

TC7W00F, TC7W00FU

DUAL 2-INPUT NAND GATE

The TC7W00 is a high speed C²MOS 2-INPUT NAND GATE fabricated with silicon gate C²MOS technology. It achieves the high speed operation similar to equivalent LSTTL while maintaining the C²MOS low power dissipation.

The internal circuit is composed of 3 stages including buffer output, which enables high noise immunity and stable output.

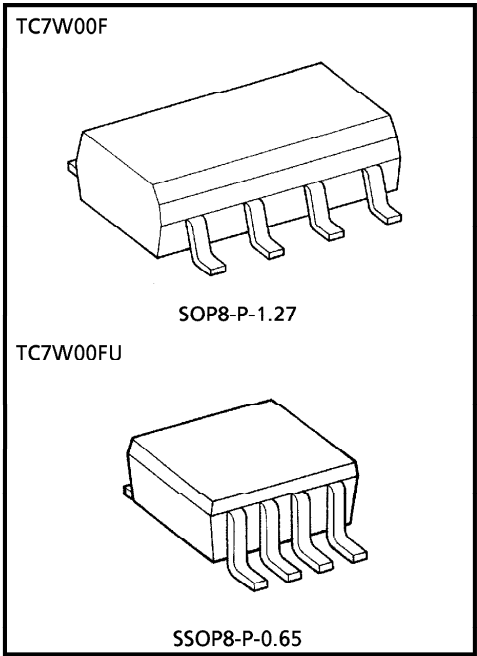
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

FEATURES

- High Speed $t_{pd} = 6\text{ns}$ (Typ.) at $V_{CC} = 5\text{V}$
- Low Power Dissipation $I_{CC} = 1\mu\text{A}$ (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 ... $V_{CC}(\text{opr}) = 2\sim 6\text{V}$

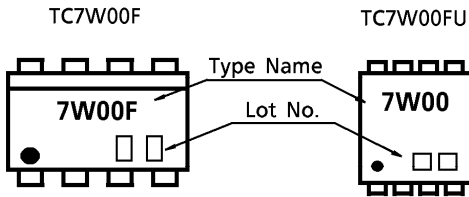
MAXIMUM RATINGS (Ta = 25°C)

| CHARACTERISTIC | SYMBOL | RATING | 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} | ± 20 | mA |
| Output Diode Current | I_{OK} | ± 20 | mA |
| DC Output Current | I_{OUT} | ± 25 | mA |
| DC V_{CC} / Ground Current | I_{CC} | ± 25 | mA |
| Power Dissipation | P_D | 300 | mW |
| Storage Temperature | T_{stg} | $-65\sim 150$ | °C |
| Lead Temperature (10s) | T_L | 260 | °C |



Weight SOP8-P-1.27 : 0.05g (Typ.)
SSOP8-P-0.65 : 0.02g (Typ.)

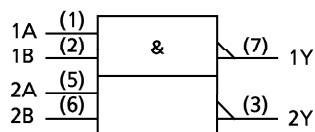
MARKING



961001EBA2

● TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.

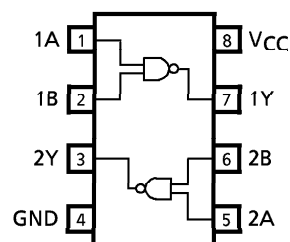
LOGIC DIAGRAM



TRUTH TABLE

| A | B | Y |
|---|---|---|
| L | L | H |
| L | H | H |
| H | L | H |
| H | H | L |

PIN ASSIGNMENT (TOP VIEW)



RECOMMENDED OPERATING CONDITIONS

| CHARACTERISTIC | SYMBOL | RATING | UNIT |
|--------------------------|------------|--|------|
| Supply Voltage | V_{CC} | 2~6 | V |
| Input Voltage | V_{IN} | 0~ V_{CC} | V |
| Output Voltage | V_{OUT} | 0~ V_{CC} | V |
| Operating Temperature | T_{opr} | -40~85 | °C |
| Input Rise and Fall Time | t_r, t_f | 0~1000 ($V_{CC} = 2.0V$) 0~500 ($V_{CC} = 4.5V$) 0~400 ($V_{CC} = 6.0V$) | ns |

DC ELECTRICAL CHARACTERISTICS

| CHARACTERISTIC | SYMBOL | TEST CONDITION | $T_a = 25^\circ\text{C}$ | | | | $T_a = -40 \sim 85^\circ\text{C}$ | | UNIT |
|---------------------------|----------|----------------------------------|---------------------------|--------------------|-------------------|---------------------|-----------------------------------|--------------------|---------------|
| | | | V_{CC} | MIN. | TYP. | MAX. | MIN. | MAX. | |
| High-Level Input Voltage | V_{IH} | — | 2.0 4.5 6.0 | 1.5 3.15 4.2 | — — — | — — — | 1.5 3.15 4.2 | — — — | V |
| Low-Level Input Voltage | V_{IL} | — | 2.0 4.5 6.0 | — — — | — — — | 0.5 1.35 1.8 | — — — | 0.5 1.35 1.8 | V |
| High-Level Output Voltage | V_{OH} | $V_{IN} = V_{IH}$ or V_{IL} | $I_{OH} = -20\mu\text{A}$ | 2.0 4.5 6.0 | 1.9 4.4 5.9 | 2.0 4.5 6.0 | — — — | 1.9 4.4 5.9 | V |
| | | | | 4.5 6.0 | 4.18 5.68 | 4.31 5.80 | — — | 4.13 5.63 | |
| | | | $I_{OL} = 20\mu\text{A}$ | 2.0 4.5 6.0 | — — — | 0.0 0.0 0.0 | 0.1 0.1 0.1 | — — — | V |
| | | | | 4.5 6.0 | — — | 0.17 0.18 | 0.26 0.26 | — — | |
| Low-Level Output Voltage | V_{OL} | $V_{IN} = V_{IH}$ | $I_{OL} = 4\text{mA}$ | 2.0 4.5 6.0 | — — — | 0.0 0.17 0.18 | 0.1 0.26 0.26 | — — — | V |
| | | | | 4.5 6.0 | — — | 0.17 0.18 | 0.26 0.26 | — — | |
| | | | $I_{OL} = 5.2\text{mA}$ | 2.0 4.5 6.0 | — — — | 0.0 0.17 0.18 | 0.1 0.26 0.26 | — — — | |
| | | | | 4.5 6.0 | — — | 0.17 0.18 | 0.26 0.26 | — — | |
| 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 | — | — | 1.0 | — | 10.0 | |

961001EBA2'

- The products described in this document are subject to foreign exchange and foreign trade control laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.

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

| CHARACTERISTIC | SYMBOL | TEST CONDITION | $T_a = 25^\circ\text{C}$ | | | UNIT |
|------------------------|------------------------|----------------|--------------------------|------|------|------|
| | | | MIN. | TYP. | MAX. | |
| Output Transition Time | t_{TLH} t_{THL} | — | — | 4 | 8 | ns |
| Propagation Delay Time | t_{pLH} t_{pHL} | — | — | 6 | 12 | ns |

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

| CHARACTERISTIC | SYMBOL | TEST CONDITION | V _{CC} | Ta = 25°C | | | Ta = - 40~85°C | | UNIT |
|-------------------------------|--------------------------------------|----------------|-----------------|-----------|------|------|----------------|------|------|
| | | | | MIN. | TYP. | MAX. | MIN. | MAX. | |
| Output Transition Time | t _{TLH} t _{THL} | — | 2.0 | — | 25 | 75 | — | 95 | ns |
| | | | 4.5 | — | 7 | 15 | — | 19 | |
| | | | 6.0 | — | 6 | 13 | — | 16 | |
| Propagation Delay Time | t _{pLH} t _{pHL} | — | 2.0 | — | 27 | 75 | — | 95 | ns |
| | | | 4.5 | — | 9 | 15 | — | 19 | |
| | | | 6.0 | — | 8 | 13 | — | 16 | |
| Input Capacitance | C _{IN} | — | | — | 5 | 10 | — | 10 | pF |
| Power Dissipation Capacitance | C _{PD} | (Note 1) | | — | 20 | — | — | — | |

Note 1 : C_{PD} is defined as the value of internal equivalent capacitance of IC which is calculated from the operating current consumption without load (refer to Test Circuit).

Average operating current can be obtained by the equation hereunder.

$$I_{CC(\text{opr})} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 2 \text{ (per gate)}$$