

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74HC4514AP

4-to-16 Line Decoder/Latch

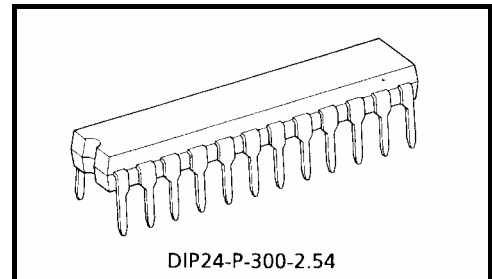
The TC74HC4514A are high speed CMOS 4-LINE TO 16-LINE DECODER WITH LATCHED INPUTs fabricated with silicon gate C²MOS technology.

It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

The selected output is enabled by a low on the inhibit input (INHIBIT). A binary code stored in the four input latches (A thru D) is decided and provides a high level at the corresponding one of sixteen outputs. When the INHIBIT is held low, all outputs are kept low however, the latch function is available.

The data applied to the data inputs are transferred to the outputs of latches when the strobe input is held high. When the strobe input is taken low, the data is retained at the output of the latches.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.

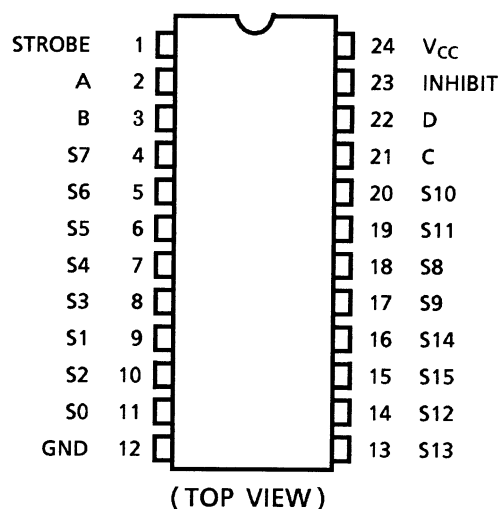


Weight: 1.50 g (typ.)

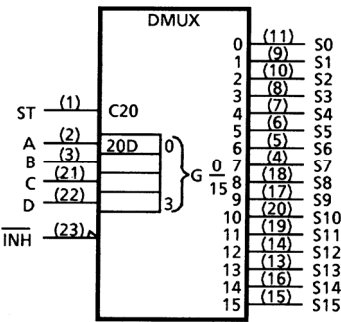
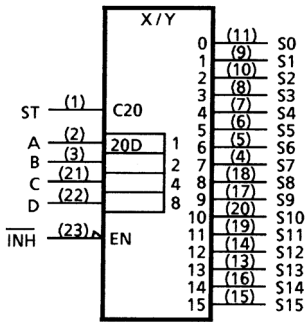
Features

- High speed: $t_{pd} = 18 \text{ ns}$ (typ.) at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 4 \mu\text{A}$ (max) at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (min)
- Output drive capability: 10 LSTTL loads
- Symmetrical output impedance: $|I_{OH}| = I_{OL} = 4 \text{ mA}$ (min)
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range: $V_{CC} (\text{opr}) = 2 \text{ to } 6 \text{ V}$
- Pin and function compatible with 4514B

Pin Assignment



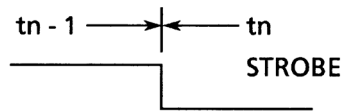
IEC Logic Symbol



Truth Table

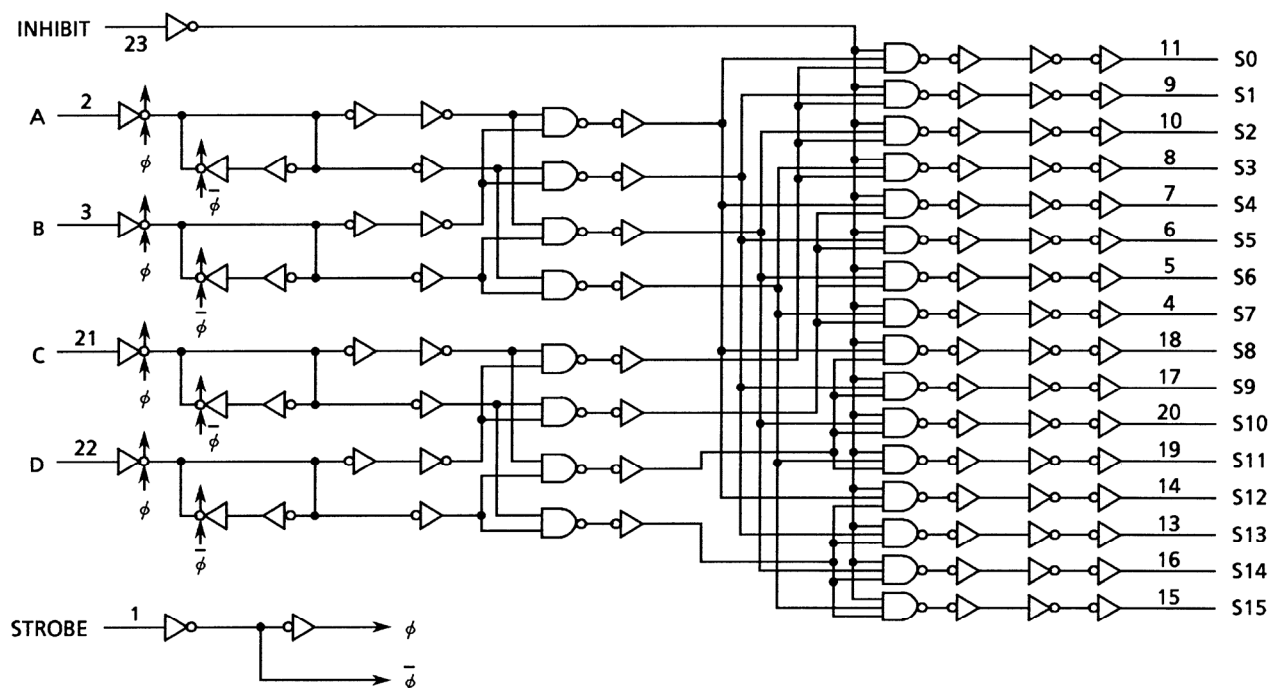
| Inputs | | | | | Selected Outputs |
|---------|---|---|---|---|------------------|
| Inhibit | A | B | C | D | "H" |
| L | L | L | L | L | S0 |
| L | H | L | L | L | S1 |
| L | L | H | L | L | S2 |
| L | H | H | L | L | S3 |
| L | L | L | H | L | S4 |
| L | H | L | H | L | S5 |
| L | L | H | H | L | S6 |
| L | H | H | H | L | S7 |
| L | L | L | L | H | S8 |
| L | H | L | L | H | S9 |
| L | L | H | L | H | S10 |
| L | H | H | L | H | S11 |
| L | L | L | H | H | S12 |
| L | H | L | H | H | S13 |
| L | L | H | H | H | S14 |
| L | H | H | H | H | S15 |
| H | X | X | X | X | All Outputs "L" |

X: Don't care
STROBE = "H"; Refer to truth table
STROBE = "L"



Data at the negative going transition of strobe shall be provided on each output while strobe is held low.

System Diagram



Absolute Maximum Ratings (Note 1)

| Characteristics | Symbol | Rating | Unit |
|-----------------------------|-----------|------------------------|------|
| Supply voltage range | V_{CC} | -0.5 to 7 | V |
| DC input voltage | V_{IN} | -0.5 to $V_{CC} + 0.5$ | V |
| DC output voltage | V_{OUT} | -0.5 to $V_{CC} + 0.5$ | V |
| Input diode current | I_{IK} | ±20 | mA |
| Output diode current | I_{OK} | ±20 | mA |
| DC output current | I_{OUT} | ±25 | mA |
| DC V_{CC} /ground current | I_{CC} | ±50 | mA |
| Power dissipation | P_D | 500 (DIP) (Note 2) | mW |
| Storage temperature | T_{stg} | -65 to 150 | °C |

Note 1: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 2: 500 mW in the range of $T_a = -40$ to 65°C . From $T_a = 65$ to 85°C a derating factor of $-10 \text{ mW}/^\circ\text{C}$ shall be applied until 300 mW.

Operating Ranges (Note)

| Characteristics | Symbol | Rating | Unit |
|--------------------------|------------|---|------|
| Supply voltage | V_{CC} | 2 to 6 | V |
| Input voltage | V_{IN} | 0 to V_{CC} | V |
| Output voltage | V_{OUT} | 0 to V_{CC} | V |
| Operating temperature | T_{opr} | -40 to 85 | °C |
| Input rise and fall time | t_r, t_f | 0 to 1000 ($V_{CC} = 2.0$ V) 0 to 500 ($V_{CC} = 4.5$ V) 0 to 400 ($V_{CC} = 6.0$ V) | ns |

Note: The operating ranges must be maintained to ensure the normal operation of the device.
Unused inputs must be tied to either V_{CC} or GND.

Electrical Characteristics

DC Characteristics

| Characteristics | Symbol | Test Condition | | V _{CC} (V) | Ta = 25°C | | | Ta = −40 to 85°C | | Unit |
|---------------------------|-----------------|--|--|------------------------|----------------------|-------------|----------------------|----------------------|----------------------|------|
| | | | | | Min | Typ. | Max | Min | Max | |
| High-level input voltage | V _{IH} | — | | 2.0 4.5 6.0 | 1.50 3.15 4.20 | — — — | — — — | 1.50 3.15 4.20 | — — — | V |
| Low-level input voltage | V _{IL} | — | | 2.0 4.5 6.0 | — — — | — — — | 0.50 1.35 1.80 | — — — | 0.50 1.35 1.80 | V |
| High-level output voltage | V _{OH} | V _{IN} = V _{IH} or V _{IL} | I _{OH} = −20 μA | 2.0 | 1.9 | 2.0 | — | 1.9 | — | V |
| | | | | 4.5 | 4.4 | 4.5 | — | 4.4 | — | |
| | | | I _{OH} = −4 mA I _{OH} = −5.2 mA | 4.5 | 4.18 | 4.31 | — | 4.13 | — | |
| | | | | 6.0 | 5.9 | 6.0 | — | 5.9 | — | |
| Low-level output voltage | V _{OL} | V _{IN} = V _{IH} or V _{IL} | I _{OL} = 20 μA | 2.0 | — | 0.0 | 0.1 | — | 0.1 | V |
| | | | | 4.5 | — | 0.0 | 0.1 | — | 0.1 | |
| | | | I _{OL} = 4 mA I _{OL} = 5.2 mA | 6.0 | — | 0.0 | 0.1 | — | 0.1 | |
| | | | | 4.5 | — | 0.17 | 0.26 | — | 0.33 | |
| | | | 6.0 | — | 0.18 | 0.26 | — | 0.33 | | |
| Input leakage current | I _{IN} | V _{IN} = V _{CC} or GND | | 6.0 | — | — | ±0.1 | — | ±1.0 | μA |
| Quiescent supply current | I _{CC} | V _{IN} = V _{CC} or GND | | 6.0 | — | — | 4.0 | — | 40.0 | μA |

Timing Requirements (input: $t_r = t_f = 6\text{ ns}$)

| Characteristics | Symbol | Test Condition | Ta = 25°C | | Ta = -40 to 85°C | Unit |
|---------------------------------|-----------|----------------|---------------------|------|------------------------|------|
| | | | V _{CC} (V) | Typ. | Limit | |
| Minimum pulse width (STROBE) | t_W (H) | — | 2.0 | — | 75 | ns |
| | | | 4.5 | — | 15 | |
| | | | 6.0 | — | 13 | |
| Minimum set-up time (DATA) | t_s | — | 2.0 | — | 50 | ns |
| | | | 4.5 | — | 10 | |
| | | | 6.0 | — | 9 | |
| Minimum hold time (DATA) | t_h | — | 2.0 | — | 5 | ns |
| | | | 4.5 | — | 5 | |
| | | | 6.0 | — | 5 | |

AC Characteristics ($C_L = 15\text{ pF}$, $V_{CC} = 5\text{ V}$, $T_a = 25^\circ\text{C}$, input: $t_r = t_f = 6\text{ ns}$)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|--|-----------|----------------|-----|------|-----|------|
| Output transition time | t_{TLH} | — | — | 4 | 8 | ns |
| | t_{THL} | | | | | |
| Propagation delay time (DATA-Sn) | t_{PLH} | — | — | 18 | 30 | ns |
| | t_{PHL} | | | | | |
| Propagation delay time (STROBE-Sn) | t_{PLH} | — | — | 20 | 30 | ns |
| | t_{PHL} | | | | | |
| Propagation delay time (INHIBIT-Sn) | t_{PLH} | — | — | 16 | 30 | ns |
| | t_{PHL} | | | | | |

AC Characteristics ($C_L = 50 \text{ pF}$, input: $t_r = t_f = 6 \text{ ns}$)

| Characteristics | Symbol | Test Condition | V_{CC} (V) | $T_a = 25^\circ\text{C}$ | | | $T_a = -40 \text{ to } 85^\circ\text{C}$ | | Unit |
|--|--------------------|----------------|-----------------|--------------------------|------|-----|--|-----|------|
| | | | | Min | Typ. | Max | Min | Max | |
| Output transition time | t_{TLH} | — | 2.0 | — | 30 | 75 | — | 95 | ns |
| | t_{THL} | | 4.5 | — | 8 | 15 | — | 19 | |
| | | | 6.0 | — | 7 | 13 | — | 16 | |
| Propagation delay time (DATA-Sn) | t_{pLH} | — | 2.0 | — | 65 | 175 | — | 220 | ns |
| | t_{pHL} | | 4.5 | — | 22 | 35 | — | 44 | |
| | | | 6.0 | — | 19 | 30 | — | 37 | |
| Propagation delay time (STROBE-Sn) | t_{pLH} | — | 2.0 | — | 75 | 175 | — | 220 | ns |
| | t_{pHL} | | 4.5 | — | 24 | 35 | — | 44 | |
| | | | 6.0 | — | 20 | 30 | — | 37 | |
| Propagation delay time (INHIBIT-Sn) | t_{pLH} | — | 2.0 | — | 60 | 175 | — | 220 | ns |
| | t_{pHL} | | 4.5 | — | 20 | 35 | — | 44 | |
| | | | 6.0 | — | 17 | 30 | — | 37 | |
| Input capacitance | C_{IN} | — | | — | 5 | 10 | — | 10 | pF |
| Power dissipation capacitance | C_{PD} (Note) | — | | — | 61 | — | — | — | pF |

Note: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

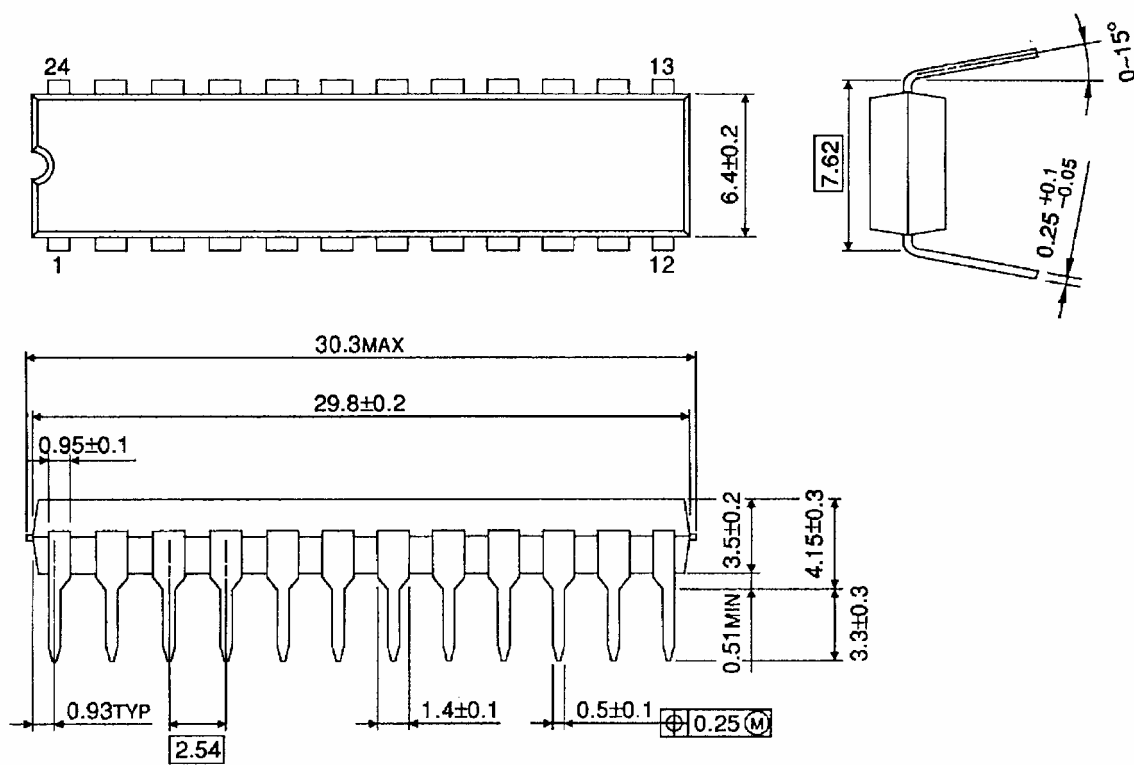
Average operating current can be obtained by the equation:

$$I_{CC}(\text{opr}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

Package Dimensions

DIP24-P-300-2.54

Unit : mm



Weight: 1.50 g (typ.)

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20070701-EN GENERAL

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