

### TRIPLE 2-CHANNEL MULTIPLEXER

#### GENERAL DESCRIPTION

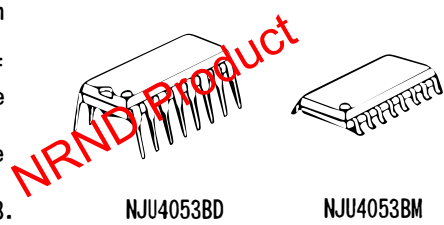
The NJU4053B is a triple 2-channel multiplexer with three independent control inputs and an inhibit input.

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 5μA max. (at V<sub>DD</sub>=5V).

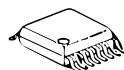
It is equivalent to RCA CD4053B and Motorola MC14053B.

#### PACKAGE OUTLINE



NJU4053BD

NJU4053BM

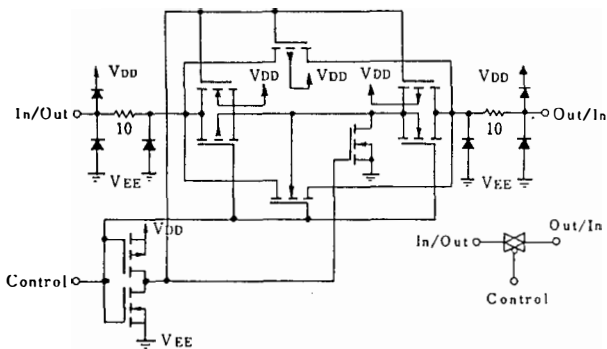


NJU4053B

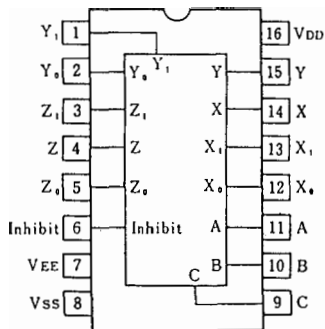
#### FEATURES

- High ON/OFF Output Voltage Ratio
  - 65dB Typ. (R<sub>L</sub>=10kΩ)
- Low Quiescent Current
  - 5μA Typ. at V<sub>DD</sub>=5V
- Low Crosstalk between channels
  - 80dB Typ.
- Wide Operating Voltage
  - 3 ~ 18V
- Linearity in the transfer characteristics.
  - ΔR<sub>ON</sub> < 60Ω (V<sub>IN</sub>=V<sub>DD</sub>~V<sub>EE</sub>, V<sub>DD</sub>=15V)
- Package Outline
  - DIP/DMP/SSOP 16
- C-MOS Technology

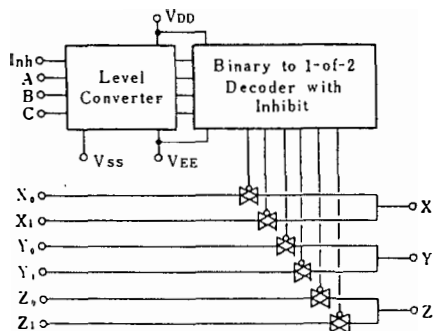
#### EQUIVALENT CIRCUIT



#### 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 | $\mu A$  |         |
| 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         | $\Omega$ |         |
| 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        |                   |                           | $\Omega$ |         |
| 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<br>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      | $\mu A$ |

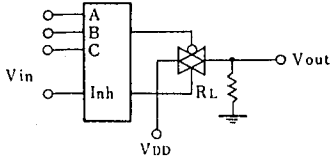
■ SWITCHING CHARACTERISTICS

( Ta=25°C, CL=50pF )

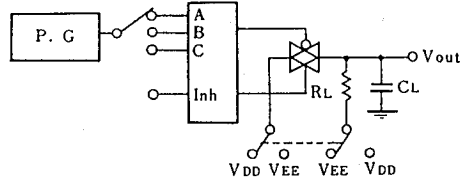
| PARAMETER                 |                    | SYMBOL               | CONDITIONS  | V <sub>DD</sub> (V) | MIN  | TYP | MAX | UNIT |
|---------------------------|--------------------|----------------------|---|---------------------|------|-----|-----|------|
| Propagation Delay Time    | SW Input to Output | t <sub>PLH</sub>     | R <sub>L</sub> =10kΩ  | 5                   | 15   | 45  | ns  |      |
|                           |                    |                      |   | 10                  | 8    | 30  |     |      |
|                           |                    | 15                   |   | 5                   | 20   |     |     |      |
|                           | t <sub>PHL</sub>   | 5                    |   | 15                  | 45   |     |     |      |
|                           |                    | 10                   |   | 8                   | 30   |     |     |      |
|                           |                    | 15                   |   | 5                   | 20   |     |     |      |
| CONT Input to Output      | t <sub>PHL</sub>   | 5                    | 450   | 1000                | ns   |     |     |      |
|                           |                    | 10                   | 200   | 500                 |      |     |     |      |
|                           |                    | 15                   | 150   | 400                 |      |     |     |      |
|                           | t <sub>PZH</sub>   | 5                    | 450   | 1000                |      |     |     |      |
| 10                        |                    | 200                  | 500   |                     |      |     |     |      |
| 15                        |                    | 150                  | 400   |                     |      |     |     |      |
| Output Enable Time        | t <sub>PHZ</sub>   | R <sub>L</sub> =10kΩ | 5   | 600                 | 1400 | ns  |     |      |
|                           |                    |                      | 10  | 250                 | 700  |     |     |      |
| t <sub>PLZ</sub>          | 15                 |                      | 200   | 500                 |      |     |     |      |
|                           | 5                  |                      | 600   | 1400                | ns   |     |     |      |
| Output Disable Time       |                    |                      | 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

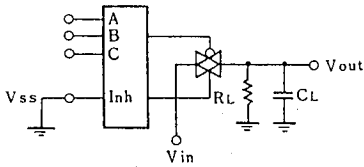
1. Noise Margin



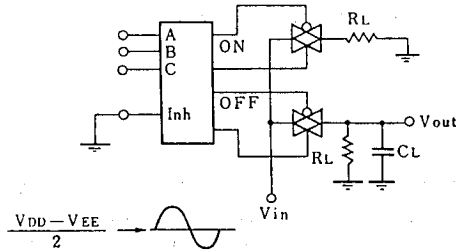
2. Propagation Delay



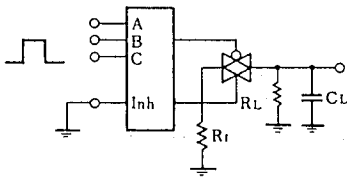
3. Feedthrough



4. Crosstalk (Switch A and B)



5. Crosstalk (Control and Out)



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