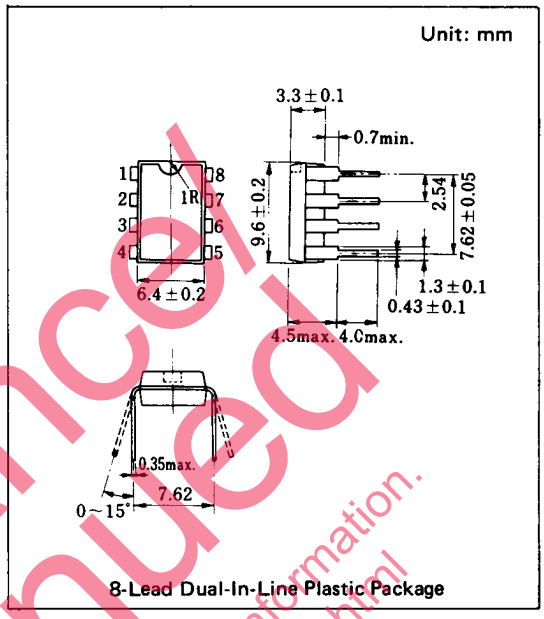
# MN3206

## 128-STAGE LOW VOLTAGE OPERATION LOW NOISE BBD

### ■ General description

The MN3206 is a 128-stage low voltage operation ($V_{DD}$ = 5V) BBD that provides a signal delay of up to 6.4ms and is suitable for use as reverberation effect of audio equipments operated by low voltage such as portable stereo and radio cassette recorder.




### ■ Features

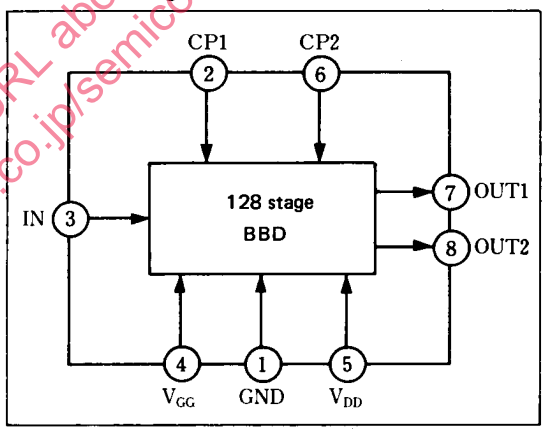
- Variable delay of audio signals: 0.32ms ~ 6.4ms.
- Wide power supply voltage: 4 ~ 10V.
- No insertion loss: $L_i$ = 0dB typ.
- Wide dynamic range: S/N = 83dB typ.
- Low distortion: THD = 0.3% typ. ($V_i$ = 0.25Vrms)
- Clock frequency range: 10KHz ~ 200KHz.
- N channel silicon gate process.
- 8-Lead Dual-In-Line Plastic Package.

### ■ Applications

- Reverberation and echo effects of audio equipments such as radio cassette recorder, car radio, portable radio, portable stereo, echo microphone and pre-taped musical accompaniment (Karaoke), etc.
- Sound effect in electronic musical instruments.
- Variable or fixed delay of analog signals.



### ■ Block Diagram




### ■ Quick Reference Data

| Item | Symbol | Value | Unit |
|---|---|---|---|
| Supply Voltage | $V_{DD}$, $V_{GG}$ | +5, $\frac{14}{15}V_{DD}$ | V |
| Signal Delay Time | $t_D$ | 0.32~6.4 | ms |
| Total Harmonic Distortion | THD | 0.3 | % |
| Signal to Noise Ratio | S/N | 83 | dB |

## ■ Absolute Maximum Ratings (Ta = 25°C)

| Item | Symbol | Ratings | Unit |
|---|---|---|---|
| Terminal Voltage | $V_{DD}$, $V_{GG}$, $V_{CP}$, $V_I$ | −0.3~+11 | V |
| Output Voltage | $V_O$ | −0.3~+11 | V |
| Operating Temperature | Topr | −20~+70 | ℃ |
| Storage Temperature | Tstg | −55~+125 | ℃ |

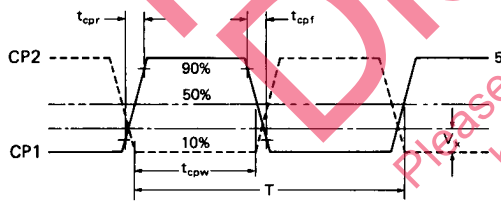
## ■ Operating Condition (Ta = 25°C)

| Item | Symbol | Conditon | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Drain Supply Voltage | $V_{DD}$ | | +4 | +5 | +10 | V |
| Gate Supply Voltage | $V_{GG}$ | | | $\frac{14}{15}V_{DD}$ | | V |
| Clock Voltage "H" Level | $V_{CPH}$ | | | $V_{DD}$ | | V |
| Clock Voltage "L" Level | $V_{CPL}$ | | 0 | | +1 | V |
| Clock Frequency | $f_{CP}$ | | 10 | | 200 | kHz |
| Clock Pulse Width *1 | $t_{CPW}$ | | | | 0.5T *2 | |
| Clock Rise Time *1 | $t_{CPr}$ | | | | 500 | ns |
| Clock Fall Time *1 | $t_{CPf}$ | | | | 500 | ns |
| Clock Input Capacitance | $C_{CP}$ | | | | 700 | pF |
| Clock Cross Point *1 | $V_X$ | | 0 | | 0.3$V_{CPH}$ | V |

## ■ Electrical Characteristics (Ta=25°C, $V_{DD}$=$V_{CPH}$=5V, $V_{CPL}$=0V, $V_{GG}$=$\frac{14}{15}V_{DD}$, $R_L$=100kΩ)

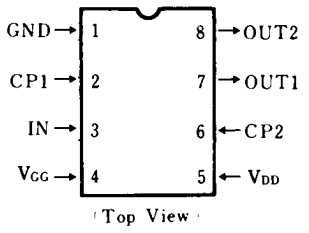
| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Signal Delay Time | $t_D$ | | 0.32 | | 6.4 | ms |
| Input Signal Frequency | $f_i$ | $f_{cp}$ = 40kHz, Output −3dB down | 12 | | | kHz |
| Input Signal Swing | $V_i$ | THD=2.5% | 0.6 | | | Vrms |
| Insertion Loss | $L_i$ | $f_{CP}$=40kHz, $f_i$=1kHz | −4 | 0 | 4 | dB |
| Total Harmonic Distortion | THD | $f_{CP}$=40kHz, $f_i$=1kHz, $V_i$=0.25Vrms | | 0.3 | 2.5 | % |
| Noise Voltage | $V_{no}$ | $f_{cp}$ = 100kHz, Weighted by "A" curve | | | 0.1 | mVrms |
| Signal to Noise Ratio | S/N | | | 83 | | dB |

*1 Clock Pulse Waveforms



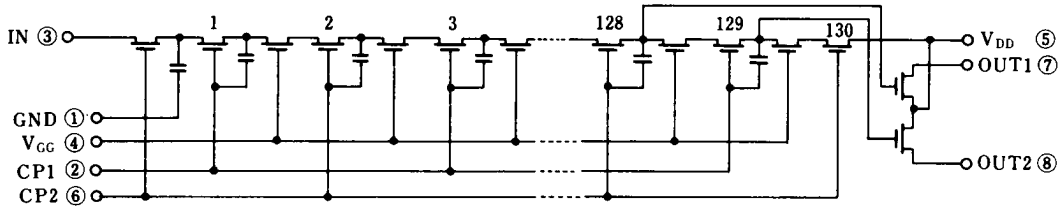

*2 T = 1/$f_{CP}$ (Clock Period)

## ■ Terminal Assignments



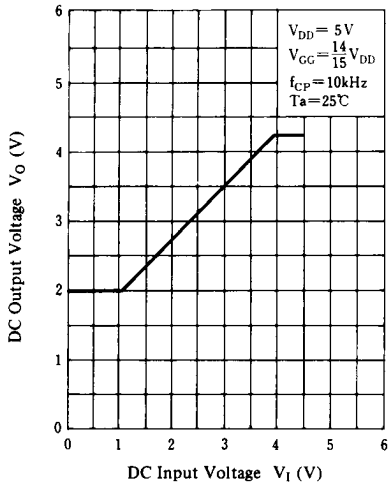

(Top View)

## ■ Circuit Diagram

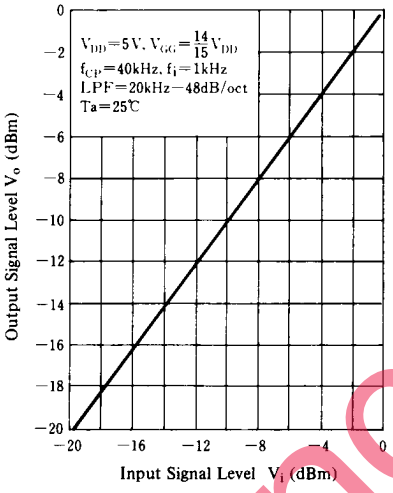


## ■ Typical Electrical Characteristic Curves

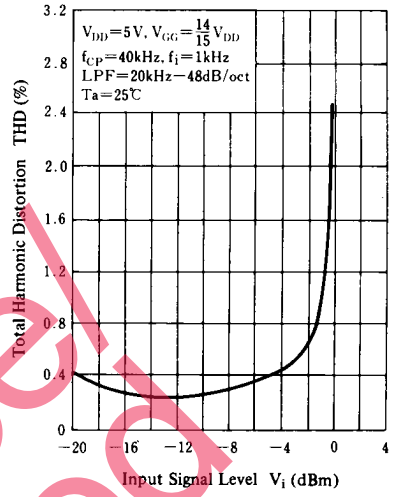
$V_O - V_I$



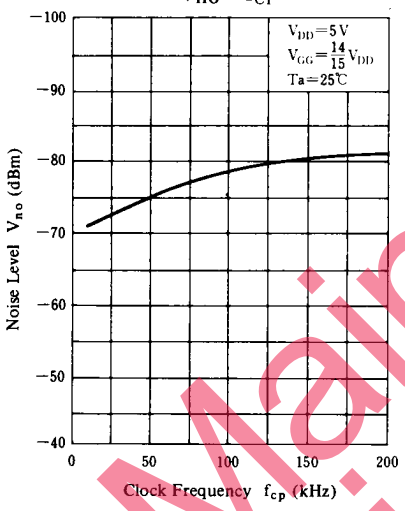

$V_o - V_i$



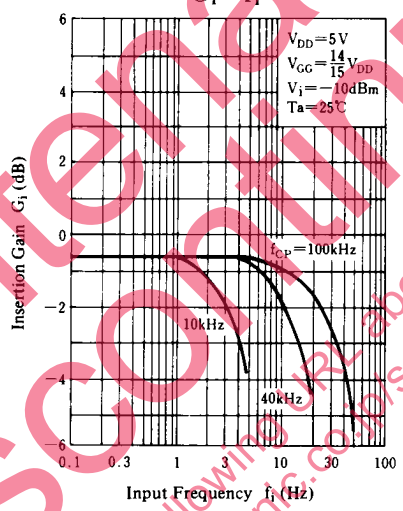

THD − $V_i$



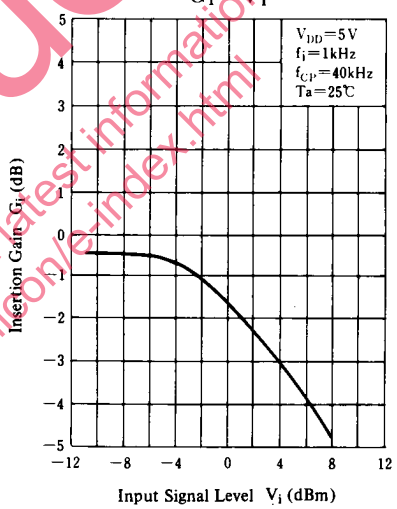

$V_{no} - f_{CP}$



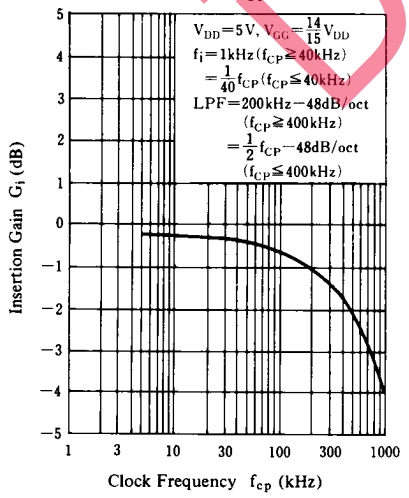

$G_i - f_i$



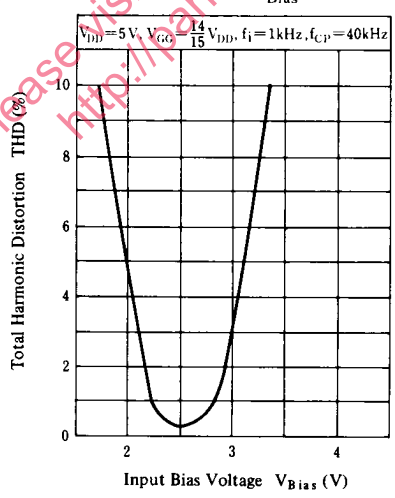

$G_i - V_i$



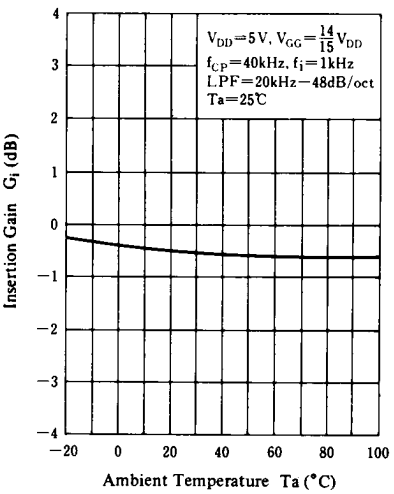

$G_i - f_{CP}$



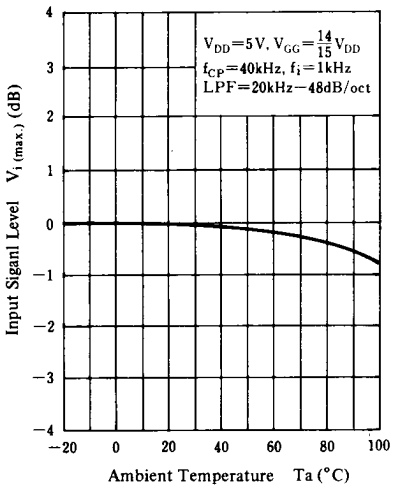

THD − $V_{Bias}$



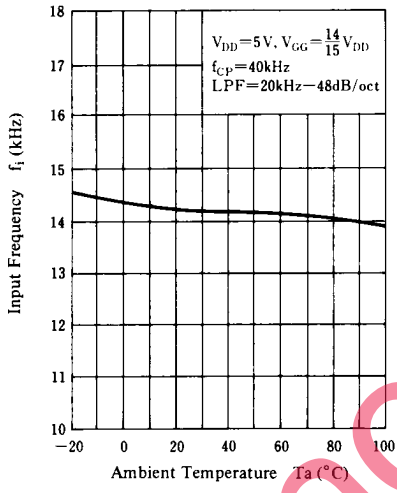

$G_i - Ta$



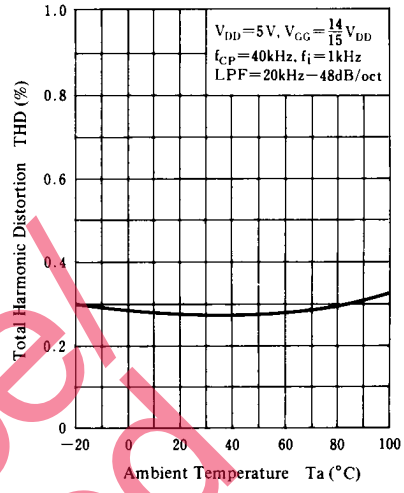
$V_{i(max.)}$ — Ta




$f_i$ — Ta



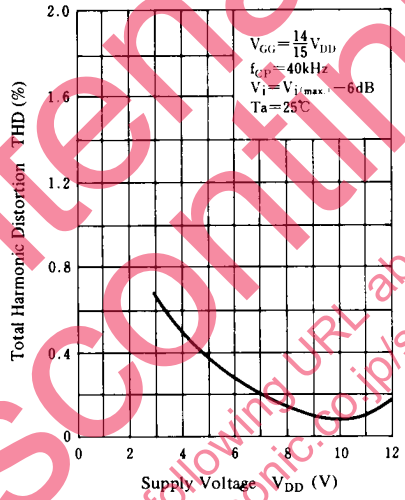

THD — Ta



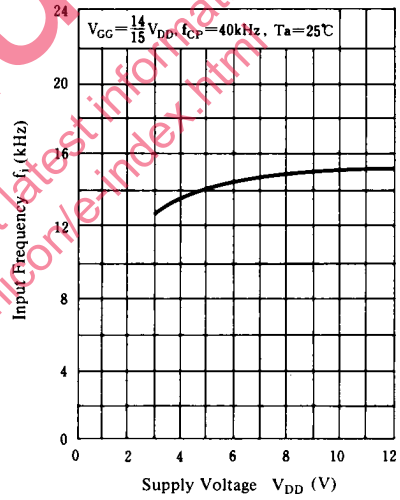

## ■ Supply Voltage Characteristics

$V_{Bias}$ — $V_{DD}$

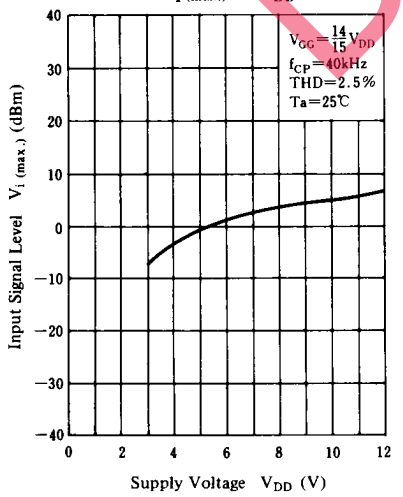

THD — $V_{DD}$



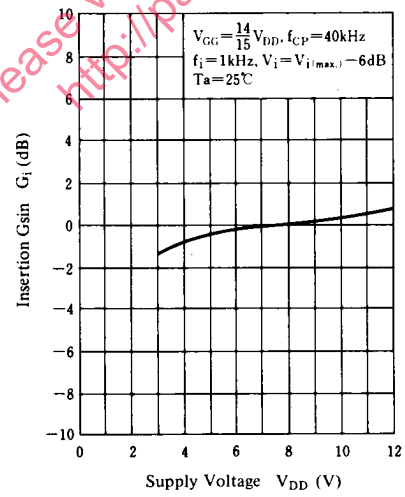

$f_i$ — $V_{DD}$



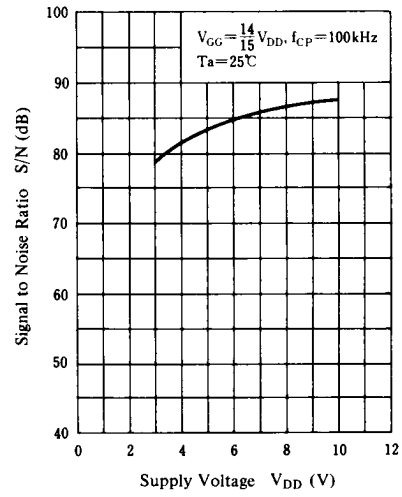

$V_{i(max.)}$ — $V_{DD}$



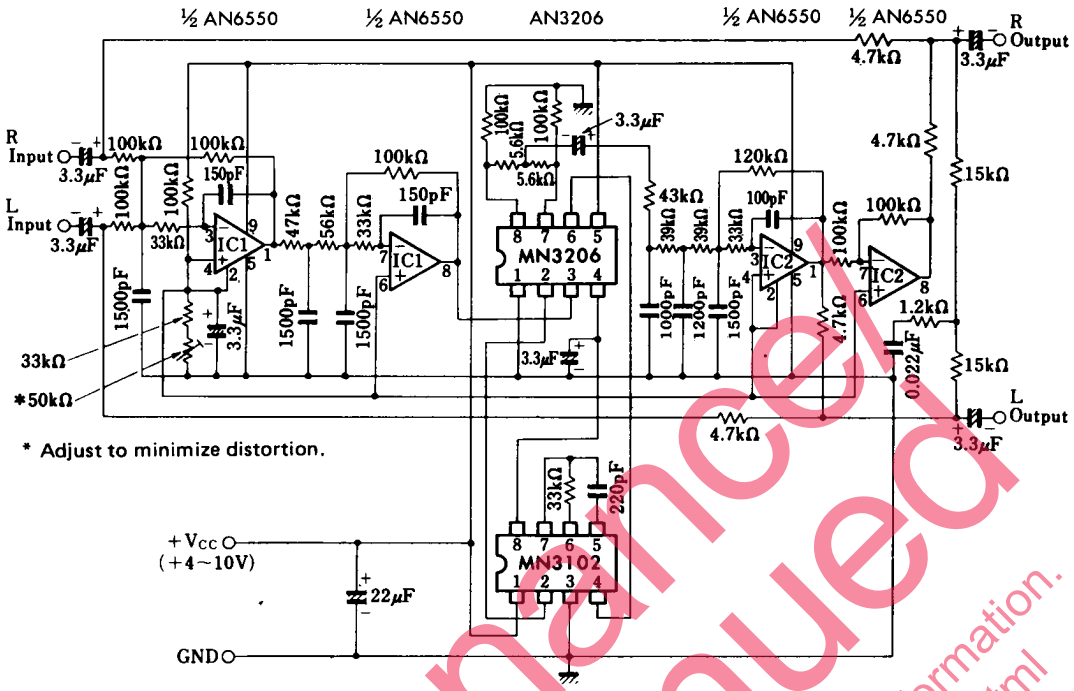

$G_i$ — $V_{DD}$




S/N — $V_{DD}$



## ■ Application Circuit




Vibrato and/or chorus effects Generation Circuit

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