

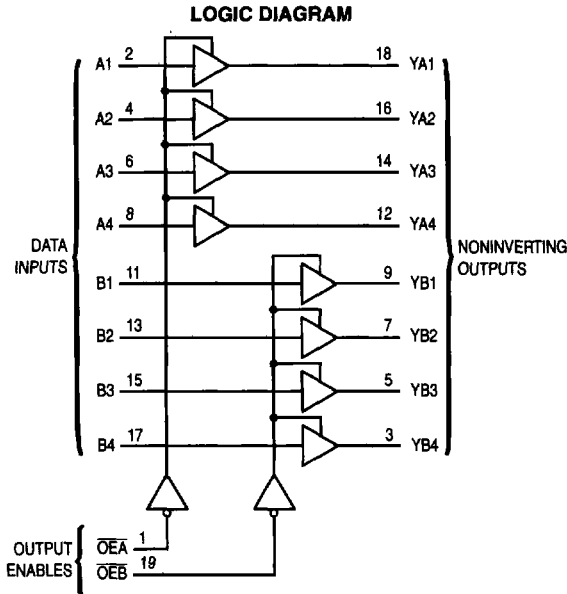
# Octal Bus Buffer

The MC74VHC244 is an advanced high speed CMOS octal bus buffer fabricated with silicon gate CMOS technology. It achieves high speed operation similar to equivalent Bipolar Schottky TTL while maintaining CMOS low power dissipation.

The MC74VHC244 is a noninverting 3-state buffer, and has two active-low output enables. This device is designed to be used with 3-state memory address drivers, etc.

The internal circuit is composed of three stages, including a buffer output which provides high noise immunity and stable output. The inputs tolerate voltages up to 7V, allowing the interface of 5V systems to 3V systems.

- High Speed:  $t_{pD} = 3.9ns$  (Typ) at  $V_{CC} = 5V$
- Low Power Dissipation:  $I_{CC} = 4\mu A$  (Max) at  $T_A = 25^\circ C$
- High Noise Immunity:  $V_{NIH} = V_{NIL} = 28\% V_{CC}$
- Power Down Protection Provided on Inputs
- Balanced Propagation Delays
- Designed for 2V to 5.5V Operating Range
- Low Noise:  $V_{OLP} = 0.9V$  (Max)
- Pin and Function Compatible with Other Standard Logic Families
- Latchup Performance Exceeds 300mA
- ESD Performance: HBM > 2000V; Machine Model > 200V
- Chip Complexity: 136 FETs or 34 Equivalent Gates



**FUNCTION TABLE**

INPUTS		OUTPUTS
OE A, OE B	A, B	YA, YB
L	L	L
L	H	H
H	X	Z

## MC74VHC244



**DW SUFFIX**  
 20-LEAD SOIC WIDE PACKAGE  
 CASE 751D-04



**DT SUFFIX**  
 20-LEAD TSSOP PACKAGE  
 CASE 948E-02



**M SUFFIX**  
 20-LEAD SOIC EIAJ PACKAGE  
 CASE 967-01

**ORDERING INFORMATION**

MC74VHCXXDW	SOIC WIDE
MC74VHCXXDT	TSSOP
MC74VHCXXM	SOIC EIAJ

**PIN ASSIGNMENT**

OE A	1	20	V <sub>CC</sub>
A1	2	19	OE B
YB4	3	18	YA1
A2	4	17	B4
YB3	5	16	YA2
A3	6	15	B3
YB2	7	14	YA3
A4	8	13	B2
YB1	9	12	YA4
GND	10	11	B1

**MAXIMUM RATINGS\***

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	DC Supply Voltage	- 0.5 to + 7.0	V
V <sub>in</sub>	DC Input Voltage	- 0.5 to + 7.0	V
V <sub>out</sub>	DC Output Voltage	- 0.5 to V <sub>CC</sub> + 0.5	V
I <sub>IJK</sub>	Input Diode Current	- 20	mA
I <sub>OK</sub>	Output Diode Current	± 20	mA
I <sub>out</sub>	DC Output Current, per Pin	± 25	mA
I <sub>CC</sub>	DC Supply Current, V <sub>CC</sub> and GND Pins	± 50	mA
P <sub>D</sub>	Power Dissipation in Still Air, SOIC Packages† TSSOP Package†	500 450	mW
T <sub>stg</sub>	Storage Temperature	- 65 to + 150	°C

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V<sub>in</sub> and V<sub>out</sub> should be constrained to the range GND ≤ (V<sub>in</sub> or V<sub>out</sub>) ≤ V<sub>CC</sub>. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V<sub>CC</sub>). Unused outputs must be left open.

\* Absolute maximum continuous ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute-maximum-rated conditions is not implied.

† Derating — SOIC Packages: - 7 mW/°C from 65° to 125°C  
TSSOP Package: - 6.1 mW/°C from 65° to 125°C

**RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Min	Max	Unit
V <sub>CC</sub>	DC Supply Voltage	2.0	5.5	V
V <sub>in</sub>	DC Input Voltage	0	5.5	V
V <sub>out</sub>	DC Output Voltage	0	V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature, All Package Types	- 40	+ 85	°C
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time V <sub>CC</sub> = 3.3V ± 0.3V V <sub>CC</sub> = 5.0V ± 0.5V	0	100 20	ns/V

**DC ELECTRICAL CHARACTERISTICS**

Symbol	Parameter	Test Conditions	V <sub>CC</sub> V	T <sub>A</sub> = 25°C			T <sub>A</sub> = - 40 to 85°C		Unit
				Min	Typ	Max	Min	Max	
V <sub>IH</sub>	Minimum High-Level Input Voltage		2.0 3.0 to 5.5	1.50 V <sub>CC</sub> × 0.7			1.50 V <sub>CC</sub> × 0.7		V
V <sub>IL</sub>	Maximum Low-Level Input Voltage		2.0 3.0 to 5.5			0.50 V <sub>CC</sub> × 0.3		0.50 V <sub>CC</sub> × 0.3	V
V <sub>OH</sub>	Minimum High-Level Output Voltage	V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OH</sub> = - 50µA	2.0 3.0 4.5	1.9 2.9 4.4	2.0 3.0 4.5		1.9 2.9 4.4		V
		V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OH</sub> = - 4mA I <sub>OH</sub> = - 8mA	3.0 4.5	2.58 3.94			2.48 3.80		
V <sub>OL</sub>	Maximum Low-Level Output Voltage	V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OL</sub> = 50µA	2.0 3.0 4.5		0.0 0.0 0.0	0.1 0.1 0.1		0.1 0.1 0.1	V
		V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OL</sub> = 4mA I <sub>OL</sub> = 8mA	3.0 4.5			0.36 0.36		0.44 0.44	
I <sub>in</sub>	Maximum Input Leakage Current	V <sub>in</sub> = 5.5V or GND	0 to 5.5			± 0.1		± 1.0	µA

## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V <sub>CC</sub> V	T <sub>A</sub> = 25°C			T <sub>A</sub> = -40 to 85°C		Unit
				Min	Typ	Max	Min	Max	
I <sub>OZ</sub>	Maximum Three-State Leakage Current	V <sub>in</sub> = V <sub>IL</sub> or V <sub>IH</sub> V <sub>out</sub> = V <sub>CC</sub> or GND	5.5			± 0.25		± 2.5	μA
I <sub>CC</sub>	Maximum Quiescent Supply Current	V <sub>in</sub> = V <sub>CC</sub> or GND	5.5			4.0		40.0	μA

AC ELECTRICAL CHARACTERISTICS (Input t<sub>r</sub> = t<sub>f</sub> = 3.0ns)

Symbol	Parameter	Test Conditions	T <sub>A</sub> = 25°C			T <sub>A</sub> = -40 to 85°C		Unit	
			Min	Typ	Max	Min	Max		
t <sub>PLH</sub> , t <sub>PHL</sub>	Maximum Propagation Delay, A to YA or B to YB	V <sub>CC</sub> = 3.3 ± 0.3V C <sub>L</sub> = 15pF C <sub>L</sub> = 50pF		5.8 8.3	8.4 11.9	1.0 1.0	10.0 13.5	ns	
		V <sub>CC</sub> = 5.0 ± 0.5V C <sub>L</sub> = 15pF C <sub>L</sub> = 50pF		3.9 5.4	5.5 7.5	1.0 1.0	6.5 8.5		
t <sub>PZL</sub> , t <sub>PZH</sub>	Output Enable Time OE <sub>A</sub> to YA or OE <sub>B</sub> to YB	V <sub>CC</sub> = 3.3 ± 0.3V R <sub>L</sub> = 1kΩ C <sub>L</sub> = 50pF		6.6 9.1	10.6 14.1	1.0 1.0	12.5 16.0	ns	
		V <sub>CC</sub> = 5.0 ± 0.5V R <sub>L</sub> = 1kΩ C <sub>L</sub> = 50pF		4.7 6.2	7.3 9.3	1.0 1.0	8.5 10.5		
t <sub>PLZ</sub> , t <sub>PHZ</sub>	Output Disable Time OE <sub>A</sub> to YA or OE <sub>B</sub> to YB	V <sub>CC</sub> = 3.3 ± 0.3V R <sub>L</sub> = 1kΩ C <sub>L</sub> = 50pF		10.3	14.0	1.0	16.0	ns	
		V <sub>CC</sub> = 5.0 ± 0.5V R <sub>L</sub> = 1kΩ C <sub>L</sub> = 50pF		6.7	9.2	1.0	10.5		
t <sub>OSLH</sub> , t <sub>OSHL</sub>	Output to Output Skew	V <sub>CC</sub> = 3.3 ± 0.3V (Note 1.) C <sub>L</sub> = 50pF			1.5		1.5	ns	
		V <sub>CC</sub> = 5.0 ± 0.5V (Note 1.) C <sub>L</sub> = 50pF			1.0		1.0		
C <sub>in</sub>	Maximum Input Capacitance			4	10		10	pF	
C <sub>out</sub>	Maximum Three-State Output Capacitance (Output in High-Impedance State)			6				pF	
C <sub>PD</sub>	Power Dissipation Capacitance (Note 2.)	Typical @ 25°C, V <sub>CC</sub> = 5.0V							pF
		19							

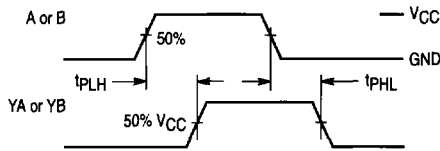
1. Parameter guaranteed by design. t<sub>OSLH</sub> = |t<sub>PLHm</sub> - t<sub>PHLn</sub>|, t<sub>OSHL</sub> = |t<sub>PHLm</sub> - t<sub>PLLn</sub>|.

2. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: I<sub>CC(OPR)</sub> = C<sub>PD</sub> • V<sub>CC</sub> • f<sub>in</sub> + I<sub>CC</sub> / 8 (per bit). C<sub>PD</sub> is used to determine the no-load dynamic power consumption; P<sub>D</sub> = C<sub>PD</sub> • V<sub>CC</sub><sup>2</sup> • f<sub>in</sub> + I<sub>CC</sub> • V<sub>CC</sub>.

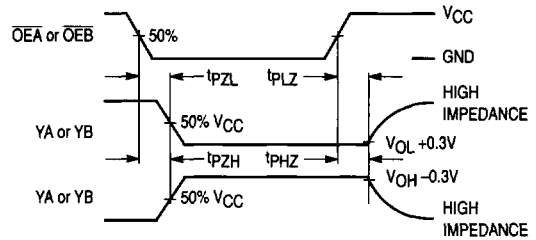
NOISE CHARACTERISTICS (Input t<sub>r</sub> = t<sub>f</sub> = 3.0ns, C<sub>L</sub> = 50pF, V<sub>CC</sub> = 5.0V)

Symbol	Parameter	T <sub>A</sub> = 25°C		Unit
		Typ	Max	
V <sub>OLP</sub>	Quiet Output Maximum Dynamic V <sub>OL</sub>	0.6	0.9	V
V <sub>OLV</sub>	Quiet Output Minimum Dynamic V <sub>OL</sub>	-0.6	-0.9	V
V <sub>IHD</sub>	Minimum High Level Dynamic Input Voltage		3.5	V
V <sub>ILD</sub>	Maximum Low Level Dynamic Input Voltage		1.5	V

**SWITCHING WAVEFORMS**

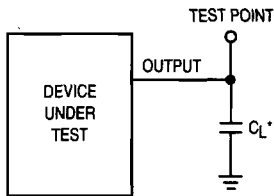


**Figure 1.**



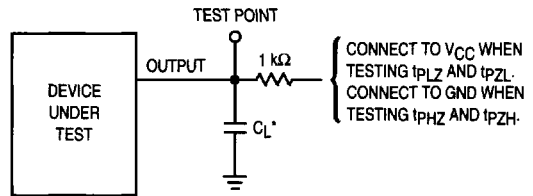
**Figure 2.**

**TEST CIRCUITS**



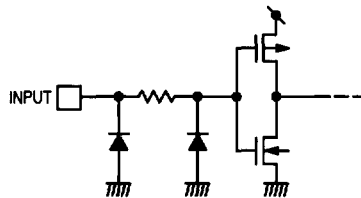
\* Includes all probe and jig capacitance

**Figure 3. Test Circuit**



\* Includes all probe and jig capacitance

**Figure 4. Test Circuit**



**Figure 5. Input Equivalent Circuit**