MPS

User Guide

MP2696B Evaluation Kit (EVKT-MP2696B)

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Overview

Introduction

The EVKT-MP2696B is an evaluation kit for the MP2696B, a highly integrated, single-cell battery charger with a pass-through power path management function. It is designed for use in lithium-ion or lithium-polymer battery charger applications. Its layout accommodates most common capacitors. The default function of this board is preset for charge mode, and the full-charge voltage is preset to 4.2V for a single-cell lithium-ion battery.

Kit Contents

EVKT-MP2696B kit contents (items below can be ordered separately, and the GUI installation file and supplemental documents can be downloaded from the MPS website).

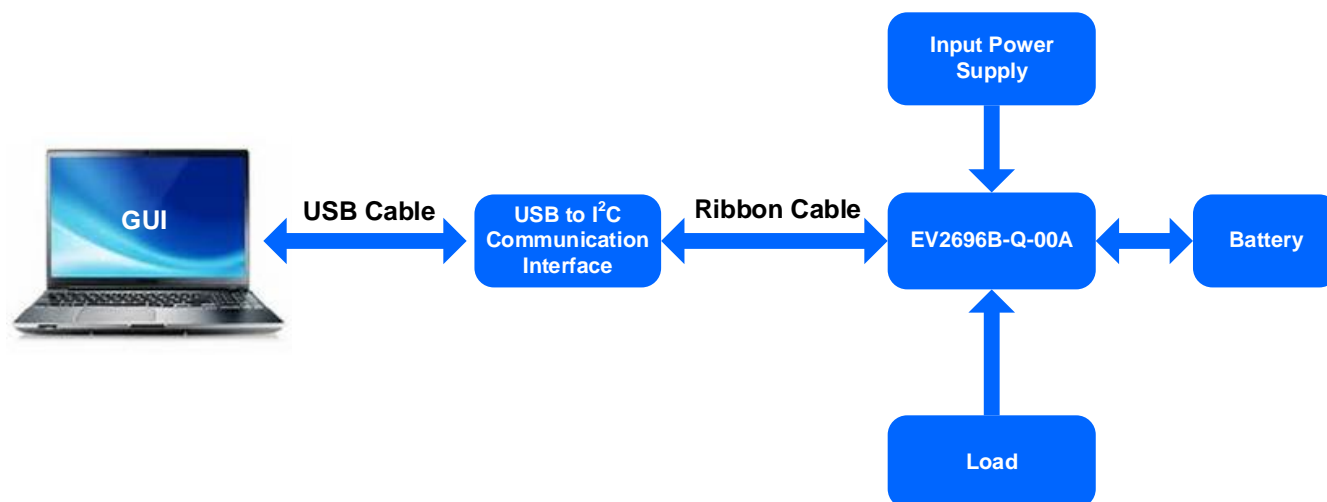| #	Part Number	Item	Quantity
1	EV2696B-Q-00A	MP2696B evaluation board	1
2	EVKT-USBI2C-02 bag	Includes one USB to I^{2}C communication interface, one USB cable, and one ribbon cable	1

Figure 1: EVKT-MP2696B Evaluation Kit Set-Up

Features and Benefits

- Flexible Switch-Mode Battery Charger
- 4V to 11V Operating Input Range
- Up to 16V Sustainable Input Voltage
- 500mA to 3.5A Configurable Charge Current Limit
- 500mA to 3.6A Configurable Charge Current
- 3.6V to 4.45V Configurable Charge Regulation Voltage (±0.5% Accuracy)
- Boost Converter with Up to 4A Output Current (±10% Accuracy)
- Minimum Input Voltage Loop for Maximum Adapter Power Tracking
- Ultra-Low 25µA Battery Discharge Current in Sleep Mode
- Power Path Management
- High Integration
  - Integrated Power Switches: IN to PMID block FET (25mΩ), PMID to SYS FET (15mΩ), HS-FET (15mΩ), LS-FET (14mΩ)
  - No External Blocking Diode
- Safety
  - Customizable JEITA Profile with Configurable Temperature Threshold
  - Charge Safety Timer
  - Input Over-Voltage Protection (OVP)
  - Battery Under-Voltage Protection (UVP)
  - SYS Over-Current Protection (OCP) and Short-Circuit Protection (SCP)
  - Thermal Limiting Regulator and Thermal Shutdown
- System Power Output (SYS) Plug-In Detection and SYS No-Load Detection
- SYS DP/DM Interface for BC1.2 and Non-Standard Adapters
- Analog Voltage Output IB pin for Battery Current Monitoring
- I²C Interface for Flexible Parameter Control and Status Reporting
- Available in a Small QFN-21 (3mmx3mm) Package

⚠ *All changes made in I²C mode are not retained once the EVB shuts down.*

⚠ *Information written in OTP mode cannot be changed.*

Adjustable features are outlined below:

I²C	OTP
• Battery Regulation Voltage • Charge Current • Discharge Current • Trickle Charge Current • Input Voltage Regulation • Input Current Limit • Battery Under-Voltage Lockout (UVLO) • JEITA Threshold • System Power Output (SYS) Voltage Regulation • SYS Cable Voltage Drop Compensation • Switching Frequency • No-Load Threshold	• Battery Regulation Voltage • No-Load Threshold • NTC Action • Charge Safety Timer • Pre-Charge to Fast Charge Threshold

Kit Specifications

Features	Specification
Supply for Board	4.5V to 6V
Operating Input Voltage	4.5V to 6V
Operating Systems Supported	Windows XP, 7, or later
System Requirements	Minimum 22.2MB free
GUI Software	MP2696B V1.0

Section 1. Hardware Specifications

1.1 Personal Computer Requirements

The following minimum conditions must be met to use the EVKT-MP2696B:

- Operating system of Windows XP, 7, or later
- Net Framework 4.0
- PC with a minimum of one available USB port
- At least 22.2MB of free space

1.2 EV2696B-Q-00A Specifications

The EV2696B-Q-00A is an evaluation board for the MP2696B (see Figure 2). For more information, refer to the EV2696B-Q-00A datasheet.

Figure 2: EV2696B-Q-00A Evaluation Board

Feature	Specification
Supply for the Evaluation Board	4.5V to 6V
Operating Input Voltage	4.5V to 6V
EVB Size (LxW)	6.3cmx6.3cm

1.3 EVKT-USBI2C-02 Specifications

The EVKT-USBI2C-02 refers to the USB to I^{2}C communication interface device, which connects the EVB, the PC, and its supporting accessories (see Figure 3). Together with MPS's Virtual Bench Pro and GUI tools, it provides a quick and easy way to evaluate the performance of MPS digital products. For more details, refer to the EVKT-USBI2C-02 datasheet.

Figure 3: EVKT-USBI2C-02 Communication Interface

Section 2. Software Requirements

2.1 Software Installation Procedure

Programming occurs through the MPS I²C GUI. Follow the instructions below to install the software:

Note: This software can be downloaded from the MPS website:

1. Download and extract the zip package titled "MP2696B+r1.0".

2. Double-click the ".exe" file to open the software. If a protection window comes up, click "More info," then click "Run anyway."

3. Follow the prompts in the set-up guide.

4. Wait for the status screen to verify that installation is complete (see Figure 4).
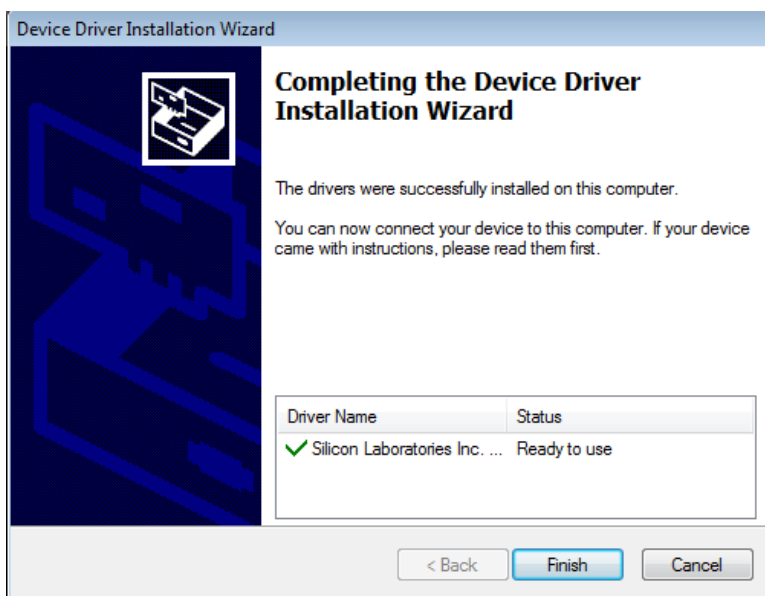

Figure 4: Driver Set-Up Success

Section 3. Evaluation Kit Test Set-Up

3.1 Hardware Set-Up

The hardware must be properly configured prior to use. Follow the instructions below to set up the EVB:

1. Locate the proper wires to connect the EVB to the EVKT-USBI2C-02 communication interface.

2. Connect SCL, SDA, and GND (see Figure 5). Refer to the MP2696B datasheet for further clarification.

Figure 5: EVB to MPS I²C Communication Interface Wire Connection

3.2 Powering Up the EVB

1. Connect the load terminals to:

    a. Positive (+): TP5/SYS

    b. Negative (-): TP6/GND

2. Connect the battery terminals to:

    a. Positive (+): TP1/BATT

    b. Negative (-): TP2/GND

3. If using a battery simulator, preset the battery voltage between 0V and 4.45V, then turn the battery simulator off. Then connect the battery simulator output terminals to:

    a. Positive (+): BATT

    b. Negative (-): GND

4. Preset the power supply output between 4.5V and 6V, then turn the power supply off.

5. Connect the power supply terminals to:

    a. Positive (+): TP3/VIN

    b. Negative (-): TP4/GND

6. Ensure the battery voltage is present (if using a battery simulator, turn on the battery simulator).

7. Turn on the power supply. The board should start up automatically.

3.3 Software Set-Up

After connecting the hardware according to the steps above, follow the steps below to use the GUI software:

1. Start the software. It should check the EVB connection automatically.

   - If connection is successful, both the USB and the MP2696B demo board statuses will be listed as "Connected" in green (see Figure 6).
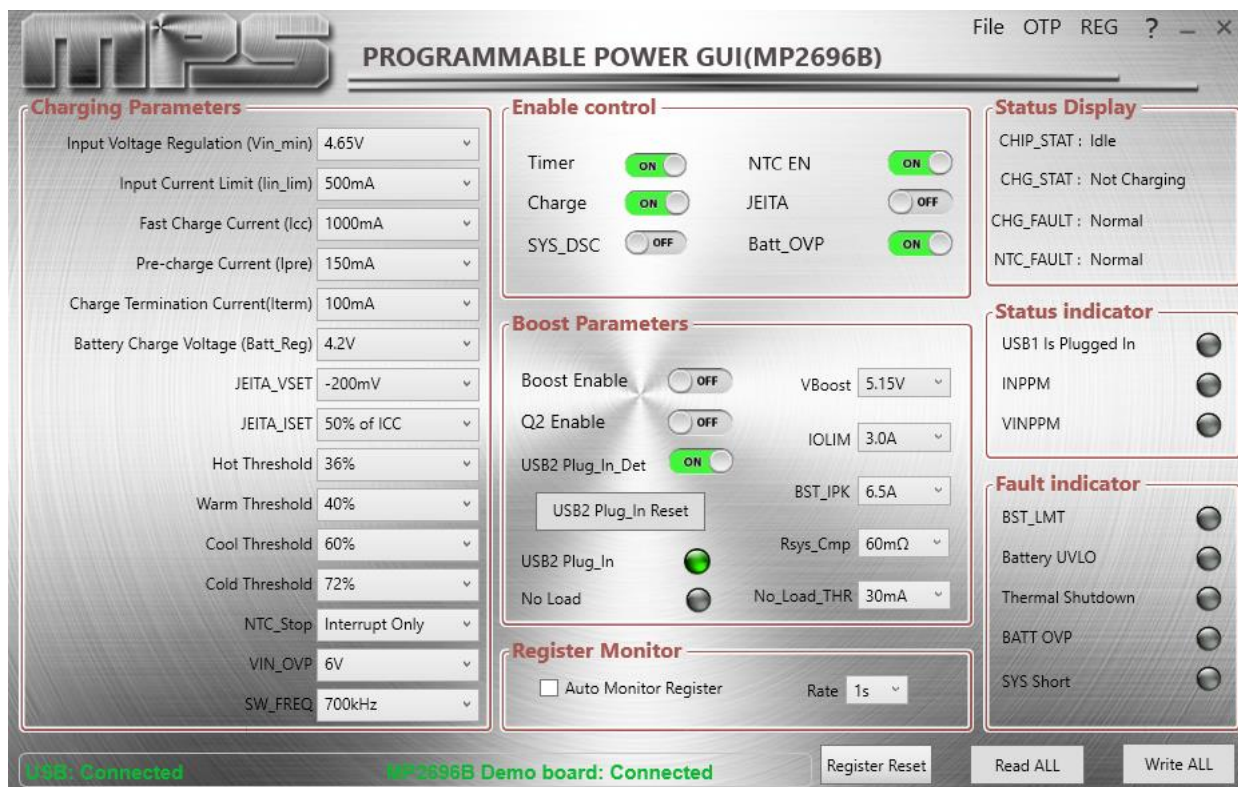

Figure 6: Connected USB and MP2696B Demo Board

   - If the connection is unsuccessful, they will be listed as "Disconnected" in red. Check the connections between the EVB, communication interface, and PC. Re-plug the USB into the computer.

     o If the MP2696B demo board is listed as "Disconnected," this means that the evaluation board is not connected correctly.

     o If the USB is listed as "Disconnected," this means that the USB I²C communication interface is not connected correctly.

2. Click the "Read All Register" button to read the I²C register values. The default values should be displayed (see Figure 6).

3. Find the item to be changed, then select a value from the drop-down menu.

4. Click the "Write All" button to update the values. The item's changed information should be downloaded to the IC.

   ⚠ *All changes made via the I²C are restored to default values once the EVB shuts down.*

3.4 Device Programming Instructions

The MP2696B-xxxx is a one-time programmable (OTP) part. Follow the steps below to create and export customized configurations:

1. Using a computer, open the MPS GUI software.

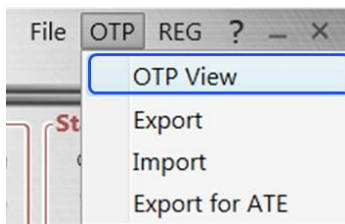2. Click "OTP" in the toolbar, then select "OTP View" from the drop-down menu (see Figure 7).

Figure 7: "OTP View" in the Drop-Down Menu

3. Enter a new table. Changes can be made to the parameters in red (see Figure 8).
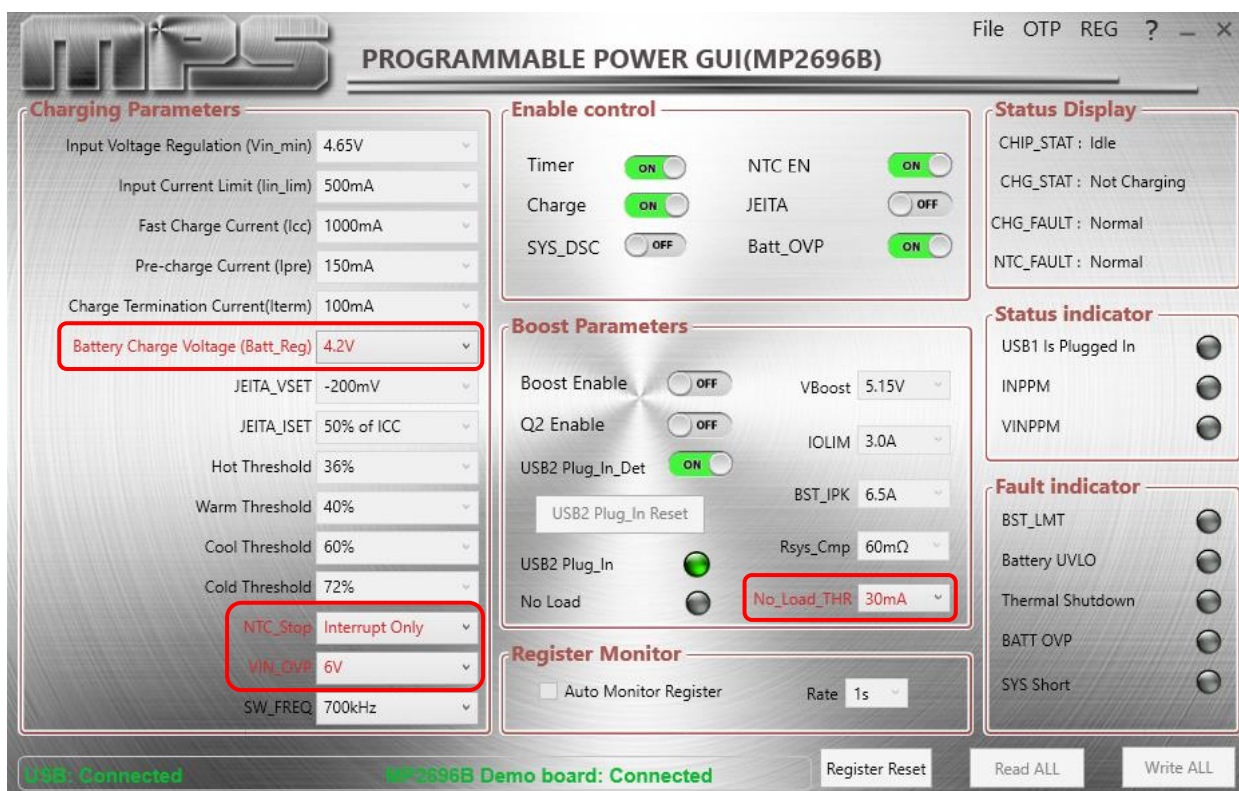

Figure 8: Configurable Parameters in OTP Mode

4. To change a parameter, select a value from the corresponding drop-down menu. Ensure that all the parameters are populated before exporting the file. To export the new configuration, select "Export" from the drop-down menu, then click the "Export" button (see Figure 9 and Figure 10).
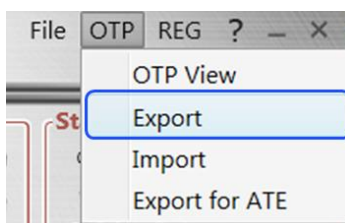

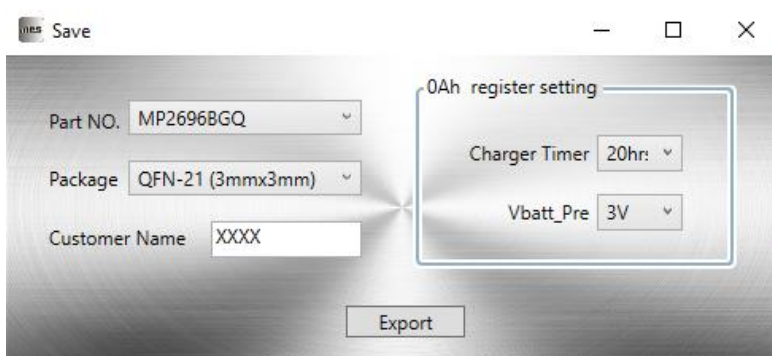**Figure 9: "Export" in the Drop-Down Menu**

Figure 10: Export the New Configuration

5. Select a location for the exported file, then click the "Save" button. The new configuration should save as a ".txt" file (see Figure 11).
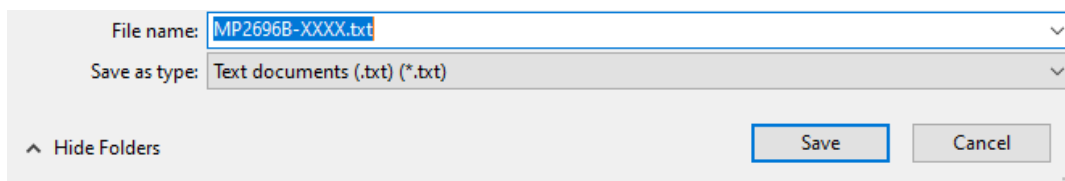

**Figure 11: New Configuration Saved as a ".txt" File**

6. Send the saved file to an MPS FAE to apply for a customized "xxxx" code.

3.5 Troubleshooting Tips

EVKT-USBI2C-02 Driver Installation Problem

If the USBI2C-02 driver is not properly installed, manual installation is required. Follow the steps below to manually install the EVKT-USBI2C-02 driver:

Note: Check the driver version. Find "USBXpress Device" in the Device Manager under USB controllers.
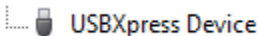
Right-click and view properties. Ensure the driver version matches the newest version. If the PC is running Windows 10, Windows 10 may automatically install the older USB driver, which is not compatible. The correct driver version should be newer than 4.0.0.0 (see Figure 12 on page 12).

1. Install the correct USBXpress ".exe" file.

    Choose either the 32-bit or 64-bit operating system.

    > 32-bit: \EVKT-USBI2C-02 USB Driver\USBXpressInstaller_x86.exe.

    > 64-bit: \EVKT-USBI2C-02 USB Driver\USBXpressInstaller_x64.exe.

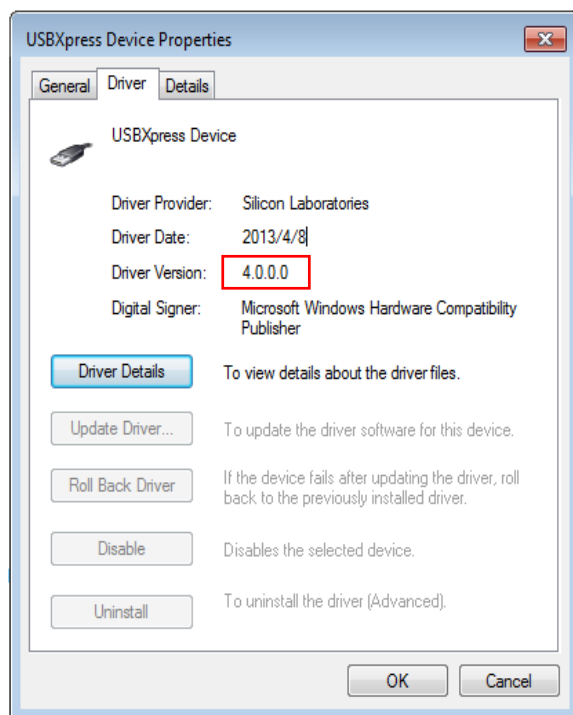2. Connect the EVKT-USBI2C-02 communication interface to the PC with the USB cable.

Figure 12: Determining the Driver Software

No Charging Event

If the IC detects that V_{IN} is below the UVLO falling threshold (device enters a no supply state), or over-temperature protection (OTP) is triggered (device enters a shutdown state), then the IC's charging function is disabled.

Thermal Recovery

If the die temperature exceeds the thermal protection threshold, the device shuts down. Once the die temperature decreases, the IC starts up again and resumes normal operation.

Section 4. Ordering Information

The components of the evaluation kit can be purchased separately, depending on user needs.

Part Number	Description
EVKT-MP2696B	Complete evaluation kit
Contents of EVKT-MP2696B	
EV2696B-Q-00A	MP2696B-xxxx evaluation board, which allows users to access the I^{2}C
EVKT-USBI2C-02 bag	Includes one USB to I^{2}C communication interface, one USB cable, and one ribbon cable

Order directly from MonolithicPower.com or our distributors.

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	3/25/2021	Initial Release	-