

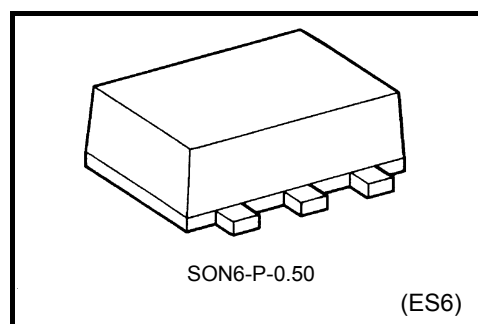
TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

# TC7PG34AFE

Dual NON-Inverter

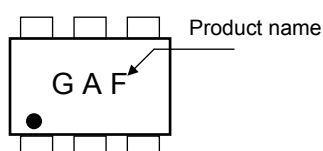
## Features

- High output current :  $\pm 8$  mA (min) at  $V_{CC} = 3$  V
- Super high speed operation :  $t_{pd} = 2.8$  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

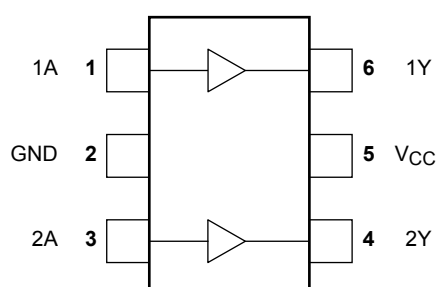


Weight: 0.003 g (typ.)

## 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 4.6            | 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 $V_{CC}$ /GND current | $I_{CC}$  | $\pm 100$              | 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).

Note 1:  $V_{OUT} < GND$ ,  $V_{OUT} > V_{CC}$

IEC Logic Symbol



Truth Table

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

Operating Ranges

| Characteristics          | Symbol                           | Rating               | Unit |
|--------------------------|----------------------------------|----------------------|------|
| Supply voltage           | V <sub>CC</sub>                  | 0.9 to 3.6           | V    |
| Input voltage            | V <sub>IN</sub>                  | 0 to 5.5             | V    |
| Output voltage           | V <sub>OUT</sub>                 | 0 to V <sub>CC</sub> | V    |
| Output Current           | I <sub>OH</sub> /I <sub>OL</sub> | ±8.0 (Note 2)        | mA   |
|                          |                                  | ±4.0 (Note 3)        |      |
|                          |                                  | ±3.0 (Note 4)        |      |
|                          |                                  | ±1.7 (Note 5)        |      |
|                          |                                  | ±0.3 (Note 6)        |      |
|                          |                                  | ±0.02 (Note 7)       |      |
| Operating temperature    | T <sub>opr</sub>                 | −40 to 85            | °C   |
| Input rise and fall time | dt/dv                            | 0 to 10 (Note 8)     | ns/V |

Note 2: V<sub>CC</sub> = 3.0 to 3.6 V

Note 3: V<sub>CC</sub> = 2.3 to 2.7 V

Note 4: V<sub>CC</sub> = 1.65 to 1.95 V

Note 5: V<sub>CC</sub> = 1.4 to 1.6 V

Note 6: V<sub>CC</sub> = 1.1 to 1.3 V

Note 7: V<sub>CC</sub> = 0.9 V

Note 8: V<sub>IN</sub> = 0.8 to 2.0 V, V<sub>CC</sub> = 3.0 V

## Electrical Characteristics

## DC Electrical Characteristics

| Characteristics           | Symbol          | Test Condition                           |                            | Ta = 25°C           |                        |      |                        | Ta = -40 to 85°C       |                        | Unit |
|---------------------------|-----------------|------------------------------------------|----------------------------|---------------------|------------------------|------|------------------------|------------------------|------------------------|------|
|                           |                 |                                          |                            | V <sub>CC</sub> (V) | Min                    | Typ. | Max                    | Min                    | Max                    |      |
| High-level input voltage  | V <sub>IH</sub> | —                                        |                            | 0.9                 | V <sub>CC</sub>        | —    | —                      | V <sub>CC</sub>        | —                      | V    |
|                           |                 |                                          |                            | 1.1 to 1.3          | V <sub>CC</sub> × 0.7  | —    | —                      | V <sub>CC</sub> × 0.7  | —                      |      |
|                           |                 |                                          |                            | 1.4 to 1.6          | V <sub>CC</sub> × 0.65 | —    | —                      | V <sub>CC</sub> × 0.65 | —                      |      |
|                           |                 |                                          |                            | 1.65 to 1.95        | V <sub>CC</sub> × 0.65 | —    | —                      | V <sub>CC</sub> × 0.65 | —                      |      |
|                           |                 |                                          |                            | 2.3 to 2.7          | 1.7                    | —    | —                      | 1.7                    | —                      |      |
|                           |                 |                                          |                            | 3.0 to 3.6          | 2.0                    | —    | —                      | 2.0                    | —                      |      |
| Low-level input voltage   | V <sub>IL</sub> | —                                        |                            | 0.9                 | —                      | —    | GND                    | —                      | GND                    | V    |
|                           |                 |                                          |                            | 1.1 to 1.3          | —                      | —    | V <sub>CC</sub> × 0.3  | —                      | V <sub>CC</sub> × 0.3  |      |
|                           |                 |                                          |                            | 1.4 to 1.6          | —                      | —    | V <sub>CC</sub> × 0.35 | —                      | V <sub>CC</sub> × 0.35 |      |
|                           |                 |                                          |                            | 1.65 to 1.95        | —                      | —    | V <sub>CC</sub> × 0.35 | —                      | V <sub>CC</sub> × 0.35 |      |
|                           |                 |                                          |                            | 2.3 to 2.7          | —                      | —    | 0.7                    | —                      | 0.7                    |      |
|                           |                 |                                          |                            | 3.0 to 3.6          | —                      | —    | 0.8                    | —                      | 0.8                    |      |
| High-level output voltage | V <sub>OH</sub> | V <sub>IN</sub> = V <sub>IH</sub>        | I <sub>OH</sub> = -0.02 mA | 0.9                 | 0.75                   | —    | —                      | 0.75                   | —                      | V    |
|                           |                 |                                          | I <sub>OH</sub> = -0.3 mA  | 1.1 to 1.3          | V <sub>CC</sub> × 0.75 | —    | —                      | V <sub>CC</sub> × 0.75 | —                      |      |
|                           |                 |                                          | I <sub>OH</sub> = -1.7 mA  | 1.4 to 1.6          | V <sub>CC</sub> × 0.75 | —    | —                      | V <sub>CC</sub> × 0.75 | —                      |      |
|                           |                 |                                          | I <sub>OH</sub> = -3.0 mA  | 1.65 to 1.95        | V <sub>CC</sub> -0.45  | —    | —                      | V <sub>CC</sub> -0.45  | —                      |      |
|                           |                 |                                          | I <sub>OH</sub> = -4.0 mA  | 2.3 to 2.7          | 2.0                    | —    | —                      | 2.0                    | —                      |      |
|                           |                 |                                          | I <sub>OH</sub> = -8.0 mA  | 3.0 to 3.6          | 2.48                   | —    | —                      | 2.48                   | —                      |      |
| Low-level output voltage  | V <sub>OL</sub> | V <sub>IN</sub> = V <sub>IL</sub>        | I <sub>OL</sub> = 0.02 mA  | 0.9                 | —                      | —    | 0.1                    | —                      | 0.1                    | V    |
|                           |                 |                                          | I <sub>OL</sub> = 0.3 mA   | 1.1 to 1.3          | —                      | —    | V <sub>CC</sub> × 0.25 | —                      | V <sub>CC</sub> × 0.25 |      |
|                           |                 |                                          | I <sub>OL</sub> = 1.7 mA   | 1.4 to 1.6          | —                      | —    | V <sub>CC</sub> × 0.25 | —                      | V <sub>CC</sub> × 0.25 |      |
|                           |                 |                                          | I <sub>OL</sub> = 3.0 mA   | 1.65 to 1.95        | —                      | —    | 0.45                   | —                      | 0.45                   |      |
|                           |                 |                                          | I <sub>OL</sub> = 4.0 mA   | 2.3 to 2.7          | —                      | —    | 0.4                    | —                      | 0.4                    |      |
|                           |                 |                                          | I <sub>OL</sub> = 8.0 mA   | 3.0 to 3.6          | —                      | —    | 0.4                    | —                      | 0.4                    |      |
| Input leakage current     | I <sub>IN</sub> | V <sub>IN</sub> = 0 to 5.5V              |                            | 0 to 3.6            | —                      | —    | ±0.1                   | —                      | ±1.0                   | μA   |
| Quiescent supply current  | I <sub>CC</sub> | V <sub>IN</sub> = V <sub>CC</sub> 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 <sub>CC</sub> (V) | Min | Typ. | Max              | Min | Max  |
| Propagation delay time        | $t_{pLH}$<br>$t_{pHL}$ | $C_L = 10$ pF,<br>$R_L = 1$ M $\Omega$ | 0.9                 | —   | 27.2 | —                | —   | —    |
|                               |                        |                                        | 1.1 to 1.3          | —   | 12.2 | 23.2             | 1.0 | 42.6 |
|                               |                        |                                        | 1.4 to 1.6          | —   | 6.5  | 10.2             | 1.0 | 12.0 |
|                               |                        |                                        | 1.65 to 1.95        | —   | 4.7  | 7.0              | 1.0 | 7.6  |
|                               |                        |                                        | 2.3 to 2.7          | —   | 3.1  | 4.4              | 1.0 | 4.9  |
|                               |                        |                                        | 3.0 to 3.6          | —   | 2.4  | 3.5              | 1.0 | 4.1  |
|                               |                        | $C_L = 15$ pF,<br>$R_L = 1$ M $\Omega$ | 0.9                 | —   | 29.8 | —                | —   | —    |
|                               |                        |                                        | 1.1 to 1.3          | —   | 13.5 | 26.0             | 1.0 | 44.5 |
|                               |                        |                                        | 1.4 to 1.6          | —   | 7.2  | 11.4             | 1.0 | 13.6 |
|                               |                        |                                        | 1.65 to 1.95        | —   | 5.2  | 7.5              | 1.0 | 7.7  |
|                               |                        |                                        | 2.3 to 2.7          | —   | 3.4  | 4.8              | 1.0 | 5.5  |
|                               |                        |                                        | 3.0 to 3.6          | —   | 2.8  | 3.8              | 1.0 | 4.4  |
|                               |                        | $C_L = 30$ pF,<br>$R_L = 1$ M $\Omega$ | 0.9                 | —   | 40.7 | —                | —   | —    |
|                               |                        |                                        | 1.1 to 1.3          | —   | 17.8 | 33.9             | 1.0 | 64.1 |
|                               |                        |                                        | 1.4 to 1.6          | —   | 9.1  | 14.3             | 1.0 | 17.4 |
|                               |                        |                                        | 1.65 to 1.95        | —   | 6.6  | 9.8              | 1.0 | 10.2 |
|                               |                        |                                        | 2.3 to 2.7          | —   | 4.1  | 6.2              | 1.0 | 6.6  |
|                               |                        |                                        | 3.0 to 3.6          | —   | 3.3  | 4.8              | 1.0 | 5.2  |
| Input capacitance             | C <sub>IN</sub>        | —                                      | 3.6                 | —   | 3    | —                | —   | pF   |
| Power dissipation capacitance | C <sub>PD</sub>        | (Note 9)                               | 0.9 to 3.6          | —   | 6    | —                | —   | pF   |

Note 9: C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

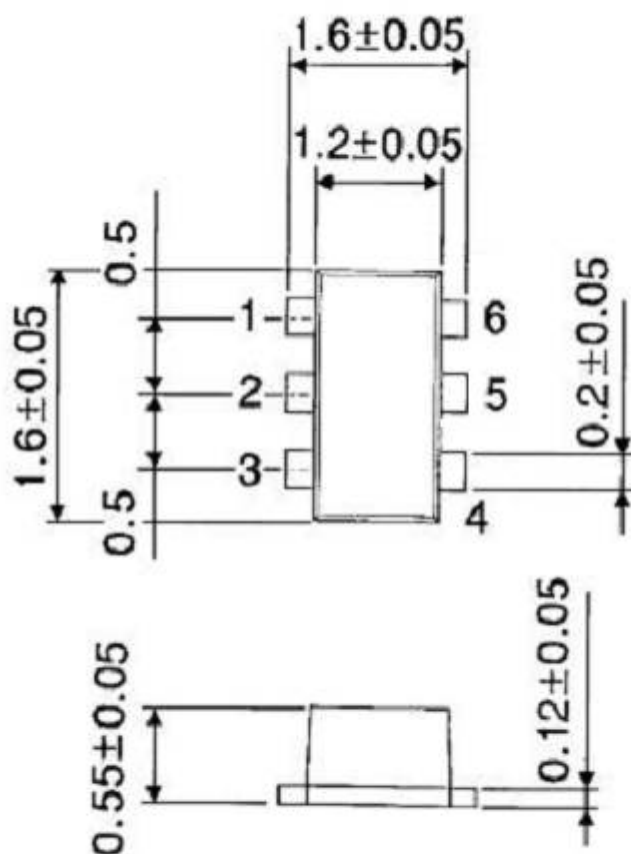
Average operating current can be obtained by the equation:

$$I_{CC}(\text{opr.}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/2$$

## Package Dimensions

SON6-P-0.50

Unit : mm



Weight: 0.003 g (typ.)

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