74ABT640
Octal transceiver with direction pin, inverting (3-State)

Product specification
Supersedes data of 1993 Jun 21
IC23 Data Handbook
**FEATURES**

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

**DESCRIPTION**

The 74ABT640 high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

The 74ABT640 device is an octal transceiver featuring inverting 3-State bus compatible outputs in both send and receive directions. The control function implementation minimizes external timing requirements. The device features an Output Enable (OE) input for easy cascading and a Direction (DIR) input for direction control.

**QUICK REFERENCE DATA**

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>TYPICAL</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>tPLH</td>
<td>Propagation delay</td>
<td>An to Bn or Bn to An; C_L = 50pF; V_CC = 5V</td>
<td>3.1</td>
<td>ns</td>
</tr>
<tr>
<td>tPHL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C_IN</td>
<td>Input capacitance</td>
<td>DIR, OE; V_I = 0V or V_CC</td>
<td>4</td>
<td>pF</td>
</tr>
<tr>
<td>C_I/O</td>
<td>I/O capacitance</td>
<td>Outputs disabled; V_O = 0V or V_CC</td>
<td>7</td>
<td>pF</td>
</tr>
<tr>
<td>I_CCZ</td>
<td>Total supply current</td>
<td>Outputs disabled; V_CC = 5.5V</td>
<td>50</td>
<td>µA</td>
</tr>
</tbody>
</table>

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>PACKAGES</th>
<th>TEMPERATURE RANGE</th>
<th>OUTSIDE NORTH AMERICA</th>
<th>NORTH AMERICA</th>
<th>DWG NUMBER</th>
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</thead>
<tbody>
<tr>
<td>20-Pin Plastic DIP</td>
<td>–40°C to +85°C</td>
<td>74ABT640 N</td>
<td>74ABT640 N</td>
<td>SOT146-1</td>
</tr>
<tr>
<td>20-Pin plastic SO</td>
<td>–40°C to +85°C</td>
<td>74ABT640 D</td>
<td>74ABT640 D</td>
<td>SOT163-1</td>
</tr>
<tr>
<td>20-Pin Plastic SSOP Type II</td>
<td>–40°C to +85°C</td>
<td>74ABT640 DB</td>
<td>74ABT640 DB</td>
<td>SOT339-1</td>
</tr>
<tr>
<td>20-Pin Plastic TSSOP Type I</td>
<td>–40°C to +85°C</td>
<td>74ABT640 PW</td>
<td>74ABT640PW DH</td>
<td>SOT360-1</td>
</tr>
</tbody>
</table>

**PIN CONFIGURATION**

```
    1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20
DIR  A0  A1  A2  A3  A4  A5  A6  A7  OE  GND
     B0  B1  B2  B3  B4  B5  B6  B7  
     VCC OE

SA00208
```

**PIN DESCRIPTION**

<table>
<thead>
<tr>
<th>PIN NUMBER</th>
<th>SYMBOL</th>
<th>NAME AND FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DIR</td>
<td>Direction control input</td>
</tr>
<tr>
<td>2, 3, 4, 5, 6, 7, 8, 9</td>
<td>A0 – A7</td>
<td>Data inputs/outputs (A side)</td>
</tr>
<tr>
<td>18, 17, 16, 15, 14, 13, 12, 11</td>
<td>B0 – B7</td>
<td>Data inputs/outputs (B side)</td>
</tr>
<tr>
<td>19</td>
<td>OE</td>
<td>Output enable input, B side to A side (active-Low)</td>
</tr>
<tr>
<td>10</td>
<td>GND</td>
<td>Ground (0V)</td>
</tr>
<tr>
<td>20</td>
<td>V_CC</td>
<td>Positive supply voltage</td>
</tr>
</tbody>
</table>
**LOGIC SYMBOL**

![Logic Symbol](image)

**LOGIC SYMBOL (IEEE/IEC)**

![Logic Symbol (IEEE/IEC)](image)

**FUNCTION TABLE**

<table>
<thead>
<tr>
<th>INPUTS</th>
<th>INPUTS/OUTPUTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OE</td>
<td>DIR</td>
</tr>
<tr>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>H</td>
<td>X</td>
</tr>
</tbody>
</table>

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

**ABSOLUTE MAXIMUM RATINGS**

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>RATING</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCC</td>
<td>DC supply voltage</td>
<td>−0.5 to +7.0</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>IiK</td>
<td>DC input diode current</td>
<td>V_i &lt; 0</td>
<td>−18</td>
<td>mA</td>
</tr>
<tr>
<td>Vi</td>
<td>DC input voltage</td>
<td>−1.2 to +7.0</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>IOK</td>
<td>DC output diode current</td>
<td>V_O &lt; 0</td>
<td>−50</td>
<td>mA</td>
</tr>
<tr>
<td>VOOUT</td>
<td>DC output voltage</td>
<td>−0.5 to +5.5</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>IOUT</td>
<td>DC output current</td>
<td>output in Low state</td>
<td>128</td>
<td>mA</td>
</tr>
<tr>
<td>TSLG</td>
<td>Storage temperature range</td>
<td>−65 to 150</td>
<td>°C</td>
<td></td>
</tr>
</tbody>
</table>

**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.
### RECOMMENDED OPERATING CONDITIONS

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>LIMITS</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>V_CC</td>
<td>DC supply voltage</td>
<td>4.5</td>
<td>5.5</td>
</tr>
<tr>
<td>V_I</td>
<td>Input voltage</td>
<td>0</td>
<td>V_{CC}</td>
</tr>
<tr>
<td>V_{IH}</td>
<td>High-level input voltage</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>V_{IL}</td>
<td>Low-level input voltage</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>I_{OH}</td>
<td>High-level output current</td>
<td>–32</td>
<td></td>
</tr>
<tr>
<td>I_{OL}</td>
<td>Low-level output current</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>Δt/Δv</td>
<td>Input transition rise or fall rate</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>T_{amb}</td>
<td>Operating free-air temperature range</td>
<td>–40</td>
<td>+85</td>
</tr>
</tbody>
</table>

### DC ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>TEST CONDITIONS</th>
<th>LIMITS</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>T_{amb} = +25°C</td>
<td>T_{amb} = –40°C to +85°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Min</td>
<td>Typ</td>
<td>Max</td>
</tr>
<tr>
<td>V_{IK}</td>
<td>Input clamp voltage</td>
<td>V_{CC} = 4.5V; I_{IK} = –18mA</td>
<td>–0.9</td>
<td>–1.2</td>
</tr>
<tr>
<td>V_{OH}</td>
<td>High-level output voltage</td>
<td>V_{CC} = 4.5V; I_{OH} = –3mA; V_I = V_{IL} or V_{IH}</td>
<td>2.5</td>
<td>2.9</td>
</tr>
<tr>
<td>V_{OL}</td>
<td>Low-level output voltage</td>
<td>V_{CC} = 4.5V; I_{OL} = 64mA; V_I = V_{IL} or V_{IH}</td>
<td>0.42</td>
<td>0.55</td>
</tr>
<tr>
<td>I_{i}</td>
<td>Input leakage current</td>
<td>V_{CC} = 5.5V; V_I = GND or 5.5V</td>
<td>±0.01</td>
<td>±1.0</td>
</tr>
<tr>
<td>I_{OFF}</td>
<td>Power-off leakage current</td>
<td>V_{CC} = 0.0V; V_O ≤ 4.5V</td>
<td>±5</td>
<td>±100</td>
</tr>
<tr>
<td>IPU/IPD</td>
<td>Power-up/down 3-State output current</td>
<td>V_{CC} = 2.1V; V_O = 0.5V; V_I = GND or V_{CC}; V_OE = Don’t care</td>
<td>±5.0</td>
<td>±100</td>
</tr>
<tr>
<td>I_{IH} + I_{OZH}</td>
<td>3-State output High current</td>
<td>V_{CC} = 5.5V; V_O = 2.7V; V_I = V_{IL} or V_{IH}</td>
<td>5.0</td>
<td>50</td>
</tr>
<tr>
<td>I_{IL} + I_{OZL}</td>
<td>3-State output Low current</td>
<td>V_{CC} = 5.5V; V_O = 0.5V; V_I = V_{IL} or V_{IH}</td>
<td>–5.0</td>
<td>–50</td>
</tr>
<tr>
<td>I_{CEX}</td>
<td>Output High leakage current</td>
<td>V_{CC} = 5.5V; V_{O} = 5.5V; V_I = GND or V_{CC}</td>
<td>5.0</td>
<td>50</td>
</tr>
<tr>
<td>I_O</td>
<td>Output current¹</td>
<td>V_{CC} = 5.5V; V_O = 2.5V</td>
<td>–50</td>
<td>–100</td>
</tr>
<tr>
<td>I_{CCH}</td>
<td>Quiescent supply current</td>
<td>V_{CC} = 5.5V; Outputs High, V_I = GND or V_{CC}</td>
<td>50</td>
<td>250</td>
</tr>
<tr>
<td>I_{CCZ}</td>
<td>Quiescent supply current</td>
<td>V_{CC} = 5.5V; Outputs Low, V_I = GND or V_{CC}</td>
<td>24</td>
<td>30</td>
</tr>
<tr>
<td>I_{CCL}</td>
<td>Additional supply current per input pin²</td>
<td>V_{CC} = 5.5V; one output at 3.4V, other inputs at V_{CC} or GND</td>
<td>0.05</td>
<td>1.5</td>
</tr>
</tbody>
</table>
AC CHARACTERISTICS
GND = 0V; \( t_R = t_F = 2.5\text{ns} \); \( C_L = 50\text{pF} \); \( R_L = 500\Omega \)

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>WAVEFORM</th>
<th>LIMITS</th>
</tr>
</thead>
</table>
| \( \text{t}_{\text{PLH}} \) | Propagation delay | 1 | \begin{align*} 
\text{Min} & = 1.0 \\
\text{Typ} & = 2.8 \\
\text{Max} & = 4.2 \\
\text{Min} & = 1.0 \\
\text{Typ} & = 4.9
\end{align*} |
| \( \text{t}_{\text{PHL}} \) | An to \( B_n \) or \( B_n \) to An | 1 | \begin{align*} 
\text{Min} & = 1.5 \\
\text{Typ} & = 3.1 \\
\text{Max} & = 4.3 \\
\text{Min} & = 1.5 \\
\text{Typ} & = 4.9
\end{align*} |
| \( \text{t}_{\text{PZH}} \) | Output enable time | 2 | \begin{align*} 
\text{Min} & = 1.5 \\
\text{Typ} & = 3.6 \\
\text{Max} & = 4.9 \\
\text{Min} & = 1.5 \\
\text{Typ} & = 5.8
\end{align*} |
| \( \text{t}_{\text{PZL}} \) | to High and Low level | 2 | \begin{align*} 
\text{Min} & = 1.3 \\
\text{Typ} & = 3.2 \\
\text{Max} & = 5.9 \\
\text{Min} & = 1.3 \\
\text{Typ} & = 7.3
\end{align*} |
| \( \text{t}_{\text{PHZ}} \) | Output disable time | 2 | \begin{align*} 
\text{Min} & = 2.5 \\
\text{Typ} & = 5.2 \\
\text{Max} & = 6.5 \\
\text{Min} & = 2.5 \\
\text{Typ} & = 6.8
\end{align*} |
| \( \text{t}_{\text{PLZ}} \) | from High and Low Level | 2 | \begin{align*} 
\text{Min} & = 2.0 \\
\text{Typ} & = 4.1 \\
\text{Max} & = 5.3 \\
\text{Min} & = 2.0 \\
\text{Typ} & = 5.5
\end{align*} |

AC WAVEFORMS
\( V_M = 1.5V \), \( V_IN = \text{GND to 3.0V} \)

TEST CIRCUIT AND WAVEFORMS

Definitions
\( C_L \) = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.
Octal transceiver with direction pin, inverting (3-State)

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

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

<table>
<thead>
<tr>
<th>UNIT</th>
<th>A_max.</th>
<th>A_1_min.</th>
<th>A_2_max.</th>
<th>b</th>
<th>b_1</th>
<th>c</th>
<th>D^(1)</th>
<th>E^(1)</th>
<th>e</th>
<th>e_1</th>
<th>L</th>
<th>M_E</th>
<th>M_H</th>
<th>w</th>
<th>Z^(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>4.2</td>
<td>0.51</td>
<td>3.2</td>
<td>1.73</td>
<td>1.30</td>
<td>0.53</td>
<td>0.38</td>
<td>0.23</td>
<td>26.92</td>
<td>26.54</td>
<td>6.40</td>
<td>6.22</td>
<td>2.54</td>
<td>7.62</td>
<td></td>
</tr>
<tr>
<td>inches</td>
<td>0.17</td>
<td>0.020</td>
<td>0.13</td>
<td>0.068</td>
<td>0.051</td>
<td>0.021</td>
<td>0.015</td>
<td>0.014</td>
<td>0.009</td>
<td>1.060</td>
<td>1.045</td>
<td>0.25</td>
<td>0.24</td>
<td>0.10</td>
<td>0.30</td>
</tr>
</tbody>
</table>

Note
1. Plastic or metal 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>
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<tr>
<td>SOT146-1</td>
<td>IEC</td>
<td>JEDEC</td>
<td>EIAJ</td>
</tr>
<tr>
<td></td>
<td>IEC</td>
<td>JEDEC</td>
<td>SC603</td>
</tr>
</tbody>
</table>
Octal transceiver with direction pin, inverting (3-State) 74ABT640

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

SOT163-1

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

<table>
<thead>
<tr>
<th>UNIT</th>
<th>A max.</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>bP</th>
<th>c</th>
<th>D (1)</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>θ</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>2.65</td>
<td>0.30</td>
<td>2.45</td>
<td>0.28</td>
<td>0.49</td>
<td>0.32</td>
<td>13.0</td>
<td>7.6</td>
<td>1.27</td>
<td>10.65</td>
<td>10.00</td>
<td>1.4</td>
<td>1.1</td>
<td>1.1</td>
<td>0.25</td>
<td>0.25</td>
<td>0.9</td>
<td>4.0</td>
</tr>
<tr>
<td>inches</td>
<td>0.10</td>
<td>0.012</td>
<td>0.096</td>
<td>0.01</td>
<td>0.019</td>
<td>0.013</td>
<td>0.51</td>
<td>0.30</td>
<td>0.050</td>
<td>0.42</td>
<td>0.39</td>
<td>0.055</td>
<td>0.043</td>
<td>0.043</td>
<td>0.01</td>
<td>0.01</td>
<td>0.004</td>
<td>0.035</td>
</tr>
</tbody>
</table>

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

OUTLINE VERSION

<table>
<thead>
<tr>
<th>REFERENCES</th>
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<th>ISSUE DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC</td>
<td>JEDEC</td>
<td>EIAJ</td>
</tr>
</tbody>
</table>

1998 Jan 16
Philips Semiconductors Product specification

Octal transceiver with direction pin, inverting (3-State) 74ABT640

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

SOT339-1

DIMENSIONS (mm are the original dimensions)

<table>
<thead>
<tr>
<th>UNIT</th>
<th>A max.</th>
<th>A₁</th>
<th>A₂</th>
<th>A₃</th>
<th>b₁</th>
<th>c</th>
<th>D⁽¹⁾</th>
<th>E⁽¹⁾</th>
<th>e</th>
<th>Hₑ</th>
<th>L</th>
<th>Lₚ</th>
<th>Q</th>
<th>v</th>
<th>w</th>
<th>y</th>
<th>Z⁽¹⁾</th>
<th>θ</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>2.0</td>
<td>0.21</td>
<td>1.80</td>
<td>0.25</td>
<td>0.25</td>
<td>0.9</td>
<td>7.4</td>
<td>5.4</td>
<td>0.65</td>
<td>7.9</td>
<td>1.25</td>
<td>1.03</td>
<td>0.9</td>
<td>0.2</td>
<td>0.13</td>
<td>0.1</td>
<td>0.9</td>
<td>8⁰</td>
</tr>
<tr>
<td></td>
<td>0.05</td>
<td>1.65</td>
<td>0.20</td>
<td>0.20</td>
<td>0.25</td>
<td>0.09</td>
<td>7.0</td>
<td>5.2</td>
<td>0.95</td>
<td>7.6</td>
<td>0.63</td>
<td>0.63</td>
<td>0.7</td>
<td>0.5</td>
<td>0.5</td>
<td>0.1</td>
<td>0.5</td>
<td>0⁰</td>
</tr>
</tbody>
</table>

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

OUTLINE VERSION | REFERENCES | EUROPEAN PROJECTION | ISSUE DATE
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
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<tbody>
<tr>
<td>SOT339-1</td>
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<td>JEDEC</td>
<td>EIAJ</td>
</tr>
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<td></td>
<td>MO-150AE</td>
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<td>95-02-04</td>
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</table>
Philips Semiconductors Product specification

Octal transceiver with direction pin, inverting (3-State) 74ABT640

TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm SOT360-1

DIMENSIONS (mm are the original dimensions)

<table>
<thead>
<tr>
<th>UNIT</th>
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<th>Q</th>
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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

| SOT360-1 | IEC | JEDEC | EIAJ | | -93-06-16 -95-02-04 |

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Data sheet status

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<td>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.</td>
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[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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