
HD74HC646/HD74HC648

Octal Bus Transceivers/Registers with Multiplexed 3-state outputs

HITACHI

Description

Six control inputs enable this device to be used as a latched transceiver, unlatched transceiver or a combination of both. As a latched transceiver, data from one bus is stored for later retrieval by the other bus. Alternately real time bus data (unlatched) may be directly transferred from one bus to another.

Circuit operation is determined by the Control \bar{G} , Direction, Clock AB, Clock BA, Select AB, Select BA control inputs. The enable input, Control \bar{G} , controls whether any bus outputs are enabled. The direction control Direction (DIR), determines which bus is enabled, and hence the direction data flows: The Select AB, Select BA inputs control whether the latched data (stored in D type flip-flops), or the bus data (from other bus input pins) is transferred. Each set of flip-flops has its own clock Clock AB and Clock BA, for storing data. Data is latched on the rising edge of the clock.

Features

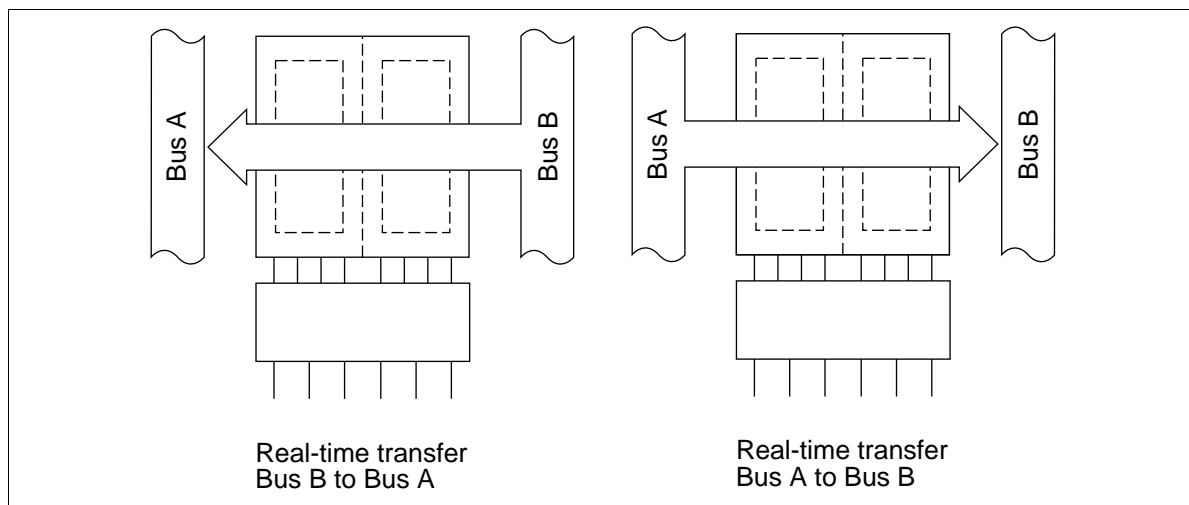
- High Speed Operation: t_{pd} (Bus to Bus) = 14 ns typ ($C_L = 50$ pF)
- High Output Current: Fanout of 15 LSTTL Loads
- Wide Operating Voltage: $V_{CC} = 2$ to 6 V
- Low Input Current: 1 μ A max
- Low Quiescent Supply Current: I_{CC} (static) = 4 μ A max ($T_a = 25^\circ\text{C}$)

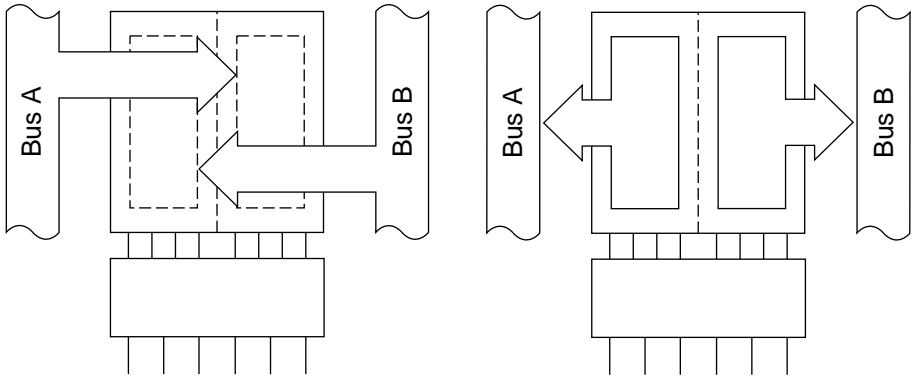
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Function Table

Inputs

| Control | Clock | Select | | | | Data I/O | Data I/O | Operation or Function | |
|-----------|-----------|--------|----|----|----|------------|------------|---------------------------|-----------------------------------|
| | | BA | AB | AB | BA | A1 thru A8 | B1 thru B8 | HD74HC646 | HD74HC648 |
| \bar{G} | Direction | BA | AB | AB | BA | A1 thru A8 | B1 thru B8 | HD74HC646 | HD74HC648 |
| H | X | X | X | X | X | Z (Input) | Z (Input) | Isolation | Isolation |
| H | X | | | H | H | Z (Input) | Z (Input) | Store A & B data | Store \bar{A} & \bar{B} data |
| L | L | X | X | X | L | Output | Z (Input) | B real-time data to A bus | \bar{B} real-time data to A bus |
| L | L | H | H | X | H | Output | Z (Input) | B stored data to A bus | \bar{B} stored data to A bus |
| L | L | L | L | X | H | Output | Z (Input) | B stored data to A bus | \bar{B} stored data to A bus |
| L | H | X | X | L | X | Z (Input) | Output | A real-time data to B bus | \bar{A} real-time data to B bus |
| L | H | H | H | H | X | Z (Input) | Output | A stored data to B bus | \bar{A} stored data to B bus |
| L | H | L | L | H | X | Z (Input) | Output | A stored data to B bus | \bar{A} stored data to B bus |

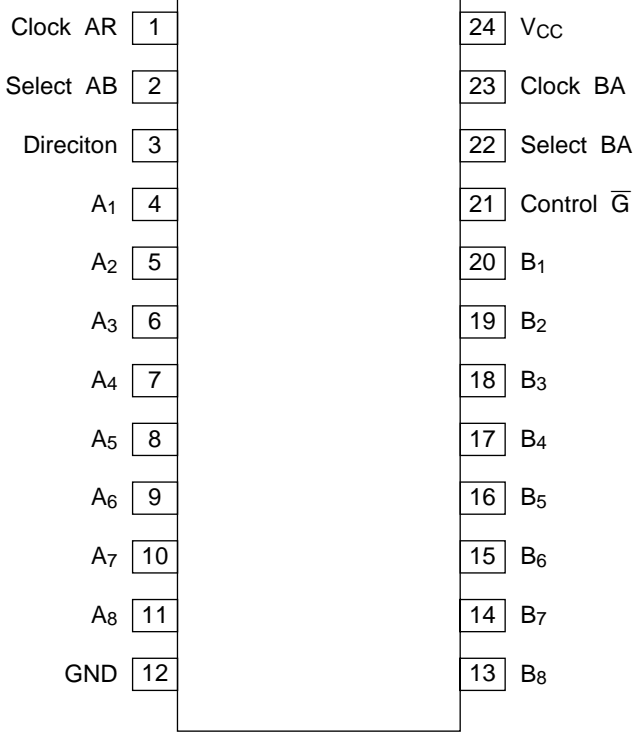




Storage from A, B, or A and B

Transfer stored data to A or B

Pin Arrangement



(Top view)

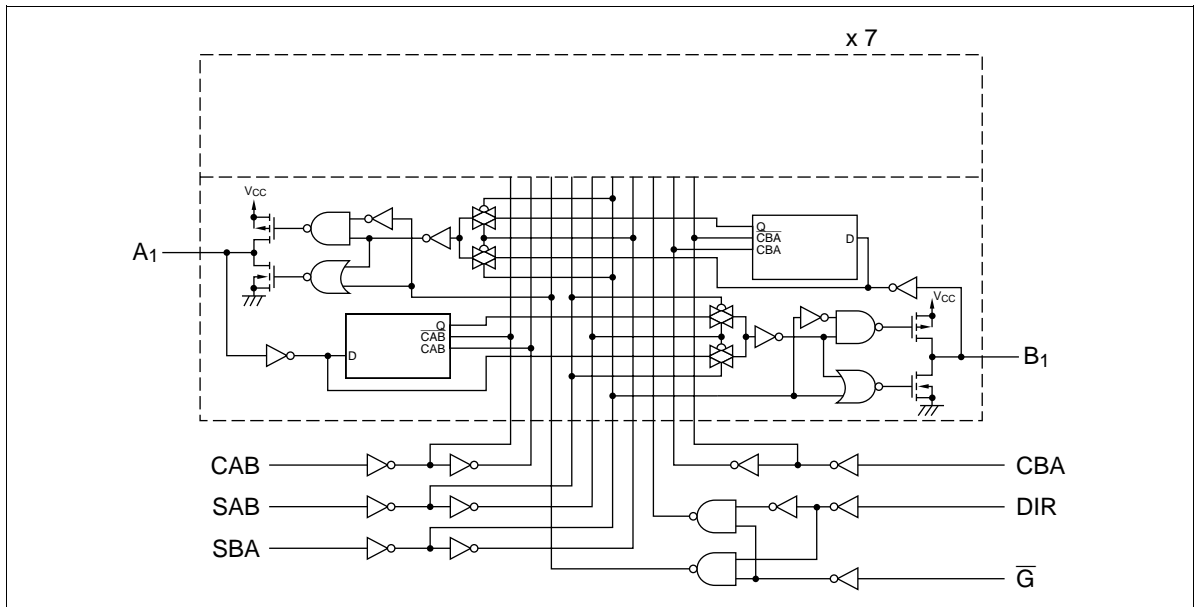
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Absolute Maximum Ratings

| Item | Symbol | Rating | Unit |
|-------------------------------------|----------------------|------------------------|-------------|
| Supply voltage range | V_{CC} | -0.5 to +7.0 | V |
| Input voltage | V_{IN} | -0.5 to $V_{CC} + 0.5$ | V |
| Output voltage | V_{OUT} | -0.5 to $V_{CC} + 0.5$ | V |
| Output current | I_{OUT} | ± 35 | mA |
| DC current drain per V_{CC} , GND | I_{CC} , I_{GND} | ± 75 | mA |
| DC input diode current | I_{IK} | ± 20 | mA |
| DC output diode current | I_{OK} | ± 20 | mA |
| Power Dissipation per package | P_T | 500 | mW |
| Storage temperature | T_{stg} | -65 to +150 | $^{\circ}C$ |

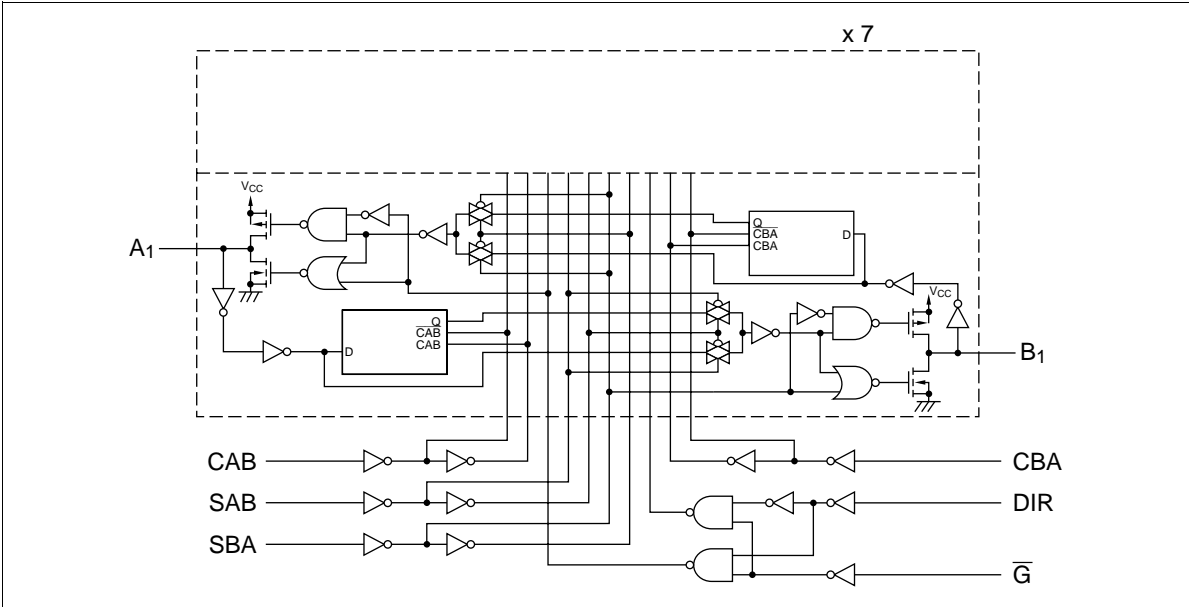
Logic Diagram

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DC Characteristics

| Item | Symbol | V _{CC} (V) | Ta = 25°C | | Ta = -40 to +85°C | | Unit | Test Conditions | |
|--------------------------|-----------------|---------------------|-----------|-----|-------------------|------|------|---|---|
| | | | Min | Typ | Max | Min | | | Max |
| Input voltage | V _{IH} | 2.0 | 1.5 | — | — | 1.5 | — | V | |
| | | 4.5 | 3.15 | — | — | 3.15 | — | | |
| | | 6.0 | 4.2 | — | — | 4.2 | — | | |
| | V _{IL} | 2.0 | — | — | 0.5 | — | 0.5 | | V |
| | | 4.5 | — | — | 1.35 | — | 1.35 | | |
| | | 6.0 | — | — | 1.8 | — | 1.8 | | |
| Output voltage | V _{OH} | 2.0 | 1.9 | 2.0 | — | 1.9 | — | Vin = V _{IH} or V _{IL} I _{OH} = -20 μA | |
| | | 4.5 | 4.4 | 4.5 | — | 4.4 | — | | |
| | | 6.0 | 5.9 | 6.0 | — | 5.9 | — | | |
| | | 4.5 | 4.18 | — | — | 4.13 | — | | I _{OH} = -6 mA |
| | | 6.0 | 5.68 | — | — | 5.63 | — | | I _{OH} = -7.8 mA |
| | V _{OL} | 2.0 | — | 0.0 | 0.1 | — | 0.1 | Vin = V _{IH} or V _{IL} I _{OL} = 20 μA | |
| | | 4.5 | — | 0.0 | 0.1 | — | 0.1 | | |
| | | 6.0 | — | 0.0 | 0.1 | — | 0.1 | | |
| | | 4.5 | — | — | 0.26 | — | 0.33 | | I _{OL} = 6 mA |
| | | 6.0 | — | — | 0.26 | — | 0.33 | | I _{OL} = 7.8 mA |
| Off-state output current | I _{OZ} | 6.0 | — | — | ±0.5 | — | ±5.0 | μA | Vin = V _{IH} or V _{IL} , Vout = V _{CC} or GND |
| Input current | I _{in} | 6.0 | — | — | ±0.1 | — | ±1.0 | μA | Vin = V _{CC} or GND |
| Quiescent supply current | I _{CC} | 6.0 | — | — | 4.0 | — | 40 | μA | Vin = V _{CC} or GND, Iout = 0 μA |

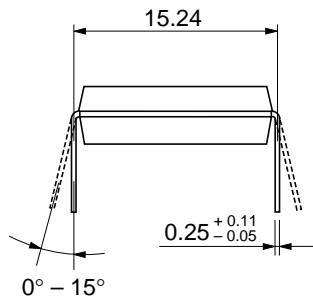
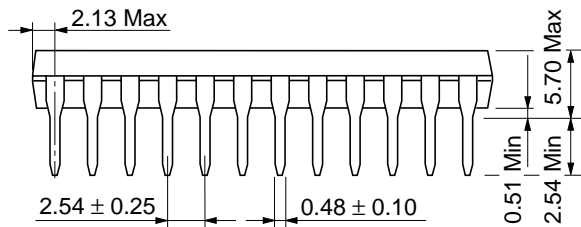
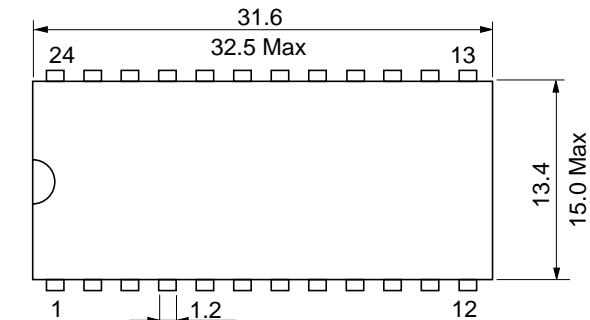
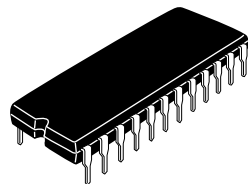
AC Characteristics ($C_L = 50$ pF, Input $t_r = t_f = 6$ ns)

| Item | Symbol | V_{CC} (V) | $T_a = 25^\circ\text{C}$ | | | $T_a = -40$ to $+85^\circ\text{C}$ | | Unit | Test Conditions |
|-------------------------|-----------|--------------|--------------------------|-----|-----|------------------------------------|-----|---|--|
| | | | Min | Typ | Max | Min | Max | | |
| Maximum clock frequency | f_{max} | 2.0 | — | — | 5 | — | 4 | ns | Clock AB to B or |
| | | 4.5 | — | — | 27 | — | 21 | | Clock BA to A |
| | | 6.0 | — | — | 32 | — | 25 | | |
| Propagation delay time | t_{PLH} | 2.0 | — | — | 170 | — | 215 | ns | A or B input to B or A output (HD74HC646 only) |
| | | 4.5 | — | 14 | 34 | — | 43 | | |
| | | 6.0 | — | — | 29 | — | 37 | | |
| | t_{PHL} | 2.0 | — | — | 150 | — | 190 | ns | A or B input to B or A output (HD74HC648 only) |
| | | 4.5 | — | 14 | 30 | — | 38 | | |
| | | 6.0 | — | — | 26 | — | 33 | | |
| | t_{PLH} | 2.0 | — | — | 220 | — | 275 | ns | Clock BA or Clock AB input to A or B output |
| | | 4.5 | — | 18 | 44 | — | 55 | | |
| | | 6.0 | — | — | 37 | — | 47 | | |
| | t_{PHL} | 2.0 | — | — | 170 | — | 215 | ns | Select BA or Select AB input to A or B output, with A or B high |
| | | 4.5 | — | 15 | 34 | — | 43 | | |
| | | 6.0 | — | — | 29 | — | 37 | | |
| t_{PLH} | 2.0 | — | — | 170 | — | 215 | ns | Select BA or Select AB input to A or B output, with A or B low | |
| | 4.5 | — | 16 | 34 | — | 43 | | | |
| | 6.0 | — | — | 29 | — | 37 | | | |
| Output enable time | t_{ZH} | 2.0 | — | — | 150 | — | 190 | ns | Control \overline{G} input or Direction to A or B output |
| | | 4.5 | — | 17 | 30 | — | 38 | | |
| | | 6.0 | — | — | 26 | — | 33 | | |
| Output disable time | t_{LZ} | 2.0 | — | — | 150 | — | 190 | ns | Control \overline{G} input to A or B output |
| | | 4.5 | — | 20 | 30 | — | 38 | | |
| | | 6.0 | — | — | 26 | — | 33 | | |
| Setup time | t_{su} | 2.0 | 100 | — | — | 125 | — | ns | |
| | | 4.5 | 20 | 3 | — | 25 | — | | |
| | | 6.0 | 17 | — | — | 21 | — | | |
| Hold time | t_h | 2.0 | 5 | — | — | 5 | — | ns | |
| | | 4.5 | 5 | 0 | — | 5 | — | | |
| | | 6.0 | 5 | — | — | 5 | — | | |

HD74HC646/HD74HC648

AC Characteristics ($C_L = 50$ pF, Input $t_r = t_f = 6$ ns) (cont)

| Item | Symbol | V_{CC} (V) | $T_a = 25^\circ\text{C}$ | | | $T_a = -40$ to $+85^\circ\text{C}$ | | Unit | Test Conditions |
|-----------------------|------------------------|--------------|--------------------------|-----|-----|------------------------------------|-----|------|-----------------|
| | | | Min | Typ | Max | Min | Max | | |
| Pulse width | t_w | 2.0 | 80 | — | — | 100 | — | ns | |
| | | 4.5 | 16 | 5 | — | 20 | — | | |
| | | 6.0 | 14 | — | — | 17 | — | | |
| Output rise/fall time | t_{TLH} t_{THL} | 2.0 | — | — | 60 | — | 75 | ns | |
| | | 4.5 | — | 4 | 12 | — | 15 | | |
| | | 6.0 | — | — | 10 | — | 13 | | |
| Input capacitance | C_{in} | — | — | 5 | 10 | — | 10 | pF | |



| | |
|--------------------------|----------|
| Hitachi Code | DP-24 |
| JEDEC | Conforms |
| EIAJ | Conforms |
| Weight (reference value) | 3.1 g |

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