



# High Speed CMOS Logic – 54HC373

8-bit transparent D-Type Latch with 3-State Outputs in bare die form

Rev 1.0  
10/03/21

## Description

The 54HC373 consists of eight D-type transparent latches fabricated using a 2.5µm 5V CMOS process to combine high speed performance LSTTL performance with CMOS low power consumption. Each latch is equipped with separate D-Type inputs and 3-State outputs for bus oriented applications. Data output changes asynchronously and data may be latched even when the outputs are not enabled. Device inputs accept standard CMOS outputs or LSTTL outputs using pull-up resistors. All inputs are equipped with protection circuits against static discharge and transient excess voltage.

## Features:

- Output Drive Capability: 15 LSTTL Loads
- Low Input Current: 1µA
- Outputs directly interface CMOS, NMOS and TTL
- Operating Voltage Range: 2V to 6V
- CMOS High Noise Immunity
- Function compatible with 54LS373
- Full Military Temperature Range.

## Ordering Information

The following part suffixes apply:

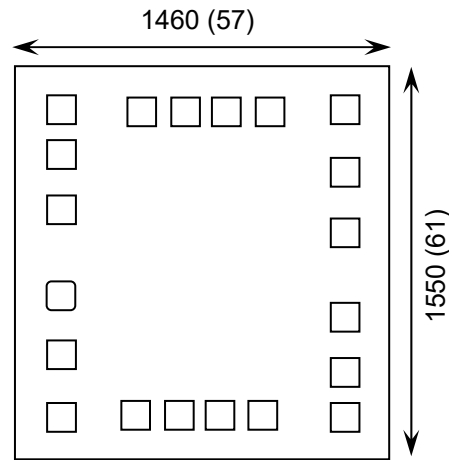
- No suffix - MIL-STD-883 /2010B Visual Inspection
- “H” - MIL-STD-883 /2010B Visual Inspection  
+ MIL-PRF-38534 Class H LAT
- “K” - MIL-STD-883 /2010A Visual Inspection (Space)  
+ MIL-PRF-38534 Class K LAT

LAT = Lot Acceptance Test.

For further information on LAT process flows see below.

[www.siliconsupplies.com/quality/bare-die-lot-qualification](http://www.siliconsupplies.com/quality/bare-die-lot-qualification)

## Die Dimensions in µm (mils)



## Supply Formats:

- Default – Die in Waffle Pack (100 per tray capacity)
- Sawn Wafer on Tape – On request
- Unsawn Wafer – On request
- Die Thickness <> 350µm(14 Mils) – On request
- Assembled into Ceramic Package – On request

## Mechanical Specification

Die Size (Unsawn)	1460 x 1550 57 x 61	µm mils
Minimum Bond Pad Size	108 x 108 4.25 x 4.25	µm mils
Die Thickness	350 (±20) 13.78 (±0.79)	µm mils
Top Metal Composition	Al 1%Si 1.1µm	
Back Metal Composition	N/A – Bare Si	

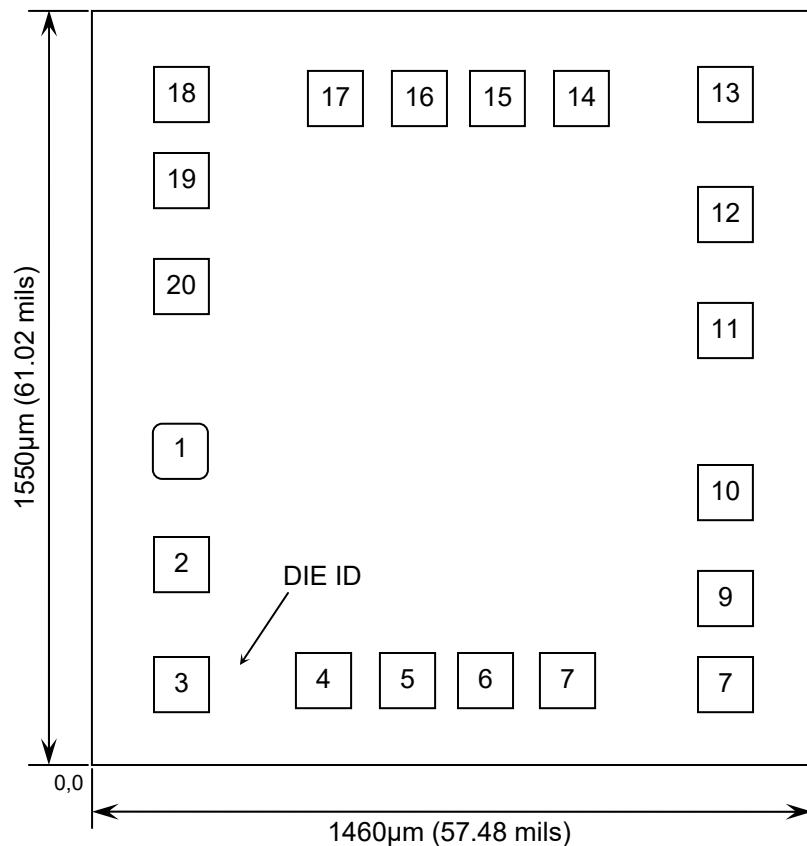




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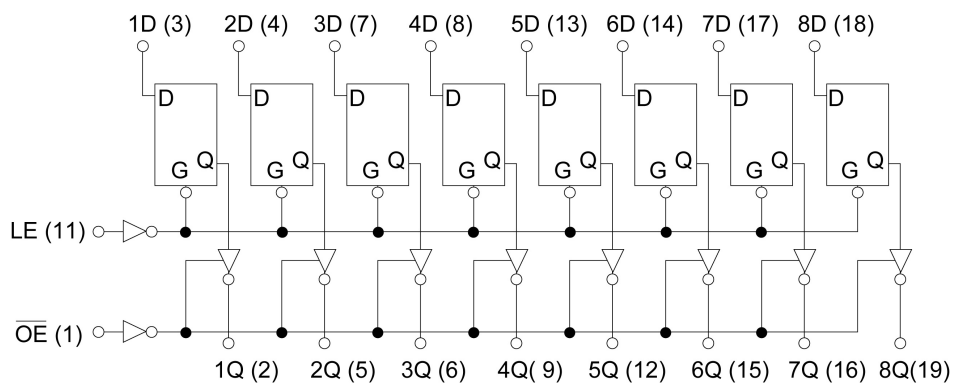
## Pad Layout and Functions



PAD	FUNCTION	COORDINATES (mm)	
		X	Y
1	$\overline{OE}$	0.1205	0.597
2	1Q	0.1205	0.3595
3	1D	0.1205	0.122
4	2D	0.413	0.1225
5	2Q	0.582	0.1225
6	3Q	0.7415	0.1225
7	3D	0.913	0.1225
8	4D	1.234	0.116
9	4Q	1.232	0.29
10	GND	1.232	0.51
11	LE	1.232	0.842
12	5Q	1.232	1.0795
13	5D	1.232	1.317
14	6D	0.9395	1.3165
15	6Q	0.7705	1.3165
16	7Q	0.611	1.3165
17	7D	0.4395	1.3165
18	8D	0.1185	1.323
19	8Q	0.1205	1.149
20	V <sub>CC</sub>	0.1205	0.929

CONNECT CHIP BACK TO V<sub>CC</sub> OR FLOAT

## Logic Diagram



Pad 10 = GND, Pad 20 = V<sub>CC</sub>

## Truth Table

INPUTS			OUTPUT
$\overline{OE}$	LE	D	Q
L	H	H	H
L	H	L	L
L	L	X	No Change
H	X	X	Z

H = High level (steady state)  
L = Low level (steady state)  
Z = High Impedance  
X = Don't care





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## Absolute Maximum Ratings<sup>1</sup>

PARAMETER	SYMBOL	VALUE	UNIT
DC Supply Voltage (Referenced to GND)	$V_{CC}$	-0.5 to +7.0	V
DC Input Voltage (Referenced to GND)	$V_{IN}$	-1.5 to $V_{CC} + 1.5$	V
DC Output Voltage (Referenced to GND)	$V_{OUT}$	-0.5 to $V_{CC} + 0.5$	V
DC Input Current, per pad	$I_{IN}$	$\pm 20$	mA
DC Output Current, per pad	$I_{OUT}$	$\pm 35$	mA
DC Supply Current, $V_{CC}$ or GND	$I_{CC}$	$\pm 75$	mA
Power Dissipation in Still Air <sup>2</sup>	$P_D$	750	mW
Storage Temperature Range	$T_{STG}$	-65 to 150	$^{\circ}C$

1. Operation above the absolute maximum rating may cause device failure. Operation at the absolute maximum ratings, for extended periods, may reduce device reliability. 2. Measured in plastic DIP package, results in die form are dependent on die attach and assembly method.

## Recommended Operating Conditions<sup>3</sup> (Voltages referenced to GND)

PARAMETER	SYMBOL	MIN	MAX	UNITS	
Supply Voltage	$V_{CC}$	2	6	V	
DC Input or Output Voltage	$V_{IN}, V_{OUT}$	0	$V_{CC}$	V	
Operating Temperature Range	$T_J$	-55	+125	$^{\circ}C$	
Input Rise or Fall Times	$t_r, t_f$	$V_{CC} = 2V$	0	1000	ns
		$V_{CC} = 4.5V$	0	500	
		$V_{CC} = 6.0V$	0	400	

3. This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation,  $V_{IN}$  and  $V_{OUT}$  should be constrained to the range  $GND \leq (V_{IN} \text{ or } V_{OUT}) \leq V_{CC}$ . Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or  $V_{CC}$ ). Unused outputs must be left open.

## DC Electrical Characteristics (Voltages Referenced to GND)

PARAMETER	SYMBOL	$V_{CC}$	CONDITIONS	LIMITS			UNITS
				25 $^{\circ}C$	85 $^{\circ}C$	FULL RANGE <sup>4</sup>	
Minimum High-Level Input Voltage	$V_{IH}$	2.0V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$ $ I_{OUT}  \leq 20\mu A$	1.5	1.5	1.5	V
		4.5V		3.15	3.15	3.15	
		6.0V		4.2	4.2	4.2	
Maximum Low-Level Input Voltage	$V_{IL}$	2.0V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$ $ I_{OUT}  \leq 20\mu A$	0.5	0.5	0.5	V
		4.5V		1.35	1.35	1.35	
		6.0V		1.8	1.8	1.8	
Minimum High-Level Output Voltage	$V_{OH}$	2V	$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 20\mu A$	1.9	1.9	1.9	V
		4.5V		4.4	4.4	4.4	
		6.0V		5.9	5.9	5.9	
	4.5V	$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 6.0mA$	3.98	3.84	3.70	V	
			6.0V	5.48	5.34		5.20

4. -55 $^{\circ}C \leq T_J \leq +125^{\circ}C$





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## DC Electrical Characteristics Continued (Voltages referenced to GND)

PARAMETER	SYMBOL	V <sub>CC</sub>	CONDITIONS	LIMITS			UNITS
				25°C	85°C	FULL RANGE <sup>4</sup>	
Maximum Low-Level Output Voltage	V <sub>OL</sub>	2V	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>OUT</sub>   ≤ 20μA	0.1	0.1	0.1	V
		4.5V		0.1	0.1	0.1	
		6.0V		0.1	0.1	0.1	
	4.5V	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>OUT</sub>   ≤ 6.0mA	0.26	0.33	0.40	V	
	6.0V		V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>OUT</sub>   ≤ 7.8mA	0.26	0.33	0.40	V
Maximum Input Leakage Current	I <sub>IN</sub>	6.0V		V <sub>IN</sub> = V <sub>CC</sub> or GND	±0.1	±1.0	±1.0
Maximum Quiescent Supply Current	I <sub>CC</sub>	6.0V	V <sub>IN</sub> = V <sub>CC</sub> or GND, I <sub>OUT</sub> = 0μA	4	40	160	μA
Maximum Three-State Leakage Current	I <sub>OZ</sub>	6.0V	Output in High-Impedance State, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> , V <sub>OUT</sub> = V <sub>CC</sub> or GND	±0.5	±5.0	±10.0	μA

## AC Electrical Characteristics<sup>5</sup>

PARAMETER	SYMBOL	V <sub>CC</sub>	CONDITIONS	LIMITS			UNITS
				25°C	85°C	FULL RANGE <sup>4</sup>	
Maximum Propagation Delay, D to Q, (Figure 1,5)	t <sub>PLH</sub> , t <sub>PHL</sub>	2.0V	C <sub>L</sub> = 50pF, Input t <sub>r</sub> = t <sub>f</sub> = 6ns	125	155	190	ns
		4.5V		25	31	38	
		6.0V		21	26	32	
Maximum Propagation Delay, LE to Q, (Figure 2,5)	t <sub>PLH</sub> , t <sub>PHL</sub>	2.0V	C <sub>L</sub> = 50pF, Input t <sub>r</sub> = t <sub>f</sub> = 6ns	140	175	210	ns
		4.5V		28	35	42	
		6.0V		24	30	36	
Maximum Propagation Delay, OE to Q (Figure 3,6)	t <sub>PLZ</sub> , t <sub>PHZ</sub>	2.0V	C <sub>L</sub> = 50pF, Input t <sub>r</sub> = t <sub>f</sub> = 6ns	150	190	225	ns
		4.5V		30	38	45	
		6.0V		26	33	38	
Maximum Propagation Delay, OE to Q (Figure 3,6)	t <sub>PZL</sub> , t <sub>PZH</sub>	2.0V	C <sub>L</sub> = 50pF, Input t <sub>r</sub> = t <sub>f</sub> = 6ns	150	190	225	ns
		4.5V		30	38	45	
		6.0V		26	33	38	

<sup>5</sup> Not production tested in die form, characterized by chip design





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## AC Electrical Characteristics continued<sup>5</sup>

PARAMETER	SYMBOL	V <sub>CC</sub>	CONDITIONS	LIMITS			UNITS
				25°C	85°C	FULL RANGE <sup>4</sup>	
Maximum Output Transition Time, Any Output (Figure 1,5)	t <sub>TLH</sub> , t <sub>THL</sub>	2.0V	C <sub>L</sub> = 50pF, Input t <sub>r</sub> = t <sub>f</sub> = 6ns	60	75	90	pF
		4.5V		12	15	18	
		6.0V		10	13	15	
Maximum Input Capacitance	C <sub>IN</sub>	-	C <sub>L</sub> = 50pF, Input t <sub>r</sub> = t <sub>f</sub> = 6ns	10	10	10	pF
Maximum 3-State Output Capacitance	C <sub>OUT</sub>	-	C <sub>L</sub> = 50pF, Input t <sub>r</sub> = t <sub>f</sub> = 6ns High Z state	15	15	15	pF
Power Dissipation Capacitance (Per latch) <sup>7</sup>	C <sub>PD</sub>	5V	-	TYPICAL			pF
				36			

7. Used to determine the no-load dynamic power consumption:  $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$ .

## Timing Requirements<sup>6</sup>

PARAMETER	SYMBOL	V <sub>CC</sub>	CONDITIONS	LIMITS			UNITS
				25°C	85°C	FULL RANGE <sup>4</sup>	
Minimum Setup Time, D to LE (Figure 4)	t <sub>su</sub>	2.0V	C <sub>L</sub> = 50pF, Input t <sub>r</sub> = t <sub>f</sub> = 6ns	25	30	40	ns
		4.5V		5.0	6.0	8.0	
		6.0V		5.0	6.0	7.0	
Minimum Hold Time, LE to D (Figure 4)	t <sub>h</sub>	2.0V	C <sub>L</sub> = 50pF, Input t <sub>r</sub> = t <sub>f</sub> = 6ns	5.0	5.0	5.0	ns
		4.5V		5.0	5.0	5.0	
		6.0V		5.0	5.0	5.0	
Minimum Pulse Width, LE (Figure 4)	t <sub>w</sub>	2.0V	C <sub>L</sub> = 50pF, Input t <sub>r</sub> = t <sub>f</sub> = 6ns	60	75	90	ns
		4.5V		12	15	18	
		6.0V		10	13	15	
Maximum Input Rise & Fall Times (Figure 4)	t <sub>r</sub> , t <sub>f</sub>	2.0V	C <sub>L</sub> = 50pF, Input t <sub>r</sub> = t <sub>f</sub> = 6ns	1000	1000	1000	ns
		4.5V		500	500	500	
		6.0V		400	400	400	





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## Switching Waveforms

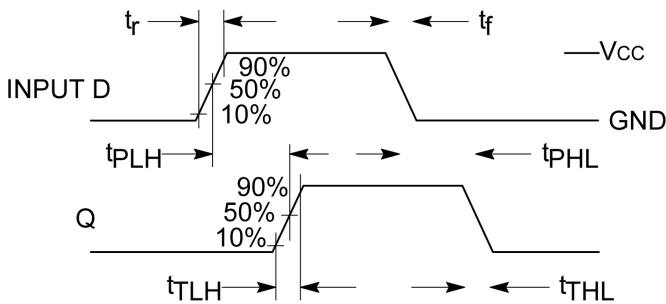


Figure 1 – Propagation Delay & Output Transition Time

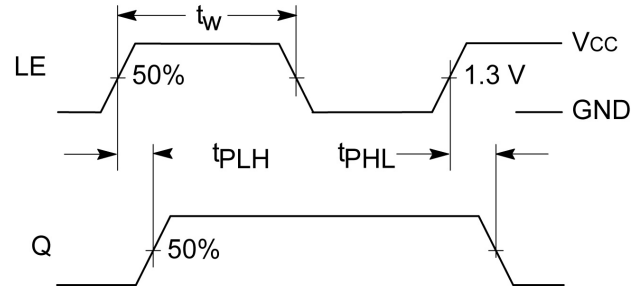


Figure 2 – Propagation Delay – Latch Enable to Q

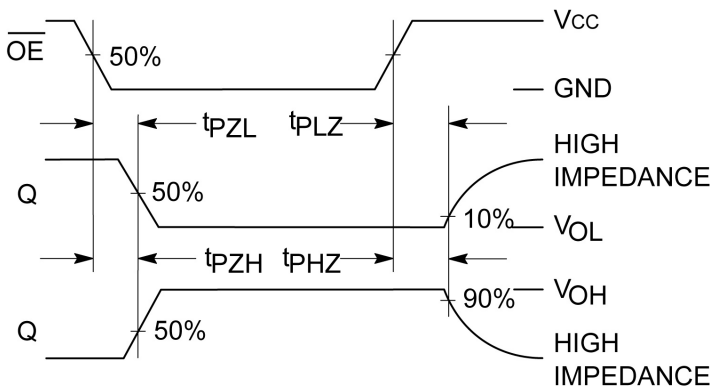


Figure 3 – Propagation Delay - Output Enable to Q

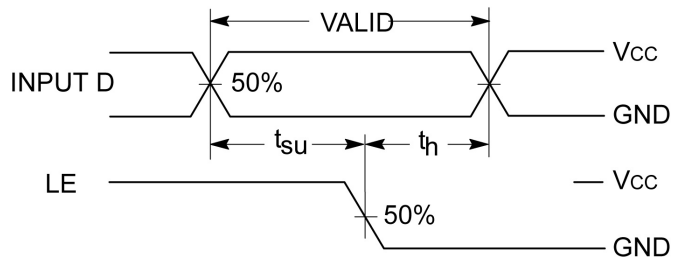
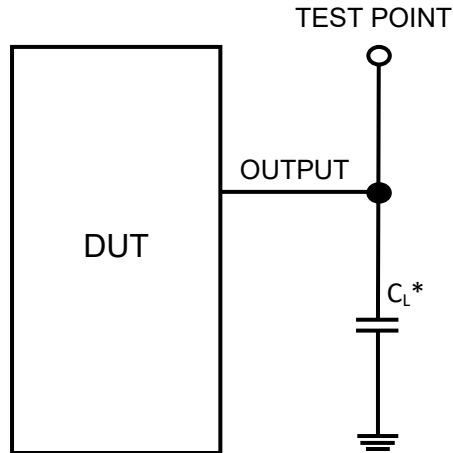


Figure 4 – Timing Requirements



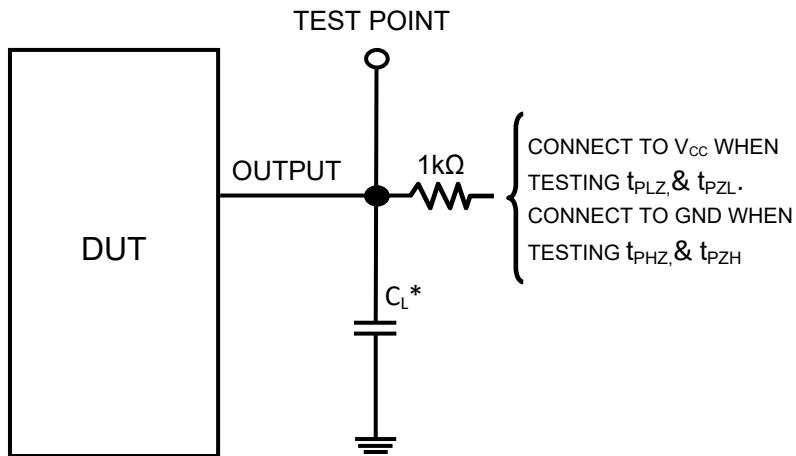


## Test Circuits



\* Includes all probe and jig capacitance

Figure 5



\* Includes all probe and jig capacitance

Figure 6

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