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

PRODUCT SUMMARY		
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
20	0.030 at V_{GS} = 4.5 V	7.7
	0.036 at V_{GS} = 2.5 V	7.0
	0.045 at V_{GS} = 1.8 V	6.3

FEATURES

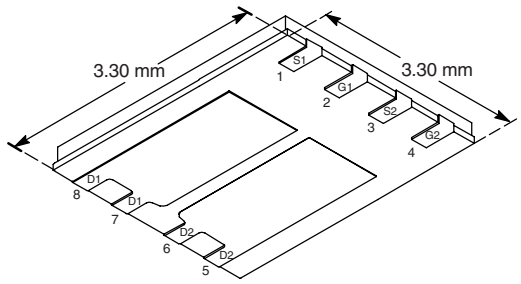
- **Halogen-free Option Available**
- TrenchFET® Power MOSFETS: 1.8 V Rated
- New Low Thermal Resistance PowerPAK® Package with Low 1.07 mm Profile

Pb-free
RoHS COMPLIANT

APPLICATIONS

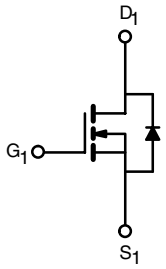
- HDD Spindle Drive

PowerPAK 1212-8

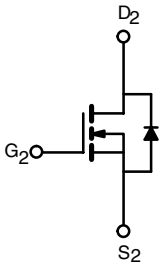


Bottom View

Ordering Information: Si7904DN-T1-E3 (Lead (Pb)-free)
Si7904DN-T1-GE3 (Lead (Pb)-free and Halogen-free)



N-Channel MOSFET



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted					
Parameter		**Symbol**	**10 s**	**Steady State**	**Unit**
Drain-Source Voltage		V_{DS}	20		V
Gate-Source Voltage		V_{GS}	± 8		
Continuous Drain Current (T_J = 150 °C)[a]	T_A = 25 °C	I_D	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	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	15		
Avalanche Energy		E_{AS}	11		mJ
Maximum Power Dissipation[a]	T_A = 25 °C	P_D	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 ≤ 10 s	R_{thJA}	35	44	°C/W
	Steady State		75	94	
Maximum Junction-to-Case	Steady State	R_{thJC}	4	5	

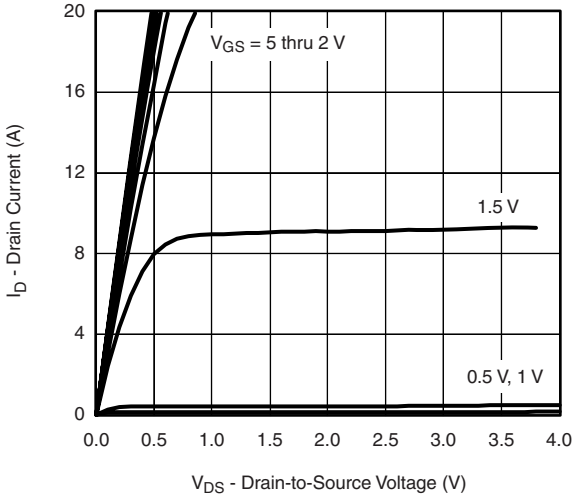
Notes:
a. Surface Mounted on 1" x 1" FR4 board.
b. See Solder Profile (*http://www.vishay.com/ppg?73257*). The PowerPAK 1212-8 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper 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 °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 = 935 µA	0.45		1.0	V
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 8 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V			1	µA
		V_{DS} = 20 V, V_{GS} = 0 V, T_J = 85 °C			5	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq$ 5 V, V_{GS} = 4.5 V	20			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 4.5 V, I_D = 7.7 A		0.025	0.030	Ω
		V_{GS} = 2.5 V, I_D = 7.0 A		0.030	0.036	
		V_{GS} = 1.8 V, I_D = 1 A		0.037	0.045	
Forward Transconductance[a]	g_{fs}	V_{DS} = 10 V, I_D = 7.7 A		23		S
Diode Forward Voltage[a]	V_{SD}	I_S = 2.3 A, V_{GS} = 0 V		0.70	1.2	V
Dynamic[b]						
Total Gate Charge	Q_g	V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 7.7 A		10.2	15	nC
Gate-Source Charge	Q_{gs}			1.3		
Gate-Drain Charge	Q_{gd}			2.4		
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 10 V, R_L = 10 Ω $I_D \cong$ 1 A, V_{GEN} = 4.5 V, R_G = 6 Ω		15	23	ns
Rise Time	t_r			50	75	
Turn-Off DelayTime	$t_{d(off)}$			60	90	
Fall Time	t_f			45	68	
Source-Drain Reverse Recovery Time	t_{rr}	I_F = 2.3 A, dI/dt = 100 A/µs		40	80	

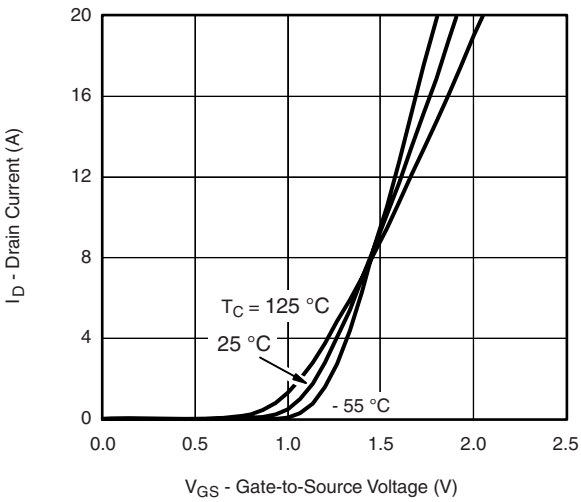
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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 °C, unless otherwise noted

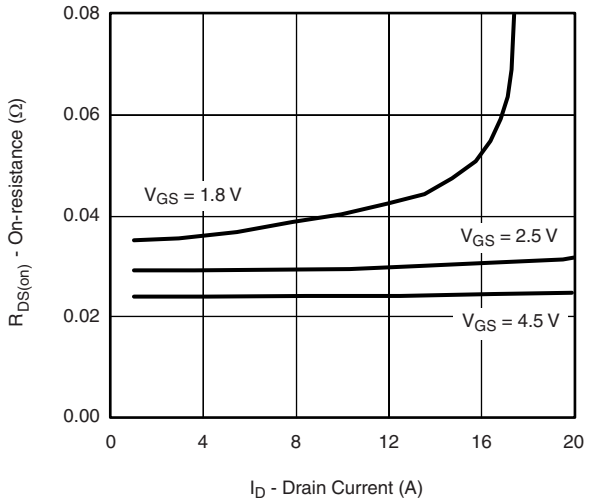


Output Characteristics

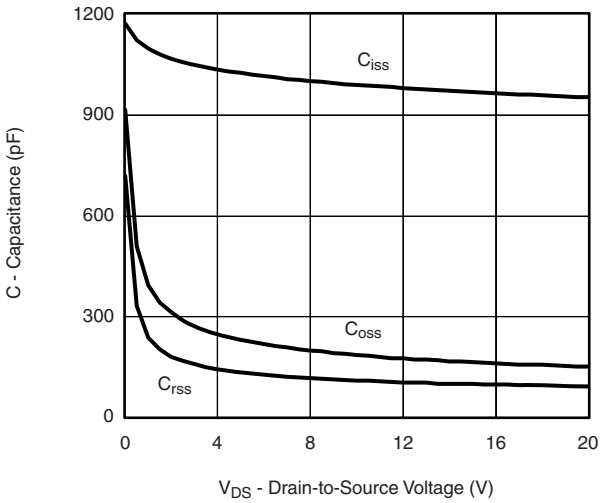


Transfer Characteristics

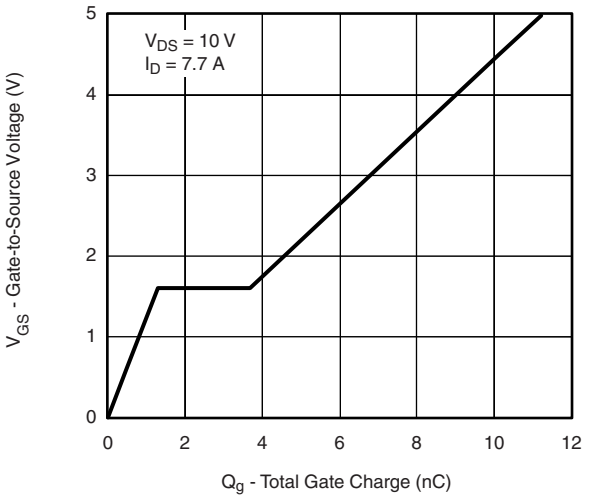
TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted



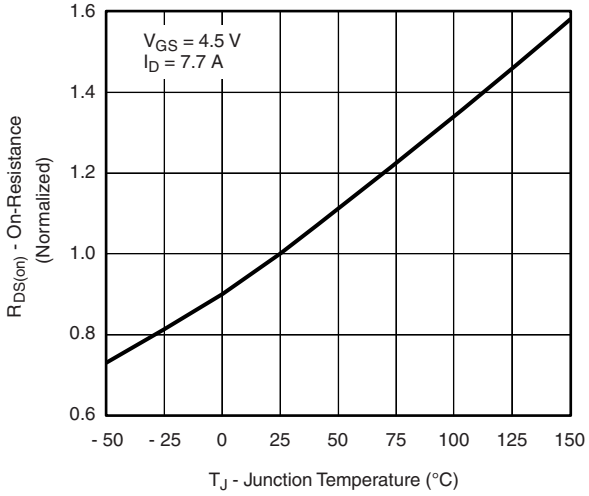
On-Resistance vs. Drain Current



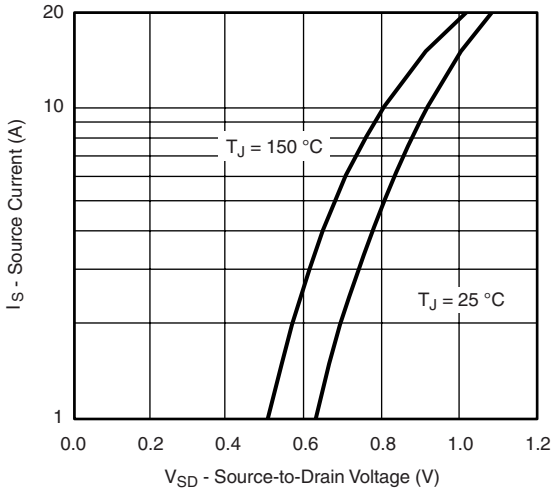
Capacitance



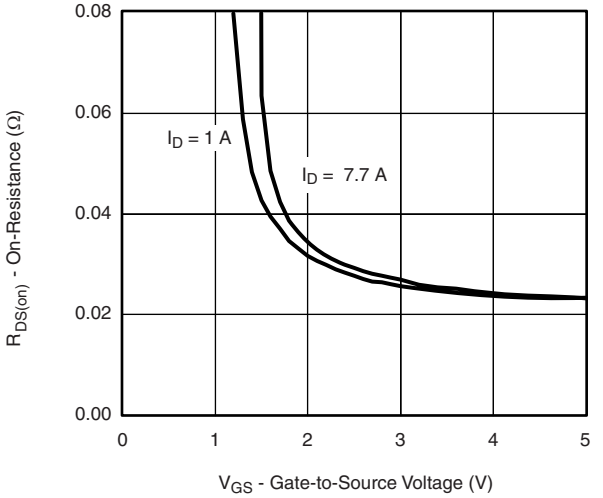
Gate Charge



On-Resistance vs. Junction Temperature

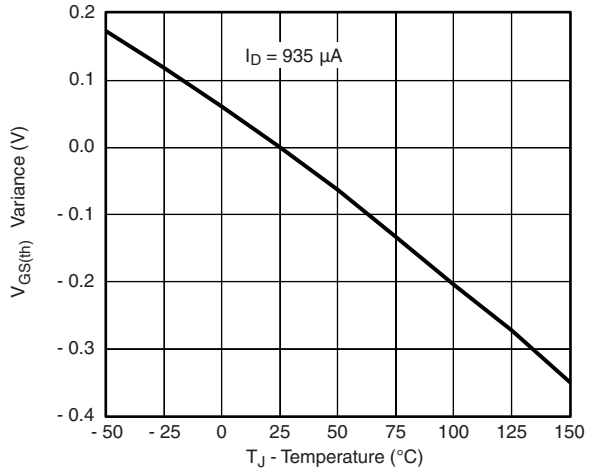


Source-Drain Diode Forward Voltage

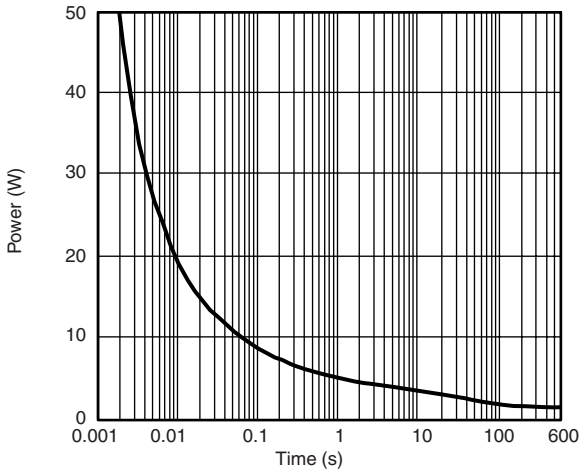


On-Resistance vs. Gate-to-Source Voltage

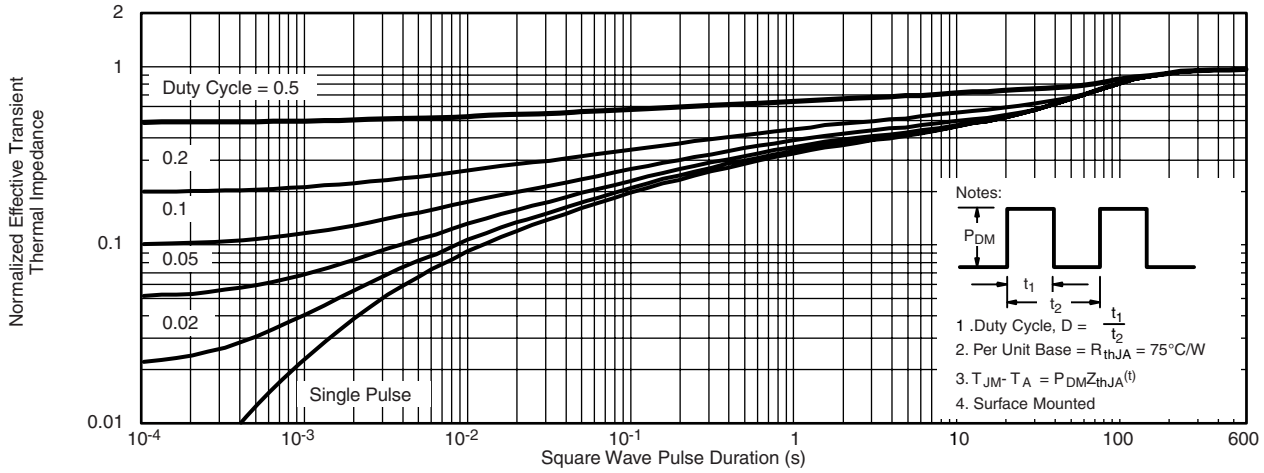
TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted



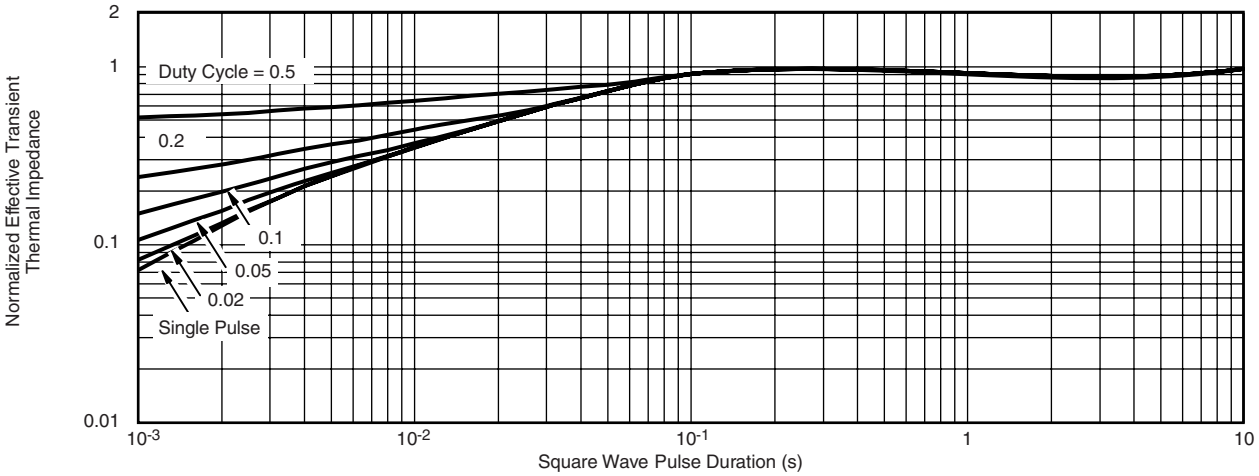
Threshold Voltage



Single Pulse Power, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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