The SN54LS/74LS13 and SN54LS/74LS14 contain logic gates/inverters which accept standard TTL input signals and provide standard TTL output levels. They are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals. Additionally, they have greater noise margin than conventional inverters.

Each circuit contains a Schmitt trigger followed by a Darlington level shifter and a phase splitter driving a TTL totem pole output. The Schmitt trigger uses positive feedback to effectively speed-up slow input transitions, and provide different input threshold voltages for positive and negative-going transitions. This hysteresis between the positive-going and negative-going input thresholds (typically 800 mV) is determined internally by resistor ratios and is essentially insensitive to temperature and supply voltage variations.

### GUARANTEED OPERATING RANGES

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</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>54</td>
<td>4.5</td>
<td>5.0</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>74</td>
<td>4.75</td>
<td>5.0</td>
<td>V</td>
</tr>
<tr>
<td>$T_A$</td>
<td>Operating Ambient Temperature Range</td>
<td>54</td>
<td>−55</td>
<td>25</td>
<td>°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>74</td>
<td>0</td>
<td>25</td>
<td>°C</td>
</tr>
<tr>
<td>$I_{OH}$</td>
<td>Output Current — High</td>
<td>54, 74</td>
<td>−0.4</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>$I_{OL}$</td>
<td>Output Current — Low</td>
<td>54</td>
<td>4.0</td>
<td>8.0</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>74</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### ORDERING INFORMATION

- SN54LSXXJ Ceramic
- SN74LSXXN Plastic
- SN74LSXXD SOIC

- J SUFFIX CERAMIC CASE 632-08
- N SUFFIX PLASTIC CASE 646-06
- D SUFFIX SOIC CASE 751A-02
### DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Limits</th>
<th>Test Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{T^+}</td>
<td>Positive-Going Threshold Voltage</td>
<td>Min</td>
<td>Typ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td>V_{T^-}</td>
<td>Negative-Going Threshold Voltage</td>
<td>0.6</td>
<td>1.1</td>
</tr>
<tr>
<td>V_{T^+} - V_{T^-}</td>
<td>Hysteresis</td>
<td>0.4</td>
<td>0.8</td>
</tr>
<tr>
<td>V_{IK}</td>
<td>Input Clamp Diode Voltage</td>
<td>-0.65</td>
<td>-1.5</td>
</tr>
<tr>
<td>V_{OH}</td>
<td>Output HIGH Voltage</td>
<td>54</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>74</td>
<td>2.7</td>
</tr>
<tr>
<td>V_{OL}</td>
<td>Output LOW Voltage</td>
<td>54, 74</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>74</td>
<td>0.35</td>
</tr>
<tr>
<td>I_{T^+}</td>
<td>Input Current at Positive-Going Threshold</td>
<td>-0.14</td>
<td>mA</td>
</tr>
<tr>
<td>I_{T^-}</td>
<td>Input Current at Negative-Going Threshold</td>
<td>-0.18</td>
<td>mA</td>
</tr>
<tr>
<td>I_{IH}</td>
<td>Input HIGH Current</td>
<td>1.0</td>
<td>20</td>
</tr>
<tr>
<td>I_{IL}</td>
<td>Input LOW Current</td>
<td>-0.4</td>
<td>mA</td>
</tr>
<tr>
<td>IOS</td>
<td>Short Circuit Current (Note 1)</td>
<td>-20</td>
<td>-100</td>
</tr>
</tbody>
</table>

Note 1: Not more than one output should be shorted at a time, nor for more than 1 second.

### AC CHARACTERISTICS (T_a = 25°C)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Max</th>
<th>Test Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>I_{PLH}</td>
<td>Propagation Delay, Input to Output</td>
<td>22</td>
<td>22 ns</td>
</tr>
<tr>
<td>I_{PHL}</td>
<td>Propagation Delay, Input to Output</td>
<td>27</td>
<td>22 ns</td>
</tr>
</tbody>
</table>

Figure 1. AC Waveforms
Figure 2. $V_{IN}$ versus $V_{OUT}$ Transfer Function

Figure 3. Threshold Voltage and Hysteresis versus Power Supply Voltage

Figure 4. Threshold Voltage Hysteresis versus Temperature