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# HD74HC646/HD74HC648

Octal Bus Transceivers/Registers with Multiplexed 3-state outputs

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### 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  $\overline{G}$ , Direction, Clock AB, Clock BA, Select AB, Select BA control inputs. The enable input, Control  $\overline{G}$ , 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

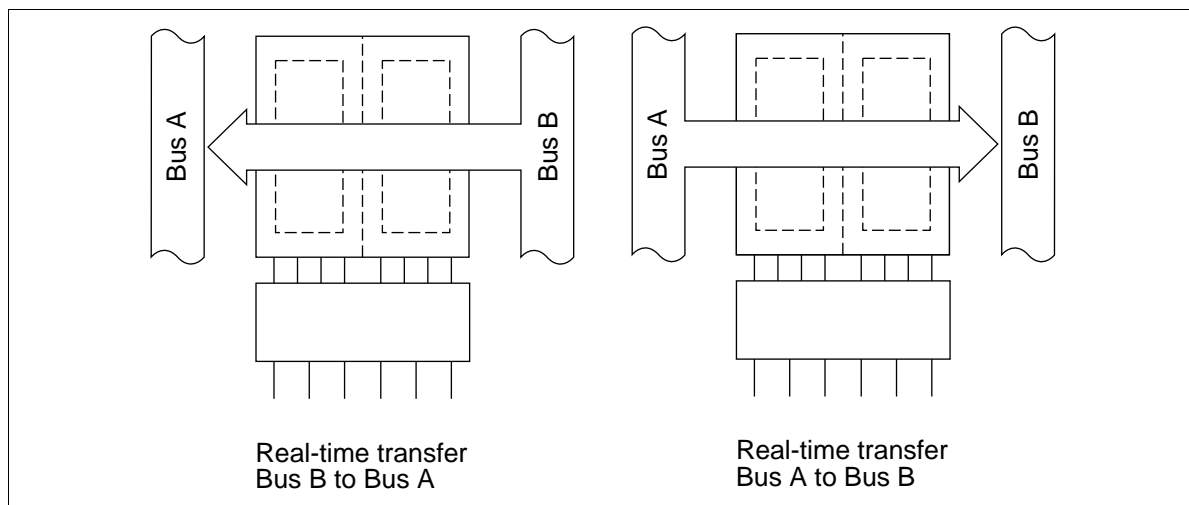
- High Speed Operation:  $t_{pd}$  (Bus to Bus) = 14 ns typ ( $C_L = 50$  pF)
- High Output Current: Fanout of 15 LSTTL Loads
- Wide Operating Voltage:  $V_{CC} = 2$  to 6 V
- Low Input Current: 1  $\mu$ A max
- Low Quiescent Supply Current:  $I_{CC}$  (static) = 4  $\mu$ A max ( $T_a = 25^\circ\text{C}$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

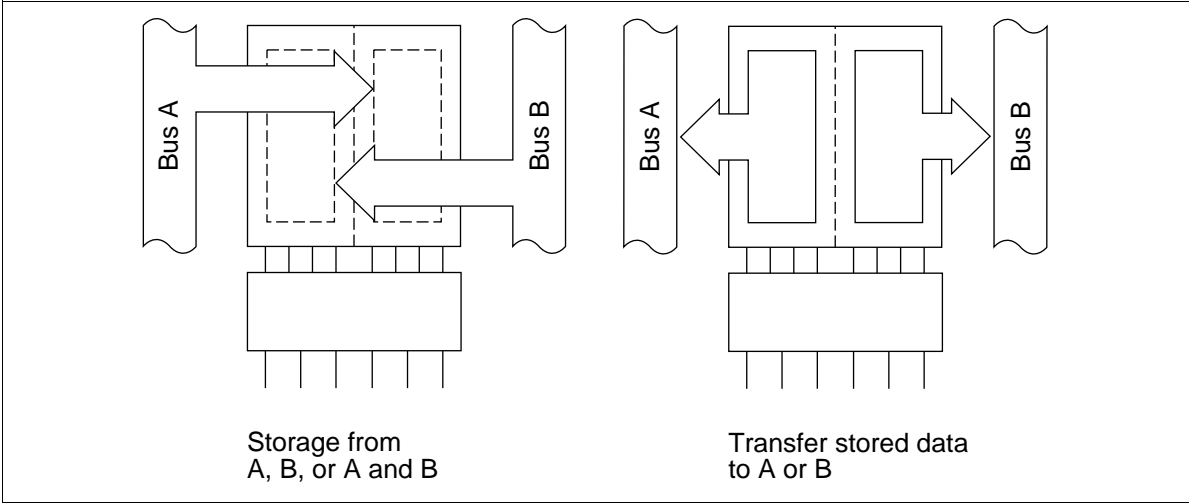
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## Function Table

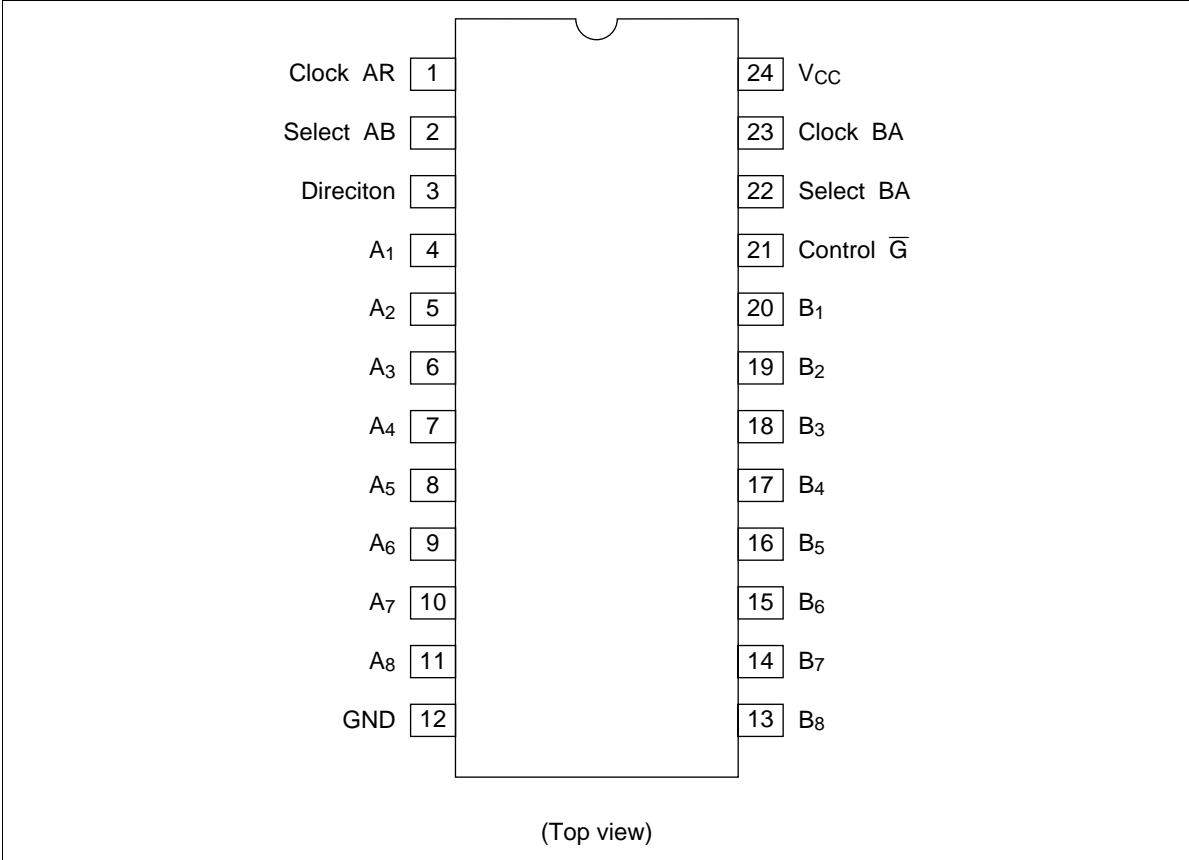
### Inputs

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





Pin Arrangement



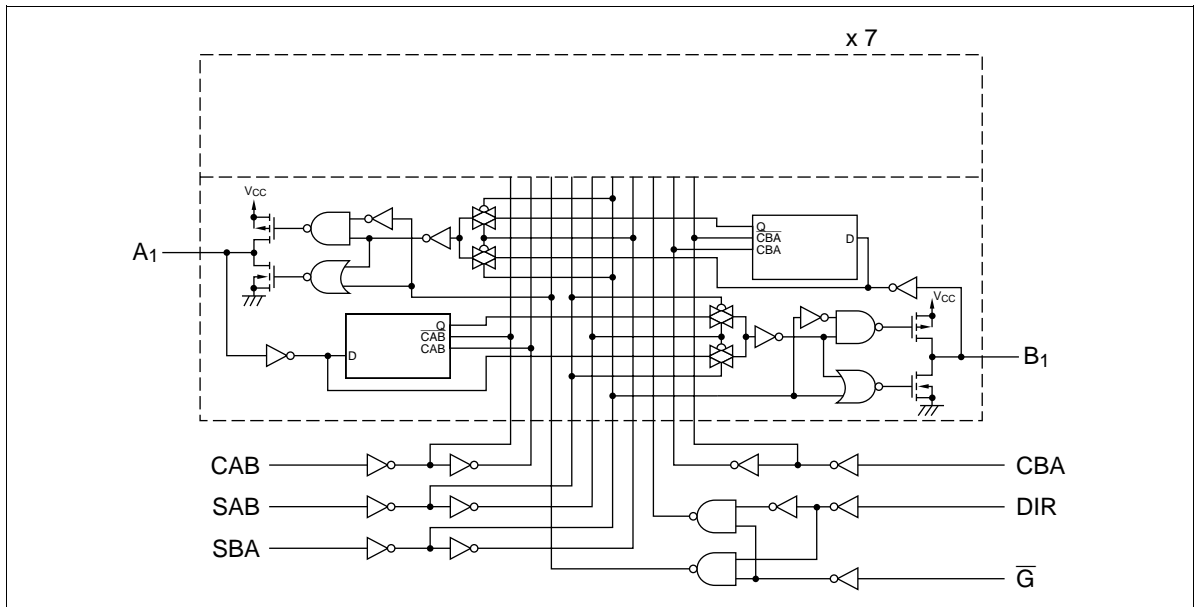
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## Absolute Maximum Ratings

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	$I_{OUT}$	$\pm 35$	mA
DC current drain per $V_{CC}$ , GND	$I_{CC}$ , $I_{GND}$	$\pm 75$	mA
DC input diode current	$I_{IK}$	$\pm 20$	mA
DC output diode current	$I_{OK}$	$\pm 20$	mA
Power Dissipation per package	$P_T$	500	mW
Storage temperature	$T_{stg}$	-65 to +150	$^{\circ}C$

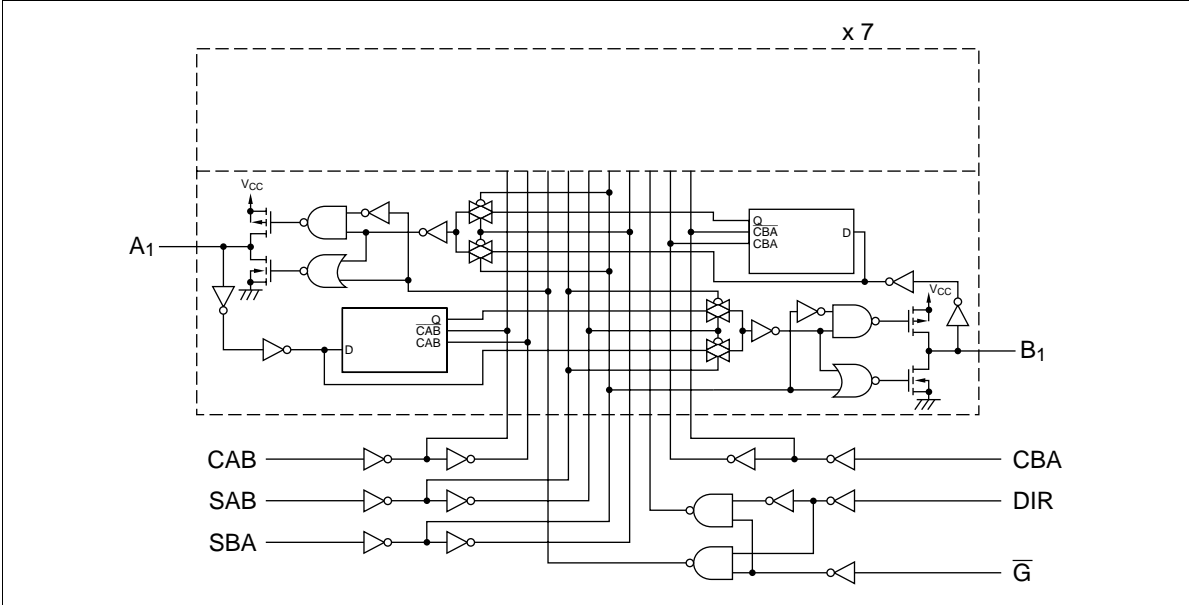
## Logic Diagram

### HD74HC646



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HD74HC648



## DC Characteristics

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

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

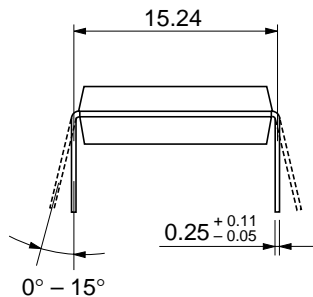
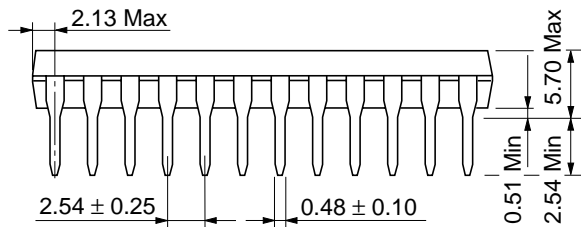
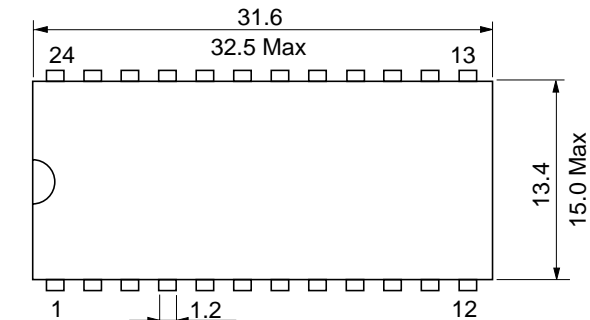
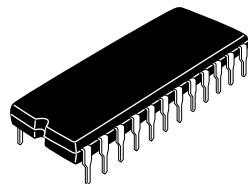
Item	Symbol	$V_{CC}$ (V)	$T_a = 25^\circ\text{C}$		$T_a = -40$ to $+85^\circ\text{C}$		Unit	Test Conditions	
			Min	Typ	Max	Min			Max
Maximum clock frequency	$f_{max}$	2.0	—	—	5	—	4	ns	Clock AB to B or
		4.5	—	—	27	—	21		Clock BA to A
		6.0	—	—	32	—	25		
Propagation delay time	$t_{PLH}$	2.0	—	—	170	—	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	—		

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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	$t_{TLH}$	2.0	—	—	60	—	75	ns	
	$t_{THL}$	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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