

# MN3012

## BBD with 3 outputs (190-STAGE, 5-STAGE, 3-STAGE)

### General description

The MN3012 is a BBD comprised of 190, 5 and 3-stages in parallel with 3 outputs incorporating a clock generator suitably designed for sound effect generator such as chorus, fading, vibrato and reverberation effects of audio equipments.

Clock generating frequency can be freely controlled by the value of external resistors and capacitors connected to CG<sub>1</sub>, CG<sub>2</sub> and CG<sub>3</sub> terminals. Also delay time can be set by changing the clock frequency.

Output signal of different delay time can be obtained simultaneously from 3 output terminals (OUT1, OUT2, OUT3) against input signal.

### Features

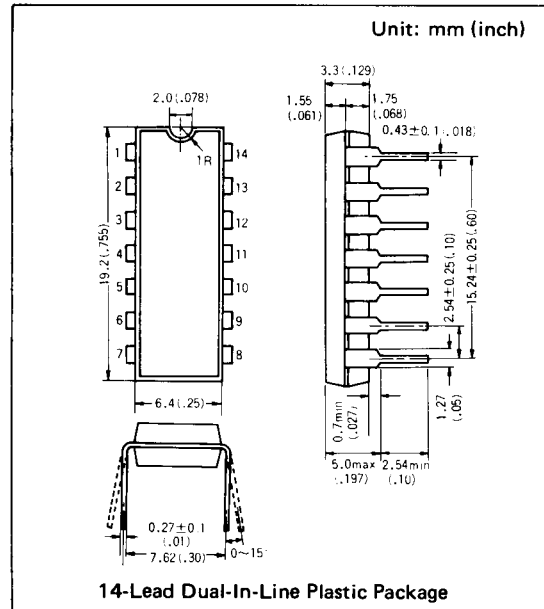
- Single power supply (V<sub>DD</sub> terminal): -8.5 ~ -16V.
- Dynamic range: S/N = 98dB typ.
- No insertion loss: L<sub>i</sub> = 0dB typ.
- Low distortion: THD = 0.4% typ.
- Built-in clock generator.
- Clock frequency range %: 10 ~ 200KHz.
- Built-in clock component cancellation circuit.
- P channel silicon gate process.
- 14-Lead Dual-In-Line Plastic Package.

### Applications

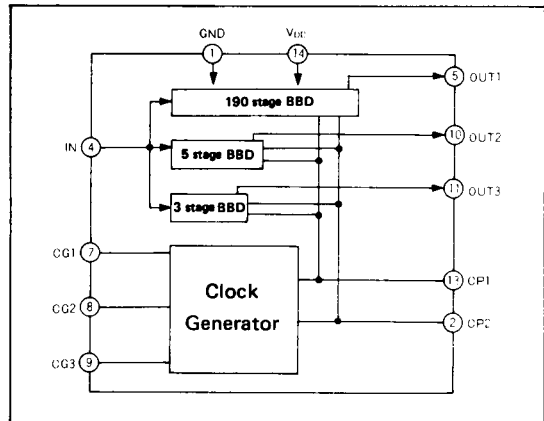
- Chorus, fading, vibrato and reverberation effects of audio equipments.
- Sound effect of electronic musical instruments.

### Maximum Delay Time by Tap Output

Terminal of the Tap Output	OUT 1	OUT 2	OUT 3
Stages of BBD (Stage)	190	5	3
Maximum Delay Time (mS)	0.475 ~9.5	0.0125 ~0.25	0.0075 ~0.15



### Block Diagram



■ Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Rating	Unit	Remarks
Terminal Voltage	V <sub>DD</sub>	-18~+0.3	V	GND = 0V
Input Terminal Voltage	V <sub>I</sub>	-18~+0.3	V	〃
Output Terminal Voltage	V <sub>O</sub> , V <sub>CP</sub>	-18~+0.3	V	〃
Operating Ambient Temperature	T <sub>opr</sub>	-20~+70	°C	
Storage Temperature	T <sub>stg</sub>	-55~+125	°C	

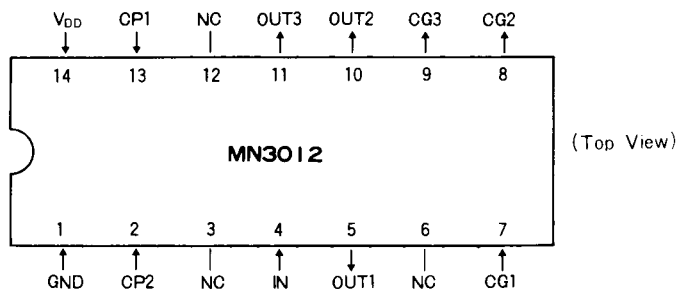
■ Operating Condition (Ta = 25°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain Supply Voltage	V <sub>DD</sub>		-8.5	-15	-16	V
Clock Voltage "H" Level	V <sub>CPH</sub>		0		-0.4	V
Clock Voltage "L" Level	V <sub>CPL</sub>			V <sub>DD</sub>		V
Clock Frequency	f <sub>CP</sub>		10		200	kHz
Clock Input Capacitance	C <sub>CP</sub>				180	pF
Input DC Bias	V <sub>Bias</sub>		-3		-12	V

■ Electrical Characteristics (Ta = 25°C, V<sub>DD</sub> = -15V, V<sub>CPL</sub> = -15V, V<sub>CPH</sub> = 0V, R<sub>L</sub> = 56kΩ, C = 100pF, R<sub>2</sub> = R<sub>3</sub> = 22kΩ, R<sub>4</sub> = R<sub>5</sub> = 2.2kΩ, f<sub>CP</sub> = 1/2f<sub>OSC</sub> (Adjusted by R1))

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Signal Delay Time						
OUT 1 Terminal	t <sub>D1</sub>	f <sub>CP</sub> =10kHz~200kHz	0.475		9.5	ms
OUT 2 Terminal	t <sub>D2</sub>		0.0125		0.25	ms
OUT 3 Terminal	t <sub>D3</sub>		0.0075		0.15	ms
Input Signal Frequency						
OUT 1 Terminal	f <sub>i1</sub>	f <sub>CP</sub> = 40kHz Output -3dB	12			kHz
OUT 2 Terminal	f <sub>i2</sub>		12			kHz
OUT 3 Terminal	f <sub>i3</sub>		12			kHz
Input Signal Voltage	V <sub>i</sub>	THD ≤ 2.5%	1.2			V <sub>rms</sub>
Insertion Loss	L <sub>i</sub>	f <sub>CP</sub> =40kHz, f <sub>i</sub> =1 kHz	-4	0	4	dB
Total Harmonic Distortion	THD	V <sub>i</sub> =0.775V <sub>rms</sub>		0.4	2.5	%
Noise Voltage						
OUT 1 Terminal	V <sub>NO1</sub>	f <sub>CP</sub> = 100kHz Weighted by "A" curve			0.14	mV <sub>rms</sub>
OUT 2 Terminal	V <sub>NO2</sub>				0.14	mV <sub>rms</sub>
OUT 3 Terminal	V <sub>NO3</sub>				0.14	mV <sub>rms</sub>
Signal to Noise Ratio						
OUT 1 Terminal	S/N <sub>1</sub>	f <sub>CP</sub> = 100kHz Weighted by "A" curve		90		dB
OUT 2 Terminal	S/N <sub>2</sub>			97		dB
OUT 3 Terminal	S/N <sub>3</sub>			98		dB

■ Terminal Assignments

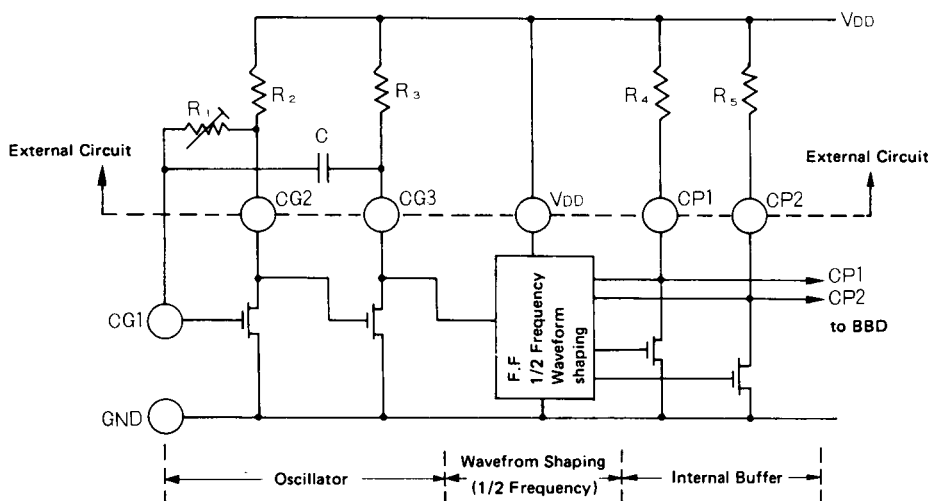


Terminal Description

Terminal No.	Symbol	Terminal name	Description
1	GND	Earth terminal	Connected to GND of the circuit.
2	CP2	Clock 2	Load resistor connection terminal of the driver that drives basic clock pulse to transfer electron of BBD.
4	IN	Signal input terminal	Analog signal to be delayed is input. Most suitable DC bias is applied to this terminal.
5	OUT 1	Output terminal 1	BBD output of 190 and 191 stages are composed and output is obtained by cancelling the clock components.
7	CG1	Clock osc. terminal 1	Input terminal for clock oscillator. Note) Refer to clock generating circuit.
8	CG2	Clock osc. terminal 2	
9	CG3	Clock osc. terminal 3	
10	OUT 2	Output terminal 2	Composed output of 5 and 6-stage BBD.
11	OUT 3	Output terminal 3	Composed output of 3 and 4-stage BBD.
13	CP1	Clock 1	Load resistor connection terminal of the driver to drive reverse clock pulse against CP 2.
14	V <sub>DD</sub>	V <sub>DD</sub> apply terminal	-15 volt is applied.

Note) No connection for the terminal No. 3, 6 and 12.

Clock Generator Circuit

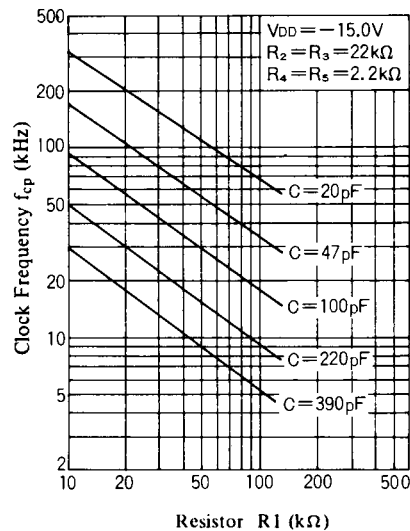


Note: when external clock is used, remove R<sub>1</sub> and C<sub>1</sub>, and apply clock input to CG1.

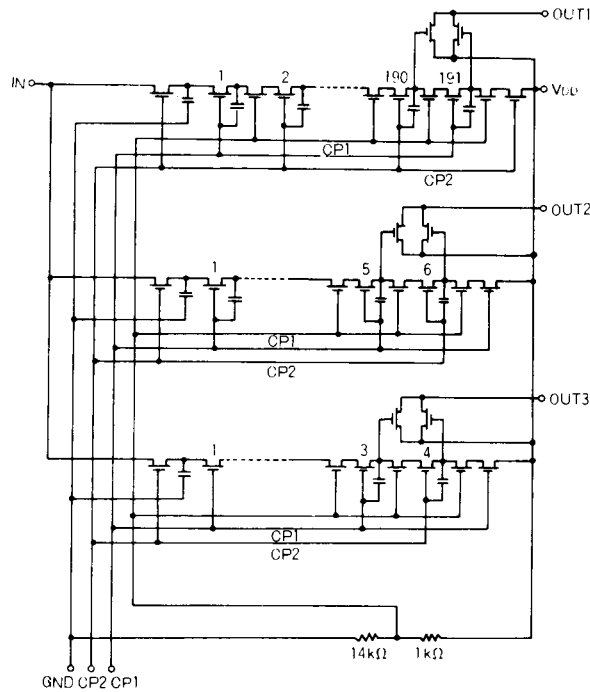
$R_2 = R_3 = 22\text{k}\Omega$   
 $R_4 = R_5 = 2.2\text{k}\Omega$

Adjusted by C, R1.  $f_{cp} = 1/2 f_{osc}$   
 Self-oscillation example should be referred to attached figure.

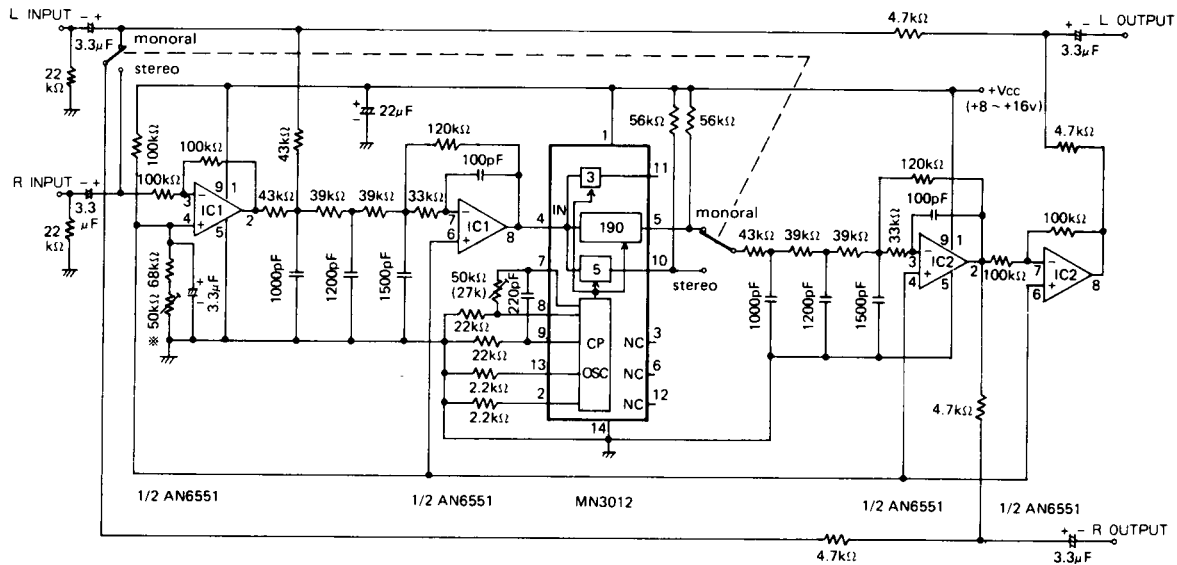
Attached Figure Example of Self-Oscillation



■ B B D Circuit Diagram



■ Example of application circuit



\* Adjust so as to reduce its distortion to the minimum.

Sound field magnifying effect generating circuit (Stereo input)

**Sound field magnifying effect generating circuit**

Isn't it really wonderful if the speaker reproduction of sound for a grand hall can be got in the listening room or the car? Application of the sound image control technology and the delay characteristic of the BBD makes it possible to realize the above effect easily.

In listening through a speaker in the room, the listener feels the distance and direction up to the speaker. As to the directional sense, for instance, there occurs some difference in the time for both direct and indirect sounds to reach his left and right ears depending on the position of the sound source, as well as the difference in the sound level, and from these differences the listener feels the "direction of sound". Further he feels the "distance of sound" from the energy ratio of the direct sound to the indirect sound (reverberation sound). The circuit for generating a sound field magnifying effect reproduces electronically the delicate time lag of these sounds, thereby makes it possible for the listener to feel as if he hears sounds from his surroundings other than the position of the speaker, and thus producing such effect that he is listening sounds in a large hall. Also the fatigue from listening for a long time through a conventional headphone is eliminated, and the effect similar to that of listening through an ordinary speaker is obtained.