N-Channel 40-V (D-S) Fast Switching MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ.)
40	0.0078 at V_{GS} = 10 V	16.4	15 nC
	0.010 at V_{GS} = 4.5 V	14.5	

FEATURES

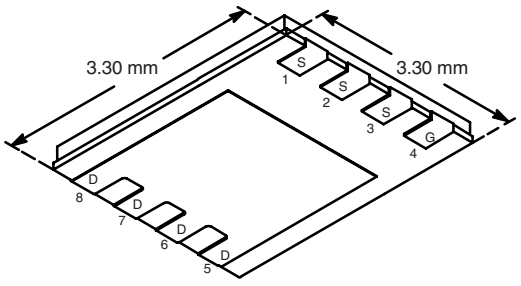
- **Halogen-free Option Available**
- TrenchFET® Power MOSFET
- New Low Thermal Resistance PowerPAK® Package with Low 1.07 mm Profile
- PWM Optimized
- 100 % R_g Tested

RoHS COMPLIANT

APPLICATIONS

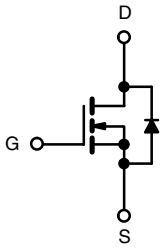
- Synchronous Rectification
- Intermediate Switch
- Synchronous Buck

PowerPAK 1212-8



Bottom View

Ordering Information: Si7116DN-T1-E3 (Lead (Pb)-free)
Si7116DN-T1-GE3 (Lead (Pb)-free and Halogen-free)



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}	40		V
Gate-Source Voltage		V_{GS}	± 20		
Continuous Drain Current (T_J = 150 °C)[a]	T_A = 25 °C	I_D	16.4	10.5	A
	T_A = 70 °C		13.1	8.4	
Pulsed Drain Current		I_{DM}	60		
Continuous Source Current (Diode Conduction)[a]		I_S	3.2	1.3	
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	3.8	1.5	W
	T_A = 70 °C		2.0	0.8	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150		°C
Soldering Recommendations (Peak Temperature)[b, c]			260		

THERMAL RESISTANCE RATINGS					
Parameter		**Symbol**	**Typical**	**Maximum**	**Unit**
Maximum Junction-to-Ambient[a]	t ≤ 10 s	R_{thJA}	24	33	°C/W
	Steady State		65	81	
Maximum Junction-to-Case (Drain)	Steady State	R_{thJC}	1.9	2.4	

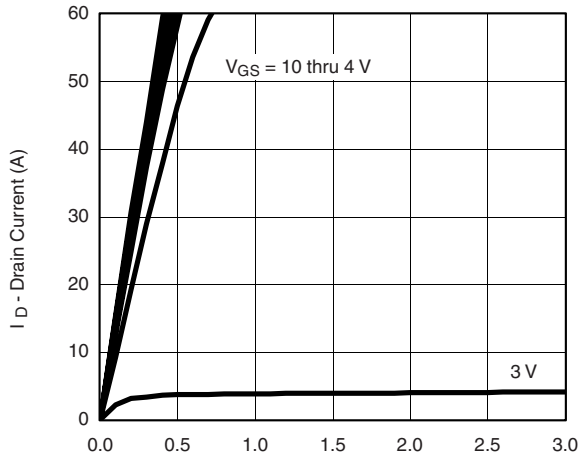
Notes:
a. Surface Mounted on 1" x 1" FR4 board.
b. See Solder Profile (*http://www.vishay.com/ppg?73257*). The PowerPAK 1212-8 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper 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.

MOSFET SPECIFICATIONS T_J = 25 °C, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Static						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250$ µA	1.5		2.5	V
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0$ V, $V_{GS} = \pm 20$ V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 40$ V, $V_{GS} = 0$ V			1	µA
		$V_{DS} = 40$ V, $V_{GS} = 0$ V, $T_J = 55$ °C			5	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq 5$ V, $V_{GS} = 10$ V	40			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	$V_{GS} = 10$ V, $I_D = 16.4$ A		0.0065	0.0078	Ω
		$V_{GS} = 4.5$ V, $I_D = 14.5$ A		0.0083	0.010	
Forward Transconductance[a]	g_{fs}	$V_{DS} = 15$ V, $I_D = 16.4$ A		68		S
Diode Forward Voltage[a]	V_{SD}	$I_S = 3.2$ A, $V_{GS} = 0$ V		0.8	1.2	V
Dynamic[b]						
Total Gate Charge	Q_g	$V_{DS} = 20$ V, $V_{GS} = 4.5$ V, $I_D = 16.4$ A		15	23	nC
Gate-Source Charge	Q_{gs}			6.7		
Gate-Drain Charge	Q_{gd}			5.1		
Gate Resistance	R_g	f = 1 MHz	0.7	1.4	2.1	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 20$ V, $R_L = 20$ Ω $I_D \cong 1$ A, $V_{GEN} = 10$ V, $R_g = 6$ Ω		10	15	ns
Rise Time	t_r			10	15	
Turn-Off Delay Time	$t_{d(off)}$			36	55	
Fall Time	t_f			10	15	
Source-Drain Reverse Recovery Time	t_{rr}	$I_F = 3.2$ A, di/dt = 100 A/µs		30	60	
Body Diode Reverse Recovery Charge	Q_{rr}	$I_F = 3.2$ A, di/dt = 100 A/µs		26	52	nc

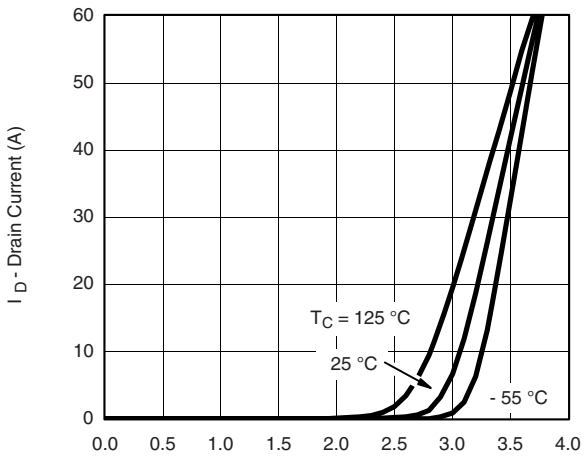
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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 25 °C, unless otherwise noted



Output Characteristics



Transfer Characteristics

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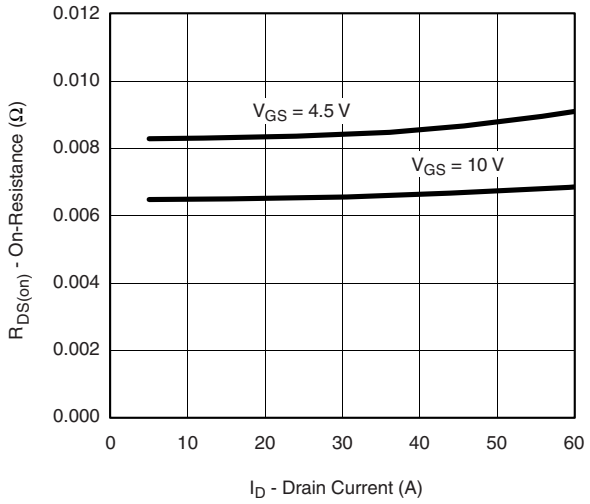
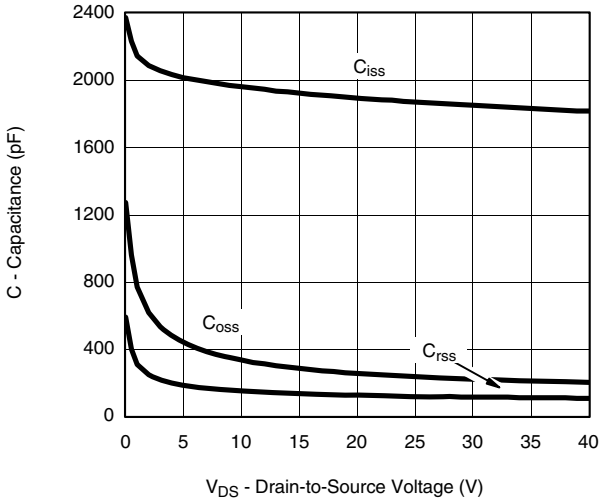
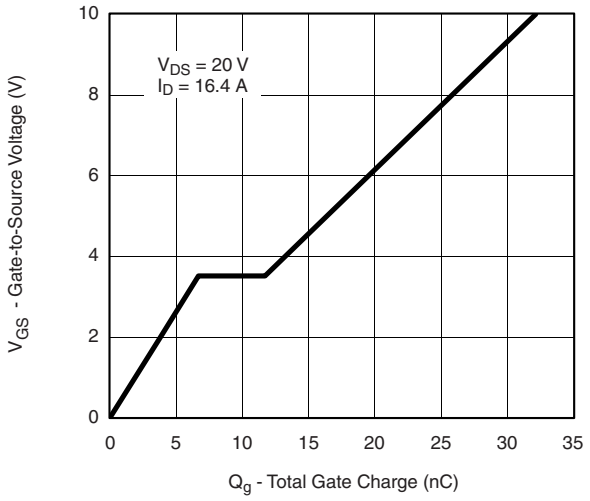


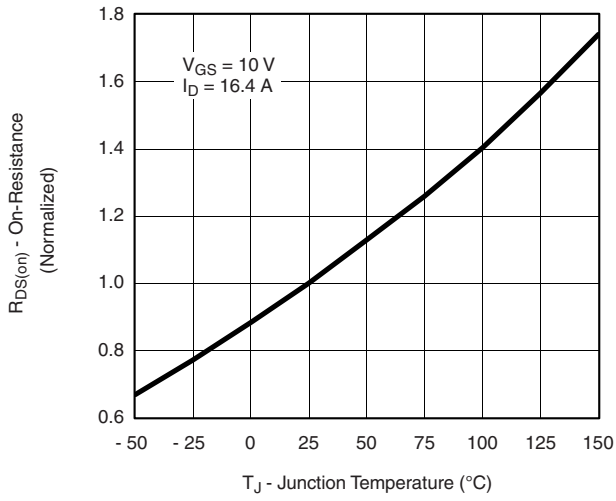
On-Resistance vs. Drain Current



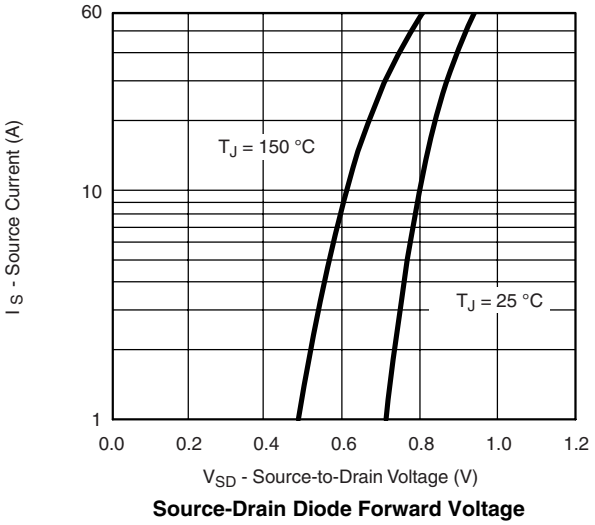
Capacitance



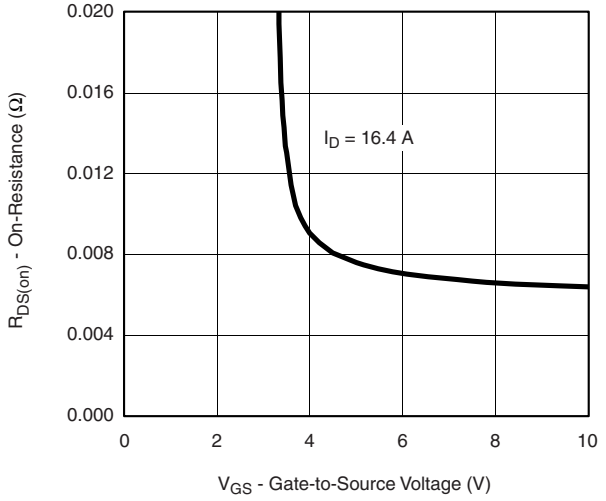
Gate Charge



On-Resistance vs. Junction Temperature

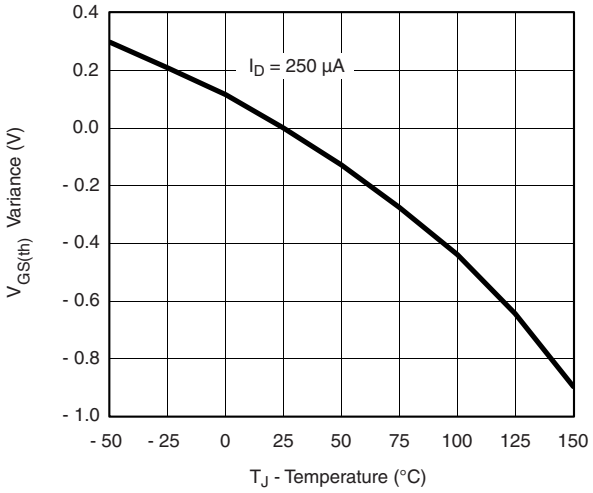


Source-Drain Diode Forward Voltage

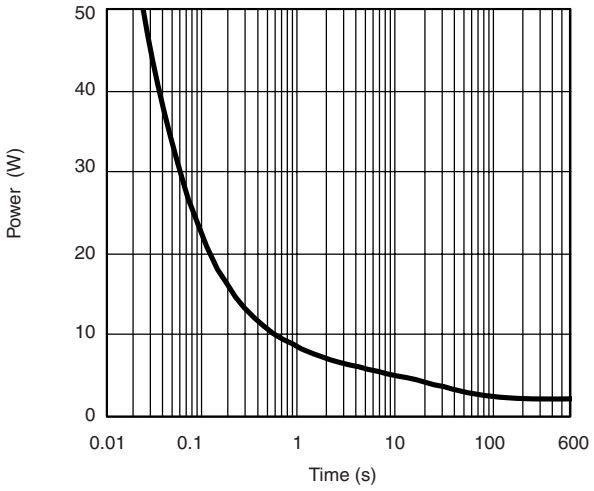


On-Resistance vs. Gate-to-Source Voltage

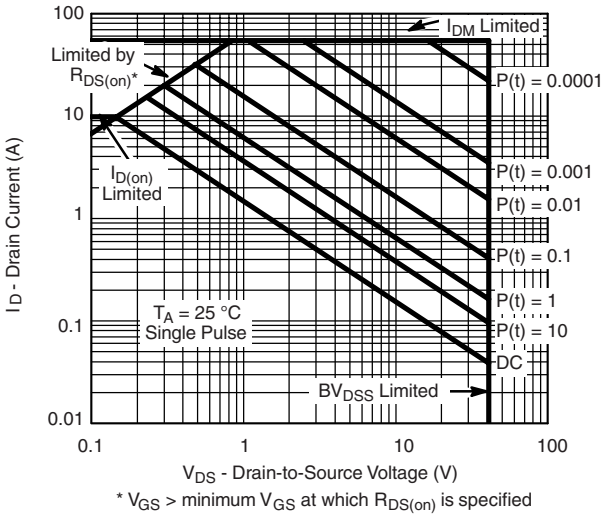
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Threshold Voltage

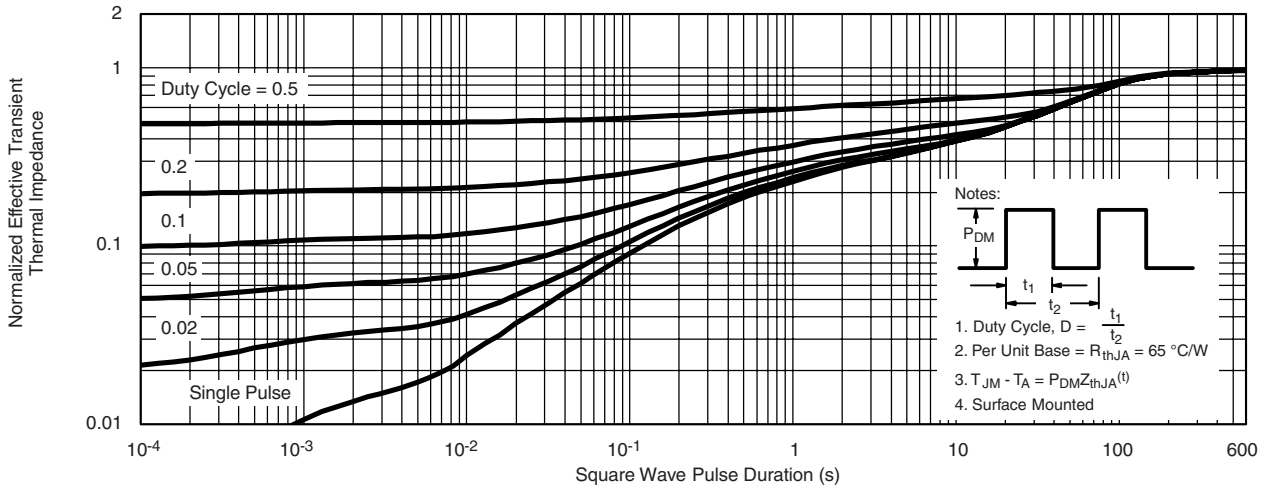


Single Pulse Power, Junction-to-Ambient



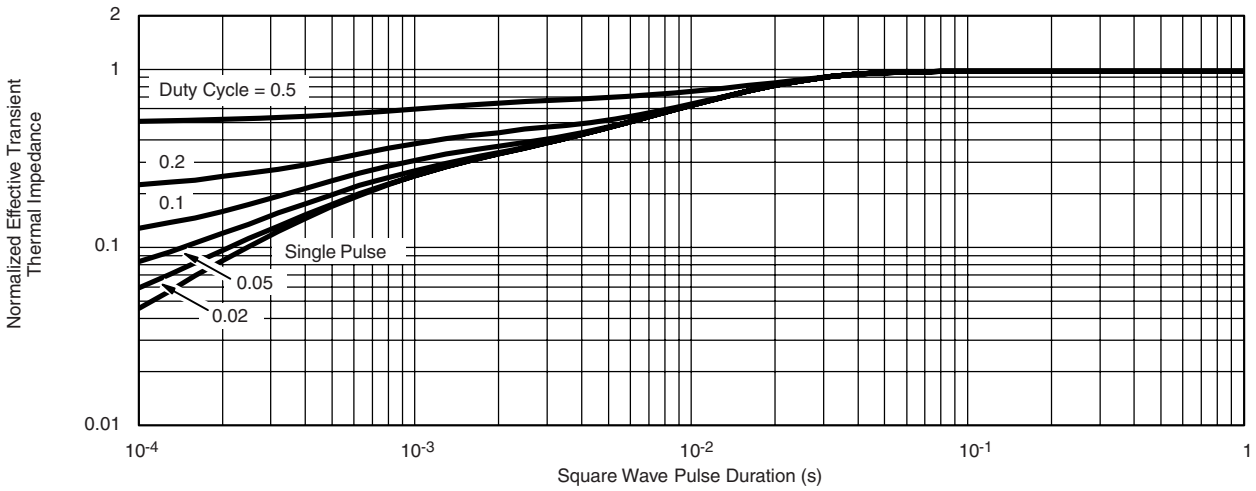
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Case

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