

# DATA SHEET

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**74ALVT16344**

2.5V/3.3V 1-to-4 address driver (3-State)

Product specification

1998 Jun 30

IC24 Data Handbook

## 2.5V/3.3V 1-to-4 address driver (3-State)

## 74ALVT16344

## FEATURES

- Multiple  $V_{CC}$  and GND pins minimize switching noise
- 5V I/O Compatible
- Live insertion/extraction permitted
- 3-State output buffers
- Power-up 3-State
- Output capability: +64mA/-32mA
- Latch-up protection exceeds 500mA per Jedec JC40.2 Std 17
- ESD protection exceeds 2000 V per MIL STD 883 Method 3015 and 200 V per Machine Model

## DESCRIPTION

The 74ALVT16344 high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive. It is designed for  $V_{CC}$  operation at 2.5V or 3.3V with I/O compatibility to 5V.

The 74ALVT16344 is a 1-to-4 address driver used in applications where four separate memory locations must be addressed by a single address.

## QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS $T_{amb} = 25^{\circ}\text{C}$	TYPICAL		UNIT
			2.5V	3.3V	
$t_{PLH}$ $t_{PHL}$	Propagation delay nAx to nBx or nBx to nAx	$C_L = 50\text{pF}$	2.5 1.9	1.9 1.6	ns
$C_{IN}$	Input capacitance DIR, $\overline{OE}$	$V_I = 0\text{V}$ or $V_{CC}$	3	3	pF
$C_{Out}$	Output capacitance	$V_{I/O} = 0\text{V}$ or $V_{CC}$	9	9	pF
$I_{CCZ}$	Total supply current	Outputs disabled	40	70	$\mu\text{A}$

## ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
56-Pin Plastic SSOP Type III	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	74ALVT16344 DL	AV16344 DL	SOT371-1
56-Pin Plastic TSSOP Type II	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	74ALVT16344 DGG	AV16344 DGG	SOT364-1

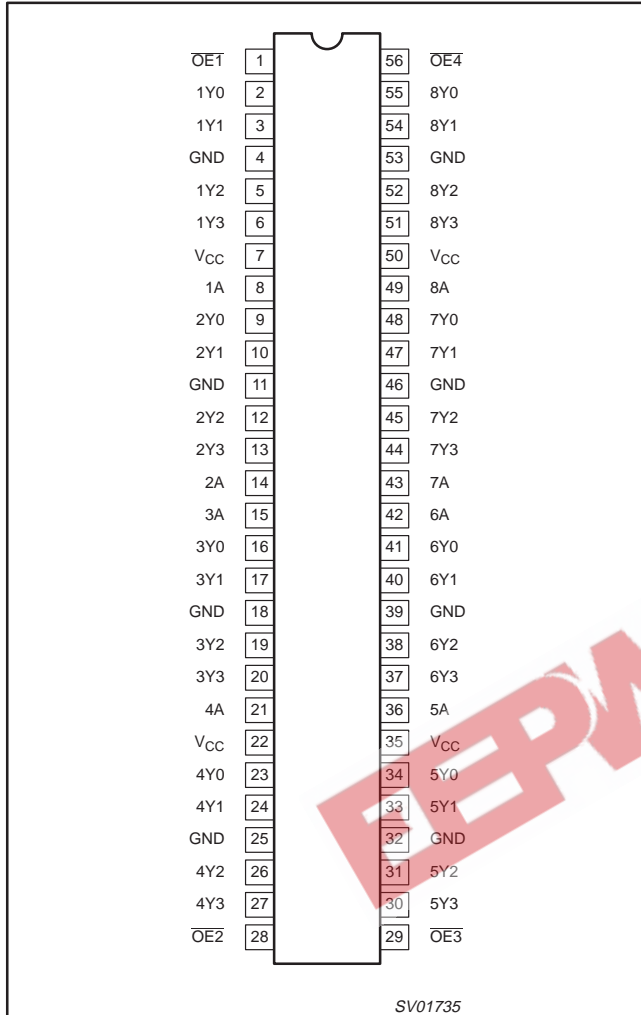
## PIN DESCRIPTION

PIN NUMBER	SYMBOL	FUNCTION
8, 14, 15, 21, 36, 42, 43, 49	nA	Data inputs
2, 3, 5, 6, 9, 10, 12, 13, 16, 17, 19, 20, 23, 24, 26, 27, 30, 31, 33, 34, 37, 38, 40, 44, 45, 47, 48, 51, 52, 54, 55,	$nY_X$	Data outputs
1, 28, 29, 56	$\overline{OE}$	Output enable inputs (active-Low)
4, 11, 18, 25, 32, 39, 46, 53	GND	Ground (0V)
7, 22, 35, 50	$V_{CC}$	Positive supply voltage

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PIN CONFIGURATION

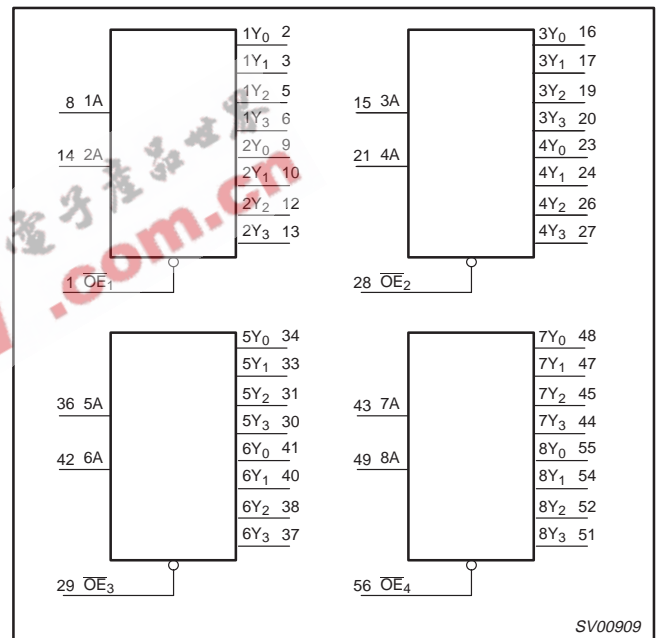


FUNCTION TABLE

INPUTS		OUTPUTS	OPERATING MODE
OE	nA	nY <sub>x</sub>	
L	L	L	Transparent
L	H	H	Transparent
H	X	Z	High impedance

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

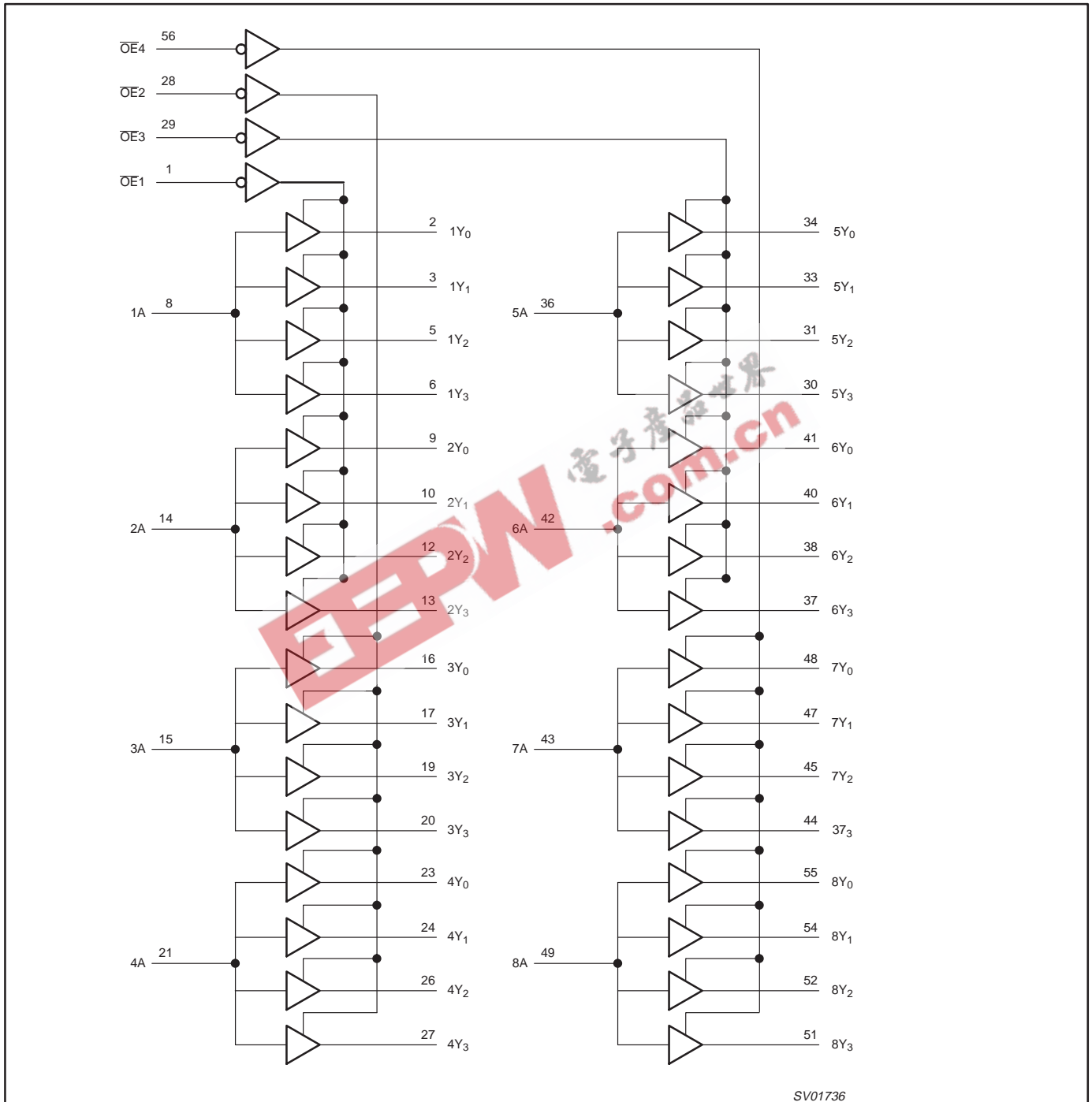
LOGIC SYMBOL



2.5V/3.3V 1-to-4 address driver (3-State)

74ALVT16344

LOGIC DIAGRAM



## 2.5V/3.3V 1-to-4 address driver (3-State)

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**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	2.5V RANGE LIMITS		3.3V RANGE LIMITS		UNIT
		MIN	MAX	MIN	MAX	
$V_{CC}$	DC supply voltage	2.3	2.7	3.0	3.6	V
$V_I$	Input voltage	0	5.5	0	5.5	V
$V_{IH}$	High-level input voltage	1.7		2.0		V
$V_{IL}$	Input voltage		0.7		0.8	V
$I_{OH}$	High-level output current		-8		-32	mA
$I_{OL}$	Low-level output current		8		32	mA
	Low-level output current; current duty cycle $\leq 50\%$ ; $f \geq 1\text{kHz}$		24		64	
$\Delta t/\Delta v$	Input transition rise or fall rate; Outputs enabled		10		10	ns/V
$T_{amb}$	Operating free-air temperature range	-40	+85	-40	+85	°C

## 2.5V/3.3V 1-to-4 address driver (3-State)

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## DC ELECTRICAL CHARACTERISTICS (3.3V ± 0.3V RANGE)

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> = 3.0V; I <sub>IK</sub> = -18mA		-0.85	-1.2	V
V <sub>OH</sub>	High-level output voltage	V <sub>CC</sub> = 3.0 to 3.6V; I <sub>OH</sub> = -100μA	V <sub>CC</sub> -0.2	V <sub>CC</sub>		
		V <sub>CC</sub> = 3.0V; I <sub>OH</sub> = -32mA	2.0	2.3		
V <sub>OL</sub>	Low-level output voltage	V <sub>CC</sub> = 3.0V; I <sub>OL</sub> = 100μA		0.07	0.2	V
		V <sub>CC</sub> = 3.0V; I <sub>OL</sub> = 16mA		0.25	0.4	
		V <sub>CC</sub> = 3.0V; I <sub>OL</sub> = 32mA		0.3	0.5	
		V <sub>CC</sub> = 3.0V; I <sub>OL</sub> = 64mA		0.4	0.55	
I <sub>I</sub>	Input leakage current	V <sub>CC</sub> = 3.6V; V <sub>I</sub> = V <sub>CC</sub> or GND	Control pins	0.1	±1	μA
		V <sub>CC</sub> = 0 or 3.6V; V <sub>I</sub> = 5.5V		0.1	10	
		V <sub>CC</sub> = 3.6V; V <sub>I</sub> = 5.5V	Data pins <sup>4</sup>	0.1	10	
		V <sub>CC</sub> = 3.6V; V <sub>I</sub> = V <sub>CC</sub>		0.1	1	
		V <sub>CC</sub> = 3.6V; V <sub>I</sub> = 0		0.1	-5	
I <sub>OFF</sub>	Off current	V <sub>CC</sub> = 0V; V <sub>I</sub> or V <sub>O</sub> = 0 to 4.5V		0.1	±100	μA
I <sub>HOLD</sub>	Bus Hold current A or B outputs	V <sub>CC</sub> = 3V; V <sub>I</sub> = 0.8V	75	130		μA
		V <sub>CC</sub> = 3V; V <sub>I</sub> = 2.0V	-75	-200		μA
		V <sub>I</sub> = 0V to 3.6V; V <sub>CC</sub> = 3.6V <sup>6</sup>	±500			μA
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		10	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		1	±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>		0.5	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>		0.5	-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		0.06	0.1	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		7	8.5	
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 <sup>5</sup>		0.06	0.1	
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		0.05	0.4	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.
- I<sub>CCZ</sub> is measured with outputs pulled up to V<sub>CC</sub> or pulled down to ground.
- This is the bus hold overdrive current required to force the input to the opposite state.

## AC CHARACTERISTICS (3.3V ± 0.3V RANGE)

GND = 0V, t<sub>R</sub> = t<sub>F</sub> = 2.5ns, C<sub>L</sub> = 50pF, R<sub>L</sub> = 500Ω

SYMBOL	PARAMETER	WAVEFORM	LIMITS			UNIT
			T <sub>amb</sub> = -40 to +85°C V <sub>CC</sub> = +3.3V ± 0.3V			
			MIN	TYP	MAX	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay nAx to nYx	1	0.5 0.5	1.9 1.6	3.0 2.5	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output enable time to High and Low level	2	1.0 1.0	2.8 2.3	4.7 3.6	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output disable time from High and Low level	2	1.0 1.0	3.7 2.3	5.5 4.1	ns

## 2.5V/3.3V 1-to-4 address driver (3-State)

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## DC ELECTRICAL CHARACTERISTICS (2.5V ± 0.2V RANGE)

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> = 2.3V; I <sub>IK</sub> = -18mA		-0.85	-1.2	V
V <sub>OH</sub>	High-level output voltage	V <sub>CC</sub> = 2.3 to 2.7V; I <sub>OH</sub> = -100μA	V <sub>CC</sub> -0.2	V <sub>CC</sub>		V
		V <sub>CC</sub> = 2.3V; I <sub>OH</sub> = -8mA	1.7	2.1		
V <sub>OL</sub>	Low-level output voltage	V <sub>CC</sub> = 2.3V; I <sub>OL</sub> = 100μA		0.07	0.2	V
		V <sub>CC</sub> = 2.3V; I <sub>OL</sub> = 24mA		0.3	0.5	
I <sub>I</sub>	Input leakage current	V <sub>CC</sub> = 2.7V; V <sub>I</sub> = V <sub>CC</sub> or GND	Control pins	0.1	±1	μA
		V <sub>CC</sub> = 0 or 2.7V; V <sub>I</sub> = 5.5V		0.1	10	
		V <sub>CC</sub> = 2.7V; V <sub>I</sub> = 5.5V	Data pins <sup>4</sup>	0.1	10	
		V <sub>CC</sub> = 2.7V; V <sub>I</sub> = V <sub>CC</sub>		0.1	1	
		V <sub>CC</sub> = 2.7V; V <sub>I</sub> = 0		0.1	-5	
I <sub>OFF</sub>	Off current	V <sub>CC</sub> = 0V; V <sub>I</sub> or V <sub>O</sub> = 0 to 4.5V		0.1	±100	μA
I <sub>HOLD</sub> <sup>6</sup>	Bus Hold current A inputs	V <sub>CC</sub> = 2.5V; V <sub>I</sub> = 0.8V		105		μA
		V <sub>CC</sub> = 2.5V; V <sub>I</sub> = 2.0V		10		μA
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> = 2.3V		10	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		1	100	μA
I <sub>OZH</sub>	3-State output High current	V <sub>CC</sub> = 2.7V; V <sub>O</sub> = 2.3V; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>		0.5	5	μA
I <sub>OZL</sub>	3-State output Low current	V <sub>CC</sub> = 2.7V; V <sub>O</sub> = 0.5V; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>		0.5	-5	μA
I <sub>CCH</sub>	Quiescent supply current	V <sub>CC</sub> = 2.7V; Outputs High, V <sub>I</sub> = GND or V <sub>CC</sub> , I <sub>O</sub> = 0		0.04	0.1	mA
I <sub>CCL</sub>		V <sub>CC</sub> = 2.7V; Outputs Low, V <sub>I</sub> = GND or V <sub>CC</sub> , I <sub>O</sub> = 0		5.0	6.5	
I <sub>CCZ</sub>		V <sub>CC</sub> = 2.7V; Outputs Disabled; V <sub>I</sub> = GND or V <sub>CC</sub> , I <sub>O</sub> = 0 <sup>5</sup>		0.04	0.1	
ΔI <sub>CC</sub>	Additional supply current per input pin <sup>2</sup>	V <sub>CC</sub> = 2.3V to 2.7V; One input at V <sub>CC</sub> -0.6V, Other inputs at V <sub>CC</sub> or GND		0.04	0.4	mA

## NOTES:

- All typical values are at V<sub>CC</sub> = 2.5V 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> = 2.5V ± 0.2V 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.
- I<sub>CCZ</sub> is measured with outputs pulled up to V<sub>CC</sub> or pulled down to ground.
- Not guaranteed.

## AC CHARACTERISTICS (2.5V ± 0.2V RANGE)

GND = 0V, t<sub>R</sub> = t<sub>F</sub> = 2.5ns, C<sub>L</sub> = 50pF, R<sub>L</sub> = 500Ω

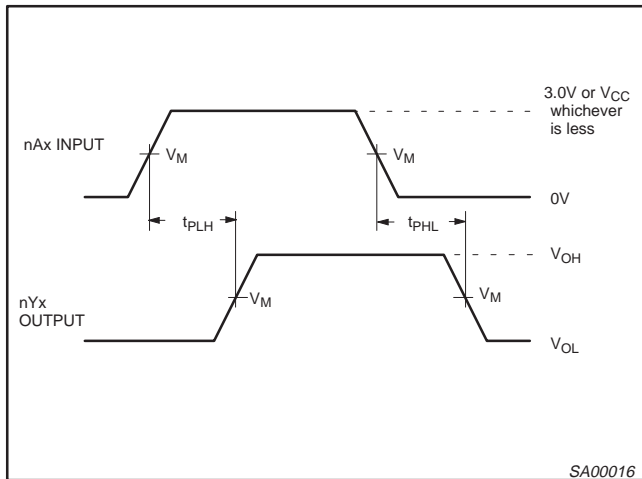
SYMBOL	PARAMETER	WAVEFORM	LIMITS			UNIT
			T <sub>amb</sub> = -40 to +85°C V <sub>CC</sub> = +2.5V ± 0.2V			
			MIN	TYP	MAX	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay nAx to nYx	1	0.5 0.5	2.5 1.9	4.2 3.9	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output enable time to High and Low level	2	1.0 1.0	3.5 2.8	6.1 4.6	
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output disable time from High and Low level	2	1.0 1.0	2.8 3.1	5.3 4.9	ns

# 2.5V/3.3V 1-to-4 address driver (3-State)

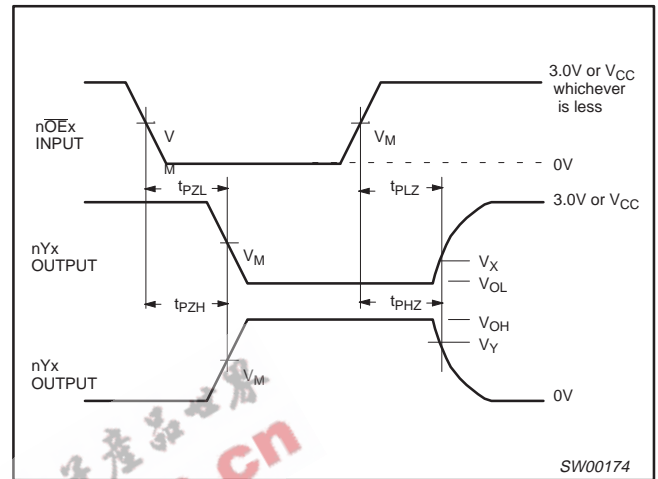
# 74ALVT16344

### AC WAVEFORMS

$V_M = 1.5V$  for  $V_{CC} \geq 3.0V$ ;  $V_M = V_{CC}/2$  for  $V_{CC} \leq 2.7V$   
 $V_X = V_{OL} + 0.3V$  for  $V_{CC} \geq 3.0V$ ;  $V_X = V_{OL} + 0.15V$  for  $V_{CC} \leq 2.7V$   
 $V_Y = V_{OH} - 0.3V$  for  $V_{CC} \geq 3.0V$ ;  $V_Y = V_{OH} - 0.15V$  for  $V_{CC} \leq 2.7V$



Waveform 1. Input (nAx) to Output (nYx) Propagation Delays



Waveform 2. 3-State Output Enable and Disable Times

### TEST CIRCUIT AND WAVEFORM

**Test Circuit for 3-State Outputs**

**SWITCH POSITION**

TEST	SWITCH
$t_{PLZ}/t_{PZL}$	6V or $V_{CC} \times 2$
$t_{PLH}/t_{PHL}$	Open
$t_{PHZ}/t_{PZH}$	GND

**DEFINITIONS**

$R_L$  = Load resistor; see AC CHARACTERISTICS for value.  
 $C_L$  = Load capacitance includes jig and probe capacitance: See AC CHARACTERISTICS for value.  
 $R_T$  = Termination resistance should be equal to  $Z_{OUT}$  of pulse generators.

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	$t_W$	$t_R$	$t_F$
74ALVT16	3.0V or $V_{CC}$ whichever is less	$\leq 10\text{MHz}$	500ns	$\leq 2.5\text{ns}$	$\leq 2.5\text{ns}$

SW00205

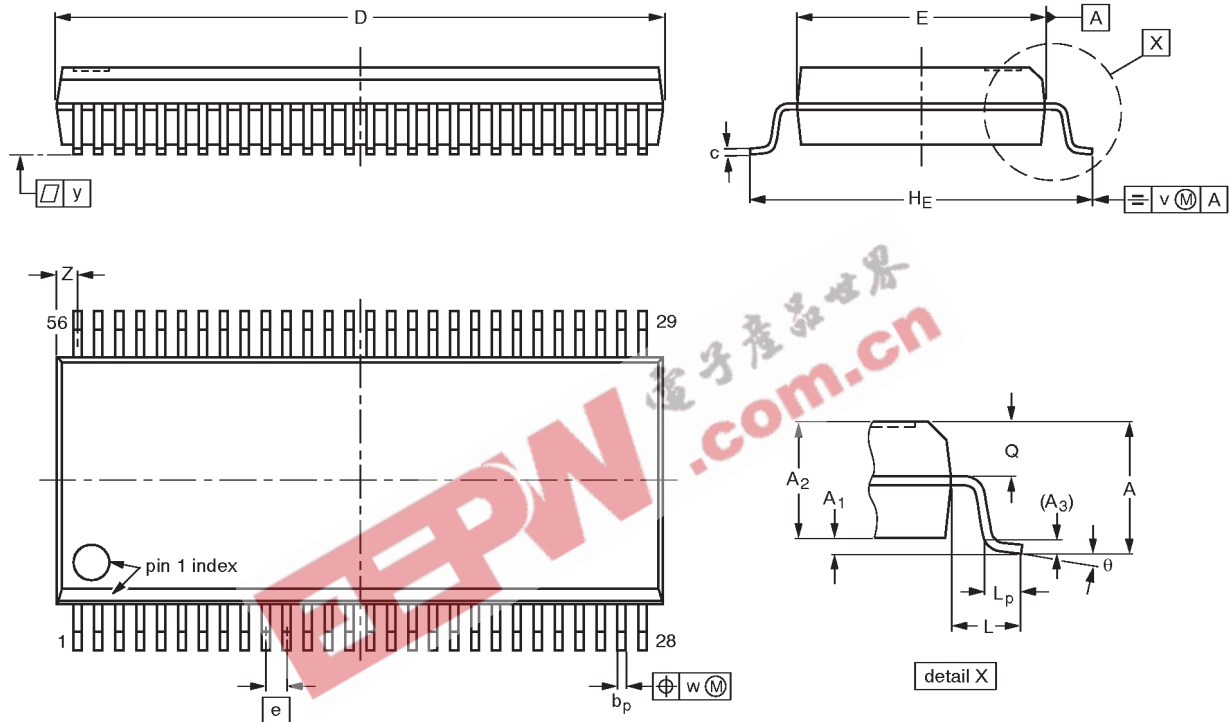


2.5V/3.3V 1-to-4 address driver (3-State)

74ALVT16344

SSOP56: plastic shrink small outline package; 56 leads; body width 7.5 mm

SOT371-1



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	2.8	0.4 0.2	2.35 2.20	0.25	0.3 0.2	0.22 0.13	18.55 18.30	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.

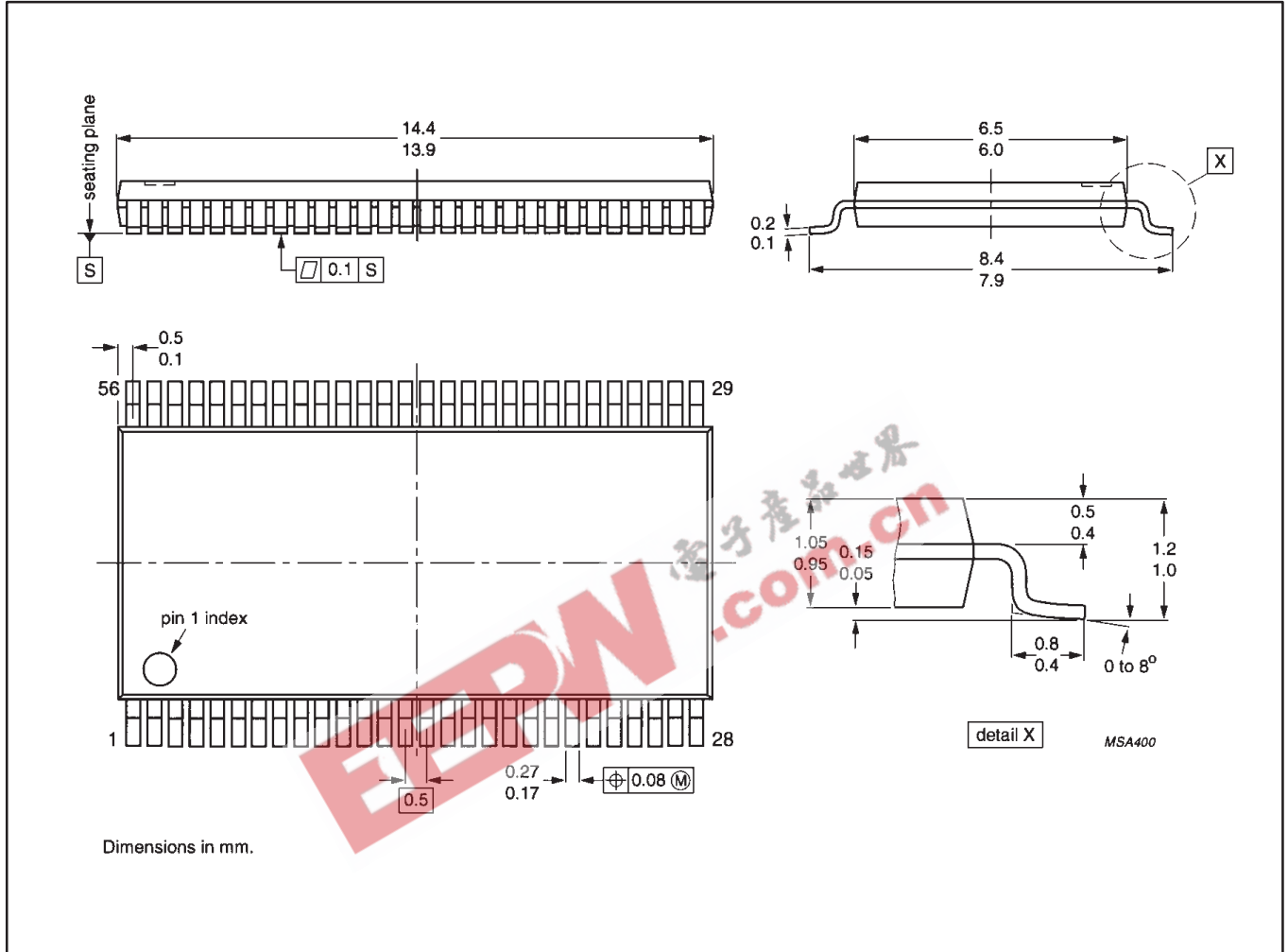
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT371-1		MO-118AB				93-11-02 95-02-04

2.5V/3.3V 1-to-4 address driver (3-State)

74ALVT16344

TSSOP56: plastic thin shrink small outline package; 56 leads; body width 6.1mm

SOT364-1



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2.5V/3.3V 1-to-4 address driver (3-State)

74ALVT16344

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NOTES



## 2.5V/3.3V 1-to-4 address driver (3-State)

74ALVT16344

## Data sheet status

Data sheet status	Product status	Definition [1]
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
Preliminary specification	Qualification	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
Product specification	Production	This data sheet contains final specifications. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.

[1] Please consult the most recently issued datasheet before initiating or completing a design.

## Definitions

**Short-form specification** — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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