# Dual Differential Comparators

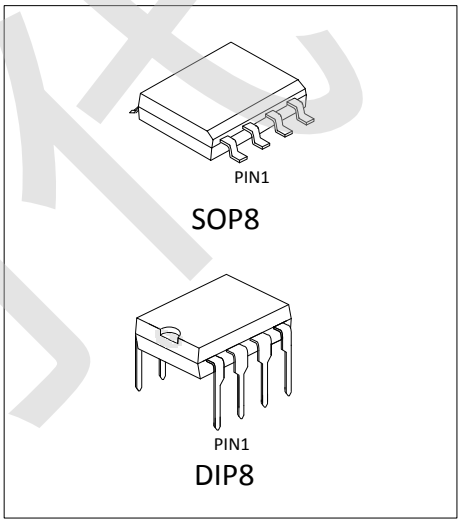
## DESCRIPTION

The LM293 consists of two independent voltage comparators. These were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage. The outputs can be connected to other open-collector outputs to achieve wired-AND relationships.

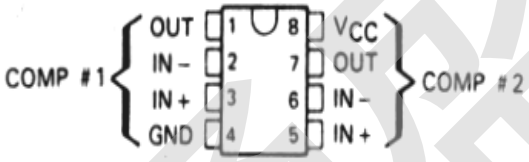
## FEATURES

Wide supply voltage range

- Low supply current drain independent of the supply voltage.
- Low input biasing current
- Low input offset current
- Low input offset voltage
- Input common-mode voltage range includes GND
- Differential input voltage range equal to the power supply voltage
- Low output saturation voltage
- Output voltage compatible with TTL, MOS and CMOS logic




## PACKAGE INFORMATION




## ORDERING INFORMATION

| DEVICE | Package Type | MARKING | Packing | Packing Qty |
|---|---|---|---|---|
| LM293N | DIP8 | LM293 | TUBE | 2000/box |
| LM293M/TR | SOP8 | LM293 | REEL | 2500/reel |



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## ELECTRICAL CHARACTERISTICS

at specified free-air temperature, $V_{CC}$=5V (unless otherwise noted)

| PARAMETER | TEST CONDITIONS* | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| $V_{IO}$ Input offset voltage | Vcc=5V to 30, $V_{IC}=V_{ICR}$ min, Vo=1.4V | 25°C | | 2 | 5 | mV |
| | | Full range | | | 9 | |
| $I_{IO}$ Input offset current | Vo=1.4V | 25°C | | 5 | 50 | nA |
| | | Full range | | | 150 | |
| $I_{IB}$ Input bias current | Vo=1.4V | 25°C | | -25 | -250 | nA |
| | | Full range | | | -400 | |
| $V_{ICR}$ Common-mode input voltage range** | | 25°C | 0 to Vcc-1.5 | | | V |
| | | Full range | 0 to Vcc-2 | | | |
| $A_{VD}$ Large-signal differential voltage amplification | Vcc=15V, Vo=1.4V to 11.4V, $R_L \geq 15k\Omega$ to $V_{CC}$ | 25°C | 50 | 200 | | V/mV |
| $I_{OH}$ High-level output current | $V_{OH}$=5V, $V_{ID}$=1V, | 25°C | | 0.1 | 50 | nA |
| | $V_{OH}$=30V, $V_{ID}$=1V | Full range | | | 1 | μA |
| $V_{OL}$ Low-level output voltage | $I_{OL}$=4mA, $V_{ID}$=-1V | 25°C | | 150 | 400 | mV |
| | | Full range | | | 700 | |
| $I_{OL}$ Low-level output current | $V_{OL}$=1.5V, $V_{ID}$=-1V | 25°C | 6 | | | mA |
| $I_{CC}$ Supply current | $R_L$=∞, $V_{CC}$=5V | 25°C | | 0.8 | 1 | mA |
| | $V_{CC}$=30V | Full range | | | 2.5 | |

*Full range (MIN to MAX), for the LM293 is -40°C to 85 °C. All characteristics are measured with zero common-mode input voltage unless otherwise specified.
**The voltage at either input or common-mode should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is $V_{CC}$-1.5V, but either or both inputs can go to 30V without damage.

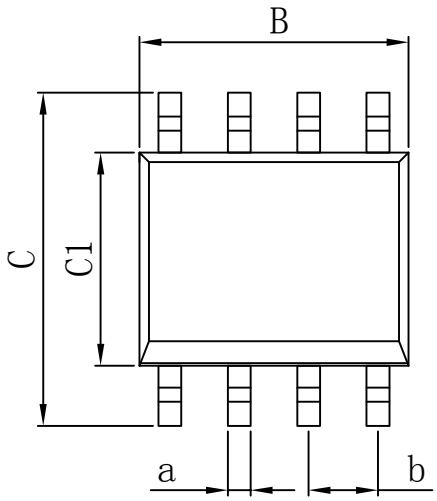
## SWITCHING CHARACTERISTICS, $V_{CC}$=5V, $T_A$=25°C

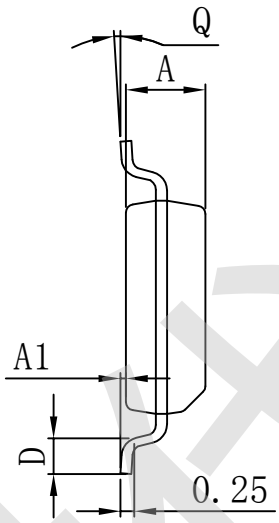
| PARAMETER | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Response time | $R_L$ connected to 5V through 5.1kΩ, $C_L$=15pF* (See Note 1) | 100-mV input step with 5-mV overdrive | | 1.3 | | μs |
| | | TTL-level input step | | 0.3 | | |

*$C_L$ includes probe and jig capacitance.
NOTE 1: The response time specified is the interval between the input step function and the instant, when the output crosses 1.4V.

## PACKAGE

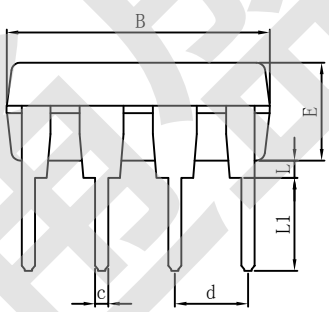
### SOP8

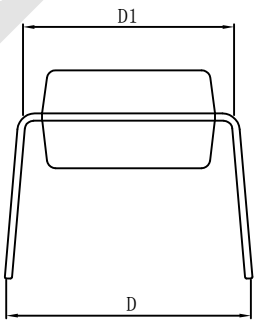


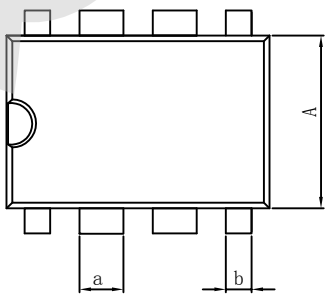




| Dimensions In Millimeters | | | | | |
|---|---|---|---|---|---|
| Symbol : | Min : | Max : | Symbol : | Min : | Max : |
| A | 1.225 | 1.570 | D | 0.400 | 0.950 |
| A1 | 0.100 | 0.250 | Q | 0° | 8° |
| B | 4.800 | 5.100 | a | 0.420 TYP | |
| C | 5.800 | 6.250 | b | 1.270 TYP | |
| C1 | 3.800 | 4.000 | | | |

### DIP8




| Dimensions In Millimeters | | | | | |
|---|---|---|---|---|---|
| Symbol : | Min : | Max : | Symbol : | Min : | Max : |
| A | 6.100 | 6.680 | L1 | 3.000 | 3.600 |
| B | 9.000 | 9.500 | a | 1.524 TYP | |
| D | 8.400 | 9.000 | b | 0.889 TYP | |
| D1 | 7.420 | 7.820 | c | 0.457 TYP | |
| E | 3.100 | 3.550 | d | 2.540 TYP | |
| L | 0.500 | 0.700 | | | |



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