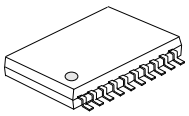
U74HC240

CMOS IC

OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS



TSSOP-20

■ 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 μA (Max.) at 6V
* ±6 mA output driver at 5V
* Low Input Current of 1 μA Max

■ ORDERING INFORMATION

Ordering Number	Package	Packing
U74HC240G-P20-R	TSSOP-20	Tape Reel

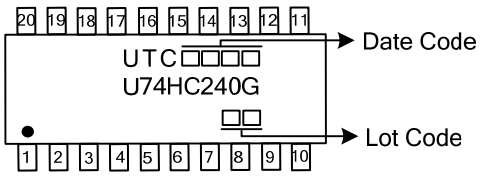
U74HC240G-P20-R

(1)Packing Type — (1) R: Tape Reel

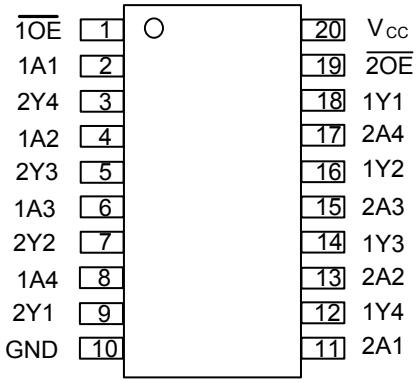
(2)Package Type — (2) P20: TSSOP-20

(3)Green Package — (3) G: Halogen Free and Lead Free

■ MARKING



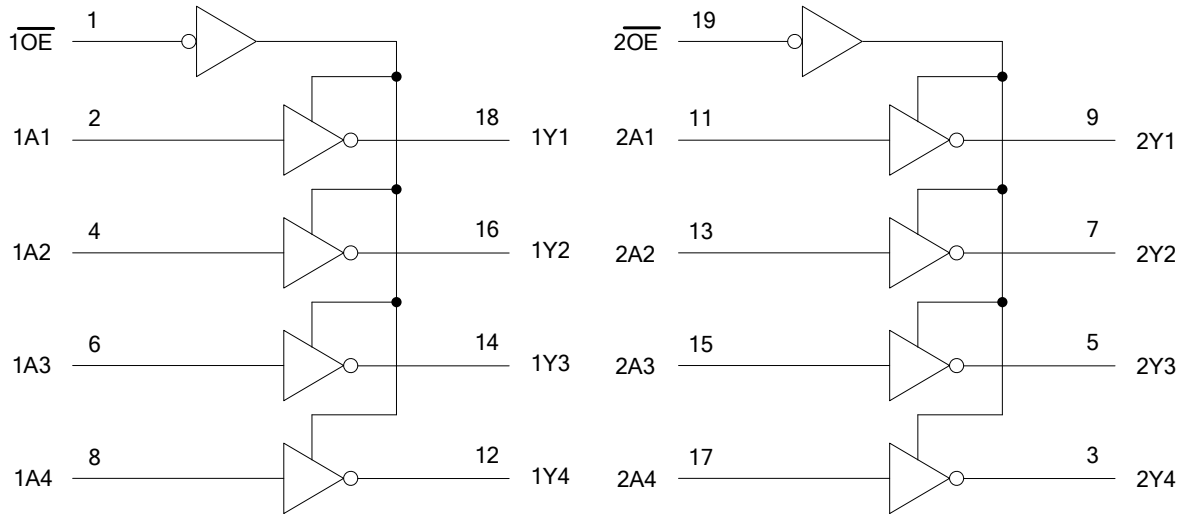
■ PIN CONFIGURATION



■ 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}	±20	mA
Output Clamp Current (V_{OUT}<0, or V_{OUT}>V_{CC})	I_{OK}	±20	mA
Output Current	I_{OUT}	±35	mA
V_{CC} or GND Current	I_{CC}	±70	mA
Storage Temperature	T_{STG}	-65 ~ +150	°C

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

■ 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	Δt/Δv	V_{CC} = 2V			1000	ns/V
		V_{CC} = 4.5V			500	
		V_{CC} = 6V			400	
Operating Temperature	T_A		-40		85	°C

■ ELECTRICAL CHARACTERISTICS (T_A =25°C , unless otherwise specified)

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

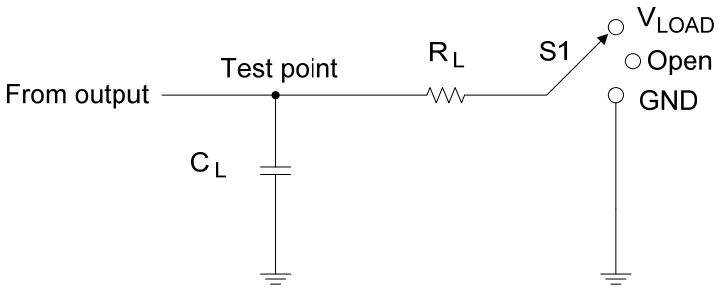
■ SWITCHING CHARACTERISTICS (T_A =25°C)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Propagation delay from input A to output Y, t_{pd}	t_{PLH} / t_{PHL}	C_L=50pF, R_L=1kΩ	V_{CC}=2V		50	100	ns
			V_{CC}=4.5V		10	20	
			V_{CC}=6V		9	17	
		C_L=150pF, R_L=1kΩ	V_{CC}=2V		75	150	ns
			V_{CC}=4.5V		15	30	
			V_{CC}=6V		13	26	
Output enable time from input $\overline{OE}$ to output Y, t_{en}	t_{PZH} / t_{PZL}	C_L=50pF, R_L=1kΩ	V_{CC}=2V		75	150	ns
			V_{CC}=4.5V		15	30	
			V_{CC}=6V		13	26	
		C_L=150pF, R_L=1kΩ	V_{CC}=2V		100	200	ns
			V_{CC}=4.5V		20	40	
			V_{CC}=6V		17	34	
Output disable time from input $\overline{OE}$ to output Y, t_{dis}	t_{PHZ} / t_{PLZ}	C_L=50pF, R_L=1kΩ	V_{CC}=2V		44	150	ns
			V_{CC}=4.5V		22	30	
			V_{CC}=6V		21	26	
Propagation of rise or fall, t_t	t_r / t_f	C_L=50pF, R_L=1kΩ	V_{CC}=2V		28	60	ns
			V_{CC}=4.5V		8	12	
			V_{CC}=6V		6	10	
		C_L=150pF, R_L=1kΩ	V_{CC}=2V		45	210	ns
			V_{CC}=4.5V		17	42	
			V_{CC}=6V		13	36	

■ OPERATING CHARACTERISTICS (T_A =25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power dissipation capacitance per buffer/driver	C_{pd}	No load		35		pF

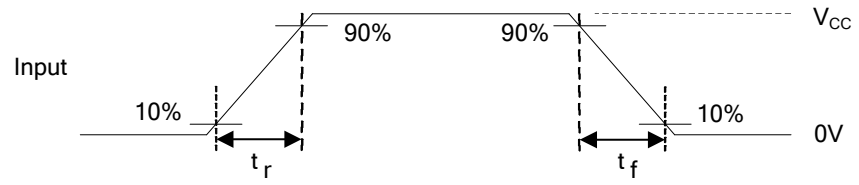
■ TEST CIRCUIT AND WAVEFORMS



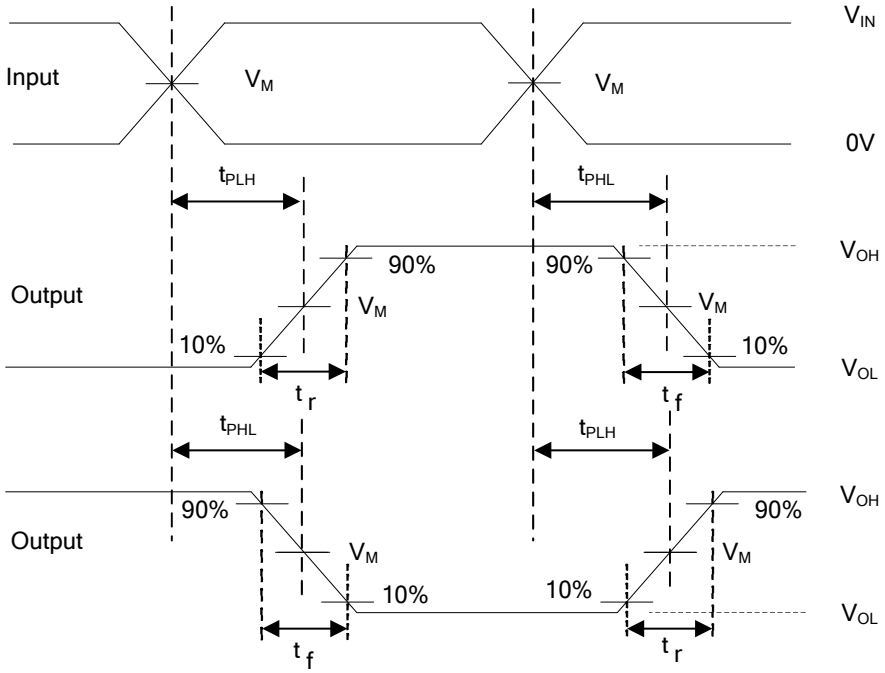
TEST CIRCUIT

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}	≤ 6ns	$V_{CC}/2$	V_{CC}	50 or 150pF	500Ω

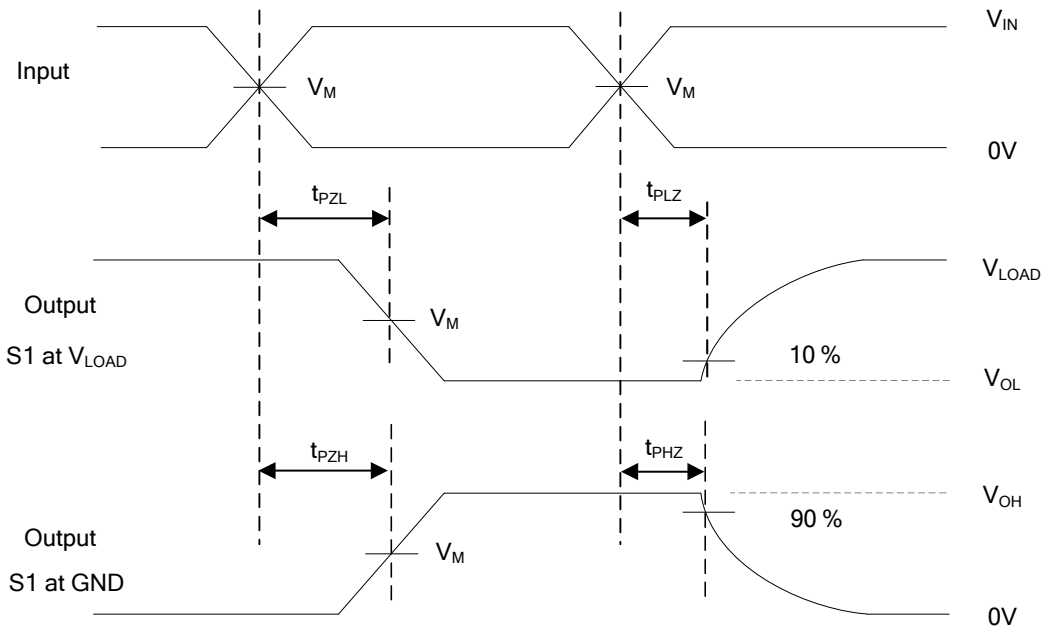


VOLTAGE WAVEFORMS INPUT RISE AND FALL TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY AND OUTPUT TRANSITION TIMES

■ TEST CIRCUIT AND WAVEFORMS (Cont.)



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 ≤1MHz, Z_O = 50Ω.