

N-Channel Reduced  $Q_{gd}$ , Fast Switching WFET<sup>®</sup>

## PRODUCT SUMMARY

$V_{DS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
20	0.0028 at $V_{GS} = 10$ V	25
	0.0040 at $V_{GS} = 4.5$ V	22

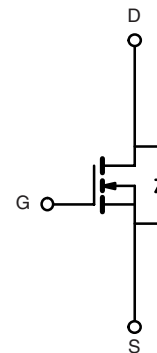
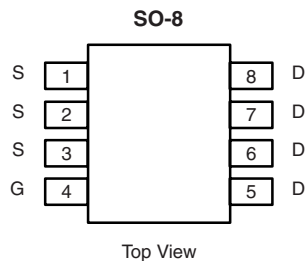
## FEATURES

- Extremely Low  $Q_{gd}$  WFET Technology for Switching Losses
- Ultra-Low On-Resistance
- 100 %  $R_g$  and UIS Tested

RoHS  
COMPLIANT

## APPLICATIONS

- Synchronous Rectifier in Low Power DC/DC Converters
- POL
- OR-ing



N-Channel MOSFET

Ordering Information: Si4398DY-T1-E3 (Lead (Pb)-free)

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

Parameter	Symbol	10 sec	Steady State	Unit	
Drain-Source Voltage	$V_{DS}$	20		V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$			
Continuous Drain Current ( $T_J = 150$ °C) <sup>a</sup>	$I_D$	$T_A = 25$ °C	25	19	A
		$T_A = 70$ °C	20	13	
Pulsed Drain Current (10 $\mu$ s Pulse Width)	$I_{DM}$	70			
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	2.9	1.3		
Avalanche Current	$I_{AS}$	L = 0.1 mH	40		mJ
Single Pulse Avalanche Energy			$E_{AS}$	80	
Maximum Power Dissipation <sup>a</sup>	$P_D$	$T_A = 25$ °C	3.5	1.6	W
		$T_A = 70$ °C	2.2	1.0	
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 <sup>a</sup>	$R_{thJA}$	$t \leq 10$ sec	29	35	°C/W
		Steady State	67	80	
Maximum Junction-to-Foot (Drain)	$R_{thJF}$	13	16		

Notes:

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



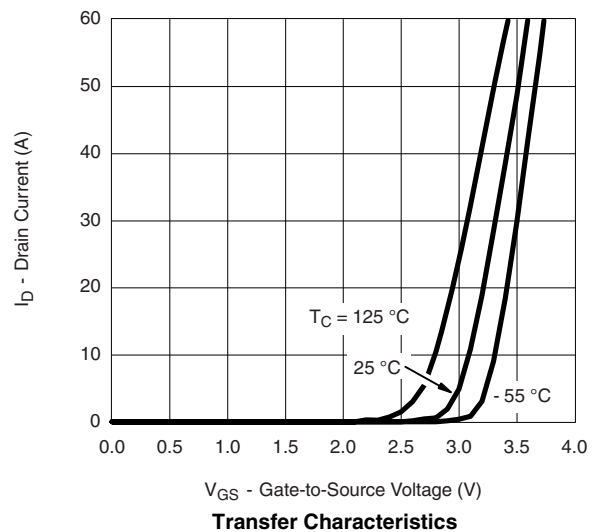
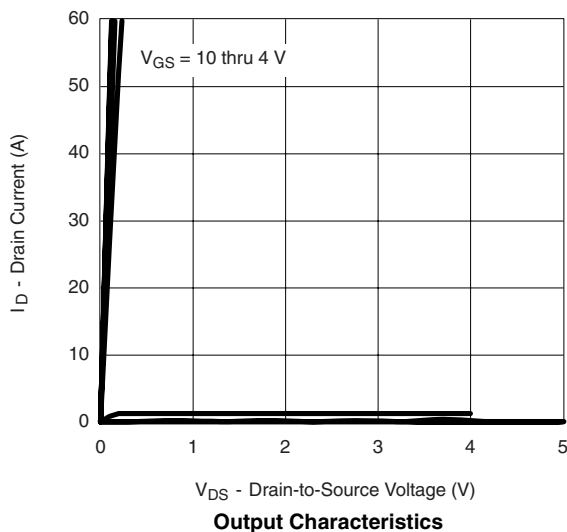
<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Static</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	1.0		3.0	V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\ \text{V}, V_{GS} = \pm 12\ \text{V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 20\ \text{V}, V_{GS} = 0\ \text{V}$			1	$\mu\text{A}$
		$V_{DS} = 20\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 55\text{ }^\circ\text{C}$			5	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\ \text{V}, V_{GS} = 10\ \text{V}$	50			A
Drain-Source On-State Resistance <sup>a</sup>	$r_{DS(on)}$	$V_{GS} = 10\ \text{V}, I_D = 25\ \text{A}$		0.0023	0.0028	$\Omega$
		$V_{GS} = 4.5\ \text{V}, I_D = 22\ \text{A}$		0.0033	0.0040	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 10\ \text{V}, I_D = 15\ \text{A}$		95		S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = 2.9\ \text{A}, V_{GS} = 0\ \text{V}$		0.72	1.1	V
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 10\ \text{V}, V_{GS} = 0\ \text{V}, f = 1\ \text{MHz}$		5620		pF
Output Capacitance	$C_{oss}$			1340		
Reverse Transfer Capacitance	$C_{rss}$			540		
Total Gate Charge	$Q_g$	$V_{DS} = 10\ \text{V}, V_{GS} = 4.5\ \text{V}, I_D = 20\ \text{A}$		34	50	nC
Gate-Source Charge	$Q_{gs}$			17.5		
Gate-Drain Charge	$Q_{gd}$			7.5		
Gate Resistance	$R_g$		0.7	1.4	2.1	$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\ \text{V}, R_L = 10\ \Omega$ $I_D \cong 1\ \text{A}, V_{GEN} = 4.5\ \text{V}, R_G = 6\ \Omega$		23	35	ns
Rise Time	$t_r$			15	23	
Turn-Off Delay Time	$t_{d(off)}$			80	120	
Fall Time	$t_f$			23	35	
Source-Drain Reverse Recovery Time	$t_{rr}$		$I_F = 2.9\ \text{A}, di/dt = 100\ \text{A}/\mu\text{s}$		50	

Notes:

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

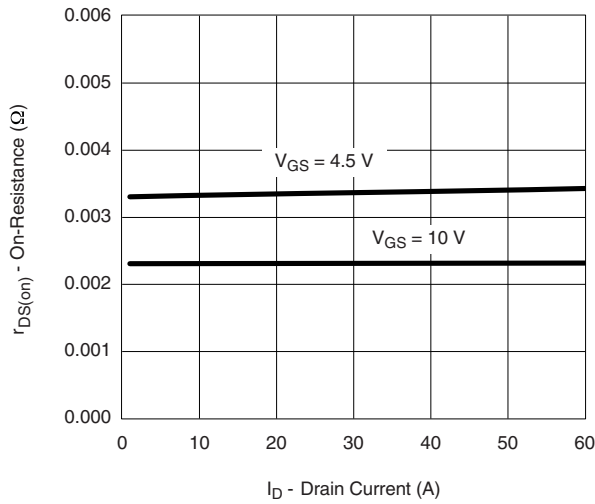
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

**TYPICAL CHARACTERISTICS**  $25\text{ }^\circ\text{C}$ , unless otherwise noted

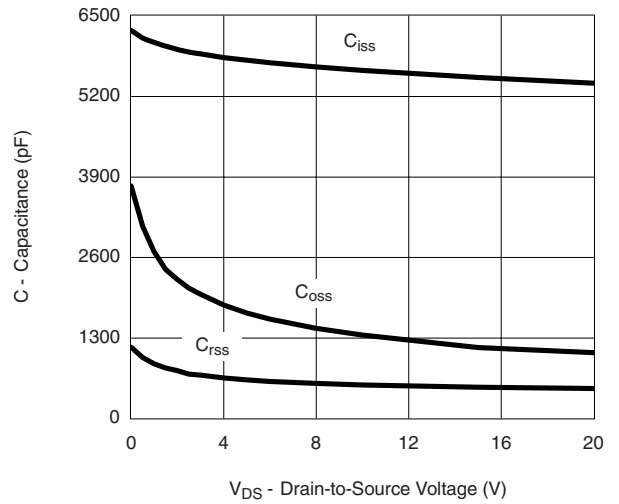




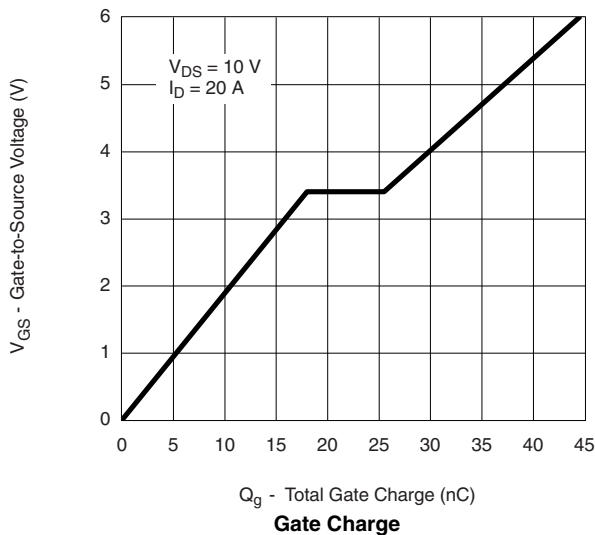
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



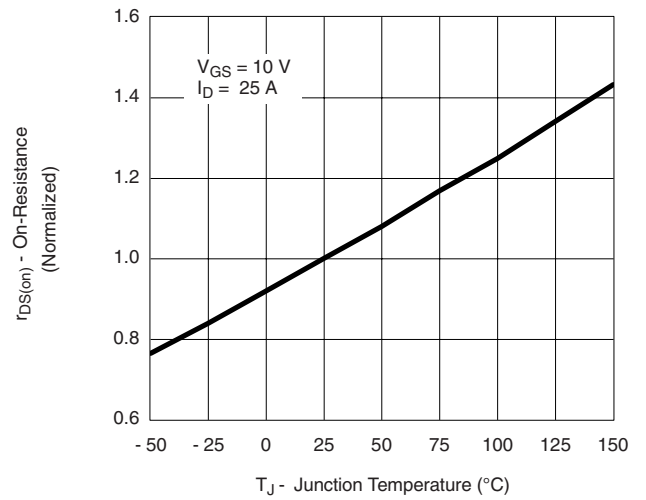
**On-Resistance vs. Drain Current**



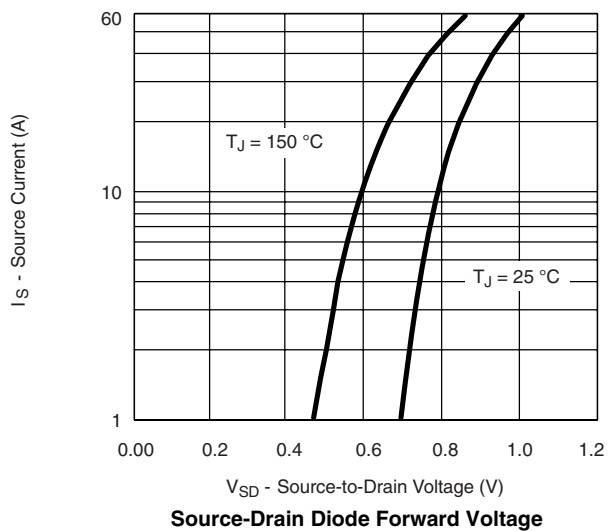
**Capacitance**



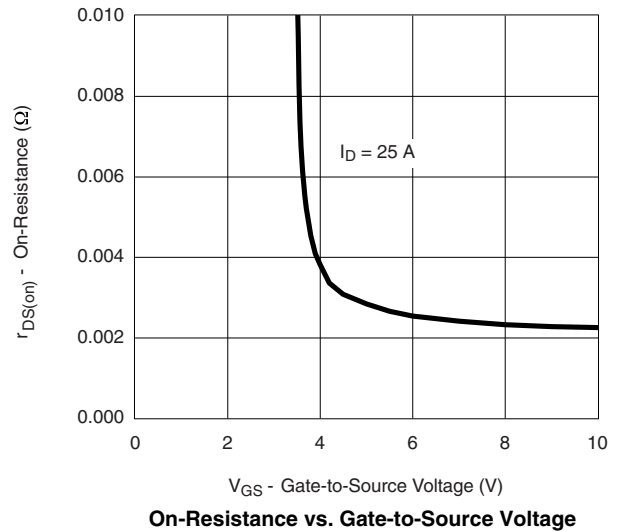
**Gate Charge**



**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**



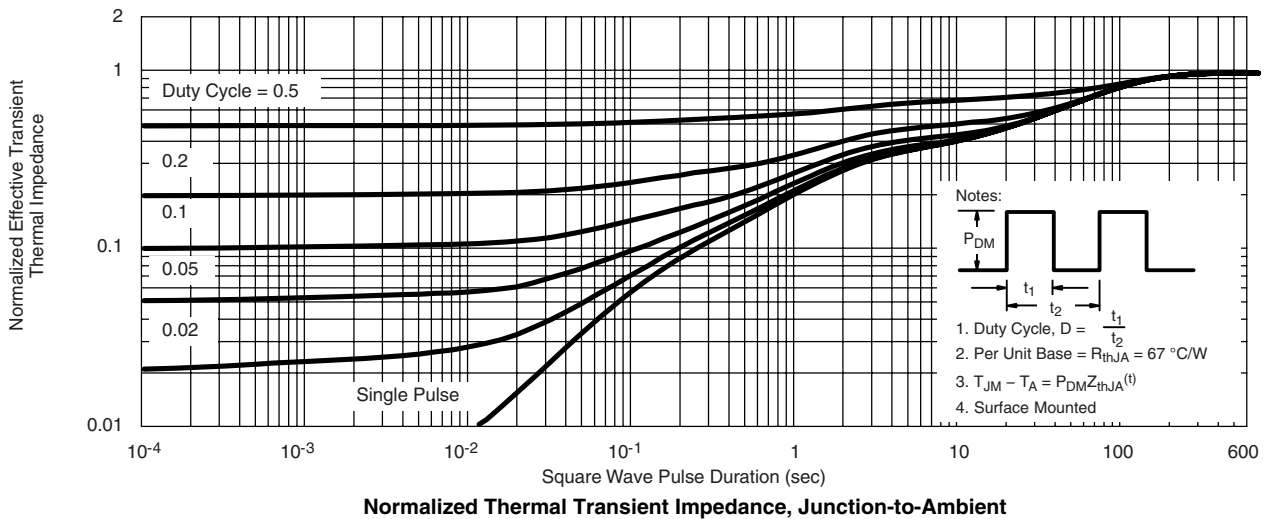
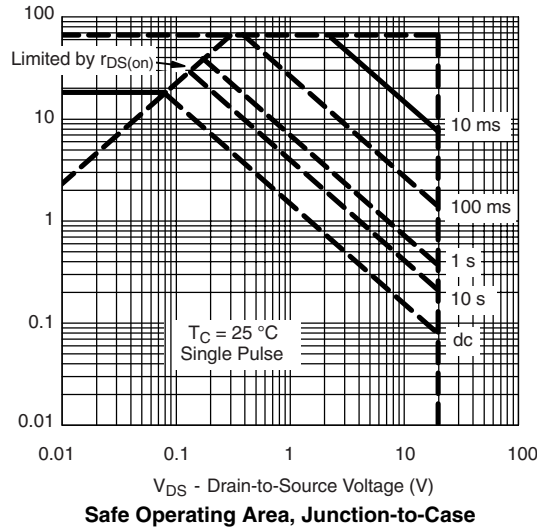
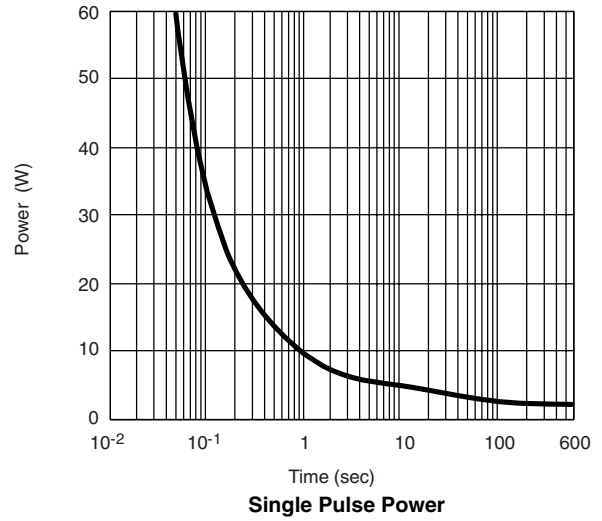
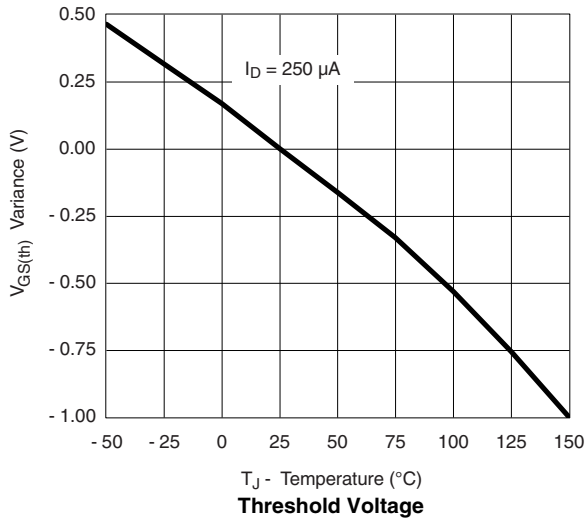
**On-Resistance vs. Gate-to-Source Voltage**

# Si4398DY

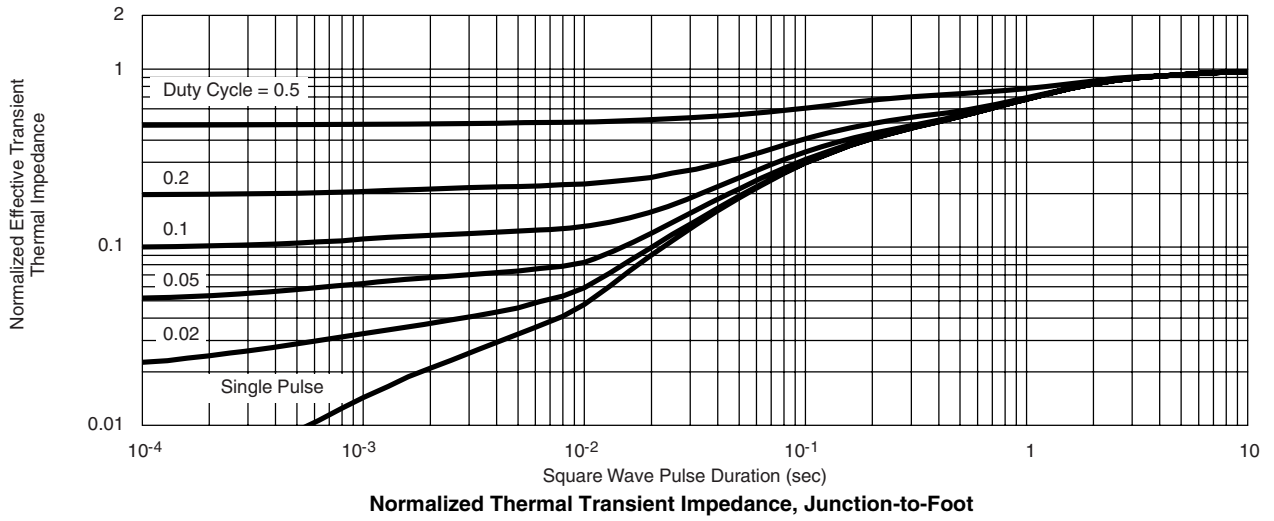
Vishay Siliconix



**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise 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?73018>.



## 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.