

DATA SHEET

74LVT14

3.3V Hex inverter Schmitt trigger

Product specification

1996 Aug 28

IC24 Data Handbook

3.3V Hex inverter Schmitt trigger

74LVT14

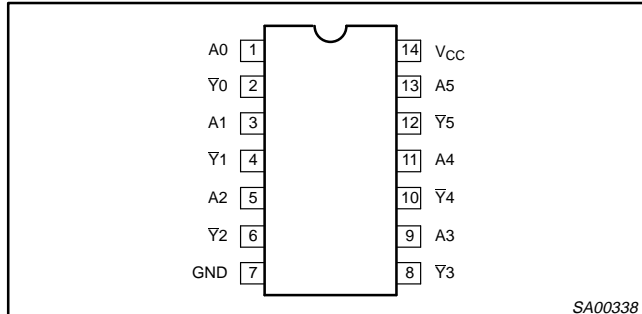
DESCRIPTION

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 $T_{amb} = 25^{\circ}C$; $GND = 0V$	TYPICAL	UNIT
t_{PLH} t_{PHL}	Propagation delay An to \bar{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	A_n	Data inputs
2, 4, 6, 8, 10, 12	\bar{Y}_n	Data outputs
7	GND	Ground (0V)
14	V_{CC}	Positive supply voltage

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

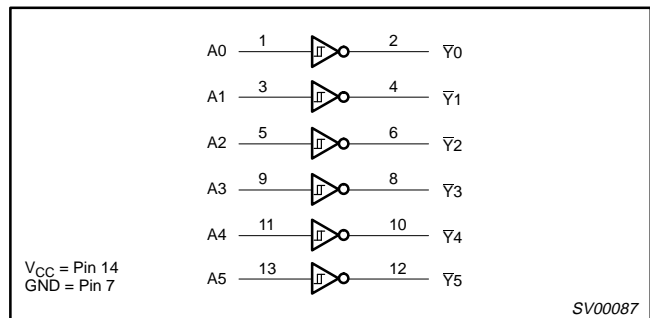
FUNCTION TABLE

INPUTS	OUTPUT
D_n	Q_n
L	H
H	L

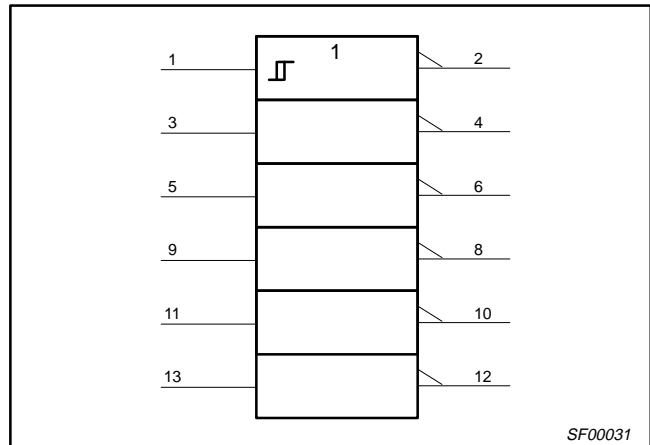
NOTES:

H = High voltage level
L = Low voltage level

LOGIC DIAGRAM



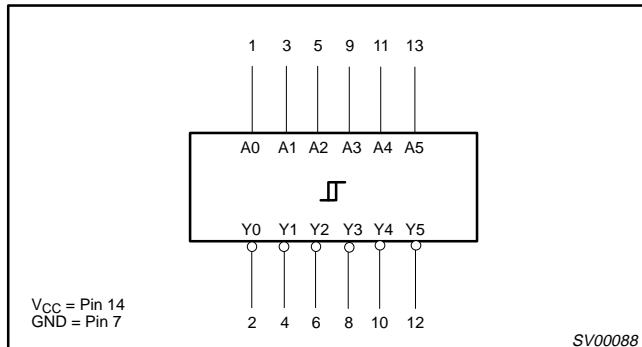
IEC/IEEE SYMBOL



3.3V Hex inverter Schmitt trigger

74LVT14

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:

- 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}	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

3.3V Hex inverter Schmitt trigger

74LVT14

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 $3.6V; I_{OH} = -100\mu A$	$V_{CC}-0.2$			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	$V_{CC} = 2.7V; I_{OL} = 100\mu A$			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	$V_{CC} = 3.6V; \text{Outputs High, } V_I = \text{GND or } V_{CC}, I_O = 0$			0.02	mA
I_{CCL}		$V_{CC} = 3.6V; \text{Outputs Low, } V_I = \text{GND or } V_{CC}, I_O = 0$		1.5	3	
ΔI_{CC}	Additional supply current per input pin ²	$V_{CC} = 3V$ to $3.6V; \text{One input at } V_{CC}-0.6V, \text{Other inputs at } V_{CC}$ or GND			0.2	μA
C_I	Input capacitance	$V_I = 3V$ or 0		3		pF

NOTES:

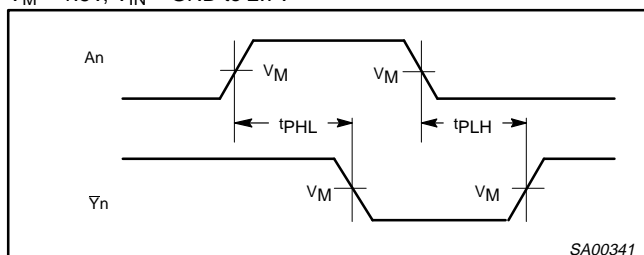
1. All typical values are at $V_{CC} = 3.3V$ and $T_{amb} = 25^\circ C$.
2. This is the increase in supply current for each input at the specified voltage level other than V_{CC} or GND

AC ELECTRICAL CHARACTERISTICS

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

AC WAVEFORMS

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

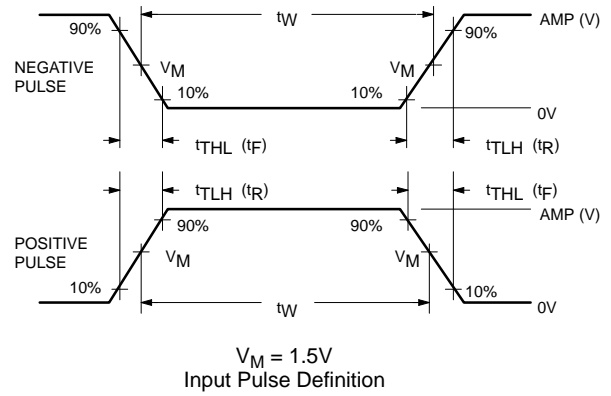
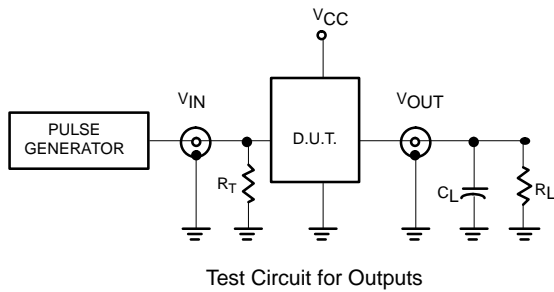


Waveform 1. Propagation delay for inverting outputs

3.3V Hex inverter Schmitt trigger

74LVT14

TEST CIRCUIT AND WAVEFORMS



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	$\leq 10MHz$	500ns	$\leq 2.5ns$	$\leq 2.5ns$

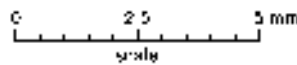
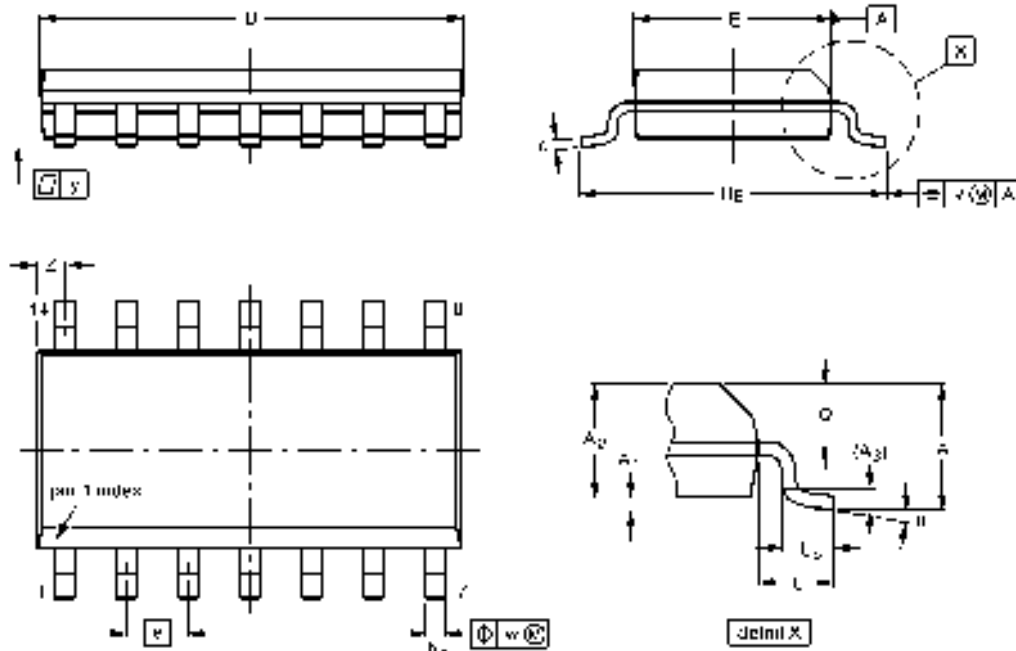
SV00022

3.3V Hex inverter Schmitt trigger

74LVT14

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	e	Ø ⁽¹⁾	ε ⁽¹⁾	φ	H _E	L	L _p	Q	v	w	y	z ⁽¹⁾	⋅
mm	1.75	0.25 0.10	1.45 1.25	0.20	0.45 0.30	0.25 0.19	8.75 8.00	4.0 3.0	1.27	5.2 5.0	1.5	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	⋅
inches	0.069	0.0098 0.0039	0.057 0.049	0.008	0.018 0.014	0.0099 0.0075	0.34 0.31	0.16 0.12	0.050	0.21 0.20	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.029 0.012	B ⁽²⁾ D ⁽²⁾

Note

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

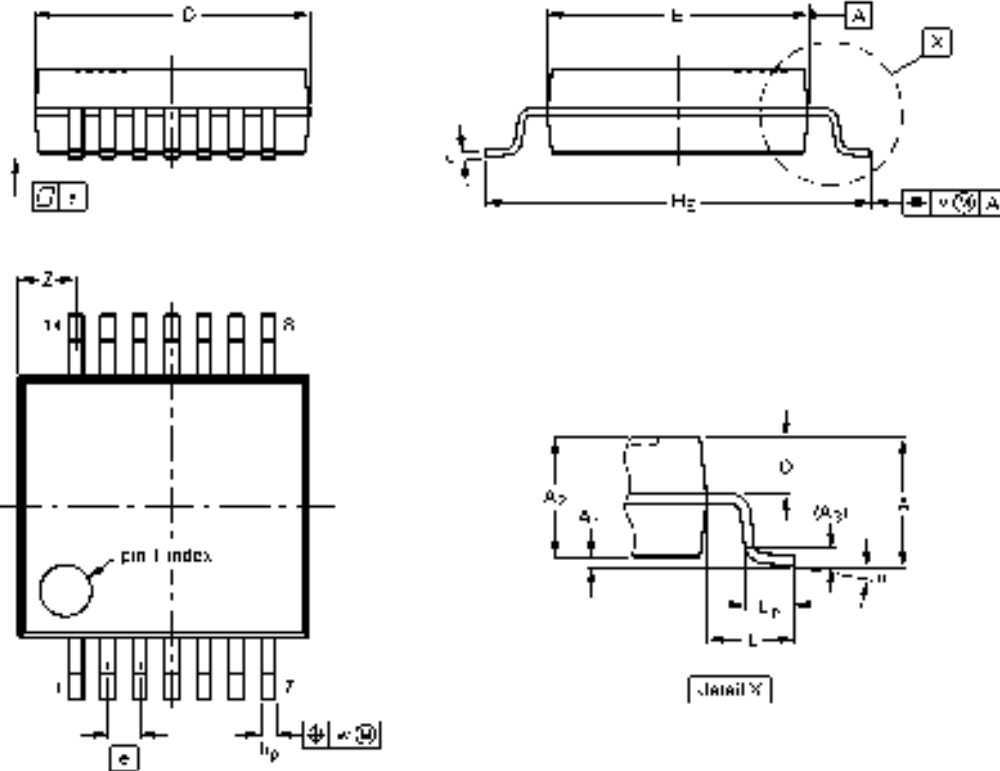
OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ		
SOT108-1	076E060	MS-012AB			5-198-19 95-01-23

3.3V Hex inverter Schmitt trigger

74LVT14

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 ₂	L	L _p	Q	y	w	y	z ⁽¹⁾	φ
mm	2.0	0.71 0.75	1.80 1.05	0.20	0.50 0.25	0.20 0.09	6.4 0.0	5.4 5.2	0.65	7.0 7.8	1.25	1.00 0.82	0.9 0.7	0.2	0.10	0.1	1.4 0.9	0° 0°

Note

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

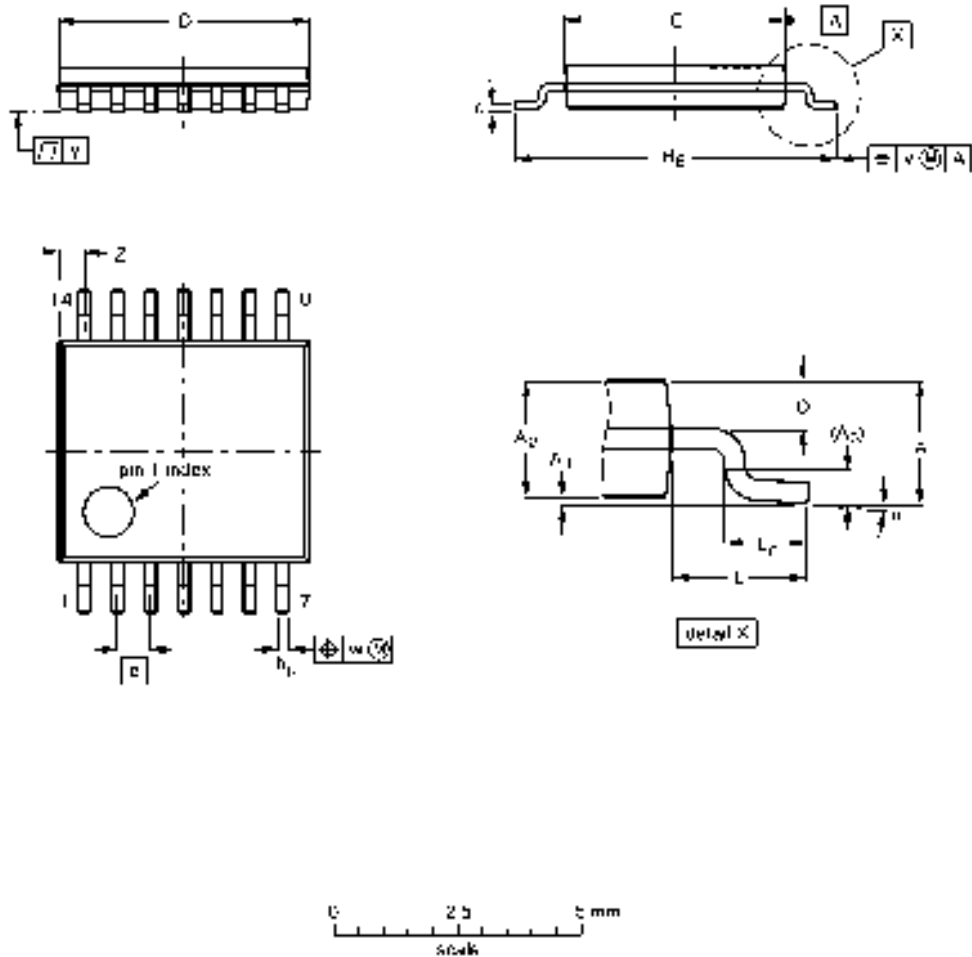
OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ		
SOT337-1		MO-150AB			95-85-94 96-01-19

3.3V Hex inverter Schmitt trigger

74LVT14

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⁾	u
mm	1.10	0.15 0.75	0.05 0.00	0.25	0.50 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.55	6.6 6.2	1.0	0.75 0.57	0.4 0.3	0.2	0.13	0.1	0.72 0.20	0 ^c 0 ^c

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-150				94-07-12 95-11-01

3.3V Hex inverter Schmitt trigger

74LVT14

NOTES

3.3V Hex inverter Schmitt trigger

74LVT14

DEFINITIONS

Data Sheet Identification	Product Status	Definition
<i>Objective Specification</i>	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.
<i>Preliminary Specification</i>	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.
<i>Product Specification</i>	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.

Philips Semiconductors and Philips Electronics North America Corporation reserve the right to make changes, without notice, in the products, including circuits, standard cells, and/or software, described or contained herein in order to improve design and/or performance. Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no license or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified. Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

LIFE SUPPORT APPLICATIONS

Philips Semiconductors and Philips Electronics North America Corporation Products are not designed for use in life support appliances, devices, or systems where malfunction of a Philips Semiconductors and Philips Electronics North America Corporation Product can reasonably be expected to result in a personal injury. Philips Semiconductors and Philips Electronics North America Corporation customers using or selling Philips Semiconductors and Philips Electronics North America Corporation Products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors and Philips Electronics North America Corporation for any damages resulting from such improper use or sale.

Philips Semiconductors
811 East Arques Avenue
P.O. Box 3409
Sunnyvale, California 94088-3409
Telephone 800-234-7381

Philips Semiconductors and Philips Electronics North America Corporation register eligible circuits under the Semiconductor Chip Protection Act.
 © Copyright Philips Electronics North America Corporation 1996
 All rights reserved. Printed in U.S.A.