

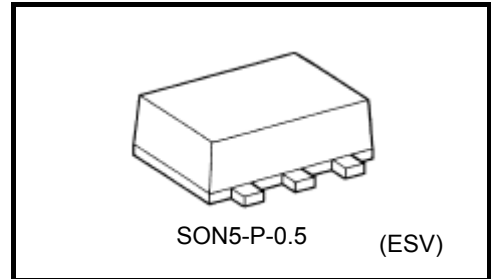
TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7SZ125FE

Bus Buffer 3-State Output

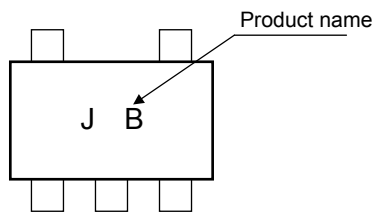
Features

- High output current : $\pm 24\text{mA}$ (min) at $V_{CC} = 3\text{V}$
- Super high speed operation : $t_{pd} = 2.6\text{ns}$ (typ.)
at $V_{CC} = 5\text{V}$, 50pF
- Operation voltage range : $V_{CC} = 1.65$ to 5.5V
- 5.5-V tolerant inputs
- 5.5-V power down protection output
- Matches the performance of TC74LCX series when operated at $3.3\text{V } V_{CC}$.



Weight: 0.003 g (typ.)

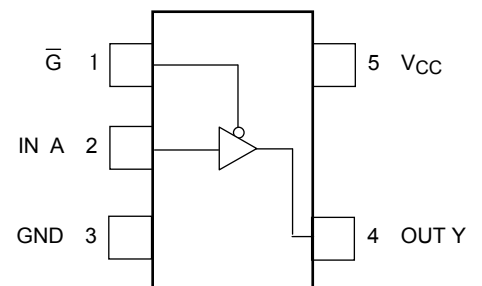
Marking



Absolute Maximum Ratings (Ta = 25°C)

| Characteristics | Symbol | Rating | Unit |
|-----------------------------|-----------|-------------------------------|------|
| Supply voltage | V_{CC} | -0.5 to 6 | V |
| DC input voltage | V_{IN} | -0.5 to 6 | V |
| DC output voltage | V_{OUT} | -0.5 to 6 (Note 1) | V |
| | | -0.5 to $V_{CC}+0.5$ (Note 2) | |
| Input diode current | I_{IK} | -20 | mA |
| Output diode current | I_{OK} | -20 (Note 3) | 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 to 150 | °C |

Pin Assignment (top view)



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.

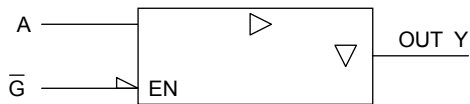
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: $V_{CC} = 0\text{V}$ or high impedance condition

Note 2: High or Low state. Do not exceed I_{OUT} of absolute maximum ratings.

Note 3: $V_{OUT} < \text{GND}$

IEC Logic Symbol



Truth Table

| Input | | Output |
|-------|-----------|--------|
| A | \bar{G} | Y |
| X | H | Z |
| L | L | L |
| H | L | H |

X: Don't Care

Z: High Impedance

Operating Ranges

| Characteristics | Symbol | Rating | Unit |
|--------------------------|-----------|---|------|
| Supply voltage | V_{CC} | 1.65 to 5.5 | V |
| | | 1.5 to 5.5 (Note 4) | |
| Input voltage | V_{IN} | 0 to 5.5 | V |
| Output voltage | V_{OUT} | 0 to 5.5 (Note 5) | V |
| | | 0 to V_{CC} (Note 6) | |
| Operating temperature | T_{opr} | -40 to 85 | °C |
| Input rise and fall time | dt/dv | 0 to 20 ($V_{CC} = 1.80\text{ V} \pm 0.15\text{ V}, 2.5\text{ V} \pm 0.2\text{ V}$) | ns/V |
| | | 0 to 10 ($V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$) | |
| | | 0 to 5 ($V_{CC} = 5.0\text{ V} \pm 0.5\text{ V}$) | |

Note 4: Data retention only

Note 5: $V_{CC} = 0\text{ V}$ or high impedance condition

Note 6: High or Low state

Electrical Characteristics

DC Characteristics

| Characteristics | | Symbol | Test Condition | Ta = 25°C | | | Ta = -40 to 85°C | | Unit | | | |
|----------------------------------|-------------------------|------------------|---|-----------------------------------|--------------------------|------|------------------------|------------------------|------------------------|------|---|-----|
| | | | | V _{CC} (V) | Min | Typ. | Max | Min | | Max | | |
| Input voltage | High level | V _{IH} | — | 1.65 to 1.95 | V _{CC} × 0.75 | — | — | V _{CC} × 0.75 | — | V | | |
| | | | | 2.3 to 5.5 | V _{CC} × 0.7 | — | — | V _{CC} × 0.7 | — | | | |
| | Low level | V _{IL} | — | 1.65 to 1.95 | — | — | V _{CC} × 0.25 | — | V _{CC} × 0.25 | | | |
| | | | | 2.3 to 5.5 | — | — | V _{CC} × 0.3 | — | V _{CC} × 0.3 | | | |
| Output voltage | High level | V _{OH} | V _{IN} = V _{IH} or V _{IL} | I _{OH} = -100 μA | 1.65 | 1.55 | 1.65 | — | 1.55 | — | 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} = -4 mA | 1.65 | 1.29 | 1.52 | — | 1.29 | — | | |
| | | | | | 2.3 | 1.9 | 2.15 | — | 1.9 | — | | |
| | | | | | 3.0 | 2.4 | 2.8 | — | 2.4 | — | | |
| | | | | | 4.5 | 2.3 | 2.68 | — | 2.3 | — | | |
| | I _{OH} = -8 mA | 3.0 | 2.4 | 2.8 | — | 2.4 | — | | | | | |
| | | 4.5 | 3.8 | 4.2 | — | 3.8 | — | | | | | |
| | | Low level | V _{OL} | V _{IN} = V _{IL} | I _{OL} = 100 μA | 1.65 | — | 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 _{OL} = 4 mA | | | | 1.65 | — | 0.08 | 0.24 | — | 0.24 | | |
| | 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 to 5.5 | — | — | ±1 | — | ±10 | μA | | |
| 3-state output off-state current | | I _{OZ} | V _{IN} = V _{IH} or V _{IL} V _{OUT} = 0 to 5.5 V | 1.65 to 5.5 | — | — | ±1 | — | ±10 | μA | | |
| Power off leakage current | | I _{OFF} | V _{IN} or V _{OUT} = 5.5 V | 0.0 | — | — | 1 | — | 10 | μA | | |
| Quiescent supply current | | I _{CC} | V _{IN} = V _{CC} 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 to 85°C | | Unit | |
|-------------------------------|--|--|-----------|-----|------|------------------|-----|------|-----|
| | | | VCC (V) | Min | Typ. | Max | Min | | Max |
| Propagation delay time | t_{pLH} | $C_L = 15$ pF, $R_L = 1$ M Ω (Figure 1) | 1.8±0.15 | 2.0 | 5.3 | 11.0 | 2.0 | 11.5 | ns |
| | | | 2.5 ± 0.2 | 0.8 | 3.4 | 7.5 | 0.8 | 8.0 | |
| | t_{pHL} | | 3.3 ± 0.3 | 0.5 | 2.5 | 5.2 | 0.5 | 5.5 | |
| | 5.0 ± 0.5 | | 0.5 | 2.1 | 4.5 | 0.5 | 4.8 | | |
| | $C_L = 50$ pF, $R_L = 500$ Ω (Figure 1) | | 3.3 ± 0.3 | 1.5 | 3.2 | 5.7 | 1.5 | 6.0 | |
| | | | 5.0 ± 0.5 | 0.8 | 2.6 | 5.0 | 0.8 | 5.3 | |
| Output enable time | t_{pZL} | $C_L = 50$ pF, $R_L = 500$ Ω (Figure 1) | 1.8±0.15 | 2.0 | 7.0 | 14.9 | 2.0 | 16.6 | ns |
| | | | 2.5 ± 0.2 | 1.5 | 4.6 | 8.5 | 1.5 | 9.0 | |
| | t_{pZH} | | 3.3 ± 0.3 | 1.5 | 3.5 | 6.2 | 1.5 | 6.5 | |
| | 5.0 ± 0.5 | | 0.8 | 2.8 | 5.5 | 0.8 | 5.8 | | |
| Output disable time | t_{pLZ} | $C_L = 50$ pF, $R_L = 500$ Ω (Figure 1) | 1.8±0.15 | 2.0 | 5.4 | 11.8 | 2.0 | 12.7 | ns |
| | | | 2.5 ± 0.2 | 1.5 | 4.0 | 8.0 | 1.5 | 8.5 | |
| | t_{pHZ} | | 3.3 ± 0.3 | 1.0 | 3.5 | 5.7 | 1.0 | 6.0 | |
| | 5.0 ± 0.5 | | 0.5 | 2.5 | 4.7 | 0.5 | 5.0 | | |
| Input capacitance | C_{IN} | — | 0 to 5.5 | — | 4 | — | — | — | pF |
| Power dissipation capacitance | C_{PD} | (Note 7) | 3.3 | — | 17 | — | — | — | pF |
| | | | 5.5 | — | 24 | — | — | — | |

Note 7: 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

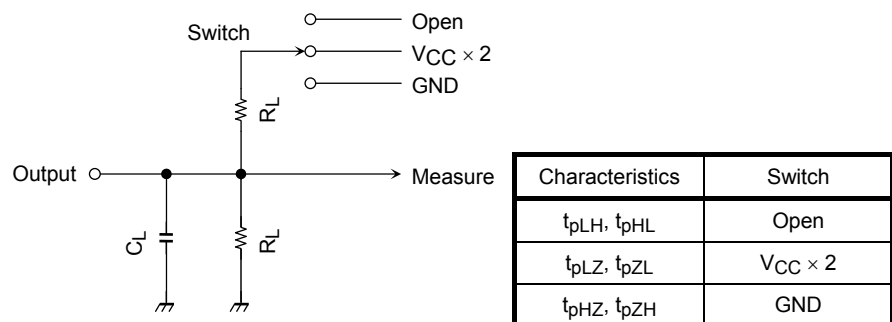
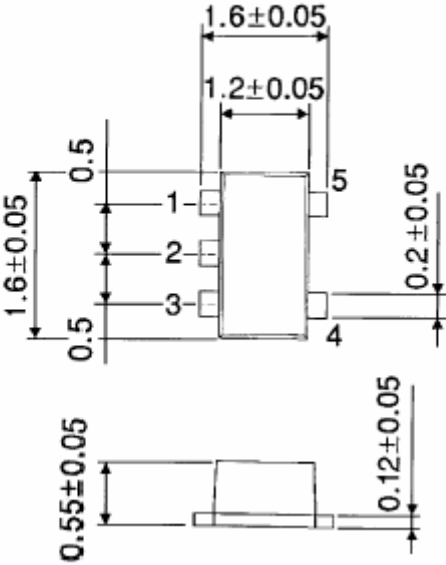


Figure 1

Package Dimensions

SON5-P-0.50

Unit : mm



Weight: 0.003 g (typ.)

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