Fast CMOS 3.3V 16-Bit Transparent Latch

Product Features

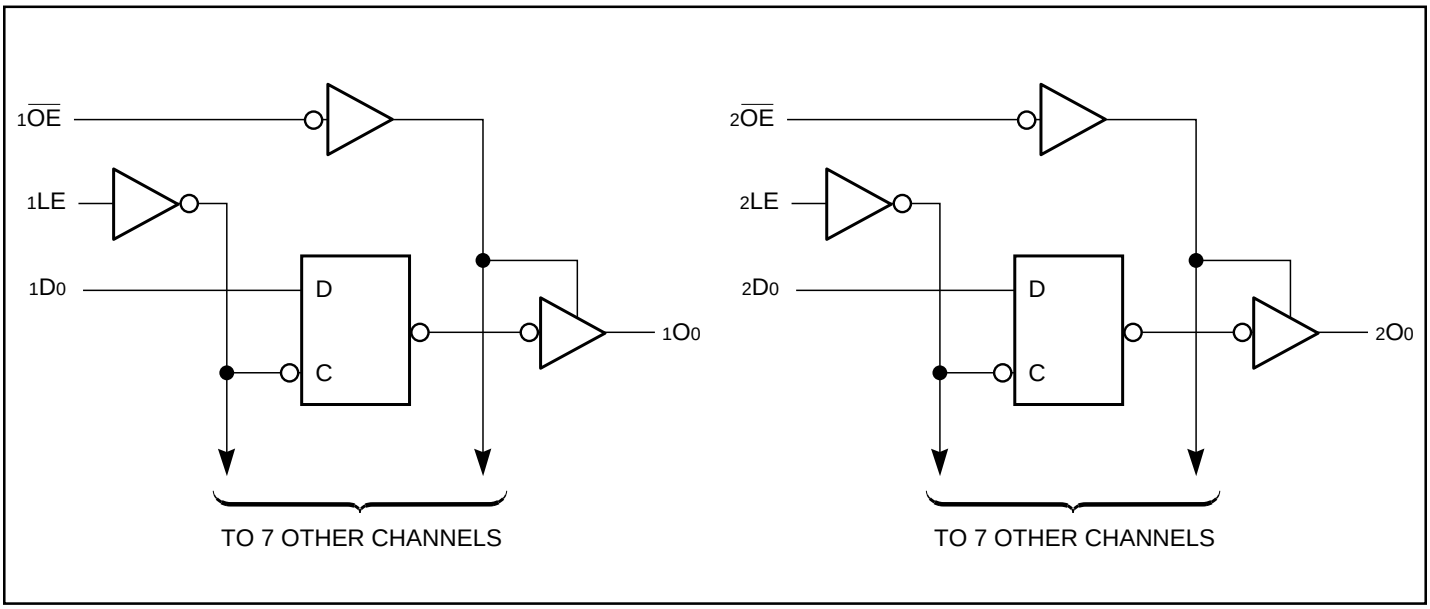
- Advanced Low Power CMOS Operation
- Can serve as a 5V to 3V translator
- Excellent output drive capability:
  Balanced drives (24mA sink and source)
  Compatible with LVC™ class of products.
- Pin compatible with industry standard double-density pinouts
- Low ground bounce outputs
- Hysteresis on all inputs
- Industrial operating temperature range: –40°C to +85°C
- Inputs can be driven by 3.3V or 5V devices
- Multiple center pin and distributed Vcc/GND pins minimizing switching noise
- Packages available:
  – 48-pin 240 mil wide plastic TSSOP (A)
  – 48-pin 300 mil wide plastic SSOP (V)
  – 48-pin 173 mil wide plastic TVSOP (K)
- Device models available on request

Product Description

Pericom Semiconductor's PI74FCT series of logic circuits are produced in the Company's advanced 0.6 micron CMOS technology, achieving industry leading speed grades.

The PI74FCT163373 is a 16-bit transparent latch designed with 3-state outputs and are intended for bus oriented applications. The Output Enable and Latch Enable controls are organized to operate as two 8-bit latches or one 16-bit latch. When Latch Enable (LE) is HIGH, the flip-flops appear transparent to the data. The data that meets the set-up time when LE is LOW is latched. When $\overline{OE}$ is HIGH, the bus output is in the high impedance state.

Logic Block Diagram



Product Pin Description

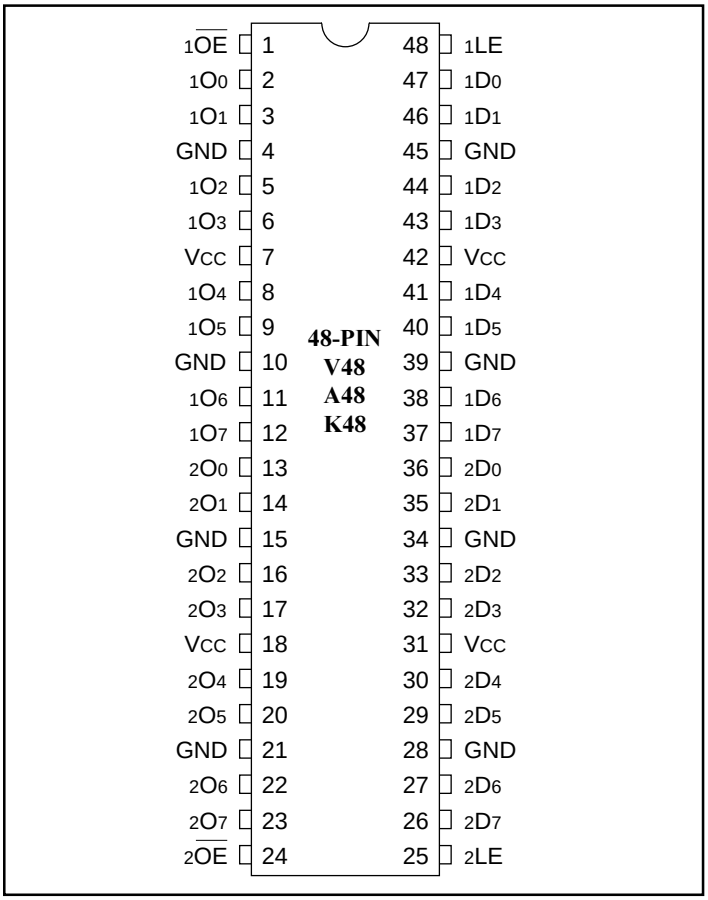
Pin Name	Description
x$\overline{OE}$	3-State Output Enable Inputs (Active LOW)
xLE	Latch Enable Inputs (Active HIGH)
xDx	Data Inputs
xOx	3-State Outputs
GND	Ground
VCC	Power

Truth Table

Inputs(1)			Outputs(1)
xDx	**xLE**	**x$\overline{OE}$**	**xOx**
H	H	L	H
L	H	L	L
X	X	H	Z

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

Product Pin Configuration



Capacitance (TA = 25°C, f = 1 MHz)

Parameters(1)	Description	Test Conditions	Typ.	Max.	Units
CIN	Input Capacitance	VIN = 0V	4.5	6	pF
COUT	Output Capacitance	VOUT = 0V	5.5	8	pF

Note:
1. This parameter is determined by device characterization but is not production tested.

Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature	–55°C to +125°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	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	—	Vcc+0.5	V
V_{IL}	Input LOW Voltage (Input and I/O pins)	Guaranteed Logic LOW Level		–0.5	—	0.8	V
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	µA
I_{IL}	Input LOW Current (Input pins)	V_{CC} = Max.	V_{IN} = GND	—	—	±1	µA
	Input LOW Current (I/O pins)	V_{CC} = Max.	V_{IN} = GND	—	—	±1	µA
I_{OZH}	High Impedance Output Current	V_{CC} = Max.	V_{OUT} = V_{CC}	—	—	±1	µA
I_{OZL}	(3-State Output pins)	V_{CC} = Max.	V_{OUT} = GND	—	—	±1	µA
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	mA
V_{OH}	Output HIGH Voltage	V_{CC} = Min.	I_{OH} = –0.1mA	Vcc-0.2	—	—	V
		V_{IN} = V_{IH} or V_{IL}	I_{OH} = –3mA	2.4	3.0	—	V
		V_{CC} = 3.0V,	I_{OH} = –8mA	2.4[5]	3.0	—	V
		V_{IN} = V_{IH} OR V_{IL}	I_{OH} = –24mA	2.0	—	—	V
V_{OL}	Output LOW Voltage	V_{CC} = Min.	I_{OL} = 0.1mA	—	—	0.2	V
		V_{IN} = V_{IH} or V_{IL}	I_{OL} = 16mA	—	0.2	0.4	V
			I_{OL} = 24mA	—	0.3	0.5	V
I_{OS} mA	Short Circuit Current[4]	V_{CC} = Max.[3], V_{OUT} = GND			–60	–85	–240
V_H	Input Hysteresis			—	150	—	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 Vcc = 3.3V, +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 guaranteed but not tested.
5. V_{OH} = V_{CC} – 0.6V at rated current.

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	10	µA
ΔI_{CC}	Quiescent Power Supply Current TTL Inputs HIGH	V_{CC} = Max.	V_{IN} = V_{CC} – 0.6V[3]		2.0	30	µA
I_{CCD}	Dynamic Power Supply[4]	V_{CC} = Max., Outputs Open x$\overline{OE}$ = GND xLE = Vcc One Bit Toggling 50% Duty Cycle	V_{IN} = V_{CC} V_{IN} = GND		50	75	µA/ MHz
I_C	Total Power Supply Current[6]	V_{CC} = Max., Outputs Open f_i = 10 MHz 50% Duty Cycle x$\overline{OE}$ = GND xLE = V_{CC} One Bit Toggling	V_{IN} = V_{CC} – 0.6V V_{IN} = GND		0.5	0.8	mA
		V_{CC} = Max., Outputs Open f_i = 2.5 MHz 50% Duty Cycle x$\overline{OE}$ = GND xLE = V_{CC} 16 Bits Toggling	V_{IN} = V_{CC} – 0.6V V_{IN} = GND		2.0	3.3[5]	

Notes:

1. For Max. or Min.conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
2. Typical values are at Vcc = 3.3V, +25°C ambient.
3. Per TTL driven input; all other inputs at Vcc or GND.
4. This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
5. Values for these conditions are examples of the Icc formula. These limits are guaranteed but not tested.
6. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
   $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_{INI})$
   I_{CC} = Quiescent Current (I_{CCL}, I_{CCH} and I_{CCZ})
   ΔI_{CC} = Power Supply Current for a TTL High Input
   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)
   N_{CP} = Number of Clock Inputs at f_{CP}
   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[1]

Parameters	Description	Conditions[2]	FCT163373 Com. Min.[3]	FCT163373 Com. Max.	FCT163373A Com. Min.[3]	FCT163373A Com. Max.	FCT163373C Com. Min.[3]	FCT163373C Com. Max.	Units
tPLH tPHL	Propagation Delay xDx to xOx	CL = 50 pF RL = 500 Ω	1.5	8.0	1.5	5.2	1.5	4.2	ns
tPLH tPHL	Propagation Delay xLE to xOx		2.0	13.0	2.0	8.5	2.0	5.5	ns
tPZH tPZL	Output Enable Time x$\overline{OE}$ to xOx		1.5	12.0	1.5	6.5	1.5	5.5	ns
tPHZ tPLZ	Output Disable Time[4] x$\overline{OE}$ to xOx		1.5	7.5	1.5	5.5	1.5	5.0	ns
tSU	Setup Time HIGH or LOW, xDx to xLE		2.0		2.0		2.0		ns
tH	Hold Time HIGH or LOW, xDx to xLE		1.5		1.5		1.5		ns
tW	xLE Pulse Width HIGH		6.0		5.0		5.0		ns
tSK(o)	Output Skew[5]			0.5		0.5		0.5	ns

Notes:
1. Propagation Delays and Enable/Disable times are with Vcc = 3.3V ±0.3V, normal range. For Vcc = 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.