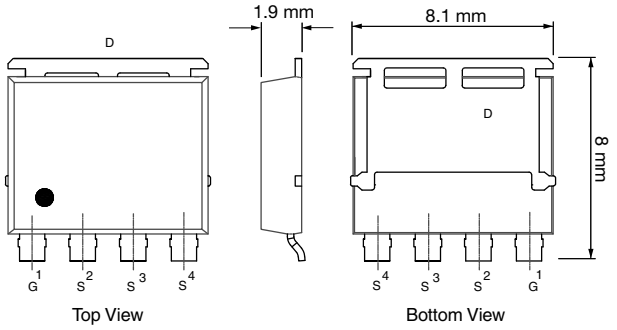
Automotive N-Channel 40 V (D-S) 175 °C MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	40
$R_{DS(on)}$ (Ω) at V_{GS} = 10 V	0.0017
$R_{DS(on)}$ (Ω) at V_{GS} = 4.5 V	0.0020
I_D (A)	200
Configuration	Single

PowerPAK® 8x8L Single



Top View

Bottom View

FEATURES

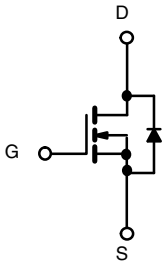
- TrenchFET® power MOSFET
- AEC-Q101 qualified
- 100 % R_g and UIS tested
- Thin 1.9 mm height
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb-free

RoHS COMPLIANT

HALOGEN FREE



N-Channel MOSFET

ORDERING INFORMATION	
Package	PowerPAK 8x8L
Lead (Pb)-free and Halogen-free	SQJQ402E-T1-GE3

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	200	A
	T_C = 125 °C		127	
Continuous Source Current (Diode Conduction)		I_S	200	
Pulsed Drain Current [b]		I_{DM}	300	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	85	
Single Pulse Avalanche Energy		E_{AS}	361	mJ
Maximum Power Dissipation	T_C = 25 °C	P_D	150	W
	T_C = 125 °C		50	
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}	50	°C/W
Junction-to-Case (Drain)		R_{thJC}	1	

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). The PowerPAK 8x8L 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.

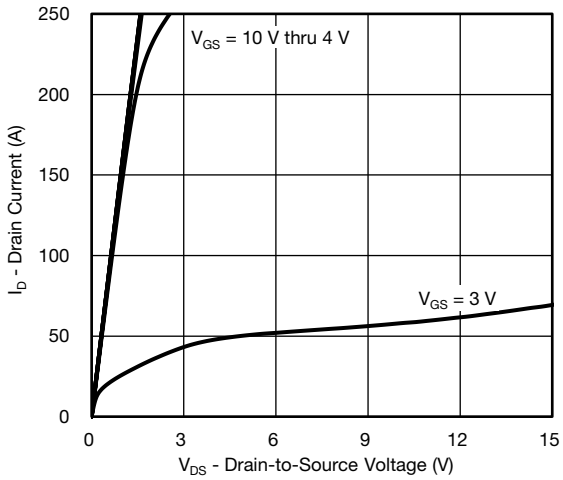
SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static							
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0, I_D = 250 µA		40	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA		1.5	2	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	100	-	-	A
Drain-Source On-State Resistance [a]	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 20 A	-	0.0013	0.0017	Ω
		V_{GS} = 4.5 V	I_D = 10 A	-	0.0015	0.0020	
		V_{GS} = 10 V	I_D = 20 A, T_J = 125 °C	-	-	0.0026	
		V_{GS} = 10 V	I_D = 20 A, T_J = 175 °C	-	-	0.0031	
Forward Transconductance [b]	g_{fs}	V_{DS} = 15 V, I_D = 20 A		-	140	-	S
Dynamic [b]							
Input Capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = 20 V, f = 1 MHz	-	10 760	13 500	pF
Output Capacitance	C_{oss}			-	1370	1800	
Reverse Transfer Capacitance	C_{rss}			-	650	850	
Total Gate Charge [c]	Q_g	V_{GS} = 10 V	V_{DS} = 20 V, I_D = 40 A	-	169	260	nC
Gate-Source Charge [c]	Q_{gs}			-	32	-	
Gate-Drain Charge [c]	Q_{gd}			-	29	-	
Gate Resistance	R_g	f = 1 MHz		0.6	1.3	2.5	Ω
Turn-On Delay Time [c]	$t_{d(on)}$	V_{DD} = 20 V, R_L = 0.5 Ω I_D ≅ 40 A, V_{GEN} = 10 V, R_g = 1 Ω		-	19	30	ns
Rise Time [c]	t_r			-	15	25	
Turn-Off Delay Time [c]	$t_{d(off)}$			-	69	110	
Fall Time [c]	t_f			-	11	20	
Source-Drain Diode Ratings and Characteristics [b]							
Pulsed Current [a]	I_{SM}			-	-	300	A
Forward Voltage	V_{SD}	I_F = 50 A, V_{GS} = 0		-	0.82	1.2	V

Notes

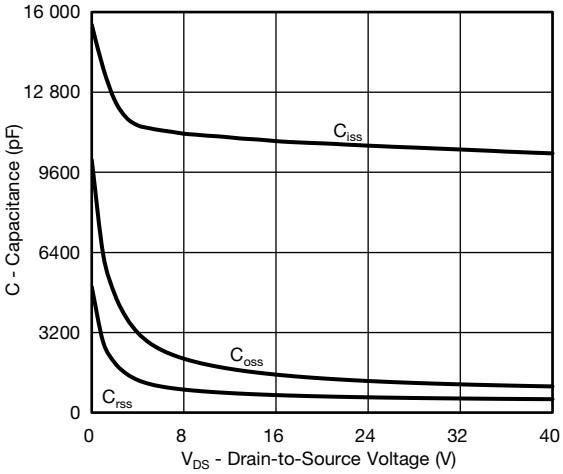
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

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.

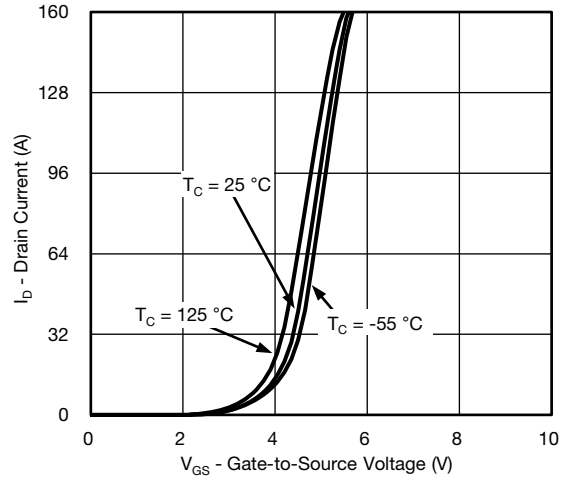
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



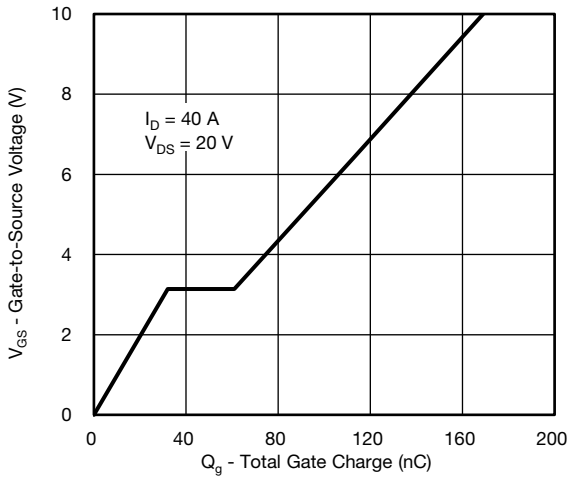
Output Characteristics



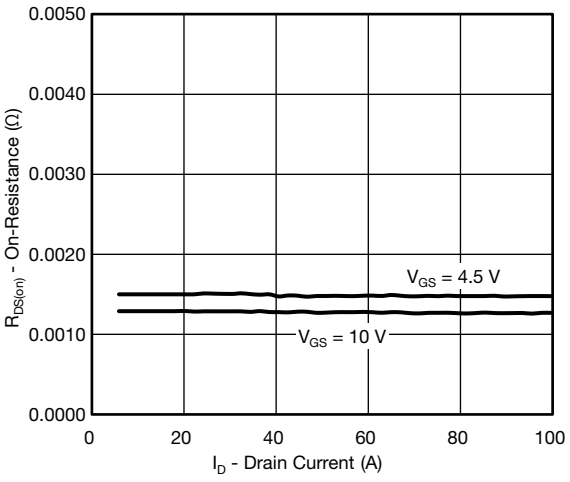
Capacitance



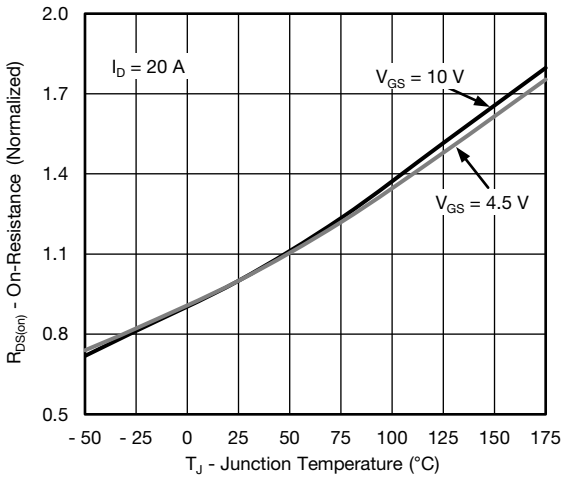
Transfer Characteristics



Gate Charge

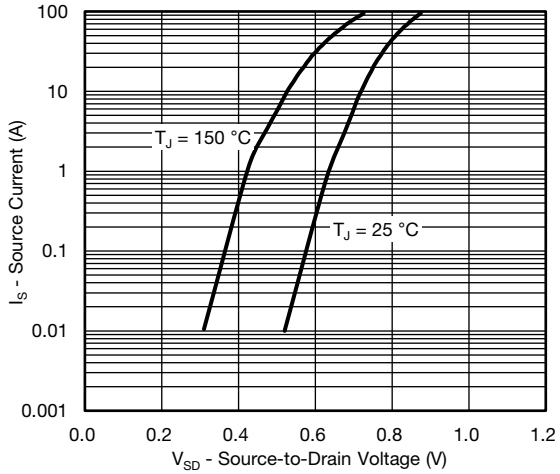


On-Resistance vs. Drain Current

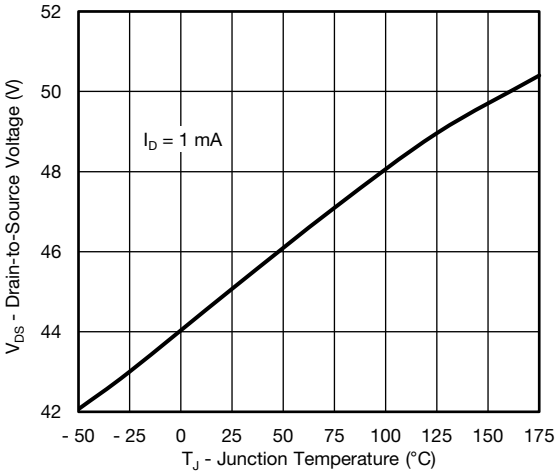


On-Resistance vs. Junction Temperature

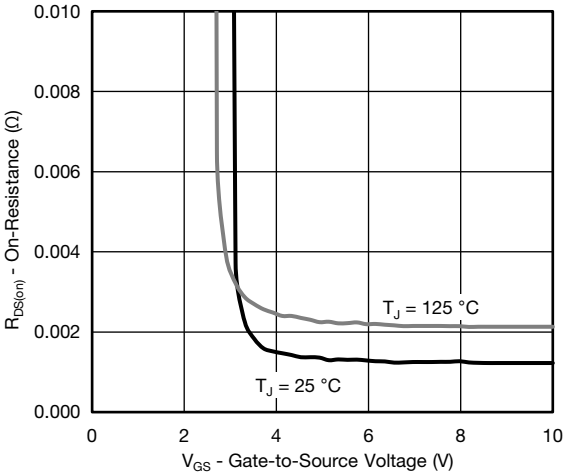
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



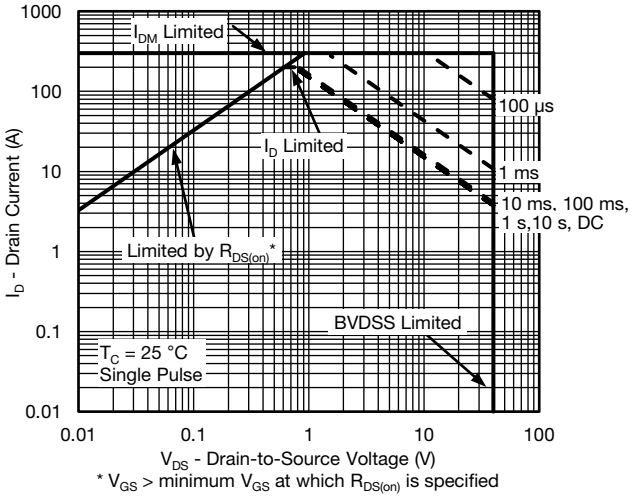
Source Drain Diode Forward Voltage



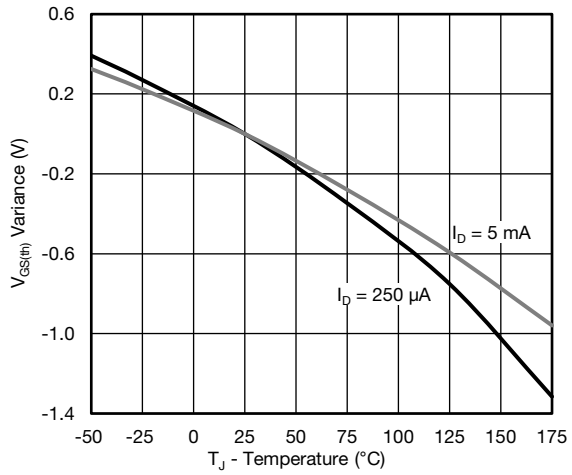
Drain Source Breakdown vs. Junction Temperature



On-Resistance vs. Gate-to-Source Voltage

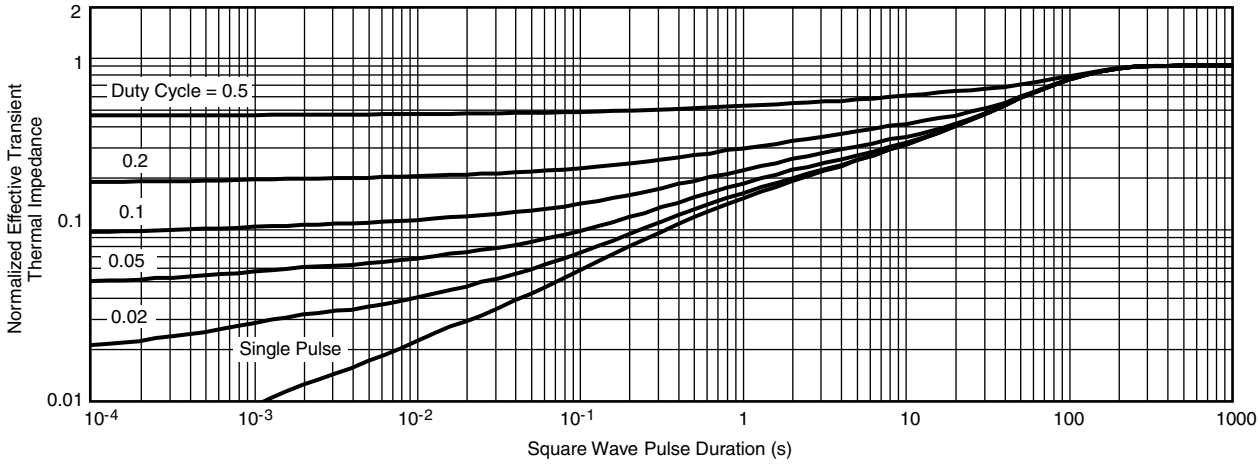


Safe Operating Area

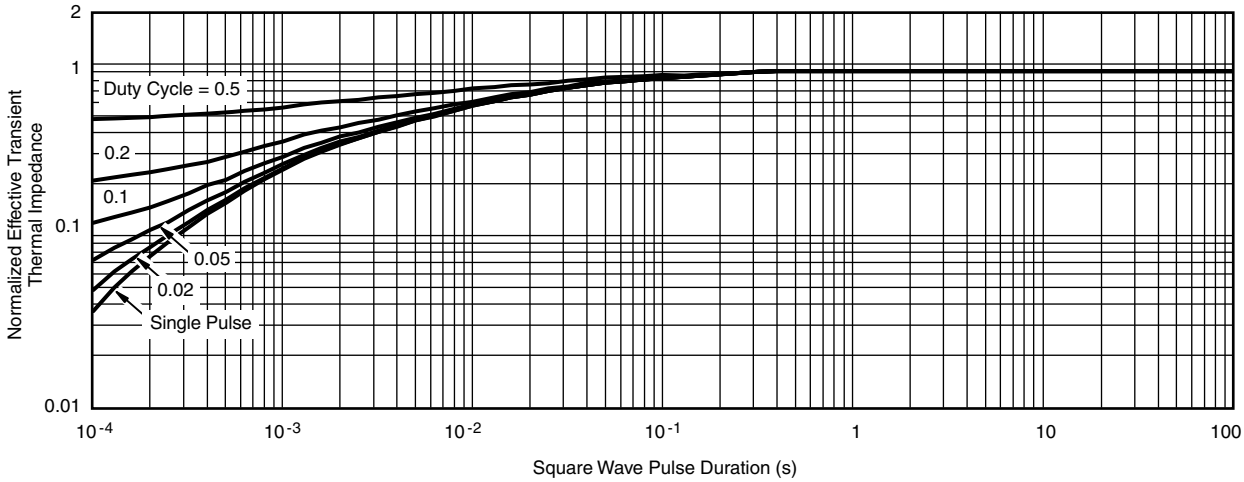


Threshold Voltage

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



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see www.vishay.com/ppg?62748.

PowerPAK® 8 x 8L

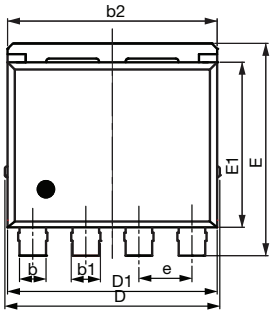
Ordering codes for the SQ rugged series power MOSFETs in the PowerPAK 8 x 8L package:

DATASHEET PART NUMBER	OLD ORDERING CODE [a]	NEW ORDERING CODE
SQJQ402E	SQJQ402E-T1-GE3	**SQJQ402E-T1_GE3**

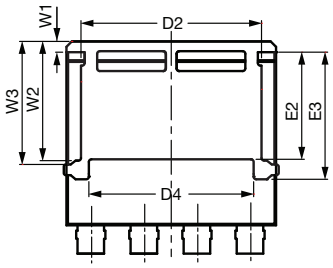
Note

a. Old ordering code is obsolete and no longer valid for new orders

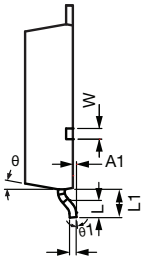
PowerPAK® 8 x 8L Case Outline



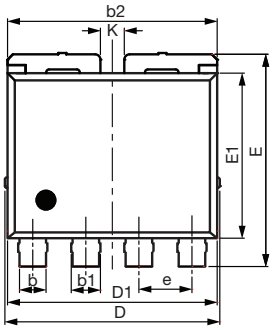
Top view (single)



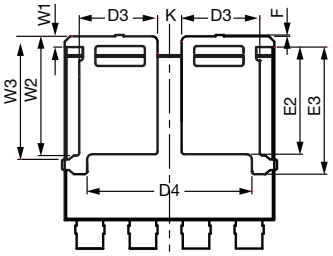
Bottom view (single)



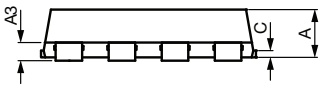
0.25 gauge line



Top view (dual)



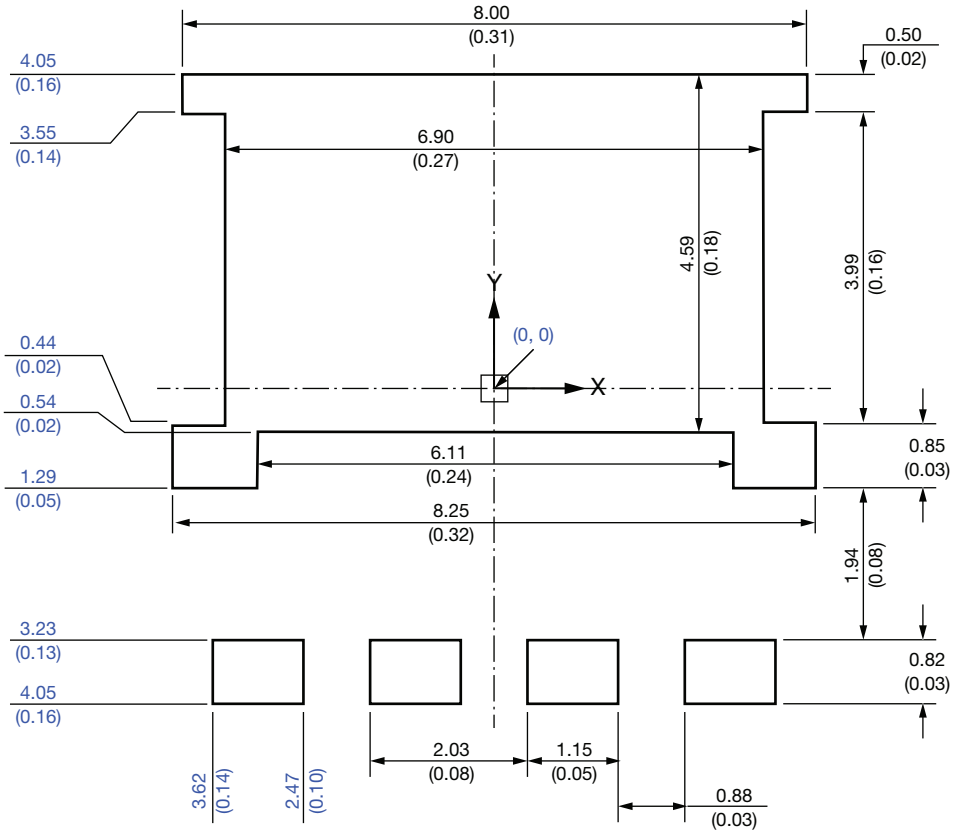
Bottom view (dual)



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
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
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
F	0.05	0.10	0.15	0.002	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
θ	6°	10°	14°	6°	10°	14°
θ1	0°	3°	8°	0°	3°	8°

C14-0891-Rev. A, 06-Oct-14
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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