

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

PRODUCT SUMMARY			
	V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)
N-Channel	20	0.0145 at $V_{GS} = 10$ V	9.6
		0.017 at $V_{GS} = 4.5$ V	8.6
P-Channel	- 20	0.033 at $V_{GS} = - 4.5$ V	- 6.2
		0.050 at $V_{GS} = - 2.5$ V	- 5

FEATURES

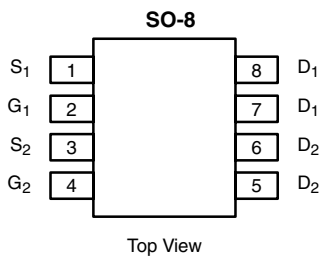
- TrenchFET[®] Power MOSFET

APPLICATIONS

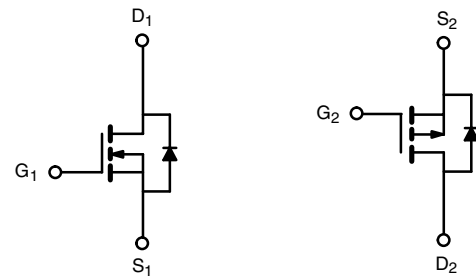
- Level Shift
- Load Switch



RoHS*
COMPLIANT



Ordering Information: Si4511DY-T1
Si4511DY-T1-E3 (Lead (Pb)-Free)



ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted							
Parameter	Symbol	N-Channel		P-Channel		Unit	
		10 secs	Steady	10 secs	Steady		
Drain-Source Voltage	V_{DS}	20		- 20		V	
Gate-Source Voltage	V_{GS}	± 16		± 12			
Continuous Drain Current ($T_J = 150$ °C) ^{a, b}	I_D	$T_A = 25$ °C	9.6	7.2	- 6.2	- 4.6	A
		$T_A = 70$ °C	7.7	5.8	- 4.9	- 3.7	
Pulsed Drain Current	I_{DM}	40		- 40		A	
Continuous Source Current (Diode Conduction) ^a	I_S	1.7	0.9	- 1.7	0.9		
Maximum Power Dissipation ^a	P_D	$T_A = 25$ °C	2	1.1	2	1.1	W
		$T_A = 70$ °C	1.3	0.7	1.3	0.7	
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	Typ	Max		
Maximum Junction-to-Ambient ^a	R_{thJA}	$t \leq 10$ sec	50	62.5	50	62.5	°C/W
		Steady State	85	110	90	110	
Maximum Junction-to-Foot (Drain)	R_{thJF}	30	40	30	35		

Notes

- a. Surface Mounted on 1" x 1" FR4 Board.
b. $t \leq 10$ sec

* Pb containing terminations are not RoHS compliant, exemptions may apply.

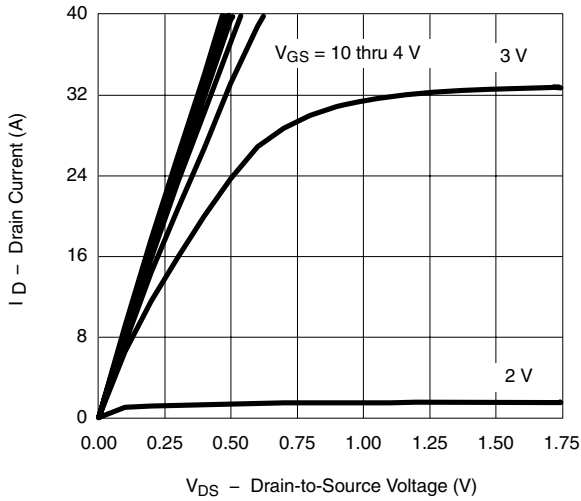
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted							
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit	
Static							
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	N-Ch	0.6		1.8	V
		$V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	P-Ch	-0.6		1.4	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\ \text{V}, V_{GS} = \pm 16\ \text{V}$	N-Ch			± 100	nA
		$V_{DS} = 0\ \text{V}, V_{GS} = \pm 12\ \text{V}$	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	
		$V_{DS} = 20\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 55\text{ }^\circ\text{C}$	N-Ch			5	
		$V_{DS} = -20\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 55\text{ }^\circ\text{C}$	P-Ch			-5	
On-State Drain Current ^b	$I_{D(on)}$	$V_{DS} = 5\ \text{V}, V_{GS} = 10\ \text{V}$	N-Ch	40			A
		$V_{DS} = -5\ \text{V}, V_{GS} = -4.5\ \text{V}$	P-Ch	-40			
Drain-Source On-State Resistance ^b	$r_{DS(on)}$	$V_{GS} = 10\ \text{V}, I_D = 9.6\ \text{A}$	N-Ch		0.0115	0.0145	Ω
		$V_{GS} = -4.5\ \text{V}, I_D = -6.2\ \text{A}$	P-Ch		0.022	0.033	
		$V_{GS} = 4.5\ \text{V}, I_D = 8.6\ \text{A}$	N-Ch		0.0135	0.017	
		$V_{GS} = -2.5\ \text{V}, I_D = -5\ \text{A}$	P-Ch		0.035	0.050	
Forward Transconductance ^b	g_{fs}	$V_{DS} = 15\ \text{V}, I_D = 9.6\ \text{A}$	N-Ch		33		S
		$V_{DS} = -15\ \text{V}, I_D = -6.2\ \text{A}$	P-Ch		17		
Diode Forward Voltage ^b	V_{SD}	$I_S = 1.7\ \text{A}, V_{GS} = 0\ \text{V}$	N-Ch		0.8	1.2	V
		$I_S = -1.7\ \text{A}, V_{GS} = 0\ \text{V}$	P-Ch		-0.8	-1.2	
Dynamic^a							
Total Gate Charge	Q_g	N-Channel $V_{DS} = 10\ \text{V}, V_{GS} = 4.5\ \text{V}, I_D = 9.6\ \text{A}$ P-Channel $V_{DS} = -10\ \text{V}, V_{GS} = -4.5\ \text{V}, I_D = -6.2\ \text{A}$	N-Ch		11.5	18	nC
Gate-Source Charge	Q_{gs}		N-Ch		3.7		
			P-Ch		4.1		
Gate-Drain Charge	Q_{gd}	N-Ch		3.3			
		P-Ch		4.3			
Turn-On Delay Time	$t_{d(on)}$	N-Channel $V_{DD} = 10\ \text{V}, R_L = 10\ \Omega$ $I_D \cong 1\ \text{A}, V_{GEN} = 10\ \text{V}, R_G = 6\ \Omega$ 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		12	20	ns
Rise Time	t_r		N-Ch		12	20	
			P-Ch		30	45	
Turn-Off Delay Time	$t_{d(off)}$		N-Ch		55	85	
			P-Ch		70	105	
Fall Time	t_f		N-Ch		15	25	
			P-Ch		50	75	
Source-Drain Reverse Recovery Time	t_{rr}		$I_F = 1.7\ \text{A}, di/dt = 100\ \text{A}/\mu\text{s}$	N-Ch		50	
		$I_F = -1.7\ \text{A}, di/dt = 100\ \text{A}/\mu\text{s}$	P-Ch		40	80	

Notes

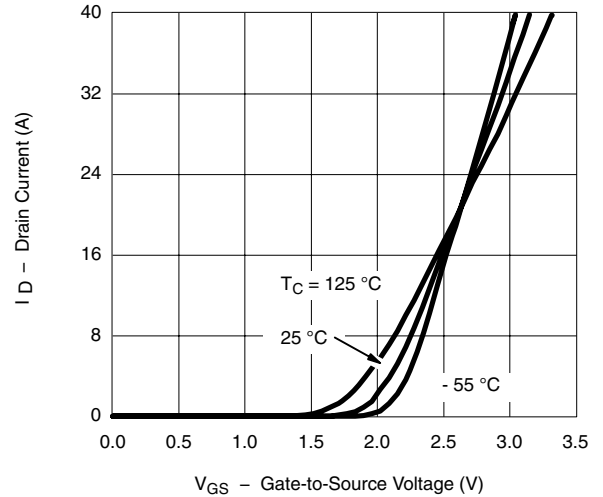
- a. Guaranteed by design, not subject to production testing.
b. Pulse test; pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

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.

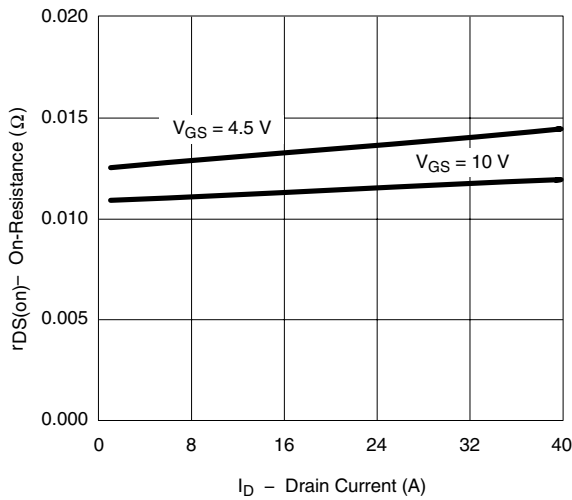
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless noted



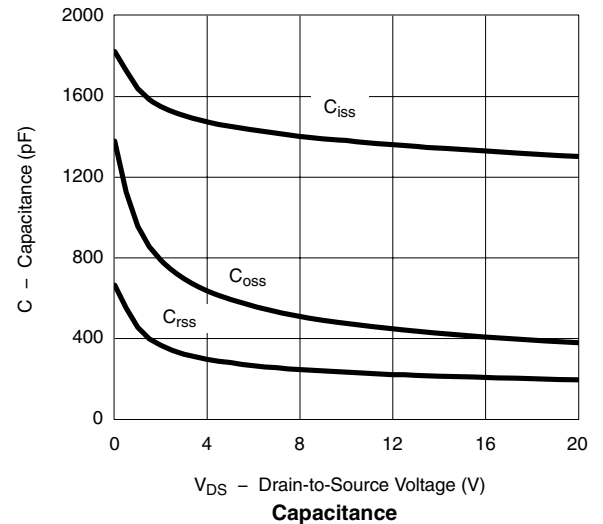
Output Characteristics



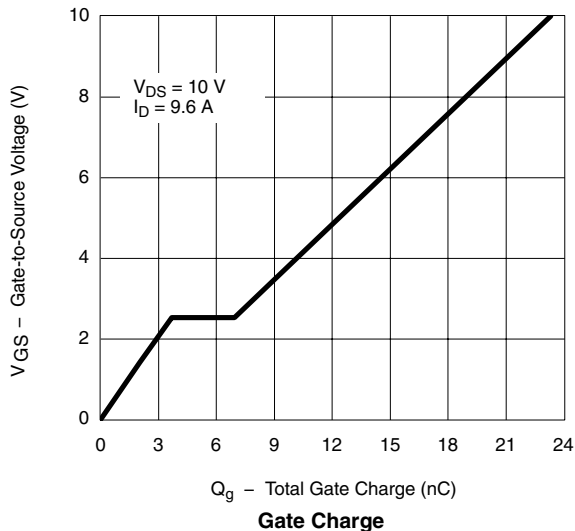
Transfer Characteristics



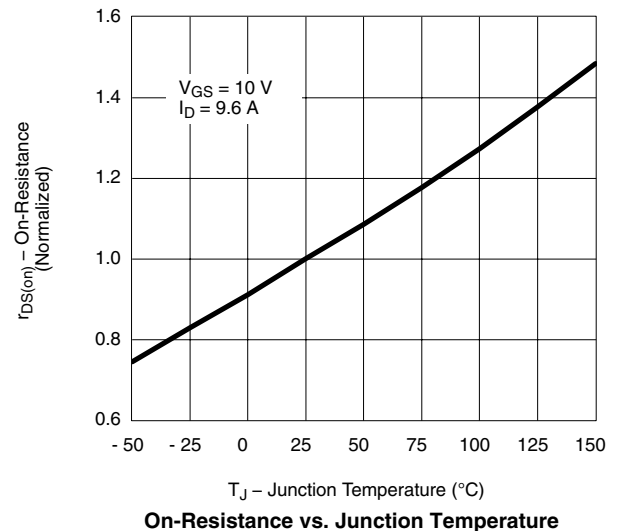
On-Resistance vs. Drain Current



Capacitance

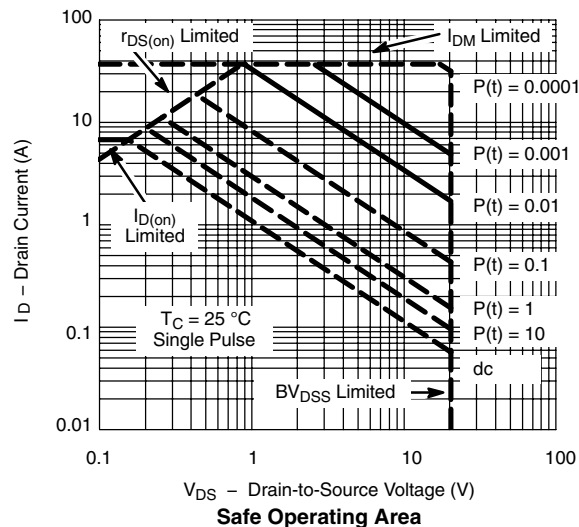
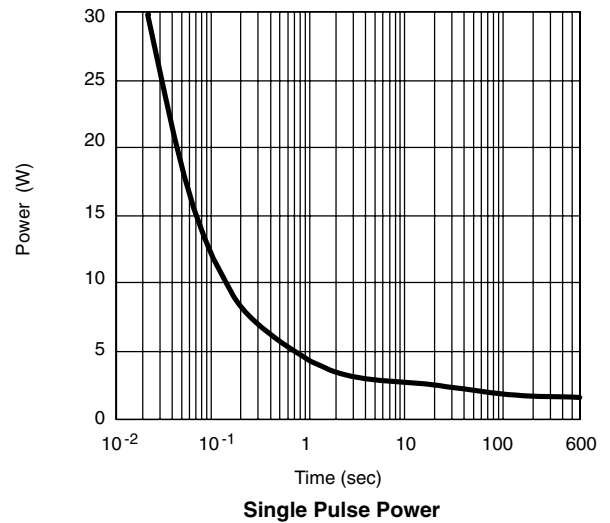
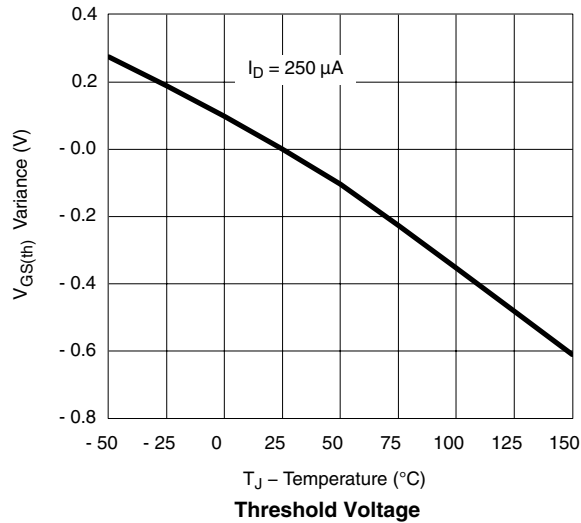
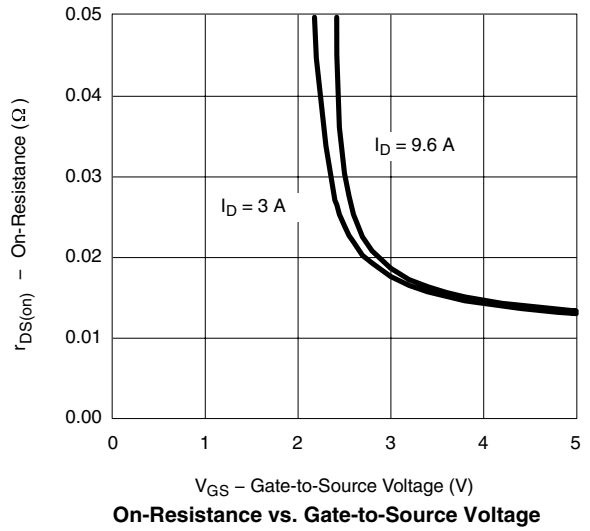
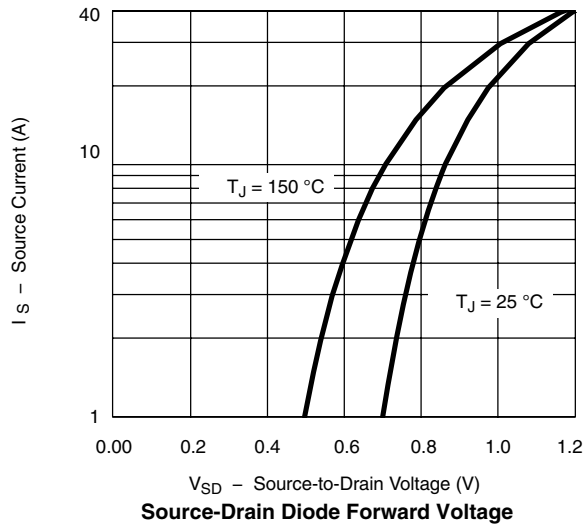


Gate Charge

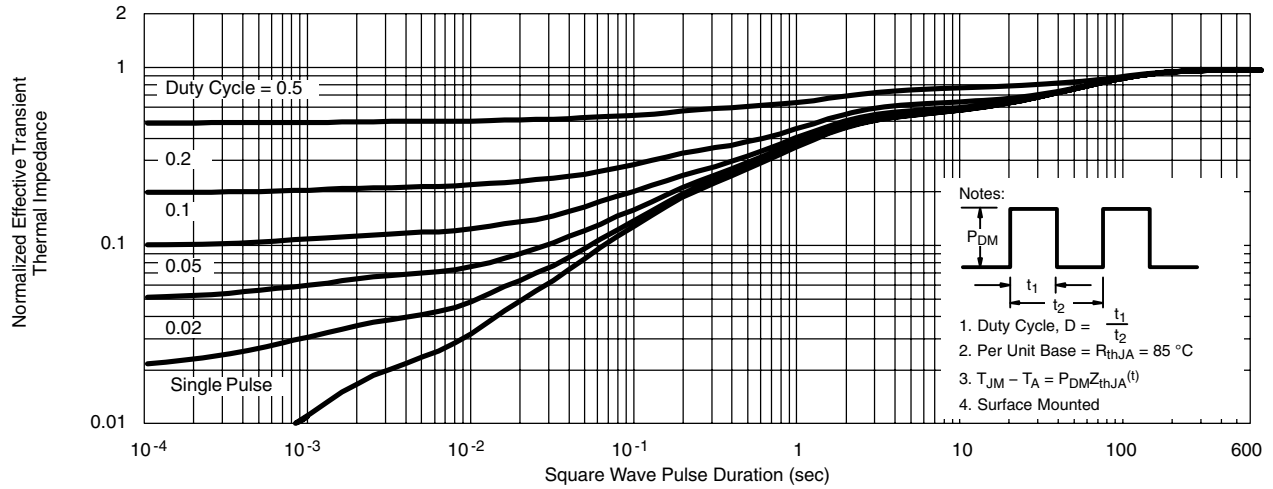


On-Resistance vs. Junction Temperature

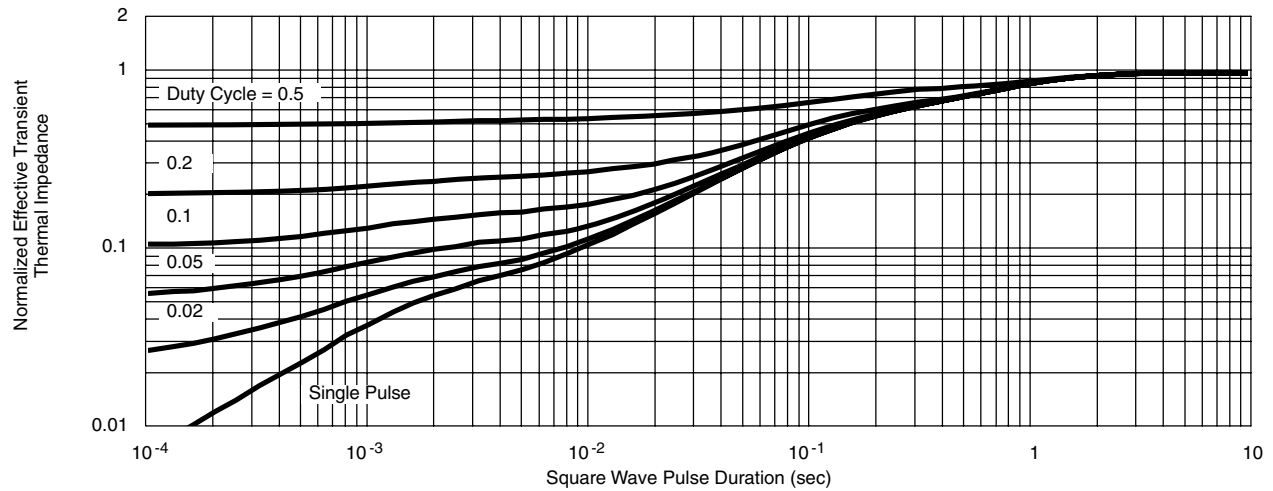
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless noted



N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless noted

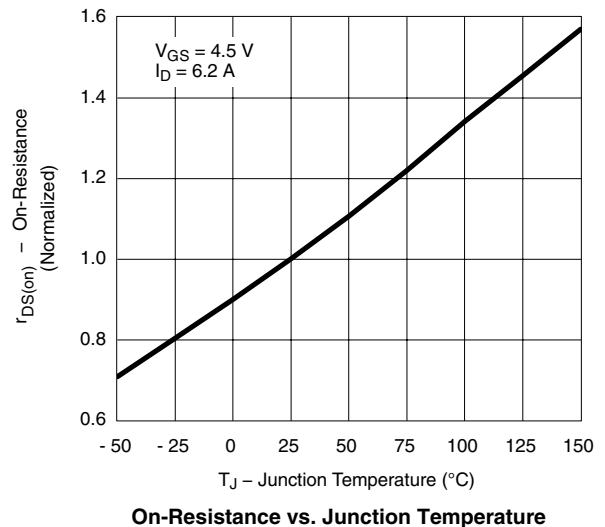
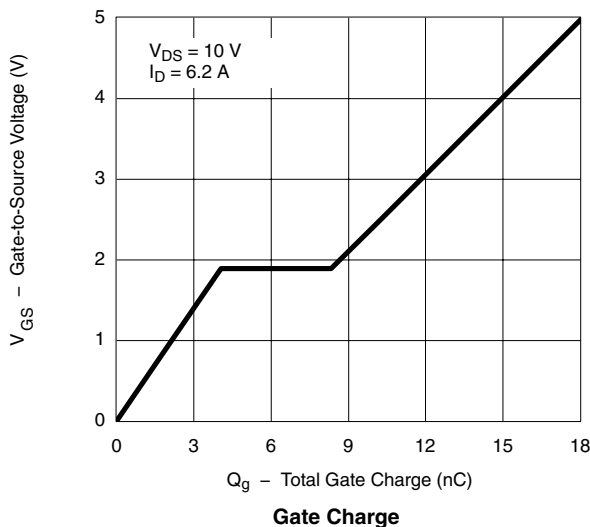
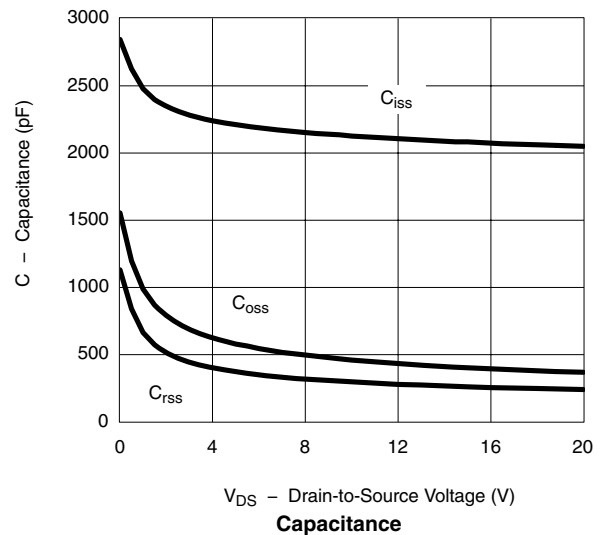
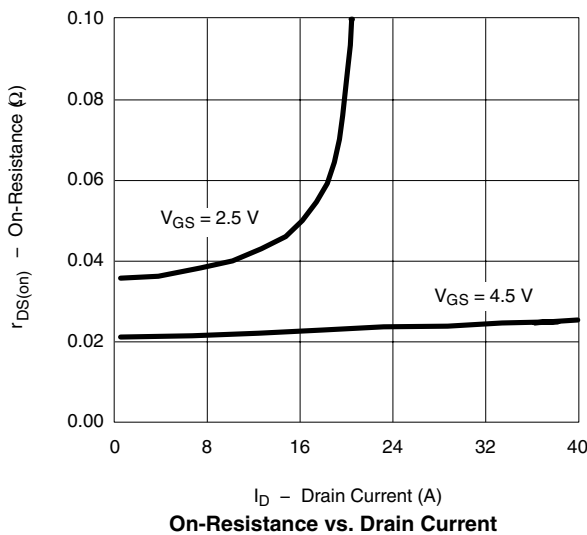
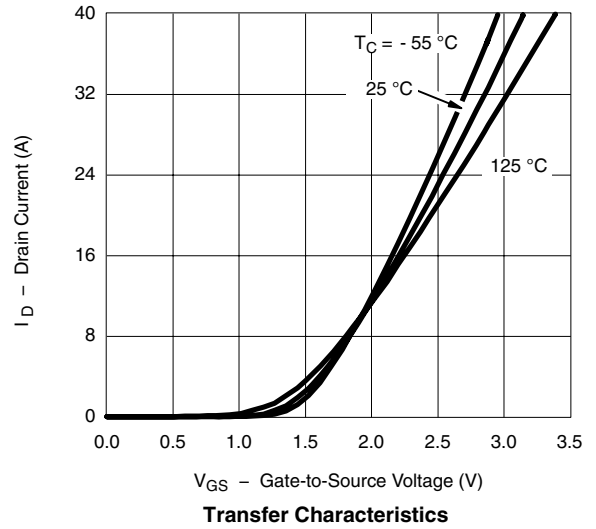
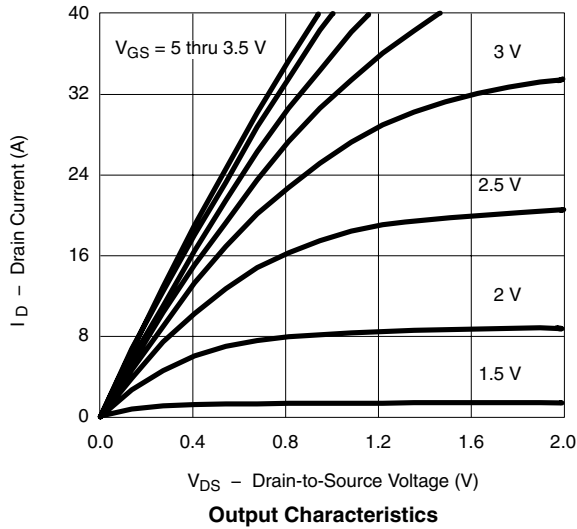


Normalized Thermal Transient Impedance, Junction-to-Ambient

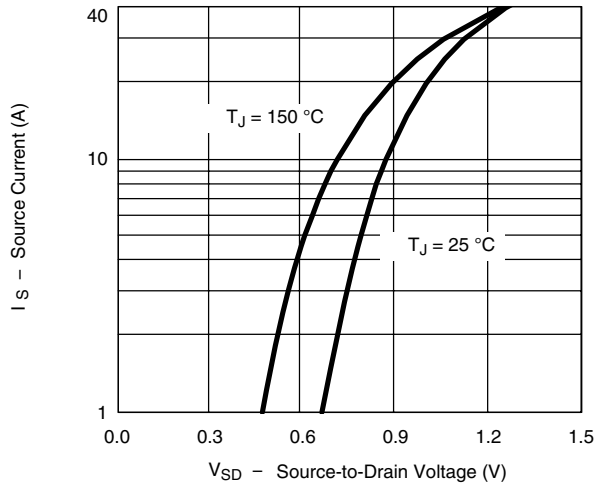


Normalized Thermal Transient Impedance, Junction-to-Foot

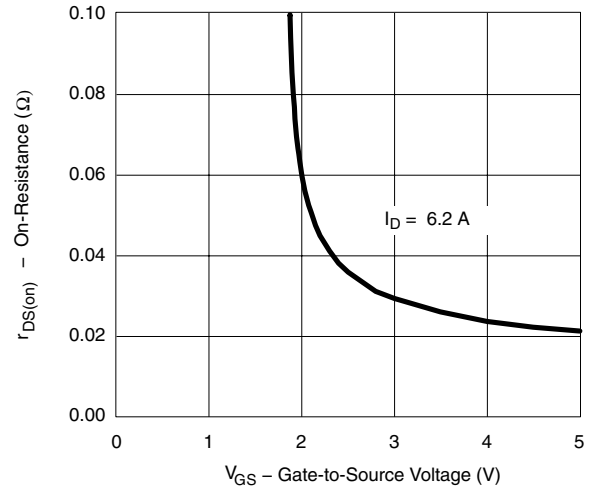
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless noted



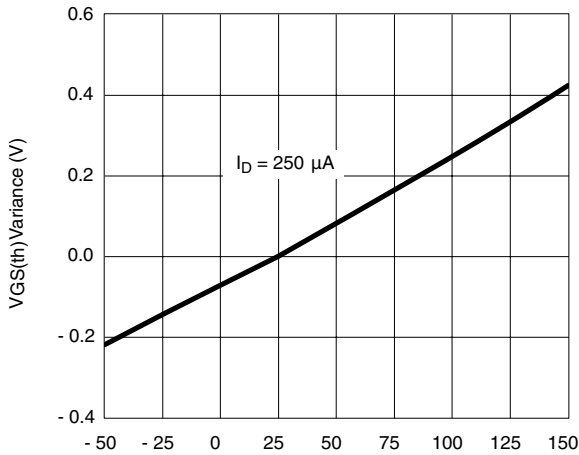
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless noted



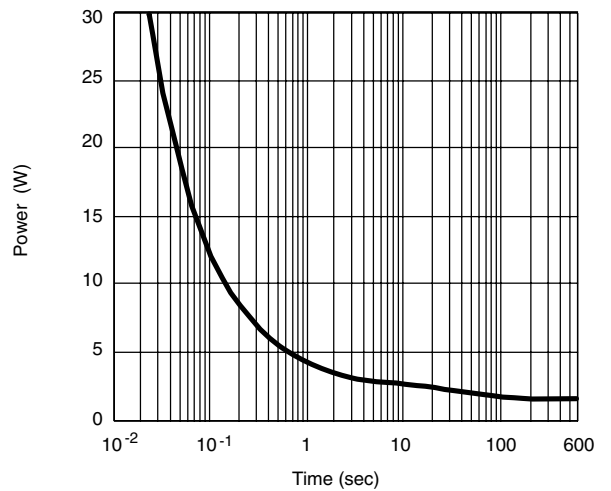
Source-Drain Diode Forward Voltage



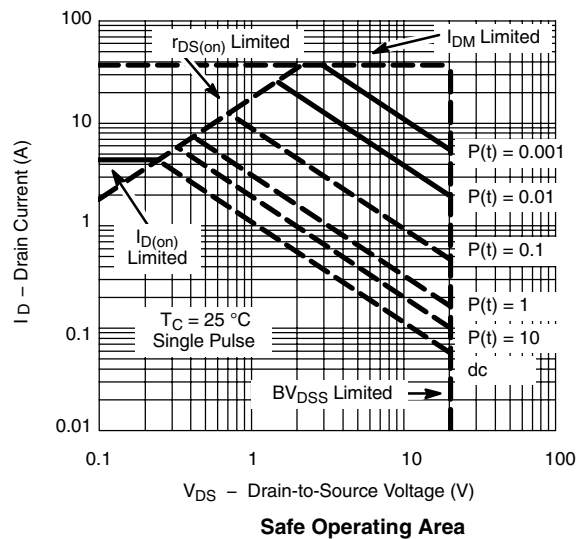
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

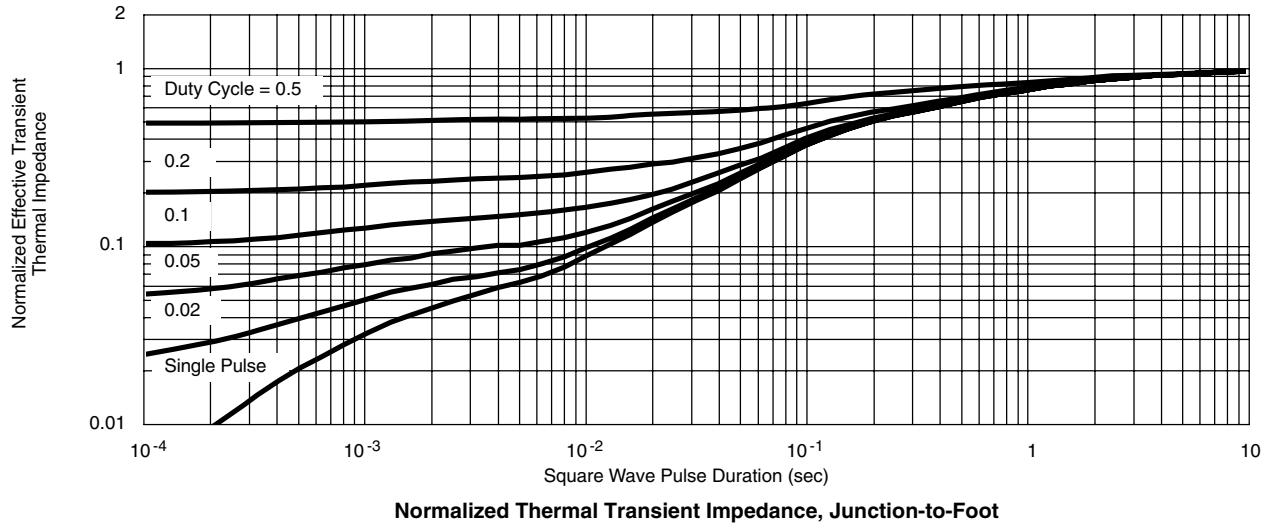
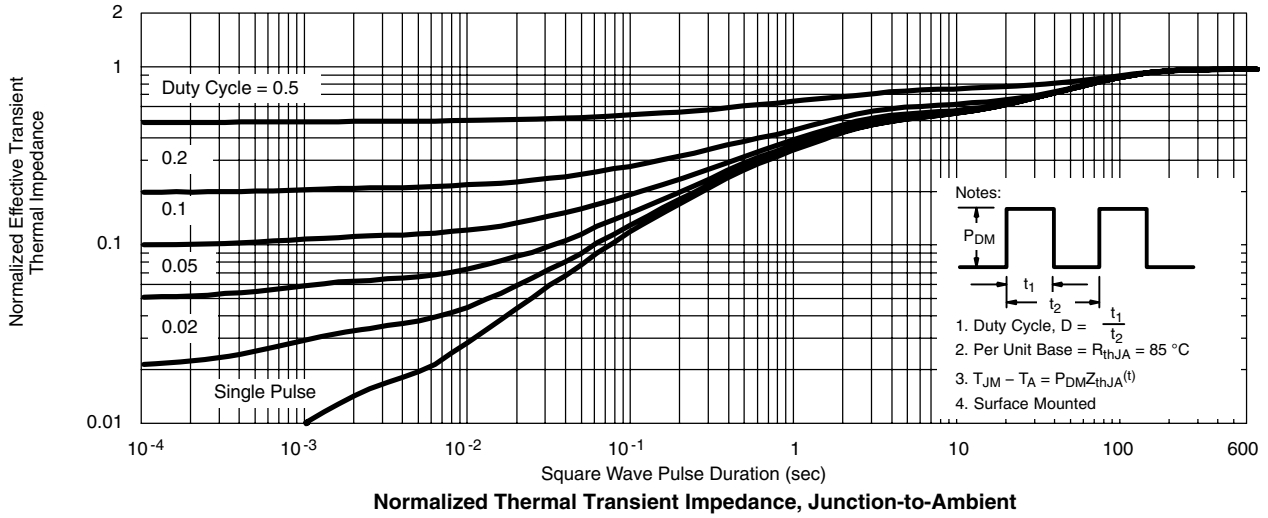


Single Pulse Power



Safe Operating Area

P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless noted



Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see <http://www.vishay.com/ppg?72223>.



Notice

Specifications of the products displayed herein are subject to change without notice. Vishay Intertechnology, Inc., or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in Vishay's terms and conditions of sale for such products, Vishay assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of Vishay products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Vishay for any damages resulting from such improper use or sale.