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DATA SHEET

74F14
Hex inverter Schmitt trigger

Product specification

1990 Nov 26

IC15 Data Handbook

Philips
Semiconductors

PHILIPS

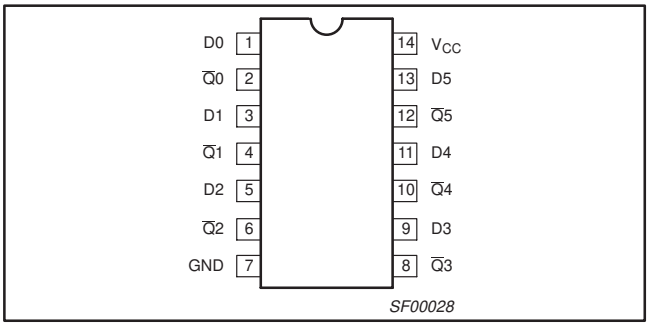
Hex inverter Schmitt trigger 74F14

FEATURE

- Industrial temperature range available (–40°C to +85°C)

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74F14	5.0ns	18mA

PIN CONFIGURATION



DESCRIPTION

The 74F14 contains six logic inverters which accept standard TTL input signals and provide standard TTL output levels. 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 800mV) is determined internally by resistor ratios and is insensitive to temperature and supply voltage variations.

ORDERING INFORMATION

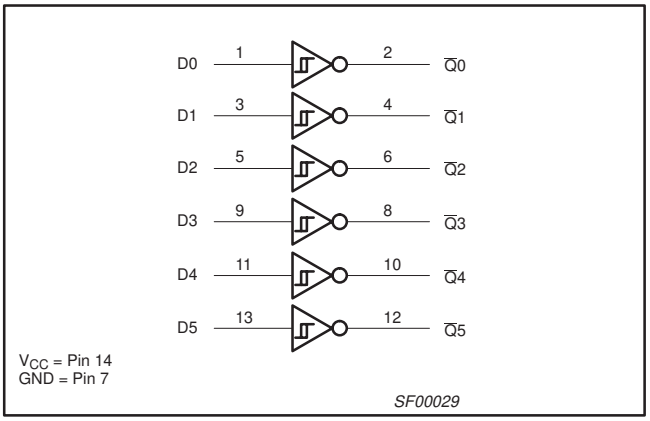
DESCRIPTION	ORDER CODE		PKG DWG #
	COMMERCIAL RANGE V_{CC} = 5V ±10%, T_{amb} = 0°C to +70°C	INDUSTRIAL RANGE V_{CC} = 5V ±10%, T_{amb} = –40°C to +85°C	
14-pin plastic DIP	N74F14N	I74F14N	SOT27-1
14-pin plastic SO	N74F14D	I74F14D	SOT108-1

INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
Dn	Data inputs	1.0/1.0	20µA/0.6mA
$\overline{Q}$n	Data output	50/33	1.0mA/20mA

NOTE:
1 One (1.0) FAST unit load is defined as: 20µA in the High state and 0.6mA in the Low state.

LOGIC DIAGRAM

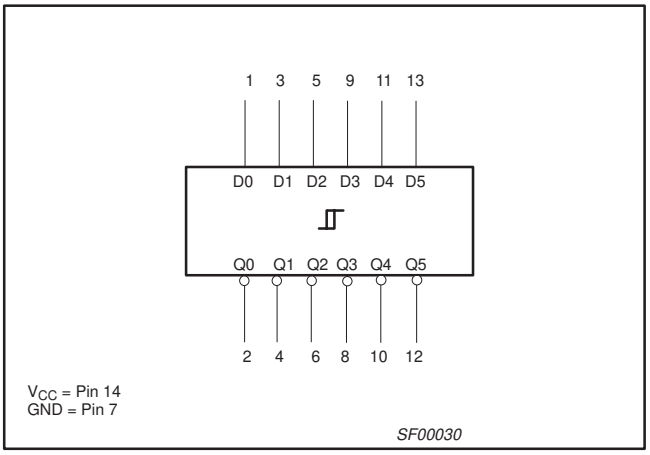


FUNCTION TABLE

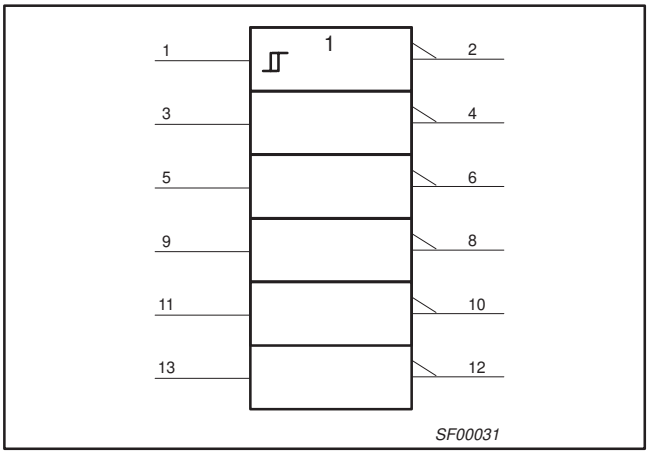
INPUTS	OUTPUT
Dn	**$\overline{Q}$n**
L	H
H	L

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

LOGIC SYMBOL



IEC/IEEE SYMBOL



ABSOLUTE MAXIMUM RATINGS

(Operation beyond the limits set forth in this table may impair the useful life of the device.
Unless otherwise noted these limits are over the operating free-air temperature range.)

SYMBOL	PARAMETER		RATING	UNIT
V_{CC}	Supply voltage		–0.5 to +7.0	V
V_{IN}	Input voltage		–0.5 to +7.0	V
I_{IN}	Input current		–30 to +5	mA
V_{OUT}	Voltage applied to output in high output state		–0.5 to V_{CC}	V
I_{OUT}	Current applied to output in low output state		40	mA
T_{amb}	Operating free-air temperature range	Commercial range	0 to +70	°C
		Industrial range	–40 to +85	°C
T_{stg}	Storage temperature range		–65 to +150	°C

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER		LIMITS			UNIT
			MIN	NOM	MAX	
V_{CC}	Supply voltage		4.5	5.0	5.5	V
V_{IH}	High-level input voltage		2.0			V
V_{IL}	Low-level input voltage				0.8	V
I_{Ik}	Input clamp current				–18	mA
I_{OH}	High-level output current				–1	mA
I_{OL}	Low-level output current				20	mA
T_{amb}	Operating free air temperature range	Commercial range	0		+70	°C
		Industrial range	–40		+85	°C

DC ELECTRICAL CHARACTERISTICS

(Over recommended operating free-air temperature range unless otherwise noted.)

SYMBOL	PARAMETER		TEST CONDITIONS[1]		LIMITS			UNIT
					MIN	TYP[2]	MAX	
V_{T+}	Positive-going threshold		V_{CC} = 5.0V		1.4	1.7	2.0	V
V_{T-}	Negative-going threshold		V_{CC} = 5.0V		0.7	0.9	1.1	V
ΔV_T	Hysteresis ($V_{T+} - V_{T-}$)		V_{CC} = 5.0V		0.4	0.8		V
V_{OH}	High-level output voltage		V_{CC} = MIN, $V_I = V_{T-MIN}$,	±10%V_{CC}	2.5			V
			I_{OH} = MAX	±5%V_{CC}	2.7	3.4		V
V_{OL}	Low-level output voltage		V_{CC} = MIN, $V_I = V_{T+MAX}$,	±10%V_{CC}		0.30	0.50	V
			I_{OL} = MAX	±5%V_{CC}		0.30	0.50	V
V_{IK}	Input clamp voltage		V_{CC} = MIN, $I_I = I_{IK}$			-0.73	-1.2	V
I_{T+}	Input current at positive-going threshold		V_{CC} = 5.0V, $V_I = V_{T+}$			0		µA
I_{T-}	Input current at negative-going threshold		V_{CC} = 5.0V, $V_I = V_{T-}$			–175		µA
I_I	Input current at maximum input voltage		V_{CC} = MAX, V_I = 7.0V				100	µA
I_{IH}	High-level input current		V_{CC} = MAX, V_I = 2.7V				20	µA
I_{IL}	Low-level input current		V_{CC} = MAX, V_I = 0.5V				-0.6	mA
I_{OS}	Short-circuit output current[3]		V_{CC} = MAX		-60		-150	mA
I_{CC}	Supply current (total)	I_{CCH}	V_{CC} = MAX	V_{IN} = GND		13	22	mA
		I_{CCL}	V_{CC} = MAX	V_{IN} = 4.5V		23	32	mA

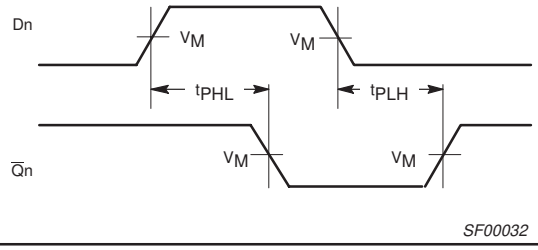
NOTES:

1 For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
2 All typical values are at V_{CC} = 5V, T_{amb} = 25°C.
3 Not more than one output should be shorted at a time. For testing I_{OS}, the use of high-speed test apparatus and/or sample-and-hold techniques are preferable in order to minimize internal heating and more accurately reflect operational values. Otherwise, prolonged shorting of a high output may raise the chip temperature well above normal and thereby cause invalid readings in other parameter tests. In any sequence of parameter tests, I_{OS} tests should be performed last.

AC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITION	LIMITS							UNIT
			V_{CC} = +5.0V T_{amb} = +25°C C_L = 50pF, R_L = 500Ω			V_{CC} = +5.0V ± 10% T_{amb} = 0°C to +70°C C_L = 50pF, R_L = 500Ω		V_{CC} = +5.0V ± 10% T_{amb} = –40°C to +85°C C_L = 50pF, R_L = 500Ω		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH} t_{PHL}	Propagation delay Dn to $\overline{Q}$n	Waveform 1	4.0 3.5	6.5 5.0	8.5 6.5	4.0 3.5	9.5 7.0	3.0 3.5	10.5 9.0	ns

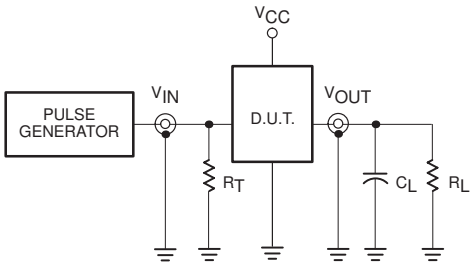
AC WAVEFORMS



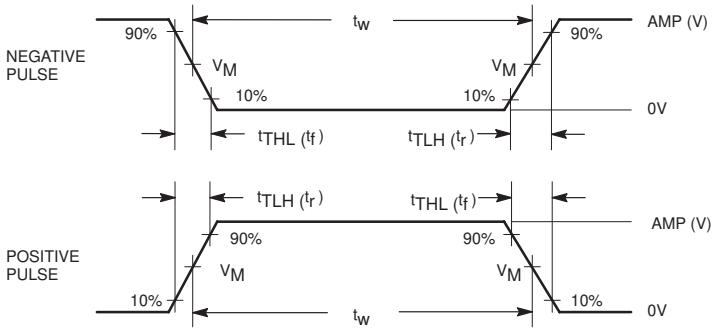
Waveform 1. Propagation delay for inverting outputs

NOTE:
For all waveforms, V_M = 1.5V.

TEST CIRCUIT AND WAVEFORMS



Test Circuit for Totem-Pole Outputs



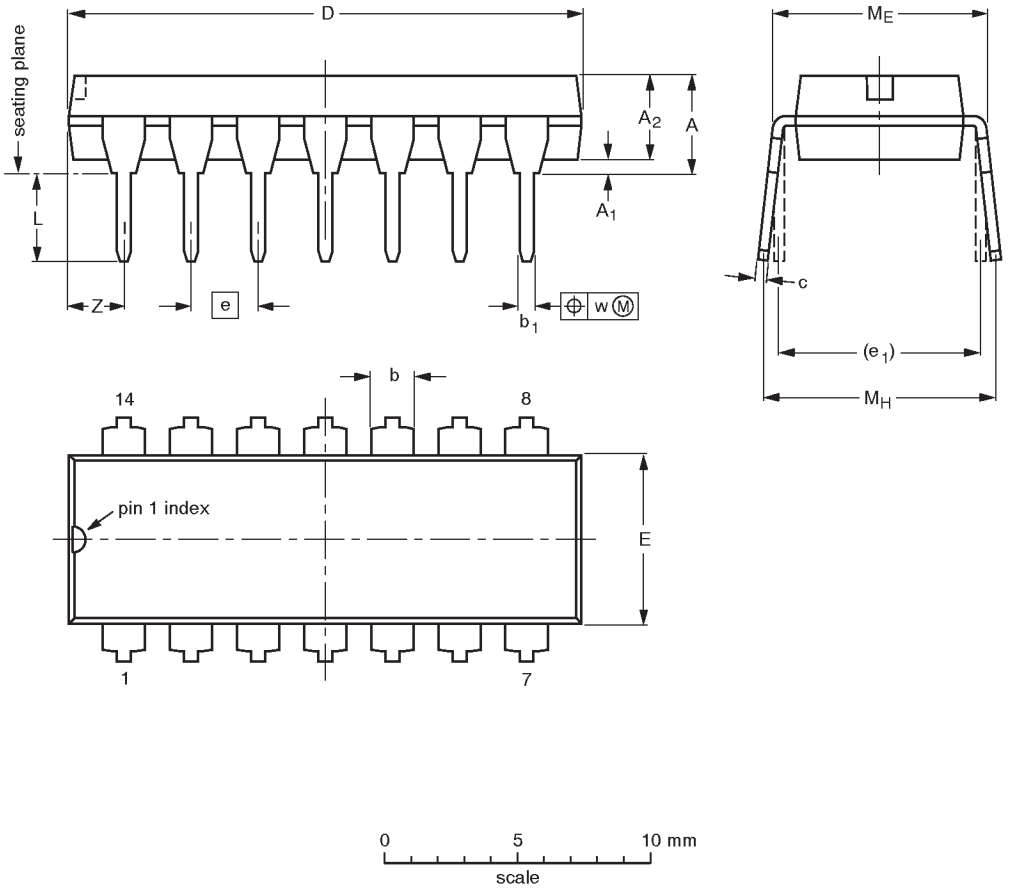
DEFINITIONS:
R_L = Load resistor;
see AC ELECTRICAL CHARACTERISTICS for value.
C_L = Load capacitance includes jig and probe capacitance;
see AC ELECTRICAL CHARACTERISTICS for value.
R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

Input Pulse Definition

family	INPUT PULSE REQUIREMENTS					
	amplitude	V_M	rep. rate	t_w	t_{TLH}	t_{THL}
74F	3.0V	1.5V	1MHz	500ns	2.5ns	2.5ns

SF00006

DIP14: plastic dual in-line package; 14 leads (300 mil) **SOT27-1**



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

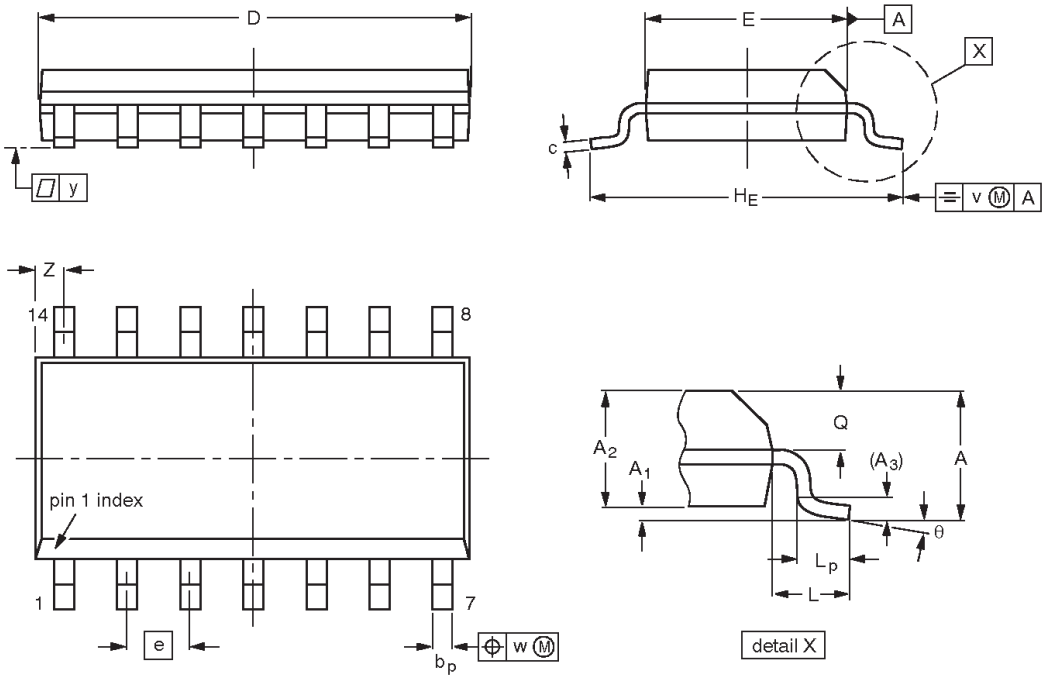
UNIT	A max.	A_1 min.	A_2 max.	b	b_1	c	D (1)	E (1)	e	e_1	L	M_E	M_H	w	Z (1) max.
mm	4.2	0.51	3.2	1.73 1.13	0.53 0.38	0.36 0.23	19.50 18.55	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	2.2
inches	0.17	0.020	0.13	0.068 0.044	0.021 0.015	0.014 0.009	0.77 0.73	0.26 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.087

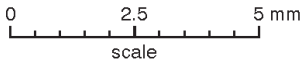
Note

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			
SOT27-1	050G04	MO-001AA				~~92-11-17~~ 95-03-11

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^o 0^o
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.35 0.34	0.16 0.15	0.050	0.244 0.228	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				~~95-01-23~~ 97-05-22

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

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