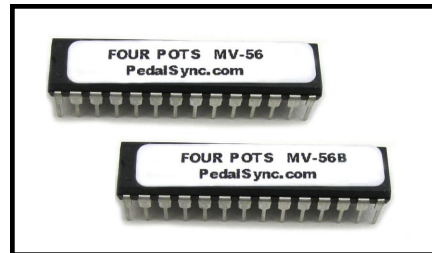
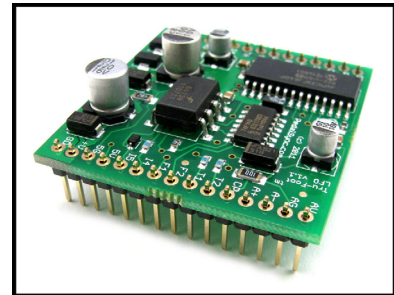


PedalSync™

Four Pots



Chips MV-56 and MV-56B and



Module v1.0

Key Features

- Stores and recalls up to four (4) potentiometer settings
- Stores and recalls Bypass status plus two additional user-defined momentary switch inputs and pin outputs that can control other device features like alternate signal paths.
- Standard 5 volt and Extended 18 volt versions available
- Robust, 128 program storage
- Simple, intuitive user pot-controlled interface
- Backwards-Compatible with MIDI
- Scalable - combine chips like building blocks to make elaborate designs
- Efficiently Designed to ensure Low part count
- Easy to create stand-alone pedals that can be used traditionally and tested in-store
- Use PedalSync™ trademark on your devices and in advertising
- Thru-Hole or SMT
- CadSoft Eagle footprint available for module

Overview

The PedalSync Four Pots chip MV-56 and MV-56B store and recalls four potentiometers settings for 128 different programs.

The chips receive input from traditional analog potentiometers (5K), then send *real-time* or programmed resistance data to Microchip MCP4151 digital potentiometers [**MV-56**] or to PedalSync Hi-V DigiPot modules [**MV-56B**] for higher current and voltage applications (up to 5 mA and 18VDC).

As a result, the user interface is instantly recognizable and intuitive, yet highly sophisticated.

User Interface

Program Storage

Four Pots chip programs are stored by toggling the Write Switch (*pin 16*) or upon a command from the PedalSync Master Control chip.

Program Recall

Programs are recalled using the PedalSync Master Control chip (MV-58), standard MIDI Program Change messages on Channel 15, or the PedalSync 4 Presets chip (MV-59).

On power up, the chip always loads program 1.

Write switch *(pin 16)*

Using a toggle switch, the user will switch down then up again to write the current settings to the currently selected program. If the switch is in the down position, the user will need to go up, down, then up again. When a program is written, the Status LED will briefly flash.

While it is possible to use a momentary pushbutton for the Write switch, a toggle switch is recommended so it is much more difficult for users to accidentally program a setting.

Status LED *(pin 17)*

The Status LED is normally on.

When a program is written, the Status LED will blink.

In addition, whenever the potentiometers are not stable (*i.e.* when they are moving or have recently moved), the Status LED will turn off until they become stable again. Each pot will stabilize after approximately three (3) seconds of no motion.

User Buttons A & B *(pins 23 and 25)*

User Buttons A & B are momentary switch inputs that toggle the User Button A & B outputs (*pins 24 and 26*).

The status of the User Buttons are stored as part of each program. These outputs can control other device features such as alternate signal paths.

The program default for the User Button A & B outputs is logic low.

Bypass button (pin 7)

Pressing the Bypass button toggles pin 18.

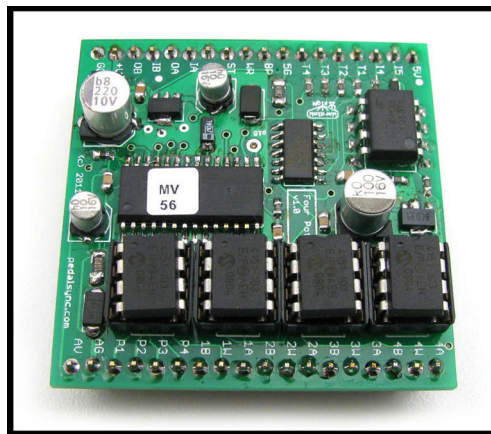
The program default for the Bypass Button is OFF. If using the Relay Bypass chip (MV-57), this corresponds to having the device bypassed.

Bypass output (pin 18)

Pin 18 can be used to control the PedalSync Relay Bypass chip (MV-57). If the Relay Bypass system is not used, the Bypass button and Bypass output can be serve as a third User Button.

DigiPots for MV-56

MV-56 sends real-time or programmed resistance data to Microchip MCP4151 digital potentiometers



Microchip MCP4151 digital potentiometers come in four values:

- 5K [P/N MCP4151-502]
- 10K [P/N MCP4151-103]
- 50K [P/N MCP4151-503]
- 100K [P/N MCP4151-104].

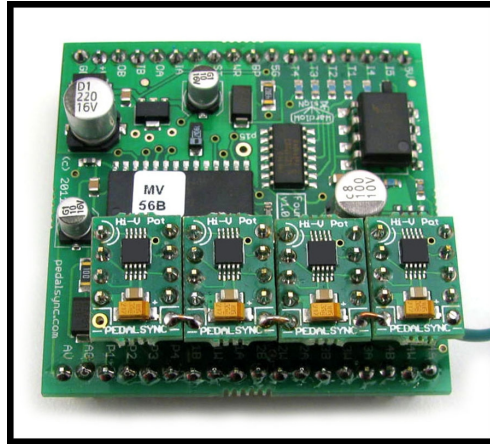
Refer to the manufacturer's documentation for further details:

<http://www.microchip.com/wwwproducts/Devices.aspx?dDocName=en531886>

Each MCP4151 digipot lug can handle up to 2.5mA. The voltage on any digipot lug must not exceed 5 volts.

DigiPots for MV-56B

MV-56B sends real-time or programmed resistance data to PedalSync Hi-V DigiPot Modules.



Each Hi-V digipot lug can handle up to 5mA and up to 18VDC. The voltage applied to any Hi-V digipot pin must not exceed the Hi-V digipot module input voltage.

The Hi-V digipot modules were design so the input voltage pins can be easily interconnected with a short bare wire (0.2") from one module to the next when used on the Four Pots module

The modules fit in a standard 8-pin DIP socket or can be soldered in place for a lower profile.

Currently only 100K digipots are available but 10K and 50K are coming soon.

Refer to the *PedalSync Hi-V DigiPot Module Datasheet* for more information.

Pot Interfacing

The digipots can be used in place of standard mechanical as long as the voltage and current limits are followed.

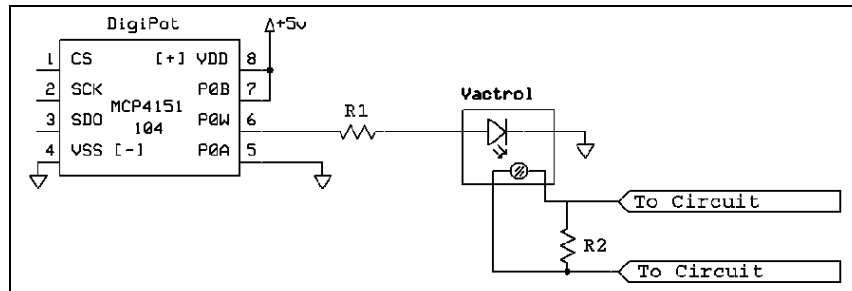
If a current or voltage in excess of the digipot limit needs to be controlled, additional circuitry will be required.

An op amp interface can output a programmed voltage. The following Microchip application note gives a number of examples for creating programmable amplifiers using digital potentiometers:

Optimizing the Digital Potentiometer in Precision Circuits - AN691
<http://ww1.microchip.com/downloads/en/AppNotes/00691a.pdf>

Using Digital Potentiometers for Programmable Amplifier Gain - AN1316
<http://ww1.microchip.com/downloads/en/AppNotes/01316A.pdf>

Another method of dealing with higher currents and voltages is to employ a vactrol as shown in the following schematic:



R1 will vary depending on the make and model of vactrol. Parallel resistor R2 can be used to limit the maximum resistance.

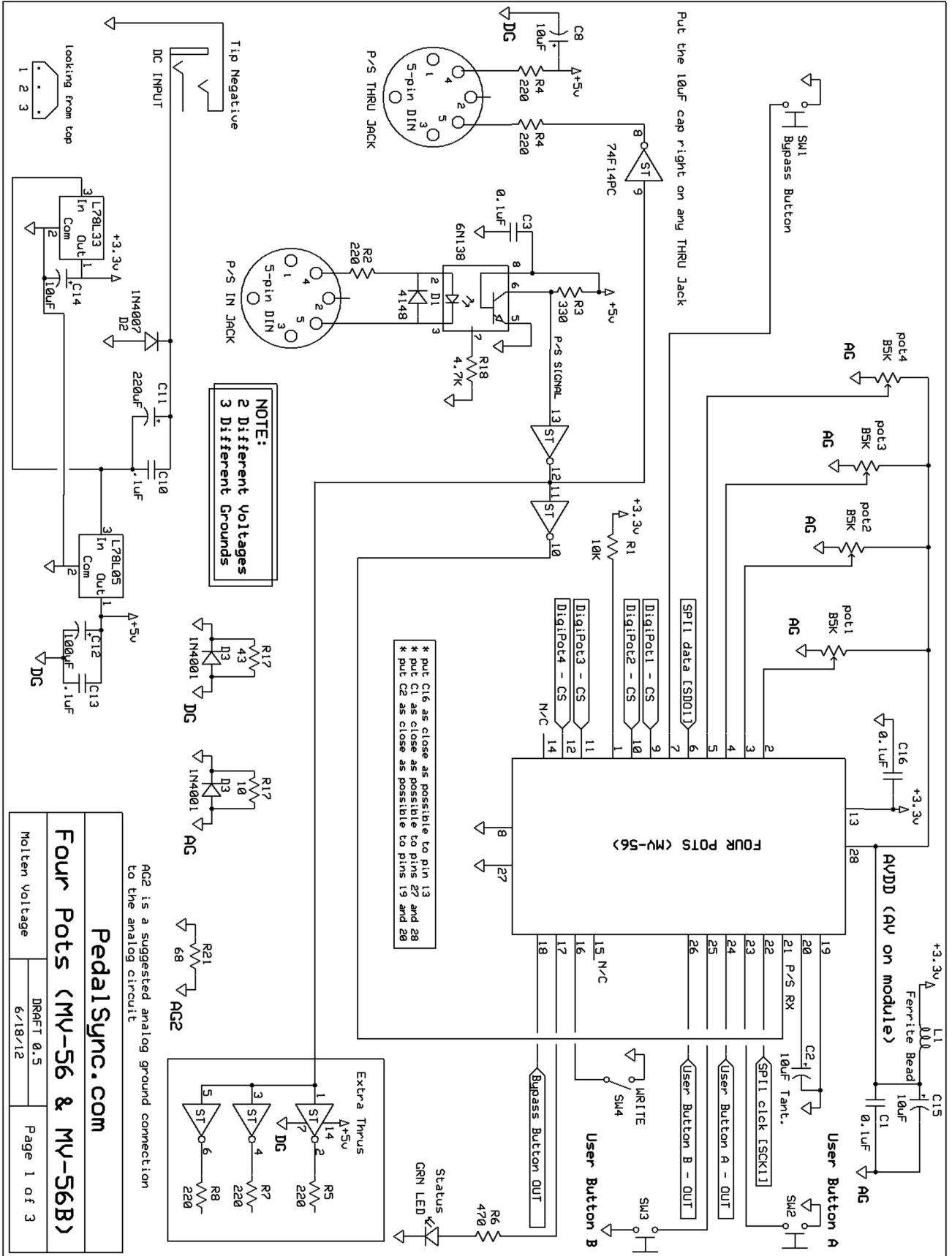
Because of the 256 step limit on the digital pots, “zippering” may be audible when subjecting the digipots to *real-time* control in sensitive applications.

Digipots also have a nominal amount of resistance in the wiper. As such, the extremes of resistance are generally about 4% lower than the total resistance.

Connect the (B5K) mechanical pots to the MV-56(B) chip pins as shown in the schematic. Be sure to connect the outside lugs to AVDD (**which is 3.3 volts**) and AG, rather than any other power or ground rail. Voltages in excess of 3.3 volts at the pot inputs can permanently damage the chip.

** As the voltage input from the mechanical pot increases, the digipot lug A-W resistance *decreases* and the digipot lug W-B resistance *increases* proportionally.

If your design calls for a different taper, A5K or C5K mechanical pots can be used.



AG2 is a suggested analog ground connection to the analog circuit

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Four Pots (MV-56 & MV-56B)

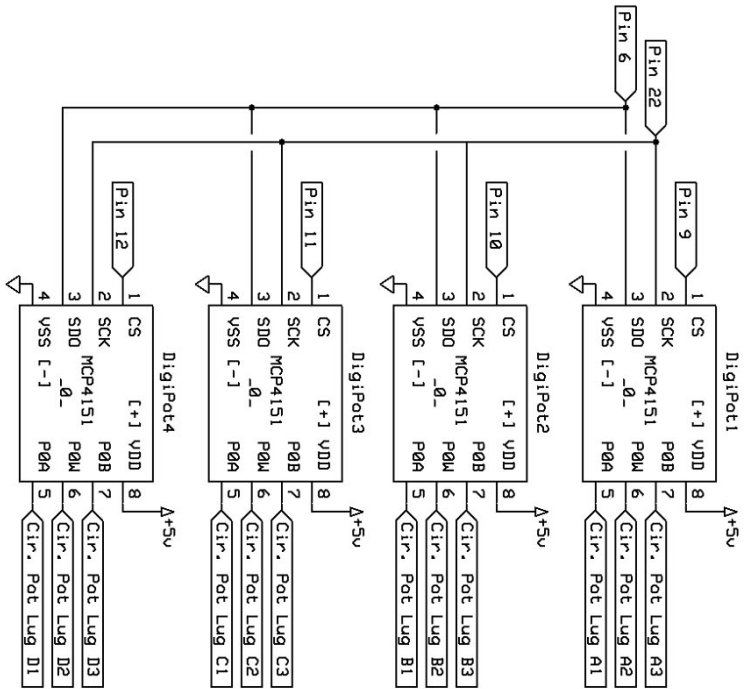
Molten Voltage

DRAFT 0.5

6/18/12

Page 1 of 3

VDD +0.3v max per pot lug
 2.5 mA max current through any pot lug



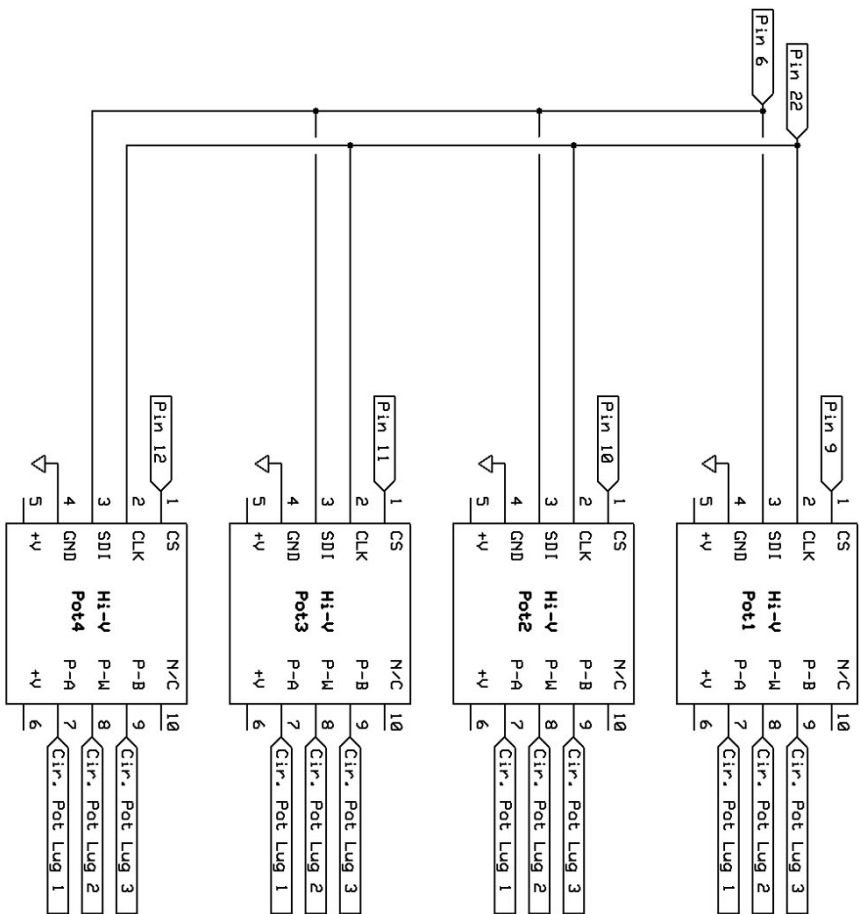
Available values for MCP4151 are
 5K (<502>), 10K (<103>), 50K (<503>), 100K (<104>)

MCP4151 DIGIPOTS
 - used with MV-56 only -

PedalSync.com	
Four Pots (MV-56)	
Molten Voltage	DRAFT 0.6 6/18/12
Page 2 of 3	

PedalSync Hi-V Pot Modules

- used with MV-56B only -



Pins 5 and 6 are connected
 off-board when using the Four Pots Module

+V max. 18 volts
 5 mA max current through pot lugs

Currently available in 10K only
 10K, 50K versions coming soon

PedalSync.com		
Four Pots (MV-56B)		
Molten Voltage	DRAFT 0.6 6/18/12	Page 3 of 3

Electrical Considerations

9 volt maximum on the power input to the module.

Place C16 as close as possible to Pin 13.

Place C2 as close as possible to Pin 20.

Place C1 as close as possible to Pins 27 and 28.

Keep in mind the ***Pin Voltage and Current Limits*** as set forth in the following table:

Pin	Max Voltage	Max Current*
1	5	4
2	3.3	12
3	3.3	12
4	3.3	12
5	3.3	12
6	3.3	4
7	3.3	4
8	GND	
9	3.3	4
10	3.3	25
11	3.3	12
12	3.3	4
13	3.3	
14	5	12
15	5	12
16	5	4
17	5	12
18	5	12
19	GND	
20	N/A	
21	5	12
22	5	12
23	3.3	4
24	3.3	4
25	3.3	4
26	3.3	4
27	GND	
28	3.3	

* 200 mA max current sink or source for the whole chip at any given time, except on the Module which is limited to ~50 mA. Keep your currents low to minimize noise.

The datasheet for the underlying dsPIC33FJ64GP202 chip can be found [here](http://www.microchip.com/wwwproducts/Devices.aspx?dDocName=en532310):
<http://www.microchip.com/wwwproducts/Devices.aspx?dDocName=en532310>

Noise

It is very important to properly filter your power supply as shown in the schematics, above.

To minimize digital noise bleeding into your audio circuit, be careful to run three separate grounds as indicated on the schematic.

Follow proper PCB layout design rules and isolate the digital and analog sections of your circuit as much as possible, connecting the grounds at a common point at the power supply.

The Ferrite on AVDD may not be totally necessary but will quiet down and stabilize the analog voltage. Thru hole values for ferrites are limited and may not be available beyond 800 ohms. The recommended part which appears on the Four Pots Module is a 2.5 KOhm Impedance 50mA Ferrite, such as Murata P/N BLM18BD252SN1D.

MIDI - Backward Compatibility

The exclusive MIDI channel for the PedalSync system is MIDI Channel 15. MIDI Program Change messages sent on any other channel will be ignored by the chip.

Module

The MV-56 Four Pots Module provides sockets for four 8-pin DIP Microchip MCP4151 digital potentiometers. The available digipot values are listed above. Be sure to insert the MCP4151 digipots so that each notch faces to the left.

The MV-56B Four Pots Module provides sockets for four PedalSync Hi-V DigiPot modules. The available digipot values are listed above. Be sure to insert as shown in the photo, above.

Pot 1 is on the bottom and Pot 4 is on the top of the module. The header pin inputs for the four mechanical pots (P1-P4) also go from bottom to top.

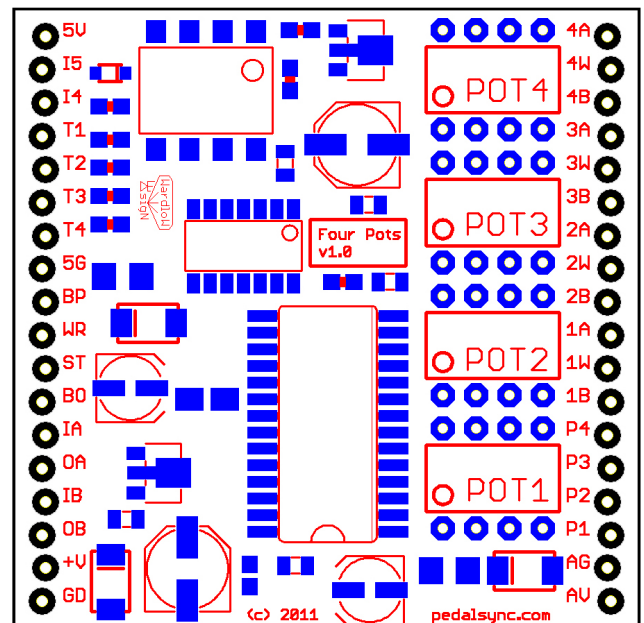
Input and Output header pins are provided for all necessary connections, but series resistors are necessary for many of the LEDs. Please refer to the Table of Four Pots Module v1.0 Pin Assignments on the next page for more information.

The Module accepts 9 volt DC input, and provides regulated, filtered power for the 3.3 and 5-volt circuits, as well as off-board connections for both voltages and the isolated grounds (DG and AG).

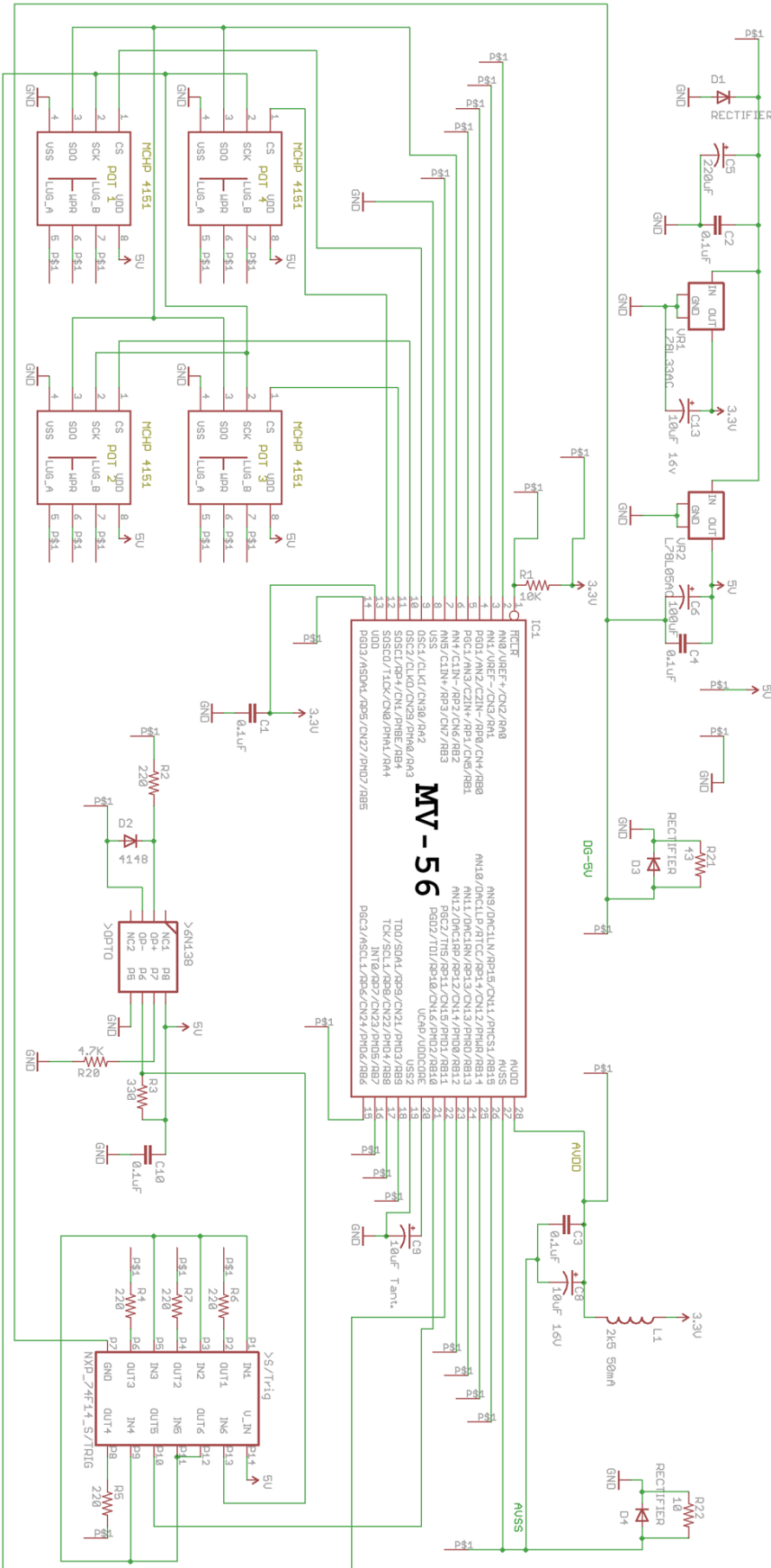
Table of Four Pots Module v1.0 Pin Assignments

Pin	Label	Connection
1	5V	5 Volt Rail - for MIDI Thru
2	I5	Pin 5 of Input MIDI Jack
3	I4	Pin 4 of Input MIDI Jack
4	T1	Pin 5 - Thru 1 MIDI Jack (buffered & 220 ohm series resistor)
5	T2	Pin 5 - Thru 2 MIDI Jack (buffered & 220 ohm series resistor)
6	T3	Pin 5 - Thru 3 MIDI Jack (buffered & 220 ohm series resistor)
7	T4	Pin 5 - Thru 4 MIDI Jack (buffered & 220 ohm series resistor)
8	5G	Digital 5 volt ground [DG]
9	BP	Bypass Switch (pin 7)
10	WR	Write (PGM) Switch (pin 16)
11	ST	Status LED (pin 17 - no series resistor)
12	BO	Bypass Output (pin 18 - no series resistor)
13	IA	User Button A Input (pin 23)
14	OA	User Button A Output (pin 24 - no series resistor)
15	IB	User Button B Input (pin 25)
16	OB	User Button 2 Output (pin 26 - no series resistor)
17	+V	9 volt Power Supply Input
18	GD	Common Ground (Power Supply)

Pin	Label	Connection
36	4A	DigiPot 4, Lug A
35	4W	Digipot 4, Wiper
34	4B	Digipot 4, Lug B
33	3A	DigiPot 3, Lug A
32	3W	Digipot 3, Wiper
31	3B	Digipot 3, Lug B
30	2A	DigiPot 2, Lug A
29	2W	Digipot 2, Wiper
28	2B	Digipot 2, Lug B
27	1A	DigiPot 1, Lug A
26	1W	Digipot 1, Wiper
25	1B	Digipot 1, Lug B
24	P4	Pot 4 Input (pin 5)
23	P3	Pot 3 Input (pin 4)
22	P2	Pot 2 Input (pin 3)
21	P1	Pot 1 Input (pin 2)
20	AG	Analog Ground Rail
19	AV	Analog Power Rail (AVDD)



FOUR POTS MODULE V1.0 SCHEMATIC



Module Dimensions

Circuit board: 1.9 x 1.9"

Header pins are spaced 0.1" and the two header strips are 1.7" apart

A complete set of CadSoft Eagle footprints for PedalSync modules is available for download at:
www.PedalSync.com

Related Products

- Use with PedalSync Hi-V DigiPot modules [MV-56B] for higher current and voltage applications (*up to 5 mA and 18VDC*).
 - Use the Four Pots chip with Tru-Foot™ LFO chip (MV-55) to save LFO depth and center settings.
 - Use the Four Pots chip with 4 Presets chip (MV-59) to make a stand-alone device that can store and recall four programs.
 - Use with the PedalSync Master Controller to store and recall 128 programs upon command.
-

Support

info@PedalSync.com

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