



## Description

The HIRF7313TRPBF 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.



## General Features

$$V_{DS} = 30V \quad I_D = 6A$$

$$R_{DS(ON)} < 30m\Omega \text{ @ } V_{GS}=10V$$

$$R_{DS(ON)} < 42m\Omega \text{ @ } V_{GS}=4.5V$$

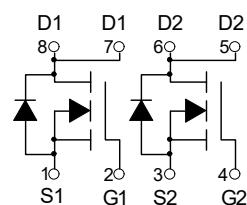
**SOP-8  
(SOIC-8)**

## Application

## Battery protection

## Load switch

## Uninterruptible power supply



## Dual N-Channel MOSFET

## Package Marking and Ordering Information

Product ID	Pack	Brand	Qty(PCS)
HIRF7313TRPBF	SOP-8(SOIC-8)	HXY MOSFET	3000

## Absolute Maximum Ratings@T<sub>j</sub>=25°C(unless otherwise specified)

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	30	V
$V_{GS}$	Gate-Source Voltage	+20	V
$I_D @ T_A = 25^\circ C$	Drain Current, $V_{GS} @ 4.5V^3$	6	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	W
$T_{STG}$	Storage Temperature Range	-55 to 150	°C
$T_J$	Operating Junction Temperature Range	-55 to 150	°C
$R_{thj-a}$	Maximum Thermal Resistance, Junction-ambient <sup>3</sup>	62.5	°C/W



**Electrical Characteristics ( $T_J=25^\circ\text{C}$  unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$\text{BV}_{\text{DSS}}$	Drain-Source Breakdown Voltage	$I_D=-250\mu\text{A}$ , $V_{\text{GS}}=0\text{V}$	30			V
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{\text{DS}}=30\text{V}$ , $V_{\text{GS}}=0\text{V}$	$T_J=55^\circ\text{C}$		1	$\mu\text{A}$
					5	
$I_{\text{GSS}}$	Gate-Body leakage current	$V_{\text{DS}}=0\text{V}$ , $V_{\text{GS}}=\pm 20\text{V}$			$\pm 100$	nA
$V_{\text{GS}(\text{th})}$	Gate Threshold Voltage	$V_{\text{DS}}=V_{\text{GS}}$ $I_D=250\mu\text{A}$	1.2	1.8	2.4	V
$I_{\text{D}(\text{ON})}$	On state drain current	$V_{\text{GS}}=10\text{V}$ , $V_{\text{DS}}=5\text{V}$	30			A
$R_{\text{DS}(\text{ON})}$	Static Drain-Source On-Resistance	$V_{\text{GS}}=10\text{V}$ , $I_D=6\text{A}$	$T_J=125^\circ\text{C}$	25	30	$\text{m}\Omega$
				40	48	
		$V_{\text{GS}}=4.5\text{V}$ , $I_D=5\text{A}$		33	42	$\text{m}\Omega$
$g_{\text{FS}}$	Forward Transconductance	$V_{\text{DS}}=5\text{V}$ , $I_D=6\text{A}$		15		S
$V_{\text{SD}}$	Diode Forward Voltage	$I_S=1\text{A}$ , $V_{\text{GS}}=0\text{V}$		0.76	1	V
$I_S$	Maximum Body-Diode Continuous Current				2.5	A
<b>DYNAMIC PARAMETERS</b>						
$C_{\text{iss}}$	Input Capacitance	$V_{\text{GS}}=0\text{V}$ , $V_{\text{DS}}=15\text{V}$ , $f=1\text{MHz}$		255	310	pF
$C_{\text{oss}}$	Output Capacitance			45		pF
$C_{\text{rss}}$	Reverse Transfer Capacitance			35	50	pF
$R_g$	Gate resistance	$V_{\text{GS}}=0\text{V}$ , $V_{\text{DS}}=0\text{V}$ , $f=1\text{MHz}$	1.6	3.25	4.9	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_{\text{g}(10\text{V})}$	Total Gate Charge	$V_{\text{GS}}=10\text{V}$ , $V_{\text{DS}}=15\text{V}$ , $I_D=6\text{A}$		5.2	6.3	nC
$Q_{\text{g}(4.5\text{V})}$				2.55	3.2	nC
$Q_{\text{gs}}$	Gate Source Charge			0.85		nC
$Q_{\text{gd}}$	Gate Drain Charge			1.3		nC
$t_{\text{D}(\text{on})}$	Turn-On Delay Time	$V_{\text{GS}}=10\text{V}$ , $V_{\text{DS}}=15\text{V}$ , $R_L=2.5\Omega$ , $R_{\text{GEN}}=3\Omega$		4.5		ns
$t_r$	Turn-On Rise Time			2.5		ns
$t_{\text{D}(\text{off})}$	Turn-Off Delay Time			14.5		ns
$t_f$	Turn-Off Fall Time			3.5		ns
$t_{\text{rr}}$	Body Diode Reverse Recovery Time	$I_F=6\text{A}$ , $dl/dt=100\text{A}/\mu\text{s}$		8.5		ns
$Q_{\text{rr}}$	Body Diode Reverse Recovery Charge	$I_F=6\text{A}$ , $dl/dt=100\text{A}/\mu\text{s}$		2.2		nC

A. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The value in any given application depends on the user's specific board design.

B. The power dissipation  $P_D$  is based on  $T_{J(\text{MAX})}=150^\circ\text{C}$ , using  $\leq 10\text{s}$  junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature  $T_{J(\text{MAX})}=150^\circ\text{C}$ . Ratings are based on low frequency and duty cycles to keep initial  $T_J=25^\circ\text{C}$ .

D. The  $R_{\theta JA}$  is the sum of the thermal impedance from junction to lead  $R_{\theta JL}$  and lead to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using  $<300\mu\text{s}$  pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, assuming a maximum junction temperature of  $T_{J(\text{MAX})}=150^\circ\text{C}$ . The SOA curve provides a single pulse rating.



### TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

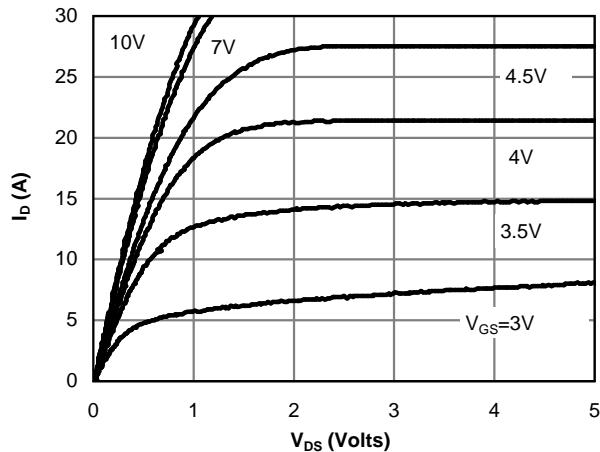


Fig 1: On-Region Characteristics (Note E)

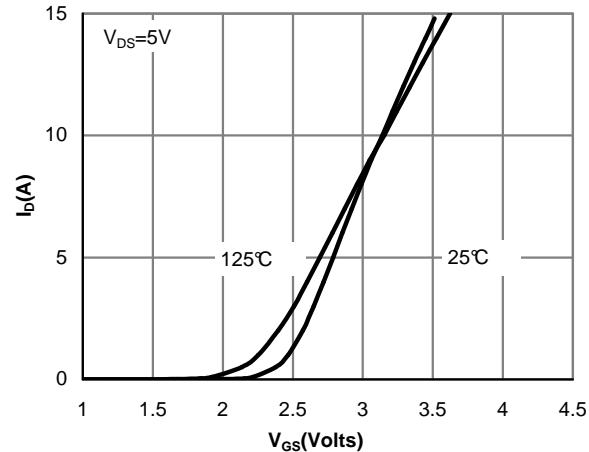


Figure 2: Transfer Characteristics (Note E)

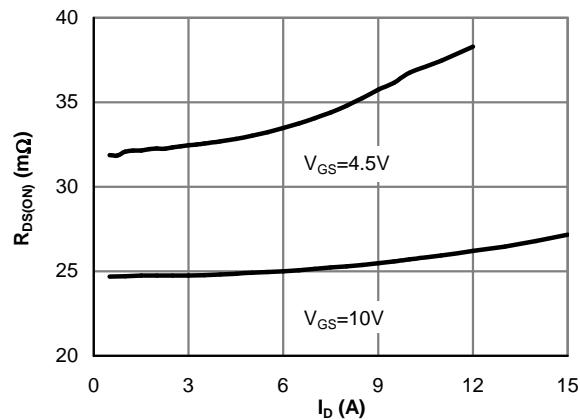


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

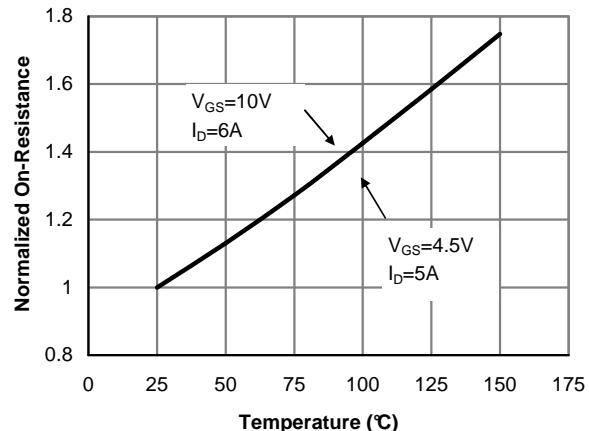


Figure 4: On-Resistance vs. Junction Temperature (Note E)

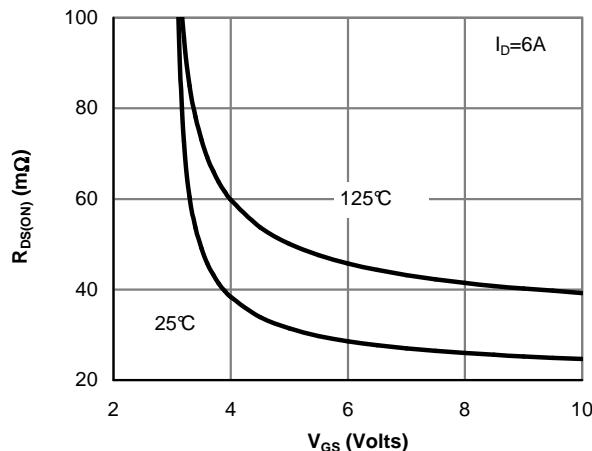


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

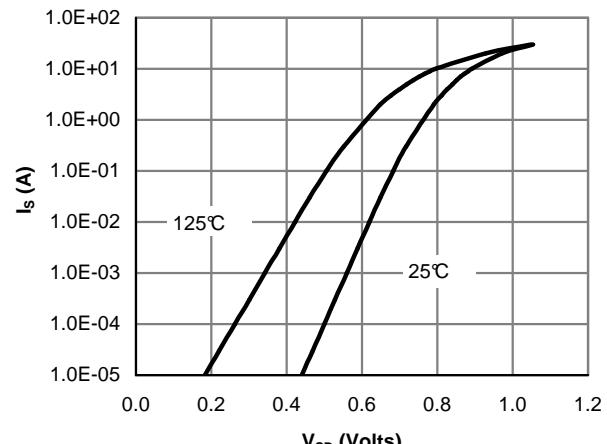


Figure 6: Body-Diode Characteristics (Note E)



### TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

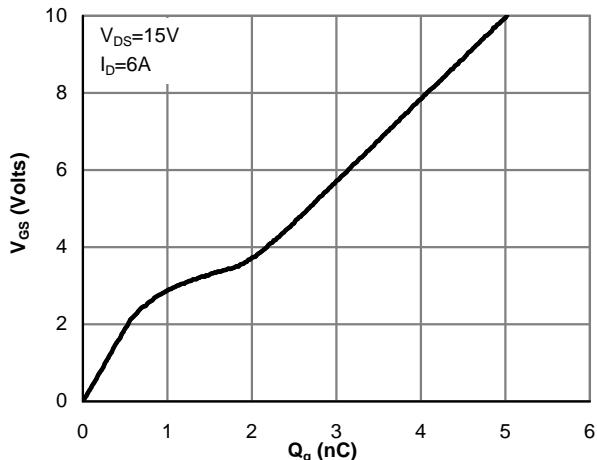


Figure 7: Gate-Charge Characteristics

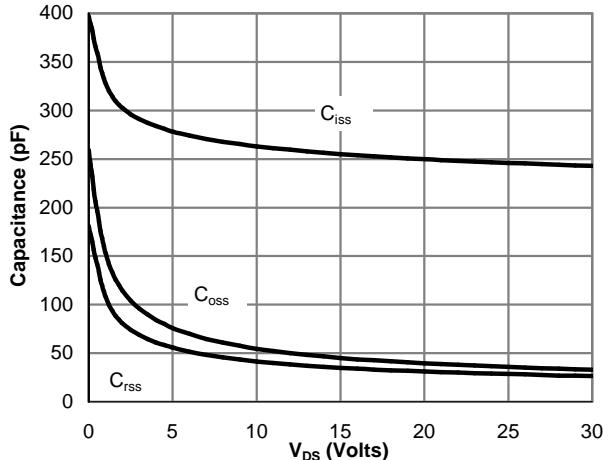


Figure 8: Capacitance Characteristics

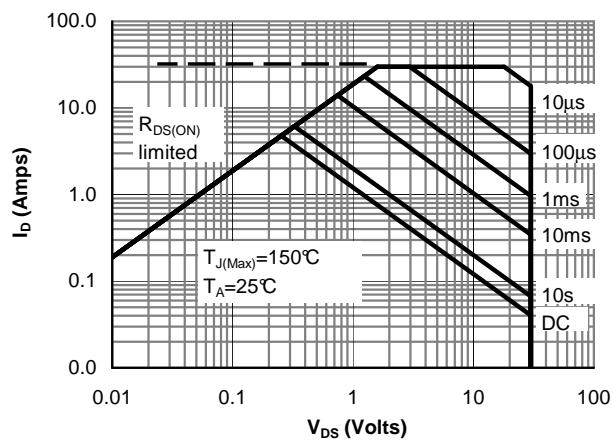


Figure 10: Maximum Forward Biased Safe Operating Area (Note F)

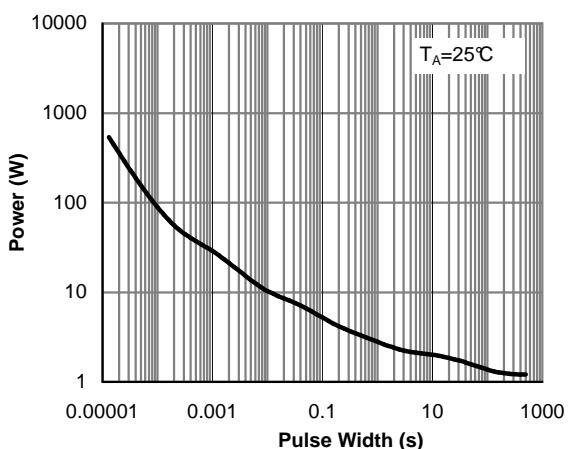


Figure 11: Single Pulse Power Rating Junction-to-Ambient (Note F)

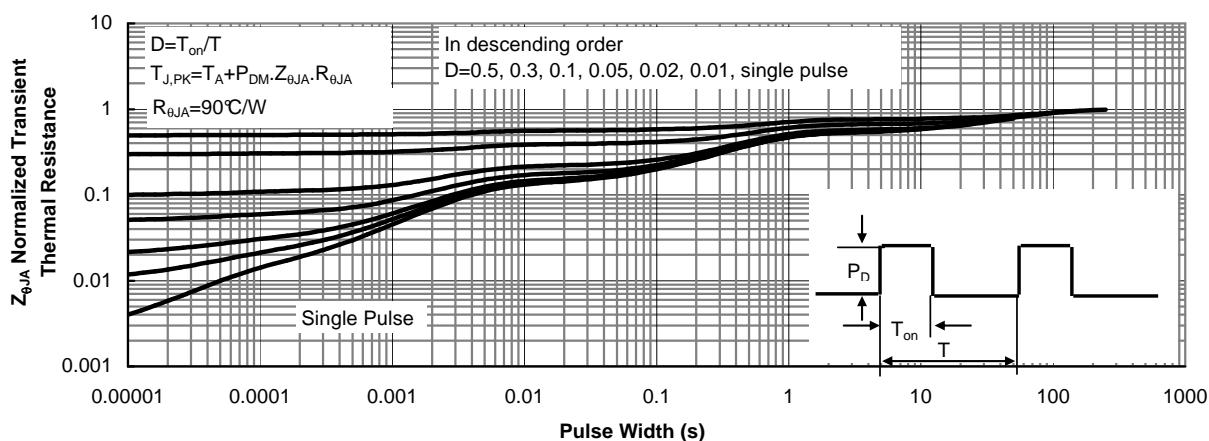
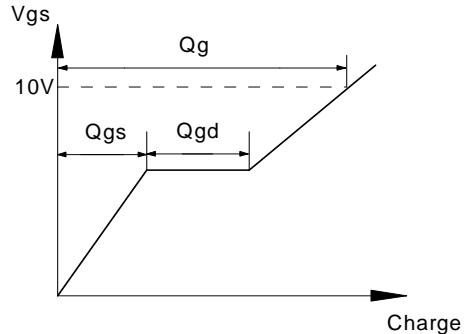
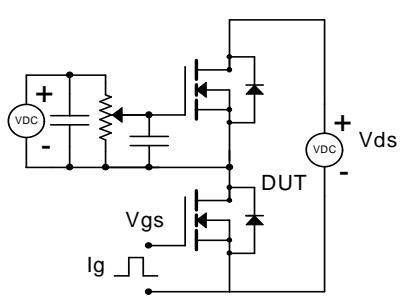


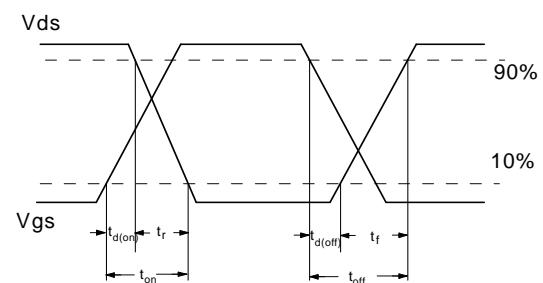
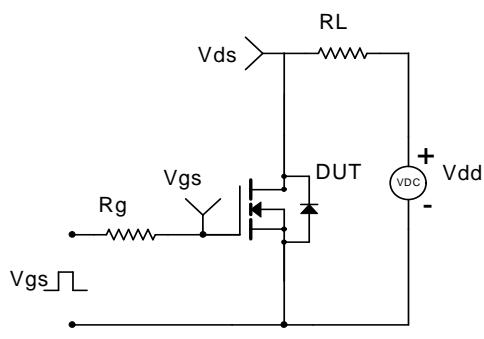
Figure 12: Normalized Maximum Transient Thermal Impedance (Note F)



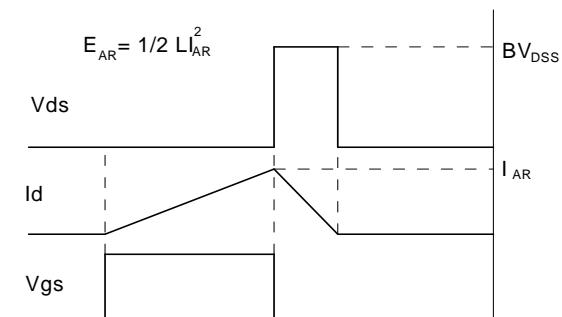
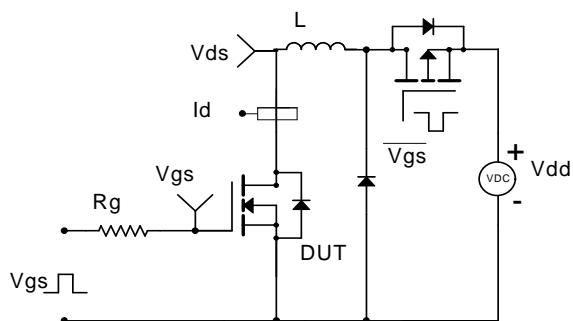
Gate Charge Test Circuit & Waveform



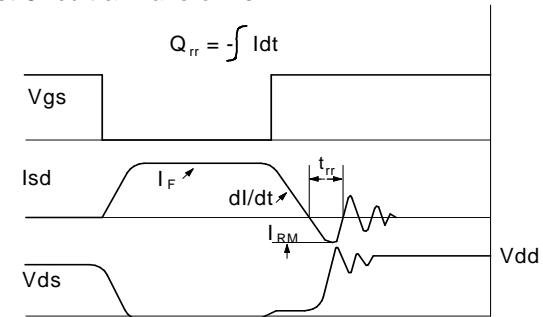
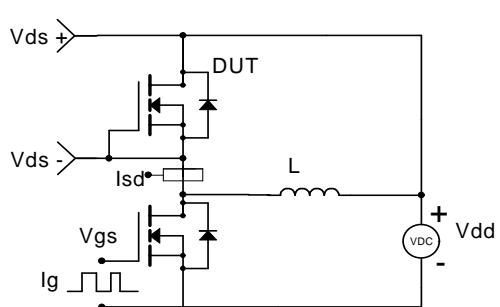
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

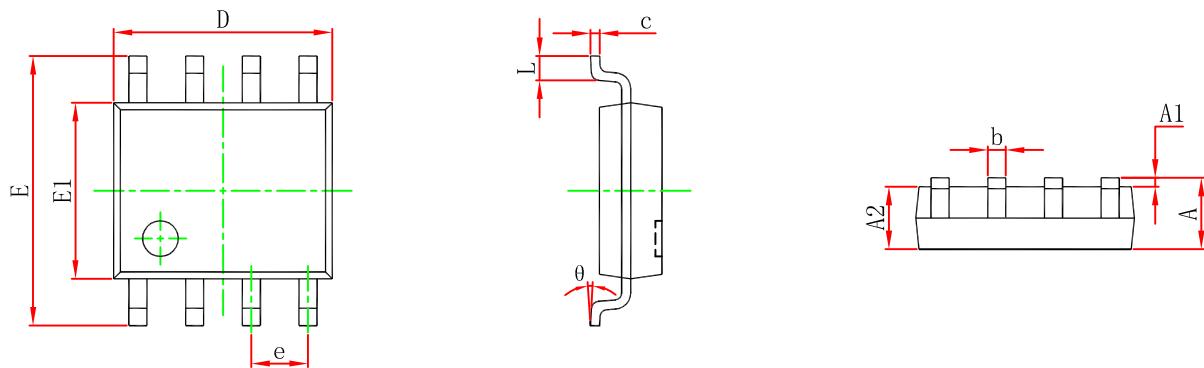


Diode Recovery Test Circuit & Waveforms

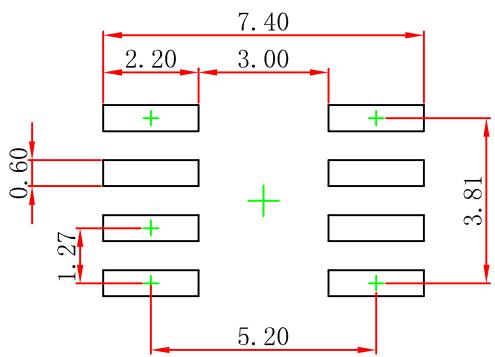




### SOP-8(SOIC-8) Package Outline Dimensions



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:  $\pm 0.05$ mm.  
3. The pad layout is for reference purposes only.



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