

PRELIMINARY APRIL 1978

FEATURES

- On-board audio amplifier
- Generates noise, tone, low-frequency (or mixture) based sounds
- Allows "Custom" sounds to be created easily
- Low-power requirements
- Stand-alone or compatible with microprocessor systems

DESCRIPTION

The SN76487N Complex Sound Generator is a Linear/I²L device which provides noise, tone or low-frequency (or a combination thereof) based complex sounds. Programming is via external components, that are user-defined, which allows a wide variety of sounds to be created. The SN76487N is designed for ultimate flexibility in user-defined sounds, and may be applied in any application requiring audio feedback to the operator (i.e., arcade/home video games, pinball games, toys, etc.; consumer oriented equipment, such as timers, alarms, controls, etc.; industrial equipment for indicators, alarms, feedback controls, etc.)

BLOCK DIAGRAM

- ◁ Denotes Output
- Denotes Programming Via Capacitor
- ◻ Denotes Programming Via Resistor
- ▷ Denotes Programming Via Logic Level
- ◊ Denotes Programming Via Analog Voltage

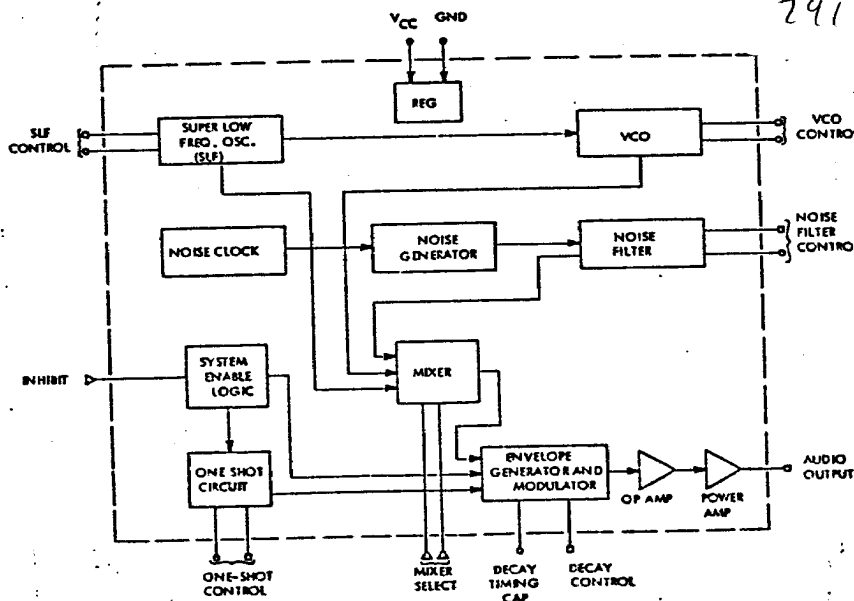
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ADVANCED CIRCUITS

COMPLEX SOUND GENERATOR WITH AUDIO AMP

OPERATION

1. SLF (SUPER LOW FREQUENCY OSCILLATOR)

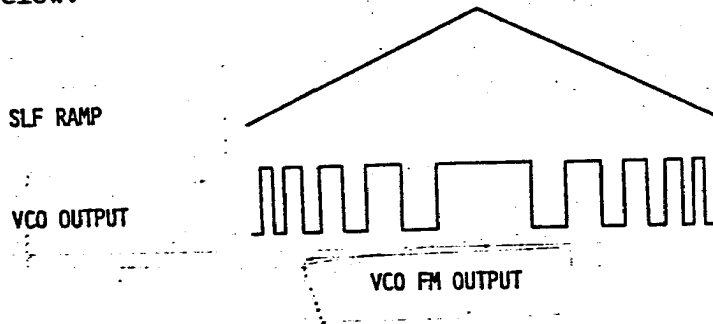
The SLF is normally operated in the range of 0.1 - 30 Hz, but will operate up to 20 KHz. The frequency is determined by the SLF control resistor and capacitor.

The SLF feeds a 50% duty cycle square wave to the "mixer"; it also feeds a triangular wave to the VCO.

2. VCO (VOLTAGE CONTROLLED OSCILLATOR)

The VCO circuitry produces a tone output whose frequency is dependent upon the voltage at the input of the VCO. The higher the control voltage which is applied to the SLF cap, the lower the frequency is.

A frequency modulated waveform results when the SLF ramp controls the VCO, as shown below:



An alternate method to apply an external voltage to the VCO input is to place the controlling voltage on the SLF control capacitor pin. The frequency "range" of the VCO is internally determined at an approximate ratio of 10:1. The minimum frequency of the VCO may be determined by adjusting the RC time constant of the "VCO Control" resistor and the "VCO Control" capacitor.

3. NOISE CLOCK

The "Noise Clock" clocks the "Noise Generator". The noise generator is a binary psuedo random white noise generator whose output passes through the noise filter before being inputed to the mixer. The filter is a variable band width low-pass filter.

4. The "mixer" logic selects one, or a combination, of the inputs from the generators and feeds the output to the "envelope generator and modulator".

MIXER SELECT		MIXER OUTPUT
B	A	
0	0	VCO
0	1	SLF
1	0	NOISE
1	1	SLF/NOISE

MIXER SELECT LOGIC

OPERATIONS (CONT'D)

5. SYSTEM ENABLE LOGIC

The "System Enable" logic provides an enable/inhibit for the system output. The sound output is controlled according to the following table:

<u>SYSTEM ENABLE</u>	<u>OUTPUT</u>
0	Enabled
1	Inhibited

SYSTEM ENABLE LOGIC

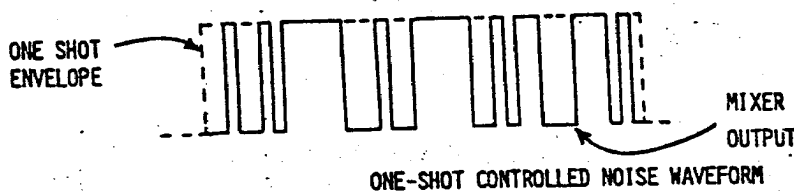
This input also triggers the "one-shot" logic for momentary sounds, such as gun shots, bells, explosions. The "one-shot" logic is triggered by the negative-going edge. System enable pin must be held low for the entire duration of the one-shot sound (including decay period).

6. "ONE-SHOT" LOGIC

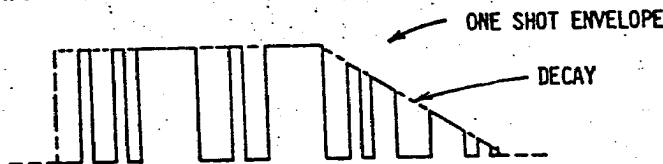
The duration of the "one-shot" is defined by a programming resistor and capacitor. If it is desired to have continuous sound, the "one-shot" components do not have to be added.

7. DECAY CONTROL

The decay circuitry alters the fall of the envelope. An example of a noise waveform utilizing the envelope generator under "one-shot" control is:



By utilizing the decay control inputs, the waveform may be affected in the following manner:



The amount of decay is determined by the "Decay Control" resistor (R_d) and the "Decay Timing Capacitor".

8. OUTPUT AMPLIFIER

The output amplifier is designed to interface with an 8 ohm speaker AC coupled with approximately 100 mW output capability.

OPERATION (CONT'D)

9. NOTE:

Control resistors and capacitors may be eliminated if the desired sound does not require that generator or logic section. For dedicated sound, the logic inputs may be hard wired for high or low logic levels. Individual sounds (single or multiple) will determine which of the other components are required. Internal 6K ohm limit resistors are in each via programming resistor line.

N package

This dual-in-line package consists of a circuit mounted on a 16-lead frame and encapsulated within an electrically nonconductive plastic compound. The compound will withstand soldering temperature with no deformation and circuit performance characteristics remain stable when operated in high-humidity conditions. The package is intended for insertion in mounting-hole rows on 0.300-inch centers. Once the leads are compressed and inserted, sufficient tension is provided to secure the package in the board during soldering. Leads require no additional cleaning or processing when used in soldered assembly.

