

Tempo~Wave LFO Sequencer Chip MV-53

DATASHEET

Tempo~Wave LFO Sequencer Chip MV-53 by **Molten Voltage** is a Programmable Low Frequency Oscillator [LFO]. Highly accurate and packed with features, MV-53 has been designed and engineered to control analog audio effects, synthesizers, and other circuitry requiring precision low frequency oscillation.





FEATURES:

Analog waveform generation at a **1.23 MHz sample rate**, output by an on-board Digital Analog Converter [DAC]

Four different waveforms: Square, Sawtooth Up, Sawtooth Down, Sine

Four different playback rates: 1:1 [real time], 1:2 [double time], 1:3 [triplets], 1:4 [quadruple time]

Wide playback speed range of .033 seconds [1818 bpm] to 13 seconds [4.6 bpm]

Waveforms, rates, and speeds can be switched seamlessly "on the fly"

Programmable with sequences of waveform and rate combinations of up to 16 steps, stored in nine (9) non-volatile memory locations

Simple to program

Switchable between two different speed controls:

- Tap Tempo ~ accurate to better than 1/1,000th of a second
- Potentiometer-based

Dual simultaneous waveform output (one is inverted)

Duty Cycle Control with 11 different musical ratios that can "swing": 1/8, 1/6, 1/4, 1/3, 3/8, 1/2, 5/8, 2/3, 3/4, 5/6, 7/8

Real-time LED interface

Easy to defeat unwanted features

SPECIFICATIONS

Supply Voltage ~ 3.3 Volts DC Maximum Output Current ~ 4mA [each pin]

Minimum Tempo ~ 461 bpm in Real Time (.13 seconds) ~ 1,818 bpm at 1:4 (.033 seconds) Maximum Tempo ~ 4.6 bpm in Real Time (13 seconds)

RoHS Complaint

MV-53 ~ TYPICAL CONNECTION



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MV-53 ~ Operation

SPEED CONTROL:

MV-53 offers two different methods of controlling LFO playback speed: Tap-tempo and via Potentiometer. The two modes are switched by toggling Pin 12.

The tempo can be set between .13 and 13 seconds in real-time, and scaled down to .033 seconds in 1:4 mode.

In Tap mode, users change the output tempo by pressing a normally open switch twice. The time between presses determines the real-time output tempo. The first tap can be held down up to 3.5 seconds. If it is held down more than 3.5 seconds and a Program is selected, MV-53 enters Program mode, discussed below. If MV-53 is in Free-Running mode, the waveform resets upon release, allowing users to release on the beat so they are in time with the music.

In Tap mode, the second tap can be held down any length of time. When the second tap is released, the waveform also resets and playback begins. Because playback always starts when the second tap is released, users can keep tapping as much as they like, as long as it is an even number of taps, until the desired tempo is obtained.

RATE AND WAVEFORM SELECTION:

When in the Free-Running "Potentiometer" speed mode, users sequentially cycle through the sixteen (16) rate and waveform combinations by pressing the Tap Button. When in the Free-Running "Tap" speed mode, users select the combinations by rotating the Rate/Wave potentiometer. In each case, the LEDs indicate the current rate and waveform combination.

Rates and waveforms can be switched seamlessly "on the fly".

PROGRAMMING:

If the Tap button is held for 3.5 seconds and a Program is selected, Sequence Program mode is entered (indicated by the outside LEDs flashing). After entering Sequence Program mode, users program MV-53 by rotating the Rate/Wave potentiometer until the desired rate and waveform combination is selected. By toggling Pin 12, the selected combination is written to the next step of the sequence. An LED flashes, indicating which step of the sequence was programmed. The 1:1 rate LED represents the first step and the Sine LED represents step 8. For steps 9-15, the Sine LED stays lit, indicating the second half of the sequence, with the 1:1 rate LED indicating step 9, the 1:2 rate LED indicating step 10, etc.

When the program is complete, the user presses the Tap button again to exit Program mode and resume playing. If sixteen steps are programmed, MV-53 automatically exits Program mode. Users can store sequences in one of nine (9) different program memory locations. At the time the user exits Sequence Program mode, the selected Program is overwritten with the new sequence.

If Sequence Program mode is entered but no steps are programmed, after about 13 seconds MV-53 resumes playback without overwriting anything.

MV-53 will not enter Sequence Program mode when Free-Running mode is selected. As a result, the Program mode capability can be defeated by leaving the program select pins unconnected.

SEQUENCE PLAYBACK:

Programs can be seamlessly switched "on the fly" by grounding the desired program select pin.

When in a Sequence Playback mode while under Pot control, pressing the Tap button will reset the sequence to the beginning upon release. When in Sequence Playback mode while under Tap control, the Rate/Wave potentiometer has no effect.

MV-53 ~ Operation

DUTY CYCLE:

Connect a linear 50K potentiometer to Pin 3 as a Duty Cycle control to adjust the relative playback speed of the first and second half of the waveform to make the output swing!

The eleven (11) Duty Cycle ratios correspond to the most common musical subdivisions. The relative length of the first half is indicated by the numerator, the overall length by the denominator: 1/8, 1/6, 1/4, 1/3, 3/8, 1/2, 5/8, 2/3, 3/4, 5/6, 7/8

The 1/2 ratio is accessible within the middle 20% of the potentiometer range, while the other ten ratios occupy 8% each.

To defeat the Duty Cycle control, attach two 100K resistors to Pin 3, the opposite end of one resistor to +3.3 volts, the opposite end of the other to Ground.

CONNECTION:

MV-53 features two (2) simultaneous outputs from Pins 23 and 24. The Pin 24 output is inverted.

The two outputs can be connected to two separate circuits, and can sink or source 4mA each.

The schematic on Page 2 illustrates a typical setup using a rail-to-rail operational amplifier to convert MV-53's output into a waveform that cycles between zero and 9 volts. **NOTE the two different chip power voltages on the schematic.**

If a different output range is required, the "CEILING" potentiometer sets the upper limit for the output voltage, while the "FLOOR" potentiometer sets the lower limit for the output voltage.

The Output LED offers a visual indication of the current waveform and playback speed.

MV-53 uses six (6) output pins to control eight (8) LEDs. As seen on the schematic, the Rate LEDs are connected to Pins 15, 16, and 17, while the Waveform LEDs are connected to Pins 18, 21, and 22. Connecting the LEDs without the current limiting resistors (R2-R7) will cause MV-53 to overheat and should never be done.

Be certain to connect capacitor C1 as close to Pin 13 as possible; C2 as close to Pins 28 and 27 as possible; and C3 as close to Pins 19 and 20 as possible.

CONTACT:

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For more information, and to view the **demonstration video**, visit **www.MoltenVoltage.com/mv-53.html**

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