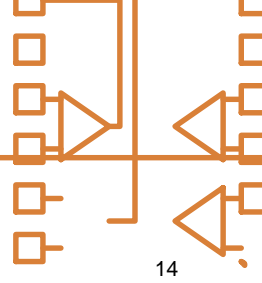


Single Supply Quad Comparators



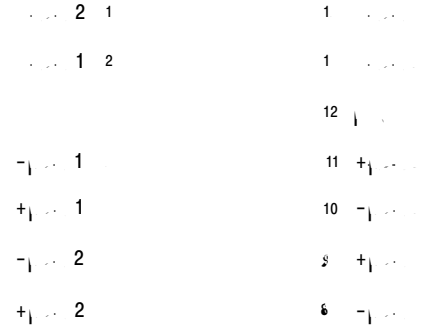
LM339, LM339E, LM239, LM2901, LM2901E, LM2901V, NCV2901, MC3302

SOIC-14

These comparators are designed for use in level detection, low-level sensing and memory applications in consumer, automotive, and industrial electronic applications.

Features

- Single Supply Operation: 3.0 V to 36 V
- Split Supply Operation: 1.5 V to 18 V
- Low Input Bias Current: 25 nA (Typ)
- Low Input Offset Current: 5.0 nA (Typ)
- Low Input Offset Voltage
- Input Common Mode Voltage Range to GND
- Low Output Saturation Voltage: 130 mV (Typ) @ 4.0 mA
- TTL and CMOS Compatible
- ESD Clamps on the Inputs Increase Reliability without Affecting Device Operation
- NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant



LM339, LM339E, LM239, LM2901, LM2901E, LM2901V, NCV2901, MC3302

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--|----------------------------|--|------------|
| Power Supply Voltage LM239/LM339, E/LM2901, E, V MC3302, NCV2901 | V_{CC} | +36 or 18 +30 or 15 | Vdc |
| Input Differential Voltage Range LM239/LM339, E/LM2901, E, V MC3302, NCV2901 | V_{IDR} | 36 30 | Vdc |
| Input Common Mode Voltage Range | V_{ICMR} | -0.3 to 36 | Vdc |
| Output Short Circuit to Ground (Note 1) | I_{SC} | Continuous | |
| Power Dissipation @ $T_A = 25\text{ C}$ Plastic Package Derate above 25 C | P_D $1/R_{\theta JA}$ | 1.0 8.0 | W mW/ C |
| Junction Temperature | T_J | 150 | C |
| Operating Ambient Temperature Range LM239 MC3302 LM2901, LM2901E LM2901V, NCV2901 LM339, LM339E | T_A | -25 to +85 -40 to +85 -40 to +105 -40 to +125 0 to +70 | C |
| Storage Temperature Range | T_{stg} | -65 to +150 | C |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. The maximum output current may be as high as 20 mA, independent of the magnitude of V_{CC} . Output short circuits to V_{CC} can cause excessive heating and eventual destruction.

ESD RATINGS

| Rating | HBM | MM | Unit |
|---|------|-----|------|
| ESD Protection at any Pin (Human Body Model – HBM, Machine Model – MM) NCV2901 | 2000 | 200 | V |
| LM339E, LM2901E | 1500 | 200 | V |
| LM339DG/DR2G, LM2901DG/DR2G | 250 | 100 | V |
| All Other Devices | 1500 | 200 | V |

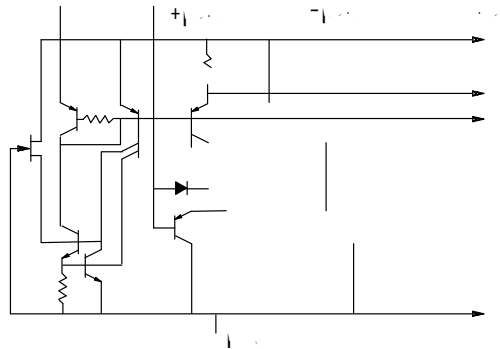


Figure 1. Circuit Schematic

LM339, LM339E, LM239, LM2901, LM2901E, LM2901V, NCV2901, MC3302

ELECTRICAL CHARACTERISTICS (V_{CC} = +5.0 Vdc, T_A = +25 °C, unless otherwise noted)

| Characteristic | Symbol | LM239/339/339E | | | LM2901/2901E/2901V /NCV2901 | | | MC3302 | | | Unit |
|---------------------------------|-----------------|----------------|-----|-----|--------------------------------|-----|-----|--------|-----|-----|------|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| Input Offset Voltage (Note 3) | V _{IO} | - | 2.0 | 5.0 | - | 2.0 | 7.0 | - | 3.0 | 20 | mVdc |
| Input Bias Current (Notes 3, 4) | I _B | - | 25 | 250 | - | 25 | 250 | - | | | |

LM339, LM339E, LM239, LM2901, LM2901E, LM2901V, NCV2901, MC3302

PERFORMANCE CHARACTERISTICS ($V_{CC} = +5.0$ Vdc, $T_A = T_{low}$ to T_{high} [Note 7])

| Characteristic | Symbol | LM239/339/339E | | | LM2901/2901E/2901V /NCV2901 | | | MC3302 | | | Unit |
|--|------------|----------------|-----|----------------|--------------------------------|-----|----------------|--------|-----|----------------|---------|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| Input Offset Voltage (Note 8) | V_{IO} | - | - | 9.0 | - | - | 15 | - | - | 40 | mVdc |
| Input Bias Current (Notes 8, 9) (Output in Analog Range) | I_{IB} | - | - | 400 | - | - | 500 | - | - | 1000 | nA |
| Input Offset Current (Note 8) | I_{IO} | - | - | 150 | - | - | 200 | - | - | 300 | nA |
| Input Common Mode Voltage Range | V_{ICMR} | 0 | - | $V_{CC} - 2.0$ | 0 | - | $V_{CC} - 2.0$ | 0 | - | $V_{CC} - 2.0$ | V |
| Saturation Voltage $V_{I(-)} + 1.0$ Vdc, $V_{I(+)} = 0$, $I_{sink} \leq 4.0$ mA | V_{sat} | - | - | 700 | - | - | 700 | - | - | 700 | mV |
| Output Leakage Current $V_{I(+)} + 1.0$ Vdc, $V_{I(-)} = 0$, $V_O = 30$ Vdc | I_{OL} | - | - | 1.0 | - | - | 1.0 | - | - | 1.0 | μ A |
| Differential Input Voltage All $V_{Ii} = 0$ Vdc | V_{ID} | - | - | V_{CC} | - | - | V_{CC} | - | - | V_{CC} | Vdc |

7. (LM239) $T_{low} = -25$ C, $T_{high} = +85$
 (LM339, LM339E) $T_{low} = 0$ C, $T_{high} = +70$ C
 (MC3302) $T_{low} = -40$ C, $T_{high} = +85$ C
 (LM2901, LM2901E) $T_{low} = -40$ C, $T_{high} = +105$
 (LM2901V & NCV2901) $T_{low} = -40$ C, $T_{high} = +125$ C
NCV2901 is qualified for automotive use.

8. At the output switch point, $V_O \approx 1.4$ Vdc, $R_S \leq 100 \Omega$ 5.0 Vdc $\leq V_{CC} \leq 30$ Vdc, with the inputs over the full common mode range (0 Vdc to $V_{CC} - 1.5$ Vdc).
 9. The bias current flows out of the inputs due to the PNP input stage. This current is virtually constant, independent of the output state.

LM339, LM339E, LM239, LM2901, LM2901E, LM2901V, NCV2901, MC3302

APPLICATIONS INFORMATION

These quad comparators feature high gain, wide bandwidth characteristics. This gives the device oscillation tendencies if the outputs are capacitively coupled to the inputs via stray capacitance. This oscillation manifests itself during output transitions (V_{OL} to V_{OH}). To alleviate this situation input resistors $< 10\text{ k}\Omega$ should be used. The

addition of positive feedback ($< 10\text{ mV}$) is also recommended. It is good design practice to ground all unused input pins.

Differential input voltages may be larger than supply voltages without damaging the comparator's inputs. Voltages more negative than -300 mV should not be used.

1 (1)

10

Figure 9. Zero Crossing Detector
(Single Supply)

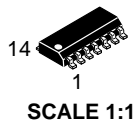
Figure 10. Zero Crossing Detector
(Split Supplies)

LM339, LM339E, LM239, LM2901, LM2901E, LM2901V, NCV2901, MC3302

MARKING DIAGRAMS

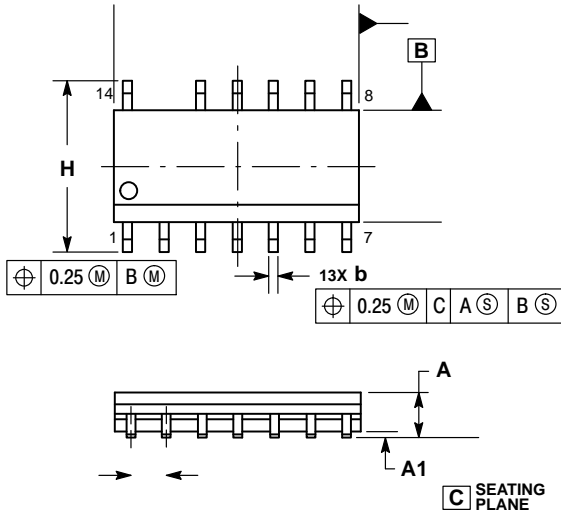
SOIC-14
D SUFFIX
CASE 751A

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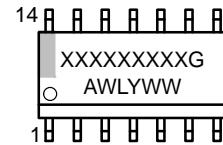
SOIC 14 NB
CASE 751A-03
ISSUE L

DATE 03 FEB 2016



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
 4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
 5. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.

GENERIC MARKING DIAGRAM*



- XXXXXX = Specific Device Code
- A = Assembly Location
- WL = Wafer Lot
- Y = Year
- WW = Work Week
- G = Pb-Free Package

STYLES ON PAGE 2

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STYLE 7:
PIN 1. ANODE/CATHODE
2. COMMON ANODE
3. COMMON CATHODE
4. ANODE/CATHODE
5. ANODE/CATHODE

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