

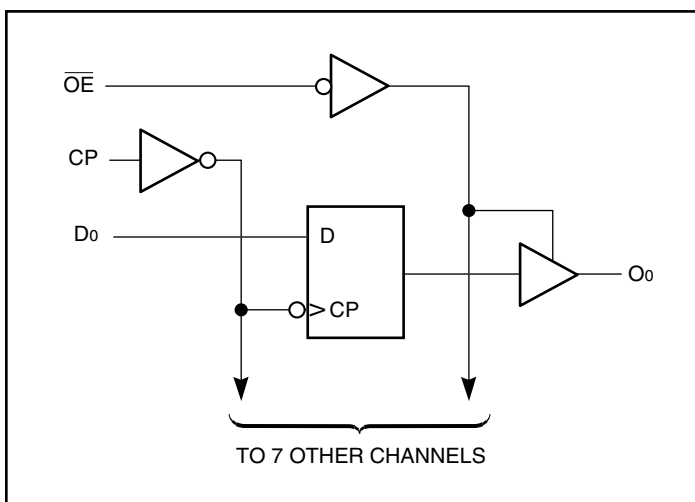
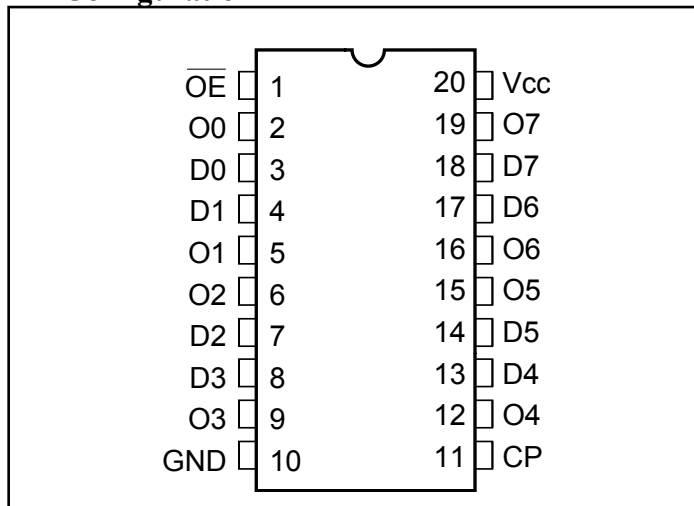
Fast CMOS 3.3V Octal D Flip-Flop
Features

- Compatible with LCX™ and LVT™ 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
- Industrial operating temperature range: -40°C to +85°C
- Packaging:
 - 20-pin 173-mil wide plastic TSSOP (L)
 - 20-pin 150-mil wide plastic QSOP (Q)
 - 20-pin 300-mil wide plastic SOIC (S)

Description

Pericom Semiconductor's PI74LPT374 8-bit wide octal registers designed with eight D-type flip-flops, 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 PI74LPT374 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.

Block Diagram

Pin Configuration

Truth Table⁽¹⁾

Inputs			Outputs
D _N	CP	\overline{OE}	O _N
H	↑	L	H
L	↑	L	L
X	X	H	Z

Note:

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

Pin Description

Pin Name	Description
\overline{OE}	Output Enable Input (Active LOW)
CP	Clock Pulse, LOW-to-HIGH Transition
D7-D0	Data Inputs
O7-O0	3-State Outputs
GND	Ground
VCC	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.....	120 mA
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.

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 (Input pins)	Guaranteed Logic HIGH Level		2.2		5.5	V
	Input HIGH Voltage (I/O pins)			2.0		5.5	
V _{IL}	Input LOW Voltage (Input and I/O pins)	Guaranteed Logic LOW Level		-0.5		0.8	
I _{IH}	Input HIGH Current (Input pins)	V _{CC} = Max.	V _{IN} = 5.5V			±1	μA
	Input HIGH Current (I/O pins)	V _{CC} = Max.	V _{IN} = V _{CC}			±1	
I _{IL}	Input LOW Current (Input pins)	V _{CC} = Max.	V _{IN} = GND			±1	
	Input LOW Current (I/O pins)	V _{CC} = Max.	V _{IN} = GND			±1	
I _{OZH}	High Impedance Output Current	V _{CC} = Max.	V _{OUT} = 5.5V			±1	
I _{OZL}	(3-State Output pins)	V _{CC} = Max.	V _{OUT} = GND			±1	
V _{IK}	Clamp Diode Voltage	V _{CC} = Min., I _{IN} = -18 mA			-0.7	-1.2	V
I _{ODH}	Output HIGH Current	V _{CC} = 3.3V, V _{IN} = V _{IH} or V _{IL} , V _O = 1.5V ⁽³⁾		-36	-60	-110	mA
I _{ODL}	Output LOW Current	V _{CC} = 3.3V, V _{IN} = V _{IH} or V _{IL} , V _O = 1.5V ⁽³⁾		50	90	200	
V _{OH}	Output HIGH Voltage	V _{CC} = Min., V _{IN} = V _{IH} or V _{IL}	I _{OH} = -0.1 mA	V _{CC} -0.2			V
			I _{OH} = -3 mA	2.4	3.0		
		V _{CC} = 3.0V, V _{IN} = V _{IH} or V _{IL}	I _{OH} = -8 mA	2.4 ⁽⁵⁾	3.0		
			I _{OH} = -24 mA	2.0			
V _{OL}	Output LOW Voltage	V _{CC} = Min., V _{IN} = V _{IH} or V _{IL}	I _{OL} = 0.1 mA			0.2	
			I _{OL} = 16 mA		0.2	0.4	
		I _{OL} = 24 mA		0.3	0.5		
I _{OS}	Short Circuit Current ⁽⁴⁾	V _{CC} = Max. ⁽³⁾ , V _{OUT} = GND		-60	-85	-240	mA
I _{OFF}	Power Down Disable	V _{CC} = 0V, V _{IN} or V _{OUT} ≤ 4.5V				±100	μA
V _H	Input Hysteresis				150		mV

Notes:

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at V_{CC} = 3.3V, +25°C ambient and maximum loading.
- Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
- This parameter is guaranteed but not tested.
- V_{OH} = V_{CC} - 0.6V at rated current.

Capacitance ($T_A = 25^\circ\text{C}$, $f = 1\text{ MHz}$)

Parameters ⁽¹⁾	Description	Test Conditions	Typ	Max.	Units
C_{IN}	Input Capacitance	$V_{IN} = 0V$	4.5	6	pF
C_{OUT}	Output Capacitance	$V_{OUT} = 0V$	5.5	8	

Note:

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

Power Supply Characteristics

Parameters	Description	Test Conditions ⁽¹⁾		Min.	Typ ⁽²⁾	Max.	Units
I_{CC}	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$	$V_{IN} = \text{GND or } V_{CC}$		0.1	10	μA
ΔI_{CC}	Quiescent Power Supply Current TTL Inputs HIGH	$V_{CC} = \text{Max.}$	$V_{IN} = V_{CC} - 0.6V^{(3)}$			500	
I_{CCD}	Dynamic Power Supply ⁽⁴⁾	$V_{CC} = \text{Max.},$ Outputs Open $\overline{OE} = \text{GND}$ One Bit Toggling 50% Duty Cycle	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$		50	75	$\mu\text{A}/\text{MHz}$
I_C	Total Power Supply Current ⁽⁶⁾	$V_{CC} = \text{Max.},$ Outputs Open $f_i = 10\text{ MHz}$ 50% Duty Cycle $\overline{OE} = \text{GND}$ One Bit Toggling	$V_{IN} = V_{CC} - 0.6V$ $V_{IN} = \text{GND}$		0.6	2.3	mA
		$V_{CC} = \text{Max.},$ Outputs Open $f_i = 2.5\text{ MHz}$ 50% Duty Cycle $\overline{OE} = \text{GND}$ 8 Bits Toggling	$V_{IN} = V_{CC} - 0.6V$ $V_{IN} = \text{GND}$		2.1	4.7 ⁽⁵⁾	

Notes:

- For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device.
- Typical values are at $V_{CC} = 3.3V$, $+25^\circ\text{C}$ ambient.
- Per TTL driven input; all other inputs at V_{CC} or GND.
- This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
- Values for these conditions are examples of the I_{CC} formula. These limits are guaranteed but not tested.
- $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$

$$I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_i N_i)$$

$$I_{CC} = \text{Quiescent Current } (I_{CCL}, I_{CCV} \text{ and } I_{CCZ})$$

$$\Delta I_{CC} = \text{Power Supply Current for a TTL High Input}$$

$$D_H = \text{Duty Cycle for TTL Inputs High}$$

$$N_T = \text{Number of TTL Inputs at } D_H$$

$$I_{CCD} = \text{Dynamic Current Caused by an Input Transition Pair (HLH or LHL)}$$

$$f_{CP} = \text{Clock Frequency for Register Devices (Zero for Non-Register Devices)}$$

$$N_{CP} = \text{Number of Clock Inputs at } f_{CP}$$

$$f_i = \text{Input Frequency}$$

$$N_i = \text{Number of Inputs at } f_i$$

All currents are in milliamps and all frequencies are in megahertz.

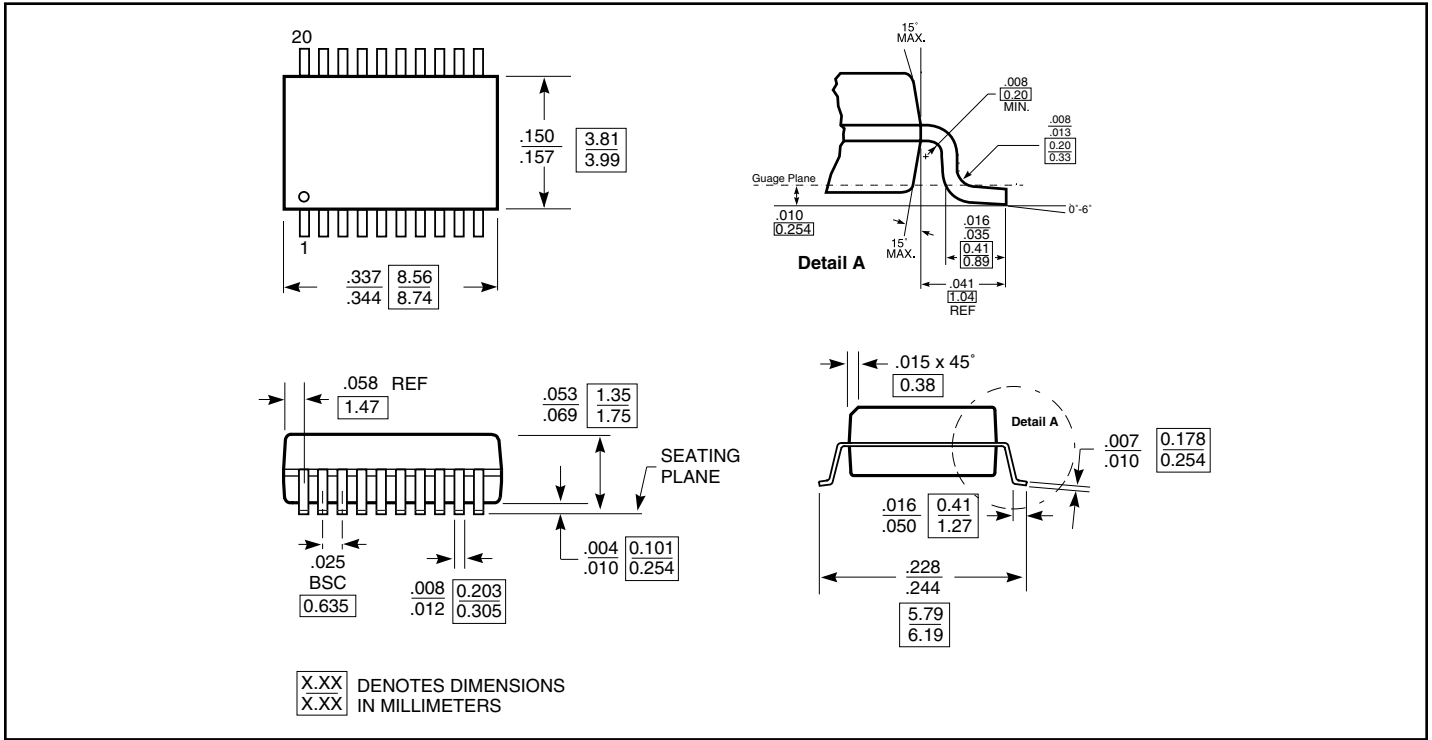
Switching Characteristics over Operating Range⁽¹⁾

Parameters	Description	Conditions ⁽²⁾	LPT374		LPT374C		Unit
			Com.		Com.		
			Min ⁽³⁾	Max	Min ⁽³⁾	Max	
F _{MAX}	Maximum Clock Frequency	C _L = 50pF R _L = 500 Ω	150		150		MHz
t _{PLH} t _{PHL}	Propagation Delay xCLK to xOx		2.0	8.0	2.0	4.5	ns
t _{PZH} t _{PZL}	Output Enable Time ⁽⁴⁾ xOE to xOx		1.5	8.5	1.5	5.5	
t _{PHZ} t _{PLZ}	Output Disenable Time xOE to xOx		1.5	8.5	1.5	5.0	
t _{SU}	Setup time HIGH or LOW, xDx to xCLK		2.0		2.0		
t _H	HOLD time HIGH or LOW, xDx to xCLK		1.5		1.5		
t _w	xCLK Pulse Width ⁽⁴⁾ HIGH		7.0		5.0		
t _{SK(o)}	Output Skew ⁽⁵⁾			0.5		0.5	

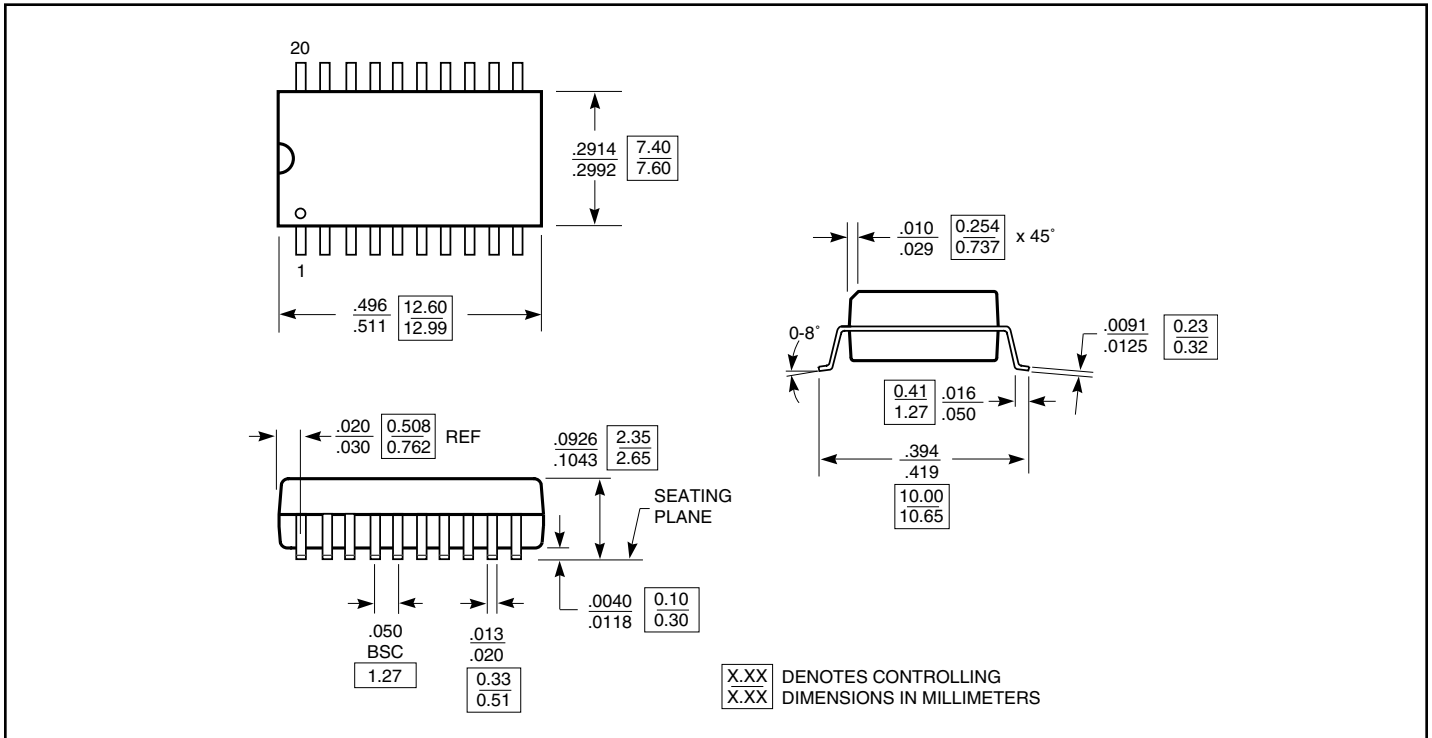
Notes:

1. Propagation Delays and Enable/Disable times are with V_{CC} = 3.3V ±0.3V, normal range. For V_{CC} = 2.7V, extended range, all Propagation Delays and Enable/Disable times should be degraded by 20%.
2. See test circuit and wave forms.
3. Minimum limits are guaranteed but not tested on Propagation Delays.
4. This parameter is guaranteed but not production tested.
5. Skew between any two outputs, of the same package, switching in the same direction. This parameter is guaranteed by design.

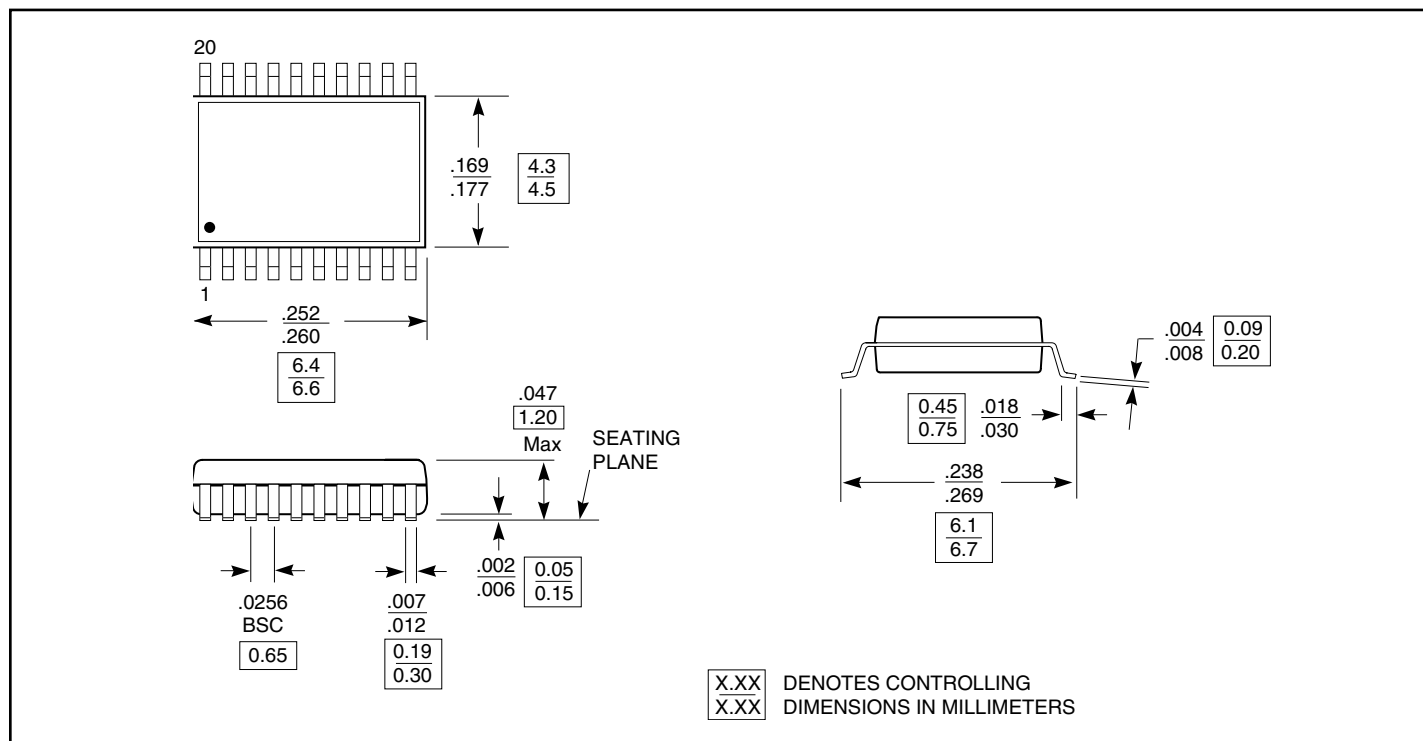
Packaging Mechanical: 20-pin QSOP (Q)



Packaging Mechanical: 20-pin SOIC (S)



Packaging Mechanical: 20-pin TSSOP (L)



Ordering Information

Ordering Code	Package Code	Speed Grade	Description
PI74LPT374L	L	Blank	20-pin 173-mil wide plastic TSSOP
PI74LPT374CQ	Q	C	20-pin 150-mil wide plastic QSOP
PI74LPT374CS	S	C	20-pin 300-mil wide plastic SOIC
PI74LPT374CL	L	C	20-pin 173-mil wide plastic TSSOP

Notes:

1. Thermal characteristics can be found on the company web site at www.pericom.com/packaging/