User Guide

MP2731 Evaluation Kit (EVKT-MP2731)

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Overview

Introduction

The EVKT-MP2731 is an evaluation kit for the MP2731, a standalone switching charger with integrated USB detection and USB-OTG functionality. Its layout accommodates most common capacitors. The default function of this board is preset for charger mode, and the full-charge voltage is preset to 4.2V for a single-cell Li-ion battery.

Kit Contents

EVKT-MP2731 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	EV2731-QC-00A	MP2731 evaluation board	1
2	EVKT-USBI2C-02-BAG	Includes one USB to I²C communication kit, one USB cable, and one ribbon cable	1

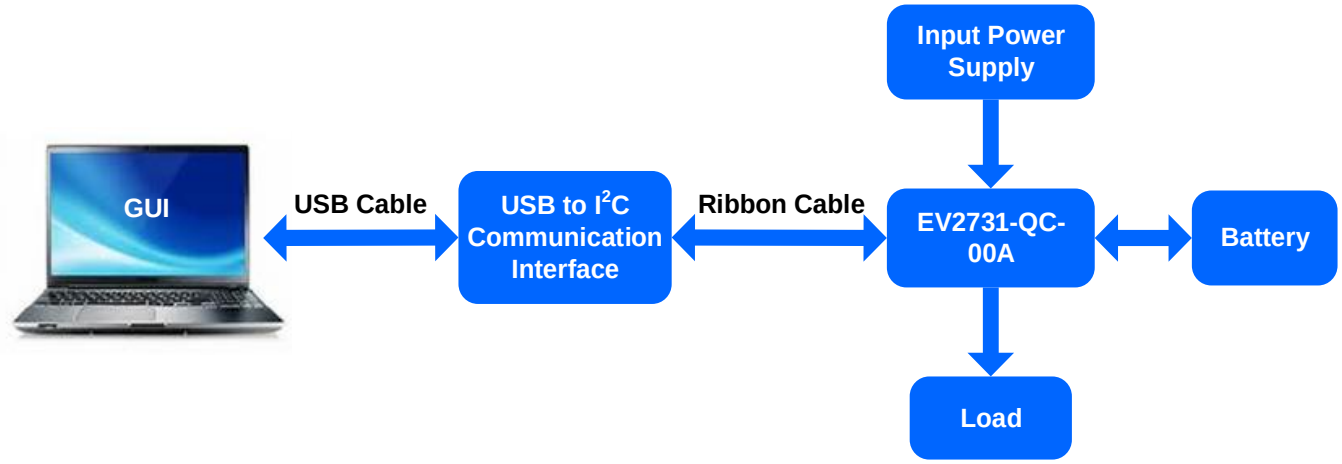

Figure 1: EVKT-MP2731 Evaluation Kit Set-Up

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Features and Benefits

- 3.7V to 16V operating input voltage range
- Up to 22V sustainable voltage
- High-efficiency, 4.5A, 1.35MHz buck charger
  - Configurable D+/D- for flexible fast-charge protocol support
  - Adjustable minimum input voltage regulation for maximum power point tracking
- USB on-the-go (OTG) with adjustable output from 4.8V to 5.5V
  - Selectable 1.35MHz boost converter
  - Up to 3.0A output current
- Up to 9A battery discharge current
- Integrated ADC for monitoring input voltage, input current, battery voltage, charge current, system voltage, and battery temperature
- Narrow voltage DC (NVDC) power path management
  - Instant-on works with no battery or deeply discharged battery
  - Ideal diode operation in battery supplemental mode
- Constant-off-time (COT) control to reduce charging time under lower input voltage condition
- I^2C port for flexible system parameter setting and status reporting
- Full DISC control to support shipping mode and system restart
- High accuracy
  - ±0.5% charge voltage regulation
  - ±5% charge current regulation
  - ±5% input current regulation
  - ±2% output regulation in boost mode
- High integration
  - Fully integrated power switches and no external blocking diode
  - Built-in robust charging protection, including battery temperature monitoring and configurable timer
  - Built-in battery disconnection
- Safety
  - Configurable JEITA for battery temperature protection
  - Thermal regulation and thermal shutdown
  - Watchdog monitoring I^2C operation
  - Input/system over-voltage protection (OVP)
  - MOSFET over-current protection (OCP)
  - Support temperature protection in battery side
- Charging operation indicator
- On-chip thermal limiting regulation

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

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

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Adjustable features are outlined below:

I²C	OTP
• Charge-full voltage • Charge current • Input voltage regulation • Input current limit • Pre-charge current • Charge termination current • VSYS_MIN regulation current • Auto-recharge threshold • NTC comparing ratio • OTG voltage regulation • OTG current limit	• IIN_LIM default value • VIN_MIN default value • ICC default value • VBATT_REG default value • CHG_TMR default value • IINLIM RESET_EN default status • VINMIN RESET_EN default status • VINOVP_CS default status • ADDRESS default status • PFM_EN default status

Kit Specifications

Feature	Specification
Supply for Board	3.7V to 16V
Operating Input Voltage	3.7V to 16V
Operating Systems Supported	Windows XP, 7, or later
System Requirements	Minimum 22.2MB free
GUI Software	MP2731 V1.0

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Section 1. Hardware Specifications

1.1 Personal Computer Requirements

The following requirements must be met to use the EVKT-MP2731:

- 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 EV2731-QC-00A Specifications

The EV2731-QC-00A is an evaluation board for the MP2731. For more information, refer to the EV2731-QC-00A datasheet.

Figure 2: EV2731-QC-00A Evaluation Board

Feature	Specification
Supply for Evaluation Board	3.7V to 16V
Operating Input Voltage	3.7V to 16V
EVB Size (LxW)	6.3cmx6.3cm

1.3 EVKT-USBI2C-02 Specifications

The EVKT-USBI2C-02 refers to the USB to I²C communication interface device, which connects the EVB, the PC, and its supporting accessories. It provides I²C capabilities. 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

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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.

1. Download and extract the zip package titled “MP2731 I2C Evaluation GUI”.
2. Double-click the .exe file to open the set-up guide (see Figure 4). 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 5).

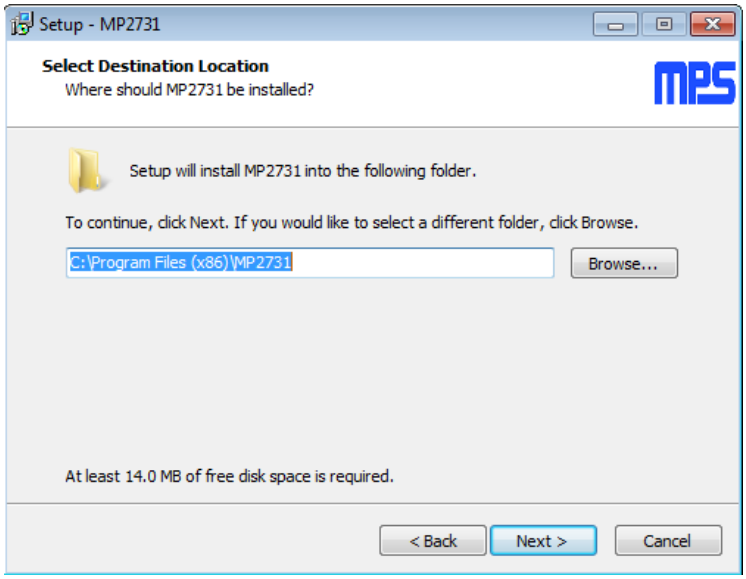

Figure 4: MPS I²C GUI Set-Up Guide

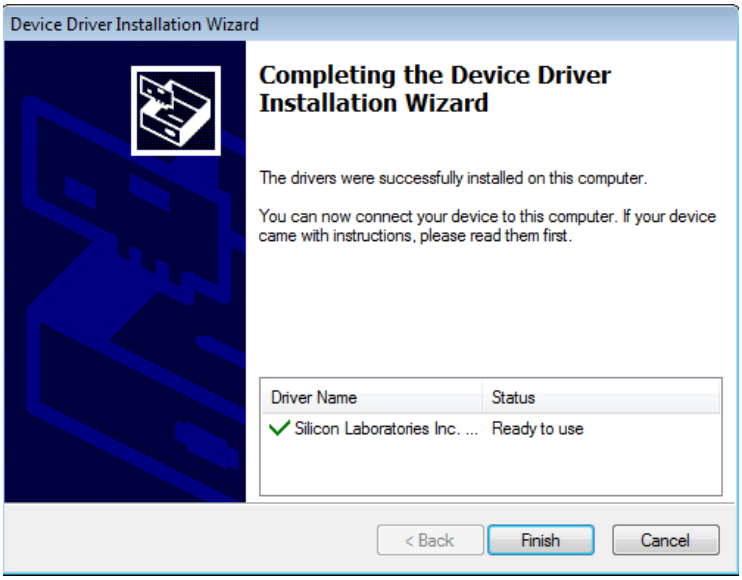

Figure 5: Successful Driver Set-Up

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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 MP2731 datasheet for further clarification.

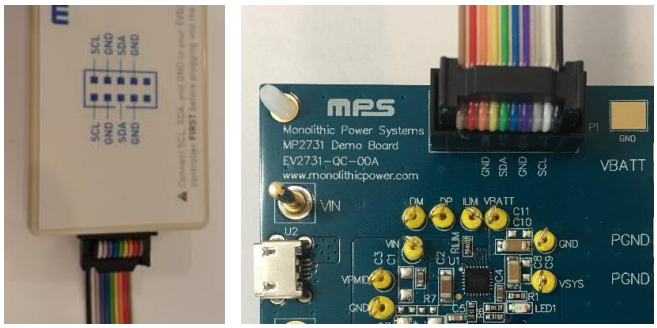

Figure 6: EVB to MPS I²C Communication Interface Wire Connection

3.2 Powering Up the EVB

1. Connect the load to:
    a. Positive (+): VSYS
    b. Negative (-): PGND
2. Connect the battery terminals to:
    a. Positive (+): VBATT
    b. Negative (-): PGND
3. If using a battery simulator, preset the battery voltage between 0V and 4.2V, then turn it off. Connect the battery simulator output to the BATT and PGND pins, respectively.
4. Preset the power supply output between 3.7V and 16V, and then turn off the power supply.
5. Connect the power supply terminals to:
    a. Positive (+): VIN
    b. Negative (-): PGND
6. Ensure the battery voltage is present (if using a battery simulator, turn on the battery simulator). Turn the power supply on. The IC should start up automatically.

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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 should check the EVB connection automatically.
   - If the connection is successful, both the USB and MP2731 demo board statuses will be listed as “Connected” (see Figure 7).

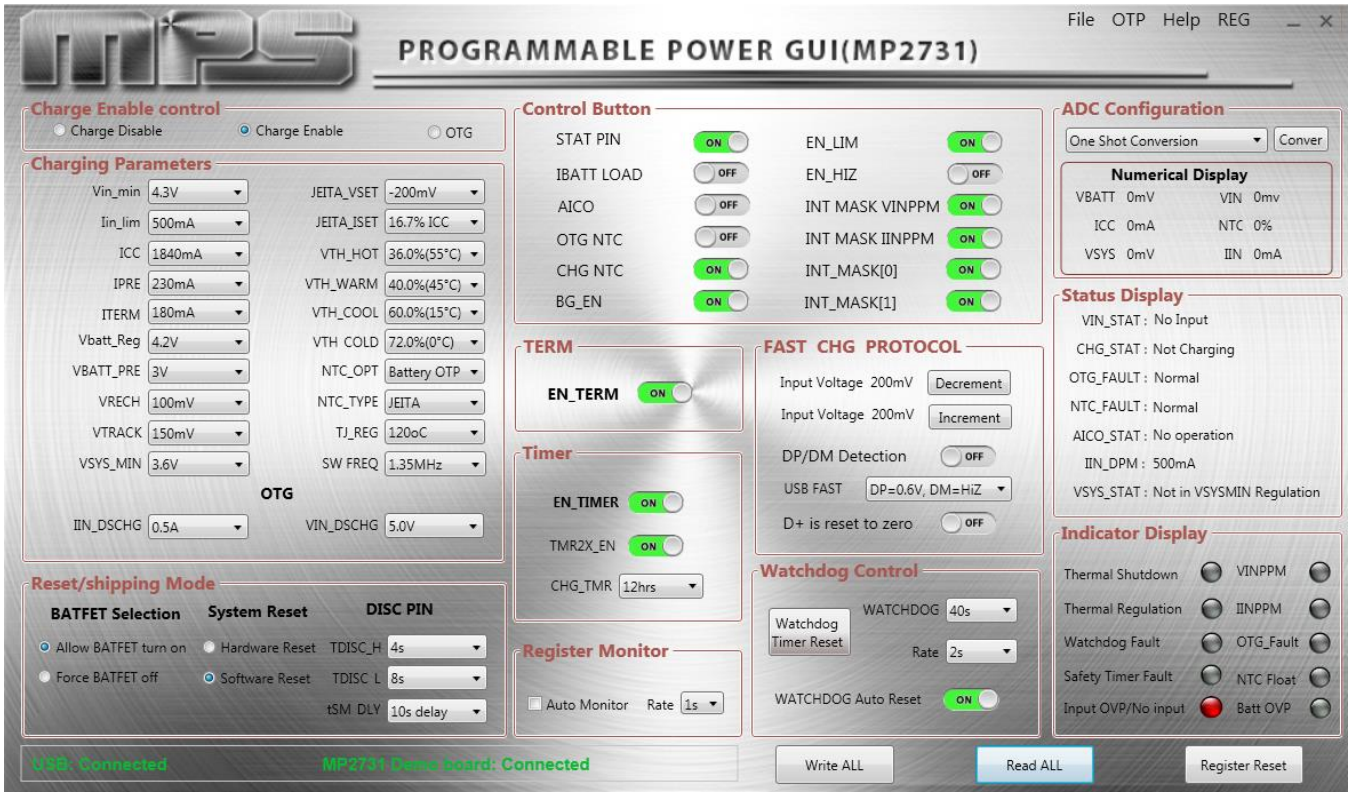

Figure 7: Connected USB and MP2731 Demo Board

   - 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.
     - If the MP2731 demo board is listed as “Disconnected,” this means that the evaluation board is not connected correctly.
     - If the USB is listed as “Disconnected,” this means that the USB I²C communication interface is not connected correctly.
2. Click the “Read All” button to read the I²C register values. The default values should be displayed (see Figure 7).
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.

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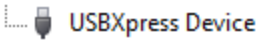
3.4 Troubleshooting Tips

EVKT-USBI2C-02

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 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 8).

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

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

   32-bit: USBXpressInstaller_x86.exe

   64-bit: USBXpressInstaller_x64.exe

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

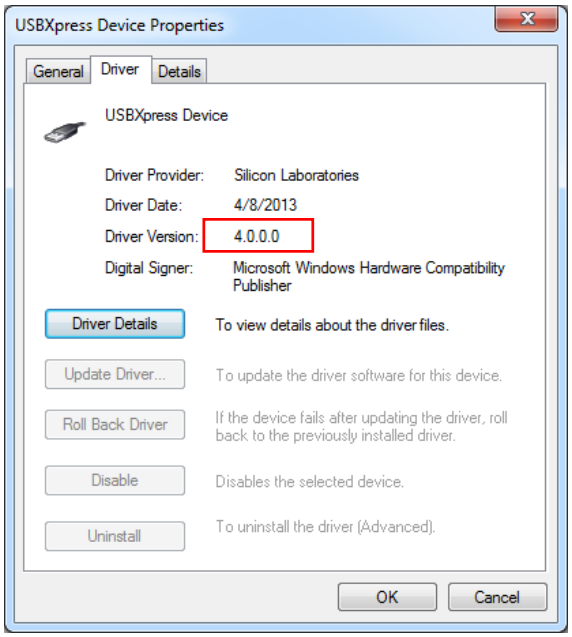


Figure 8: Determining the Driver Software

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 (V_{IN}) is below the under-voltage lockout (UVLO) falling threshold (device enters a no supply state), or over-temperature protection is triggered (device enters a shutdown state), the IC stops switching and charging is suspended.

Thermal Recovery

If the die temperature exceeds the thermal protection threshold, the device enters a shutdown state. The IC starts up again once the die 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-MP2731	Complete evaluation kit
Contents of EVKT-MP2731	
EV2731-QC-00A	MP2731 evaluation board, allowing users to access the I2C
EVKT-USBI2C-02-BAG	Includes one USB to I^2C USB communication interface, one USB cable, and one ribbon cable

Order directly from MonolithicPower.com or our distributors.

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