

SSM6K513NU-VB Datasheet

DFN6(2X2) Trench Single-N 30V MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω) (Typ.)	I_D (A) ^a	Q_g (Typ.)
30	0.020 at $V_{GS} = 10$ V	12	5 nC
	0.022 at $V_{GS} = 6$ V	12	
	0.024 at $V_{GS} = 4.5$ V	12	

FEATURES

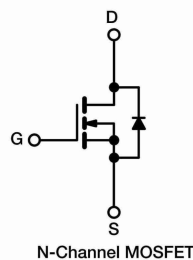
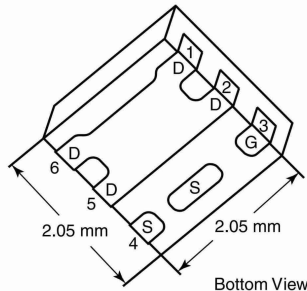
- TrenchFET[®] Power MOSFET
- 100 % R_g Tested


RoHS
 COMPLIANT

APPLICATIONS

- DC/DC Converters and Synchronous Buck Converters
 - Lower Ringing Voltage from Soft Turn-On
 - High Efficiency from Fast Turn-Off
 - Lower Shoot-Through Possibility

PowerPAK SC-70-6L-Single



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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 150^\circ\text{C}$)	I_D	$T_C = 25^\circ\text{C}$ 12 ^a	A
		$T_C = 70^\circ\text{C}$ 12 ^a	
		$T_A = 25^\circ\text{C}$ 12 ^{a,b,c}	
		$T_A = 70^\circ\text{C}$ 9.7 ^{b,c}	
Pulsed Drain Current ($t = 300 \mu\text{s}$)	I_{DM}	40	
Continuous Source-Drain Diode Current	I_S	$T_C = 25^\circ\text{C}$ 12 ^a	
		$T_A = 25^\circ\text{C}$ 2.9 ^{b,c}	
Maximum Power Dissipation	P_D	$T_C = 25^\circ\text{C}$ 19	W
		$T_C = 70^\circ\text{C}$ 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	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Case (Drain)	R_{thJC}	5.3	6.5	

Notes:

a. Based on package limited.

b. Surface mounted on 1" x 1" FR4 board.

c. $t = 5$ s.

d. 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.

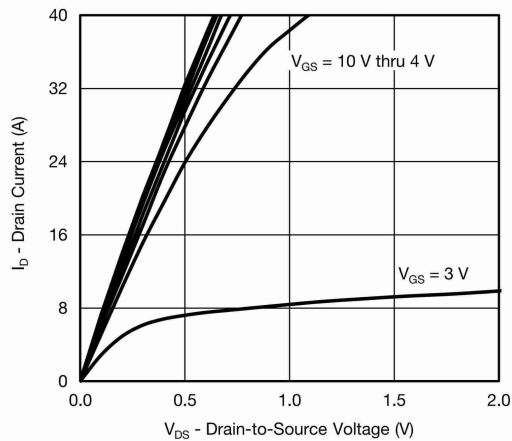
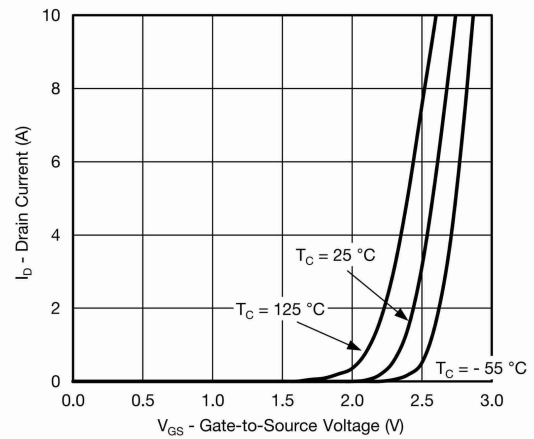
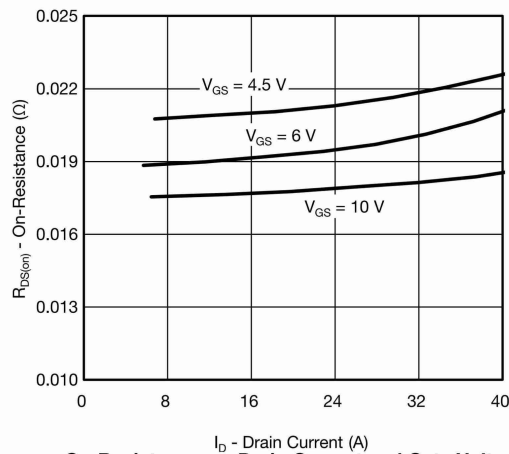
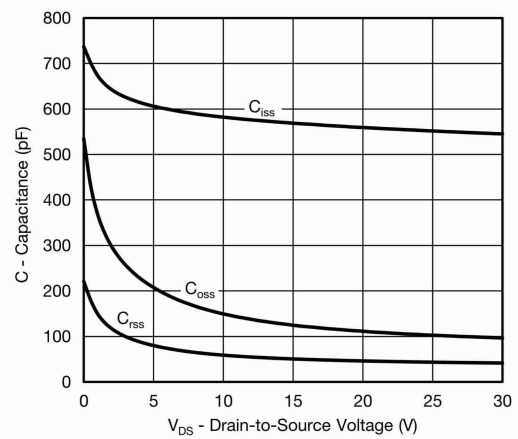
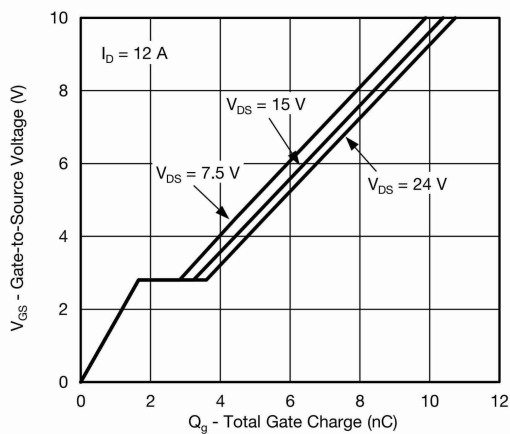
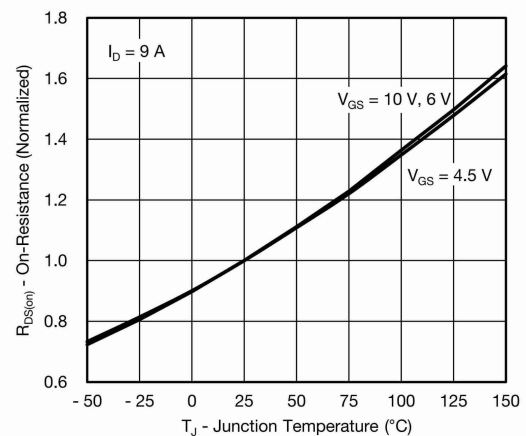
SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	30			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = 250 μA		34		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			- 5		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	-1.0		- 2.4	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} = 30 V, V _{GS} = 0 V			1	μA
		V _{DS} = 30 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	10			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 9 A		0.020		Ω
		V _{GS} = 6 V, I _D = 7 A		0.022		
		V _{GS} = 4.5 V, I _D = 7 A		0.024		
Forward Transconductance ^a	g _{fs}	V _{DS} = 10 V, I _D = 9 A		35		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = 15 V, V _{GS} = 0 V, f = 1 MHz		570		pF
Output Capacitance	C _{oss}			126		
Reverse Transfer Capacitance	C _{rss}			52		
Total Gate Charge	Q _g	V _{DS} = 15 V, V _{GS} = 10 V, I _D = 12 A		11	17	nC
Gate-Source Charge	Q _{gs}	V _{DS} = 15 V, V _{GS} = 4.5 V, I _D = 12 A		5	7.5	
Gate-Drain Charge	Q _{gd}			1.7		
				1.6		
Gate Resistance	R _g	f = 1 MHz	0.2	1	2	Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = 15 V, R _L = 1.5 Ω I _D ≅ 10 A, V _{GEN} = 10 V, R _g = 1 Ω		5	10	ns
Rise Time	t _r			10	20	
Turn-Off Delay Time	t _{d(off)}			15	30	
Fall Time	t _f			10	20	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 15 V, R _L = 1.5 Ω I _D ≅ 10 A, V _{GEN} = 4.5 V, R _g = 1 Ω		12	25	
Rise Time	t _r			15	30	
Turn-Off Delay Time	t _{d(off)}			15	30	
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 ^a	I _{SM}			40		
Body Diode Voltage	V _{SD}	I _S = 10 A		0.85	1.2	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = 10 A, dI/dt = 100 A/μs, T _J = 25 °C		20	40	ns
Body Diode Reverse Recovery Charge	Q _{rr}			11	20	nC
Reverse Recovery Fall Time	t _a			12		ns
Reverse Recovery Rise Time	t _b			8		

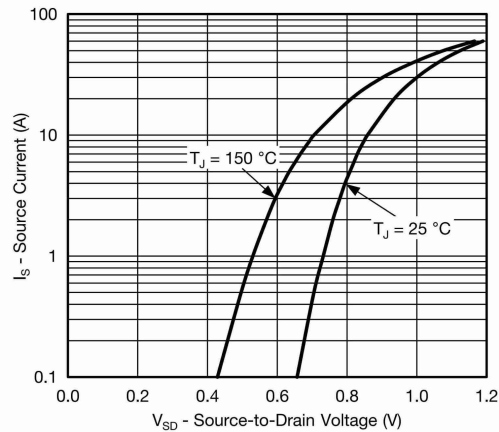
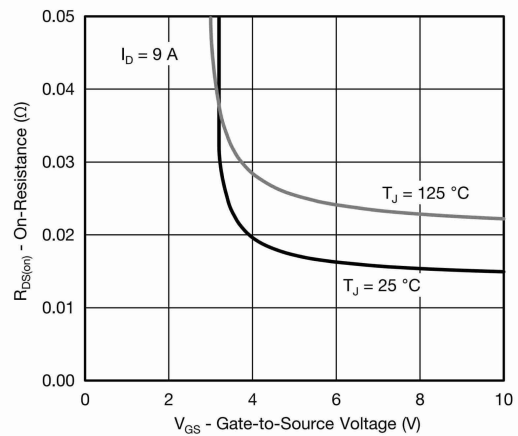
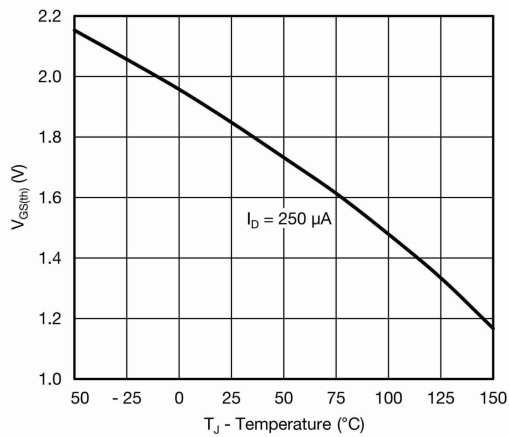
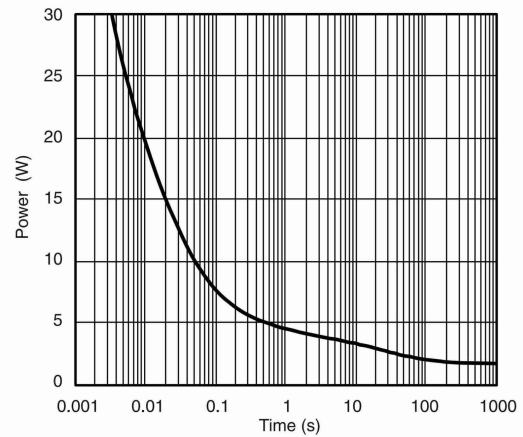
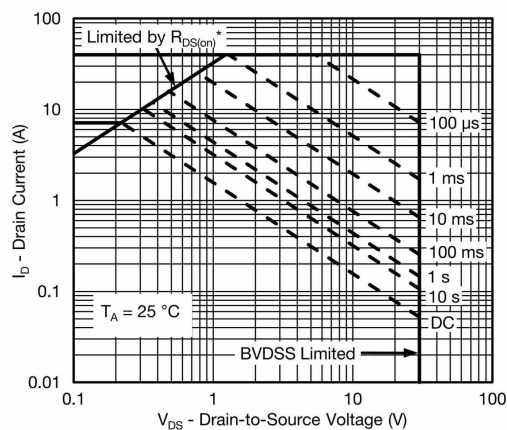
Notes:

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

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

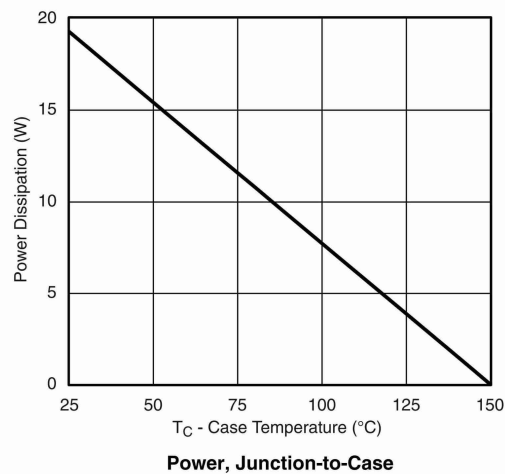
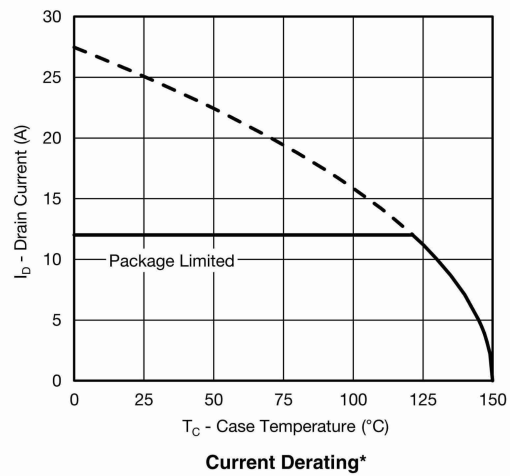
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

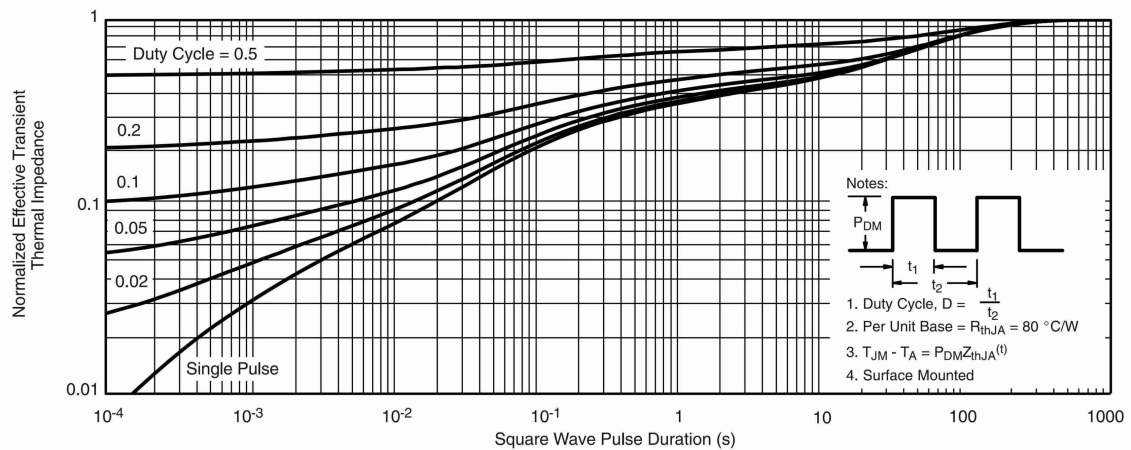
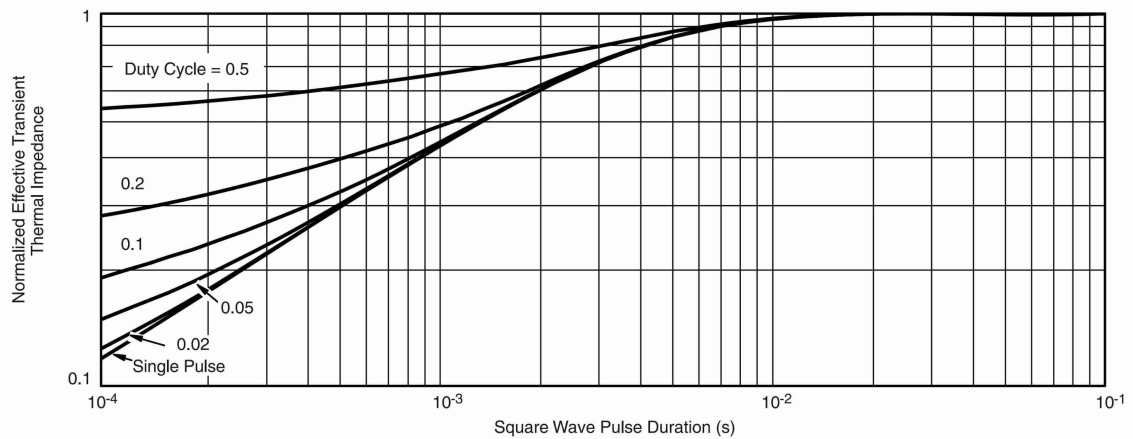
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Source-Drain Diode Forward Voltage

On-Resistance vs. Gate-to-Source Voltage

Threshold Voltage

Single Pulse Power, Junction-to-Ambient


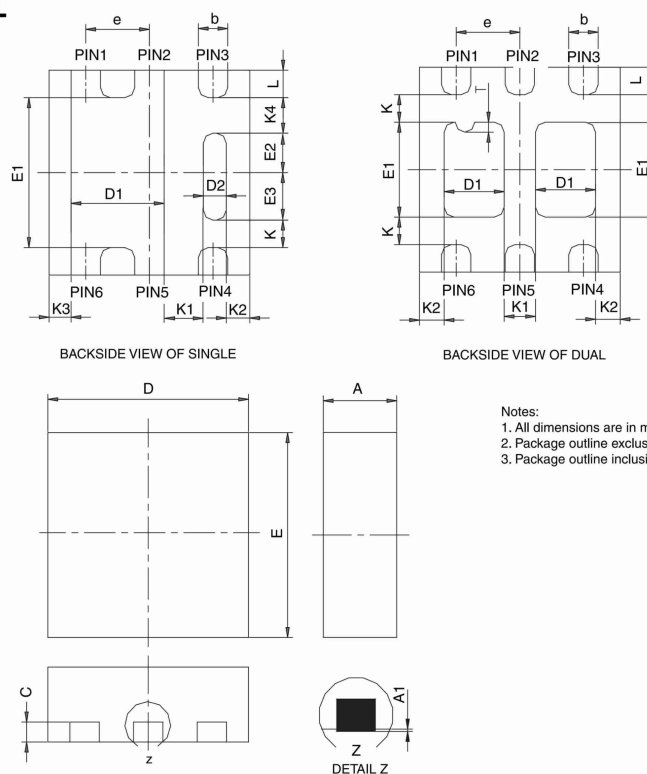
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

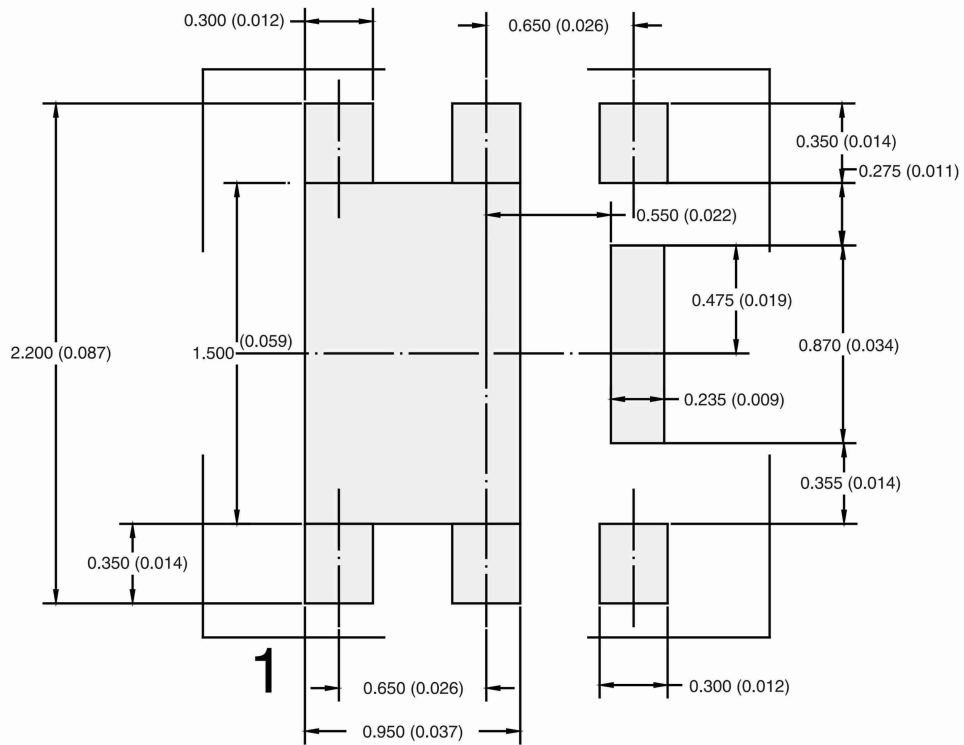
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

* 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.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Normalized Thermal Transient Impedance, Junction-to-Ambient

Normalized Thermal Transient Impedance, Junction-to-Case

PowerPAK® SC70-6L

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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