

**Philips Components**

|               |                       |
|---------------|-----------------------|
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| Status        | Product Specification |
| ECL Products  |                       |

# 100124/100124A

## Hex TTL-to-ECL Translator

**FEATURES**

- Typical propagation delay: 1.70ns
- Typical ECL supply current ( $-I_{EE}$ ): 96mA for the 100124 and 71mA for the 100124A
- Typical TTL supply current ( $I_{TTL}$ ): 44mA for the 100124 and 10mA for the 100124A

**DESCRIPTION**

The 100124 is a hex translator that converts TTL logic levels to 100K ECL logic levels. When the common Enable (E) is Low, all true outputs are Low, and all inverting outputs are High. The differential outputs allow each circuit to be used as an inverting, noninverting, or differential line driver. In differential operation, common mode rejection helps overcome ground offsets

and transients between the 100124 and its receiver.  $V_{EE}$  and  $V_{TTL}$  may be applied in any order.

The 100124A is a low power version of the 100124. The only difference between the two parts are the limits of the ECL and TTL supply currents.

All unused inputs can be left open due to integrated pull-down resistors.

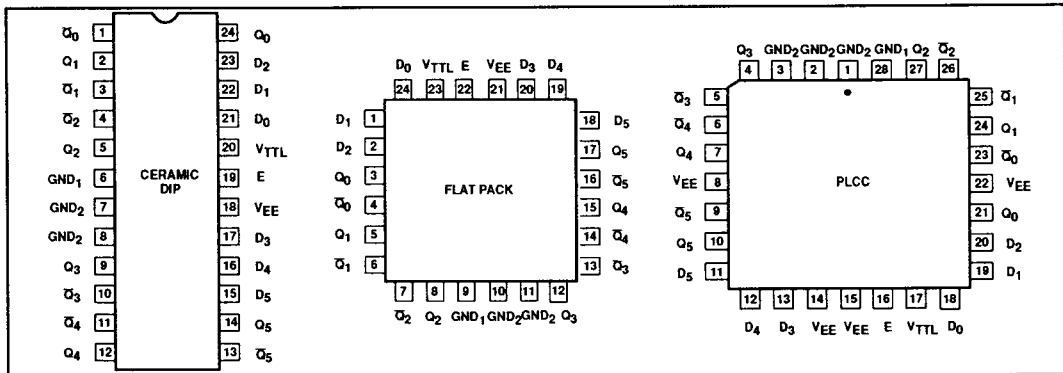
**PIN DESCRIPTION**

| PINS                    | DESCRIPTION                                      |
|-------------------------|--------------------------------------------------|
| $D_0 - D_5$             | Data Inputs (TTL compatible)                     |
| E                       | Enable input (TTL compatible)                    |
| $Q_0 - Q_5$             | True data outputs (100K ECL compatible)          |
| $\bar{Q}_0 - \bar{Q}_5$ | Complementary data outputs (100K ECL compatible) |

**ORDERING INFORMATION**

| DESCRIPTION                        | ORDER CODE       |
|------------------------------------|------------------|
| 24-Pin Ceramic DIP (400 mils wide) | 100124F/100124AF |
| 24-Pin Ceramic Flat Pack           | 100124Y/100124AY |
| 28-Pin PLCC                        | 100124A/100124AA |

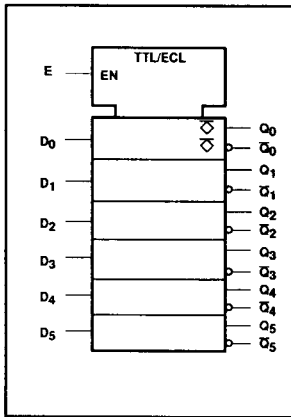
**PIN CONFIGURATIONS**



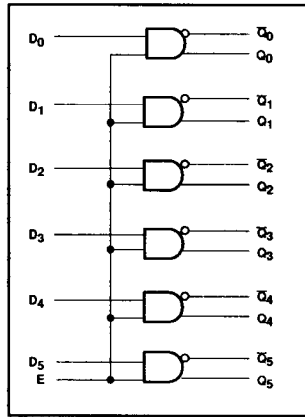
# Translator

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### IEC/IEEE SYMBOL



### LOGIC DIAGRAM

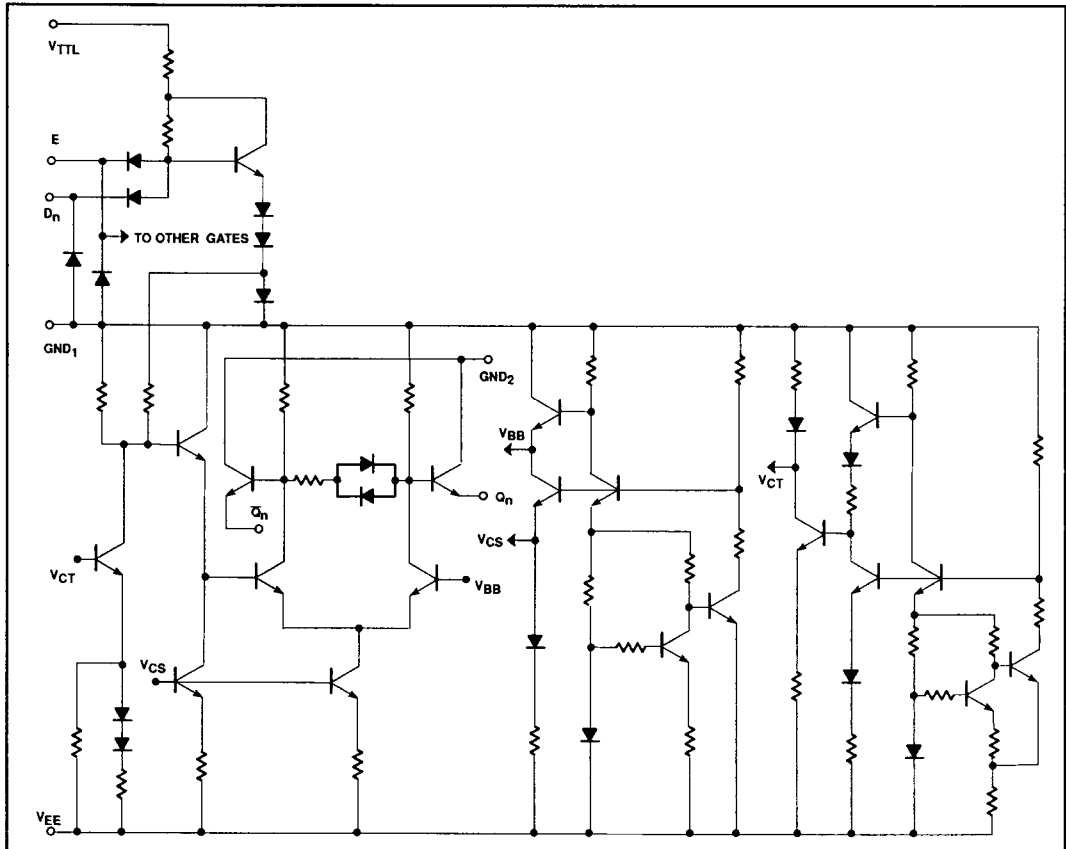


### FUNCTION TABLE (One Gate)

| INPUTS |                | OUTPUTS        |             |
|--------|----------------|----------------|-------------|
| E      | D <sub>n</sub> | Q <sub>n</sub> | $\bar{Q}_n$ |
| H      | H              | H              | L           |
| H      | L              | L              | H           |
| L      | X              | L              | H           |

NOTES:  
 H = High voltage level  
 L = Low voltage level  
 X = Don't care

### SIMPLIFIED SCHEMATIC



**Translator****100124/100124A****ABSOLUTE MAXIMUM RATINGS**  $GND_1 = GND_2 = \text{ground}$ ,  $T_A = 0^\circ\text{C}$  to  $+85^\circ\text{C}$  unless otherwise specified.

| SYMBOL    | PARAMETER                          | LIMITS            | UNIT             |
|-----------|------------------------------------|-------------------|------------------|
| $V_{TTL}$ | TTL Supply voltage                 | -0.5 to +7.0      | V                |
| $V_{IN}$  | Input voltage                      | -0.5 to $V_{TTL}$ | V                |
| $I_{IN}$  | Input current                      | -30 to +5.0       | mA               |
| $V_{EE}$  | ECL Supply voltage                 | -7.0 to +0.5      | V                |
| $I_O$     | Output source current (continuous) | -55               | mA               |
| $T_S$     | Storage temperature range          | -65 to +150       | $^\circ\text{C}$ |
| $T_J$     | Maximum junction temperature       | +150              | $^\circ\text{C}$ |

**NOTE:**

Operation beyond the limits set forth in this table may impair the useful life of the device.

**DC OPERATING CONDITIONS**

| SYMBOL         | PARAMETER                                                         | LIMITS |      |      | UNIT             |
|----------------|-------------------------------------------------------------------|--------|------|------|------------------|
|                |                                                                   | MIN.   | NOM. | MAX. |                  |
| $GND_1, GND_2$ | Circuit ground                                                    | 0      | 0    | 0    | V                |
| $V_{TTL}$      | TTL Supply voltage                                                | +4.5   | +5.0 | +5.5 | V                |
| $V_{EE}$       | ECL Supply voltage                                                | -4.8   | -4.5 | -4.2 | V                |
| $V_{EE}$       | Supply voltage when operating with the 10K or the 10KH ECL family | -5.7   |      |      | V                |
| $V_{IH}$       | High level input voltage                                          | +2.0   |      |      | V                |
| $V_{IL}$       | Low level input voltage                                           |        |      | +0.8 | V                |
| $T_A$          | Operating ambient temperature range                               | 0      | +25  | +85  | $^\circ\text{C}$ |

**NOTE:**

When operating at other than the  $V_{EE}$  specified voltages (-4.2V, -4.5V, -4.8V), the DC and AC electrical characteristics will vary slightly from their specified values.

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**DC ELECTRICAL CHARACTERISTICS**  $GND_1 = GND_2 = \text{ground}$ ,  $V_{TTL} = 4.5\text{V to } 5.5\text{V}$ ,  $V_{EE} = -4.8\text{V to } -4.2\text{V}$ ,  $T_A = 0^\circ\text{C to } +85^\circ\text{C}$  unless otherwise specified<sup>1,3,4</sup>

| SYMBOL    | PARAMETER                              |              | TEST CONDITIONS <sup>2</sup>                                              |                                     | LIMITS                  |       |       | UNIT          |    |
|-----------|----------------------------------------|--------------|---------------------------------------------------------------------------|-------------------------------------|-------------------------|-------|-------|---------------|----|
|           |                                        |              |                                                                           |                                     | MIN.                    | TYP.  | MAX.  |               |    |
| $V_{OH}$  | High level output voltage              |              | E, $D_n = 2.4\text{V}$ , test $Q_n$                                       | $V_{EE} = -4.2\text{V}$             | -1020                   |       | -870  | mV            |    |
|           |                                        |              |                                                                           | $V_{EE} = -4.5\text{V}$             | -1025                   | -955  | -880  | mV            |    |
|           |                                        |              |                                                                           | $V_{EE} = -4.8\text{V}$             | -1035                   |       | -880  | mV            |    |
| $V_{OHT}$ | High level output threshold voltage    |              | E, $D_n = 2.0\text{V}$ , test $Q_n$                                       | $V_{EE} = -4.2\text{V}$             | -1030                   |       |       | mV            |    |
|           |                                        |              |                                                                           | $V_{EE} = -4.5\text{V}$             | -1035                   |       |       | mV            |    |
|           |                                        |              |                                                                           | $V_{EE} = -4.8\text{V}$             | -1045                   |       |       | mV            |    |
| $V_{OLT}$ | Low level output threshold voltage     |              | with $50\Omega$<br>to $-2.0\text{V}$<br>$\pm 0.010\text{V}$               | E, $D_n = 0.8\text{V}$ , test $Q_n$ | $V_{EE} = -4.2\text{V}$ |       |       | -1595         | mV |
|           |                                        |              |                                                                           |                                     | $V_{EE} = -4.5\text{V}$ |       |       | -1610         | mV |
|           |                                        |              |                                                                           |                                     | $V_{EE} = -4.8\text{V}$ |       |       | -1610         | mV |
| $V_{OL}$  | Low level output voltage               |              | E, $D_n = 0.4\text{V}$ , test $Q_n$                                       | $V_{EE} = -4.2\text{V}$             | -1810                   |       | -1605 | mV            |    |
|           |                                        |              |                                                                           | $V_{EE} = -4.5\text{V}$             | -1810                   | -1705 | -1620 | mV            |    |
|           |                                        |              |                                                                           | $V_{EE} = -4.8\text{V}$             | -1830                   |       | -1620 | mV            |    |
| $-I_{EE}$ | $V_{EE}$ supply current                | 100124       | All inputs $\geq V_{IHMIN}$                                               |                                     |                         | 96    | 140   | mA            |    |
|           |                                        | 100124A      |                                                                           |                                     |                         | 71    | 90    |               |    |
| $V_K$     | Input clamp voltage                    | $D_n$ inputs | Apply $-18\text{mA}$ to one $D_n$ , other inputs open.                    |                                     | -1.5                    |       |       | V             |    |
|           |                                        | E input      | Apply $-18\text{mA}$ to one E, other inputs open.                         |                                     | -1.5                    |       |       | V             |    |
| $I_I$     | Input current at maximum input voltage | $D_n$ inputs | $D_n$ input under test = $+5.5\text{V}$ , other inputs = ground.          |                                     |                         |       | 1.0   | mA            |    |
|           |                                        | E input      | E = $+5.5\text{V}$ , other inputs = ground.                               |                                     |                         |       | 1.0   |               |    |
| $I_{IH}$  | High level input current               | $D_n$ inputs | $D_n$ input under test = $+2.4\text{V}$ , other inputs = ground.          |                                     |                         |       | 20    | $\mu\text{A}$ |    |
|           |                                        | E input      | E = $+2.4\text{V}$ , other inputs = ground.                               |                                     |                         |       | 120   |               |    |
| $-I_{IL}$ | Low level input current                | $D_n$ inputs | $D_n$ input under test = $+0.4\text{V}$ , other inputs = $+2.4\text{V}$ . |                                     |                         |       | 1.6   | mA            |    |
|           |                                        | E input      | E = $+0.4\text{V}$ , other inputs = $+2.4\text{V}$ .                      |                                     |                         |       | 9.6   |               |    |
| $I_{TTL}$ | TTL supply current                     | 100124       | All inputs at ground.                                                     |                                     |                         | 44    | 75    | mA            |    |
|           |                                        | 100124A      |                                                                           |                                     |                         | 10    | 15    |               |    |

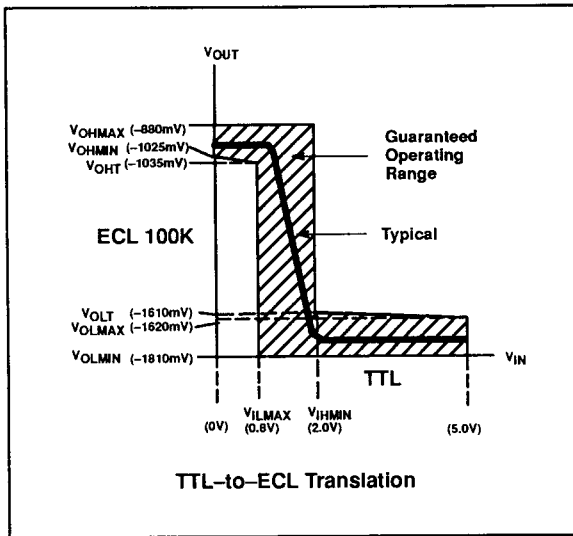
**NOTES:**

- The specified limits represent the worst case values for the parameter. Since these worst case values normally occur at the supply voltage and temperature extremes, additional noise immunity can be achieved by decreasing the allowable operating condition ranges.
- Conditions for testing shown in the tables are not necessarily worst case. For worst case testing guidelines, refer to DC Testing, Chapter 1, Section 3.
- The specified limits shown in the DC electrical characteristics table can be met only after thermal equilibrium has been established. Thermal equilibrium is established by applying power for at least 2 minutes, while maintaining transverse airflow of 2.5 meters/sec (500 linear feet/min) over the device, mounted either in a test socket or on a printed circuit board. Test voltage values are given in the DC operating conditions table.
- The device can function down to  $V_{EE} = -5.7\text{V}$ , allowing operation with either the 10K or the 10KH family. Correction factors can be used to calculate new DC limits for the extended  $V_{EE}$  range. For more information, see Chapters 5 and 10, Section 4.

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## TRANSFER CHARACTERISTICS



## AC ELECTRICAL CHARACTERISTICS

Ceramic DIP  $GND_1 = GND_2 = \text{ground}$ ,  $V_{TTL} = 4.5V \text{ to } 5.5V$ ,  $V_{EE} = -4.8V \text{ to } -4.2V$

| SYMBOL                 | PARAMETER                                                 | TEST CONDITION | LIMITS            |      |                     |      |                     |      | UNIT |
|------------------------|-----------------------------------------------------------|----------------|-------------------|------|---------------------|------|---------------------|------|------|
|                        |                                                           |                | $T_A = 0^\circ C$ |      | $T_A = +25^\circ C$ |      | $T_A = +85^\circ C$ |      |      |
|                        |                                                           |                | MIN.              | MAX. | MIN.                | MAX. | MIN.                | MAX. |      |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation delay<br>$D_n$ or $E$ to $Q_n$ or $\bar{Q}_n$ | Waveform 1     | 0.50              | 3.00 | 0.50                | 2.90 | 0.50                | 3.00 | ns   |
|                        |                                                           |                | 0.50              | 3.00 | 0.50                | 2.90 | 0.50                | 3.00 | ns   |
| $t_{TLH}$<br>$t_{THL}$ | Transition time $Q_n$ or $\bar{Q}_n$                      |                | 0.45              | 1.80 | 0.45                | 1.80 | 0.45                | 1.80 | ns   |
|                        |                                                           | 0.45           | 1.80              | 0.45 | 1.80                | 0.45 | 1.80                | ns   |      |

**NOTE:**

For AC test setup information, see AC Testing, Chapter 2, Section 3.

## AC ELECTRICAL CHARACTERISTICS

Ceramic DIP  $GND_1 = GND_2 = \text{ground}$ ,  $V_{TTL} = 4.5V \text{ to } 5.5V$ ,  $V_{EE} = -5.2V \pm 5\%$

| SYMBOL                 | PARAMETER                                                 | TEST CONDITION | LIMITS            |      |                     |      |                     |      | UNIT |
|------------------------|-----------------------------------------------------------|----------------|-------------------|------|---------------------|------|---------------------|------|------|
|                        |                                                           |                | $T_A = 0^\circ C$ |      | $T_A = +25^\circ C$ |      | $T_A = +85^\circ C$ |      |      |
|                        |                                                           |                | MIN.              | MAX. | MIN.                | MAX. | MIN.                | MAX. |      |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation delay<br>$D_n$ or $E$ to $Q_n$ or $\bar{Q}_n$ | Waveform 1     | 0.50              | 3.00 | 0.50                | 2.90 | 0.50                | 3.00 | ns   |
|                        |                                                           |                | 0.50              | 3.00 | 0.50                | 2.90 | 0.50                | 3.00 | ns   |
| $t_{TLH}$<br>$t_{THL}$ | Transition time $Q_n$ or $\bar{Q}_n$                      |                | 0.45              | 1.80 | 0.45                | 1.80 | 0.45                | 1.80 | ns   |
|                        |                                                           | 0.45           | 1.80              | 0.45 | 1.80                | 0.45 | 1.80                | ns   |      |

**NOTE:**

For AC test setup information, see AC Testing, Chapter 2, Section 3.

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## AC ELECTRICAL CHARACTERISTICS

Flat Pack and PLCC GND<sub>1</sub> = GND<sub>2</sub> = ground, V<sub>TTL</sub> = 4.5V to 5.5V, V<sub>EE</sub> = -4.8V to -4.2V

| SYMBOL                               | PARAMETER                                                                 | TEST CONDITION | LIMITS               |              |                        |              |                        |              | UNIT     |
|--------------------------------------|---------------------------------------------------------------------------|----------------|----------------------|--------------|------------------------|--------------|------------------------|--------------|----------|
|                                      |                                                                           |                | T <sub>A</sub> = 0°C |              | T <sub>A</sub> = +25°C |              | T <sub>A</sub> = +85°C |              |          |
|                                      |                                                                           |                | MIN.                 | MAX.         | MIN.                   | MAX.         | MIN.                   | MAX.         |          |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation delay<br>D <sub>n</sub> or E to Q <sub>n</sub> or $\bar{Q}_n$ | Waveform 1     | 0.50<br>0.50         | 2.80<br>2.80 | 0.50<br>0.50           | 2.70<br>2.70 | 0.50<br>0.50           | 2.80<br>2.80 | ns<br>ns |
| t <sub>TLH</sub><br>t <sub>THL</sub> | Transition time Q <sub>n</sub> or $\bar{Q}_n$                             |                | 0.45<br>0.45         | 1.70<br>1.70 | 0.45<br>0.45           | 1.70<br>1.70 | 0.45<br>0.45           | 1.70<br>1.70 | ns<br>ns |

**NOTE:**

For AC test setup information, see AC Testing, Chapter 2, Section 3.

## AC ELECTRICAL CHARACTERISTICS

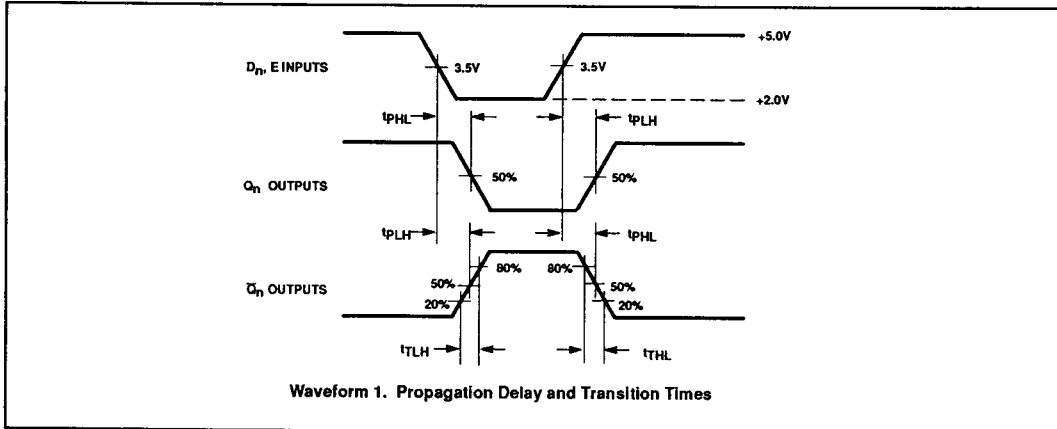
Flat Pack and PLCC GND<sub>1</sub> = GND<sub>2</sub> = ground, V<sub>TTL</sub> = 4.5V to 5.5V, V<sub>EE</sub> = -5.2V ± 5%

| SYMBOL                               | PARAMETER                                                                 | TEST CONDITION | LIMITS               |              |                        |              |                        |              | UNIT     |
|--------------------------------------|---------------------------------------------------------------------------|----------------|----------------------|--------------|------------------------|--------------|------------------------|--------------|----------|
|                                      |                                                                           |                | T <sub>A</sub> = 0°C |              | T <sub>A</sub> = +25°C |              | T <sub>A</sub> = +85°C |              |          |
|                                      |                                                                           |                | MIN.                 | MAX.         | MIN.                   | MAX.         | MIN.                   | MAX.         |          |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation delay<br>D <sub>n</sub> or E to Q <sub>n</sub> or $\bar{Q}_n$ | Waveform 1     | 0.50<br>0.50         | 2.80<br>2.80 | 0.50<br>0.50           | 2.70<br>2.70 | 0.50<br>0.50           | 2.80<br>2.80 | ns<br>ns |
| t <sub>TLH</sub><br>t <sub>THL</sub> | Transition time Q <sub>n</sub> or $\bar{Q}_n$                             |                | 0.45<br>0.45         | 1.70<br>1.70 | 0.45<br>0.45           | 1.70<br>1.70 | 0.45<br>0.45           | 1.70<br>1.70 | ns<br>ns |

**NOTE:**

For AC test setup information, see AC Testing, Chapter 2, Section 3.

## AC WAVEFORMS



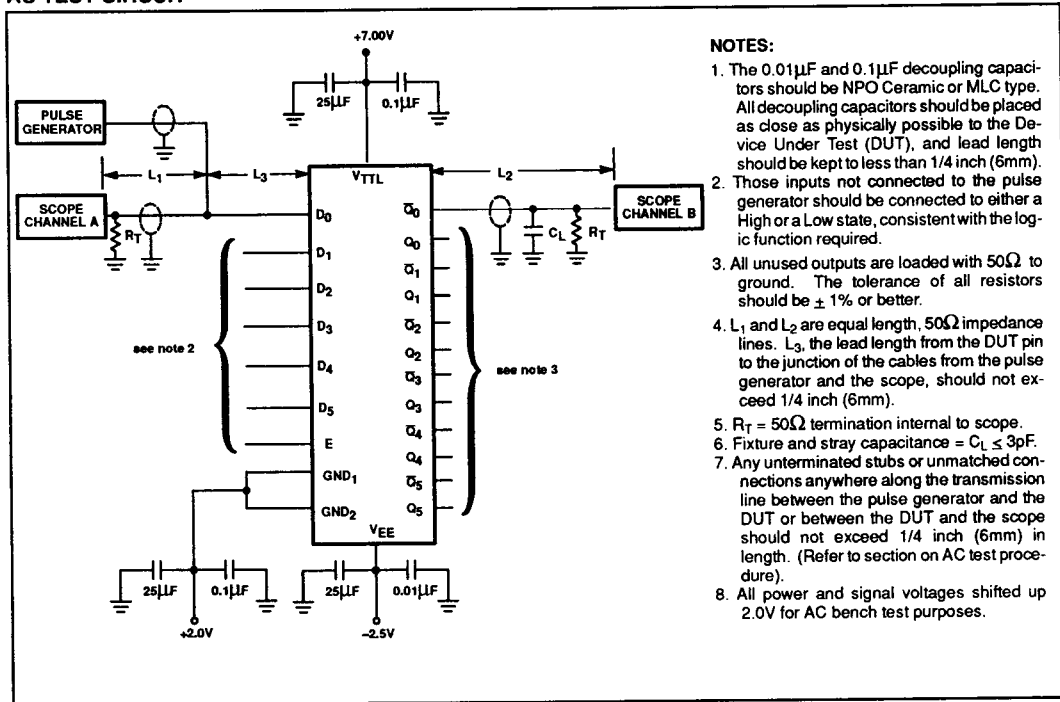
**NOTE:**

All power and signal voltages shifted up 2.0V for AC bench test purposes.

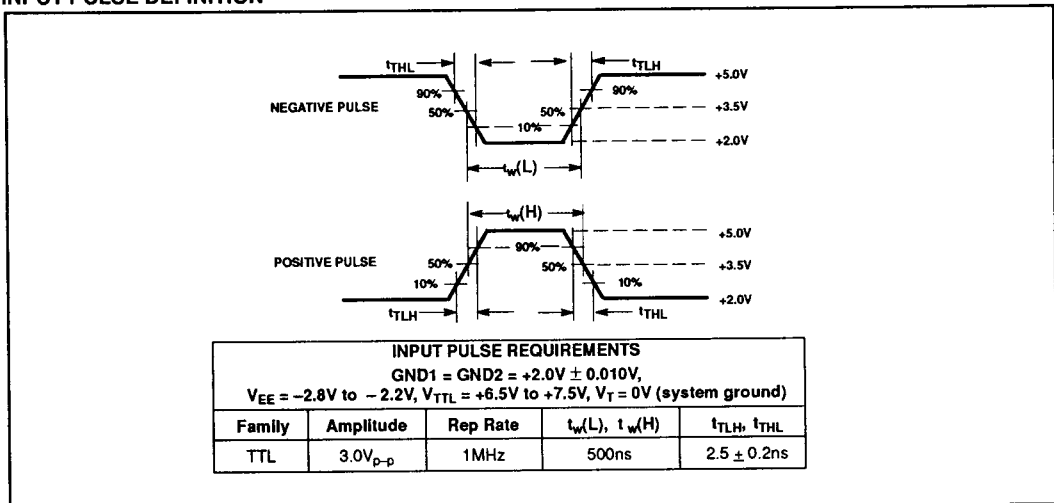
# Translator

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## AC TEST CIRCUIT



## INPUT PULSE DEFINITION



**NOTE:**  
All power and signal voltages shifted up 2.0V for AC bench test purposes.

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