

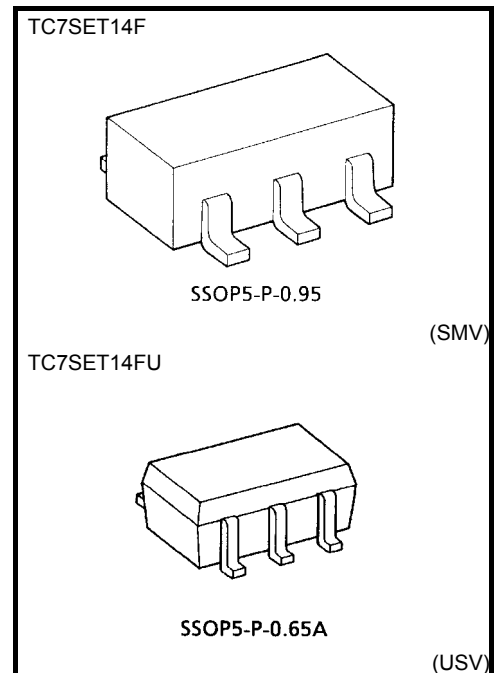
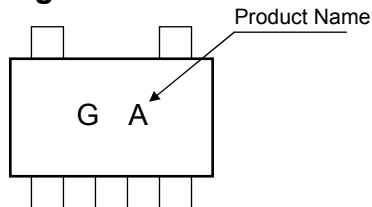
# TC7SET14F, TC7SET14FU

## Schmitt Inverter

### Features

- High speed .....  $t_{pd} = 5.0 \text{ ns (typ.)}$   
at  $V_{CC} = 5 \text{ V}$ ,  $C_L = 15 \text{ pF}$
- Low power dissipation .....  $I_{CC} = 2 \mu\text{A (max)}$  at  $T_a = 25^\circ\text{C}$
- Compatible with TTL outputs.
- 5.5V tolerant input.

### Marking

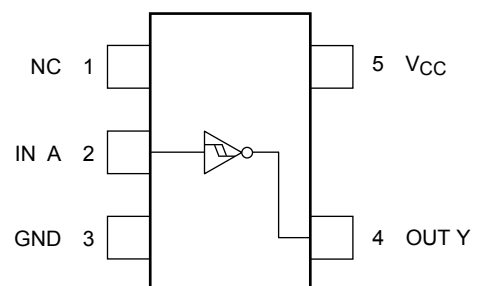


Weight  
 SSOP5-P-0.95 : 0.016 g (typ.)  
 SSOP5-P-0.65A : 0.006 g (typ.)

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

| Characteristics             | Symbol    | Rating                 | Unit             |
|-----------------------------|-----------|------------------------|------------------|
| Supply voltage              | $V_{CC}$  | -0.5 to 7.0            | V                |
| DC input voltage            | $V_{IN}$  | -0.5 to 7.0            | V                |
| DC output voltage           | $V_{OUT}$ | -0.5 to $V_{CC} + 0.5$ | V                |
| Input diode current         | $I_{IK}$  | -20                    | mA               |
| Output diode current        | $I_{OK}$  | $\pm 20$ (Note 1)      | mA               |
| DC output current           | $I_{OUT}$ | $\pm 25$               | mA               |
| DC $V_{CC}$ /ground current | $I_{CC}$  | $\pm 50$               | mA               |
| Power dissipation           | $P_D$     | 200                    | mW               |
| Storage temperature         | $T_{stg}$ | -65 to 150             | $^\circ\text{C}$ |
| Lead temperature (10 s)     | $T_L$     | 260                    | $^\circ\text{C}$ |

### Pin Assignment (top view)

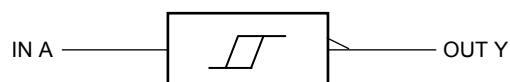


Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

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

## IEC Logic Symbol



## Truth Table

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

## Operating Ranges

| Characteristics       | Symbol    | Rating        | Unit |
|-----------------------|-----------|---------------|------|
| Supply voltage        | $V_{CC}$  | 4.5 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   |

## Electrical Characteristics

### DC Characteristics

| Characteristics            | Symbol    | Test Condition                                                                | $V_{CC}$<br>(V)            | $T_a = 25^{\circ}\text{C}$ |      |           | $T_a = -40 \text{ to } 85^{\circ}\text{C}$ |           | Unit          |
|----------------------------|-----------|-------------------------------------------------------------------------------|----------------------------|----------------------------|------|-----------|--------------------------------------------|-----------|---------------|
|                            |           |                                                                               |                            | Min                        | Typ. | Max       | Min                                        | Max       |               |
| Positive Threshold Voltage | $V_P$     | —                                                                             | 4.5                        | —                          | —    | 1.90      | —                                          | 1.90      | V             |
|                            |           |                                                                               | 5.5                        | —                          | —    | 2.10      | —                                          | 2.10      |               |
| Negative Threshold Voltage | $V_N$     | —                                                                             | 4.5                        | 0.50                       | —    | —         | 0.50                                       | —         |               |
|                            |           |                                                                               | 5.5                        | 0.60                       | —    | —         | 0.60                                       | —         |               |
| Hysteresis Voltage         | $V_H$     | —                                                                             | 4.5                        | 0.40                       | —    | 1.40      | 0.40                                       | 1.40      | V             |
|                            |           |                                                                               | 5.5                        | 0.40                       | —    | 1.50      | 0.40                                       | 1.50      |               |
| High-level output voltage  | $V_{OH}$  | $V_{IN} = V_{IL}$                                                             | $I_{OH} = -50 \mu\text{A}$ | 4.5                        | 4.4  | 4.5       | —                                          | 4.4       | V             |
|                            |           |                                                                               | $I_{OH} = -8 \text{ mA}$   | 4.5                        | 3.94 | —         | —                                          | 3.80      |               |
| Low-level output voltage   | $V_{OL}$  | $V_{IN} = V_{IH}$                                                             | $I_{OL} = 50 \mu\text{A}$  | 4.5                        | —    | 0.0       | 0.10                                       | —         |               |
|                            |           |                                                                               | $I_{OL} = 8 \text{ mA}$    | 4.5                        | —    | —         | 0.36                                       | 0.44      |               |
| Input leakage current      | $I_{IN}$  | $V_{IN} = 5.5 \text{ V or GND}$                                               | 0 to 5.5                   | —                          | —    | $\pm 0.1$ | —                                          | $\pm 1.0$ | $\mu\text{A}$ |
| Quiescent supply current   | $I_{CC}$  | $V_{IN} = V_{CC} \text{ or GND}$                                              | 5.5                        | —                          | —    | 2.0       | —                                          | 20.0      | $\mu\text{A}$ |
|                            | $I_{CCT}$ | Per Input : $V_{IN} = 3.4 \text{ V}$<br>Other Input : $V_{CC} \text{ or GND}$ | 5.5                        | —                          | —    | 1.35      | —                                          | 1.50      | mA            |

**AC Characteristics (input:  $t_r = t_f = 3\text{ ns}$ )**

| Characteristics               | Symbol                               | Test Condition      |                     | Ta = 25°C |      |     | Ta = -40 to 85°C |      | Unit |
|-------------------------------|--------------------------------------|---------------------|---------------------|-----------|------|-----|------------------|------|------|
|                               |                                      | V <sub>CC</sub> (V) | C <sub>L</sub> (pF) | Min       | Typ. | Max | Min              | Max  |      |
| Propagation delay time        | t <sub>pLH</sub><br>t <sub>pHL</sub> | 5.0 ± 0.5           | 15                  | —         | 5.0  | 7.6 | 1.0              | 9.0  | ns   |
|                               |                                      |                     | 50                  | —         | 6.5  | 9.6 | 1.0              | 11.0 |      |
| Input capacitance             | C <sub>IN</sub>                      |                     |                     | —         | 4    | 10  | —                | 10   | pF   |
| Power dissipation capacitance | C <sub>PD</sub>                      | (Note 2)            |                     | —         | 18   | —   | —                | —    | pF   |

Note 2: C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

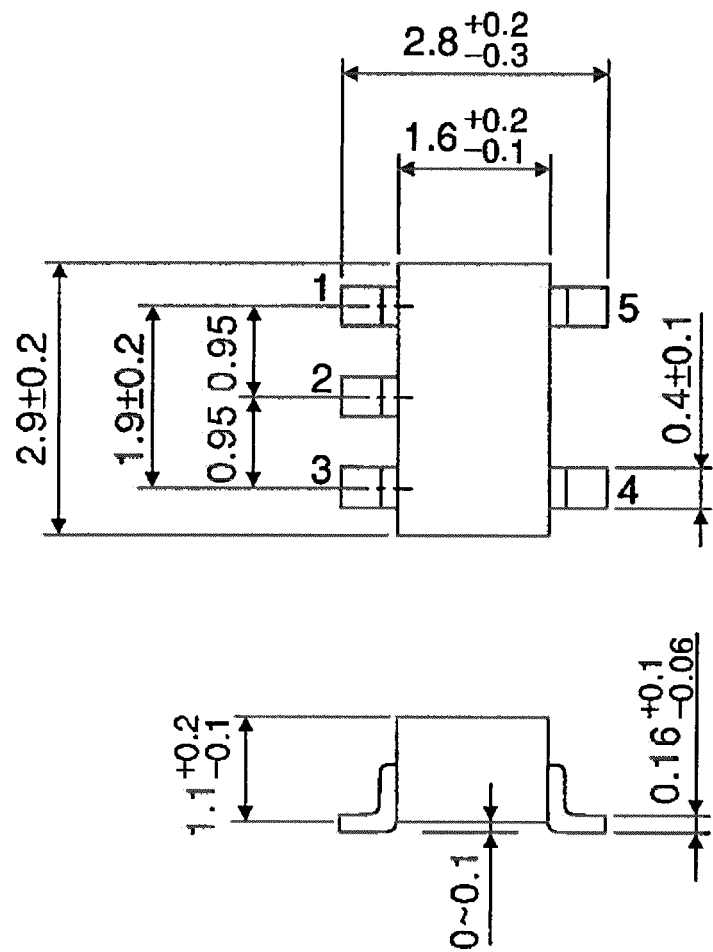
Average operating current can be obtained by the equation:

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

Package Dimensions

SSOP5-P-0.95

Unit : mm

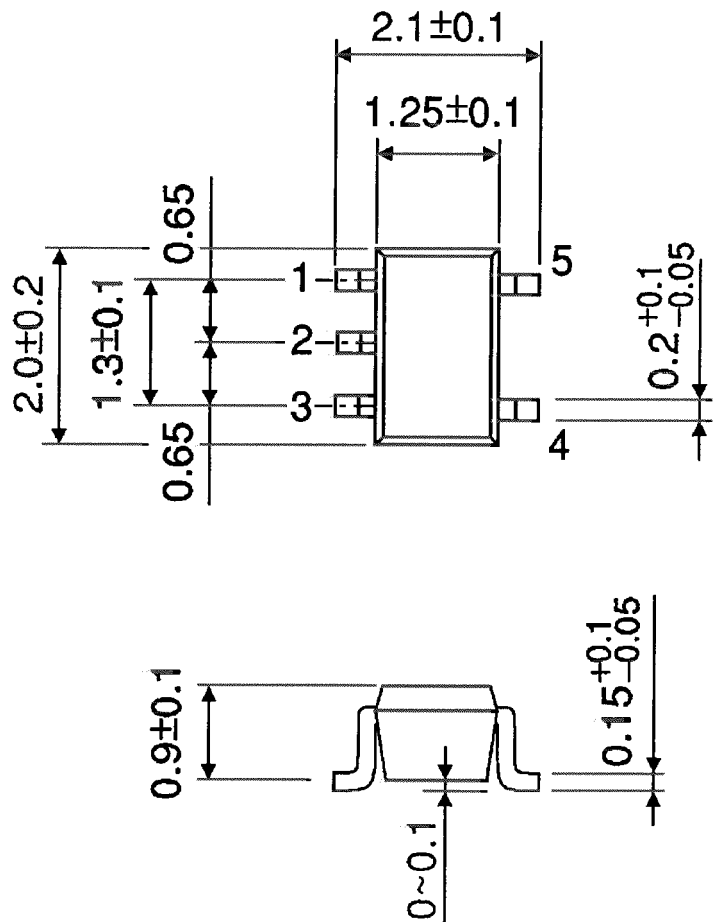


Weight: 0.016 g (typ.)

Package Dimensions

SSOP5-P-0.65A

Unit : mm



Weight: 0.006 g (typ.)

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