

# Dual comparators

## BA10393 / BA10393F / BA10393N

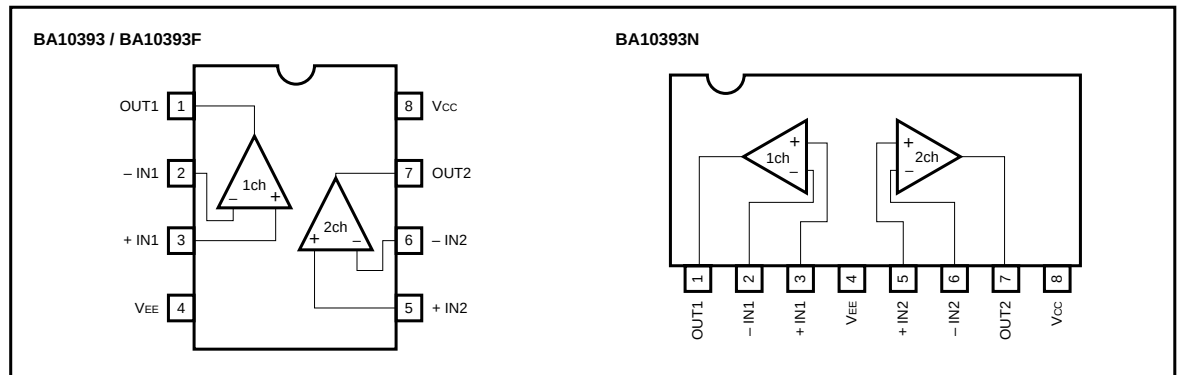
The BA10393, BA10393F, and BA10393N are dual comparators with open-collector output which allows wired OR connections.

The operating power supply voltage ranges from 2 to 36V for a single power supply and  $\pm 1$  to  $\pm 18$ V for a dual power supply. The packages are as follows: DIP 8-pin (BA10393), SOP 8-pin (BA10393F), and SIP 8-pin (BA10393N).

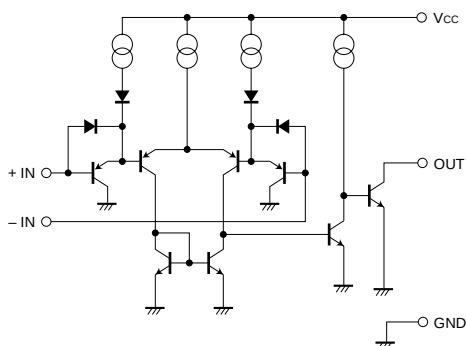
### ●Features

- 1) Wide operating voltage range.  
(Single power supply: 2 to 36V, dual power supply:  $\pm 1$  to  $\pm 18$ V)
- 2) Low current dissipation. (0.4mA typ. at  $V_{CC} = 5$ V)
- 3) Low input offset voltage. (25nA typ. at  $V_{CC} = 5$ V) and low input offset voltage. (typically  $\pm 1.0$ mV at  $V_{CC} = 5$ V)
- 4) Wide common-mode input voltage. (0 to  $V_{CC} - 1.5$ V)
- 5) Open collector output.
- 6) Compatible with 393 comparators from other manufacturers.

### ●Block diagram



● Internal circuit configuration



● Absolute maximum ratings (Ta = 25°C)

| Parameter                  | Symbol           | Limits                  |                         |                         | Unit |
|----------------------------|------------------|-------------------------|-------------------------|-------------------------|------|
|                            |                  | BA10393                 | BA10393F                | BA10393N                |      |
| Power supply voltage       | V <sub>CC</sub>  | 36 (± 18)               | 36 (± 18)               | 36 (± 18)               | V    |
| Power dissipation          | P <sub>d</sub>   | 800*                    | 550*                    | 900*                    | mW   |
| Differential input voltage | V <sub>ID</sub>  | ± V <sub>CC</sub>       | ± V <sub>CC</sub>       | ± V <sub>CC</sub>       | V    |
| Common-mode input voltage  | V <sub>I</sub>   | - 0.3 ~ V <sub>CC</sub> | - 0.3 ~ V <sub>CC</sub> | - 0.3 ~ V <sub>CC</sub> | V    |
| Operating temperature      | T <sub>opr</sub> | - 40 ~ + 85             | - 40 ~ + 85             | - 40 ~ + 85             | °C   |
| Storage temperature        | T <sub>stg</sub> | - 55 ~ + 125            | - 55 ~ + 125            | - 55 ~ + 125            | °C   |

\* Refer to the P<sub>d</sub> characteristics diagram.

The values for the BA10393F are those when it is mounted on a glass epoxy PCB (50mm × 50mm × 1.6mm).

● Electrical characteristics (unless otherwise noted, Ta = 25°C, V<sub>CC</sub> = + 5V)

| Parameter                 | Symbol            | Min. | Typ. | Max.                  | Unit | Conditions                                                                                      |
|---------------------------|-------------------|------|------|-----------------------|------|-------------------------------------------------------------------------------------------------|
| Input offset voltage      | V <sub>IO</sub>   | —    | ± 1  | ± 5                   | mV   | V <sub>O</sub> = 1.4V                                                                           |
| Input offset current      | I <sub>IO</sub>   | —    | ± 5  | ± 50                  | nA   | I <sub>IN</sub> <sup>+</sup> - I <sub>IN</sub> <sup>-</sup>  , V <sub>O</sub> = 1.4V            |
| Input bias current        | I <sub>B</sub>    | —    | 25   | 250                   | nA   | V <sub>O</sub> = 1.4V                                                                           |
| Common-mode input voltage | V <sub>ICM</sub>  | 0    | —    | V <sub>CC</sub> - 1.5 | V    |                                                                                                 |
| Voltage gain              | A <sub>v</sub>    | 93   | 106  | —                     | dB   | R <sub>L</sub> = 15kΩ, V <sub>CC</sub> = 15V                                                    |
| Quiescent current         | I <sub>Q</sub>    | —    | 0.4  | 1                     | mA   | R <sub>L</sub> = ∞, on All Comparators                                                          |
| Output sink current       | I <sub>sink</sub> | 6    | 16   | —                     | mA   | V <sub>IN</sub> <sup>-</sup> = + 1V, V <sub>IN</sub> <sup>+</sup> = 0V, V <sub>O</sub> = 1.5V   |
| Output saturation voltage | V <sub>OL</sub>   | —    | 250  | 400                   | mV   | V <sub>IN</sub> <sup>-</sup> = + 1V, V <sub>IN</sub> <sup>+</sup> = 0V, I <sub>sink</sub> = 4mA |
| Output leakage current    | I <sub>leak</sub> | —    | 0.1  | —                     | nA   | V <sub>IN</sub> <sup>+</sup> = + 1V, V <sub>IN</sub> <sup>-</sup> = 0V, V <sub>O</sub> = 5V     |
| Response time             | t <sub>r</sub>    | —    | 1.3  | —                     | μs   | R <sub>L</sub> = 5.1kΩ, V <sub>RL</sub> = 5V                                                    |

## ● Electrical characteristic curves

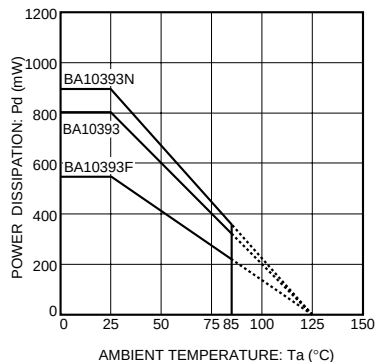


Fig. 1 Power dissipation vs. ambient temperature

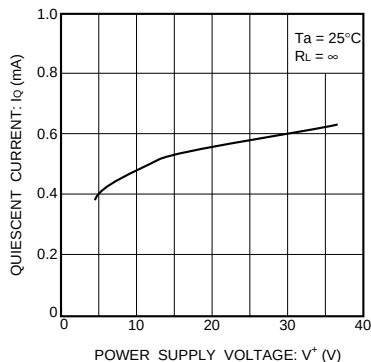


Fig. 2 Quiescent current vs. power supply voltage

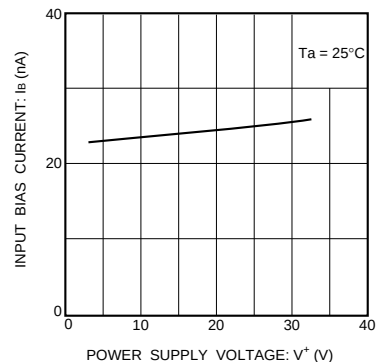


Fig. 3 Input bias current vs. power supply voltage

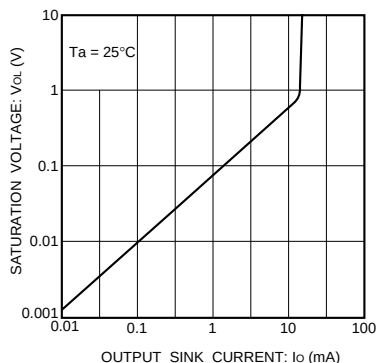


Fig. 4 Output saturation voltage vs. output current

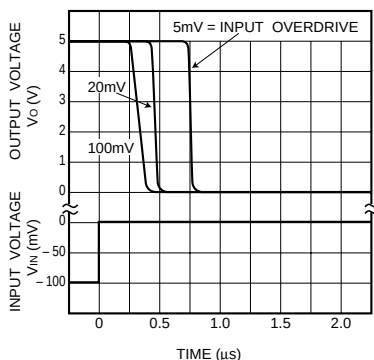


Fig. 5 Propagation characteristics ( I )

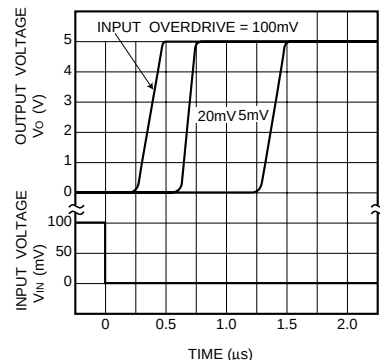


Fig. 6 Propagation characteristics ( II )

## ● Operation notes

## (1) Handling unused circuits

If a circuit is not in use, we recommend connecting it as shown in Figure 7, so that its input is connected to the potential within the in-phase input voltage range ( $V_{ICM}$ ) and the output is left open.

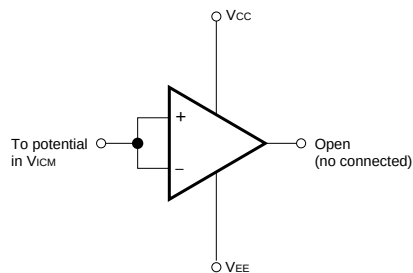
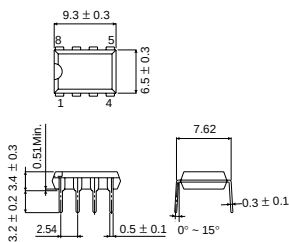


Fig. 7 Example of unused circuit connection

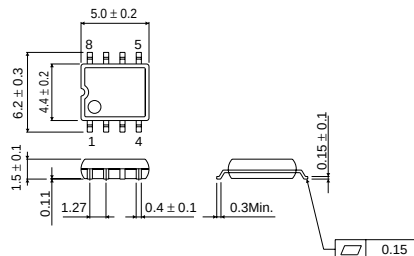
## ● External dimensions (Units: mm)

BA10393



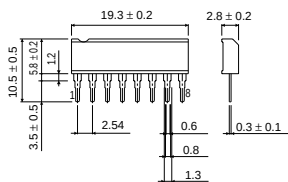
DIP8

BA10393F



SOP8

BA10393N



SIP8