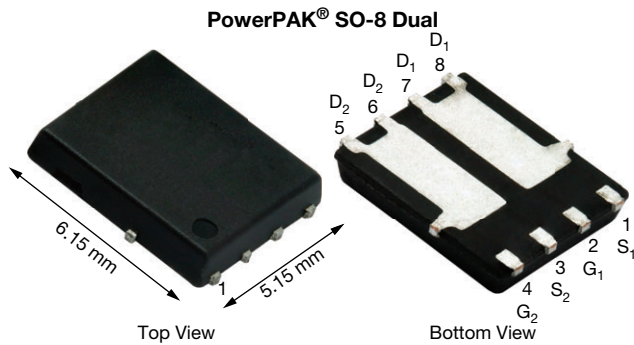


## Dual N-Channel 60 V (D-S) MOSFET



### FEATURES

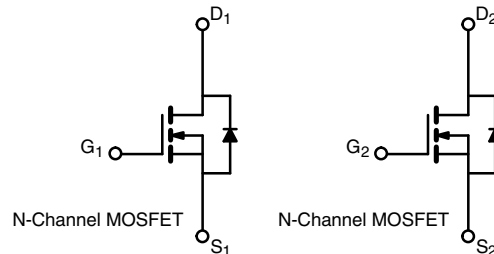
- TrenchFET® power MOSFET
- PWM optimized
- 100 % R<sub>g</sub> and UIS tested
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

### APPLICATIONS

- System power DC/DC



PRODUCT SUMMARY	
V <sub>DS</sub> (V)	60
R <sub>DS(on)</sub> max. (Ω) at V <sub>GS</sub> = 10 V	0.018
R <sub>DS(on)</sub> max. (Ω) at V <sub>GS</sub> = 4.5 V	0.021
Q <sub>g</sub> typ. (nC)	7.1
I <sub>D</sub> (A)	8 <sup>a</sup>
Configuration	Dual

ORDERING INFORMATION	
Package	PowerPAK SO-8
Lead (Pb)-free and halogen-free	Si7972DP-T1-GE3

ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25 °C, unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	V <sub>DS</sub>	60	V
Gate-source voltage	V <sub>GS</sub>	± 20	
Continuous drain current (T <sub>J</sub> = 150 °C)	I <sub>D</sub>	T <sub>C</sub> = 25 °C	8 <sup>a</sup>
		T <sub>C</sub> = 70 °C	8 <sup>a</sup>
		T <sub>A</sub> = 25 °C	8 <sup>a</sup>
		T <sub>A</sub> = 70 °C	8 <sup>a</sup>
Pulsed drain current	I <sub>DM</sub>	40	A
Source-drain current diode current	I <sub>S</sub>	T <sub>C</sub> = 25 °C	
		T <sub>A</sub> = 25 °C	3 <sup>b, c</sup>
Maximum power dissipation	P <sub>D</sub>	T <sub>C</sub> = 25 °C	22
		T <sub>C</sub> = 70 °C	14
		T <sub>A</sub> = 25 °C	3.6 <sup>b, c</sup>
		T <sub>A</sub> = 70 °C	2.3 <sup>b, c</sup>
Operating junction and storage temperature range	T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C
Soldering recommendations (peak temperature) <sup>d, e</sup>		260	

THERMAL RESISTANCE RATINGS					
PARAMETER	SYMBOL	TYP.	MAX.	UNIT	
Maximum junction-to-ambient <sup>b, f</sup>	R <sub>thJA</sub>	26	35	°C/W	
Maximum junction-to-case (drain)	R <sub>thJC</sub>	4	5.5		

#### Notes

- Package limited
- 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-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
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components
- Maximum under steady state conditions is 80 °C/W



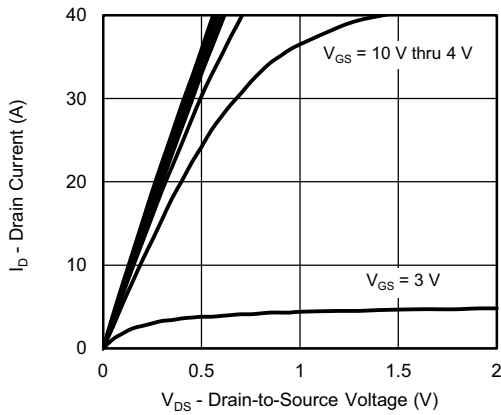
SPECIFICATIONS ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-source breakdown voltage	$V_{DS}$	$V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$	60	-	-	V
$V_{DS}$ temperature coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$	-	38	-	mV/ $^\circ\text{C}$
$V_{GS(th)}$ temperature coefficient	$\Delta V_{GS(th)}/T_J$	$I_D = 250\text{ }\mu\text{A}$	-	-4.9	-	
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	1.2	-	2.7	V
Gate-body leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$	-	-	100	nA
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 85\text{ }^\circ\text{C}$	-	-	10	
On-state drain current <sup>b</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}$ , $V_{GS} = 10\text{ V}$	30	-	-	A
Drain-source on-state resistance <sup>b</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$ , $I_D = 11\text{ A}$	-	0.015	0.018	$\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 10\text{ A}$	-	0.017	0.021	
Forward transconductance <sup>b</sup>	$g_{fs}$	$V_{DS} = 30\text{ V}$ , $I_D = 11\text{ A}$	-	38	-	S
<b>Dynamic <sup>a</sup></b>						
Input capacitance	$C_{iss}$	$V_{DS} = 30\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$	-	1050	-	pF
Output capacitance	$C_{oss}$		-	435	-	
Reverse transfer capacitance	$C_{rss}$		-	20	-	
Total gate charge	$Q_g$	$V_{DS} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 11\text{ A}$	-	15.2	23	nC
		$V_{DS} = 30\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 11\text{ A}$	-	7.1	11	
Gate-source charge	$Q_{gs}$		-	4.4	-	
Gate-drain charge	$Q_{gd}$		-	1.3	-	
Gate resistance	$R_g$	$f = 1\text{ MHz}$	0.12	0.6	1.2	$\Omega$
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 30\text{ V}$ , $R_L = 3.45\text{ }\Omega$ $I_D \cong 8.7\text{ A}$ , $V_{GEN} = 4.5\text{ V}$ , $R_g = 1\text{ }\Omega$	-	15	120	ns
Rise time	$t_r$		-	80	30	
Turn-off delay time	$t_{d(off)}$		-	15	30	
Fall time	$t_f$		-	15	30	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 30\text{ V}$ , $R_L = 3.45\text{ }\Omega$ $I_D \cong 8.7\text{ A}$ , $V_{GEN} = 10\text{ V}$ , $R_g = 1\text{ }\Omega$	-	10	15	
Rise time	$t_r$		-	25	40	
Turn-off delay time	$t_{d(off)}$		-	20	30	
Fall time	$t_f$		-	10	15	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous source-drain diode Current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$	-	-	8	A
Pulse diode forward current <sup>a</sup>	$I_{SM}$		-	-	40	
Body diode voltage	$V_{SD}$	$I_S = 8.7\text{ A}$	-	0.8	1.2	V
Body diode reverse recovery time	$t_{rr}$	$I_F = 8.7\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $T_J = 25\text{ }^\circ\text{C}$	-	34	51	ns
Body diode reverse recovery charge	$Q_{rr}$		-	30	45	nC
Reverse recovery fall time	$t_a$		-	16	-	ns
Reverse recovery rise time	$t_b$		-	18	-	

**Notes**

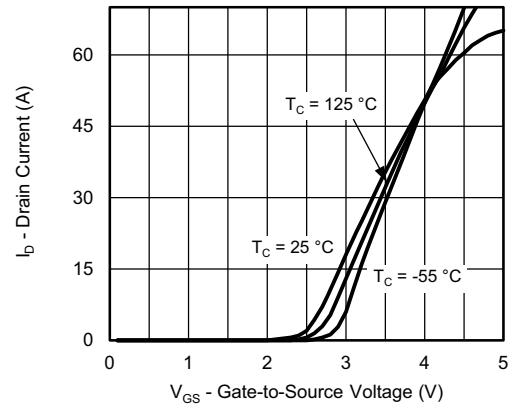
- a. Guaranteed by design, not subject to production testing  
b. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$

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.

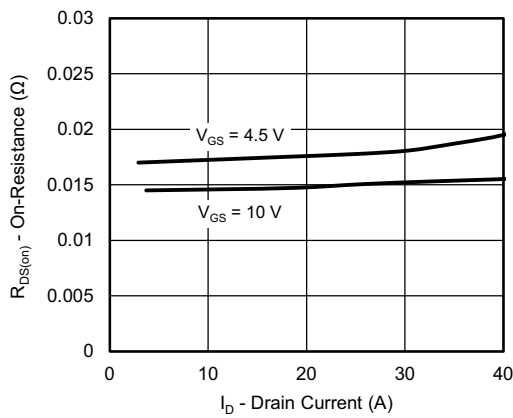
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



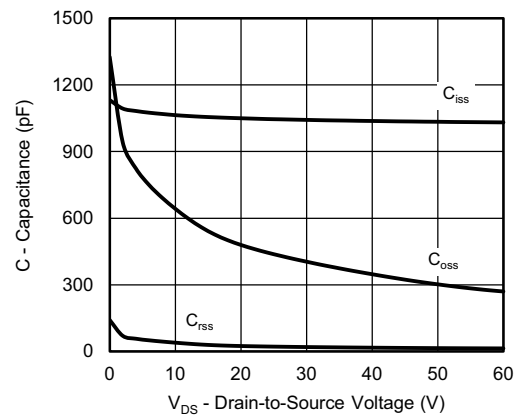
**Output Characteristics**



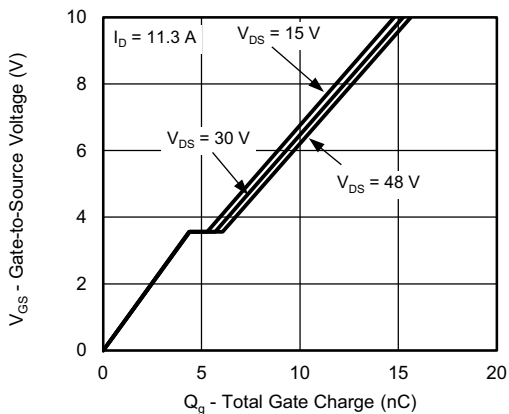
**Transfer Characteristics**



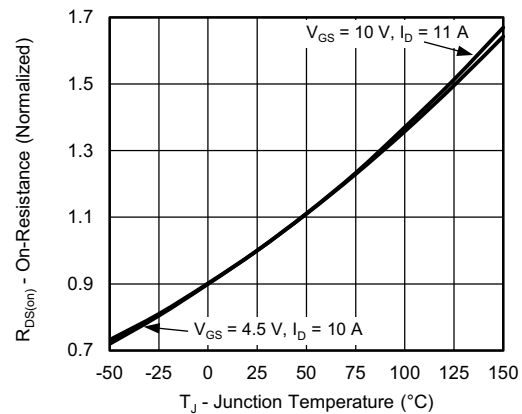
**On-Resistance vs. Drain Current**



**Capacitance**

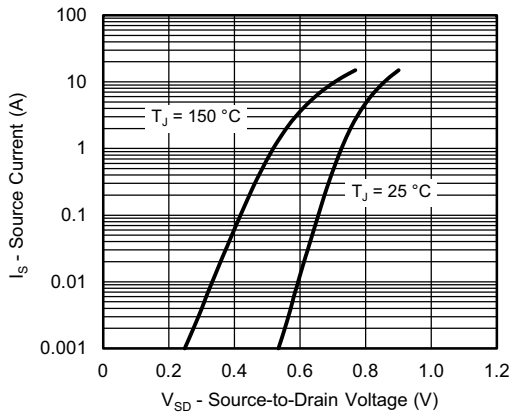


**Gate Charge**

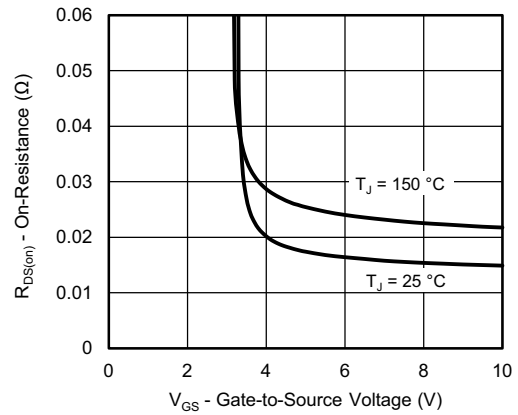


**On-Resistance vs. Junction Temperature**

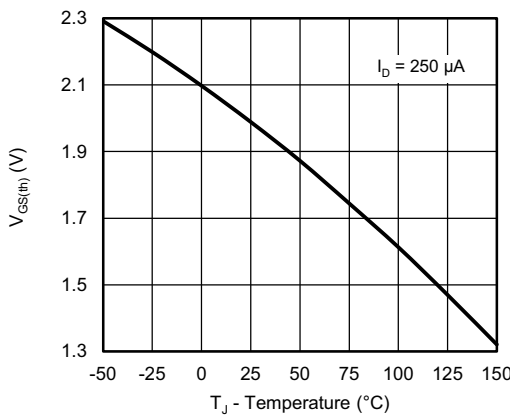
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



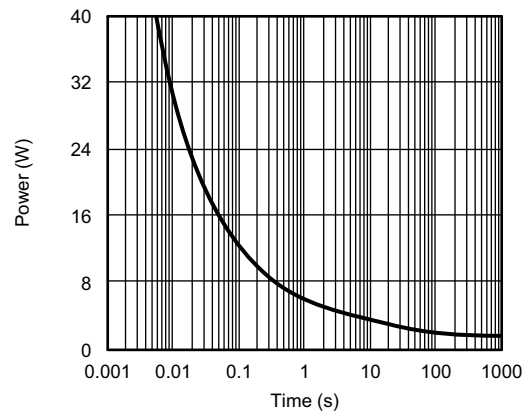
**Source-Drain Diode Forward Voltage**



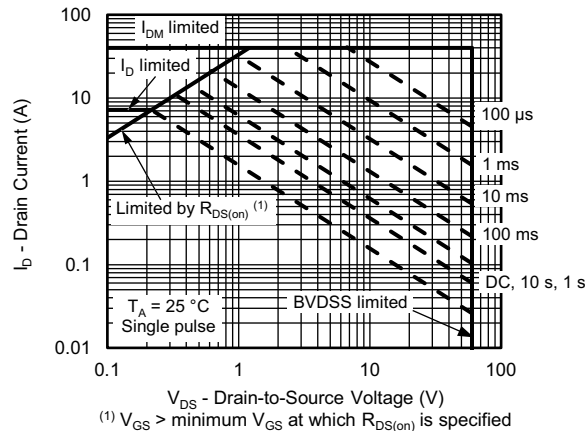
**On-Resistance vs. Gate-to-Source Voltage**



**Threshold Voltage**



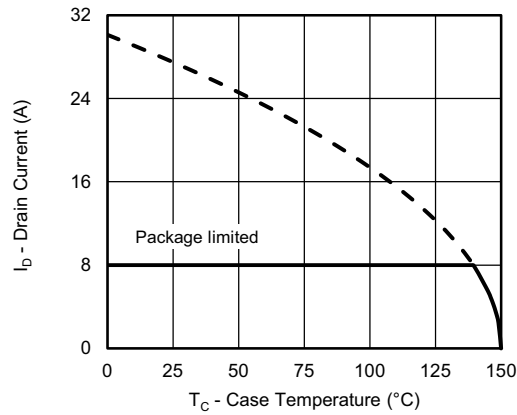
**Single Pulse Power**



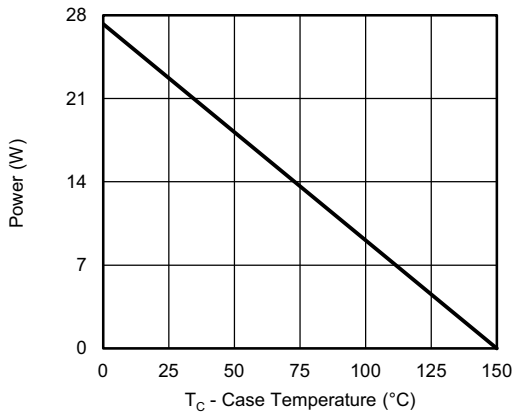
**Safe Operating Area, Junction-to-Ambient**



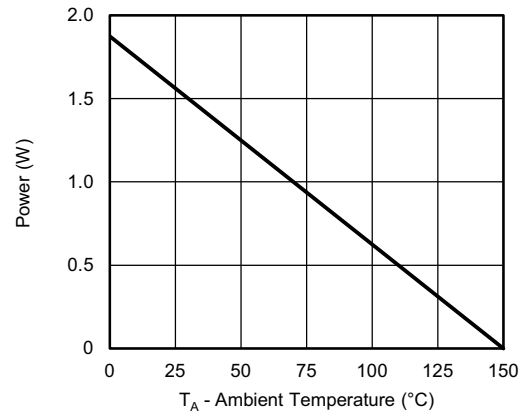
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating <sup>a</sup>



Power, Junction-to-Case



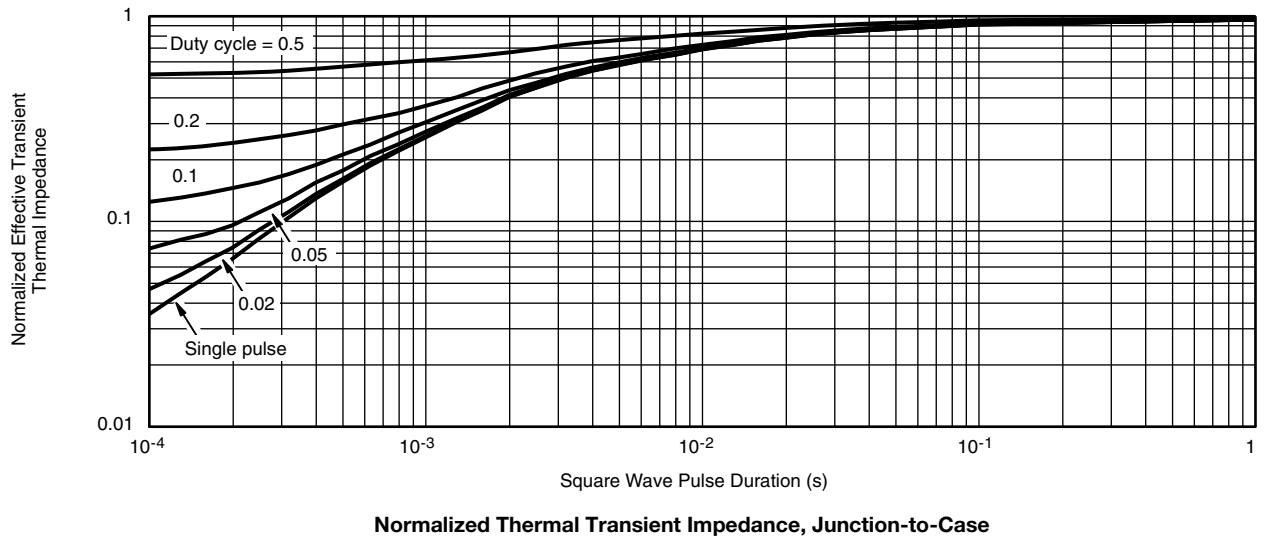
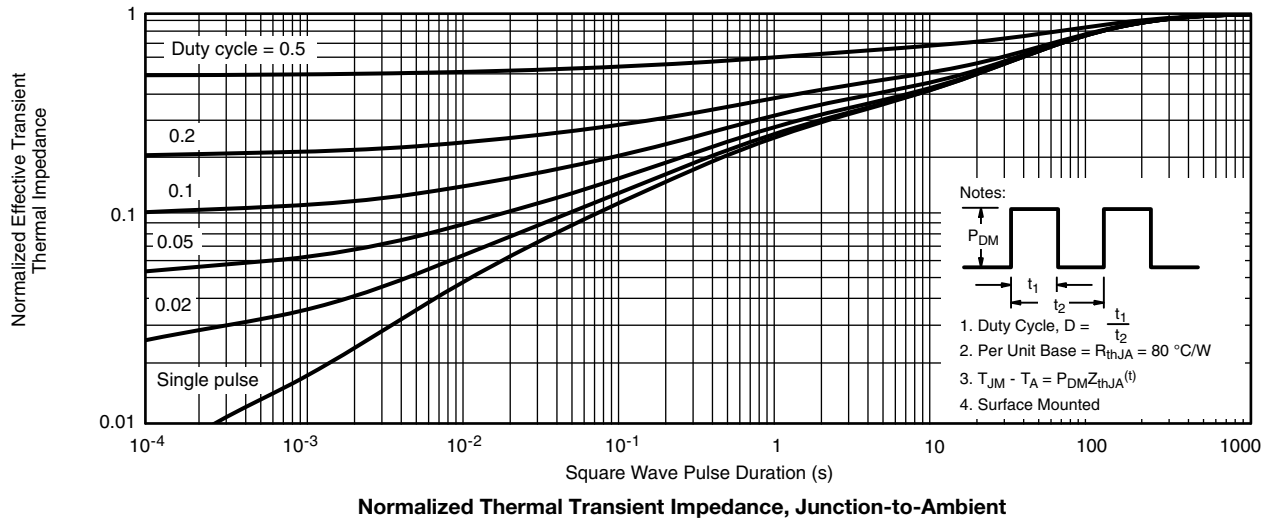
Power, Junction-to-Ambient

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)



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?75360](http://www.vishay.com/ppg?75360).



# PowerPAK<sup>®</sup> SO-8, (Single/Dual)



- Notes**
1. Inch will govern.
  2. Dimensions exclusive of mold gate burrs.
  3. Dimensions exclusive of mold flash and cutting burrs.

DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.97	1.04	1.12	0.038	0.041	0.044
A1		-	0.05	0	-	0.002
b	0.33	0.41	0.51	0.013	0.016	0.020
c	0.23	0.28	0.33	0.009	0.011	0.013
D	5.05	5.15	5.26	0.199	0.203	0.207
D1	4.80	4.90	5.00	0.189	0.193	0.197
D2	3.56	3.76	3.91	0.140	0.148	0.154
D3	1.32	1.50	1.68	0.052	0.059	0.066
D4	0.57 typ.			0.0225 typ.		
D5	3.98 typ.			0.157 typ.		
E	6.05	6.15	6.25	0.238	0.242	0.246
E1	5.79	5.89	5.99	0.228	0.232	0.236
E2	3.48	3.66	3.84	0.137	0.144	0.151
E3	3.68	3.78	3.91	0.145	0.149	0.154
E4	0.75 typ.			0.030 typ.		
e	1.27 BSC			0.050 BSC		
K	1.27 typ.			0.050 typ.		
K1	0.56	-	-	0.022	-	-
H	0.51	0.61	0.71	0.020	0.024	0.028
L	0.51	0.61	0.71	0.020	0.024	0.028
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
M	0.125 typ.			0.005 typ.		
ECN: S17-0173-Rev. L, 13-Feb-17						
DWG: 5881						

## RECOMMENDED MINIMUM PADS FOR PowerPAK® SO-8 Single



Recommended Minimum Pads  
Dimensions in Inches/(mm)

[Return to Index](#)





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