Signetics

# 10124
# Translator

**Quad TTL-to-ECL Translator**
***Product Specification***

**ECL Products**

## DESCRIPTION

The 10124 is a Quad TTL – ECL Translator with an individual Data and a common Select TTL-compatable input on each gate. When the Select input is in the LOW state, all ECL non-inverting outputs are in a LOW state and inverting outputs are in a HIGH state.

| TYPE | TYPICAL PROPAGATION DELAY | TYPICAL SUPPLY CURRENT ($-I_{EE}$) |
|---|---|---|
| 10124 | 3.5ns | 53mA |

## ORDERING CODE

| PACKAGES | COMMERCIAL RANGE $V_{CC}$ = +5V, GND = 0V, $V_{EE}$ = −5.2V $T_A$ = −30°C to +85°C |
|---|---|
| Plastic DIP | 10124N |
| Ceramic DIP | 10124F |

## PIN DESCRIPTION

| PINS | DESCRIPTION |
|---|---|
| $D_0 - D_3$ | Data Inputs (Schottky TTL) |
| S | Select Input (Schottky TTL) |
| $Q_1$, $Q_3$, $Q_5$, $Q_7$ | Data Outputs (AND) (10K ECL) |
| $\overline{Q}_0$, $\overline{Q}_2$, $\overline{Q}_4$, $\overline{Q}_6$ | Data Outputs (NAND) (10K ECL) |

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## PIN CONFIGURATION

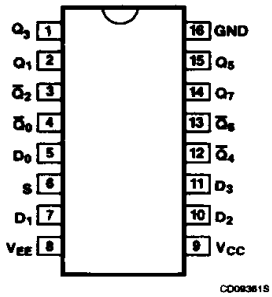



Figure 1

## LOGIC SYMBOL

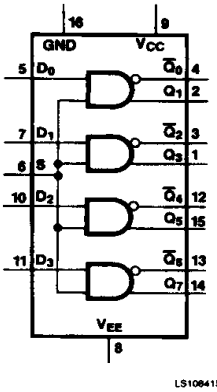



Figure 2

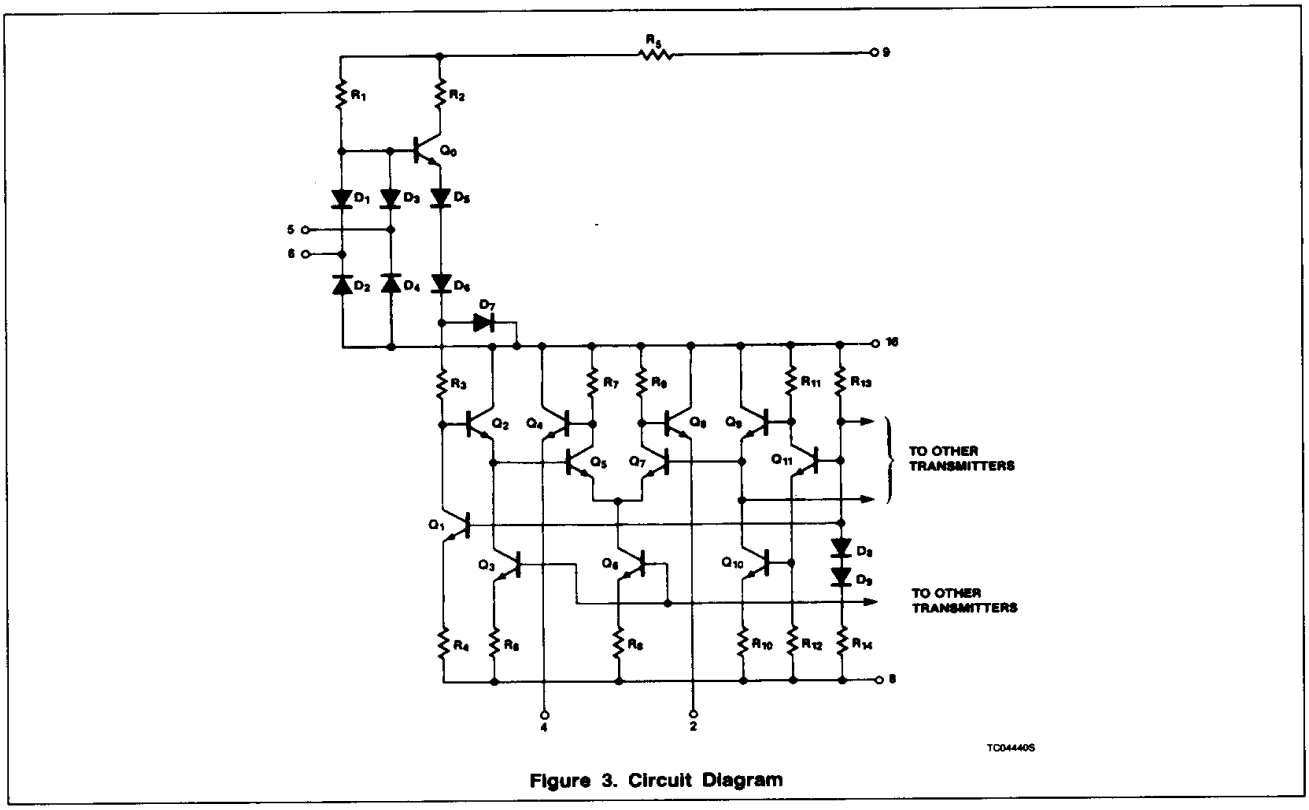



Figure 3. Circuit Diagram

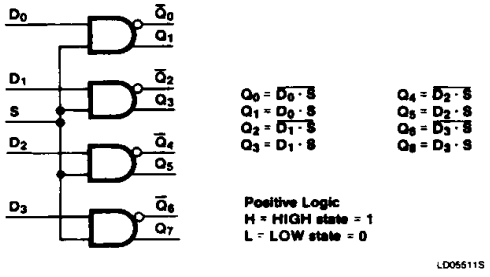



Figure 4. Logic Diagram

## ABSOLUTE MAXIMUM RATINGS

(Operation beyond the limits set forth in this table may impair useful life of the device. Unless otherwise noted, these limits are specified over the operating ambient temperature range.)

| PARAMETER | | | 10K ECL | UNIT |
|---|---|---|---|---|
| $V_{EE}$ | Supply voltage (negative) | | −8.0 | V |
| $V_{CC}$ | Supply voltage (positive) | | +7.0 | V |
| $V_{IN}$ | Input voltage ($V_{IN}$ should never be more positive than $V_{CC3}$) | | 0 to $V_{CC}$ | V |
| $I_O$ | Output current | | −50 | mA |
| $T_S$ | Storage temperature | | −55 to +150 | °C |
| $T_J$ | Maximum junction temperature | Ceramic package | +165 | °C |
| | | Plastic package | +150 | °C |

## DC OPERATING CONDITIONS

| PARAMETER | | | 10K ECL | | | UNIT |
|---|---|---|---|---|---|---|
| | | | Min | Nom | Max | |
| GND | Device ground (common) | | 0 | 0 | 0 | V |
| $V_{CC}$ | Supply voltage (positive) | | | 5.0 | | V |
| $V_{EE}$ | Supply voltage (negative) | | | −5.2 | | V |
| $V_{IH}$ | HIGH level input voltage | $T_A = -30°C$ | 2.0 | | 4.0 | V |
| | | $T_A = +25°C$ | 1.8 | | 4.0 | V |
| | | $T_A = +85°C$ | 1.8 | | 4.0 | V |
| $V_{IHT}$ | HIGH level input threshold voltage | $T_A = -30°C$ | 2.0 | | | V |
| | | $T_A = +25°C$ | 1.8 | | | V |
| | | $T_A = +85°C$ | 1.8 | | | V |
| $V_{ILT}$ | LOW level input threshold voltage | $T_A = -30°C$ | | | 1.1 | V |
| | | $T_A = +25°C$ | | | 1.1 | V |
| | | $T_A = +85°C$ | | | 0.9 | V |
| $V_{IL}$ | LOW level input voltage | $T_A = -30°C$ | 0.4 | | 1.1 | V |
| | | $T_A = +25°C$ | 0.4 | | 1.1 | V |
| | | $T_A = +85°C$ | 0.4 | | 0.8 | V |
| $T_A$ | Operating ambient temperature | | −30 | +25 | +85 | °C |

**NOTE:**
When operating at $V_{EE}$ other than specified voltage (−5.2V), the DC and AC Characteristics will vary slightly from specified values. (See table of DC Characteristics)

## DC ELECTRICAL CHARACTERISTICS

GND = 0V, $V_{CC}$ = +5.0V ±0.010V, $V_{EE}$ = −5.2V ±0.010V, $T_A$ = −30°C to +85°C, output loading with 50Ω to −2.0V ±0.010V unless otherwise specified[1,3]

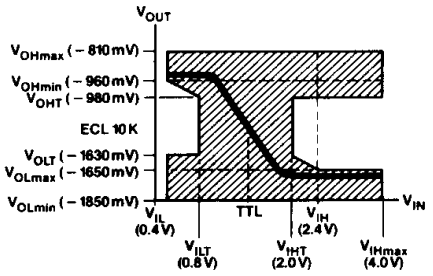
| PARAMETER | | | MIN | TYP | MAX | UNIT | TEST CONDITIONS[2] |
|---|---|---|---|---|---|---|---|
| $V_{OH}$ | HIGH level output voltage | $T_A$ = −30°C | −1060 | | −890 | mV | For $Q_n$ outputs, apply $V_{IHmax}$ to all inputs. For $\overline{Q}_n$ outputs, apply $V_{ILmin}$ to all inputs. |
| | | $T_A$ = +25°C | −960 | | −810 | mV | |
| | | $T_A$ = +85°C | −890 | | −700 | mV | |
| $V_{OHT}$ | HIGH level output threshold voltage | $T_A$ = −30°C | −1080 | | | mV | For $Q_n$ outputs, apply $V_{IHT}$ to $D_1$ input with $V_{IHmax}$ applied to all other inputs. For $\overline{Q}_n$ outputs, apply $V_{ILT}$ to $D_1$ input with $V_{IHmax}$ applied to all other inputs. |
| | | $T_A$ = +25°C | −980 | | | mV | |
| | | $T_A$ = +85°C | −910 | | | mV | |
| $V_{OLT}$ | LOW level output threshold voltage | $T_A$ = −30°C | | | −1655 | mV | For $Q_n$ outputs, apply $V_{ILT}$ to $D_1$ input with $V_{IHmax}$ applied to all other inputs. For $\overline{Q}_n$ outputs, apply $V_{IHT}$ to $D_1$ input with $V_{IHmax}$ applied to all other inputs. |
| | | $T_A$ = +25°C | | | −1630 | mV | |
| | | $T_A$ = +85°C | | | −1595 | mV | |
| $V_{OL}$ | LOW level output voltage | $T_A$ = −30°C | −1890 | | −1675 | mV | For $Q_n$ outputs, apply $V_{ILmin}$ to all inputs. For $\overline{Q}_n$ outputs, apply $V_{IHmax}$ to all inputs. |
| | | $T_A$ = +25°C | −1850 | | −1650 | mV | |
| | | $T_A$ = +85°C | −1825 | | −1615 | mV | |
| $-I_{EE}$ | $V_{EE}$ supply current | $T_A$ = −30°C | | | 72 | mA | Apply $V_{IHmax}$ to all inputs. |
| | | $T_A$ = +25°C | | 53 | 66 | mA | |
| | | $T_A$ = +85°C | | | 72 | mA | |
| $\frac{\Delta V_{OH}}{\Delta V_{EE}}$ | HIGH level output voltage compensation | $T_A$ = +25°C | | 0.016 | | V/V | |
| $\frac{\Delta V_{OL}}{\Delta V_{EE}}$ | LOW level output voltage compensation | | | 0.250 | | V/V | |
| $\frac{\Delta V_{BB}}{\Delta V_{EE}}$ | Reference Bias voltage compensation | | | 0.148 | | V/V | |

**NOTES:**

1. The specified limits represent the "worst case" value for the parameter. Since these "worst case" values normally occur at the temperature extremes, additional noise immunity and guard banding can be achieved by decreasing the allowable system operating ranges.
2. Conditions for testing shown in the tables are not necessarily worst case. For worst-case testing guidelines, refer to Section 3 Testing, DC testing.
3. The specified limits shown in the DC Characteristics 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 air flow of 2.5 meters/s (500 linear feet/min) over the device either mounted in the test socket or on the printed circuit board. Test voltage values are given in the DC Operating Conditions and defined in Figure 5.

**DC ELECTRICAL CHARACTERISTICS** GND = 0V, $V_{CC}$ = +5.0V ±0.010V, $V_{EE}$ = −5.2V ±0.010V, $T_A$ = −30°C to +85°C. Output loading with 50Ω to −2.0V ±0.010V unless otherwise specified

| PARAMETER | | | MIN | TYP | MAX | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|---|
| $V_{IK}$ | Clamp input voltage | S input | | | −1.5 | V | Apply −20mA to S input. |
| | | other inputs | | | | | Apply −10mA to each input under test, one at a time. |
| $V_{BIN}$ | Input breakdown voltage | | 5.5 | | | V | Apply 1.0mA to each input under test, one at a time. |
| $I_F$ | Forward current | S input | | | −12.8 | mA | Apply VF(0.40V) to S input and VR(2.4V) to all other inputs. |
| | | other inputs | | | −3.2 | mA | Apply VF(0.40V) to each input under test, one at a time, with VR(2.4V) applied to all other inputs. |
| $I_R$ | Reverse current | S input | | | 200 | μA | Apply VR(2.4V) to S input with VF(0.4V) to all other inputs. |
| | | other inputs | | | 50 | μA | Apply VR(2.4V) to each input under test, one at a time with VF(0.4V) to all other inputs. |
| $I_{CCH}$ | Supply current HIGH (positive) | $T_A$ = −30°C | | | 16 | mA | Apply $V_{IHmax}$ to all inputs. |
| | | $T_A$ = +25°C | | | 16 | mA | |
| | | $T_A$ = +85°C | | | 18 | mA | |
| $I_{CCL}$ | Supply current LOW (positive) | | | | 25 | mA | Ground all inputs. |




**NOTES:**
- $V_{IHmax}$ – Maximum HIGH level input voltage (the most positive $V_{IH}$).
- $V_{IHT}$ – HIGH level input threshold voltage.
- $V_{ILT}$ – LOW level input threshold voltage.
- $V_{ILmin}$ – Minimum LOW level input voltage (the most negative $V_{IL}$).
- $V_{OHmax}$ – Maximum HIGH level output voltage (the most positive $V_{OH}$) under the specified input and loading condition.
- $V_{OHmin}$ – Minimum HIGH level output voltage (the most negative $V_{OH}$) under the specified input and loading condition.
- $V_{OHT}$ – HIGH level output threshold voltage with the inputs set to their respective threshold levels.
- $V_{OLT}$ – LOW level output threshold voltage with the inputs set to their respective threshold levels.
- $V_{OLmax}$ – Maximum LOW level output voltage (the most positive $V_{OL}$) under the specified input and loading conditions.
- $V_{OLmin}$ – Minimum LOW level output voltage (the most negative $V_{OL}$) under the specified input and loading conditions.
- $V_{BB}$ – Reference Bias voltage. The internally generated reference voltage which is used to set the input and output threshold level.

**Figure 5. Transfer Characteristics**

## AC ELECTRICAL CHARACTERISTICS

GND = +2.0V ±0.010V, $V_{CC}$ = +7.0V ±0.010V, $V_{EE}$ = −3.2V ±0.010V, $V_T$ = System Gnd.

| PARAMETER | $T_A$ = −30°C | | $T_A$ = +25°C | | | $T_A$ = +85°C | | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|---|---|---|
| | Min | Max | Min | Typ | Max | Min | Max | | |
| $t_{PLH}$ Propagation delay | 1.0 | 6.5 | 1.0 | 3.5 | 6.0 | 1.0 | 6.5 | ns | Figs. 6, 7, 8 |
| $t_{PHL}$ $D_n$ to $Q_n$, $\overline{Q}_n$ | 1.0 | 6.5 | 1.0 | 3.5 | 6.0 | 1.0 | 6.5 | ns | |
| $t_{TLH}$ Transition time | 1.3 | 4.1 | 1.3 | 2.5 | 3.9 | 1.3 | 4.1 | ns | Figs. 6, 7, 8 |
| $t_{THL}$ 20% to 80%, 80% to 20% | 1.3 | 4.1 | 1.3 | 2.5 | 3.9 | 1.3 | 4.1 | ns | |

## AC WAVEFORMS

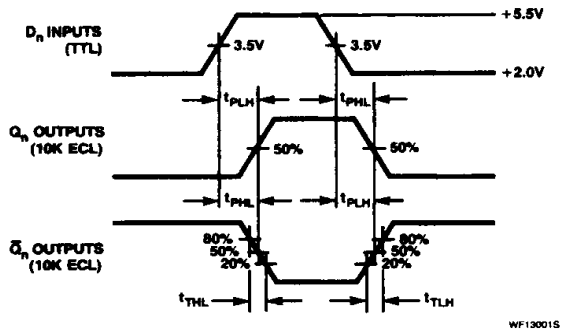
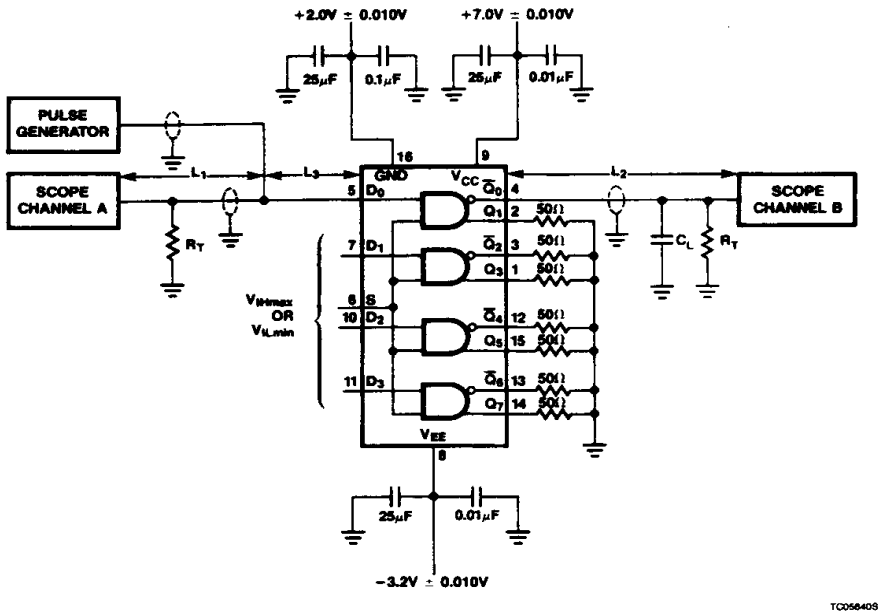



**Figure 6. Propagation Delay and Transition Times**

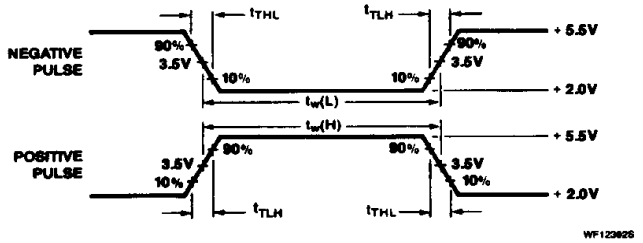
## TEST CIRCUITS AND WAVEFORMS




**NOTES:**

1. GND = +2.0V ±0.010V, $V_{CC}$ = +7.0V ±0.010V, $V_{EE}$ = −3.2V + 0.010V.
2. Decoupling 0.1μF and 25μF from GND to Sys. Gnd., 0.01μF and 25μF from $V_{CC}$ to Sys. Gnd. and from $V_{EE}$ to Sys. Gnd. (0.01 and 0.1μF capacitors should be NPO Ceramic or MLC type). Decoupling capacitors should be placed as close as physically possible to the DUT and lead length should be kept to less than ¼ inch (6mm).
3. All unused inputs should be connected to either HIGH or LOW state consistent with the LOGIC function required.
4. All unused outputs are loaded with 50Ω to Sys. Gnd.
5. $L_1$ and $L_2$ are equal length 50Ω impedance lines. $L_3$, the distance from the DUT pin to the junction of the cable from the Pulse Generator and the cable to the Scope, should not exceed ¼ inch (6mm).
6. $R_T$ = 50Ω terminator internal to Scope.
7. The unmatched wire stub between coaxial cable and pins under test must be less than ¼ inch (6mm) long for proper test.
8. $C_L$ = Fixture and stray capacitance < 3pF.
9. Any unterminated stubs connected anywhere along the transmission line between the Pulse Generator and the DUT or between the DUT and the Scope should not exceed ¼ inch (6mm) in length (refer to section on AC setup procedure).
10. All 50Ω resistors should have tolerance of ±1% or better.

**Figure 7. AC Test Circuit for 10124**




**INPUT PULSE REQUIREMENTS**
**GND = +2.0V ±0.010V, $V_{CC}$ = +7.0V ±0.010V, $V_{EE}$ = −3.2V ±0.010V, $V_T$ = Sys. Gnd.(0V)**

| Family | Amplitude | Rep Rate | Pulse Width | $t_{TLH}$ | $t_{THL}$ |
|---|---|---|---|---|---|
| 10K ECL | 800mVp-p | 1MHz | 500ns | 2.0 ±0.2ns | 2.0 ±0.2ns |

**Figure 8. Input Pulse Definition**