## SQJ461EP

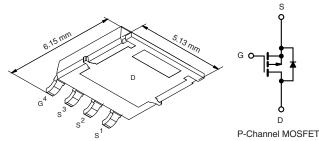


**Vishay Siliconix** 

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

PRODUCT SUMMARY	
V <sub>DS</sub> (V)	- 60
$R_{DS(on)} (\Omega)$ at $V_{GS} = -10 \text{ V}$	0.016
$R_{DS(on)} (\Omega)$ at $V_{GS} = -4.5 V$	0.021
I <sub>D</sub> (A)	- 30
Configuration	Single

#### PowerPAK<sup>®</sup> SO-8L Single



#### **FEATURES**

- Halogen-free According to IEC 61249-2-21
  Definition
- TrenchFET<sup>®</sup> Power MOSFET
- AEC-Q101 Qualified<sup>d</sup>
- 100 %  $R_{\rm q}$  and UIS Tested
- Compliant to RoHS Directive 2002/95/EC



COMPLIANT HALOGEN

ORDERING INFORMATION	
Package	PowerPAK SO-8L
Lead (Pb)-free and Halogen-free	SQJ461EP-T1-GE3

ABSOLUTE MAXIMUM RATING			1		
PARAMETER		SYMBOL	LIMIT	UNIT	
Drain-Source Voltage		V <sub>DS</sub>	- 60	V	
Gate-Source Voltage		V <sub>GS</sub>	± 20		
Continuous Drain Current <sup>a</sup>	T <sub>C</sub> = 25 °C	1	- 30		
Continuous Drain Currents	T <sub>C</sub> = 125 °C	ID	- 29		
Continuous Source Current (Diode Conduct	ion) <sup>a</sup>	I <sub>S</sub>	- 30	А	
Pulsed Drain Current <sup>b</sup>		I <sub>DM</sub>	- 120		
Single Pulse Avalanche Current		I <sub>AS</sub>	- 50		
Single Pulse Avalanche Energy	L = 0.1 MH	E <sub>AS</sub>	125	mJ	
Maximum Power Dissipation <sup>b</sup>	T <sub>C</sub> = 25 °C	P	83	W	
	T <sub>C</sub> = 125 °C	PD	27	vv	
Operating Junction and Storage Temperatu	re Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to + 175	**	
Soldering Recommendations (Peak Temperature) <sup>e, f</sup>		-	260	°C	

THERMAL RESISTANCE RATINGS				
PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-Ambient	PCB Mount <sup>c</sup>	R <sub>thJA</sub>	65 °C/W	
Junction-to-Case (Drain)		R <sub>thJC</sub>	1.8	0/10

#### Notes

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

- e. See Solder Profile (<u>www.vishay.com/doc?73257</u>). The PowerPAK SO-8L. 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.
- f. Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.

d. Parametric verification ongoing.

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PARAMETER	SYMBOL	TES	T CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static	•	-					
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> =	$V_{GS} = 0$ , $I_{D} = -250 \ \mu A$		-	-	v
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =	V <sub>GS</sub> , I <sub>D</sub> = - 250 μA	- 1.5	- 2.0	- 2.5	V
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>DS</sub> =	0 V, $V_{GS} = \pm 20$ V	-	-	± 100	nA
		$V_{GS} = 0 V$	V <sub>DS</sub> = - 60 V	-	-	- 1	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	$V_{GS} = 0 V$	$V_{DS} = -60 \text{ V}, \text{ T}_{J} = 125 ^{\circ}\text{C}$	-	-	- 50	μA
		$V_{GS} = 0 V$	$V_{DS}$ = - 60 V, $T_J$ = 175 °C	-	-	- 150	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>GS</sub> = - 10 V	$V_{DS} \ge 5 V$	- 30	-	-	Α
		V <sub>GS</sub> = - 10 V	I <sub>D</sub> = - 14.4 A	-	0.013	0.016	
Drain-Source On-State Resistance <sup>a</sup>	В	$V_{GS} = -4.5 V$	I <sub>D</sub> = - 12.6 A	-	0.017	0.021	
Drain-Source On-State Resistance	R <sub>DS(on)</sub>	$V_{GS} = -10 V$	I <sub>D</sub> = - 14.4 A, T <sub>J</sub> = 125 °C	-	0.021	0.026	Ω
		V <sub>GS</sub> = - 10 V	I <sub>D</sub> = - 14.4 A, T <sub>J</sub> = 175 °C	-	0.026	0.032	
Forward Transconductanceb	9 <sub>fs</sub>	V <sub>DS</sub> = ·	- 15 V, I <sub>D</sub> = - 14.4 A	-	40	-	S
Dynamic <sup>b</sup>		-					
Input Capacitance	C <sub>iss</sub>			-	3920	4710	
Output Capacitance	C <sub>oss</sub>	$V_{GS} = 0 V$	V <sub>DS</sub> = - 30 V, f = 1 MHz	-	420	510	pF
Reverse Transfer Capacitance	C <sub>rss</sub>			-	295	360	]
Total Gate Charge <sup>c</sup>	Qg			-	90	140	
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>	V <sub>GS</sub> = - 10 V	$V_{DS} = -30 V$ , $I_{D} = -14.4 A$	-	13	-	nC
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			-	22	-	]
Gate Resistance	Rg		f = 1 MHz	1.4	2.3	3.2	Ω
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>			-	16	20	
Rise Time <sup>c</sup>	t <sub>r</sub>		$-30 \text{ V}, \text{ R}_{\text{I}} = 30 \Omega$	-	10	13	1
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>	I <sub>D</sub> ≅ - 1 Å, '	$V_{\text{GEN}} = -10$ V, $R_{\text{g}} = 6 \Omega$	-	70	85	ns
Fall Time <sup>c</sup>	t <sub>f</sub>	1		-	22	30	1
Source-Drain Diode Ratings and Char	acteristics <sup>b</sup>	•					
Pulsed Current <sup>a</sup>	I <sub>SM</sub>			-	-	- 120	Α
Forward Voltage	V <sub>SD</sub>	In -	- 4.5 A, V <sub>GS</sub> = 0	-	- 0.8	- 1.2	V

Notes

a. Pulse test; pulse width  $\leq$  300 µs, duty cycle  $\leq$  2 %.

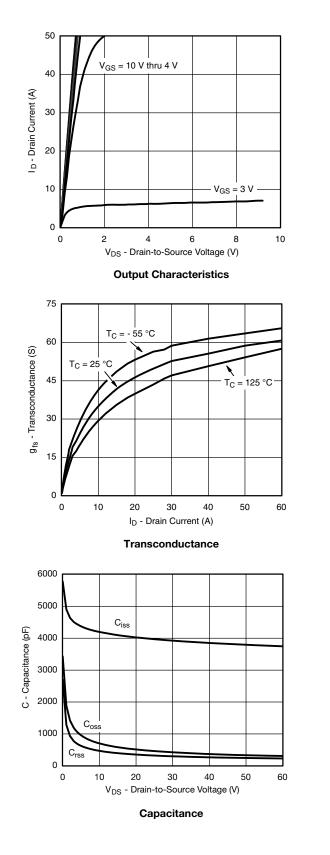
b. Guaranteed by design, not subject to production testing.

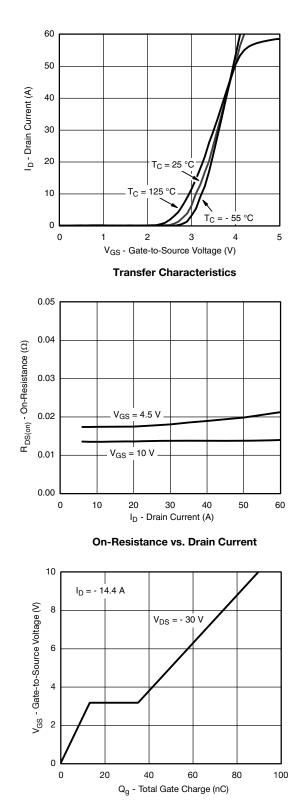
c. Independent of operating temperature.

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





Gate Charge

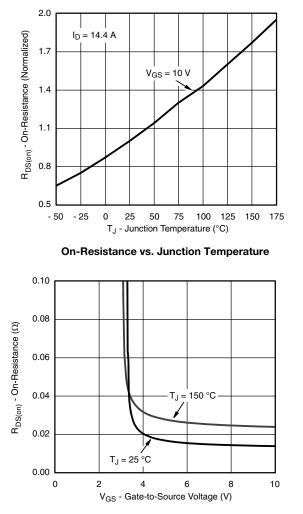
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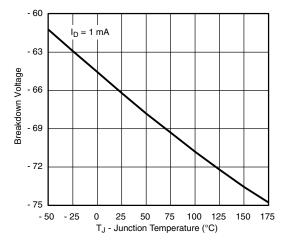
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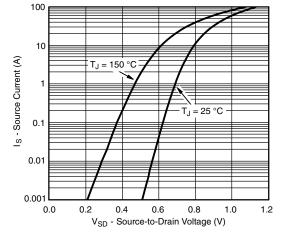
### **TYPICAL CHARACTERISTICS** ( $T_A = 25 \text{ °C}$ , unless otherwise noted)



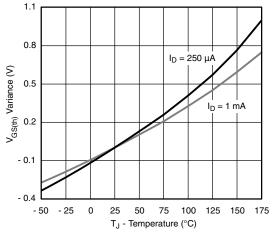
**On-Resistance vs. Gate-to-Source Voltage** 



Breakdown Voltage vs. Junction Temperature



Source Drain Diode Forward Voltage

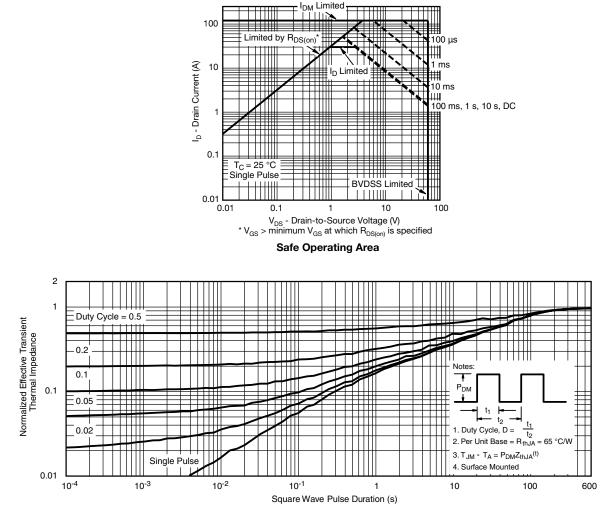




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### **THERMAL RATINGS** ( $T_A = 25 \text{ °C}$ , unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient

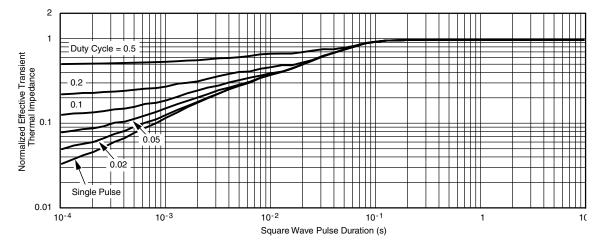
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## SQJ461EP

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### **THERMAL RATINGS** (T<sub>A</sub> = 25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Case

#### Note

• The characteristics shown in the two graphs

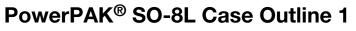
- Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)

- Normalized Transient Thermal Impedance Junction-to-Case (25 °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 <a href="http://www.vishay.com/ppg?65541">www.vishay.com/ppg?65541</a>.

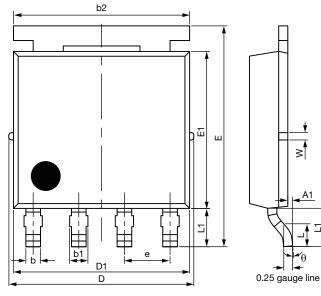


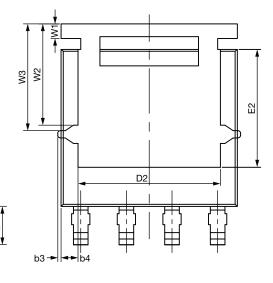


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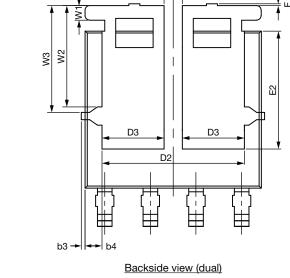
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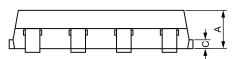




Topside view

Backside view (single)





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## **Package Information**



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DIM	MILLIMETERS			INCHES			
DIM.	MIN.	NOM.	MAX.	MIN.	MIN. NOM.		
А	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		
С	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	
е		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	
К		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°	

Note

• Millimeters will gover



#### RECOMMENDED MINIMUM PAD FOR PowerPAK<sup>®</sup> SO-8L SINGLE



Recommended Minimum Pads Dimensions in mm (inches)

Revision: 07-Feb-12



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