XL74HC245 SOP-20
XD74HC245 DIP-20

1 Features

- 3-State Outputs Drive Bus Lines Directly
- PNP Inputs Reduce DC Loading on Bus Lines
- Hysteresis at Bus Inputs Improves Noise Margins
- Typical Propagation Delay Times Port to Port, 8 ns

2 Applications

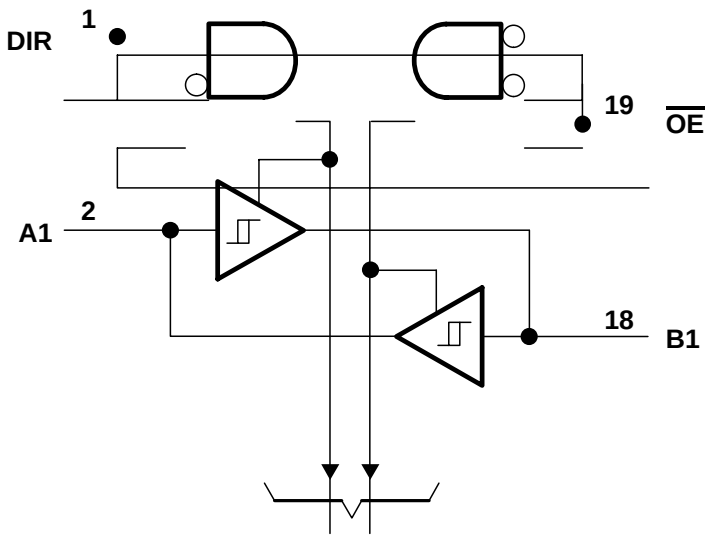
- Building Automation
- Electronic Point of Sale
- Factory Automation and Control
- Test and Measurement

3 Description

These octal bus transceivers are designed for asynchronous two-way communication between data buses. The control-function implementation minimizes external timing requirements.

The 74HC245 devices allow data transmission from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the direction-control (DIR) input. The output-enable ($\overline{OE}$) input can disable the device so that the buses are effectively isolated.

4 Logic Diagram (Positive Logic)

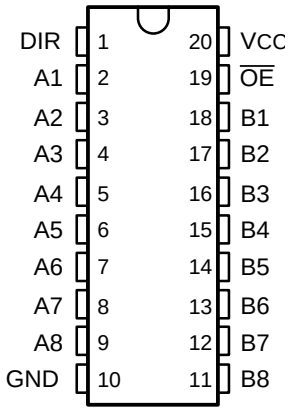


5 Device Comparison Table

TYPE	I_{OL} (SINK CURRENT)	I_{OH} (SOURCE CURRENT)
74HC245	24 mA	–15 mA

6 Pin Configuration and Functions

SOP/DIP



Pin Functions

PIN		I/O	DESCRIPTION
NO.	NAME		
1	DIR	I	Controls signal direction; Low = Bx to Ax, High = Ax to Bx
2	A1	I/O	Channel 1, A side
3	A2	I/O	Channel 2, A side
4	A3	I/O	Channel 3, A side
5	A4	I/O	Channel 4, A side
6	A5	I/O	Channel 5, A side
7	A6	I/O	Channel 6, A side
8	A7	I/O	Channel 7, A side
9	A8	I/O	Channel 8, A side
10	GND	—	Ground
11	B8	O/I	Channel 8, B side
12	B7	O/I	Channel 7, B side
13	B6	O/I	Channel 6, B side
14	B5	O/I	Channel 5, B side
15	B4	O/I	Channel 4, B side
16	B3	O/I	Channel 3, B side
17	B2	O/I	Channel 2, B side
18	B1	O/I	Channel 1, B side
19	$\overline{OE}$	I	Active low output enable; Low = all channels active, High = all channels disabled (high impedance)
20	V_{CC}	—	Power supply

7 Specifications

7.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)

		MIN	MAX	UNIT
V_{CC}	Supply voltage		7	V
V_I	Input voltage(1)		7	V
T_J	Operating virtual junction temperature		150	°C
T_{stg}	Storage temperature	–65	150	°C

(1) All voltage values are with respect to GND.

7.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001(1)	±2500	V
		Charged-device model (CDM), per JEDEC specification JESD22-C101(2)	±1500	

7.5 Electrical Characteristics

over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER			TEST CONDITIONS(1)			MIN	TYP(1)	MAX	UNIT
V_{IH}	High-level input voltage					2			V
V_{IL}	Low-level input voltage			74HC245				0.8	V
V_{IK}	Input clamp voltage		V_{CC} = MIN,	I_I = –18 mA				–1.5	V
	Hysteresis ($V_{T+} – V_{T–}$)	A or B	V_{CC} = MIN			0.2	0.4		V
V_{OH}	High-level output voltage		V_{CC} = MIN, V_{IL} = $V_{IL(max)}$ V_{IH} = 2 V,	I_{OH} = –3 mA		2.4	3.4		V
				I_{OH} = MAX		2			
V_{OL}	Low-level output voltage		V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = $V_{IL(max)}$	I_{OL} = 12 mA				0.4	V
				I_{OL} = 24 mA	74HC245			0.5	
I_{OZH}	Off-state output current, high-level voltage applied		V_{CC} = MAX, $\overline{OE}$ at 2 V	V_O = 2.7 V				20	µA
I_{OZL}	Off-state output current, low-level voltage applied		V_{CC} = MAX, $\overline{OE}$ at 2 V	V_O = 0.4 V				–200	µA
I_I	Input current at maximum input voltage	A or B	V_{CC} = MAX	V_I = 5.5 V				0.1	mA
		DIR or $\overline{OE}$		V_I = 7 V				0.1	
I_{IH}	High-level input current		V_{CC} = MAX,	V_{IH} = 2.7 V				20	µA
I_{IL}	Low-level input current		V_{CC} = MAX,	V_{IL} = 0.4 V				–0.2	mA
I_{OS}	Short-circuit output current(2)		V_{CC} = MAX			–40		–225	mA
I_{CC}	Supply current	Total, outputs high	V_{CC} = MAX	Outputs open			48	70	mA
		Total, outputs low					62	90	
		Outputs at high Z					64	95	

(1) All typical values are at V_{CC} = 5 V, T_A = 25°C.
(2) Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.

7.6 Switching Characteristics

V_{CC} = 5 V, T_A = 25°C (see Figure 2)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low- to high-level output	C_L = 45 pF, R_L = 667 Ω		8	12	ns
t_{PHL}	Propagation delay time, high- to low-level output			8	12	
t_{PZL}	Output enable time to low level	C_L = 45 pF, R_L = 667 Ω		27	40	ns
t_{PZH}	Output enable time to high level			25	40	
t_{PLZ}	Output disable time from low level	C_L = 5 pF, R_L = 667 Ω		15	25	ns
t_{PHZ}	Output disable time from high level			15	28	

7.7 Typical Characteristics

V_{CC} = 5 V, T_A = 25°C, C_L = 45 pF, R_L = 667 Ω

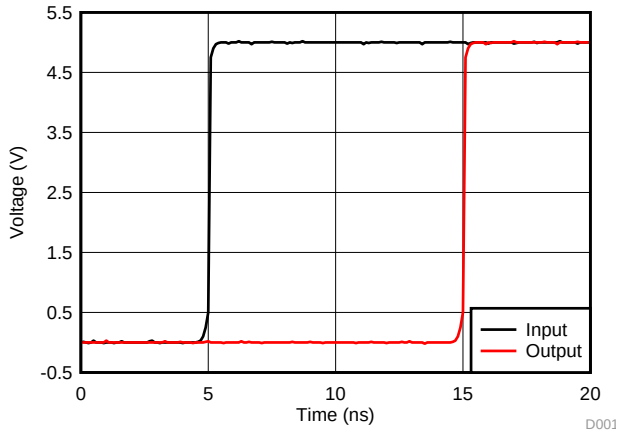
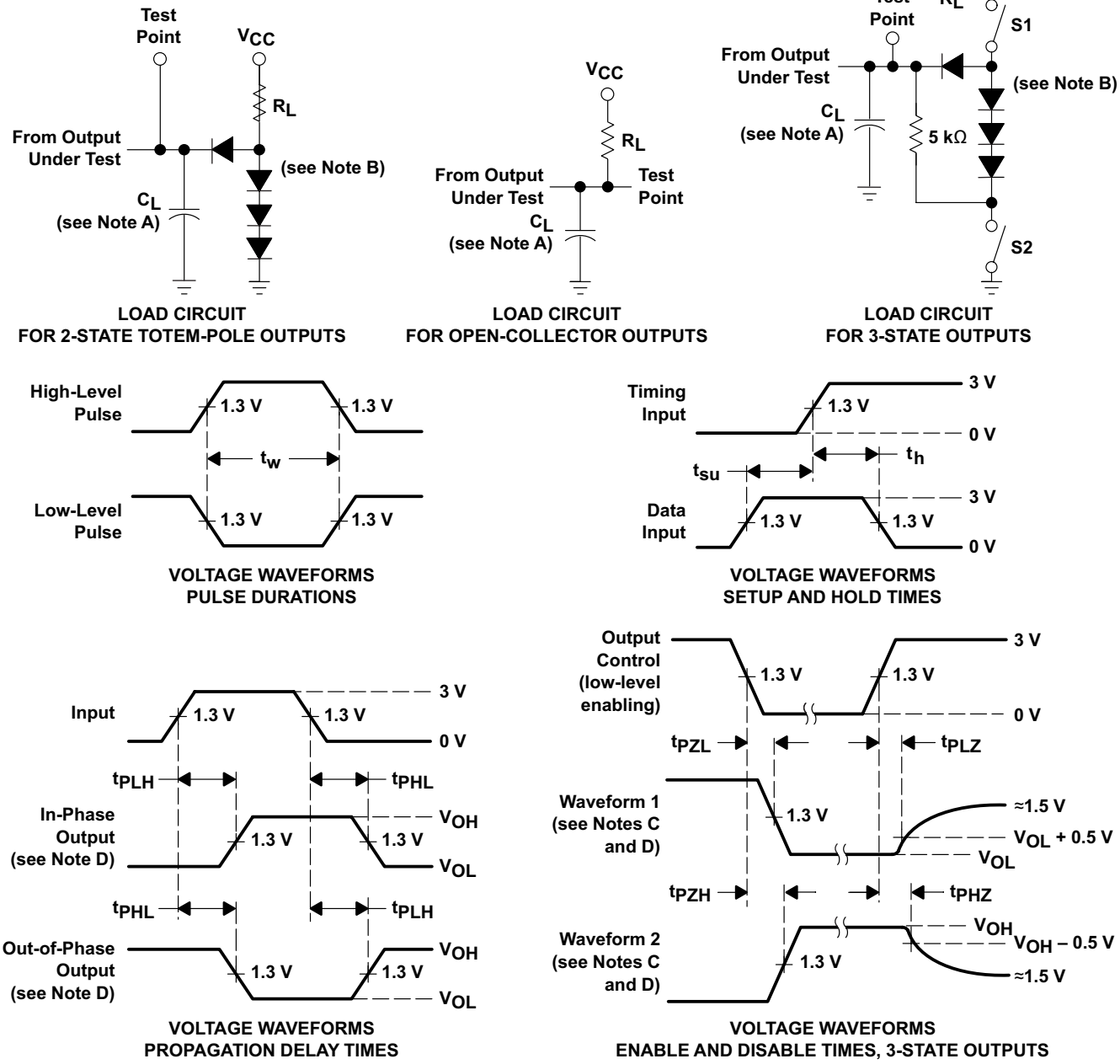


Figure 1. Simulated Propagation Delay From Input to Output

8 Parameter Measurement Information



NOTES: A. C_L includes probe and jig capacitance.
B. All diodes are 1N3064 or equivalent.
C. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
D. S1 and S2 are closed for t_{PLH}, t_{PHL}, t_{PHZ}, and t_{PLZ}; S1 is open and S2 is closed for t_{PZH}; S1 is closed and S2 is open for t_{PZL}.
E. Phase relationships between inputs and outputs have been chosen arbitrarily for these examples.
F. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O ≈ 50 Ω, t_r ≤ 1.5 ns, t_f ≤ 2.6 ns.
G. The outputs are measured one at a time with one input transition per measurement.

Figure 2. Load Circuits and Voltage Waveforms

9 Detailed Description

9.1 Overview

The 74HC245 uses Schottky transistor logic to perform the standard '245 transceiver function. This standard logic function has a common pinout, direction select pin, and active-low output enable. When the outputs are disabled, the A and B sides of the device are effectively isolated.

9.2 Functional Block Diagram

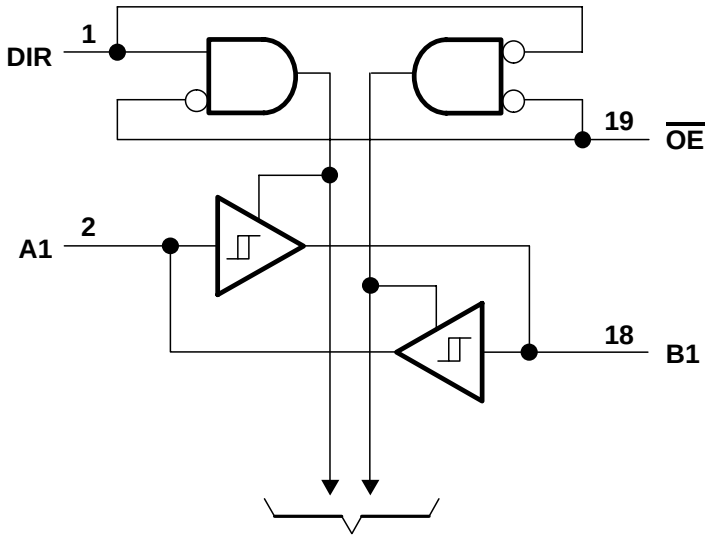


Figure 3. Logic Diagram (Positive Logic)

9.3 Feature Description

9.3.1 3-State outputs

The 3-state outputs can drive bus lines directly. All outputs can be put into high impedance mode through the $\overline{OE}$ pin.

9.3.2 PNP Inputs

This device has PNP inputs which reduce dc loading on bus lines.

9.3.3 Hysteresis on Bus Inputs

The bus inputs have built-in hysteresis that improves noise margins.

9.4 Device Functional Modes

The 74HC245 performs the standard '245 logic function. Data can be transmitted from A to B or from B to A depending on the DIR pin value, or the A and B sides can be isolated from one another by setting the $\overline{OE}$ pin HIGH.

Table 1. Function Table

INPUTS		OPERATION
$\overline{OE}$	DIR	
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

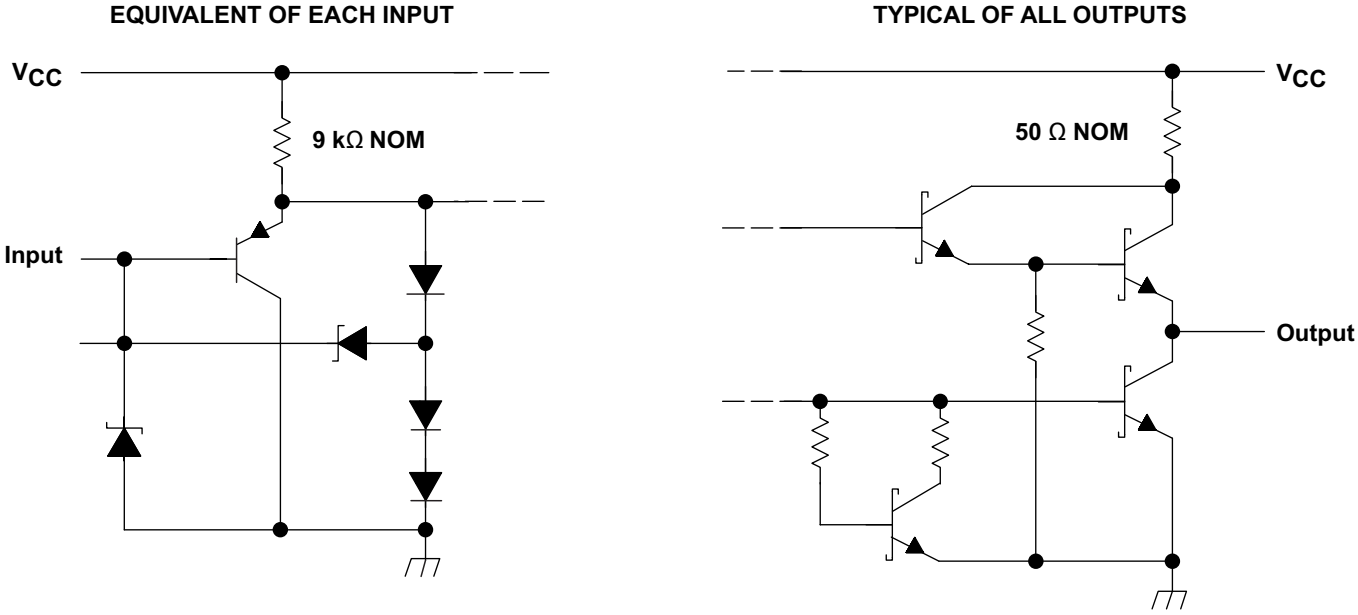


Figure 4. Schematics of Inputs and Outputs