

## N-Channel Reduced $Q_{gd}$ , Fast Switching MOSFET

PRODUCT SUMMARY		
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
30	0.00825 at $V_{GS} = 10$ V	15
	0.00975 at $V_{GS} = 4.5$ V	14

### FEATURES

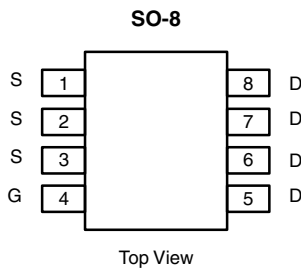
- Extremely Low  $Q_{gd}$  for Switching Losses
- TrenchFET<sup>®</sup> Power MOSFET
- 100 %  $R_g$  Tested



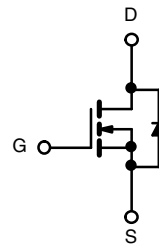
RoHS  
COMPLIANT

### APPLICATIONS

- High-Side DC/DC Conversion
  - Notebook
  - Server
- Synchronous Rectification



Ordering Information: Si4394DY-T1-E3 (Lead (Pb)-free)



ABSOLUTE MAXIMUM RATINGS ( $T_A = 25$ °C, unless otherwise noted)					
Parameter	Symbol	10 s	Steady State	Unit	
Drain-Source Voltage	$V_{DS}$	30		V	
Gate-Source Voltage	$V_{GS}$	$\pm 12$			
Continuous Drain Current ( $T_J = 150$ °C) <sup>a</sup>	$I_D$	$T_A = 25$ °C	15	10	A
		$T_A = 70$ °C	12	8	
Pulsed Drain Current (10 $\mu$ s Pulse Width)	$I_{DM}$	50			
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	2.7	1.3		
Avalanche Current	$I_{AS}$	L = 0.1 mH	45		
Maximum Power Dissipation <sup>a</sup>			$T_A = 25$ °C	2.7	1.4
	$T_A = 70$ °C	1.9	0.9		
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>	$t \leq 10$ s	$R_{thJA}$	32	42	°C/W
	Steady State		68	90	
Maximum Junction-to-Foot (Drain)	Steady State	$R_{thJF}$	16	20	

Notes:

a. Surface mounted on 1" x 1" FR4 board.

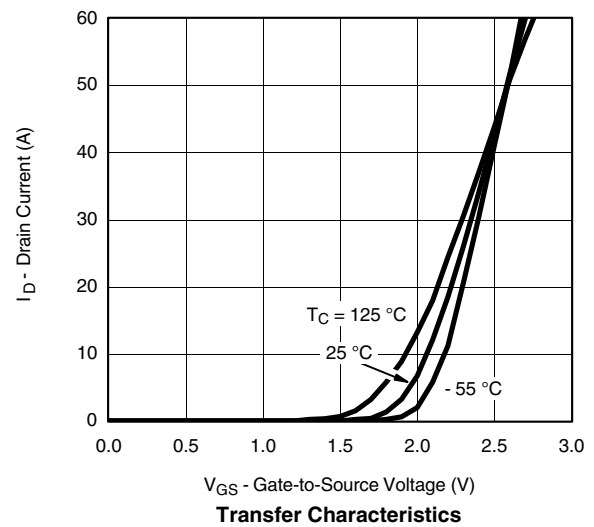
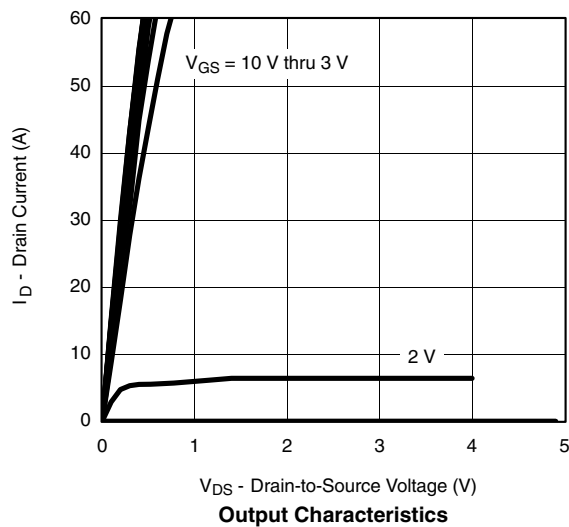
**SPECIFICATIONS** ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	0.6		1.8	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	$I_{DSS}$	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			5	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	30			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 15\text{ A}$		0.0066	0.00825	$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 14\text{ A}$		0.0077	0.00975	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 15\text{ A}$		65		S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = 2.9\text{ A}, V_{GS} = 0\text{ V}$		0.73	1.1	V
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		1900		$\mu\text{F}$
Output Capacitance	$C_{oss}$			530		
Reverse Transfer Capacitance	$C_{rss}$			120		
Total Gate Charge	$Q_g$	$V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 15\text{ A}$		12.5		nC
Gate-Source Charge	$Q_{gs}$			3.9		
Gate-Drain Charge	$Q_{gd}$			2.1		
Gate Resistance	$R_g$	$f = 1\text{ MHz}$	0.8	1.2	1.8	$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 15\text{ }\Omega$ $I_D \cong 1\text{ A}, V_{GEN} = 10\text{ V}, R_g = 6\text{ }\Omega$		13	20	ns
Rise Time	$t_r$			8	13	
Turn-Off Delay Time	$t_{d(off)}$			48	75	
Fall Time	$t_f$			13	20	
Source-Drain Reverse Recovery Time	$t_{rr}$		$I_F = 2.9\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		36	

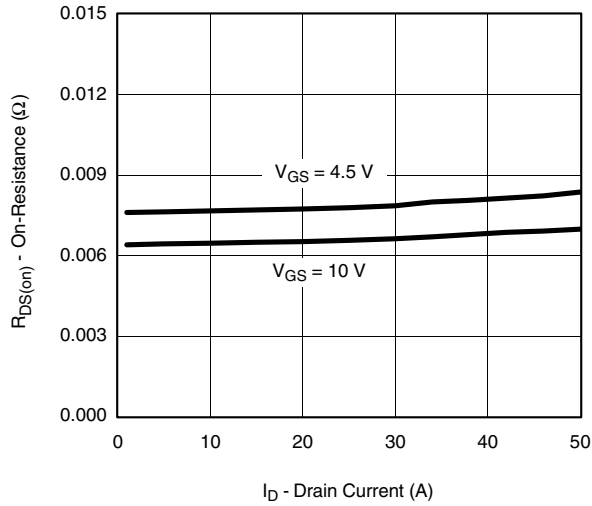
Notes:

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

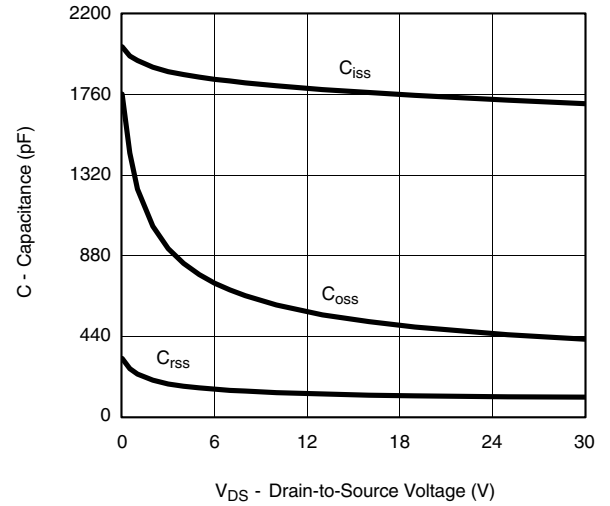
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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

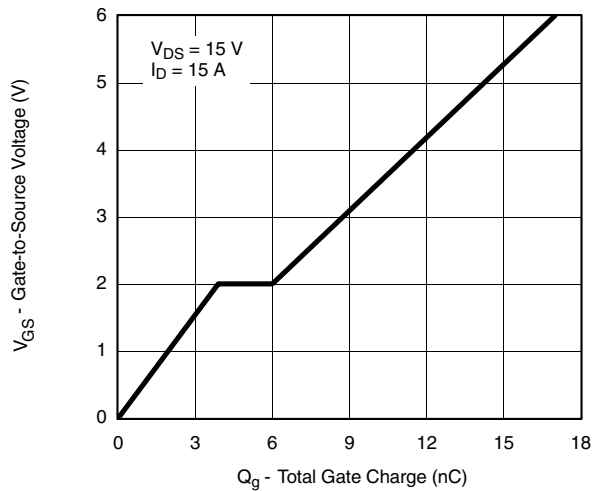
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



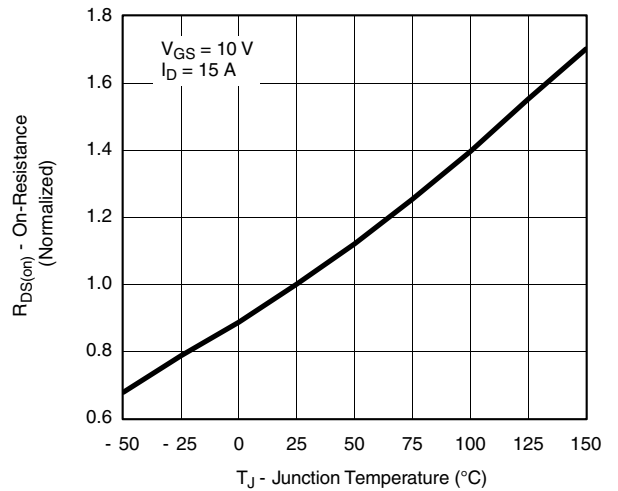
**On-Resistance vs. Drain Current**



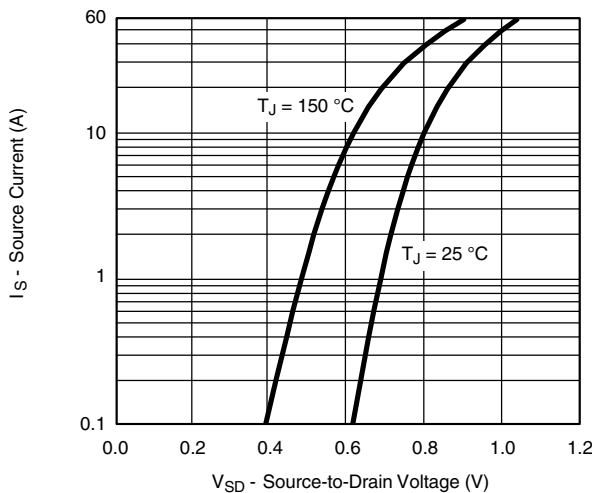
**Capacitance**



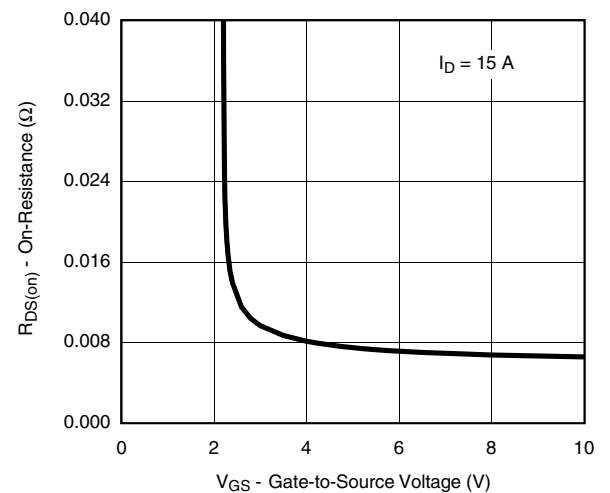
**Gate Charge**



**On-Resistance vs. Junction Temperature**

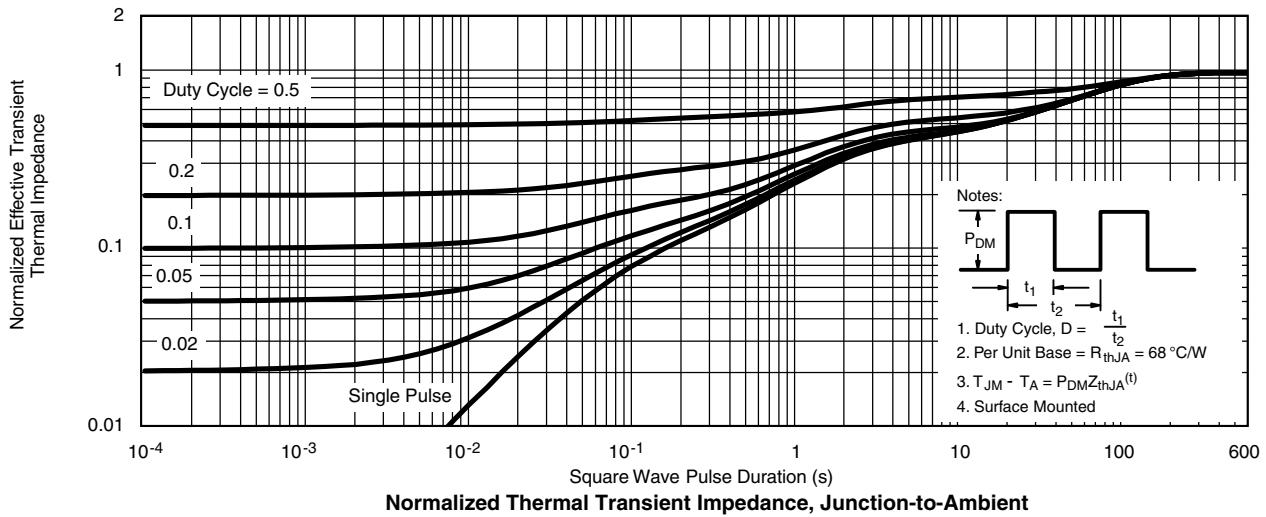
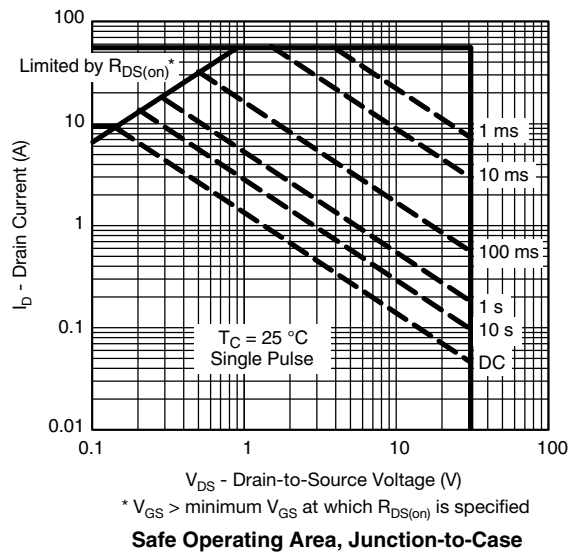
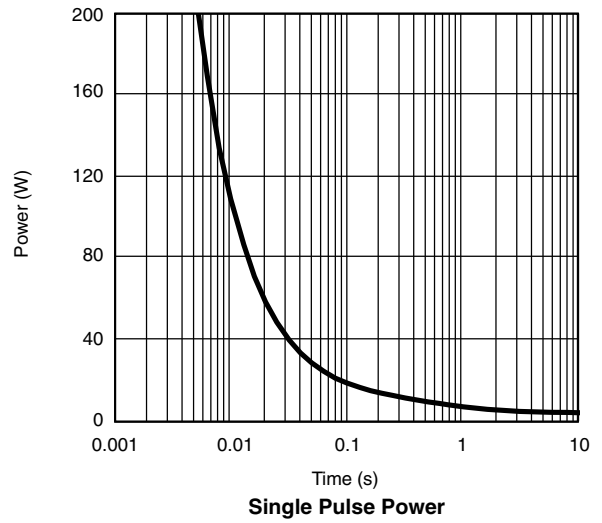
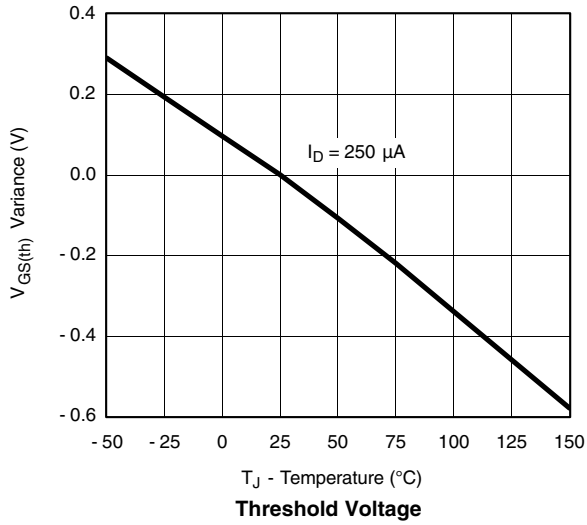


**Source-Drain Diode Forward Voltage**



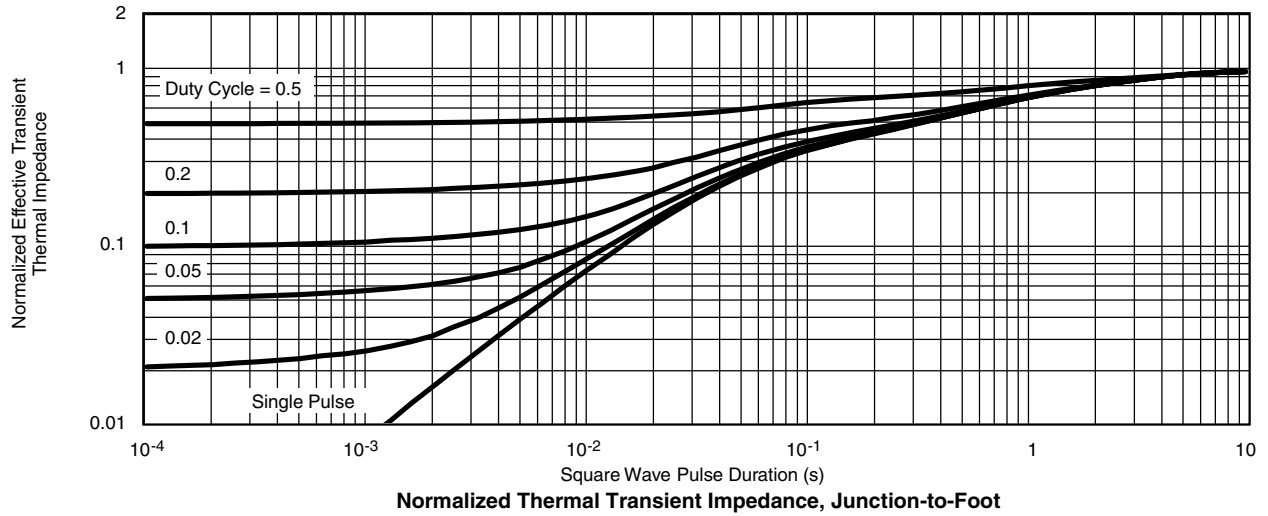
**On-Resistance vs. Gate-to-Source Voltage**

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





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



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