Electric Druid MIDI to Clock MIDICLK I

Introduction

The Electric Druid MIDI to Clock chip is designed to easily allow analog electronics to be synchronized with MIDI Clock and MIDI Realtime signals.

It is intended for analog drum machines and sequencers and similar projects, allowing them to be MIDI-fied simply.

Features

Two independent clock outputs

The chip is very simple to use and provides two independent 0-5V clock outputs at selectable sub-multiples of the 24ppqn (pulses per quarter note) rate of MIDI Clock.

Each clock can be set (using the CLOCK DIV CV inputs) for rates between 1 clock pulse per 4 bars to 12 clock pulses per quarter note.

Start, Stop, Continue and Running signals

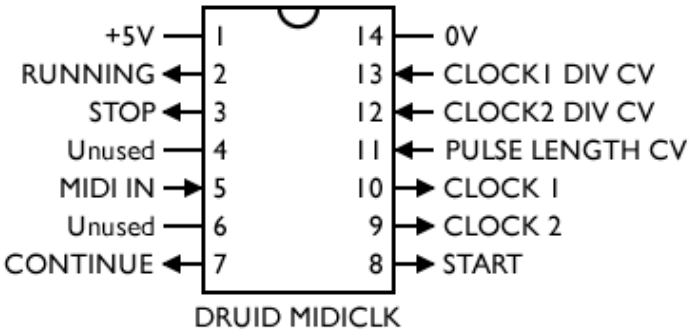
The chip provides 0-5V pulse outputs for the MIDI Start, MIDI Stop, and MIDI Continue messages. The length of the output pulse is variable between 256us and 65.5ms using the PULSE LENGTH CV.

In addition, there is a RUNNING output which is high when the MIDI clock is running (after a Start or Continue message) and low after a Stop message is received.

Understands MIDI SysReset

MIDI System Reset messages will reset all clock counters and clear all chip outputs.

Pinout Diagram



Pin	Function	Details	Notes
1	+5V	Power supply	
2	RUNNING	0-5V digital output	High when the MIDI sequencer is running, and low when it is stopped or paused.
3	STOP	0-5V digital input	Outputs a pulse when a MIDI Stop message is received
4	Unused	0-5V digital IO	
5	MIDI IN	0-5V digital input	Receives MIDI input from optocoupler
6	Unused	0-5V digital IO	
7	CONTINUE	0-5V digital output	Outputs a pulse when a MIDI Continue message is received.
8	START	0-5V digital output	Outputs a pulse when a MIDI Start message is received.
9	CLOCK 2	0-5V digital output	
10	CLOCK 1	0-5V digital output	
11	PULSE LENGTH CV	0-5V analog input	Sets the length of the pulses output by the STOP, CONTINUE, and START outputs (pins 3, 7, and 8). Pulse length is variable between 256us and 65.5ms.
12	CLOCK 2 DIV CV	0-5V analog input	Sets the division ratio for the CLOCK 2 output
13	CLOCK 1 DIV CV	0-5V analog input	Sets the division ratio for the CLOCK 1 output
14	0V	Power supply	

Application Notes

Clock Div CV inputs

The CLOCK DIV CV inputs allow the clock rates on the two clock outputs to be individually configured at useful sub-multiples of the MIDI 24ppqn rate.

The incoming CV is reduced to a 4-bit value from 0 to 15. This value is then used to set the division ratio for the clock output. Note that there are only 14 settings, and settings 14 and 15 simply repeat the previous division value.

CV	Division	Notes
0	192	1 clock per four bars
1	144	1 clock per 3 bars
2	96	1 clock per two bars
3	48	1 clock per bar, whole notes
4	32	1.5 clocks per bar, whole note triplets
5	24	2 clocks per bar, 1/2 notes
6	16	3 clocks per bar, 1/2 note triplets
7	12	1 clock per quarter note, straight 1/4 notes
8	8	1.5 clocks per quarter note, 1/4 note triplets
9	6	2 clocks per quarter note, 1/8th notes
10	4	3 clocks per quarter note, 1/8th note triplets
11	3	4 clocks per quarter note, 1/16th notes
12	2	6 clocks per quarter note, 1/16th note triplets
13	1	12 clocks per quarter note
14	1	As above
15	1	As above

MIDI Messages

The chip responds to the following MIDI messages.

Message	Byte	Effect
MIDI Clock	0xF8	CLOCK1 and CLOCK2 counters are updated. If required, the output state on CLOCK1 or CLOCK2 is altered.
Start	0xFA	START output goes high briefly, RUNNING output goes high.
Continue	0xFB	CONTINUE output goes high briefly, RUNNING output goes high.
Stop	0xFC	STOP output goes high briefly, RUNNING output goes low.
System Reset	0xFF	Both CLOCK outputs go low. START, STOP, CONTINUE, and RUNNING outputs all go low. All clock counters are reset.

The only other MIDI Realtime message which is defined by the specification is the little-used 0xFE Active Sense message. This is ignored by the MIDICLK chip.

The chip ignores all other MIDI messages, including Sysex.

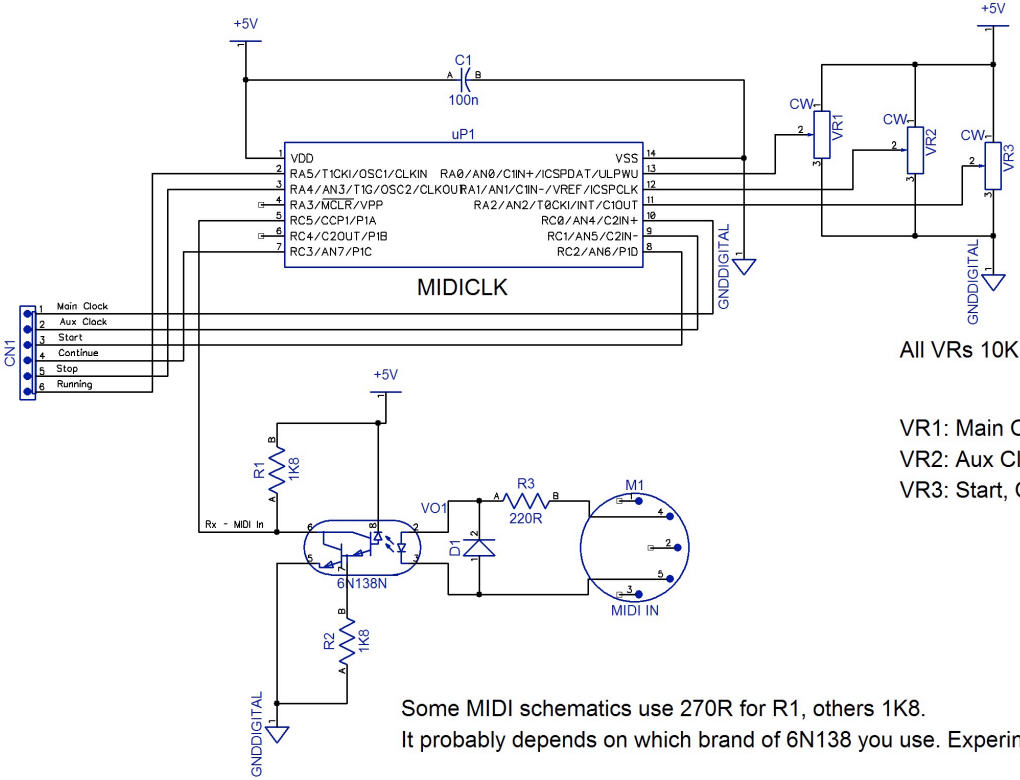
Basic circuit diagram

The schematic on the following page shows potentiometers used to allow the two clock rates and the pulse length to be variable. For specific applications, these could be fixed voltages or presets.

MIDI Realtime messages to +5V gate pulses

This circuit provides pulse outputs for the MIDI Start, Continue, and Stop messages.
It also provides two independent Clock outputs at sub-multiples of the MIDI 24PPQN rate,

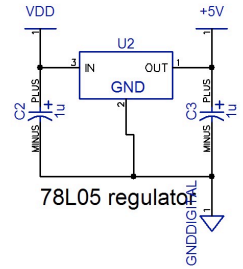
RC4 is USART Tx and can't be used for IO
RA3 is input-only



Some MIDI schematics use 270R for R1, others 1K8.
It probably depends on which brand of 6N138 you use. Experiment!

Optional +5V Supply

Power input +5V to circuit



78L05 regulator

All VRs 10K Lin, although 47K or 100K probably work.

VR1: Main Clock division ratio
VR2: Aux Clock division ratio
VR3: Start, Continue, and Stop pulse length

Title	MIDI realtime to +5V gate pulses		
Size A4	Model MIDI Clock		Rev 1
Date	1 Mar 2012	Drawn by	TMW
Filename	Midi Clock.dch	Sheet	1 of 1