

# HD74HC620, HD74HC623

Octal Bus Transceivers (with inverted 3-state outputs)

Octal Bus Transceivers (with 3-state outputs)

REJ03D0636-0200  
(Previous ADE-205-516)  
Rev.2.00  
Mar 30, 2006

## Description

This octal bus transceiver is designed for asynchronous two-way communication between data buses. The control function implementation allows for maximum flexibility in timing.

This device allows data transmission from the A bus to the B bus or from the B bus to the A bus depending upon the logic levels at the enable inputs ( $\overline{\text{GBA}}$  and  $\text{GAB}$ ).

The enable inputs can be used to disable the device so that the buses are effectively isolated.

The dual-enable configuration gives these devices the capability to store data by simultaneous enabling of  $\overline{\text{GBA}}$  and  $\text{GAB}$ . Each output reinforces its input in this transceiver configuration. Thus, when both control inputs are enabled and all other data sources to the two sets of bus lines are at high impedance, both sets of bus lines (16 in all) will remain at their last states. The 8-bit codes appearing on the two sets of buses will be identical for the HD74HC623 or complementary for the HD74HC620.

## Features

- High Speed Operation:  $t_{pd}$  (Bus to Bus) = 12 ns typ ( $C_L = 50$  pF)
- High Output Current: Fanout of 15 LSTTL Loads ( $Q_A$  to  $Q_H$  outputs)
- Wide Operating Voltage:  $V_{CC} = 2$  to 6 V
- Low Input Current: 1  $\mu\text{A}$  max
- Low Quiescent Supply Current:  $I_{CC}$  (static) = 4  $\mu\text{A}$  max ( $T_a = 25^\circ\text{C}$ )
- Ordering Information

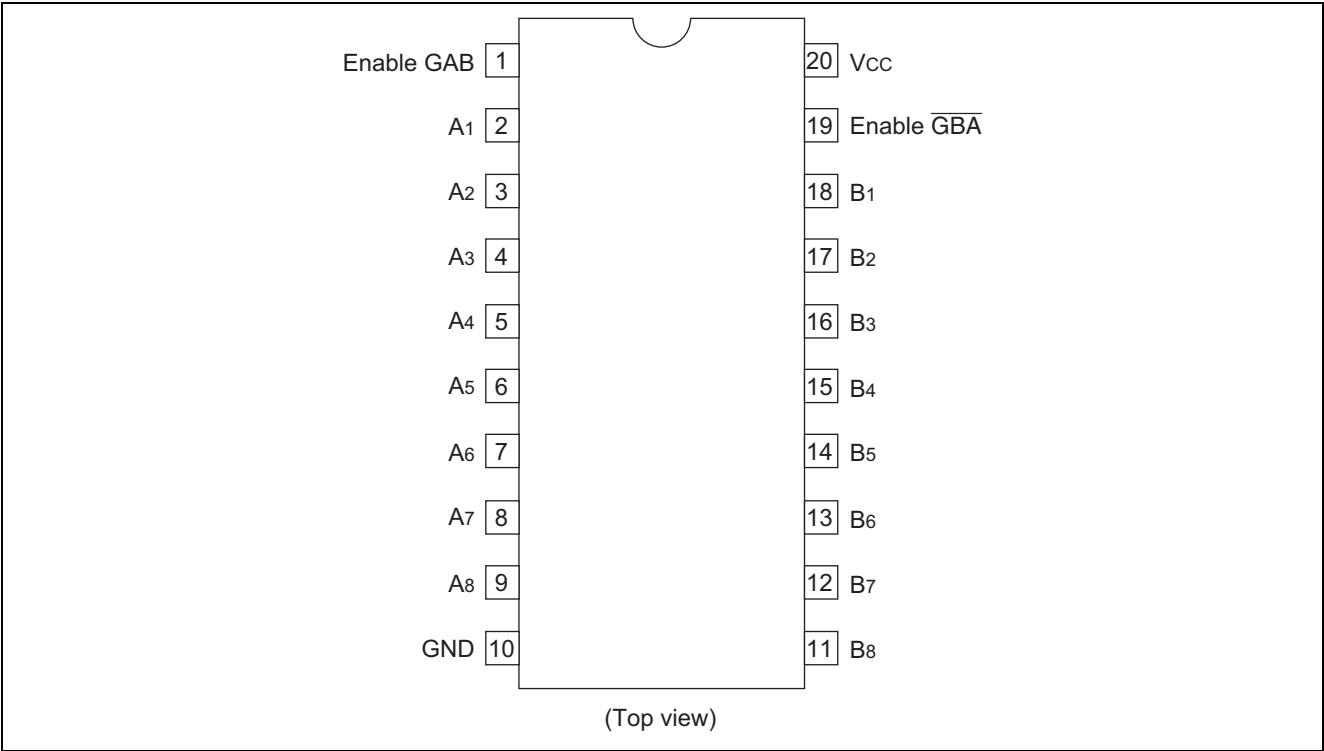
| Part Name                      | Package Type       | Package Code<br>(Previous Code) | Package<br>Abbreviation | Taping Abbreviation<br>(Quantity) |
|--------------------------------|--------------------|---------------------------------|-------------------------|-----------------------------------|
| HD74HC620P                     | DILP-20 pin        | PRDP0020AC-B<br>(DP-20NEV)      | P                       | —                                 |
| HD74HC620FPEL<br>HD74HC623FPEL | SOP-20 pin (JEITA) | PRSP0020DD-B<br>(FP-20DAV)      | FP                      | EL (2,000 pcs/reel)               |
| HD74HC620RPEL<br>HD74HC623RPEL | SOP-20 pin (JEDEC) | PRSP0020DC-A<br>(FP-20DBV)      | RP                      | EL (1,000 pcs/reel)               |

Note: Please consult the sales office for the above package availability.

## Function Table

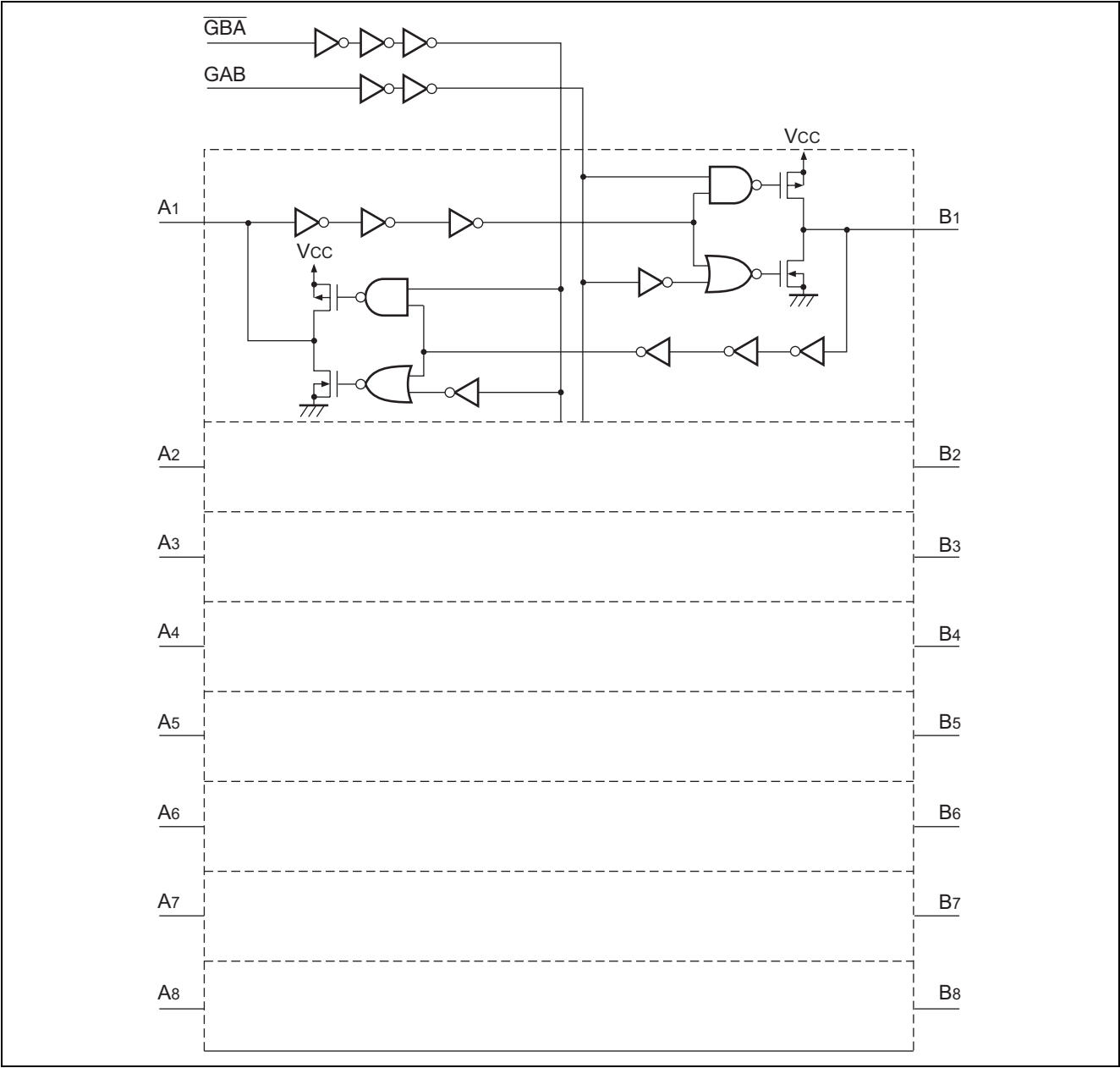
| Enable Inputs           |              | Operation                                                                |                                  |
|-------------------------|--------------|--------------------------------------------------------------------------|----------------------------------|
| $\overline{\text{GBA}}$ | $\text{GAB}$ | HD74HC620                                                                | HD74HC623                        |
| L                       | L            | $\overline{\text{B}}$ data to A bus                                      | B data to A bus                  |
| H                       | H            | $\overline{\text{A}}$ data to B bus                                      | A data to B bus                  |
| H                       | L            | Isolation                                                                | Isolation                        |
| L                       | H            | $\overline{\text{B}}$ data to A bus, $\overline{\text{A}}$ data to B bus | B data to A bus, A data to B bus |

Pin Arrangement

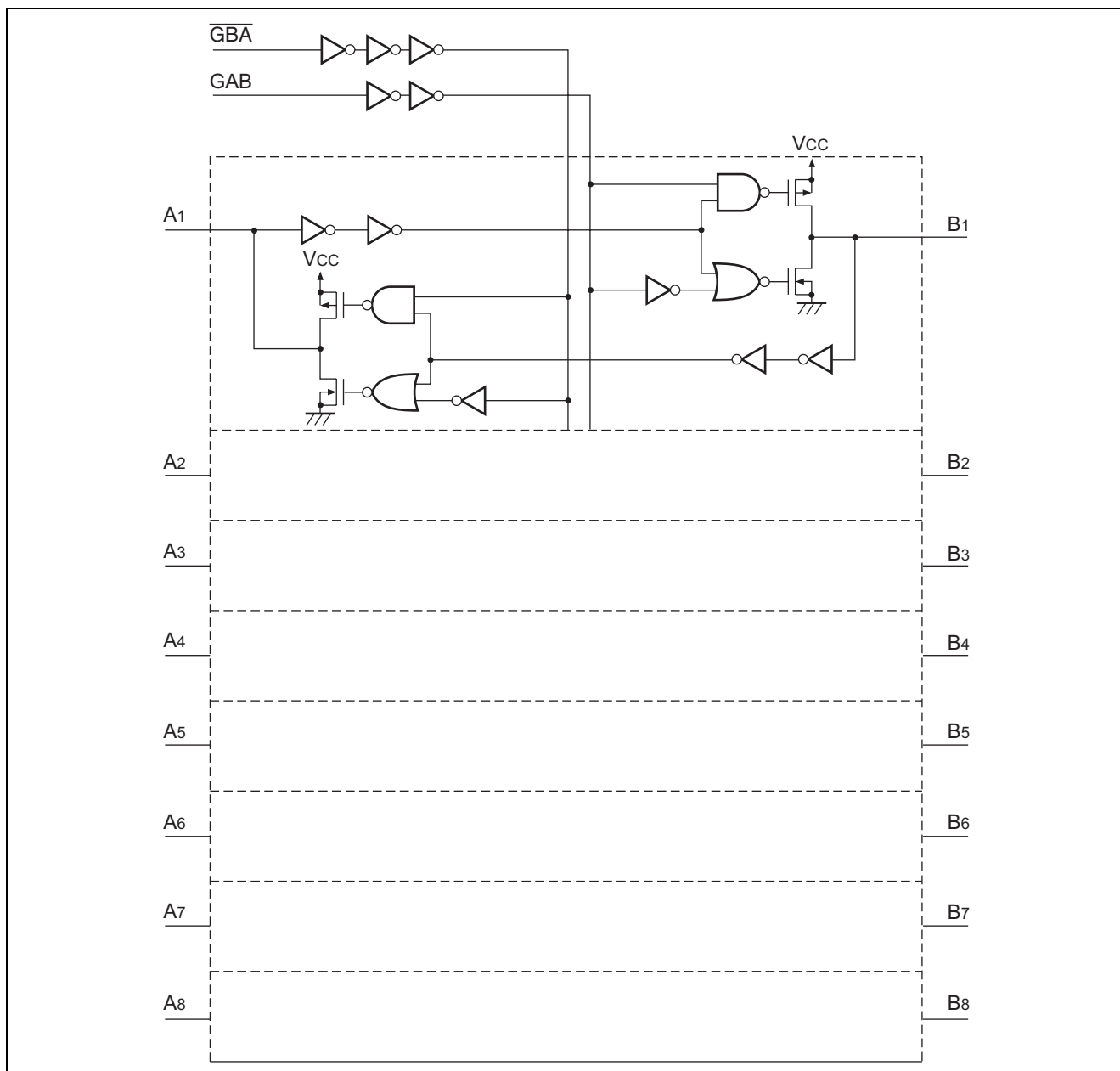


Logic Diagram

HD74HC620



## HD74HC623



## Absolute Maximum Ratings

| Item                         | Symbol                | Ratings                | Unit |
|------------------------------|-----------------------|------------------------|------|
| Supply voltage range         | $V_{CC}$              | -0.5 to 7.0            | V    |
| Input / Output voltage       | $V_{IN}, V_{OUT}$     | -0.5 to $V_{CC} + 0.5$ | V    |
| Input / Output diode current | $I_{IK}, I_{OK}$      | $\pm 20$               | mA   |
| Output current               | $I_{OUT}$             | $\pm 35$               | mA   |
| $V_{CC}$ , GND current       | $I_{CC}$ or $I_{GND}$ | $\pm 75$               | mA   |
| Power dissipation            | $P_T$                 | 500                    | mW   |
| Storage temperature          | $T_{stg}$             | -65 to +150            | °C   |

Note: The absolute maximum ratings are values, which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.

## Recommended Operating Conditions

| Item                                 | Symbol            | Ratings       | Unit | Conditions              |
|--------------------------------------|-------------------|---------------|------|-------------------------|
| Supply voltage                       | $V_{CC}$          | 2 to 6        | V    |                         |
| Input / Output voltage               | $V_{IN}, V_{OUT}$ | 0 to $V_{CC}$ | V    |                         |
| Operating temperature                | $T_a$             | -40 to 85     | °C   |                         |
| Input rise / fall time <sup>*1</sup> | $t_r, t_f$        | 0 to 1000     | ns   | $V_{CC} = 2.0\text{ V}$ |
|                                      |                   | 0 to 500      |      | $V_{CC} = 4.5\text{ V}$ |
|                                      |                   | 0 to 400      |      | $V_{CC} = 6.0\text{ V}$ |

Note: 1. This item guarantees maximum limit when one input switches.

Waveform: Refer to test circuit of switching characteristics.

## Electrical Characteristics

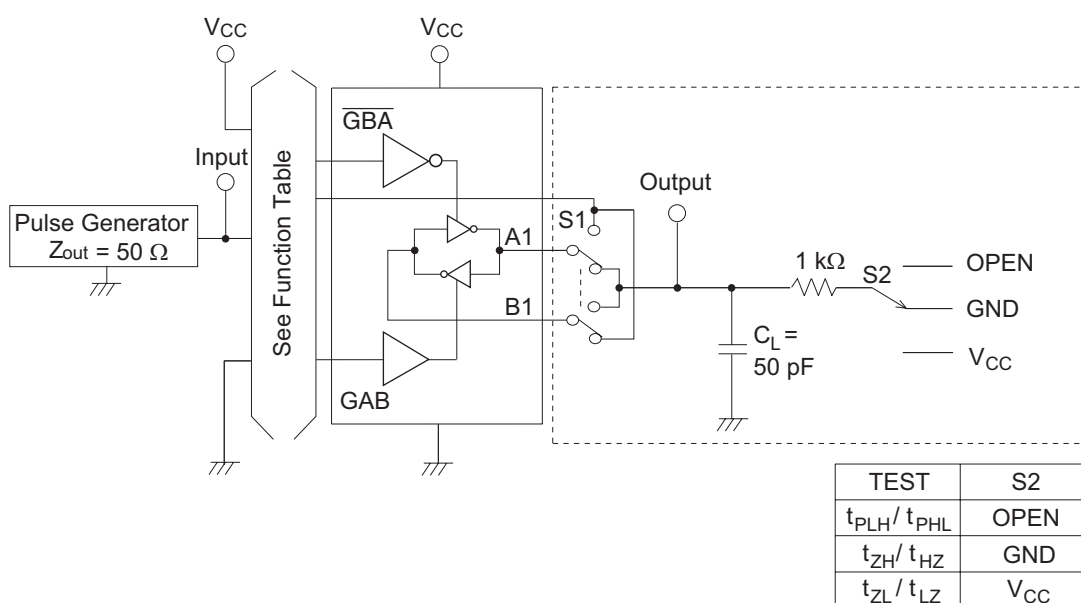
| Item                     | Symbol          | V <sub>CC</sub> (V) | Ta = 25°C |     |      | Ta = −40 to+85°C |      | Unit | Test Conditions                                                             |                           |                          |
|--------------------------|-----------------|---------------------|-----------|-----|------|------------------|------|------|-----------------------------------------------------------------------------|---------------------------|--------------------------|
|                          |                 |                     | 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              | —    |      |                                                                             | I <sub>OH</sub> = −6 mA   |                          |
|                          |                 | 6.0                 | 5.9       | 6.0 | —    | 5.9              | —    |      |                                                                             | I <sub>OH</sub> = −7.8 mA |                          |
|                          |                 | 4.5                 | 4.18      | —   | —    | 4.13             | —    |      |                                                                             | I <sub>OL</sub> = 20 μA   |                          |
|                          |                 | 6.0                 | 5.68      | —   | —    | 5.63             | —    |      |                                                                             |                           |                          |
|                          | 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> ,<br>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                                   |                           |                          |

Switching Characteristics ( $C_L = 50 \text{ pF}$ , Input  $t_r = t_f = 6 \text{ ns}$ )

| Item                   | Symbol    | $V_{CC} \text{ (V)}$ | $T_a = 25^\circ\text{C}$ |     |     | $T_a = -40 \text{ to } +85^\circ\text{C}$ |     | Unit | Test Conditions |
|------------------------|-----------|----------------------|--------------------------|-----|-----|-------------------------------------------|-----|------|-----------------|
|                        |           |                      | Min                      | Typ | Max | Min                                       | Max |      |                 |
| Propagation delay time | $t_{PLH}$ | 2.0                  | —                        | —   | 100 | —                                         | 125 | ns   |                 |
|                        | $t_{PHL}$ | 4.5                  | —                        | 12  | 20  | —                                         | 25  |      |                 |
|                        |           | 6.0                  | —                        | —   | 17  | —                                         | 21  |      |                 |
| Output enable time     | $t_{ZH}$  | 2.0                  | —                        | —   | 150 | —                                         | 190 | ns   |                 |
|                        | $t_{ZL}$  | 4.5                  | —                        | 12  | 30  | —                                         | 38  |      |                 |
|                        |           | 6.0                  | —                        | —   | 26  | —                                         | 33  |      |                 |
| Output disable time    | $t_{HZ}$  | 2.0                  | —                        | —   | 150 | —                                         | 190 | ns   |                 |
|                        | $t_{LZ}$  | 4.5                  | —                        | 16  | 30  | —                                         | 38  |      |                 |
|                        |           | 6.0                  | —                        | —   | 26  | —                                         | 33  |      |                 |
| 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   |                 |

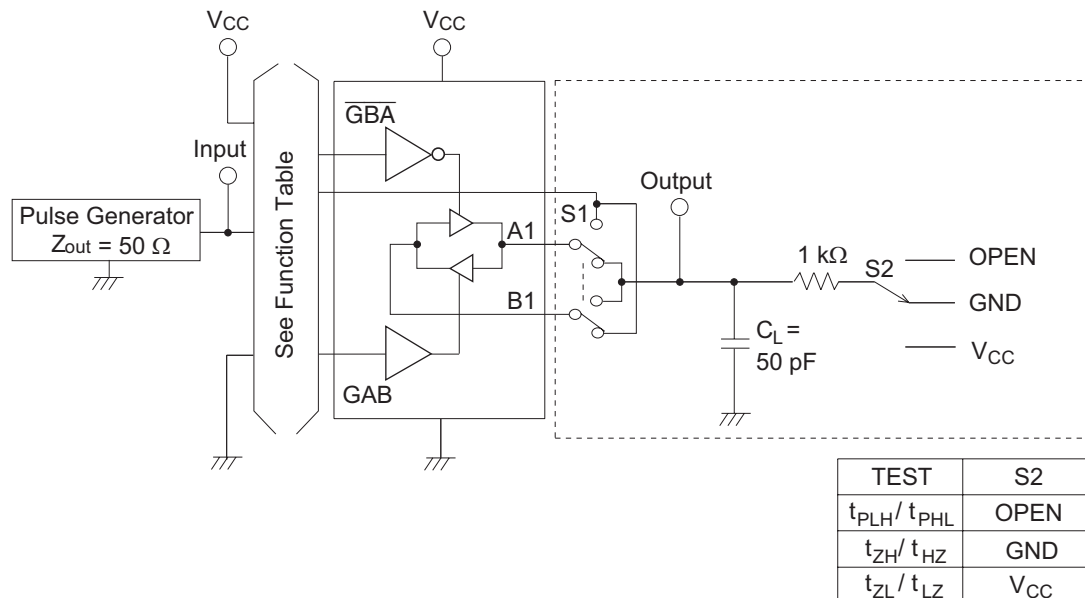
## Test Circuit

## HD74HC620



- Notes : 1.  $C_L$  includes probe and jig capacitance.  
 2. A2–B2, A3–B3, A4–B4, A5–B5, A6–B6, A7–B7, A8–B8 are identical to above load circuit.  
 3. S1 is a input / output switch.

## HD74HC623

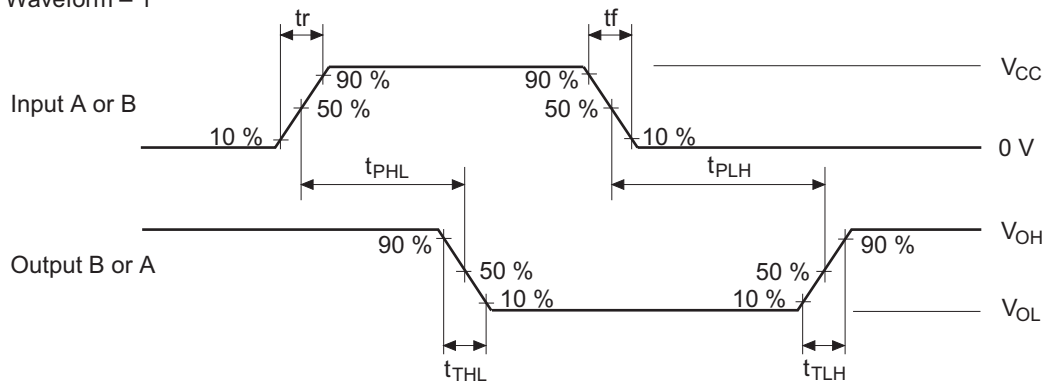


- Notes :
1.  $C_L$  includes probe and jig capacitance.
  2. A2–B2, A3–B3, A4–B4, A5–B5, A6–B6, A7–B7, A8–B8 are identical to above load circuit.
  3. S1 is a input / output switch.

## Waveforms

### HD74HC620

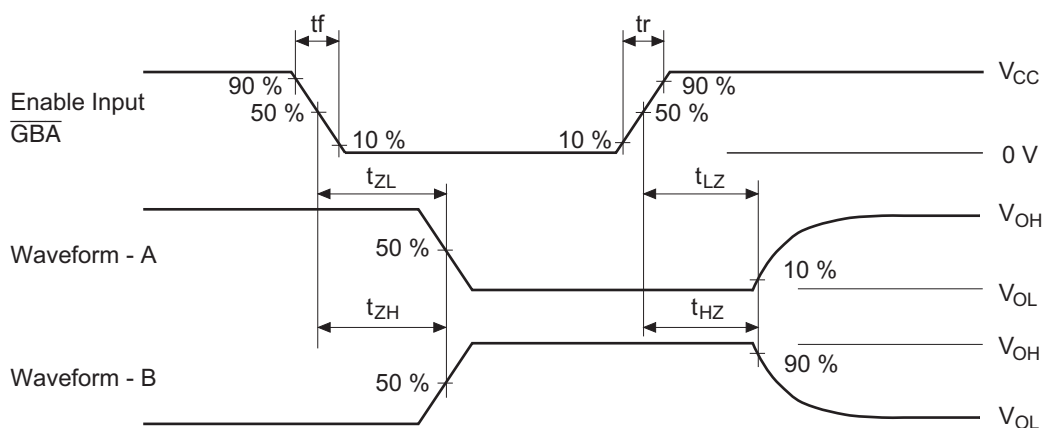
- Waveform – 1



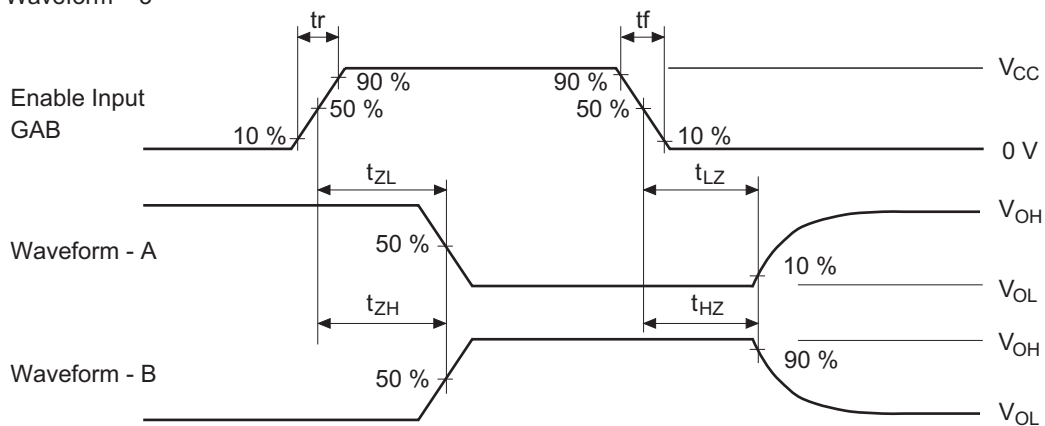
- Notes :
1. Input waveform : PRR  $\leq$  1 MHz, duty cycle 50%,  $t_r \leq 6$  ns,  $t_f \leq 6$  ns
  2. The output are measured one at a time with one transition per measurement.

HD74HC623

• Waveform – 2



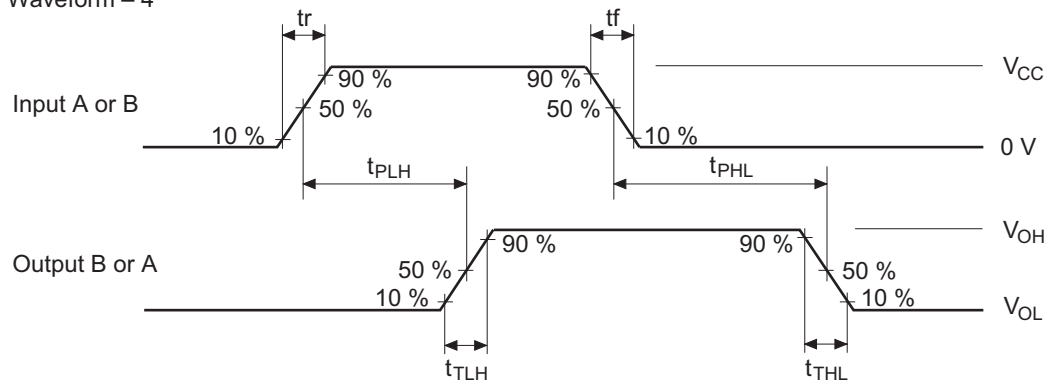
• Waveform – 3



- Notes :
1. Input waveform :  $PRR \leq 1 \text{ MHz}$ , duty cycle 50%,  $t_r \leq 6 \text{ ns}$ ,  $t_f \leq 6 \text{ ns}$
  2. Waveform - A is for an output with internal conditions such that the output is low except when disabled by the output control.
  3. Waveform - B is for an output with internal conditions such that the output is high except when disabled by the output control.
  4. The output are measured one at a time with one transition per measurement.

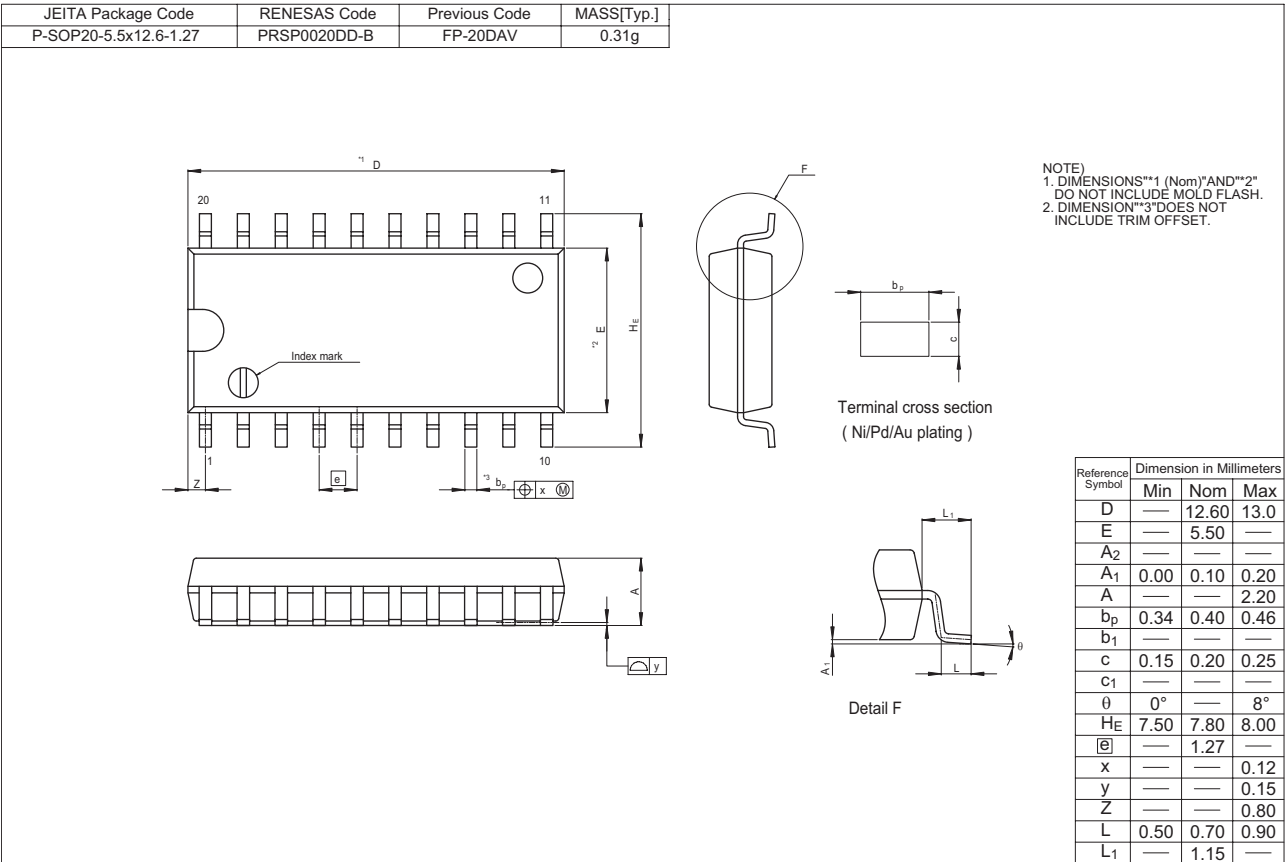
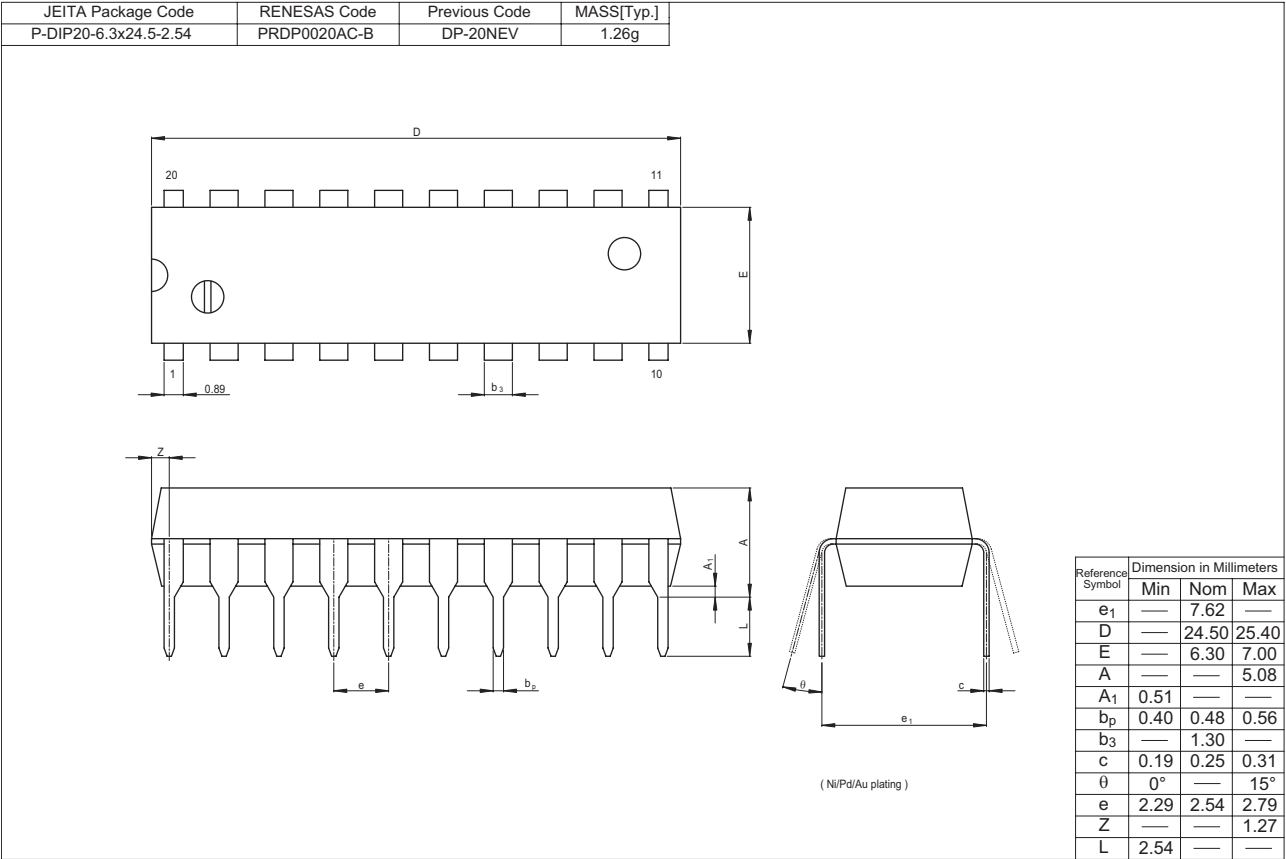


• Waveform – 4



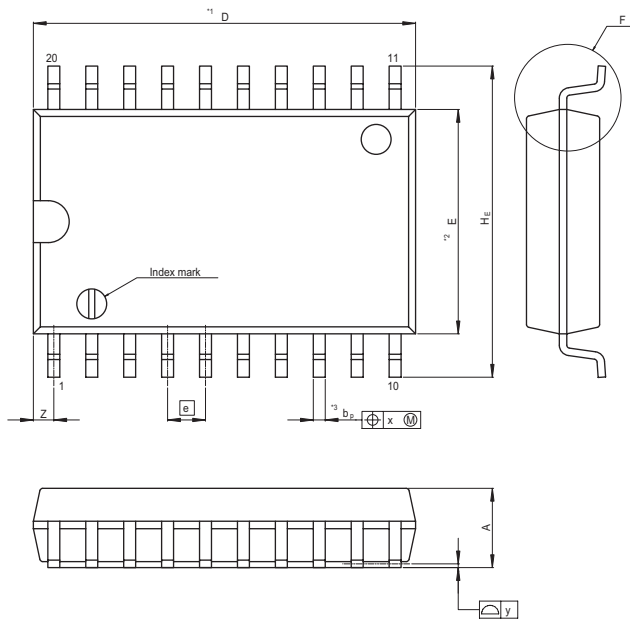
- Notes : 1. Input waveform :  $PRR \leq 1 \text{ MHz}$ , duty cycle 50%,  $t_r \leq 6 \text{ ns}$ ,  $t_f \leq 6 \text{ ns}$   
 2. The output are measured one at a time with one transition per measurement.

Package Dimensions

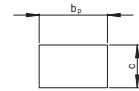


HD74HC620, HD74HC623

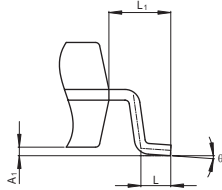
| JEITA Package Code    | RENESAS Code | Previous Code | MASS[Typ.] |
|-----------------------|--------------|---------------|------------|
| P-SOP20-7.5x12.8-1.27 | PRSP0020DC-A | FP-20DBV      | 0.52g      |



NOTE)  
1. DIMENSIONS\*\*1 (Nom)\*\*AND\*\*2\*  
@ DO NOT INCLUDE MOLD FLASH.  
2. DIMENSION\*\*3\*DOES NOT  
@ INCLUDE TRIM OFFSET.



Terminal cross section  
( Ni/Pd/Au plating )



Detail F

| Reference<br>Symbol | Dimension in Millimeters |       |       |
|---------------------|--------------------------|-------|-------|
|                     | Min                      | Nom   | Max   |
| D                   | —                        | 12.80 | 13.2  |
| E                   | —                        | 7.50  | —     |
| A <sub>2</sub>      | —                        | —     | —     |
| A <sub>1</sub>      | 0.10                     | 0.20  | 0.30  |
| A                   | —                        | —     | 2.65  |
| b <sub>p</sub>      | 0.34                     | 0.40  | 0.46  |
| b <sub>1</sub>      | —                        | —     | —     |
| c                   | 0.20                     | 0.25  | 0.30  |
| c <sub>1</sub>      | —                        | —     | —     |
| θ                   | 0°                       | —     | 8°    |
| H <sub>E</sub>      | 10.00                    | 10.40 | 10.65 |
| @                   | —                        | 1.27  | —     |
| x                   | —                        | —     | 0.12  |
| y                   | —                        | —     | 0.15  |
| z                   | —                        | —     | 0.935 |
| L                   | 0.40                     | 0.70  | 1.27  |
| L <sub>1</sub>      | —                        | 1.45  | —     |

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