



Low Power Low Offset Voltage Quad Comparators

LM339

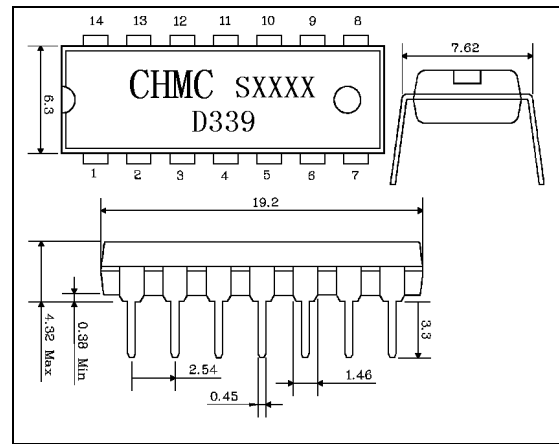
DESCRIPTION:

The LM339 consists of four independent precision voltage comparators. These were designed specifically to operate from a signal power supply over a wide range of voltage. 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. The LM339 also has a unique characteristic in that the input common-mode voltage range includes ground, even though operated from a single power supply voltage.

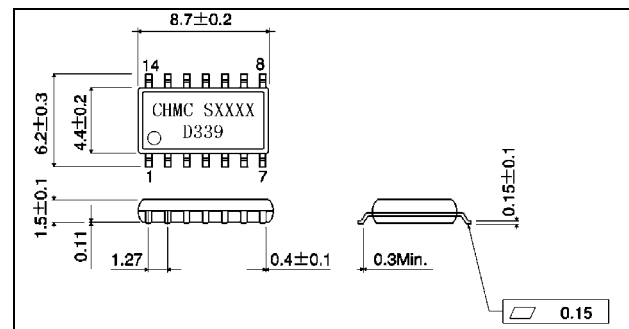
FEATURE:

- Low input biasing current: 25nA (TYP.) .
- Low input offset current: $\pm 5.0\text{nA}$ (TYP.) .
- Low output saturation voltage: 130mV.
- Output voltage compatible with TTL, CMOS.

Outline Drawing

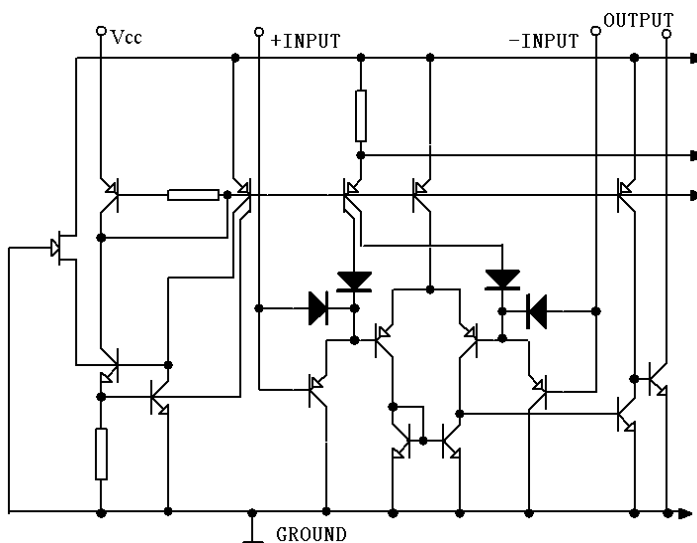


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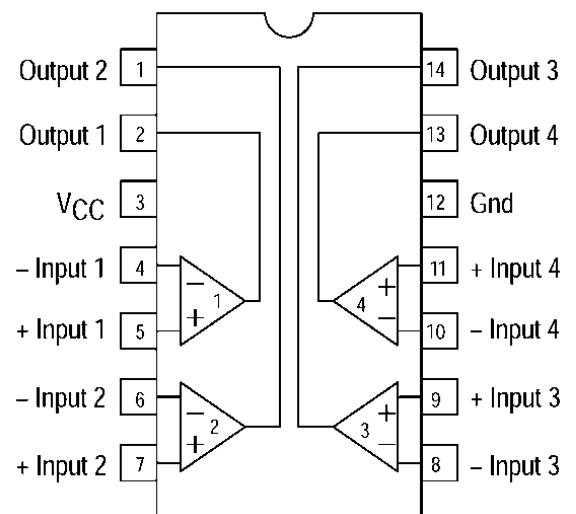


SOP14

PIN CONFIGURATION



BLOCK DIAGRAM



PIN DESCRIPTIONS

No	Description	Symbol	No	Description	Symbol
1	Output 2	OUT2	8	-Input3	IN3 (-)
2	Output 1	OUT1	9	+Input3	IN3 (+)
3	Supply Voltage	Vcc	10	-Input4	IN4 (-)
4	-Input1	IN1 (-)	11	+Input4	IN4 (+)
5	+Input1	IN1 (+)	12	Ground	GND
6	-Input2	IN2 (-)	13	Output 4	OUT4
7	+Input2	IN2 (+)	14	Output 3	OUT3

ABSOLUTE MAXIMUM RATINGS

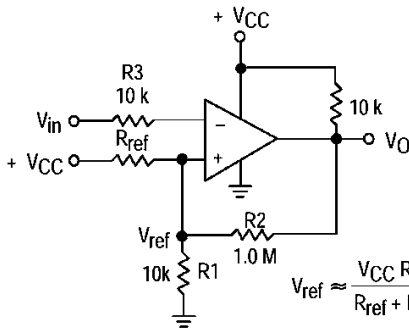
Characteristics	Symbol	Value	Unit
Supply Voltage	Vcc	36 or ± 18	V
Differential Input Voltage	V _{IDR}	36	V
Input Voltage	V _{ICMR}	-0.3~Vcc	V
Input Current	I _{sc}	50	
Power Dissipation (*)	P _D	1.0	W
Operating Temperature Range	T _{amb}	-20~+85	°C
Storage Temperature Range	T _{stg}	-65~150	°C

Note (*): Power dissipation reduces 8 mW/°C for using above Ta=25°C.

ELECTRICAL CHARACTERISTICS (Unless otherwise specified :Vcc=5V, Tamb=25°C)

Characteristics	Test conditions	Symbol	Mi	Typ.	Max	Unit
Input Offset Voltage		V _{IO}		± 2.0	± 5.0	mV
	0°C ≤ Ta ≤ 70°C				± 9.0	
Input Offset Current		I _{IO}		± 5.0	± 50	nA
	0°C ≤ Ta ≤ 70°C				± 150	
Input Bias Current		I _{IB}		25	250	nA
	0°C ≤ Ta ≤ 70°C				400	
Input Common-mode Voltage Range		V _{ICR}	0		Vcc-1.5	V
	0°C ≤ Ta ≤ 70°C		0		Vcc-2.0	
Supply Current	R _L =∞	I _{CC}		0.8	2.0	mA
	R _L =∞, Vcc=30V			1.0	2.5	
Voltage Gain	R _L ≥ 15KΩ, Vcc=15V	G _v	50	200		V/mV
Large Signal Response Time	V _{IN} =TTL Logic Swing, V _{REF} =1.4V, V _{RL} =5.0V, R _L =5.1KΩ	t _{RES}		300		ns
Response Time	V _{RL} =5.0V, R _L =5.1KΩ	t _{RES}		1.3		ns
Input Differential Voltage		V _{ID}			Vcc	V
Output Sink Current	V _{IN} (-) ≥ 1.0V, V _{IN} (+)=0V, V _O ≤ 1.5V	I _{SINK}	6.0	16		mA
output saturation voltage	V _{IN} (-) ≥ 1.0V, V _{IN} (+)=0V, I _{SINK} ≤ 4.0mA	V _{SAT}		130	400	mV
	V _{IN} (-) ≥ 1.0V, V _{IN} (+)=0V, I _{SINK} ≤				700	
Output Leakage Current	V _{IN} (+) ≥ 1.0V, V _{IN} (-)=0V, V _O =5.0V	I _{OL}		0.1		nA
	V _{IN} (+) ≥ 1.0V, V _{IN} (-)=0V, V _O =30V 0°C ≤ Ta ≤ 70°C				1000	

APPLICATION CIRCUIT

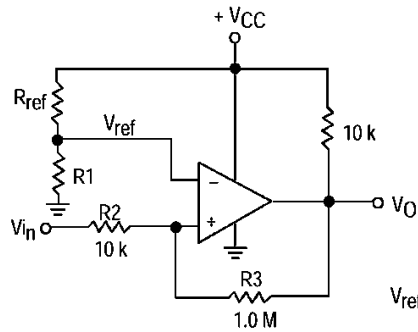


$$V_{ref} \approx \frac{V_{CC} R_1}{R_{ref} + R_1}$$

$$R_3 = R_1 // R_{ref} // R_2$$

$$V_H = \frac{R_1 // R_{ref}}{R_1 // R_{ref} + R_2} [V_{O(max)} - V_{O(min)}]$$

$$R_2 \gg R_{ref} // R_1$$

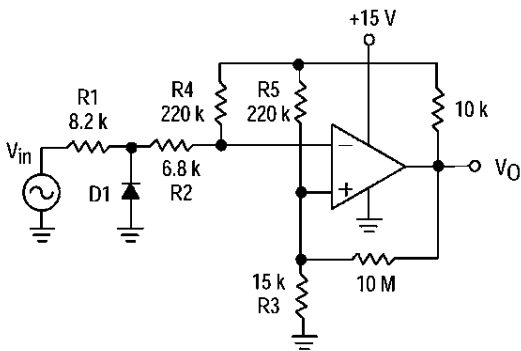


$$V_{ref} = \frac{V_{CC} R_1}{R_{ref} + R_1}$$

$$R_2 \approx R_1 // R_{ref}$$

Amount of Hysteresis V_H

$$V_H = \frac{R_2}{R_2 + R_3} [(V_{O(max)} - V_{O(min)})]$$

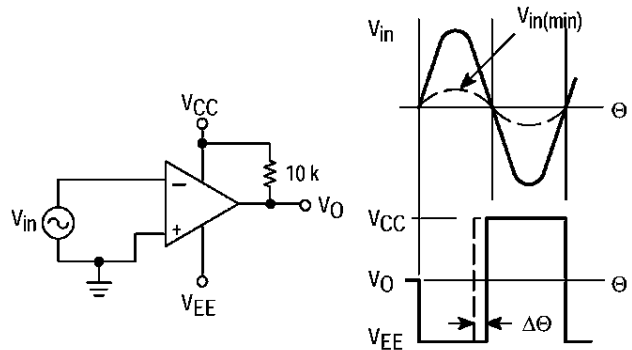


D1 prevents input from going negative by more than 0.6 V.

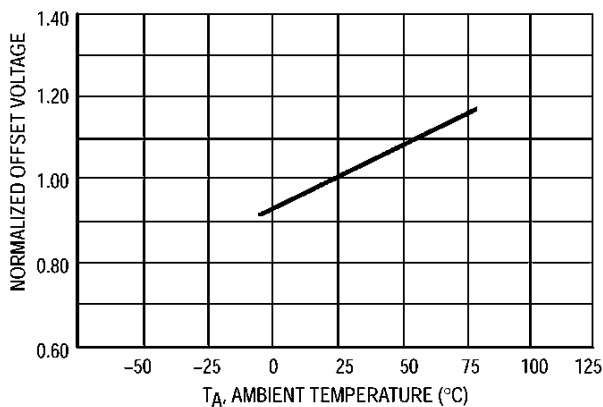
$$R_1 + R_2 = R_3$$

$$R_3 \leq \frac{R_5}{10} \text{ for small error in zero crossing}$$

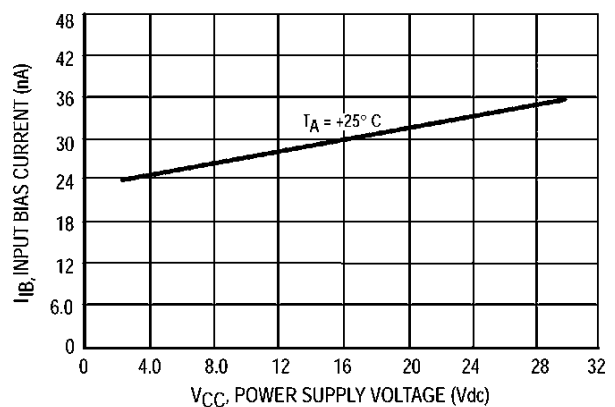
$V_{in(min)} \approx 0.4 \text{ V peak for } 1\% \text{ phase distortion } (\Delta\theta)$.



TYPICAL CHARACTERISTICS CURVES:

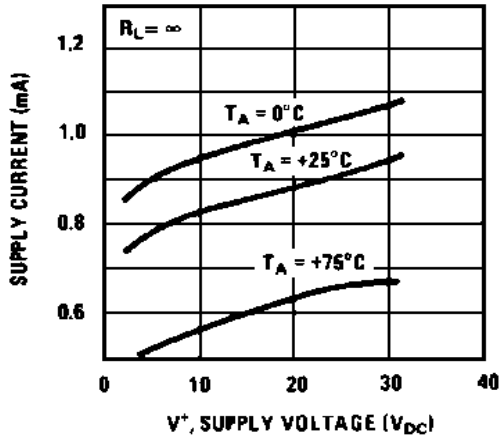


Input Offset Voltage

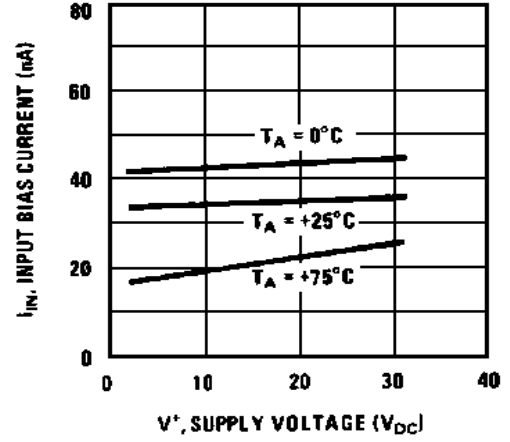


Input Bias Current

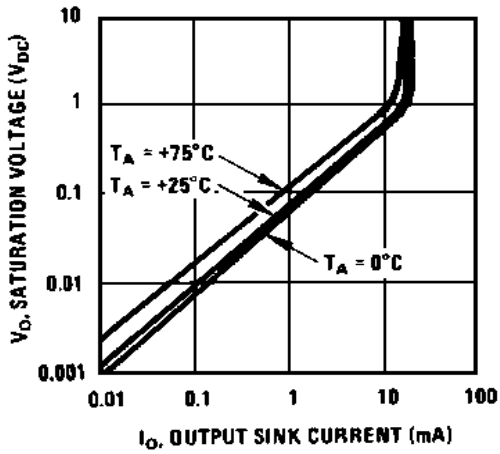
Supply Current



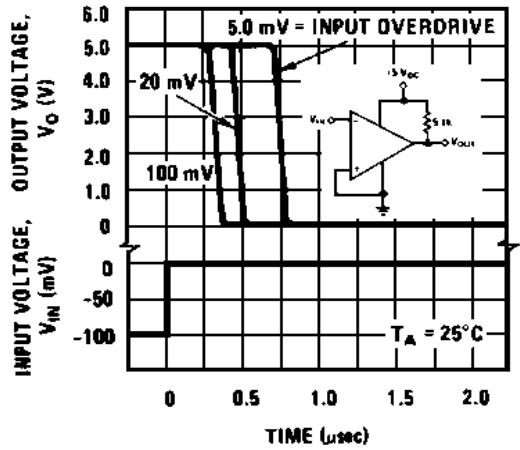
Input Current



Output Saturation Voltage



Response Time for Various Input Overdrives — Negative Transition



Response Time for Various Input Overdrives — Positive Transition

