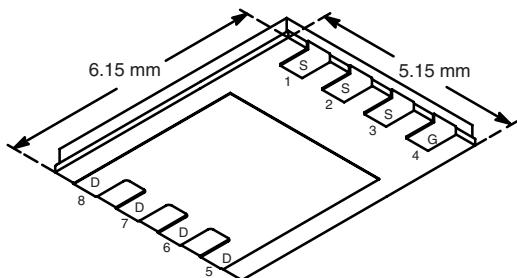


N-Channel 20-V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
20	0.0029 at $V_{GS} = 10$ V	50 ^g	20 nC
	0.0040 at $V_{GS} = 4.5$ V	50 ^g	

PowerPAK® SO-8



Bottom View

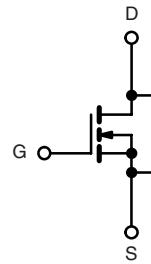
FEATURES

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



APPLICATIONS

- Low-Side MOSFET in Synchronous Buck dc-to-dc Converters
 - Game Machine



N-Channel MOSFET

Ordering Information: SiR890DP-T1-GE3 (Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted					
Parameter	Symbol	Limit	Unit		
Drain-Source Voltage	V_{DS}	20		V	
Gate-Source Voltage	V_{GS}	± 20			
Continuous Drain Current ($T_J = 150$ °C)	I_D	50 ^{a, g} 50 ^g 30 ^{b, c} 24 ^{b, c}		A	
Pulsed Drain Current	I_{DM}	70			
Continuous Source-Drain Diode Current	I_S	50 ^{a, g} 4.5 ^{b, c}			
Single Pulse Avalanche Current	I_{AS}	40			
Single Pulse Avalanche Energy	E_{AS}	80	mJ		
Maximum Power Dissipation	P_D	50 32 5.0 ^{b, c} 3.2 ^{b, c}			
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150			°C
Soldering Recommendations (Peak Temperature) ^{d, e}		260			

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{b, f}	R_{thJA}	20	25	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	2.0	2.5	

Notes:

- a. Based on $T_C = 25$ °C.
- b. Surface Mounted on 1" x 1" FR4 board.
- c. $t = 10$ s.
- d. See Solder Profile (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 70 °C/W.
- g. Package limited.

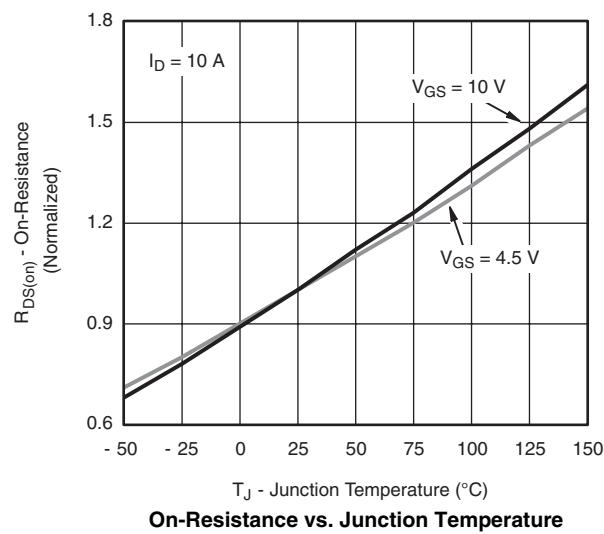
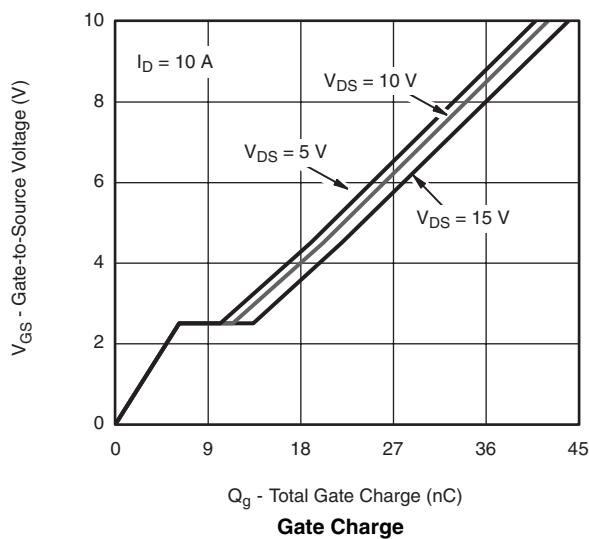
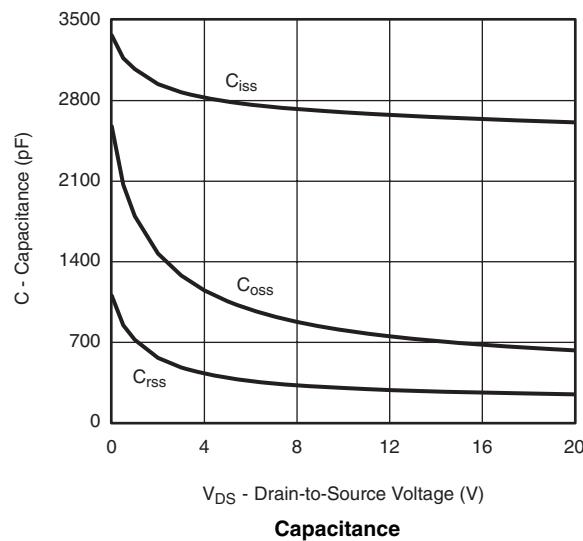
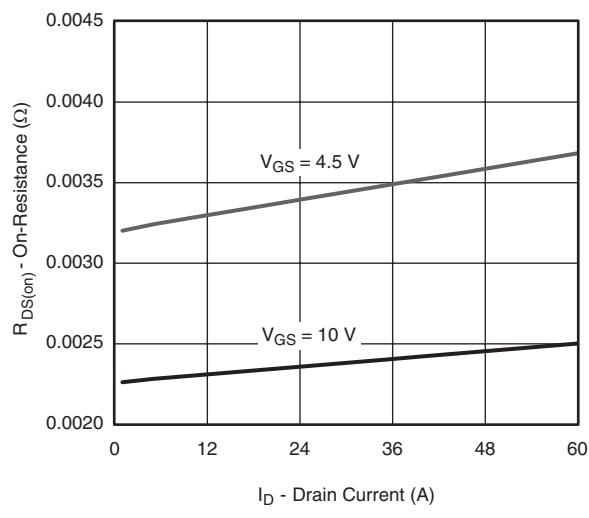
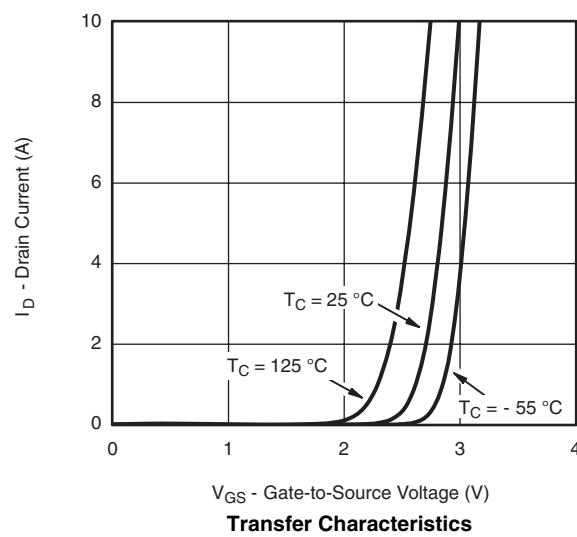
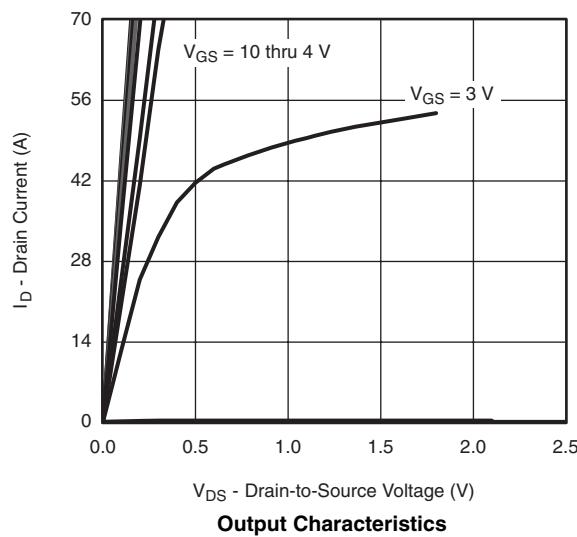
SPECIFICATIONS $T_J = 25^\circ\text{C}$, unless otherwise noted

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0 \text{ V}$, $I_D = 250 \mu\text{A}$	20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250 \mu\text{A}$		23		mV/ $^\circ\text{C}$
$V_{GS(\text{th})}$ Temperature Coefficient	$\Delta V_{GS(\text{th})}/T_J$			- 5.3		
Gate-Source Threshold Voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$, $I_D = 250 \mu\text{A}$	1.0		2.6	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0 \text{ V}$, $V_{GS} = \pm 20 \text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 20 \text{ V}$, $V_{GS} = 0 \text{ V}$		1		μA
		$V_{DS} = 20 \text{ V}$, $V_{GS} = 0 \text{ V}$, $T_J = 55^\circ\text{C}$			10	
On-State Drain Current ^a	$I_{D(\text{on})}$	$V_{DS} \geq 5 \text{ V}$, $V_{GS} = 10 \text{ V}$	30			A
Drain-Source On-State Resistance ^a	$R_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}$, $I_D = 10 \text{ A}$		0.0023	0.0029	Ω
		$V_{GS} = 4.5 \text{ V}$, $I_D = 10 \text{ A}$		0.0033	0.0040	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 10 \text{ V}$, $I_D = 10 \text{ A}$		50		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = 10 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$		2747		pF
Output Capacitance	C_{oss}			810		
Reverse Transfer Capacitance	C_{rss}			310		
Total Gate Charge	Q_g	$V_{DS} = 10 \text{ V}$, $V_{GS} = 10 \text{ V}$, $I_D = 10 \text{ A}$		42	60	nC
				20	30	
Gate-Source Charge	Q_{gs}	$V_{DS} = 10 \text{ V}$, $V_{GS} = 4.5 \text{ V}$, $I_D = 10 \text{ A}$		6.2		
Gate-Drain Charge	Q_{gd}			5.2		
Gate Resistance	R_g	$f = 1 \text{ MHz}$	0.15	0.7	1.4	Ω
Turn-On Delay Time	$t_{d(\text{on})}$	$V_{DD} = 10 \text{ V}$, $R_L = 1 \Omega$ $I_D \geq 10 \text{ A}$, $V_{GEN} = 10 \text{ V}$, $R_g = 1 \Omega$		13	25	ns
Rise Time	t_r			10	20	
Turn-Off Delay Time	$t_{d(\text{off})}$			28	50	
Fall Time	t_f			9	18	
Turn-On Delay Time	$t_{d(\text{on})}$			30	55	
Rise Time	t_r	$V_{DD} = 10 \text{ V}$, $R_L = 1 \Omega$ $I_D \geq 10 \text{ A}$, $V_{GEN} = 4.5 \text{ V}$, $R_g = 1 \Omega$		18	35	ns
Turn-Off Delay Time	$t_{d(\text{off})}$			40	80	
Fall Time	t_f			25	50	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25^\circ\text{C}$			50	A
Pulse Diode Forward Current ^a	I_{SM}				70	
Body Diode Voltage	V_{SD}	$I_S = 3 \text{ A}$		0.71	1.1	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 10 \text{ A}$, $dI/dt = 100 \text{ A}/\mu\text{s}$, $T_J = 25^\circ\text{C}$		27	50	ns
Body Diode Reverse Recovery Charge	Q_{rr}			17	32	nC
Reverse Recovery Fall Time	t_a			14		ns
Reverse Recovery Rise Time	t_b			13		

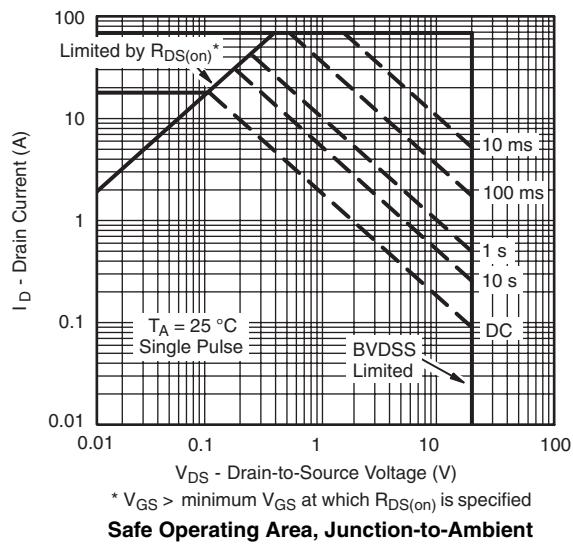
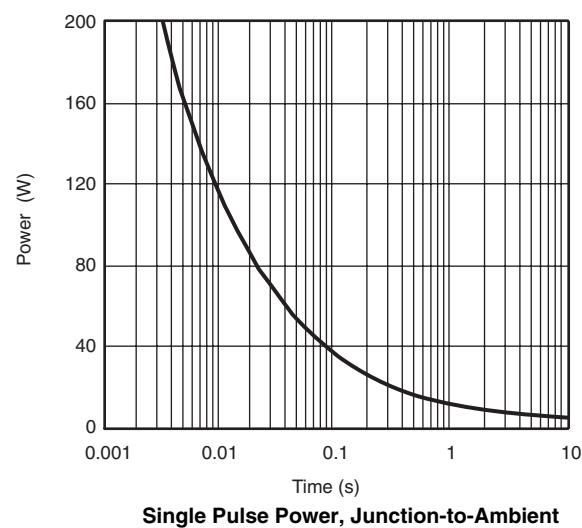
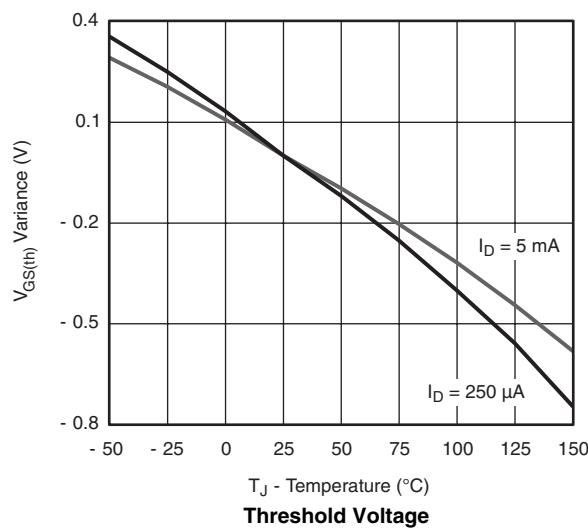
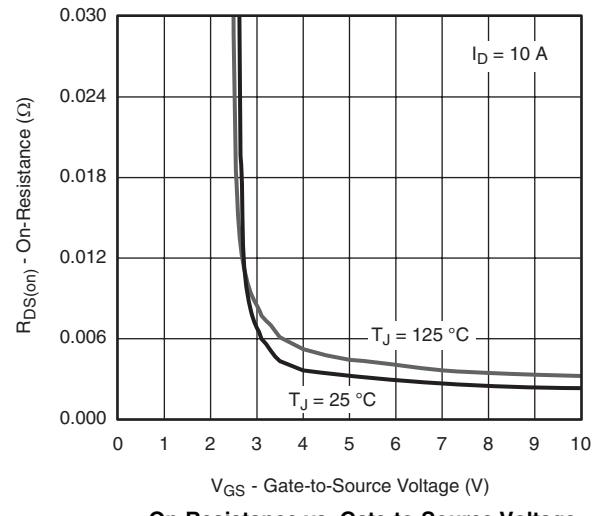
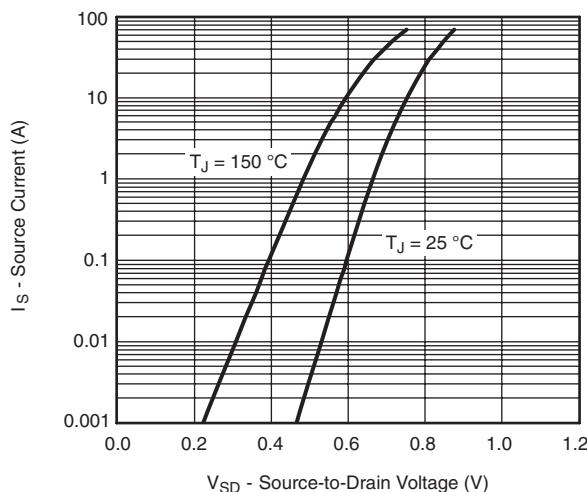
Notes:

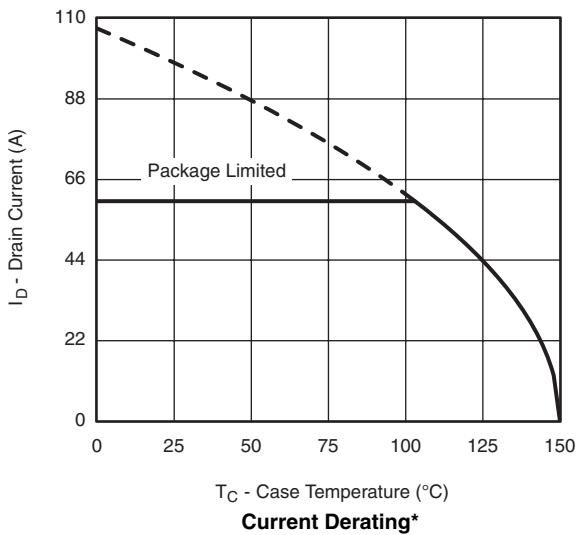
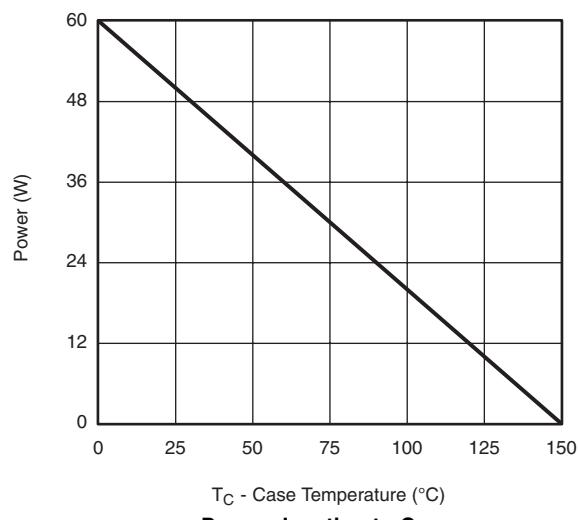
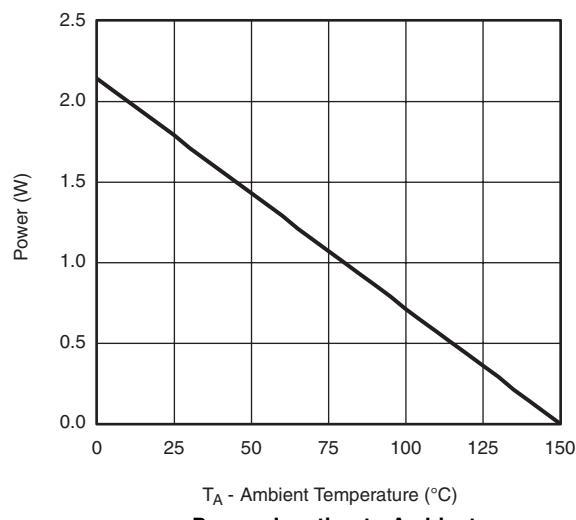
a. Pulse test; pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

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


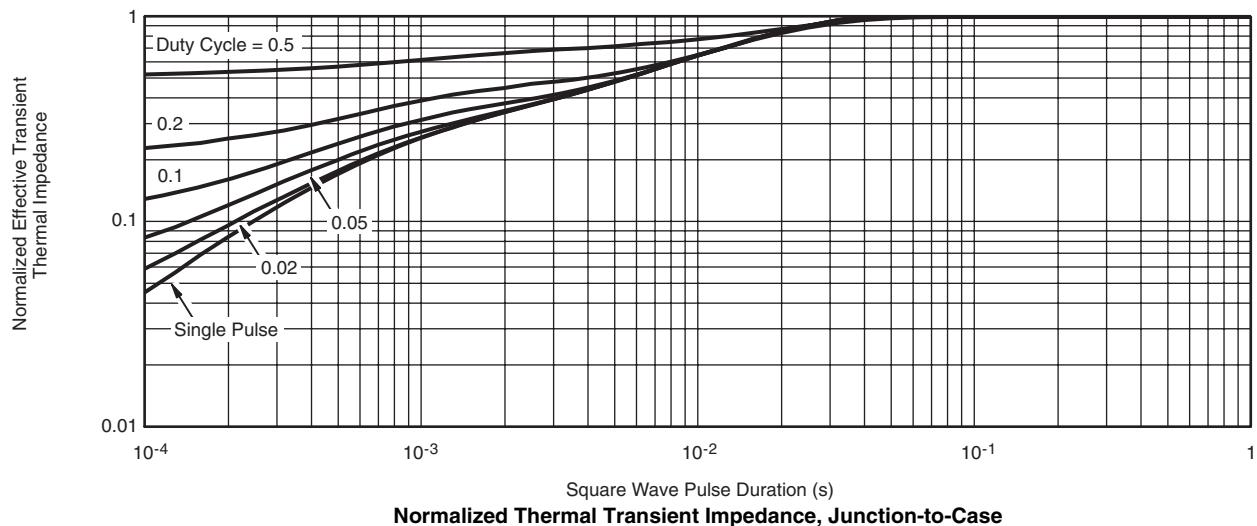
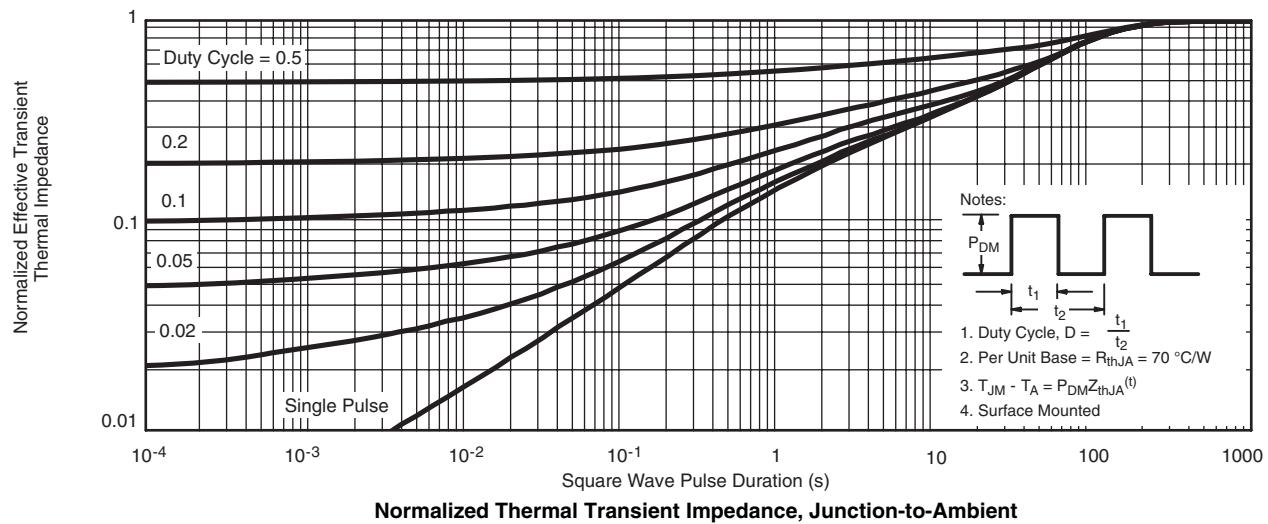
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Case Temperature (°C)
Current Derating*

Case Temperature (°C)
Power, Junction-to-Case

Ambient Temperature (°C)
Power, Junction-to-Ambient

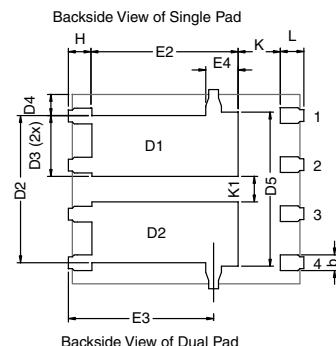
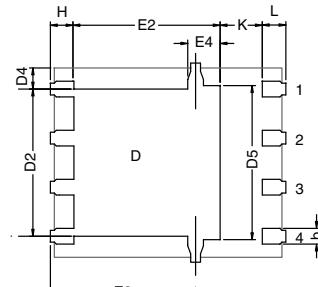
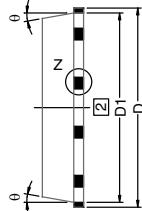
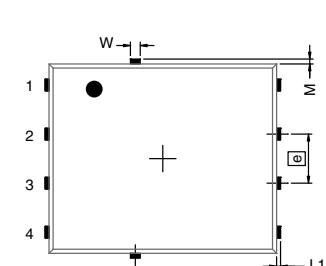
* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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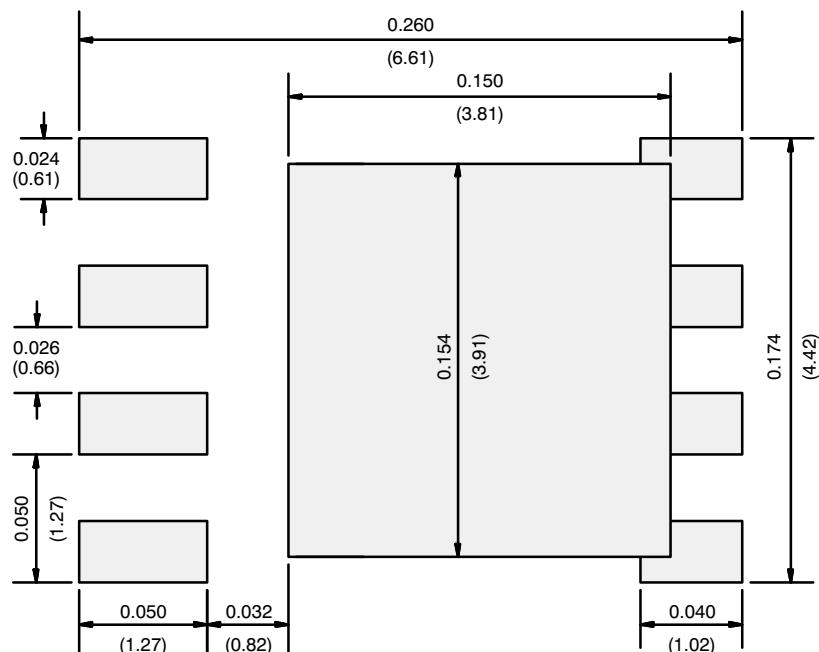
PowerPAK® SO-8, (Single/Dual)


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)

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