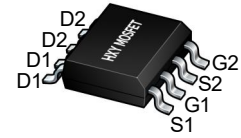




## Description

The SI4946BEY-T1-E3 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.



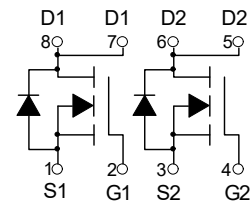
SOP-8

## General Features

$V_{DS} = 60V$   $I_D = 6.5A$   
 $R_{DS(ON)} < 36m\Omega @ V_{GS}=10V$   
 $R_{DS(ON)} < 48m\Omega @ V_{GS}=4.5V$

## Application

Battery protection  
 Load switch  
 Uninterruptible power supply



Dual N-Channel MOSFET

## Package Marking and Ordering Information

Product ID	Pack	Brand	Qty(PCS)
SI4946BEY-T1-E3	SOP-8	HXY MOSFET	3000

## Absolute Maximum Ratings@ $T_J=25^\circ C$ (unless otherwise specified)

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	60	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D @ T_A=25^\circ C$	Drain Current, $V_{GS} @ 4.5V^3$	6.5	A
$I_D @ T_A=70^\circ C$	Drain Current, $V_{GS} @ 4.5V^3$	5	A
$I_{DM}$	Pulsed Drain Current <sup>1</sup>	30	A
$P_D @ T_A=25^\circ C$	Total Power Dissipation	2.1	W
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ C$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ C$
$R_{thj-a}$	Maximum Thermal Resistance, Junction-ambient <sup>3</sup>	60	$^\circ C/W$



**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit	
<b>Off Characteristics</b>							
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	60	69	-	V	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =60V, V <sub>GS</sub> =0V	-	-	1	μA	
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA	
<b>On Characteristics</b> (Note 3)							
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.0	1.4	2.0	V	
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =6A		32	36	mΩ	
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =4A		34	48	mΩ	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =6A		20	-	S	
<b>Dynamic Characteristics</b> (Note 4)							
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, F=1.0MHz		1920		PF	
Output Capacitance	C <sub>oss</sub>				155		PF
Reverse Transfer Capacitance	C <sub>rss</sub>				116		PF
<b>Switching Characteristics</b> (Note 4)							
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DS</sub> =30V, R <sub>L</sub> =4.7Ω V <sub>GS</sub> =10V, R <sub>GEN</sub> =3Ω	-	8	-	nS	
Turn-on Rise Time	t <sub>r</sub>		-	5	-	nS	
Turn-Off Delay Time	t <sub>d(off)</sub>		-	29	-	nS	
Turn-Off Fall Time	t <sub>f</sub>		-	6	-	nS	
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =30V, I <sub>D</sub> =6A, V <sub>GS</sub> =10V	-	50	-	nC	
Gate-Source Charge	Q <sub>gs</sub>		-	8	-	nC	
Gate-Drain Charge	Q <sub>gd</sub>		-	16	-	nC	
<b>Drain-Source Diode Characteristics</b>							
Diode Forward Voltage (Note 3)	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =6A	-	-	1.2	V	
Diode Forward Current (Note 2)	I <sub>S</sub>		-	-	7	A	
Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> = 25°C, I <sub>F</sub> =7A di/dt = 100A/μs (Note 3)	-	35	-	nS	
Reverse Recovery Charge	Q <sub>rr</sub>		-	43	-	nC	
Forward Turn-On Time	t <sub>on</sub>	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)					

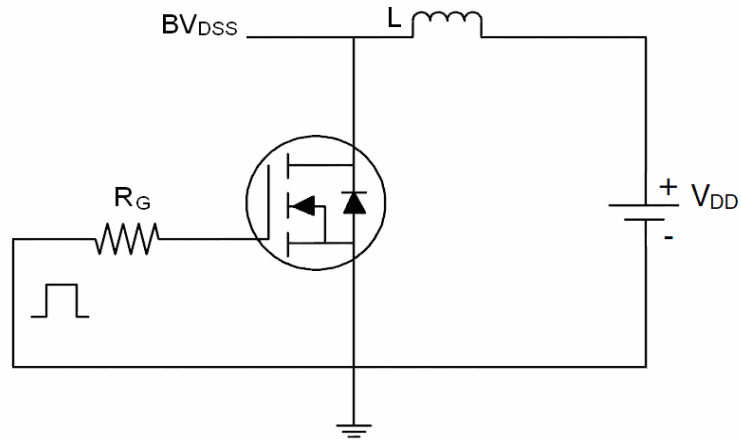
**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production

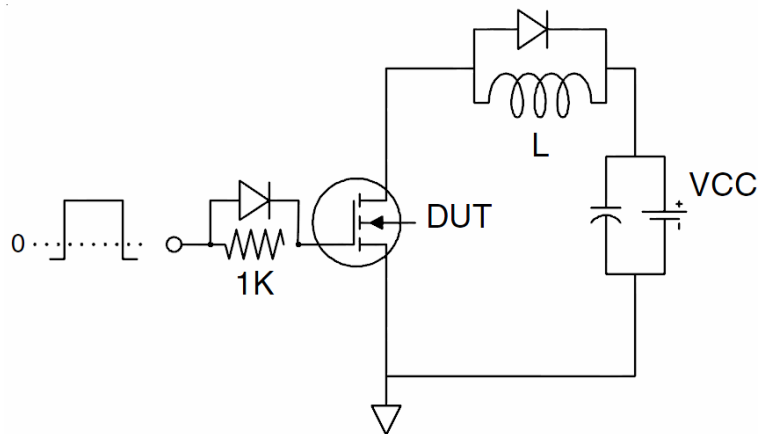


## Test Circuit

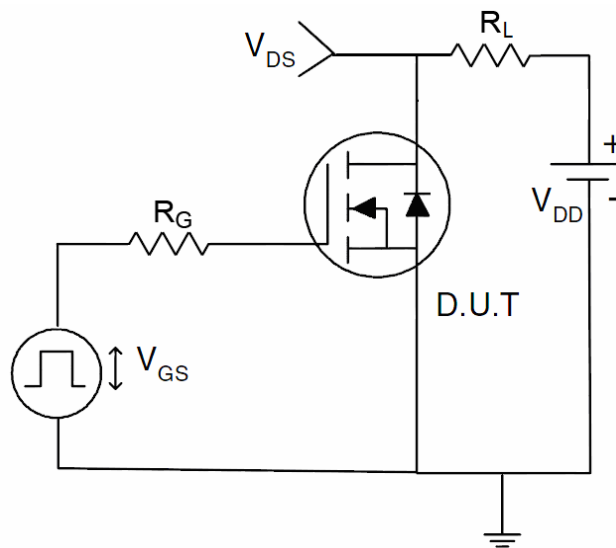
### 1) $E_{AS}$ test Circuits



### 2) Gate charge test Circuit



### 3) Switch Time Test Circuit





### Typical Electrical and Thermal Characteristics (Curves)

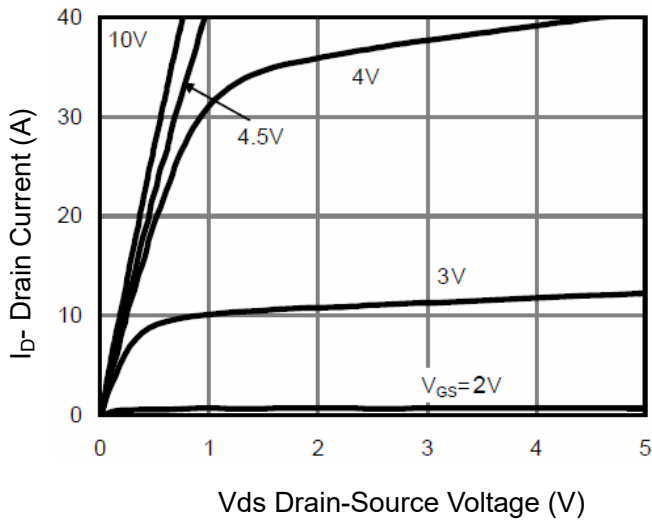


Figure 1 Output Characteristics

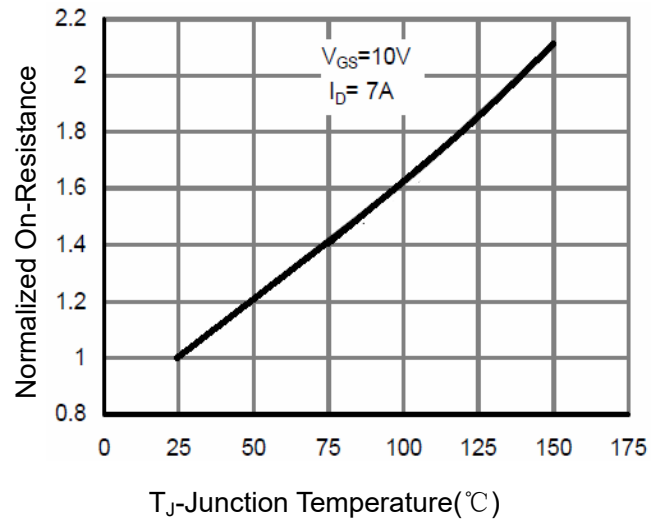


Figure 4  $R_{dson}$ -Junction Temperature

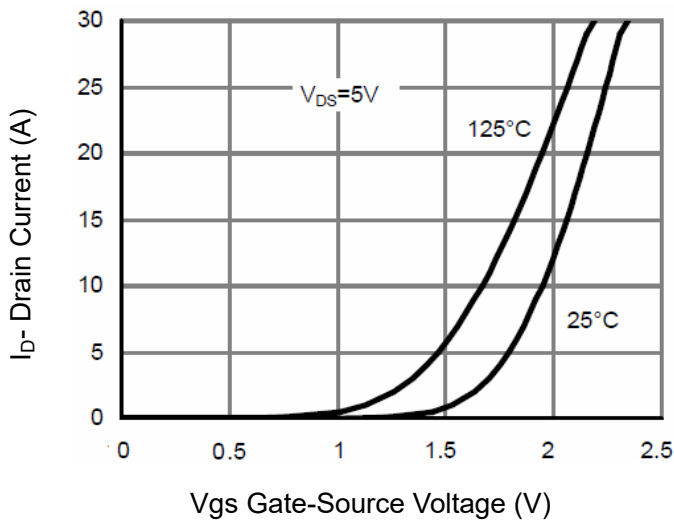


Figure 2 Transfer Characteristics

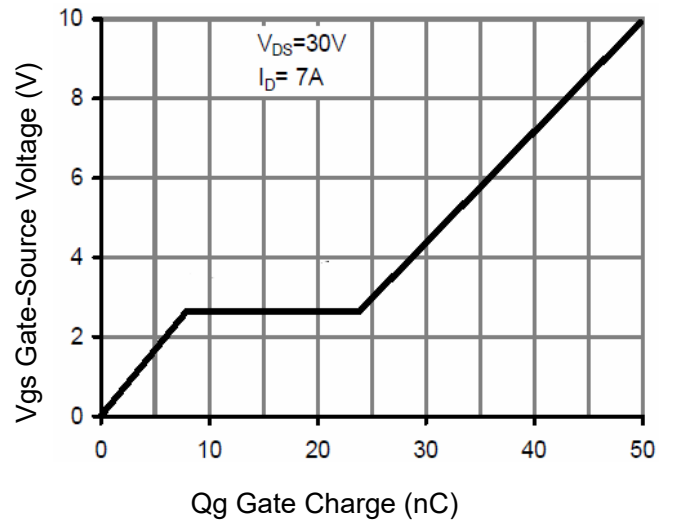


Figure 5 Gate Charge

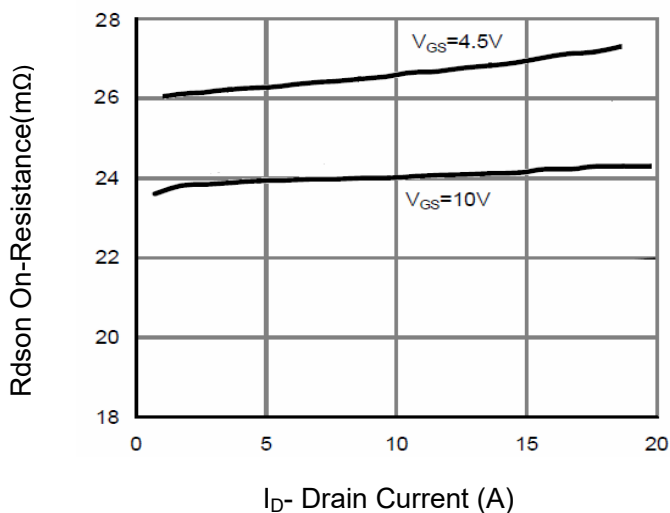


Figure 3  $R_{dson}$ - Drain Current

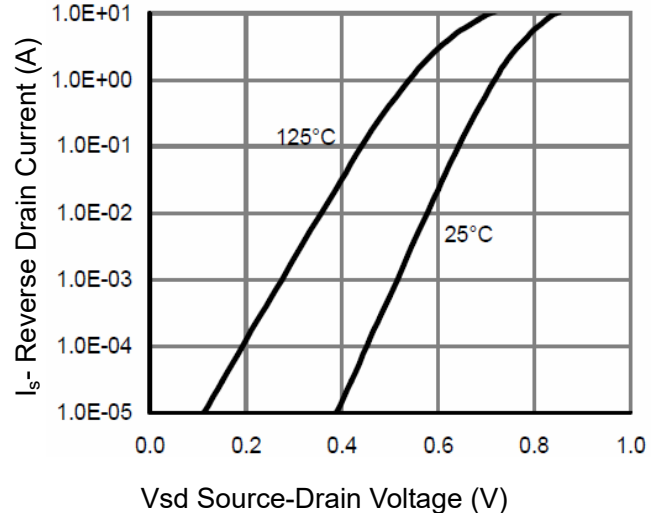


Figure 6 Source- Drain Diode Forward

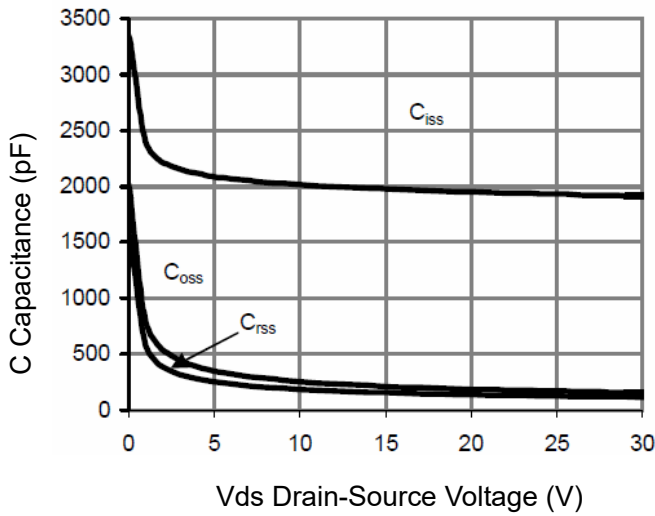


Figure 7 Capacitance vs Vds

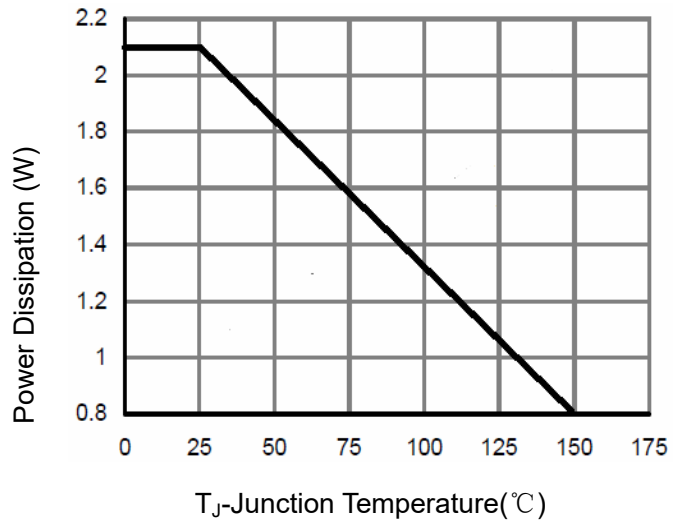


Figure 9 Power De-rating

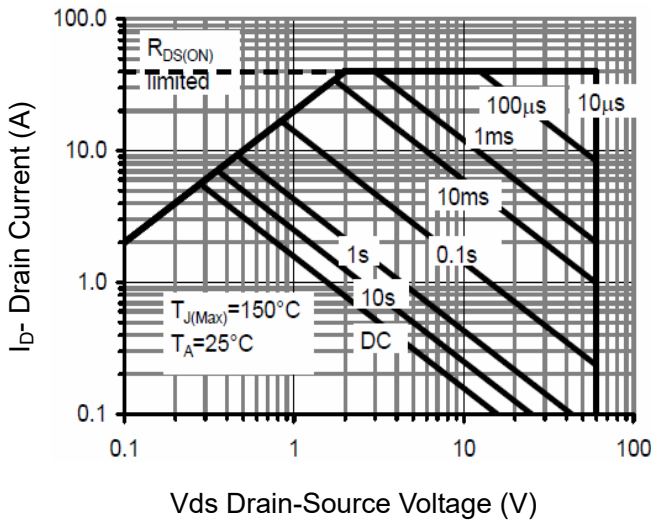


Figure 8 Safe Operation Area

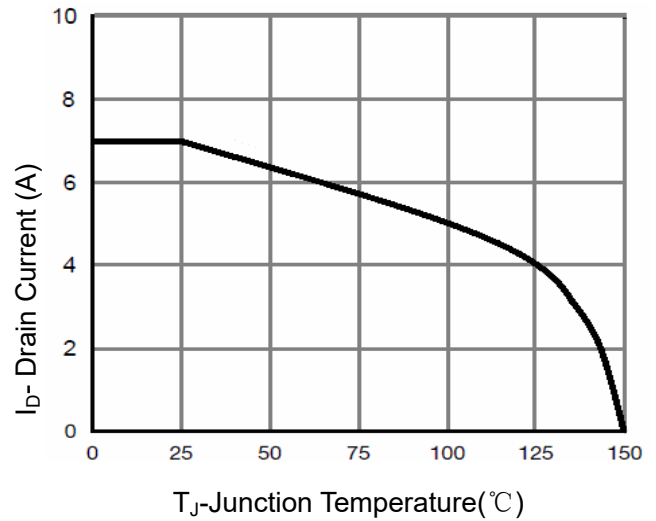


Figure 10 Current De-rating

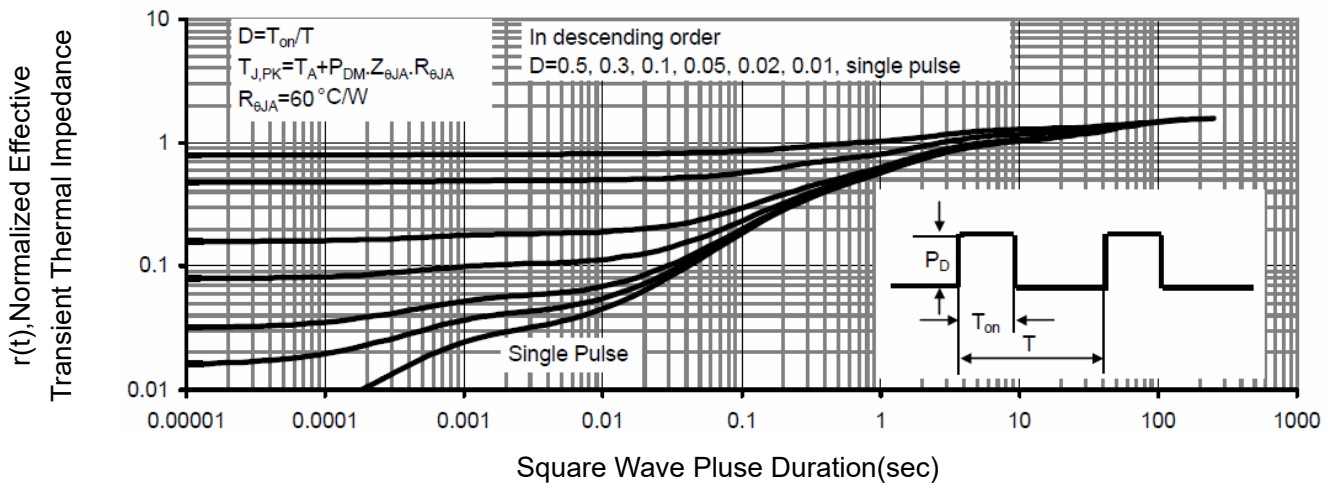
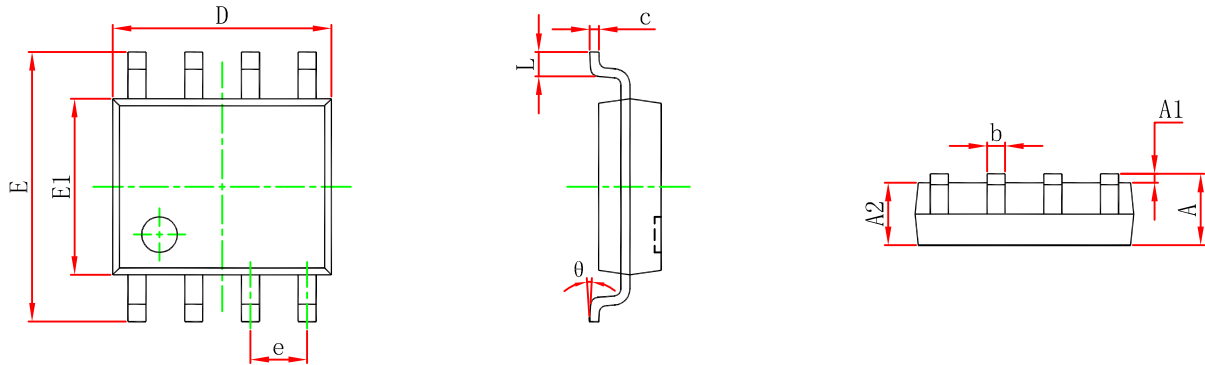


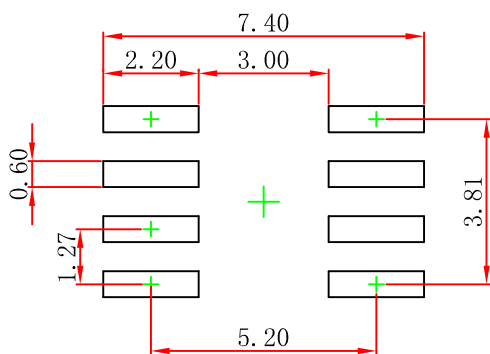
Figure 11 Normalized Maximum Transient Thermal Impedance



### SOP-8 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
e	1.270 (BSC)		0.050 (BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°



- Note:
1. Controlling dimension: in millimeters.
  2. General tolerance:  $\pm 0.05\text{mm}$ .
  3. The pad layout is for reference purposes only.



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