

N-Channel 25 V (D-S) MOSFET



PRODUCT SUMMARY	
V_{DS} (V)	25
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 10$ V	0.00076
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 4.5$ V	0.00117
Q_g typ. (nC)	45.5
I_D (A)	60 ^{a, g}
Configuration	Single

FEATURES

- TrenchFET® Gen IV power MOSFET
- Optimized Q_g , Q_{gd} , and Q_{gd}/Q_{gs} ratio reduces switching related power loss
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Synchronous rectification
- High power density DC/DC
- Synchronous buck converter
- Load switching



N-Channel MOSFET

ORDERING INFORMATION

Package	PowerPAK SO-8 Single
Lead (Pb)-free and halogen-free	SiRA22DP-T1-RE3

ABSOLUTE MAXIMUM RATINGS ($T_A = 25$ °C, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	V_{DS}	25	V
Gate-source voltage	V_{GS}	+16 / -12	
Continuous drain current ($T_J = 150$ °C)	I_D	$T_C = 25$ °C	60 ^a
		$T_C = 70$ °C	60 ^a
		$T_A = 25$ °C	60 ^{a, b, c}
		$T_A = 70$ °C	51.2 ^{b, c}
Pulsed drain current ($t = 100$ μ s)	I_{DM}	400	A
Continuous source-drain diode current	I_S	$T_C = 25$ °C	
		$T_A = 25$ °C	4.5 ^{b, c}
Single pulse avalanche current	I_{AS}	50	mJ
Single pulse avalanche energy	E_{AS}	125	
Maximum power dissipation	P_D	$T_C = 25$ °C	83.3
		$T_C = 70$ °C	53.3
		$T_A = 25$ °C	5 ^{b, c}
		$T_A = 70$ °C	3.2 ^{b, c}
Operating junction and storage temperature range	T_J, T_{stg}	-55 to +150	°C
Soldering recommendations (peak temperature) ^c		260	

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient ^b	R_{thJA}	20	25	°C/W
Maximum junction-to-case (drain)	R_{thJC}	1.2	1.5	

Notes

- Package limited.
- Surface mounted on 1" x 1" FR4 board.
- $t = 10$ s.
- See solder profile (www.vishay.com/doc?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.
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.
- Maximum under steady state conditions is 65 °C/W.
- $T_C = 25$ °C.



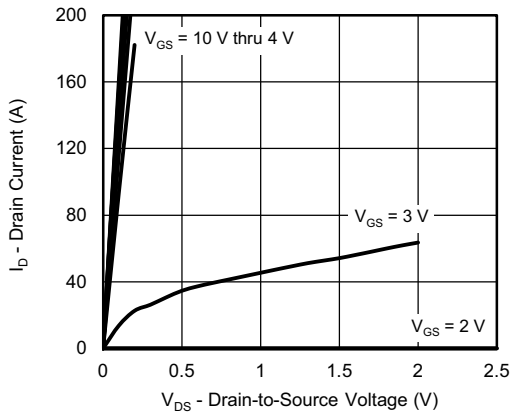
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	25	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	$I_D = 10\text{ mA}$	-	21	-	mV/ $^\circ\text{C}$
$V_{GS(th)}$ temperature coefficient	$\Delta V_{GS(th)}/T_J$	$I_D = 250\text{ }\mu\text{A}$	-	-4.4	-	
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	1	-	2.2	V
Gate-source leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = +16 / -12\text{ V}$	-	-	100	nA
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 25\text{ V}$, $V_{GS} = 0\text{ V}$	-	-	1	μA
		$V_{DS} = 25\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 70\text{ }^\circ\text{C}$	-	-	15	
On-state drain current ^a	$I_{D(on)}$	$V_{DS} \geq 10\text{ V}$, $V_{GS} = 10\text{ V}$	40	-	-	A
Drain-source on-state resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$, $I_D = 15\text{ A}$	-	0.00063	0.00076	Ω
		$V_{GS} = 4.5\text{ V}$, $I_D = 10\text{ A}$	-	0.00093	0.00117	
Forward transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}$, $I_D = 15\text{ A}$	-	89	-	S
Dynamic ^b						
Input capacitance	C_{ISS}	$V_{DS} = 10\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$	-	7570	-	μF
Output capacitance	C_{OSS}		-	2130	-	
Reverse transfer capacitance	C_{RSS}		-	502	-	
Total gate charge	Q_g	$V_{DS} = 10\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 10\text{ A}$	-	102	155	nC
		$V_{DS} = 10\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 10\text{ A}$	-	45.5	69	
Gate-source charge	Q_{gs}		-	17	-	
Gate-drain charge	Q_{gd}		-	8.3	-	
Gate resistance	R_g	$f = 1\text{ MHz}$	0.1	0.5	0.9	Ω
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 10\text{ V}$, $R_L = 1\text{ }\Omega$, $I_D \cong 10\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\text{ }\Omega$	-	18	36	ns
Rise time	t_r		-	25	50	
Turn-off delay time	$t_{d(off)}$		-	35	70	
Fall time	t_f		-	11	22	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 10\text{ V}$, $R_L = 1\text{ }\Omega$, $I_D \cong 10\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 1\text{ }\Omega$	-	37	74	
Rise time	t_r		-	61	120	
Turn-off delay time	$t_{d(off)}$		-	40	80	
Fall time	t_f		-	25	50	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I_S	$T_C = 25\text{ }^\circ\text{C}$	-	-	60	A
Pulse diode forward current	I_{SM}		-	-	400	
Body diode voltage	V_{SD}	$I_S = 5\text{ A}$, $V_{GS} = 0\text{ V}$	-	0.71	1.1	V
Body diode reverse recovery time	t_{rr}	$I_F = 10\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^\circ\text{C}$	-	52	104	ns
Body diode reverse recovery charge	Q_{rr}		-	51	102	nC
Reverse recovery fall time	t_a		-	24	-	ns
Reverse recovery rise time	t_b		-	28	-	

Notes

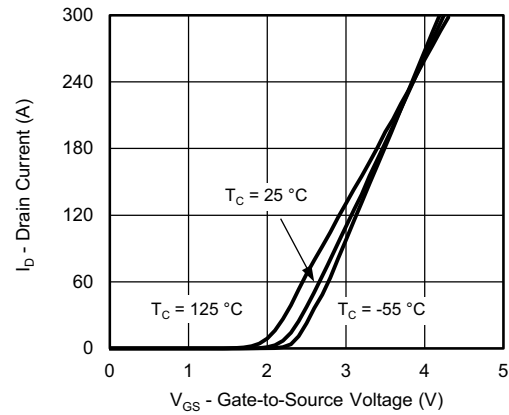
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

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.

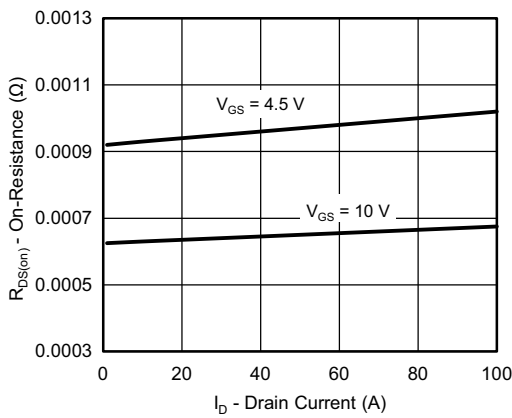
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



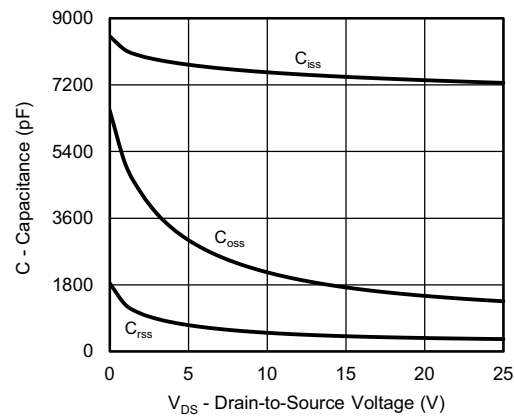
Output Characteristics



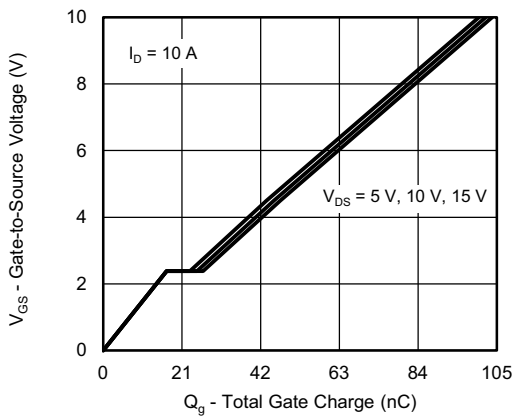
Transfer Characteristics



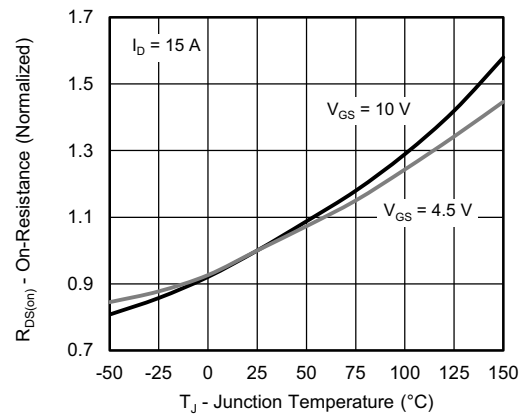
On-Resistance vs. Drain Current and Gate Voltage



Capacitance



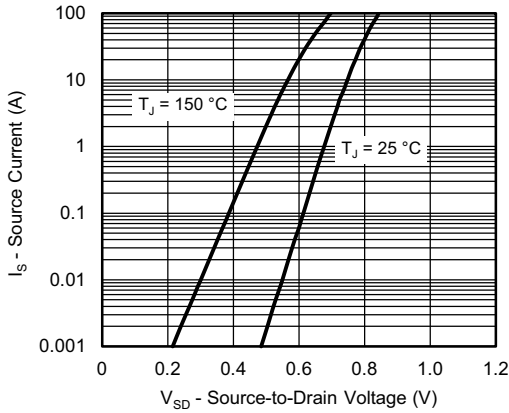
Gate Charge



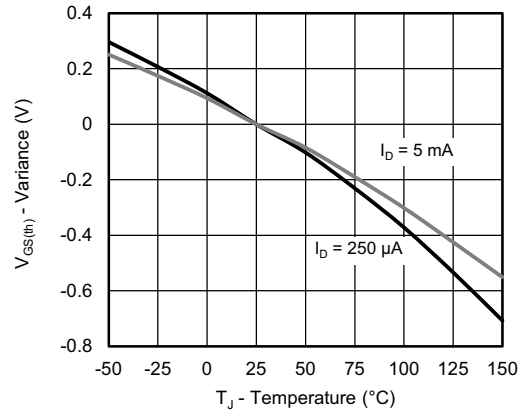
On-Resistance vs. Junction Temperature



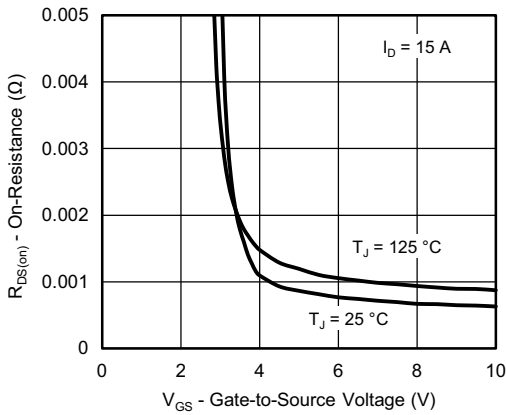
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



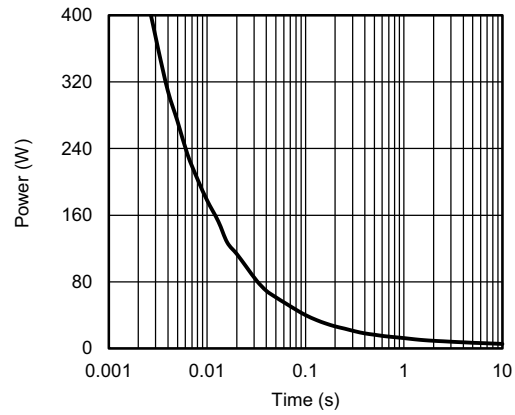
Source-Drain Diode Forward Voltage



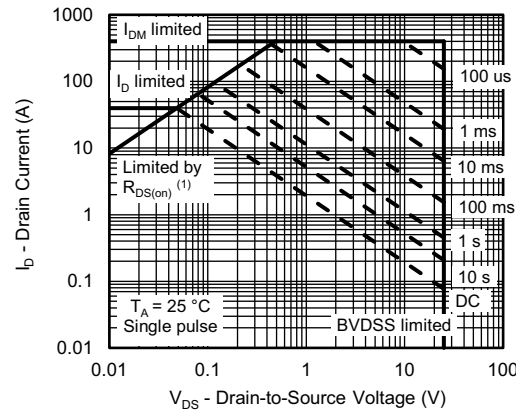
Threshold Voltage



On-Resistance vs. Gate-to-Source Voltage



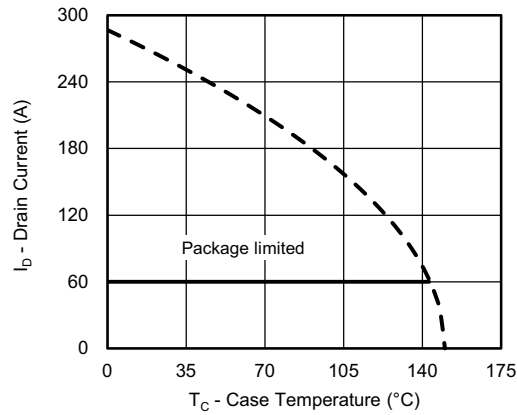
Single Pulse Power, Junction-to-Ambient



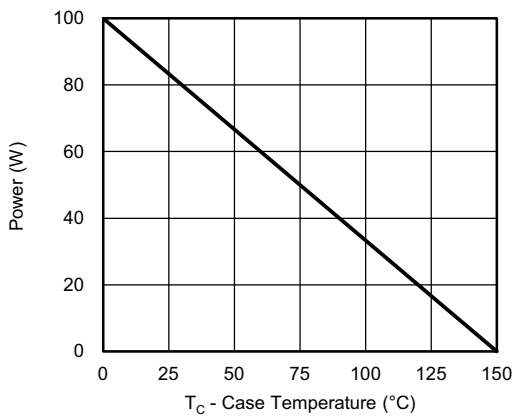
Safe Operating Area, Junction-to-Ambient



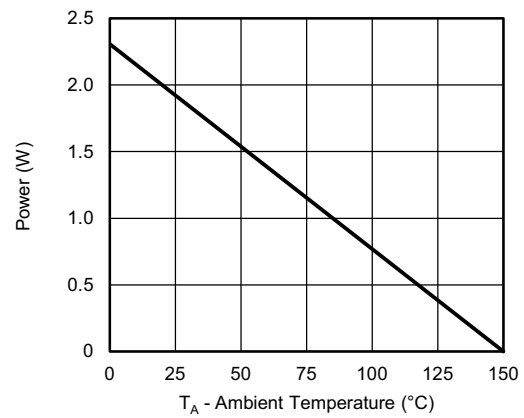
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating ^a



Power, Junction-to-Case



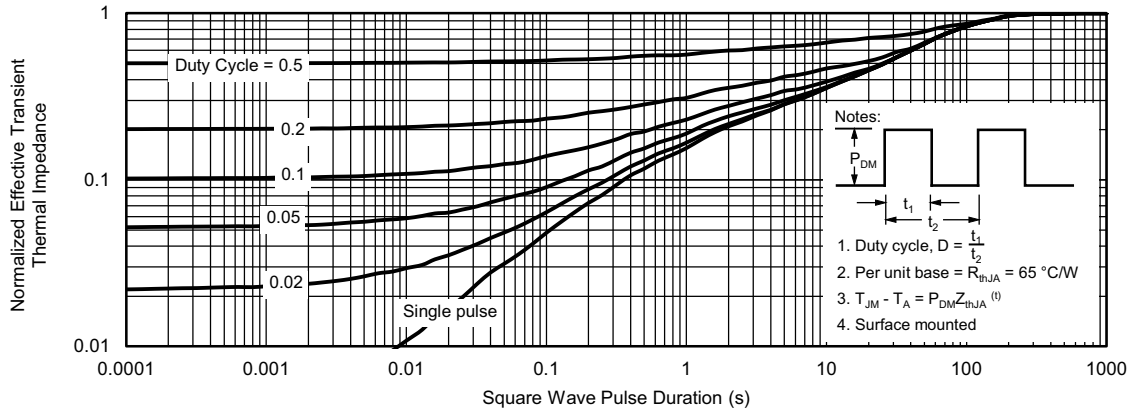
Power, Junction-to-Ambient

Note

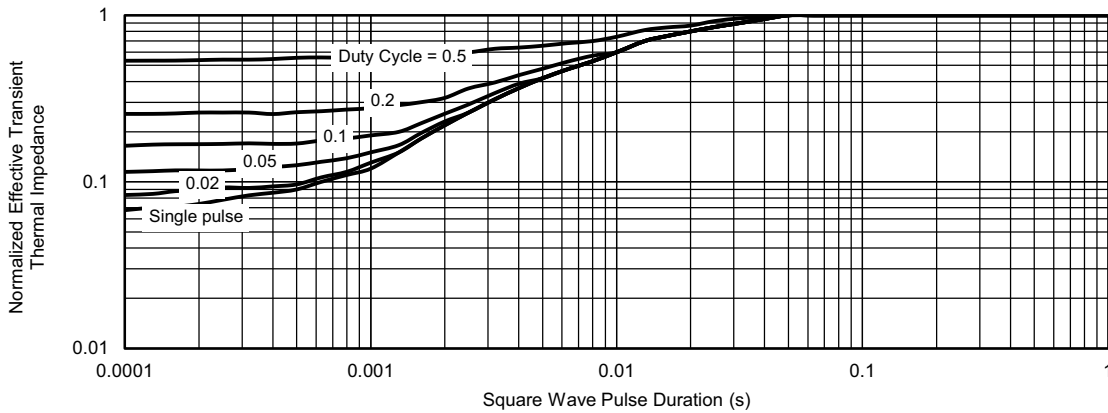
- a. The power dissipation P_D is based on T_J max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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PowerPAK® SO-8, (Single/Dual)



- Notes**
1. Inch will govern.
 2. Dimensions exclusive of mold gate burrs.
 3. Dimensions exclusive of mold flash and cutting burrs.

DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.97	1.04	1.12	0.038	0.041	0.044
A1		-	0.05	0	-	0.002
b	0.33	0.41	0.51	0.013	0.016	0.020
c	0.23	0.28	0.33	0.009	0.011	0.013
D	5.05	5.15	5.26	0.199	0.203	0.207
D1	4.80	4.90	5.00	0.189	0.193	0.197
D2	3.56	3.76	3.91	0.140	0.148	0.154
D3	1.32	1.50	1.68	0.052	0.059	0.066
D4	0.57 typ.			0.0225 typ.		
D5	3.98 typ.			0.157 typ.		
E	6.05	6.15	6.25	0.238	0.242	0.246
E1	5.79	5.89	5.99	0.228	0.232	0.236
E2	3.48	3.66	3.84	0.137	0.144	0.151
E3	3.68	3.78	3.91	0.145	0.149	0.154
E4	0.75 typ.			0.030 typ.		
e	1.27 BSC			0.050 BSC		
K	1.27 typ.			0.050 typ.		
K1	0.56	-	-	0.022	-	-
H	0.51	0.61	0.71	0.020	0.024	0.028
L	0.51	0.61	0.71	0.020	0.024	0.028
L1	0.06	0.13	0.20	0.002	0.005	0.008
θ	0°	-	12°	0°	-	12°
W	0.15	0.25	0.36	0.006	0.010	0.014
M	0.125 typ.			0.005 typ.		
ECN: S17-0173-Rev. L, 13-Feb-17						
DWG: 5881						

RECOMMENDED MINIMUM PADS FOR PowerPAK® SO-8 Single



Recommended Minimum Pads
Dimensions in Inches/(mm)

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