

# BA3830F BA3830S BA3832F

## Bandpass filter for spectroanalyzer

The BA3830F, BA3830S and BA3832F are ICs with 5+1 bandpass filters that are used to display the spectral analysis of an audio signal.

Since all filter circuit components are contained in the IC, the number of external devices is greatly reduced.

### Features

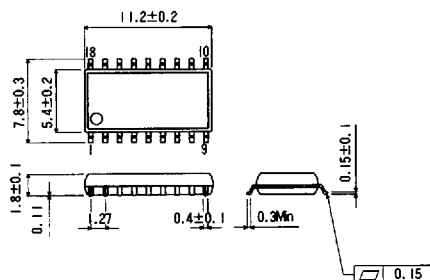
- available in a SOP18 and SDIP18 package
- supply voltage range is 4.5 ~ 8.0 V
- inputs and outputs for the recording indicator are built in

### Applications

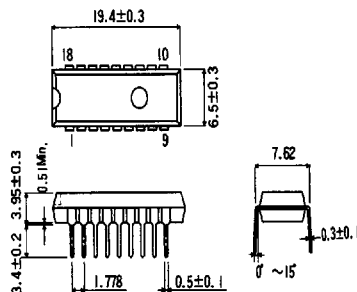
- CD radio cassette recorder
- mini component stereo
- car stereo

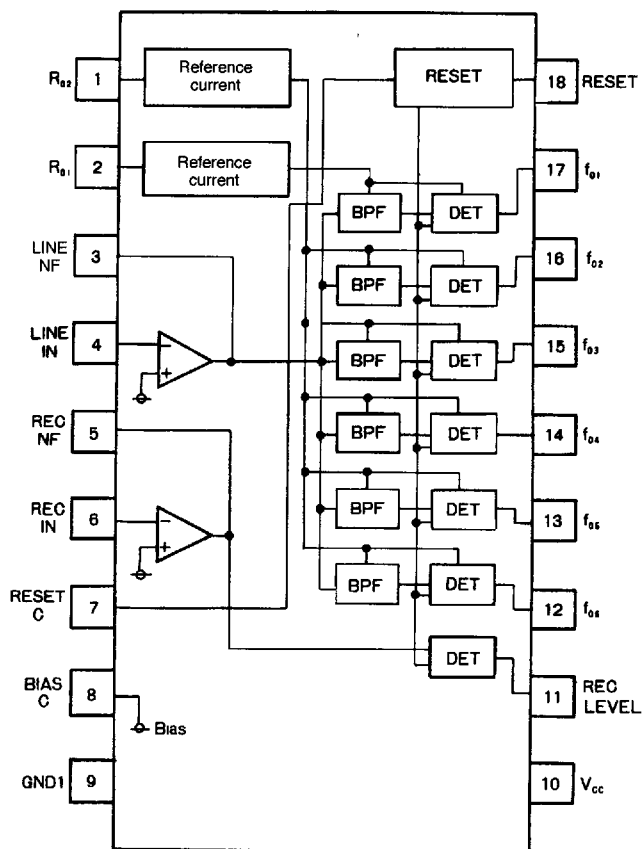
### Dimensions (Units : mm)

#### BA3830F and BA3832F (SOP18)



#### BA3830S (SDIP18)



**Block diagram**

**Absolute maximum ratings ( $T_a = 25^\circ\text{C}$ )**

| Parameter                   |                    | Symbol    | Limits          | Unit             | Conditions                                                        |
|-----------------------------|--------------------|-----------|-----------------|------------------|-------------------------------------------------------------------|
| Power supply voltage        |                    | $V_{CC}$  | 9               | V                |                                                                   |
| Power dissipation           | BA3830F<br>BA3832F | $P_d$     | 500             | mW               | Reduce power by 5.0 mW for each degree above $25^\circ\text{C}$ . |
|                             | BA3830S            |           | 600             |                  | Reduce power by 6.0 mW for each degree above $25^\circ\text{C}$ . |
| Operating temperature range |                    | $T_{opr}$ | $-25 \sim +75$  | $^\circ\text{C}$ |                                                                   |
| Storage temperature range   |                    | $T_{stg}$ | $-55 \sim +125$ | $^\circ\text{C}$ |                                                                   |

**Recommended operating conditions ( $T_a = 25^\circ\text{C}$ )**

| Parameter            | Symbol   | Min | Typical | Max | Unit |
|----------------------|----------|-----|---------|-----|------|
| Power supply voltage | $V_{CC}$ | 4.5 |         | 8.0 | V    |

**Electrical characteristics—BA3830F/BA3830S**(unless otherwise noted,  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 5\text{ V}$ ,  $R_L = 10\text{ M}\Omega$ ,  $R_{\phi 1} = 270\text{ k}\Omega$ ,  $R_{\phi 2} = 270\text{ k}\Omega$ )

| Parameter                                 | Symbol      | Min  | Typical | Max  | Unit          | Conditions                                                                                |
|-------------------------------------------|-------------|------|---------|------|---------------|-------------------------------------------------------------------------------------------|
| Quiescent current                         | $I_Q$       |      | 3.8     | 5.2  | mA            |                                                                                           |
| Reference output level (LEVEL)            | $V_{OL}$    | -3   | 0       | 3    | dB            | $V_{IN} = -30\text{ dBV}$ , $V_O = 1.5\text{ V}$ (0 dB)<br>$f = \text{central frequency}$ |
| Maximum output level (LEVEL)              | $V_{OLmax}$ | 3.2  | 4.2     |      | V             | $f = \text{central frequency}$ ,<br>$V_{IN} = -14\text{ dBV}$                             |
| Reference output level (REC LEVEL)        | $V_{OR}$    | -3   | 0       | 3    | dB            | $V_{IN} = -30\text{ dBV}$ , $V_O = 1.5\text{ V}$ (0 dB)<br>$f = 1\text{ kHz}$             |
| Maximum output level (REC LEVEL)          | $V_{ORmax}$ | 3.8  | 4.8     |      | V             | $V_{IN} = -14\text{ dBV}$ , $f = 1\text{ kHz}$                                            |
| Output offset voltage                     | $V_{OFF}$   |      | 30      | 90   | mV            | Quiescent                                                                                 |
| Central frequency 1                       | $f_{01}$    | 49   | 63      | 77   | Hz            | $V_{IN} = -30\text{ dBV}$                                                                 |
| Central frequency 2                       | $f_{02}$    | 117  | 150     | 183  | Hz            | $V_{IN} = -30\text{ dBV}$                                                                 |
| Central frequency 3                       | $f_{03}$    | 257  | 330     | 403  | Hz            | $V_{IN} = -30\text{ dBV}$                                                                 |
| Central frequency 4                       | $f_{04}$    | 0.78 | 1       | 1.22 | kHz           | $V_{IN} = -30\text{ dBV}$                                                                 |
| Central frequency 5                       | $f_{05}$    | 2.55 | 3.3     | 4.03 | kHz           | $V_{IN} = -30\text{ dBV}$                                                                 |
| Central frequency 6                       | $f_{06}$    | 7.8  | 10      | 12.2 | kHz           | $V_{IN} = -30\text{ dBV}$                                                                 |
| Input current when the reset pin is HIGH  | $I_{IN}$    | 150  | 215     | 280  | $\mu\text{A}$ | $V_{th} = 5\text{ V}$                                                                     |
| Threshold level when the reset pin is ON  | $V_{th}$    |      | 1.4     | 1.8  | V             |                                                                                           |
| Threshold level when the reset pin is OFF | $V_{th}$    | 1.0  | 1.4     |      | V             |                                                                                           |

**Electrical characteristics—BA3832F**(unless otherwise noted,  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 5\text{ V}$ ,  $R_L = 10\text{ M}\Omega$ ,  $R_{\phi 1} = 150\text{ k}\Omega$ ,  $R_{\phi 2} = 270\text{ k}\Omega$ )

| Parameter                                 | Symbol      | Min  | Typ | Max  | Unit          | Conditions                                                                                |
|-------------------------------------------|-------------|------|-----|------|---------------|-------------------------------------------------------------------------------------------|
| Quiescent current                         | $I_Q$       |      | 3.8 | 5.2  | mA            |                                                                                           |
| Reference output level (LEVEL)            | $V_{OL}$    | -3   | 0   | 3    | dB            | $V_{IN} = -30\text{ dBV}$ , $V_O = 1.5\text{ V}$ (0 dB)<br>$f = \text{central frequency}$ |
| Maximum output level (LEVEL)              | $V_{OLmax}$ | 3.2  | 4.2 |      | V             | $f = \text{central frequency}$ , $V_{IN} = -14\text{ dBV}$                                |
| Reference output level (REC LEVEL)        | $V_{OR}$    | -3   | 0   | 3    | dB            | $V_{IN} = -30\text{ dBV}$ , $V_O = 1.5\text{ V}$ (0 dB)<br>$f = 1\text{ kHz}$             |
| Maximum output level (REC LEVEL)          | $V_{ORmax}$ | 3.8  | 4.8 |      | V             | $V_{IN} = -14\text{ dBV}$ , $f = 1\text{ kHz}$                                            |
| Output offset voltage                     | $V_{OFF}$   |      | 30  | 90   | mV            | Quiescent                                                                                 |
| Central frequency 1                       | $f_{01}$    | 78   | 100 | 122  | Hz            | $V_{IN} = -30\text{ dBV}$                                                                 |
| Central frequency 2                       | $f_{02}$    | 117  | 150 | 183  | Hz            | $V_{IN} = -30\text{ dBV}$                                                                 |
| Central frequency 3                       | $f_{03}$    | 312  | 400 | 488  | Hz            | $V_{IN} = -30\text{ dBV}$                                                                 |
| Central frequency 4                       | $f_{04}$    | 0.78 | 1   | 1.22 | kHz           | $V_{IN} = -30\text{ dBV}$                                                                 |
| Central frequency 5                       | $f_{05}$    | 3.12 | 4   | 4.88 | kHz           | $V_{IN} = -30\text{ dBV}$                                                                 |
| Central frequency 6                       | $f_{06}$    | 7.8  | 10  | 12.2 | kHz           | $V_{IN} = -30\text{ dBV}$                                                                 |
| Input current when the reset pin is HI    | $I_{IN}$    | 150  | 215 | 280  | $\mu\text{A}$ | $V_{th} = 5\text{ V}$                                                                     |
| Threshold level when the reset pin is ON  | $V_{th}$    |      | 1.4 | 1.8  | V             |                                                                                           |
| Threshold level when the reset pin is OFF | $V_{th}$    | 1.0  | 1.4 |      | V             |                                                                                           |

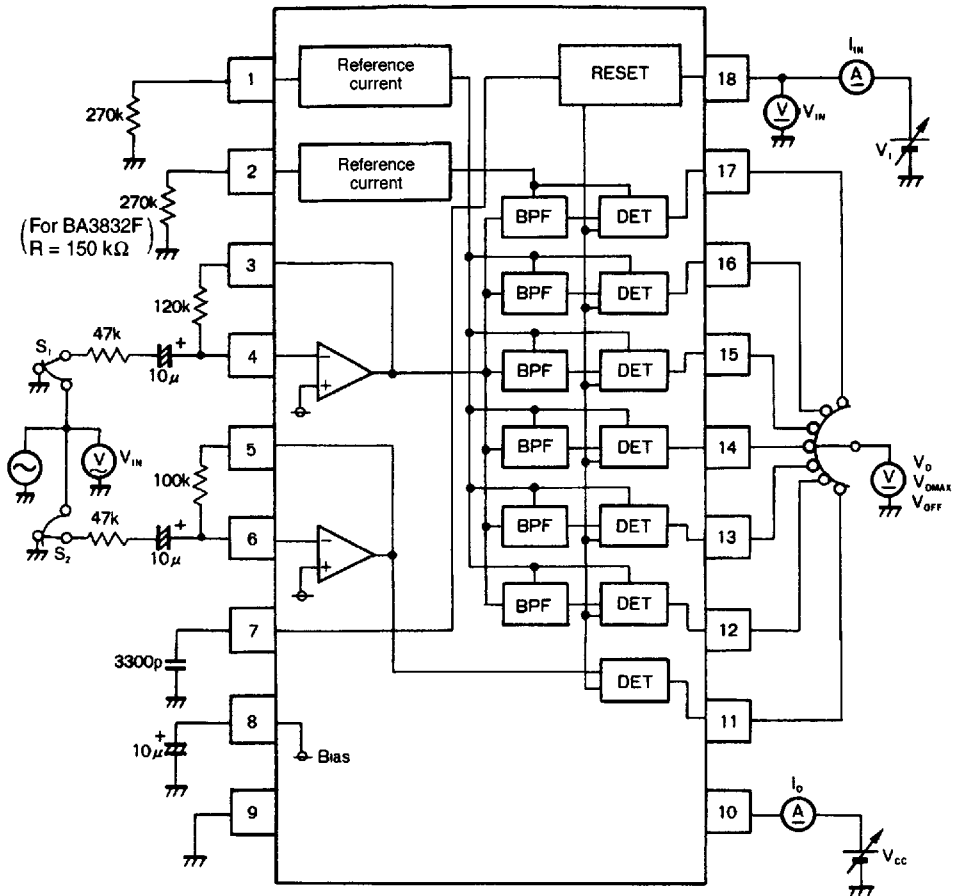
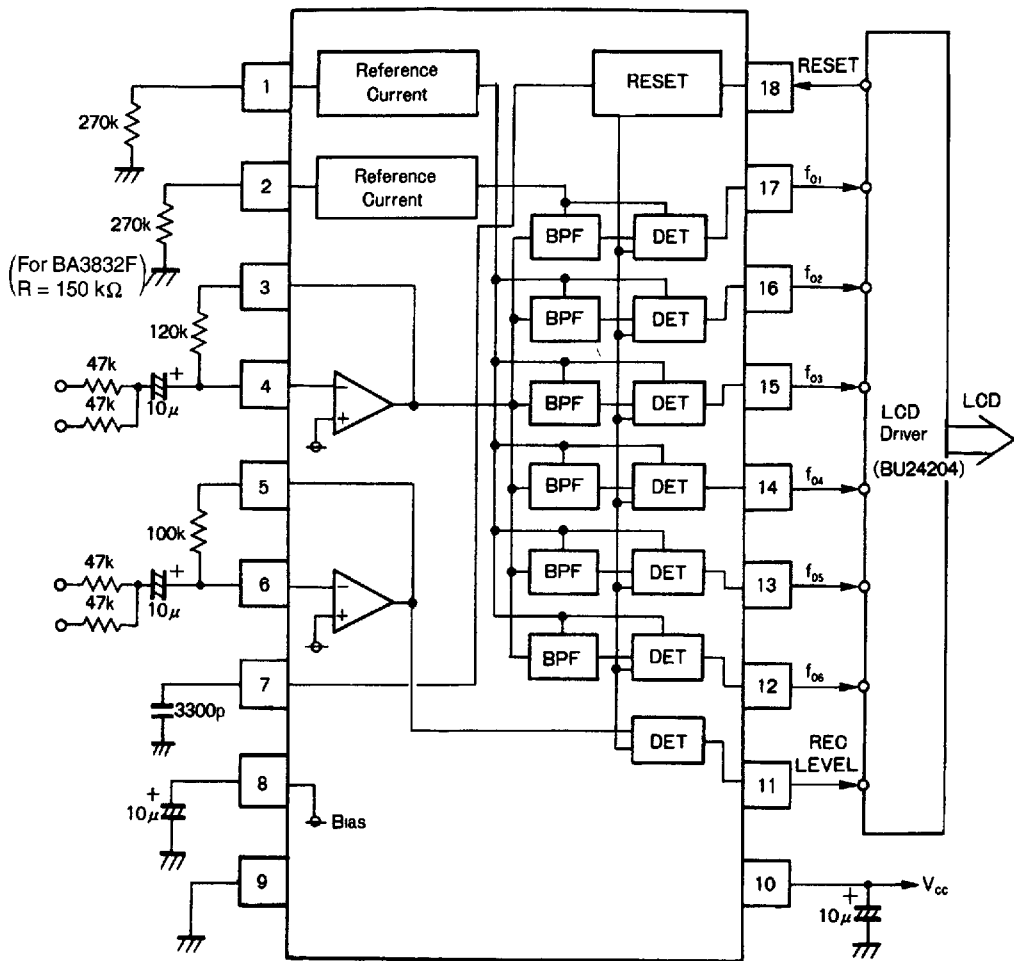
**Figure 1 Test circuit**

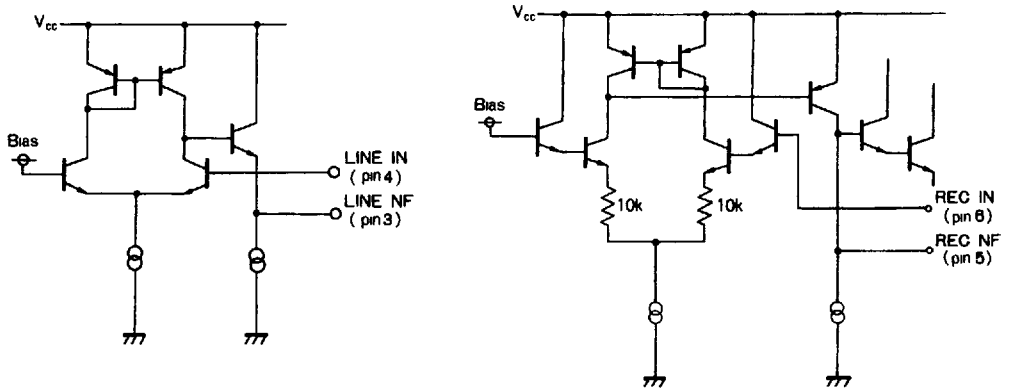
Figure 2 Application example



**Circuit operation****LINE and REC inputs**

The LINE and REC input circuits are differential amplifiers. The gain can be set using an external resistor.

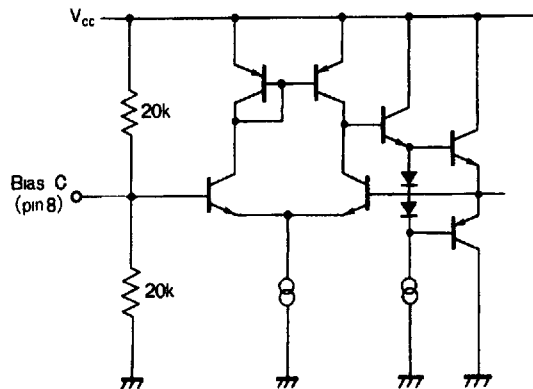
The input impedance is determined by the external resistance.

**Figure 3 LINE and REC equivalent circuit**

**Note:** The resistance values noted in the internal circuit diagrams are all standard values

**Bias**

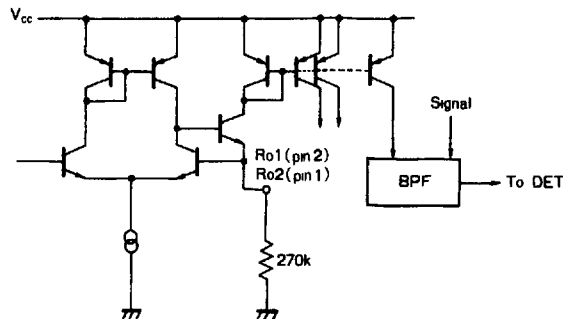
A bias voltage equal to  $V_{CC}/2$  is applied to each circuit. The output stage is in push-pull format. Therefore, a stable bias source can be realized.

**Figure 4 Bias equivalent circuit**

## Band pass filters

Each of these circuits selects the necessary frequency component from the input signal and amplifies it. The circuit does not require any external capacitor. The central frequency is selected using an equivalent current. The central frequencies  $f_{01}$  and  $f_{02} \sim f_{06}$  can be set independently by using separate resistances on pins 1 and 2.

**Figure 5 Band pass filter equivalent circuit**

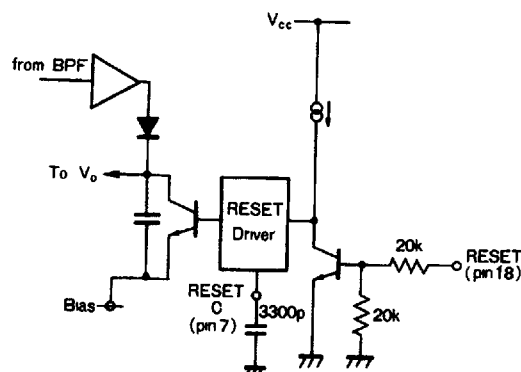


## Detectors

Each of these circuits detects the signal selected and amplified by the BPF and performs a peak hold. The capacitor is internal to the IC.

The charged electrical load in the DET circuit built-in capacitor is set to discharge at, typically 75 ms/V. In order to eliminate the effects of dispersion, a RESET circuit is included.

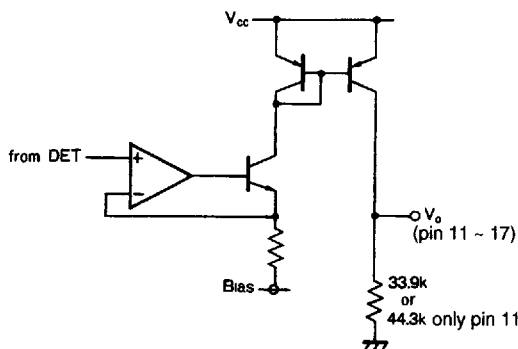
**Figure 6 Detector equivalent circuit**



## Output

Each of these output circuits performs a voltage-to-current conversion on the signal level held at peak by the detector and then outputs it. Because the next stage is a high input impedance MOS, a resistance of 33.9 k $\Omega$  (REC output only: 44.3 k $\Omega$ ) is connected between each output pin and the ground (within the IC). Consequently, the output value changes depending on the input impedance of the next stage.

**Figure 7 Output equivalent circuit**



## Precautions for use

### Load resistance

All characteristics in the specifications are tested at a resistance value of 10 M $\Omega$ . The output of this IC is a current output (MOS). Caution is required because the output varies depending on the input impedance of the next stage.

### RESET capacitor

When using the RESET, a 3300 pF or greater capacitor is required for the RESET C (pin 7). If a capacitor is not used, the displays may not be correct.

### Coupling capacitor

Make sure to determine the polarity of the input electrolytic coupling capacitor with consideration for the electric potential relationship with the input stage.

Electrical characteristic curves

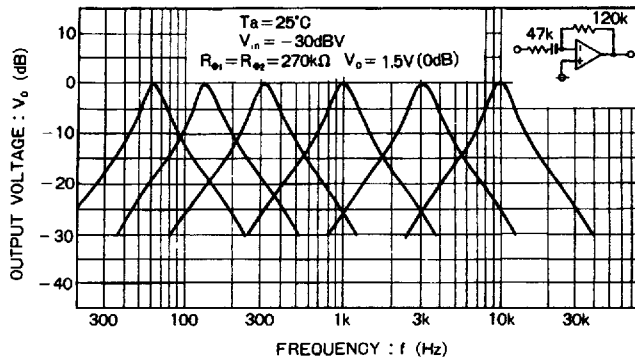


Figure 8

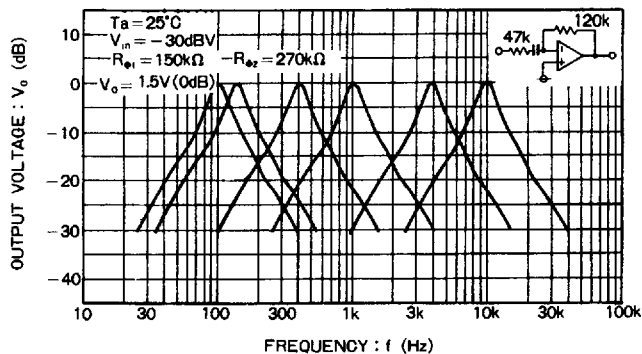


Figure 9

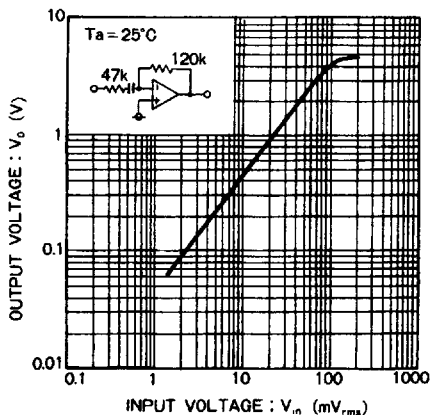


Figure 10

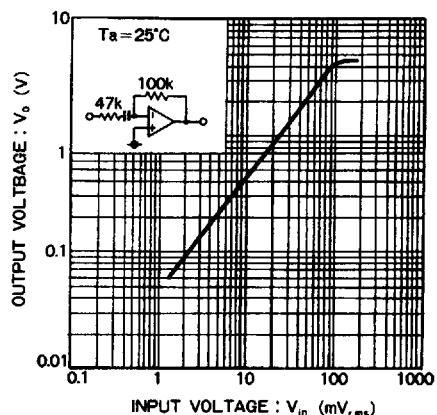


Figure 11