

## TRIPLE 2-CHANNEL MULTIPLEXER

### ■ GENERAL DESCRIPTION

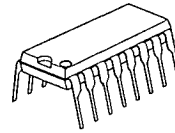
The NJU4053B is a triple 2-channel multiplexer with three independent control inputs and an inhibit input.

The three control input signals select 1 of a pair of channels to be turned on and connect them to the three outputs.

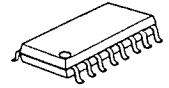
The operating voltage is as wide as 3 to 18V and the quiescent current is as low as  $5\mu\text{A}$  max. (at  $V_{DD}=5\text{V}$ ).

It is equivalent to RCA CD4053B and Motorola MC14053B.

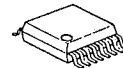
### ■ PACKAGE OUTLINE



NJU4053BD



NJU4053BM

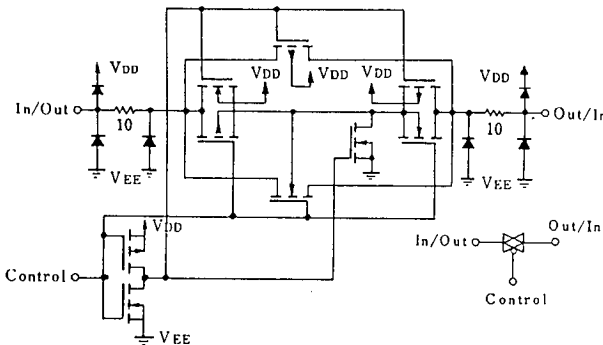


NJU4053BV

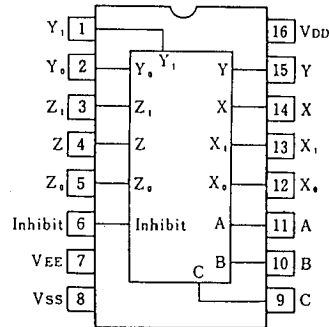
### ■ FEATURES

- High ON/OFF Output Voltage Ratio  
--- 85dB Typ. ( $R_L=10\text{k}\Omega$ )
- Low Quiescent Current  
---  $5\mu\text{A}$  Typ. at  $V_{DD}=5\text{V}$
- Low Crosstalk between channels  
--- 80dB Typ.
- Wide Operating Voltage  
--- 3 ~ 18V
- Linearity in the transfer characteristics.  
 $\Delta R_{ON} < 60\Omega$  ( $V_{IN}=V_{DD}\sim V_{EE}$ ,  $V_{DD}=15\text{V}$ )
- Package Outline  
--- DIP/DMP/SSOP 16
- C-MOS Technology

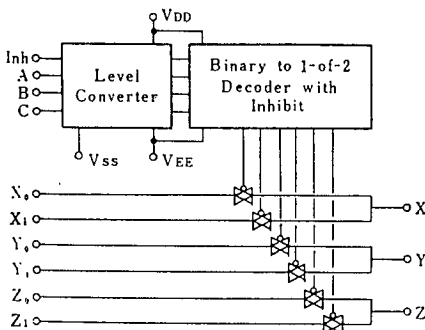
### ■ EQUIVALENT CIRCUIT



### ■ PIN CONFIGURATION



### ■ BLOCK DIAGRAM



### ■ TRUTH TABLE

| INH | C | B | A | On Switch      |                |                |
|-----|---|---|---|----------------|----------------|----------------|
| 0   | 0 | 0 | 0 | Z <sub>0</sub> | Y <sub>0</sub> | X <sub>0</sub> |
| 0   | 0 | 0 | 1 | Z <sub>0</sub> | Y <sub>0</sub> | X <sub>1</sub> |
| 0   | 0 | 1 | 0 | Z <sub>0</sub> | Y <sub>1</sub> | X <sub>0</sub> |
| 0   | 0 | 1 | 1 | Z <sub>0</sub> | Y <sub>1</sub> | X <sub>1</sub> |
| 0   | 1 | 0 | 0 | Z <sub>1</sub> | Y <sub>0</sub> | X <sub>0</sub> |
| 0   | 1 | 0 | 1 | Z <sub>1</sub> | Y <sub>0</sub> | X <sub>1</sub> |
| 0   | 1 | 1 | 0 | Z <sub>1</sub> | Y <sub>1</sub> | X <sub>0</sub> |
| 0   | 1 | 1 | 1 | Z <sub>1</sub> | Y <sub>1</sub> | X <sub>1</sub> |
| 1   | x | x | x | None           |                |                |

x: Don't Care

■ ABSOLUTE MAXIMUM RATINGS

( Ta=25°C )

| PARAMETER                     | SYMBOL            | RATINGS                              | UNIT |
|-------------------------------|-------------------|--------------------------------------|------|
| Supply Voltage                | $V_{DD} - V_{EE}$ | - 0.5 ~ + 20                         | V    |
| Input Voltage(Control Signal) | $V_{IN}$          | $V_{SS}-0.5 \sim V_{DD}+0.5$         | V    |
| Input Voltage(Analog Signal)  | $V_{SIG}$         | $V_{EE}-0.5 \sim V_{DD}+0.5$         | V    |
| Input Current                 | $I_{IN}$          | ± 10                                 | mA   |
| Output Current                | $I_{OUT}$         | ± 10                                 | mA   |
| Power Dissipation             | $P_D$             | 500 (DIP)<br>200 (DMP)<br>300 (SSOP) | mW   |
| Operating Temperature Range   | $T_{opr}$         | - 40 ~ + 85                          | °C   |
| Storage Temperature Range     | $T_{stg}$         | - 65 ~ + 150                         | °C   |

■ ELECTRICAL CHARACTERISTICS

• DC Characteristics

(  $V_{SS}=0V$  )

| PARAMETER                     | SYMBOL          | CONDITIONS                                        | $V_{DD}$<br>(V)                                          | Ta=-40°C |                      | Ta=25°C |                    |                      | Ta=85°C            |                           | UNIT |
|-------------------------------|-----------------|---------------------------------------------------|----------------------------------------------------------|----------|----------------------|---------|--------------------|----------------------|--------------------|---------------------------|------|
|                               |                 |                                                   |                                                          | MIN      | MAX                  | MIN     | TYP                | MAX                  | MIN                | MAX                       |      |
| Quiescent Current             | $I_{DD}$        | No signal<br>Per Package                          | 5<br>10<br>15<br>20                                      |          | 5<br>10<br>20<br>100 |         |                    | 5<br>10<br>20<br>100 |                    | 150<br>300<br>600<br>3000 | μA   |
| On-State Resistance           | $R_{ON}$        | $0 \leq V_{IS} \leq V_{DD}$<br>$V_{EE}=V_{SS}=0V$ | 5<br>10<br>15                                            |          | 500<br>210<br>140    |         | 220<br>100<br>60   | 600<br>250<br>160    |                    | 800<br>300<br>200         | Ω    |
| On-State Resistance Deviation | $\Delta R_{ON}$ | Between 2 channels<br>$V_{EE}=V_{SS}=0V$          | 5<br>10<br>15                                            |          |                      |         | 15<br>10<br>5      |                      |                    |                           | Ω    |
| Off-Channel Leakage Current   |                 | Each channel<br>$V_{EE}=V_{SS}=0V$                | 18                                                       |          | ±1000                |         | ±10                | ±100                 |                    | ±1000                     | nA   |
| Input Capacitance             | $C_{IN}$        | $V_{IN}=0V$<br>Control Inhibit Switch             |                                                          |          |                      |         | 5.0<br>10          | 7.5                  |                    |                           | pF   |
| Low Level Input Voltage       | $V_{IL}$        | $R_L=10k\Omega$<br>$SW=V_{DD}$<br>$V_{EE}=V_{SS}$ | $V_O=1.0V$<br>5<br>$V_O=1.0V$<br>10<br>$V_O=1.5V$<br>15  |          | 1.5<br>3.0<br>4.0    |         |                    | 1.5<br>3.0<br>4.0    |                    | 1.5<br>3.0<br>4.0         | V    |
| High Level Input Voltage      | $V_{IH}$        |                                                   | $V_O=4.0V$<br>5<br>$V_O=9.0V$<br>10<br>$V_O=13.5V$<br>15 |          | 3.5<br>7.0<br>11.0   |         | 3.5<br>7.0<br>11.0 |                      | 3.5<br>7.0<br>11.0 |                           | V    |
| Input Current                 | $\pm I_{IN}$    |                                                   | $V_{IN}=0$ or 18V                                        | 18       |                      | ±0.1    |                    | ±0.1                 |                    | ± 1                       | μA   |

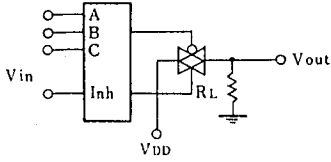
# SWITCHING CHARACTERISTICS

( Ta=25°C, CL=50pF )

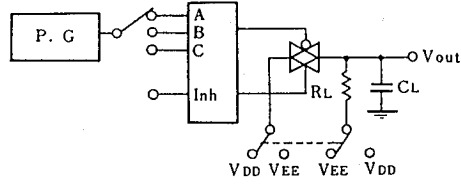
| PARAMETER                 |                      | SYMBOL           | CONDITIONS                                                                                  | V <sub>DD</sub> (V) | MIN  | TYP  | MAX | UNIT |
|---------------------------|----------------------|------------------|---------------------------------------------------------------------------------------------|---------------------|------|------|-----|------|
| Propagation Delay Time    | SW Input to Output   | t <sub>PLH</sub> | R <sub>L</sub> =10kΩ                                                                        | 5                   | 15   | 45   |     | ns   |
|                           |                      |                  |                                                                                             | 10                  | 8    | 30   |     |      |
|                           |                      |                  |                                                                                             | 15                  | 5    | 20   |     |      |
|                           | CONT Input to Output | t <sub>PHL</sub> |                                                                                             | 5                   | 15   | 45   |     | ns   |
|                           |                      |                  |                                                                                             | 10                  | 8    | 30   |     |      |
|                           |                      |                  |                                                                                             | 15                  | 5    | 20   |     |      |
|                           | t <sub>PZH</sub>     | 5                | 450                                                                                         | 1000                |      | ns   |     |      |
|                           |                      | 10               | 200                                                                                         | 500                 |      |      |     |      |
|                           |                      | 15               | 150                                                                                         | 400                 |      |      |     |      |
|                           | t <sub>PZL</sub>     | 5                | 450                                                                                         | 1000                |      | ns   |     |      |
|                           |                      | 10               | 200                                                                                         | 500                 |      |      |     |      |
|                           |                      | 15               | 150                                                                                         | 400                 |      |      |     |      |
| Output Enable Time        |                      | t <sub>PHZ</sub> | R <sub>L</sub> =10kΩ                                                                        | 5                   | 600  | 1400 |     | ns   |
|                           |                      | t <sub>PLZ</sub> |                                                                                             | 10                  | 250  | 700  |     |      |
|                           |                      |                  |                                                                                             | 15                  | 200  | 500  |     |      |
| Output Disable Time       |                      |                  |                                                                                             | 5                   | 600  | 1400 |     | ns   |
|                           |                      |                  |                                                                                             | 10                  | 250  | 700  |     |      |
|                           |                      |                  |                                                                                             | 15                  | 200  | 500  |     |      |
| Sine-Wave Distortion      |                      |                  | R <sub>L</sub> =10kΩ, f=1kHz, V <sub>IS</sub> =5V <sub>P-P</sub>                            | 10                  | 0.05 |      |     | %    |
| Feedthrough (all-ch. off) |                      |                  | R <sub>L</sub> =1kΩ, 20log <sub>10</sub> V <sub>os</sub> /V <sub>IS</sub> =-50dB            | 10                  | 4.5  |      |     | MHz  |
| Crosstalk                 | SW A to B            |                  | R <sub>L</sub> =1kΩ, V <sub>IS</sub> =1/2(V <sub>DD</sub> -V <sub>SS</sub> ) <sub>P-P</sub> | 10                  | 3.0  |      |     | MHz  |
|                           | Control-Out          |                  | R <sub>I</sub> =1kΩ, R <sub>L</sub> =10kΩ, tr=tf=20ns<br>CONTROL/INHIBIT                    | 10                  | 30   |      |     | mV   |

## MEASUREMENT CIRCUITS

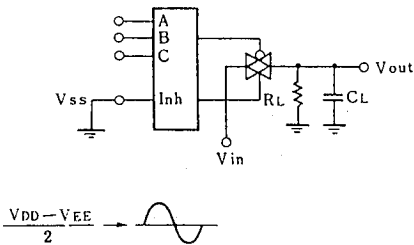
### 1. Noise Margin



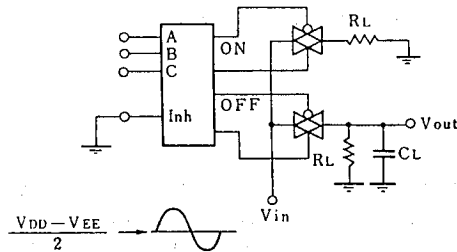
### 2. Propagation Delay



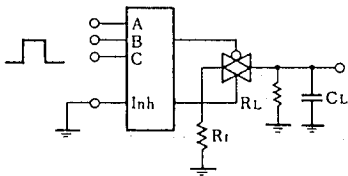
### 3. Feedthrough



### 4. Crosstalk (Switch A and B)



### 5. Crosstalk (Control and Out)



## MEMO

**[CAUTION]**

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