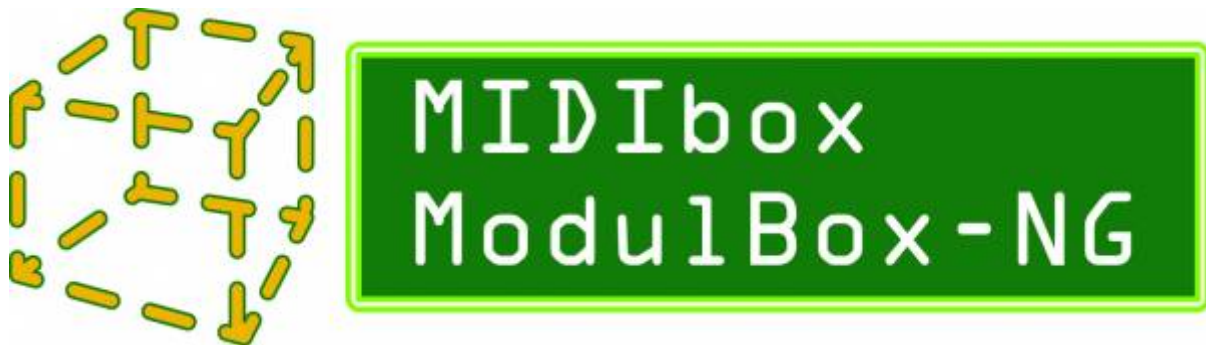


# MB-ModulBox NG



*Under Heavy Developpment @ 9/8/2016*

## Introduction

The MB-Modulbox-NG Project is a modern version of the **Modulbox** project .

In short words, it's a **Eurorack-size compliant Modular MIDibox Control Surface** based upon MB-NG.

From a **Main Part**,small modules would be chained to **Build the custom-sized control surface of your dreams by choosing the MIDI controls you want.**

Main part would also allow **Access to Menus for configuring and saving things on SD Card** , and optionnal **External Analog Inputs/Outputs** to trigger from external sensors and/or drive your analog synth.

**Each Small Module will have a Different type of Interaction** and will include Digital Shift Registers and/or Multiplexers For Analog lines . Then modules would be chained one to another up to main part.

Modules **Chain Connectors will be 2.54mm dual row pinheader** (Molex?) and will carry Digital/Analog bus lines and Current supply. PSU Main input will be on main part PCB.

## Main Part Features

1. **STM32F4 Board**
2. **Standard Control Surface** with 6 Tactile switches, Push - Encoder ,**OLED** Graphical screen
3. **SD Card Slot** (+USB in?)
4. **2xMIDI IN + 2xMIDI OUT 2.5mm jack Plugs**
5. **Optionnal 16x3.5mm jacks** for external **Analog Ins/Analog Outs** with External interfaces for expanding.

## Community users working on it

- **Ksir** - Modulbox Original Designer - PCB Design - Programming
- **Psykhaze** - Documentation - Frontpanel design - PCB Design - Programming
- **Latigid On** - PCB Design -Troubleshooting Help

## Getting Involved ?

Just let a Private message on the forum to users already involved

## Software Tools used

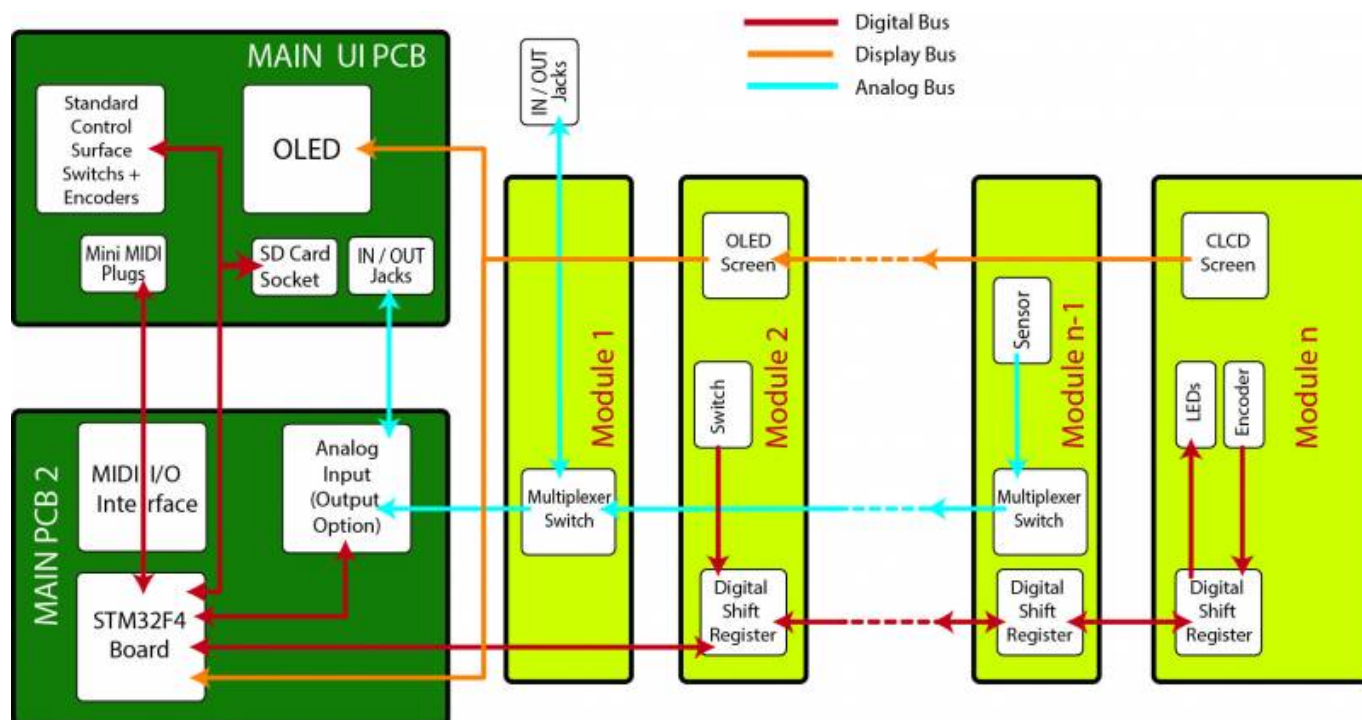
- **Inkscape Vector Drawing Software** - Front panel Concept Drawing
- **KiCAD PCB** - PCB Design | **KiCAD Librairies**
- **FreeCAD 3D Technical Drawing** - Case Design
- **Code::Blocks Integrated Development environment** - GUI Software - MIOS programming
- **JUCE** - Cross-Platform Audio/MIDI/GUI Library

## PCB process

1. Parts List – Datasheets Gathering – Reference selection
2. KiCAD Library
3. Schematics
4. FootPrint Creation / Association to schematics
5. Netlist Export
6. Make Pcb routing - Put pinheader/jumper to Strategic Troubleshooting Places.

## Architecture

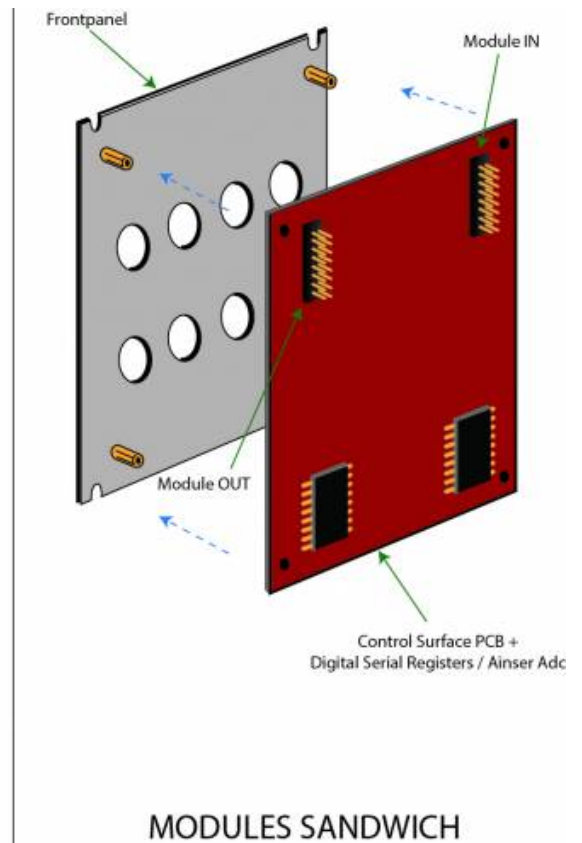
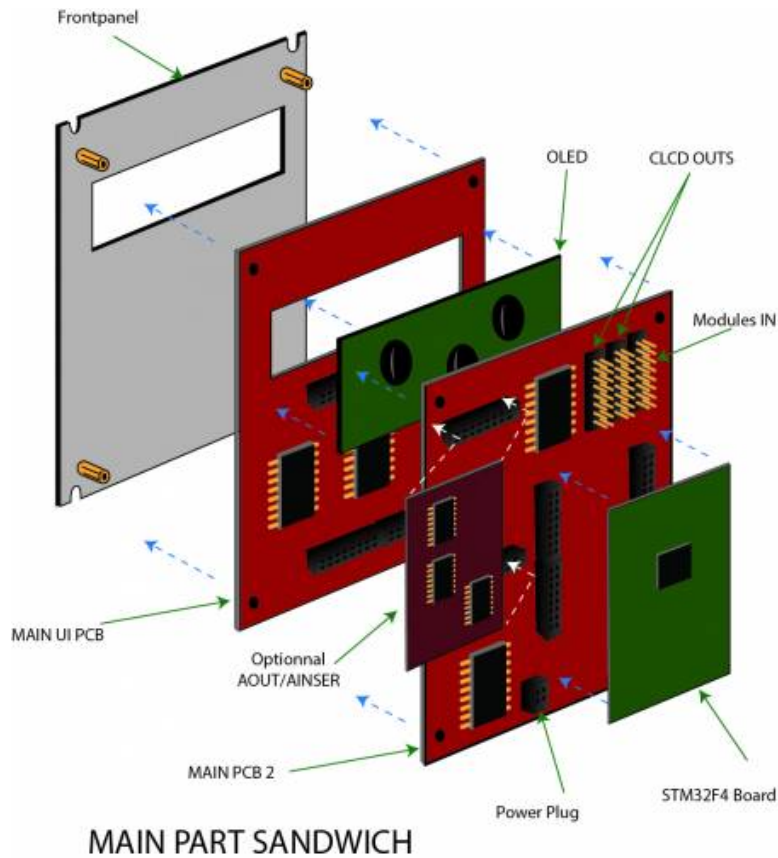
### Modulbox-NG



## Eurorack design

- **Eurorack Design is 3U Height** So frontpanel =  $5,25'' = 133mm - rails = 128,5mm$  Height . Sandwich Design is ok here due to non heating components and allow to spare space.
- **Modules Frontpanels are 8HP-multiple wide (8HP=40,3mm)** see [Eurorack Specification](#).  
Frontpanel back spacers glued with JB-weld to avoid front screwing. [Eurorack Templates PDF](#)
- **PCB Size is 100mm height** To stay compliant to [Eurocard Specification](#)

## Splitted View



## Tech Demos Videos



Video



Video



**Video**



**Video**



**Video**



**Video**



Video



Video



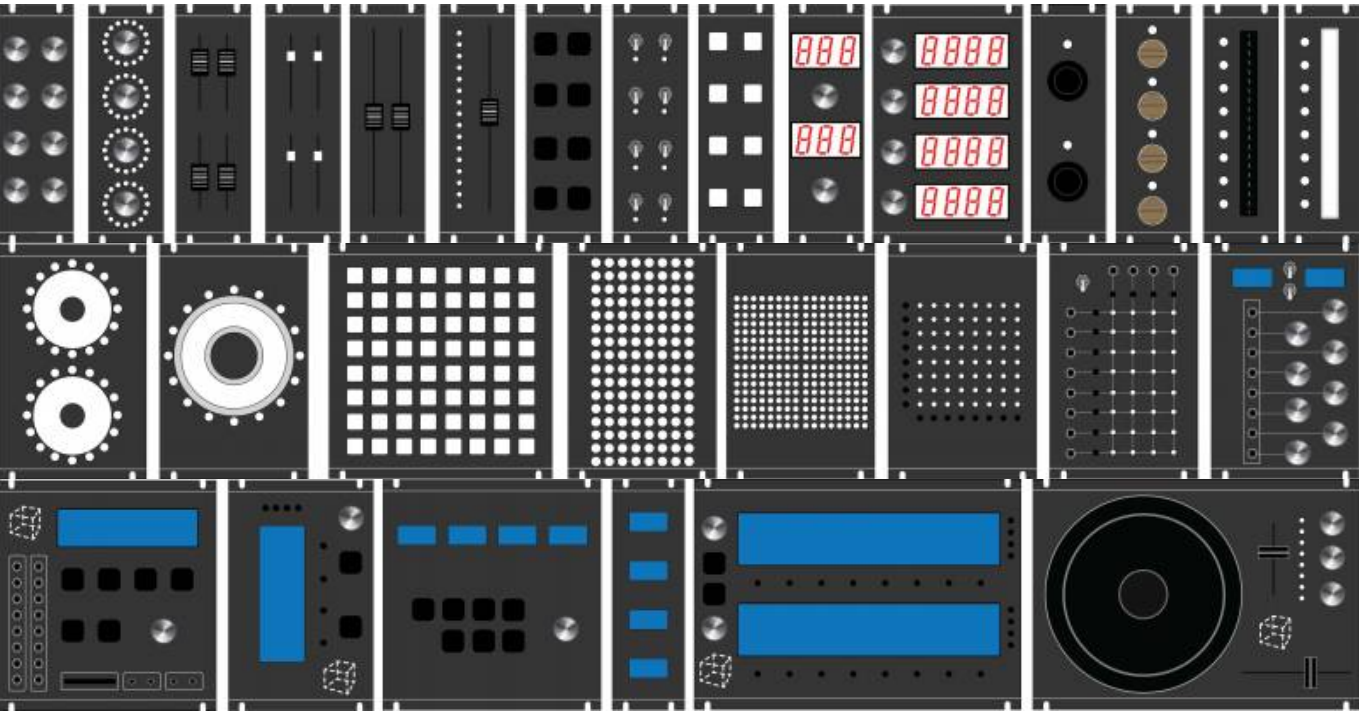
Video

## Modules List + UI Parts

| Module                            | N° | Analog   | LED | Encoders         | Switches        | HP | User     | Display        |
|-----------------------------------|----|----------|-----|------------------|-----------------|----|----------|----------------|
| Main UI+Main PCB                  | 1  | Jacksx16 |     | x1<br>PushRotary | Tactilex6       | 24 | Psykhaze | Graphic-OLEDx1 |
| Horizontal<br>4xOLEDS<br>SCSE     | 2  |          |     | x1<br>PushRotary | Tactilex7       | 24 |          | Small-OLEDx4   |
| Vertical<br>4xOLEDS               | 3  |          |     |                  |                 | 16 |          | Small-OLEDx4   |
| LCD Vertical<br>SCS               | 4  |          |     | x1<br>PushRotary | Tactilex(4+4+2) | 16 |          | CLCD 20×4      |
| LCD<br>Horizontal<br>Extended SCS | 5  |          |     | x2<br>PushRotary | Tactilex22      | 32 | Psykhaze | 2xCLCD 40×4    |

| Module                                | N° | Analog                          | LED           | Encoders                     | Switches                     | HP | User     | Display      |
|---------------------------------------|----|---------------------------------|---------------|------------------------------|------------------------------|----|----------|--------------|
| Encoders x8                           | 6  |                                 |               | x8<br>PushRotary             |                              | 8  | Ksir     |              |
| Pots x8                               | 7  | Pots x8                         |               |                              |                              | 8  | Ksir     |              |
| LED Ring Encoders x4                  | 8  |                                 | 16x4 3mm      | x4<br>PushRotary             |                              | 8  |          |              |
| Faders 2x2                            | 9  | Fadersx4                        |               |                              |                              | 8  |          |              |
| Light-Fader 2x2                       | 10 | Light-Fadersx4                  |               |                              |                              | 8  |          |              |
| Long Faders x2                        | 11 | Long Fadersx2                   |               |                              |                              | 8  | Psykhaze |              |
| Motor Fader x1                        | 12 | Motor Fader                     | 16x3mm        |                              |                              | 8  | Psykhaze |              |
| Switches x8 A                         | 13 |                                 |               |                              | Tactilex8                    | 8  | Ksir     |              |
| Switches x8 B                         | 14 |                                 | 8xBicolor     |                              | Toggle 3 polesx8             | 8  | Ksir     |              |
| Light-Switches x8 A                   | 15 |                                 | Bicolor Opt   |                              | Light Tactilex8              | 8  | Ksir     |              |
| Light-Switches x8 B                   | 16 |                                 |               |                              | Light Togglex8               | 8  | Ksir     |              |
| Numeric Displayx2                     | 17 |                                 |               | x2<br>PushRotary             |                              | 8  |          | 2x Numeric   |
| Numeric Displayx4                     | 18 |                                 |               | x4<br>PushRotary             |                              | 16 |          | 4x Numeric   |
| 8x8 LED Modulation Matrix             | 19 |                                 | x(8x8)3mm     |                              | Tactilex(8+8)                | 16 |          |              |
| 16x16 LED DotMatrix                   | 20 |                                 |               |                              |                              | 16 | Psykhaze | 4xDotMatrix  |
| 8x16 RGB DotMatrix                    | 21 |                                 |               |                              |                              | 16 | Psykhaze | 2xDotMatrix  |
| Additional Analog In or Out Interface | 22 | Jacksx8                         |               | x8<br>PushRotary             | Toggle 4 polesx2             | 16 | Psykhaze | Small-OLEDx2 |
| Crosspoint Matrix 8x4(x4)             | 23 | Jacksx(8+4)                     | x(8x4) 3mm    |                              | Toggle 4poles, Tactilex(8+4) | 16 | Psykhaze |              |
| Adafruit Silicon 3mm 8x8 Matrix       | 24 |                                 | x(8x8)3mm     |                              | Adafruit Silicon (4x4)x4     | 24 | Psykhaze |              |
| Joystick                              | 25 | 2xJoystick                      | 2xRGB         |                              |                              | 8  |          |              |
| Linear Touch                          | 26 | 1x(Force)Linear Sensor          | 8xWS2812      |                              |                              | 8  | Psykhaze |              |
| Circular touch                        | 27 | 1x(2x)Circular Sensor           | 16(x2)xWS2812 |                              |                              | 16 | Psykhaze |              |
| Force touch                           | 28 | 4xForce touch                   | 4xRGB         |                              |                              | 8  |          |              |
| MiniDeck DJ Control                   | 29 | 1xScratchFader+1xVertical Fader | x8 3mm        | x1 Code Wheel +x3 PushRotary |                              | 32 |          |              |

## Frontpanels Layouts



Modules Ins/Outs + Related Parts

| .            | 1 | 2    | 3 | 4  | 5  | 6  | 7  | 8  | 9 | 10 | 11 | 12   | 13 | 14 | 15   |
|--------------|---|------|---|----|----|----|----|----|---|----|----|------|----|----|------|
| Digital Ins  | 8 | 0>16 | / | 12 | 30 | 16 | /  | 8  | / | /  | /  | ?    | 8  | 24 | 8    |
| 74HC165 #    | 1 | 0>2  | / | 2  | 4  | 2  | /  | 1  | / | /  | /  | ?    | 1  | 3  | 1    |
| Digital Outs | / | /    | / | /  | /  | /  | /  | 16 | / | /  | /  | 16+? | /  | 16 | 8>16 |
| 74HC595 #    | / | /    | / | /  | /  | /  | /  | 2  | / | /  | /  | 2+?  | /  | 2  | 1>2  |
| Analog Ins   | / | /    | / | /  | /  | /  | 16 | /  | 8 | 8  | 4  | ?    | /  | /  | /    |
| CLCD #       | / | /    | / | 1  | 2  | /  | /  | /  | / | /  | /  | /    | /  | /  | /    |
| OLED #       | 1 | 1>8  | 4 | /  | /  | /  | /  | /  | / | /  | /  | /    | /  | /  | /    |

| .            | 16 | 17 | 18  | 19 | 20 | 21 | 22  | 23 | 24 | 25 | 26 | 27 | 28 | 29  | 30 | 31 |
|--------------|----|----|-----|----|----|----|-----|----|----|----|----|----|----|-----|----|----|
| Digital Ins  | 16 | 4  | 8   | 16 | /  | /  | 24  | 15 | 16 | 16 | 32 | /  | 3  | /   | /  | 12 |
| 74HC165 #    | 2  | 1  | 1   | 2  | /  | /  | 3   | 2  | 2  | 2  | 4  | /  | 1  | /   | /  | 2  |
| Digital Outs | 8  | 16 | 32? | 16 | 16 | 32 | /   | 16 | 16 | /  | /  | 6  | /  | /   | 12 | 8  |
| 74HC595 #    | 1  | 2  | 4   | 2  | 2  | 4  | /   | 2  | 2  | /  | /  | 1  | /  | /   | 2  | 1  |
| Analog Ins   | /  | /  | /   | /  | /  | /  | 0>8 | /  | /  | /  | /  | 8  | /  | 3>6 | 8  | 8  |
| CLCD #       | /  | /  | /   | /  | /  | /  | /   | /  | /  | /  | /  | /  | /  | /   | /  | /  |
| OLED #       | /  | /  | /   | /  | /  | /  | 1   | /  | /  | /  | /  | /  | /  | /   | /  | /  |

Parts References

Parts Datasheets

| Designation                   | Datasheet Link                                | Reference                                                              |
|-------------------------------|-----------------------------------------------|------------------------------------------------------------------------|
| Serial Register IN            | <a href="#">74HC165</a>                       | cd74hc165                                                              |
| Serial Register OUT           | <a href="#">74HC595</a>                       | cd74hc595                                                              |
| Line Driver                   | <a href="#">74HCT541</a>                      | cd74hct541                                                             |
| OptoCoupler                   | <a href="#">6N138</a>                         | 6N138M                                                                 |
| Analog>Digital Converter      | <a href="#">MCP3208</a>                       | MCP3208                                                                |
| Multiplexer switch            | <a href="#">MOS4051</a>                       | cd74hc4051                                                             |
| Digital>Analog Converter      | <a href="#">MAX525</a>                        | MAX525                                                                 |
| Operational Amplifier         | <a href="#">MCP600X</a>                       | MCP6008                                                                |
| Crosspoint Switch             | <a href="#">CD22m3494</a>                     | CD22m3494                                                              |
| Switch Rotary Encoder         | <a href="#">Alps EC11E</a>                    | EC11E15244B2                                                           |
| 5mm WS2812 LED                | <a href="#">WS2812</a>                        | APA-106-F5                                                             |
| 5mm RGB LED                   | <a href="#">RGB LED</a>                       | SL-R596CR4G3B5W-F12                                                    |
| Tactile Switch                | <a href="#">Small Round Tactile Switch</a>    | SKHHDTA010                                                             |
| Tactile Switch 2              | <a href="#">Square Tactile Switch</a>         | 03.0752                                                                |
| Light-Tactile Switch          | <a href="#">Square Light Tactile switch</a>   | B3W-9000-G1N, B3W-9000-R1N, B3W-9000-Y1N, B3W-9000-RG2N                |
| Toggle Switch 3/4 Poles       | <a href="#">Toggle Switch</a>                 | 100SP1T2B3M2QEH                                                        |
| Light-Toggle Switch           | <a href="#">Light Toggle Switch</a>           | G12JPCF                                                                |
| Code Wheel+ Optical Encoder   | <a href="#">Encoder+ Code Wheel</a>           | HEDB-9100-C12                                                          |
| Fader                         | <a href="#">Bourns PTA</a>                    | PTA3043-2015CPB103,PTA6043-2015CPB103                                  |
| Long Fader                    | <a href="#">ALPS RS series</a>                | RSA0N11S9A0K                                                           |
| Long Fader 2                  | <a href="#">Bourns PTB</a>                    | PTB0143-2010BPB103                                                     |
| Light-Fader                   | <a href="#">Bourns PTL</a>                    | PTL30-10G1-103B2, PTL30-15R1-104B2, PTL60-10G1-103B2, PTL60-15R1-104B2 |
| Motor Fader                   | <a href="#">Alps MotorFader 60mm</a>          | RS60N11M9A0F                                                           |
| Rotary Pot                    | <a href="#">ALPS Rotary pot</a>               | RK09L1140A66                                                           |
| SD Card Socket                | <a href="#">SD Socket</a>                     | SDCRD-GM-271                                                           |
| OLED 256x64px 3,12"           | <a href="#">Newhaven OLED</a>                 | NHD-3.12-25664UMY3                                                     |
| OLED 256x64px 3,2 "           | <a href="#">3.2" OLED</a>                     | ER-OLEDM032                                                            |
| OLED 128x64px 0,96"           | <a href="#">0.96" OLED</a>                    | ER-OLEDM0.96                                                           |
| CLCD 20x4                     | <a href="#">20x4 LCD</a>                      | ERM2004                                                                |
| CLCD 40x4                     | <a href="#">40x4 LCD</a>                      | ERM4004                                                                |
| 8x8 Monochrome DotMatrix      | <a href="#">8x8 Dotmatrix</a>                 | TC15-11EWA                                                             |
| 8x8 RGB DotMatrix             | <a href="#">8x8 RGB Dotmatrix</a>             | YSM-2388CRGBC                                                          |
| 3 Digits Numeric Display      | <a href="#">3 Digits Numeric Display</a>      | BA56-12SRWA                                                            |
| Silicon 4x4 Button Matrix 5mm | <a href="#">Silicon 4x4 5mm Button Matrix</a> | /                                                                      |
| Silicon 4x4 Button Matrix 3mm | <a href="#">Silicon 4x4 3mm Button Matrix</a> | /                                                                      |
| jack 3,5mm mono               | <a href="#">Jack 3.5mm</a>                    | 35RAPC2AV, PJ301BM                                                     |

| Designation           | Datasheet Link                                | Reference        |
|-----------------------|-----------------------------------------------|------------------|
| Joystick 1            | <a href="#">Joystick 1</a>                    | /                |
| Joystick 2            | <a href="#">Joystick 2</a>                    | /                |
| Force Touch Sensor    | <a href="#">Interlink FSR402</a>              | 34-00015         |
| Ring Sensor           | <a href="#">Interlink Ring Sensor</a>         | 40-24131         |
| Linear+Force Sensor   | <a href="#">Interlink linear+force sensor</a> | 34-00022         |
| Linear Touch Sensor   | <a href="#">SpectraSymbol SoftPot</a>         | SP-L-0100-103-ST |
| Circular Touch Sensor | <a href="#">SpectraSymbol SoftPot</a>         | SP-R-0046-103-ST |

## Buy Places

- [Mouser](#)
- [Buydisplay](#)
- [Interlink Force Sensors @ Digikey](#)
- [Interlink Ring Sensor @ Roboshop](#)
- [SpectraSymbol Circular Tactile Sensor @Adafruit](#)
- [SpectraSymbol Linear Tactile Sensor @Adafruit](#)

## Software / Firmware

- [JUCE Ressources](#)

A **GUI** will be developped with JUCE Library to make your **MIDI mapping** upon your custom control interface and make your **custom infos display on OLED / CLCDs / LEDs Matrixes**. Upon a list of **Pre-made functions**, you would be able to connect a **MIDI mapping** to Controller / Sequencer / Other MIDIbox apps functions into the JUCE GUI

**TODO:** Make a inkscape sketch For the JUCE GUI then remake it with **Projucer**

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