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

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ.)
- 20	0.054 at V_{GS} = - 10 V	6.2	4.5 nC
	0.094 at V_{GS} = - 4.5 V	4.7	

SCHOTTKY PRODUCT SUMMARY		
V_{KA} (V)	V_f (V) Diode Forward Voltage	I_F (A)[a]
20	0.45 at 1 A	2

FEATURES

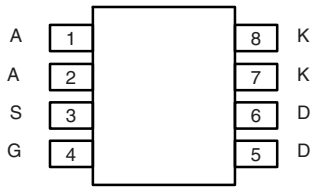
- **Halogen-free According to IEC 61249-2-21 Definition**
- LITTLE FOOT® *Plus* Schottky
- Compliant to RoHS Directive 2002/95/EC

Pb-free
RoHS COMPLIANT
HALOGEN FREE Available

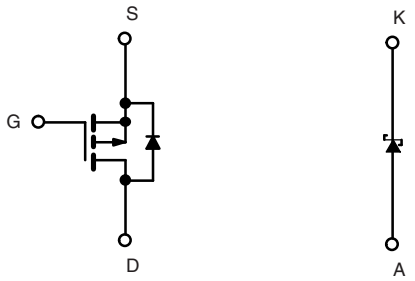
APPLICATIONS

- Portable Devices
  - Ideal for Boost Circuits
  - Ideal for Buck Circuits

SO-8



Top View



P-Channel MOSFET

Ordering Information: Si4621DY-T1-E3 (Lead (Pb)-free)
Si4621DY-T1-GE3 (Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)				
Parameter		**Symbol**	**Limit**	**Unit**
Drain-Source Voltage (MOSFET)		V_{DS}	- 20	V
Reverse Voltage (Schottky)		V_{KA}	20	
Gate-Source Voltage (MOSFET)		V_{GS}	± 20	
Continuous Drain Current (T_J = 150 °C) (MOSFET)	T_C = 25 °C	I_D	- 6.2	A
	T_C = 70 °C		- 5[a]	
	T_A = 25 °C		- 5[b, c]	
	T_A = 70 °C		- 4[b, c]	
Pulsed Drain Current (MOSFET)		I_{DM}	- 25	
Continuous Source-Drain Diode Current (MOSFET Diode Conduction)	T_C = 25 °C	I_S	- 2.6	
	T_A = 25 °C		1.7[b, c]	
Average Forward Current (Schottky)		I_F	2[b]	
Pulsed Forward Current (Schottky)		I_{FM}	5	
Maximum Power Dissipation (MOSFET)	T_C = 25 °C	P_D	3.1	W
	T_C = 70 °C		2	
	T_A = 25 °C		2[b, c]	
	T_A = 70 °C		1.3[b, c]	
Maximum Power Dissipation (Schottky)	T_C = 25 °C		2.7	
	T_C = 70 °C		1.7	
	T_A = 25 °C		1.6[b, c]	
	T_A = 70 °C		1[b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C

This document is subject to change without notice.
THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient (MOSFET)[b, f]	R_{thJA}	55	62.5	°C/W
Maximum Junction-to-Foot (Drain) (MOSFET)	R_{thJF}	33	40	
Maximum Junction-to-Ambient (Schottky)[b, g]	R_{thJA}	63	78	
Maximum Junction-to-Foot (Drain) (Schottky)	R_{thJF}	39	47	

Notes:
b. Surface Mounted on 1" x 1" FR4 board.
c. t = 10 s.
f. Maximum under Steady State conditions is 110 °C/W.
g. Maximum under Steady State conditions is 115 °C/W.

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = - 250 µA	- 20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = - 250 µA		- 16		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			3.6		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = - 250 µA	- 1		- 3	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = - 20 V, V_{GS} = 0 V			- 1	µA
		V_{DS} = - 20 V, V_{GS} = 0 V, T_J = 55 °C			- 10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \leq$ 5 V, V_{GS} = - 10 V	- 25			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = - 10 V, I_D = - 5 A		0.042	0.054	Ω
		V_{GS} = - 4.5 V, I_D = - 1.1 A		0.073	0.094	
Forward Transconductance[a]	g_{fs}	V_{DS} = - 10 V, I_D = - 5 A		10		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = - 10 V, V_{GS} = 0 V, f = 1 MHz		450		pF
Output Capacitance	C_{oss}			160		
Reverse Transfer Capacitance	C_{rss}			105		
Total Gate Charge	Q_g	V_{DS} = - 10 V, V_{GS} = - 10 V, I_D = - 6.2 A		8.7	13	nC
		V_{DS} = - 10 V, V_{GS} = - 4.5 V, I_D = - 6.2 A		4.5	6.8	
Gate-Source Charge	Q_{gs}			1.7		
Gate-Drain Charge	Q_{gd}			1.8		
Gate Resistance	R_g	f = 1 MHz		9		Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 10 V, R_L = 2.5 Ω $I_D \cong$ - 4 A, V_{GEN} = - 4.5 V, R_g = 1 Ω		15	25	ns
Rise Time	t_r			60	90	
Turn-Off DelayTime	$t_{d(off)}$			22	35	
Fall Time	t_f			15	25	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 10 V, R_L = 2.5 Ω $I_D \cong$ - 4 A, V_{GEN} = - 10 V, R_g = 1 Ω		5	10	
Rise Time	t_r			60	90	
Turn-Off DelayTime	$t_{d(off)}$			20	30	
Fall Time	t_f			7	15	

This document is subject to change without notice.
THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			- 6.2	A
Pulse Diode Forward Current	I_{SM}				- 25	
Body Diode Voltage	V_{SD}	I_S = - 1.7 A, V_{GS} = 0 V		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = - 1.7 A, dI/dt = 100 A/µs, T_J = 25 °C		21	40	ns
Body Diode Reverse Recovery Charge	Q_{rr}			10	20	nC
Reverse Recovery Fall Time	t_a			7		ns
Reverse Recovery Rise Time	t_b			16		

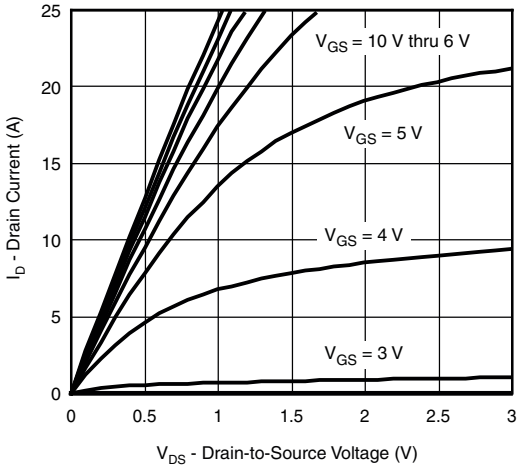
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

SCHOTTKY SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Forward Voltage Drop	V_F	I_F = 1 A		0.41	0.45	V
		I_F = 1 A, T_J = 125 °C		0.36	0.41	
Maximum Reverse Leakage Current	I_{rm}	V_r = 20 V		0.02	0.20	mA
		V_r = 20 V, T_J = 85 °C		0.7	7	
		V_r = 20 V, T_J = 125 °C		5	50	
Junction Capacitance	C_T	V_r = 10 V		60		pF

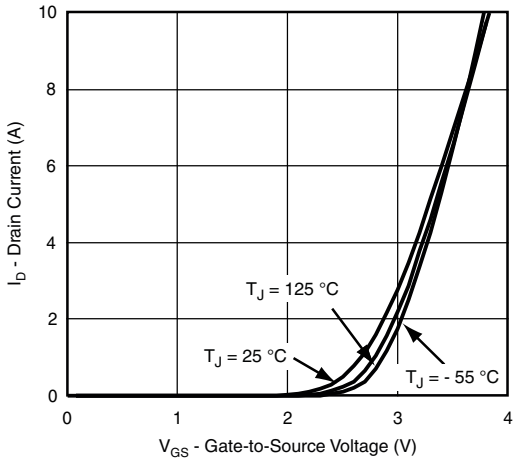
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

This document is subject to change without notice.
THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

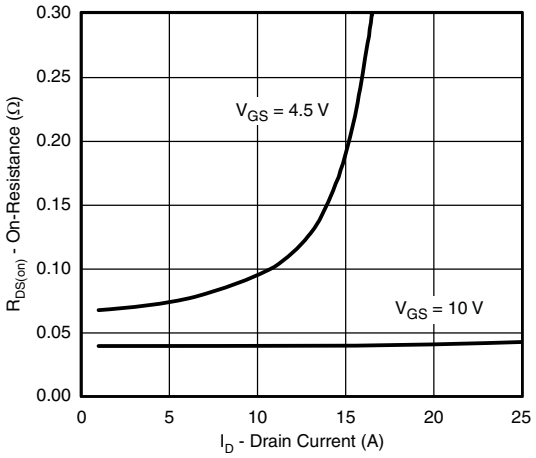
MOSFET TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



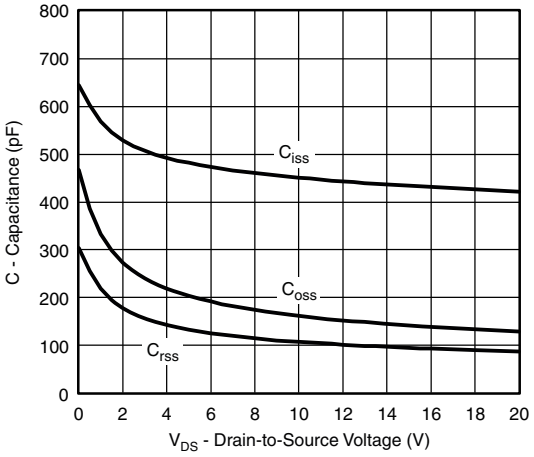
Output Characteristics



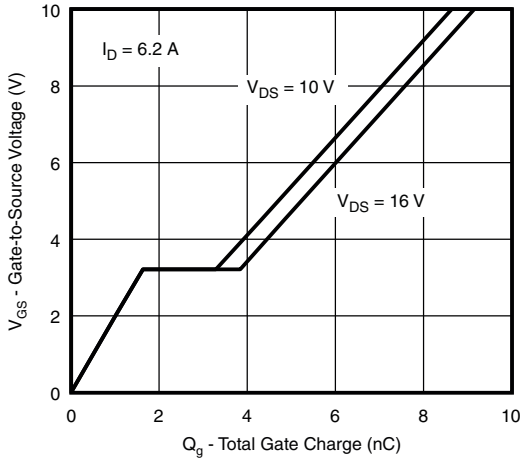
Transfer Characteristics



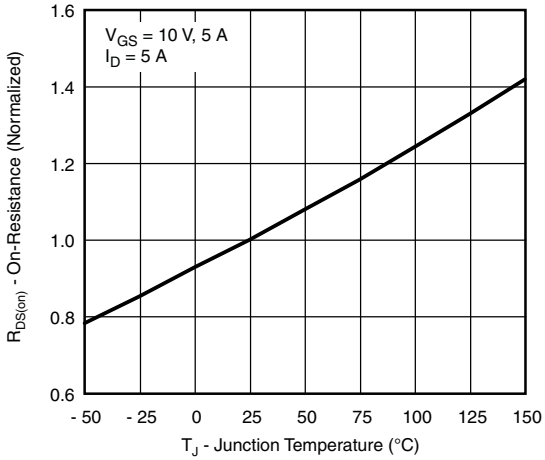
On-Resistance vs. Drain Current and Gate Voltage



Capacitance



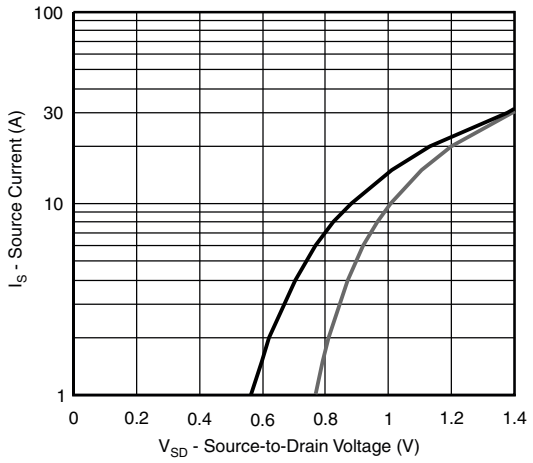
Gate Charge



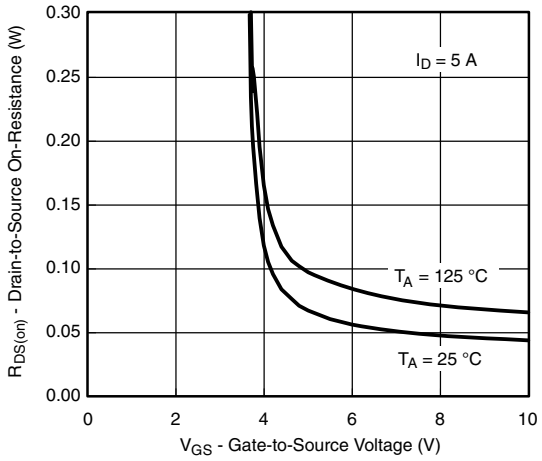
On-Resistance vs. Junction Temperature

This document is subject to change without notice.
THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

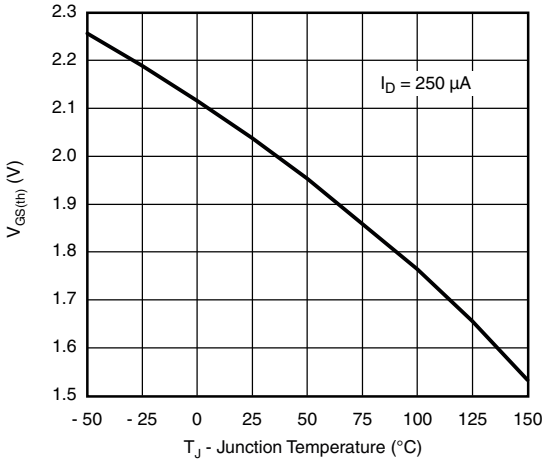
MOSFET TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



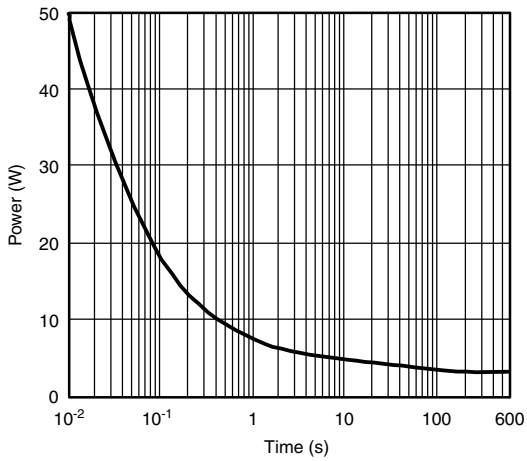
Source-Drain Diode Forward Voltage



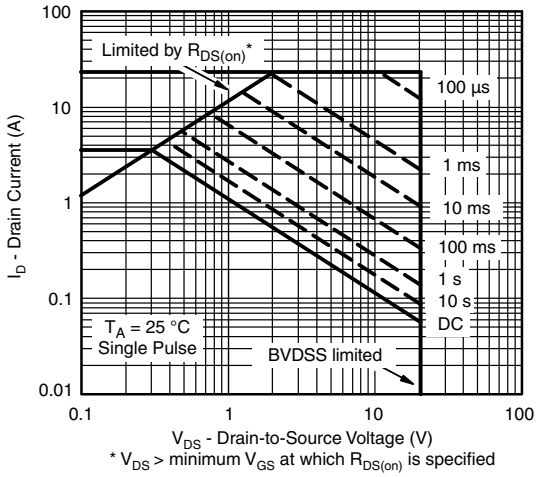
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



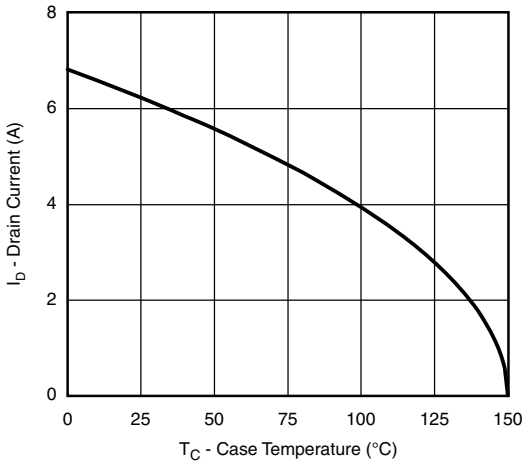
Single Pulse Power, Junction-to-Ambient



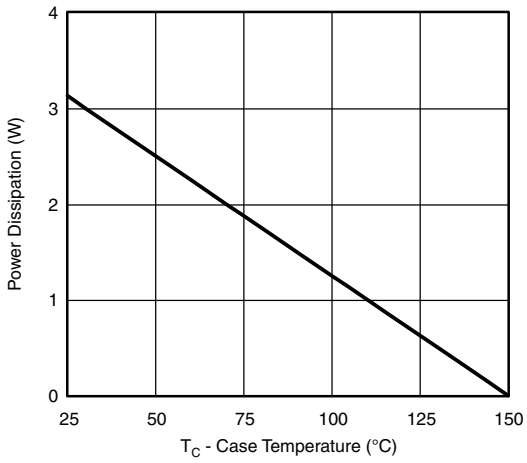
Safe Operating Area, Junction-to-Case

This document is subject to change without notice.
THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

MOSFET TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



Current Derating*

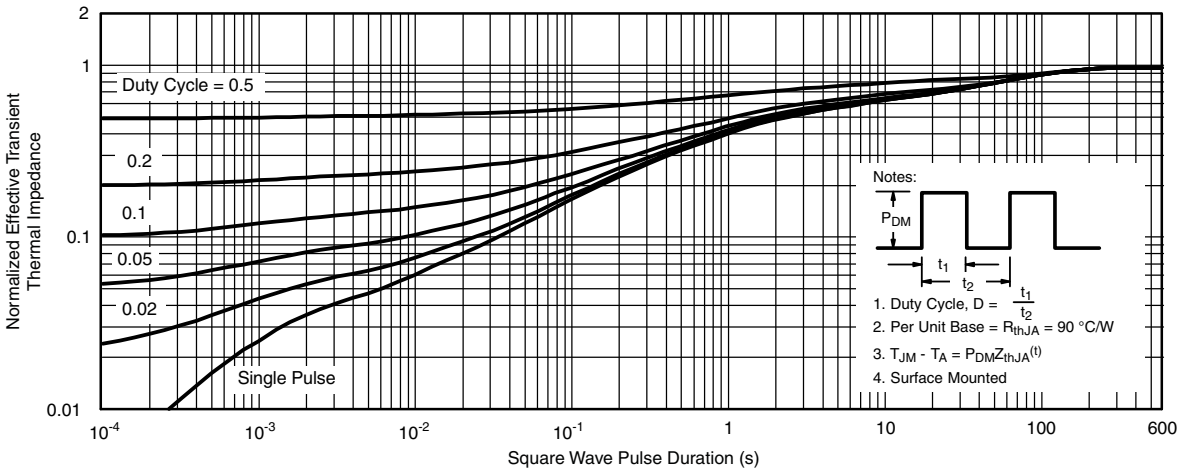


Power Derating

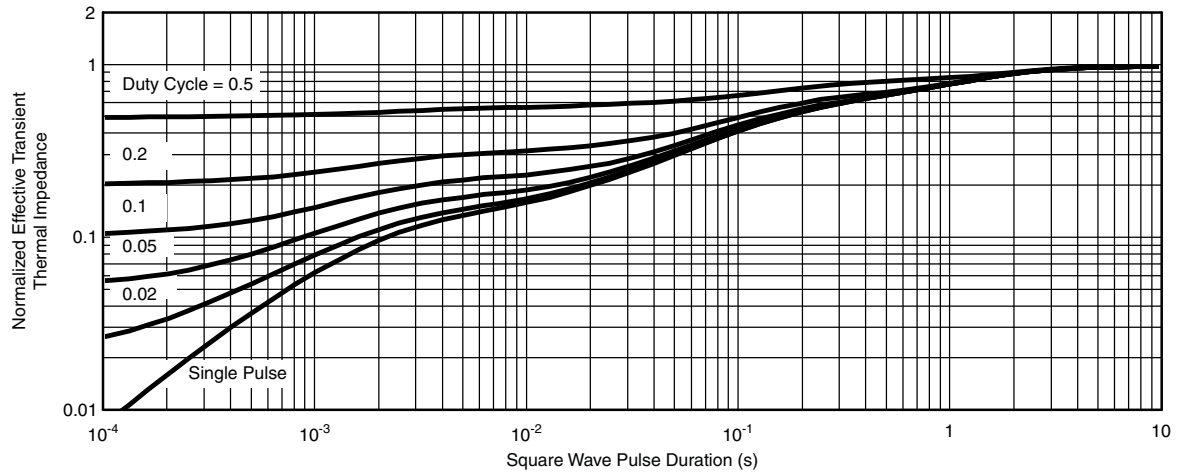
* The power dissipation P_D is based on $T_{J(max)}$ = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

This document is subject to change without notice.
THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

MOSFET TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



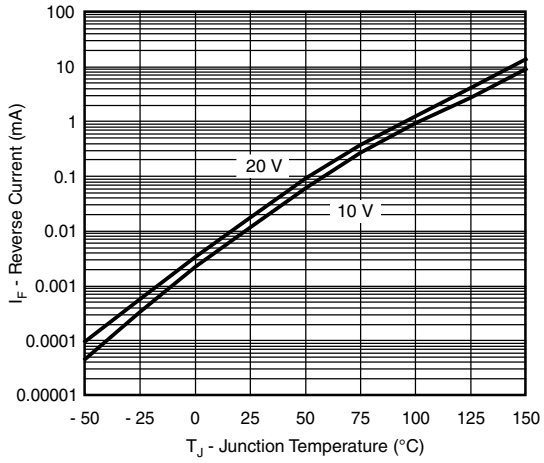
Normalized Thermal Transient Impedance, Junction-to-Ambient



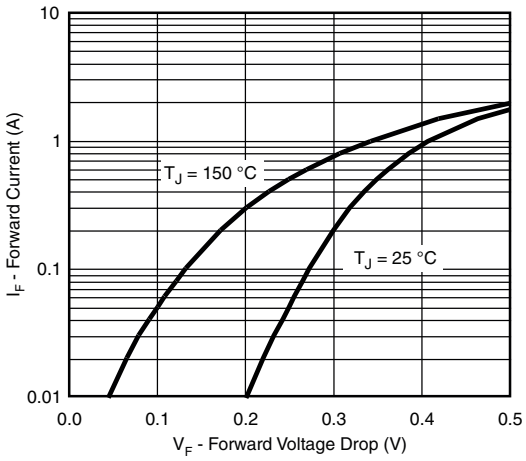
Normalized Thermal Transient Impedance, Junction-to-Foot

This document is subject to change without notice.
THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

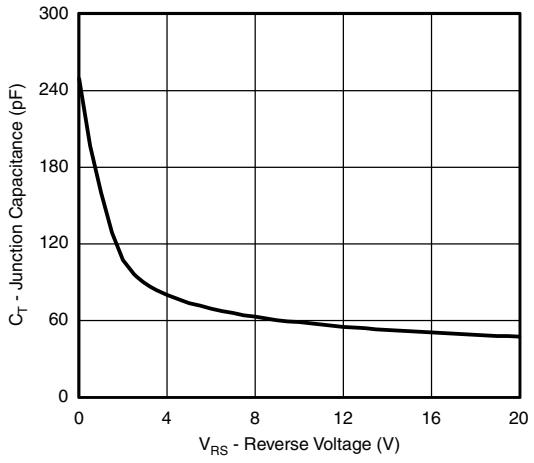
SCHOTTKY TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



Reverse Current vs. Junction Temperature



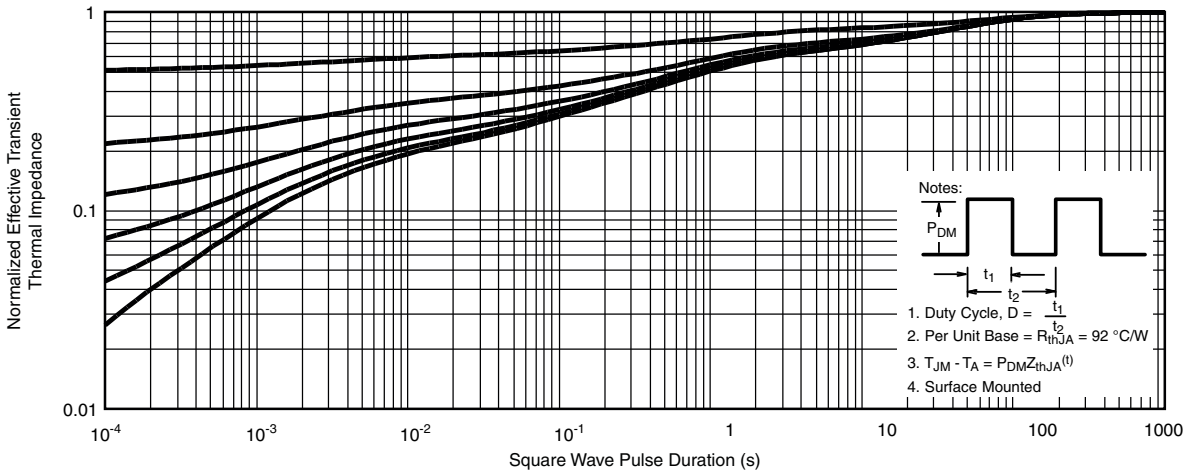
Forward Voltage Drop



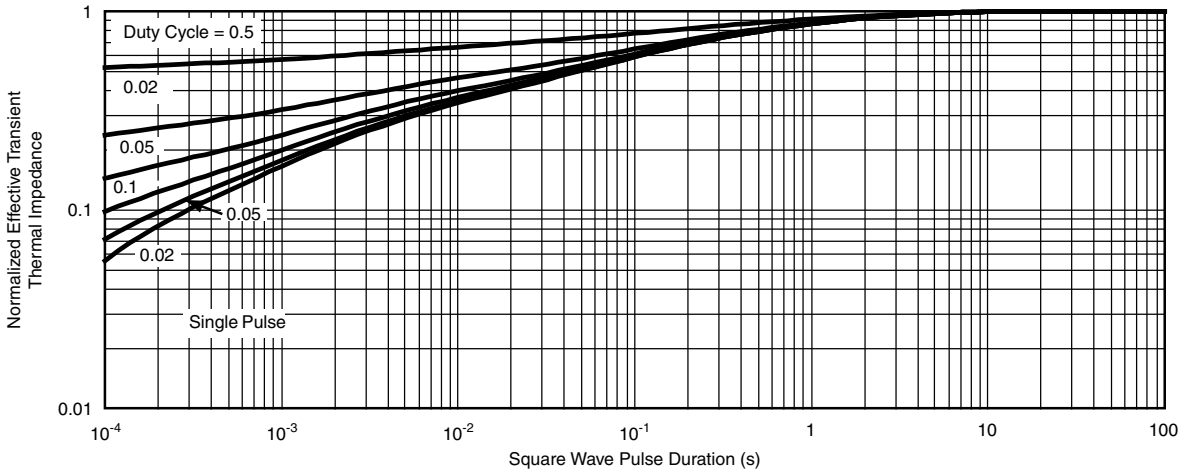
Capacitance

This document is subject to change without notice.
THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

SCHOTTKY TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



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?73855.

This document is subject to change without notice.
THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

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.

© 2023 VISHAY INTERTECHNOLOGY, INC. ALL RIGHTS RESERVED