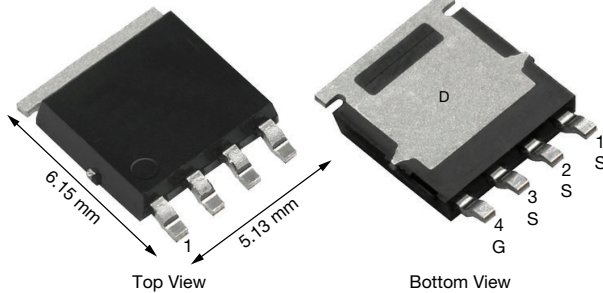


## N-Channel 45 V (D-S) MOSFET

PowerPAK® SO-8L Single

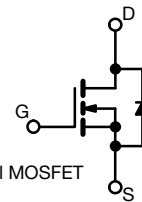

**RoHS**  
 COMPLIANT  
 HALOGEN  
**FREE**

### FEATURES

- TrenchFET® Gen IV power MOSFET
- Very low  $Q_g$  and  $Q_{oss}$  reduce power loss and improve efficiency
- Flexible leads provide resilience to mechanical stress
- 100 %  $R_g$  and UIS tested
- $Q_{gd}/Q_{gs}$  ratio < 1 optimizes switching characteristics
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

### APPLICATIONS

- Synchronous rectification
- High power density DC/DC
- DC/AC inverters



N-Channel MOSFET

PRODUCT SUMMARY	
$V_{DS}$ (V)	45
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 10$ V	0.0019
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 4.5$ V	0.00265
$Q_g$ typ. (nC)	34
$I_D$ (A) <sup>a</sup>	113
Configuration	Single

ORDERING INFORMATION	
Package	PowerPAK SO-8L
Lead (Pb)-free and halogen-free	SIJ450DP-T1-GE3

ABSOLUTE MAXIMUM RATINGS ( $T_A = 25$ °C, unless otherwise noted)					
PARAMETER	SYMBOL	LIMIT	UNIT		
Drain-source voltage	$V_{DS}$	45	V		
Gate-source voltage	$V_{GS}$	+20, -16			
Continuous drain current ( $T_J = 150$ °C)	$I_D$	$T_C = 25$ °C	113	A	
		$T_C = 70$ °C	91		
		$T_A = 25$ °C	36 <sup>b, c</sup>		
		$T_A = 70$ °C	28.7 <sup>b, c</sup>		
Pulsed drain current ( $t = 100$ $\mu$ s)	$I_{DM}$	300			
Continuous source-drain diode current	$I_S$	$T_C = 25$ °C	43.6		
		$T_A = 25$ °C	4.3 <sup>b, c</sup>		
Single pulse avalanche current	$I_{AS}$	40			
Single pulse avalanche energy	$E_{AS}$	80	mJ		
Maximum power dissipation	$P_D$	$T_C = 25$ °C	48	W	
		$T_C = 70$ °C	30.7		
		$T_A = 25$ °C	4.8 <sup>b, c</sup>		
		$T_A = 70$ °C	3.0 <sup>b, c</sup>		
Operating junction and storage temperature range	$T_J, T_{stg}$	-55 to +150	°C		
Soldering recommendations (peak temperature) <sup>d, e</sup>		260			

THERMAL RESISTANCE RATINGS					
PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT	
Maximum junction-to-ambient <sup>b, f</sup>	$R_{thJA}$	22	26	°C/W	
Maximum junction-to-case (drain)	$R_{thJC}$	1.7	2.6		

### Notes

- $T_C = 25$  °C
- Surface mounted on 1" x 1" FR4 board
- $t = 10$  s
- See solder profile ([www.vishay.com/doc?73257](http://www.vishay.com/doc?73257)). The PowerPAK SO-8L 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 70 °C/W



SPECIFICATIONS ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-source breakdown voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	45	-	-	V
$V_{DS}$ temperature coefficient	$\Delta V_{DS}/T_J$	$I_D = 1\text{ mA}$	-	30	-	mV/ $^\circ\text{C}$
$V_{GS(th)}$ temperature coefficient	$\Delta V_{GS(th)}/T_J$	$I_D = 250\text{ }\mu\text{A}$	-	-5.6	-	
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.0	-	2.3	V
Gate-source leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = +20, -16\text{ V}$	-	-	$\pm 100$	nA
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 45\text{ V}, V_{GS} = 0\text{ V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 45\text{ V}, V_{GS} = 0\text{ V}, T_J = 75\text{ }^\circ\text{C}$	-	-	20	
On-state drain current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	50	-	-	A
Drain-source on-state resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 10\text{ A}$	-	0.00155	0.0019	$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$	-	0.0021	0.00265	
Forward transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 10\text{ V}, I_D = 10\text{ A}$	-	105	-	S
<b>Dynamic <sup>b</sup></b>						
Input capacitance	$C_{ISS}$	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	5920	-	pF
Output capacitance	$C_{OSS}$		-	805	-	
Reverse transfer capacitance	$C_{RSS}$		-	53	-	
Total gate charge	$Q_g$	$V_{DS} = 20\text{ V}, V_{GS} = 10\text{ V}, I_D = 10\text{ A}$	-	75.5	114	nC
		$V_{DS} = 20\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$	-	34	51	
Gate-source charge	$Q_{gs}$		-	17	-	
Gate-drain charge	$Q_{gd}$		-	4.5	-	
Output charge	$Q_{OSS}$	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$	-	40.5	-	
Gate resistance	$R_g$	$f = 1\text{ MHz}$	0.5	1.2	2	$\Omega$
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 20\text{ V}, R_L = 2\text{ }\Omega$ $I_D \cong 10\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$	-	15	30	ns
Rise time	$t_r$		-	6	12	
Turn-off delay time	$t_{d(off)}$		-	41	82	
Fall time	$t_f$		-	6	12	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 20\text{ V}, R_L = 2\text{ }\Omega$ $I_D \cong 10\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$	-	36	72	
Rise time	$t_r$		-	70	140	
Turn-off delay time	$t_{d(off)}$		-	41	82	
Fall time	$t_f$		-	8	16	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous source-drain diode current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$	-	-	43.6	A
Pulse diode forward current ( $t_p = 100\text{ }\mu\text{s}$ )	$I_{SM}$		-	-	300	
Body diode voltage	$V_{SD}$	$I_S = 5\text{ A}$	-	0.71	1.1	V
Body diode reverse recovery time	$t_{rr}$	$I_F = 10\text{ A}, di/dt = 100\text{ A}/\mu\text{s},$ $T_J = 25\text{ }^\circ\text{C}$	-	40	80	ns
Body diode reverse recovery charge	$Q_{rr}$		-	47	94	nC
Reverse recovery fall time	$t_a$		-	27	-	ns
Reverse recovery rise time	$t_b$		-	13	-	

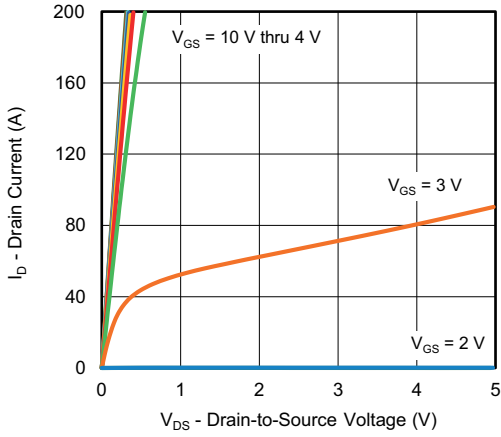
**Notes**

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

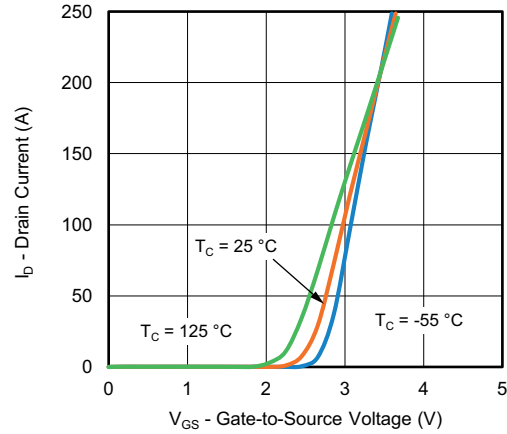
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



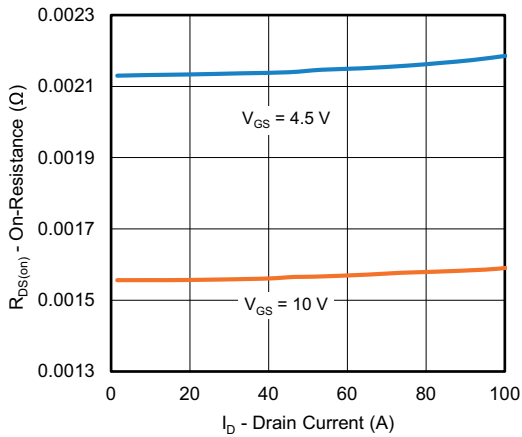
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



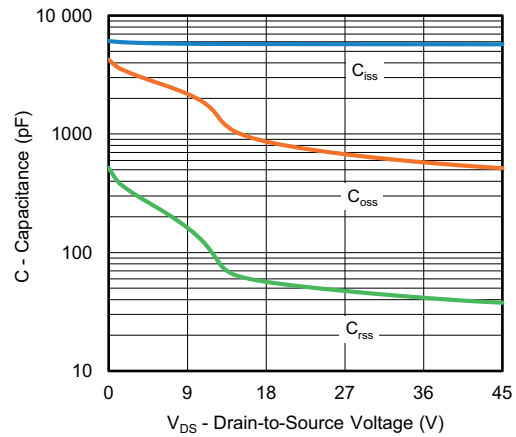
**Output Characteristics**



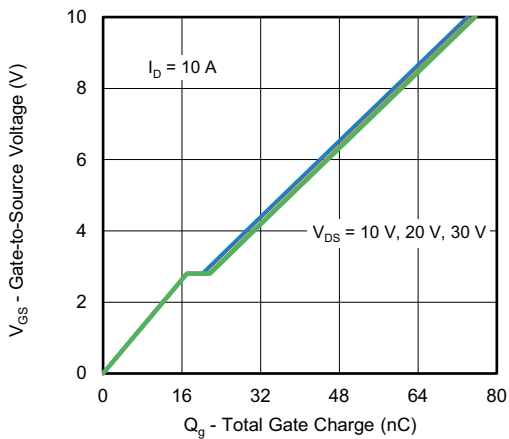
**Transfer Characteristics**



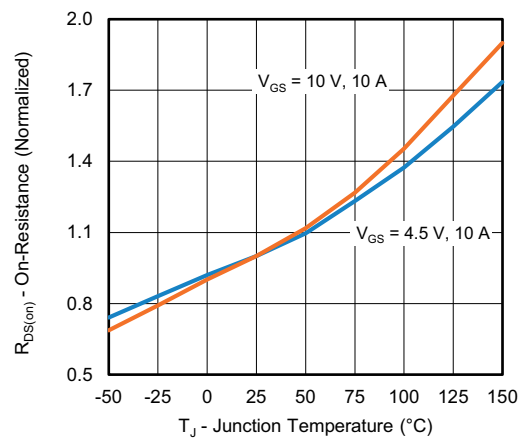
**On-Resistance vs. Drain Current**



**Capacitance**



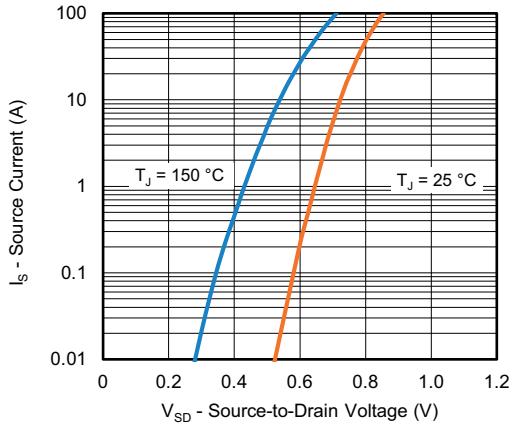
**Gate Charge**



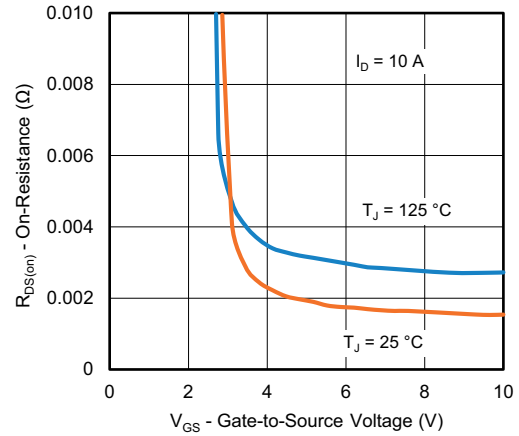
**On-Resistance vs. Junction Temperature**



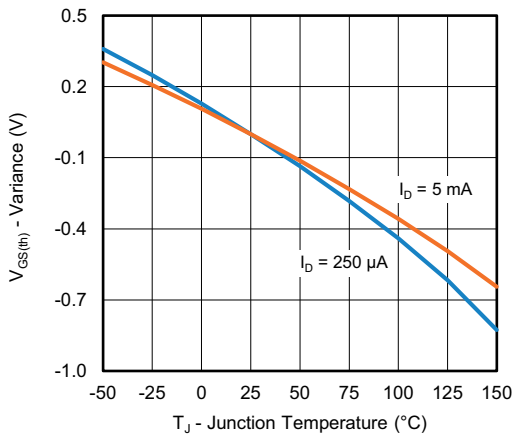
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



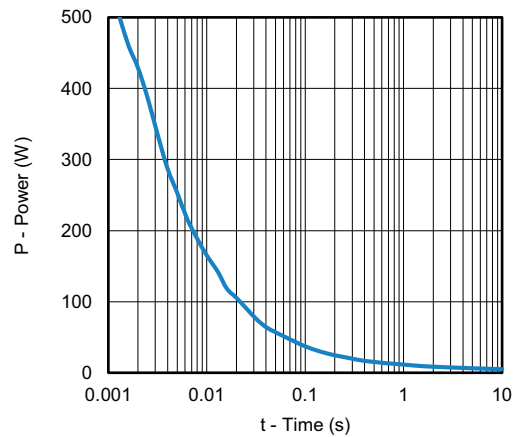
Source-Drain Diode Forward Voltage



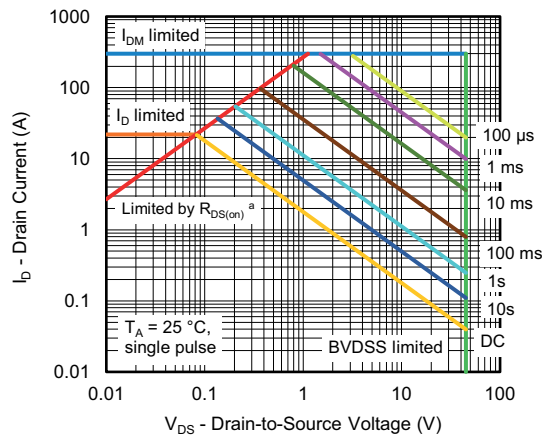
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power, Junction-to-Ambient



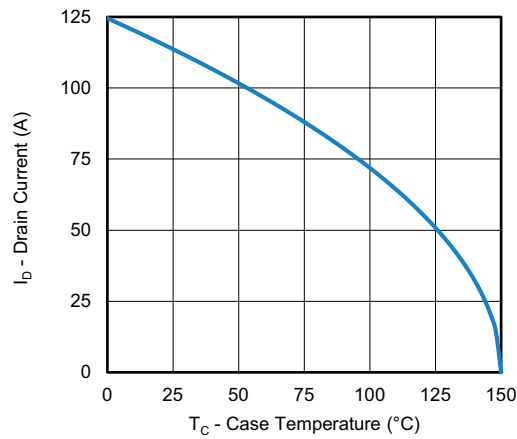
Safe Operating Area

Note

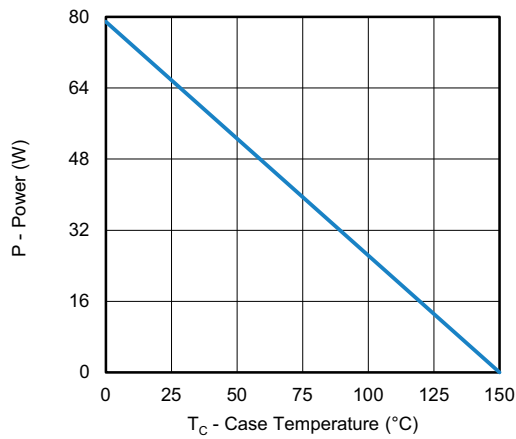
a.  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified



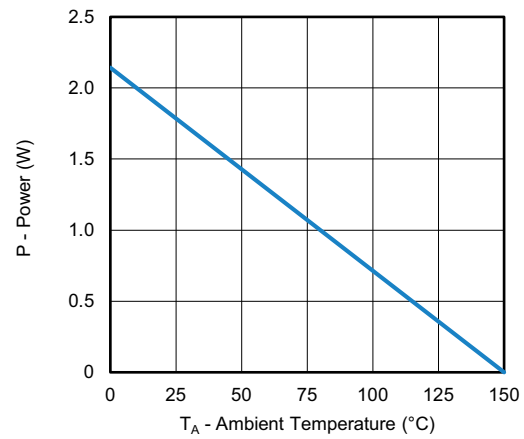
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



**Current Derating <sup>a</sup>**



**Power, Junction-to-Case**



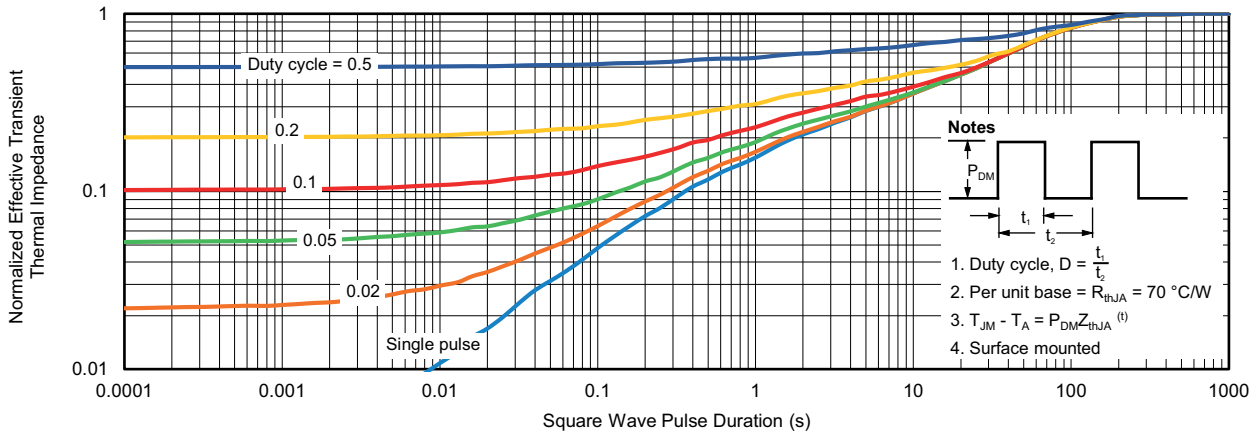
**Power, Junction-to-Ambient**

**Note**

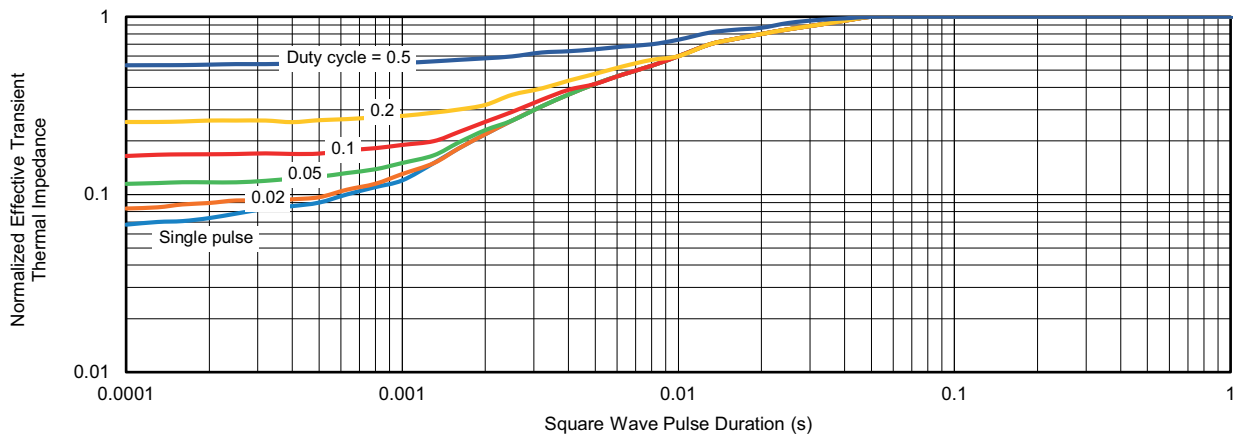
- a. The power dissipation  $P_D$  is based on  $T_J$  max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package 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<sup>®</sup> SO-8L Case Outline 1



Topside view



Backside view (single)



Backside view (dual)



DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.00	1.07	1.14	0.039	0.042	0.045
A1	0.00	-	0.127	0.00	-	0.005
b	0.33	0.41	0.48	0.013	0.016	0.019
b1	0.44	0.51	0.58	0.017	0.020	0.023
b2	4.80	4.90	5.00	0.189	0.193	0.197
b3	0.094			0.004		
b4	0.47			0.019		
c	0.20	0.25	0.30	0.008	0.010	0.012
D	5.00	5.13	5.25	0.197	0.202	0.207
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
D3	1.63	1.73	1.83	0.064	0.068	0.072
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
F	-	-	0.15	-	-	0.006
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
K	0.51			0.020		
W	0.23			0.009		
W1	0.41			0.016		
W2	2.82			0.111		
W3	2.96			0.117		
θ	0°	-	10°	0°	-	10°

ECN: S19-0643-Rev. E, 05-Aug-2019  
 DWG: 5976

Note

- Millimeters will gover





**RECOMMENDED MINIMUM PAD FOR PowerPAK® SO-8L SINGLE**



Recommended Minimum Pads  
Dimensions in mm (inches)



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