



AiP74LVC245

Octal Bus Transceiver; 3-state

Product Specification

Specification Revision History:

Version	Date	Description
2017-10-A1	2017-10	New
2021-12-A2	2021-12	Modify Ordering Information
2022-02-A3	2022-02	Modify ambient temperature to $-40^{\circ}\text{C}\sim+105^{\circ}\text{C}$ and add electrical characteristics of $-40^{\circ}\text{C}\sim+105^{\circ}\text{C}$



General Description

The AiP74LVC245 is a 8-bit transceivers featuring non-inverting 3-state bus compatible outputs in both send and receive directions. The device features an output enable(\overline{OE}) input for easy cascading and a send/receive (DIR) input for direction control. \overline{OE} controls the outputs so that the buses are effectively isolated.

Inputs can be driven from either 3.3V or 5V devices. When disabled, up to 5.5V can be applied to the outputs. These features allow the use of these devices in mixed 3.3V and 5V applications.

Features:

- 5V tolerant inputs/outputs for interfacing with 5V logic
- Wide supply voltage range from 1.2V to 3.6V
- CMOS low power consumption
- Direct interface with TTL levels
- Inputs accept voltages up to 5.5V
- High-impedance when $V_{CC}=0V$
- Packaging information: SOP20/TSSOP20/DHVQFN20

**Ordering Information:****Tube packing specifications:**

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
AiP74LVC245SA20.TB	SOP20	74LVC245	35 PCS/tube	80 tube/box	2800 PCS/box	Dimensions of plastic enclosure: 12.8mm×7.5mm Pin spacing: 1.27mm
AiP74LVC245TA20.TB	TSSOP20	74LVC245	70 PCS/tube	200 tube/box	14000 PCS/box	Dimensions of plastic enclosure: 6.5mm×4.4mm Pin spacing: 0.65mm

Reel packing specifications:

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
AiP74LVC245SA20.TR	SOP20	74LVC245	2000 PCS/reel	4000 PCS/box	Dimensions of plastic enclosure: 12.8mm×7.5mm Pin spacing:1.27mm
AiP74LVC245TA20.TR	TSSOP20	74LVC245	2500 PCS/reel	5000 PCS/box	Dimensions of plastic enclosure: 6.5mm×4.4mm Pin spacing:0.65mm
AiP74LVC245QE20.TR	DHVQFN20	74LVC245	3000 PCS/reel	3000 PCS/box	Dimensions of plastic enclosure: 4.5mm×2.5mm Pin spacing:0.5mm

Note: If the physical information is inconsistent with the ordering information, please refer to the actual product.



2、Block Diagram And Pin Description

2.1、Block Diagram

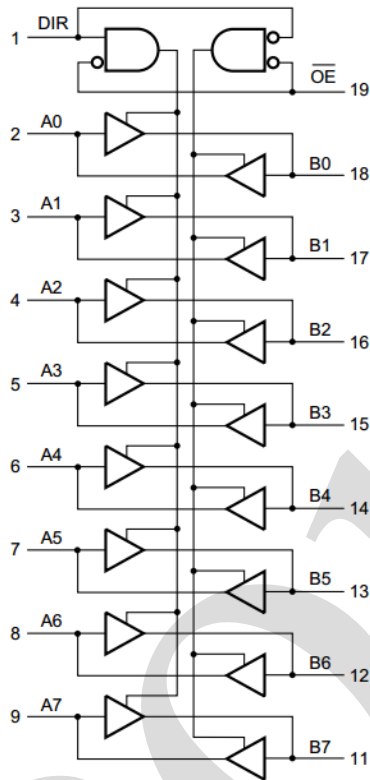


Figure 1. Logic diagram

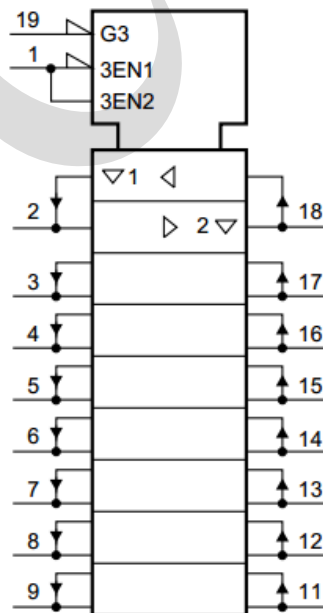
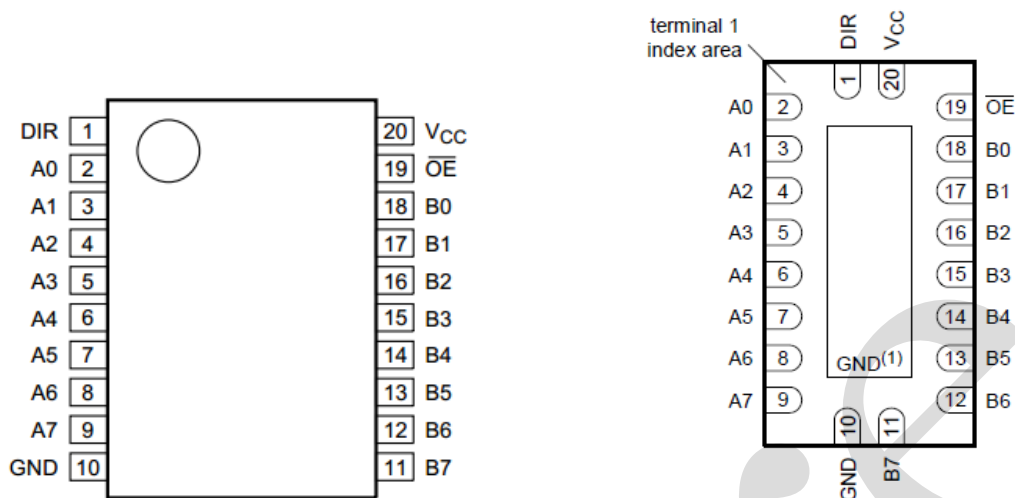


Figure 2. IEC logic symbol



2.2、Pin Configurations



Note:(1) This is not a supply pin. The substrate is attached to this pad using conductive die attach material. There is no electrical or mechanical requirement to solder this pad. However, if it is soldered, the solder land should remain floating or be connected to GND.

2.3、Pin Description

Pin No.	Pin Name	Description
1	DIR	direction control
2	A0	data input/output
3	A1	data input/output
4	A2	data input/output
5	A3	data input/output
6	A4	data input/output
7	A5	data input/output
8	A6	data input/output
9	A7	data input/output
10	GND	ground (0 V)
11	B7	data input/output
12	B6	data input/output
13	B5	data input/output
14	B4	data input/output
15	B3	data input/output
16	B2	data input/output
17	B1	data input/output
18	B0	data input/output
19	\overline{OE}	output enable input (active LOW)
20	V _{CC}	supply voltage



2.4、Function Table

Input		Inputs/outputs	
OE	DIR	An	Bn
L	L	An=Bn	inputs
L	H	inputs	Bn=An
H	X	Z	Z

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

3、Electrical Parameter

3.1、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	6.5	V
input clamping current	I_{IK}	$V_I < 0V$	-50	-	mA
input voltage	V_I	-	-0.5	6.5	V
output clamping current	I_{OK}	$V_O > V_{CC}$ or $V_O < 0V$	-	± 50	mA
output voltage	V_O	output HIGH or LOW	-0.5	$V_{CC}+0.5$	V
		output 3-state	-0.5	6.5	V
output current	I_O	$V_O=0V$ to V_{CC}	-	± 50	mA
supply current	I_{CC}	-	-	100	mA
ground current	I_{GND}	-	-100	-	mA
storage temperature	T_{stg}	-	-65	150	°C
total power dissipation	P_{tot}	-	-	500	mW
Soldering Temperature	T_L	10s	250		°C

Note:

[1] The minimum input voltage ratings may be exceeded if the input current ratings are observed.

[2] The output voltage ratings may be exceeded if the output current ratings are observed.

[3] For SOP20 packages: above 70°C the value of P_{tot} derates linearly with 8mW/K.

For TSSOP20 packages: above 60°C the value of P_{tot} derates linearly with 5.5mW/K.

For DHVQFN20 packages: above 60°C the value of P_{tot} derates linearly with 4.5mW/K.



3.2、Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	V _{CC}	-	1.65	-	3.6	V
		functional	1.2	-	3.6	V
input voltage	V _I	-	0	-	5.5	V
output voltage	V _O	output HIGH or LOW	0	-	V _{CC}	V
		output 3-state	0	-	5.5	V
ambient temperature	T _{amb}	in free air	-40	-	+105	°C
input transition rise and fall rate	Δt/ΔV	V _{CC} =1.2V to 2.7V	0	-	20	ns/V
		V _{CC} =2.7V to 3.6V	0	-	10	ns/V

3.3、Electrical Characteristics

3.3.1、DC Characteristics 1

(T_{amb}=-40°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} =1.2V	1.08	-	-	V	
		V _{CC} =1.65V to 1.95V	0.65×V _{CC}	-	-	V	
		V _{CC} =2.3V to 2.7V	1.7	-	-	V	
		V _{CC} =2.7V to 3.6V	2.0	-	-	V	
LOW-level input voltage	V _{IL}	V _{CC} =1.2V	-	-	0.12	V	
		V _{CC} =1.65V to 1.95V	-	-	0.35×V _{CC}	V	
		V _{CC} =2.3V to 2.7V	-	-	0.7	V	
		V _{CC} =2.7V to 3.6V	-	-	0.8	V	
HIGH-level output voltage	V _{OH}	V _I =V _{IH} or V _{IL}	I _O =-100uA; V _{CC} =1.65V to 3.6V	V _{CC} -0.2	-	-	V
			I _O =-4mA; V _{CC} =1.65V	1.2	-	-	V
			I _O =-8mA; V _{CC} =2.3V	1.8	-	-	V
			I _O =-12mA; V _{CC} =2.7V	2.2	-	-	V
			I _O =-18mA; V _{CC} =3.0V	2.4	-	-	V
			I _O =-24mA; V _{CC} =3.0V	2.2	-	-	V
LOW-level output voltage	V _{OL}	V _I =V _{IH} or V _{IL}	I _O =100uA; V _{CC} =1.65V to 3.6V	-	-	0.2	V
			I _O =4mA; V _{CC} =1.65V	-	-	0.45	V
			I _O =8mA; V _{CC} =2.3V	-	-	0.6	V
			I _O =12mA; V _{CC} =2.7V	-	-	0.4	V
			I _O =24mA; V _{CC} =3.0V	-	-	0.55	V
input leakage current	I _I	V _{CC} =3.6V; V _I =5.5V or GND	-	±0.1	±5	uA	
OFF-state output current	I _{OZ}	V _{CC} =3.6V; V _I =V _{IH} or V _{IL} ; V _O =5.5V or GND	-	±0.1	±5	uA	



power-off leakage current	I_{OFF}	$V_{CC}=0V$; V_I or $V_O=5.5V$	-	± 0.1	± 10	μA
supply current	I_{CC}	$V_{CC}=3.6V$; $V_I=V_{CC}$ or GND; $I_O=0A$	-	0.1	10	μA
additional supply current	ΔI_{CC}	per input pin; $V_{CC}=2.7V$ to $3.6V$; $V_I=V_{CC}-0.6V$; $I_O=0A$	-	5	500	μA
input capacitance	C_I	$V_{CC}=0V$ to $3.6V$; $V_I=GND$ to V_{CC}	-	4	-	pF
input/output capacitance	$C_{I/O}$	$V_{CC}=0V$ to $3.6V$; $V_I=GND$ to V_{CC}	-	10	-	pF

Note:

 [1] All typical values are measured at $V_{CC}=3.3V$ (unless stated otherwise) and $T_{amb}=25^{\circ}C$.

3.3.2、DC Characteristics 2

 ($T_{amb}=-40^{\circ}C$ to $+105^{\circ}C$, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
HIGH-level input voltage	V_{IH}	$V_{CC}=1.2V$	1.08	-	-	V	
		$V_{CC}=1.65V$ to $1.95V$	$0.65 \times V_{CC}$	-	-	V	
		$V_{CC}=2.3V$ to $2.7V$	1.7	-	-	V	
		$V_{CC}=2.7V$ to $3.6V$	2.0	-	-	V	
LOW-level input voltage	V_{IL}	$V_{CC}=1.2V$	-	-	0.12	V	
		$V_{CC}=1.65V$ to $1.95V$	-	-	$0.35 \times V_{CC}$	V	
		$V_{CC}=2.3V$ to $2.7V$	-	-	0.7	V	
		$V_{CC}=2.7V$ to $3.6V$	-	-	0.8	V	
HIGH-level output voltage	V_{OH}	$V_I=V_{IH}$ or V_{IL}	$I_O=-100\mu A$; $V_{CC}=1.65V$ to $3.6V$	$V_{CC}-0.3$	-	-	V
			$I_O=-4mA$; $V_{CC}=1.65V$	1.05	-	-	V
			$I_O=-8mA$; $V_{CC}=2.3V$	1.65	-	-	V
			$I_O=-12mA$; $V_{CC}=2.7V$	2.05	-	-	V
			$I_O=-18mA$; $V_{CC}=3.0V$	2.25	-	-	V
			$I_O=-24mA$; $V_{CC}=3.0V$	2.0	-	-	V
LOW-level output voltage	V_{OL}	$V_I=V_{IH}$ or V_{IL}	$I_O=100\mu A$; $V_{CC}=1.65V$ to $3.6V$	-	-	0.3	V
			$I_O=4mA$; $V_{CC}=1.65V$	-	-	0.65	V
			$I_O=8mA$; $V_{CC}=2.3V$	-	-	0.8	V
			$I_O=12mA$; $V_{CC}=2.7V$	-	-	0.6	V
			$I_O=24mA$; $V_{CC}=3.0V$	-	-	0.8	V
input leakage current	I_I	$V_{CC}=3.6V$; $V_I=5.5V$ or GND	-	-	± 20	μA	
OFF-state output current	I_{OZ}	$V_{CC}=3.6V$; $V_I=V_{IH}$ or V_{IL} ; $V_O=5.5V$ or GND	-	-	± 20	μA	
power-off	I_{OFF}	$V_{CC}=0V$; V_I or $V_O=5.5V$	-	-	± 20	μA	



leakage current						
supply current	I_{CC}	$V_{CC}=3.6V$; $V_I=V_{CC}$ or GND; $I_O=0A$	-	-	40	μA
additional supply current	ΔI_{CC}	per input pin; $V_{CC}=2.7V$ to $3.6V$; $V_I=V_{CC}-0.6V$; $I_O=0A$	-	-	5000	μA

Note:

[1] All typical values are measured at $V_{CC}=3.3V$ (unless stated otherwise) and $T_{amb}=25^\circ C$.

3.3.3、AC Characteristics 1

($T_{amb}=-40^\circ C$ to $+85^\circ C$, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
nAn to nBn nBn to nAn propagation delay	t_{pd}	see Figure 4	$V_{CC}=1.2V$	-	17.0	-	ns
			$V_{CC}=1.65V$ to $1.95V$	1.5	6.5	14.6	ns
			$V_{CC}=2.3V$ to $2.7V$	1.0	3.4	7.6	ns
			$V_{CC}=2.7V$	1.5	3.4	7.3	ns
			$V_{CC}=3.0V$ to $3.6V$	1.5	2.9	6.3	ns
nOE to nAn/nBn enable time	t_{en}	see Figure 5	$V_{CC}=1.2V$	-	22.0	-	ns
			$V_{CC}=1.65V$ to $1.95V$	1.9	8.3	19.5	ns
			$V_{CC}=2.3V$ to $2.7V$	1.5	4.6	10.7	ns
			$V_{CC}=2.7V$	1.5	4.8	9.5	ns
			$V_{CC}=3.0V$ to $3.6V$	1.5	3.7	8.5	ns
nOE to nAn/nBn disable time	t_{dis}	see Figure 5	$V_{CC}=1.2V$	-	12.0	-	ns
			$V_{CC}=1.65V$ to $1.95V$	2.9	5.5	12.3	ns
			$V_{CC}=2.3V$ to $2.7V$	1.0	3.1	7.1	ns
			$V_{CC}=2.7V$	1.5	3.9	8.0	ns
			$V_{CC}=3.0V$ to $3.6V$	1.7	3.6	7.0	ns
output skew time	$t_{sk(o)}$	-	-	-	1.0	ns	
power dissipation capacitance	C_{PD}	per input; $V_I=GND$ to V_{CC}	$V_{CC}=1.65V$ to $1.95V$	-	7.7	-	pF
			$V_{CC}=2.3V$ to $2.7V$	-	11.3	-	
			$V_{CC}=3.0V$ to $3.6V$	-	14.4	-	

Note:

[1] Typical values are measured at $T_{amb}=25^\circ C$ and $V_{CC}=1.8V, 2.5V, 2.7V,$ and $3.3V$ respectively.

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

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

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

[3] Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.

[4] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

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

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_{olt} .

N =number of inputs switching.

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



3.3.4、 AC Characteristics 2

($T_{amb}=-40^{\circ}\text{C}$ to $+105^{\circ}\text{C}$, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
nAn to nBn nBn to nAn propagation delay	t_{pd}	see Figure 4	$V_{CC}=1.65\text{V}$ to 1.95V	1.5	-	16.9	ns
			$V_{CC}=2.3\text{V}$ to 2.7V	1.0	-	8.7	ns
			$V_{CC}=2.7\text{V}$	1.5	-	9.5	ns
			$V_{CC}=3.0\text{V}$ to 3.6V	1.5	-	8.0	ns
$\overline{\text{nOE}}$ to nAn/nBn enable time	t_{en}	see Figure 5	$V_{CC}=1.65\text{V}$ to 1.95V	1.9	-	22.5	ns
			$V_{CC}=2.3\text{V}$ to 2.7V	1.5	-	12.4	ns
			$V_{CC}=2.7\text{V}$	1.5	-	12.0	ns
			$V_{CC}=3.0\text{V}$ to 3.6V	1.5	-	11.0	ns
$\overline{\text{nOE}}$ to nAn/nBn disable time	t_{dis}	see Figure 5	$V_{CC}=1.65\text{V}$ to 1.95V	2.9	-	14.2	ns
			$V_{CC}=2.3\text{V}$ to 2.7V	1.0	-	8.2	ns
			$V_{CC}=2.7\text{V}$	1.5	-	10.0	ns
			$V_{CC}=3.0\text{V}$ to 3.6V	1.7	-	9.0	ns
output skew time	$t_{sk(o)}$	-	-	-	1.5	ns	

Note:

[1] Typical values are measured at $T_{amb}=25^{\circ}\text{C}$ and $V_{CC}=1.8\text{V}$, 2.5V , 2.7V , and 3.3V respectively.

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

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

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

[3] Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.



4、 Testing Circuit

4.1、 AC Testing Circuit

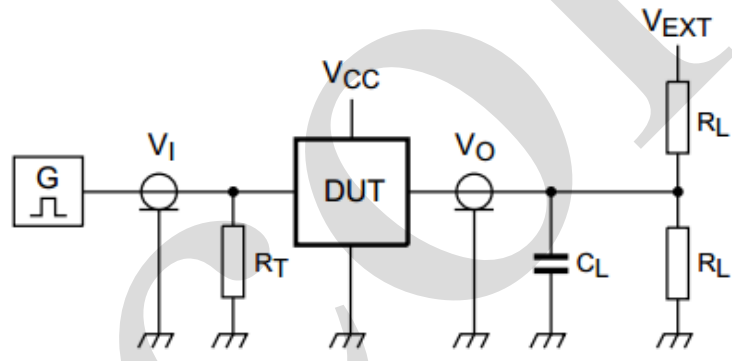
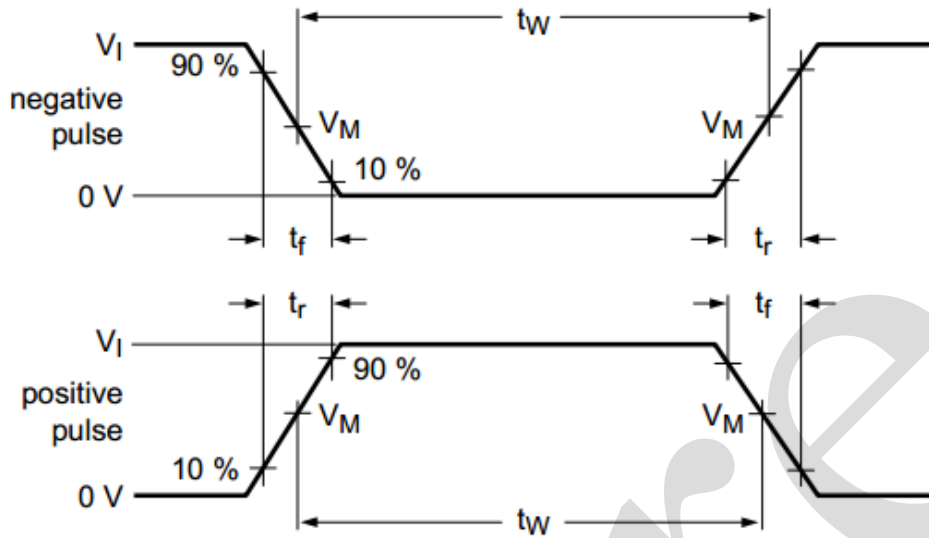


Figure 3. Test circuit for measuring switching times

Definitions for test circuit:

R_L =Load resistance.

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.

V_{EXT} =External voltage for measuring switching times.



4.2、AC Testing Waveforms

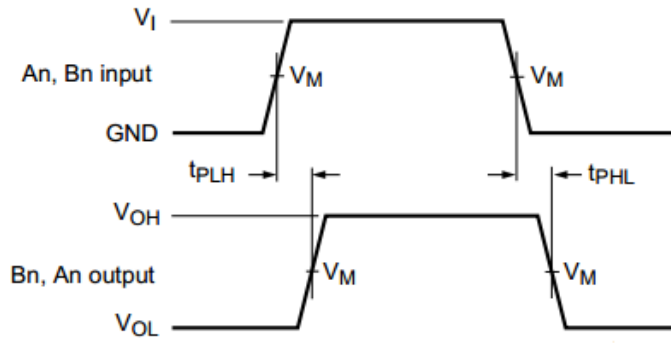


Figure 4. The input (An,Bn) to output (Bn,An) propagation delays

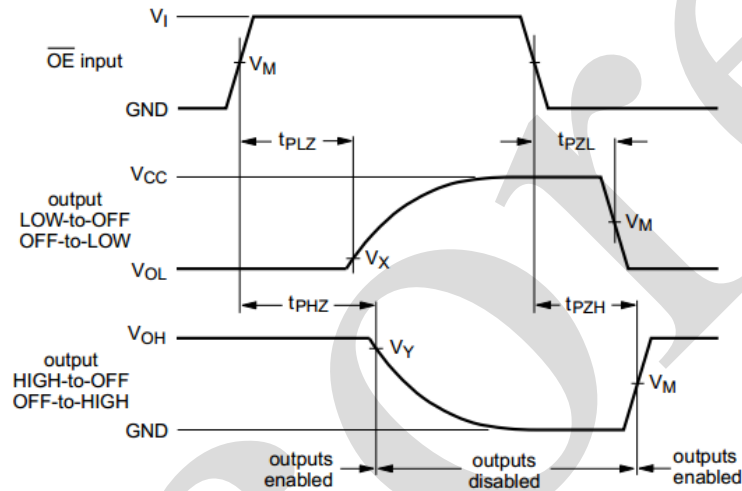


Figure 5. 3-state enable and disable times

4.3、Measurement Points

Supply voltage	VM	Input		
		VI	VX	VY
VCC				
1.2V	0.5×VCC	VCC	VOL+0.15V	VOH-0.15V
1.65V to 1.95V	0.5×VCC	VCC	VOL+0.15V	VOH-0.15V
2.3V to 2.7V	0.5×VCC	VCC	VOL+0.15V	VOH-0.15V
2.7V	1.5V	2.7V	VOL+0.3V	VOH-0.3V
3.0V to 3.6V	1.5V	2.7V	VOL+0.3V	VOH-0.3V

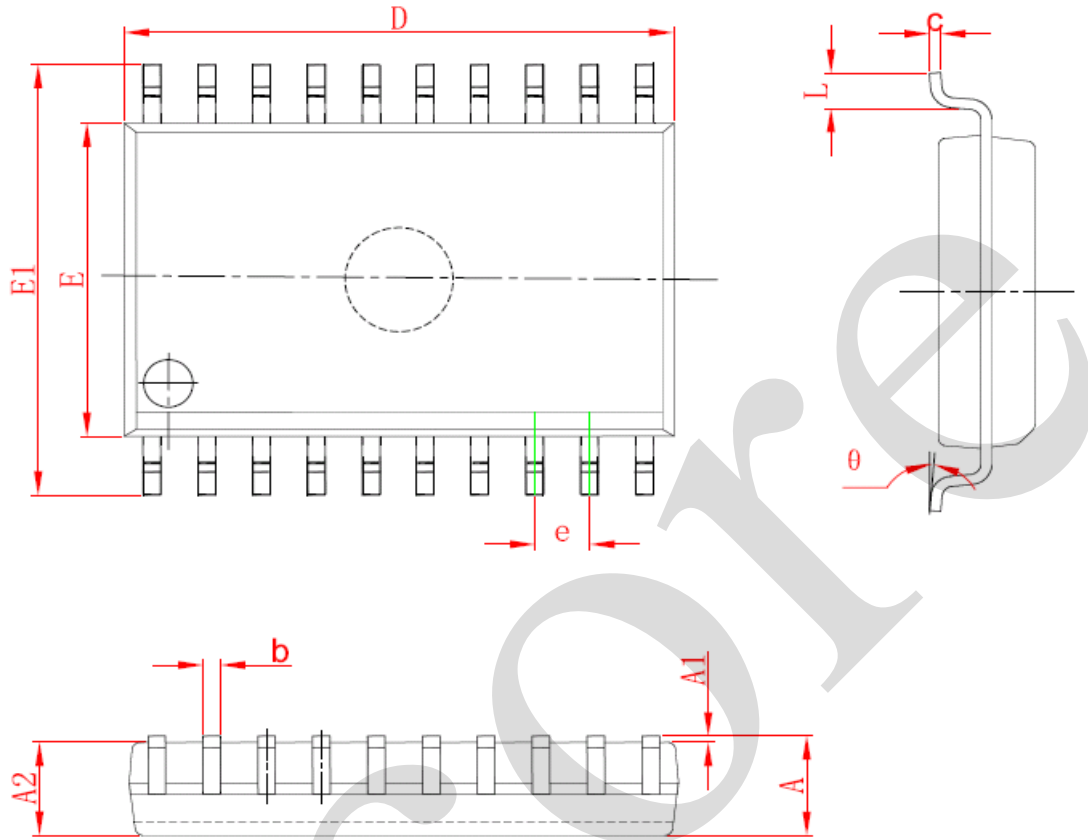
4.4、Test Data

Supply voltage	Input		Load		VEXT		
	VI	tr,tf	CL	RL	tPLH,tPHL	tPLZ,tPZL	tPHZ,tPZH
VCC							
1.2V	VCC	≤2ns	30pF	1kΩ	open	2×VCC	GND
1.65V to 1.95V	VCC	≤2ns	30pF	1kΩ	open	2×VCC	GND
2.3V to 2.7V	VCC	≤2ns	30pF	500Ω	open	2×VCC	GND
2.7V	2.7V	≤2.5ns	50pF	500Ω	open	2×VCC	GND
3.0V to 3.6V	2.7V	≤2.5ns	50pF	500Ω	open	2×VCC	GND



5、Package Information

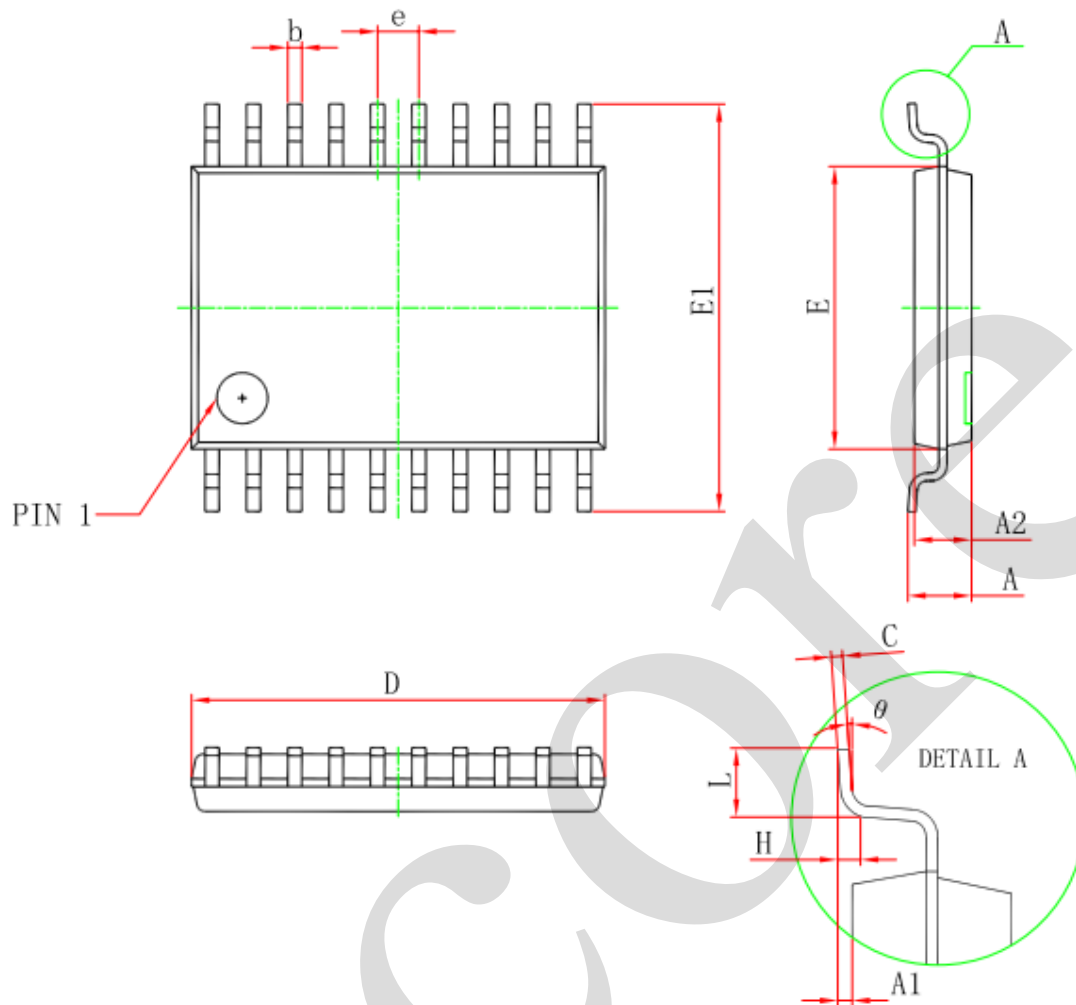
5.1、SOP20



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	2.350	2.650	0.093	0.104
A1	0.100	0.300	0.004	0.012
A2	2.100	2.500	0.083	0.098
b	0.330	0.510	0.013	0.020
c	0.204	0.330	0.008	0.013
D	12.520	13.000	0.493	0.512
E	7.400	7.600	0.291	0.299
E1	10.210	10.610	0.402	0.418
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°



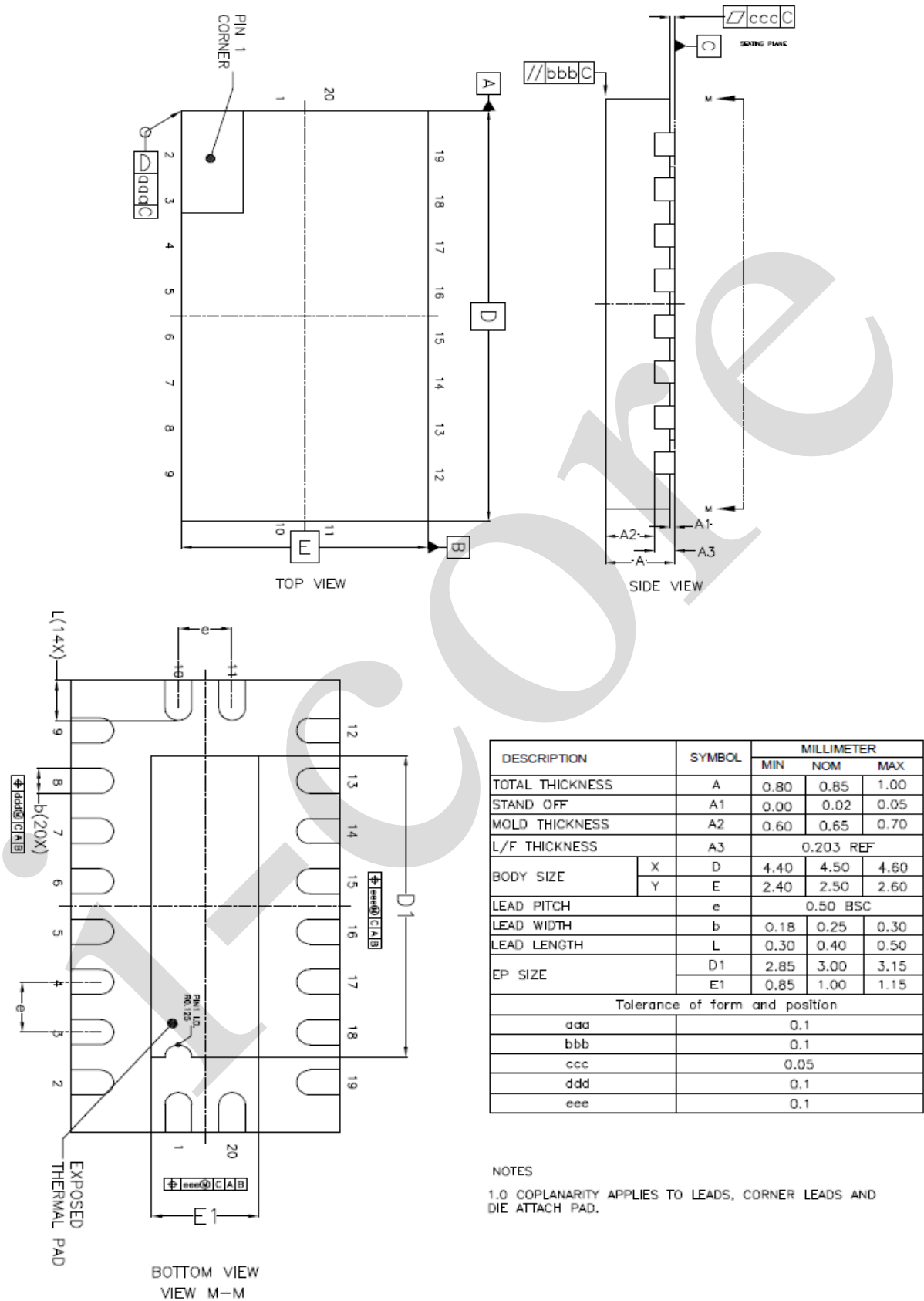
5.2、TSSOP20



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



5.3、DHVQFN20





6、 Statements And Notes

6.1、 The name and content of Hazardous substances or Elements in the product

Part name	Hazardous substances or Elements									
	Lead and lead compounds	Mercury and mercury compounds	Cadmium and cadmium compounds	Hexavalent chromium compounds	Polybrominated biphenyls	Polybrominated biphenyl ethers	Dibutyl phthalate	Butylbenzyl phthalate	Di-2-ethylhexyl phthalate	Diisobutyl phthalate
Lead frame	○	○	○	○	○	○	○	○	○	○
Plastic resin	○	○	○	○	○	○	○	○	○	○
Chip	○	○	○	○	○	○	○	○	○	○
The lead	○	○	○	○	○	○	○	○	○	○
Plastic sheet installed	○	○	○	○	○	○	○	○	○	○
explanation	○: Indicates that the content of hazardous substances or elements in the detection limit of the following the SJ/T11363-2006 standard. ×: Indicates that the content of hazardous substances or elements exceeding the SJ/T11363-2006 Standard limit requirements.									

6.2、 Notion

Recommended carefully reading this information before the use of this product;

The information in this document are subject to change without notice;

This information is using to the reference only, the company is not responsible for any loss;

The company is not responsible for the any infringement of the third party patents or other rights of the responsibility.