OCTAL POSITIVE EDGE-TRIGGERED D-TYPE FLIP FLOP WITH RESET

DESCRIPTION

The M74LS273P is a semiconductor integrated circuit containing 8 D-type positive edge-triggered flip-flop circuits with common direct reset and clock inputs.

FEATURES

- Positive edge-triggering
- High mounting density with 8 circuits contained
- Direct reset and clock inputs common to all 8 circuits
- Wide operating temperature range (T_a = −20~+75°C)

APPLICATION

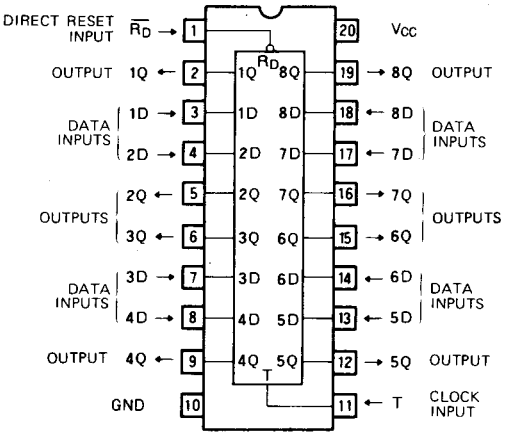
General purpose, for use in industrial and consumer equipment.

FUNCTIONAL DESCRIPTION

This device contains 8 edge-triggered D-type flip-flop circuits and it is provided with direct reset $\overline{R_D}$ input and clock input T common to all 8 circuits. When T changes in each flip-flop from low to high, the data input signal D immediately before the change appears in output Q.

When $\overline{R_D}$ is set low, 1Q through 8Q are all set low irrespective of the status of the ID through 8D and T signals. For use as a D-type flip-flop, $\overline{R_D}$ must be kept in high.

PIN CONFIGURATION (TOP VIEW)



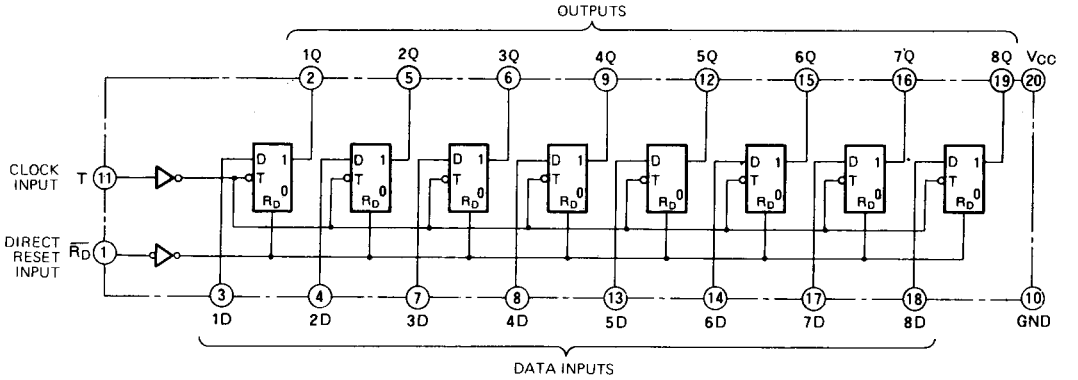
Outline 20P4

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 (positive edge trigger)
Q_0: Level of Q before the indicated steady-state input conditions were established.
X : Irrelevant

BLOCK DIAGRAM



MITSUBISHI ELECTRIC

OCTAL POSITIVE EDGE-TRIGGERED D-TYPE FLIP FLOP WITH RESET

ABSOLUTE MAXIMUM RATINGS (T_a = −20 ~ +75°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	High-level state	−0.5 ~ V_{CC}	V
Topr	Operating free-air ambient temperature range		−20 ~ +75	°C
Tstg	Storage temperature range		−65 ~ +150	°C

RECOMMENDED OPERATING CONDITIONS (T_a = −20 ~ +75°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	$V_{OH} \geqq 2.7V$	0		−400	μA
I_{OL}	Low-level output current	$V_{OL} \leqq 0.4V$	0		4	mA
		$V_{OL} \leqq 0.5V$	0		8	mA

ELECTRICAL CHARACTERISTICS (T_a = −20 ~ +75°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} = 4.75V, 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)			17	27	mA

* : All typical values are at V_{CC} = 5V, T_a = 25°C

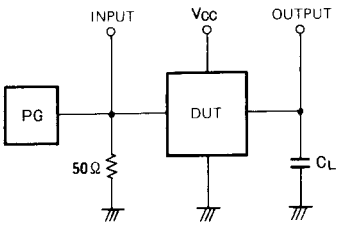
Note 2: All measurements should be done quickly, and not more than one output should be shorted at a time.

Note 3: I_{CC} is measured after 1D ~ 8D and $\overline{R_D}$ are made 4.5V and T has been changed from 0V to 4.5V.

SWITCHING CHARACTERISTICS (V_{CC} = 5V, T_a = 25°C, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
f_{max}	Maximum clock frequency	C_L = 15pF (Note 4)	30	40		MHz
t_{PLH}	Low-to-high-level, high-to-low-level output propagation time, from T to 1Q ~ 8Q			12	27	ns
t_{PHL}				13	27	ns
t_{PHL}	High-to-low-level output propagation time, from $\overline{R_D}$ to 1Q ~ 8Q			15	27	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.

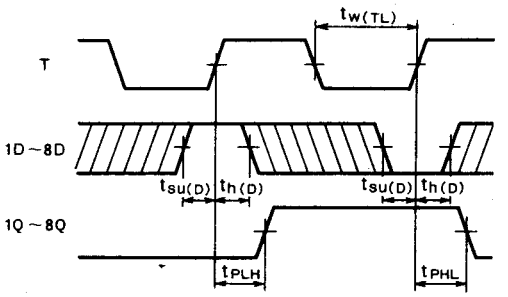
(2) C_L includes probe and jig capacitance.

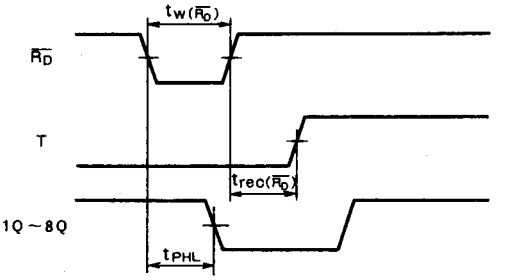
OCTAL POSITIVE EDGE-TRIGGERED D-TYPE FLIP FLOP WITH RESET

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

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$t_{W(TL)}$	Clock input T low pulse width		20	7		ns
$t_{W(\overline{R_D})}$	Direct reset pulse width		20	6		ns
$t_{SU(D)}$	Setup time 1D~8D to T		20	7		ns
$t_{h(D)}$	Hold time 1D~8D to T		5	−3		ns
$t_{rec(\overline{R_D})}$	Recovery time $\overline{R_D}$ to T		25	8		ns

TIMING DIAGRAM (Reference level = 1.3V)

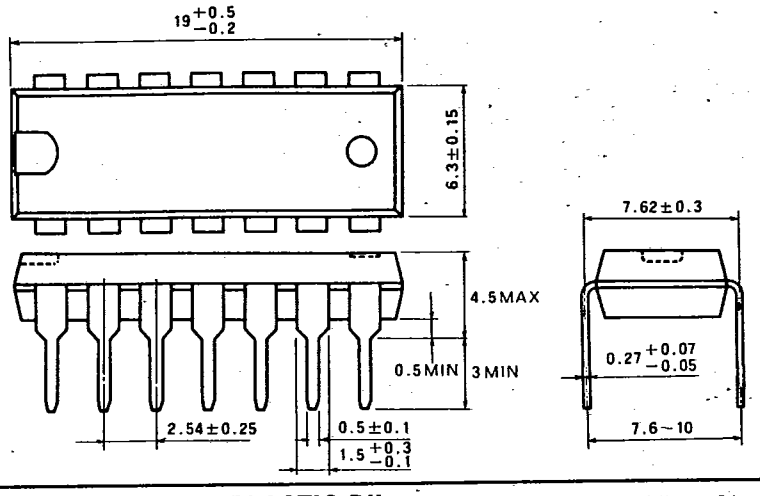




Note 5: The shaded areas indicate when the input is permitted to change for predictable output performance.

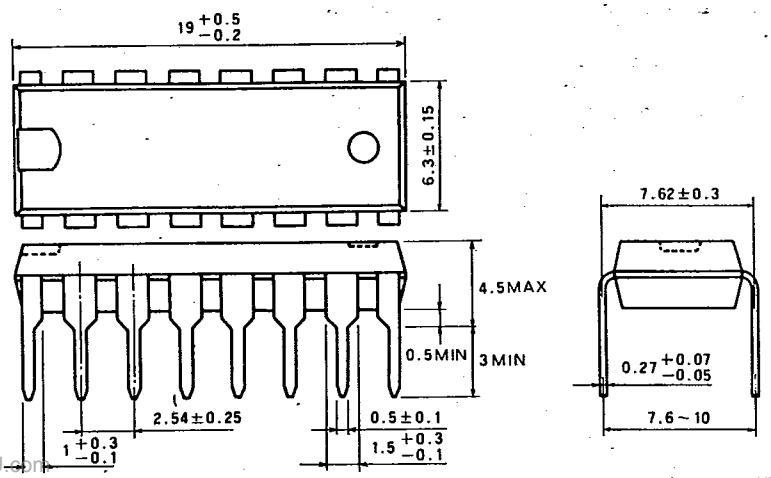
TYPE 14P4 14-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 16P4 16-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 20P4 20-PIN MOLDED PLASTIC DIL

Dimension in mm