



LM111-LM211-LM311

Voltage comparator with strobe

Features

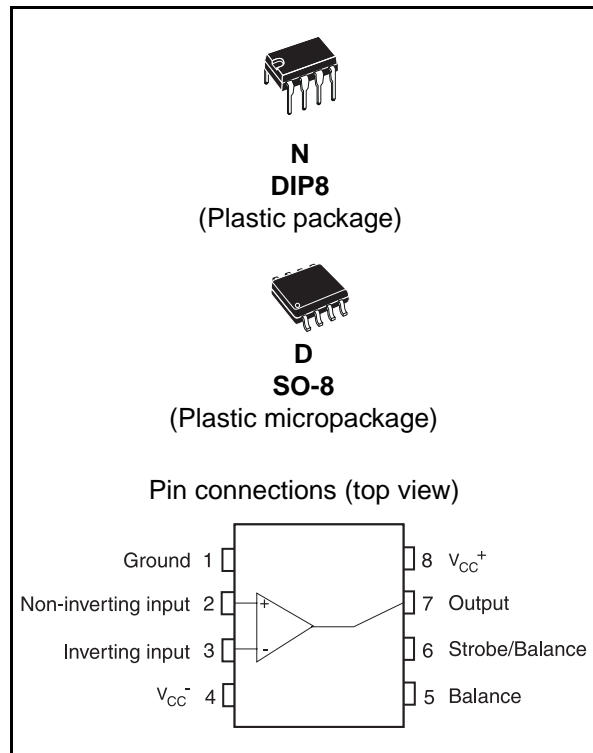
- Maximum input current: 150nA
- Maximum offset current: 20nA
- Differential input voltage range: $\pm 30V$
- Power consumption: 135mW at $\pm 15V$
- Supply voltage: +5V to $\pm 15V$
- Output current: 50mA

Description

The LM111, LM211, LM311 are voltage comparators that have low input currents.

They are also designed to operate over a wide range of supply voltages: from standard $\pm 15V$ operational amplifier supplies down to the single +5V supply used for IC logic.

Their output is compatible with RTL-DTL and TTL as well as MOS circuits and can switch voltages up to +50V at output currents as high as 50mA.



Order codes

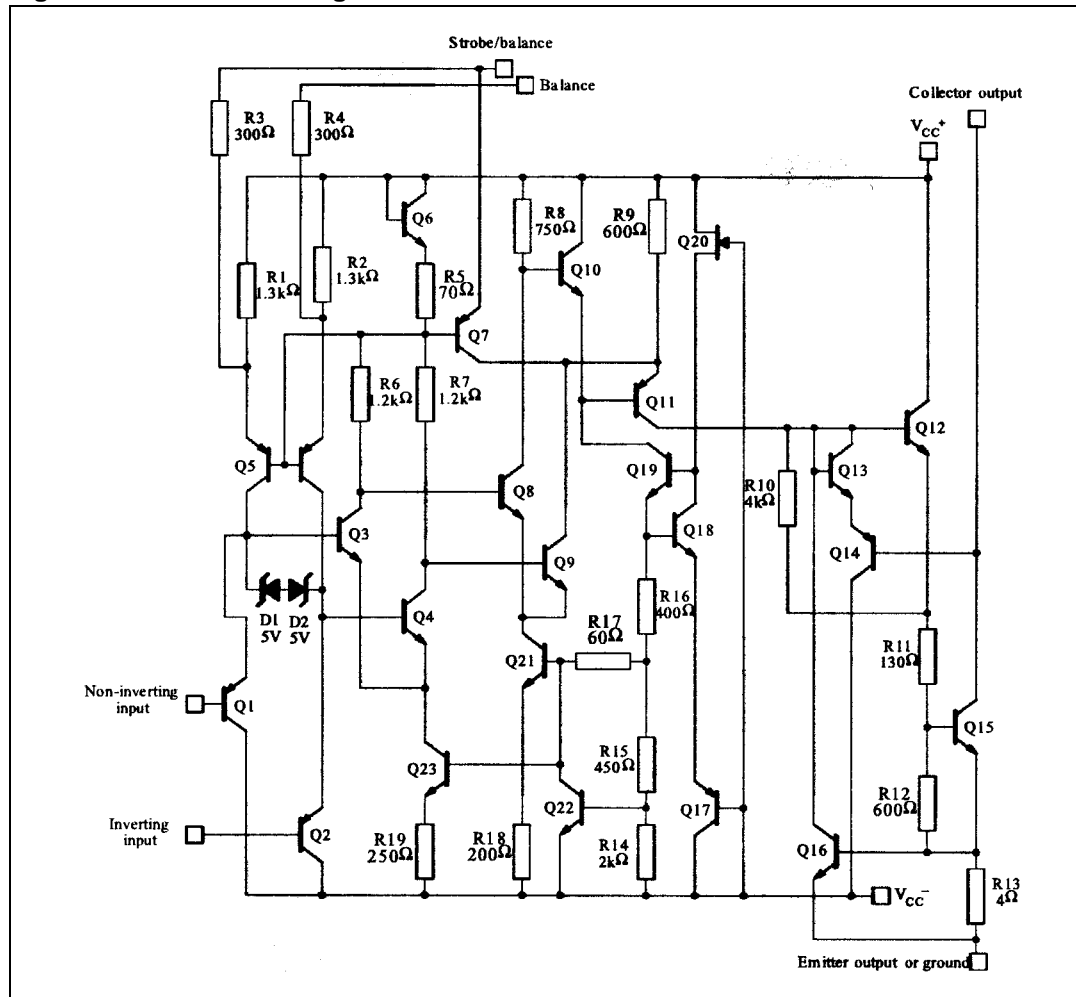
| Part number | Temperature range | Package | Packing | Marking |
|-------------|-------------------|---------|---------------------|---------|
| LM211N | -40°C, +105°C | DIP8 | Tube | LM211N |
| LM211D/DT | | SO-8 | Tube or tape & reel | 211 |
| LM311N | 0°C, +70°C | DIP8 | Tube | LM311 |
| LM311D/DT | | SO-8 | Tube or Tape & reel | 311 |

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1 Schematic diagram

Figure 1. Schematic diagram



2 Absolute maximum ratings & operating conditions

Table 1. Absolute maximum ratings (AMR)

| Symbol | Parameter | Value | Unit |
|-------------|-----------------------------------|----------------|------|
| V_{CC} | Supply voltage | 36 | V |
| V_{id} | Differential input voltage | ± 30 | V |
| V_i | Input voltage ⁽¹⁾ | ± 15 | V |
| $V_{(1-4)}$ | Ground to negative supply voltage | 30 | V |
| $V_{(7-4)}$ | Output to negative supply voltage | | |
| | LM111-LM211 LM311 | 50 40 | V |
| | Output short-circuit duration | 10 | s |
| | Voltage at strobe pin | $V_{CC}^+ - 5$ | V |
| P_d | Power dissipation ⁽²⁾ | | |
| | DIP8 | 1250 | mW |
| | SO-8 | 710 | |
| T_j | Junction temperature | +150 | °C |
| T_{stg} | Storage temperature range | -65 to +150 | °C |

1. This rating applies for $\pm 15V$ supplies. The positive input voltage limit is 30V above the negative. The negative input voltage is equal to the negative supply voltage or 30V below the positive supply, whichever is less.
2. P_d is calculated with $T_{amb} = +25^\circ C$, $T_j = +150^\circ C$ and $R_{thja} = 100^\circ C/W$ for the DIP8 package, and $R_{thja} = 175^\circ C/W$ for the SO-8 package.

Table 2. Operating conditions

| Symbol | Parameter | Value | Unit |
|------------|--------------------------------------|---------------|------|
| V_{CC} | Supply voltage | 5 to ± 15 | V |
| T_{oper} | Operating free-air temperature range | | |
| | LM111 | -55 to +125 | °C |
| | LM211 | -40 to +105 | |
| | LM311 | 0 to +70 | |

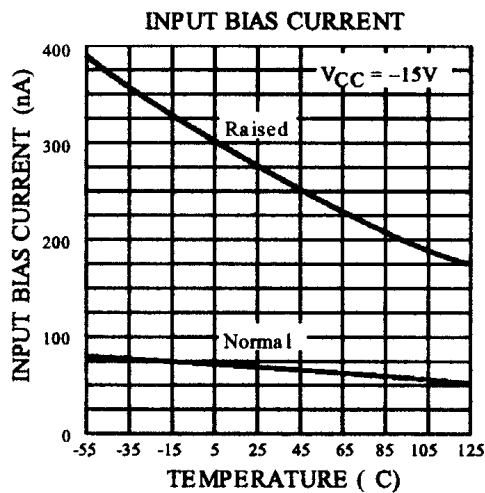
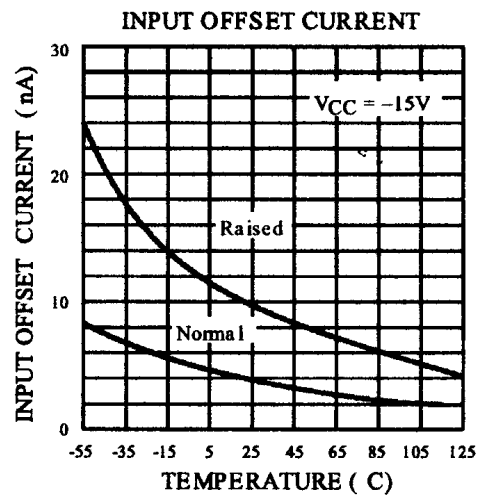
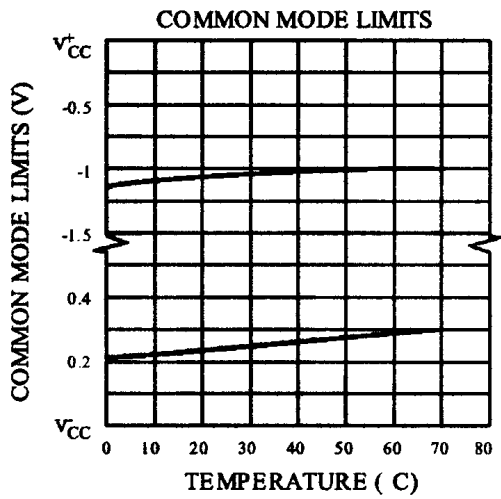
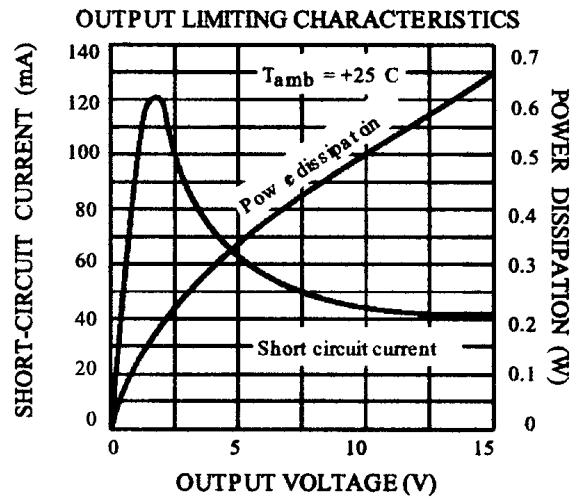
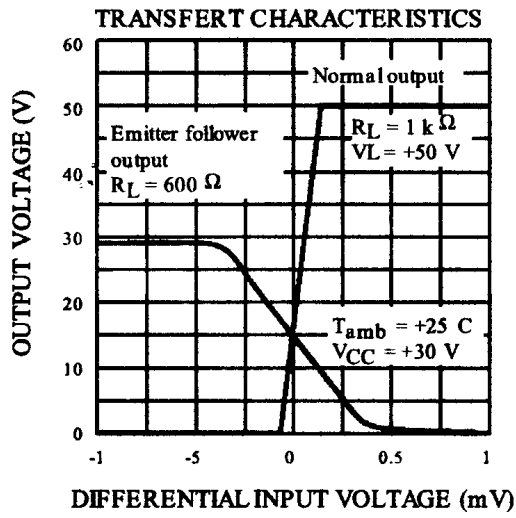
3 Electrical characteristics

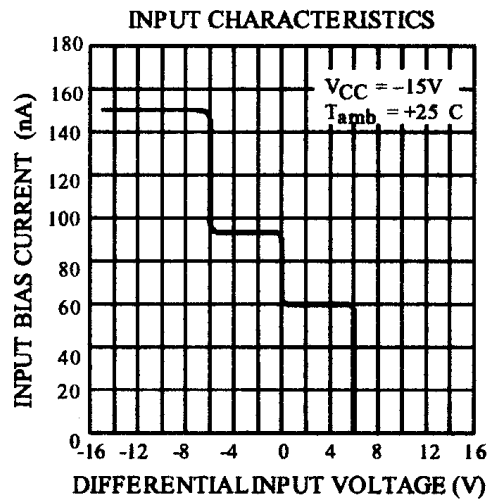
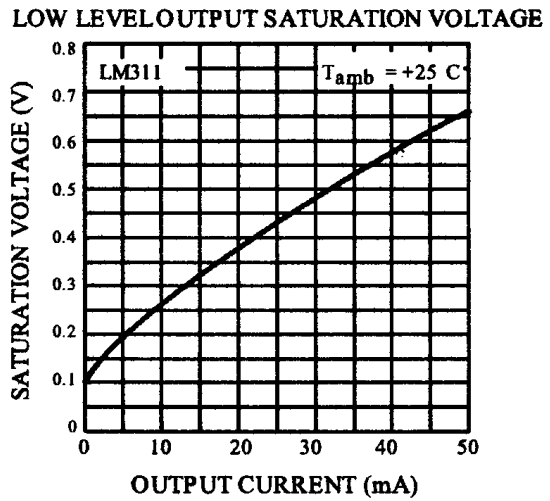
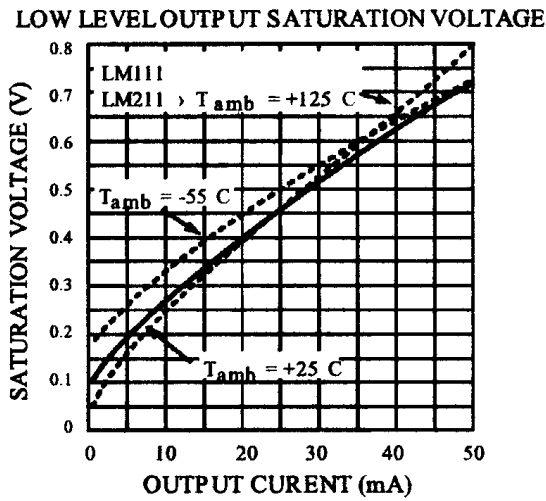
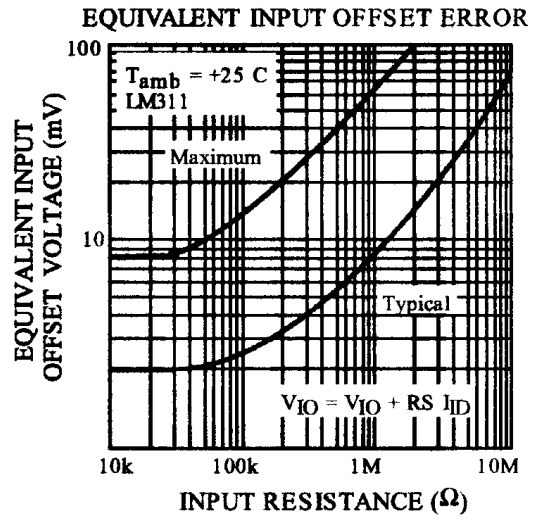
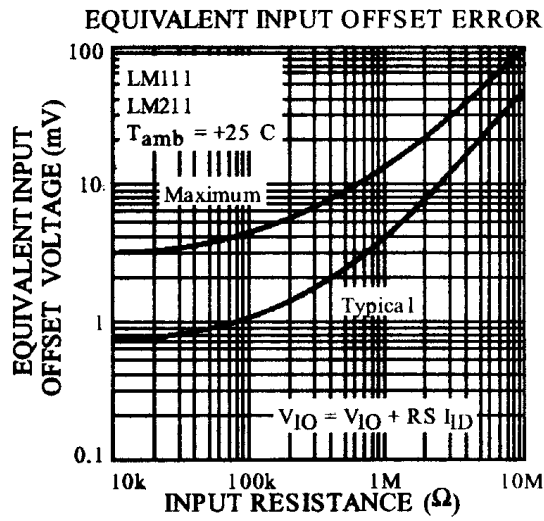
Table 3. $V_{CC}^+ = \pm 15V$, $T_{amb} = +25^\circ C$ (unless otherwise specified)

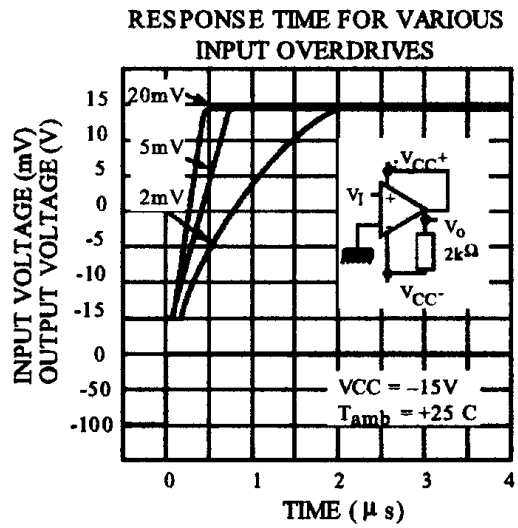
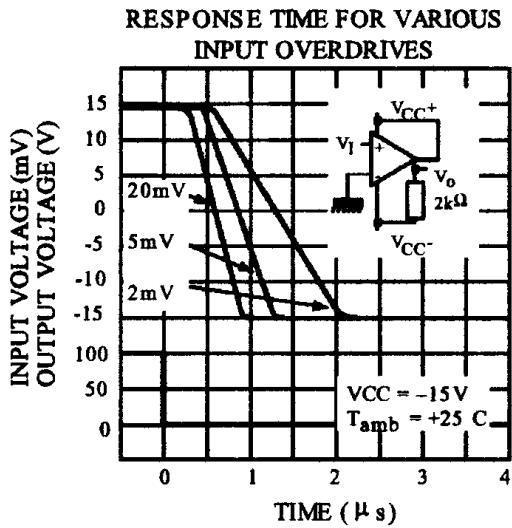
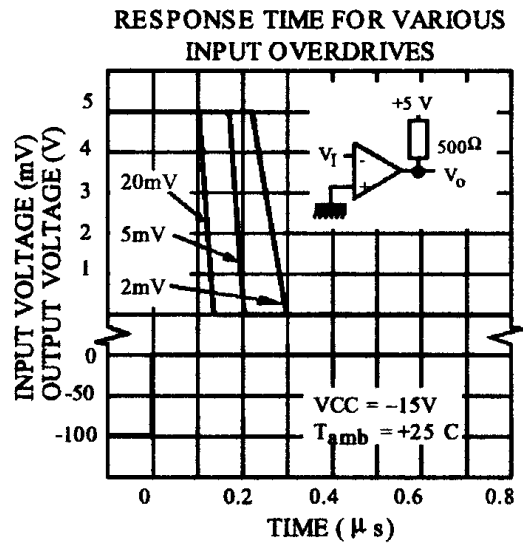
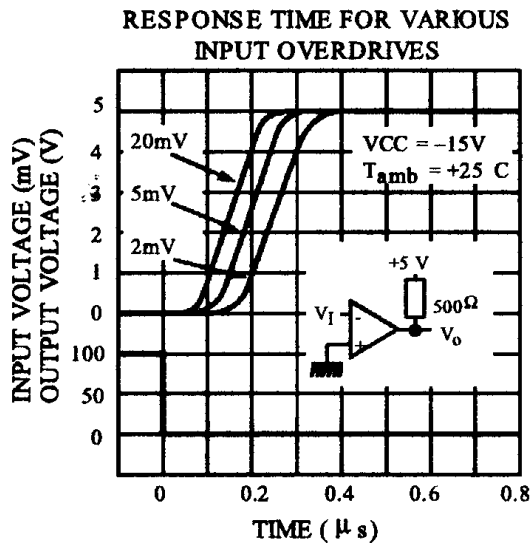
| Symbol | Parameter | Conditions | LM111 - LM211 | | | LM311 | | | Unit |
|--------------------------|---------------------------------|---|---------------|----------------|------------|-------|----------------|------------|---------|
| | | | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| V_{io} | Input offset voltage (1) | $R_S \leq 50k\Omega$ $T_{amb} = +25^\circ C$ $T_{min} \leq T_{amb} \leq T_{max}$ | | 0.7 | 3 4 | | 2 | 7.5 10 | mV |
| I_{io} | Input offset current (1) | $T_{amb} = +25^\circ C$ $T_{min} \leq T_{amb} \leq T_{max}$ | | 4 | 10 20 | | 6 | 50 70 | nA |
| I_{ib} | Input bias current (1) | $T_{amb} = +25^\circ C$ $T_{min} \leq T_{amb} \leq T_{max}$ | | 60 | 100 150 | | 100 | 250 300 | nA |
| A_{vd} | Large signal voltage gain | | 40 | 200 | | 40 | 200 | | V/mV |
| I_{CC}^+ I_{CC}^- | Supply currents | Positive Negative | | 5.1 4.1 | 6 5 | | 5.1 4.1 | 7.5 5 | mA |
| V_{icm} | Input common mode voltage range | $T_{min} \leq T_{amb} \leq T_{max}$ | -14.5 | +13.8 -14.7 | +13 | -14.5 | +13.8 -14.7 | +13 | V |
| V_{OL} | Low level output voltage | $T_{amb} = +25^\circ C$, $I_O = 50mA$, $V_i \leq -5mV$ | | 0.75 | 1.5 | | | | V |
| | | $T_{amb} = +25^\circ C$, $I_O = 50mA$, $V_i \leq -10mV$ | | | | | 0.75 | 1.5 | |
| | | $T_{min} \leq T_{amb} \leq T_{max}$ $V_{CC}^+ \geq +4.5V$, $V_{CC}^- = 0$ $I_O = 8mA$, $V_i \leq -6mV$ | | 0.23 | 0.4 | | | | |
| | | $T_{min} \leq T_{amb} \leq T_{max}$ $V_{CC}^+ \geq +4.5V$, $V_{CC}^- = 0$ $I_O = 8mA$, $V_i \leq -10mV$ | | | | | 0.23 | 0.4 | |
| I_{OH} | High level output current | $T_{amb} = +25^\circ C$ $V_i \geq +5mV$, $V_O = +35V$ | | 0.2 | 10 | | | | nA |
| | | $T_{amb} = +25^\circ C$ $V_i \geq +10mV$, $V_O = +35V$ | | | | | 0.2 | 50 | nA |
| | | $T_{min} \leq T_{amb} \leq T_{max}$ $V_i \geq +5mV$, $V_O = +35V$ | | 0.1 | 0.5 | | | | μA |
| I_{strobe} | Strobe current | | | 3 | | | 3 | | mA |
| t_{re} | Response time (2) | | | 200 | | | 200 | | ns |

1. The offset voltage, offset current and bias current specifications apply for any supply voltage from a single +5V supply up to $\pm 15V$ supplies. The offset voltages and offset currents given are the maximum values required to drive the output down to +1V or up to +14V with a 1mA load current. Thus, these parameters define an error band and take into account the worst-case of voltage gain and input impedance.

2. The response time specified is for a 100mV input step with 5mV overdrive.



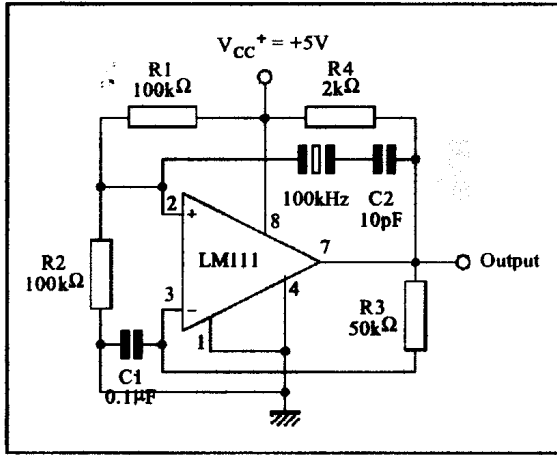




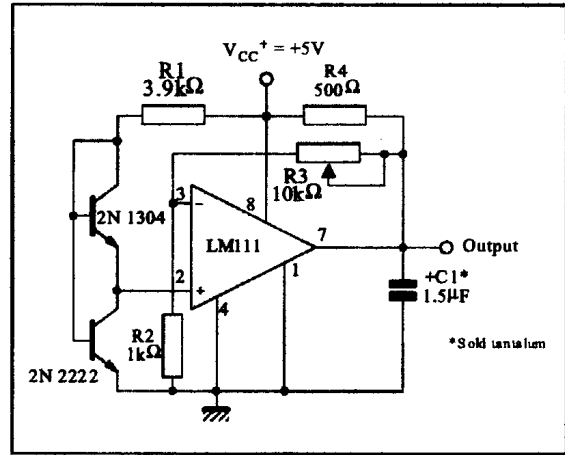
4 Typical application schematics

TYPICAL APPLICATIONS

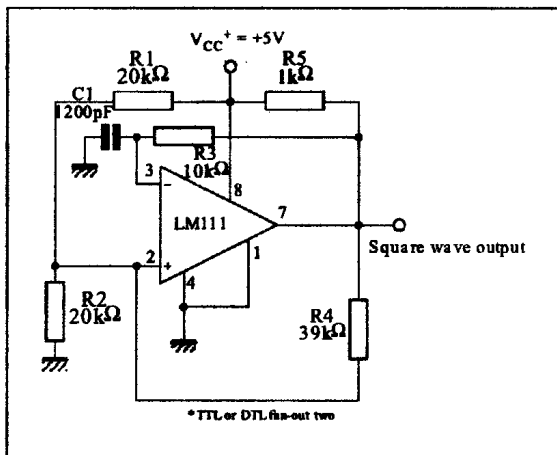
CRYSTAL OSCILLATOR



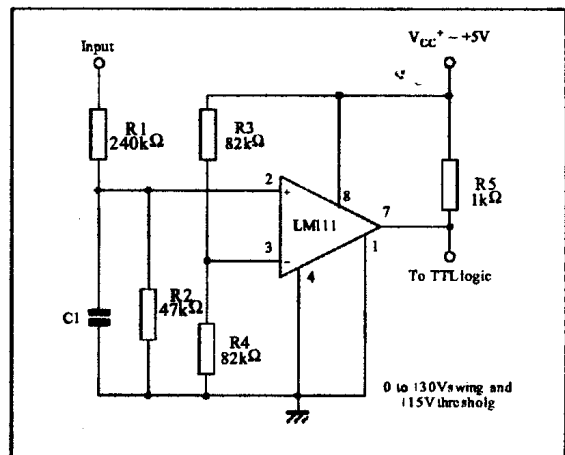
LOW VOLTAGE ADJUSTABLE REFERENCE SUPPLY



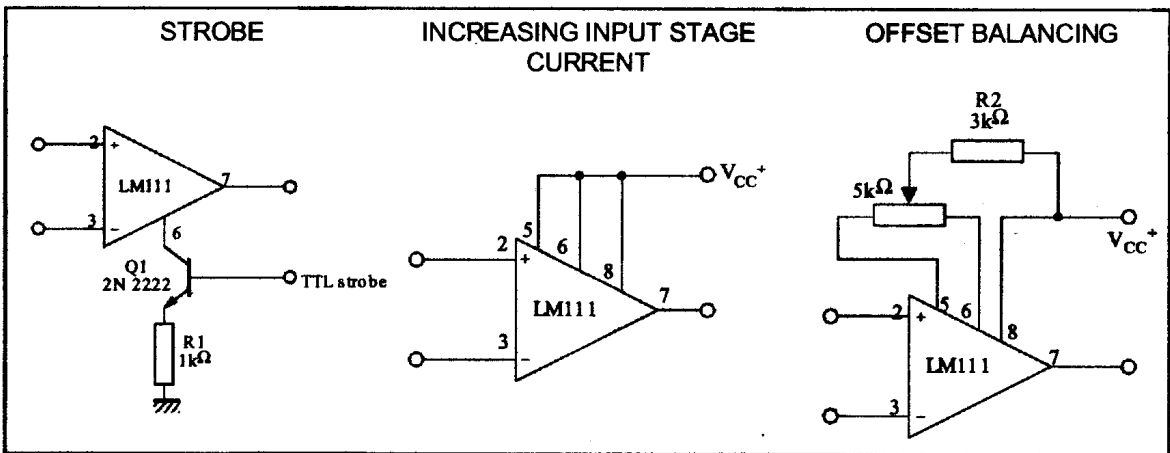
100KHz FREE RUNNING MULTIVIBRATOR



TTL INTERFACE WITH HIGH LEVEL LOGIC



AUXILIARY CIRCUITS

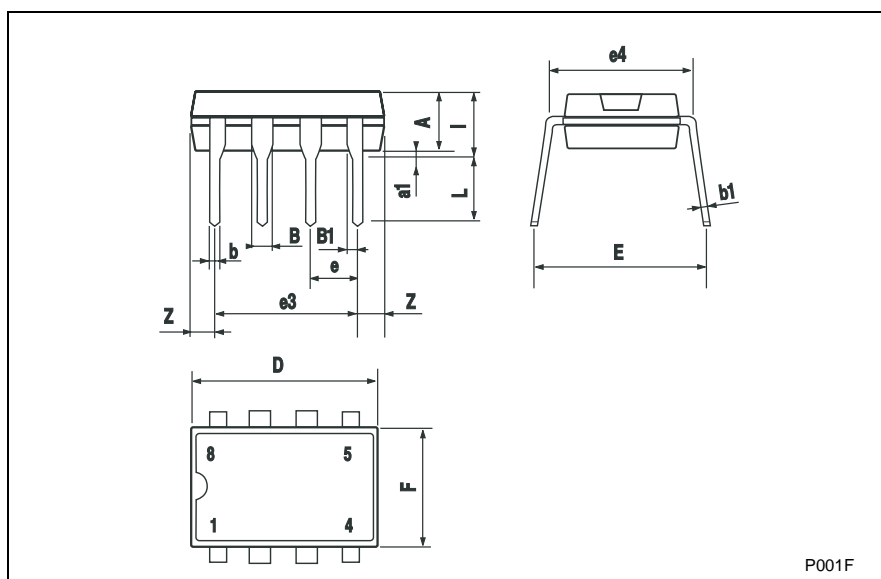


5 Package mechanical data

In order to meet environmental requirements, STMicroelectronics offers these devices in ECOPACK[®] packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an STMicroelectronics trademark. ECOPACK specifications are available at: www.st.com.

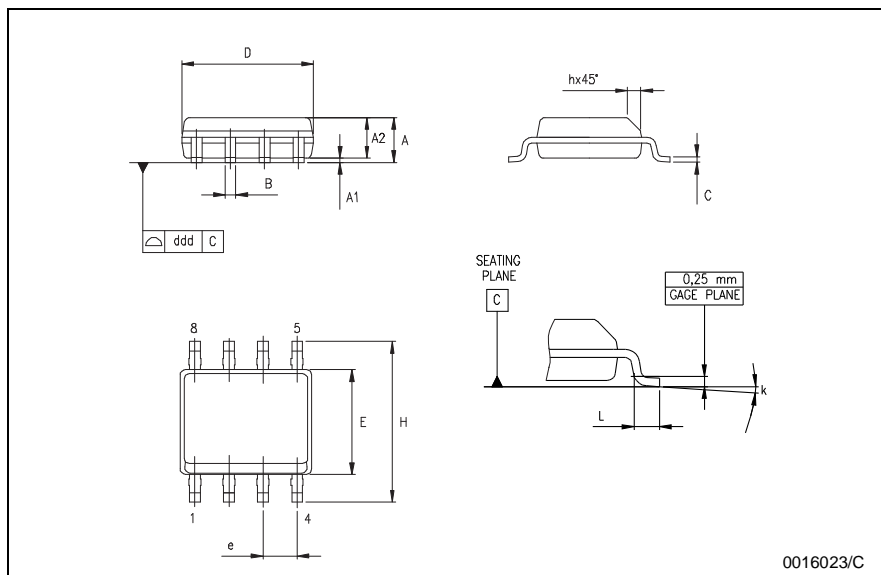
5.1 DIP8 package

| Plastic DIP-8 MECHANICAL DATA | | | | | | |
|-------------------------------|------|------|------|-------|-------|-------|
| DIM. | mm. | | | inch | | |
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | 3.3 | | | 0.130 | |
| a1 | 0.7 | | | 0.028 | | |
| B | 1.39 | | 1.65 | 0.055 | | 0.065 |
| B1 | 0.91 | | 1.04 | 0.036 | | 0.041 |
| b | | 0.5 | | | 0.020 | |
| b1 | 0.38 | | 0.5 | 0.015 | | 0.020 |
| D | | | 9.8 | | | 0.386 |
| E | | 8.8 | | | 0.346 | |
| e | | 2.54 | | | 0.100 | |
| e3 | | 7.62 | | | 0.300 | |
| e4 | | 7.62 | | | 0.300 | |
| F | | | 7.1 | | | 0.280 |
| l | | | 4.8 | | | 0.189 |
| L | | 3.3 | | | 0.130 | |
| Z | 0.44 | | 1.6 | 0.017 | | 0.063 |



5.2 SO-8 package

| SO-8 MECHANICAL DATA | | | | | | |
|----------------------|-----------|------|------|-------|-------|-------|
| DIM. | mm. | | | inch | | |
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 1.35 | | 1.75 | 0.053 | | 0.069 |
| A1 | 0.10 | | 0.25 | 0.04 | | 0.010 |
| A2 | 1.10 | | 1.65 | 0.043 | | 0.065 |
| B | 0.33 | | 0.51 | 0.013 | | 0.020 |
| C | 0.19 | | 0.25 | 0.007 | | 0.010 |
| D | 4.80 | | 5.00 | 0.189 | | 0.197 |
| E | 3.80 | | 4.00 | 0.150 | | 0.157 |
| e | | 1.27 | | | 0.050 | |
| H | 5.80 | | 6.20 | 0.228 | | 0.244 |
| h | 0.25 | | 0.50 | 0.010 | | 0.020 |
| L | 0.40 | | 1.27 | 0.016 | | 0.050 |
| k | 8° (max.) | | | | | |
| ddd | | | 0.1 | | | 0.04 |



6 Revision history

| Date | Revision | Changes |
|-----------|----------|---|
| 1-Jun-02 | 1 | Initial release. |
| 2-Jan-06 | 2 | Table 3. on page 5 updated. Formatting changes throughout. |
| 1-Mar-06 | 3 | Pin connections updated on page 1. |
| 26-Sep-06 | 4 | Corrected description under title on cover page. |

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