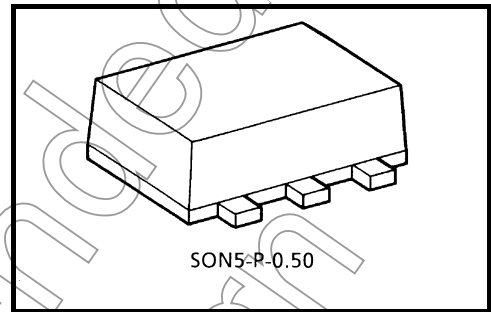


# TC7SZ126AFE

## Bus Buffer with 3-STATE Output

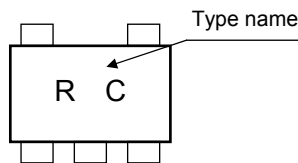
### Features

- High output drive:  $\pm 24$  mA (min) at  $V_{CC} = 3$  V
- Super high speed operation:  $t_{pd} = 2.6$  ns (typ.)  
at  $V_{CC} = 5$  V, 50 pF
- Operation voltage range:  $V_{CC (opr)} = 1.8\sim 5.5$  V
- 5.5-V tolerant inputs
- Matches the performance of TC74LCX series when operated at 3.3-V  $V_{CC}$

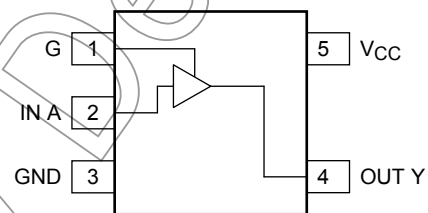


Weight: 0.003 g (typ.)

### Marking



### Pin Assignment (top view)



### Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

| Characteristics             | Symbol    | Rating                  | Unit             |
|-----------------------------|-----------|-------------------------|------------------|
| Power supply voltage        | $V_{CC}$  | $-0.5\sim 6$            | V                |
| DC input voltage            | $V_{IN}$  | $-0.5\sim 6$            | V                |
| DC output voltage           | $V_{OUT}$ | $-0.5\sim V_{CC} + 0.5$ | V                |
| Input diode current         | $I_{IK}$  | -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           | $P_D$     | 150                     | mW               |
| Storage temperature         | $T_{stg}$ | $-65\sim 150$           | $^\circ\text{C}$ |
| Lead temperature (10s)      | $T_L$     | 260                     | $^\circ\text{C}$ |

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

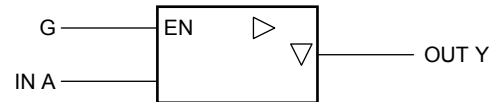
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

## Truth Table

| A | G | Y |
|---|---|---|
| X | L | Z |
| L | H | L |
| H | H | H |

X : Don't Care  
Z : High Impedance

## Logic Diagram



## Operating Ranges

| Characteristics          | Symbol    | Rating  | Unit |
|--------------------------|-----------|---|------|
| Supply voltage           | $V_{CC}$  | 1.8~5.5   | V    |
|                          |           | 1.5~5.5 (Note1)   |      |
| Input voltage            | $V_{IN}$  | 0~5.5   | V    |
| Output voltage           | $V_{OUT}$ | 0~ $V_{CC}$   | V    |
| Operating temperature    | $T_{opr}$ | -40~85  | °C   |
| Input rise and fall time | dt/dv     | 0~20 ( $V_{CC} = 1.8\text{ V}, 2.5\text{ V} \pm 0.2\text{ V}$ ) | ns/V |
|                          |           | 0~10 ( $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ )               |      |
|                          |           | 0~5 ( $V_{CC} = 5.5\text{ V} \pm 0.5\text{ V}$ )                |      |

Note1: Data retention only

Not Recommended for New Design

## Electrical Characteristics

### DC Characteristics

| Characteristics                  | Symbol          | Test Condition   | Ta = 25°C   |                           |                        | Ta = -40~85°C |                        | Unit                   |      |                        |   |
|----------------------------------|-----------------|--|---|---------------------------|------------------------|---------------|------------------------|------------------------|------|------------------------|---|
|                                  |                 |  | V <sub>CC</sub> (V)                                     | Min                       | Typ.                   | Max           | Min                    |                        | Max  |                        |   |
| Input voltage                    | High level      | V <sub>IH</sub>  | —   | 1.8                       | 0.75 × V <sub>CC</sub> | —             | —                      | 0.75 × V <sub>CC</sub> | V    |                        |   |
|                                  |                 |  |   | 2.3~5.5                   | 0.7 × V <sub>CC</sub>  | —             | —                      | 0.7 × V <sub>CC</sub>  |      |                        |   |
|                                  | Low level       | V <sub>IL</sub>  | —   | 1.8                       | —                      | —             | 0.25 × V <sub>CC</sub> | —                      |      | 0.25 × V <sub>CC</sub> |   |
|                                  |                 |  |   | 2.3~5.5                   | —                      | —             | 0.3 × V <sub>CC</sub>  | —                      |      | 0.3 × V <sub>CC</sub>  |   |
| Output voltage                   | High level      | V <sub>OH</sub>  | V <sub>IN</sub> = V <sub>IH</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  | —                      |   |
|                                  |                 |  |   |                           | 3.0                    | 2.4           | 2.8                    | —                      | 2.4  | —                      |   |
|                                  |                 |  |   |                           | 3.0                    | 2.3           | 2.68                   | —                      | 2.3  | —                      |   |
|                                  |                 |  |   |                           | 4.5                    | 3.8           | 4.2                    | —                      | 3.8  | —                      |   |
|                                  | Low level       | V <sub>OL</sub>  | V <sub>IN</sub> = V <sub>IH</sub><br>or V <sub>IL</sub> | I <sub>OL</sub> = 100 μA  | 1.8                    | —             | 0                      | 0.1                    | —    | 0.1                    |   |
|                                  |                 |  |   |                           | 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                    |   |
|                                  |                 |  |   |                           | 3.0                    | —             | 0.15                   | 0.4                    | —    | 0.4                    |   |
| 3.0                              |                 |  |   |                           | —                      | 0.22          | 0.55                   | —                      | 0.55 |                        |   |
| 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   |                        |   |
| 3-state output off-state current | I <sub>OZ</sub> | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> ,<br>V <sub>OUT</sub> = 0~5.5 V | 1.8~5.5   | —                         | —                      | ±1            | —                      | ±10                    | μA   |                        |   |
| Quiescent supply current         | I <sub>CC</sub> | V <sub>IN</sub> = 5.5 V or GND   | 5.5   | —                         | —                      | 2             | —                      | 20                     | μA   |                        |   |

**AC Characteristics (unless otherwise specified, Input:  $t_r = t_f = 3$  ns)**

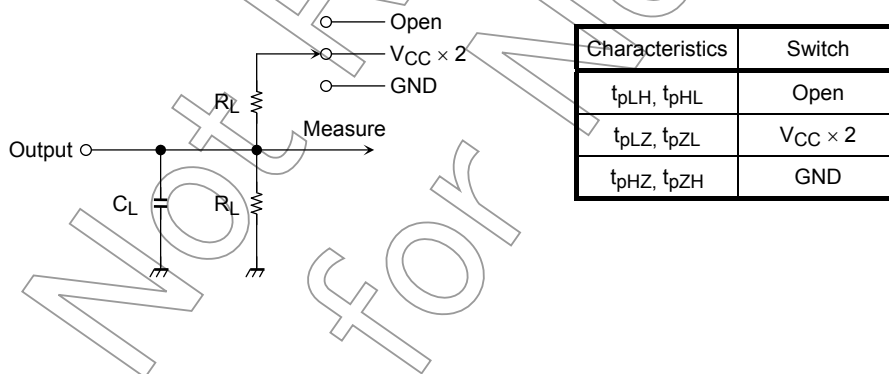
| Characteristics               | Symbol                 | Test Condition                      | Ta = 25°C           |     |      | Ta = -40~85°C |     | Unit |     |
|-------------------------------|------------------------|-------------------------------------|---------------------|-----|------|---------------|-----|------|-----|
|                               |                        |                                     | V <sub>CC</sub> (V) | Min | Typ. | Max           | Min |      | Max |
| Propagation delay time        | $t_{pLH}$<br>$t_{pHL}$ | $C_L = 15$ pF, $R_L = 1$ M $\Omega$ | 1.8                 | 2.0 | 5.3  | 11.0          | 2.0 | 11.5 | ns  |
|                               |                        |                                     | $2.5 \pm 0.2$       | 0.8 | 3.4  | 7.5           | 0.8 | 8.0  |     |
|                               |                        |                                     | $3.3 \pm 0.3$       | 0.5 | 2.5  | 5.2           | 0.5 | 5.5  |     |
|                               |                        | $C_L = 50$ pF, $R_L = 500$ $\Omega$ | $5.0 \pm 0.5$       | 0.5 | 2.1  | 4.5           | 0.5 | 4.8  |     |
|                               |                        |                                     | $3.3 \pm 0.3$       | 1.5 | 3.2  | 5.7           | 1.5 | 6.0  |     |
|                               |                        |                                     | $5.0 \pm 0.5$       | 0.8 | 2.6  | 5.0           | 0.8 | 5.3  |     |
| Output enable time            | $t_{pZH}$<br>$t_{pZL}$ | $C_L = 50$ pF, $R_L = 500$ $\Omega$ | 1.8                 | 2.0 | 6.5  | 11.5          | 2.0 | 12.0 | ns  |
|                               |                        |                                     | $2.5 \pm 0.2$       | 1.5 | 3.8  | 8.0           | 1.5 | 8.5  |     |
|                               |                        |                                     | $3.3 \pm 0.3$       | 1.5 | 3.2  | 5.7           | 1.5 | 6.0  |     |
|                               |                        |                                     | $5.0 \pm 0.5$       | 0.8 | 2.3  | 5.0           | 0.8 | 5.3  |     |
| Output disable time           | $t_{pLZ}$<br>$t_{pHZ}$ | $C_L = 50$ pF, $R_L = 500$ $\Omega$ | 1.8                 | 2.0 | 5.6  | 11.0          | 2.0 | 12.0 | ns  |
|                               |                        |                                     | $2.5 \pm 0.2$       | 1.0 | 4.0  | 8.0           | 1.5 | 8.5  |     |
|                               |                        |                                     | $3.3 \pm 0.3$       | 1.0 | 3.5  | 5.7           | 1.0 | 6.0  |     |
|                               |                        |                                     | $5.0 \pm 0.5$       | 0.5 | 2.7  | 4.7           | 0.5 | 5.0  |     |
| Input capacitance             | $C_{IN}$               | —                                   | 0~5.5               | —   | 4    | —             | —   | pF   |     |
| Power dissipation capacitance | $C_{PD}$               | (Note2)                             | 3.3                 | —   | 20   | —             | —   | —    | pF  |
|                               |                        |                                     | 5.5                 | —   | 27   | —             | —   | —    |     |

Note2:  $C_{PD}$  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:

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

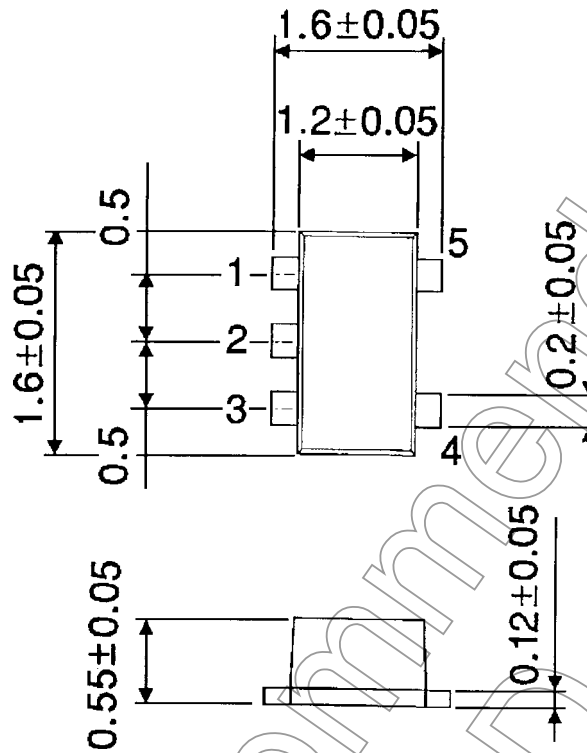
**AC Characteristics Measurement Circuit**



**Package Dimensions**

SON5-P-0.50

Unit : mm



Weight: 0.003 g (typ.)

Not Recommended for New Design

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