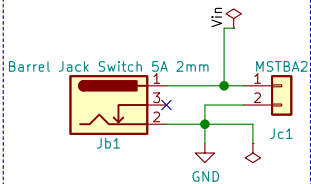


Input Connectors

Make sure to feed Vin with voltage that the LED strip can handle 5–30VDC. Two connector options for power:

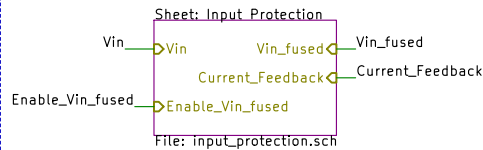
- Phoenix Contact MSTBA
- Barrel Jack 2x6.4mm



Input Protection

There is 2 options for input protection:

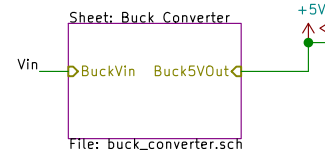
- A classic fuse
- Highside High Current Power Switch



5V Buck

The 5V buck converter will feed the micro controller with 5V DC. There is 2 options for 5V:

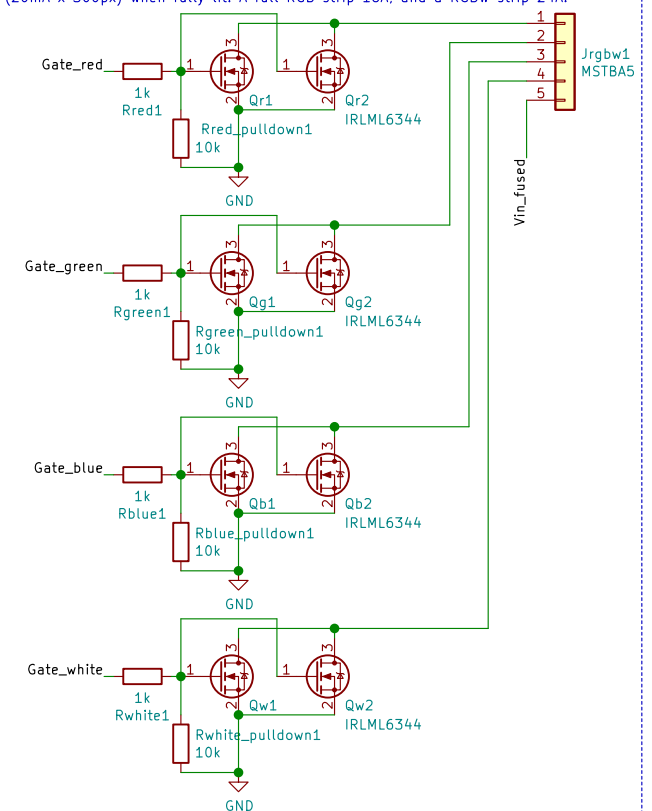
- Use buck to lower Vin to 5V
- Direct connection to 5V from Vin



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.

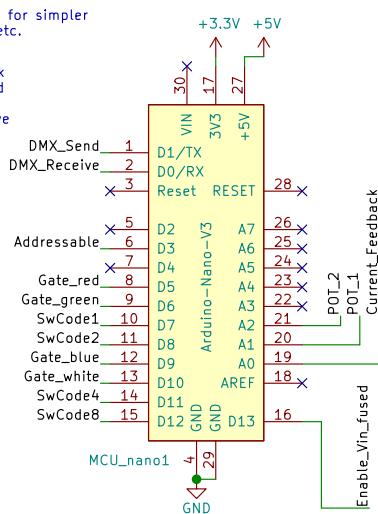


MCU Option Nano (Option 1)

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

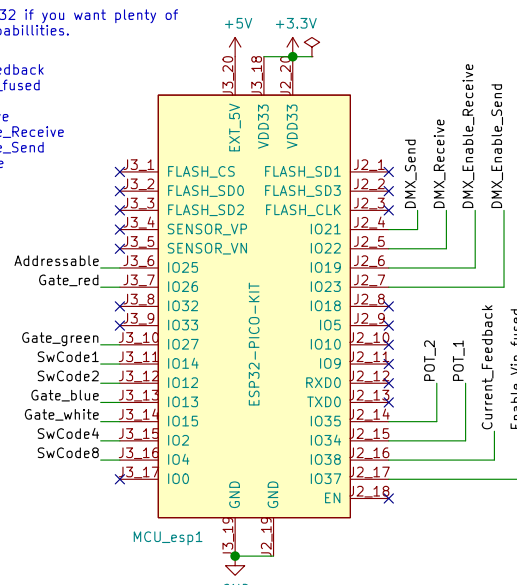


MCU Option ESP32 (Option 2)

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

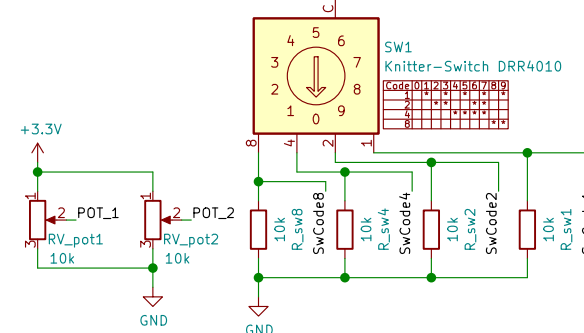
Ports:

- 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
- I02 SwCode4
- I04 SwCode8



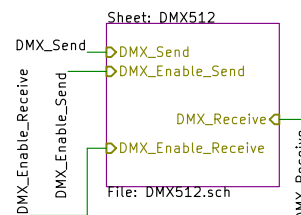
User Interface (Optional)

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 code switch that can be used for modes.

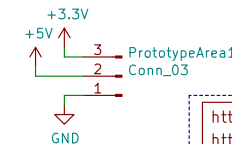


DMX512 (Optional)

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



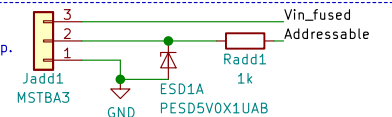
Mechanical



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

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.



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

Todo:
 * Place ESD diodes on connector pins

a generic PCB for controlling LED's both LED strip and WS2812
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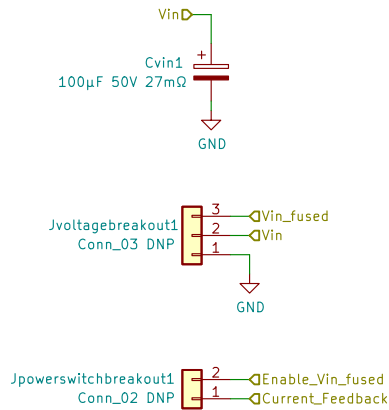
Sheet: /
 File: LightBoxNano.sch

Title: LightBoxNano – Main

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

Rev:
 Id: 1/4

Decoupling and Breakout Pin Header



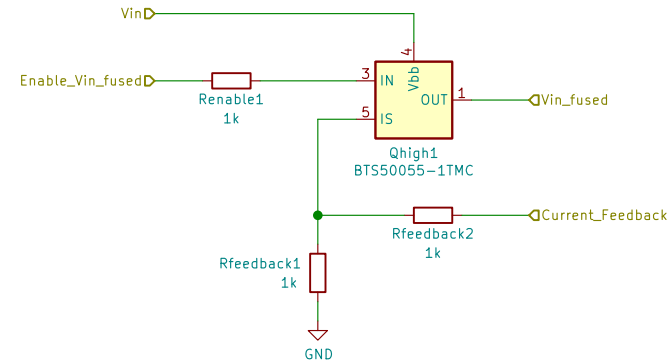
Classic Fuse (Option 1)

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 build 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.



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

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Sheet: /Input Protection/

File: input_protection.sch

Title: LightBoxNano – Input Protection

Size: A4

Date:

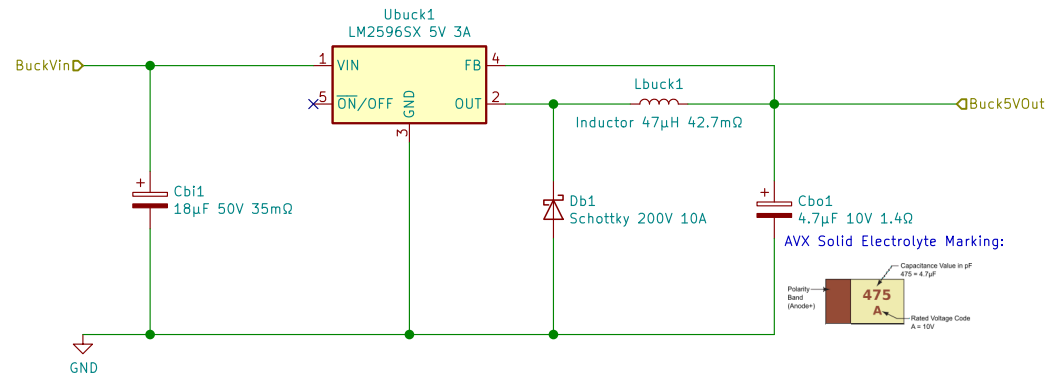
Rev:

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Id: 2/4

Use 5V Buck (Option 1)

The buck option is used when $V_{in} > 5.5V$ 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

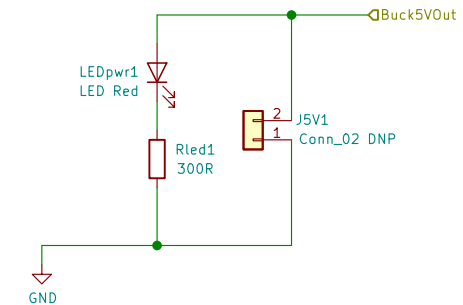
V_{out} p-p: 945.86mV

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

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

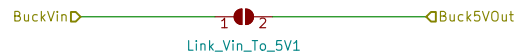
5V Output

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.



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

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

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Sheet: /Buck Converter/

File: buck_converter.sch

Title: LightBoxNano – Buck Converter

Size: A4

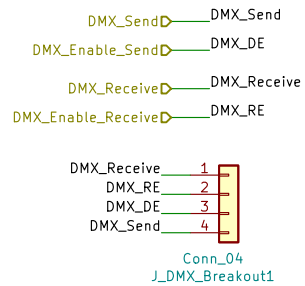
Date:

KiCad E.D.A. kicad (5.1.5)–2

Rev:

Id: 3/4

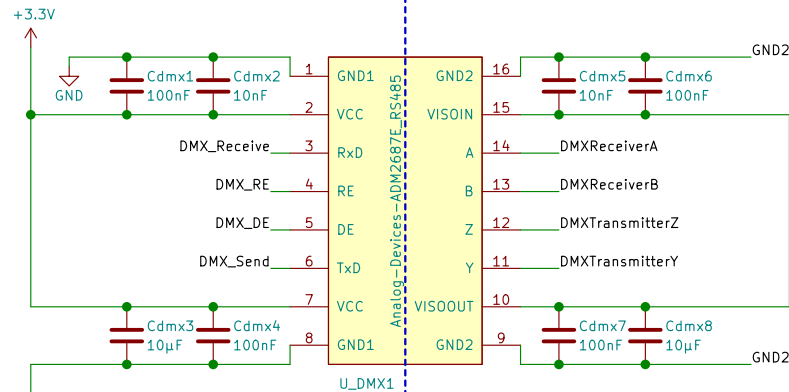
MCU Interface



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.

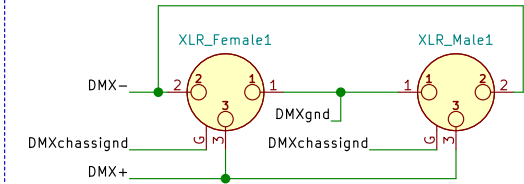
ADM2687E also isolates the power on the bus side by a built in DC to DC converter.



* 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>

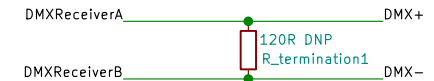
DMX Connectors

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



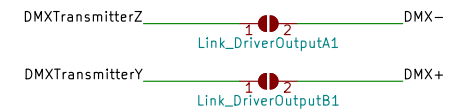
Terminator

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



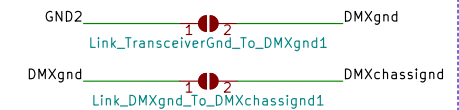
Link Tx to Rx (Optional)

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



Link Ground (Optional)

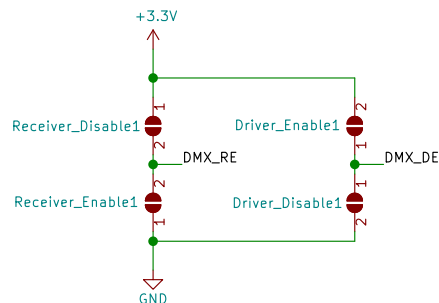
Options for linking ground and shield of XLR connectors with RS-485 side of the transceiver.



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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Sheet: /DMX512/

File: DMX512.sch

Title: LightBoxNano - DMX512

Size: A4

Date:

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Rev:

Id: 4/4