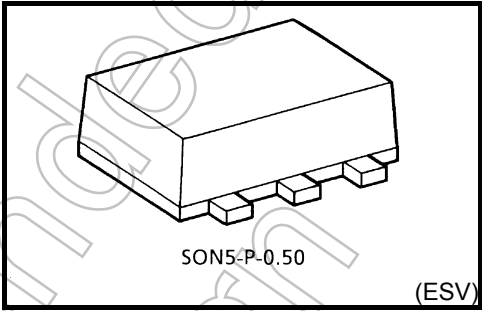


TC7SH126FE

Bus Buffer with 3-STATE Output

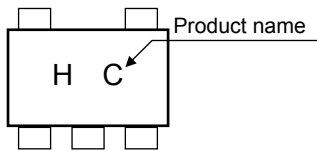
Features

- High speed: $t_{pd} = 3.8\text{ns}$ (typ.) at $V_{CC} = 5\text{ V}$, $C_L = 15\text{ pF}$
- Low power dissipation: $I_{CC} = 2\mu\text{A}$ (max) at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (min)
- 5.5 V tolerant input.
- Wide operating voltage range: $V_{CC} = 2\text{ to }5.5\text{V}$

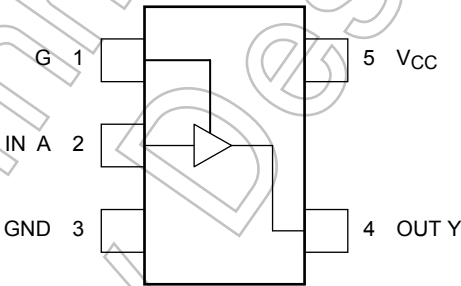


Weight: 0.003 g (typ.)

Marking



Pin Assignment (top view)



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

| Characteristics | Symbol | Rating | Unit |
|-----------------------------|-----------|------------------------|------------------|
| Supply voltage | V_{CC} | -0.5 to 7 | V |
| DC input voltage | V_{IN} | -0.5 to 7 | V |
| DC output voltage | V_{OUT} | -0.5 to $V_{CC} + 0.5$ | V |
| Input diode current | I_{IK} | -20 | mA |
| Output diode current | I_{OK} | ± 20 (Note1) | mA |
| DC output current | I_{OUT} | ± 25 | mA |
| DC V_{CC} /ground current | I_{CC} | ± 50 | mA |
| Power dissipation | P_D | 150 | mW |
| Storage temperature | T_{stg} | -65 to 150 | $^\circ\text{C}$ |

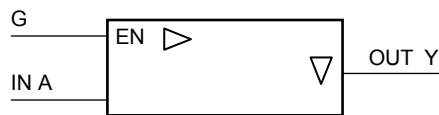
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

Note1: $V_{OUT} < GND$, $V_{OUT} > V_{CC}$

Start of commercial production
2004-05

IEC Logic Symbol



Truth Table

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

X: Don't care
Z: High impedance

Operating Ranges

| Characteristics | Symbol | Rating | Unit |
|--------------------------|------------------|--|------|
| Supply voltage | V _{CC} | 2 to 5.5 | V |
| Input voltage | V _{IN} | 0 to 5.5 | V |
| Output voltage | V _{OUT} | 0 to V _{CC} | V |
| Operating temperature | T _{opr} | -40 to 85 | °C |
| Input rise and fall time | dt/dv | 0 to 100 (V _{CC} = 3.3 V ± 0.3 V) | ns/V |
| | | 0 to 20 (V _{CC} = 5.0 V ± 0.5 V) | |

Electrical Characteristics

DC Characteristics

| Characteristics | Symbol | Test Condition | | Ta = 25°C | | | Ta = -40 to 85°C | | Unit | |
|----------------------------------|--------|---------------------------------------|--------------|------------|-----------|-------|------------------|-----------|-----------|-----|
| | | | | VCC (V) | Min | Typ. | Max | Min | | Max |
| High-level input voltage | VIH | — | | 2.0 | 1.5 | — | — | 1.5 | — | V |
| | | | | 3.0 to 5.5 | VCC × 0.7 | — | — | VCC × 0.7 | — | |
| Low-level input voltage | VIL | — | | 2.0 | — | — | 0.5 | — | 0.5 | V |
| | | | | 3.0 to 5.5 | — | — | VCC × 0.3 | — | VCC × 0.3 | |
| High-level output voltage | VOH | VIN = VIH | IOH = -50 μA | 2.0 | 1.9 | 2.0 | — | 1.9 | — | V |
| | | | | 3.0 | 2.9 | 3.0 | — | 2.9 | — | |
| | | | | 4.5 | 4.4 | 4.5 | — | 4.4 | — | |
| | | | IOH = -4 mA | 3.0 | 2.58 | — | — | 2.48 | — | |
| | | | IOH = -8 mA | 4.5 | 3.94 | — | — | 3.80 | — | |
| Low-level output voltage | VOL | VIN = VIH or VIL | IOL = 50 μA | 2.0 | — | 0 | 0.1 | — | 0.1 | V |
| | | | | 3.0 | — | 0 | 0.1 | — | 0.1 | |
| | | | | 4.5 | — | 0 | 0.1 | — | 0.1 | |
| | | | IOL = 4 mA | 3.0 | — | — | 0.36 | — | 0.44 | |
| | | | IOL = 8 mA | 4.5 | — | — | 0.36 | — | 0.44 | |
| 3-state output off-state current | IOZ | VIN = VIH or VIL VOUT = VCC or GND | 5.5 | — | — | ±0.25 | — | ±2.5 | μA | |
| Input leakage current | IIN | VIN = 5.5 V or GND | 0 to 5.5 | — | — | ±0.1 | — | ±1.0 | μA | |
| Quiescent supply current | ICC | VIN = VCC or GND | 5.5 | — | — | 2.0 | — | 20.0 | μA | |

AC Characteristics (unless otherwise specified, input: $t_r = t_f = 3 \text{ ns}$)

| Characteristics | Symbol | | Test Condition | | Ta = 25°C | | | Ta = -40 to 85°C | | Unit |
|-------------------------------|------------------------|---|---------------------|---------------------|-----------|------|------|------------------|------|------|
| | | | V _{CC} (V) | C _L (pF) | Min | Typ. | Max | Min | Max | |
| Propagation delay time | t_{pLH} t_{pHL} | — | 3.3 ± 0.3 | 15 | — | 5.6 | 8.0 | 1.0 | 9.5 | ns |
| | | | | 50 | — | 8.1 | 11.5 | 1.0 | 13.0 | |
| | | | 5.0 ± 0.5 | 15 | — | 3.8 | 5.5 | 1.0 | 6.5 | |
| | | | | 50 | — | 5.3 | 7.5 | 1.0 | 8.5 | |
| 3-state output enable time | t_{pZL} t_{pZH} | — | 3.3 ± 0.3 | 15 | — | 5.4 | 8.0 | 1.0 | 9.5 | ns |
| | | | | 50 | — | 7.9 | 11.5 | 1.0 | 13.0 | |
| | | | 5.0 ± 0.5 | 15 | — | 3.6 | 5.1 | 1.0 | 6.0 | |
| | | | | 50 | — | 5.1 | 7.1 | 1.0 | 8.0 | |
| 3-state output disable time | t_{pLZ} t_{pHZ} | — | 3.3 ± 0.3 | 50 | — | 9.5 | 13.2 | 1.0 | 15.0 | ns |
| | | | 5.0 ± 0.5 | 50 | — | 6.1 | 8.8 | 1.0 | 10.0 | |
| Input capacitance | C _{IN} | — | — | — | — | 4 | 10 | — | 10 | pF |
| Output capacitance | C _{OUT} | — | — | — | — | 6 | — | — | — | pF |
| Power dissipation capacitance | C _{PD} | — | — | (Note 2) | — | 14 | — | — | — | pF |

Note 2: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

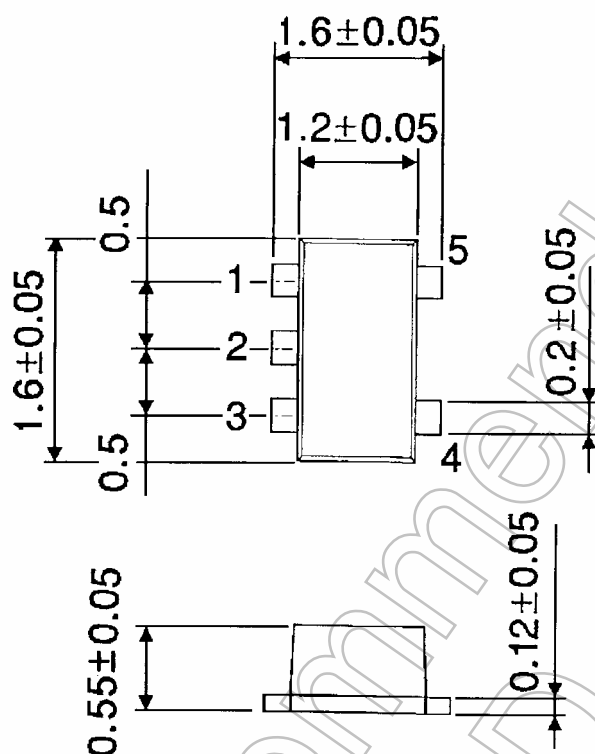
Average operating current can be obtained by the equation.

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

Package Dimensions

SON5-P-0.50

Unit : mm



Weight: 0.003 g (typ.)

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