

Automotive N-Channel 40 V (D-S) 175 °C MOSFET

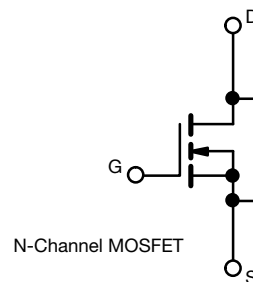
PowerPAK® SO-8L


FEATURES

- TrenchFET® Gen IV power MOSFET
- AEC-Q101 qualified
- 100 % R_g and UIS tested
- Material categorization:
for definitions of compliance please
see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE



PRODUCT SUMMARY	
V_{DS} (V)	40
$R_{DS(on)}$ (Ω) at $V_{GS} = 10$ V	0.0050
$R_{DS(on)}$ (Ω) at $V_{GS} = 4.5$ V	0.0075
I_D (A)	123
Configuration	Single
Package	PowerPAK SO-8L

ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V_{DS}	40	V
Gate-source voltage		V_{GS}	± 20	
Continuous drain current	$T_C = 25$ °C	I_D	123	A
	$T_C = 125$ °C		71	
Continuous source current (diode conduction)		I_S	124	
Pulsed drain current ^a		I_{DM}	168	
Single pulse avalanche current	L = 0.1 mH	I_{AS}	14	
		E_{AS}	9.8	mJ
Maximum power dissipation ^a	$T_C = 25$ °C	P_D	136	W
	$T_C = 125$ °C		45	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +175	°C
Soldering recommendations (peak temperature) ^c			260	

THERMAL RESISTANCE RATINGS				
PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-ambient	PCB mount ^b	R_{thJA}	42	°C/W
Junction-to-case (drain)		R_{thJC}	1.1	

Notes

- Pulse test; pulse width ≤ 300 μ s, duty cycle ≤ 2 %
- When mounted on 1" square PCB (FR4 material)
- See solder profile (www.vishay.com/doc?73257). 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

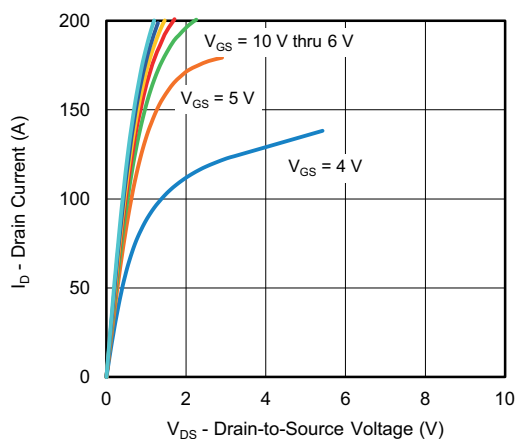
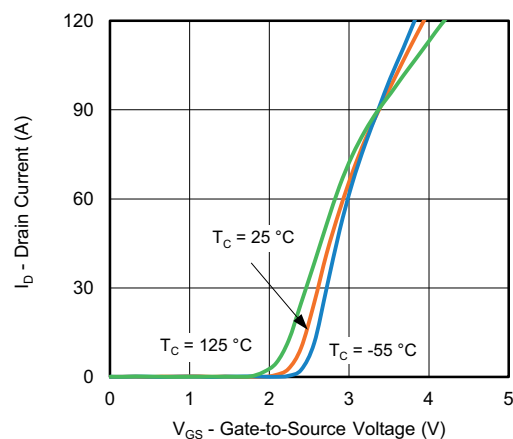
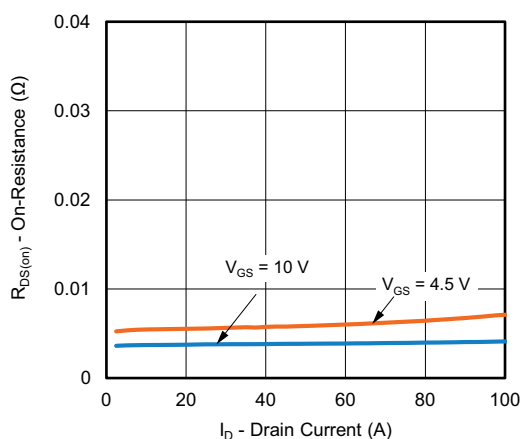
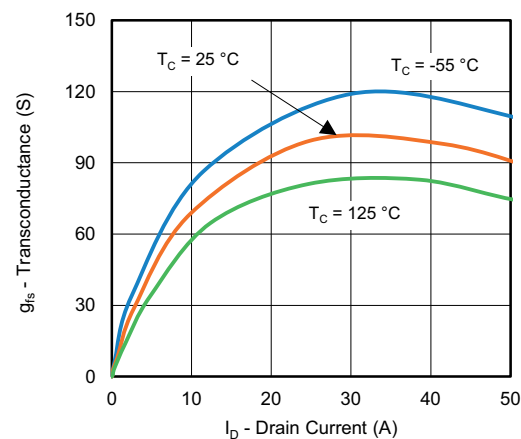
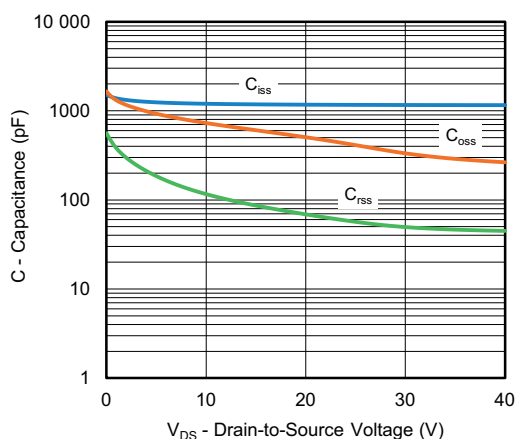
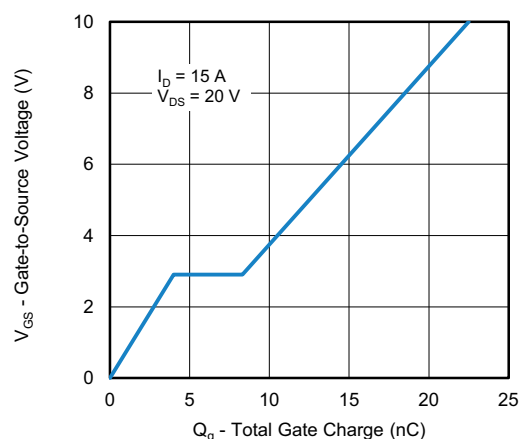


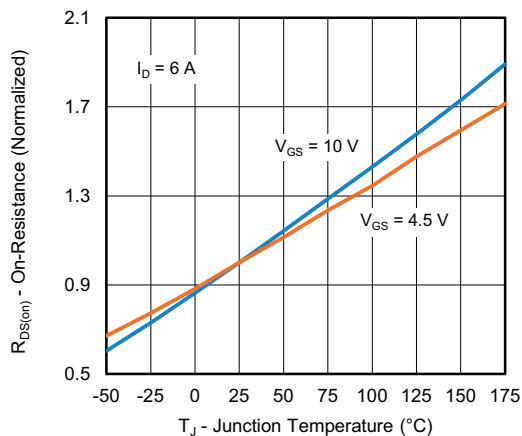
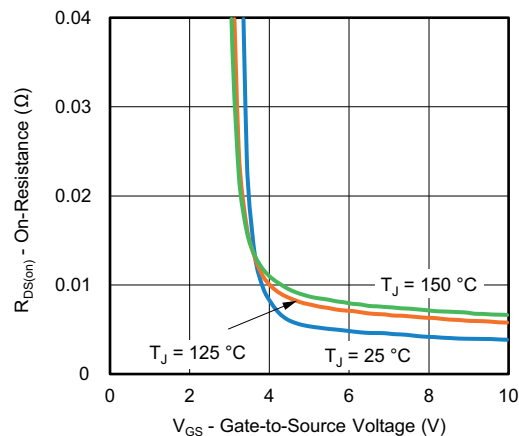
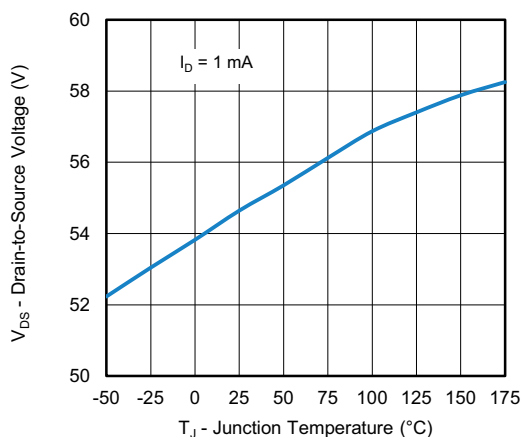
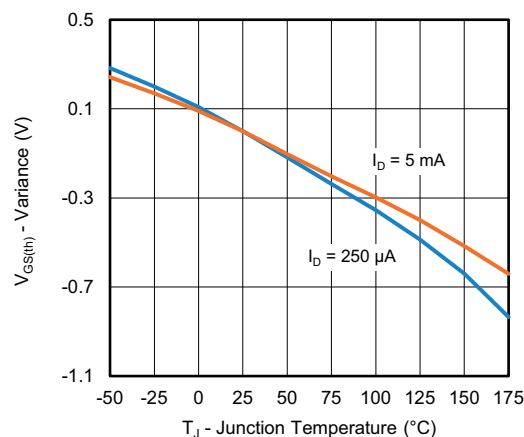
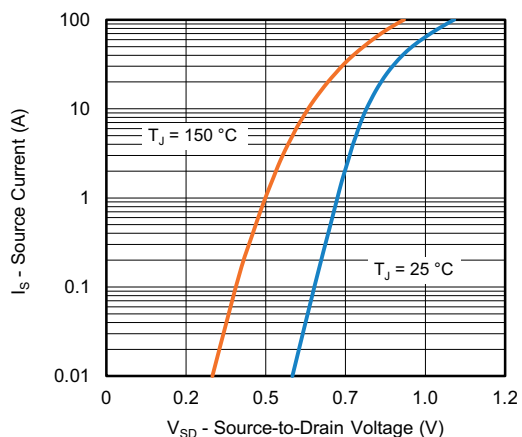
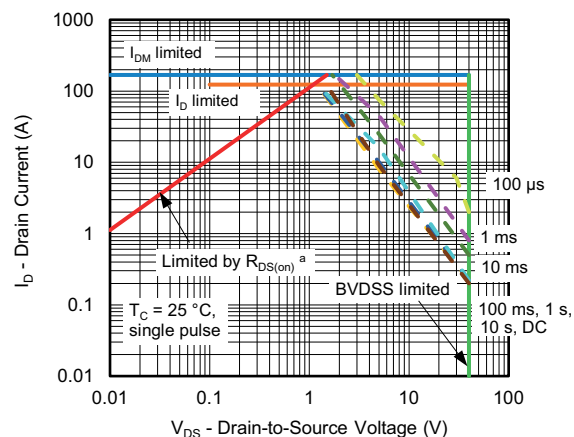
SPECIFICATIONS (T _C = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V _{DS}	V _{GS} = 0, I _D = 250 μA		40	-	-	V
Gate-source threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA		1.2	1.7	2.2	
Gate-source leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V		-	-	± 100	nA
Zero gate voltage drain current	I _{DSS}	V _{GS} = 0 V	V _{DS} = 40 V	-	-	1	μA
		V _{GS} = 0 V	V _{DS} = 40 V, T _J = 125 °C	-	-	50	
		V _{GS} = 0 V	V _{DS} = 40 V, T _J = 175 °C	-	-	250	
On-state drain current ^a	I _{D(on)}	V _{GS} = 10 V	V _{DS} ≥ 5 V	30	-	-	A
Drain-source on-state resistance ^a	R _{DS(on)}	V _{GS} = 10 V	I _D = 15 A	-	0.004	0.0050	Ω
		V _{GS} = 10 V	I _D = 15 A, T _J = 125 °C	-	-	0.0085	
		V _{GS} = 10 V	I _D = 15 A, T _J = 175 °C	-	-	0.0100	
		V _{GS} = 4.5 V	I _D = 15 A	-	0.0055	0.0075	
Forward transconductance ^b	g _{fs}	V _{DS} = 15 V, I _D = 10 A		-	69	-	S
Dynamic ^b							
Input capacitance	C _{iss}	V _{GS} = 0 V	V _{DS} = 25 V, f = 1 MHz	-	1166	1633	pF
Output capacitance	C _{oss}			-	412	577	
Reverse transfer capacitance	C _{rss}			-	57	80	
Total gate charge ^c	Q _g	V _{GS} = 10 V	V _{DS} = 20 V, I _D = 15 A	-	22.5	34	nC
Gate-source charge ^c	Q _{gs}			-	4	-	
Gate-drain charge ^c	Q _{gd}			-	4.3	-	
Gate resistance	R _g	f = 1 MHz		2.5	4.6	7.4	Ω
Turn-on delay time ^c	t _{d(on)}	V _{DD} = 20 V, R _L = 1.33 Ω I _D ≅ 15 A, V _{GEN} = 10 V, R _g = 1 Ω		-	9.6	13.5	ns
Rise time ^c	t _r			-	4.3	6.1	
Turn-off delay time ^c	t _{d(off)}			-	25	35	
Fall time ^c	t _f			-	8.5	12	
Source-Drain Diode Ratings and Characteristics ^b							
Pulsed current ^a	I _{SM}			-	-	168	A
Forward voltage	V _{SD}	I _F = 15 A, V _{GS} = 0 V		-	-	1.1	V
Body diode reverse recovery time	t _{rr}	I _F = 6 A, di/dt = 100 A/μs		-	28	42	ns
Body diode reverse recovery charge	Q _{rr}			-	12	18	nC
Reverse recovery fall time	t _a			-	10	14	ns
Reverse recovery rise time	t _b			-	16	28	
Body diode peak reverse recovery current	I _{RM(REC)}			-	0.8	1.4	A

Notes

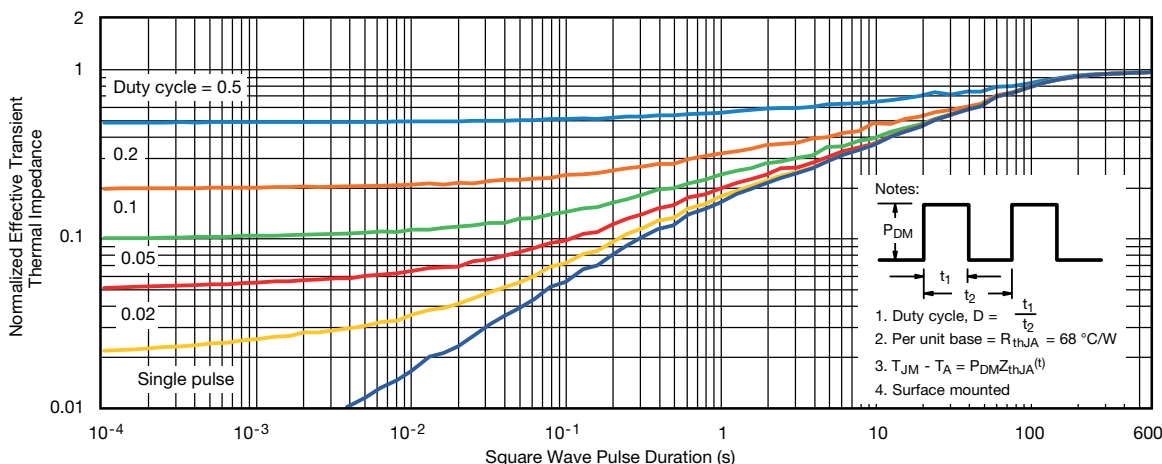
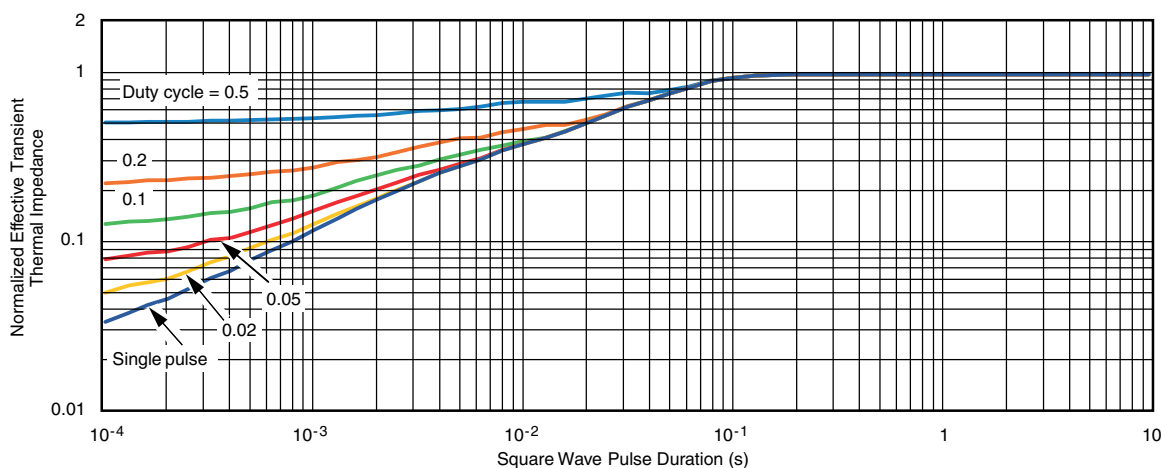
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
b. Guaranteed by design, not subject to production testing
c. Independent of operating temperature

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 ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

Output Characteristics

Transfer Characteristics

On-Resistance vs. Drain Current

Transconductance

Capacitance

Gate Charge

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

On-Resistance vs. Junction Temperature

On-Resistance vs. Gate-to Source Voltage

Drain Source Breakdown vs. Junction Temperature

Threshold Voltage

Source Drain Diode Forward Voltage

Safe Operating Area
Note

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

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

Normalized Thermal Transient Impedance, Junction-to-Ambient

Normalized Thermal Transient Impedance, Junction-to-Case
Note

- The characteristics shown in the two graphs
 - Normalized Transient Thermal Impedance Junction-to-Ambient ($25\text{ }^{\circ}\text{C}$)
 - Normalized Transient Thermal Impedance Junction-to-Case ($25\text{ }^{\circ}\text{C}$)
 are given for general guidelines only to enable the user to get a “ball park” indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions

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PowerPAK® SO-8L (PPKS08LWLA) Case Outline 3



DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.00	1.05	1.10	0.039	0.041	0.043
A1	0.00	---	0.127	0.000	---	0.005
b	0.33	0.41	0.49	0.013	0.016	0.019
b1	0.43	0.51	0.59	0.017	0.020	0.023
b2	4.00	4.10	4.20	0.157	0.161	0.165
c	0.15	0.20	0.25	0.006	0.008	0.010
D1	4.80	4.90	5.00	0.189	0.193	0.197
D2	3.86	3.96	4.06	0.152	0.156	0.160
D5	0.51	0.61	0.71	0.020	0.024	0.028
D6	2.64	2.74	2.84	0.104	0.108	0.112
e	1.27 BSC			0.050 BSC		
E	6.05	6.15	6.25	0.238	0.242	0.246
E1	4.27	4.37	4.47	0.168	0.172	0.176
E2	3.18	3.28	3.38	0.125	0.129	0.133
E3	3.48	3.58	3.68	0.137	0.141	0.145
E4	2.72	2.82	2.92	0.107	0.111	0.115
E5	0.71	0.81	0.91	0.028	0.032	0.036
L	0.62	0.72	0.82	0.024	0.028	0.032
L1	0.92	1.07	1.22	0.036	0.042	0.048
W1	0.31	0.41	0.51	0.012	0.016	0.020
W4	0.31	0.36	0.41	0.012	0.014	0.016
z1	0.37	0.47	0.57	0.015	0.019	0.022
z2	0.99	1.09	1.19	0.039	0.043	0.047
θ	0°	---	5°	0°	---	5°

ECN: C23-1016-Rev. D, 18-Sep-2023

DWG: 6067

Note

- Millimeter will govern



Recommended Land Pattern PowerPAK® SO-8L Single Short Ear



Dimensions in Millimeters (Inches)



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