

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

PRODUCT SUMMARY			
	V _{DS} (V)	r _{DS(on)} (Ω)	I _D (A)
N-Channel	30	0.077 at V _{GS} = 4.5 V	3
		0.120 at V _{GS} = 2.5 V	2
P-Channel	- 30	0.170 at V _{GS} = - 4.5 V	- 2
		0.300 at V _{GS} = - 2.5 V	- 1.2

FEATURES

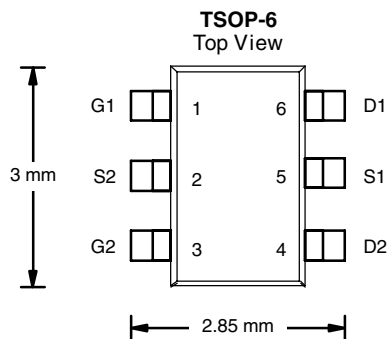
- TrenchFET[®] Power MOSFET
- Ultra Low r_{DS(on)} N- and P-Channel for High Efficiency
- Optimized for High-Side/Low-Side
- Minimized Conduction Losses



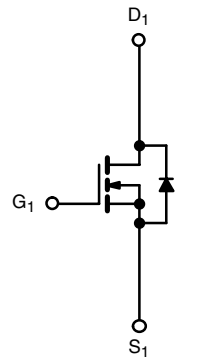
RoHS*
COMPLIANT

APPLICATIONS

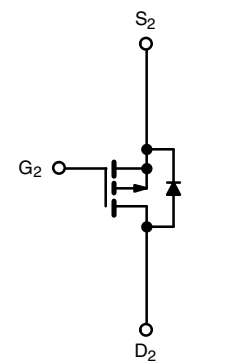
- Portable Devices Including PDAs, Cellular Phones and Pagers



Ordering Information: Si3590DV-T1
Si3590DV-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	
		10 sec	Steady State	10 sec	Steady State		
Drain-Source Voltage	V _{DS}	30		- 30		V	
Gate-Source Voltage	V _{GS}	± 12		± 12			
Continuous Drain Current (T _J = 150 °C) ^a	I _D	T _A = 25 °C	3	2.5	- 2	- 1.7	A
		T _A = 70 °C	2.3	2.0	- 1.6	- 1.3	
Pulsed Drain Current	I _{DM}	8		- 8			
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	0.70	0.53	0.70	0.53	
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 ≤ 10 sec	93	110	93	110	°C/W
		Steady State	130	150	130	150	
Maximum Junction-to-Foot (Drain)	R _{thJF}	75	90	75	90		

Notes:

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

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

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	0.6		1.5	V
		$V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	P-Ch	-0.6		-1.5	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\ \text{V}, V_{GS} = \pm 12\ \text{V}$	N-Ch P-Ch			± 100 ± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 30\ \text{V}, V_{GS} = 0\ \text{V}$	N-Ch			1	μA
		$V_{DS} = -30\ \text{V}, V_{GS} = 0\ \text{V}$	P-Ch			-1	
		$V_{DS} = 30\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 55\text{ }^\circ\text{C}$	N-Ch			5	
		$V_{DS} = -30\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 55\text{ }^\circ\text{C}$	P-Ch			-5	
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	$r_{DS(on)}$	$V_{GS} = 4.5\ \text{V}, I_D = 3\ \text{A}$	N-Ch		0.062	0.077	Ω
		$V_{GS} = -4.5\ \text{V}, I_D = -2\ \text{A}$	P-Ch		0.135	0.170	
		$V_{GS} = 2.5\ \text{V}, I_D = 2\ \text{A}$	N-Ch		0.095	0.120	
		$V_{GS} = -2.5\ \text{V}, I_D = -1.2\ \text{A}$	P-Ch		0.235	0.300	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 5\ \text{V}, I_D = 3\ \text{A}$	N-Ch		10		S
		$V_{DS} = -5\ \text{V}, I_D = -2\ \text{A}$	P-Ch		5		
Diode Forward Voltage ^a	V_{SD}	$I_S = 1.05\ \text{A}, V_{GS} = 0\ \text{V}$	N-Ch		0.80	1.10	V
		$I_S = -1.05\ \text{A}, V_{GS} = 0\ \text{V}$	P-Ch		-0.83	-1.10	
Dynamic^b							
Total Gate Charge	Q_g	N-Channel $V_{DS} = 15\ \text{V}, V_{GS} = 4.5\ \text{V}, I_D = 2\ \text{A}$	N-Ch		3	4.5	nC
Gate-Source Charge	Q_{gs}		P-Ch		3.8	6	
Gate-Drain Charge	Q_{gd}	P-Channel $V_{DS} = -15\ \text{V}, V_{GS} = -4.5\ \text{V}, I_D = -2\ \text{A}$	N-Ch		0.6		
			P-Ch		0.6		
Turn-On Delay Time	$t_{d(on)}$	N-Channel $V_{DD} = 15\ \text{V}, R_L = 15\ \Omega$ $I_D \cong 1\ \text{A}, V_{GEN} = 10\ \text{V}, R_G = 6\ \Omega$	N-Ch		5	8	ns
			P-Ch		5	8	
Rise Time	t_r		N-Ch		12	23	
			P-Ch		15	23	
Turn-Off Delay Time	$t_{d(off)}$	P-Channel $V_{DD} = -15\ \text{V}, R_L = 15\ \Omega$ $I_D \cong -1\ \text{A}, V_{GEN} = -10\ \text{V}, R_G = 6\ \Omega$	N-Ch		13	23	
			P-Ch		20	30	
Fall Time	t_f		N-Ch		7	12	
			P-Ch		20	30	
Source-Drain Reverse Recovery Time	t_{rr}	$I_F = 1.05\ \text{A}, di/dt = 100\ \text{A}/\mu\text{s}$	N-Ch		15	25	
		$I_F = -1.05\ \text{A}, di/dt = 100\ \text{A}/\mu\text{s}$	P-Ch		18	30	

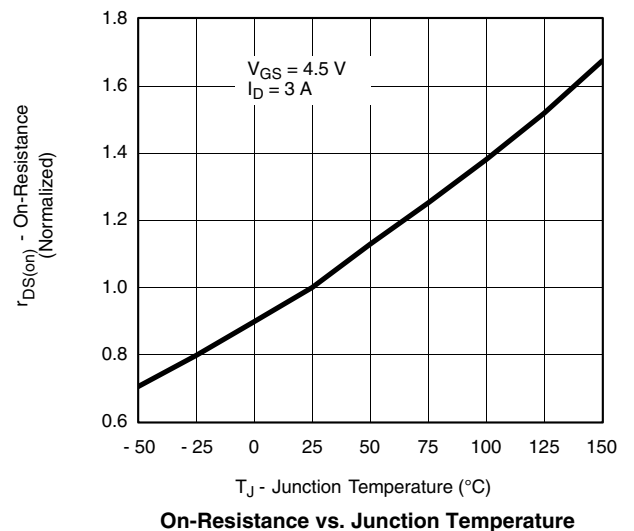
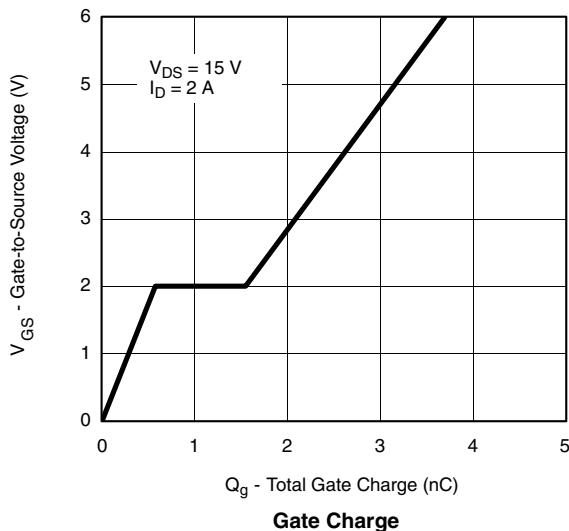
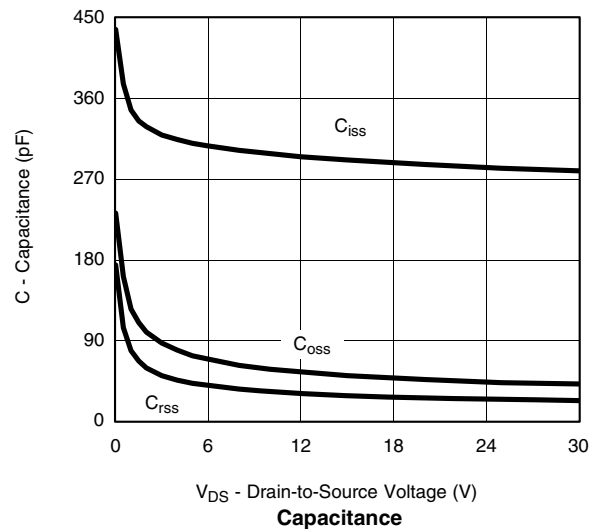
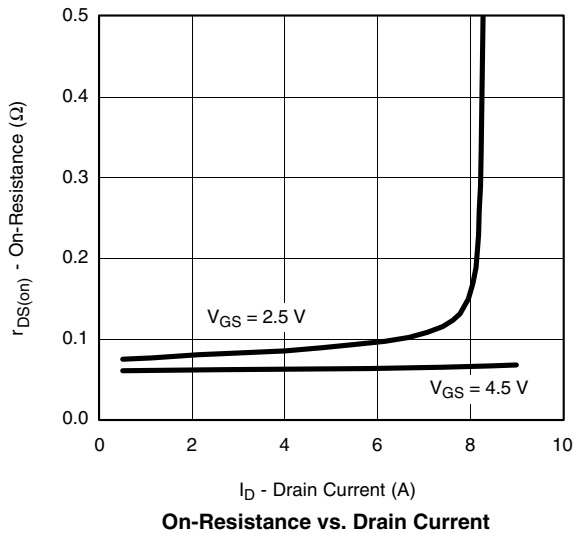
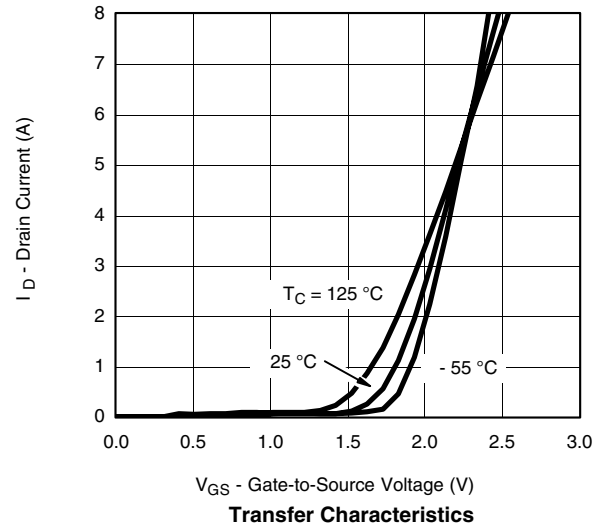
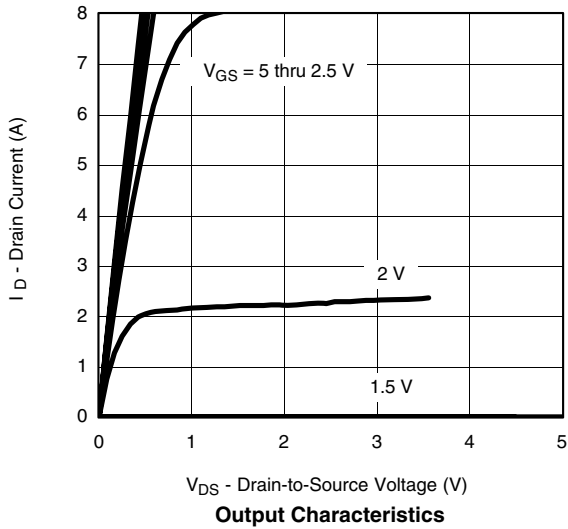
Notes:

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

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

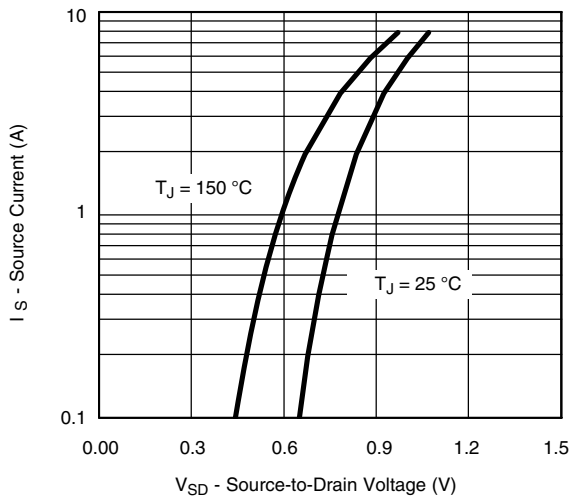
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

N-CHANNEL TYPICAL CHARACTERISTICS 25 °C unless noted

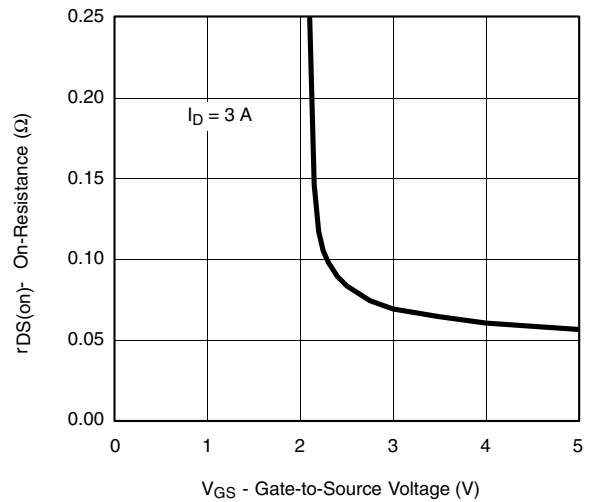




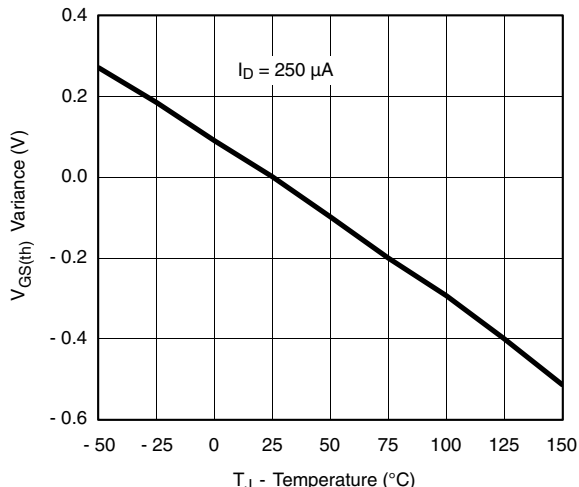
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C unless noted



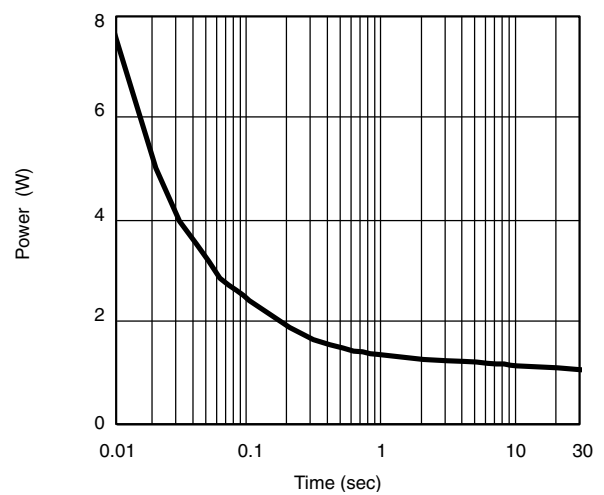
Source-Drain Diode Forward Voltage



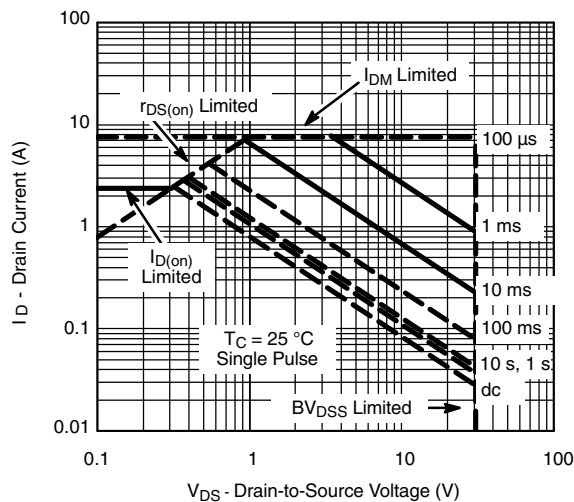
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power, Junction-to-Ambient

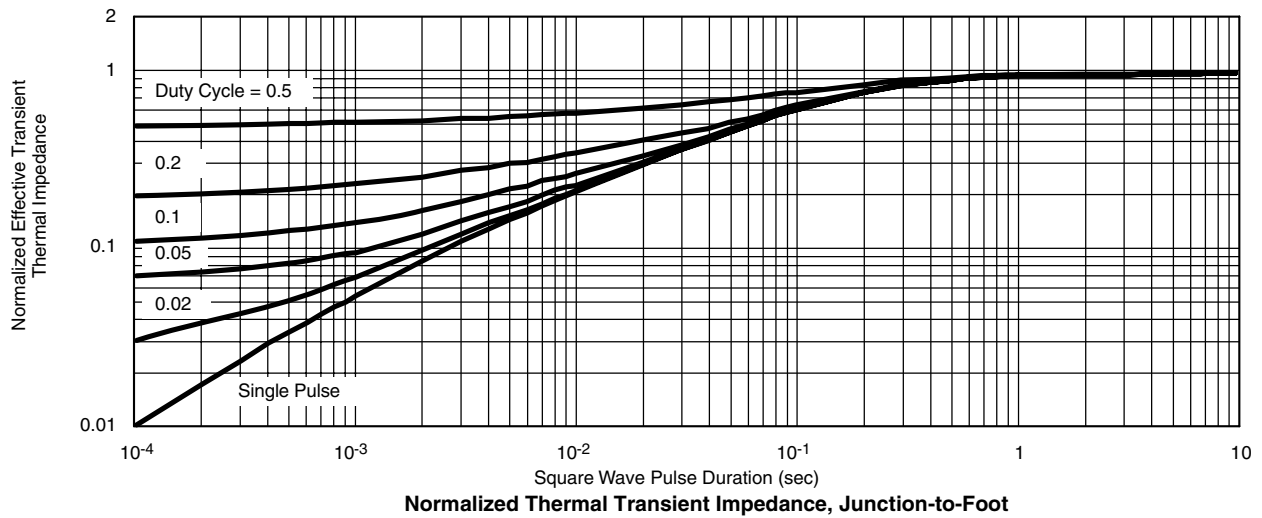
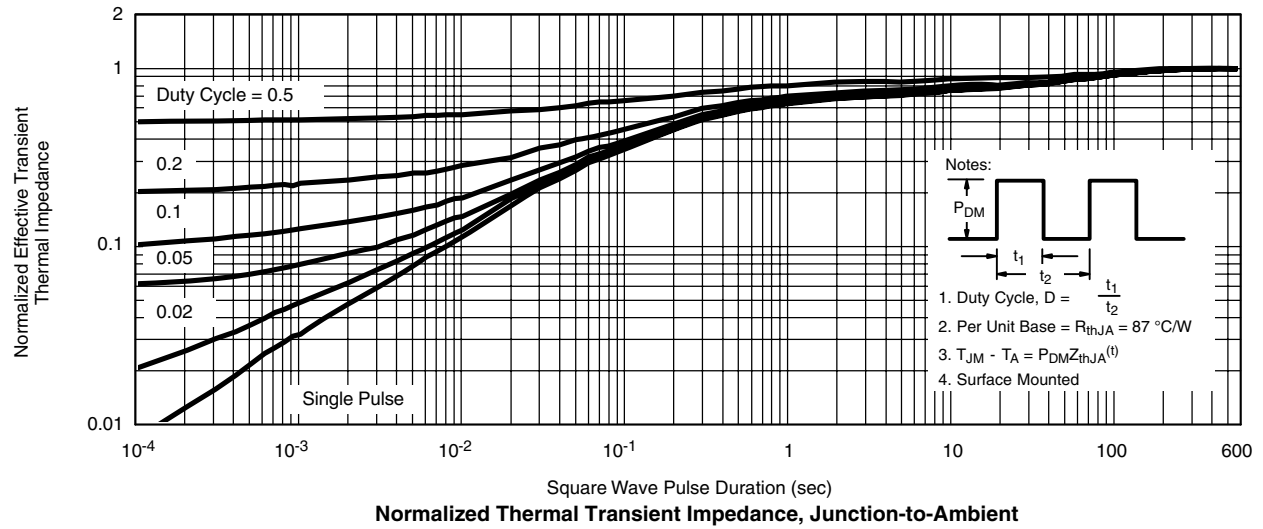


* $V_{GS} >$ minimum V_{GS} at which $r_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Case

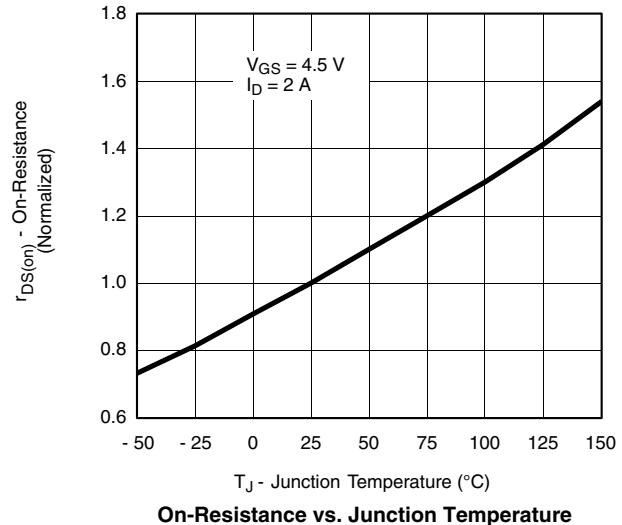
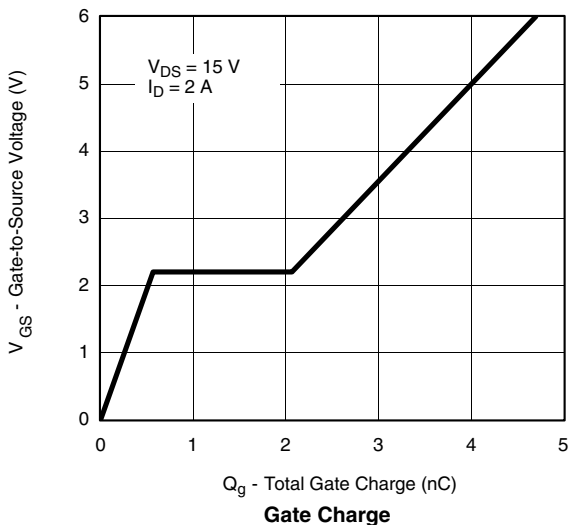
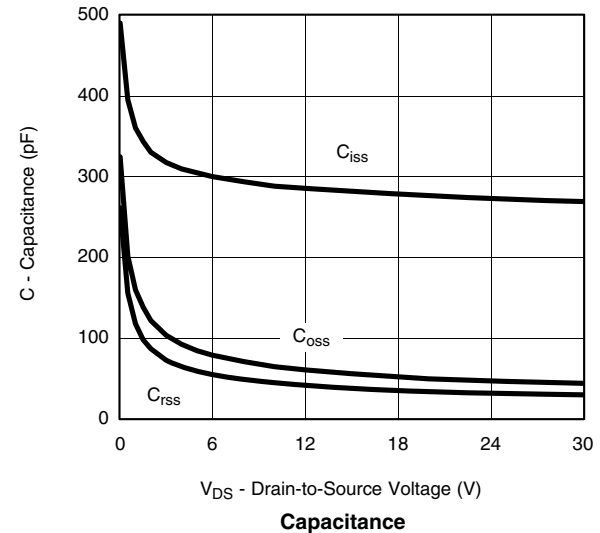
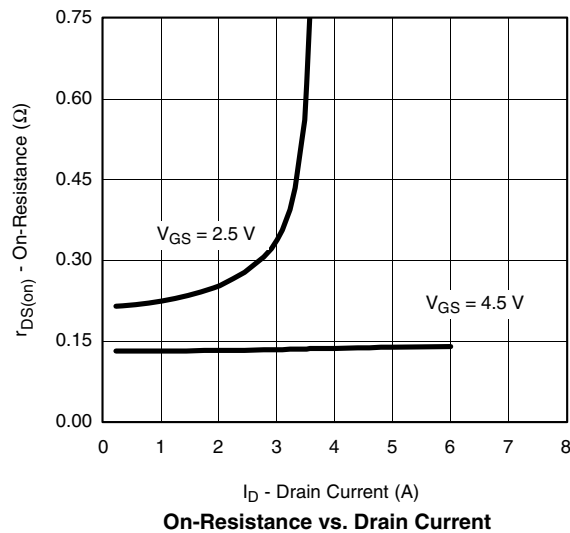
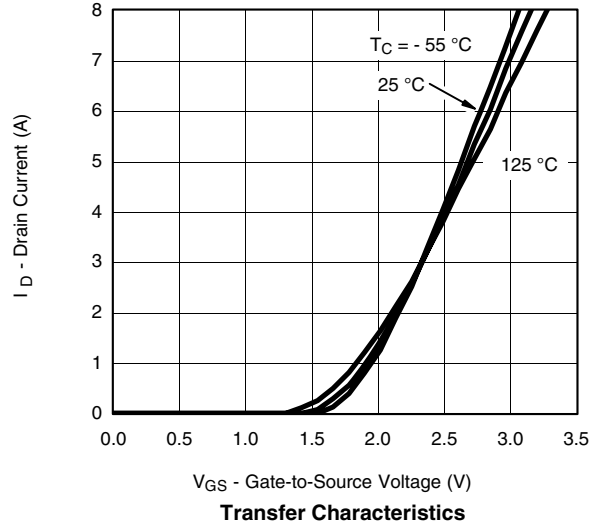
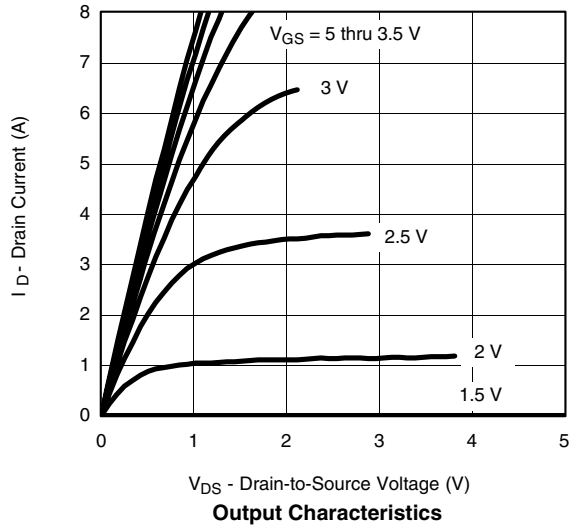


N-CHANNEL TYPICAL CHARACTERISTICS 25 °C unless noted

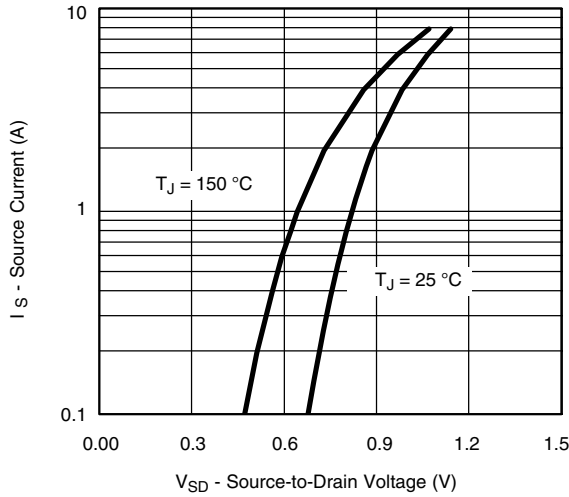




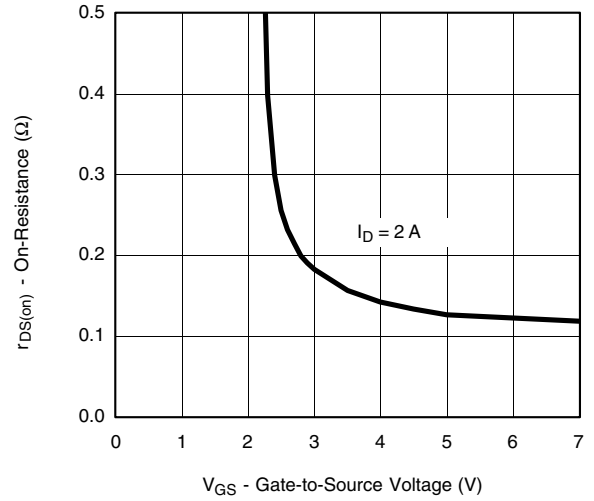
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C unless noted



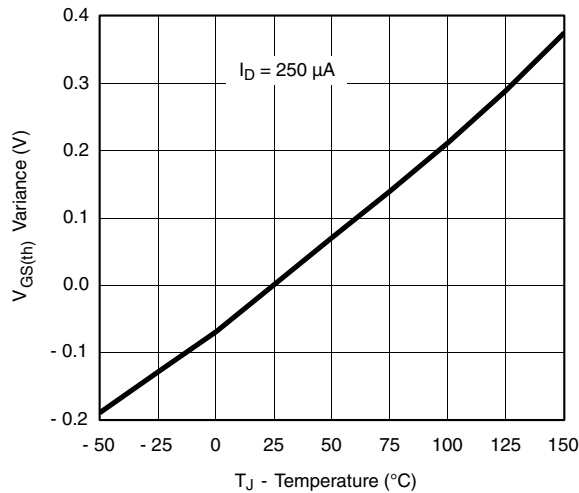
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C unless noted



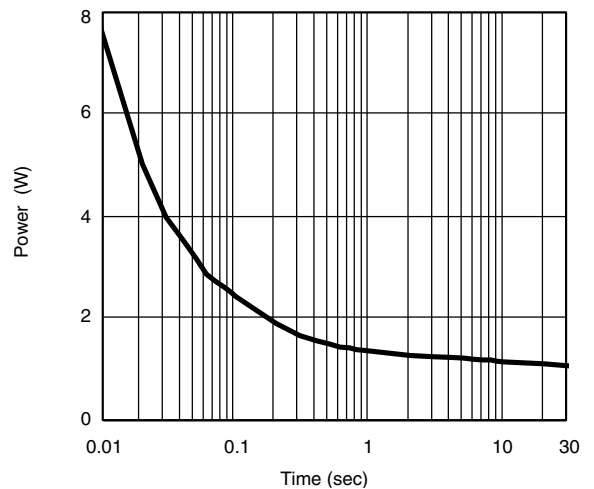
Source-Drain Diode Forward Voltage



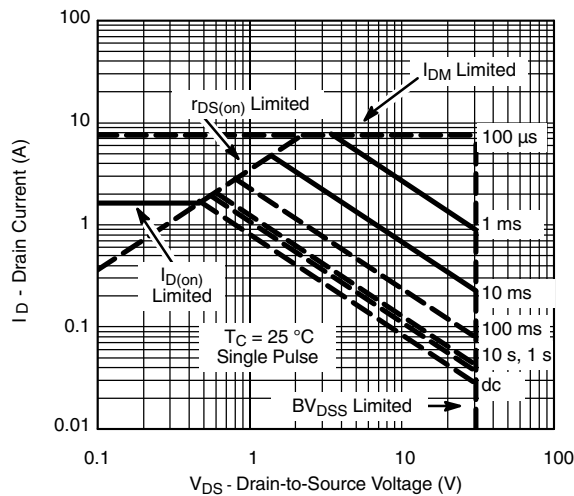
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power, Junction-to-Ambient

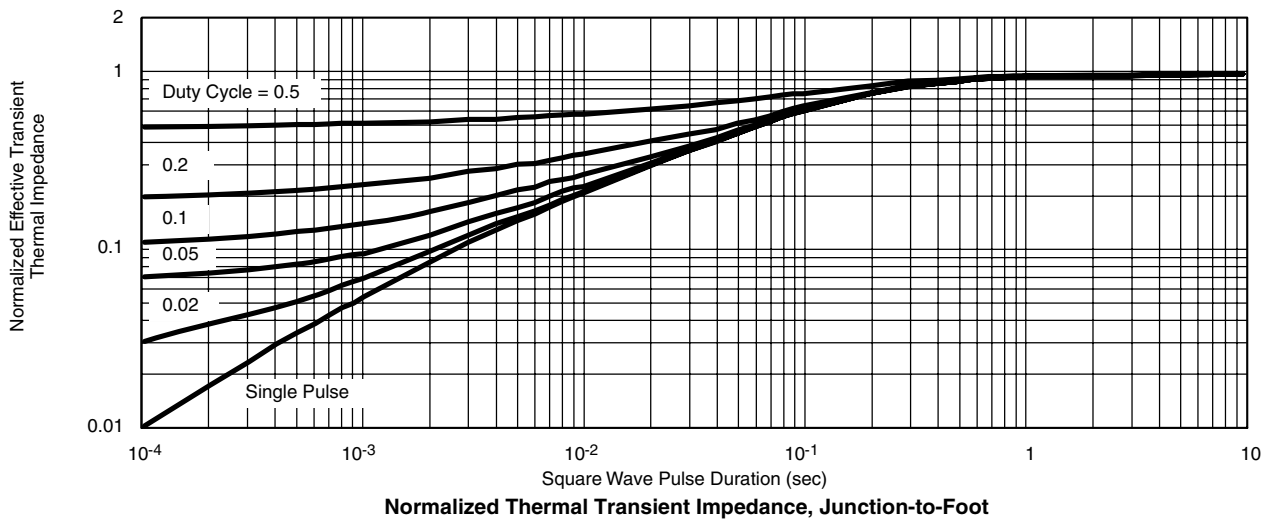
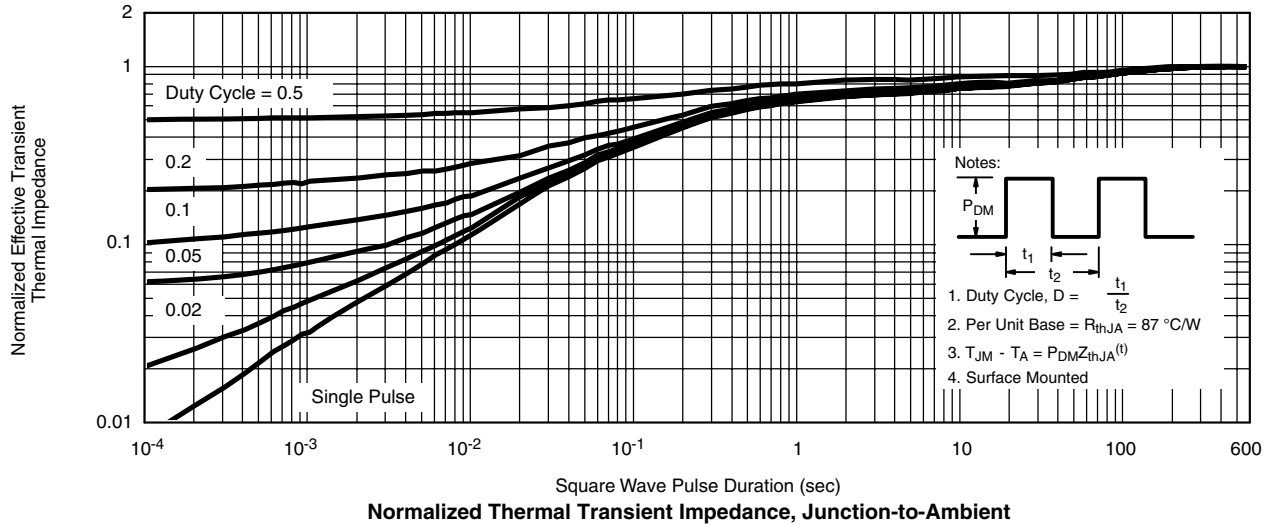


* $V_{GS} >$ minimum V_{GS} at which $r_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Case



P-CHANNEL TYPICAL CHARACTERISTICS 25 °C unless 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?72032>.



Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.