

**OCTAL POSITIVE EDGE-TRIGGERED D-TYPE FLIP FLOPS
 WITH 3-STATE OUTPUTS**

DESCRIPTION

The M74LS374P is a semiconductor integrated circuit containing 8 D-type positive edge-triggered flipflop circuits with 3-state output, and is provided with an output control input and a clock input, which are common to all the circuits.

FEATURES

- Positive edge triggering
- 3-state, high fan-out output
- The use of pnp transistor input for the output control and clock inputs has made the input load factor small
- The clock input has high noise margin.
(Hysterisis = 400mV typical)
- Package density is high with 8 circuits in one package
- Provided with output control and clock inputs which are common to all 8 circuits.
- Wide operating temperature range ($T_a = -20 \sim +75^\circ\text{C}$)

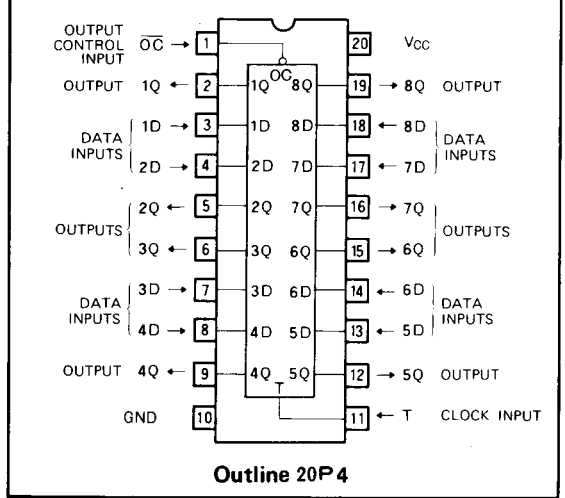
APPLICATION

General purpose, for use in industrial and consumer equipment.

FUNCTIONAL DESCRIPTION

Since the 8 D-type ege-triggered flip-flop circuits use a pnp transistor input for the output control input \overline{OC} and clock input T, which are common to all 8 circuits, the input load factor is small. With a hysteresis of 400mV (typical) specially given to the input circuit T, noise margin is high.

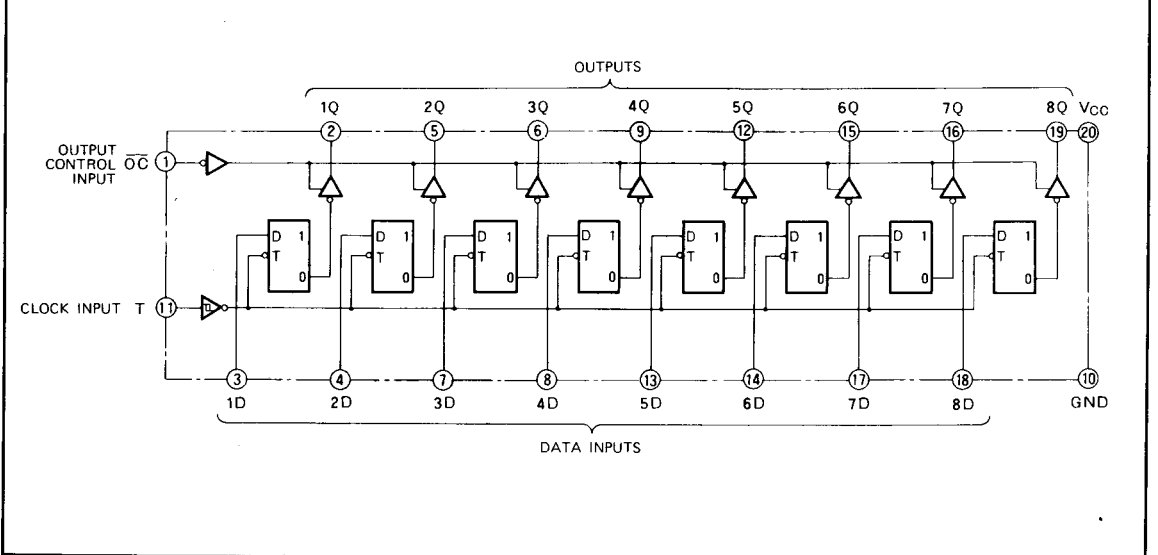
PIN CONFIGURATION (TOP VIEW)



When T changes from low to high, the information of data input D immediately before the change appears in the output Q in accordance with the function table.

When \overline{OC} is high, 1Q – 8Q are all put into the high-impedance state, irrespective of other input signals. Since all outputs have high fan-out, this device is suitable for use as a buffer register, I/O port, or bi-directional bus driver.

BLOCK DIAGRAM



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FUNCTION TABLE (Note 1)

\overline{OC}	T	D	Q
L	↑	H	H
L	↑	L	L
L	L	X	Q^0
H	X	X	Z

Note 1: ↑ : transition from low to high level

Q^0 : level of Q before the indicated steady-state input conditions were established

Z : high-impedance

X : irrelevant

ABSOLUTE MAXIMUM RATINGS ($T_a = -20 \sim +75^\circ\text{C}$, unless otherwise noted)

Symbol	Parameter	Conditions	Limits	Unit
V_{CC}	Supply voltage		-0.5 ~ +7	V
V_i	Input voltage		-0.5 ~ +15	V
V_o	Output voltage	Off-state	-0.5 ~ +7	V
T_{opr}	Operating free-air ambient temperature range		-20 ~ +75	$^\circ\text{C}$
T_{stg}	Storage temperature range		-65 ~ +150	$^\circ\text{C}$

RECOMMENDED OPERATING CONDITIONS ($T_a = -20 \sim +75^\circ\text{C}$, unless otherwise noted)

Symbol	Parameter		Limits			Unit
			Min	Typ	Max	
V_{CC}	Supply voltage		4.75	5	5.25	V
I_{OH}	High-level output current	$V_{OH} \geq 2.4\text{V}$	0		-2.6	mA
I_{OL}	Low-level output current	$V_{OL} \leq 0.4\text{V}$	0		12	mA
		$V_{OL} \leq 0.5\text{V}$	0		24	mA

ELECTRICAL CHARACTERISTICS ($T_a = -20 \sim +75^\circ\text{C}$, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ*	Max	
V_{IH}	High-level input voltage		2			V
V_{IL}	Low-level input voltage				0.8	V
V_{IC}	Input clamp voltage	$V_{CC} = 4.75\text{V}, I_{IC} = -18\text{mA}$			-1.5	V
V_{OH}	High-level output voltage	$V_{CC} = 4.75\text{V}, V_i = 0.8\text{V}$ $V_i = 2\text{V}, I_{OH} = -2.6\text{mA}$	2.4	3.1		V
V_{OL}	Low-level output voltage	$V_{CC} = 4.75\text{V}$		0.25	0.4	V
		$V_i = 0.8\text{V}, V_i = 2\text{V}$		0.35	0.5	V
I_{OZH}	Off-state high-level output current	$V_{CC} = 5.25\text{V}, V_i = 2\text{V}, V_o = 2.7\text{V}$			20	μA
I_{OZL}	Off-state low-level output current	$V_{CC} = 5.25\text{V}, V_i = 2\text{V}, V_o = 0.4\text{V}$			-20	μA
I_{IH}	High-level input current	$V_{CC} = 5.25\text{V}, V_i = 2.7\text{V}$			20	μA
		$V_{CC} = 5.25\text{V}, V_i = 10\text{V}$			0.1	mA
I_{iL}	Low-level input current	$V_{CC} = 5.25\text{V}, V_i = 0.4\text{V}$			-0.4	mA
I_{OS}	Short-circuit output current (Note 2)	$V_{CC} = 5.25\text{V}, V_o = 0\text{V}$			-130	mA
I_{CCZ}	Supply current, all outputs off	$V_{CC} = 5.25\text{V}$ (Note 3)		27	45	mA

* : All typical values are at $V_{CC} = 5\text{V}, T_a = 25^\circ\text{C}$.

Note 2: All measurements should be done quickly, and not more than one output should be shorted at a time.

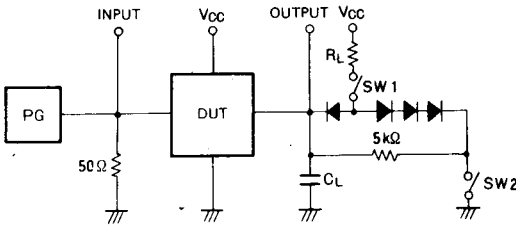
3: I_{CCZ} is measured with \overline{OC} input at 4.5V.

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SWITCHING CHARACTERISTICS ($V_{CC}=5V$, $T_a=25^\circ C$, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
f_{max}	Maximum clock frequency	$C_L = 45 pF$ (Note 4)	35	40		MHz
t_{PLH}	Low-to-high-level, high-to-low-level output propagation time, from input T to output 1Q~8Q			10	28	ns
t_{PHL}				13	28	ns
t_{PZH}	Output enable time to high-level	$R_L = 667 \Omega$, $C_L = 45 pF$ (Note 4)		14	28	ns
t_{PZL}	Output enable time to low-level	$R_L = 667 \Omega$, $C_L = 45 pF$ (Note 4)		14	28	ns
t_{PHZ}	Output disable time from high-level	$R_L = 667 \Omega$, $C_L = 5 pF$ (Note 4)		16	20	ns
t_{PLZ}	Output disable time from low-level	$R_L = 667 \Omega$, $C_L = 5 pF$ (Note 4)		8	25	ns

Note 4: Measurement circuit



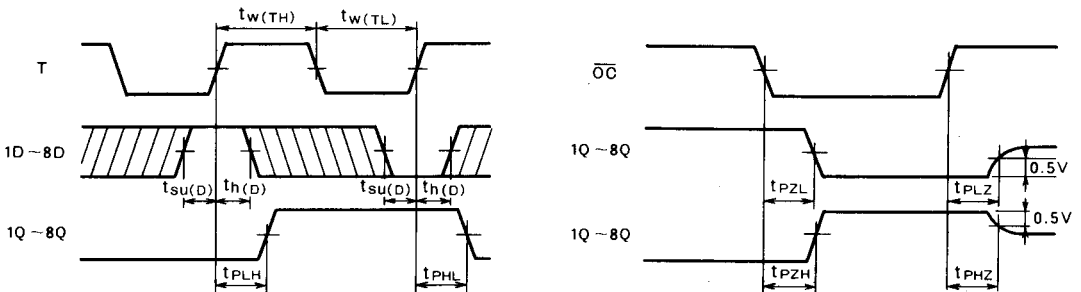
Symbol	SW 1	SW 2
t_{PZH}	Open	Closed
t_{PZL}	Closed	Open
t_{PLZ}	Closed	Closed
t_{PHZ}	Closed	Closed

- (1) The pulse generator (PG) has the following characteristics:
 PRR = 1MHz, $t_r = 6ns$, $t_f = 6ns$, $t_w = 500ns$,
 $V_p = 3V_{p.p}$, $Z_0 = 50\Omega$
- (2) All diodes are switching diodes ($t_{rr} \leq 4ns$)
- (3) C_L includes probe and jig capacitance.

TIMING REQUIREMENTS ($V_{CC}=5V$, $T_a=25^\circ C$, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$t_{w(TH)}$	Clock input T high pulse width		15	5		ns
$t_{w(TL)}$	Clock input T low pulse width		18	15		ns
$t_{su(D)}$	Setup time 1D~8D to T		20	6		ns
$t_{h(D)}$	Hold time 1D~8D to T		4	1		ns

TIMING DIAGRAM (Reference level = 1.3V)

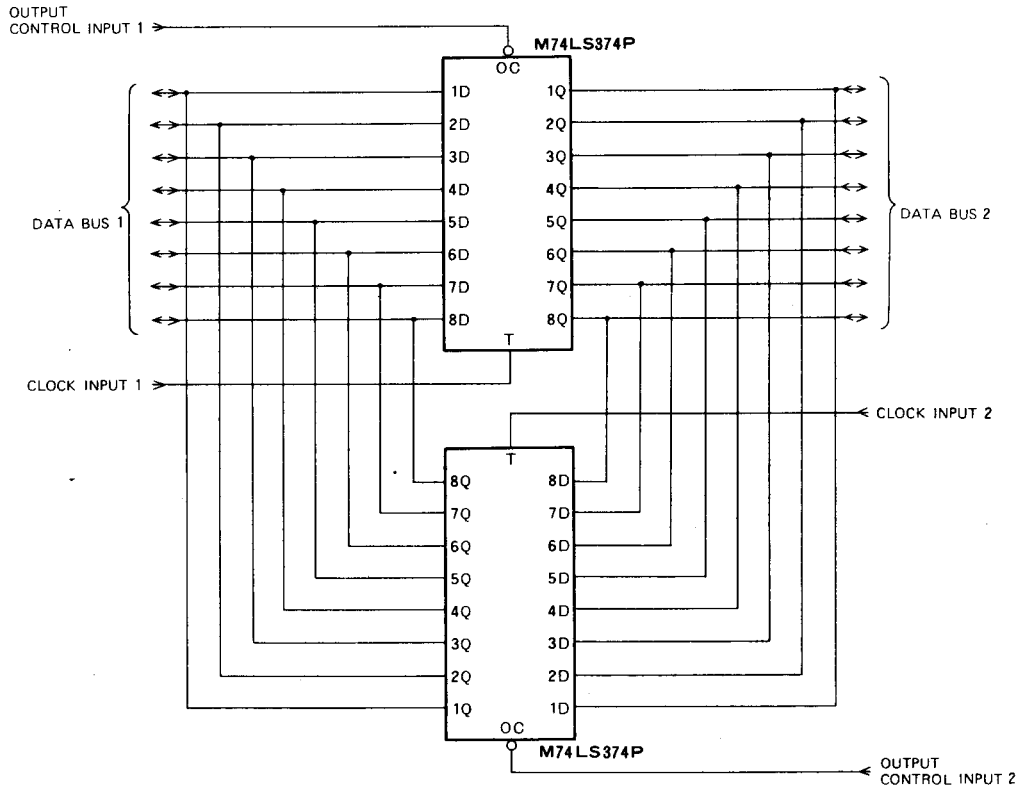


Note 5: The shaded areas indicate when the input is permitted to change for predictable output performance.

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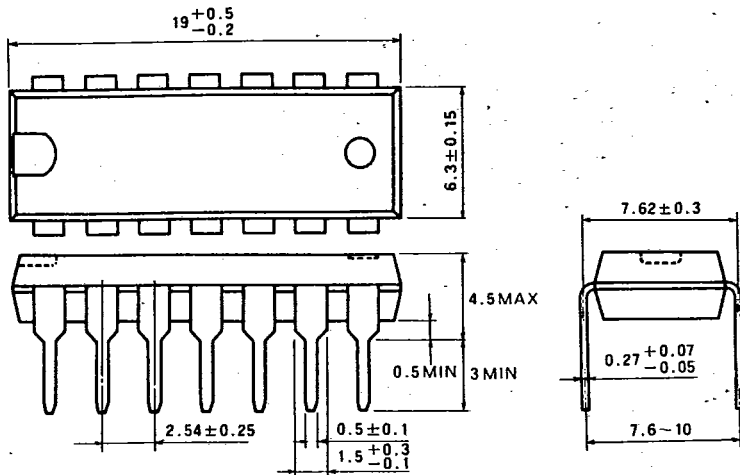
APPLICATION EXAMPLE

8-Bit shift register



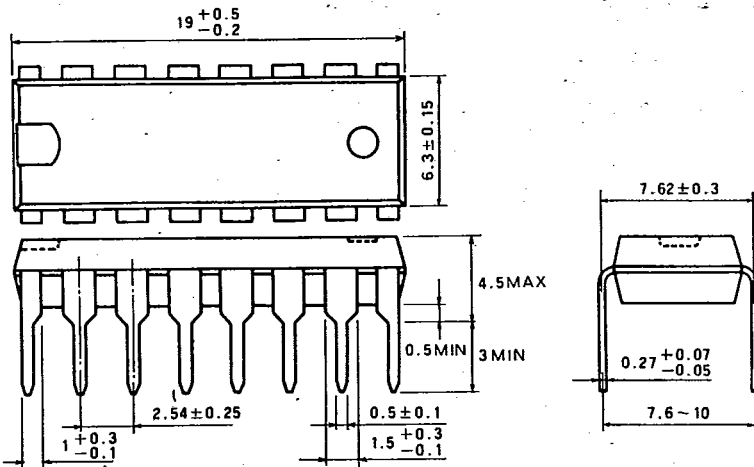
TYPE 14P4 14-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 16P4 16-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 20P4 20-PIN MOLDED PLASTIC DIL

Dimension in mm

