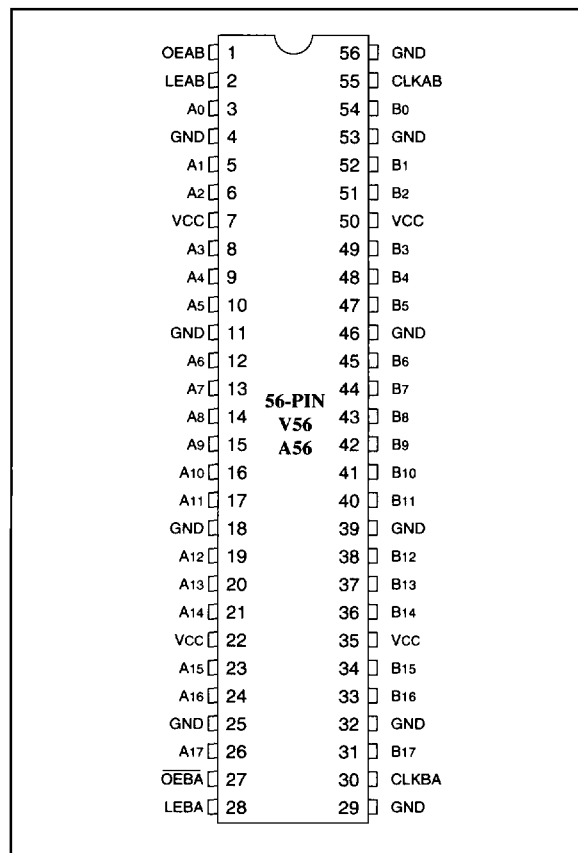


Product Pin Description

| Pin Name | Description |
|----------|---|
| OEAB | A-to-B Output Enable Input |
| OEBA | B-to-A Output Enable Input (Active LOW) |
| LEAB | A-to-B Latch Enable Input |
| LEBA | B-to-A Latch Enable Input |
| CLKAB | A-to-B Clock Input |
| CLKBA | B-to-A Clock Input |
| Ax | A-to-B Data Inputs or B-to-A 3-State Outputs ⁽¹⁾ |
| Bx | B-to-A Data Inputs or A-to-B 3-State Outputs ⁽¹⁾ |
| GND | Ground |
| Vcc | Power |

Note: 1. For the PI74FCT162H501T, these pins have "Bus Hold." All other pins are standard, outputs, or I/Os.

Product Pin Configuration



Truth Table^(1,4)

| Inputs | | | | Outputs |
|--------|------|-------|----|------------------|
| OEAB | LEAB | CLKAB | Ax | Bx |
| L | X | X | X | Z |
| H | H | X | L | L |
| H | H | X | H | H |
| H | L | ↑ | L | L |
| H | L | ↑ | H | H |
| H | L | L | X | B ⁽²⁾ |
| H | L | H | X | B ⁽³⁾ |

Notes:

1. A-to-B data flow is shown. B-to-A data flow is similar but uses OEBA, LEBA, and CLKBA.
2. Output level before the indicated steady-state input conditions were established.
3. Output level before the indicated steady-state input conditions were established, provided that CLKAB was LOW before LEAB went LOW.
4. H = High Voltage Level
L = Low Voltage Level
Z = High Impedance
↑ = LOW-to-HIGH Transition

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 | 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, TA = -40°C to +85°C, VCC = 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. | | | 1 | μA |
| I _{IH} | Input HIGH Current | Standard I/O, V _{CC} = Max. | | | 1 | μA |
| I _{IH} | Input HIGH Current | Bus Hold Input ⁽⁴⁾ , V _{CC} = Max. | | | ±100 | μA |
| I _{IH} | Input HIGH Current | Bus Hold I/O ⁽⁴⁾ , V _{CC} = Max. | | | ±100 | μA |
| I _{IL} | Input LOW Current | Standard Input, V _{CC} = Min. | | | -1 | μA |
| I _{IL} | Input LOW Current | Standard I/O, V _{CC} = Min. | | | -1 | μA |
| I _{IL} | Input LOW Current | Bus Hold Input ⁽⁴⁾ , V _{CC} = Min. | | | ±100 | μA |
| I _{IL} | Input LOW Current | Bus Hold I/O ⁽⁴⁾ , V _{CC} = Min. | | | ±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 | | |
| IOZH ⁽⁵⁾ | High-Impedance | V _{CC} = Max. | | | 1 | μA |
| IOZL ⁽⁵⁾ | Output Current (3-STATE OUTPUTS) | V _{CC} = Max. | | | -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.

PI74FCT16501T 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 | IOH = 64 mA | | 0.2 | 0.55 | V |
| IOFF | Power Down Disable | VCC = 0V, VIN or VOUT ≤ 4.5V | | — | — | ±100 | μA |

PI74FCT162501T/162H501T 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 | IOH = 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 |
| COU | 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 OEAB = OEBA = V _{cc} or GND One Bit Toggling 50% Duty Cycle | V _{IN} = V _{cc} V _{IN} = GND | | 75 | 120 | μA/ MHz |
| I _c | Total Power Supply Current ⁽⁶⁾ | V _{cc} = Max., Outputs Open f _{CP} = 10 MHz (CLKAB) 50% Duty Cycle OEAB = OEBA = V _{cc} LEAB = GND One Bit Toggling fi = 5 MHz 50% Duty Cycle | V _{IN} = V _{cc} V _{IN} = GND | | 0.8 | 1.7 ⁽⁵⁾ | mA |
| | | | V _{IN} = 3.4V V _{IN} = GND | | 1.3 | 4.2 ⁽⁵⁾ | |
| | | | V _{IN} = V _{cc} V _{IN} = GND | | 3.8 | 6.5 ⁽⁵⁾ | |
| | | | V _{IN} = 3.4V V _{IN} = GND | | 8.5 | 20.8 ⁽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}
 $I_c = I_{cc} + \Delta I_{cc} D_H N_T + I_{ccd} (f_{CP}/2 + f_i N_i)$
 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.

PI74FCT16501T Switching Characteristics over Operating Range

| Parameters | Description | Conditions ⁽¹⁾ | 16501AT | | 16501CT | | 16501DT | | 16501ET | | Unit |
|--------------------------------------|--|---------------------------|---------|-----|---------|-----|---------|-----|---------|-----|------|
| | | | Com. | | Com. | | Com. | | Com. | | |
| | | | Min | Max | Min | Max | Min | Max | Min | Max | |
| t _{MAX} | CLKAB or CLKBA frequency | CL = 50 pF | — | 150 | — | 150 | — | 150 | — | 150 | MHz |
| t _{PLH} t _{PHL} | Propagation Delay Ax to Bx or Ax to Bx | RL = 500Ω | 1.5 | 5.1 | 1.5 | 4.6 | 1.5 | 4.1 | 1.5 | 3.8 | ns |
| t _{PLH} t _{PHL} | Propagation Delay LEBA to Ax, LEAB to Bx | | 1.5 | 5.6 | 1.5 | 5.3 | 1.5 | 4.6 | 1.5 | 4.2 | ns |
| t _{PLH} t _{PHL} | Propagation Delay CLKBA to Ax, CLKAB to Bx | | 1.5 | 5.6 | 1.5 | 5.3 | 1.5 | 4.6 | 1.5 | 4.2 | ns |
| t _{PZH} t _{PZL} | Output Enable Time OEBA to Ax, OEAB to Bx | | 1.5 | 6.0 | 1.5 | 5.6 | 1.5 | 5.2 | 1.5 | 4.8 | ns |
| t _{PHZ} t _{PLZ} | Output Disable Time ⁽³⁾ OEBA to Ax, OEAB to Bx | | 1.5 | 5.6 | 1.5 | 5.2 | 1.5 | 5.2 | 1.5 | 5.2 | ns |
| t _{SU} | Setup Time HIGH or LOW Ax to CLKAB, Bx to CLKBA | | 3.0 | — | 3.0 | — | 3.0 | — | 2.4 | — | ns |
| t _H | Hold Time HIGH or LOW Ax to CLKAB, Bx to CLKBA | | 0 | — | 0 | — | 0 | — | 0 | — | ns |
| t _{SU} | Setup Time HIGH or LOW Ax to LEAB, Bx to LEBA | Clock HIGH | 3.0 | — | 3.0 | — | 3.0 | — | 2.0 | — | ns |
| | | Clock LOW | 1.5 | — | 1.5 | — | 1.5 | — | 1.5 | — | ns |
| t _H | Hold Time HIGH or LOW Ax to LEAB, Bx to LEBA | | 1.5 | — | 1.5 | — | 1.5 | — | 0.5 | — | ns |
| t _w | LEAB or LEBA Pulse Width HIGH ⁽³⁾ | | 3.0 | — | 3.0 | — | 3.0 | — | 3.0 | — | ns |
| t _w | CLKAB or CLKBA Pulse Width HIGH or LOW ⁽³⁾ | | 3.0 | — | 3.0 | — | 3.0 | — | 3.0 | — | ns |
| t _{SK(O)} | Output Skew ⁽⁴⁾ | | — | 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.

PI74FCT162501T Switching Characteristics over Operating Range

| Parameters | Description | Conditions ⁽¹⁾ | 162501AT | | 162501CT | | 162501DT | | 162501ET | | Unit | |
|--------------------------------------|--|---------------------------|------------|-----|----------|-----|----------|-----|----------|-----|------|----|
| | | | Com. | | Com. | | Com. | | Com. | | | |
| | | | Min | Max | Min | Max | Min | Max | Min | Max | | |
| t _{MAX} | CLKAB or CLKBA frequency | CL = 50 pF RL = 500Ω | — | 150 | — | 150 | — | 150 | — | 150 | MHz | |
| t _{PLH} t _{PHL} | Propagation Delay Ax to Bx or Ax to Bx | | 1.5 | 5.1 | 1.5 | 4.6 | 1.5 | 4.1 | 1.5 | 3.8 | ns | |
| t _{PLH} t _{PHL} | Propagation Delay LEBA to Ax, LEAB to Bx | | 1.5 | 5.6 | 1.5 | 5.3 | 1.5 | 4.6 | 1.5 | 4.2 | ns | |
| t _{PLH} t _{PHL} | Propagation Delay CLKBA to Ax, CLKAB to Bx | | 1.5 | 5.6 | 1.5 | 5.3 | 1.5 | 4.6 | 1.5 | 4.2 | ns | |
| t _{PZH} t _{PZL} | Output Enable Time OEBA to Ax, OEAB to Bx | | 1.5 | 6.0 | 1.5 | 5.6 | 1.5 | 5.2 | 1.5 | 4.8 | ns | |
| t _{PHZ} t _{PLZ} | Output Disable Time ⁽³⁾ OEBA to Ax, OEAB to Bx | | 1.5 | 5.6 | 1.5 | 5.2 | 1.5 | 5.2 | 1.5 | 5.2 | ns | |
| t _{SU} | Setup Time HIGH or LOW Ax to CLKAB, Bx to CLKBA | | 3.0 | — | 3.0 | — | 3.0 | — | 2.4 | — | ns | |
| t _H | Hold Time HIGH or LOW Ax to CLKAB, Bx to CLKBA | | 0 | — | 0 | — | 0 | — | 0 | — | ns | |
| t _{SU} | Setup Time HIGH or LOW Ax to LEAB, Bx to LEBA | | Clock HIGH | 3.0 | — | 3.0 | — | 3.0 | — | 2.0 | — | ns |
| | | | Clock LOW | 1.5 | — | 1.5 | — | 1.5 | — | 1.5 | — | ns |
| t _H | Hold Time HIGH or LOW Ax to LEAB, Bx to LEBA | | 1.5 | — | 1.5 | — | 1.5 | — | 0.5 | — | ns | |
| t _w | LEAB or LEBA Pulse Width HIGH ⁽³⁾ | | 3.0 | — | 3.0 | — | 3.0 | — | 3.0 | — | ns | |
| t _w | CLKAB or CLKBA Pulse Width HIGH or LOW ⁽³⁾ | | 3.0 | — | 3.0 | — | 3.0 | — | 3.0 | — | ns | |
| t _{sk(O)} | Output Skew ⁽⁴⁾ | | — | 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.

PI74FCT162H501T Switching Characteristics over Operating Range (Advance Information)

| Parameters | Description | Conditions ⁽¹⁾ | 162H501AT | | 162H501CT | | 162H501DT | | 162H501ET | | Unit |
|--------------------------------------|--|---------------------------|-----------|-----|-----------|-----|-----------|-----|-----------|-----|------|
| | | | Com. | | Com. | | Com. | | Com. | | |
| | | | Min | Max | Min | Max | Min | Max | Min | Max | |
| t _{MAX} | CLKAB or CLKBA frequency | C _L = 50 pF | — | 150 | — | 150 | — | 150 | — | 150 | MHz |
| t _{PLH} t _{PHL} | Propagation Delay Ax to Bx or Ax to Bx | R _L = 500Ω | 1.5 | 5.1 | 1.5 | 4.6 | 1.5 | 4.1 | 1.5 | 3.8 | ns |
| t _{PLH} t _{PHL} | Propagation Delay LEBA to Ax, LEAB to Bx | | 1.5 | 5.6 | 1.5 | 5.3 | 1.5 | 4.6 | 1.5 | 4.2 | ns |
| t _{PLH} t _{PHL} | Propagation Delay CLKBA to Ax, CLKAB to Bx | | 1.5 | 5.6 | 1.5 | 5.3 | 1.5 | 4.6 | 1.5 | 4.2 | ns |
| t _{PZH} t _{PZL} | Output Enable Time OEBA to Ax, OEAB to Bx | | 1.5 | 6.0 | 1.5 | 5.6 | 1.5 | 5.2 | 1.5 | 4.8 | ns |
| t _{PHZ} t _{PLZ} | Output Disable Time ⁽³⁾ OEBA to Ax, OEAB to Bx | | 1.5 | 5.6 | 1.5 | 5.2 | 1.5 | 5.2 | 1.5 | 5.2 | ns |
| t _{SU} | Setup Time HIGH or LOW Ax to CLKAB, Bx to CLKBA | | 3.0 | — | 3.0 | — | 3.0 | — | 2.4 | — | ns |
| t _H | Hold Time HIGH or LOW Ax to CLKAB, Bx to CLKBA | | 0 | — | 0 | — | 0 | — | 0 | — | ns |
| t _{SU} | Setup Time HIGH or LOW Ax to LEAB, Bx to LEBA | Clock HIGH | 3.0 | — | 3.0 | — | 3.0 | — | 2.0 | — | ns |
| | | Clock LOW | 1.5 | — | 1.5 | — | 1.5 | — | 1.5 | — | ns |
| t _H | Hold Time HIGH or LOW Ax to LEAB, Bx to LEBA | | 1.5 | — | 1.5 | — | 1.5 | — | 0.5 | — | ns |
| t _w | LEAB or LEBA Pulse Width HIGH ⁽³⁾ | | 3.0 | — | 3.0 | — | 3.0 | — | 3.0 | — | ns |
| t _w | CLKAB or CLKBA Pulse Width HIGH or LOW ⁽³⁾ | | 3.0 | — | 3.0 | — | 3.0 | — | 3.0 | — | ns |
| t _{SK(0)} | Output Skew ⁽⁴⁾ | | — | 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.