

Octal Buffer/Line Driver: 3-state

CJ74LVC244 Logic

1 Introduction

The CJ74LVC244 is an octal non-inverting buffer/line driver with 3-state outputs. The 3-state outputs are controlled by the output enable inputs /1OE and /2OE. A HIGH on /nOE causes the outputs to assume a high-impedance OFF-state.

Inputs can be driven from either 3.3 V or 5.0 V devices. In 3-state operation, outputs can handle 5V. These features allow the use of these devices as translators in a mixed 3.3 V and 5V environment.

2 Available Packages

PART NUMBER	PACKAGE
CJ74LVC244	SOP20
	TSSOP20
	QFN4.5x2.5-20L

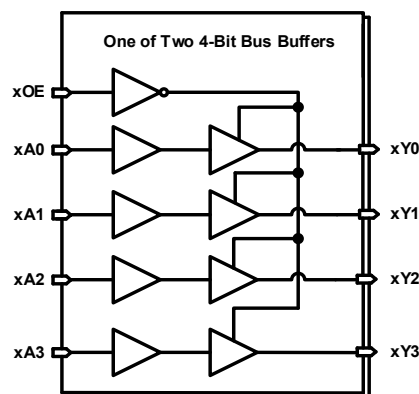
Note: If the physical information is inconsistent with the ordering information, please refer to the actual product.

3 Features

- 5 V 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 $V_{CC} = 0V$

4 Applications

- Servers
- LED displays
- Network switches
- Telecom infrastructure
- Motor drivers
- I/O expanders



Logic diagram

5 Orderable Information

DEVICE	PACKAGE	OP TEMP	ECO PLAN	MSL	PACKING OPTION	SORT
CJ74LVC244AGN	SOP20	-40~125°C	RoHS & Green	Level 3 168HR	Tape and Reel 2000 Units / Reel	Active
CJ74LVC244BGN	TSSOP20	-40~125°C	RoHS & Green	Level 3 168HR	Tape and Reel 4000 Units / Reel	Active
CJ74LVC244QDN	QFN4.5x2.5-20L	-40~125°C	RoHS & Green	Level 3 168HR	Tape and Reel 3000 Units / Reel	Active

Note:

ECO PLAN: For the RoHS and Green certification standards of this product, please refer to the official report provided by JSCJ.

MSL: Moisture Sensitivity Level. Determined according to JEDEC industry standard classification.

SORT: Specifically defined as follows:

Active: Recommended for new products;

Customized: Products manufactured to meet the specific needs of customers;

Preview: The device has been released and has not been fully mass produced. The sample may or may not be available;

NoRD: It is not recommended to use the device for new design. The device is only produced for the needs of existing customers;

Obsolete: The device has been discontinued.

6 Pin Configuration and Marking Information

6.1 Pin Configuration

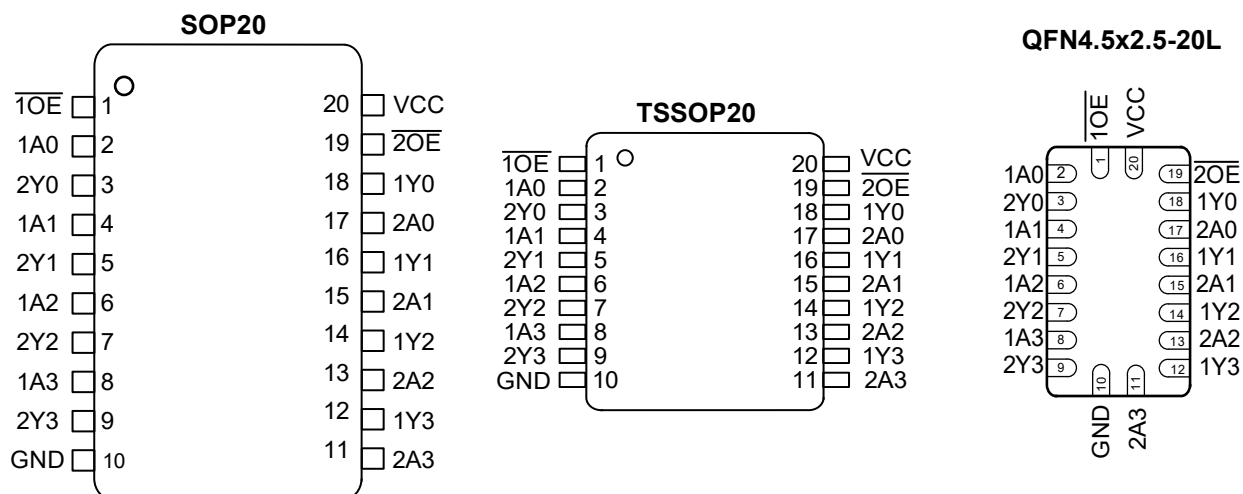


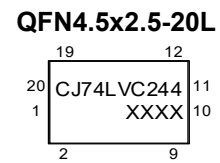
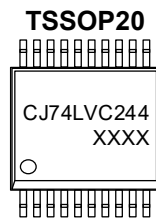
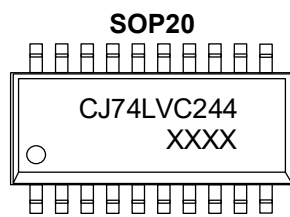
Figure 6-1 Pin configuration

6.2 Pin Function

PIN		I/O ⁽¹⁾	DESCRIPTION
No.	NAME		
1	$\overline{1OE}$	I	Output enable input (active LOW)
2	1A0	I	Data input
3	2Y0	O	Bus output
4	1A1	I	Data input
5	2Y1	O	Bus output
6	1A2	I	Data input
7	2Y2	O	Bus output
8	1A3	I	Data input
9	2Y3	O	Bus output
10	GND	G	Ground (0V)
11	2A3	I	Data input
12	1Y3	O	Bus output
13	2A2	I	Data input
14	1Y2	O	Bus output
15	2A1	I	Data input
16	1Y1	O	Bus output
17	2A0	I	Data input
18	1Y0	O	Bus output
19	$\overline{2OE}$	I	Output enable input (active LOW)
20	VCC	P	Supply voltage

(1) I-Input, O-Output, P-Power, G-Ground.

6.3 Marking Information



XXXX: Code, indicates weekly record information.

7 Specifications

7.1 Absolute Maximum Ratings

Voltages are referenced to GND(ground=0V), unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CC}	Supply voltage	-	-0.5	6.5	V
I_{IK}	Input clamping current	$V_I < 0V$	-50	-	mA
V_I	Input voltage	-	-0.5	6.5	V
I_{OK}	Output clamping current	$V_O > V_{CC}$ or $V_O < 0V$	-	± 50	mA
V_O	Output voltage	Output HIGH or LOW	-0.5	$V_{CC}+0.5$	V
		Output 3-state	-0.5	6.5	V
I_O	Output current	$V_O=0V$ to V_{CC}	-	± 50	mA
I_{CC}	Supply current	-	-	100	mA
I_{GND}	Ground current	-	-100	-	mA
T_{stg}	Storage temperature	-	-65	150	°C
P_{tot}	Total power dissipation	-	-	500	mW
T_L	Soldering temperature	10s	-	260	°C

Note: Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are absolute voltages referenced to GND. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions.

7.2 Recommended Operating Conditions

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CC}	Supply voltage	-	1.65	-	3.6	V
		Functional	1.2	-	3.6	V
V_I	Input voltage	-	0	-	5.5	V
V_O	Output voltage	Output HIGH or LOW	0	-	V_{CC}	V
		Output 3-state	0	-	5.5	V
T_{amb}	Ambient temperature	In free air	-40	-	+125	°C
$\Delta t/\Delta V$	Input transition rise and fall rate	$V_{CC}= 1.2V$ to $2.7V$	0	-	20	ns/V
		$V_{CC}= 2.7V$ to $3.6V$	0	-	10	ns/V

7.3 ESD Ratings

SYMBOL	ESD RATINGS		VALUE	UNIT
$V_{ESD-HBM}$	Electrostatic discharge	Human body model (HBM) ⁽¹⁾	± 4000	V

(1) JEDEC document JEP155 states that 500-V H1BM allows safe manufacturing with a standard ESD control process.

7.4 Electrical Characteristics

7.4.1 DC Characteristics 1

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

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
V _{IH}	HIGH-level input voltage	V _{CC} = 1.2V		1.08	-	-	V
		V _{CC} = 1.65V to 1.95V		0.65xV _{CC}	-	-	V
		V _{CC} = 2.3V to 2.7V		1.7	-	-	V
		V _{CC} = 2.7V to 3.6V		2.0	-	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 1.2V		-	-	0.12	V
		V _{CC} = 1.65V to 1.95V		-	-	0.35xV _{CC}	V
		V _{CC} = 2.3V to 2.7V		-	-	0.7	V
		V _{CC} = 2.7V to 3.6V		-	-	0.8	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}	I _O = -100uA; V _{CC} = 1.65 V to 3.6 V	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
V _{OL}	LOW-level output voltage	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
I _I	Input leakage current	V _{CC} =3.6V; V _I =5.5V or GND		-	-	±5	uA
I _{OZ}	OFF-state output current	V _{CC} =3.6V; V _I =V _{IH} or V _{IL} ; V _O =5.5V or GND		-	-	±5	uA
I _{OFF}	Power-off leakage current	V _{CC} =0V; V _I or V _O =5.5V		-	-	±10	uA
I _{CC}	Supply current	V _{CC} =3.6 V; V _I =V _{CC} or GND; I _O =0A		-	-	10	uA
ΔI _{CC}	Additional supply current	Per input pin; V _{CC} =2.7V to 3.6V; V _I = V _{CC} -0.6V; I _O =0A		-	-	500	uA
C _I	Input capacitance	-		-	4	-	pF

Note:

- (1) All typical values are measured at $V_C = 3.3\text{V}$ (unless stated otherwise) and $T_{amb} = 25^{\circ}\text{C}$.
- (2) The bus hold circuit is switched off when $V_I > V_{CC}$ allowing 5.5 V on the input terminal.

7.4.2 DC Characteristics 2

$T_{amb} = -40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, voltages are referenced to GND (ground=0V), unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
V _{IH}	HIGH-level input voltage	V _{CC} = 1.2V		1.08	-	-	V
		V _{CC} = 1.65V to 1.95V		0.65xV _{CC}	-	-	V
		V _{CC} = 2.3V to 2.7V		1.7	-	-	V
		V _{CC} = 2.7V to 3.6V		2.0	-	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 1.2V		-	-	0.12	V
		V _{CC} = 1.65V to 1.95V		-	-	0.35xV _{CC}	V
		V _{CC} = 2.3V to 2.7V		-	-	0.7	V
		V _{CC} = 2.7V to 3.6V		-	-	0.8	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}	I _O = -100uA; V _{CC} = 1.65 V to 3.6 V	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
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}	I _O = 100uA; 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
I _I	Input leakage current	V _{CC} =3.6V; V _I =5.5V or GND		-	-	±20	uA
I _{OZ}	OFF-state output current	V _{CC} =3.6V; V _I =V _{IH} or V _{IL} ; V _O =5.5V or GND		-	-	±20	uA
I _{OFF}	Power-off leakage current	V _{CC} =0V; V _I or V _O =5.5V		-	-	±20	uA
I _{CC}	Supply current	V _{CC} =3.6 V; V _I =V _{CC} or GND; I _O =0A		-	-	40	uA
ΔI _{CC}	Additional supply current	per input pin; V _{CC} =2.7V to 3.6V; V _I = V _{CC} -0.6V; I _O =0A		-	-	5000	uA

Note:

- (1) All typical values are measured at $V_{CC} = 3.3\text{V}$ (unless stated otherwise) and $T_{amb} = 25^{\circ}\text{C}$.
 (2) The bus hold circuit is switched off when $V_I > V_{CC}$ allowing 5.5 V on the input terminal.

7.4.3 AC Characteristics 1

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

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
t _{pd}	nAn to nYn propagation delay	See Figure 8-5	V _{CC} = 1.2V	-	17.0	-	ns
			V _{CC} = 1.65V to 1.95V	1.5	6.4	13.7	ns
			V _{CC} = 2.3V to 2.7V	1.0	3.4	7.1	ns
			V _{CC} = 2.7V	1.5	3.4	6.9	ns
			V _{CC} =3.0V to 3.6V	1.5	2.9	5.9	ns
t _{en}	nOE to nYn enable time	See Figure 8-6	V _{CC} = 1.2V	-	24.0	-	ns
			V _{CC} = 1.65V to 1.95V	1.5	7.0	17.3	ns
			V _{CC} = 2.3V to 2.7V	1.5	3.9	9.5	ns
			V _{CC} = 2.7V	1.5	4.1	8.6	ns
			V _{CC} =3.0V to 3.6V	1.0	3.2	7.6	ns
t _{dis}	nOE to nYn disable time	See Figure 8-6	V _{CC} = 1.2V	-	9.0	-	ns
			V _{CC} = 1.65V to 1.95V	2.2	4.5	9.8	ns
			V _{CC} = 2.3V to 2.7V	0.5	3.6	5.5	ns
			V _{CC} = 2.7V	1.5	3.3	6.8	ns
			V _{CC} =3.0V to 3.6V	1.5	3.1	5.8	ns
t _{sk(o)}	Output skew time	-		-	-	1.0	ns
C _{PD}	Power dissipation capacitance	Per input; V _I = GND to V _{CC}	V _{CC} = 1.65V to 1.95V	-	6.4	-	pF
			V _{CC} = 2.3V to 2.7V	-	9.6	-	pF
			V _{CC} =3.0V to 3.6V	-	12.5	-	pF

Note:

- (1) Typical values are measured at T_{amb}=25°C and V_{CC}=1.2V, 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 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_{olt}.
N=number of inputs switching.
 $\sum (C_L \times V_{CC}^2 \times f_o)$ =sum of the outputs.

7.4.4 AC Characteristics 2

$T_{amb} = -40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, voltages are referenced to GND (ground=0V), unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
t _{pd}	nAn to nYn propagation delay	See Figure 8-5	V _{CC} = 1.65V to 1.95V	1.5	-	15.8	ns
			V _{CC} = 2.3V to 2.7V	1.0	-	8.2	ns
			V _{CC} = 2.7V	1.5	-	9.0	ns
			V _{CC} =3.0V to 3.6V	1.5	-	7.5	ns
t _{en}	$\overline{\text{nOE}}$ to nYn enable time	See Figure 8-6	V _{CC} = 1.65V to 1.95V	1.5	-	20.0	ns
			V _{CC} = 2.3V to 2.7V	1.5	-	11.0	ns
			V _{CC} = 2.7V	1.5	-	11.0	ns
			V _{CC} =3.0V to 3.6V	1.0	-	9.5	ns
t _{dis}	$\overline{\text{nOE}}$ to nYn disable time	See Figure 8-6	V _{CC} = 1.65V to 1.95V	2.2	-	11.3	ns
			V _{CC} = 2.3V to 2.7V	0.5	-	6.4	ns
			V _{CC} = 2.7V	1.5	-	8.5	ns
			V _{CC} =3.0V to 3.6V	1.5	-	7.5	ns
t _{sk(o)}	Output skew time	-		-	-	1.5	ns

Note:

- (1) Typical values are measured at $T_{amb} = 25^{\circ}\text{C}$ and $V_{CC} = 1.2\text{V}, 1.8\text{V}, 2.5\text{V}, 2.7\text{V}$, 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.

8 Detailed Description

8.1 Overview

The CJ74LVC244 is an octal non-inverting buffer/line driver with 3-state outputs. The 3-state outputs are controlled by the output enable inputs $\overline{1OE}$ and $\overline{2OE}$. A HIGH on $\overline{1OE}$ causes the outputs to assume a high-impedance OFF-state.

Inputs can be driven from either 3.3 V or 5.0 V devices. In 3-state operation, outputs can handle 5V. These features allow the use of these devices as translators in a mixed 3.3 V and 5V environment.

8.2 Functional Block Diagram

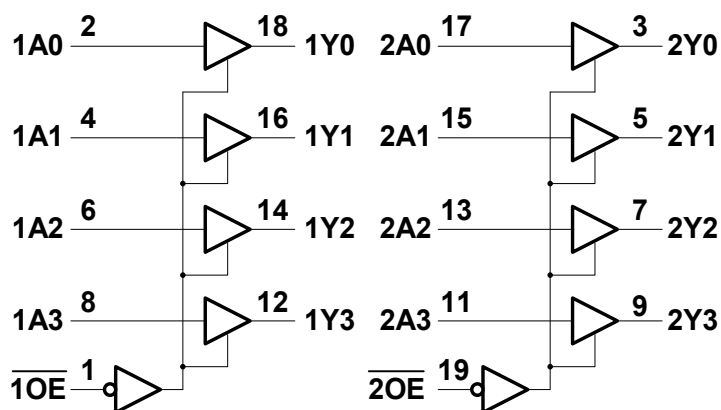


Figure 8-1 Logic symbol

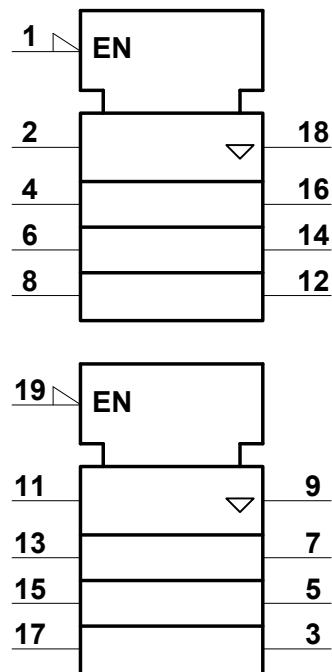


Figure 8-2 IEC Logic symbol

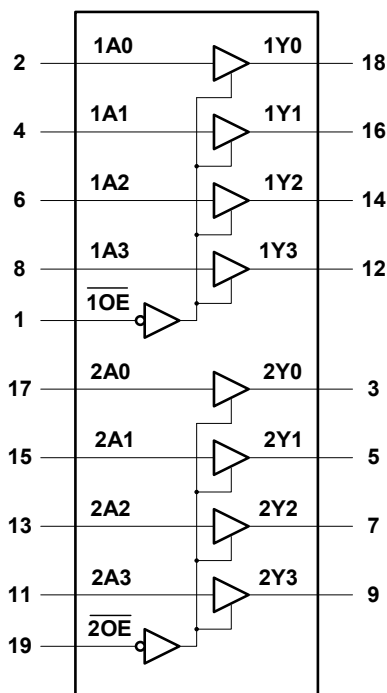


Figure 8-3 Functional diagram

8.3 Function Table⁽¹⁾

INPUT		OUTPUT
$\overline{\text{nOE}}$	nAn	nYn
L	L	L
L	H	H
H	X	Z

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

8.4 Testing Circuit

8.4.1 AC Testing Circuit

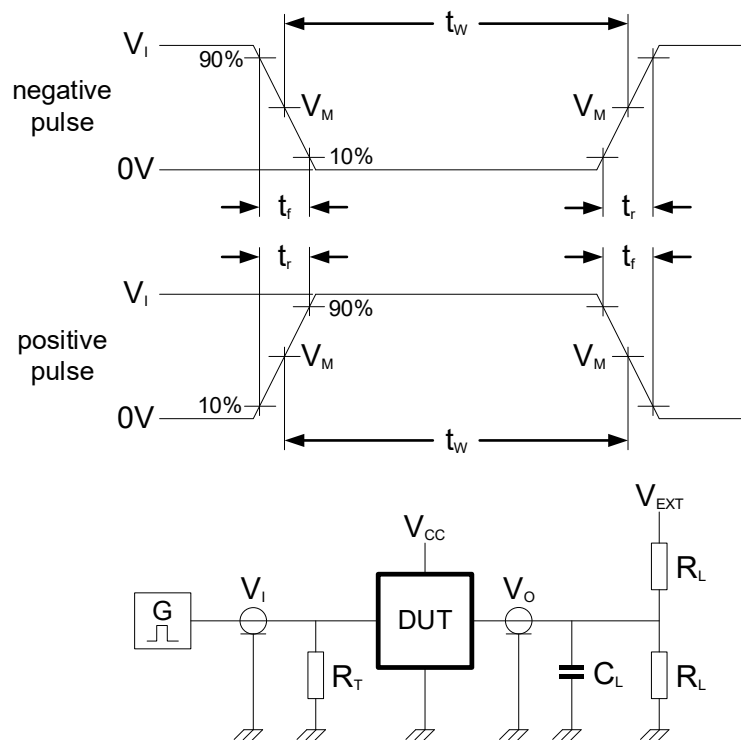


Figure 8-4 Test circuit for measuring switching times

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.

8.4.2 AC Testing Waveforms

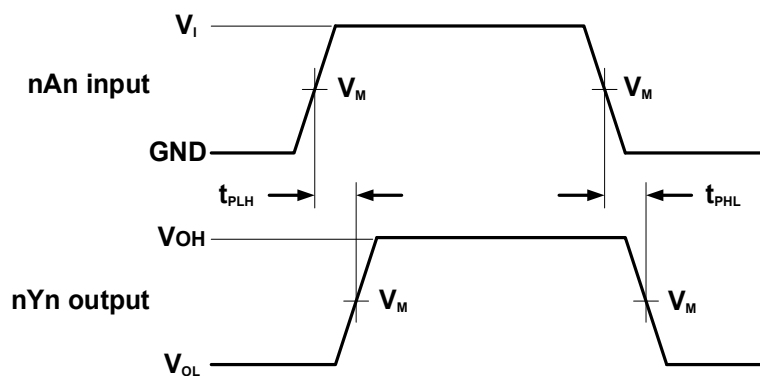


Figure 8-5 The input (nAn) to output (nYn) propagation delays

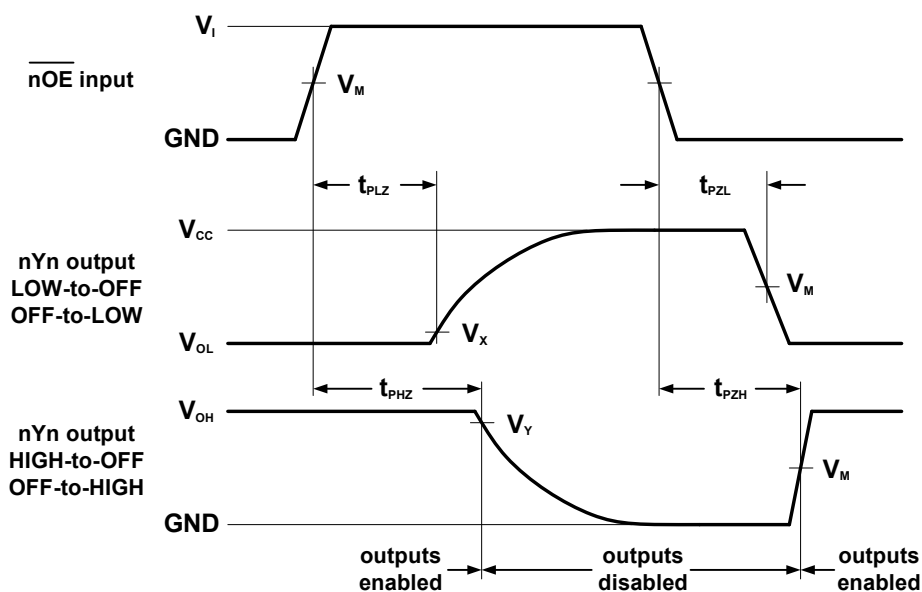


Figure 8-6 3-state enable and disable times

8.4.3 Measurement Points

SUPPLY VOLTAGE	INPUT		OUTPUT		
V_{CC}	V_I	V_M	V_M	V_X	V_Y
1.2V	V_{CC}	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.15V$	$V_{OH} - 0.15V$
1.65V to 1.95V	V_{CC}	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.15V$	$V_{OH} - 0.15V$
2.3V to 2.7V	V_{CC}	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.15V$	$V_{OH} - 0.15V$
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	$V_{OL} + 0.3V$	$V_{OH} - 0.3V$

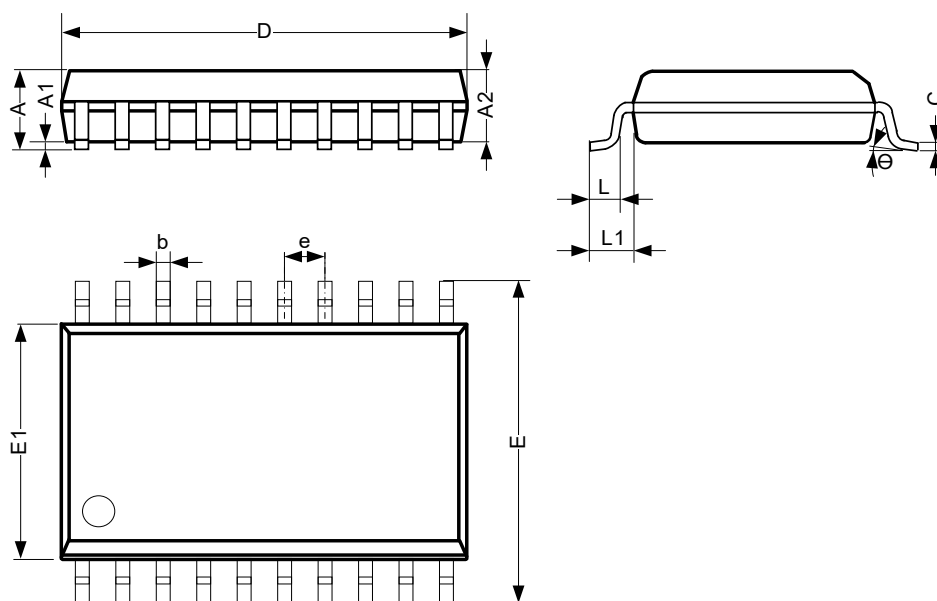
8.4.4 Test Data

SUPPLY VOLTAGE	INPUT		LOAD		V_{EXT}		
V_{CC}	V_I	t_r, t_f	C_L	R_L	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
1.2V	V_{CC}	$\leq 2.0ns$	30pF	1k Ω	Open	GND	$2 \times V_{CC}$
1.65V to 1.95V	V_{CC}	$\leq 2.0ns$	30pF	1k Ω	Open	GND	$2 \times V_{CC}$
2.3V to 2.7V	V_{CC}	$\leq 2.0ns$	30pF	500 Ω	Open	GND	$2 \times V_{CC}$
2.7V	2.7V	$\leq 2.5ns$	50pF	500 Ω	Open	GND	$2 \times V_{CC}$
3.0V to 3.6V	2.7V	$\leq 2.5ns$	50pF	500 Ω	Open	GND	$2 \times V_{CC}$

9 Mechanical Information

9.1 SOP20 Mechanical Information

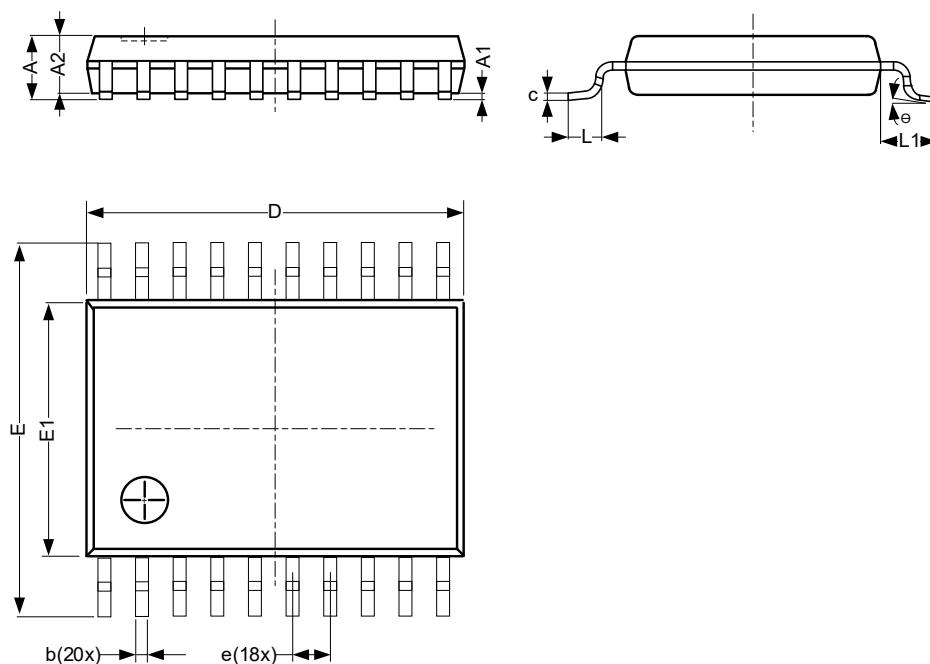
9.1.1 SOP20 Outline Dimensions



SYMBOL	Dimensions In Millimeters		
	Min.	Typ.	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 BSC		
L	0.40	-	1.05
L1	1.30	-	1.50
θ	0°	-	8°
Unit: mm			

9.2 TSSOP20 Mechanical Information

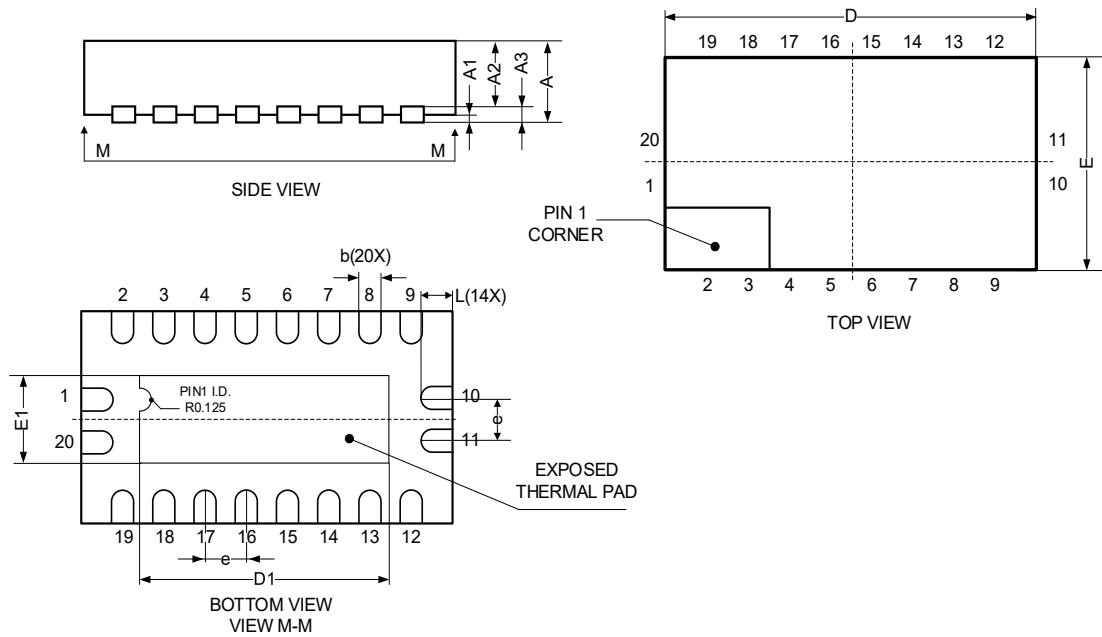
9.2.1 TSSOP20 Outline Dimensions



SYMBOL	Dimensions In Millimeters		
	Min.	Typ.	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
E	6.20	-	6.60
E1	4.30	-	4.50
e	0.65 BSC		
L	0.45	-	0.75
L1	-	1.00	-
θ	0°	-	8°
Unit: mm			

9.3 QFN4.5x2.5-20L Mechanical Information

9.3.1 QFN4.5x2.5-20L Outline Dimensions



SYMBOL	Dimensions In Millimeters		
	Min.	Typ.	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 BSC		
b	0.18	-	0.30
L	0.30	-	0.50
D1	2.70	-	3.15
E1	0.70	-	1.15
Unit: mm			

10 Notes and Revision History

10.1 Associated Product Family and Others

To view other products of the same type or IC products of other types, click the official website of JSCJ -- <https://www.jscj-elec.com> for more details.

10.2 Notes

Electrostatic Discharge Caution



This IC may be damaged by ESD. Relevant personnel shall comply with correct installation and use specifications to avoid ESD damage to the IC. If appropriate measures are not taken to prevent ESD damage, the hazards caused by ESD include but are not limited to degradation of integrated circuit performance or complete damage of integrated circuit. For some precision integrated circuits, a very small parameter change may cause the whole device to be inconsistent with its published specifications.

DISCLAIMER

IMPORTANT NOTICE, PLEASE READ CAREFULLY

The information in this data sheet is intended to describe the operation and characteristics of our products. JSCJ has the right to make any modification, enhancement, improvement, correction or other changes to any content in this data sheet, including but not limited to specification parameters, circuit design and application information, without prior notice.

Any person who purchases or uses JSCJ products for design shall: 1. Select products suitable for circuit application and design; 2. Design, verify and test the rationality of circuit design; 3. Procedures to ensure that the design complies with relevant laws and regulations and the requirements of such laws and regulations. JSCJ makes no warranty or representation as to the accuracy or completeness of the information contained in this data sheet and assumes no responsibility for the application or use of any of the products described in this data sheet.

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