

## N-Channel 60-V (D-S) Fast Switching MOSFET

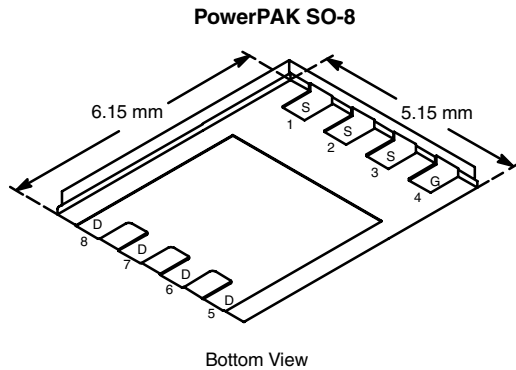
PRODUCT SUMMARY		
$V_{DS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
60	0.022 at $V_{GS} = 10$ V	10.3
	0.031 at $V_{GS} = 4.5$ V	8.7

### FEATURES

- TrenchFET<sup>®</sup> Power MOSFET
- New Low Thermal Resistance PowerPAK<sup>®</sup> Package with Low 1.07-mm Profile
- PWM Optimized for Fast Switching
- 100 %  $R_g$  Tested
- Lead (Pb)-free Version is RoHS Compliant



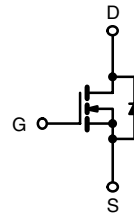
**RoHS\***  
COMPLIANT



Ordering Information: Si7850DP-T1  
Si7850DP-T1—E3 (Lead (Pb)-free)

### APPLICATIONS

- Primary Side Switch for 24-V DC/DC Applications
- Secondary Synchronous Rectifier



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted					
Parameter	Symbol	10 secs	Steady State	Unit	
Drain-Source Voltage	$V_{DS}$	60		V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$			
Continuous Drain Current ( $T_J = 150$ °C) <sup>a</sup>	$I_D$	$T_A = 25$ °C	10.3	6.2	A
		$T_A = 85$ °C	7.5	4.5	
Continuous Source Current	$I_S$	3.7	1.5		
Pulsed Drain Current	$I_{DM}$	40			
Avalanche Current <sup>b</sup>	$I_{AS}$	15			
Single Avalanche Energy <sup>b</sup>	$E_{AS}$	11		mJ	
Maximum Power Dissipation <sup>a</sup>	$P_D$	$T_A = 25$ °C	4.5	1.8	W
		$T_A = 85$ °C	2.3	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>	$R_{thJA}$	$t \leq 10$ sec	22	28	°C/W
		Steady State	58	70	
Maximum Junction-to-Case (Drain)	$R_{thJC}$	2.6	3.3		

Notes

- a. Surface Mounted on 1" x 1" FR4 Board.  
b. Guaranteed by design, not subject to production testing.

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



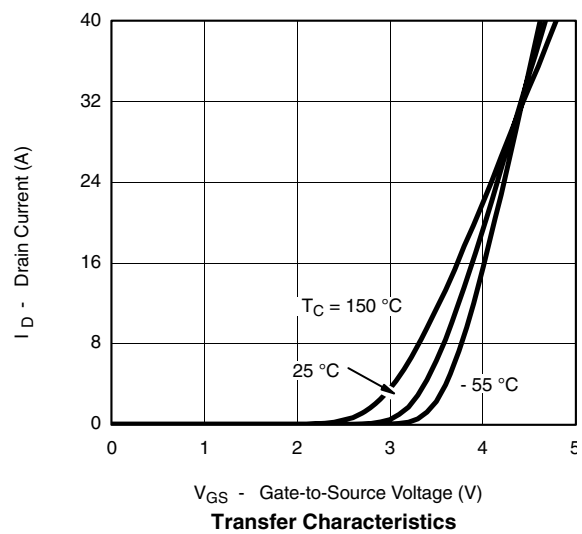
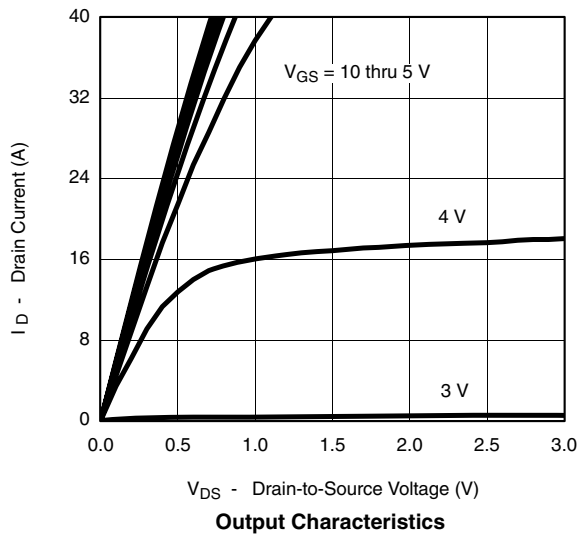
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	60			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1		3	V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			20	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	40			A
Drain-Source On-State Resistance <sup>a</sup>	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 10.3\text{ A}$		0.018	0.022	$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 8.7\text{ A}$		0.025	0.031	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 10.3\text{ A}$		26		S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = 3.8\text{ A}, V_{GS} = 0\text{ V}$		0.85	1.2	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = 30\text{ V}, V_{GS} = 10\text{ V}, I_D = 10.3\text{ A}$		18	27	nC
Gate-Source Charge	$Q_{gs}$			3.4		
Gate-Drain Charge	$Q_{gd}$			5.3		
Gate Resistance	$R_G$		0.5	1.4	2.2	$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 30\text{ }\Omega$ $I_D \cong 1\text{ A}, V_{GEN} = 10\text{ V}, R_G = 6\text{ }\Omega$		10	20	ns
Rise Time	$t_r$			10	20	
Turn-Off Delay Time	$t_{d(off)}$			25	50	
Fall Time	$t_f$			12	24	
Source-Drain Reverse Recovery Time	$t_{rr}$	$I_F = 3.8\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		50	80	

Notes

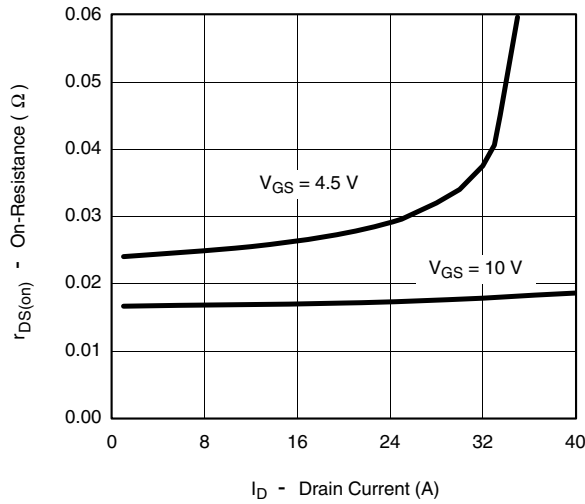
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- b. Guaranteed by design, not subject to production testing.

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.

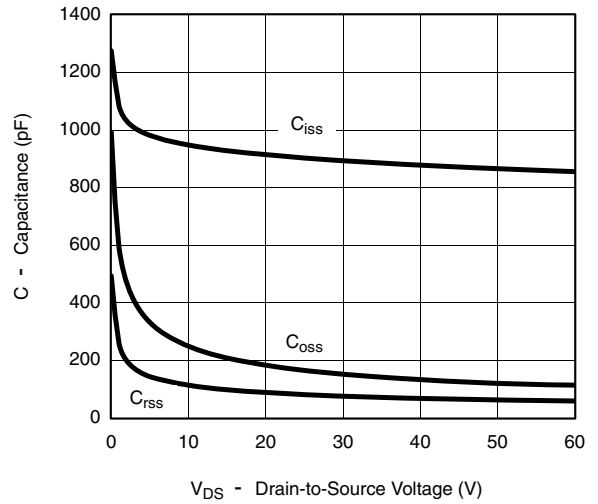
**TYPICAL CHARACTERISTICS**  $25\text{ }^\circ\text{C}$ , unless noted



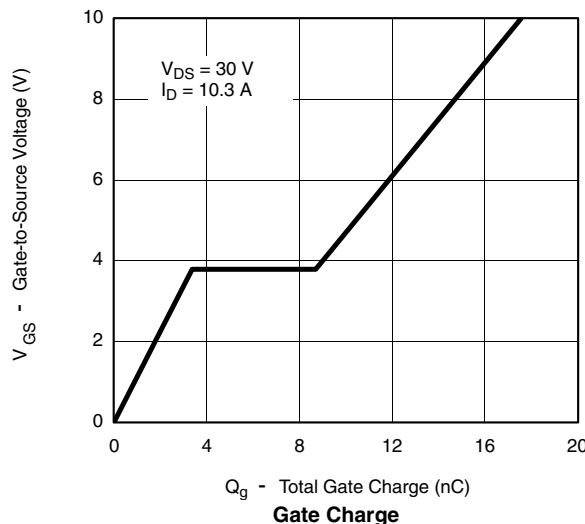
**TYPICAL CHARACTERISTICS** 25 °C, unless noted



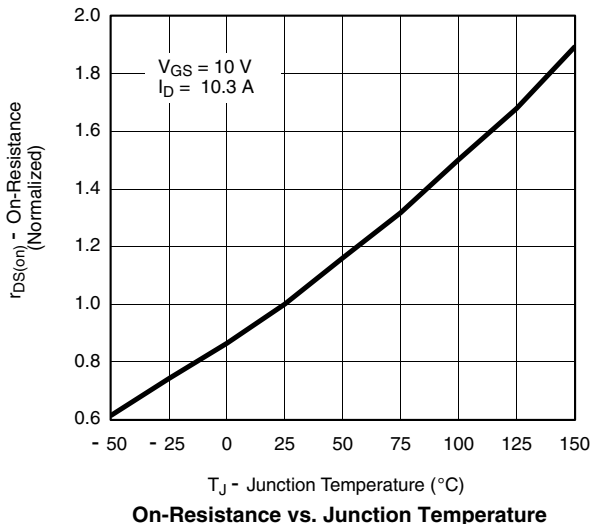
**On-Resistance vs. Drain Current**



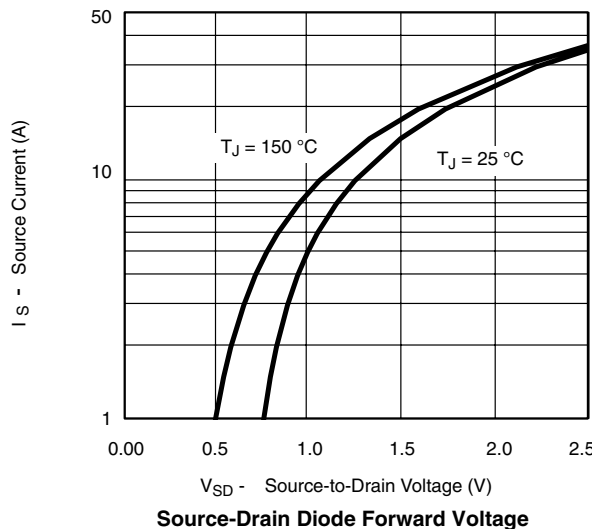
**Capacitance**



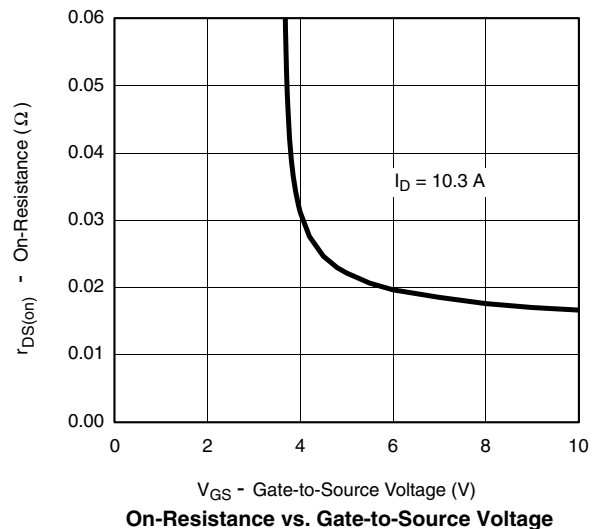
**Gate Charge**



**On-Resistance vs. Junction Temperature**

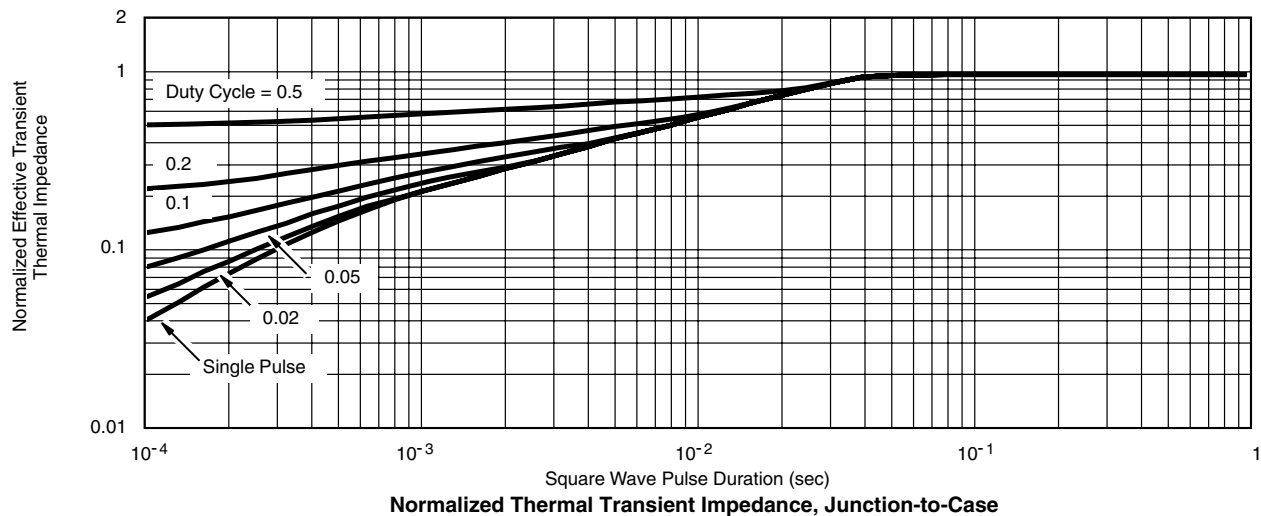
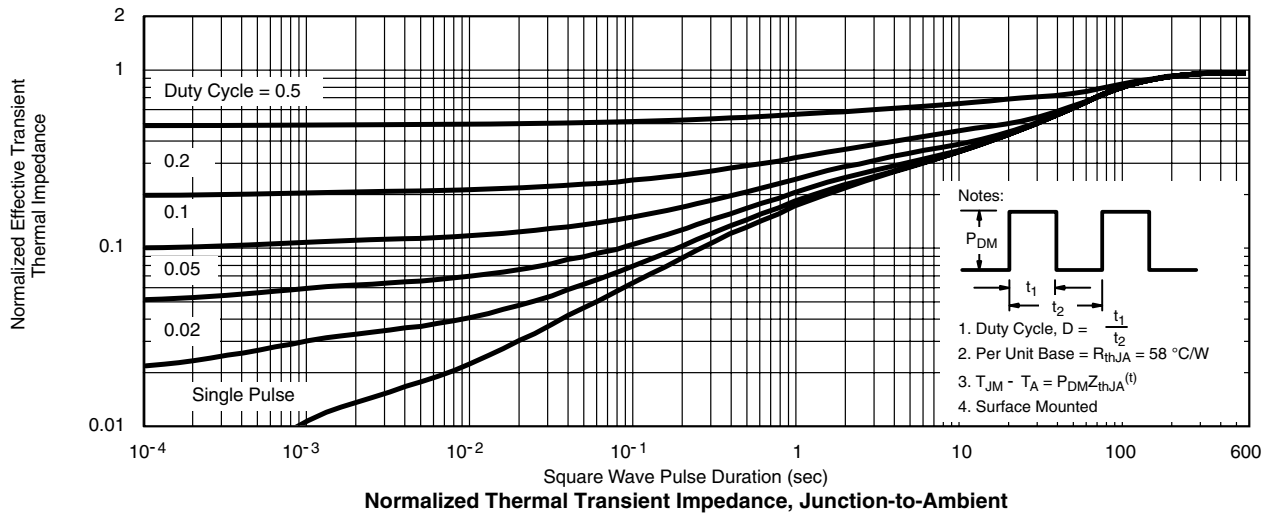
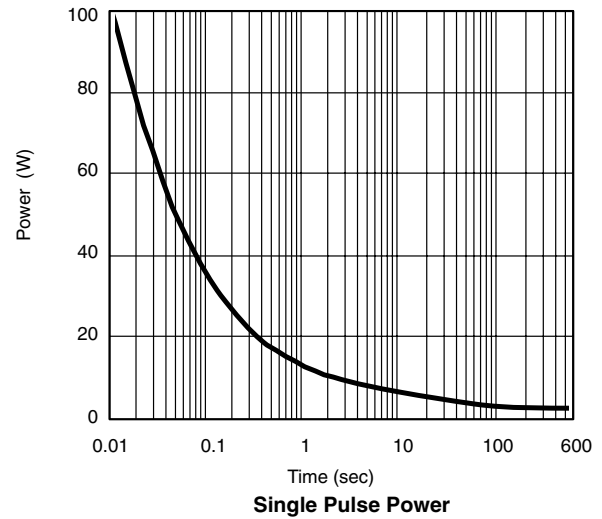
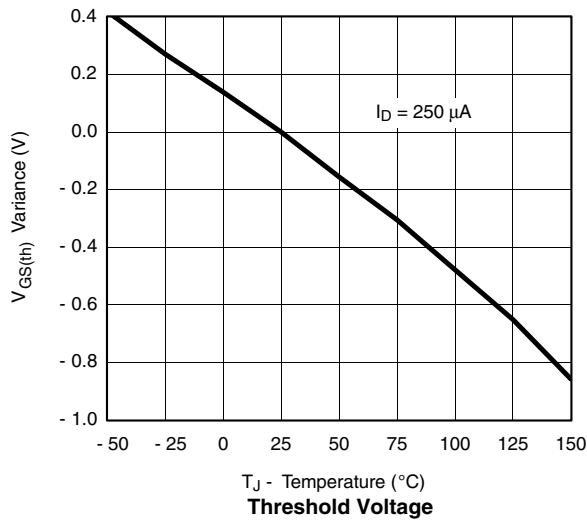


**Source-Drain Diode Forward Voltage**



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

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



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