FUJITSU SEMICONDUCTOR
SUPPORT SYSTEM

SS01-26036-1E

F²MC-8FX Family

8-bit MICROCONTROLLER

MB95330 Series

EV BOARD MB2146-440-E

SETUP GUIDE

FUJITSU

PREFACE

Thank you for purchasing the F²MC*-8FX Family EV board: MB2146-440-E.
This product is an EV board for F²MC-8FX MB95330 Series MCU.
This manual explains how to use the EV board. Be sure to read this manual before using the product.
For mass production/evaluation MCUs for this product, consult with sales representatives or support representatives.

* : F²MC is the abbreviation of FUJITSU Flexible Microcontroller.

■ Handling and use

Handling and use of this product and notes regarding its safe use are described in the manuals for products bundled with the EV board.
Follow the instructions in the manuals to use this product.
Keep this manual at hand so that you can refer to it anytime during use of this product.

■ Using the product safely

This manual contains important information required for using the product safely. Be sure to read through the manual before using the product and follow the instructions contained therein to use it correctly.
In particular, carefully read "■ Caution of the products described in this manual" at the beginning of this manual to understand the requirements for safe use of the product before using it.
After reading the manual, keep it handy for future reference.

■ European RoHS compliance

Products with a -E suffix on the part number are European RoHS compliant products.

■ Notice on this document

All information included in this document is current as of the date it is issued. Such information is subject to change without any prior notice.
Please confirm the latest relevant information with the sales representatives.

■ **Caution of the products described in this document**

The following precautions apply to the product described in this manual.

⚠ WARNING	Indicates a potentially hazardous situation which could result in death or serious injury and/or a fault in the user's system if the product is not used correctly.

Electric shock, Damage	Before performing any operation described in this manual, turn off all the power supplies to the system. Performing such an operation with the power on may cause an electric shock or device fault.
Electric shock, Damage	Once the product has been turned on, do not touch any metal part of it. Doing so may cause an electric shock or device fault.

⚠ CAUTION	Indicates the presence of a hazard that may cause a minor or moderate injury, damages to this product or devices connected to it, or may cause to loose software resources and other properties such as data, if the device is not used appropriately.

Cuts, Damage	Before moving the product, be sure to turn off all the power supplies and unplug the cables. Watch your step when carrying the product. Do not use the product in an unstable location such as a place exposed to strong vibration or a sloping surface. Doing so may cause the product to fall, resulting in an injury or fault.
Cuts	The product contains sharp edges that are left unavoidably exposed, such as jumper plugs. Handle the product with due care not to get injured with such pointed parts.
Damage	Do not place anything on the product or expose the product to physical shocks. Do not carry the product after the power has been turned on. Doing so may cause a malfunction due to overloading or shock.
Damage	Since the product contains many electronic components, keep it away from direct sunlight, high temperature, and high humidity to prevent condensation. Do not use or store the product where it is exposed to much dust or a strong magnetic or electric field for an extended period of time. Inappropriate operating or storage environments may cause a fault.
Damage	Use the product within the ranges given in the specifications. Operation over the specified ranges may cause a fault.
Damage	To prevent electrostatic breakdown, do not let your finger or other object come into contact with the metal parts of any of the connectors. Before handling the product, touch a metal object (such as a door knob) to discharge any static electricity from your body.
Damage	When turning the power on or off, follow the relevant procedure as described in this document. Before turning the power on, in particular, be sure to finish making all the required connections. Furthermore, be sure to configure and use the product by following the instructions given in this document. Using the product incorrectly or inappropriately may cause a fault.
Damage	Always turn the power off before connecting or disconnecting any cables from the product. When unplugging a cable, unplug the cable by holding the connector part without pulling on the cable itself. Pulling the cable itself or bending it may expose or disconnect the cable core, resulting in a fault.
Damage	Because the product has no casing, it is recommended that it be stored in the original packaging. Transporting the product may cause a damage or fault. Therefore, keep the packaging materials and use them when re-shipping the product.

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1. BGM Adapter Manual

1.1 BGM Adapter Overview

Below is a close look of MB95330 Series BGM Adapter. The part number is MB2146-08-E. It provides a debugging platform for the MB95330 Series MCU in a small size of 55.7mm (W) × 127mm (D) × 30mm (H).

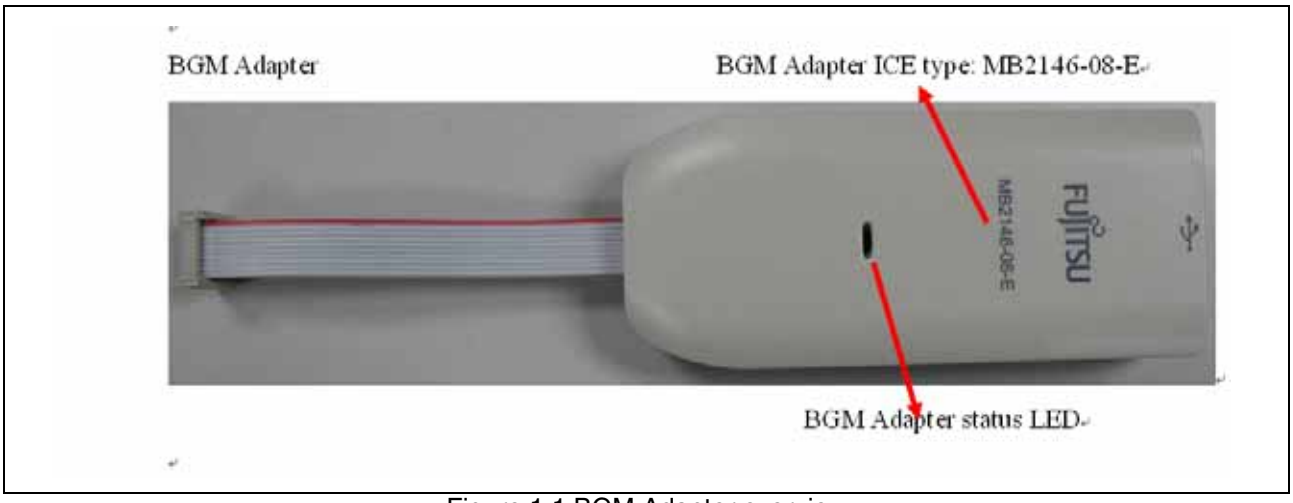

Figure 1.1 BGM Adapter overview

1.2 Function List

ID	Function description	Remarks
1	Support MB95330 Series MCU	MCU MAX machine clock: 16.25 MHz MCU power voltage: 2.4 V to 5.5 V
2	Break pointer	256 software breakpoints
3	USB interface to PC/SOFTUNE	Compatible with USB protocol version 1.1
4	1-Line UART interface to the MB95330 Series MCU	The Baud rate is 62,500 bps
5	Support the MCU flash programming for engineering development	The programming and reading speed is about 800 B/S.

1.3 IDC10 Interface Description

Pin Number	Pin Name	Description
1	UVCC	Target MCU Vcc
2	GND	Target MCU Vss
3	RSTIN	Target MCU reset input / 10V output CAUTION: Do not connect RSTIN to this device (MB95330Series)
4	RSTOUT	Target MCU reset output
5	RSV	Reserved
6	RSV	Reserved
7	RSV	Reserved
8	DBG	Target MCU debugging pin
9	RSV	Reserved
10	RSV	Reserved

1.4 BGM Adapter USB Configuration

The BGM Adapter is provided with a USB cable. Connect the BGM Adapter to PC with the USB cable. If the connection is right, the following window will pop up. Follow the instructions displayed, and then click "Next".

Figure 1.4-1 Install BGM Adapter in Windows (1)

Select “Install from a list or specific location (Advanced)”, then click “Next”,

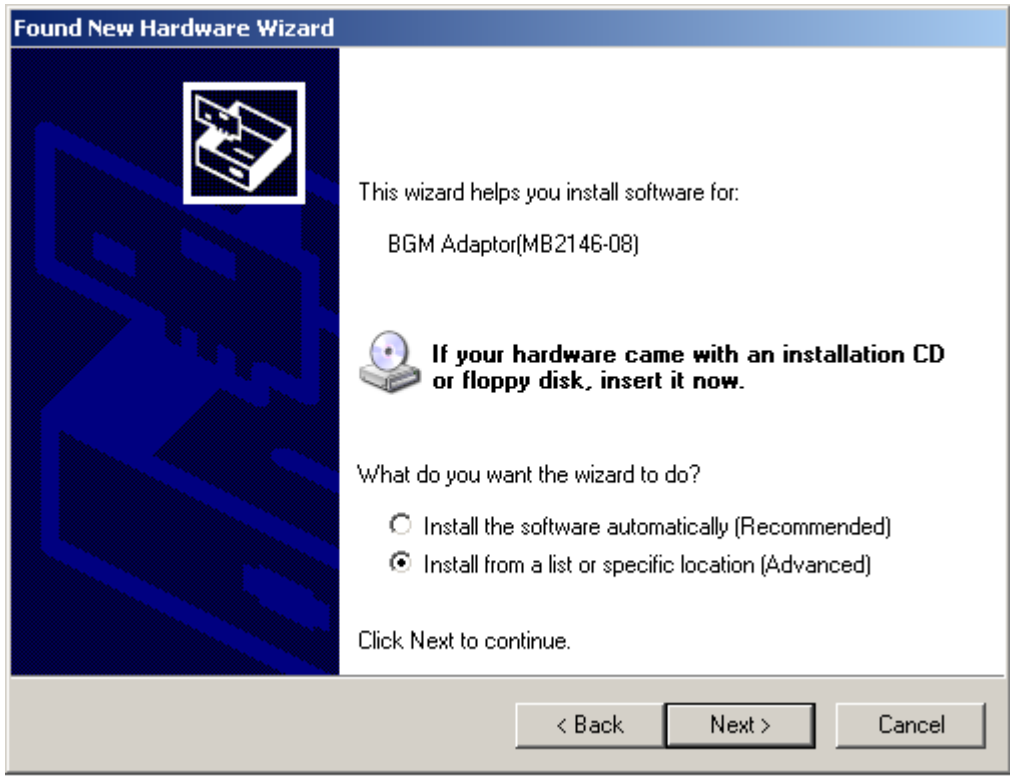

Figure 1.4-2 Install BGM Adapter in Windows (2)

Select “…\Drivers” from the folder where SOFTUNE is installed, click “Next”,

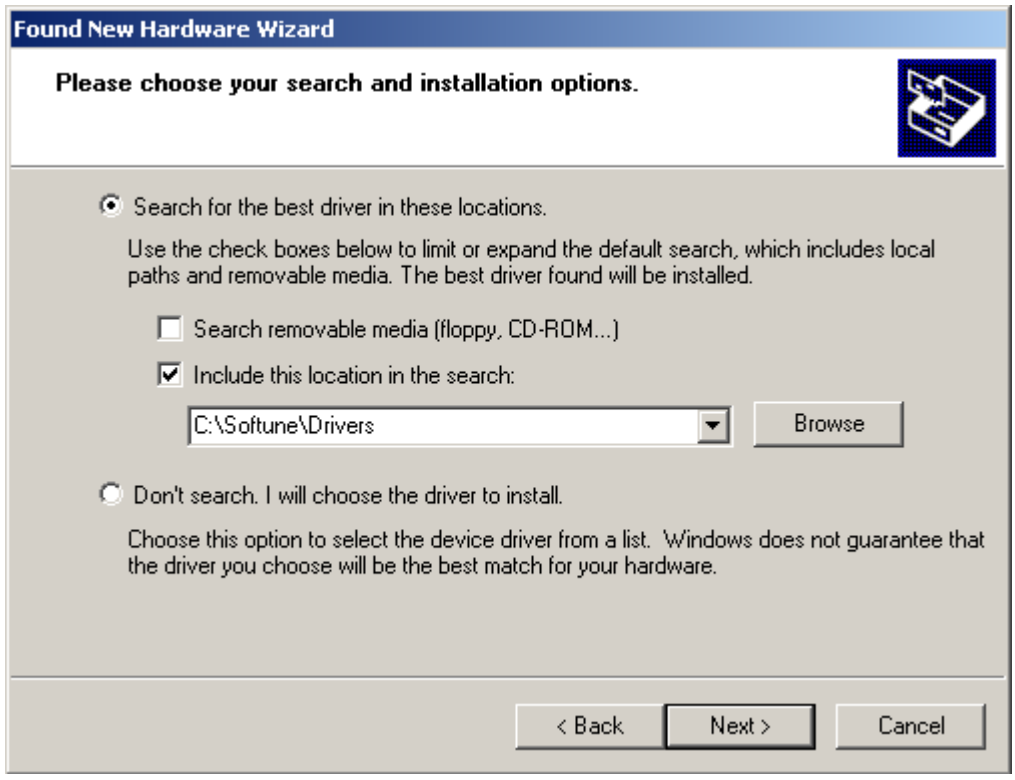

Figure 1.4-3 Install BGM Adapter in Windows (3)

Select BGM Adapter (MB2146-08) as displayed below, and then click “Next”,

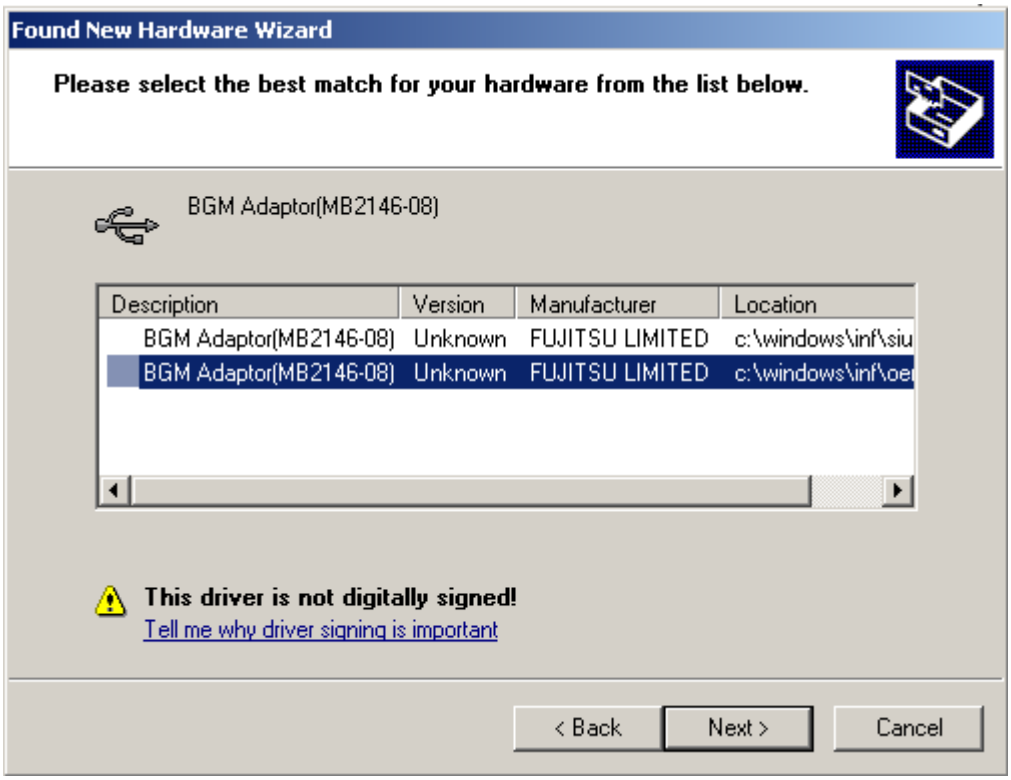

Figure 1.4-4 Install BGM Adapter in Windows (4)

Windows will install the driver automatically. Click “Finish” after the driver has completed the installation normally. Then users can find the BGM Adapter is recognized as MB2146-08 in Windows system.

Figure 1.4-5 BGM Adapter is installed in Windows

1.5 LED Description

First, only plug USB cable to PC, check whether the power LED on BGM Adapter turns green. Refer to Figure 1.5-1.

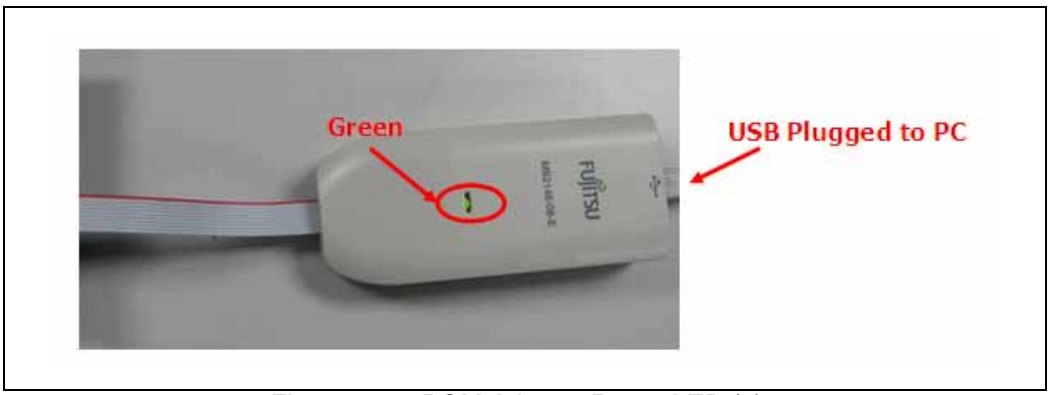

Figure 1.5-1 BGM Adapter Power LED (1)

Second, plug IDC10 cable to the EV-board (target MCU board), then turn on EV board. After that, check whether power LED on the BGM Adapter turns orange. Refer to Figure 1.5-2.

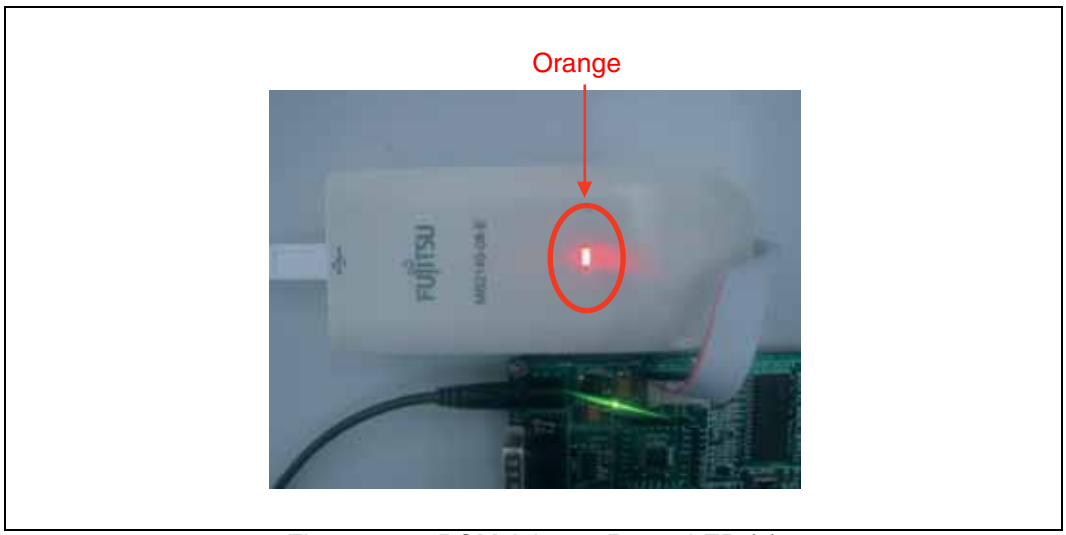

Figure 1.5-2 BGM Adapter Power LED (2)

2. EV board Introduction

2.1 EV board Overview

MB95330 Series EV board provides a user-friendly evaluation platform for the MB95330 Family microcontroller.
MB95330H/330K MCU EV board PN is MB2146-440-E.
Figure 2.1 is a close look of EV-board.

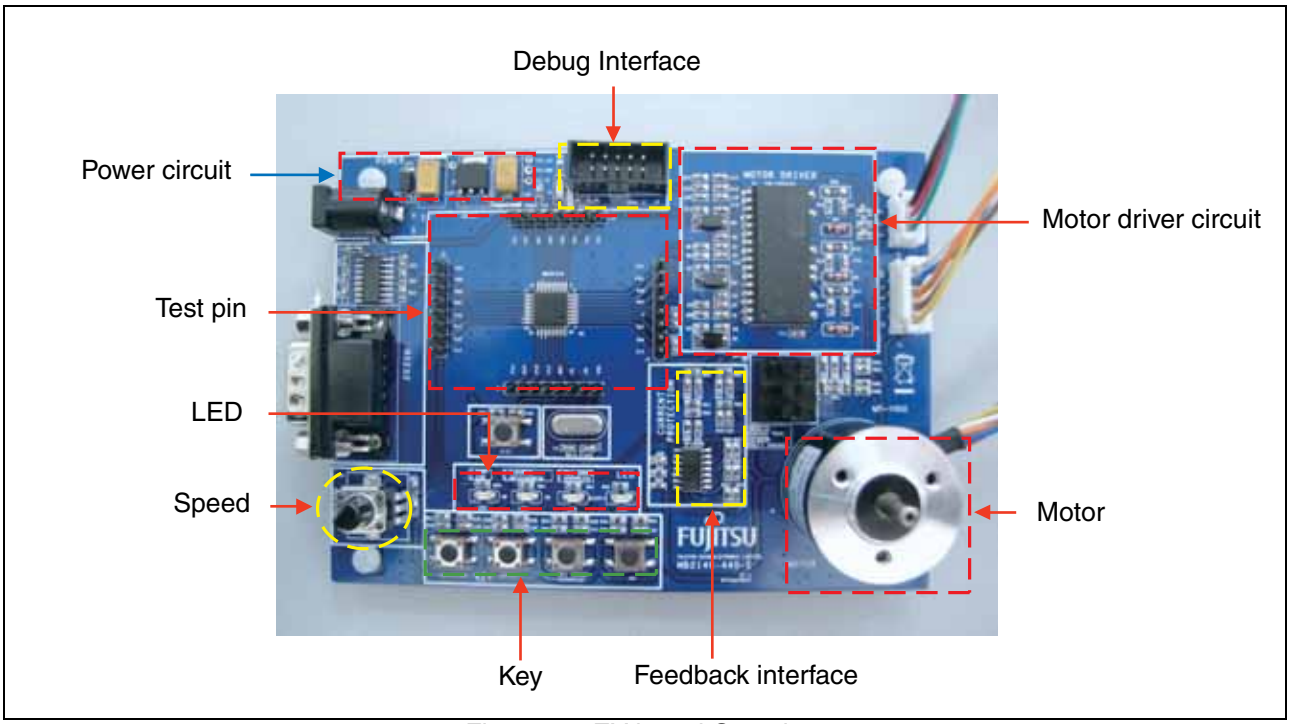

Figure 2.1 EV board Overview

2.2 Function List

This MB95330 Motor EV board provides a platform with inverter motor circuit, for user to evaluate MB95330 series MCU and demo 120 degree inverter driving solution together with sample code. It features the following functions,

- Provide IDC10 debug interface
- All MCU ports are easy accessible through test pins
- Support 120 degree inverter driving solution, hall sensor or back-EMF
- Support motor start, motor stop, speed increase, speed decrease, reverse.

2.3 EV-board Schematic

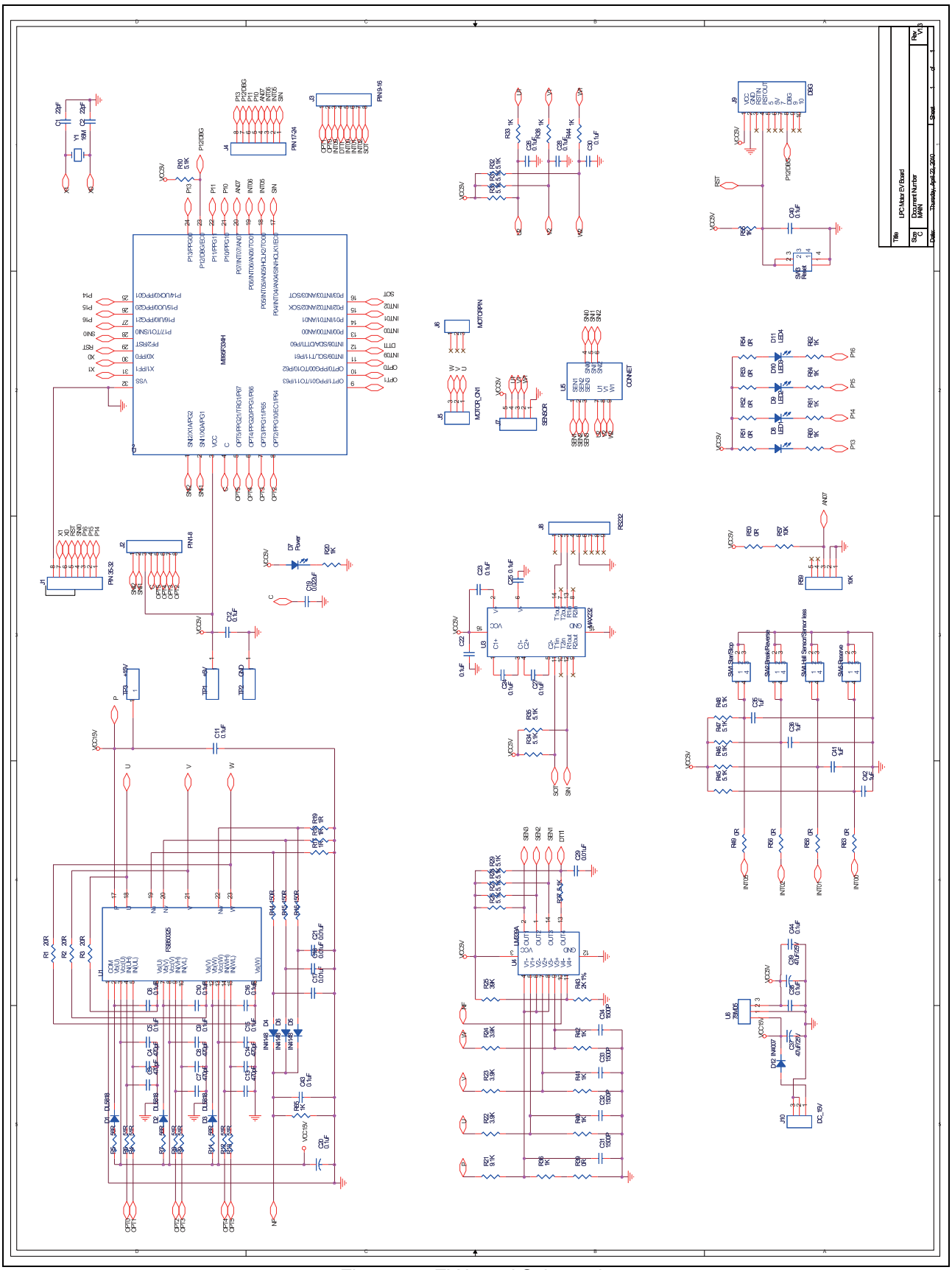

Figure 2.3 EV-board Schematic

2.4 HW Module Description

2.4.1 Power Module

Input DC 15 V from outside, supply it to motor driver circuit and motor directly, and convert it to 5 V for MCU. The power supply needs as below,

- Output voltage: 15 V
- Output Current: ≥ 2 A
- Connection: Power connector (DC 15 V)

2.4.2 BGM Adapter Interface

To start debugging_using a BGM Adapter, users can connect IDC10 socket from the BGM Adapter to BGM Adapter IF on an EV board before power on.

2.4.3 Key Module

The key module controls motor start, stop, reverse.

Module	Name	Function
Key	START/STOP	Motor start and motor stop
	REVERSE	Clockwise/Counter clockwise
	HALL SENSOR/SENSOR LESS	Select motor driving method
	SW1	Reserve

2.4.4 Speed Module

Module	Name	Function
Speed up/down	R59	Speed down: Tune clockwise; Speed up: Tune anticlockwise.

2.4.5 LED Module

There are four LEDs on the LED module of EV board. They show the system status.

Module	Name	Function	Remark	
LED	D8	Show motor status: stopped, running, error	ON	Running
			OFF	Stopped
			Winking	Error
	D9	Show motor running orientation	ON	Clockwise
			OFF	Counter clockwise
	D10	Show motor driving method: hall sensor or Back EMF	ON	Hall sensor
			OFF	Back EMF
	D11	Reserve		

2.4.6 Feedback Module

The module inputs the motor back EMF signal to MCU.

2.4.7 Motor Drive Module

The module is designed for driving motor. It features the following functions:

- 250 V 3.0 A 3-phase FRFET inverter including high voltage integrated circuit (HVIC);
- HVIC for gate driving and under voltage protection;
- Optimized for low electromagnetic interference;
- Isolation voltage rating of 1500 Vrms for 1min.

3. EV Board Operation

3.1 Connect the Motor Connector and the Hall Sensor Connector

Before power on, connect the motor lines to the motor connector and the hall sensor connector according to the following direction. Refer to Figure 3.1.

Note : If the driving method is Back EMF, the hall sensor connector should not be connected.

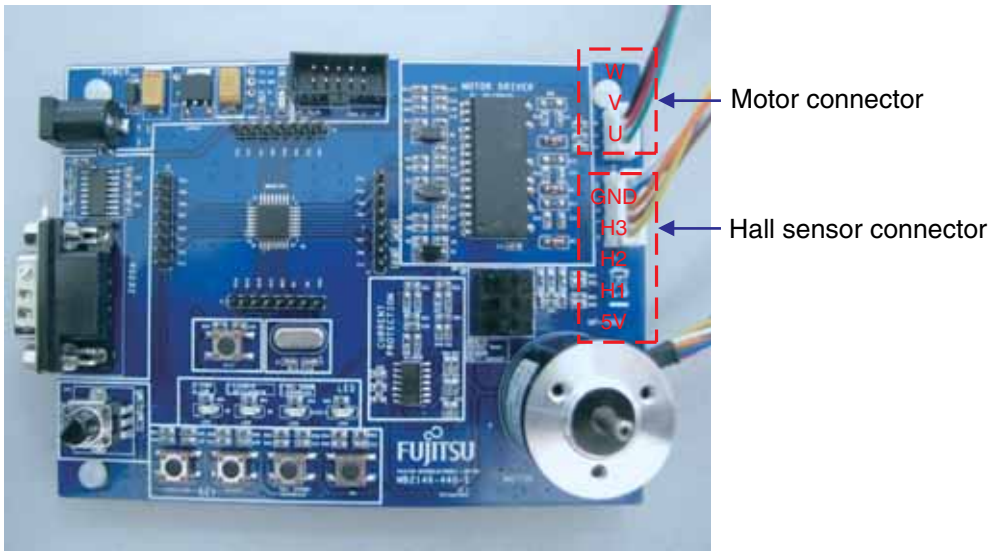

Figure 3.1

3.2 Select the Driving Method as Hall Sensor or Back EMF

If you want to select the hall sensor, the switchers are set as J1(2-3), J2 (2-3), and J3 (2-3). Otherwise, the switchers are set as J1 (1-3), J2 (1-3), and J3 (1-3). Switch on the power and the power LED turns on. When the LED3 is on, it means the FW driving method is B-EMF. If you want to change the FW driving method, press the hall sensor/B-EMF key when the motor is stopped. Then, the LED3 turns off. It means the FW driving method is hall sensor. Refer to Figure 3.2.

Note : The selection of the FW driving method should match with the selection of switchers.

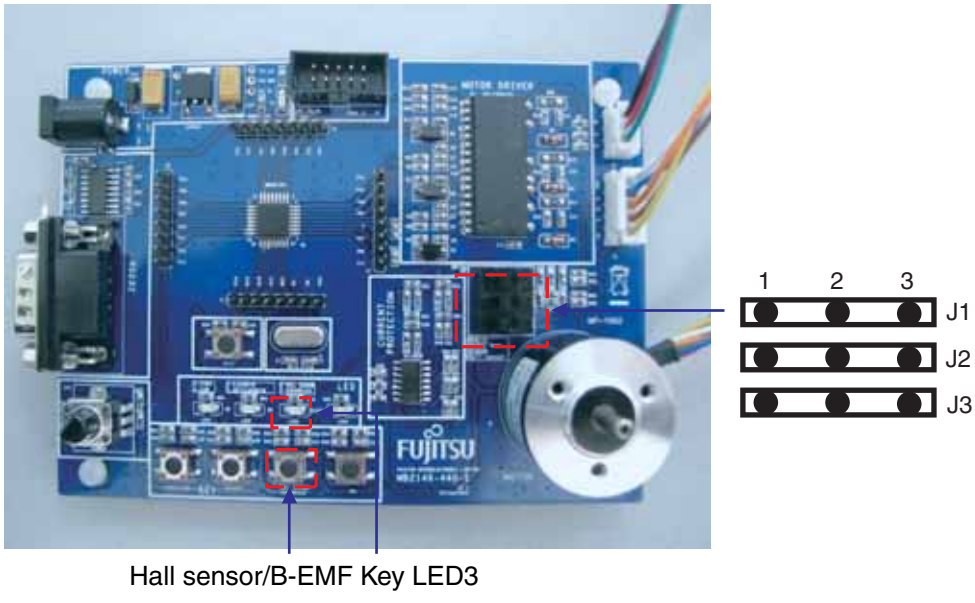

Figure 3.2

3.3 Start and Stop Motor

When the LED1 is off, it means motor is stopped. If you want to start the motor, press the start/stop key, and the LED1 turns on. It means motor is running. At the same time, you can see that motor is rotating. If you want to stop the motor, press the start/stop key again, and the LED1 turns off. It means motor is stopped. At the same time, you can see that the motor is stopped.
Refer to Figure 3.3.

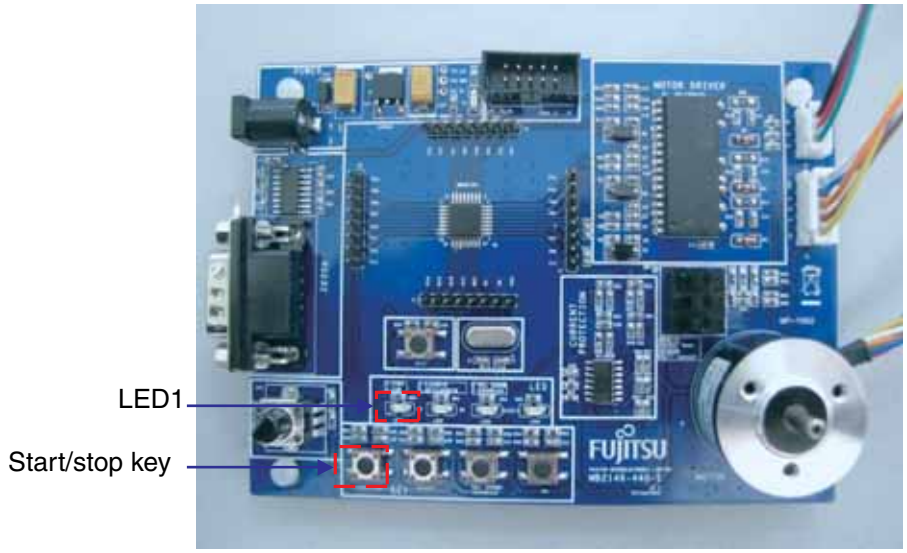

Figure 3.3

3.4 Adjust Motor Speed

If you want to adjust the speed when the motor is running, tuning the potentiometer can adjust the speed. Refer to Figure 3.4.

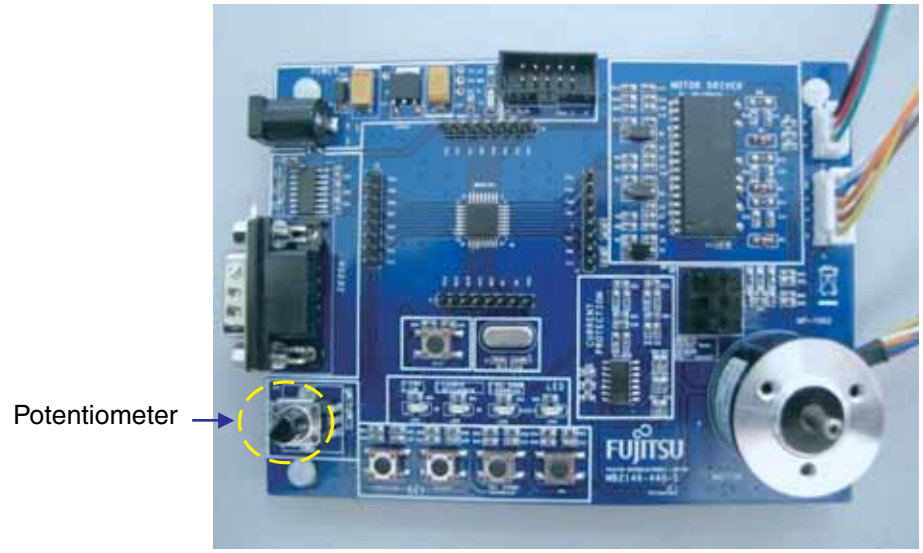

Figure 3.4

3.5 Reverse Motor Rotation

Pressing the reverse key can reverse motor rotation when the motor is stopped. The on and off of LED2 respectively indicate clockwise and counter clockwise. Refer to Figure 3.5.

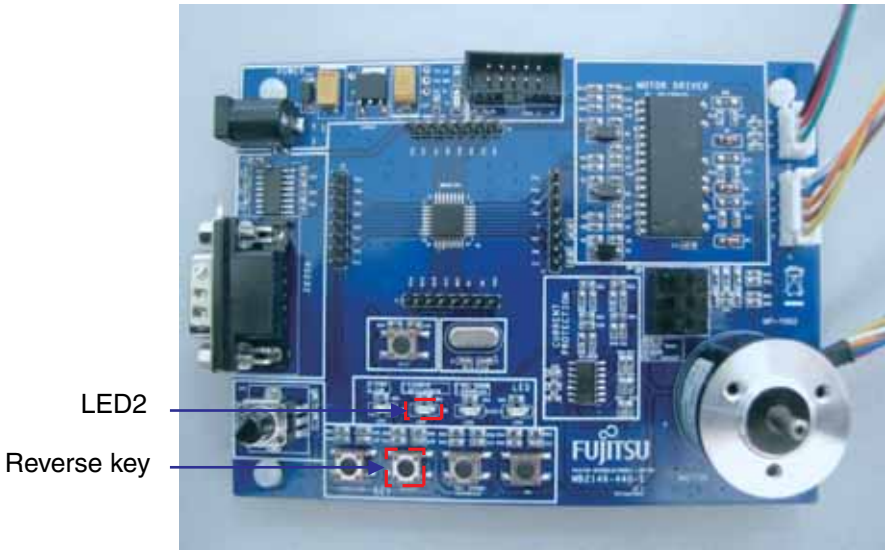

Figure 3.5

4. Development Platform Quick Start

4.1 Tools Setup Sequence

Start the debugging system in the following sequence:

- Connect a BGM Adapter to the PC using a USB cable, confirm the LED on the BGM Adapter is green;
- Connect an EV board to BGM Adapter IF socket;
- Turn on the EV board, confirm the LED on the BGM Adapter is orange and the power LED on the EV board is on.

4.2 Open Project and Start Debug

Users can start a debugging from PC software SOFTUNE workbench in the following sequence.

- Start the SOFTUNE from "Startup Menu > Programs > SOFTUNE V3 > F^{2}MC-8L Family SOFTUNE Workbench" in Windows;
- Click "Open workspace" from "File" Menu in SOFTUNE;
- Select "MB95F334 Motor Drive V1.0.prj" in "Open Space" window;
- Click "Start debug" from "Debug" Menu.

If the entire procedure goes right, a debugging will start normally.

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