User Guide

MP5470 Evaluation Kit (EVKT-MP5470)

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Overview

Introduction

The EVKT-MP5470 is an evaluation kit for the MP5470, a complete power management IC with four high-efficiency, step-down, DC/DC converters and flexible system configurations via the I^2C and a multi-time programmable (MTP) eFuse. The kit allows for quick evaluation of the PMIC and offers MTP capabilities, which allows users to program custom configurations three times maximum, supporting a wide range of designs.

Kit Contents

EVKT-MP5470 Kit contents: (items below can be ordered separately)

#	Part Number	Item	Quantity
1	EV5470-L-00A	MP5470GL evaluation board	1
2	EVKT-USBI2C-02	Includes one USB to I2C communication interface device, one USB cable, and one ribbon cable	1
3	MP5470GL-0000	MP5470 IC which can be used for MTP programming	2

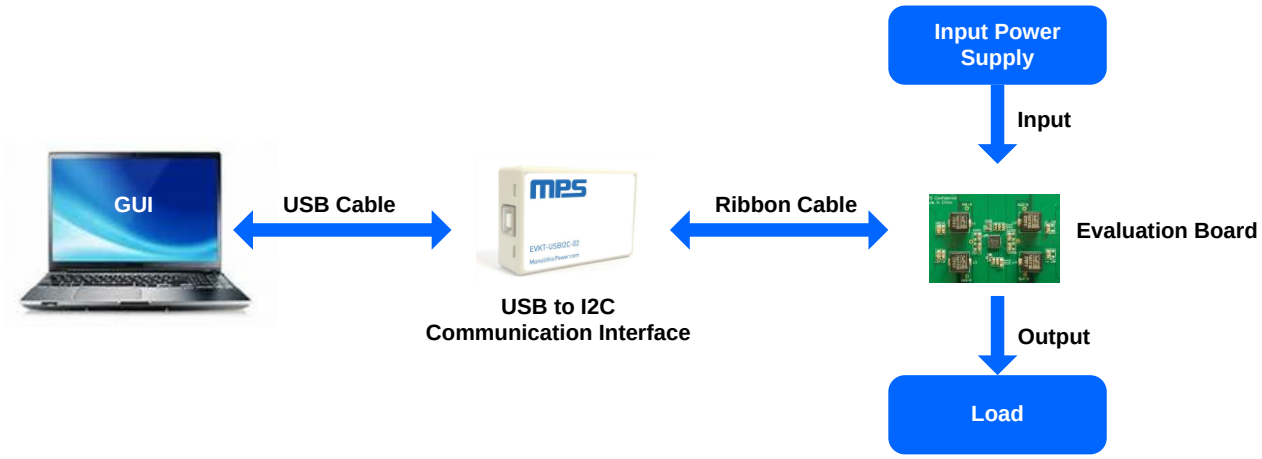

Figure 1: EVKT-MP5470 Evaluation Kit Set-Up

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Features and Benefits

The MP5470 is highly customizable. Users can program the PMIC via the MPS I2C GUI and multi-time programming (MTP).

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

⚠ MTP burn action can be executed three times maximum.

Features adjustable under each method are outlined below.

I2C/MTP
• Programmable output voltage • Initial on/off • Selectable auto PFM/PWM or FPWM mode • Programmable soft start delay/slew rate • Programmable valley current limit • Programmable initial phase delay • Additional phase delay time • Buck output discharge on/off • Buck output limit on/off • Selectable buck parallel mode operation • Selectable switching frequency • Programmable VIN UVLO rising • Programmable PG delay time • Programmable software initially I2C slave address

Kit Specifications

Features	Specification
Supply for Board	6.5V - 16V
Operating Input Voltage	4V - 16V
Operating Systems Supported	Windows XP, 7, or later
System Requirements	Minimum 14.6 MB free
GUI Software	3 register controls: MTP Configure, BUCKCTRL, SYSCTRL
EVB Size (L x W)	6.35cm x 6.35cm

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Section 1. Hardware Specifications

1.1 Personal Computer Requirements

The following must be minimally met to use the EVKT-MP5470.

- Operating system of Windows XP, 7, or later
- Net Framework 4.0
- PC with a minimum of one available USB port
- At least 14.6 MB of free space

1.2 EV5470-L-00ASpecifications

The EV5470-L-00A is an evaluation board for the MP5470GR-0000. For more information, please refer to the EV5470-L-00A datasheet.

Figure 2: EV5470-L-00A Evaluation Board

Feature	Specification
Supply for Evaluation Board	6.5V - 16V
Operating Input Voltage	4V - 16V
EVB Size (L x W)	6.35cm x 6.35cm

1.3 EVKT-USBI2C-02 Specifications

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

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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 directly from the MPS website. .

1. Browse to the folder containing the thumb drive contents.
2. Double click the .exe file to open the set-up guide (see Figure 4).
3. Follow the prompts in the set-up guide.
4. Wait for status screen to verify that installation is complete (see Figure 5).

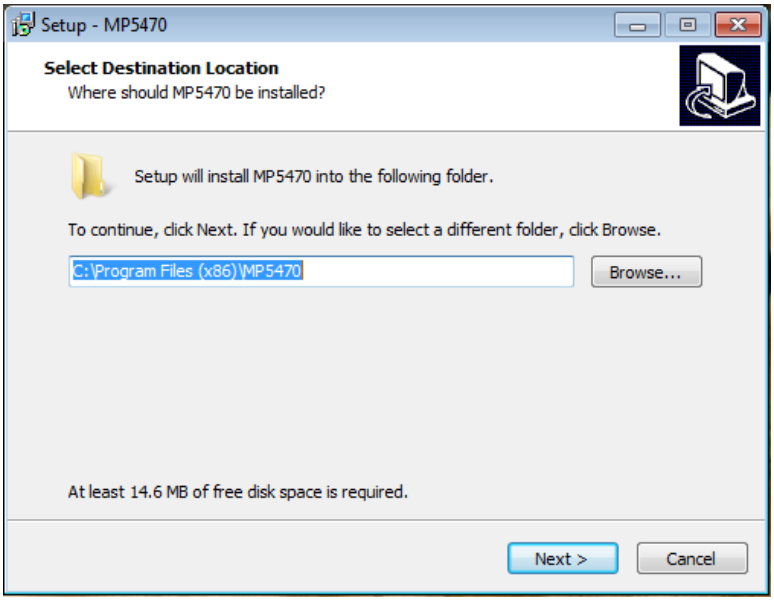

Figure 4: MPS I²C GUI Set-Up Guide

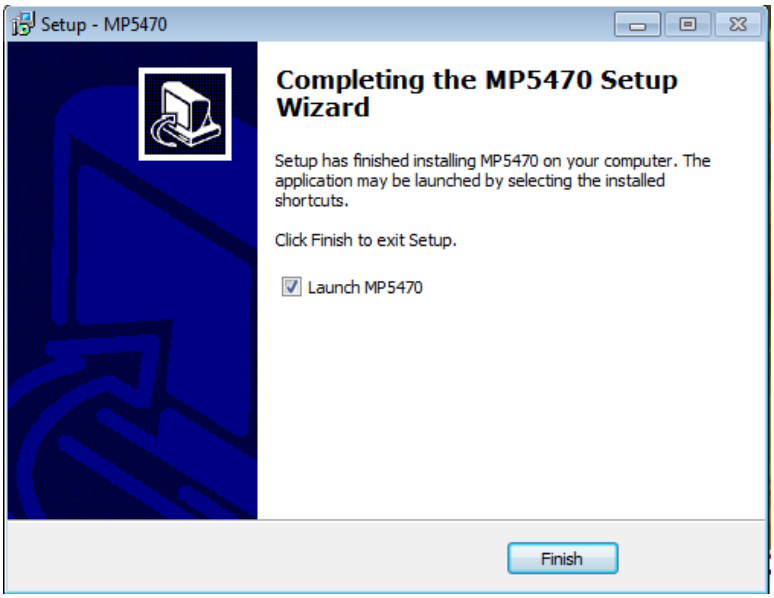

Figure 5: Driver Set-Up Success

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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 device.
2. Connect SCL, SDA, and GND (see Figure 6). If needed, refer to the datasheet for further clarification.
3. Use the USB cable to connect the EVKT-USBI2C-02 communication interface device to the PC and follow the instructions below to set up the EVB.

Figure 6: EVB to MPS I²C Communication Interface Device Wire Connection

3.2 Powering up the EVB

1. Preset power supply between 6.5V and 16V.
2. Turn power supply off.
3. Connect power supply terminals to:
   a. Positive (+): VIN
   b. Negative (–): GND
4. Connect load to:

Load1:
a. Positive (+): Vout1
b. Negative (–): GND

Load2:
a. Positive (+): Vout2
b. Negative (–): GND

Load3:
a. Positive (+): Vout3
b. Negative (–): GND

Load4:
a. Positive (+): Vout4
b. Negative (–): GND

5. Turn power supply on after making connections. The board will 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 will check the EVB connection automatically.
   - If connection is successful, the address will be listed in the “Slave Address” (see Figure 7).

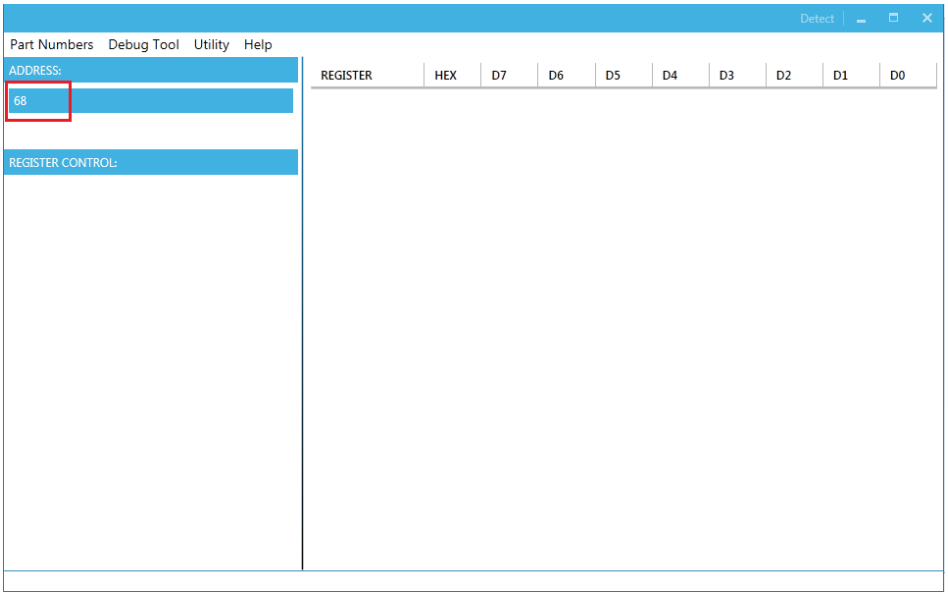

Figure 7: Appearance of Address Shows Successful Connection

   - If not, one of two warnings will appear at the bottom:
     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 I2C communication interface device is not connected (see Figure 9).

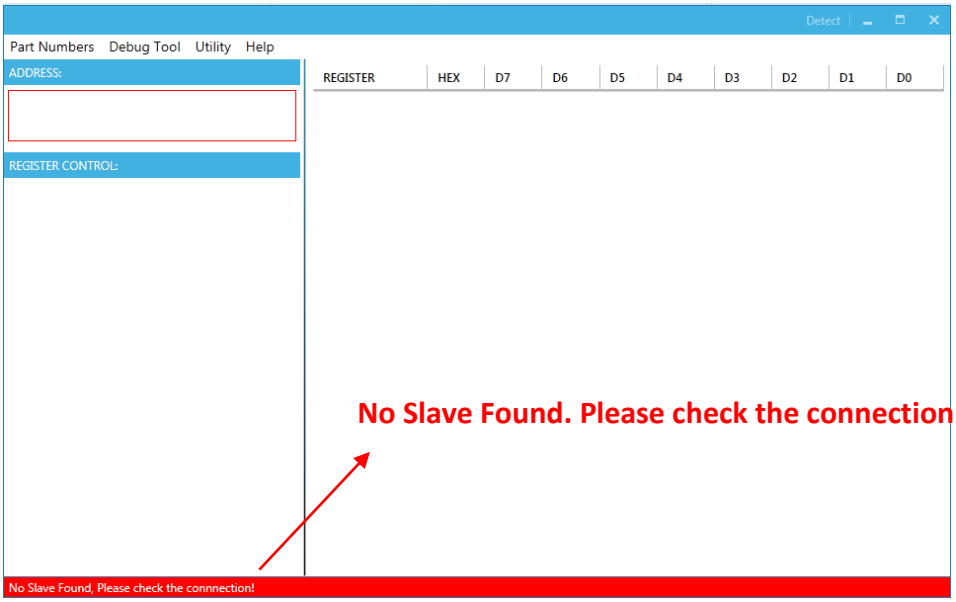

Figure 8: Warning Indicates Unsuccessful Connection – Evaluation Board Not Connected

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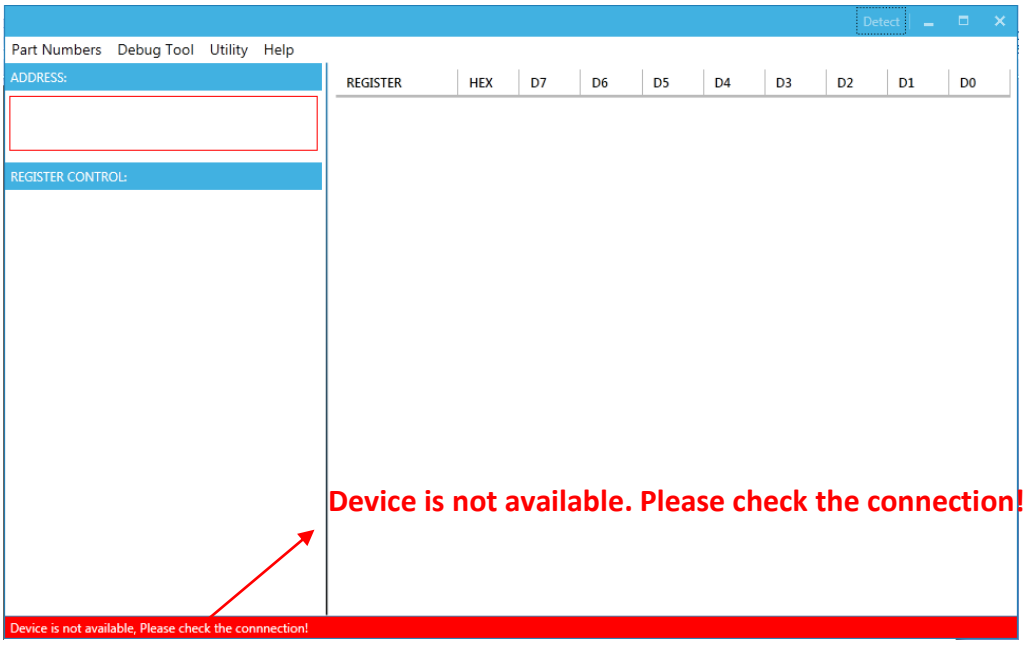

Figure 9: Warning Indicates Unsuccessful Connection – USBI2C Communication Interface Devices not Connected

2. If connection is successful, proceed to Step 3. Otherwise, check the connections between the EVB, communication interface device, and PC. Re-plug the USB into the PC and restart the GUI.
3. Select MP5470 from under Part Numbers. The Register Control menu will appear on the left side. I2C register values will be read automatically and displayed on the right (see Figure 10).

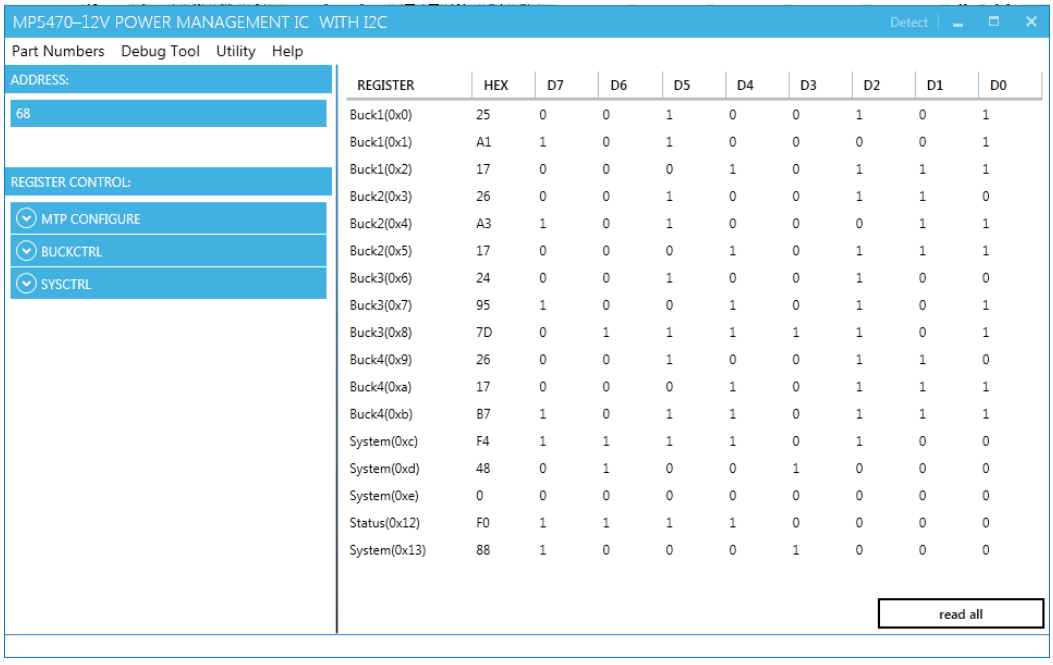

Figure 10: Values from I2C Shown in Table

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

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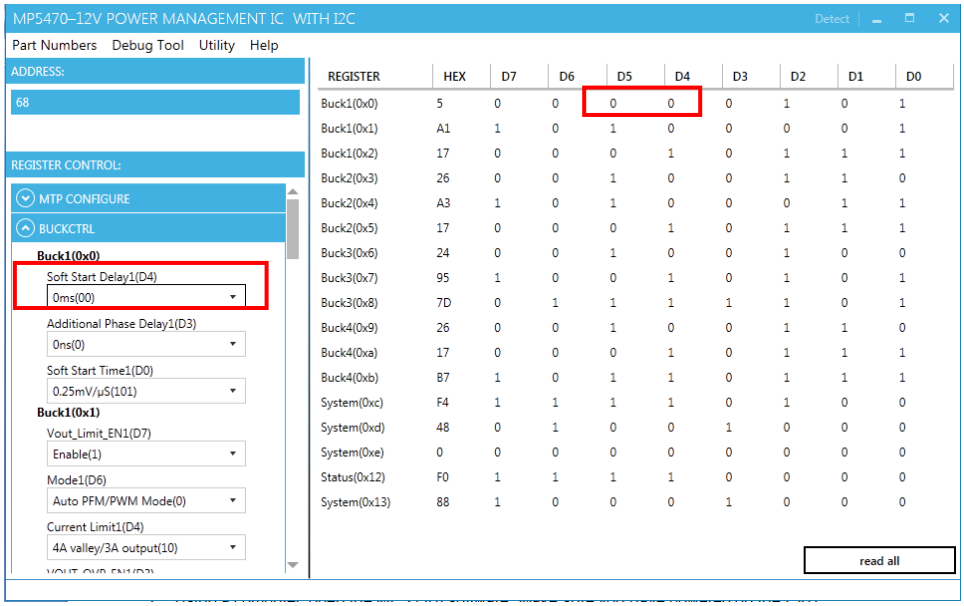

Figure 11: Refer to Datasheet to Translate 0's and 1's

⚠ All changes made via the I2C will be restored to default values once the EVB is powered down.

3.4 Device Programming Instructions

The MP5470 can be custom programmed and saved to the PMIC. Follow the instructions outlined below to create and export customized configurations.

1. Open the GUI on computer.
2. Ensure the correct connection between USB dongle, EVB, and computer.
3. Select the MP5470 part number from Part Numbers menu.
4. User can change any parameter they choose within the table (e.g.: change system switching frequency from 800kHz to 1060kHz).

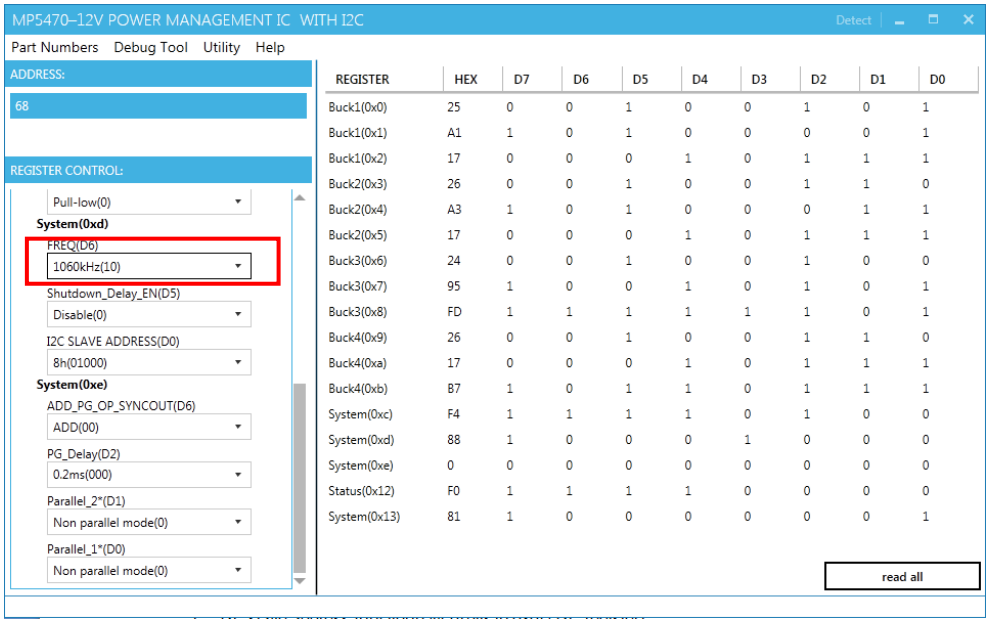

Figure 12: Parameters Modification via I2C Interface

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5. If user modified below function:
    1. I2C slave address function(D[4:0] bits in 0x0D I2C register)
    2. ADD_PG_OP_SYNCOUT function(D[7:6] bits in 0x0E I2C register)

    I2C slave address may be changed immediately after the operation. Press the Detect button again and select the new I2C slave address before other I2C register modifications or MTP actions.

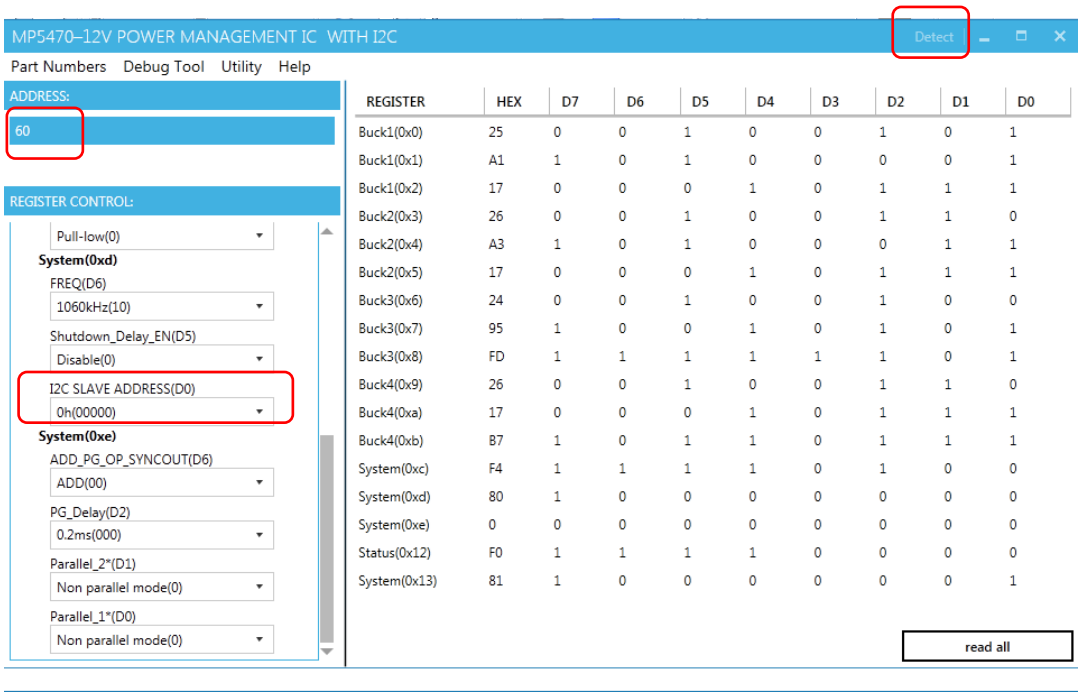

Figure 13: Refresh Device's I2C Address after the Modification of "I2C SLAVE ADDRESS" Function

As shown in Figure 13, after changing the I2C slave address function related bits (D[4:0] bits in 0x0D I2C register) from "01000" default value to "00000", the new I2C slave address "0x60" will take effect immediately. Press the Detect button again and select the new I2C address before taking any other action.

6. The MTP registers configuration file can also be exported by clicking "Utility—MTP/OTP--Export". Afterward, the software interface will be as shown in Figure 14.

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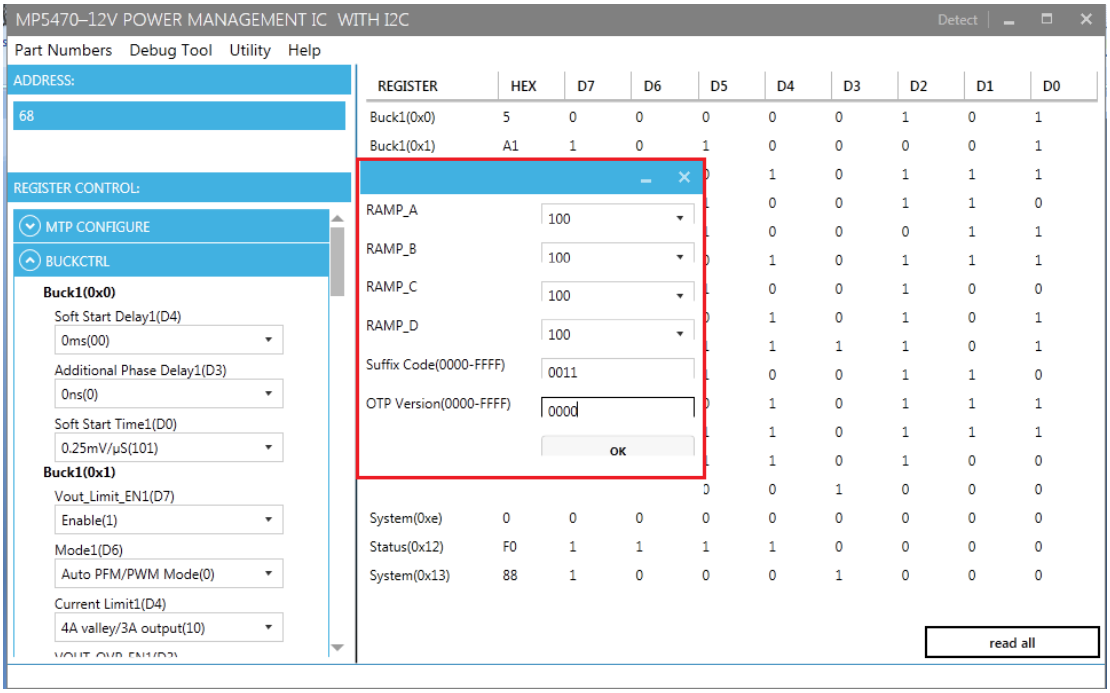

Figure 14: Export MTP Registers Configuration Files

7. Choose the RAMP value setting for Buck 1 to Buck 4. Enter the suffix code (work with an MPS FAE to get this unique number or refer to the DS ordering information section for details) and OTP version number. Click “OK”. Find a location for the exported file and click “OK” again. Your MTP registers configuration will be saved into a text file (.txt) with the file name format: MP5470GR-0011 (MTP configure code) -rev0000 (MTP revision number). Send this text file to an MPS FAE to order the MP5470 C-spec IC following the MTP configuration in it.

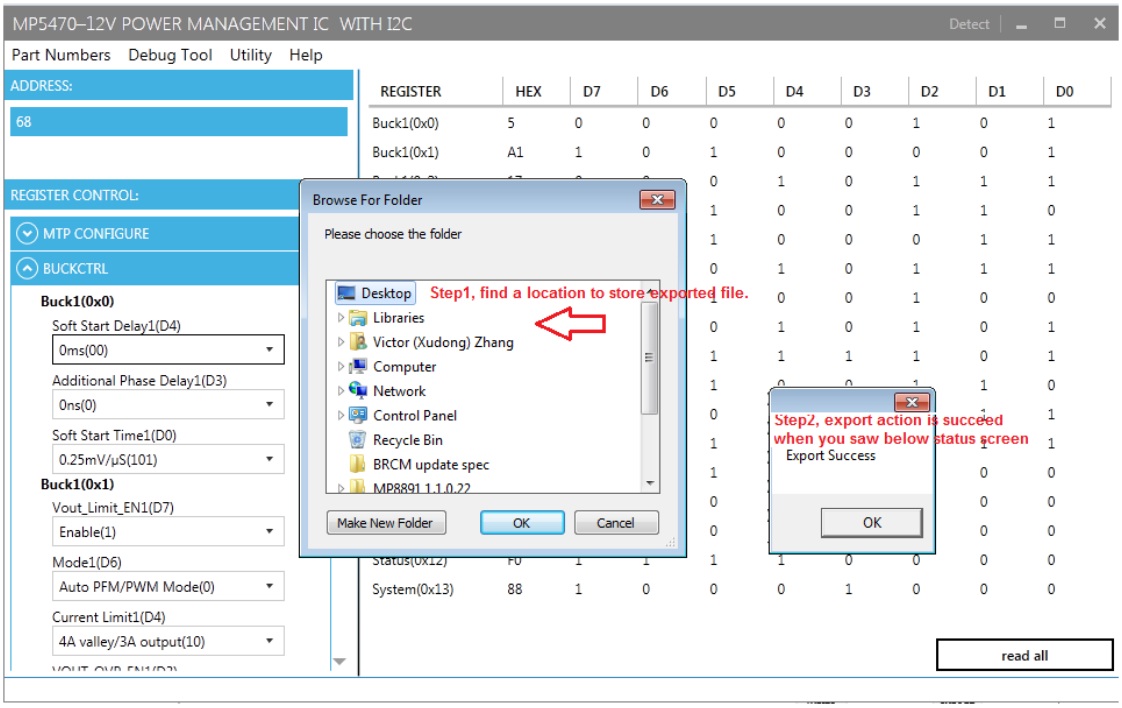

Figure 15: Storing Configuration Files

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8. Click the MTP Configure tab to save the changes to the IC. Fill in the MTP configure code, MTP version number, and correct MTP program password (NOTE: the MTP Program button will be invalid with the wrong password). The MTP program password is “mps0519”.

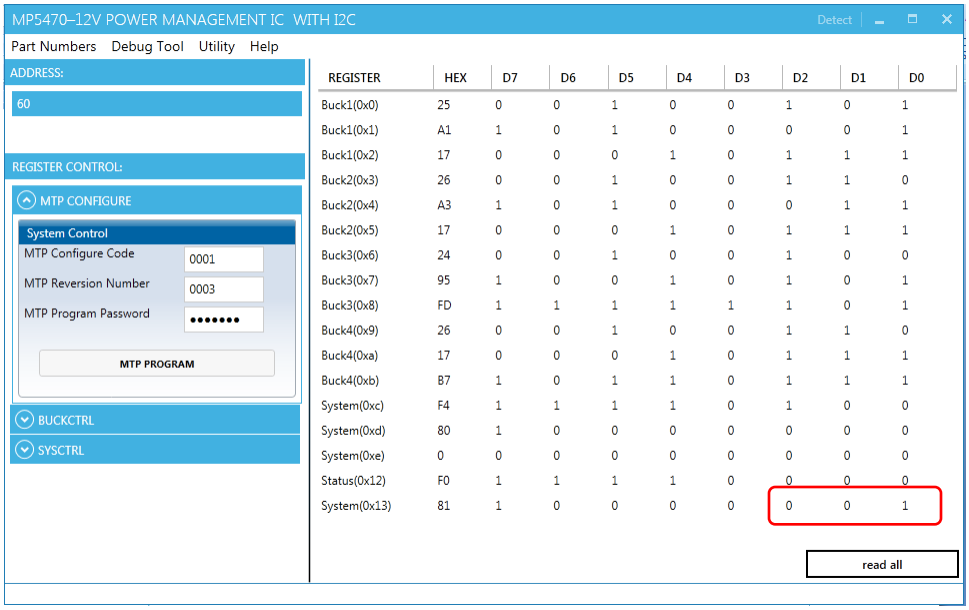

Figure 16: Burn MTP Action Ongoing

9. Click the MTP Program button. The GUI will be as shown in Figure 17. Click the Read All button. The 0x13 register value changing from 0x81H to 0x82H indicates a successful MTP.

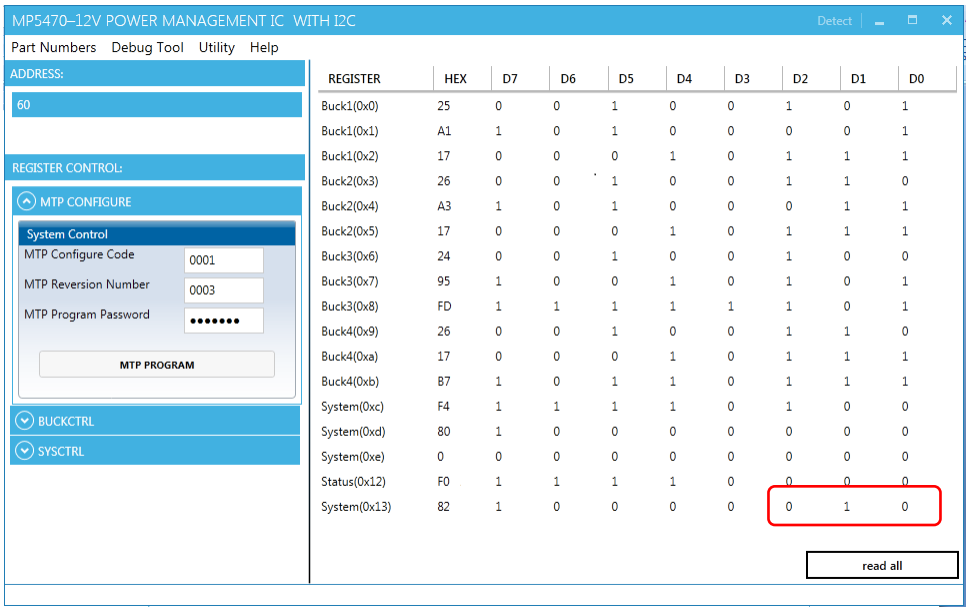

Figure 17: Burn MTP Action Success

10. NOTE: the MP5470 can be programmed three times. It will be ineffective if the program time is larger than three.

The remaining steps are optional and instruct how to check that new configurations have been successfully programmed.

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Optional:

11. Adjust the input voltage to 6.5-12V.
12. Repeat steps 1-3 from this section.
13. If done correctly, new configurations will be shown in the table on the right hand side.

Notes:

- Unlike in I2C, not all of the configurations set in MTP mode will be displayed until a MP5470-0000 write and power cycle.

  After MTP, the values can still be changed using the I2C.
- If you attempts to perform MTP on a device that already been programmed three times, the GUI software will allow you to proceed normally. However, your configurations will NOT be saved.

3.5 Troubleshooting Tips

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

EVKT-USBI2C-01

In case that 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 18).
2. Click “Browse my computer for driver software”, find the driver located on thumb drive and install.

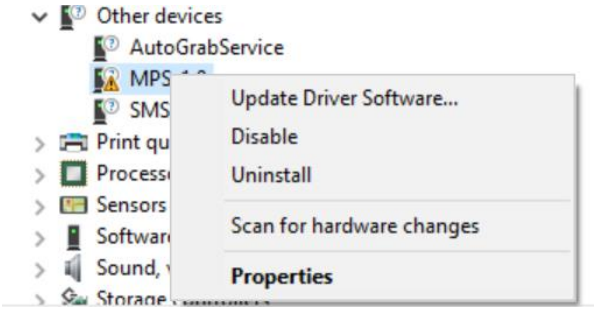
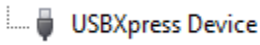


Figure 18: Updating the Driver Software

EVKT-USBI2C-02

In the case that 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 19).

1. Install the correct USBXpress “.exe” file.

Choose either 32 bit or 64 bit operating system.

32-bit: USBXpressInstaller_x86.exe
64-bit: USBXpressInstaller_x64.exe

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

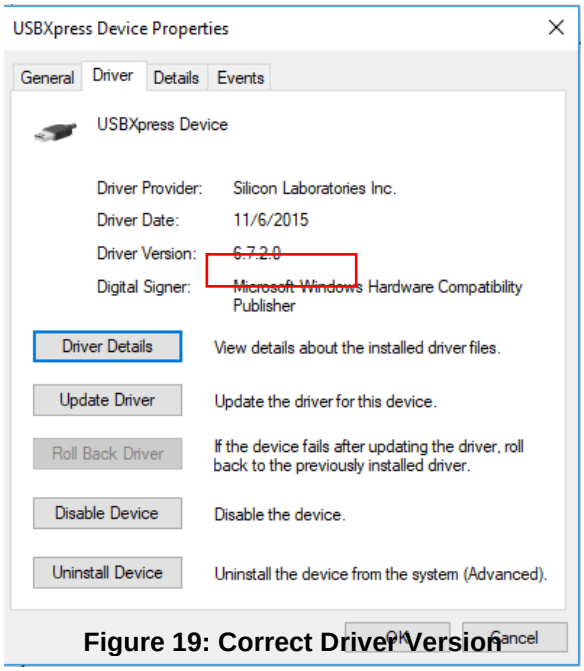


Figure 19: Correct Driver Version

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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-MP5470	Complete evaluation kit
Contents of EVKT-5470	
EV5470-L-00A	EV5470 evaluation board
EVKT-USBI2C-02	Includes one USB to I2C communication interface device, one USB cable, and one ribbon cable
MP5470GR-0000	MP5470 ICs which can be used for MTP programming

Order directly from MonolithicPower.com or our distributors.

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