

DATA SHEET

74ALS240A/74ALS240A-1 Octal inverter buffer (3-State)

Product specification
IC05 Data Handbook

1991 Feb 08

Octal inverter buffer (3-State)

74ALS240A/ 74ALS240A-1

FEATURES

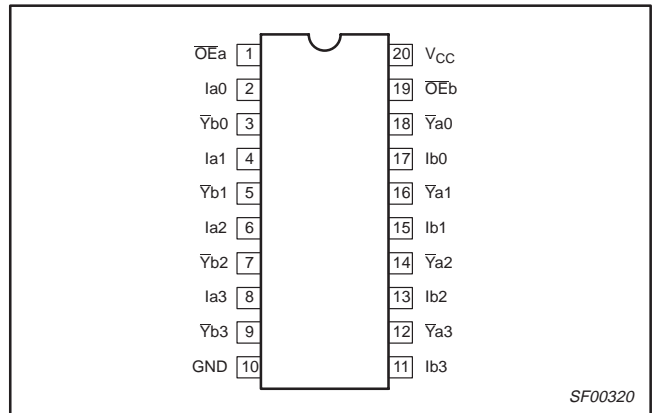
- Octal bus interface
- 3-State buffer outputs sink 24mA and source 15mA
- The -1 version sinks 48 mA

DESCRIPTION

The 74ALS240A is an octal buffer that is ideal for driving bus lines or buffer memory address registers. The outputs are all capable of sinking 24mA and sourcing up to 15mA, producing very good capacitive drive characteristics. The device features two output enables, $\overline{OE}a$ and $\overline{OE}b$, each controlling four of the 3-State outputs.

The 74ALS240A-1 sinks 48 mA I_{OL} if the V_{CC} is limited to 5.0V $\pm 0.25V$.

PIN CONFIGURATION



| TYPE | TYPICAL PROPAGATION DELAY | TYPICAL SUPPLY CURRENT (TOTAL) |
|-------------|---------------------------|--------------------------------|
| 74ALS240A | 4.5ns | 15mA |
| 74ALS240A-1 | 4.5ns | 15mA |

ORDERING INFORMATION

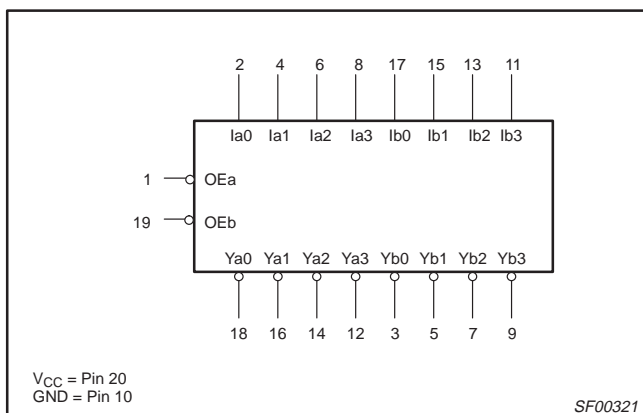
| DESCRIPTION | ORDER CODE | DRAWING NUMBER |
|--------------------------------|--|----------------|
| | COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$, $T_{amb} = 0^{\circ}C$ to $+70^{\circ}C$ | |
| 20-pin plastic DIP | 74ALS240AN, 74ALS240A-1N | SOT146-1 |
| 20-pin plastic SOL | 74ALS240AD, 74ALS240A-1D | SOT163-1 |
| 20-pin plastic SSOP Type II | 74ALS240ADB, 74ALS240A-1DB | SOT339-1 |

INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

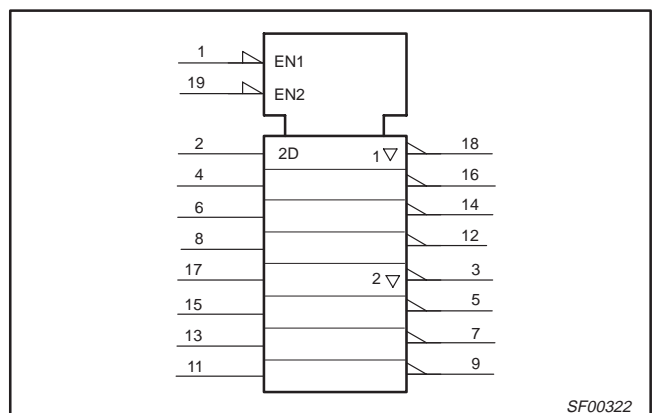
| PINS | DESCRIPTION | 74ALS (U.L.) HIGH/LOW | LOAD VALUE HIGH/LOW |
|-------------------------------------|-----------------------------------|-----------------------|---------------------|
| Ian, Ibn | Data inputs | 1.0/1.0 | 20 μ A/0.1mA |
| $\overline{OE}a$, $\overline{OE}b$ | Output Enable inputs (active-Low) | 1.0/1.0 | 20 μ A/0.1mA |
| $\overline{Y}an$, $\overline{Y}bn$ | Data outputs | 750/240 | 15mA/24mA |
| $\overline{Y}an$, $\overline{Y}bn$ | Data outputs (-1 version) | 750/480 | 15mA/48mA |

NOTE: One (1.0) ALS unit load is defined as: 20 μ A in the High state and 0.1mA in the Low state.

LOGIC SYMBOL



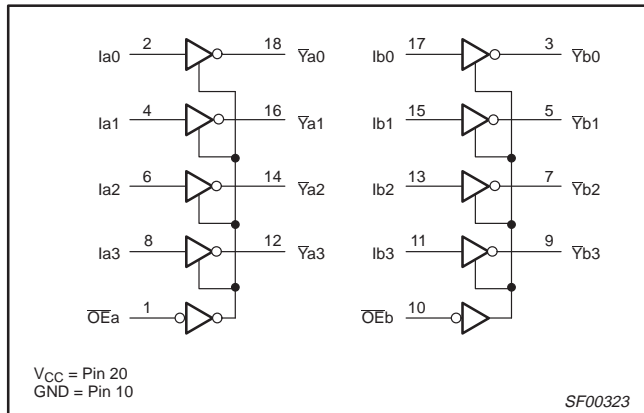
IEC/IEEE SYMBOL



Octal inverter buffer (3-State)

74ALS240A/
74ALS240A-1

LOGIC DIAGRAM



FUNCTION TABLE

| INPUTS | | | | OUTPUTS | |
|--------|----|-----|----|---------|----|
| OEa | Ia | OEb | Ib | Ya | Yb |
| L | L | L | L | H | H |
| L | H | L | H | L | L |
| H | X | H | X | Z | Z |

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

ABSOLUTE MAXIMUM RATINGS

(Operation beyond the limit set forth in this table may impair the useful life of the device. Unless otherwise noted these limits are over the operating free air temperature range.)

| SYMBOL | PARAMETER | RATING | UNIT |
|------------------|--|-------------------------|------|
| V _{CC} | Supply voltage | -0.5 to +7.0 | V |
| V _{IN} | Input voltage | -0.5 to +7.0 | V |
| I _{IN} | Input current | -30 to +5 | mA |
| V _{OUT} | Voltage applied to output in High output state | -0.5 to V _{CC} | V |
| I _{OUT} | Current applied to output in Low output state | All versions | 48 |
| | | -1 version | 96 |
| T _{amb} | Operating free-air temperature range | 0 to +70 | °C |
| T _{stg} | Storage temperature range | -65 to +150 | °C |

RECOMMENDED OPERATING CONDITIONS

| SYMBOL | PARAMETER | LIMITS | | | UNIT |
|------------------|--------------------------------------|--------------|-----|-----------------|------|
| | | MIN | NOM | MAX | |
| V _{CC} | Supply voltage | 4.5 | 5.0 | 5.5 | V |
| V _{IH} | High-level input voltage | 2.0 | | | V |
| V _{IL} | Low-level input voltage | | | 0.8 | V |
| I _{IK} | Input clamp current | | | -18 | mA |
| I _{OH} | High-level output current | | | -15 | mA |
| I _{OL} | Low-level output current | All versions | | 24 | mA |
| | | -1 version | | 48 ¹ | mA |
| T _{amb} | Operating free-air temperature range | 0 | | +70 | °C |

NOTE:

1. The 48mA limit applies only under the condition of V_{CC} = 5.0V ±5%.

Octal inverter buffer (3-State)

74ALS240A/
74ALS240A-1**DC ELECTRICAL CHARACTERISTICS**

(Over recommended operating free-air temperature range unless otherwise noted.)

| SYMBOL | PARAMETER | | TEST CONDITIONS ¹ | LIMITS | | | UNIT | | |
|------------------|---|------------------|--|--------------------------|---------------------|-------|------|------|----|
| | | | | MIN | TYP ² | MAX | | | |
| V _{OH} | High-level output voltage | | V _{CC} ±10%, V _{IL} = MAX, V _{IH} = MIN | I _{OH} = -0.4mA | V _{CC} - 2 | | V | | |
| | | | | I _{OH} = -3mA | 2.4 | 3.2 | V | | |
| | | | V _{CC} = MIN, V _{IL} = MAX, V _{IH} = MIN | I _{OH} = -15mA | 2.0 | | | | |
| V _{OL} | Low-level output voltage | All versions | V _{CC} = MIN, V _{IL} = MAX, V _{IH} = MIN | I _{OL} = 12mA | | 0.25 | 0.40 | V | |
| | | | | I _{OL} = 24mA | | 0.35 | 0.50 | V | |
| | | -1 version | V _{CC} = 4.75V, V _{IL} = MAX, V _{IH} = MIN | I _{OL} = 48mA | | 0.35 | 0.50 | V | |
| V _{IK} | Input clamp voltage | | V _{CC} = MIN, I _I = I _{IK} | | | -0.73 | -1.5 | V | |
| I _I | Input current at maximum input voltage | | V _{CC} = MAX, V _I = 7.0V | | | | 0.1 | mA | |
| I _{IH} | High-level input current | | V _{CC} = MAX, V _I = 2.7V | | | | 20 | μA | |
| I _{IL} | Low-level input current | | V _{CC} = MAX, V _I = 0.4V | | | | -0.1 | mA | |
| I _{OZH} | Off-state output current, High-level voltage applied | | V _{CC} = MAX, V _I = 2.7V | | | | 20 | μA | |
| I _{OZL} | Off-state output current, Low-level voltage applied | | V _{CC} = MAX, V _I = 0.4V | | | | -20 | μA | |
| I _O | Output current ³ | | V _{CC} = MAX, V _O = 2.25V | | | | -30 | -112 | mA |
| I _{CC} | Supply current (total) | I _{CCH} | V _{CC} = MAX | | | 2.5 | 11 | mA | |
| | | I _{CCL} | | | | 19.5 | 23 | mA | |
| | | I _{CCZ} | | | | 23 | 30 | | |

NOTES:

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at V_{CC} = 5V, T_{amb} = 25°C.
- The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS}.

AC ELECTRICAL CHARACTERISTICS

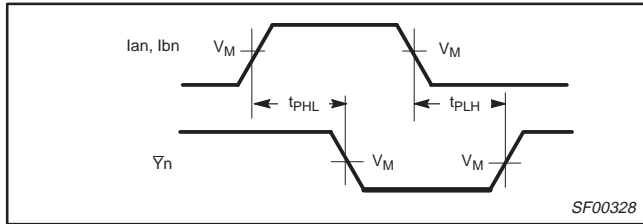
| SYMBOL | PARAMETER | TEST CONDITION | LIMITS | | UNIT |
|--------------------------------------|---|--------------------------|--|--------------|------|
| | | | T _{amb} = 0°C to +70°C V _{CC} = +5.0V ± 10% C _L = 50pF, R _L = 500Ω | | |
| | | | MIN | MAX | |
| t _{PLH} t _{PHL} | Propagation delay In to Yn | Waveform 1 | 2.0 2.0 | 9.0 9.0 | ns |
| t _{PZH} t _{PZL} | Output Enable time to High or Low level | Waveform 2 Waveform 3 | 2.0 3.0 | 10.0 12.0 | ns |
| t _{PHZ} t _{PLZ} | Output disable time from High or Low level | Waveform 2 Waveform 3 | 2.0 3.0 | 10.0 12.0 | ns |

Octal inverter buffer (3-State)

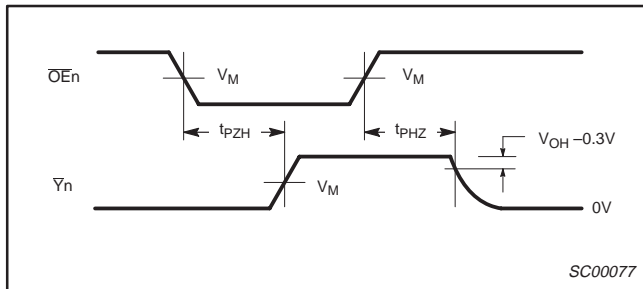
74ALS240A/
74ALS240A-1

AC WAVEFORMS

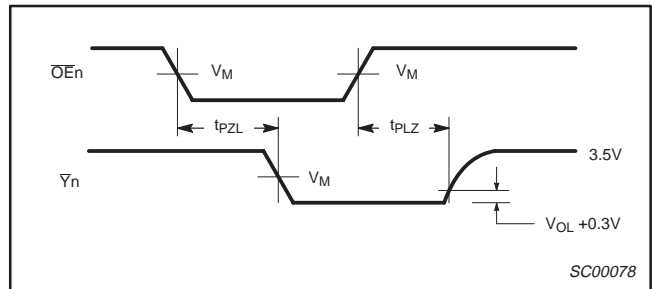
For all waveforms, $V_M = 1.3V$.



Waveform 1. Propagation Delay for Non-Inverting Output



Waveform 2. 3-State Output Enable Time to High Level and Output Disable Time from High Level



Waveform 3. 3-State Output Enable Time to Low Level and Output Disable Time from Low Level

TEST CIRCUIT AND WAVEFORMS

Test Circuit for 3-State Outputs

| SWITCH POSITION | |
|--------------------|--------|
| TEST | SWITCH |
| t_{pLZ}, t_{pZL} | closed |
| All other | open |

DEFINITIONS:
 R_L = Load resistor; see AC electrical characteristics for value.
 C_L = Load capacitance includes jig and probe capacitance; see AC electrical characteristics for value.
 R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

Input Pulse Definition

| Family | INPUT PULSE REQUIREMENTS | | | | | |
|--------|--------------------------|-------|----------|-------|-----------|-----------|
| | Amplitude | V_M | Rep.Rate | t_w | t_{TLH} | t_{THL} |
| 74ALS | 3.5V | 1.3V | 1MHz | 500ns | 2.0ns | 2.0ns |

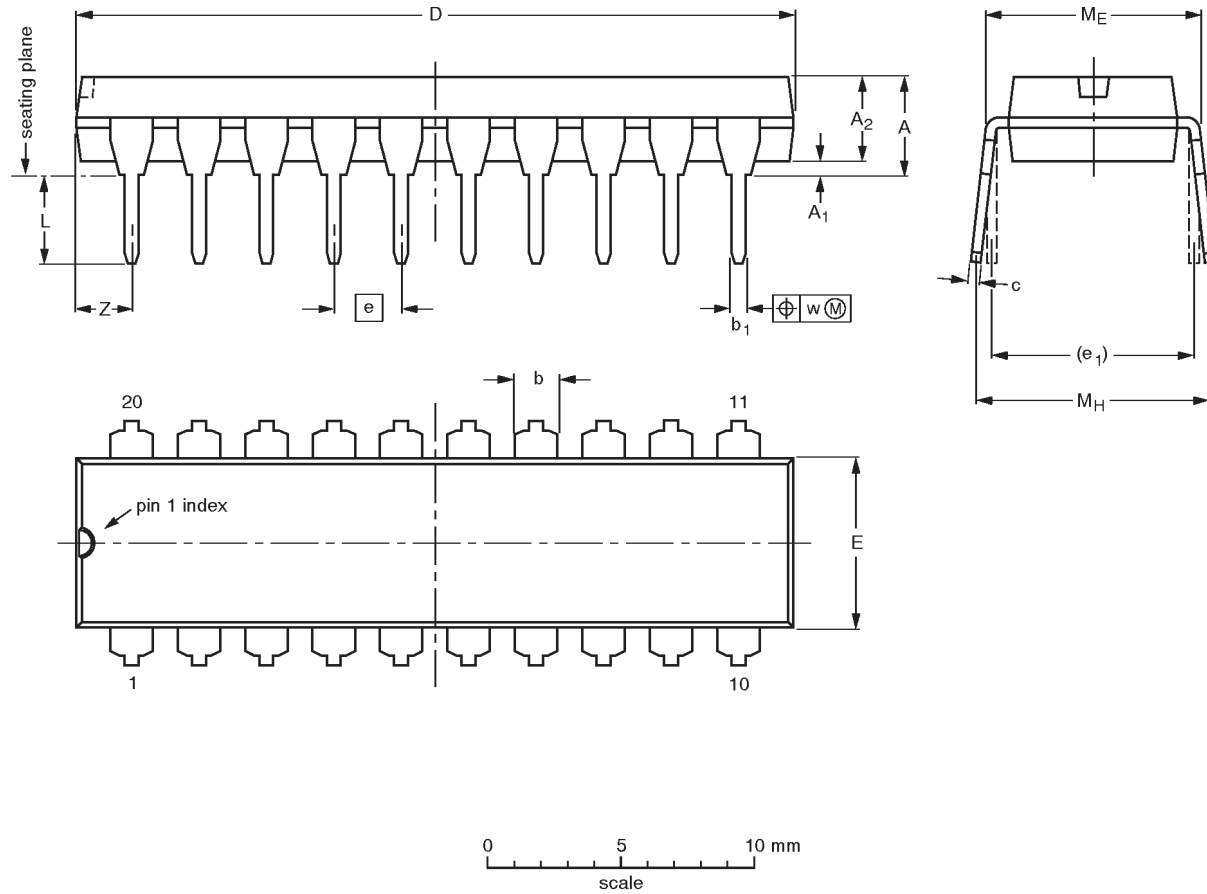
SC00072

Octal inverter buffer (3-State)

74ALS240A/74ALS240A-1

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

Note

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

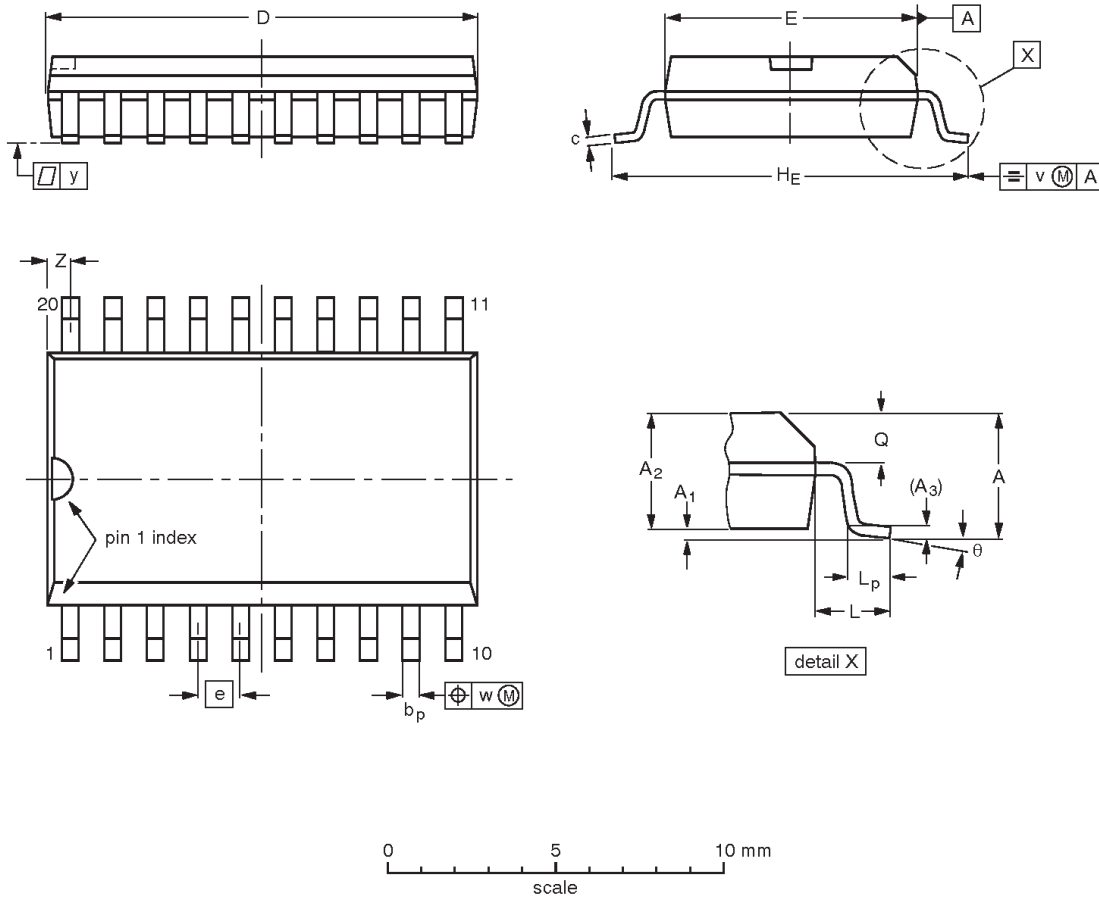
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|-------|--|---------------------|----------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT146-1 | | | SC603 | | | 92-11-17 95-05-24 |

Octal inverter buffer (3-State)

74ALS240A/74ALS240A-1

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 ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽¹⁾ | e | H _E | L | L _p | Q | v | w | y | Z ⁽¹⁾ | θ |
|--------|--------|----------------|----------------|----------------|----------------|----------------|------------------|------------------|-------|----------------|-------|----------------|----------------|------|------|-------|------------------|----------|
| mm | 2.65 | 0.30 0.10 | 2.45 2.25 | 0.25 | 0.49 0.36 | 0.32 0.23 | 13.0 12.6 | 7.6 7.4 | 1.27 | 10.65 10.00 | 1.4 | 1.1 0.4 | 1.1 1.0 | 0.25 | 0.25 | 0.1 | 0.9 0.4 | 8° 0° |
| inches | 0.10 | 0.012 0.004 | 0.096 0.089 | 0.01 | 0.019 0.014 | 0.013 0.009 | 0.51 0.49 | 0.30 0.29 | 0.050 | 0.42 0.39 | 0.055 | 0.043 0.016 | 0.043 0.039 | 0.01 | 0.01 | 0.004 | 0.035 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 95-01-24 |

Octal inverter buffer (3-State)

74ALS240A/74ALS240A-1

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 ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽¹⁾ | e | H _E | L | L _p | Q | v | w | y | Z ⁽¹⁾ | θ |
|------|--------|----------------|----------------|----------------|----------------|--------------|------------------|------------------|------|----------------|------|----------------|------------|-----|------|-----|------------------|----------|
| mm | 2.0 | 0.21 0.05 | 1.80 1.65 | 0.25 | 0.38 0.25 | 0.20 0.09 | 7.4 7.0 | 5.4 5.2 | 0.65 | 7.9 7.6 | 1.25 | 1.03 0.63 | 0.9 0.7 | 0.2 | 0.13 | 0.1 | 0.9 0.5 | 8° 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 95-02-04 |

Octal inverter buffer (3-State)

74ALS240A/74ALS240A-1

DEFINITIONS

| Data Sheet Identification | Product Status | Definition |
|----------------------------------|-------------------------------|--|
| <i>Objective Specification</i> | Formative or in Design | This data sheet contains the design target or goal specifications for product development. Specifications may change in any manner without notice. |
| <i>Preliminary Specification</i> | Preproduction Product | 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. |
| <i>Product Specification</i> | Full 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. |

Philips Semiconductors and Philips Electronics North America Corporation reserve the right to make changes, without notice, in the products, including circuits, standard cells, and/or software, described or contained herein in order to improve design and/or performance. Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no license or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified. Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

LIFE SUPPORT APPLICATIONS

Philips Semiconductors and Philips Electronics North America Corporation Products are not designed for use in life support appliances, devices, or systems where malfunction of a Philips Semiconductors and Philips Electronics North America Corporation Product can reasonably be expected to result in a personal injury. Philips Semiconductors and Philips Electronics North America Corporation customers using or selling Philips Semiconductors and Philips Electronics North America Corporation Products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors and Philips Electronics North America Corporation for any damages resulting from such improper use or sale.

Philips Semiconductors
811 East Arques Avenue
P.O. Box 3409
Sunnyvale, California 94088-3409
Telephone 800-234-7381

© Copyright Philips Electronics North America Corporation 1997
 All rights reserved. Printed in U.S.A.

Let's make things better.