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

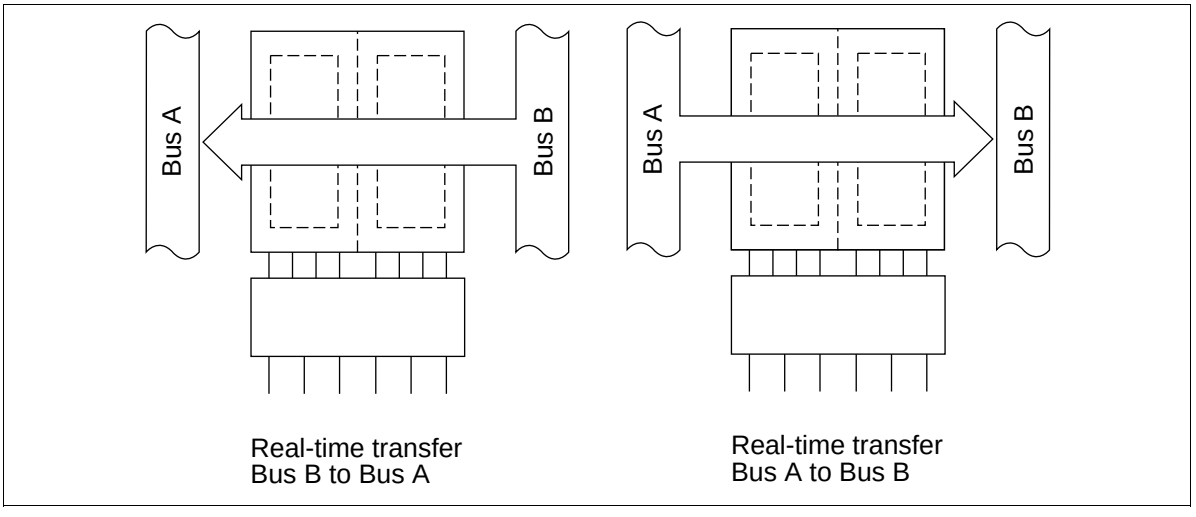
- High Speed Operation: t_{pd} (Bus to Bus) = 14 ns typ (C_L = 50 pF)
- High Output Current: Fanout of 15 LSTTL Loads
- Wide Operating Voltage: V_{CC} = 2 to 6 V
- Low Input Current: 1 µA max
- Low Quiescent Supply Current: I_{CC} (static) = 4 µA max (Ta = 25°C)

Hitachi semiconductor

Function Table

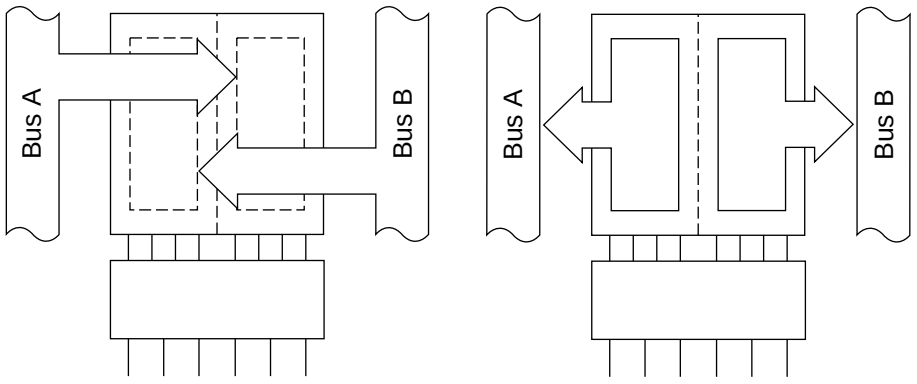
Inputs

Control		Clock		Select		Data I/O	Data I/O	Operation or Function	
$\overline{G}$	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 $\overline{A}$ & $\overline{B}$ data
L	L	X	X	X	L	Output	Z (Input)	B real-time data to A bus	$\overline{B}$ real-time data to A bus
L	L	H	H	X	H	Output	Z (Input)	B stored data to A bus	$\overline{B}$ stored data to A bus
L	L	L	L	X	H	Output	Z (Input)	B stored data to A bus	$\overline{B}$ stored data to A bus
L	H	X	X	L	X	Z (Input)	Output	A real-time data to B bus	$\overline{A}$ real-time data to B bus
L	H	H	H	H	X	Z (Input)	Output	A stored data to B bus	$\overline{A}$ stored data to B bus
L	H	L	L	H	X	Z (Input)	Output	A stored data to B bus	$\overline{A}$ stored data to B bus

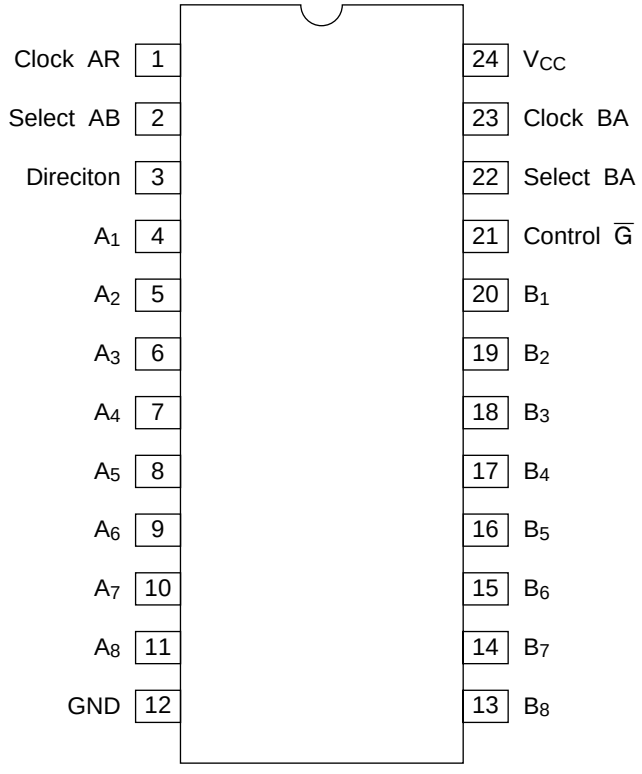


Real-time transfer
Bus B to Bus A

Real-time transfer
Bus A to Bus B



Pin Arrangement



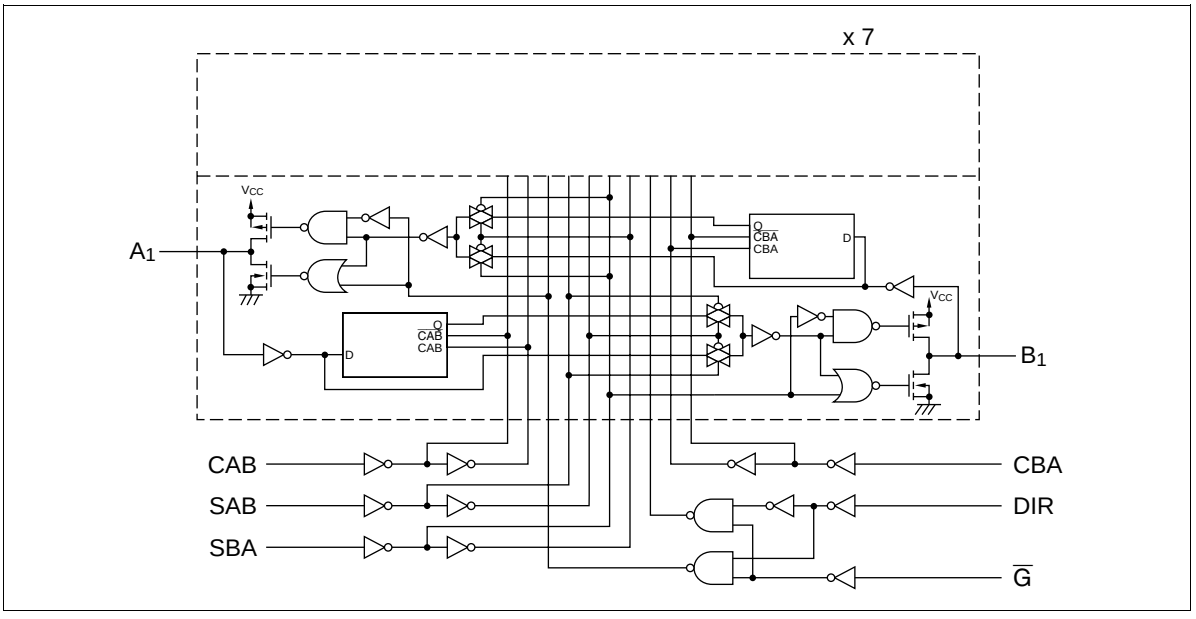
(Top view)

Absolute Maximum Ratings

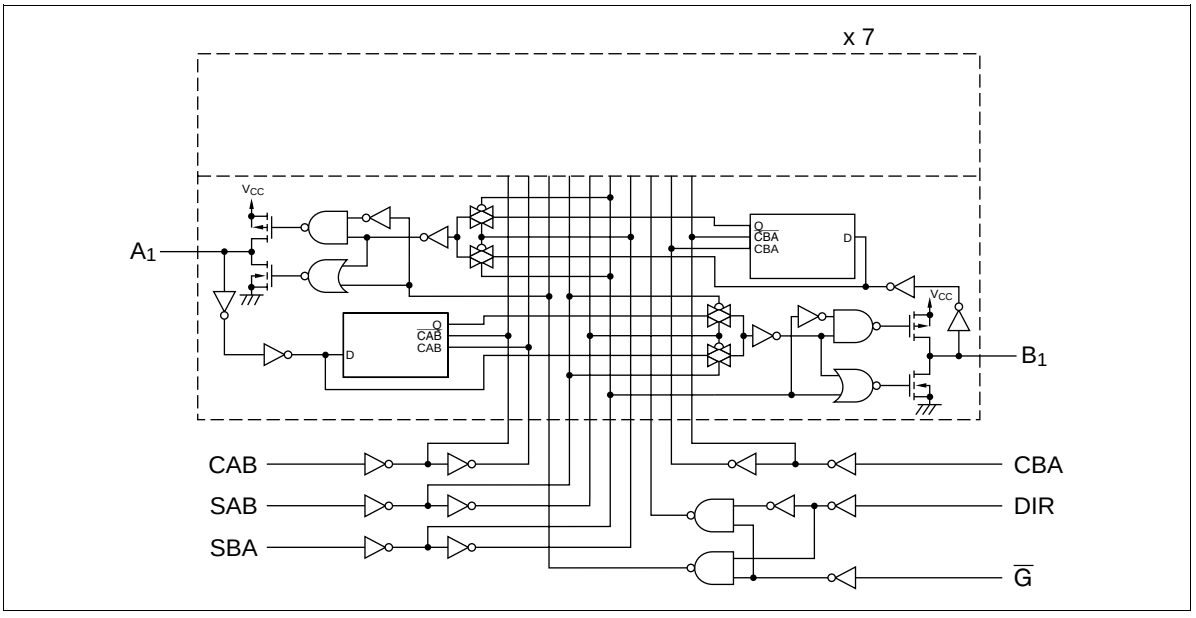
Item	Symbol	Rating	Unit
Supply voltage range	V_{CC}	–0.5 to +7.0	V
Input voltage	V_{IN}	–0.5 to V_{CC} + 0.5	V
Output voltage	V_{OUT}	–0.5 to V_{CC} + 0.5	V
Output current	I_{OUT}	±35	mA
DC current drain per V_{CC} , GND	I_{CC}, I_{GND}	±75	mA
DC input diode current	I_{IK}	±20	mA
DC output diode current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

Logic Diagram

HD74HC646



HD74HC648


x 7
V_{CC}
A_1
B_1
CAB
SAB
SBA
CBA
DIR
$\overline{G}$
D
Q
$\overline{CAB}$
CAB
$\overline{CBA}$

DC Characteristics

Item	Symbol	V_{CC} (V)	Ta = 25°C Min	Typ	Max	Ta = –40 to +85°C Min	Max	Unit	Test Conditions	
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	—	V	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	V	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	Iin	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	

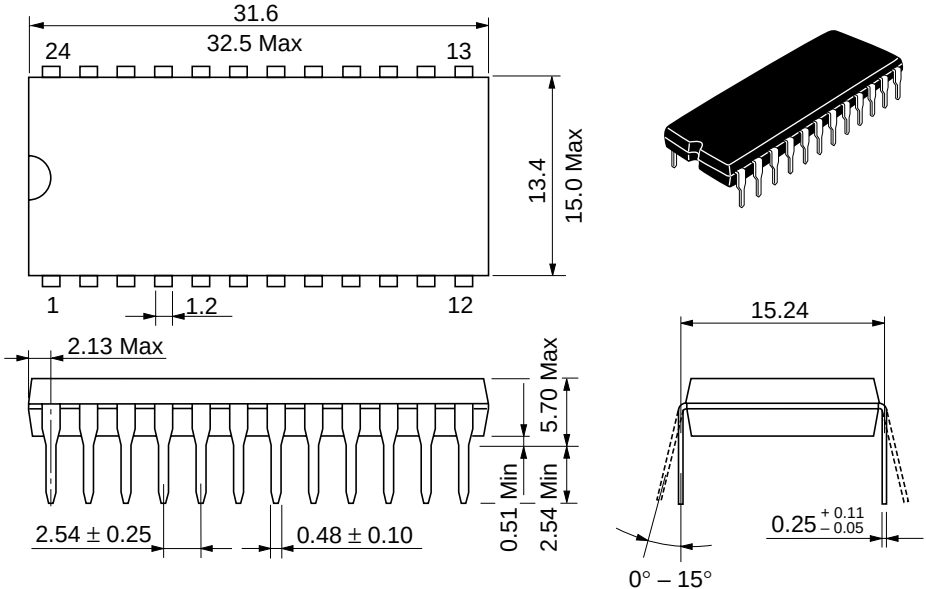
AC Characteristics (C_L = 50 pF, Input $t_r = t_f$ = 6 ns)

			Ta = 25°C			Ta = –40 to +85°C			
Item	**Symbol**	**V_{cc} (V)**	**Min**	**Typ**	**Max**	**Min**	**Max**	**Unit**	**Test Conditions**
Maximum clock frequency	f_{max}	2.0	—	—	5	—	4	ns	Clock AB to B or Clock BA to A
		4.5	—	—	27	—	21		
		6.0	—	—	32	—	25		
Propagation delay time	t_{PLH} t_{PHL}	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_{PLH} 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} t_{PHL}	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_{PLH} 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} t_{PHL}	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} t_{ZL}	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} t_{HZ}	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	—		

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

			Ta = 25°C			Ta = –40 to +85°C			
Item	**Symbol**	**V_{CC} (V)**	**Min**	**Typ**	**Max**	**Min**	**Max**	**Unit**	**Test Conditions**
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	Cin	—	—	5	10	—	10	pF	

Unit: mm



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

Cautions

1. Hitachi neither warrants nor grants licenses of any rights of Hitachi's or any third party's patent, copyright, trademark, or other intellectual property rights for information contained in this document. Hitachi bears no responsibility for problems that may arise with third party's rights, including intellectual property rights, in connection with use of the information contained in this document.
2. Products and product specifications may be subject to change without notice. Confirm that you have received the latest product standards or specifications before final design, purchase or use.
3. Hitachi makes every attempt to ensure that its products are of high quality and reliability. However, contact Hitachi's sales office before using the product in an application that demands especially high quality and reliability or where its failure or malfunction may directly threaten human life or cause risk of bodily injury, such as aerospace, aeronautics, nuclear power, combustion control, transportation, traffic, safety equipment or medical equipment for life support.
4. Design your application so that the product is used within the ranges guaranteed by Hitachi particularly for maximum rating, operating supply voltage range, heat radiation characteristics, installation conditions and other characteristics. Hitachi bears no responsibility for failure or damage when used beyond the guaranteed ranges. Even within the guaranteed ranges, consider normally foreseeable failure rates or failure modes in semiconductor devices and employ systemic measures such as fail-safes, so that the equipment incorporating Hitachi product does not cause bodily injury, fire or other consequential damage due to operation of the Hitachi product.
5. This product is not designed to be radiation resistant.
6. No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without written approval from Hitachi.
7. Contact Hitachi's sales office for any questions regarding this document or Hitachi semiconductor products.

HITACHI

Hitachi, Ltd.
Semiconductor & Integrated Circuits.
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

URL
NorthAmerica : http:semiconductor.hitachi.com/
Europe : http://www.hitachi-eu.com/hel/ecg
Asia (Singapore) : http://www.has.hitachi.com.sg/grp3/sicd/index.htm
Asia (Taiwan) : http://www.hitachi.com.tw/E/Product/SICD_Frame.htm
Asia (HongKong) : http://www.hitachi.com.hk/eng/bo/grp3/index.htm
Japan : http://www.hitachi.co.jp/Sicd/indx.htm

For further information write to:

Hitachi Semiconductor
(America) Inc.
179 East Tasman Drive,
San Jose,CA 95134
Tel: <1> (408) 433-1990
Fax: <1>(408) 433-0223

Hitachi Europe GmbH
Electronic components Group
Dornacher Straße 3
D-85622 Feldkirchen, Munich
Germany
Tel: <49> (89) 9 9180-0
Fax: <49> (89) 9 29 30 00

Hitachi Europe Ltd.
Electronic Components Group.
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire SL6 8YA, United Kingdom
Tel: <44> (1628) 585000
Fax: <44> (1628) 778322

Hitachi Asia Pte. Ltd.
16 Collyer Quay #20-00
Hitachi Tower
Singapore 049318
Tel: 535-2100
Fax: 535-1533

Hitachi Asia Ltd.
Taipei Branch Office
3F, Hung Kuo Building. No.167,
Tun-Hwa North Road, Taipei (105)
Tel: <886> (2) 2718-3666
Fax: <886> (2) 2718-8180

Hitachi Asia (Hong Kong) Ltd.
Group III (Electronic Components)
7/F., North Tower, World Finance Centre,
Harbour City, Canton Road, Tsim Sha Tsui,
Kowloon, Hong Kong
Tel: <852> (2) 735 9218
Fax: <852> (2) 730 0281
Telex: 40815 HITEC HX

Copyright ' Hitachi, Ltd., 1999. All rights reserved. Printed in Japan.