

PROP BLADE

FEATURES

- Designed for use with the Brillidea LED Painter
- Powered by a Propeller microcontroller by Parallax
- DMX-512A in and thru capability for using the industry standard lighting control protocol
- Input of 6V to 9V DC with on-board 5V and 3.3V DC regulators
- A power switch and power LED indicator
- 10 position DIP switch and 5 tactile push buttons for DMX addressing and setting adjustments
- One software controlled LED to indicate status of the system such as receiving DMX
- I/O brought to two 2x10 0.1" headers for prototyping and attaching add-on boards
- Four holes for easy mounting of the PCB

OVERVIEW

Brillidea is proud to present the Prop Blade, a Propeller powered controller for use in lighting and prototyping applications. The Prop Blade is configured with the components needed for DMX-512A control applications while leaving plenty of I/O free for experimentation. The Prop Blade has two groups of I/O which make it easy to interface to external devices.

The Prop Blade was designed to be used with the LED Painter, but the design of the PCB is general enough that it can be used in many other applications such as automated test equipment, multiple node communication network, and learning about the Propeller.

Datasheet

Prop Blade PCB
P/N: 010-55344-00

Rev 01.1

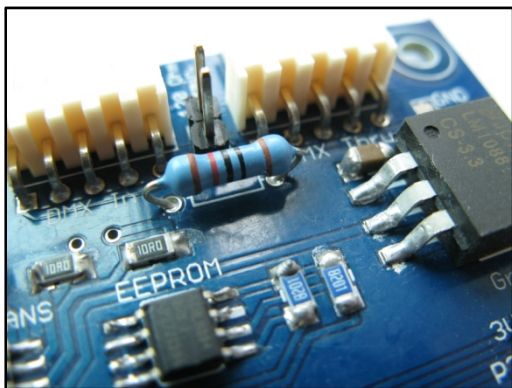
ASSEMBLY

The Prop Blade PCB is shipped by Brillidea without any components. The bill of materials at the end of this document lists the components needed to assemble the Prop Blade.

The Prop Blade is made with a variety of through-hole and surface mount components. When assembling the Prop Blade, we recommend soldering the inner most components first and working your way to the outer edges. We also recommend soldering the surface mount items first and then the through-hole items.

The hardest component to solder will probably be the Propeller QFP package. If you are not comfortable with surface mount soldering, review the YouTube videos related to the subject. Be patient and take your time to solder the components correctly.

There are three items on the board that don't fit the foot prints exactly. The first item is R6, a 120 ohm resistor located near the DMX connections. This resistor should be a 1/2 watt resistor but the footprint works better for 1/4 or 1/8 watt. The 1/2 watt resistor will stick up slightly from the PCB.



Another component that may give you trouble is the on/off switch. The on/off switch footprint is made up of five holes. The outer two holes are for the mechanical mounting of the switch. These holes are smaller than required for the mounting legs of the switch. Since the legs are mechanical in nature you can trim them off the switch and it will mount OK on to the PCB.

The final footprint problem is J1, the power connector. Originally this PCB was designed for use with a larger 2-pin connector with a wide spacing. The holes on the PCB, however, are not large enough for the pins of the larger connector. What we recommend is a smaller, 0.1", 2 pin header be used instead and the pins should be bent to reach to both holes.

Take time to inspect the PCB assembly after you soldered all the components. Check each IC for solder bridges. Ensure that each 1206 SMD is completely soldered.

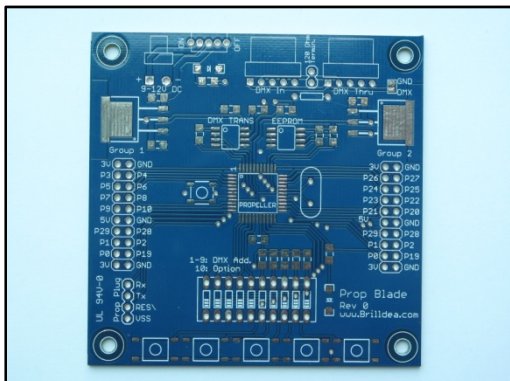
When you first plug in the PCB to power nothing should happen until you turn the switch to on. Once the switch is turned on the power LED near the on/off switch should also turn on.

DESIGN

A schematic of the PCB layout is located near the end of this datasheet. A larger PDF may also be downloaded from www.brillidea.com.

The Prop Blade is a 3" by 3" FR4 material PCB with 2 layers of copper, front and back. The Prop Blade components are mounted only to the front side. The Prop Blade's design is centered on the Propeller microcontroller by Parallax. The Propeller is

an 8 core, 32 bit processor with 32 pins of I/O.



A 6V to 9V DC power source should be applied to J1 for powering the PCB. Note the PCB can accept 12V DC, but only at limited current draw. If 12V DC is used, heat sinks and additional forced air cooling should be applied to the PCB to ensure the regulators do not go into thermal overload and shutdown.

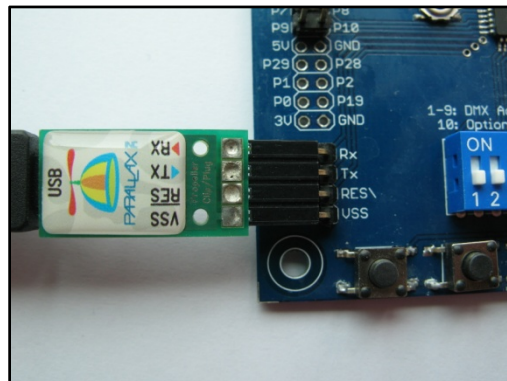
The incoming voltage to the Prop Blade is regulated to a 5V DC and a 3.3V DC bus using LM1086 regulators. The 5V is used to power the MAX487E in the DMX circuit. In addition, the 5V DC bus is located on the Group 1 and Group 2 headers for any user added circuits.

The 3.3V DC bus is used to power the Propeller MCU, the EEPROM and the switches and LED I/O. The 3.3V DC bus is also located on the Group 1 and Group 2 headers for any user added circuits.

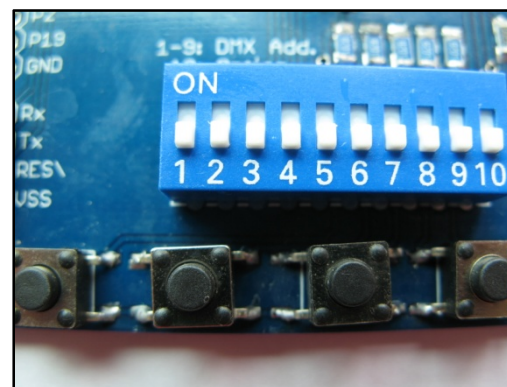
The Propeller microcontroller should be programmed with a Prop Plug from Parallax. Be sure to attach the Prop Plug in the proper orientation.

The BOM for the Prop Blade has a 5 MHz crystal. Crystals of other values can be used as long as they fit the same footprint. With a 5 MHz crystal and the Propeller PLL

set to 16, the Propeller will operate at 80 MHz

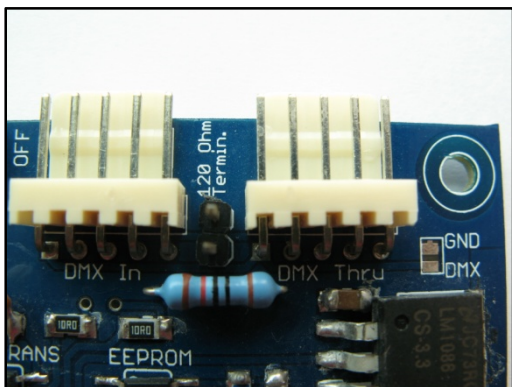


The 10 position DIP switch and 5 tactile buttons are attached to the Propeller in a multiplex fashion. This means that instead of 15 I/O lines, the Propeller can use only 8 lines for reading all of these devices! In order to use the switches, the software in the Propeller should sequence the I/O properly. Please follow the notes in the schematic and see the example code at www.brillidea.com.

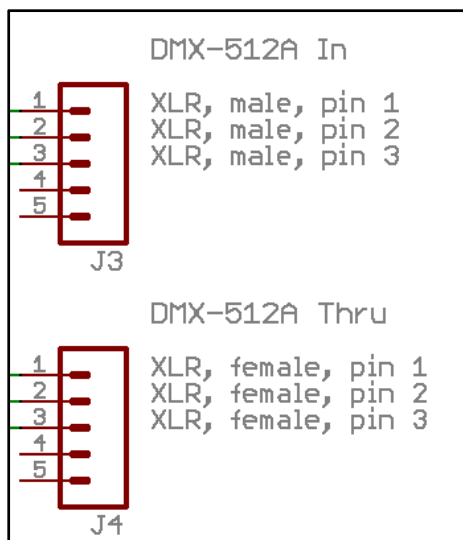


The Prop Blade has a circuit for receiving and sending DMX-512A. In order to connect to a DMX network, an interface chip is needed. A DMX-512A network is similar to EIA-485 (RS-485) which is a 2 wire, 12V DC type of bus. This circuit doesn't have to be used for DMX-512A, but could be used for other serial (RS-485) style networks. A debug LED is included with the DMX circuit

and attached to one I/O pins of the Propeller. This debug LED can be used for purposes other than DMX. Example code for receiving DMX-512A is available at www.brillidea.com.

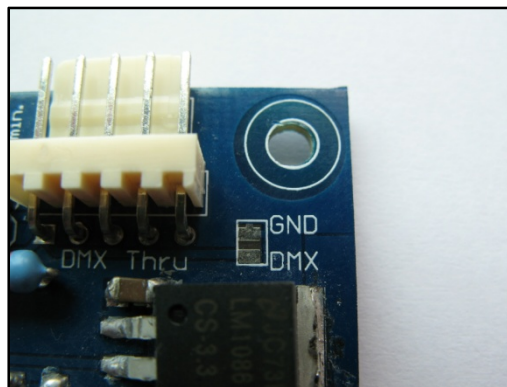


The two, 0.1" space, 5 pin headers are used to connect the Prop Blade to a DMX or RS-485 network. If you have multiple DMX devices on the network, and the Prop Blade is the last device in the chain, then you may want to use the terminating resistor located on the Prop Blade to reduce reflections on the communication line. A jumper should be installed on JP1, which is in between the two DMX connection points.

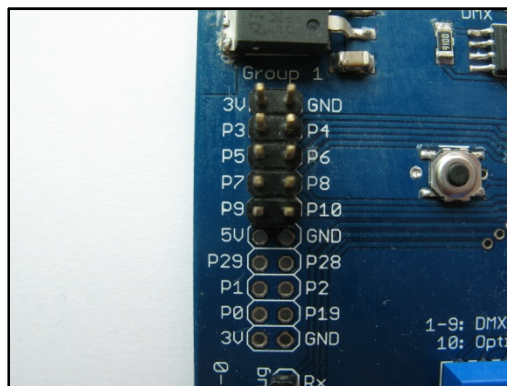


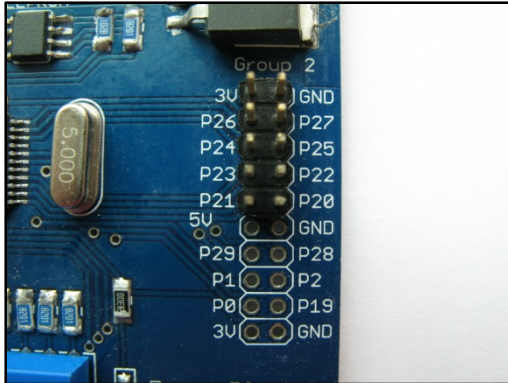
If the Prop Blade is used as a DMX transmitting device, then you may want to

place a solder bridge on the GND/DMX pad located just to the right of the DMX connection points. A solder bridge on this pad will connect the shield of the DMX-512A network to ground. If the Prop Blade is only receiving DMX, do not add solder to this pad.



There are two groups of I/O pins on the Prop Blade. Each group can be used to connect to an LED Painter or to connect other circuits of your own design. If connecting to an LED Painter, only half of the pins of each group are used. You should solder a header similar to that shown in the picture below.





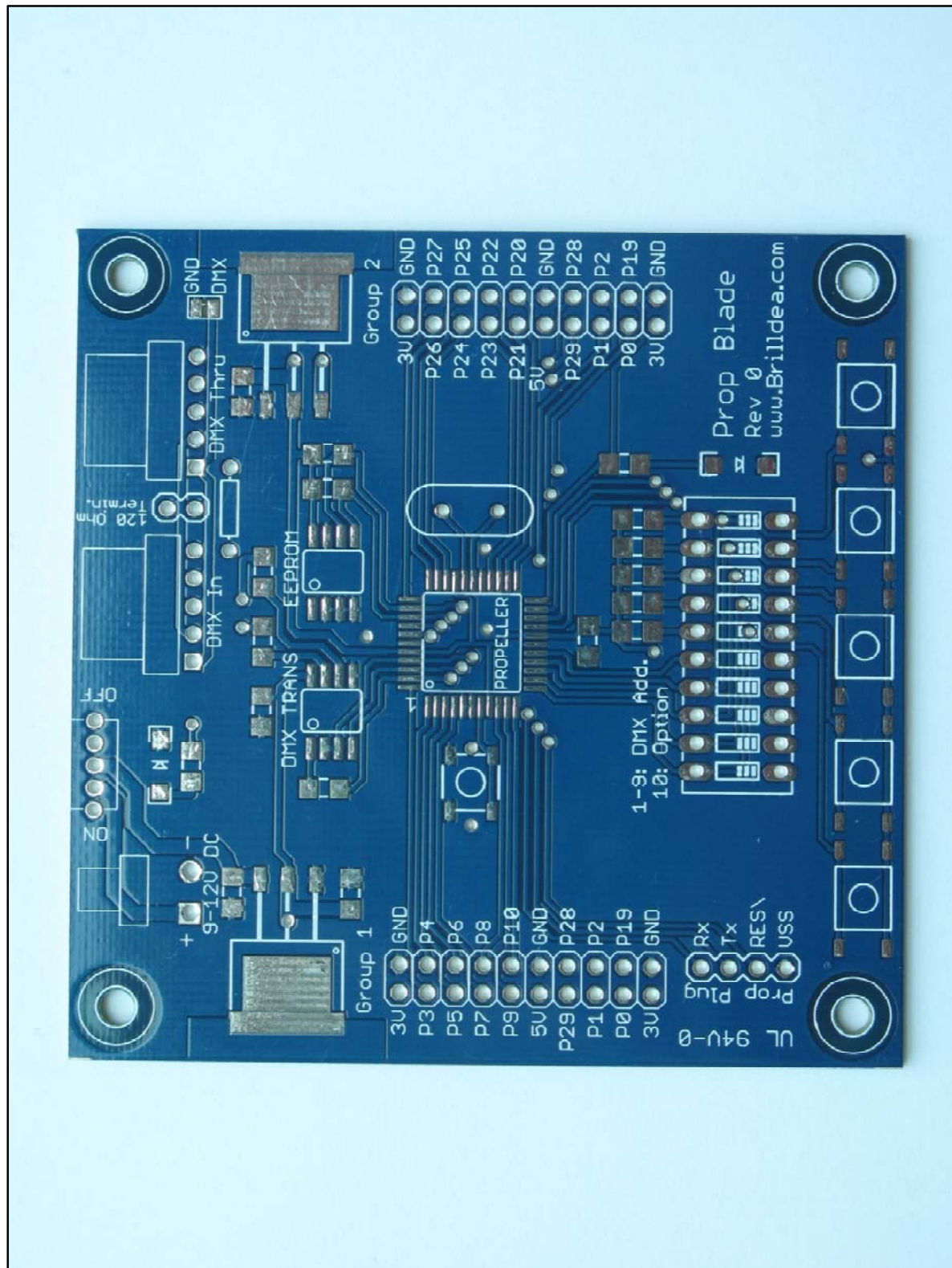
APPLICATION

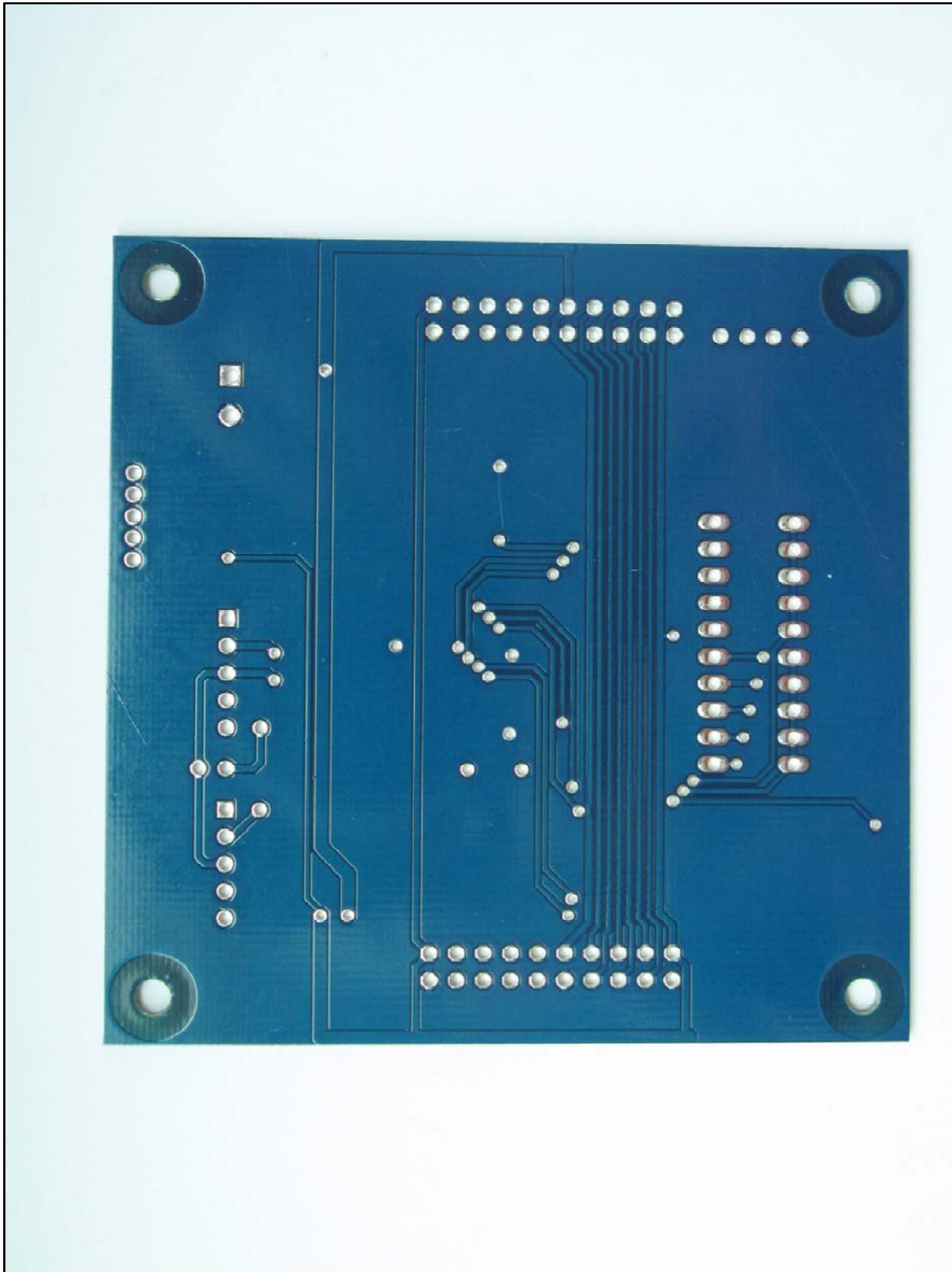
The Prop Blade includes the necessary components for receiving and sending DMX-512A and therefore it is a likely candidate for theatrical and lighting applications.

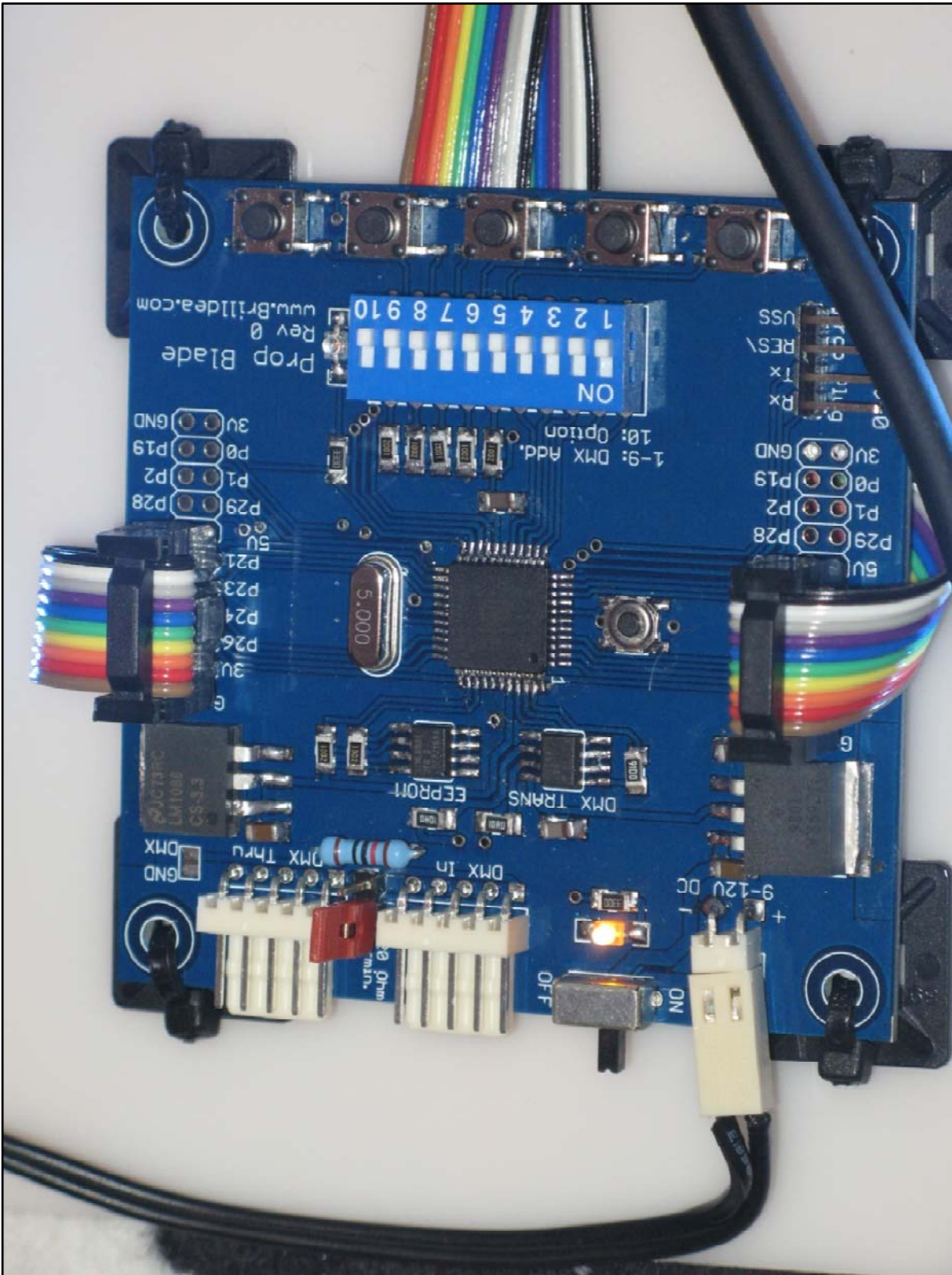
The Prop Blade can function as the master controller for applications using the LED Painter. Each I/O Group on the Prop Blade can be used to control a chain of LED Painters.

The Prop Blade could also be used for other applications where the user adds their own circuitry on a custom design PCB or perforated board. The custom circuit could straddle the two I/O groups or ribbon cable can connect the Prop Blade to the external circuits.

HIGH RESOLUTION IMAGES





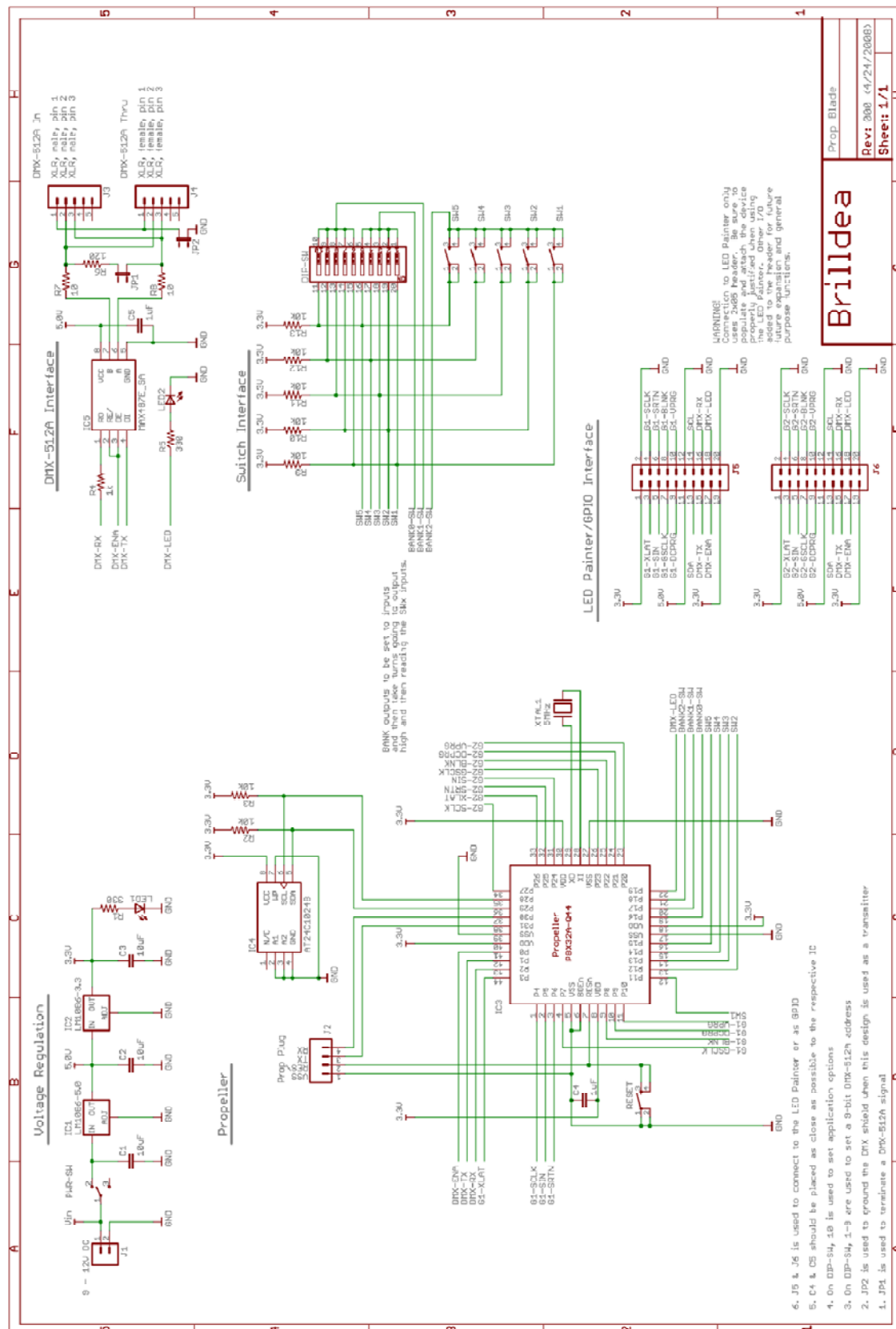


BILL OF MATERIALS

Qty	Ref Des	Manufacturer	Mfg Part #	Distributor	Dist. Part #	Description	Package	Type
1	IC1	National	LM1086CS-5.0/NOPB	Digikey	LM1086CS-5.0-ND	Low dropout positive voltage regulator, 1.5A, 5.0V	TO-263, 3-lead	SMD
1	IC2	National	LM1086CS-3.3/NOPB	Digikey	LM1086CS-3.3-ND	Low dropout positive voltage regulator, 1.5A, 3.3V	TO-263, 3-lead	SMD
1	IC3	Parallax	P8X32A-Q44	Digikey	P8X32A-Q44-ND	Propeller Microcontroller, 32 I/O	LQFP (44)	SMD
1	IC4	Atmel	AT24C512BN-SH25-T	Digikey	AT24C512BN-SH25-T	512K I2C serial eeprom, 2.5-5.5v	SOIC (8)	SMD
1	IC5	Maxim	MAX487ECSA+	Digikey	MAX487EC SA+-ND	RS-485/RS-422 transceiver, low power, slew-rate-limited, ESD protected	SOIC (8)	SMD
3	C1, C2, C3	-	-	Digikey	587-1352-1-ND	10uF, ceramic capacitor, 35V	1206	SMD
1	J1	-	-	-	-	2 position, 1 row, 3.96mm spaced, header, right angle (may use 0.1" spaced and bend the legs out, the holes on the PCB are smaller than the larger diameter legs)	-	thru-hole
1	PWR-Sw	-	-	-	-	Single pole, single throw, switch, right angle (3 pins for the switch and 2 mounting tabs)	-	thru-hole
2	R1, R5	-	-	-	-	330 Ohm resistor, 1% tolerance, 1/8 watt	1206	SMD

2	LED1, LED2	-	-	-	-	1.9mm, SMD, yellow light emitting diode, gull wing legs	2mm axial	SMD
1	C4, C5	-	-	Digikey	PCC2234C T-ND	1uF, ceramic capacitor, 50V	1206	SMD
7	R2, R3, R9, R10, R11, R12, R13	-	-	Digikey	RHM10.0KF CT-ND	10k Ohm resistor, 1% tolerance, 1/4 watt	1206	SMD
1	XTAL1	-	-	-	-	5.00 MHz crystal	HC49U/S	thru-hole
1	RESET	-	-	-	-	5.2mm tactile switch, normally open	-	SMD
1	J2	-	-	-	-	2.54mm, 1x04, header, right angle	-	thru-hole
1	R4	-	-	-	-	1k Ohm resistor, 1% tolerance, 1/8 watt	1206	SMD
1	R6	-	-	-	-	120 Ohm resistor, 1% tolerance, 1/2 watt (note the PCB footprint is a little small for this part)	-	thru-hole
2	R7, R8	-	-	-	-	10 Ohm resistor, 1% tolerance, 1/8 watt	1206	SMD
1	JP1	-	-	-	-	2 position, 0.1" spaced, header	-	thru-hole
2	J3, J4	-	-	-	-	2.54mm, 1x05, header, right angle (male and female)	-	thru-hole
1	DIP-SW	-	-	-	-	DIP switch, 10 position, slide type	-	thru-hole
5	SW1, SW2, SW3, SW4, SW5	-	-	-	-	6.0mm tactile switch, normally open, short button height	-	SMS
1	J5, J6	-	-	-	-	2x10, 0.1" spaced, header (only 2x5 per Group for when used with LED Painter)	-	thru-hole

SCHEMATIC



REVISION HISTORY

Release Date	Document Revision	Change Description
2008-07-19	01.0	Initial Release
2008-08-05	01.1	Adjusted package name of regulators in BOM

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