

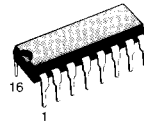


## 3-STATE HEX BUFFERS

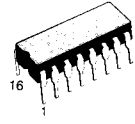
### DESCRIPTION

These devices are high-speed Hex Buffers with 3-state outputs. They are organized as single 6-bit or 2-bit/4-bit, with inverting or non-inverting data (D) paths. The outputs are designed to drive 15 TTL Unit Loads or 60 Low Power Schottky loads when the Enable ( $\bar{E}$ ) is LOW.

When the output Enable input ( $\bar{E}$ ) is HIGH, the outputs are forced to a high impedance "off" state. If the outputs of the 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 there is no overlap.



**B1**  
Plastic Package



**D1/D2**  
Ceramic Package



**M1**  
Micro Package



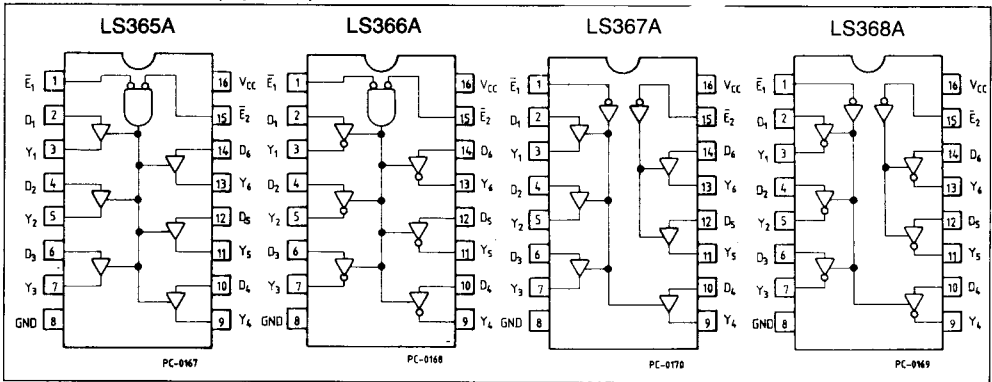
**C1**  
Plastic Chip Carrier

### ORDERING NUMBERS:

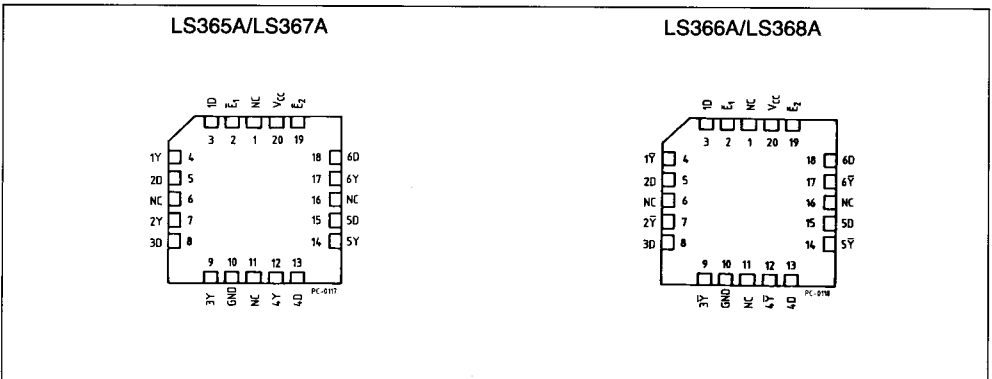
T54LSXXXX D2  
T74LSXXXX D1  
T74LSXXXX B1

T74LSXXXX C1  
T74LSXXXX M1

### PIN CONNECTION (top view) DUAL IN LINE



### CHIP CARRIER





## TRUTH TABLES

**LS365A**

| INPUTS      |             |   | OUTPUT |
|-------------|-------------|---|--------|
| $\bar{E}_1$ | $\bar{E}_2$ | D |        |
| L           | L           | L | L      |
| L           | L           | H | H      |
| H           | X           | X | (Z)    |
| X           | H           | X | (Z)    |

**LS366A**

| INPUTS      |             |   | OUTPUT |
|-------------|-------------|---|--------|
| $\bar{E}_1$ | $\bar{E}_2$ | D |        |
| L           | L           | L | H      |
| L           | L           | H | L      |
| H           | X           | X | (Z)    |
| X           | H           | X | (Z)    |

**LS367A**

| INPUTS    |   | OUTPUT |
|-----------|---|--------|
| $\bar{E}$ | D |        |
| L         | L | L      |
| L         | H | H      |
| H         | X | (Z)    |

**LS368A**

| INPUTS    |   | OUTPUT |
|-----------|---|--------|
| $\bar{E}$ | D |        |
| L         | L | H      |
| L         | H | L      |
| H         | X | (Z)    |

## 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 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    |                 |
| T54LS365A/366A/367A/368AD2 | 4.5 V          | 5.0 V | 5.5 V  | -55°C to +125°C |
| T74LS365A/366A/367A/368AXX | 4.75 V         | 5.0 V | 5.25 V | 0°C to +70°C    |

XX = package type.



## DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE

| Symbol           | Parameter                                |          | Limits |       |           | Test Conditions<br>(Note 1)  | Units   |   |
|------------------|--|----------|--------|-------|-----------|--|---|---|
|                  |  |          | Min.   | Typ.  | Max.      |  |   |   |
| V <sub>IH</sub>  | Input HIGH Voltage                       |          | 2.0    |       |           | Guaranteed input HIGH Voltage for all Inputs   | V   |   |
| V <sub>IL</sub>  | Input LOW Voltage                        | 54       |        |       | 0.7       | Guaranteed input LOW Voltage for all Inputs  | V   |   |
|                  |  | 74       |        |       | 0.8       |  |   |   |
| V <sub>CD</sub>  | Input Clamp Diode Voltage                |          |        | -0.65 | -1.5      | V <sub>CC</sub> = MIN, I <sub>IN</sub> = -18mA   | V   |   |
| V <sub>OH</sub>  | Output HIGH Voltage                      | 54       | 2.4    | 3.4   |           | I <sub>OH</sub> = -1.0mA   | V <sub>CC</sub> = MIN, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> per Truth Table | V |
|                  |  | 74       | 2.4    | 3.1   |           | I <sub>OH</sub> = -2.6mA   |   |   |
| V <sub>OL</sub>  | Output LOW Voltage                       | 54,74    |        | 0.25  | 0.4       | I <sub>OL</sub> = 12mA   | V <sub>CC</sub> = MIN, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> per Truth Table | V |
|                  |  | 74       |        | 0.35  | 0.5       | I <sub>OL</sub> = 24mA   |   |   |
| I <sub>OZH</sub> | Output Off Current HIGH                  |          |        |       | 20        | V <sub>CC</sub> = MAX, V <sub>OUT</sub> = 2.7V, V <sub>E</sub> = 2.0V                          | μA  |   |
| I <sub>OZL</sub> | Output Off Current LOW                   |          |        |       | -20       | V <sub>CC</sub> = MAX, V <sub>OUT</sub> = 0.4V, V <sub>E</sub> = 2.0V                          | μA  |   |
| I <sub>IH</sub>  | Input HIGH Current                       |          |        |       | 20<br>0.1 | V <sub>CC</sub> = MAX, V <sub>IN</sub> = 2.7V<br>V <sub>CC</sub> = MAX, V <sub>IN</sub> = 7.0V | μA  |   |
| I <sub>IL</sub>  | Input LOW Current                        | D Inputs |        |       | -20       | V <sub>CC</sub> = MAX, V <sub>IN</sub> = 0.5V<br>Either E Input at 2V                          | μA  |   |
|                  |  |          |        |       | -0.4      | V <sub>CC</sub> = MAX, V <sub>IN</sub> = 0.4V<br>Both E Inputs at 0.4V                         | mA  |   |
|                  |  | E Inputs |        |       | -0.4      |  | mA  |   |
| I <sub>OS</sub>  | Output Short Circuit Current<br>(Note 2) |          | -40    |       | -225      | V <sub>CC</sub> = MAX, V <sub>OUT</sub> = 0V   | mA  |   |
| I <sub>CC</sub>  | Power Supply Current<br>LS365A/367A      |          |        | 13.5  | 24        | V <sub>CC</sub> = MAX, V <sub>IN</sub> = 0V, V <sub>E</sub> = 4.5V                             | mA  |   |
|                  | LS366A/368A                              |          |        | 11.8  | 21        |  |   |   |

### Notes:

- 1) For conditions shown as MIN or MAX, use the appropriate value specified under guaranteed operating conditions for the device type.
- 2) Not more than one output should be shorted at a time.
- 3) Typical values are at V<sub>CC</sub> = 5.0V, T<sub>A</sub> = 25°C

## AC CHARACTERISTICS: T<sub>A</sub> = 25°C

| Symbol                               | Parameter           | Limits      |           |          |             |           |          | Test Conditions  | Units |
|--------------------------------------|---------------------|-------------|-----------|----------|-------------|-----------|----------|--|-------|
|                                      |                     | LS365A/367A |           |          | LS366A/368A |           |          |  |       |
|                                      |                     | Min.        | Typ.      | Max.     | Min.        | Typ.      | Max.     |  |       |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay,  |             | 10<br>9.0 | 16<br>22 |             | 7.0<br>12 | 15<br>18 | V <sub>CC</sub> = 5.0V<br>C <sub>L</sub> = 45pF<br>R <sub>L</sub> 667Ω | ns    |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Output Enable Time  |             | 19<br>24  | 35<br>40 |             | 18<br>28  | 35<br>45 |  | ns    |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Output Disable Time |             |           | 30<br>35 |             |           | 32<br>35 | V <sub>CC</sub> = 5.0V<br>C <sub>L</sub> = 5.0pF                       | ns    |

## AC WAVEFORMS

Fig. 1

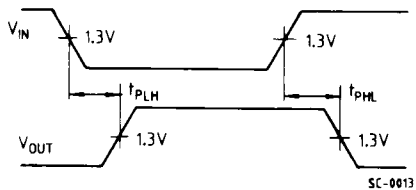


Fig. 2

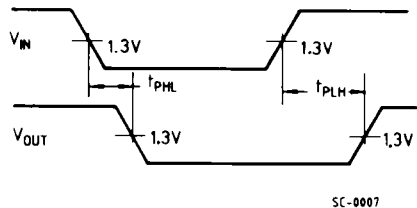


Fig. 3

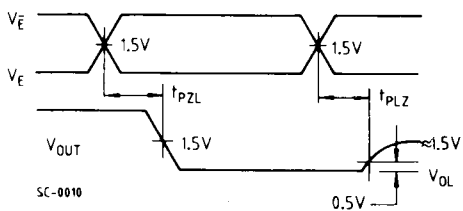
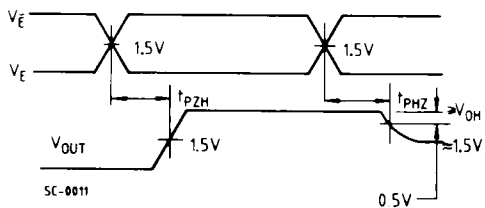
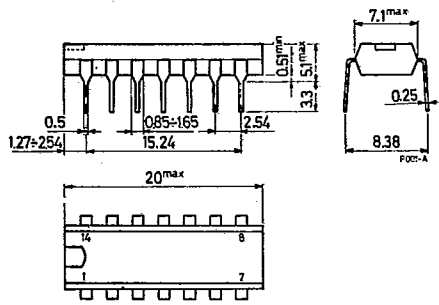
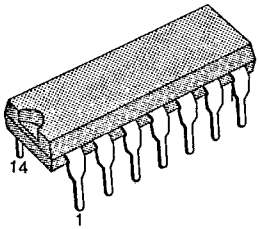


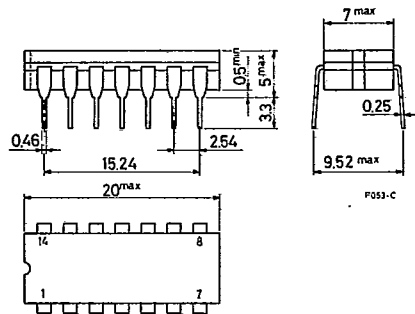
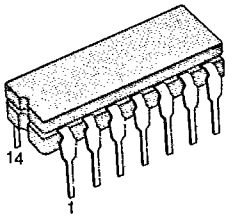
Fig. 4



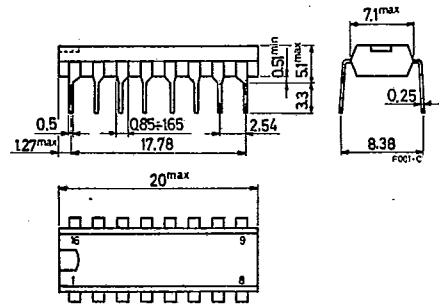
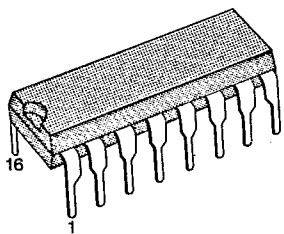
### 14-LEAD PLASTIC DIP



### 14-LEAD CERAMIC DIP



### 16-LEAD PLASTIC DIP



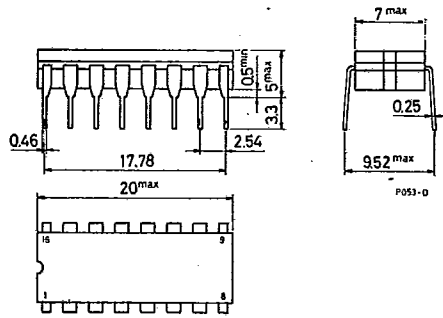
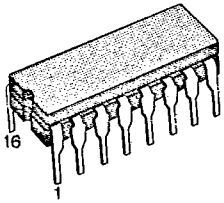
# Packages

67C 16545

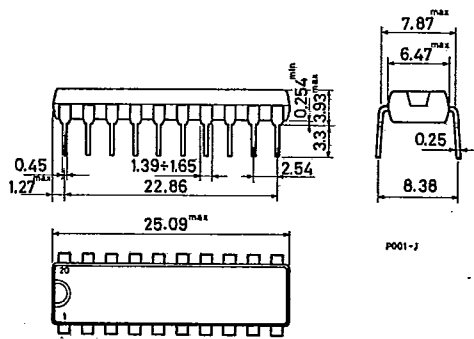
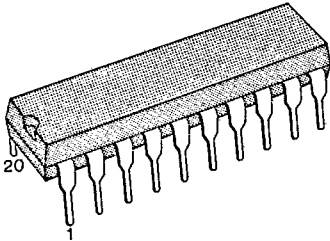
D

T-90-20

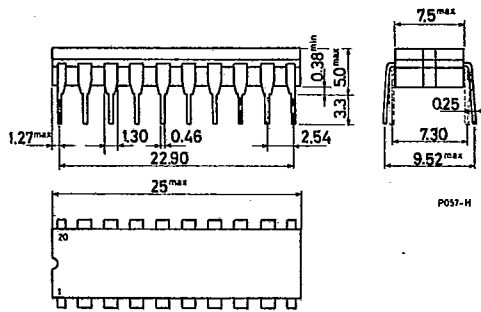
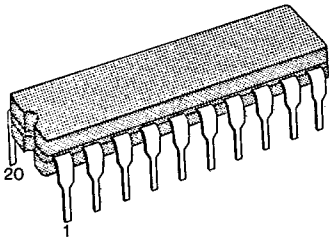
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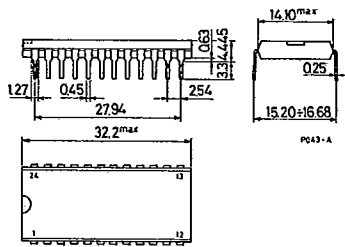
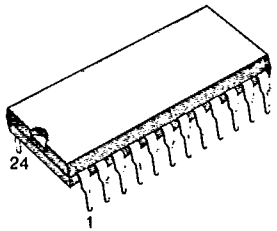
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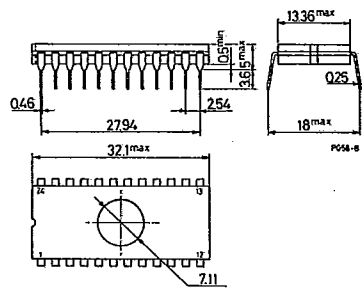
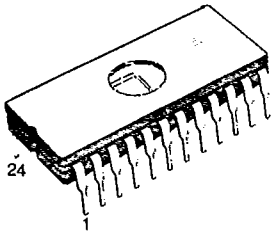
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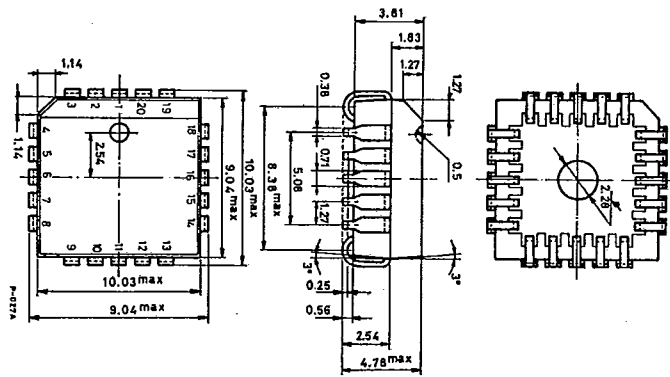
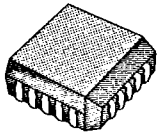
24-LEAD PLASTIC DIP



24-LEAD CERAMIC DIP



CHIP CARRIER 20 LEAD PLASTIC



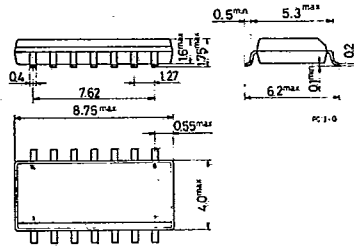
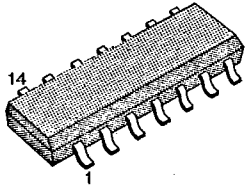
# Packages

67C 16547

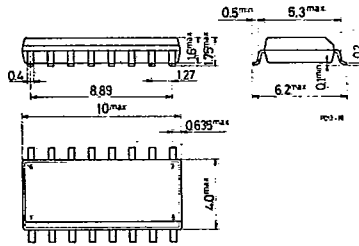
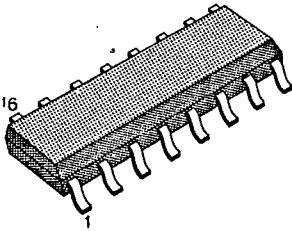
D

T-90-20

## 14-LEAD PLASTIC DIP MICROPACKAGE



## 16-LEAD PLASTIC DIP MICROPACKAGE



NOTE: FOR 20-LEAD PLASTIC DIP MICROPACKAGE CONTACT SGS



# Surface Mounted

67C 16548

D

T-90-20

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 propagation 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.

