PMBus Interface and Accessories User Guide

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Introduction

The PMBus-USB Adapter enables communication with the PMBus® interface of Vicor power modules using a Host PC. The PMBus control interface provides digital management capabilities and access to the telemetry monitoring and status reporting offered by the product.

The PMBus-USB Adapter converts the PMBus interface to a USB communication protocol using an internal isolated controller, allowing users to easily connect to a Host PC (no driver installation is required with Windows operating systems). The Power System Configurator GUI, available from Vicor, provides a convenient means for monitoring and control of the power module.

All PMBus capabilities and features of the connected power module are available through the GUI, allowing users to read and write into the status configuration registers of the module, observe input and output telemetry, monitor faults and obtain other additional device information. The PMBus-USB Adapter enables easy evaluation of the PMBus digital interface offered on select Vicor products in a test environment. Contact Vicor Applications for a complete list of compatible products.

Please note that this User Guide applies only to the operation of the PMBus-USB Adapters listed below with Vicor converters and the Power System Configurator GUI. Support for VIA™ products that include PMBus communication capabilities is provided by the I2C-ADAPTER-A00 PMBus-USB Adapter and the Vicor Digital Interface Demo Board software.

Compatible Adapter Part Number	VDDB Bias Voltage
I2C-ADAPTER-A02	5V supply output
I2C-ADAPTER-A03	3.3V supply output

⚠️ **IMPORTANT NOTICE:**

**Hazardous voltages may be present on the interfaced Vicor power module.**

PERSONAL CONTACT WITH LINE VOLTAGE MAY RESULT IN SEVERE INJURY, DISABILITY, OR DEATH. IMPROPER OR UNSAFE HANDLING OF THIS ACCESSORY AND RELATED POWER MODULE(S) MAY RESULT IN SERIOUS INJURY OR DEATH

Read the precautions below entirely BEFORE using the PMBus®-USB Adapter. Do not operate the PMBus-USB Adapter unless you have the appropriate safety precautions in place on your bench to guarantee safety.

The list below is not comprehensive and is not a substitute for common sense and good practice.

- During operation, the power devices and surrounding structures can be operated safely at high temperatures.
- Remove power from converter and use caution when connecting and disconnecting test probes and interface lines to avoid inadvertent short circuits and contact with hot surfaces.
- Never use a jumper in place of the fuse.
- Always use approved safety glasses when testing electronic products. Follow good laboratory practice and procedures.
- Avoid creating ground loops when making measurements of the isolated input or output voltage and signals.
- Care should be taken to protect the user from accidental contact with electrical terminals when operating under power.
- Care should be taken to avoid reversing polarities if connecting to the opposite (solder) side of the board.
- The PMBus-USB Adapter described in this document is designed for general laboratory evaluation, and is not suitable for installation in end user equipment or applications.
- Refer to the specific Vicor power module data sheet of the interfaced product(s) for electrical, thermal, and mechanical product details.

Connector Information – PMBus-USB Adapter

Side View

USB Micro-B Cable
Connector Pinout [a]
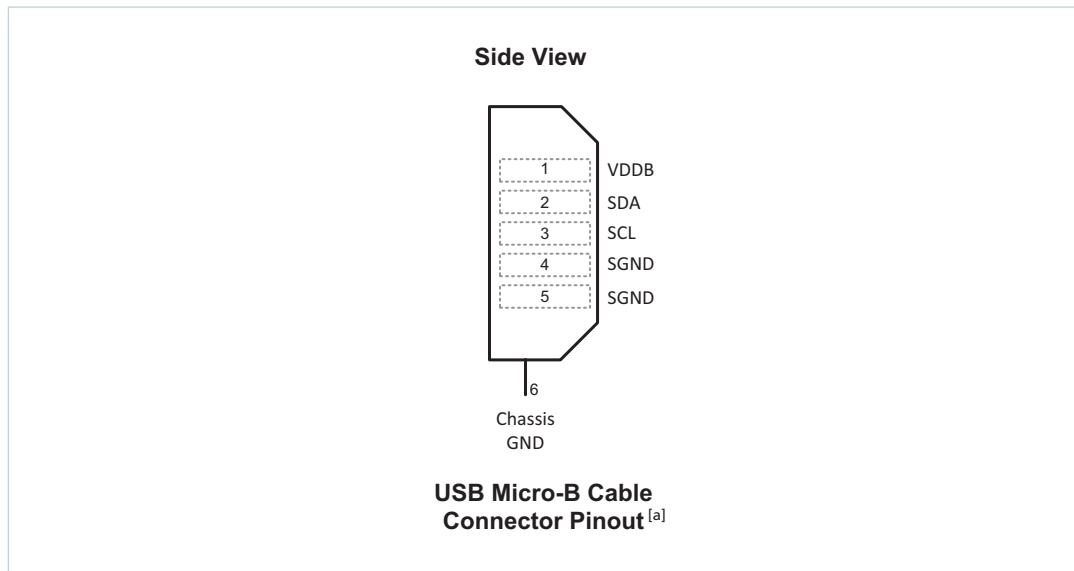
Pin Number	Signal Name	Type	Function
1	VDDB	OUTPUT	3.3V or 5V supply output
2	SDA	INPUT/OUTPUT	I²C™ Data PMBus® compatible [b]
3	SCL	OUTPUT	I²C Clock PMBus compatible [b]
4	SGND	SIGNAL RETURN	Signal ground
5	SGND	SIGNAL RETURN	Signal ground
6	Chassis GND	SHIELD	Connector housing ground

[a] The USB Micro-B cable connector represents the pinout of the PMBus-USB Adapter.
It does not represent the USB Micro-B PCB receptacle.
[b] The PMBus-USB Adapter does not include internal pull-up resistors on the SDA and SCL lines. This allows the user to select the internal 3.3V or 5V bus (VDDB) for pull up or an external VDD bus between 3.3V and 5V. See Figure 2 for further details.

Figure 1
*Host PC to Vicor power module array connection, PMBus® communication interface shown as a typical application set up*
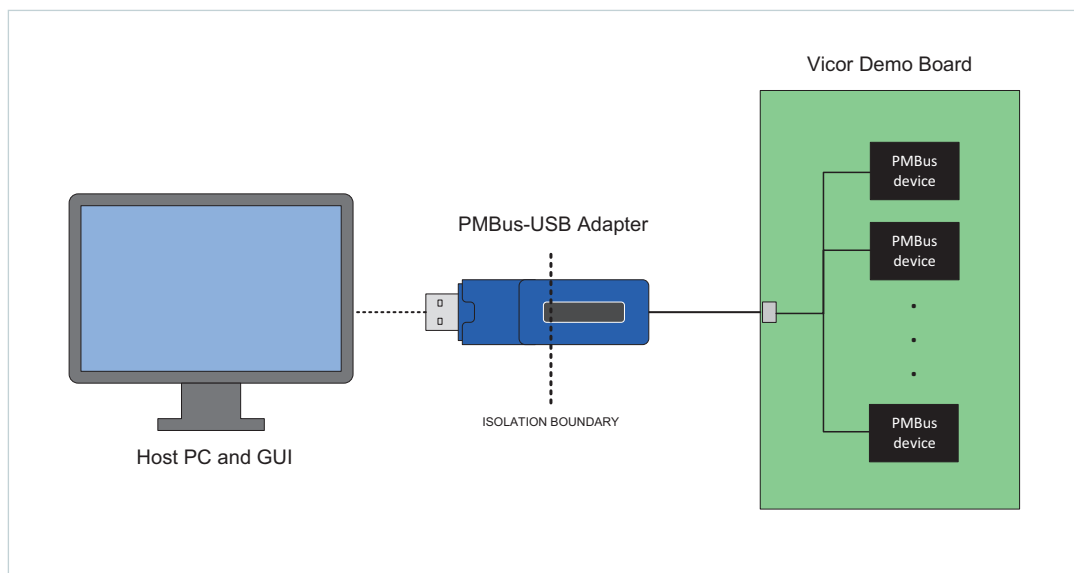
Configuration Details

The SDA and SCL lines are not pulled up to VDDB within the adapter to enable flexibility of the compatible adapters and I²C™ bus voltages, 3.3V or 5V. The user must include the pull-up resistors R1 and R2 as shown in either of the diagrams below in Figure 2 for the adapter to function properly. C1 is recommended for I²C bus bypassing. R3 and C2 are recommended to provide a path to GND for high-frequency noise.

- ■ I2C-ADAPTER-A02 is compatible with either 3.3V or 5V I²C bus voltages.
- ■ I2C-ADAPTER-A03 is only compatible with 3.3V I²C bus voltage.
  Note: Do not apply a I²C bus voltage greater than 3.3V; this will damage the adapter.

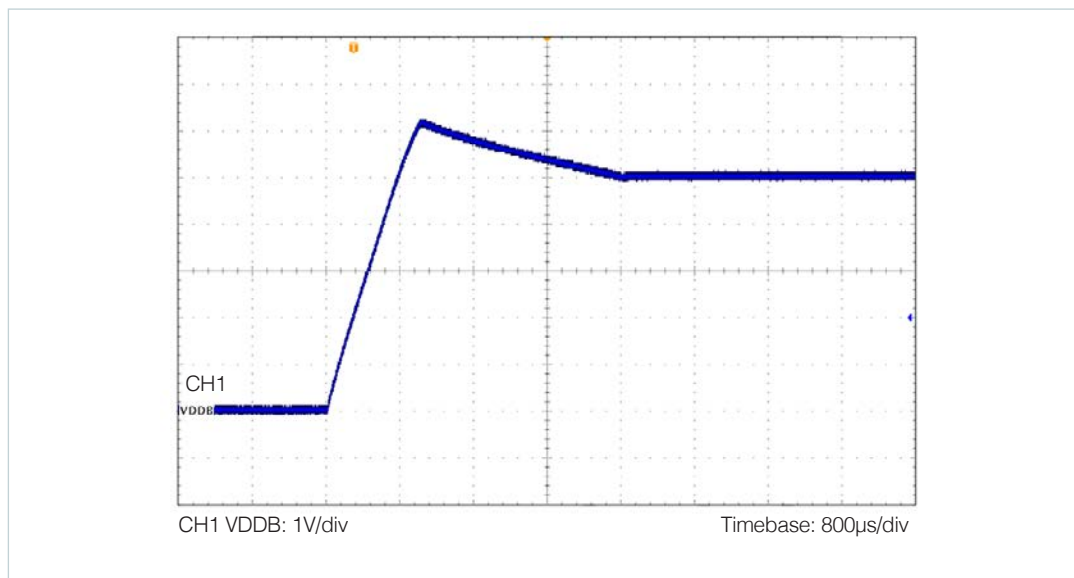***Figure 2***
Recommended pull-up resistor configurations

Using 3.3V or 5V VDDB supply for I²C bus

Using external I²C bus of 3.3V or 5V
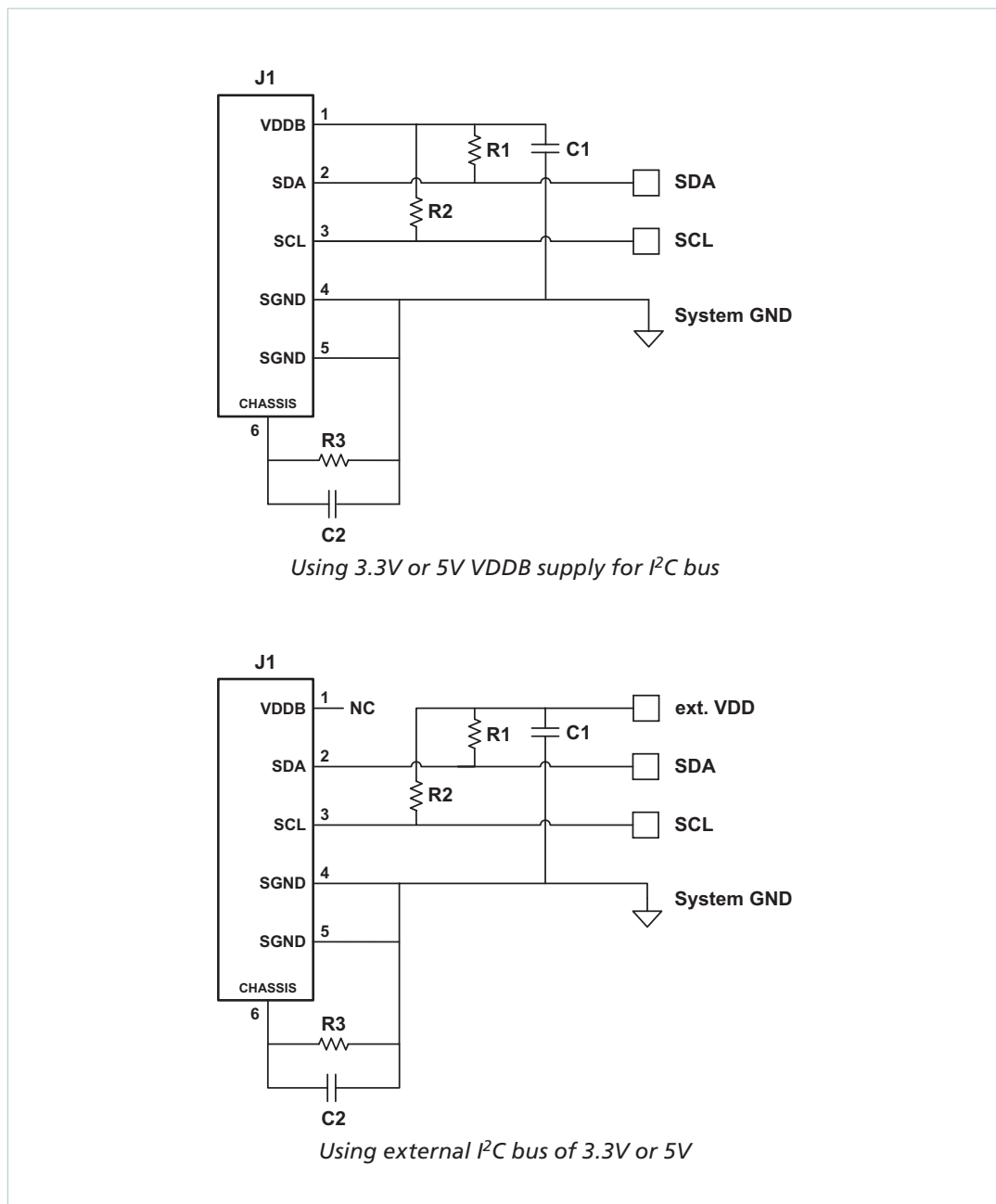
Table 1
Component information for Figure 2

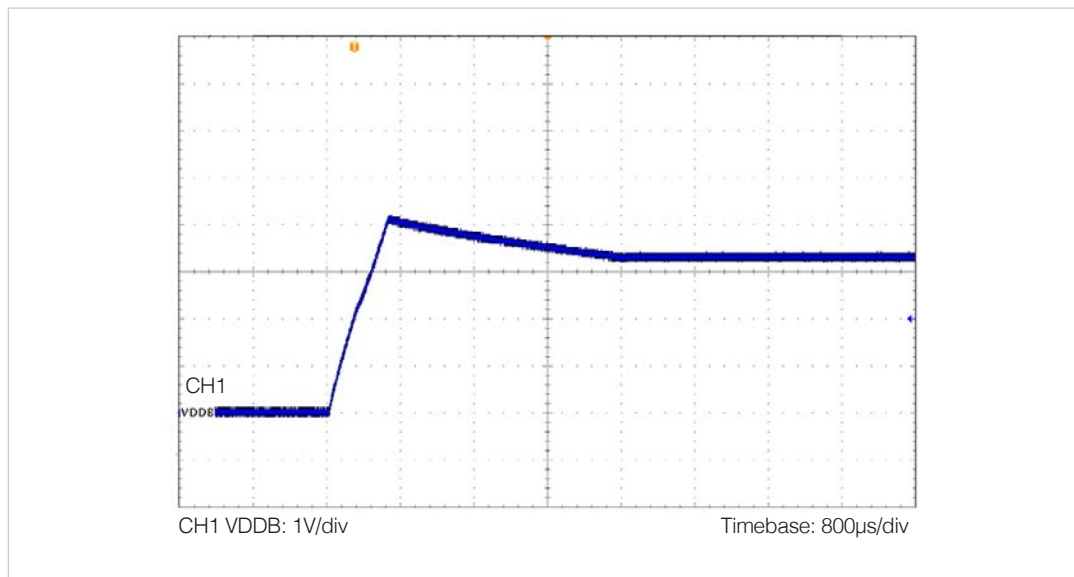| Reference Designator	Description
R1, R2	RES 2kΩ 1/20W 1%
R3	RES 10kΩ 1/16W 1%
C1, C2	CAP X7R 0.1µF 10% 16V
J1	CONN MICRO-B USB SMD

Configuration Details, Cont.

Note: The VDDB output of the the dongle will overshoot when initially plugged into a Host PC. In configurations where the SCL and SDA pull-up resistors are terminated to the adapter's VDDB supply, special care should be taken to avoid damaging the power module's SCL and SDA pins due to this overshooot. It is recommended to first plug the adapter into a Host PC, then connect to the power module's I²C bus. Please see appropriate module data sheets for information on absolute maximum rated voltages for I²C clock and data pins.

Figure 3
I2C-ADAPTER-A02
VDDB overshoot (6.2V$_{PEAK}$)

CH1

VDDB

CH1 VDDB: 1V/div   Timebase: 800µs/div

Figure 4
I2C-ADAPTER-A03
VDDB overshoot (4.2V$_{PEAK}$)

CH1

VDDB

CH1 VDDB: 1V/div   Timebase: 800µs/div

Application Details

The PMBus-USB Adapter, along with the listed companion accessories and Power System Configurator GUI, provides a convenient means to demonstrate the PMBus® digital interface offered on Vicor power modules in an evaluation environment. With these tools, the user can quickly get started with evaluating the features offered by the PMBus interface and determining the needs of a final production power system.

Features

- Easily configure and monitor PMBus enabled Vicor power modules
  - Power System Configurator GUI for PMBus control interface; contact Vicor Applications for details
- USB connection to host PC
- Provides external bias (VDDB)
- Isolated PMBus to host interface (4242V_{DC})
- Measurement of input and output parameters such as voltage, current and temperature
- Fault monitoring and reporting
- Enable / Disable control with compatible products

Table 2
PMBus companion accessories

Part Number	Description
I2C-ADAPTER-A02	PMBus-USB Adpater
I2C-ADAPTER-A03	PMBus-USB Adpater
Software Interface	Power System Configurator GUI

GUI Configuration

After making the necessary connections, follow the guidelines for configuring the GUI and to ensure establishment of communication between the power module and the host PC.

1. Verify I²C™ bus voltage is available for external SCL and SDA pull-up resistors, whether from VDDB or external source.

2. Power up module within the input voltage continuous operating range specified by the device datasheet.

3. Open the Power System Configurator software installed on the connected host PC.

4. The Power System Configurator GUI will connect with and display any compatible Vicor products on the Devices side panel.

5. Verify the desired power module device is selected (highlighted in orange) for communication through the GUI.

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