

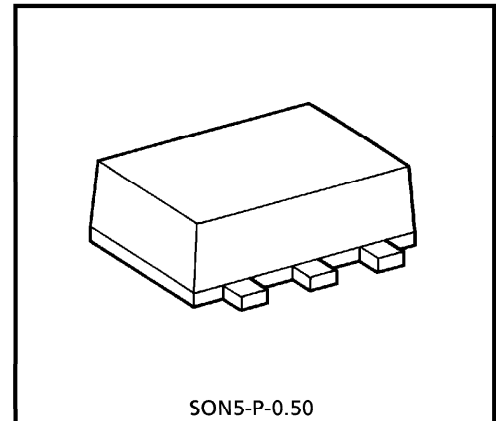
TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC7SZ02AFE

2 INPUT NOR GATE

FEATURES

- High Output Drive : ± 24 mA (Typ.)
@ $V_{CC} = 3$ V
- Super High Speed Operation : t_{pD} 2.4 ns (Typ.)
@ $V_{CC} = 5$ V, 50 pF
- Operation Voltage Range : $V_{CC}(\text{opr}) = 1.8\sim 5.5$ V
- Supply Voltage Data Retention : $V_{CC} = 1.5\sim 5.5$ V
- Latch-up Performance : ± 500 mA
- ESD Performance : Human Body Model $> \pm 2000$ V
Machine Model $> \pm 200$ V
- Power Down Protection is provided on all inputs.
- Matches the Performance of TC74LCX Series when Operated at 3.3 V V_{CC}
- Input Rise and Fall Time (t_r , t_f) (Recommended Operation Condition)
 - @ $V_{CC} = 1.8$ V, 2.5 V ± 0.2 V : 0~20 ns/V
 - @ $V_{CC} = 3.3$ V ± 0.3 V : 0~10 ns/V
 - @ $V_{CC} = 5.5$ V ± 0.5 V : 0~5 ns/V



Weight : 0.003 g (Typ.)

MAXIMUM RATINGS (Ta = 25°C)

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

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DC ELECTRICAL CHARACTERISTICS

| CHARACTERISTIC | SYMBOL | TEST CONDITION | | V _{CC} (V) | Ta = 25°C | | | Ta = -40~85°C | | UNIT | |
|---------------------------|-----------------|---|---------------------------|--------------------------|------------------------|------|------------------------|------------------------|------------------------|------|------|
| | | | | | MIN. | TYP. | MAX. | MIN. | MAX. | | |
| High-Level Input Voltage | V _{IH} | | | 1.8 | 0.75 × V _{CC} | — | — | 0.75 × V _{CC} | — | V | |
| | | | | 2.3 – 5.5 | 0.7 × V _{CC} | — | — | 0.7 × V _{CC} | — | | |
| Low-Level Input Voltage | V _{IL} | | | 1.8 | — | — | 0.25 × V _{CC} | — | 0.25 × V _{CC} | V | |
| | | | | 2.3 – 5.5 | — | — | 0.3 × V _{CC} | — | 0.3 × V _{CC} | | |
| High-Level Output Voltage | V _{OH} | V _{IN} = V _{IL} | I _{OH} = -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 _{OH} = -8 mA | 2.3 | 1.9 | 2.15 | — | 1.9 | | — |
| | | | | I _{OH} = -16 mA | 3.0 | 2.4 | 2.8 | — | 2.4 | | — |
| | | | | I _{OH} = -24 mA | 3.0 | 2.3 | 2.68 | — | 2.3 | | — |
| I _{OH} = -32 mA | 4.5 | 3.8 | 4.2 | — | 3.8 | — | | | | | |
| Low-Level Output Voltage | V _{OL} | V _{IN} = V _{IH} or V _{IL} | I _{OL} = 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 _{OL} = 8 mA | 2.3 | — | 0.1 | 0.3 | — | | 0.3 |
| | | | | I _{OL} = 16 mA | 3.0 | — | 0.15 | 0.4 | — | | 0.4 |
| | | | | I _{OL} = 24 mA | 3.0 | — | 0.22 | 0.55 | — | | 0.55 |
| I _{OL} = 32 mA | 4.5 | — | 0.22 | 0.55 | — | 0.55 | | | | | |
| Input Leakage Current | I _{IN} | V _{IN} = 5.5 V or GND | | 0 – 5.5 | — | — | ±1 | — | ±10 | μA | |
| Quiescent Supply Current | I _{CC} | V _{IN} = V _{CC} or GND | | 5.5 | — | — | 2 | — | 20 | μA | |

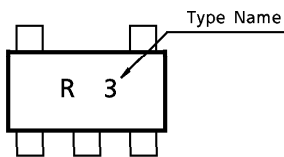
AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3$ ns)

| CHARACTERISTIC | SYMBOL | TEST CONDITION | Ta = 25°C | | | Ta = -40~85°C | | UNIT | |
|-------------------------------|--------------------------------------|---|---------------------|------|------|---------------|------|------|------|
| | | | V _{CC} (V) | MIN. | TYP. | MAX. | MIN. | | MAX. |
| Propagation Delay Time | t _{PLH} t _{PHL} | C _L = 15 pF, R _L = 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 | 2.3 | 4.5 | 0.5 | 4.7 | |
| | | | 5.0 ± 0.5 | 0.5 | 1.9 | 3.9 | 0.5 | 4.1 | |
| | | C _L = 50 pF, R _L = 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 | C _{IN} | | 0 - 5.5 | — | 4 | — | — | pF | |
| Power Dissipation Capacitance | C _{PD} | (Note 1) | 3.3 | — | 19 | — | — | — | pF |
| | | | 5.5 | — | 27 | — | — | — | |

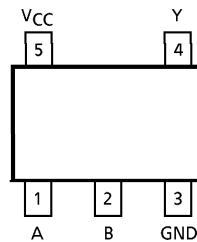
(Note 1) : C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.
Average operating current can be obtained by the equation.

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

MARKING



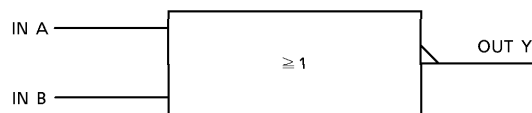
PIN ASSIGNMENT (TOP VIEW)



TRUTH TABLE

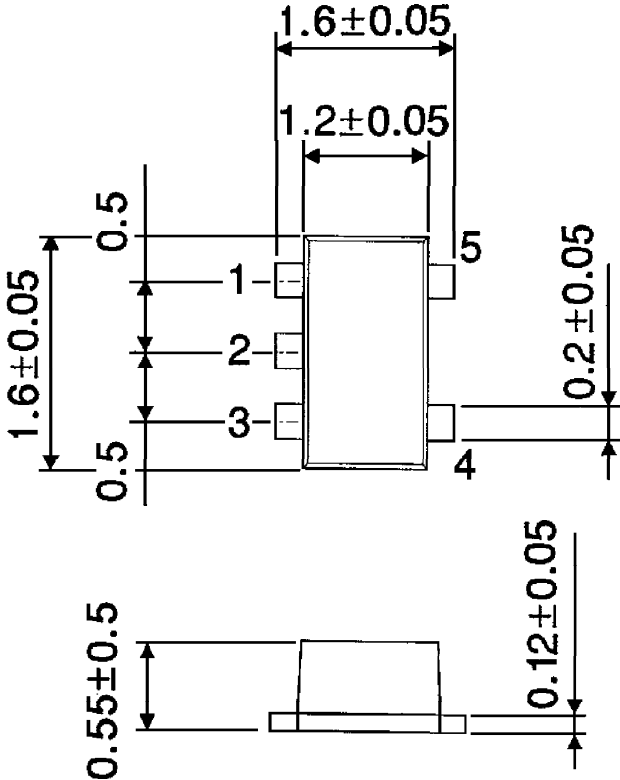
| A | B | Y |
|---|---|---|
| L | L | H |
| L | H | L |
| H | L | L |
| H | H | L |

LOGIC DIAGRAM



PACKAGE DIMENSIONS
SON5-P-0.50

Unit : mm



Weight : 0.003 g (Typ.)