Octal buffer/line driver with 5-volt tolerant inputs/outputs; 3-state

74LVC241A 74LVCH241A

FEATURES

- **5-Volt tolerant inputs/outputs, for interfacing with 5-volt logic.**
- **Supply voltage range of 2.7 V to 3.6 V**
- **In accordance with JEDEC standard no. 8-1A.**
- **CMOS low power consumption**
- **Direct interface with TTL levels**
- **High impedance when V_{CC} =0 V**
- **Bushold on all data inputs (LVCH241A only).**

DESCRIPTION

The 74LVC(H)241A is a high-performance, low-power, low-voltage, Si-gate CMOS device and superior to most advanced CMOS compatible TTL families.

Inputs can be driven from either 3.3 V or 5 V devices. In 3-state operation, outputs can handle 5 V. This feature allows the use of these devices as translators in a mixed 3.3 V/5 V environment

The 74LVC(H)241A is an octal non-inverting buffer/line driver with 3-state outputs. The 3-state outputs are controlled by the output enable inputs $1\overline{OE}$ and 2OE. Schmitt-trigger action at all inputs makes the circuit highly tolerant for slower input rise and fall times.

QUICK REFERENCE DATA

GND = 0 V; T_{amb} = 25 °C; $t_r = t_f \leq 2.5$ ns

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
t_{PHL}/t_{PLH}	propagation delay $1A_n$ to $1Y_n$; $2A_n$ to $2Y_n$	C_L = 50 pF V_{CC} = 3.3 V	3.8	ns
C_I	input capacitance		5.0	pF
C_{PD}	power dissipation capacitance per buffer	notes 1 and 2	20	pF

Notes to the quick reference data

1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW)
   $P_D = C_{PD} \times V_{CC}^2 \times f_i + \Sigma (C_L \times V_{CC}^2 \times f_o)$ where:
   f_i = input frequency in MHz; C_L = output load capacity in pF;
   f_o = output frequency in MHz; V_{CC} = supply voltage in V;
   $\Sigma (C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.
2. The condition is V_I = GND to V_{CC}

ORDERING INFORMATION

TYPE NUMBER	PACKAGES			
	PINS	PACKAGE	MATERIAL	CODE
74LVC(H)241D	20	SO20	plastic	SOT163-1
74LVC(H)241DB	20	SSOP20	plastic	SOT339-1
74LVC(H)241PW	20	TSSOP20	plastic	SOT360-1

PINNING

PIN NO.	SYMBOL	NAME AND FUNCTION
1	$1\overline{OE}$	output enable input (active LOW)
2, 4, 6, 8	$1A_0$ to $1A_3$	data inputs
3, 5, 7, 9	$2Y_0$ to $2Y_3$	bus outputs
10	GND	ground (0 V)
17, 15, 13, 11	$2A_0$ to $2A_3$	data inputs
18, 16, 14, 12	$1Y_0$ to $1Y_3$	bus outputs
19	2OE	output enable input (active HIGH)
20	V_{CC}	positive power supply

FUNCTION TABLES

INPUTS		OUTPUT
$1\overline{OE}$	$1A_n$	$1Y_n$
L	L	L
L	H	H
H	X	Z

INPUTS		OUTPUT
2OE	$2A_n$	$2Y_n$
H	L	L
H	H	H
L	X	Z

H = HIGH voltage level
L = LOW voltage level
X = don't care
Z = high impedance OFF-state

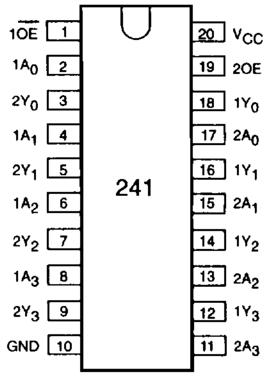


Fig.1 Pin configuration.

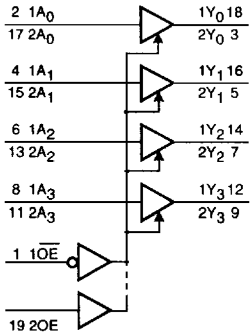


Fig.2 Logic symbol.

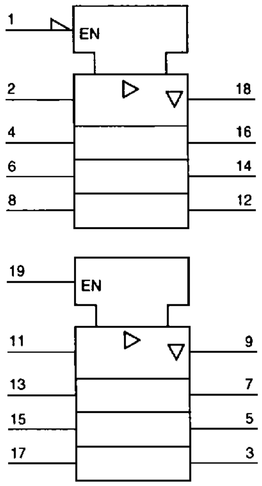


Fig.3 IEC logic symbol.

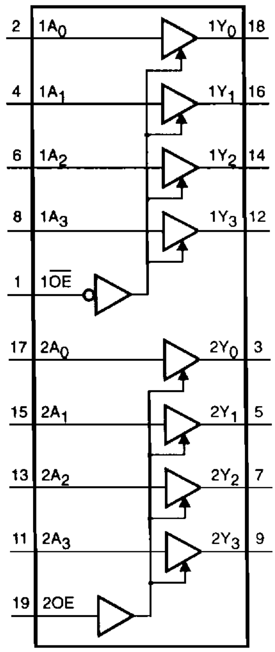


Fig.4 Functional diagram.

DC CHARACTERISTICS FOR 74LVC(H)241A

For the DC characteristics see chapter "LVC(H)-A family characteristics", section "Family specifications".
I_{CC} category: MSI

AC CHARACTERISTICS FOR 74LVC(H)241A

GND = 0 V; $t_r = t_f \leq 2.5$ ns; $C_L = 50$ pF

SYMBOL	PARAMETER	T_{amb} (°C) -40 to +85			UNIT	TEST CONDITIONS	
		MIN.	TYP.	MAX.		V_{CC} (V)	WAVEFORMS
t_{PHL}/t_{PLH}	propagation delay $1A_n$ to $1Y_n$; $2A_n$ to $2Y_n$	– 1.5 1.5	– – –	– 7.5 6.5	ns	1.2 2.7 3.0 to 3.6	Figs 5, 8
t_{PZH}/t_{PZL}	3-state output enable time $1\overline{OE}$ to $1Y_n$	– 1.5 1.5	– – –	– 9.0 8.0	ns	1.2 2.7 3.0 to 3.6	Figs 6, 8
t_{PHZ}/t_{PLZ}	3-state output disable time $1\overline{OE}$ to 1Yn	– 1.5 1.5	– – –	– 8.0 7.0	ns	1.2 2.7 3.0 to 3.6	Figs 6, 8
t_{PZH}/t_{PZL}	3-state output enable time 2OE to $2Y_n$	– 1.5 1.5	– – –	– 9.0 8.0	ns	1.2 2.7 3.0 to 3.6	Figs 7, 8
t_{PHZ}/t_{PLZ}	3-state output disable time 2OE to $2Y_n$	– 1.5 1.5	– – –	– 8.0 7.0	ns	1.2 2.7 3.0 to 3.6	Figs 7, 8

Notes: All typical values are measured at T_{amb} = 25 °C.
* Typical values are measured at V_{CC} = 3.3 V.

AC WAVEFORMS

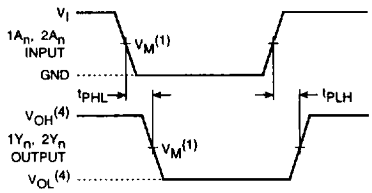


Fig. 5 Waveforms showing the input ($1A_n$, $2A_n$) to output ($1Y_n$, $2Y_n$) propagation delays.

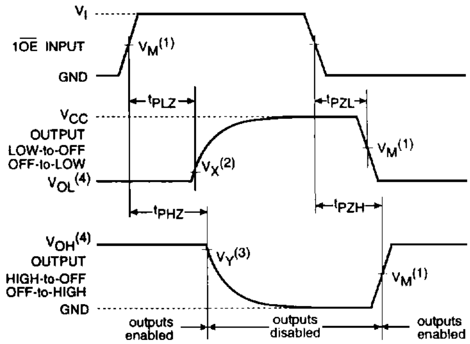


Fig.6 Waveforms showing the 3-state enable and disable times for input $1\overline{OE}$.

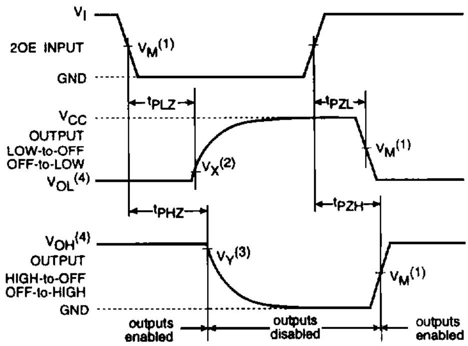
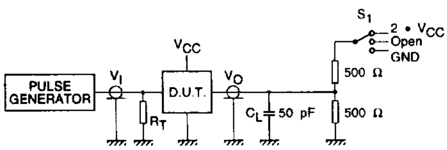


Fig.7 Waveforms showing the 3-state enable and disable times for input 2OE.



V_{CC}	V_I
< 2.7 V	V_{CC}
2.7 - 3.6 V	2.7 V

Test	S_1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	2 • V_{CC}
t_{PHZ}/t_{PZH}	GND

Fig.8 Load circuitry for switching times

Notes:
(1) $V_M = 1.5$ V at $V_{CC} \geq 2.7$ V
$V_M = 0.5 \cdot V_{CC}$ at $V_{CC} < 2.7$ V
(2) $V_X = V_{OL} + 0.3$ V at $V_{CC} \geq 2.7$ V
$V_X = V_{OL} + 0.1 \cdot V_{CC}$ at $V_{CC} < 2.7$ V
(3) $V_Y = V_{OH} - 0.3$ V at $V_{CC} \geq 2.7$ V
$V_Y = V_{OH} - 0.1 \cdot V_{CC}$ at $V_{CC} < 2.7$ V
(4) V_{OL} and V_{OH} are the typical output voltage drop that occur with the output load.