

MM6D Remote controlled switching device

Technical manual



Hardware version: v200612

Software version: v0.3

Technical manual version: v3.0

Issue date: 2021.04.02.

Draw number: 59/11/1

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	Technical manual				
Name:	Pozsár Zsolt			Date:	2021.04.02.

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I. Hardware

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Name:	Pozsár Zsolt			Date:	2021.04.02.

1. Technical data

Supply voltage:	230V AC	IP protection:	IP 55
Auxiliary voltage:	12V DC	Mass of cover:	termoplast (ABS)
Supply current:	max. 15 A	Communication:	Wireless LAN,
Isolation class:	Class I		TTL 3.3V serial port
Mechanical size:	300 x 220 x 120 mm	Get/set data:	via HTTP
		Administration:	via serial connection

2. General description

The device has four 12V DC inputs separated by an optocoupler and four relay outputs. These have a predefined function. Their status can be queried or set via HTTP. The power outputs can also be switched manually. The continuous operation of the microcontroller is ensured by a 3.7V 500mAh LiPoly battery, the alarm sensor is provided by a non-rechargeable 6F22 9V battery.

Load capacity of outputs:

Function	Voltage	Maximal load	Overcurrent protection	Watched?
Status lamp outputs	12V DC	6W	fuse	no
Lamp output	230V AC	460W	overcurrent breaker	yes
Ventilator output	230V AC	460W		yes
Heater output	230V AC	2.3 kW		yes

3. Schematic and PCB draws

The wiring diagrams of the device is shown in Annex 2, schematic and PCB draws are in Annex 3-7. You can download it as part of the complete documentation or in separate PDF, SVG and KiCAD formats from the developer/manufacturer's website. The Gerber files needed for production of boards are included in the package.

4. Other draws and documents

Documentation package contents draw of frontpage in ODG and PDF and drilling draw in DXF and PDF format.

5. Terms of use

Hardware documentation can be modified and/or redistributed under the Creative Commons 4.0 Attribution Non-Commercial (CC-BY-NC-4.0) License. You can read the full text of the license online. (Refer to Chapter III for references.)

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6. Look of device

a) Manuals

1. Mains voltage signal light (white LED)
2. Auxiliary voltage signal light (white LED)
3. Activity signal light (blue LED)
4. Manual mode signal light (yellow LED)
5. Alarm/General error signal light (red LED)
6. Protection error signal light (red LED)
7. Lamp on signal light (green LED)
8. Ventilator on signal light (green LED)
9. Heater on signal light (green LED)
10. Lamp manual mode switch (SW1)
11. Ventilator manual mode switch (SW2)
12. Heater manual mode switch (SW3)
13. Operation mode switch (SW4)

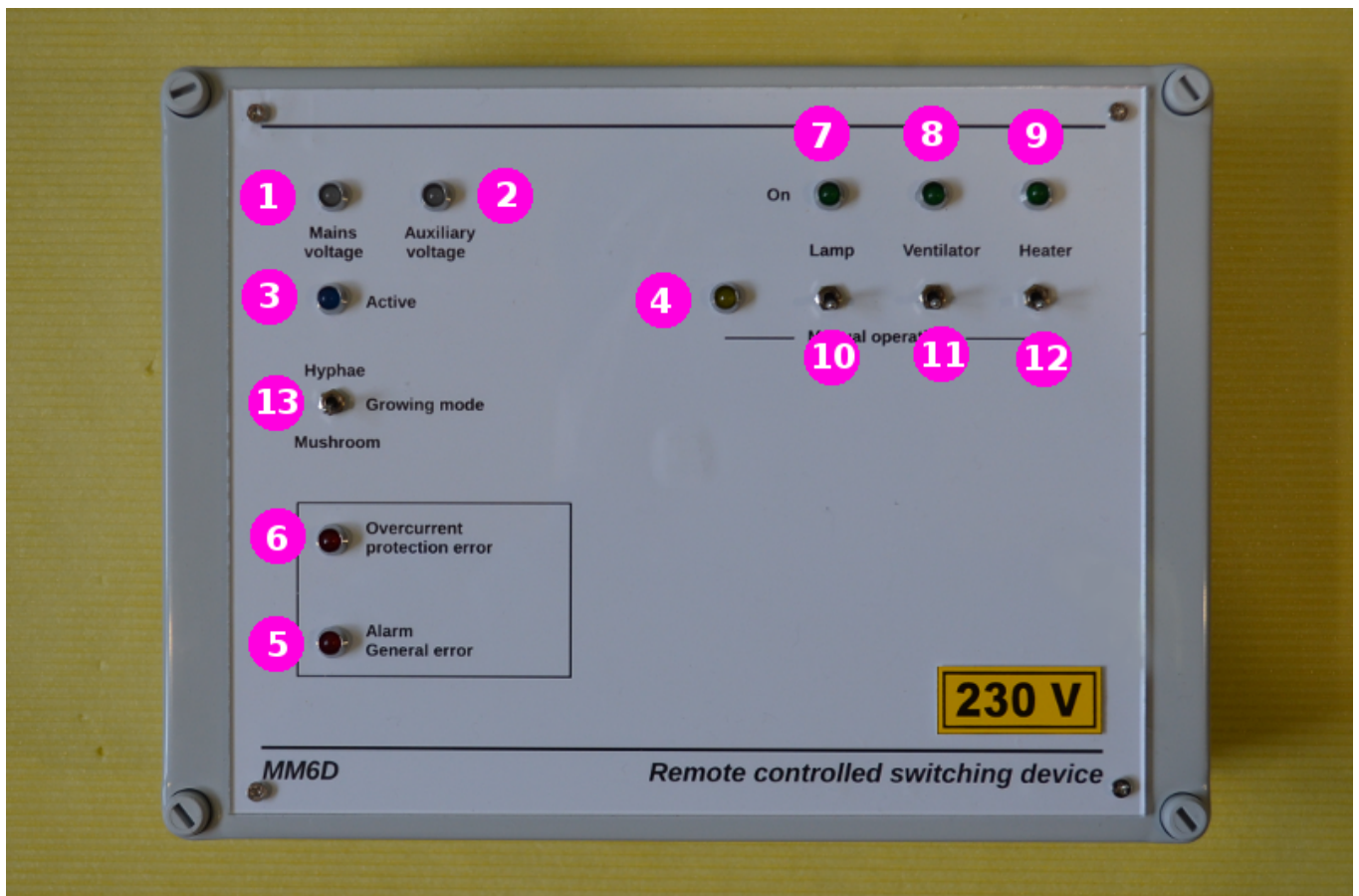


Figure 1: Manuals

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b) Internal construction

1. Main board
2. Display board
3. Accumulator of microcontroller (BT101)
4. Battery of alarm input (BT201)
5. Transformers
6. Fuse of transformers (F4)
7. Fuse of auxiliary voltage (F6)
8. Fuse of external status lamps (F5)
9. Relay of external status lamp (K4)
10. Relay of lamp output (K1)
11. Relay of ventilator output (K2)
12. Relay of heater output (K3)
13. Breaker of lamp output (F1)
14. Breaker of ventilator output (F2)
15. Breaker of heater output (F3)
16. Mains connectors (P1-3)
17. Console connector (P18)
18. Alarm sensor connectors (P13-14)
19. Status lamp connectors (P15-17)
20. Lamp connectors (P4-6)
21. Ventilator connectors (P7-9)
22. Heater connectors (P10-12)
23. Mounting holes

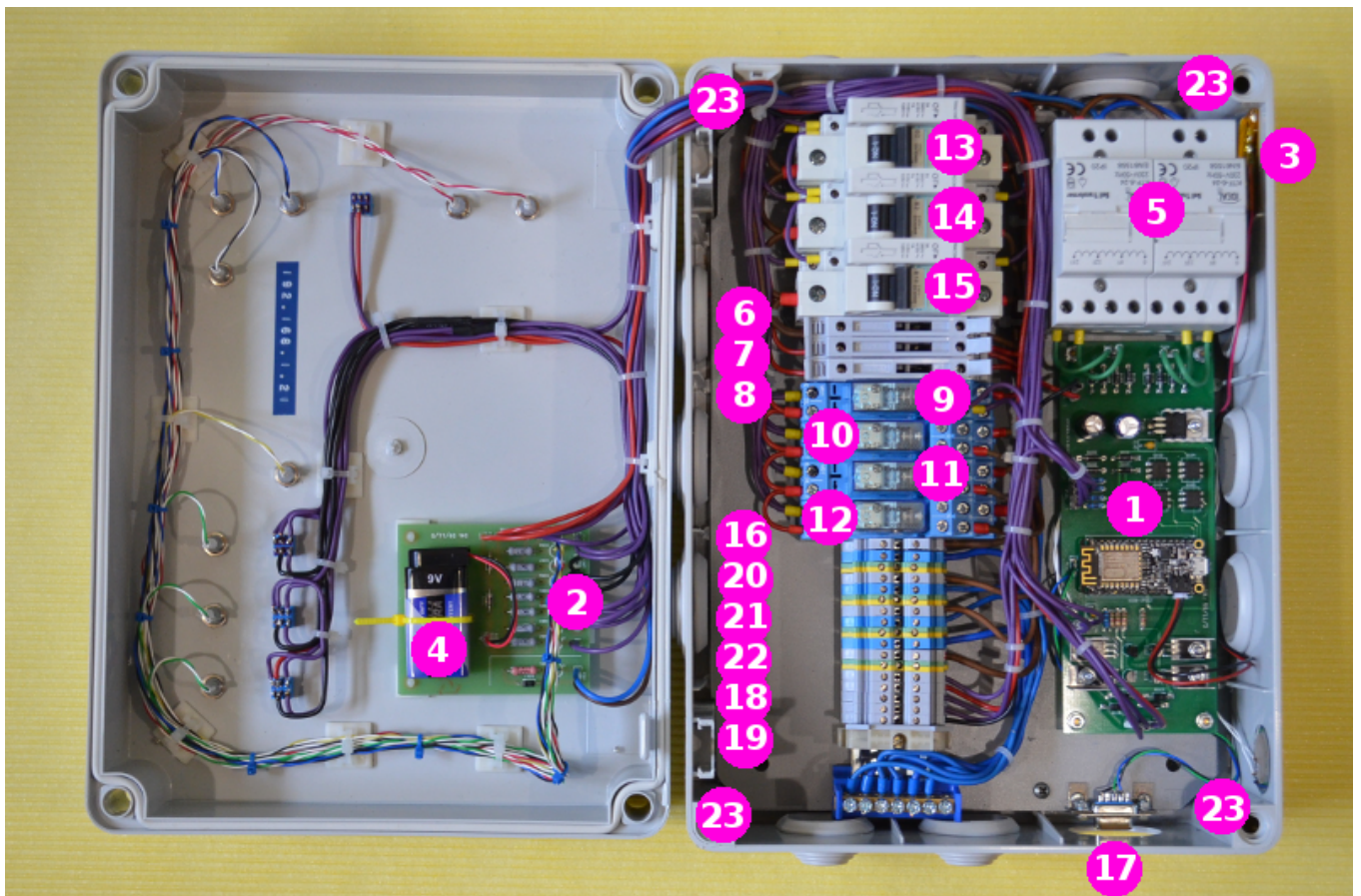


Figure 2: Internal construction

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c) Pinout of connectors

[illegible]

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7. Downloadable documentation

The complete documentation of the hardware in the .tar.gz format compressed file can be downloaded from the manufacturer's website or Github. (Refer to Chapter III for references.) Name of package is: *mm6d-hw-200612-3.0.tar.gz*.

Content of package - only important files:

mm6d-hw	KiCAD and LibreCAD files
cad_files	<i>display board</i>
display	project file
display.pro	schematic draw
display.sch	PCB draw
display.kicad_pcb	drilling file
display.drl	Gerber files
display-*.gbr	<i>drilling draws</i>
drilling	front of box
front.dxf	mounting plate
mountingplate.dxf	<i>main board</i>
mainboard	project file
mainboard.pro	schematic draw
mainboard.sch	PCB draw
mainboard.kicad_pcb	drilling file
mainboard.drl	Gerber files
mainboard-*.gbr	<i>internal wiring</i>
wiring	project file
wiring.pro	schematic draw
wiring.sch	documentation
documents	Technical manual
mm6d_en.pdf	drilling draws
drl_*.pdf	pcb draws
pcb_*.pdf	schematic draws
sch_*.pdf	frontpage
frontpage	pictures of frontpage
*	pictures
pictures	look of the unit
mm6d.jpg	PCB draws
pcb_*.svg	schematic draws
sch_*.svg	
LICENCE	terms of use
README.md	short description

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II. Software

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1. General description

The task of the program is to operate the hardware and communicate with the central controller.

The program displays initialization steps and error messages on the serial console.

When an HTTP request is received, the client's IP address and username argument are checked. If appropriate, read inputs or turn outputs on/off. After displays the result on the web interface. Incoming requests are indicated by the flashing of the blue activity LED.

2. Setup

You can find source file of software in *source* directory. Before installing the program, you need to set these values:

```
// settings
const char* wifi_ssid      = "";
const char* wifi_password  = "";
const String www_username  = "";
const String allowedaddress = "";
```

3. Installation

Use a micro USB cable and Arduino IDE software to install program to microcontroller. Before installation procedure unpack required libraries from *libraries* directory or clone from Github.com to *~/Arduino/libraries/*.

4. Using the device

The device operates automatically does not require any human intervention.

5. Check operation

You can check operation of controller on serial console, with a web browser (use index.html in *testpage* folder) or with MM7DTest command line utility (on FreeDOS or GNU/Linux). You can download this program from homepage or Github.

Connect to console via serial port

The console connector of the device and the RS-232 serial port of the computer must be connected by means of a level shifter adapter with a null modem cable. The level shifter adapter is required due to the different voltages of the logic levels (0 V / 3.3 V and -12 V / + 12 V).

The console connector of the device and the USB port of the computer must be connected using

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an Adafruit 954, FTDI TTL-232R-RPI or similar 3.3V serial / USB cable.

Connection parameters

speed (baudrate): 115 200 bps
data bits: 8
parity bit: no
stop bit: 1
flow control: no

Connect via linux terminal

Name of ports (device files):

RS-232 serial port: /dev/ttyS0, /dev/ttyS1, ...
serial/USB converter: /dev/ttyUSB0, /dev/ttyUSB1, ...

Make sure you are a member of the dialout group:

```
username@localhost$ id
```

If not, set up your group membership:

```
username@localhost$ sudo usermod -a -G dialout username
```

Connect with GNU Screen program:

```
username@localhost$ screen port_name 115200
```

Connect with Minicom program:

```
username@localhost$ minicom -b 115200 -o -D port_name
```

Connect with Windows terminal (Putty)

Name of ports:

RS-232 serial port: COM1, COM2, ...
serial port/USB converter: variable, see the device manager

Select the serial connection mode and communication port, set the speed and start the connection.

6. Terms of use

These programs are free softwares: you can redistribute them and/or modify them under the terms of the European Union Public License 1.1 version.

These programs are distributed in the hope that they will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. You can read the full text of the license online. (Refer to Chapter III for references.)

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7. Data set and retrieval via HTTP

URL	description	page type
Information pages		
http://192.168.1.11	Help page page	text/html
http://192.168.1.11/summary?uid=abcdef	Summary of status	text/html
http://192.168.1.11/log?uid=abcdef	System log	text/html
http://192.168.1.11/version	Device information	text/plain
Alarm		
http://192.168.1.11/get/alarm?uid=abcdef	Get alarm status	text/plain
http://192.168.1.11/set/alarm/off?uid=abcdef	Disable alarm	text/plain
Get status		
http://192.168.1.11/get/all?uid=abcdef	Get all status (except outputs)	text/plain
http://192.168.1.11/get/manualswitch?uid=abcdef	Get status of manual op. switches	text/plain
http://192.168.1.11/get/operationmode?uid=abcdef	Get status of operation mode switch	text/plain
http://192.168.1.11/get/protection?uid=abcdef	Get status of overcurrent protection	text/plain
http://192.168.1.11/get/heater?uid=abcdef	Get status of heater output	text/plain
http://192.168.1.11/get/lamp?uid=abcdef	Get status of lamp output	text/plain
http://192.168.1.11/get/ventilator?uid=abcdef	Get status of ventilator output	text/plain
Operation		
http://192.168.1.11/operation?uid=abcdef&a=0&h=0&l=0&v=0	Get all status (except outputs) and set status of outputs	text/plain
Manual operation		
http://192.168.1.11/set/all/off?uid=abcdef	Switch off all outputs	text/plain
http://192.168.1.11/set/heater/off?uid=abcdef	Switch off heater output	text/plain
http://192.168.1.11/set/heater/on?uid=abcdef	Switch on heater output	text/plain
http://192.168.1.11/set/lamp/off?uid=abcdef	Switch off lamp output	text/plain
http://192.168.1.11/set/lamp/on?uid=abcdef	Switch on lamp output	text/plain
http://192.168.1.11/set/ventilator/off?uid=abcdef	Switch off ventilator output	text/plain
http://192.168.1.11/set/ventilator/on?uid=abcdef	Switch on ventilator output	text/plain

Arguments:

uid: user ID
 a: disable alarm (0/1)
 h: switch off/on heater output (0/1)
 l: switch off/on lamp output (0/1)
 v: switch off/on ventilator output (0/1)

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MM6D * Remote controlled switching device

IP address: 192.168.1.11
MAC address: EC:FA:BC:C1:0A:72
Hardware serial number: 2011561
Software version: v0.3

Pages:

Information pages		
http://192.168.1.11	This page	text/html
http://192.168.1.11/summary?uid=abcdef	Summary of status	text/html
http://192.168.1.11/log?uid=abcdef	System log	text/html
http://192.168.1.11/version	Device information	text/plain
Alarm		
http://192.168.1.11/get/alarm?uid=abcdef	Get alarm status	text/plain
http://192.168.1.11/set/alarm/off?uid=abcdef	Restore alarm status	text/plain
Get data		
http://192.168.1.11/get/all?uid=abcdef	Get all status	text/plain
http://192.168.1.11/get/operationmode?uid=abcdef	Get status of operation mode switch	text/plain
http://192.168.1.11/get/manualswitch?uid=abcdef	Get status of manual mode switches	text/plain
http://192.168.1.11/get/protection?uid=abcdef	Get status of overcurrent protection	text/plain
http://192.168.1.11/get/lamp?uid=abcdef	Get status of lamp output	text/plain
http://192.168.1.11/get/ventilator?uid=abcdef	Get status of ventilator output	text/plain
http://192.168.1.11/get/heater?uid=abcdef	Get status of heater output	text/plain
Operation		
http://192.168.1.11/operation?uid=abcdef&a=0&h=0&l=0&v=0	Get all data and set status of outputs	text/plain
Manual operation		
http://192.168.1.11/set/all/off?uid=abcdef	Switch off all outputs	text/plain

Figure 3: Start page

```
pozsarzs@karak: ~
MM6D * Remote controlled switching device * v0.3
Copyright (C) 2020-2021 Pozsar Zsolt <pozsar.zsolt@szerafingomba.hu>
Serial number of hardware: 2011561
* Initializing GPIO ports...done.
* Connecting to wireless network.....done.
  device MAC address: EC:FA:BC:C1:0A:72
  my IP address:      192.168.1.11
  subnet mask:       255.255.255.0
  gateway IP address: 192.168.1.1
* Starting webserver...done.
* HTTP request received from: 192.168.1.8.
  get all data, restore alarm and set outputs
  get all data
  status:
    alarm:           0
    operation mode:   1
    manual switch:    0
    protection:       0
* HTTP request received from: (IP unset).
* E05: Page not found!
```

Figure 4: Serial console with messages

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8. Downloadable software package

The software package in .tar.gz format compressed file can be downloaded from the manufacturer's website or Github. (Refer to Chapter III for references.)

Name of package is: *mm6d-sw-0.3.tar.gz*.

Content of package - only important files:

mm6d-sw	
— documents	documentation
*	documentation
— libraries	external libraries
*.tar.gz	libraries in archive file
clone.bat	clone batch file
clone	clone script
— testpage	test page
index.html	startpage
— source	source code
mm6d.ino	source code
— LICENCE	terms of use
— README.md	short description

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III. Related links

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1. Hardware

Full package	http://www.szerafingomba.hu/equipments/mm6d/mm6d-hw-200612-3.0.tar.gz
Download from Github	http://github.com/pozsarzs/mm6d-hw.git
Technical manual	http://www.szerafingomba.hu/equipments/mm6d/technical-manual-200612-0.3-3.0-en.pdf

Schematic and PCB draws (PDF):

Schematics	http://www.szerafingomba.hu/equipments/mm6d/sch_mm6d-1.pdf http://www.szerafingomba.hu/equipments/mm6d/sch_mm6d-2.pdf http://www.szerafingomba.hu/equipments/mm6d/sch_mm6d-3.pdf
PCB main board	http://www.szerafingomba.hu/equipments/mm6d/pcb_mm6d-1-sold.pdf http://www.szerafingomba.hu/equipments/mm6d/pcb_mm6d-1-comp.pdf http://www.szerafingomba.hu/equipments/mm6d/pcb_mm6d-1-silk.pdf
PCB display board	http://www.szerafingomba.hu/equipments/mm6d/pcb_mm6d-2-sold.pdf http://www.szerafingomba.hu/equipments/mm6d/pcb_mm6d-2-silk.pdf

2. Software

Software package	http://www.szerafingomba.hu/software/mm6d/mm6d-sw-0.3.tar.gz
Download from Github	http://github.com/pozsarzs/mm6d-sw.git

3. Terms of use

CC-BY-NC-4.0	https://creativecommons.org/licenses/by-nc/4.0/legalcode
CC-BY-NC-4.0	https://creativecommons.org/licenses/by-nc/4.0/
EURL v1.2	https://eupl.eu/1.2/en/

4. Developer and manufacturer

Homepage	https://www.szerafingomba.hu
E-mail	info@szerafingomba.hu

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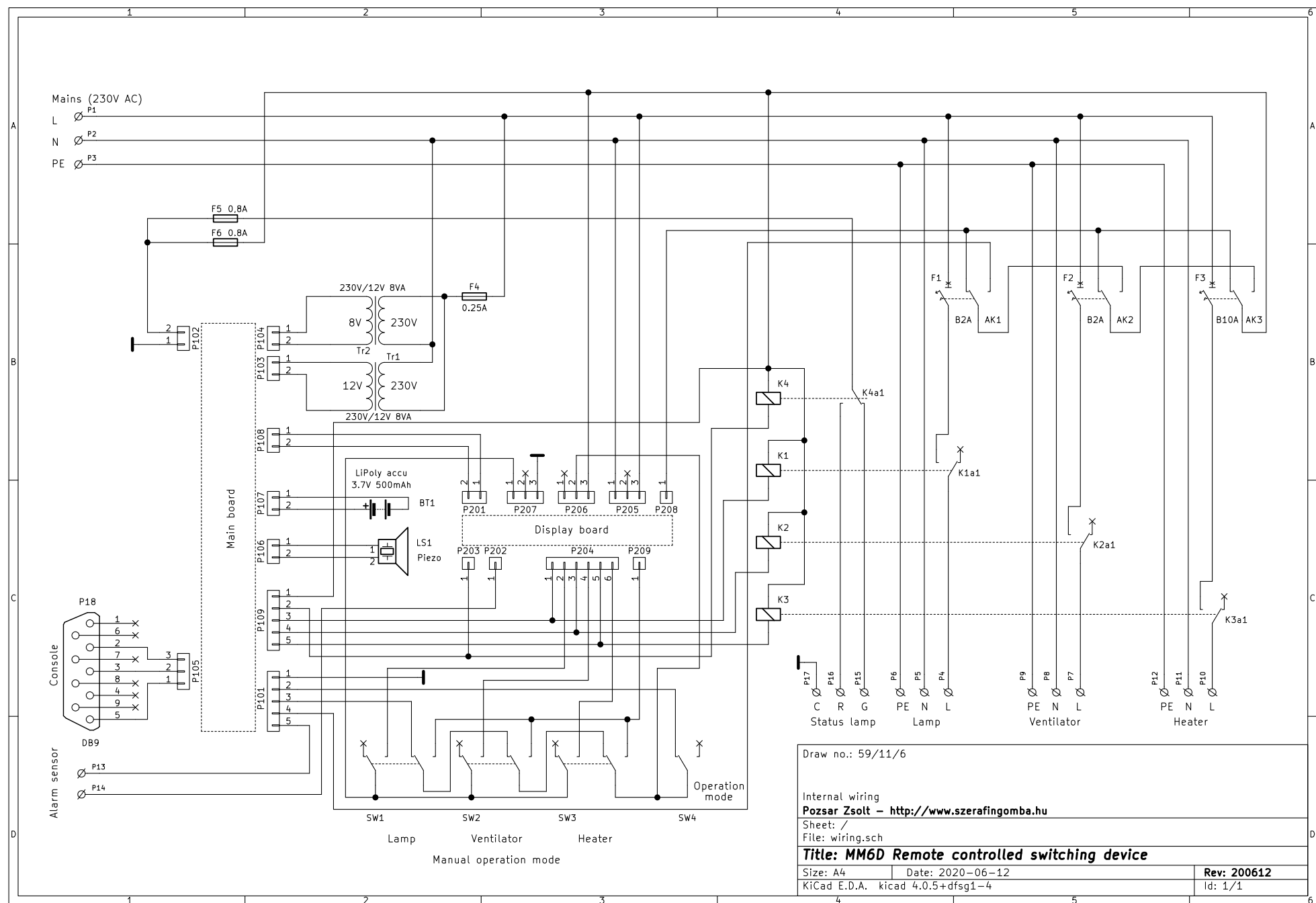
IV. Annexes

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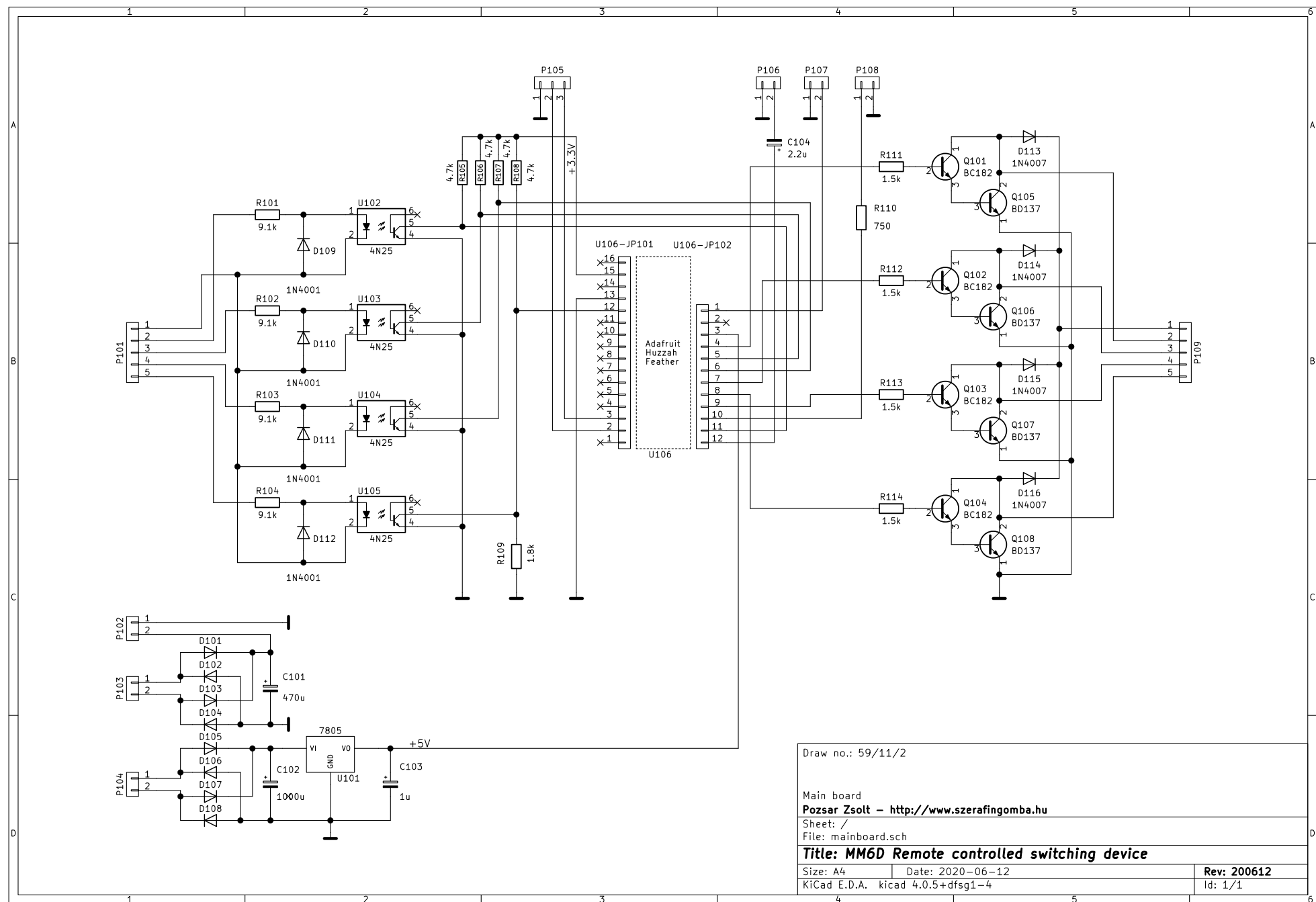
Content

1. Error messages and signs
2. Internal wiring
3. Schematic of main board
4. PCB solder side of main board
5. PCB component side of main board
6. PCB silkscreen of main board
7. Schematic of display board
8. PCB solder side of display board
9. PCB silkscreen of display board

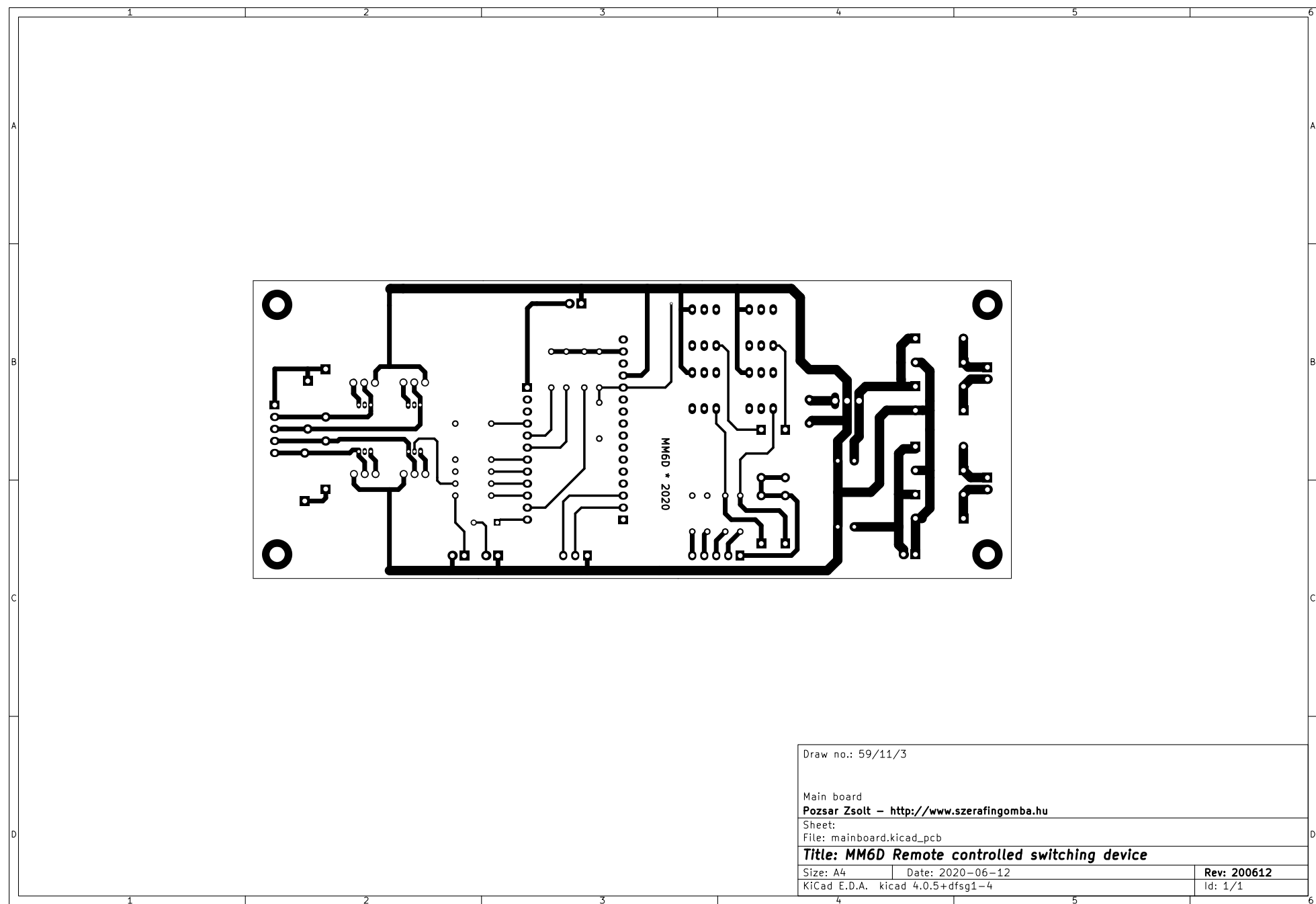
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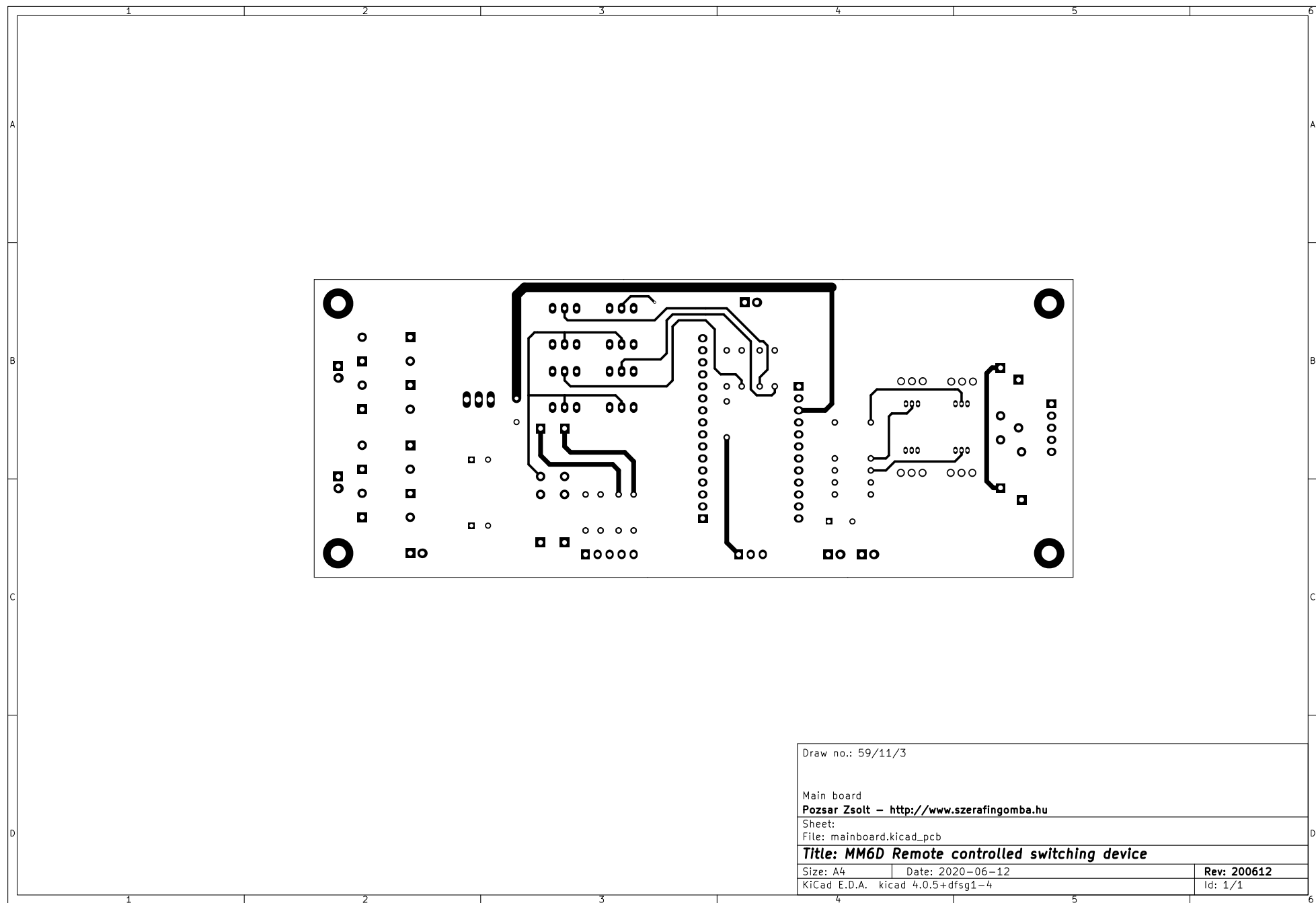
Annex 2: Internal wiring



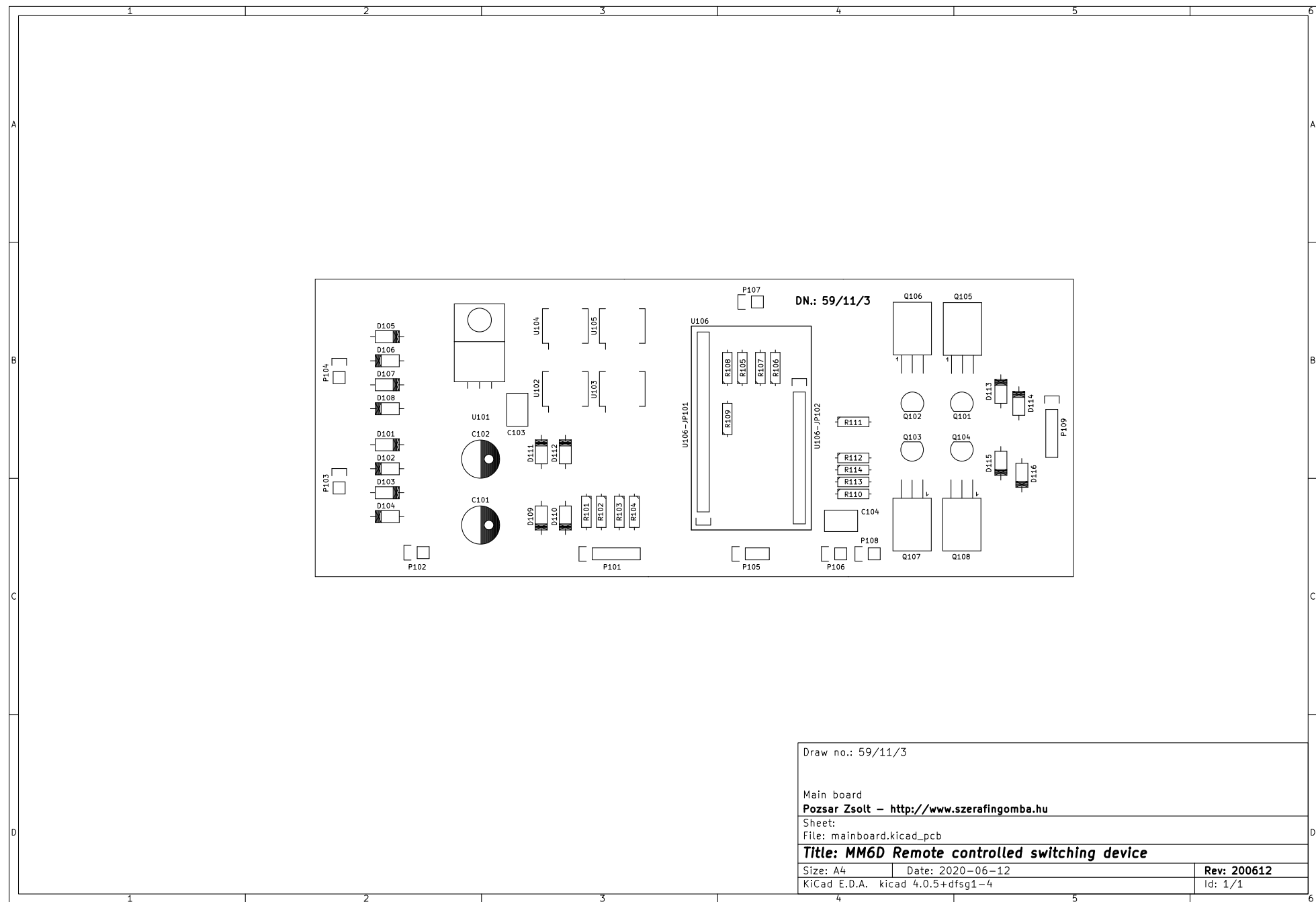
Annex 3: Schematic of main board



Annex 4: PCB solder side of main board

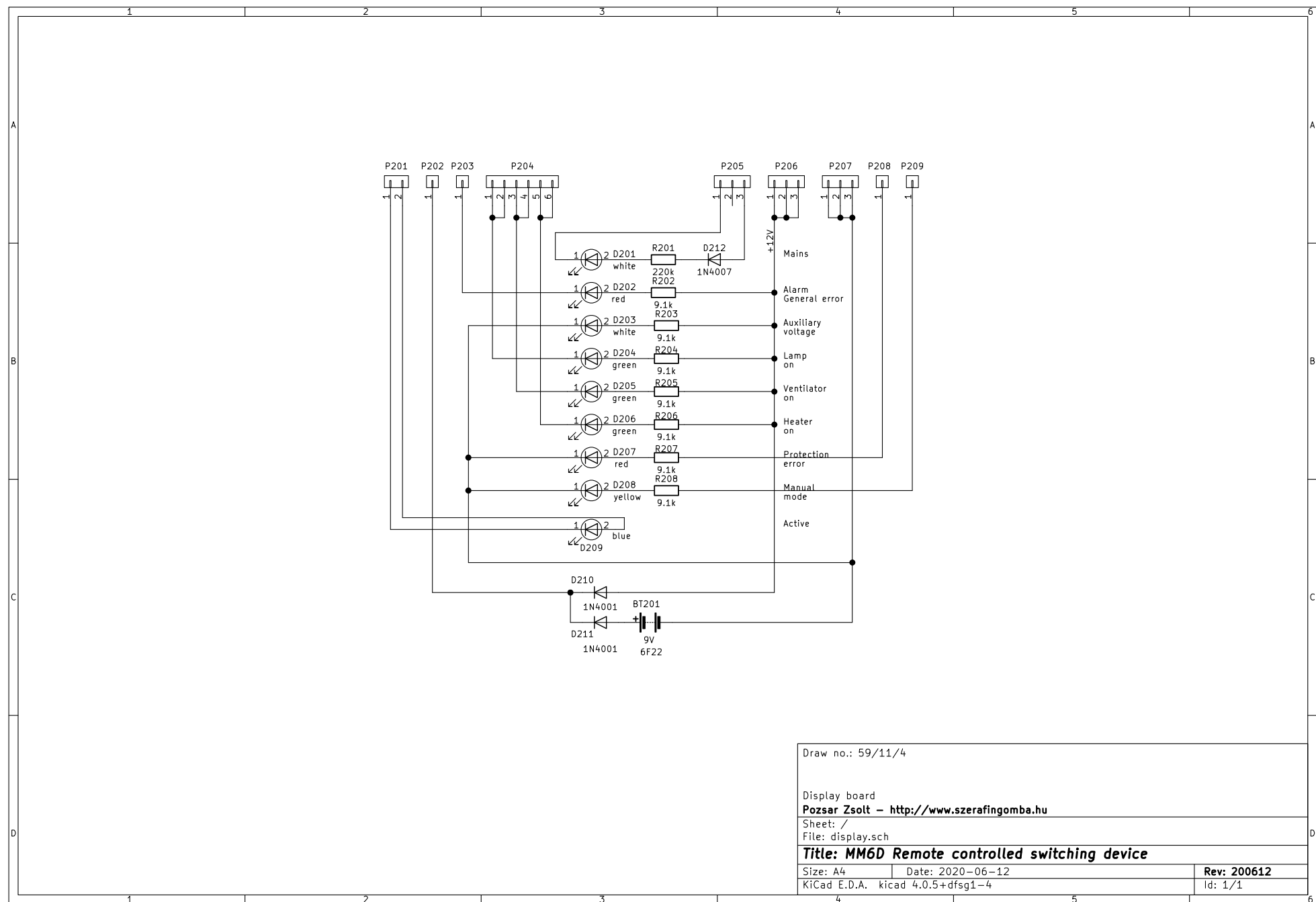


Annex 5: PCB component side of main board



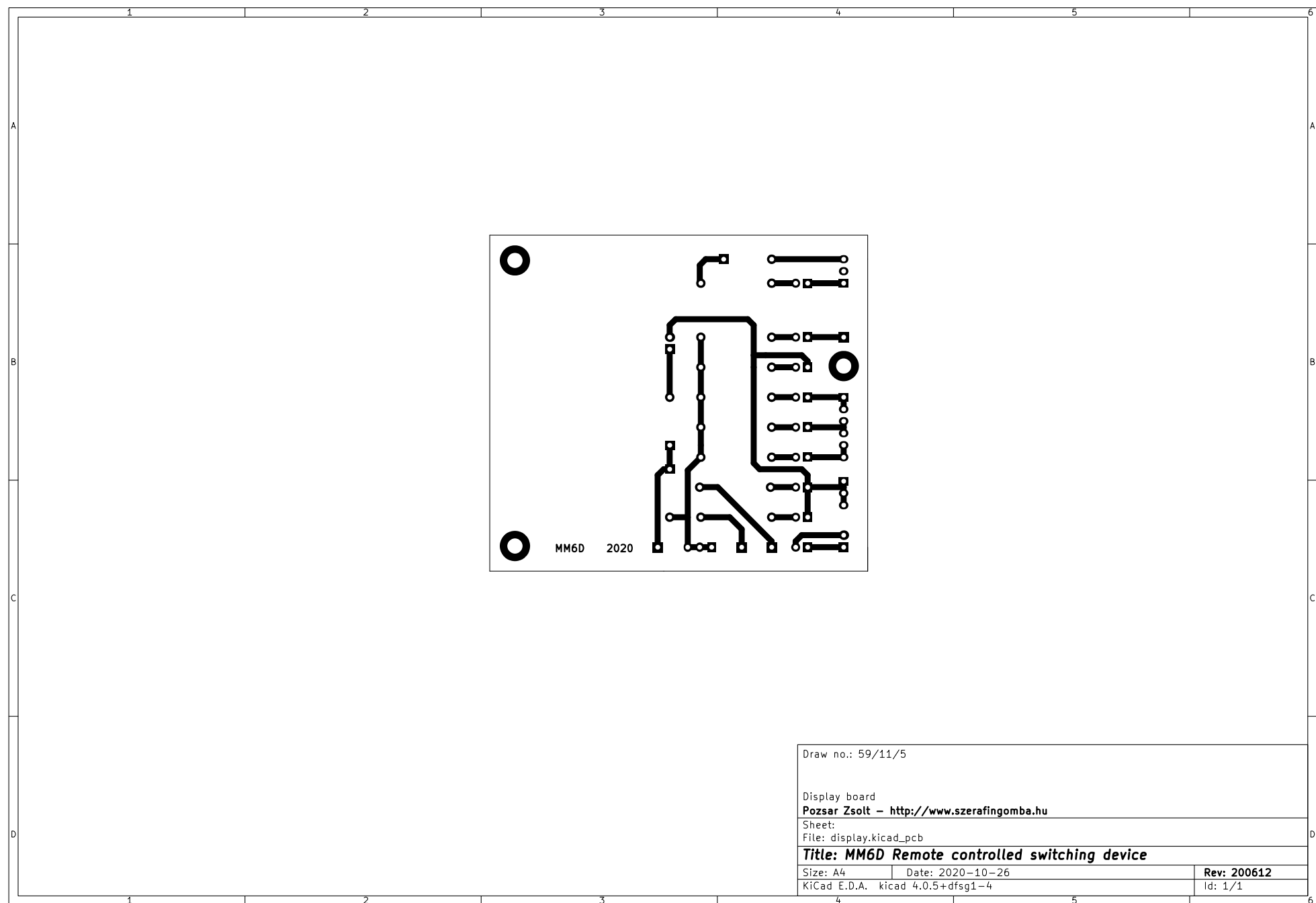
Draw no.: 59/11/3		
Main board		
Pozsar Zsolt – http://www.szerafingomba.hu		
Sheet:		
File: mainboard.kicad_pcb		
Title: MM6D Remote controlled switching device		
Size: A4	Date: 2020-06-12	Rev: 200612
KiCad E.D.A. kicad 4.0.5+dfsg1-4		Id: 1/1

Annex 6: PCB silkscreen of main board



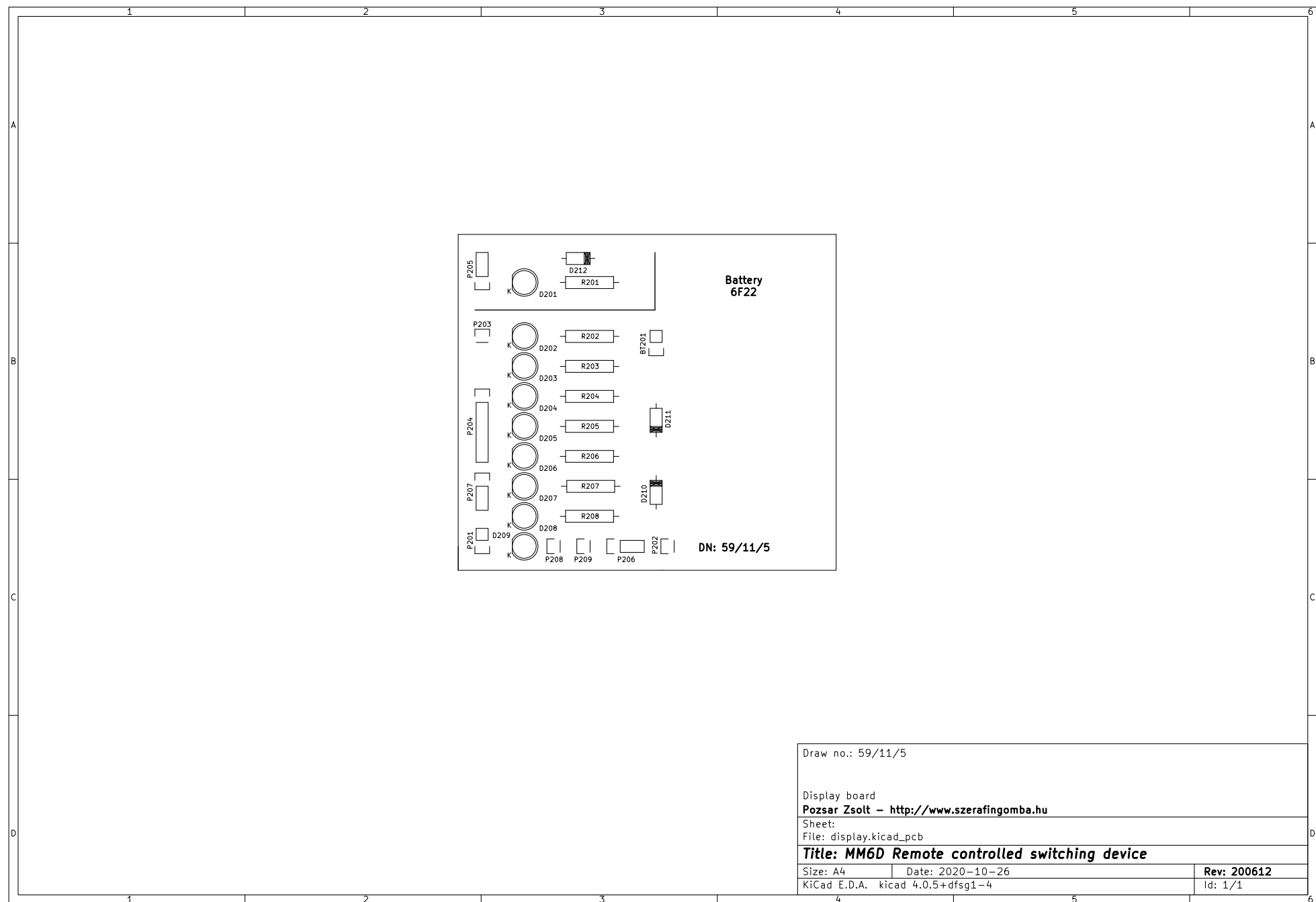
Draw no.: 59/11/4		
Display board		
Pozsar Zsolt – http://www.szerafingomba.hu		
Sheet: /		
File: display.sch		
Title: MM6D Remote controlled switching device		
Size: A4	Date: 2020-06-12	Rev: 200612
KiCad E.D.A. kicad 4.0.5+dfsg1-4		Id: 1/1

Annex 7: Schematic of display board



Draw no.: 59/11/5		
Display board		
Pozsar Zsolt – http://www.szerafingomba.hu		
Sheet:		
File: display.kicad_pcb		
Title: MM6D Remote controlled switching device		
Size: A4	Date: 2020-10-26	Rev: 200612
KiCad E.D.A. kicad 4.0.5+dfsg1-4		Id: 1/1

Annex 8: PCB solder side of display board



Annex 9: PCB silkscreen of display board