M74LS174P

HEX D-TYPE FLIP FLOPS WITH RESET

DESCRIPTION

The M74LS174P is a semiconductor integrated circuit containing 6 D-type edge-triggered flip-flop circuits with common clock input T and direct reset input $\overline{R_D}$ as well as discrete data input D.

FEATURES

- Positive edge-triggering
- Common clock and direct reset inputs for all 6 circuits
- Q and $\overline{Q}$ outputs
- Wide operating temperature range (T_a = -20 ~ +75°C)

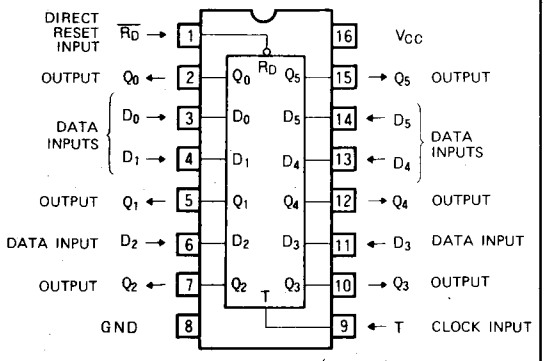
APPLICATION

General purpose, for use in industrial and consumer equipment.

FUNCTIONAL DESCRIPTION

When T changes from low to high, the D signal immediately before the change appears in the output Q in accordance with the function table. When $\overline{R_D}$ is low, all Q are low, regardless of the status of the other input signals. For use as a D-type flip-flop, keep $\overline{R_D}$ high.

PIN CONFIGURATION (TOP VIEW)



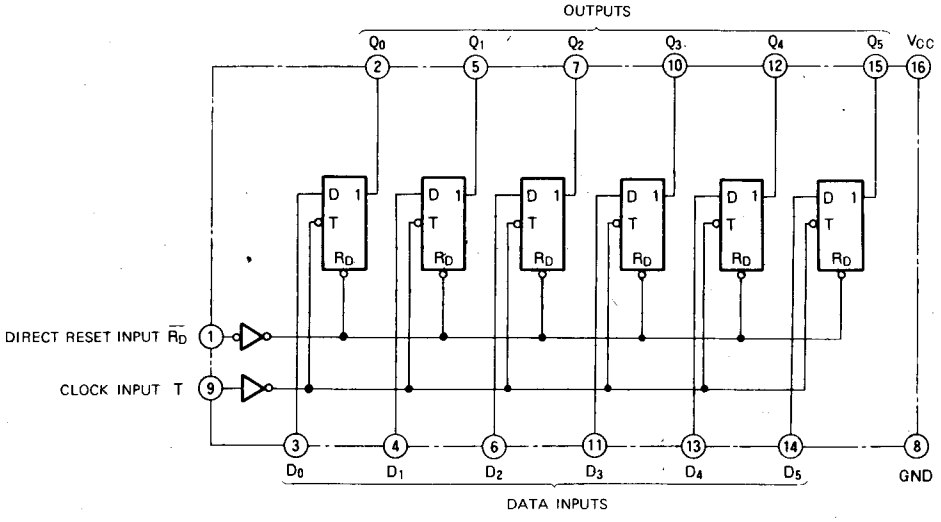
Outline 16P4

FUNCTION TABLE (Note 1)

$\overline{R_D}$	T	D	Q
L	X	X	L
H	↑	H	H
H	↑	L	L
H	L	X	Q^0

Note 1: ↑ : transition from low to high level
Q^0 : level of Q before the indicated steady-state input conditions were established
X : irrelevant

BLOCK DIAGRAM



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HEX D-TYPE FLIP FLOPS WITH RESET

ABSOLUTE MAXIMUM RATINGS (T_a = −20 ~ +75℃, 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	High-level state	−0.5 ~ V_{CC}	V
T_{opr}	Operating free-air ambient temperature range		−20 ~ +75	℃
T_{stg}	Storage temperature range		−65 ~ +150	℃

RECOMMENDED OPERATING CONDITIONS (T_a = −20 ~ +75℃, 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}≧2.7V	0		−400	μA
I_{OL}	Low-level output current	V_{OL}≦0.4V	0		4	mA
		V_{OL}≦0.5V	0		8	mA

ELECTRICAL CHARACTERISTICS (T_a = −20 ~ +75℃, unless otherwise noted)

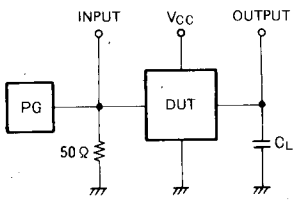
Symbol	Parameter	Test conditions		Limits			Unit
				Min	Typ*	Max	
V_{IH}	High-level input voltage			2			V
V_{IL}	Low-level input voltage					0.8	V
V_{IC}	Input clamp voltage	V_{CC}=4.75V, I_{IC}=−18mA				−1.5	V
V_{OH}	High-level output voltage	V_{CC}=4.75V, V_I=0.8V V_I=2V, I_{OH}=−400μA		2.7	3.4		V
V_{OL}	Low-level output voltage	V_{CC}=4.75V	I_{OL}=4mA		0.25	0.4	V
		V_I=0.8V, V_I=2V	I_{OL}=8mA		0.35	0.5	V
I_{IH}	High-level input current	V_{CC}=5.25V, V_I=2.7V				20	μA
		V_{CC}=5.25V, V_I=10V				0.1	mA
I_{IL}	Low-level input current	V_{CC}=5.25V, V_I=0.4V				−0.4	mA
I_{OS}	Short-circuit output current Note 2	V_{CC}=5.25V, V_O=0V		−20		−100	mA
I_{CC}	Supply current	V_{CC}=5.25V (Note 3)			16	26	mA

* : All typical values are at V_{CC} = 5V, Ta = 25°C.
Note 2: All measurements should be done quickly, and not more than one output should be shorted at a time.
Note 3: I_{CC} is measured with D, $\overline{R_D}$ inputs at 4.5V and a momentary ground, then 4.5V, applied to T input

SWITCHING CHARACTERISTICS (V_{CC} = 5V, Ta = 25℃, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
fmax	Maximum clock frequency	C_L = 15pF (Note 4)	30	47		MHz
t_{PLH}	Low-to-high-level, high-to-low-level output propagation time, from input T to output Q			10	30	ns
t_{PHL}				10	30	ns
t_{PHL}	High-to-low-level output propagation time, from input $\overline{R_D}$ to output Q			11	35	ns

Note 4: Measurement circuit

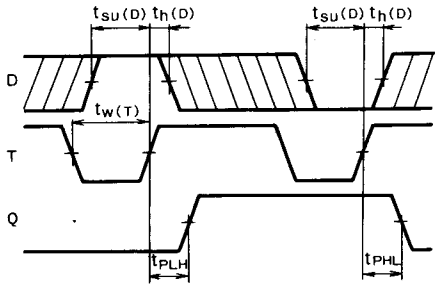


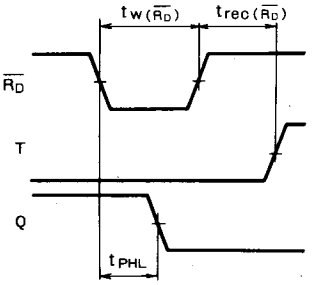
(1) The pulse generator (PG) has the following characteristics:
PRR = 1MHz, t_r = 6ns, t_f = 6ns, t_w = 500ns,
V_P = $3V_{P-P}$, Z_O = 50Ω
(2) C_L includes probe and jig capacitance.

TIMING REQUIREMENTS (V_{CC} = 5 V, T_a = 25℃, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$t_{w(T)}$	Clock input T pulse width		20	4		ns
$t_{w(\overline{R_D})}$	Reset input $\overline{R_D}$ pulse width		20	6		ns
$t_{su(D)}$	Setup time D to T		20	2		ns
$t_{h(D)}$	Hold time D to T		5	0		ns
$t_{rec(\overline{R_D})}$	Recovery time $\overline{R_D}$ to T		25	5		ns

TIMING DIAGRAM (Reference level = 1.3V)

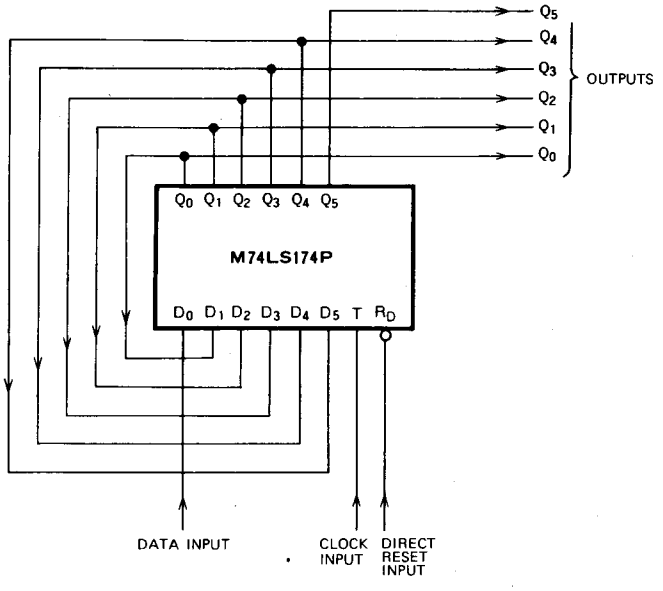




Note 5: The shaded areas indicate when the input is permitted to change for predictable output performance.

APPLICATION EXAMPLE

6-bit shift register



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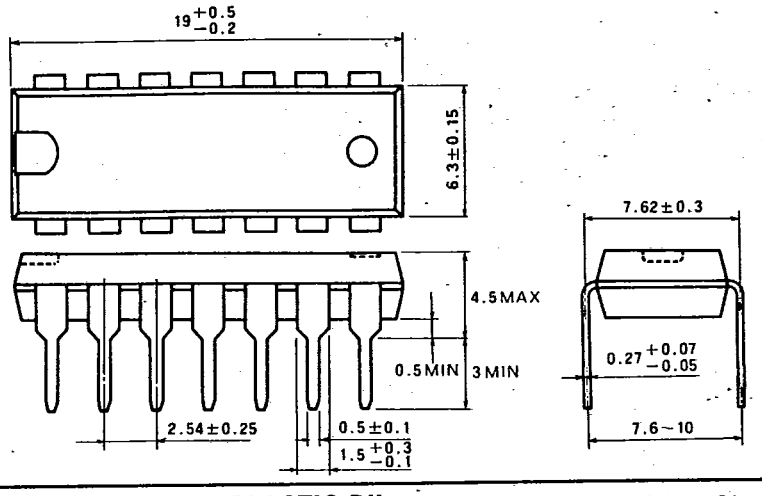
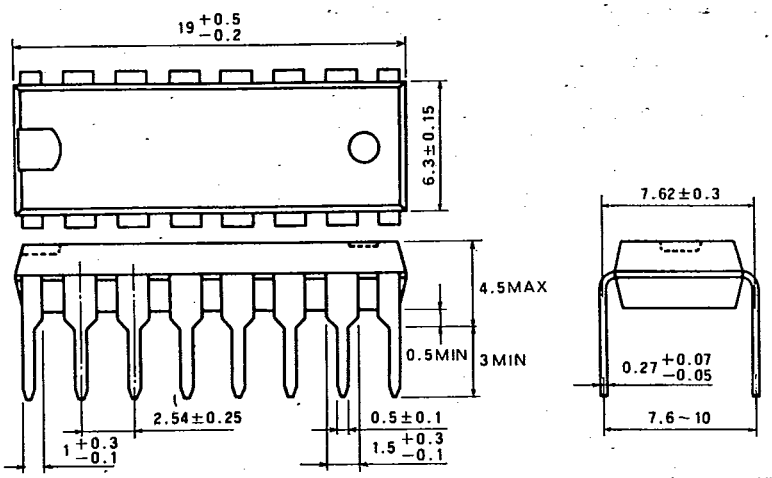
TYPE 14P4 14-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 16P4 16-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 20P4 20-PIN MOLDED PLASTIC DIL

Dimension in mm