

## P-Channel 20-V (D-S) MOSFET

### PRODUCT SUMMARY

$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)	$Q_g$ (Typ)
- 20	0.035 at $V_{GS} = - 4.5$ V	- 12 <sup>a</sup>	15 nC
	0.051 at $V_{GS} = - 2.5$ V	- 12 <sup>a</sup>	

### FEATURES

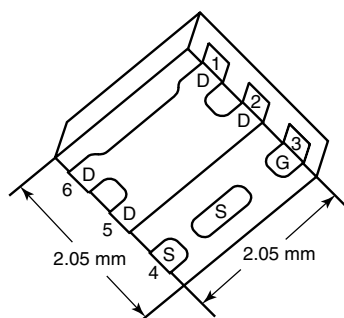
- Halogen-free
- TrenchFET<sup>®</sup> Power MOSFET
- New Thermally Enhanced PowerPAK<sup>®</sup> SC-70 Package
  - Small Footprint Area
  - Low On-Resistance


**RoHS**  
COMPLIANT

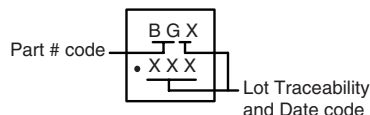
### APPLICATIONS

- Load Switch, PA Switch and Battery Switch for Portable Devices

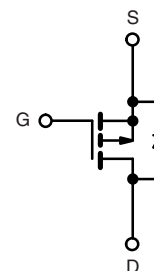
PowerPAK SC-70-6L-Single



### Marking Code



Ordering Information: SiA415DJ-T1-GE3 (Lead (Pb)-free and Halogen-free)



P-Channel MOSFET

### ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	- 20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	
Continuous Drain Current ( $T_J = 150$ °C)	$T_C = 25$ °C	- 12 <sup>a</sup>	A
	$T_C = 70$ °C	- 12 <sup>a</sup>	
	$T_A = 25$ °C	- 8.4 <sup>b, c</sup>	
	$T_A = 70$ °C	- 6.7 <sup>b, c</sup>	
Pulsed Drain Current	$I_{DM}$	- 30	
Continuous Source-Drain Diode Current	$T_C = 25$ °C	- 12 <sup>a</sup>	
	$T_A = 25$ °C	- 2.9 <sup>b, c</sup>	
Maximum Power Dissipation	$T_C = 25$ °C	19	W
	$T_C = 70$ °C	12	
	$T_A = 25$ °C	3.5 <sup>b, c</sup>	
	$T_A = 70$ °C	2.2 <sup>b, c</sup>	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 150	°C
Soldering Recommendations (Peak Temperature) <sup>d, e</sup>		260	

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>b, f</sup>	$R_{thJA}$	28	36	°C/W
Maximum Junction-to-Case (Drain)	$R_{thJC}$	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 (<http://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.

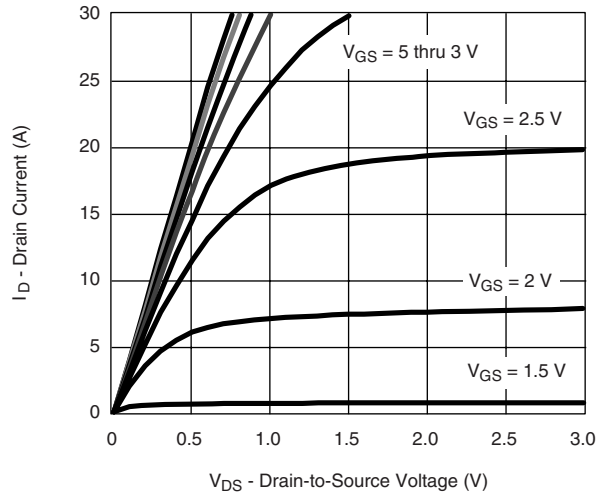
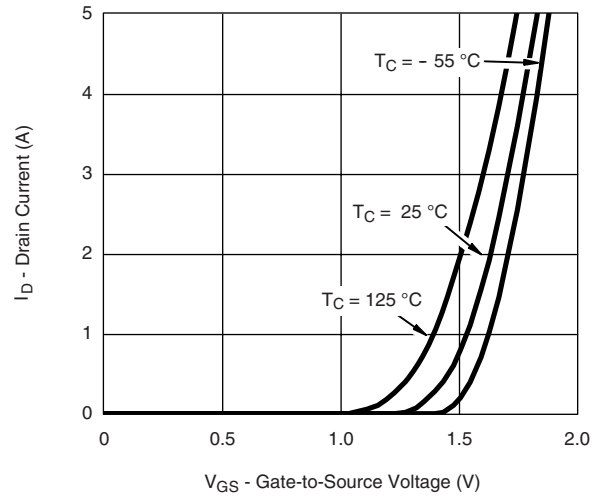
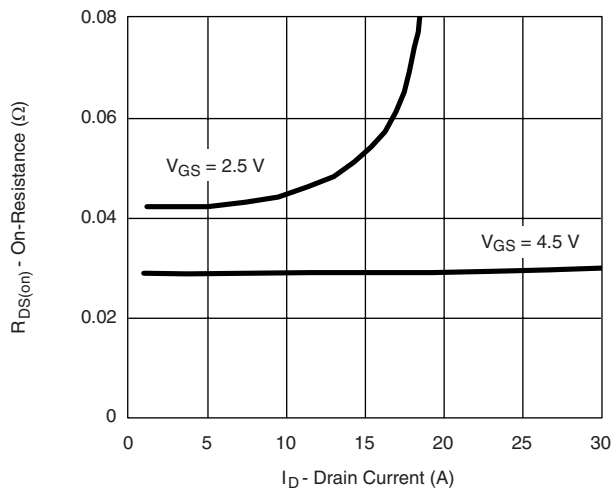
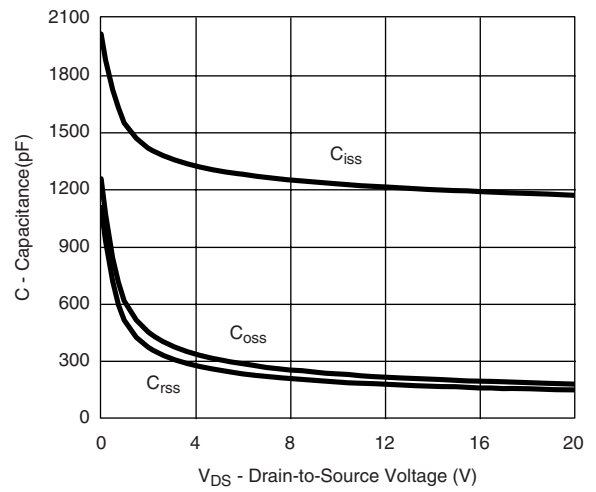
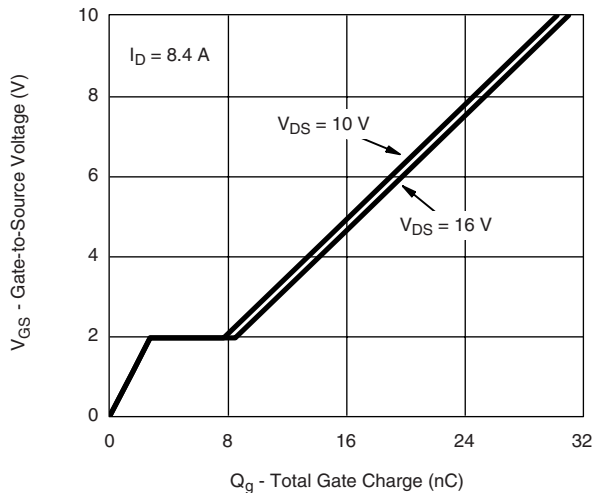
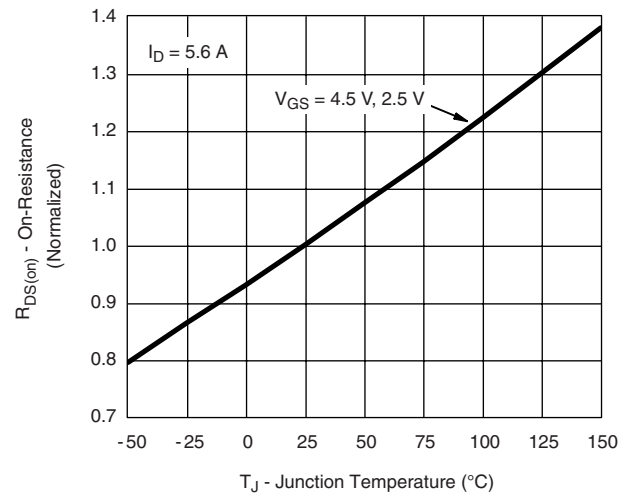
SPECIFICATIONS T <sub>J</sub> = 25 °C, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = - 250 μA	- 20			V
V <sub>DS</sub> Temperature Coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	I <sub>D</sub> = - 250 μA		- 20		mV/°C
V <sub>GS(th)</sub> Temperature Coefficient	ΔV <sub>GS(th)</sub> /T <sub>J</sub>			3.5		
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = - 250 μA	- 0.6		- 1.5	V
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 12 V			± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = - 20 V, V <sub>GS</sub> = 0 V			- 1	μA
		V <sub>DS</sub> = - 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C			- 10	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> ≤ - 5 V, V <sub>GS</sub> = - 4.5 V	- 20			A
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = - 4.5 V, I <sub>D</sub> = - 5.6 A		0.029	0.035	Ω
		V <sub>GS</sub> = - 2.5 V, I <sub>D</sub> = - 2 A		0.042	0.051	
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = - 10 V, I <sub>D</sub> = - 5.6 A		20		S
Dynamic <sup>b</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = - 10 V, V <sub>GS</sub> = 0 V, f = 1 MHz		1250		pF
Output Capacitance	C <sub>oss</sub>			250		
Reverse Transfer Capacitance	C <sub>rss</sub>			190		
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = - 10 V, V <sub>GS</sub> = - 10 V, I <sub>D</sub> = - 8.4 A		31	47	nC
		V <sub>DS</sub> = - 10 V, V <sub>GS</sub> = - 4.5 V, I <sub>D</sub> = - 8.4 A		15	23	
Gate-Source Charge	Q <sub>gs</sub>			2.8		
Gate-Drain Charge	Q <sub>gd</sub>			5		
Gate Resistance	R <sub>g</sub>	f = 1 MHz		7		Ω
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = - 10 V, R <sub>L</sub> = 1.5 Ω I <sub>D</sub> ≅ - 6.7 A, V <sub>GEN</sub> = - 4.5 V, R <sub>g</sub> = 1 Ω		25	40	ns
Rise Time	t <sub>r</sub>			50	75	
Turn-Off Delay Time	t <sub>d(off)</sub>			40	60	
Fall Time	t <sub>f</sub>			20	30	
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = - 10 V, R <sub>L</sub> = 1.5 Ω I <sub>D</sub> ≅ - 6.7 A, V <sub>GEN</sub> = - 10 V, R <sub>g</sub> = 1 Ω		10	15	
Rise Time	t <sub>r</sub>			10	15	
Turn-Off Delay Time	t <sub>d(off)</sub>			45	70	
Fall Time	t <sub>f</sub>			12	20	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C			- 12	A
Pulse Diode Forward Current	I <sub>SM</sub>				30	
Body Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = - 6.7 A, V <sub>GS</sub> = 0 V		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = - 6.7 A, di/dt = 100 A/μs, T <sub>J</sub> = 25 °C		35	55	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			21	35	nC
Reverse Recovery Fall Time	t <sub>a</sub>			12		ns
Reverse Recovery Rise Time	t <sub>b</sub>			23		

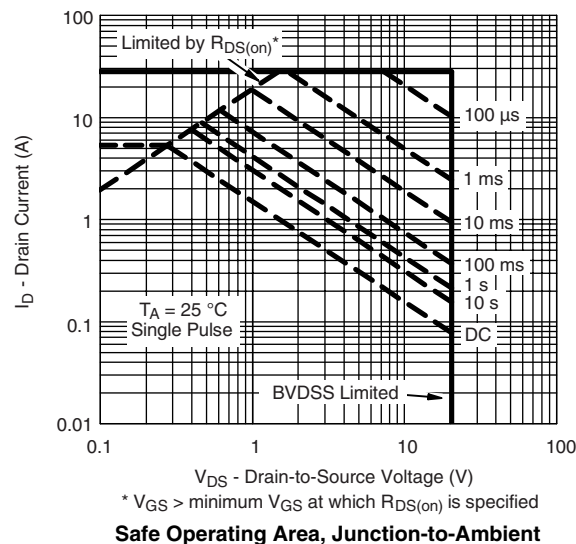
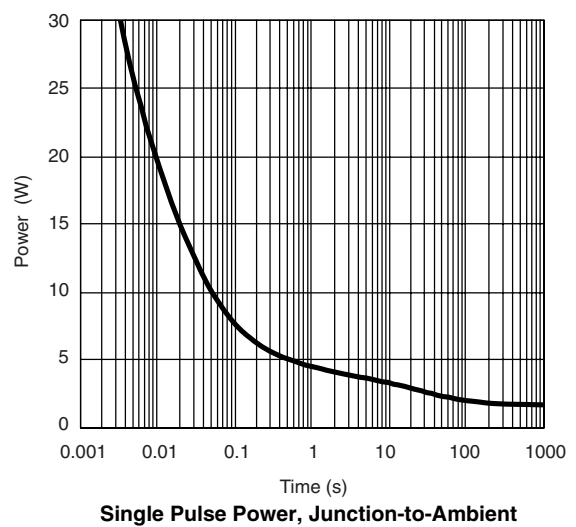
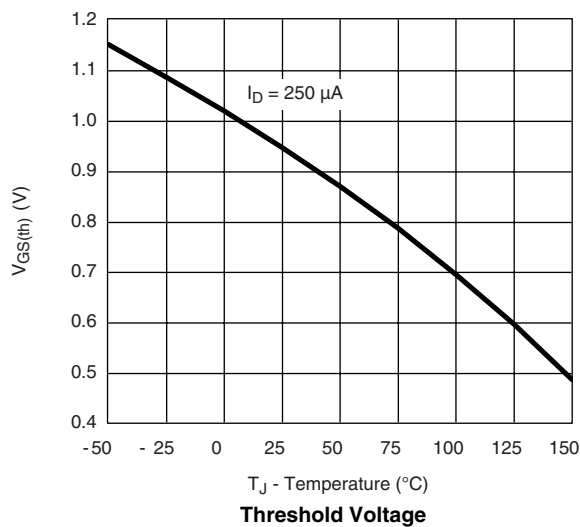
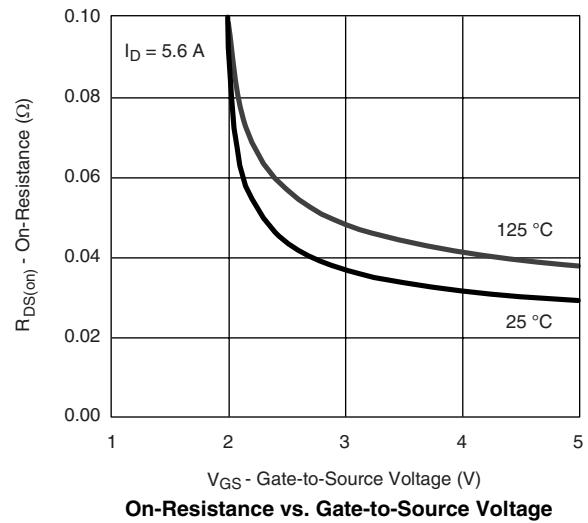
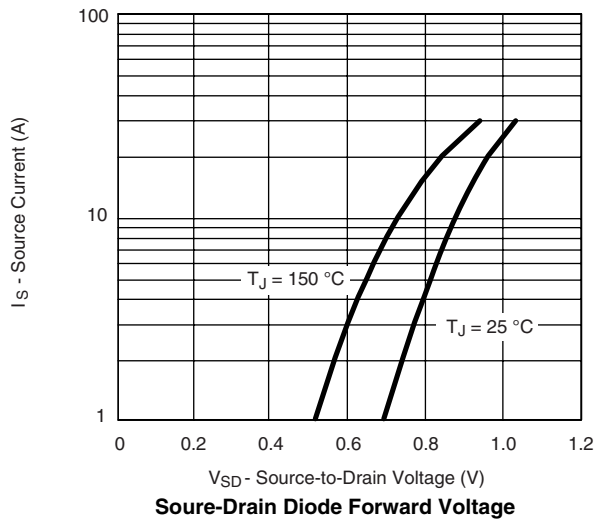
Notes:

a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

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

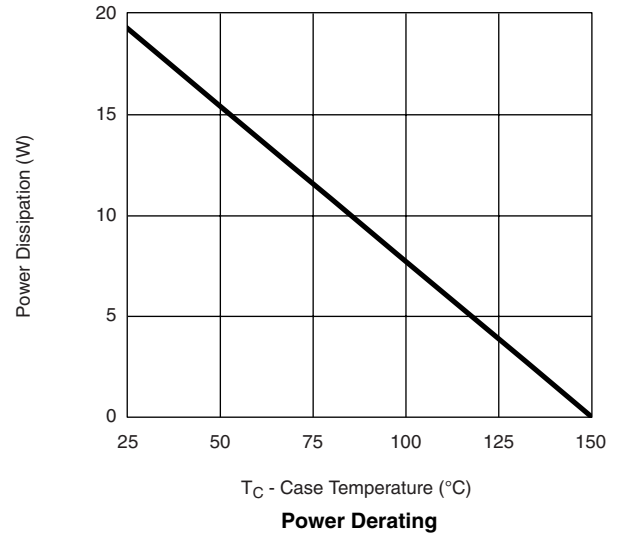
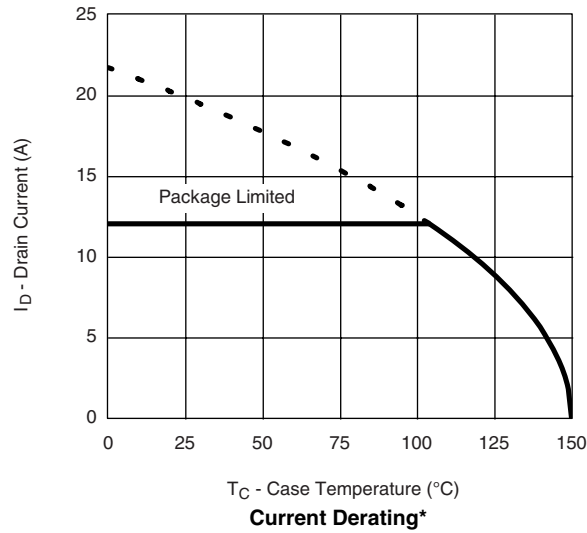
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure 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 and Gate Voltage****Capacitance****Gate Charge****On-Resistance vs. Junction Temperature**

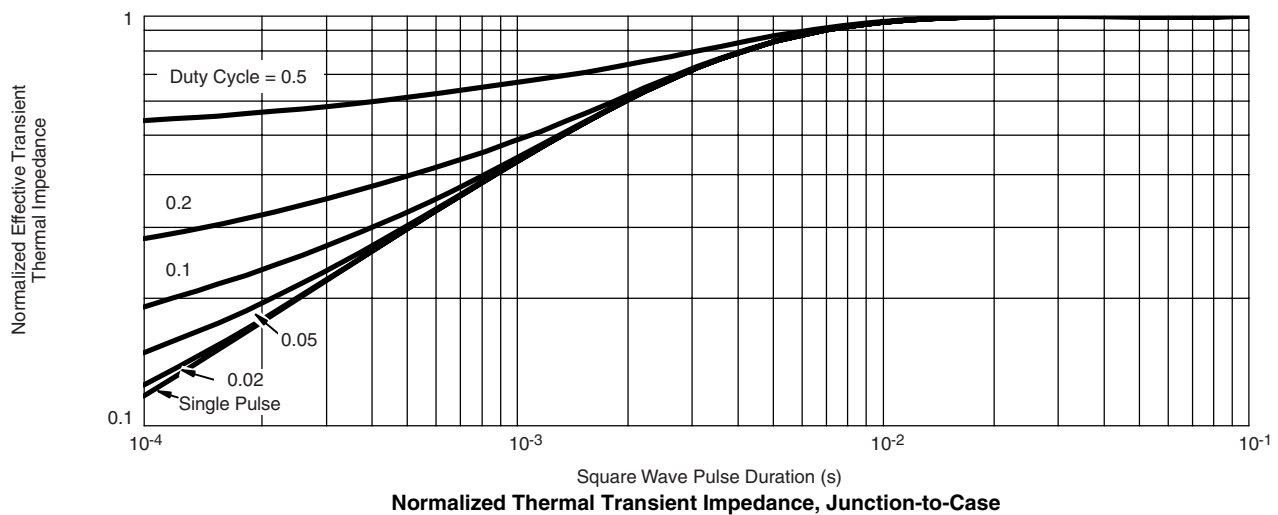
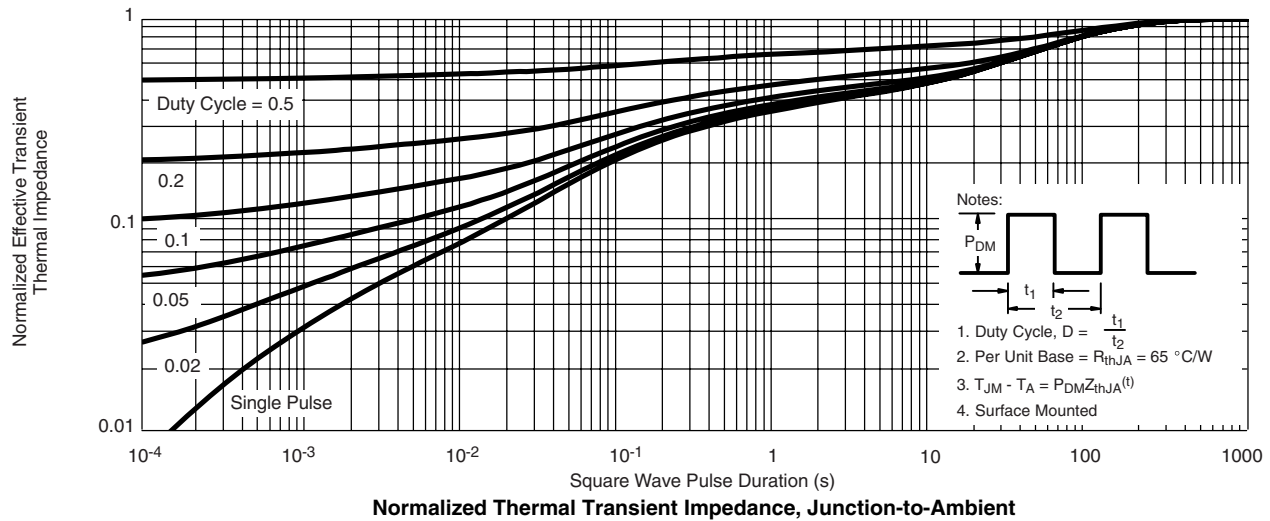
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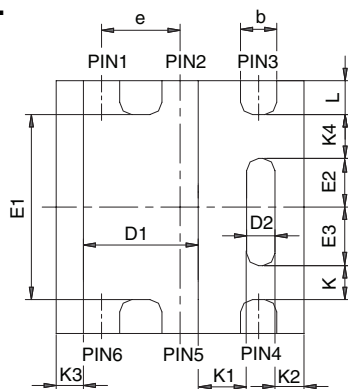
\* The power dissipation  $P_D$  is based on  $T_{J(max)} = 150$  °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package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

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

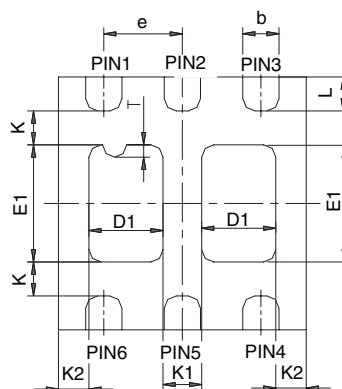
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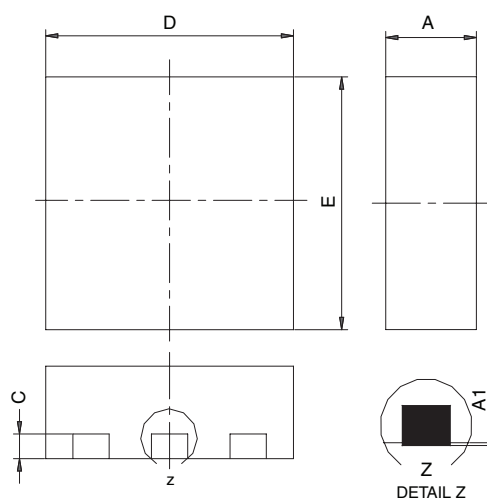
## PowerPAK® SC70-6L



BACKSIDE VIEW OF SINGLE



BACKSIDE VIEW OF DUAL



- Notes:
1. All dimensions are in millimeters
  2. Package outline exclusive of mold flash and metal burr
  3. Package outline inclusive of plating

DIM	SINGLE PAD						DUAL PAD					
	MILLIMETERS			INCHES			MILLIMETERS			INCHES		
	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
A	0.675	0.75	0.80	0.027	0.030	0.032	0.675	0.75	0.80	0.027	0.030	0.032
A1	0	-	0.05	0	-	0.002	0	-	0.05	0	-	0.002
b	0.23	0.30	0.38	0.009	0.012	0.015	0.23	0.30	0.38	0.009	0.012	0.015
C	0.15	0.20	0.25	0.006	0.008	0.010	0.15	0.20	0.25	0.006	0.008	0.010
D	1.98	2.05	2.15	0.078	0.081	0.085	1.98	2.05	2.15	0.078	0.081	0.085
D1	0.85	0.95	1.05	0.033	0.037	0.041	0.513	0.613	0.713	0.020	0.024	0.028
D2	0.135	0.235	0.335	0.005	0.009	0.013						
E	1.98	2.05	2.15	0.078	0.081	0.085	1.98	2.05	2.15	0.078	0.081	0.085
E1	1.40	1.50	1.60	0.055	0.059	0.063	0.85	0.95	1.05	0.033	0.037	0.041
E2	0.345	0.395	0.445	0.014	0.016	0.018						
E3	0.425	0.475	0.525	0.017	0.019	0.021						
e	0.65 BSC			0.026 BSC			0.65 BSC			0.026 BSC		
K	0.275 TYP			0.011 TYP			0.275 TYP			0.011 TYP		
K1	0.400 TYP			0.016 TYP			0.320 TYP			0.013 TYP		
K2	0.240 TYP			0.009 TYP			0.252 TYP			0.010 TYP		
K3	0.225 TYP			0.009 TYP								
K4	0.355 TYP			0.014 TYP								
L	0.175	0.275	0.375	0.007	0.011	0.015	0.175	0.275	0.375	0.007	0.011	0.015
T							0.05	0.10	0.15	0.002	0.004	0.006
ECN: C-07431 – Rev. C, 06-Aug-07												
DWG: 5934												

## RECOMMENDED PAD LAYOUT FOR PowerPAK® SC70-6L Single



Dimensions in mm/(Inches)

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