User Guide

MP2696A Evaluation Kit (EVKT-MP2696A)

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Overview

Introduction

The EVKT-MP2696A is an evaluation kit for the MP2696A, a highly-integrated, single-cell Li-Ion/Li-Polymer battery charger with a pass-through power path management function. Its layout accommodates most commonly used capacitors. The default function of this board is preset for charger mode, and the full-charge voltage is preset to 4.200V for a single-cell, Li-Ion battery.

Kit Contents

EVKT-MP2696A kit contents (items below can be ordered separately):

#	Part Number	Item	Quantity
1	EV2696A-Q-00B	MP2696A evaluation board	1
2	EVKT-USBI2C-02-Bag	Includes one USB to I²C communication interface, one USB cable, and one ribbon cable	1
3	Online Resources	Include datasheet, user guide, product brief, and GUI	1

Figure 1: EVKT-2696A Evaluation Kit Set-Up

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Features and Benefits

- Highly Integrated, Flexible Switch-Mode Battery Charger
  - Power Switches: IN to PMID Block FET, 25mΩ
  - PMID to SYS FET: 15mΩ
- No External Blocking Diode
- 15mΩ High-Side Power MOSFET
- 14mΩ Low-Side Power MOSFET
- 4.0V to 6.0V Operation Voltage Range with Up to 16V Sustainable Input Voltage
- Minimum Input Voltage Loop for Maximum Adapter Power Tracking
- Capabilities
  - Charge Regulation Voltage from 3.6V to 4.45V (Accuracy ±0.5%)
  - Charge Current from 500mA to 3600mA
  - Input Current Limit from 100mA to 3000mA
  - Boost Converter Output Current Up to 3.6A (Accuracy ±10%)
- Ultra-Low, 25µA Battery Discharge Current in Idle Mode
- SYS Plug-In Detection and SYS No Load Detection in Boost Discharge Mode
- SYS DP/DM Interface for BC1.2 and Non-Standard Adapters
- Comprehensive Safety Features
  - Fully Customizable JEITA Profile with Programmable Temperature Threshold
  - Charge Safety Timer
  - Input Over-Voltage Protection (OVP)
  - Battery Under-Voltage Protection (UVP)
  - SYS Over-Current and Short Protection
  - Thermal Limiting Regulation and Thermal Shutdown
- Analog Voltage Output IB Pin for Battery Current Monitoring
- I^2C Interface for Setting Parameters and Status Reporting
- Available in a small QFN-21 (3mmx3mm) Package

⚠ *All changes made in the I^2C mode are NOT retained once the EVB powers down.*

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

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Adjustable features for each method are outlined below:

I²C	OTP
• Battery Regulation Voltage • Charge Current • Discharge Current • Trickle Current • Input Voltage Regulation • Input Current Limit • BATT_UVLO • JEITA Threshold • SYS Voltage Regulation • SYS Cable Voltage Drop Compensation • SW_FREQ • No_Load_THR	• Battery Regulation Voltage • No Load Threshold • NTC Action • Charge Timer • V_{BATT_PRE}

Kit Specifications

Feature	Specification
Supply for Board	4.5V to 6.0V
Operating Input Voltage	4.5V to 6.0V
Operating Systems Supported	Windows XP, 7, and later
System Requirements	Minimum 22.2MB free
GUI Software	MP2696A V1.0

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Section 1. Hardware Specifications

1.1 Personal Computer Requirements

The following minimum requirements must be met to use the EVKT-MP2696A:

- 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 available memory

1.2 EV2696A-Q-00B Specifications

The EV2696A-Q-00B is an evaluation board for the MP2696A. Refer to the EV2696A-Q-00B datasheet for more information.

Figure 2: EV2696A-Q-00B Evaluation Board

Feature	Specification
Supply for Evaluation Board	4.5V to 6.0V
Operating Input Voltage	4.5V to 6.0V
EVB Size (LxW)	6.3cmx6.3cm

1.3 EVKT-USBI2C-02 Specifications

The EVKT-USBI2C-02 refers to the communication interface, which connects the EVB to the PC and its supporting accessories. When used with the MPS Virtual Bench Pro and I^{2}C GUI tools, this kit 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

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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 on the EVKT-MP2696A product page.

1. Download and extract the zip package titled "I2C evaluation kit software for MP2696A."
2. Double click the .exe file to open the software (see Figure 4).
3. Follow the prompts in the set-up guide.
4. Wait for the status screen to verify that installation is complete (see Figure 5).

Figure 4: MPS I²C GUI Set-Up Guide

Figure 5: Driver Set-Up Success

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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 6). Refer to the MP2696A datasheet for further clarification.

Figure 6: EVB to MPS USB Communication Interface Wire Connection

3.2 Powering Up the EVB

1. Connect the positive and negative terminals of the load to the SYS (TP5) and GND (TP6) pins, respectively.
2. Connect the positive and negative terminals of the battery to the BATT (TP1) and GND (TP2) pins, respectively.
3. If it is a battery simulator, preset the battery voltage between 0V and 4.45V, then turn it off.
4. Connect the battery simulator output to the BATT and GND pins, respectively.
5. Preset the power supply output between 4.5V and 6.0V, then turn off the power supply.
6. Connect the positive and negative terminals of the power supply output to the VIN (TP3) and GND (TP4) pins, respectively.
7. Ensure the battery voltage is present (if a battery simulator is used, turn on the battery emulator).
8. Turn the power supply on. The IC automatically enters the power-on sequence.

Reminder: If the battery simulator is connected, turn on the battery emulator before the input supply in the start-up sequence.

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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 will automatically check the EVB connection.
   - If the connection is successful, both the USB and MP2696A demo board statuses will appear as "Connected" in green (see Figure 7).

Figure 7: USB Communication Interface and the MP2696A EVB Show as Connected

   - If not, they will appear as "Disconnected" in red. Check the connections between the EVB, the communication interface, and the PC. Re-plug the USB into the computer.
     - MP2696A demo board: "Disconnected" means the evaluation board is not connected correctly.
     - USB: "Disconnected" 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 are displayed (see Figure 7).
3. Find the item to be changed, and select the desired value from the drop-down menu.
4. Click the "Write All" button to update the values. The new information will be downloaded to the IC.

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

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3.4 Device Programming Instructions

The MP2696A-xxxx is an OTP part. Follow the instructions below to create and export customized configurations:

1. Open the MPS GUI software using a computer.
2. Select “OTP View” in the toolbar (see Figure 8).

Figure 8: Select OTP

3. Enter a new table (see Figure 9). The parameters highlighted in red can be changed.

Figure 9: Adjustable Parameters in OTP Mode

4. Select values from the drop-down menus. Ensure all the parameters are populated before selecting “Export” in the toolbar. Click “Export” to export the configuration (see Figure 10).

Figure 10: Exporting the Configuration

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5. Find a location for the exported file, and click “Save.” The configurations are saved in a .txt file (see Figure 11).

Figure 11: Saving Configurations as a .txt File

6. Send the file to an MPS FAE to apply for the customized “xxxx” code.

3.5 Troubleshooting Tips

- **EVKT-USBI2C-02 Driver Problem**

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

Note: Check the driver version. Find “USBXpress Device” in the Device Manager under USB controllers.

Right-click to view Properties. If the PC is running Windows 10, check to make sure the driver version of matches the newest version. Windows 10 may automatically install an outdated USB driver that is not compatible with this product. The correct driver version is 4.0.0.0 (see Figure 12).

1. Install the correct “.exe” file according to the Windows operating system.

   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 I^2C communication interface to the PC with the USB cable.

Figure 12: Correct Driver Version is 4.0.0.0

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No Supply

The IC's input pin has an under-voltage lockout (UVLO) detection circuit. If the input voltage (V_{IN}) is below the UVLO rising threshold, the charging function is disabled.

No Charging Event

If the IC detects that the input voltage is below the UVLO falling threshold (enter no supply state) or over-temperature protection is triggered (enters shutdown state), the IC switches to supplement mode powered by the battery.

Thermal Recovery

If the MP2696A is in a shutdown state due to the die temperature exceeding the thermal protection threshold, the IC powers on again once the die's temperature decreases.

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Section 4. Ordering Information

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

Part Number	Description
EVKT-MP2696A	Complete evaluation kit
Contents of EVKT-MP2696A	
EV2696A-Q-00B	MP2696A-xxxx evaluation board
EVKT-USBI2C-02	Includes one USB to I^2C communication interface, one USB cable, and one ribbon cable
Online Resources	Include datasheet, user guide, product brief, and GUI

Order directly from MonolithicPower.com or our distributors.

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