

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74HC373AP, TC74HC373AF

Octal D-Type Latch with 3-State Output

The TC74HC373A is a high speed CMOS OCTAL LATCH with 3-STATE OUTPUT fabricated with silicon gate C²MOS technology.

It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

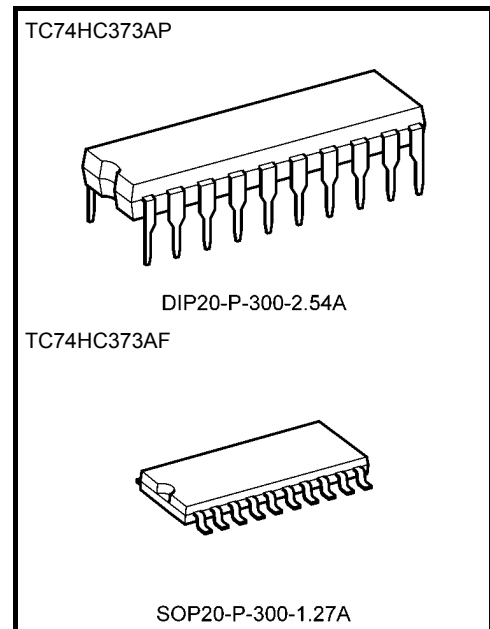
These 8-bit D-type latches are controlled by a latch enable input (LE) and an output enable input (\overline{OE}).

When the \overline{OE} input is high, the eight outputs are in a high impedance state.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.

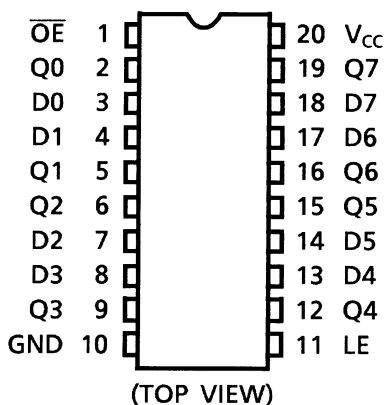
Features

- High speed: $t_{pd} = 11 \text{ ns}$ (typ.) at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 4 \mu\text{A}$ (max) at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (min)
- Output drive capability: 15 LSTTL loads
- Symmetrical output impedance: $|I_{OH}| = I_{OL} = 6 \text{ mA}$ (min)
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range: $V_{CC} \text{ (opr)} = 2 \text{ to } 6 \text{ V}$
- Pin and function compatible with 74LS373



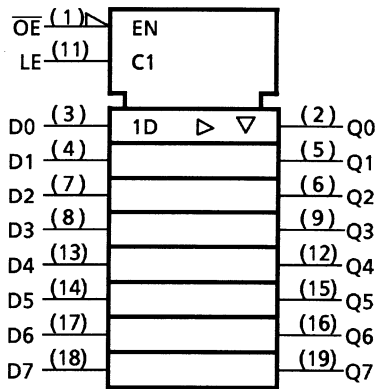
Weight	
DIP20-P-300-2.54A	: 1.30 g (typ.)
SOP20-P-300-1.27A	: 0.22 g (typ.)

Pin Assignment



Start of commercial production
1986-05

IEC Logic Symbol



Truth Table

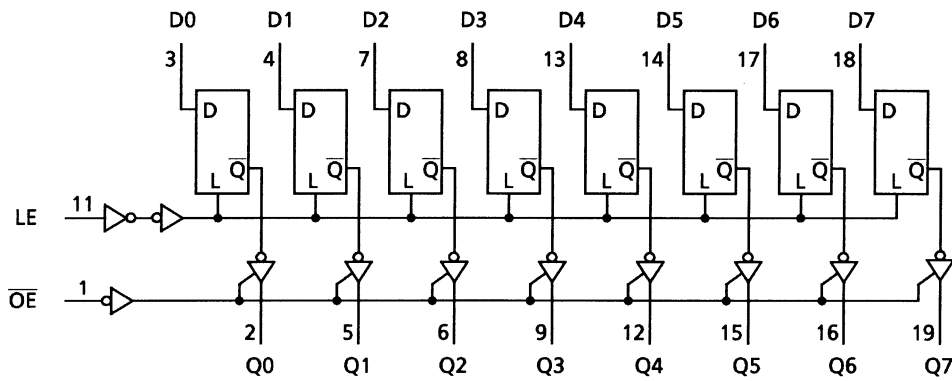
Inputs			Output
\overline{OE}	LE	D	Q
H	X	X	Z
L	L	X	Q_n
L	H	L	L
L	H	H	H

X: Don't care

Z: High impedance

Q_n : Q outputs are latched at the time when the LE input is taken to a low logic level.

System Diagram



Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	-0.5 to 7	V
DC input voltage	V_{IN}	-0.5 to $V_{CC} + 0.5$	V
DC output voltage	V_{OUT}	-0.5 to $V_{CC} + 0.5$	V
Input diode current	I_{IK}	± 20	mA
Output diode current	I_{OK}	± 20	mA
DC output current	I_{OUT}	± 35	mA
DC V_{CC} /ground current	I_{CC}	± 75	mA
Power dissipation	P_D	500 (DIP) (Note 2)/180 (SOP)	mW
Storage temperature	T_{stg}	-65 to 150	$^{\circ}\text{C}$

Note 1: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 2: 500 mW in the range of $T_a = -40$ to 65°C . From $T_a = 65$ to 85°C a derating factor of -10 mW/ $^{\circ}\text{C}$ shall be applied until 300 mW.

Operating Ranges (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2 to 6	V
Input voltage	V_{IN}	0 to V_{CC}	V
Output voltage	V_{OUT}	0 to V_{CC}	V
Operating temperature	T_{opr}	-40 to 85	$^{\circ}\text{C}$
Input rise and fall time	t_r, t_f	0 to 1000 ($V_{CC} = 2.0$ V) 0 to 500 ($V_{CC} = 4.5$ V) 0 to 400 ($V_{CC} = 6.0$ V)	ns

Note: The operating ranges must be maintained to ensure the normal operation of the device. Unused inputs must be tied to either V_{CC} or GND.

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = -40 to 85°C		Unit	
				V _{CC} (V)	Min	Typ.	Max	Min		Max
High-level input voltage	V _{IH}	—		2.0	1.50	—	—	1.50	—	V
				4.5	3.15	—	—	3.15	—	
				6.0	4.20	—	—	4.20	—	
Low-level input voltage	V _{IL}	—		2.0	—	—	0.50	—	0.50	V
				4.5	—	—	1.35	—	1.35	
				6.0	—	—	1.80	—	1.80	
High-level output voltage	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -20 μA	2.0	1.9	2.0	—	1.9	—	V
				4.5	4.4	4.5	—	4.4	—	
				6.0	5.9	6.0	—	5.9	—	
			I _{OH} = -6 mA	4.5	4.18	4.31	—	4.13	—	
		I _{OH} = -7.8 mA	6.0	5.68	5.80	—	5.63	—		
Low-level output voltage	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 20 μA	2.0	—	0.0	0.1	—	0.1	V
				4.5	—	0.0	0.1	—	0.1	
				6.0	—	0.0	0.1	—	0.1	
			I _{OL} = 6 mA	4.5	—	0.17	0.26	—	0.33	
		I _{OL} = 7.8 mA	6.0	—	0.18	0.26	—	0.33		
3-state output off-state current	I _{OZ}	V _{IN} = V _{IH} or V _{IL} V _{OUT} = V _{CC} or GND	6.0	—	—	±0.5	—	±5.0	μA	
Input leakage current	I _{IN}	V _{IN} = V _{CC} or GND	6.0	—	—	±0.1	—	±1.0	μA	
Quiescent supply current	I _{CC}	V _{IN} = V _{CC} or GND	6.0	—	—	4.0	—	40.0	μA	

Timing Requirements (input: t_r = t_f = 6 ns)

Characteristics	Symbol	Test Condition		Ta = 25°C		Ta = -40 to 85°C	Unit	
				V _{CC} (V)	Typ.	Limit		Limit
Minimum pulse width (LE)	t _W (H)	—		2.0	—	75	95	ns
				4.5	—	15	19	
				6.0	—	13	16	
Minimum set-up time (Dn)	t _s	—		2.0	—	50	65	ns
				4.5	—	10	13	
				6.0	—	9	11	
Minimum hold time (Dn)	t _h	—		2.0	—	5	5	ns
				4.5	—	5	5	
				6.0	—	5	5	

AC Characteristics (input: $t_r = t_f = 6$ ns)

Characteristics	Symbol	Test Condition	Ta = 25°C			Ta = -40 to 85°C		Unit		
			CL (pF)	V _{CC} (V)	Min	Typ.	Max		Min	Max
Output transition time	t_{TLH} t_{THL}	—	50	2.0	—	20	60	—	75	ns
				4.5	—	6	12	—	15	
				6.0	—	5	10	—	13	
Propagation delay time (LE-Q)	t_{pLH} t_{pHL}	—	50	2.0	—	42	125	—	155	ns
				4.5	—	14	25	—	31	
				6.0	—	12	21	—	26	
			150	2.0	—	57	175	—	220	
				4.5	—	19	35	—	44	
				6.0	—	16	30	—	37	
Propagation delay time (D-Q)	t_{pLH} t_{pHL}	—	50	2.0	—	42	125	—	155	ns
				4.5	—	14	25	—	31	
				6.0	—	12	21	—	26	
			150	2.0	—	57	175	—	220	
				4.5	—	19	35	—	44	
				6.0	—	16	30	—	37	
Output enable time	t_{pZL} t_{pZH}	$R_L = 1$ k Ω	50	2.0	—	39	125	—	155	ns
				4.5	—	13	25	—	31	
				6.0	—	11	21	—	26	
			150	2.0	—	54	175	—	220	
				4.5	—	18	35	—	44	
				6.0	—	15	30	—	37	
Output disable time	t_{pLZ} t_{pHZ}	$R_L = 1$ k Ω	50	2.0	—	30	125	—	155	ns
				4.5	—	14	25	—	31	
				6.0	—	13	21	—	26	
Input capacitance	C_{IN}	—	—	—	5	10	—	10	pF	
Output capacitance	C_{OUT}	—	—	—	10	—	—	—	pF	
Power dissipation capacitance	C_{PD} (Note)	—	—	—	38	—	—	—	pF	

Note: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation:

$$I_{CC}(\text{opr}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/8 \text{ (per latch)}$$

And the total C_{PD} when n pcs. of latch operate can be gained by the following equation:

$$C_{PD}(\text{total}) = 22 + 16 \cdot n$$

Package Dimensions

DIP20-P-300-2.54A

Unit : mm



Weight: 1.30 g (typ.)

Package Dimensions

SOP20-P-300-1.27A

Unit: mm



Weight: 0.22 g (typ.)

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