

16-bit buffer/line driver; 5V input/output tolerant (3-State)

74LVC16244A

FEATURES

- 5 volt tolerant inputs/outputs for interfacing with 5V logic
- Wide supply voltage range of 1.2V to 3.6V
- Complies with JEDEC standard no. 8-1A
- CMOS low power consumption
- MULTIBYTE™ flow-through standard pin-out architecture
- Low inductance multiple power and ground pins for minimum noise and ground bounce
- Direct interface with TTL levels

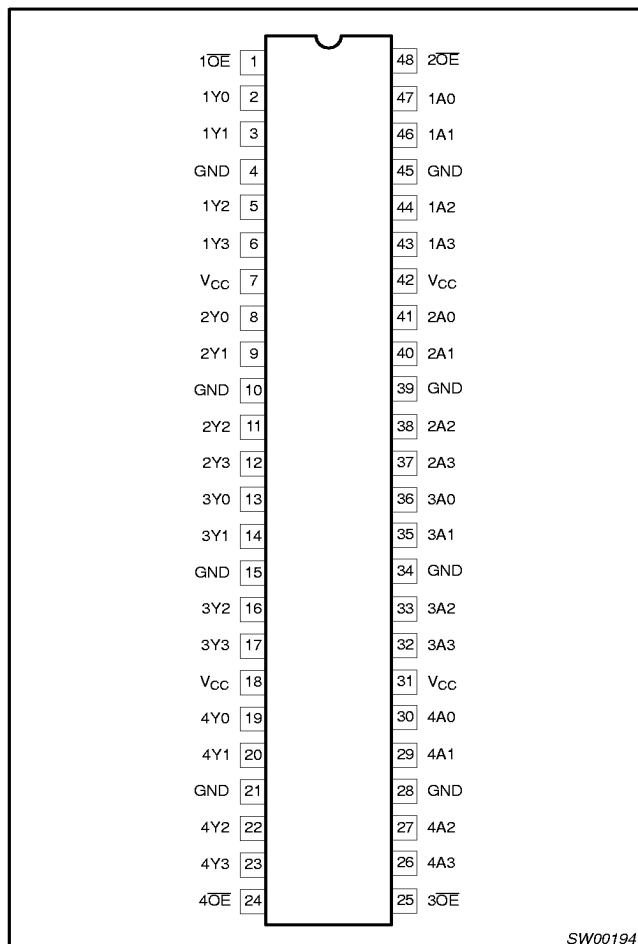
DESCRIPTION

The 74LVC16244A is a high-performance, low-power, low-voltage, Si-gate CMOS device, superior to most advanced CMOS compatible TTL families. Inputs can be driven from either 3.3V or 5V devices. In 3-State operation, outputs can handle 5V. These features allow the use of these devices in a mixed 3.3V/5V environment.

The 74LVC16244A is a 16-bit non-inverting buffer/line driver with 3-State outputs. The device can be used as four 4-bit buffers, two 8-bit buffers or one 16-bit buffer. The 3-State outputs are controlled by the output enable inputs $1\overline{OE}$ and $2\overline{OE}$. A HIGH on $n\overline{OE}$ causes the outputs to assume a high impedance OFF-state. Active bushold circuitry is provided to hold unused or floating data inputs at a valid logic level. This feature eliminates the need for external pull-up or pull-down resistors. The device can be used as four 4-bit buffers, two 8-bit buffers or one 16-bit buffer.

The 74LVC16244A is identical to the 74LVC16240A but has non-inverting outputs.

PIN CONFIGURATION



SW00194

ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
48-Pin Plastic SSOP Type III	-40°C to +85°C	74LVC16244A DL	VC16244A DL	SOT370-1
48-Pin Plastic TSSOP Type II	-40°C to +85°C	74LVC16244A DGG	VC16244A DGG	SOT362-1

QUICK REFERENCE DATA

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

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
t _{PHL} /t _{PLH}	Propagation delay 1An to 1Yn; 2An to 2Yn	C _L = 50pF V _{CC} = 3.3V	3.5	ns
C _I	Input capacitance		5.0	pF
C _{PD}	Power dissipation capacitance per buffer	V _I = GND to V _{CC} ¹	30	pF

NOTES:

1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW):

$$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$$
 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;
 $\sum (C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.

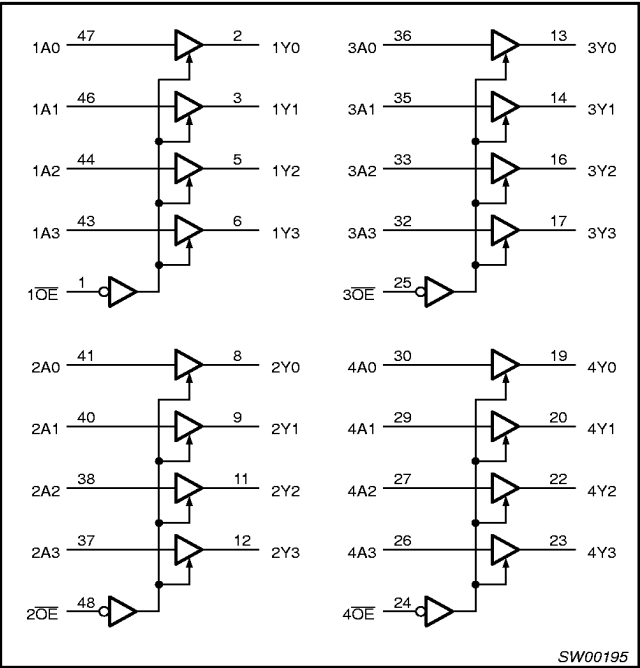
16-bit buffer/line driver; 5V input/output tolerant
(3-State)

74LVC16244A

PIN DESCRIPTION

PIN NUMBER	SYMBOL	NAME AND FUNCTION
1	1 $\overline{\text{OE}}$	Output enable input (active LOW)
2, 3, 5, 6	1Y0 to 1Y3	Data outputs
4, 10, 15, 21, 28, 34, 39, 45	GND	Ground (0V)
7, 18, 31, 42	V _{CC}	Positive supply voltage
8, 9, 11, 12	2Y0 to 2Y3	Data outputs
13, 14, 16, 17	3Y0 to 3Y3	Data outputs
19, 20, 22, 23	4Y0 to 4Y3	Data outputs
24	4 $\overline{\text{OE}}$	Output enable input (active LOW)
25	3 $\overline{\text{OE}}$	Output enable input (active LOW)
30, 29, 27, 26	4A0 to 4A3	Data inputs
36, 35, 33, 32	3A0 to 3A3	Data inputs
41, 40, 38, 37	2A0 to 2A3	Data inputs
47, 46, 44, 43	1A0 to 1A3	Data inputs
48	2 $\overline{\text{OE}}$	Output enable input (active LOW)

LOGIC SYMBOL

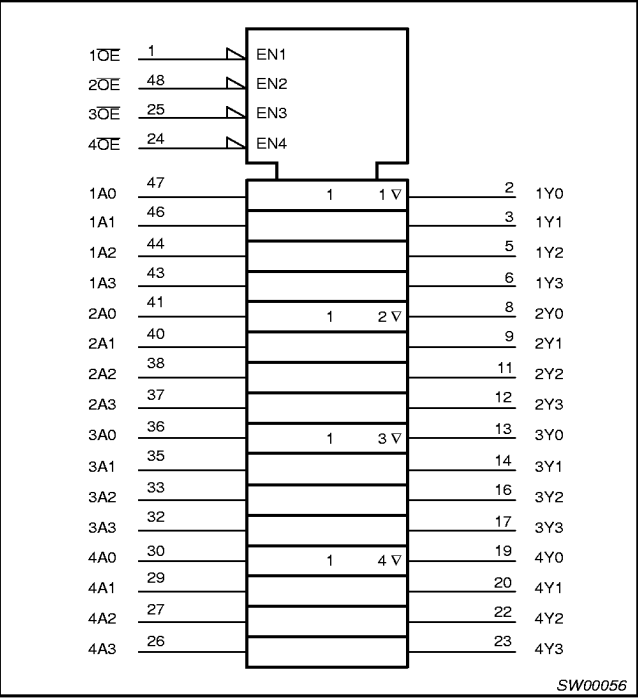


FUNCTION TABLE

INPUTS		OUTPUT
n $\overline{\text{OE}}$	nAn	nYn
L	L	L
L	H	H
H	X	Z

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

LOGIC SYMBOL (IEEE/IEC)



16-bit buffer/line driver; 5V input/output tolerant (3-State)

74LVC16244A

ABSOLUTE MAXIMUM RATINGS¹

In accordance with the Absolute Maximum Rating System (IEC 134) Voltages are referenced to GND (ground = 0V)

SYMBOL	PARAMETER	CONDITIONS	LIMITS		UNIT
			MIN	MAX	
V_{CC}	DC supply voltage		-0.5	+6.5	V
I_{IK}	DC input diode current	$V_I < 0$	—	-50	mA
V_I	DC input voltage	Note 2	-0.5	+6.5	V
I_{OK}	DC output diode current	$V_O > V_{CC}$ or $V_O < 0$	—	± 50	mA
V_O	DC output voltage; output HIGH or LOW state	Note 2	-0.5	$V_{CC} + 0.5$	V
V_O	DC output voltage; output 3-State	Note 2	-0.5	6.5	V
I_O	DC output source or sink current	$V_O = 0$ to V_{CC}	—	± 50	mA
I_{GND}, I_{CC}	DC V_{CC} or GND current		—	± 100	mA
T_{stg}	Storage temperature range		-65	+150	°C
P_{tot}	Power dissipation per package — SO package — SSOP and TSSOP package	Above +70°C derate linearly 8mW/K Above +60°C derate linearly 5.5mW/K		500 500	mW

NOTES:

- Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- The input and output voltage ratings may be exceeded if the input and output clamp current ratings are observed.

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	CONDITIONS	LIMITS		UNIT
			MIN.	MAX.	
V_{CC}	DC supply voltage (for max. speed performance)		2.7	3.6	V
V_{CC}	DC supply voltage (for low-voltage applications)		1.2	3.6	V
V_I	DC Input voltage range		0	5.5	V
V_O	DC output voltage range; output HIGH or LOW state		0	V_{CC}	V
V_O	DC output voltage range; output 3-State		0	5.5	V
T_{amb}	Operating ambient temperature range in free air	See DC and AC characteristics for individual device	-40	+85	°C
t_r, t_f	Input rise and fall times	$V_{CC} = 1.2$ to $2.7V$ $V_{CC} = 2.7$ to $3.6V$	0 0	20 10	ns/V

16-bit buffer/line driver; 5V input/output tolerant (3-State)

74LVC16244A

DC ELECTRICAL CHARACTERISTICS

Over recommended operating conditions

Voltages are referenced to GND (ground = 0V)

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			Temp = -40°C to +85°C			
			MIN	TYP ¹	MAX	
V _{IH}	HIGH level input voltage	V _{CC} = 1.2V	V _{CC}			V
		V _{CC} = 2.7 to 3.6V	2.0			
V _{IL}	LOW level input voltage	V _{CC} = 1.2V			GND	V
		V _{CC} = 2.7 to 3.6V			0.8	
V _{OH}	HIGH level output voltage	V _{CC} = 2.7; V _I = V _{IH} or V _{IL} ; I _O = -12mA	V _{CC} -0.5			V
		V _{CC} = 3.0V; V _I = V _{IH} or V _{IL} ; I _O = -100μA	V _{CC} -0.2	V _{CC}		
		V _{CC} = 3.0V; V _I = V _{IH} or V _{IL} ; I _O = -18mA	V _{CC} -0.6			
		V _{CC} = 3.0V; V _I = V _{IH} or V _{IL} ; I _O = -24mA	V _{CC} -0.8			
V _{OL}	LOW level output voltage	V _{CC} = 2.7V; V _I = V _{IH} or V _{IL} ; I _O = 12mA			0.40	V
		V _{CC} = 3.0V; V _I = V _{IH} or V _{IL} ; I _O = 100μA			0.20	
		V _{CC} = 3.0V; V _I = V _{IH} or V _{IL} ; I _O = 24mA			0.55	
I _I	Input leakage current	V _{CC} = 3.6V; V _I = 5.5V or GND; not for I/O pins		± 0.1	± 5	μA
I _{IHZ} /I _{ILZ}	Input current for common I/O pins	V _{CC} = 3.6V; V _I = 5.5V or GND; output disabled		± 0.1	± 10	μA
I _{OZ}	3-State output OFF-state current	V _{CC} = 3.6V; V _I = V _{IH} or V _{IL} ; V _O = 5.5V or GND		0.1	± 10	μA
I _{OFF}	Power off leakage current	V _{CC} = 0.0V; V _I or V _O = 5.5V			±10	μA
I _{CC}	Quiescent supply current	V _{CC} = 3.6V; V _I = V _{CC} or GND; I _O = 0		0.1	40	μA
ΔI _{CC}	Additional quiescent supply current given per input pin	V _{CC} = 2.7 to 3.6V; V _I = V _{CC} -0.6V; I _O = 0		5	500	μA

NOTES:

1. All typical values are at $V_{CC} = 3.3V$ and $T_{amb} = 25^\circ C$.

16-bit buffer/line driver; 5V input/output tolerant
(3-State)

74LVC16244A

AC CHARACTERISTICS

GND = 0V; $t_R = t_F = 2.5\text{ns}$; $C_L = 50\text{pF}$; $R_L = 500\Omega$; $T_{\text{amb}} = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$.

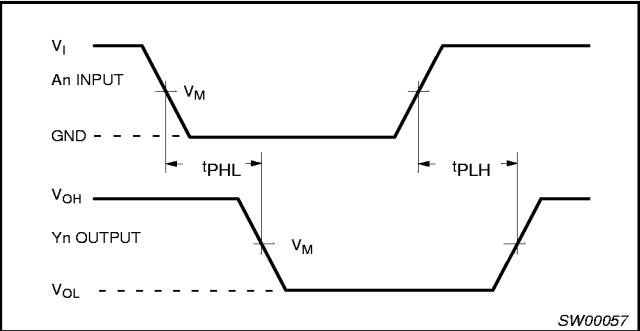
SYMBOL	PARAMETER	WAVEFORM	LIMITS						UNIT
			$V_{CC} = 3.3V \pm 0.3V$			$V_{CC} = 2.7V$		$V_{CC} = 1.2V$	
			MIN	TYP ¹	MAX	MIN	MAX	TYP	
t_{PHL} t_{PLH}	Propagation delay 1An to 1Yn; 2An to 2Yn	1	1.5	3	5.0	1.5	5.8	11.0	ns
t_{PZH} t_{PZL}	3-State output enable time 1OE to 1Yn; 2OE to 2Yn	2, 3	1.5	3.5	6.9	1.5	6.9	15.0	ns
t_{PHZ} t_{PLZ}	3-State output disable time 1OE to 1Yn; 2OE to 2Yn	2, 3	1.5	3.7	5.3	1.5	6.3	10.0	ns

NOTE:

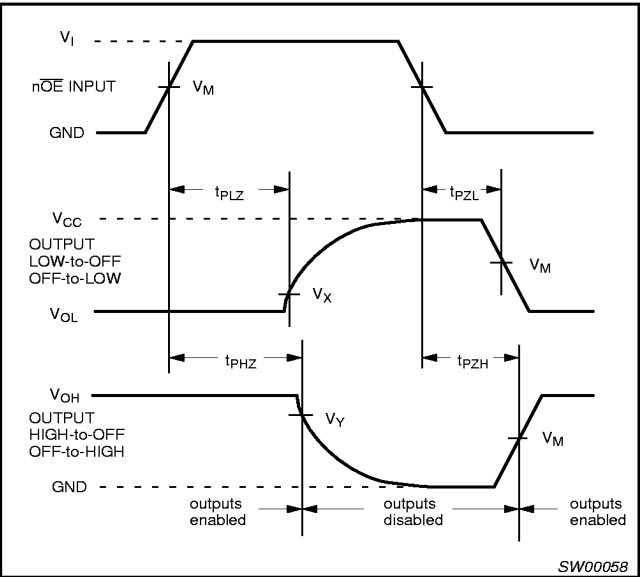
1. All typical values are at $V_{CC} = 3.3V$ and $T_{\text{amb}} = 25^{\circ}\text{C}$.

AC WAVEFORMS

$V_M = 1.5V$ at $V_{CC} \geq 2.7V$; $V_M = 0.5 V_{CC}$ at $V_{CC} < 2.7V$.
 V_{OL} and V_{OH} are the typical output voltage drop that occur with the output load.
 $V_X = V_{OL} + 0.3V$ at $V_{CC} \geq 2.7V$; $V_X = V_{OL} + 0.1 V_{CC}$ at $V_{CC} < 2.7V$
 $V_Y = V_{OH} - 0.3V$ at $V_{CC} \geq 2.7V$; $V_Y = V_{OH} - 0.1 V_{CC}$ at $V_{CC} < 2.7V$

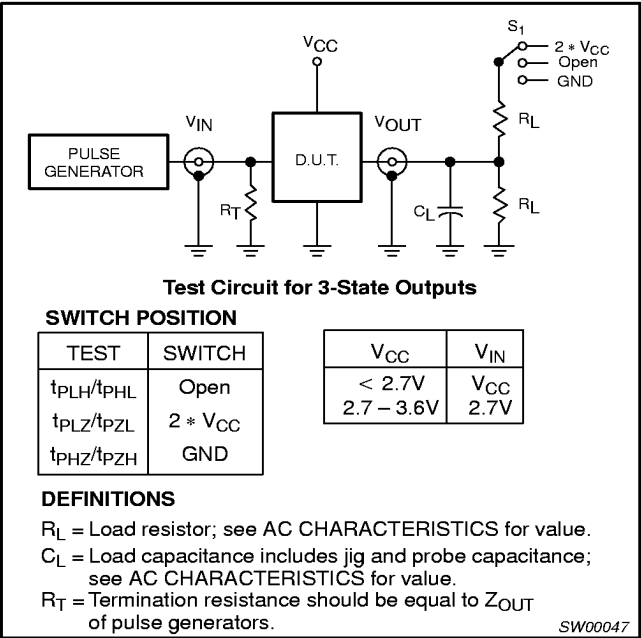


Waveform 1. Input (An) to output (Yn) propagation delay times



Waveform 2. 3-State enable and disable times

TEST CIRCUIT



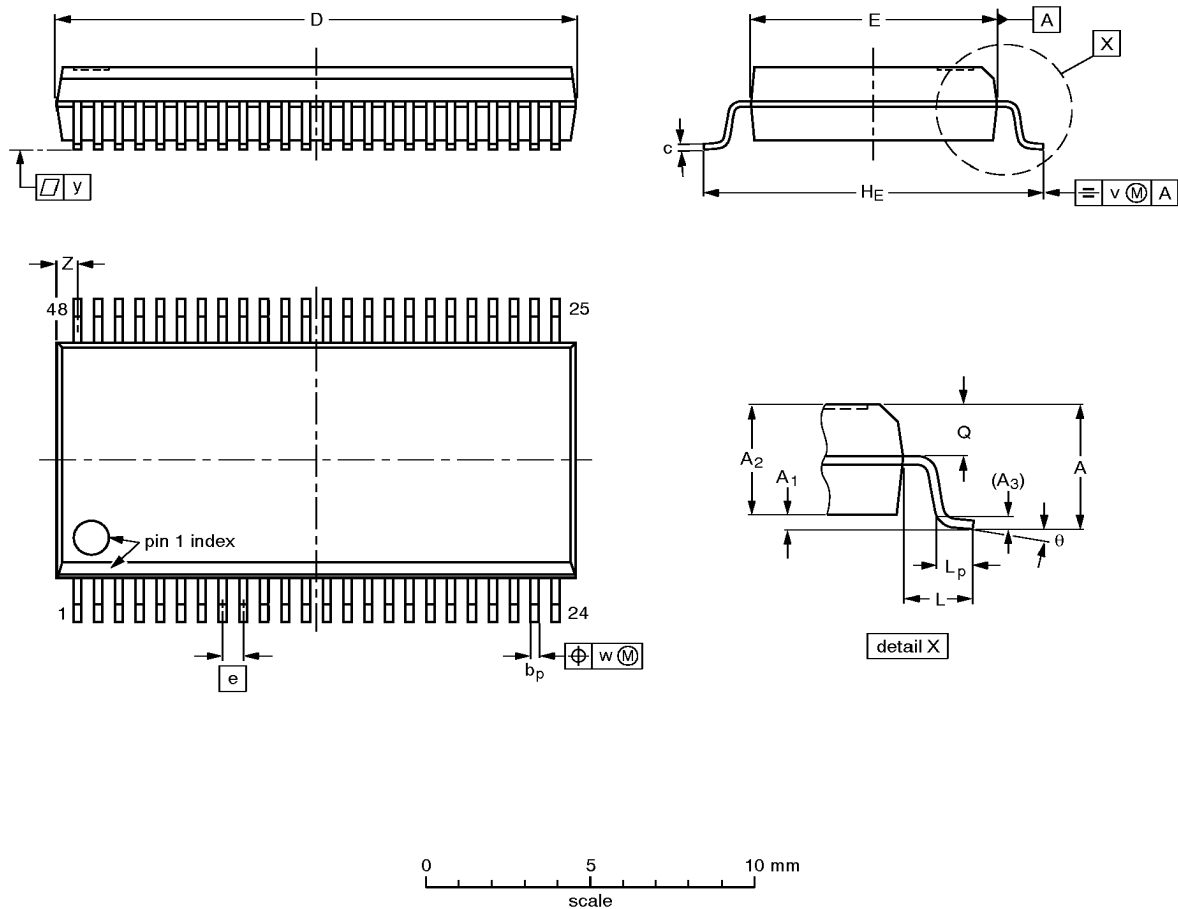
Waveform 3. Load circuitry for switching times

16-bit buffer/line driver; 5V input/output tolerant
(3-State)

74LVC16244A

SSOP48: plastic shrink small outline package; 48 leads; body width 7.5 mm

SOT370-1



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽¹⁾	e	H _E	L	L _p	Q	v	w	y	Z ⁽¹⁾	θ
mm	2.8	0.4 0.2	2.35 2.20	0.25	0.3 0.2	0.22 0.13	16.00 15.75	7.6 7.4	0.635	10.4 10.1	1.4	1.0 0.6	1.2 1.0	0.25	0.18	0.1	0.85 0.40	8° 0°

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT370-1		MO-118AA				93-11-02 95-02-04

74LVC16244A

SOT362-1

