

Product Specification

XBLW SN74LS157

Quad 2-input Multiplexer

WEB | www.xinboleic.com



Description

The SN74LS157 is a quad 2-input multiplexers which select 4 bits of data from two sources under the control of a common data select input (S). The enable input ($\bar{E}$) is active LOW. When $\bar{E}$ is HIGH, all of the outputs (1Y to 4Y) are forced LOW regardless of all other input conditions.

Moving the data from two groups of registers to four common output buses is a common use of the SN74LS157. The state of the common data select input (S) determines the particular register from which the data comes. It can also be used as function generator. The device is useful for implementing highly irregular logic by generating any four of the 16 different functions of two variables with one variable common. The SN74LS157 is logic implementation of a 4-pole, 2-position switch, where the position of the switch is determined by the logic levels applied to S.

The logic equations are:

$$1Y = \bar{E} \times (1I1 \times S + 1I0 \times \bar{S})$$

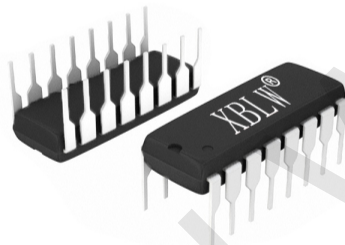
$$2Y = \bar{E} \times (2I1 \times S + 2I0 \times \bar{S})$$

$$3Y = \bar{E} \times (3I1 \times S + 3I0 \times \bar{S})$$

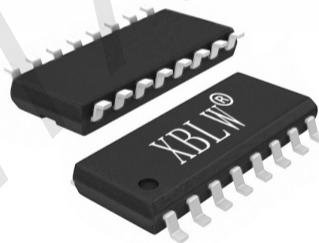
$$4Y = \bar{E} \times (4I1 \times S + 4I0 \times \bar{S})$$

Features

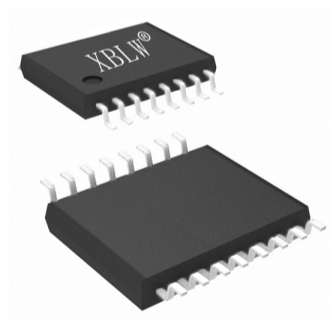
- Low-power dissipation
- Non-inverting data path
- Specified from -20°C to +85°C
- Packaging information: DIP-16/SOP-16/TSSOP-16



DIP-16



SOP-16



TSSOP-16

Ordering Information

Product Model	Package Type	Marking	Packing	Packing Qty
XBLW SN74LS157N	DIP-16	74LS157N	Tube	1000Pcs/Box
XBLW SN74LS157DTR	SOP-16	74LS157	Tape	2500Pcs/Reel
XBLW SN74LS157TDTR	TSSOP-16	74LS157	Tape	3000Pcs/Reel

Block Diagram

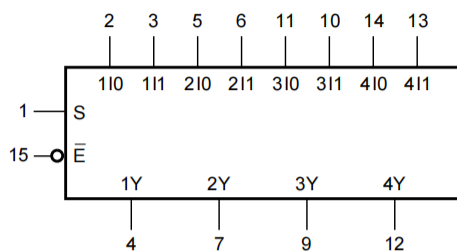


Figure 1. Logic symbol

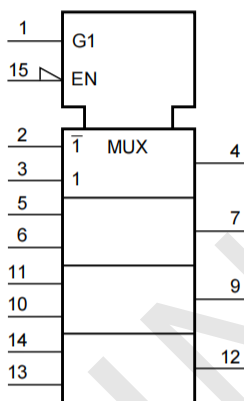


Figure 2. IEC logic symbol

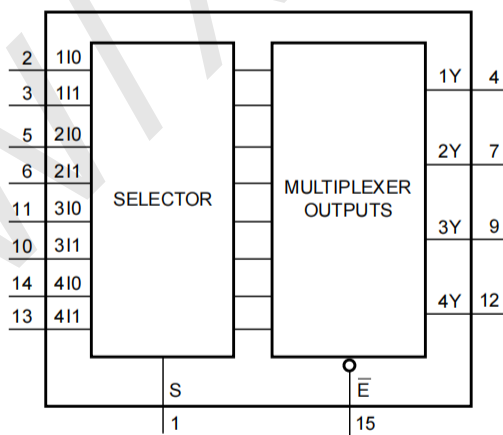


Figure 3. Functional diagram

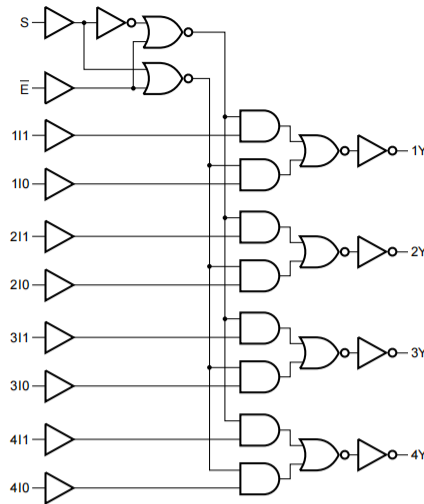
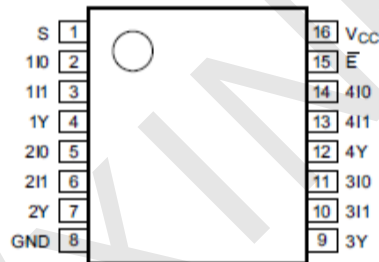


Figure 4. Logic diagram

Pin Configurations



Pin Description

Pin No.	Pin Name	Description
1	S	common data select input
2	1I0	data input from source 0
3	1I1	data input from source 1
4	1Y	multiplexer output
5	2I0	data input from source 0
6	2I1	data input from source 1
7	2Y	multiplexer output
8	GND	ground (0V)
9	3Y	multiplexer output
10	3I1	data input from source 1
11	3I0	data input from source 0
12	4Y	multiplexer output
13	4I1	data input from source 1
14	4I0	data input from source 0
15	$\bar{E}$	enable input (active LOW)
16	V _{CC}	supply voltage

Function Table

Input				Output
$\bar{E}$	S	nI0	nI1	nY
H	X	X	X	L
L	L	L	X	L
L	L	H	X	H
L	H	X	L	L
L	H	X	H	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	$V_O = -0.5V$ to $(V_{CC}+0.5V)$		-	± 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		°C

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

($T_{amb}=25^{\circ}C$, 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} $I_O=-20\mu A$; $V_{CC}=2.0V$	1.9	2.0	-	V
		$I_O=-20\mu A$; $V_{CC}=4.5V$	4.4	4.5	-	V
		$I_O=-20\mu A$; $V_{CC}=6.0V$	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} $I_O=20\mu A$; $V_{CC}=2.0V$	-	0	0.1	V
		$I_O=20\mu A$; $V_{CC}=4.5V$	-	0	0.1	V
		$I_O=20\mu A$; $V_{CC}=6.0V$	-	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	$V_I=V_{CC}$ or GND; $V_{CC}=6.0V$	-	-	± 1	μA
supply current	I_{CC}	$V_I=V_{CC}$ or GND; $I_O=0A$; $V_{CC}=6.0V$	-	-	8.0	μA
input capacitance	C_I	-	-	3.5	-	pF

DC Characteristics 2

($T_{amb} = -20^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, 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		-	-	±1.0	uA
supply current	I _{CC}	V _I =V _{CC} or GND; I _O =0A; V _{CC} =6.0V		-	-	80	uA

AC Characteristics 1

($T_{amb}=25^{\circ}C$, $GND=0V$, $C_L=50pF$, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
propagation delay	t _{pd}	nI0, nI1 to nY; see Figure 6 ^[1]	V _{CC} =2.0V	-	36	125	ns
			V _{CC} =4.5V	-	13	25	ns
			V _{CC} =5.0V; C _L = 15pF	-	11	-	ns
			V _{CC} =6.0V	-	10	21	ns
		S to nY; see Figure 6 ^[1]	V _{CC} =2.0V	-	41	125	ns
			V _{CC} =4.5V	-	15	25	ns
			V _{CC} =5.0V; C _L = 15pF	-	12	-	ns
			V _{CC} =6.0V	-	12	21	ns
		E̅ to nY; see Figure 7 ^[1]	V _{CC} =2.0V	-	39	115	ns
			V _{CC} =4.5V	-	14	23	ns
			V _{CC} =5.0V; C _L = 15pF	-	11	-	ns
			V _{CC} =6.0V	-	11	20	ns
transition time	t _t	nY; see Figure 6 ^[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}	C _L =50pF; f=1MHz; V _I =GND to V _{CC} ^[3]		-	70	-	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

($T_{amb} = -20^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $GND = 0V$, $C_L = 50\text{pF}$, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
propagation delay	t _{pd}	nI0, nI1 to nY; see Figure 6 ^[1]	V _{CC} =2.0V	-	-	155	ns
			V _{CC} =4.5V	-	-	31	ns
			V _{CC} =6.0V	-	-	26	ns
		S to nY; see Figure 6 ^[1]	V _{CC} =2.0V	-	-	155	ns
			V _{CC} =4.5V	-	-	31	ns
			V _{CC} =6.0V	-	-	26	ns
		$\bar{E}$ to nY; see Figure 7 ^[1]	V _{CC} =2.0V	-	-	145	ns
			V _{CC} =4.5V	-	-	29	ns
			V _{CC} =6.0V	-	-	25	ns
transition time	t _t	nY; see Figure 6 ^[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

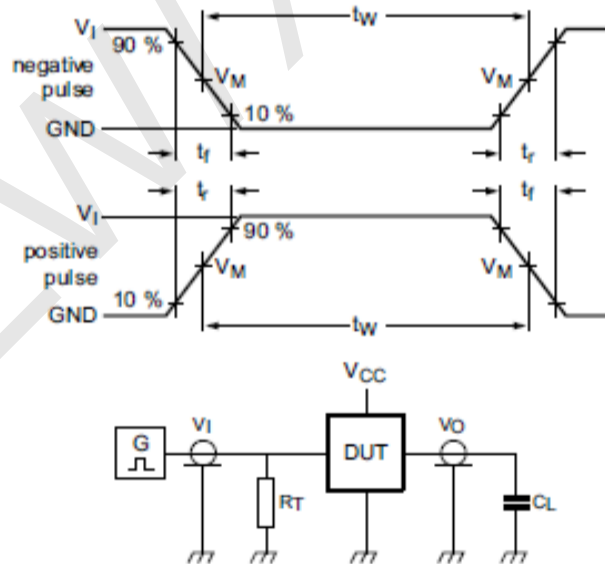


Figure 5. Test circuit for measuring switching times

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

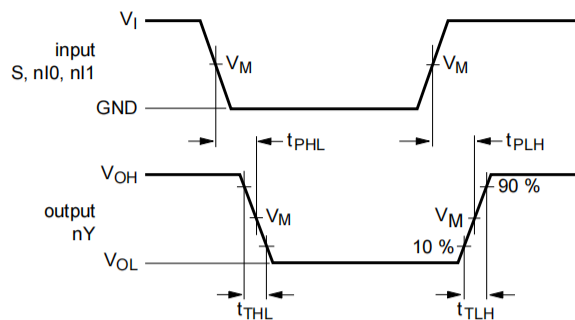


Figure 6. Propagation delay input (nI0, nI1, S) to output (nYn)

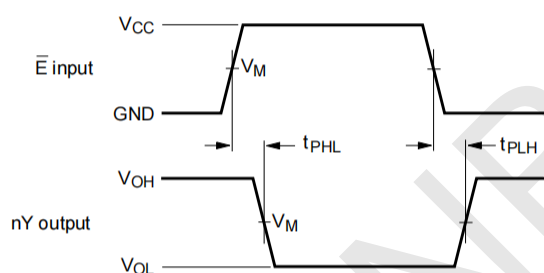


Figure 7. Propagation delay input ($\bar{E}$) to output (nY)

Measurement Points

Type	Input	Output
	V_M	V_M
SN74LS157	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$

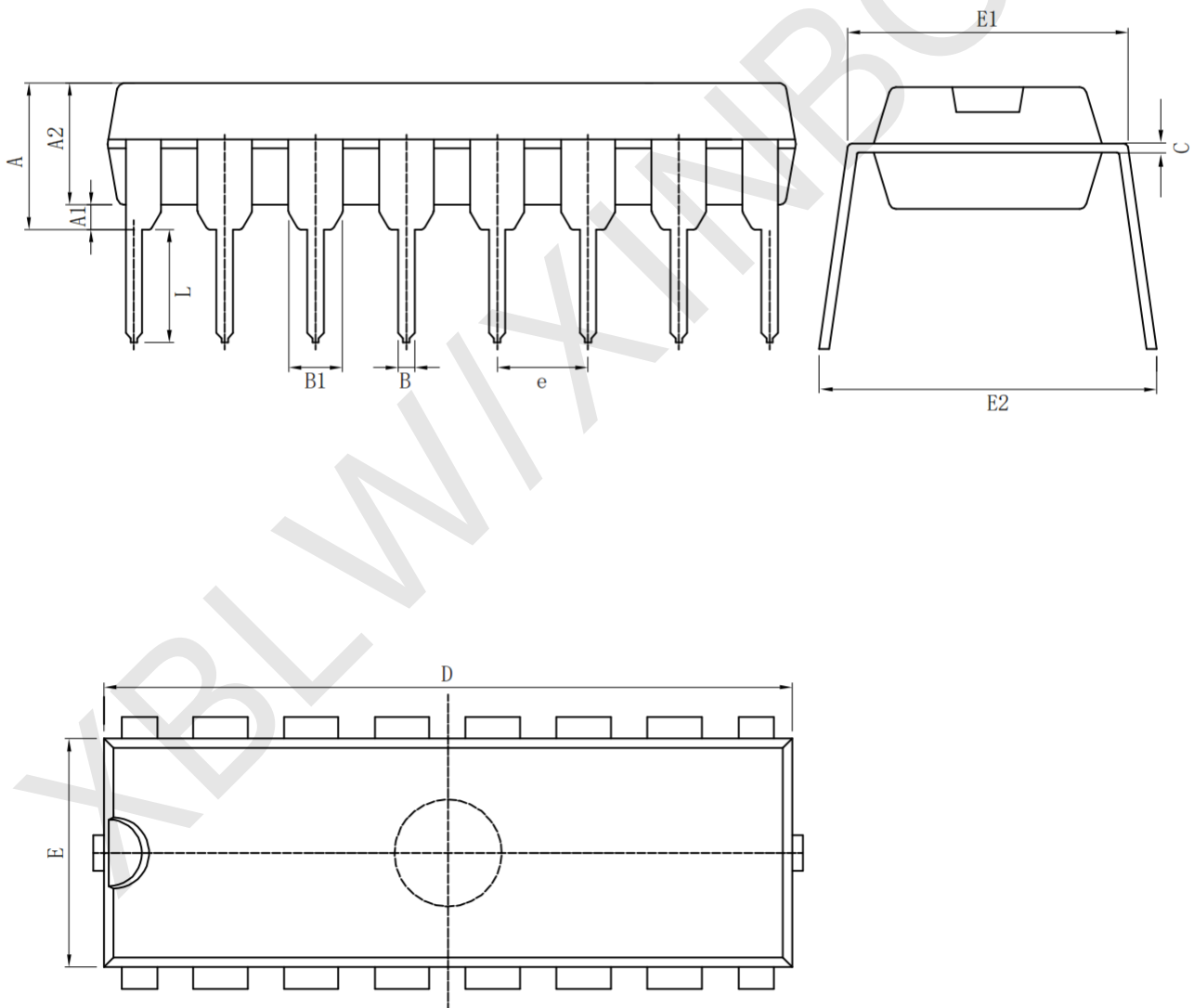
Test Data

Type	Input		Load	Test
	V_I	t_r, t_f	C_L	
SN74LS157	V_{CC}	6ns	15pF, 50pF	t_{PHL}, t_{PLH}

Package Information

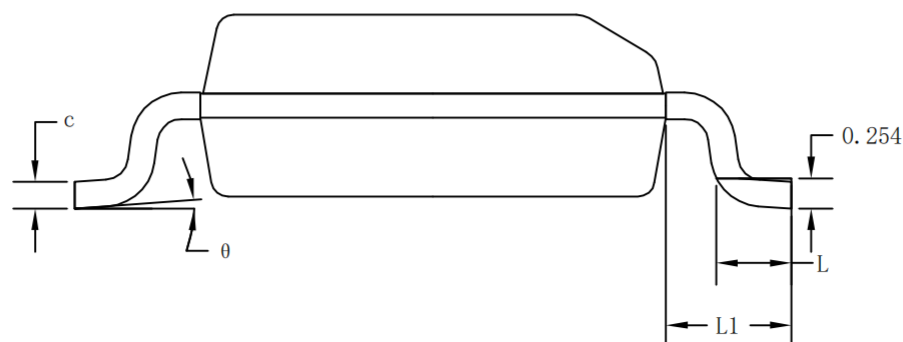
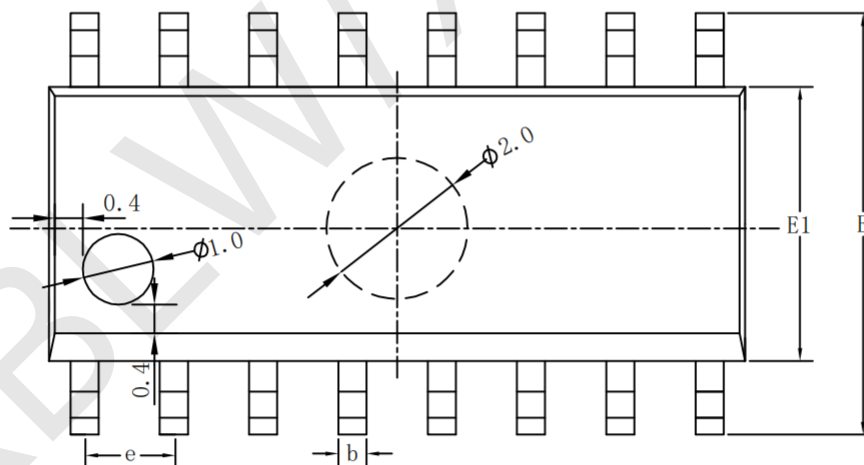
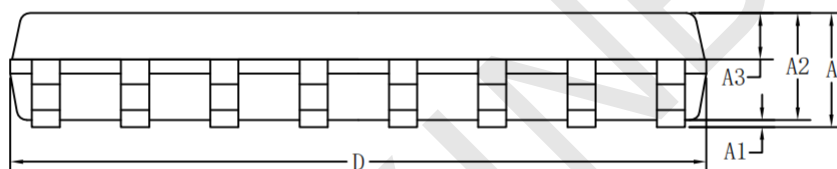
• DIP-16

Symbol	Size	Dimensions In Millimeters		Symbol	Size	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



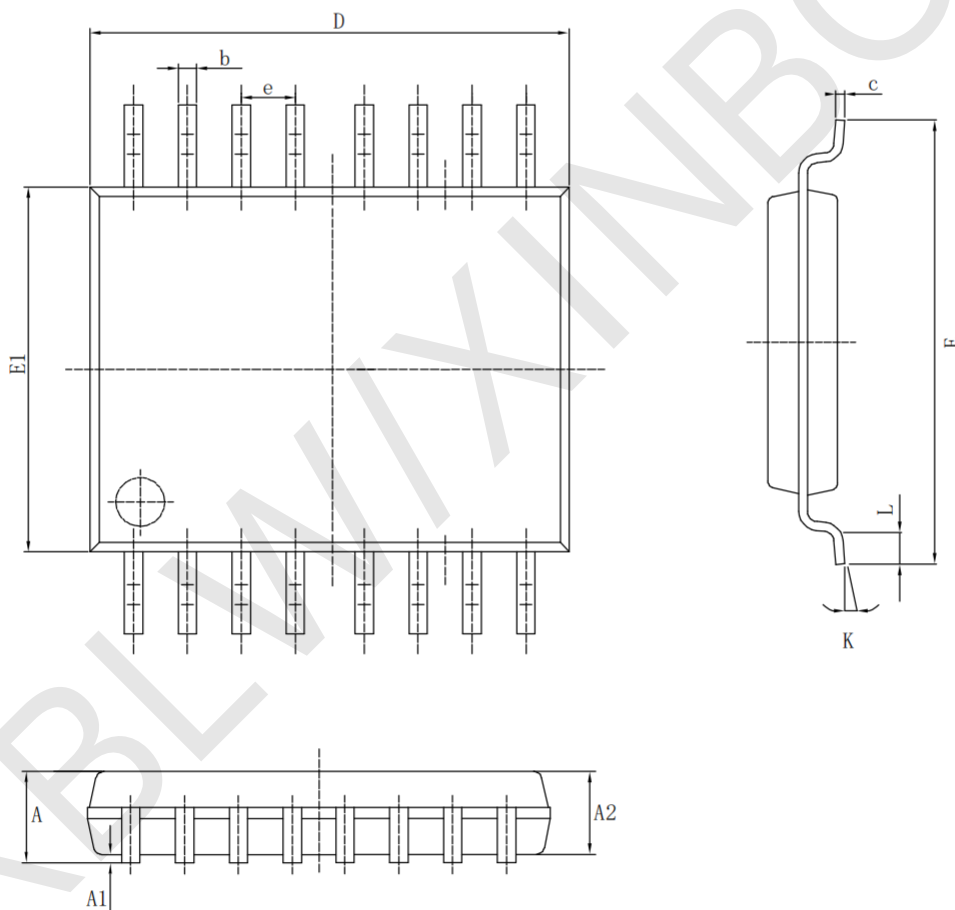
· SOP-16

Symbol	Dimensions In Millimeters			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



Statement

- XBLW reserves the right to modify the product manual without prior notice! Before placing an order, customers need to confirm whether the obtained information is the latest version and verify the completeness of the relevant information.
- Any semi-guide product is subject to failure or malfunction under specified conditions. It is the buyer's responsibility to comply with safety standards when using XBLW products for system design and whole machine manufacturing. And take the appropriate safety measures to avoid the potential in the risk of loss of personal injury or loss of property situation!
- XBLW product has not been licensed for life support, military and aerospace applications, and therefore XBLW is not responsible for any consequences arising from its use in these areas.
- If any or all XBLW products (including technical data, services) described or contained in this document are subject to any applicable local export control laws and regulations, they may not be exported without an export license from the relevant authorities in accordance with such laws.
- The specifications of any and all XBLW products described or contained in this document specify the performance, characteristics, and functionality of said products in their standalone state, but do not guarantee the performance, characteristics, and functionality of said products installed in Customer's products or equipment. In order to verify symptoms and conditions that cannot be evaluated in a standalone device, the Customer should ultimately evaluate and test the device installed in the Customer's product device.
- XBLW documentation is only allowed to be copied without any alteration of the content and with the relevant authorization. XBLW assumes no responsibility or liability for altered documents.
- XBLW is committed to becoming the preferred semiconductor brand for customers, and XBLW will strive to provide customers with better performance and better quality products.