

- Dual 5-Input
- Quad 2-Input (Open Collector)
- Quad 2-Input (Passive Pullup)
- Triple 4, 3, 4-Input (Passive Pullup)

**Features**

- 15 mA DRIVE CURRENT
- DRIVES LINES UP TO 1,000 FEET LONG
- IDEAL SYSTEM CLOCK DRIVER
- DRIVES LAMPS AND RELAYS DIRECTLY
- EXPANDER INPUTS

**302/303/304**

- FANOUT UP TO 20
- COLLECTOR OR'ABLE
- IDEAL LAMP DRIVERS
- EXPANDER INPUTS
- 302 OUTPUT LEVELS ADJUSTABLE TO DTL, TTL OR MOS LEVELS
- 303, 304 HAVE PASSIVE PULLUP RESISTORS ON CHIP

**General Descriptions**

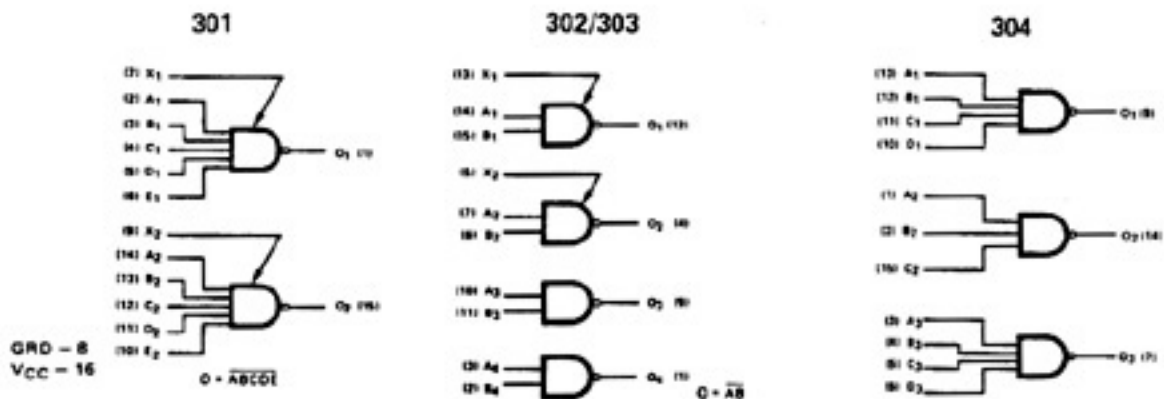
**301**

The 301 is an expandable buffer gate with high drive and sink currents. It is ideal for applications such as driving lamps, relays and long lines, and it makes an excellent system clock driver. The outputs are active pullup.

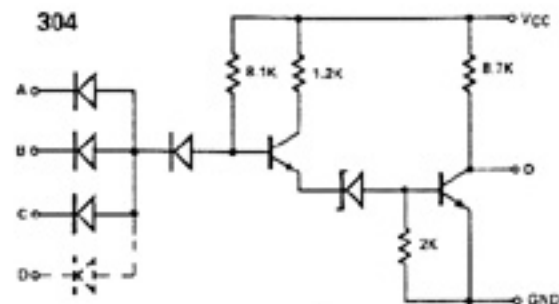
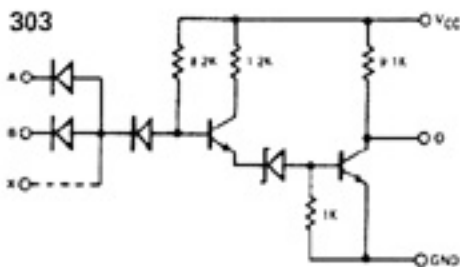
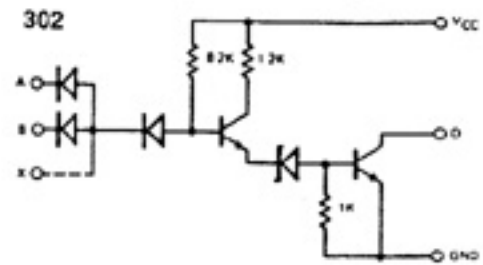
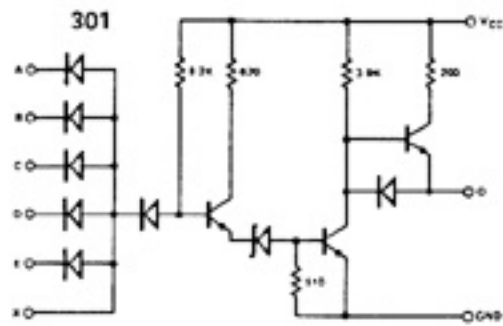
**302/303/304**

The 302, 303 and 304 are buffer gates for applications such as "wire-OR" logic systems, lamp driving and interfaces with other logic families. Two gates in each 302 and 303 package have expander inputs. The 302 is used with an external pullup resistor while the 303 and 304 have pullup resistors on the chip.

**Logic Diagrams**



## Equivalent Circuits



## Specifications

### 301

$I_{CC}$ (WORST-CASE)	45 mA @ 13V, 65 mA @ 16V
$t_{PD}$	240 ns    400 ns
I/O FUNCTION FOR $t_{PD}$	A+D-    A-D+

### 302

$I_{CC}$ (WORST-CASE)	40 mA @ 13V, 60 mA @ 16V
$t_{PD}$	240 ns    600 ns
I/O FUNCTION FOR $t_{PD}$	A+D-    A-C+

### 303, 304

$I_{CC}$ (WORST-CASE)	49 mA @ 13V, 70 mA @ 16V
$t_{PD}$	240 ns    600 ns
I/O FUNCTION FOR $t_{PD}$	A+D-    A-D+

#### NOTE:

$I_{CC}$  is tested at  $V_{CC} + 1$  Volt (+13V for C Type and +16V for A Type) and is guaranteed across the applicable temp range.  $t_{PD}$  is guaranteed at  $V_{CC} \pm 1V$  and across the applicable temp range with the output loaded (28 UL - 302C, 25 UL - 303C, 304C; 23 UL - 302A, 20 UL - 303A, 304A).

See page 12 for electrical summary data.

## Switching Time Waveforms



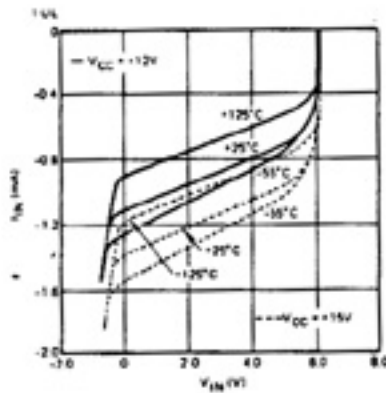
Loading Table

PINS	FUNCTION	LOADING
A,B	Inputs	1 UL
X	Expanders	Each diode tied to X, or X <sub>2</sub> is 1 unit load
0	Outputs	20 UL (301) 20 UL (302 with 3.9K $\Omega$ pullup resistor) 20 UL (303, 304 with 5.6K $\Omega$ pullup resistor)

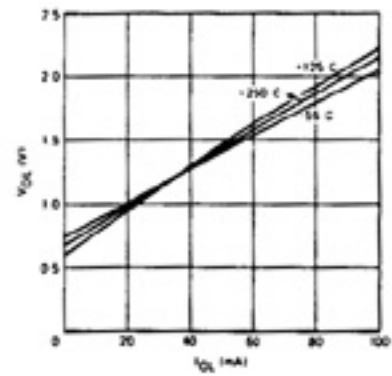
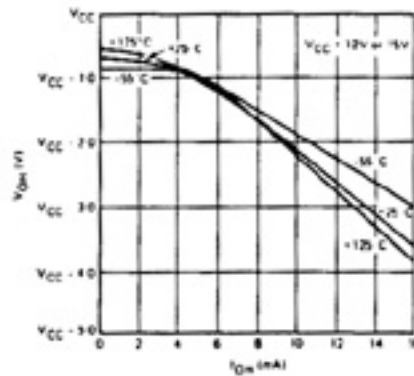
302 handles 10 TTL loads at 400 mV.

Typical Performance Characteristics

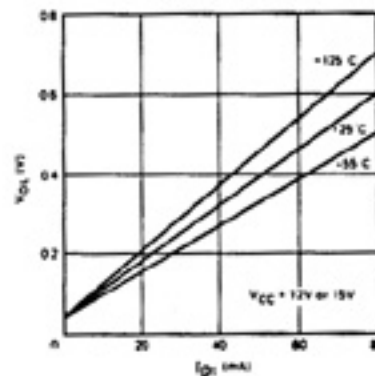
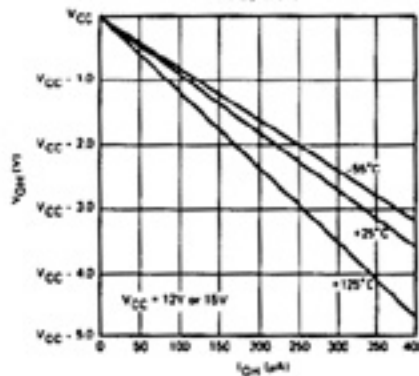
INPUT CURRENT VS. INPUT VOLTAGE



OUTPUT CURRENT VS. OUTPUT VOLTAGE  
OUTPUT HIGH 301      OUTPUT LOW 301

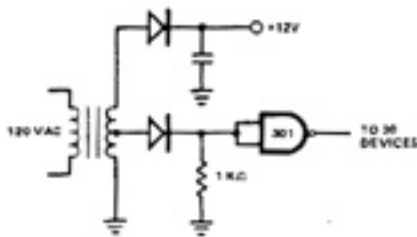


OUTPUT CURRENT VS. OUTPUT VOLTAGE  
OUTPUT HIGH 303, 304      OUTPUT LOW 302, 303, 304



## Typical Applications

### 60 Hz SYSTEM CLOCK



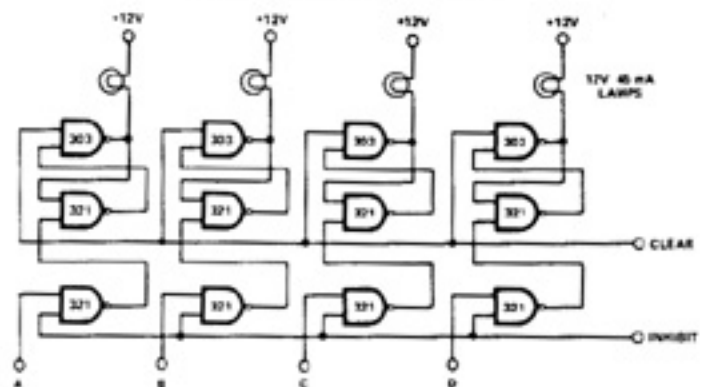
The center tap on the power supply transformer serves as a system clock.

### LINE DRIVER



Up to 10,000 pF can be driven by the 301. When the 301 is used in this way, terminate the line with a 500Ω resistor.

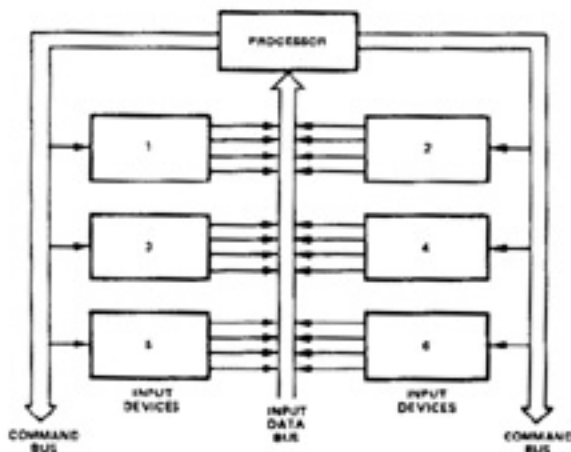
### 50 mA QUAD FLIP-FLOP



The 303 serves here as lamp driver outputs on latches formed by 303 and 321 gates. The circuit also provides inhibit and clear lines.

Rules for selecting external resistors and calculating fanout with collectors OR'd are given in the applications notes. The external resistor of the 302 may be connected to a voltage other than  $V_{CC}$  to adjust the output voltage level. The expandable gates may be provided any number of inputs by adding 331 gate expanders or 1N4148 diodes (or any 20-volt silicon diodes) to the expander inputs.

### CONNECTIONS TO DATA BUS



Each input device is connected to the data bus through a 302 used in the collector-OR configuration. Up to 20 input devices may be connected to a 4-line bus segment. Pullup resistors  $R$  are chosen by the rules given in the applications notes.

