AiP74LVC374
Octal D-type flip-flop; positive-edge trigger; 3-state

Product Specification

Specification Revision History：

Version	Date	Description
2023-10-A0	2023-10	New
2023-11-A1	2023-11	Parameter modification
2025-12-A2	2025-12	Modify the supply voltage range; add the parameters at the condition of V_{CC}=4.5V to 5.5V; add ESD

Contents

i-core

1、General Description

The AiP74LVC374 is an octal D-type flip-flop featuring separate D-type inputs for each flip-flop and 3-state outputs for bus-oriented applications.

The input can be driven from either 3.3V or 5V devices. This feature allows the use of this device in a mixed 3.3V and 5V environment.

Features:

- Supply voltage range:1.2V to 5.5V
- Inputs accept voltages up to 5.5V
- ±24mA output drive at 3.0V
- High-impedance when V_{CC}=0V
- Temperature range:-40℃ to +125℃
- Packaging information: SOP20/TSSOP20/DHVQFN20

Ordering Information:

Tube packing specifications:

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
AiP74LVC374 SA20.TB	SOP20	74LVC374	35 PCS/tube	80 tube/box	2800 PCS/box	Dimensions of plastic enclosure: 12.8mm×7.5mm Pin spacing: 1.27mm
AiP74LVC374 TA20.TB	TSSOP20	74LVC374	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
AiP74LVC374 SA20.TR	SOP20	74LVC374	2000 PCS/reel	2000 PCS/box	Dimensions of plastic enclosure: 12.8mm×7.5mm Pin spacing:1.27mm
AiP74LVC374 TA20.TR	TSSOP20	74LVC374	4000 PCS/reel	8000 PCS/box	Dimensions of plastic enclosure: 6.5mm×4.4mm Pin spacing:0.65mm
AiP74LVC374 QE20.TR	DHVQFN20	74LVC374	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

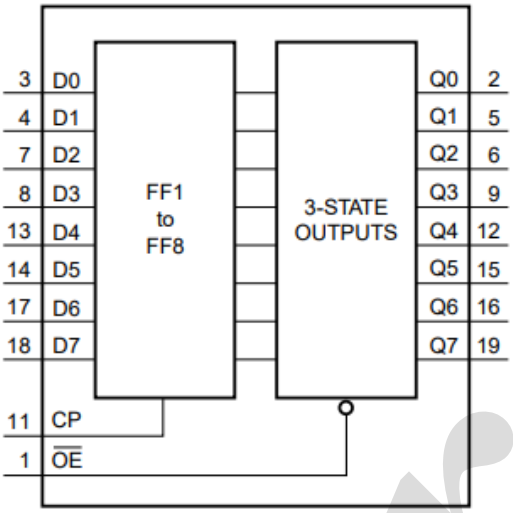


Figure 1. Functional diagram

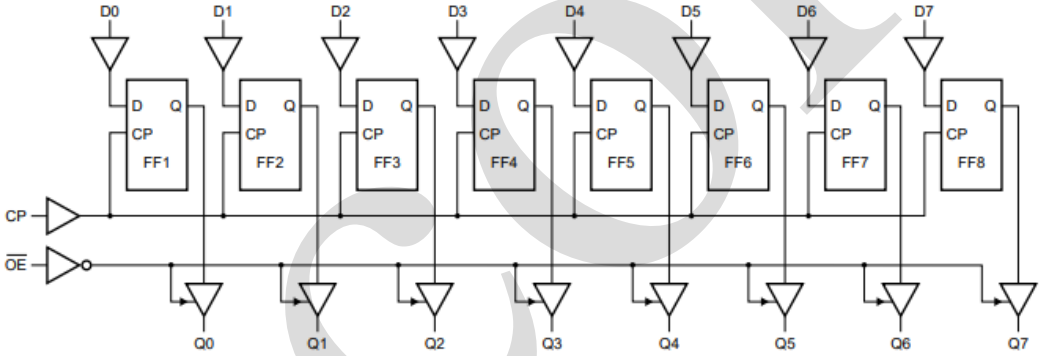
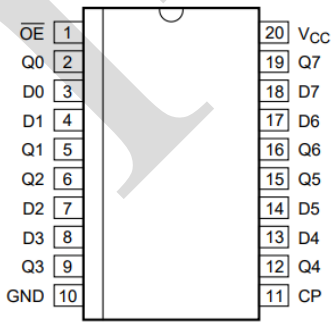
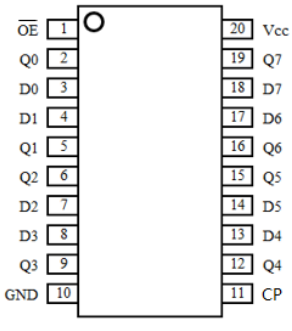


Figure 2. Logic diagram

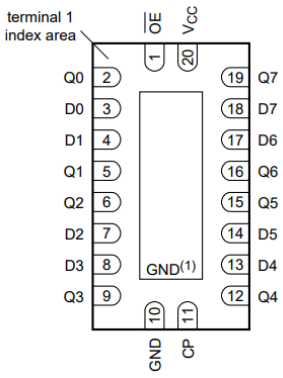
2.2、Pin Configurations



SOP20



TSSOP20



DHVQFN20

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	$\overline{OE}$	output enable input (active LOW)
2	Q0	data output
3	D0	data input
4	D1	data input
5	Q1	data output
6	Q2	data output
7	D2	data input
8	D3	data input
9	Q3	data output
10	GND	ground (0V)
11	CP	Clock input (LOW-to-HIGH, edge-triggered)
12	Q4	data output
13	D4	data input
14	D5	data input
15	Q5	data output
16	Q6	data output
17	D6	data input
18	D7	data input
19	Q7	data output
20	V_{CC}	supply voltage

2.4、Function Table

Operating modes	Input			Internal flip-flop	Output
	$\overline{OE}$	CP	Dn		Qn
Load and read register	L	↑	l	L	L
	L	↑	h	H	H
Load register and disable outputs	H	↑	l	L	Z
	H	↑	h	H	Z

Note:
H = HIGH voltage level;
h = HIGH voltage level one set-up time prior to the HIGH-to-LOW LE transition
L = LOW voltage level;
l = LOW voltage level one set-up time prior to the HIGH-to-LOW LE transition
Z = high-impedance OFF-state

↑=LOW-to-HIGH clock transition

3、Electrical Parameter

3.1、Absolute Maximum Ratings

(T_{amb}=25℃, All voltage referenced to Vss, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Max.	Unit
supply voltage	V_{CC}	-	-0.5	+6.5	V
input voltage	V_I	-	-0.5	+6.5	V
output voltage	V_O	Active mode	-0.5	V_{CC}+0.5	V
		Power-down mode; V_{CC}=0V	-0.5	+6.5	V
		output 3-state	-0.5	+6.5	V
supply current	I_{CC}	-	-	100	mA
ground current	I_{GND}	-	-100	-	mA
input clamping current	I_{IK}	V_I < 0V	-50	-	mA
output current	I_O	V_O=0V to V_{CC}	-	±50	mA
output clamping current	I_{OK}	V_O > V_{CC} or V_O < 0V	-	±50	mA
storage temperature	T_{stg}	-	-65	+150	℃
soldering temperature	T_L	10s	260		℃
electrostatic discharge	ESD	HBM	2000		V

3.2、Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	V_{CC}	-	1.2	-	5.5	V
input voltage	V_I	-	0	-	5.5	V
output voltage	V_O	Active mode	0	-	V_{CC}	V
		Power-down mode; V_{CC}=0V	0	-	5.5	V
		output 3-state	0	-	5.5	V
ambient temperature	T_{amb}	-	-40	-	+125	℃

3.3、Electrical Characteristics

3.3.1、DC Characteristics 1

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

Parameter	Symbol	V_{CC}	Conditions	Min.	Typ.	Max.	Unit
HIGH-level input voltage	V_{IH}	1.2V	-	1.08	-	-	V
		1.65V to 1.95V	-	0.65× V_{CC}	-	-	V
		2.3V to 2.7V	-	1.7	-	-	V
		2.7V to 3.6V	-	2.0	-	-	V
		4.5V to 5.5V	-	0.7× V_{CC}	-	-	V
LOW-level input voltage	V_{IL}	1.2V	-	-	-	0.12	V
		1.65V to 1.95V	-	-	-	0.35× V_{CC}	V
		2.3V to 2.7V	-	-	-	0.7	V
		2.7V to 3.6V	-	-	-	0.8	V
		4.5V to 5.5V	-	-	-	0.3× V_{CC}	V
HIGH-level output voltage	V_{OH}	1.65V to 5.5V	I_O=-100uA	V_{CC}-0.2	-	-	V
		1.65V	I_O =-4mA	1.2	-	-	V
		2.3V	I_O =-8mA	1.8	-	-	V
		2.7V	I_O =-12mA	2.2	-	-	V
		3.0V	I_O =-18mA	2.4	-	-	V
		3.0V	I_O =-24mA	2.2	-	-	V
		4.5V	I_O =-32mA	3.8	-	-	V
LOW-level output voltage	V_{OL}	1.65V to 5.5V	I_O=100uA	-	-	0.2	V
		1.65V	I_O =4mA	-	-	0.45	V
		2.3V	I_O =8mA	-	-	0.6	V
		2.7V	I_O =12mA	-	-	0.4	V
		3.0V	I_O =24mA	-	-	0.55	V
		4.5V	I_O =32mA	-	-	0.55	V
input leakage	I_I	3.6V	V_I=5.5V or GND	-	-	±5	uA
OFF-state output current	I_{OZ}	3.6V	V_I=V_{IH} or V_{IL}; V_O=5.5V or GND	-	-	±5	uA
power-off leakage current	I_{OFF}	0V	V_I or V_O=5.5V	-	-	±10	uA
supply current	I_{CC}	3.6V	V_I=V_{CC} or GND; I_O=0A	-	-	10	uA
additional supply current	ΔI_{CC}	2.7V to 3.6V	per input pin; V_I= V_{CC}-0.6V; I_O=0A	-	-	500	uA

3.3.2、DC Characteristics 2

(T_{amb}=-40℃ to +125℃, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	V_{CC}	Conditions	Min.	Typ.	Max.	Unit
HIGH-level input voltage	V_{IH}	1.2V	-	1.08	-	-	V
		1.65V to 1.95V	-	0.65× V_{CC}	-	-	V
		2.3V to 2.7V	-	1.7	-	-	V
		2.7V to 3.6V	-	2.0	-	-	V
		4.5V to 5.5V	-	0.7× V_{CC}	-	-	V
LOW-level input voltage	V_{IL}	1.2V	-	-	-	0.12	V
		1.65V to 1.95V	-	-	-	0.35× V_{CC}	V
		2.3V to 2.7V	-	-	-	0.7	V
		2.7V to 3.6V	-	-	-	0.8	V
		4.5V to 5.5V	-	-	-	0.3× V_{CC}	V
HIGH-level output voltage	V_{OH}	1.65V to 5.5V	I_O=-100uA	V_{CC}-0.3	-	-	V
		1.65V	I_O =-4mA	1.05	-	-	V
		2.3V	I_O =-8mA	1.65	-	-	V
		2.7V	I_O =-12mA	2.05	-	-	V
		3.0V	I_O =-18mA	2.25	-	-	V
		3.0V	I_O =-24mA	2.0	-	-	V
		4.5V	I_O =-32mA	3.4	-	-	V
LOW-level output voltage	V_{OL}	1.65V to 5.5V	I_O=100uA	-	-	0.3	V
		1.65V	I_O =4mA	-	-	0.65	V
		2.3V	I_O =8mA	-	-	0.8	V
		2.7V	I_O =12mA	-	-	0.6	V
		3.0V	I_O =24mA	-	-	0.8	V
		4.5V	I_O =32mA	-	-	0.8	V
input leakage	I_I	3.6V	V_I=5.5V or GND	-	-	±20	uA
OFF-state output current	I_{OZ}	3.6V	V_I=V_{IH} or V_{IL}; V_O=5.5V or GND	-	-	±20	uA
power-off leakage current	I_{OFF}	0V	V_I or V_O=5.5V	-	-	±20	uA
supply current	I_{CC}	3.6V	V_I=V_{CC} or GND; I_O=0A	-	-	40	uA
additional supply current	ΔI_{CC}	2.7V to 3.6V	per input pin; V_I= V_{CC}-0.6V; I_O=0A	-	-	5000	uA

3.3.3、AC Characteristics 1

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

Parameter	Symbol	V_{CC}	Conditions	Min.	Typ.[1]	Max.	Unit
CP to Qn propagation delay	t_{PLH}, t_{PHL}	1.2V	see Figure 4	-	16.0	-	ns
		1.65V to 1.95V		2.2	7.4	16.3	ns
		2.3V to 2.7V		1.5	3.9	8.4	ns
		2.7V		1.5	3.5	8.0	ns
		3.0V to 3.6V		1.5	3.3	7.0	ns
		4.5V to 5.5V		1.5	2.9	6.1	ns
$\overline{OE}$ to Qn; enable time	t_{PZH}, t_{PZL}	1.2V	see Figure 6	-	19.0	-	ns
		1.65V to 1.95V		1.5	6.6	16.7	ns
		2.3V to 2.7V		1.5	3.7	9.3	ns
		2.7V		1.5	3.8	8.5	ns
		3.0V to 3.6V		1.5	3.0	7.5	ns
		4.5V to 5.5V		1.5	2.6	6.5	ns
$\overline{OE}$ to Qn disable time	t_{PLZ}, t_{PHZ}	1.2V	see Figure 6	-	8.0	-	ns
		1.65V to 1.95V		2.3	4.0	10.1	ns
		2.3V to 2.7V		1.0	2.2	5.7	ns
		2.7V		1.5	3.1	6.5	ns
		3.0V to 3.6V		1.5	2.9	6.0	ns
		4.5V to 5.5V		1.5	2.5	5.2	ns
clock HIGH or LOW pulse width	t_W	1.65V to 1.95V	see Figure 5	5.0	-	-	ns
		2.3V to 2.7V		4.0	-	-	ns
		2.7V		3.0	-	-	ns
		3.0V to 3.6V		3.0	-	-	ns
		4.5V to 5.5V		3.0	-	-	ns
Dn toCP set-up time	t_{su}	1.65V to 1.95V	see Figure 7	4.0	-	-	ns
		2.3V to 2.7V		3.0	-	-	ns
		2.7V		2.0	-	-	ns
		3.0V to 3.6V		2.0	-	-	ns
		4.5V to 5.5V		2.0	-	-	ns
Dn to CP hold time	t_h	1.65V to 1.95V	see Figure 7	3.0	-	-	ns
		2.3V to 2.7V		2.0	-	-	ns
		2.7V		1.5	-	-	ns
		3.0V to 3.6V		1.5	-	-	ns
		4.5V to 5.5V		1.5	-	-	ns

Note:

[1] Typical values are measured at T_{amb}=25℃ and V_{CC}=1.2V, 1.8V, 2.5V, 2.7V, and 3.3V respectively.

3.3.4、AC Characteristics 2

(T_{amb}=-40℃ to +125℃, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	V_{CC}	Conditions	Min.	Typ	Max.	Unit
Dn to Qn propagation delay	t_{PLH}, t_{PHL}	1.65V to 1.95V	see Figure 4	2.2	-	18.8	ns
		2.3V to 2.7V		1.5	-	9.7	ns
		2.7V		1.5	-	10.0	ns
		3.0V to 3.6V		1.5	-	9.0	ns
		4.5V to 5.5V		1.5	-	7.8	ns
$\overline{OE}$ to Qn; enable time	t_{PZH}, t_{PZL}	1.65V to 1.95V	see Figure 6	1.5	-	19.3	ns
		2.3V to 2.7V		1.5	-	10.8	ns
		2.7V		1.5	-	11.0	ns
		3.0V to 3.6V		1.5	-	9.5	ns
		4.5V to 5.5V		1.5	-	8.3	ns
$\overline{OE}$ to Qn disable time	t_{PLZ}, t_{PHZ}	1.65V to 1.95V	see Figure 6	2.3	-	11.7	ns
		2.3V to 2.7V		1.0	-	6.7	ns
		2.7V		1.5	-	9.0	ns
		3.0V to 3.6V		1.5	-	7.5	ns
		4.5V to 5.5V		1.5	-	6.5	ns
clock HIGH or LOW pulse width	t_W	1.65V to 1.95V	see Figure 5	5.0	-	-	ns
		2.3V to 2.7V		4.0	-	-	ns
		2.7V		4.5	-	-	ns
		3.0V to 3.6V		4.5	-	-	ns
		4.5V to 5.5V		4.5	-	-	ns
Dn to CP set-up time	t_{su}	1.65V to 1.95V	see Figure 7	4.0	-	-	ns
		2.3V to 2.7V		3.0	-	-	ns
		2.7V		2.0	-	-	ns
		3.0V to 3.6V		2.0	-	-	ns
		4.5V to 5.5V		2.0	-	-	ns
Dn to CP hold time	t_h	1.65V to 1.95V	see Figure 7	3.0	-	-	ns
		2.3V to 2.7V		2.0	-	-	ns
		2.7V		1.5	-	-	ns
		3.0V to 3.6V		1.5	-	-	ns
		4.5V to 5.5V		1.5	-	-	ns

4、Testing Circuit

4.1、AC Testing Circuit

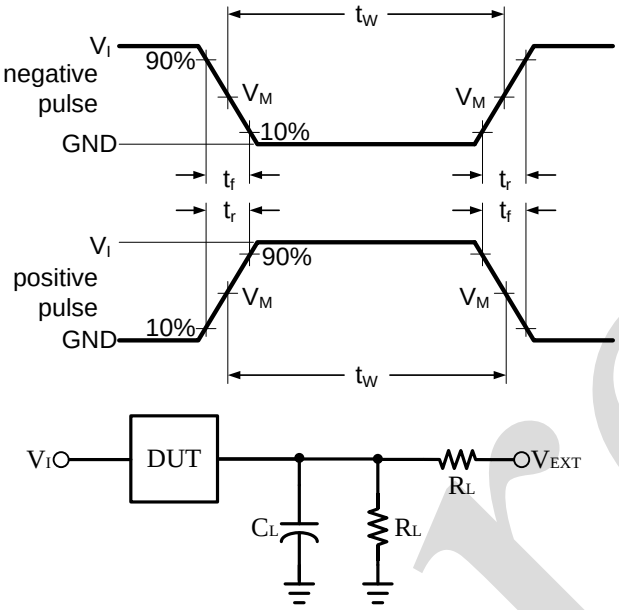


Figure 3. Test circuit for measuring switching times

Definitions for test circuit:

R_L=Load resistance.

C_L=Load capacitance including jig and probe capacitance.

4.2、Test Data

Supply voltage	Input		Load		V_{EXT}		
V_{CC}	V_I	t_r, t_f	C_L	R_L	t_{PLH}, t_{PHL}	t_{PLZ}, t_{PZL}	t_{PHZ}, t_{PZH}
1.2V	V_{CC}	≤ 2ns	30pF	1kΩ	open	2×V_{CC}	GND
1.65V to 1.95V	V_{CC}	≤ 2ns	30pF	1kΩ	open	2×V_{CC}	GND
2.3V to 2.7V	V_{CC}	≤ 2ns	30pF	500Ω	open	2×V_{CC}	GND
2.7V	2.7V	≤ 2.5ns	50pF	500Ω	open	2×V_{CC}	GND
3.0V to 3.6V	2.7V	≤ 3ns	50pF	500Ω	open	2×V_{CC}	GND

4.3、AC Testing Waveforms

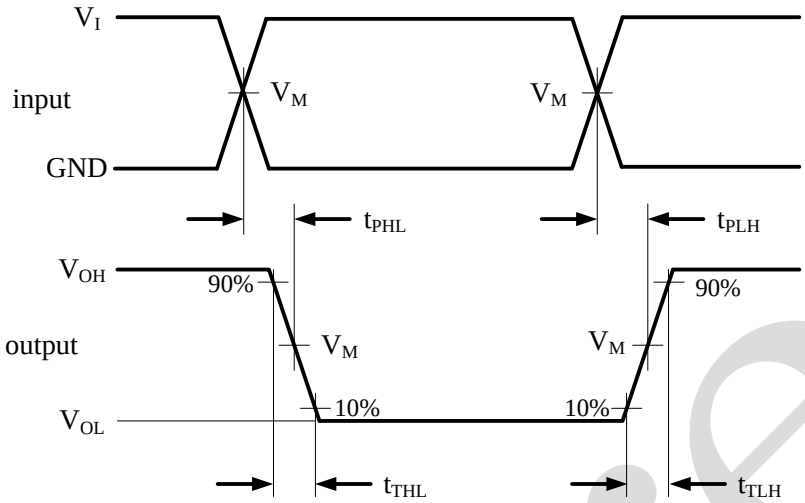


Figure 4. Input (Dn) to output (Qn) propagation delays

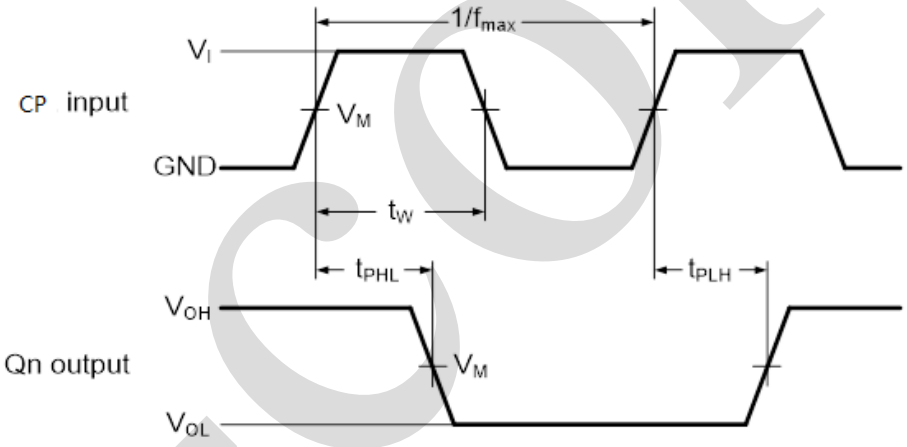


Figure 5. Clock (CP) to output (Qn) propagation delays, the clock pulse width, output transition times, and the maximum frequency

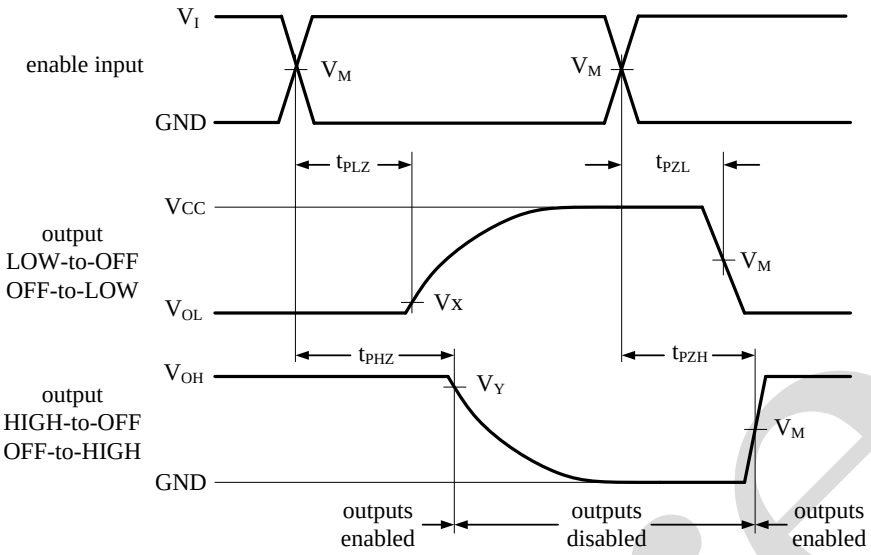


Figure 6. 3-state enable and disable times

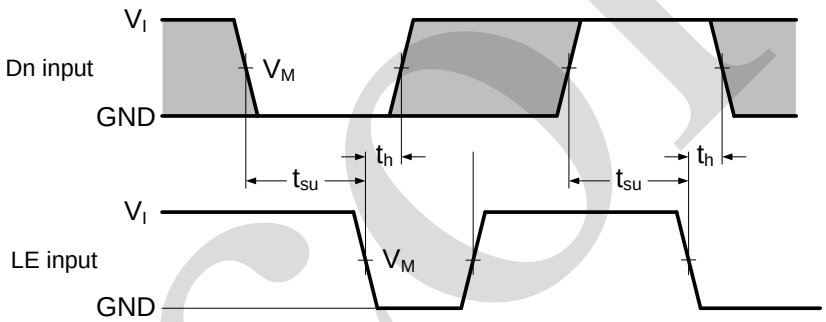


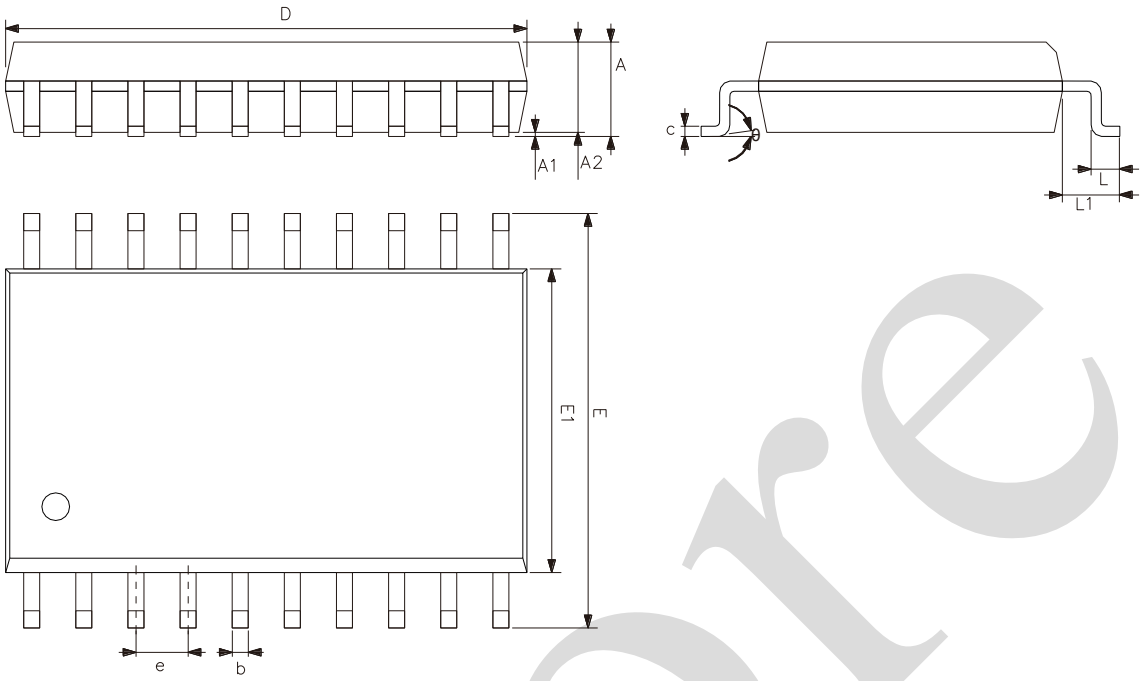
Figure 7. Data set-up and hold times for the Dn input to the LE input

4.4、Measurement Points

Supply voltage	Input		Output		
V_{CC}	V_I	V_M	V_M	V_X	V_Y
1.2V	V_{CC}	0.5×V_{CC}	0.5×V_{CC}	V_{OL}+0.15V	V_{OH}-0.15V
1.65V to 1.95V	V_{CC}	0.5×V_{CC}	0.5×V_{CC}	V_{OL}+0.15V	V_{OH}-0.15V
2.3V to 2.7V	V_{CC}	0.5×V_{CC}	0.5×V_{CC}	V_{OL}+0.15V	V_{OH}-0.15V
2.7V	2.7V	1.5V	1.5V	V_{OL}+0.3V	V_{OH}-0.3V
3.0V to 3.6V	2.7V	1.5V	1.5V	V_{OL}+0.3V	V_{OH}-0.3V

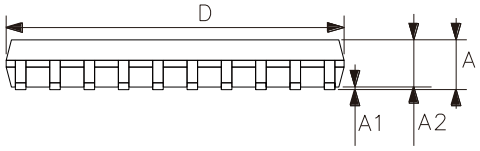
5、Package Information

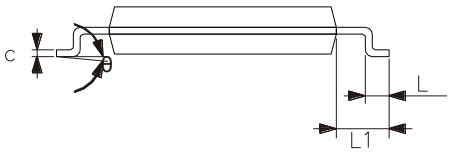
5.1、SOP20

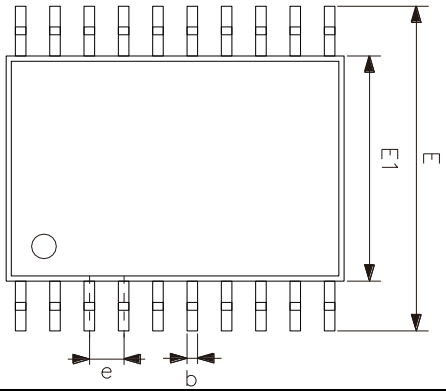


Symbol	Dimensions (mm)	
	Min.	Max.
A	2.47	2.65
A1	0.05	0.30
A2	2.20	2.44
b	0.35	0.50
c	0.15	0.30
D	12.54	12.94
E	10.00	10.60
E1	7.30	7.70
e	1.27	
L	0.40	1.05
L1	1.30	1.50
θ	0 °	8 °

5.2、TSSOP20







Symbol	Dimensions (mm)	
	Min.	Max.
A	-	1.20
A1	0.05	0.15
A2	0.80	1.05
b	0.19	0.30
c	0.09	0.20
D	6.40	6.60
E1	4.30	4.50
E	6.20	6.60
e	0.65	
L	0.45	0.75
L1	1.00	
θ	0°	8°

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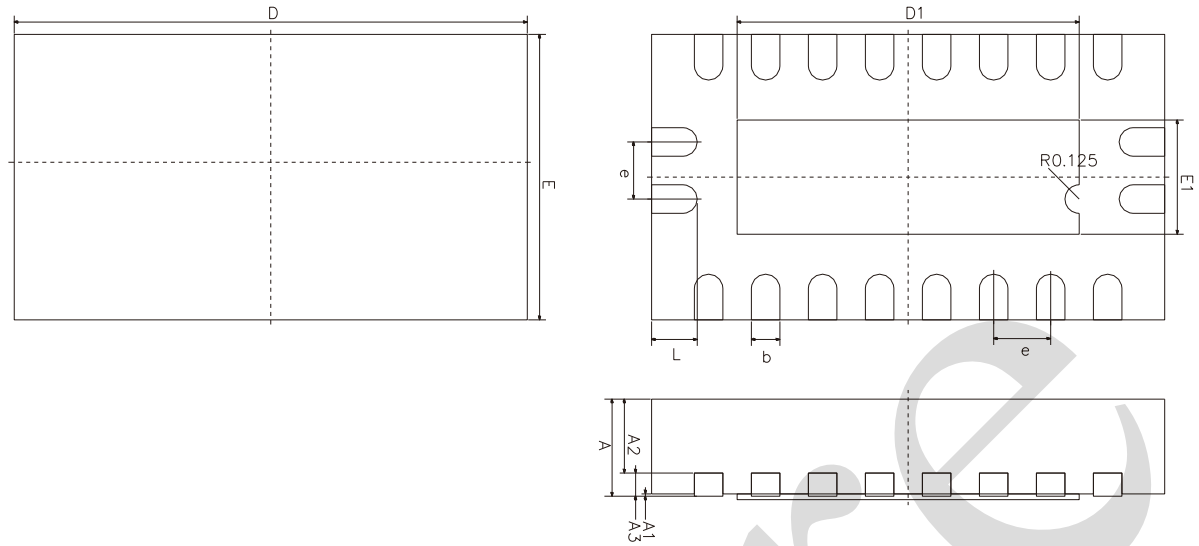
5.3、DHVQFN20



Symbol	Dimensions (mm)	
	Min.	Max.
A	0.80	1.00
A1	0.00	0.05
A2	0.60	0.70
A3	0.20	
D	4.40	4.60
E	2.40	2.60
e	0.50	
b	0.18	0.30
L	0.30	0.50
D1	2.70	3.15
E1	0.70	1.15

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、Notes

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