Program-controlled backlight of the Witcher figure series

The project of program-controlled backlighting of collector's figurines combines the practical use of arduino IOT modules to provide program-controlled lighting effects as well as the application of LED lighting.

Requirements for the final proposal:

- the ability to independently control the light intensity and color tone of the light in a group of 6 collector's figures,
- the selection of the backlight program mode must be possible by means of the IR remote control,
- the control module must be compactly integrated in the

protective cover,

- the power supply is solved by means of a small pulse source,
- the output power must be sufficient for backlighting consisting of 2 * 3 RGB leds with a consumption of about 10mA per segment (expandable to 9 or 12 collector figures.

The control electronics module consists of a pulse power supply with an output of approximately 30VA. The Arduino Mega module was used as a control module due to the sufficient number of programmable PWM outputs. The PWM output makes it possible to ensure the gradual switching on and off of the individual light strips placed in the packaging of the collector's figures.

## Problems in the implementation phase and their solutions

In the conceptual design phase, despite the selected module, I encountered the problem of insufficient number of PWM outputs, which I solved by introducing a two-state control for the red backlight component (this is a compromise solution).

Power amplification of the outputs is achieved by using Darlington transistors TIP120 purchased from e-bay.

Description of the technical solution of the backlight

The backlight of each figure consists of a pair of LED strips,

a part with warm white and an RGB strip. The pictures in the photo gallery show a more detailed link.
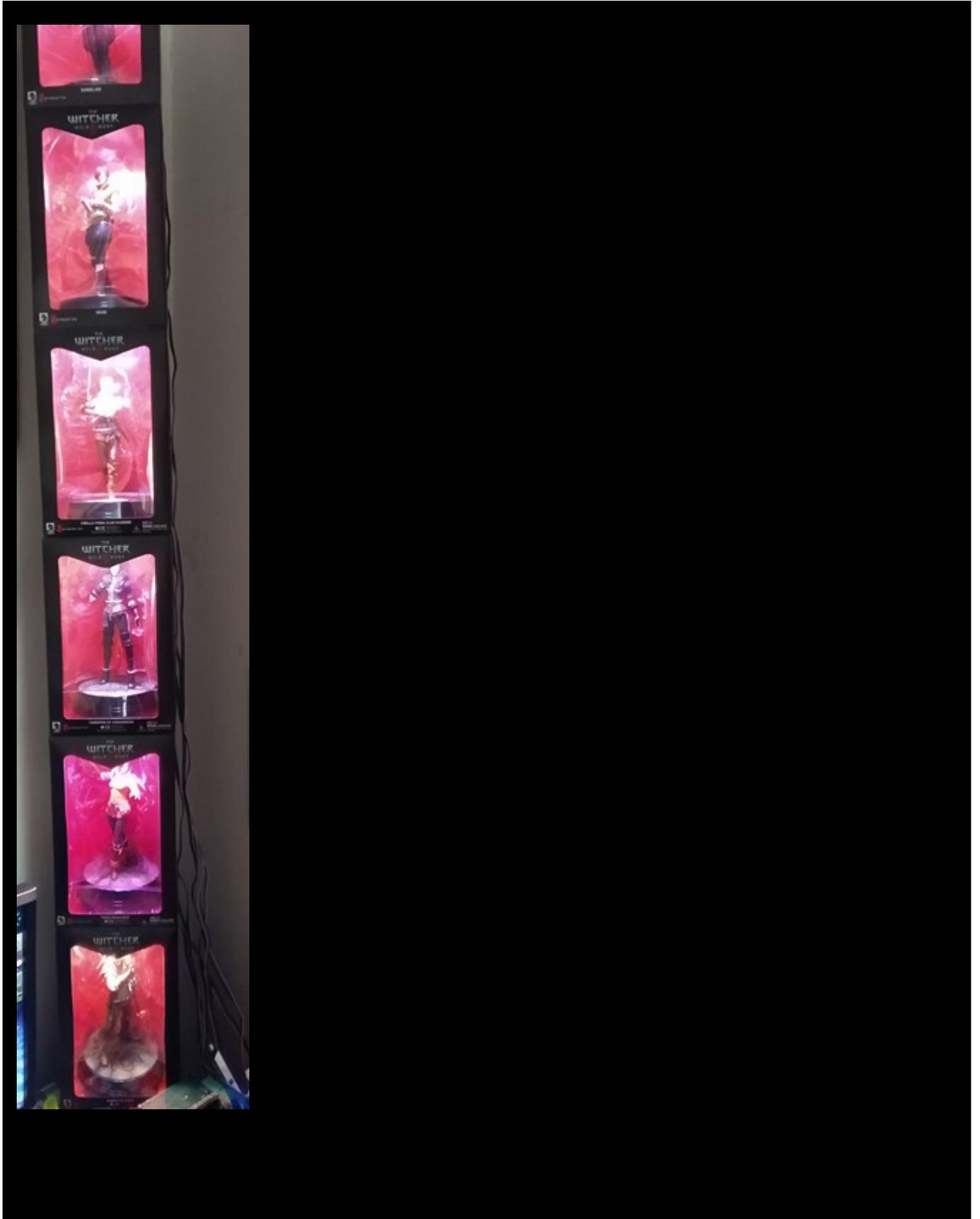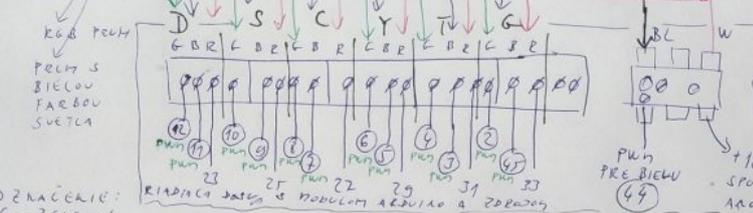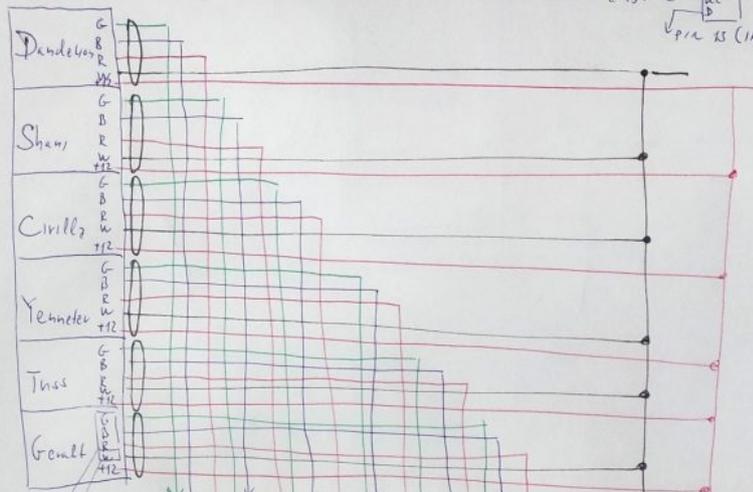
Block diagrams of electronics modules

The connection of the control module with the block of Darlington transistors is shown in the following figures (block interconnection diagrams).

ROZMIESTNENIE FIGÚROK

INFRA SENZOR – PIN 53
ARDUINO { GND
{ +5V

PIN 53 (IN)

FIXÁCIA GLEJACOU PIŠTOĽOU

BIELA
MODRÁ
ZELENÁ
ČERVENÁ

RGB PRUH

ČIERNA

WARM WHITE

OBV. VNÚTORNÉ ZAPOJENIE PODSVIETENIA

POUŽIL SOM 1 SEGMENT t.j. 3 LED

Dandelion
G
B
R
W

Shani
G
B
R
W
+12

Cirilla
G
B
R
W
+12

Yennefer
G
B
R
W
+12

Triss
G
B
R
W
+12

Geralt
G
B
R
W
+12

POSILNENIE VÝSTUPOV MODULU ARDUINO S TRANZISTOROM (DARLINGTONOU DVOJICOU) TIP 120 5A, max 60V

+12V

A (SPOLOČNÁ ANÓDA +12V → RGB SO SPOLOČNOU ANÓDOU !!!)

TIP 120

PIN ARDUINO

GND

RGB PRUH

PRUH S BIELOU FARBOU SVETLA

D   S   C   Y   TV   G
G B R G B R G B R G B R G B R G B R

BL   W

PIN ARDUINO

PWM PREBIELU

+12V SPOLOČNÁ ANÓDA

PWM 12   10   8   6   4   2
PWM   9   7   5   3   1
23   25   27   29   31   33

44
PWM

RIADIACA DOSKA S MODULOM ARDUINO A ZDROJOM

n PNP SMD
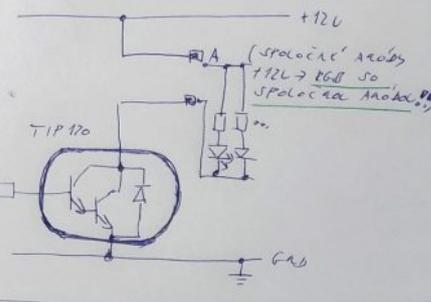
OZNAČENIE:
G – ZELENÁ
B – MODRÁ
R – ČERVENÁ
W – BIELA
BL – ČIERNA

PIN – 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 44, 45 – UMOŽŇUJÚ PWM S PRÍKAZOM AnalogWrite (PIN, 0÷255)
PINY – 23, 25, 27, 29, 31, 33 – KLASICKÉ DIGITÁLNE VÝSTUPNÉ PINY (NUTNÉ POUŽIŤ Z DÔVODU OBMEDZENÉHO POČTU PWM VÝSTUPOV :-()

POZNÁMKA: ZDROJ – IMPULZNÝ ZDROJ TIE 12V, 3A (PREKRÁČNE TREŤ SDVE POŽIADAVKU ODBER PRE JEDNU FIGÚRKU MAX 50mA → CELKOM 6×50 = 300mA, REZERVA DO BUDÚCNA)
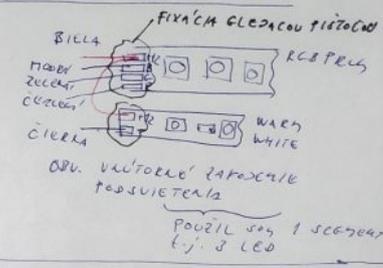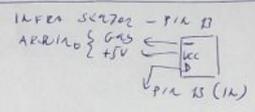
FIXÁCIA GLEDACOU PIŠTOĽOU

BIELA

MODRÝ
ZELENÝ
ČERVENÝ

ČIERNA

RGB PRÚŽ

WARM
WHITE

OBV. VNÚTORNÉ ZAPOJENIE
PODSVIETENIA

POUŽIL SOM 1 SEGMENT
t.j. 3 LED
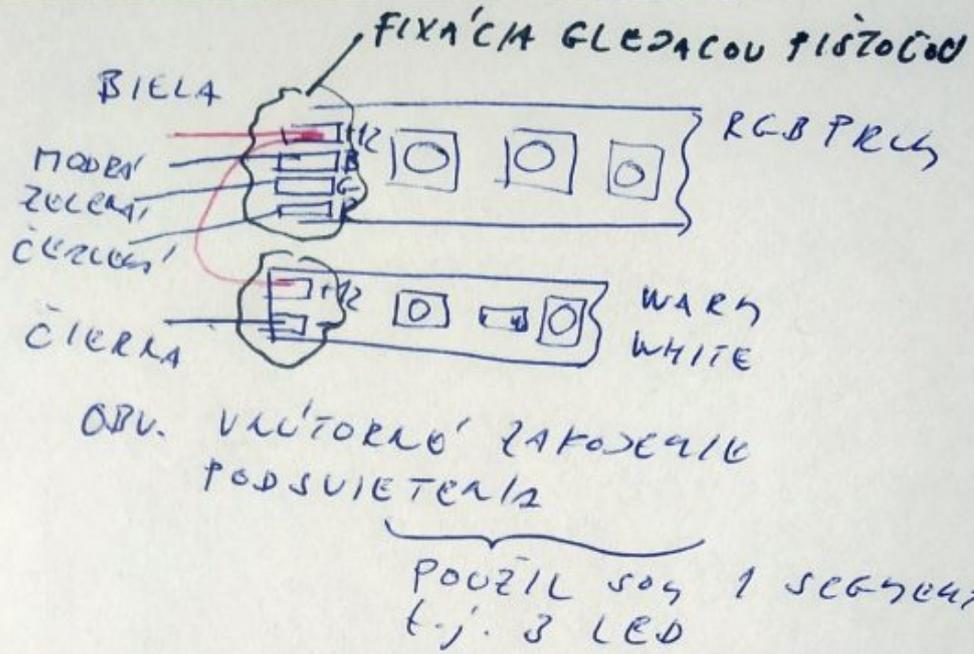
POSILNENIE VÝSTUPOV MODULU
ARDUINO S TRANZISTOROM
(DARLINGTONOVOU DVOJICOU) TIP 120
5A, MAX 60V

+12V

A   (SPOLOČNÉ ANÓDY
+12V → RGB SO
SPOLOČNOU ANÓDOU...)

TIP 120

PIN

ARDUINO

GND
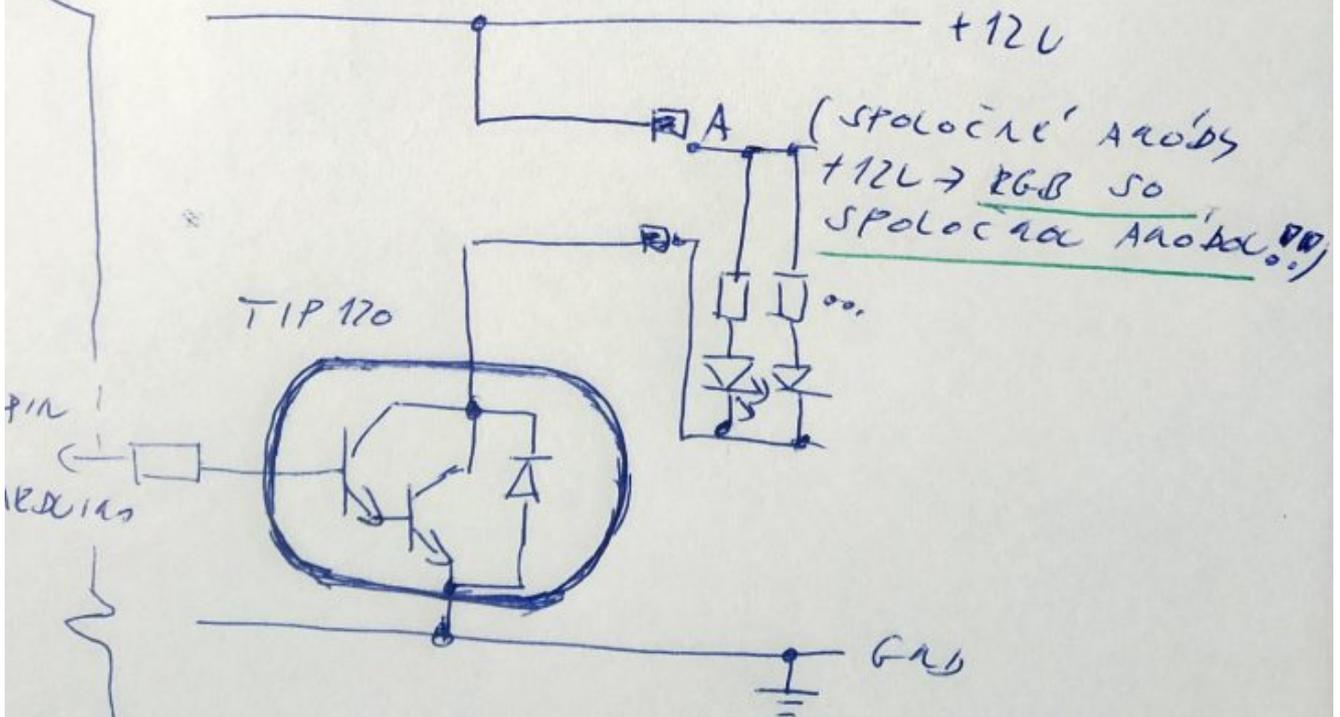
PODSVIETENIE ZBIERKY FIGÚROK ZAKLÍNAČ III – NAMA...

ROZMIESTNENIE FIGÚROK

INFRA SENZOR – PIN 13
ARDUINO { GND { +5V
PIN 13 (IN...
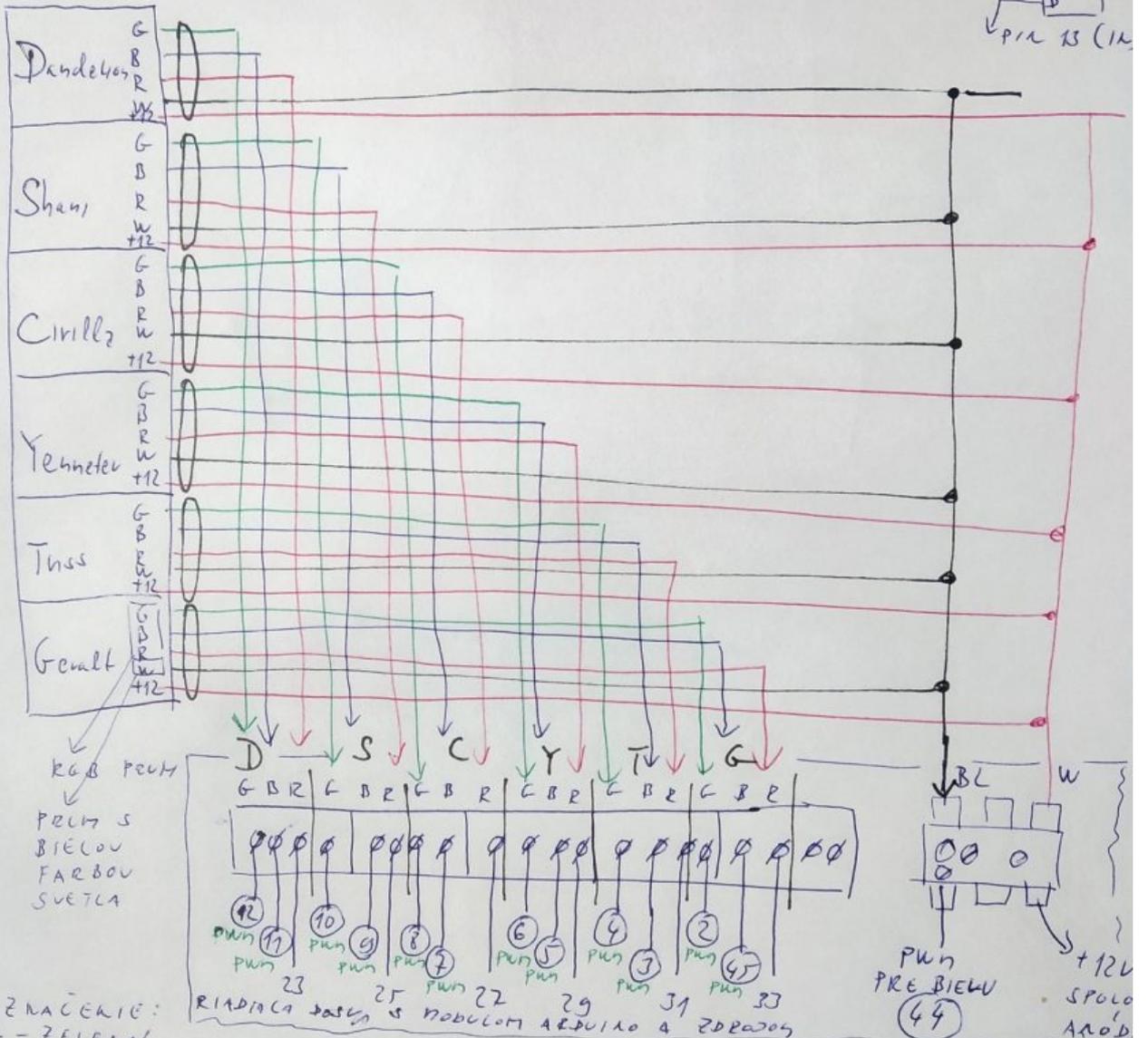
Dandelion — G B R W
Shani — G B R W +12
Cirilla — G B R W +12
Yennefer — G B R W +12
Triss — G B R W +12
Geralt — G B R W +12

RGB PECH
PECH S BIELOU FARBOU SVETLA

D — G B R | S — G B R | C — G B R | Y — G B R | T — G B R | G — G B R

PWM 12 PWM 11 (10) PWM 9 (8) PWM 7 (6) PWM 5 (4) PWM 3 (2) (45)
PWM 23   25   PWM 27   29   31   PWM 33

RIADIACA DOSKA S MODULOM ARDUINO A ZDROJOM

BL   W
PWM PRE BIELU (44)   +12V SPOLO... ANÓD...
PWM

OZNAČENIE:
G – ZELENÁ
B – MODRÁ
R – ČERVENÁ
W – BIELA
BL – ČIERNA

PINY – 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 44, 45 – UMOŽŇUJÚ PWM S P...
PINY – 23, 25, 27, 29, 31, 33 – KLASICKÉ DIGITÁLNE VÝSTU...
Z DÔVODU OBMEDZENÉHO ...

POZNÁMKA: ZDROJ – IMPULZNÝ ZDROJ PRE 12V 3A ...
ODBER PRE JEDNU FIGÚRKU MAX 50mA → (...
BUDÚCNA)

The procedure for 3D printing of the protective cover is shown in the following photo gallery.
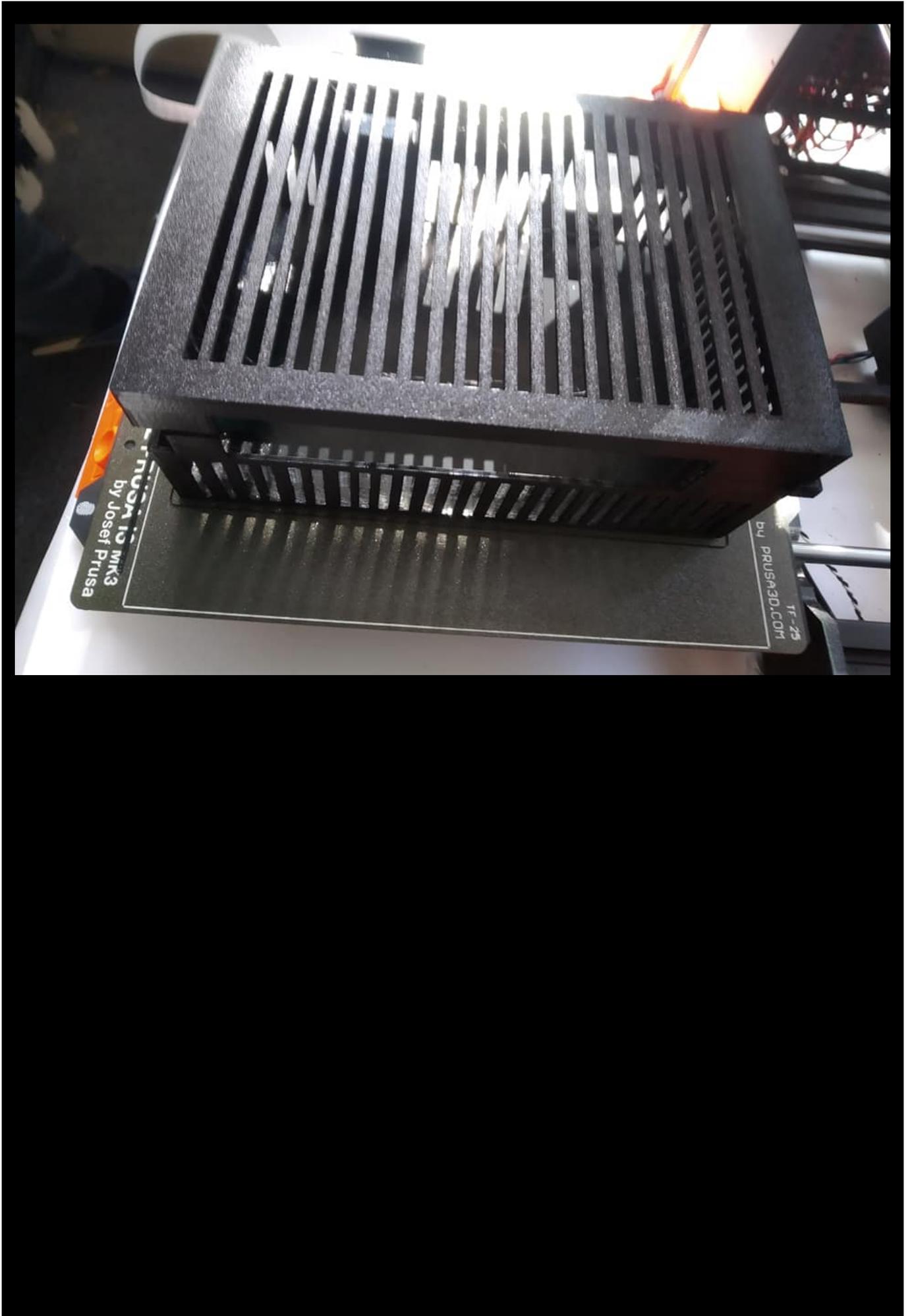
```
 Tom and bottom part aligned for testing purpousis
```

Demonstration of the control program

You can download one of the driver versions as an arduino sketch.

I firmly believe that this text will serve as inspiration for the backlighting of other collector's collections.