



## 93L12 8-Input Multiplexer

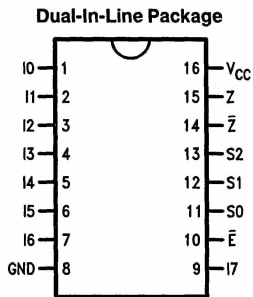
### General Description

The 93L12 is a monolithic, high speed, 8-input digital multiplexer circuit. It provides, in one package, the ability to select one bit of data from up to eight sources. The 93L12 can be used as a universal function generator to generate any logic function of four variables. Both assertion and negation outputs are provided.

### Features

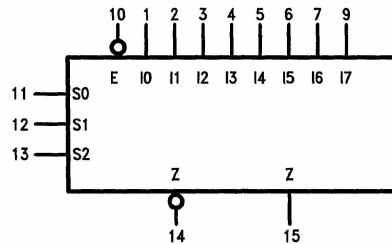
- Multifunction capability
- On-chip select logic decoding
- Fully buffered complementary outputs

### Connection Diagram



TL/F/9610-1

### Logic Symbol



V<sub>CC</sub> = Pin 16  
GND = Pin 8

TL/F/9610-2

Order Number 93L12DMQB or 93L12FMQB  
See NS Package Number J16A or W16A

Pin Names	Description
S <sub>0</sub> -S <sub>2</sub>	Select Inputs
E	Enable Input (Active LOW)
I <sub>0</sub> -I <sub>7</sub>	Multiplexer Inputs
Z	Multiplexer Output
Z̄	Complementary Multiplexer Output

## Absolute Maximum Ratings (Note)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	7V
Input Voltage	5.5V
Operating Free Air Temperature Range MIL	-55°C to +125°C
Storage Temperature Range	-65°C to +150°C

Note: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

## Recommended Operating Conditions

Symbol	Parameter	93L12 (MIL)			Units
		Min	Nom	Max	
V <sub>CC</sub>	Supply Voltage	4.5	5	5.5	V
V <sub>IH</sub>	High Level Input Voltage	2			V
V <sub>IL</sub>	Low Level Input Voltage			0.7	V
I <sub>OH</sub>	High Level Output Current			-400	μA
I <sub>OL</sub>	Low Level Output Current			4.8	mA
T <sub>A</sub>	Free Air Operating Temperature	-55		125	°C

## Electrical Characteristics over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units
V <sub>I</sub>	Input Clamp Voltage	V <sub>CC</sub> = Min, I <sub>I</sub> = -10 mA			-1.5	V
V <sub>OH</sub>	High Level Output Voltage	V <sub>CC</sub> = Min, I <sub>OH</sub> = Max, V <sub>IL</sub> = Max, V <sub>IH</sub> = Min	2.4	3.4		V
V <sub>OL</sub>	Low Level Output Voltage	V <sub>CC</sub> = Min, I <sub>OL</sub> = Max, V <sub>IH</sub> = Min, V <sub>IL</sub> = Max			0.3	V
I <sub>I</sub>	Input Current @ Max Input Voltage	V <sub>CC</sub> = Max, V <sub>I</sub> = 5.5V			1	mA
I <sub>IH</sub>	High Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 2.4V			20	μA
I <sub>IL</sub>	Low Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 0.3V			-400	μA
I <sub>OS</sub>	Short Circuit Output Current	V <sub>CC</sub> = Max (Note 2)	-2.5		-25	mA
I <sub>CC</sub>	Supply Current	V <sub>CC</sub> = Max (Note 3)			13.3	mA

Note 1: All typicals are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Note 3: I<sub>CC</sub> is measured with all outputs open and all inputs grounded.

## Switching Characteristics

$V_{CC} = +5.0V$ ,  $T_A = +25^\circ C$  (See Section 1 for waveforms and load configurations)

Symbol	Parameter	$C_L = 15\text{ pF}$		Units
		Min	Max	
$t_{PLH}$ $t_{PHL}$	Propagation Delay S0 to Z		60 75	ns
$t_{PLH}$ $t_{PHL}$	Propagation Delay S0 to $\bar{Z}$		70 50	ns
$t_{PLH}$ $t_{PHL}$	Propagation Delay $\bar{E}$ to Z		60 75	ns
$t_{PLH}$ $t_{PHL}$	Propagation Delay $\bar{E}$ to $\bar{Z}$		70 45	ns
$t_{PLH}$ $t_{PHL}$	Propagation Delay In to Z		70 65	ns
$t_{PLH}$ $t_{PHL}$	Propagation Delay In to $\bar{Z}$		55 55	ns

## Functional Description

The 93L12 is a logical implementation of a single pole, eight position switch with the switch position controlled by the state of three Select inputs, S0, S1, S2. Both assertion and negation outputs are provided. The Enable input (E) is active LOW. When it is not activated the negation output is HIGH and the assertion output is LOW, regardless of all other inputs. The logic function provided at the output is:

$$Z = E \cdot (I0 \cdot \bar{S0} \cdot \bar{S1} \cdot \bar{S2} + I1 \cdot S0 \cdot \bar{S1} \cdot \bar{S2} + I2 \cdot \bar{S0} \cdot S1 \cdot \bar{S2} + I3 \cdot S0 \cdot S1 \cdot \bar{S2} + I4 \cdot \bar{S0} \cdot \bar{S1} \cdot S2 + I5 \cdot S0 \cdot \bar{S1} \cdot S2 + I6 \cdot \bar{S0} \cdot S1 \cdot S2 + I7 \cdot S0 \cdot S1 \cdot S2).$$

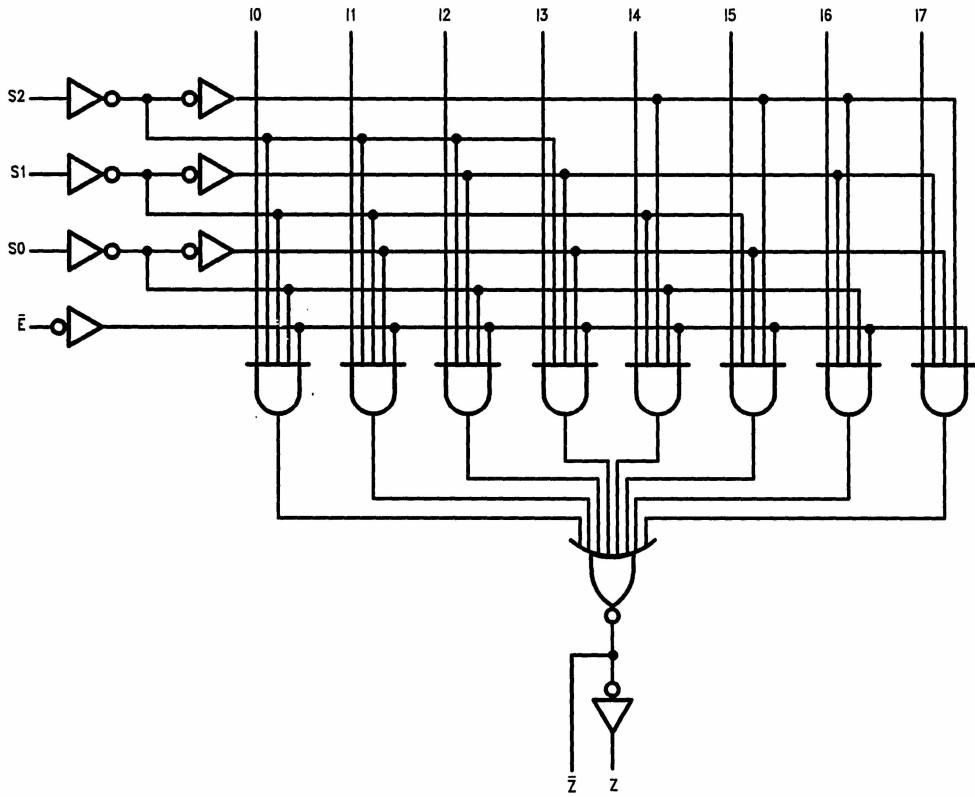
The 93L12 provides the ability, in one package, to select from eight sources of data or control information. By proper manipulation of the inputs, the 93L12 can provide any logic function of four variables and its negation. Thus any number of random logic elements used to generate unusual truth tables can be replaced by one 93L12.

## Truth Table

Inputs												Outputs	
$\bar{E}$	S2	S1	S0	I0	I1	I2	I3	I4	I5	I6	I7	$\bar{Z}$	Z
H	X	X	X	X	X	X	X	X	X	X	X	H	L
L	L	L	L	L	X	X	X	X	X	X	X	H	L
L	L	L	L	H	X	X	X	X	X	X	X	L	H
L	L	L	H	X	L	X	X	X	X	X	X	H	L
L	L	L	H	X	H	X	X	X	X	X	X	L	H
L	L	L	H	X	X	L	X	X	X	X	X	H	L
L	L	L	H	X	X	H	X	X	X	X	X	L	H
L	L	L	H	X	X	X	L	X	X	X	X	H	L
L	L	H	H	X	X	X	H	X	X	X	X	L	H
L	H	L	L	X	X	X	X	L	X	X	X	H	L
L	H	L	L	X	X	X	X	H	X	X	X	L	H
L	H	L	L	X	X	X	X	X	L	X	X	H	L
L	H	L	H	X	X	X	X	X	X	X	X	L	H
L	H	H	L	X	X	X	X	X	X	H	X	L	H
L	H	H	L	X	X	X	X	X	X	X	L	H	L
L	H	H	H	X	X	X	X	X	X	X	H	L	H

H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Immaterial

### Logic Diagram



TL/F/9610-3