

# FAST 74F14

## Schmitt Trigger

### Hex Inverter Schmitt Trigger

#### FAST Products

#### Product Specification

#### 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 transitions. This hysteresis between the 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

PACKAGES	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$ ; $T_A = 0^\circ C$ to $+70^\circ C$
14-Pin Plastic DIP	N74F14N
14-Pin Plastic SO	N74F14D

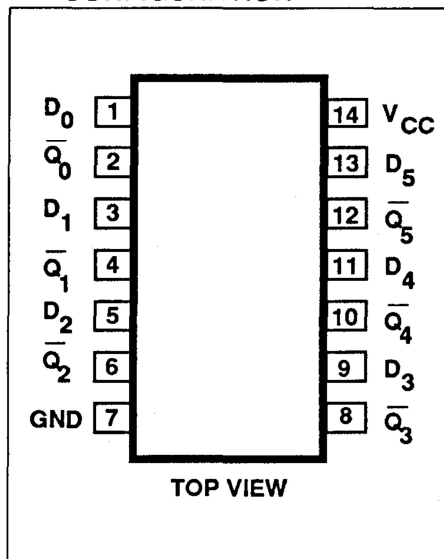
#### INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74F(U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
$D_n$	Data inputs	1.0/1.0	20 $\mu$ A/0.6mA
$\bar{Q}_n$	Data outputs	50/33	1.0mA/20mA

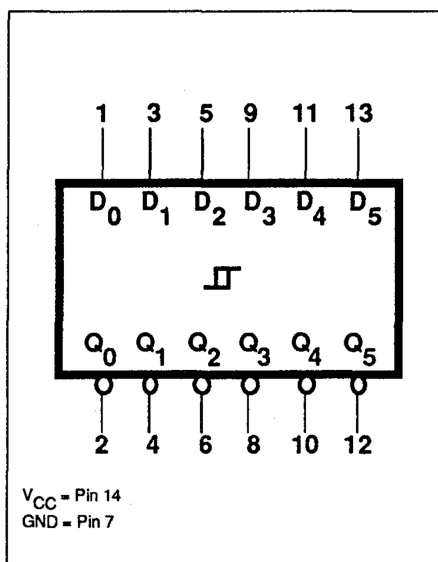
#### NOTE:

One (1.0) FAST Unit Load is defined as: 20 $\mu$ A in the High state and 0.6mA in the Low state.

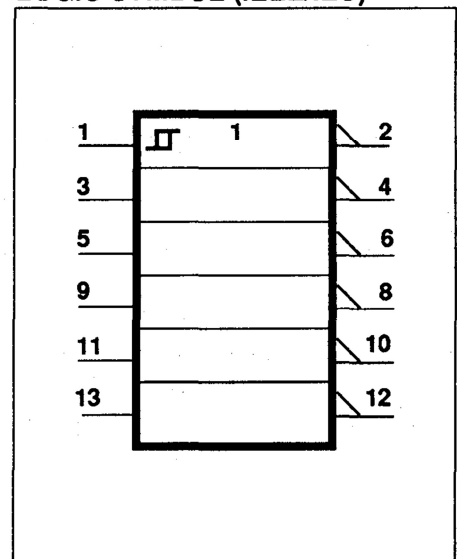
#### PIN CONFIGURATION



#### LOGIC SYMBOL



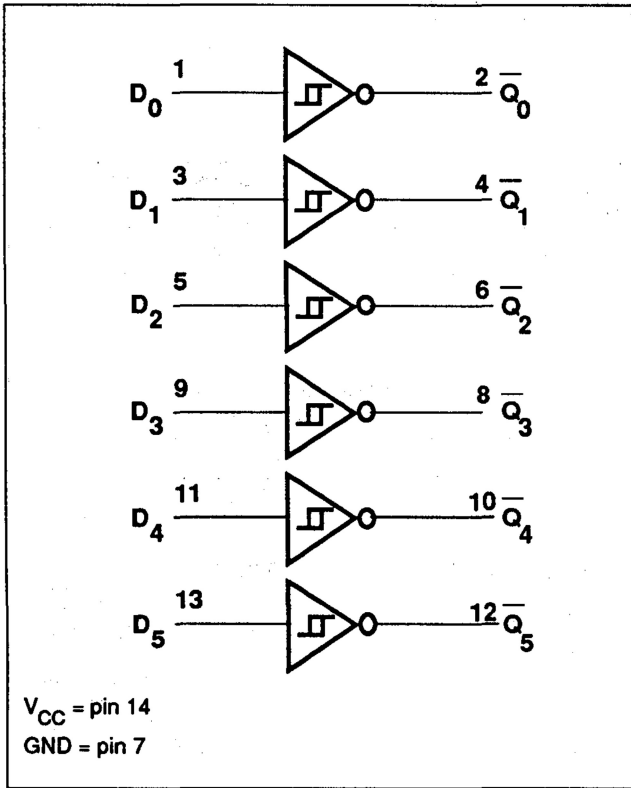
#### LOGIC SYMBOL (IEEE/IEC)



# Schmitt Trigger

# FAST 74F14

### LOGIC DIAGRAM



### FUNCTION TABLE

INPUT	OUTPUT
$D_n$	$\bar{Q}_n$
L	H
H	L

H = High voltage level  
L = Low voltage level

### 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
$T_A$	Operating free-air temperature range	0 to +70	°C
$T_{STG}$	Storage temperature	-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
$I_K$	Input clamp current			-18	mA
$I_{OH}$	High-level output current			-1	mA
$I_{OL}$	Low-level output current			20	mA
$T_A$	Operating free-air temperature range	0		70	°C

## Schmitt Trigger

FAST 74F14

**DC ELECTRICAL CHARACTERISTICS** (Over recommended operating free-air temperature range unless otherwise noted.)

SYMBOL	PARAMETER	TEST CONDITIONS <sup>1</sup>	LIMITS			UNIT	
			Min	Typ <sup>2</sup>	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	
$\Delta V_T$	Hysteresis ( $V_{T+} - V_{T-}$ )	$V_{CC} = 5.0V$	0.4	0.8		V	
$V_{OH}$	High-level output voltage	$V_{CC} = \text{MIN},$ $V_I = V_{T-\text{MIN}}, I_{OH} = \text{MAX}$	$\pm 10\% V_{CC}$	2.5		V	
			$\pm 5\% V_{CC}$	2.7	3.4	V	
$V_{OL}$	Low-level output voltage	$V_{CC} = \text{MIN},$ $V_I = V_{T+\text{MAX}}, I_{OL} = \text{MAX}$	$\pm 10\% V_{CC}$		0.30	0.50	V
			$\pm 5\% V_{CC}$		0.30	0.50	V
$V_{IK}$	Input clamp voltage	$V_{CC} = \text{MIN}, I_I = I_{IK}$		-0.73	-1.2	V	
$I_{T+}$	Input current at positive-going threshold	$V_{CC} = 5.0V, V_I = V_{T+}$		0		$\mu A$	
$I_{T-}$	Input current at negative-going threshold	$V_{CC} = 5.0V, V_I = V_{T-}$		-175		$\mu A$	
$I_I$	Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 7.0V$			100	$\mu A$	
$I_{IH}$	High-level input current	$V_{CC} = \text{MAX}, V_I = 2.7V$			20	$\mu A$	
$I_{IL}$	Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.5V$			-0.6	mA	
$I_{OS}$	Short circuit output current <sup>3</sup>	$V_{CC} = \text{MAX}$		-60	-150	mA	
$I_{CC}$	Supply current (total)	$V_{CC} = \text{MAX}$	$V_{IN} = \text{GND}$		13	22	mA
			$V_{IN} = 4.5V$		23	32	mA

**NOTES:**

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at  $V_{CC} = 5V, T_A = 25^\circ C$ .
- 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.

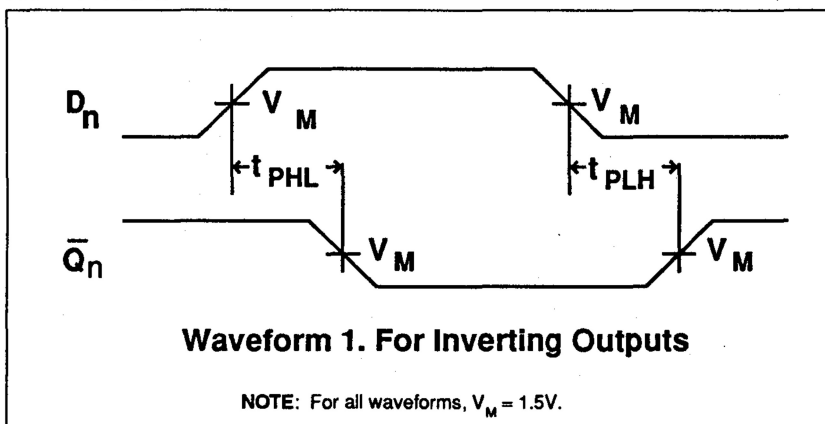
# Schmitt Trigger

FAST 74F14

## AC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITION	LIMITS					UNIT
			$T_A = +25^\circ\text{C}$ $V_{CC} = 5\text{V}$ $C_L = 50\text{pF}$ $R_L = 500\Omega$			$T_A = 0^\circ\text{C to } +70^\circ\text{C}$ $V_{CC} = 5\text{V} \pm 10\%$ $C_L = 50\text{pF}$ $R_L = 500\Omega$		
			Min	Typ	Max	Min	Max	
$t_{PLH}$ $t_{PHL}$	Propagation delay $D_n$ to $\bar{Q}_n$	Waveform 1	4.0 3.5	6.5 5.0	8.5 6.5	4.0 3.5	9.5 7.0	ns

## AC WAVEFORMS



## TEST CIRCUIT AND WAVEFORMS

**Test Circuit For Totem-Pole Outputs**

**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.

$V_M = 1.5\text{V}$   
Input Pulse Definition

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	$t_w$	$t_{TLH}(t_r)$	$t_{THL}(t_f)$
74F	3.0V	1MHz	500ns	2.5ns	2.5ns