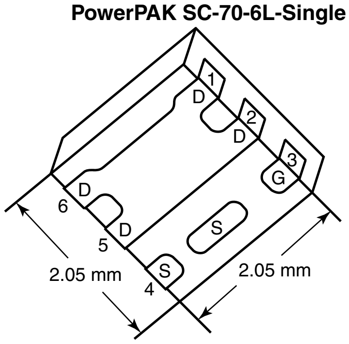
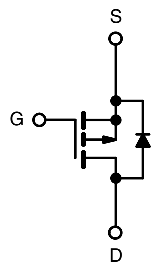
P-Channel 40 V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ.)
- 40	0.047 at V_{GS} = - 10 V	- 12[a]	11 nC
	0.065 at V_{GS} = - 4.5 V	- 12[a]	

PowerPAK SC-70-6L-Single





P-Channel MOSFET

FEATURES

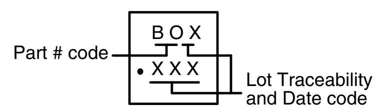
- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- Thermally Enhanced PowerPAK® SC-70 Package
  - Small Footprint Area
  - Low On-Resistance
- 100 % R_g and UIS Tested
- Compliant to RoHS Directive 2002/95/EC

Pb-free
RoHS COMPLIANT
HALOGEN FREE

APPLICATIONS

- Portable and Consumer Devices
  - Load Switch
  - DC/DC Converter
  - Motor Drive
  - High-Side Switch in Half- and Full-Bridge Converters

Marking Code



Ordering Information:
SiA441DJ-T1-GE3 (Lead (Pb)-free and Halogen-free)

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	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	- 12[a]	A
	T_C = 70 °C		- 12[a]	
	T_A = 25 °C		- 6.6[b, c]	
	T_A = 70 °C		- 5.3[b, c]	
Pulsed Drain Current (t = 300 µs)		I_{DM}	- 30	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	- 12[a]	
	T_A = 25 °C		- 2.9[b, c]	
Avalanche Current	L = 0.1 mH	I_{AS}	13	
Single Pulse Avalanche Energy		E_{AS}	8.5	mJ
Maximum Power Dissipation	T_C = 25 °C	P_D	19	W
	T_C = 70 °C		12	
	T_A = 25 °C		3.5[b, c]	
	T_A = 70 °C		2.2[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]	t ≤ 5 s	R_{thJA}	28	36	°C/W
Maximum Junction-to-Case (Drain)	Steady State	R_{thJC}	5.3	6.5	

Notes:
a. Package limited.
b. Surface Mounted on 1" x 1" FR4 board.
c. t = 5 s.
d. See Solder Profile (www.vishay.com/ppg?73257). The PowerPAK SC-70 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 80 °C/W.

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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, I_D = - 250 µA	- 40			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = - 250 µA		- 29		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			4.3		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = - 250 µA	- 1.2		- 2.2	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 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 = 55 °C			- 10	
On-State Drain Current[a]	$I_{D(on)}$	V_{DS} ≤ - 5 V, V_{GS} = - 10 V	- 20			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = - 10 V, I_D = - 4.4 A		0.039	0.047	Ω
		V_{GS} = - 4.5 V, I_D = - 3.7 A		0.053	0.065	
Forward Transconductance[a]	g_{fs}	V_{DS} = - 15 V, I_D = - 4.4 A		13		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = - 20 V, V_{GS} = 0 V, f = 1 MHz		890		pF
Output Capacitance	C_{oss}			115		
Reverse Transfer Capacitance	C_{rss}			95		
Total Gate Charge	Q_g	V_{DS} = - 20 V, V_{GS} = - 10 V, I_D = - 4.9 A		22	35	nC
		V_{DS} = - 20 V, V_{GS} = - 4.5 V, I_D = - 4.9 A		11	17	
Gate-Source Charge	Q_{gs}			2.9		
Gate-Drain Charge	Q_{gd}			5.2		
Gate Resistance	R_g	f = 1 MHz	1.4	7.2	14.4	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 20 V, R_L = 5.1 Ω I_D ≅ - 3.9 A, V_{GEN} = - 4.5 V, R_g = 1 Ω		40	80	ns
Rise Time	t_r			30	60	
Turn-Off Delay Time	$t_{d(off)}$			30	60	
Fall Time	t_f			12	25	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 20 V, R_L = 5.1 Ω I_D ≅ - 3.9 A, V_{GEN} = - 10 V, R_g = 1 Ω		7	15	
Rise Time	t_r			12	25	
Turn-Off Delay Time	$t_{d(off)}$			30	60	
Fall Time	t_f			10	20	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			- 12	A
Pulse Diode Forward Current	I_{SM}				- 30	
Body Diode Voltage	V_{SD}	I_S = - 3.9 A, V_{GS} = 0 V		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = - 3.9 A, dI/dt = 100 A/µs, T_J = 25 °C		25	50	ns
Body Diode Reverse Recovery Charge	Q_{rr}			22	50	nC
Reverse Recovery Fall Time	t_a			17		ns
Reverse Recovery Rise Time	t_b			8		

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.

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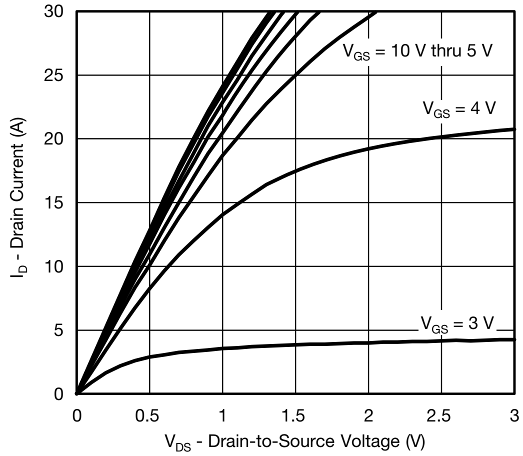
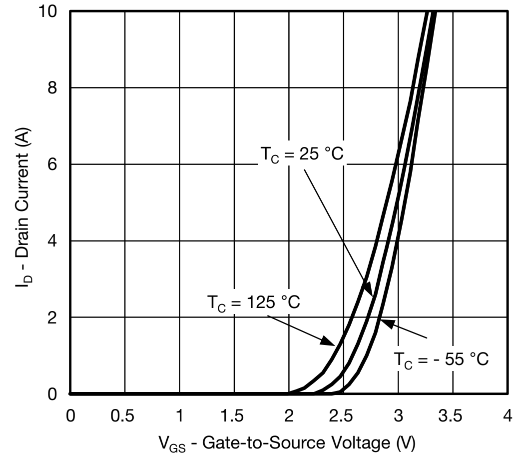
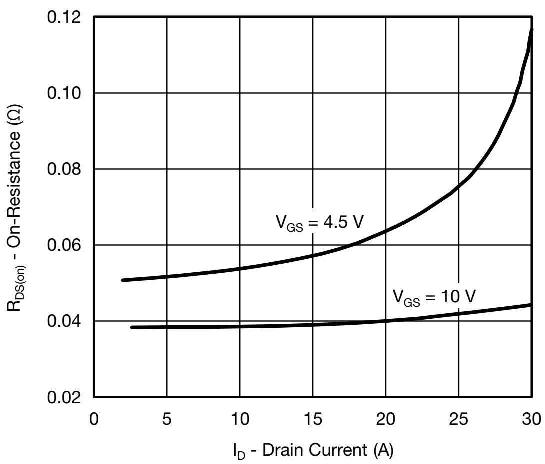


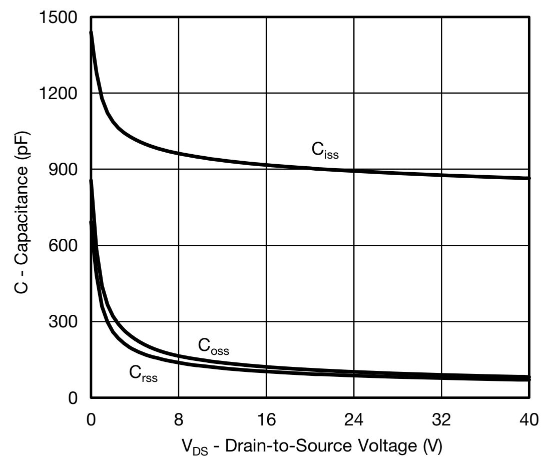
Output Characteristics



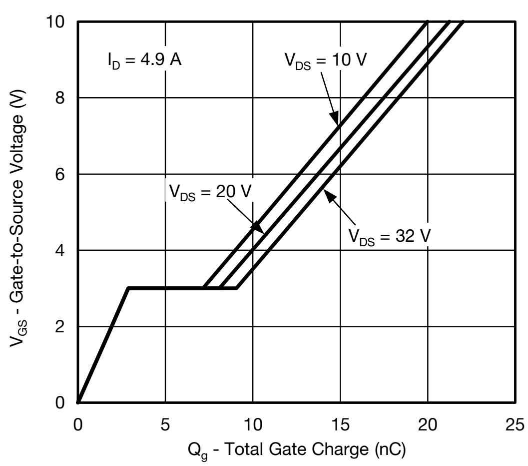
Transfer Characteristics



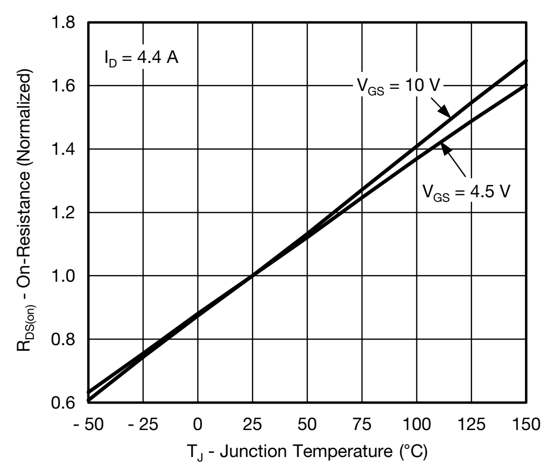
On-Resistance vs. Drain Current and Gate Voltage



Capacitance



Gate Charge



On-Resistance vs. Junction Temperature

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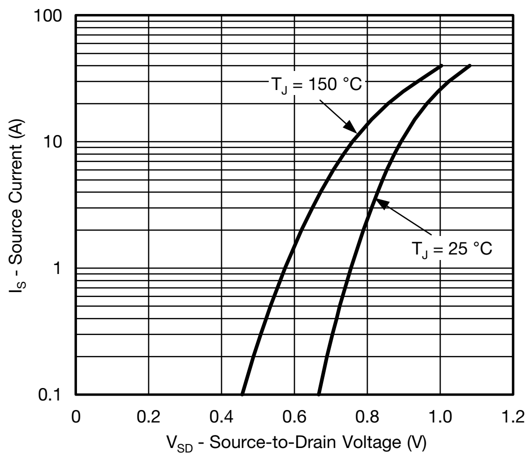
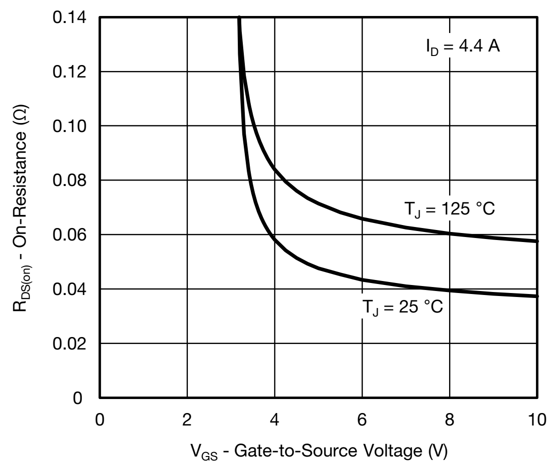
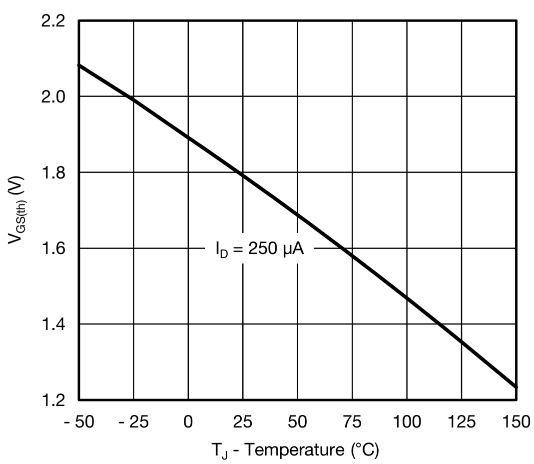


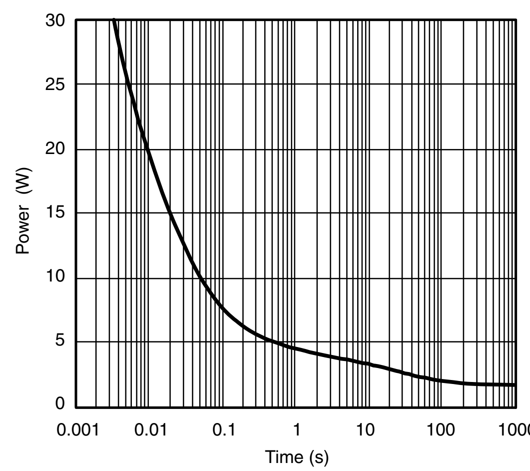
Soure-Drain Diode Forward Voltage



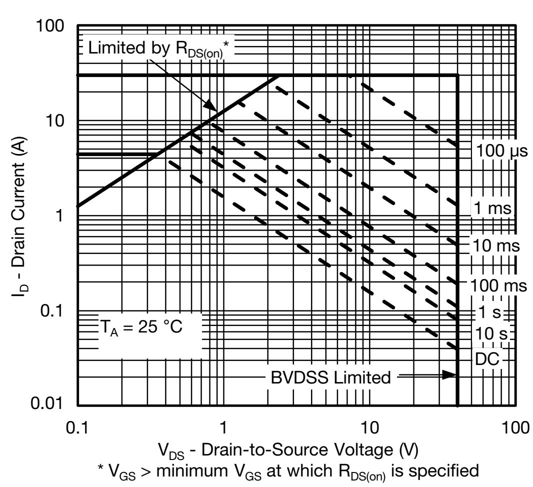
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power, Junction-to-Ambient



Safe Operating Area, Junction-to-Ambient

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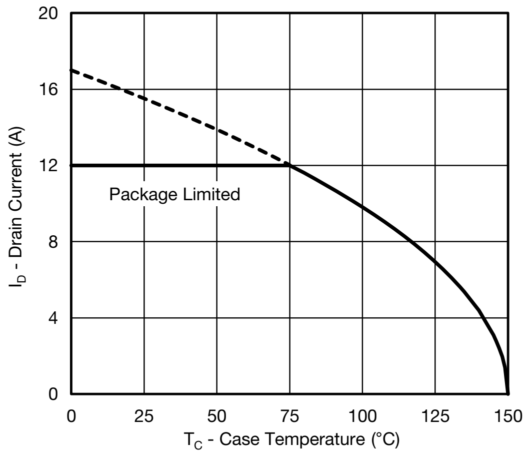
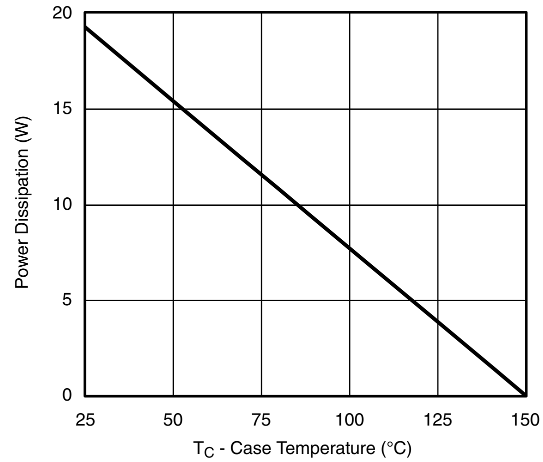


Current Derating*



Power Derating

* 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.

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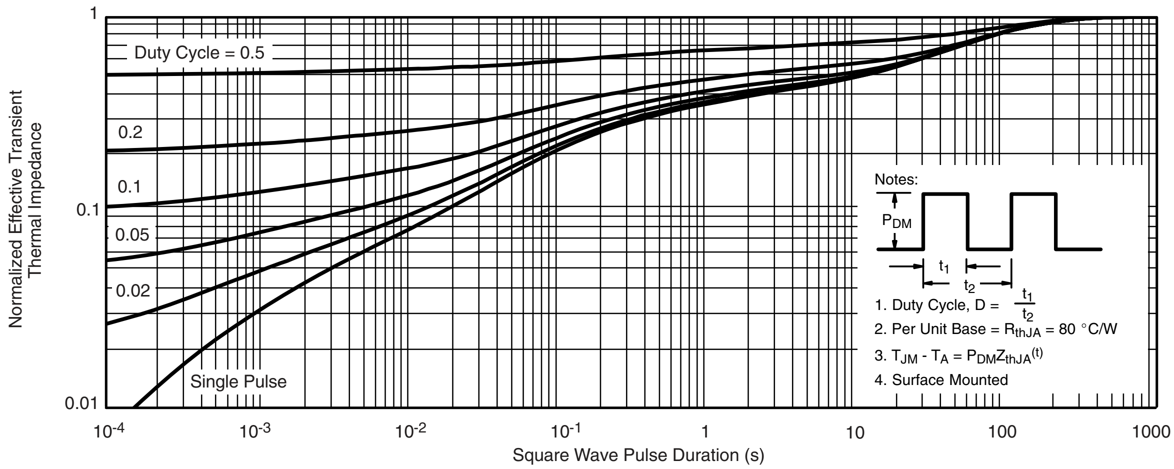
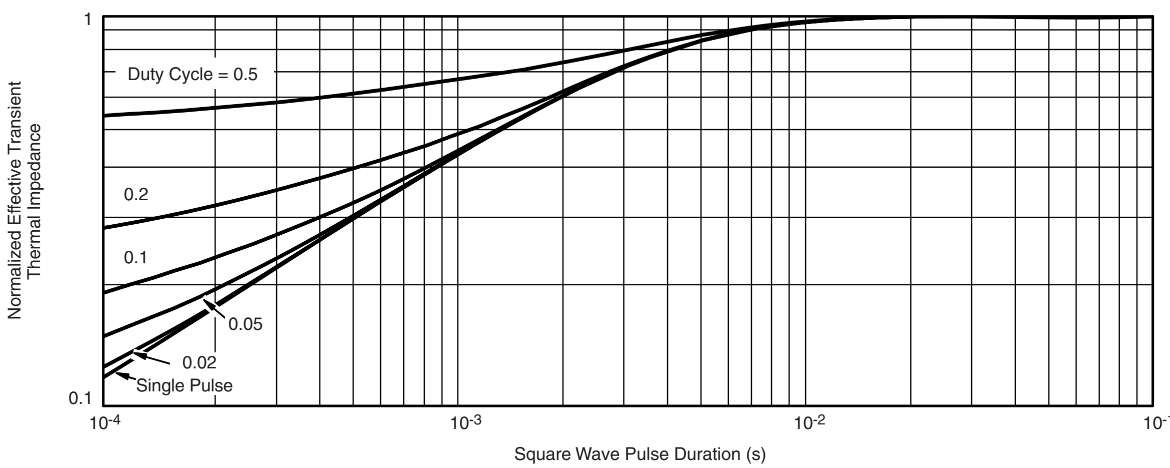


Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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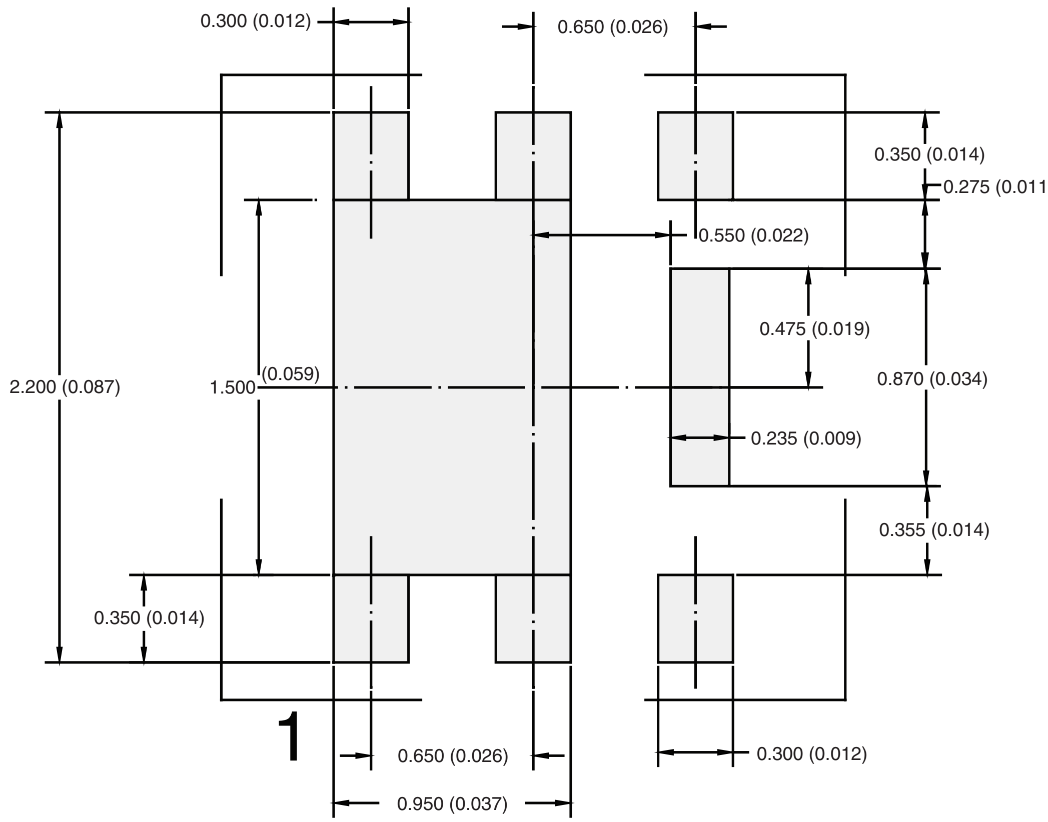
RECOMMENDED PAD LAYOUT FOR PowerPAK® SC70-6L Single



Dimensions in mm/(Inches)

Return to Index

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