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# HD74HC651/HD74HC652

Octal Bus Transceivers/Registers (with inverted 3-state outputs)  
Octal Bus Transceivers/Registers (with 3-state outputs)

## HITACHI

ADE-205-519 (Z)  
1st. Edition  
Sep. 2000

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### Description

This device consists of bus transceiver circuits, D-type flip-flops, and control circuitry arranged for multiplexed transmission of data directly from the data bus or from the internal storage registers. Enable  $\overline{GAB}$  and  $\overline{GBA}$  are provided to control the transceiver functions. Select AB and Select BA control pins are provided to select whether real-time or stored data is transferred. A low input level selects real-time data, and a high selects stored data. The following examples demonstrate the four fundamental bus-management functions that can be performed with the HD74HC651 and HD74HC652.

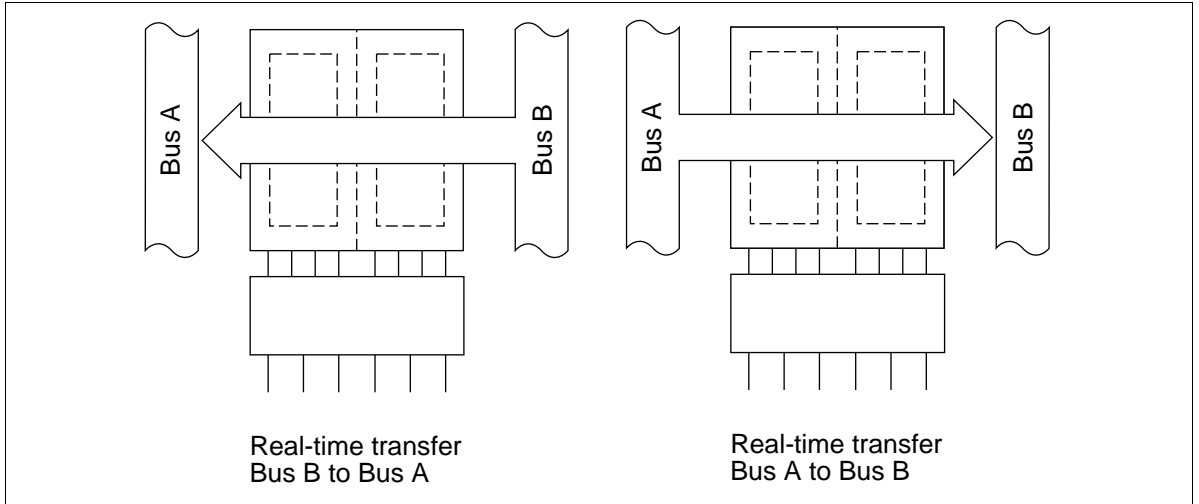
Data on the A or B data bus, or both, can be stored in the internal D flip-flops by low-to-high transition at the appropriate clock pins (Clock AB or Clock BA) regardless of the select or enable control pins. When Select AB and Select BA are in the real-time transfer mode, it is also possible to store data without using the internal D-type flip-flops by simultaneously enabling Enable  $\overline{GAB}$  and  $\overline{GBA}$ . In this configuration each output reinforces its input. Thus, when all other data sources to the two sets of bus lines are at high impedance, each set of bus lines will remain at its last state.

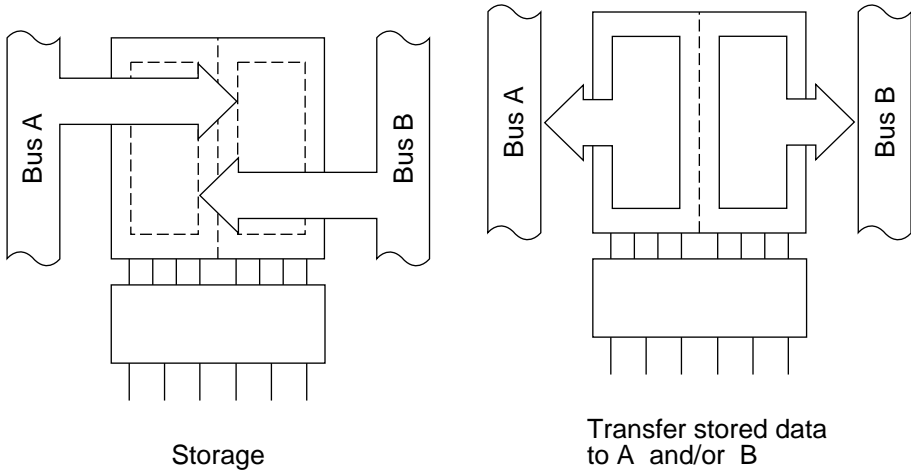
### Features

- High Speed Operation:  $t_{pd}$  (Bus to Bus) = 16 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 ( $T_a = 25^\circ\text{C}$ )

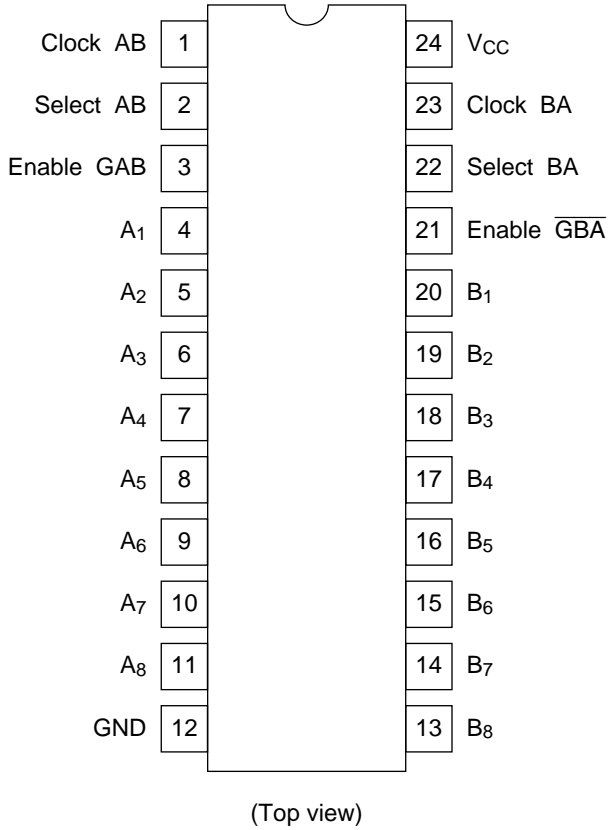
## Function Table

	Real-Time Transfer Bus B to Bus A	Real-Time Transfer Bus A to Bus B	Storage	Transfer Stored Data to A and/or B
Clock AB	X	X		L or H
Select AB	X	L	X	H
Enable GAB	L	H	L	H
Clock BA	X	X		L or H
Select BA	L	X	X	H
Enable GBA	L	H	H	L





Pin Arrangement



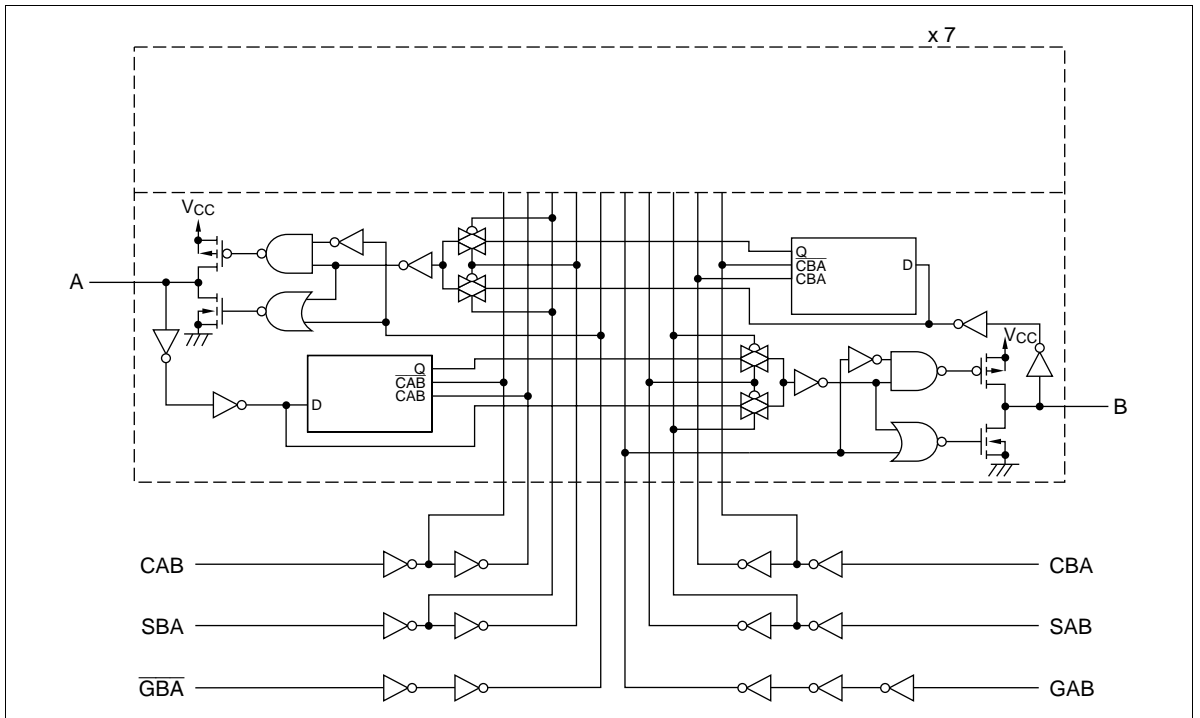
# HD74HC651/HD74HC652

## 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	$^{\circ}C$

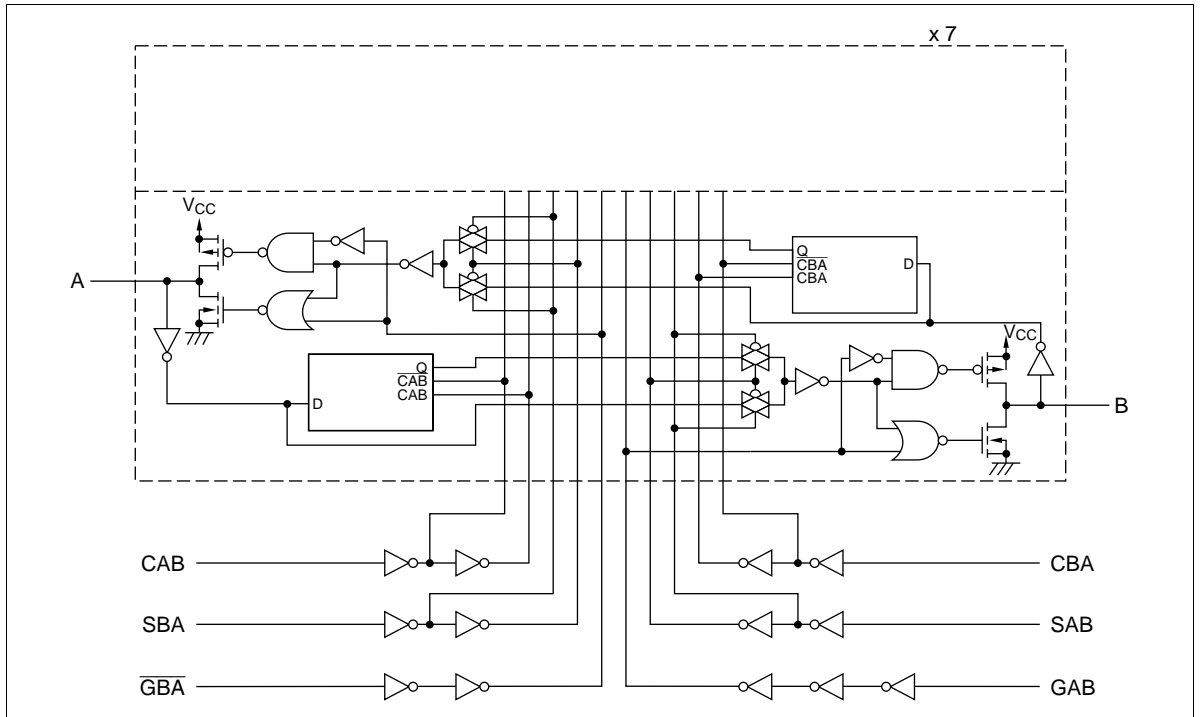
## Logic Diagram

### HD74HC651



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HD74HC652



## DC Characteristics

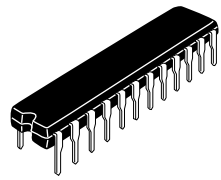
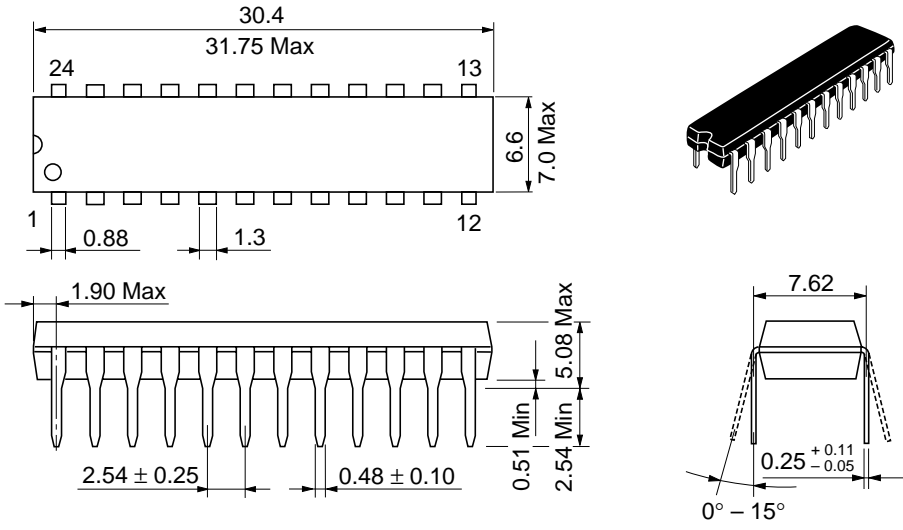
Item	Symbol	V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40 to +85°C		Unit	Test Conditions	
			Min	Typ	Max	Min	Max			
Input voltage	V <sub>IH</sub>	2.0	1.5	—	—	1.5	—	V		
		4.5	3.15	—	—	3.15	—			
		6.0	4.2	—	—	4.2	—			
	V <sub>IL</sub>	2.0	—	—	0.5	—	0.5			V
		4.5	—	—	1.35	—	1.35			
		6.0	—	—	1.8	—	1.8			
Output 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, I <sub>out</sub> = 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			
Propagation delay time	$t_{PLH}$	2.0	—	—	170	—	215	ns	Clock to Bus	
		4.5	—	19	34	—	43			
		6.0	—	—	29	—	37			
		$t_{PHL}$	2.0	—	—	135	—	170	ns	Bus to Bus
			4.5	—	16	27	—	34		
			6.0	—	—	23	—	29		
			2.0	—	—	190	—	240	ns	Select to Bus
			4.5	—	18	38	—	48		
			6.0	—	—	32	—	41		
Output enable time	$t_{ZL}$	2.0	—	—	150	—	190	ns		
	$t_{ZH}$	4.5	—	14	30	—	38			
		6.0	—	—	26	—	33			
Output disable time	$t_{LZ}$	2.0	—	—	150	—	190	ns		
	$t_{HZ}$	4.5	—	18	30	—	38			
		6.0	—	—	26	—	33			
Pulse width	$t_w$	2.0	80	—	—	100	—	ns		
		4.5	16	7	—	20	—			
		6.0	14	—	—	17	—			
Setup time	$t_{su}$	2.0	100	—	—	125	—	ns		
		4.5	20	4	—	25	—			
		6.0	17	—	—	21	—			
Hold time	$t_h$	2.0	5	—	—	5	—	ns		
		4.5	5	-1	—	5	—			
		6.0	5	—	—	5	—			
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		

## Package Dimensions

Unit: mm



Hitachi Code	DP-24N
JEDEC	—
EIAJ	Conforms
Mass (reference value)	1.84 g



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