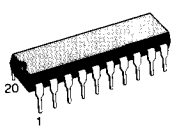
PRELIMINARY DATA

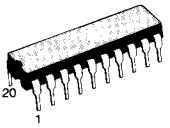
# OCTAL BUFFER/LINE DRIVERS WITH 3-STATE OUTPUTS

## DESCRIPTION

The T54LS/T74LS540/541 are Octal Buffers and Line Drivers. Although they have the same functions as LS240 and LS241, they offer a pinout with inputs and outputs on apposite sides of the package. These device are disigned to be used with 3-state memory address drivers, etc.




**B1**
Plastic Package




**D1/D2**
Ceramic Package

**M1**
Micro Package

**C1**
Plastic Chip Carrier

ORDERING NUMBERS:

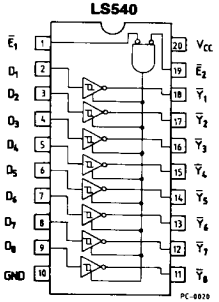
T54LSXXX D2
T74LSXXX D1
T74LSXXX B1
T74LSXXX C1
T74LSXXX M1

- PNP INPUTS REDUCE LOADING
- 3-STATE OUTPUTS DRIVE BUS LINES
- INPUTS AND OUTPUTS OPPOSITE SIDE OF PACKAGE, ALLOWING EASIERS INTERFACE TO MICROPROCESSOR
- INPUT CLAMP DIODES LIMIT HIGH SPEED TERMINATION EFFECTS

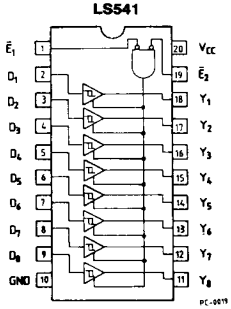
**PIN CONNECTION**
(top view)

DUAL IN LINE

LS540




LS541

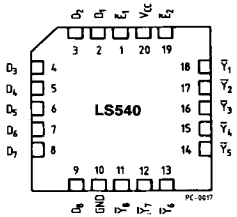


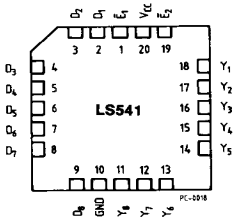

## TRUTH TABLE

| INPUTS | | | OUTPUTS | |
|---|---|---|---|---|
| $\overline{E}_1$ | $\overline{E}_2$ | D | LS540 | LS541 |
| L | L | H | L | H |
| H | X | X | Z | Z |
| X | H | X | Z | Z |
| L | L | L | H | L |

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

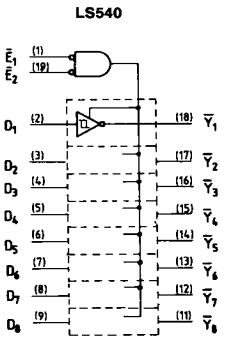
## CHIP CARRIER

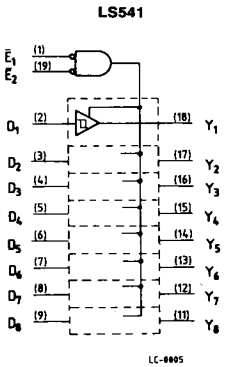



NC = No Internal Connection

## BLOCK 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 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 | |
| T54LS540/541D2 | 4.5 V | 5.0 V | 5.5 V | −55°C to +125°C |
| T74LS540/541XX | 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 (Note 1) | | Units |
|---|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | | |
| $V_{IH}$ | 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 | 54,74 | 2.4 | 3.4 | | $V_{CC}$ = MIN, $I_{OH}$ = −3.0mA | | V |
| | | 54 | 2.0 | | | $I_{OH}$ = −12mA | $V_{CC}$ = MIN, $V_{IL}$ = 0.5V | V |
| | | 74 | 2.0 | | | $I_{OH}$ = −15mA | | |
| $V_{OL}$ | Output LOW Voltage | 54,74 | | 0.25 | 0.4 | $I_{OL}$ = 12mA | $V_{CC}$ = MIN, $V_{IN}$ = $V_{IL}$ or $V_{IH}$ per Truth Table | V |
| | | 74 | | 0.35 | 0.5 | $I_{OL}$ = 24mA | | |
| $V_{T+}$-$V_{T-}$ | Hysteresis | | 0.2 | 0.4 | | $V_{CC}$ = MIN | | V |
| $I_{OZH}$ | Output Off Current High | | | | 20 | $V_{CC}$ = MAX, $V_{OUT}$ = 2.7V | | μA |
| $I_{OZL}$ | Output Off Current Low | | | | −20 | $V_{CC}$ = MAX, $V_{OUT}$ = 0.4V | | μA |
| $I_{IH}$ | Input HIGH Current | | | | 20<br>0.1 | $V_{CC}$ = MAX, $V_{IN}$ = 2.7V<br>$V_{CC}$ = MAX, $V_{IN}$ = 7.0V | | μA<br>mA |
| $I_{IL}$ | Input LOW Current | | | | −0.2 | $V_{CC}$ = MAX, $V_{IN}$ = 0.4V | | mA |
| $I_{OS}$ | Output Short Circuit Current (Note 2) | | −40 | | −225 | $V_{CC}$ = MAX, $V_{OUT}$ = 0V | | mA |
| $I_{CC}$ | Power Supply Current Total, Output HIGH | LS540<br>LS541 | | | 25<br>32 | $V_{CC}$ = MAX | | mA |
| | Total, Output LOW | LS540<br>LS541 | | | 45<br>52 | | | |
| | Total, Output 3-State | LS540<br>LS541 | | | 52<br>55 | | | |

**Notes:**
1) For conditions shown as MIN or MAX, use the appropriate value specified under guaranteed operating ranges.
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

## AC CHARACTERISTICS: $T_A = 25°C$

| Symbol | Parameter | | Limits | | | Test Conditions | Units |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| $t_{PLH}$ | Propagation Delay, Data to Output | LS540 | | 9.0 | 15 | $V_{CC} = 5.0V$<br>$C_L = 45pF$<br>$R_L = 667\Omega$ | ns |
| | | LS541 | | 12 | 15 | | |
| $t_{PHL}$ | | LS540 | | 12 | 15 | | ns |
| | | LS541 | | 12 | 18 | | |
| $t_{PZH}$ | Output Enable Time to HIGH Level | LS540 | | 15 | 25 | | ns |
| | | LS541 | | 15 | 32 | | |
| $t_{PZL}$ | Output Enable Time to LOW Level | LS540 | | 20 | 38 | | ns |
| | | LS541 | | 20 | 38 | | |
| $t_{PHZ}$ | Output Disable Time from HIGH Level | LS540 | | 10 | 18 | $C_L = 5.0pF$ | ns |
| | | LS541 | | 10 | 18 | | |
| $t_{PLZ}$ | Output Disable Time to LOW Level | LS540 | | 15 | 25 | | ns |
| | | LS541 | | 15 | 29 | | |

## AC WAVEFORMS

Fig. 1

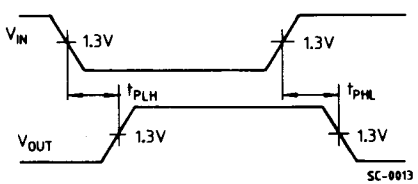



Fig. 2

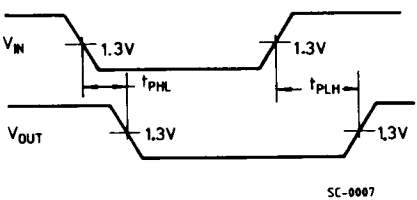



Fig. 3

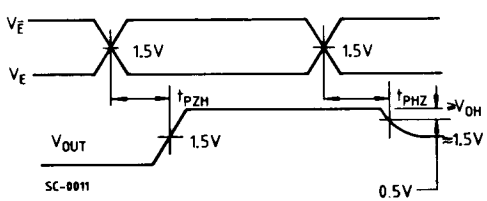
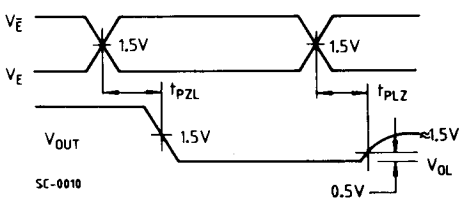
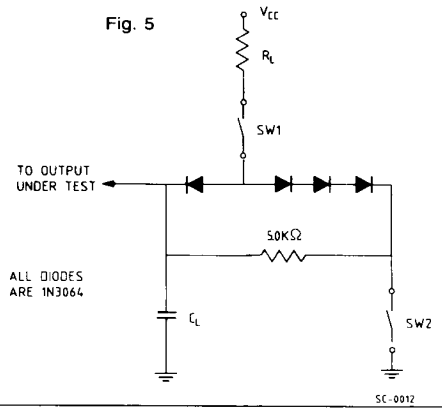



Fig. 4



## AC LOAD CIRCUIT

Fig. 5




**SWITCH POSITION**

| Symbol | SW1 | SW2 |
|---|---|---|
| $t_{PZH}$ | Open | Closed |
| $t_{PZL}$ | Closed | Open |
| $t_{PLZ}$ | Closed | Closed |
| $t_{PHZ}$ | Closed | Closed |