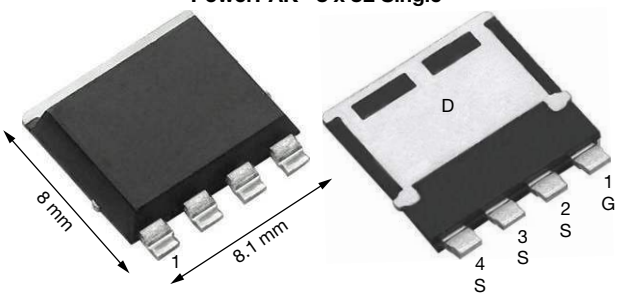
N-Channel 40 V (D-S) 175 °C MOSFET

PowerPAK® 8 x 8L Single



Top View Bottom View

FEATURES

- TrenchFET® Gen IV power MOSFET
- Fully lead (Pb)-free device
- Optimized Q_g, Q_{gd}, and Q_{gd}/Q_{gs} ratio reduces switching related power loss
- Up to 200 A maximum continuous drain current
- 50 % smaller footprint than D²PAK / TO-263
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

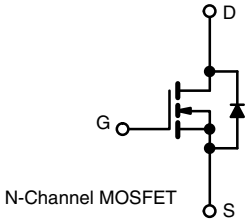
Pb-free

RoHS COMPLIANT

HALOGEN FREE

APPLICATIONS

- Synchronous rectification
- OR-ing
- Motor drive control
- Battery management



N-Channel MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	40
$R_{DS(on)}$ max. (Ω) at V_{GS} = 10 V	0.00096
$R_{DS(on)}$ max. (Ω) at V_{GS} = 4.5 V	0.00115
Q_g typ. (nC)	127
I_D (A) [a, g]	200
Configuration	Single

ORDERING INFORMATION	
Package	PowerPAK 8 x 8L
Lead (Pb)-free and halogen-free	SiJH440E-T1-GE3

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)	T_C = 25 °C	I_D	200 [a]	A
	T_C = 70 °C		200 [a]	
	T_A = 25 °C		40 [b]	
	T_A = 70 °C		33.8 [b]	
Pulsed drain current (t = 100 µs)		I_{DM}	500	
Continuous source-drain diode current	T_C = 25 °C	I_S	160	
	T_A = 25 °C		2.67 [b, c]	
Single pulse avalanche current	L = 0.1 mH	I_{AS}	60	
Single pulse avalanche energy		E_{AS}	180	mJ
Maximum power dissipation	T_C = 25 °C	P_D	158	W
	T_C = 70 °C		110	
	T_A = 25 °C		3 [b]	
	T_A =70 °C		2.1 [b]	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +175	°C
Soldering recommendations (peak temperature) [c]			260	

THERMAL RESISTANCE RATINGS

PARAMETER		SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient [b]	Steady state	R_{thJA}	42	50	°C/W
Maximum junction-to-case (drain)	Steady state	R_{thJC}	0.8	0.95	

Notes

a. Package limited.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 10 s.
d. See solder profile (www.vishay.com/doc?73257). The PowerPAK 8 x 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.
e. Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.
f. Maximum under steady state conditions is 50 °C/W.
g. T_C = 25 °C.

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static						
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA	40	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	I_D = 10 mA	-	24	-	mV/°C
$V_{GS(th)}$ temperature coefficient	$\Delta V_{GS(th)}/T_J$	I_D = 250 µA	-	-6.6	-	
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D =250 µA	1	-	2.3	V
Gate-source leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = +20 / -16 V	-	-	100	nA
Zero gate voltage drain current	I_{DSS}	V_{DS} = 40 V, V_{GS} =0 V	-	-	1	µA
		V_{DS} = 40 V, V_{GS} = 0 V, T_J = 70 °C	-	-	15	
On-state drain current [a]	$I_{D(on)}$	$V_{DS} \geq$ 10 V, V_{GS} =10 V	60	-	-	A
Drain-source on-state resistance [a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 20 A	-	0.00080	0.00096	Ω
		V_{GS} = 4.5 V, I_D = 20 A	-	0.00096	0.00115	
Forward transconductance [a]	g_{fs}	V_{DS} = 15 V, I_D = 20 A	-	140	-	S
Dynamic [b]						
Input capacitance	C_{iss}	V_{DS} = 20 V, V_{GS} = 0 V, f = 1 MHz	-	20 330	-	pF
Output capacitance	C_{oss}		-	2920	-	
Reverse transfer capacitance	C_{rss}		-	820	-	
Total gate charge	Q_g	V_{DS} = 20 V, V_{GS} = 10 V, I_D = 20 A	-	279	420	nC
		V_{DS} = 20 V, V_{GS} = 4.5 V, I_D =20 A	-	127	195	
Gate-source charge	Q_{gs}		-	64	-	
Gate-drain charge	Q_{gd}		-	24.5	-	
Gate resistance	R_g	f = 1 MHz	0.5	1.7	3.0	Ω
Turn-on delay time	$t_{d(on)}$	V_{DD} = 20 V, R_L = 10 Ω, $I_D \cong$ 20 A, V_{GEN} = 10 V, R_g = 1 Ω	-	28	56	ns
Rise time	t_r		-	35	70	
Turn-off delay time	$t_{d(off)}$		-	105	210	
Fall time	t_f		-	30	60	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 20 V, R_L = 1 Ω, $I_D \cong$ 20 A, V_{GEN} = 4.5 V, R_g = 1 Ω	-	140	280	
Rise time	t_r		-	290	580	
Turn-off delay time	$t_{d(off)}$		-	78	156	
Fall time	t_f		-	53	106	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I_S	T_C = 25 °C	-	-	160	A
Pulse diode forward current	I_{SM}		-	-	300	
Body diode voltage	V_{SD}	I_S = 5 A, V_{GS} = 0 V	-	0.68	1.1	V
Body diode reverse recovery time	t_{rr}	I_F = 20 A, dI/dt = 100 A/µs, T_J = 25 °C	-	92	184	ns
Body diode reverse recovery charge	Q_{rr}		-	245	490	nC
Reverse recovery fall time	t_a		-	54	-	ns
Reverse recovery rise time	t_b		-	38	-	

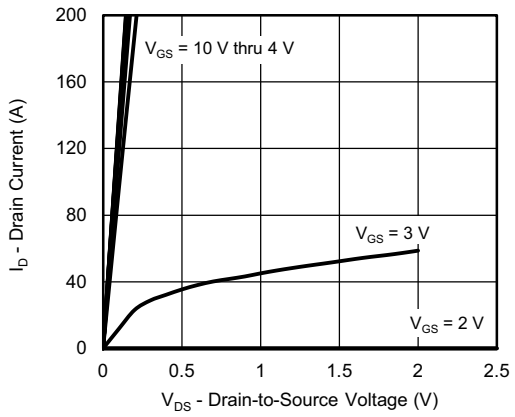
Notes

a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.

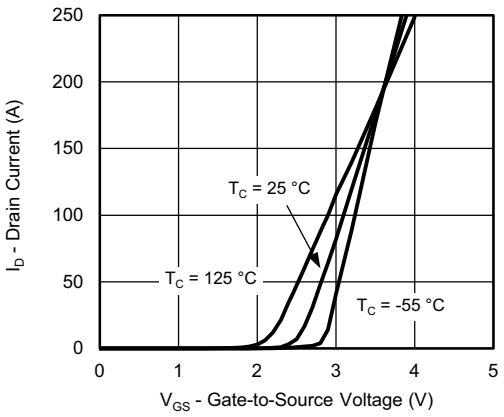
b. Guaranteed by design, not subject to production testing.

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.

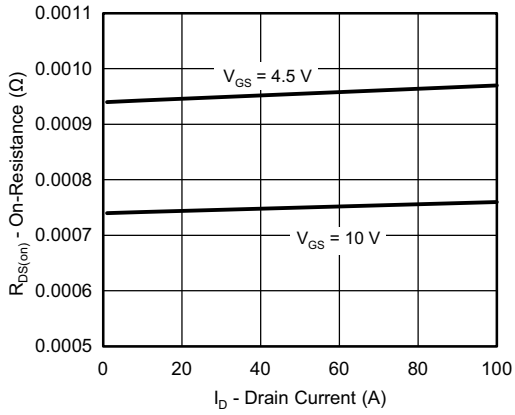
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



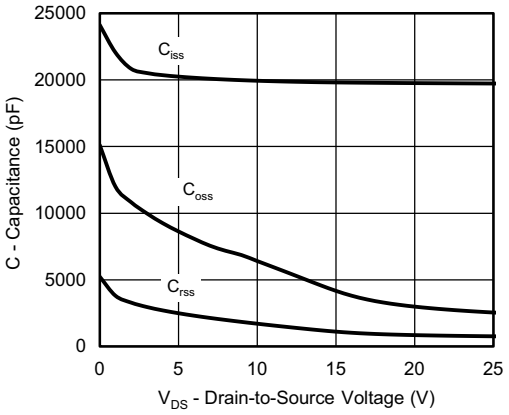
Output Characteristics



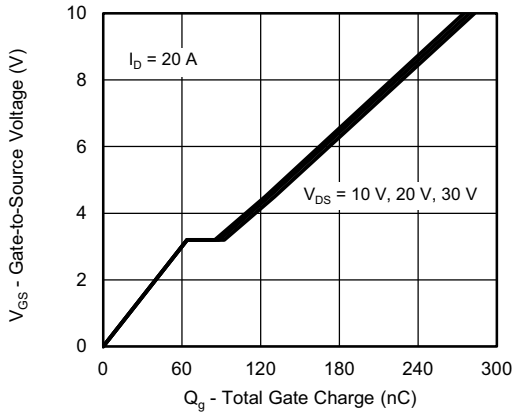
Transfer Characteristics



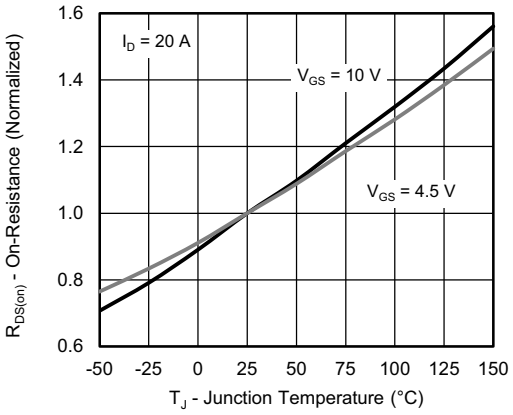
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

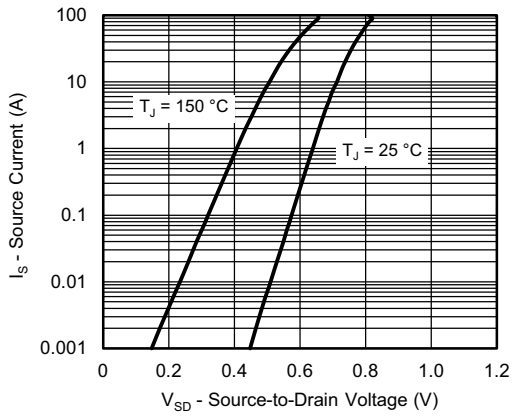


Gate Charge

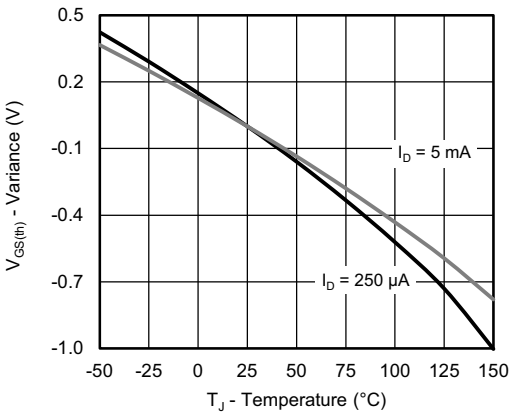


On-Resistance vs. Junction Temperature

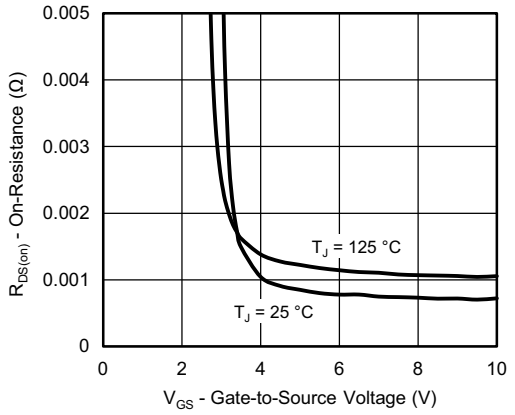
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



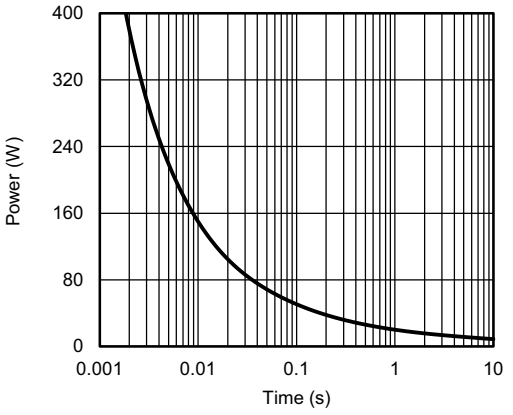
Source-Drain Diode Forward Voltage



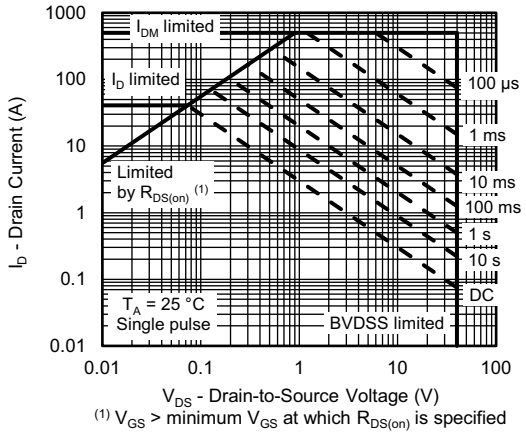
Threshold Voltage



On-Resistance vs. Gate-to-Source Voltage

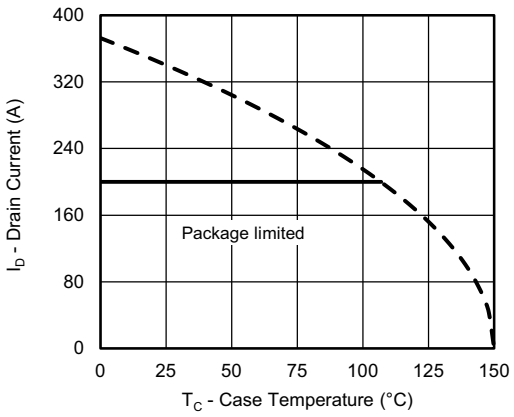


Single Pulse Power, Junction-to-Ambient

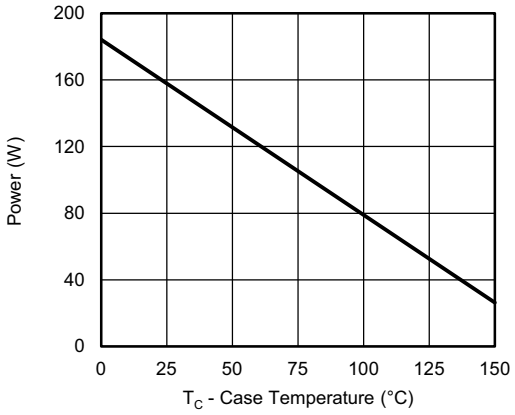


Safe Operating Area, Junction-to-Ambient

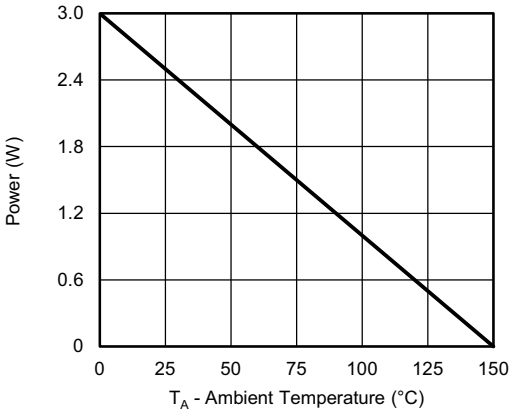
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating [a]



Power, Junction-to-Case

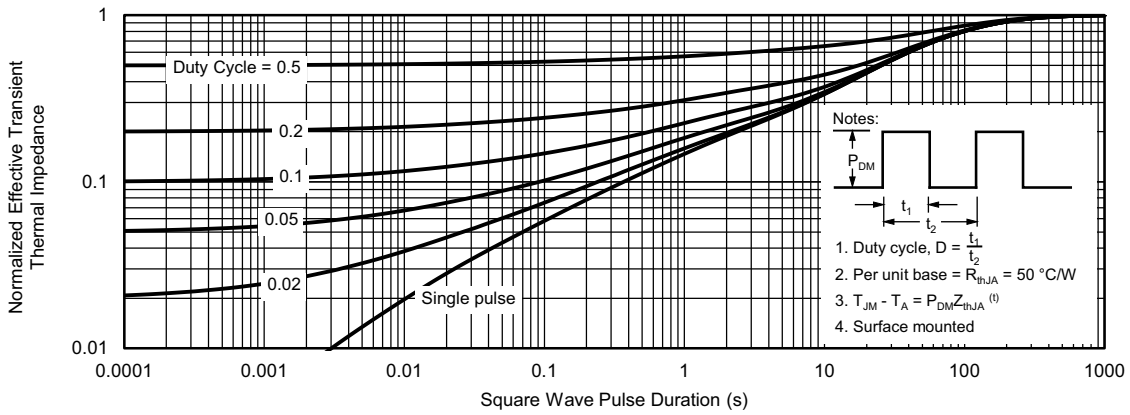


Power, Junction-to-Ambient

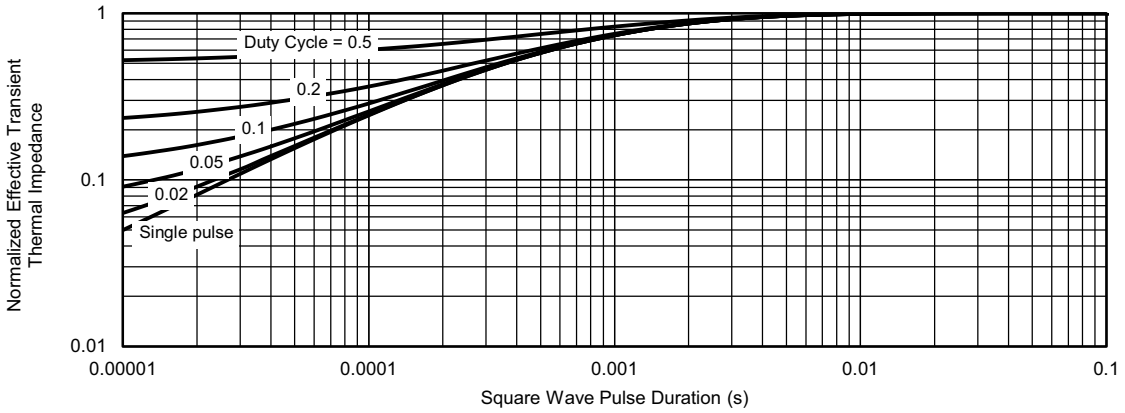
Note

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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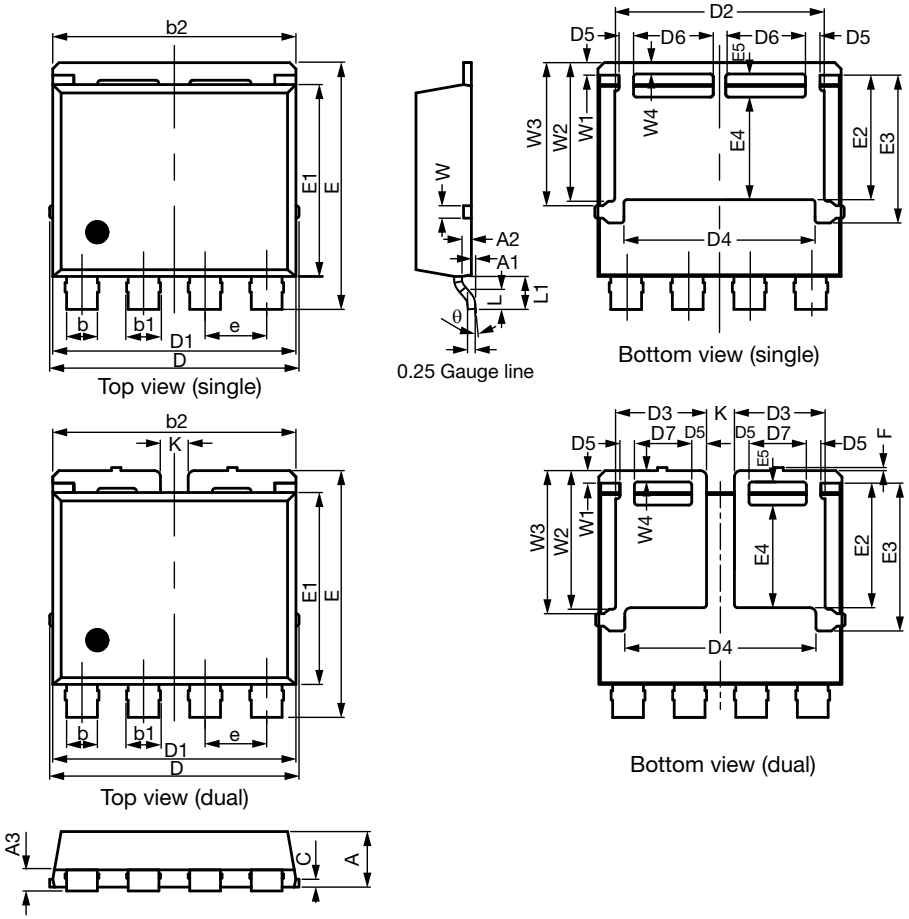
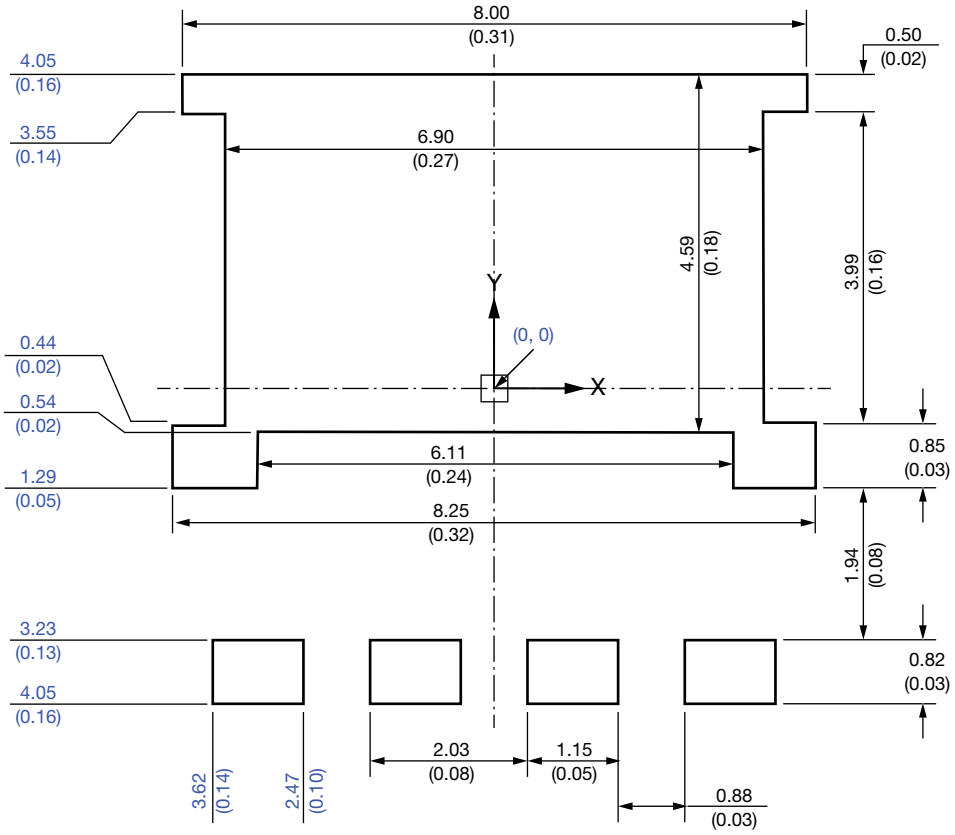
PowerPAK® 8 x 8L Case Outline



DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.70	1.80	1.90	0.067	0.071	0.075
A1	0.00	0.08	0.13	0.000	0.003	0.005
A2	0.25	0.30	0.35	0.010	0.012	0.014
A3	0.55	0.62	0.70	0.022	0.024	0.028
b	0.92	1.00	1.08	0.036	0.039	0.043
b1	1.02	1.10	1.18	0.040	0.043	0.046
b2	7.80	7.90	8.00	0.307	0.311	0.315
c	0.20	0.25	0.30	0.008	0.010	0.012
D	8.00	8.10	8.25	0.315	0.319	0.325
D1	7.80	7.90	8.00	0.307	0.311	0.315
D2	6.70	6.80	6.90	0.264	0.268	0.272
D3	2.85	2.95	3.05	0.112	0.116	0.120
D4	6.11	6.21	6.31	0.241	0.244	0.248
D5	0.37	0.47	0.57	0.015	0.019	0.022
D6	2.49	2.59	2.69	0.098	0.102	0.106
D7	1.76	1.86	1.96	0.069	0.073	0.077

DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
e	1.95	2.00	2.05	0.077	0.079	0.081
E	7.90	8.00	8.10	0.311	0.315	0.319
E1	6.12	6.22	6.32	0.241	0.245	0.249
E2	3.94	4.04	4.14	0.140	0.159	0.163
E3	4.69	4.79	4.89	0.185	0.189	0.193
E4	3.23	3.33	3.43	0.127	0.131	0.135
E5	0.65	0.75	0.85	0.026	0.030	0.033
F	0.00	0.10	0.15	0.000	0.004	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	0.80	0.90	1.00	0.031	0.035	0.039
W	0.30	0.40	0.50	0.012	0.016	0.020
W1	0.30	0.40	0.50	0.012	0.016	0.020
W2	4.39	4.49	4.59	0.173	0.177	0.181
W3	4.54	4.64	4.74	0.179	0.183	0.187
W4	0.32	0.37	0.42	0.013	0.015	0.017
θ	6°	10°	14°	6°	10°	14°
C17-1388-Rev. B, 16-Oct-17 DWG: 6026						

Recommended Minimum PADs for PowerPAK® 8 x 8L Single



Dimensions in millimeters (inches)

Note

- Linear dimensions are in black, the same information is provided in ordinate dimensions which are in blue.

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