

# **DUAL 4-INPUT MULTIPLEXER**

The LSTTL/MSI SN54/74LS153 is a very high speed Dual 4-Input Multiplexer with common select inputs and individual enable inputs for each section. It can select two bits of data from four sources. The two buffered outputs present data in the true (non-inverted) form. In addition to multiplexer operation, the LS153 can generate any two functions of three variables. The LS153 is fabricated with the Schottky barrier diode process for high speed and is completely compatible with all Motorola TTL families.

- Multifunction Capability
- Non-Inverting Outputs
- Separate Enable for Each Multiplexer
- Input Clamp Diodes Limit High Speed Termination Effects



PIN NAM	ES	LOADIN	<b>G</b> (Note a)
		HIGH	LOW
<u>S</u> 0 E	Common Select Input	0.5 U.L.	0.25 U.L.
E	Enable (Active LOW) Input	0.5 U.L.	0.25 U.L.
I <sub>0</sub> , I <sub>1</sub>	Multiplexer Inputs	0.5 U.L.	0.25 U.L.
Z	Multiplexer Output (Note b)	10 U.L.	5 (2.5) U.L.

NOTES:

- a) 1 TTL Unit Load (U.L.) = 40  $\mu$ A HIGH/1.6 mA LOW.
- b) The Output LOW drive factor is 2.5 U.L. for Military (54) and 5 U.L. for Commercial (74) Temperature Ranges.

#### LOGIC DIAGRAM



# SN54/74LS153 **DUAL 4-INPUT MULTIPLEXER** 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



### FAST AND LS TTL DATA

#### FUNCTIONAL DESCRIPTION

The LS153 is a Dual 4-input Multiplexer fabricated with Low Power, Schottky barrier diode process for high speed. It can select two bits of data from up to four sources under the control of the common Select Inputs (S<sub>0</sub>, S<sub>1</sub>). The two 4-inp<u>ut</u> m<u>ultiplexer</u> circuits have individual active LOW Enables (E<sub>a</sub>, E<sub>b</sub>) which can be<u>used</u> to strobe the outputs independently. When the Enables (E<sub>a</sub>, E<sub>b</sub>) are HIGH, the corresponding outputs (Z<sub>a</sub>, Z<sub>b</sub>) are forced LOW.

The LS153 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.

$$\begin{split} & Z_a = \overline{E}_a \cdot (I_{0a} \cdot \overline{S}_1 \cdot \overline{S}_0 + I_{1a} \cdot \overline{S}_1 \cdot S_0 + I_{2a} \cdot S_1 \cdot \overline{S}_0 + \\ & I_{3a} \cdot S_1 \cdot S_0) \end{split}$$

$$& Z_b = \overline{E}_b \cdot (I_{0b} \cdot \overline{S}_1 \cdot \overline{S}_0 + I_{1b} \cdot \overline{S}_1 \cdot S_0 + I_{2b} \cdot S_1 \cdot \overline{S}_0 + \\ & I_{3b} \cdot S_1 \cdot S_0) \end{split}$$

The LS153 can be used to move data from a group of registers to a common output bus. The particular register from which the data came would be determined by the state of the Select Inputs. A less obvious application is a function generator. The LS153 can generate two functions of three variables. This is useful for implementing highly irregular random logic.

SELECT	INPUTS	INPUTS (a or b)					OUTPUT
S <sub>0</sub>	S <sub>1</sub>	E	I0	I <sub>1</sub>	I <sub>2</sub>	l3	Z
Х	Х	Н	Х	Х	Х	Х	L
L	L	L	L	Х	Х	Х	L
L	L	L	н	Х	Х	Х	н
н	L	L	Х	L	Х	Х	L
н	L	L	Х	н	Х	Х	н
L	Н	L	Х	Х	L	х	L
L	Н	L	Х	Х	н	Х	н
н	н	L	Х	Х	Х	L	L
н	Н	L	Х	Х	Х	Н	Н

H = HIGH Voltage Level

L = LOW Voltage Level

X = Don't Care

#### **GUARANTEED OPERATING RANGES**

Symbol	Parameter		Min	Тур	Max	Unit
VCC	Supply Voltage	54 74	4.5 4.75	5.0 5.0	5.5 5.25	V
Τ <sub>Α</sub>	Operating Ambient Temperature Range	54 74	-55 0	25 25	125 70	°C
IOH	Output Current — High	54, 74			-0.4	mA
IOL	Output Current — Low	54 74			4.0 8.0	mA

## SN54/74LS153

				Limits				
Symbol	Parameter		Min	Тур	Max	Unit	Tes	t Conditions
VIH	Input HIGH Voltage		2.0			V	Guaranteed Input HIGH Voltage for All Inputs	
Ma		54			0.7	v	Guaranteed Input	t LOW Voltage for
VIL	Input LOW Voltage	74			0.8	v	All Inputs	
VIK	Input Clamp Diode Voltage			-0.65	-1.5	V	$V_{CC} = MIN, I_{IN} = -18 \text{ mA}$	
V <sub>OH</sub> O	Output HIGH Voltage	54	2.5	3.5		V	V <sub>CC</sub> = MIN, I <sub>OH</sub>	= MAX, VIN = VIH
		74	2.7	3.5		V	or V <sub>IL</sub> per Truth Table	
		54, 74		0.25	0.4	V	I <sub>OL</sub> = 4.0 mA         V <sub>CC</sub> = V <sub>CC</sub> MIN,           I <sub>OL</sub> = 8.0 mA         VIN = VIL or VIH           per Truth Table         Per Truth Table	
VOL	Output LOW Voltage	74		0.35	0.5	V		
					20	μΑ	V <sub>CC</sub> = MAX, V <sub>IN</sub>	= 2.7 V
IН	Input HIGH Current				0.1	mA	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 7.0 V	
IIL	Input LOW Current				-0.4	mA	$V_{CC} = MAX, V_{IN} = 0.4 V$	
los	Short Circuit Current (Note 1	)	-20		-100	mA	V <sub>CC</sub> = MAX	
ICC	Power Supply Current				10	mA	V <sub>CC</sub> = MAX	

#### DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

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

#### AC CHARACTERISTICS (T<sub>A</sub> = $25^{\circ}$ C)

		Limits					
Symbol	Parameter	Min	Тур	Max	Unit	Test Conditions	
<sup>t</sup> PLH <sup>t</sup> PHL	Propagation Delay Data to Output		10 17	15 26	ns	Figure 2	
<sup>t</sup> PLH <sup>t</sup> PHL	Propagation Delay Select to Output		19 25	29 38	ns	Figure 1	V <sub>CC</sub> = 5.0 V C <sub>L</sub> = 15 pF
<sup>t</sup> PLH <sup>t</sup> PHL	Propagation Delay Enable to Output		16 21	24 32	ns	Figure 2	

#### AC WAVEFORMS



Figure 1





Case 751B-03 D Suffix **16-Pin Plastic** SO-16



Case 648-08 N Suffix **16-Pin Plastic** 





NOTES:

- 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: MILLIMETER. DIMENSION A AND B DO NOT INCLUDE MOLD 2 3.
- PROTRUSION. MAXIMUM MOLD PROTRUSION 0.15 (0.006) 4.
- PER SIDE. 751B-01 IS OBSOLETE, NEW STANDARD 751B-03. 5.

	MILLIM	ETERS	INC	HES	
DIM	MIN	MAX	MIN	MAX	
Α	9.80	10.00	0.386	0.393	
В	3.80	4.00	0.150	0.157	
C	1.35	1.75	0.054	0.068	
D	0.35	0.49	0.014	0.019	
F	0.40	1.25	0.016	0.049	
G	1.27	BSC	0.050 BSC		
J	0.19	0.25	0.008	0.009	
К	0.10	0.25	0.004	0.009	
Μ	0°	<b>7</b> °	0°	7°	
Р	5.80	6.20	0.229	0.244	
R	0.25	0.50	0.010	0.019	

NOTES:

DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

2.

CONTROLLING DIMENSION: INCH. DIMENSION "L" TO CENTER OF LEADS WHEN FORMED PARALLEL. 3.

DIMENSION "B" DOES NOT INCLUDE MOLD 4.

FLASH.

5. 6.

ROUNDED CORNERS OPTIONAL. 648-01 THRU -07 OBSOLETE, NEW STANDARD 648-08.

	MILLIM	ETERS	INCHES		
DIM	MIN MAX		MIN	MAX	
Α	18.80	19.55	0.740	0.770	
В	6.35	6.85	0.250	0.270	
С	3.69	4.44	0.145	0.175	
D	0.39	0.53	0.015	0.021	
F	1.02	1.77	0.040	0.070	
G	2.54	BSC	0.100 BSC		
Н	1.27	BSC	0.050 BSC		
J	0.21	0.38	0.008	0.015	
K	2.80	3.30	0.110	0.130	
L	7.50	7.74	0.295	0.305	
М	0°	10°	0°	10°	
S	0.51	1.01	0.020	0.040	

NOTES: 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982. 2. CONTROLLING DIMENSION: INCH. 3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL. 4. DIM F MAY NARROW TO 0.76 (0.030) WHERE THE LEAD ENTERS THE CERAMIC BODY. 5. 620-01 THRU-08 OBSOLETE, NEW STANDARD 620-09.

620-09.

	MILLIM	ETERS	INC	HES
DIM	MIN	MAX	MIN	MAX
Α	19.05	19.55	0.750	0.770
В	6.10	7.36	0.240	0.290
С	-	4.19	-	0.165
D	0.39	0.53	0.015	0.021
E	1.27	1.27 BSC		BSC
F	1.40	1.77	0.055	0.070
G	2.54	BSC	0.100	BSC
J	0.23	0.27	0.009	0.011
K	—	5.08	—	0.200
L	7.62	7.62 BSC		BSC
М	0°	15°	<b>0</b> °	15°
Ν	0.39	0.88	0.015	0.035

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