LV8548MCSLDGEVB

Stepper Motor Driver Module Solution Kit Quick Start Guide

Overview

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

Motor driving is made easy with Arduino Micro¹⁾ 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.

Features:

• VCCmax = 20 V, IOmax =1.0 $A^{2)}$ (between OUT_A and B, between OUT_C and D)

- <u>6~12 V applications</u> 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

What you need

PC Windows 7, 64bit
<u>Connected to the Internet</u> (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.



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LV8548MCSLDGEVB Board



ONBB4AMGEVB Board with Arduino Micro and LV8548MCSLDGEVB Board

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

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

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 📗 Enalish 🔀 ON_MD_Module_Kit_GUI.msi 🔹 🔹 GUI Related Files • • • GUI as well as .NET Framework4.6.1 Installer setup.exe • • .NET Framework4.6.1 Related Files DotNetFX461 For DCmotor • • DC Motor Files (Refer to DC Motor Manual) For Stepper LV8548_STEP_APILibrary • • API Library • • • GUI – Arduino Firmware 💿 LV8548 STEP Program.ino 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.



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"

ł	UV0340_DU	_Program Arduino 1.6.0		Manage Libraries	
	File Edit Ske	tch Tools Help	5		
	$\bigcirc \bigcirc$	Verify/Compile	Ctrl+R	Add .ZIP Library	
		Upload	Ctrl+U	A 1 2 19 1	
	LV854	Upload Using Programmer	Ctrl+Shift+U	Arduino libraries	
	1 4 2 1 1	opieda osnigi rogramite		Bridge	
	1 #Ind	Export compiled Binary Ctrl+Alt+S		EEPROM	
	2	Charles Clastels Faller	Child	Feelers	
	3 // 0	Show Sketch Folder	Ctri+K	Espiora	
	4	Include Library		Ethernet	
	5 Lib_	Add File		Firmata	
	0		HID		
	/ void se	tup() {	Kadaard		
I	8 // pu	t your setup code here	, to run onc	Reyboard	
	9 Iv854	8. initLib();	Mouse		

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

<u>Click the folder only once and push "Open" button.</u> Do not double click the folder.

💿 Select a zip fil	e or a folder co	ntaining the library	you'd like to add		×
Look in:		otor		- 🦸 🖻	
Recent Items	LV854	8_STEP_APILi	brary		
Desktop					
My Documents					
Computer					
	File <u>n</u> ame:	LV8548_STEP_APILi	brary		Open
Network	Files of type:	ZIP files or folders		•	Cancel

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"

File Edit Sketo	h Tools Help		Г	Manage Libraries
$\odot \odot$	Verify/Compile	Ctrl+R		Add .ZIP Library
LV854	Upload Upload Using Programmer Export compiled Binary	Ctrl +U Ctrl +Shift +U Ctrl +Alt +S	Arduino libraries Bridge	Arduino libraries Bridge FFPROM
2 3 // G 4	Show Sketch Folder Include Library	Ctrl+K		Esplora Ethernet
5 Lib_	Add File			Firmata

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

Cibrary Manager		
Type [Filter your search	
Arduino Low Power by Arduino Power save primitives features for SAND and ni newer Arduino boards <u>More info</u>	RF32 32bit boards With this library you can manage the low power states of	• 11
Arduino SigFox for MKRFox1200 by Arduino Helper library for MKRFox1200 board and ATABI module, to ease integration with existing projects <u>More info</u>	320E Sigfox module This library allows some high level operations on Sigfox s	-
Arduino Uno WiFi Dev Ed Library by Arduino This library allows users to use network features with Arduino Uno WiFi Developer Edition. More info	like rest and mqtt. Includes some tools for the ESP8266. Use this library only	

Select and install "TimerOne" in the search results

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Stiv S Multi- (ideal <u>More</u>	eg by Steph digit seven Ily) from a T Info	ien Racz -segmen TimerOne	t display lib interrupt.	rary for an	luino. Light-weight desi	in allows the user t	o continuou	ily write data	gathered
Timer Use h	rOne by Jes ardware Tin	se Tane, ner1 for	Jérôme De Î ner PW M (spatis, Mich control and	iael Polli, Dan Clemens,	Paul Stoffregen			
More	<u>info</u>				or ranning on periodic				
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More.	info						1		

Compiling the Arduino Program <u>• Write to Arduino</u>

 Select the Arduino board to upload to by navigating to

"Tools-Board-Arduino/Genuino Micro"

Fool	s Help				
	Auto Format	Ctrl+T		Boards Manager	
	Archive Sketch			Arduino AVR Boards	
	Fix Encoding & Reload			Arduino Yún	
	Serial Monitor	Ctrl+Shift+M		Arduino/Genuino Uno	
	Serial Plotter	Ctrl+Shift+L		Arduino Duemilanove or Diecimila Arduino Nano Arduino/Genuino Mega or Mega 2560	
	WiFi101 Firmware Updater				
	Board: "Arduino/Genuino Micro"		•	Arduino Mega ADK	
	Port		•	Arduino Leonardo	
	Get Board Info			Arduino Leonardo ETH	
	Des sesses "Anduin sICD and"		•	Arduino/Genuino Micro	
	Pure Reatileader			Arduino Esplora	
	burn boolloader			Arduino Mini	

(2) Write an Arduino sketch and navigate to "Sketch→Verify/Compile" when finished writing

	VVIIL	ing			
File	Edit	Sketch	Tools	Help	

00	Verify/Compile	Ctrl+R
	Upload	Ctrl+U
LV854	Upload Using Programmer	Ctrl+Shift+U
1 #inc	Export compiled Binary	Ctrl+Alt+S
2 3 // G	Show Sketch Folder	Ctrl+K
4	Include Library	+
5 Lib_	Add File	

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 <u>USB</u> and select the corresponding COM port as shown below

Tool	Help			_
1001	Auto Format	Ctrl+T		
	Archive Sketch	Culti		
	Fix Encoding & Reload			
	Serial Monitor	Ctrl+Shift+M		
	Serial Plotter	Ctrl+Shift+L		
	WiFi101 Firmware Updater			
	Board: "Arduino/Genuino Micro"	1	•	
	Port	1		Serial ports
	Get Board Info			COM3
	Programmer: "ArduinoISP.org"	1		COM4 COM34 (Arduino/Genuino Micro)

 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.

1	COM4のArduino/Genuino Micro	
	Arduino Micro bootloader (COM6) Device driver software installed corre	≪ × ectly.

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 $(\mbox{\sc 1})$ check board name and step $(\mbox{\sc 3})$ check serial port connection.

Rewrite the Arduino Program

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

When updating the API Function library
 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")
- 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

 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.

Setup	2
For the following components:	
Microsoft .NET Framework 4.6.1 (x86 and x64)	
Please read the following license agreement. Press the page down key to a the rest of the agreement.	see
MICROSOFT SOFTWARE SUPPLEMENTAL LICENSE TERMS	*
.NET FRAMEWORK AND ASSOCIATED LANGUAGE PACKS FOR MICROSOFT WINDOWS OPERATING SYSTEM	
Microsoft Corporation (or based on where you live, one of its affiliates) licenses this supplement to you. If you are licensed to use Microsoft Windows operating system software (the "softwared") you may use this supplement. You may not use it if	•
View EULA for printing	
Do you accept the terms of the pending License Agreement?	
If you choose Don't Accept, install will close. To install you must accept th agreement.	nis
Accept Don't Accept	

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.



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

😸 ON_MD_Module_Kit_GUI			
Select Installation Folder			
The installer will install ON_MD_Module_Kit_	GUI to the follow	ving folder.	
To install in this folder, click "Next". To instal	l to a different fo	lder, enter it below	or click "Browse".
<u>F</u> older:			
C:¥Program Files (x86)¥OnSemiconduc	ctor¥ON_MD_Mo	dule_Kit_Gl	Browse
,			<u>D</u> isk Cost
Install ON_MD_Module_Kit_GUI for yourse	elf, or for anyone	who uses this con	nputer:
Everyone			
Just me			
	Cancel	< <u>B</u> ack	Next >

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.

谩 ON_MD_Module_Kit_GUI	- • •
Installation Complete	
ON_MD_Module_Kit_GUI has been successfully installed. Click "Close" to exit.	
Please use Windows Update to check for any critical updates to the .NET Fram	ework.
Cancel (Back	Close

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.

ON -	Desktop Short	tcut	
ON_MD_Mod ule_Kit_GUI	Start	Menu	
Microsoft Ex	cel 2010	-	\sim
Microsoft We	ord 2010	16	
	dule_Kit_GUI		
Visual Studio	o 2015	•	
Arduino		-	

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:

	<u></u>	
OUT_A	A (Blue)	A(Blue) Motor Wiring
OUT_B	\bar{A} (White)	لََّهُ (White) کَلْ
OUT_C	B (Yellow)	لممس
OUT_D	₿ (Red)	(Red) B B (Yellow)

(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 <u>Center positive type</u> adapter is being used with an <u>output voltage 4-16V.</u>



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



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

Language	ToolTipMode	e Help					
- Serial Po	rt Settings						
Arduino M	licro (COM3)	~	19200 ~	None		~	Connect
Arduino M	licro (COM3)						
LV8714	LV8548DC	LV8548Step	LV8907	LV8121	LV8702		

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
- ③ Specify 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	$2{\sim}500$ 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*





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

Transfer Unit	Transfer Step
🔘 Seconds	100 🊔
O Steps	steps
Oegree	

Example 3: Rotating the motor **180 degrees** Transfer Unit= *Degree*

Transfer Angle=	180 [degree]
Transfer Unit	Transfer Angle
© Seconds	180 🌲
© Steps	degree
Oegree	

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 <u>hold the torque.</u> When the Free button is pressed, the motor will stop and <u>lose the torque.</u>

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

10 Help 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.

ON_MD_Module_Kit_GUI
Are you sure you want to Exit?
(オレ\(Y) いいえ(<u>N</u>)

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: ①Saving the GUI log ③Clear the GUI log ④Program 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.

	~			9
Subversion *	名前	更新日時	種類	サイズ
📑 ドキュメント	For_DCmotor	2017/10/05 13:04	ファイル フォル	
📔 ピクチャ	For_Stepper	2017/10/05 10:37	ファイル フォル…	
📑 ビデオ	Motor_test_20171128_174833	2017/11/28 17:48	ファイル フォル	
⇒ ミュージック	Dotor_test_20171128_175652	2017/11/28 19:18	ファイル フォル	
E	ON_MD_Module_Kit_GUI	2017/10/05 11:52	ファイル フォル	
コンピューター	Readme.txt	2017/10/05 10:37	テキスト ドキュ	0 KB
🏭 ローカル ディス				
🚽 share (¥¥10.3.€				
ファイル名(N): Moto	r_test_20180105_104401.txt			
ァイルの種類(T): Text	Files (*.txt)			

13Clear GUI Log

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

(14) Program 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 (4) Arduino Program Automatic Generation.

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