Dual N-Channel 20-V (D-S) MOSFET with Schottky Diode

PRODUCT SUMMARY			
	V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
Channel-1	20	0.012 at V_{GS} = 10 V	9.6
		0.0175 at V_{GS} = 4.5 V	7.8
Channel-2		0.010 at V_{GS} = 10 V	13.5
		0.0115 at V_{GS} = 4.5 V	12.8

SCHOTTKY PRODUCT SUMMARY		
V_{DS} (V)	V_{SD} (V) Diode Forward Voltage	I_F (A)
20	0.53 V at 3 A	2.0

FEATURES

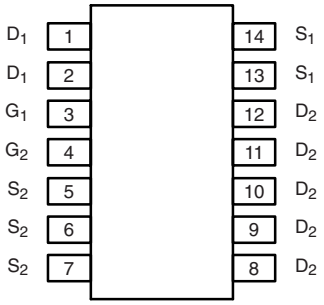
- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC

Pb-free
RoHS COMPLIANT
HALOGEN FREE Available

APPLICATIONS

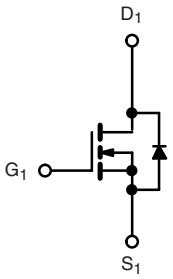
- DC/DC Converters
  - Game Stations
  - Notebook PC Logic

SO-14

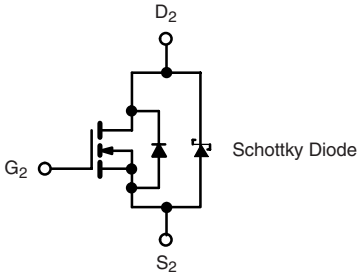


Top View

Ordering Information: Si4340DY-T1-E3 (Lead (Pb)-free)
Si4340DY-T1-GE3 (Lead (Pb)-free and Halogen-free)



N-Channel 1 MOSFET



N-Channel 2 MOSFET

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted

Parameter		Symbol	Channel-1		Channel-2		Unit
			10 s	Steady State	10 s	Steady State	
Drain-Source Voltage		V_{DS}	20				V
Gate-Source Voltage		V_{GS}	± 20		± 16		
Continuous Drain Current (T_J = 150 °C)[a]	T_A = 25 °C	I_D	9.6	7.3	13.5	9.9	A
	T_A = 70 °C		7.7	5.8	10.8	7.5	
Pulsed Drain Current		I_{DM}	40		50		
Continuous Source Current (Diode Conduction)[a]		I_S	1.8	1.04	2.73	1.30	
Maximum Power Dissipation[a]	T_A = 25 °C	P_D	2.0	1.14	3.0	1.43	W
	T_A = 70 °C		1.28	0.73	1.9	0.91	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150				°C

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Channel-1		Channel-2		Schottky		Unit
			Typ.	Max.	Typ.	Max.	Typ.	Max.	
Maximum Junction-to-Ambient[a]	t ≤ 10 s	R_{thJA}	53	62.5	35	42	40	48	°C/W
	Steady State		92	110	72	87	76	93	
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	35	42	18	23	21	25	

Notes:
a. Surface Mounted on 1" x 1" FR4 board.

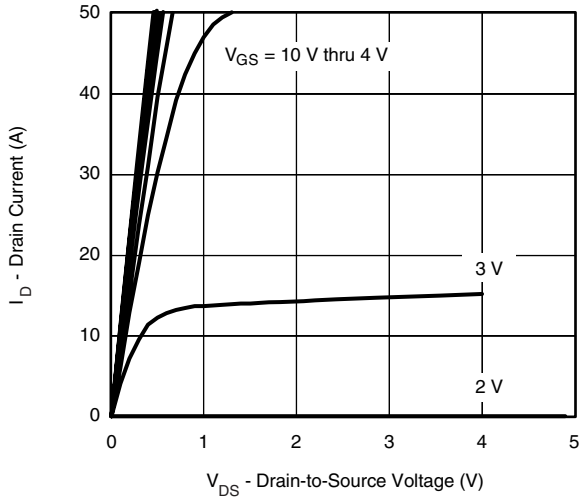
MOSFET SPECIFICATIONS T_J = 25 °C, unless otherwise noted							
Parameter	**Symbol**	**Test Conditions**		**Min.**	**Typ.[a]**	**Max.**	**Unit**
Static							
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	Ch-1	0.8		2.00	V
			Ch-2	0.8		1.90	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V	Ch-1			100	nA
		V_{DS} = 0 V, V_{GS} = ± 12 V	Ch-2			100	
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V	Ch-1			1	µA
			Ch-2			100	
		V_{DS} = 20 V, V_{GS} = 0 V, T_J = 85 °C	Ch-1			15	
			Ch-2			4000	
On-State Drain Current[b]	$I_{D(on)}$	V_{DS} = 5 V, V_{GS} = 10 V	Ch-1	20			A
			Ch-2	30			
Drain-Source On-State Resistance[b]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 9.6 A	Ch-1		0.0095	0.012	Ω
		V_{GS} = 10 V, I_D = 13.5 A	Ch-2		0.007	0.010	
		V_{GS} = 4.5 V, I_D = 7.8 A	Ch-1		0.0135	0.0175	
		V_{GS} = 4.5 V, I_D = 12.8 A	Ch-2		0.0085	0.0115	
Forward Transconductance[b]	g_{fs}	V_{DS} = 15 V, I_D = 9.6 A	Ch-1		25		S
		V_{DS} = 15 V, I_D = 13.5 A	Ch-2		38		
Diode Forward Voltage[b]	V_{SD}	I_S = 1.8 A, V_{GS} = 0 V	Ch-1		0.74	1.1	V
		I_S = 2.73 A, V_{GS} = 0 V	Ch-2		0.485	0.53	
Dynamic[a]							
Total Gate Charge	Q_g	Channel-1 V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 9.6 A Channel-2 V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = - 13.5 A	Ch-1		10	15	nC
			Ch-2		17	25	
Gate-Source Charge	Q_{gs}		Ch-1		3.3		
			Ch-2		4.5		
Gate-Drain Charge	Q_{gd}		Ch-1		3.1		
			Ch-2		4.5		
Gate Resistance	R_g	f = 1 MHz	Ch-1	0.45	0.9	1.35	Ω
			Ch-2	0.7	1.4	2.1	
Turn-On Delay Time	$t_{d(on)}$	Channel-1 V_{DD} = 10 V, R_L = 10 Ω $I_D \cong$ 1 A, V_{GEN} = 10 V, R_g = 6 Ω Channel-2 V_{DD} = 10 V, R_L = 10 Ω $I_D \cong$ 1 A, V_{GEN} = 10 V, R_g = 6 Ω	Ch-1		15	25	ns
			Ch-2		24	35	
Rise Time	t_r		Ch-1		16	25	
			Ch-2		22	35	
Turn-Off Delay Time	$t_{d(off)}$		Ch-1		42	65	
			Ch-2		68	100	
Fall Time	t_f		Ch-1		16	25	
			Ch-2		19	30	
Source-Drain Reverse Recovery Time	t_{rr}	I_F = 1.8 A, dI/dt = 100 A/µs	Ch-1		35	60	
		I_F = 2.73 A, dI/dt = 100 µA/µs	Ch-2		38	65	

Notes:
a. Guaranteed by design, not subject to production testing.
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.

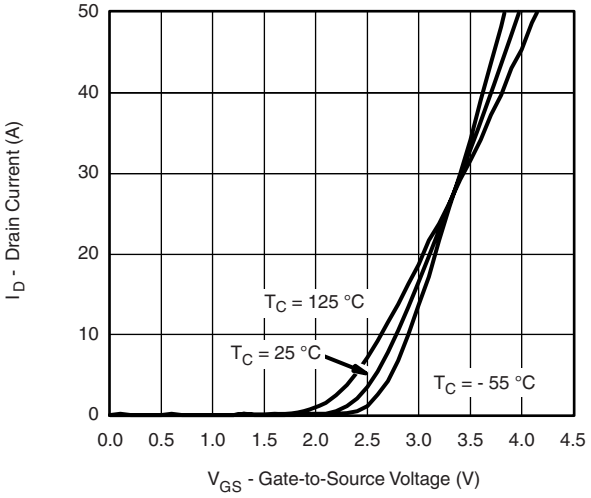
SCHOTTKY SPECIFICATIONS T_J = 25 °C, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Forward Voltage Drop	V_F	I_F = 3 A		0.485	0.53	V
		I_F = 3 A, T_J = 125 °C		0.42	0.42	
Maximum Reverse Leakage Current	I_{rm}	V_R = 20 V		0.008	0.100	mA
		V_R = 20 V, T_J = 75 °C		0.4	5	
		V_R = - 20 V, T_J = 125 °C		6.5	20	
Junction Capacitance	C_T	V_R = 15 V		102		pF

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.

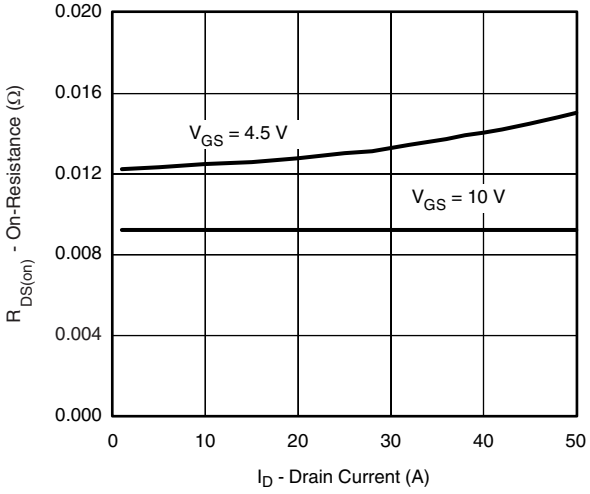
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



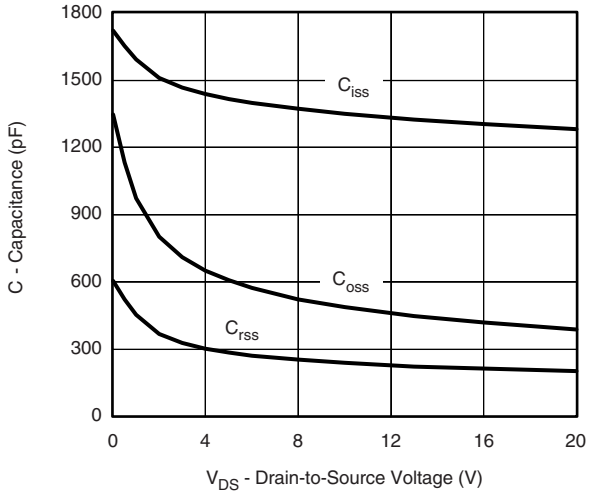
Output Characteristics



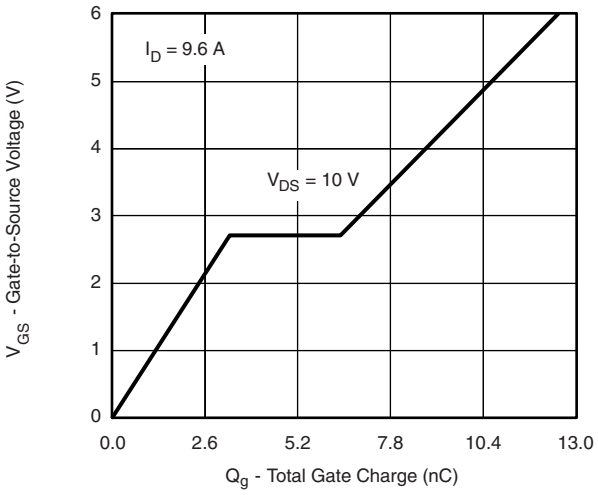
Transfer Characteristics



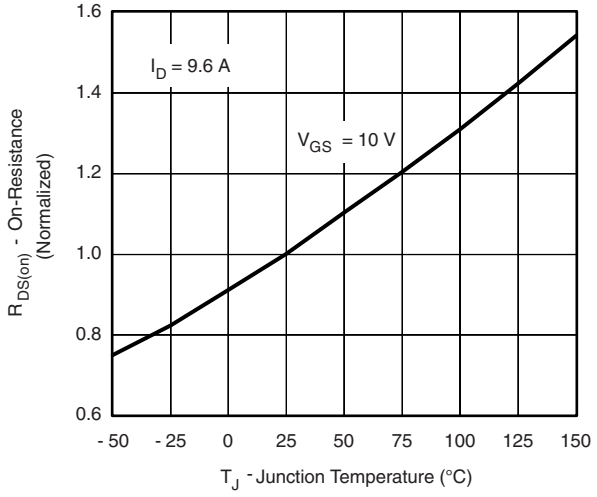
On-Resistance vs. Drain Current



Capacitance

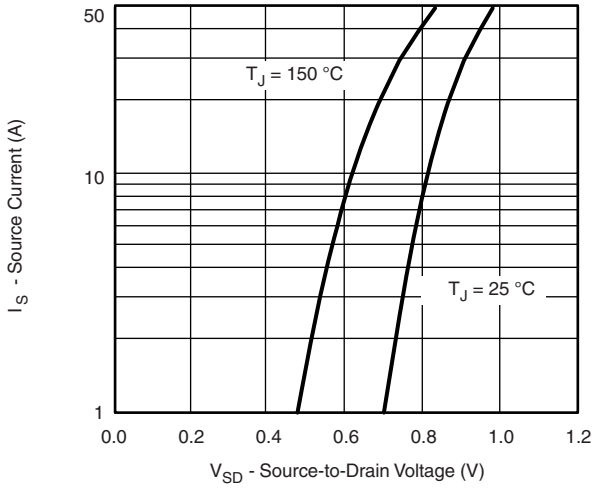


Gate Charge

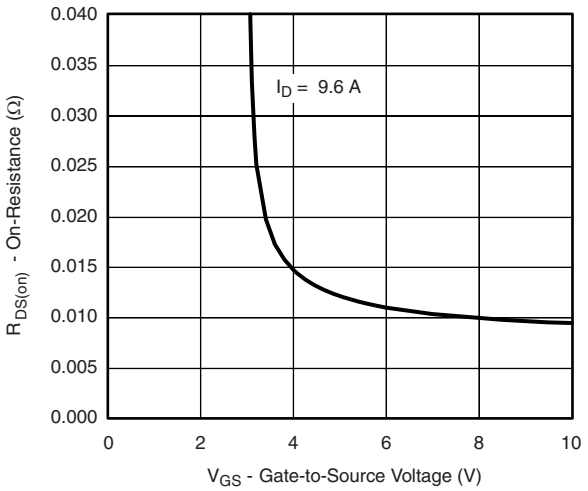


On-Resistance vs. Junction Temperature

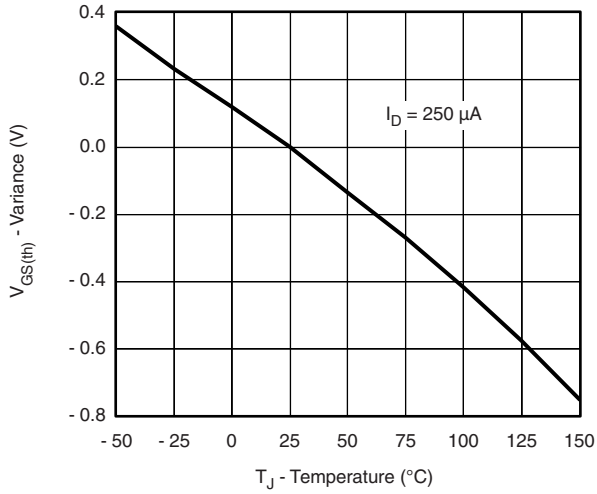
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



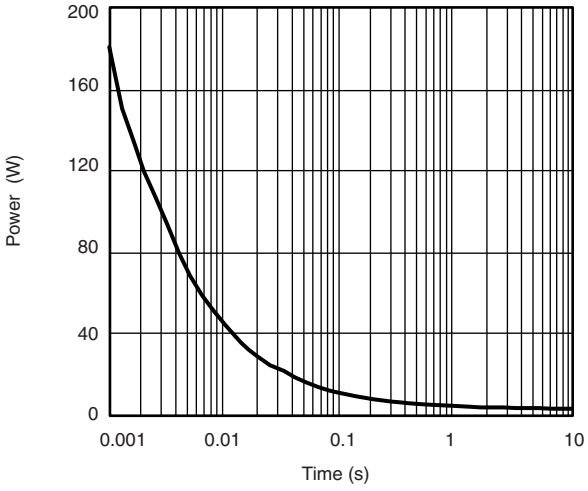
Source-Drain Diode Forward Voltage



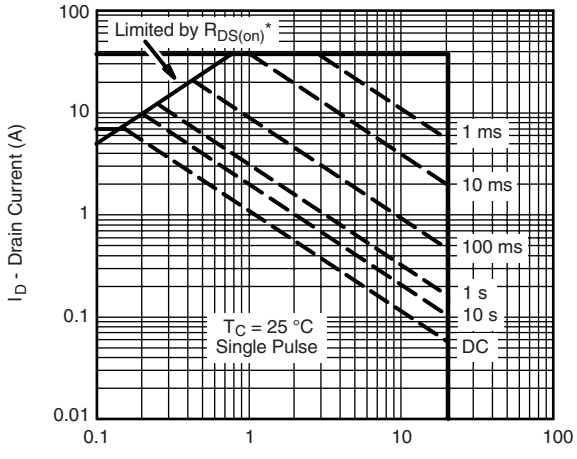
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



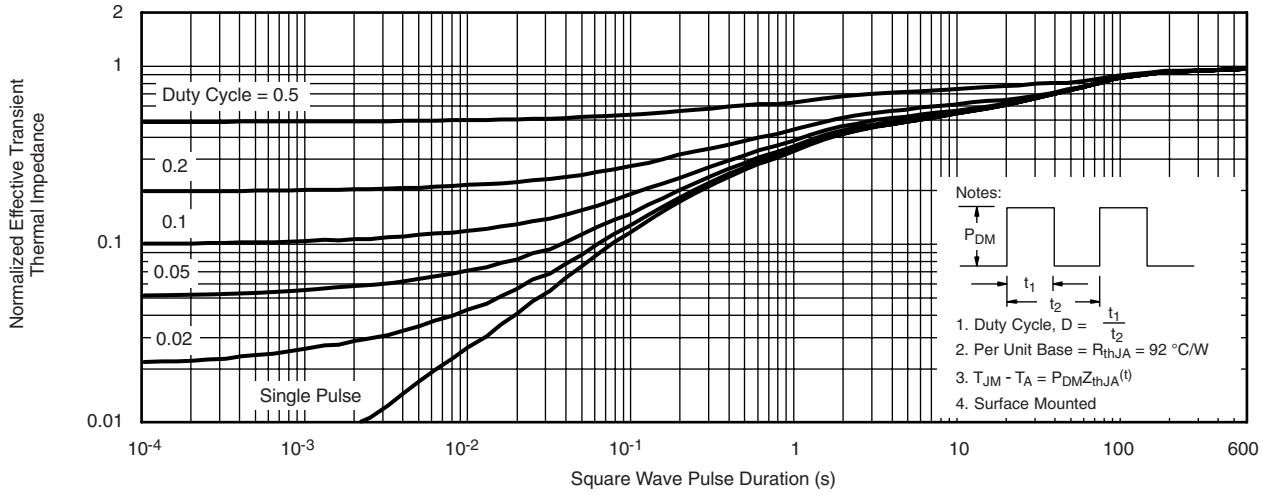
Single Pulse Power



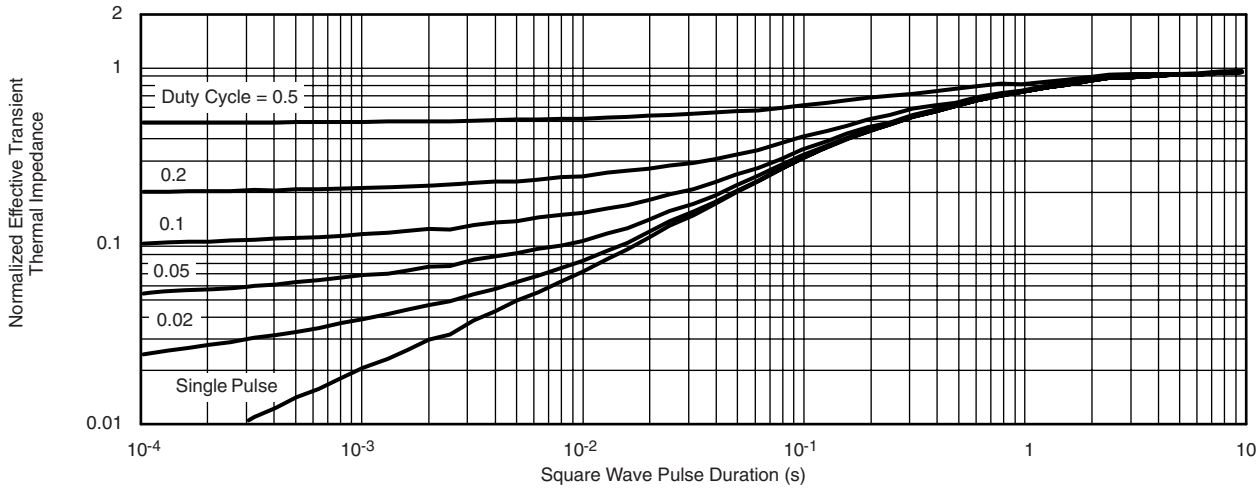
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Case

CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

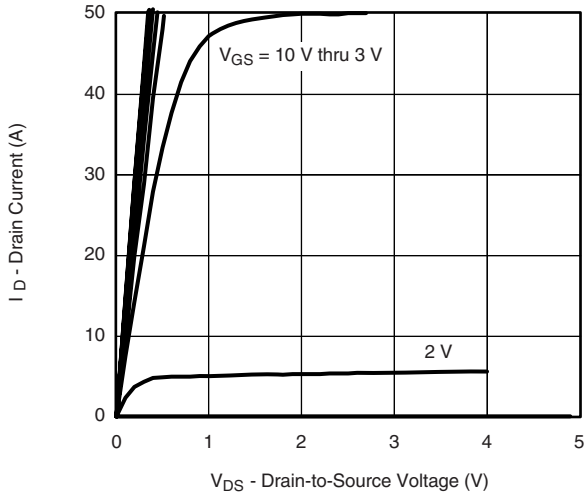


Normalized Thermal Transient Impedance, Junction-to-Ambient

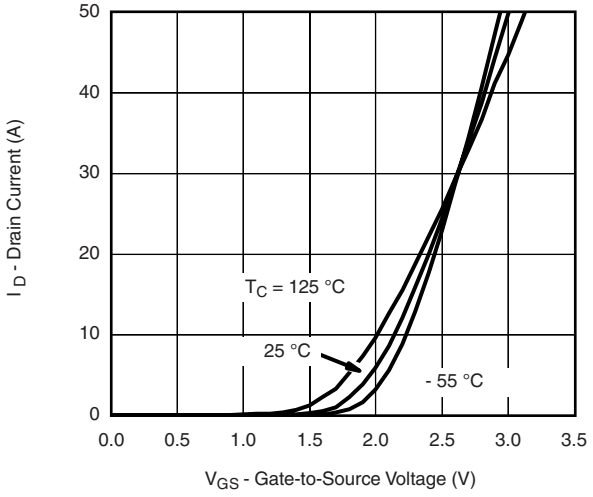


Normalized Thermal Transient Impedance, Junction-to-Foot

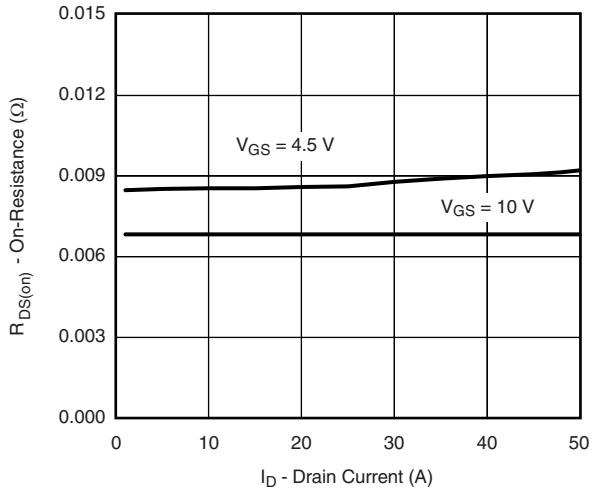
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



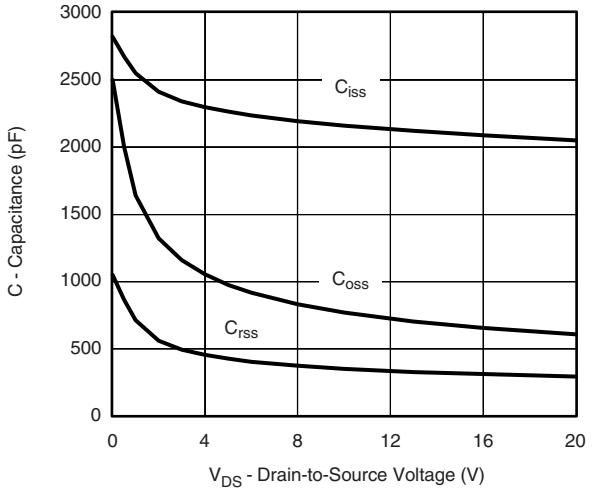
Output Characteristics



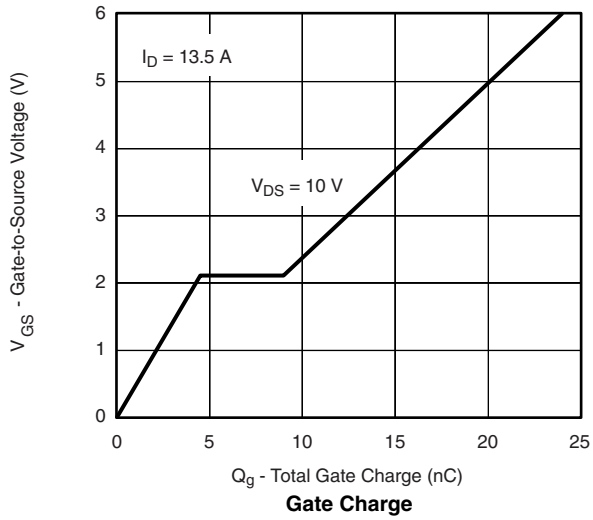
Transfer Characteristics



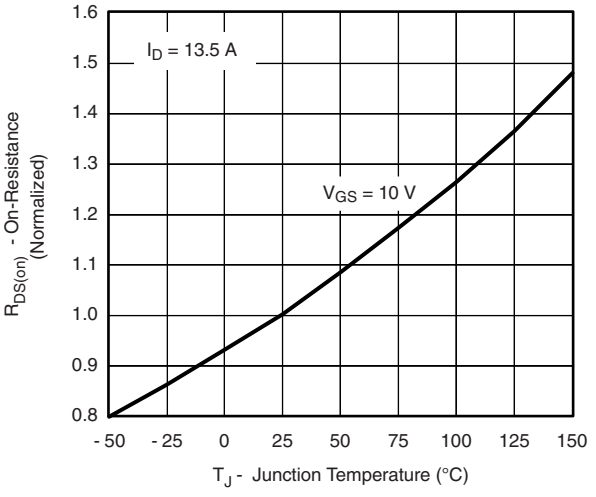
On-Resistance vs. Drain Current



Capacitance

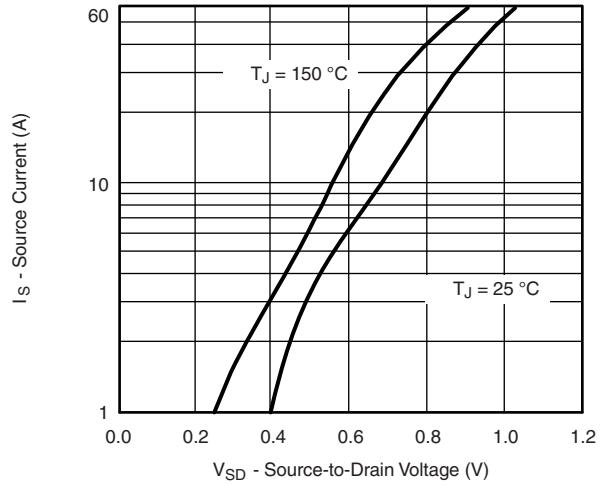


Gate Charge

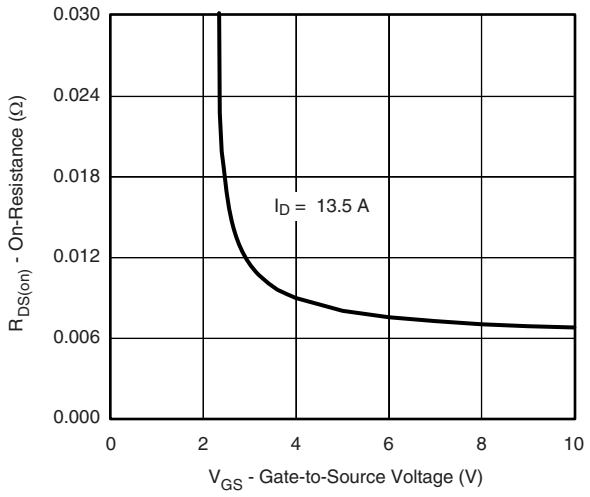


On-Resistance vs. Junction Temperature

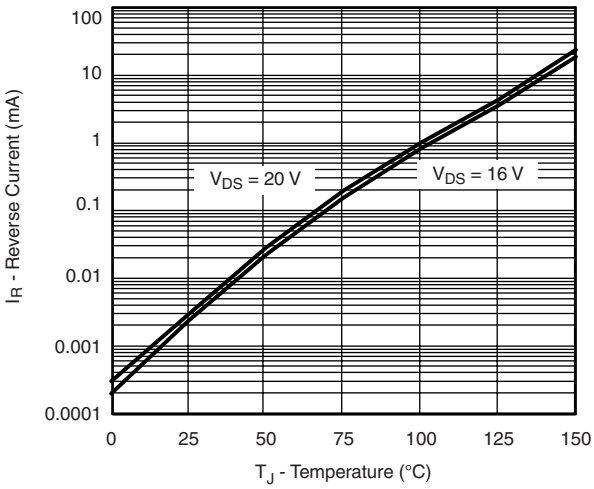
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



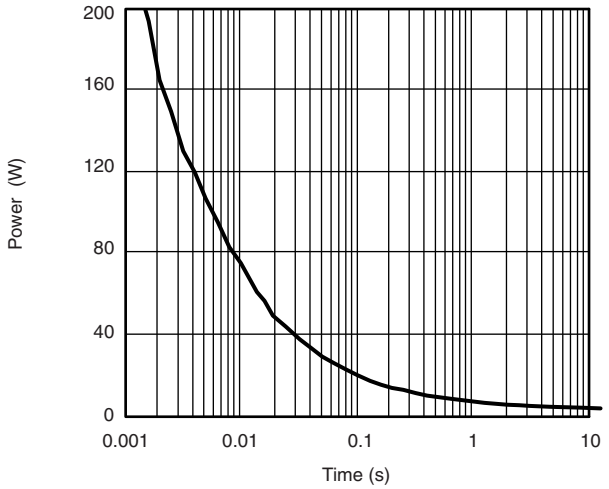
Source-Drain Diode Forward Voltage



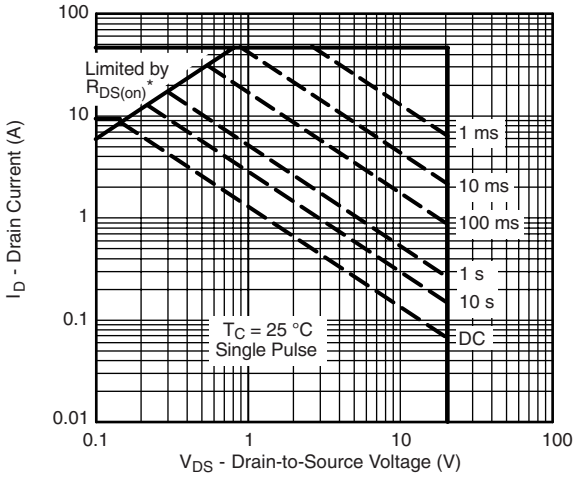
On-Resistance vs. Gate-to-Source Voltage



Reverse Current vs. Junction Temperature



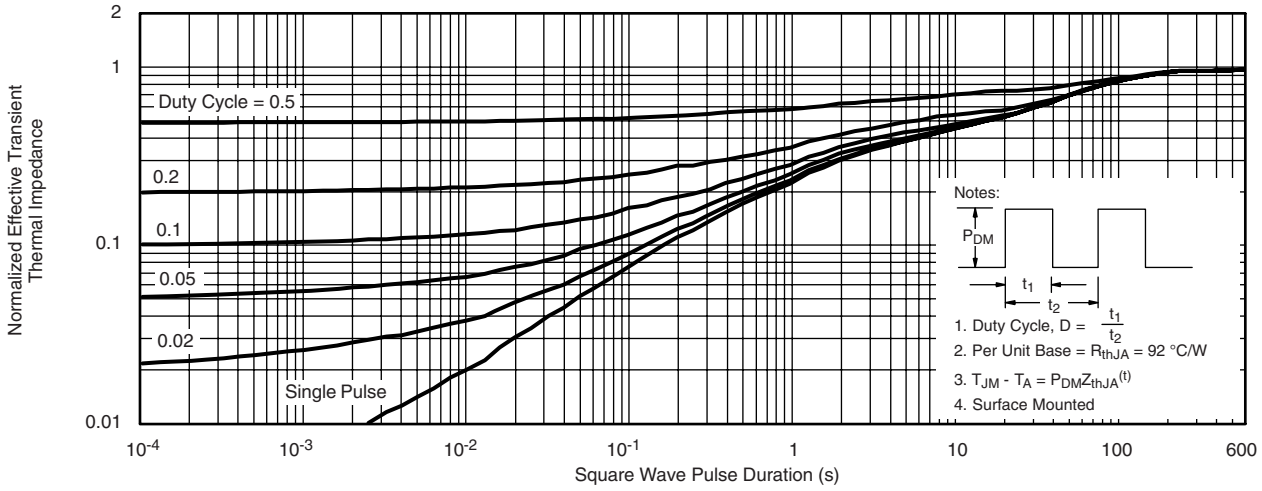
Single Pulse Power



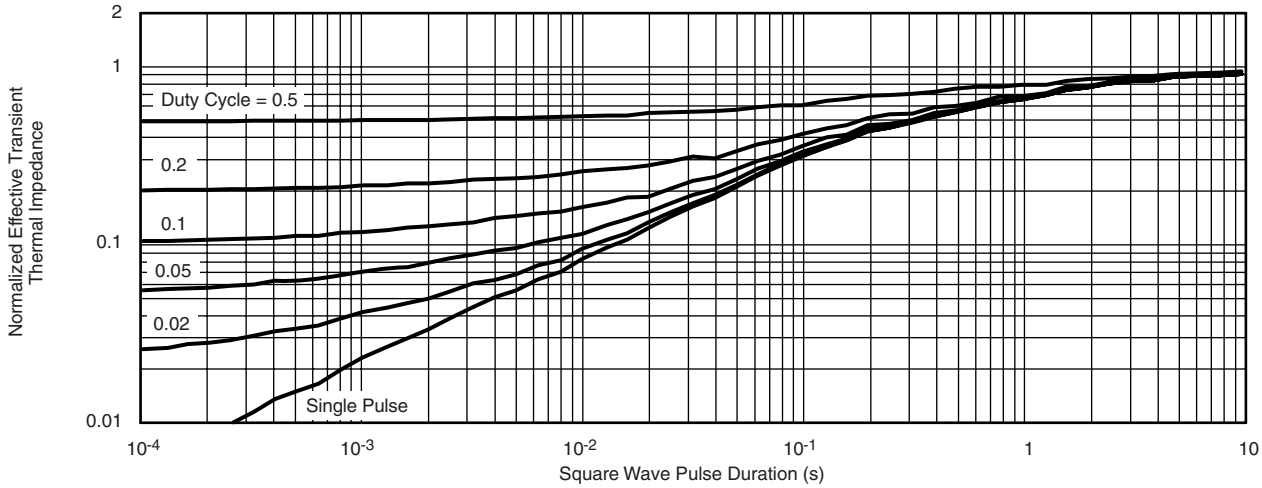
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Case

CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

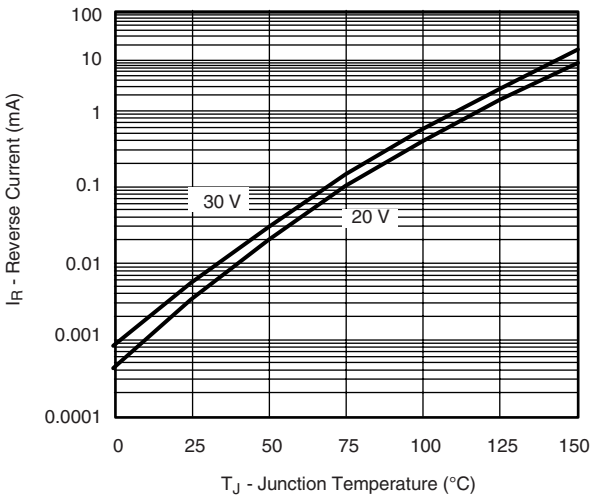


Normalized Thermal Transient Impedance, Junction-to-Ambient

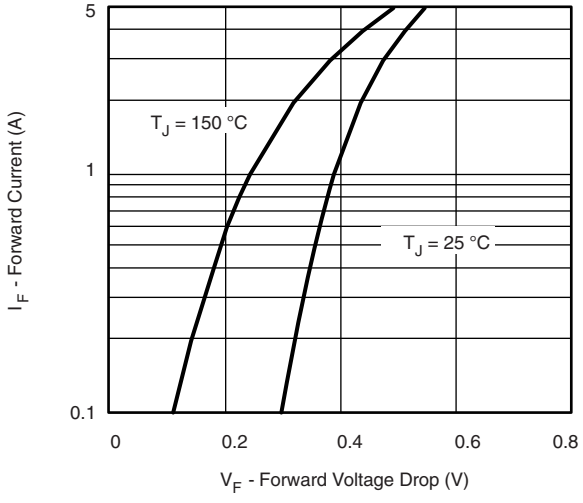


Normalized Thermal Transient Impedance, Junction-to-Foot

SCHOTTKY TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

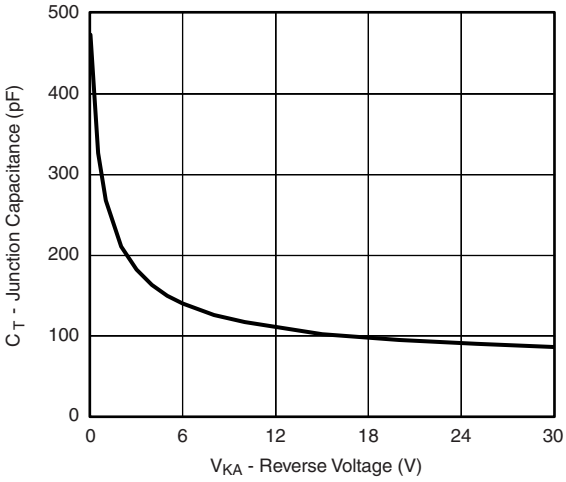


Reverse Current vs. Junction Temperature

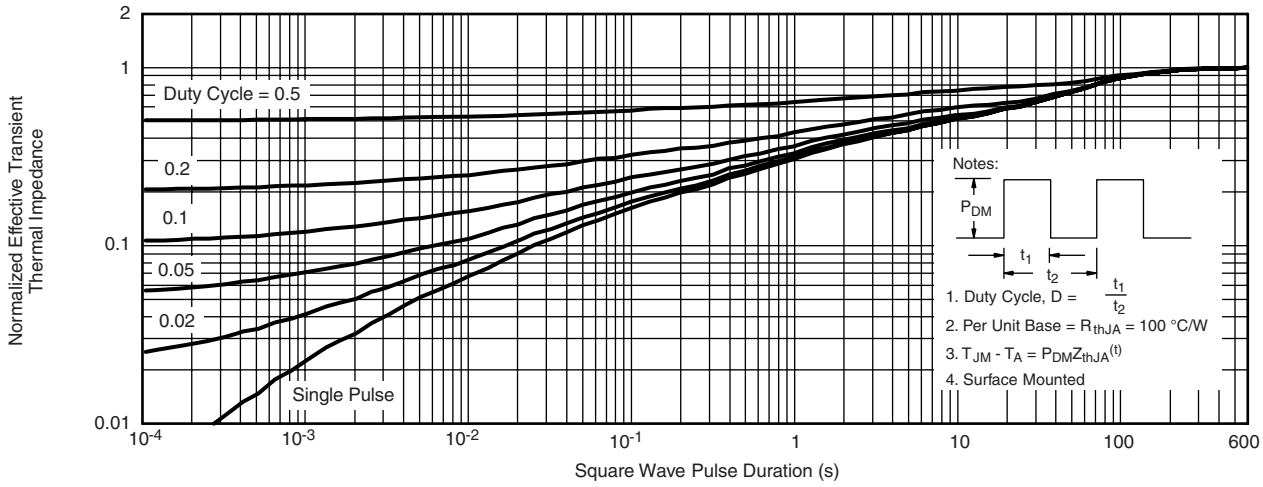


Forward Voltage Drop

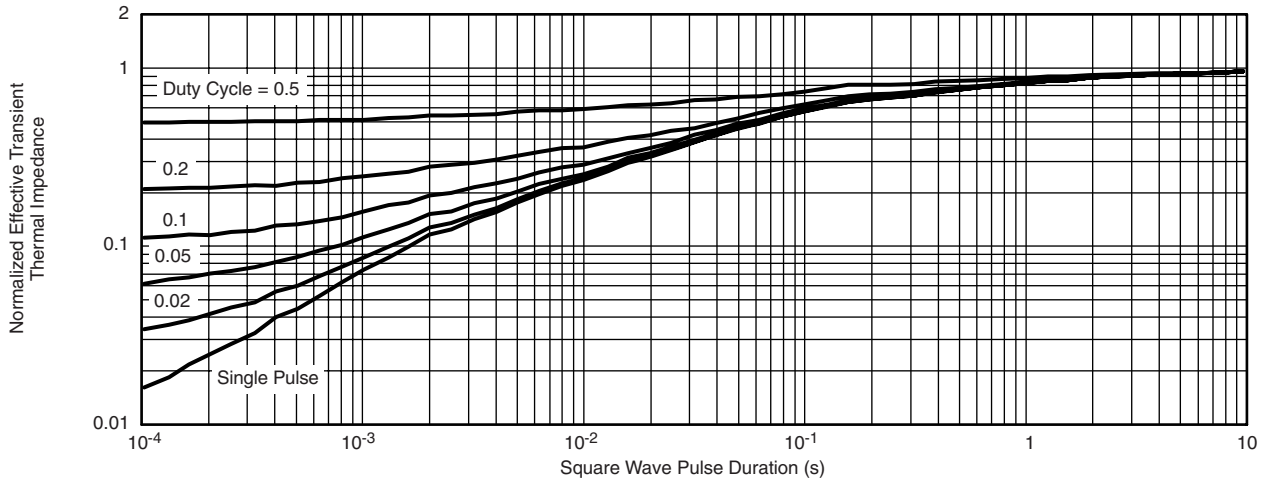
SCHOTTKY TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Capacitance



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

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 www.vishay.com/ppg?72376.

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

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 in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

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