

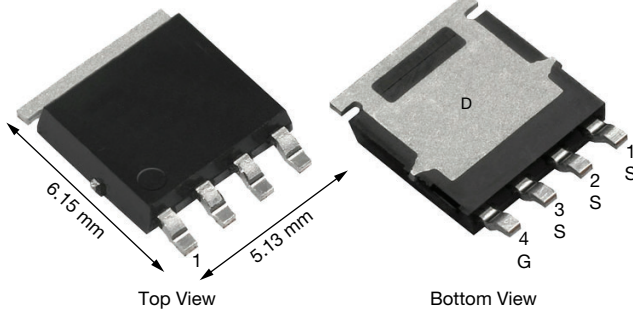
N-Channel 40 V (D-S) MOSFET



RoHS
COMPLIANT
HALOGEN
FREE

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω) Max.	I _D (A) ^{a, g}	Q _g (Typ.)
40	0.00135 at V _{GS} = 10 V	80	58 nC
	0.00175 at V _{GS} = 4.5 V	80	

PowerPAK® SO-8L Single



Ordering Information:

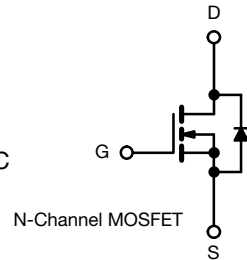
SiJ438DP-T1-GE3 (lead (Pb)-free and halogen-free)

FEATURES

- TrenchFET® Gen IV power MOSFET
- Tuned for the lowest R_{DS}-Q_{oss} FOM
- 100 % R_g and UIS tested
- Q_{gd} / Q_{gs} ratio < 1 optimizes switching characteristics
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS

- Synchronous rectification
- ORing
- High power density DC/DC
- VRMs and embedded DC/DC
- DC/AC inverters
- Load switch



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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V _{DS}	40	V
Gate-Source Voltage	V _{GS}	+20, -16	
Continuous Drain Current (T _J = 150 °C)	I _D	T _C = 25 °C	80 ^g
		T _C = 70 °C	80 ^g
		T _A = 25 °C	45.3 ^{b, c}
		T _A = 70 °C	36.2 ^{b, c}
Pulsed Drain Current (t = 100 μs)	I _{DM}	200	A
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	
		T _A = 25 °C	4.5 ^{b, c}
Single Pulse Avalanche Current	I _{AS}	50	mJ
Single Pulse Avalanche Energy	E _{AS}	125	
Maximum Power Dissipation	P _D	T _C = 25 °C	69.4
		T _C = 70 °C	44.4
		T _A = 25 °C	5 ^{b, c}
		T _A = 70 °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}	1.3	1.8	

Notes

- T_C = 25 °C.
- Surface mounted on 1" x 1" FR4 board.
- t = 10 s.
- See solder profile (www.vishay.com/doc?73257). The PowerPAK SO-8L 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 65 °C/W.
- Package limited.



SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	40	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$	-	22	-	mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		-	-5.6	-	
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.1	-	2.4	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = +20\text{ V}, -16\text{ V}$	-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$	-	-	1	μA
		$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$	-	-	10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	30	-	-	A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$	-	0.00110	0.00135	Ω
		$V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$	-	0.00145	0.00175	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 10\text{ V}, I_D = 20\text{ A}$	-	149	-	S
Dynamic ^b						
Input Capacitance	C_{ISS}	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	9400	-	pF
Output Capacitance	C_{OSS}		-	1340	-	
Reverse Transfer Capacitance	C_{RSS}		-	215	-	
Total Gate Charge	Q_g	$V_{DS} = 20\text{ V}, V_{GS} = 10\text{ V}, I_D = 10\text{ A}$	-	121	182	nC
		$V_{DS} = 20\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$	-	58	87	
Gate-Source Charge	Q_{gs}		-	22.6	-	
Gate-Drain Charge	Q_{gd}		-	13.5	-	
Output Charge	Q_{OSS}	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$	-	62.5	94	
Gate Resistance	R_g	$f = 1\text{ MHz}$	0.4	1.1	2.0	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 20\text{ V}, R_L = 2\text{ }\Omega$ $I_D \cong 10\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$	-	16	32	ns
Rise Time	t_r		-	19	38	
Turn-Off Delay Time	$t_{d(off)}$		-	54	108	
Fall Time	t_f		-	9	18	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 20\text{ V}, R_L = 2\text{ }\Omega$ $I_D \cong 10\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$	-	55	110	
Rise Time	t_r		-	98	196	
Turn-Off Delay Time	$t_{d(off)}$		-	47	94	
Fall Time	t_f		-	17	34	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$	-	-	63	A
Pulse Diode Forward Current ($t = 100\text{ }\mu\text{s}$)	I_{SM}		-	-	200	
Body Diode Voltage	V_{SD}	$I_S = 5\text{ A}$	-	0.7	1.1	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 10\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$	-	60	120	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	95	190	nC
Reverse Recovery Fall Time	t_a		-	33	-	ns
Reverse Recovery Rise Time	t_b		-	27	-	

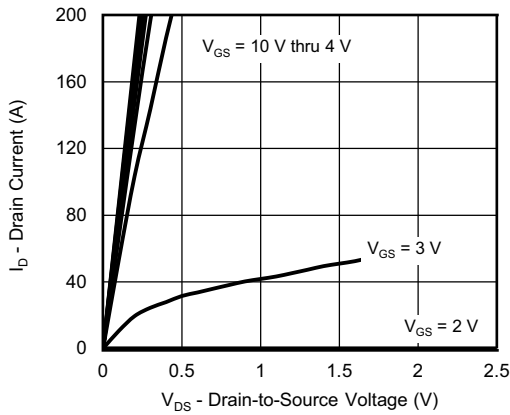
Notes

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

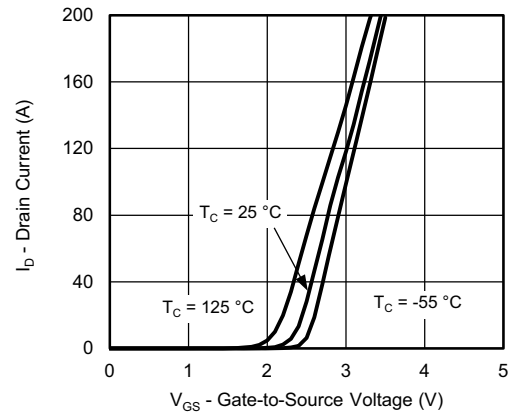
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



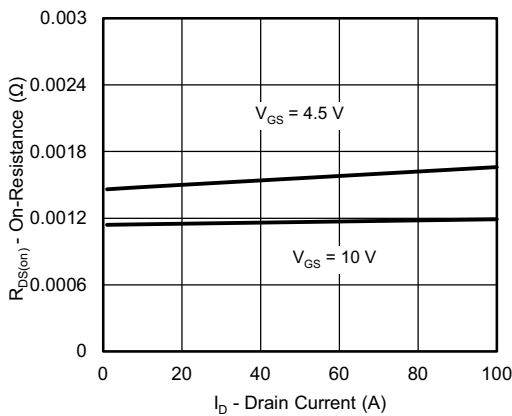
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



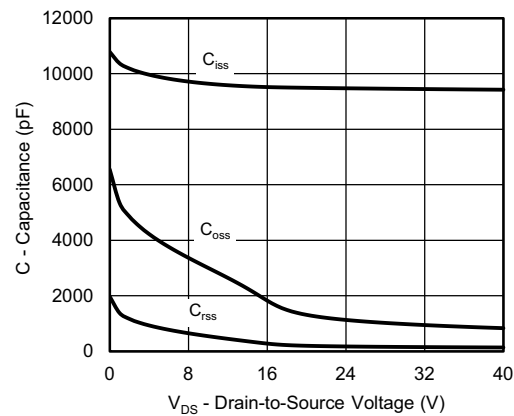
Output Characteristics



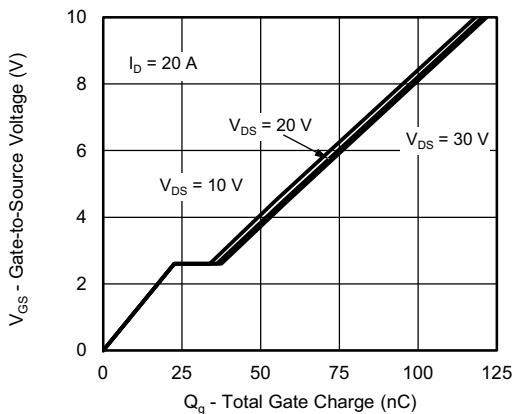
Transfer Characteristics



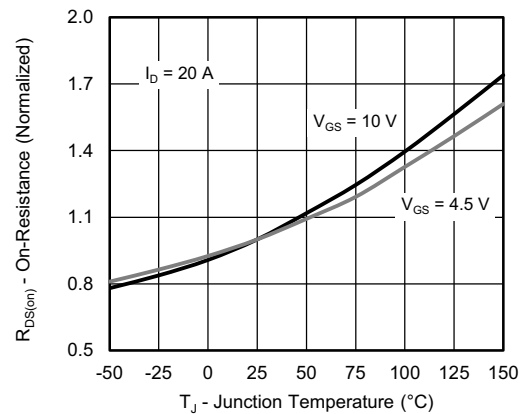
On-Resistance vs. Drain Current



Capacitance



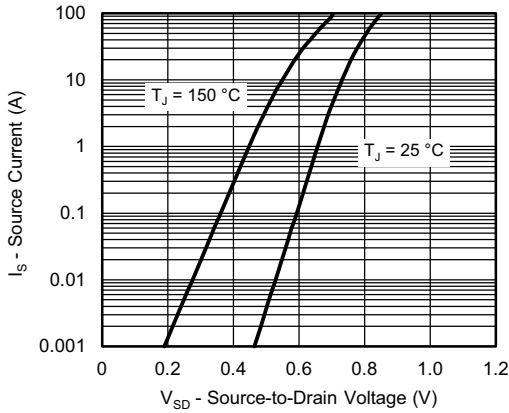
Gate Charge



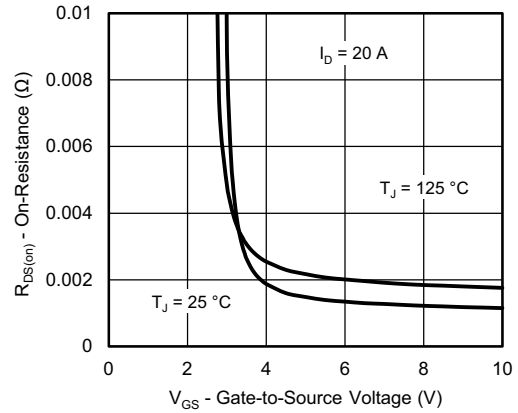
On-Resistance vs. Junction Temperature



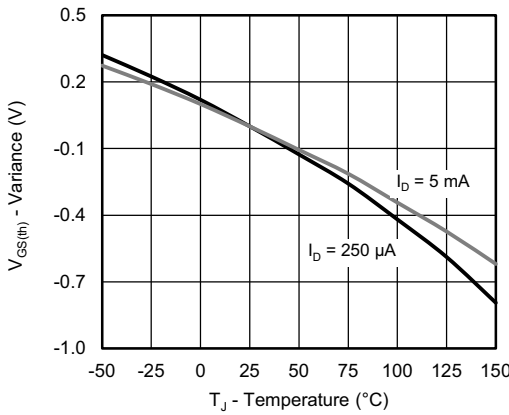
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



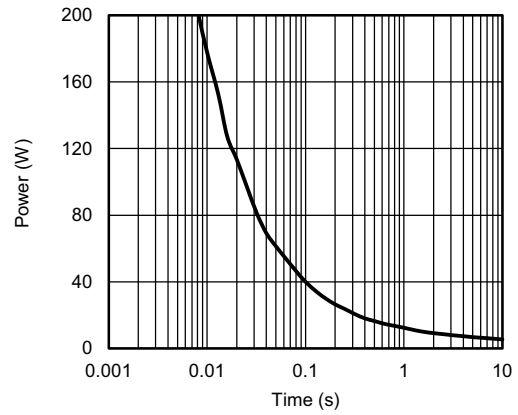
Source-Drain Diode Forward Voltage



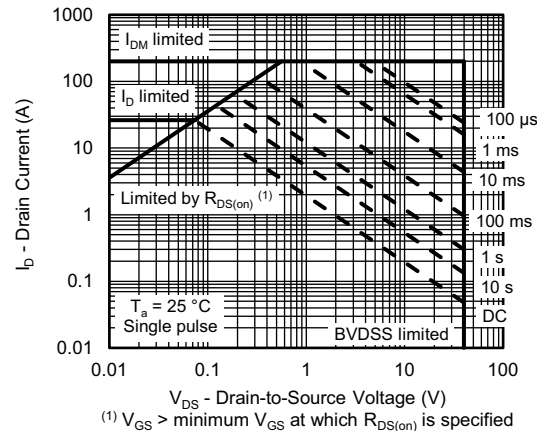
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



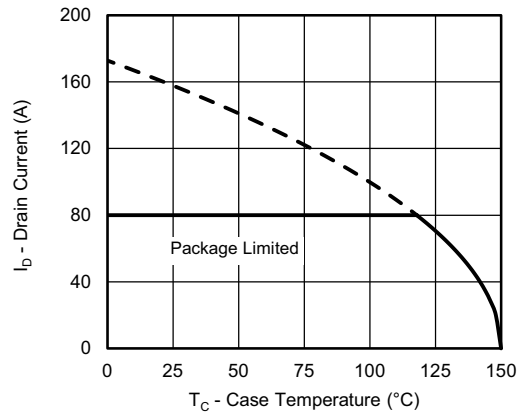
Single Pulse Power, Junction-to-Ambient



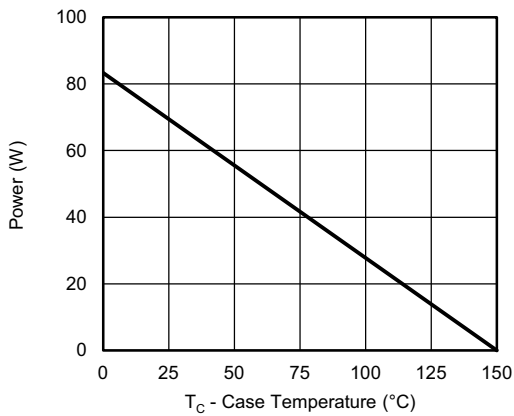
Safe Operating Area, Junction-to-Ambient



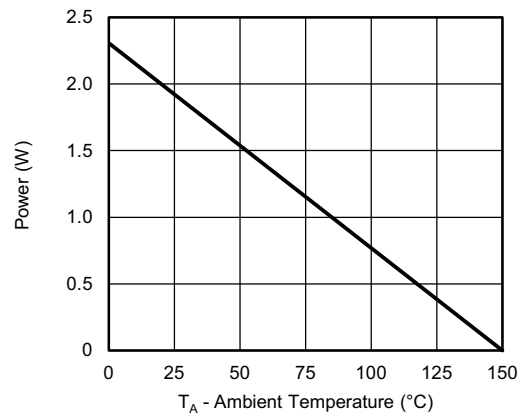
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating ^a



Power, Junction-to-Case



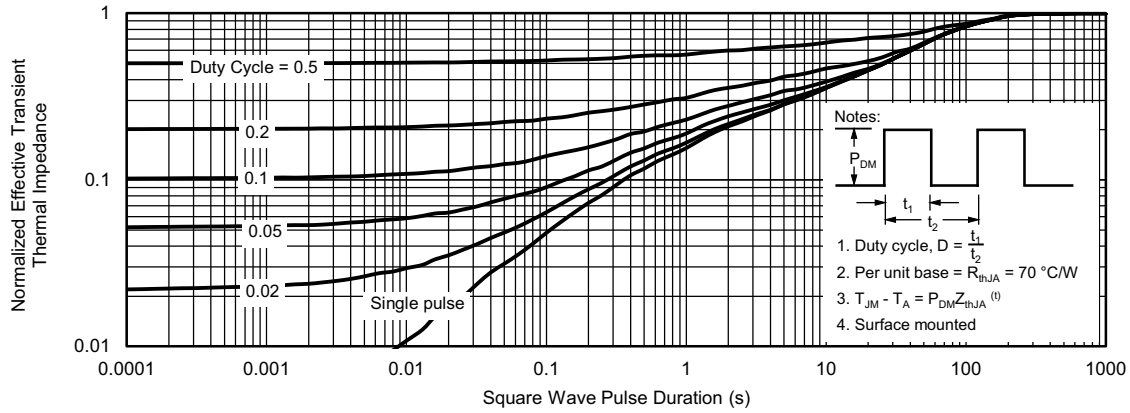
Power, Junction-to-Ambient

Note

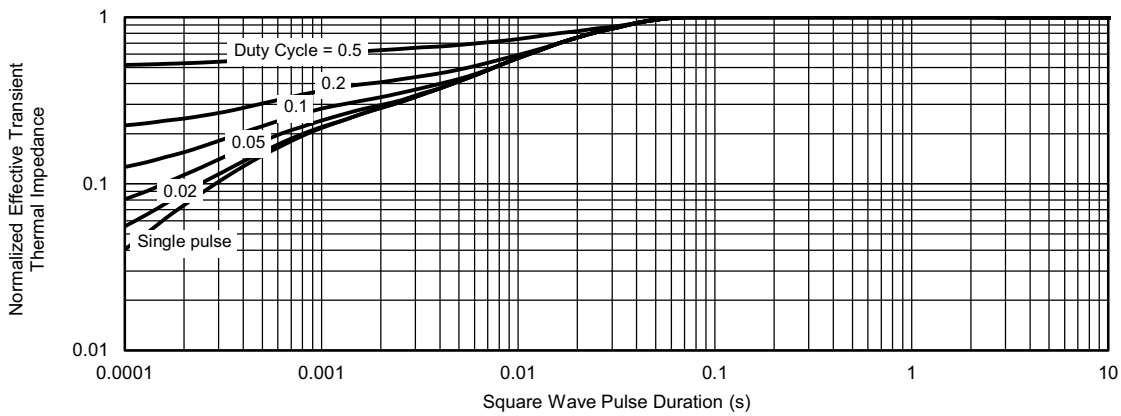
a. The power dissipation P_D is based on T_J (max.) = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient

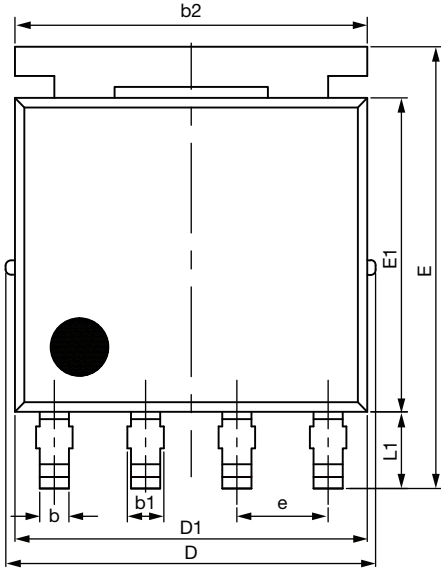


Normalized Thermal Transient Impedance, Junction-to-Case

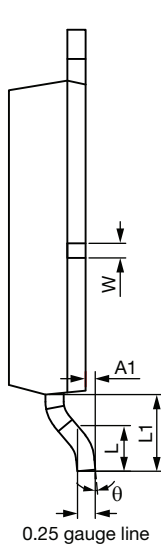
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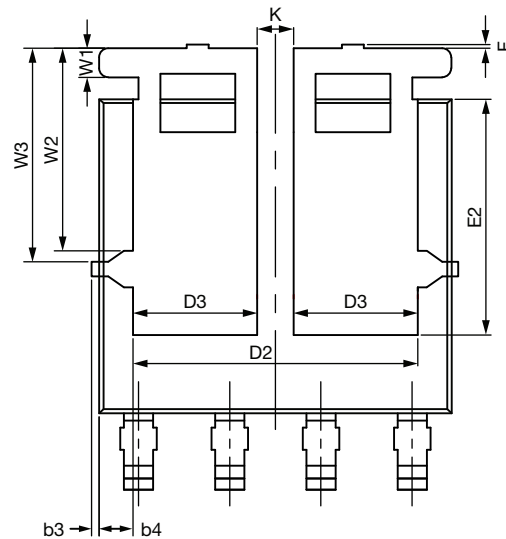
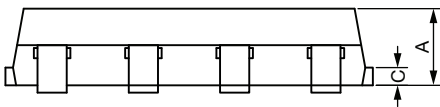
PowerPAK[®] SO-8L Case Outline 1



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: S19-0643-Rev. E, 05-Aug-2019
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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