

Fast CMOS Quad Dual-Port Register

Product Features

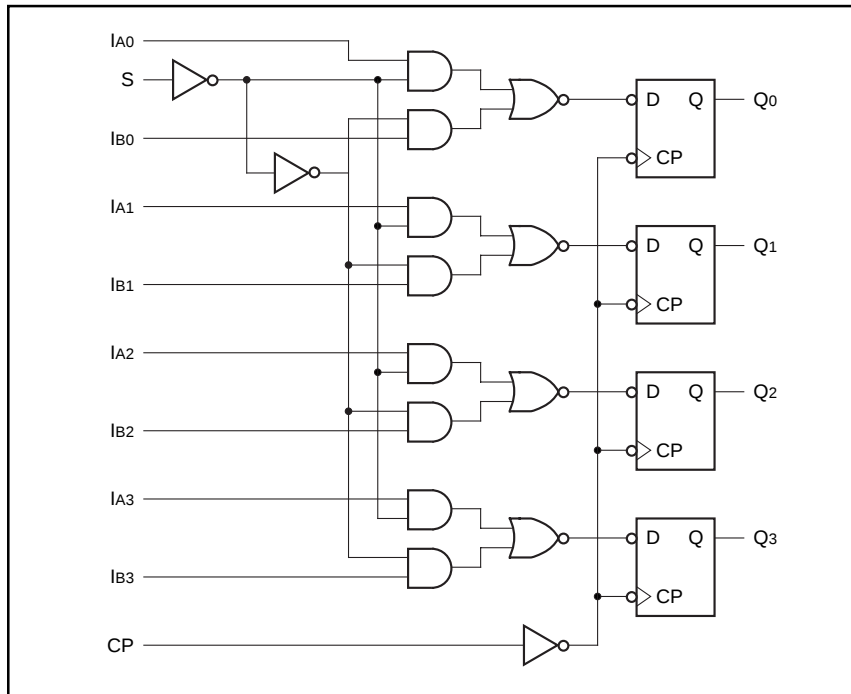
- PI74FCT399T is pin compatible with bipolar FAST™ Series at a higher speed and lower power consumption
- TTL input and output levels
- Extremely low static power
- Hysteresis on all inputs
- Industrial operating temperature range: -40°C to $+85^{\circ}\text{C}$
- Packages available:
 - 16-pin 300 mil wide plastic DIP (P)
 - 16-pin 150 mil wide plastic QSOP (Q)
 - 16-pin 300 mil wide plastic SOIC (S)
 - 16-pin 150 mil wide plastic SOIC (W)

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.

These high-speed quad dual-port registers select 4-bit wide data from one of the two sources (Ports) under control of a common Select input (S). Synchronous with the LOW-to-HIGH transition of the Clock input (CP), the selected data is transferred to a 4-bit output register. The 4-bit D-type output register is fully edge-triggered. For predictable operation, the Data inputs (IA_X, IB_X) and Select input (S) must be stable one set-up time prior to, and hold time after, the LOW-to-HIGH transition of the Clock input.

Logic Block Diagram



Product Pin Description

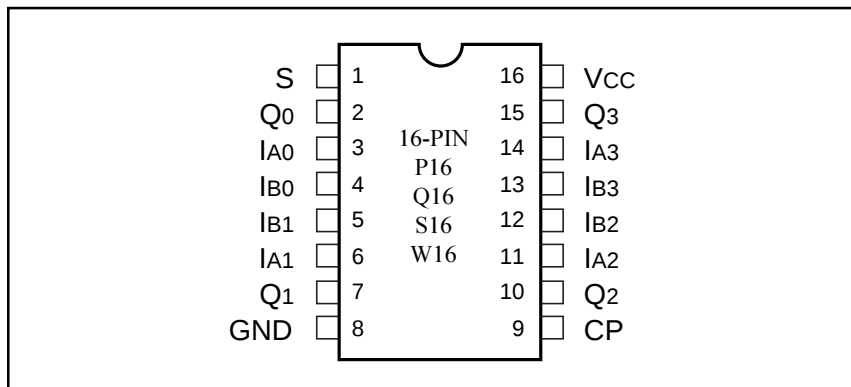
Pin Name	Description
S	Common Select Input
CP	Clock Pulse Input
IA0-IA3	Data Inputs from Source A
IB0-IB3	Data Inputs from Source B
Q0-Q3	Register True Outputs
GND	Ground
VCC	Power

Truth Table⁽¹⁾

Inputs			Outputs
S	IA	IB	Q
I	I	X	L
I	h	X	H
h	X	I	L
h	X	h	H

- H = HIGH Voltage Level
- h = HIGH Voltage Level one setup time prior to the LOW-to-HIGH Clock Transition
- L = LOW Voltage Level
- l = LOW Voltage Level one setup time prior to the LOW-to-HIGH Clock Transition
- X = Don't Care

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 & Vcc 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	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, $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$, $V_{CC} = 5V \pm 5\%$)

Parameters	Description	Test Conditions ⁽¹⁾		Min.	Typ ⁽²⁾	Max.	Units
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{Min.}$, $V_{IN} = V_{IH}$ or V_{IL}	$I_{OH} = -15.0 \text{ mA}$	2.4	3.0		V
V_{OL}	Output LOW Current	$V_{CC} = \text{Min.}$, $V_{IN} = V_{IH}$ or V_{IL}	$I_{OL} = 48 \text{ mA}$		0.3	0.50	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	$V_{CC} = \text{Max.}$	$V_{IN} = V_{CC}$			1	μA
I_{IL}	Input LOW Current	$V_{CC} = \text{Max.}$	$V_{IN} = \text{GND}$			–1	μA
V_{IK}	Clamp Diode Voltage	$V_{CC} = \text{Min.}$, $I_{IN} = -18 \text{ mA}$			–0.7	–1.2	V
I_{OS}	Short Circuit Current	$V_{CC} = \text{Max.}$ ⁽³⁾ , $V_{OUT} = \text{GND}$		–60	–120		mA
I_{OFF}	Power Down Disable	$V_{CC} = \text{GND}$, $V_{OUT} = 4.5V$		—	—	100	μA
V_H	Input Hysteresis				200		mV

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

Parameters ⁽⁴⁾	Description	Test Conditions	Typ	Max.	Units
C_{IN}	Input Capacitance	$V_{IN} = 0V$	6	10	pF
C_{OUT}	Output Capacitance	$V_{OUT} = 0V$	8	12	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 $V_{CC} = 5.0V$, $+25^\circ\text{C}$ 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	2.0	mA
I _{CCD}	Supply Current per Input per MHz ⁽⁴⁾	V _{CC} = Max., Outputs Open S = GND One Input 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 _{CP} = 10 MHz, 50% Duty Cycle S = GND 50% Duty Cycle One Bit toggling at f _i = 5 MHz	V _{IN} = V _{CC} V _{IN} = GND		1.5	3.5 ⁽⁵⁾	mA
			V _{IN} = 3.4V V _{IN} = GND		2.0	5.5 ⁽⁵⁾	
		V _{CC} = Max., Outputs Open f _{CP} = 10 MHz, 50% Duty Cycle S = GND Eight Bits toggling at f _i = 2.5 MHz 50% Duty Cycle	V _{IN} = V _{CC} V _{IN} = GND		3.8	7.3 ⁽⁵⁾	
			V _{IN} = 3.4V V _{IN} = GND		5.0	12.3 ⁽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} = 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}

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

I_{CC} = Quiescent Current
ΔI_{CC} = Power Supply Current for a TTL High Input (V_{IN} = 3.4V)
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.)

Switching Characteristics over Operating Range

Parameters	Description	Conditions ⁽¹⁾	399T		399AT		399CT		Unit
			Com.		Com.		Com.		
			Min	Max	Min	Max	Min	Max	
t _{PLH}	Propagation Delay	C _L = 50 pF R _L = 500Ω	3.0	10.0	2.5	7.0	2.5	5.6	ns
t _{PHL}	CP to Q								
t _{SU}	Setup Time, HIGH or LOW D to Q		4.0	—	3.5	—	3.0	—	ns
t _H	Hold Time, HIGH or LOW D to Q		1.0	—	1.0	—	1.0	—	ns
t _{SU}	Setup Time HIGH or LOW S to CP		9.0	—	8.5	—	3.0	—	ns
t _H	Hold Time HIGH or LOW S to CP		0	—	0	—	0	—	ns
t _W	Clock Pulse Width ⁽³⁾ HIGH or LOW		5.0	—	5.0	—	4.0	—	ns

Notes:

- See test circuit and wave forms.
- Minimum limits are guaranteed but not tested on Propagation Delays.
- This parameter is guaranteed but not production tested.