Fast CMOS Octal Transparent Latches

Product Features:

- PI74FCT373/533/573T have the same speed and drive of Bipolar FAST™ "F" series, at CMOS power levels.
  - "A" speeds at 5.2 ns max.
  - "C" speeds at 4.2 ns max.
  - "D" speeds are an industry first, at 3.8 ns max.
- TTL input and output levels, reducing problematic "ground bounce"
- High output drive, I_{OL} = 64 mA
- Extremely low static power (1 mW, typ.)
- Industry standard pinout, plug into existing "74F" sockets for speed enhancement at reduced power levels
- Octal transparent latch with 3-state output control
- Hysteresis on all inputs
- Packaged in 20-pin plastic DIP, surface mount SOIC, or the industry's new "1/4 size" surface mount QSOP

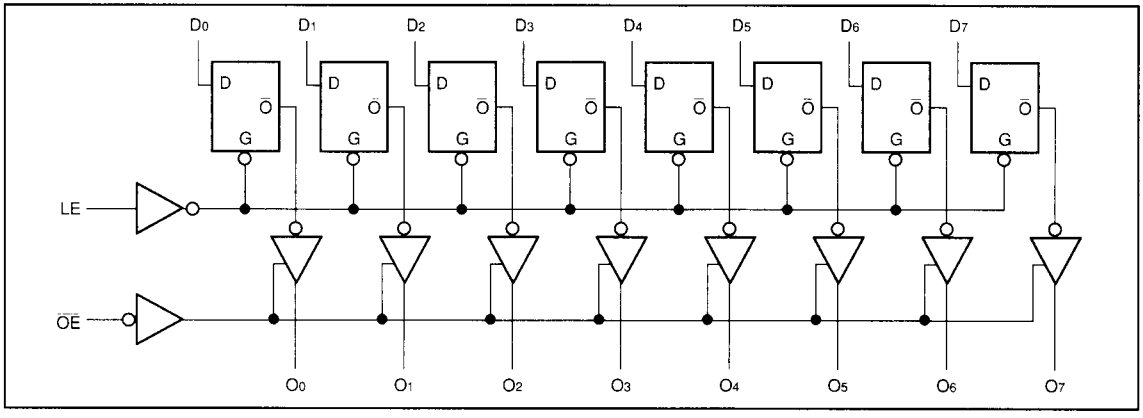
Product Description:

Pericom Semiconductor's PI74FCT series of logic circuits are produced in the Company's advanced 0.8 micron CMOS technology, achieving industry leading speed grades.

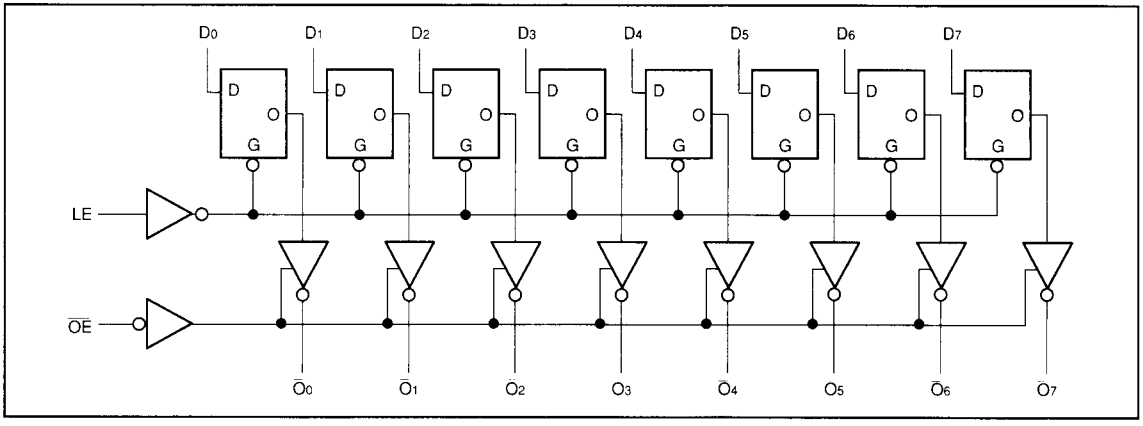
The PI74FCT373T, 533T, and 573T are 8-bit wide octal transparent latches designed with 3-state outputs and are intended for bus oriented applications. When Latch Enable (LE) is HIGH, the flip-flops appear transparent to the data. The data that meets the set-up time when LE is LOW is latched. When $\overline{OE}$ is HIGH, the bus output is in the high impedance state.

All products are available in three package types: 20-pin, 300 mil wide plastic DIP, 300 mil wide plastic SOIC, and the industry's new 150 mil wide QSOP (one quarter the size of an SOIC).

PI74FCT373T and PI74FCT573T Logic Block Diagram



PI74FCT533T Logic Block Diagram



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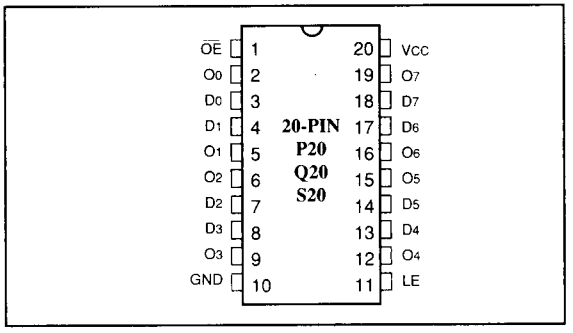
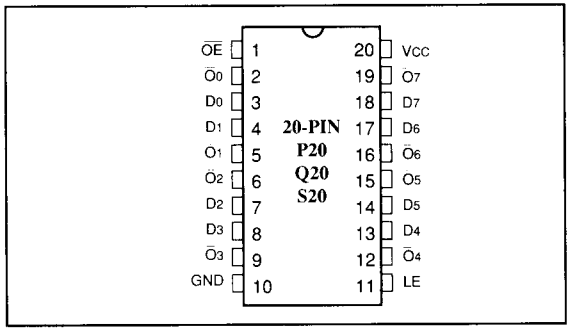
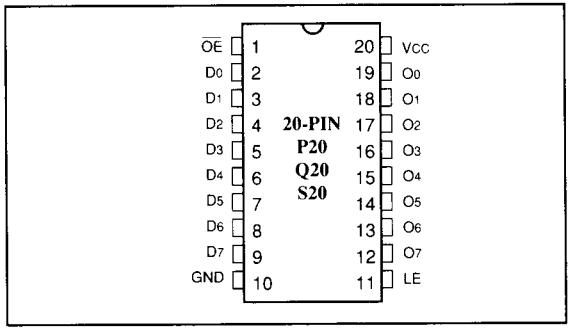
PI74FCT373T Product Pin Configuration



PI74FCT533T Product Pin Configuration



PI74FCT573T Product Pin Configuration



Product Pin Description

Pin Name	Description
$\overline{OE}$	Output Enable Input (Active LOW)
LE	Latch Enable Input (Active HIGH)
D0-D7	Data Inputs
O0-O7	3-State Outputs
$\overline{O0}$-$\overline{O7}$	Complementary 3-State Outputs
GND	Ground
VCC	Power

PI74FCT533T Truth Table[1]

Inputs			Outputs
D_N	LE	$\overline{OE}$	$\overline{O}_N$
H	H	L	L
L	H	L	H
X	X	H	Z

PI74FCT373/573T Truth Table[1]

Inputs			Outputs
D_N	LE	$\overline{OE}$	O_N
H	H	L	H
L	H	L	L
X	X	H	Z

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

Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature	–65°C to +150°C
Ambient Temperature with Power Applied	0°C to +70°C
Supply Voltage to Ground Potential (Inputs & Vcc Only)	–0.5V to +7.0V
Supply Voltage to Ground Potential (Outputs & D/O Only)	–0.5V to Vcc
DC Input Voltage	–0.5V to +7.0V
DC Output Current	120 mA
Power Dissipation	0.5W

Note:
Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

DC Electrical Characteristics (Over the Operating Range, T_A = 0°C to +70°C, V_{CC} = 5.0V ± 5%)

Parameters	Description	Test Conditions[1]		Min.	Typ[2]	Max.	Units
V_{OH}	Output HIGH Voltage	V_{CC} = Min., V_{IN} = V_{IH} or V_{IL}	I_{OH} = –8.0 mA	2.4	3.3		V
			I_{OH} = –15.0 mA	2.0	3.0		V
V_{OL}	Output LOW Current	V_{CC} = Min., V_{IN} = V_{IH} or V_{IL}	I_{OL} = 64 mA		0.3	0.55	V
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH Level		2.0			V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW Level				0.8	V
I_{IH}	Input HIGH Current	V_{CC} = Max.	V_{IN} = 2.7 V			5	µA
I_{IL}	Input LOW Current	V_{CC} = Max.	V_{IN} = 0.5 V			–5	µA
I_{OZH}	High Impedance	V_{CC} = Max.	V_{OUT} = 2.7 V			+10	µA
I_{OZL}	Output Current		V_{OUT} = 0.5 V			–10	µA
I_I	Input HIGH Current	V_{CC} = Max., V_{IN} = V_{CC} (Max.)				20	µA
V_{IK}	Clamp Diode Voltage	V_{CC} = Min., I_{IN} = –18 mA			–0.7	–1.2	V
I_{OS}	Short Circuit Current	V_{CC} = Max.[3], V_{OUT} = GND		–60	–120		mA
I_{OFF}	Power Down Disable	V_{CC} = GND, V_{OUT} = 4.5 V		—	—	100	µA
V_H	Input Hysteresis				200		mV

Capacitance (T_A = 25°C, f = 1 MHz)

Parameters[4]	Description	Test Conditions	Typ	Max.	Units
C_{IN}	Input Capacitance	V_{IN} = 0 V	6	10	pF
C_{OUT}	Output Capacitance	V_{OUT} = 0 V	8	12	pF

Notes:
1. For conditions show as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at Vcc = 5.0, +25°C ambient and maximum loading.
3. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
4. This parameter is determined by device characterization but is not production tested.

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Power Supply Characteristics

Parameters	Description	Test Conditions[1]		Min.	Typ[2]	Max.	Units
I_{CC}	Quiescent Power Supply Current	V_{CC} = Max.	V_{IN} = GND or V_{CC}		0.2	1.5	mA
ΔI_{CC}	Supply Current per Input @ TTL HIGH	V_{CC} = Max.,	V_{IN} = 3.4 V[3]		0.5	2.5	mA
I_{CCD}	Supply Current per Input per MHz[4]	V_{CC} = Max., Outputs Open $\overline{OE}$ = GND LE = V_{CC} One Bit Toggling 50% Duty Cycle	V_{IN} = V_{CC} V_{IN} = GND		0.15	0.25	mA/ MHz
I_C	Total Power Supply Current[6]	V_{CC} = Max., Outputs Open f_i = 10 MHz 50% Duty Cycle $\overline{OE}$ = GND LE = V_{CC} One Bit Toggling	V_{IN} = V_{CC} V_{IN} = GND		1.7	4.0[5]	mA
			V_{IN} = 3.4 V V_{IN} = GND		2.0	5.0[5]	
		V_{CC} = Max., Outputs Open f_i = 2.5 MHz 50% Duty Cycle $\overline{OE}$ = GND LE = V_{CC} Eight Bits Toggling	V_{IN} = V_{CC} V_{IN} = GND		3.2	6.5[5]	
			V_{IN} = 3.4 V V_{IN} = GND		5.2	14.5[5]	

Notes:
1. For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device.
2. Typical values are at Vcc = 5.0 V, +25°C ambient.
3. Per TTL driven input (V_{IN} = 3.4 V); all other inputs at Vcc or GND.
4. This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
5. Values for these conditions are examples of the Icc formula. These limits are guaranteed but not tested.
6. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
   $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_i N_i)$
   I_{CC} = Quiescent Current
   ΔI_{CC} = Power Supply Current for a TTL High Input (V_{IN} = 3.4 V)
   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.

PI74FCT373T Switching Characteristics over Operating Range

Parameters	Description	Conditions[1]	FCT373T Com. Min	FCT373T Com. Max	FCT373AT Com. Min	FCT373AT Com. Max	FCT373CT Com. Min	FCT373CT Com. Max	FCT373DT Com. Min	FCT373DT Com. Max	Unit
t_{PLH} t_{PHL}	Propagation Delay D_N to O_N	C_L = 50 pF R_L = 500Ω	1.5	8.0	1.5	5.2	1.5	4.2	1.5	3.8	ns
t_{PLH} t_{PHL}	Propagation Delay LE to O_N		2.0	13.0	2.0	8.5	2.0	5.5	2.0	4.0	ns
t_{PZH} t_{PZL}	Output Enable Time		1.5	12.0	1.5	6.5	1.5	5.5	1.5	4.8	ns
t_{PHZ} t_{PLZ}	Output Disable Time		1.5	7.5	1.5	5.5	1.5	5.0	1.5	4.0	ns
t_{SU}	Set-up Time HIGH or LOW, D_N to LE		2.0	—	2.0	—	2.0	—	1.5	—	ns
t_H	Hold Time HIGH or LOW, D_N to LE		1.5	—	1.5	—	1.5	—	1.0	—	ns
t_W	LE Pulse Width HIGH		6.0	—	5.0	—	5.0	—	3.0	—	ns

PI74FCT533T Switching Characteristics over Operating Range

Parameters	Description	Conditions[1]	FCT533T Com. Min	FCT533T Com. Max	FCT533AT Com. Min	FCT533AT Com. Max	FCT533CT Com. Min	FCT533CT Com. Max	FCT533DT Com. Min	FCT533DT Com. Max	Unit
t_{PLH} t_{PHL}	Propagation Delay D_N to O_N	C_L = 50 pF R_L = 500Ω	1.5	10.0	1.5	5.2	1.5	4.2	1.5	3.8	ns
t_{PLH} t_{PHL}	Propagation Delay LE to O_N		2.0	13.0	2.0	8.5	2.0	5.5	2.0	4.0	ns
t_{PZH} t_{PZL}	Output Enable Time		1.5	11.0	1.5	6.5	1.5	5.5	1.5	4.8	ns
t_{PHZ} t_{PLZ}	Output Disable Time		1.5	7.0	1.5	5.5	1.5	5.0	1.5	4.0	ns
t_{SU}	Set-up Time HIGH or LOW, D_N to LE		2.0	—	2.0	—	2.0	—	1.5	—	ns
t_H	Hold Time HIGH or LOW, D_N to LE		1.5	—	1.5	—	1.5	—	1.0	—	ns
t_W	LE Pulse Width HIGH		6.0	—	5.0	—	5.0	—	3.0	—	ns

Notes:
1. See test circuit and wave forms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.

PI74FCT573T Switching Characteristics over Operating Range

Parameters	Description	Conditions[1]	FCT573T Com. Min	FCT573T Com. Max	FCT573AT Com. Min	FCT573AT Com. Max	FCT573CT Com. Min	FCT573CT Com. Max	FCT573DT Com. Min	FCT573DT Com. Max	Unit
t_{PLH} t_{PHL}	Propagation Delay D_N to $\overline{O}_N$	C_L = 50 pF R_L = 500Ω	1.5	8.0	1.5	5.2	1.5	4.2	1.5	3.8	ns
t_{PLH} t_{PHL}	Propagation Delay LE to $\overline{O}_N$		2.0	12.0	2.0	8.5	2.0	5.5	2.0	4.0	ns
t_{PZH} t_{PZL}	Output Enable Time		1.5	9.5	1.5	6.5	1.5	5.5	1.5	4.8	ns
t_{PHZ} t_{PLZ}	Output Disable Time		1.5	6.5	1.5	5.5	1.5	5.0	1.5	4.0	ns
t_{SU}	Set-up Time HIGH or LOW, D_N to LE		2.0	—	2.0	—	2.0	—	1.5	—	ns
t_H	Hold Time HIGH or LOW, D_N to LE		1.5	—	1.5	—	1.5	—	1.0	—	ns
t_W	LE Pulse Width HIGH		6.0	—	5.0	—	5.0	—	3.0	—	ns

Notes:
1. See test circuit and wave forms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.