**EFM8BB1LCK BLDC Quick-start Guide**

This quick start guide aims to demonstrate the capabilities of the EFM8 Busy Bee Low Cost 8-bit MCU starter kit for operating BLDC motors. Code was ported from the C8051F850 BLDC reference design kit to allow the EFM8BB1 to power and control the power train board MCRD-PWR-NLV-F85X.

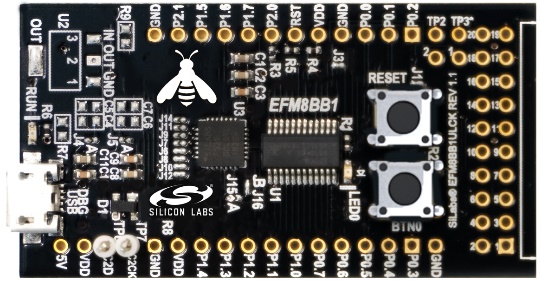
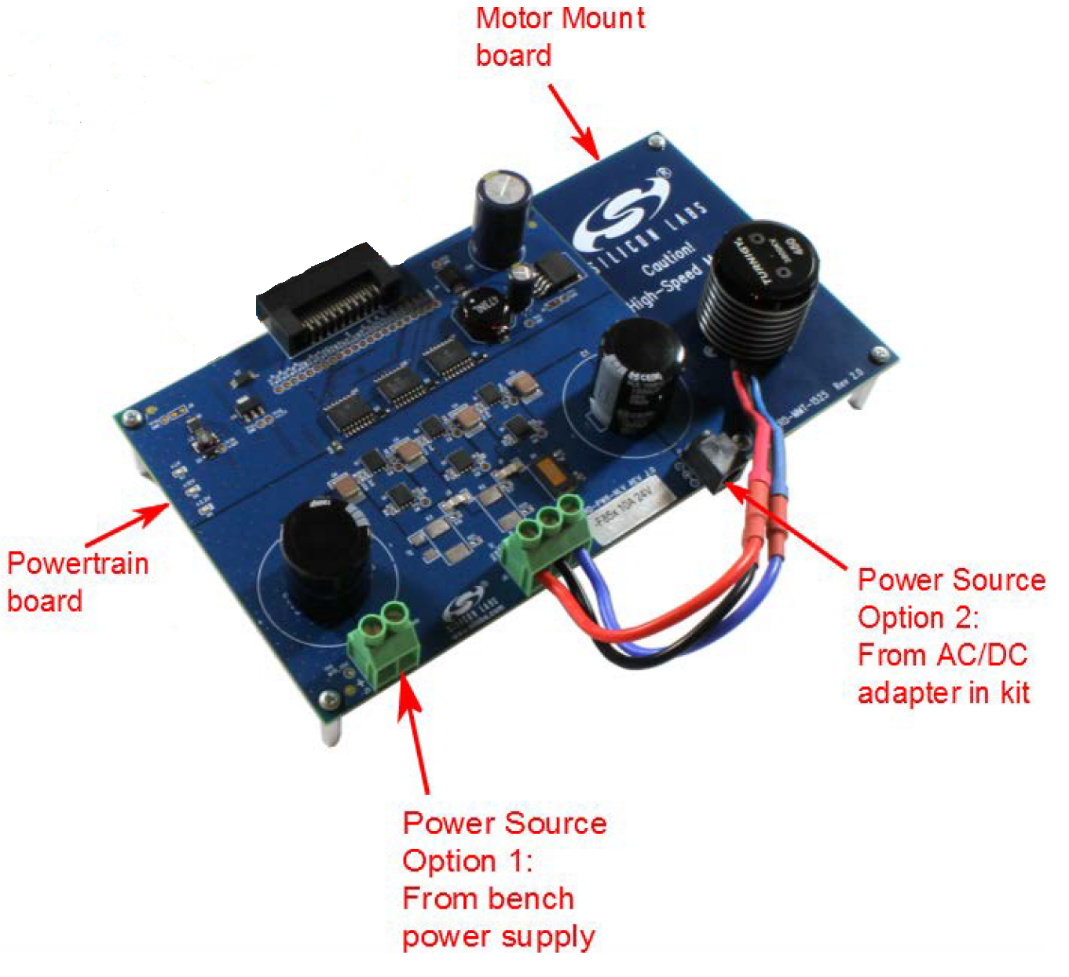
Kit Contents

* 1 x EFM8BB1LCK
* 1 x Powertrain Board: MCRD-PWR-NLV-F85X
* 1 x BLDC Motor: Turnigy 450 Series 3800 kV Brushless Outrunner Helicopter Motor
* 1 x Motor Mount Board
* 1 x 12 V, 5 Amp Universal Input Power Adapter
* 1 x micro USB cable

For reference to operation specs, theory of operation, system implementation and code review, refer to the document AN794 from Silicon Labs

The unique features offered by this implementation to the 8 bit MCU for BLDC motor operation are:

* PWM synchronized blanking of comparator for BEMF Zero-Crossing Detection
* Automatic PWM duty cycle reduction to limit motor current during startup
* Hyperdrive mode to increase the maximum speed of some motors



1. **Setup Instructions**

Firstly, there are hardware changes that need to be made on the EFM8BB1LCK. Under the boards default configuration, btn0 is hard wired to pin 0.2. Although buttons are needed for this demo, pin0.2 is required to run the program. Therefore, the connection from the pin to btn0 needs to be cut. This is done by de-soldering jumper j2.

We will then need to set up two external push buttons. One for starting and stopping the motor, and the second to change the direction in which the motor spins. Use any of the vdd pins on the board to drive the push buttons. Btn0 as seen in the connector diagram is used to start/stop the motor and is connected to pin P1.1. Btn1 is used to change the motor direction; this is connected to pin P2.1.

Additionally, the demo requires the use of a potentiometer. This is used to change the motor speed. For this demo a 10K potentiometer is used. A 3.3V volt driving voltage is taken from vdd, and the output of the potentiometer is connected to pin P1.0.

The final configuration required is to ensure that all the GDx\_EN pins from the powertrain all need to be grounded to the MCU ground. This requirement can be seen on page 64 of document AN794.

Once all requirements listed above are met then refer to the connector diagram shown below to make the necessary connections.

At this point you will need to download and import the BLDC motor code from the Github repository shown below:

<https://github.com/ArrowElectronicsESC/EFM8BB1_BLDC_PORT>

Once installed and properly imported into Simplicity Studio, build the code, debug and program the board.

Powertrain Connector

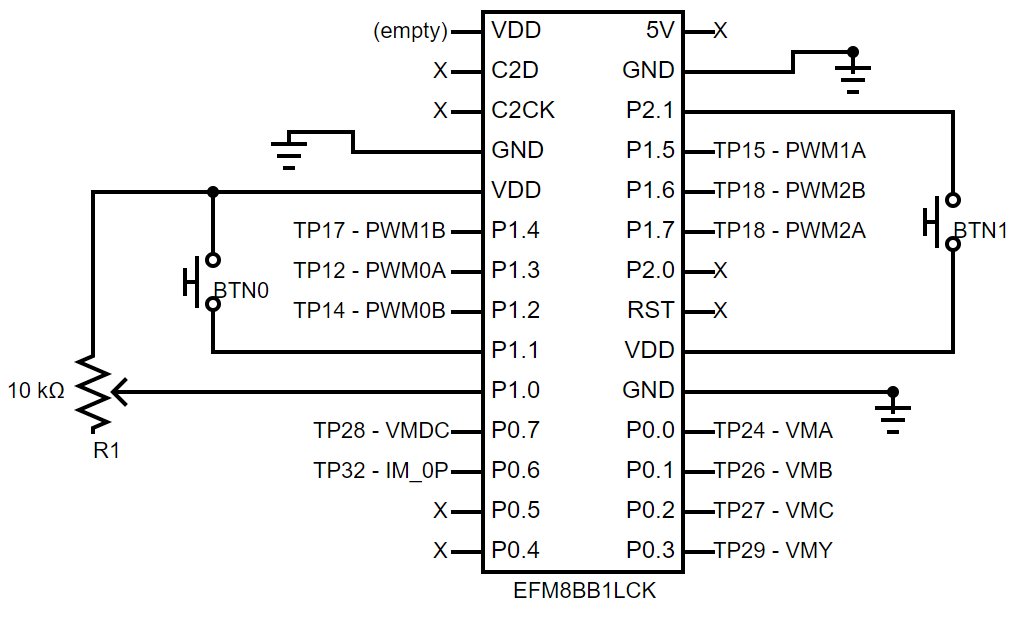
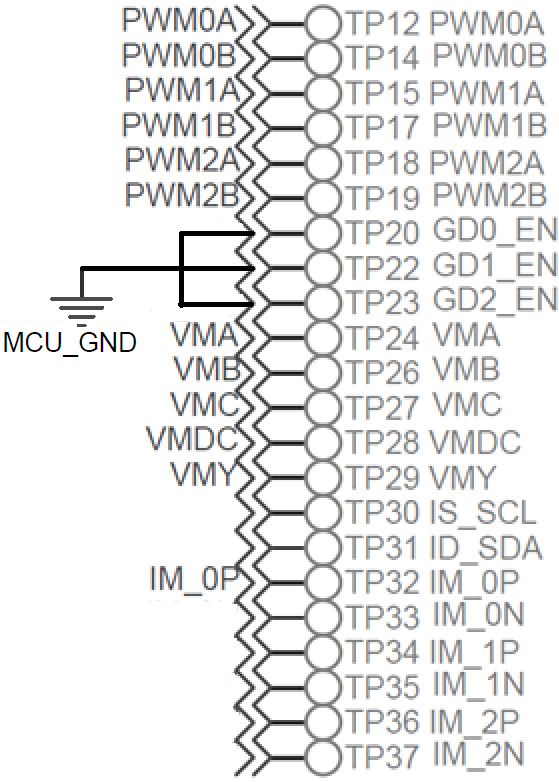


Figure 1. Pin Configuration Diagram

1. **Connector Diagram**

1. **Operation**

* Connect the AC/DC Adapter to the Powertrain board, and power up the board.
* Connect the EFM8BB1 to your computer (our to a power supply)
* Fin the potentiometer connected to the MCU board and rotate it fully counterclockwise to prepare to spin the motor at minimum speed
* Press the Start/Stop button to start spinning the motor
* Adjust the potentiometer to control motor speed
* Press the Start/Stop button to stop spinning the motor

Important: The MCU reset button can also be used to stop the motor at any time