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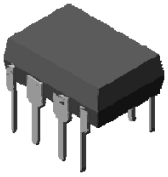
# Low Power Dual Comparator SN393/P

**SOP-8**



**DIP-8**

## Description

The SN393 consists of two independent voltage comparators designed to operate from a single power supply over a wide voltage range.

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.

These comparators also have a unique characteristic in that the input common–mode voltage range includes ground, even though they are operated from a single power supply voltage.

## Application

◈ A/D Converters
◈ Wide Range VCO
◈ MOS Clock Generator
◈ High Voltage Logic Gate
◈ Multi-Vibrators

## ORDERING INFORMATION

| Product Name. | Marking | Package Name |
|---|---|---|
| SN393 | SN393 | SOP-8 |
| SN393P | SN393P | DIP-8 |

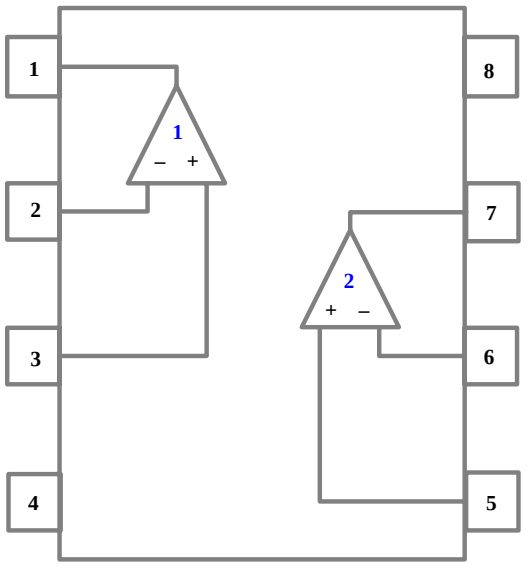
▲ **Marking Information**


① Device Code
② Year & Week Code

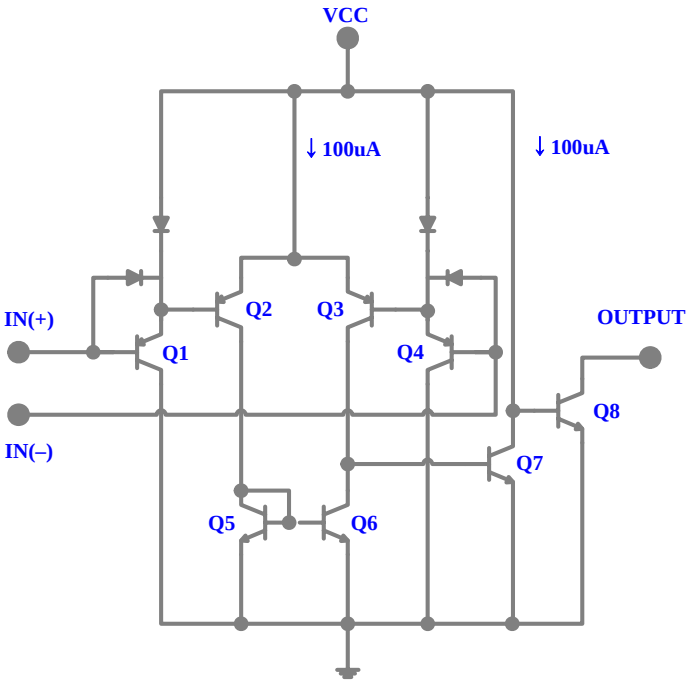
## Features and Benefits

◈ Wide single supply voltage range [ 2.0V to 36V ]
or dual supplies [±1.0V to ±18V]
◈ Very low supply current drain [Typ. 0.8mA]
◈ Low input biasing current [Typ. 25nA]
◈ Low input offset current and offset voltage
◈ Differential input voltage range equal to the Vcc
◈ Low output 250mV at 4mA saturation voltage
◈ Output voltage compatible with TTL, DTL, ECL even CMOS Logic systems

## Internal Block Diagram




## Equivalent Circuit




## ◈ Pin Description

| No | Symbol | I/O | Description |
|---|---|---|---|
| 1 | Output1 | O | Comparator 1's Output |
| 2 | IN1(-) | I | Comparator 1's Inverting Input |
| 3 | IN1(+) | I | Comparator 1's Non- Inverting Input |
| 4 | GND | GND | Ground |
| 5 | IN2(+) | I | Comparator 2's Non- Inverting Input |
| 6 | IN2(-) | I | Comparator 2's Inverting Input |
| 7 | Output2 | O | Comparator 2's Output |
| 8 | $V_{CC}$ | PWR | $V_{CC}$ for Dual Comparators |

## Absolute maximum ratings

| Characteristic | Symbol | | Ratings | Unit |
|---|---|---|---|---|
| Supply voltage | $V_{CC}$ | | 36 or ±18 | V |
| Differential input voltage | $V_{IND}$ | | 36 | V |
| Input voltage | $V_{IN}$ | | -0.3 ~ +36 | V |
| Power Dissipation | $P_D$ | SOP-8 | 600 | mW |
| | | DIP-8 | 1000 | |
| Junction Temperature | Tj | | 150 | °C |
| Operating temperature | $T_{opr}$ | | -40 ~ +85 | °C |
| Storage temperature | $T_{stg}$ | | -55 ~ 150 | °C |

## Electrical Characteristics

(Unless otherwise specified. $V_{CC}$ = 5V, $V_{EE}$ = GND and 0 °C ≤ Ta ≤ +70 °C)

| Characteristic | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Input Offset Voltage | $V_{IOS}$ | $V_O$ = 1.4V, Rs = 0Ω | - | ±2 | ±5 | mV |
| Input Offset Current | $I_{IOS}$ | - | - | ±5 | ±50 | nA |
| Input Bias Current | $I_{IB}$ | - | - | 25 | 250 | nA |
| Input Common Mode Voltage Range | $V_{ICR}$ | - | 0 | - | $V_{CC}$–1.5 | V |
| Supply Current | $I_{CC}$ | $V_{CC}$ = 5V, $R_L$ = ∞, All Channel | - | 0.8 | 2 | mA |
| Large Signal Voltage Gain | $A_V$ | $V_{CC}$ = 15V , $R_L$ = 15 KΩ | - | 200 | - | V/mV |
| Output Voltage (‘L’ Level) | $V_{SAT}$ | $V_{IN+}$= 0V, $V_{IN-}$= 1V<br>$I_{SINK}$≤ 4mA | - | 130 | 400 | mV |
| Response Time | $t_{RES}$ | $V_{RC}$ = 5V, $R_L$ = 5.1KΩ | - | 1.3 | - | uS |
| Output Sink Current | $I_{SINK}$ | $V_O$≤1.5V,<br>$V_{IN+}$ = 0V, $V_{IN-}$ = 1V | 6 | 16 | - | mA |
| Output Leakage Current | $I_{Leak}$ | $V_O$ = 5V<br>$V_{IN+}$ = 1V, $V_{IN-}$ = 0V | - | 0.1 | - | nA |

## Electrical Characteristic Curves

**Fig. 1 $V_{CC}$-$I_{CC}$**

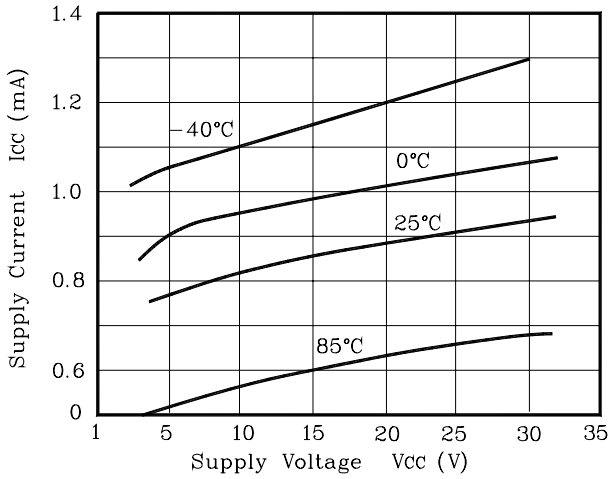



**Fig. 2 $V_{CC}$-$I_{IB}$**

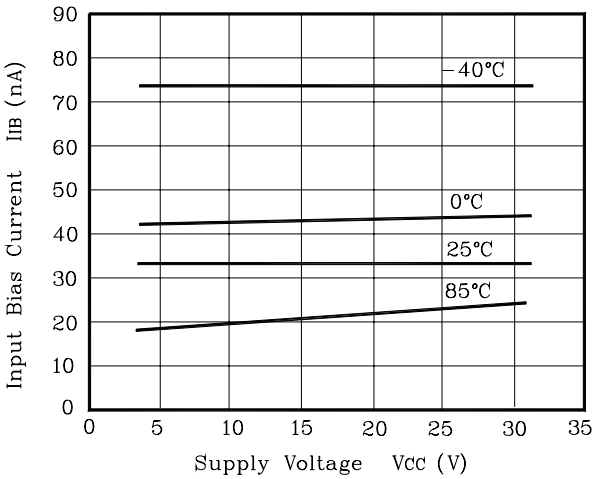



**Fig. 3 $V_{OL}$-$I_{SINK}$**

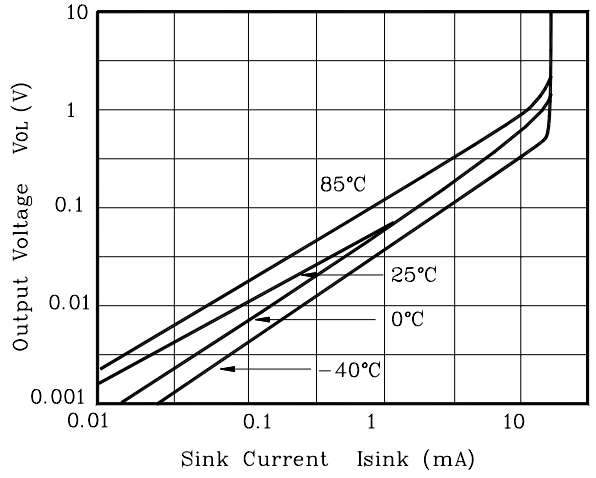



**Fig. 4 $P_D$-Ta**

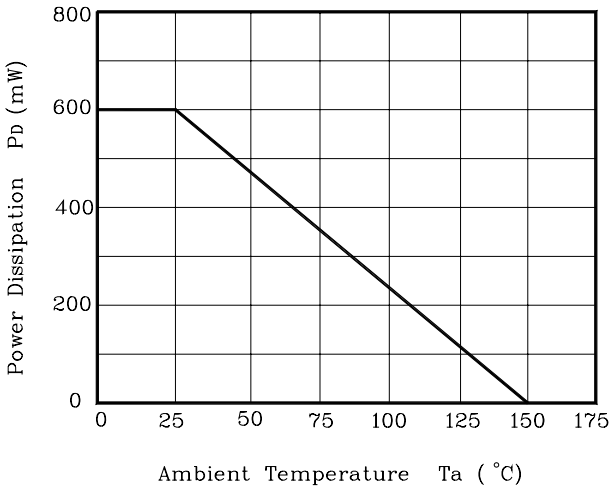



**Fig. 5 $V_{IN}$,$V_{OUT}$-$t_{rsp}$**

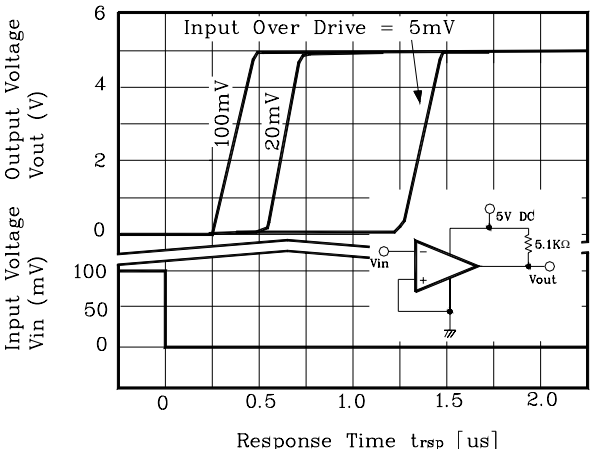
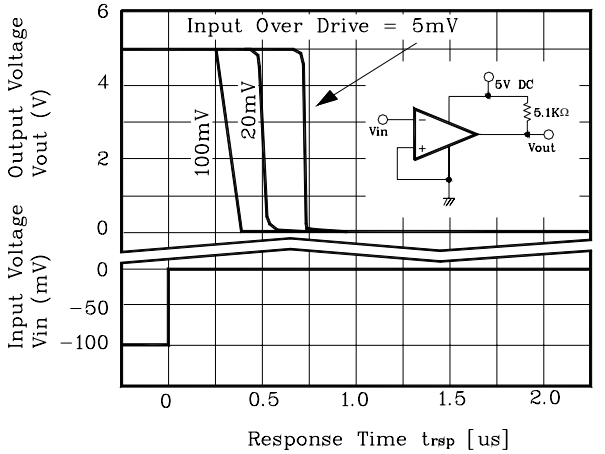
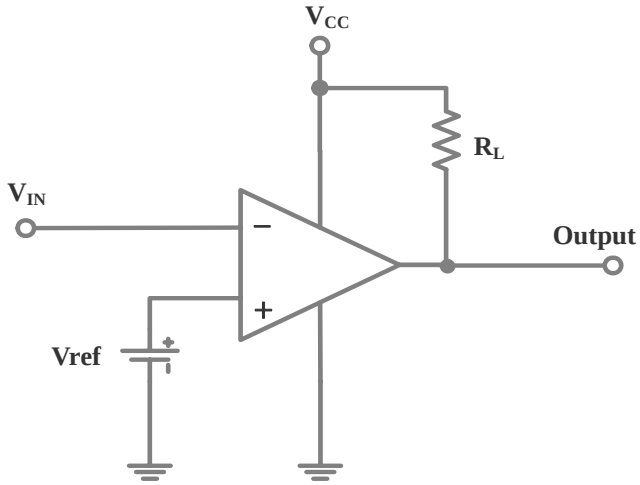



**Fig. 6 $V_{IN}$,$V_{OUT}$-$t_{rsp}$**

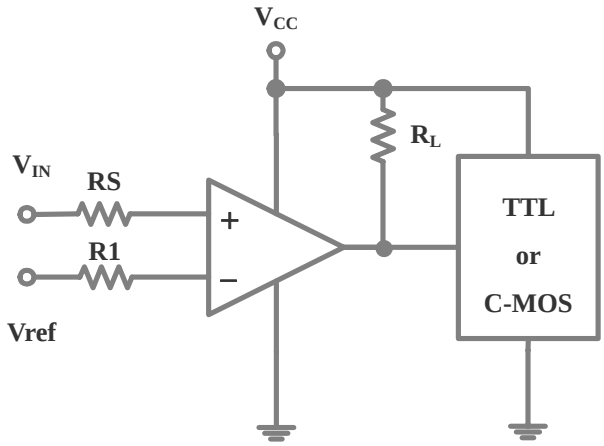


## Typical Applications

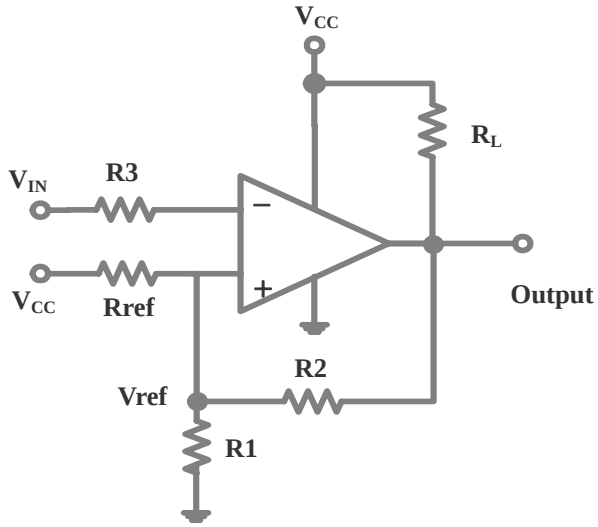
### Basic Comparator



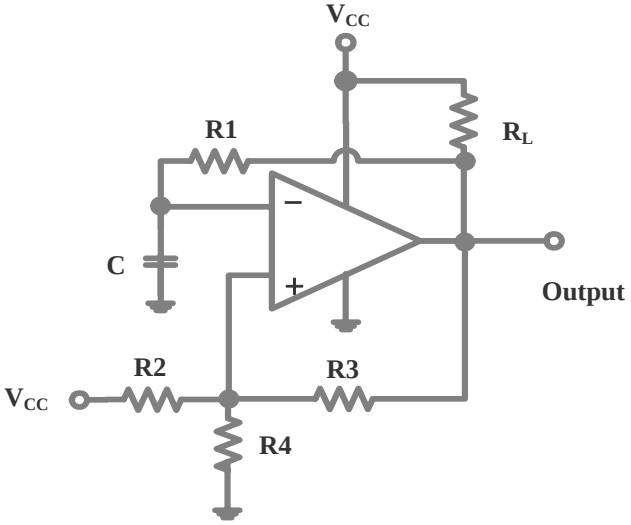

### Driving Logic or C-MOS



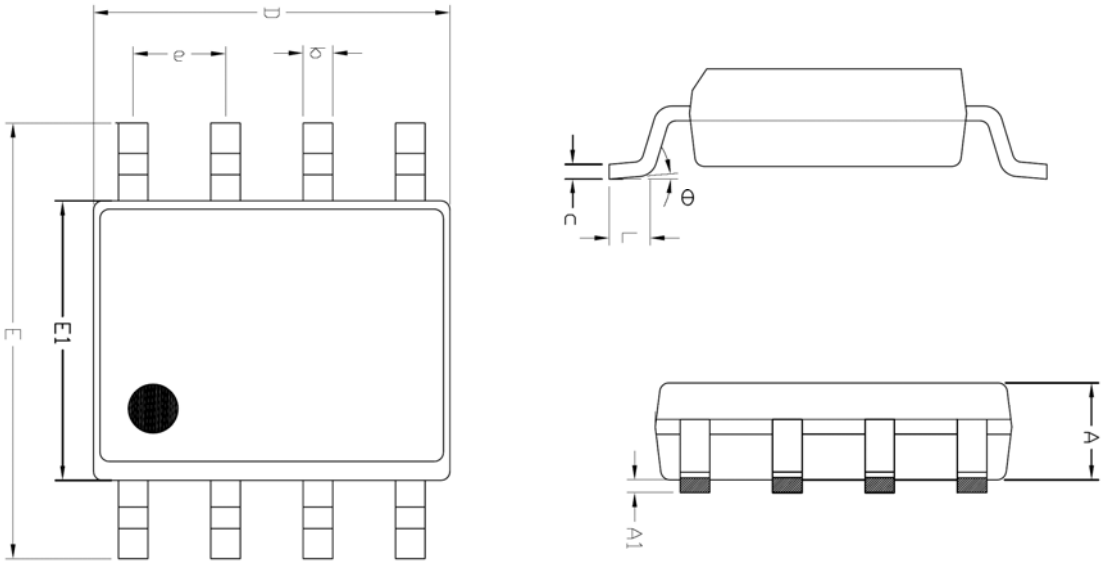

### Comparator with Hysteresis Circuit




### Square-wave Oscillator

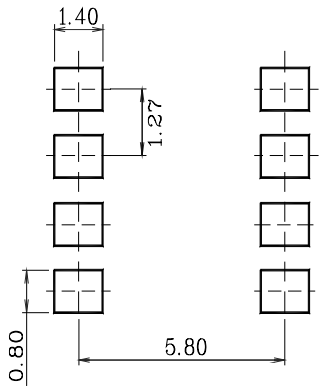


## Outline Dimension (Unit : mm)

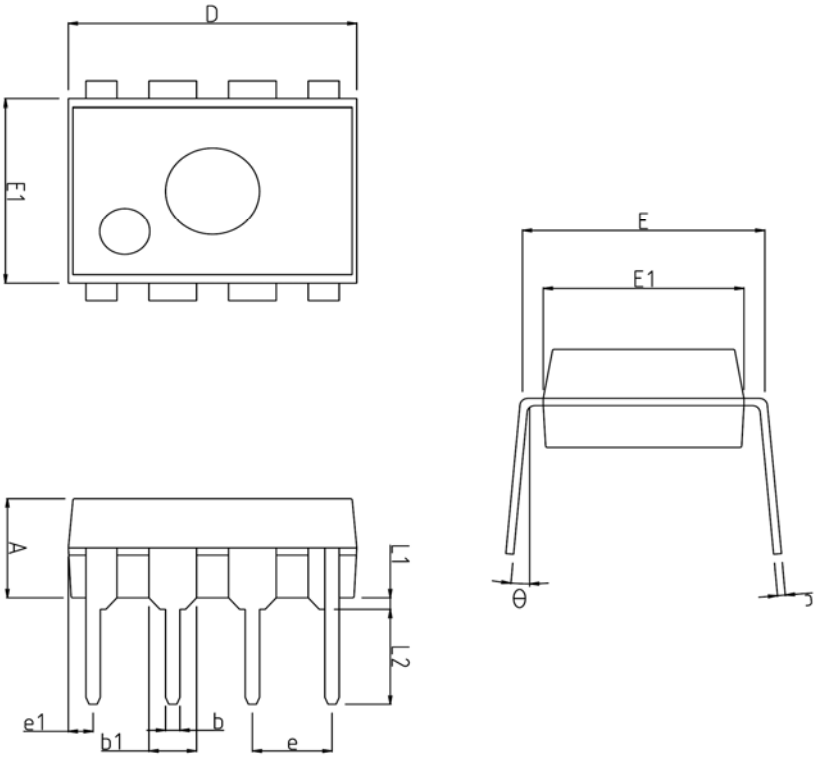



| SYMBOL | MILLIMETER(mm) | | | NOTE |
|---|---|---|---|---|
| | MINIMUM | NOMINAL | MAXIMUM | |
| A | 1.245 | – | 1.445 | |
| A1 | 0.125 | 0.175 | 0.275 | |
| b | 0.320 | 0.420 | 0.520 | |
| c | 0.170 | 0.220 | 0.270 | |
| D | 4.802 | 4.902 | 5.002 | |
| E | 5.870 | 6.020 | 6.170 | |
| E1 | 3.761 | 3.861 | 3.961 | |
| e | 1.270 BSC | | | |
| L | 0.462 | 0.562 | 0.662 | |
| θ | 0 ° | – | 8 ° | |

### ※ Recommend PCB solder land (Unit : mm)



## Outline Dimension (Unit : mm)




| SYMBOL | MILLIMETERS | | | NOTE |
|---|---|---|---|---|
| | MINIMUM | NOMINAL | MAXIMUM | |
| A | 3.20 | 3.40 | 3.60 | |
| b | 0.36 | 0.46 | 0.56 | |
| b1 | 1.42 | 1.52 | 1.62 | |
| c | 0.20 | 0.25 | 0.35 | |
| D | 9.00 | 9.20 | 9.40 | |
| E | 7.37 | 7.62 | 7.87 | |
| E1 | 6.20 | 6.40 | 6.60 | |
| e | 2.54 TYP | | | |
| e1 | 0.79 TYP | | | |
| L1 | 0.33 | – | – | |
| L2 | 3.00 | 3.30 | 3.60 | |
| θ | 0° | – | 15° | |

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