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CD74LPT573

December 1996

Fast CMOS 3.3V 8-Bit Transparent Latch

Features

- **Advanced 0.6 micron CMOS Technology**
- **Compatible with LCX™ Families of Products**
- **Supports 5V Tolerant Mixed Signal Mode Operation**
  - **Input Can Be 3V or 5V**
  - **Output Can Be 3V or Connected to 5V Bus**
- **Advanced Low Power CMOS Operation**
- **Excellent Output Drive Capability:**
  - **Balanced Drives (24mA Sink and Source)**
- **Low Ground Bounce Outputs**
- **Hysteresis on All Inputs**

Description

The CD74LPT573 is an 8-bit transparent latch designed with three-state outputs and is intended for bus oriented applications. When Latch Enable (LE) is HIGH, the flip-flops appear transparent to the data. The data that meets the set-up time when LE is LOW is latched. When $\overline{OE}$ is HIGH, the bus output is in the high impedance state.

The CD74LPT573 can be driven from either 3.3V or 5.0V devices allowing this device to be used as a translator in a mixed 3.3/5.0V system.
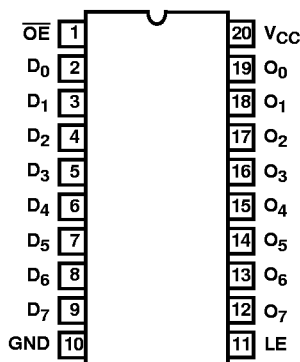
Ordering Information

PART NUMBER	TEMP. RANGE ($^{\circ}$C)	PACKAGE	PKG. NO.
CD74LPT573AM	-40 to 85	20 Ld SOIC	M20.3-P
CD74LPT573AQM	-40 to 85	20 Ld QSOP	M20.15-P
CD74LPT573CM	-40 to 85	20 Ld SOIC	M20.3-P
CD74LPT573CQM	-40 to 85	20 Ld QSOP	M20.15-P
CD74LPT573M	-40 to 85	20 Ld SOIC	M20.3-P
CD74LPT573QM	-40 to 85	20 Ld QSOP	M20.15-P

NOTE: QSOP is commonly known as SSOP.

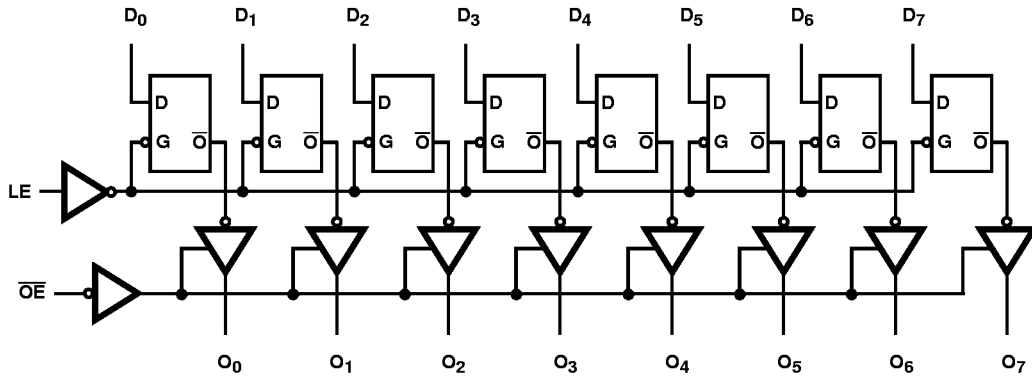When ordering, use the entire part number. Add the suffix 96 to obtain the variant in the tape and reel.

Pinout

CD74LPT573
(QSOP, SOIC)
TOP VIEW

Pin	Signal		Pin	Signal
1	$\overline{OE}$		20	V_{CC}
2	D_0		19	O_0
3	D_1		18	O_1
4	D_2		17	O_2
5	D_3		16	O_3
6	D_4		15	O_4
7	D_5		14	O_5
8	D_6		13	O_6
9	D_7		12	O_7
10	GND		11	LE

File Number **4201.2**

CD74LPT573

Functional Block Diagram

TRUTH TABLE (NOTE 1)

INPUTS			OUTPUTS
D_N	LE	$\overline{OE}$	O_N
H	H	L	H
L	H	L	L
X	X	H	Z

NOTE:
1. H = High Voltage Level
   L = Low Voltage Level
   X = Don't Care
   Z = High Impedance

Pin Descriptions

PIN NAME	DESCRIPTION
$\overline{OE}$	Output Enable Input (Active LOW)
LE	Latch Enable Input (Active HIGH)
D_7-D_0	Data Inputs
O_7-O_0	Three-State Outputs
GND	Ground
V_{CC}	Power

CD74LPT573

Absolute Maximum Ratings

DC Input Voltage . . . .-0.5V to 7.0V
DC Output Current 120mA

Operating Conditions

Operating Temperature Range. . . . .-40°C to 85°C
Supply Voltage to Ground Potential
   Inputs and V$_{CC}$ Only . . . .-0.5V to 7.0V
Supply Voltage to Ground Potential
   Outputs and D/O Only. . . . .-0.5V to 7.0V

Thermal Information

Thermal Resistance (Typical, Note 2) θ_{JA} (^{o}C/W)

SOIC Package.	87
QSOP Package	110

Maximum Junction Temperature . . . . .150°C
Maximum Storage Temperature Range . . . .-65°C to 150°C
Maximum Lead Temperature (Soldering 10s) . . . . .300°C
   (Lead Tips Only)

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTE:

2. θ_{JA} is measured with the component mounted on an evaluation PC board in free air.

Electrical Specifications

PARAMETER	SYMBOL	(NOTE 3) TEST CONDITIONS		MIN	(NOTE 4) TYP	MAX	UNITS
DC ELECTRICAL SPECIFICATIONS Over the Operating Range, T$_A$ = -40°C to 85°C, V$_{CC}$ = 2.7V to 3.6V							
Input HIGH Voltage (Input Pins)	V$_{IH}$	Guaranteed Logic HIGH Level		2.2	-	5.5	V
Input HIGH Voltage (I/O Pins)	V$_{IH}$	Guaranteed Logic HIGH Level		2.0	-	5.5	V
Input LOW Voltage (Input and I/O Pins)	V$_{IL}$	Guaranteed Logic LOW Level		-0.5	-	0.8	V
Input HIGH Current (Input Pins)	I$_{IH}$	V$_{CC}$ = Max	V$_{IN}$ = 5.5V	-	-	±1	µA
Input HIGH Current (I/O Pins)	I$_{IH}$	V$_{CC}$ = Max	V$_{IN}$ = V$_{CC}$	-	-	±1	µA
Input LOW Current (Input Pins)	I$_{IL}$	V$_{CC}$ = Max	V$_{IN}$ = GND	-	-	±1	µA
Input LOW Current (I/O Pins)	I$_{IL}$	V$_{CC}$ = Max	V$_{IN}$ = GND	-	-	±1	µA
High Impedance Output Current (Three-State)	I$_{OZH}$	V$_{CC}$ = Max	V$_{OUT}$ = 5.5V	-	-	±1	µA
	I$_{OZL}$	V$_{CC}$ = Max	V$_{OUT}$ = GND	-	-	±1	µA
Clamp Diode Voltage	V$_{IK}$	V$_{CC}$ = Min, I$_{IN}$ = -18mA		-	-0.7	-1.2	V
Output HIGH Current	I$_{ODH}$	V$_{CC}$ = 3.3V, V$_{IN}$ = V$_{IH}$ or V$_{IL}$, V$_O$ = 1.5V (Note 5)		-36	-60	-110	mA
Output LOW Current	I$_{ODL}$	V$_{CC}$ = 3.3V, V$_{IN}$ = V$_{IH}$ or V$_{IL}$, V$_O$ = 1.5V (Note 5)		50	90	200	mA
Output HIGH Voltage	V$_{OH}$	V$_{CC}$ = Min, V$_{IN}$ = V$_{IH}$ or V$_{IL}$	I$_{OH}$ = -0.1mA	V$_{CC}$ - 0.2	-	-	V
			I$_{OH}$ = -3mA	2.4	3.0	-	V
		V$_{CC}$ = 3.0V, V$_{IN}$ = V$_{IH}$ or V$_{IL}$	I$_{OH}$ = -8mA	2.4 (Note 7)	3.0	-	V
			I$_{OH}$ = -24mA	2.0	-	-	V
Output LOW Voltage	V$_{OL}$	V$_{CC}$ = Min, V$_{IN}$ = V$_{IH}$ or V$_{IL}$	I$_{OL}$ = 0.1mA	-	-	0.2	V
			I$_{OL}$ = 16mA	-	0.2	0.4	V
			I$_{OL}$ = 24mA	-	0.3	0.5	V

Electrical Specifications (Continued)

PARAMETER	SYMBOL	(NOTE 3) TEST CONDITIONS		MIN	(NOTE 4) TYP	MAX	UNITS
Short Circuit Current (Note 6)	I_{OS}	V_{CC} = Max (Note 5), V_{OUT} = GND		-60	-85	-240	mA
Power Down Disable	I_{OFF}	V_{CC} = 0V, V_{IN} or $V_{OUT} \leq 4.5V$		-	-	±100	µA
Input Hysteresis	V_H			-	150	-	mV
CAPACITANCE $T_A = 25^oC$, f = 1MHz							
Input Capacitance (Note 8)	C_{IN}	V_{IN} = 0V		-	4.5	6	pF
Output Capacitance (Note 8)	C_{OUT}	V_{OUT} = 0V		-	5.5	8	pF
POWER SUPPLY SPECIFICATIONS							
Quiescent Power Supply Current	I_{CC}	V_{CC} = Max	V_{IN} = GND or V_{CC}	-	0.1	10	µA
Quiescent Power Supply Current TTL Inputs HIGH	ΔI_{CC}	V_{CC} = Max	V_{IN} = VCC - 0.6V (Note 9)	-	2.0	30	µA
Dynamic Power Supply Current (Note 10)	I_{CCD}	V_{CC} = Max, Outputs Open $\overline{OE}$ = GND One Bit Toggling 50% Duty Cycle	$V_{IN} = V_{CC}$ V_{IN} = GND	-	50	75	µA/ MHz
Total Power Supply Current (Note 12)	I_C	V_{CC} = Max, Outputs Open f_I = 10MHz, 50% Duty Cycle $\overline{OE}$ = GND One Bit Toggling	$V_{IN} = V_{CC}$ - 0.6V V_{IN} = GND	-	0.6	2.3	mA
		V_{CC} = Max, Outputs Open f_I = 2.5MHz, 50% Duty Cycle $\overline{OE}$ = GND 8 Bits Toggling	$V_{IN} = V_{CC}$ - 0.6V V_{IN} = GND	-	2.1	4.7 (Note 11)	mA

CD74LPT573
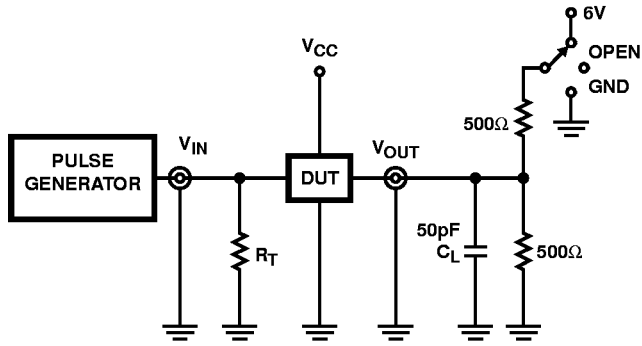
Switching Specifications Over Operating Range (Note 13)

PARAMETER	SYMBOL	(NOTE 14) TEST CONDITIONS	CD74LPT573 (NOTE 15) MIN	MAX	CD74LPT573A (NOTE 15) MIN	MAX	CD74LPT573C (NOTE 15) MIN	MAX	UNITS
Propagation Delay D_X to O_X	t_{PLH}, t_{PHL}	$C_L = 50pF$ $R_L = 500\Omega$	1.5	8.0	1.5	5.2	1.5	4.2	ns
Propagation Delay LE to O_X	t_{PLH}, t_{PHL}		2.0	12.0	2.0	8.5	2.0	5.5	ns
Output Enable Time $\overline{OE}$ to O_X	t_{PZH}, t_{PZL}		1.5	9.5	1.5	6.5	1.5	5.5	ns
Output Disable Time (Note 16) $\overline{OE}$ to O_X	t_{PHZ}, t_{PLZ}		1.5	6.5	1.5	5.5	1.5	5.0	ns
Setup Time HIGH or LOW, D_X to LE	t_{SU}		2.0	-	2.0	-	2.0	-	ns
Hold Time HIGH or LOW, D_X to LE	t_H		1.5	-	1.5	-	1.5	-	ns
LE Pulse Width HIGH (Note 16)	t_W		6.0	-	5.0	-	5.0	-	ns
Output Skew (Note 17)	$t_{SK(O)}$		-	0.5	-	0.5	-	0.5	ns

NOTES:

3. For conditions shown as Max or Min, use appropriate value specified under Electrical Specifications for the applicable device type.

4. Typical values are at $V_{CC} = 3.3V$, 25°C ambient and maximum loading.

5. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.

6. This parameter is guaranteed but not tested.

7. $V_{OH} = V_{CC}$ - 0.6V at rated current.

8. This parameter is determined by device characterization but is not production tested.

9. Per TTL driven input; all other inputs at V_{CC} or GND.

10. This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.

11. Values for these conditions are examples of the I_{CC} formula. These limits are guaranteed but not tested.

12. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
$I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_I N_I)$
I_{CC} = Quiescent Current
ΔI_{CC} = Power Supply Current for a TTL High Input
D_H = Duty Cycle for TTL Inputs High
N_T = Number of TTL Inputs at D_H
I_{CCD} = Dynamic Current Caused by an Input Transition Pair (HLH or LHL)
f_{CP} = Clock Frequency for Register Devices (Zero for Non-Register Devices)
f_I = Input Frequency
N_I = Number of Inputs at f_I
All currents are in milliamps and all frequencies are in megahertz.

13. Propagation Delays and Enable/Disable times are with $V_{CC} = 3.3V \pm 0.3V$, normal range. For $V_{CC} = 2.7V$, extended range, all Propagation Delays and Enable/Disable times should be degraded by 20%.

14. See test circuit and wave forms.

15. Minimum limits are guaranteed but not tested on Propagation Delays.

16. This parameter is guaranteed but not production tested.

17. Skew between any two outputs, of the same package, switching in the same direction. This parameter is guaranteed by design.

CD74LPT573

Test Circuits and Waveforms

FIGURE 1. TEST CIRCUIT

SWITCH POSITION

TEST	SWITCH
t_{PLZ}, t_{PZL}, Open Drain	6V
t_{PHZ}, t_{PZH}	GND
t_{PLH}, t_{PHL}	Open

DEFINITIONS:

C_L = Load capacitance, includes jig and probe capacitance.
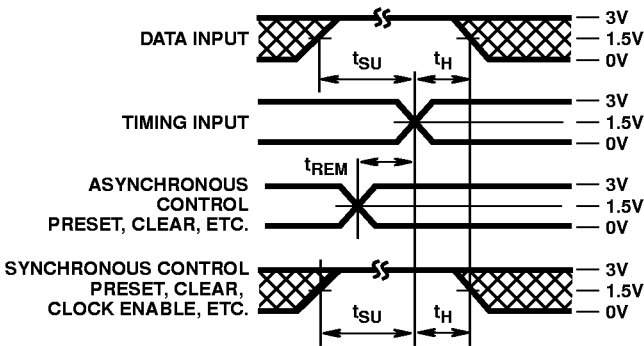R_T = Termination resistance, should be equal to Z_{OUT} of the Pulse Generator.

NOTE:

18. Pulse Generator for All Pulses: Rate ≤ 1.0MHz; Z_{OUT} ≤ 50Ω; t_f, t_r ≤ 2.5ns.

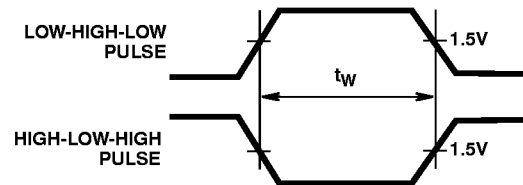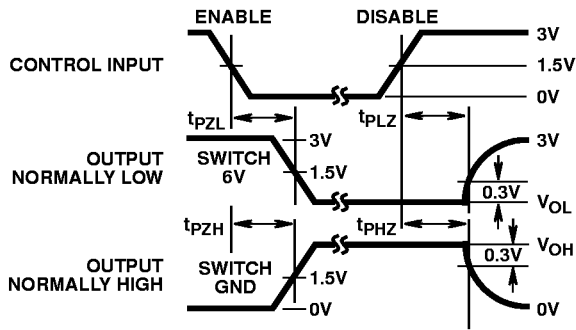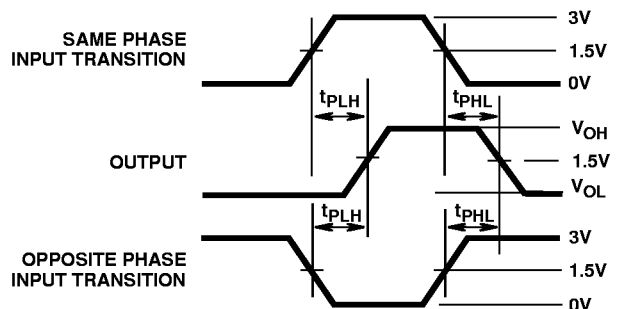FIGURE 2. SETUP, HOLD, AND RELEASE TIMING

FIGURE 3. PULSE WIDTH

FIGURE 4. ENABLE AND DISABLE TIMING

FIGURE 5. PROPAGATION DELAY