



## LM393

## LINEAR INTEGRATED CIRCUIT

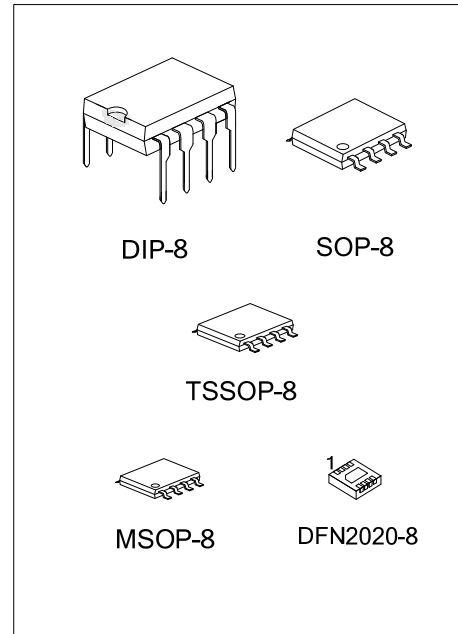
### DUAL DIFFERENTIAL COMPARATOR

#### DESCRIPTION

The UTC **LM393** consists of two independent voltage comparators, designed specifically to operate from a single power supply over a wide voltage range.

#### FEATURES

- \* Single or dual supply operation.
- \* Wide operating supply range ( $V_{CC}=2V \sim 36V$  or  $\pm 1 \sim \pm 18V$ )
- \* Input common-mode voltage includes ground.
- \* Low supply current drain  $I_{CC}=0.8mA$  (Typical).
- \* Low input bias current  $I_{BIAS}=25nA$  (Typical).
- \* Output compatible with TTL, DTL, and CMOS logic system.



#### ORDERING INFORMATION

| Ordering Number   |                   | Package   | Packing   |
|-------------------|-------------------|-----------|-----------|
| Lead Free         | Halogen-Free      |           |           |
| LM393L-D08-T      | LM393G-D08-T      | DIP-8     | Tube      |
| LM393L-S08-R      | LM393G-S08-R      | SOP-8     | Tape Reel |
| LM393L-P08-R      | LM393G-P08-R      | TSSOP-8   | Tape Reel |
| LM393L-SM1-R      | LM393G-SM1-R      | MSOP-8    | Tape Reel |
| LM393L-K08-2020-R | LM393G-K08-2020-R | DFN2020-8 | Tape Reel |

|  |   |
|--|---|
| <p>LM393G-D08-T</p> <p>(1) Packing Type<br/>(2) Package Type<br/>(3) Green Package</p> | <p>(1) T: Tube, R: Tape Reel<br/>(2) D08: DIP-8, S08: SOP-8, P08: TSSOP-8, SM1: MSOP-8, K08-2020: DFN2020-8<br/>(3) G: Halogen Free and Lead Free, L: Lead Free</p> |
|--|---|

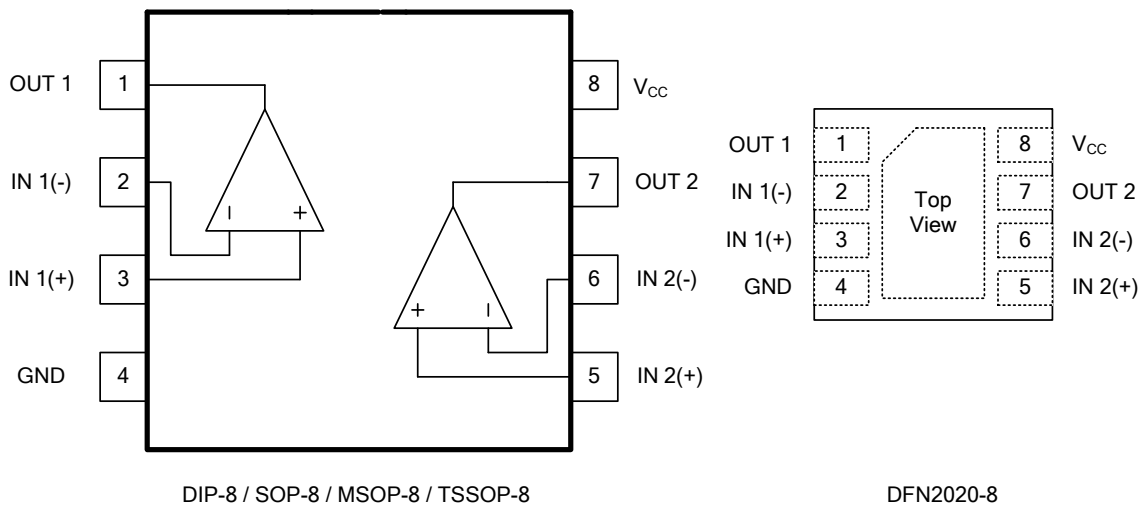
# LM393

## LINEAR INTEGRATED CIRCUIT

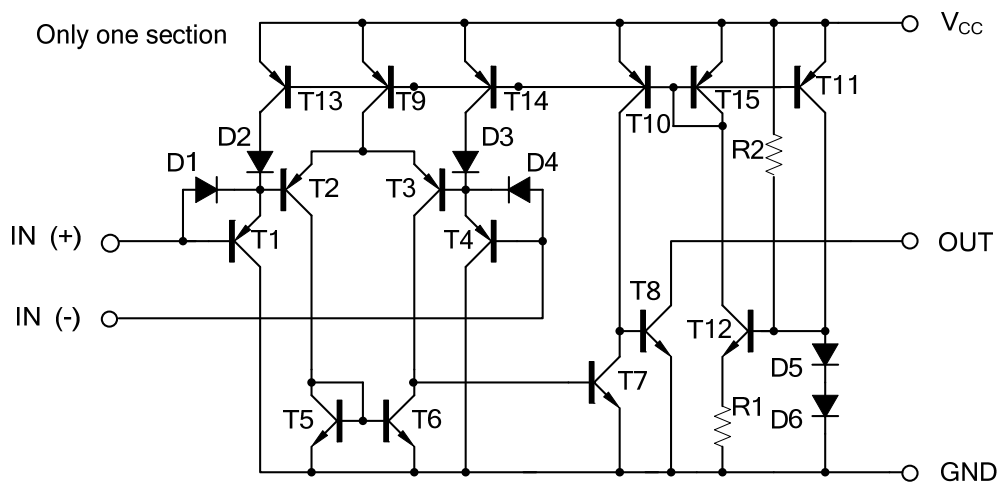
### MARKING

| DIP-8  | SOP-8 / MSOP-8   |
|--|--|
| <p>UTC □□□□ → Date Code<br/>           L: Lead Free<br/>           G: Halogen Free<br/>           Lot Code</p> | <p>UTC □□□□ → Date Code<br/>           L: Lead Free<br/>           G: Halogen Free<br/>           Lot Code</p> |
| TSSOP-8  | DFN2020-8  |
| <p>UTC □□□□ → Date Code<br/>           L: Lead Free<br/>           G: Halogen Free<br/>           Lot Code</p> | <p>M93C<br/>           □□□□ → Date Code</p>  |

### PIN DESCRIPTION



### BLOCK DIAGRAM



### ■ ABSOLUTE MAXIMUM RATINGS

| PARAMETER                            |           | SYMBOL        | RATINGS        | UNIT |
|--------------------------------------|-----------|---------------|----------------|------|
| Supply Voltage                       |           | $V_{CC}$      | $\pm 18$ or 36 | V    |
| Differential Input Voltage           |           | $V_{I(DIFF)}$ | $\pm 36$       | V    |
| Input Voltage                        |           | $V_{IN}$      | -0.3 ~ +36     | V    |
| Power Dissipation                    | DIP-8     | $P_D$         | 600            | mW   |
|                                      | SOP-8     |               | 420            | mW   |
|                                      | TSSOP-8   |               | 350            | mW   |
|                                      | MSOP-8    |               | 300            | mW   |
|                                      | DFN2020-8 |               | 830            | mW   |
| Operating Temperature Range (Note 2) |           | $T_{OPR}$     | -40 ~ +125     | °C   |
| Storage Temperature Range            |           | $T_{STG}$     | -65 ~ +150     | °C   |

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

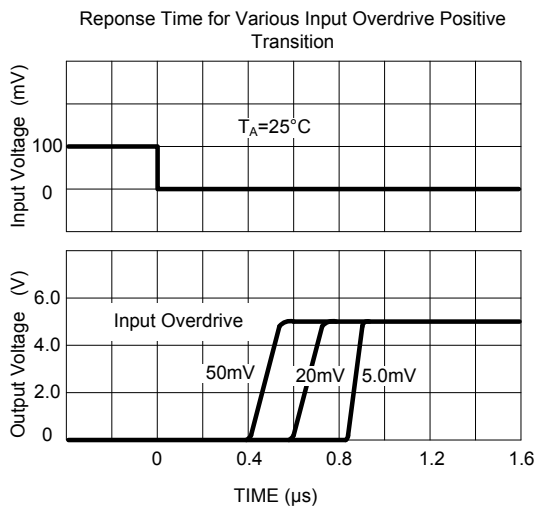
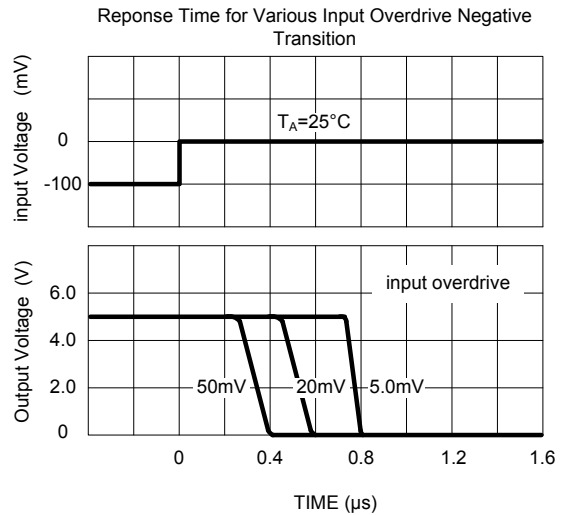
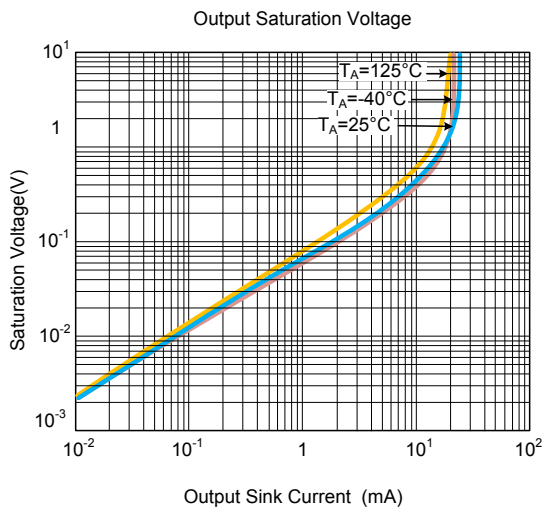
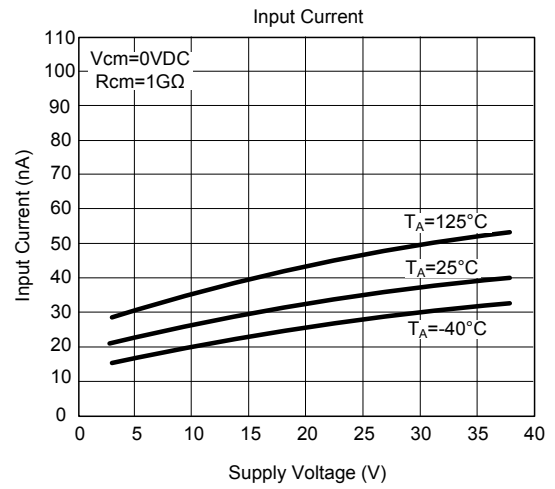
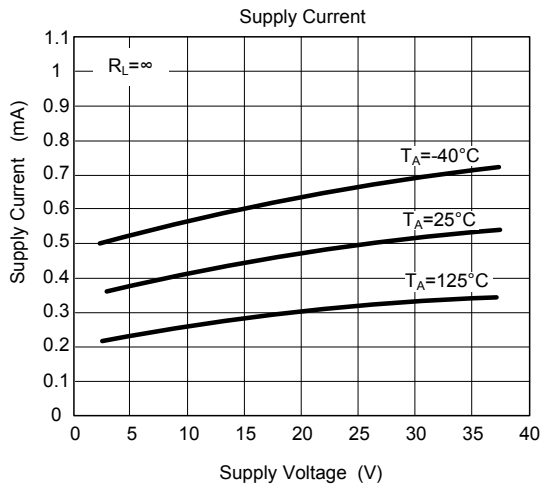
2. It is guarantee by design, not 100% be tested.

### ■ ELECTRICAL CHARACTERISTICS

( $V_{CC}=5.0V$ ,  $T_A=25^\circ C$ , All voltage referenced to GND unless otherwise specified)

| PARAMETER                  | SYMBOL        | TEST CONDITIONS   | MIN | TYP  | MAX          | UNIT    |
|----------------------------|---------------|---|-----|------|--------------|---------|
| Input Offset Voltage       | $V_{I(OFF)}$  | $V_{CM}=0V$ to $V_{CC}-1.5V$<br>$V_{O(P)}=1.4V$ , $R_S=0\Omega$             |     | 1.0  | 5.0          | mV      |
| Output Saturation Voltage  | $V_{SAT}$     | $V_{I(-)}>1V$ , $V_{I(+)}=0V$ , $I_{SINK}=4mA$                              |     | 160  | 400          | mV      |
| Input Common Mode Voltage  | $V_{I(CM)}$   | $V_{CC}=30V$  | 0   |      | $V_{CC}-1.5$ | V       |
| Large Signal Voltage Gain  | $G_V$         | $V_{CC}=15V$ , $R_L \geq 15k\Omega$   | 50  | 200  |              | V/mV    |
| Power Supply Current       | $I_{CC}$      | $R_L=\infty$ , $V_{CC}=30V$   |     | 0.8  | 2.5          | mA      |
|                            |               | $R_L=\infty$  |     | 0.6  | 1.0          | mA      |
| Input Offset Current       | $I_{I(OFF)}$  |   |     | 5    | 50           | nA      |
| Input Bias Current         | $I_{I(BIAS)}$ |   |     | 65   | 250          | nA      |
| Output Sink Current        | $I_{O(SINK)}$ | $V_{I(-)}>1V$ , $V_{I(+)}=0V$ , $V_{O(p)}<1.5V$                             | 6   | 18   |              | mA      |
| Output Leakage Current     | $I_{O(LEAK)}$ | $V_{I(+)}=1V$ , $V_{I(-)}=0$  |     | 0.1  |              | nA      |
|                            |               |   |     |      | 1.0          | $\mu A$ |
| Large Signal Response Time | $t_R$         | $V_{IN}$ =TTL logic wing<br>$V_{REF}=1.4V$ , $V_{RL}=5V$ , $R_L=5.1k\Omega$ |     | 350  |              | ns      |
| Response Time              | $t_R$         | $V_{RL}=5V$ , $R_L=5.1k\Omega$  |     | 1400 |              | ns      |

## TYPICAL CHARACTERISTICS



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