

## N-Channel 20-V (D-S) MOSFET

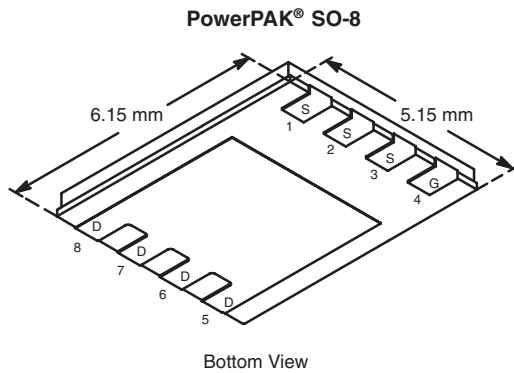
PRODUCT SUMMARY		
$V_{DS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
20	0.00225 at $V_{GS} = 10$ V	29
	0.00275 at $V_{GS} = 4.5$ V	25

### FEATURES

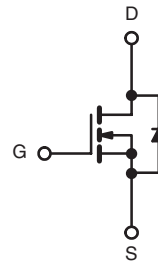
- TrenchFET<sup>®</sup> Power MOSFET
- Low  $r_{DS(on)}$
- PWM ( $Q_{gd}$  and  $R_g$ ) Optimized
- 100 %  $R_g$  Tested

### APPLICATION

- Low Output Voltage Synchronous Rectifier



Ordering Information: Si7868DP-T1  
Si7868DP-T1-E3 (Lead (Pb)-free)



N-Channel MOSFET

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	$V_{GS}$	$\pm 16$		
Continuous Drain Current ( $T_J = 150$ °C) <sup>a</sup>	$I_D$	$T_A = 25$ °C	29	18
		$T_A = 70$ °C	25	14
Pulsed Drain Current (10 $\mu$ s Pulse Width)	$I_{DM}$	60		A
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	4.5	1.6	
Avalanche Current	$I_{AS}$	50		
Single Pulse Avalanche Energy	$E_{AS}$	125		mJ
Maximum Power Dissipation <sup>a</sup>	$P_D$	$T_A = 25$ °C	5.4	1.9
		$T_A = 70$ °C	3.4	1.2
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	18	23
		Steady State	50	65
Maximum Junction-to-Case (Drain)	$R_{thJC}$	1.0	1.5	°C/W

Notes:

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



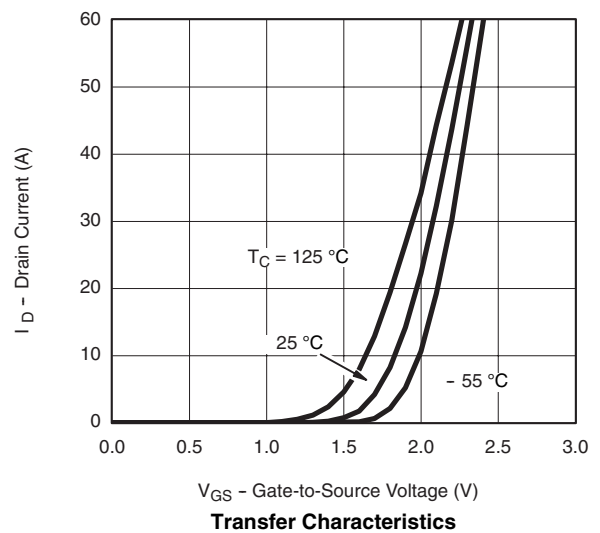
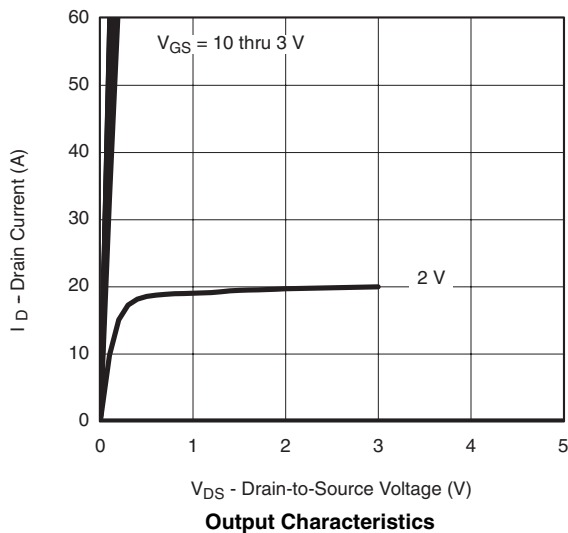
<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Static</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	0.6		1.5	V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 16\text{ V}$			$\pm 100$	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>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	30			A
Drain-Source On-State Resistance <sup>a</sup>	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 29\text{ A}$		0.0018	0.00225	$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 25\text{ A}$		0.0022	0.00275	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 6\text{ V}, I_D = 29\text{ A}$		95		S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = 4.5\text{ A}, V_{GS} = 0\text{ V}$		0.63	1.1	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 29\text{ A}$		50	75	nC
Gate-Source Charge	$Q_{gs}$			12		
Gate-Drain Charge	$Q_{gd}$			11		
Gate Resistance	$R_g$		0.5	1.2	1.8	$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 10\text{ }\Omega$ $I_D \cong 1\text{ A}, V_{GEN} = 4.5\text{ V}, R_G = 6\text{ }\Omega$		53	80	ns
Rise Time	$t_r$			49	75	
Turn-Off Delay Time	$t_{d(off)}$			150	240	
Fall Time	$t_f$			75	110	
Source-Drain Reverse Recovery Time	$t_{rr}$	$I_F = 2.9\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		65	100	

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.

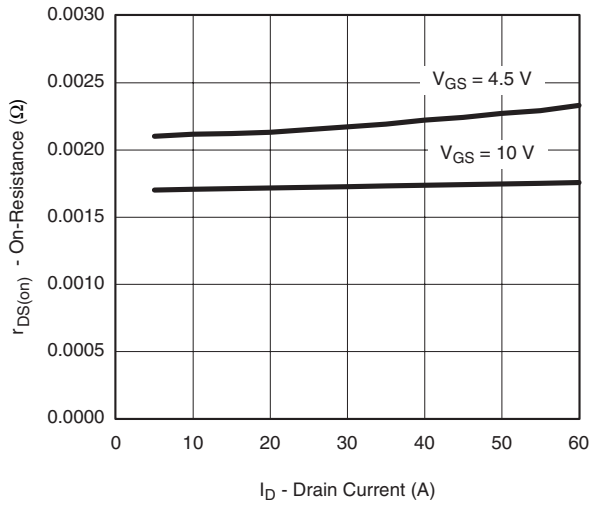
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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

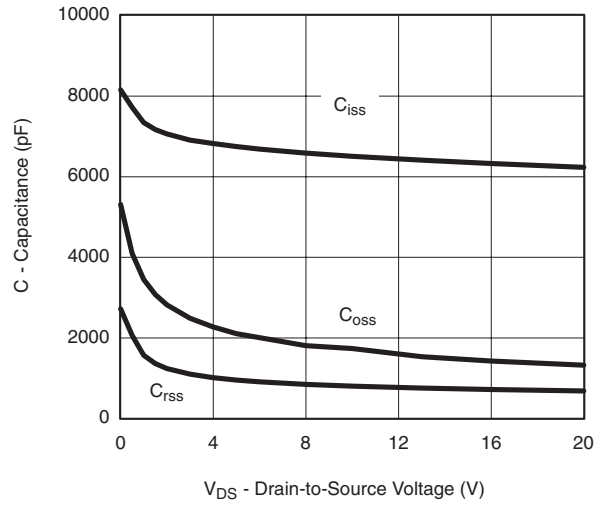




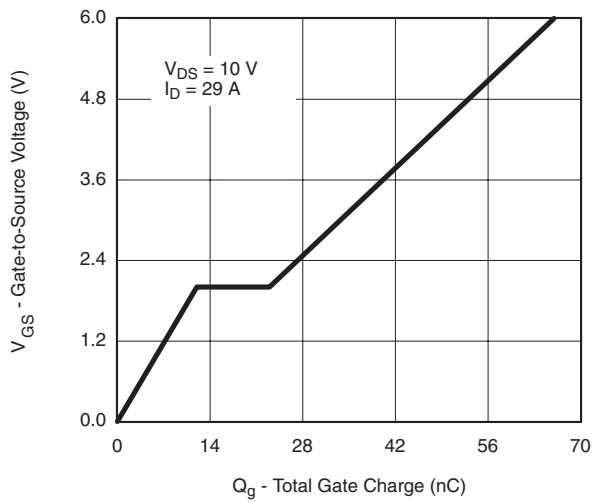
**TYPICAL CHARACTERISTICS** 25 °C unless noted



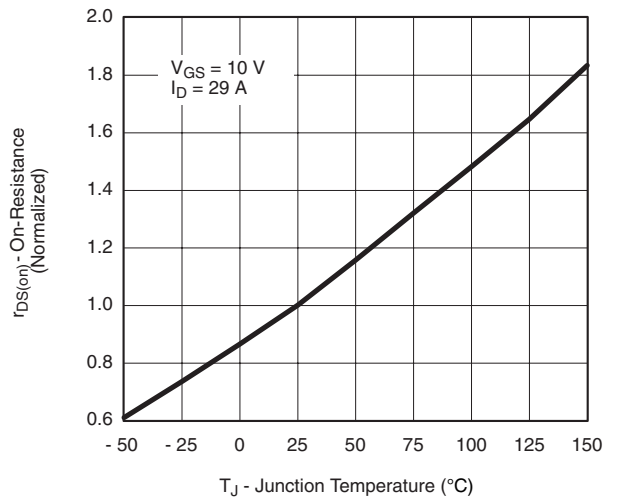
**On-Resistance vs. Drain Current**



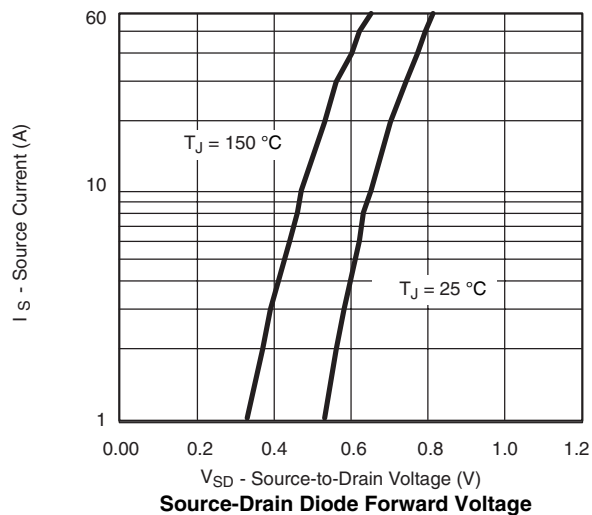
**Capacitance**



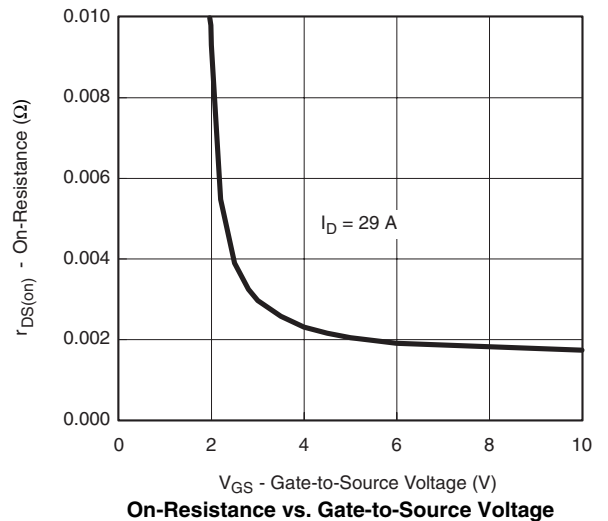
**Gate Charge**



**On-Resistance vs. Junction Temperature**

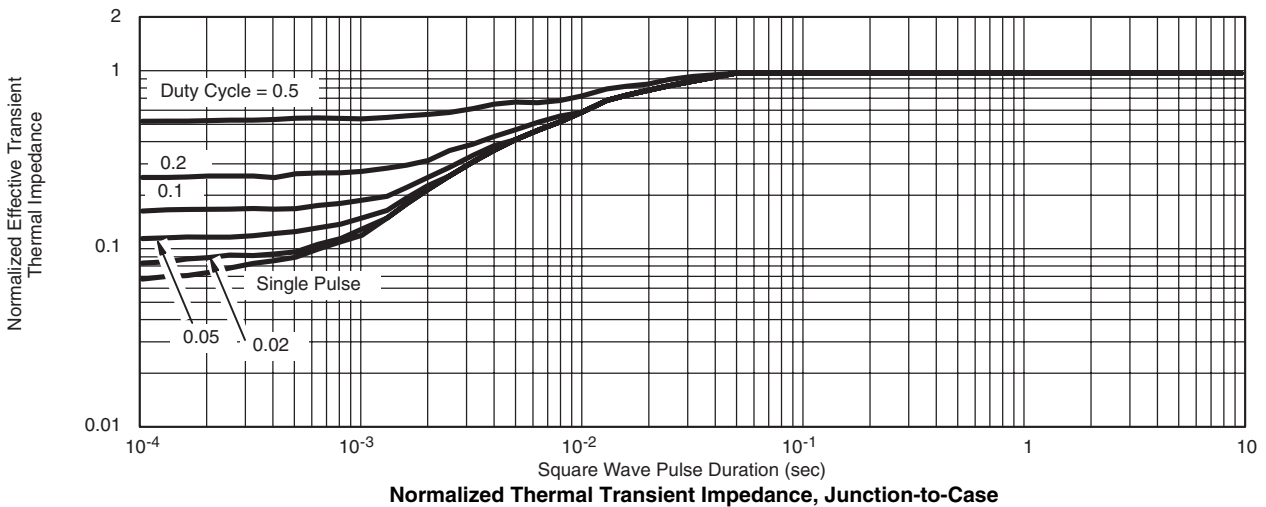
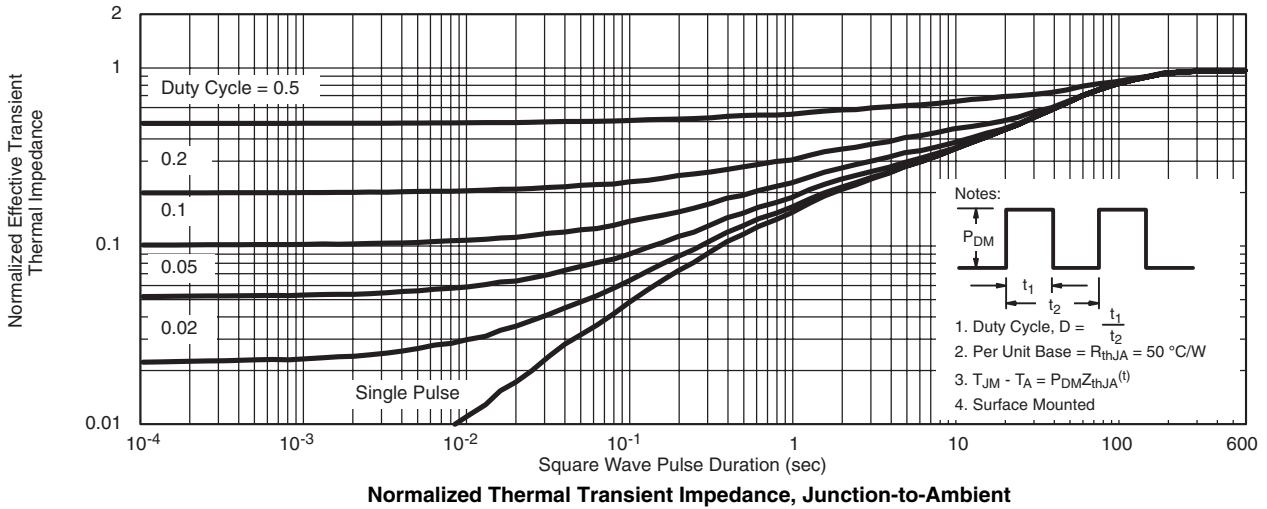
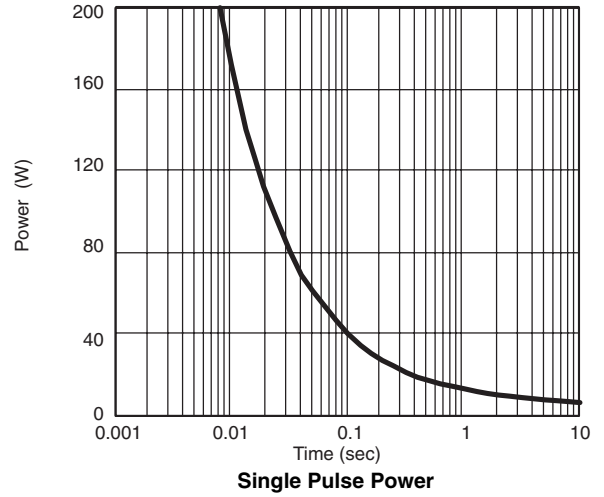
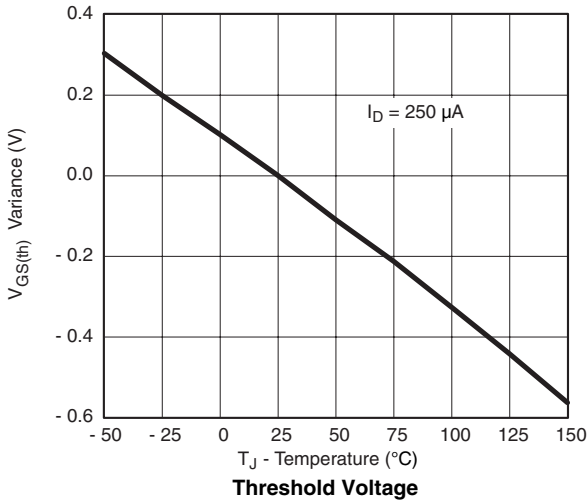


**Source-Drain Diode Forward Voltage**



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

**TYPICAL CHARACTERISTICS** 25 °C unless noted



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