## Description

The GM393 consists of four independent precision voltage comparators which 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. These comparators also have a unique characteristic. In that, the input common-mode voltage range includes ground, even though operated from a single power supply voltage.

Application areas include limit comparators, simple analog to digital converters; pulse, square wave and time delay generators; wide range VCO; MOS clock timers; multivibrators and high voltage digital logic gates. The GM339 are designed to directly interface with TTL and CMOS. When operated from both plus and minus power supplies, the GM339 will directly interface with MOS logic, where their low power drain is a distinct advantage over standard comparators.

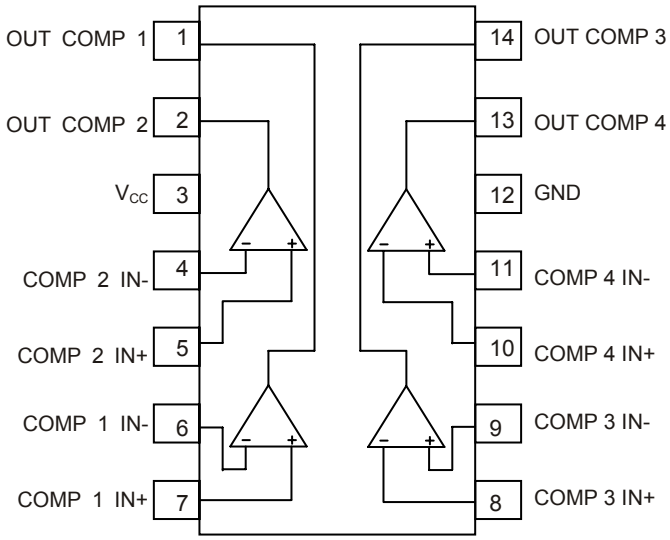
The GM339 is available in DIP-8 and SOP-8 packages.

## Features

- **Single- supply Range: ±1.0V to ±18V**
- **Wide supply voltage range: ±2.0V to ±36V**
- **Very low supply current drain (0.4 mA) -**
- **independent of supply voltage**
- **Low input biasing current: 25 nA**
- **Low input offset current: ±5 nA**
- **Maximum offset voltage: ±3 mV**
- **Input common-mode voltage range includes ground**
- **Differential input voltage range equal to the power supply voltage**
- **Low output saturation voltage: 250 mV at 4 mA**
- **Output voltage compatible with TTL, DTL, ECL, MOS and CMOS logic systems**

## Connecting Diagram

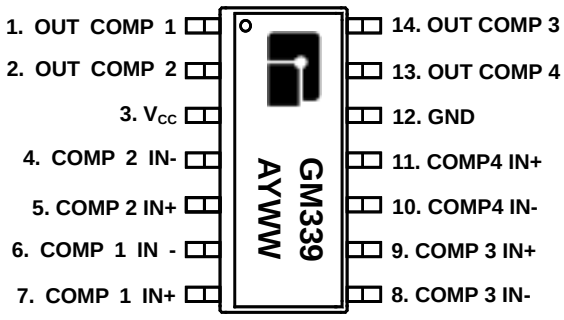
**(Top View)**




**SOP-14, DIP-14 PACKAGE**

## Marking Information and Pin Configurations (Top View)

**SO14 and DIP14**




A: Assembly / Test site code
Y: Year
WW: Week

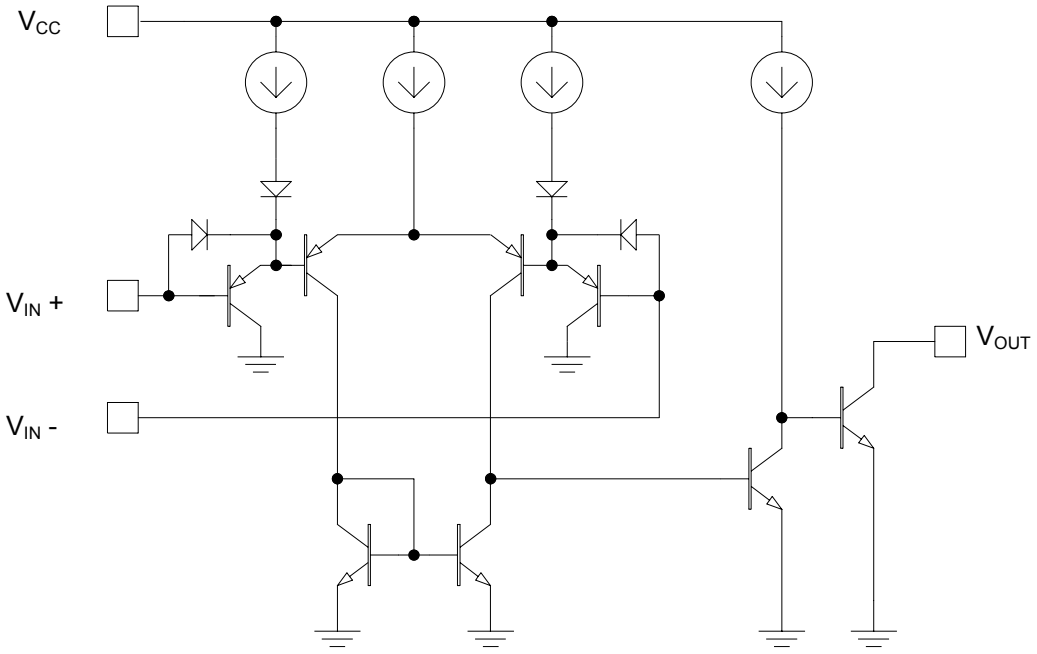
## Ordering Information

| Ordering Number | Package | Shipping |
|---|---|---|
| GM339D14T | DIP-14 | 25 Units / Tube |
| GM339S14T | SO-14 | 50 Units / Tube |
| GM339S14R | SO-14 | 2,500 Units / Tape & Reel |

## Absolute Maximum Ratings

| PARAMETER | RATINGS | UNITS |
|---|---|---|
| Supply Voltage | ±18 or 36 | V |
| Input Current | 50 | mA |
| Input Voltage | -0.3 to +32 | V |
| Operating Temperature Range | -40 to 125 | ℃ |
| Storage Temperature | - 65 to 150 | ℃ |
| Lead Temperature (soldering 10 sec.) | 260 | ℃ |

## Block Diagram



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

| Parameter | Symbol | Condition | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Input offset Voltage | $V_{IO}$ | $V_{CC}$ = 5V to Max<br>$V_{IC}$ = $V_{ICR}$ min<br>$V_O$ = 1.4V | $T_A$ = 25℃ | | ±2 | ±5 | mV |
| | | | Full Range | | | 9 | |
| Input Offest Current | $I_{IO}$ | $V_O$ = 1.4V | $T_A$ = 25℃ | | ±5 | ±50 | nA |
| | | | Full Range | | | ±150 | |
| Input Bias Current | $I_{IB}$ | $V_O$ =1.4V | $T_A$ = 25℃ | | -20 | -250 | nA |
| | | | Full Range | | | 400 | |
| Common-Mode Input Voltage Range** | $V_{ICR}$ | | $T_A$ = 25℃ | 0 to $V_{CC}$-1.5V | | | V |
| | | | Full Range | 0 to $V_{CC}$-2.0V | | | |
| Low-Level output Voltage | $V_{OL}$ | $I_{OL}$ = 4mA, $V_{ID}$ = 1V | $T_A$ = 25℃ | | 150 | 400 | mV |
| | | | Full Range | | | 700 | |
| Large-Signal Differential Voltage Amplification | $A_{VD}$ | $V_{CC}$ = 15V,<br>$V_O$ = 1V to 11V<br>$R_L$ = 15K to $V_{CC}$ | $T_A$ = 25℃ | 50 | 200 | | V/mV |
| High Level Output Current | $I_{OH}$ | $V_{OH}$ = 5V, $V_{ID}$ = 1V | $T_A$ = 25℃ | | 0.1 | 50 | nA |
| | | $V_{OH}$ = 30V, $V_{ID}$ = 1V | Full Range | | 1 | | μA |
| Low Level Output Current | $I_{OL}$ | $V_{OH}$ = 1.5V, $V_{ID}$ = -1V | $T_A$ = 25℃ | 6 | | | mA |
| Supply Current | $I_{CC}$ | $R_L$ = ∞, $V_{CC}$ = 5V | $T_A$ = 25℃ | | 0.8 | 1.0 | mA |
| | | $R_L$ = ∞, $V_{CC}$ = 30V | Full Range | | | 2.5 | |
| Response Time (Note 1) | | $R_L$ Connected to 5V through 5.1k.<br>$C_L$ = 15pF | 100mV input step with 5mV overdrive | | 1.3 | | μs |
| | | | TTL - level input step | | 0.3 | | |

All characteristics are measured under open loop conditions with zero common-mode input voltage unless otherwise specified. "MAX" $V_{CC}$ for testing purposes is 30V. Full range is 0°C to 70°C.

** 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.

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

## Typical Performance Characteristics

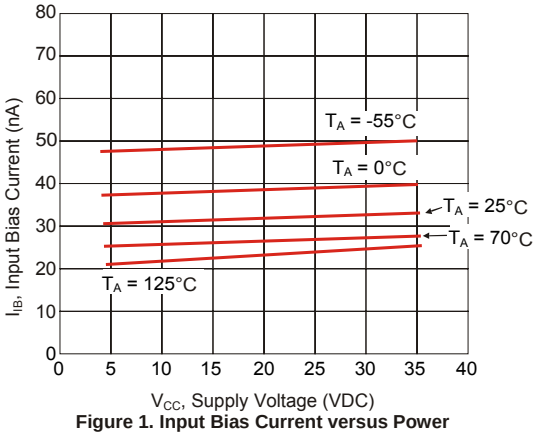



**Figure 1. Input Bias Current versus Power Supply Voltage**

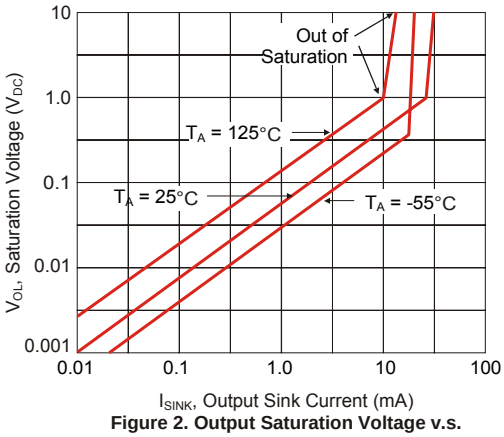



**Figure 2. Output Saturation Voltage v.s. Output Sink Current**

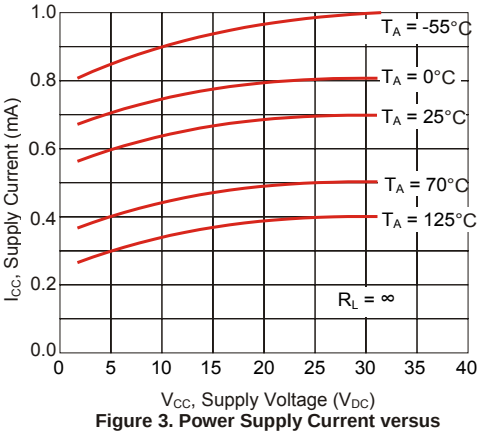
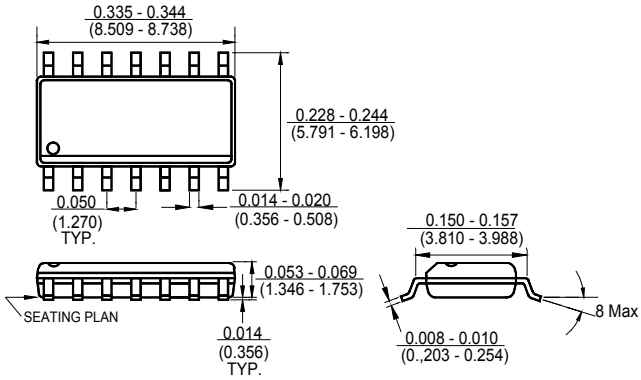
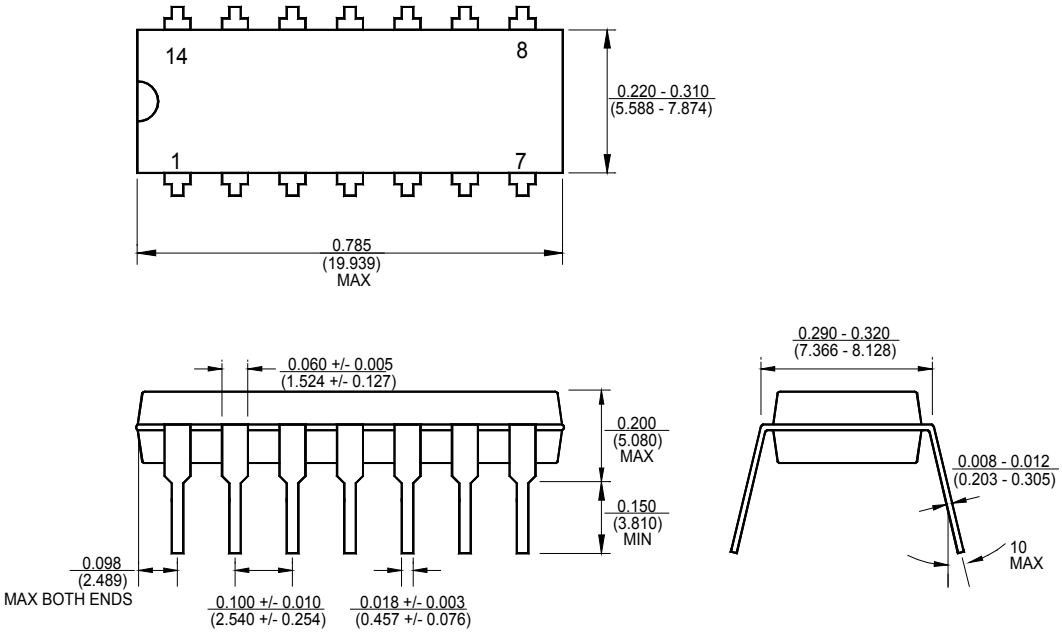



**Figure 3. Power Supply Current versus Power Supply Voltage**

## Package Outline Dimensions – SO 14




## Package Outline Dimensions – DIP 14



## Ordering Number

| GM | 339 | S14 | R |
|---|---|---|---|
| APM Gamma Micro | Circuit Type | Package Type<br>S14: SO 14<br>D14: DIP 14 | Shipping Type<br>R: Taping & Reel<br>T: Tube |