

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

# TC7SZ02F, TC7SZ02FU

## 2 INPUT NOR GATE

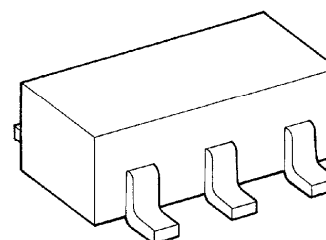
### FEATURES

- High Output Drive :  $\pm 24\text{mA}$  (Typ.) ( $V_{CC} = 3\text{V}$ )
- Super High Speed Operation :  $t_{PD} = 2.4\text{ns}$  (Typ.)  
( $V_{CC} = 5\text{V}$ ,  $50\text{pF}$ )
- Operation Voltage Range :  $V_{CC}(\text{opr}) = 1.8 \sim 5.5\text{V}$
- 5V Tolerant Function
- Matches the Performance of TC74LCX Series when Operated at  $3.3\text{V } V_{CC}$

### MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

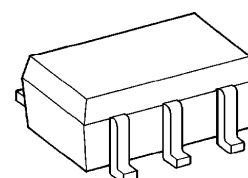
| CHARACTERISTIC               | SYMBOL    | RATING         | UNIT             |
|------------------------------|-----------|----------------|------------------|
| Supply Voltage Range         | $V_{CC}$  | $-0.5 \sim 6$  | V                |
| DC Input Voltage             | $V_{IN}$  | $-0.5 \sim 6$  | V                |
| DC Output Voltage            | $V_{OUT}$ | $-0.5 \sim 6$  | V                |
| Input Diode Current          | $I_{IK}$  | $\pm 20$       | mA               |
| Output Diode Current         | $I_{OK}$  | $\pm 20$       | mA               |
| DC Output Current            | $I_{OUT}$ | $\pm 50$       | mA               |
| DC $V_{CC}$ / Ground Current | $I_{CC}$  | $\pm 50$       | mA               |
| Power Dissipation            | $P_D$     | 200            | mW               |
| Storage Temperature          | $T_{stg}$ | $-65 \sim 150$ | $^\circ\text{C}$ |
| Lead Temperature (10s)       | $T_L$     | 260            | $^\circ\text{C}$ |

TC7SZ02F



SSOP5-P-0.95

TC7SZ02FU



SSOP5-P-0.65A

### Weight

SSOP5-P-0.95 : 0.016g (Typ.)  
SSOP5-P-0.65A : 0.006g (Typ.)

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## DC ELECTRICAL CHARACTERISTICS

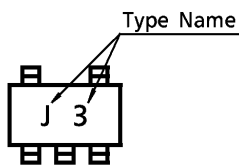
| CHARACTERISTIC            | SYMBOL           | TEST CONDITION                                       | V <sub>CC</sub><br>(V)   | Ta = 25°C              |      |                        | Ta = -40~85°C          |                        | UNIT |
|---------------------------|------------------|--|--------------------------|------------------------|------|------------------------|------------------------|------------------------|------|
|                           |                  |  |                          | MIN.                   | TYP. | MAX.                   | MIN.                   | MAX.                   |      |
| High-Level Input Voltage  | V <sub>IH</sub>  |  | 1.8                      | 0.88 × V <sub>CC</sub> | —    | —                      | 0.88 × V <sub>CC</sub> | —                      | V    |
|                           |                  |  | 2.3~5.5                  | 0.75 × V <sub>CC</sub> | —    | —                      | 0.75 × V <sub>CC</sub> | —                      | V    |
| Low-Level Input Voltage   | V <sub>IL</sub>  |  | 1.8                      | —                      | —    | 0.12 × V <sub>CC</sub> | —                      | 0.12 × V <sub>CC</sub> | V    |
|                           |                  |  | 2.3~5.5                  | —                      | —    | 0.25 × V <sub>CC</sub> | —                      | 0.25 × V <sub>CC</sub> | V    |
| High-Level Output Voltage | V <sub>OH</sub>  | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> | I <sub>OH</sub> = -100μA | 1.8                    | 1.7  | 1.8                    | —                      | 1.7                    | V    |
|                           |                  |  |                          | 2.3                    | 2.2  | 2.3                    | —                      | 2.2                    |      |
|                           |                  |  |                          | 3.0                    | 2.9  | 3.0                    | —                      | 2.9                    |      |
|                           |                  |  |                          | 4.5                    | 4.4  | 4.5                    | —                      | 4.4                    |      |
|                           |                  |  | I <sub>OH</sub> = -8mA   | 2.3                    | 1.9  | 2.15                   | —                      | 1.9                    | V    |
|                           |                  |  | I <sub>OH</sub> = -16mA  | 3.0                    | 2.4  | 2.8                    | —                      | 2.4                    |      |
|                           |                  |  | I <sub>OH</sub> = -24mA  | 3.0                    | 2.3  | 2.68                   | —                      | 2.3                    |      |
|                           |                  |  | I <sub>OH</sub> = -32mA  | 4.5                    | 3.8  | 4.2                    | —                      | 3.8                    |      |
| Low-Level Output Voltage  | V <sub>OL</sub>  | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> | I <sub>OH</sub> = 100μA  | 1.8                    | —    | 0                      | 0.1                    | —                      | V    |
|                           |                  |  |                          | 2.3                    | —    | 0                      | 0.1                    | —                      |      |
|                           |                  |  |                          | 3.0                    | —    | 0                      | 0.1                    | —                      |      |
|                           |                  |  |                          | 4.5                    | —    | 0                      | 0.1                    | —                      |      |
|                           |                  |  | I <sub>OH</sub> = 8mA    | 2.3                    | —    | 0.1                    | 0.3                    | —                      | V    |
|                           |                  |  | I <sub>OH</sub> = 16mA   | 3.0                    | —    | 0.15                   | 0.4                    | —                      |      |
|                           |                  |  | I <sub>OH</sub> = 24mA   | 3.0                    | —    | 0.22                   | 0.55                   | —                      |      |
|                           |                  |  | I <sub>OH</sub> = 32mA   | 4.5                    | —    | 0.22                   | 0.55                   | —                      |      |
| Input Leakage Current     | I <sub>IN</sub>  | V <sub>IN</sub> = 5.5V or GND                        | 0~5.5                    | —                      | —    | ±1                     | —                      | ±10                    | μA   |
| Power Off Leakage Current | I <sub>OFF</sub> | V <sub>IN</sub> or V <sub>OUT</sub> = 5.5V           | 0.0                      | —                      | —    | 1                      | —                      | 10                     | μA   |
| Quiescent Supply Current  | I <sub>CC</sub>  | V <sub>IN</sub> = V <sub>CC</sub> or GND             | 5.5                      | —                      | —    | 2                      | —                      | 20                     | μA   |

AC ELECTRICAL CHARACTERISTICS (Input  $t_r = t_f = 3\text{ns}$ )

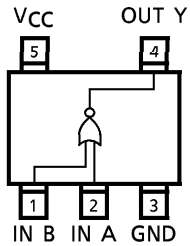
| CHARACTERISTIC                      | SYMBOL                               | TEST CONDITION                               | V <sub>CC</sub><br>(V) | Ta = 25°C |      |      | Ta = -40~85°C |      | UNIT |
|-------------------------------------|--------------------------------------|--|------------------------|-----------|------|------|---------------|------|------|
|                                     |                                      |  |                        | MIN.      | TYP. | MAX. | MIN.          | MAX. |      |
| Propagation<br>Delay Time           | t <sub>PLH</sub><br>t <sub>PHL</sub> | C <sub>L</sub> = 15pF, R <sub>L</sub> = 1MΩ  | 1.8                    | 2.0       | 4.4  | 9.5  | 2.0           | 10.0 | ns   |
|                                     |                                      |  | 2.5 ± 0.2              | 0.8       | 2.9  | 6.5  | 0.8           | 7.0  |      |
|                                     |                                      |  | 3.3 ± 0.3              | 0.5       | 2.3  | 4.5  | 0.5           | 4.7  |      |
|                                     |                                      |  | 5.0 ± 0.5              | 0.5       | 1.9  | 3.9  | 0.5           | 4.1  |      |
|                                     |                                      | C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω | 3.3 ± 0.3              | 1.5       | 2.9  | 5.0  | 1.5           | 5.2  |      |
|                                     |                                      |  | 5.0 ± 0.5              | 0.8       | 2.4  | 4.3  | 0.8           | 4.5  |      |
| Input<br>Capacitance                | C <sub>IN</sub>                      |  | 0~5.5                  | —         | 4    | —    | —             | —    | pF   |
| Power<br>Dissipation<br>Capacitance | C <sub>PD</sub>                      | (Note 1)                                     | 3.3                    | —         | 23   | —    | —             | —    | pF   |
|                                     |                                      |  | 5.5                    | —         | 30   | —    | —             | —    |      |

(Note 1) : C<sub>PD</sub> 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.  
 $I_{CC (opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$

MARKING



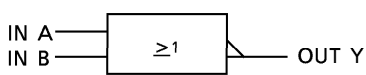
PIN ASSIGNMENT (TOP VIEW)



TRUTH TABLE

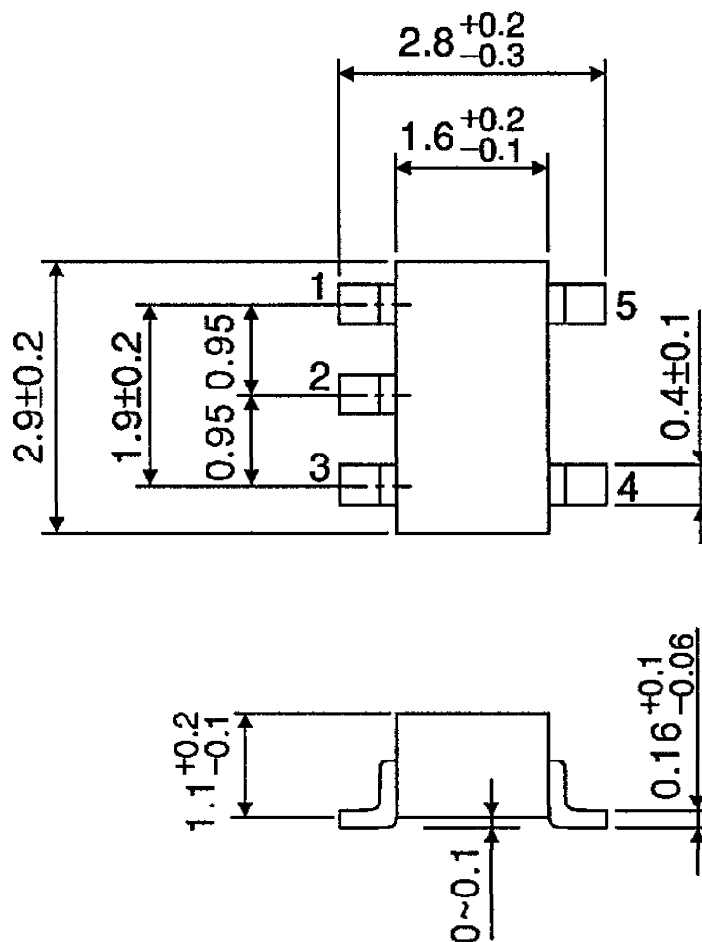
| A | B | Y |
|---|---|---|
| L | L | H |
| L | H | L |
| H | L | L |
| H | H | L |

LOGIC DIAGRAM



OUTLINE DRAWING  
SSOP5-P-0.95

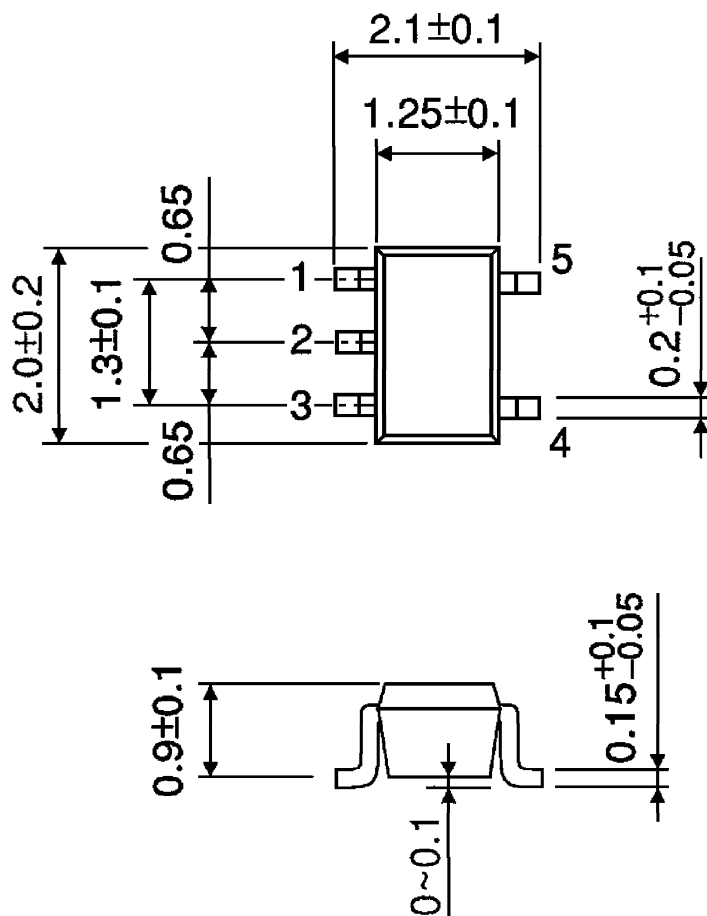
Unit : mm



Weight : 0.016g (Typ.)

OUTLINE DRAWING  
SSOP5-P-0.65A

Unit : mm



Weight : 0.006g (Typ.)