## DUAL VOLTAGE COMPARATOR

| 8 DIP | Unit: mm |



Specially designed to offer a versatility as high as possible

## ☐ FEATURES

- ○ Very low supply current drain(0.8mA)
- ○ Allows sensing near ground
- ○ Logic output compatible with TTL, DTL, ECL, MOS and CMOS
- ○ Low input biasing current
- ○ Low input offset current
- ○ Low output saturation voltage
- ○ Wide supply voltage range :
  - Single : 2V~36V
  - Dual : ±1V~ ±18V
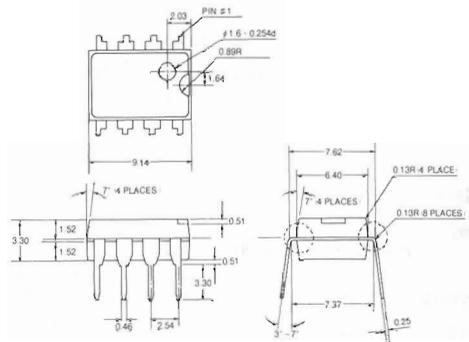
## ☐ APPLICATIONS

- ○ High precision comparators
- ○ Driving logic systems
- ○ Various multivibrators
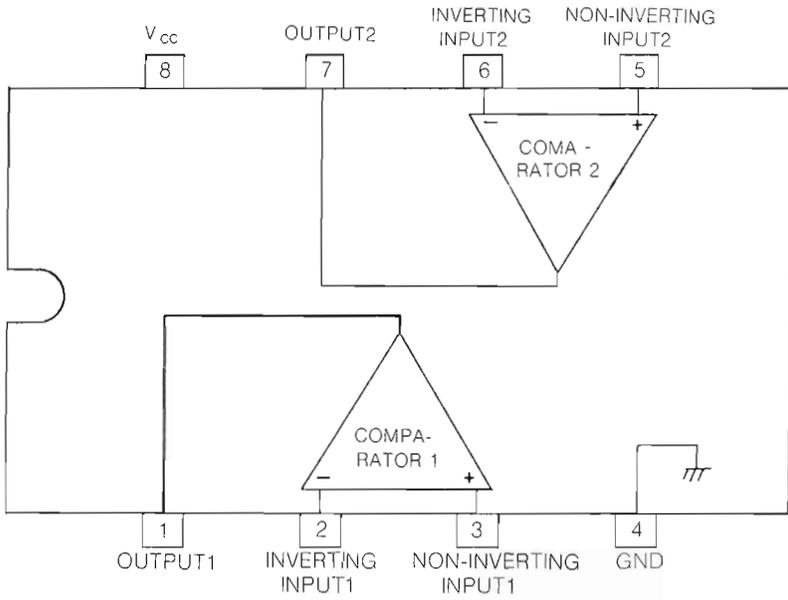- ○ Generators and Oscillators

## ☐ MAXIMUM RATINGS

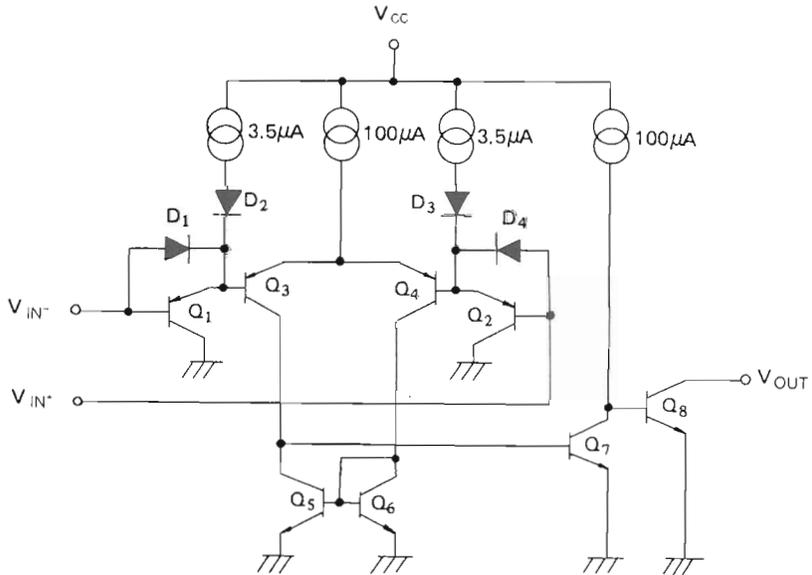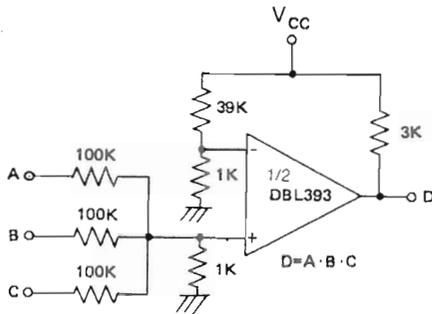| Characteristic | Symbol | Rating | Unit |
|----------------|--------|--------|------|
| Supply Voltage | $V_{CC}$ | 36 or ±18 | V |
| Differential Input Voltage | $V_{IND}$ | 36 | V |
| Input Voltage | $V_{IN}$ | $-0.3 \sim +36$ | V |
| Power Dissipation | $P_D$ | 570 | mW |
| Operating Temperature | $T_{opr}$ | $0 \sim -70$ | °C |
| Storage Temperature | $T_{stg}$ | $-55 \sim +150$ | °C |

# DBL 393

## BLOCK DIAGRAM



## EQUIVALENT CIRCUIT (One section)

☐ **APPLICATION CIRCUITS** ($V_{CC}$ =15V)

### 4. AND Gate

$V_{CC}$

39K

3K

100K

A

1K

1/2
DBL393

100K

B

D

100K

1K

C

$D = A \cdot B \cdot C$

### 5. OR Gate

$V_{CC}$

200K

3K

100K

A

1K

1/2
DBL393

100K

B

$D = A + B + C$

100K

C

1K
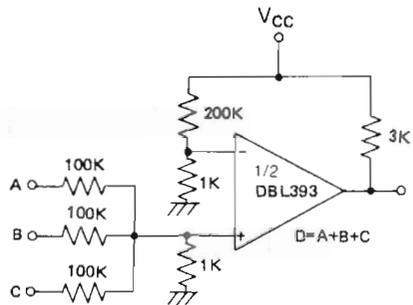
### 6. Squarewave Oscillator

$V_{CC}$

100K

4.3K

75pF

1/2
DBL393

$V_{OUT}$

$V_{CC}$
0

$V_{CC}$

100K

100K

100K

### 7. Pulse Generator

$V_{CC}$

1M

D1

15K

100K

D2

80pF

1/2
DBL393

$V_{OUT}$

1M

$V_{CC}$

1M

1M
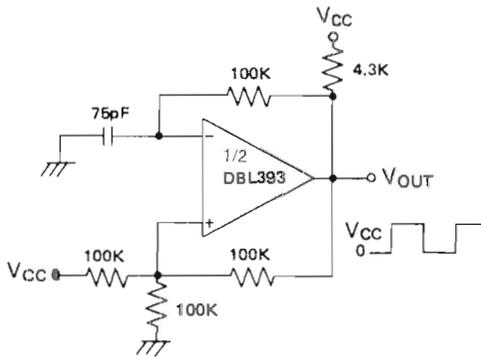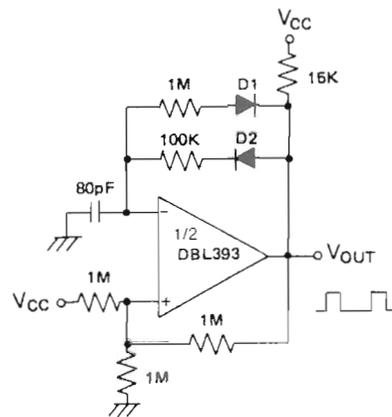
### 8. One-Shot Multivibrator with Input Lock Out

$V_{CC}$

100K

1M

1M

10M

560K

15K

+$V_{IN}$

100K

1/2
DBL393

100pF

1/2
DBL393

$V_{OUT}$

10M

240K

62K
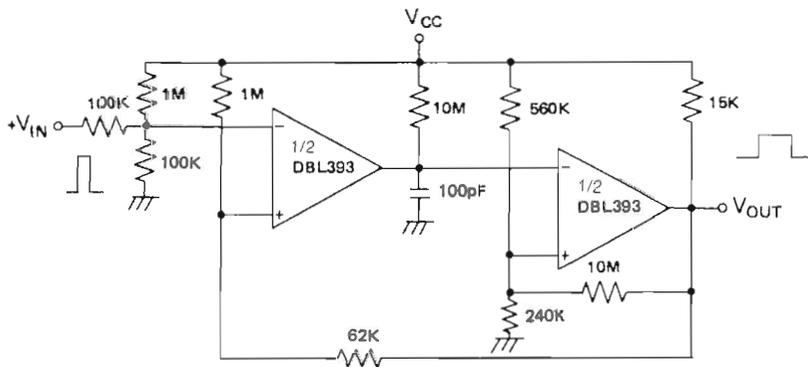
☐ APPLICATION CIRCUITS ($V_{CC}$ =5V)

1. Basic Comparator
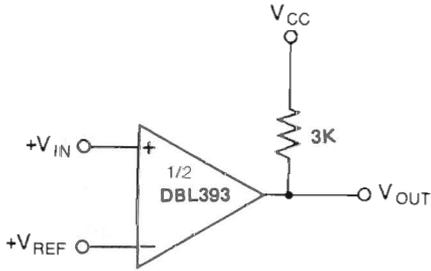
2. Driving CMOS
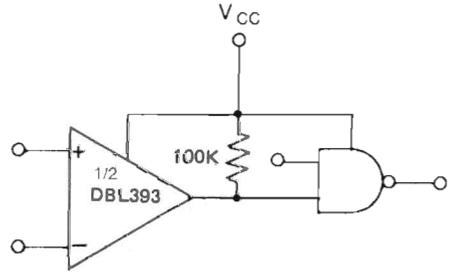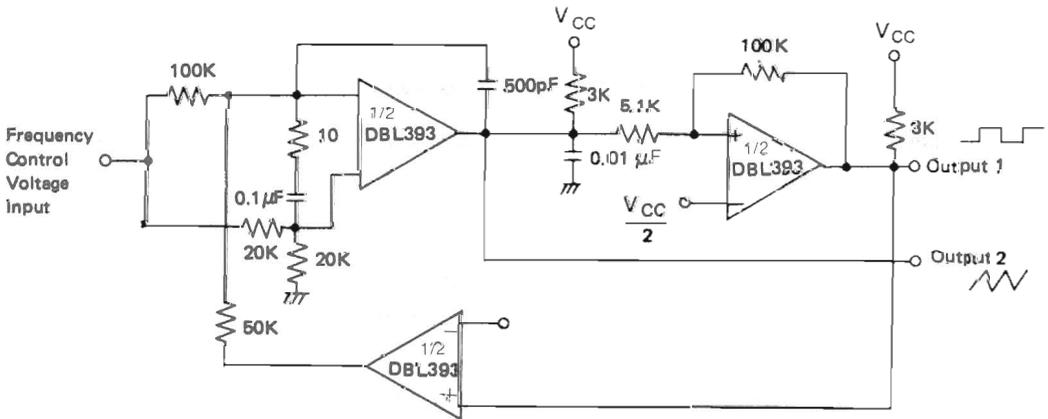
3. Two Decade High Frequency V.C.O

☐ ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, $V_{CC} = 5V$ and $0°C \leq Ta \leq 70°C$

| Characteristic | | Symbol | Test Condition | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|---|
| Input Offset Voltage | | $V_{IOS}$ | $V_{OUT} = 1.4V$, $5V \leq V_{CC} \leq 30V$ | $Ta = 25°C$ | — | ±1 | ±5 | mV |
| | | | $Rg = 0\,\Omega$, $0V \leq V_{IC} \leq V_{CC} - 1.5V$ | | — | — | 9 | mV |
| Input Offset Current | | $I_{IOS}$ | — | $Ta = 25°C$ | — | ±5 | ±50 | nA |
| | | | | | — | — | ±150 | nA |
| Input Bias Current | | $I_{IB}$ | — | $Ta = 25°C$ | — | 25 | 250 | nA |
| | | | | | — | — | 400 | nA |
| Input Common Mode Voltage Range | | $V_{ICR}$ | — | $Ta = 25°C$ | 0 | — | $V_{CC}-1.5$ | V |
| | | | | | 0 | — | $V_{CC}-2$ | V |
| Supply Current | | $I_{CC}$ | $R_L = \infty$, $V_{CC} = 30V$, | | — | — | 2.5 | mA |
| Voltage Gain | | $G_V$ | $R_L \geq 15K\,\Omega$, $V_{CC} = 15V$, $Ta = 25°C$ | | 50 | 200 | — | V/mV |
| Response Time | Large Signal | $t_R$ | $V_{RL} = 5V$ $R_L = 5.1K\,\Omega$ $Ta = 25°C$ | $V_{IN} = TTL$ Logic swing $V_{REF} = 1.4V$ | — | 300 | — | nS |
| | Small Signal | | | $V_{IN} = 100mV$ Input step with 5mV overdrive | — | 1.3 | — | $\mu S$ |
| Output sink Current | | $I_{SINK}$ | $V_{IN-} \geq 1V$, $V_{IN+} = 0V$, $V_{OUT} \leq 1.5V$, $Ta = 25°C$ | | 6 | 16 | — | mA |
| Output Leakage Current | | $I_{LEAK}$ | $V_{IN^+} \geq 1V$ $V_{IN^-} = 0V$ | $V_{OUT} = 5V$ $Ta = 25°C$ | — | 0.1 | — | nA |
| | | | | $V_{OUT} = 30V$ | — | — | 1 | $\mu A$ |
| Saturation Voltage | | $V_{SAT}$ | $V_{IN-} \geq 1V$, $V_{IN+} = 0V$ $I_{SINK} \leq 4mA$ | $Ta = 25°C$ | — | 250 | 400 | mV |
| | | | | | — | — | 700 | mV |
| Differential Input Voltage | | $V_{IND}$ | Keep all $V_{IN'S} \geq 0V$ | | — | — | 36 | V |

* $V_{IC}$ : Input Common Mode Voltage

## TYPICAL PERFORMANCE CHARACTERISTICS
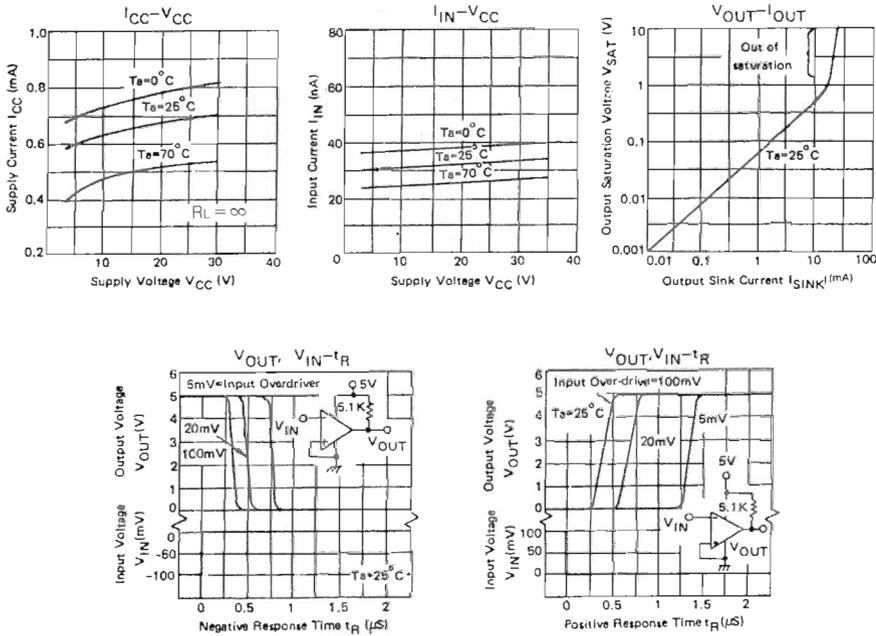


## APPLICATION INFORMATION

During the output voltage transition intervals as the comparator changes states, the DBL393 can easily oscillate if the output lead is inadvertently allowed to capacitively couple to the inputs via stray capacitance. PC board layout is helpful as it reduces stray input-output coupling. Reducing the input resistors to less than 10K Ω reduces the feedback signal levels and finally. Adding even a small amount (1 to 10mV) of positive feedback(hysteresis)causes such a rapid transition that oscillations due to stray feedback are not possible. It is good design practice to ground all pins of any unused comparator

The differential input voltage may be larger than $V_{CC}$ without damaging the device. Because input voltages more negative than −0.3V (at 25°C) should not be used, an input clamp diode can be used as protection. The output of the DBL393 is the uncommitted collector of a grounded-emitter NPN output transistor. Many collectors can be tied together to provide an wired-OR output function.

When the output sink current limit (approximately 16mA) is exceeded, the output transistor will come out of saturation and output voltage will rise very rapidly. Under this limit, the output saturation voltage is limited by the approximately 60 Ω saturation resistance of the output transistor.

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