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XINBOLE

Product Specification

XBLW SN74LS153

Dual 4-Line To 1-Line Data Selectors/Multiplexers

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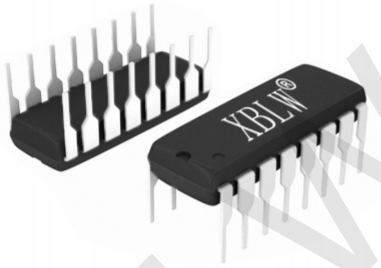
Description

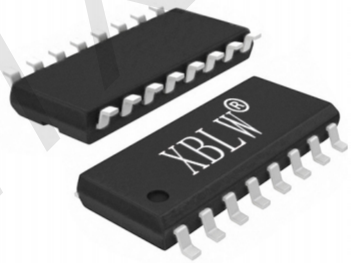
The SN74LS153 is a dual 4-input multiplexer. The device features independent enable inputs ($n\bar{E}$) and common data select inputs (S0 and S1). For each multiplexer, the select inputs select one of the four binary inputs and routes it to the multiplexer output (nY). A HIGH on $\bar{E}$ forces the corresponding multiplexer outputs LOW. Inputsinclude clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC}.

Features

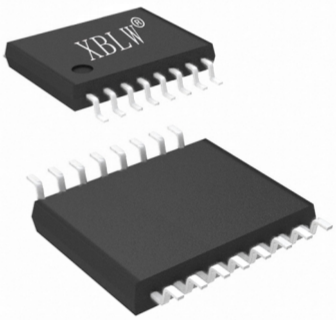
- Non-inverting outputs
- Separate enable input for each output
- Common select inputs
- Permits multiplexing from n lines to 1 line
- Enable line provided for cascading (n lines to 1 line)
- Specified from -20℃ to +85℃
- Packaging information: DIP-16/SOP-16/TSSOP-16



DIP-16



SOP-16



TSSOP-16

ORDERING INFORMATION

Product Model	Package Type	Marking	Packing	Packing Qty
XBLW SN74LS153N	DIP-16	74LS153N	Tube	1000Pcs/Box
XBLW SN74LS153DTR	SOP-16	74LS153	Tape	2500Pcs/Reel
XBLW SN74LS153TDTR	TSSOP-16	74LS153	Tape	3000Pcs/Reel

Block Diagram

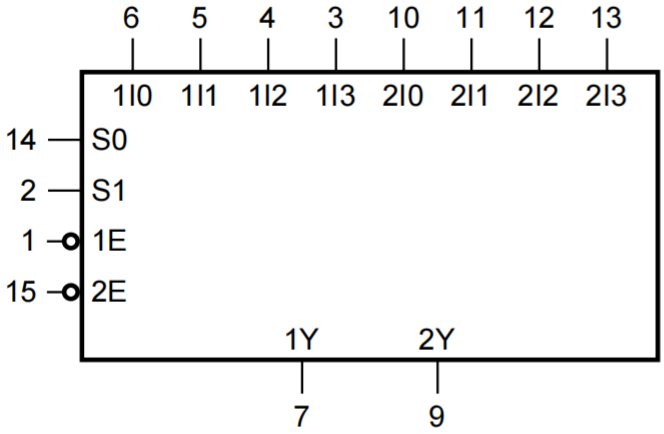


Figure 1. Logic symbol

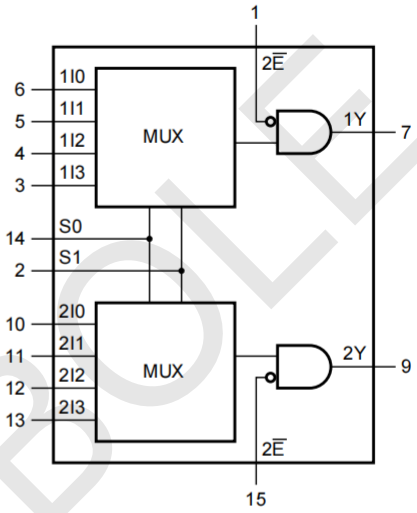


Figure 2. Functional diagram

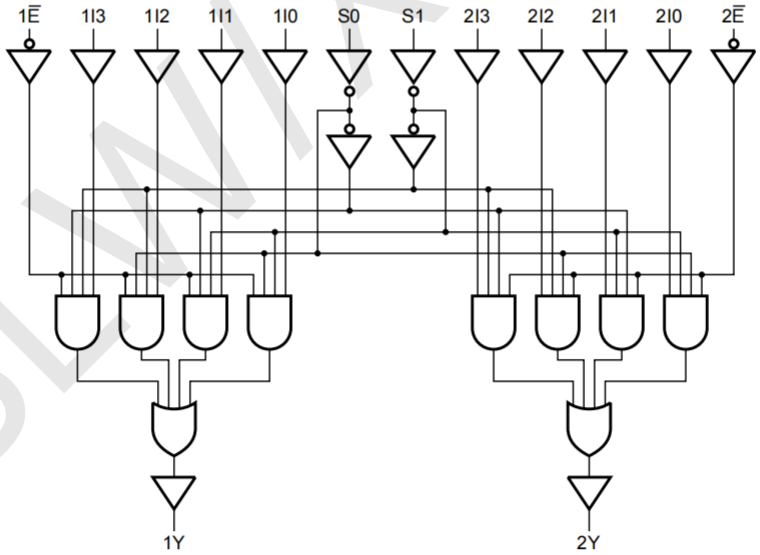
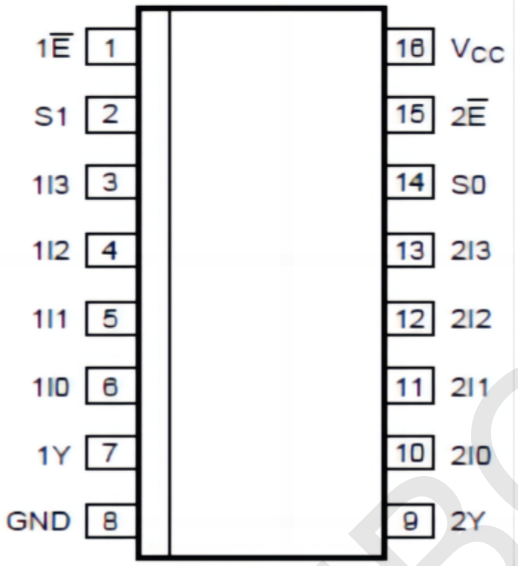


Figure 3. Logic diagram

Pin Configurations



Pin Description

Pin No.	Pin Name	Description
1	1E	out enable input(active LOW)
2	S1	data select input
3	1I3	data input source1
4	1I2	data input source1
5	1I1	data input source1
6	1I0	data input source1
7	1Y	multiplexer output source1
8	GND	ground(0V)
9	2Y	multiplexer output source2
10	2I0	data input source2
11	2I1	data input source2
12	2I2	data input source2
13	2I3	data input source2
14	S0	data select input
15	2$\overline{E}$	out enable input(active LOW)
16	Vcc	supply voltage

Function Table

Select Input		Input				Output Enable	Output
S0	S1	nI0	nI1	nI2	nI3	$n\bar{E}$	nY
X	X	X	X	X	X	H	L
L	L	L	X	X	X	L	L
L	L	H	X	X	X	L	H
H	L	X	L	X	X	L	L
H	L	X	H	X	X	L	H
L	H	X	X	L	X	L	L
L	H	X	X	H	X	L	H
H	H	X	X	X	L	L	L
H	H	X	X	X	H	L	H

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	+7.0	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
storage temperature	T_{stg}	-		-65	+150	°C
total power dissipation	P_{tot}	-		-	500	mW
soldering temperature	T_L	10s	DIP	245		°C
			SOP	250		

Note:

[1] For DIP16 packages: above 70°C the value of P_{tot} derates linearly with 12mW/K.

[2] For SOP16 packages: above 70°C the value of P_{tot} derates linearly with 8mW/K.

[3] For (T)SSOP16 packages: above 60°C the value of P_{tot} derates linearly with 5.5mW/K.

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		1.5	1.2	-	V
		V_{CC}=4.5V		3.15	2.4	-	V
		V_{CC}=6.0V		4.2	3.2	-	V
LOW-level input voltage	V_{IL}	V_{CC}=2.0V		-	0.8	0.5	V
		V_{CC}=4.5V		-	2. 1	1.35	V
		V_{CC}=6.0V		-	2.8	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	2.0	-	V
			I_O=-20uA;V_{CC}=4.5V	4.4	4.5	-	V
			I_O=-20uA;V_{CC}=6.0V	5.9	6.0	-	V
			I_O=-4.0mA;V_{CC}=4.5V	3.98	4.32	-	V
			I_O=-5.2mA;V_{CC}=6.0V	5.48	5.81	-	V
LOW-level output voltage	V_{OL}	V_I= V_{IH} or V_{IL}	I_O=20uA;V_{CC}=2.0V	-	0	0. 1	V
			I_O=20uA;V_{CC}=4.5V	-	0	0. 1	V
			I_O=20uA;V_{CC}=6.0V	-	0	0. 1	V
			I_O=4.0mA;V_{CC}=4.5V	-	0.15	0.26	V
			I_O=5.2mA;V_{CC}=6.0V	-	0.16	0.26	V
input leakage current	I_I	V_I=Vcc or GND;V_{CC}=6.0V		-	-	±1.0	μA
supply current	I_{CC}	V_I=V_{CC} or GND;I_O=0A;V_{CC}=6.0V		-	-	8.0	μA
input apacitance	C_I	-		-	3.5	-	pF

DC Characteristics 2

(T_{amb}=-20℃to +85℃, 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	Vi= V_{CC} or GND;V_{CC}=6.0V		-	-	±1.0	μA
supply current	I_{CC}	Vi=Vcc or GND;Io=0A;V_{CC}=6.0V		-	-	80	μA

AC Characteristics 1

(T_{amb}=25°C, GND =0V; t_r=t_f=6ns; C_L=50pF,unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Propagation delay	t_{pd}	1In to nY,2In to nY; see Figure5[1]	V_{CC}=2.0V	-	47	145	ns
			V_{CC}=4.5V	-	17	29	ns
			VCC=5.0V;CL= 15pF	-	14	-	ns
			V_{CC}=6.0V	-	14	25	ns
		Sn to nY; see Figure6	V_{CC}=2.0V	-	50	150	ns
			V_{CC}=4.5V	-	18	30	ns
			VCC=5.0V;CL= 15pF	-	15	-	ns
			V_{CC}=6.0V	-	14	26	ns
		$n\bar{E}$ to nY see Figure6	V_{CC}=2.0V	-	33	100	ns
			V_{CC}=4.5V	-	12	20	ns
			VCC=5.0V;CL= 15pF	-	10	-	ns
			V_{CC}=6.0V	-	10	17	ns
transition time	t_t	see Figure5[2]	V_{CC}=2.0V	-	19	75	ns
			V_{CC}=4.5V	-	7	15	ns
			V_{CC}=6.0V	-	6	13	ns
power dissipation capacitance	C_{PD}	per package;V_I=GND to V_{CC}[3]		-	30	-	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} is used to determine the dynamic power dissipation (P_D in uW).

$P_D=C_{PD}\times V_{CC}^2\times f_i\times N+\sum(C_L\times V_{CC}^2\times f_o)$ 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;

$\sum(C_L\times V_{CC}^2\times f_o)$=sum of outputs.

AC Characteristics 2

(T_{amb}=-20°C to +85°C,GND=0V; t_r=t_f=6ns;C_L=50pF, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Propagation delay	t_{pd}	1In to nY,2In to nY; see Figure5[1]	V_{CC}=2.0V	-	-	180	ns
			V_{CC}=4.5V	-	-	36	ns
			V_{CC}=6.0V	-	-	31	ns
		Sn to nY; see Figure6	V_{CC}=2.0V	-	-	190	ns
			V_{CC}=4.5V	-	-	38	ns
			V_{CC}=6.0V	-	-	33	ns
		$n\bar{E}$ to nY see Figure6	V_{CC}=2.0V	-	-	125	ns
			V_{CC}=4.5V	-	-	25	ns
			V_{CC}=6.0V	-	-	21	ns
transition time	t_t	see Figure5[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}.

Testing Circuit

AC Testing Circuit

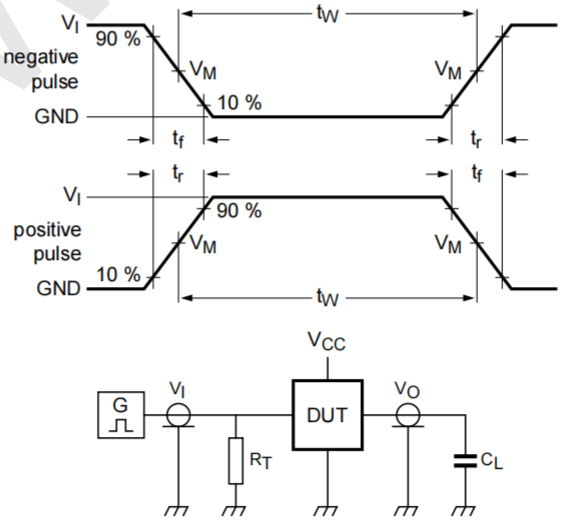


Figure 4. Test circuit for measuring switching times

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

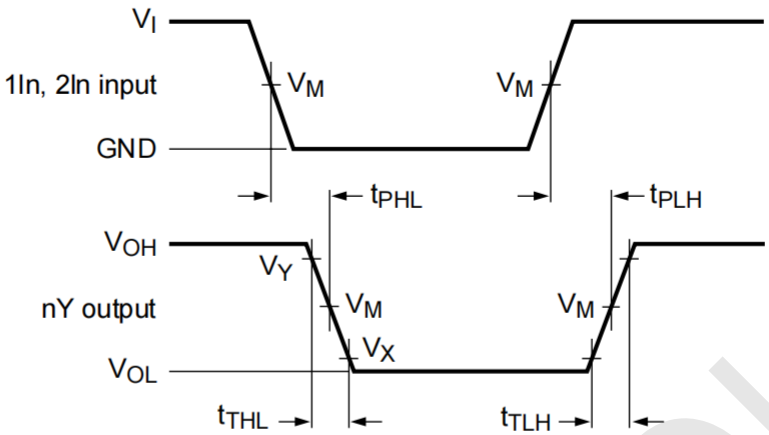


Figure 5. Waveforms showing the input (1In, 2In) to output (1Y, 2Y) propagation delays and output transition times

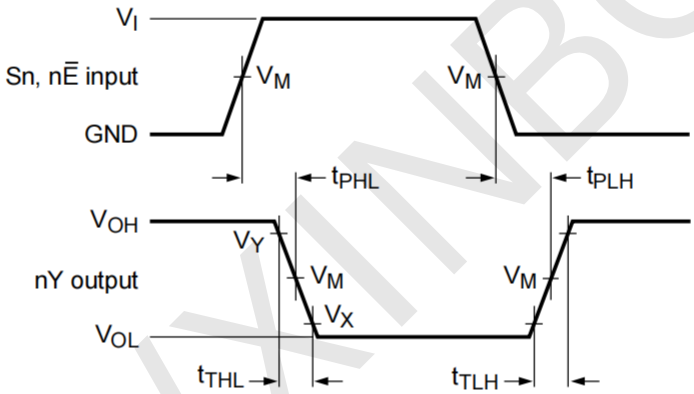


Figure 6. Waveforms showing input (Sn,nE) to output (nY) propagation delays

Measurement Points

Type	Input	Output		
	V_M	V_M	V_X	V_Y
SN74LS153	0.5×V_{CC}	0.5×V_{CC}	0. 1×V_{CC}	0.9×V_{CC}

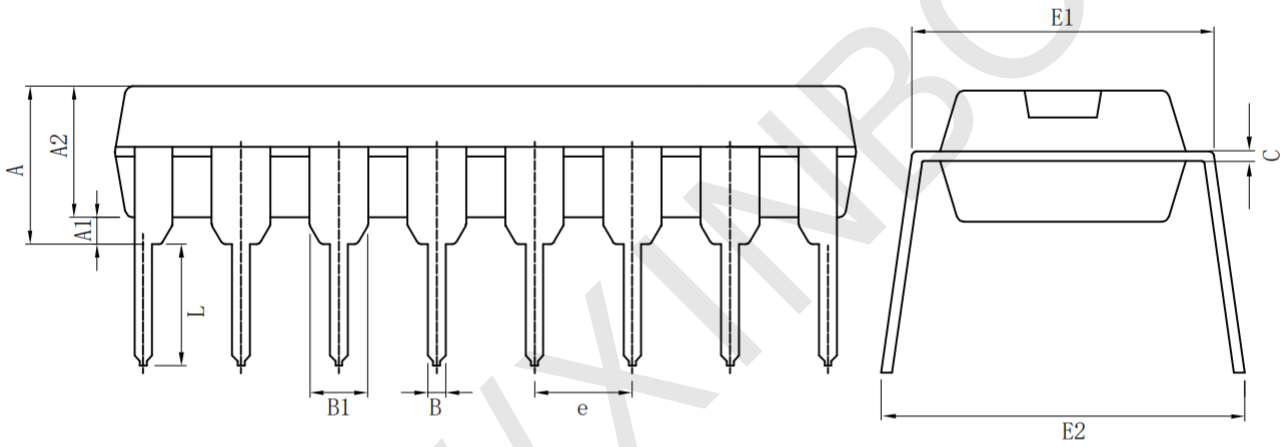
Test Data

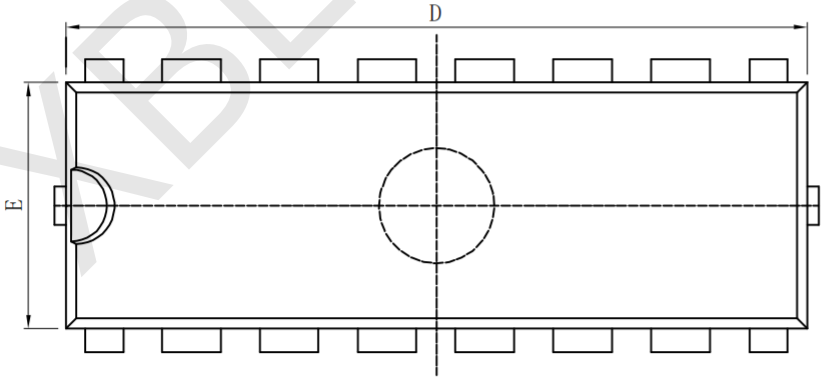
Type	Input		Load	Test
	V_I	t_r,t_f	C_L	
SN74LS153	V_{CC}	6.0ns	15pF,50pF	t_{PHL},t_{PLH}

Package Information

· DIP-16

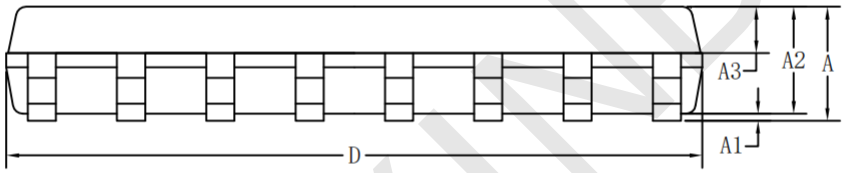
Size / Symbol	Dimensions In Millimeters		Size / Symbol	Dimensions In Inches	
	Min(mm)	Max(mm)		Min(in)	Max(in)
A	3.710	4.310	A	0.146	0.170
A1	0.510		A1	0.020	
A2	3.200	3.600	A2	0.126	0.142
B	0.380	0.570	B	0.015	0.022
B1	1.524(BSC)		B1	0.060(BSC)	
C	0.204	0.360	C	0.008	0.014
D	18.80	19.20	D	0.740	0.756
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

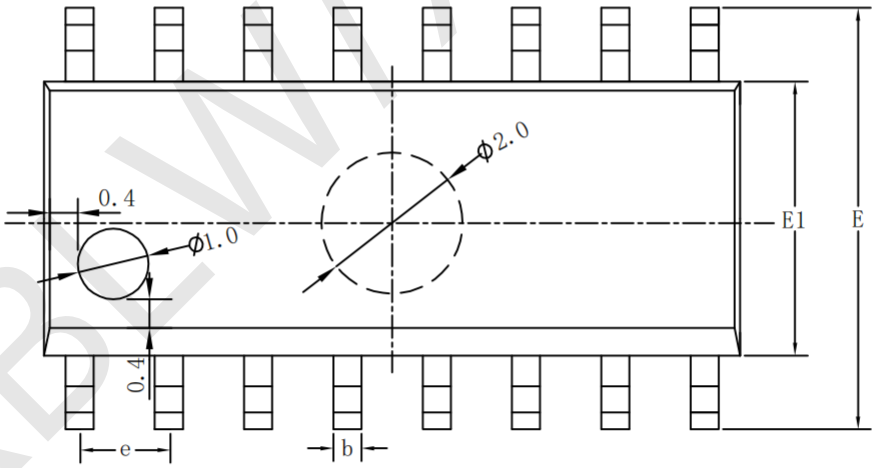


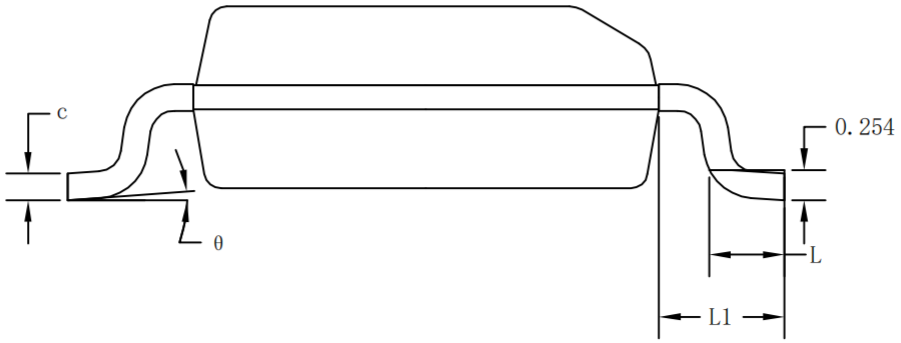


· SOP-16

Size / Symbol	Dimensions In Millimeters			Size / Symbol	Dimensions In Inches		
	Min(mm)	Nom(mm)	Max(mm)		Min(in)	Nom(in)	Max(in)
A	1.500	1.600	1.700	A	0.059	0.063	0.067
A1	0.100	0.150	0.250	A1	0.004	0.006	0.010
A2	1.400	1.450	1.500	A2	0.055	0.057	0.059
A3	0.600	0.650	0.700	A3	0.024	0.026	0.028
b	0.300	0.400	0.500	b	0.012	0.016	0.020
c	0.150	0.200	0.250	c	0.006	0.008	0.010
D	9.800	9.900	10.00	D	0.386	0.390	0.394
E	5.800	6.000	6.200	E	0.228	0.236	0.244
E1	3.850	3.900	3.950	E1	0.152	0.154	0.156
e	1.27(BSC)			e	0.050(BSC)		
L	0.500	0.600	0.700	L	0.020	0.024	0.028
L1	1.05(BSC)			L1	0.041(BSC)		
θ	0°	4°	8°	θ	0°	4°	8°

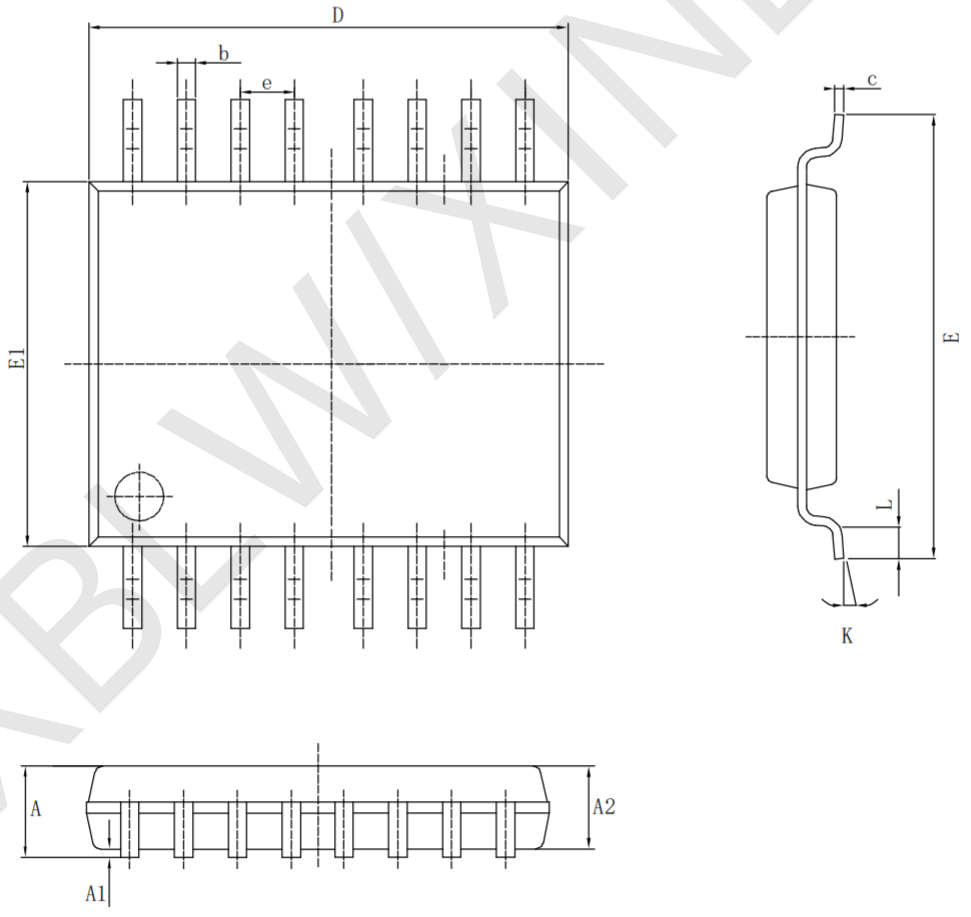






· TSSOP-16

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	4.480	E1	0.169	0.176
e	0.65(BSC)		e	0.0256(BSC)	
K	0°	8°	K	0°	8°
L	0.450	0.750	L	0.018	0.030



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