



N-Channel 12-V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
12	0.0198 at $V_{GS} = 4.5$ V	4.5	13.7 nC
	0.0222 at $V_{GS} = 2.5$ V	4.5	
	0.0264 at $V_{GS} = 1.8$ V	4.5	

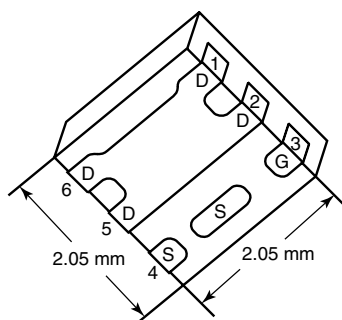
FEATURES

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

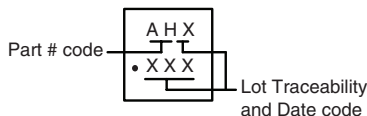


RoHS
COMPLIANT
HALOGEN
FREE

PowerPAK SC-70-6L-Single



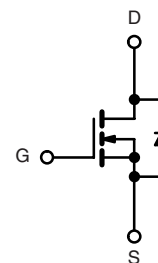
Marking Code



Ordering Information: SiA406DJ-T1-GE3 (Lead (Pb)-free and Halogen-free)

APPLICATIONS

- Load Switch for Portable Devices



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_A = 25^\circ\text{C}$, unless otherwise noted

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	12	V
Gate-Source Voltage	V_{GS}	± 8	
Continuous Drain Current ($T_J = 150^\circ\text{C}$) ^a	I_D	$T_C = 25^\circ\text{C}$	4.5 ^a
		$T_C = 70^\circ\text{C}$	4.5 ^a
		$T_A = 25^\circ\text{C}$	4.5 ^{a, b, c}
		$T_A = 70^\circ\text{C}$	4.5 ^{a, b, c}
Pulsed Drain Current	I_{DM}	20	A
Continuous Source-Drain Diode Current	I_S	$T_C = 25^\circ\text{C}$	4.5 ^a
		$T_A = 25^\circ\text{C}$	2.9 ^{b, c}
Maximum Power Dissipation	P_D	$T_C = 25^\circ\text{C}$	19
		$T_C = 70^\circ\text{C}$	12
		$T_A = 25^\circ\text{C}$	3.5 ^{b, c}
		$T_A = 70^\circ\text{C}$	2.2 ^{b, c}
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	$^\circ\text{C}$
Soldering Recommendations (Peak Temperature) ^{d, e}		260	

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{b, f}	R_{thJA}	28	36	$^\circ\text{C/W}$
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 (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 .

SiA406DJ

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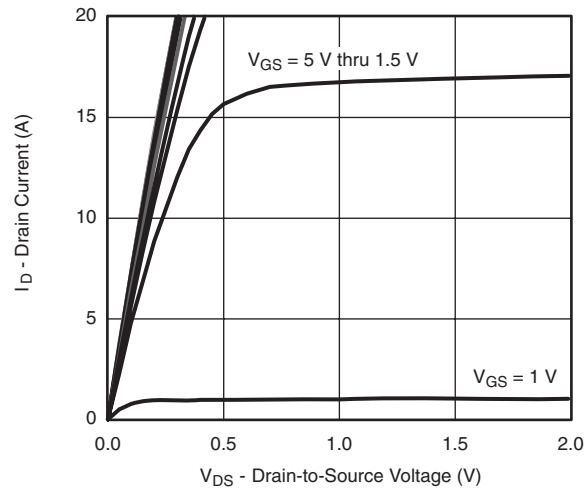
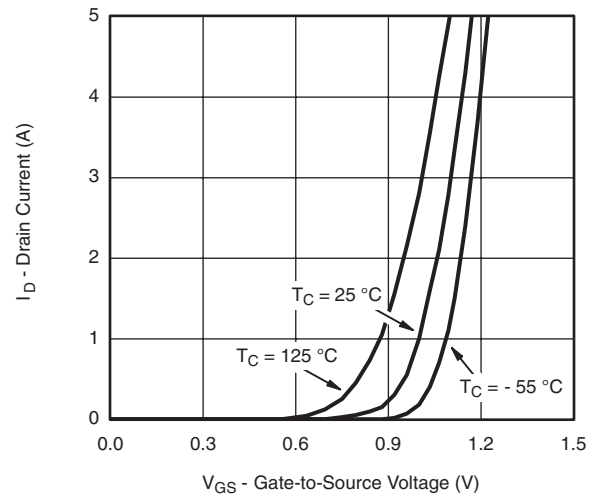
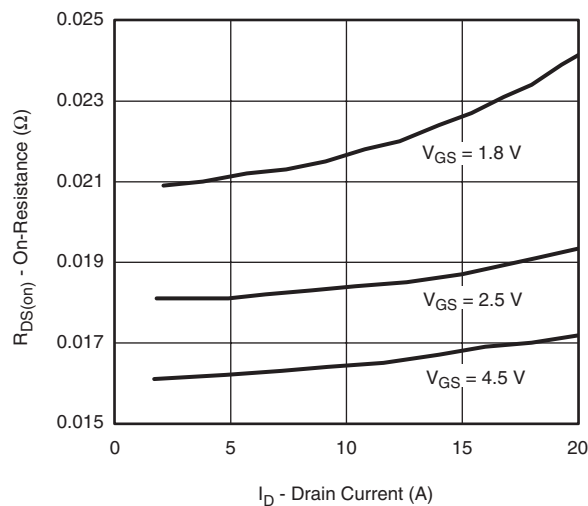
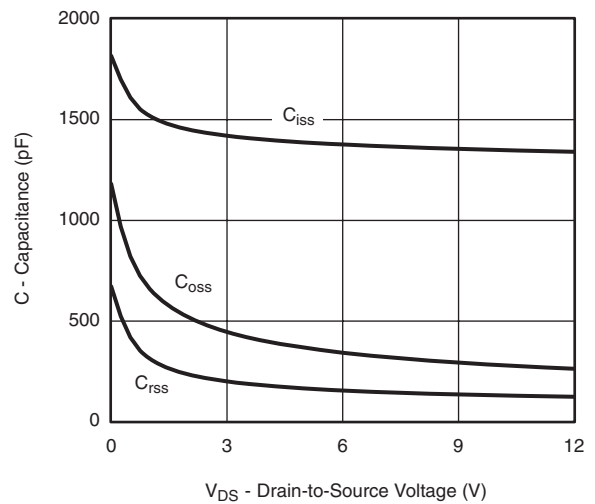
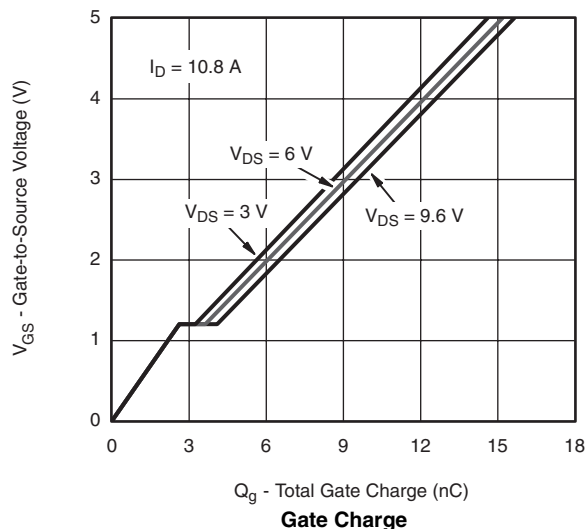
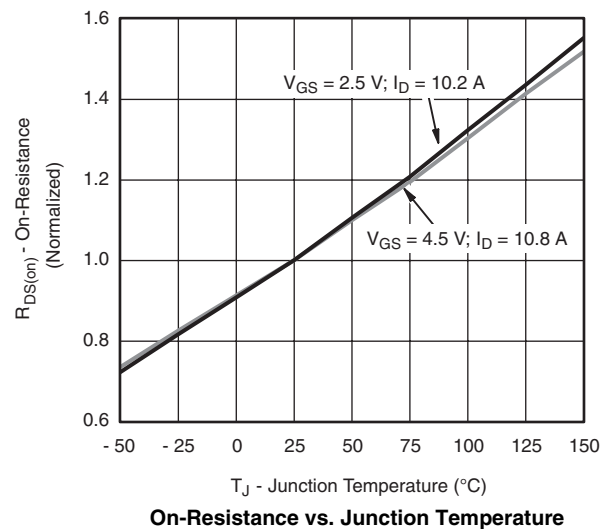


SPECIFICATIONS T _J = 25 °C, unless otherwise noted							
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
Static							
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	12			V	
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = 250 μA		11		mV/°C	
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			- 2.9			
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	0.4		1.0	V	
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 8 V			± 100	nA	
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 12 V, V _{GS} = 0 V			1	μA	
		V _{DS} = 12 V, V _{GS} = 0 V, T _J = 55 °C			10		
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≤ 5 V, V _{GS} = 4.5 V		20		A	
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 4.5 V, I _D = 10.8 A		0.0165	0.0198	Ω	
		V _{GS} = 2.5 V, I _D = 10.2 A		0.0185	0.0222		
		V _{GS} = 1.8 V, I _D = 3 A		0.0220	0.0264		
Forward Transconductance ^a	g _{fs}	V _{DS} = 6 V, I _D = 10.8 A		38		S	
Dynamic ^b							
Input Capacitance	C _{iss}	V _{DS} = 6 V, V _{GS} = 0 V, f = 1 MHz		1380		pF	
Output Capacitance	C _{oss}			345			
Reverse Transfer Capacitance	C _{rss}			155			
Total Gate Charge	Q _g	V _{DS} = 6 V, V _{GS} = 5 V, I _D = 10.8 A		15.2	23	nC	
Gate-Source Charge	Q _{gs}	V _{DS} = 6 V, V _{GS} = 4.5 V, I _D = 10.8 A		13.7	21		
Gate-Drain Charge	Q _{gd}			2.6			
Gate Resistance	R _g			1.1			
Turn-On Delay Time	t _{d(on)}	f = 1 MHz	0.5	2.5	5	Ω	
Rise Time	t _r		V _{DD} = 6 V, R _L = 0.7 Ω I _D ≅ 8.6 A, V _{GEN} = 4.5 V, R _g = 1 Ω		10	20	ns
Turn-Off Delay Time	t _{d(off)}				9	18	
Fall Time	t _f				40	60	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 6 V, R _L = 0.7 Ω I _D ≅ 8.6 A, V _{GEN} = 8 V, R _g = 1 Ω			14	21	
Rise Time	t _r			6	12		
Turn-Off Delay Time	t _{d(off)}			11	17		
Fall Time	t _f			27	41		
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			4.5 ^c	A	
Pulse Diode Forward Current	I _{SM}				20		
Body Diode Voltage	V _{SD}	I _S = 8.6 A, V _{GS} = 0 V		0.8	1.2	V	
Body Diode Reverse Recovery Time	t _{rr}	I _F = 8.6 A, dI/dt = 100 A/μs, T _J = 25 °C		22	33	ns	
Body Diode Reverse Recovery Charge	Q _{rr}			7	14	nC	
Reverse Recovery Fall Time	t _a			8		ns	
Reverse Recovery Rise Time	t _b			14			

Notes:

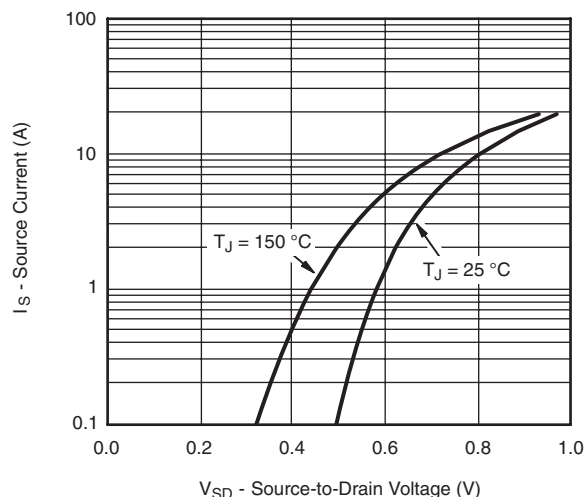
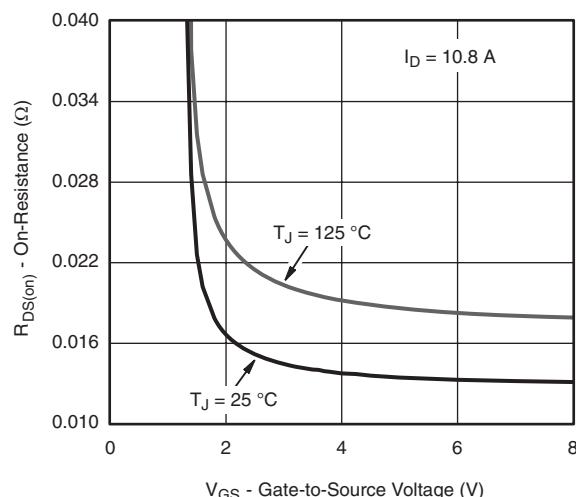
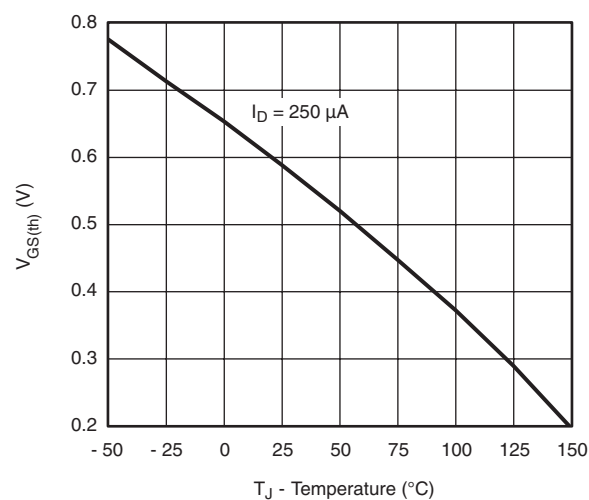
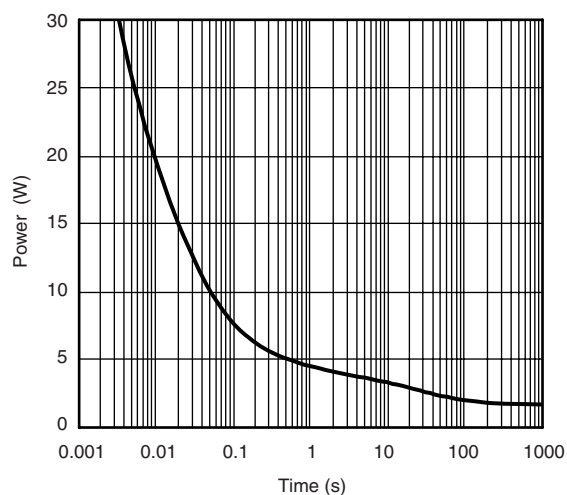
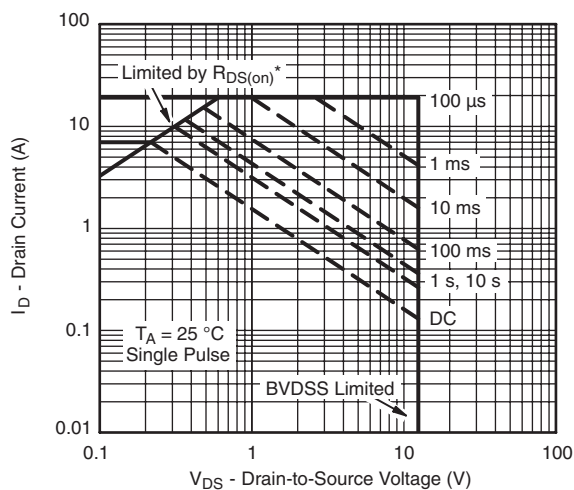
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.
c. Package limited

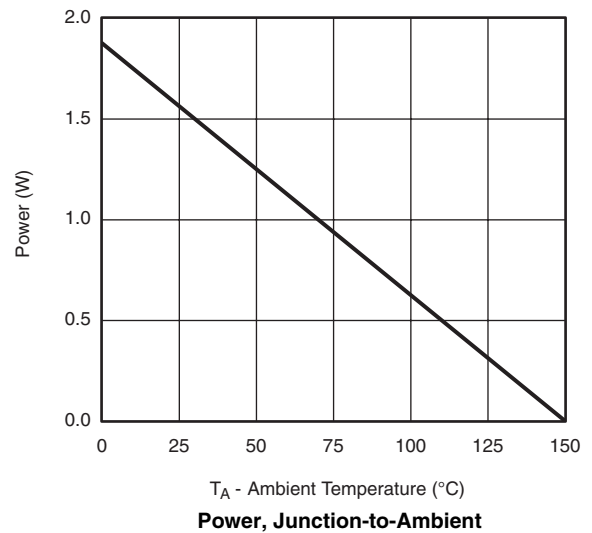
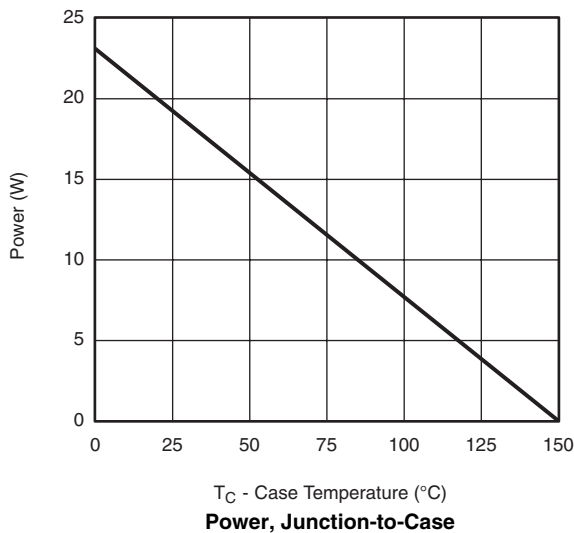
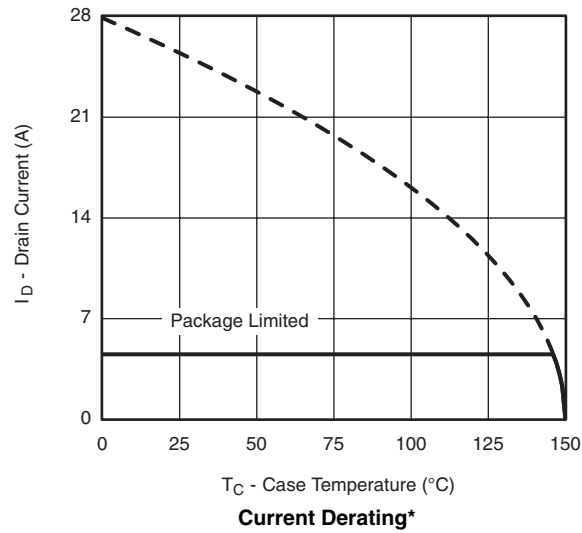
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

SiA406DJ

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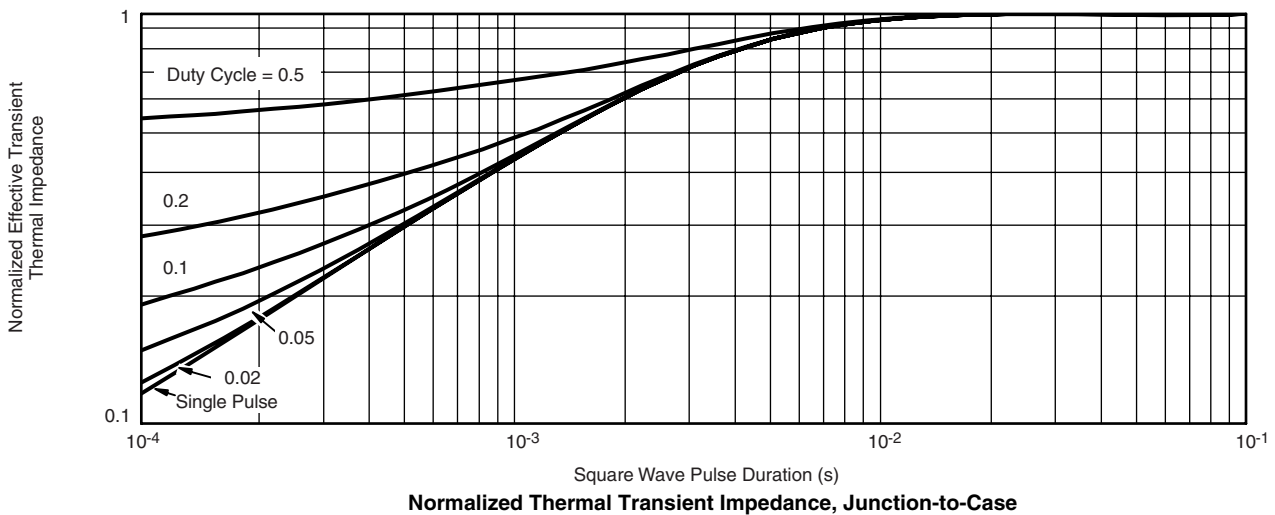
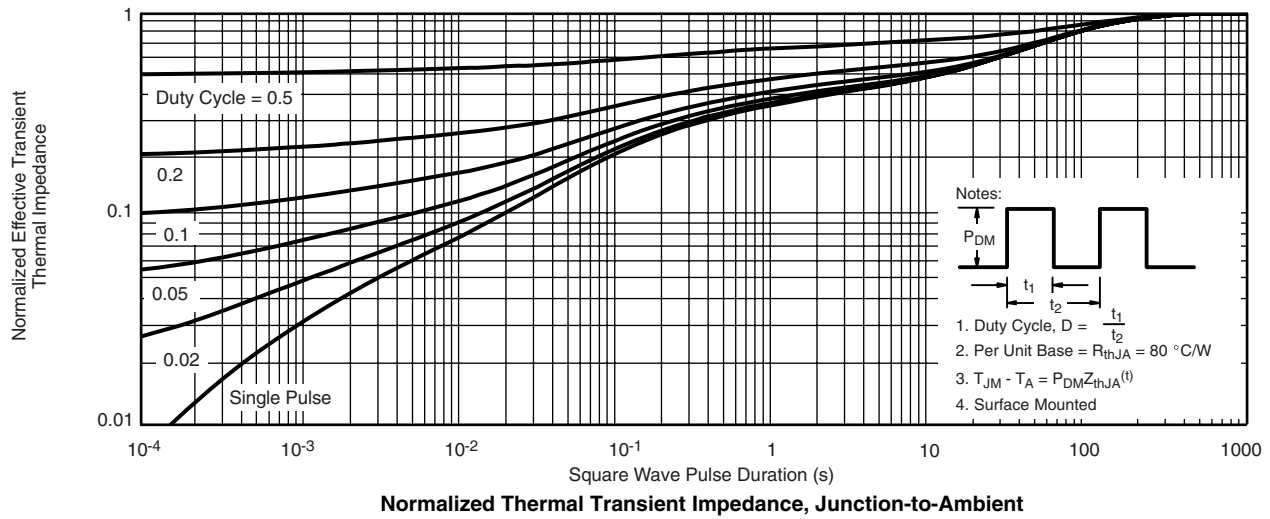
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted**Source-Drain Diode Forward Voltage****On-Resistance vs. Gate-to-Source Voltage****Threshold Voltage****Single Pulse Power, Junction-to-Ambient*** $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified**Safe Operating Area, Junction-to-Ambient**


TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


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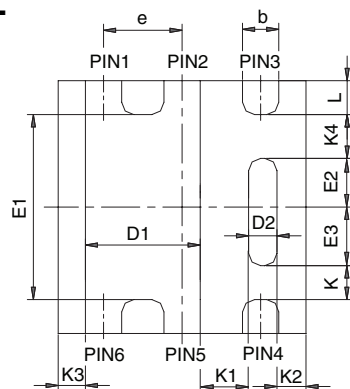
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**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

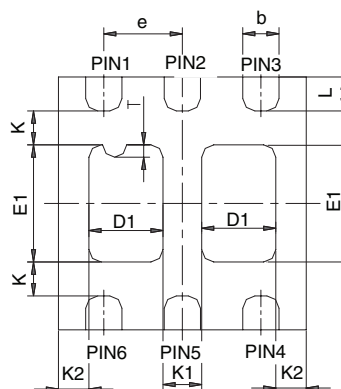
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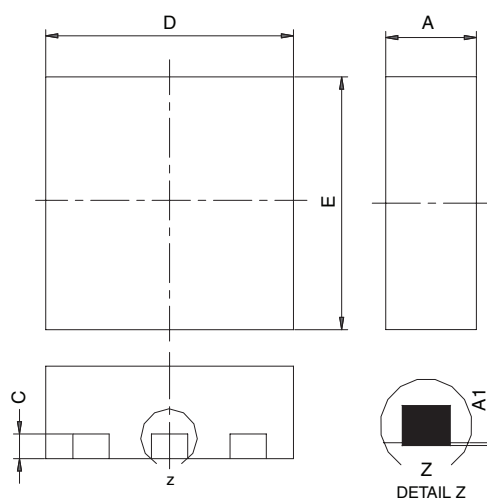
PowerPAK® SC70-6L



BACKSIDE VIEW OF SINGLE



BACKSIDE VIEW OF DUAL

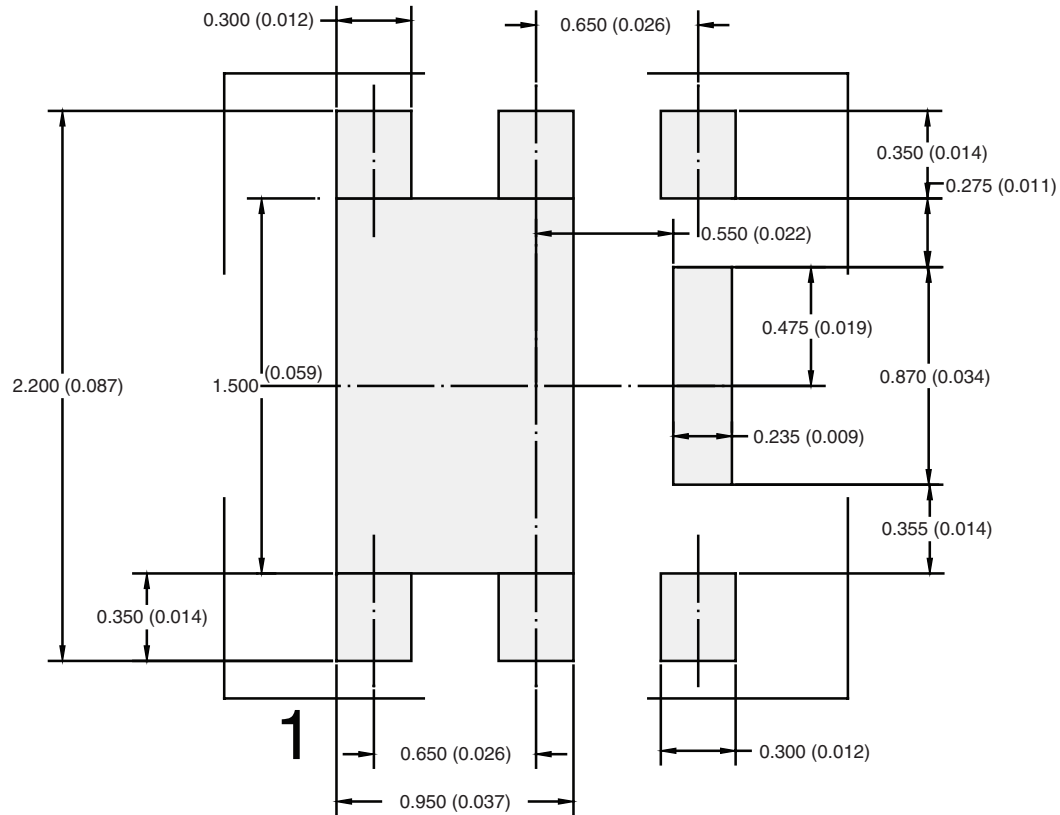


Notes:

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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