LV8548MCSLDGEVB

Stepper Motor Driver Module Solution Kit
Quick Start Guide

Overview

The LV8548MCSLDGEVB is an **ON Semiconductor** motor driver module featuring the **LV8548MC**. This module is capable of easily driving a **stepper motor**.

Motor driving is made easy with Arduino Micro[1] compatibility. The LV8548MCSLDGEVB comes with a Baseboard for facilitated plug-and-play connectivity with an Arduino Micro.

GUI and Open-source API Functions are available for custom, user-specific motor driving programs.

ON Semiconductor®

www.onsemi.com

LV8548MCSLDGEVB Board

Features:

• VCC_{max} = 20 V, IO_{max} =1.0 A[2]（between OUT_A and B, between OUT_C and D）

• **6～12 V applications** Recommended（VCC = 4～16V Max）

• **Standby current consumption = 0**

• Full step, Half step drivability

• Typical Applications: In-Home Appliances, Consumer Products, Industrial Products

For further product information, please visit:
http://www.onsemi.com/PowerSolutions/product.do?id=LV8548MC

ONBB4AMGEVB Board with Arduino Micro and LV8548MCSLDGEVB Board

What you need

• PC
Windows 7, 64bit
Connected to the Internet
(Only for "Including the TimerOne Libary" on Page3)
Arduino IDE 1.8.4 [3] Installed
User with an Administrator rights

• Power Supply
AC Adapter Output voltage：4～16V
Output current：～2A
Connector specification
Polarization：Positive Center
Inner diameter＝2.1mm、outer diameter＝5.5mm
Recommended：WSU075-1000（Triad Magnetics）
or stabilized DC power supply, dry cell battery, etc.

1) Arduino / Genuino is ArduinoAG are registered trademarks.
2) Stress exceeding this voltage or current may risk damage to the device. Functionality and reliability may be hindered if the device exceeds these values. The maximum current value, IOmax, does not guarantee the module can handle that much current. If the device overheats, thermal shutdown will occur.
3) Contents of kit may not be compatible with different versions. Please see the Appendix attached if specified version is not installed

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2 April 2018- Rev 1.0

Contents of the Kit

Hardware

- LV8548MCSLDGEVB：Motor driver module
- ONBB4AMGEVB：Baseboard
- Arduino Micro
- USB Cable (Micro B-A)
- USB Thumb Drive
- Flat-tip Screw Driver
- Stepper motor MDP-35A (Nidec Seimitsu, Step angle= 7.5 deg, 12V/ 300mA) 1pc (Brush DC Motor 1pc)

Software (Included in USB Thumb Drive)

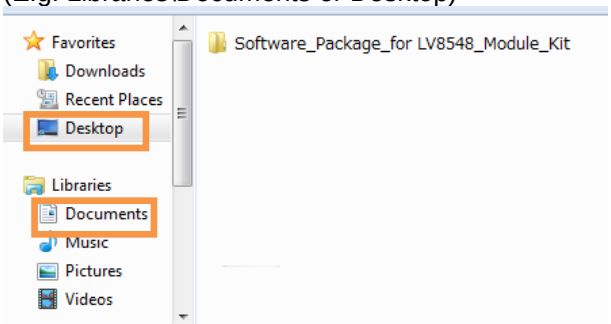
```
Software_Package_for LV8548_Module_Kit
├ Readme.txt
├ arduino-1.8.4-windows.exe          ・・・Arduino IDE Installer
├ ON_MD_Module_Kit_GUI
│ ├ Japanese                         ・・・Installer package in Japanese
│ └ English
│   ├ ON_MD_Module_Kit_GUI.msi       ・・・GUI Related Files
│   ├ setup.exe                      ・・・GUI as well as .NET Framework4.6.1 Installer
│   └ DotNetFX461                    ・・・.NET Framework4.6.1 Related Files
├ For_DCmotor                        ・・・DC Motor Files
│                                      (Refer to DC Motor Manual)
└ For_Stepper
  ├ LV8548_STEP_APILibrary           ・・・API Library
  ├ LV8548_STEP_Program.ino          ・・・GUI – Arduino Firmware
  ├ Manual_LV8548_STEP_ModuleSolutionKit_E10.pdf ・・・Instructions for operation and setup
  └ Appendix_Manual_LV8548_STEP_ModuleSolutionKit_E10.pdf ・・・Appendix for supplementary material
```

Software Setup

Please download

Software_Package_for LV8548_Module_Kit

found on the provided USB flash drive to any preferred directory.
(E.g. Libraries\Documents or Desktop)

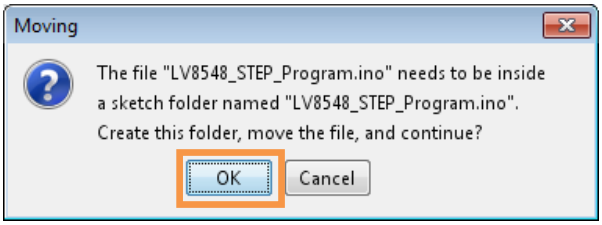


API Library

The following process should be operated with **the Arduino Micro disconnected.**

① Double click on the Arduino sketch for GUI LV8548_STEP_Program.ino This will launch the Arduino IDE.
(Check the Appendix, "How to install Arduino IDE", if the Arduino IDE is not installed)

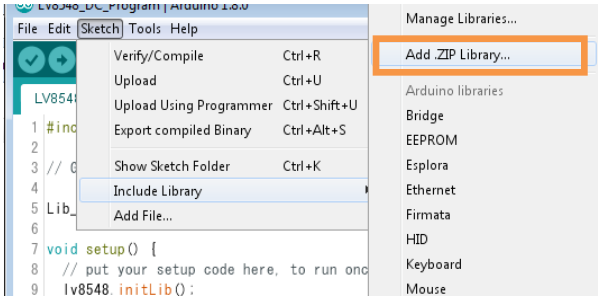
The IDE will display the following message when the LV8548_STEP_Program.ino file is opened for the first time. Click "OK" to continue.



This message will be displayed if the .ino file is not inside of a folder with the same name. (E.g. Sketch12345.ino must be in the Sketch12345 folder).

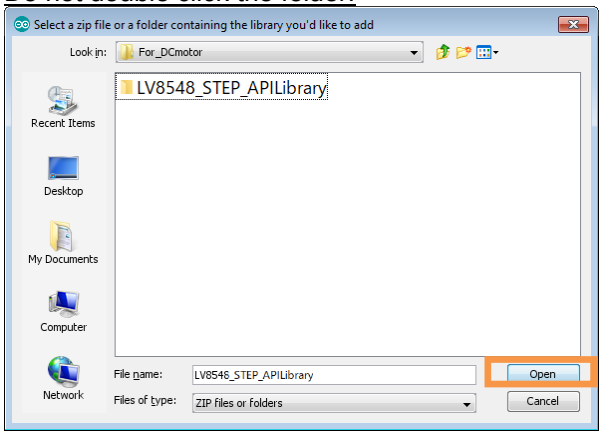
*Some screen captures are taken from different motor driver modules

② Include the API Library
As shown below, navigate to “Sketch→Include Library→Add .Zip Library”



The following window will appear. Select the “LV8548_STEP_APILibrary” folder, and open this folder as shown below.

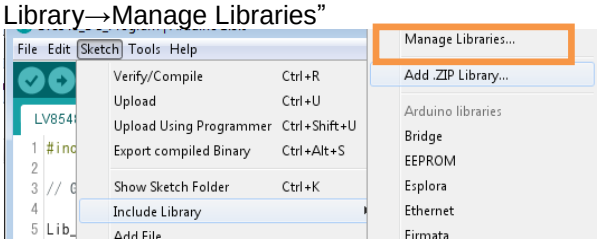
Click the folder only once and push “Open” button. Do not double click the folder.



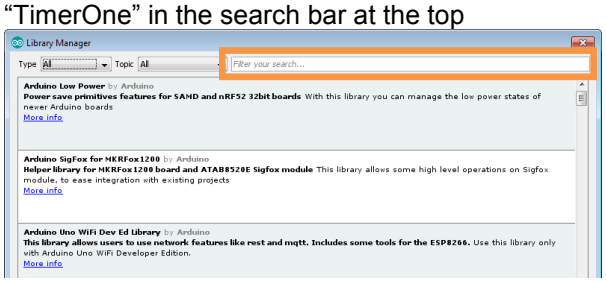
Unless updating the function library, including the API function library only needs to be done once.

Including the TimerOne Library

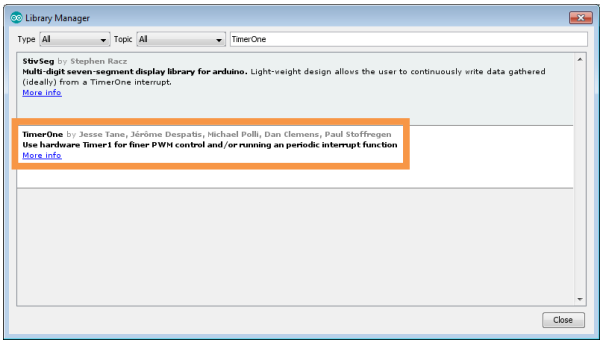
As shown below, navigate to “Sketch→Include Library→Manage Libraries”



Once the library manager starts up, please type “TimerOne” in the search bar at the top



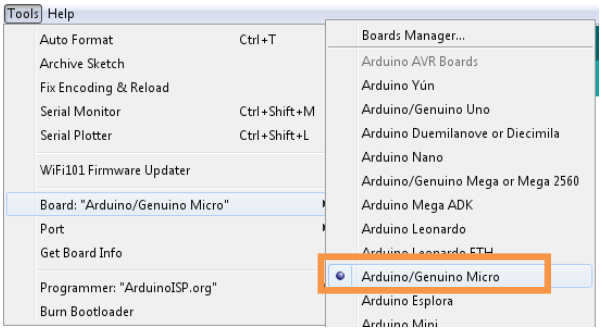
Select and install “TimerOne” in the search results



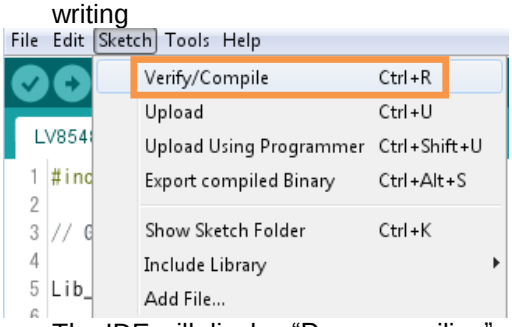
Compiling the Arduino Program

・Write to Arduino

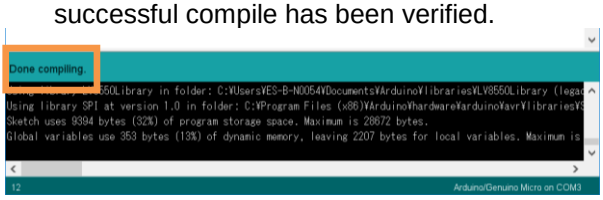
① Select the Arduino board to upload to by navigating to “Tools→Board→Arduino/Genuino **Micro**”



② Write an Arduino sketch and navigate to “Sketch→Verify/Compile” when finished writing

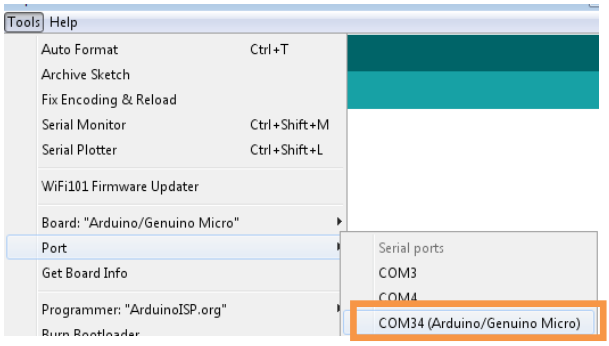


The IDE will display “Done compiling” after a successful compile has been verified.

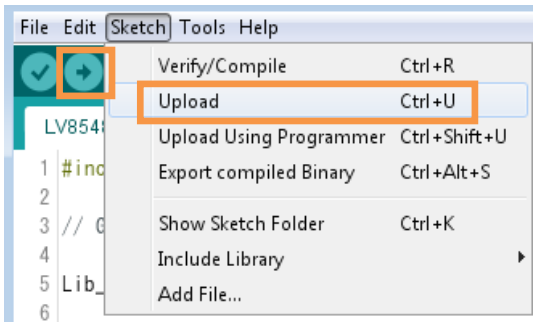


*Some screen captures are taken from different motor driver modules

③ **Connect the PC to the Arduino Micro via USB** and select the corresponding COM port as shown below

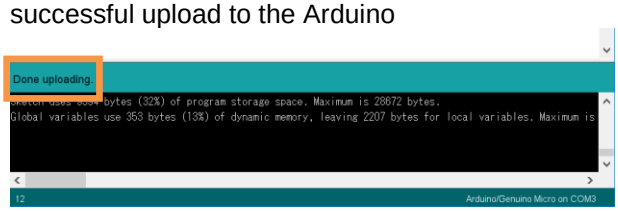


④ Upload the sketch by clicking "Sketch→Upload" or by pressing the ⊖ button



In the process of uploading, the Arduino Micro bootloader will be installed.

The IDE will display "Done uploading" after a successful upload to the Arduino



Sketches written to the Arduino will not be erased unless rewritten

If the uploading of the program fails confirm the details in step ① check board name and step ③ check serial port connection.

Rewrite the Arduino Program

In the case of ① or ② below, please rewrite the program to the Arduino

① When updating the API Function library

1) Delete the existing API function library by navigating to Documents\Arduino\libraries and deleting the LV8548_STEP_APILibrary folder.
2) Include the latest API function library. Please save the latest API function library in your preferred directory on your PC. (See Page 2, "Software Setup") Include the latest API function library. (See Page 2 "API Library")
3) Compile and write the program to the Arduino (See Page 3, "Writing and Compiling with the Arduino IDE")

② When evaluating the LV8548 DC and other motor driver modules (Assuming other motor driver module libraries have already been included)

1) Compile and write the program to the Arduino (See Page 3, "Writing and Compiling with the Arduino IDE")

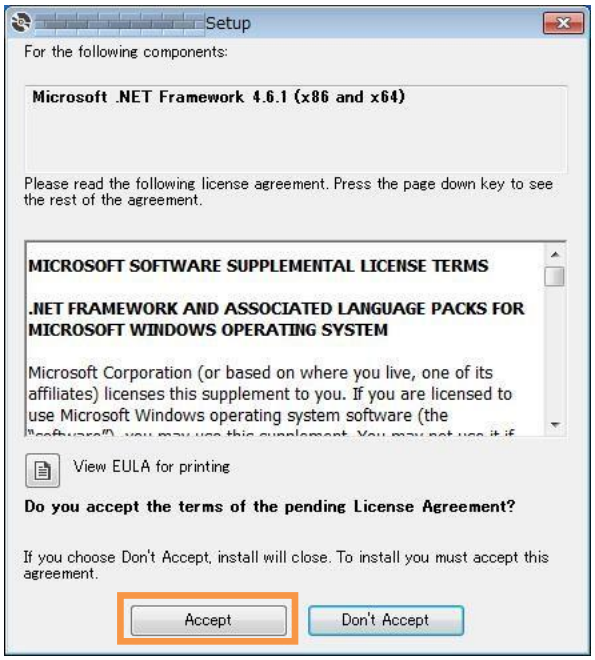
If you are testing the LV8548 DC module library or any other motor driver module library for the first time, please operate according to their corresponding manual.

GUI Installation

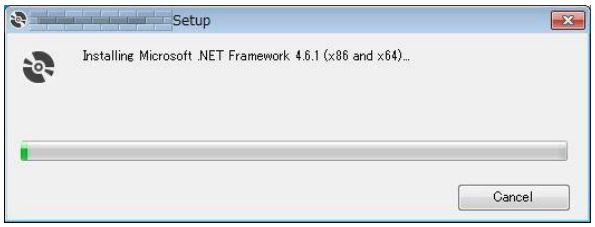
① Double click on setup.exe in the ON_MD_Module_Kit_GUI folder and proceed with the installation as shown below

*If a previous version of this GUI (ON_MD_Module_Kit_GUI) has already been installed, please uninstall and reinstall the GUI

② The .NET Framework4.6.1 installation window will appear if the PC does not have the necessary version. If .NET Framework4.6.1 is not installed, click Accept to install.

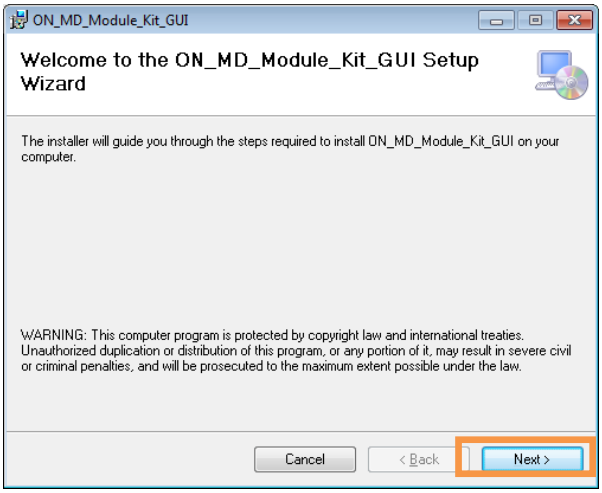


The following window shows the installation in progress. (This may take several minutes)

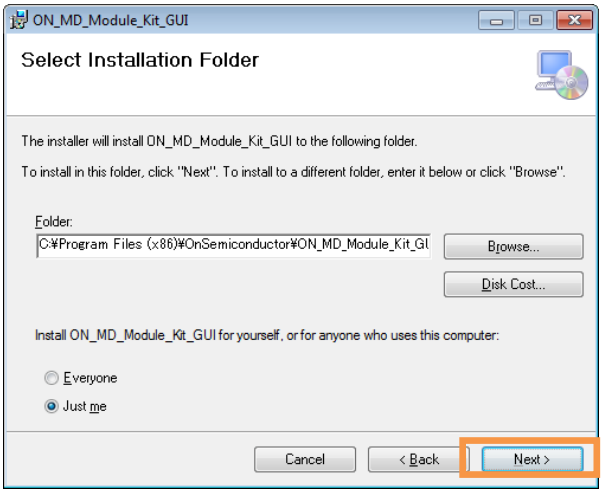


If the installation requires a reboot to complete, a message will appear on the screen. Please press "Yes" to reboot.
Once rebooted, run setup.exe installation file again.

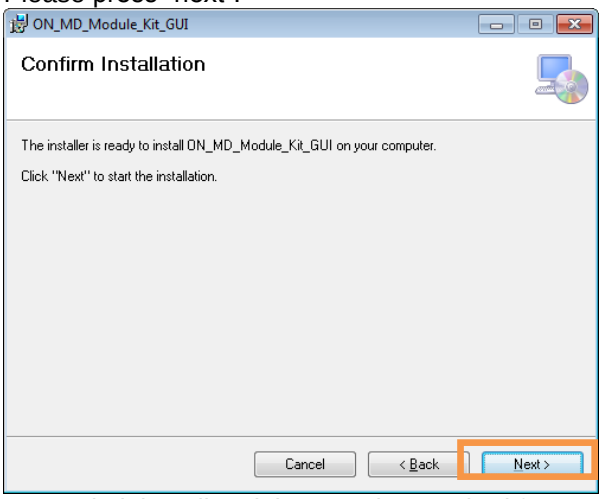
③ Install the GUI.
Press "Next"



④ Specify installation folder, or just click "next" to continue with the installation

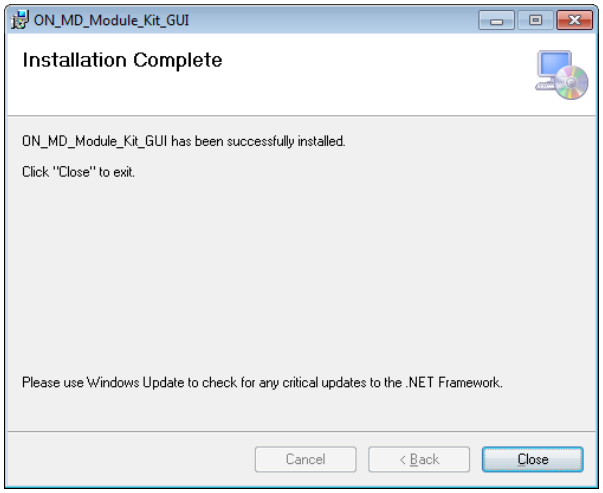


Please press "next".

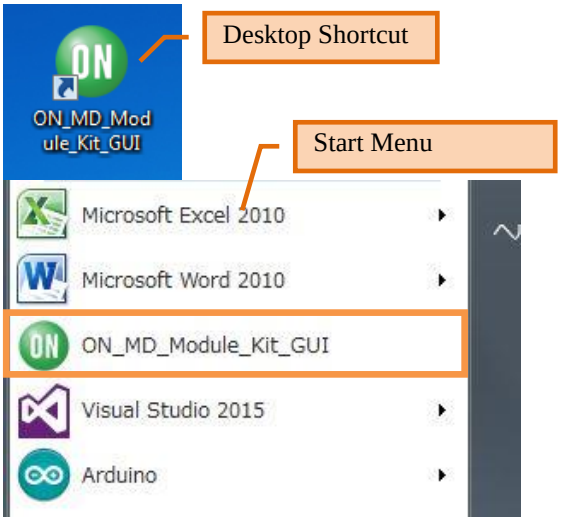


User administratiive rights may be required for installation. If an alert for user account control is displayed, please select "Yes."

The following screen will be displayed after a successful installation.



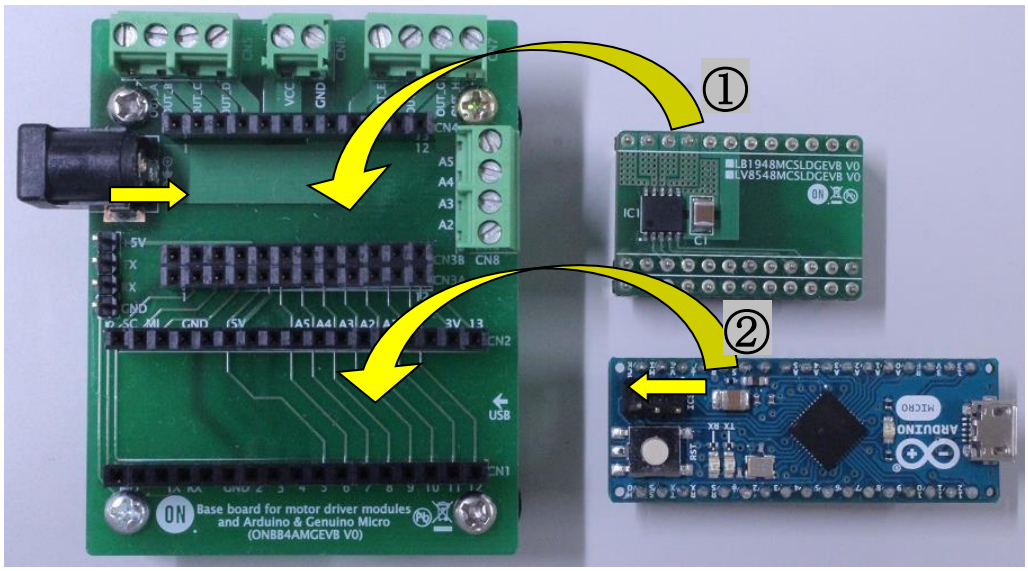
Make sure the GUI shortcut icon is created on the desktop as shown below and that the program has been added to the Windows start menu.



Hardware Setup

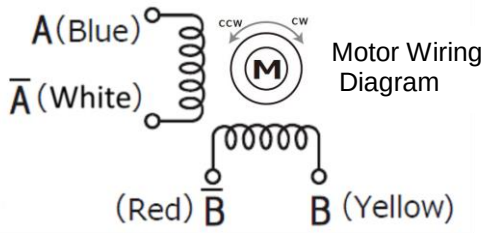
① Connect the LV8548MCSLDGEVB（Motor Driver Module）to the ONBB4AMGEVB（Motor Driver Baseboard）. Insert the module into the baseboard, while being careful not to bend the header pins

② Connect the Arduino/Genuino Micro to the baseboard, as seen in the figure above. The USB connection port should be labeled on the baseboard "🡐USB" to dictate the orientation of the Arduino



③ Plug in the motor wires (Insulation between 5mm – 10mm) into the output terminals on the baseboard – OUT_A/B/C/D (CN5). Firmly fix the wires by screwing down the terminals with a flat-heat screwdriver. Refer to the table below for motor connectivity:

OUT_A	A (Blue)
OUT_B	$\bar{A}$ (White)
OUT_C	B (Yellow)
OUT_D	$\bar{B}$ (Red)

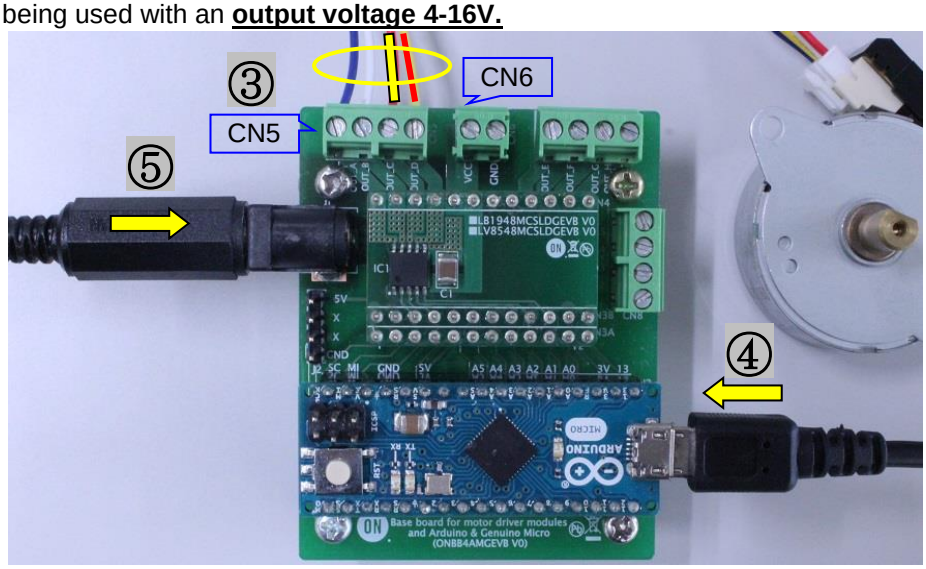


Motor Wiring Diagram

（Do not worry about incorrect wiring. Incorrect wiring will NOT cause any damage to hardware.）

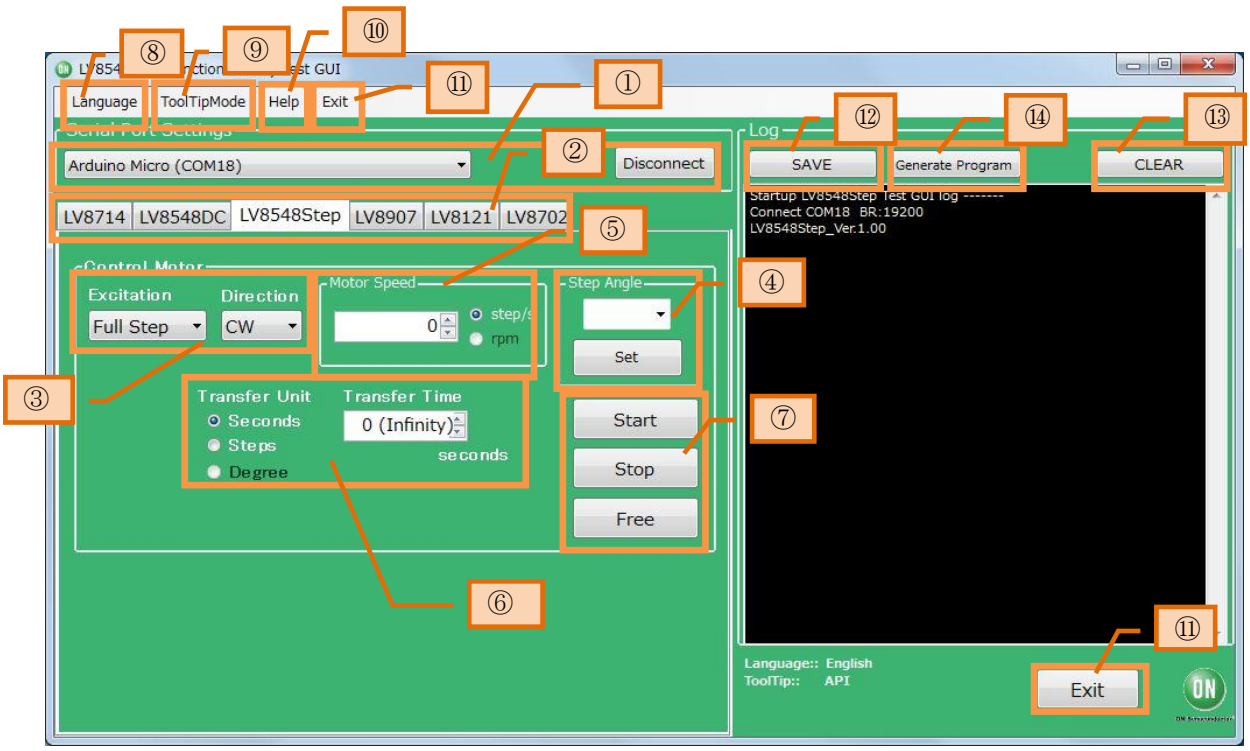
④ Connect the Arduino to a PC using a USB cable.

⑤ Insert the AC Power adapter into the DC Jack on the baseboard. Be sure that a **Center positive type** adapter is being used with an **output voltage 4-16V.**

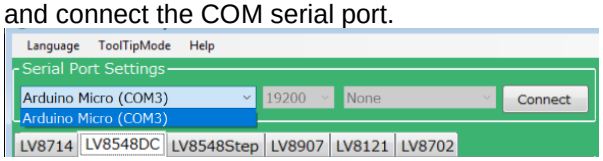


If using power supply cables, please connect the positive terminal to VCC and the negative terminal to GND in the CN6 connector. **The power supply terminals +/- at CN6 are polarity sensitive**.(VCC=+, GND=-)

How to use the GUI



①Double-click the GUI shortcut located on the desktop and connect the COM serial port.



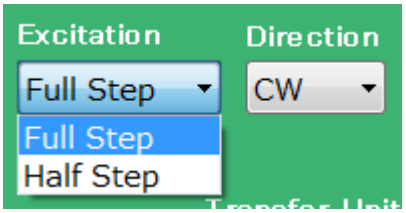
Available COM ports will appear in the drop-down box.
If the Arduino is connected correctly to the PC, an option for “Arduino Micro (COMx)” will be available (where x is the number associated with the port); select that COM port and click connect.

②After connecting the Arduino, the GUI will automatically navigate to the LV8548Step tab

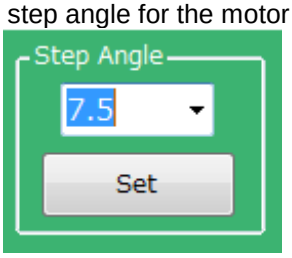
③Specify the desired motor excitation and direction of rotation

Excitation:
Full Step- Larger angle rotated per step
Half Step- Smaller angle rotated per step
Direction:
CW- Clockwise
CCW- Counter clockwise

*Note: The direction of rotation may vary depending on how the motor wires are connected to the terminals

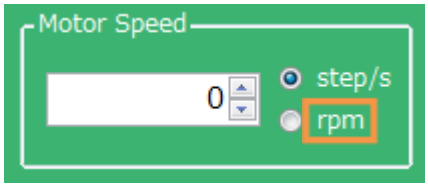


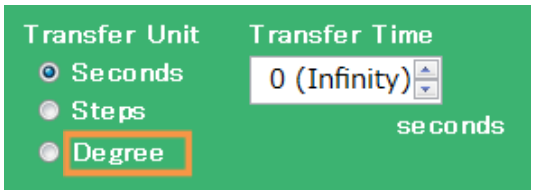
④ Set the step angle for the motor



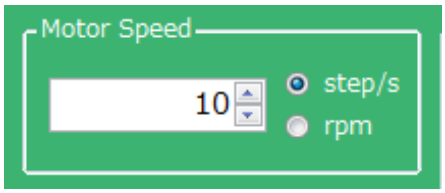
*The step angle will vary depending on the motor. If using the included reference motor, please set it to 7.5°

The step angle setting enables the “rpm” setting under Motor Speed and “Degree” setting under Transfer Unit.





⑤ Set the motor speed in step/s or rpm



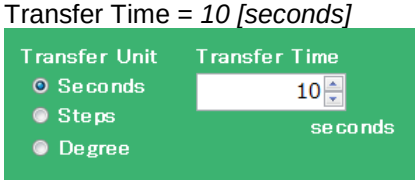
step/s（=pps）:
Frequency of the number of steps per second
rpm: Rotational speed of the motor per minute

Stepper motors are not intended for sudden acceleration, and will vibrate if the control exceeds the maximum rotation speed. When using the included reference motor with the recommended AC adaptor, please set the rotation speed according to the table below.

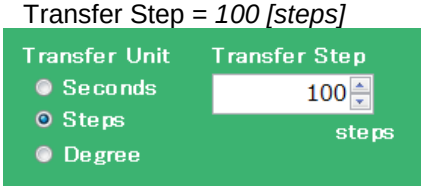
Full Step	1～400 step/s	2～500 rpm
Half Step	1～720 step/s	1～450 rpm

⑥ Set the units and value of the transfer condition for the control signal. After the specified transfer condition elapses, the motor will stop and hold its torque. **Since current continues to flow to the motor, it is important to pay attention to heat generation.** Please select the Free button to stop powering the motor.
For an unspecified rotation time, select 0 (Infinity)

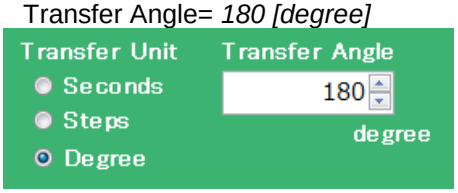
Example 1: Rotating the motor for **10 seconds**
Transfer Unit = *Seconds*
Transfer Time = *10 [seconds]*



Example 2: Rotating the motor for **100 steps**
Transfer Unit = *Steps*
Transfer Step = *100 [steps]*



Example 3: Rotating the motor **180 degrees**
Transfer Unit= *Degree*
Transfer Angle= *180 [degree]*



⑦ When the Start button is pressed, the motor will rotate. If changes to the excitation method or motor speed are made, the changes will take effect upon pressing the Start button.

To change the direction of rotation, it is recommended to stop the motor first with the Stop button, change the current value, and then press the Start button to begin the motor rotation.

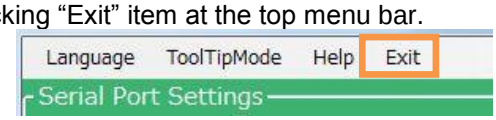
Pressing the Stop button causes the motor to stop, and hold the torque.
When the Free button is pressed, the motor will stop and lose the torque.

To maintain the position while the motor rotates, or to pause the motor and restart from the same position, select the Stop button.
At this time, because of the current still flowing to the motor, attention must again be paid to heat generation.

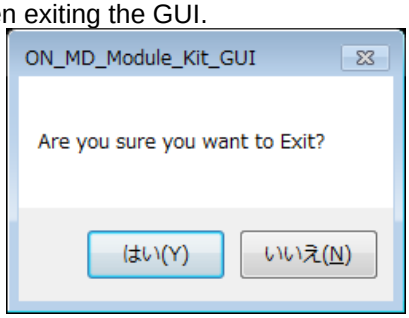
⑧GUI Language Settings
⑨GUI Tool Tip Display
⑩Help function
See appendix for more information

⑪Closing the GUI

When finished, exit the GUI by pressing the “Exit” button at the bottom right of the screen or by clicking “Exit” item at the top menu bar.



The following popup message will be displayed when exiting the GUI.



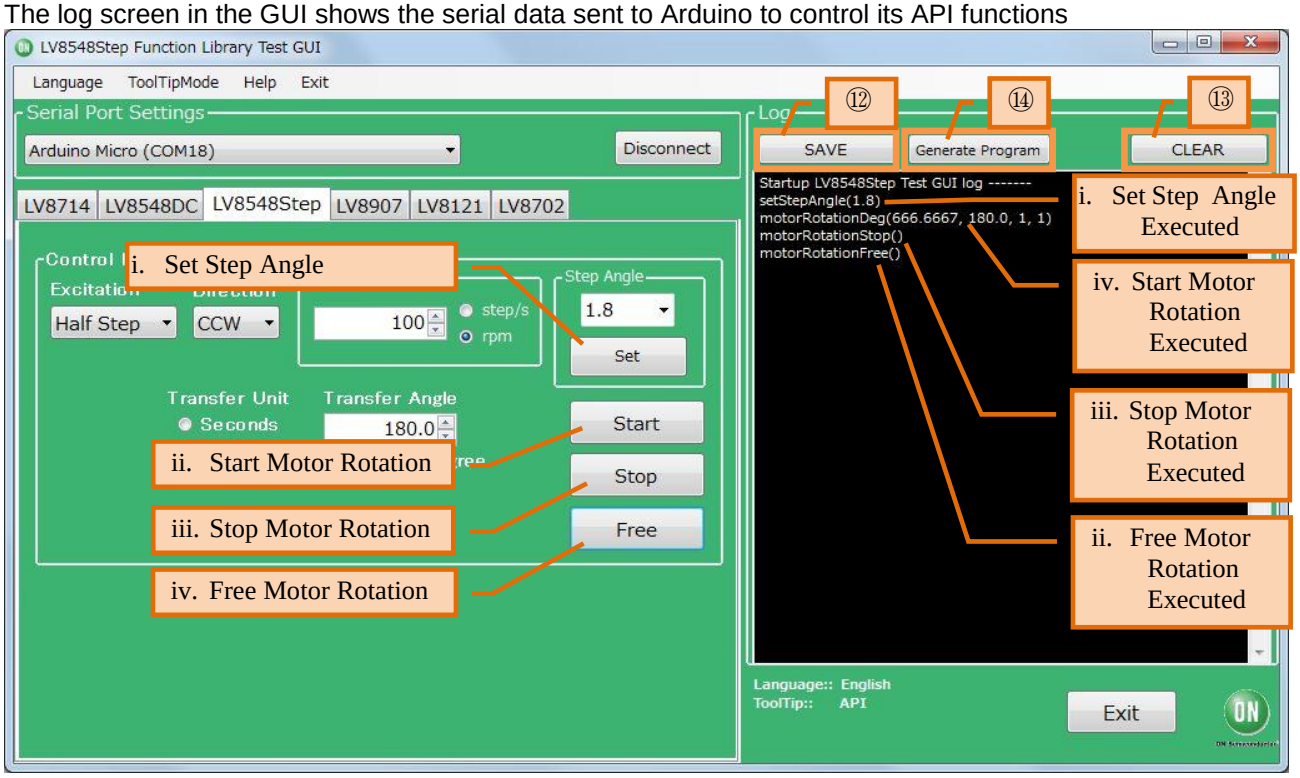
Select “Yes” to quit the GUI.
Select “No” to cancel the exit and return to the main screen.

If the GUI is closed while the motor is still running, the motor will be stopped and the window will close.

For more details on the following features, refer to the next section on How to use the GUI Log:
⑫Saving the GUI log
⑬Clear the GUI log
⑭Program generation

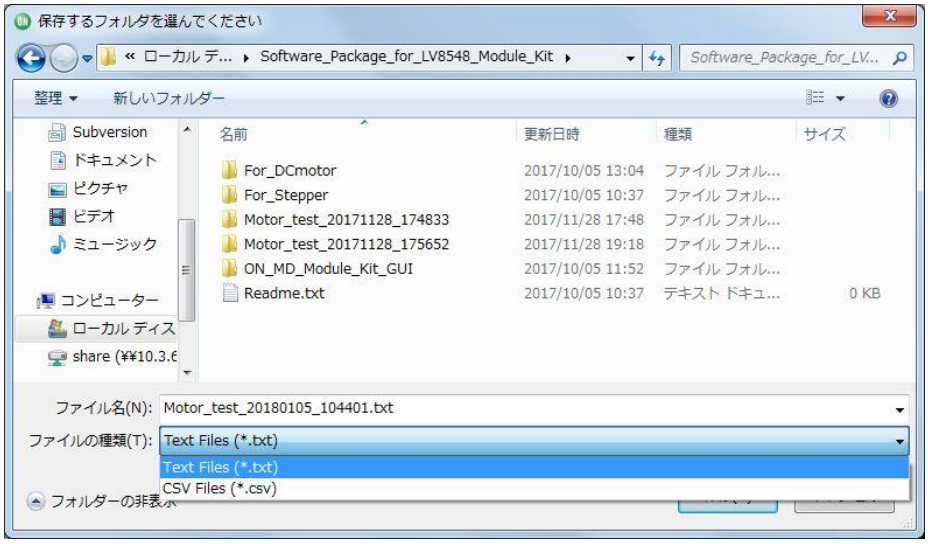
How to use the GUI Log

The log screen in the GUI shows the serial data sent to Arduino to control its API functions



⑫Saving the GUI Log

By pressing the “SAVE” button, the content displayed on the work log can be saved as a .txt file or a .csv file.



⑬Clear GUI Log

By pressing the “CLEAR” button, the content displayed on the work log will be erased.

⑭Program Generation

Pressing the “Generate Program” will output the executed API functions on the work log into a .ino program file that can be uploaded directly with Arduino. By writing the output of the .ino file to Arduino, motor control can be executed automatically through standalone operation according to the procedure generated through the GUI Log.

For more details regarding the Arduino program generation function, refer to the attached Appendix under ⑭ Arduino Program Automatic Generation.