### 40V 3.5 A (Peak 6A) Current limit DC Brush Motor Driver BD64950EFJ Evaluation board

# BD64950EFJ-EVK-001 User's Guide

This user's guide describes the evaluation instructions using the evaluation board for BD64950EFJ DC brush motor driver, which features a 40 V rating, 3.5 A (Peak 6 A) and Current limit. This user's guide includes information on peripheral components and operating instructions.

## General Description

BD64950EFJ is a motor driver IC with a single H-bridge circuit capable of driving DC brush motors. It enables high-efficiency operation through either direct PWM control or constant-current PWM control. The IC also includes various protection circuits, contributing to enhanced system reliability. This IC is designed for motor drive applications in devices such as robotic vacuum cleaners, vending machines, bidet toilet seats, PPCs, multifunction printers, laser beam printers, inkjet printers, photo printers, fax machines, and mini printers. The evaluation board already includes BD64950EFJ, as well as capacitors, resistors, switches, pins, and sockets.

## Key Specification of BD64950EFJ

- Input voltage range·····8 to 40V
- Rated Output current (Continuous)·····3.5A
- Rated Output current (Peak)·····6.0A
- Operating Temperature Range····· -25 to +85°C
- Output ON Resistance (High + Low)·····0.55Ω (Typ.)

## Electrical characteristics of BD64950EFJ

| Parameter | Symbol | Range | | | Unit | Condition |
|---|---|---|---|---|---|---|
| | | Min | Typ | Max | | |
| Power Supply voltage | $V_{CC}$ | 8 | 24 | 40 | V | |
| Output Current (Continuous) | $I_{OUT}$ | | | 3.5 | A | |
| Operating temperature | Topr | -25 | +25 | +85 | °C | |
| Circuit Current at Standby | $I_{CCST}$ | - | 0 | 1 | μA | IN1=IN2 =0V |
| Circuit current | $I_{CC}$ | - | 2.4 | 5.0 | mA | IN1=5V, IN2=0V |
| High level input voltage | $V_{INH}$ | 2.0 | - | - | V | |
| Low level input voltage | $V_{INL}$ | - | - | 0.8 | V | |
| VREF input voltage | $V_{VREF}$ | 0 | - | 3.0 | V | |




No. 68UG038E Rev.001
2025.9

# Table of Contents

# 1 Introduction

The user's guide describes how to set up and use the BD64950EFJ-EVK-001. This evaluation board is designed to drive DC brush motors using BD64950EFJ. For detailed specifications of this IC, please refer to the datasheet.

# 2 Hardware Description

## 2.1 BD64950EFJ-EVK-001 Circuit Diagram

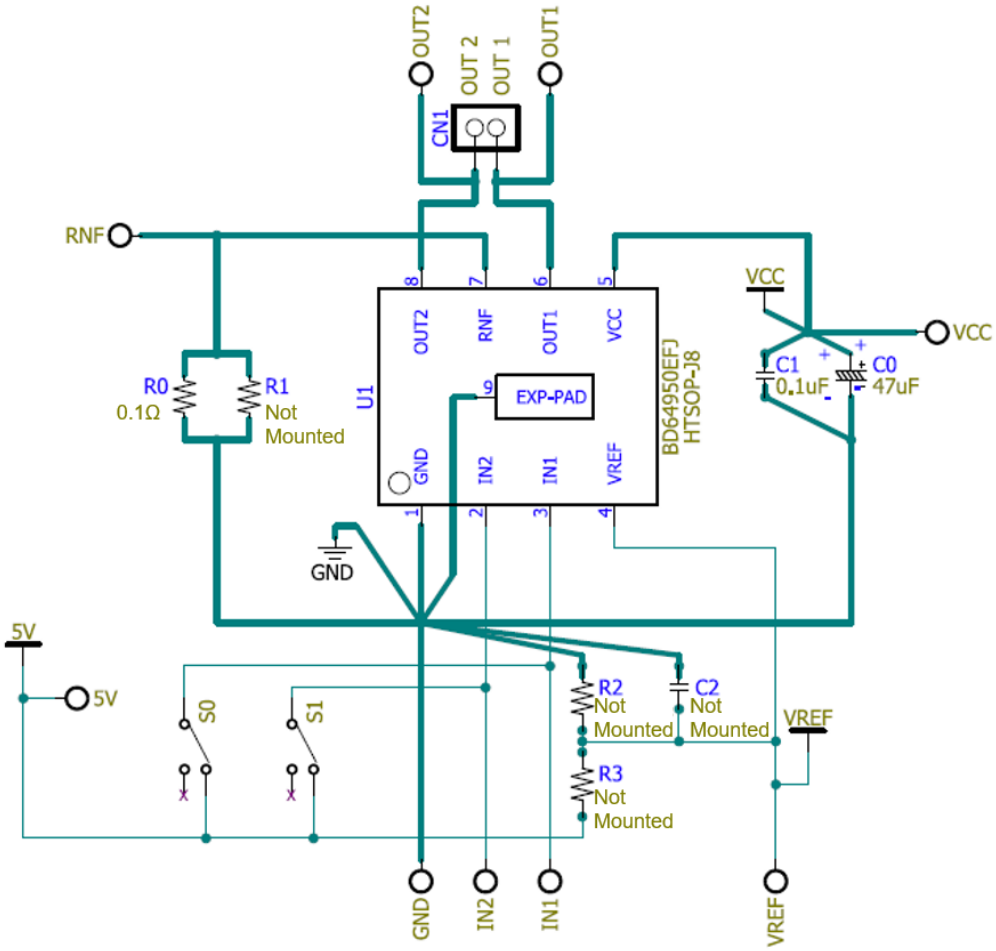


Figure 1. BD64950EFJ-EVK-001 Circuit Diagram

## 2.2 Bill of Materials

Table 1. Bill of Materials for the Evaluation Board

| Part Number | Component Values | Size (mm / inch) | Description | Quantity |
|---|---|---|---|---|
| C0 | 50V / 47µF | - | VCC Stabilizing Electrolytic Capacitor | 1 |
| C1 | 50V / 0.1µF | 3216 / 1206 | VCC Stabilizing Capacitor | 1 |
| C2 | - | - | Pattern for VREF Stabilizing Capacitor | - |
| CN1 | - | - | Connector Header for Motor Connection | 1 |
| R0 | 0.1Ω / 3W | 6432 / 2512 | Resistor for Current Limit | 1 |
| R1 | - | - | Pattern for Current Limit Resistor (Spare) | - |
| R2, R3 | - | - | Pattern for VREF Divider Resistor | - |
| S0 | - | - | Logic Setting Switch (IN1) | 1 |
| S1 | - | - | Logic Setting Switch (IN2) | 1 |
| TP1 | - | - | Test Pin (OUT2) | 1 |
| TP2 | - | - | Test Pin (OUT1) | 1 |
| TP3 | - | - | Test Pin (IN2) | 1 |
| TP4 | - | - | Test Pin (IN1) | 1 |
| TP5 | - | - | Test Pin (VREF) | 1 |
| TP6 | - | - | Test Pin (GND) | 1 |
| TP7 | - | - | Test Pin (5V) | 1 |
| TP8 | - | - | Test Pin (VCC) | 1 |
| TP9 | - | - | Test Pin (RNF) | 1 |
| U1 | - | - | Motor driver (BD64950EFJ) | 1 |

## 2.3 PCB Layout

Table 2. PCB Specifications

| | |
|---|---|
| Board Size: | 50mm×50mm×1.6mm (4 layers) |
| Material: | FR-4 |
| Copper Foil Thickness: | 70μm |

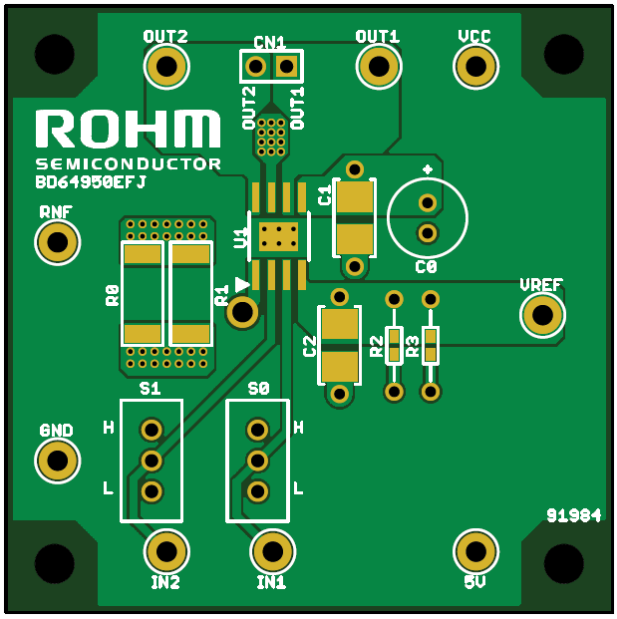


Figure 2. PCB layout (Top view)

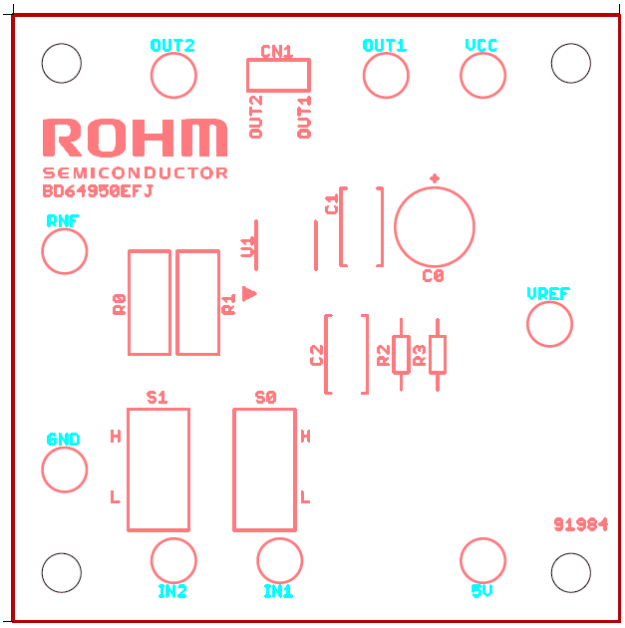


Figure 3. Silkscreen (Top view)

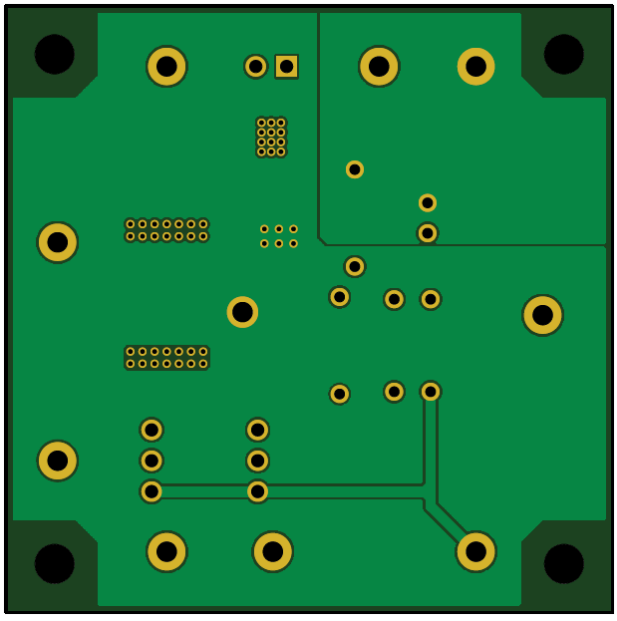

Figure 4. PCB layout (Bottom view)

# 3 Setup Instructions

## 3.1 Required Equipment

Table 3. Required equipment list

| Equipment | Details | Note |
|---|---|---|
| Power Supply<br>for VCC Pin | DC stabilized power supply<br>capable of 8 to 40 V output | A power supply with a maximum output current capacity of at least 3.5A, which is the motor drive current. |
| Power Supply<br>for 5 V Pin | DC stabilized power supply<br>capable of 5V output | For supplying high-level voltage to S0 and S1.<br>(Not required when both S0 and S1 are set to Low) |
| Power Supply<br>for VREF Pin | DC stabilized power supply<br>capable of 0 to 3 V output | Not required when using R2 and R3. |
| Function Generator<br>for PWM Input Signal | Square wave, Output frequency up to 100 kHz, Output amplitude (High level: 5 V, Low level: 0 V) | Not required when PWM signal is supplied from MCU. |
| DC Brush Motor | - | - |

## 3.2 Wiring Example

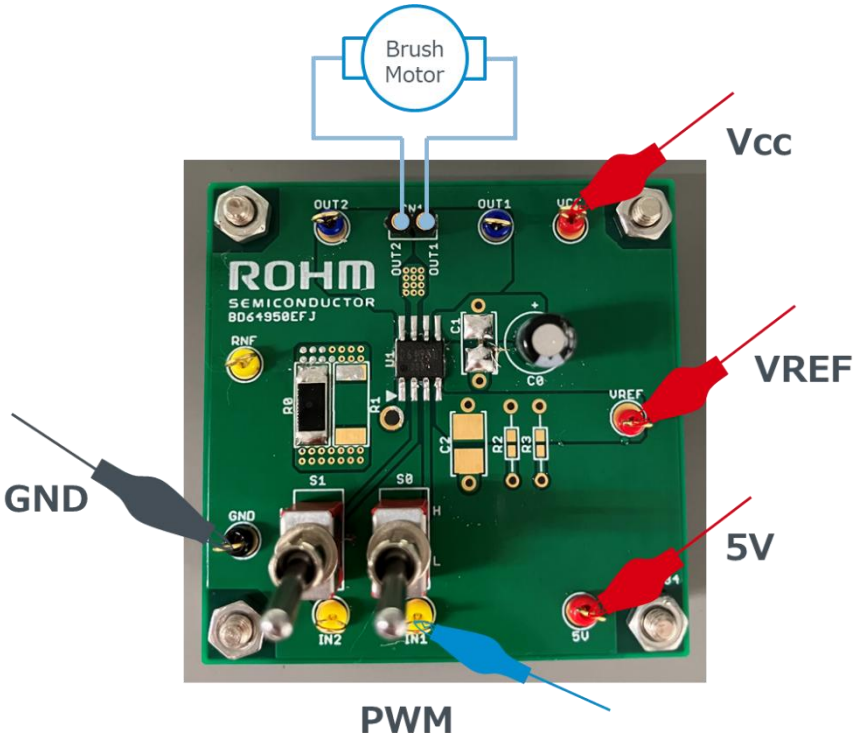


Figure 5. Wiring Example

# 4 Description of operating instructions

## 4.1 Startup Instructions

1. Connect the function generator to IN1 Pin (for forward rotation). *1
2. Set S0 to H/L to make IN1 = H/OPEN (IN2 is configured via S1). Initially, set S0 and S1 to L/L. *2*3
3. Turn on the power supply connected to VCC Pin.
4. Turn on the power supplies connected to 5 V Pin and VREF Pin.
5. Install appropriate resistors on R2 and R3 when dividing VREF.
   In this case, a power supply for VREF is not required.

$$VREF = 5[V] \times \frac{R2[\Omega]}{R2 + R3[\Omega]}$$

6. Turn on the function generator connected to IN1 Pin. Output a square wave with an amplitude of 5V high level and 0V low level, at the desired frequency and with the minimum input duty cycle required to safely start the motor. The drive state should follow the input-output logic table shown in Table 4.
7. If you raise the input duty, the motor's rotational speed will be increased.

Table 4. Input/Output Logic Table

| Input | | Output | | Condition |
|---|---|---|---|---|
| IN1 | IN2 | OUT1 | OUT2 | |
| L | L | OPEN | OPEN | Standby |
| H | L | H | L | Forward |
| L | H | L | H | Reverse |
| H | H | L | L | Brake |

## 4.2 Shutdown Instructions

1. Reduce the input duty of the function generator connected to IN1/IN2 Pin to its minimum value.
2. Turn off the function generator connected to IN1/IN2 Pin.
3. Turn off the power supplies connected to 5V Pin and VREF Pin.
4. After confirming that the motor has stopped, turn off the power supply connected to VCC Pin.

*1 When you evaluate reverse rotation, connect the function generator to IN2 Pin.

*2 For safety reason, please follow this procedure. Driving with IN1/IN2 = PWM/L is recommended. If driven with PWM/H, the motor may operate at full torque when no PWM signal is applied, which is dangerous. This occurs because the internal pull-down resistor on IN1/IN2 Pin forces the input to low. If you plan to perform this evaluation, please use MCU.

*3 Please make sure to set the switch on IN1/IN2 Pin side receiving the PWM signal to Low.

## 5 Revision History

| Date | Revision | Changes |
|---|---|---|
| 2025.09.19 | 001 | New release |

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