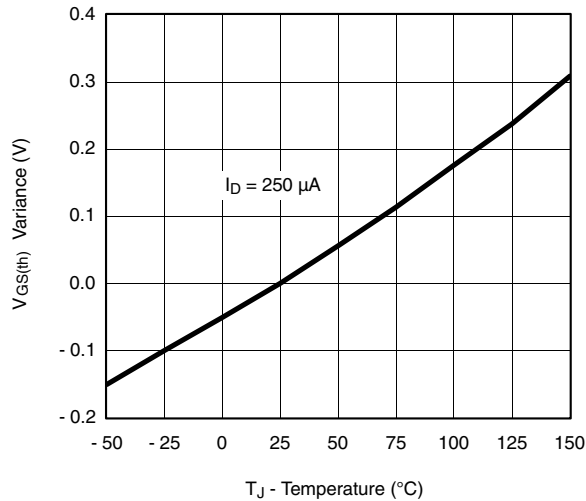
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C unless noted



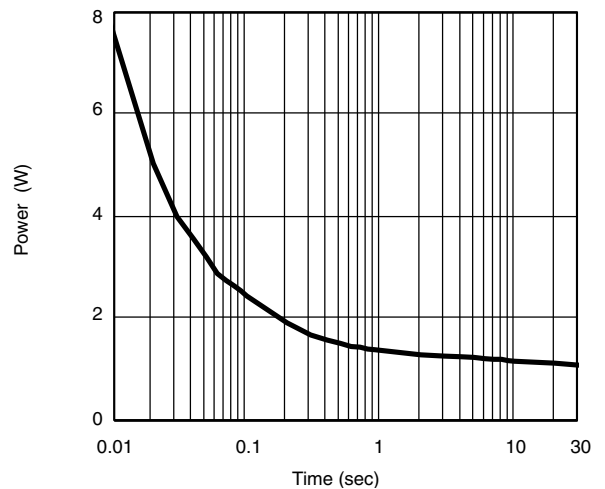
Source-Drain Diode Forward Voltage



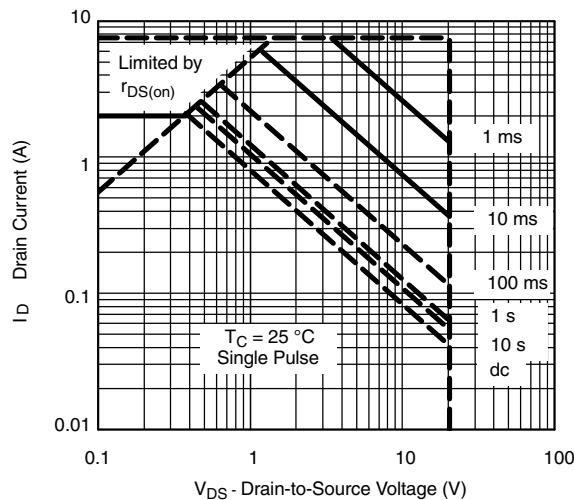
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power (Junction-to-Ambient)

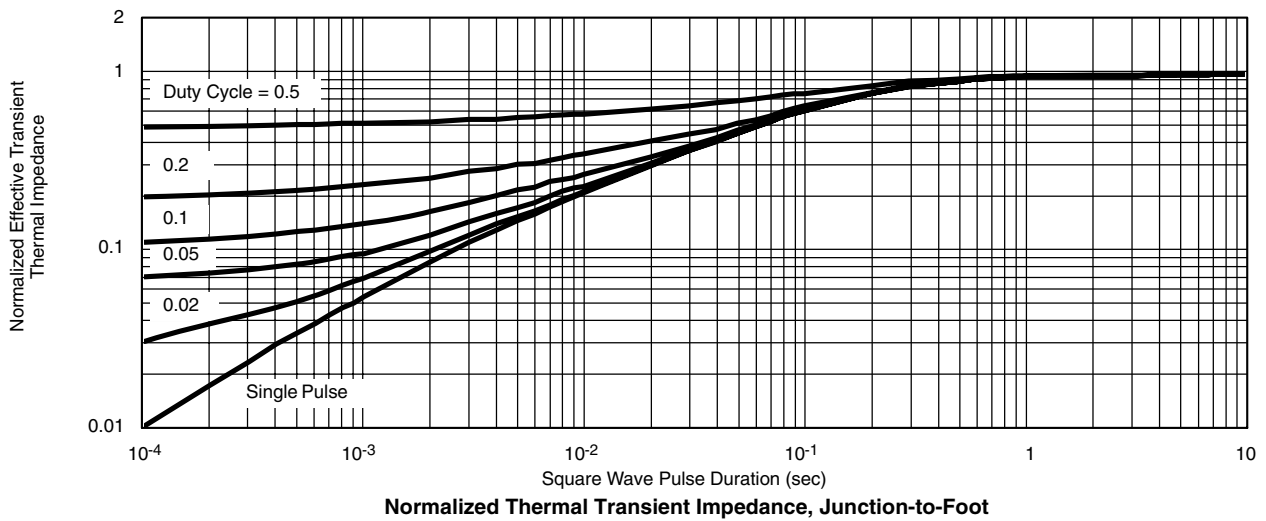
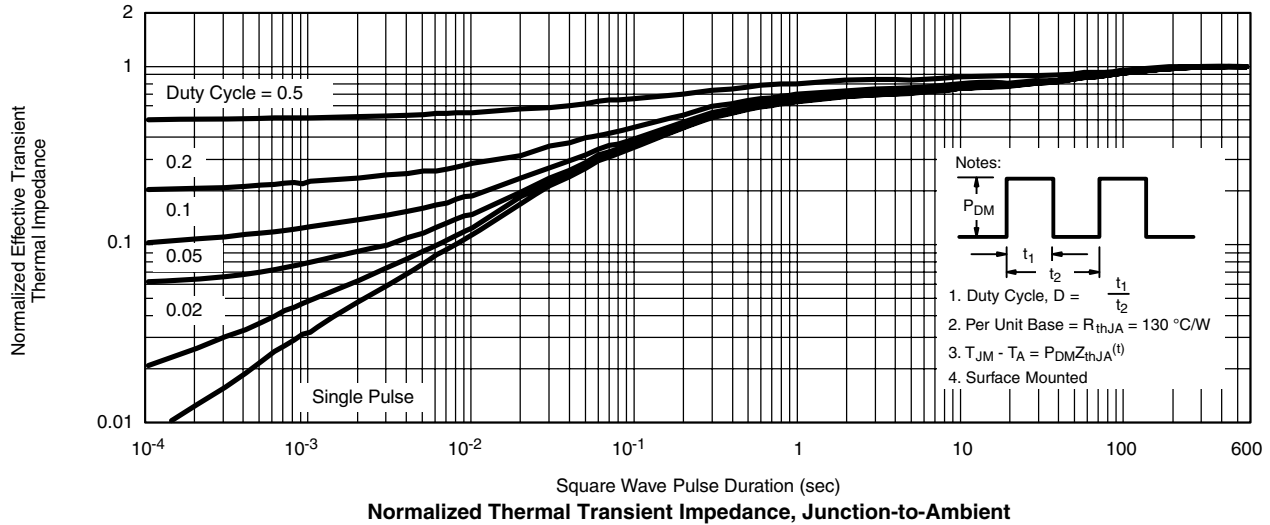


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Safe Operating Area, Junction-to-Case



P-CHANNEL TYPICAL CHARACTERISTICS 25 °C unless noted



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