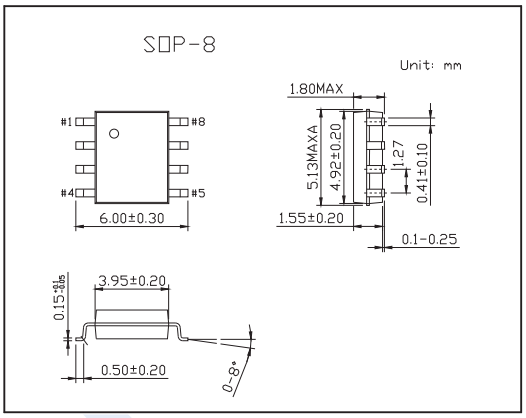
# Low Power Low Offset Voltage Dual Comparators

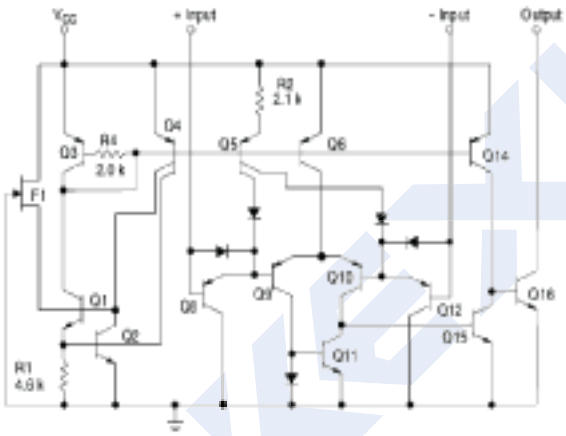
# KM393

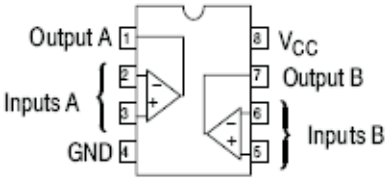
## Features

- Wide Single-Supply Range: 2.0 V to 36 V
- Split-Supply Range: ±1.0 V to ±18 V
- Very Low Current Drain Independent of Supply Voltage: 0.4 mA
- Low Input Bias Current: 25 nA
- Low Input Offset Current: 5.0 nA
- Low Input Offset Voltage: 5.0 mV (max)
- Input Common Mode Range to Ground Level
- Differential Input Voltage Range Equal to Power Supply Voltage




## Representative Schematic Diagram




## Absolute Maximum Ratings Ta = 25℃

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Power Supply Voltage | Vcc | +36 or ±18 | V |
| Input Differential Voltage Range | VIDR | 36 | V |
| Input Common Mode Voltage Range | VICR | -0.3 to +36 | V |
| Output Short Circuit-to-Ground | Isc | Continuous | mA |
| Output Sink Current* | Isink | 20 | |
| Power Dissipation @ TA = 25℃<br>Derate above 25℃ | PD<br>1/Rθ JA | 570<br>5.7 | mW<br>mW/℃ |
| Operating Ambient Temperature Range | TA | 0 to 70 | ℃ |
| Maximum Operating Junction Temperature | TJ(max) | 150 | ℃ |
| Storage Temperature Range | Tstg | -65 to +150 | ℃ |
| ESD Protection at any Pin<br>- Human Body Model<br>- Machine Model | Vesd | <br>2000<br>200 | V |

* The maximum output current may be as high as 20 mA, independent of the magnitude of Vcc, output short circuits to Vcc can cause excessive heating and eventual destruction.

# KM393

■ Electrical Characteristics ($V_{CC}$ = 5.0 V, 0℃≤ $T_A$ ≤ 70℃, unless otherwise noted.)

| Parameter | Symbol | Testconditons | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Input Offset Voltage*1 | $V_{IO}$ | $T_A$ = 25℃<br>0℃≤ $T_A$ ≤ 70℃ | | ±1.0 | ±5.0<br>9.0 | mV |
| Input Offset Current | $I_{IO}$ | $T_A$ = 25℃<br>0℃≤ $T_A$ ≤ 70℃ | | ±5.0 | ±50<br>±150 | nA |
| Input Bias Current *2 | $I_{IB}$ | $T_A$ = 25℃<br>0℃≤ $T_A$ ≤ 70℃ | | 25 | 250<br>400 | nA |
| Input Common Mode Voltage Range *2 | $V_{ICR}$ | $T_A$ = 25℃<br>0℃≤ $T_A$ ≤ 70℃ | 0<br>0 | | $V_{CC}$ - 1.5<br>$V_{CC}$ - 2.0 | V |
| Voltage Gain | $A_{VOL}$ | $R_L$≥15 kΩ, $V_{CC}$ = 15 V, $T_A$ = 25℃ | 50 | 200 | | V/mV |
| Large Signal Response Time | | $V_{in}$ = TTL Logic Swing, $V_{ref}$ = 1.4 V, $V_{RL}$ = 5.0 V, $R_L$ = 5.1 kΩ, $T_A$ = 25℃ | | 300 | | ns |
| Response Time *4 | $t_{TLH}$ | $V_{RL}$ = 5.0 V, $R_L$ = 5.1 kΩ, TA = 25℃ | | 1.3 | | μs |
| Input Differential Voltage *5 | $V_{ID}$ | All $V_{in}$≥GND or V-Supply (if used) | | | $V_{CC}$ | V |
| Output Sink Current | $I_{Sink}$ | $V_{in}$≥1.0 V, $V_{in+}$ = 0 V, $V_O$ ≤ 1.5 V $T_A$ = 25℃ | 6.0 | 16 | | mA |
| Output Saturation Voltage | $V_{OL}$ | $V_{in}$≥1.0 V, $V_{in+}$ = 0, $I_{Sink}$ ≤ 4.0 mA, $T_A$ = 25℃ | | 150 | 400 | mV |
| | | 0℃≤ TA ≤ 70℃ | | | 700 | |
| Output Leakage Current | $I_{OL}$ | $V_{in-}$ = 0 V, $V_{in+}$ ≥1.0 V, $V_O$ = 5.0 V, $T_A$ = 25℃ | | 0.1 | | nA |
| | | $V_{in-}$ = 0 V, $V_{in+}$≥1.0 V, $V_O$ = 30 V,0℃≤ $T_A$ ≤ 70℃ | | | 1000 | |
| Supply Current | $I_{CC}$ | $R_L$ = ∞ Both Comparators, $T_A$ = 25℃ | | 0.4 | 1.0 | mA |
| | | $R_L$ = ∞ Both Comparators, $V_{CC}$ = 30 V | | | 2.5 | |

*1. At output switch point, $V_O$=1.4 V, $R_S$ = 0Ù with $V_{CC}$ from 5.0 V to 30 V, and over the full input common mode range (0 V to $V_{CC}$ = -1.5 V).

*2. Due to the PNP transistor inputs, bias current will flow out of the inputs. This current is essentially constant, independent of the output state, therefore, no loading changes will exist on the input lines.

*3. Input common mode of either input should not be permitted to go more than 0.3 V negative of ground or minus supply. The upper limit of common mode range is $V_{CC}$ -1.5 V.

*4. Response time is specified with a 100 mV step and 5.0 mV of overdrive. With larger magnitudes of overdrive faster response times are obtainable.

*5. The comparator will exhibit proper output state if one of the inputs becomes greater than $V_{CC}$, the other input must remain within the common mode range. The low input state must not be less than -0.3 V of ground or minus supply.

■ Marking

| Marking | 393 |
|---|---|