

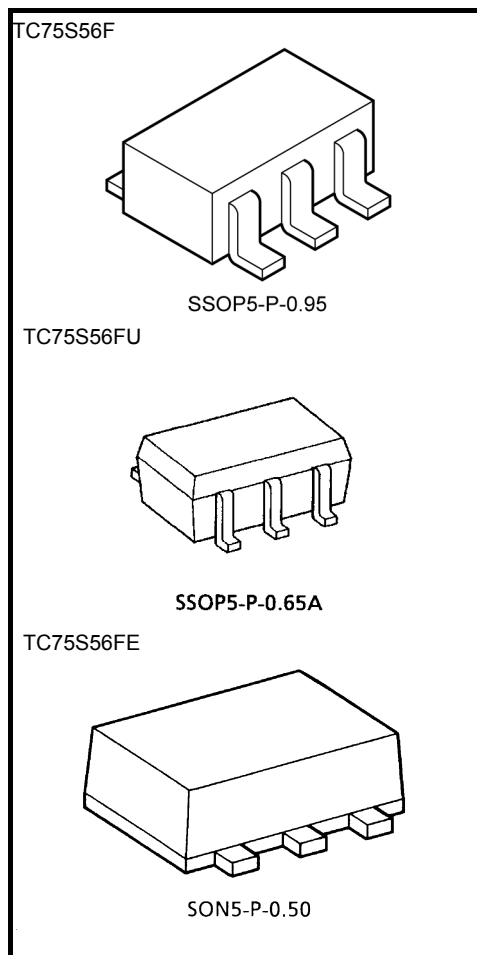
# TC75S56F, TC75S56FU, TC75S56FE

## Single Comparator

The TC75S56F/TC75S56FU/TC75S56FE is a CMOS general-purpose single comparator. The device can operate off a single power supply and draws a lower supply current than a conventional bipolar general-purpose comparator. This device's push-pull output stage can be directly connected to TTL or CMOS logic ICs, among others.

### Features

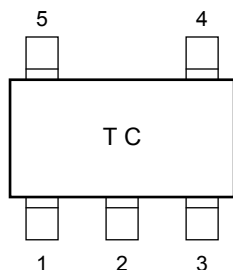
- Low-current power supply :  $I_{DD} = 10 \mu A$  (typ.)
- Single power supply operation
- Wide common mode input voltage range:  $V_{SS} \sim V_{DD} - 0.9 V$
- Push-pull output circuit
- Low input bias current
- Small package



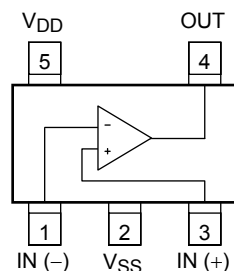
#### Weight

SSOP5-P-0.95 : 0.014 g (typ.)  
 SSOP5-P-0.65A : 0.006 g (typ.)  
 SON5-P-0.50 : 0.003 g (typ.)

### Marking (top view)



### Pin Connection (top view)



## Absolute Maximum Ratings (Ta = 25°C)

| Characteristics            |             | Symbol           | Rating               | Unit |
|----------------------------|-------------|------------------|----------------------|------|
| Supply voltage             |             | $V_{DD}, V_{SS}$ | $\pm 3.5$ or 7       | V    |
| Differential input voltage |             | $DV_{IN}$        | $\pm 7$              | V    |
| Input voltage              |             | $V_{IN}$         | $V_{SS} \sim V_{DD}$ | V    |
| Output Current             |             | $I_{OUT}$        | $\pm 35$             | mA   |
| Power dissipation          | TC75S56F/FU | $P_D$            | 200                  | mW   |
|                            | TC75S56FE   |                  | 100                  |      |
| Operating temperature      |             | $T_{opr}$        | $-40 \sim 85$        | °C   |
| Storage temperature        |             | $T_{stg}$        | $-55 \sim 125$       | °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: This device's CMOS structure makes it prone to latch-up. To prevent latch-up, please take the following precautions:

- Ensure that no I/O pin's voltage level ever exceeds  $V_{DD}$  or drops below  $V_{SS}$ .  
In addition, check the power-on timing.
- Do not subject the device to excessive noise.

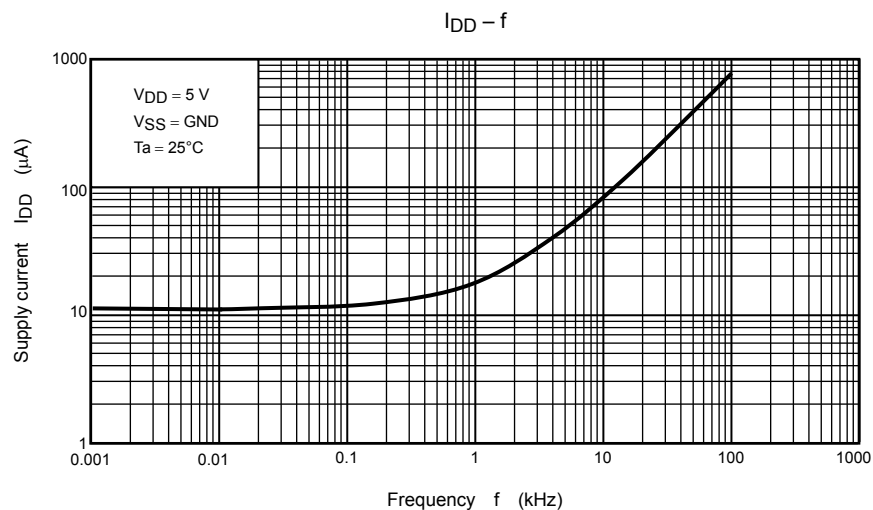
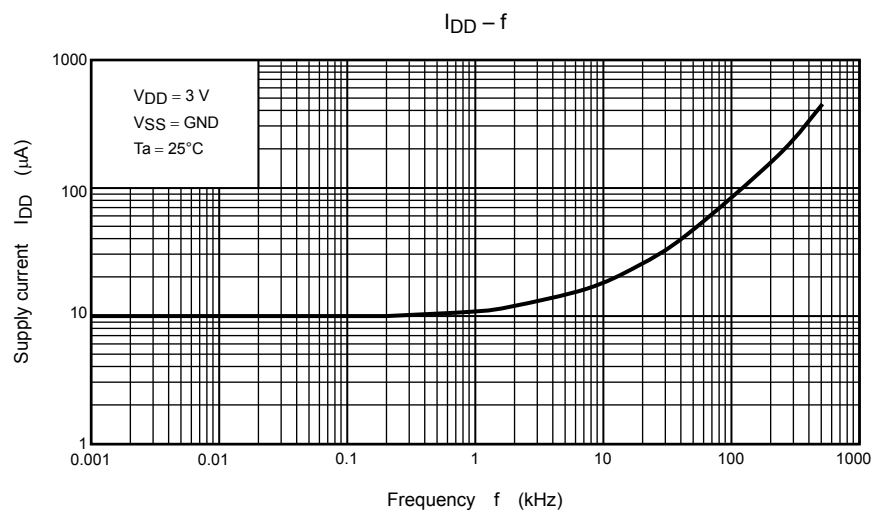
**Electrical Characteristics (unless otherwise specified,  $V_{DD} = 5\text{ V}$ ,  $V_{SS} = \text{GND}$ ,  $T_a = 25^\circ\text{C}$ )**

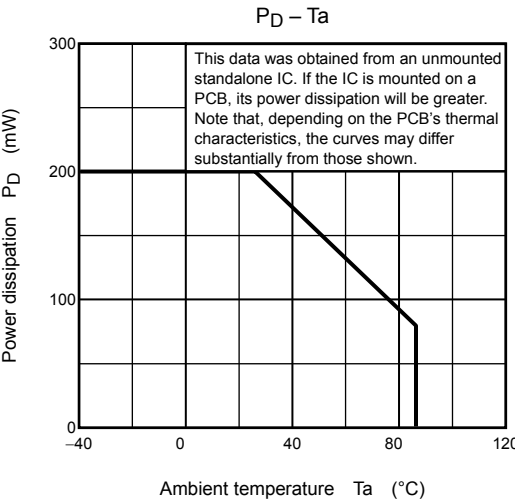
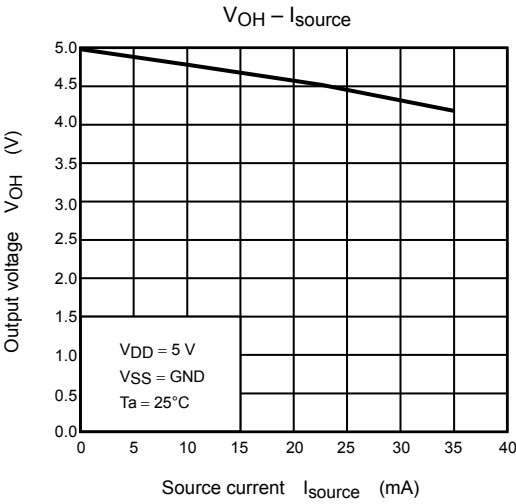
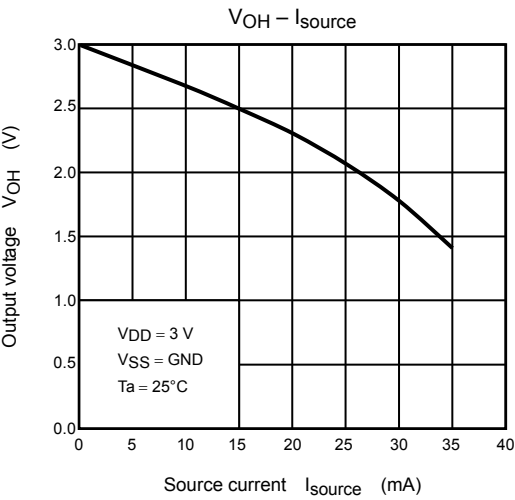
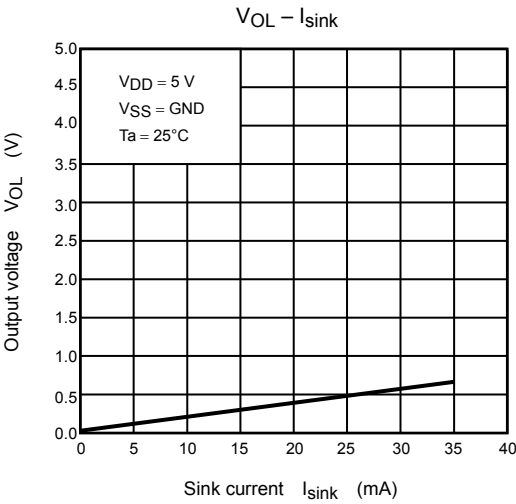
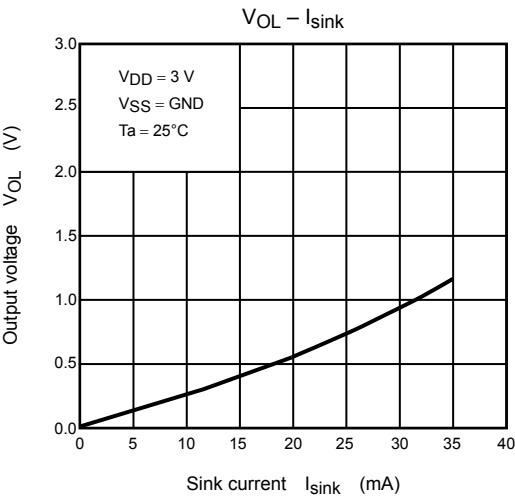
| Characteristics                   | Symbol                  | Test Circuit | Test Condition                      | Min | Typ.    | Max     | Unit          |
|-----------------------------------|-------------------------|--------------|-------------------------------------|-----|---------|---------|---------------|
| Input offset voltage              | $V_{IO}$                | —            | —                                   | —   | $\pm 1$ | $\pm 7$ | mV            |
| Input offset current              | $I_{IO}$                | —            | —                                   | —   | 1       | —       | pA            |
| Input bias current                | $I_I$                   | —            | —                                   | —   | 1       | —       | pA            |
| Common mode input voltage         | $CMV_{IN}$              | —            | —                                   | 0   | —       | 4.1     | V             |
| Supply current                    | $I_{DD} \text{ (Note)}$ | —            | —                                   | —   | 11      | 22      | $\mu\text{A}$ |
| Voltage gain                      | $G_V$                   | —            | —                                   | —   | 94      | —       | dB            |
| Sink current                      | $I_{\text{sink}}$       | —            | $V_{OL} = 0.5\text{ V}$             | 13  | 25      | —       | mA            |
| Source current                    | $I_{\text{source}}$     | —            | $V_{OH} = 4.5\text{ V}$             | 9   | 21      | —       | mA            |
| Output voltage                    | $V_{OL}$                | —            | $I_{\text{sink}} = 5.0\text{ mA}$   | —   | 0.1     | 0.3     | V             |
|                                   | $V_{OH}$                | —            | $I_{\text{source}} = 5.0\text{ mA}$ | 4.7 | 4.9     | —       |               |
| Operating supply voltage          | $V_{DD}$                | —            | —                                   | 1.8 | —       | 7.0     | V             |
| Propagation delay time (turn on)  | $t_{PLH} \text{ (1)}$   | —            | Over drive = 100 mV                 | —   | 680     | —       | ns            |
|                                   | $t_{PLH} \text{ (2)}$   | —            | TTL step input                      | —   | 500     | —       |               |
| Propagation delay time (turn off) | $t_{PHL} \text{ (1)}$   | —            | Over drive = 100 mV                 | —   | 250     | —       | ns            |
|                                   | $t_{PHL} \text{ (2)}$   | —            | TTL step input                      | —   | 380     | —       |               |
| Response time                     | $t_{TLH}$               | —            | Over drive = 100 mV                 | —   | 60      | —       | ns            |
|                                   | $t_{THL}$               | —            | Over drive = 100 mV                 | —   | 8       | —       |               |

**Electrical Characteristics (unless otherwise specified,  $V_{DD} = 3\text{ V}$ ,  $V_{SS} = \text{GND}$ ,  $T_a = 25^\circ\text{C}$ )**

| Characteristics                   | Symbol                  | Test Circuit | Test Condition                      | Min  | Typ.    | Max     | Unit          |
|-----------------------------------|-------------------------|--------------|-------------------------------------|------|---------|---------|---------------|
| Input offset voltage              | $V_{IO}$                | —            | —                                   | —    | $\pm 1$ | $\pm 7$ | mV            |
| Input offset current              | $I_{IO}$                | —            | —                                   | —    | 1       | —       | pA            |
| Input bias current                | $I_I$                   | —            | —                                   | —    | 1       | —       | pA            |
| Common mode input voltage         | $CMV_{IN}$              | —            | —                                   | 0    | —       | 2.1     | V             |
| Supply current                    | $I_{DD} \text{ (Note)}$ | —            | —                                   | —    | 10      | 20      | $\mu\text{A}$ |
| Sink current                      | $I_{\text{sink}}$       | —            | $V_{OL} = 0.5\text{ V}$             | 6    | 18      | —       | mA            |
| Source current                    | $I_{\text{source}}$     | —            | $V_{OH} = 2.5\text{ V}$             | 3    | 15      | —       | mA            |
| Output voltage                    | $V_{OL}$                | —            | $I_{\text{sink}} = 5.0\text{ mA}$   | —    | 0.15    | 0.35    | V             |
|                                   | $V_{OH}$                | —            | $I_{\text{source}} = 5.0\text{ mA}$ | 2.65 | 2.85    | —       |               |
| Propagation delay time (turn on)  | $t_{PLH}$               | —            | Over drive = 100 mV                 | —    | 550     | —       | ns            |
| Propagation delay time (turn off) | $t_{PHL}$               | —            | Over drive = 100 mV                 | —    | 250     | —       | ns            |
| Response time                     | $t_{TLH}$               | —            | Over drive = 100 mV                 | —    | 30      | —       | ns            |
|                                   | $t_{THL}$               | —            | Over drive = 100 mV                 | —    | 8       | —       |               |

Note: This device's current consumption increases as its operating frequency increases. Note that the power dissipation should not exceed the allowable power dissipation.

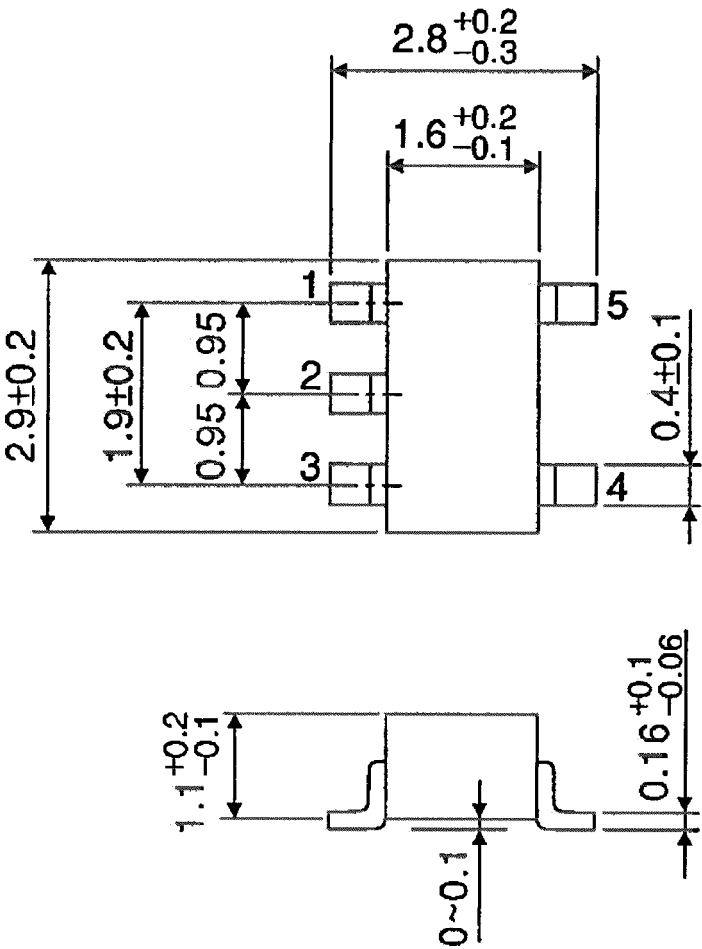




Package Dimensions

SSOP5-P-0.95

Unit : mm

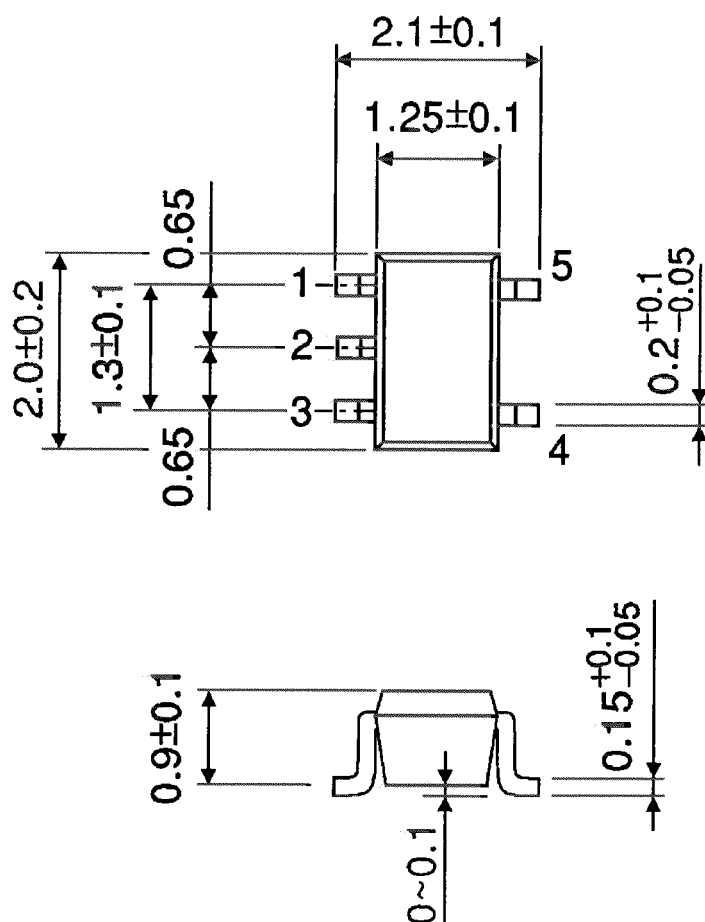


Weight: 0.014 g (typ.)

## Package Dimensions

SSOP5-P-0.65A

Unit : mm

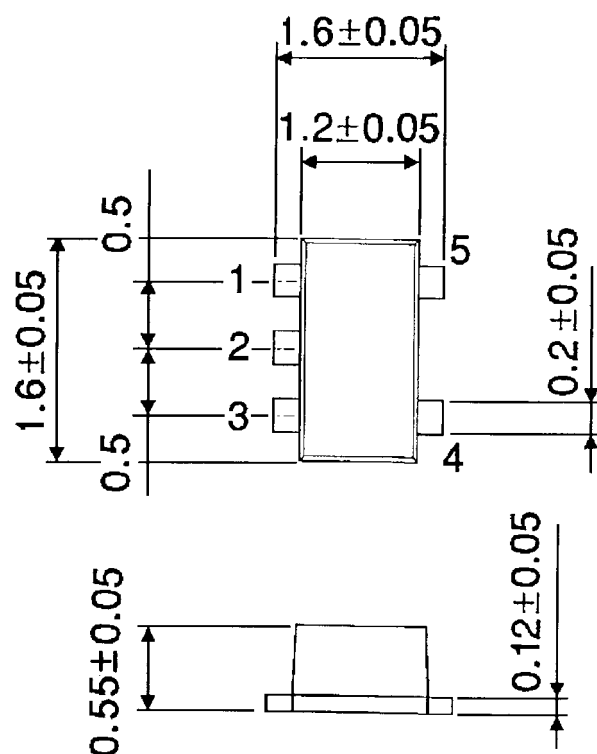


Weight: 0.006 g (typ.)

## Package Dimensions

SON5-P-0.50

Unit : mm



Weight: 0.003 g (typ.)



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