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# NC7SB3257

## 2:1 Multiplexer/Demultiplexer Bus Switch

### Features

- Space Saving SC70 6-Lead Surface Mount Package
- Typical 3  $\Omega$  Switch Resistance at 5.0 V  $V_{CC}$
- Minimal Propagation Delay through the Switch
- Power-Down High Impedance Control Input
- Zero Bounce in Flow through Mode
- TTL Compatible Control Input
- Over-Voltage Tolerance of Control Input to 7.0 V
- Break-before-Make Enable Circuitry

### Description

The NC7SB3257 is a high performance, 2:1 NMOS passgate multiplexer/demultiplexer. The device is fabricated with advanced sub-micron CMOS technology to achieve high speed enable and disable times and low On Resistance. The device is specified to operate over the 4.0 to 5.5 V  $V_{CC}$  operating range.

The control input tolerates voltages up to 5.5 V independent of the  $V_{CC}$  operating range.

### Ordering Information

| Part Number  | Top Mark | Package                              | Packing Method            |
|--------------|----------|--------------------------------------|---------------------------|
| NC7SB3257P6X | B7B      | 6-Lead SC70, EIAJ SC88, 1.25 mm Wide | 3000 Units on Tape & Reel |

## Logic Symbol

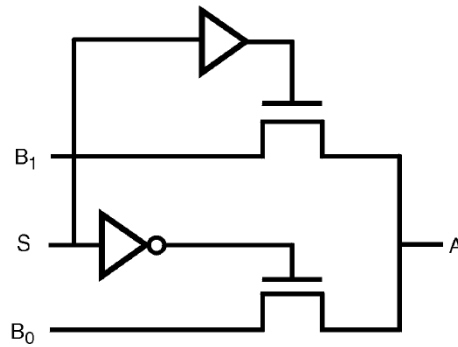


Figure 1. Logic Symbol

## Pin Configurations

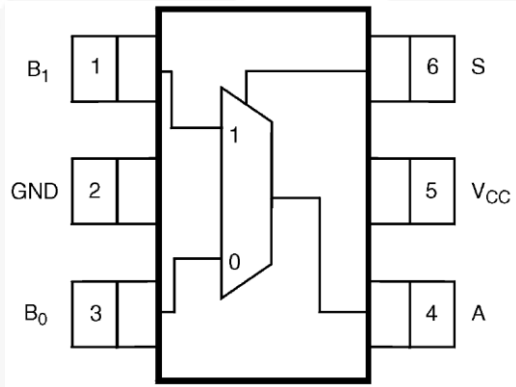


Figure 2. SC70 (Top View)

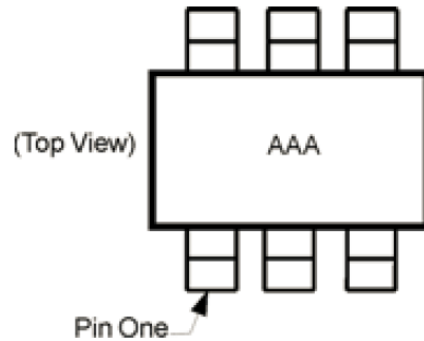


Figure 3. Pin One Orientation Diagram<sup>(1, 2)</sup>

### Notes:

1. Orientation of Top Mark determines Pin One location. Read the top product code mark left to right, Pin One is the lower left pin.
2. AAA - Product Code Top Mark - see ordering code.

## Pin Definitions

| Pin # | Name            | Description    |
|-------|-----------------|----------------|
| 1     | B <sub>1</sub>  | Data Ports     |
| 2     | GND             | Ground         |
| 3     | B <sub>0</sub>  | Data Ports     |
| 4     | A               | Data Ports     |
| 6     | V <sub>CC</sub> | Supply Voltage |
| 5     | S               | Control Input  |

## Function Table

| Inputs | Functions                     |
|--------|-------------------------------|
| L      | B <sub>0</sub> Connected to A |
| H      | B <sub>1</sub> Connected to A |

H = HIGH Logic Level.

L = LOW Logic Level.

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

| Symbol                | Parameter                                   | Min. | Max.      | Unit               |
|-----------------------|---|------|-----------|--------------------|
| $V_{CC}$              | Supply Voltage                              | -0.5 | 7.0       | V                  |
| $V_S$                 | DC Switch Voltage                           | -0.5 | 7.0       | V                  |
| $V_{IN}$              | DC Input Voltage <sup>(3)</sup>             | -0.5 | 7.0       | V                  |
| $I_{IK}$              | DC Input Diode Current                      |      | -50       | mA                 |
|                       | $V_{IN} < 0\text{ V}$                       |      |           |                    |
| $I_{OUT}$             | DC Output Current                           |      | 128       | mA                 |
| $I_{CC}$ OR $I_{GND}$ | DC $V_{CC}$ or Ground Current               |      | $\pm 100$ | mA                 |
| $T_{STG}$             | Storage Temperature Range                   | -65  | +150      | $^{\circ}\text{C}$ |
| $T_J$                 | Junction Lead Temperature under Bias        |      | +150      | $^{\circ}\text{C}$ |
| $T_L$                 | Lead Temperature (Soldering, 10 Seconds)    |      | +260      | $^{\circ}\text{C}$ |
| $P_D$                 | Power Dissipation at +85 $^{\circ}\text{C}$ |      | 180       | mW                 |

**Note:**

- The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.

## Recommended Operating Conditions<sup>(4)</sup>

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

| Symbol        | Parameter                 | Conditions  | Min. | Max.     | Unit                 |
|---------------|---------------------------|---|------|----------|----------------------|
| $V_{CC}$      | Supply Voltage Operating  |   | 4.0  | 5.5      | V                    |
| $V_{IN}$      | Control Input Voltage     |   | 0    | $V_{CC}$ | V                    |
|               | Switch Input Voltage      |   | 0    | $V_{CC}$ | V                    |
| $V_{OUT}$     | Output Voltage            |   | 0    | $V_{CC}$ | V                    |
| $T_A$         | Operating Temperature     |   | -40  | +85      | $^{\circ}\text{C}$   |
| $t_r, t_f$    | Input Rise and Fall Times | Control Input $V_{CC} = 4.0\text{ V to }5.5\text{ V}$ | 0    | 5        | ns/V                 |
| $\theta_{JA}$ | Thermal Resistance        |   |      | 350      | $^{\circ}\text{C/W}$ |

**Note:**

- Control input must be held HIGH or LOW, it must not float.

## DC Electrical Characteristics

| Symbol           | Parameter  | Conditions  | V <sub>CC</sub> | T <sub>A</sub> =-40 to +85°C |      |      | Unit |
|------------------|--|---|-----------------|------------------------------|------|------|------|
|                  |  |   |                 | Min.                         | Typ. | Max. |      |
| V <sub>IK</sub>  | Clamp Diode Voltage                                  | I <sub>IN</sub> = -18 mA  | 4.5             |                              |      | -1.2 | V    |
| V <sub>IH</sub>  | HIGH Level Input Voltage                             |   | 4.5 to 5.5      | 2.0                          |      |      | V    |
| V <sub>IL</sub>  | LOW Level Input Voltage                              |   | 4.5 to 5.5      |                              |      | 0.8  | V    |
| I <sub>IN</sub>  | Input Leakage Current                                | 0 ≤ V <sub>IN</sub> ≤ 5.5 V                                       | 5.5             |                              |      | ±1.0 | μA   |
| I <sub>OFF</sub> | OFF State Leakage Current                            | 0 ≤ A, B ≤ V <sub>CC</sub>  | 5.5             |                              |      | ±1.0 | μA   |
| R <sub>ON</sub>  | Switch On Resistance <sup>(5)</sup>                  | V <sub>IN</sub> = 0 V, I <sub>IN</sub> = 64 mA                    | 4.5             |                              | 3.0  | 7.0  | Ω    |
|                  |  | V <sub>IN</sub> = 0 V, I <sub>IN</sub> = 30 mA                    | 4.5             |                              | 3.0  | 7.0  |      |
|                  |  | V <sub>IN</sub> = 2.4 V, I <sub>IN</sub> = 15 mA                  | 4.5             |                              | 6.0  | 15.0 |      |
|                  |  | V <sub>IN</sub> = 2.4 V, I <sub>IN</sub> = 15 mA                  | 4.0             |                              | 10.0 | 20.0 |      |
| I <sub>CC</sub>  | Quiescent Supply Current                             | V <sub>IN</sub> = V <sub>CC</sub> or GND I <sub>OUT</sub> = 0     | 5.5             |                              |      | 10.0 | μA   |
| ΔI <sub>CC</sub> | Increase in I <sub>CC</sub> per Input <sup>(6)</sup> | V <sub>IN</sub> = 3.4 V, I <sub>O</sub> = 0<br>Control Input Only | 5.5             |                              | 0.9  | 2.5  | mA   |

### Notes:

- Measured by the voltage drop between A and B pins at the indicated current through the switch. On Resistance is determined by the lower of the voltages on the two (A or B Ports).
- Per TTL driven Input (V<sub>IN</sub> = 3.4 V, Control input only). A and B pins do not contribute to I<sub>CC</sub>.

## AC Electrical Characteristics

| Symbol                              | Parameter                                   | V <sub>CC</sub> (V) | Conditions                                | T <sub>A</sub> =-40°C to +85°C,<br>C <sub>L</sub> = 50 pF,<br>R <sub>U</sub> =R <sub>D</sub> = 500 Ω |      |      | Unit |
|-------------------------------------|---|---------------------|---|--|------|------|------|
|                                     |   |                     |   | Min.   | Typ. | Max. |      |
| t <sub>PHL</sub> , t <sub>PLH</sub> | Propagation Delay Bus-to-Bus <sup>(7)</sup> | 4.0-5.5             | V <sub>I</sub> = OPEN                     |  |      | 0.25 | ns   |
| t <sub>PZL</sub> , t <sub>PZH</sub> | Output Enable Time                          | 4.0-5.5             | V <sub>I</sub> = 7 V for t <sub>PZL</sub> | 1.8  |      | 6.5  | ns   |
|                                     |   | 4.0                 | V <sub>I</sub> = 0 V for t <sub>PZH</sub> | 1.8  |      | 7.3  |      |
| t <sub>PLZ</sub> , t <sub>PHZ</sub> | Output Disable Time                         | 4.5-5.5             | V <sub>I</sub> = 7 V for t <sub>PLZ</sub> | 0.8  |      | 4.7  | ns   |
|                                     |   | 4.0                 | V <sub>I</sub> = 0 V for t <sub>PHZ</sub> | 0.8  |      | 5.3  |      |
| t <sub>B-M</sub>                    | Break-before-Make Time <sup>(8)</sup>       | 4.5-5.5             |   | 0.5  |      |      | ns   |
|                                     |   | 4.0                 |   | 0.5  |      |      |      |

### Notes:

- This parameter is guaranteed by design but not tested. The bus switch contributes no propagation delay other than the RC delay of the On Resistance of the switch and the 50 pF load capacitance, when driven by an ideal voltage source (zero output impedance).
- Guaranteed by design.

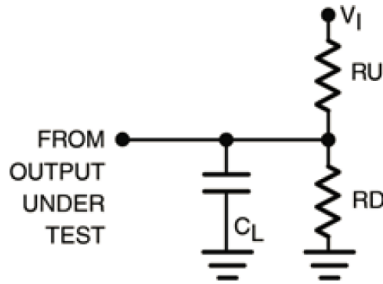
## Capacitance<sup>(9)</sup>

| Symbol            | Parameter                     | Conditions              | Typ. | Unit |
|-------------------|-------------------------------|-------------------------|------|------|
| C <sub>IN</sub>   | Control Pin Input Capacitance | V <sub>CC</sub> = 0.0 V | 2.3  | pF   |
| C <sub>IO-B</sub> | B Port OFF Capacitance        | V <sub>CC</sub> = 5.0 V | 5.7  | pF   |
| C <sub>IO-A</sub> | A Port ON Capacitance         | V <sub>CC</sub> = 5.0 V | 16.0 | pF   |

### Note:

- Capacitance is characterized but not tested.

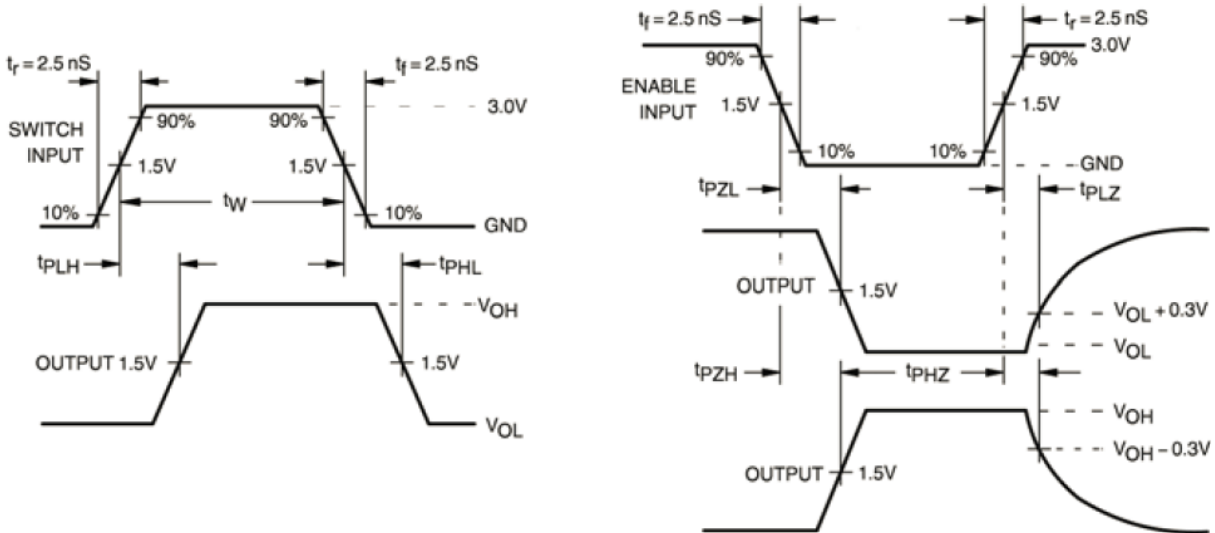
### AC Loading and Waveforms



**Note:**

Input Driven by 50 Ω source terminated in 50 Ω.  
 $C_L$  includes load and stray capacitance.  
 Input PRR=10 MHz;  $t_w=500$  ns.

Figure 4. AC Test Circuit



**Note:**

Input = AC Waveform;  
 PRR = Variable; Duty Cycle = 50%

Figure 5. AC Waveforms

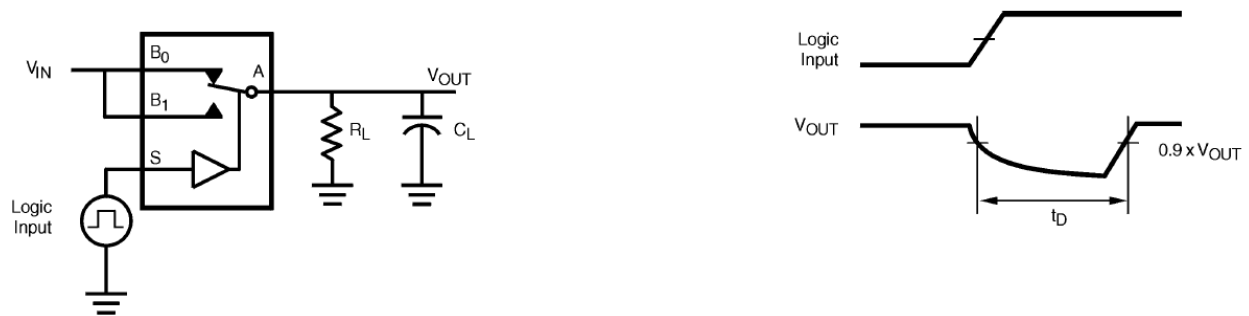


Figure 6. Break-Before-Make Interval Timing

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