

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT   SILICON MONOLITHIC

**TC7SZ04F, TC7SZ04FU**

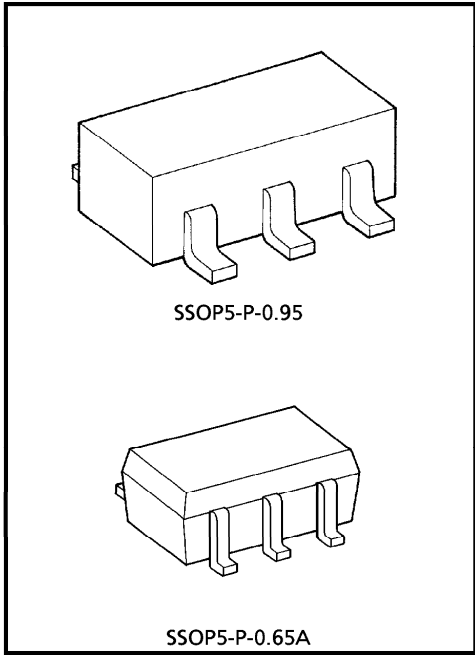
**INVERTER**

**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 :  $V_{CC}(\text{opr}) = 1.8\sim 5.5\text{ V}$
- Supply Voltage Data Retention :  $V_{CC} = 1.5\sim 5.5\text{ V}$
- 5 V 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 (10 s)     | $T_L$     | 260           | $^\circ\text{C}$ |



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

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## DC ELECTRICAL CHARACTERISTICS

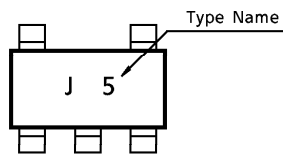
| CHARACTERISTIC            | SYMBOL           | TEST CONDITION                              |                           | V <sub>CC</sub><br>(V) | Ta = 25°C                 |      |                           | Ta = -40~85°C             |                           | UNIT |
|---------------------------|------------------|---------------------------------------------|---------------------------|------------------------|---------------------------|------|---------------------------|---------------------------|---------------------------|------|
|                           |                  |                                             |                           |                        | MIN.                      | TYP. | MAX.                      | MIN.                      | MAX.                      |      |
| High-Level Input Voltage  | V <sub>IH</sub>  |                                             |                           | 1.8                    | 0.88<br>× V <sub>CC</sub> | —    | —                         | 0.88<br>× V <sub>CC</sub> | —                         | V    |
|                           |                  |                                             |                           | 2.3 – 5.5              | 0.75<br>× V <sub>CC</sub> | —    | —                         | 0.75<br>× V <sub>CC</sub> | —                         |      |
| Low-Level Input Voltage   | V <sub>IL</sub>  |                                             |                           | 1.8                    | —                         | —    | 0.12<br>× V <sub>CC</sub> | —                         | 0.12<br>× V <sub>CC</sub> | V    |
|                           |                  |                                             |                           | 2.3 – 5.5              | —                         | —    | 0.25<br>× V <sub>CC</sub> | —                         | 0.25<br>× V <sub>CC</sub> |      |
| High-Level Output Voltage | V <sub>OH</sub>  | V <sub>IN</sub> = V <sub>IL</sub>           | I <sub>OH</sub> = -100 μA | 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> = -8 mA   | 2.3                    | 1.9                       | 2.15 | —                         | 1.9                       | —                         |      |
|                           |                  |                                             | I <sub>OH</sub> = -16 mA  | 3.0                    | 2.4                       | 2.8  | —                         | 2.4                       | —                         |      |
|                           |                  |                                             | I <sub>OH</sub> = -24 mA  | 3.0                    | 2.3                       | 2.68 | —                         | 2.3                       | —                         |      |
|                           |                  |                                             | I <sub>OH</sub> = -32 mA  | 4.5                    | 3.8                       | 4.2  | —                         | 3.8                       | —                         |      |
| Low-Level Output Voltage  | V <sub>OL</sub>  | V <sub>IN</sub> = V <sub>IH</sub>           | I <sub>OL</sub> = 100 μA  | 1.8                    | —                         | 0    | 0.1                       | —                         | 0.1                       | V    |
|                           |                  |                                             |                           | 2.3                    | —                         | 0    | 0.1                       | —                         | 0.1                       |      |
|                           |                  |                                             |                           | 3.0                    | —                         | 0    | 0.1                       | —                         | 0.1                       |      |
|                           |                  |                                             |                           | 4.5                    | —                         | 0    | 0.1                       | —                         | 0.1                       |      |
|                           |                  |                                             | I <sub>OL</sub> = 8 mA    | 2.3                    | —                         | 0.1  | 0.3                       | —                         | 0.3                       |      |
|                           |                  |                                             | I <sub>OL</sub> = 16 mA   | 3.0                    | —                         | 0.15 | 0.4                       | —                         | 0.4                       |      |
|                           |                  |                                             | I <sub>OL</sub> = 24 mA   | 3.0                    | —                         | 0.22 | 0.55                      | —                         | 0.55                      |      |
|                           |                  |                                             | I <sub>OL</sub> = 32 mA   | 4.5                    | —                         | 0.22 | 0.55                      | —                         | 0.55                      |      |
| Input Leakage Current     | I <sub>IN</sub>  | V <sub>IN</sub> = 5.5 V 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> = 5.5 V |                           | 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  $t_r = t_f = 3\text{ ns}$ )

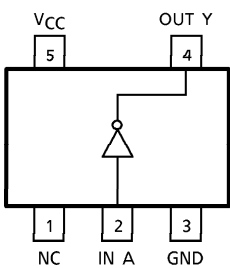
| CHARACTERISTIC                | SYMBOL       | TEST CONDITION            | Ta = 25°C |      |      |      | Ta = -40~85°C |      | UNIT |
|-------------------------------|--------------|---------------------------|-----------|------|------|------|---------------|------|------|
|                               |              |                           | VCC (V)   | MIN. | TYP. | MAX. | MIN.          | MAX. |      |
| Propagation Delay Time        | tPLH<br>tPHL | CL = 15 pF,<br>RL = 1 MΩ  | 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  | 2.1  | 4.5  | 0.5           | 4.7  |      |
|                               |              |                           | 5.0 ± 0.5 | 0.5  | 1.8  | 3.9  | 0.5           | 4.1  |      |
|                               |              | CL = 50 pF,<br>RL = 500 Ω | 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 Capacitance             | CIN          |                           | 0 – 5.5   | —    | 4    | —    | —             | pF   |      |
| Power Dissipation Capacitance | CPD          | (Note 1)                  | 3.3       | —    | 20   | —    | —             | pF   |      |
|                               |              |                           | 5.5       | —    | 26   | —    | —             |      |      |

(Note 1) CpD 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



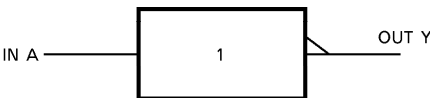
PIN ASSIGNMENT (TOP VIEW)



TRUTH TABLE

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

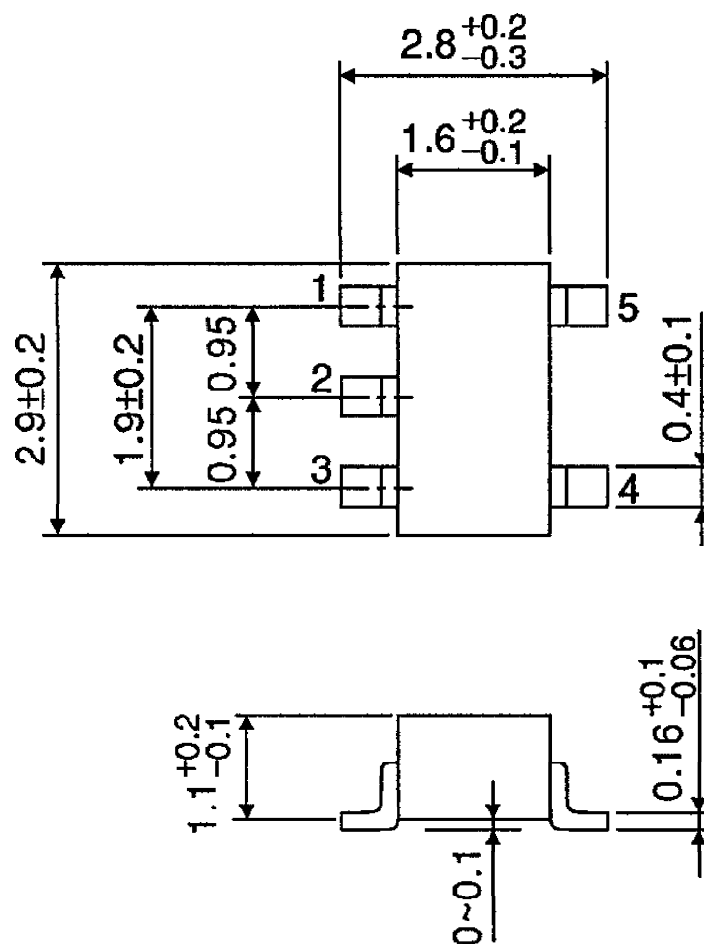
LOGIC DIAGRAM



## OUTLINE DRAWING

### SSOP5-P-0.95

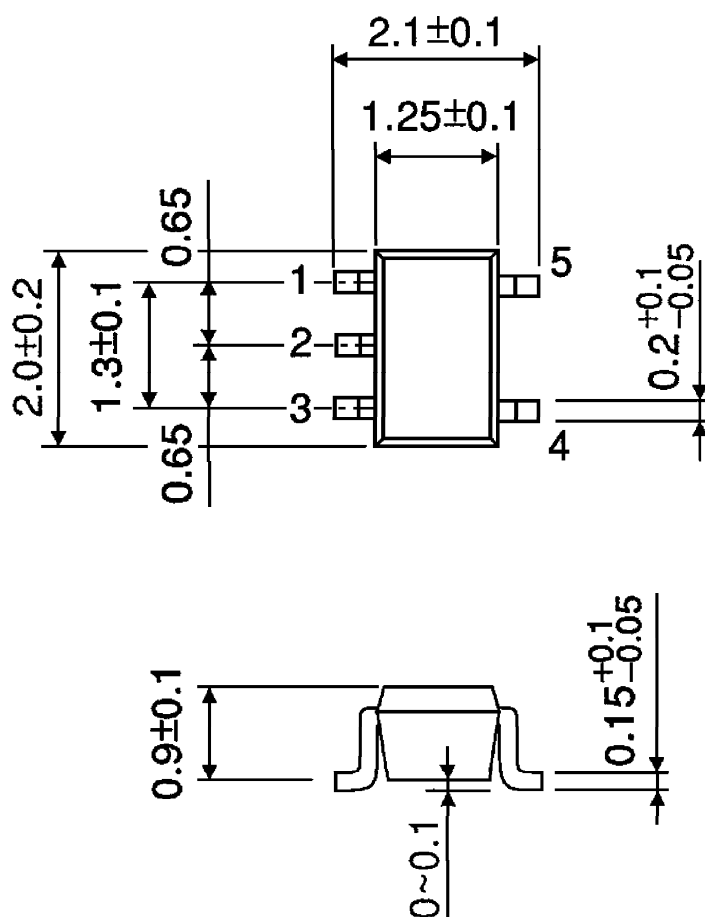
Unit : mm



Weight : 0.016 g (Typ.)

OUTLINE DRAWING  
SSOP5-P-0.65A

Unit : mm



Weight : 0.006 g (Typ.)

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