Convert TTL Voltage Levels to MOS Levels
High Sink-Current Capability
Input Clamping Diodes Simplify System Design
Open-Collector Drivers for Indicator Lamps and Relays
Inputs Fully Compatible With Most TTL Circuits

These TTL hex inverter buffers/drivers feature high-voltage open-collector outputs for interfacing with high-level circuits (such as MOS) or for driving high-current loads (such as lamps or relays), and also are characterized for use as inverter buffers for driving TTL inputs. The SN5406 and SN7406 have minimum breakdown voltages of 30 V. The SN5416 and SN7416 have minimum breakdown voltages of 15 V. The maximum sink current is 30 mA for the SN5406 and SN5416, and 40 mA for the SN7406 and SN7416.

## ORDERING INFORMATION

<table>
<thead>
<tr>
<th>TA</th>
<th>PACKAGE†</th>
<th>ORDERABLE PART NUMBER</th>
<th>TOP-SIDE MARKING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SOIC – D</td>
<td>Tube</td>
<td>SN7406D</td>
</tr>
<tr>
<td></td>
<td>SOIC – D</td>
<td>Tape and reel</td>
<td>SN7406DR</td>
</tr>
<tr>
<td></td>
<td>PDIP – N</td>
<td>Tube</td>
<td>SN7406N</td>
</tr>
<tr>
<td></td>
<td>PDIP – N</td>
<td>Tube</td>
<td>SN7416N</td>
</tr>
<tr>
<td></td>
<td>SOP – NS</td>
<td>Tape and reel</td>
<td>SN7406NSR</td>
</tr>
<tr>
<td></td>
<td>CDIP – J</td>
<td>Tube</td>
<td>SNJ5406J</td>
</tr>
<tr>
<td></td>
<td>CDIP – W</td>
<td>Tube</td>
<td>SNJ5406W</td>
</tr>
<tr>
<td></td>
<td>CDIP – J</td>
<td>Tube</td>
<td>SNJ5416J</td>
</tr>
<tr>
<td></td>
<td>CDIP – W</td>
<td>Tube</td>
<td>SNJ5416W</td>
</tr>
<tr>
<td></td>
<td>LCCC – FK</td>
<td>Tube</td>
<td>SNJ5406FK</td>
</tr>
</tbody>
</table>

†Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

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logic diagram (positive logic)

```
A    1A  1  2    2Y
     2
     3  4  4A  4
3A  5  5  6A  6  6
     8  8  8Y
5A  9  9  10  10  10
     11 11  11
6A 13  13  12  12  12

Y = A
```

schematic (each buffer/driver)

```
Input A

6 kΩ

1.4 kΩ

1 kΩ

2 kΩ

100 Ω

GND

Output Y

1.6 kΩ

V CC

06, '16

Resistor values shown are nominal.

absolute maximum ratings over operating free-air temperature (unless otherwise noted)†

Supply voltage, V CC (see Note 1) ................................................................. 7 V
Input voltage, V I (see Note 1) ................................................................. 5.5 V
Output voltage, V O (see Notes 1 and 2): SN5406, SN7406 .......................... 30 V
SN5416, SN7416 ......................... 15 V
Package thermal impedance, θ JA (see Note 3): D package ......................... 86°C/W
N package ................................. 80°C/W
NS package .............................. 76°C/W
Storage temperature range, T stg ............................................................. −65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” 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.

NOTES: 1. Voltage values are with respect to network ground terminal.
2. This is the maximum voltage which should be applied to any output when it is in the off state.
3. The package thermal impedance is calculated in accordance with JEDE 51-7.
### recommended operating conditions

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITIONS</th>
<th>SN5406</th>
<th>SN5416</th>
<th>SN7406</th>
<th>SN7416</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCC</td>
<td>Supply voltage</td>
<td>4.5</td>
<td>5</td>
<td>5.5</td>
<td>4.75</td>
<td>5</td>
</tr>
<tr>
<td>VH</td>
<td>High-level input voltage</td>
<td>2</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VL</td>
<td>Low-level input voltage</td>
<td>0.8</td>
<td></td>
<td>0.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VOH</td>
<td>High-level output voltage</td>
<td>'06</td>
<td>30</td>
<td></td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>IOL</td>
<td>Low-level output current</td>
<td>30</td>
<td></td>
<td>40</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>TA</td>
<td>Operating free-air temperature</td>
<td>-55</td>
<td></td>
<td>125</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

### electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITIONS</th>
<th>SN5406</th>
<th>SN5416</th>
<th>SN7406</th>
<th>SN7416</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIK</td>
<td>VCC = MIN, Ii = -12 mA</td>
<td>-1.5</td>
<td></td>
<td>-1.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IOH</td>
<td>VCC = MIN, VIL = 0.8 V, VOH = §</td>
<td>0.25</td>
<td></td>
<td>0.25</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>VOL</td>
<td>VCC = MIN, VIL = 2 V</td>
<td>IOL = 16 mA</td>
<td>0.4</td>
<td></td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>VCC = MAX,</td>
<td>VIL = 5.5 V</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>IIL</td>
<td>VCC = MAX, VIL = 0.4 V</td>
<td>-1.6</td>
<td></td>
<td>-1.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICCH</td>
<td>VCC = MAX</td>
<td>30</td>
<td></td>
<td>48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICCCL</td>
<td>VCC = MAX</td>
<td>32</td>
<td></td>
<td>51</td>
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<td></td>
</tr>
</tbody>
</table>

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ All typical values are at VCC = 5 V, TA = 25°C.
§ VOH = 30 V for '06 and 15 V for '16.
¶ IOL = 30 mA for SN54' and 40 mA for SN74'.

### switching characteristics, VCC = 5 V, TA = 25°C (see Figure 1)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>FROM (INPUT)</th>
<th>TO (OUTPUT)</th>
<th>TEST CONDITIONS</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>tPLH</td>
<td>A</td>
<td>Y</td>
<td>RL = 110 Ω, CL = 15 pF</td>
<td>10</td>
<td>15</td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>tPHL</td>
<td></td>
<td></td>
<td></td>
<td>15</td>
<td>23</td>
<td></td>
<td>ns</td>
</tr>
</tbody>
</table>
PARAMETER MEASUREMENT INFORMATION

From Output
Under Test

\[ V_{CC} \]
\[ R_L \]

\[ C_L \text{ (see Note A)} \]

LOAD CIRCUIT

\[ t_w \]

\[ \text{High-Level Pulse} \]
\[ \text{Low-Level Pulse} \]

VOLTAGE WAVEFORMS
PULSE WIDTHS

\[ 1.5 \text{ V} \]
\[ 1.5 \text{ V} \]
\[ 1.5 \text{ V} \]
\[ 1.5 \text{ V} \]

NOTES:
A. \( C_L \) includes probe and jig capacitance.
B. In the examples above, the phase relationships between inputs and outputs have been chosen arbitrarily.
C. All input pulses are supplied by generators having the following characteristics: PRR \( \leq 1 \text{ MHz} \), \( Z_0 = 50 \Omega \), \( t_r \leq 7 \text{ ns} \), \( t_f \leq 7 \text{ ns} \).
D. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms
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