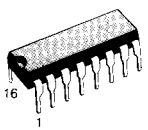
T54LS158
T74LS158

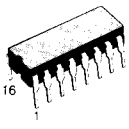
QUAD 2-INPUT MULTIPLEXER

DESCRIPTION

The TTL/MSI T54LS158/T74LS158 is a high speed Quad 2-Input Multiplexer. It selects four bits of data from two sources using common Select and Enable inputs. The four buffered outputs present the selected data in the true inverted from. The LS158 can also generate any four of the 16 different functions of two variables. The LS158 is fabricated with the Schottky barrier diode process for high speed and is completely compatible with all SGS TTL families.



B1
Plastic Package



D1/D2
Ceramic Package

M1
Micro Package

C1
Plastic Chip Carrier

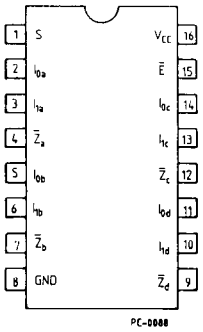
ORDERING NUMBERS:

T54LS158 D2
T74LS158 D1
T74LS158 B1
T74LS158 C1
T74LS158 M1

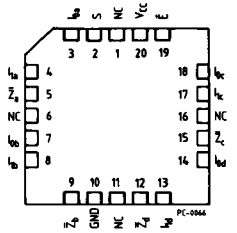
- SCHOTTKY PROCESS FOR HIGH SPEED
- MULTIFUNCTION CAPABILITY
- INVERTING OUTPUTS
- INPUT CLAMP DIODES LIMIT HIGH SPEED TERMINATION EFFECTS
- FULLY TTL AND CMOS COMPATIBLE

PIN CONNECTION
(top view)

DUAL IN LINE



CHIP CARRIER

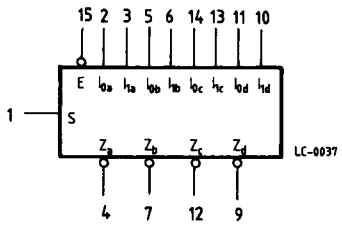


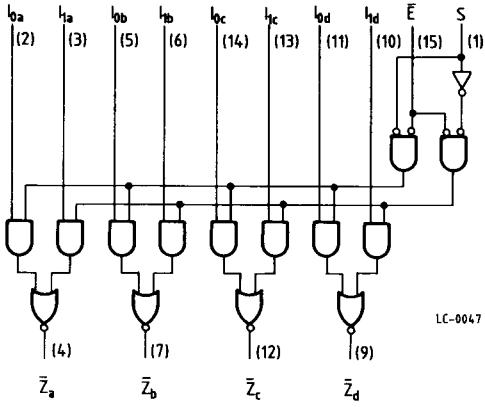
NC = No Internal Connection

PIN NAMES

S	Common Select Input
$\overline{E}$	Enable (Active LOW) Input
I_{0a}-I_{0d}	Data Inputs from Source 0
I_{1a}-I_{1d}	Data Inputs from Source 1
Z_a-Z_d	Inverted Outputs

LOGIC SYMBOL AND LOGIC DIAGRAM





V_{CC} = Pin 16
GND = Pin 8
( ) = Pin numbers

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	
T54LS158D2	4.5 V	5.0 V	5.5 V	−55°C to +125°C
T74LS158XX	4.75 V	5.0 V	5.25 V	0°C to +70°C

XX = package type.

FUNCTIONAL DESCRIPTION

The LS158 is a Quad 2-Input Multiplexer fabricated with the Schottky barrier diode process for high speed. It selects four bits of data from two sources under the control of the common Select Input (S) and present the data in inverted form at the four outputs. The Enable Input ($\overline{E}$) is active LOW. When $\overline{E}$ is HIGH, all of the outputs ($\overline{Z}$) are forced HIGH regardless of all other inputs.
The LS158 is the logic implementation of a 4-pole, 2-position switch, where the position of the switch is determined by the logic levels supplied to the Select Inputs.
A common use of the LS158 is the moving of data from two groups of registers to four common output buses. The particular register from which the data comes is determined by the state of the Select Input. A less obvious use is as a function generator. The LS158 can generate four functions of two variables with one variable common. This is useful for implementing gating functions.

TRUTH TABLE

ENABLE	SELECT INPUT	INPUTS		OUTPUT
$\overline{E}$	S	I_0	I_1	$\overline{Z}$
H	X	X	X	H
L	L	L	X	H
L	L	H	X	L
L	H	X	L	H
L	H	X	H	L

H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care

AC WAVEFORMS

Fig. 1

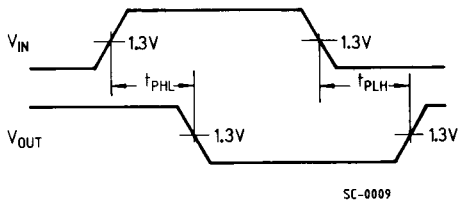
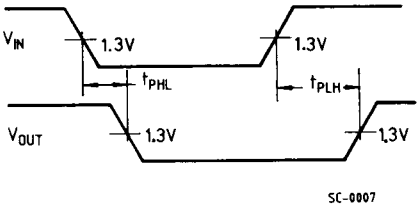


Fig. 2



DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE

Symbol	Parameter		Limits Min.	Limits Typ.	Limits Max.	Test Conditions (Note 1)	Units
V_{IH}	Input HIGH Voltage		2.0			Guaranteed input HIGH Voltage for all Inputs	V
V_{IL}	Input LOW Voltage	54			0.7	Guaranteed input LOW Voltage for all Inputs	V
		74			0.8		
V_{CD}	Input Clamp Diode Voltage			−0.65	−1.5	V_{CC} = MIN, I_{IN} = −18mA	V
V_{OH}	Output HIGH Voltage	54	2.5	3.4		V_{CC} = MIN, I_{OH} = −400μA, V_{IN} = V_{IH} or V_{IL} per Truth Table	V
		74	2.7	3.4			
V_{OL}	Output LOW Voltage	54,74		0.25	0.4	I_{OL} = 4.0mA; V_{CC} = MIN, V_{IN} = V_{IH} or V_{IL} per Truth Table	V
		74		0.35	0.5	I_{OL} = 8.0mA	
I_{IH}	Input HIGH Current I_0, I_1				20	V_{CC} = MAX, V_{IN} = 2.7V	μA
	E, S				40		
	Input HIGH Current at Max Input Voltage I_0, I_1				0.1	V_{CC} = MAX, V_{IN} = 7.0V	mA
	E, S				0.2		
I_{IL}	Input LOW Current I_0, I_1				−0.4	V_{CC} = MAX, V_{IN} = 0.4V	mA
	E, S				−0.8		
I_{OS}	Output Short Circuit Current (Note 2)		−20		−100	V_{CC} = MAX, V_{OUT} = 0V	mA
I_{CC}	Power Supply Current			5.0	8.0	V_{CC} = MAX	mA

AC CHARACTERISTICS: $T_A = 25°C$

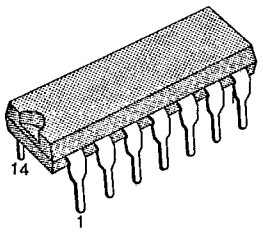
Symbol	Parameter	Limits Min.	Limits Typ.	Limits Max.	Test Conditions		Units
t_{PLH}	Propagation Delay,		13	20	Fig. 1	V_{CC} = 5.0V, C_L = 15pF	ns
t_{PHL}	Select to Output		16	24			
t_{PLH}	Propagation Delay,		11	17	Fig. 2		ns
t_{PHL}	Enable to Output		18	24			
t_{PLH}	Propagation Delay,		7	12	Fig. 1		ns
t_{PHL}	Data to Output		10	15			

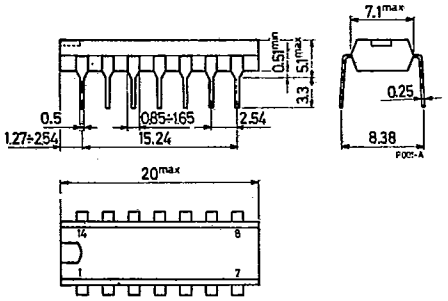
Notes:

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} = 5.0V, T_A = 25°C

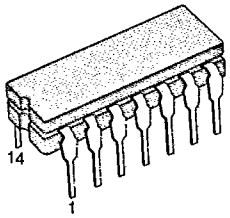
Packages

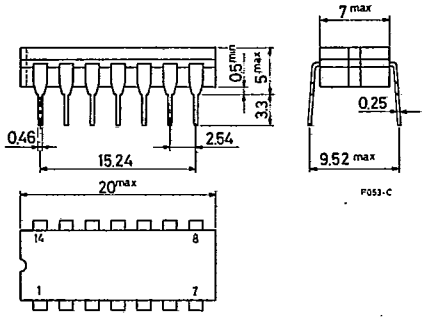
14-LEAD PLASTIC DIP





14-LEAD CERAMIC DIP





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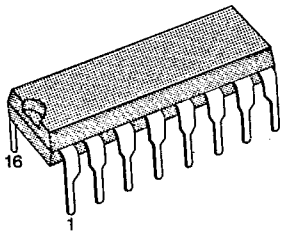

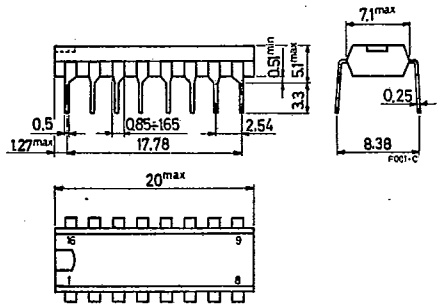

Packages

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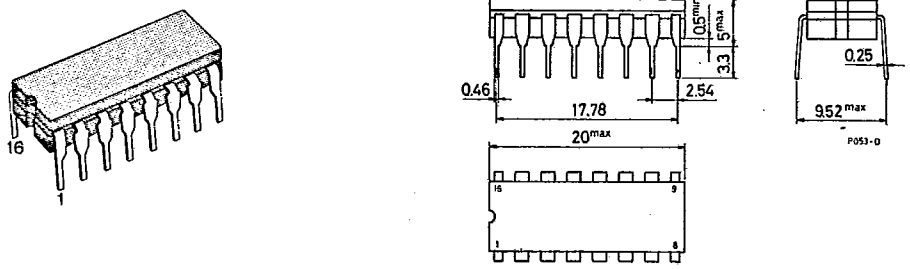

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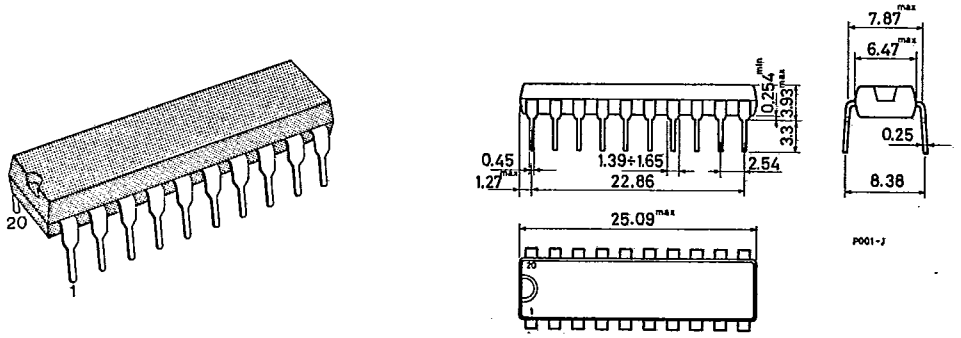

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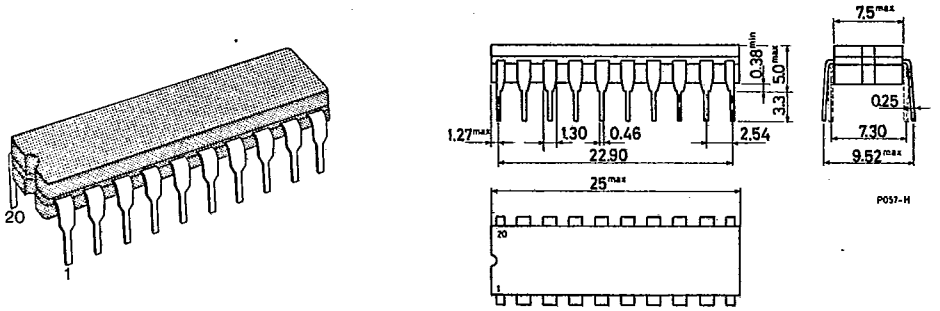
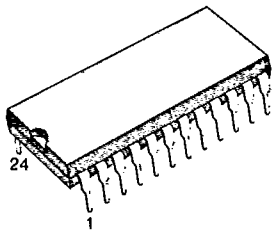
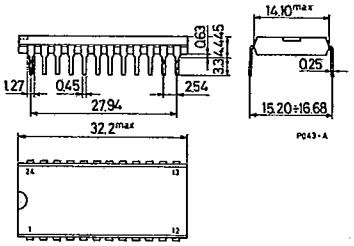


Packages

24-LEAD PLASTIC DIP





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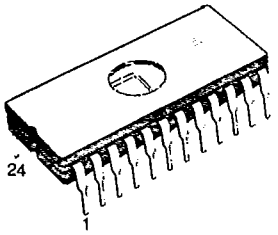
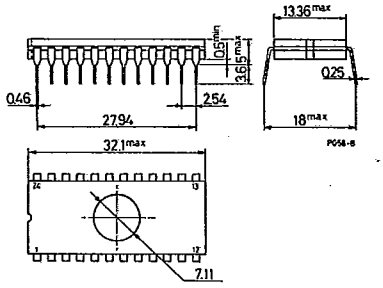
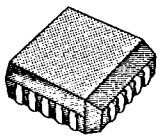
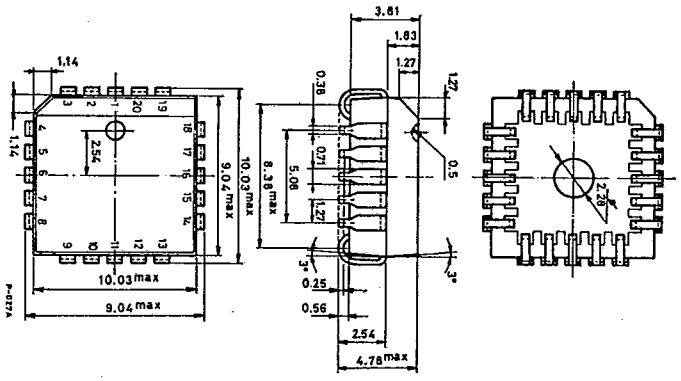




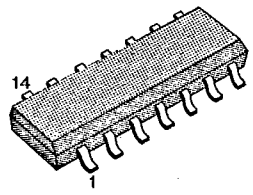
CHIP CARRIER 20 LEAD PLASTIC

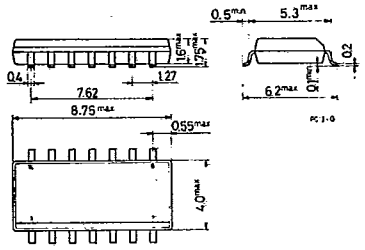




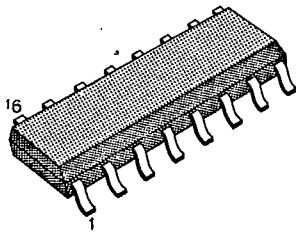
Packages

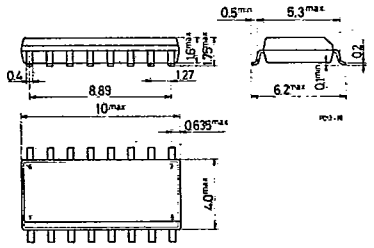
14-LEAD PLASTIC DIP MICROPACKAGE





16-LEAD PLASTIC DIP MICROPACKAGE





NOTE: FOR 20-LEAD PLASTIC DIP MICROPACKAGE CONTACT SGS

Surface Mounted

One possible solution to the important problem of PWB minimization, is that of using surface mounted components. Integrated circuits in SO (Small Outline) packages are made up of standard chips mounted in very small plastic packages.
The advantages given by using these devices are:

PWB Reduction

This is by far the most important advantage since the reduction of PWB size varies from 40 to 60% in comparison with standard board types. (See page 584 for package dimensions.)

Assembly Cost Reduction

SO Devices require no preliminary operation prior to mounting and can therefore be easily utilized in fully automatic equipment.

Increasing Reliability

The following characteristics lead to a higher level of reliability with respect to their standard packaged counter parts:

- The mounting system is fully automatic
- PWB number and the interconnections between them are reduced when the same number of devices are used.
- The high density of components on the board makes it thermally much more stable.

Noise Reduction and Improved Frequency Response

The reduction of the length of the connecting wires between the leads and the silicon guarantees a more homogeneous propogation delay between the external pins, with respect to the standard type.

Assembly Without Board Holes

The devices are placed on the board and soldered. This technology permits a higher level of tolerance in the positioning (automatic) of the device. For the standard DIP types this must be done with great accuracy due to the insertion of the leads into their holes.