

# DATA SHEET

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## 74ABT540

Octal buffer, inverting (3-State)

Product specification  
Supersedes data of 1996 Oct 08  
IC23 Data Handbook

1998 Jan 16

# Octal buffer, inverting (3-State)

# 74ABT540

## FEATURES

- Octal bus interface
- 3-State buffers
- Live insertion/extraction permitted
- Efficient pinout to facilitate PC board layout
- Output capability: +64mA/−32mA
- Latch-up protection exceeds 500mA per Jedec JC40.2 Std 17
- ESD protection exceeds 2000 V per MIL STD 883 Method 3015 and 200 V per Machine Model
- Power-up 3-State

## DESCRIPTION

The 74ABT540 high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

The 74ABT540 device is an octal inverting buffer that is ideal for driving bus lines. The device features input and outputs on opposite sides of the package to facilitate printed circuit board layout.

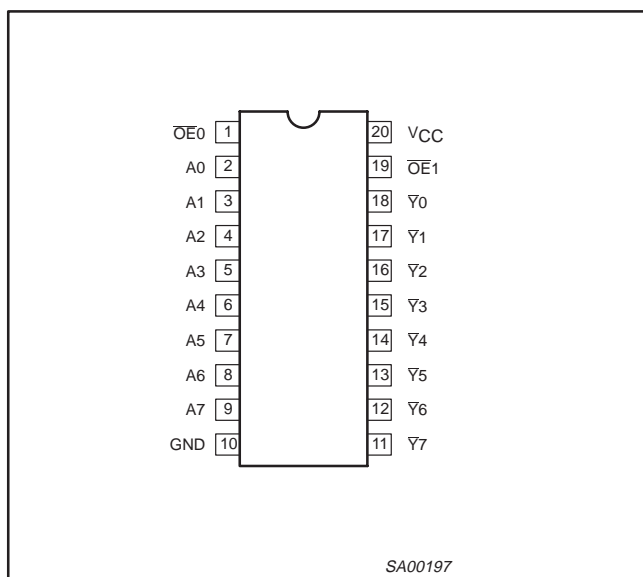
## QUICK REFERENCE DATA

| SYMBOL   | PARAMETER   | CONDITIONS<br><i>T</i> <sub>amb</sub> = 25°C; GND = 0V                 | TYPICAL | UNIT |
|--|---|--|---------|------|
| <i>t</i> <sub>PLH</sub><br><i>t</i> <sub>PHL</sub> | Propagation delay<br>A <sub>n</sub> to $\bar{Y}$ <sub>n</sub> | <i>C</i> <sub>L</sub> = 50pF; <i>V</i> <sub>CC</sub> = 5V              | 3.1     | ns   |
| <i>C</i> <sub>IN</sub>                             | Input capacitance   | <i>V</i> <sub>I</sub> = 0V or <i>V</i> <sub>CC</sub>                   | 3       | pF   |
| <i>C</i> <sub>OUT</sub>                            | Output capacitance  | Outputs disabled; <i>V</i> <sub>O</sub> = 0V or <i>V</i> <sub>CC</sub> | 7       | pF   |
| <i>I</i> <sub>CCZ</sub>                            | Total supply current  | Outputs disabled; <i>V</i> <sub>CC</sub> = 5.5V                        | 50      | μA   |

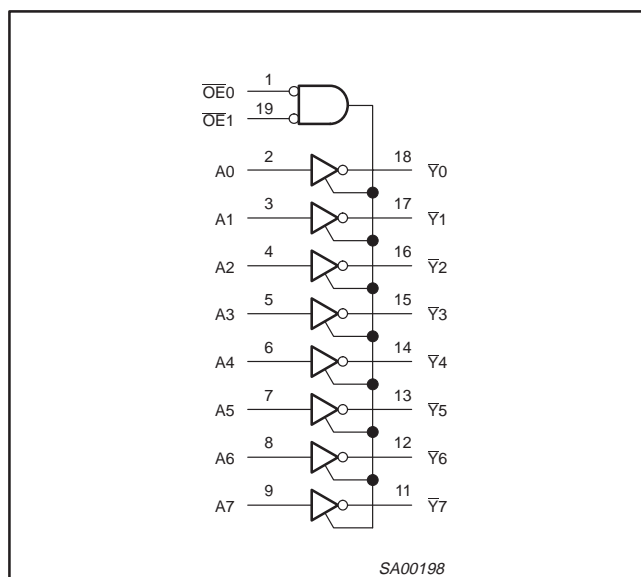
## ORDERING INFORMATION

| PACKAGES                    | TEMPERATURE RANGE | OUTSIDE NORTH AMERICA | NORTH AMERICA | DWG NUMBER |
|-----------------------------|-------------------|-----------------------|---------------|------------|
| 20-Pin Plastic DIP          | −40°C to +85°C    | 74ABT540 N            | 74ABT540 N    | SOT146-1   |
| 20-Pin plastic SO           | −40°C to +85°C    | 74ABT540 D            | 74ABT540 D    | SOT163-1   |
| 20-Pin Plastic SSOP Type II | −40°C to +85°C    | 74ABT540 DB           | 74ABT540 DB   | SOT339-1   |
| 20-Pin Plastic TSSOP Type I | −40°C to +85°C    | 74ABT540 PW           | 74ABT540PW DH | SOT360-1   |

## PIN CONFIGURATION



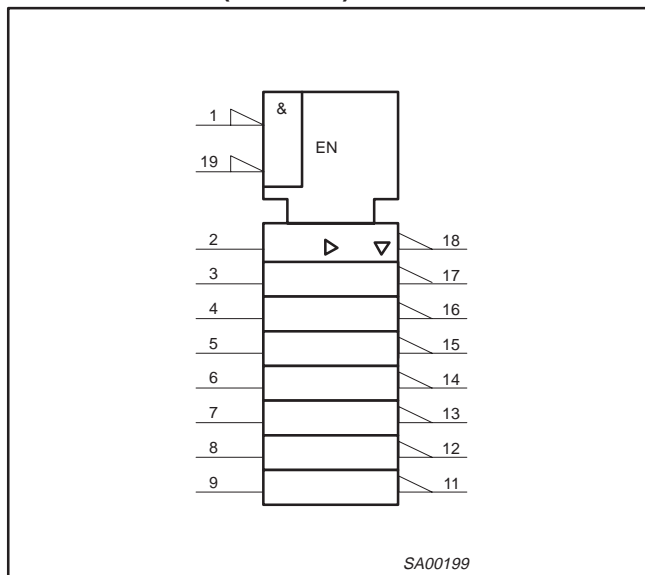
## LOGIC SYMBOL



# Octal buffer, inverting (3-State)

74ABT540

## LOGIC SYMBOL (IEEE/IEC)



## PIN DESCRIPTION

| PIN NUMBER                     | SYMBOL          | NAME AND FUNCTION       |
|--------------------------------|-----------------|-------------------------|
| 2, 3, 4, 5, 6, 7, 8, 9         | A0 – A7         | Data inputs             |
| 18, 17, 16, 15, 14, 13, 12, 11 | Y0 – Y7         | Data outputs            |
| 1, 19                          | OE0, OE1        | Output enables          |
| 10                             | GND             | Ground (0V)             |
| 20                             | V <sub>CC</sub> | Positive supply voltage |

## FUNCTION TABLE

| INPUTS |     |                | OUTPUTS        |
|--------|-----|----------------|----------------|
| OE0    | OE1 | A <sub>n</sub> | Y <sub>n</sub> |
| L      | L   | L              | H              |
| L      | L   | H              | L              |
| X      | H   | X              | Z              |
| H      | X   | X              | Z              |

H = High voltage level  
 L = Low voltage level  
 X = Don't care  
 Z = High impedance "off" state

## ABSOLUTE MAXIMUM RATINGS<sup>1, 2</sup>

| SYMBOL           | PARAMETER                      | CONDITIONS                  | RATING       | UNIT |
|------------------|--------------------------------|-----------------------------|--------------|------|
| V <sub>CC</sub>  | DC supply voltage              |                             | -0.5 to +7.0 | V    |
| I <sub>IK</sub>  | DC input diode current         | V <sub>I</sub> < 0          | -18          | mA   |
| V <sub>I</sub>   | DC input voltage <sup>3</sup>  |                             | -1.2 to +7.0 | V    |
| I <sub>OK</sub>  | DC output diode current        | V <sub>O</sub> < 0          | -50          | mA   |
| V <sub>OUT</sub> | DC output voltage <sup>3</sup> | output in Off or High state | -0.5 to +5.5 | V    |
| I <sub>OUT</sub> | DC output current              | output in Low state         | 128          | mA   |
| T <sub>stg</sub> | Storage temperature range      |                             | -65 to 150   | °C   |

### NOTES:

- Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150°C.
- The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

## Octal buffer, inverting (3-State)

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## RECOMMENDED OPERATING CONDITIONS

| SYMBOL              | PARAMETER                            | LIMITS |          | UNIT |
|---------------------|--------------------------------------|--------|----------|------|
|                     |                                      | Min    | Max      |      |
| $V_{CC}$            | DC supply voltage                    | 4.5    | 5.5      | V    |
| $V_I$               | Input voltage                        | 0      | $V_{CC}$ | V    |
| $V_{IH}$            | High-level input voltage             | 2.0    |          | V    |
| $V_{IL}$            | Low-level Input voltage              |        | 0.8      | V    |
| $I_{OH}$            | High-level output current            |        | -32      | mA   |
| $I_{OL}$            | Low-level output current             |        | 64       | mA   |
| $\Delta t/\Delta v$ | Input transition rise or fall rate   | 0      | 10       | ns/V |
| $T_{amb}$           | Operating free-air temperature range | -40    | +85      | °C   |

## DC ELECTRICAL CHARACTERISTICS

| SYMBOL          | PARAMETER  | TEST CONDITIONS  | LIMITS                        |            |           |   |           | UNIT          |
|-----------------|--|--|-------------------------------|------------|-----------|---|-----------|---------------|
|                 |  |  | $T_{amb} = +25^\circ\text{C}$ |            |           | $T_{amb} = -40^\circ\text{C}$<br>to $+85^\circ\text{C}$ |           |               |
|                 |  |  | Min                           | Typ        | Max       | Min   | Max       |               |
| $V_{IK}$        | Input clamp voltage                                  | $V_{CC} = 4.5\text{V}; I_{IK} = -18\text{mA}$  |                               | -0.9       | -1.2      |   | -1.2      | V             |
| $V_{OH}$        | High-level output voltage                            | $V_{CC} = 4.5\text{V}; I_{OH} = -3\text{mA}; V_I = V_{IL}$ or $V_{IH}$                                 | 2.5                           | 2.9        |           | 2.5   |           | V             |
|                 |  | $V_{CC} = 5.0\text{V}; I_{OH} = -3\text{mA}; V_I = V_{IL}$ or $V_{IH}$                                 | 3.0                           | 3.4        |           | 3.0   |           | V             |
|                 |  | $V_{CC} = 4.5\text{V}; I_{OH} = -32\text{mA}; V_I = V_{IL}$ or $V_{IH}$                                | 2.0                           | 2.4        |           | 2.0   |           | V             |
| $V_{OL}$        | Low-level output voltage                             | $V_{CC} = 4.5\text{V}; I_{OL} = 64\text{mA}; V_I = V_{IL}$ or $V_{IH}$                                 |                               | 0.42       | 0.55      |   | 0.55      | V             |
| $I_I$           | Input leakage current                                | $V_{CC} = 5.5\text{V}; V_I = \text{GND}$ or $5.5\text{V}$  |                               | $\pm 0.01$ | $\pm 1.0$ |   | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{OFF}$       | Power-off leakage current                            | $V_{CC} = 0.0\text{V}; V_I$ or $V_O \leq 4.5\text{V}$  |                               | $\pm 5.0$  | $\pm 100$ |   | $\pm 100$ | $\mu\text{A}$ |
| $I_{PU}/I_{PD}$ | Power-up/down 3-State output current <sup>3</sup>    | $V_{CC} = 2.1\text{V}; V_O = 0.5\text{V}; V_I = \text{GND}$ or $V_{CC}$ ; $V_{OE} = \text{Don't care}$ |                               | $\pm 5.0$  | $\pm 50$  |   | $\pm 50$  | $\mu\text{A}$ |
| $I_{OZH}$       | 3-State output High current                          | $V_{CC} = 5.5\text{V}; V_O = 2.7\text{V}; V_I = V_{IL}$ or $V_{IH}$                                    |                               | 5.0        | 50        |   | 50        | $\mu\text{A}$ |
| $I_{OZL}$       | 3-State output Low current                           | $V_{CC} = 5.5\text{V}; V_O = 0.5\text{V}; V_I = V_{IL}$ or $V_{IH}$                                    |                               | -5.0       | -50       |   | -50       | $\mu\text{A}$ |
| $I_{CEX}$       | Output High leakage current                          | $V_{CC} = 5.5\text{V}; V_O = 5.5\text{V}; V_I = \text{GND}$ or $V_{CC}$                                |                               | 5.0        | 50        |   | 50        | mA            |
| $I_O$           | Output current <sup>1</sup>                          | $V_{CC} = 5.5\text{V}; V_O = 2.5\text{V}$  | -50                           | -100       | -180      | -50   | -180      | mA            |
| $I_{CCH}$       | Quiescent supply current                             | $V_{CC} = 5.5\text{V}; \text{Outputs High}, V_I = \text{GND}$ or $V_{CC}$                              |                               | 50         | 250       |   | 250       | $\mu\text{A}$ |
| $I_{CCL}$       |  | $V_{CC} = 5.5\text{V}; \text{Outputs Low}, V_I = \text{GND}$ or $V_{CC}$                               |                               | 24         | 30        |   | 30        | mA            |
| $I_{CCZ}$       |  | $V_{CC} = 5.5\text{V}; \text{Outputs 3-State}; V_I = \text{GND}$ or $V_{CC}$                           |                               | 50         | 250       |   | 250       | $\mu\text{A}$ |
| $\Delta I_{CC}$ | Additional supply current per input pin <sup>2</sup> | Outputs enabled, one input at 3.4V, other inputs at $V_{CC}$ or GND; $V_{CC} = 5.5\text{V}$            |                               | 0.5        | 1.5       |   | 1.5       | mA            |
|                 |  | Outputs 3-State, one data input at 3.4V, other inputs at $V_{CC}$ or GND; $V_{CC} = 5.5\text{V}$       |                               | 0.5        | 50        |   | 50        | $\mu\text{A}$ |
|                 |  | Outputs 3-State, one enable input at 3.4V, other inputs at $V_{CC}$ or GND; $V_{CC} = 5.5\text{V}$     |                               | 0.5        | 1.5       |   | 1.5       | mA            |

## NOTES:

- Not more than one output should be tested at a time, and the duration of the test should not exceed one second.
- This is the increase in supply current for each input at 3.4V.
- This parameter is valid for any  $V_{CC}$  between 0V and 2.1V, with a transition time of up to 10msec. From  $V_{CC} = 2.1\text{V}$  to  $V_{CC} = 5\text{V} \pm 10\%$  a transition time of up to 100 $\mu\text{sec}$  is permitted.

# Octal buffer, inverting (3-State)

74ABT540

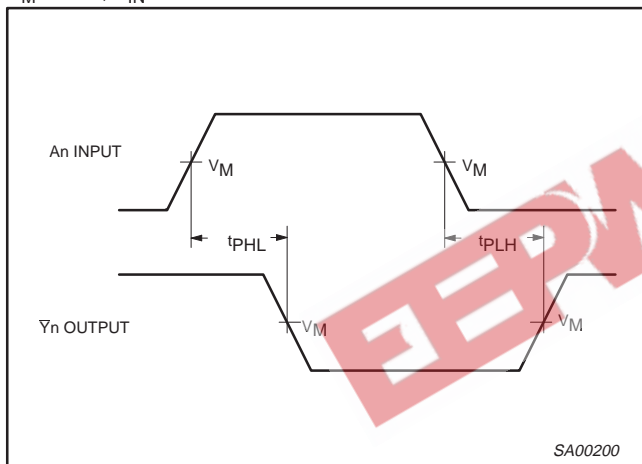
## AC CHARACTERISTICS

GND = 0V;  $t_R = t_F = 2.5\text{ns}$ ;  $C_L = 50\text{pF}$ ,  $R_L = 500\Omega$

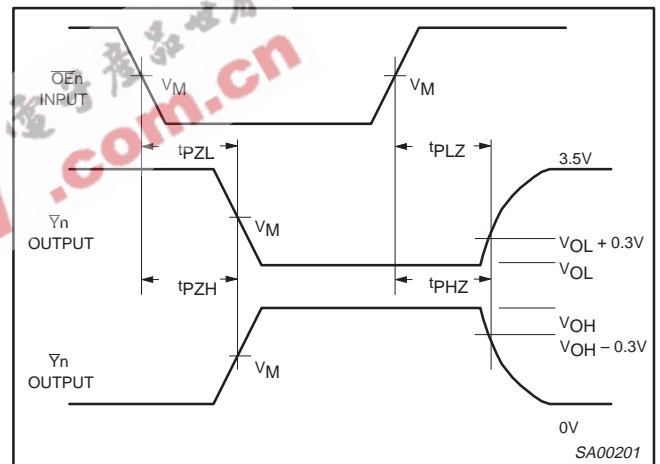
| SYMBOL                               | PARAMETER                                      | WAVEFORM | LIMITS   |            |            |  |            | UNIT |
|--------------------------------------|--|----------|--|------------|------------|--|------------|------|
|                                      |  |          | $T_{\text{amb}} = +25^\circ\text{C}$<br>$V_{\text{CC}} = +5.0\text{V}$ |            |            | $T_{\text{amb}} = -40^\circ\text{C to } +85^\circ\text{C}$<br>$V_{\text{CC}} = +5.0\text{V} \pm 0.5\text{V}$ |            |      |
|                                      |  |          | Min  | Typ        | Max        | Min  | Max        |      |
| $t_{\text{PLH}}$<br>$t_{\text{PHL}}$ | Propagation delay<br>An to $\bar{Y}_n$         | 1        | 1.0<br>1.0   | 2.9<br>3.1 | 4.1<br>4.3 | 1.0<br>1.0   | 4.8<br>4.8 | ns   |
| $t_{\text{PZH}}$<br>$t_{\text{PZL}}$ | Output enable time<br>to High and Low level    | 2        | 1.1<br>1.1   | 4.1<br>4.6 | 4.9<br>5.8 | 1.1<br>1.1   | 5.9<br>6.4 | ns   |
| $t_{\text{PHZ}}$<br>$t_{\text{PLZ}}$ | Output disable time<br>from High and Low level | 2        | 1.5<br>1.2   | 3.6<br>2.9 | 6.8<br>5.7 | 1.5<br>1.2   | 7.3<br>6.2 | ns   |

## AC WAVEFORMS

$V_M = 1.5\text{V}$ ,  $V_{\text{IN}} = \text{GND to } 3.0\text{V}$

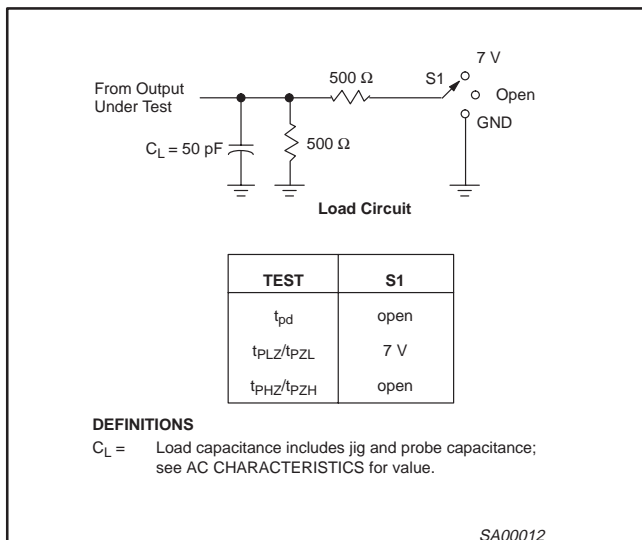


Waveform 1. Waveforms Showing the Input (An) to Output ( $\bar{Y}_n$ ) Propagation Delays



Waveform 2. Waveforms Showing the 3-State Output Enable and Disable Times

## TEST CIRCUIT AND WAVEFORMS

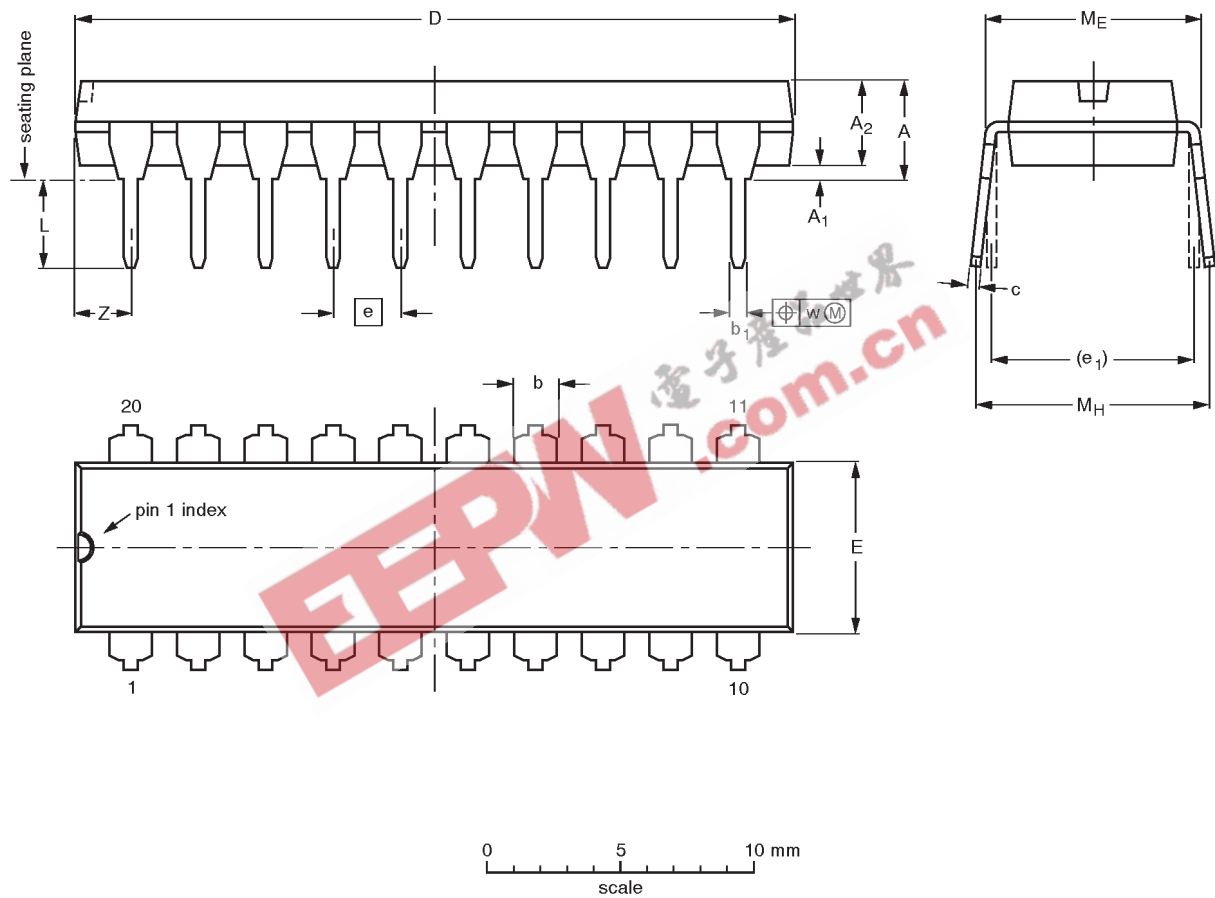


Octal buffer, inverting (3-State)

74ABT540

DIP20: plastic dual in-line package; 20 leads (300 mil)

SOT146-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

| UNIT   | A max. | A <sub>1</sub> min. | A <sub>2</sub> max. | b              | b <sub>1</sub> | c              | D <sup>(1)</sup> | E <sup>(1)</sup> | e    | e <sub>1</sub> | L            | M <sub>E</sub> | M <sub>H</sub> | w     | Z <sup>(1)</sup> max. |
|--------|--------|---------------------|---------------------|----------------|----------------|----------------|------------------|------------------|------|----------------|--------------|----------------|----------------|-------|-----------------------|
| mm     | 4.2    | 0.51                | 3.2                 | 1.73<br>1.30   | 0.53<br>0.38   | 0.36<br>0.23   | 26.92<br>26.54   | 6.40<br>6.22     | 2.54 | 7.62           | 3.60<br>3.05 | 8.25<br>7.80   | 10.0<br>8.3    | 0.254 | 2.0                   |
| inches | 0.17   | 0.020               | 0.13                | 0.068<br>0.051 | 0.021<br>0.015 | 0.014<br>0.009 | 1.060<br>1.045   | 0.25<br>0.24     | 0.10 | 0.30           | 0.14<br>0.12 | 0.32<br>0.31   | 0.39<br>0.33   | 0.01  | 0.078                 |

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

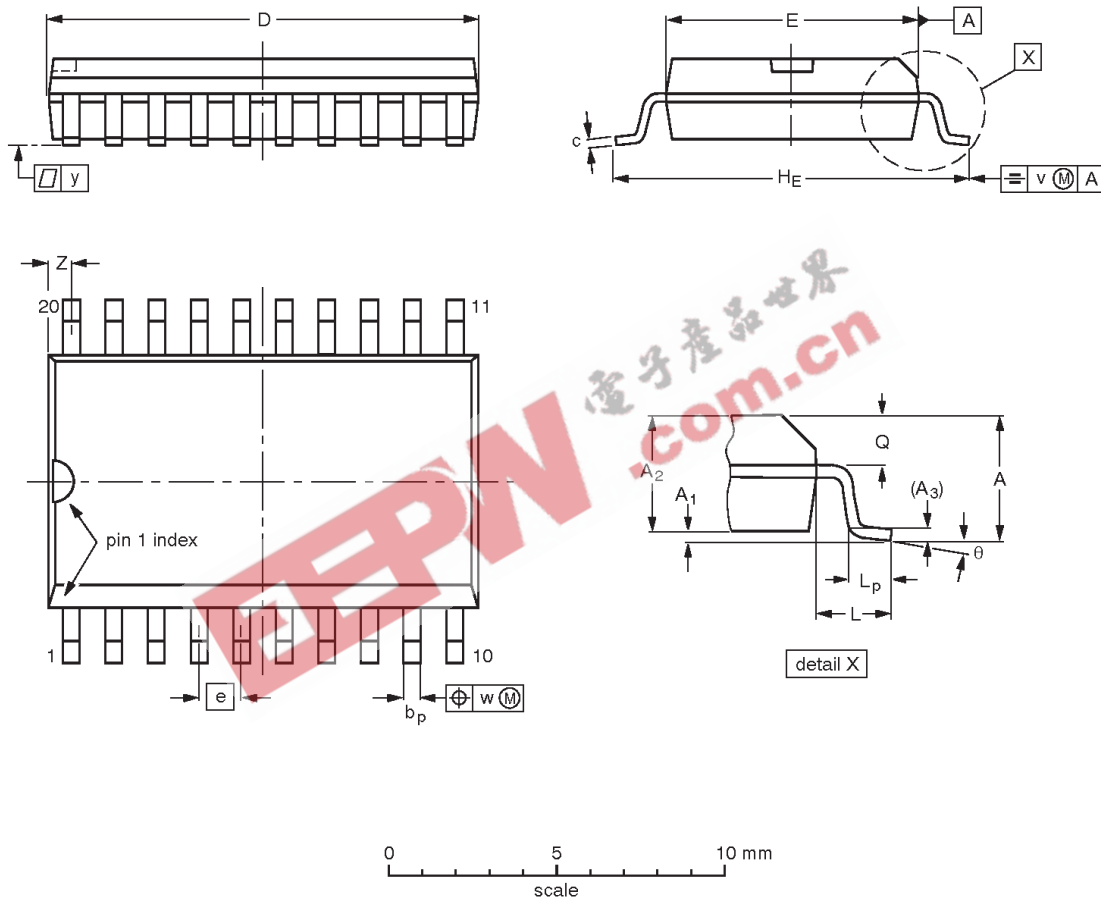
| OUTLINE VERSION | REFERENCES |       |       |  | EUROPEAN PROJECTION | ISSUE DATE           |
|-----------------|------------|-------|-------|--|---------------------|----------------------|
|                 | IEC        | JEDEC | EIAJ  |  |                     |                      |
| SOT146-1        |            |       | SC603 |  |                     | 92-11-17<br>95-05-24 |

Octal buffer, inverting (3-State)

74ABT540

SO20: plastic small outline package; 20 leads; body width 7.5 mm

SOT163-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

| UNIT   | A max. | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> | b <sub>p</sub> | c              | D <sup>(1)</sup> | E <sup>(1)</sup> | e     | H <sub>E</sub> | L     | L <sub>p</sub> | Q              | v    | w    | y     | z <sup>(1)</sup> | θ        |
|--------|--------|----------------|----------------|----------------|----------------|----------------|------------------|------------------|-------|----------------|-------|----------------|----------------|------|------|-------|------------------|----------|
| mm     | 2.65   | 0.30<br>0.10   | 2.45<br>2.25   | 0.25           | 0.49<br>0.36   | 0.32<br>0.23   | 13.0<br>12.6     | 7.6<br>7.4       | 1.27  | 10.65<br>10.00 | 1.4   | 1.1<br>0.4     | 1.1<br>1.0     | 0.25 | 0.25 | 0.1   | 0.9<br>0.4       | 8°<br>0° |
| inches | 0.10   | 0.012<br>0.004 | 0.096<br>0.089 | 0.01           | 0.019<br>0.014 | 0.013<br>0.009 | 0.51<br>0.49     | 0.30<br>0.29     | 0.050 | 0.42<br>0.39   | 0.055 | 0.043<br>0.016 | 0.043<br>0.039 | 0.01 | 0.01 | 0.004 | 0.035<br>0.016   |          |

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

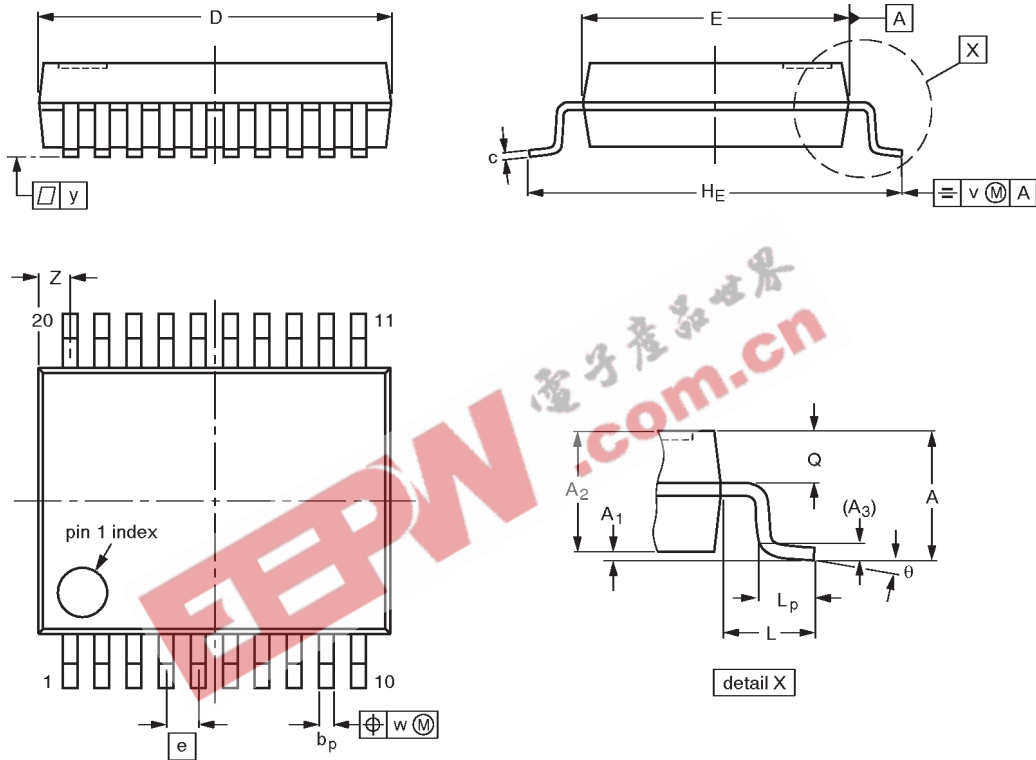
| OUTLINE VERSION | REFERENCES |          |      |  | EUROPEAN PROJECTION | ISSUE DATE           |
|-----------------|------------|----------|------|--|---------------------|----------------------|
|                 | IEC        | JEDEC    | EIAJ |  |                     |                      |
| SOT163-1        | 075E04     | MS-013AC |      |  |                     | 92-11-17<br>95-01-24 |

Octal buffer, inverting (3-State)

74ABT540

SSOP20: plastic shrink small outline package; 20 leads; body width 5.3 mm

SOT339-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A max. | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> | b <sub>p</sub> | c            | D <sup>(1)</sup> | E <sup>(1)</sup> | e    | H <sub>E</sub> | L    | L <sub>p</sub> | Q          | v   | w    | y   | z <sup>(1)</sup> | θ        |
|------|--------|----------------|----------------|----------------|----------------|--------------|------------------|------------------|------|----------------|------|----------------|------------|-----|------|-----|------------------|----------|
| mm   | 2.0    | 0.21<br>0.05   | 1.80<br>1.65   | 0.25           | 0.38<br>0.25   | 0.20<br>0.09 | 7.4<br>7.0       | 5.4<br>5.2       | 0.65 | 7.9<br>7.6     | 1.25 | 1.03<br>0.63   | 0.9<br>0.7 | 0.2 | 0.13 | 0.1 | 0.9<br>0.5       | 8°<br>0° |

Note

1. Plastic or metal protrusions of 0.20 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES |          |      |  | EUROPEAN PROJECTION | ISSUE DATE           |
|-----------------|------------|----------|------|--|---------------------|----------------------|
|                 | IEC        | JEDEC    | EIAJ |  |                     |                      |
| SOT339-1        |            | MO-150AE |      |  |                     | 93-09-08<br>95-02-04 |

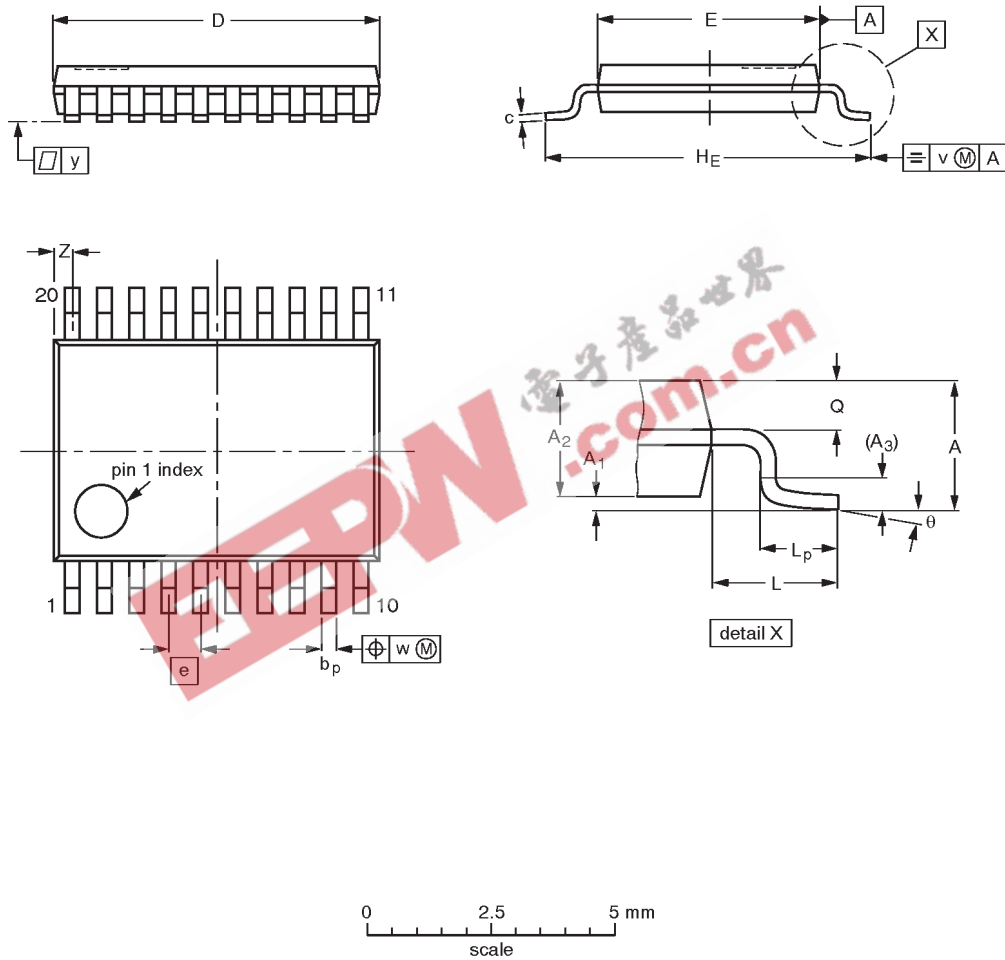


Octal buffer, inverting (3-State)

74ABT540

TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm

SOT360-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A max. | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> | b <sub>p</sub> | c          | D <sup>(1)</sup> | E <sup>(2)</sup> | e    | H <sub>E</sub> | L   | L <sub>p</sub> | Q          | v   | w    | y   | Z <sup>(1)</sup> | θ        |
|------|--------|----------------|----------------|----------------|----------------|------------|------------------|------------------|------|----------------|-----|----------------|------------|-----|------|-----|------------------|----------|
| mm   | 1.10   | 0.15<br>0.05   | 0.95<br>0.80   | 0.25           | 0.30<br>0.19   | 0.2<br>0.1 | 6.6<br>6.4       | 4.5<br>4.3       | 0.65 | 6.6<br>6.2     | 1.0 | 0.75<br>0.50   | 0.4<br>0.3 | 0.2 | 0.13 | 0.1 | 0.5<br>0.2       | 8°<br>0° |

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES |          |      |  | EUROPEAN PROJECTION | ISSUE DATE           |
|-----------------|------------|----------|------|--|---------------------|----------------------|
|                 | IEC        | JEDEC    | EIAJ |  |                     |                      |
| SOT360-1        |            | MO-153AC |      |  |                     | 93-06-16<br>95-02-04 |

## Octal buffer, inverting (3-State)

74ABT540

## Data sheet status

| Data sheet status         | Product status | Definition [1]   |
|---------------------------|----------------|--|
| Objective specification   | Development    | This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.  |
| Preliminary specification | Qualification  | This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product. |
| Product specification     | Production     | This data sheet contains final specifications. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.   |

[1] Please consult the most recently issued datasheet before initiating or completing a design.

## Definitions

**Short-form specification** — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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