



PS2034A 03/28/01

Product Pin Description

Pin Name	Description
$\overline{xOE}$	3-State Output Enable Inputs (Active LOW)
xCLK	Clock Inputs
xDx	Inputs ⁽¹⁾
xOx	3-State Outputs
GND	Ground
Vcc	Power

Note: 1. For the PI74FCT162H374T, these pins have “Bus Hold.” All other pins are standard, outputs, or I/Os.

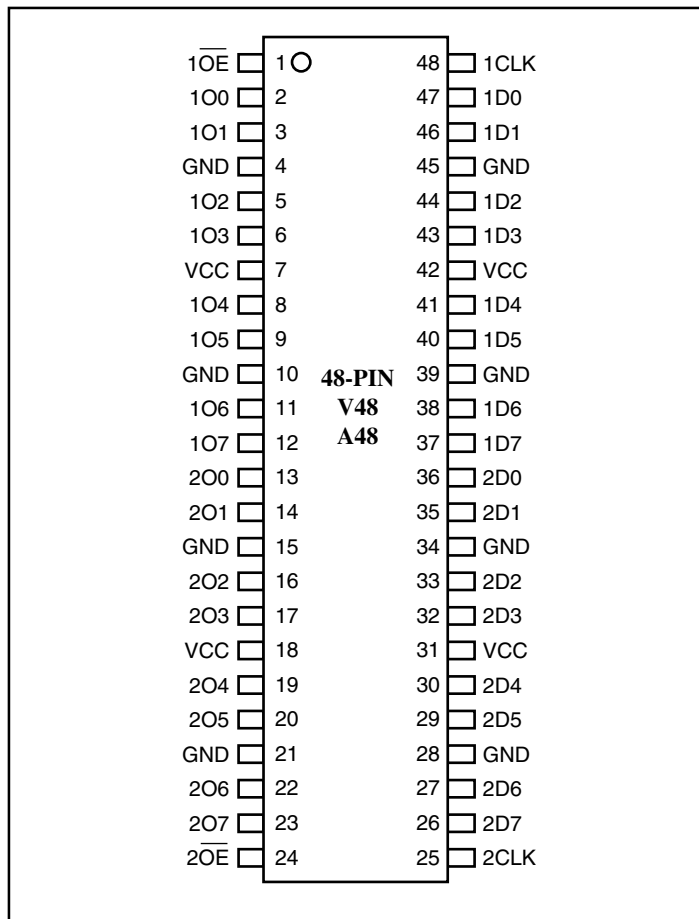
Truth Table⁽¹⁾

	Inputs			Outputs
Function	xDx	$xCLK$	$\overline{xOE}$	xOx
High-Z	X	L	H	Z
	X	H	H	Z
Load Register	L	↑	L	L
	H	↑	L	H
	L	↑	H	Z
	H	↑	H	Z

Note:

- H = High Voltage Level
L = Low Voltage Level
X = Don't Care
Z = High Impedance
↑ = LOW-to-HIGH transition

Product Pin Configuration



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.

DC Electrical Characteristics (Over the Operating Range, T_A = –40°C to +85°C, V_{CC} = 5.0V ± 10%)

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
I _{IH}	Input HIGH Current	Standard Input, V _{CC} = Max.	V _{IN} = V _{CC}			1	μA
I _{IH}	Input HIGH Current	Standard I/O, V _{CC} = Max.	V _{IN} = V _{CC}			1	μA
I _{IH}	Input HIGH Current	Bus Hold Input ⁽⁴⁾ , V _{CC} = Max.	V _{IN} = V _{CC}			±100	μA
I _{IH}	Input HIGH Current	Bus Hold I/O ⁽⁴⁾ , V _{CC} = Max.	V _{IN} = V _{CC}			±100	μA
I _{IL}	Input LOW Current	Standard Input, V _{CC} = Min.	V _{IN} = GND			–1	μA
I _{IL}	Input LOW Current	Standard I/O, V _{CC} = Min.	V _{IN} = GND			–1	μA
I _{IL}	Input LOW Current	Bus Hold Input ⁽⁴⁾ , V _{CC} = Min.	V _{IN} = GND			±100	μA
I _{IL}	Input LOW Current	Bus Hold I/O ⁽⁴⁾ , V _{CC} = Min.	V _{IN} = GND			±100	μA
I _{BHH}	Bus Hold	Bus Hold Input ⁽⁴⁾ , V _{CC} = Min.	V _{IN} = 2.0V	–50			μA
I _{BHL}	Sustain Current		V _{IN} = 0.8V	+50			
I _{OZH} ⁽⁵⁾	High Impedance	V _{CC} = Max.	V _{OUT} = 2.7V			1	μA
I _{OZL} ⁽⁵⁾	Output Current	V _{CC} = Max.	V _{OUT} = 0.5V			–1	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		–80	–140	–200	mA
I _O	Output Drive Current	V _{CC} = Max. ⁽³⁾ , V _{OUT} = 2.5V		–50		–180	mA
V _H	Input Hysteresis				100		mV

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} = 5.0V, +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. Pins with Bus Hold are identified in the pin description.
5. This specification does not apply to bi-directional functionalities with Bus Hold.

PI74FCT16374T Output Drive Characteristics (Over the Operating Range)

Parameters	Description	Test Conditions ⁽¹⁾		Min.	Typ ⁽²⁾	Max.	Units
VOH	Output HIGH Voltage	VCC = Min., VIN = VIH or VIL	IOH = -3.0 mA	2.5	3.5		V
			IOH = -15.0 mA	2.4	3.5		
			IOH = -32.0 mA	2.0	3.0		
VOL	Output LOW Voltage	VCC = Min., VIN = VIH or VIL	IOL = 64 mA		0.2	0.55	V
IOFF	Power Down Disable	VCC = 0V, VIN or VOUT ≤ 5V		—	—	±100	μA

PI74FCT162374T/162H374T Output Drive Characteristics (Over the Operating Range)

Parameters	Description	Test Conditions ⁽¹⁾		Min.	Typ ⁽²⁾	Max.	Units
VOH	Output HIGH Voltage	VCC = Min., VIN = VIH or VIL	IOH = -24.0 mA	2.4	3.3		V
VOL	Output LOW Voltage	VCC = Min., VIN = VIH or VIL	IOL = 24 mA		0.3	0.55	V
IODL	Output LOW Current	VCC = 5V, VIN = VIH OR VIL, VOUT = 1.5V ⁽³⁾		60	115	150	mA
IODH	Output HIGH Current	VCC = 5V, VIN = VIH OR VIL, VOUT = 1.5V ⁽³⁾		-60	-115	-150	mA

Capacitance (TA = 25°C, f = 1 MHz)

Parameters ⁽⁴⁾	Description	Test Conditions	Typ	Max.	Units
CIN	Input Capacitance	VIN = 0V	4.5	6	pF
COUT	Output Capacitance	VOUT = 0V	5.5	8	pF

Notes:

1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at VCC = 5.0V, +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.

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}		0.1	500	μA
ΔI _{CC}	Supply Current per Input @ TTL HIGH	V _{CC} = Max.	V _{IN} = 3.4V ⁽³⁾		0.5	1.5	mA
I _{CCD}	Supply Current per Input per MHz ⁽⁴⁾	V _{CC} = Max., Outputs Open x $\overline{OE}$ = GND One Bit Toggling 50% Duty Cycle	V _{IN} = V _{CC} V _{IN} = GND		60	100	μA/ MHz
I _C	Total Power Supply Current ⁽⁶⁾	V _{CC} = Max., Outputs Open f _{CP} = 10 MHz 50% Duty Cycle x $\overline{OE}$ = GND f _I = 5 MHz 50% Duty Cycle One Bit Toggling	V _{IN} = V _{CC} V _{IN} = GND		0.6	1.5 ⁽⁵⁾	mA
			V _{IN} = 3.4V V _{IN} = GND		1.1	3.0 ⁽⁵⁾	
		V _{CC} = Max., Outputs Open f _{CP} = 10 MHz 50% Duty Cycle x $\overline{OE}$ = GND 16 Bits Toggling f _I = 2.5 MHz 50% Duty Cycle	V _{IN} = V _{CC} V _{IN} = GND		3.0	5.5 ⁽⁵⁾	
			V _{IN} = 3.4V V _{IN} = GND		7.5	19.0 ⁽⁵⁾	

Notes:

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
- Typical values are at V_{CC} = 5.0V, +25°C ambient.
- Per TTL driven input (V_{IN} = 3.4V); 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} + ΔI_{CC} D_HN_T + I_{CCD} (f_{CP}/2 + f_IN_I)
I_{CC} = Quiescent Current
ΔI_{CC} = Power Supply Current for a TTL High Input (V_{IN} = 3.4V)
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.

PI74FCT16374T Switching Characteristics over Operating Range

Parameters	Description	Conditions ⁽¹⁾	16374T		16374AT		16374CT		16374DT		16374ET		Unit
			Com.		Com.		Com.		Com.		Com.		
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
tPLH tPHL	PropagationDelay xCLKx to xOx	CL = 50 pF RL = 500Ω	20	10.0	20	6.5	20	5.2	20	4.2	1.5	3.7	ns
tpZH tpZL	Output Enable Time xOE to xOx		1.5	12.5	1.5	6.5	1.5	5.5	1.5	4.8	1.5	4.4	ns
tpHZ tPLZ	Output Disable Time ⁽³⁾ xOE to xOx		1.5	8.0	1.5	5.5	1.5	5.0	1.5	4.0	1.5	4.0	ns
tsU	Setup Time HIGH or LOW, xDx to xCLK		2.0	—	2.0	—	2.0	—	2.0	—	1.5	—	ns
th	Hold Time HIGH or LOW, xDx to xCLK		1.5	—	1.5	—	1.5	—	1.0	—	0.0	—	ns
tw	xCLK Pulse Width HIGH or LOW ⁽³⁾		7.0	—	5.0	—	5.0	—	3.0	—	3.0	—	ns
tsk(o)	Output Skew ⁽⁴⁾		—	0.5	—	0.5	—	0.5	—	0.5	—	0.5	ns

PI74FCT162374T Switching Characteristics over Operating Range

Parameters	Description	Conditions ⁽¹⁾	162374T		162374AT		162374CT		162374DT		162374ET		Unit
			Com.		Com.		Com.		Com.		Com.		
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
tPLH tPHL	PropagationDelay xCLKx to xOx	CL = 50 pF RL = 500Ω	2.0	10.0	2.0	6.5	2.0	5.2	2.0	4.2	1.5	3.7	ns
tpZH tpZL	Output Enable Time xOE to xOx		1.5	12.5	1.5	6.5	1.5	5.5	1.5	4.8	1.5	4.4	ns
tpHZ tPLZ	Output Disable Time ⁽³⁾ xOE to xOx		1.5	8.0	1.5	5.5	1.5	5.0	1.5	4.0	1.5	4.0	ns
tsU	Setup Time HIGH or LOW, xDx to xCLK		2.0	—	2.0	—	2.0	—	2.0	—	1.5	—	ns
th	Hold Time HIGH or LOW, xDx to xCLK		1.5	—	1.5	—	1.5	—	1.0	—	0.0	—	ns
tw	xCLK Pulse Width HIGH or LOW ⁽³⁾		7.0	—	5.0	—	5.0	—	3.0	—	3.0	—	ns
tsk(o)	Output Skew ⁽⁴⁾		—	0.5	—	0.5	—	0.5	—	0.5	—	0.5	ns

Notes:

1. See test circuit and wave forms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. This parameter is guaranteed but not production tested.
4. Skew between any two outputs, of the same package, switching in the same direction. This parameter is guaranteed by design.

PI74FCT162H374T Switching Characteristics over Operating Range

Parameters	Description	Conditions ⁽¹⁾	162H374T		162H374AT		162H374CT		162H374DT		162H374ET		Unit
			Com.		Com.		Com.		Com.		Com.		
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
tPLH tPHL	PropagationDelay xCLKx to xOx	CL = 50 pF RL = 500Ω	2.0	10.0	2.0	6.5	2.0	5.2	2.0	4.2	1.5	3.7	ns
tpZH tpZL	Output Enable Time xOE to xOx		1.5	12.5	1.5	6.5	1.5	5.5	1.5	4.8	1.5	4.4	ns
tpHZ tpLZ	Output Disable Time ⁽³⁾ xOE to xOx		1.5	8.0	1.5	5.5	1.5	5.0	1.5	4.0	1.5	4.0	ns
tsU	Setup Time HIGH or LOW, xDx to xCLK		2.0	—	2.0	—	2.0	—	2.0	—	1.5	—	ns
th	Hold Time HIGH or LOW, xDx to xCLK		1.5	—	1.5	—	1.5	—	1.0	—	0.0	—	ns
tw	xCLK Pulse Width HIGH or LOW ⁽³⁾		7.0	—	5.0	—	5.0	—	3.0	—	3.0	—	ns
tsk(o)	Output Skew ⁽⁴⁾		—	0.5	—	0.5	—	0.5	—	0.5	—	0.5	ns

Notes:

1. See test circuit and wave forms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. This parameter is guaranteed but not production tested.
4. Skew between any two outputs, of the same package, switching in the same direction. This parameter is guaranteed by design.