Octal Buffers/Drivers With 3-State Outputs

General Description

The ET74LV541V octal buffers/drivers is ideal for driving bus lines or buffer memory address registers. The device feature inputs and outputs on opposite sides of the package to facilitate printed circuit board layout.

The 3-state control gate is a 2-input AND gate with active-low inputs so that if either output-enable($\overline{OE}$1 or $\overline{OE}$2) input is high, all corresponding outputs are in the high-impedance state. The outputs provide non-inverted data when they are not in the high-impedance state.

To ensure the high-impedance state during power up or power down, $\overline{OE}$ should be tied to V_{CC} through a pull-up resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

Features

- Designed for 2 to 5.5V V_{CC} Operation
- Inputs are TTL Voltage Compatible
- Max t_{pd} of 6ns at 5V
- ESD Protection:

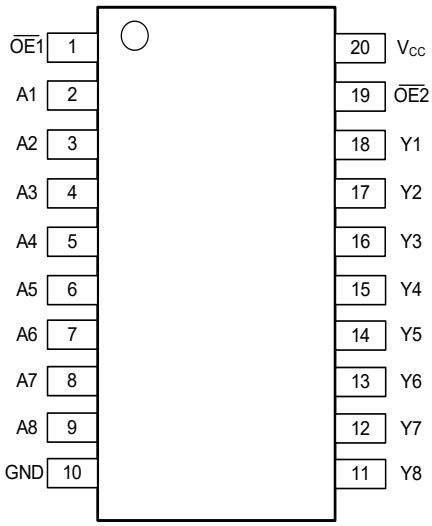
  --HBM JESD22-A114-A Exceeds 2000 V
  --CDM JESD22-C101-A Exceeds 1500 V
- Latch-up Performance Exceeds 200 mA
- Part No. and package

Part No.	Package	MSL
ET74LV541V	TSSOP20 (6.5mm×4.4mm)	3

Applications

- Fully compliant with standards for automotive applications
- Combine normal power signals from multiple power rails

Pin Configuration



ET74LV541V

Figure 1. Top View

Pin Function

Pin No.	Name	Description
1	$\overline{OE}$ 1	Output Enable 1
2	A1	Input A1
3	A2	Input A2
4	A3	Input A3
5	A4	Input A4
6	A5	Input A5
7	A6	Input A6
8	A7	Input A7
9	A8	Input A8
10	GND	Ground
11	Y8	Output Y8
12	Y7	Output Y7
13	Y6	Output Y6
14	Y5	Output Y5
15	Y4	Output Y4
16	Y3	Output Y3
17	Y2	Output Y2
18	Y1	Output Y1
19	$\overline{OE}$ 2	Output Enable 2
20	V_{CC}	Power

Block Diagram

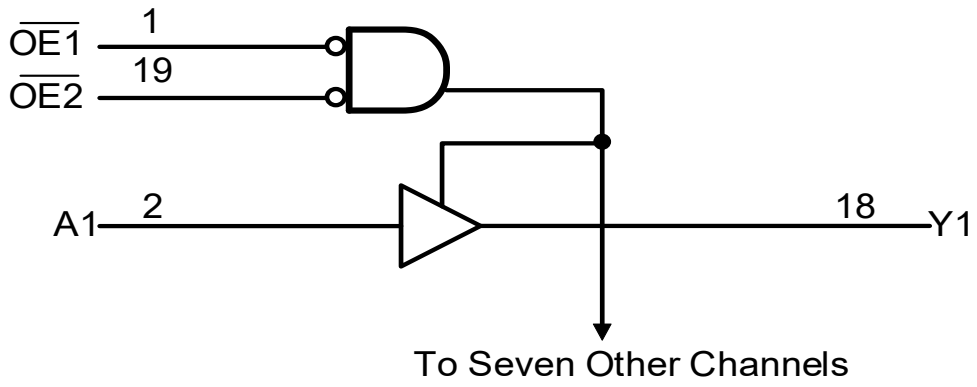


Figure 2. Logic Diagram

Functional Description

Function Table

Inputs			Output
$\overline{OE1}$	$\overline{OE2}$	A	Y
L	L	L	L
L	L	H	H
H	X	X	Z
X	H	X	Z

Note: H = High voltage level

L = Low voltage level

X = Don't care

Z = High-impedance OFF-state

Absolute Maximum Ratings

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Symbol	Parameter	Conditions	Value	Unit
V_{CC}	DC Supply Voltage		-0.5 to 7.0	V
V_I	Input Voltage(1)		-0.5 to 7.0	V
V_O	Output Voltage(1) (2)		-0.5 to 7.0	V
			-0.5 to V_{CC} + 0.5	V
I_{IK}	Input Clamp Current	V_I < GND	-20	mA
I_{OK}	Output Clamp Current	V_O < GND	-50	mA
I_O	Output Current	I_O(V_O=0 to V_{CC})	±35	mA
I_{CC}	Supply Current		±70	mA
I_{GND}	Ground Current		±70	mA
T_{JMAX}	Maximum Junction Temperature		150	°C
P_D	Max Power Dissipation	TSSOP20	400	mW
T_{STG}	Storage Temperature Range		-65 to 150	°C
V_{ESD}	HBM	Per JESD22-A114-A	±2000	V
	CDM	Per JESD22-C101-A	±1500	
I_{LU}	Max Latch up Current	Per EIA/JESD78E	±200	mA

Note1. The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.

Note2. This value is limited to 5.5V maximum.

Recommended Operating Conditions

Symbol	Parameter		Min	Max	Unit
V_{CC}	Supply voltage		2.0	5.5	V
V_{IH}	High-level input voltage	V_{CC}=2V	1.5		V
		V_{CC}=2.3V to 2.7V	V_{CC}*0.7		
		V_{CC}=3V to 3.6V	V_{CC}*0.7		
		V_{CC}=4.5V to 5.5V	V_{CC}*0.7		
V_{IL}	Low-level input voltage	V_{CC}=2V		0.5	V
		V_{CC}=2.3V to 2.7V		V_{CC}*0.3	
		V_{CC}=3V to 3.6V		V_{CC}*0.3	
		V_{CC}=4.5V to 5.5V		V_{CC}*0.3	
V_I	Input Voltage		0	5.5	V
V_O	Output Voltage		0	V_{CC}	V
I_{OH}	High-level output current	V_{CC}=2V		-50	uA
		V_{CC}=2.3V to 2.7V		-2	mA
		V_{CC}=3V to 3.6V		-8	mA
		V_{CC}=4.5V to 5.5V		-16	mA
I_{OL}	Low-level output current	V_{CC}=2V		50	uA
		V_{CC}=2.3V to 2.7V		2	mA
		V_{CC}=3V to 3.6V		8	mA
		V_{CC}=4.5V to 5.5V		16	mA
T_A	Operating Temperature Range		-40	125	°C
$\Delta t/\Delta V$	Input Transition rise or fall rate	V_{CC}=2.3V to 2.7V		200	ns/V
		V_{CC}=3V to 3.6V		100	
		V_{CC}=4.5V to 5.5V		20	

Electrical Characteristics

DC Electrical Characteristics

Symbol	Parameter	Condition	V_{CC}(V)	T_A=25°C			−40°C≤T_A≤125°C		Unit
				Min	Typ	Max	Min	Max	
V_{OH}	High−Level Output Voltage	I_{OH}=-50uA	2 to 5.5	V_{CC}-0.1	4.5		V_{CC}-0.1		V
		I_{OH}=-2mA	2.3	2			2		
		I_{OH}=-8mA	3	2.48			2.48		
		I_{OH}=-16mA	4.5	3.8			3.8		
V_{OL}	Low−Level Output Voltage	I_{OL}=50uA	2 to 5.5			0.1		0.1	V
		I_{OL}=2mA	2.3			0.4		0.4	
		I_{OL}=8mA	3			0.44		0.44	
		I_{OL}=16mA	4.5			0.55		0.55	
I_I	Input Leakage Current	V_I=5.5V or GND	0 to 5.5			±1		±1	uA
I_{OZ}	Output Leakage Current	Vo=V_{CC} or GND	5.5			±5		±5	
I_{CC}	Quiescent Supply Current	V_I = V_{CC} or GND	5.5			20		20	μA
I_{off}	Power-off Leakage Current	V_I or V_O = 0 to 5.5V	0			5		5	uA
C_i	V_I=V_{CC} or GND		3.3		2				pF

Switching Characteristics [(3)]

Symbol	Condition		T_A=25°C		−40°C≤T_A≤125°C			Unit
			Typ	Max	Min	Typ	Max	
t_{pd}	From A to Y, C_L=15pF	V_{CC}=2.5V	6.7	11.3	1.0		13.5	ns
		V_{CC}=3.3V	4.8	7.0	1.0		8.5	
		V_{CC}=5V	3.5	5	1.0		6	
	From A to Y, C_L=50pF	V_{CC}=2.5V	8.7	15.9	1.0		18.5	
		V_{CC}=3.3V	6.1	10.5	1.0		12	
		V_{CC}=5V	4.3	7.0	1.0		8.0	
t_{en}	From /OE to Y, C_L=15pF	V_{CC}=2.5V	8.5	16.6	1.0		19.5	
		V_{CC}=3.3V	6.1	10.5	1.0		12.5	
		V_{CC}=5V	4.3	7.2	1.0		8.5	
	From /OE to Y, C_L=50pF	V_{CC}=2.5V	10.5	20.7	1.0		24	
		V_{CC}=3.3V	7.4	14	1.0		16	
		V_{CC}=5V	5.3	9.2	1.0		10.5	

Switching Characteristics (Continued) [3]

Symbol	Condition		T_A=25°C		−40°C≤T_A≤125°C			Unit
			Typ	Max	Min	Typ	Max	
t_{dis}	From /OE to Y, C_L=15pF	V_{CC}=2.5V	8.4	13.1	1.0		15	ns
		V_{CC}=3.3V	5.8	11	1.0		12	
		V_{CC}=5V	3.9	7.5	1.0		8	
	From /OE to Y, C_L=50pF	V_{CC}=2.5V	12.3	17.9	1.0		20	
		V_{CC}=3.3V	8.8	15.4	1.0		17.5	
		V_{CC}=5V	5.6	8.8	1.0		10	
$T_{sk(o)}$	V_{CC}=2.5V			2			2	
	V_{CC}=3.3V			1.5			1.5	
	V_{CC}=5V			1			1	

Note3. Guaranteed by design and characterization. not a FT item.

Noise Characteristics[4]

V_{CC} = 3.3 V, C_L = 50pF, T_A = 25°C

Symbol	Parameter	Min	Typ	Max	Unit
$V_{OL(P)}$	Quiet output, maximum dynamic V_{OL}		0.5	0.8	V
$V_{OL(V)}$	Quiet output, minimum dynamic V_{OL}		-0.4	-0.8	V
$V_{OH(V)}$	Quiet output, minimum dynamic V_{OH}		2.9		V
$V_{IH(D)}$	High-level dynamic input voltage	2.31			V
$V_{IL(D)}$	Low-level dynamic input voltage			0.99	V

Note4. Characteristics are for surface-mount packages only.

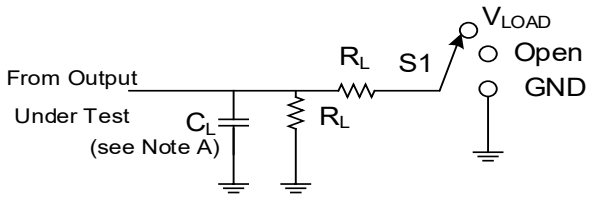
Operating Characteristics[5]

T_A = 25°C

Symbol	Parameter		Conditions		Typ	Unit
C_{pd}	Power dissipation capacitance	Outputs enabled	C_L = 50pF, f =10 MHz	V_{CC}=3.3 V	16.3	pF
				V_{CC}=5 V	17.8	

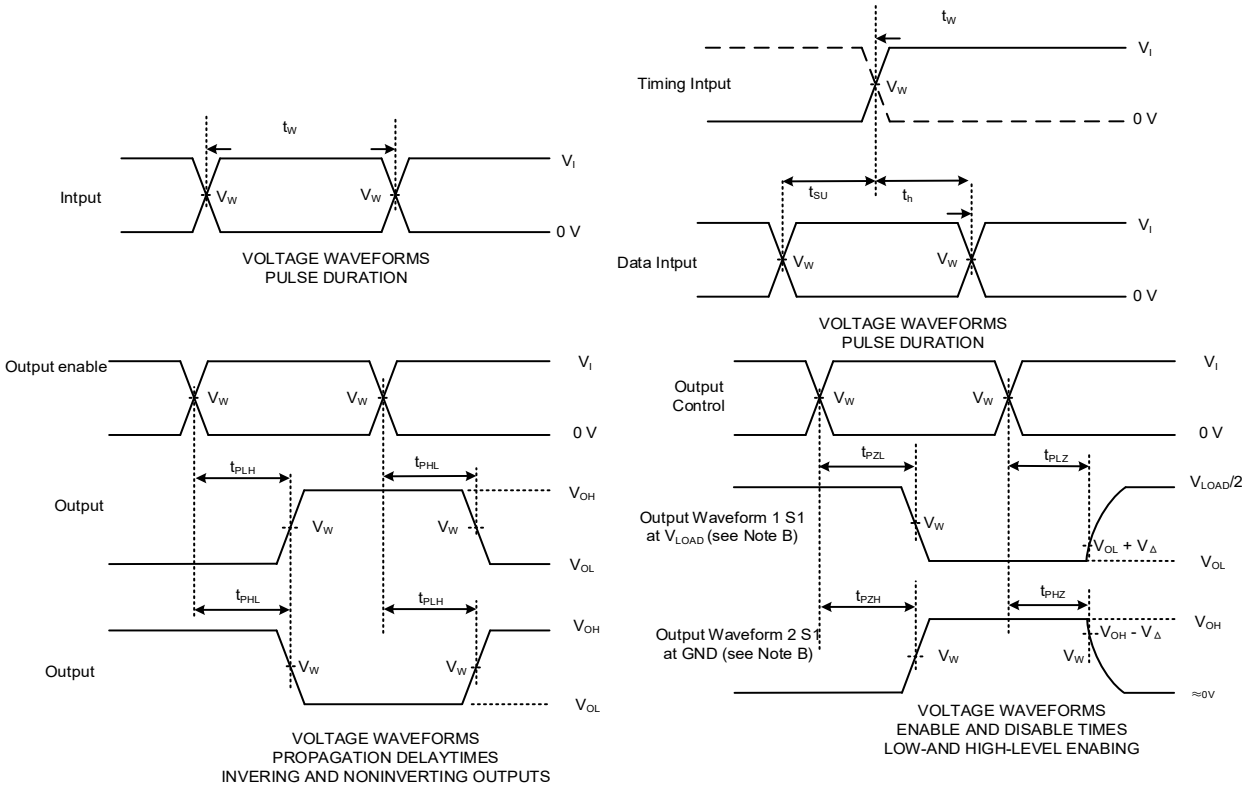
Note5. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

AC Characteristics Test Waveform



TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND

Figure.3 Test circuit for measuring switching times



Notes:

A. C_L includes probe and jig capacitance.

B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control.

C. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.

D. All input pulses are supplied by generators having the following characteristics:

PRR ≤10 MHz, Z_O = 50 Ω

E. The outputs are measured one at a time, with one transition per measurement.

F. t_{PLZ} and t_{PHZ} are the same as t_{dis}.

G. t_{PZL} and t_{PZH} are the same as t_{en}.

H. t_{PLH} and t_{PHL} are the same as t_{pd}.

I. All parameters and waveforms are not applicable to all devices.

Figure.4 Input to output propagation delay times

Typical Application

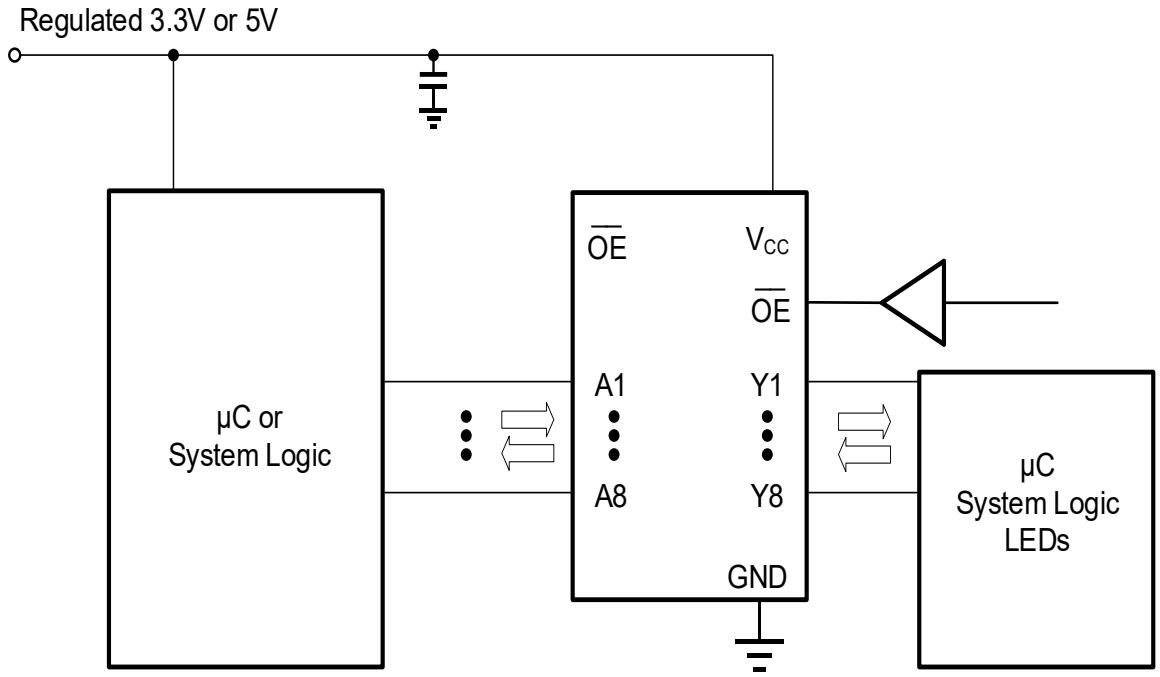
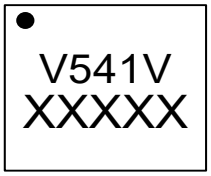


Figure 5. Typical Application Schematic

Marking

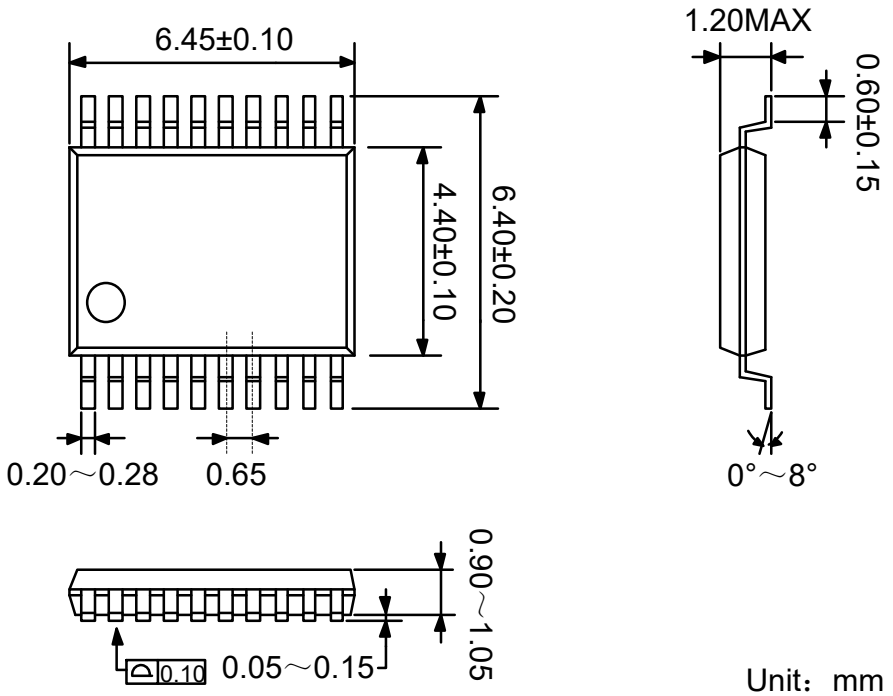


V541V - Part Number

XXXXX - Tracking Number

Package Dimension

TSSOP20



Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.0	2023-12-20	Initial version	Shibo	Luh	Liujy
1.0	2025-6-20	Official Version	Lizihao	Yangxx	Liujy