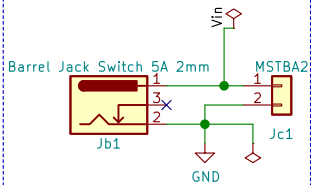


## Input Connectors

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

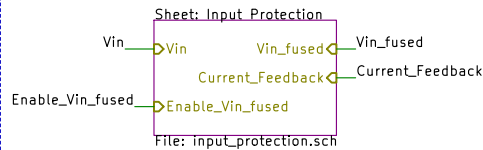
- Phoenix Contact MSTBA
- Barrel Jack 2x6.4mm



## Input Protection

There is 2 options for input protection:

- A classic fuse
- Highside High Current Power Switch

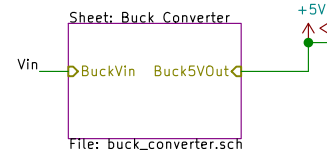


## 5V Buck

The 5V buck converter will feed the micro controller with 5V DC.

There is 2 options for 5V:

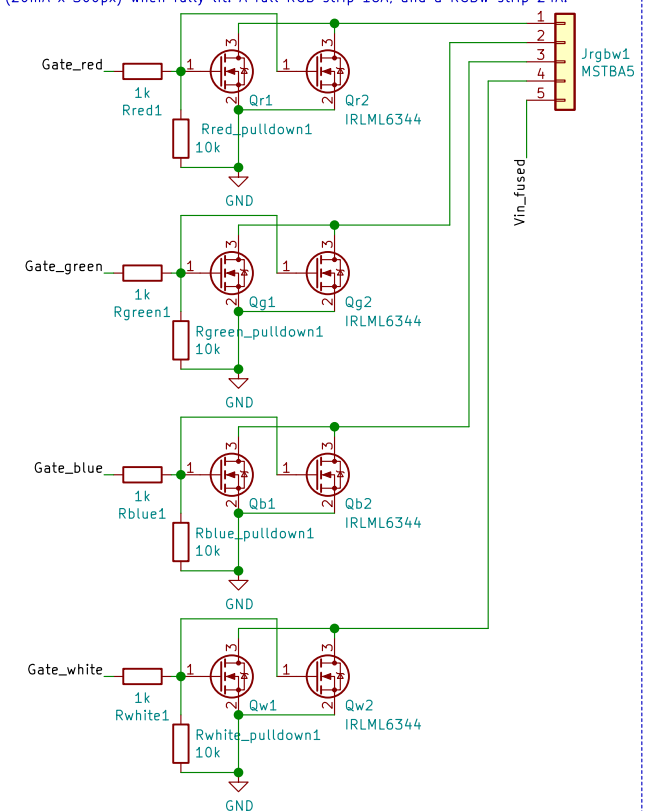
- Use buck to lower Vin to 5V
- Direct connection to 5V from Vin



## 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.

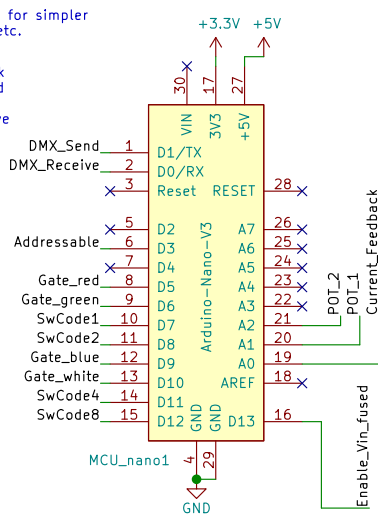


## MCU Option Nano (Option 1)

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

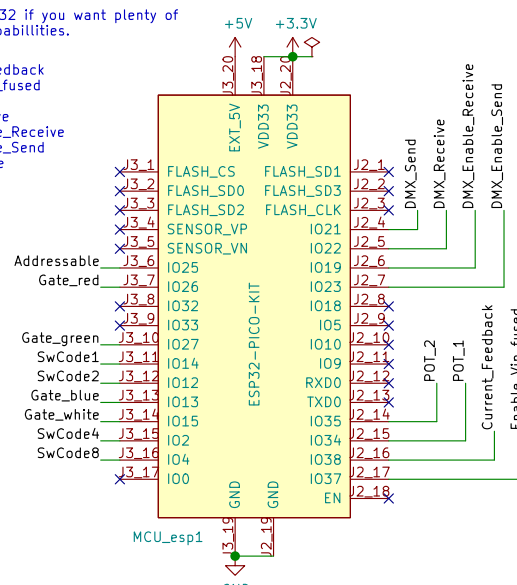


## MCU Option ESP32 (Option 2)

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

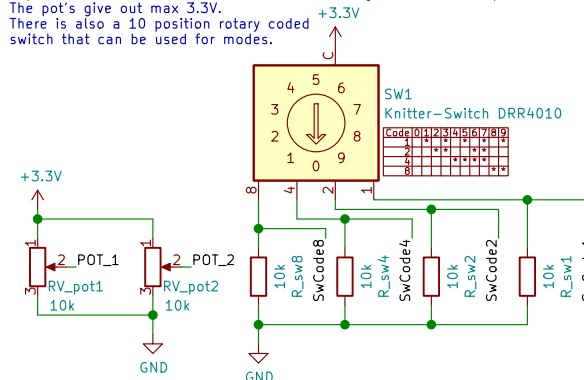
Ports:

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



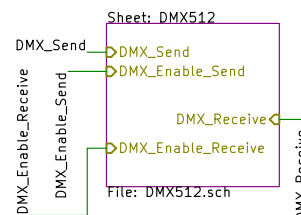
## User Interface (Optional)

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.

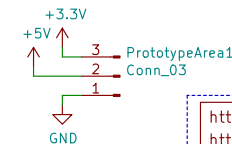


## DMX512 (Optional)

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



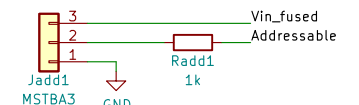
## Mechanical



- 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

**Tim Gremalm**

Sheet: /

File: LightBoxNano.sch

**Title: LightBoxNano – Main**

Size: A4

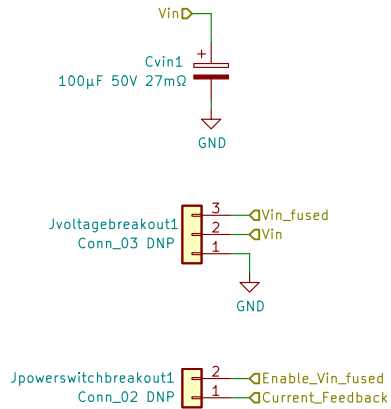
Date:

KiCad E.D.A. kicad (5.1.5)–2

Rev:

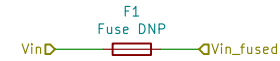
Id: 1/4

## Decoupling and Breakout Pin Header



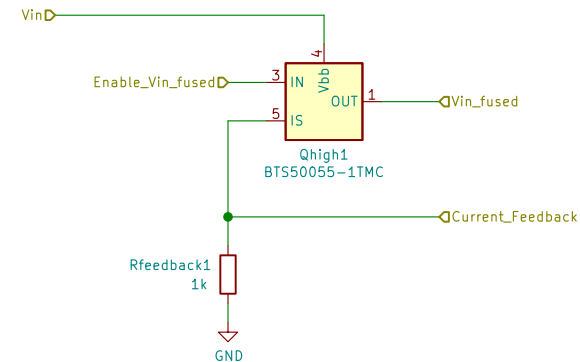
## Classic Fuse (Option 1)

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.



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

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

Sheet: /Input Protection/  
File: input\_protection.sch

**Title: LightBoxNano – Input Protection**

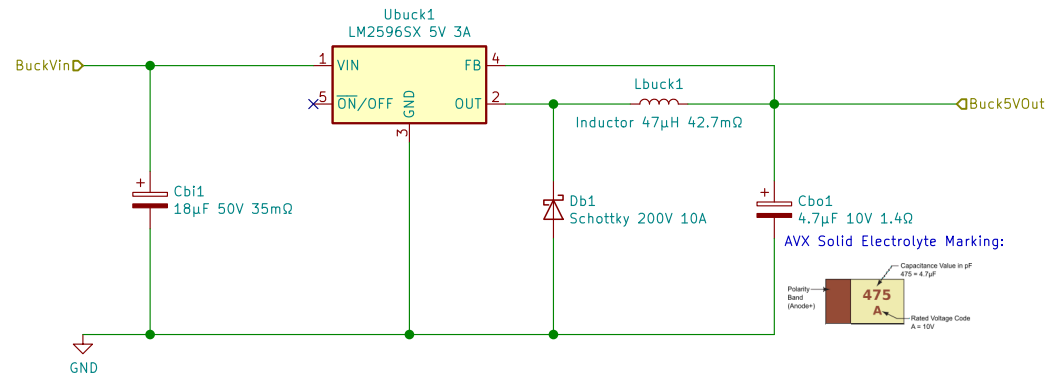
Size: A4  
KiCad E.D.A. kicad (5.1.5)–2

Date:  
Id: 2/4

Rev:

## 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

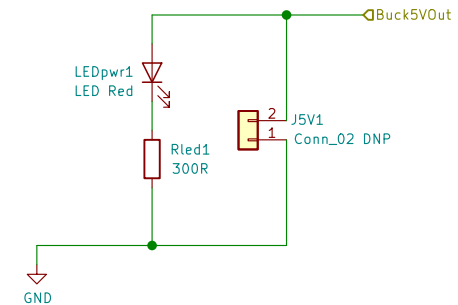
$V_{out\ p-p}$ : 945.86mV

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

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

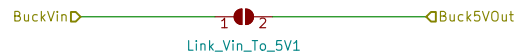
## 5V Output

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

**Tim Gremalm**

Sheet: /Buck Converter/

File: buck\_converter.sch

**Title: LightBoxNano – Buck Converter**

Size: A4

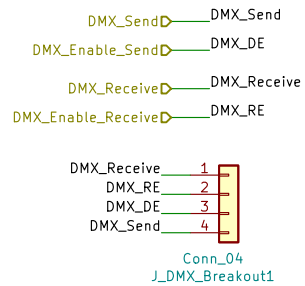
Date:

KiCad E.D.A. kicad (5.1.5)–2

Rev:

Id: 3/4

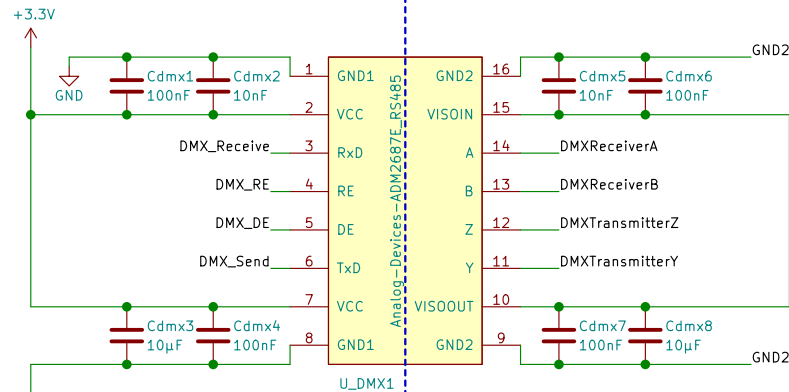
## MCU Interface



## 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.

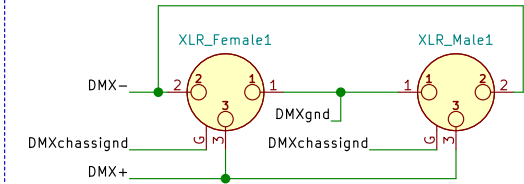
ADM2687E also isolates the power on the bus side by a built in DC to DC converter.



\* 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>

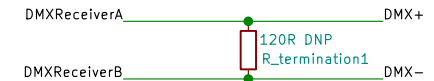
## DMX Connectors

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



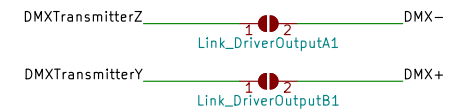
## Terminator

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



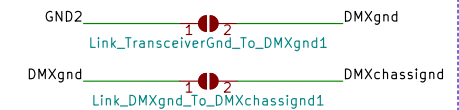
## Link Tx to Rx (Optional)

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



## Link Ground (Optional)

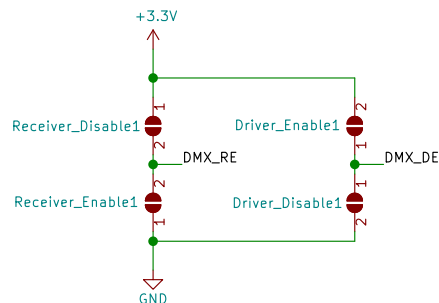
Options for linking ground and shield of XLR connectors with RS-485 side of the transceiver.



## 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.



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

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

Tim Gremalm

Sheet: /DMX512/

File: DMX512.sch

**Title: LightBoxNano - DMX512**

Size: A4

Date:

KiCad E.D.A. kicad (5.1.5)-2

Rev:

Id: 4/4