

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} = - 1.8V	- 1.0

FEATURES

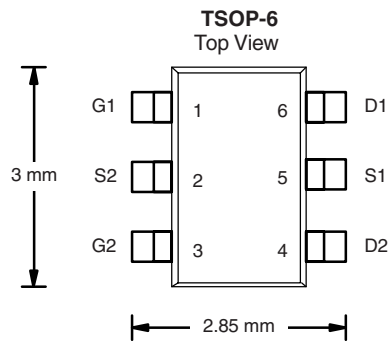
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET[®] Power MOSFET
- Fast Switching In Small Footprint
- Very Low R_{DS(on)} for Increased Efficiency
- Compliant to RoHS Directive 2002/95/EC



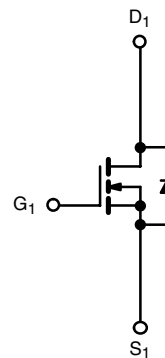
RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

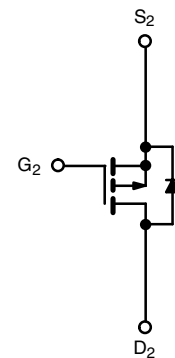
- Load Switch for Portable Devices



Ordering Information: Si3586DV-T1-E3 (Lead (Pb)-free)
Si3586DV-T1-GE3 (Lead (Pb)-free and Halogen-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 s	Steady State	5 s	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				A	
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 ≤ 5 s	R _{thJA}	93	110	°C/W
	Steady State		130	150	
Maximum Junction-to-Foot (Drain)	Steady State	R _{thJF}	90	90	

Note:

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	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	N-Ch	0.40	1.1	V	
		$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	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	Ω	
		$V_{GS} = -4.5\text{ V}, I_D = -2.5\text{ A}$	P-Ch		0.086		
		$V_{GS} = 2.5\text{ V}, I_D = 3.2\text{ A}$	N-Ch		0.054		
		$V_{GS} = -2.5\text{ V}, I_D = -2.0\text{ A}$	P-Ch		0.116		
		$V_{GS} = -1.8\text{ V}, I_D = -2.5\text{ A}$	N-Ch		0.075		
		$V_{GS} = -1.8\text{ V}, I_D = -1.0\text{ A}$	P-Ch		0.170		
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	V	
		$I_S = -1.05\text{ A}, V_{GS} = 0\text{ V}$	P-Ch		-0.8		
Dynamic^b							
Total Gate Charge	Q_g	N-Channel $V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 3.4\text{ A}$ P-Channel $V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -2.5\text{ A}$	N-Ch		4.1	nC	
Gate-Source Charge	Q_{gs}		P-Ch		5		
			N-Ch		0.65		
Gate-Drain Charge	Q_{gd}	P-Ch		0.68			
		N-Ch		0.8			
Gate Resistance	R_g		N-Ch		2.6	Ω	
			P-Ch		9.8		
Turn-On Delay Time	$t_{d(on)}$	N-Channel $V_{DD} = 10\text{ V}, R_L = 10\text{ }\Omega$ $I_D \cong 1\text{ A}, V_{GEN} = 4.5\text{ V}, R_G = 6\text{ }\Omega$	N-Ch		30	ns	
Rise Time	t_r		P-Ch		28		
		N-Ch		52	85		
P-Ch		55					
Turn-Off Delay Time	$t_{d(off)}$	P-Channel $V_{DD} = -10\text{ V}, R_L = 10\text{ }\Omega$ $I_D \cong -1\text{ A}, V_{GEN} = -4.5\text{ V}, R_G = 6\text{ }\Omega$	N-Ch		25	ns	
			P-Ch		55		
Fall Time	t_f		N-Ch		20	30	
			P-Ch		32		
Source-Drain Reverse Recovery Time	t_{rr}		N-Ch		25	40	
			P-Ch		25		

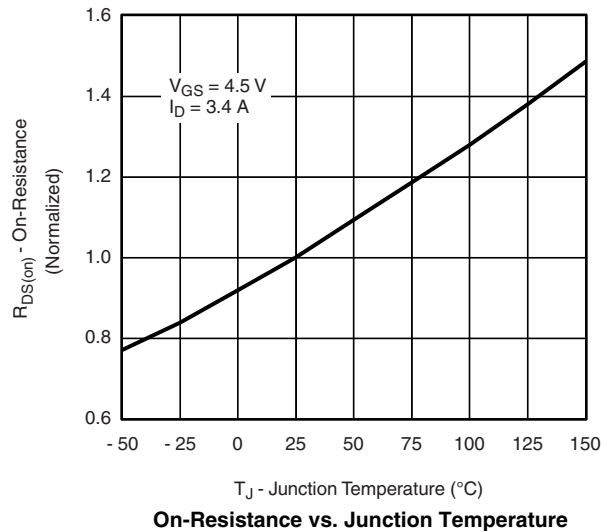
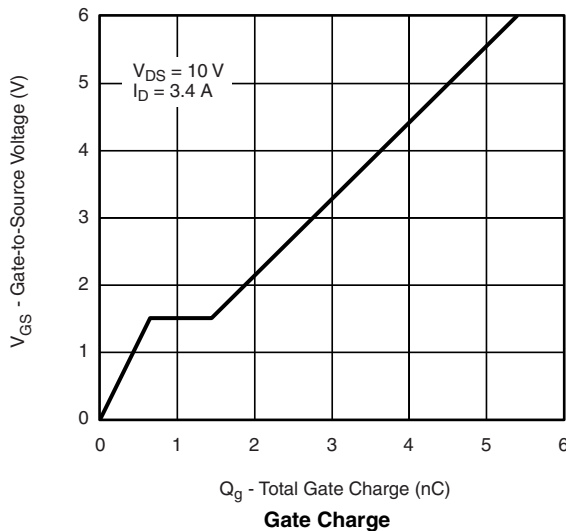
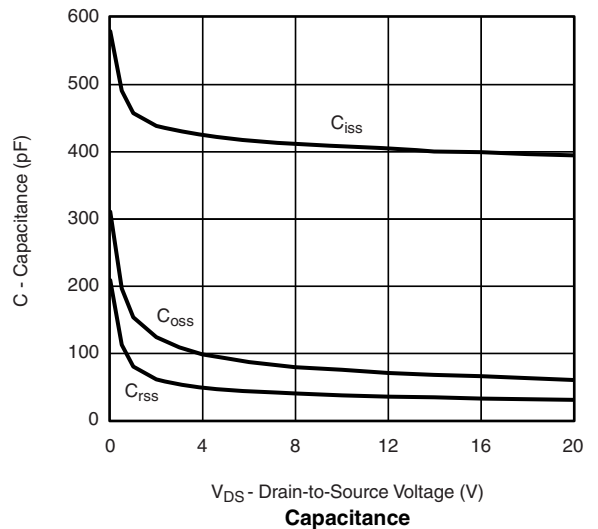
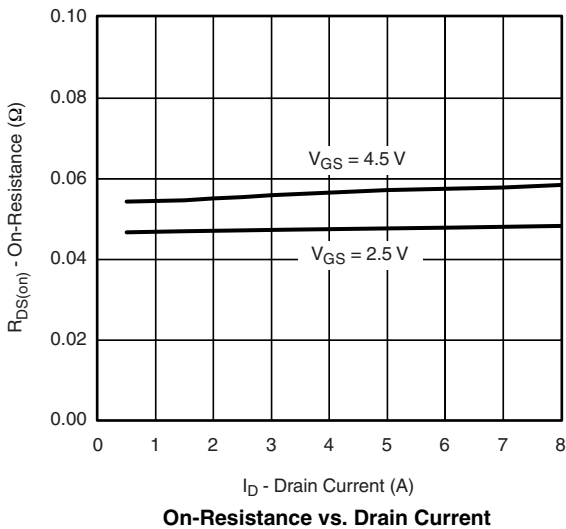
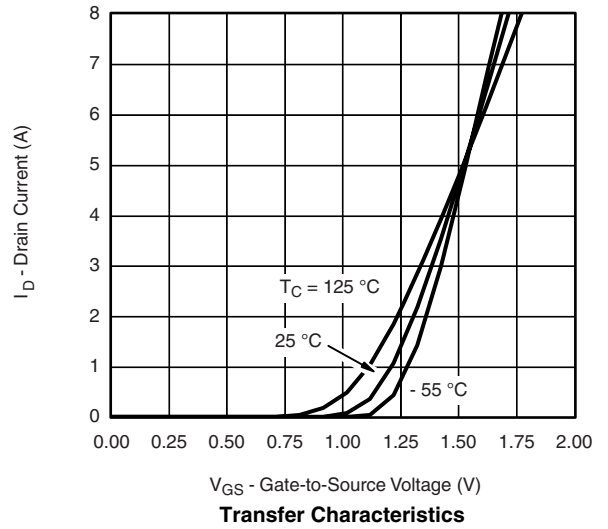
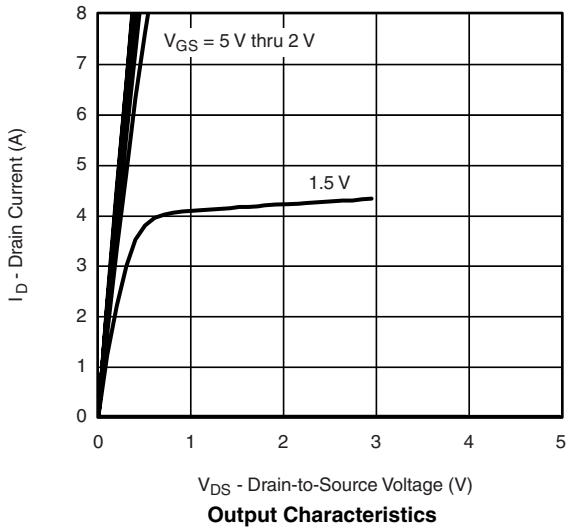
Notes:

a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

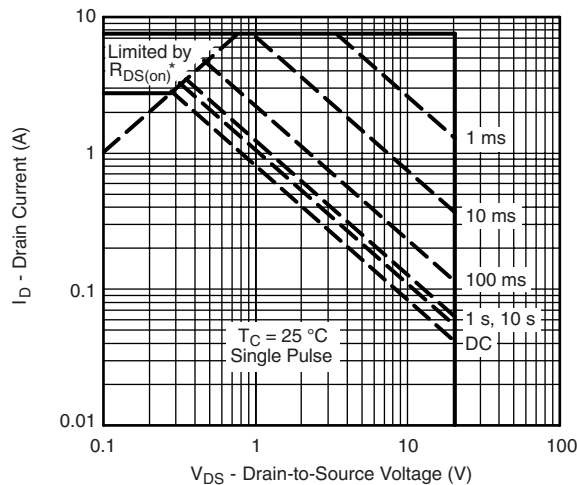
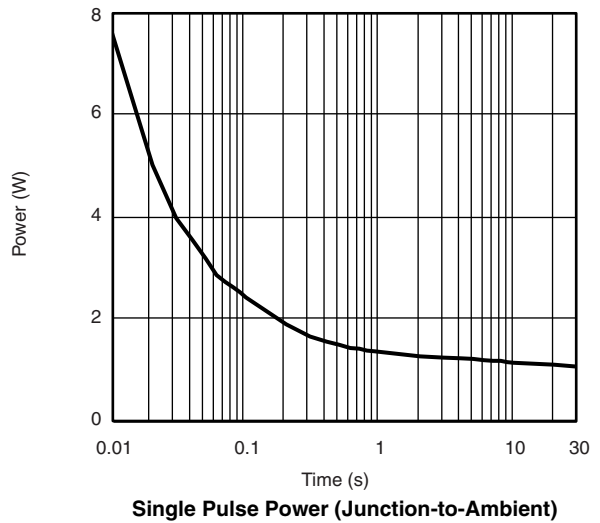
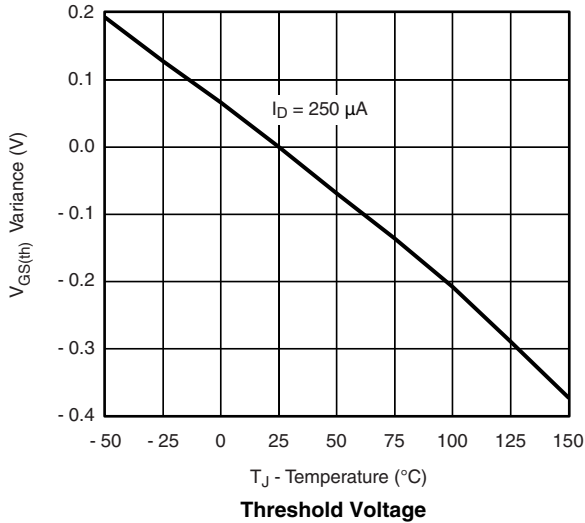
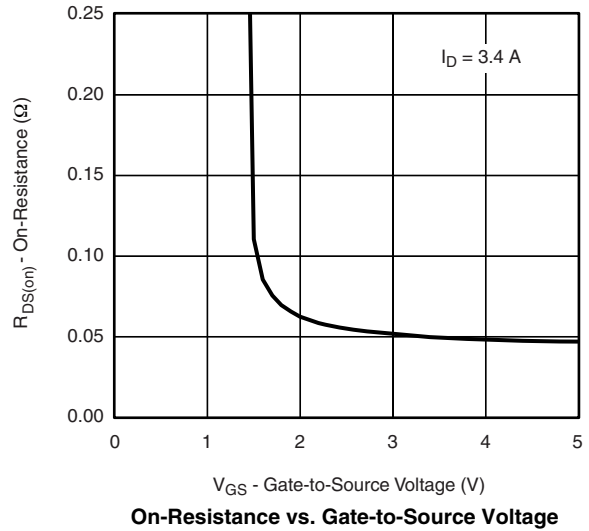
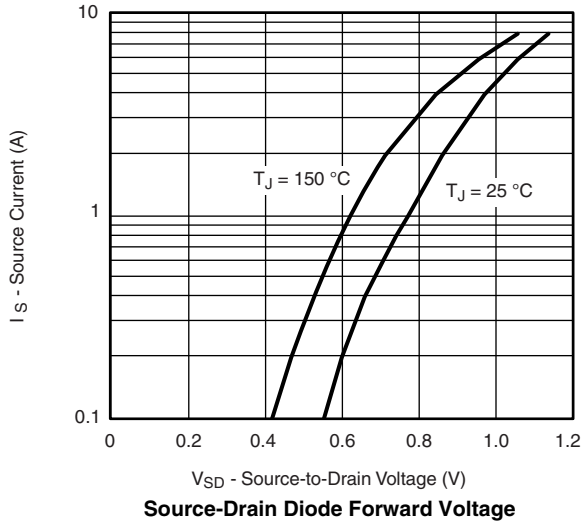
b. Guaranteed by design, not subject to production testing.

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.

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

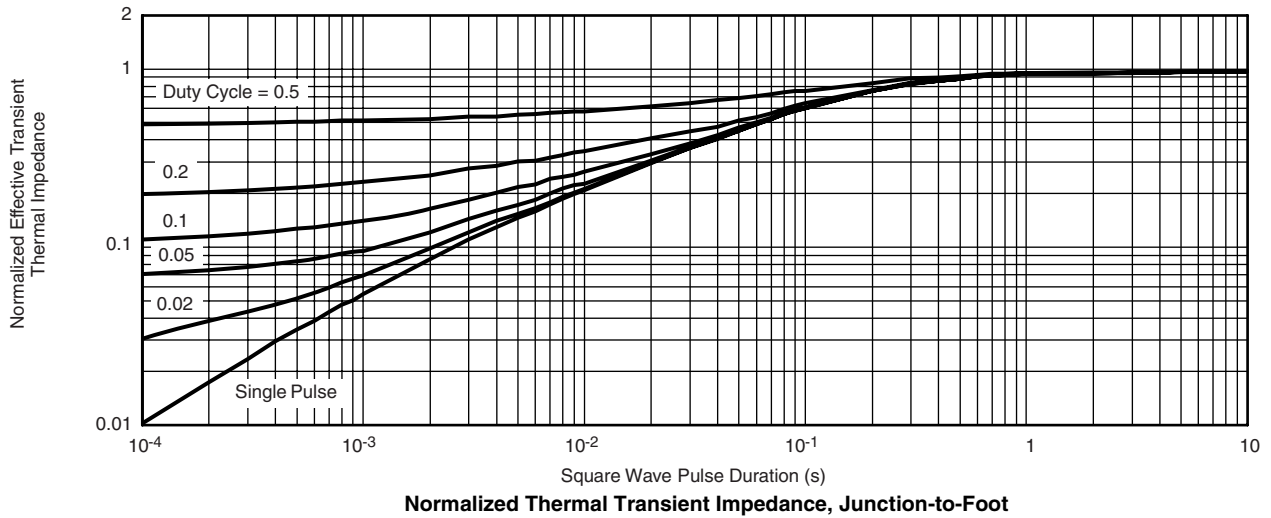
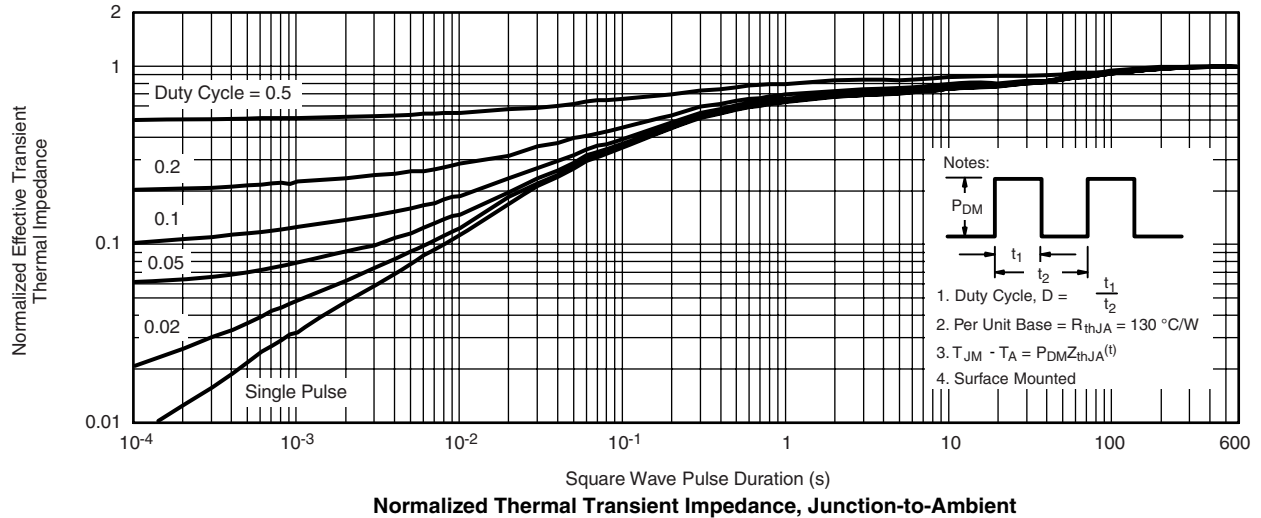


N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

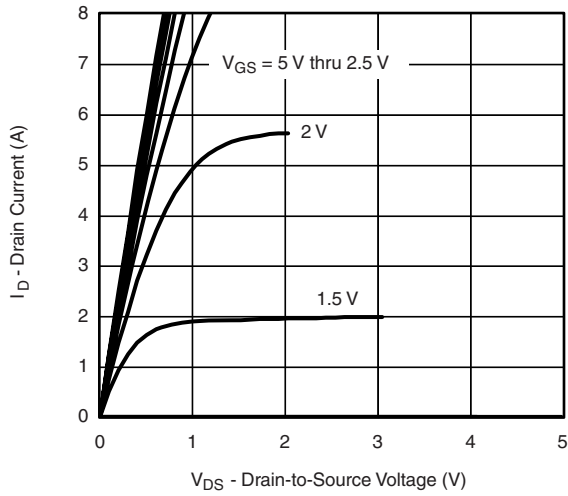


* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

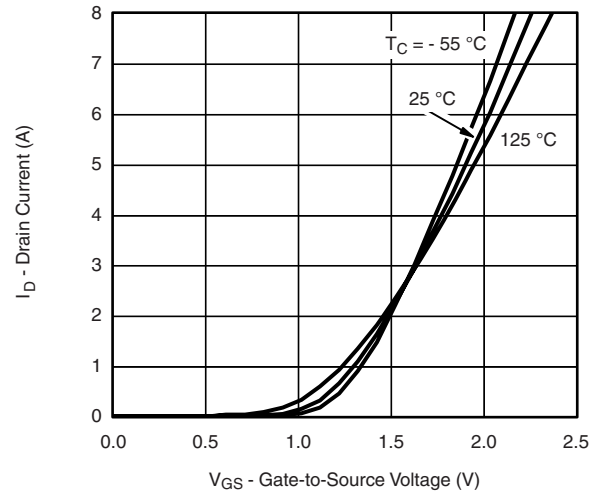
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



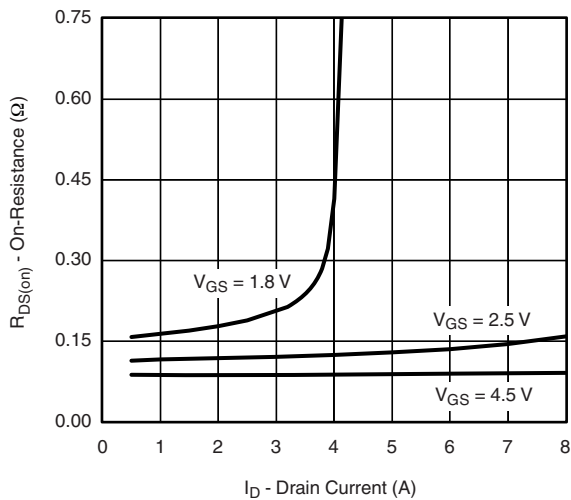
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



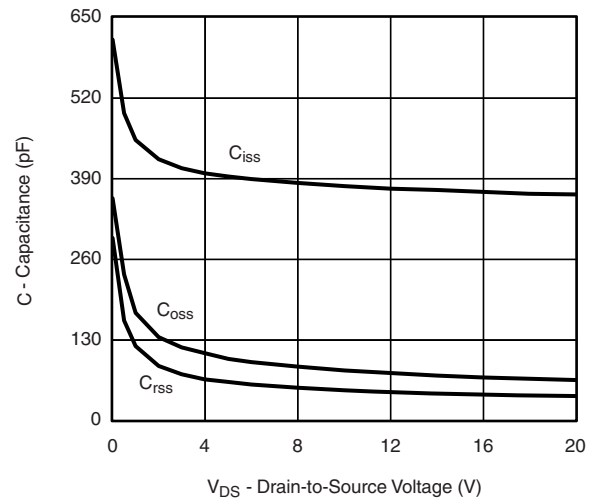
Output Characteristics



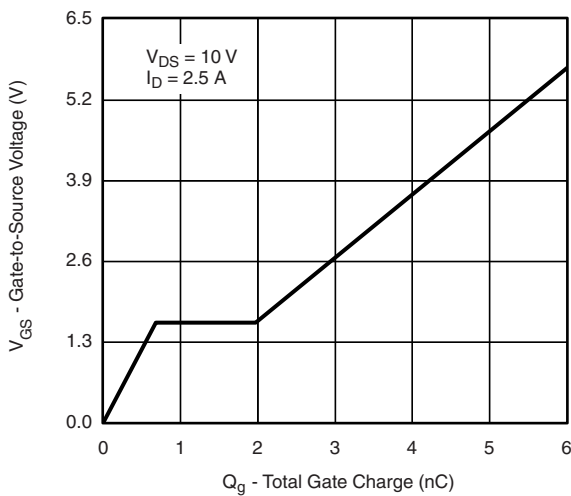
Transfer Characteristics



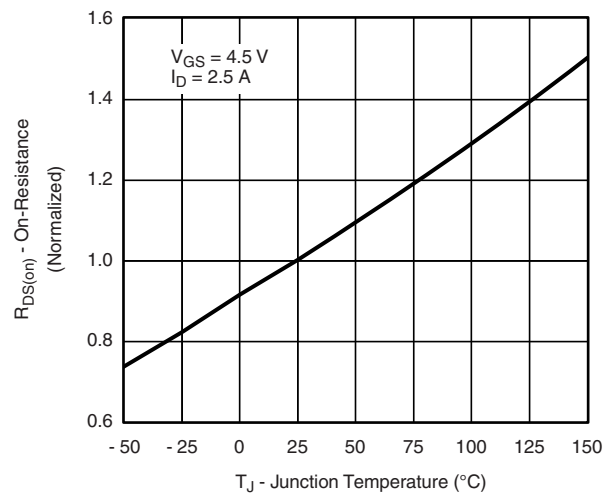
On-Resistance vs. Drain Current



Capacitance

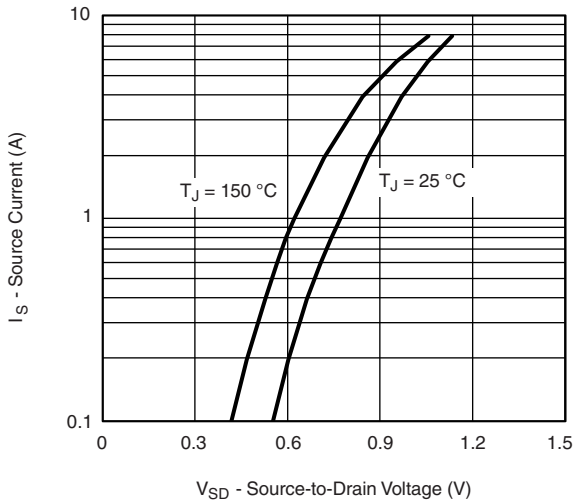


Gate Charge

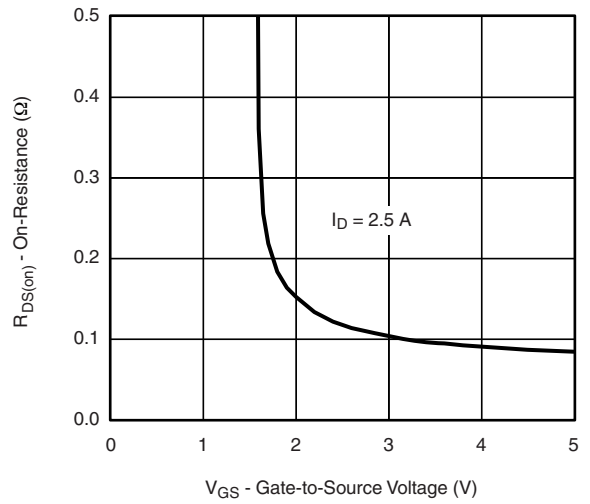


On-Resistance vs. Junction Temperature

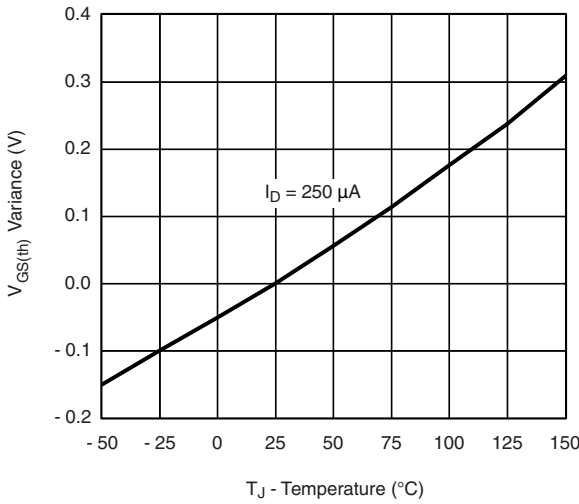
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



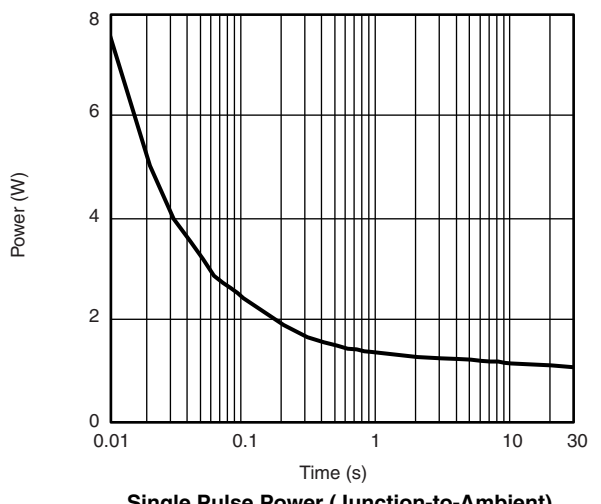
Source-Drain Diode Forward Voltage



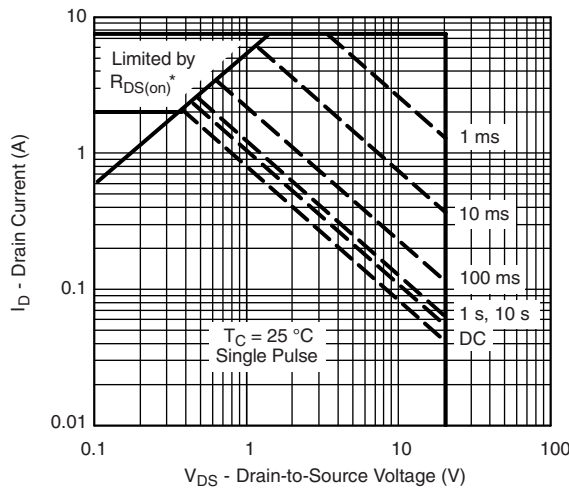
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



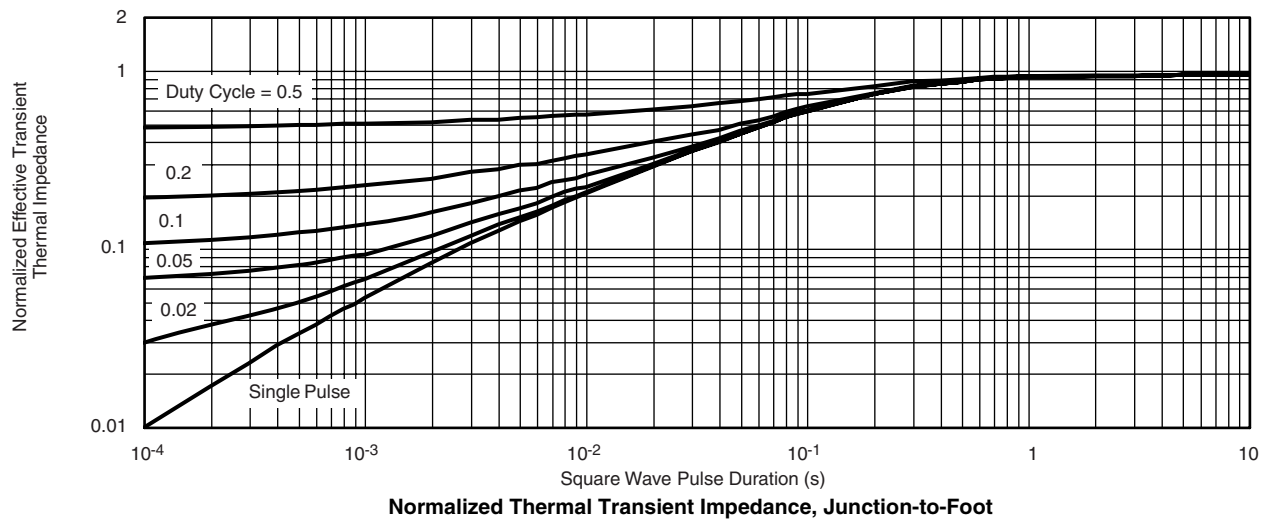
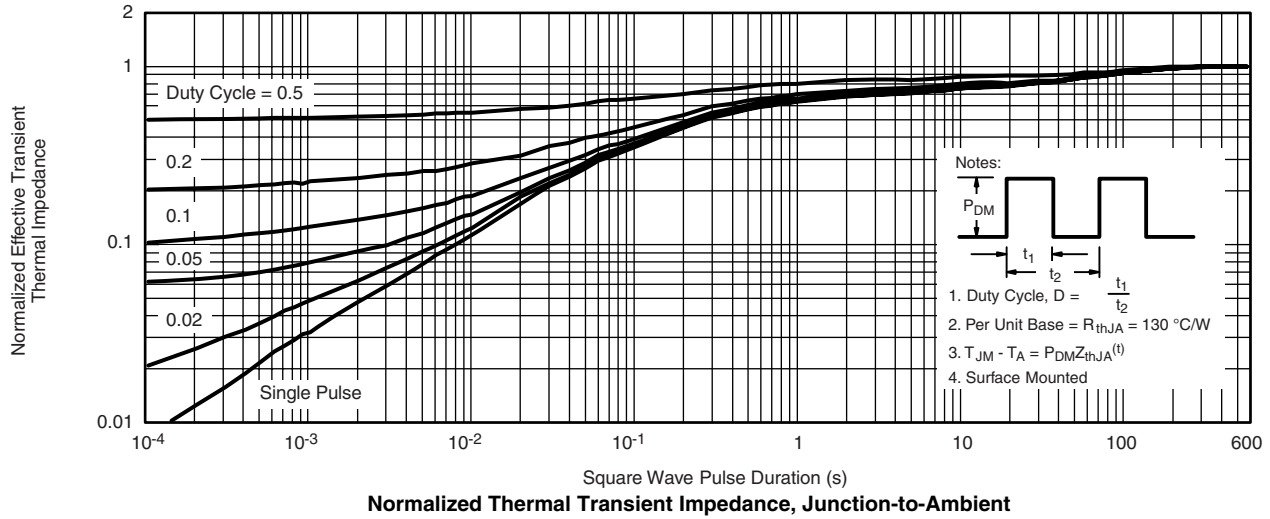
Single Pulse Power (Junction-to-Ambient)



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

Safe Operating Area, Junction-to-Case

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



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