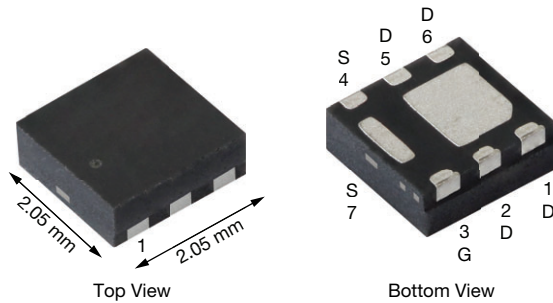


# Automotive P-Channel 40 V (D-S) 175 °C MOSFET

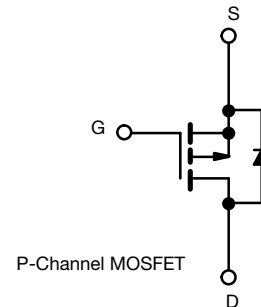
**PowerPAK® SC-70W-6L Single**

**Marking Code:** QRXXXX

PRODUCT SUMMARY	
$V_{DS}$ (V)	-40
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = -10$ V	0.0395
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = -4.5$ V	0.0545
$I_D$ (A)	-9
Configuration	Single

**FEATURES**

- TrenchFET® power MOSFET
- AEC-Q101 qualified
- 100 %  $R_g$  and UIS tested
- Wettable flank terminals
- Material categorization:  
for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

 AUTOMOTIVE  
GRADE

**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**


ORDERING INFORMATION	
Package	PowerPAK SC-70W-6L
Lead (Pb)-free and halogen-free	SQA405CEJW (for detailed order number please see <a href="http://www.vishay.com/doc?79776">www.vishay.com/doc?79776</a> )

ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$ °C, unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	$V_{DS}$	-40	V
Gate-source voltage <sup>f</sup>	$V_{GS}$	$\pm 20$	
Continuous drain current	$I_D$	$T_C = 25$ °C <sup>a</sup>	-9
		$T_C = 125$ °C	-7.9
Continuous source current (diode conduction) <sup>a</sup>	$I_S$	-9	A
Pulsed drain current <sup>b</sup>	$I_{DM}$	-36	mJ
Single pulse avalanche current	$I_{AS}$	-13.5	
Single pulse avalanche energy		$E_{AS}$	
Maximum power dissipation	$P_D$	$T_C = 25$ °C	13.6
		$T_C = 125$ °C	4.5
Soldering recommendations (peak temperature) <sup>d, e</sup>		260	°C
Operating junction and storage temperature range	$T_J, T_{stg}$	-55 to +175	

THERMAL RESISTANCE RATINGS			
PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-ambient	$R_{thJA}$	90	°C/W
Junction-to-case (drain)			

**Notes**

- Package limited
- Pulse test; pulse width  $\leq 300$   $\mu$ s, duty cycle  $\leq 2$  %
- When mounted on 1" square PCB (FR4 material)
- See solder profile ([www.vishay.com/doc?73257](http://www.vishay.com/doc?73257)). The PowerPAK SC-70W-6L is a leadless package and features wettable flank terminals. The end of the lead terminal is plated with tin
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components
- Not intended for continuous use with positive gate voltage  $> 3$  V. Operation in the range  $3$  V  $< V_{GS} \leq 12$  V is limited to 25 % duty



SPECIFICATIONS (T <sub>C</sub> = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
<b>Static</b>							
Drain-source breakdown voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0, I <sub>D</sub> = -250 μA		-40	-	-	V
Gate-source threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA		-1.5	-2.0	-2.5	
Gate-source leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V		-	-	± 100	nA
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V	V <sub>DS</sub> = -40 V	-	-	-1	μA
		V <sub>GS</sub> = 0 V	V <sub>DS</sub> = -40 V, T <sub>J</sub> = 125 °C	-	-	-50	
		V <sub>GS</sub> = 0 V	V <sub>DS</sub> = -40 V, T <sub>J</sub> = 175 °C	-	-	-150	
On-state drain current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>GS</sub> = -10 V	V <sub>DS</sub> ≥ -5 V	-8	-	-	A
Drain-source on-state resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = -10 V	I <sub>D</sub> = -5 A	-	0.0326	0.0395	Ω
		V <sub>GS</sub> = -10 V	I <sub>D</sub> = -5 A, T <sub>J</sub> = 125 °C	-	-	0.0616	
		V <sub>GS</sub> = -10 V	I <sub>D</sub> = -5 A, T <sub>J</sub> = 175 °C	-	-	0.0727	
		V <sub>GS</sub> = -4.5 V	I <sub>D</sub> = -4 A	-	0.0453	0.0545	
Forward transconductance <sup>b</sup>	g <sub>fs</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -7 A		-	18	-	S
<b>Dynamic <sup>b</sup></b>							
Input capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V	V <sub>DS</sub> = -25 V, f = 1 MHz	-	1142	1700	pF
Output capacitance	C <sub>oss</sub>			-	83	125	
Reverse transfer capacitance	C <sub>rss</sub>			-	70	105	
Total gate charge <sup>c</sup>	Q <sub>g</sub>	V <sub>GS</sub> = -10 V	V <sub>DS</sub> = -20 V, I <sub>D</sub> = -8 A	-	22.6	34	nC
Gate-source charge <sup>c</sup>	Q <sub>gs</sub>			-	4.4	-	
Gate-drain charge <sup>c</sup>	Q <sub>gd</sub>			-	4.1	-	
Gate resistance	R <sub>g</sub>	f = 1 MHz		3.3	6.6	9.9	Ω
Turn-on delay time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = -20 V, R <sub>L</sub> = 8 Ω I <sub>D</sub> ≅ -2.5 A, V <sub>GEN</sub> = -10 V, R <sub>g</sub> = 1 Ω		-	9	15	ns
Rise time <sup>c</sup>	t <sub>r</sub>			-	4	8	
Turn-off delay time <sup>c</sup>	t <sub>d(off)</sub>			-	32	50	
Fall time <sup>c</sup>	t <sub>f</sub>			-	6	10	
<b>Source-Drain Diode Ratings and Characteristics</b>							
Pulsed current <sup>a</sup>	I <sub>SM</sub>			-	-	-36	A
Forward voltage	V <sub>SD</sub>	I <sub>F</sub> = -5 A, V <sub>GS</sub> = 0		-	-0.85	-1.2	V
Body diode reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = -2 A, di/dt = 100 A/μs		-	14	30	ns
Body diode reverse recovery charge	Q <sub>rr</sub>			-	9	20	nC
Reverse recovery fall time	t <sub>a</sub>			-	9	-	ns
Reverse recovery rise time	t <sub>b</sub>			-	5	-	
Body diode peak reverse recovery current	I <sub>RM(REC)</sub>			-	-1.5	-	A

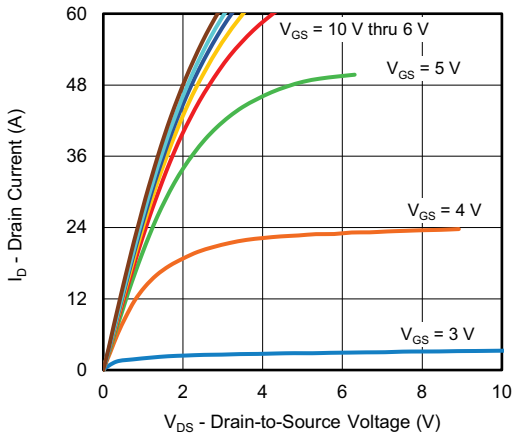
**Notes**

- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %
- b. Guaranteed by design, not subject to production testing
- c. Independent of operating temperature

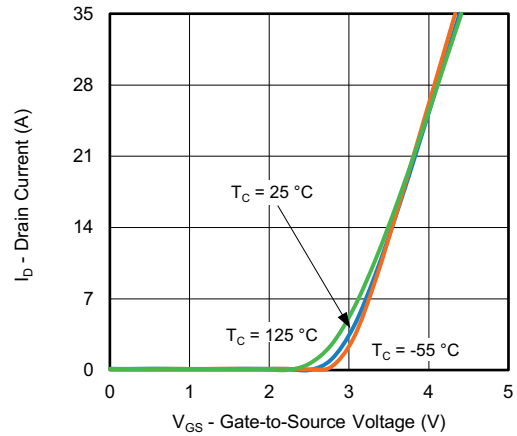
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



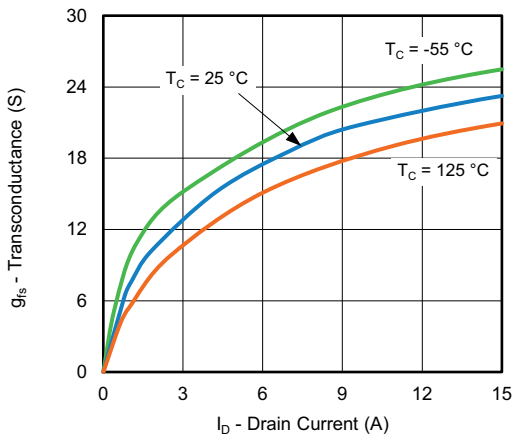
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C, unless otherwise noted)



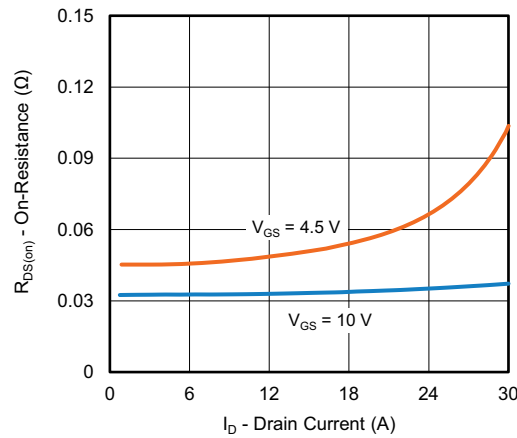
Output Characteristics



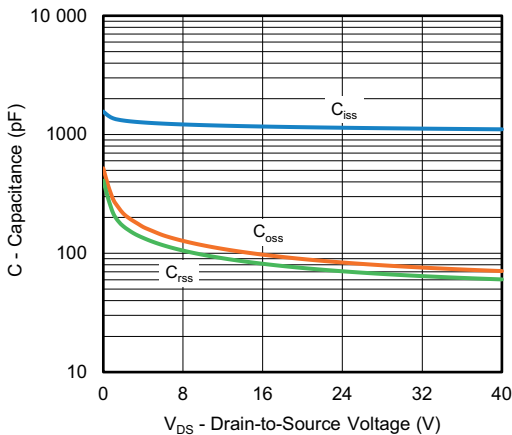
Transfer Characteristics



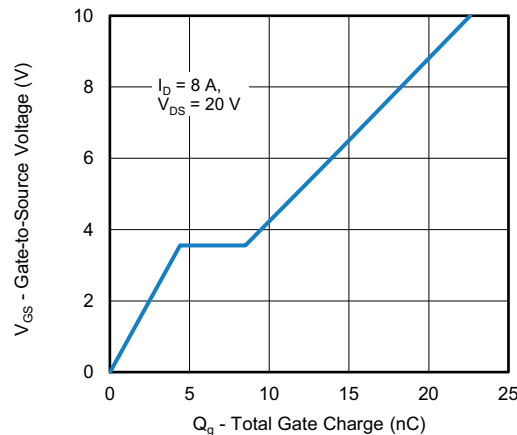
Transconductance



On-Resistance vs. Drain Current



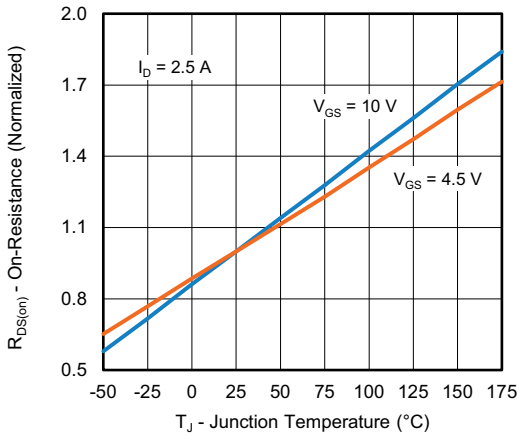
Capacitance



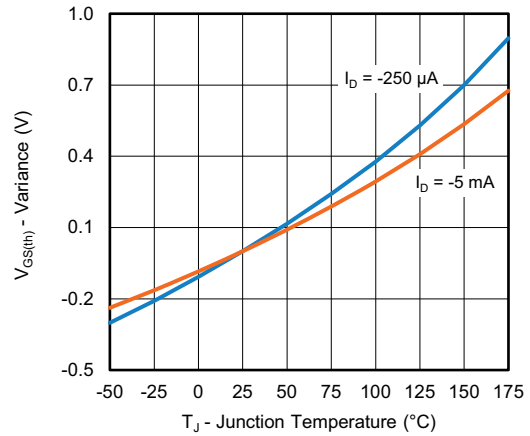
Gate Charge



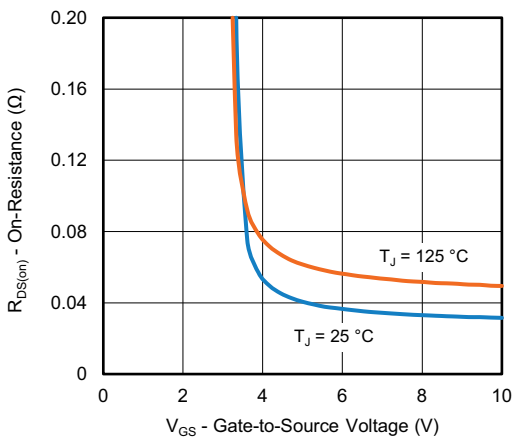
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C, unless otherwise noted)



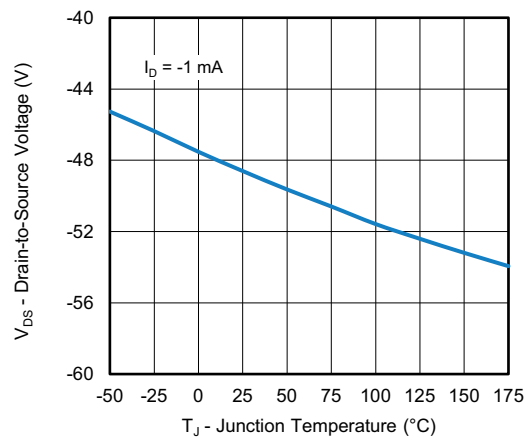
On-Resistance vs. Junction Temperature



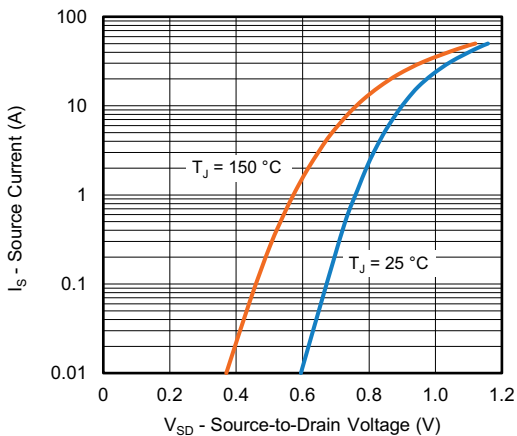
Threshold Voltage



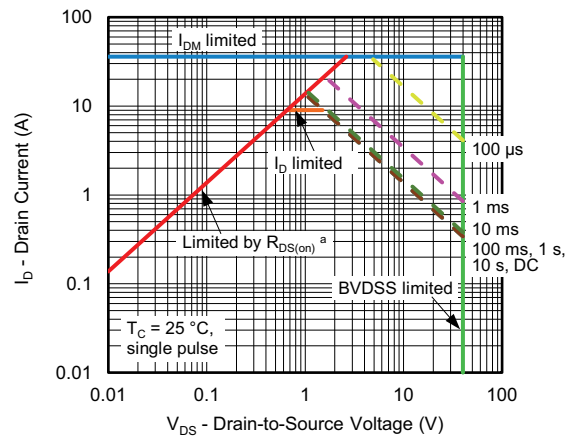
On-Resistance vs. Gate-to-Source Voltage



Drain Source Breakdown vs. Junction Temperature



Source-Drain Diode Forward Voltage



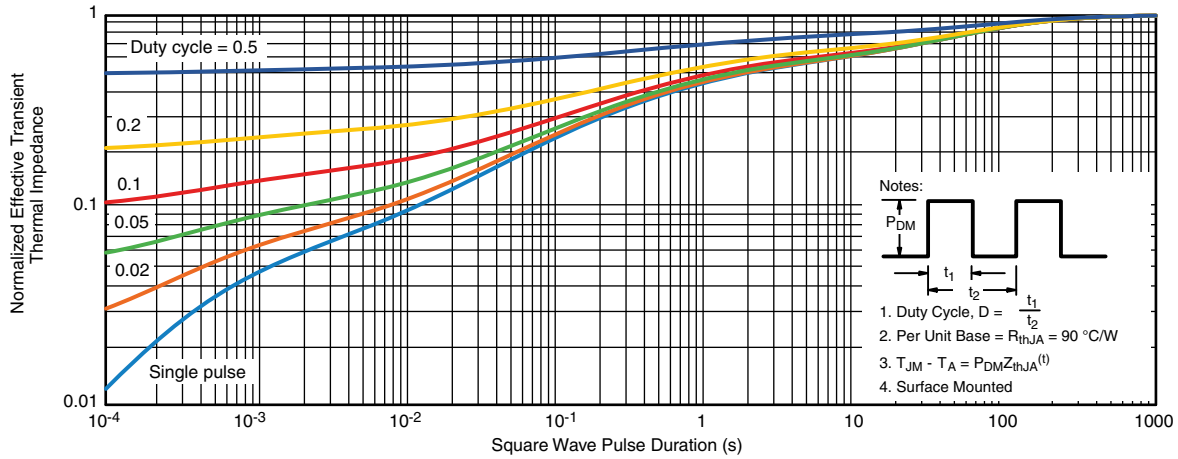
Safe Operating Area

Note

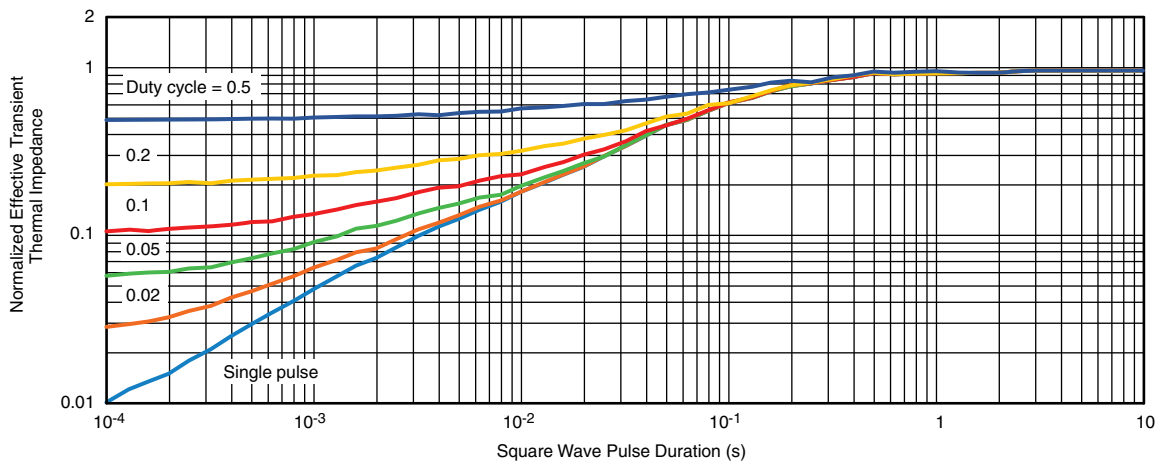
- a. V<sub>GS</sub> > minimum V<sub>GS</sub> at which R<sub>DS(on)</sub> is specified



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



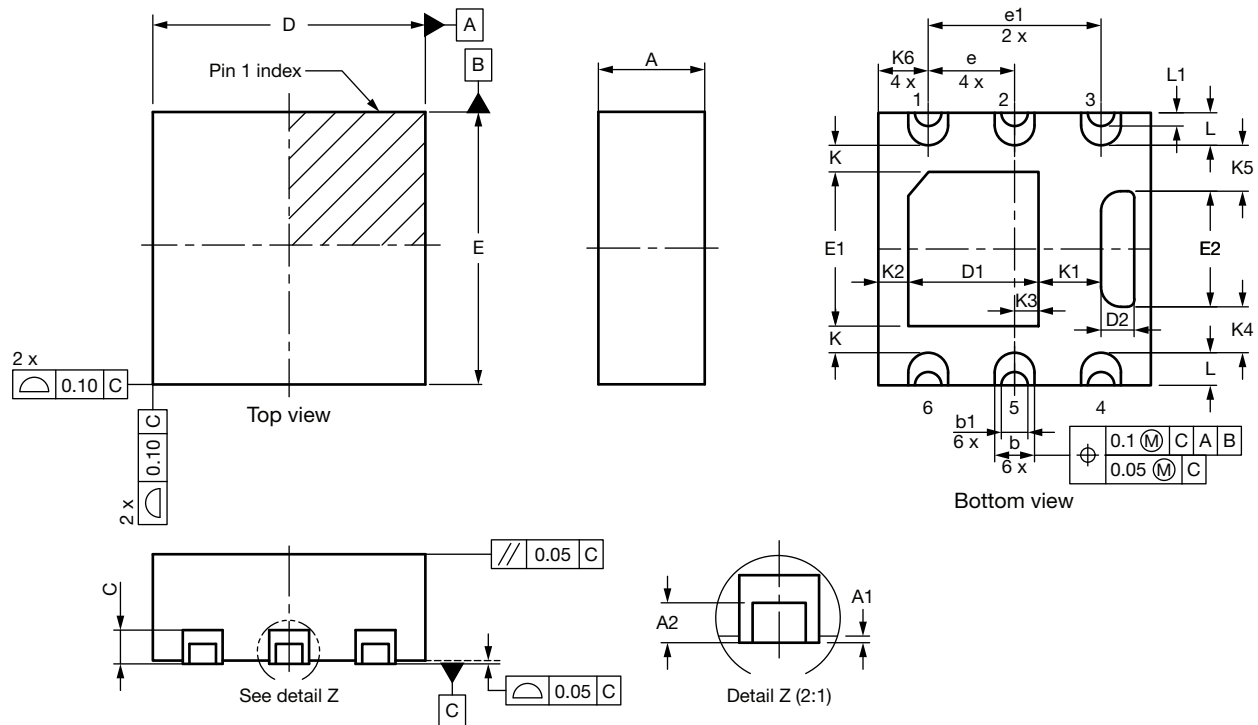
**Normalized Thermal Transient Impedance, Junction-to-Ambient**



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

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### PowerPAK® SC70W-6L SIDEWETTABLE



DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.80	0.90	0.027	0.031	0.035
A1	0.00	0.02	0.05	0.000	0.001	0.002
A2	0.10	-	-	0.004	-	-
b	0.25	0.30	0.35	0.010	0.012	0.014
b1	0.15	0.20	0.23	0.006	0.008	0.009
C	0.20	0.25	0.30	0.008	0.010	0.012
D	1.95	2.05	2.15	0.077	0.081	0.085
D1	0.88	0.98	1.08	0.035	0.039	0.043
D2	0.20	0.25	0.30	0.008	0.010	0.012
E	1.95	2.05	2.15	0.077	0.081	0.085
E1	1.06	1.16	1.26	0.042	0.046	0.050
E2	0.82	0.87	0.92	0.032	0.034	0.036
e	0.65 BSC			0.026 BSC		
e1	1.30 BSC			0.051 BSC		
K	0.20 typ.			0.008 typ.		
K1	0.47 typ.			0.019 typ.		
K2	0.23 typ.			0.009 typ.		
K3	0.18 typ.			0.007 typ.		
K4	0.35 typ.			0.014 typ.		
K5	0.35 typ.			0.014 typ.		
K6	0.38 typ.			0.015 typ.		
L	0.15	0.25	0.35	0.006	0.010	0.014
L1	-	0.10	-	-	0.004	-

ECN: C19-1644-Rev. A, 10-Jan-2020  
DWG: 6076

#### Notes

- Package outline exclusive of mold flash and metal burr
- Package outline inclusive of plating



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