

# 3.3V ABT 16-Bit Inverting buffers/drivers with 30Ω termination resistors (3-State)

74LVT16240A-1

## FEATURES

- 16-bit bus interface
- 3-State buffers
- Output capability: +12mA/-32mA
- TTL input and output switching levels
- Input and output interface capability to systems at 5V supply
- Bus-hold data inputs eliminate the need for external pull-up resistors to hold unused inputs
- Live insertion/extraction permitted

- Outputs include series resistance of 30Ω making external termination resistors unnecessary
- Power-up 3-State
- No bus current loading when output is tied to 5V bus
- Latch-up protection exceeds 500mA per JEDEC JC40.2 Std 17
- ESD protection exceeds 2000V per MIL STD 883 Method 3015 and 200V per Machine Model

## DESCRIPTION

The LVT16240A-1 is a high-performance BiCMOS product designed for V<sub>CC</sub> operation at 3.3V.

This device is an inverting 16-bit buffer that is ideal for driving bus lines. The device features four Output Enables (1OE, 2OE, 3OE, 4OE), each controlling four of the 3-State outputs.

The LVT16240A-1 is designed with 30Ω series resistance in both the High and Low states of the output. This design reduces line noise in applications such as memory address drivers, clock drivers, and bus receivers/transmitters.

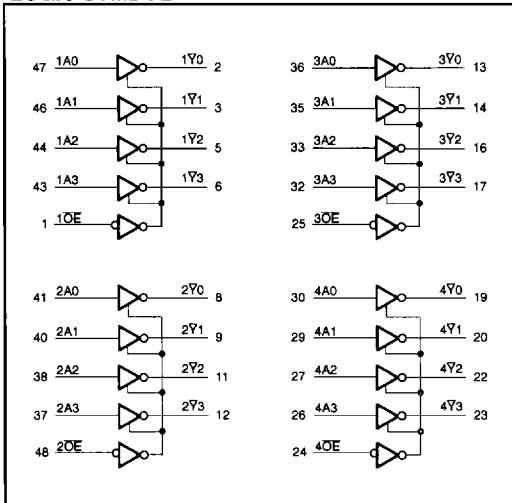
## QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS T <sub>amb</sub> = 25°C; GND = 0V	TYPICAL	UNIT
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay nAx to nYx	C <sub>L</sub> = 50pF; V <sub>CC</sub> = 3.3V		ns
C <sub>IN</sub>	Input capacitance nOE	V <sub>I</sub> = 0V or 3.0V	4	pF
C <sub>OUT</sub>	Output capacitance	V <sub>O</sub> = 0V or 3.0V	10	pF
I <sub>CCZ</sub>	Total supply current	Outputs disabled; V <sub>CC</sub> = 3.6V	100	μA

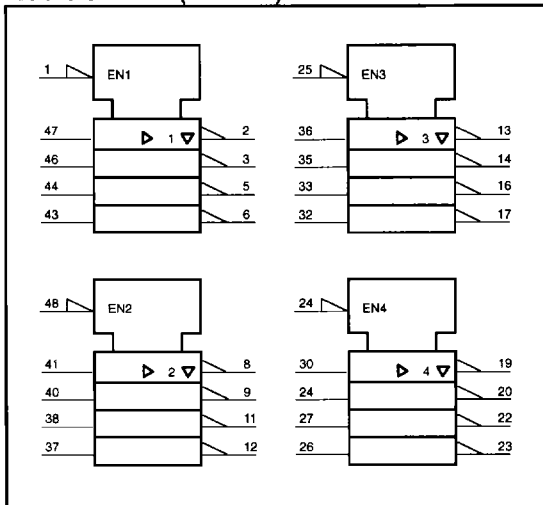
## ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	ORDER CODE	DRAWING NUMBER
48-Pin Plastic Shrink Small Outline (SSOP) Type III	-40°C to +85°C	74LVT16240A-1DL	SOT370-1
48-Pin Plastic Thin Shrink Small Outline (TSSOP) Type II	-40°C to +85°C	74LVT16240A-1DGG	SOT362-1

## LOGIC SYMBOL



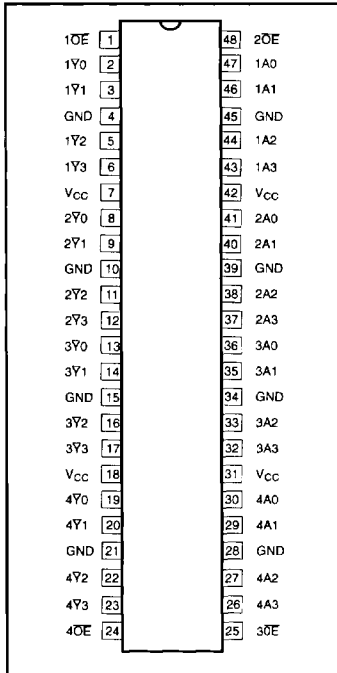
## LOGIC SYMBOL (IEEE/EC)



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**PIN CONFIGURATION**



**PIN DESCRIPTION**

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

**FUNCTION TABLE**

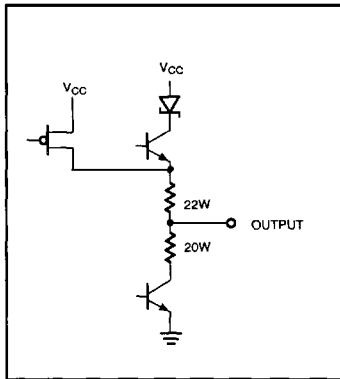
Inputs		Outputs
nOE	nAx	nYx
L	L	H
L	H	L
H	X	Z

H = High voltage level  
 L = Low voltage level  
 X = Don't care  
 Z = High Impedance "off" state

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#### SCHEMATIC OF EACH OUTPUT



#### ABSOLUTE MAXIMUM RATINGS<sup>1,2</sup>

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
$V_{CC}$	DC supply voltage		-0.5 to +4.6	V
$I_{IK}$	DC input diode current	$V_I < 0$	-50	mA
$V_I$	DC input voltage <sup>3</sup>		-0.5 to +7.0	V
$I_{OK}$	DC output diode current	$V_O < 0$	-50	mA
$V_{OUT}$	DC output voltage <sup>3</sup>	Output in Off or High state	-0.5 to +7.0	V
$I_{OUT}$	DC output current	Output in Low state	128	mA
		Output in High state	-64	
$T_{stg}$	Storage temperature range		-65 to +150	°C

#### 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 performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150°C.
- The input and output negative voltage ratings may be exceeded if the input and output clamp current ratings are observed.

#### RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS		UNIT
		MIN	MAX	
$V_{CC}$	DC supply voltage	2.7	3.6	V
$V_I$	Input voltage	0	5.5	V
$V_{IH}$	High-level input voltage	2.0		V
$V_{IL}$	Input voltage		0.8	V
$I_{OH}$	High-level output current		-32	mA
$I_{OL}$	Low-level output current		12	mA
$\Delta V/\Delta v$	Input transition rise or fall rate; Outputs enabled		10	ns/V
$T_{amb}$	Operating free-air temperature range	-40	+85	°C

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#### DC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			Temp = -40°C to +85°C			
			MIN	TYP <sup>1</sup>	MAX	
V <sub>IK</sub>	Input clamp voltage	V <sub>CC</sub> = 2.7V; I <sub>IK</sub> = -18mA			1.2	V
V <sub>OH</sub>	High-level output voltage	V <sub>CC</sub> = 3.0V; I <sub>OH</sub> = -12mA	2.0			V
V <sub>OL</sub>	Low-level output voltage	V <sub>CC</sub> = 3.0V; I <sub>OL</sub> = 12mA			0.8	V
I <sub>I</sub>	Input leakage current	V <sub>CC</sub> = 3.6V; V <sub>I</sub> = V <sub>CC</sub> or GND			±1	μA
		V <sub>CC</sub> = 0 or 3.6V; V <sub>I</sub> = 5.5V			10	
		V <sub>CC</sub> = 3.6V; V <sub>I</sub> = V <sub>CC</sub>			1	
		V <sub>CC</sub> = 3.6V; V <sub>I</sub> = 0			-5	
I <sub>OFF</sub>	Output off current	V <sub>CC</sub> = 0V; V <sub>I</sub> or V <sub>O</sub> = 0 to 4.5V			±100	μA
I <sub>HOLD</sub>	Bus Hold current A outputs	V <sub>CC</sub> = 3.0V; V <sub>I</sub> = 0.8V	75			μA
		V <sub>CC</sub> = 3.0V; V <sub>I</sub> = 2.0V	-75			
I <sub>EX</sub>	Current into an output in the High state when V <sub>O</sub> > V <sub>CC</sub>	V <sub>O</sub> = 5.5V; V <sub>CC</sub> = 3.0V			125	μA
I <sub>PU/PD</sub>	Power up/down 3-State output current <sup>3</sup>	V <sub>CC</sub> ≤ 1.2V; V <sub>O</sub> = 0.5V to V <sub>CC</sub> ; V <sub>I</sub> = GND or V <sub>CC</sub> ; OE/OE = Don't care			±100	μA
I <sub>OZH</sub>	3-State output High current	V <sub>CC</sub> = 3.6V; V <sub>O</sub> = 3.0V; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>			5	μA
I <sub>OZL</sub>	3-State output Low current	V <sub>CC</sub> = 3.6V; V <sub>O</sub> = 0.5V; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>			-5	μA
I <sub>CCH</sub>	Quiescent supply current	V <sub>CC</sub> = 3.6V; Outputs High, V <sub>I</sub> = GND or V <sub>CC</sub> , I <sub>O</sub> = 0			0.12	mA
I <sub>CCL</sub>		V <sub>CC</sub> = 3.6V; Outputs Low, V <sub>I</sub> = GND or V <sub>CC</sub> , I <sub>O</sub> = 0			5	
I <sub>CCZ</sub>		V <sub>CC</sub> = 3.6V; Outputs Disabled; V <sub>I</sub> = GND or V <sub>CC</sub> , I <sub>O</sub> = 0			0.12	
ΔI <sub>CC</sub>	Additional supply current per input pin <sup>2</sup>	V <sub>CC</sub> = 3V to 3.6V; One input at V <sub>CC</sub> -0.6V, Other inputs at V <sub>CC</sub> or GND			0.2	mA

#### NOTES:

- All typical values are at V<sub>CC</sub> = 3.3V and T<sub>amb</sub> = 25°C.
- This is the increase in supply current for each input at the specified voltage level other than V<sub>CC</sub> or GND
- This parameter is valid for any V<sub>CC</sub> between 0V and 1.2V with a transition time of up to 10msec. From V<sub>CC</sub> = 1.2V to V<sub>CC</sub> = 3.3V ± 0.3V a transition time of 100μsec is permitted. This parameter is valid for T<sub>amb</sub> = 25°C only.
- Unused pins at V<sub>CC</sub> or GND.

#### AC CHARACTERISTICS

GND = 0V; t<sub>R</sub> = t<sub>F</sub> = 2.5ns; C<sub>L</sub> = 50pF; R<sub>L</sub> = 500Ω; T<sub>amb</sub> = -40°C to +85°C.

SYMBOL	PARAMETER	WAVEFORM	LIMITS				UNIT
			V <sub>CC</sub> = 3.3V ± 0.3V			V <sub>CC</sub> = 2.7V	
			MIN	TYP <sup>1</sup>	MAX	MAX	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay nAx to nYx	1				ns	
t <sub>PZH</sub> t <sub>PZL</sub>	Output enable time to High and Low level	2				ns	
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output disable time from High and Low Level	2				ns	

#### NOTE:

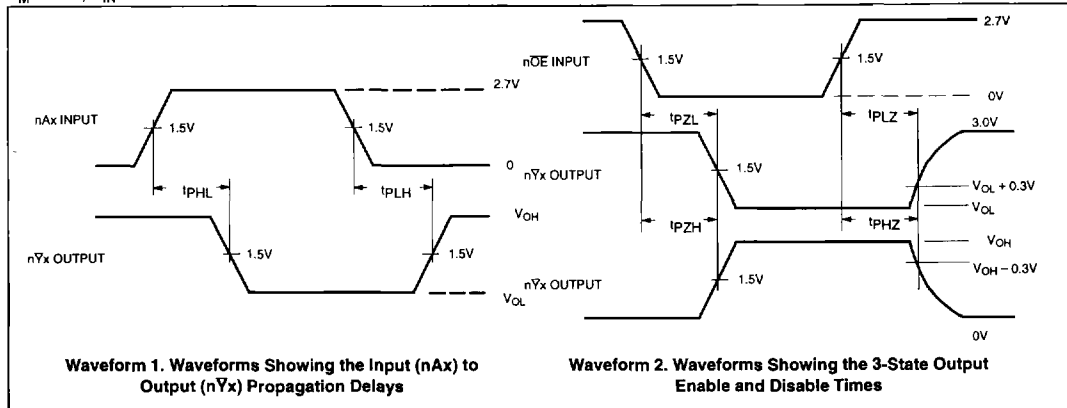
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## AC WAVEFORMS

$V_M = 1.5V$ ,  $V_{IN} = GND$  to  $2.7V$



## TEST CIRCUIT AND WAVEFORMS

