MultiFX

Image52.png

Codesign Methods and Tools - Nese10

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Table of Contents

[Actors\_multifx](#Ox7hxb6GAqBwAR5F_3x5bOP6GAqBwAZeO)

[Class\_multifx](#XRTW1H6GAqBwAU7q_095bOP6GAqBwAZfd)

[Components\_multiFx](#A1xmJ36GAqBwASto_AnFbOP6GAqBwAZkS)

[PowerWindow\_CloseRightWindow](#crzMHL6GAqBwAU1S_1fFbOP6GAqBwAZkV)

[TuneVolumeUp](#59LWSP6GAqBwAWj8__glbOP6GAqBwAZkt)

[TuneVolumeDown](#RrILSP6GAqBwAY.z_tYlbOP6GAqBwAZll)

[TuneParameterFxUp](#2QKrSP6GAqBwAZhB_zUlbOP6GAqBwAZmd)

[TuneParameterFxDown](#hUebSP6GAqBwAZmJ_18lbOP6GAqBwAZnV)

[NextEffect](#MIF3SP6GAqBwAaBb_QKlbOP6GAqBwAZoN)

[BackFx](#niQQyP6GAqBwAbAT_vmlbOP6GAqBwAZqA)

[Bypass](#FPDEyP6GAqBwAbhJ_z.lbOP6GAqBwAZrz)

[Switch\_ON](#KikCyP6GAqBwAccv_4JlbOP6GAqBwAZsv)

[Switch\_OFF](#bbUuyP6GAqBwAZL0_F5lbOP6GAqBwAZtb)

Table of Figures

[Actors\_multifx](#Ox7hxb6GAqBwAR5F_3x5bOP6GAqBwAZeP)

[Class\_multifx](#XRTW1H6GAqBwAU7q_095bOP6GAqBwAZfe)

[Components\_multiFx](#A1xmJ36GAqBwASto_AnFbOP6GAqBwAZkT)

[PowerWindow\_CloseRightWindow](#crzMHL6GAqBwAU1S_1fFbOP6GAqBwAZkW)

[TuneVolumeUp](#59LWSP6GAqBwAWj8__glbOP6GAqBwAZku)

[TuneVolumeDown](#RrILSP6GAqBwAY.z_tYlbOP6GAqBwAZlm)

[TuneParameterFxUp](#2QKrSP6GAqBwAZhB_zUlbOP6GAqBwAZme)

[TuneParameterFxDown](#hUebSP6GAqBwAZmJ_18lbOP6GAqBwAZnW)

[NextEffect](#MIF3SP6GAqBwAaBb_QKlbOP6GAqBwAZoO)

[BackFx](#niQQyP6GAqBwAbAT_vmlbOP6GAqBwAZqB)

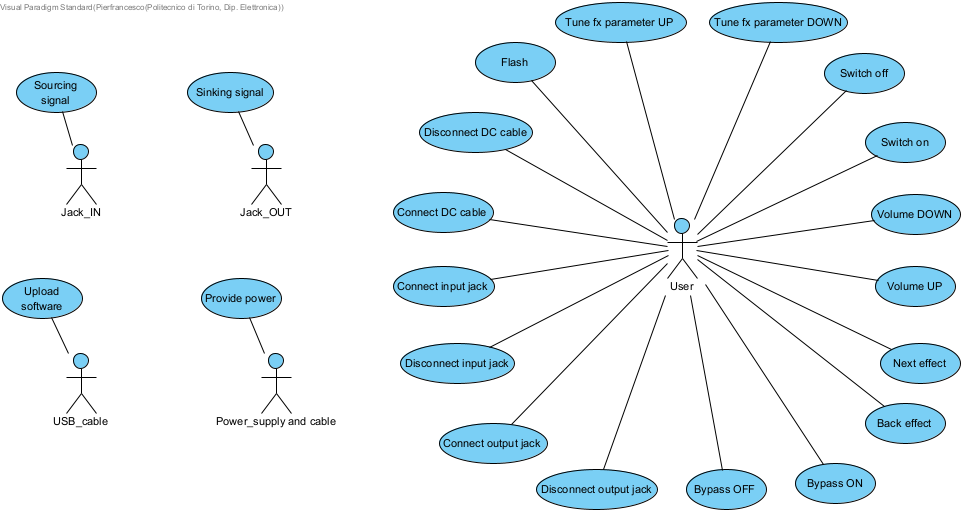
[Bypass](#FPDEyP6GAqBwAbhJ_z.lbOP6GAqBwAZr0)

[Switch\_ON](#KikCyP6GAqBwAccv_4JlbOP6GAqBwAZsw)

[Switch\_OFF](#bbUuyP6GAqBwAZL0_F5lbOP6GAqBwAZtc)

Use Case Diagram

# Actors\_multifx



## Image1.png USB\_cable

Name: USB\_cable

A USB cable having a micro USB 2.0 male connector.

## Image1.png User

Name: User

Human being with full control of at least one hand.

Minimum age: 3 years old.

Language: basic English.

Non blind.

## Image1.png Power\_supply and cable

Name: Power\_supply and cable

Connector:

-male DC connector;

-internal diameter: 2.1 mm;

-external diameter: 5.5 mm;

-external pin length: 9.5 mm;

-central pin positive;



Power:

-DC;

-Voltage range: +4V to 17V ;

-max current at least 500 mA;

## Image1.png Jack\_OUT

Name: Jack\_OUT



Standard mono TRS jack cable 6.35mm.

Max output level: Line +5dBm (with output load 10 kΩ or more).

Max length 6.0 m.

## Image1.png Jack\_IN

Name: Jack\_IN



Standard mono TRS jack cable 6.35mm.

Nominal input level: −20dBm.

Max length: 6.0 m.

## Image5.png Disconnect DC cable

Name: Disconnect DC cable

The [User](#M55bOP6GAqBwAZeR) can remove the [Power\_supply and cable](#.55bOP6GAqBwAZeS) from the [CONN1: 5mm7\_2mm\_DC\_THT](#TF5bOP6GAqBwAZeX). In this way, the [MultiFX\_nese10\_2122](#TF5bOP6GAqBwAZeY) can not work, even if it is switched ON, because there is no voltage supply.

## Image5.png Connect DC cable

Name: Connect DC cable

The [User](#M55bOP6GAqBwAZeR) can insert ([insertMaleConn()](#Yl5bOP6GAqBwAZeb)) the [Power\_supply and cable](#.55bOP6GAqBwAZeS) inside the [CONN1: 5mm7\_2mm\_DC\_THT](#TF5bOP6GAqBwAZeX) in order to supply the [MultiFX\_nese10\_2122](#TF5bOP6GAqBwAZeY). However, before the system is turned on ([switchOn()](#Yl5bOP6GAqBwAZec)) the supply voltage will not reach the internal circuit.

## Image5.png Disconnect output jack

Name: Disconnect output jack

The [User](#M55bOP6GAqBwAZeR) can remove the [Jack\_OUT](#755bOP6GAqBwAZeT) from the [CONN3: 6mm35\_JACK\_Female\_THT](#ml5bOP6GAqBwAZef). However, in this way he/she can not be able to get the processed audio signal anymore.

## Image5.png Disconnect input jack

Name: Disconnect input jack

The [User](#M55bOP6GAqBwAZeR) can remove the [Jack\_IN](#UF5bOP6GAqBwAZeU) from the [CONN2: 6mm35\_JACK\_Female\_THT](#tl5bOP6GAqBwAZei). However, in this way he/she can not be able to provide any audio signal anymore.

## Image5.png Connect output jack

Name: Connect output jack

The [User](#M55bOP6GAqBwAZeR) can insert ([insertMaleJack()](#_l5bOP6GAqBwAZel)) the [Jack\_OUT](#755bOP6GAqBwAZeT) inside the [CONN3: 6mm35\_JACK\_Female\_THT](#ml5bOP6GAqBwAZef) in order to acquire the audio signal processed by [MultiFX\_nese10\_2122](#TF5bOP6GAqBwAZeY).

It can be inserted before or after the system is turned on, but until that moment there is no way to use the processed audio signal.

## Image5.png Connect input jack

Name: Connect input jack

The [User](#M55bOP6GAqBwAZeR) can insert ([insertMaleJack()](#_l5bOP6GAqBwAZel)) the [Jack\_IN](#UF5bOP6GAqBwAZeU) inside the [CONN2: 6mm35\_JACK\_Female\_THT](#tl5bOP6GAqBwAZei) in order to provide the audio signal to process to [MultiFX\_nese10\_2122](#TF5bOP6GAqBwAZeY).

It can be inserted before or after the system is turned on, but until that moment there is no way to process the audio signal.

## Image5.png Flash

Name: Flash

The [User](#M55bOP6GAqBwAZeR) in order to upload correctly the software must perform the following operations in the given order:

1. [pressBoot()](#pV5bOP6GAqBwAZeq)
2. [pressReset()](#ZV5bOP6GAqBwAZer)
3. [releaseReset()](#ZV5bOP6GAqBwAZes)
4. [releaseBoot()](#ZV5bOP6GAqBwAZet)

## Image5.png Upload software

Name: Upload software

Using the [USB\_cable](#IZ5bOP6GAqBwAZeQ) it is possible to update software.

## Image5.png Tune fx parameter DOWN

Name: Tune fx parameter DOWN

[User](#M55bOP6GAqBwAZeR) rotates [POT2: 10K\_t20%\_LOG\_POT\_H20mm\_THT](#U15bOP6GAqBwAZey) counterclockwise ([FxDown()](#U15bOP6GAqBwAZez)). Parameter value of the selected effect is decreased until [User](#M55bOP6GAqBwAZeR) stops the rotation and is sent to the processing unit in order to obtain the desired signal processing:

- in case of [delay()](#U15bOP6GAqBwAZe0) time delay is increased

- in case of [tremolo()](#U15bOP6GAqBwAZe1) modulation frequency is increased

- in case of [phaser()](#015bOP6GAqBwAZe2) modulation frequency is increased

The new decreased value is updated on the [OLED: OLED\_Display](#015bOP6GAqBwAZe3) ([updateDisplay()](#015bOP6GAqBwAZe4)).

## Image5.png Volume DOWN

Name: Volume DOWN

The [User](#M55bOP6GAqBwAZeR) rotates [POT1: 10K\_t20%\_LOG\_POT\_H20mm\_THT](#u15bOP6GAqBwAZe7) counterclockwise ([volumeDown()](#u15bOP6GAqBwAZe8)). Volume value is sent to the processing unit so that amplitude of output signal decreases until [User](#M55bOP6GAqBwAZeR) stops the rotation. The new decreased value of volume is updated ([updateDisplay()](#015bOP6GAqBwAZe4)) on the [OLED\_Display](#e15bOP6GAqBwAZe9).

## Image5.png Sourcing signal

Name: Sourcing signal

[Jack\_IN](#UF5bOP6GAqBwAZeU) provides an electric signal coming from a musical instrument with nominal input level -20dBm.

This signal is being processed by the system.

## Image5.png Sinking signal

Name: Sinking signal

[Jack\_OUT](#755bOP6GAqBwAZeT) receives an electric signal processed by the system with the following characteristics: Line +5dBm (with output load 10 kΩ or more).

## Image5.png Provide power

Name: Provide power

[Power\_supply and cable](#.55bOP6GAqBwAZeS) provides a DC voltage in range +4V up to +17V referred to common ground, with max current at least 500 mA.

## Image5.png Bypass OFF

Name: Bypass OFF

When [LED: RedLED\_module\_3V3](#JN5bOP6GAqBwAZfG) is ON and [User](#M55bOP6GAqBwAZeR) [pushBypass()](#pN5bOP6GAqBwAZfH), a digital signal is sent to the processing unit such that it will apply the selected processing effect on the input signal.

## Image5.png Bypass ON

Name: Bypass ON

When [LED: RedLED\_module\_3V3](#JN5bOP6GAqBwAZfG) is OFF and [User](#M55bOP6GAqBwAZeR) [pushBypass()](#pN5bOP6GAqBwAZfH), a digital signal is sent to the processing unit such that it will not apply any processing on the input signal.

## Image5.png Tune fx parameter UP

Name: Tune fx parameter UP

[User](#M55bOP6GAqBwAZeR) rotates [POT2: 10K\_t20%\_LOG\_POT\_H20mm\_THT](#U15bOP6GAqBwAZey) clockwise ([FxUp()](#ct5bOP6GAqBwAZfM)). Parameter value of the selected effect is increased until [User](#M55bOP6GAqBwAZeR) stops the rotation and is sent to the processing unit in order to obtain the desired signal processing:

- in case of [delay()](#U15bOP6GAqBwAZe0) time delay is increased

- in case of [tremolo()](#U15bOP6GAqBwAZe1) modulation frequency is increased

- in case of [phaser()](#015bOP6GAqBwAZe2) modulation frequency is increased

The new increased value is updated on the [OLED: OLED\_Display](#015bOP6GAqBwAZe3) ([updateDisplay()](#015bOP6GAqBwAZe4)).

## Image5.png Back effect

Name: Back effect

[User](#M55bOP6GAqBwAZeR) [pushBackFx()](#Ft5bOP6GAqBwAZfP) and [releaseBackFx()](#Ft5bOP6GAqBwAZfQ). A digital signal is sent to the processing unit in order to change to the previous processing effect between the ones available, according to the effect sequence [delay()](#U15bOP6GAqBwAZe0)->[tremolo()](#U15bOP6GAqBwAZe1)->[phaser()](#015bOP6GAqBwAZe2).

The [delay()](#U15bOP6GAqBwAZe0) effect allows to apply a temporal delay to the input audio signal. Then the delayed signal is overlapped to the original one in order to have an effect that is similar to the echo.

The [tremolo()](#U15bOP6GAqBwAZe1) effect applies a little amplitude modulation to the input audio signal.

The [phaser()](#015bOP6GAqBwAZe2) effect applies a phase shift to the input audio signal.

The new effect name is displayed on the [OLED: OLED\_Display](#015bOP6GAqBwAZe3).

## Image5.png Next effect

Name: Next effect

[User](#M55bOP6GAqBwAZeR) [pushBackFx()](#Ft5bOP6GAqBwAZfP) and [releaseBackFx()](#Ft5bOP6GAqBwAZfQ). A digital signal is sent to the processing unit in order to change to the next processing effect between the ones available, according to the effect sequence [delay()](#U15bOP6GAqBwAZe0)->[tremolo()](#U15bOP6GAqBwAZe1)->[phaser()](#015bOP6GAqBwAZe2).

The [delay()](#U15bOP6GAqBwAZe0) effect allows to apply a temporal delay to the input audio signal. Then the delayed signal is overlapped to the original one in order to have an effect that is similar to the echo.

The [tremolo()](#U15bOP6GAqBwAZe1) effect applies a little amplitude modulation to the input audio signal.

The [phaser()](#015bOP6GAqBwAZe2) effect applies a phase shift to the input audio signal.

The new effect name is displayed on the [OLED: OLED\_Display](#015bOP6GAqBwAZe3).

## Image5.png Volume UP

Name: Volume UP

The [User](#M55bOP6GAqBwAZeR) rotates [POT1: 10K\_t20%\_LOG\_POT\_H20mm\_THT](#u15bOP6GAqBwAZe7) clockwise ([volumeUp()](#6d5bOP6GAqBwAZfV)). Volume value is sent to the processing unit so that amplitude of output signal increases until [User](#M55bOP6GAqBwAZeR) stops the rotation. The new increased value of volume is updated ([updateDisplay()](#015bOP6GAqBwAZe4)) on the [OLED: OLED\_Display](#015bOP6GAqBwAZe3).

## Image5.png Switch off

Name: Switch off

The [User](#M55bOP6GAqBwAZeR) toggles [SW1: SPDT\_ON-OFF\_ToggleSwitch\_THT](#td5bOP6GAqBwAZfY) in the OFF position ([switchOff()](#td5bOP6GAqBwAZfZ)), so that the system is not supplied.

## Image5.png Switch on

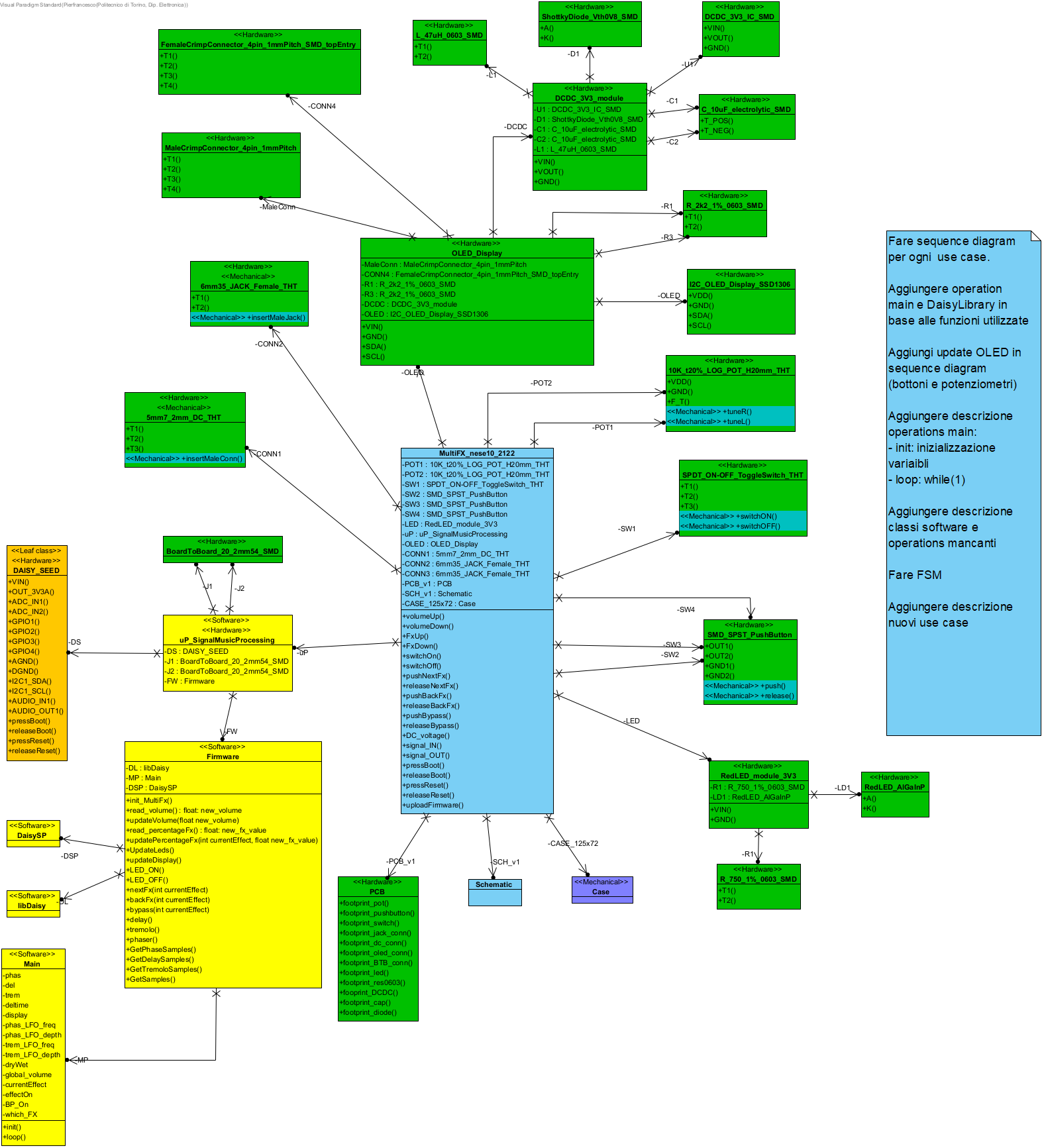
Name: Switch on

The [User](#M55bOP6GAqBwAZeR) toggles [SW1: SPDT\_ON-OFF\_ToggleSwitch\_THT](#td5bOP6GAqBwAZfY) in the ON position ([switchOn()](#Yl5bOP6GAqBwAZec)). If connected, [Power\_supply and cable](#.55bOP6GAqBwAZeS) provides power to the system.

The processing unit starts applying the default effect ([delay()](#U15bOP6GAqBwAZe0)) on input signal and [LED: RedLED\_module\_3V3](#JN5bOP6GAqBwAZfG) is kept OFF.

Class Diagram

# Class\_multifx



## Image7.png L\_47uH\_0603\_SMD

Name: L\_47uH\_0603\_SMD

Surface mount inductor.

**Electrical characteristics:**

- Inductance: 47uH

- Tolerance: +/-20%

**Mechanical characteristics:**

- Length: 1.6mm

- Width: 0.8mm

- Height: 0.8mm

Operations

## Image8.png T1

Name: T1

Pin 1 inductor.

**Coding:** voltage

**Periodicity:** continuous

## Image8.png T2

Name: T2

Pin 2 inductor.

**Coding:** voltage

**Periodicity:** continuous

## Image7.png DCDC\_3V3\_IC\_SMD

Name: DCDC\_3V3\_IC\_SMD

It is a DCDC converter that allows to provide a stable DC voltage.

It takes as input a DC voltage inside a range from 4.5V to 22V, in order to have a stable 3.3V DC voltage at the output.

To avoid noise on the output a decoupling capacitor can be needed, depending on the application.

**Electrical characteristics:**

- Max input DC voltage: 24V

- Output DC voltage: 3.3V

- Max output current: 2A

- Min efficiency: 75%

Operations

## Image8.png VIN

Name: VIN

This is the positive input supply for the IC switching regulator. A suitable input bypass capacitor must be presented at this pin to minimize voltage transients and to supply the switching currents required by the regulator.

**Coding:** voltage, from 4.5V to 22V

**Periodicity:** continuous

## Image8.png VOUT

Name: VOUT

Output voltage fixed to 3.3V.

The voltage at this pin switches between approximately [VIN()](#Sr5bOP6GAqBwAZfj) and -0.5V with a duty cycle of approximately [VOUT()](#Zr5bOP6GAqBwAZfk)/[VIN()](#Sr5bOP6GAqBwAZfj).

To minimize coupling to sensitive circuitry, the PCB copper area connected to this pin should be minimized.

**Coding:** voltage, 3.3V

**Periodicity:** continuous

## Image8.png GND

Name: GND

Reference ground voltage.

**Coding:** voltage

**Periodicity:** continuous

## Image7.png RedLED\_AlGaInP

Name: RedLED\_AlGaInP

When a voltage drop larger than Vth is applied to terminals of the LED, it turns ON and emits red light (625nm), otherwise it is turned OFF.

**Electrical characteristics:**

- Vth = 1.8V

- Max DC forward current: 30mA

- Max Reverse Voltage: 5V

- Viewing angle: 120°

Operations

## Image8.png A

Name: A

Anode connected to the higher potential.

When voltage drop [(model element not found)](#Fb5bOP6GAqBwAZfo) - [(model element not found)](#vb5bOP6GAqBwAZfq) > 1.8V (threshold voltage of red LED) LED turns on.

A resistor can be needed in order to limit the current that flows in the LED.

**Coding:** voltage

**Periodicity:** continuous

## Image8.png K

Name: K

Cathode connected to the lower potential (ground).

Anode connected to the higher potential.

When voltage drop [(model element not found)](#Fb5bOP6GAqBwAZfo) - [(model element not found)](#vb5bOP6GAqBwAZfq) > 1.8V (threshold voltage of red LED) LED turns on.

A resistor can be needed in order to limit the current that flows in the LED.

**Coding:** voltage

**Periodicity:** continuous

## Image7.png I2C\_OLED\_Display\_SSD1306

Name: I2C\_OLED\_Display\_SSD1306

The display exploits the I2C protocol to communicate, so only 4 pins are needed. Two pull-up resistors are needed: one for SDA (Serial DAta) line and the other for SCL (Serial CLock) line.

Pins must be connected to a male connector having a pitch equal to 1mm.

**Basic specifications:**

- Size: 0.96''

- Supply voltage: [3, 5]V

- I2C interface

- Max module length: 40mm

- Max module width: 40mm

- 128x64 pixel

- Display size: 0.96"

- Display width: 10.86mm

- Display length: 21.74mm

Operations

## Image8.png VDD

Name: VDD

Voltage supply pin.

A DC voltage 3.3V is require to supply the OLED display.

**Coding:** voltage, 3.3V

**Periodicity:** continuous

## Image8.png GND

Name: GND

Reference ground pin.

**Coding:** voltage

**Periodicity:** continuous

## Image8.png SDA

Name: SDA

Serial DAta pin: data are sent and received in a serial way using this pin.

**Coding**: I2C

* Input logic levels:
  + '0': [DGND()](#ZH5bOP6GAqBwAZfx) - 0.99V
  + '1': 2.31V - 3.3V
* Output logic levels:
  + '0': [DGND()](#ZH5bOP6GAqBwAZfx) - 0.4V
  + '1': 2.9V - 3.3V

**Periodicity**: continuous

## Image8.png SCL

Name: SCL

Serial CLock pin: a synchronous signal is connected to this pin in order to synchronize Master and Slave.

**Coding**: I2C

* Input logic levels:
  + '0': [DGND()](#ZH5bOP6GAqBwAZfx) - 0.99V
  + '1': 2.31V - 3.3V
* Output logic levels:
  + '0': [DGND()](#ZH5bOP6GAqBwAZfx) - 0.4V
  + '1': 2.9V - 3.3V

**Periodicity**: continuous

## Image7.png C\_10uF\_electrolytic\_SMD

Name: C\_10uF\_electrolytic\_SMD

Surface mount electrolytic capacitor.

**Electrical characteristics:**

- Capacitance: 10uF

- Max DC voltage: 25V

- Max ESR: 35mOhm

- Max leakage current: 125uA

**Mechanical characteristics:**

- Diameter: 8mm

- Height: 7mm

Operations

## Image8.png T\_POS

Name: T\_POS

Electrolytic capacitor terminal to connect to higher voltage.

**Coding:** voltage

**Periodicity:** continuous

## Image8.png T\_NEG

Name: T\_NEG

Electrolytic capacitor terminal to connect to lower voltage.

**Coding:** voltage

**Periodicity:** continuous

## Image7.png ShottkyDiode\_Vth0V8\_SMD

Name: ShottkyDiode\_Vth0V8\_SMD

When a voltage drop larger than Vth is applied to terminals of the LED, it turns ON and allows current to flow from anode ([A()](#sX5bOP6GAqBwAZf5)) to cathode ([K()](#sX5bOP6GAqBwAZf6)).

**Electrical characteristics:**

- Vth = 0.8V

- Forward current: 0.5A

- Max DC forward current: 30mA

- Max Reverse Voltage: 80V

- Max RMS forward voltage: 56V

Operations

## Image8.png A

Name: A

Anode connected to the higher potential.

When voltage drop [(model element not found)](#Fb5bOP6GAqBwAZfo) - [(model element not found)](#vb5bOP6GAqBwAZfq) > 0.8V (threshold voltage of diode) diode turns on.

**Coding:** voltage

**Periodicity:** continuous

## Image8.png K

Name: K

Cathode connected to the lower potential (ground).

Anode connected to the higher potential.

When voltage drop [(model element not found)](#Fb5bOP6GAqBwAZfo) - [(model element not found)](#vb5bOP6GAqBwAZfq) > 0.8V (threshold voltage of diode) diode turns on.

**Coding:** voltage

**Periodicity:** continuous

## Image7.png DCDC\_3V3\_module

Name: DCDC\_3V3\_module

It is a DCDC converter that allows to provide a stable DC voltage.

It takes as input a DC voltage inside a range from 4.5V to 22V, in order to have a stable 3.3V DC voltage at the output.

To avoid noise on the output a decoupling capacitor can be needed, depending on the application.

**Electrical characteristics:**

- Max input DC voltage: 24V

- Output DC voltage: 3.3V

- Max output current: 2A

- Min efficiency: 75%

Attributes

## Image9.png U1

Name: U1

## Image9.png D1

Name: D1

A diode can be needed to clamp the [VOUT()](#Zr5bOP6GAqBwAZfk).

## Image9.png C1

Name: C1

Bypass capacitor connected at [VIN()](#Sr5bOP6GAqBwAZfj) pin of [DCDC\_3V3\_IC\_SMD](#XL5bOP6GAqBwAZfi). It allows to filter out noise on power line in order to minimize voltage transient at the input of [DCDC\_3V3\_IC\_SMD](#XL5bOP6GAqBwAZfi).

This capacitor must be placed as close as possible to [VIN()](#Sr5bOP6GAqBwAZfj) pin.

The [T\_POS()](#6n5bOP6GAqBwAZf1) pin must be connected to [VIN()](#Sr5bOP6GAqBwAZfj), instead the [T\_NEG()](#ln5bOP6GAqBwAZf2) pin to [GND()](#N35bOP6GAqBwAZgD).

## Image9.png C2

Name: C2

Decoupling capacitor connected at the [VOUT()](#Zr5bOP6GAqBwAZfk) pin of [DCDC\_3V3\_IC\_SMD](#XL5bOP6GAqBwAZfi) in order to maintain stable the output voltage at 3.3V.

The [T\_POS()](#6n5bOP6GAqBwAZf1) pin must be connected to [VOUT()](#Zr5bOP6GAqBwAZfk), instead the [T\_NEG()](#ln5bOP6GAqBwAZf2) pin to [GND()](#N35bOP6GAqBwAZgD).

## Image9.png L1

Name: L1

Operations

## Image8.png VIN

Name: VIN

It is the positive input supply. The [DCDC\_3V3\_module](#zX5bOP6GAqBwAZf9) can accept an input voltage between 4.5V and 22V. It is connected to the [VIN()](#Sr5bOP6GAqBwAZfj) pin on [DCDC\_3V3\_IC\_SMD](#XL5bOP6GAqBwAZfi).

A suitable input bypass capacitor must be presented at this pin to minimize voltage transients and to supply the switching currents required by the regulator.

**Coding:** voltage, 4.5V - 22V

**Periodicity:** continuous

## Image8.png VOUT

Name: VOUT

Output voltage fixed to 3.3V.

It is connected to [VOUT()](#Zr5bOP6GAqBwAZfk) pin of [DCDC\_3V3\_IC\_SMD](#XL5bOP6GAqBwAZfi).

**Coding:** voltage, 3.3V

**Periodicity:** continuous

## Image8.png GND

Name: GND

Reference ground voltage.

**Coding:** voltage

**Periodicity:** continuous

## Image7.png DaisySP

Name: DaisySP

Set of functions to implement digital audio processing algorithms, available in Electrosmith's repository (<https://github.com/electro-smith/DaisySP>).

## Image7.png R\_2k2\_1%\_0603\_SMD

Name: R\_2k2\_1%\_0603\_SMD

Surface mount resistor, it is a linear passive component.

**Electrical characteristics:**

- Resistance: 2.2kOhm

- Tolerance: +/-1%

- Max power: 0.1W

- Max voltage: 75V

- Temperature coefficient: +/-200ppm/°C

**Mechanical characteristics:**

- Length: 1.55mm

- Width: 0.8mm

- Height: 0.45mm

Operations

## Image8.png T1

Name: T1

Pin 1 resistor.

Max current: 1A

**Coding:** voltage

**Periodicity:** continuous

## Image8.png T2

Name: T2

Pin 2 resistor.

Max current: 1A

**Coding:** voltage

**Periodicity:** continuous

## Image7.png R\_750\_1%\_0603\_SMD

Name: R\_750\_1%\_0603\_SMD

Surface mount resistor, it is a linear passive component.

**Electrical characteristics:**

- Resistance: 750 Ohm

- Tolerance: +/-1%

- Max power: 0.1W

- Max voltage: 75V

- Temperature coefficient: +/-200ppm/°C

**Mechanical characteristics:**

- Length: 1.55mm

- Width: 0.8mm

- Height: 0.45mm

Operations

## Image8.png T1

Name: T1

Pin 1 resistor.

Max current: 1A

**Coding:** voltage

**Periodicity:** continuous

## Image8.png T2

Name: T2

Pin 2 resistor.

Max current: 1A

**Coding:** voltage

**Periodicity:** continuous

## Image7.png Main

Name: Main

Main program in which all the functions to process audio signal are called.

Attributes

## Image9.png phas

Name: phas

## Image9.png del

Name: del

## Image9.png trem

Name: trem

## Image9.png deltime

Name: deltime

## Image9.png display

Name: display

## Image9.png phas\_LFO\_freq

Name: phas\_LFO\_freq

## Image9.png phas\_LFO\_depth

Name: phas\_LFO\_depth

## Image9.png trem\_LFO\_freq

Name: trem\_LFO\_freq

## Image9.png trem\_LFO\_depth

Name: trem\_LFO\_depth

## Image9.png dryWet

Name: dryWet

## Image9.png global\_volume

Name: global\_volume

## Image9.png currentEffect

Name: currentEffect

## Image9.png effectOn

Name: effectOn

## Image9.png BP\_On

Name: BP\_On

## Image9.png which\_FX

Name: which\_FX

Operations

## Image8.png init

Name: init

## Image8.png loop

Name: loop

## Image7.png libDaisy

Name: libDaisy

Set of functions to manage Daisy seed hardware, available in Electrosmith's repository (<https://github.com/electro-smith/libDaisy>).

## Image7.png Firmware

Name: Firmware

Attributes

## Image9.png DL

Name: DL

## Image9.png MP

Name: MP

## Image9.png DSP

Name: DSP

Operations

## Image8.png init\_MultiFx

Name: init\_MultiFx

When [MultiFX\_nese10\_2122](#TF5bOP6GAqBwAZeY) is switched ON ([switchON()](#FAFbOP6GAqBwAZgr)), the default effect is delay. [updateDisplay()](#015bOP6GAqBwAZe4) shows the current effect, volume and effect value on [OLED\_Display](#e15bOP6GAqBwAZe9).

**Coding:** bit, interrupt

**Periodicity:** occasional (event driven)

## Image8.png read\_volume

Name: read\_volume

The voltage sampled by the [ADC\_IN1()](#_AFbOP6GAqBwAZgu) is read from the register, corresponding to the new value of volume.

The latter is compared with the previous value of volume:

- same volume, nothing happened

- different volume, the position of [POT1: 10K\_t20%\_LOG\_POT\_H20mm\_THT](#u15bOP6GAqBwAZe7) is changed. In this case, the input audio signal is processed in order to [updateVolume(float new\_volume)](#wgFbOP6GAqBwAZgv).

Then the [OLED\_Display](#e15bOP6GAqBwAZe9) must be updated ([updateDisplay()](#015bOP6GAqBwAZe4)) in order to show the new value of volume.

**Coding:** int, integer variable to store the sampled value of volume

**Periodicity:** periodic (main loop delay)

## Image8.png updateVolume

Name: updateVolume

The magnitude of the input audio signal is adjusted in order to be proportional to the sampled volume ([read\_volume(): float: new\_volume](#lAFbOP6GAqBwAZgs)).

## Image8.png read\_percentageFx

Name: read\_percentageFx

The voltage sampled by the [ADC\_IN2()](#1gFbOP6GAqBwAZgz) is read from the register, corresponding to the new effect percentage.

The latter is compared with the previous effect percentage:

- same percentage, nothing happened

- different percentage, the position of [POT2: 10K\_t20%\_LOG\_POT\_H20mm\_THT](#U15bOP6GAqBwAZey) is changed. In this case, the input audio signal is processed in order to [updatePercentageFx(int currentEffect, float new\_fx\_value)](#NgFbOP6GAqBwAZg0).

Then the [OLED\_Display](#e15bOP6GAqBwAZe9) must be updated ([updateDisplay()](#015bOP6GAqBwAZe4)) in order to show the new effect percentage.

**Coding:** int, integer variable storing the effect percentage

**Periodicity:** periodic (main loop delay)

## Image8.png updatePercentageFx

Name: updatePercentageFx

Based on the current effect and sampled parameter value ([read\_percentageFx(): float: new\_fx\_value](#6gFbOP6GAqBwAZgx)) the input audio signal is adjusted in a different way:

- [delay()](#U15bOP6GAqBwAZe0): delay time between original audio signal and the delayed one is changed

- [tremolo()](#U15bOP6GAqBwAZe1): modulation frequency is changed

- [phaser()](#015bOP6GAqBwAZe2): phase shift applied to the input audio signal is changed

## Image8.png UpdateLeds

Name: UpdateLeds

## Image8.png updateDisplay

Name: updateDisplay

The [OLED\_Display](#e15bOP6GAqBwAZe9) must be updated showing the current:

- effect name

- effect percentage

- volume percentage

**Coding:** bit, interrupt

**Periodicity:** occasional (event driven)

## Image8.png LED\_ON

Name: LED\_ON

Voltage at pin [GPIO4()](#1QFbOP6GAqBwAZg6) becomes 3.3V (logic level '1') in order to turn ON the [LED: RedLED\_module\_3V3](#JN5bOP6GAqBwAZfG).

**Coding:** bit

**Periodicity:** occasional (event driven)

## Image8.png LED\_OFF

Name: LED\_OFF

Voltage at pin [GPIO4()](#1QFbOP6GAqBwAZg6) becomes 0V (logic level '0') in order to turn OFF the [LED: RedLED\_module\_3V3](#JN5bOP6GAqBwAZfG).

**Coding:** bit

**Periodicity:** occasional (event driven)

## Image8.png nextFx

Name: nextFx

Status of [SW3: SMD\_SPST\_PushButton](#awFbOP6GAqBwAZg_) is read from [GPIO1()](#awFbOP6GAqBwAZhA). Whenever a '0' logic level is read the next effect must be applied:

- [delay()](#U15bOP6GAqBwAZe0)->[tremolo()](#U15bOP6GAqBwAZe1)

- [tremolo()](#U15bOP6GAqBwAZe1)->[phaser()](#015bOP6GAqBwAZe2)

- [phaser()](#015bOP6GAqBwAZe2)->[delay()](#U15bOP6GAqBwAZe0)

Then the [OLED\_Display](#e15bOP6GAqBwAZe9) is updated ([updateDisplay()](#015bOP6GAqBwAZe4)). The value of volume and effect remain the same of previous effect, based on the position of [POT1: 10K\_t20%\_LOG\_POT\_H20mm\_THT](#u15bOP6GAqBwAZe7) and [POT2: 10K\_t20%\_LOG\_POT\_H20mm\_THT](#U15bOP6GAqBwAZey) respectively.

Before [release()](#GwFbOP6GAqBwAZhB), even if a '0' logic level is read, the effect is not switched.

**Coding:** boolean

**Periodicity:** occasional (event driven)

## Image8.png backFx

Name: backFx

Status of [SW2: SMD\_SPST\_PushButton](#DwFbOP6GAqBwAZhE) is read from [GPIO2()](#jwFbOP6GAqBwAZhF). Whenever a '0' logic level is read the previous effect must be applied:

- [delay()](#U15bOP6GAqBwAZe0)->[phaser()](#015bOP6GAqBwAZe2)

- [phaser()](#015bOP6GAqBwAZe2)->[tremolo()](#U15bOP6GAqBwAZe1)

- [tremolo()](#U15bOP6GAqBwAZe1)->[delay()](#U15bOP6GAqBwAZe0)

Then the [OLED\_Display](#e15bOP6GAqBwAZe9) is updated ([updateDisplay()](#015bOP6GAqBwAZe4)). The value of volume and effect remain the same of previous effect, based on the position of [POT1: 10K\_t20%\_LOG\_POT\_H20mm\_THT](#u15bOP6GAqBwAZe7) and [POT2: 10K\_t20%\_LOG\_POT\_H20mm\_THT](#U15bOP6GAqBwAZey) respectively.

Before [release()](#GwFbOP6GAqBwAZhB), even if a '0' logic level is read, the effect is not switched.

**Coding:** boolean

**Periodicity:** occasional (event driven)

## Image8.png bypass

Name: bypass

Status of [SW4: SMD\_SPST\_PushButton](#EIFbOP6GAqBwAZhI) is read from [GPIO3()](#EIFbOP6GAqBwAZhJ). Whenever a '0' logic level is read bypass value is toggled.

If bypass is OFF, it turns ON, and vice versa. When bypass turns ON, [LED\_ON()](#GQFbOP6GAqBwAZg4), otherwise [LED\_OFF()](#tQFbOP6GAqBwAZg7).

The [OLED\_Display](#e15bOP6GAqBwAZe9) is updated ([updateDisplay()](#015bOP6GAqBwAZe4)) in order to show that the input signal is not modified.

Before [release()](#GwFbOP6GAqBwAZhB), even if a '0' logic level is read, the effect is not switched.

**Coding:** boolean

**Periodicity:** occasional (event driven)

## Image8.png delay

Name: delay

Delay effect stores a copy of the input signal and applies a temporal delay to it. Then, the delayed signal is added to the input signal and this process can be replicated with a lowering amplitude of the reproduced replica.

There are two user-tunable parameters:

-Time delay: which sets the delay between the original signal and the copies;

-Decay: which sets decay trend for the amplitude of the replicas;

**Coding**: int, integer variable that corresponds to the delay effect (int currentEffect = 0)

**Periodicity**: occasional (event driven), when [nextFx(int currentEffect)](#AwFbOP6GAqBwAZg9) or [backFx(int currentEffect)](#mwFbOP6GAqBwAZhC) and effect variable is equal to the number that corresponds to delay effect

## Image8.png tremolo

Name: tremolo

The tremolo effect applies a little amplitude modulation to the input signal, by means of a Low Frequency Oscillator (LFO).

There are two user-tunable parameters:

-Frequency: which sets the frequency of the LFO;

-Depth: which sets the amplitude of the LFO;

**Coding**: int, integer variable that corresponds to the tremolo effect (int currentEffect = 1)

**Periodicity**: occasional (event driven), when [nextFx(int currentEffect)](#AwFbOP6GAqBwAZg9) or [backFx(int currentEffect)](#mwFbOP6GAqBwAZhC) and effect variable is equal to the number that corresponds to tremolo effect

## Image8.png phaser

Name: phaser

Phaser effect applies a phase shift to the input signal controlled by a Low Frequency Oscillator and then adds back the processed signal inverted by 180° with the original input signal.

The effect of this processing for the listener is a slow modulation of the signal.

There are two user-tunable parameters:

-Frequency: which sets the frequency of the LFO;

-Depth: which sets the amplitude of the LFO;

**Coding**: int, integer variable that corresponds to the phaser effect (int currentEffect = 2)

**Periodicity**: occasional (event driven), when [nextFx(int currentEffect)](#AwFbOP6GAqBwAZg9) or [backFx(int currentEffect)](#mwFbOP6GAqBwAZhC) and effect variable is equal to the number that corresponds to phaser effect

## Image8.png GetPhaseSamples

Name: GetPhaseSamples

## Image8.png GetDelaySamples

Name: GetDelaySamples

## Image8.png GetTremoloSamples

Name: GetTremoloSamples

## Image8.png GetSamples

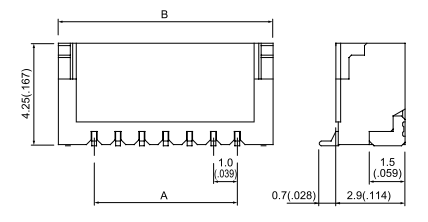
Name: GetSamples

## Image7.png FemaleCrimpConnector\_4pin\_1mmPitch\_SMD\_topEntry

Name: FemaleCrimpConnector\_4pin\_1mmPitch\_SMD\_topEntry

Crimp style female connector that allows to connect a [MaleCrimpConnector\_4pin\_1mmPitch](#5oFbOP6GAqBwAZhT) from the top side. So it allows to connect 4 wires to a board, having 4 pins 1 mm pitch.

[FemaleCrimpConnector\_4pin\_1mmPitch\_SMD\_topEntry](#coFbOP6GAqBwAZhR) must be similar to the following one:



Looking at the side in which there are surface mount pins, the first pin ([T1()](#FoFbOP6GAqBwAZhU)) is the first one starting from the right.

**Specifications:**

- Max contact resistance: 20mOhm

- Min insulation resistance: 100MOhm

- Max current: 0.7A

- Max DC voltage: 50V

- Height: 4.25mm

- External thickness: 2.9mm

- Width: 6mm

Operations

## Image8.png T1

Name: T1

Pin 1

**Coding:** voltage

**Periodicity:** continuous

## Image8.png T2

Name: T2

Pin 2

**Coding:** voltage

**Periodicity:** continuous

## Image8.png T3

Name: T3

Pin 3

**Coding:** voltage

**Periodicity:** continuous

## Image8.png T4

Name: T4

Pin 4

**Coding:** voltage

**Periodicity:** continuous

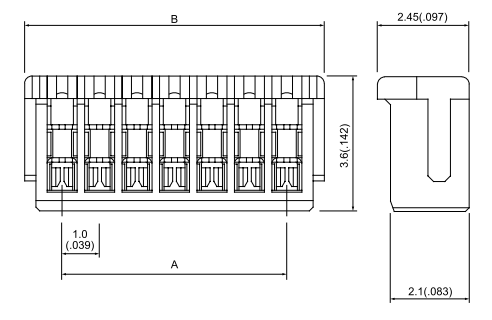
## Image7.png MaleCrimpConnector\_4pin\_1mmPitch

Name: MaleCrimpConnector\_4pin\_1mmPitch

Crimp style male connector. It has 4 pins 1mm pitch.

It is used to terminate 4 wires in order to connect them to a board, avoiding soldering them. For this purpose a [FemaleCrimpConnector\_4pin\_1mmPitch\_SMD\_topEntry](#coFbOP6GAqBwAZhR) is needed on the board.

[MaleCrimpConnector\_4pin\_1mmPitch](#5oFbOP6GAqBwAZhT) must be similar to the following one:



**Specifications:**

- Max contact resistance: 20mOhm

- Min insulation resistance: 100MOhm

- Max current: 0.7A

- Max DC voltage: 50V

- Height: 3.6mm

- Thickness: 2.1mm

- Width: 5mm

Operations

## Image8.png T1

Name: T1

Pin 1.

It must be connected to [T1()](#FoFbOP6GAqBwAZhU) of [FemaleCrimpConnector\_4pin\_1mmPitch\_SMD\_topEntry](#coFbOP6GAqBwAZhR).

**Coding:** voltage

**Periodicity:** continuous

## Image8.png T2

Name: T2

Pin 2.

It must be connected to [T2()](#foFbOP6GAqBwAZhV) of [FemaleCrimpConnector\_4pin\_1mmPitch\_SMD\_topEntry](#coFbOP6GAqBwAZhR).

**Coding:** voltage

**Periodicity:** continuous

## Image8.png T3

Name: T3

Pin 3.

It must be connected to [T3()](#SYFbOP6GAqBwAZhW) of [FemaleCrimpConnector\_4pin\_1mmPitch\_SMD\_topEntry](#coFbOP6GAqBwAZhR).

**Coding:** voltage

**Periodicity:** continuous

## Image8.png T4

Name: T4

Pin 4.

It must be connected to [T4()](#JYFbOP6GAqBwAZhX) of [FemaleCrimpConnector\_4pin\_1mmPitch\_SMD\_topEntry](#coFbOP6GAqBwAZhR).

**Coding:** voltage

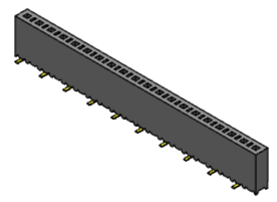
**Periodicity:** continuous

## Image7.png BoardToBoard\_20\_2mm54\_SMD

Name: BoardToBoard\_20\_2mm54\_SMD

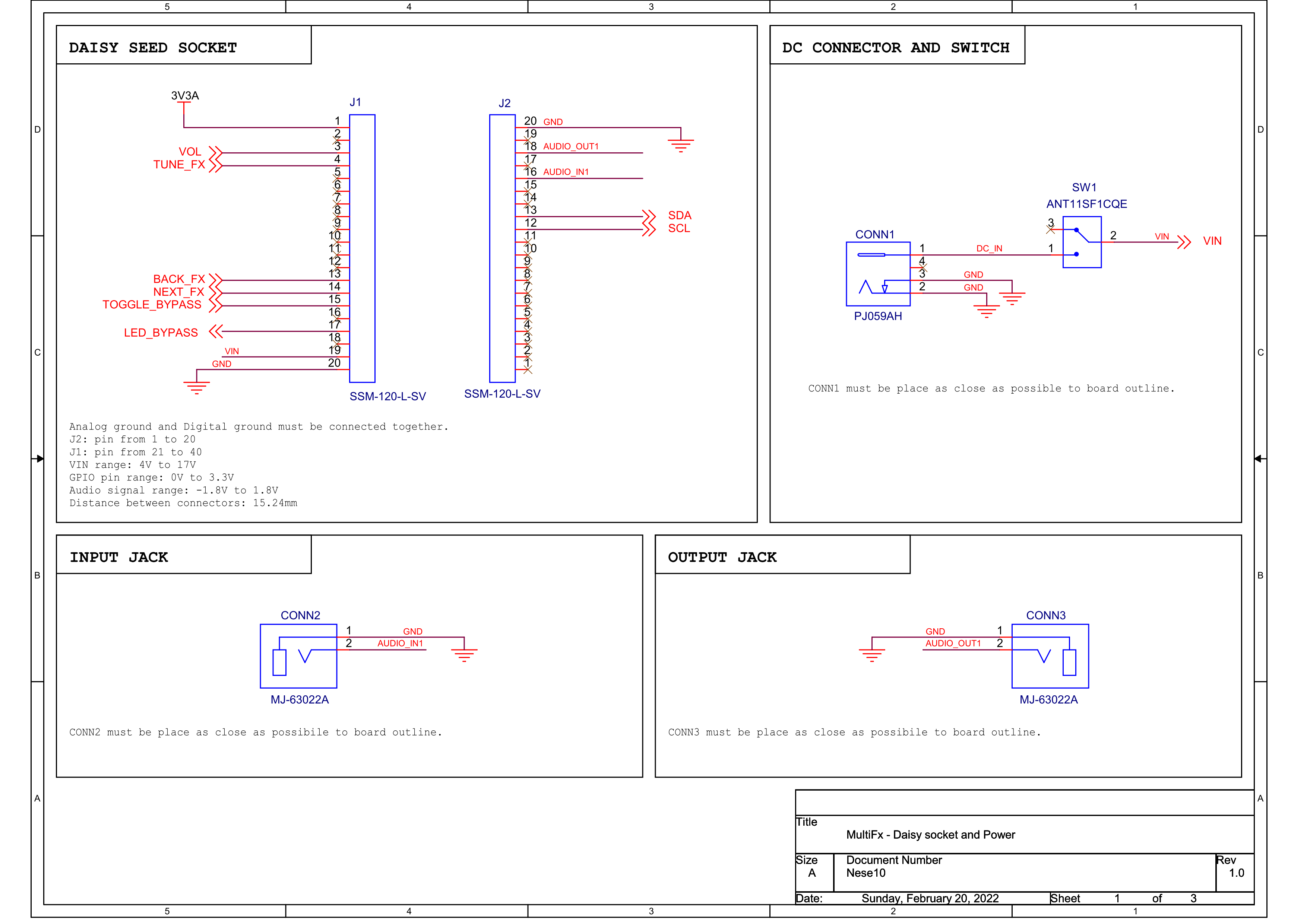
Surface mount socket to connect another board to the [PCB](#nEFbOP6GAqBwAZhj) on which circuit is implemented.

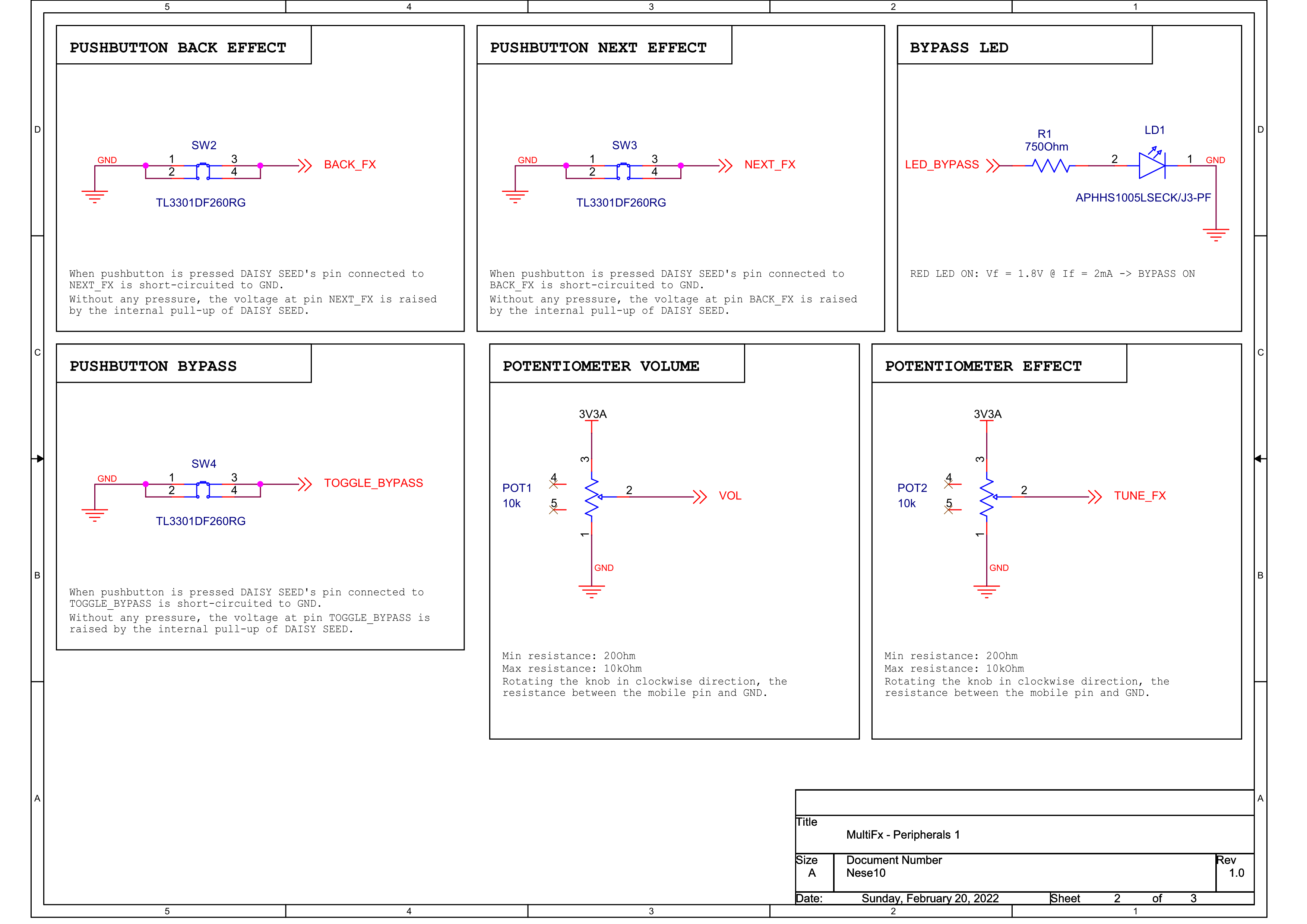
20 inputs are aligned on a single row, with a pitch of 2.54mm.

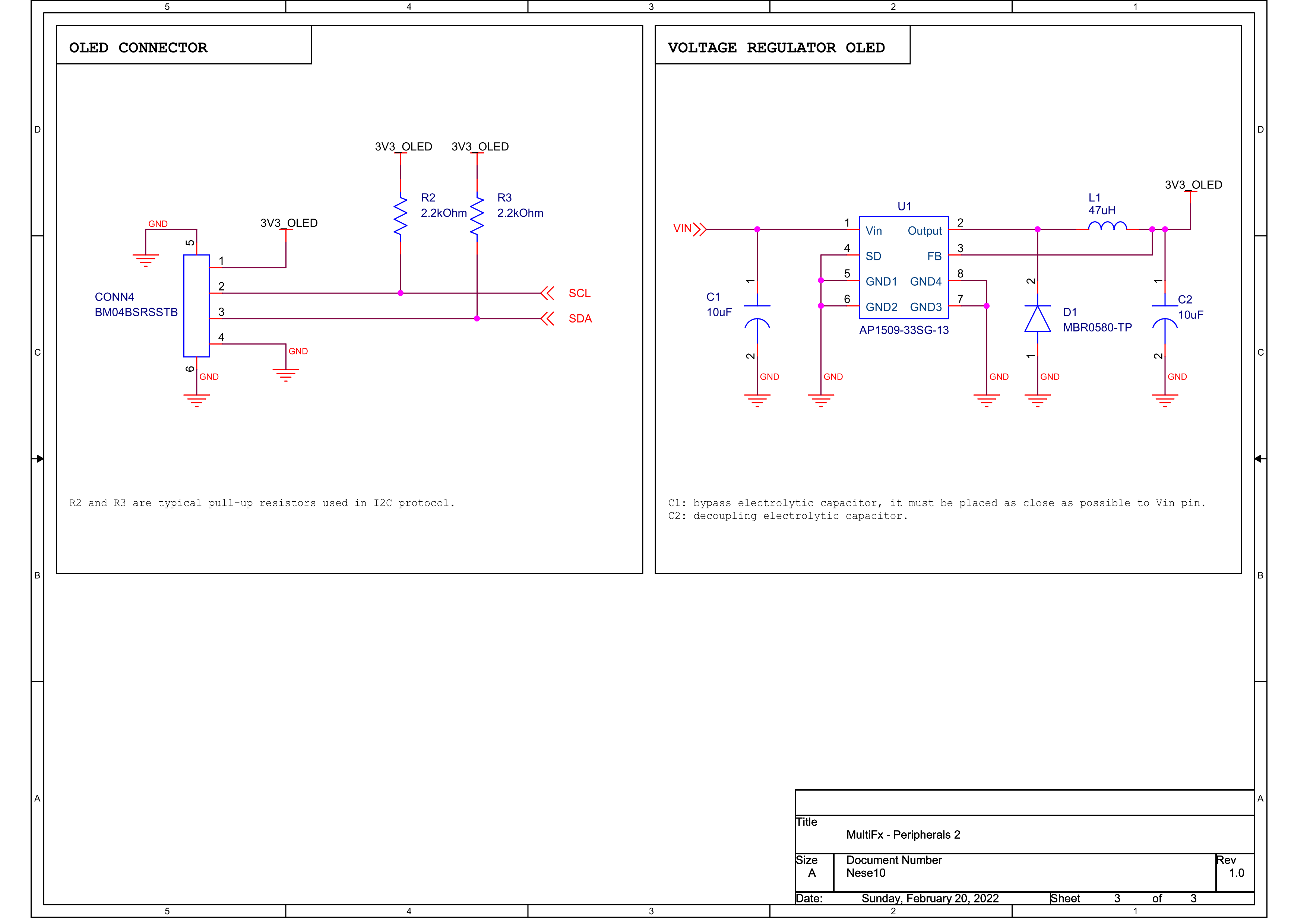


## Image7.png Schematic

Name: Schematic







## Image7.png DAISY\_SEED

Name: DAISY\_SEED

[DAISY\_SEED](#f8FbOP6GAqBwAZhl) is an embedded platform for music. It features everything you need for creating high fidelity audio hardware devices. It integrates:

- SDRAM 64MB

- ARM Cortex-M7 MCU, running at 480MHz

- 31 GPIO

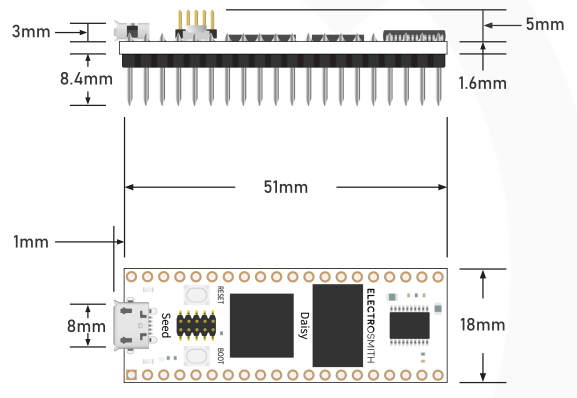
- 12 bit ADC

**Absolute maximum ratings:**

- Vin: [4, 17] V

- GPIO: [0, 5] V

- Audio inputs: [-1.8, 1.8] V



Operations

## Image8.png VIN

Name: VIN

Voltage supply (DC) input terminal of [DAISY\_SEED](#f8FbOP6GAqBwAZhl) board. It is pin 39.

VIN: 4V to 17V

**Coding:** voltage, 4V - 17V

**Periodicity:** continuous

## Image8.png OUT\_3V3A

Name: OUT\_3V3A

Output DC voltage 3.3V provided by [DAISY\_SEED](#f8FbOP6GAqBwAZhl). It can be used to supply other components. It corresponds to pin 21.

Maximum available current: 150mA.

**Coding:** voltage, 3.3V

**Periodicity:** continuous

## Image8.png ADC\_IN1

Name: ADC\_IN1

Input ADC. An analog signal can be connected to this input in order to be converted in digital (12 bit resolution).

Input voltage can be in the range from 0V to 3.3V.

**Coding:** voltage, 0V - 3.3V

**Periodicity:** continuous

## Image8.png ADC\_IN2

Name: ADC\_IN2

Input ADC. An analog signal can be connected to this input in order to be converted in digital (12 bit resolution).

Input voltage can be in the range from 0V to 3.3V.

**Coding:** voltage, 0V - 3.3V

**Periodicity:** continuous

## Image8.png GPIO1

Name: GPIO1

GPIO pin: 0V to 3.3V

When configured as input each pin can configure an internal pull-up, pull-down, or no pull resistor.

When configured as an output each pin can be configured for push-pull or open-drain configuration.

**Coding**: digital voltage

* Input logic levels:
  + '0': [DGND()](#ZH5bOP6GAqBwAZfx) - 0.99V
  + '1': 2.31V - 3.3V
* Output logic levels:
  + '0': [DGND()](#ZH5bOP6GAqBwAZfx) - 0.4V
  + '1': 2.9V - 3.3V

**Periodicity**: continuous

## Image8.png GPIO2

Name: GPIO2

GPIO pin: 0V to 3.3V

When configured as input each pin can configure an internal pull-up, pull-down, or no pull resistor.

When configured as an output each pin can be configured for push-pull or open-drain configuration.

**Coding**: digital voltage

* Input logic levels:
  + '0': [DGND()](#ZH5bOP6GAqBwAZfx) - 0.99V
  + '1': 2.31V - 3.3V
* Output logic levels:
  + '0': [DGND()](#ZH5bOP6GAqBwAZfx) - 0.4V
  + '1': 2.9V - 3.3V

**Periodicity**: continuous

## Image8.png GPIO3

Name: GPIO3

GPIO pin: 0V to 3.3V

When configured as input each pin can configure an internal pull-up, pull-down, or no pull resistor.

When configured as an output each pin can be configured for push-pull or open-drain configuration.

**Coding**: digital voltage

* Input logic levels:
  + '0': [DGND()](#ZH5bOP6GAqBwAZfx) - 0.99V
  + '1': 2.31V - 3.3V
* Output logic levels:
  + '0': [DGND()](#ZH5bOP6GAqBwAZfx) - 0.4V
  + '1': 2.9V - 3.3V

**Periodicity**: continuous

## Image8.png GPIO4

Name: GPIO4

GPIO pin: 0V to 3.3V

When configured as input each pin can configure an internal pull-up, pull-down, or no pull resistor.

When configured as an output each pin can be configured for push-pull or open-drain configuration.

**Coding**: digital voltage

* Input logic levels:
  + '0': [DGND()](#ZH5bOP6GAqBwAZfx) - 0.99V
  + '1': 2.31V - 3.3V
* Output logic levels:
  + '0': [DGND()](#ZH5bOP6GAqBwAZfx) - 0.4V
  + '1': 2.9V - 3.3V

**Periodicity**: continuous

## Image8.png AGND

Name: AGND

Analog ground reference voltage of [DAISY\_SEED](#f8FbOP6GAqBwAZhl) board. It corresponds to pin 20.

[AGND()](#uyFbOP6GAqBwAZhv)must be shorted to [DGND()](#ZH5bOP6GAqBwAZfx).

**Coding:** voltage, 0V - 3.3V

**Periodicity:** continuous

## Image8.png DGND

Name: DGND

Digital ground reference voltage of [DAISY\_SEED](#f8FbOP6GAqBwAZhl) board. It corresponds to pin 40.

[DGND()](#ZH5bOP6GAqBwAZfx) must be shorted to [AGND()](#uyFbOP6GAqBwAZhv).

**Coding:** voltage

**Periodicity:** continuous

## Image8.png I2C1\_SDA

Name: I2C1\_SDA

GPIO pin dedicated for I2C Serial DAta line (SDA).

Input voltage can be in the range from 0V to 3.3V.

**Coding**: I2C

* Input logic levels:
  + '0': [DGND()](#ZH5bOP6GAqBwAZfx) - 0.99V
  + '1': 2.31V - 3.3V
* Output logic levels:
  + '0': [DGND()](#ZH5bOP6GAqBwAZfx) - 0.4V
  + '1': 2.9V - 3.3V

**Periodicity**: continuous

## Image8.png I2C1\_SCL

Name: I2C1\_SCL

GPIO pin dedicated for I2C Serial CLock line (SCL).

Input voltage can be in the range from 0V to 3.3V.

**Coding**: I2C

* Input logic levels:
  + '0': [DGND()](#ZH5bOP6GAqBwAZfx) - 0.99V
  + '1': 2.31V - 3.3V
* Output logic levels:
  + '0': [DGND()](#ZH5bOP6GAqBwAZfx) - 0.4V
  + '1': 2.9V - 3.3V

**Periodicity**: continuous

## Image8.png AUDIO\_IN1

Name: AUDIO\_IN1

Line Level, AC Coupled analog audio

Audio will begin to clip when input or output signal approach 3Vpp

For line level audio, the pins can be connected directly to jacks, etc.

**Coding:** voltage, -1.8V - 1.8V

**Periodicity:** continuous

## Image8.png AUDIO\_OUT1

Name: AUDIO\_OUT1

Line Level, AC Coupled analog audio

Audio will begin to clip when input or output signal approach 3Vpp

For line level audio, the pins can be connected directly to jacks, etc.

**Coding:** voltage, -1.8V - 1.8V

**Periodicity:** continuous

## Image8.png pressBoot

Name: pressBoot

Boot pushbutton on [DAISY\_SEED](#f8FbOP6GAqBwAZhl) board is pressed. It can be useful to flash [uP: uP\_SignalMusicProcessing](#AaFbOP6GAqBwAZh6).

## Image8.png releaseBoot

Name: releaseBoot

Boot pushbutton on [DAISY\_SEED](#f8FbOP6GAqBwAZhl) board is released.

## Image8.png pressReset

Name: pressReset

Reset pushbutton on [DAISY\_SEED](#f8FbOP6GAqBwAZhl) board is pressed. It allows to reset the [DAISY\_SEED](#f8FbOP6GAqBwAZhl) board and can be useful to flash [uP: uP\_SignalMusicProcessing](#AaFbOP6GAqBwAZh6).

## Image8.png releaseReset

Name: releaseReset

Reset pushbutton on [DAISY\_SEED](#f8FbOP6GAqBwAZhl) board is released.

## Image7.png Case

Name: Case

Plastic black case to protect the [PCB](#nEFbOP6GAqBwAZhj) on which the circuit is assembled.

Since [DAISY\_SEED](#f8FbOP6GAqBwAZhl) board height is approximately 15mm, we need a [Case](#3aFbOP6GAqBwAZh.) height at least equal to 20mm.

A break in the case 10.86mm x 21.74mm is needed for the [OLED\_Display](#e15bOP6GAqBwAZe9).

On the top side of the case there are:

- 5 circular holes with a 9mm diameter

- 1 circular holes with a 5.72 diameter

- 1 rectangular hole 10.86mm x 21.74mm

On the left lateral side there is a circular hole with a 10.8mm diameter.

On the right lateral side there are:

- 1 circular hole with a 10.8mm diameter

- 1 hole for micro USB 2.0 connector

Finally, on the lateral bottom side there is a rectangular hole 9.2mm x 11.2mm

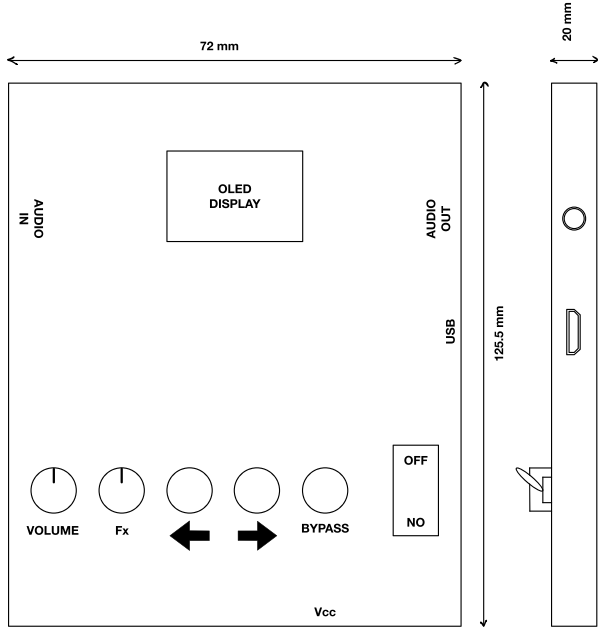
**Specifications:**

- Thickness: 3mm

- Width: 72mm

- Length: 125.5mm

Aggiungi LED, spazio per bottoni su daisy e vista da sotto



## Image7.png PCB

Name: PCB

Printed Circuit Board to assembly all the components. It is a double layer PCB. A ground plane on the bottom layer is required to minimize the trace inductance.

[DAISY\_SEED](#f8FbOP6GAqBwAZhl) board must be positioned as close as possible to the outline of the board so that the USB connector can be reached from the outside.

Components accessible from the outside must be Through-Hole devices (THT) because they provide a better mechanical attach to the board. Instead, for all the other components Surface Mount Technology (SMT) can be more useful in case of high speed signals.

The [PCB](#nEFbOP6GAqBwAZhj) must have 4 holes to be fixed to the case. Hole diameter must be 5mm. the holes centers coordinates in mm (origin in the bottom left corner of the [PCB](#nEFbOP6GAqBwAZhj)):

- 5,5

- 100.5, 5

- 64, 5

- 100.5, 64.5

No components in the next 5mm around these holes.

A couple of [BoardToBoard\_20\_2mm54\_SMD](#pEFbOP6GAqBwAZhh) useful to connect the [DAISY\_SEED](#f8FbOP6GAqBwAZhl) must be placed in the middle of [PCB](#nEFbOP6GAqBwAZhj), parallel to the shortest side of the board.

Then components that allows [User](#M55bOP6GAqBwAZeR) to provide input must be placed on the left side. The [OLED\_Display](#e15bOP6GAqBwAZe9), instead, must be placed on the right. As far as connectors, they must be placed in order to have the entry oriented towards the outside:

- [5mm7\_2mm\_DC\_THT](#wGFbOP6GAqBwAZiB) for the [Power\_supply and cable](#.55bOP6GAqBwAZeS), on the left, having the entry exposed on the shorter side of the board

- [6mm35\_JACK\_Female\_THT](#wGFbOP6GAqBwAZiC) for the [Jack\_IN](#UF5bOP6GAqBwAZeU), on the right, having the entry exposed on the longest side of the board (left, looking at the board top layer)

- [6mm35\_JACK\_Female\_THT](#wGFbOP6GAqBwAZiC) for the [Jack\_OUT](#755bOP6GAqBwAZeT), on the right, having the entry exposed on the longest side of the board (right, looking at the board top layer)

**Specifications:**

- Width: 69mm

- Length: 105.5mm

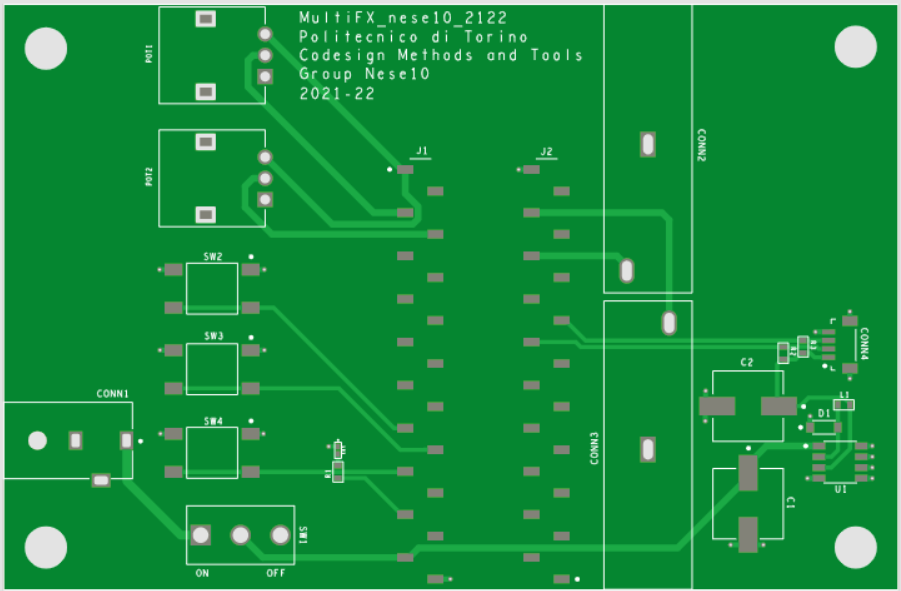
- Core material: FR-4

- Board thickness: 1.6mm

- Material TG: 145-150°C

- Copper thickness: 0.035mm

**Top view**



**Bottom view**



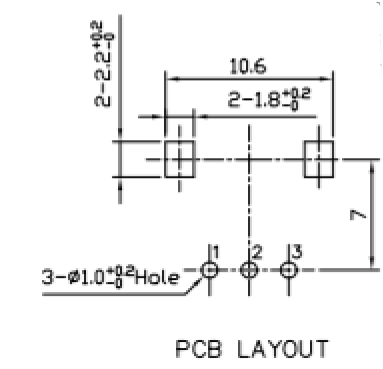
Operations

## Image8.png footprint\_pot

Name: footprint\_pot

Footprint of [10K\_t20%\_LOG\_POT\_H20mm\_THT](#FGFbOP6GAqBwAZiF).

Since it is a through-hole component, 3 plated circular holes are required (diameter = 1.2mm), and 2 mechanical rectangular holes (2.4mm x 4.3mm) are required in order to have a better attach to the board.

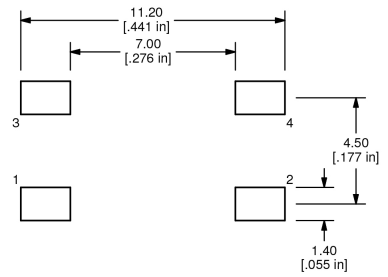


## Image8.png footprint\_pushbutton

Name: footprint\_pushbutton

Footprint of [SMD\_SPST\_PushButton](#_GFbOP6GAqBwAZiI).

Since it is a surface mount component, 4 copper rectangular exposed pads are required (2.1mm x 1.4mm).

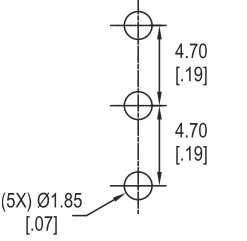


## Image8.png footprint\_switch

Name: footprint\_switch

Footprint of [SPDT\_ON-OFF\_ToggleSwitch\_THT](#6mFbOP6GAqBwAZiL).

Since it is a through-hole component, 3 plated circular holes are required (diameter = 1.85mm).

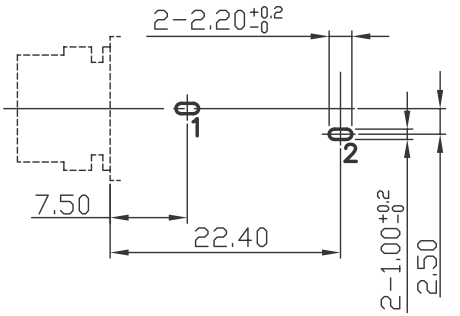


## Image8.png footprint\_jack\_conn

Name: footprint\_jack\_conn

Footprint of [6mm35\_JACK\_Female\_THT](#wGFbOP6GAqBwAZiC).

Since it is a through-hole component, 2 plated oval holes are required (1.2mm x 2.4mm).

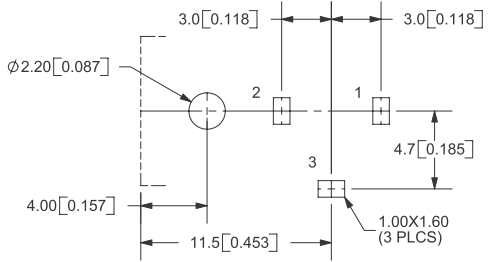


## Image8.png footprint\_dc\_conn

Name: footprint\_dc\_conn

Footprint of [5mm7\_2mm\_DC\_THT](#wGFbOP6GAqBwAZiB).

Since it is a through-hole component, 3 plated rectangular holes are required (1.6mm x 1mm), and 1 mechanical circular hole (diameter = 2.2mm) is required in order to have a better attach to the board.



## Image8.png footprint\_oled\_conn

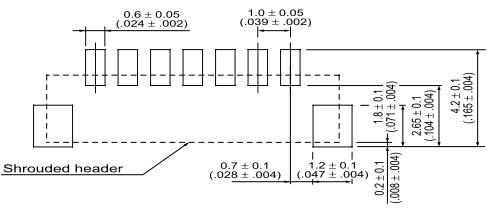
Name: footprint\_oled\_conn

Footprint of [FemaleCrimpConnector\_4pin\_1mmPitch\_SMD\_topEntry](#coFbOP6GAqBwAZhR).

Since it is a surface mount component:

- 4 rectangular exposed copper pads (0.65mm x 1.55mm) are required for pins

- 4 rectangular exposed copper pads (1.3mm x 1.9mm) are required for mechanical connection to the board

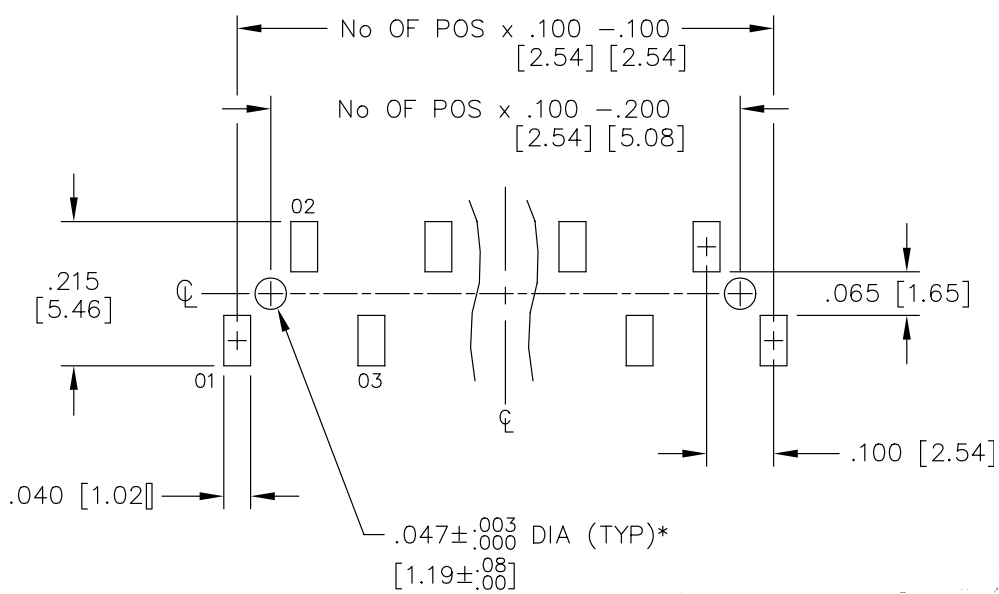


## Image8.png footprint\_BTB\_conn

Name: footprint\_BTB\_conn

Footprint of [BoardToBoard\_20\_2mm54\_SMD](#pEFbOP6GAqBwAZhh).

Since it is a surface mount component, 20 exposed rectangular copper pads (1.02mm x 1.975mm).

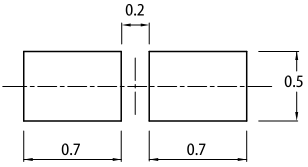


## Image8.png footprint\_led

Name: footprint\_led

Footprint of [RedLED\_module\_3V3](#C2FbOP6GAqBwAZiW).

Since it is a surface mount component, 2 exposed rectangular copper pads (0.5mm x 0.7mm) are required.



## Image8.png footprint\_res0603

Name: footprint\_res0603

Footprint for 0603 resistors.

Since surface mount resistors are used, 2 copper rectangular exposed pads are required (0.9mm x 0.65mm).

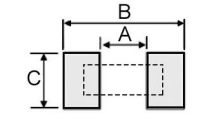


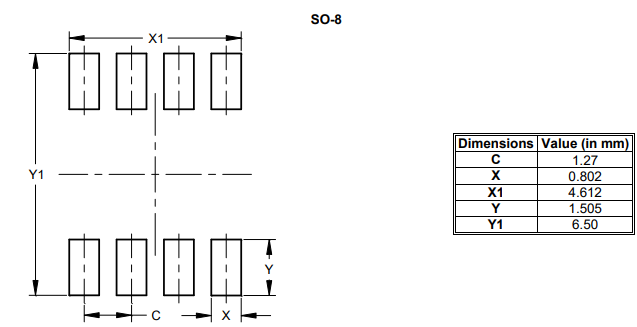
Image29.png

## Image8.png fooprint\_DCDC

Name: fooprint\_DCDC

Footprint of [DCDC\_3V3\_IC\_SMD](#XL5bOP6GAqBwAZfi).

Since it is a surface mount component, 8 copper rectangular exposed pads are required (0.802mm x 1.505mm).

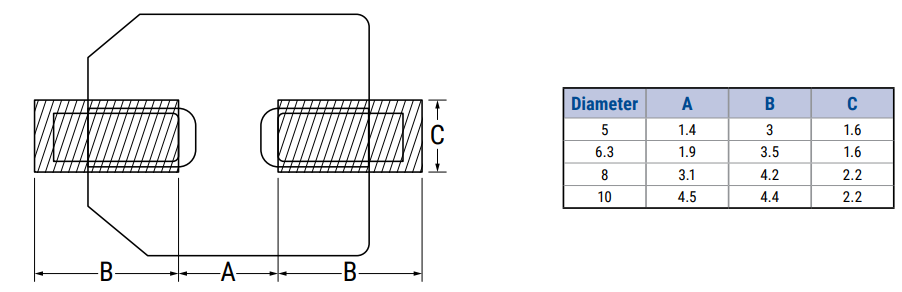


## Image8.png footprint\_cap

Name: footprint\_cap

Footprint of [C\_10uF\_electrolytic\_SMD](#Qn5bOP6GAqBwAZf0).

Since it is a surface mount component, 2 copper rectangular exposed pads are required (2.2mm x 4.2mm).

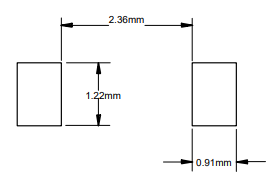


## Image8.png footprint\_diode

Name: footprint\_diode

Footprint of [SMD\_SPST\_PushButton](#_GFbOP6GAqBwAZiI).

Since it is a surface mount component, 2 copper rectangular exposed pads are required (1.22mm x 0.91mm).



## Image7.png 5mm7\_2mm\_DC\_THT

Name: 5mm7\_2mm\_DC\_THT

Female Jack connector for DC voltage.

The positive DC voltage is received at the core of the connector, instead the external metal cylinder provides the reference voltage.

On the pin [T1()](#AuFbOP6GAqBwAZif) there is the DC voltage to supply the circuit. Instead pin [T2()](#AuFbOP6GAqBwAZig) and [T3()](#AuFbOP6GAqBwAZih) provide the reference ground.



**Basic characteristics:**

- External contact diameter: 5.7mm

- Internal contact diameter: 2mm

- Max voltage: 24V

- Max current: 5A

- 5000 cycles

- Through hole technology

Operations

## Image8.png T1

Name: T1

Terminal connected to the core of [5mm7\_2mm\_DC\_THT](#wGFbOP6GAqBwAZiB) connector.

It receives the positive DC supply voltage.

Max voltage: 24V

**Coding**: voltage

**Periodicity**: continuous

## Image8.png T2

Name: T2

Terminal connected to the external metallic cylinder of [5mm7\_2mm\_DC\_THT](#wGFbOP6GAqBwAZiB) connector.

It receives the ground reference.

**Coding**: voltage

**Periodicity**: continuous

## Image8.png T3

Name: T3

Terminal connected to the external metallic shell of [5mm7\_2mm\_DC\_THT](#wGFbOP6GAqBwAZiB) connector.

It receives the ground reference.

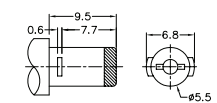
**Coding**: voltage

**Periodicity**: continuous

## Image8.png insertMaleConn

Name: insertMaleConn

Male connector is inserted inside [5mm7\_2mm\_DC\_THT](#wGFbOP6GAqBwAZiB).



**Coding**: inserted/non-inserted

**Periodicity**: occasional

## Image7.png 6mm35\_JACK\_Female\_THT

Name: 6mm35\_JACK\_Female\_THT

Female Jack connector for Jack mono 6.35mm.

Signal is received from tip of male Jack mono connector 6.35mm, and it is made available at pin [T2()](#5eFbOP6GAqBwAZin). Instead the ground reference is on the sleeve.



**Basic characteristics:**

- Hole diameter: 6.4mm

- Max voltage: 12V

- Max current: 1A

- Max contact resistance: 30mOhm

- 5000 cycles

- Through hole technology

Operations

## Image8.png T1

Name: T1

Terminal connected to ground reference.

**Coding**: voltage

**Periodicity**: continuous

## Image8.png T2

Name: T2

Terminal that receives the input signal.

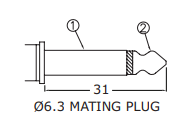
**Coding**: voltage

**Periodicity**: continuous

## Image8.png insertMaleJack

Name: insertMaleJack

Male Jack connector is inserted inside [6mm35\_JACK\_Female\_THT](#wGFbOP6GAqBwAZiC).



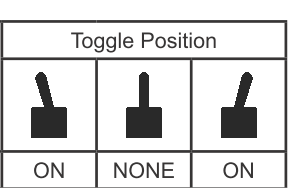
**Coding**: inserted/non-inserted

**Periodicity**: occasional

## Image7.png SPDT\_ON-OFF\_ToggleSwitch\_THT

Name: SPDT\_ON-OFF\_ToggleSwitch\_THT

The switch is an ON-OFF switch. There is a lever that can be in two different positions. When position of lever is modified, it remains in that position until lever is moved in the opposite one.



So it can be in two states:

- ON: circuit is connected to voltage supply

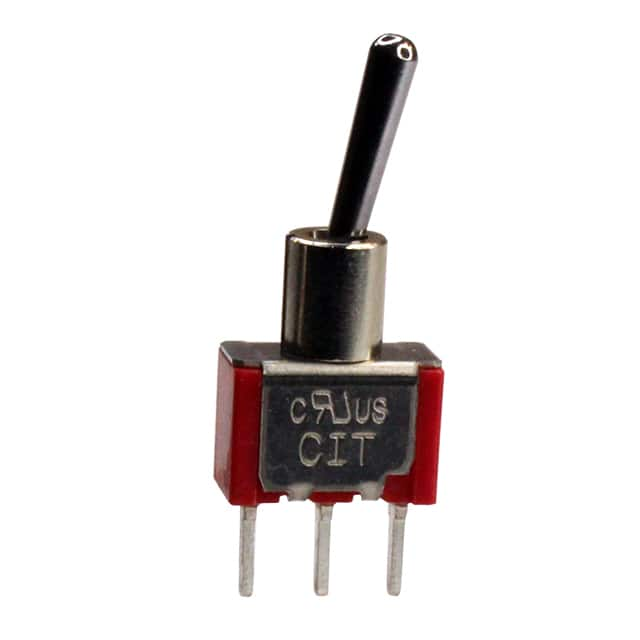
- OFF: circuit is not supplied

The switch remains in a state until the lever is moved in the opposite position.

This switch is a SPDT (Single Pole Double Throw) with a common pin ([T2()](#RBFbOP6GAqBwAZir)) that can be shorted to [T1()](#RBFbOP6GAqBwAZis) or [T3()](#xBFbOP6GAqBwAZit).

Body must be higher approximately 20mm in order to guarantee that the lever is outside the [Case](#3aFbOP6GAqBwAZh.).

In the following image is reported an example of toggle switch.



**Electrical characteristics:**

- Insulation resistance: more than 1000MOhm

- Contact resistance: less than 20mOhm

- Maximum current: 5A

**Mechanical characteristics:**

- Through-hole technology

- 50000 cycles

- Total height (without considering lever): at least 2cm

- Circular diameter: 5.72mm

Operations

## Image8.png T1

Name: T1

Terminal connected to the voltage supply.

**Coding:** voltage

**Periodicity:** continuous

## Image8.png T2

Name: T2

Terminal connected to the circuit (common pin).

**Coding:** voltage

**Periodicity:** continuous

## Image8.png T3

Name: T3

Terminal non-connected.

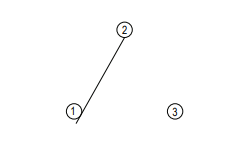
**Coding:** voltage

**Periodicity:** continuous

## Image8.png switchON

Name: switchON

The lever is moved in ON position (towards the "ON" label) in order to connect [T1()](#RBFbOP6GAqBwAZis) and [T2()](#RBFbOP6GAqBwAZir).



**Coding:** force

**Periodicity:** occasional

## Image8.png switchOFF

Name: switchOFF

The lever is moved in OFF position (towards the "OFF" label) in order to connect [T3()](#xBFbOP6GAqBwAZit) and [T2()](#RBFbOP6GAqBwAZir).

**Coding:** voltage

**Periodicity:** occasional

## Image7.png RedLED\_module\_3V3

Name: RedLED\_module\_3V3

Red LED module that allows to have a bright indication on the circuit.

A SMD LED will require a guide in order to propagate the light until the surface of the package.

In order to limit the current flows in the LED a resistor is required.

A 3.3V DC voltage must be applied to [VIN()](#xRFbOP6GAqBwAZiy) pin in order to switch on the LED.

Attributes

## Image9.png R1

Name: R1

This resistor allows to limit the current that flows through the [RedLED\_AlGaInP](#Sb5bOP6GAqBwAZfn) up to 2mA, considering that [VIN()](#xRFbOP6GAqBwAZiy) = 3.3V when [RedLED\_AlGaInP](#Sb5bOP6GAqBwAZfn) must be switched ON.

The [T1()](#4_5bOP6GAqBwAZgQ) pin must be connected to [VIN()](#xRFbOP6GAqBwAZiy) pin of [RedLED\_module\_3V3](#C2FbOP6GAqBwAZiW), instead the [T2()](#W_5bOP6GAqBwAZgR) pin must be connected to [A()](#Fb5bOP6GAqBwAZfo) pin of [LD1: RedLED\_AlGaInP](#7RFbOP6GAqBwAZi1).

## Image9.png LD1

Name: LD1

Red LED that switches ON when a voltage larger than 1.8V drops on it.

The anode [A()](#Fb5bOP6GAqBwAZfo) must be connected to [T2()](#W_5bOP6GAqBwAZgR) pin of [R1: R\_750\_1%\_0603\_SMD](#xRFbOP6GAqBwAZiz), instead the cathode [K()](#vb5bOP6GAqBwAZfq) must be connected to [GND()](#0xFbOP6GAqBwAZi3).

Operations

## Image8.png VIN

Name: VIN

Positive voltage pin.

**Coding:** voltage:

- 0V -> switched OFF

- 3.3V -> switched ON

**Periodicity:** continuous

## Image8.png GND

Name: GND

Reference ground pin.

**Coding:** voltage

**Periodicity:** continuous

## Image7.png SMD\_SPST\_PushButton

Name: SMD\_SPST\_PushButton

It is a tactile (ON)-OFF switch. There is a button that can be pushed, for an arbitrary long time interval. When it is released it comes back in its original position.

Most of time it is in OFF position, it means that it sends a '1' logic level on [OUT2()](#IJFbOP6GAqBwAZi5) pin (external pull-up can be required). Instead when button is pressed it sends a '0' logic level on [OUT2()](#IJFbOP6GAqBwAZi5) pin.

**Basic characteristics:**

- Max contact resistance: 10mOhm

- Min insulation resistance: 100MOhm

- SPST (Single Pole Single Throw)

- Actuation force: 260gf

Operations

## Image8.png OUT1

Name: OUT1

This terminal provides the state of [SMD\_SPST\_PushButton](#_GFbOP6GAqBwAZiI):

- pressed: '0' logic level

- non-pressed: '1' logic level

It must be shortcircuited to [OUT2()](#IJFbOP6GAqBwAZi5).

**Coding:** voltage

**Periodicity:** continuous

## Image8.png OUT2

Name: OUT2

This terminal provides the state of [SMD\_SPST\_PushButton](#_GFbOP6GAqBwAZiI):

- pressed: '0' logic level

- non-pressed: '1' logic level

It must be shortcircuited to [OUT1()](#oJFbOP6GAqBwAZi6).

**Coding:** voltage

**Periodicity:** continuous

## Image8.png GND1

Name: GND1

Terminal connected to ground reference voltage.

It must be shortcircuited to [GND2()](#4pFbOP6GAqBwAZi_).

**Coding:** voltage

**Periodicity:** continuous

## Image8.png GND2

Name: GND2

Terminal connected to ground reference voltage.

It must be shortcircuited to [GND1()](#zJFbOP6GAqBwAZi9).

**Coding:** voltage

**Periodicity:** continuous

## Image8.png push

Name: push

When button is pressed the [OUT1()](#oJFbOP6GAqBwAZi6) and [OUT2()](#IJFbOP6GAqBwAZi5) terminal are shortcircuited to [GND1()](#zJFbOP6GAqBwAZi9) and [GND2()](#4pFbOP6GAqBwAZi_).

**Coding:** force

**Periodicity:** occasional

## Image8.png release

Name: release

When button is not pressed [OUT1()](#oJFbOP6GAqBwAZi6) and [OUT2()](#IJFbOP6GAqBwAZi5) pins are float.

**Coding:** voltage

**Periodicity:** occasional

## Image7.png 10K\_t20%\_LOG\_POT\_H20mm\_THT

Name: 10K\_t20%\_LOG\_POT\_H20mm\_THT

The potentiometer [10K\_t20%\_LOG\_POT\_H20mm\_THT](#FGFbOP6GAqBwAZiF) is a logarithmic potentiometer that allows to have a variable resistance. The resistance value depends on the position of the knob, that can be rotated in clockwise and counterclockwise direction. Since [VDD()](#xZFbOP6GAqBwAZjF) must be connected to a voltage supply, the variable resistance allows to tune the voltage at pin [F\_T()](#xZFbOP6GAqBwAZjG).



**Electrical characteristics:**

- Minimum resistance: 20Ohm

- Maximum resistance: 10KOhm

- Tolerance: +/-20%

- Maximum voltage: 50V

**Mechanical characteristics:**

- Knob diameter: 6mm

- Total height: 20mm

- Total rotation: 280°

- 100000 cycles

- Through-hole technology

Operations

## Image8.png VDD

Name: VDD

Voltage supply pin.

Max voltage: 50V

**Coding:** voltage

**Periodicity:** continuous

## Image8.png GND

Name: GND

Reference ground pin.

**Coding:** voltage

**Periodicity:** continuous

## Image8.png F\_T

Name: F\_T

Terminal at which the variable voltage can be read. Voltage at this pin can vary in the range from [F\_T()](#xZFbOP6GAqBwAZjG) = 20/10k \* [VDD()](#xZFbOP6GAqBwAZjF) = 2\*10^-3\*[VDD()](#xZFbOP6GAqBwAZjF) (due to the minimum resistance of potentiometer) to [F\_T()](#xZFbOP6GAqBwAZjG) = [VDD()](#xZFbOP6GAqBwAZjF).

**Coding:** voltage

**Periodicity:** continuous

## Image8.png tuneR

Name: tuneR

Knob is rotated in clockwise direction: voltage at pin [F\_T()](#xZFbOP6GAqBwAZjG)increases, so resistance is higher

**Coding:** force

**Periodicity:** occasional

## Image8.png tuneL

Name: tuneL

Knob is rotated in counterclockwise direction: voltage at pin [F\_T()](#xZFbOP6GAqBwAZjG) decreases, so resistance is lower

**Coding:** force

**Periodicity:** occasional

## Image7.png OLED\_Display

Name: OLED\_Display

OLED display module.

A DC voltage between 4.5V and 22V is required to supply this module.

The I2C protocol is exploited to establish a communication with the remaining part of the circuit.

Attributes

## Image9.png MaleConn

Name: MaleConn

The 4 wire starting from the [OLED\_Display](#e15bOP6GAqBwAZe9) pins end in the [MaleCrimpConnector\_4pin\_1mmPitch](#5oFbOP6GAqBwAZhT).

This male connector will be inserted inside the [CONN4: FemaleCrimpConnector\_4pin\_1mmPitch\_SMD\_topEntry](#PFFbOP6GAqBwAZjP), so that there is a direct mapping between pins of both connectors:

- [T4()](#iEFbOP6GAqBwAZhf) -> [GND()](#PFFbOP6GAqBwAZjQ)

- [T3()](#n4FbOP6GAqBwAZhd) -> [SDA()](#PFFbOP6GAqBwAZjR)

- [T2()](#x4FbOP6GAqBwAZhb) -> [SCL()](#vFFbOP6GAqBwAZjS)

- [T1()](#c4FbOP6GAqBwAZhZ) -> [VOUT()](#6P5bOP6GAqBwAZgJ)

## Image9.png CONN4

Name: CONN4

Female crimp style connector on the board that allows to connect [OLED\_Display](#e15bOP6GAqBwAZe9) to the circuit. Pins of connector must be mapped in the following way:

- [T4()](#iEFbOP6GAqBwAZhf) -> [GND()](#PFFbOP6GAqBwAZjQ)

- [T3()](#n4FbOP6GAqBwAZhd) -> [SDA()](#PFFbOP6GAqBwAZjR)

- [T2()](#x4FbOP6GAqBwAZhb) -> [SCL()](#vFFbOP6GAqBwAZjS)

- [T1()](#c4FbOP6GAqBwAZhZ) -> [VOUT()](#6P5bOP6GAqBwAZgJ)

## Image9.png R1

Name: R1

Pull-up resistor to rise the [SCL()](#vFFbOP6GAqBwAZjS) line.

## Image9.png R3

Name: R3

Pull-up resistor to rise the [SDA()](#PFFbOP6GAqBwAZjR) line.

## Image9.png DCDC

Name: DCDC

A DCDC regulator is used to supply the [OLED\_Display](#e15bOP6GAqBwAZe9) in order to isolate it from the power supply of [uP: uP\_SignalMusicProcessing](#AaFbOP6GAqBwAZh6).

Therefore [DCDC: DCDC\_3V3\_module](#XlFbOP6GAqBwAZjY) provide the positive supply voltage to [OLED\_Display](#e15bOP6GAqBwAZe9). In fact, [VIN()](#_35bOP6GAqBwAZgH) pin of [DCDC: DCDC\_3V3\_module](#XlFbOP6GAqBwAZjY) receives the DC voltage from [T1()](#AuFbOP6GAqBwAZif) of [5mm7\_2mm\_DC\_THT](#wGFbOP6GAqBwAZiB) and provides on [VOUT()](#6P5bOP6GAqBwAZgJ) pin a suitable supply voltage for [OLED\_Display](#e15bOP6GAqBwAZe9).

## Image9.png OLED

Name: OLED

OLED display that exploits the I2C protocol to communicate.

Operations

## Image8.png VIN

Name: VIN

Voltage supply pin of OLED display module.

A supply voltage from 4.5V to 22V can be applied.

**Coding:** voltage, 4.5V - 22V

**Periodicity:** continuous

## Image8.png GND

Name: GND

Reference ground pin.

**Coding:** voltage

**Periodicity:** continuous

## Image8.png SDA

Name: SDA

Serial DAta pin: data are sent and received in a serial way using this pin.

**Coding**: I2C

* Input logic levels:
  + '0': [DGND()](#ZH5bOP6GAqBwAZfx) - 0.99V
  + '1': 2.31V - 3.3V
* Output logic levels:
  + '0': [DGND()](#ZH5bOP6GAqBwAZfx) - 0.4V
  + '1': 2.9V - 3.3V

**Periodicity**: continuous

## Image8.png SCL

Name: SCL

Serial CLock pin: a synchronous signal is connected to this pin in order to synchronize Master and Slave.

**Coding**: I2C

* Input logic levels:
  + '0': [DGND()](#ZH5bOP6GAqBwAZfx) - 0.99V
  + '1': 2.31V - 3.3V
* Output logic levels:
  + '0': [DGND()](#ZH5bOP6GAqBwAZfx) - 0.4V
  + '1': 2.9V - 3.3V

**Periodicity**: continuous

## Image7.png uP\_SignalMusicProcessing

Name: uP\_SignalMusicProcessing

It is the microprocessor module must be able to process the input signal received by means of [Jack\_IN](#UF5bOP6GAqBwAZeU).

It exploits the [DAISY\_SEED](#f8FbOP6GAqBwAZhl) board, available on the market.

Some digital signal processing algorithm are implemented in order to apply effects to the input signal.

Attributes

## Image9.png DS

Name: DS

## Image9.png J1

Name: J1

Model: **SSM-120-L-SV**

## Image9.png J2

Name: J2

Model: **SSM-120-L-SV**

## Image9.png FW

Name: FW

## Image7.png MultiFX\_nese10\_2122

Name: MultiFX\_nese10\_2122

[MultiFX\_nese10\_2122](#TF5bOP6GAqBwAZeY) is a system that allows to apply some effects to an input audio signal, so that a new audio signal can be provided as output.

The [User](#M55bOP6GAqBwAZeR) can easily interface with the system using the knobs and pushbuttons on the top side of the [MultiFX\_nese10\_2122](#TF5bOP6GAqBwAZeY). Furthermore an OLED display allows to understand what is the current effect applied on the input audio signal, the parameter value of that effect and the volume.

Attributes

## Image9.png POT1

Name: POT1

This [10K\_t20%\_LOG\_POT\_H20mm\_THT](#FGFbOP6GAqBwAZiF) allows to [tuneR()](#Z5FbOP6GAqBwAZjJ) the volume of the input signal processed by [uP: uP\_SignalMusicProcessing](#AaFbOP6GAqBwAZh6).

The pin [VDD()](#xZFbOP6GAqBwAZjF) must be connected to [OUT\_3V3A()](#LCFbOP6GAqBwAZhp) pin of [DAISY\_SEED](#f8FbOP6GAqBwAZhl).

The pin [F\_T()](#xZFbOP6GAqBwAZjG) must be connected to [ADC\_IN1()](#_AFbOP6GAqBwAZgu). Due to the connection to [OUT\_3V3A()](#LCFbOP6GAqBwAZhp) the voltage at this pin can be tuned in the voltage range between 6.6mV (minimum volume) and 3.3V (maximum volume).

Finally, the pin [GND()](#PZFbOP6GAqBwAZjH) will be connected to ground reference provided by [CONN1: 5mm7\_2mm\_DC\_THT](#TF5bOP6GAqBwAZeX).

## Image9.png POT2

Name: POT2

This [10K\_t20%\_LOG\_POT\_H20mm\_THT](#FGFbOP6GAqBwAZiF) allows to [tuneR()](#Z5FbOP6GAqBwAZjJ) the volume of the input signal processed by [uP: uP\_SignalMusicProcessing](#AaFbOP6GAqBwAZh6).

The pin [VDD()](#xZFbOP6GAqBwAZjF) must be connected to [OUT\_3V3A()](#LCFbOP6GAqBwAZhp) pin of [DAISY\_SEED](#f8FbOP6GAqBwAZhl).

The pin [F\_T()](#xZFbOP6GAqBwAZjG) must be connected to [ADC\_IN2()](#1gFbOP6GAqBwAZgz).

Due to the connection to [OUT\_3V3A()](#LCFbOP6GAqBwAZhp) the voltage at this pin can be tuned in the voltage range between 6.6mV (minimum volume) and 3.3V (maximum volume).

Finally, the pin [GND()](#PZFbOP6GAqBwAZjH) will be connected to ground reference provided by [CONN1: 5mm7\_2mm\_DC\_THT](#TF5bOP6GAqBwAZeX).

## Image9.png SW1

Name: SW1

This [SPDT\_ON-OFF\_ToggleSwitch\_THT](#6mFbOP6GAqBwAZiL) is used to turn ON/OFF the device.

When device is turned ON ([switchON()](#FAFbOP6GAqBwAZgr)) the whole circuit is supplied, otherwise ([switchOFF()](#vhFbOP6GAqBwAZiv)) it is not connected to supply voltage.

## Image9.png SW2

Name: SW2

This [SMD\_SPST\_PushButton](#_GFbOP6GAqBwAZiI) that allows to switch to the previous effect.

When button is pressed ([push()](#upFbOP6GAqBwAZjB)), there is a commutation ('1' -> '0') on [OUT1()](#oJFbOP6GAqBwAZi6) and [OUT2()](#IJFbOP6GAqBwAZi5) pins, that indicate the previous effect must be applied.

Pins [OUT1()](#oJFbOP6GAqBwAZi6) and [OUT2()](#IJFbOP6GAqBwAZi5) must be connected to [GPIO2()](#jwFbOP6GAqBwAZhF).

## Image9.png SW3

Name: SW3

This [SMD\_SPST\_PushButton](#_GFbOP6GAqBwAZiI) that allows to switch to the next effect.

When button is pressed ([push()](#upFbOP6GAqBwAZjB)), there is a commutation ('1' -> '0') on [OUT1()](#oJFbOP6GAqBwAZi6) and [OUT2()](#IJFbOP6GAqBwAZi5) pins, that indicate the next effect must be applied.

Pins [OUT1()](#oJFbOP6GAqBwAZi6) and [OUT2()](#IJFbOP6GAqBwAZi5) must be connected to [GPIO1()](#awFbOP6GAqBwAZhA).

## Image9.png SW4

Name: SW4

This [SMD\_SPST\_PushButton](#_GFbOP6GAqBwAZiI) that allows to switch ON bypass: the input output signal is not processed.

When button is pressed ([push()](#upFbOP6GAqBwAZjB)), there is a commutation ('1' -> '0') on [OUT1()](#oJFbOP6GAqBwAZi6) and [OUT2()](#IJFbOP6GAqBwAZi5) pins, so it is possible to toggle between bypass ON and OFF, and vice versa.

Pins [OUT1()](#oJFbOP6GAqBwAZi6) and [OUT2()](#IJFbOP6GAqBwAZi5) must be connected to [GPIO3()](#EIFbOP6GAqBwAZhJ).

## Image9.png LED

Name: LED

This LED provides a luminous indication about the bypass:

- LED is ON: input signal is bypassed without any processing

- LED is OFF: an effect in applied to input signal

The [VIN()](#xRFbOP6GAqBwAZiy) pin must be connected to [GPIO3()](#EIFbOP6GAqBwAZhJ).

The [GND()](#0xFbOP6GAqBwAZi3) pin must be connected to the reference ground voltage provided by [CONN1: 5mm7\_2mm\_DC\_THT](#TF5bOP6GAqBwAZeX).

## Image9.png uP

Name: uP

The [uP\_SignalMusicProcessing](#ANFbOP6GAqBwAZje) module exploits the [DAISY\_SEED](#f8FbOP6GAqBwAZhl) board to process input signal.

## Image9.png OLED

Name: OLED

The [OLED: OLED\_Display](#015bOP6GAqBwAZe3) is used to show:

- Current effect

- Bypass status

- Volume percentage

- Effect percentage

It communicates with the [uP: uP\_SignalMusicProcessing](#AaFbOP6GAqBwAZh6), that provides also the required supply voltage:

- [VIN()](#JVFbOP6GAqBwAZjb): [T1()](#AuFbOP6GAqBwAZif) of [5mm7\_2mm\_DC\_THT](#wGFbOP6GAqBwAZiB)

- [GND()](#PFFbOP6GAqBwAZjQ): [AGND()](#uyFbOP6GAqBwAZhv)

- [SDA()](#PFFbOP6GAqBwAZjR): [I2C1\_SDA()](#0KFbOP6GAqBwAZhy)

- [SCL()](#vFFbOP6GAqBwAZjS): [I2C1\_SCL()](#pKFbOP6GAqBwAZh0)

## Image9.png CONN1

Name: CONN1

Connector that receives the voltage supply from [Power\_supply and cable](#.55bOP6GAqBwAZeS) in order to supply the whole circuit.

## Image9.png CONN2

Name: CONN2

Connector that receives the signal from [Jack\_IN](#UF5bOP6GAqBwAZeU)(tip of male Jack connector 6.35mm) and send it to [uP: uP\_SignalMusicProcessing](#AaFbOP6GAqBwAZh6) at pin [AUDIO\_IN1()](#_KFbOP6GAqBwAZh2).

## Image9.png CONN3

Name: CONN3

Connector that allows to send the processed audio signal, provided by [uP: uP\_SignalMusicProcessing](#AaFbOP6GAqBwAZh6) at pin [AUDIO\_OUT1()](#aqFbOP6GAqBwAZh3), to [Jack\_OUT](#755bOP6GAqBwAZeT).

## Image9.png PCB\_v1

Name: PCB\_v1

## Image9.png SCH\_v1

Name: SCH\_v1

## Image9.png CASE\_125x72

Name: CASE\_125x72

Operations

## Image8.png volumeUp

Name: volumeUp

The knob of [POT1: 10K\_t20%\_LOG\_POT\_H20mm\_THT](#u15bOP6GAqBwAZe7) is rotated in clockwise direction ([tuneR()](#Z5FbOP6GAqBwAZjJ)). In this way, an higher voltage value will be sampled by [DAISY\_SEED](#f8FbOP6GAqBwAZhl) at [ADC\_IN1()](#_AFbOP6GAqBwAZgu) pin, so it is possible to increase the volume (magnitude) of audio signal processed by [uP: uP\_SignalMusicProcessing](#AaFbOP6GAqBwAZh6).

## Image8.png volumeDown

Name: volumeDown

The knob of [POT1: 10K\_t20%\_LOG\_POT\_H20mm\_THT](#u15bOP6GAqBwAZe7) is rotated in counterclockwise direction ([tuneL()](#n5FbOP6GAqBwAZjL)). In this way, a lower voltage value will be sampled by [DAISY\_SEED](#f8FbOP6GAqBwAZhl) at [ADC\_IN1()](#_AFbOP6GAqBwAZgu) pin, so it is possible to decrease the volume (magnitude) of audio signal processed by [uP: uP\_SignalMusicProcessing](#AaFbOP6GAqBwAZh6).

## Image8.png FxUp

Name: FxUp

The knob of [POT2: 10K\_t20%\_LOG\_POT\_H20mm\_THT](#U15bOP6GAqBwAZey) is rotated in clockwise direction ([tuneR()](#Z5FbOP6GAqBwAZjJ)). In this way, an higher voltage value will be sampled by [DAISY\_SEED](#f8FbOP6GAqBwAZhl) at [ADC\_IN2()](#1gFbOP6GAqBwAZgz) pin, so it is possible to increase the way in which the effect affect the audio signal processed by [uP: uP\_SignalMusicProcessing](#AaFbOP6GAqBwAZh6).

## Image8.png FxDown

Name: FxDown

The knob of [POT2: 10K\_t20%\_LOG\_POT\_H20mm\_THT](#U15bOP6GAqBwAZey) is rotated in clockwise direction ([tuneR()](#Z5FbOP6GAqBwAZjJ)). In this way, a lower voltage value will be sampled by [DAISY\_SEED](#f8FbOP6GAqBwAZhl) at [ADC\_IN2()](#1gFbOP6GAqBwAZgz) pin, so it is possible to decrease the way in which the effect affect the audio signal processed by [uP: uP\_SignalMusicProcessing](#AaFbOP6GAqBwAZh6).

## Image8.png switchOn

Name: switchOn

The lever is moved in ON position (towards the "ON" label) in order to [switchON()](#FAFbOP6GAqBwAZgr) the circuit. In this way the circuit is supplied.

## Image8.png switchOff

Name: switchOff

The lever is moved in OFF position (towards the "OFF" label) in order to [switchOFF()](#vhFbOP6GAqBwAZiv) the circuit. In this way the circuit is not connected to any voltage supply.

## Image8.png pushNextFx

Name: pushNextFx

When [User](#M55bOP6GAqBwAZeR) [push()](#upFbOP6GAqBwAZjB) the [SW3: SMD\_SPST\_PushButton](#awFbOP6GAqBwAZg_) the next effect is applied to the audio signal processed by [uP: uP\_SignalMusicProcessing](#AaFbOP6GAqBwAZh6). In particular, variation of voltage at [GPIO1()](#awFbOP6GAqBwAZhA) pin is read like a request ([nextFx(int currentEffect)](#AwFbOP6GAqBwAZg9)) to switch to the next effect.

One switch per each pressure, until [release()](#GwFbOP6GAqBwAZhB) of [SW3: SMD\_SPST\_PushButton](#awFbOP6GAqBwAZg_).

## Image8.png releaseNextFx

Name: releaseNextFx

The [User](#M55bOP6GAqBwAZeR) [release()](#GwFbOP6GAqBwAZhB) the [SW3: SMD\_SPST\_PushButton](#awFbOP6GAqBwAZg_), so the voltage value become again equal to the quiescent value ('1'). Only now a new [pushNextFx()](#kzFbOP6GAqBwAZj6) can lead to another effect switch.

## Image8.png pushBackFx

Name: pushBackFx

When [User](#M55bOP6GAqBwAZeR) [push()](#upFbOP6GAqBwAZjB) the [SW2: SMD\_SPST\_PushButton](#DwFbOP6GAqBwAZhE) the previous effect is applied to the audio signal processed by [uP: uP\_SignalMusicProcessing](#AaFbOP6GAqBwAZh6). In particular, variation of voltage at [GPIO2()](#jwFbOP6GAqBwAZhF) pin is read like a request ([backFx(int currentEffect)](#mwFbOP6GAqBwAZhC)) to switch to the next effect.

One switch per each pressure, until [release()](#GwFbOP6GAqBwAZhB) of [SW2: SMD\_SPST\_PushButton](#DwFbOP6GAqBwAZhE).

## Image8.png releaseBackFx

Name: releaseBackFx

The [User](#M55bOP6GAqBwAZeR) [release()](#GwFbOP6GAqBwAZhB) the [SW2: SMD\_SPST\_PushButton](#DwFbOP6GAqBwAZhE), so the voltage value become again equal to the quiescent value ('1'). Only now a new [pushBackFx()](#Ft5bOP6GAqBwAZfP) can lead to another effect switch.

## Image8.png pushBypass

Name: pushBypass

When [User](#M55bOP6GAqBwAZeR) [push()](#upFbOP6GAqBwAZjB) the [SW4: SMD\_SPST\_PushButton](#EIFbOP6GAqBwAZhI) the next effect is applied to the audio signal processed by [uP: uP\_SignalMusicProcessing](#AaFbOP6GAqBwAZh6). In particular, variation of voltage at [GPIO3()](#EIFbOP6GAqBwAZhJ) pin is read like a request ([bypass(int currentEffect)](#zwFbOP6GAqBwAZhG)) to switch to the next effect.

One switch per each pressure, until [release()](#GwFbOP6GAqBwAZhB) of [SW4: SMD\_SPST\_PushButton](#EIFbOP6GAqBwAZhI).

## Image8.png releaseBypass

Name: releaseBypass

The [User](#M55bOP6GAqBwAZeR) [release()](#GwFbOP6GAqBwAZhB) the [SW4: SMD\_SPST\_PushButton](#EIFbOP6GAqBwAZhI), so the voltage value become again equal to the quiescent value ('1'). Only now a new [pushBypass()](#pN5bOP6GAqBwAZfH) can lead to another effect switch.

## Image8.png DC\_voltage

Name: DC\_voltage

DC voltage between 4V and 17V

## Image8.png signal\_IN

Name: signal\_IN

Input audio signal provided by [Jack\_IN](#UF5bOP6GAqBwAZeU).

Nominal input level: −20dBm.

## Image8.png signal\_OUT

Name: signal\_OUT

Processed output audio signal provided to [Jack\_OUT](#755bOP6GAqBwAZeT).

Max output level: Line +5dBm (with output load 10 kΩ or more).

## Image8.png pressBoot

Name: pressBoot

Boot pushbutton on [DAISY\_SEED](#f8FbOP6GAqBwAZhl) board is pressed. It can be useful to flash [uP: uP\_SignalMusicProcessing](#AaFbOP6GAqBwAZh6).

## Image8.png releaseBoot

Name: releaseBoot

Boot pushbutton on [DAISY\_SEED](#f8FbOP6GAqBwAZhl) board is released.

## Image8.png pressReset

Name: pressReset

Reset pushbutton on [DAISY\_SEED](#f8FbOP6GAqBwAZhl) board is pressed. It allows to reset the [DAISY\_SEED](#f8FbOP6GAqBwAZhl) board and can be useful to flash [uP: uP\_SignalMusicProcessing](#AaFbOP6GAqBwAZh6).

## Image8.png releaseReset

Name: releaseReset

Reset pushbutton on [DAISY\_SEED](#f8FbOP6GAqBwAZhl) board is released.

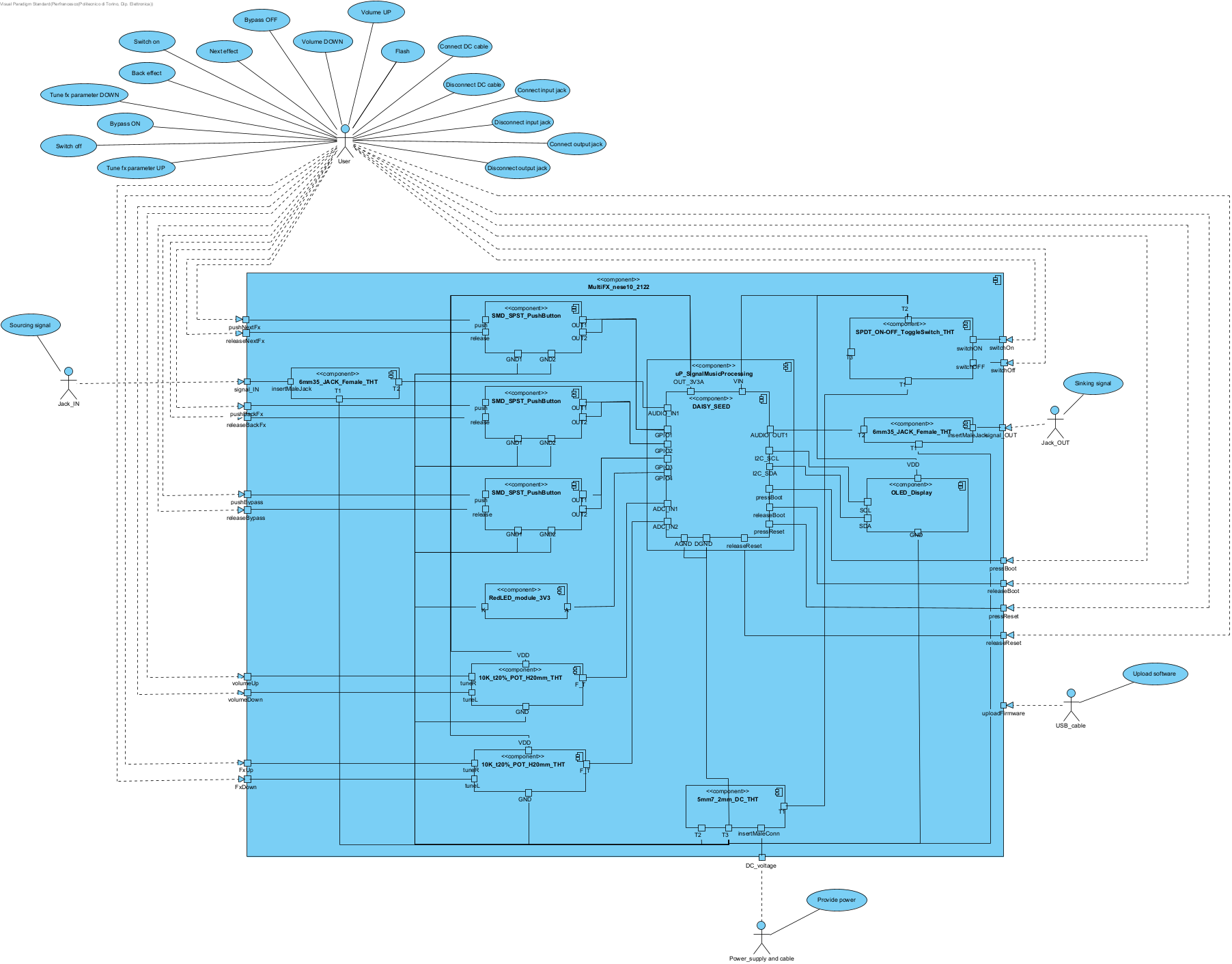
## Image8.png uploadFirmware

Name: uploadFirmware

Connecting the [USB\_cable](#IZ5bOP6GAqBwAZeQ) to [DAISY\_SEED](#f8FbOP6GAqBwAZhl) it is possible to upload a new firmware.

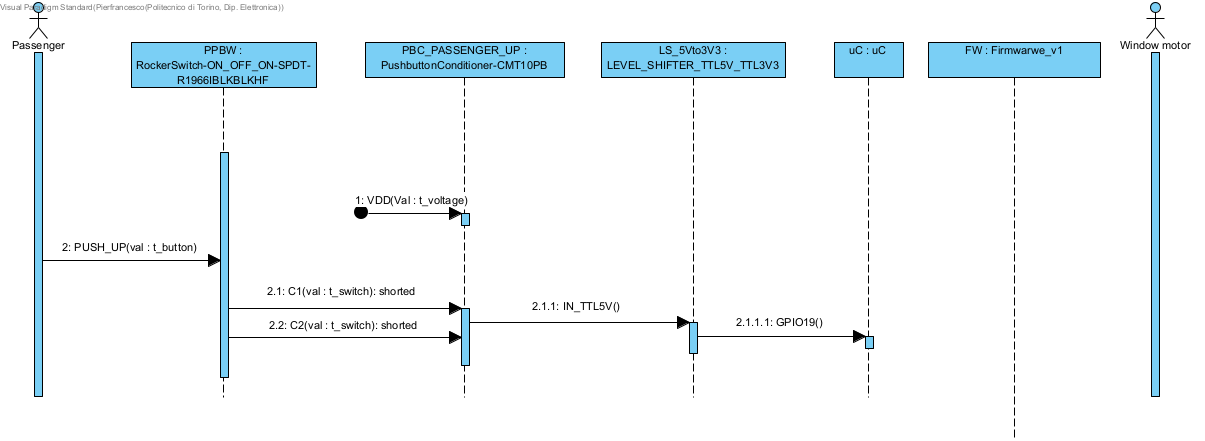
Component Diagram

# Components\_multiFx



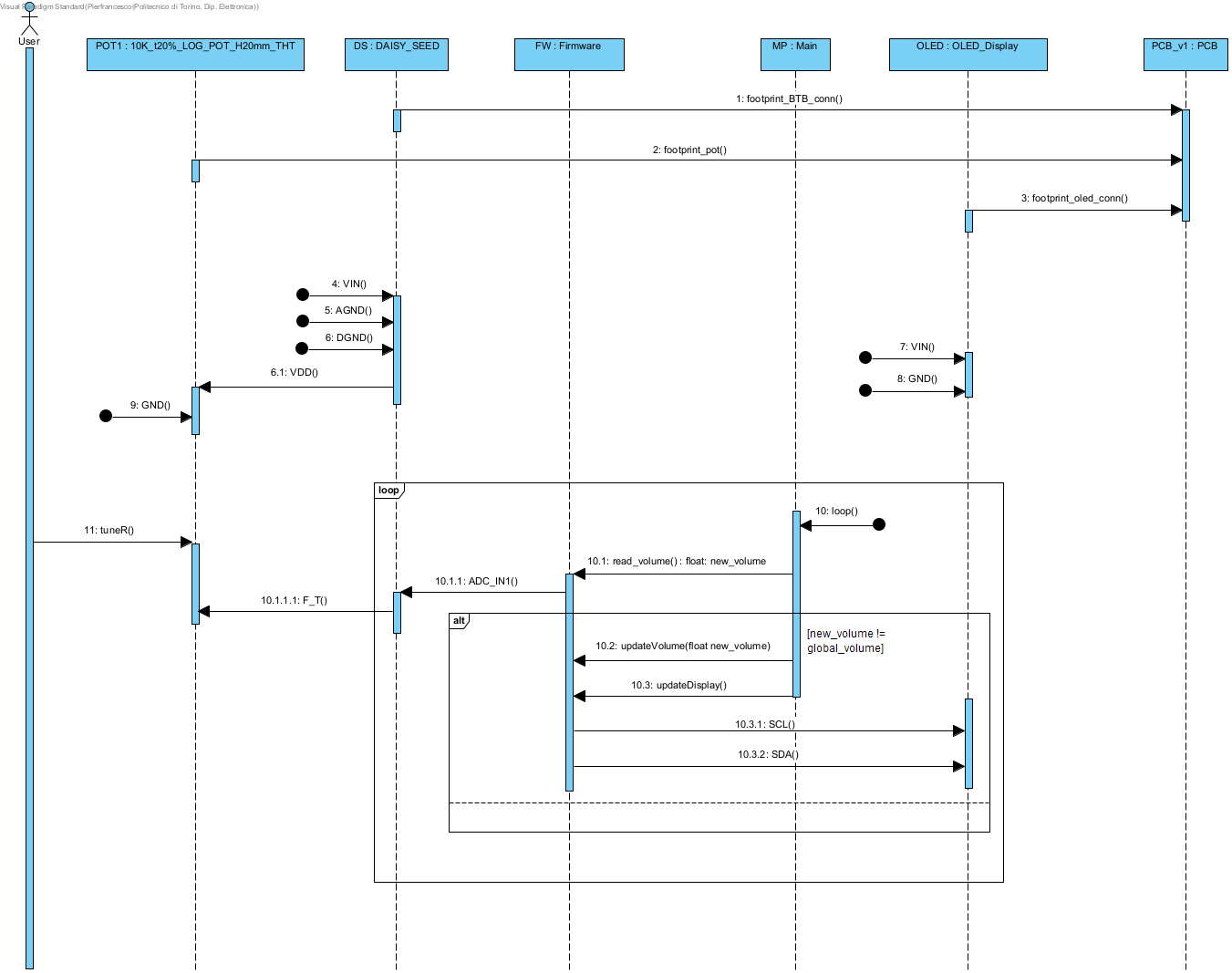
Sequence Diagram

# PowerWindow\_CloseRightWindow



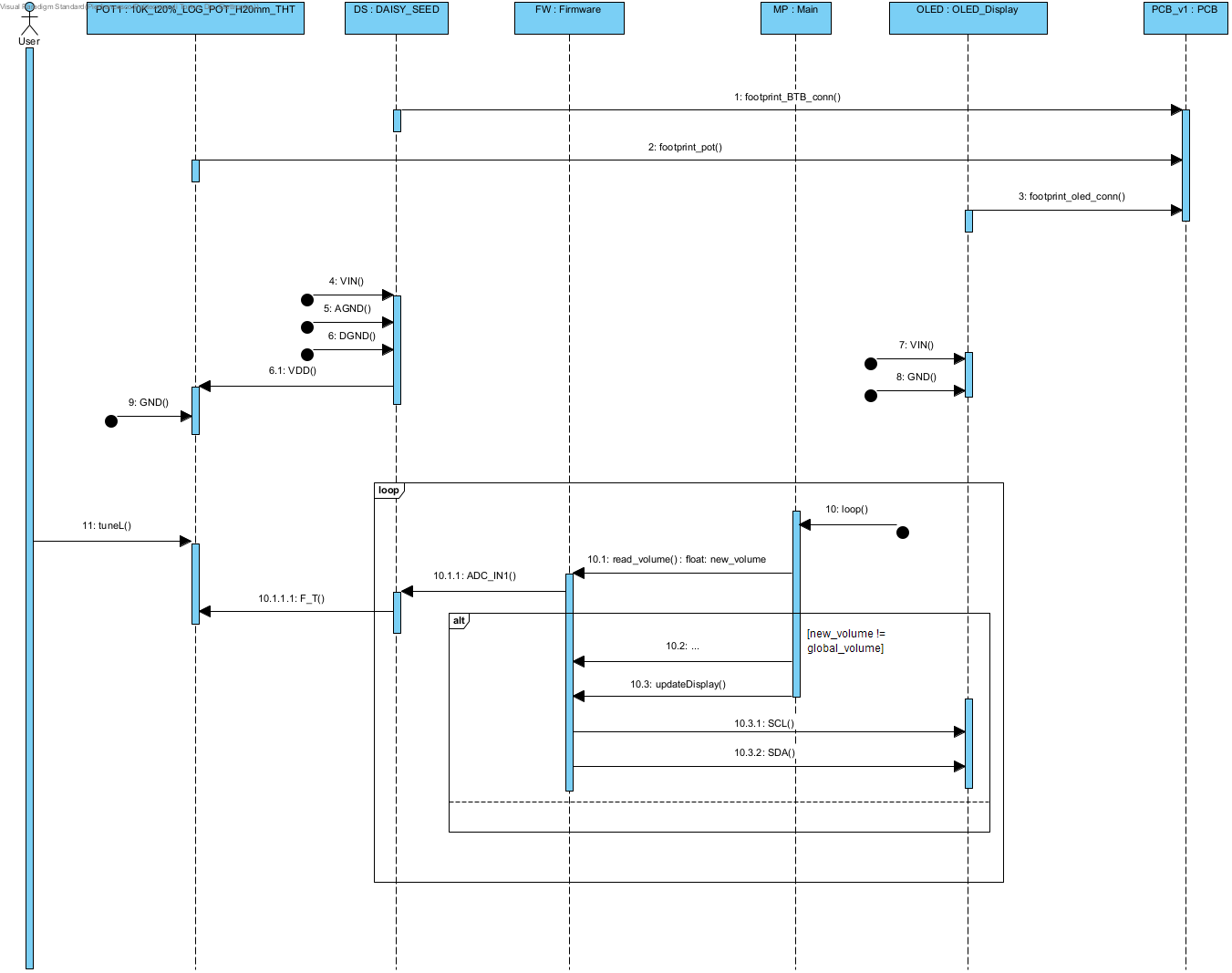
Sequence Diagram

# TuneVolumeUp



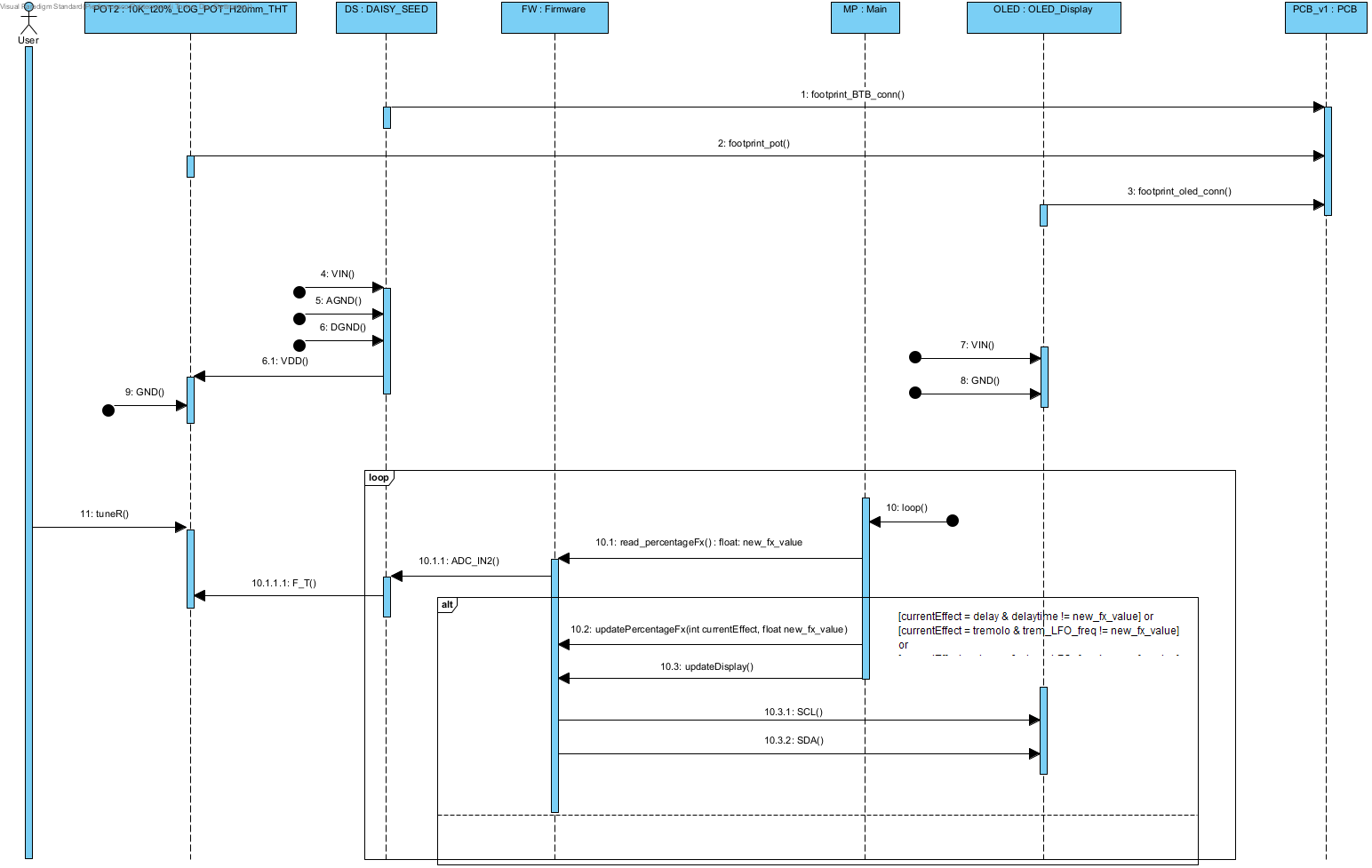
Sequence Diagram

# TuneVolumeDown



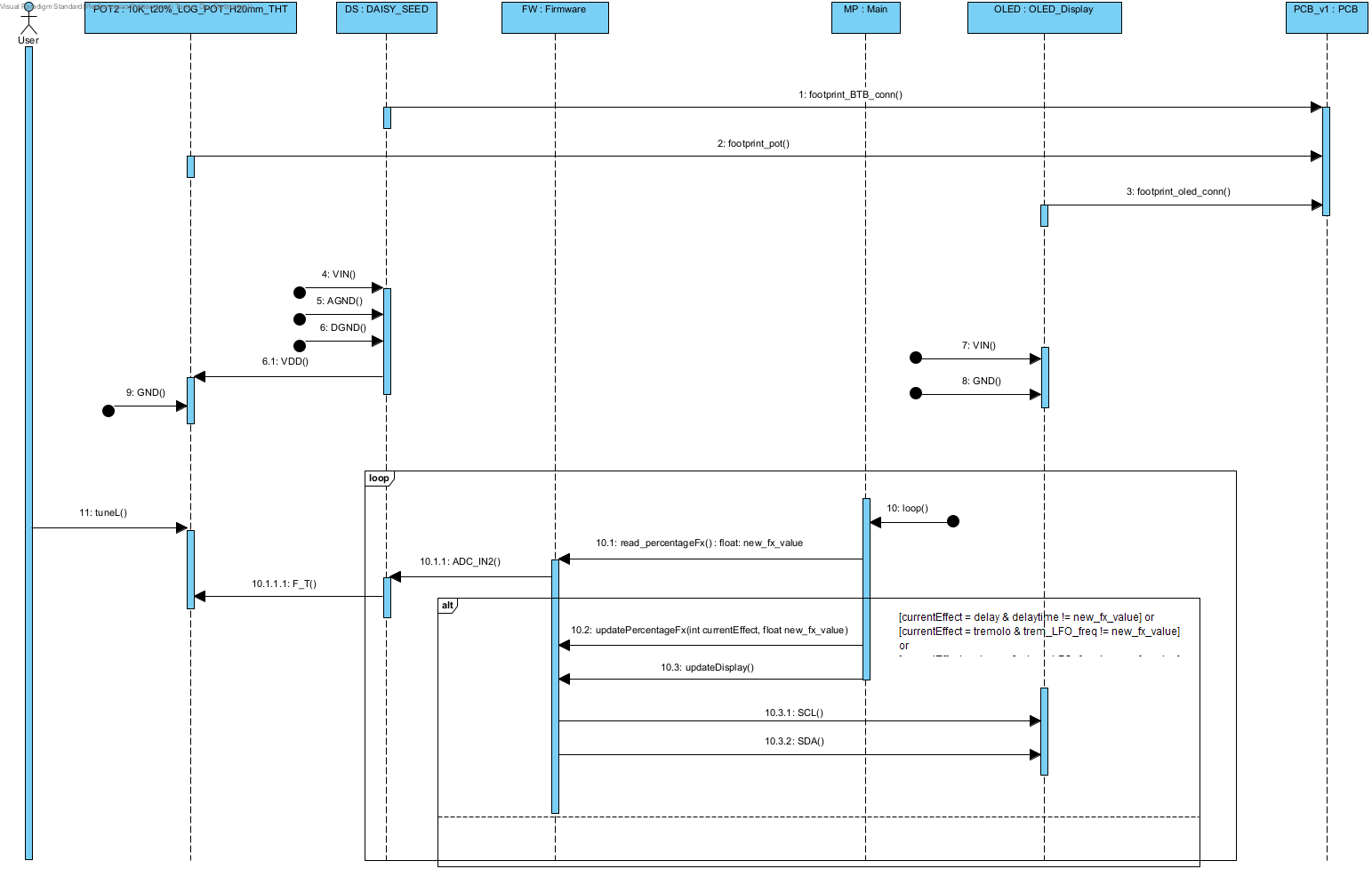
Sequence Diagram

# TuneParameterFxUp



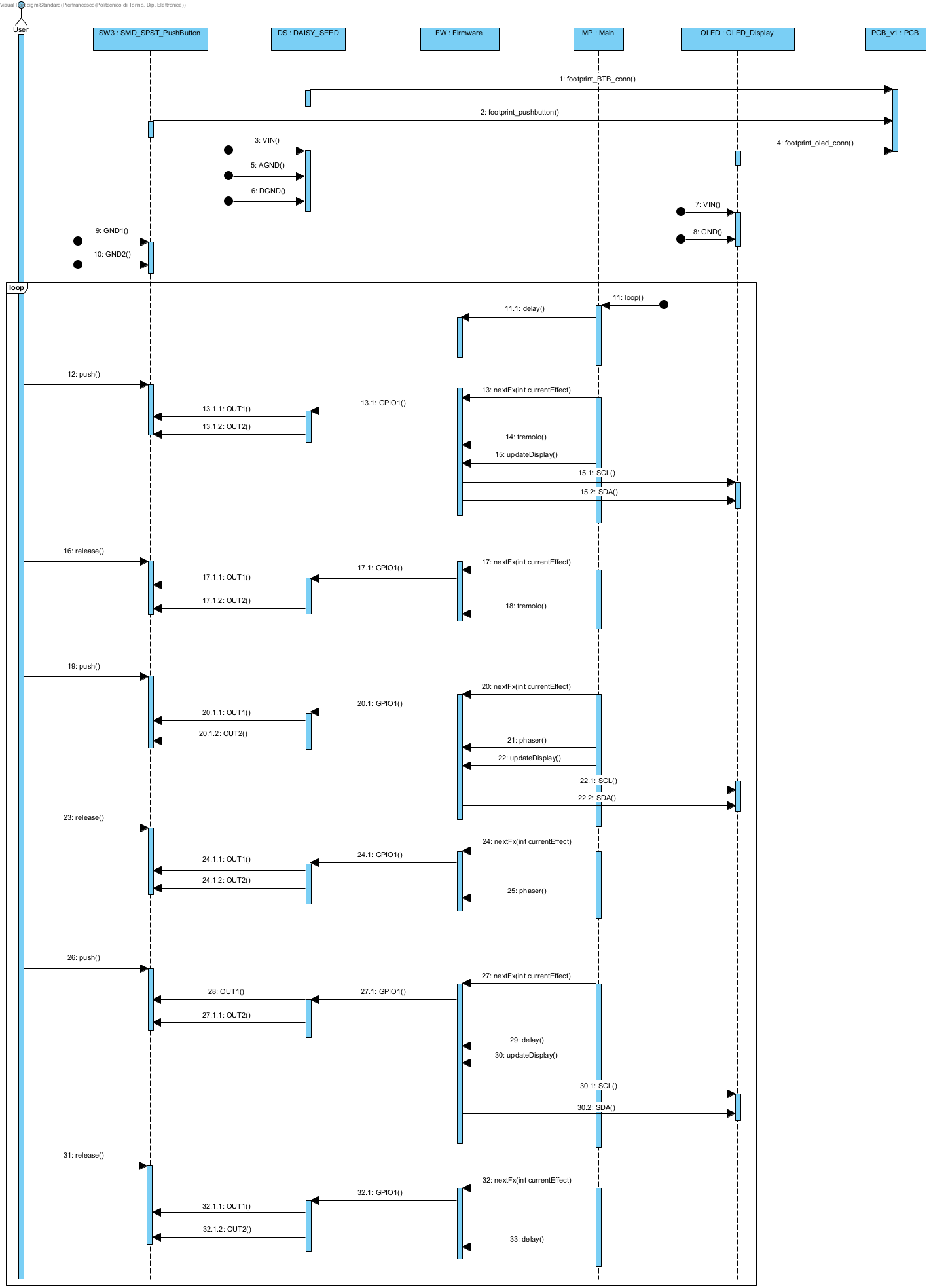
Sequence Diagram

# TuneParameterFxDown



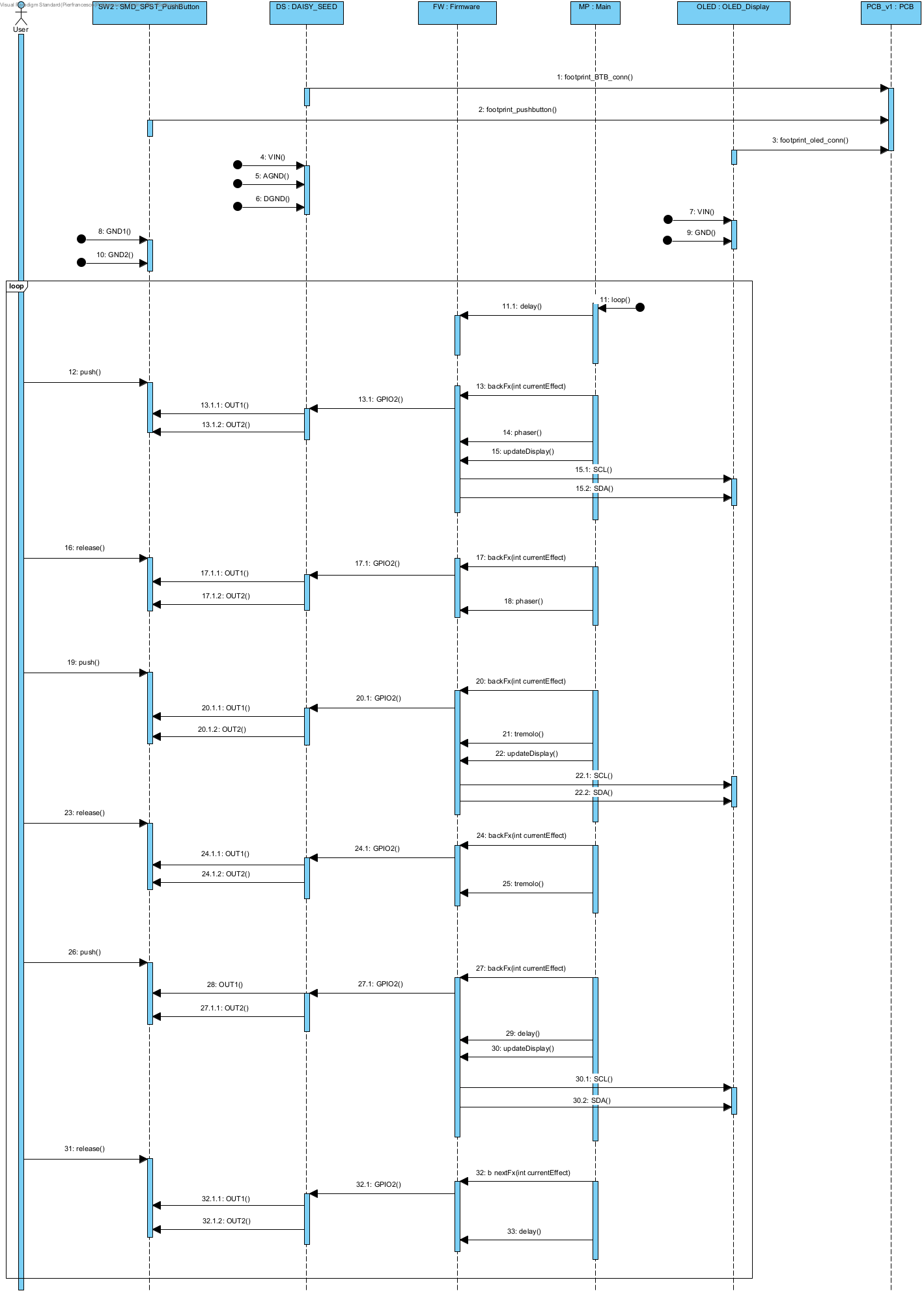
Sequence Diagram

# NextEffect



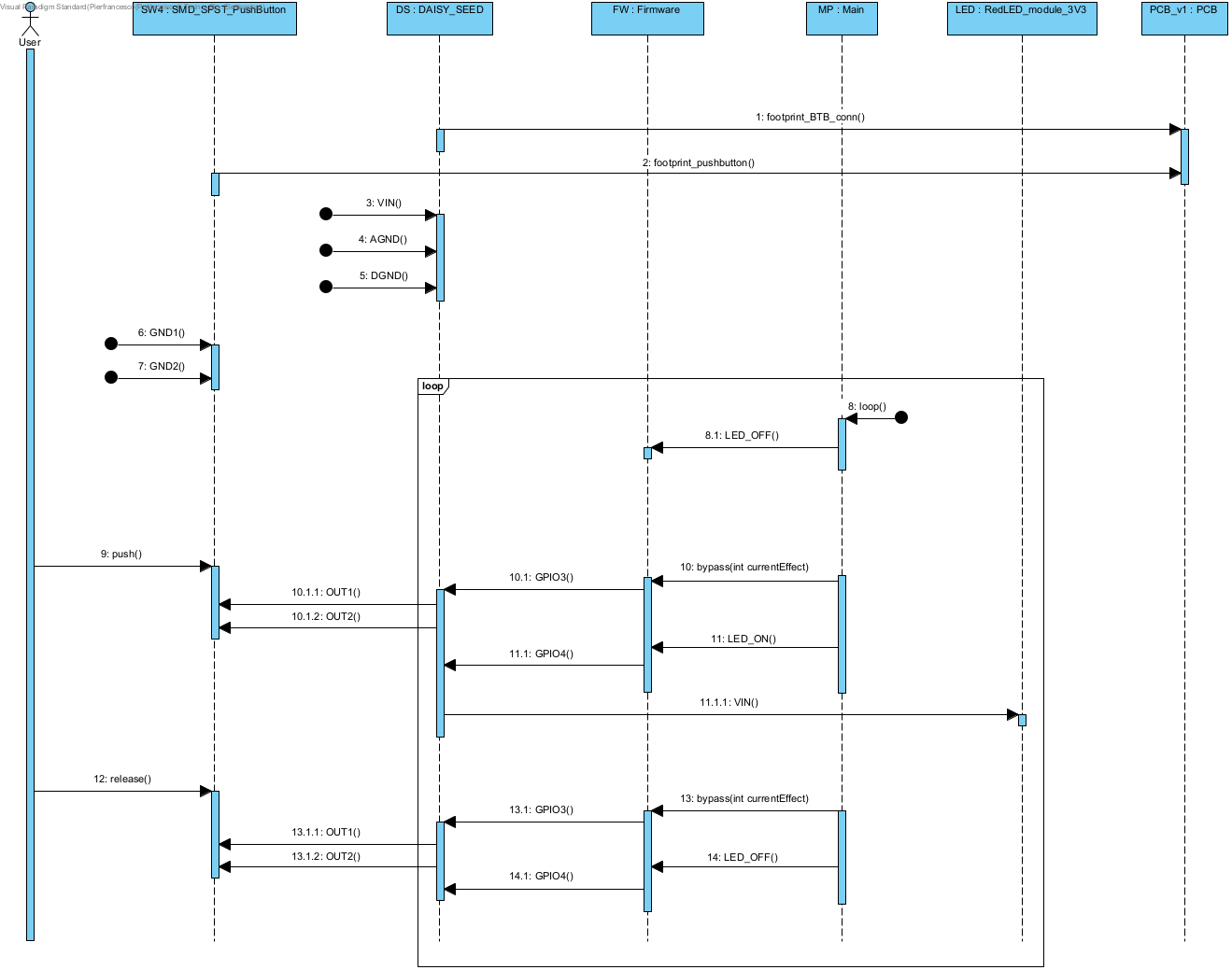
Sequence Diagram

# BackFx



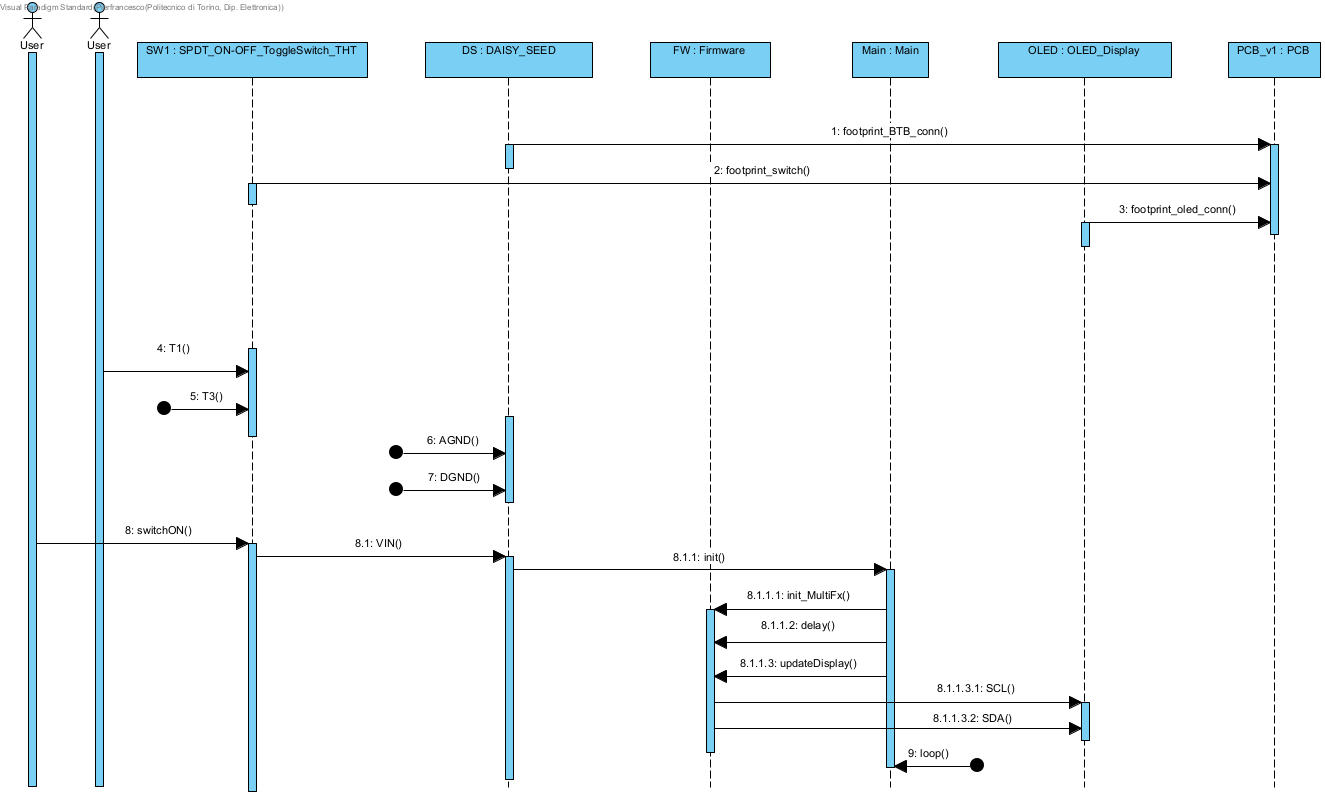
Sequence Diagram

# Bypass



Sequence Diagram

# Switch\_ON



Sequence Diagram

# Switch\_OFF

