



## U74LVC541

CMOS IC

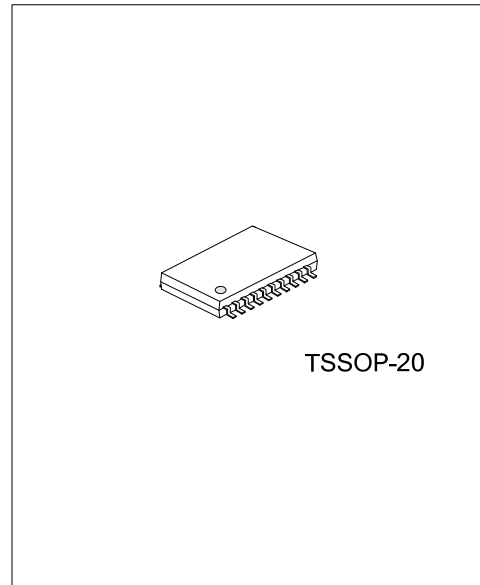
### OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

#### DESCRIPTION

The **U74LVC541A** octal buffer/driver is designed for 1.65V to 3.6V  $V_{CC}$  operation.

#### FEATURES

- \* Operate From 1.65V to 3.6V
- \* Inputs Accept Voltages to 5.5V
- \* Max tpd of 5.1 ns at 3.3V
- \*  $I_{off}$  Supports Partial-Power-Down Mode Operation

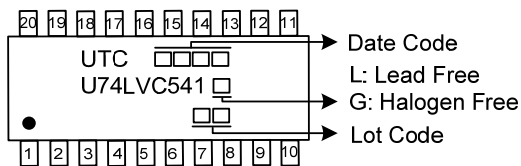


#### ORDERING INFORMATION

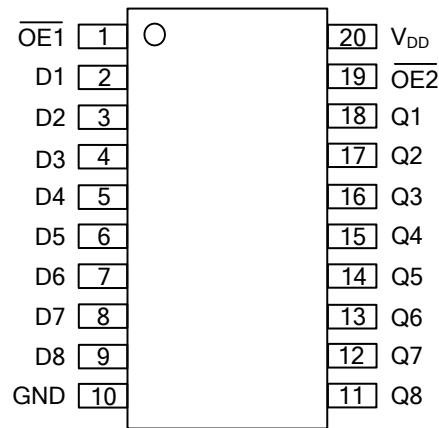
Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74LVC541L-P20-R	U74LVC541G-P20-R	TSSOP-20	Tape Reel

<p>U74LVC541G-P20-R</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>	<p>(1) R: Tape Reel</p> <p>(2) P20: TSSOP-20</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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#### MARKING



■ PIN CONFIGURATION

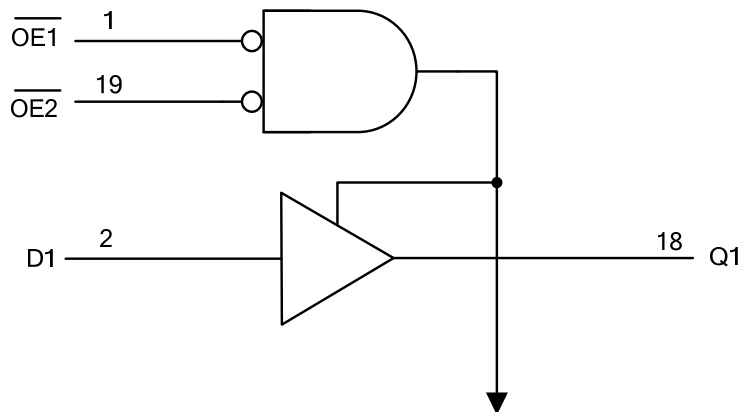


■ FUNCTION TABLE

INPUTS			OUTPUT
$\overline{OE1}$	$\overline{OE2}$	D	Q
L	L	L	L
L	L	H	H
H	X	X	Z
X	H	X	Z

H = High voltage level ; L = Low voltage level ; X = Don't care ; Z= high impedance OFF-state

■ LOGIC SYMBOL



## ■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNIT
Supply Voltage	$V_{CC}$		-0.5 ~ +6.5	V
Input Voltage (Note 2)	$V_{IN}$		-0.5 ~ +6.5	V
Output Voltage	$V_{OUT}$	Output in the high or low state	-0.5 ~ $V_{CC}+0.5$	V
Continuous $V_{CC}$ or GND Current	$I_{CC}$		±100	mA
Continuous Output Current	$I_{OUT}$		±50	mA
Input Clamp Current	$I_{IK}$	$V_{IN}<0V$	-50	mA
Output Clamp Current	$I_{OK}$	$V_{OUT}<0V$	-50	mA
Storage Temperature Range	$T_{STG}$		-65 ~ +150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

## ■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	$V_{CC}$	Operating	1.65		3.6	V
		Data Retention Only	1.5			V
Input Voltage	$V_{IN}$		0		5.5	V
Output Voltage	$V_{OUT}$	High or Low State	0		$V_{CC}$	V
		3-State	0		5.5	V
Operating Temperature	$T_A$		-40		+85	°C

## ■ ELECTRICAL CHARACTERISTICS ( $T_A=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP (Note 1)	MAX	UNIT
High-level Input Voltage	$V_{IH}$	$V_{CC}=1.8V\pm 0.15V$	$0.65\times V_{CC}$			V
		$V_{CC}=2.5V\pm 0.2V$	1.7			V
		$V_{CC}=3.3V\pm 0.3V$	2.0			V
Low-level Input Voltage	$V_{IL}$	$V_{CC}=1.8V\pm 0.15V$			$0.35\times V_{CC}$	V
		$V_{CC}=2.5V\pm 0.2V$			0.7	V
		$V_{CC}=3.3V\pm 0.3V$			0.8	V
High-Level Output Voltage	$V_{OH}$	$V_{CC}=1.65V \sim 3.6V, I_{OH}=-100\mu A$	$V_{CC}-0.2$			V
		$V_{CC}=1.65V, I_{OH}=-4mA$	1.20			V
		$V_{CC}=2.3V, I_{OH}=-8mA$	1.7			V
		$V_{CC}=2.7V, I_{OH}=-12mA$	2.2			V
		$V_{CC}=3.0V, I_{OH}=-12mA$	2.4			V
Low-Level Output Voltage	$V_{OL}$	$V_{CC}=1.65V \sim 3.6V, I_{OH}=100\mu A$			0.2	V
		$V_{CC}=1.65V, I_{OH}=4mA$			0.45	V
		$V_{CC}=2.3V, I_{OH}=8mA$			0.7	V
		$V_{CC}=2.7V, I_{OH}=12mA$			0.4	V
		$V_{CC}=3.0V, I_{OH}=24mA$			0.55	V
Input Leakage Current	$I_{I(LEAK)}$	$V_{CC}=3.6V, V_{IN}=0 \sim 5.5V$ or GND			±5	μA
Power OFF Leakage Current	$I_{OFF}$	$V_{CC}=0V, V_{IN}$ or $V_{OUT}=5.5V$			±10	μA
Output OFF-State Current	$I_{OZ}$	$V_{CC}=3.6V, V_{OUT}=0$ or 5.5V			±10	μA
Quiescent Supply Current	$I_{CC}$	$V_{CC}=3.6V, V_{IN}=V_{CC}$ or GND, $I_{OUT}=0A$			10	μA
		$3.6V\leq V_I\leq 5.5V, I_{OUT}=0A$ (Note 2)			10	μA
Additional Quiescent Supply Current Per Input Pin	$\Delta I_{CC}$	$V_{CC}=2.7V\sim 3.6V$ , One Input at $V_{CC}-0.6V$ , Other Inputs at $V_{CC}$ or GND			500	μA

### ■ ELECTRICAL CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP (Note 1)	MAX	UNIT
Input Capacitance	$C_I$	$V_{CC}=3.3V, V_{IN}=V_{CC}$ or GND		4		pF
Output Capacitance	$C_O$	$V_{CC}=3.3V, V_{OUT}=V_{CC}$ or GND		5.5		pF

Notes: 1. All typical values are at  $V_{CC}=3.3V, T_A=25^\circ C$ .

2. This applies in the disabled state only.

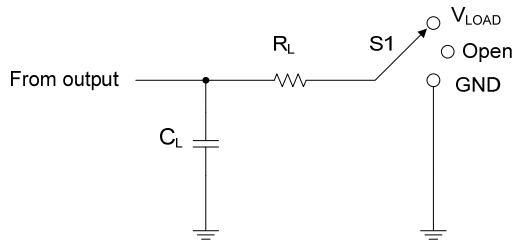
### ■ SWITCHING CHARACTERISTICS ( $T_A=25^\circ C$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation delay from input (Dn) to output(Qn)	$t_{PD}$	$V_{CC}=1.8V\pm 0.15V$	1.0		15.7	ns
		$V_{CC}=2.5V\pm 0.2V$	1.0		7.8	ns
		$V_{CC}=2.7V$	1.0		5.6	ns
		$V_{CC}=3.3V\pm 0.3V$	1.5		5.1	ns
Propagation delay from input ( $\overline{OE}$ ) to output(Qn)	$t_{en}$	$V_{CC}=1.8V\pm 0.15V$	1.0		17.5	ns
		$V_{CC}=2.5V\pm 0.2V$	1.0		10.5	ns
		$V_{CC}=2.7V$	1.0		7.5	ns
		$V_{CC}=3.3V\pm 0.3V$	1.5		7.0	ns
Propagation delay from input ( $\overline{OE}$ ) to output(Qn)	$t_{dis}$	$V_{CC}=1.8V\pm 0.15V$	1.0		16.5	ns
		$V_{CC}=2.5V\pm 0.2V$	1.0		9.0	ns
		$V_{CC}=2.7V$	1.0		7.7	ns
		$V_{CC}=3.3V\pm 0.3V$	1.5		7.0	ns
Propagation delay	$t_{SK(O)}$	$V_{CC}=3.3V\pm 0.3V$			1.0	ns

### ■ OPERATING CHARACTERISTICS ( $f=10MHz, T_A=25^\circ C$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
Power Dissipation Capacitance	Outputs enabled	$V_{CC}=1.8V\pm 0.15V$		65		pF	
		$V_{CC}=2.5V\pm 0.2V$		58		pF	
		$V_{CC}=3.3V\pm 0.3V$		33		pF	
	Outputs disabled	$V_{CC}=1.8V\pm 0.15V$			2		pF
		$V_{CC}=2.5V\pm 0.2V$			2		pF
		$V_{CC}=3.3V\pm 0.3V$			2		pF

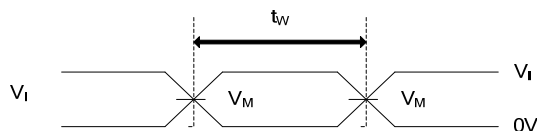
## TEST CIRCUIT AND WAVEFORMS



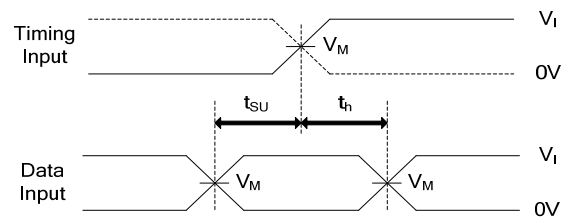
TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	$V_{LOAD}$
$t_{PHZ}/t_{PZH}$	GND

Test Circuit

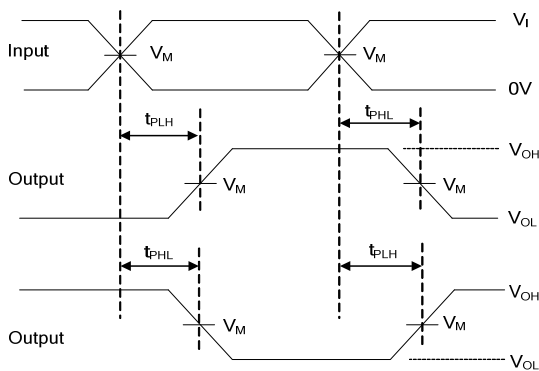
$V_{CC}$	INPUTS		$V_M$	$V_{LOAD}$	$C_L$	$R_L$	$V_{\Delta}$
	$V_{IN}$	$t_R/t_F$					
$1.8V \pm 0.15V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	30pF	1K $\Omega$	0.15V
$2.5V \pm 0.2V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	30pF	500 $\Omega$	0.15V
2.7V	2.7V	$\leq 2.5ns$	1.5V	6V	50pF	500 $\Omega$	0.3V
$3.3V \pm 0.3V$	2.7V	$\leq 2.5ns$	1.5V	6V	50pF	500 $\Omega$	0.3V



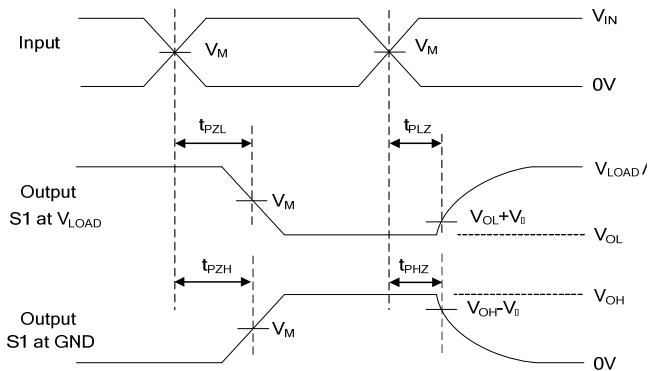
VOLTAGE WAVEFORMS PULSE DURATION



VOLTAGE WAVEFORMS SETUP AND HOLD TIMES



Voltage Waveforms Propagation Delay Times



Voltage Waveforms Enable and Disable Times

Notes: 1.  $C_L$  includes probe and jig capacitance.

2. All input pulses are supplied by generators having the following characteristics: PRR  $\leq 10MHz$ ,  $Z_0 = 50\Omega$ .

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