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Kind regards,

Team Nexperia

74LVC16240A

16-bit buffer/line driver with 5V tolerant inputs/outputs; inverting; 3-state

Rev. 4 — 3 November 2011

Product data sheet

1. General description

The 74LVC16240A is a 16-bit 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 device features four output enables (10E, 20E, 30E and 40E), each controlling four of the 3-state outputs. A HIGH on nOE causes the outputs to assume a high-impedance OFF-state.

Inputs can be driven from either 3.3 V or 5 V devices. When disabled, up to 5.5 V can be applied to the outputs. These features allow the use of these devices in mixed 3.3 V and 5 V applications.

This device is fully specified for partial power-down applications using I_{OFF} . The I_{OFF} circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

2. Features and benefits

- 5 V tolerant inputs/outputs for interfacing with 5 V logic
- Wide supply voltage range from 1.2 V to 3.6 V
- 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
- Complies with JEDEC standard:
 - ◆ JESD8-7A (1.65 V to 1.95 V
 - ◆ JESD8-5A (2.3 V to 2.7 V
 - ◆ JESD8-C/JESD36 (2.7 V to 3.6 V
- ESD protection:
 - ◆ HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115B exceeds 200 V
 - ◆ CDM JESD22-C101E exceeds 1000 V
- Specified from −40 °C to +85 °C and from −40 °C to +125 °C.

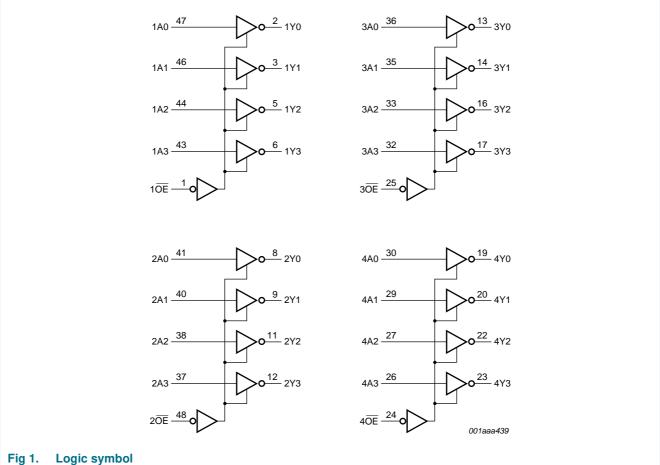


Ordering information

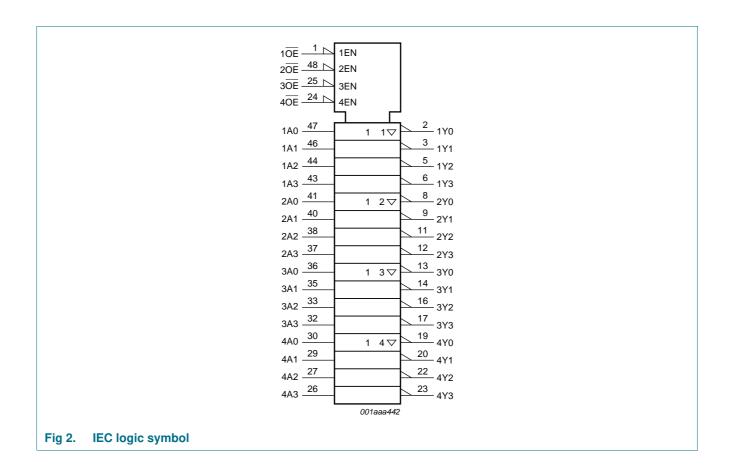
Table 1. **Ordering information**

Type number	Package							
	Temperature range	ge Name Description						
74LVC16240ADGG	–40 °C to +125 °C	TSSOP48	plastic thin shrink small outline package; 48 leads; body width 6.1 mm	SOT362-1				
74LVC16240ADL	–40 °C to +125 °C	SSOP48	plastic shrink small outline package; 48 leads; body width 7.5 mm	SOT370-1				

Functional diagram 4.

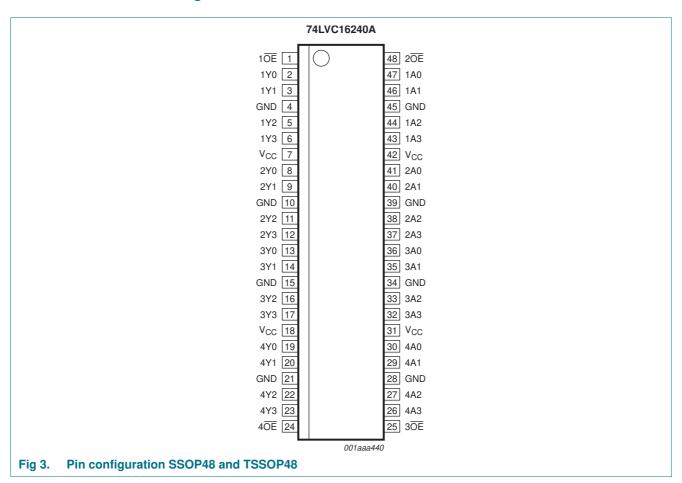


16-bit buffer/line driver; 5V tolerant; inverting; 3-state



5. Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

Name	Pin	Description
1 OE	1	output enable input (active LOW)
20E	48	output enable input (active HIGH)
30E	25	output enable input (active HIGH)
4 OE	24	output enable input (active LOW)
GND	4, 10, 15, 21, 28, 34, 39, 45	ground (0 V)
V _{CC}	7, 18, 31, 42	supply voltage
1Y[0:3]	2, 3, 5, 6	data output
2Y[0:3]	8, 9, 11, 12	data output
3Y[0:3]	13, 14, 16, 17	data output
4Y[0:3]	19, 20, 22, 23	data output
1A[0:3]	47, 46, 44, 43	data input

74LVC16240A

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Table 2. Pin description ...continued

Name	Pin	Description
2A[0:3]	41, 40, 38, 37	data input
3A[0:3]	36, 35, 33, 32	data input
4A[0:3]	30, 29, 27, 26	data input

6. Functional description

Table 3. Function table[1]

Input nOE	Output	
nOE	nAn	nYn
L	L	Н
L	Н	L
Н	X	Z

^[1] H = HIGH voltage level

7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		-0.5	+6.5	V
I _{IK}	input clamping current	V _I < 0 V	-50	-	mA
VI	input voltage		<u>[1]</u> –0.5	+6.5	V
l _{OK}	output clamping current	$V_O > V_{CC}$ or $V_O < 0 V$	-	±50	mA
V _O	output voltage	output HIGH or LOW state	<u>[2]</u> -0.5	$V_{CC} + 0.5$	V
		output 3-state	<u>[2]</u> –0.5	+6.5	V
lo	output current	$V_O = 0 V \text{ to } V_{CC}$	-	±50	mA
I _{CC}	supply current		-	100	mA
I _{GND}	ground current		-100	-	mA
T _{stg}	storage temperature		-65	+150	°C
P _{tot}	total power dissipation	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$	[3] _	500	mW

^[1] The minimum input voltage ratings may be exceeded if the input current ratings are observed.

L = LOW voltage level

X = don't care

Z = high-impedance OFF-state

^[2] The output voltage ratings may be exceeded if the output current ratings are observed.

^[3] Above 60 $^{\circ}$ C the value of P_{tot} derates linearly with 5.5 mW/K.

Recommended operating conditions

Table 5. **Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V_{CC}	supply voltage		1.65	-	3.6	V
		functional	1.2	-	-	V
VI	input voltage		0	-	5.5	V
Vo	output voltage	output HIGH or LOW state	0	-	V_{CC}	V
		output 3-state	0	-	5.5	V
T _{amb}	ambient temperature	in free air	-40	-	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 1.65 \text{ V to } 2.7 \text{ V}$	-	-	20	ns/V
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	-	-	10	ns/V

Static characteristics

Table 6. **Static characteristics**

At recommended operating conditions. Voltages are referenced to GND (ground = 0 V).

Symbol Parameter		Conditions	-40	°C to +8	35 °C	–40 °C to	Unit	
			Min	Typ[1]	Max	Min	Max	
V_{IH}	HIGH-level	V _{CC} = 1.2 V	1.08	-	-	1.08	-	V
	input voltage	V _{CC} = 1.65 V to 1.95 V	$0.65 \times V_{CC}$	-	-	$0.65 \times V_{CC}$	-	V
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.7	-	-	1.7	-	V
		V _{CC} = 2.7 V to 3.6 V	2.0	-	-	2.0	-	V
V_{IL}	LOW-level	V _{CC} = 1.2 V	-	-	0.12	-	0.12	V
	input voltage	V _{CC} = 1.65 V to 1.95 V	-	-	$0.35 \times V_{CC}$	-	$0.35 \times V_{CC}$	V
		V _{CC} = 2.3 V to 2.7 V	-	-	0.7	-	0.7	V
	V _{CC} = 2.7 V to 3.6 V	-	-	0.8	-	0.8	V	
V _{OH} HIGH-leve output voltage	HIGH-level	$V_I = V_{IH}$ or V_{IL}						
	•	$I_O = -100 \mu A;$ $V_{CC} = 1.65 \text{ V to } 3.6 \text{ V}$	$V_{CC}-0.2$	-	-	$V_{CC}-0.3$	-	V
		$I_O = -4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	1.2	-	-	1.05	-	٧
		$I_{O} = -8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	1.8	-	-	1.65	-	٧
		$I_{O} = -12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	2.2	-	-	2.05	-	٧
		$I_{O} = -18 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.4	-	-	2.25	-	٧
		$I_{O} = -24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.2	-	-	2.0	-	V
V _{OL}	LOW-level	$V_I = V_{IH}$ or V_{IL}						
	output voltage	$I_O = 100 \mu A;$ $V_{CC} = 1.65 \text{ V to } 3.6 \text{ V}$	-	-	0.2	-	0.3	V
		$I_O = 4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	-	-	0.45	-	0.65	٧
		$I_O = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.6	-	0.8	٧
		$I_O = 12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	-	-	0.4	-	0.6	٧
		$I_O = 24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.55	-	0.8	٧
l _l	input leakage current	V_{CC} = 3.6 V; V_I = 5.5 V or GND	-	±0.1	±5	-	±20	μА

Table 6. Static characteristics ...continued

At recommended operating conditions. Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	-40	°C to +8	35 °C	-40 °C to	o +125 °C	Unit
			Min	Typ[1]	Max	Min	Max	
l _{OZ}	OFF-state output current	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 3.6$ V; $V_O = 5.5$ V or GND;	-	0.1	±5	-	±20	μА
l _{OFF}	power-off leakage current	$V_{CC} = 0 \text{ V}; V_1 \text{ or } V_O = 5.5 \text{ V}$	-	0.1	±10	-	±20	μА
I _{CC}	supply current	V_{CC} = 3.6 V; V_I = V_{CC} or GND; I_O = 0 A	-	0.1	20	-	80	μΑ
ΔI_{CC}	additional supply current	per input pin; $V_{CC} = 2.7 \text{ V to } 3.6 \text{ V};$ $V_{I} = V_{CC} - 0.6 \text{ V};$ $I_{O} = 0 \text{ A}$	-	5	500	-	5000	μА
Cı	input capacitance	V_{CC} = 0 V to 3.6 V; V_{I} = GND to V_{CC}	-	5.0	-	-	-	pF

^[1] All typical values are measured at V_{CC} = 3.3 V (unless stated otherwise) and T_{amb} = 25 °C.

10. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V). For test circuit see Figure 6.

Symbol	Parameter	Conditions	Conditions		–40 °C to	+85 °C	-40 °C to +125 °C		Unit
				Min	Typ[1]	Max	Min	Max	
t _{pd}	propagation	nAn to nYn; see Figure 4	[2]						
	delay	V _{CC} = 1.2 V		-	12.0	-	-	-	ns
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$		1.0	5.1	11.0	1.0	11.7	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		0.5	2.7	5.5	0.5	6.1	ns
		$V_{CC} = 2.7 V$		1.0	2.7	5.2	1.0	6.5	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$		1.0	2.3	4.2	1.0	5.5	ns
t _{en}	enable time	nOE to nYn; see Figure 5	[2]						
		V _{CC} = 1.2 V		-	18.0	-	-	-	ns
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$		1.5	6.6	12.8	1.5	13.5	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		1.0	3.8	6.8	1.0	7.5	ns
		V _{CC} = 2.7 V		1.5	3.5	5.8	1.5	7.5	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$		1.0	3.0	5.0	1.0	6.5	ns
t _{dis}	disable time	nOE to nYn; see Figure 5	[2]						
		V _{CC} = 1.2 V		-	11.0	-	-	-	ns
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$		2.9	4.7	9.2	2.9	9.7	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		1.0	2.6	5.0	1.0	5.6	ns
		$V_{CC} = 2.7 \text{ V}$		1.5	3.5	5.1	1.5	6.5	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$		1.5	3.2	4.9	1.5	6.5	ns
t _{sk(o)}	output skew time	V_{CC} = 3.0 V to 3.6 V	[3]	-	-	1.0	-	1.5	ns

16-bit buffer/line driver; 5V tolerant; inverting; 3-state

 Table 7.
 Dynamic characteristics ...continued

Voltages are referenced to GND (ground = 0 V). For test circuit see Figure 6.

Symbol	Parameter	Conditions		T _{amb} =	–40 °C to	+85 °C	-40 °C to +125 °C		Unit
				Min	Typ[1]	Max	Min	Max	
C _{PD} power	per input; $V_I = GND$ to V_{CC}	[4]							
	dissipation	V _{CC} = 1.65 V to 1.95 V		-	4.8	-	-	-	pF
	capacitance	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		-	8.3	-	-	-	pF
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$		-	11.4	-	-	-	pF

- [1] Typical values are measured at T_{amb} = 25 °C and V_{CC} = 1.2 V, 1.8 V, 2.5 V, 2.7 V, and 3.3 V respectively.
- $\begin{array}{ll} [2] & t_{pd} \text{ is the same as } t_{PLH} \text{ and } t_{PHL}. \\ & t_{en} \text{ is the same as } t_{PZL} \text{ and } t_{PZH}. \\ & t_{dis} \text{ is the same as } t_{PLZ} \text{ and } t_{PHZ}. \end{array}$
- [3] Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.
- [4] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma (C_L \times V_{CC}^2 \times f_o) \text{ where:}$

 f_i = input frequency in MHz; f_o = output frequency in MHz

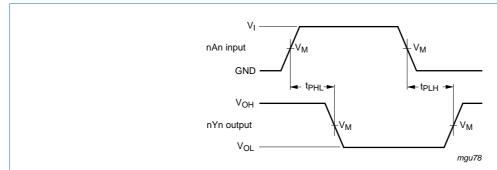
C_L = output load capacitance in pF

V_{CC} = supply voltage in Volts

N = number of inputs switching

 $\Sigma(C_L \times V_{CC}^2 \times f_0)$ = sum of the outputs

11. Waveforms



 $V_M = 1.5 \text{ V at } V_{CC} \ge 2.7 \text{ V};$

 $V_M = 0.5 \times V_{CC}$ at $V_{CC} < 2.7$ V.

 $\ensuremath{V_{\text{OL}}}$ and $\ensuremath{V_{\text{OH}}}$ are typical output voltage levels that occur with the output load.

Fig 4. The input nAn to output nYn propagation delays

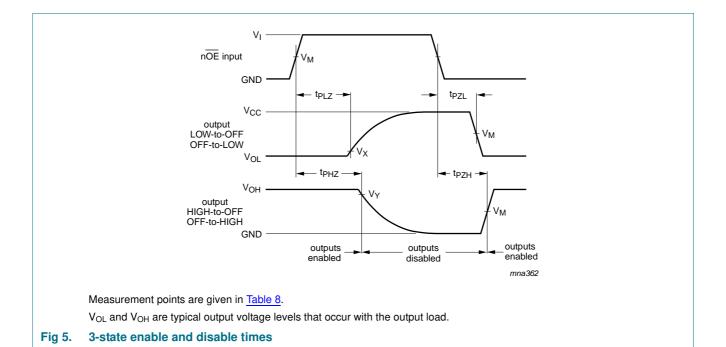
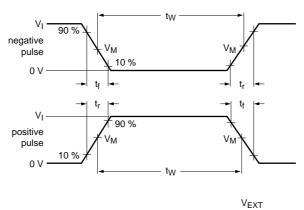
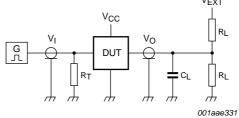


Table 8. Measurement points

Supply voltage	Input	Output		
V _{CC}	V _M	V _M	V _X	V _Y
1.2 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.1 V$	$V_{OH}-0.1\ V$
1.65 V to 1.95 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.1 V$	$V_{OH}-0.1\ V$
2.3 V to 2.7 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	V _{OL} + 0.1 V	$V_{OH}-0.1\ V$
2.7 V	1.5 V	1.5 V	$V_{OL} + 0.3 V$	V _{OH} – 0.3 V
3.0 V to 3.6 V	1.5 V	1.5 V	V_{OL} + 0.3 V	V _{OH} – 0.3 V





Test data is given in Table 9.

Definitions for test circuit:

R_L = Load resistance.

 C_L = Load capacitance including jig and probe capacitance.

 R_T = Termination resistance should be equal to output impedance Z_0 of the pulse generator.

 V_{EXT} = External voltage for measuring switching times.

Fig 6. Test circuit for measuring switching times

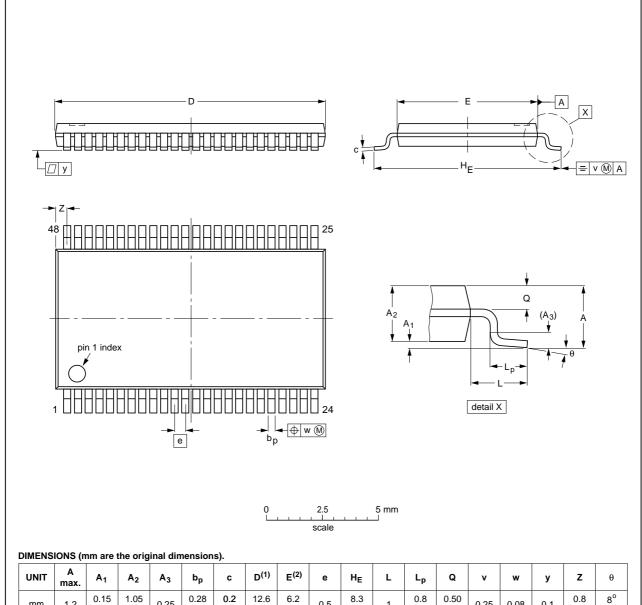
Table 9. Test data

Supply voltage	ply voltage Input Load		V _{EXT}	V _{EXT}			
	VI	t _r , t _f	CL	R _L	t _{PLH} , t _{PHL}	t_{PLZ} , t_{PZL}	t _{PHZ} , t _{PZH}
1.2 V	V_{CC}	≤ 2 ns	30 pF	1 kΩ	open	$2\times V_{CC}$	GND
1.65 V to 1.95 V	V_{CC}	≤ 2 ns	30 pF	1 kΩ	open	$2\times V_{CC}$	GND
2.3 V to 2.7 V	V_{CC}	≤ 2 ns	30 pF	500Ω	open	$2\times V_{CC}$	GND
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500Ω	open	$2\times V_{CC}$	GND
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500Ω	open	$2\times V_{CC}$	GND

12. Package outline

TSSOP48: plastic thin shrink small outline package; 48 leads; body width 6.1 mm

SOT362-1



UNIT	A max.	A ₁	A ₂	A ₃	bp	С	D ⁽¹⁾	E ⁽²⁾	е	HE	L	Lp	Q	v	w	у	Z	θ
mm	1.2	0.15 0.05	1.05 0.85	0.25	0.28 0.17	0.2 0.1	12.6 12.4	6.2 6.0	0.5	8.3 7.9	1	0.8 0.4	0.50 0.35	0.25	0.08	0.1	0.8 0.4	8° 0°

- 1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
- 2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE		REFER	EUROPEAN	ISSUE DATE			
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE	
SOT362-1		MO-153				-99-12-27 03-02-19	
						30 02 10	

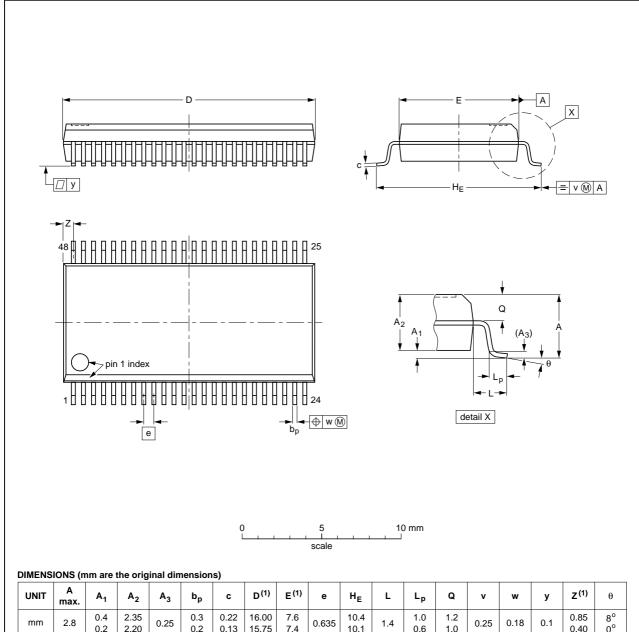
Fig 7. Package outline SOT362-1 (TSSOP48)

74LVC16240A

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

SOT370-1



п					,		-,												
	UNIT	A max.	A ₁	A ₂	A ₃	bp	С	D ⁽¹⁾	E ⁽¹⁾	е	HE	L	Lp	Q	v	w	у	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		REFER	EUROPEAN	ISSUE DATE		
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT370-1		MO-118				99-12-27 03-02-19

Fig 8. Package outline SOT370-1 (SSOP48)

74LVC16240A

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16-bit buffer/line driver; 5V tolerant; inverting; 3-state

13. Abbreviations

Table 10. Abbreviations

Acronym	Description
CDM	Charged Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
НВМ	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

14. Revision history

Table 11. Revision history

	•								
Document ID	Release date	Data sheet status	Change notice	Supersedes					
74LVC16240A v.4	20111103	Product data sheet	-	74LVC16240A v.3					
Modifications:	 The format of t NXP Semicon 	his document has been rede ductors.	signed to comply with t	he new identity guidelines of					
	 Legal texts have been adapted to the new company name where appropriate. 								
	• Table 4, Table	5, Table 6, Table 7, and Table	e 9: values added for l	ower voltage ranges.					
74LVC16240A v.3	20040305	Product specification	-	74LVC16240A v.2					
74LVC16240A v.2	19970729	Product specification	-	74LVC16240A v.1					
74LVC16240A v.1	19951226	Product specification	-	-					

15. Legal information

15.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

- [1] Please consult the most recently issued document before initiating or completing a design
- [2] The term 'short data sheet' is explained in section "Definitions"
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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16-bit buffer/line driver; 5V tolerant; inverting; 3-state

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