

## E Series Power MOSFET

PRODUCT SUMMARY	
$V_{DS}$ (V) at $T_J$ max.	700
$R_{DS(on)}$ typ. ( $\Omega$ ) at 25 °C	$V_{GS} = 10$ V   0.755
$Q_g$ max. (nC)	32
$Q_{gs}$ (nC)	5
$Q_{gd}$ (nC)	7
Configuration	Single

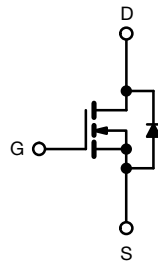
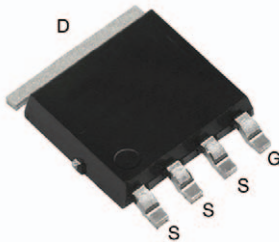
### FEATURES

- Low figure-of-merit (FOM)  $R_{on} \times Q_g$
- Low input capacitance ( $C_{iss}$ )
- Reduced switching and conduction losses
- Ultra low gate charge ( $Q_g$ )
- Avalanche energy rated (UIS)
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

PowerPAK® SO-8L



N-Channel MOSFET

### APPLICATIONS

- Switch mode power supplies (SMPS)
- Power factor correction power supplies (PFC)
- Lighting
  - High-intensity discharge (HID)
  - Fluorescent ballast lighting
- Consumer
  - Adaptors

### ORDERING INFORMATION

Package	PowerPAK SO-8L
Lead (Pb)-free and Halogen-free	SiHJ6N65E-T1-GE3

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


PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	650	V
Gate-Source Voltage	$V_{GS}$	$\pm 30$	V
Continuous Drain Current ( $T_J = 150$ °C)	$V_{GS}$ at 10 V	$T_C = 25$ °C	5.6
		$T_C = 100$ °C	3.6
Pulsed Drain Current <sup>a</sup>	$I_{DM}$	12	A
Linear Derating Factor		0.76	W/°C
Single Pulse Avalanche Energy <sup>b</sup>	$E_{AS}$	36	mJ
Maximum Power Dissipation	$P_D$	74	W
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	°C
Drain-Source Voltage Slope	$dV/dt$	$T_J = 125$ °C	70
Reverse Diode $dV/dt$ <sup>c</sup>		9.4	V/ns

#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- $V_{DD} = 120$  V, starting  $T_J = 25$  °C,  $L = 28.2$  mH,  $R_g = 25$   $\Omega$ ,  $I_{AS} = 1.6$  A.
- $I_{SD} \leq I_D$ ,  $dI/dt = 100$  A/ $\mu$ s, starting  $T_J = 25$  °C.

### THERMAL RESISTANCE RATINGS

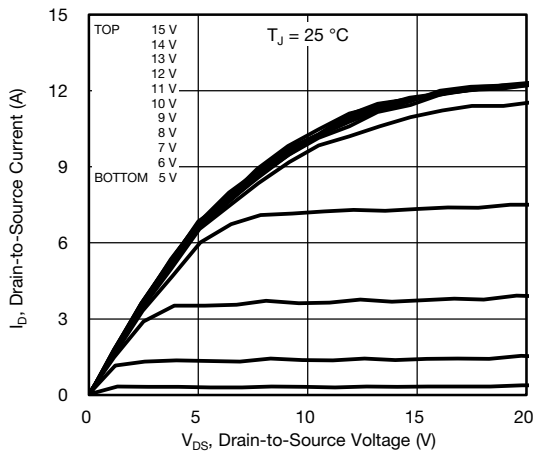
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	$R_{thJA}$	52	65	°C/W
Maximum Junction-to-Case (Drain)	$R_{thJC}$	1.2	1.7	

<b>SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$	650	-	-	V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$ , $I_D = 1\text{ mA}$	-	0.8	-	V/ $^\circ\text{C}$
Gate-Source Threshold Voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	2.0	-	4.0	V
Gate-Source Leakage	$I_{GSS}$	$V_{GS} = \pm 20\text{ V}$	-	-	$\pm 100$	nA
		$V_{GS} = \pm 30\text{ V}$	-	-	$\pm 1$	$\mu\text{A}$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 650\text{ V}$ , $V_{GS} = 0\text{ V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 520\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 125\text{ }^\circ\text{C}$	-	-	10	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$ , $I_D = 3\text{ A}$	-	0.755	0.868	$\Omega$
Forward Transconductance	$g_{fs}$	$V_{DS} = 30\text{ V}$ , $I_D = 3\text{ A}$	-	1.8	-	S
<b>Dynamic</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$ , $V_{DS} = 100\text{ V}$ , $f = 1\text{ MHz}$	-	596	-	pF
Output Capacitance	$C_{oss}$		-	35	-	
Reverse Transfer Capacitance	$C_{rss}$		-	4	-	
Effective Output Capacitance, Energy Related <sup>a</sup>	$C_{o(er)}$		$V_{DS} = 0\text{ V to } 520\text{ V}$ , $V_{GS} = 0\text{ V}$	-	26	
Effective Output Capacitance, Time Related <sup>b</sup>	$C_{o(tr)}$		-	90	-	
Total Gate Charge	$Q_g$	$V_{GS} = 10\text{ V}$ , $I_D = 3\text{ A}$ , $V_{DS} = 520\text{ V}$	-	16	32	nC
Gate-Source Charge	$Q_{gs}$		-	5	-	
Gate-Drain Charge	$Q_{gd}$		-	7	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 520\text{ V}$ , $I_D = 3\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_g = 9.1\text{ }\Omega$	-	14	28	ns
Rise Time	$t_r$		-	14	28	
Turn-Off Delay Time	$t_{d(off)}$		-	25	50	
Fall Time	$t_f$		-	17	34	
Gate Input Resistance	$R_g$		$f = 1\text{ MHz}$	0.4	0.8	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	5.6	A
Pulsed Diode Forward Current	$I_{SM}$		-	-	12	
Diode Forward Voltage	$V_{SD}$	$T_J = 25\text{ }^\circ\text{C}$ , $I_S = 3\text{ A}$ , $V_{GS} = 0\text{ V}$	-	0.9	1.2	V
Reverse Recovery Time	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}$ , $I_F = I_S = 3\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 25\text{ V}$	-	278	556	ns
Reverse Recovery Charge	$Q_{rr}$		-	2.1	4.2	$\mu\text{C}$
Reverse Recovery Current	$I_{RRM}$		-	12	-	A

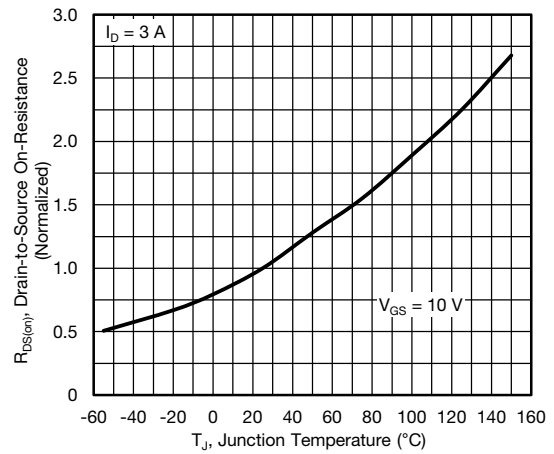
**Notes**

- a.  $C_{oss(er)}$  is a fixed capacitance that gives the same energy as  $C_{oss}$  while  $V_{DS}$  is rising from 0 % to 80 %  $V_{DSS}$ .  
 b.  $C_{oss(tr)}$  is a fixed capacitance that gives the same charging time as  $C_{oss}$  while  $V_{DS}$  is rising from 0 % to 80 %  $V_{DSS}$ .

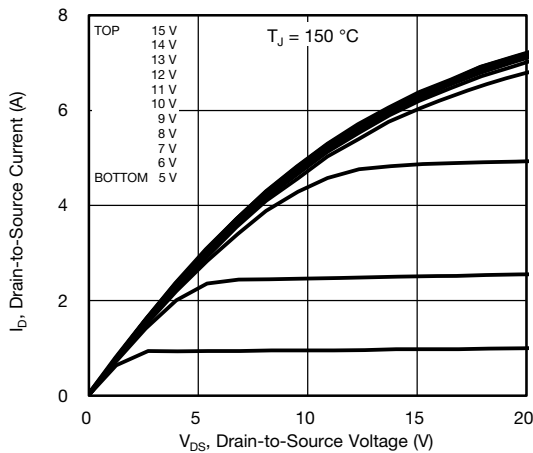
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



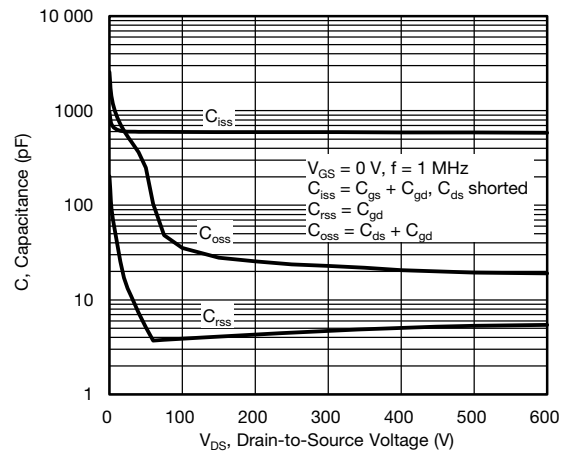
**Fig. 1 - Typical Output Characteristics**



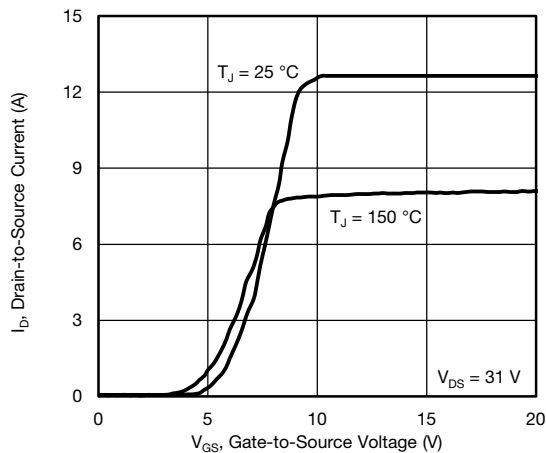
**Fig. 4 - Normalized On-Resistance vs. Temperature**



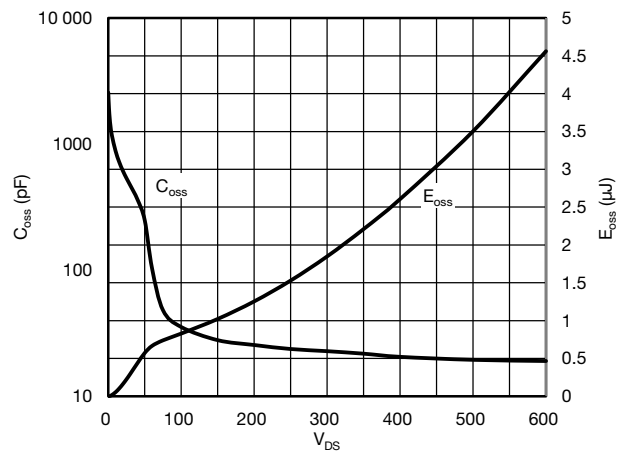
**Fig. 2 - Typical Output Characteristics**



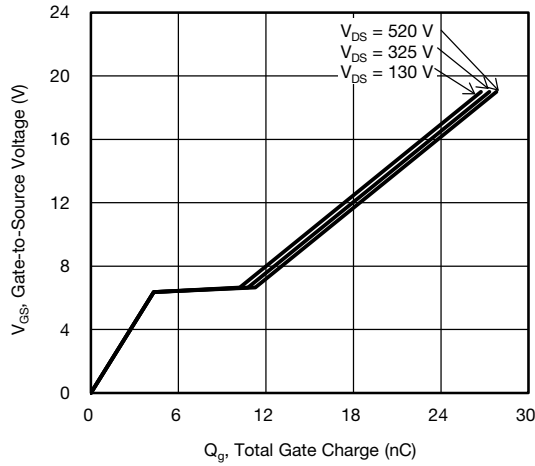
**Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage**



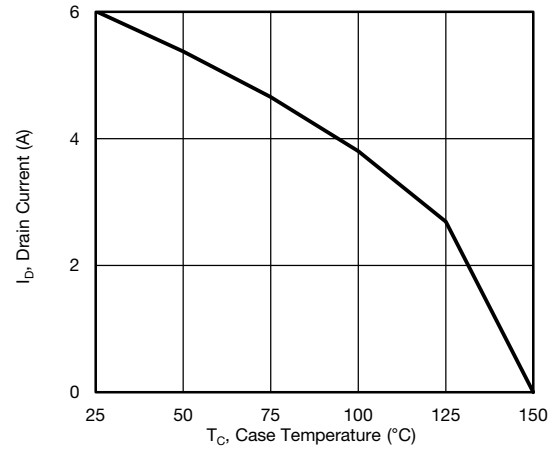
**Fig. 3 - Typical Transfer Characteristics**



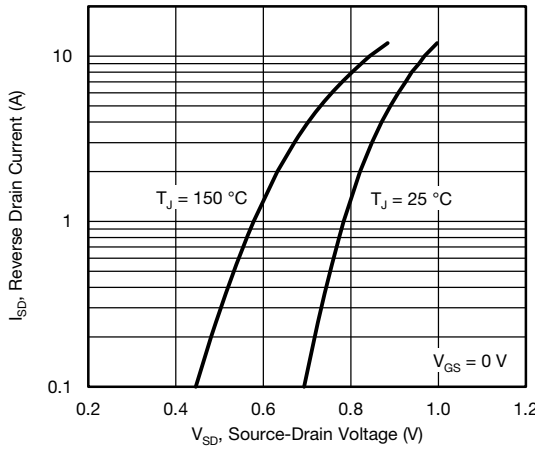
**Fig. 6 -  $C_{oss}$  and  $E_{oss}$  vs.  $V_{ds}$**



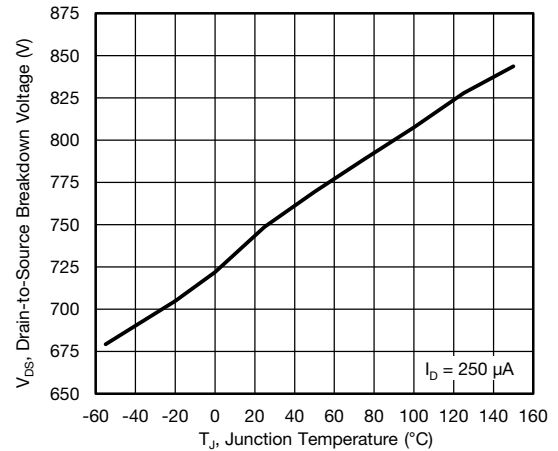
**Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage**



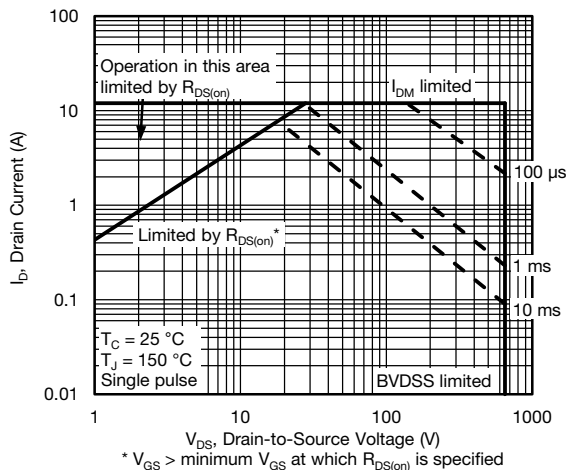
**Fig. 10 - Maximum Drain Current vs. Case Temperature**



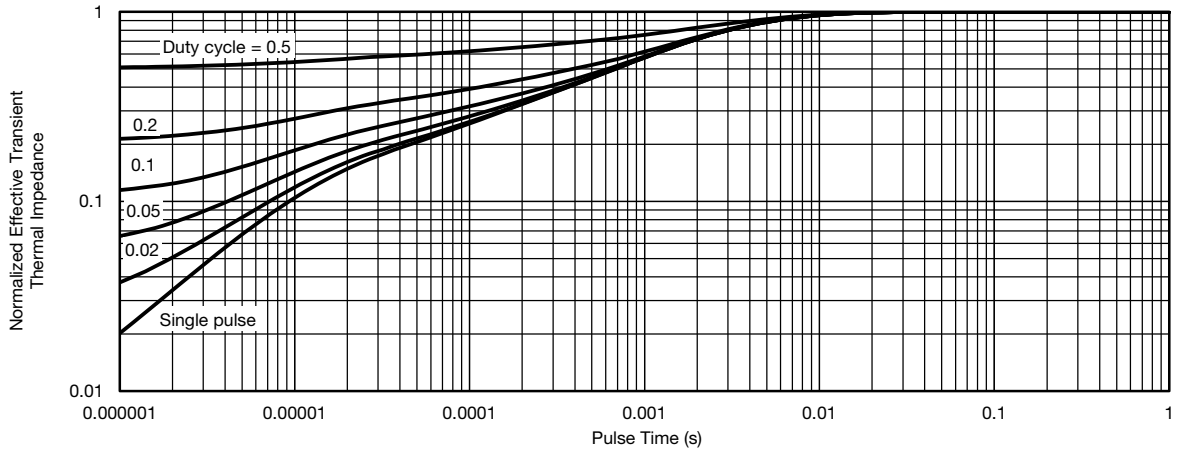
**Fig. 8 - Typical Source-Drain Diode Forward Voltage**



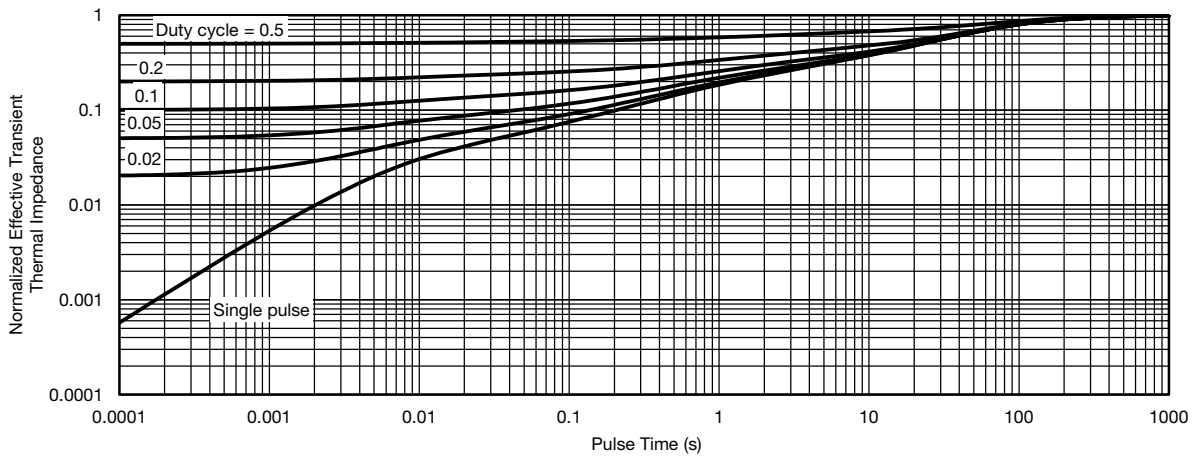
**Fig. 11 - Temperature vs. Drain-to-Source Voltage**



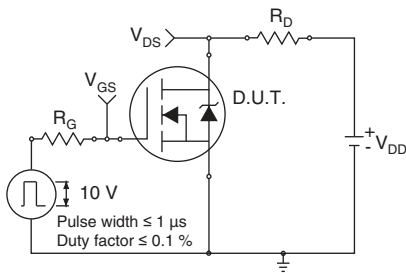
**Fig. 9 - Maximum Safe Operating Area**



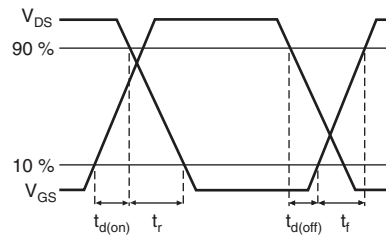
**Fig. 12 - Normalized Thermal Transient Impedance, Junction-to-Case**



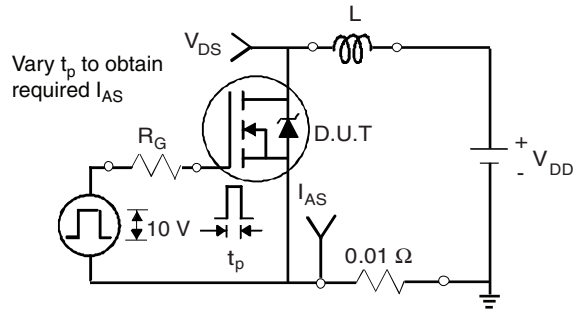
**Fig. 13 - Normalized Thermal Transient Impedance, Junction-to-Ambient**



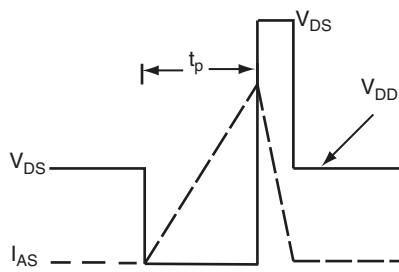
**Fig. 14 - Switching Time Test Circuit**



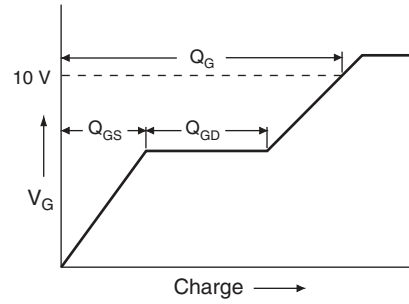
**Fig. 15 - Switching Time Waveforms**



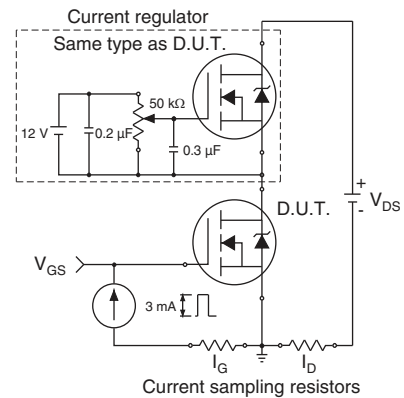
**Fig. 16 - Unclamped Inductive Test Circuit**



**Fig. 17 - Unclamped Inductive Waveforms**

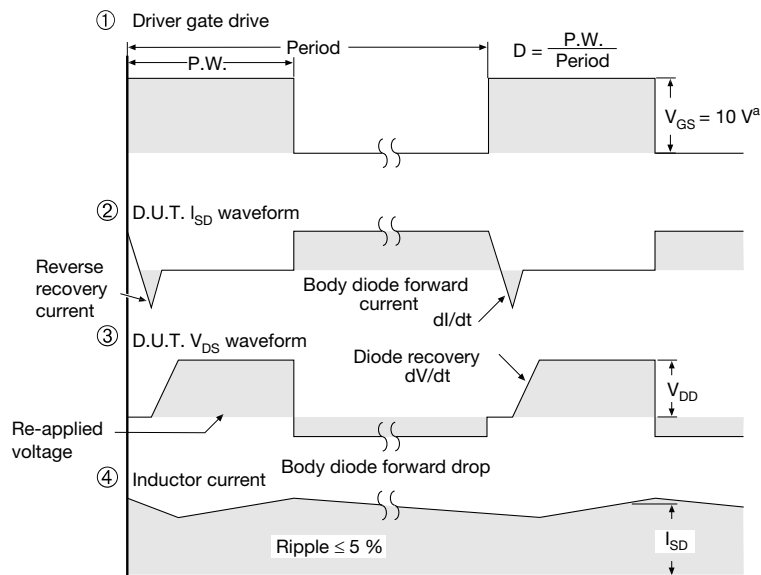
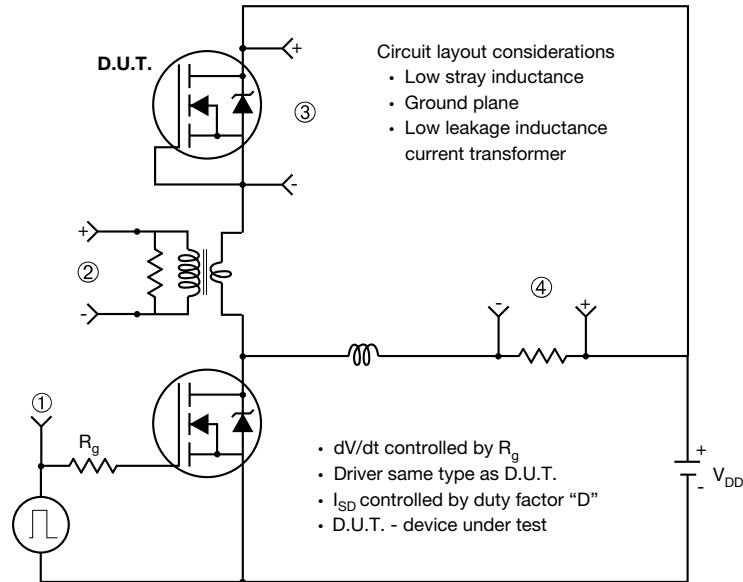


**Fig. 18 - Basic Gate Charge Waveform**



**Fig. 19 - Gate Charge Test Circuit**

**Peak Diode Recovery dV/dt Test Circuit**



**Note**

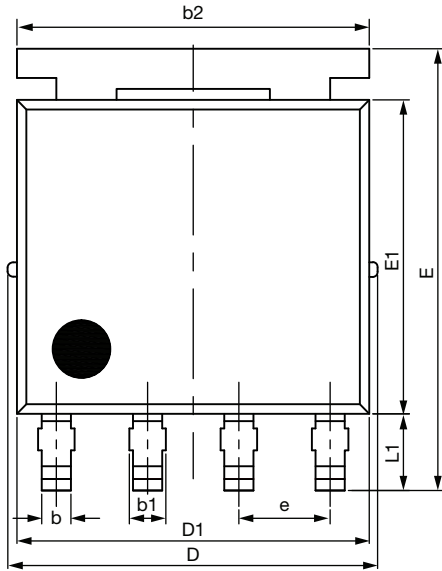
a.  $V_{GS} = 5\text{ V}$  for logic level devices

**Fig. 20 - For N-Channel**

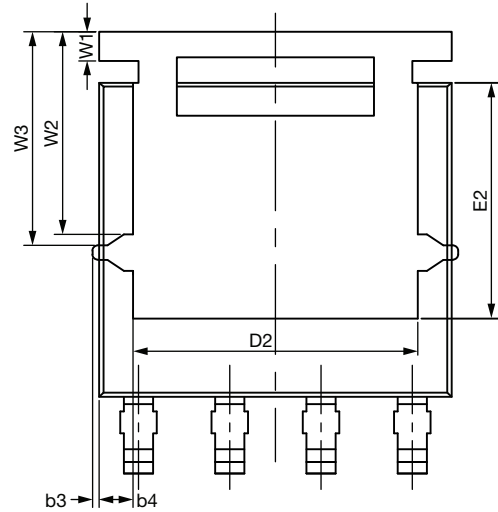
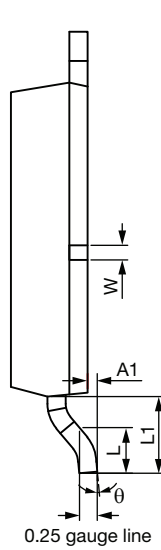
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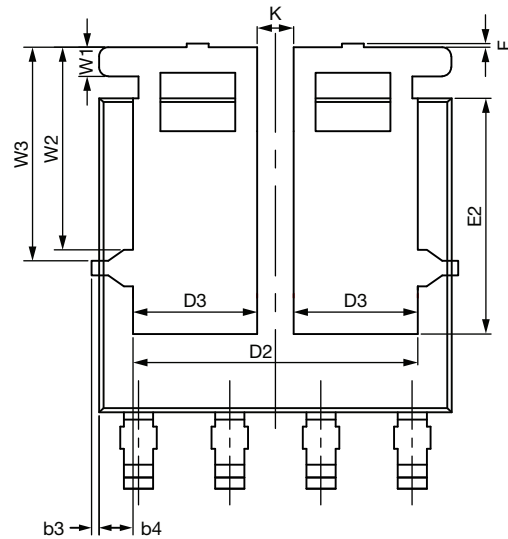
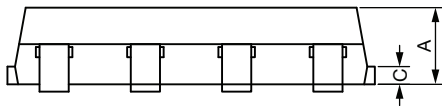
# PowerPAK<sup>®</sup> SO-8L Case Outline for Non-AI Parts



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	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
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		
θ	0°	-	10°	0°	-	10°
ECN: T16-0221-Rev. D, 16-May-16 DWG: 5976						

**Note**

- Millimeters will govern



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



Recommended Minimum Pads  
Dimensions in mm (inches)



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