

TC7WH157FU, TC7WH157FK

2-Channel Multiplexer

The TC7WH157 is an advanced high speed CMOS 2-Channel Multiplexer fabricated with silicon gate CMOS technology.

It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation. It consists of 2-input digital multiplexer with common select and strobe inputs.

When the $\overline{\text{STROBE}}$ input is held "H" level, selection of data is inhibited and all the outputs become "L" level.

The SELECT decoding determines whether the A or B inputs get routed to their corresponding Y outputs.

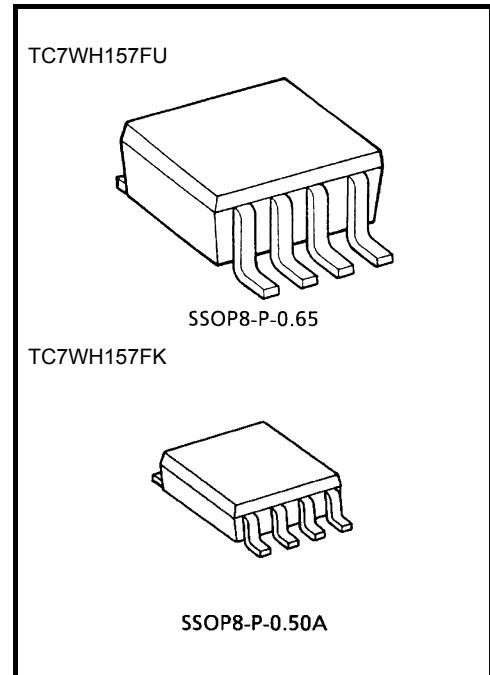
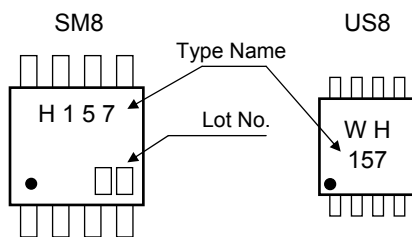
An input protection circuit ensures that 0 to 7 V can be applied to the input pins without regard to the supply voltage.

This device can be used to interface 5 V to 3 V systems and two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

Features

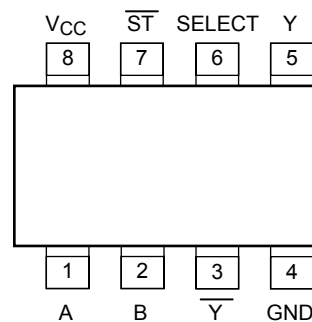
- High speed: $t_{pd} = 4.1 \text{ ns (typ.)}$ at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 2 \mu\text{A (max)}$ at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (min)}$
- 5.5-V Tolerant inputs.
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range: $V_{CC} \text{ (opr)} = 2\sim 5.5 \text{ V}$
- Low Noise : $V_{OLP} = 0.8 \text{ V (max.)}$

Marking



Weight
 SSOP8-P-0.65: 0.02 g (typ.)
 SSOP8-P-0.50A: 0.01 g (typ.)

Pin Assignment (top view)



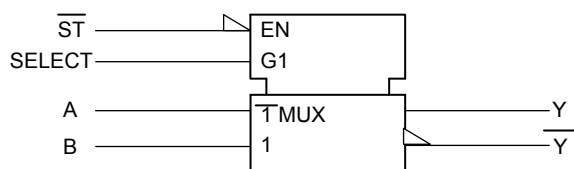
Absolute Maximum Ratings (Ta = 25°C)

| Characteristics | Symbol | Rating | Unit |
|------------------------------------|------------------|----------------------------|------|
| Supply voltage range | V _{CC} | -0.5~7.0 | V |
| DC input voltage | V _{IN} | -0.5~7.0 | 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} | ±25 | mA |
| DC V _{CC} /ground current | I _{CC} | ±50 | mA |
| Power dissipation | P _D | 300 (SM8) | mW |
| | | 200 (US8) | |
| Storage temperature | T _{stg} | -65~150 | °C |
| Lead temperature (10 s) | T _L | 260 | °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).

Logic Diagram



Truth Table

| INPUTS | | | | OUTPUTS | |
|-----------------|--------|---|---|---------|----------------|
| \overline{ST} | SELECT | A | B | Y | \overline{Y} |
| H | X | X | X | L | H |
| L | L | L | X | L | H |
| L | L | H | X | H | L |
| L | H | X | L | L | H |
| L | H | X | H | H | L |

X : Don't Care

Operating Ranges

| Characteristics | Symbol | Rating | Unit |
|--------------------------|------------------|---------------------------------------|------|
| Supply voltage | V _{CC} | 2.0~5.5 | V |
| 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 | 0~100 (V _{CC} = 3.3 ± 0.3 V) | ns/V |
| | | 0~20 (V _{CC} = 5 ± 0.5 V) | |

Electrical Characteristics

DC Characteristics

| Characteristics | 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} | — | 2.0 | 1.50 | — | — | 1.50 | — | V | |
| | | | 3.0~5.5 | V _{CC} × 0.7 | — | — | V _{CC} × 0.7 | — | | |
| Low-level input voltage | V _{IL} | — | 2.0 | — | — | 0.50 | — | 0.50 | V | |
| | | | 3.0~5.5 | — | — | V _{CC} × 0.3 | — | V _{CC} × 0.3 | | |
| High-level output voltage | V _{OH} | V _{IN} = V _{IH} or V _{IL} | I _{OH} = -50 μA | 2.0 | 1.9 | 2.0 | — | 1.9 | — | V |
| | | | | 3.0 | 2.9 | 3.0 | — | 2.9 | — | |
| | | | I _{OH} = -4 mA | 4.5 | 4.4 | 4.5 | — | 4.4 | — | |
| | | | | 3.0 | 2.58 | — | — | 2.48 | — | |
| I _{OH} = -8 mA | 4.5 | 3.94 | — | — | 3.80 | — | | | | |
| | Low-level output voltage | V _{OL} | V _{IN} = V _{IH} or V _{IL} | I _{OL} = 50 μA | 2.0 | — | 0.0 | 0.1 | — | 0.1 |
| 3.0 | | | | | — | 0.0 | 0.1 | — | 0.1 | |
| 4.5 | | | | | — | 0.0 | 0.1 | — | 0.1 | |
| I _{OL} = 4 mA | | | | 3.0 | — | — | 0.36 | — | 0.44 | |
| | | | | 4.5 | — | — | 0.36 | — | 0.44 | |
| Input leakage current | I _{IN} | V _{IN} = 5.5 V or GND | 0~5.5 | — | — | ±0.1 | — | ±1.0 | μA | |
| Quiescent supply current | I _{CC} | V _{IN} = V _{CC} or GND | 5.5 | — | — | 2.0 | — | 20.0 | μA | |

AC Characteristics (Input: $t_r = t_f = 3$ ns)

| Characteristics | Symbol | Test Condition | Ta = 25°C | | | Ta = -40~85°C | | Unit | | |
|---|-----------------|----------------|-----------|---------|------|---------------|------|------|------|------|
| | | | VCC (V) | CL (pF) | Min. | Typ. | Max. | | Min. | Max. |
| Propagation Delay Time (A, B - Y) | t_{pLH} | | 3.3 ± 0.3 | 15 | — | 6.2 | 9.7 | 1.0 | 11.5 | ns |
| | | | | 50 | — | 8.7 | 13.2 | 1.0 | 15.0 | |
| | t_{pHL} | | 5.0 ± 0.5 | 15 | — | 4.1 | 6.4 | 1.0 | 7.5 | |
| | | | | 50 | — | 5.6 | 8.4 | 1.0 | 9.5 | |
| Propagation Delay Time (SELECT - Y) | t_{pLH} | | 3.3 ± 0.3 | 15 | — | 8.4 | 13.2 | 1.0 | 15.5 | ns |
| | | | | 50 | — | 10.9 | 16.7 | 1.0 | 19.0 | |
| | t_{pHL} | | 5.0 ± 0.5 | 15 | — | 5.3 | 8.1 | 1.0 | 9.5 | |
| | | | | 50 | — | 6.8 | 10.1 | 1.0 | 11.5 | |
| Propagation Delay Time (\overline{ST} - Y) | t_{pLH} | | 3.3 ± 0.3 | 15 | — | 8.7 | 13.6 | 1.0 | 16.0 | ns |
| | | | | 50 | — | 11.2 | 17.1 | 1.0 | 19.5 | |
| | t_{pHL} | | 5.0 ± 0.5 | 15 | — | 5.6 | 8.6 | 1.0 | 10.0 | |
| | | | | 50 | — | 7.1 | 10.6 | 1.0 | 12.0 | |
| Input Capacitance | C _{IN} | | | — | 4 | 10 | — | 10 | pF | |
| Power Dissipation Capacitance | C _{PD} | (Note 1) | | | — | 20 | — | — | — | pF |

Note 1: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

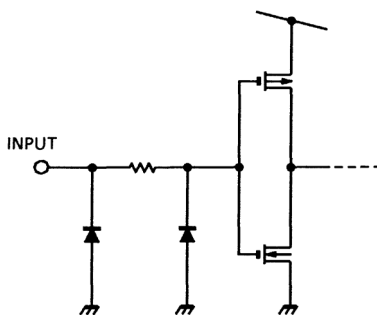
Average operating current can be obtained by the equation :

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

Noise Characteristics (Ta = 25°C, input: $t_r = t_f = 3$ ns)

| Characteristics | Symbol | Test Condition | VCC (V) | Typ. | Limit | Unit |
|--|------------------|------------------------|---------|------|-------|------|
| | | | | | | |
| Quiet output minimum dynamic V _{OL} | V _{OLV} | C _L = 50 pF | 5.0 | -0.3 | -0.8 | V |
| Minimum high level dynamic input voltage | V _{IHD} | C _L = 50 pF | 5.0 | — | 3.5 | V |
| Maximum low level dynamic input voltage | V _{ILD} | C _L = 50 pF | 5.0 | — | 1.5 | V |

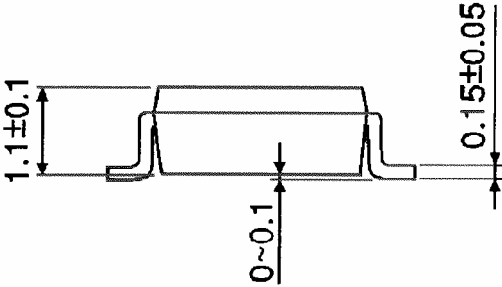
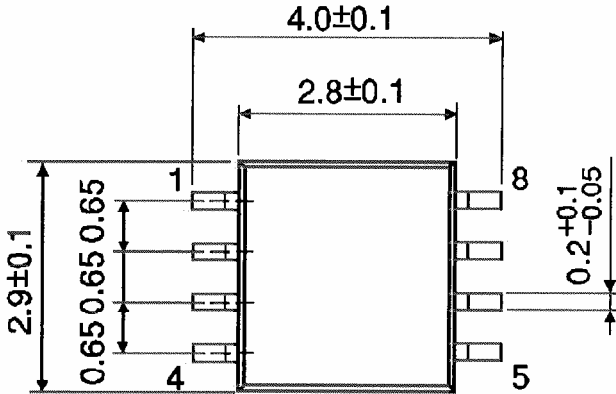
Input Equivalent Circuit



Package Dimensions

SSOP8-P-0.65

Unit : mm

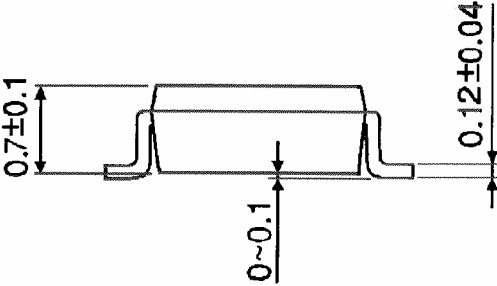
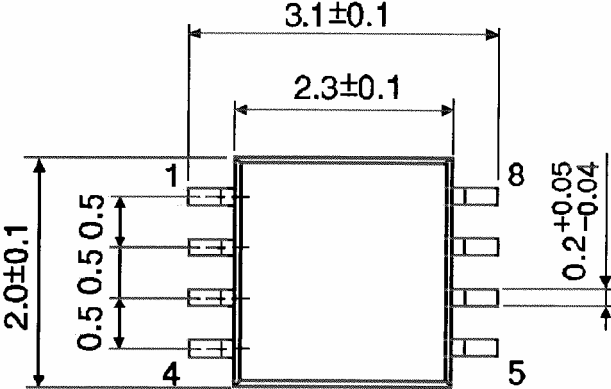


Weight: 0.02 g (typ.)

Package Dimensions

SSOP8-P-0.50A

Unit : mm



Weight: 0.01 g (typ.)

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20070701-EN GENERAL

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