

Dual P-Channel 12-V (D-S) MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
- 12	0.037 at $V_{GS} = - 4.5$ V	- 7.7
	0.048 at $V_{GS} = - 2.5$ V	- 6.8
	0.068 at $V_{GS} = - 1.8$ V	- 5.7

FEATURES

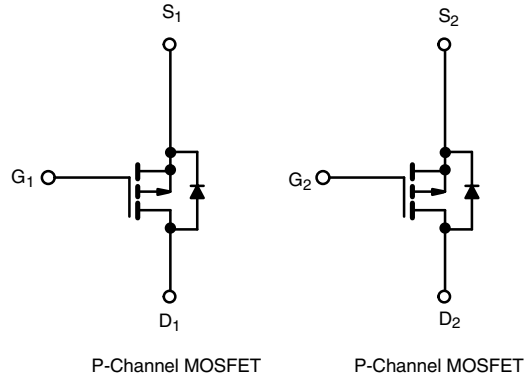
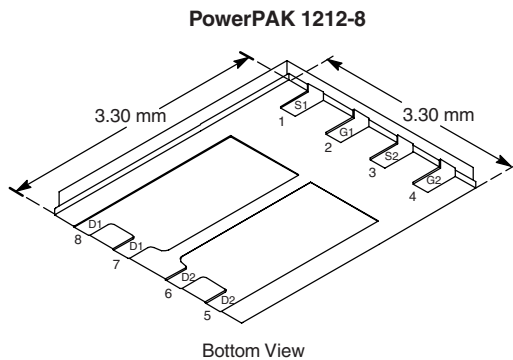
- Halogen-free Option Available
- TrenchFET[®] Power MOSFETS: 1.8 V Rated
- New Low Thermal Resistance PowerPAK[®] Package
- Advanced High Cell Density Process
- Ultra-Low $R_{DS(on)}$, and High P_D Capability



RoHS
COMPLIANT

APPLICATIONS

- Load Switch
- PA Switch
- Battery Switch
- Bi-Directional Switch



Ordering Information: Si7909DN-T1-E3 (Lead (Pb)-free)
Si7909DN-T1-GE3 (Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted					
Parameter	Symbol	10 s	Steady State	Unit	
Drain-Source Voltage	V_{DS}	- 12		V	
Gate-Source Voltage	V_{GS}	± 8			
Continuous Drain Current ($T_J = 150$ °C) ^a	I_D	$T_A = 25$ °C	- 7.7	- 5.3	A
		$T_A = 85$ °C	- 5.5	- 3.8	
Pulsed Drain Current	I_{DM}	- 20			
Continuous Source Current (Diode Conduction) ^a	I_S	- 2.3	- 1.1		
Maximum Power Dissipation ^a	P_D	$T_A = 25$ °C	2.8	1.3	W
		$T_A = 85$ °C	1.5	0.85	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150		°C	
Soldering Recommendations ^{b, c}		260			

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^a	$t \leq 10$ s	R_{thJA}	35	44	°C/W
	Steady State		75	94	
Maximum Junction-to-Case	Steady State	R_{thJC}	4	5	

Notes:

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

b. See Solder Profile (<http://www.vishay.com/ppg?73257>). The PowerPAK 1212-8 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.

c. Rework Conditions: manual soldering with a soldering iron is not recommended for leadless components.

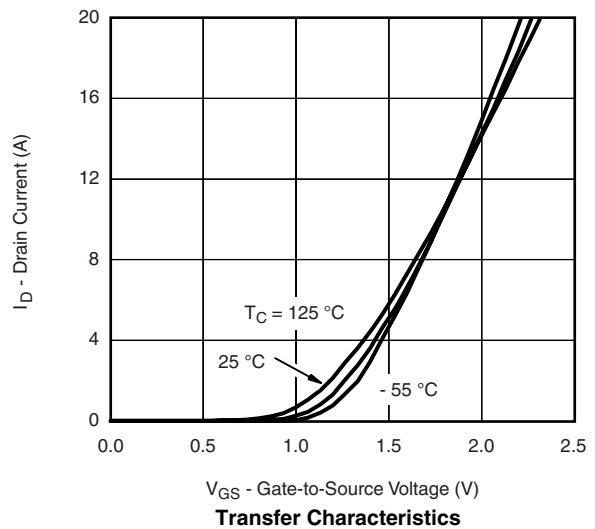
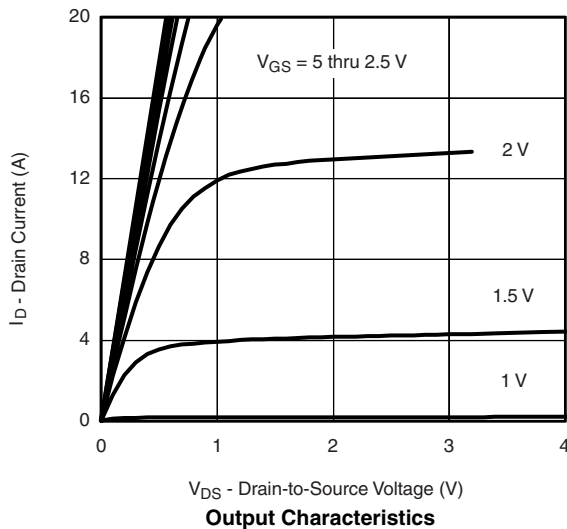
SPECIFICATIONS $T_J = 25^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -700\ \mu\text{A}$	-0.40		-1.0	V
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\ \text{V}, V_{GS} = \pm 8\ \text{V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -12\ \text{V}, V_{GS} = 0\ \text{V}$			-1	μA
		$V_{DS} = -12\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 85^\circ\text{C}$			-5	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq -5\ \text{V}, V_{GS} = -4.5\ \text{V}$	-20			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5\ \text{V}, I_D = -7.7\ \text{A}$		0.031	0.037	Ω
		$V_{GS} = -2.5\ \text{V}, I_D = -6.8\ \text{A}$		0.040	0.048	
		$V_{GS} = -1.8\ \text{V}, I_D = -3.0\ \text{A}$		0.057	0.068	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -6\ \text{V}, I_D = -7.7\ \text{A}$		17		S
Diode Forward Voltage ^a	V_{SD}	$I_S = -2.3\ \text{A}, V_{GS} = 0\ \text{V}$		-0.7	-1.2	V
Dynamic^b						
Total Gate Charge	Q_g	$V_{DS} = -6\ \text{V}, V_{GS} = -4.5\ \text{V}, I_D = -7.7\ \text{A}$		15.5	24	nC
Gate-Source Charge	Q_{gs}		2.5			
Gate-Drain Charge	Q_{gd}		4.3			
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -6\ \text{V}, R_L = 6\ \Omega$ $I_D \cong -1\ \text{A}, V_{GEN} = -4.5\ \text{V}, R_G = 6\ \Omega$		25	40	ns
Rise Time	t_r		45	70		
Turn-Off Delay Time	$t_{d(off)}$		90	135		
Fall Time	t_f		85	130		
Source-Drain Reverse Recovery Time	t_{rr}	$I_F = -2.3\ \text{A}, di/dt = 100\ \text{A}/\mu\text{s}$		70	110	

Notes

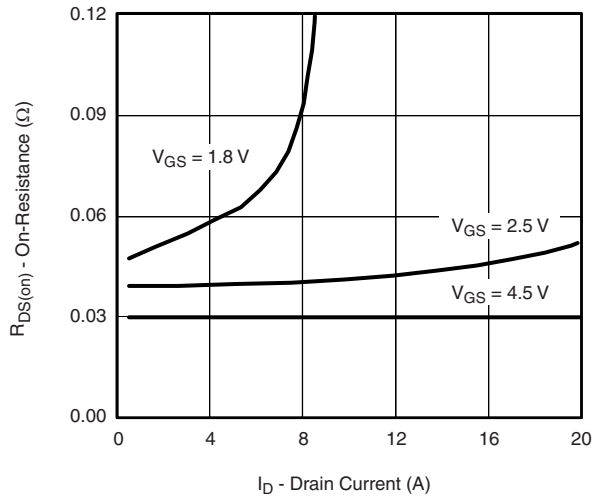
- a. Pulse test; pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
- b. Guaranteed by design, not subject to production testing.

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.

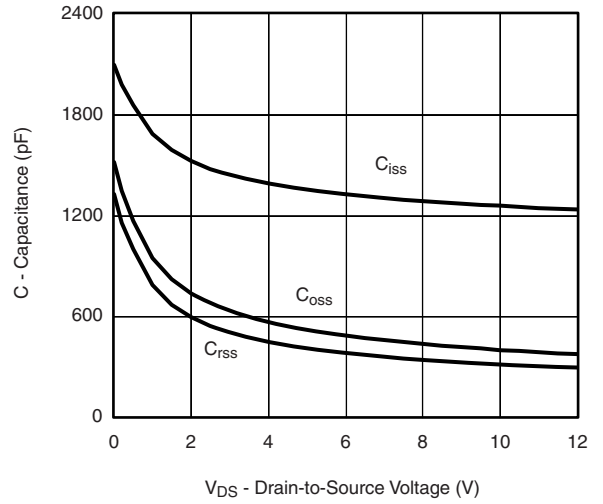
TYPICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$, unless otherwise noted



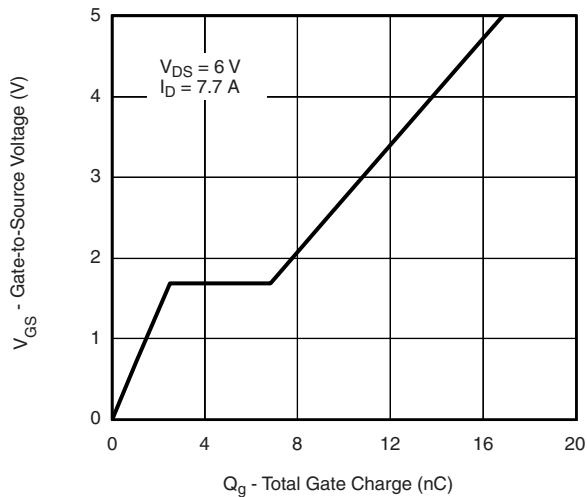
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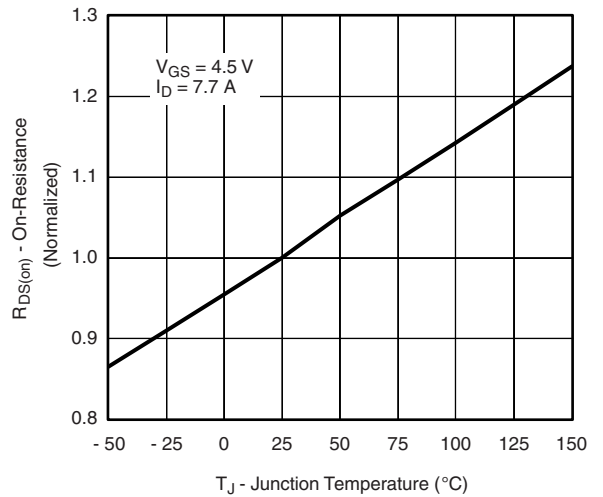
On-Resistance vs. Drain Current



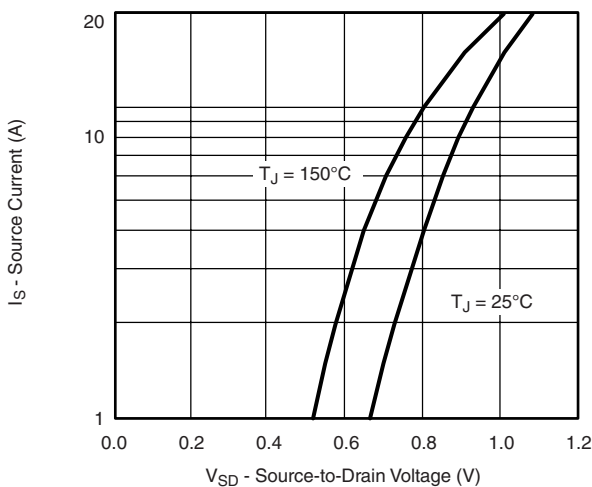
Capacitance



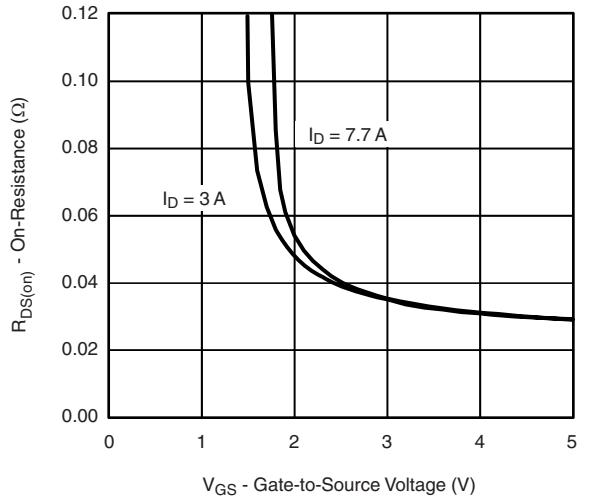
Gate Charge



On-Resistance vs. Junction Temperature

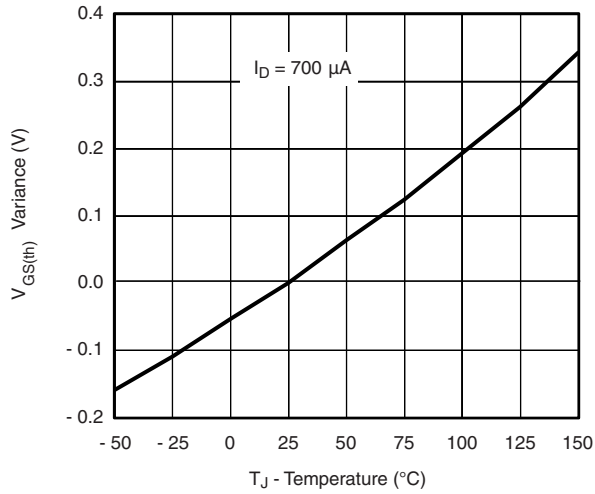


Source-Drain Diode Forward Voltage

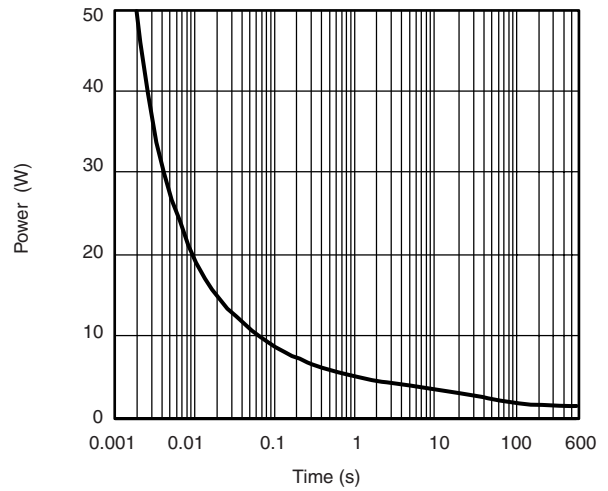


On-Resistance vs. Gate-to-Source Voltage

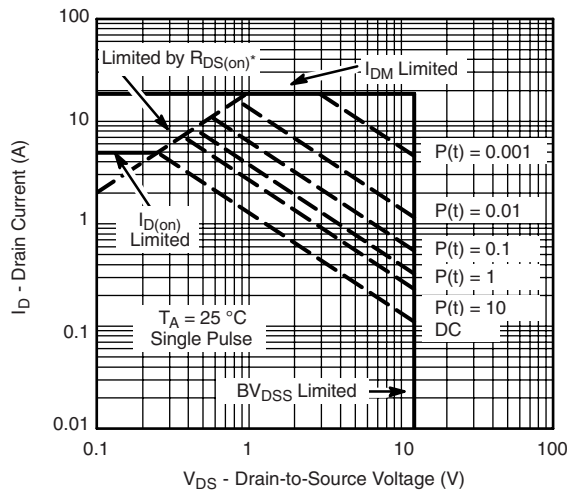
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Threshold Voltage

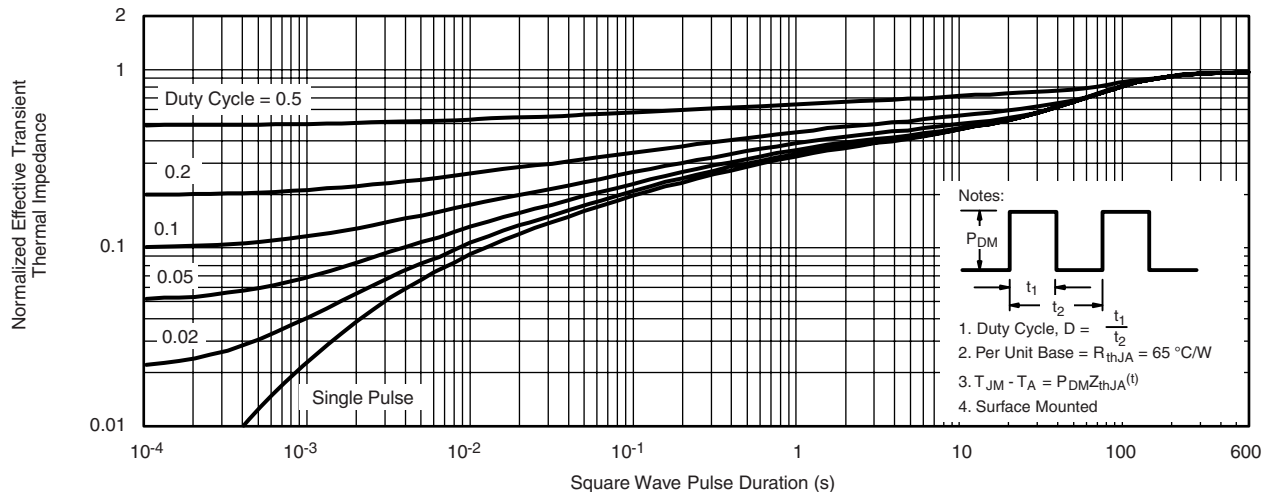


Single Pulse Power, Junction-to-Ambient



* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-To-Ambient

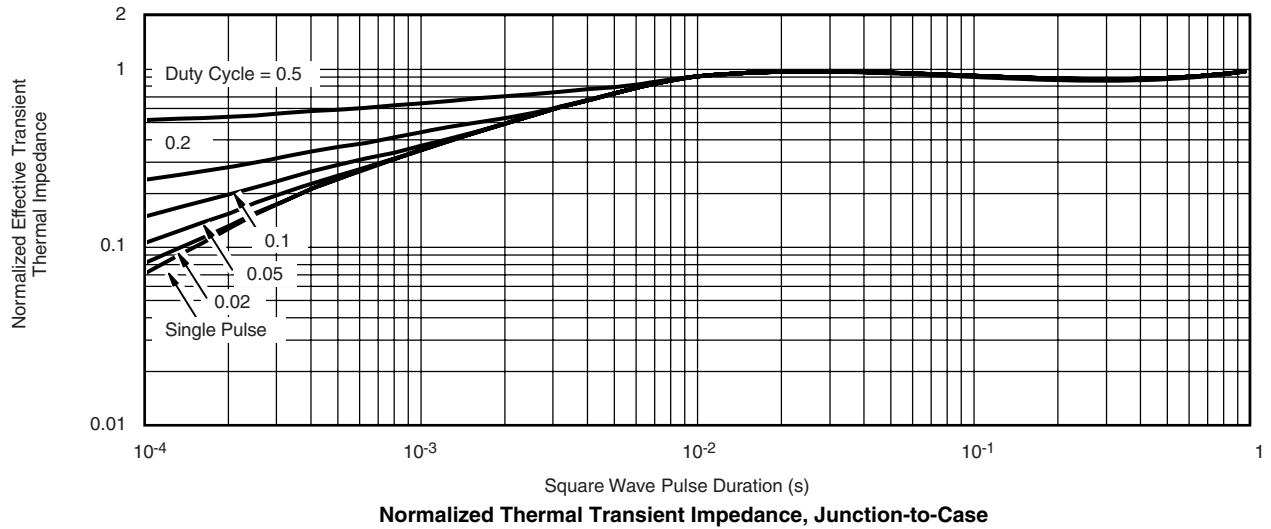


Notes:

1. Duty Cycle, $D = \frac{t_1}{t_2}$
2. Per Unit Base = $R_{thJA} = 65\text{ }^\circ\text{C/W}$
3. $T_{JM} - T_A = P_{DM} Z_{thJA}(t)$
4. Surface Mounted

Normalized Thermal Transient Impedance, Junction-to-Ambient

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



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