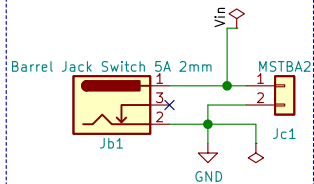


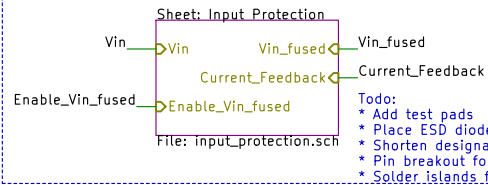
Input Connectors

Make sure to feed Vin with voltage that the LED strip can handle 5–30VDC.
Two connector options for power:
* Phoenix Contact MSTBA
* Barrel Jack 2x6.4mm



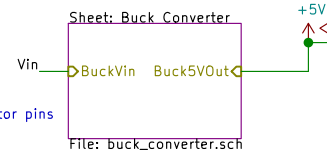
Input Protection

- There is 2 options for input protection:
 - * A classic fuse
 - * Highside High Current Power Switch



5V Buck

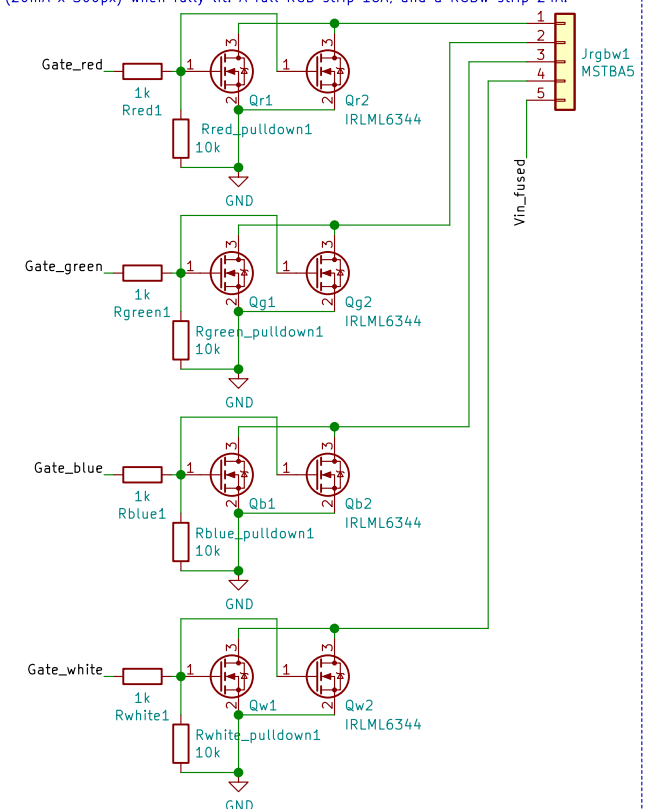
- The 5V buck converter will feed the micro controller with 5V DC.
- There is 2 options for 5V:
 - * Use buck to lower Vin to 5V
 - * Direct connection to 5V from Vin



RGBW LED Driver (CV-mode, Optional)

LED driver is made for LED strip that have red, green, blue and white channels that have a common positive rail like +12V.

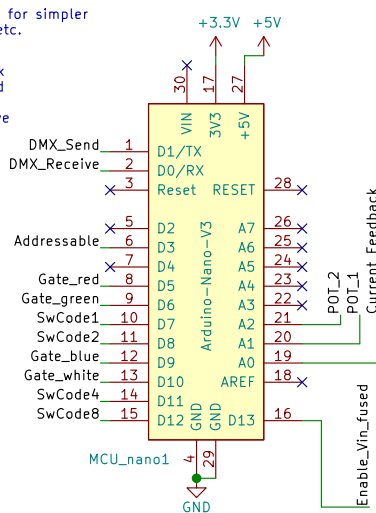
The LED driver can drive 4 output channels in constant voltage mode at 5A each. The channel can drive up to 10A current if an optional IRLML6344 is mounted. One color channel on a 5m LED strip consisting of 300 LED's will draw 6A (20mA x 300px) when fully lit. A full RGB strip 18A, and a RGBW strip 24A.



MCU Option Nano (Option 1)

Populate the Arduino Nano for simpler jobs like DMX controlling etc.

Ports:		
A0	PC0	Current_Feedback
D13	PB5	Enable_Vin_fused
D1	PD0	(TX) DMX_Send
D0	PD1	(RX) DMX_Receive
D3	PD3	addressable
D5	PD5	red
D6	PD6	green
D9	PB1	blue
D10	PB2	white
A1	PC1	POT_1
A2	PC2	POT_2
D7	PD7	SwCode1
D8	PB0	SwCode2
D11	PB3	SwCode4
D12	PB4	SwCode8



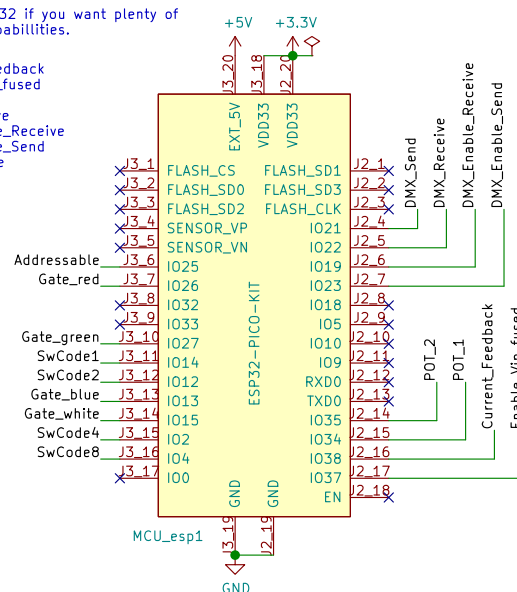
MCU Option ESP32 (Option 2)

Populate the ESP32 if you want plenty of power or WiFi capabilities.

```

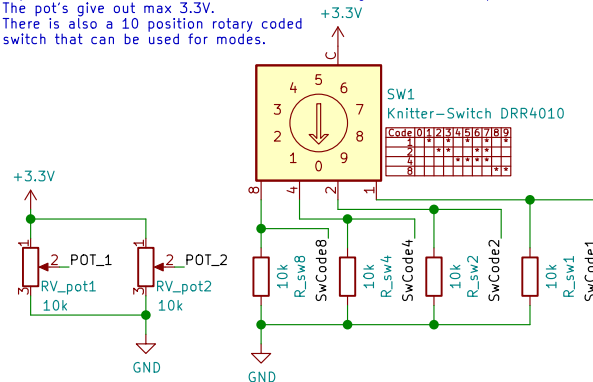
Ports:
I038 Current_Feedback
I037 Enable_Vin_fused
I021 DMX_Send
I022 DMX_Receive
I019 DMX_Enable_Receive
I023 DMX_Enable_Send
I025 addressable
I026 red
I027 green
I013 blue
I015 white
I034 POT_1
I035 POT_2
I014 SwCode1
I012 SwCode2
I040 SwCode4
I04 SwCode8

```



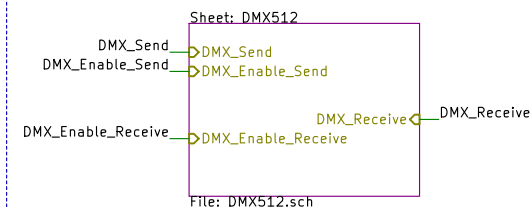
User Interface (Optional)

2 potentiometers can be utilized to hue and brightness for example.
The pot's give out max 3.3V.
There is also a 10 position rotary coded switch that can be used for modes.



DMX512 Isolated (Optional)

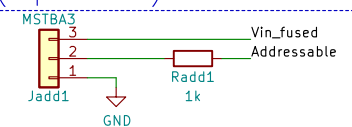
A RS-485 transceiver can optionally be mounted for sending and receiving DMX512.
See sheet DMX512 for configuration.



Addressable LED (Optional)

Make sure to feed Vin with the right voltage for the LED strip. Usually 5V for addressable LED strip. Place connector close to Vin_fused.

- Place ESD diodes on connector pins.



- H1 MountingHole
- H2 MountingHole
- H3 MountingHole
- H4 MountingHole

<http://tim.gremalm.se/>
<https://github.com/TimGremalm/LightBoxNano>

a generic PCB for controlling LED's both LED strip and WS2812
Tim Gremalm

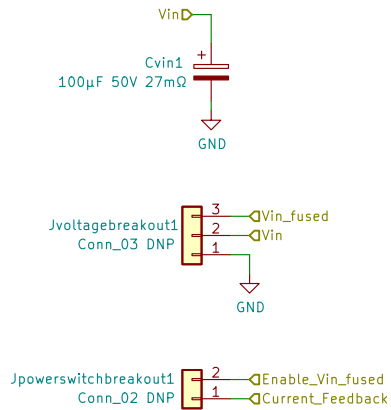
Sheet: /
File: LightBoxNano.sch

Title: LightBoxNano – Main

Size: A4	Date:
KiCad E.D.A. kicad (5.1.5)–2	

Rev:
Id: 1/4

Decoupling and Breakout Pin Header



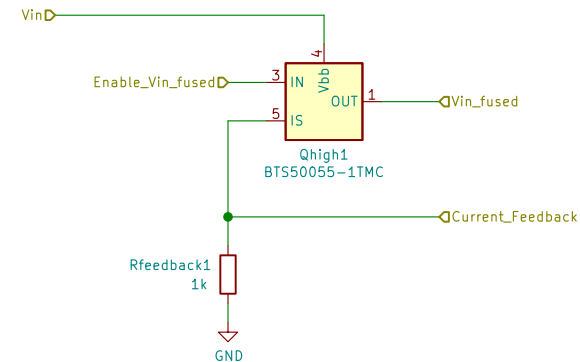
Classic Fuse (Option 1)

A much cheaper option then the high side switch, but one time use only.
Populate with a appropriate 1206 fast blow fuse.
Example: Fuse Fast Blow 10A 1206 MCCFB1206TFF/10



Highside Power Switch (Option 2)

The Infineon BTS50055-1TMC is a highside high current power switch with buildt in reverse polarity and temperature protection.
It's also used to measure current consumption; Current_Feedback as analog output.
To enable the high power switch Enable_Vin_fused must be driven low.
Both Current_Feedback and Enable_Vin_fused goes to the MCU so it can act on over current and act as a breaker.



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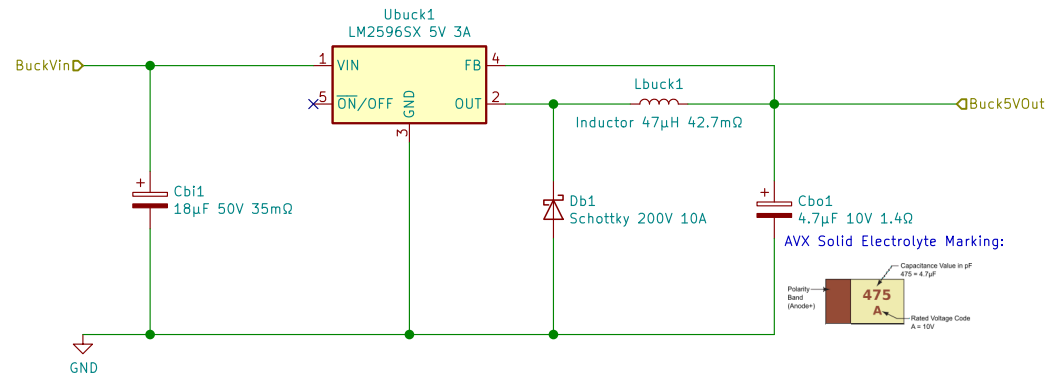
Sheet: /Input Protection/
File: input_protection.sch

Title: LightBoxNano – Input Protection

Size: A4	Date:	Rev:
KiCad E.D.A. kicad (5.1.5)–2		Id: 2/4

Use 5V Buck (Option 1)

The buck option is used when $V_{in} > 5.0V$ and needs to be lowered to 5.0V. The 5V is used for feeding the micro controller.
Example: When using 12V on V_{in} to feed a 12V LED strip.



Using TI's LM2596 guide:

V_{in} : 30V

V_{out} : 5V

I_{out} : 3A

Efficiency: 77.1%

Duty Cycle: 19.95%

Frequency: 150kHz

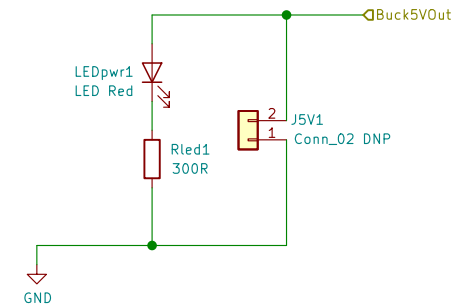
$V_{out\ p-p}$: 945.86mV

<https://webench.ti.com/power-designer/switching-regulator/select>

<https://webench.ti.com/appinfo/webench/scripts/SDP.cgi?ID=572687AF787DDED1>

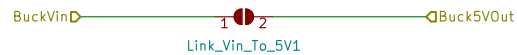
5V Output

5V Output feeds the micro controllers on this PCB.



Use direct 5V (Option 2)

The direct option is only used when V_{in} is 5V and we don't need to lower the voltage.
A typical use case is when using addressable LED strip like WS2812.



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Sheet: /Buck Converter/

File: buck_converter.sch

Title: LightBoxNano – Buck Converter

Size: A4

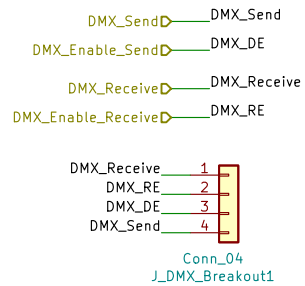
Date:

KiCad E.D.A. kicad (5.1.5)–2

Rev:

Id: 3/4

MCU Interface

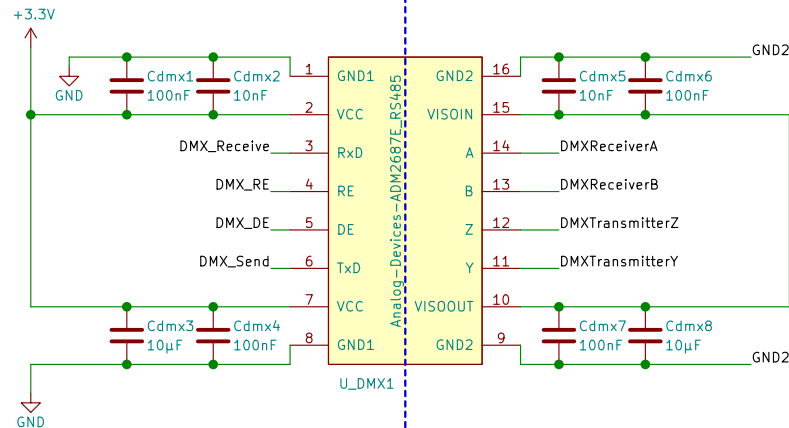


RS-485 Transceiver

For sending and receiving DMX512 a Analog Devices ADM2687E is used which isolates the RS-485 bus from the low voltage micro controller side.

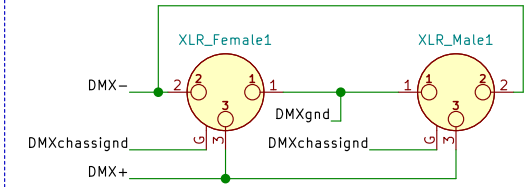
ADM2687E also isolates the power on the bus side by a buildt in DC to DC converter.

* Place capacitors as close to ADM2687E for noise suppression.
* Avoid sharp corners around the isolation barrier and ground plane.
See Analog's application notes for further tips:
<https://www.analog.com/media/en/technical-documentation/application-notes/AN-0971.pdf>



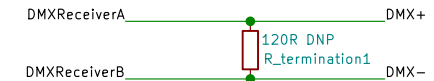
DMX Connectors

Neutrik female (NC3FAAH2) and male (NC3MAAH) 3 pin XLR connector is used for DMX512.



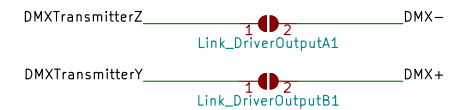
Terminator

A RS-485 bus is terminated by a 120 ohm resistor. This can be mounted here if needed.



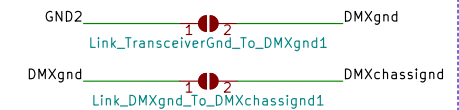
Link Tx to Rx (Optional)

For enabling sending on the DMX bus, these two jumper links must be soldered.



Link Ground (Optional)

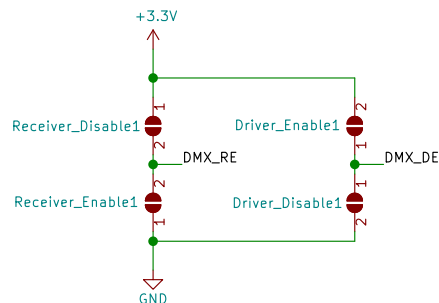
Options for linking ground and shield of XLR connectors with RS-485 side of the transceiver.



Configure Transceiver (Rx & Tx)

To receive data on the DMX bus; RE (Receiver Enable) must be pulled low, or high for disable.
For sending data; Tx to Rx link must be enabled, and DE (Driver Enable) must be pulled high, or low to disable.

RE and DE can be controlled from the MCU, or hard coded via these jumper links.



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Tim Gremalm

Sheet: /DMX512/

File: DMX512.sch

Title: LightBoxNano - DMX512

Size: A4
KiCad E.D.A. kicad (5.1.5)-2

Date:

Rev:

Id: 4/4