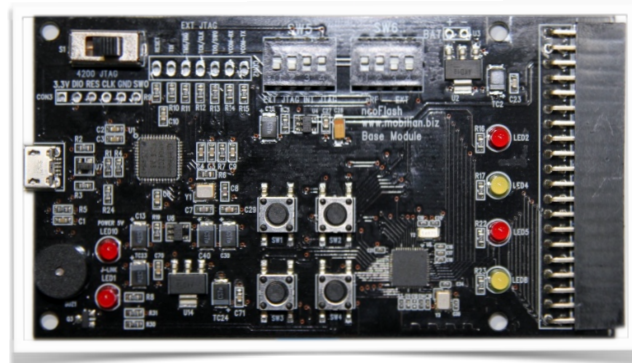


neoFlash & Add-on-Pack

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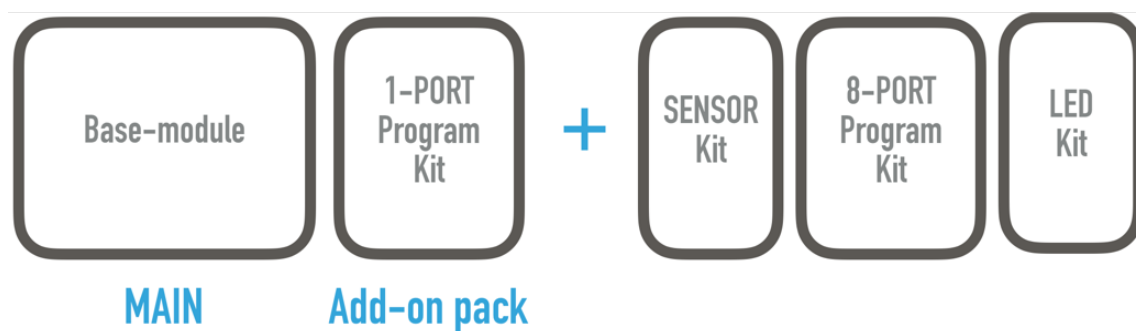
1. What is neoFlash?
 2. Features
 3. neoFlash PC Program User's Guide
 4. Price & Reference
 5. Schematics
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-

1. What is neoFlash?

Introduction

neoFlash is a brand new Bluetooth Low Energy (*BLE) development toolkit. It is composed of Base-module and extra Add-on-Packs as shown in Fig1. Also you can see a brief function of each module in Table1.

We designed Add-on-Packs to connect to Base-module in series or independently, because each module doesn't have conflicted I/O.



<Fig. 1> neoFlash block diagram

Module	Function	Parts
Base-module	Bluetooth LE development	NORDIC nRF52832, SEGGER J-Link OB
Program Kit	Flashing target device using ARM's *SWD interface	GPIO Extender, MUX/DEMUX
Sensor Kit	Measures environment around you	Humidity & Temperature, VOC, MIC, Pressure, Acceleroerometer, Magnetometer
LED Kit	Display text or ICON	16x16 LED & Controller

<Table 1> Brief function of neoFlash components

*BLE : Bluetooth Low Energy(Bluetooth LE, BLE, Bluetooth Smart) is a wireless personal area network technology designed and marketed by the Bluetooth Special Interest Group aimed at novel application in the healthcare, fitness, beacons, security, and home entertainment industries. Compared to classic Bluetooth, it intended to provide considerably reduced power consumption and cost. (by Wiki)

* SWD : Serial Wire Debug technology is available as part of the CoreSight™ Debug Access Port and provides a 2-pin debug port, the low pin count and high-performance alternative to JTAG. (by ARM)

2. Features

Benefit

- ✓ The main role of neoFlash is to support your **target device production** with nRF5x series.

As mentioned above, it has a program-kits which are using ARM's Serial-Wire-Debug(SWD) interface. We prepared 1-port & 8-ports program kits. Connecting your target device to program-kit can make your burdens easier than before. You can easily erase or program your target devices just clicking a predefined buttons attached on Base-module. Additionally you can connect neoFlash to your PC and monitor program status.

- ✓ This is complete solution as a Bluetooth LE development.

When you are designing your own Bluetooth LE device, almost everyone might think like below.

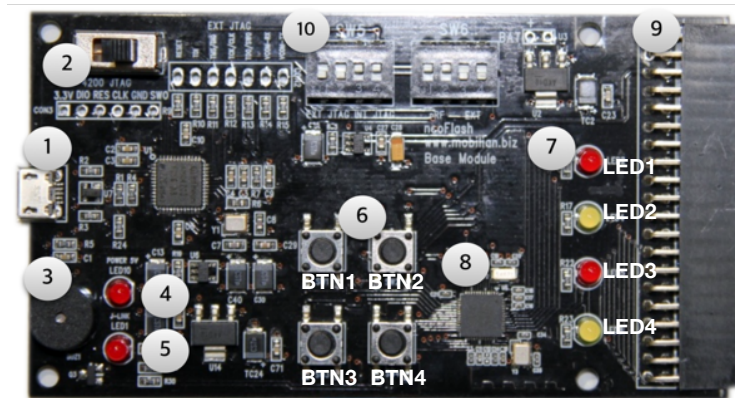
- I want to know how it might be a *discomfort index surrounding me?
- Is it safe from *VOC & CO2 to my children?
- I would like to measure interlayer noise in my home or how it might be the noise level surrounding my office environment?
- I would like to make a device which is relative to kinetic energy.
- My children likes drawing picture, as a replacement of a pencil how about LED-light?

Instead of purchasing ready made devices in the market, you can build all these inspirations with neoFlash even cost-effectively.

*VOC : Volatile Organic Compounds are organic chemicals that have a high vapor pressure at ordinary room temperature. VOCs are numerous, varied, and ubiquitous. They include both human-made and naturally occurring chemical compounds. Most scents or odors are of VOCs. Some VOCs are dangerous to human health or cause harm to the environment. (Formaldehyde from paint is a representative) (by Wiki)

* Discomfort index : Discomfort index is the thermal comfort condition your mind that expresses satisfaction with the thermal environment and is accessed by subjective evaluation.

2.1. Base-module



<Fig. 2> Base module & block diagram

neoFlash Base-module is a development kit for Bluetooth LE and identical with NORDIC's nRF52 development kit, PCA10040. Rather it has a buzzer and easy expandable 40 pin-out ports.

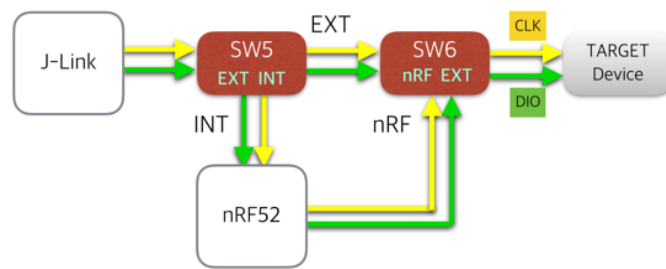
No	Part	Function
1	Micro USB connector	Connect to your PC's USB host provides power to the board and enables J-Link & UART * UART TX & RX is mapped on P0.06 / P0.08
2	Power SW	Main power switch
3	Buzzer	ALP05S
4	Power LED	Main power status
5	J-Link LED	J-Link status
6	Button	4 buttons mapped on P0.13 ~ P0.16
7	LED	4 leds mapped on P0.17 ~ P0.20
8	NORDIC nRF52832	Multiprotocol Bluetooth low energy / ANT / 2.4GHz SoC
9	Extended ports	Expandable 40 pin-out ports for nRF52 / 3.3V / 5V / GND
10	SWD interface SW	Controls SWD pin direction. (See next page for more details)

<Table 2> Base-module parts and functionality

* SWD pin direction

As shown in Fig3. neoFlash Base-module has an internal J-Link OB solutions, additionally it can program external target device with ARM's SWD interface without intervention of your PC.

By adjusting DIP SW, you can control SWD interface flow to your target device.

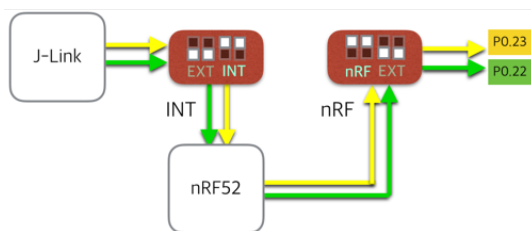


<Fig. 3> SWD direction diagram

Refer to Fig3, SW5 selects J-Link path to internal or external and SW6 selects destination as J-Link or nRF52.

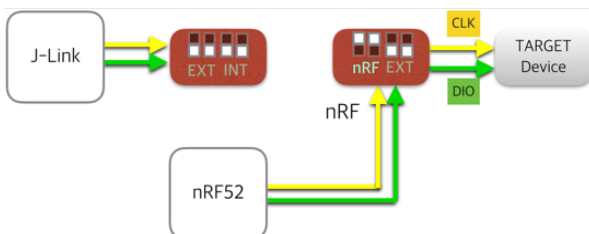
Below is all possibilities that you can choose.

1) Internal nRF52 development purpose.



- SW5 : INT switch should be high
- SW6 : nRF switch should be high
- CLK / DIO is mapped on P0.23 / P0.22
- * Refer to schematics, you can develop bluetooth low energy device.
- * If you are about to change Base-module as flashing purpose, use neoFlash PC software and flash internal nRF52 with prebuilt firmware provided by Mobilian.

2) External device flashing purpose

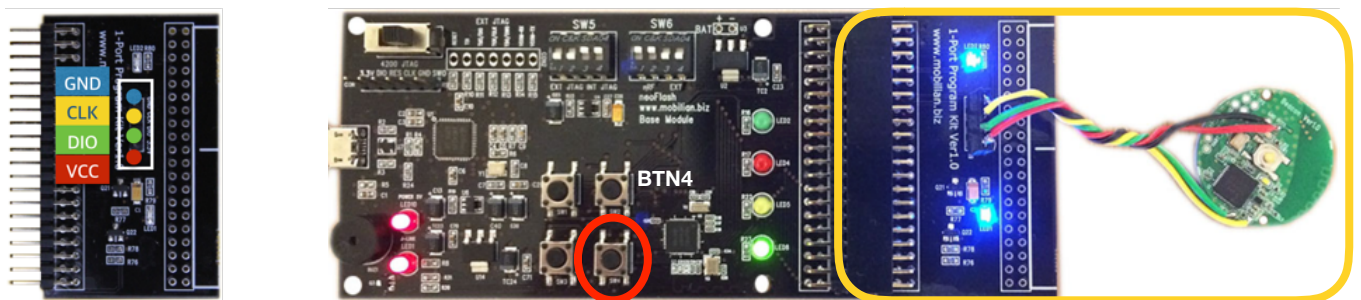


- SW5 : INT/EXT switch should be kept low as not to disturb internal nRF52 operation.
- SW6 : nRF switch should be high
- CLK / DIO is mapped on P0.23 / P0.22
- * For more detailed information, refer to neoFlash software user's guide.

2.2. 1-Port Program Kit

You are very lucky, because we supplies unlimited easy flashing solution just purchasing Base-module. 1-Port program kit is bonus package for your convenience.

It's feature is very simple but the functionality is great powerful, because if you store your target device binaries to internal nRF52 then anytime/anywhere you can program/erase your target device just clicking predefined button BTN4.



<Fig. 4> 1-Port Program Kit & example connection to beacon

BTN4 has multi functions. By **clicking** it you can **program** and **long-touch** fully **erases** your target device very quickly.

- * It just takes 3 seconds to program about 120KB. Just 1 second to erase operation.
- * As mentioned in introduction, Mobilian developed SWD flashing solution with program-kit. But you can also do it by use of this.
- * Also you can use it as a port extender for various purpose.

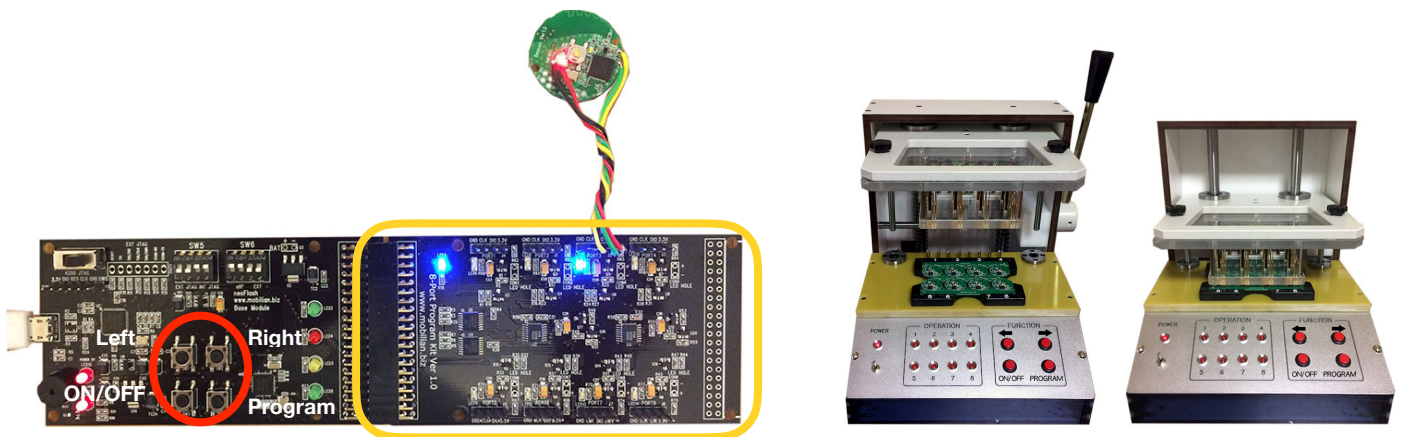
2.3. 8-Port Program Kit

8-Port Program Kit is real cost effective production solution that extends 1-Port Program Kit. It has 8 ports SWD pin-outs, status LEDs and customizable LEDs PIN outs. All operation is the same as 1-Port Program Kit except it program / erase for 8-ports sequentially.

Why not parallel flashing?

It only takes 24-seconds to flash 8-devices. You can produce 10K devices in a day (Arithmetically 8.4 hours).

Also it is easy to create your own JIG and customization for buttons and status LED. Refer to Fig. 5 you can see all of these things.



<Fig. 5> 8-Port Program Kit examples

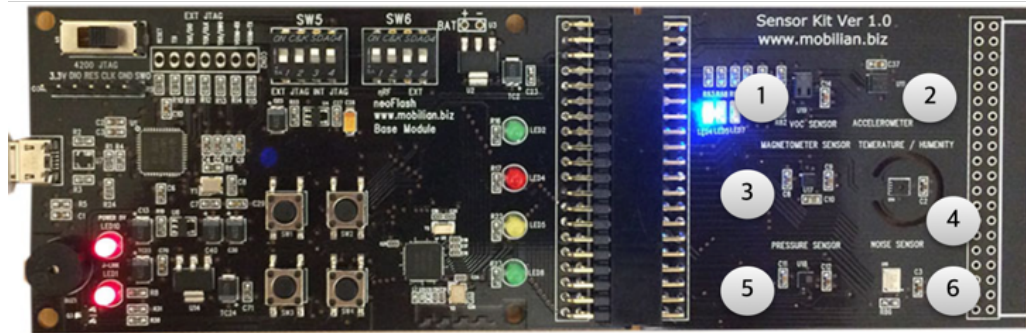
In this case all buttons are meaningful, you can program just clicking “Program” button, fully erases by long-touch “Program” button.

After program you can test your target device by pressing power buttons (Left, Right, ON/OFF). This feature enables you to check your device’s operation for the first time and pick out normal/abnormal devices.

2.4. Sensor Kit

As mentioned in Feature section, you may want to measure real environment surrounding by you, not simulation. We prepared this kit for your inspirations, don't simulate sensor value not any more. Measure and feel it how it is important to know real sensor value.

See below Fig. 6 and Table 3 for more information about sensors that it includes.



<Fig. 6> Sensor Kit

No	Function	Manufacturer	Part	Application
1	VOC	Cambridge CMOS sensors	CCS811	Smart home/office
2	Accelerometer	ST-Micro	LIS3DH	Pedometer
3	Magnetometer	ST-Micro	LIS3MDL	Compass
4	Humidity&Temperature	Sensirion	SHT31	Smart home/office
5	Pressure	ST-Micro	LPS25H	Altimeter / GPS application
6	MIC	InvenSense	ICS-43432	NOISE / VOICE record

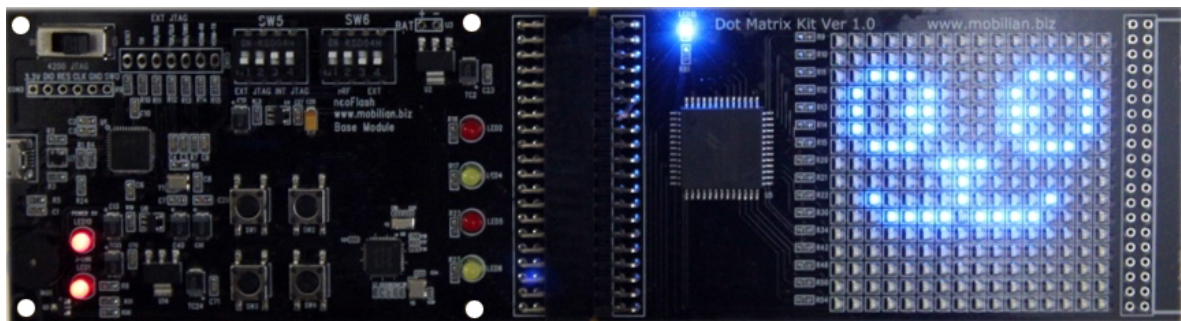
<Table 3> Sensor Kit components

* With neoFlash PC application, you can experience all these values in Sensor-Kit demonstration.

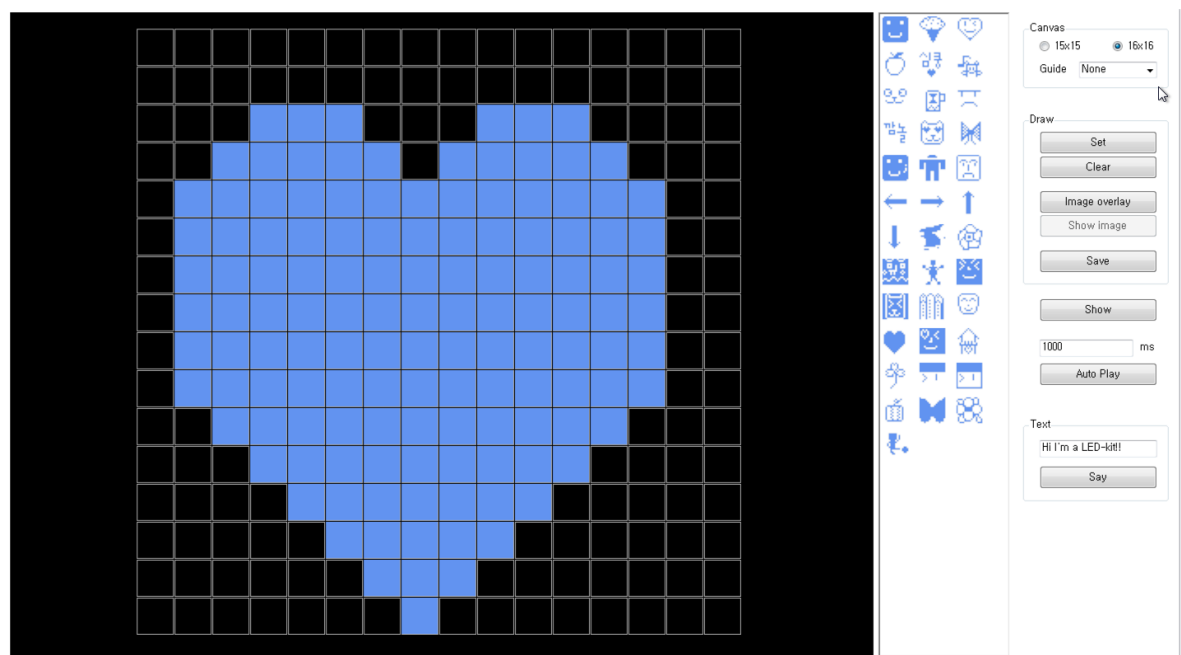
2.5. LED Kit

LED Kit is a really interesting component among Add-on-Packs. From now on, you have checked device status just watching your SmartPhone, UART or etc. But now you can show text, numbers and icon to 16x16 matrix LED.

It has a LED controller IC(HOLTEK's HT1632C) and it is mapped to nRF52's GPIO. We provide a sample code and demonstration.



<Fig. 7> LED Kit



<Fig. 8> LED Kit demonstration

* Thanks my daughters, *YouMe*, *YouJin* who loves LED module and contribution for their artwork.

3. neoFlash PC Program User's Guide

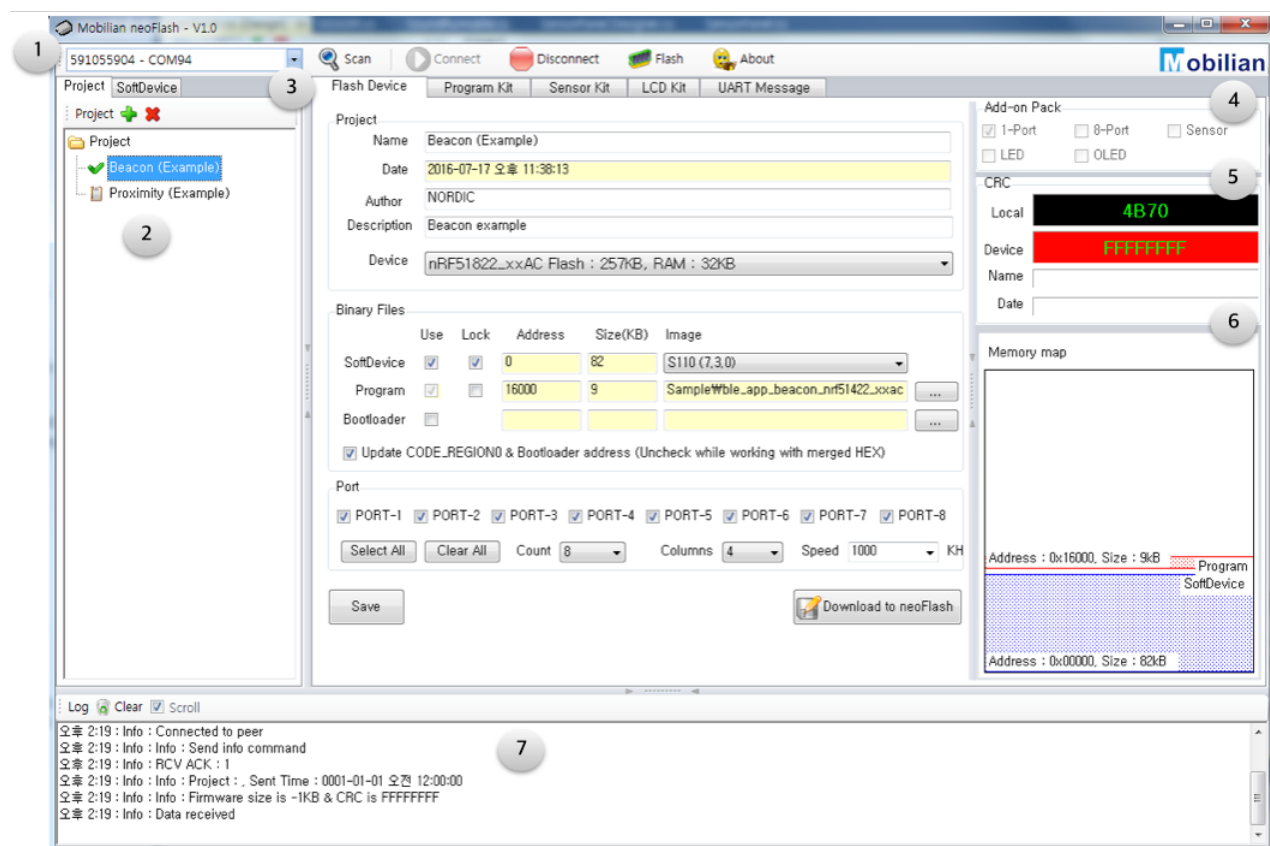
neoFlash PC program is composed of utilizing all above features that has been explained and you can download in download-tab at Mobilian homepage (<http://www.mobilian.biz/#/app/product/neoFlash>) .

3.1. Execution environment

- * Microsoft Windows enabled PC / .NET Framework 4 is mandatory.
- * Using setup version, you can build up execution environment in a simple way.
- * Also we prepared ZIP package for those whom already built up.

3.2. Run

Select “neoFlash.exe” and execute ,you can see main screen as shown in Fig. 9.



<Fig. 9> neoFlash PC program

neoFlash program emphasizes Program Kit's ability and also reveals all the possibilities about Add-on-Packs.

Internal nRF52 detects Add-on-Pack that is attached to itself. But it doesn't support plug-and-play feature for the performance reason. If you are to replace another Add-on-Pack please turn off power and replace Add-on-Pack for the safety reason.

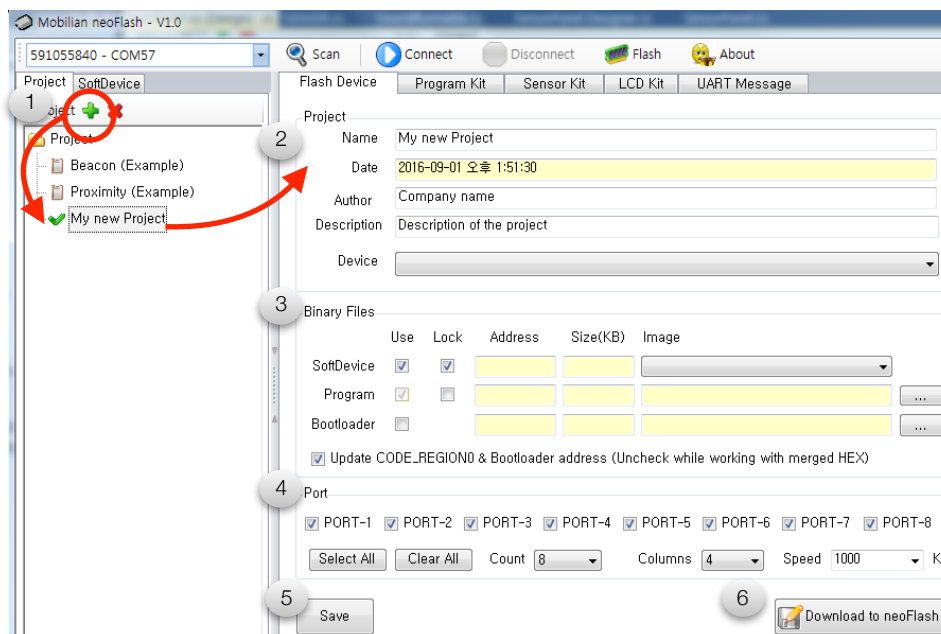
But for your convenience, pressing BTN3 and BTN4 simultaneously in 2-seconds results RESET and you may heard BEEP.

No	Name	Function
1	Main Toolbar	Main toolbar shows you a neoFlash board information and enables you to connect to it. Connecting neoFlash enables to watch all the status of Add-on-Packs. * As mentioned in Program Kit section, You are about to use neoFlash board as flashing device, choose "Flash" tool and re-program internal nRF52
2	Manage project/SoftDevice	To use as a program kit, you should create a project and configure settings in order to fit your requirement and target device.
3	Demo tab (* Flash Device)	Each tab shows demonstrations for Add-on-Packs. Especially you are now watching Program Kit's ability. * Configure project name, description and select target device type. * Choose SoftDevice & Binary files to fit your circumstances. * Adjust port setting to meet your PCB array. * "Save" button saves all these settings in your local repository. * "Download to neoFlash" stores these settings to internal nRF52 * Now it's ready to flash your target device.
4	Add-on-Pack information	Identifies Add-on-Pack that is attached to Base-module.
5	Device information	It reveals project information and firmware checksum that was previously downloaded including name & download date. * If the checksum is different, CRC panel alerts you with RED color. This means something has be changed.
6	Memory map	This is just informative panel for your firmware's geometrical address. * <i>It's too cold to remain as an empty space. (^_^)</i>
7	Log message	Print out log message while running

<Table 4> neoFlash software compoments

3.3. Program Kit (More detailed...)

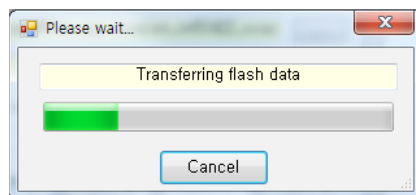
Create new project



<Fig. 10> Create a new project

As shown in Fig.10, using neoFlash as a flashing device requires below procedures,

- 1) Create a new project clicking '+' button in project tab results "My new project" will be shown in project tree view.
- 2) Fill out project name, description and select your target device type
- 3) Choose SoftDevice, Program & Bootloader file. Check or Uncheck "Update CODE_REGION0 ..." according to your HEX file type.
- 4) Select PORT usage and geometry according to your PCB array, also select program speed.
- 5) Save your settings to your local repository not to lose changes.
- 6) Download project settings and binaries to internal nRF52. This will show download status as shown in FIG. 11



<Fig. 11> Download status

Check downloaded project setting

After download your project data to neoFlash, you can see a CRC checksum and related project properties like project name & date.



<Fig 12> Device information

Refer to Fig12, left side depicts PC & neoFlash data is identical but right-side means something changes have been made after download, so the CRC is different for each other.

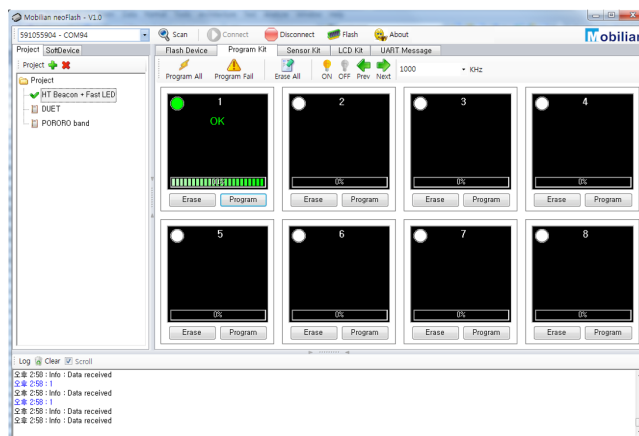
Once you download binaries to neoFlash storage section, it remains until you erase or updates.

Now connect your target device and enjoy with it.

- * Pressing BTN4 - Program button in Base-module flashes your target device
- * Success : 2-times short beep
- * Fail : 3-times short beep
- * No flashing data : 4-times long beep, in this case please download your project settings to neoFlash with PC program.

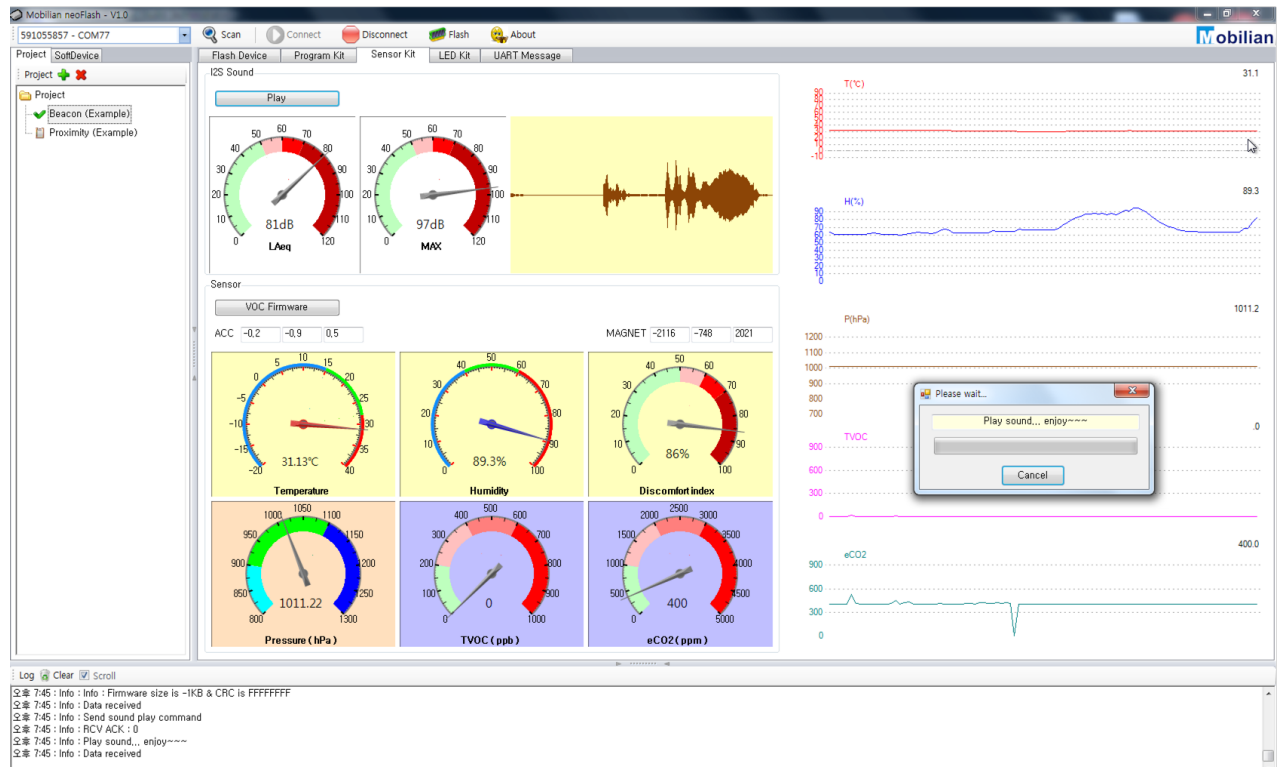
Monitor program status

neoFlash program kit is standalone flash programmer, but you can monitor program-status and send flash-command as shown in Fig. 13. in the Program Kit tab.



<Fig. 13> Monitor program status

3.4. Sensor Kit



<Fig. 14> Sensor kit demonstration

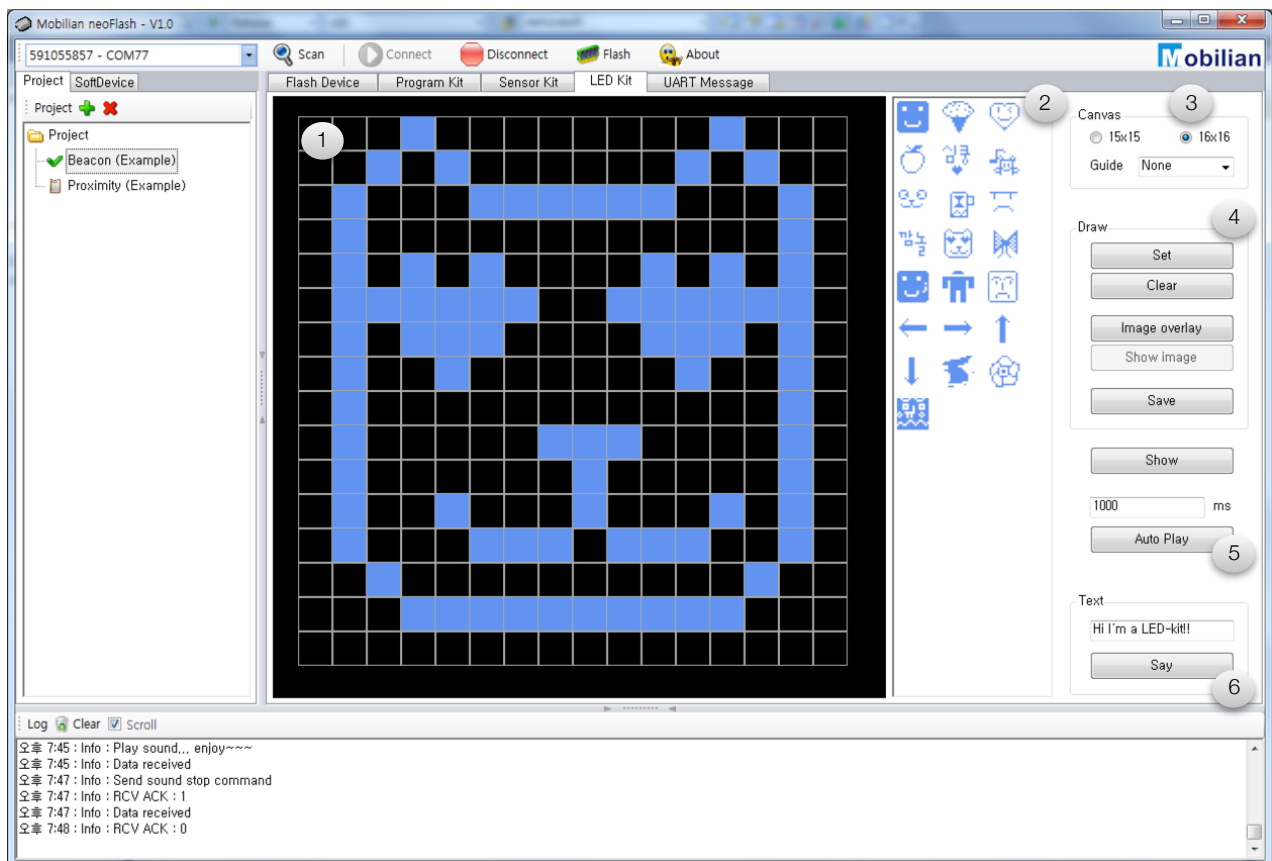
You can see sensor demonstration in Fig.14. All sensor values are automatically transferred as long as it is connected to your PC.

- * MIC (InvenSense - ICS43432) : Play sound via PC and shows waveforms. Additionally it measures NOISE level that is represented by LAeq (This is not a professional NOISE meter but almost equivalent).
- * Humidity & Temperature sensor (Sensirion - SHT31) : Show humidity/temperature and calculates discomfort index.
- * VOC (Cambridge CMOS Sensors - CCS811) : Show TVOC & CO2 equivalent.
- * Pressure (ST Micro - LPS25H) : Show pressure surrounding by you.
- * Accelerometer (ST Micro - LIS3DH) : Detect 3-axes motion up to 16G.
- * Magnetometer (ST Micro - LIS3MDL) : Detect 3-axes magnetics.

3.5. LED Kit

You can experience 16x16Maxtrix LED with LED Kit & demonstration program.

You can turn on/off LED and draw ICON / display text with realtime or keep it autoplay with pre-built ICONs.

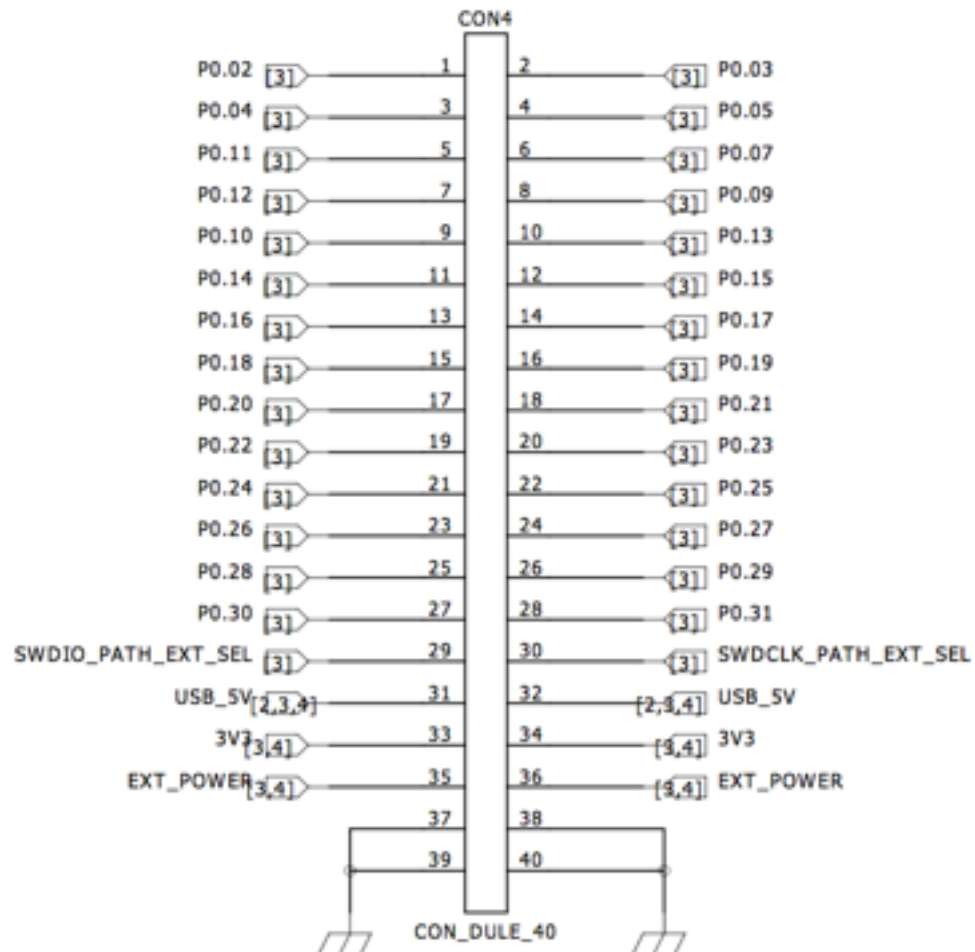


<Fig. 15> LCD Kit canvas and samples

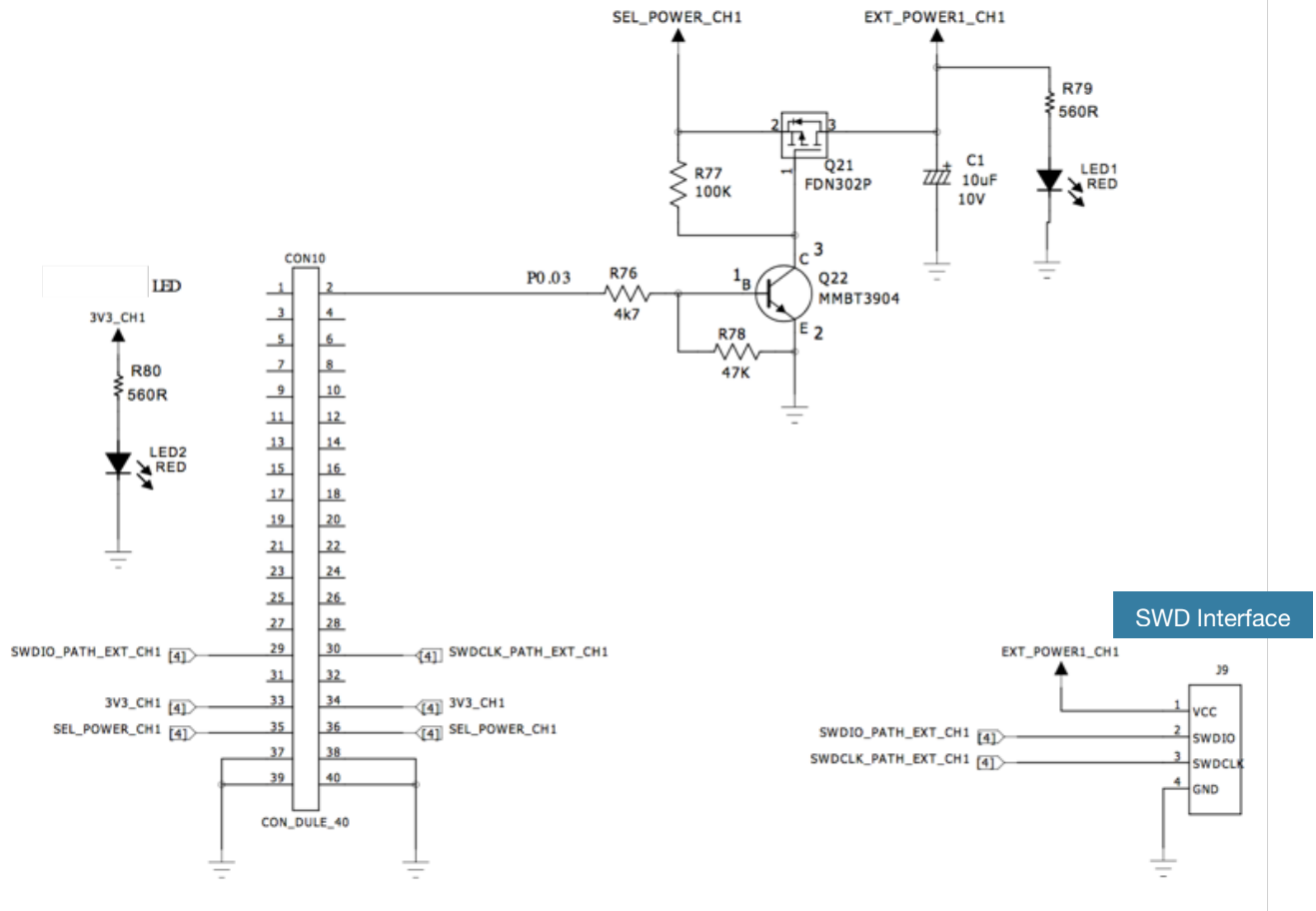
- 1) Drawing area is 16x16 matrix. If you click pixel, it immediately turn on/off in your LED kit.
- 2) This is an ICON repository, if you save your icon it will automatically position in this panel. Or clicking one of them, it is displayed in the drawing area & real device.
- 3) Adjust canvas size & show/hide guide lines
- 4) Set/Clear all the led or overlays image in the drawing area's background with transparency. This feature helps your children to draw picture familiar.
- 5) Automatically play ICONs which are in ICON repository.
- 6) Say text like water flows, right-to-left.

5.1. Base module

2) External 40-PINS

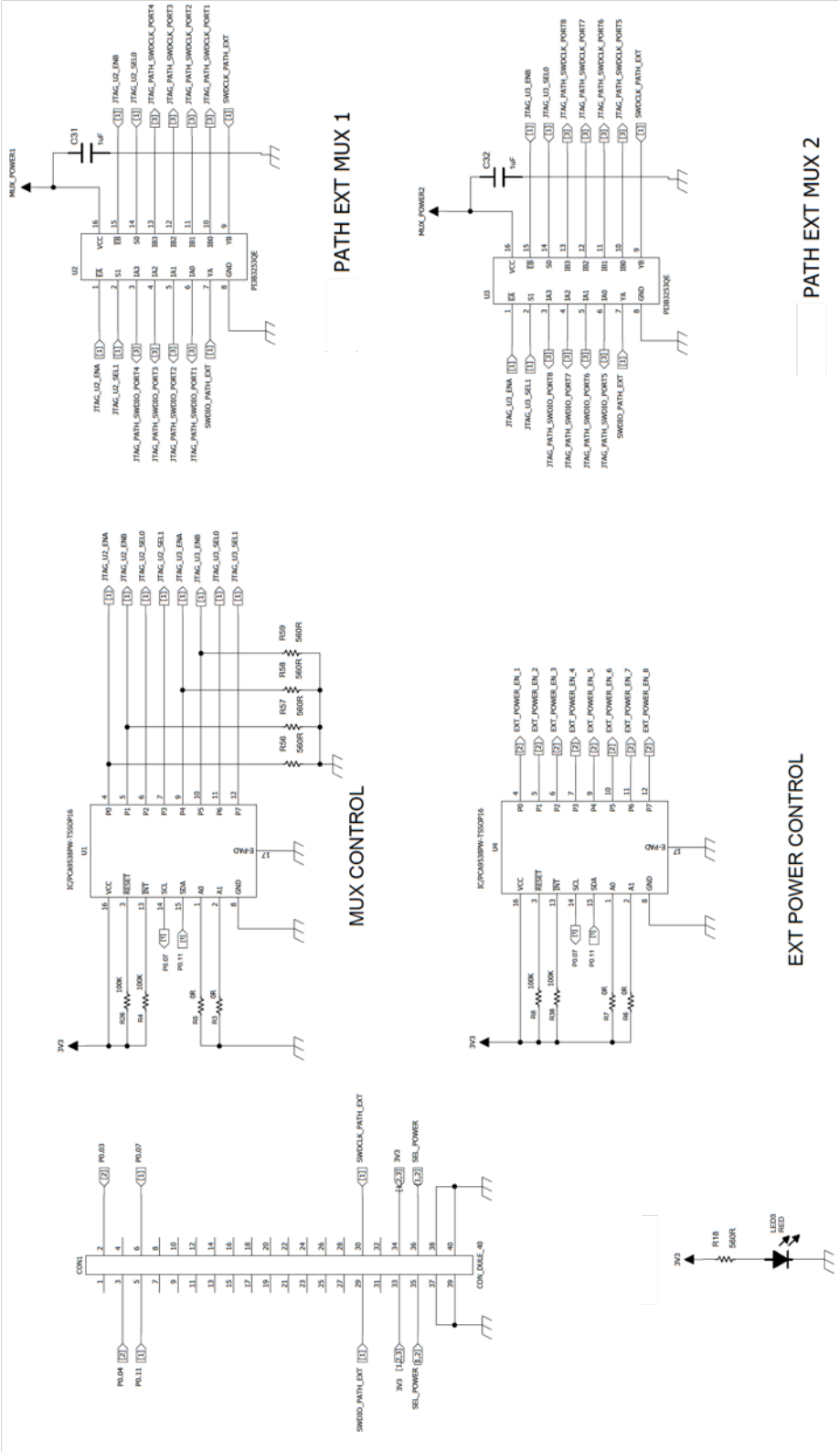


5.2. 1-Port Program Kit

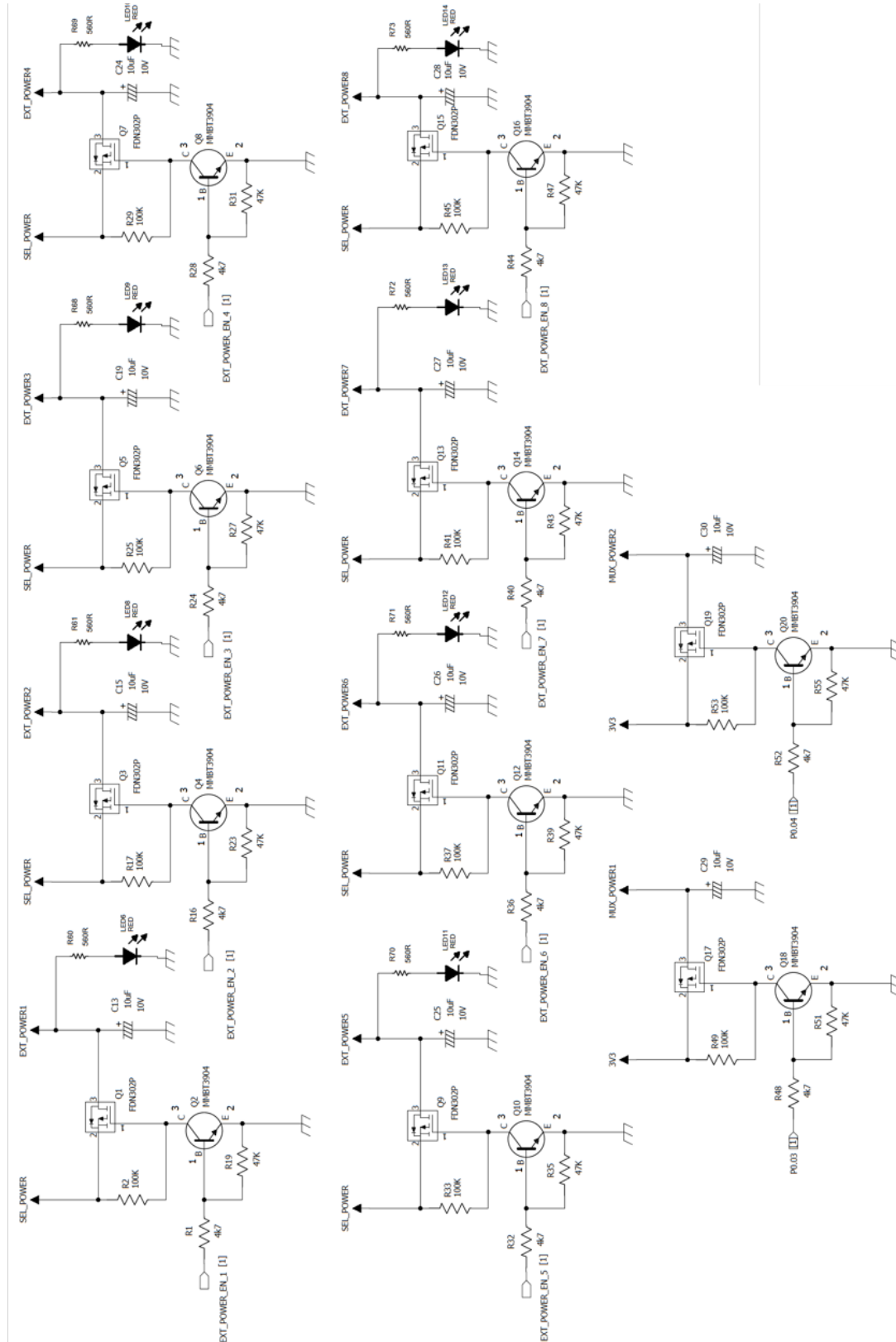


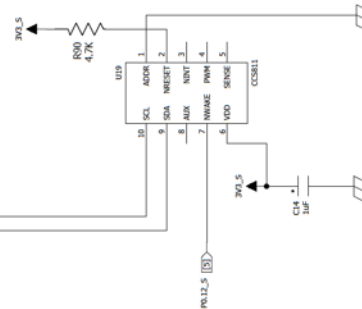
5.3. 8-Port Program Kit

1) MUX



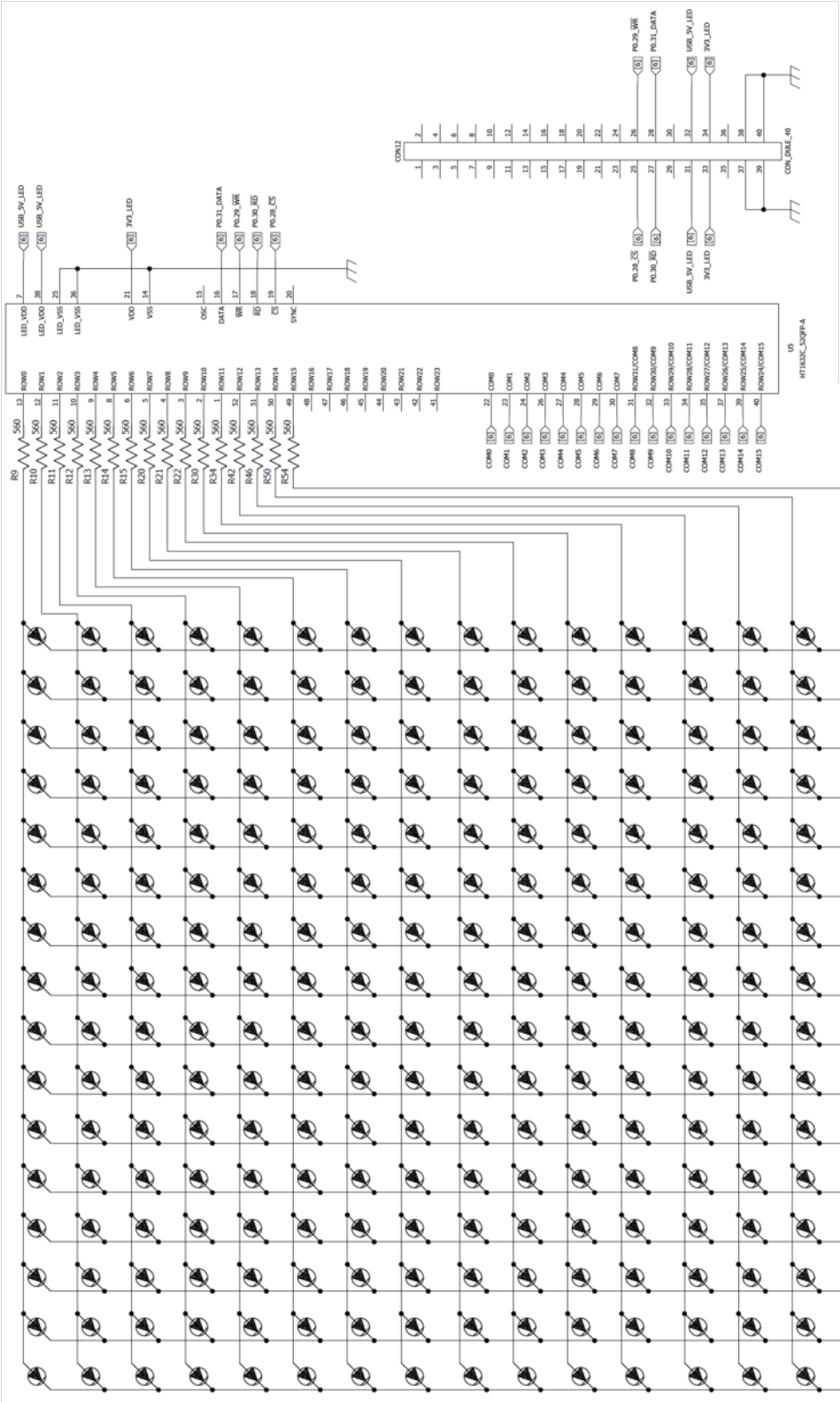
2) Power





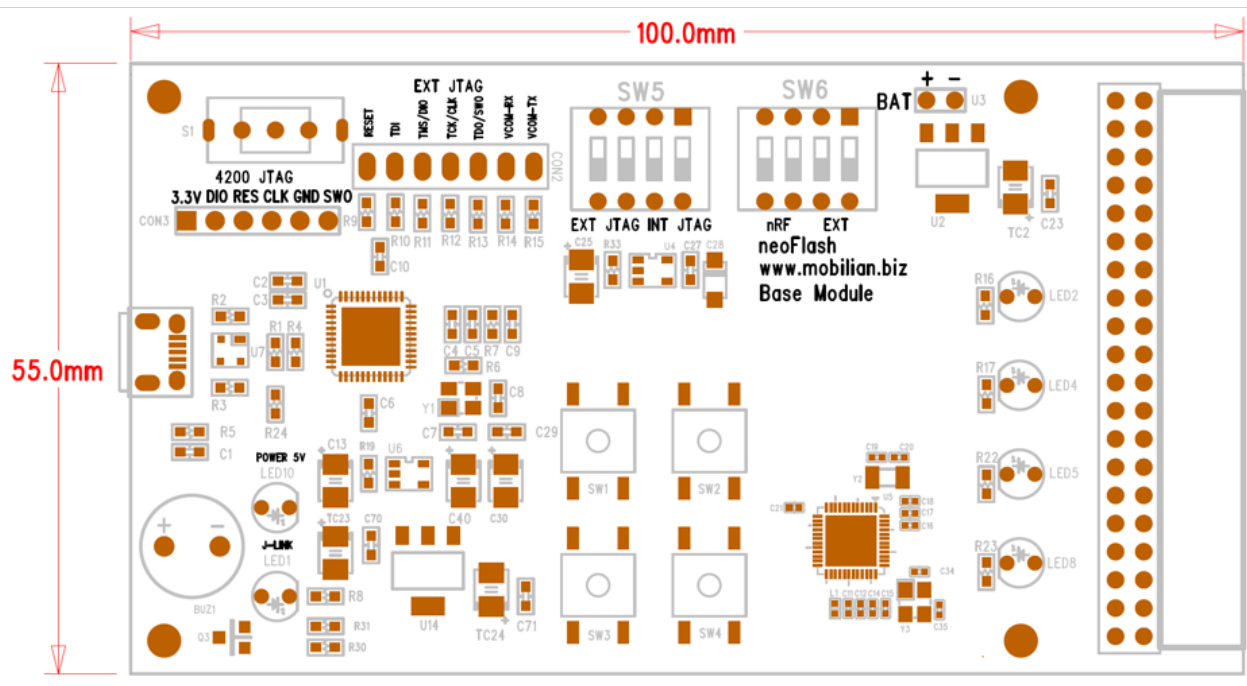
Noisc Sensor / I2S

5.5. LED Kit

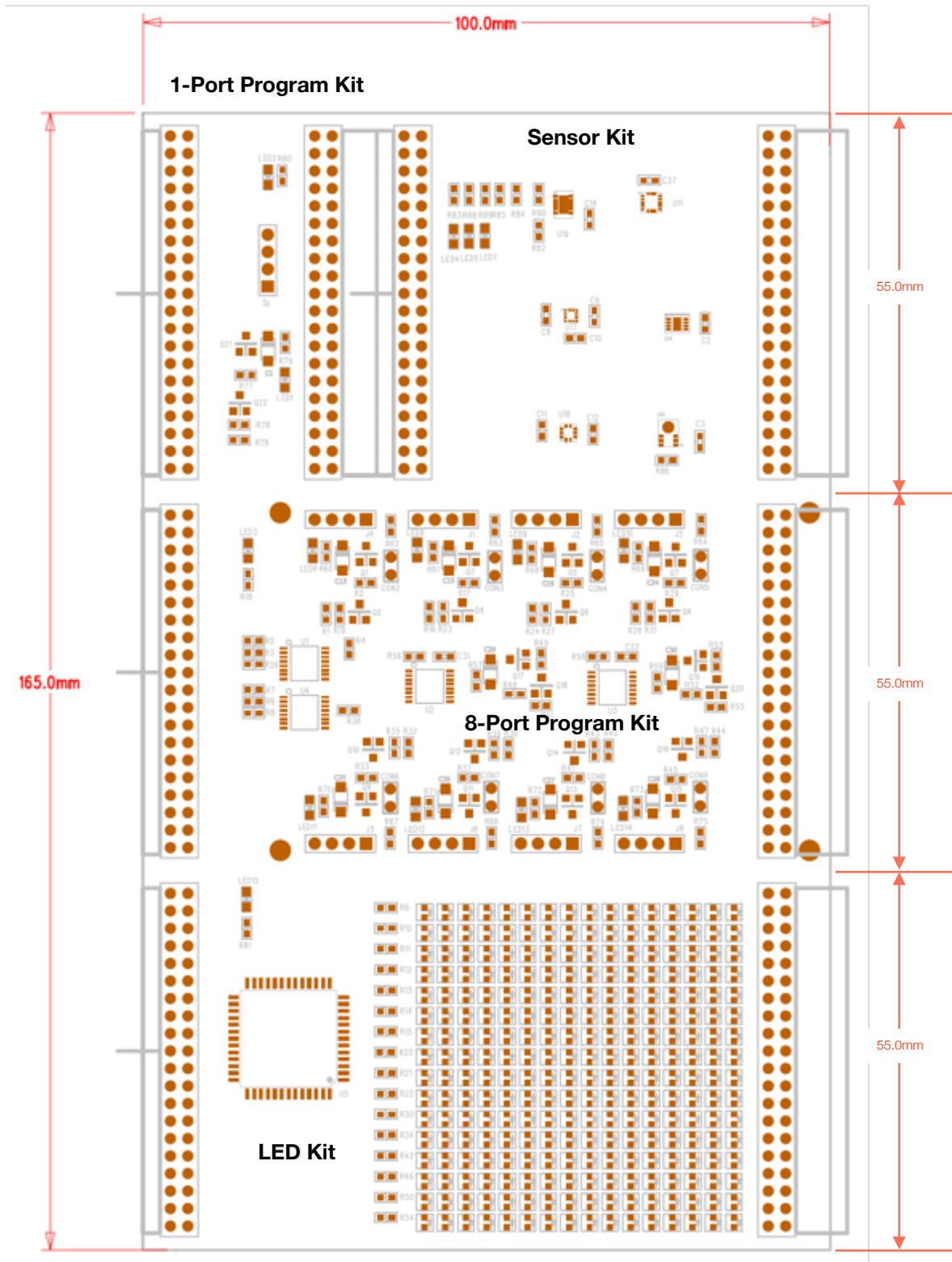


6. PCB Layout & Case

Base-module



Add-on-Pack



Case

* We provide 3D printer model file, so you can download and print-out.

