Hex inverter schmitt trigger 74F14

FEATURE

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

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.

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

ORDERING INFORMATION

DESCRIPTION	ORDER CODE	
	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
14–pin plastic SO	N74F14D	I74F14D

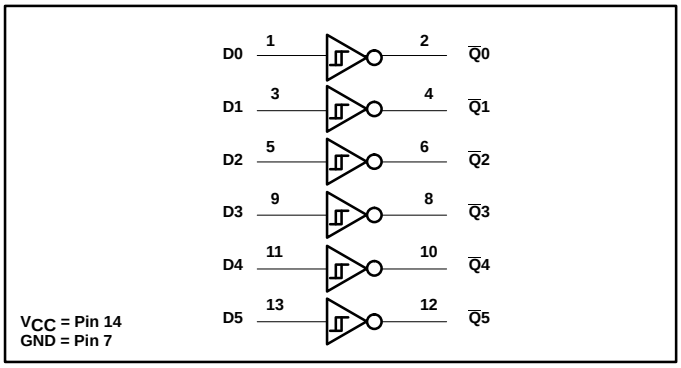
INPUT AND OUTPUT LOADNG AND FAN OUT TABLE

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 to input and output loading and fan out table

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

LOGIC DIAGRAM



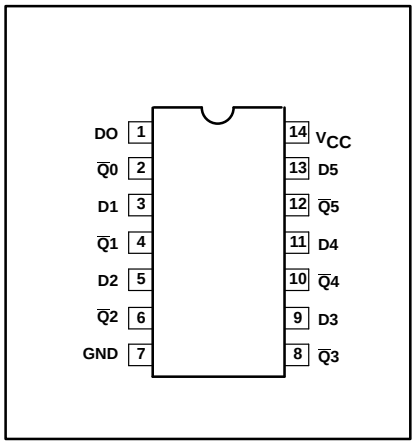
FUNCTION TABLE

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

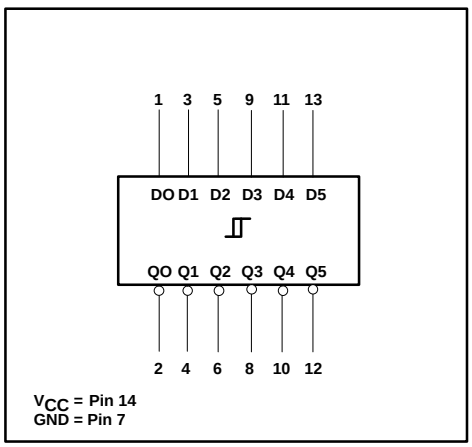
Notes to function table

1. H = High voltage level
2. L = Low voltage level

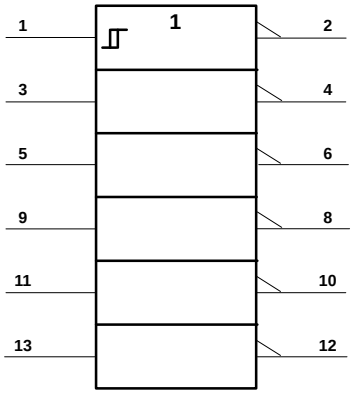
PIN CONFIGURATION



LOGIC SYMBOL



IEC/IEEE SYMBOL



ABSOLUTE MAXIMUM RATINGS

(Operation beyond the limit 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, $V_I = V_{T-MIN}$,	$\pm$10%V_{CC}	2.5			V
			I_{OH} = MAX	$\pm$5%V_{CC}	2.7	3.4		V
V_{OL}	Low-level output voltage		V_{CC} = MIN, $V_I = V_{T+MAX}$,	$\pm$10%V_{CC}		0.30	0.50	V
			I_{OL} = MAX	$\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

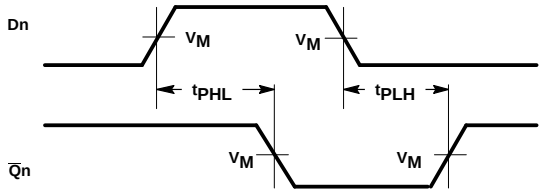
Notes to DC electrical characteristics

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
			T_{amb} = +25°C V_{CC} = +5.0V C_L = 50pF, R_L = 500Ω			T_{amb} = 0°C to +70°C V_{CC} = +5.0V ± 10% C_L = 50pF, R_L = 500Ω		T_{amb} = –40°C to +85°C V_{CC} = +5.0V ± 10% 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

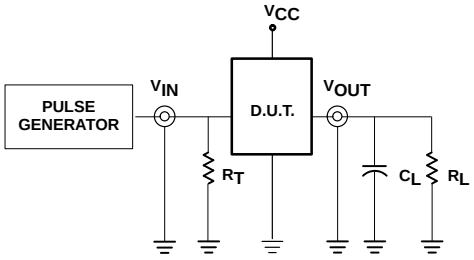
AC WAVEFORMS



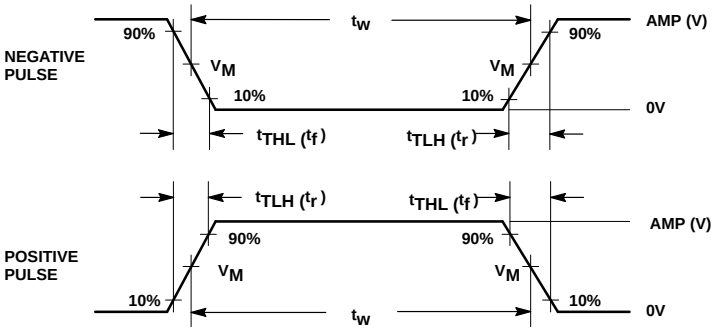
Waveform 1. Propagation delay for inverting outputs

Note to AC Waveforms
1. For all waveforms, V_M = 1.5V.

TEST CIRCUIT AND WAVEFORMS



Test circuit for totem-pole outputs



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

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.

NOTES