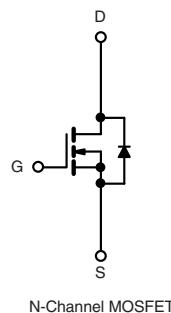


# Automotive N-Channel 60 V (D-S) 175 °C MOSFET

<b>PRODUCT SUMMARY</b>	
$V_{DS}$ (V)	60
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 10$ V	0.017
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 4.5$ V	0.020
$I_D$ (A)	24
Configuration	Single


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


## FEATURES

- TrenchFET® Power MOSFET
- AEC-Q101 Qualified
- 100 %  $R_g$  and UIS Tested
- Material categorization:  
For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

## ORDERING INFORMATION

Package	PowerPAK SO-8L
Lead (Pb)-free and Halogen-free	SQJ464EP-T1-GE3

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current <sup>a</sup>	$I_D$	32	A
		18	
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	41	
Pulsed Drain Current <sup>b</sup>	$I_{DM}$	130	
Single Pulse Avalanche Current	$I_{AS}$	25	
Single Pulse Avalanche Energy	$E_{AS}$	31	mJ
Maximum Power Dissipation <sup>b</sup>	$P_D$	45	W
		15	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to + 175	°C
Soldering Recommendations (Peak Temperature) <sup>d, e</sup>		260	

## THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-Ambient	$R_{thJA}$	70	°C/W
Junction-to-Case (Drain)	$R_{thJC}$	3.3	

### Notes

- Package limited.
- Pulse test; pulse width  $\leq 300$   $\mu$ s, duty cycle  $\leq 2$  %.
- When mounted on 1" square PCB (FR-4 material).
- 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.

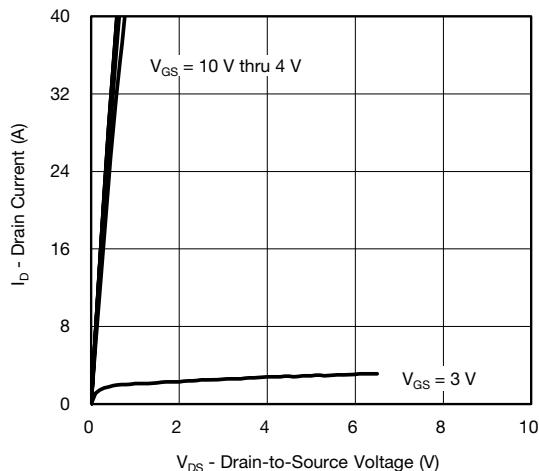
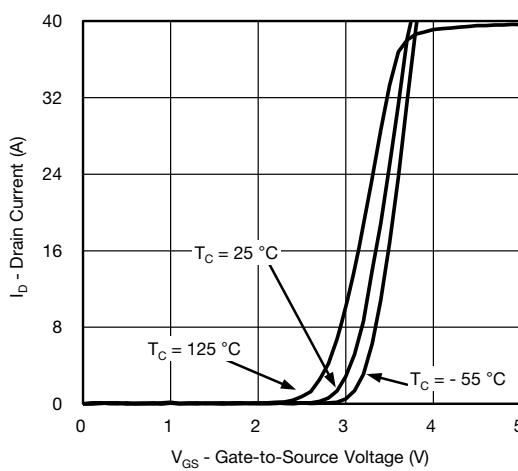
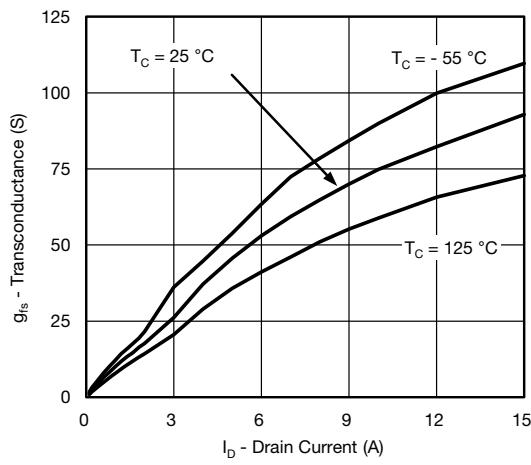
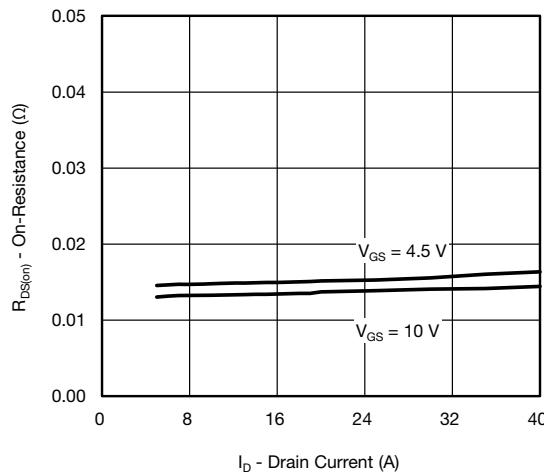
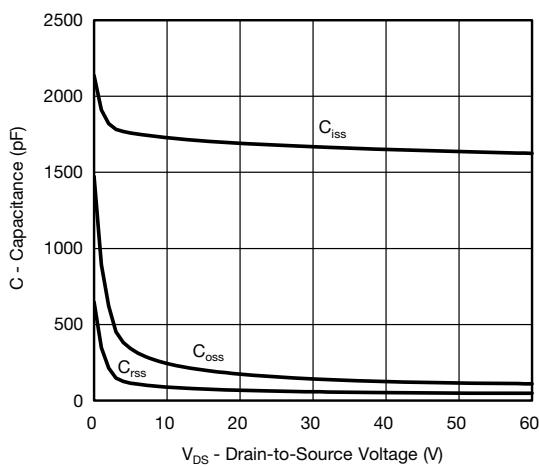
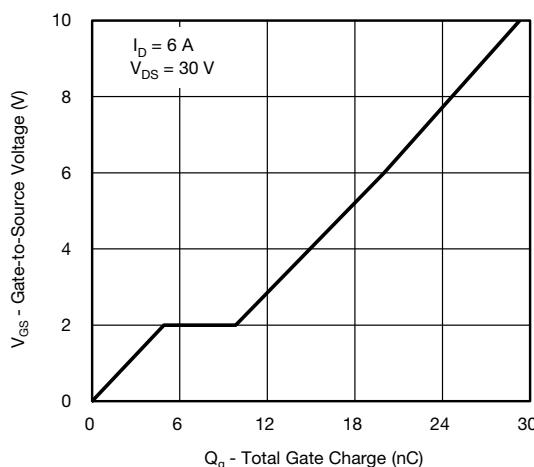
**SPECIFICATIONS** ( $T_C = 25^\circ\text{C}$ , unless otherwise noted)

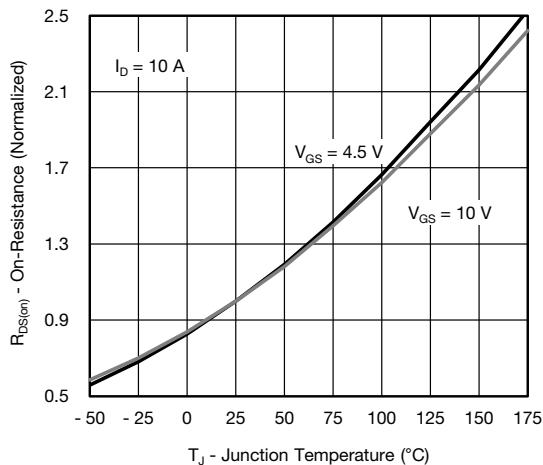
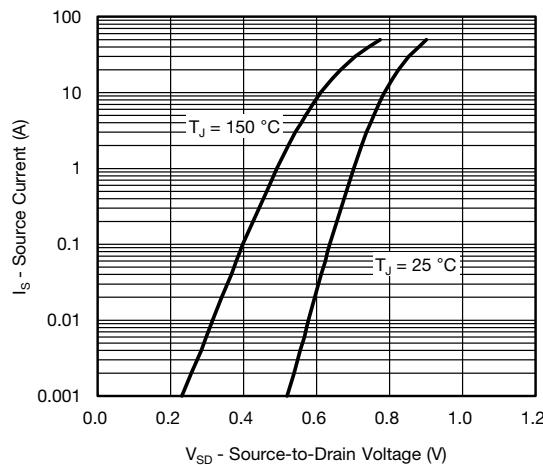
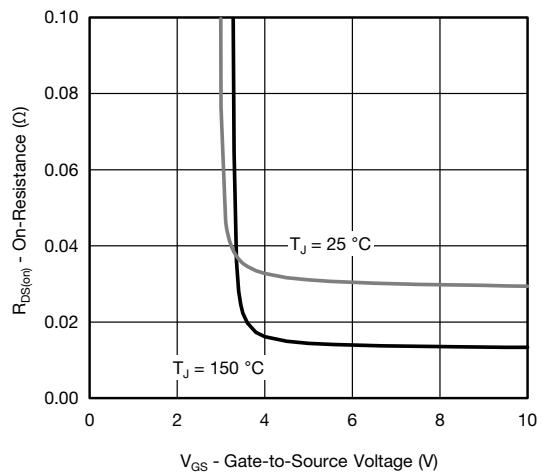
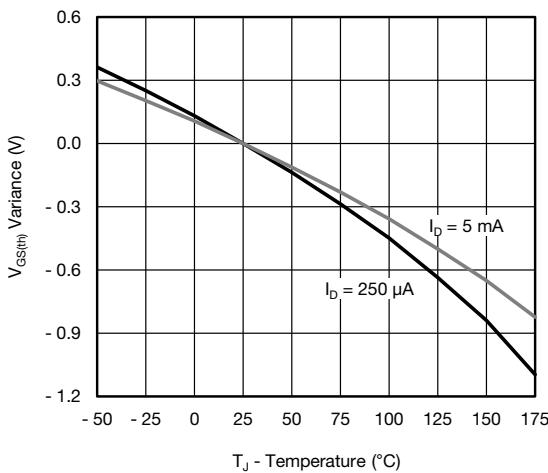
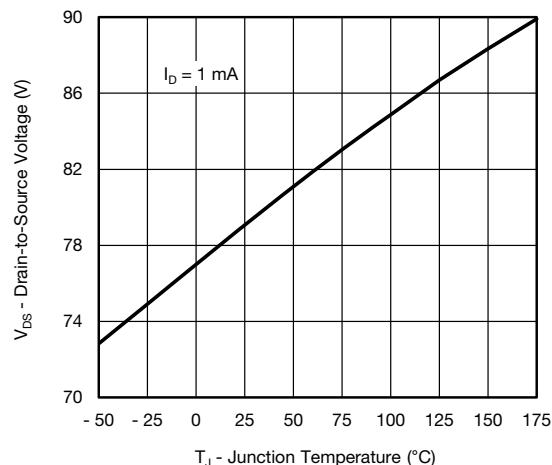
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT	
<b>Static</b>								
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0$	$I_D = 250 \mu\text{A}$	60	-	-	V	
Gate-Source Threshold Voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$	$I_D = 250 \mu\text{A}$	1.5	2.0	2.5		
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0 \text{ V}$	$V_{GS} = \pm 20 \text{ V}$	-	-	$\pm 100$	nA	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0 \text{ V}$	$V_{DS} = 60 \text{ V}$	-	-	1	$\mu\text{A}$	
		$V_{GS} = 0 \text{ V}$	$V_{DS} = 60 \text{ V}, T_J = 125^\circ\text{C}$	-	-	50		
		$V_{GS} = 0 \text{ V}$	$V_{DS} = 60 \text{ V}, T_J = 175^\circ\text{C}$	-	-	150		
On-State Drain Current <sup>a</sup>	$I_{D(\text{on})}$	$V_{GS} = 10 \text{ V}$	$V_{DS} \geq 5 \text{ V}$	30	-	-	A	
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}$	$I_D = 7.1 \text{ A}$	-	0.0140	0.0170	$\Omega$	
		$V_{GS} = 4.5 \text{ V}$	$I_D = 6.5 \text{ A}$	-	0.0165	0.0200		
		$V_{GS} = 10 \text{ V}$	$I_D = 7.1 \text{ A}, T_J = 125^\circ\text{C}$	-	-	0.0310		
		$V_{GS} = 10 \text{ V}$	$I_D = 7.1 \text{ A}, T_J = 175^\circ\text{C}$	-	-	0.0410		
Forward Transconductance <sup>b</sup>	$g_{fs}$	$V_{DS} = 15 \text{ V}, I_D = 7.1 \text{ A}$		-	60	-	S	
<b>Dynamic<sup>b</sup></b>								
Input Capacitance	$C_{iss}$	$V_{GS} = 0 \text{ V}$	$V_{DS} = 30 \text{ V}, f = 1 \text{ MHz}$	-	1670	2086	pF	
Output Capacitance	$C_{oss}$			-	145	181		
Reverse Transfer Capacitance	$C_{rss}$			-	59	74		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{GS} = 10 \text{ V}$	$V_{DS} = 30 \text{ V}, I_D = 6 \text{ A}$	-	29	44	nC	
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			-	4.9	-		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			-	4.9	-		
Gate Resistance	$R_g$	$f = 1 \text{ MHz}$		0.45	0.91	2	$\Omega$	
Turn-On Delay Time <sup>c</sup>	$t_{d(\text{on})}$	$V_{DD} = 30 \text{ V}, R_L = 30 \Omega$ $I_D \equiv 1 \text{ A}, V_{GEN} = 10 \text{ V}, R_g = 6 \Omega$	$V_{DS} = 30 \text{ V}, I_D = 6 \text{ A}$	-	7.7	11.5	ns	
Rise Time <sup>c</sup>	$t_r$			-	8.9	13.4		
Turn-Off Delay Time <sup>c</sup>	$t_{d(\text{off})}$			-	25.4	38		
Fall Time <sup>c</sup>	$t_f$			-	8.8	13.2		
<b>Source-Drain Diode Ratings and Characteristics<sup>b</sup></b>								
Pulsed Current <sup>a</sup>	$I_{SM}$			-	-	96	A	
Forward Voltage	$V_{SD}$	$I_F = 4.8 \text{ A}, V_{GS} = 0$		-	0.8	1.2	V	

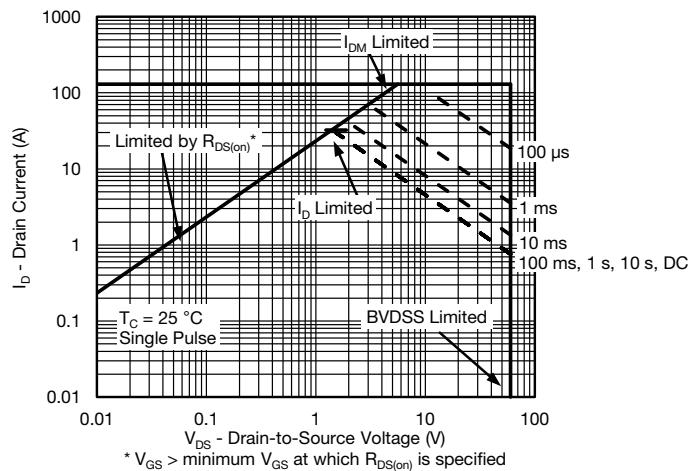
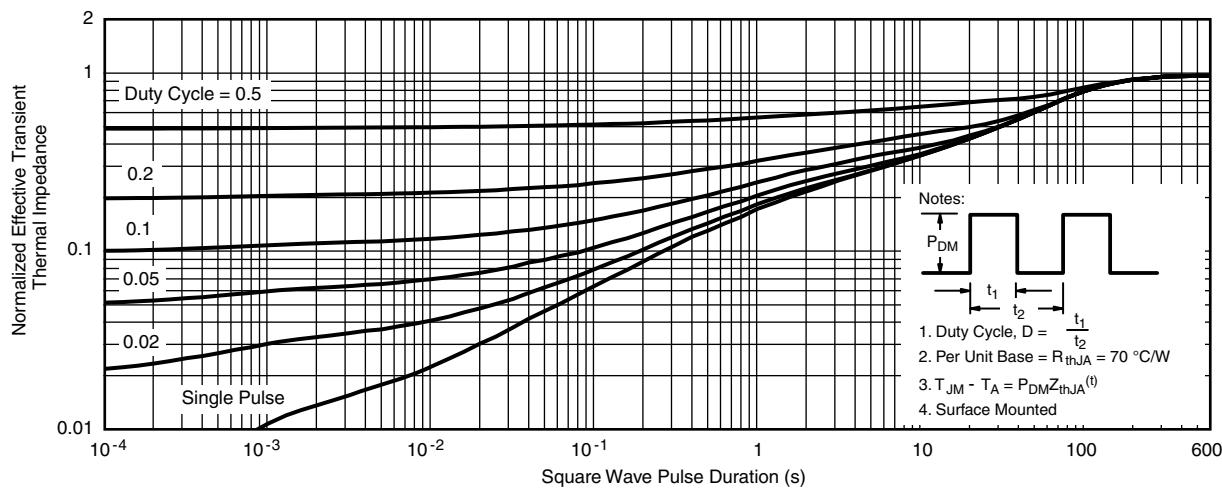
**Notes**

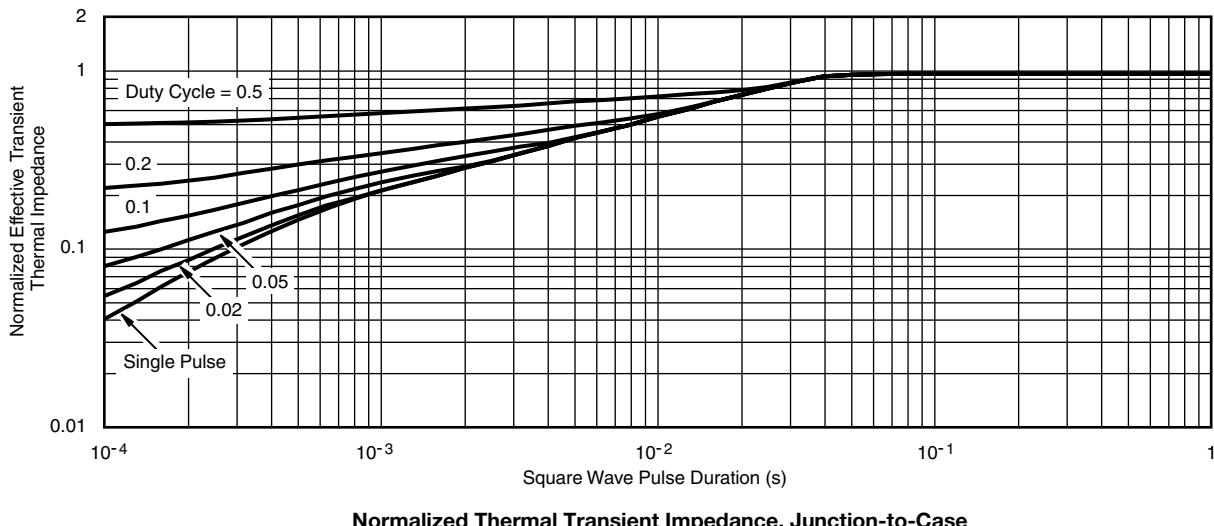
- a. Pulse test; pulse width  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2\%$ .
- b. Guaranteed by design, not subject to production testing.
- c. Independent of operating temperature.

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

**Output Characteristics**

**Transfer Characteristics**

**Transconductance**

**On-Resistance vs. Drain Current**

**Capacitance**

**Gate Charge**

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

**On-Resistance vs. Junction Temperature**

**Source Drain Diode Forward Voltage**

**On-Resistance vs. Gate-to-Source Voltage**

**Threshold Voltage**

**Drain Source Breakdown vs. Junction Temperature**

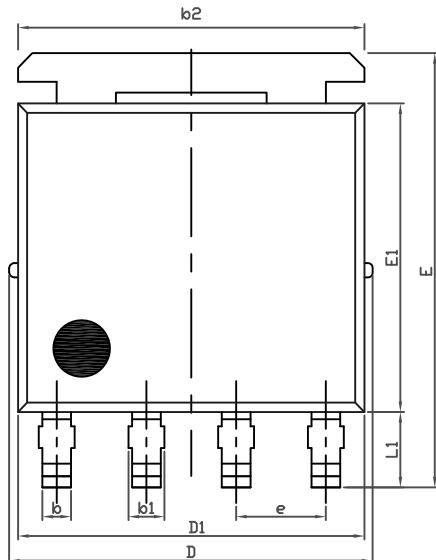
**THERMAL RATINGS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)

**Safe Operating Area**

**Normalized Thermal Transient Impedance, Junction-to-Ambient**

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

**Normalized Thermal Transient Impedance, Junction-to-Case**
**Note**

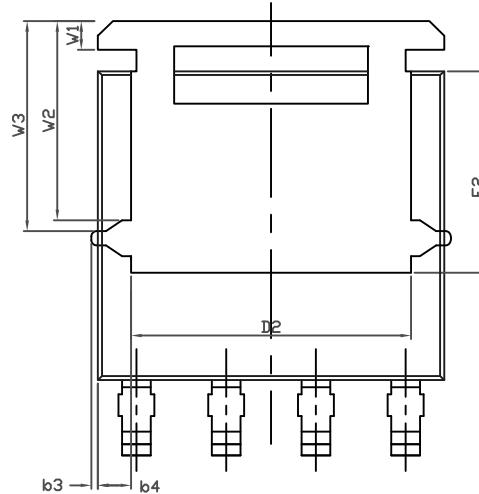
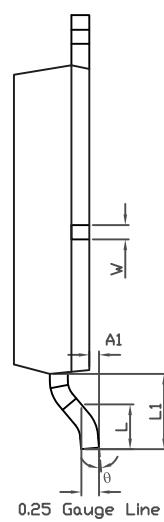
- The characteristics shown in the two graphs
    - Normalized Transient Thermal Impedance Junction-to-Ambient ( $25^\circ\text{C}$ )
    - Normalized Transient Thermal Impedance Junction-to-Case ( $25^\circ\text{C}$ )
- are given for general guidelines only to enable the user to get a "ball park" indication 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.

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?65397](http://www.vishay.com/ppg?65397).

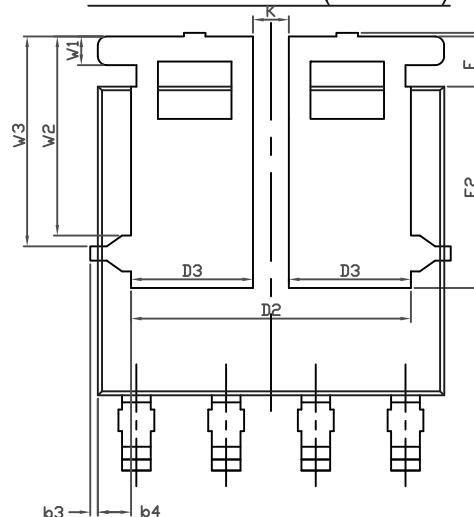
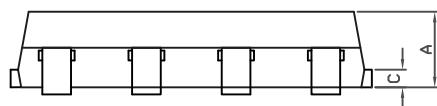
## PowerPAK® SO-8L Case Outline for all Parts



TOPSIDE VIEW



BACKSIDE VIEW(SINGLE)



BACKSIDE VIEW(DUAL)



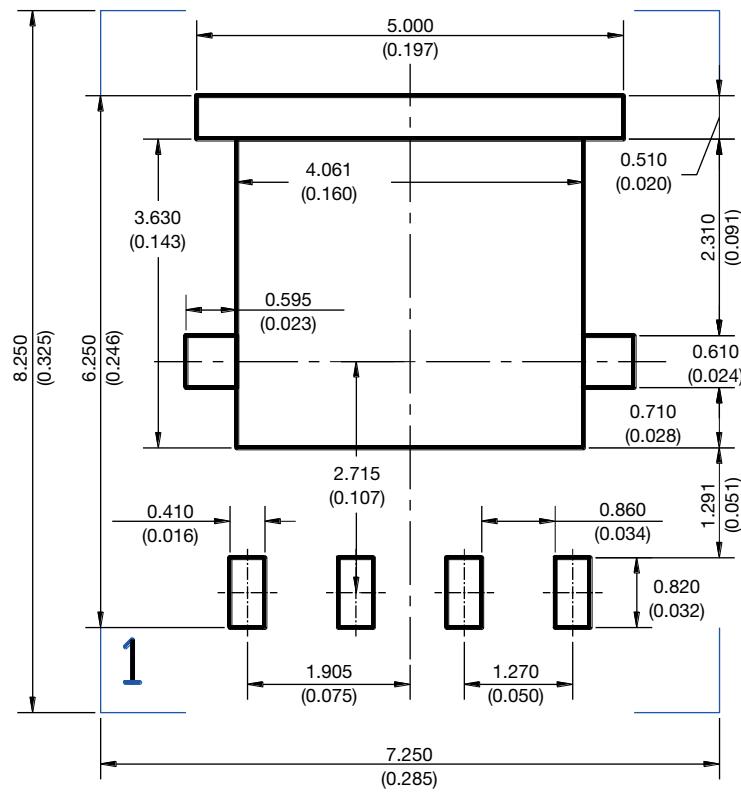
DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.00	1.07	1.14	0.039	0.042	0.045
A1	0.00	-	0.127	0.00	-	0.005
b	0.33	0.41	0.48	0.013	0.016	0.019
b1	0.44	0.51	0.58	0.017	0.020	0.023
b2	4.80	4.90	5.00	0.189	0.193	0.197
b3	0.094			0.004		
b4	0.47			0.019		
c	0.20	0.25	0.30	0.008	0.010	0.012
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	2.75	2.85	2.95	0.108	0.112	0.116
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		
q	0°	-	10°	0°	-	10°

ECN: C15-1203-Rev. A, 07-Sep-15

DWG: 6044

**Note**

- Millimeters will govern

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




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**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

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#### Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помошь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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Факс: 8 (812) 320-02-42

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