DATA SHEET

74LVT14
3.3V Hex inverter Schmitt trigger

Product specification

IC24 Data Handbook

1996 Aug 28

Philips
Semiconductors

PHILIPS

3.3V Hex inverter Schmitt trigger 74LVT14

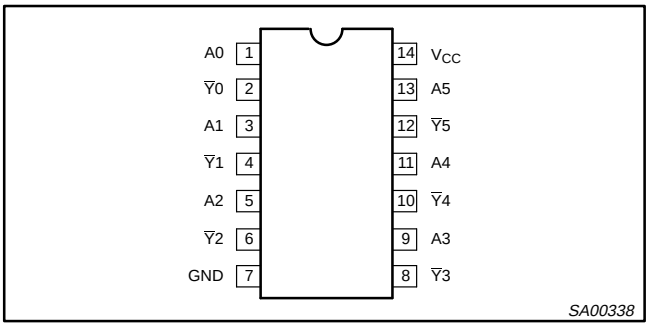
DESCRIPTION

The 74LVT14 is a high-performance BiCMOS product designed for V_{CC} operation at 3.3V. They are capable of transforming slowly changing input signals into sharply defined, jitter free output signals. In addition, they have greater noise margin than conventional inverters. Each circuit contains a Schmitt trigger followed by a Darlington level shifter and a phase splitter driving a TTL totem-pole output. The Schmitt trigger uses positive feedback to effectively speed-up slow input transitions, and provide different input threshold voltages for positive-going and negative-going input threshold (typically 600mV) is determined internally by resistor ratios and is insensitive to temperature and supply voltage variations.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS T_{amb} = 25°C; GND = 0V	TYPICAL	UNIT
t_{PLH} t_{PHL}	Propagation delay An to $\overline{Y}n$	C_L = 50pF; V_{CC} = 3.3V	3.2 3.0	ns
C_{IN}	Input capacitance	V_I = 0V or 3.0V	3	pF
I_{CCL}	Total supply current	Outputs low; V_{CC} = 3.6V	1.5	mA

PIN CONFIGURATION



PIN DESCRIPTION

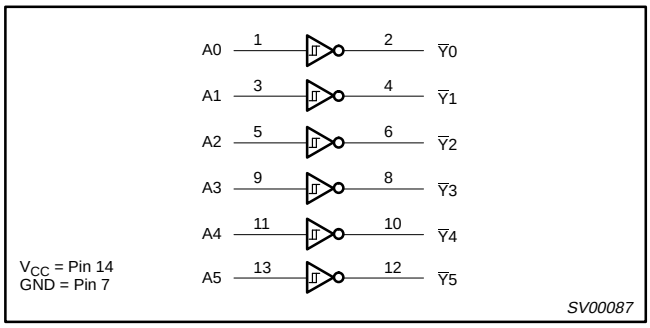
PIN NUMBER	SYMBOL	NAME AND FUNCTION
1, 3, 5, 9, 11, 13	An	Data inputs
2, 4, 6, 8, 10, 12	$\overline{Y}n$	Data outputs
7	GND	Ground (0V)
14	V_{CC}	Positive supply voltage

FUNCTION TABLE

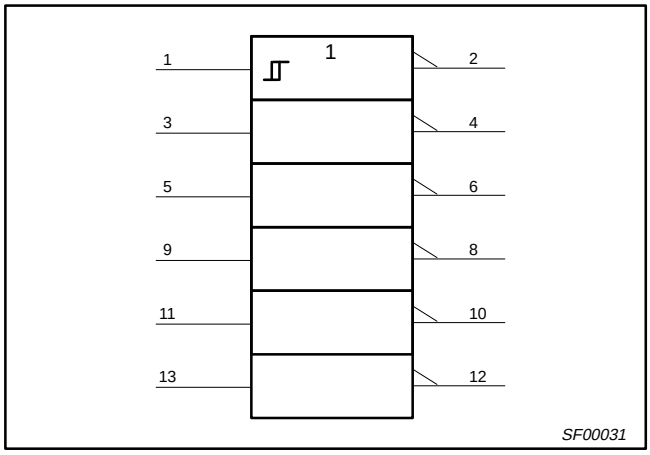
INPUTS	OUTPUT
Dn	$\overline{Q}n$
L	H
H	L

NOTES:
H = High voltage level
L = Low voltage level

LOGIC DIAGRAM



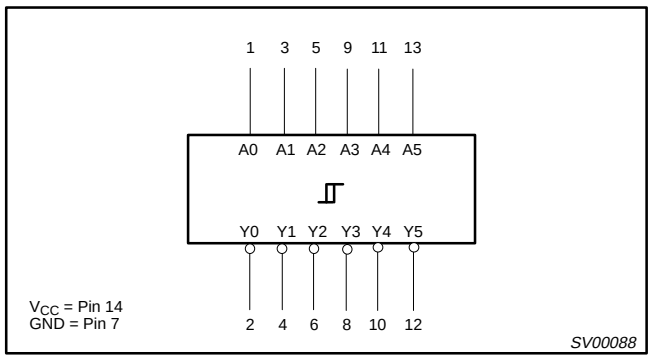
IEC/IEEE SYMBOL



ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
14-Pin Plastic SO	–40°C to +85°C	74LVT14 D	74LVT14 D	SOT108-1
14-Pin Plastic SSOP	–40°C to +85°C	74LVT14 DB	74LVT14 DB	SOT337-1
14-Pin Plastic TSSOP	–40°C to +85°C	74LVT14 PW	74LVT14 PWDH	SOT402-1

LOGIC SYMBOL



ABSOLUTE MAXIMUM RATINGS[1, 2]

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[3]		–0.5 to +7.0	V
I_{OK}	DC output diode current	$V_O < 0$	–50	mA
V_{OUT}	DC output voltage[3]	Output in Off or High state	–0.5 to +7.0	V
I_{OUT}	DC output current	Output in High state	–32	mA
		Output in Low state	64	
T_{stg}	Storage temperature range		–65 to 150	°C

NOTES:
1. 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.
2. 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.
3. 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}	Low-level Input voltage		0.8	V
I_{OH}	High-level output current		–20	mA
I_{OL}	Low-level output current		32	mA
$\Delta t/\Delta v$	Input transition rise or fall rate; Outputs enabled		10	ns/V
T_{amb}	Operating free-air temperature range	–40	+85	°C

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_{T+}	Positive-going threshold	V_{CC} = 3.3V	1.5	1.7	2.0	V
V_{T-}	Negative-going threshold	V_{CC} = 3.3V	0.9	1.1	1.3	V
ΔV_T	Hysteresis	V_{CC} = 3.3V	0.4	0.6		V
V_{IK}	Input clamp voltage	V_{CC} = 2.7V; I_{IK} = –18mA			–1.2	V
V_{OH}	High-level output voltage	V_{CC} = 2.7 to 3.6V; I_{OH} = –100µA	V_{CC}–0.2			V
		V_{CC} = 2.7V; I_{OH} = –6mA	2.4			
		V_{CC} = 3.0V; I_{OH} = –20mA	2.0			
V_{OL}	Low–level output voltage	V_{CC} = 2.7V; I_{OL} = 100µA			0.2	V
		V_{CC} = 2.7V; I_{OL} = 24mA			0.5	
		V_{CC} = 3.0V; I_{OL} = 32mA			0.5	
I_I	Input leakage current	V_{CC} = 0 or 3.6V; V_I = 5.5V			10	µA
		V_{CC} = 3.6V; V_I = V_{CC} or GND			±1	
I_{OFF}	Output off current	V_{CC} = 0V; V_I or V_O = 0 to 4.5V			±100	µA
I_{CCH}	Quiescent supply current	V_{CC} = 3.6V; Outputs High, V_I = GND or V_{CC}, I_O = 0			0.02	mA
I_{CCL}		V_{CC} = 3.6V; Outputs Low, V_I = GND or V_{CC}, I_O = 0		1.5	3	
ΔI_{CC}	Additional supply current per input pin[2]	V_{CC} = 3V to 3.6V; One input at V_{CC}–0.6V, Other inputs at V_{CC} or GND			0.2	µA
C_I	Input capacitance	V_I = 3V or 0		3		pF

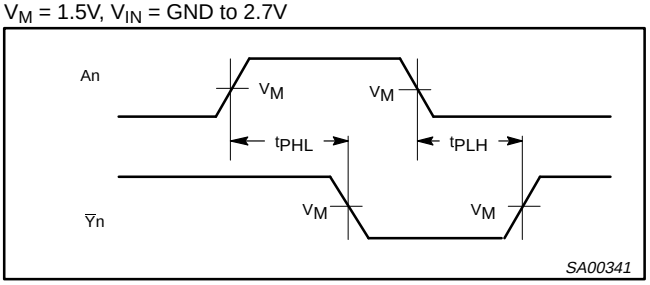
NOTES:
1. All typical values are at V_{CC} = 3.3V and T_{amb} = 25°C.
2. This is the increase in supply current for each input at the specificed voltage level other than V_{CC} or GND

AC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITION	LIMITS				UNIT
			V_{CC} = 3.3V ±0.3V			V_{CC} = 2.7V	
			MIN	TYP	MAX	MAX	
t_{PLH} t_{PHL}	Propagation delay An to $\overline{Y}$n	Waveform 1	1.0 1.0	3.8 3.2	5.7 4.5	6.9 4.1	ns

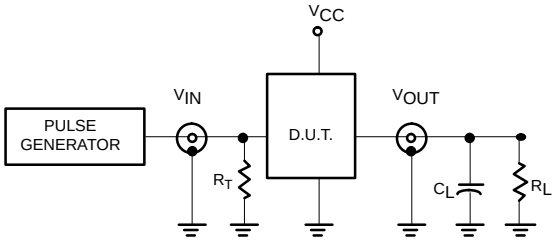
AC WAVEFORMS

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

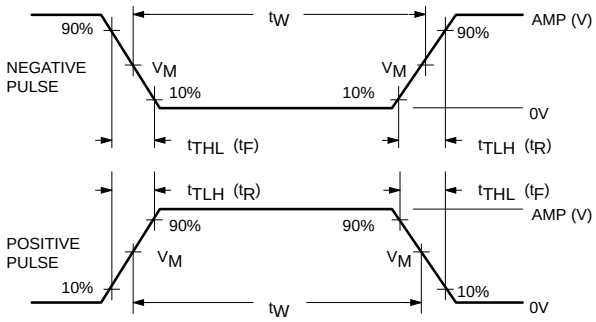


Waveform 1. Propagation delay for inverting outputs

TEST CIRCUIT AND WAVEFORMS



Test Circuit for Outputs



V_M = 1.5V
Input Pulse Definition

DEFINITIONS

R_L = Load resistor; see AC CHARACTERISTICS for value.

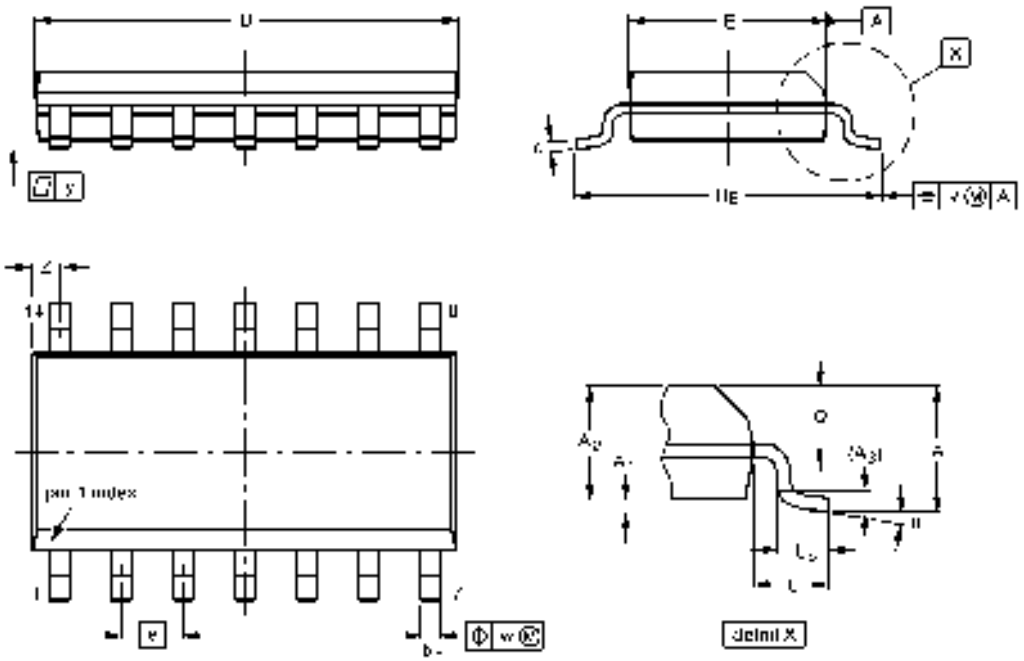
C_L = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

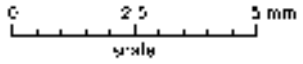
R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	t_W	t_R	t_F
74LVT	2.7V	≤10MHz	500ns	≤2.5ns	≤2.5ns

SV00022

SO14: plastic small outline package; 14 leads; body width 3.9 mm **SOT108-1**





DIMENSIONS (inch dimensions are derived from the original mm dimensions)

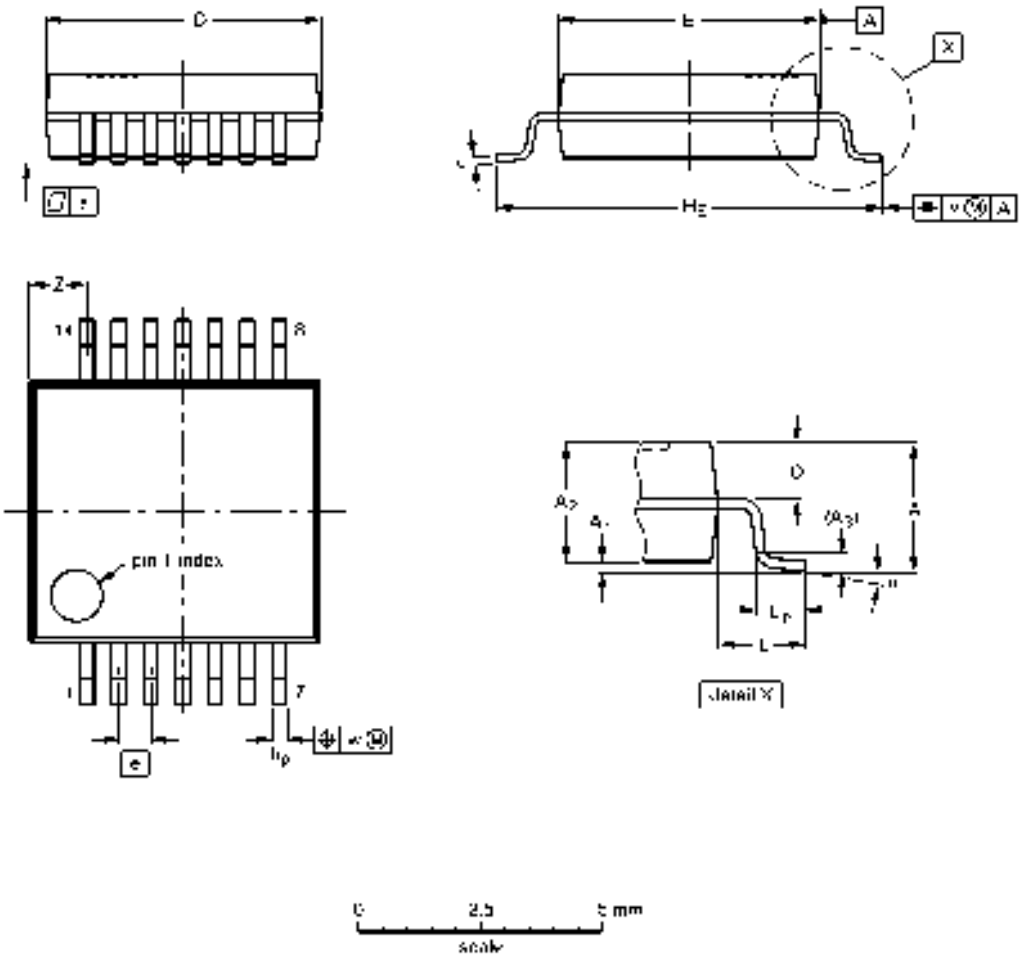
UNIT	A max.	A_1	A_2	A_3	b_p	c	D[1]	E[1]	e	H_E	L	L_p	Q	v	w	y	Z[1]	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	8.75 8.55	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0098 0.0075	0.35 0.34	0.16 0.15	0.050	0.24 0.23	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT108-1	076E06S	MS-012AB				~~91-08-13~~ 95-01-23

SSOP14: plastic shrink small outline package; 14 leads; body width 5.3 mm **SOT337-1**



DIMENSIONS (mm are the original dimensions)

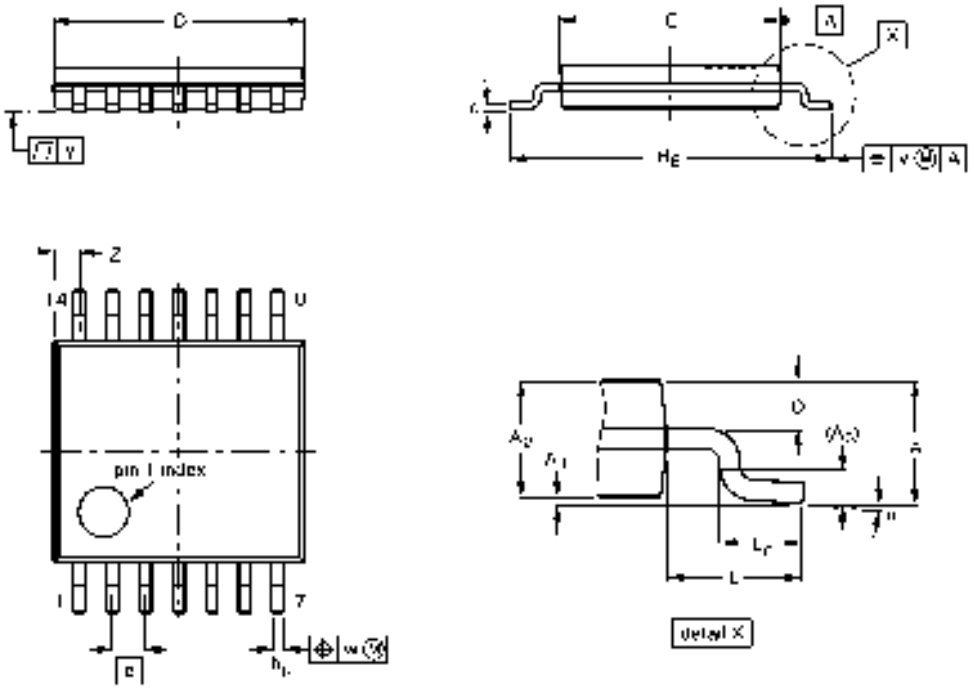
UNIT	A max.	A_1	A_2	A_3	b_p	c	D[1]	E[1]	e	H_E	L	L_p	Q	v	w	y	Z[1]	θ
mm	2.0	0.21 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	6.4 6.0	5.4 5.2	0.65	7.9 7.6	1.25	1.03 0.63	0.9 0.7	0.2	0.13	0.1	1.4 0.9	8° 0°

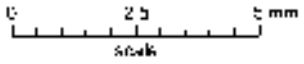
Notes

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			
SOT337-1		MO-150AB				~~95-02-04~~ 96-01-19

TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm SOT402-1





DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D [1]	E [2]	e	H_E	L	L_p	Q	v	w	y	Z [1]	θ
mm	1.10	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1.0	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.72 0.38	8° 0°

Notes

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 VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT402-1		MO-153				~~94-07-12~~ 95-04-04

NOTES

DEFINITIONS

Data Sheet Identification	Product Status	Definition
Objective Specification	Formative or in Design	This data sheet contains the design target or goal specifications for product development. Specifications may change in any manner without notice.
Preliminary Specification	Preproduction Product	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	Full 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.

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