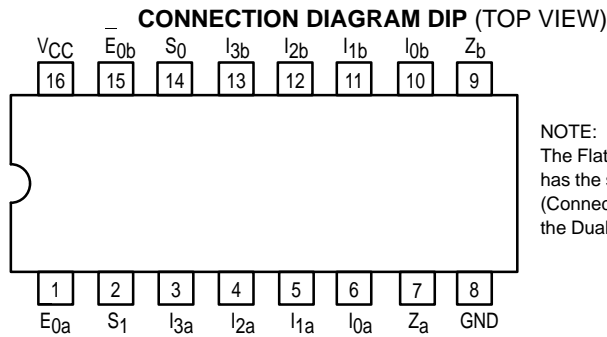




DUAL 4-INPUT MULTIPLEXER WITH 3-STATE OUTPUTS

The LSTTL/MSI SN54/74LS253 is a Dual 4-Input Multiplexer with 3-state outputs. It can select two bits of data from four sources using common select inputs. The outputs may be individually switched to a high impedance state with a HIGH on the respective Output Enable (E_0) inputs, allowing the outputs to interface directly with bus oriented systems. It is fabricated with the Schottky barrier diode process for high speed and is completely compatible with all Motorola TTL families.

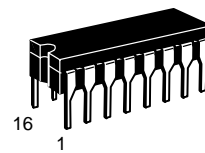
- Schottky Process for High Speed
- Multifunction Capability
- Non-Inverting 3-State Outputs
- Input Clamp Diodes Limit High Speed Termination Effects



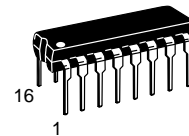
NOTE:
The Flatpak version has the same pinouts (Connection Diagram) as the Dual In-Line Package.

SN54/74LS253

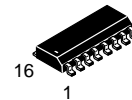
DUAL 4-INPUT MULTIPLEXER WITH 3-STATE OUTPUTS LOW POWER SCHOTTKY



J SUFFIX
CERAMIC
CASE 620-09



N SUFFIX
PLASTIC
CASE 648-08



D SUFFIX
SOIC
CASE 751B-03

ORDERING INFORMATION

| | |
|------------|---------|
| SN54LSXXXJ | Ceramic |
| SN74LSXXXN | Plastic |
| SN74LSXXXD | SOIC |

PIN NAMES

S_0, S_1 Common Select Inputs

Multiplexer A

E_{0a} Output Enable (Active LOW) Input

$I_{0a}-I_{3a}$ Multiplexer Inputs

Z_a Multiplexer Output (Note b)

Multiplexer B

E_{0b} Output Enable (Active LOW) Input

$I_{0b}-I_{3b}$ Multiplexer Inputs

Z_b Multiplexer Output (Note b)

NOTES:

a) 1 TTL Unit Load (U.L.) = 40 μ A HIGH/1.6 mA LOW.

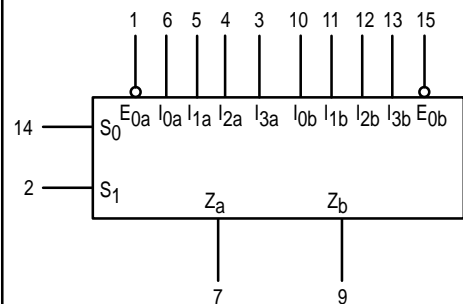
b) The Output LOW drive factor is 7.5 U.L. for Military (54) and 15 U.L. for Commercial (74)

Temperature Ranges. The Output HIGH drive factor is 25 U.L. for Military (54) and 65 U.L. for Commercial (74) Temperature Ranges.

LOADING (Note a)

| | HIGH | LOW |
|-----------------|--------------|---------------|
| S_0, S_1 | 0.5 U.L. | 0.25 U.L. |
| E_{0a} | 0.5 U.L. | 0.25 U.L. |
| $I_{0a}-I_{3a}$ | 0.5 U.L. | 0.25 U.L. |
| Z_a | 65 (25) U.L. | 15 (7.5) U.L. |
| E_{0b} | 0.5 U.L. | 0.25 U.L. |
| $I_{0b}-I_{3b}$ | 0.5 U.L. | 0.25 U.L. |
| Z_b | 65 (25) U.L. | 15 (7.5) U.L. |

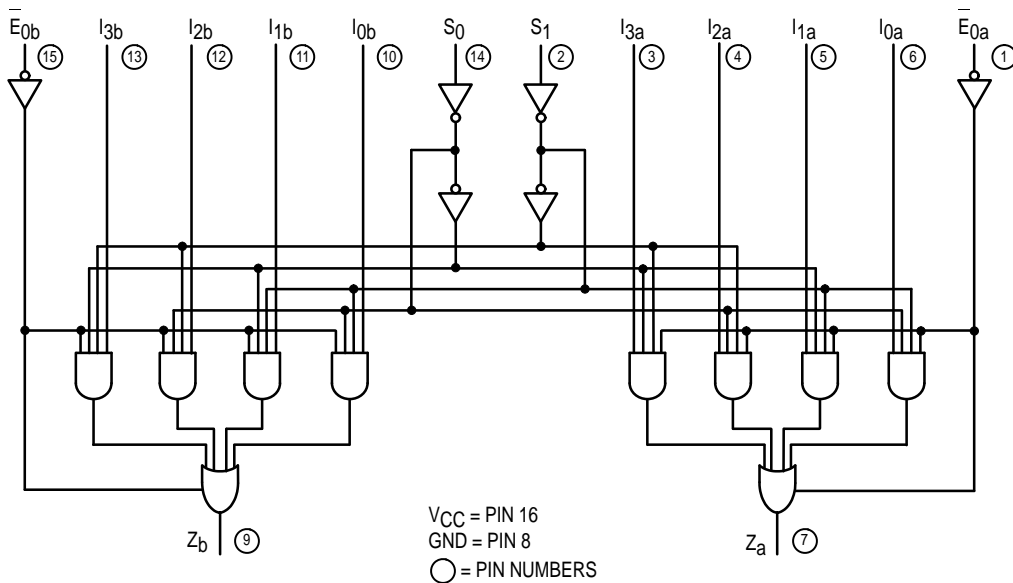
LOGIC SYMBOL



V_{CC} = PIN 16
 GND = PIN 8

SN54/74LS253

LOGIC DIAGRAM



FUNCTIONAL DESCRIPTION

The LS253 contains two identical 4-Input Multiplexers with 3-state outputs. They select two bits from four sources selected by common select inputs (S_0 , S_1). The 4-input multiplexers have individual Output Enable (E_{0a} , E_{0b}) inputs which when HIGH, forces the outputs to a high impedance (high Z) state.

The LS253 is the logic implementation of a 2-pole, 4-position switch, where the position of the switch is determined by the logic levels supplied to the two select inputs. The logic equations for the outputs are shown below:

$$Z_a = \bar{E}_{0a} \cdot (I_{0a} \cdot \bar{S}_1 \cdot \bar{S}_0 + I_{1a} \cdot \bar{S}_1 \cdot S_0 + I_{2a} \cdot S_1 \cdot \bar{S}_0 + I_{3a} \cdot S_1 \cdot S_0)$$

$$Z_b = \bar{E}_{0b} \cdot (I_{0b} \cdot \bar{S}_1 \cdot \bar{S}_0 + I_{1b} \cdot \bar{S}_1 \cdot S_0 + I_{2b} \cdot S_1 \cdot \bar{S}_0 + I_{3b} \cdot S_1 \cdot S_0)$$

If the outputs of 3-state devices are tied together, all but one device must be in the high impedance state to avoid high currents that would exceed the maximum ratings. Designers should ensure that Output Enable signals to 3-state devices whose outputs are tied together are designed so that there is no overlap.

TRUTH TABLE

| SELECT INPUTS | | DATA INPUTS | | | | OUTPUT ENABLE | OUTPUT |
|---------------|-------|-------------|-------|-------|-------|---------------|--------|
| S_0 | S_1 | I_0 | I_1 | I_2 | I_3 | E_0 | Z |
| X | X | X | X | X | X | H | (Z) |
| L | L | L | X | X | X | L | L |
| L | L | H | X | X | X | L | H |
| H | L | X | L | X | X | L | L |
| H | L | X | H | X | X | L | H |
| L | H | X | X | L | X | L | L |
| L | H | X | X | H | X | L | H |
| H | H | X | X | X | L | L | L |
| H | H | X | X | X | H | L | H |

H = HIGH Level

L = LOW Level

X = Irrelevant

(Z) = High Impedance (off)

Address inputs S_0 and S_1 are common to both sections.

SN54/74LS253

GUARANTEED OPERATING RANGES

| Symbol | Parameter | | Min | Typ | Max | Unit |
|-----------------|-------------------------------------|----------|-------------|------------|--------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54 74 | | | -1.0 -2.6 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 12 24 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| Symbol | Parameter | Limits | | | Unit | Test Conditions | |
|------------------|--------------------------------|--------|-------|------|------|--|--|
| | | Min | Typ | Max | | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs | |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs | |
| | | 74 | | 0.8 | | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA | |
| V _{OH} | Output HIGH Voltage | 54 | 2.4 | 3.4 | V | V _{CC} = MIN, I _{OH} = MAX, V _{IN} = V _{IH} or V _{IL} per Truth Table | |
| | | 74 | 2.4 | 3.1 | V | | |
| V _{OL} | Output LOW Voltage | 54, 74 | | 0.25 | 0.4 | V | I _{OL} = 12 mA V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | | 0.35 | 0.5 | V | |
| I _{OZH} | Output Off Current HIGH | | | 20 | μA | V _{CC} = MAX, V _{OUT} = 2.7 V | |
| I _{OZL} | Output Off Current LOW | | | -20 | μA | V _{CC} = MAX, V _{OUT} = 0.4 V | |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V | |
| | | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V | |
| I _{IL} | Input LOW Current | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V | |
| I _{OS} | Short Circuit Current (Note 1) | -30 | | -130 | mA | V _{CC} = MAX | |
| I _{CC} | Power Supply Current | | | 12 | mA | V _{CC} = MAX, V _E = 0 V | |
| | | | | 14 | mA | V _{CC} = MAX, V _E = 4.5 V | |

Note 1: Not more than one output should be shorted at a time, nor for more than 1 second.

AC CHARACTERISTICS (T_A = 25°C, V_{CC} = 5.0 V) See SN54LS251 for Waveforms

| Symbol | Parameter | Limits | | | Unit | Test Conditions | |
|--------------------------------------|--|--------|----------|----------|------|-----------------|--|
| | | Min | Typ | Max | | | |
| t _{PLH} t _{PHL} | Propagation Delay, Data to Output | | 17 13 | 25 20 | ns | Figure 1 | C _L = 45 pF, R _L = 667 Ω |
| t _{PLH} t _{PHL} | Propagation Delay, Select to Output | | 30 21 | 45 32 | ns | Figure 1 | |
| t _{PZH} t _{PZL} | Output Enable Time | | 15 15 | 28 23 | ns | Figures 4, 5 | |
| t _{PHZ} t _{PLZ} | Output Disable Time | | 27 18 | 41 27 | ns | Figures 3, 5 | C _L = 5.0 pF, R _L = 667 Ω |