



# **Automotive Power and Motor Drive BD63800MUF-C Evaluation Board BD63800MUF-EVK-001**

## <High Voltage Safety Precautions>

◇ Read all safety precautions before use

Please note that this document covers only the BD63800MUF-C evaluation board (BD63800MUF-EVK-001) and its functions. For additional information, please refer to the datasheet.

**To ensure safe operation, please carefully read all precautions before handling the evaluation board**



Depending on the configuration of the board and voltages used,

**Potentially lethal voltages may be generated.**

Therefore, please make sure to read and observe all safety precautions described in the red box below.

### Before Use

- [1] Verify that the parts/components are not damaged or missing (i.e. due to the drops).
- [2] Check that there are no conductive foreign objects on the board.
- [3] Be careful when performing soldering on the module and/or evaluation board to ensure that solder splash does not occur.
- [4] Check that there is no condensation or water droplets on the circuit board.

### During Use

- [5] Be careful to not allow conductive objects to come into contact with the board.
- [6] **Brief accidental contact or even bringing your hand close to the board may result in discharge and lead to severe injury or death.**

**Therefore, DO NOT touch the board with your bare hands or bring them too close to the board.**

In addition, as mentioned above please exercise extreme caution when using conductive tools such as tweezers and screwdrivers.

- [7] If used under conditions beyond its rated voltage, it may cause defects such as short-circuit or, depending on the circumstances, explosion or other permanent damages.
- [8] Be sure to wear insulated gloves when handling is required during operation.

### After Use

- [9] The ROHM Evaluation Board contains the circuits which store the high voltage. Since it stores the charges even after the connected power circuits are cut, please discharge the electricity after using it, and please deal with it after confirming such electric discharge.
- [10] Protect against electric shocks by wearing insulated gloves when handling.

This evaluation board is intended for use only in research and development facilities and should be handled **only by qualified personnel familiar with all safety and operating procedures.**

We recommend carrying out operation in a safe environment that includes the use of high voltage signage at all entrances, safety interlocks, and protective glasses.

## Automotive Power and Motor Drive

# Evaluation Kit for Stepping Motor Driver

## BD63800MUF-EVK-001

The ROHM BD63800MUF-C is an AEC-Q100 automotive qualified bipolar low-consumption stepping motor driver that is driven by PWM current. It is suitable for Automotive applications such as Head-up Display, LED Headlight, Heat pump and Intake Air Control Valve. This EVK enables the performance evaluation of this IC in research and development laboratories.

### • Description

BD63800MUF-EVK-001 is an evaluation board for the Automotive Stepping Motor Driver IC. Also, SPI master board, USB cable and a GUI can be provided by ROHM for easy SPI register configuration.

The key component of the evaluation board is the ROHM BD63800MUF-C which have the following specifications and features:

### ● BD63800MUF-C Key Specifications:

- Supply voltage range.....6.0 to 28 V
- Output Current Rating (peak) .....1.35 A
- Output Current Rating (DC) .....1.20 A
- Output On Resistance (up and down) .....0.75  $\Omega$
- VCC quiescent supply current (max) .....10  $\mu$ A

BD63800MUF-C operates with single power supply which can simplify the set design.

### ● BD63800MUF-C Features:

- CLK-IN and SPI-IN Drive mode
- Supported Modes:  
Full step, 1/2, 1/4, 1/8, 1/16 and 1/32 step
- Current Decay Mode Switch Function
  - Mix Decay: Linear Adjustment of  
Slow Decay / Fast Decay Ratio
  - Auto Decay: Automatic Switch of  
Slow Decay / Fast Decay

Further features and protections are referred to the datasheet.

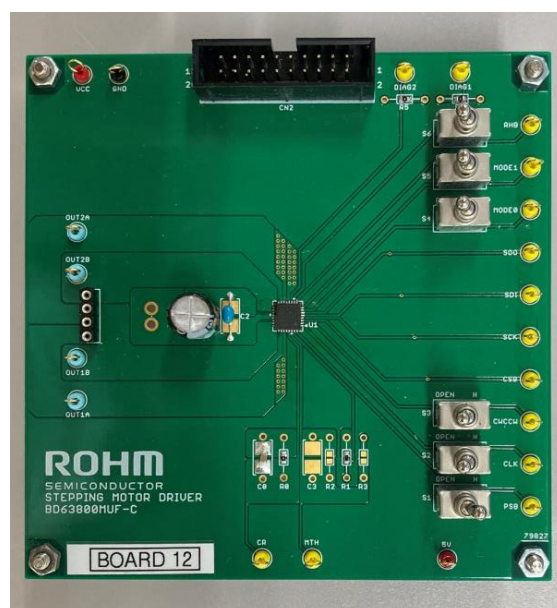


Figure 1: BD63800MUF-EVK-001

### ● EVK Features

- Plug & Play Stepping Motor Evaluation Kit
- Providing SPI master control board  
BD63800MUF-EVK-001 is also enabled evaluation with your SPI master.
- Graphical User Interface application software  
Easy to set/read register.  
[Operating System: Windows10]
- External Switches for pin setting.  
Open or High settings
- Test pins for easy signal monitoring

Contents

1 Introduction .....3

2 Safety Instructions .....4

    2.1 Warnings .....4

    2.2 Instructions for Safe Use .....4

3 Hardware Description.....5

    3.1 Schematic.....5

    3.2 PCB Layout and Component Placement .....6

    3.3 Bill of Materials .....9

4 Operating Instructions .....10

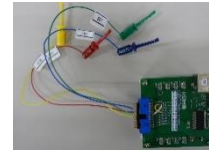
    4.1 Hardware.....10

    4.2 Software.....12

## 1 Introduction

This evaluation kit (EVK) manual describes the usage of ROHM's BD63800MUF-EVK-001 and control application. The purpose of the EVK is to allow the test and evaluation of the stepping motor driver IC BD63800MUF-C in professional research and development environments. This document provides guidelines to quickly setup the hardware and software for fast and easy stepping motor driver IC performance evaluation.

- BD63800MUF-C evaluation board [BD63800MUF-EVK-001]
- SPI Master control board
- USB cable (USB2.0 A-Male to B-Male)
- BD63800MUF-C GUI control software (MS Windows)
- USB Driver



SPI Master  
control board



USB Cable  
(A-male to B-male)

For operation of the EVK the following additional items will be required:

- PC with operating system Windows 10 or higher
- Laboratory DC power supplies: 12 V(typ.)/1.5 A(min.) and 5 V/100 mA(min.)
- Load (e.g. Bipolar DC step motor)
- Connecting cables between DC power supply and boards
- Clock generator: Input 5 V to 0 V clock signal for CLK pin. [Optional]

Figure 2 shows the setup boards and instruments as mentioned above. Detailed information for connection is described on section 4.1[Hardware]. For receiving the BD63800MUF-C GUI control software please get in touch with your local ROHM sales office or use the general ROHM customer support system.

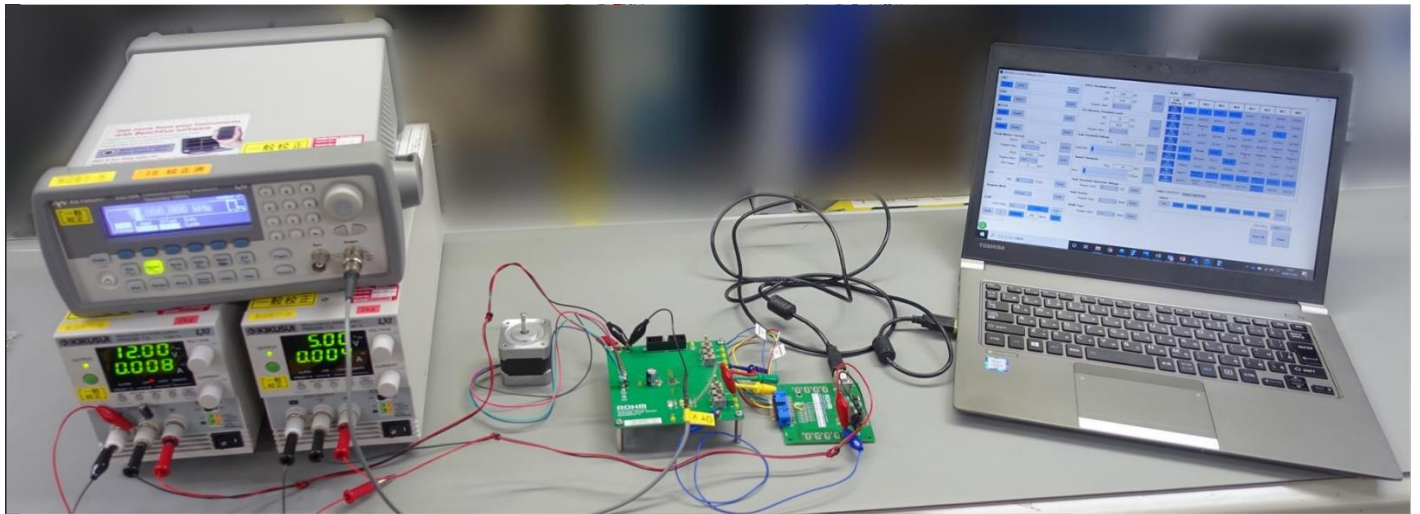


Figure 2: BD63800MUF-EVK-001 Evaluation Setup.

## 2 Safety Instructions

### 2.1 Warnings

- This evaluation kit must only be operated by trained professionals.
- This evaluation kit should be operated in a well ventilated environment and, if used inside a case, the case should not be covered.
- This evaluation kit should be placed on a stable, flat, non-conductive surface in use and should not be contacted by conductive items.
- All peripherals used with the evaluation kit should comply with relevant standards for the country of use and be marked accordingly to ensure that safety and performance requirements are met.
- Where peripherals are connected that do not include the cable or connector, the cable or connector used must offer adequate insulation and operation in order that the requirements of the relevant performance and safety are met.
- The connection of incompatible devices to the evaluation kit may affect compliance or result in damage to the unit and invalidate the warranty.

### 2.2 Instructions for Safe Use

- Do not expose the evaluation kit to water, moisture or place on a conductive surface whilst in operation.
- Take care whilst handling to avoid mechanical or electrical damage to the printed circuit board and components.
- Avoid handling the printed circuit board while it is powered. Only handle by the edges to minimize the risk of electrostatic discharge damage.
- Do not short any outputs to each other, to the supply or to GND.
- Do not operate the evaluation kit outside its specified ratings.
- Take care to monitor the PCB and IC temperatures in particular when operating with high power loads and do not exceed the absolute maximum ratings of all components.

### 3.1 Schematic

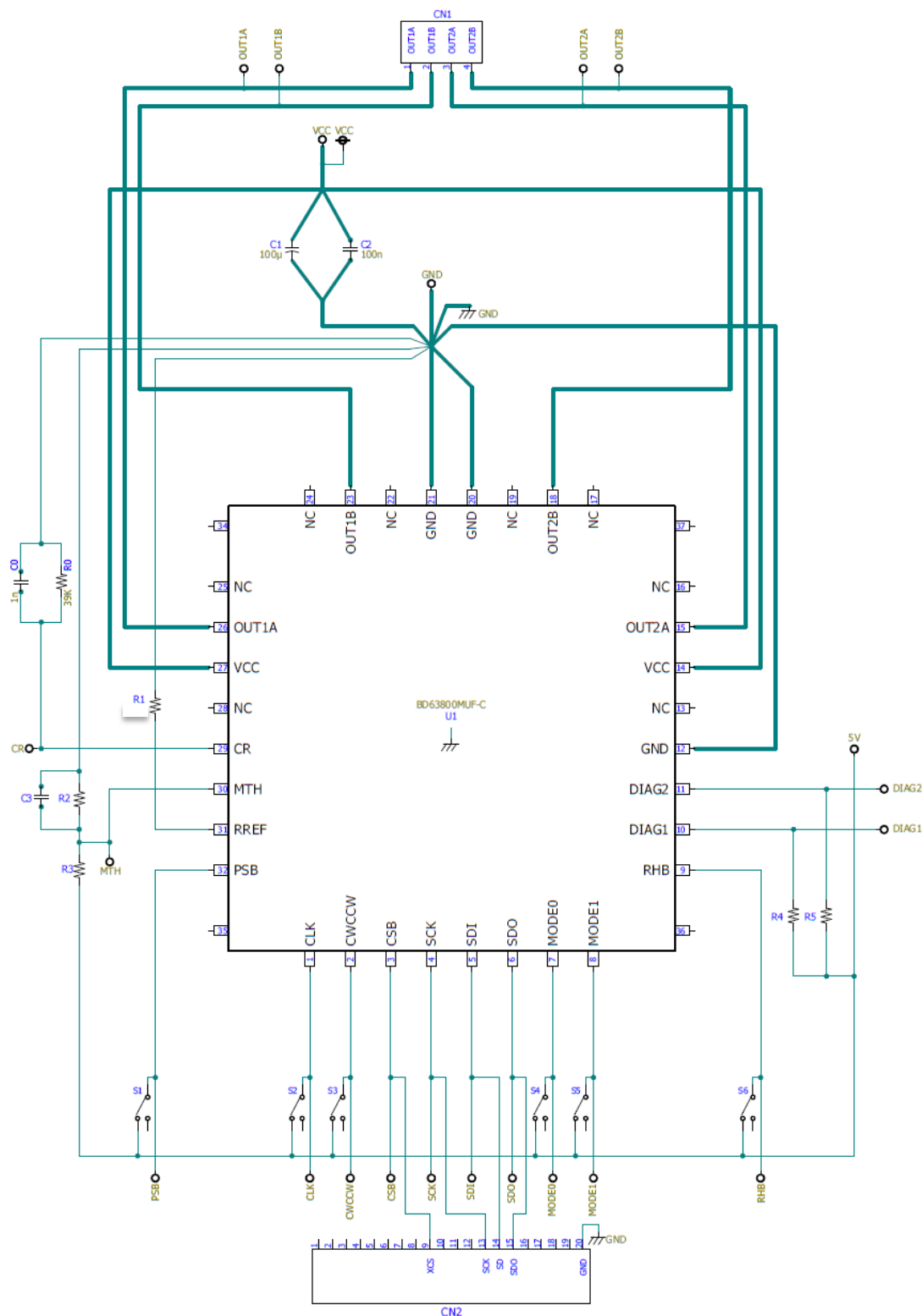


Figure 3: Evaluation Board Schematic

### 3.2 PCB Layout and Component Placement

Please note that the layout of this EVK is not optimized in terms of thermal performance or signal routing.

The focus is more on enabling easy test by adding test points to each signal. All pictures are viewed as seen from TOP side.

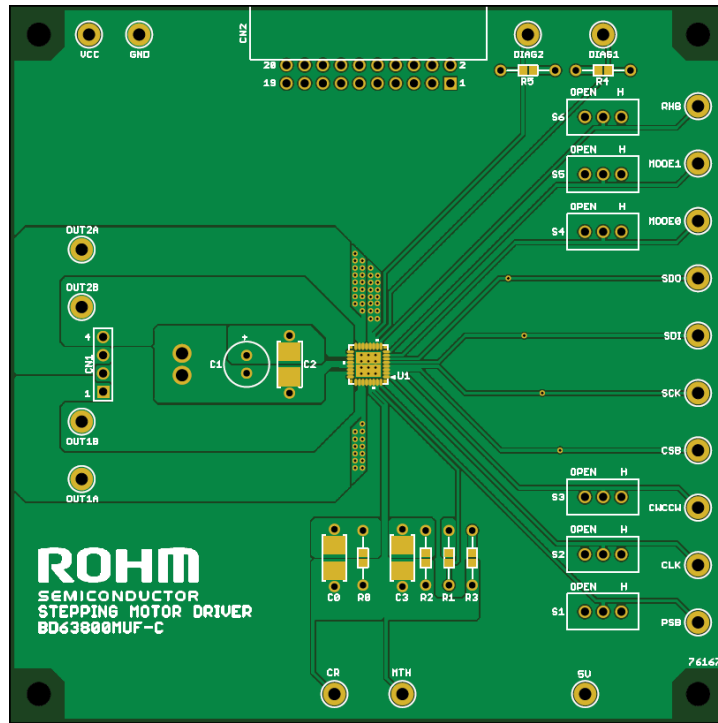


Figure 4: TOP side PCB with Pads and Silkscreen

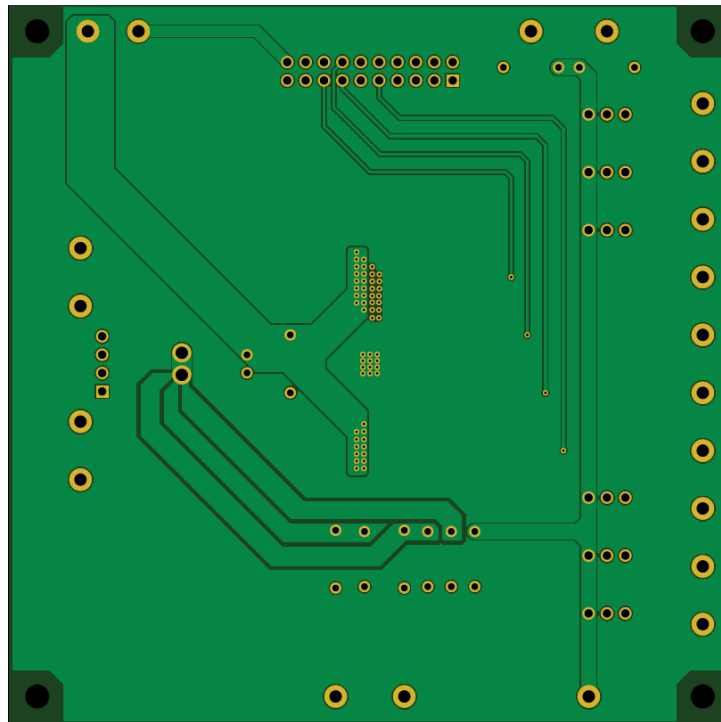


Figure 5: Bottom side with Pads and Silkscreen



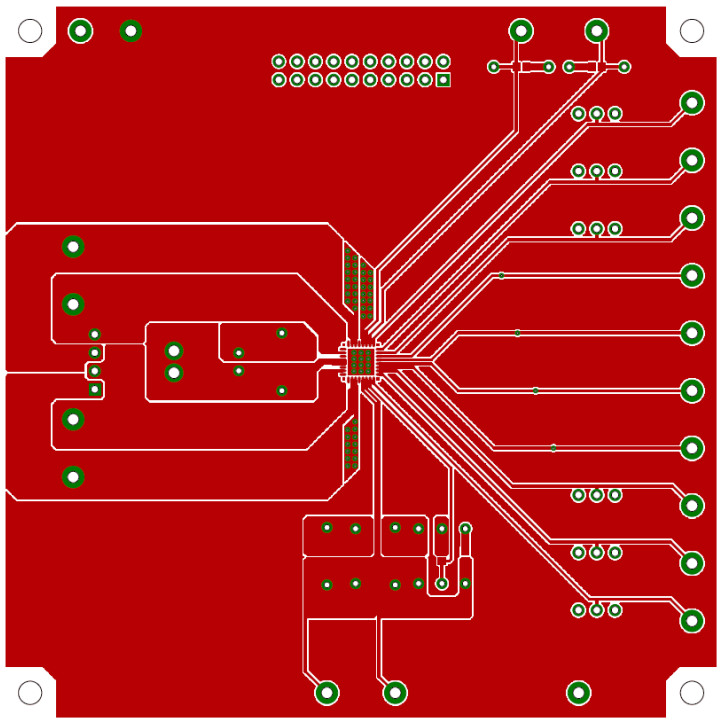


Figure 6: Top layer

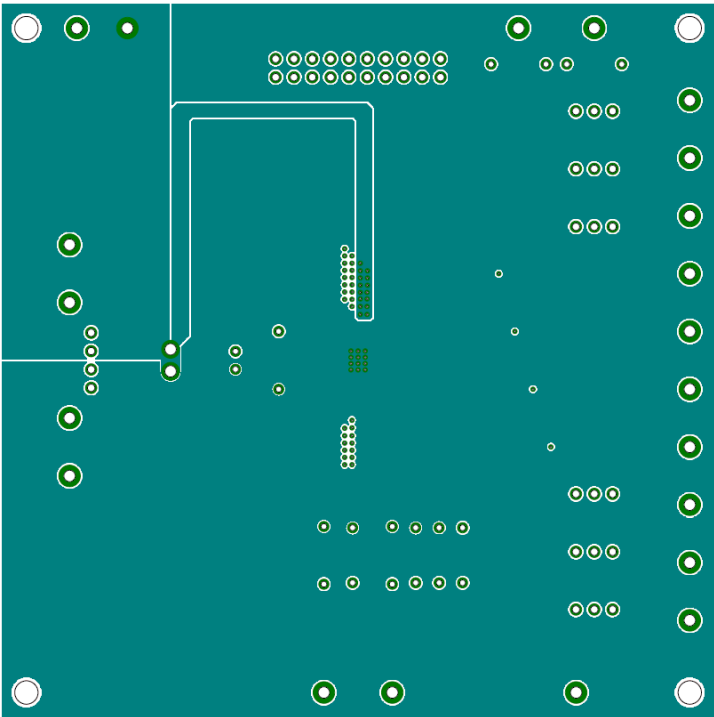


Figure 7: 2<sup>nd</sup> layer

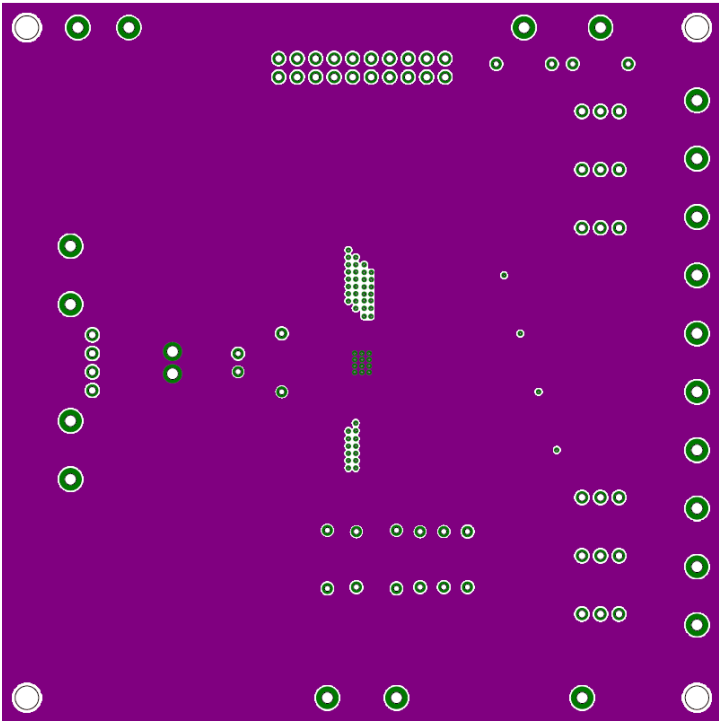


Figure 8: 3<sup>rd</sup> layer

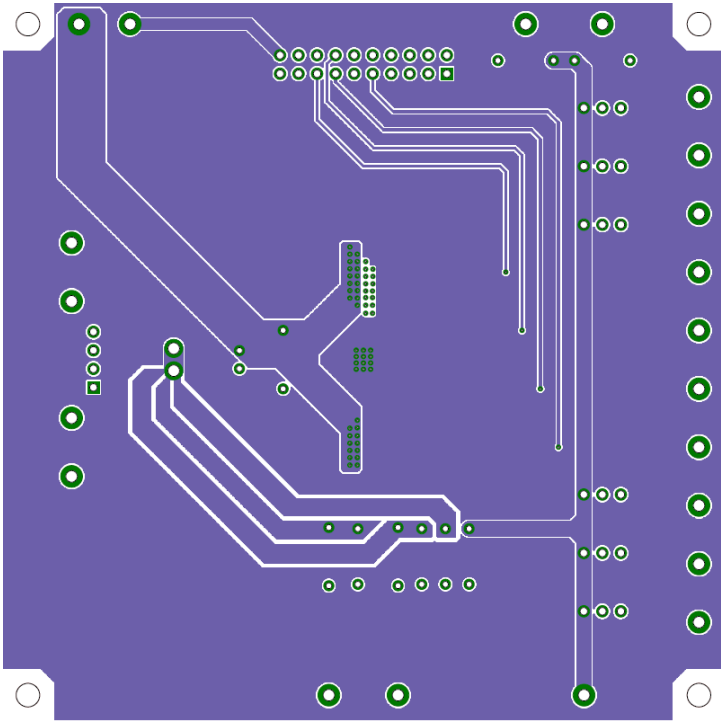


Figure 9: Bottom layer

## 3.3 Bill of Materials

Comp. Name	Value	Type	Quantity
C0	1 nF	Capacitor, Surface Mount/Through Hole	1
C1	100 $\mu$ F	Capacitor, Through Hole	1
C2	100 nF	Capacitor, Surface Mount/Through Hole	1
C3	0.1 $\mu$ F	Capacitor, Surface Mount/Through Hole	1
CN1	1 row x 4 pin Connector	2.54mm pitch, 1.0mm Hole	1
CN2	2 row x 10 pin Connector	2.54mm pitch, 1.0mm Hole	1
R0	39 k $\Omega$	Resistor, Surface Mount	1
R1	6.2 k $\Omega$	Resistor, Surface Mount	1
R4, R5	10 k $\Omega$	Resistor, Surface Mount	2
R2, R3	Open	Resistor, Surface Mount	2
S1,S2,S3,S4,S5,S6	SPDT switch	2.54mm pitch, 1.0mm Hole	6
TP1,TP2,TP3,TP4,TP5, TP7,TP8,TP9,TP10, TP11,TP12,TP14,TP16, TP17,TP18,TP19,TP20, TP22,TP23,TP25,TP26		Test Pin, 1.6mm Hole	21
U1	BD63800MUF-C	IC for Stepper Motor Driver VQFN32FBV050	1

Table 1: Evaluation Board Bill of Materials

## 4 Operating Instructions

### 4.1 Hardware

Before start to connect, make sure to turn off all equipment for your safety.

Connect the cables as followings:

[SPI Master Board]

1. Connect DC Power Supply [5 V] to DVDD(Red) and GND(Black) terminal.
2. Connect USB Cable(B-Male) to CN1.
3. Check SPI Signal cables (SDD, SDI, SCK, CSB) have been connected to the CN2 connector.

[BD63800MUF-EVK-001]

1. Connect DC Power Supply [6 to 28 V / 1.5 A (min.)] to VCC(Red) and GND(Black) terminal.
  2. Connect DC Power Supply [5 V / 100 mA (min.)] to 5 V(Red) and GND(Black) terminal.
  3. Connect SPI Signal cables (SDD, SDI, SCK, CSB) to each terminal
  4. Connect Load to Outputs (OUT1A, OUT1B, OUT2A, OUT2B).
  5. Connect Clock Signal Generator to CLK terminal. [Option: In case of use the CLK terminal]
- To make sure the correct connection, please check the install manual of the load.

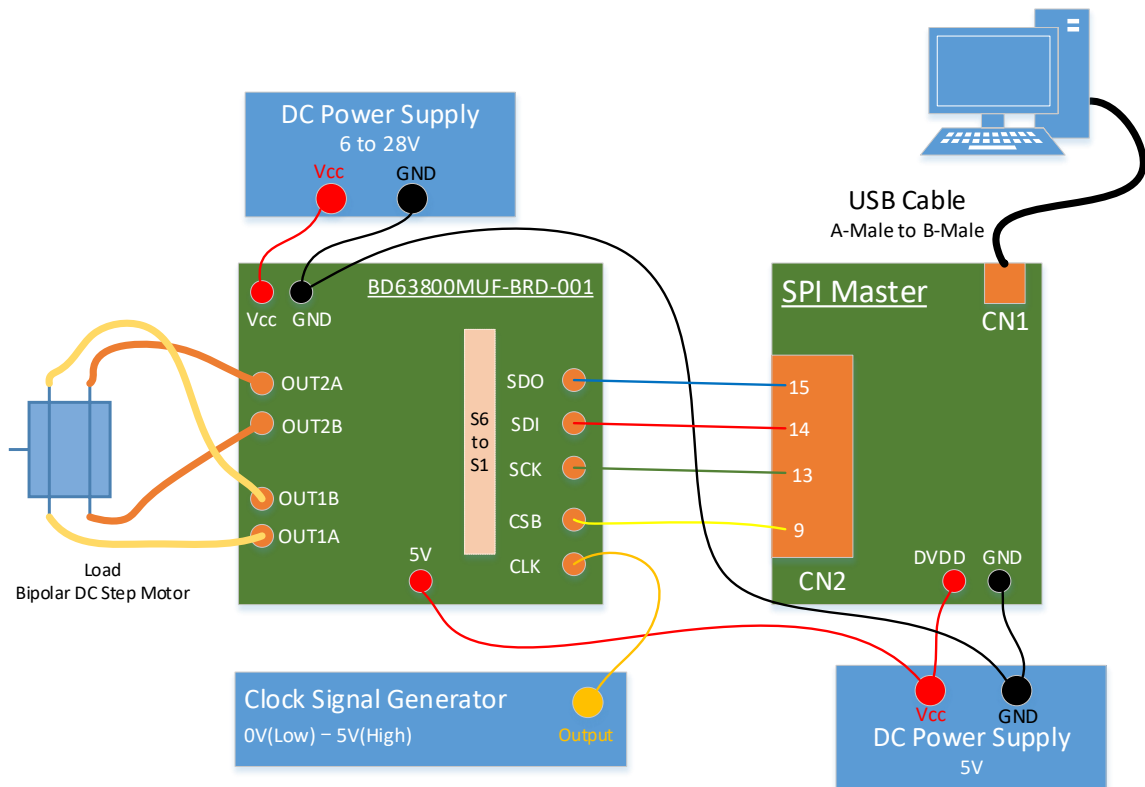


Figure 10: BD63800MUF-EVK-001 Setup

6. Set the All toggle switches (S1 to S6) to "Open" settings.  
 S1:"Open", S2:Open, S3:Open, S4:Open, S5:Open, S6:Open

All toggle switches are able to select "Open" or "H".

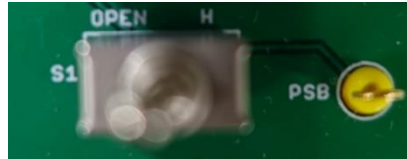
Open: Pin status depend on the external test pin and internal pull-up/pull-down resistor.

Switch to inner side of the board.

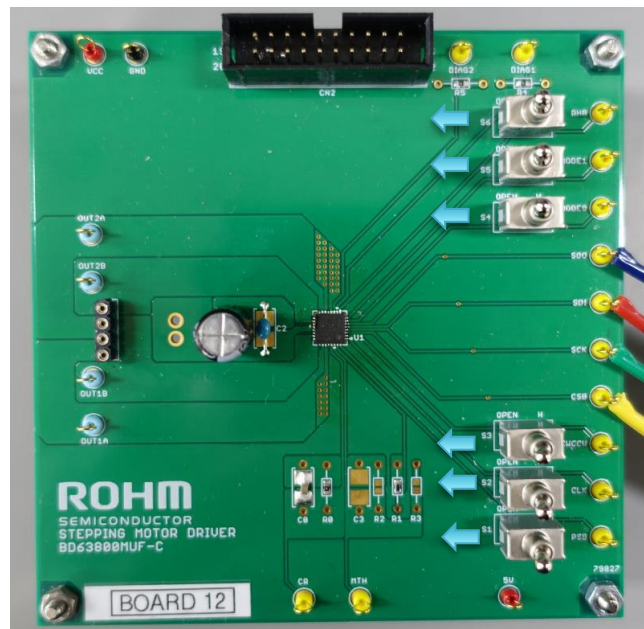
H: Pin status is forced to High (5V).

Please don't connect anything to the external test pin for the switch.

Switch to outer side of the board.



Toggle switch: (S1 for PSB)



S6: Toggle to "Open"

S5: Toggle to "Open"

S4: Toggle to "Open"

S3: Toggle to "Open"

S2: Toggle to "Open"

S1: Toggle to "Open"

Figure 11: Toggle Switch initial setting

Although the maximum operating supply voltage of the motor driver IC BD63800MUF-C is 40 V it is also the absolute maximum value of the IC. So, if you use higher supply voltage than typical please make sure to include enough margin for fluctuation or voltage spikes to never exceed the absolute maximum ratings.

Please operate the EVK at room temperature only. The maximum load current should be limited by thermal performance of the components. Please take care to measure the temperature of the EVK components when applying your desired settings and load.

## 4.2 Software

BD63800MUF-EVK-001 can be controlled by SPI commands and the external setting pins. BD63800MUF-C GUI (Graphical User Interface) software is enabled to set command and read status register easily. Followings are the setting parameter examples on the software. For detail of the software manual, receiving software, please contact to your ROHM sales office or use the general ROHM customer support system.

Software Setting items:

- Drive mode selection
  - Motor Enable / disable
  - Motor Rotation Direction [Clockwise / Counterclockwise]
  - Driving / Hold mode
  - Operation on under voltage state [Open / Hold]
  - CLK-IN / SPI-IN mode
- Drive and protection parameter
  - Excitation mode
  - Peak motor current
  - Slew rate
  - Clock speed for SPI-IN mode
  - Protection parameter (UVLO, TSD, Stall)

Revision History

Date	Revision Number	Description
2021.2	1.0	New Release

## Notes

- 1) The information contained herein is subject to change without notice.
- 2) Before you use our Products, please contact our sales representative and verify the latest specifications :
- 3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors.  
Therefore, in order to prevent personal injury or fire arising from failure, please take safety measures such as complying with the derating characteristics, implementing redundant and fire prevention designs, and utilizing backups and fail-safe procedures. ROHM shall have no responsibility for any damages arising out of the use of our Products beyond the rating specified by ROHM.
- 4) Examples of application circuits, circuit constants and any other information contained herein are provided only to illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.
- 5) The technical information specified herein is intended only to show the typical functions of and examples of application circuits for the Products. ROHM does not grant you, explicitly or implicitly, any license to use or exercise intellectual property or other rights held by ROHM or any other parties. ROHM shall have no responsibility whatsoever for any dispute arising out of the use of such technical information.
- 6) The Products specified in this document are not designed to be radiation tolerant.
- 7) For use of our Products in applications requiring a high degree of reliability (as exemplified below), please contact and consult with a ROHM representative : transportation equipment (i.e. cars, ships, trains), primary communication equipment, traffic lights, fire/crime prevention, safety equipment, medical systems, servers, solar cells, and power transmission systems.
- 8) Do not use our Products in applications requiring extremely high reliability, such as aerospace equipment, nuclear power control systems, and submarine repeaters.
- 9) ROHM shall have no responsibility for any damages or injury arising from non-compliance with the recommended usage conditions and specifications contained herein.
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