Preliminary Specification

RCL Semiconductors Ltd.

Octal Transparent D-type Latches With 3-State Outputs HC373

GENERAL DESCRIPTION

HC373 is fabricated with high-speed silicon gate CMOS technology. It has the high noise immunity and low power consumption of standard CMOS integrated circuits.

The eight latches in HC373 devices are transparent D-type latches. While the latch-enable (LE) input is high, the Q outputs follow the data (D) inputs. When LE is low, the Q outputs are latched at the levels that were set up at the D inputs.

An output-enable input ($\overline{OE}$) makes the eight outputs in either a normal logic state (high or low logic levels) or the high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased drive provide the capability to drive bus lines without interface or pull-up components.

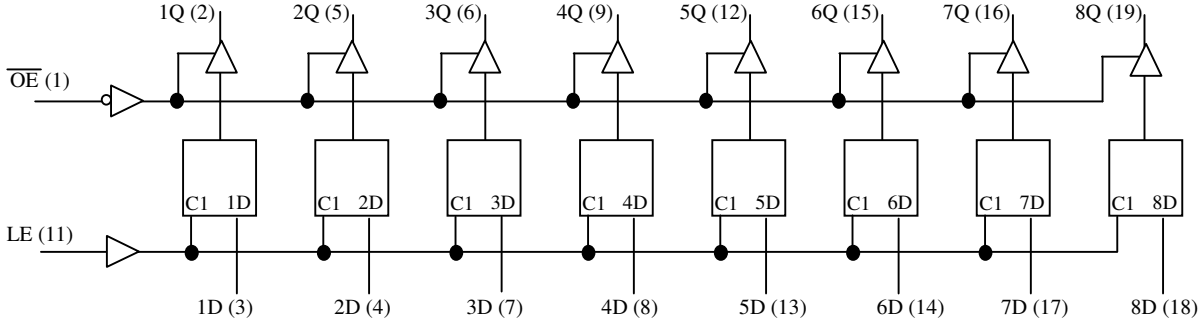
$\overline{OE}$ does not affect the internal operations of the latches. Old data can be retained or new data can be entered while the outputs are off.

These 8-bit latches with 3-state outputs are designed specifically for driving highly capacitive or relatively low-impedance loads. They are particularly suitable for implementing buffer registers, I/O ports, bi-directional bus drivers, and working registers.

FEATURES

- Wide operating supply voltage range: 2-6V
- 8 high-current latches with 3-state outputs in a single package
- Full parallel access for loading
- Low input current: 1μA (Max.)
- Low power consumption: 80μA (Max.)

LOGIC DIAGRAM



FUNCTIONAL DESCRIPTION

Truth Table

Inputs			Outputs
$\overline{OE}$	LE	D	Q
L	H	H	H
L	H	L	L
L	L	X	Q_0
H	X	X	Z

H = High Level (steady state). L= Low Level (steady state)
X = Irrelevant (any input, including transitions)

3 Dai Fu Street, Tai Po Industrial Estate, Tai Po, N.T. , Hong Kong.
Tel : (852)-26659229 Fax : (852)-26652201

ABSOLUTE MAXIMUM RATINGS

Parameter	Value	Unit
DC supply voltage (Vcc)	- 0.5 ~ + 7.0	V
DC input or output Voltage (V_{IN}, V_{OUT})	-0.5 to Vcc +0.5	V
DC Current Drain per pin, any output (I_{out})	±35	mA
DC Current per pin, Vcc or GND (Icc)	±70	mA
Storage Temperature(T_{STG})	-65 ~ +150	℃

Note: 1. Absolute maximum ratings are those values beyond which the safety of the device cannot be guaranteed.

RECOMMENDED OPERATING CONDITONS

Parameter		Min.	Normal	Max.	Unit
Vcc Supply Voltage		2.0	5.0	6.0	V
V_{IH} High-level Input Voltage	V_{CC} = 2.0V V_{CC} = 4.5V V_{CC} = 6.0V	1.5 3.15 4.2			V
V_{IL} Low-level Input Voltage	V_{CC}= 2.0V V_{CC} = 4.5V V_{CC} = 6.0V			0.5 1.35 1.8	V
V_I Input Voltage		0		Vcc	V
V_O Output Voltage		0		Vcc	V
Operating Temperature (TA)	74HC373	-40		+85	℃
	54HC373	-55		+125	℃
Input Rise/Fall Times (tr, tf)	V_{CC} = 2.0V V_{CC} = 4.5V V_{CC} = 6.0V			1000 500 400	ns

Note: 2. All unused inputs of the device must be held at Vcc or GND to ensure proper device operation.

DC ELECTRICAL CHARACTERISTICS

(apply across temperature range unless otherwise specified)

Parameter	Test Conditions		Vcc	T_A=25°C			54HC164		74HC164		Unit
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
V_{OH}	V_I =V_{IH} or V_{IL}	I_{OH} = -20uA	2V	1.9	1.998		1.9		1.9		V
			4.5V	4.4	4.499		4.4		4.4		
			6V	5.9	5.999		5.9		5.9		
		I_{OH} = -6mA	4.5V	3.98	4.3		3.7		3.84		
		I_{OH}=-7.8mA	6V	5.48	5.8		5.2		5.34		
V_{OL}	V_I =V_{IH} or V_{IL}	I_{OL} = 20uA	2V		0.002	0.1		0.1		0.1	V
			4.5V		0.001	0.1		0.1		0.1	
			6V		0.001	0.1		0.1		0.1	
		I_{OL} = 6mA	4.5V		0.17	0.26		0.4		0.33	
		I_{OL} = 7.8mA	6V		0.15	0.26		0.4		0.33	
I_I	V_I = V_{CC} or 0		6V		±0.1	±100		±1000		±1000	nA
I_{OZ}	V_O = V_{CC} or 0		6V		±0.01	±0.5		±10		±5	μA
I_{CC}	V_I = V_{CC} or 0, I_O = 0		6V			8		160		80	μA
C_i			2V～6V		3	10		10		10	pF

TIMING REQUIREMENTS OVER RECOMMENDED OPERATING TEMPERATURE

(unless otherwise specified)

Parameter		V_{DD}	T_A = 25℃		54HC373		74HC373		Unit
			Min	Max	Min	Max	Min	Max	
tw	Pulse duration, LE high	2.0 V	80		120		100		ns
		4.5V	16		24		20		
		6.0 V	14		20		17		
tsu	Setup time, data before LE ↓	2.0 V	50		75		63		ns
		4.5V	10		15		13		
		6.0 V	9		13		11		
th	Hold time, data after LE ↓	2.0 V	20		26		24		ns
		4.5V	10		13		12		
		6.0 V	10		13		12		

AC ELECTRICAL CHARACTERISTICS OVER RECOMMENDED OPERATING TEMPERATURE, CL = 50 pF

(unless otherwise specified)

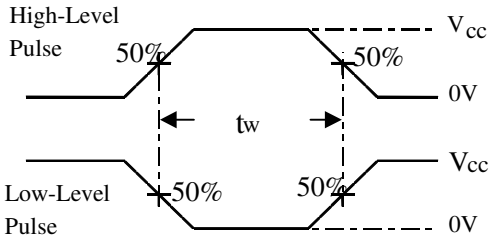
Parameter	From (Input)	To (Output)	V_{DD}	T_A = 25℃			54HC373		74HC373		Unit
				Min	Typ	Max	Min	Max	Min	Max	
tpd	D	Q	2.0 V		58	150		225		190	ns
			4.5V		15	30		45		38	
			6.0 V		13	26		38		32	
	LE	Any Q	2.0 V		73	175		265		220	
			4.5V		18	35		53		44	
			6.0 V		15	30		45		38	
ten	$\overline{OE}$	Any Q	2.0 V		65	150		225		190	ns
			4.5V		17	30		45		38	
			6.0 V		14	26		38		32	
tdis	$\overline{OE}$	Any Q	2.0 V		50	150		225		190	ns
			4.5V		15	30		45		38	
			6.0 V		13	26		38		32	
t_t		Any Q	2.0 V		28	60		90		75	ns
			4.5V		8	12		18		15	
			6.0 V		6	10		15		13	

AC ELECTRICAL CHARACTERISTICS OVER RECOMMENDED OPERATING TEMPERATURE, CL = 150 pF

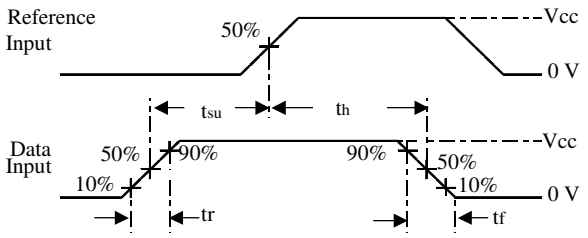
(unless otherwise specified)

Parameter	From (Input)	To (Output)	V_{DD}	T_A = 25℃			54HC373		74HC373		Unit
				Min	Typ	Max	Min	Max	Min	Max	
tpd	D	Q	2.0 V		82	200		300		250	ns
			4.5V		22	40		60		50	
			6.0 V		19	34		51		43	
	LE	Any Q	2.0 V		100	225		335		285	
			4.5V		24	45		67		57	
			6.0 V		20	38		57		48	
ten	$\overline{OE}$	Any Q	2.0 V		90	200		300		250	ns
			4.5V		23	40		60		50	
			6.0 V		19	34		51		43	
t_t		Any Q	2.0 V		45	210		315		265	ns
			4.5V		17	42		63		53	
			6.0 V		13	36		53		45	

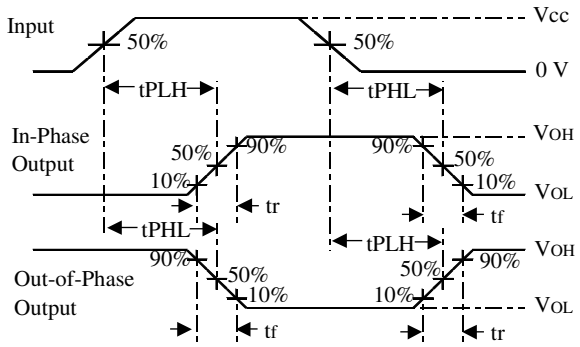
AC SWITCHING WAVEFORM AND AC TEST CIRCUIT



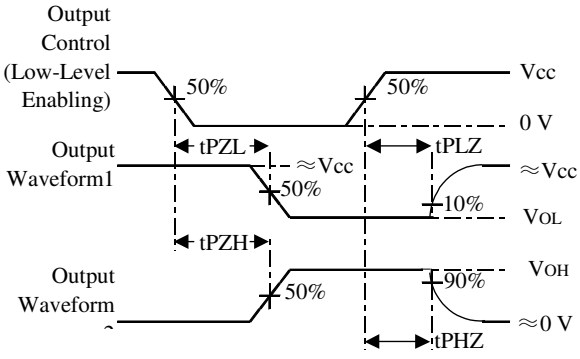
Voltage Waveforms
Pulse Durations



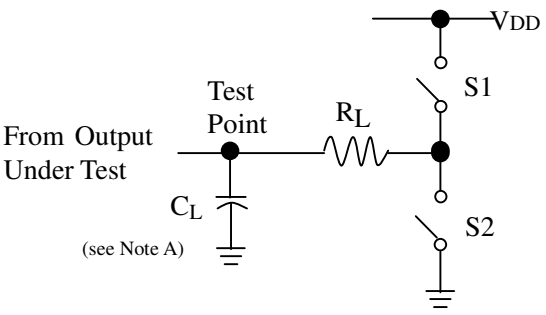
Voltage Waveforms
Setup & Hold and Input Rise & Fall Times



Voltage Waveforms
Propagation Delay and Output Transition Times



Voltage Waveforms
Enable and Disable Times for 3-State Outputs



Parameter		R_L	C_L	S1	S2
t_{en}	t_{PZH}	1k Ω	50 pF or 150 pF	Open	Closed
	t_{PZL}			Closed	Open
t_{dis}	t_{PHZ}	1k Ω	50 pF	Open	Closed
	t_{PLZ}			Closed	Open
t_{pd} or t_t		-	50 pF or 150 pF	Open	Open

Notes:

A. C_L includes probe and test-fixture capacitance.

B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control.
Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.

C. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics:
PRR≤ 1 MHz, Zo = 50 Ω, t_r=6ns, t_f =6ns.

D. The outputs are measured one at a time with one input transition per measurement.

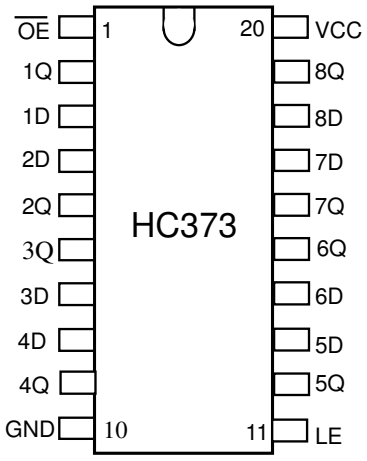
E. t_{PLZ} and t_{PHZ} are the same as t_{dis}.

F. t_{PZL} and t_{PZH} are the same as t_{en}.

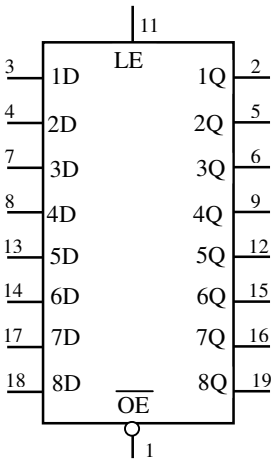
G. t_{PLH} and t_{PHL} are the same as t_{pd}.

PIN DESCRIPTION

PIN NO.	SYMBOL	DESCRIPTION
3, 4, 7, 8, 13, 14, 17, 18	1D - 8D	Data Inputs
2, 5, 6, 9, 12, 15, 16, 19	1Q - 8Q	Outputs
10	GND	Ground (0V)
1	$\overline{OE}$	Output-enable
11	LE	latch-enable
20	VCC	Positive power supply

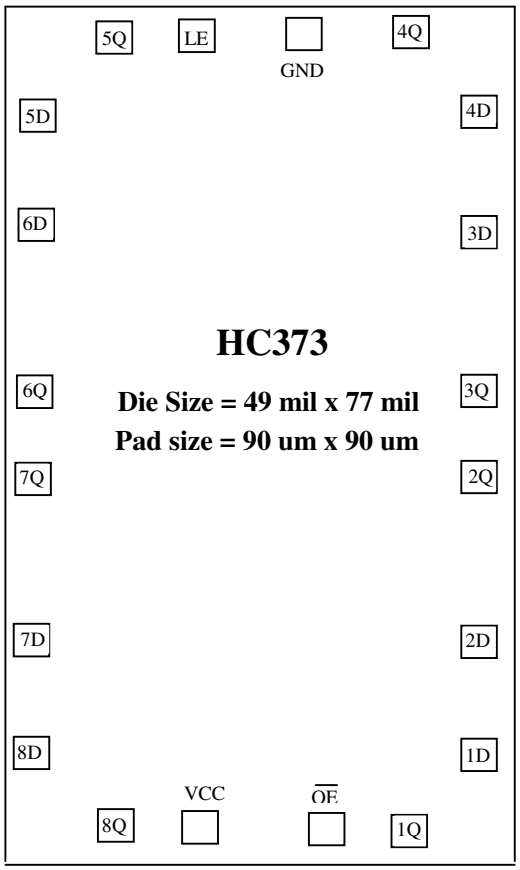


Pin Configuration (DIP-20)



Logic Symbol

PAD DIAGRAM



The Coordinate of Each Pad

8Q	(-326.1, -808.7)	4Q	(237.7, 718.5)
V_{CC}	(-151.7, -816.1)	GND	(42.5, 729.9)
$\overline{OE}$	(82.5, -808.7)	LE	(-160.5, 718.6)
1Q	(237.7, -808.7)	5Q	(-326.1, 718.6)
1D	(388.3, -673.1)	5D	(-476.5, 568.7)
2D	(388.3, -457.3)	6D	(-476.5, 352.9)
2Q	(388.0, -132.2)	6Q	(-476.5, 24.7)
3Q	(388.0, 25.6)	7Q	(-476.5, -135.0)
3D	(388.1, 351.8)	7D	(-476.5, -457.2)
4D	(388.1, 567.6)	8D	(-476.5, -673.0)

Note: Substrate should be connected to Vcc or left it open.