

6.6 Electrical Characteristics: LM239, LM339, LM2901, LM3302

($V^+ = 5 V_{DC}$, $T_A = 25^\circ\text{C}$ ⁽¹⁾ unless otherwise stated)

| PARAMETER | TEST CONDITIONS | LM239, LM339 | | | LM2901 | | | LM3302 | | | UNIT |
|---------------------------------|---|--------------|-----|-------------|--------|-----|-------------|--------|-----|-------------|--------------------|
| | | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX | |
| Input Offset Voltage | See ⁽²⁾ | | 2.0 | 5.0 | | 2.0 | 7.0 | | 3 | 20 | mV _{DC} |
| Input Bias Current | $I_{IN(+)}$ or $I_{IN(-)}$ with Output in Linear Range ⁽³⁾ , $V_{CM}=0\text{ V}$ | | 25 | 250 | | 25 | 250 | | 25 | 500 | nA _{DC} |
| Input Offset Current | $I_{IN(+)} - I_{IN(-)}$, $V_{CM} = 0\text{ V}$ | | 5.0 | 50 | | 5 | 50 | | 3 | 100 | nA _{DC} |
| Input Common-Mode Voltage Range | $V^+ = 30 V_{DC}$ (LM3302, $V^+ = 28 V_{DC}$) ⁽⁴⁾ | 0 | | $V^+ - 1.5$ | 0 | | $V^+ - 1.5$ | 0 | | $V^+ - 1.5$ | V _{DC} |
| Supply Current | (LM3302, $V^+ = 28 V_{DC}$) $R_L = \infty$ on all Comparators | | 0.8 | 2.0 | | 0.8 | 2.0 | | 0.8 | 2.0 | mA _{DC} |
| | (LM3302, $V^+ = 28 V_{DC}$) $R_L = \infty$, $V^+ = 36\text{ V}$ | | 1.0 | 2.5 | | 1.0 | 2.5 | | 1.0 | 2.5 | mA _{DC} |
| Voltage Gain | $R_L \geq 15\text{ k}\Omega$, $V^+ = 15 V_{DC}$ $V_O = 1 V_{DC}$ to $11 V_{DC}$ | 50 | 200 | | 25 | 100 | | 2 | 30 | | V/mV |
| Large Signal Response Time | $V_{IN} = \text{TTL Logic Swing}$, $V_{REF} = 1.4 V_{DC}$, $V_{RL} = 5 V_{DC}$, $R_L = 5.1\text{ k}\Omega$, | | 300 | | | 300 | | | 300 | | ns |
| Response Time | $V_{RL} = 5 V_{DC}$, $R_L = 5.1\text{ k}\Omega$ ⁽⁵⁾ | | 1.3 | | | 1.3 | | | 1.3 | | μs |
| Output Sink Current | $V_{IN(-)} = 1 V_{DC}$, $V_{IN(+)} = 0$, $V_O \leq 1.5 V_{DC}$ | 6.0 | 16 | | 6.0 | 16 | | 6.0 | 16 | | mA _{DC} |
| Saturation Voltage | $V_{IN(-)} = 1 V_{DC}$, $V_{IN(+)} = 0$, $I_{SINK} \leq 4\text{ mA}$ | | | | | | | | | | |
| Output Leakage Current | $V_{IN(+)} = 1 V_{DC}$, $V_{IN(-)} = 0$, $V_O = 5 V_{DC}$ | | 0.1 | | | 0.1 | | | 0.1 | | nA _{DC} |
| Input Offset Voltage | See ⁽²⁾ | | | 9.0 | | 9 | 15 | | | 40 | mV _{DC} |
| Input Offset Current | $I_{IN(+)} - I_{IN(-)}$, $V_{CM} = 0\text{ V}$ | | | 150 | | 50 | 200 | | | 300 | nA _{DC} |
| Input Bias Current | $I_{IN(+)}$ or $I_{IN(-)}$ with Output in Linear Range, $V_{CM} = 0\text{ V}$ ⁽³⁾ | | | 400 | | 200 | 500 | | | 1000 | nA _{DC} |
| Input Common-Mode Voltage Range | $V^+ = 30 V_{DC}$ (LM3302, $V^+ = 28 V_{DC}$) | | | $V^+ - 2.0$ | 0 | | $V^+ - 2.0$ | 0 | | $V^+ - 2.0$ | V _{DC} |
| Saturation Voltage | $V_{IN(-)} = 1 V_{DC}$, $V_{IN(+)} = 0$, $I_{SINK} \leq 4\text{ mA}$ | | | 700 | | 400 | 700 | | | 700 | mV _{DC} |
| Output Leakage Current | $V_{IN(+)} = 1 V_{DC}$, $V_{IN(-)} = 0$, $V_O = 30 V_{DC}$, (LM3302, $V_O = 28 V_{DC}$) | | | 1.0 | | | 1.0 | | | 1.0 | μA_{DC} |
| Differential Input Voltage | Keep all V_{IN} 's $\geq 0 V_{DC}$ (or V^- , if used) ⁽⁶⁾ | | | 36 | | | 36 | | | 28 | V _{DC} |

Are these full temperature ratings?

- (1) These specifications are limited to $-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$, for the LM139/LM139A. With the LM239/LM239A, all temperature specifications are limited to $-25^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$, the LM339/LM339A temperature specifications are limited to $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$, and the LM2901, LM3302 temperature range is $-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$.
- (2) At output switch point, $V_O = 1.4 V_{DC}$, $R_S = 0\ \Omega$ with V^+ from $5 V_{DC}$ to $30 V_{DC}$; and over the full input common-mode range ($0 V_{DC}$ to $V^+ - 1.5 V_{DC}$), at 25°C . For LM3302, V^+ from $5 V_{DC}$ to $28 V_{DC}$.
- (3) The direction of the input current is out of the IC due to the PNP input stage. This current is essentially constant, independent of the state of the output so no loading change exists on the reference or input lines.
- (4) The input common-mode voltage or either input signal voltage should not be allowed to go negative by more than 0.3 V . The upper end of the common-mode voltage range is $V^+ - 1.5\text{ V}$ at 25°C , but either or both inputs can go to $30 V_{DC}$ without damage (25 V for LM3302), independent of the magnitude of V^+ .
- (5) The response time specified is a 100-mV input step with 5-mV overdrive. For larger overdrive signals 300 ns can be obtained, see typical performance characteristics section.
- (6) Positive excursions of input voltage may exceed the power supply level. As long as the other voltage remains within the common-mode range, the comparator will provide a proper output state. The low input voltage state must not be less than $-0.3 V_{DC}$ (or $0.3 V_{DC}$ below the magnitude of the negative power supply, if used) (at 25°C).