

## LED PAINTER

### FEATURES

- 48 channels of LED control
- Groups of channel and LED power arranged for easy control of 16 red, green and blue LEDs or 48 individual LEDs
- All control signals brought to two 2x5, 0.1" spaced headers for easy connection to a controller
- Multiple LED Painters easily connected in series to increase the number of LEDs controlled
- LED control performed by the popular Texas Instrument TLC5940 integrated circuit
- Large footprint for a 5mm screw terminal block for LED power
- Four holes for easy mounting of the PCB

### OVERVIEW

Brillidea is proud to present the LED Painter, the second PCB in a series of PCB designed to control LEDs. This PCB uses the popular Texas Instrument TLC5940 to control the LEDs. Each PCB has three of the TLC5940 for a total of 48 channels of LED control.

The LED Painter PCB is easily populated with the components listed in the bill of materials at the end of this datasheet. Most components may be in your junk box already. The PCB is a two layer PCB with a blue solder mask and white silkscreen.

The LED channels on the PCB are grouped for easy connection of red, green and blue LEDs. In addition, each group also has power connections to make it easy to connect 48 individual LEDs. You can create large arrays of LEDs using multiple LED Painter PCBs.

### Datasheet

LED Painter PCB  
P/N: 010-16790-00

Rev 01.0

## ASSEMBLY

The LED Painter 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 LED Painter.

When assembling the LED Painter, we recommend soldering the 1206 surface mount components first. The surface mount components are the largest SMT size so that even beginners can solder the components.

After installing the SMT components, the next step is to solder the IC sockets to the PCB. You do not have to use IC sockets, but we recommend it in case you need to replace a failed IC because of mishandling or miswiring.

The final step in the assembly process is to install the headers and connectors. Your choice of connectors and headers will vary based on your choice of configuration, but we recommend installing the shortest components first and working your way to installing the tallest components last.

Once you have finished installing all components, visual check each component and solder connection to ensure that the solder joint is good and that there are no solder bridges.

## 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](http://www.brillidea.com).

The core components of the LED painter are the three Texas Instruments TLC5940 ICs. These integrated circuits each have 16

channels of 12-bit PWM control. Each channel can sink up to 17V DC.

Furthermore, the IC's logic is powered by a separate 5V or 3.3V DC supply so that it can easily be interfaced to a variety of microcontrollers.

The communication to the three TLC5940 is serial. The serial protocol reduces the number of I/O pins required in order to control many LEDs. Each IC is essentially a serial shift register and the ICs are connected in series in which the data leaves the output of one IC and enters the input of another IC.

If you are using the LED Painter as an RGB LED controller, then each IC is responsible for one color. In other words, the first IC is used to control the red LEDs of all 16 channels, the second IC is for the green LEDs and the third IC is for the blue LEDs.

The main control I/O pins are located on two 2x5, 0.1" spaced headers. One header is the incoming data while the other header is the outgoing data. There is a separate jumper configuration which can either route the serial data back to the controller via the SRTN on the input header or pass the serial data out to the next board via the SOUT on the output header. See the schematic for configuration information.

Each TLC5940 provides an error signal if one of the channels has an open LED or a thermal overload. The error signals are on a separate 1x4, 0.1" spaced header and more information about the error signal can be found in the IC's datasheet.

Each IC on the PCB can have up to two 1206 SMD decoupling capacitors. Depending on your design, you may choose to only populate one or both of the locations. We recommend at least

populating one of the locations with a 0.1uF capacitor.

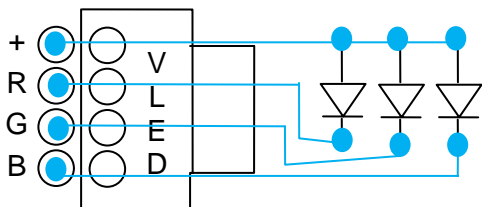
Finally, each IC on the PCB also has a place to populate a 1206 SMD resistor for setting the maximum LED current.

For further information about the TLC5940, the serial protocol, the error signals and the operating margins, please refer to the Texas Instruments TLC5940 datasheet.

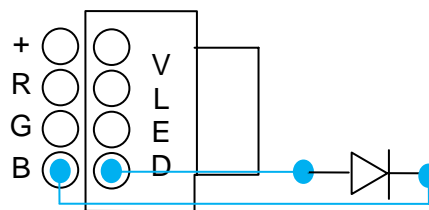
## APPLICATION

Each LED Painter has a total of 48 channels of LED control. Your application needs may vary and the LED Painter is designed to be flexible and to meet your LED needs.

The 48 channels are arranged into 16 groups of 3 LEDs each. This arrangement provides for easy connection of RGB LEDs that have a common anode (common positive voltage) configuration with only four pins (positive voltage for all LEDs, and the common or ground of each red, green, blue color).



**Figure 1 Connecting LEDs with a common anode (common positive voltage)**



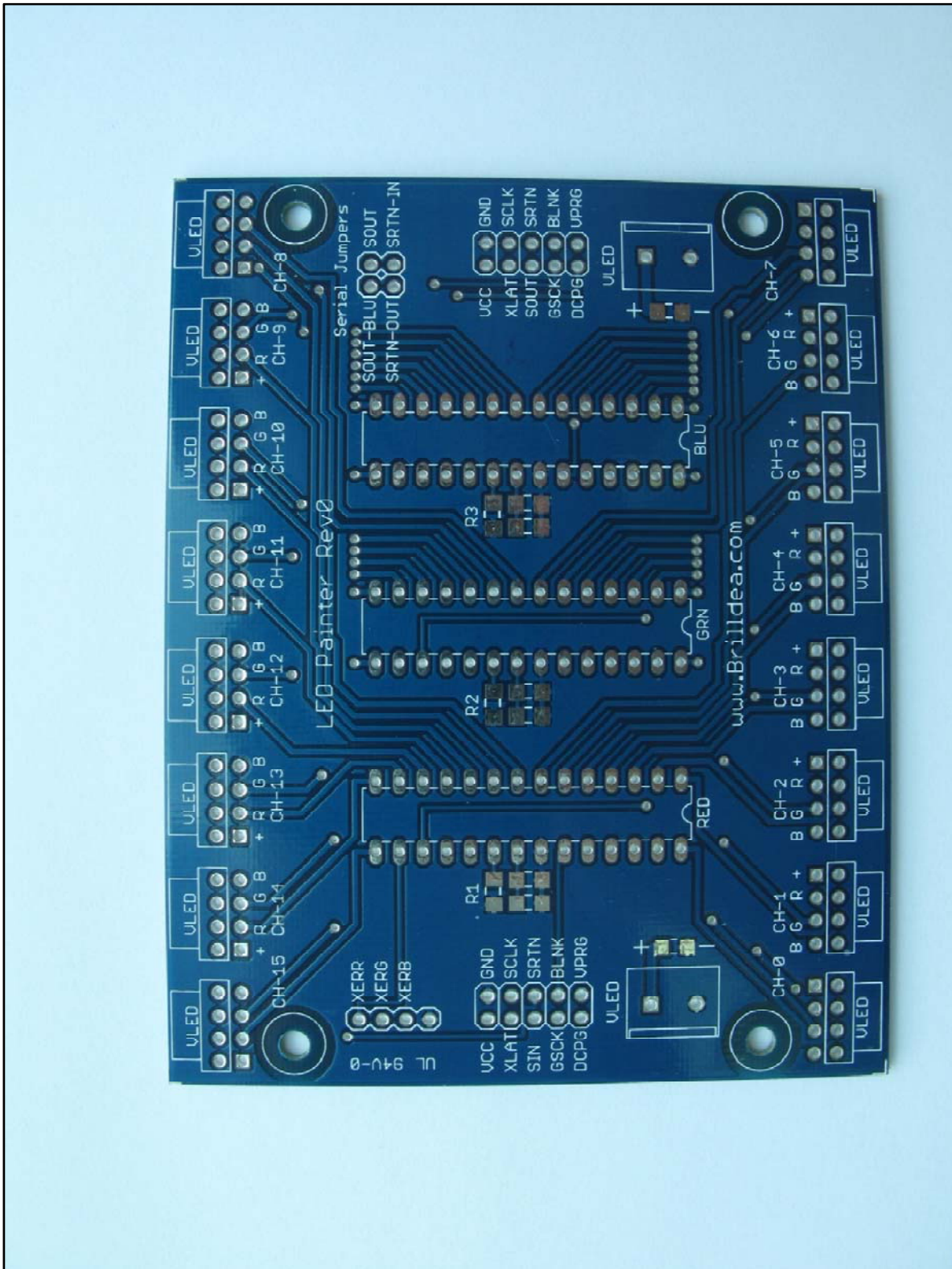
**Figure 2 Connecting an LED individually**

The LED Painters can be set up in a daisy chain fashion. The data and power entering one LED painter can be passed through to additional LED Painters. In practice, you need to make sure that the proper VCC power makes it to all LED Painters attached in series. We recommend using 5V DC and large size wires and ribbon cable when setting up a series of several PCBs.

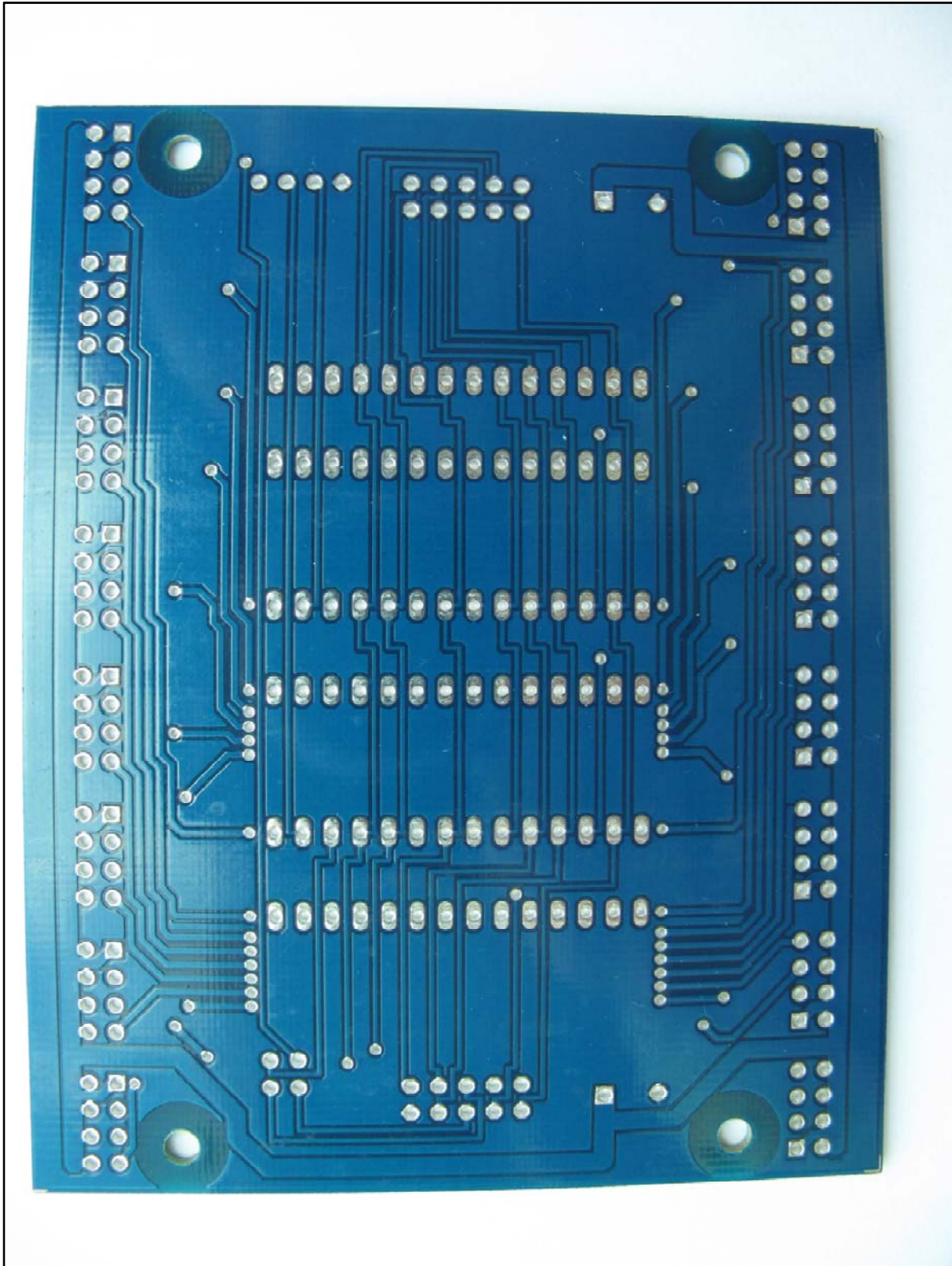
The 2x5 header has all the control signals needed to control the TLC5940. Your controller should implement a software protocol as described in the TLC5940 datasheet. Please be sure to observe the proper polarity of the signals.

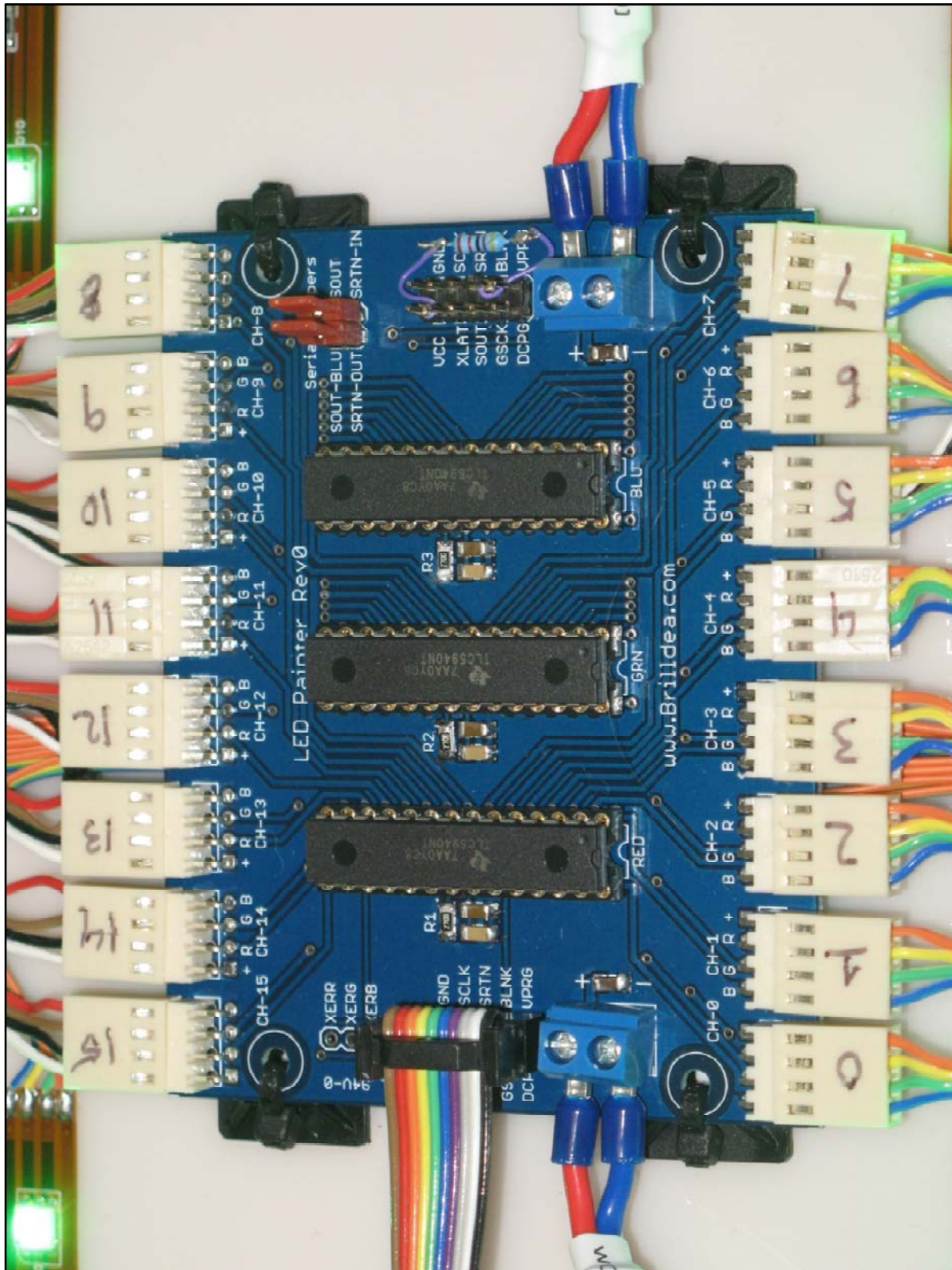
One addition you may chose to make is to add a 10K ohm or higher pullup resistor on the BLNK signal. When the LED Painter and your controller are first powered on, the TLC5940 will be in an unknown state and your LEDs will display random data until the controller properly updates all channel data. The pullup resistor will ensure the channels are all off until the controller has control.

# HIGH RESOLUTION IMAGES







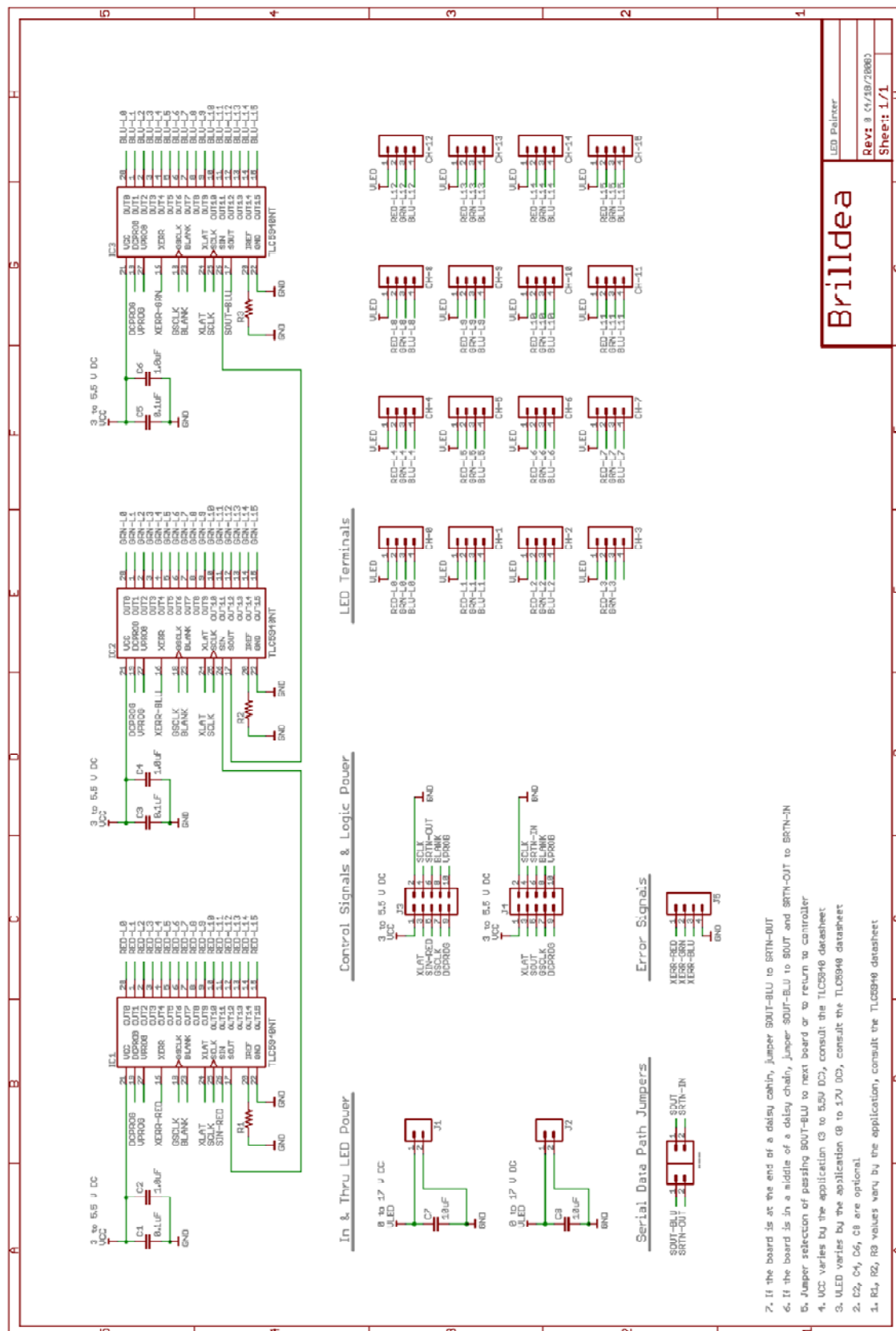


## BILL OF MATERIALS

Qty	Ref Des	Manufacturer	Mfg Part #	Description	Package	Type
3	IC1, IC2, IC3	Texas Instruments	TLC5940NT	16 channel LED driver with dot correction and grayscale PWM control	28-pin PDIP	thru-hole
6	IC1s, IC2s, IC3s	-	-	14 Pin IC socket, 0.3" wide	14-pin PDIP	thru-hole
3	R1, R2, R3	-	-	LED Current setting resistor for IC1, IC2, IC3 (recommend: 270 ohm resistor, 1/4 watt, 1% tolerance)	1206	SMD
3	C1, C3, C5	-	-	0.1uF, ceramic, 50V (this component varies based on application)	1206	SMD
3	C2, C4, C6	-	-	1.0uF, ceramic, 50V (this component varies based on application)	1206	SMD
2	C7, C8	-	-	10.0uF, ceramic, 35V (this component varies based on application)	1206	SMD
2	J1, J2	-	-	5.08mm pitch, 2 pin, blue, screw terminal block	-	thru-hole
-	J3, J4, Serial Jumpers	-	-	2.54mm spaced header (two 5x2 and one 2x2 are needed)	-	thru-hole
16	CH-0, CH-1, CH-2, CH-3, CH-4, CH-5, CH-6, CH-7, CH-8, CH-9, CH-10, CH-11, CH-12, CH-13, CH-14, CH-15	-	-	These components varies based on application, you can use 2x3 headers or 1x4 headers	-	thru-hole
1	J6	-	-	2.54mm spaced header (one 4x1 is optional)	-	thru-hole
1	jumpers			Jumper to bridge 0.1" header. Optionally a wire jumper could be made or a solder bridge	-	-



## SCHEMATIC





## REVISION HISTORY

Release Date	Document Revision	Change Description
2008-06-30	01.0	Initial Release

**Brillidea**

www.brillidea.com

sales@brillidea.com

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