

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

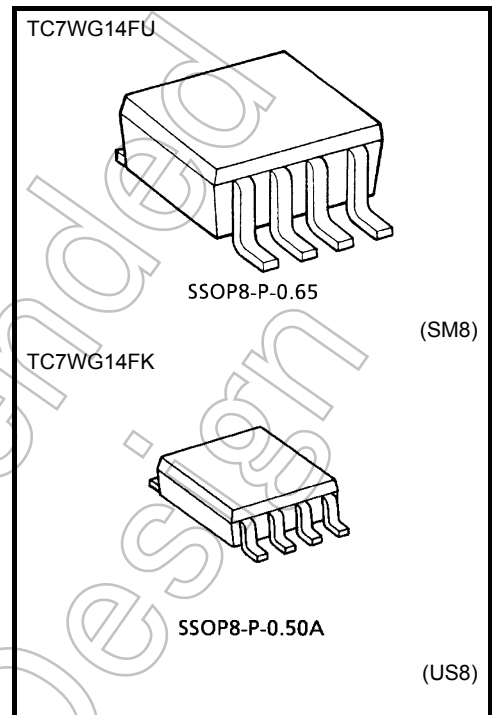
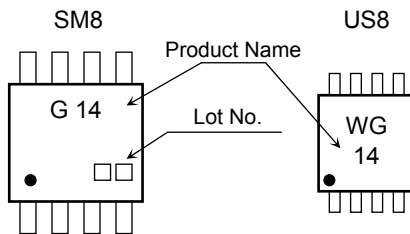
TC7WG14FU, TC7WG14FK

Triple Schmitt Inverter

Features

- High output current : ± 8 mA (min) at $V_{CC} = 3$ V
- Super high speed operation: $t_{pd} = 4.0$ ns (typ.)
at $V_{CC} = 3.3$ V, 15pF
- Operating voltage range : $V_{CC} = 0.9$ to 3.6 V
- 5.5-V tolerant inputs
- 3.6-V power down protection outputs

Marking

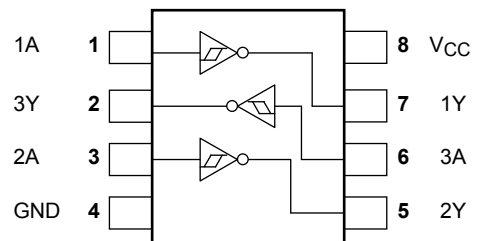


Weight
 SSOP8-P-0.65 : 0.02 g (typ.)
 SSOP8-P-0.50A : 0.01 g (typ.)

Absolute Maximum Ratings (Ta = 25°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 (Note1) | V |
| | | -0.5 to $V_{CC}+0.5$ (Note2) | |
| Input diode current | I_{IK} | -20 | mA |
| Output diode current | I_{OK} | -20 (Note3) | mA |
| DC output current | I_{OUT} | ± 25 | mA |
| DC V_{CC}/GND current | I_{CC} | ± 50 | mA |
| Power dissipation | P_D | 300 (SM8) | mW |
| | | 200 (US8) | |
| 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).

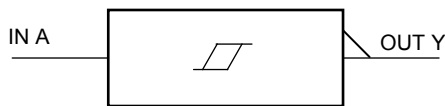
Note 1: $V_{CC} = 0$ V

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

Note 3: $V_{OUT} < GND$

Start of commercial production
2006-02

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 | $^{\circ}C$ |

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 | | | |
|---------------------------|----------------------------|--|-----------------------------------|----------------------------|--------------|------------------------|------|------------------------|------------------------|------------------------|---|
| | | | V _{CC} (V) | Min | Typ. | Max | Min | | Max | | |
| Threshold Voltage | Positive threshold voltage | V _P | — | 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 | V _N | — | 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 | V _H | — | 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 | 0.60 | 0.76 | | | |
| | | | 3.0 | 0.79 | — | 0.93 | 0.79 | 0.94 | | | |
| Output voltage | High level | V _{OH} | V _{IN} = V _{IL} | I _{OH} = -0.02 mA | 0.9 | 0.75 | — | — | 0.75 | — | V |
| | | | | I _{OH} = -0.3 mA | 1.1 to 1.3 | V _{CC} × 0.75 | — | — | V _{CC} × 0.75 | — | |
| | | | | I _{OH} = -1.7 mA | 1.4 to 1.6 | V _{CC} × 0.75 | — | — | V _{CC} × 0.75 | — | |
| | | | | I _{OH} = -3.0 mA | 1.65 to 1.95 | V _{CC} - 0.45 | — | — | V _{CC} - 0.45 | — | |
| | | | | I _{OH} = -4.0 mA | 2.3 to 2.7 | 2.0 | — | — | 2.0 | — | |
| | | | | I _{OH} = -8.0 mA | 3.0 to 3.6 | 2.48 | — | — | 2.48 | — | |
| | Low level | V _{OL} | V _{IN} = V _{IH} | I _{OL} = 0.02 mA | 0.9 | — | — | 0.1 | — | 0.1 | |
| | | | | I _{OL} = 0.3 mA | 1.1 to 1.3 | — | — | V _{CC} × 0.25 | — | V _{CC} × 0.25 | |
| | | | | I _{OL} = 1.7 mA | 1.4 to 1.6 | — | — | V _{CC} × 0.25 | — | V _{CC} × 0.25 | |
| | | | | I _{OL} = 3.0 mA | 1.65 to 1.95 | — | — | 0.45 | — | 0.45 | |
| | | | | I _{OL} = 4.0 mA | 2.3 to 2.7 | — | — | 0.4 | — | 0.4 | |
| | | | | I _{OL} = 8.0 mA | 3.0 to 3.6 | — | — | 0.4 | — | 0.4 | |
| Input leakage current | I _{IN} | V _{IN} = 0 to 5.5 V | 0 to 3.6 | — | — | ±0.1 | — | ±1.0 | μA | | |
| Power off leakage current | I _{OFF} | V _{IN} = 0 to 5.5 V or V _{OUT} = 0 to 3.6 V | 0 | — | — | 1.0 | — | 10.0 | μA | | |
| Quiescent supply current | I _{CC} | V _{IN} = V _{CC} 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 | — | 41.3 | — | — | ns | |
| | | | 1.1 to 1.3 | — | 18.0 | 25.4 | 1.0 | | 40.8 |
| | | | 1.4 to 1.6 | — | 9.5 | 12.2 | 1.0 | | 13.5 |
| | | | 1.65 to 1.95 | — | 7.0 | 8.7 | 1.0 | | 9.3 |
| | | | 2.3 to 2.7 | — | 4.7 | 5.7 | 1.0 | | 6.2 |
| | | | 3.0 to 3.6 | — | 3.7 | 4.5 | 1.0 | | 4.7 |
| | | $C_L = 15$ pF, $R_L = 1$ M Ω | 0.9 | — | 44.4 | — | — | | — |
| | | | 1.1 to 1.3 | — | 19.3 | 27.7 | 1.0 | | 46.9 |
| | | | 1.4 to 1.6 | — | 10.2 | 13.1 | 1.0 | | 14.7 |
| | | | 1.65 to 1.95 | — | 7.5 | 9.3 | 1.0 | | 9.9 |
| | | | 2.3 to 2.7 | — | 5.0 | 5.9 | 1.0 | | 6.4 |
| | | | 3.0 to 3.6 | — | 4.0 | 4.8 | 1.0 | | 5.2 |
| | | $C_L = 30$ pF, $R_L = 1$ M Ω | 0.9 | — | 55.8 | — | — | | — |
| | | | 1.1 to 1.3 | — | 24.7 | 36.3 | 1.0 | | 59.6 |
| | | | 1.4 to 1.6 | — | 12.9 | 16.8 | 1.0 | | 19.2 |
| | | | 1.65 to 1.95 | — | 9.2 | 11.5 | 1.0 | | 12.9 |
| | | | 2.3 to 2.7 | — | 5.9 | 7.1 | 1.0 | | 8.3 |
| | | | 3.0 to 3.6 | — | 4.9 | 5.7 | 1.0 | | 6.6 |
| Input capacitance | C_{IN} | — | 3.6 | — | 3 | — | — | pF | |
| Power dissipation capacitance | C_{PD} | (Note 12) | 0.9 to 3.6 | — | 11 | — | — | — | 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.

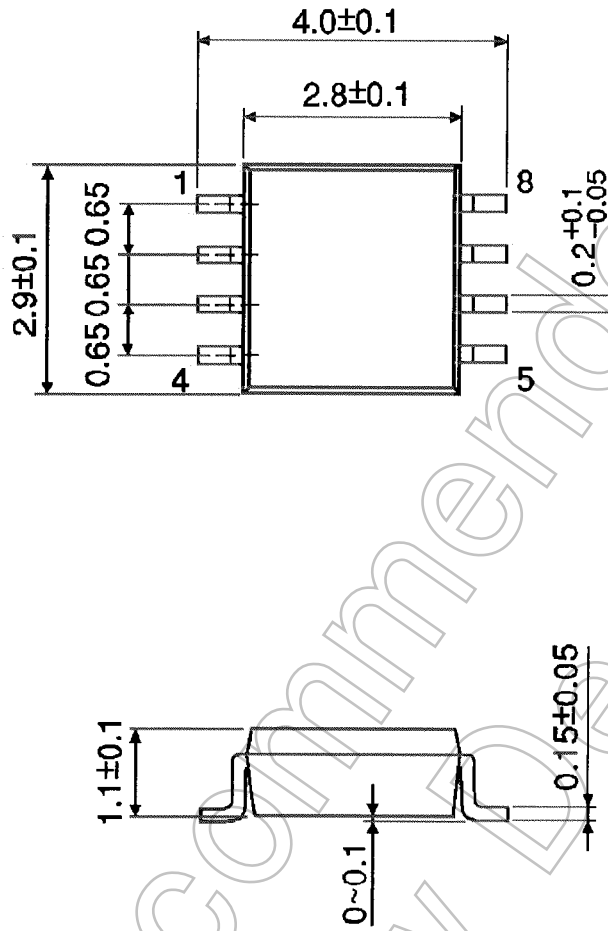
Average operating current can be obtained by the equation:

$$I_{CC}(\text{opr.}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/3$$

Package Dimensions

SSOP8-P-0.65

Unit : mm



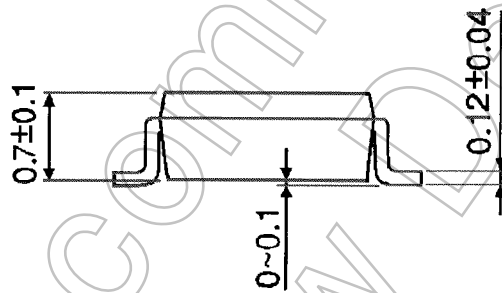
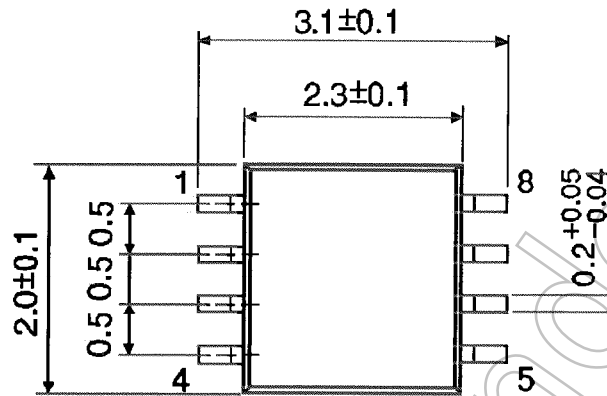
Weight: 0.02 g (typ.)

Not Recommended for New Design

Package Dimensions

SSOP8-P-0.50A

Unit : mm



Weight: 0.01 g (typ.)

Not Recommended for New Design

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