芯伯乐®
XINBOLE

Product Specification

XBLW SN74LS00

Quad 2-input Nand Gate

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Description

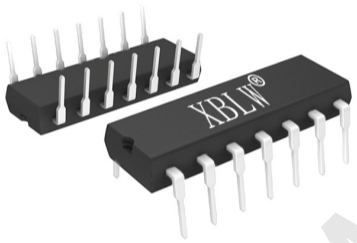
The SN74LS00 is a quad 2-input NAND gate. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC}.

Features

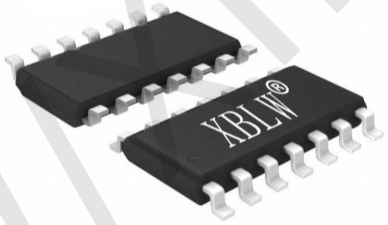
- Wide operating voltage range: 2 V to 6 V
- Specified from -20℃ to +85℃
- Packaging information: DIP14/SOP14/TSSOP14

Applications

- Alarm / tamper detect circuit
- S-R latch



DIP-14



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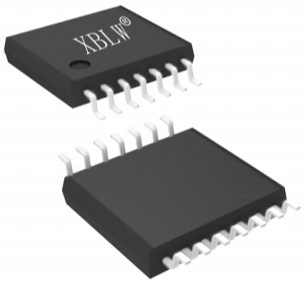


TSSOP-14

Ordering Information

Product Model	Package Type	Marking	Packing	Packing Qty
XBLW SN74LS00N	DIP-14	74LS00N	Tube	1000Pcs/Box
XBLW SN74LS00DTR	SOP-14	74LS00	Tape	2500Pcs/Reel
XBLW SN74LS00TDTR	TSSOP-14	74LS00	Tape	3000Pcs/Reel

Block Diagram

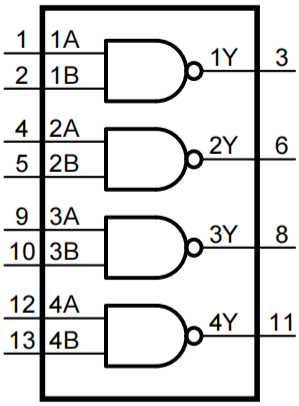


Figure 1. Logic symbol

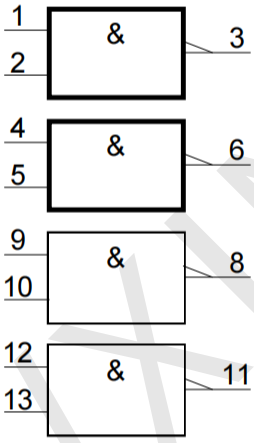


Figure 2. IEC logic symbol

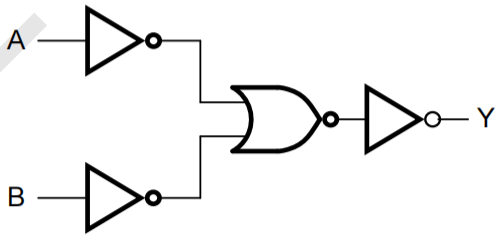
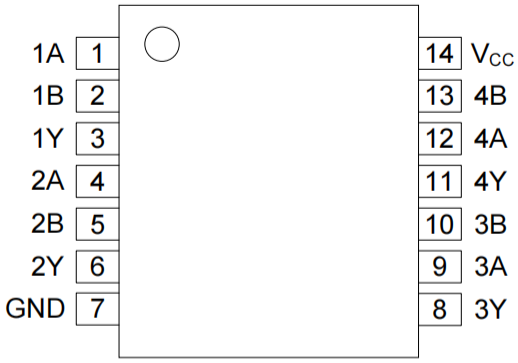


Figure 3. Logic diagram for one gate

Pin Configurations



Pin Description

Pin No.	Pin Name	Description
1	1A	data input
2	1B	data input
3	1Y	data output
4	2A	data input
5	2B	data input
6	2Y	data output
7	GND	ground (0V)
8	3Y	data output
9	3A	data input
10	3B	data input
11	4Y	data output
12	4A	data input
13	4B	data input
14	V_{CC}	supply voltage

Function Table

Input		Output
nA	**nB**	**nY**
L	X	H
X	L	H
H	H	L

Note: H=HIGH voltage level; L=LOW voltage level; X=don't care.

Electrical Parameter

Absolute Maximum Ratings

(Voltages are referenced to GND(ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Max.	Unit
supply voltage	V_{CC}	-		-0.5	+7	V
input clamping current	I_{IK}	V_I < -0.5V or V_I > V_{CC}+0.5V		-	±20	mA
output clamping current	I_{OK}	V_O < -0.5V or V_O > V_{CC}+0.5V		-	±20	mA
output current	I_O	-0.5V < V_O < V_{CC}+0.5V		-	±25	mA
supply current	I_{CC}	-		-	50	mA
ground current	I_{GND}	-		-50	-	mA
total power dissipation	P_{tot}	-		-	500	mW
storage temperature	T_{stg}	-		-65	+150	°C
Soldering temperature	T_L	10s	DIP	245		°C
			SOP/TSSOP	260		°C

Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	V_{CC}	-	2.0	5.0	6.0	V
input voltage	V_I	-	0	-	V_{CC}	V
output voltage	V_O	-	0	-	V_{CC}	V
input transition rise and fall rate	$\Delta t/\Delta V$	V_{CC}=2.0V	-	-	625	ns/V
		V_{CC}=4.5V	-	1.67	139	ns/V
		V_{CC}=6.0V	-	-	83	ns/V
ambient temperature	T_{amb}	-	-20	-	+85	°C

Electrical Characteristics

DC Characteristics 1

(T_{amb}=25°C, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
HIGH-level input voltage	V_{IH}	V_{CC}=2.0V		-	1.2	-	V
		V_{CC}=4.5V		-	2.4	-	V
		V_{CC}=6.0V		-	3.2	-	V
LOW-level input voltage	V_{IL}	V_{CC}=2.0V		-	0.8	-	V
		V_{CC}=4.5V		-	2.1	-	V
		V_{CC}=6.0V		-	2.8	-	V
HIGH-level output voltage	V_{OH}	V_I = V_{IH} or V_{IL}	I_O=-20uA; V_{CC}=2.0V	-	2.0	-	V
			I_O=-20uA; V_{CC}=4.5V	-	4.5	-	V
			I_O=-20uA; V_{CC}=6.0V	-	6.0	-	V
			I_O=-4.0mA; V_{CC}=4.5V	-	4.32	-	V
			I_O=-5.2mA; V_{CC}=6.0V	-	5.81	-	V
LOW-level output voltage	V_{OL}	V_I = V_{IH} or V_{IL}	I_O=20uA; V_{CC}=2.0V	-	0	-	V
			I_O=20uA; V_{CC}=4.5V	-	0	-	V
			I_O=20uA; V_{CC}=6.0V	-	0	-	V
			I_O=4.0mA; V_{CC}=4.5V	-	0.15	-	V
			I_O=5.2mA; V_{CC}=6.0V	-	0.16	-	V
input leakage current	I_I	V_I= V_{CC} or GND; V_{CC}=6.0V		-	-	±1	uA
supply current	I_{CC}	V_I= V_{CC} or GND; I_O=0A; V_{CC}=6.0V		-	-	2	uA
input capacitance	C_I	-		-	3.5	-	pF

DC Characteristics 2

(T_{amb}=-20°C to +85°C, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
HIGH-level input voltage	V_{IH}	V_{CC}=2.0V		1.5	-	-	V
		V_{CC}=4.5V		3.15	-	-	V
		V_{CC}=6.0V		4.2	-	-	V
LOW-level input voltage	V_{IL}	V_{CC}=2.0V		-	-	0.5	V
		V_{CC}=4.5V		-	-	1.35	V
		V_{CC}=6.0V		-	-	1.8	V
HIGH-level output voltage	V_{OH}	V_I = V_{IH} or V_{IL}	I_O=-20uA; V_{CC}=2.0V	1.9	-	-	V
			I_O=-20uA; V_{CC}=4.5V	4.4	-	-	V
			I_O=-20uA; V_{CC}=6.0V	5.9	-	-	V
			I_O=-4.0mA; V_{CC}=4.5V	3.84	-	-	V
			I_O=-5.2mA; V_{CC}=6.0V	5.34	-	-	V
LOW-level output voltage	V_{OL}	V_I = V_{IH} or V_{IL}	I_O=20uA; V_{CC}=2.0V	-	-	0.1	V
			I_O=20uA; V_{CC}=4.5V	-	-	0.1	V
			I_O=20uA; V_{CC}=6.0V	-	-	0.1	V
			I_O=4.0mA; V_{CC}=4.5V	-	-	0.33	V
			I_O=5.2mA; V_{CC}=6.0V	-	-	0.33	V
input leakage current	I_I	V_I=V_{CC} or GND; V_{CC}=6.0V		-	-	±1	uA
supply current	I_{CC}	V_I=V_{CC} or GND; I_O=0A; V_{CC}=6.0V		-	-	20	uA

AC Characteristics 1

(T_{amb}=25°C, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
nA, nB to nY propagation delay	t_{pd}	see Figure 5[1]	V_{CC}=2.0V	-	25	-	ns
			V_{CC}=4.5V	-	9	-	ns
			V_{CC}=5.0V;C_L=15pF	-	7	-	ns
			V_{CC}=6.0V	-	7	-	ns
transition time	t_t	see Figure 5[2]	V_{CC}=2.0V	-	19	-	ns
			V_{CC}=4.5V	-	7	-	ns
			V_{CC}=6.0V	-	6	-	ns
power dissipation capacitance	C_{PD}	per package; V_I= GND to V_{CC}[3]	-	22	-	pF	

Note:

[1] t_{pd} is the same as t_{PLH} and t_{PHL}.

[2] t_t is the same as t_{THL} and t_{TLH}.

[3] C_{PD} isused to determine the dynamic power dissipation (P_D in uW).

$P_D=(C_{PD}\times V_{CC}^2\times f_i\times N)+\Sigma(C_L\times V_{CC}^2\times f_o)$ where: f_i=input frequency in MHz;

f_o=output frequency in MHz;

C_L=output load capacitance in pF; V_{CC}=supply voltage in V;

N=number of inputs switching; $\Sigma(C_L\times V_{CC}^2\times f_o)$=sum of outputs.

AC Characteristics 2

(T_{amb}=-20°C to +85°C, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
nA, nB to nY propagation delay	t_{pd}	see Figure 5[1]	V_{CC}=2.0V	-	-	115	ns
			V_{CC}=4.5V	-	-	23	ns
			V_{CC}=6.0V	-	-	20	ns
transition time	t_t	see Figure 5[2]	V_{CC}=2.0V	-	-	95	ns
			V_{CC}=4.5V	-	-	19	ns
			V_{CC}=6.0V	-	-	16	ns

Note:

[1] t_{pd} is the same as t_{PLH} and t_{PHL}.

[2] t_t is the same as t_{THL} and t_{TLH}.

Measurement Points

Type	Input	Output		
	V_M	V_M	V_X	V_Y
SN74LS00	0.5×V_{CC}	0.5×V_{CC}	0.1×V_{CC}	0.9×V_{CC}

Test Data

Type	Input		Load	Test
	V_I	t_r ,t_f	C_L	
SN74LS00	V_{CC}	6.0ns	15pF, 50pF	t_{PLH}, t_{PHL}

Testing Circuit

AC Testing Circuit

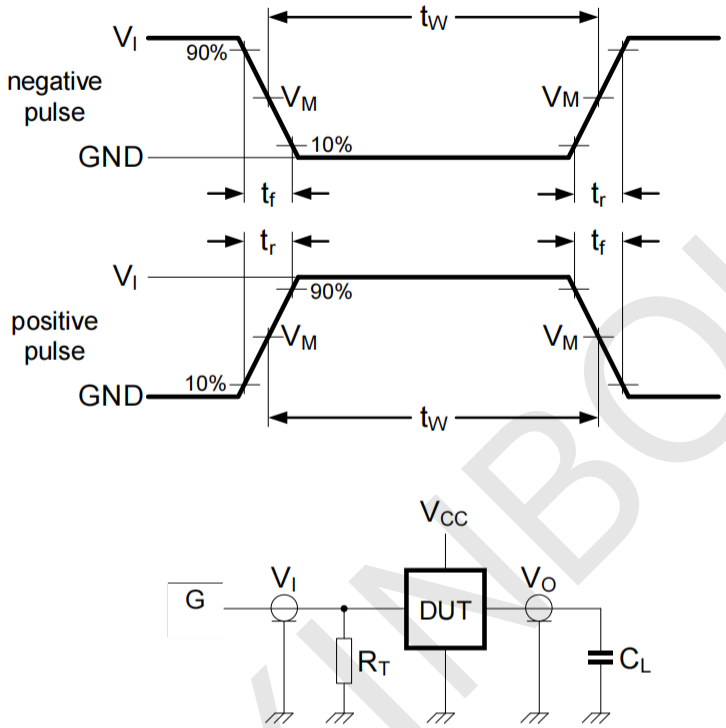


Figure 4. Test circuit for measuring switching times

Definitions for test circuit:
C_L=load capacitance including jig and probe capacitance.
R_T=termination resistance should be equal to the output impedance Z_o of the pulse generator.

AC Testing Waveforms

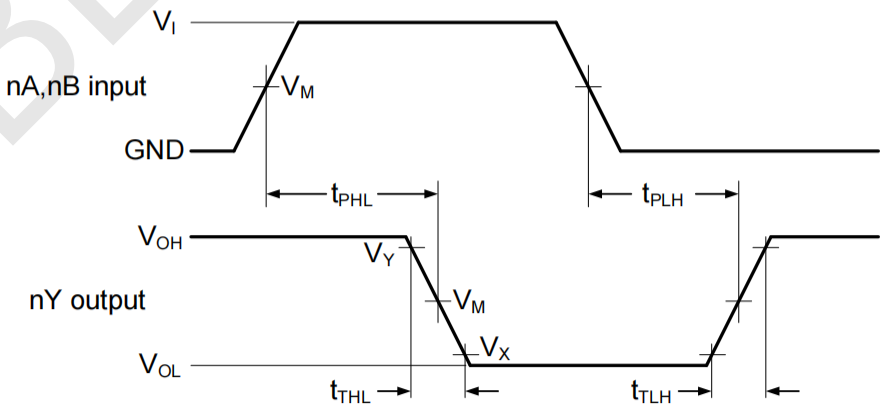
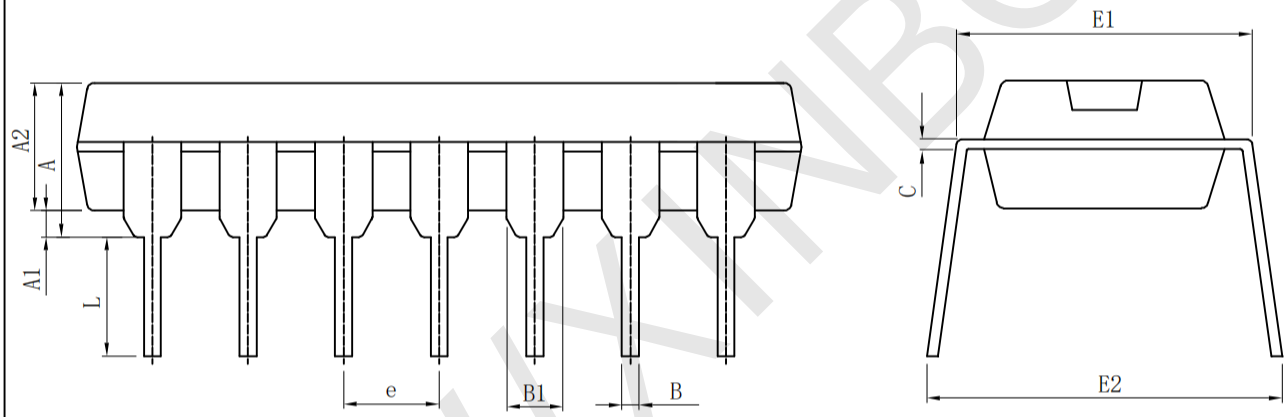


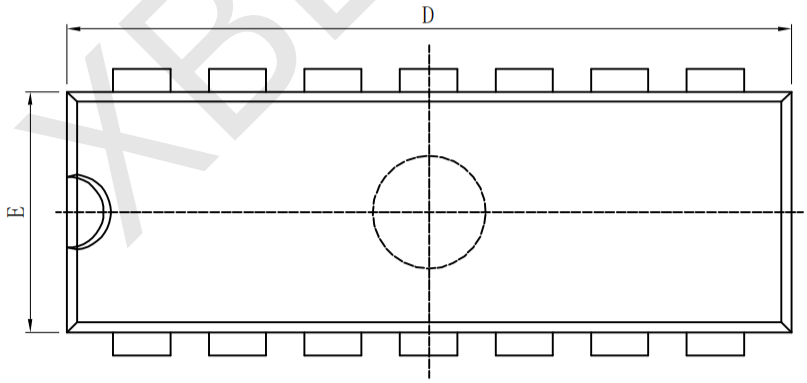
Figure 5. Input to output propagation delays

Package Information

· DIP-14

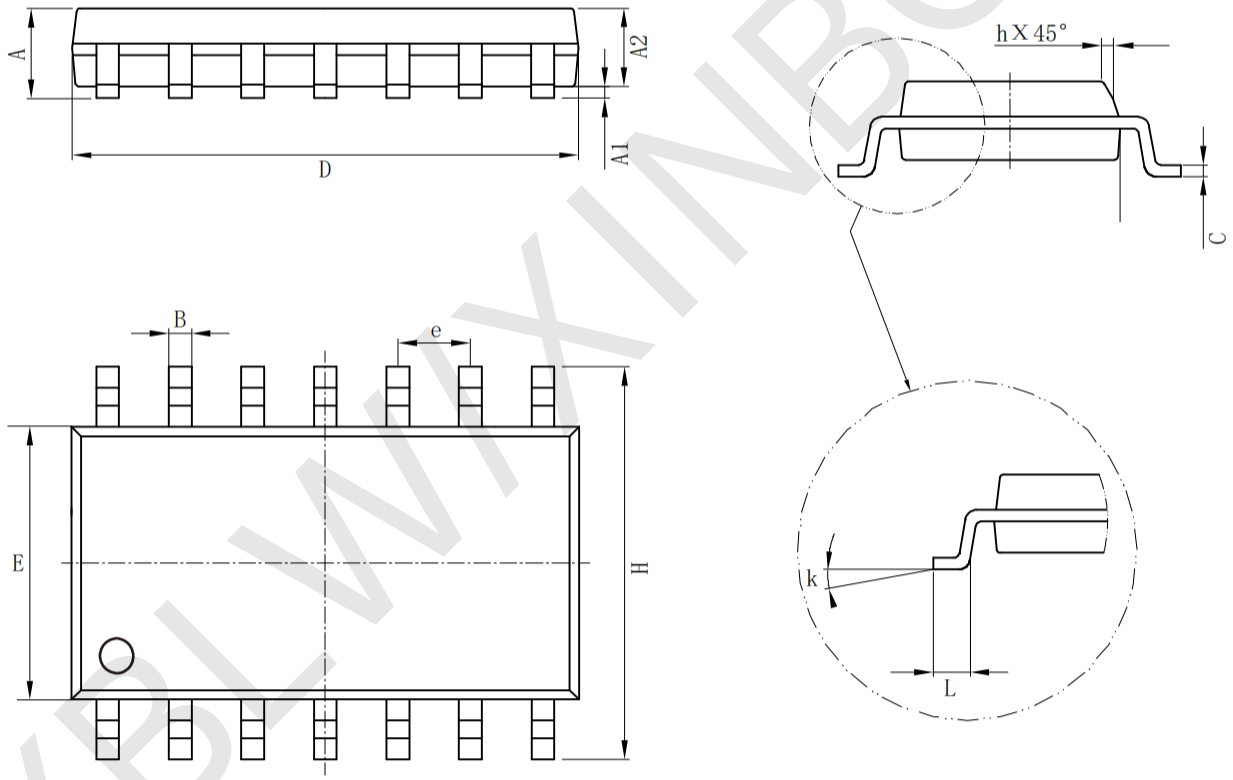
Size / Symbol	Dimensions In Millimeters		Size / Symbol	Dimensions In Inches	
	Min(mm)	Max(mm)		Min(in)	Max(in)
A	3.710	4.310	A	0.146	0.170
A1	0.510		A1	0.020	
A2	3.200	3.600	A2	0.126	0.142
B	0.380	0.570	B	0.015	0.022
B1	1.524(BSC)		B1	0.060(BSC)	
C	0.204	0.360	C	0.008	0.014
D	18.800	19.200	D	0.740	0.756
E	6.200	6.600	E	0.244	0.260
E1	7.320	7.920	E1	0.288	0.312
e	2.540(BSC)		e	0.100(BSC)	
L	3.000	3.600	L	0.118	0.142
E2	8.400	9.000	E2	0.331	0.354





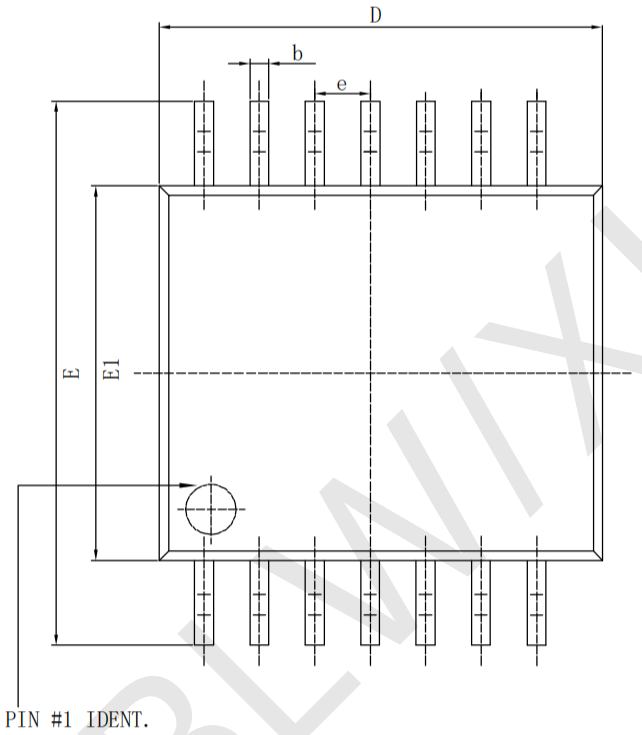
· SOP-14

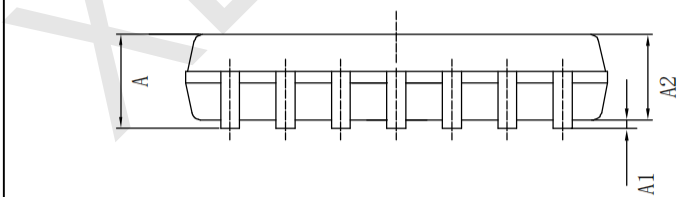
Size / Symbol	Dimensions In Millimeters		Size / Symbol	Dimensions In Inches	
	Min(mm)	Max(mm)		Min(in)	Max(in)
A	1.350	1.750	A	0.050	0.068
A1	0.100	0.250	A1	0.004	0.009
A2	1.100	1.650	A2	0.040	0.060
B	0.330	0.510	B	0.010	0.020
C	0.190	0.250	C	0.007	0.009
D	8.550	8.750	D	0.330	0.340
E	3.800	4.000	E	0.150	0.150
e	1.27		e	0.05	
H	5.800	6.200	H	0.220	0.240
h	0.250	0.500	h	0.009	0.020
L	0.400	1.270	L	0.015	0.050
k	8° (max)		k	8° (max)	

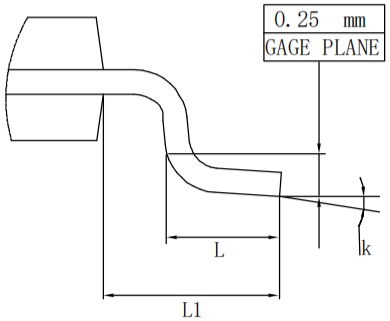


· TSSOP-14

Size / Symbol	Dimensions In Millimeters		Size / Symbol	Dimensions In Inches	
	Min(mm)	Max(mm)		Min(in)	Max(in)
A		1.200	A		0.047
A1	0.050	0.150	A1	0.002	0.006
A2	0.800	1.050	A2	0.031	0.041
b	0.190	0.300	b	0.007	0.012
c	0.090	0.200	c	0.004	0.0089
D	4.900	5.100	D	0.193	0.201
E	6.200	6.600	E	0.244	0.260
E1	4.300	4.500	E1	0.169	0.176
e	0.65		e	0.0256	
L	0.450	0.750	L	0.018	0.030
L1	1.00		L1	0.039	
k	0°	8°	k	0°	8°







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