芯伯乐®
XINBOLE

Product Specification

XBLW SN74HC240

Octal Buffers and Line Drivers With 3-State Outputs

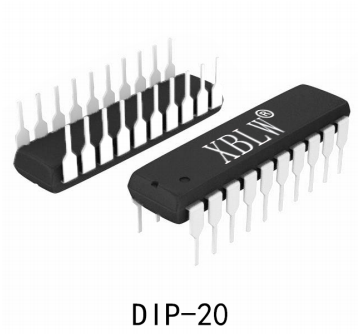
WEB | www.xinboleic.com

Description

The SN74HC240 is an 8-bit inverting buffer/line driver with 3-state outputs. The device can be used as two 4-bit buffers or one 8-bit buffer. The device features two output enables (1$\overline{OE}$ and 2$\overline{OE}$), each controlling four of the 3-state outputs. A HIGH on n$\overline{OE}$ causes the outputs to assume a high-impedance OFF-state. Inputs include clamp diodes that enable the use of current limiting resistors to interface inputs to voltages in excess of V_{CC}.

Features

- Inverting 3-state outputs
- Specified from -40°C to +105°C
- Packaging information: DIP-20/SOP-20/TSSOP-20



DIP–20

SOP–20

TSSOP-20

ORDERING INFORMATION

Product Model	Package Type	Marking	Packing	Packing Qty
XBLW SN74HC240N	DIP-20	74HC240N	Tube	720Pcs/Box
XBLW SN74HC240DTR	SOP-20	74HC240	Tape	2000Pcs/Reel
XBLW SN74HC240TDTR	TSSOP-20	74HC240	Tape	2000Pcs/Reel

Block Diagram

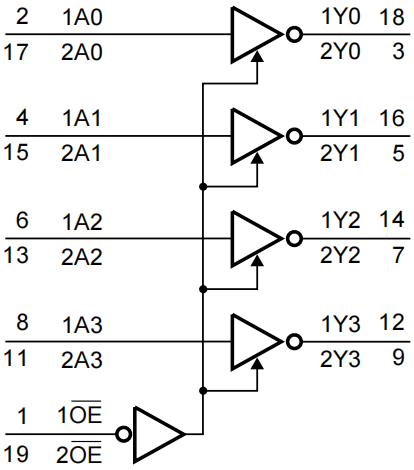


Figure 1. Logic symbol

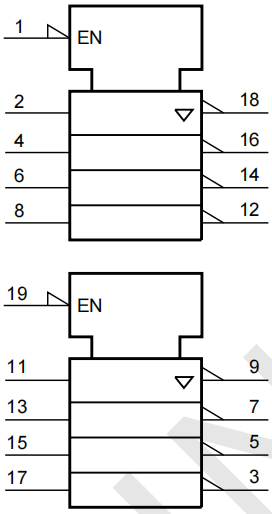


Figure 2. IEC Logic symbol

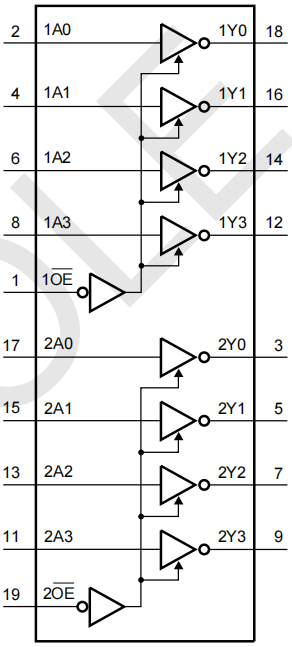
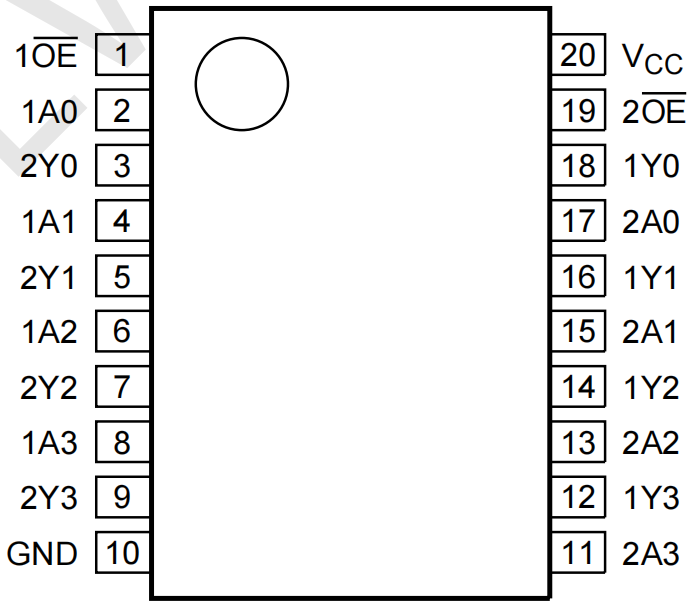


Figure 3. Functional diagram

Pin Configurations



Pin Description

Pin No.	Pin Name	Description
1	$\overline{1OE}$	output enable input(active LOW)
2	1A0	data input
3	2Y0	bus output
4	1A1	data input
5	2Y1	bus output
6	1A2	data input
7	2Y2	bus output
8	1A3	data input
9	2Y3	bus output
10	GND	ground(0V)
11	2A3	data input
12	1Y3	bus output
13	2A2	data input
14	1Y2	bus output
15	2A1	data input
16	1Y1	bus output
17	2A0	data input
18	1Y0	bus output
19	$\overline{2OE}$	output enable input(active LOW)
20	V_{CC}	supply voltage

Function Table

Input		Output
$\overline{nOE}$	nAn	nYn
L	L	H
L	H	L
H	X	Z

Note: H=HIGH voltage level; L=LOW voltage level; X=don't care; Z=high-impedance OFF-state.

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		-	±35	mA
supply current	I_{CC}	-		-	70	mA
ground current	I_{GND}	-		-70	-	mA
storage temperature	T_{stg}	-		-65	+150	℃
total power dissipation	P_{tot}	-		-	500	mW
soldering temperature	T_L	10s	DIP	245		℃
			SOP	250		

Note:
[1] For DIP20 packages: above 70℃the value of P_{tot} derates linearly with 12mW/K.
[2] For SOP20 packages: above 70℃the value of P_{tot} derates linearly with 8mW/K.
[3] For (T)SSOP20 packages: above 60℃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	Δt/ΔV	-	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}	-		-40	-	+105	℃

Electrical Characteristics

DC Characteristics 1

(Tamb=25℃, 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=-6.0mA;V_{CC}=4.5V	3.98	4.32	-	V
			I_O=-7.8mA;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=6.0mA;V_{CC}=4.5V	-	0.15	0.26	V
			I_O=7.8mA;V_{CC}=6.0V	-	0.16	0.26	V
input leakage current	I_I	V_I=Vcc or GND;V_{CC}=6.0V		-	-	±1	μA
OFF-state output current	I_{OZ}	V_I=V_{IH} or V_{IL};V_{CC}=6.0V; V_O=V_{CC} or GND		-	-	±0.5	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

(Tamb=-40℃ 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=-6.0mA;V_{CC}=4.5V	3.84	-	-	V
			I_O=-7.8mA;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=6.0mA;V_{CC}=4.5V	-	-	0.33	V
			I_O=7.8mA;V_{CC}=6.0V	-	-	0.33	V
input leakage current	I_I	V_I=Vcc or GND;V_{CC}=6.0V		-	-	±1.0	μA
OFF-state output current	I_{OZ}	V_I=V_{IH} or V_{IL};V_{CC}=6.0V; V_O=V_{CC} or GND		-	-	±5.0	μA
supply current	I_{CC}	V_I=V_{CC} or GND;I_O=0A;V_{CC}=6.0V		-	-	80	μA

DC Characteristics 3

(Tamb=-40℃ to +105℃, 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=-6.0mA;V_{CC}=4.5V	3.7	-	-	V
			I_O=-7.8mA;V_{CC}=6.0V	5.2	-	-	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=6.0mA;V_{CC}=4.5V	-	-	0.4	V
			I_O=7.8mA;V_{CC}=6.0V	-	-	0.4	V
input leakage current	I_I	V_I=Vcc or GND;V_{CC}=6.0V		-	-	±1.0	μA
OFF-state output current	I_{OZ}	V_I=V_{IH} or V_{IL};V_{CC}=6.0V; V_O=V_{CC} or GND		-	-	±10	μA
supply current	I_{CC}	V_I=V_{CC} or GND;I_O=0A;V_{CC}=6.0V		-	-	160	μA

AC Characteristics 1

(Tamb=25°C, voltages are referenced to GND(ground=0V),unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
nAn to nYn propagation delay	t_{pd}	see Figure5	V_{CC}=2.0V	-	30	100	ns
			V_{CC}=4.5V	-	11	20	ns
			V_{CC}=5.0V;C_L= 15pF	-	9	-	ns
			V_{CC}=6.0V	-	9	17	ns
$\overline{nOE}$ to nYn enable time	t_{en}	see Figure6	V_{CC}=2.0V	-	39	150	ns
			V_{CC}=4.5V	-	14	30	ns
			V_{CC}=6.0V	-	11	26	ns
$\overline{nOE}$ to nYn disable time	t_{dis}	see Figure6	V_{CC}=2.0V	-	41	150	ns
			V_{CC}=4.5V	-	15	30	ns
			V_{CC}=6.0V	-	12	26	ns
transition time	t_t	see Figure5	V_{CC}=2.0V	-	14	60	ns
			V_{CC}=4.5V	-	5	12	ns
			V_{CC}=6.0V	-	4	10	ns
power dissipation capacitance	C_{PD}	per buffer;V_I=GND to V_{CC}		-	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

(Tamb=-40℃ to 85℃, voltages are referenced to GND(ground=0V),unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
nAn to nYn propagation delay	t_{pd}	see Figure5	V_{CC}=2.0V	-	-	125	ns
			V_{CC}=4.5V	-	-	25	ns
			V_{CC}=6.0V	-	-	21	ns
$\overline{nOE}$ to nYn enable time	t_{en}	see Figure6	V_{CC}=2.0V	-	-	190	ns
			V_{CC}=4.5V	-	-	38	ns
			V_{CC}=6.0V	-	-	33	ns
$\overline{nOE}$ to nYn disable time	t_{dis}	see Figure6	V_{CC}=2.0V	-	-	190	ns
			V_{CC}=4.5V	-	-	38	ns
			V_{CC}=6.0V	-	-	33	ns
transition time	t_t	see Figure5	V_{CC}=2.0V	-	-	75	ns
			V_{CC}=4.5V	-	-	15	ns
			V_{CC}=6.0V	-	-	13	ns

Note:

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

[2] t_{en} is the same as t_{PZL} and t_{PZH}.

[3] t_{dis} is the same as t_{PLZ} and t_{PHZ}.

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

AC Characteristics 3

(Tamb=-40℃ to 105℃, voltages are referenced to GND(ground=0V),unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
nAn to nYn propagation delay	t_{pd}	see Figure5	V_{CC}=2.0V	-	-	150	ns
			V_{CC}=4.5V	-	-	30	ns
			V_{CC}=6.0V	-	-	26	ns
$n\bar{O}\bar{E}$ to nYn enable time	t_{en}	see Figure6	V_{CC}=2.0V	-	-	225	ns
			V_{CC}=4.5V	-	-	45	ns
			V_{CC}=6.0V	-	-	38	ns
$n\bar{O}\bar{E}$ to nYn disable time	t_{dis}	see Figure6	V_{CC}=2.0V	-	-	225	ns
			V_{CC}=4.5V	-	-	45	ns
			V_{CC}=6.0V	-	-	38	ns
transition time	t_t	see Figure5	V_{CC}=2.0V	-	-	90	ns
			V_{CC}=4.5V	-	-	18	ns
			V_{CC}=6.0V	-	-	15	ns

Note:

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

[2] t_{en} is the same as t_{PZL} and t_{PZH}.

[3] t_{dis} is the same as t_{PLZ} and t_{PHZ}.

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

Testing Circuit

AC Testing Circuit

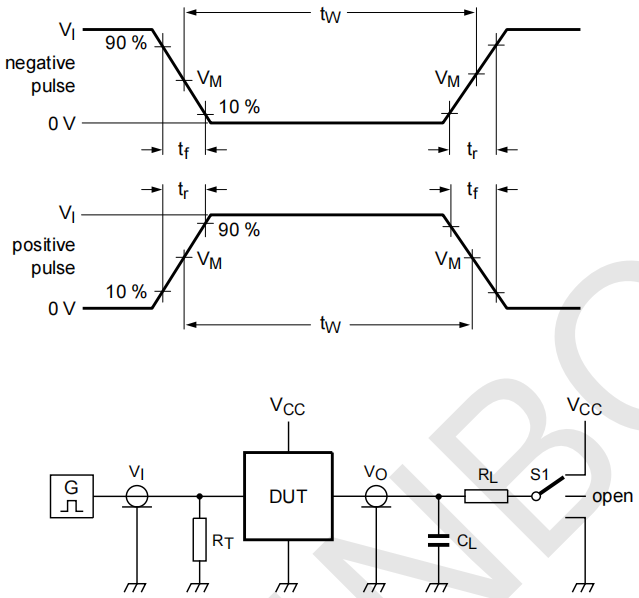


Figure 4. Test circuit for measuring switching times

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.

R_L=Load resistance

S1＝Test selection switch

AC Testing Waveforms

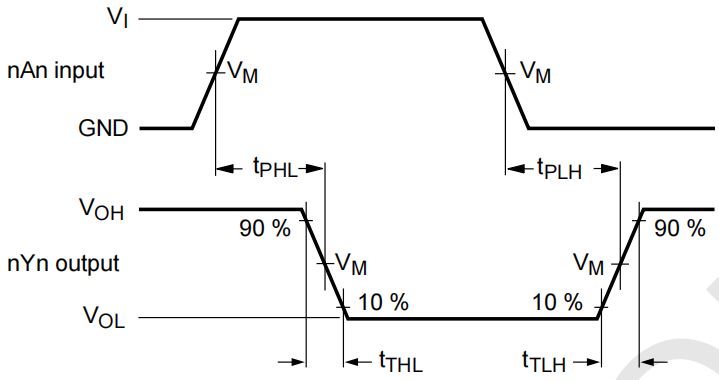


Figure 5. Input (nAn) to output (nYn) propagation delays and output transition times

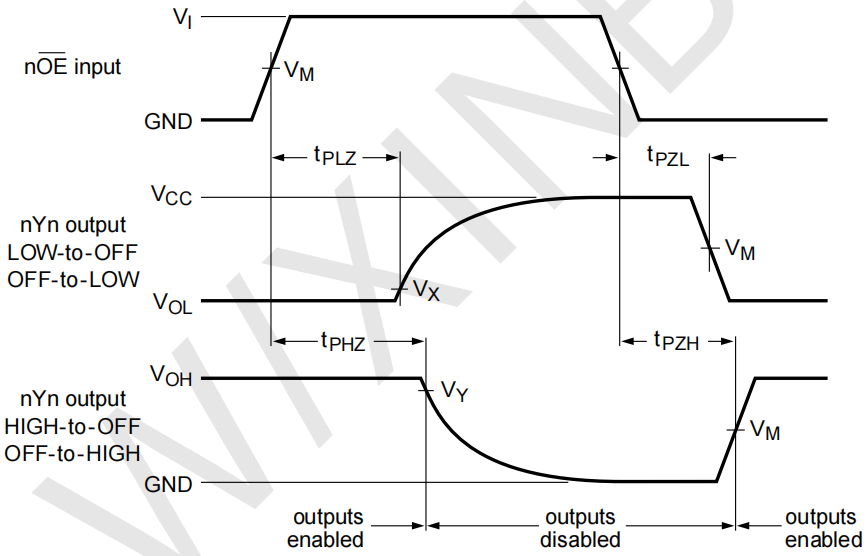


Figure 6. 3-state enable and disable times

Measurement Points

Type	Input	Output		
	V_M	V_M	V_M	V_Y
SN74HC240	0.5×V_{CC}	0.5×V_{CC}	0. 1×V_{CC}	0.9×V_{CC}

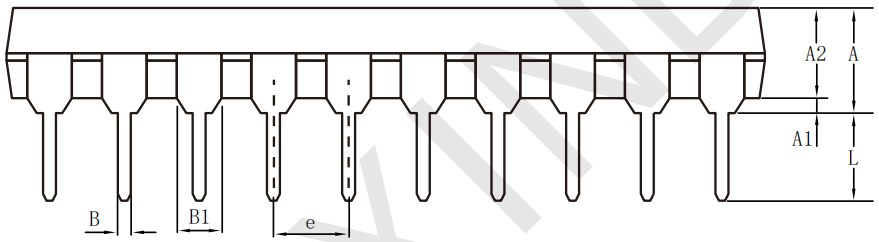
Test Data

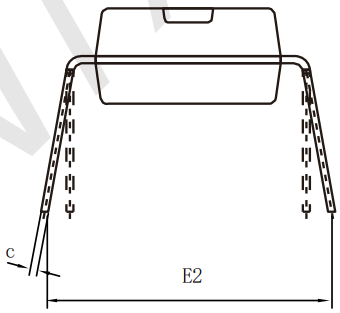
Type	Input		Load		S1 position		
	V_I	t_r,t_f	C_L	R_L	t_{PHL},t_{PLH}	t_{PZH},t_{PHZ}	t_{PZL},t_{PLZ}
SN74HC240	V_{CC}	6.0ns	15pF,50pF	1KΩ	open	GND	V_{CC}

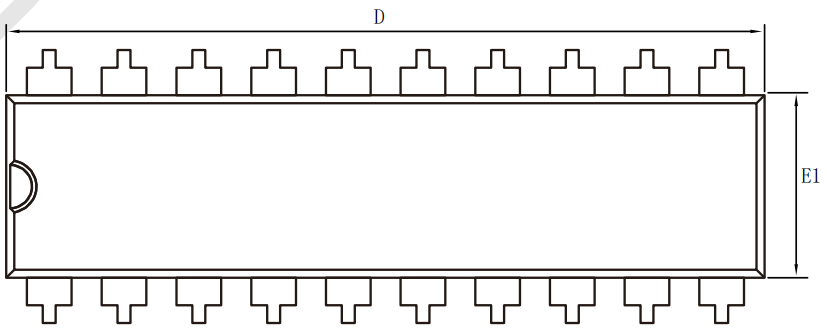
Package Information

· DIP-20

Size / Symbol	Dimensions In Millimeters Min(mm)	Max(mm)	Size / Symbol	Dimensions In Inches Min(in)	Max(in)
A	3.600	5.330	A	0.142	0.210
A1	0.510		A1	0.020	
A2	3.200	3.600	A2	0.126	0.142
B	0.360	0.530	B	0.014	0.021
B1	1.52(BSC)		B1	0.060(BSC)	
c	0.204	0.360	c	0.008	0.014
D	25.70	26.54	D	1.010	1.040
E1	6.200	6.750	E1	0.244	0.260
E2	7.620	9.300	E2	0.300	0.366
e	2.54(BSC)		e	0.100(BSC)	
L	3.000	3.600	L	0.118	0.142

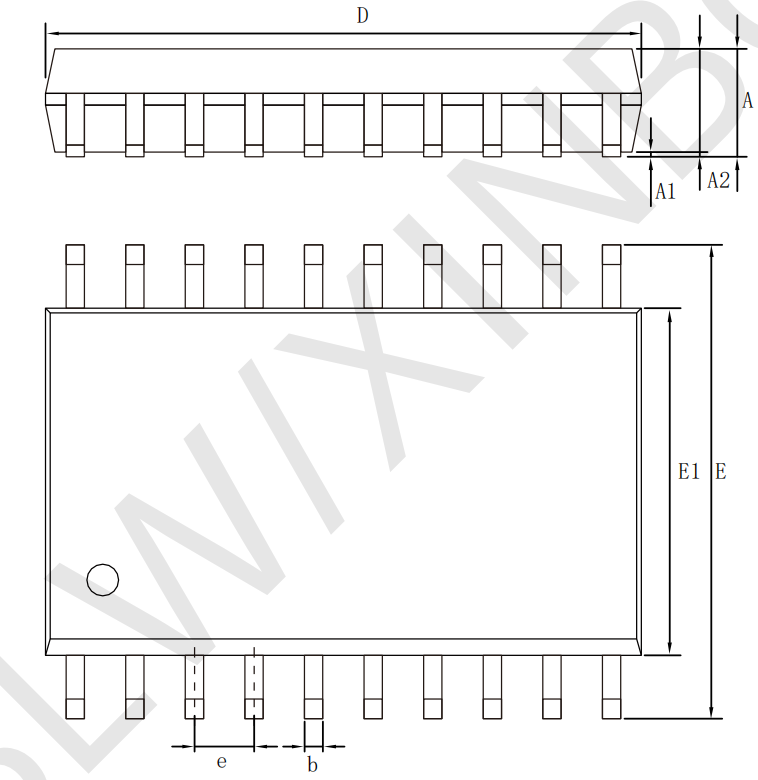


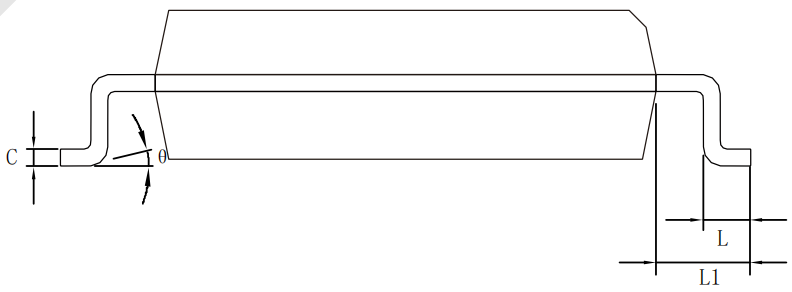




· SOP-20

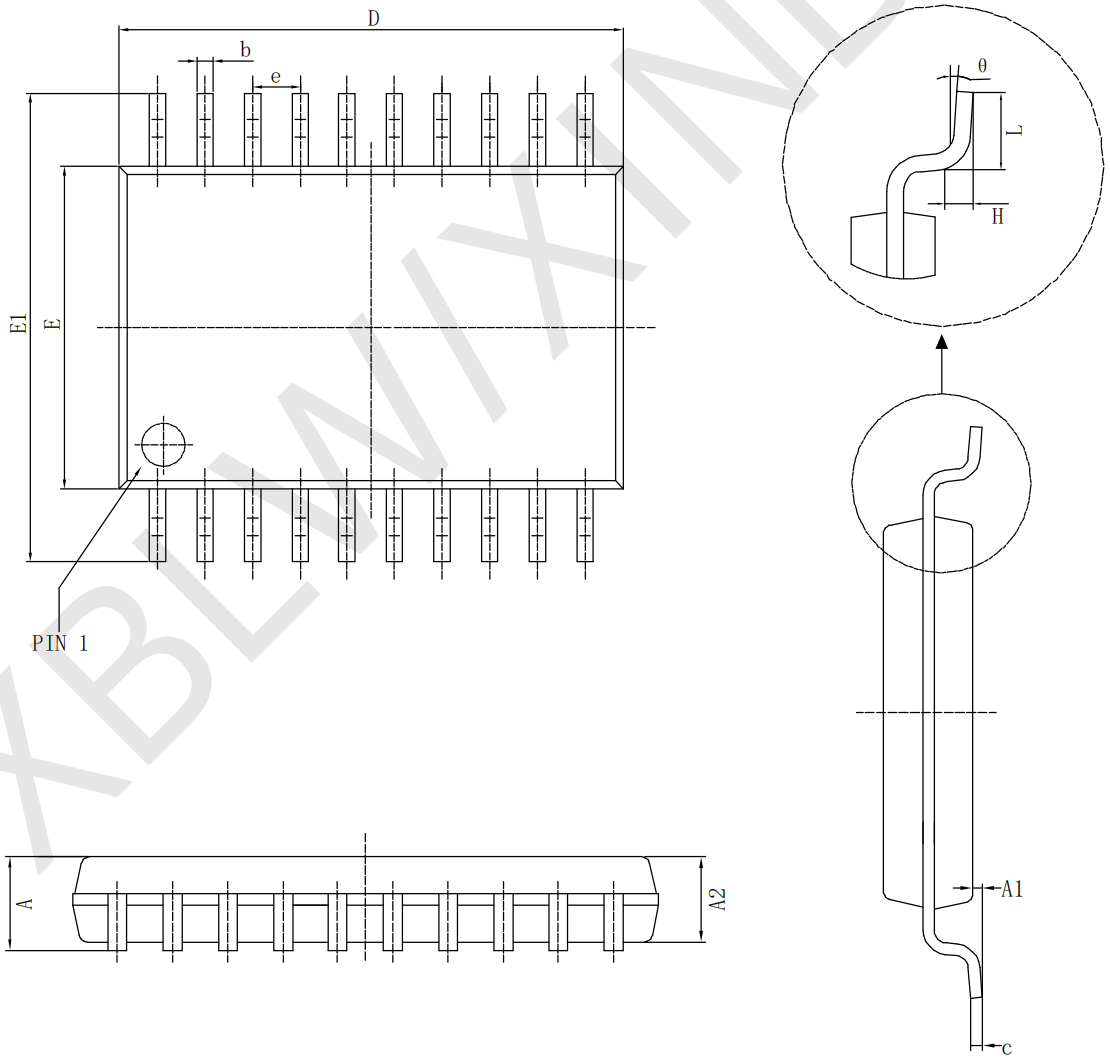
Size / Symbol	Dimensions In Millimeters		Size / Symbol	Dimensions In Inches	
	Min(mm)	Max(mm)		Min(in)	Max(in)
A	2.470	2.650	A	0.097	0.104
A1	0.050	0.300	A1	0.002	0.012
A2	2.200	2.440	A2	0.087	0.096
b	0.350	0.500	b	0.014	0.020
c	0.150	0.300	c	0.006	0.012
D	12.54	12.94	D	0.494	0.509
E	10.00	10.60	E	0.394	0.417
E1	7.300	7.700	E1	0.287	0.303
e	1.270(BSC)		e	0.050(BSC)	
L	0.400	1.050	L	0.016	0.041
L1	1.300	1.500	L1	0.051	0.059
θ	0°	8°	θ	0°	8°





· TSSOP-20

Size / Symbol	Dimensions In Millimeters		Size / Symbol	Dimensions In Inches	
	Min(mm)	Max(mm)		Min(in)	Max(in)
D	6.400	6.600	D	0.252	0.259
E	4.300	4.500	E	0.169	0.177
b	0.190	0.300	b	0.007	0.012
c	0.090	0.200	c	0.004	0.008
E1	6.250	6.550	E1	0.246	0.258
A		1.200	A		0.047
A2	0.800	1.000	A2	0.031	0.039
A1	0.050	0.150	A1	0.002	0.006
e	0.65(BSC)		e	0.026(BSC)	
L	0.500	0.700	L	0.020	0.028
H	0.25(TYP)		H	0.01(TYP)	
θ	1°	7°	θ	1°	7°



Statement

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