



# Voltage Comparators

## LM306 voltage comparator/buffer general description

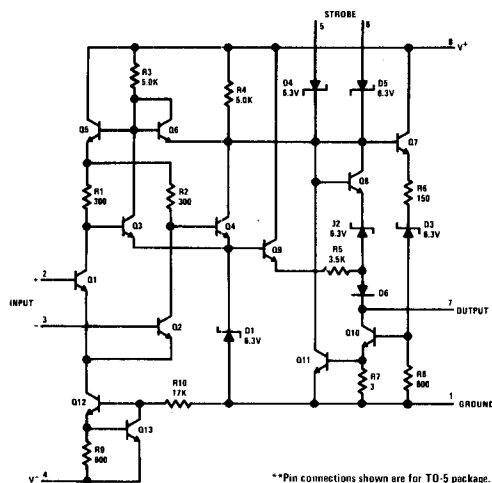
The LM306 is a high-speed voltage comparator designed to accurately detect low-level analog signals and drive a digital load. It is equivalent to an LM710C, combined with a two input NAND gate and an output buffer. The circuit can drive RTL, DTL or TTL integrated circuits directly. Furthermore, the output can switch voltages up to 24V at currents as high as 100 mA. Other features include:

- Improved accuracy: 5 mV (max) offset
- Fan-out of 10 with DTL or TTL
- Added logic or strobe capability
- Useful as a relay or lamp driver

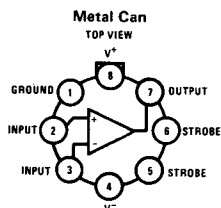
- Plug-in replacement for the LM710C.
- 40 ns maximum response time

The device has short-circuit protection which limits the inrush current when it is used to drive incandescent lamps, in addition to preventing damage from accidental shorts. The speed is equivalent to that of an LM710C. However, it is even faster where buffers and additional logic circuitry can be eliminated by the increased flexibility of the LM306. It can also be operated from any negative supply voltage between -3V and -12V with little effect on performance. The LM306 is identical to the LM106, except that it is specified over a 0°C to 70°C temperature range.

## schematic and connection diagrams\*\*



\*\*Pin connections shown are for TO-5 package.

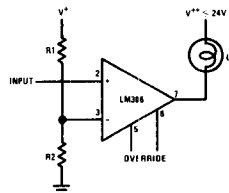


Note: Pin 4 connected to case.

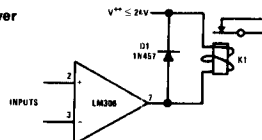
Order Number LM306H  
See Package 11

## typical applications\*\*

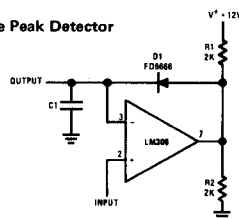
### Level Detector and Lamp Driver



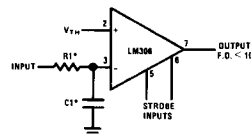
### Relay Driver



### Fast Response Peak Detector



### Adjustable Threshold Line Receiver



\*Optional for response time control.

**absolute maximum ratings**

|                                      |                 |
|--------------------------------------|-----------------|
| Positive Supply Voltage              | 15V             |
| Negative Supply Voltage              | -15V            |
| Output Voltage                       | 24V             |
| Output to Negative Supply Voltage    | 30V             |
| Differential Input Voltage           | ±5V             |
| Input Voltage                        | ±7V             |
| Power Dissipation (Note 1)           | 600 mW          |
| Output Short Circuit Duration        | 10 sec          |
| Operating Temperature Range          | 0°C to 70°C     |
| Storage Temperature Range            | -65°C to +150°C |
| Lead Temperature (soldering, 10 sec) | 300°C           |

**electrical characteristics** (Note 2)

| PARAMETER              | CONDITIONS                                         | MIN | TYP  | MAX | UNITS |
|------------------------|----------------------------------------------------|-----|------|-----|-------|
| Input Offset Voltage   | Note 3                                             |     | 1.6  | 5.0 | mV    |
| Input Offset Current   | Note 3                                             |     | 1.8  | 5.0 | μA    |
| Input Bias Current     |                                                    |     | 16   | 25  | μA    |
| Response Time          | Note 4, $R_L = 390\Omega$ to +5V,<br>$C_L = 15$ pF |     | 28   | 40  | ns    |
| Saturation Voltage     | $V_{IN} \leq -7$ mV, $I_{OUT} = 100$ mA            |     | 0.8  | 2.0 | V     |
| Output Leakage Current | $V_{IN} \geq 7$ mV, $8V \leq V_{OUT} \leq 24V$     |     | 0.02 | 2.0 | μA    |

**electrical characteristics**

The following specifications apply for  $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$  (Note 5)

|                                                         |                                                                                                                                                      |      |          |            |       |
|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|------------|-------|
| Input Offset Voltage                                    | Note 3                                                                                                                                               |      |          | 6.5        | mV    |
| Average Temperature Coefficient of Input Offset Voltage |                                                                                                                                                      |      | 5        | 20         | μV/°C |
| Input Offset Current                                    | Note 3, $0^\circ\text{C} \leq T_A < 25^\circ\text{C}$<br>$25^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$                                           |      | 2.4      | 7.5<br>5.0 | μA    |
| Average Temperature Coefficient of Input Offset Current | $25^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$<br>$0^\circ\text{C} \leq T_A \leq 25^\circ\text{C}$                                                |      | 15<br>24 | 50<br>100  | nA/°C |
| Input Bias Current                                      | $0^\circ\text{C} \leq T_A < 25^\circ\text{C}$<br>$25^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$                                                   |      | 25       | 40<br>25   | μA    |
| Input Voltage Range                                     | $-7V \geq V^- \geq -12V$                                                                                                                             | ±5.0 |          |            | V     |
| Differential Input Voltage Range                        |                                                                                                                                                      | ±5.0 |          |            | V     |
| Saturation Voltage                                      | $V_{IN} \leq -8$ mV, $I_{OUT} = 50$ mA                                                                                                               |      |          | 1.0        | V     |
| Saturation Voltage                                      | $V_{IN} \leq -8$ mV, $I_{OUT} = 16$ mA                                                                                                               |      |          | 0.4        | V     |
| Positive Output Level                                   | $V_{IN} \geq 8$ mV, $I_{OUT} = -400$ μA                                                                                                              | 2.5  |          | 5.5        | V     |
| Output Leakage Current                                  | $V_{IN} \geq 8$ mV, $8V \leq V_{OUT} \leq 24V$<br>$0^\circ\text{C} \leq T_A \leq 25^\circ\text{C}$<br>$25^\circ\text{C} < T_A \leq 70^\circ\text{C}$ |      |          | 2.0<br>100 | μA    |
| Strobe Current                                          | $V_{strobe} = 0.4V$                                                                                                                                  |      | -1.7     | -3.2       | mA    |
| Strobe ON Voltage                                       |                                                                                                                                                      | 0.9  | 1.4      |            | V     |
| Strobe OFF Voltage                                      | $I_{sink} \leq 16$ mA                                                                                                                                |      | 1.4      | 2.2        | V     |
| Positive Supply Current                                 | $V_{IN} = -8$ mV                                                                                                                                     |      | 5.5      | 10         | mA    |
| Negative Supply Current                                 |                                                                                                                                                      |      | -1.5     | -3.6       | mA    |

**Note 1:** For operating at elevated temperatures, the device must be derated based on a 85°C maximum junction temperature and a thermal resistance of 45°C/W junction to case or 150°C/W junction to ambient.

**Note 2:** These specifications apply for  $-3V \geq V^- \geq -12V$ ,  $V^+ = 12V$  and  $T_A = 25^\circ\text{C}$  unless otherwise specified. All currents into pins are considered positive.

**Note 3:** The offset voltages and offset currents given are the maximum values required to drive the output down to 0.5V or up to 5.0V. Thus, these parameters actually define an error band and take into account the worst-case effects of voltage gain, and input impedance, specified supply voltage variations, and common mode voltage variations.

**Note 4:** The response time specified (see definitions) is for a 100 mV input step with 5 mV overdrive.

**Note 5:** All currents into device pins are considered positive.

## typical performance characteristics

