Octal Bus Transceiver; 3-state

CJ74LVT/LVTH245 Logic

1 Introduction

The CJ74LVT245; CJ74LVTH245 is an octal transceiver featuring non-inverting 3-state bus compatible outputs in both send and receive directions. The control function implementation minimizes external timing requirements. It features an output enable (/OE) input for easy cascading and a direction (DIR) input for direction control.

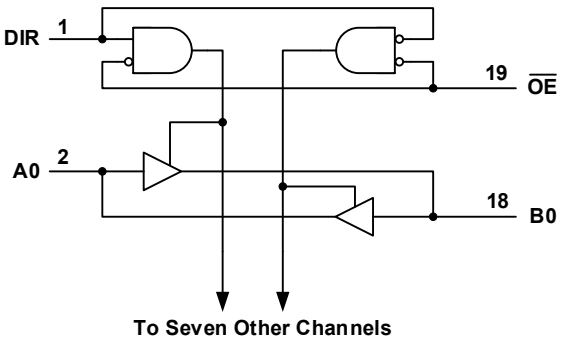
2 Available Packages

PART NUMBER	PACKAGE
CJ74LVT245	SOP20
	TSSOP20
	QFN4.5x2.5-20L
CJ74LVTH245	SOP20
	TSSOP20
	QFN4.5x2.5-20L

Note: For all available packages, please refer to the part Orderable Information.

3 Features

- 3-state buffers
- Octal bidirectional bus interface
- Input and output interface capability to systems at 5V supply
- Output capability: +64mA/-32mA
- Bus-hold data inputs eliminate the need for external pull-up resistors for unused inputs
- Live insertion/extraction permitted
- I_{OFF} and Power-up 3-state support Hot insertion
- No bus current loading when output is tied to 5V bus
- Specified from -40°C to +125°C



Logic diagram

4 Orderable Information

DEVICE	PACKAGE	OP TEMP	ECO PLAN	MSL	PACKING OPTION	SORT
CJ74LVT245AGN	SOP20	-40~125°C	RoHS & Green	Level 3 168HR	Tape and Reel 2000 Units/Reel	Active
CJ74LVTH245AGN	SOP20	-40~125°C	RoHS & Green	Level 3 168HR	Tape and Reel 2000 Units/Reel	Active
CJ74LVT245BGN	TSSOP20	-40~125°C	RoHS & Green	Level 3 168HR	Tape and Reel 4000 Units/Reel	Active
CJ74LVTH245BGN	TSSOP20	-40~125°C	RoHS & Green	Level 3 168HR	Tape and Reel 4000 Units/Reel	Active
CJ74LVT245QDN	QFN4.5x2.5-20L	-40~125°C	RoHS & Green	Level 3 168HR	Tape and Reel 3000 Units/Reel	Active
CJ74LVTH245QDN	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.

5 Pin Configuration and Marking Information

5.1 Pin Configuration

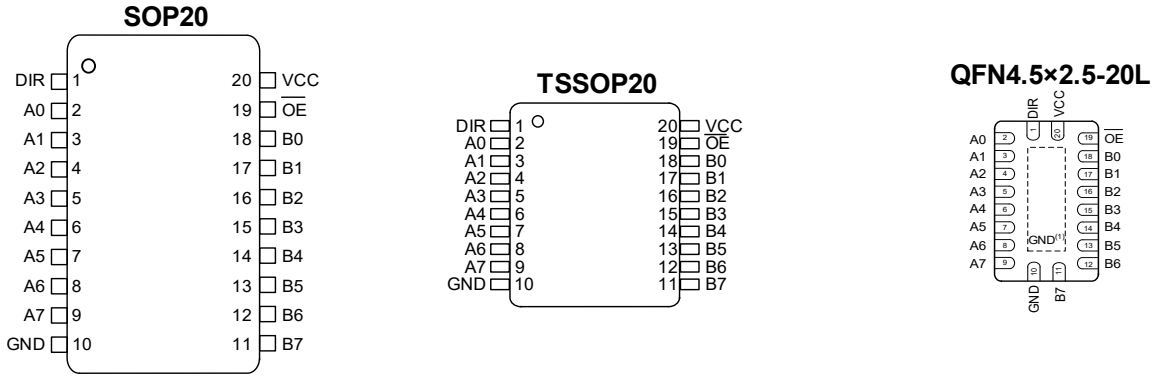


Figure 5-1 Pin configuration

(1) The die substrate is attached to this pad using a conductive die attach material. It can not be used as a supply pin or input.

5.2 Pin Function

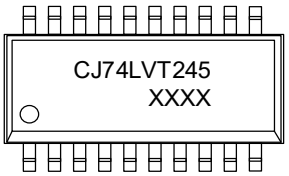
PIN		I/O(1)	DESCRIPTION
No.	NAME		
1	DIR	-	Direction control
2,3,4,5,6,7,8,9	A0 to A7	I/O	Data input/output
10	GND	G	Ground (0V)
18,17,16,15,14,13,12,11	B0 to B7	I/O	Data input/output
19	$\overline{OE}$	I	Output enable input (active LOW)
20	VCC	P	Supply voltage

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

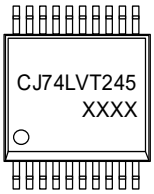
5.3 Marking Information

5.3.1 CJ74LVT245

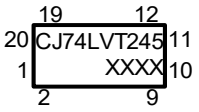
SOP20



TSSOP20



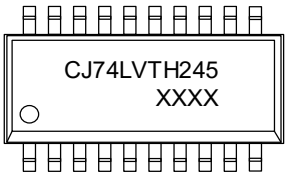
QFN4.5x2.5-20L



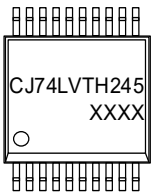
XXXX: Code, indicates weekly record information.

5.3.2 CJ74LVTH245

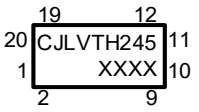
SOP20



TSSOP20



QFN4.5x2.5-20L



XXXX: Code, indicates weekly record information.

6 Specifications

6.1 Absolute Maximum Ratings

Voltages are referenced to GND(ground=0V), unless otherwise specified.(1)(2)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CC}	Supply voltage	-	-0.5	+7.0	V
V_I	Input voltage	-(3)	-0.5	+7.0	V
V_O	Output voltage	Output in OFF or HIGH state(3)	-0.5	+7.0	V
I_{IK}	Input clamping current	V_I<0V	-50	-	mA
I_{OK}	Output clamping current	V_O<0V	-50	-	mA
I_O	Output current	Output in LOW state	-	128	mA
		Output in HIGH state	-64	-	mA
T_{stg}	Storage temperature	-	-65	+150	°C
T_j	Junction temperature	-	-	+150	°C
P_{tot}	Total power dissipation	-	-	500	mW
T_L	Soldering temperature	10s	-	260	°C

(1) Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150°C.

(3) The input and output negative voltage ratings may be exceeded if the input and output clamp current ratings are observed.

6.2 Recommended Operating Conditions

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CC}	Supply voltage	-	2.7	-	5.5	V
V_I	Input voltage	-	0	-	5.5	V
I_{OH}	HIGH-level output current	-	-	-	-32	mA
I_{OL}	LOW-level output current	-	-	-	32	mA
		Current duty cycle≤50%; f_i≥1kHz	-	-	64	mA
T_{amb}	Ambient temperature	In free air	-40	-	+125	°C
Δt/ΔV	Input transition rise and fall rate	Output enabled	-	-	10	ns/V

6.3 Electrical Characteristics

6.3.1 DC Characteristics 1

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

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.(1)	MAX.	UNIT
V_{IK}	Input clamping voltage	V_{CC}=2.7V; I_{IK}= -18mA		-1.2	-0.9	-	V
V_{IH}	HIGH-level input voltage	-		2.0	-	-	V
V_{IL}	LOW-level input voltage	-		-	-	0.8	V
V_{OH}	HIGH-level output voltage	V_{CC}=2.7V to 3.6V; I_{OH}=-100uA		V_{CC}-0.2	V_{CC}-0.1	-	V
		V_{CC}=2.7V; I_{OH} =-8mA		2.4	2.5	-	V
		V_{CC}=3.0V; I_{OH} =-32mA		2.0	2.2	-	V
V_{OL}	LOW-level output voltage	V_{CC}=2.7V; I_{OL}=100uA		-	0.1	0.2	V
		V_{CC}=2.7V; I_{OL}=24mA		-	0.3	0.5	V
		V_{CC}=3.0V; I_{OL}=16mA		-	0.25	0.4	V
		V_{CC}=3.0V; I_{OL}=32mA		-	0.3	0.5	V
		V_{CC}=3.0V; I_{OL}=64mA		-	0.4	0.55	V
I_I	Input leakage current	Control pins	V_{CC}=0V or 3.6V; V_I=5.5V	-	-	10	uA
			V_{CC}=3.6V; V_I=V_{CC} or GND	-	-	±1	uA
			V_{CC}=3.6V; V_I=5.5V	-	-	20	uA
		I/O data pins(2)	V_{CC}=3.6V; V_I=V_{CC}	-	-	1	uA
			V_{CC}=3.6V; V_I=0V	-5	-	-	uA
I_{OFF}	Power-off leakage current	V_{CC}=0V; V_I or V_O=0V to 4.5V		-	-	±100	uA
I_{LO}	Output leakage current	V_O=5.5V; V_{CC}=3.6V; output HIGH		-	-	125	uA
$I_{O(pu/pd)}$	Power-up/ power-down output current	V_{CC}≤1.2V; V_O=0.5V to V_{CC}; V_I=GND or V_{CC}; $\overline{OE}$ =don't care(3)		-	-	±100	uA
I_{BHL}	Bus hold LOW current	V_{CC}=3.0V; V_I=0.8V		75	150	-	uA
I_{BHH}	Bus hold HIGH current	V_{CC}=3.0V; V_I=2.0V		-	-150	-75	uA
I_{BHLO}	Bus hold LOW overdrive current	V_{CC}=0V to 3.0V; V_I=3.6V(4)		500	-	-	uA
I_{BHHO}	Bus hold HIGH overdrive current	V_{CC}=0V to 3.0V; V_I=3.6V(4)		-	-	-500	uA
I_{CC}	Supply current	V_{CC}=3.6V; V_I=V_{CC} or GND; I_O=0A	Outputs HIGH	-	-	0.19	mA
			Outputs LOW	-	-	0.19	mA
			Outputs disabled	-	-	0.19	mA
ΔI_{CC}	Additional supply current	Per input pin; V_{CC}=3.0V to 3.6V; One input = V_{CC}-0.6V; Other inputs at V_{CC} or GND(5)		-	-	0.2	mA
C_I	Input capacitance	DIR and $\overline{OE}$ inputs; Outputs disabled; V_I=0V or 3.0V		-	4	-	pF

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.(1)	MAX.	UNIT
$C_{I/O}$	Input/output capacitance	At input/output data pins, Outputs disabled; $V_{I/O}$ = 0V or 3.0V	-	10	-	pF

(1) All typical values are measured at V_{CC}=3.3V (unless stated otherwise) and T_{amb}=25°C.

(2) Unused pins at V_{CC} or GND.

(3) This parameter is valid for any V_{CC} between 0V and 1.2V with a transition time of up to 10ms. From V_{CC}=1.2V to V_{CC}=3.3V±0.3V a transition time of 100ms is permitted. This parameter is valid for T_{amb}=+25°C only.

(4) This is the bus hold overdrive current required to force the input to the opposite logic state.

(5) This is the increase in supply current for each input at the specified voltage level other than V_{CC} or GND.

6.3.2 DC Characteristics 2

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

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.(1)	MAX.	UNIT
V_{IK}	Input clamping voltage	V_{CC}=2.7V; I_{IK}= -18mA		-1.2	-	-	V
V_{IH}	HIGH-level input voltage	-		2.0	-	-	V
V_{IL}	LOW-level input voltage	-		-	-	0.8	V
V_{OH}	HIGH-level output voltage	V_{CC}=2.7V to 3.6V; I_{OH}=-100uA		V_{CC}-0.2	-	-	V
		V_{CC}=2.7V; I_{OH} =-8mA		2.4	-	-	V
		V_{CC}=3.0V; I_{OH} =-32mA		2.0	-	-	V
V_{OL}	LOW-level output voltage	V_{CC}=2.7V; I_{OL}=100uA		-	-	0.2	V
		V_{CC}=2.7V; I_{OL}=24mA		-	-	0.5	V
		V_{CC}=3.0V; I_{OL}=16mA		-	-	0.4	V
		V_{CC}=3.0V; I_{OL}=32mA		-	-	0.5	V
		V_{CC}=3.0V; I_{OL}=64mA		-	-	0.55	V
I_I	Input leakage current	Control pins	V_{CC}=0V or 3.6V; V_I=5.5V	-	-	10	uA
			V_{CC}=3.6V; V_I=V_{CC} or GND	-	-	±1	uA
		I/O data pins(2)	V_{CC}=3.6V; V_I=5.5V	-	-	20	uA
			V_{CC}=3.6V; V_I=V_{CC}	-	-	1	uA
			V_{CC}=3.6V; V_I=0V	-5	-	-	uA
I_{OFF}	Power-off leakage current	V_{CC}=0V; V_I or V_O=0V to 4.5V		-	-	±100	uA
I_{LO}	Output leakage current	V_O=5.5V; V_{CC}=3.6V; output HIGH		-	-	125	uA
$I_{O(pu/pd)}$	Power-up/ power-down output current	V_{CC}≤1.2V; V_O=0.5V to V_{CC}; V_I=GND or V_{CC}; $\overline{OE}$ =don't care(3)		-	-	±100	uA
I_{BHL}	Bus hold LOW current	V_{CC}=3.0V; V_I=0.8V		75	-	-	uA
I_{BHH}	Bus hold HIGH current	V_{CC}=3.0V; V_I=2.0V		-	-	-75	uA
I_{BHLO}	Bus hold LOW overdrive current	V_{CC}=0V to 3.0V; V_I=3.6V(4)		500	-	-	uA
I_{BHHO}	Bus hold HIGH overdrive current	V_{CC}=0V to 3.0V; V_I=3.6V(4)		-	-	-500	uA

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.(1)	MAX.	UNIT
I_{CC}	Supply current	V_{CC}=3.6V; V_I=V_{CC} or GND; I_O=0A	Outputs HIGH	-	-	0.19	mA
			Outputs LOW	-	-	0.19	mA
			Outputs disabled	-	-	0.19	mA
ΔI_{CC}	Additional supply current	Per input pin; V_{CC}=3.0V to 3.6V; One input = V_{CC}-0.6V; Other inputs at V_{CC} or GND(5)		-	-	0.2	mA

(1) All typical values are measured at V_{CC}=3.3V (unless stated otherwise) and T_{amb}=25°C.

(2) Unused pins at V_{CC} or GND.

(3) This parameter is valid for any V_{CC} between 0V and 1.2V with a transition time of up to 10ms. From V_{CC}=1.2V to V_{CC}=3.3V±0.3V a transition time of 100ms is permitted. This parameter is valid for T_{amb}=+25°C only.

(4) This is the bus hold overdrive current required to force the input to the opposite logic state.

(5) This is the increase in supply current for each input at the specified voltage level other than V_{CC} or GND.

6.3.3 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.(1)	MAX.	UNIT
t_{PLH}	LOW to HIGH propagation delay	An to Bn or Bn to An	V_{CC}=2.7V	-	-	6.6	ns
			V_{CC}=3.3V±0.3V	1.0	3.4	5.6	ns
t_{PHL}	HIGH to LOW propagation delay	An to Bn or Bn to An	V_{CC}=2.7V	-	-	6.4	ns
			V_{CC}=3.3V±0.3V	1.0	3.4	5.6	ns
t_{PZH}	OFF-state to HIGH propagation delay	See Figure 7-5	V_{CC}=2.7V	-	-	9.9	ns
			V_{CC}=3.3V±0.3V	1.1	4.6	7.7	ns
t_{PZL}	OFF-state to LOW propagation delay	See Figure 7-5	V_{CC}=2.7V	-	-	9.1	ns
			V_{CC}=3.3V±0.3V	1.1	4.6	7.7	ns
t_{PHZ}	HIGH to OFF-state propagation delay	See Figure 7-5	V_{CC}=2.7V	-	-	9.1	ns
			V_{CC}=3.3V±0.3V	2.2	5.0	8.3	ns
t_{PLZ}	LOW to OFF-state propagation delay	See Figure 7-5	V_{CC}=2.7V	-	-	6.7	ns
			V_{CC}=3.3V±0.3V	2.0	4.8	6.7	ns

(1) Typical values are measured at T_{amb}=25°C and V_{CC}=3.3V.

6.3.4 AC Characteristics 2

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

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.(1)	MAX.	UNIT
t_{PLH}	LOW to HIGH propagation delay	An to Bn or Bn to An	V_{CC}=2.7V	-	-	7.8	ns
			V_{CC}=3.3V±0.3V	-	-	6.7	ns
t_{PHL}	HIGH to LOW propagation delay	An to Bn or Bn to An	V_{CC}=2.7V	-	-	7.7	ns
			V_{CC}=3.3V±0.3V	-	-	6.7	ns
t_{PZH}	OFF-state to HIGH propagation delay	See Figure 7-5	V_{CC}=2.7V	-	-	11.9	ns
			V_{CC}=3.3V±0.3V	-	-	9.2	ns
t_{PZL}	OFF-state to LOW propagation delay	See Figure 7-5	V_{CC}=2.7V	-	-	10.9	ns
			V_{CC}=3.3V±0.3V	-	-	9.2	ns
t_{PHZ}	HIGH to OFF-state propagation delay	See Figure 7-5	V_{CC}=2.7V	-	-	10.9	ns
			V_{CC}=3.3V±0.3V	-	-	9.9	ns
t_{PLZ}	LOW to OFF-state propagation delay	See Figure 7-5	V_{CC}=2.7V	-	-	8.1	ns
			V_{CC}=3.3V±0.3V	-	-	8.1	ns

(1) Typical values are measured at T_{amb}=25°C and V_{CC}=3.3V.

7 Detailed Description

7.1 Overview

The CJ74LVT245; CJ74LVTH245 is an octal transceiver featuring non-inverting 3-state bus compatible outputs in both send and receive directions. The control function implementation minimizes external timing requirements. It features an output enable (/OE) input for easy cascading and a direction (DIR) input for direction control.

7.2 Functional Block Diagram

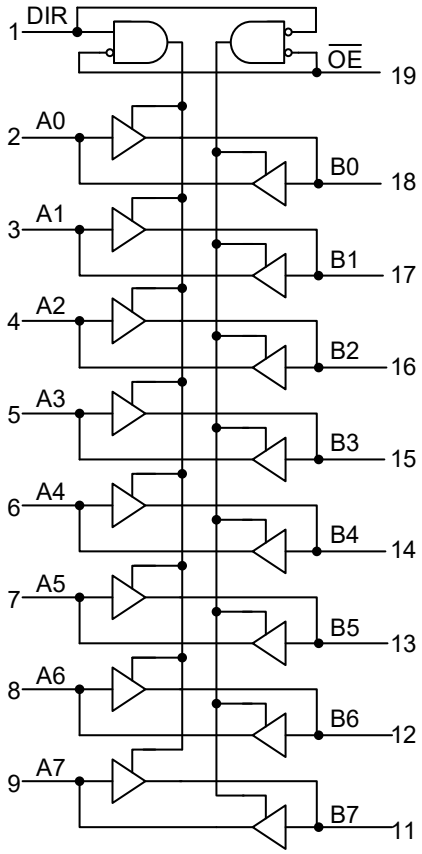


Figure 7-1 Logic symbol

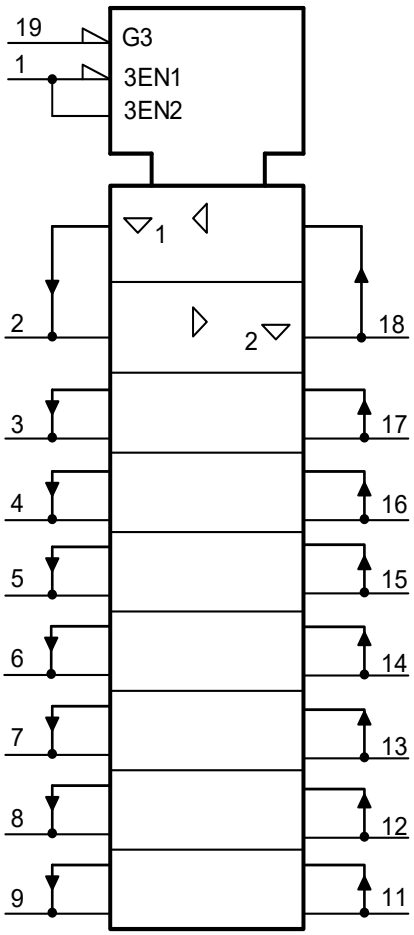


Figure 7-2 IEC logic symbol

7.3 Function Table

INPUTS		INPUTS/OUTPUTS	
$\overline{OE}$	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.

7.4 Testing Circuit

7.4.1 AC Testing Circuit

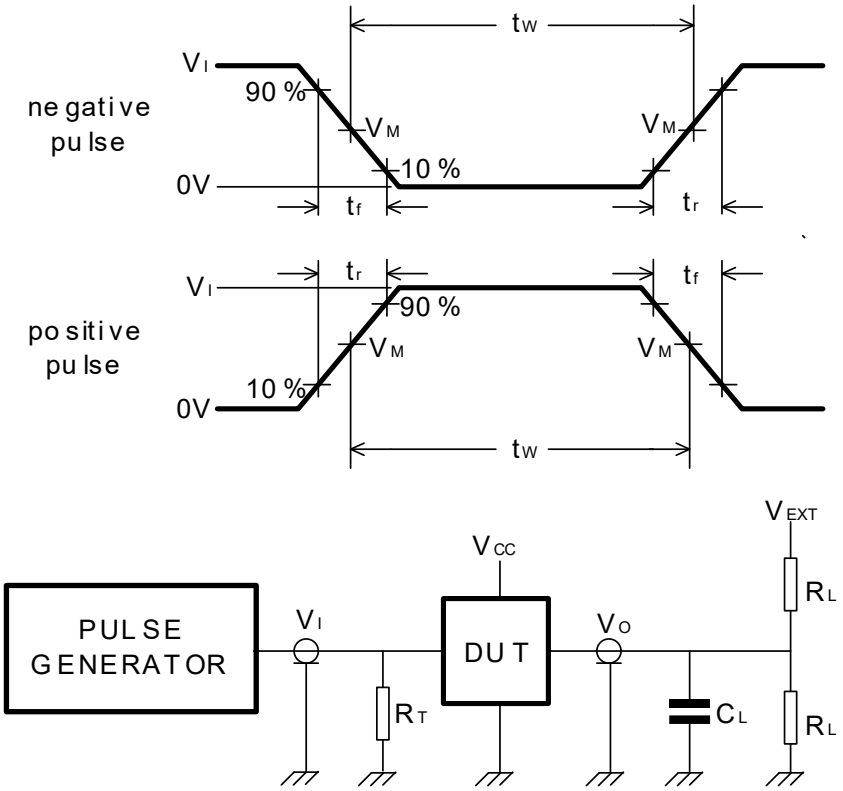


Figure 7-3 Test circuit for switching times

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 output impedance Z_o of the pulse generator.

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

7.4.2 AC Testing Waveforms

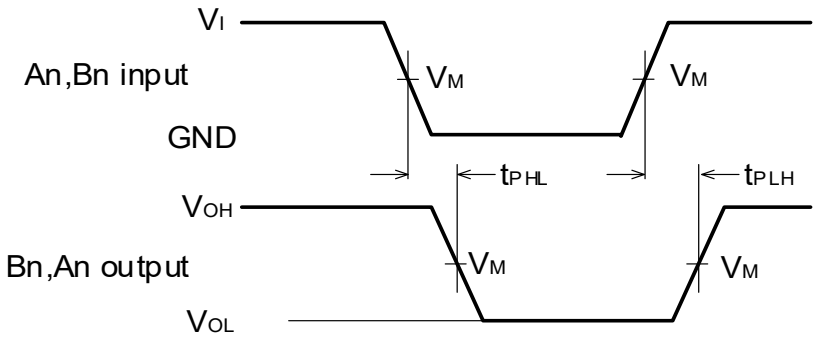


Figure 7-4 Input (An, Bn) to output (Bn, An) propagation delays and output transition times
(V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.)

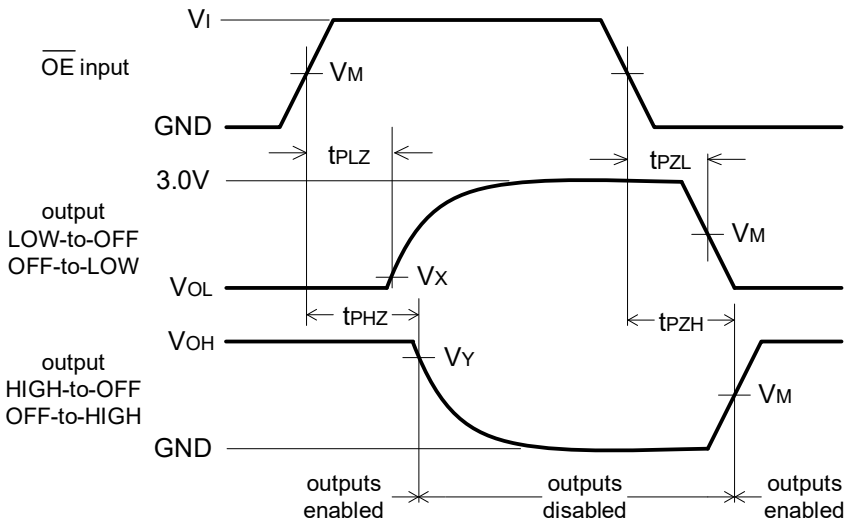


Figure 7-5 3-state output enable and disable times
(V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.)

7.4.3 Measurement Points

V_{CC}	INPUT		OUTPUT		
	V_I	V_M	V_M	V_X	V_Y
2.7V to 3.6V	GND to 2.7V	1.5V	1.5V	V_{OL}+0.3V	V_{OH}-0.3V

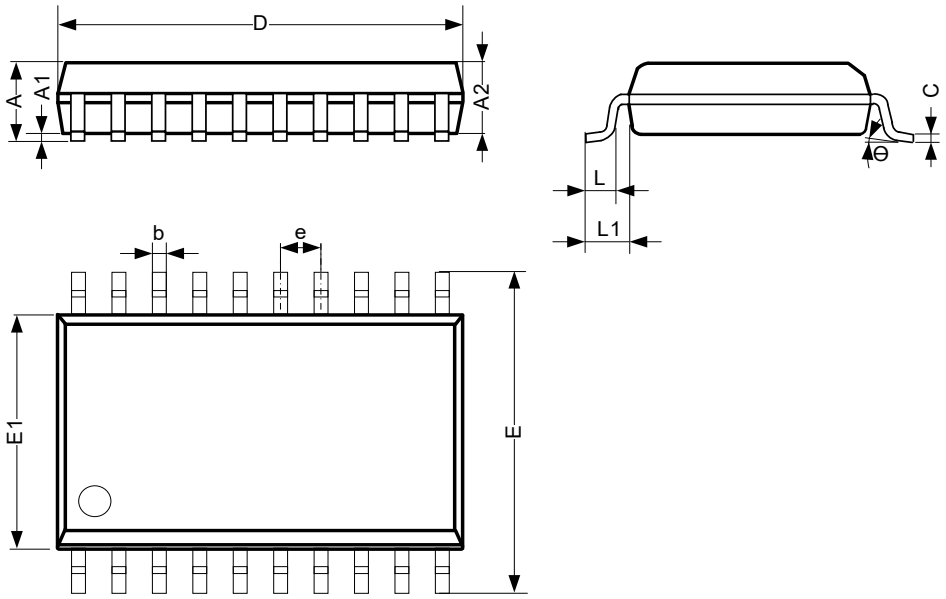
7.4.4 Test Data

INPUT				LOAD		V_{EXT}		
V_I	f_i	t_w	t_r, t_f	R_L	C_L	t_{PHZ}, t_{PZH}	t_{PLZ}, t_{PZL}	t_{PLH}, t_{PHL}
2.7V	≤10MHz	500ns	≤2.5ns	500Ω	50pF	GND	6V	Open

8 Mechanical Information

8.1 SOP20 Mechanical Information

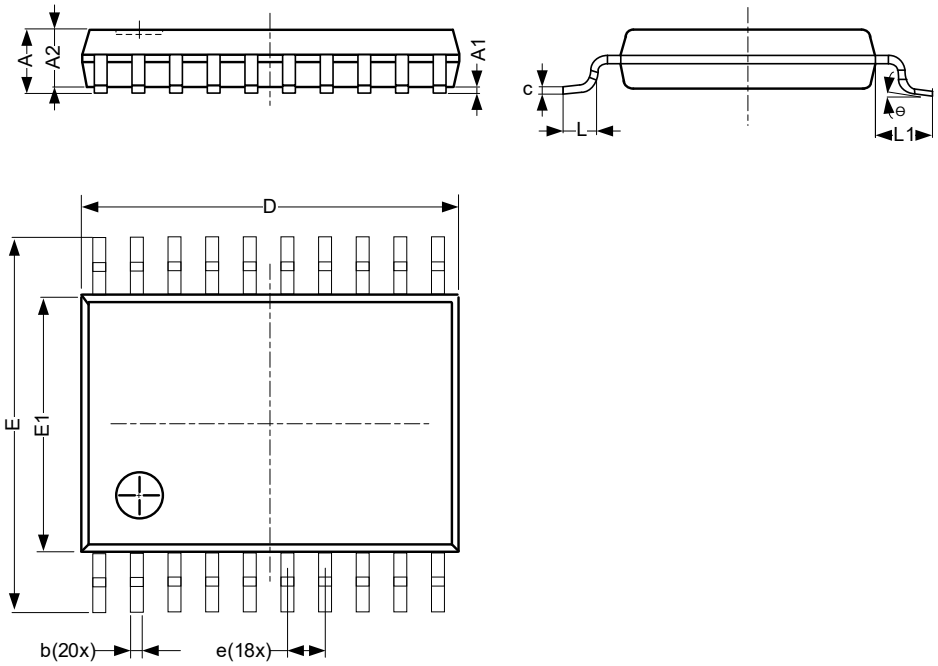
8.1.1 SOP20 Outline Dimensions



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			

8.2 TSSOP20 Mechanical Information

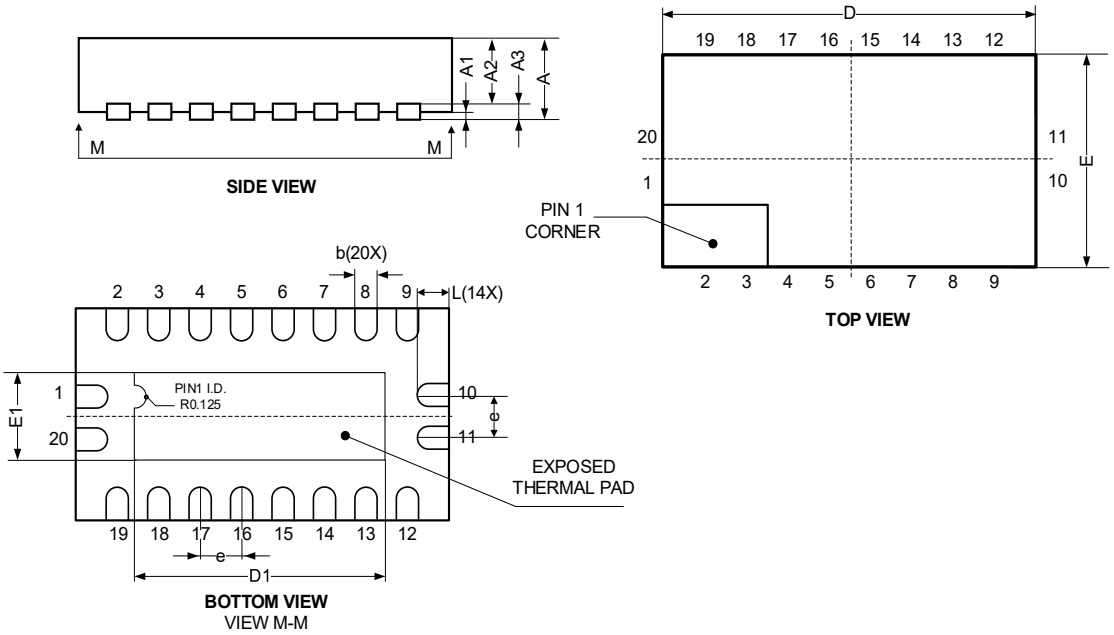
8.2.1 TSSOP20 Outline Dimensions



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			

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

8.3.1 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			

9 Notes and Revision History

9.1 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.

9.2 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.

Without the written consent of JSCJ, this product shall not be used in occasions requiring high quality or high reliability, including but not limited to the following occasions: medical equipment, military facilities and aerospace. JSCJ shall not be responsible for casualties or property losses caused by abnormal use or application of this product.

Official Website: www.jscj-elec.com