



DUAL 4-INPUT MULTIPLEXER

DESCRIPTION

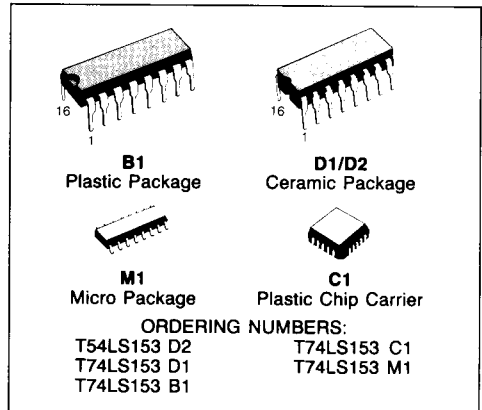
The TTL/MSI T54LS153/T74LS153 is a very high speed Dual 4-Input Multiplexer with common select inputs and individual enable inputs for each section. It can select two bits data from four sources. The two buffered outputs present data in the true (non-inverted) form. In addition to multiplexer operation, 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 SGS TTL families.

- MULTIFUNCTION CAPABILITY
- NON-INVERTING OUTPUTS
- SEPARATE ENABLE FOR EACH MULTIPLEXER
- INPUT CLAMP DIODES LIMIT HIGH SPEED TERMINATION EFFECTS
- FULLY TTL AND CMOS COMPATIBLE

PIN NAMES

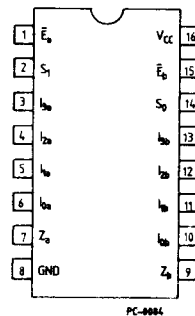
S_0	Common Select Input
\bar{E}	Enable (Active LOW) Input
I_0, I_1	Multiplexer Inputs
Z	Multiplexer Output

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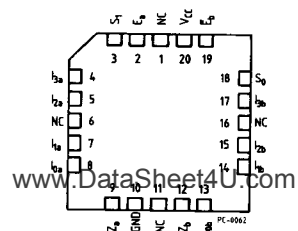


PIN CONNECTION (top view)

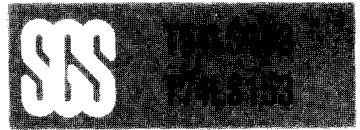
DUAL IN LINE



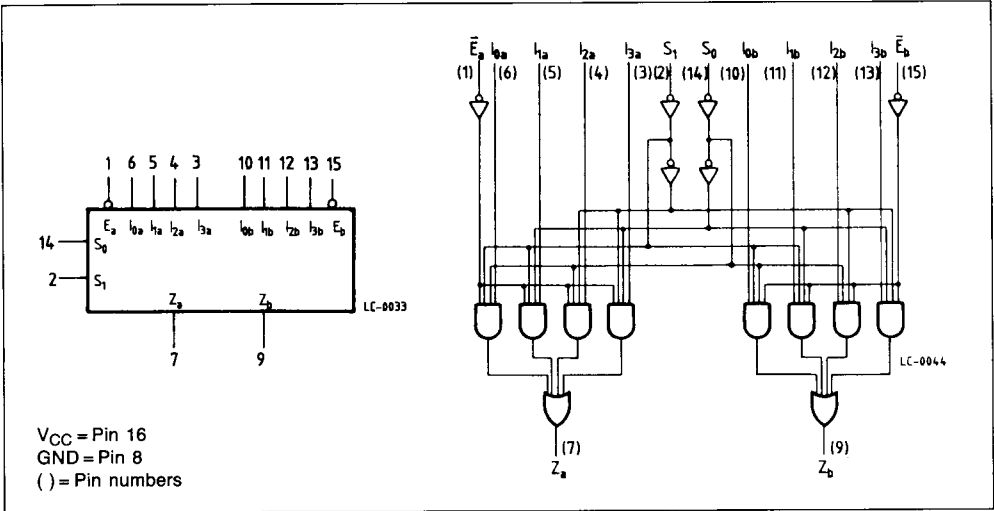
CHIP CARRIER



NC = No Internal Connection



LOGIC SYMBOL AND LOGIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	- 0.5 to 7	V
V_I	Input Voltage, Applied to Input	- 0.5 to 15	V
V_O	Output Voltage, Applied to Output	- 0.6 to 10	V
I_I	Input Current, Into Inputs	- 30 to 5	mA
I_O	Output Current, Into Outputs	50	mA

Stresses in excess of those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions in excess of those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

GUARANTEED OPERATING RANGES

Part Numbers	Supply Voltage			Temperature
	Min	Typ	Max	
T54LS153D2	4.5 V	5.0 V	5.5 V	- 55°C to + 125°C
T74LS153XX	4.75 V	5.0 V	5.25 V	0°C to + 70°C

XX = package type.



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_0 , S_1). The two 4-input multiplexer circuits have individual active LOW Enables (\bar{E}_a , \bar{E}_b) which can be used to strobe the outputs independently. When the Enables (\bar{E}_a , \bar{E}_b) are

HIGH, the corresponding outputs (Z_a , Z_b) 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.

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

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

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.

TRUTH TABLE

SELECT INPUTS		INPUTS (a or b)						OUTPUT
S_0	S_1	\bar{E}	I_0	I_1	I_2	I_3		Z
X	X	H	X	X	X	X		L
L	L	L	L	X	X	X		L
L	L	L	H	X	X	X		H
H	L	L	X	L	X	X		L
H	L	L	X	H	X	X		H
L	H	L	X	X	L	X		L
L	H	L	X	X	H	X		H
H	H	L	X	X	X	L		L
H	H	L	X	X	X	H		H

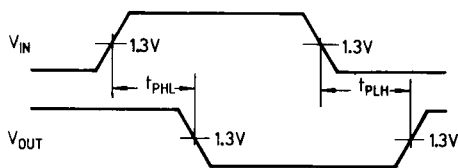
H = HIGH Voltage Level

L = LOW Voltage Level

X = Don't Care

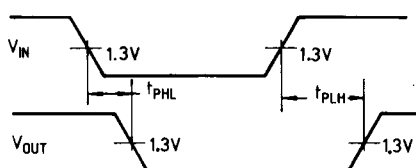
AC WAVEFORMS

Fig. 1



SC-0009

Fig. 2



SC-0007



DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE

Symbol	Parameter		Limits			Test Conditions (Note 1)	Units
			Min.	Typ.	Max.		
V_{IH}	Input HIGH Voltage		2.0			Guaranteed input HIGH Threshold Voltage for all Inputs	V
V_{IL}	Input LOW Voltage	54			0.7	Guaranteed input LOW Threshold Voltage for all Inputs	V
		74			0.8		
V_{CD}	Input Clamp Diode Voltage			- 0.65	- 1.5	$V_{CC} = \text{MIN}, I_{IN} = - 18\text{mA}$	V
V_{OH}	Output HIGH Voltage	54	2.5	3.4		$V_{CC} = \text{MIN}, I_{OH} = - 400\mu\text{A}, V_{IN} = V_{IH} \text{ or } V_{IL} \text{ per Truth Table}$	V
		74	2.7	3.4			
V_{OL}	Output LOW Voltage	54,74		0.25	0.4	$I_{OL} = 4.0\text{mA}$	V
		74		0.35	0.5	$I_{OL} = 8.0\text{mA}$	
I_{IH}	Input HIGH Current			1.0	20 0.1	$V_{CC} = \text{MAX}, V_{IN} = 2.7\text{V}$ $V_{CC} = \text{MAX}, V_{IN} = 7.0\text{V}$	μA mA
I_{IL}	Input LOW Current				- 0.36	$V_{CC} = \text{MAX}, V_{IN} = 0.4\text{V}$	mA
I_{OS}	Output Short Circuit Current (Note 2)		- 20		- 100	$V_{CC} = \text{MAX}, V_{OUT} = 0\text{V}$	mA
I_{CC}	Power Supply Current			6.0	10	$V_{CC} = \text{MAX}$	mA

AC CHARACTERISTICS: $T_A = 25^\circ\text{C}$

Symbol	Parameter		Limits			Test Conditions	Units
			Min.	Typ.	Max.		
t_{PLH} t_{PHL}	Propagation Delay, Select to Output			19 25	25 38	Fig. 2	$V_{CC} = 5.0\text{V}$ $C_L = 15\text{pF}$
t_{PLH} t_{PHL}	Propagation Delay, Enable to Output			16 21	24 32	Fig. 1	
t_{PLH} t_{PHL}	Propagation Delay, Data to Output			10 17	15 26	Fig. 2	

Notes:

- 1) Conditions for testing, not shown in the Table, are chosen to guarantee operation under "worst case" conditions.
- 2) Not more than one output should be shorted at a time.
- 3) Typical values are at $V_{CC} = 5.0\text{V}$, $T_A = 25^\circ\text{C}$