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Vishay Siliconix

N-Channel 40 V (D-S) MOSFET



PRODUCT SUMMARY					
V _{DS} (V)	40				
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 10 \text{ V}$	0.00342				
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 4.5 \text{ V}$	0.00466				
Q _g typ. (nC)	14.8				
I _D (A)	92				
Configuration	Single				

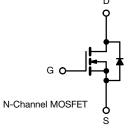
FEATURES

- TrenchFET® Gen IV power MOSFET
- \bullet Tuned for the lowest $R_{DS}\text{-}Q_{oss}$ FOM
- 100 % Rq and UIS tested
- Q_{gd}/Q_{gs} ratio < 1 optimizes switching characteristics
- Material categorization: for definitions of compliance please see <u>www.vishay.com/doc?99912</u>



APPLICATIONS

- · Synchronous rectification
- High power density DC/DC
- DC/AC inverters
- · Battery and load switch



ORDERING INFORMATION	
Package	PowerPAK 1212-8
Lead (Pb)-free and halogen-free	SiSA72ADN-T1-GE3

ABSOLUTE MAXIMUM RATINGS	$(T_A = 25 ^{\circ}C, \text{ unless})$	otherwise noted	d)		
PARAMETER	SYMBOL	LIMIT	UNIT		
Drain-source voltage	V _{DS}	40	V		
Gate-source voltage	V_{GS}	+20, -16	V		
Continuous drain current (T _J = 150 °C)	T _C = 25 °C		92		
	T _C = 70 °C	I-	74		
	T _A = 25 °C	I _D	24.8 ^{b, c}		
	T _A = 70 °C		19.8 ^{b, c}	^	
Pulsed drain current (t = 100 μs)		I _{DM}	150	A	
Continuous source-drain diode current	T _C = 25 °C		47.2		
Continuous source-drain diode current	T _A = 25 °C	l _S —	3.3 ^{a, b}		
Single pulse avalanche current	L = 0.1 mH	I _{AS}	15		
Single pulse avalanche Energy	L = U.T IIII	E _{AS}	11.25	mJ	
Maximum power dissipation	T _C = 25 °C		52		
	T _C = 70 °C		33.3	w	
	T _A = 25 °C	P _D	3.7 ^{a, b}	VV	
	T _A = 70 °C		2.4 ^{a, b}		
Operating junction and storage temperature range		T _J , T _{stg}	-55 to +150	°C	
Soldering recommendations (peak temperature) d, e		Ĭ.	260		

THERMAL RESISTANCE RATINGS					
PARAMETER		SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient b, f	t ≤ 10 s	R _{thJA}	24	33	°C/W
Maximum junction-to-case (drain)	Steady state	R_{thJC}	1.9	2.4	C/VV

Notes

- a. $T_C = 25 \,^{\circ}C$
- b. Surface mounted on 1" x 1" FR4 board
- c. t = 10 s
- d. 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
- e. Rework conditions: manual soldering with a soldering iron is not recommended for leadless components
- f. Maximum under steady state conditions is 81 °C/W



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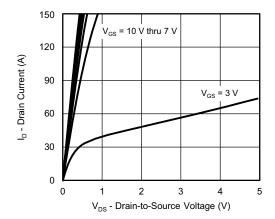
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static	L			l		
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	40	-	-	V
V _{DS} temperature coefficient	$\Delta V_{DS}/T_{J}$		-	22	-	
V _{GS(th)} temperature coefficient	$\Delta V_{GS(th)}/T_J$	$I_D = 250 \mu A$	_	-5.4	-	mV/°C
Gate-source threshold voltage	V _{GS(th)}	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	1	-	2.4	V
Gate-source leakage	I _{GSS}	$V_{DS} = 0 \text{ V}, V_{GS} = +20, -16 \text{ V}$	-	-	± 100	nA
		V _{DS} = 40 V, V _{GS} = 0 V	-	-	1	μΑ
Zero gate voltage drain current	I _{DSS}	V _{DS} = 40 V, V _{GS} = 0 V, T _J = 55 °C	-	-	10	
On-state drain current ^a	I _{D(on)}	$V_{DS} \ge 5 \text{ V}, V_{GS} = 10 \text{ V}$	30	-	-	Α
	_ ` ´	V _{GS} = 10 V, I _D = 10 A	-	0.00271	0.00342	
Drain-source on-state resistance ^a	R _{DS(on)}	V _{GS} = 4.5 V, I _D = 10 A	-	0.00388	0.00466	Ω
Forward transconductance ^a	9 _{fs}	V _{DS} = 10 V, I _D = 10 A	-	76	-	S
Dynamic ^b						
Input capacitance	C _{iss}		-	2530	-	pF
Output capacitance	C _{oss}		_	465	-	
Reverse transfer capacitance	C _{rss}	$V_{DS} = 20 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	_	19	-	
C _{rss} /C _{iss} ratio			_	0.0075	0.0150	
Total gate charge	Q _g	V _{DS} = 20 V, V _{GS} = 10 V, I _D = 26 A	-	33	50	nC
			-	14.8	23	
Gate-source charge	Q _{gs}	$V_{DS} = 20 \text{ V}, V_{GS} = 4.5 \text{ V}, I_D = 26 \text{ A}$	-	8.2	-	
Gate-drain charge	Q _{gd}			2.3	-	
Output charge	Q _{oss}	V _{DS} = 20 V, V _{GS} = 0 V	-	17.6	27	
Gate resistance	Rq	f = 1 MHz	0.26	1.3	2.6	Ω
Turn-on delay time	t _{d(on)}			15	30	
Rise time	t _r	$V_{DD} = 20 \text{ V}, R_{I} = 1 \Omega$	-	7	14	
Turn-off delay time	t _{d(off)}	$I_D \cong 20.8 \text{ A}, V_{GEN} = 10 \text{ V}, R_g = 1 \Omega$	-	35	70	
Fall time	t _f		-	5	10	
Turn-on delay time	t _{d(on)}		-	30	60	ns
Rise time	t _r	$V_{DD} = 20 \text{ V}, R_{I} = 1 \Omega$	-	150	300	
Turn-off delay time	t _{d(off)}	$I_D \cong 20.8 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$	-	35	70	
Fall time	t _f		-	14	28	
Drain-Source Body Diode Characteristic	s					
Continuous source-drain diode current	Is	T _C = 25 °C	-	-	47.2	
Pulse diode forward current (t _p = 100 μs)	I _{SM}		-	-	150	Α
Body diode voltage	V_{SD}	I _S = 10 A	-	0.74	1.1	V
Body diode reverse recovery time	t _{rr}	-	-	22	44	ns
Body diode reverse recovery charge	Q _{rr}	$I_F = 20.8 \text{ A}, \text{ di/dt} = 100 \text{ A/}\mu\text{s},$	-	10	20	nC
Reverse recovery Fall time	t _a	$T_J = 25 ^{\circ}C$	-	12	-	
Reverse recovery rise time	t _b		-	10	_	ns

Notes

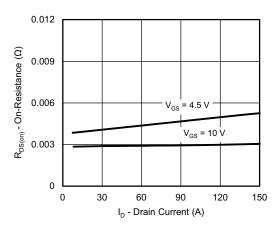
- a. Pulse test; pulse width $\leq 300~\mu s,$ duty cycle $\leq 2~\%$
- b. Guaranteed by design, not subject to production testing

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.

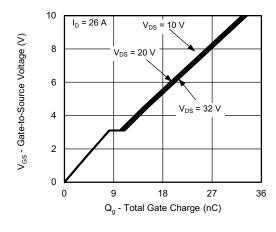




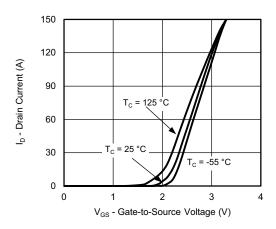
Output Characteristics



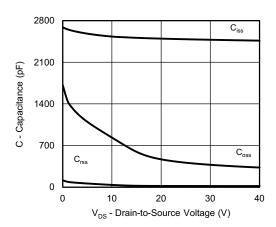
On-Resistance vs. Drain Current



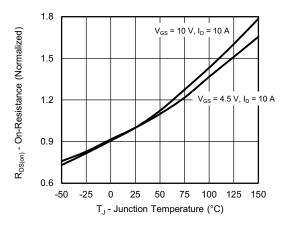
Gate Charge



Transfer Characteristics

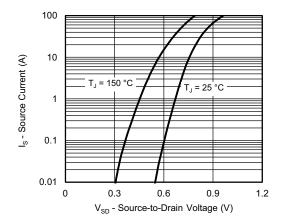


Capacitance

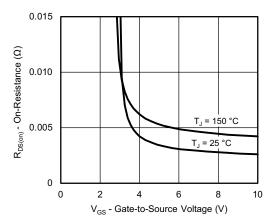


On-Resistance vs. Junction Temperature

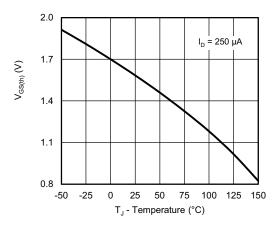




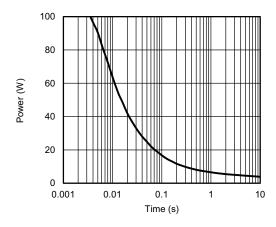
Source-Drain Diode Forward Voltage



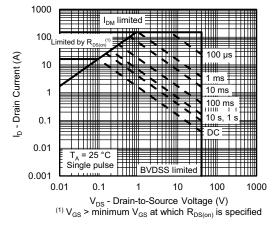
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

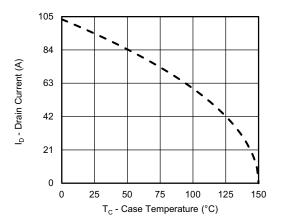


Single Pulse Power, Junction-to-Ambient

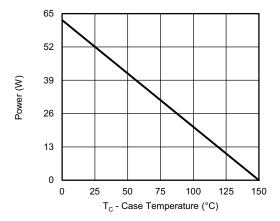


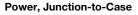
Safe Operating Area

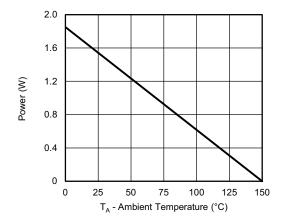




Current Derating a





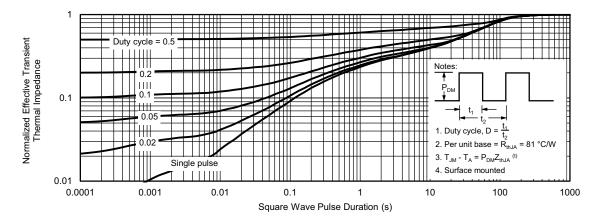


Power, Junction-to-Ambient

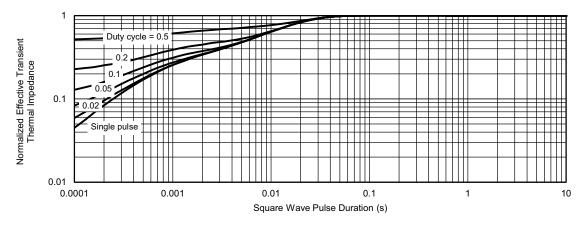
Note

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





Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package / tape drawings, part marking, and reliability data, see www.vishay.com/ppg?79409.



PowerPAK® 1212-8, (Single / Dual)





Notes

- Inch will govern
 Dimensions exclusive of mold gate burrs
- 3. Dimensions exclusive of mold flash and cutting burrs





Backside view of dual pad

DIM		MILLIMETERS			INCHES		
DIM.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	
Α	0.97	1.04	1.12	0.038	0.041	0.044	
A1	0.00	-	0.05	0.000	-	0.002	
b	0.23	0.30	0.41	0.009	0.012	0.016	
С	0.23	0.28	0.33	0.009	0.011	0.013	
D	3.20	3.30	3.40	0.126	0.130	0.134	
D1	2.95	3.05	3.15	0.116	0.120	0.124	
D2	1.98	2.11	2.24	0.078	0.083	0.088	
D3	0.48	-	0.89	0.019	-	0.035	
D4		0.47 typ.			0.0185 typ		
D5		2.3 typ.		0.090 typ			
Е	3.20	3.30	3.40	0.126	0.130	0.134	
E1	2.95	3.05	3.15	0.116	0.120	0.124	
E2	1.47	1.60	1.73	0.058	0.063	0.068	
E3	1.75	1.85	1.98	0.069	0.073	0.078	
E4	0.034 typ.			0.013 typ.			
е		0.65 BSC			0.026 BSC		
K	0.86 typ.			0.034 typ.			
K1	0.35	-	-	0.014	-	-	
Н	0.30	0.41	0.51	0.012	0.016	0.020	
L	0.30	0.43	0.56	0.012	0.017	0.022	
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	
М	0.125 typ.			0.005 typ.			

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RECOMMENDED MINIMUM PADS FOR PowerPAK® 1212-8 Single



Recommended Minimum Pads Dimensions in Inches/(mm)

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APPLICATION NOTE



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