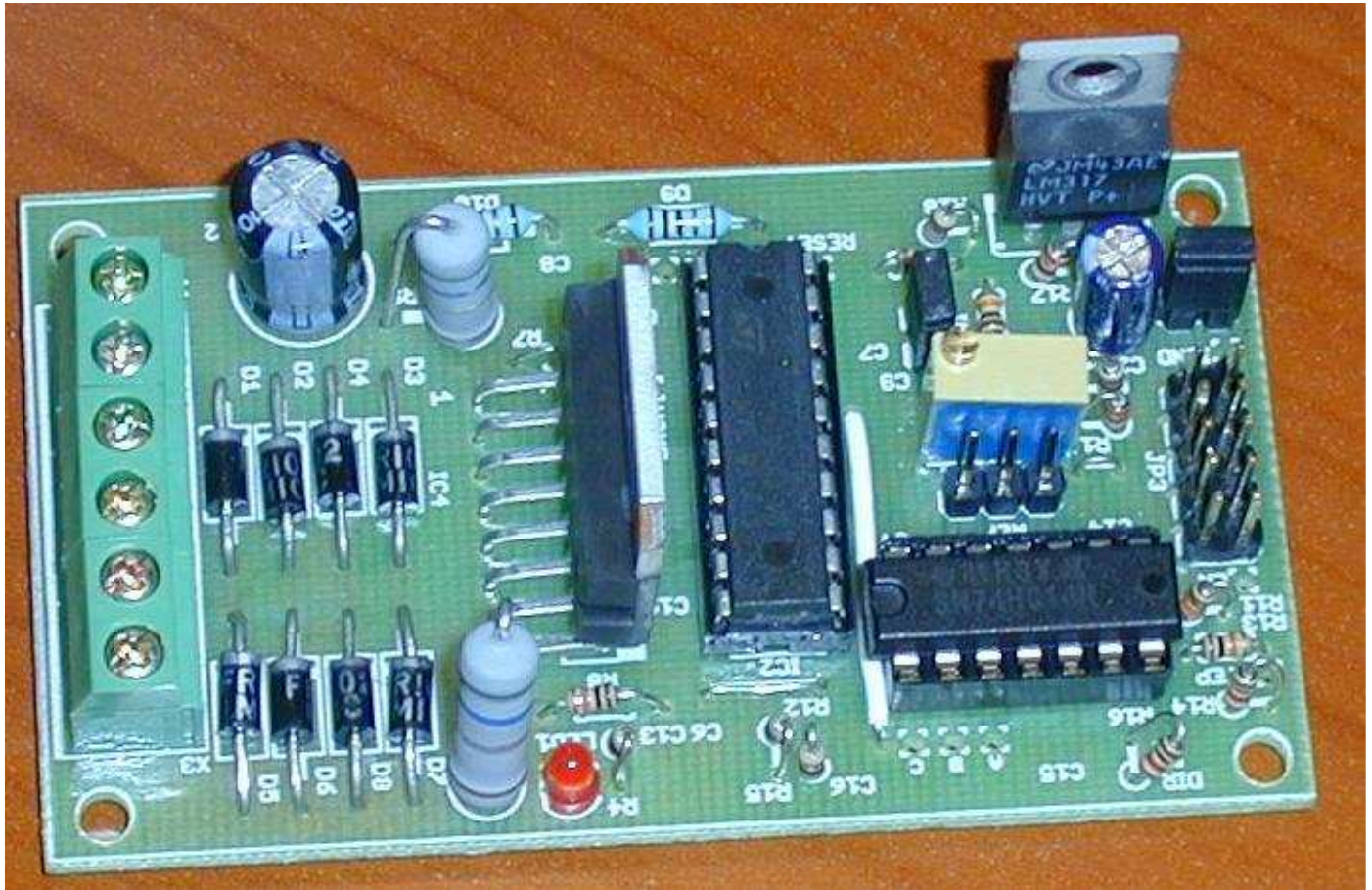
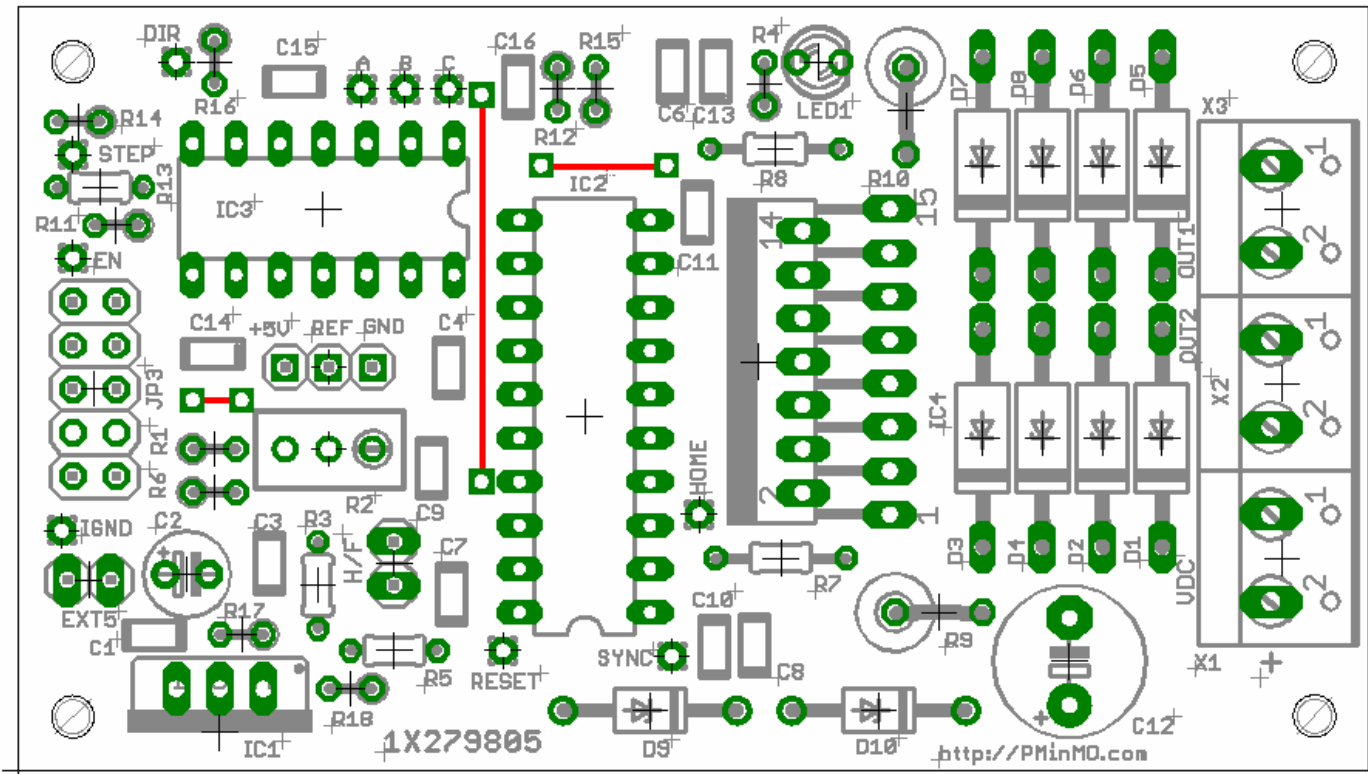




1X297805 Stepper Motor Driver



1X279805 Single Sided L297-L298 Controller Board Data



Some Words of Caution

Never remove a connection to the stepper motor with power applied, there is a HIGH probability you will damage your L298 IC if you do. The L298 is rated for 46-50VDC max. You should limit your power supply voltage lower to allow for back emf generated by the stepper. Take the necessary safety precautions when utilizing any electrical and electronic circuits and motors. Be Safe!

Regarding surface mount parts. If you can solder an electronic component to a pcb, you can do SMD's. A fine point tip on your soldering iron is a **must, no more than 25 watts**. Do not over heat a pin when soldering. Flux the pads with some rosin flux or a rosin flux pin helps. I have a little made up device that is basically a spring wire on a 12" square board than hold's the chip to the board. Make sure your orientation is correct and align them perfectly. With fine solder in hand, place the tip of the iron at the junction of the pin and the board, so both receive the heat of the iron. Place the end of the fine solder at that junction and it should suck the solder in to fill the gap, remove the iron as soon as it does. (A second or two at the most) It doesn't take much.



Build Sequence

With the exception of the L298, L297 and 74HC14N install all components. (sockets should be installed for the L297 and 74HC14N) Take notice one side of the LED has a flat spot, observe the orientation of the LED per the above layout with regard to the flat spot. Install the three jumpers shown in red on the layout above. Utilize insulated wire. Apply power greater than 18VDC and no greater than 42VDC to X1 (observe polarity !). LED1 should illuminate and you should measure 5.1 VDC + or - .25VDC on the output of IC1 to ground. Proceed if correct, remove power and install the 74HC14N. With power on, your should still measure approximately the same 5.1V reading. Measure Pin 12 to pin 2 of the L297 socket, it should read the same 5.1VDC. Once these measurements have been verified power the board down and install the L298 and L297.

Final Checks

Without the all the components installed:

1. Power up the board and with a DC Voltmeter with the negative lead connected to board ground, measure 5.1vdc at the 5V to GND TP:
2. **CAREFULLY** measure the V+ (power supply) at pin 4 of the L298.
3. Measure for less than .7vdc at pin 10 of the L297, GT (Greater Than 4vdc) at pin 18 and pin 17 of the L297.
4. Set your current limit per below via adjusting R2.

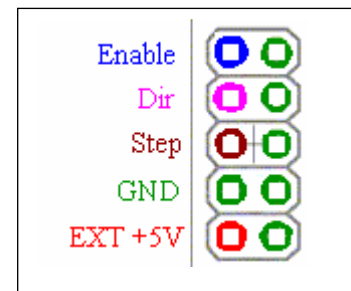
Heatsink

A heat sink on the L298 is recommended for currents greater than 1 amp.

JP4 Inputs

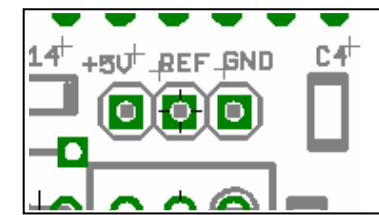
JP4 is a 10 pin IDC connector for easy hookup to the 4 axis interface board. The signal definition is below. Same orientation as the board layout above.

The outputs are enabled by a low logic signal (less than .7vdc) on the Enable pin. A second option of connection to the board is leaving JP4 off and installing a 6 pin polarized connector (.1 inch spacing). A third option is to discretely wire to the step, dir, enable and GND pads.



Jumper TP

TP is 3 test points to facilitate voltage measurements for REF and +5VDC. Utilize the G (GND) pin of TP when making measurements.



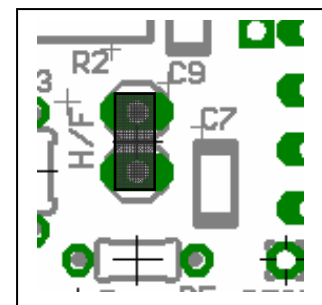
Setting Current Limit

Measuring the DC voltage between the REF Pin and GND Pin of TP. Adjust R2 as follows:

$V_{ref} = .5 * \text{Max motor current}$. i.e. .5A max = .25V, 1A max = .5V, 2A max = 1V

Jumper for Half-Full Step

Jumper in = L, jumper out = H i.e. for Full step a jumper needs to be installed.





Jumper A B C

These are used to reverse motor direction if the software used does not have the capability to set jumper direction. Since most software now has the ability to set direction, there is a default land installed between Pad A and Pad B. If it is necessary to reverse motor direction, cut the land between Pad A and Pad B, and install a jumper wire between Pad B and Pad C.

Using the board

The board was designed with a high noise immunity environment in mind. Switching heavy currents and inductive loads are prone to noise. The L297/L298 combo is a chopper current limiter. A chopper turns the outputs of the driving bridge on and off tens of thousands of times a second. The opportunity for electrical noise is a concern. For that very reason, IC3 is utilized to provide excellent noise rejection.

Software Setup

The step signal has a simple RC filter on it, as do the direction and enable signals. **Minimum pulse width for the step pulse is 3us. Maximum step frequency is 40khz.** Most steppers torque really drop above 1khz at full step, or 2khz if your using half step mode.

5VDC Output

Installing the EXT5 jumper next to JP3 will feed the driver boards 5VDC to pin 9 of JP4. This is used to power the 4 axis interface board as well as to provide 5V for to maintain true isolation for an opto isolated interface board. Only install on one driver board when using the 4 axis interface

Parts

Parts list exported 7/03/2006 10:55:11p

Qty	Value	Device	Parts
1		LED3MM	LED1
2		PINH-1X2	EXT5, H/F
1		PINH-1X3N	REF
1		PINH-2X5	JP3
1		1K 3296W	R2
6	.1uf	1206 SMD	C1, C3, C4, C6, C8, C13
2	.5 ohm	2W	R9, R10
2	1K	Resistor	R4, R5
2	1N4733	1N4733	D9, D10
4	2.7K	Resistor	R1, R11, R12, R13
6	10K	Resistor	R3, R7, R8, R14, R15, R16
1	10uf	Electrolytic	C2 (16VDC 2mm lead spacing)
1	51K	R-US_0204/2V	R6
1	74HC14N	74HC14N	IC3
1	100uf	Electrolytic	C12 (50VDC or 63VDC 5mm lead spacing)
6	220pf	1206 SMD	C7, C10, C11, C14, C15, C16
1	220	R-US_0204/2V	R17
1	680	R-US_0204/2V	R18
1	1000pf	1206 SMD	C9
8	BZW04-48-TR	Transient Diode	D1, D2, D3, D4, D5, D6, D7, D8
1	L297	L297	IC2
1	L298	L298	IC4
1	LM317AHV	T0 -220	IC1
1	OUT1	W237-02P	X3
1	OUT2	W237-02P	X2
1	VDC	W237-02P	X1

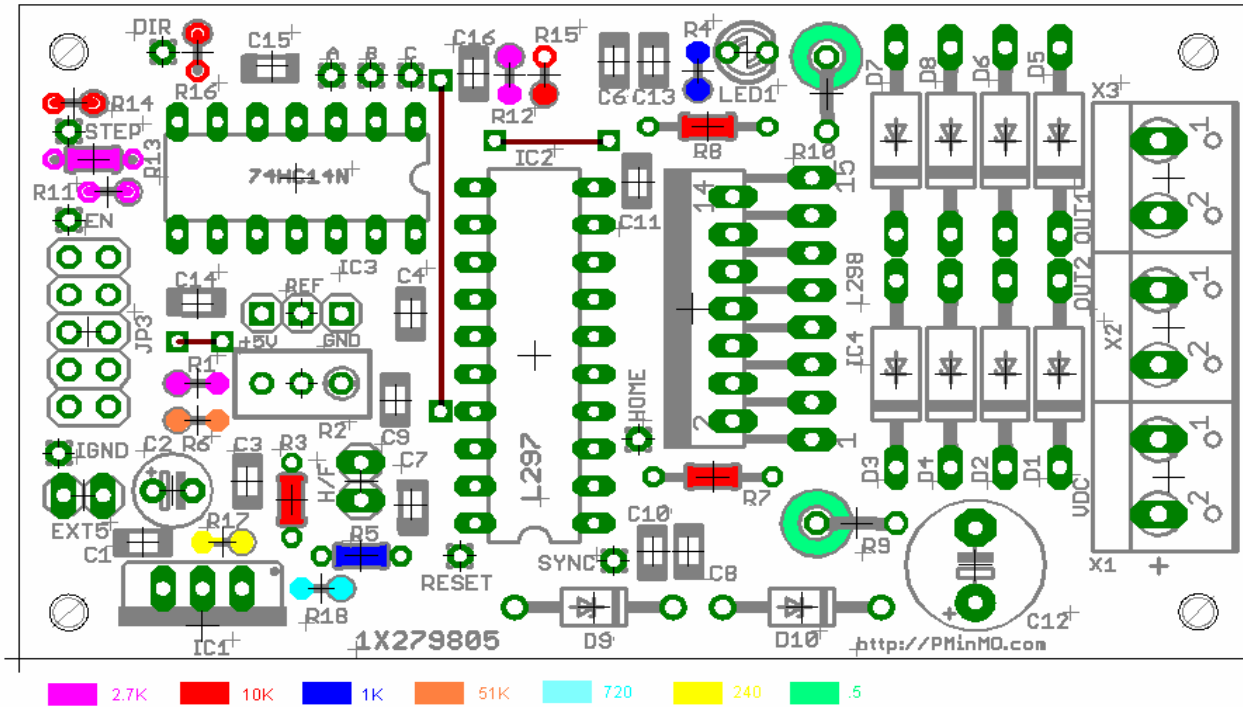
All resistors 1/8 Watt (1/4Watt can also be used but a tight fit), except R9 and R10
All small value capacitors 1206 surface mount (50V)

L297-L298 PMinMO.com 1X279805

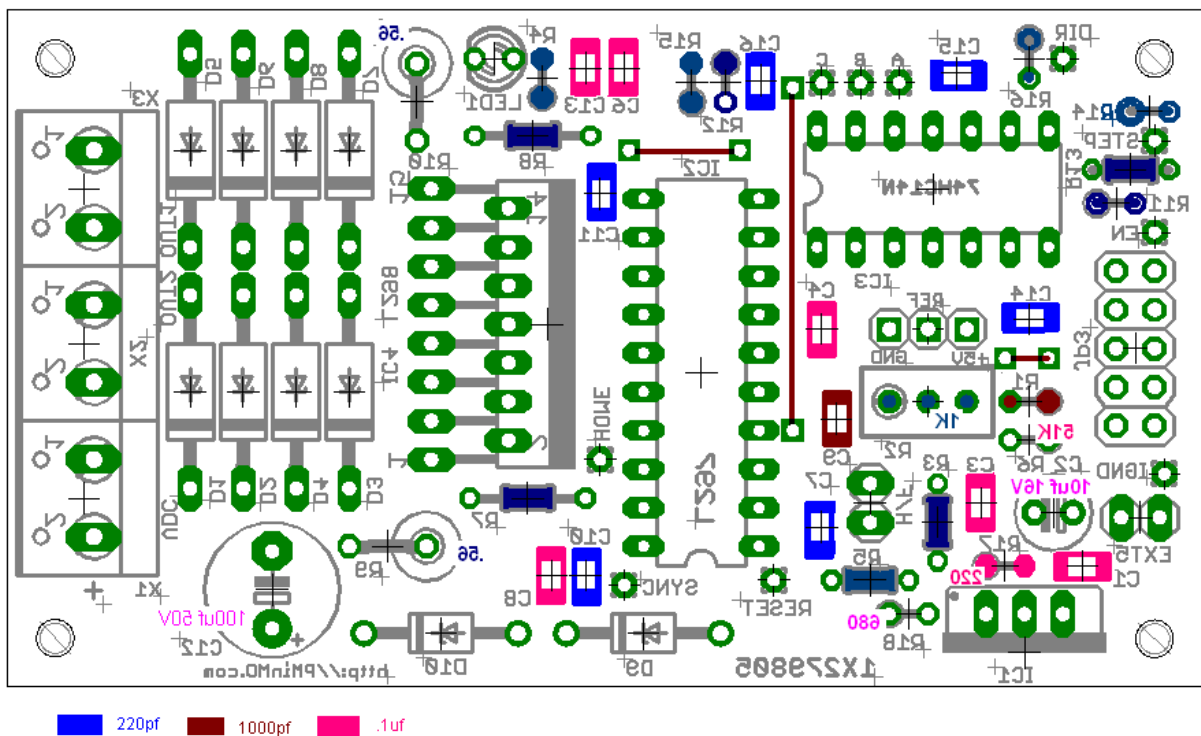
www.mouser.com		MFG part number	MFG	cost	Additional Info
CAPACITORS					
80-C1206C104K5R	.1uf	C1206C104K5RAC7800	Kemet	\$ 0.08	
80-C1206C221J5G	220pf	C1206C221J5GAC7800	Kemet	\$ 0.20	
80-C1206C102J5G	1000pf	C1206C102J5GAC7800	Kemet	\$ 0.17	
140-XRL63V100-RC	100uf	140-XRL63V100-RC	Xicon	\$ 0.14	
140-L25V10-RC	10uf	140-L25V10-RC	Xicon	\$ 0.16	
SEMICONDUCTORS & IC's					
511-LM317T	Vreg	LM317T	ST	\$ 0.31	512-LM317AHVT higher voltage alternative
511-M74HC14	IC	M74HC14B1R	ST	\$ 0.19	
511-L297	IC	L297/1	ST	\$ 8.87	www.futurlec.com L297 \$3.80
512-1N4733A	5.1V zener	1N4733A	Fairchild	\$ 0.09	
511-BZW04-48-TR	Transient Diode	BZW04-48RL	TW semi	\$ 0.09	
511-L298N	IC	L298N	ST	\$ 4.60	www.futurlec.com L298 \$3.75
859-LTL-1CHE	LED 3mm	LTL-1CHE	Lite-On	\$ 0.11	www.futurlec.com LED3R \$.08
RESISTORS					
299-10K-RC	10K 1/8W	299-10K-RC	Xicon	\$ 0.08	
299-2.7K-RC	2.7K 1/8W	299-2.7K-RC	Xicon	\$ 0.08	
299-51K-RC	51K	299-51K-RC	Xicon	\$ 1.08	
299-1K-RC	1K 1/8W	299-1K-RC	Xicon	\$ 0.08	
262-0.5-RC	.5 ohm 2 W	262-0.5-RC	Xicon	\$ 0.19	
299-220-RC	220 ohm 1/8W	299-220-RC	Xicon	\$ 0.11	
270-680-RC	680 ohm 1/8W	270-680-RC	Xicon	\$ 0.11	
594-64W102	1K trimm	064W102	Vishay	\$ 1.95	www.futurlec.com CERM1K \$1.20
HARDWARE					
651-1985865	screw terminal	1985865	Phoenix	\$ 0.65	www.futurlec.com PCB12 \$.40
* 517-6121TG	dual row pin header	2380-6121TG	3M	\$ 1.65	www.futurlec.com HEADD80 \$.50
571-1-390261-6	20 pin DIP socket	1-390261-6	Amp	\$ 0.19	www.futurlec.com ICS20 20 Pin IC socket \$.09
571-1-390261-3	14 pin DIP socket	1-390261-3	Amp	\$ 0.14	www.futurlec.com ICS14 14 Pin IC socket \$.06

* One strip (80 pins 2x40) makes eight 10 pin connectors (i.e. enough for four driver boards and one 4 axis interface board)

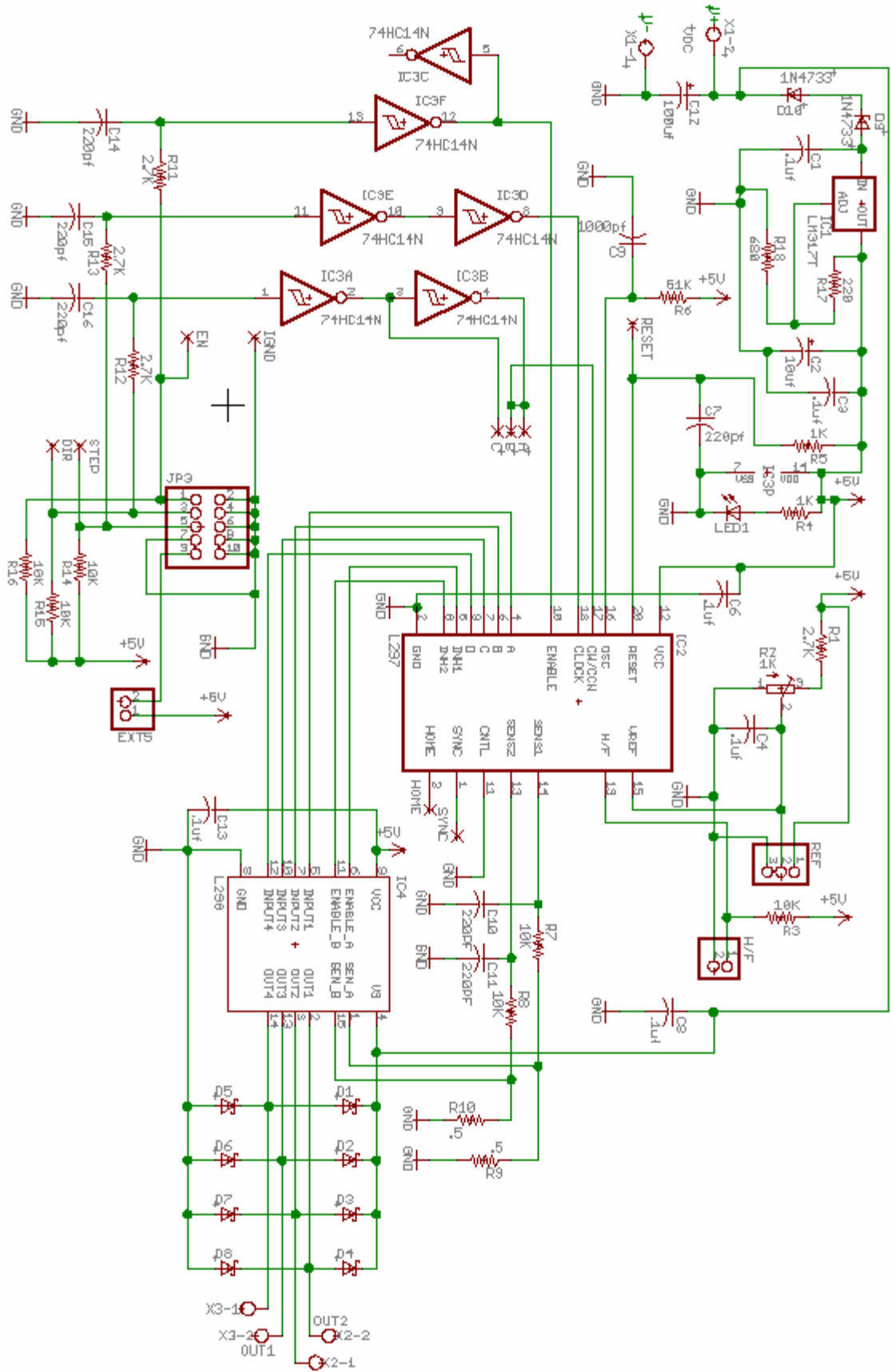
Build AID Top View



Build AID Bottom View

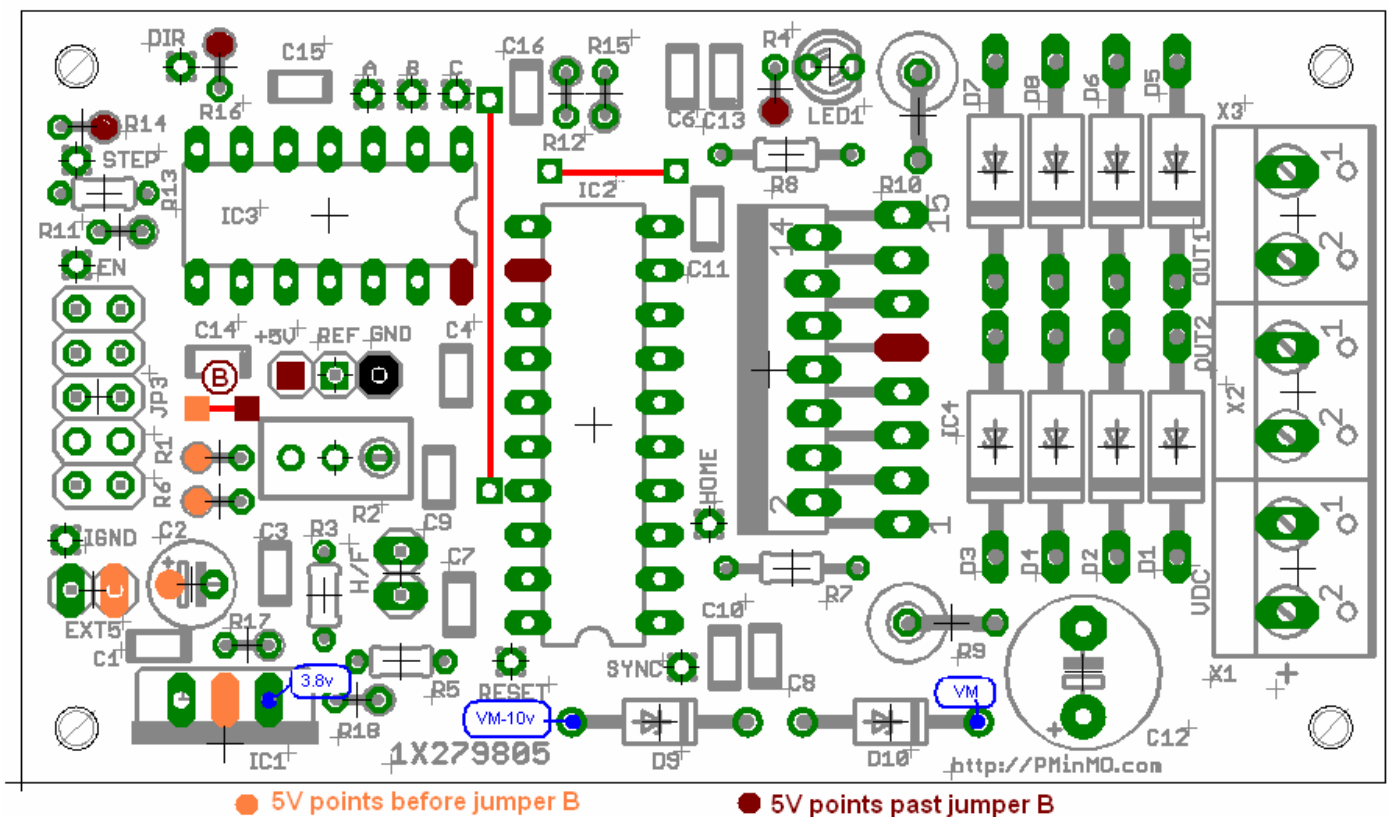


Schematic



Troubleshooting

Probably the most concerning problem is if you apply power to the board and you get no illumination from LED1 which indicates the board is powered. If that condition occurs, there is a logical path to determine the problem. Below is a picture that lists the points that should have 5V when power is applied, and several points that condition the incoming power. **VM** as shown on the graphic below is the supply voltage to the. If you use a 24V power supply **VM** is 24, if you use a 36V power supply **VM** is 36V. All voltage measurements are to be made with the meter negative connected to the GND post shown in black below next to IC3. Use a power supply **18V to 40V**. Remove power anytime the procedure instructs you to remove or add a part, and turn power back on to continue troubleshooting. With power applied measure the post on the EXT5 jumper. If 5V is present there but no LED the problem is farther along the 5V path. Make sure the jumper labeled **B** is installed. If there is no 5V, then you need to measure the blue points below. **VM**, **VM-10** (**VM-10** is your supply voltage minus 10). If those voltages are present, then the two most prevalent possibilities are a short on the 5V line causing VR1 to shutdown, or VR1 is defective. The most expeditious is to remove the jumper at **B** and reapply power and measure for 5V at the EXT5 point. If you get 5V then, VR1 is likely good, and you have a short or defective component past **B**. Pulling IC3 and the L297 from their sockets and measuring again with B installed would highlight if one of those components is defective.



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Be SAFE !!!