

DATA SHEET

74F14

Hex inverter Schmitt trigger

Product specification

1990 Nov 26

IC15 Data Handbook

Hex inverter Schmitt trigger

74F14

FEATURE

- Industrial temperature range available (-40°C to $+85^{\circ}\text{C}$)

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

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 $V_{CC} = 5V \pm 10\%$, $T_{amb} = 0^{\circ}\text{C}$ to $+70^{\circ}\text{C}$	INDUSTRIAL RANGE $V_{CC} = 5V \pm 10\%$, $T_{amb} = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	
14-pin plastic DIP	N74F14N	I74F14N	SOT27-1
14-pin plastic SO	N74F14D	I74F14D	SOT108-1

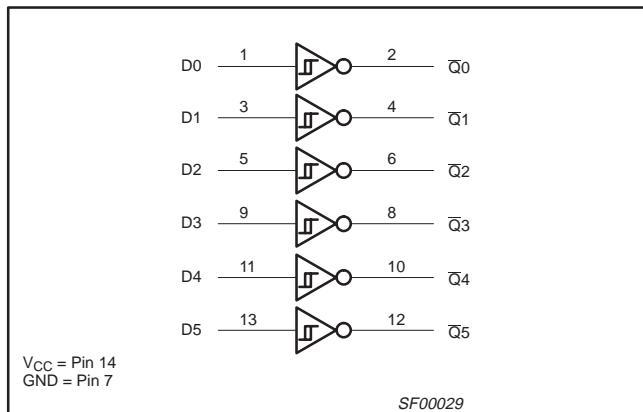
INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

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

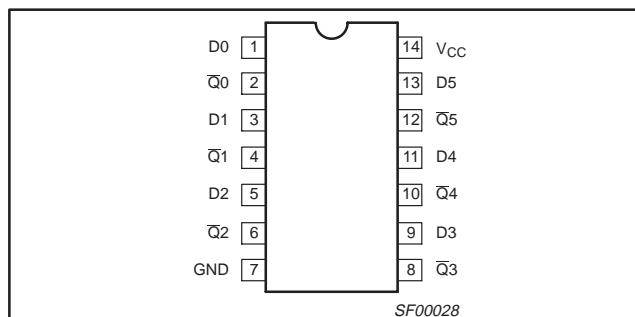
NOTE:

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

LOGIC DIAGRAM



PIN CONFIGURATION



FUNCTION TABLE

INPUTS	OUTPUT
D _n	\bar{Q}_n
L	H
H	L

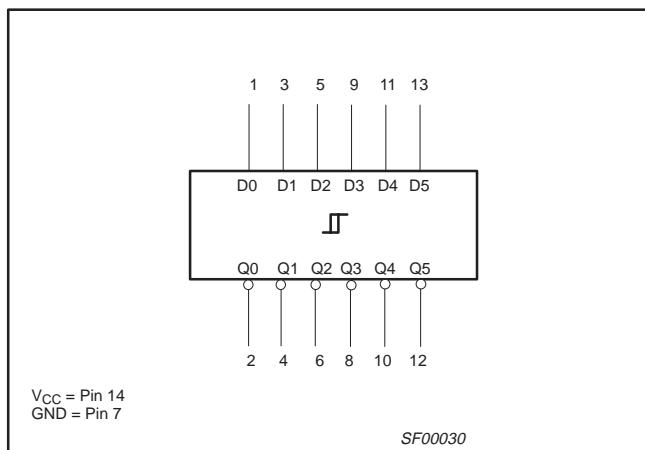
NOTES:

H = High voltage level
L = Low voltage level

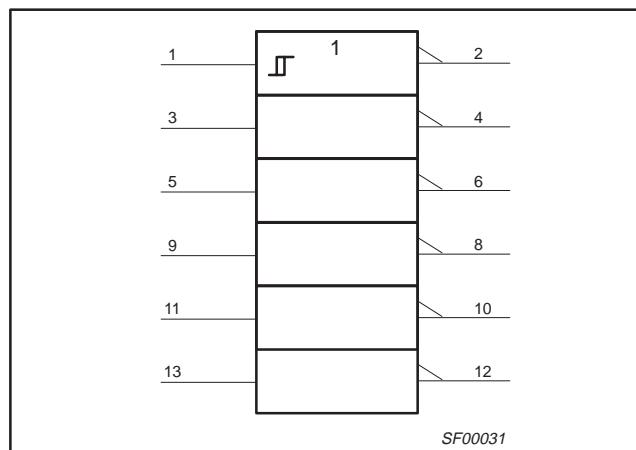
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LOGIC SYMBOL



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
		Industrial range	–40 to +85
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

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DC ELECTRICAL CHARACTERISTICS

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

SYMBOL	PARAMETER	TEST CONDITIONS ¹			LIMITS			UNIT
		MIN	TYP ²	MAX	MIN	TYP	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	$V_{CC} = MIN, V_I = V_{T-MIN}, I_{OH} = MAX$	$\pm 10\%V_{CC}$	2.5				V
			$\pm 5\%V_{CC}$	2.7	3.4			V
V_{OL}	Low-level output voltage	$V_{CC} = MIN, V_I = V_{T+MAX}, I_{OL} = MAX$	$\pm 10\%V_{CC}$		0.30	0.50		V
			$\pm 5\%V_{CC}$		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 $V_{CC} = 5V$, $T_{amb} = 25^\circ C$.
- 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.

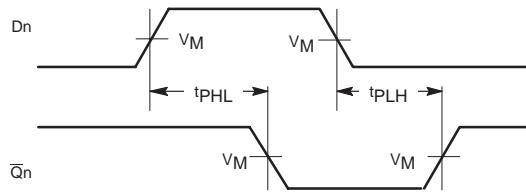
AC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITION	LIMITS						UNIT	
			$V_{CC} = +5.0V$ $T_{amb} = +25^\circ C$ $C_L = 50pF, R_L = 500\Omega$			$V_{CC} = +5.0V \pm 10\%$ $T_{amb} = 0^\circ C$ to $+70^\circ C$ $C_L = 50pF, R_L = 500\Omega$		$V_{CC} = +5.0V \pm 10\%$ $T_{amb} = -40^\circ C$ to $+85^\circ C$ $C_L = 50pF, R_L = 500\Omega$		
			MIN	TYP	MAX	MIN	MAX	MIN		
			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
t_{PLH} t_{PHL}	Propagation delay D _n to Q _n	Waveform 1								

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AC WAVEFORMS



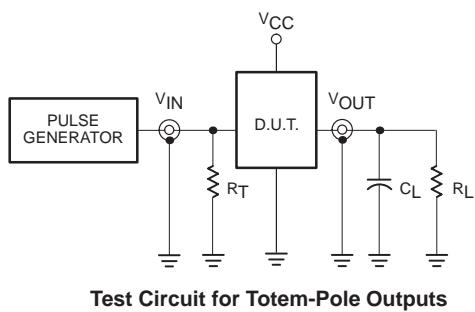
SF00032

Waveform 1. Propagation delay for inverting outputs

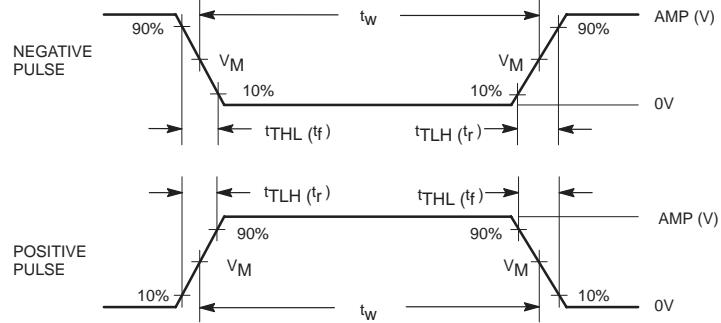
NOTE:

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

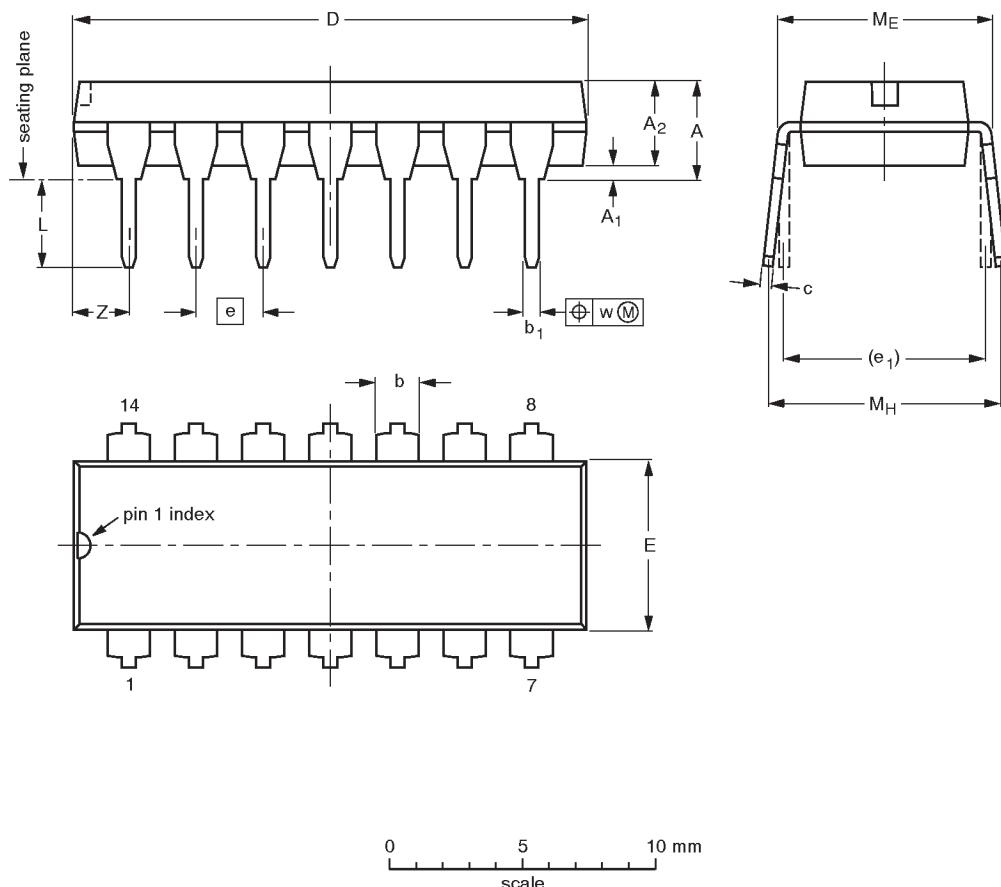
SF00006

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

SOT27-1



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

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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.

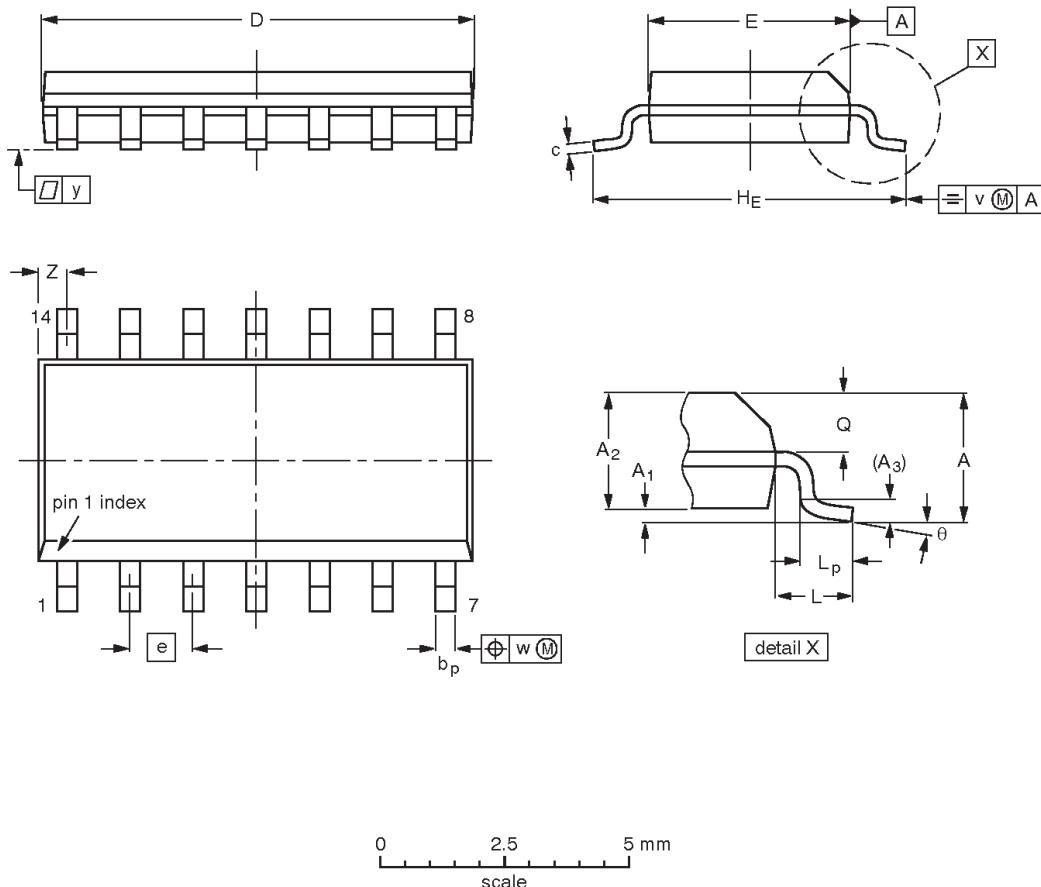
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT27-1	050G04	MO-001AA				92-11-17 95-03-11

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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 0.10	0.25 1.25	1.45	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 0.004	0.010 0.049	0.057	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

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

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