N-Channel 150 V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω) MAX.	I_D (A) [a]	Q_g (TYP.)
150	0.177 at V_{GS} = 10 V	7.7	4.3 nC
	0.185 at V_{GS} = 7.5 V	7.6	
	0.250 at V_{GS} = 6 V	4	

PowerPAK® SC-70-6L Single

Top View
Bottom View
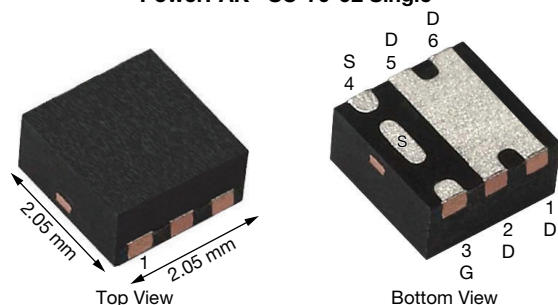
Marking Code: AV

Ordering Information:

SiA446DJ-T1-GE3 (Lead (Pb)-free and Halogen-free)

FEATURES

- ThunderFET® technology optimizes balance of $R_{DS(on)}$, Q_g, Q_{sw} and Q_{oss}
- 100 % R_g and UIS tested
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

HALOGEN FREE

APPLICATIONS

- DC/DC converters / boost converters
- Synchronous rectification
- Power management
- LED backlighting
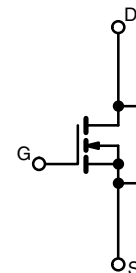
N-Channel MOSFET

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

PARAMETER S		YMBOL	LIMIT	UNIT
Drain-Source Voltage		V_{DS}	150	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	7.7	A
	T_C = 70 °C		6.2	
	T_A = 25 °C		3.3 [b, c]	
	T_A = 70 °C		2.6 [b, c]	
Pulsed Drain Current (t = 100 µs)		I_{DM}	10	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	12	
	T_A = 25 °C		2.9 [b, c]	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	7	
Single Pulse Avalanche Energy		E_{AS}	2.5	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 SYMB		OL	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. Based on T_C = 25 °C.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 5 s.
d. See solder profile (www.vishay.com/doc?73257). The PowerPAK SC-70 is a l eadless package. The end of the l ead terminal i s 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_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	150	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA	-	73	-	mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		--	6	-	
Gate-Source Threshold Voltage	$V_{GS(th)}$ V	DS = V_{GS}, I_D = 250 µA	2.5	-	3.5	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} = 150 V, V_{GS} = 0 V	-	-	1	µA
		V_{DS} = 150 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 = 3 A	-	0.145	0.177	Ω
		V_{GS} = 7.5 V, I_D = 2 A	-	0.151	0.185	
		V_{GS} = 6 V, I_D = 1 A	-	0.165	0.250	
Forward Transconductance [a]	g_{fs}	V_{DS} = 10 V, I_D = 3 A	-	6	-	S
Dynamic [b]						
Input Capacitance	C_{iss}	V_{DS} = 75 V, V_{GS} = 0 V, f = 1 MHz	-	230	-	pF
Output Capacitance	C_{oss}		-4	7	-	
Reverse Transfer Capacitance	C_{rss} -8				-	
Total Gate Charge	Q_g	V_{DS} = 75 V, V_{GS} = 10 V, I_D = 3.5 A	-	5.3	8	nC
			-4	.3	6.5	
Gate-Source Charge	Q_{gs}	V_{DS} = 75 V, V_{GS} = 7.5 V, I_D = 3.5 A	-1	.2	-	
Gate-Drain Charge	Q_{gd} -1			.8	-	
Output Charge	Q_{oss}	V_{DS} = 75 V, V_{GS} = 0 V	-	8.5	-	
Gate Resistance	R_g	f = 1 MHz	0.5	2.3	4.6	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 75 V, R_L = 29 Ω, I_D ≅ 2.6 A, V_{GEN} = 10 V, R_g = 1 Ω	-5		10	ns
Rise Time	t_r		-1	3	25	
Turn-Off Delay Time	$t_{d(off)}$ -1			0	20	
Fall Time	t_f		-1	0	20	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 75 V, R_L = 29 Ω, I_D ≅ 2.6 A, V_{GEN} = 6 V, R_g = 1 Ω	-1	0	20	
Rise Time	t_r		-4	0	80	
Turn-Off Delay Time	$t_{d(off)}$ -5				10	
Fall Time	t_f		-1	0	20	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C	-	-	12	A
Pulse Diode Forward Current (t = 100 µs)	I_{SM}		-	-	10	
Body Diode Voltage	V_{SD}	I_S = 3.5 A	-	0.9	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 3.5 A, dI/dt = 100 A/µs, T_J = 25 °C	-	51	100	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	100	200	nC
Reverse Recovery Fall Time	t_a		-4	3	-	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.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)
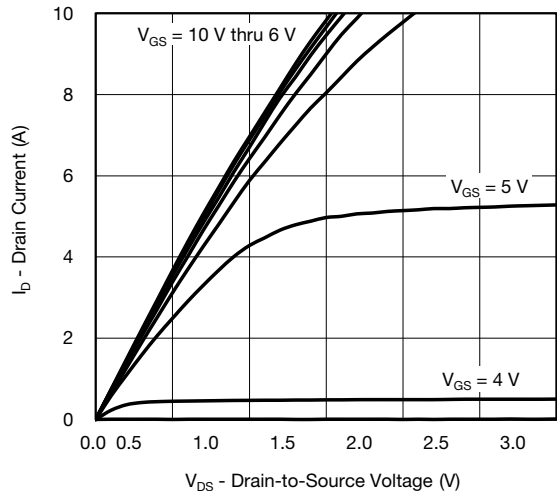
Output Characteristics
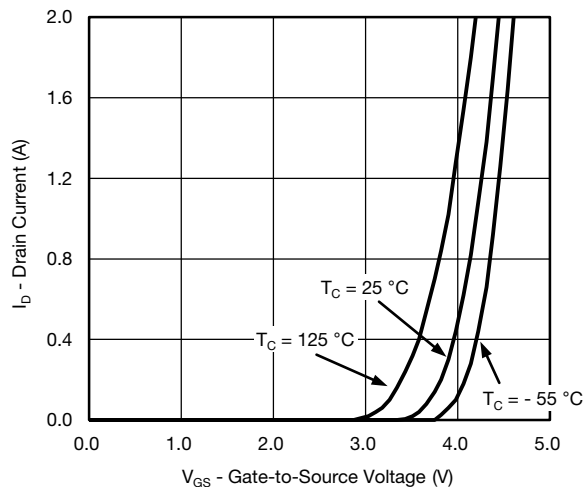
Transfer Characteristics
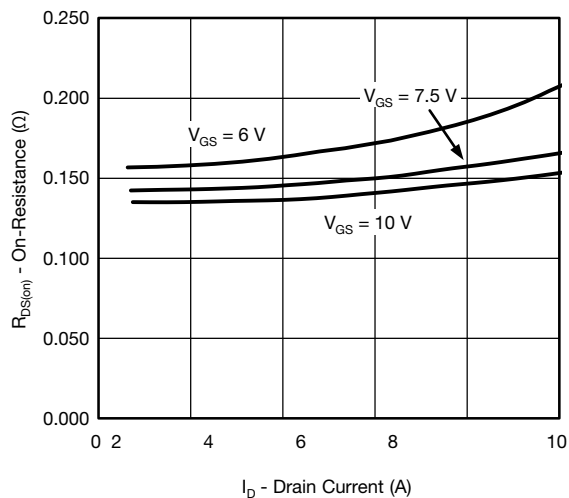
On-Resistance vs. Drain Current and Gate Voltage
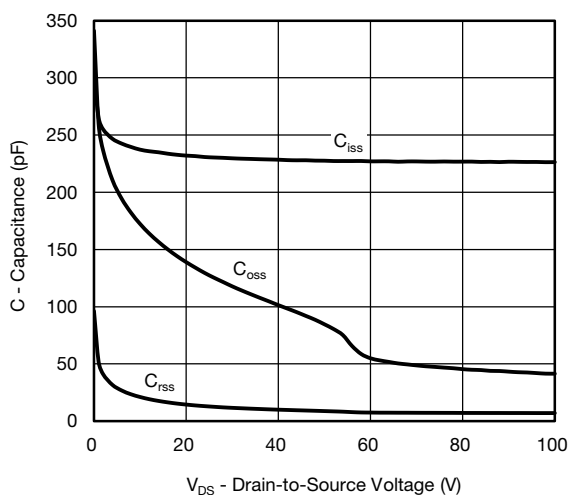
Capacitance
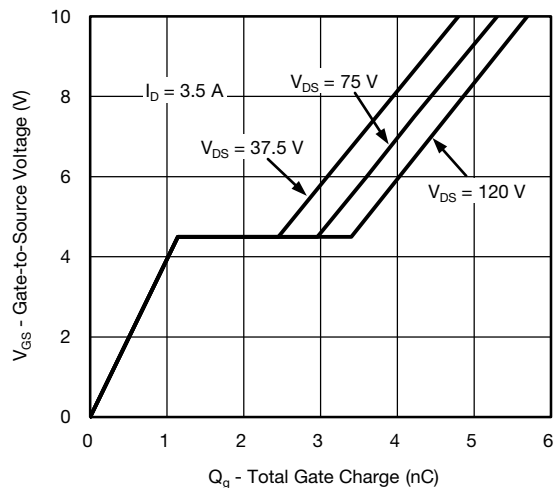
Gate Charge
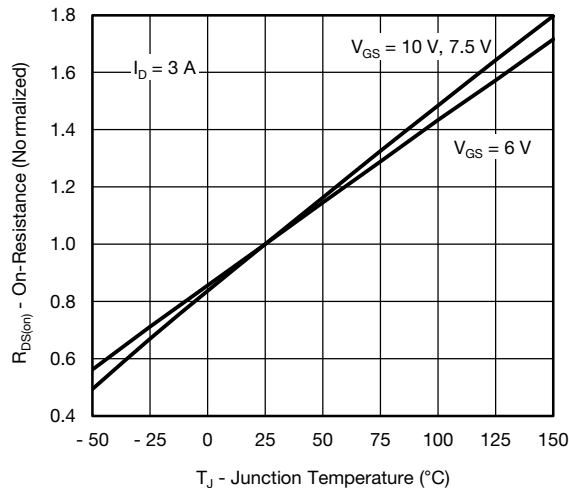
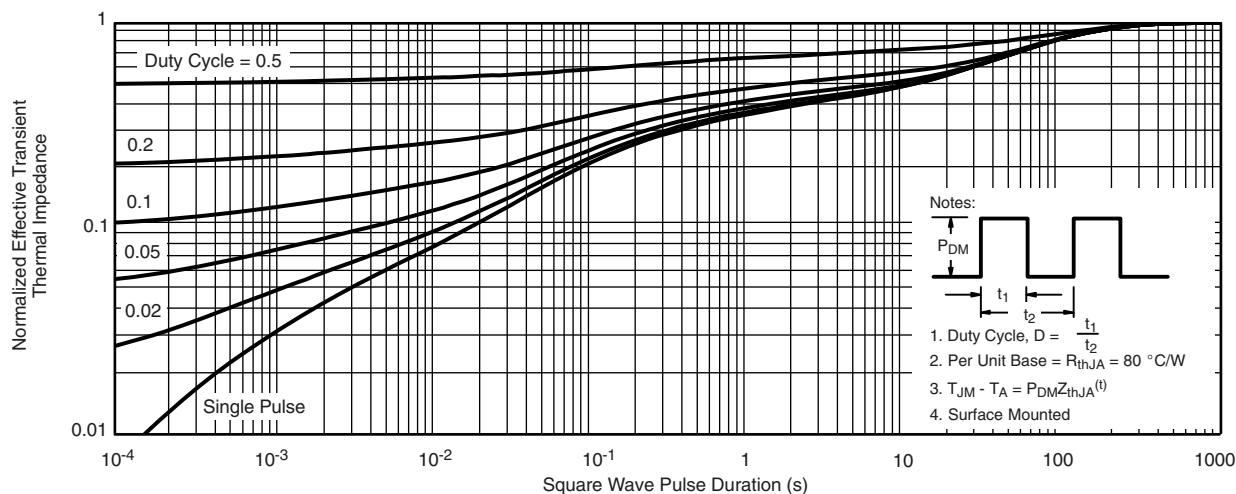**On-Resistance vs. Junction Temperature**

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)
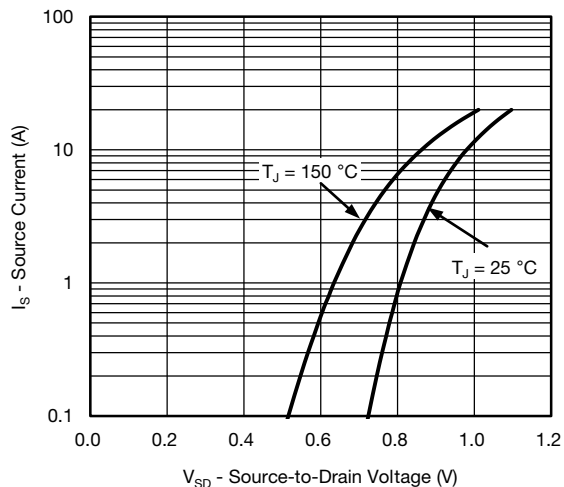
Source-Drain Diode Forward Voltage
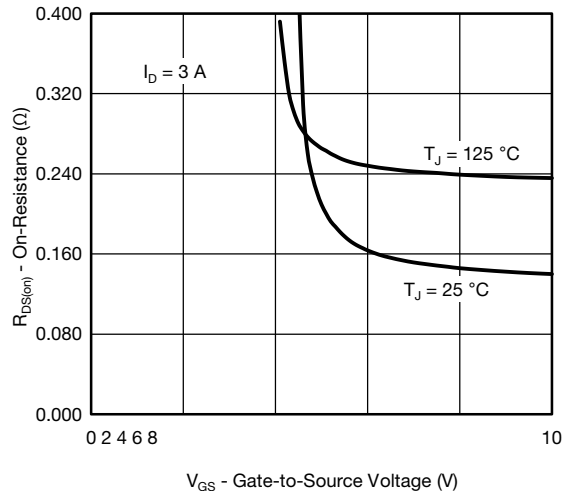
On-Resistance vs. Gate-to-Source Voltage
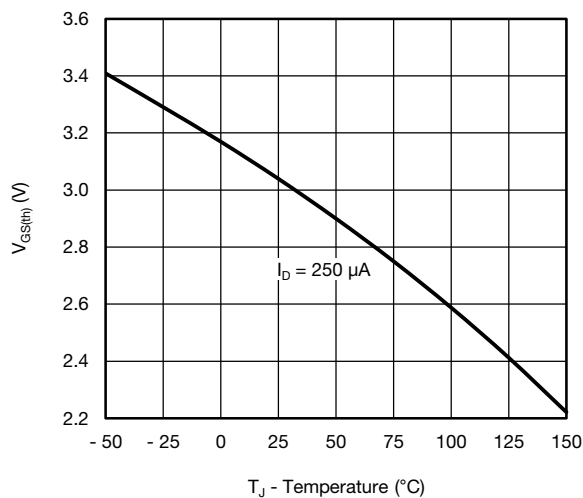
Threshold Voltage
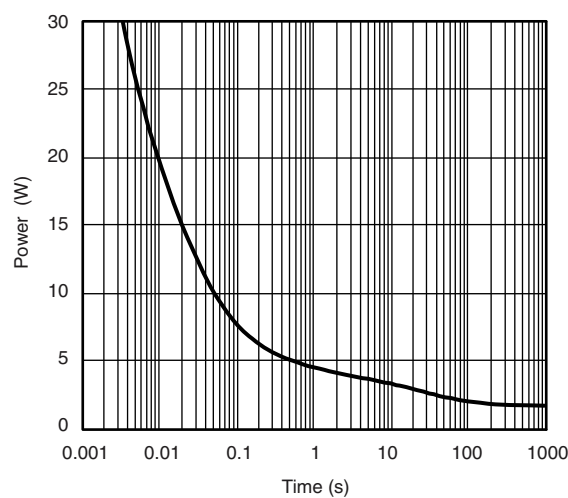
Single Pulse Power, Junction-to-Ambient
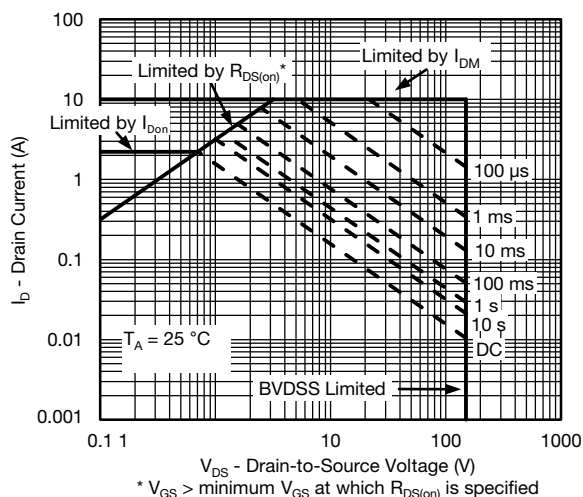
Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)
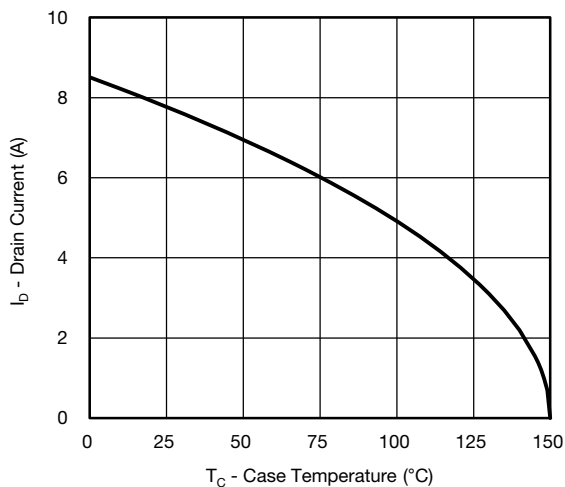
Current Derating*
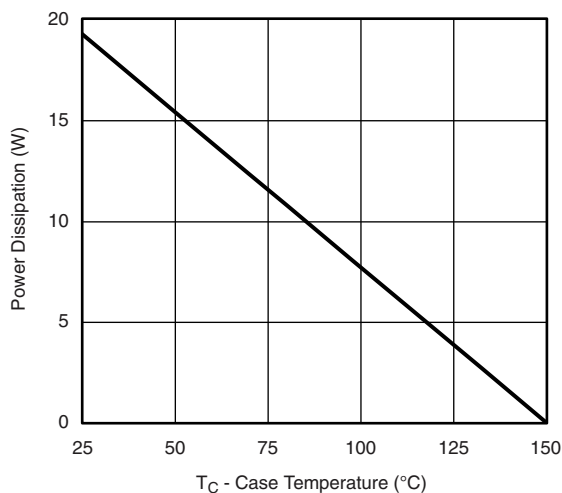
Power, Junction-to-Case

* 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)

Notes:
1. Duty Cycle, D = $\frac{t_1}{t_2}$
2. Per Unit Base = R_{thJA} = 80 °C/W
3. $T_{JM} - T_A = P_{DM}Z_{thJA}^{(t)}$
4. Surface Mounted

Normalized Thermal Transient Impedance, Junction-to-Ambient
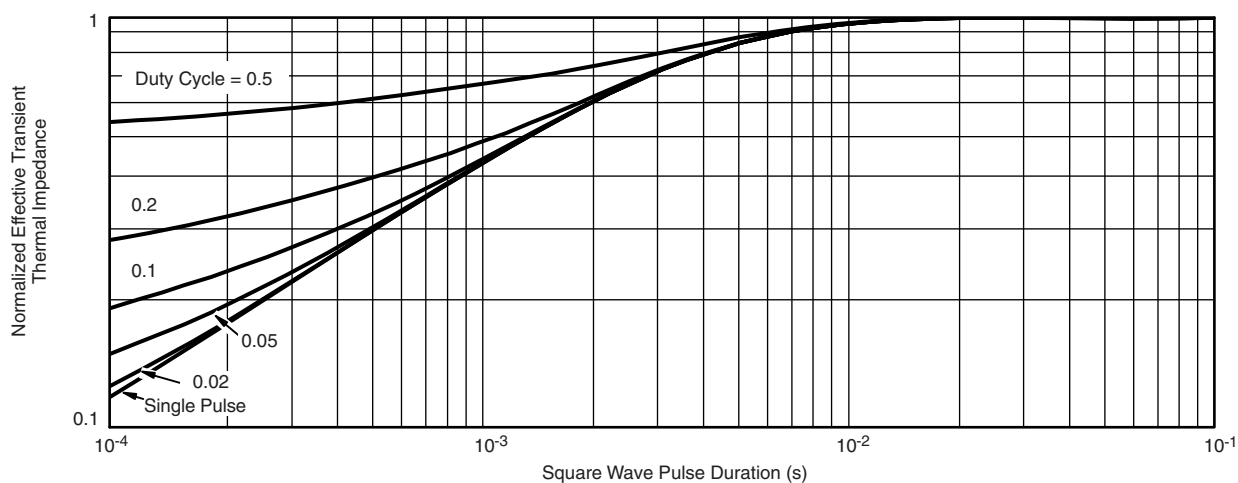
Normalized Thermal Transient Impedance, Junction-to-Case

PowerPAK® SC70-6L
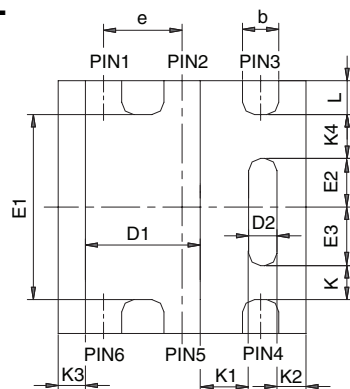
BACKSIDE VIEW OF SINGLE

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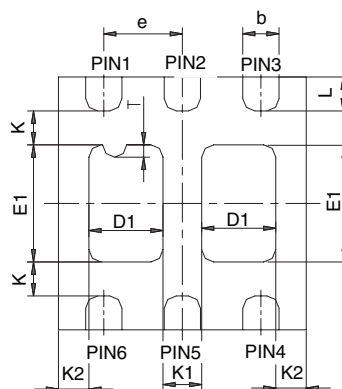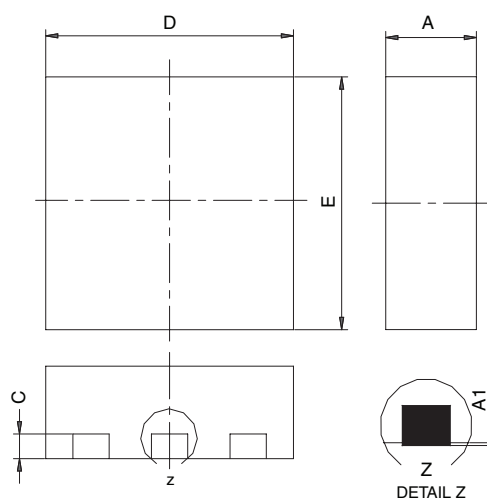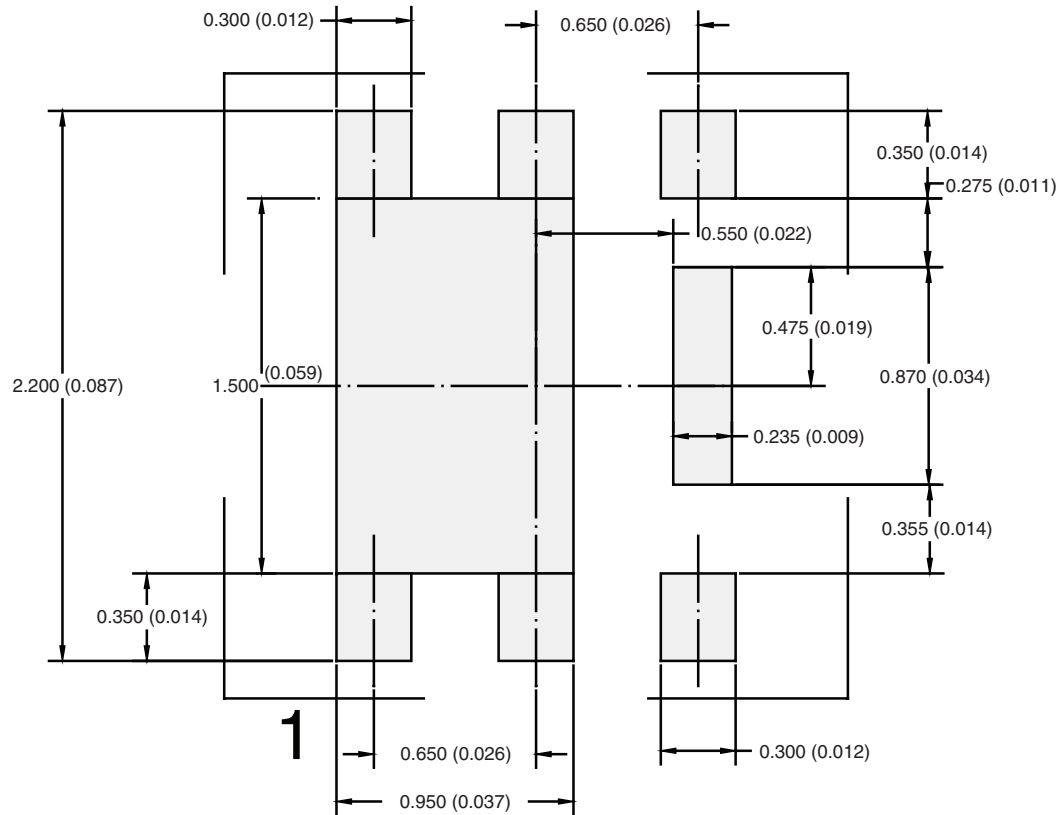
Notes:
1. All dimensions are in millimeters
2. Package outline exclusive of mold flash and metal burr
3. Package outline inclusive of plating

DETAIL Z

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

0.300 (0.012)

0.650 (0.026)

0.350 (0.014)

0.275 (0.011)

0.550 (0.022)

0.475 (0.019)

2.200 (0.087)

1.500 (0.059)

0.870 (0.034)

0.235 (0.009)

0.355 (0.014)

0.350 (0.014)

1

0.650 (0.026)

0.300 (0.012)

0.950 (0.037)

Dimensions in mm/(Inches)

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APPLICATION NOTE

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