

**TOSHIBA**

**TC74HC251AP/AF**

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

# TC74HC251AP, TC74HC251AF

## 8 - CHANNEL MULTIPLEXER (3 - STATE)

The TC74HC251A is a high speed CMOS 8 - CHANNEL MULTIPLEXER fabricated with silicon gate C<sup>2</sup>MOS technology.

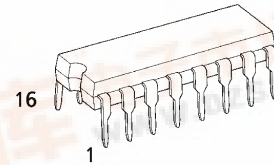
It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

One of eight data input signals (D0 - D7) is selected by decoding of the address input (A, B, C). The selected data appears on two outputs; non-inverting (Y) and inverting (W). When the strobe input is held high, both outputs are in the high-impedance state.

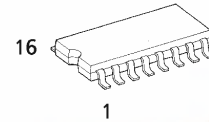
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

### FEATURES:

- High Speed..... $t_{pd} = 15\text{ns}(\text{typ.})$  at  $V_{CC} = 5\text{V}$
- Low Power Dissipation..... $I_{CC} = 4\mu\text{A}(\text{Max.})$  at  $T_a = 25^\circ\text{C}$
- High Noise Immunity..... $V_{NIH} = V_{NIL} = 28\% V_{CC}(\text{Min.})$
- Output Drive Capability.....10 LSTTL Loads
- Symmetrical Output Impedance... $|I_{OH}| = I_{OL} = 4\text{mA}(\text{Min.})$
- Balanced Propagation Delays..... $t_{PLH} \approx t_{PHL}$
- Wide Operating Voltage Range... $V_{CC}(\text{opr.}) = 2\text{V} \sim 6\text{V}$
- Pin and Function Compatible with 74LS251

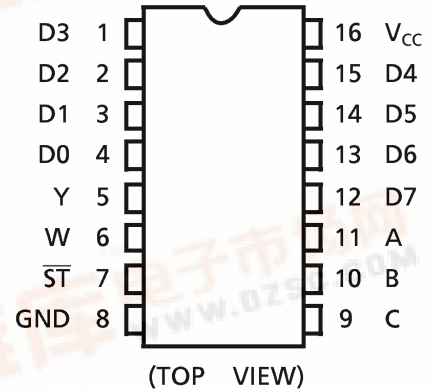


P (DIP16-P-300-2.54A)  
Weight : 1.00g (Typ.)



F (SOP16-P-300-1.27)  
Weight : 0.18g (Typ.)

### PIN ASSIGNMENT



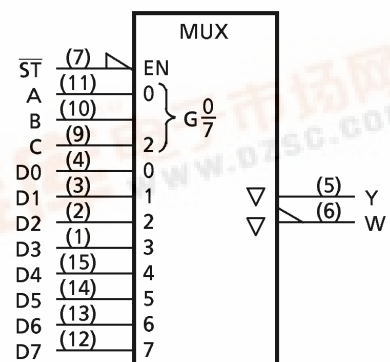
### TRUTH TABLE

| INPUTS |   |   |                 | OUTPUTS |                 |
|--------|---|---|-----------------|---------|-----------------|
| SELECT |   |   | STROBE          | Y       | W               |
| C      | B | A | $\overline{ST}$ |         |                 |
| X      | X | X | H               | Z       | Z               |
| L      | L | L | L               | D0      | $\overline{D0}$ |
| L      | L | H | L               | D1      | $\overline{D1}$ |
| L      | H | L | L               | D2      | $\overline{D2}$ |
| L      | H | H | L               | D3      | $\overline{D3}$ |
| H      | L | L | L               | D4      | $\overline{D4}$ |
| H      | L | H | L               | D5      | $\overline{D5}$ |
| H      | H | L | L               | D6      | $\overline{D6}$ |
| H      | H | H | L               | D7      | $\overline{D7}$ |

X : Don't Care

H : High Impedance

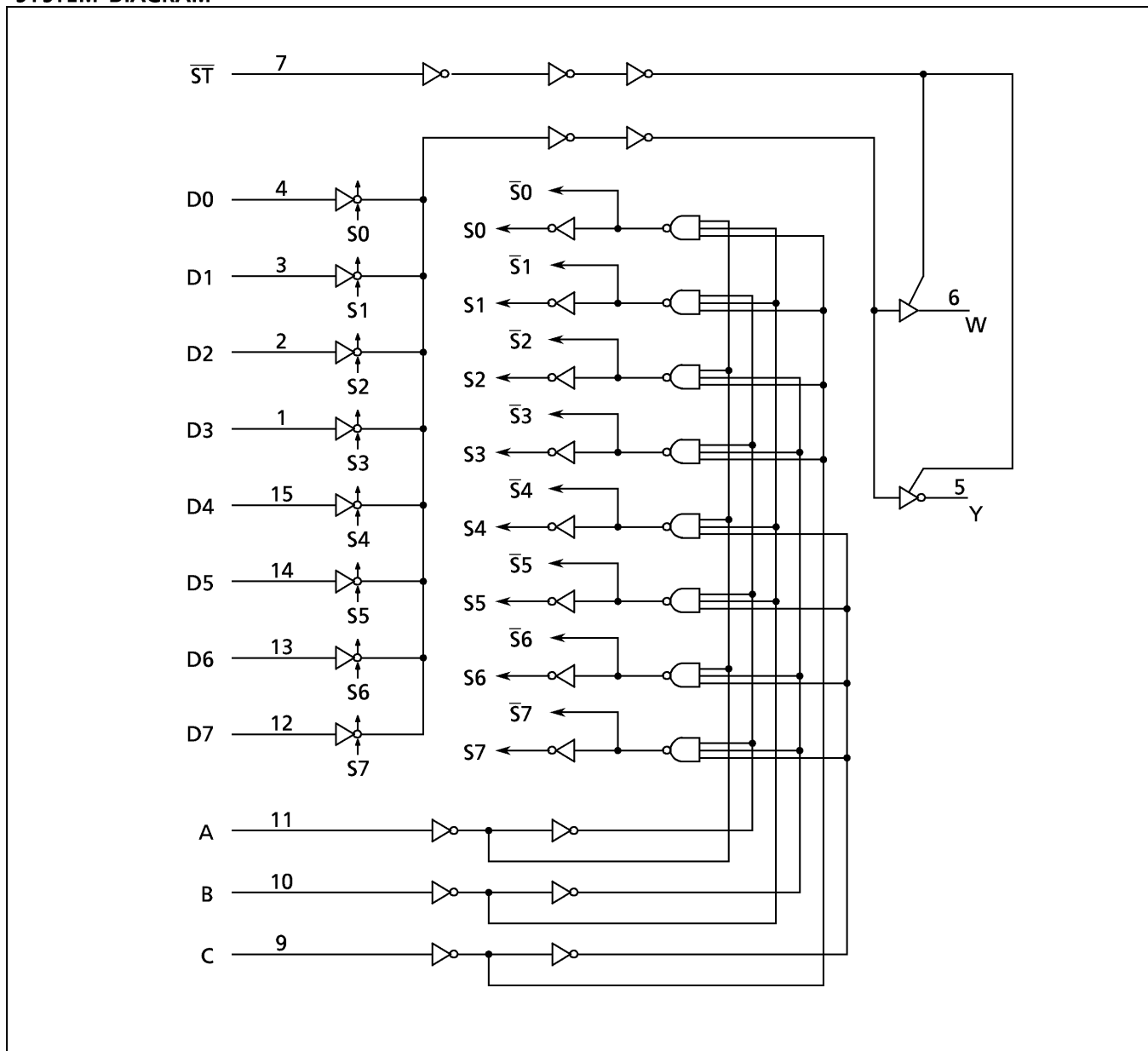
### IEC LOGIC SYMBOL



980508EBA2

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## SYSTEM DIAGRAM



980508EBA2'

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- The information contained herein is subject to change without notice.

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER                    | SYMBOL    | VALUE                    | UNIT               |
|------------------------------|-----------|--------------------------|--------------------|
| Supply Voltage Range         | $V_{CC}$  | $-0.5 \sim 7$            | V                  |
| DC Input Voltage             | $V_{IN}$  | $-0.5 \sim V_{CC} + 0.5$ | V                  |
| DC Output Voltage            | $V_{OUT}$ | $-0.5 \sim V_{CC} + 0.5$ | V                  |
| Input Diode Current          | $I_{IK}$  | $\pm 20$                 | mA                 |
| Output Diode Current         | $I_{OK}$  | $\pm 20$                 | mA                 |
| DC Output Current            | $I_{OUT}$ | $\pm 25$                 | mA                 |
| DC $V_{CC}$ / Ground Current | $I_{CC}$  | $\pm 50$                 | mA                 |
| Power Dissipation            | $P_D$     | 500 (DIP)* / 180 (SOP)   | mW                 |
| Storage Temperature          | $T_{stg}$ | $-65 \sim 150$           | $^{\circ}\text{C}$ |

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

## RECOMMENDED OPERATING CONDITIONS

| PARAMETER                | SYMBOL     | VALUE                                                                                                                          | UNIT               |
|--------------------------|------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Supply Voltage           | $V_{CC}$   | $2 \sim 6$                                                                                                                     | V                  |
| Input Voltage            | $V_{IN}$   | $0 \sim V_{CC}$                                                                                                                | V                  |
| Output Voltage           | $V_{OUT}$  | $0 \sim V_{CC}$                                                                                                                | V                  |
| Operating Temperature    | $T_{opr}$  | $-40 \sim 85$                                                                                                                  | $^{\circ}\text{C}$ |
| Input Rise and Fall Time | $t_r, t_f$ | $0 \sim 1000$ ( $V_{CC} = 2.0\text{V}$ )<br>$0 \sim 500$ ( $V_{CC} = 4.5\text{V}$ )<br>$0 \sim 400$ ( $V_{CC} = 6.0\text{V}$ ) | ns                 |

## DC ELECTRICAL CHARACTERISTICS

| PARAMETER                   | SYMBOL   | TEST CONDITION                                             | $V_{CC}$<br>(V)   | $T_a = 25^{\circ}\text{C}$ |                   |                      | $T_a = -40 \sim 85^{\circ}\text{C}$ |                      | UNIT          |
|-----------------------------|----------|------------------------------------------------------------|-------------------|----------------------------|-------------------|----------------------|-------------------------------------|----------------------|---------------|
|                             |          |                                                            |                   | MIN.                       | TYP.              | MAX.                 | MIN.                                | MAX.                 |               |
| High - Level Input Voltage  | $V_{IH}$ |                                                            | 2.0<br>4.5<br>6.0 | 1.50<br>3.15<br>4.20       | —<br>—<br>—       | —<br>—<br>—          | 1.50<br>3.15<br>4.20                | —<br>—<br>—          | V             |
| Low - Level Input Voltage   | $V_{IL}$ |                                                            | 2.0<br>4.5<br>6.0 | —<br>—<br>—                | —<br>—<br>—       | 0.50<br>1.35<br>1.80 | —<br>—<br>—                         | 0.50<br>1.35<br>1.80 | V             |
| High - Level Output Voltage | $V_{OH}$ | $V_{IN} = V_{IH}$ or $V_{IL}$<br>$I_{OH} = -20\mu\text{A}$ | 2.0<br>4.5<br>6.0 | 1.9<br>4.4<br>5.9          | 2.0<br>4.5<br>6.0 | —<br>—<br>—          | 1.9<br>4.4<br>5.9                   | —<br>—<br>—          | V             |
|                             |          | $I_{OH} = -4\text{ mA}$<br>$I_{OH} = -5.2\text{ mA}$       | 4.5<br>6.0        | 4.18<br>5.68               | 4.31<br>5.80      | —<br>—               | 4.13<br>5.63                        | —<br>—               |               |
| Low - Level Output Voltage  | $V_{OL}$ | $V_{IN} = V_{IH}$ or $V_{IL}$<br>$I_{OL} = 20\mu\text{A}$  | 2.0<br>4.5<br>6.0 | —<br>—<br>—                | 0.0<br>0.0<br>0.0 | 0.1<br>0.1<br>0.1    | —<br>—<br>—                         | 0.1<br>0.1<br>0.1    | V             |
|                             |          | $I_{OL} = 4\text{ mA}$<br>$I_{OL} = 5.2\text{ mA}$         | 4.5<br>6.0        | —<br>—                     | 0.17<br>0.18      | 0.26<br>0.26         | —<br>—                              | 0.33<br>0.33         |               |
| 3 - State Off Leak Current  | $I_{OZ}$ | $V_{IN} = V_{IH}$ or $V_{IL}$<br>$V_{OUT} = V_{CC}$ or GND | 6.0               | —                          | —                 | $\pm 0.5$            | —                                   | $\pm 5.0$            | $\mu\text{A}$ |
| Input Leakage Current       | $I_{IN}$ | $V_{IN} = V_{CC}$ or GND                                   | 6.0               | —                          | —                 | $\pm 0.1$            | —                                   | $\pm 1.0$            |               |
| Quiescent Supply Current    | $I_{CC}$ | $V_{IN} = V_{CC}$ or GND                                   | 6.0               | —                          | —                 | 4.0                  | —                                   | 40.0                 |               |

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

| PARAMETER                             | SYMBOL                 | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---------------------------------------|------------------------|----------------|------|------|------|------|
| Output Transition Time                | $t_{TLH}$<br>$t_{THL}$ |                | —    | 4    | 8    | ns   |
| Propagation Delay Time<br>(D—Y)       | $t_{pLH}$<br>$t_{pHL}$ |                | —    | 14   | 24   |      |
| Propagation Delay Time<br>(D—W)       | $t_{pLH}$<br>$t_{pHL}$ |                | —    | 15   | 24   |      |
| Propagation Delay Time<br>(A, B, C—Y) | $t_{pLH}$<br>$t_{pHL}$ |                | —    | 19   | 31   |      |
| Propagation Delay Time<br>(A, B, C—W) | $t_{pLH}$<br>$t_{pHL}$ |                | —    | 19   | 31   |      |
| 3-State Output Enable Time            | $t_{pZL}$<br>$t_{pZH}$ |                | —    | 10   | 18   |      |

AC ELECTRICAL CHARACTERISTICS (  $C_L = 50\text{pF}$ , Input  $t_r = t_f = 6\text{ns}$  )

| PARAMETER                             | SYMBOL                               | TEST CONDITION | Ta = 25°C           |      |      |      | Ta = -40~85°C |      | UNIT |
|---------------------------------------|--------------------------------------|----------------|---------------------|------|------|------|---------------|------|------|
|                                       |                                      |                | V <sub>CC</sub> (V) | MIN. | TYP. | MAX. | MIN.          | MAX. |      |
| Output Transition Time                | t <sub>TLH</sub><br>t <sub>THL</sub> |                | 2.0                 | —    | 30   | 75   | —             | 95   | ns   |
|                                       |                                      |                | 4.5                 | —    | 8    | 15   | —             | 19   |      |
|                                       |                                      |                | 6.0                 | —    | 7    | 13   | —             | 16   |      |
| Propagation Delay Time<br>(D—Y)       | t <sub>pLH</sub><br>t <sub>pHL</sub> |                | 2.0                 | —    | 65   | 140  | —             | 175  |      |
|                                       |                                      |                | 4.5                 | —    | 17   | 28   | —             | 35   |      |
|                                       |                                      |                | 6.0                 | —    | 14   | 24   | —             | 30   |      |
| Propagation Delay Time<br>(D—W)       | t <sub>pLH</sub><br>t <sub>pHL</sub> |                | 2.0                 | —    | 70   | 140  | —             | 175  |      |
|                                       |                                      |                | 4.5                 | —    | 18   | 28   | —             | 35   |      |
|                                       |                                      |                | 6.0                 | —    | 15   | 24   | —             | 30   |      |
| Propagation Delay Time<br>(A, B, C—Y) | t <sub>pLH</sub><br>t <sub>pHL</sub> |                | 2.0                 | —    | 80   | 180  | —             | 225  |      |
|                                       |                                      |                | 4.5                 | —    | 23   | 36   | —             | 45   |      |
|                                       |                                      |                | 6.0                 | —    | 19   | 31   | —             | 38   |      |
| Propagation Delay Time<br>(A, B, C—W) | t <sub>pLH</sub><br>t <sub>pHL</sub> |                | 2.0                 | —    | 80   | 180  | —             | 225  |      |
|                                       |                                      |                | 4.5                 | —    | 23   | 36   | —             | 45   |      |
|                                       |                                      |                | 6.0                 | —    | 19   | 31   | —             | 38   |      |
| 3-State Output Enable Time            | t <sub>pZL</sub><br>t <sub>pZH</sub> |                | 2.0                 | —    | 40   | 105  | —             | 130  |      |
|                                       |                                      |                | 4.5                 | —    | 13   | 21   | —             | 26   |      |
|                                       |                                      |                | 6.0                 | —    | 10   | 19   | —             | 22   |      |
| 3-State Output Disable Time           | t <sub>pLZ</sub><br>t <sub>pHZ</sub> |                | 2.0                 | —    | 25   | 105  | —             | 130  |      |
|                                       |                                      |                | 4.5                 | —    | 13   | 21   | —             | 26   |      |
|                                       |                                      |                | 6.0                 | —    | 11   | 19   | —             | 22   |      |
| Input Capacitance                     | C <sub>IN</sub>                      |                |                     | —    | 5    | 10   | —             | 10   | pF   |
| Power Dissipation Capacitance         | C <sub>PD</sub> (1)                  |                |                     | —    | 69   | —    | —             | —    |      |

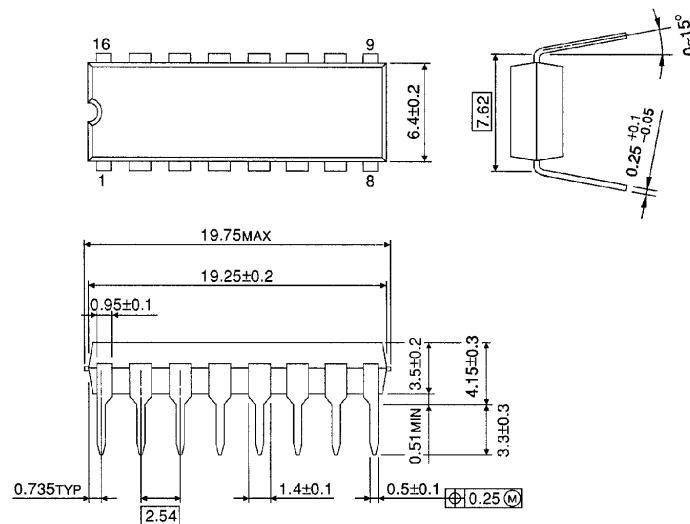
Note (1)  $C_{PD}$  is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

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

**DIP 16PIN OUTLINE DRAWING (DIP16-P-300-2.54A)**

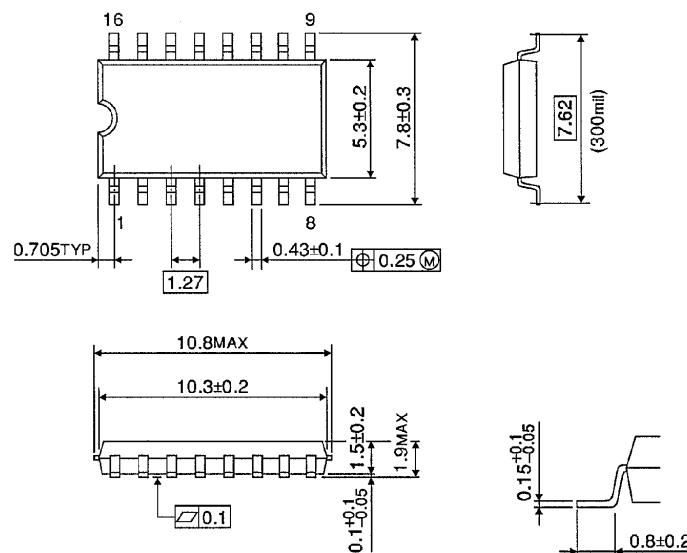
Unit in mm



Weight : 1.00g (Typ.)

**SOP 16PIN (200mil BODY) OUTLINE DRAWING (SOP16-P-300-1.27)**

Unit in mm



Weight : 0.18g (Typ.)