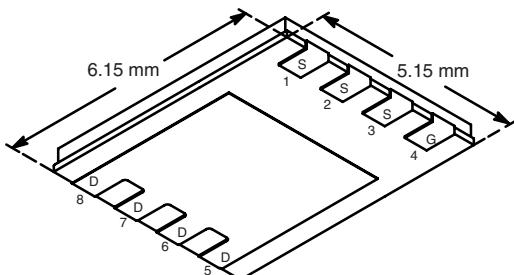


## N-Channel 40-V (D-S) MOSFET

PRODUCT SUMMARY			
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>a</sup>	$Q_g$ (Typ.)
40	0.0035 at $V_{GS} = 10$ V	50	45 nC
	0.0047 at $V_{GS} = 4.5$ V	50	

PowerPAK® SO-8



Bottom View

**Ordering Information:** Si7156DP-T1-E3 (Lead (Pb)-free)  
Si7156DP-T1-GE3 (Lead (Pb)-free and Halogen-free)

### FEATURES

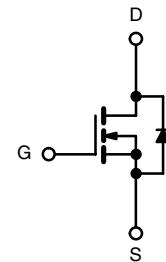
- Halogen-free According to IEC 61249-2-21 Available
- TrenchFET® Power MOSFET
- 100 %  $R_g$  Tested
- 100 % Avalanche Tested



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

### APPLICATIONS

- Synchronous Rectification
- Secondary Side DC/DC



N-Channel MOSFET

### ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	40	
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current ( $T_J = 150$ °C)	$I_D$	50 <sup>a</sup>	A
		50 <sup>a</sup>	
		29 <sup>b, c</sup>	
		23 <sup>b, c</sup>	
	$I_{DM}$	70	
Pulsed Drain Current	$I_S$	50 <sup>a</sup>	
		4.9 <sup>b, c</sup>	
Continuous Source-Drain Diode Current	$I_{AS}$	40	
Single Pulse Avalanche Current	$E_{AS}$	80	mJ
Maximum Power Dissipation	$P_D$	83	W
		53	
		5.4 <sup>b, c</sup>	
		3.4 <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>	$t \leq 10$ s	$R_{thJA}$	18	23
Maximum Junction-to-Case (Drain)	Steady State	$R_{thJC}$	1.0	1.5

Notes:

a. Package Limited.

b. Surface Mounted on 1" x 1" FR4 board.

c.  $t = 10$  s.

d. See Solder Profile ([www.vishay.com/ppg/73257](http://www.vishay.com/ppg/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.

e. Rework Conditions: manual soldering with a soldering iron is not recommended for leadless components.

f. Maximum under Steady State conditions is 65 °C/W.

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

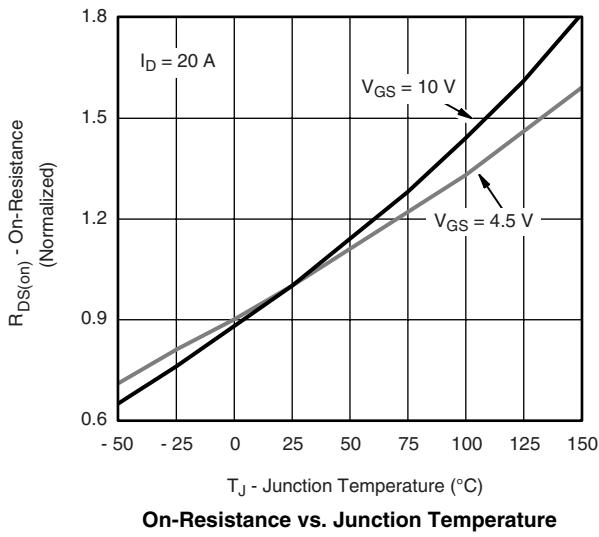
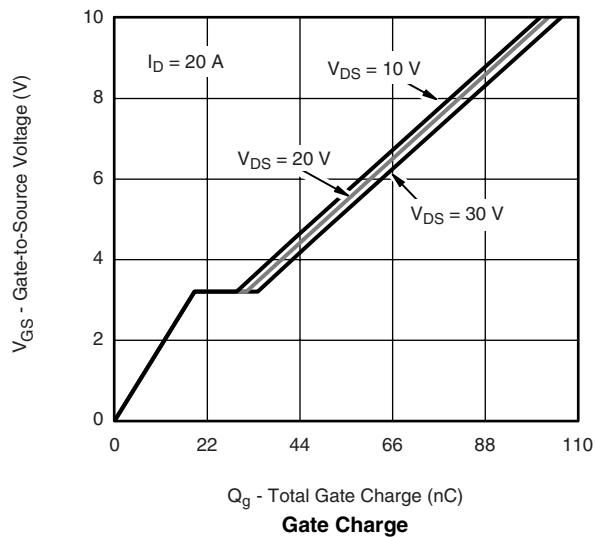
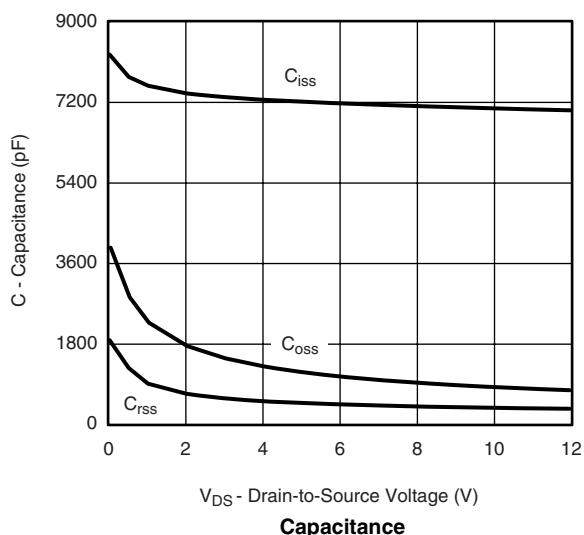
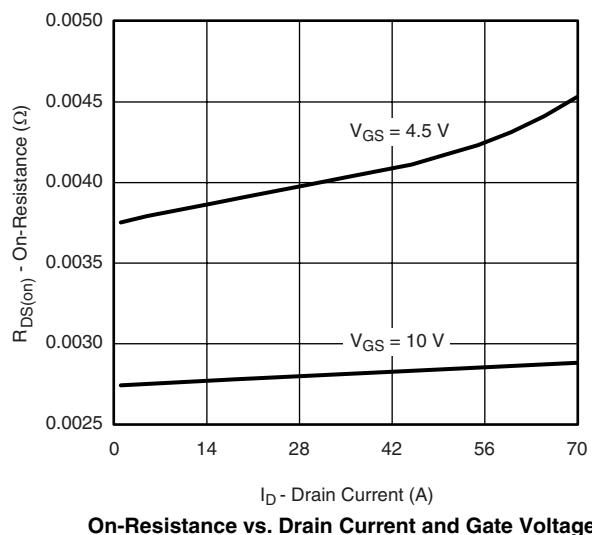
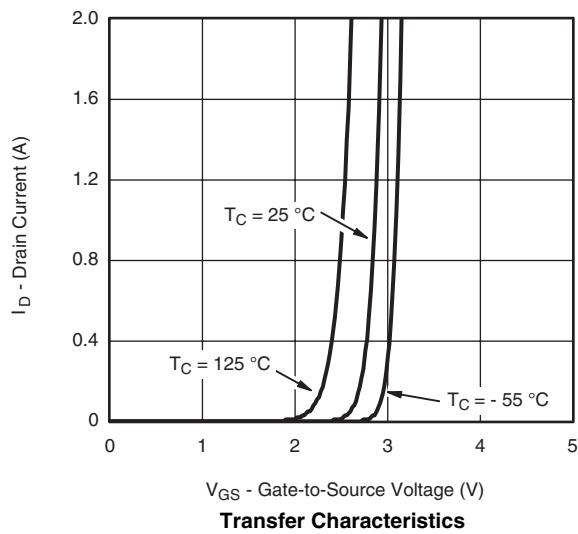
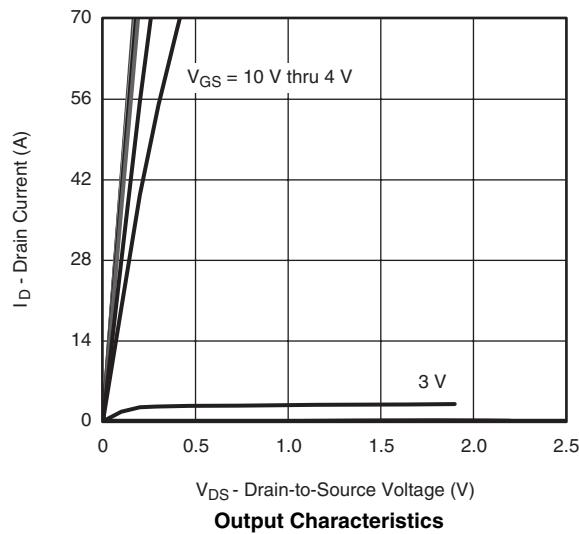
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$	40			V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250 \mu\text{A}$		45		mV/°C
$V_{GS(\text{th})}$ Temperature Coefficient	$\Delta V_{GS(\text{th})}/T_J$			- 6.5		
Gate-Source Threshold Voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$	1.0		3.0	V
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0 \text{ V}$ , $V_{GS} = \pm 20 \text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 40 \text{ V}$ , $V_{GS} = 0 \text{ V}$		1		$\mu\text{A}$
		$V_{DS} = 40 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 55^\circ\text{C}$			10	
On-State Drain Current <sup>a</sup>	$I_{D(\text{on})}$	$V_{DS} \geq 5 \text{ V}$ , $V_{GS} = 10 \text{ V}$	30			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}$ , $I_D = 20 \text{ A}$		0.0028	0.0035	$\Omega$
		$V_{GS} = 4.5 \text{ V}$ , $I_D = 15 \text{ A}$		0.0038	0.0047	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15 \text{ V}$ , $I_D = 20 \text{ A}$		85		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 20 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$		6900		pF
Output Capacitance	$C_{oss}$			605		
Reverse Transfer Capacitance	$C_{rss}$			310		
Total Gate Charge	$Q_g$	$V_{DS} = 20 \text{ V}$ , $V_{GS} = 10 \text{ V}$ , $I_D = 20 \text{ A}$		103	155	nC
				45	70	
Gate-Source Charge	$Q_{gs}$	$V_{DS} = 20 \text{ V}$ , $V_{GS} = 4.5 \text{ V}$ , $I_D = 20 \text{ A}$		19		
Gate-Drain Charge	$Q_{gd}$			12.3		
Gate Resistance	$R_g$	$f = 1 \text{ MHz}$		0.6	1.2	$\Omega$
Turn-On Delay Time	$t_{d(\text{on})}$	$V_{DD} = 20 \text{ V}$ , $R_L = 2 \Omega$ $I_D \geq 10 \text{ A}$ , $V_{GEN} = 10 \text{ V}$ , $R_g = 1 \Omega$		22	40	ns
Rise Time	$t_r$			10	20	
Turn-Off Delay Time	$t_{d(\text{off})}$			45	80	
Fall Time	$t_f$			9	18	
Turn-On Delay Time	$t_{d(\text{on})}$			55	90	
Rise Time	$t_r$	$V_{DD} = 20 \text{ V}$ , $R_L = 2 \Omega$ $I_D \geq 10 \text{ A}$ , $V_{GEN} = 4.5 \text{ V}$ , $R_g = 1 \Omega$		32	60	ns
Turn-Off Delay Time	$t_{d(\text{off})}$			56	100	
Fall Time	$t_f$			25	50	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25^\circ\text{C}$			40	A
Pulse Diode Forward Current <sup>a</sup>	$I_{SM}$				70	
Body Diode Voltage	$V_{SD}$	$I_S = 5 \text{ A}$		0.75	1.1	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 10 \text{ A}$ , $dI/dt = 100 \text{ A}/\mu\text{s}$ , $T_J = 25^\circ\text{C}$		40	70	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			52	100	
Reverse Recovery Fall Time	$t_a$			23		ns
Reverse Recovery Rise Time	$t_b$			17		

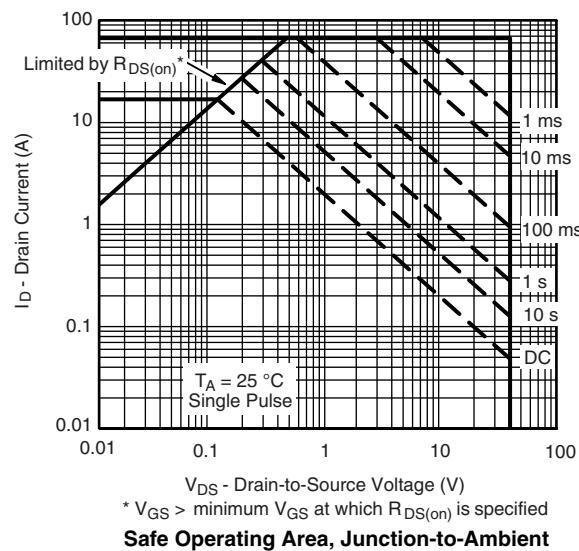
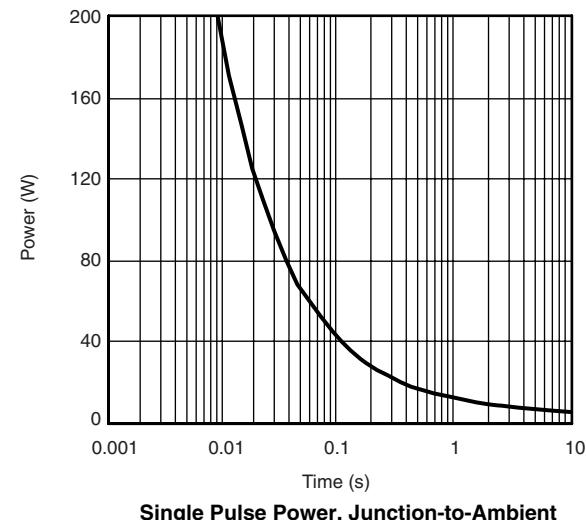
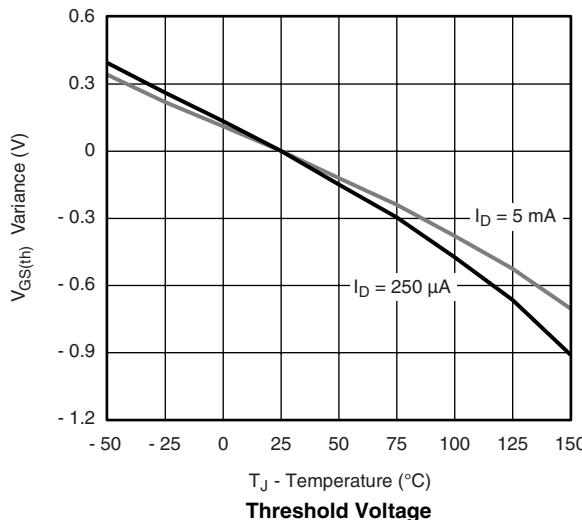
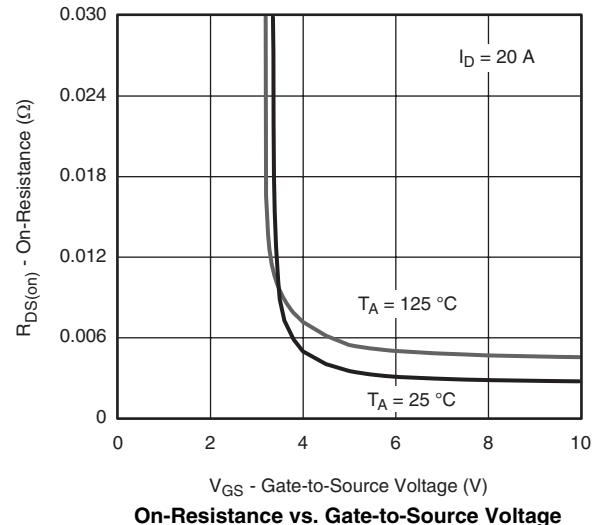
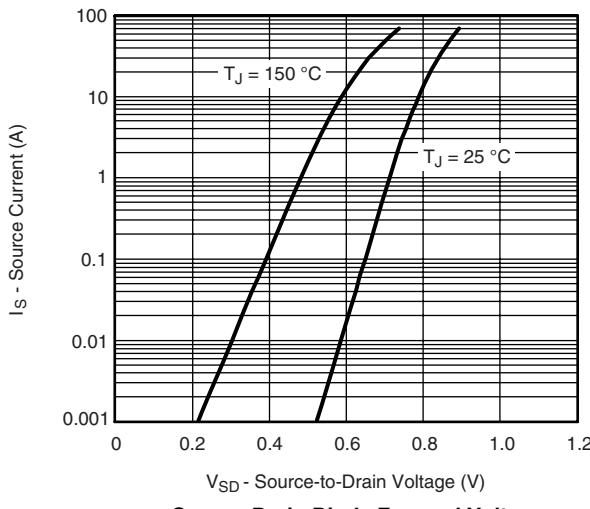
Notes:

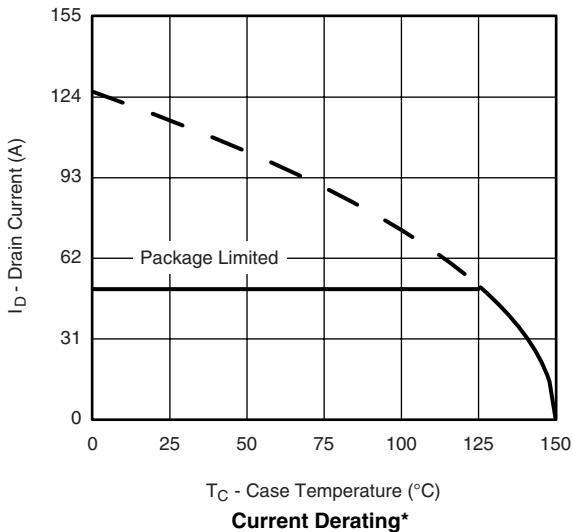
a. Pulse test; pulse width  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2 \%$ .

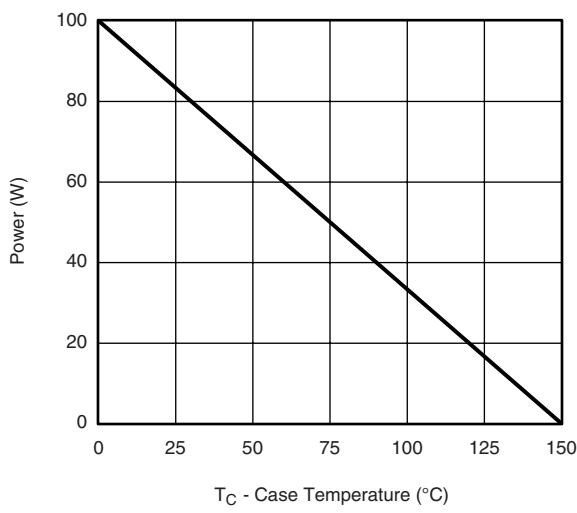
b. Guaranteed by design, not subject to production testing.

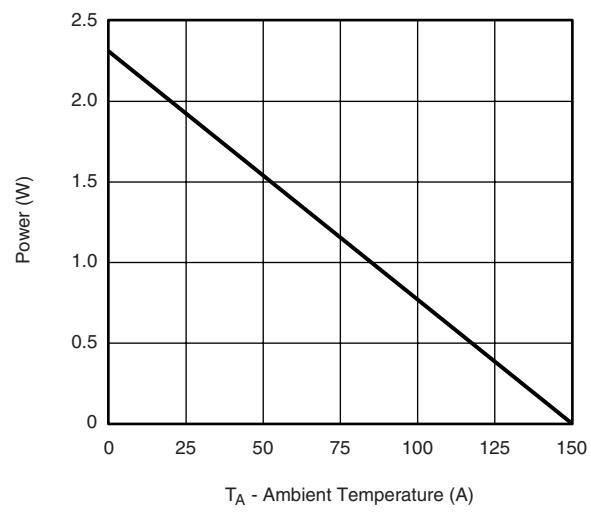
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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


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


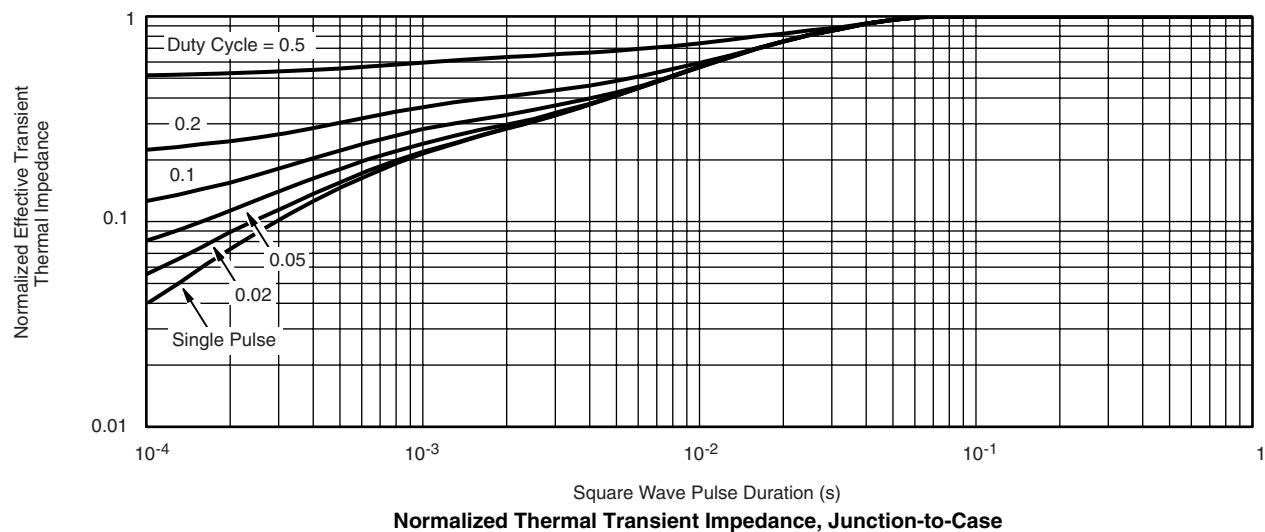
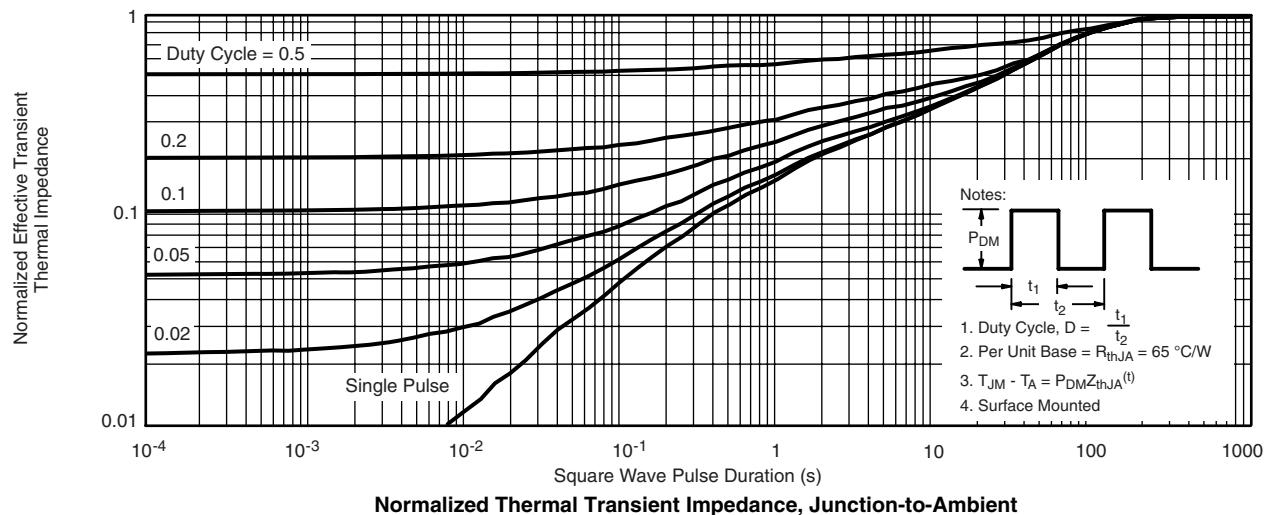
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

 $T_C$  - Case Temperature (°C)

**Current Derating\***

 $T_C$  - Case Temperature (°C)

**Power, Junction-to-Case**

 $T_A$  - Ambient Temperature (A)

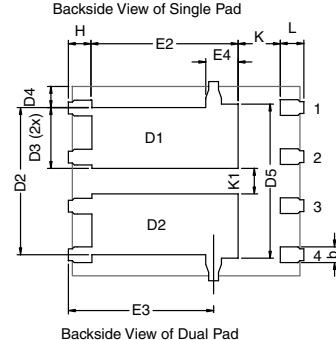
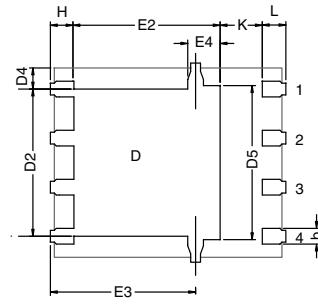
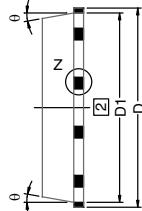
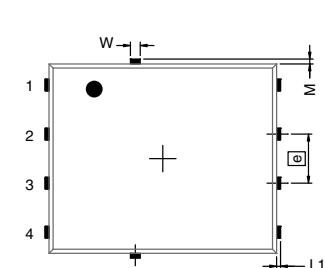
**Power, Junction-to-Ambient**

\* 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?69639](http://www.vishay.com/ppg?69639).

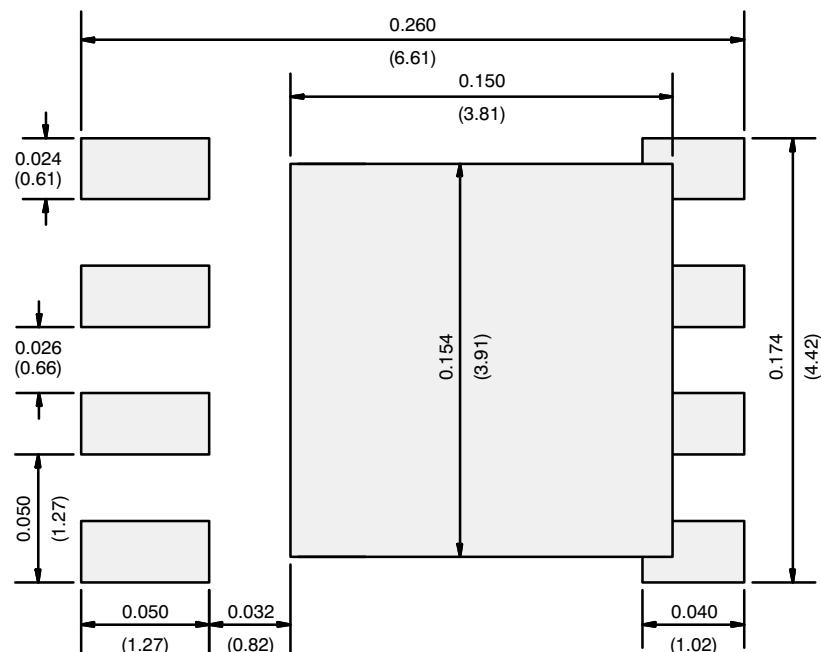
## PowerPAK® SO-8, (Single/Dual)


**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 (for AL product)	3.30	3.48	3.66	0.130	0.137	0.144	
E2 (for other product)	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 (for AL product)	0.58 typ.			0.023 typ.			
E4 (for other product)	0.75 typ.			0.030 typ.			
e	1.27 BSC			0.050 BSC			
K (for AL product)	1.45 typ.			0.057 typ.			
K (for other product)	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: C13-0702-Rev. K, 20-May-13  
DWG: 5881

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

Recommended Minimum Pads  
Dimensions in Inches/(mm)

[Return to Index](#)

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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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