

### Features

- I Wide Supply Voltage Range
- I Single Supply: 2.0V to 36V
- I Dual Supplies:  $\pm 1.0V$  to  $\pm 18V$
- I Low Supply Current Drain: 0.9mA
- I Low Input Bias Current: 25nA (Typ)
- I Low Input Offset Current: 5.0nA (Typ)
- I Low Input Offset Voltage:  $\pm 2.0mV$  (Typ)
- I Input Common Mode Voltage Range Includes Ground
- I Differential Input Voltage Range Equals to the Power Supply Voltage
- I Low Output Saturation Voltage: 200mV at 4mA
- I Open Collector Output
- I Small Package:  
GS339/339A Available in SOP-14 and TSSOP-14 Packages

### General Description

The GS339/339A consist of four independent precision voltage comparators with a typical offset voltage of 2.0mV and high gain. They are specifically designed to operate from a single power supply over wide range of voltages. Operation from split power supply is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage.

The GS339/339A series are compatible with industry standard 339.

The GS339A has more stringent input offset voltage than the GS339.

The GS339 is available in SOP-14 and TSSOP-14 packages, and the GS339A is available in SOP-14 package.

### Applications

- I Battery Charger
- I Cordless Telephone
- I Switching Power Supply
- I DC-DC Module
- I PC Motherboard
- I Communication Equipment

### Pin Configuration

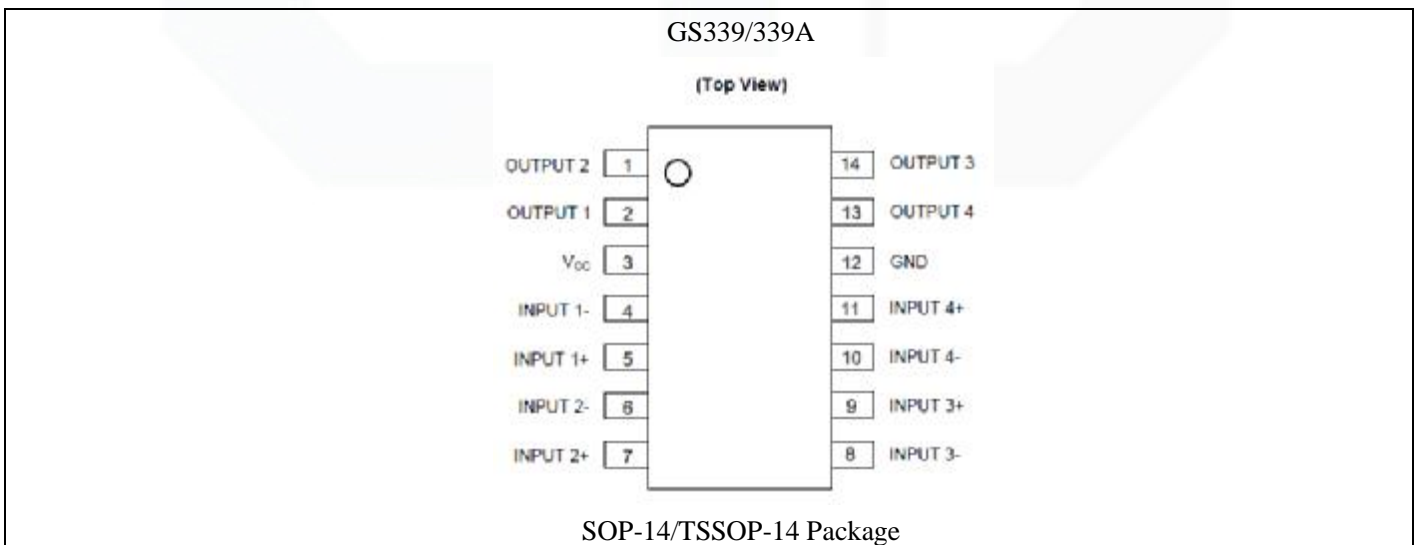


Figure 1. Pin Assignment Diagram

## Functional Block Diagram

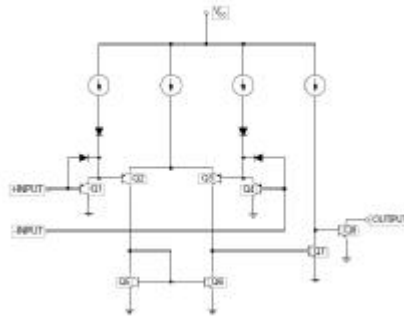


Figure 2. Functional Block Diagram of GS339/339A (Each comparator)

## Absolute Maximum Ratings

Condition	Symbol	Max
Power Supply Voltage	V <sub>CC</sub>	±20V or 40V
Differential input voltage	V <sub>I(DIFF)</sub>	40V
Input Voltage	V <sub>I</sub>	-0.3V~40V
Operating Junction Temperature	T <sub>J</sub>	150°C
Storage Temperature Range	T <sub>stg</sub>	-65°C ~+150°C

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Note 2: This input current will only exist when the voltage at any of the input leads is driven negative. It is due to the collector-base junction of the input PNP transistors becoming forward biased and thereby acting as input diode clamps. In addition to this diode action, there is also lateral NPN parasitic transistor action on the IC chip. This transistor action can cause the output voltages of the comparators to go to the V<sub>+</sub> voltage level (or to ground for a large overdrive) for the time duration that an input is driven negative. This is not destructive and normal output states will re-establish when the input voltage, which was negative, again returns to a value greater than -0.3 VDC at 25°C).

## Package/Ordering Information

MODEL	CHANNEL	ORDER NUMBER	PACKAGE DESCRIPTION	PACKAGE OPTION	MARKING INFORMATION
GS339	Quad	GS339-SR	SOP-14	Tape and Reel,2500	GS339
		GS339-TR	TSSOP-14	Tape and Reel,3000	GS339
GS339A	Quad	GS339A-SR	SOP-14	Tape and Reel,2500	GS339
		GS339A-TR	TSSOP-14	Tape and Reel,3000	GS339

**Recommended Operating Conditions**

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V <sub>CC</sub>	2	36	V
Operating Temperature Range	T <sub>A</sub>	-40	85	°C

**Electrical Characteristics**

Limits in standard typeface are for T<sub>A</sub>=25 °C, bold typeface applies over T<sub>A</sub>=-40 °C to 85 °C (Note 3), V<sub>CC</sub>=5V, GND=0V, unless otherwise specified.

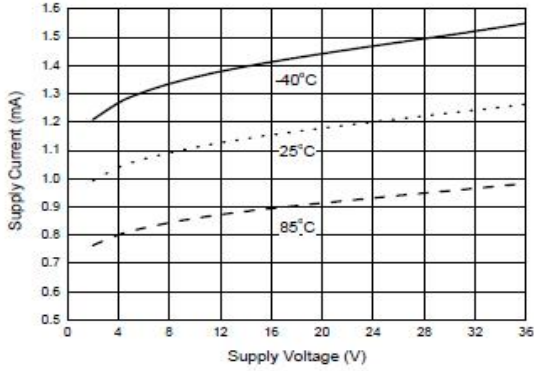
Parameter	Conditions	Min	Typ	Max	Unit	
Input Offset Voltage	V <sub>O</sub> = 1.4V, R <sub>S</sub> = 0Ω, V <sub>CC</sub> from 5V to 30V	GS339	—	2	5	mV
			—	—	7	
		GS339A	—	2	3	
			—	—	5	
Input Bias Current	I <sub>IN+</sub> or I <sub>IN-</sub> with output in Linear Range, V <sub>CM</sub> = 0V	—	25	250	nA	
		—	—	400		
Input Offset Current	I <sub>IN+</sub> - I <sub>IN-</sub> , V <sub>CM</sub> = 0V	—	5.0	50	nA	
		—	—	200		
Input Common Mode Voltage Range (Note 7)	V <sub>CC</sub> = 30V	0	—	V <sub>CC</sub> -1.5	V	
Supply Current	R <sub>L</sub> = ∞	V <sub>CC</sub> = 5V	—	0.9	2.0	mA
			—	—	3.0	
		V <sub>CC</sub> = 30V	—	1.2	2.5	
			—	—	3.5	
Voltage Gain	R <sub>L</sub> ≥ 15kΩ, V <sub>CC</sub> = 15V, V <sub>O</sub> = 1V to 11V	50	200	—	V/mV	
Large Signal Response Time	V <sub>IN</sub> = TTL Logic Swing, V <sub>REF</sub> = 1.4V, V <sub>RL</sub> = 5V, R <sub>L</sub> = 5.1kΩ	—	200	—	ns	
Response Time	V <sub>RL</sub> = 5V, R <sub>L</sub> = 5.1kΩ	—	1.3	—	μs	
Output Sink Current	V <sub>IN-</sub> = 1V, V <sub>IN+</sub> = 0, V <sub>O</sub> = 1.5V	8.0	16	—	mA	
Output Leakage Current	V <sub>IN-</sub> = 0V, V <sub>IN+</sub> = 1V, V <sub>O</sub> = 5V	—	0.1	—	nA	
	V <sub>IN-</sub> = 0V, V <sub>IN+</sub> = 1V, V <sub>O</sub> = 30V	—	—	1	μA	
Saturation Voltage	V <sub>IN-</sub> = 1V, V <sub>IN+</sub> = 0, I <sub>SINK</sub> ≤ 4mA	—	200	400	mV	
		—	—	500		
Thermal Resistance (Junction to Case)	SO-14	—	15	—	°C/W	
	TSSOP-14	—	8	—		
Thermal Resistance (Junction to Ambient)	SO-14	—	89	—		
	TSSOP-14	—	125	—		

Note 3: These specifications are limited to -40 °C ≤ T<sub>A</sub> ≤ 85 °C. Limits over temperature are guaranteed by design, but not tested in production.

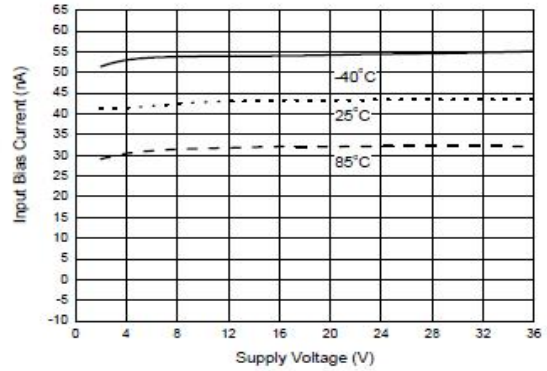
Note 4: The input common-mode voltage of either input signal voltage should not be allowed to go negatively by more than 0.3V (at 25 °C). The upper end of the common-mode voltage range is V<sub>CC</sub>-1.5V (at 25 °C), but either or both inputs can go to +36V without damages, independent of the magnitude of the V<sub>CC</sub>.

Typical Performance characteristics

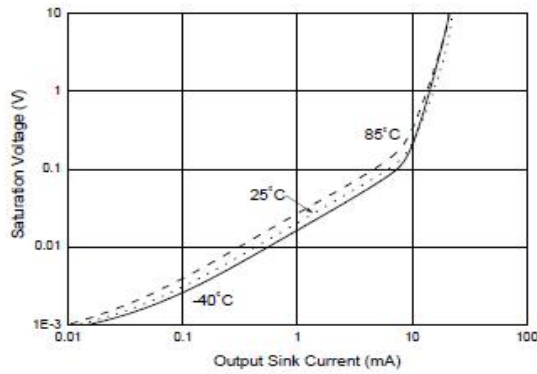
Supply Voltage vs. Supply Current



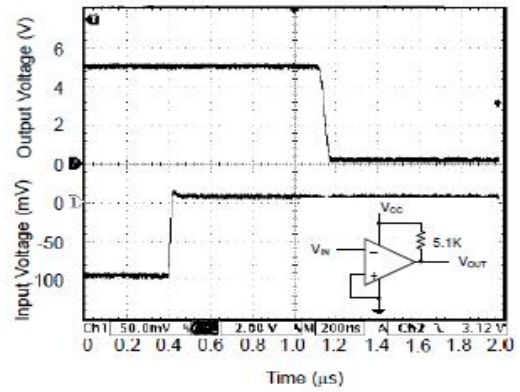
Supply Voltage vs. Input Bias Current



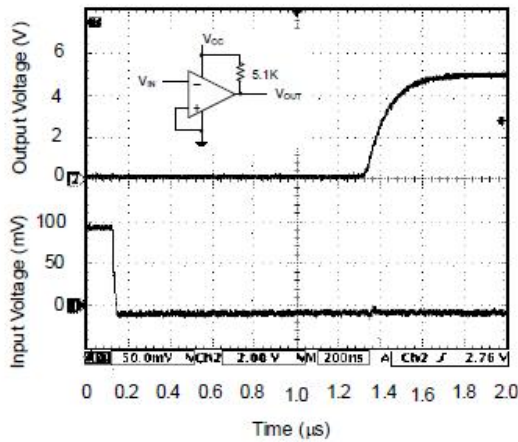
Output Sink Current vs. Saturation Voltage



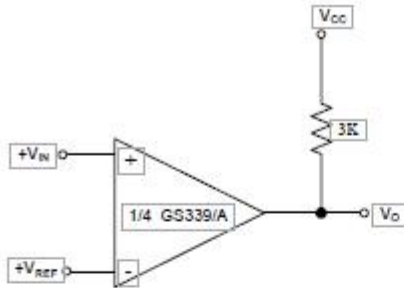
Response Time for 5mV Input Overdrive - Negative Transition



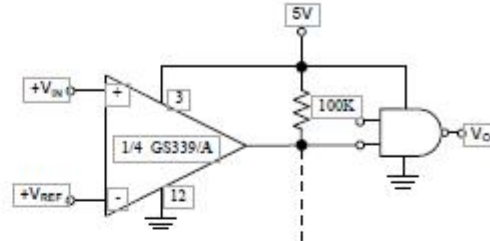
Response Time for 5mV Input Overdrive - Positive Transition



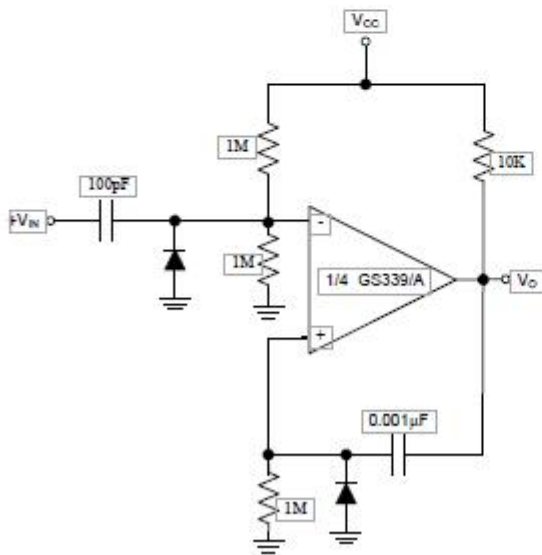
**Typical Applications**



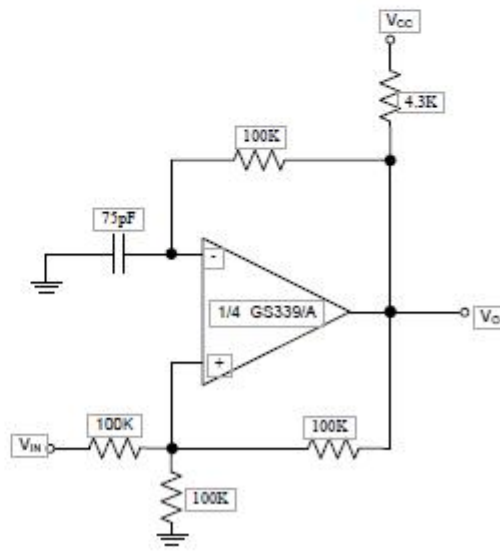
Basic Comparator



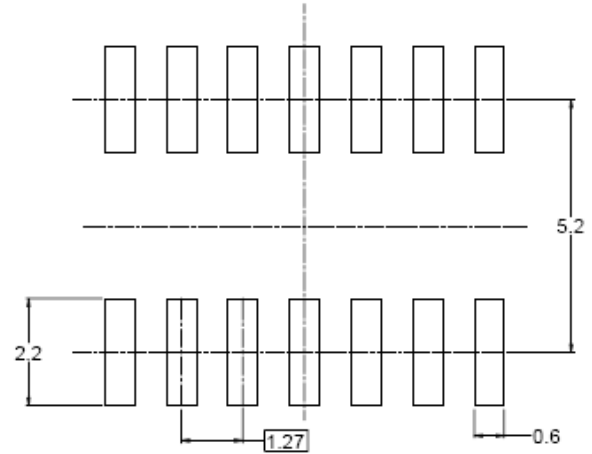
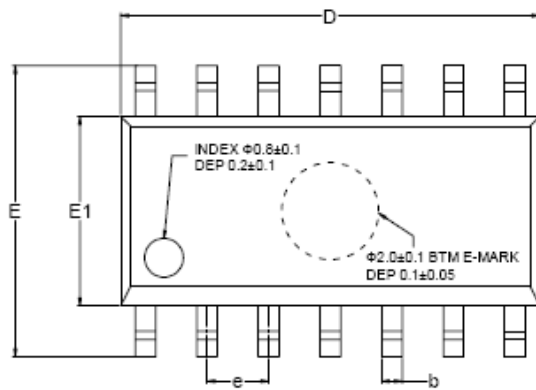
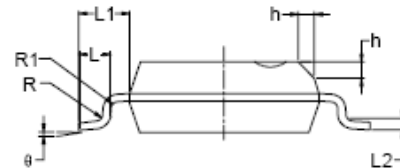
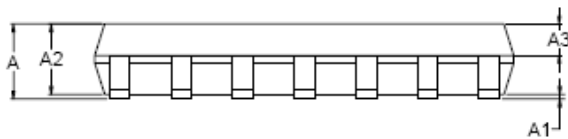
Driving CMOS



One Shot Multivibrator

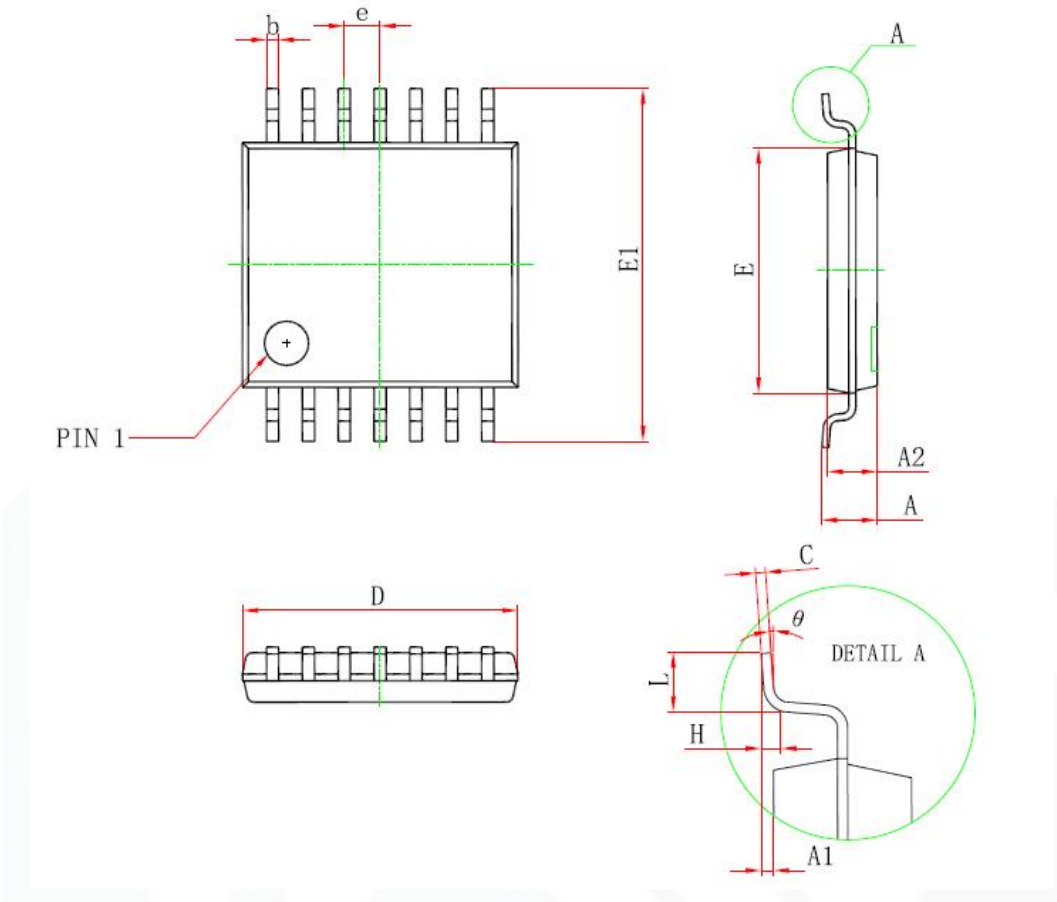


Squarewave Oscillator

**Package Information**
**SOP-14**

**RECOMMENDED LAND PATTERN (Unit: mm)**


Symbol	Dimensions In Millimeters			Dimensions In Inches		
	MIN	MOD	MAX	MIN	MOD	MAX
A	1.35		1.75	0.053		0.069
A1	0.10		0.25	0.004		0.010
A2	1.25		1.65	0.049		0.065
A3	0.55		0.75	0.022		0.030
b	0.36		0.49	0.014		0.019
D	8.53		8.73	0.336		0.344
E	5.80		6.20	0.228		0.244
E1	3.80		4.00	0.150		0.157
e	1.27 BSC			0.050 BSC		
L	0.45		0.80	0.018		0.032
L1	1.04 REF			0.040 REF		
L2	0.25 BSC			0.01 BSC		
R	0.07			0.003		
R1	0.07			0.003		
h	0.30		0.50	0.012		0.020
$\theta$	0°		8°	0°		8°

TSSOP-14



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
D	4.900	5.100	0.193	0.201
E	4.300	4.500	0.169	0.177
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
E1	6.250	6.550	0.246	0.258
A		1.200		0.047
A2	0.800	1.000	0.031	0.039
A1	0.050	0.150	0.002	0.006
e	0.65 (BSC)		0.026 (BSC)	
L	0.500	0.700	0.020	0.028
H	0.25(TYP)		0.01(TYP)	
$\theta$	1°	7°	1°	7°