PI74ALVCH162820

3.3V 10-Bit Flip-Flop with Dual Outputs and 3-State Outputs

Product Features

- PI74ALVCH162820 is designed for low voltage operation
- $V_{CC} = 2.3V$ to $3.6V$
- Hysteresis on all inputs
- Typical V_{OLP} (Output Ground Bounce) $< 0.8V$ at $V_{CC} = 3.3V$, $T_A = 25°C$
- Typical V_{OHV} (Output V_{OH} Undershoot) $< 2.0V$ at $V_{CC} = 3.3V$, $T_A = 25°C$
- Output ports have equivalent 26Ω series resistors, no external resistors are required.
- Bus Hold retains last active bus state during 3-state eliminates the need for external pullup resistors
- Industrial operation at $-40°C$ to $+85°C$
- Packages available:
  - 56-pin 240 mil wide plastic TSSOP (A)
  - 56-pin 300 mil wide plastic SSOP (V)

Product Description

Pericom Semiconductor's PI74ALVCH series of logic circuits are produced in the Company's advanced 0.5 micron CMOS technology, achieving industry leading speed.

The PI74ALVCH162820 is a 10-bit flip-flop designed for 2.3V to 3.3V V_{CC} operation. The PI74ALVCH162820 is designed with edge-triggered D-type flip-flops. On the positive transition of clock (CLK) input, the device provides true data at the Q outputs.

A buffered output-enable ($\overline{OE}$) input can be used to place the ten outputs in either a normal logic state (HIGH or LOW level) or a high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased drive provide the capacity to drive bus lines without the need for interface or pullup components. $\overline{OE}$ does not affect the internal operation of the flip-flops. Old data can be retained or new data can be entered while the outputs are in the high-impedance state.

The outputs, which are designed to sink up to 12mA, include 26Ω resistors to reduce overshoot and undershoot.

The PI74ALVCH162820 has "Bus Hold" which retains the data input's last state whenever the data input goes to high-impedance preventing "floating" inputs and eliminating the need for pullup/down resistors.

Active bus-hold circuitry is provided to hold unused or floating data inputs at a valid logic level.

Logic Block Diagram

TO 9 OTHER CHANNELS
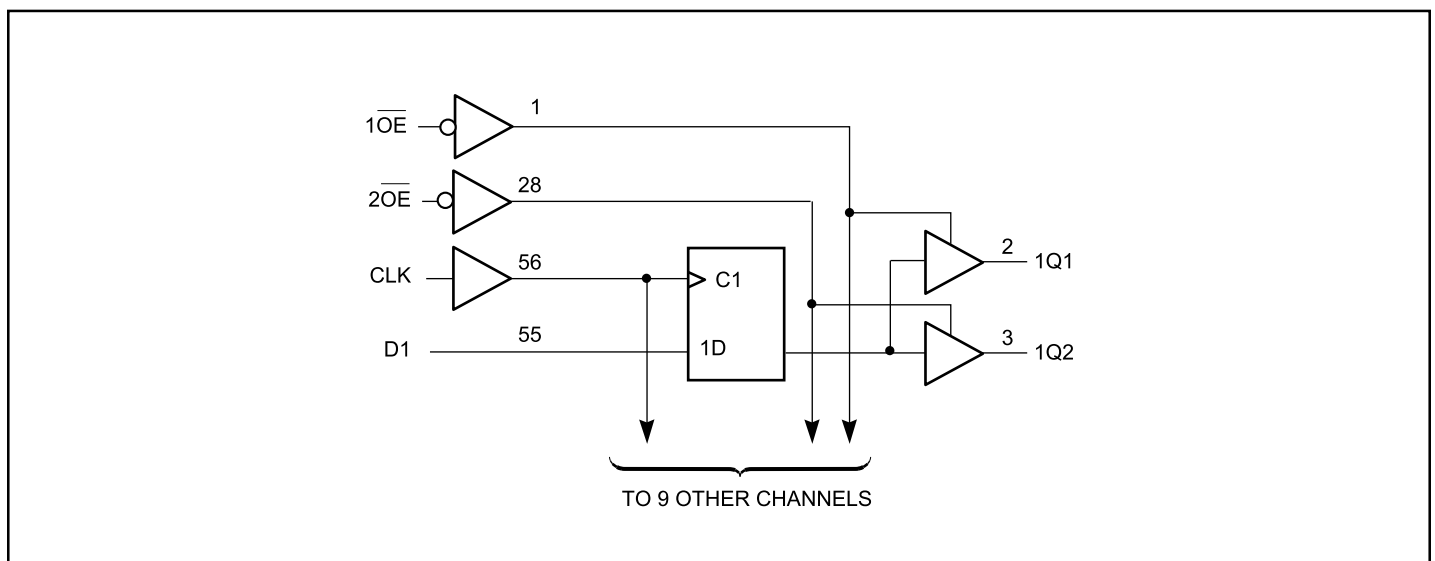
Product Pin Description

Pin Name	Description
$\overline{OE}$	Output Enable Input (Active LOW)
CLK	Clock Input (Active HIGH)
Dx	Data Inputs
Qx	3-State Outputs
GND	Ground
Vcc	Power

Truth Table[1]

Inputs			Outputs
$\overline{OE}n$	CLK	D	Qn
L	↑	H	H
L	↑	L	L
L	L	X	Q0
H	X	X	Z

Note:

1. H = High Signal Level
   L = Low Signal Level
   X = Irrelevant
   Z = High Impedance
   ↑ = LOW-to-HIGH Transition
   n = 1,2

Product Pin Configuration

Left	Pin	Pin	Right
1$\overline{OE}$	1	56	CLK
1Q1	2	55	D1
1Q2	3	54	NC
GND	4	53	GND
2Q1	5	52	D2
2Q2	6	51	NC
VCC	7	50	VCC
3Q1	8	49	D3
3Q2	9	48	NC
4Q1	10	47	D4
GND	11	46	GND
4Q2	12	45	NC
5Q1	13	44	D5
5Q2	14	43	NC
6Q1	15	42	D6
6Q2	16	41	NC
7Q1	17	40	D7
GND	18	39	GND
7Q2	19	38	NC
8Q1	20	37	D8
8Q2	21	36	NC
VCC	22	35	VCC
9Q1	23	34	D9
9Q2	24	33	NC
GND	25	32	GND
10Q1	26	31	D10
10Q2	27	30	NC
2$\overline{OE}$	28	29	NC

56-PIN
V56
A56
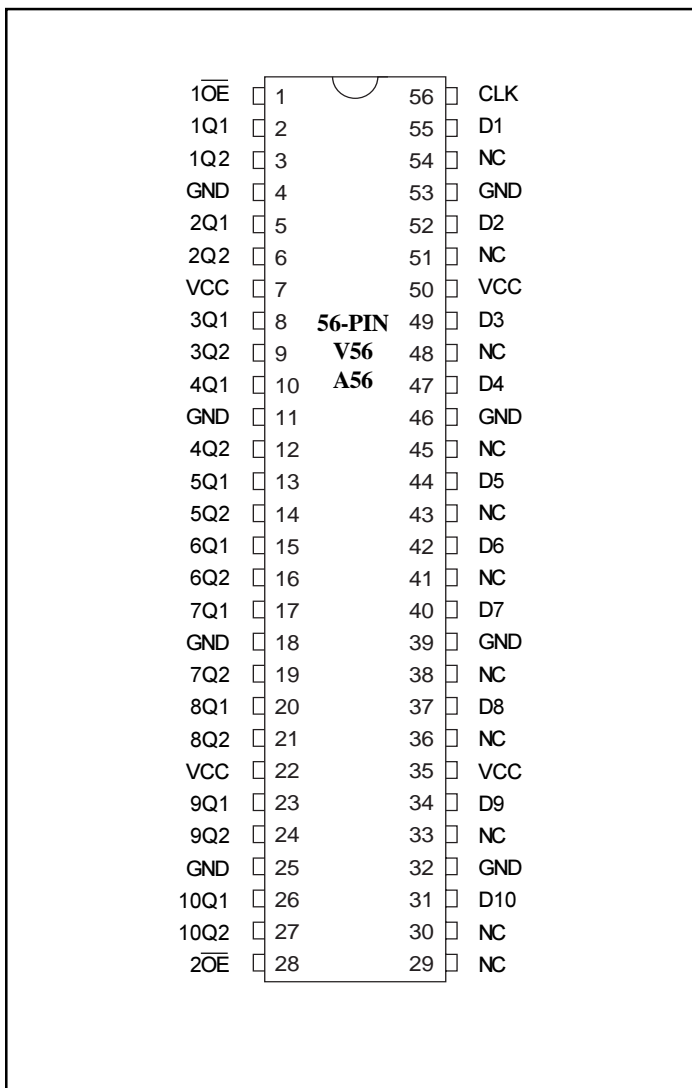
Maximum Ratings

(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
Input Voltage Range, V_{IN}	–0.5V to V_{CC} +0.5V
Output Voltage Range, V_{OUT}	–0.5V to V_{CC} +0.5V
DC Input Voltage	–0.5V to +5.0V
DC Output Current	100 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} = 3.3V ± 10%)

Parameters	Description	Test Conditions[1]	Min.	Typ.[2]	Max.	Units
V_{CC}	Supply Voltage		2.3		3.6	
V_{IH}[3]	Input HIGH Voltage	V_{CC} = 2.3V to 2.7V	1.7			
		V_{CC} = 2.7V to 3.6V	2.0			
V_{IL}[3]	Input LOW Voltage	V_{CC} = 2.3V to 2.7V			0.7	
		V_{CC} = 2.7V to 3.6V			0.8	
V_{IN}[3]	Input Voltage		0		V_{CC}	
V_{OUT}[3]	Output Voltage		0		V_{CC}	
V_{OH}	Output HIGH Voltage	I_{OH} = -100μA, V_{CC} = Min. to Max.	V_{CC} -0.2			V
		V_{IH} = 1.7V, I_{OH} = -6mA, V_{CC} = 2.3V	2.0			
		V_{IH} = 1.7V, I_{OH} = -12mA, V_{CC} = 2.3V	1.7			
		V_{IH} = 2.0V, I_{OH} = -12mA, V_{CC} = 2.7V	2.2			
		V_{IH} = 2.0V, I_{OH} = -12mA, V_{CC} = 3.0V	2.4			
		V_{IH} = 2.0V, I_{OH} = -24mA, V_{CC} = 3.0V	2.0			
V_{OL}	Output LOW Voltage	I_{OL} = 100μA, V_{IL} = Min. to Max.			0.2	
		V_{IL} = 0.7V, I_{OL} = 6mA, V_{CC} = 2.3V			0.4	
		V_{IL} = 0.7V, I_{OL} = 12mA, V_{CC} = 2.3V			0.7	
		V_{IL} = 0.8V, I_{OL} = 12mA, V_{CC} = 2.7V			0.4	
		V_{IL} = 0.8V, I_{OL} = 24mA, V_{CC} = 3.0V			0.55	
I_{OH}[3]	Output HIGH Current	V_{CC} = 2.3V			-12	mA
		V_{CC} = 2.7V			-12	
		V_{CC} = 3.0V			-24	
I_{OL}[3]	Output LOW Current	V_{CC} = 2.3V			12	
		V_{CC} = 2.7V			12	
		V_{CC} = 3.0V			24	

DC Electrical Characteristics-Continued (Over the Operating Range, $T_A = -40°C$ to $+85°C$, $V_{CC} = 3.3V \pm 10\%$)

Parameters	Description	Test Conditions[1]	Min.	Typ.[2]	Max.	Units
I_{IN}	Input Current	$V_{IN} = V_{CC}$ or GND, $V_{CC} = 3.6V$			±5	
$I_{IN\,(HOLD)}$	Input Hold Current	$V_{IN} = 0.7V$, $V_{CC} = 2.3V$	45			μA
		$V_{IN} = 1.7V$, $V_{CC} = 2.3V$	-45			
		$V_{IN} = 0.8V$, $V_{CC} = 3.0V$	75			
		$V_{IN} = 2.0V$, $V_{CC} = 3.0V$	-75			
		$V_{IN} = 0$ to $3.6V$, $V_{CC} = 3.6V$			±500	
I_{OZ}	Output Current (3-STATE Outputs)	$V_{OUT} = V_{CC}$ or GND, $V_{CC} = 3.6V$			±10	
I_{CC}	Supply Current	$V_{CC} = 3.6V$, $I_{OUT} = 0μA$, $V_{IN} = $ GND or V_{CC}			40	
ΔI_{CC}	Supply Current per Input @ TTL HIGH	$V_{CC} = 3.0V$ to $3.6V$ One Input at $V_{CC} - 0.6V$ Other Inputs at V_{CC} or GND			750	
C_I	Control Inputs	$V_{IN} = V_{CC}$ or GND, $V_{CC} = 3.3V$		3.5		pF
	Data Inputs			6		
C_O	Outputs	$V_O = V_{CC}$ or GND, $V_{CC} = 3.3V$		7		

Notes:
1. For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at $V_{CC} = 3.3V$, $+25°C$ ambient and maximum loading.
3. Unused Control Inputs must be held HIGH or LOW to prevent them from floating.

Timing Requirements over Operating Range

Parameters	Description	$V_{CC} = 2.5V \pm 0.2V$		$V_{CC} = 2.7V$		$V_{CC} = 3.3V \pm 0.3V$		Units
		Min.	Max.	Min.	Max.	Min.	Max.	
f_{CLOCK}		0	150	0	150	0	150	MHz
t_W	Pulse duration CLK HIGH or LOW	3.3		3.3		3.3		ns
t_{SU}	Setup time, data before CLK↑	1.7		1.8		1.4		
t_H	Hold time, data after CLK↑	1.1		1.1		1.0		
$\Delta t/\Delta v$[3]	Input Transition Rise or Fall	0	10	0	10	0	10	ns/V

Note:
1. Unused control inputs must be held HIGH or LOW to prevent them from floating.

PS8094A 03/26/97

Switching Characteristics over Operating Range[1]

Parameters	From (INPUT)	To (OUTPUT)	V_{CC} = 2.5V ± 0.2V		V_{CC} = 2.7V		V_{CC} = 3.3V ± 0.3V		Units
			Min.[2]	Max.	Min.[2]	Max.	Min.[2]	Max.[2]	
f_{MAX}			150		150		150		ns
t_{PD}	CLK	Q	1.0	7.0		6.2	1.0	5.4	
t_{EN}	$\overline{OE}$	Q	1.0	7.4		6.8	1.0	5.6	
t_{DIS}	$\overline{OE}$	Q	1.3	6.4		5.5	1.0	5.0	

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

Operating Characteristics, T_A = 25°C

Parameter		Test Conditions	V_{CC} = 2.5V ± 0.2V	V_{CC} = 3.3V ± 0.3V	Units
			Typical		
C_{PD} Power Dissipation Capacitance	Outputs Enabled	C_L = 50pF, f = 10 MHz	68	66	pF
	Outputs Disabled		39	47	

PS8094A 03/26/97