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LM339/LM339A, LM239A, LM2901

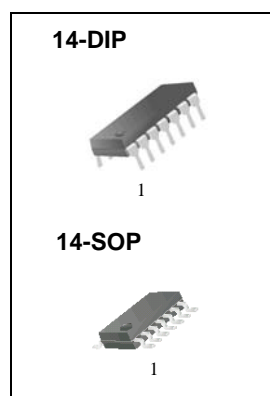
Quad Comparator

Features

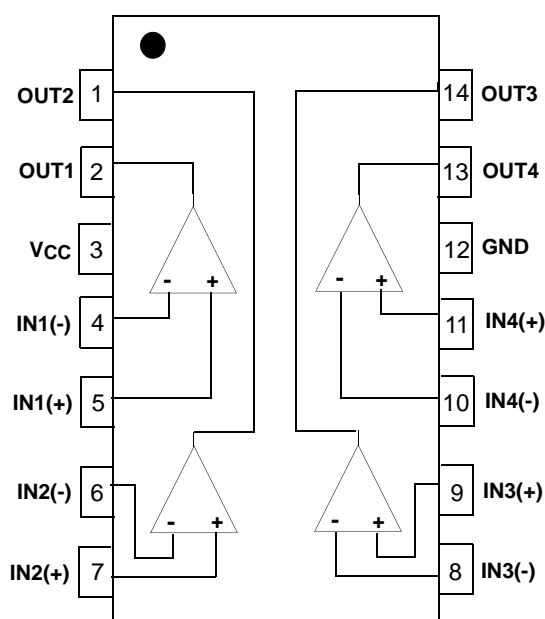
- Single or Dual Supply Operation
- Wide Range of Supply Voltage
LM2901, LM339/LM339A, LM239A: 2 ~ 36V (or $\pm 1 \sim \pm 18V$)
- Low Supply Current Drain 800 μA Typ.
- Open Collector Outputs for Wired and Connectors
- Low Input Bias Current 25nA Typ.
- Low Input Offset Current $\pm 2.3nA$ Typ.
- Low 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

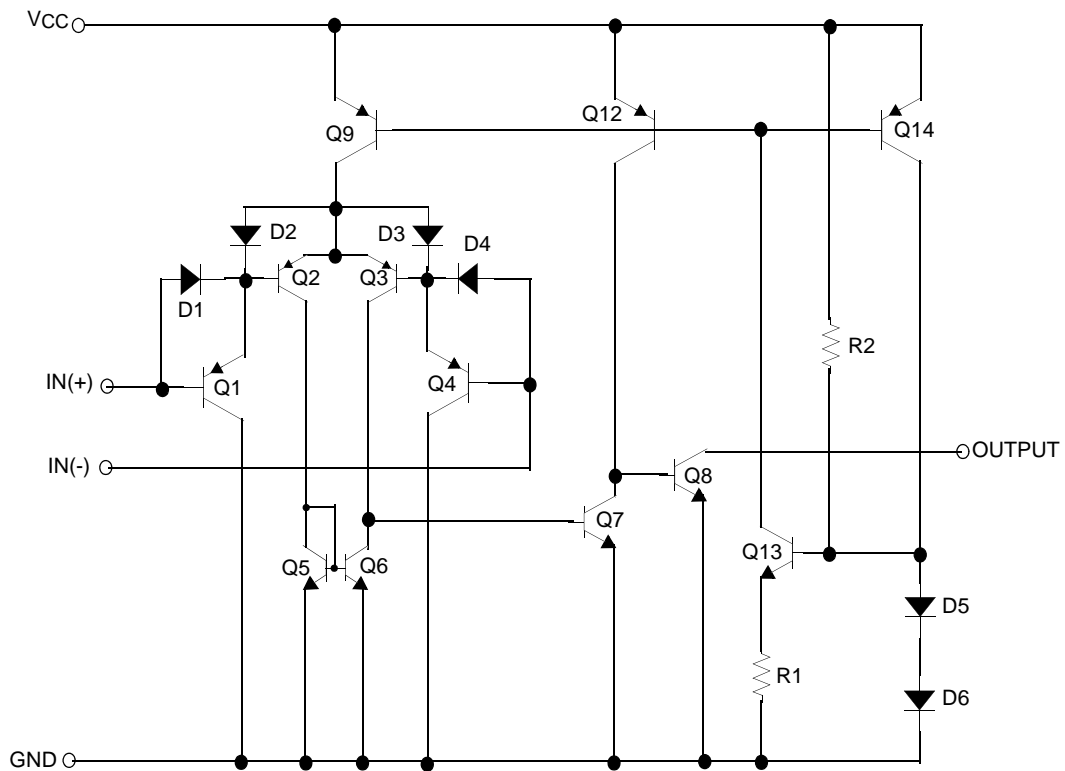
The LM339/LM339A, LM239A, LM2901 consist of four independent voltage comparators designed to operate from single power supply over a wide voltage range.



Internal Block Diagram



Schematic Diagram



Absolute Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---|----------------------|-----------------------------------|------|
| Supply Voltage | VCC | ±18 or 36 | V |
| Differential Input Voltage | V _{I(DIFF)} | 36 | V |
| Input Voltage | V _I | -0.3 to +36 | V |
| Output Short Circuit to GND | - | Continuous | - |
| Power Dissipation | P _D | 570 | mW |
| Operating Temperature LM339/LM339A LM2901 LM239A | T _{OPR} | 0 ~ +70 -40 ~ +85 -25 ~ +85 | °C |
| Storage Temperature | T _{STG} | -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 | - | μs |
| 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 | - | - | 700 | |
| Output Leakage Current | $I_{O(LKG)}$ | $V_{I(-)} = 0V$ | - | 0.1 | - | - | 0.1 | - | nA |
| | | $V_{I(+)} = 1V$ | | | 1.0 | | | 1.0 | μA |
| 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)(V_{CC} = 5V, T_A = 25°C, unless otherwise specified)

| Parameter | Symbol | Conditions | | LM2901 | | | Unit |
|---------------------------------|----------------------|---|-------------------------|--------|------|----------------------|------|
| | | | | Min. | Typ. | Max. | |
| Input Offset Voltage | V _{IO} | V _{O(P)} = 1.4V, R _S = 0Ω | | - | 2 | 7 | mV |
| | | Note1 | | - | 9 | 15 | |
| Input Offset Current | I _{IO} | | | - | 2.3 | 50 | nA |
| | | Note1 | | - | 50 | 200 | |
| Input Bias Current | I _{BIAS} | | | - | 57 | 250 | nA |
| | | Note1 | | - | 200 | 500 | |
| Input Common Mode Voltage Range | V _{I(R)} | LM2901, V _{CC} = 30V | | 0 | - | V _{CC} -1.5 | V |
| | | Note1 | | 0 | - | V _{CC} -2 | |
| Supply Current | I _{CC} | R _L = ∞, V _{CC} = 5V | | - | 1.1 | 2.0 | mA |
| | | R _L = ∞, V _{CC} = 30V | | - | 1.6 | 2.5 | |
| Voltage Gain | G _V | V _{CC} = 15V, R _L ≥ 15kΩ (for large swing) | | 25 | 100 | - | V/mV |
| Large Signal Response Time | T _{LRES} | V _I = TTL Logic Swing V _{REF} = 1.4V, V _{RL} = 5V, R _L = 5.1kΩ (Note2) | | - | 300 | - | ns |
| Response Time | T _{RES} | V _{RL} = 5V, R _L = 5.1kΩ (Note2) | | - | 1.3 | - | μs |
| Output Sink Current | I _{SINK} | V _{I(-)} ≥ 1V, V _{I(+)} = 0V, V _{O(P)} ≤ 1.5V | | 6 | 18 | - | mA |
| Output Saturation Voltage | V _{SAT} | V _{I(-)} ≥ 1V, V _{I(+)} = 0V | | - | 140 | 400 | mV |
| | | I _{SINK} = 4mA | Note1 | - | - | 700 | |
| Output Leakage Current | I _{O(LKG)} | V _{I(-)} = 0V | V _{O(P)} = 5V | - | 0.1 | - | nA |
| | | V _{I(+)} = 1V | V _{O(P)} = 30V | - | - | 1.0 | μA |
| Differential Voltage | V _{I(DIFF)} | Note1 | | - | - | 36 | V |

Note:

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

Typical Performance Characteristics

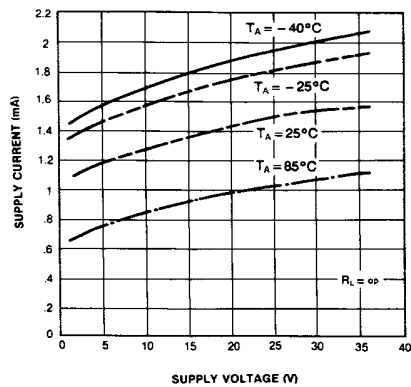


Figure 1. Supply Current vs Supply Voltage

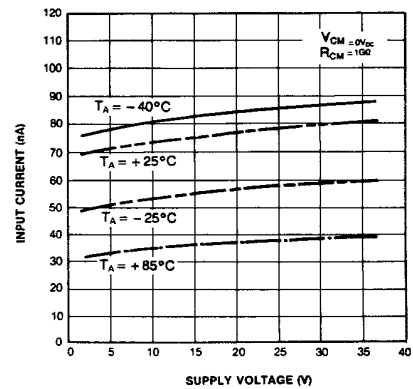


Figure 2. Input Current vs Supply Voltage

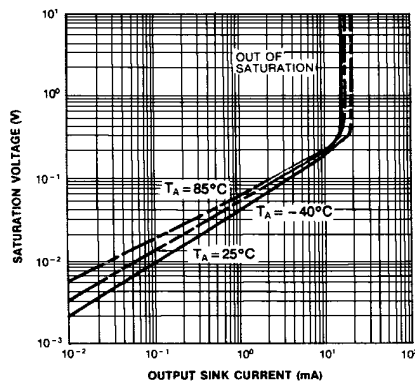


Figure 3. Output Saturation Voltage vs Sink Current

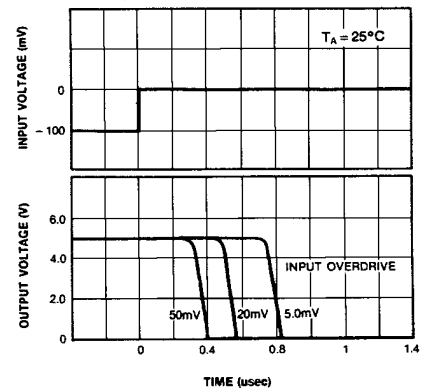


Figure 4. Response Time for Various Input Overdrive-Negative Transition

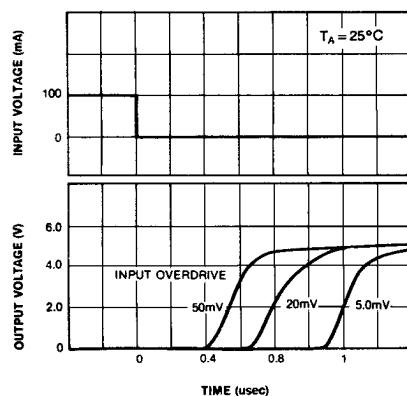


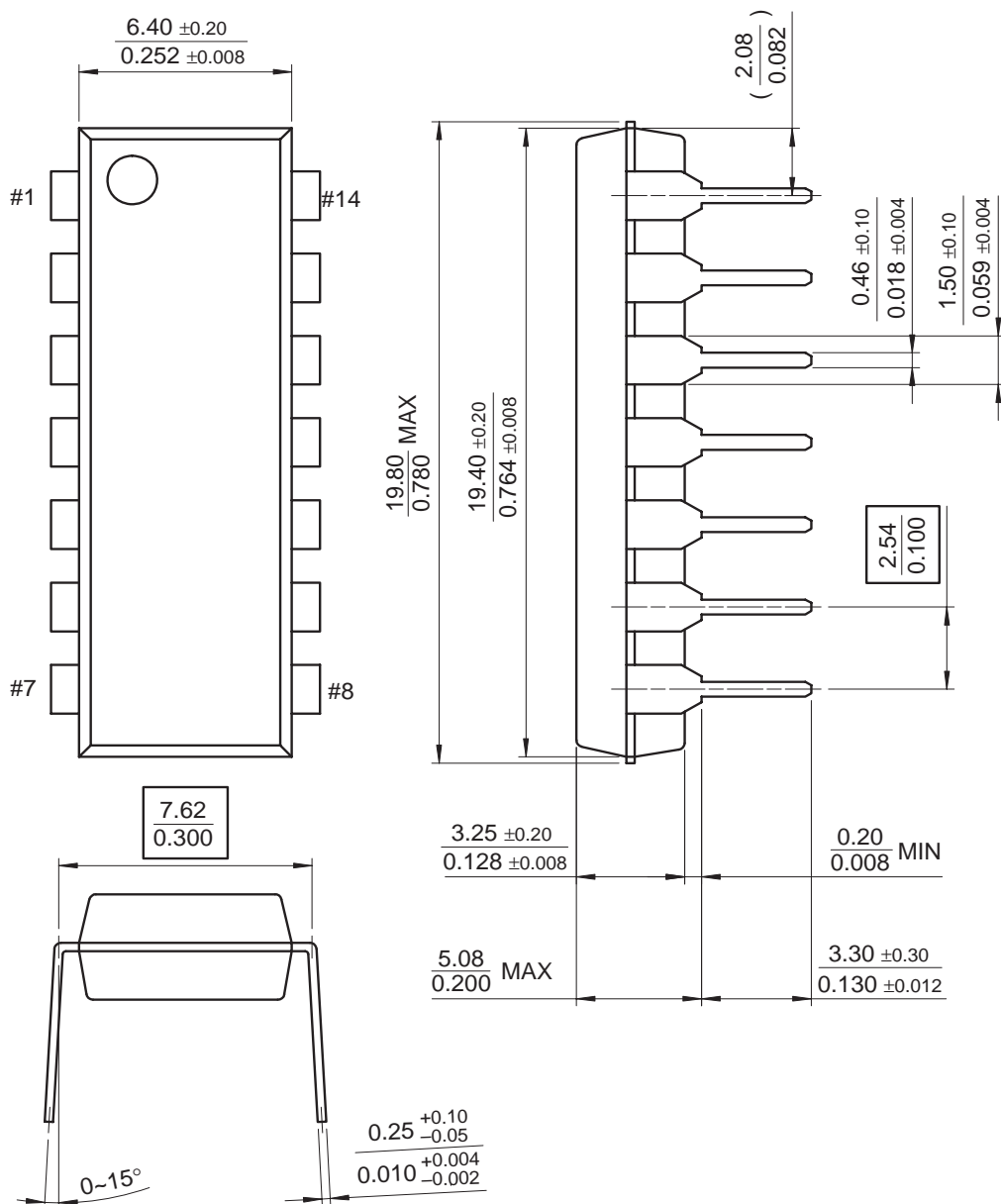
Figure 5. Response Time for Various Input Overdrive-Positive Transition

Mechanical Dimensions

Package

Dimensions in millimeters

14-DIP

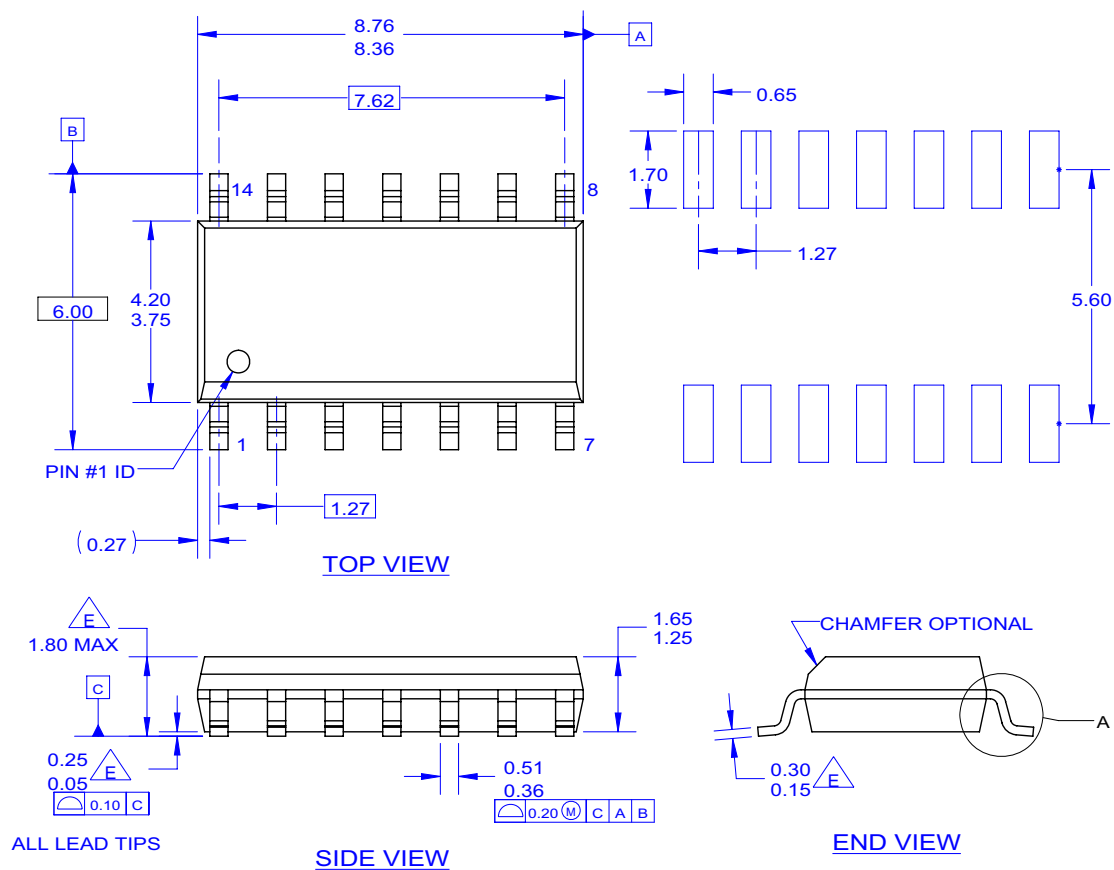


Mechanical Dimensions (Continued)

Package

Dimensions in millimeters

14-SOP



NOTES: UNLESS OTHERWISE SPECIFIED

- A. THIS PACKAGE REFERENCE TO JEDEC MS-012 VARIATION AB.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES AS PER ASME Y14.5-1994.
- E. OUT OF JEDEC STANDARD VALUE.
- F. LAND PATTERN STANDARD: SOIC127P600X145-14M.
- G. FILE NAME: MKT-M14C REV2

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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