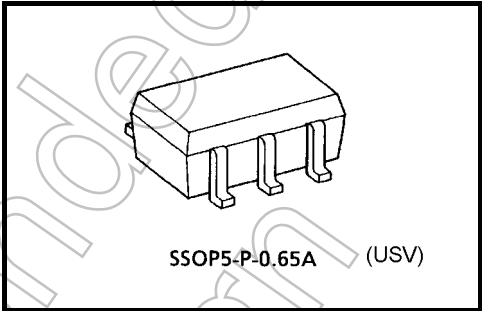


TC7SG14FU

Schmitt Inverter

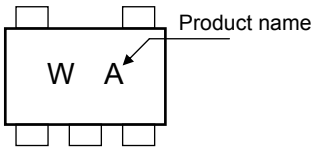
Features

- High output current : $\pm 8\text{ mA}$ (min) at $V_{CC} = 3\text{ V}$
- Super high speed operation : $t_{pd} = 3.7\text{ ns}$ (typ.)
at $V_{CC} = 3.3\text{ V}$, 15 pF
- Operating voltage range : $V_{CC} = 0.9\text{ to }3.6\text{ V}$
- 5.5-V tolerant input.
- 3.6-V power down protection output.

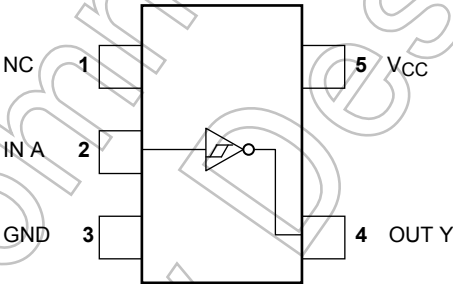


Weight: 0.006 g (typ.)

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 4.6 | V |
| DC input voltage | V_{IN} | -0.5 to 7.0 | V |
| DC output voltage | V_{OUT} | -0.5 to 4.6 (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} | ± 25 | mA |
| DC V_{CC} /ground current | I_{CC} | ± 50 | mA |
| Power dissipation | P_D | 200 | 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).

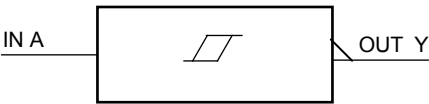
Note 1: $V_{CC} = 0\text{ V}$

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

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

Start of commercial production
2005-08

IEC Logic Symbol



Truth Table

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

Operating Ranges

| Characteristics | Symbol | Rating | Unit |
|-----------------------|----------------------------------|-------------------------------|------|
| Supply voltage | V _{CC} | 0.9 to 3.6 | V |
| Input voltage | V _{IN} | 0 to 5.5 | V |
| Output voltage | V _{OUT} | 0 to 3.6 (Note 4) | V |
| | | 0 to V _{CC} (Note 5) | |
| Output Current | I _{OH} /I _{OL} | ± 8.0 (Note 6) | mA |
| | | ± 4.0 (Note 7) | |
| | | ± 3.0 (Note 8) | |
| | | ± 1.7 (Note 9) | |
| | | ± 0.3 (Note 10) | |
| | | ± 0.02 (Note 11) | |
| Operating temperature | T _{opr} | −40 to 85 | °C |

- Note 4: V_{CC} = 0V
Note 5: High or Low state.
Note 6: V_{CC} = 3.0 to 3.6 V
Note 7: V_{CC} = 2.3 to 2.7 V
Note 8: V_{CC} = 1.65 to 1.95 V
Note 9: V_{CC} = 1.4 to 1.6 V
Note 10: V_{CC} = 1.1 to 1.3 V
Note 11: V_{CC} = 0.9 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 | |
| Threshold voltage | Positive threshold voltage | VP | — | 0.9 | — | — | 0.73 | — | 0.80 | V | |
| | | | | 1.1 | — | — | 0.86 | — | 0.93 | | |
| | | | | 1.4 | — | — | 1.07 | — | 1.12 | | |
| | | | | 1.65 | — | — | 1.23 | — | 1.25 | | |
| | | | | 2.3 | — | — | 1.66 | — | 1.68 | | |
| | | | | 3.0 | — | — | 2.14 | — | 2.15 | | |
| | Negative threshold voltage | VN | — | 0.9 | 0.18 | — | — | 0.07 | — | | |
| | | | | 1.1 | 0.26 | — | — | 0.18 | — | | |
| | | | | 1.4 | 0.36 | — | — | 0.31 | — | | |
| | | | | 1.65 | 0.45 | — | — | 0.41 | — | | |
| | | | | 2.3 | 0.69 | — | — | 0.64 | — | | |
| | | | | 3.0 | 0.96 | — | — | 0.91 | — | | |
| Hysteresis voltage | | VH | — | 0.9 | 0.20 | — | 0.38 | 0.15 | 0.53 | V | |
| | | | | 1.1 | 0.25 | — | 0.41 | 0.21 | 0.53 | | |
| | | | | 1.4 | 0.35 | — | 0.48 | 0.34 | 0.57 | | |
| | | | | 1.65 | 0.42 | — | 0.56 | 0.40 | 0.60 | | |
| | | | | 2.3 | 0.60 | — | 0.74 | 0.61 | 0.76 | | |
| | | | | 3.0 | 0.79 | — | 0.93 | 0.80 | 0.94 | | |
| Output voltage | High level | VOH | VIN=VIL | IOH = -0.02 mA | 0.9 | 0.75 | — | — | 0.75 | — | V |
| | | | | IOH = -0.3 mA | 1.1 to 1.3 | VCC × 0.75 | — | — | VCC × 0.75 | — | |
| | | | | IOH = -1.7 mA | 1.4 to 1.6 | VCC × 0.75 | — | — | VCC × 0.75 | — | |
| | | | | IOH = -3.0 mA | 1.65 to 1.95 | VCC -0.45 | — | — | VCC -0.45 | — | |
| | | | | IOH = -4.0 mA | 2.3 to 2.7 | 2.0 | — | — | 2.0 | — | |
| | | | | IOH = -8.0 mA | 3.0 to 3.6 | 2.48 | — | — | 2.48 | — | |
| | Low level | VOL | VIN=VIH | IOL = 0.02 mA | 0.9 | — | — | 0.1 | — | 0.1 | |
| | | | | IOL = 0.3 mA | 1.1 to 1.3 | — | — | VCC × 0.25 | — | VCC × 0.25 | |
| | | | | IOL = 1.7 mA | 1.4 to 1.6 | — | — | VCC × 0.25 | — | VCC × 0.25 | |
| | | | | IOL = 3.0 mA | 1.65 to 1.95 | — | — | 0.45 | — | 0.45 | |
| | | | | IOL = 4.0 mA | 2.3 to 2.7 | — | — | 0.4 | — | 0.4 | |
| | | | | IOL = 8.0 mA | 3.0 to 3.6 | — | — | 0.4 | — | 0.4 | |
| Input leakage current | | IIN | VIN = 0 to 5.5 V | 0 to 3.6 | — | — | ±0.1 | — | ±1.0 | μA | |
| Power off leakage current | | IOFF | VIN = 0 to 5.5 V VOUT = 0 to 3.6 V | 0 | — | — | 1.0 | — | 10.0 | μA | |
| Quiescent supply current | | ICC | VIN = VCC or GND | 3.6 | — | — | 1.0 | — | 10.0 | 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 |
|-------------------------------|------------------------|--|---------------------|-----|------|------------------|-----|------|
| | | | V _{CC} (V) | Min | Typ. | Max | Min | Max |
| Propagation delay time | t_{pLH} t_{pHL} | $C_L = 10$ pF, $R_L = 1$ M Ω | 0.9 | — | 27.3 | — | — | — |
| | | | 1.1 to 1.3 | — | 13.0 | 22.6 | 1.0 | 35.9 |
| | | | 1.4 to 1.6 | — | 7.5 | 10.5 | 1.0 | 11.3 |
| | | | 1.65 to 1.95 | — | 6.0 | 7.8 | 1.0 | 8.2 |
| | | | 2.3 to 2.7 | — | 4.3 | 5.4 | 1.0 | 5.8 |
| | | | 3.0 to 3.6 | — | 3.5 | 4.4 | 1.0 | 4.6 |
| | | $C_L = 15$ pF, $R_L = 1$ M Ω | 0.9 | — | 29.5 | — | — | — |
| | | | 1.1 to 1.3 | — | 14.3 | 25.1 | 1.0 | 41.8 |
| | | | 1.4 to 1.6 | — | 8.0 | 11.5 | 1.0 | 12.6 |
| | | | 1.65 to 1.95 | — | 6.3 | 8.4 | 1.0 | 8.7 |
| | | | 2.3 to 2.7 | — | 4.6 | 5.7 | 1.0 | 6.1 |
| | | | 3.0 to 3.6 | — | 3.7 | 4.6 | 1.0 | 5.0 |
| | | $C_L = 30$ pF, $R_L = 1$ M Ω | 0.9 | — | 40.5 | — | — | — |
| | | | 1.1 to 1.3 | — | 19.6 | 35.7 | 1.0 | 58.1 |
| | | | 1.4 to 1.6 | — | 10.7 | 15.8 | 1.0 | 17.6 |
| | | | 1.65 to 1.95 | — | 7.8 | 10.7 | 1.0 | 11.7 |
| | | | 2.3 to 2.7 | — | 5.4 | 6.9 | 1.0 | 8.1 |
| | | | 3.0 to 3.6 | — | 4.3 | 5.2 | 1.0 | 6.1 |
| Input capacitance | C_{IN} | — | 3.6 | — | 3 | — | — | pF |
| Power dissipation capacitance | C_{PD} | (Note 12) | 0.9 to 3.6 | — | 7 | — | — | pF |

Note 12: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

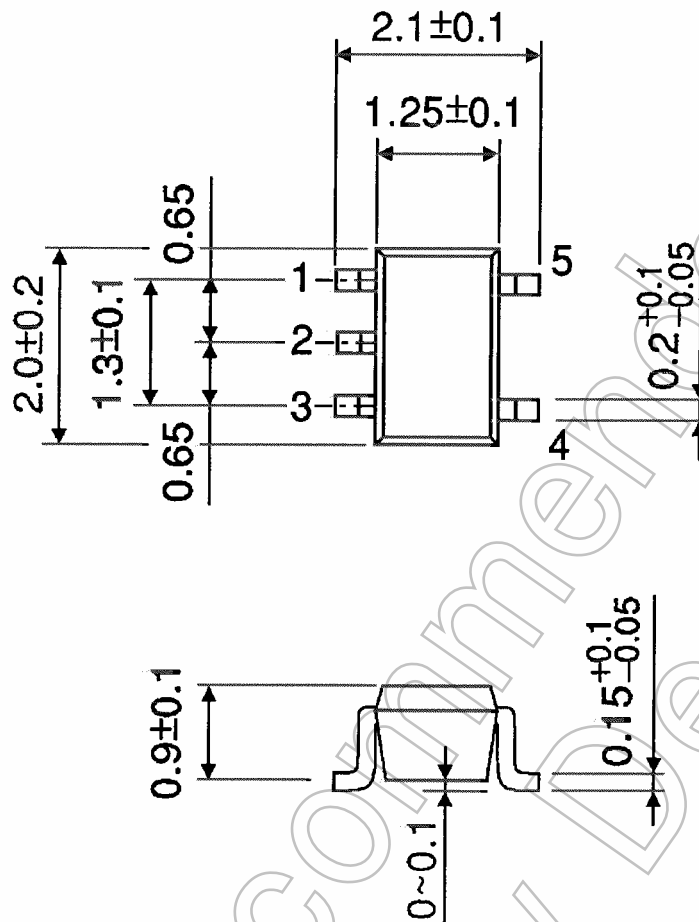
Average operating current can be obtained by the equation:

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

Package Dimensions

SSOP5-P-0.65A

Unit : mm



Weight: 0.006 g (typ.)

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