User Guide

MP5515 Evaluation Kit (EVKT-5515)

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Overview

Introduction

The EVKT-5515 is an evaluation kit for the MP5515, an input-power-conditioning PMIC targeting enterprise solid-state drives, NVDIMM, and other applications with back-up system requirements. The MP5515 consists of input current limiting, input reverse-current blocking, and an MPS-patented, high-efficiency, bidirectional, boost-buck converter with only one inductor for energy storage and system back-up power when there is an input power failure. This kit allows for quick evaluation of the MP5515. By using the I²C communication interface, users can set the input current limit, slew rate, and perform cap health tests.

Kit Contents

EVKT-5515 kit contents: (items below can be ordered separately).

#	Part Number	Item	Quantity
1	EV5515-U-00A	MP5515GU evaluation board	1
2	EVKT-USBI2C-02	Includes one USB to I²C communication interface, one USB cable, one ribbon cable	1
3	Tdrive-5515	USB flash drive that stores the GUI installation file and supplemental documents	1

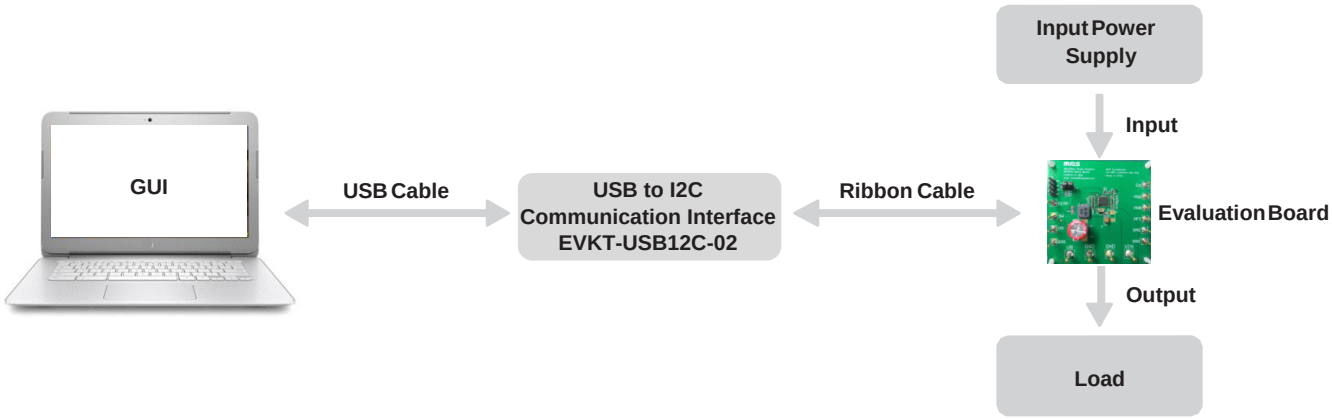


Figure 1: EVKT-5515 Evaluation Kit Set-Up

Features and Benefits

The MP5515 is highly customizable. Users can program the PMIC via the MPS I²C GUI.

⚠ *All changes made in I²C mode will NOT be retained once the EVB is powered down.*

Features adjustable under each method are outlined below.

I2C
• Back-up capacitor health test • 10-bit A/D converter to measure the input voltage, input current, backup voltage, and TEMP pin temperature sensor voltage discharge (DISCHG) • Back-up boost enable • Adjustable input current limit and ISOFET current limit • Adjustable VB ramp-up slew rate • Adjustable buck switching frequency • VIN recover control • Status indication via 10-bit A/D converter (VIN to the VB current limit, input over voltage, storage voltage, power good, high temperature and over temperature warning) • Interrupt mask control • Adjustable temperature warn threshold

Kit Specifications

Features	Specification
Supply for Board (V_{IN})	12V
Operating Input Voltage	2.7V - 18V
Storage Voltage (V_{STRG})	28V
Input Pfail Threshold (V_{PFI})	8V
Bus Back-Up Voltage (V_{RLS})	7.5V
Bus Back-Up Max Load ($I_{RELEASE}$)	5A
Operating Systems Supported	Windows XP, 7,or Later
System Requirements	Minimum 22.2 MB Free
GUI Software	4 Register Controls: System, Interrupt, ADC, Cap Test
EVB Size (L x W)	6.3 cm x 6.3 cm

Section 1. Hardware Specifications

1.1 Personal Computer Requirements

The following must be minimally met to use the EVKT-5515:

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

1.2 EV5515-U-00A Specifications

The EV5515-U-00A is an evaluation board for the MP5515GU. For more information, please refer to the EV5515-U-00A datasheet.

Figure 2:EV5515-U-00A Evaluation Board

Feature	Specification
Supply for Evaluation Board	12V
Operating Input Voltage	2.7V - 18V
Storage Voltage (V_{STRG})	28V
Input Pfail Threshold (V_{PFI})	8V
Bus Back-Up Voltage (V_{RLS})	7.5V
Bus Back-Up Max Load ($I_{RELEASE}$)	5A
EVB Size (L x W)	6.3 cm x 6.3 cm

1.3 EVKT-USBI2C-02 Specifications

The EVKT-USBI2C-02 refers to the communication interface, which connects the EVB, the PC, and its supporting accessories. It provides I^2C and PMBus capabilities. Together with MPS 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: In the near future, this software can be downloaded from the MPS website. For now, it is provided on a USB thumb drive.

1. Plug the thumb drive into the computer using any available USB port.
2. Locate the folder containing the thumb drive contents.
3. Double click the .exe file to open the set-up guide (see Figure 4).
4. Follow the prompts in the set-up guide.
5. Wait for the status screen to verify that installation is complete (see Figure 5).

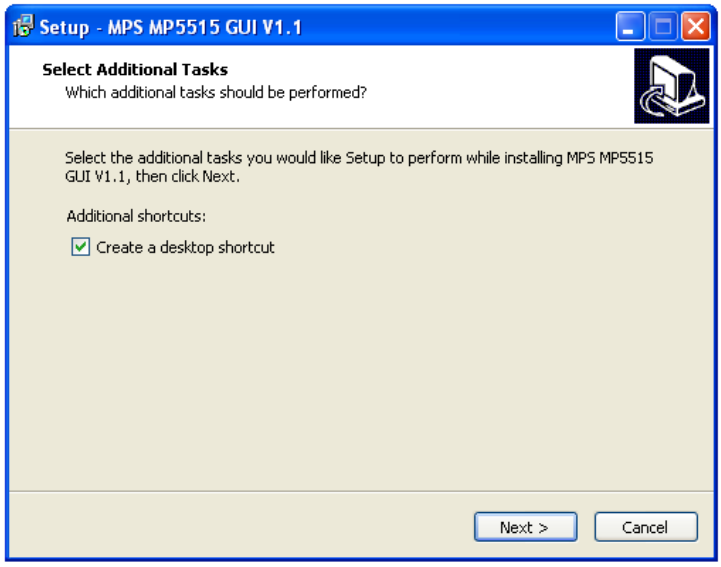


Figure 4: MPS I²C GUI Set-Up Guide

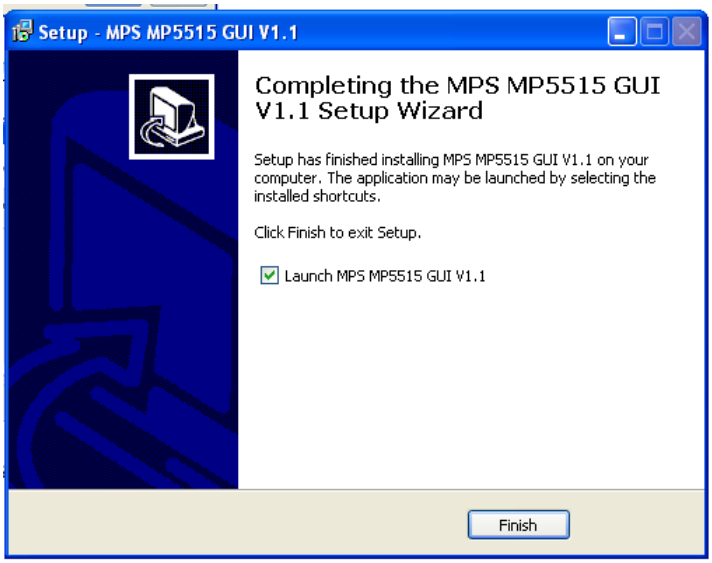


Figure 5: MP5515 I²C GUI Set-Up Success

Section 3. Evaluation Kit Test Set-Up

3.1 Hardware Set-Up

The hardware must be configured properly prior to use. Use the USB cable to connect the EVKT-USBI2C-02 communication interface to the PC, and 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). If needed, refer to the datasheet for further clarification.

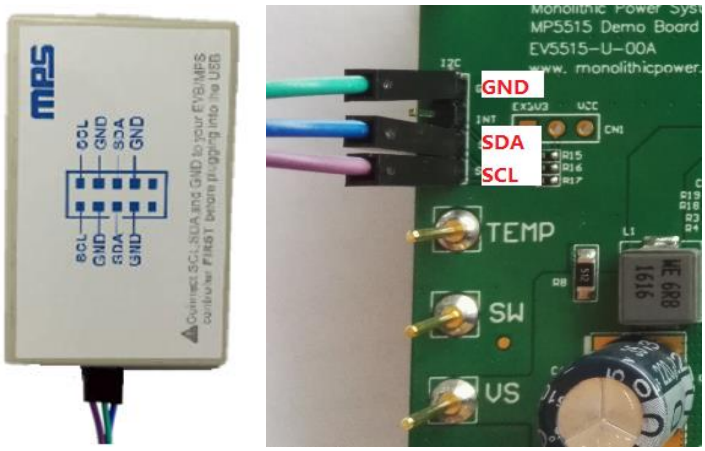


Figure 6: EVB to MPS I²C Communication Interface Wire Connection

3.2 Powering up the EVB

1. Connect the positive and negative terminals of the load to the VB and GND pins, respectively.
2. Preset the power supply output to 12V, and then turn off the power supply.
3. Connect the positive and negative terminals of the power supply output to the VIN and GND pins, respectively.
4. Turn the power supply on. The MP5515 will charge the storage capacitor to 28V.

3.3 Software Set-Up

After connecting the hardware according to the above steps, 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, the address will be listed in the “Slave Address” (see Figure 7).

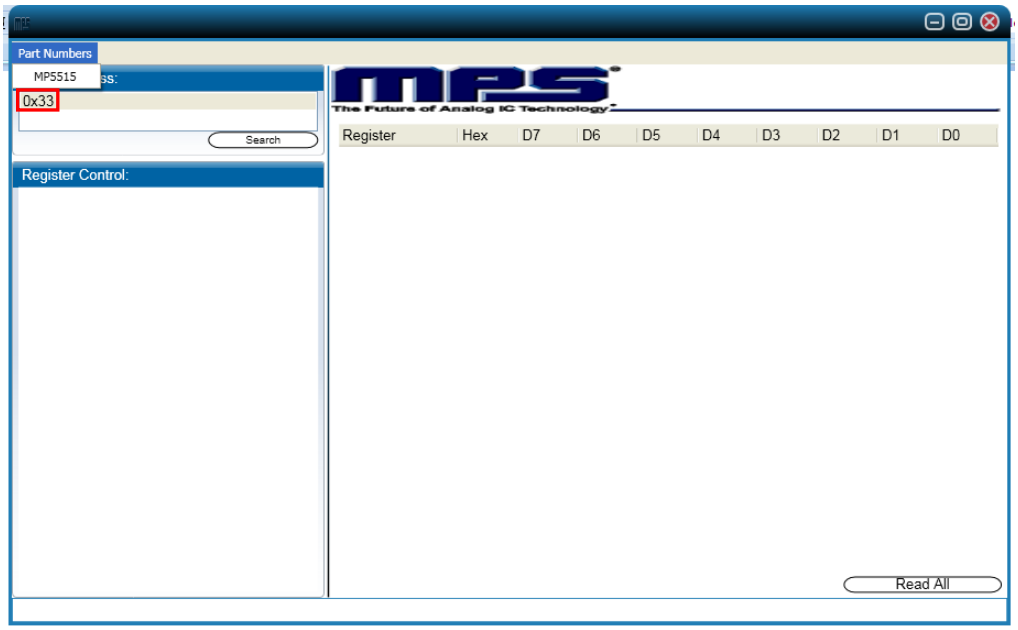


Figure 7: Appearance of Address Shows Successful Connection

- If a connection is not successful, a warning will appear at the bottom. There are two warnings users can expect.
  1) "No Slave Found. Please Check the Connection!" This means that the evaluation board is not connected (see Figure 8).
  2) "Device is not available. Please check the Connection!" This means that the USB I^2C communication interface is not connected (see Figure 9).

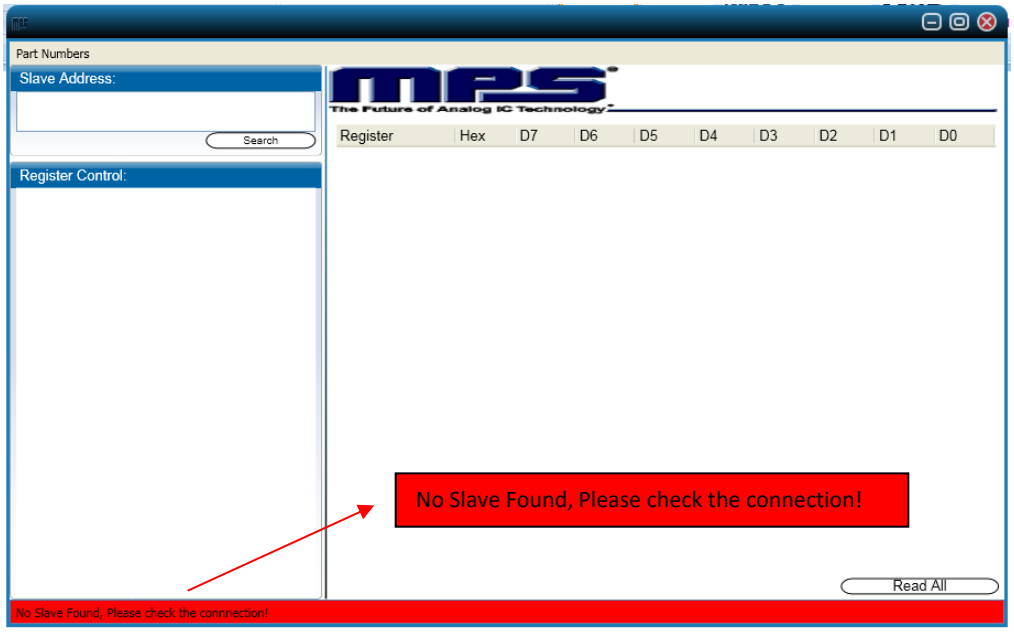


Figure 8: Warning Indicates Unsuccessful Connection – Evaluation Board not Connected

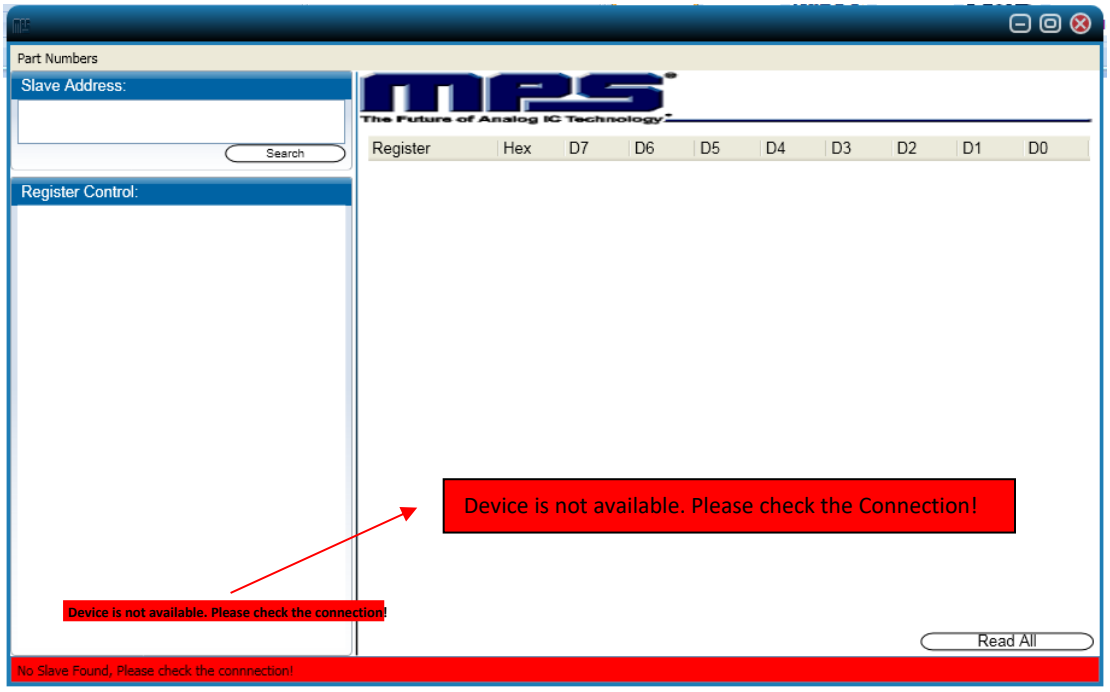


Figure 9: Warning Indicates Unsuccessful Connection – USBI2C Communication Interface not Connected

2. If the connection is successful, proceed to Step 3. Otherwise, check connections between the EVB, communication interface, and PC. Re-plug the USB into the computer and restart the GUI.
3. Select the MP5515 under Part Numbers. The Register Control menu will appear on the left side. The I²C register values will be read and displayed on the right side after clicking the **Read All** button (see Figure 10).

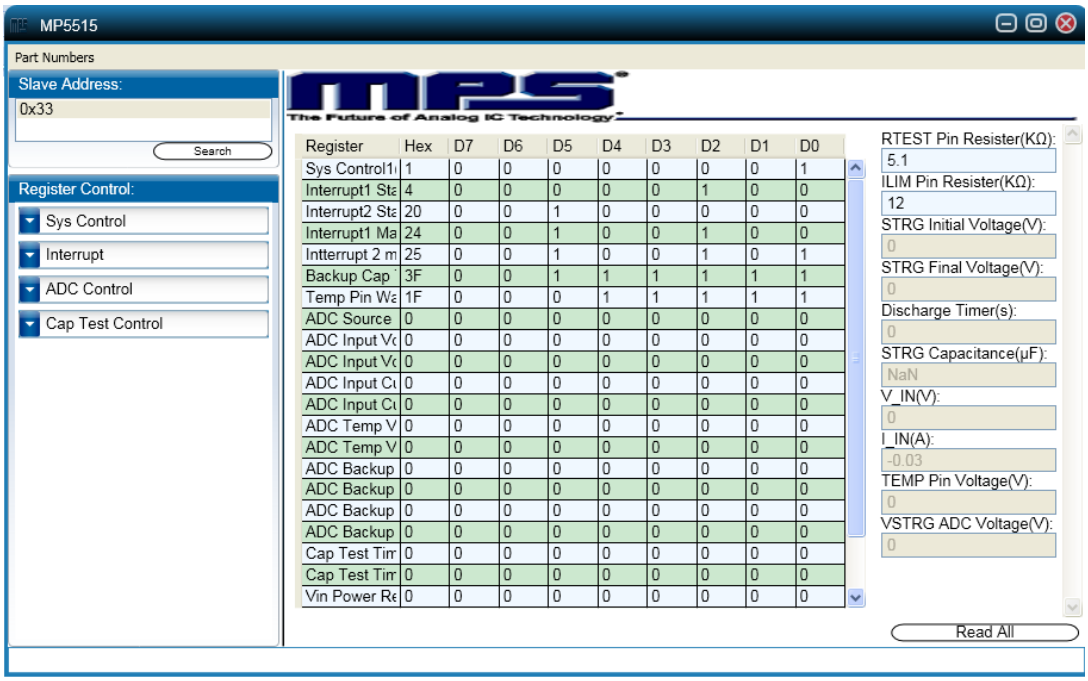


Figure 10: Values from I²C Shown in Table

4. Find the item you want to change and select the desired value from the drop-down menu.
5. Click the **Read All** button to update values. The changed information of the item will appear on the right side (see Figure 11).

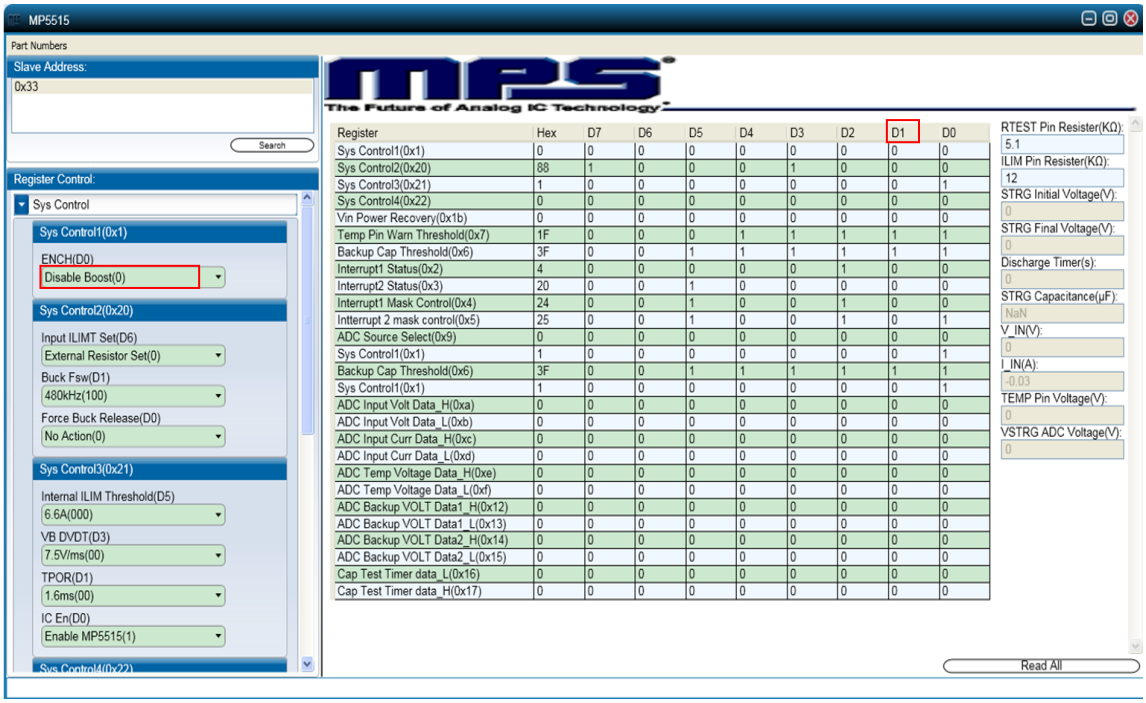


Figure 11: Refer to Datasheet to Translate 0's and 1's

⚠ *All changes made via I^2C will be restored to default values once the EVB is powered down.*

3.4 Troubleshooting Tips

Note: USBI2C-02 and USBI2C-01 drivers are not compatible. USBI2C-02 uses USBXpress and USBI2C-01 uses Cyusb3. USBI2C-02 is the recommended device for the MPS PMBus and I²C.

EVKT-USBI2C-01

In case the USBI2C-01 driver is not properly installed, manual installation is required. Follow the steps below:

1. Open the Device Manager and select “Update Driver Software” (see Figure 12).
2. Click “Browse my computer for driver software.”
3. Find the driver located on the thumb drive.
4. Install.

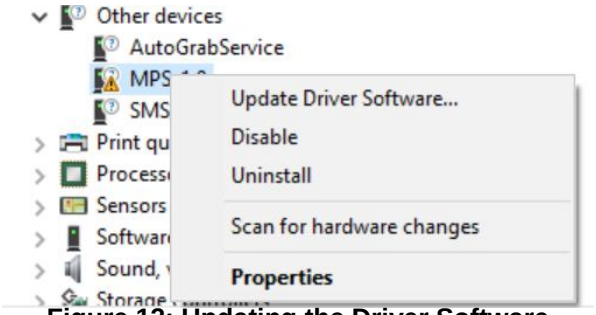
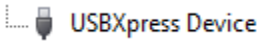


Figure 12: Updating the Driver Software

EVKT-USBI2C-02

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

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



Right click and view properties. Check to make sure the driver version matches the newest version (see Figure 13).

1. Browse the thumb drive contents and open the driver’s folder.
2. 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
3. Connect the EVKT-USBI2C-02 communication interface to the PC with the USB cable.

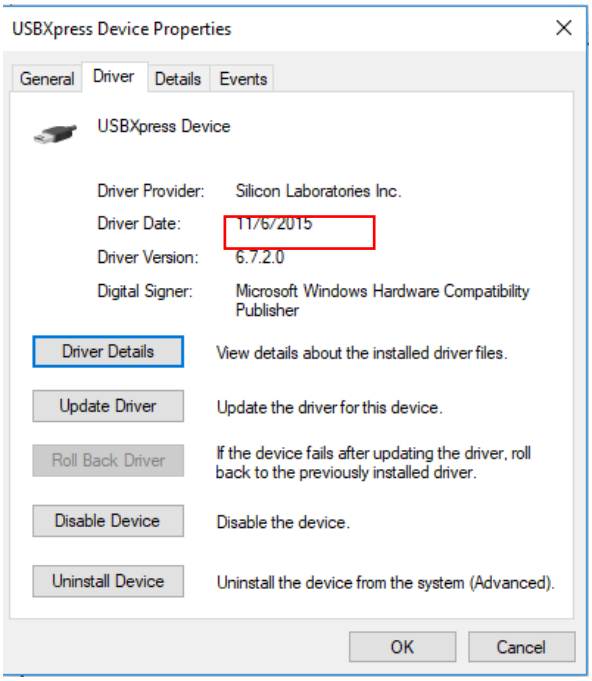


Figure 13: Correct Driver Version

- **No Supply**

The PMIC’s input pin has an under-voltage lockout (UVLO) detection circuit. If the input voltage (AVIN) is lower than the UVLO rising threshold, the PMIC’s functions are disabled.

- **Shutdown Event**

If the PMIC detects that the input voltage is lower than the UVLO falling threshold (it enters a no supply state) or over-temperature protection is triggered (it enters a power-off state), the PMIC switches to no supply state or power-off state, regardless of the current state.

- **Thermal Recovery**

If the MP5515 is in a power-off state due to the die temperature exceeding the thermal protection threshold, the PMIC enters a power-on sequence when the die's temperature decreases.

- **Shutdown Sequence**

When the input voltage is lower than the UVLO falling threshold, or the IC is over-temperature, the PMIC enters the shutdown sequence directly.