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# LM339/LM339A, LM239A, LM2901

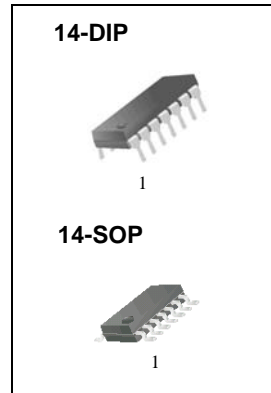
## Quad Comparator

### Features

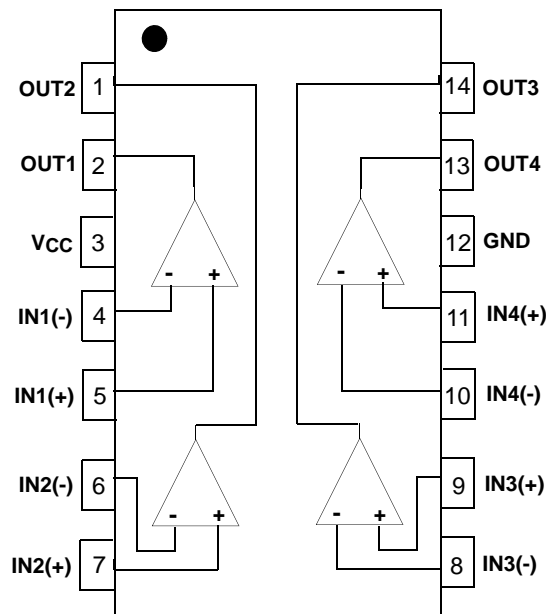
- Single or Dual Supply Operation
- Wide Range of Supply Voltage  
LM2901, LM339/LM339A, LM239A: 2 ~ 36V (or  $\pm 1 \sim \pm 18V$ )
- Low Supply Current Drain 800 $\mu A$  Typ.
- Open Collector Outputs for Wired and Connectors
- Low Input Bias Current 25nA Typ.
- Low Input Offset Current  $\pm 2.3nA$  Typ.
- Low Input Offset Voltage  $\pm 1.4mV$  Typ.
- Input Common Mode Voltage Range Includes Ground.
- Low Output Saturation Voltage
- Output Compatible With TTL, DTL and MOS Logic System

### Description

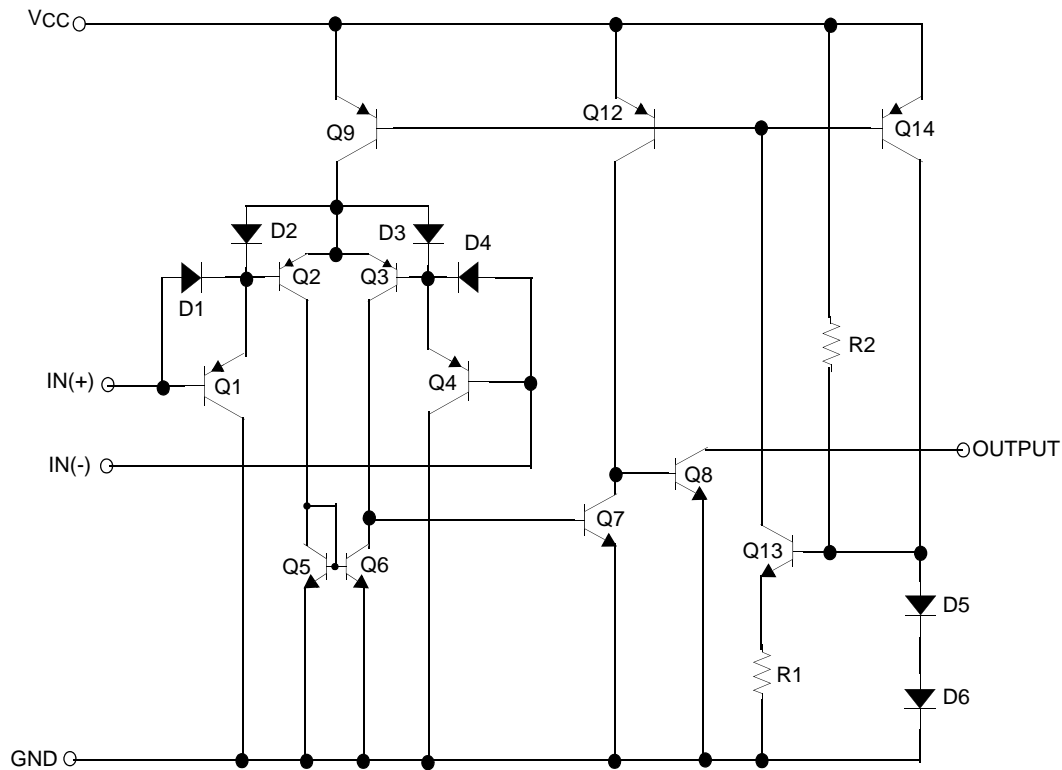
The LM339/LM339A ,LM239A, LM2901 consist of four independent voltage comparators designed to operate from single power supply over a wide voltage range.



### Internal Block Diagram



## Schematic Diagram



## Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Supply Voltage	VCC	±18 or 36	V
Differential Input Voltage	V <sub>I(DIFF)</sub>	36	V
Input Voltage	V <sub>I</sub>	-0.3 to +36	V
Output Short Circuit to GND	-	Continuous	-
Power Dissipation	P <sub>D</sub>	570	mW
Operating Temperature	T <sub>OPR</sub>	0 ~ +70	°C
LM339/LM339A		-40 ~ +85	
LM2901		-25 ~ +85	
Storage Temperature	T <sub>STG</sub>	-65 ~ +150	°C

## Electrical Characteristics

( $V_{CC} = 5V$ ,  $T_A = 25^\circ C$ , unless otherwise specified)

Parameter	Symbol	Conditions	LM239A/LM339A			LM339			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Input Offset Voltage	$V_{IO}$	$V_{O(P)} = 1.4V$ , $R_S = 0\Omega$	-	1	2	-	1.4	5	mV
		Note1	-	-	4.0	-	-	9.0	
Input Offset Current	$I_{IO}$	$I_{IN(+)} - I_{IN(-)}$ , $V_{CM} = 0V$	-	2.3	50	-	2.3	50	nA
		Note1	-	-	150	-	-	150	
Input Bias Current	$I_{BIAS}$	$V_{CM} = 0V$	-	57	250	-	57	250	nA
		Note1	-	-	400	-	-	400	
Input Common Mode Voltage Range	$V_{I(R)}$	$V_{CC} = 30V$	0	-	$V_{CC}-1.5$	0	-	$V_{CC}-1.5$	V
		Note1	0	-	$V_{CC}-2$	0	-	$V_{CC}-2$	
Supply Current	$I_{CC}$	$V_{CC} = 5V$ , $R_L = \infty$	-	1.1	2.0	-	1.1	2.0	mA
Voltage Gain	$G_V$	$V_{CC} = 15V$ , $R_L \geq 15k\Omega$ (for large swing)	50	200	-	50	200	-	V/mV
Large Signal Response Time	$T_{LRES}$	$V_I = \text{TTL Logic Swing}$ $V_{REF} = 1.4V$ , $V_{RL} = 5V$ , $R_L = 5.1k\Omega$ (Note2)	-	300	-	-	300	-	ns
Response Time	$T_{RES}$	$V_{RL} = 5V$ , $R_L = 5.1k\Omega$ (Note2)	-	1.3	-	-	1.3	-	$\mu s$
Output Sink Current	$I_{SINK}$	$V_{I(-)} \geq 1V$ , $V_{I(+)} = 0V$ , $V_{O(P)} \leq 1.5V$	6	18	-	6	18	-	mA
Output Saturation Voltage	$V_{SAT}$	$V_{I(-)} \geq 1V$ , $V_{I(+)} = 0V$	-	140	400	-	140	400	mV
		$I_{SINK} = 4mA$	Note1	-	-	700	-	-	
Output Leakage Current	$I_{o(LKG)}$	$V_{I(-)} = 0V$	$V_{O(P)} = 5V$	-	0.1	-	-	0.1	nA
		$V_{I(+)} = 1V$	$V_{O(P)} = 30V$	-	-	1.0	-	-	1.0
Differential Voltage	$V_{I(DIFF)}$	Note1	-	-	36	-	-	36	V

### Note:

- LM339/LM339A :  $0 \leq T_A \leq +70^\circ C$   
LM2901 :  $-40 \leq T_A \leq +85^\circ C$   
LM239A :  $-25 \leq T_A \leq +85^\circ C$
- These parameters, although guaranteed, are not 100% tested in production.

**Electrical Characteristics** (Continued)

(VCC = 5V, TA = 25°C, unless otherwise specified)

Parameter	Symbol	Conditions	LM2901			Unit
			Min.	Typ.	Max.	
Input Offset Voltage	VIO	VO(P) = 1.4V, RS = 0Ω	-	2	7	mV
		Note1	-	9	15	
Input Offset Current	IIO		-	2.3	50	nA
		Note1	-	50	200	
Input Bias Current	IBIAS		-	57	250	nA
		Note1	-	200	500	
Input Common Mode Voltage Range	VI(R)	LM2901, VCC = 30V	0	-	VCC-1.5	V
		Note1	0	-	VCC-2	
Supply Current	ICC	RL = ∞, VCC = 5V	-	1.1	2.0	mA
		RL = ∞, VCC = 30V	-	1.6	2.5	
Voltage Gain	GV	VCC = 15V, RL ≥ 15kΩ (for large swing)	25	100	-	V/mV
Large Signal Response Time	TLRES	VI = TTL Logic Swing VREF = 1.4V, VRL = 5V, RL = 5.1kΩ (Note2)	-	300	-	ns
Response Time	TRES	VRL = 5V, RL = 5.1kΩ (Note2)	-	1.3	-	μs
Output Sink Current	ISINK	VI(-) ≥ 1V, VI(+) = 0V, VO(P) ≤ 1.5V	6	18	-	mA
Output Saturation Voltage	VSAT	VI(-) ≥ 1V, VI(+) = 0V	-	140	400	mV
		ISINK = 4mA	Note1	-	-	
Output Leakage Current	IO(LKG)	VI(-) = 0V	VO(P) = 5V	-	0.1	nA
		VI(+) = 1V	VO(P) = 30V	-	-	1.0
Differential Voltage	VI(DIFF)	Note1	-	-	36	V

**Note:**

- LM339/LM339A :  $0 \leq T_A \leq +70^\circ\text{C}$   
LM2901 :  $-40 \leq T_A \leq +85^\circ\text{C}$   
LM239A :  $-25 \leq T_A \leq +85^\circ\text{C}$
- These parameters, although guaranteed, are not 100% tested in production.

# Typical Performance Characteristics

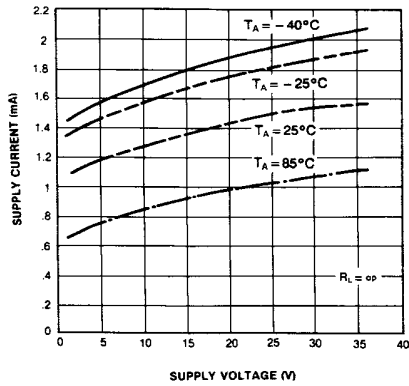


Figure 1. Supply Current vs Supply Voltage

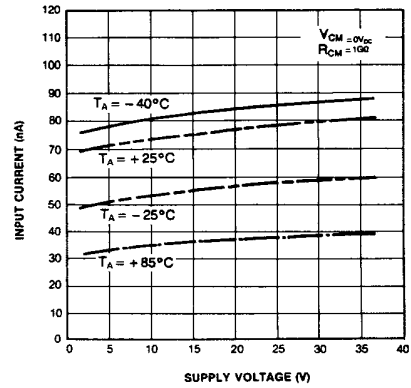


Figure 2. Input Current vs Supply Voltage

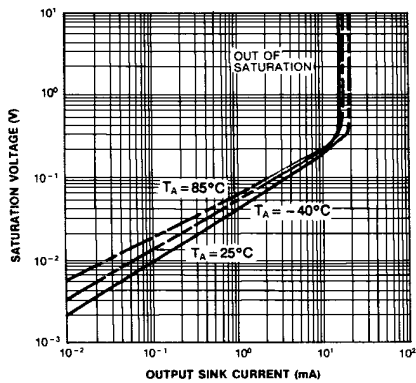


Figure 3. Output Saturation Voltage vs Sink Current

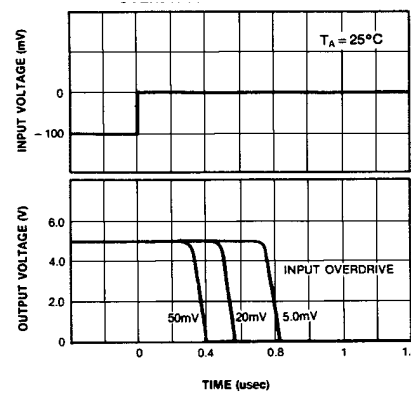


Figure 4. Response Time for Various Input Overdrive-Negative Transition

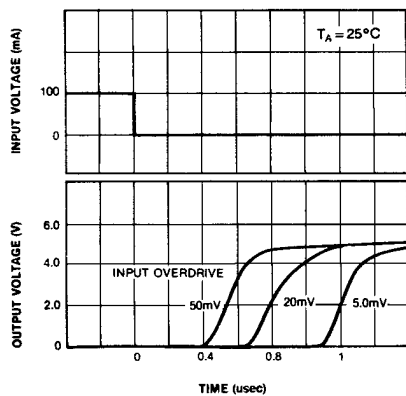


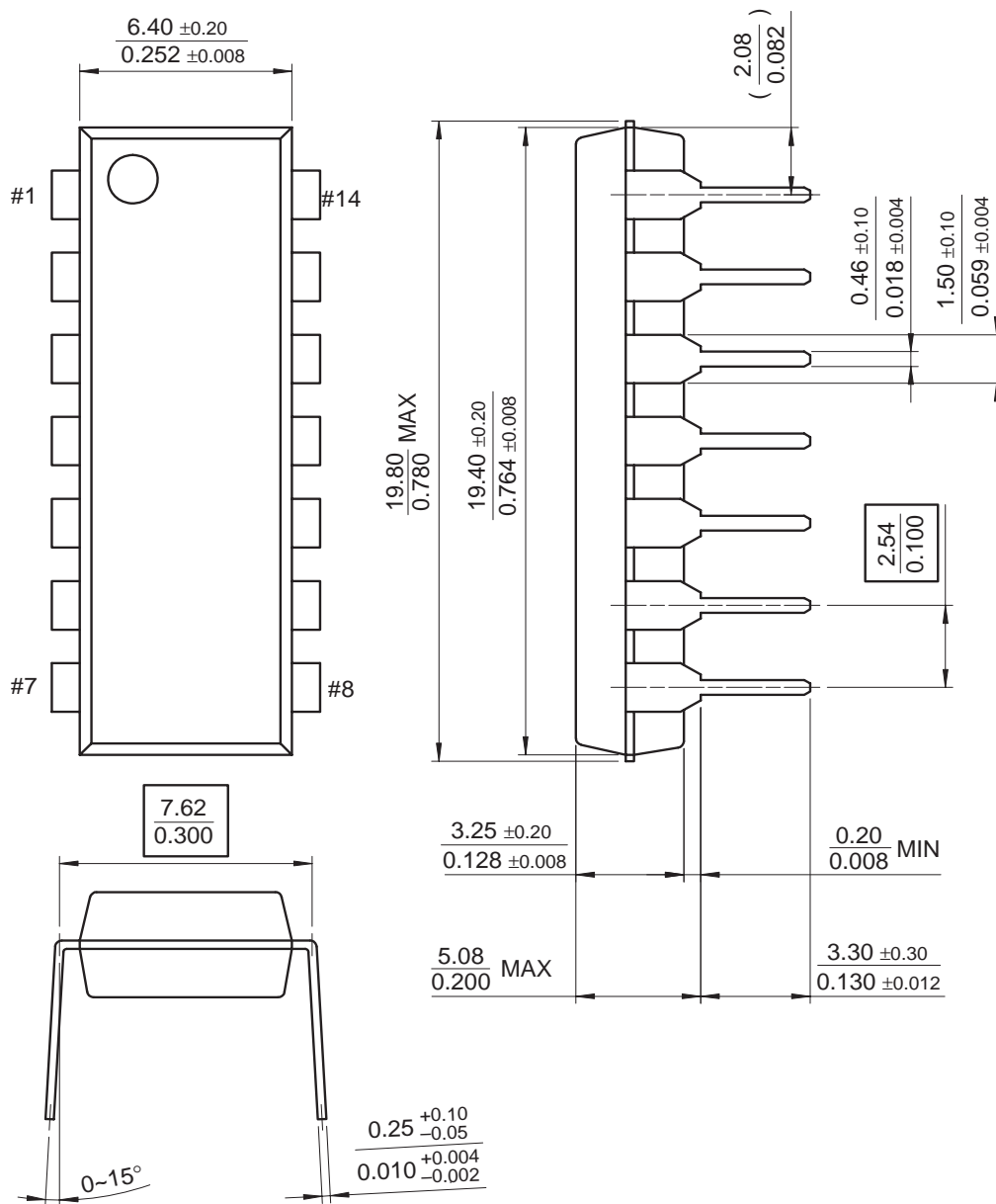
Figure 5. Response Time for Various Input Overdrive-Positive Transition

# Mechanical Dimensions

## Package

Dimensions in millimeters

### 14-DIP

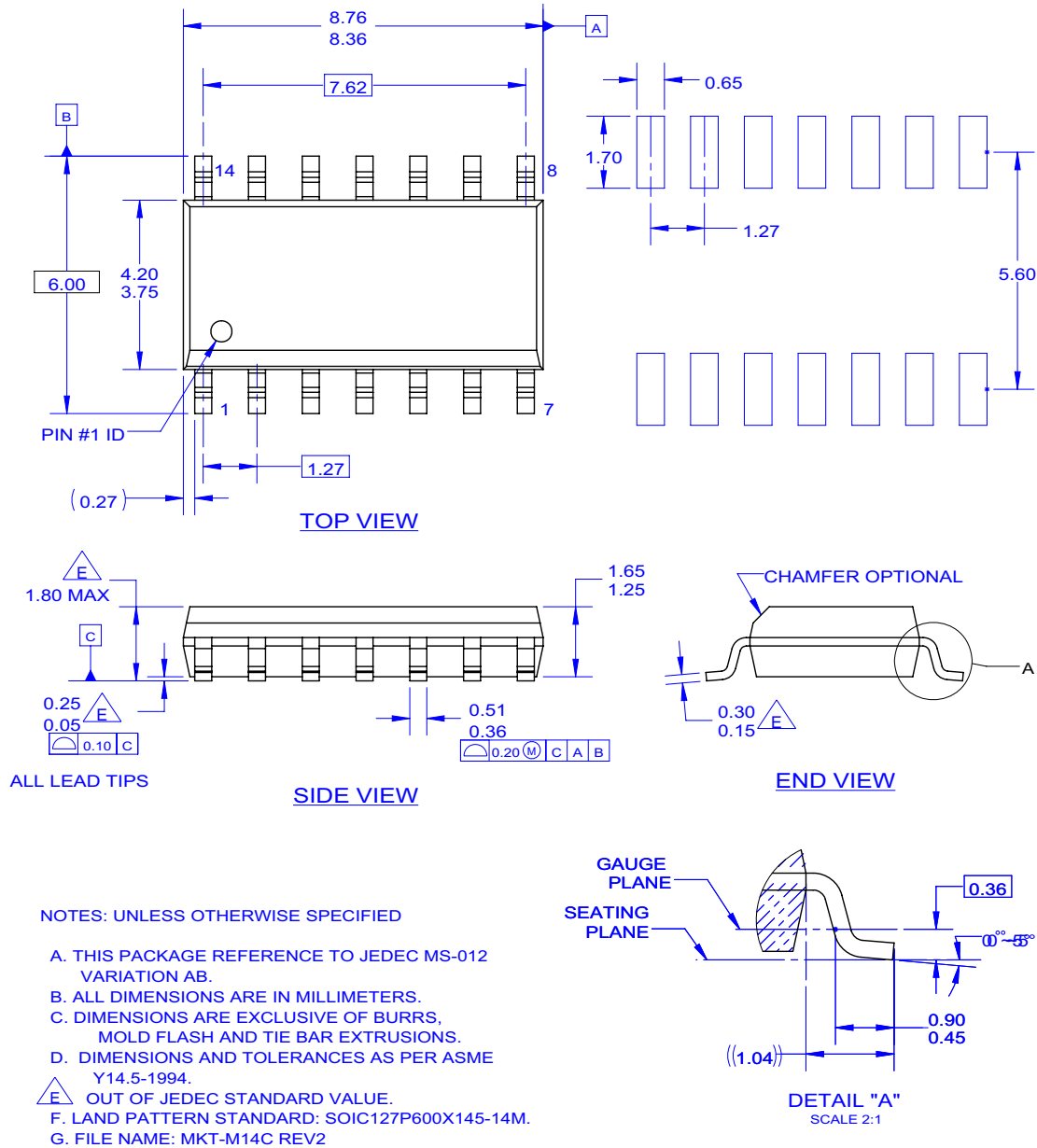


# Mechanical Dimensions (Continued)

## Package

Dimensions in millimeters

### 14-SOP





## Ordering Information

Product Number	Package	Operating Temperature
LM339N	14-DIP	0 ~ +70°C
LM339AN		
LM339M	14-SOP	
LM339AM		
LM2901N	14-DIP	-40 ~ +85°C
LM2901M	14-SOP	
LM239AN	14-DIP	-25 ~ +85°C
LM239AM	14-SOP	

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