1. General description

The 74AHCT240 is an 8-bit inverting buffer/line driver with 3-state outputs. This device can be used as two 4-bit buffers or one 8-bit buffer. It features two output enables (1OE and 2OE), each controlling four of the 3-state outputs. A HIGH on nOE causes the outputs to assume a high-impedance OFF-state. Inputs are over voltage tolerant. This feature allows the use of these devices as translators in mixed voltage environments.

2. Features and benefits

- Balanced propagation delays
- All inputs have a Schmitt-trigger action
- Inputs accept voltages higher than $V_{CC}$
- Operates with TTL input levels
- ESD protection:
  - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
  - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Multiple package options
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

3. Ordering information

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package</th>
<th>Temperature range</th>
<th>Name</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>74AHCT240D</td>
<td>SO20</td>
<td>-40 °C to +125 °C</td>
<td>plastic small outline package; 20 leads; body width 7.5 mm</td>
<td>SOT163-1</td>
<td></td>
</tr>
<tr>
<td>74AHCT240PW</td>
<td>TSSOP20</td>
<td>-40 °C to +125 °C</td>
<td>plastic thin shrink small outline package; 20 leads; body width 4.4 mm</td>
<td>SOT360-1</td>
<td></td>
</tr>
<tr>
<td>74AHCT240BQ</td>
<td>DHVQFN20</td>
<td>-40 °C to +125 °C</td>
<td>plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 20 terminals; body $2.5 \times 4.5 \times 0.85$ mm</td>
<td>SOT764-1</td>
<td></td>
</tr>
</tbody>
</table>
4. Functional diagram

Fig. 1. Logic symbol

Fig. 2. IEC logic symbol
5. Pinning information

5.1. Pinning

Table 2. Pin description

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1OE, 2OE</td>
<td>1, 19</td>
<td>output enable input (active LOW)</td>
</tr>
<tr>
<td>1A0, 1A1, 1A2, 1A3</td>
<td>2, 4, 6, 8</td>
<td>data input</td>
</tr>
<tr>
<td>2A0, 2A1, 2A2, 2A3</td>
<td>17, 15, 13, 11</td>
<td>data input</td>
</tr>
<tr>
<td>1Y0, 1Y1, 1Y2, 1Y3</td>
<td>18, 16, 14, 12</td>
<td>data output</td>
</tr>
<tr>
<td>2Y0, 2Y1, 2Y2, 2Y3</td>
<td>3, 5, 7, 9</td>
<td>data output</td>
</tr>
<tr>
<td>GND</td>
<td>10</td>
<td>ground (0 V)</td>
</tr>
<tr>
<td>VCC</td>
<td>20</td>
<td>power supply</td>
</tr>
</tbody>
</table>

(1) This is not a ground pin. There is no electrical or mechanical requirement to solder the pad. In case soldered, the solder land should remain floating or connected to GND.
6. Functional description

Table 3. Function table

<table>
<thead>
<tr>
<th>Control</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>nOE</td>
<td>nAn</td>
<td>nYn</td>
</tr>
<tr>
<td>L</td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>L</td>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td>H</td>
<td>X</td>
<td>Z</td>
</tr>
</tbody>
</table>

H = HIGH voltage level; L = LOW voltage level; X = don’t care; Z = high-impedance OFF-state.

7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_CC</td>
<td>supply voltage</td>
<td></td>
<td>-0.5</td>
<td>+7.0</td>
<td>V</td>
</tr>
<tr>
<td>V_I</td>
<td>input voltage</td>
<td></td>
<td>-0.5</td>
<td>+7.0</td>
<td>V</td>
</tr>
<tr>
<td>I_K</td>
<td>input clamping current</td>
<td>V_I &lt; -0.5 V</td>
<td>[1] -20</td>
<td>-</td>
<td>mA</td>
</tr>
<tr>
<td>I_OK</td>
<td>output clamping current</td>
<td>V_O &lt; -0.5 V or V_O &gt; V_CC + 0.5 V</td>
<td>[1] -</td>
<td>±20</td>
<td>mA</td>
</tr>
<tr>
<td>I_O</td>
<td>output current</td>
<td>V_O = -0.5 V to (V_CC + 0.5 V)</td>
<td>-</td>
<td>±25</td>
<td>mA</td>
</tr>
<tr>
<td>I_GND</td>
<td>ground current</td>
<td></td>
<td>-75</td>
<td>-</td>
<td>mA</td>
</tr>
<tr>
<td>T_stg</td>
<td>storage temperature</td>
<td>T_amb = -40 °C to +125 °C</td>
<td>[2] -</td>
<td>500</td>
<td>mW</td>
</tr>
</tbody>
</table>

[1] The minimum input and output voltage ratings may be exceeded if the input and output current ratings are observed.
[2] For SOT163-1 (SO20) package: P_tot derates linearly with 12.3 mW/K above 109 °C.
   For SOT360-1 (TSSOP20) package: P_tot derates linearly with 10.0 mW/K above 100 °C.
   For SOT764-1 (DHVQFN20) package: P_tot derates linearly with 12.9 mW/K above 111 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_CC</td>
<td>supply voltage</td>
<td></td>
<td>4.5</td>
<td>5.0</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>V_I</td>
<td>input voltage</td>
<td></td>
<td>0</td>
<td>-</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>V_O</td>
<td>output voltage</td>
<td></td>
<td>0</td>
<td>-</td>
<td>V_CC</td>
<td>V</td>
</tr>
<tr>
<td>T_amb</td>
<td>ambient temperature</td>
<td></td>
<td>-40</td>
<td>+25</td>
<td>+125</td>
<td>°C</td>
</tr>
<tr>
<td>Δt/ΔV</td>
<td>input transition rise and fall rate</td>
<td>V_CC = 5 V ± 0.5 V</td>
<td>-</td>
<td>-</td>
<td>20</td>
<td>ns/V</td>
</tr>
</tbody>
</table>
## 9. Static characteristics

Table 6. Static characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>25 °C</th>
<th>-40 °C to +85 °C</th>
<th>-40 °C to +125 °C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Min</td>
<td>Typ</td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Min</td>
</tr>
<tr>
<td>V\textsc{IH}</td>
<td>HIGH-level input voltage</td>
<td>$V_{\text{CC}} = 4.5 \text{ V to } 5.5 \text{ V}$</td>
<td>2.0</td>
<td>-</td>
<td>2.0</td>
<td>-</td>
</tr>
<tr>
<td>V\textsc{IL}</td>
<td>LOW-level input voltage</td>
<td>$V_{\text{CC}} = 4.5 \text{ V to } 5.5 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>0.8</td>
<td>-</td>
</tr>
<tr>
<td>V\textsc{OH}</td>
<td>HIGH-level output voltage</td>
<td>$V_\text{i} = V_{\text{IH}}$ or $V_{\text{IL}}$; $V_{\text{CC}} = 4.5 \text{ V}$</td>
<td>4.4</td>
<td>4.5</td>
<td>-</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Min</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td>Min</td>
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<td>Min</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Min</td>
</tr>
<tr>
<td>I\textsc{I}</td>
<td>input leakage current</td>
<td>$V_\text{i} = 5.5 \text{ V or } \text{GND}$; $V_{\text{CC}} = 0 \text{ V to } 5.5 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>0.1</td>
<td>-</td>
</tr>
<tr>
<td>I\textsc{OZ}</td>
<td>OFF-state output current</td>
<td>$V_\text{i} = V_{\text{IH}}$ or $V_{\text{IL}}$; $V_\text{o} = V_{\text{CC}}$ or $\text{GND}$; $V_{\text{CC}} = 5.5 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>±0.25</td>
<td>-</td>
</tr>
<tr>
<td>I\textsc{CC}</td>
<td>supply current</td>
<td>$V_\text{i} = V_{\text{CC}}$ or $\text{GND}$; $I_\text{o} = 0 \text{ A}$; $V_{\text{CC}} = 5.5 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>4.0</td>
<td>-</td>
</tr>
<tr>
<td>ΔI\textsc{CC}</td>
<td>additional supply current</td>
<td>per input pin; $V_{\text{i}} = V_{\text{CC}} - 2.1 \text{ V}$; other pins at $V_{\text{CC}}$ or $\text{GND}$; $I_\text{o} = 0 \text{ A}$; $V_{\text{CC}} = 4.5 \text{ V to } 5.5 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>1.35</td>
<td>-</td>
</tr>
<tr>
<td>C\textsc{I}</td>
<td>input capacitance</td>
<td>$V_\text{i} = V_{\text{CC}}$ or $\text{GND}$</td>
<td>-</td>
<td>3</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>C\textsc{O}</td>
<td>output capacitance</td>
<td>-</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
10. Dynamic characteristics

Table 7. Dynamic characteristics
Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 5.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>25 °C</th>
<th>-40 °C to +85 °C</th>
<th>-40 °C to +125 °C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Min</td>
<td>Typ [1]</td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>t_{pd}</td>
<td>propagation delay</td>
<td>nAn to nYn; see Fig. 3 [2]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{CC} = 4.5 V to 5.5 V; C_{L} = 15 pF</td>
<td>- 3.0</td>
<td>5.8</td>
<td>1.0</td>
<td>6.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{CC} = 4.5 V to 5.5 V; C_{L} = 50 pF</td>
<td>- 4.4</td>
<td>8.4</td>
<td>1.0</td>
<td>9.5</td>
</tr>
<tr>
<td>t_{en}</td>
<td>enable time</td>
<td>nOE to nYn; see Fig. 4 [2]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{CC} = 4.5 V to 5.5 V; C_{L} = 15 pF</td>
<td>- 3.4</td>
<td>7.5</td>
<td>1.0</td>
<td>9.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{CC} = 4.5 V to 5.5 V; C_{L} = 50 pF</td>
<td>- 4.5</td>
<td>9.5</td>
<td>1.0</td>
<td>11.5</td>
</tr>
<tr>
<td>t_{dis}</td>
<td>disable time</td>
<td>nOE to nYn; see Fig. 4 [2]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{CC} = 4.5 V to 5.5 V; C_{L} = 15 pF</td>
<td>- 3.9</td>
<td>6.1</td>
<td>1.0</td>
<td>6.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{CC} = 4.5 V to 5.5 V; C_{L} = 50 pF</td>
<td>- 6.2</td>
<td>8.7</td>
<td>1.0</td>
<td>9.2</td>
</tr>
<tr>
<td>C_{PD}</td>
<td>power dissipation capacitance</td>
<td>V_{I} = GND to V_{CC}; C_{L} = 50 pF; f_{i} = 1 MHz [3]</td>
<td>- 9</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

[1] Typical values are measured at nominal supply voltage (V_{CC} = 5.0 V).
[2] t_{pd} is the same as t_{PLH} and t_{PHL}; t_{en} is the same as t_{PZH} and t_{PZL}; t_{dis} is the same as t_{PLZ} and t_{PHZ}.
[3] C_{PD} is used to determine the dynamic power dissipation (P_{D} in μW).

\[ P_{D} = C_{PD} \times V_{CC}^{2} \times f_{i} \times N + \Sigma(C_{L} \times V_{CC}^{2} \times f_{o}) \]

Where:
- f_{i} = input frequency in MHz;
- f_{o} = output frequency in MHz;
- C_{L} = output load capacitance in pF;
- V_{CC} = supply voltage in V;
- N = number of inputs switching;
- \Sigma(C_{L} \times V_{CC}^{2} \times f_{o}) = sum of outputs.
10.1. Waveforms and test circuit

Measurement points are given in Table 8. 
V\(_{OL}\) and V\(_{OH}\) are typical voltage output drop that occur with the output load.

Fig. 3. Propagation delay input (nAn) to output (nYn)

Measurement points are given in Table 8. 
V\(_{OL}\) and V\(_{OH}\) are typical voltage output drop that occur with the output load.

Fig. 4. Enable and disable times

<table>
<thead>
<tr>
<th>Table 8. Measurement points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
</tr>
<tr>
<td>(V_M)</td>
</tr>
<tr>
<td>1.5 V</td>
</tr>
</tbody>
</table>
Definitions test circuit:
- $R_T$ = Termination resistance should be equal to output impedance $Z_o$ of the pulse generator;
- $C_L$ = Load capacitance including jig and probe capacitance;
- $R_L$ = Load resistance;
- $S1$ = Test selection switch.

**Fig. 5. Test circuit for measuring switching times**

**Table 9. Test data**

<table>
<thead>
<tr>
<th>Input $V_I$</th>
<th>Load $C_L$</th>
<th>$R_L$</th>
<th>$t_{PHL}$, $t_{PLH}$</th>
<th>$t_{PZH}$, $t_{PHZ}$</th>
<th>$t_{PZH}$, $t_{PLZ}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0 V</td>
<td>3.0 ns</td>
<td>15 pF, 50 pF</td>
<td>1 kΩ</td>
<td>open</td>
<td>GND</td>
</tr>
</tbody>
</table>
11. Package outline

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

**Fig. 6. Package outline SOT163-1 (SO20)**
TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm

DIMENSIONS (mm are the original dimensions)

<table>
<thead>
<tr>
<th>UNIT</th>
<th>A_{\text{max}}</th>
<th>A_1</th>
<th>A_2</th>
<th>A_3</th>
<th>b_p</th>
<th>c</th>
<th>D</th>
<th>E^{(1)}</th>
<th>e</th>
<th>H_E</th>
<th>L</th>
<th>L_p</th>
<th>Q</th>
<th>v</th>
<th>w</th>
<th>y</th>
<th>Z^{(1)}</th>
<th>\theta</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>1.1</td>
<td>0.15</td>
<td>0.05</td>
<td>0.95</td>
<td>0.80</td>
<td>0.25</td>
<td>0.30</td>
<td>0.19</td>
<td>0.2</td>
<td>6.6</td>
<td>4.5</td>
<td>4.3</td>
<td>0.65</td>
<td>6.6</td>
<td>6.2</td>
<td>1</td>
<td>0.75</td>
<td>0.50</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>OUTLINE VERSION</th>
<th>REFERENCES</th>
<th>EUROPEAN PROJECTION</th>
<th>ISSUE DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOT360-1</td>
<td>IEC</td>
<td>JEDEC</td>
<td>JEITA</td>
</tr>
<tr>
<td></td>
<td>MO-153</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 7. Package outline SOT360-1 (TSSOP20)
DHVQFN20: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 20 terminals; body 2.5 x 4.5 x 0.85 mm

Fig. 8. Package outline SOT764-1 (DHVQFN20)
12. Abbreviations

Table 10. Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>CDM</td>
<td>Charge Device Model</td>
</tr>
<tr>
<td>DUT</td>
<td>Device Under Test</td>
</tr>
<tr>
<td>ESD</td>
<td>ElectroStatic Discharge</td>
</tr>
<tr>
<td>HBM</td>
<td>Human Body Model</td>
</tr>
<tr>
<td>TTL</td>
<td>Transistor-Transistor Logic</td>
</tr>
</tbody>
</table>

13. Revision history

Table 11. Revision history

<table>
<thead>
<tr>
<th>Document ID</th>
<th>Release date</th>
<th>Data sheet status</th>
<th>Change notice</th>
<th>Supersedes</th>
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<tbody>
<tr>
<td>74AHCT240 v.7</td>
<td>20231003</td>
<td>Product data sheet</td>
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<td>74AHCT240 v.6</td>
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<td>Modifications:</td>
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<td>74AHCT240 v.6</td>
<td>20200629</td>
<td>Product data sheet</td>
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<td>74AHCT240 v.5</td>
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<td>74AHCT240 v.5</td>
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<td>74AHC_AHCT240 v.4</td>
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<td>-</td>
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Modifications:
- Section 2: ESD specification updated according to the latest JEDEC standard.
- The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.
- Legal texts have been adapted to the new company name where appropriate.
- Table 4: Derating values for $P_{tot}$ total power dissipation updated.
- Table 6: $I_{oz}$ conditions corrected. (errata)
- Type numbers 74AHC240D, 74AHC240PW and 74AHC240BQ removed.
- Fig. 3 and Fig. 4 have been made visible (errata).
- Legal pages updated.
14. Legal information

Data sheet status

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<td>[1][2]</td>
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<td>Production</td>
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</table>

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

[2] The term "short data sheet" is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices.

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