Fast CMOS 3.3V Octal D Flip-Flop

Product Features

- Compatible with LVT™ and FCT3 families of products
- 5V Tolerant inputs and outputs
- 2.0V - 3.6V V_{CC} supply operation
- Balanced sink and source output drives (±24mA)
- Low ground bounce outputs
- Power Down High Impedance inputs and outputs
- Supports live insertion
- Hysteresis on all inputs
- ESD protection exceeds -
  2000V, Human Body Mode
  200V, Machine Mode
- Packages:
  – 20-pin 173 mil -wide plastic TSSOP (L)
  – 20-pin 150 mil- wide plastic QSOP (Q)
  – 20-pin 300 mil -wide plastic SOIC (S)

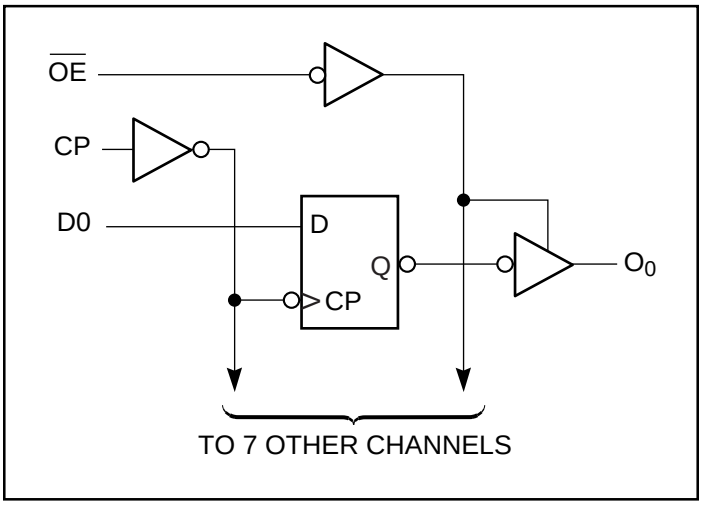
Product Description

Pericom Semiconductor's PI74LCX series of logic circuits are produced using the Company's advanced 0.6 CMOS technology, achieving industry leading speed grades.

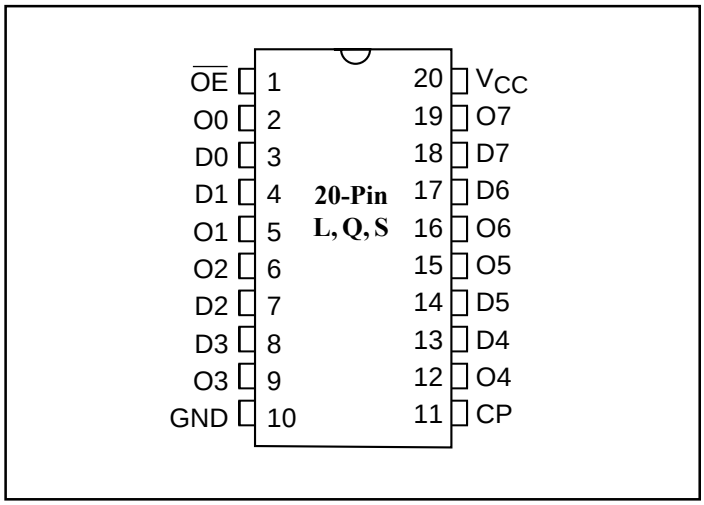
The PI74LCX374 is an 8-bit wide octal D-type flip flop designed with a buffered common clock and buffered 3-state outputs. When output enable ($\overline{OE}$) is LOW, the outputs are enabled. When $\overline{OE}$ is HIGH, the outputs are in the high impedance state. Input data meeting the setup and hold time requirements of the D inputs is transferred to the O outputs on the LOW-to-HIGH transition of the clock input.

The PI74LCX374 can be driven from either 3.3V or 5.0V devices allowing for the device to be used as a translator in a mixed 3.3V/5.0V system.

Logic Block Diagram



Product Pin Configuration



Truth Table[1]

Inputs			Outputs
D_N	CP	$\overline{OE}$	O_N
H	↑	L	H
L	↑	L	L
X	L	L	O_0
X	X	H	Z

Note:
1. H = High Voltage Level; X = Don't Care
   L = Low Voltage Level; Z = High Impedance
   ↑ = LOW-to-HIGH Transition;
   O_0 = Previous O_0 before High-to-Low of CP

Product Pin Description

Pin Name	Description
$\overline{OE}$	Output Enable Inputs (Active LOW)
CP	Clock Pulse, LOW-to-HIGH Transition
D0-D7	Data Inputs
O0-O7	3-State Outputs
GND	Ground
V_{CC}	Power

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	–40°C to +85°C
Supply Voltage to Ground Potential (Inputs & V_{CC} Only)	–0.5V to +7.0V
Supply Voltage to Ground Potential (Outputs & D/O Only)	–0.5V to +7.0V
DC Input Voltage	–0.5V to +7.0V
DC Output Current	120mA
Power Dissipation	1.0W

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.

Recommended Operating Conditions

Symbol	Parameters		Min.	Max.	Units
V_{CC}	Supply Voltage	Operating	2.0	3.6	V
		Data Retention	1.5	3.6	
V_I	Input Voltage		0	5.5	
V_O	Output Voltage	HIGH or LOW State	0	V_{CC}	
		3-State	0	5.5	
I_{OH}/I_{OL}	Output Current	V_{CC} = 3.0V - 3.6V	—	±24	mA
		V_{CC} = 2.7V	—	±12	
		V_{CC} = 2.3V - 2.7V	—	±8	
T_A	Free-Air Operating Temperature		–40	+85	°C
$\Delta t/\Delta v$	Input Edge Rate	V_{IN} = 0.8V - 2.0V, V_{CC} = 3.0V	0	10	ns/V

DC Electrical Characteristics (Over the Operating Range, $T_A = –40°C$ to $+85°C$, $V_{CC} = 2.7V$ to $3.6V$)

Parameters	Description	Test Conditions[1]		Min.	Typ[2]	Max.	Units
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH Level		2.0	—	—	V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW Level		—	—	0.8	
V_{OH}	Output HIGH Voltage	V_{CC} = 2.7-3.6	I_{OH} = –0.1mA	V_{CC}-0.2	—	—	
		V_{CC} = 2.7	I_{OH} = –12mA	2.2	—	—	
		V_{CC} = 3.0	I_{OH} = –18mA	2.4	—	—	
			I_{OH} = –24mA	2.2	—	—	
V_{OL}	Output LOW Voltage	V_{CC} = 2.7-3.6	I_{OL} = 0.1mA	—	—	0.2	
		V_{CC} = 2.7	I_{OL} = 12mA	—	—	0.4	
		V_{CC} = 3.0	I_{OL} = 16mA	—	—	0.4	
			I_{OL} = 24mA	—	—	0.55	
V_{IK}	Clamp Diode Voltage	V_{CC} = Min., I_{IN} = –18mA		—	–0.7	–1.2	
I_I	Input Leakage Current	$0 \le V_I \le 5.5V$	V_{CC} = 2.7-3.6	—	—	±5	µA
I_{OZ}	3-State Output Leakage	$0 \le V_O \le 5.5V$ $V_I = V_{IH}$ or V_{IL}	V_{CC} = 2.7-3.6	—	—	±5	
I_{OFF}	Power Down Disable	V_{CC} = 0V, V_{IN} or $V_{OUT} \le 5.5V$		—	—	10	
I_{CC}	Quiescent Power Supply Current	V_{CC} = Max.	V_{IN} = GND or V_{CC}	—	0.1	10	
ΔI_{CC}	Quiescent Power Supply Current TTL Inputs HIGH	V_{CC} = Max.	$V_{IN} = V_{CC} – 0.6V$[3]	—	—	500	

Notes:
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at $V_{CC} = 3.3V$, +25°C ambient.
3. Per TTL driven input; all other inputs at V_{CC} or GND.

Capacitance

Parameters	Description	Test Conditions	Typ.	Units
C_{IN}	Input Capacitance	V_{CC} = Open, V_I = 0V or V_{CC}	7	pF
C_{OUT}	Output Capacitance	V_{CC} = 3.3V, V_I = 0V or V_{CC}	8	
C_{PD}	Power Dissipation Capacitance	V_{CC} = 3.3V, V_I = 0V or V_{CC}, F = 10 MHz	25	

Switching Characteristics over Operating Range

Parameters	Description	Conditions	V_{CC} = 3.3V ± 0.3V		V_{CC} = 2.7V		Units
			Min.	Max.	Min.	Max.	
f_{MAX}	Maximum Clock Frequency	C_L = 50pF R_L = 500 ohms	150	–	150	–	ns
t_{PLH} t_{PHL}	Propagation Delay CP to Ox		1.5	8.5	1.5	9.5	
t_{PZH} t_{PZL}	Output Enable time $\overline{OE}$ to Ox		1.5	8.5	1.5	9.5	
t_{PHZ} t_{PLZ}	Output Disable Time $\overline{OE}$ to Ox		1.5	7.5	1.5	8.5	
t_{SU}	Setup Time HIGH or LOW, Dx to CP		2.5	–	2.5	–	
t_H	Hold Time HIGH or LOW, Dx to CP		1.5	–	1.5	–	
t_W	Pulse Width		3.3	–	3.3	–	
$t_{sk(o)}$	Output Skew(1)		–	1.0	–	–	

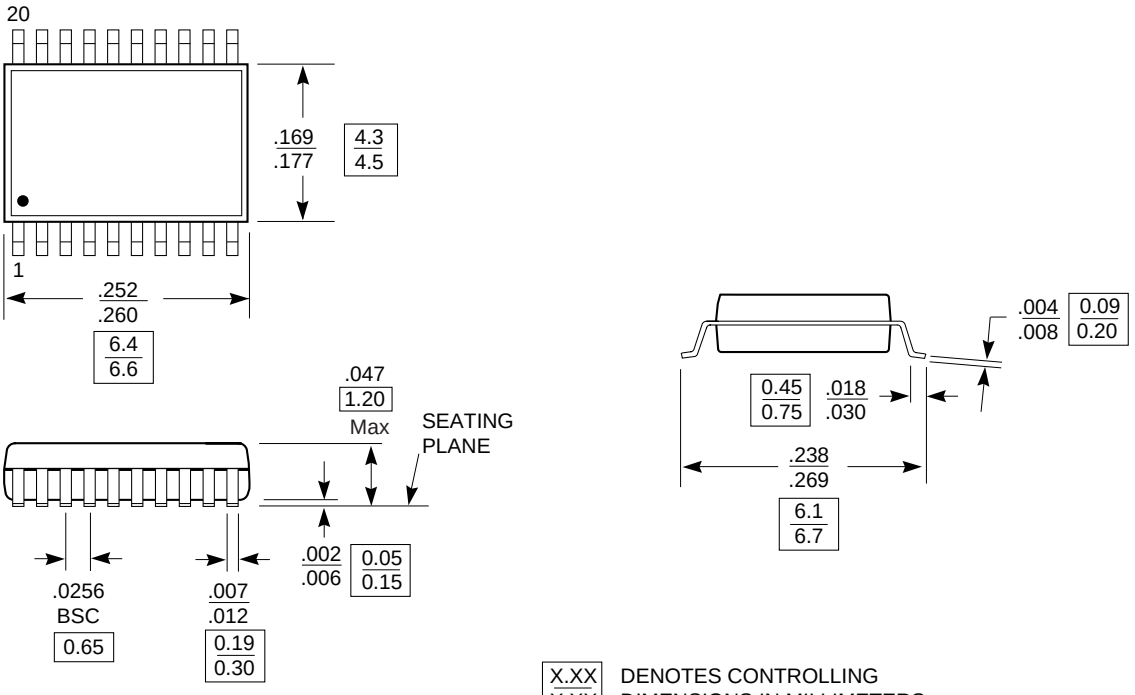
Note:
1. Skew between any two outputs, of the same package, switching in the same direction.

Dynamic Switching Characteristics (T_A = +25°C)

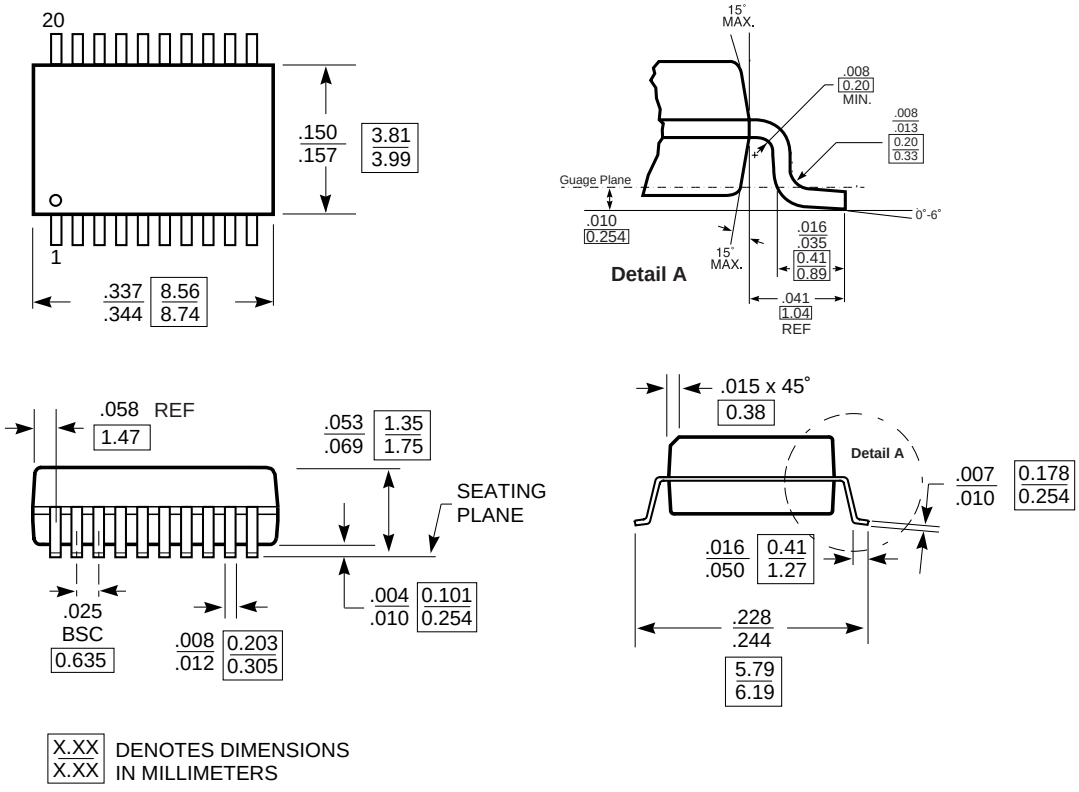
Parameters	Description	Test Conditions(1)	Typ.	Units
V_{OLP}	Dynamic Output LOW Peak Voltage	V_{CC} = 3.3V, C_L = 50pF V_{IH} = 3.3V, V_{IL} = 0V	0.8	V
V_{OLV}	Dynamic Output LOW Valley Voltage	V_{CC} = 3.3V, C_L = 50pF V_{IH} = 3.3V, V_{IL} = 0V		

Note:
1. Measured with n–1 outputs switching from High-to-Low or Low-to-High. The remaining output is measured in the LOW state.

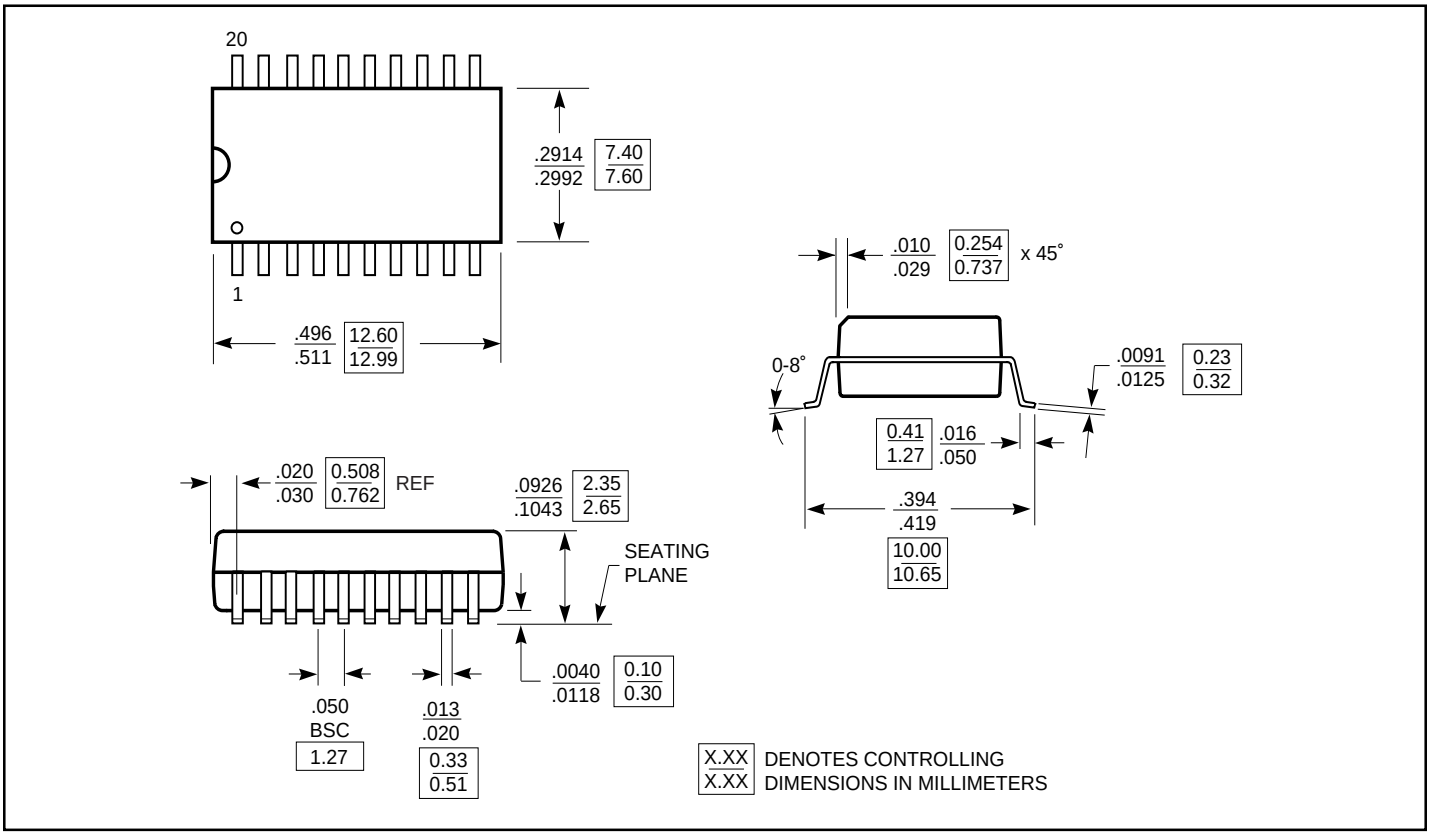
20-Pin 173 Mil-Wide Plastic TSSOP (L) Package



20-Pin 150 Mil-Wide Plastic QSOP (Q) Package



20-Pin 300 Mil-Wide Plastic SOIC (S) Package



Ordering Information

Ordering Code	Description
PI74LCX374L	20-pin, 173-mil wide plastic TSSOP
PI74LCX374Q	20-pin, 150-mil wide plastic QSOP
PI74LCX374S	20-pin, 300-mil wide plastic SOIC

Note:
1. Thermal characteristics can be found on the web at http://www.pericom.com/packaging