

Octal inverting buffer (3-State)

74ABT240

FEATURES

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

DESCRIPTION

The 74ABT240 high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

The 74ABT240 device is an octal inverting buffer that is ideal for driving bus lines. The device features two Output Enables (1OE, 2OE), each controlling four of the 3-State outputs.

QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS T _{amb} = 25°C; GND = 0V | TYPICAL | UNIT |
|--------------------------------------|---------------------------------|--|---------|------|
| t _{PLH} t _{PHL} | Propagation delay nAx to nYx | C _L = 50pF; V _{CC} = 5V | 3.1 | ns |
| C _{IN} | Input capacitance | V _I = 0V or V _{CC} | 4 | pF |
| C _{OUT} | Output capacitance | Outputs disabled; V _O = 0V or V _{CC} | 7 | pF |
| I _{CCZ} | Total supply current | Outputs disabled; V _{CC} = 5.5V | 50 | µA |

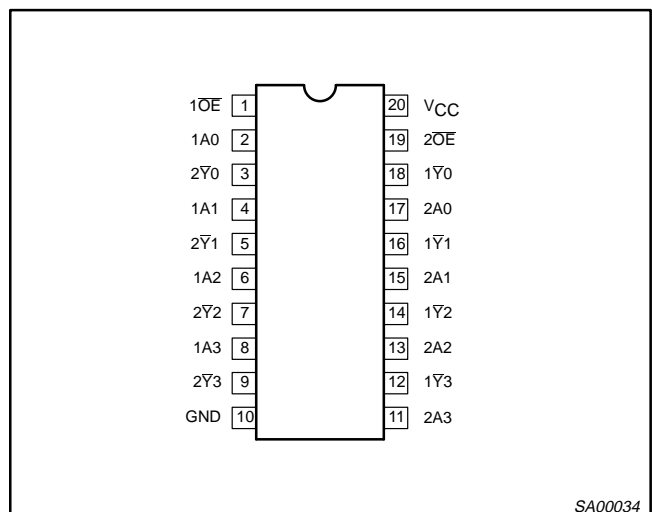
ORDERING INFORMATION

| PACKAGES | TEMPERATURE RANGE | OUTSIDE NORTH AMERICA | NORTH AMERICA | DWG NUMBER |
|-----------------------------|-------------------|-----------------------|---------------|------------|
| 20-Pin Plastic DIP | −40°C to +85°C | 74ABT240 N | 74ABT240 N | SOT146-1 |
| 20-Pin plastic SO | −40°C to +85°C | 74ABT240 D | 74ABT240 D | SOT163-1 |
| 20-Pin Plastic SSOP Type II | −40°C to +85°C | 74ABT240 DB | 74ABT240 DB | SOT339-1 |
| 20-Pin Plastic TSSOP Type I | −40°C to +85°C | 74ABT240 PW | 74ABT240PW DH | SOT360-1 |

PIN DESCRIPTION

| PIN NUMBER | SYMBOL | NAME AND FUNCTION |
|----------------|-----------------|-------------------------|
| 2, 4, 6, 8 | 1A0 – 1A3 | Data inputs |
| 11, 13, 15, 17 | 2A0 – 2A3 | Data inputs |
| 18, 16, 14, 12 | 1Y0 – 1Y3 | Data outputs |
| 9, 7, 5, 3 | 2Y0 – 2Y3 | Data outputs |
| 1, 19 | 1OE, 2OE | Output enables |
| 10 | GND | Ground (0V) |
| 20 | V _{CC} | Positive supply voltage |

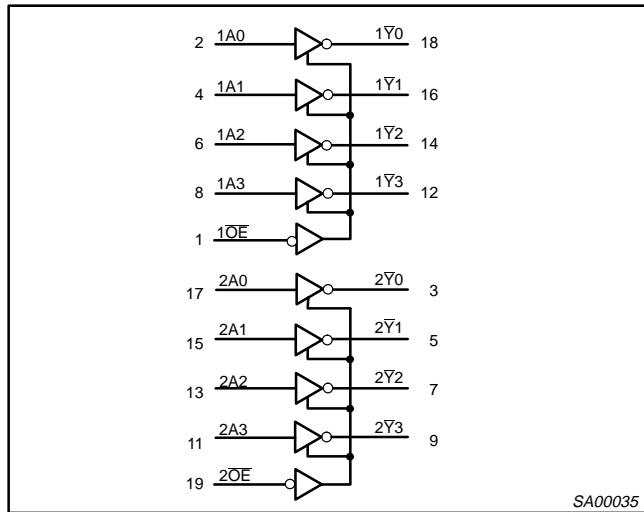
PIN CONFIGURATION



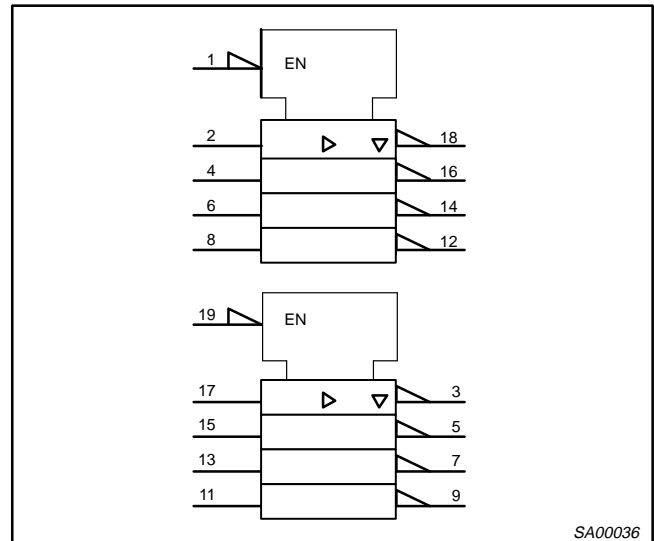
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LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



FUNCTION TABLE

| INPUTS | | | OUTPUTS | | |
|--------|-----|-----|---------|-----|-----|
| 1OE | 1An | 2OE | 2An | 1Yn | 2Yn |
| 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^{1, 2}

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

NOTES:

1. 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.
2. 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.
3. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

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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 |
|-----------------|--|---|---------------------------------|------------|-----------|---|-----------|---------------|
| | | | $T_{amb} = +25^{\circ}\text{C}$ | | | $T_{amb} = -40^{\circ}\text{C}$ 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 5.5V | | ± 0.01 | ± 1.0 | | ± 1.0 | μA |
| I_{OFF} | Power-off leakage current | $V_{CC} = 0.0\text{V}; V_I$ or $V_O \leq 4.5\text{V};$ | | ± 5.0 | ± 100 | | ± 100 | μA |
| I_{PU}/I_{PD} | Power-up/down 3-state output current ³ | $V_{CC} = 2.1\text{V}; V_O = 0.5\text{V}; V_I = \text{GND}$ or $V_{CC}; V_{OE} = \text{Don't care}$ | | ± 5.0 | ± 50 | | ± 50 | μA |
| 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 | μA |
| 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 | μA |
| 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 | μA |
| I_O | Output current ¹ | $V_{CC} = 5.5\text{V}; V_O = 2.5\text{V}$ | -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 | μA |
| 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 | μA |
| ΔI_{CC} | Additional supply current per input pin ² | Outputs 3-State, 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 |

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 μsec is permitted.

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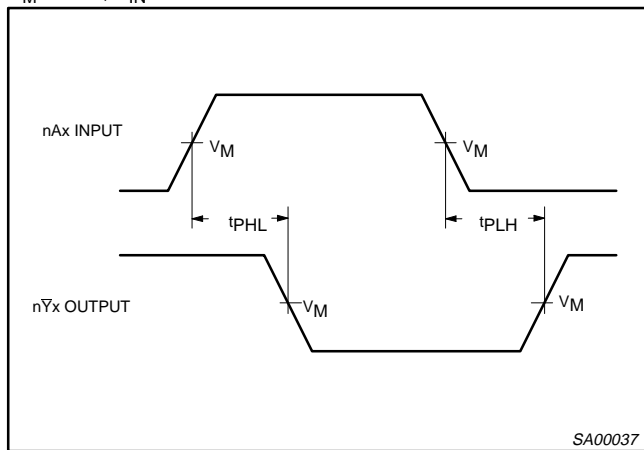
AC CHARACTERISTICS

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

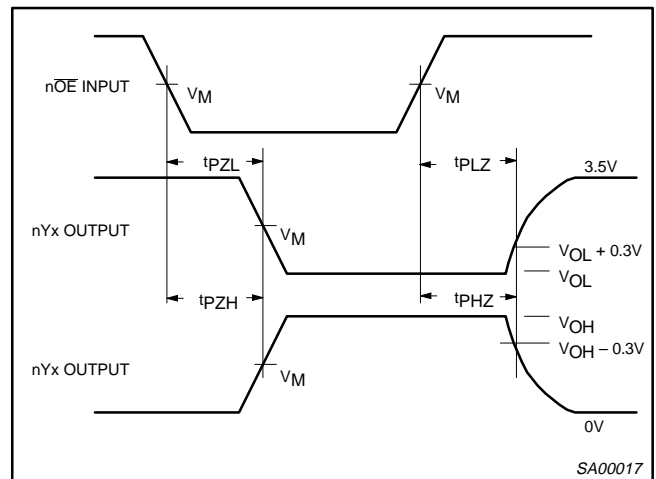
| SYMBOL | PARAMETER | WAVEFORM | LIMITS | | | | | UNIT |
|--------------------------------------|--|----------|--|------------|------------|--|------------|------|
| | | | $T_{\text{amb}} = +25^\circ\text{C}$ $V_{\text{CC}} = +5.0\text{V}$ | | | $T_{\text{amb}} = -40^\circ\text{C to } +85^\circ\text{C}$ $V_{\text{CC}} = +5.0\text{V} \pm 0.5\text{V}$ | | |
| | | | Min | Typ | Max | Min | Max | |
| t_{PLH} t_{PHL} | Propagation delay nAx to nYx | 1 | 1.0 1.6 | 2.7 3.5 | 4.1 4.3 | 1.0 1.6 | 4.8 4.8 | ns |
| t_{PZH} t_{PZL} | Output enable time to High and Low level | 2 | 1.1 1.1 | 3.1 4.2 | 4.7 5.8 | 1.1 1.1 | 5.2 6.2 | ns |
| t_{PHZ} t_{PLZ} | Output disable time from High and Low level | 2 | 1.8 1.6 | 3.7 3.0 | 5.7 5.4 | 1.8 1.6 | 6.4 5.8 | 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 (nAx) to Output (nYx) Propagation Delays

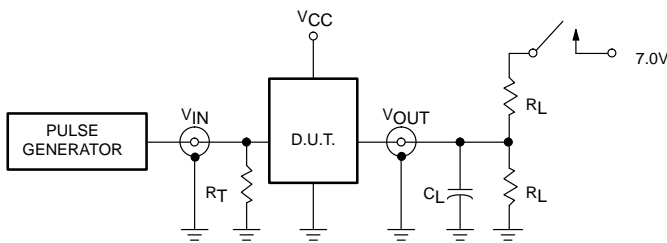


Waveform 2. Waveforms Showing the 3-State Output Enable and Disable Times

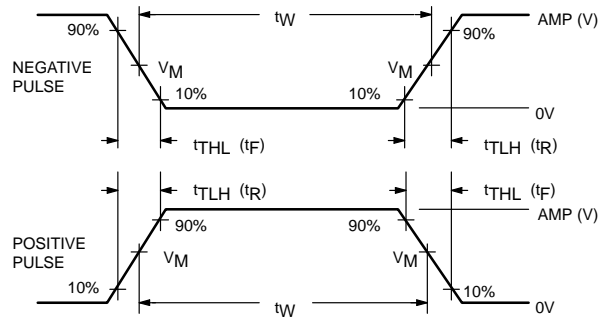
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TEST CIRCUIT AND WAVEFORMS



Test Circuit for 3-State Outputs



$V_M = 1.5V$

Input Pulse Definition

SWITCH POSITION

| TEST | SWITCH |
|-----------|--------|
| tPLZ | closed |
| tPZL | closed |
| All other | open |

DEFINITIONS

RL = Load resistor; see AC CHARACTERISTICS for value.
 CL = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.
 RT = Termination resistance should be equal to ZOUT of pulse generators.

| FAMILY | INPUT PULSE REQUIREMENTS | | | | |
|--------|--------------------------|-----------|-------|-------|-------|
| | Amplitude | Rep. Rate | tW | tR | tF |
| 74ABT | 3.0V | 1MHz | 500ns | 2.5ns | 2.5ns |

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