

MC74HC245A

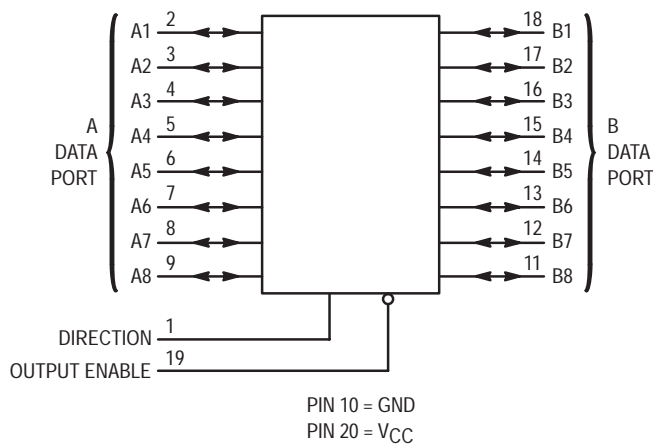
Octal 3-State Noninverting Bus Transceiver High-Performance Silicon-Gate CMOS

The MC74HC245A is identical in pinout to the LS245. The device inputs are compatible with standard CMOS outputs; with pullup resistors, they are compatible with LSTTL outputs.

The HC245A is a 3-state noninverting transceiver that is used for 2-way asynchronous communication between data buses. The device has an active-low Output Enable pin, which is used to place the I/O ports into high-impedance states. The Direction control determines whether data flows from A to B or from B to A.

- Output Drive Capability: 15 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS, and TTL
- Operating Voltage Range: 2 to 6 V
- Low Input Current: 1 μ A
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance with the Requirements Defined by JEDEC Standard No. 7A
- Chip Complexity: 308 FETs or 77 Equivalent Gates

LOGIC DIAGRAM



FUNCTION TABLE

Control Inputs		Operation
Output Enable	Direction	
L	L	Data Transmitted from Bus B to Bus A
L	H	Data Transmitted from Bus A to Bus B
H	X	Buses Isolated (High-Impedance State)

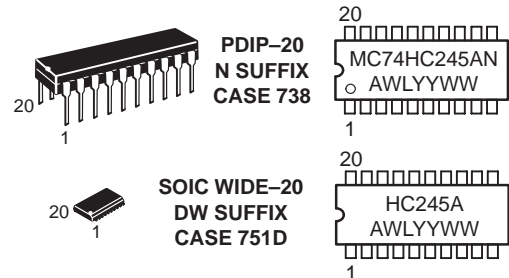
X = don't care



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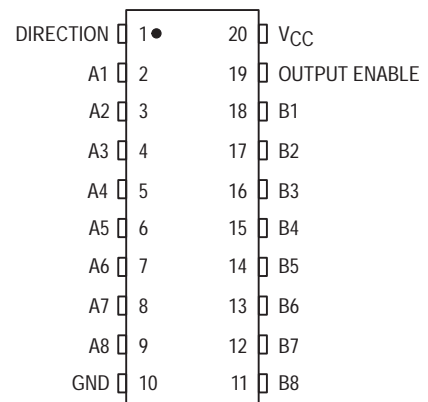
<http://onsemi.com>

MARKING DIAGRAMS



A = Assembly Location
WL = Wafer Lot
YY = Year
WW = Work Week

PIN ASSIGNMENT



ORDERING INFORMATION

Device	Package	Shipping
MC74HC245AN	PDIP-20	1440 / Box
MC74HC245ADW	SOIC-WIDE	38 / Rail
MC74HC245ADWR2	SOIC-WIDE	1000 / Reel

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MAXIMUM RATINGS*

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	- 0.5 to + 7.0	V
V_{in}	DC Input Voltage (Referenced to GND)	- 0.5 to $V_{CC} + 0.5$	V
$V_{I/O}$	DC Output Voltage (Referenced to GND)	- 0.5 to $V_{CC} + 0.5$	V
I_{in}	DC Input Current, per Pin	± 20	mA
$I_{I/O}$	DC Output Current, per Pin	± 35	mA
I_{CC}	DC Supply Current, V_{CC} and GND Pins	± 75	mA
P_D	Power Dissipation in Still Air, Plastic DIP† SOIC Package†	750 500	mW
T_{stg}	Storage Temperature	- 65 to + 150	°C
T_L	Lead Temperature, 1 mm from Case for 10 Seconds (Plastic DIP or SOIC Package)	260	°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_{in} and V_{out} should be constrained to the range $GND \leq (V_{in} \text{ or } V_{out}) \leq V_{CC}$. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

*Maximum Ratings are those values beyond which damage to the device may occur.

Functional operation should be restricted to the Recommended Operating Conditions.

†Derating — Plastic DIP: - 10 mW/°C from 65° to 125°C

SOIC Package: - 7 mW/°C from 65° to 125°C

For high frequency or heavy load considerations, see Chapter 2 of the ON Semiconductor High-Speed CMOS Data Book (DL129/D).

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	2.0	6.0	V
V_{in}, V_{out}	DC Input Voltage, Output Voltage (Referenced to GND)	0	V_{CC}	V
T_A	Operating Temperature, All Package Types	- 55	+ 125	°C
t_r, t_f	Input Rise and Fall Time (Figure 1)	$V_{CC} = 2.0 \text{ V}$ $V_{CC} = 4.5 \text{ V}$ $V_{CC} = 6.0 \text{ V}$	0 1000 500 400	ns

DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

Symbol	Parameter	Test Conditions	V_{CC} V	Guaranteed Limit			Unit
				- 55 to 25°C	$\leq 85^\circ\text{C}$	$\leq 125^\circ\text{C}$	
V_{IH}	Minimum High-Level Input Voltage	$V_{out} = V_{CC} - 0.1 \text{ V}$ $ I_{out} \leq 20 \mu\text{A}$	2.0	1.5	1.5	1.5	V
			3.0	2.1	2.1	2.1	
			4.5	3.15	3.15	3.15	
			6.0	4.2	4.2	4.2	
V_{IL}	Maximum Low-Level Input Voltage	$V_{out} = 0.1 \text{ V}$ $ I_{out} \leq 20 \mu\text{A}$	2.0	0.5	0.5	0.5	V
			3.0	0.9	0.9	0.9	
			4.5	1.35	1.35	1.35	
			6.0	1.8	1.8	1.8	
V_{OH}	Minimum High-Level Output Voltage	$V_{in} = V_{IH}$ $ I_{out} \leq 20 \mu\text{A}$	2.0	1.9	1.9	1.9	V
			4.5	4.4	4.4	4.4	
			6.0	5.9	5.9	5.9	
		$V_{in} = V_{IH}$ $ I_{out} \leq 2.4 \text{ mA}$ $ I_{out} \leq 6.0 \text{ mA}$ $ I_{out} \leq 7.8 \text{ mA}$	3.0	2.48	2.34	2.2	
			4.5	3.98	3.84	3.7	
			6.0	5.48	5.34	5.2	
V_{OL}	Maximum Low-Level Output Voltage	$V_{in} = V_{IL}$ $ I_{out} \leq 20 \mu\text{A}$	2.0	0.1	0.1	0.1	V
			4.5	0.1	0.1	0.1	
			6.0	0.1	0.1	0.1	
		$V_{in} = V_{IL}$ $ I_{out} \leq 2.4 \text{ mA}$ $ I_{out} \leq 6.0 \text{ mA}$ $ I_{out} \leq 7.8 \text{ mA}$	3.0	0.26	0.33	0.4	
			4.5	0.26	0.33	0.4	
			6.0	0.26	0.33	0.4	

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DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

Symbol	Parameter	Test Conditions	V _{CC} V	Guaranteed Limit			Unit
				– 55 to 25°C	≤ 85°C	≤ 125°C	
I _{in}	Maximum Input Leakage Current	V _{in} = V _{CC} or GND	6.0	± 0.1	± 1.0	± 1.0	μA
I _{OZ}	Maximum Three-State Leakage Current	Output in High-Impedance State V _{in} = V _{IL} or V _{IH} V _{out} = V _{CC} or GND	6.0	± 0.5	± 5.0	± 10	μA
I _{CC}	Maximum Quiescent Supply Current (per Package)	V _{in} = V _{CC} or GND I _{out} = 0 μA	6.0	4.0	40	160	μA

NOTE: Information on typical parametric values and high frequency or heavy load considerations can be found in Chapter 2 of the ON Semiconductor High-Speed CMOS Data Book (DL129/D).

AC ELECTRICAL CHARACTERISTICS (C_L = 50 pF, Input t_r = t_f = 6 ns)

Symbol	Parameter	V _{CC} V	Guaranteed Limit			Unit
			– 55 to 25°C	≤ 85°C	≤ 125°C	
t _{PLH} , t _{PHL}	Maximum Propagation Delay, A to B, B to A (Figures 1 and 3)	2.0	75	95	110	ns
		3.0	55	70	80	
		4.5	15	19	22	
		6.0	13	16	19	
t _{PLZ} , t _{PHZ}	Maximum Propagation Delay, Direction or Output Enable to A or B (Figures 2 and 4)	2.0	110	140	165	ns
		3.0	90	110	130	
		4.5	22	28	33	
		6.0	19	24	28	
t _{PZL} , t _{PZH}	Maximum Propagation Delay, Output Enable to A or B (Figures 2 and 4)	2.0	110	140	165	ns
		3.0	90	110	130	
		4.5	22	28	33	
		6.0	19	24	28	
t _{TLH} , t _{THL}	Maximum Output Transition Time, Any Output (Figures 1 and 3)	2.0	60	75	90	ns
		3.0	23	27	32	
		4.5	12	15	18	
		6.0	10	13	15	
C _{in}	Maximum Input Capacitance (Pin 1 or Pin 19)	—	10	10	10	pF
C _{out}	Maximum Three-State I/O Capacitance (I/O in High-Impedance State)	—	15	15	15	pF

NOTE: For propagation delays with loads other than 50 pF, and information on typical parametric values, see Chapter 2 of the ON Semiconductor High-Speed CMOS Data Book (DL129/D).

C _{PD}	Power Dissipation Capacitance (Per Transceiver Channel)*	Typical @ 25°C, V _{CC} = 5.0 V	
		40	
		pF	

* Used to determine the no-load dynamic power consumption: P_D = C_{PD} V_{CC}²f + I_{CC} V_{CC}. For load considerations, see Chapter 2 of the ON Semiconductor High-Speed CMOS Data Book (DL129/D).

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SWITCHING WAVEFORMS

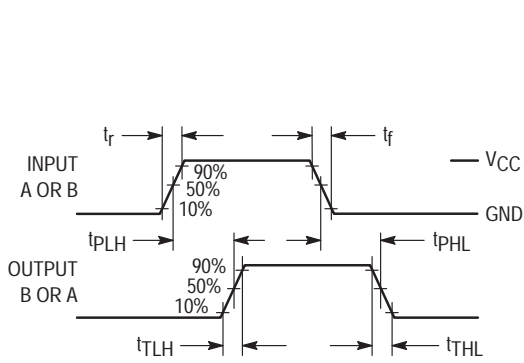


Figure 1.

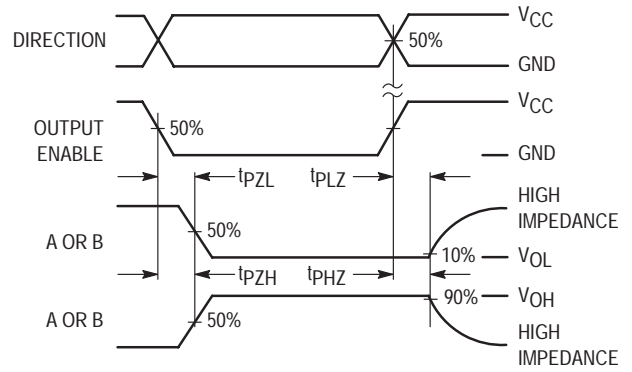
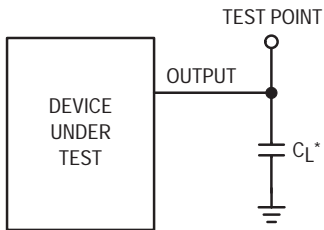


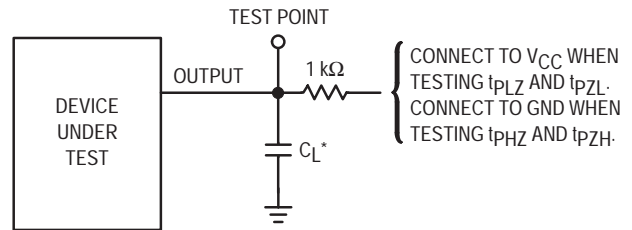
Figure 2.

TEST CIRCUITS



*Includes all probe and jig capacitance

Figure 3.

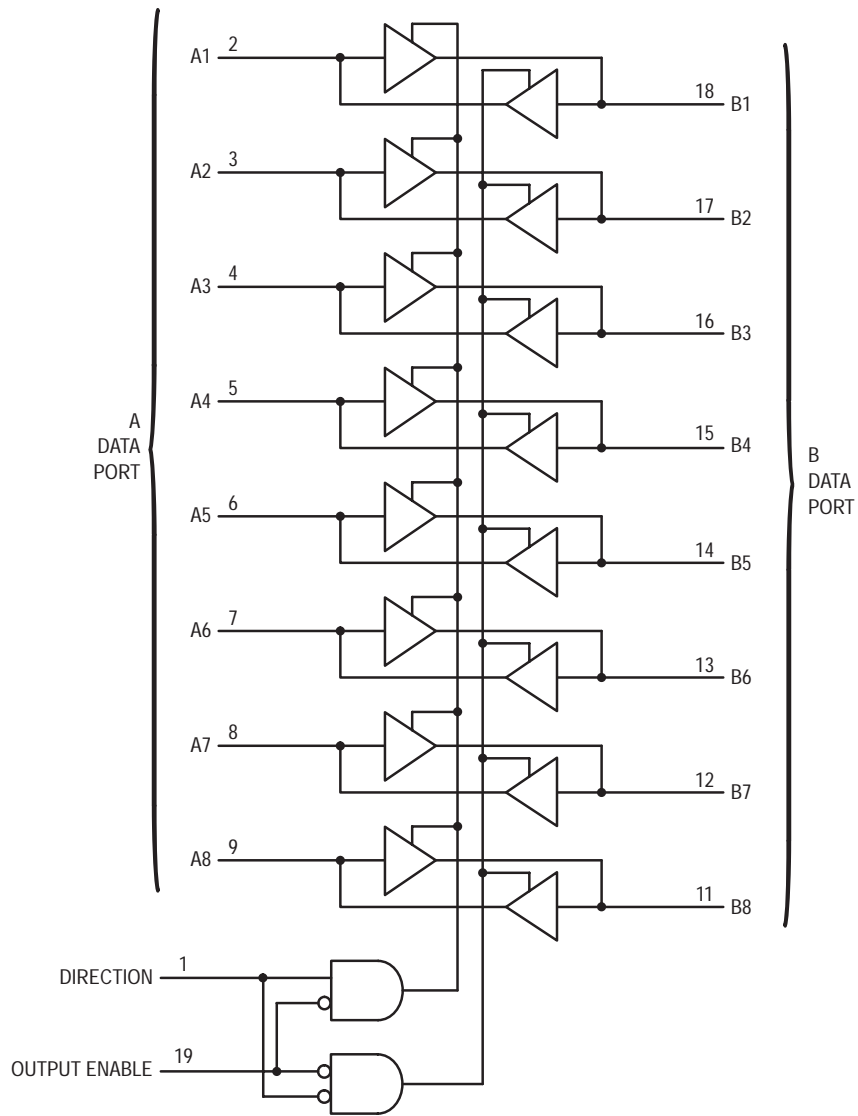


*Includes all probe and jig capacitance

Figure 4.

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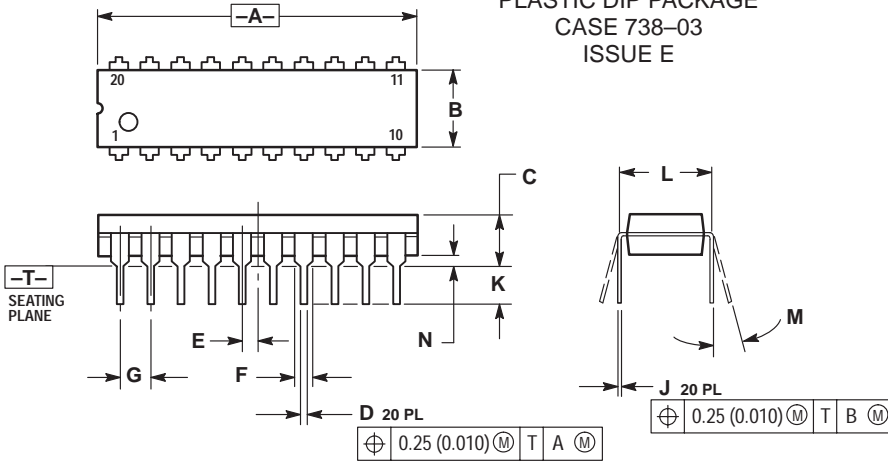
EXPANDED LOGIC DIAGRAM



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PACKAGE DIMENSIONS

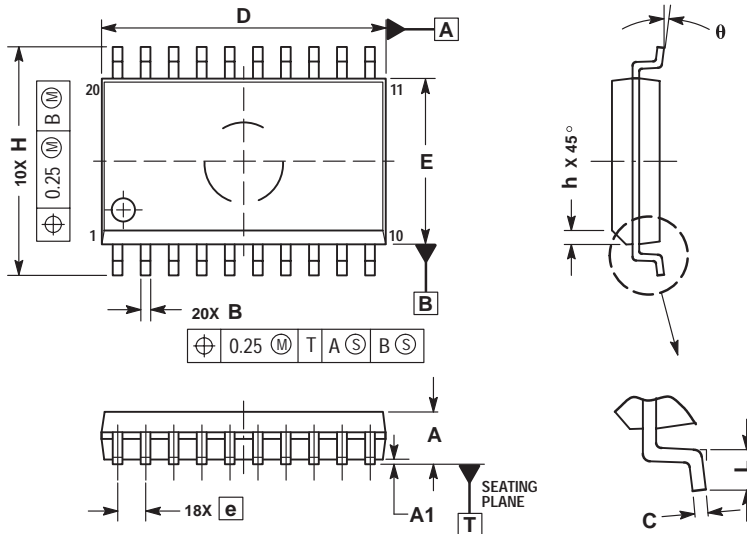
PDIP-20
N SUFFIX
 PLASTIC DIP PACKAGE
 CASE 738-03
 ISSUE E



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
 4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.010	1.070	25.66	27.17
B	0.240	0.260	6.10	6.60
C	0.150	0.180	3.81	4.57
D	0.015	0.022	0.39	0.55
E	0.050 BSC		1.27 BSC	
F	0.050	0.070	1.27	1.77
G	0.100 BSC		2.54 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.140	2.80	3.55
L	0.300 BSC		7.62 BSC	
M	0°	15°	0°	15°
N	0.020	0.040	0.51	1.01

SO-20
DW SUFFIX
 CASE 751D-05
 ISSUE F




- NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
 2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
 3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
 5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF B DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS	
	MIN	MAX
A	2.35	2.65
A1	0.10	0.25
B	0.35	0.49
C	0.23	0.32
D	12.65	12.95
E	7.40	7.60
e	1.27 BSC	
H	10.05	10.55
h	0.25	0.75
L	0.50	0.90
θ	0°	7°

Notes

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