16-bit edge triggered D-type flip-flop; 3-state — 74ALVC16374

FEATURES

- Wide supply voltage range of 1.2 V to 3.6 V
- In accordance with JEDEC standard no.8-1A
- CMOS low power consumption
- Multibyte™ flow-through standard pin-out architecture
- Low inductance multiple power and ground pins for minimum noise and ground bounce
- Direct interface with TTL levels
- All data inputs have bushold
- Output drive capability 50 Ω transmission lines @ 85 °C

DESCRIPTION

The 74ALVC16374 is a 16-bit edge-triggered flip-flop featuring separate D-type inputs for each flip-flop and 3-state outputs for bus oriented applications. A clock (CP) input and an output enable ($\overline{OE}$) are provided for each octal.

The flip-flops will store the state of their individual D-inputs that meet the set-up and hold times requirements on the LOW-to-HIGH CP transition.

When $\overline{OE}$ is LOW, the contents of the flip-flops are available at the outputs. When $\overline{OE}$ is HIGH, the outputs go to the high impedance OFF-state. Operation of the $\overline{OE}$ input does not affect the state of the flip-flops.

QUICK REFERENCE DATA

GND = 0 V; T_{amb} = 25 °C; $t_r = t_f$ = 2.5 ns

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
t_{PHL}/t_{PLH}	propagation delay CP to Q_n	C_L = 50 pF; V_{CC} = 3.3 V	3.2	ns
f_{max}	maximum clock frequency		350	MHz
C_I	input capacitance		3.0	pF
C_{PD}	power dissipation capacitance per flip-flop	notes 1 and 2	28	pF

Notes to the quick reference data

1. C_{PD} is used to determine the dynamic power dissipation (P_D in µW):
   $P_D = C_{PD} \times V_{CC}^2 \times f_i + \Sigma (C_L \times V_{CC}^2 \times f_o)$ where:
   f_i = input frequency in MHz; C_L = output load capacity in pF;
   f_o = output frequency in MHz; V_{CC} = supply voltage in V;
   $\Sigma (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.
2. The condition is V_I = GND to V_{CC}.

ORDERING INFORMATION

TYPE NUMBER	PACKAGES			
	PINS	PACKAGE	MATERIAL	CODE
74ALVC16374DL	48	SSOP48	plastic	SSOP48/SOT370
74ALVC16374DGG	48	TSSOP48	plastic	TSSOP48/SOT362

PINNING

PIN NO.	SYMBOL	NAME AND FUNCTION
1	$1\overline{OE}$	'1' output enable input (active LOW)
2, 3, 5, 6, 8, 9, 11, 12	$1Q_0$ to $1Q_7$	'1Q' data inputs/outputs
4, 10, 15, 21, 28, 34, 39, 45	GND	ground (0 V)
7, 18, 31, 42	V_{CC}	positive supply voltage
13, 14, 16, 17, 19, 20, 22, 23	$2Q_0$ to $2Q_7$	'2Q' data inputs/outputs
24	$2\overline{OE}$	'1' output enable input (active LOW)
25	2CP	'2' clock input
36, 35, 33, 32, 30, 29, 27, 26	$2D_0$ to $2D_7$	'2D' data inputs
47, 46, 44, 43, 41, 40, 38, 37	$1D_0$ to $1D_7$	'1D' data inputs
48	1CP	'1' clock input

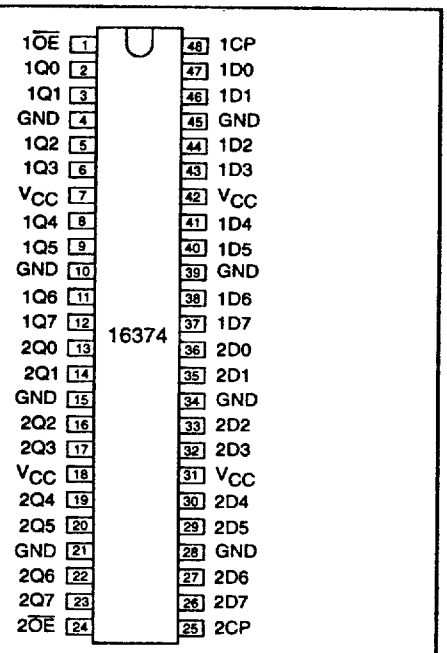


Fig.1 Pin configuration.

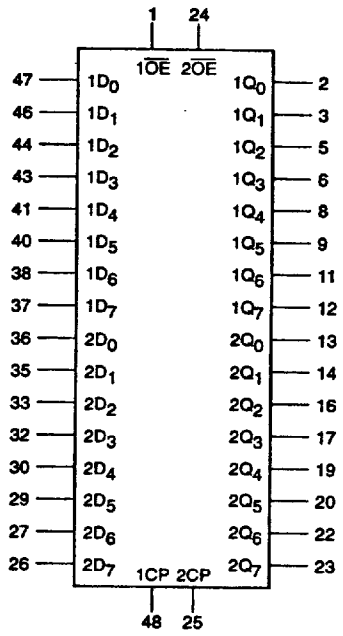


Fig.2 Logic symbol.

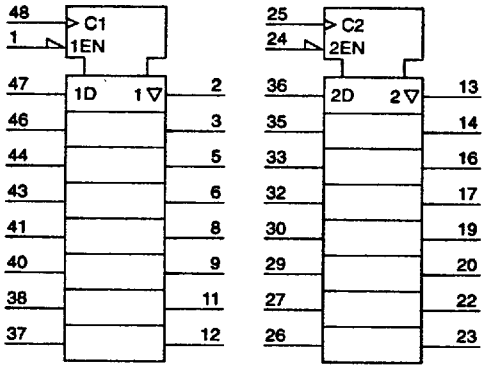


Fig.3 IEC logic symbol.

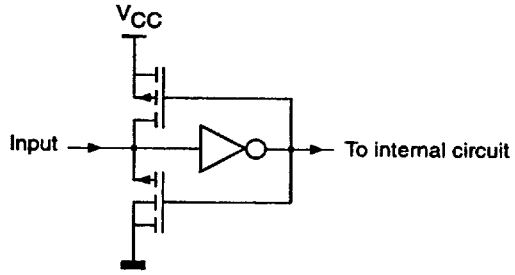


Fig.4 Bushold circuit.

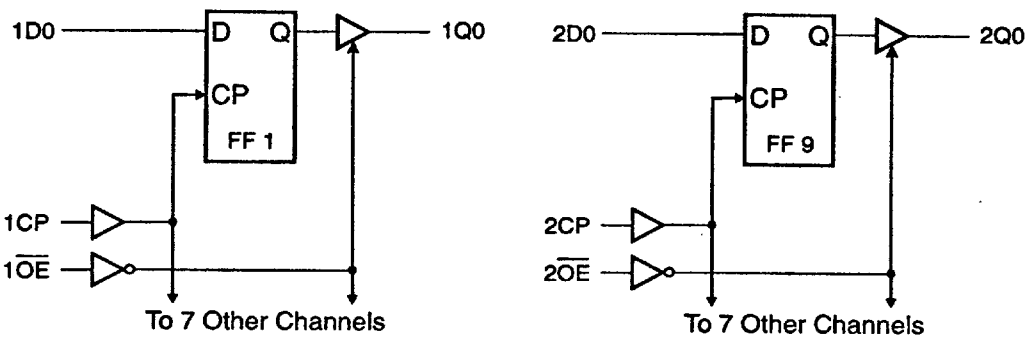


Fig.5 Logic diagram.

FUNCTION TABLE

OPERATING MODES	INPUTS			INTERNAL FLIP-FLOPS	OUTPUTS
	$\overline{OE}$	CP	D_n		Q_0 to Q_7
load and read register	L L	↑ ↑	l h	L H	L H
load register and disable outputs	H H	↑ ↑	l h	L H	Z Z

H = HIGH voltage level
h = HIGH voltage level one set-up time prior to the HIGH-to-LOW LE transition
L = LOW voltage level
l = LOW voltage level one set-up time prior to the HIGH-to-LOW LE transition
Z = high impedance OFF-state
↑ = LOW-to-HIGH CP transition

DC CHARACTERISTICS FOR 74ALVC16374

For the DC characteristics see chapter "ALVC family characteristics", section "Family specifications".

AC CHARACTERISTICS FOR 74ALVC16374

GND = 0 V; $t_r = t_f$ = 2.5 ns; C_L = 50 pF

SYMBOL	PARAMETER	T_{amb} (°C)			UNIT	TEST CONDITIONS	
		−40 to +85				V_{CC} (V)	WAVEFORMS
		MIN.		MAX.			
t_{PHL}/t_{PLH}	propagation delay CP to Q_n	–	–	–	ns	1.2	Fig.5
		–	–	5.3		2.7	
		–	3.0*	4.8		3.0 to 3.6	
t_{PZH}/t_{PZL}	3-state output enable time $\overline{OE}$ to Q_n	–	–	–	ns	1.2	Fig.6
		–	–	5.5		2.7	
		–	–	5.0		3.0 to 3.6	
t_{PHZ}/t_{PLZ}	3-state output disable time $\overline{OE}$ to Q_n	–	–	–	ns	1.2	Fig.6
		–	–	5.6		2.7	
		–	–	5.1		3.0 to 3.6	
t_w	CP pulse width HIGH or LOW	2.8	–	–	ns	2.7	Fig.5
		2.5	–	–		3.0 to 3.6	
t_{su}	set-up time D_n to CP	2.2	–	–	ns	1.2	Fig.7
		0.7	–	–		2.7	
		0.6	–	–		3.0 to 3.6	
t_h	hold time D_n to CP	2.2	–	–	ns	1.2	Fig.7
		0.7	–	–		2.7	
		0.6	–	–		3.0 to 3.6	
f_{max}	maximum clock pulse frequency	–	–	–	MHz	2.7	Fig.5
		200	–	–		3.0 to 3.6	

Notes: All typical values are measured at T_{amb} = 25 °C.
* Typical values are measured at V_{CC} = 3.3 V.

AC WAVEFORMS

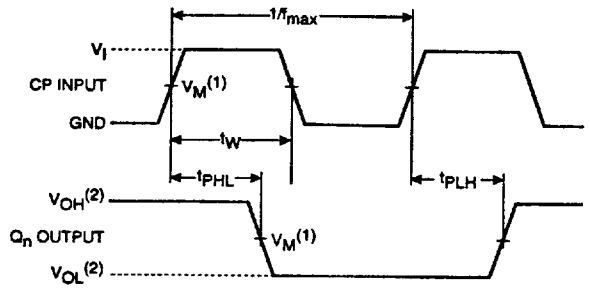


Fig.6 Waveforms showing the clock (CP) to output (Q_n) propagation delays, the clock pulse width and the maximum clock pulse frequency.

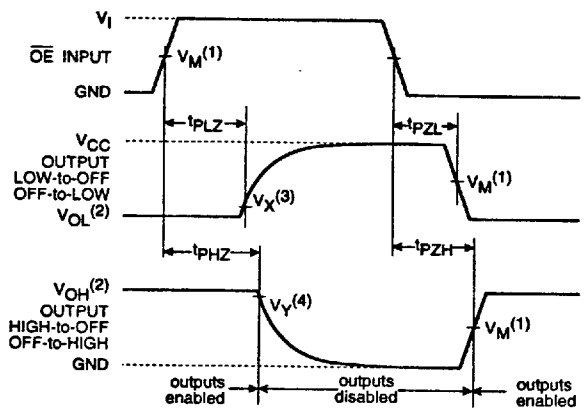


Fig.7 Waveforms showing the 3-state enable and disable times.

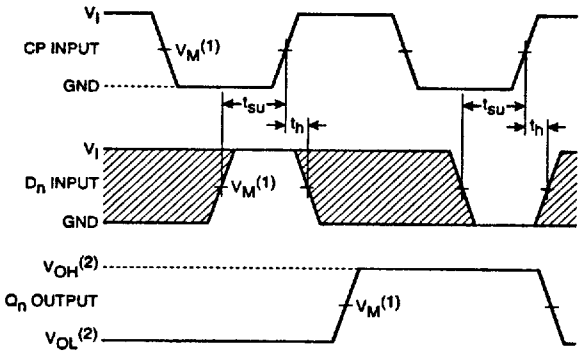
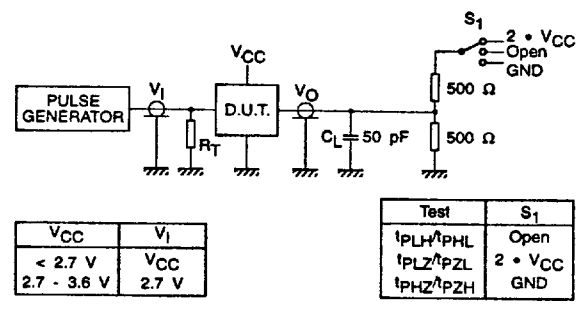


Fig.8 Waveforms showing the data set-up and hold times for the D_n input to the CP input.

Note to Fig.8:

The shaded areas indicate when the input is permitted to change for predictable output performance.



V_{CC}	V_I
< 2.7 V	V_{CC}
2.7 - 3.6 V	2.7 V

Test	S_1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	2 • V_{CC}
t_{PHZ}/t_{PZH}	GND

Fig.9 Load circuitry for switching times.

Notes:

(1) $V_M = 1.5$ V at $V_{CC} \geq 2.7$ V
$V_M = 0.5 \cdot V_{CC}$ at $V_{CC} < 2.7$ V

(2) V_{OL} and V_{OH} are the typical output voltage drop that occur with the output load

(3) $V_X = V_{OL} + 0.3$ V at $V_{CC} \geq 2.7$ V
$V_X = V_{OL} + 0.1 \cdot V_{CC}$ at $V_{CC} < 2.7$ V

(4) $V_Y = V_{OH} - 0.3$ V at $V_{CC} \geq 2.7$ V
$V_Y = V_{OH} - 0.1 \cdot V_{CC}$ at $V_{CC} < 2.7$ V