



## U74HC240

CMOS IC

### OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

#### DESCRIPTION

The U74HC240 is a octal buffer and line driver with 3-state outputs. It is organized as two 4-bit buffers/drivers with separate output-enable ( $\overline{OE}$ ) inputs. When  $\overline{OE}$  is high, the Y outputs are in a high-impedance state and the outputs neither load nor drive the bus lines. When  $\overline{OE}$  is low, the device passes inverted data from the A inputs to the Y outputs.

The U74HC240 is designed to improve the performance and density of 3-state memory address drivers, clock drivers and bus-oriented receivers and transmitters.

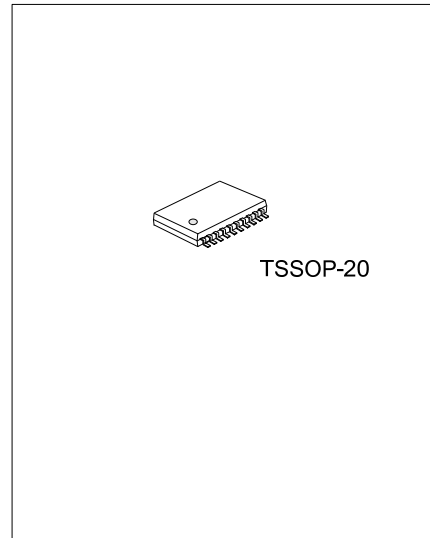
To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pull-up resistor; and the minimum value of the resistor is determined by the current-sinking capability of the driver.

#### FEATURES

- \* Wide supply voltage range from 2V to 6V
- \* Max  $t_{pd}$  of 9 ns from A to Y at 6V
- \* Low power consumption,  $I_{CC} = 8 \mu A$  (Max.) at 6V
- \*  $\pm 6$  mA output driver at 5V
- \* Low Input Current of 1  $\mu A$  Max

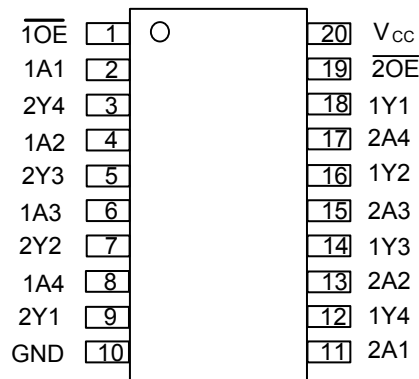
#### ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74HC240L-P20-R	U74HC240G-P20-R	TSSOP-20	Tape Reel
U74HC240L-P20-T	U74HC240G-P20-T	TSSOP-20	Tube



<p>U74HC240L-P20-T</p> <p>(1)Packing Type (2)Package Type (3)Lead Free</p>	<p>(1) R: Tape Reel, T: Tube (2) P20: TSSOP-20 (3) G: Halogen Free, L: Lead Free</p>
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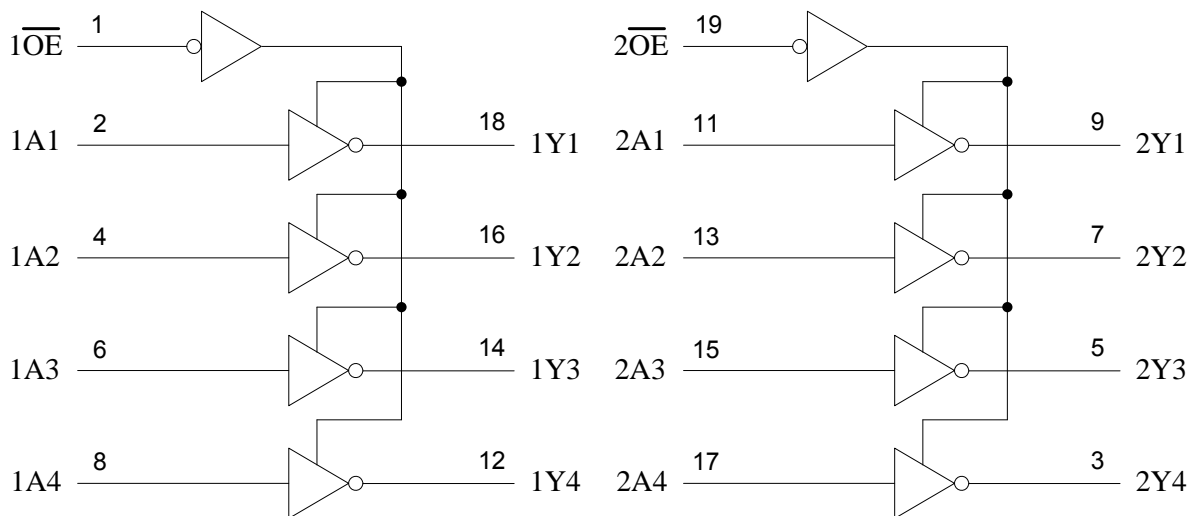
■ PIN CONFIGURATION



■ FUNCTION TABLE (each buffer)

INPUTS		OUTPUT
$\overline{OE}$	A	Y
L	H	L
L	L	H
H	X	Z

■ LOGIC DIAGRAM (positive logic)



■ ABSOLUTE MAXIMUM RATING (unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V_{CC}$	-0.5 ~ 7	V
Input Clamp Current ( $V_{IN} < 0$ , or $V_{IN} > V_{CC}$ )	$I_{IK}$	$\pm 20$	mA
Output Clamp Current ( $V_{OUT} < 0$ , or $V_{OUT} > V_{CC}$ )	$I_{OK}$	$\pm 20$	mA
Output Current	$I_{OUT}$	$\pm 35$	mA
$V_{CC}$ or GND Current	$I_{CC}$	$\pm 70$	mA
Storage Temperature	$T_{STG}$	-65 ~ +150	$^{\circ}C$

Note: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
 2. 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 COMDITIONS

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	$V_{CC}$		2	5	6	V
High-Level Input Voltage	$V_{IH}$	$V_{CC} = 2V$	1.5			V
		$V_{CC} = 4.5V$	3.15			
		$V_{CC} = 6V$	4.2			
Low-Level Input Voltage	$V_{IL}$	$V_{CC} = 2V$			0.5	V
		$V_{CC} = 4.5V$			1.35	
		$V_{CC} = 6V$			1.8	
Input Voltage	$V_{IN}$		0		$V_{CC}$	V
Output Voltage	$V_{OUT}$		0		$V_{CC}$	V
Input Transition Rise or Fall Rate	$\Delta t/\Delta v$	$V_{CC} = 2V$			1000	ns/V
		$V_{CC} = 4.5V$			500	
		$V_{CC} = 6V$			400	
Operating Temperature	$T_A$		-40		85	$^{\circ}C$

■ ELECTRICAL CHARACTERISTICS (T<sub>A</sub> =25°C , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP <sup>(1)</sup>	MAX	UNIT
High-Level Output Voltage	V <sub>OH</sub>	I <sub>OH</sub> = -20 μA, V <sub>CC</sub> = 2V	1.9	1.998		V
		I <sub>OH</sub> = -20 μA, V <sub>CC</sub> = 4.5V	4.4	4.499		
		I <sub>OH</sub> = -20 μA, V <sub>CC</sub> = 6V	5.9	5.999		
		I <sub>OH</sub> = -6 mA, V <sub>CC</sub> = 4.5V	3.98	4.3		
		I <sub>OH</sub> = -7.8 mA, V <sub>CC</sub> = 6V	5.48	5.8		
Low-Level Output Voltage	V <sub>OL</sub>	I <sub>OL</sub> = 20 μA, V <sub>CC</sub> = 2V		0.002	0.1	V
		I <sub>OL</sub> = 20 μA, V <sub>CC</sub> = 4.5V		0.001	0.1	
		I <sub>OL</sub> = 20 μA, V <sub>CC</sub> = 6V		0.001	0.1	
		I <sub>OL</sub> = 6 mA, V <sub>CC</sub> = 4.5V		0.17	0.26	
		I <sub>OL</sub> = 7.8 mA, V <sub>CC</sub> = 6V		0.15	0.26	
Input Leakage Current (A or $\overline{OE}$ inputs)	I <sub>I(LEAK)</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND, V <sub>CC</sub> = 6V		±0.1	±100	μA
High-impedance state Current	I <sub>OZ</sub>	V <sub>O</sub> = V <sub>CC</sub> or GND, V <sub>CC</sub> = 6V V <sub>I(OE)</sub> = V <sub>IL</sub> or V <sub>IH</sub>		±0.01	±0.5	μA
Quiescent Supply Current	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND, I <sub>OUT</sub> = 0, V <sub>CC</sub> = 6V			8	μA
Input Capacitance	C <sub>IN</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND, V <sub>CC</sub> = 2V to 6V		3	10	pF

■ SWITCHING CHARACTERISTICS (T<sub>A</sub> =25°C)

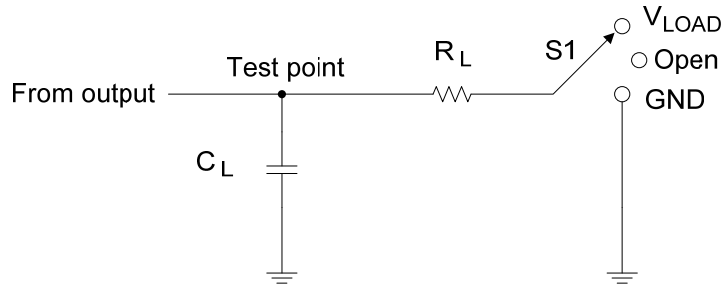
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation delay from input A to output Y, t <sub>pd</sub>	t <sub>PLH</sub> / t <sub>PHL</sub>	V <sub>CC</sub> =2V, C <sub>L</sub> =50pF, R <sub>L</sub> =1kΩ		50	100	ns
		V <sub>CC</sub> =4.5V, C <sub>L</sub> =50pF, R <sub>L</sub> =1kΩ		10	20	
		V <sub>CC</sub> =6V, C <sub>L</sub> =50pF, R <sub>L</sub> =1kΩ		9	17	
		V <sub>CC</sub> =2V, C <sub>L</sub> =150pF, R <sub>L</sub> =1kΩ		75	150	ns
		V <sub>CC</sub> =4.5V, C <sub>L</sub> =150pF, R <sub>L</sub> =1kΩ		15	30	
		V <sub>CC</sub> =6V, C <sub>L</sub> =150pF, R <sub>L</sub> =1kΩ		13	26	
Propagation delay from input $\overline{OE}$ to output Y, t <sub>en</sub>	t <sub>PZH</sub> / t <sub>PZL</sub>	V <sub>CC</sub> =2V, C <sub>L</sub> =50pF, R <sub>L</sub> =1kΩ		75	150	ns
		V <sub>CC</sub> =4.5V, C <sub>L</sub> =50pF, R <sub>L</sub> =1kΩ		15	30	
		V <sub>CC</sub> =6V, C <sub>L</sub> =50pF, R <sub>L</sub> =1kΩ		13	26	
		V <sub>CC</sub> =2V, C <sub>L</sub> =150pF, R <sub>L</sub> =1kΩ		100	200	ns
		V <sub>CC</sub> =4.5V, C <sub>L</sub> =150pF, R <sub>L</sub> =1kΩ		20	40	
		V <sub>CC</sub> =6V, C <sub>L</sub> =150pF, R <sub>L</sub> =1kΩ		17	34	
Propagation delay from input $\overline{OE}$ to output Y, t <sub>dis</sub>	t <sub>PHZ</sub> / t <sub>PLZ</sub>	V <sub>CC</sub> =2V, C <sub>L</sub> =50pF, R <sub>L</sub> =1kΩ		44	150	ns
		V <sub>CC</sub> =4.5V, C <sub>L</sub> =50pF, R <sub>L</sub> =1kΩ		22	30	
		V <sub>CC</sub> =6V, C <sub>L</sub> =50pF, R <sub>L</sub> =1kΩ		21	26	
Propagation of rise or fall, t <sub>t</sub>	t <sub>r</sub> / t <sub>f</sub>	V <sub>CC</sub> =2V, C <sub>L</sub> =50pF, R <sub>L</sub> =1kΩ		28	60	ns
		V <sub>CC</sub> =4.5V, C <sub>L</sub> =50pF, R <sub>L</sub> =1kΩ		8	12	
		V <sub>CC</sub> =6V, C <sub>L</sub> =50pF, R <sub>L</sub> =1kΩ		6	10	
		V <sub>CC</sub> =2V, C <sub>L</sub> =150pF, R <sub>L</sub> =1kΩ		45	210	ns
		V <sub>CC</sub> =4.5V, C <sub>L</sub> =150pF, R <sub>L</sub> =1kΩ		17	42	
		V <sub>CC</sub> =6V, C <sub>L</sub> =150pF, R <sub>L</sub> =1kΩ		13	36	

■ OPERATING CHARACTERISTICS (T<sub>A</sub> =25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	TYP	UNIT
Power dissipation capacitance per buffer/driver	C <sub>pd</sub>	No load	35	pF



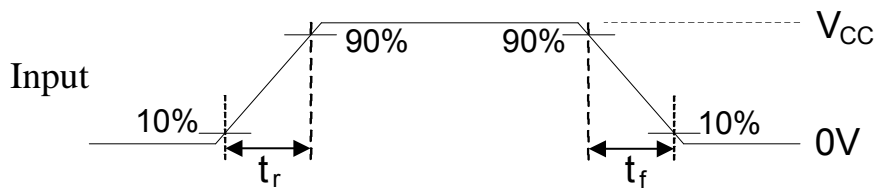
## ■ TEST CIRCUIT AND WAVEFORMS



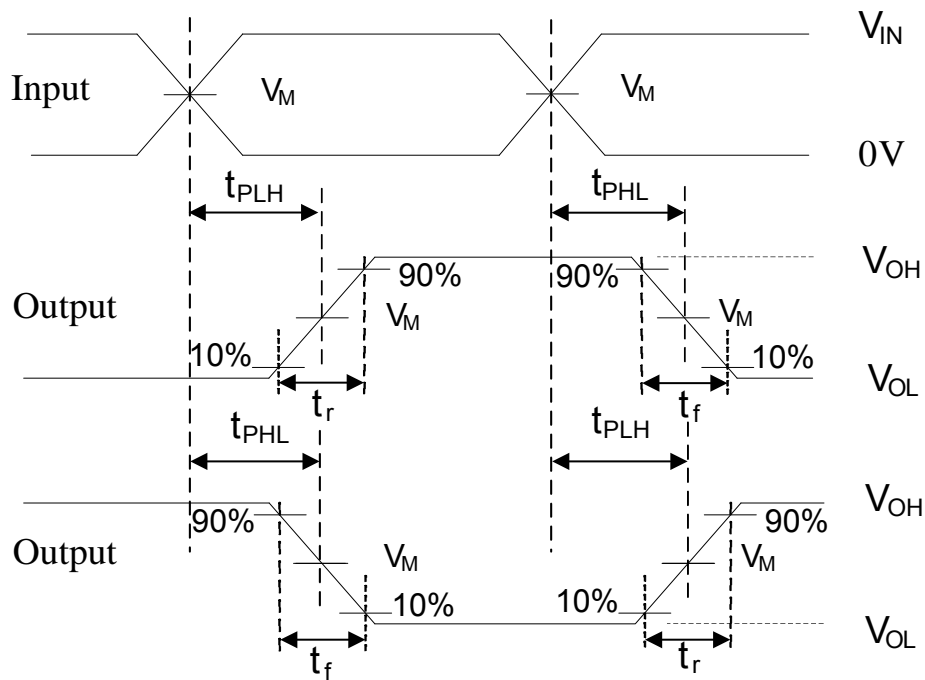
TEST CIRCUIT

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

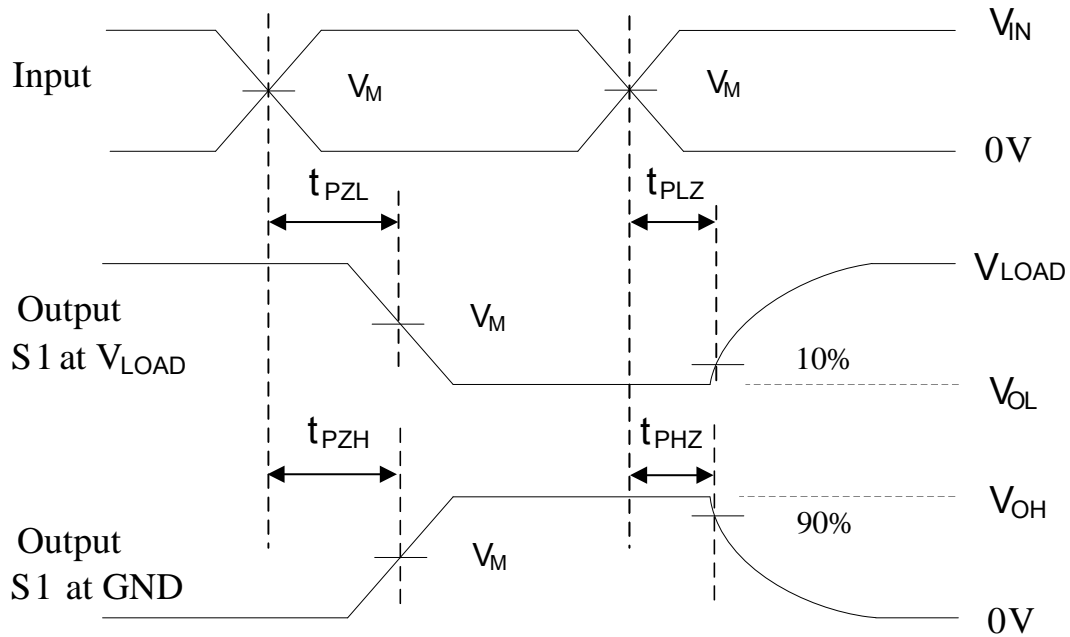
Inputs		$V_M$	$V_{LOAD}$	$C_L$	$R_L$
$V_{IN}$	$t_r, t_f$				
$V_{CC}$	$\leq 6\text{ns}$	$V_{CC}/2$	$V_{CC}$	50 or 150pF	500 $\Omega$



VOLTAGE WAVEFORMS  
INPUT RISE AND FALL TIMES



VOLTAGE WAVEFORMS  
PROPAGATION DELAY AND OUTPUT TRANSITION 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  $\leq 1$ MHz,  $Z_O = 50\Omega$ .

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