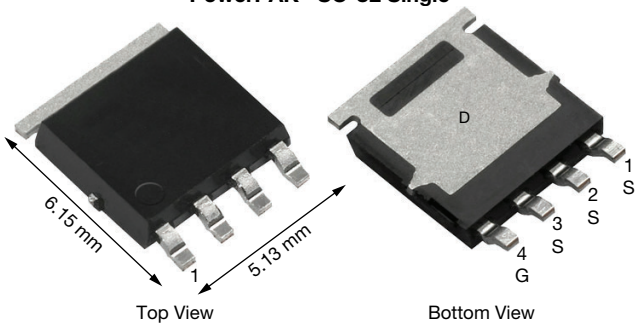
Automotive P-Channel 40 V (D-S) 175 °C MOSFET

PowerPAK® SO-8L Single



Top View | Bottom View

FEATURES

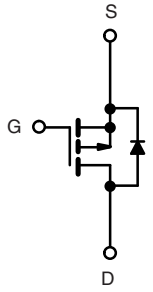
- TrenchFET® power MOSFET
- AEC-Q101 qualified
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb-free

RoHS COMPLIANT

HALOGEN FREE



P-Channel MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	-40
$R_{DS(on)}$ (Ω) at V_{GS} = -10 V	0.0070
$R_{DS(on)}$ (Ω) at V_{GS} = -4.5 V	0.0100
I_D (A)	-60
Configuration	Single

ORDERING INFORMATION	
Package	PowerPAK SO-8L
Lead (Pb)-free and halogen-free	SQJ409EP (for detailed order number please see www.vishay.com/doc?79771)

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

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V_{DS}	-40	V
Gate-source voltage		V_{GS}	± 20	
Continuous drain current	T_C = 25 °C [a]	I_D	-60	A
	T_C = 125 °C		-42	
Continuous source current (diode conduction) [a]		I_S	-60	
Pulsed drain current [b]		I_{DM}	-150	
Single pulse avalanche current	L = 0.1 mH	I_{AS}	-41	
Single pulse avalanche energy		E_{AS}	84	mJ
Maximum power dissipation [b]	T_C = 25 °C	P_D	68	W
	T_C = 125 °C		22	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +175	°C
Soldering recommendations (peak temperature) [d, e]			260	

THERMAL RESISTANCE RATINGS

PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-ambient	PCB mount [c]	R_{thJA}	68	°C/W
Junction-to-case (drain)		R_{thJC}	2.2	

Notes

a. Package limited
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %
c. When mounted on 1" square PCB (FR4 material)
d. See solder profile (www.vishay.com/doc?73257). For 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
e. Rework conditions: manual soldering with a soldering iron is not recommended for leadless components

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SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static							
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0, I_D = -250 µA		-40	-	-	V
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = -250 µA		-1.5	-2.0	-2.5	
Gate-source leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V		-	-	± 100	nA
Zero gate voltage drain current	I_{DSS}	V_{GS} = 0 V	V_{DS} = -40 V	-	-	-1	µA
		V_{GS} = 0 V	V_{DS} = -40 V, T_J = 125 °C	-	-	-50	
		V_{GS} = 0 V	V_{DS} = -40 V, T_J = 175 °C	-	-	-150	
On-state drain current [a]	$I_{D(on)}$	V_{GS} = -10 V	V_{DS} ≥ -5 V	-30	-	-	A
Drain-source on-state resistance [a]	$R_{DS(on)}$	V_{GS} = -10 V	I_D = -10 A	-	0.0058	0.0070	Ω
		V_{GS} = -10 V	I_D = -10 A, T_J = 125 °C	-	-	0.0106	
		V_{GS} = -10 V	I_D = -10 A, T_J = 175 °C	-	-	0.0126	
		V_{GS} = -4.5 V	I_D = -6 A	-	0.0083	0.0100	
Forward transconductance [b]	g_{fs}	V_{DS} = -15 V, I_D = -10 A		-	54	-	S
Dynamic [b]							
Input capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = -25 V, f = 1 MHz	-	8400	11 000	pF
Output capacitance	C_{oss}			-	620	850	
Reverse transfer capacitance	C_{rss}			-	510	700	
Total gate charge [c]	Q_g	V_{GS} = -10 V	V_{DS} = -20 V, I_D = -5 A	-	170	260	nC
Gate-source charge [c]	Q_{gs}			-	24	-	
Gate-drain charge [c]	Q_{gd}			-	35	-	
Gate resistance	R_g	f = 1 MHz		0.50	1.08	1.70	Ω
Turn-on delay time [c]	$t_{d(on)}$	V_{DD} = -20 V, R_L = 4 Ω I_D ≅ -5 A, V_{GEN} = -10 V, R_g = 1 Ω		-	23	35	ns
Rise time [c]	t_r			-	18	30	
Turn-off delay time [c]	$t_{d(off)}$			-	75	120	
Fall time [c]	t_f			-	12	20	
Source-Drain Diode Ratings and Characteristics [b]							
Pulsed current [a]	I_{SM}			-	-	-150	A
Forward voltage	V_{SD}	I_F = -10 A, V_{GS} = 0 V		-	-0.76	-1.2	V
Body diode reverse recovery time	t_{rr}	I_F = -10 A, di/dt = 100 A/µs		-	39	90	ns
Body diode reverse recovery charge	Q_{rr}			-	45	100	nC
Reverse recovery fall time	t_a			-	22	-	ns
Reverse recovery rise time	t_b			-	19	-	
Body diode peak reverse recovery current	$I_{RM(REC)}$			-	-2.3	-	A

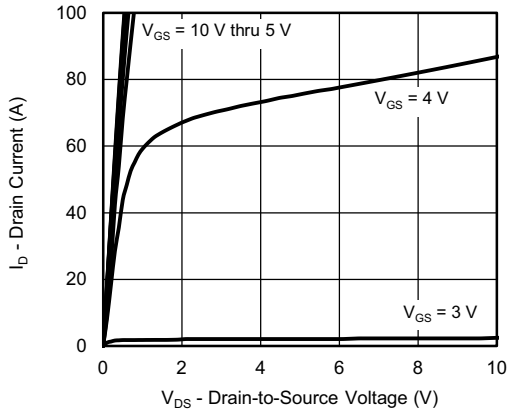
Notes

f. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %
g. Guaranteed by design, not subject to production testing
h. Independent of operating temperature

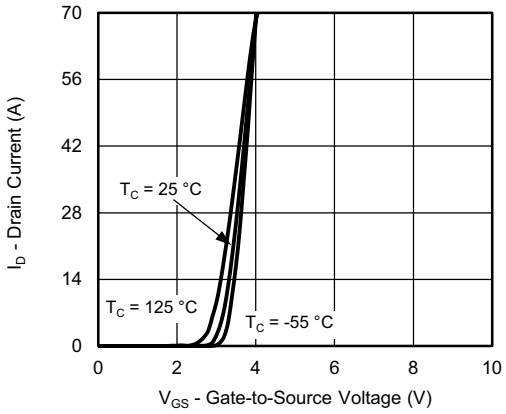
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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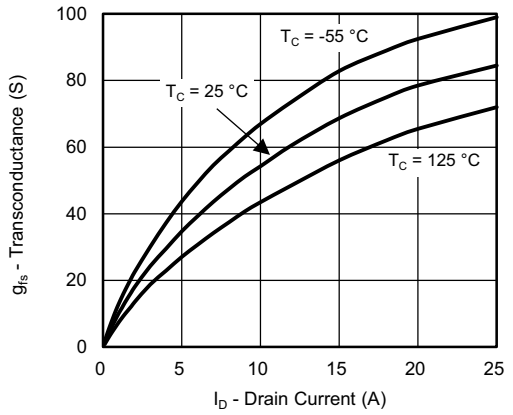
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



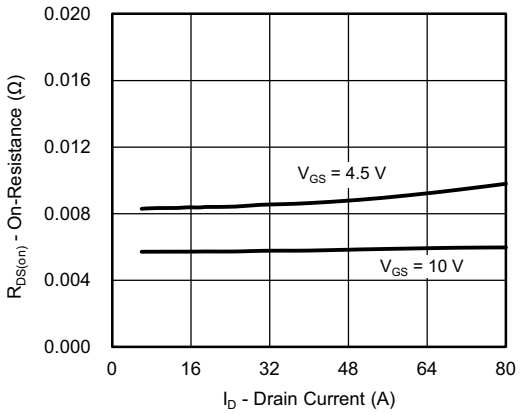
Output Characteristics



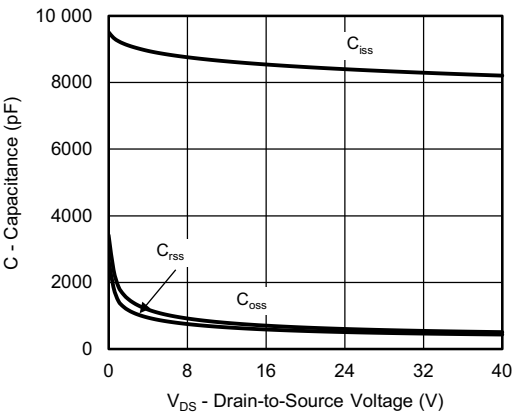
Transfer Characteristics



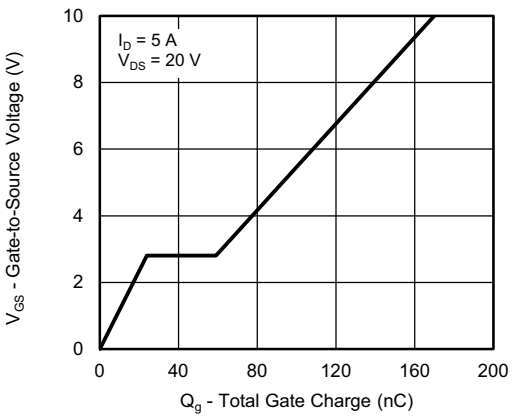
Transconductance



On-Resistance vs. Drain Current



Capacitance

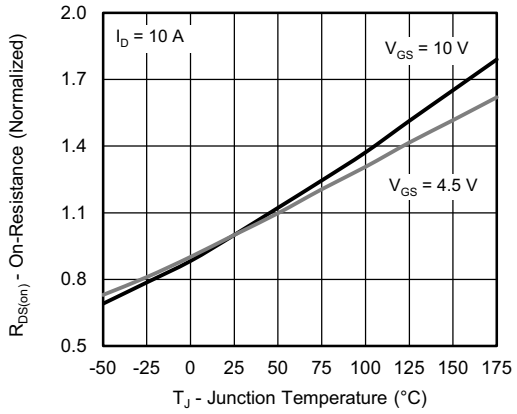


Gate Charge

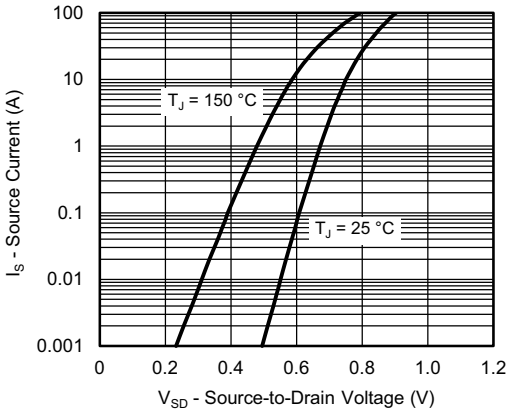
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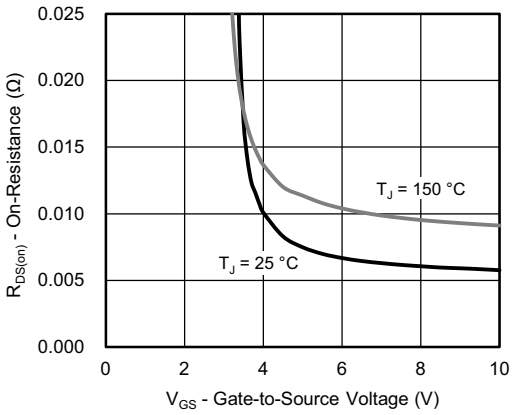
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



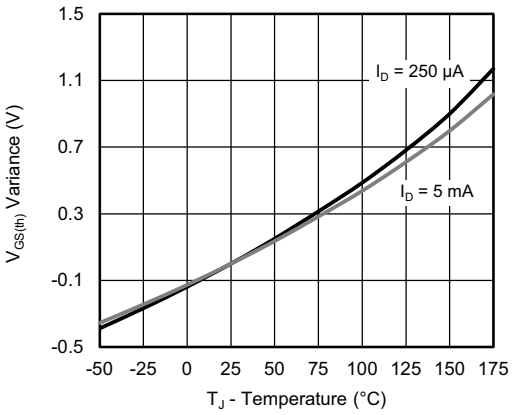
On-Resistance vs. Junction Temperature



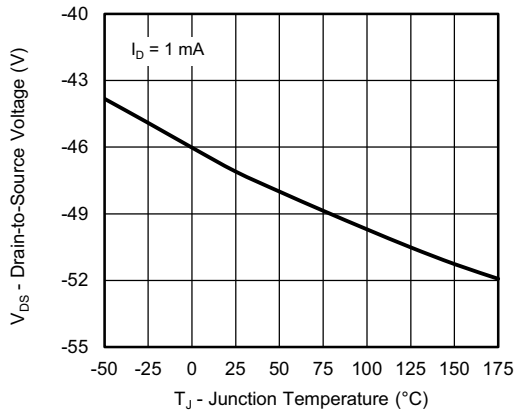
Source Drain Diode Forward Voltage



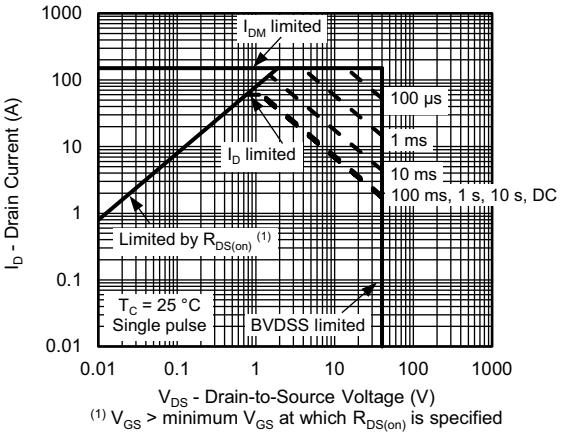
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



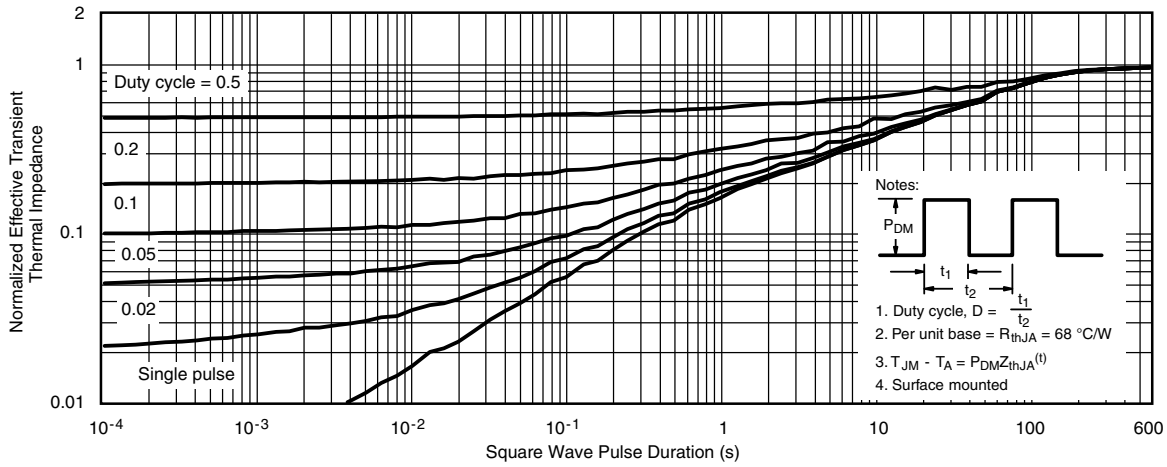
Drain-Source Breakdown vs. Junction Temperature



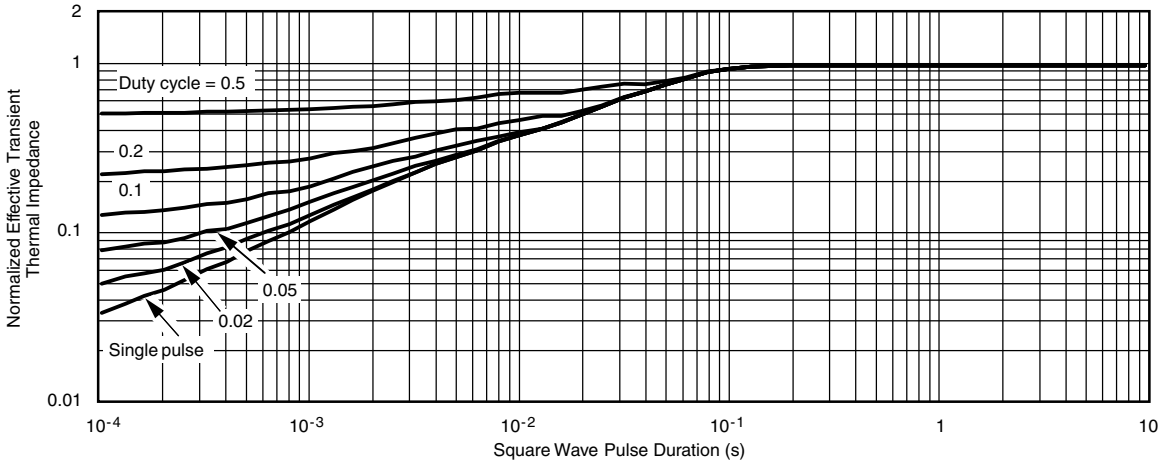
Safe Operating Area

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THERMAL RATINGS (T_C = 25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



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)

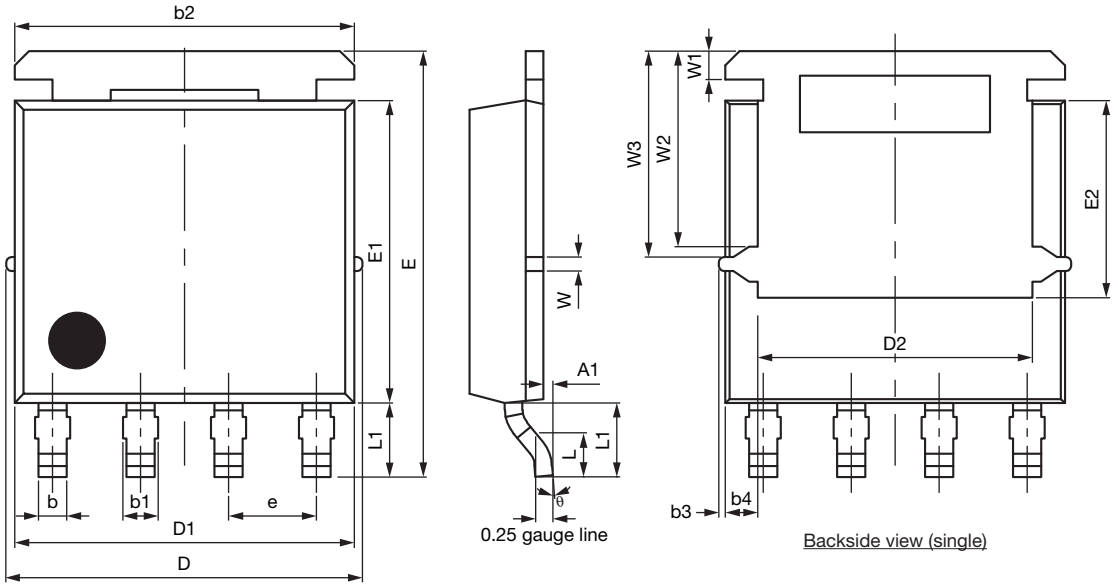
  are given for general guidelines only to enable the user to get a “ball park” indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit 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

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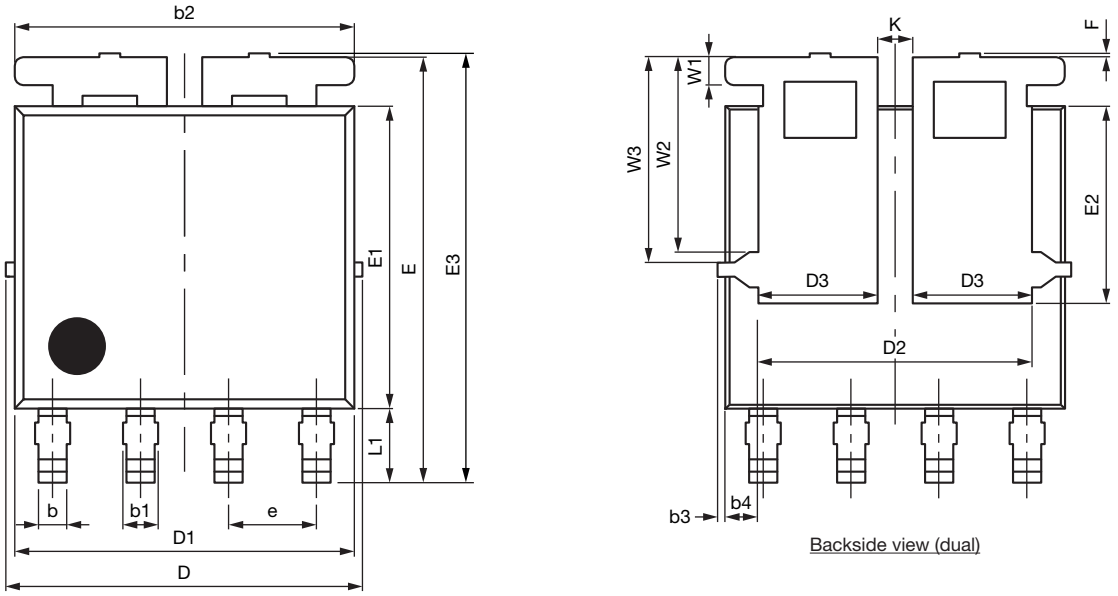
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PowerPAK® SO-8L Case Outline 2



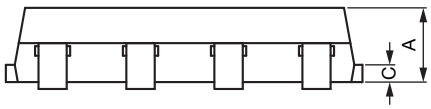
Topside view (single)

Backside view (single)



Topside view (dual)

Backside view (dual)



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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	2.75	2.85	2.95	0.108	0.112	0.116
E3	6.05	6.22	6.40	0.238	0.245	0.252
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: C23-1026-Rev. D, 25-Sep-2023 DWG: 6044						

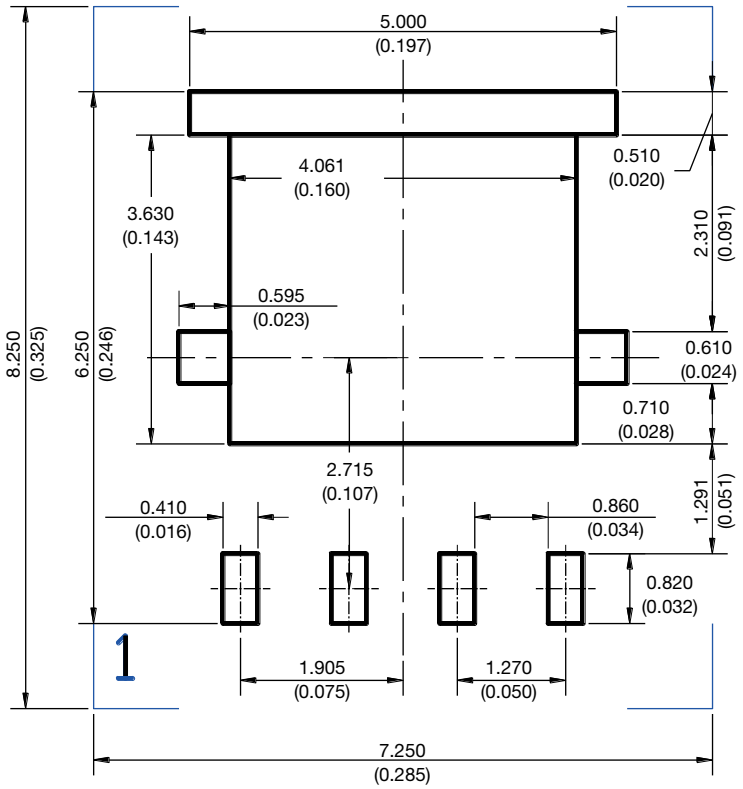
Note

- Millimeters will govern

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RECOMMENDED MINIMUM PAD FOR PowerPAK® SO-8L SINGLE



Recommended Minimum Pads
Dimensions in mm (inches)

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Teklif isteyin

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