

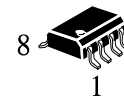
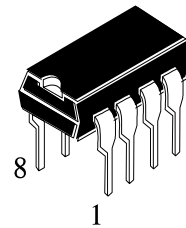
## Precision voltage-frequency converter (compatible to LM331M (TI USA))

### Description

This voltage to frequency converter provides the output pulse train at a frequency precisely proportional to the applied input voltage. The HT8331 can operate at power supplies as low as 4.0V and be changed output frequency from 1Hz to 100KHz. It is ideally suited for use in simple low cost circuit for analog-to digital conversion, long term integration, linear frequency modulation or demodulation, frequency to voltage conversion, and many other functions.

### Features

- Guaranteed linearity: 0.01% max.
- Low power dissipation: 15mW at 5V
- Wide range of full scale frequency: 1Hz to 100KHz
- Pulse output compatible with all logic forms
- Wide dynamic range: 100dB min at 10KHz full scale frequency

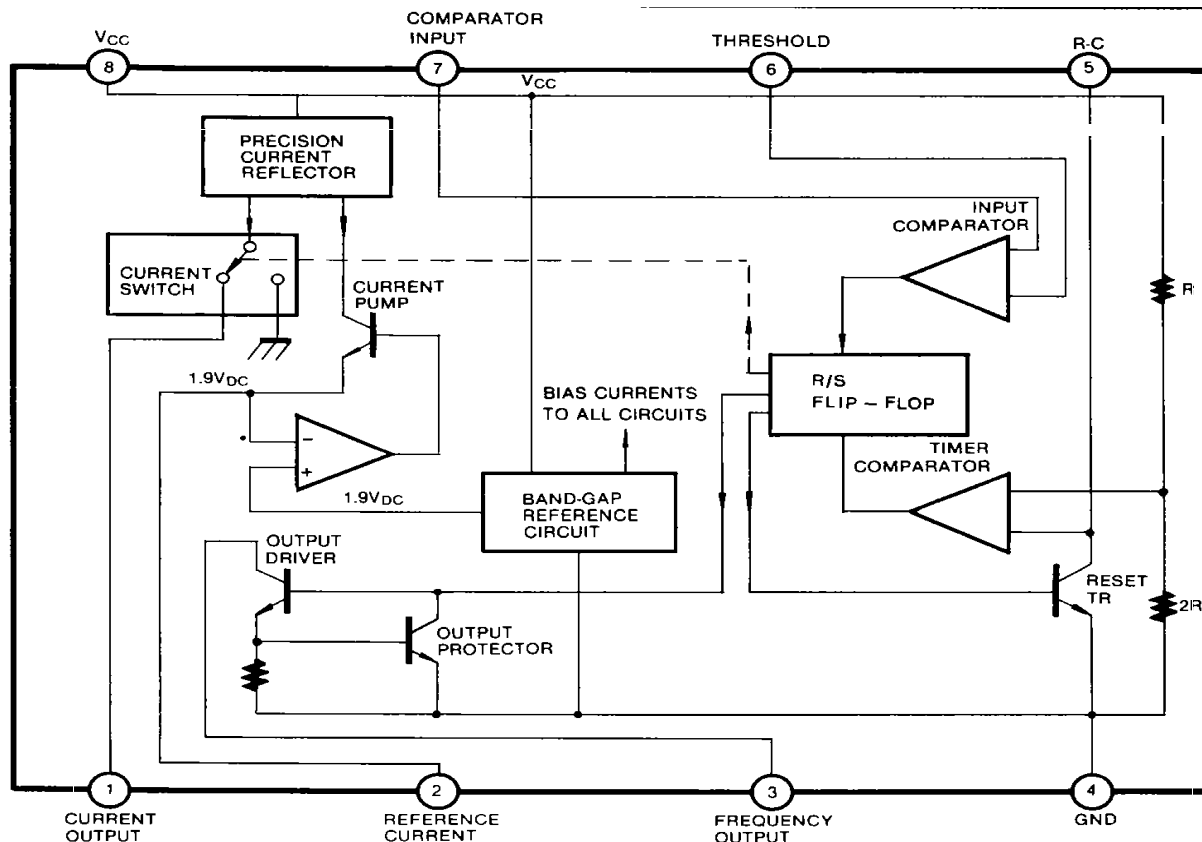


$T_A = -40^{\circ}\text{C to } +85^{\circ}\text{C}$

HT8331ARZ  
HT8331ANZ

SOP8-150mil  
DIP8-300mil

### Internal Block Diagram



**Absolute Maximum Ratings (T<sub>A</sub> = 25°C)**

| Parameter                   | Symbol           | Value                    | Unit |
|-----------------------------|------------------|--------------------------|------|
| Supply Voltage              | V <sub>CC</sub>  | 40                       | V    |
| Input Voltage               | V <sub>I</sub>   | -0.2 ~ + V <sub>CC</sub> | V    |
| Operating Temperature Range | T <sub>OPR</sub> | 0 ~ +70                  | °C   |
| Power Dissipation           | P <sub>D</sub>   | 500                      | mW   |

**Electrical Characteristics**

| Parameter                          | Symbol                             | Conditions                                           | Min. | Typ.   | Max.                 | Unit             |
|------------------------------------|------------------------------------|------------------------------------------------------|------|--------|----------------------|------------------|
| VFC Non-Linearity                  | VFCNL                              | 4.5 ≤ V <sub>CC</sub> ≤ 20V                          | -    | ±0.003 | ±0.01                | % Full-Scale     |
| Conversion Accuracy Scale Factor   | ACCUR                              | V <sub>I</sub> = -10V, R <sub>S</sub> = 14KΩ         | 0.90 | 1.00   | 1.10                 | KHz/V            |
| Chang Of Gain With V <sub>CC</sub> | V <sub>CC</sub> ΔG/V <sub>CC</sub> | 4.5V ≤ V <sub>CC</sub> ≤ 10V                         | -    | 0.01   | 0.1                  | % /V             |
|                                    |                                    | 10V ≤ V <sub>CC</sub> ≤ 40V                          | -    | 0.006  | 0.06                 |                  |
| Rated Full - Scale Frequency       | f                                  | V <sub>I</sub> = -10V                                | 10.0 | -      | -                    | KHz              |
| <b>INPUT COMPARATOR</b>            |                                    |                                                      |      |        |                      |                  |
| Offset Voltage                     | V <sub>IO</sub>                    | 0°C ≤ T <sub>A</sub> ≤ +70°C                         | -    | ±3     | ±10                  | mV               |
| Bias Current                       | I <sub>BIAS</sub>                  | -                                                    | -    | -80    | -300                 | nA               |
| Offset Current                     | I <sub>IO</sub>                    | -                                                    | -    | ±8     | ±100                 | nA               |
| Common-Mode Range                  | V <sub>CM</sub>                    | 0°C ≤ T <sub>A</sub> ≤ +70°C                         | -0.2 | -      | V <sub>CC</sub> -2.0 | V                |
| <b>TIMER (PIN 5)</b>               |                                    |                                                      |      |        |                      |                  |
| Timer Threshold Voltage            | V <sub>TH</sub>                    | -                                                    | 0.63 | 0.667  | 0.701                | ×V <sub>CC</sub> |
| Input Bias Current                 | I <sub>BIAS</sub>                  | V <sub>CC</sub> = 15V,<br>0V ≤ V <sub>5</sub> ≤ 9.9V | -    | ±10    | ±100                 | nA               |
|                                    |                                    | V <sub>5</sub> = 10V                                 | -    | 200    | 1000                 | nA               |
| Saturation Voltage                 | V <sub>SAT</sub>                   | I = 5mA                                              | -    | 0.22   | 0.5                  | V                |
| <b>CURRENT SOURCE (PIN 1)</b>      |                                    |                                                      |      |        |                      |                  |
| Output Current                     | I <sub>O</sub>                     | R <sub>S</sub> = 14KΩ, V <sub>1</sub> = 0V           | 116  | 136    | 156                  | μA               |
| Change with Voltage                | ΔI <sub>O</sub> /ΔV <sub>1</sub>   | 0V ≤ V <sub>1</sub> ≤ 10V                            | -    | 0.2    | 1.0                  | μA               |
| Current Source Off Leakage         | I <sub>LKG</sub>                   | -                                                    | -    | 0.02   | 10.0                 | nA               |
| <b>REFERENCE VOLTAGE (PIN 2)</b>   |                                    |                                                      |      |        |                      |                  |
| Reference Voltage                  | V <sub>REF</sub>                   | -                                                    | 1.70 | 1.89   | 2.08                 | V <sub>DC</sub>  |
| Stability vs Temperature           | ST <sub>T</sub>                    | -                                                    | -    | ±60    | -                    | ppm/°C           |
| Stability vs Time, 1000Hours       | ST <sub>T</sub>                    | -                                                    | -    | ±0.1   | -                    | %                |
| <b>LOGIC OUTPUT (Pin 3)</b>        |                                    |                                                      |      |        |                      |                  |
| Saturation Voltage                 | V <sub>SAT</sub>                   | I = 5mA                                              | -    | 0.15   | 0.50                 | V                |
|                                    |                                    | I = 3.2mA                                            | -    | 0.10   | 0.40                 |                  |
| Off Leakage                        | I <sub>LKG</sub>                   | -                                                    | -    | ±0.05  | 1.0                  | μA               |
| <b>SUPPLY CURRENT</b>              |                                    |                                                      |      |        |                      |                  |
| Supply Current                     | I <sub>CC</sub>                    | V <sub>CC</sub> = 5V                                 | 1.5  | 3.0    | 6.0                  | mA               |
|                                    |                                    | V <sub>CC</sub> = 40V                                | 2.0  | 4.0    | 8.0                  |                  |

## Typical Applications

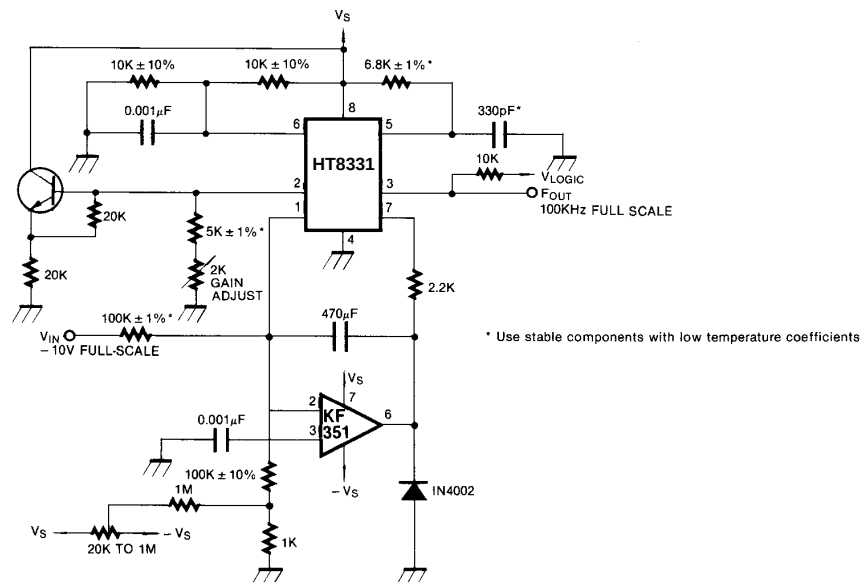


Figure 1. Precision Voltage-to-Frequency Converter, 100KHz Full-Scale

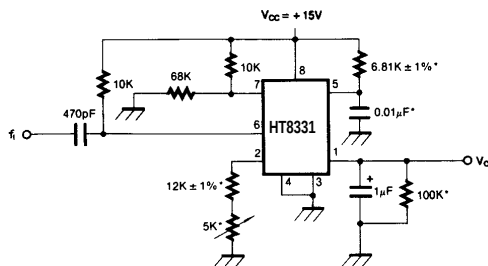


Figure 2. Simple Frequency-to-Voltage Converter, 10KHz Full-Scale

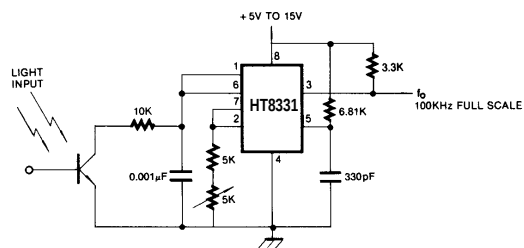
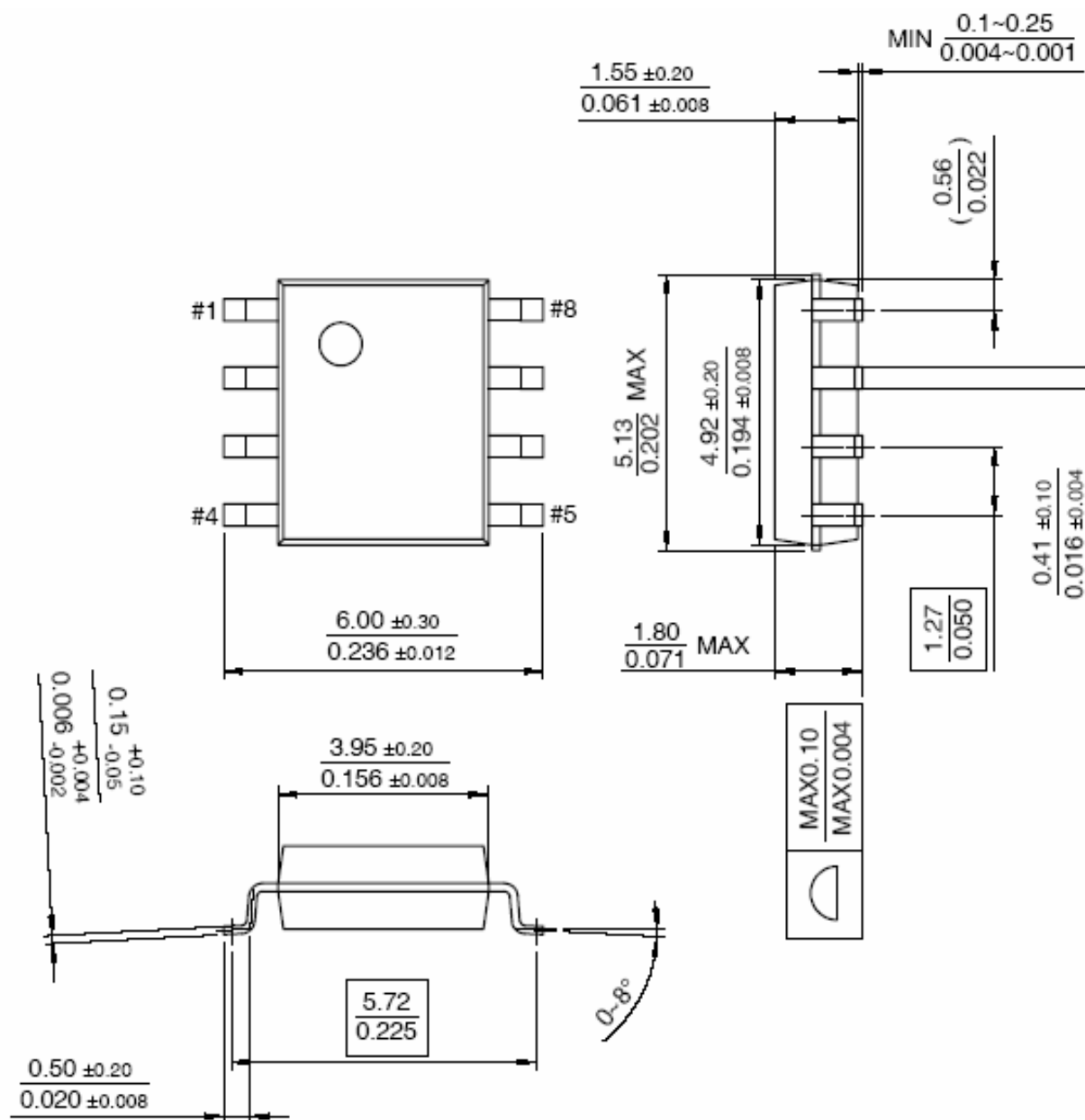


Figure 3. Light Intensity to Frequency Converter

## SOP-8 Package Dimensions



# DIP-8 Package Dimensions

