CP2112 Evaluation Kit User's Guide

1. Kit Contents

The CP2112 Evaluation Kit contains the following items:

- CP2112 Evaluation Board
- USB Cable
- DVD
- Quick Start Guide

2. Relevant Documentation

Application notes can be found on the Interface Application Notes page for all fixed-function devices: www.silabs.com/interface-appnotes.

- **AN721: CP210x/CP211x Device Customization Guide** — Customize the VID, PID, serial number, and other parameters stored in the CP2112 one-time programmable ROM.
- **AN496: CP2112 HID-to-SMBus API Specification** — Provides function descriptions and examples for all of the PC software functions that control the CP2112.
- **AN495: CP2112 Interface Specification** — Describes the HID report format for CP2112 devices.

3. Software Setup

The Software Development Kit (SDK) for the CP2112 kit is included on the kit DVD. The latest version of this installer can also be downloaded from the www.silabs.com/cp2112ek website. This package includes:

- **Device Customization Utility**
- **Documentation** — data sheet, application notes, user's guide, quick start guide, etc.
- **HidSmbusExample** — Example software utilizing the CP2112 API interface described in AN496.
- **Library** — repackaged HID DLL and CP2112 API DLL

The Windows installer should launch automatically after inserting the DVD. For Mac and Linux, browse to the appropriate directory on the DVD to install the software package. Follow the instructions to install the SDK to the system. The CP2112 is an HID device, so a driver does not need to be installed on most operating systems.

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4. CP2112 Hardware Interface

1. Connect the CP2112 evaluation board to a PC as shown in Figure 1.
2. Connect one end of the USB cable to a USB Port on the PC.
3. Connect the other end of the USB cable to the USB connector on the CP2112 evaluation board.
4. Connect the SDA, SCL, and Ground pins on the CP2112 to an SMBus device. External pull-up resistors are not needed if the pull-up resistors on the CP2112 evaluation board are used.

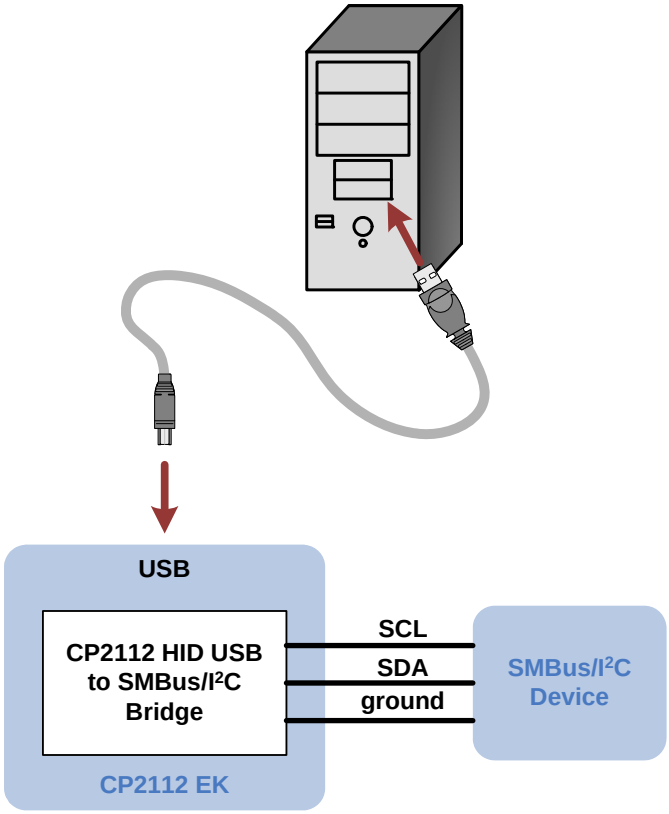


Figure 1. Hardware Setup

5. CP2112 Software Interface

The CP2112 is an HID device that uses the standard HID functions available in the operating system. To facilitate this process in Windows, Silicon Labs packaged the standard HID functions into the SLABHIDDevice DLL in the CP2112 software package. The HID report structure for the CP2112 is customized for the device and is not compatible with other HID report structures, like a mouse or keyboard. AN495, “CP2112 Interface Specification” describes the custom HID report structure for the CP2112, and AN496, “CP2112 HID-to-SMBus API Specification” describes the API software functions that can be used to read or write data and control the CP2112 from the PC. The software application described in “6. CP2112 Windows Application” provides an example of how to use these functions.

The CP2112 appears as an HID device in Device Manager as shown in Figure 2.

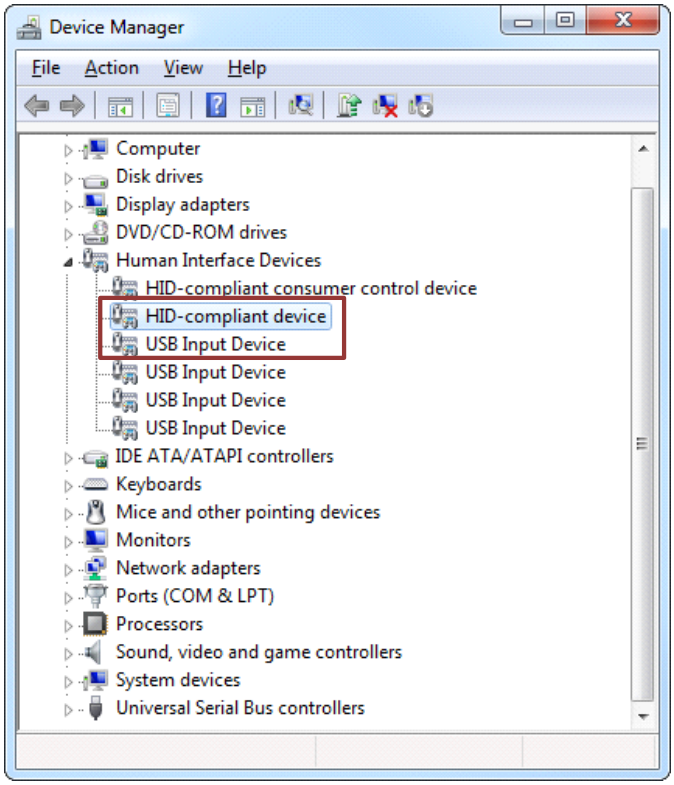


Figure 2. CP2112 in Device Manager

6. CP2112 Windows Application

The HID SMBus Example application uses the Windows CP2112 HID-to-SMBus DLL to transmit and receive data with the CP2112. The application also has access to the CP2112's GPIO pins. Figure 3 shows a screenshot of the Windows Application. The following steps describe how to start the application and use some of its features.

1. Ensure that the hardware is connected to a Windows PC as shown in Figure 1. If the device is properly connected, the red SUSPEND LED on the CP2112 evaluation board will turn on.
2. Launch the Hid SMBus Example application, which is found by clicking **Start→All Programs→Silicon Laboratories→CP2112 Evaluation Kit→HidSmbus Example**.
3. In this application, you can configure the SMBus settings and GPIO pins, customize the device descriptors, and read/write data over the SMBus interface.
4. Select the appropriate device in the **Connection** drop down box and click **Connect**.
5. The **Configuration tab** enables setting and getting the SMBus configuration parameters. To set a parameter, modify the value that is in the corresponding text box or check/uncheck a box and click **Set SMBus Config**. To verify that the settings took effect, click **Get SMBus Config**. These configuration parameters reset to their default values when the CP2112 is reset.

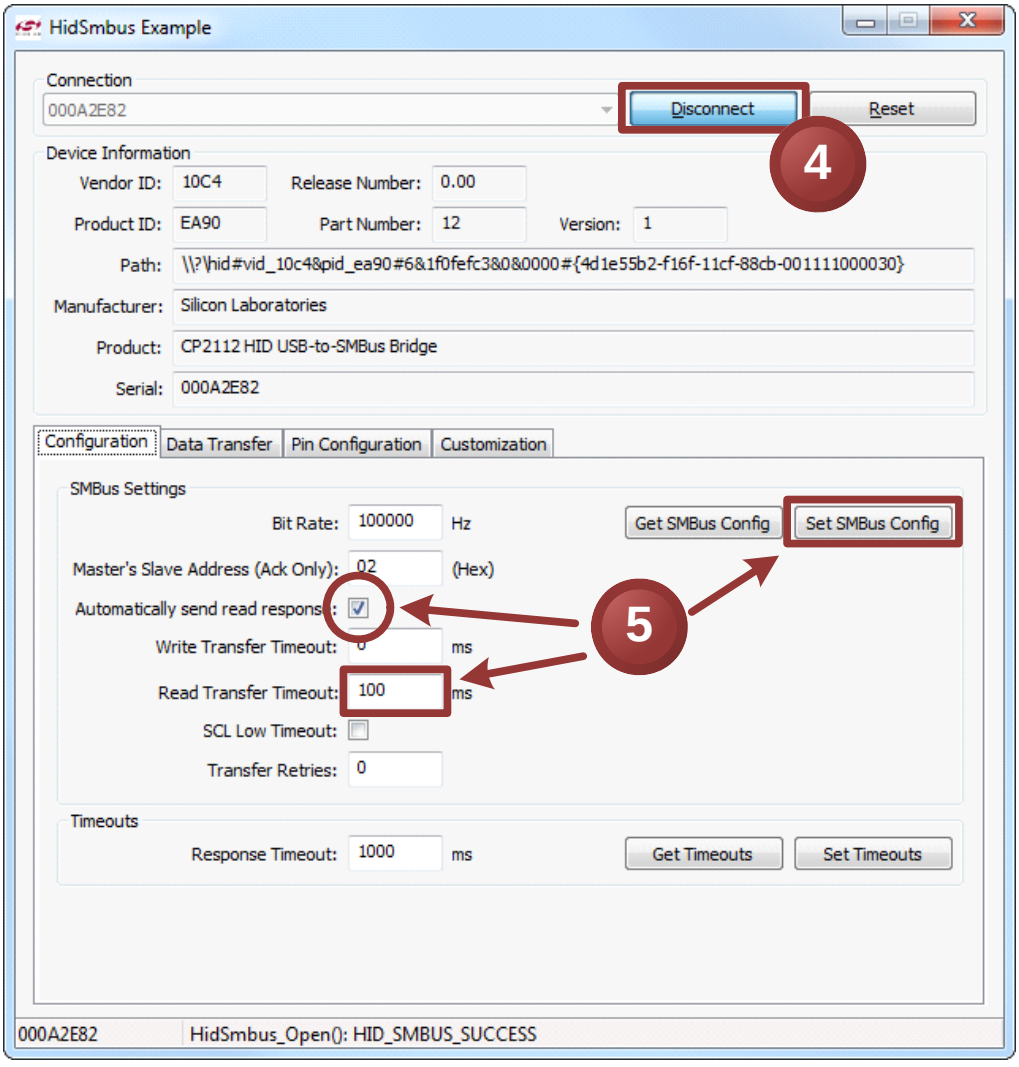


Figure 3. Configuring the SMBus Interface using the Example Application

6. To read data from an SMBus device (non-addressed mode):
   a. Click the **Data Transfer** tab.
   a. Enter the slave address and the number of bytes to read in the **Read Request** box.
   b. Click the **Read Request** button.
   c. To see the number of bytes that were read back, click **Get Read/Write Transfer Status** and verify the number of bytes read at the bottom of the application.
   d. Next, click **Force Read Response** and then **Get Read Response** until the application reads back the total number of bytes. The bytes will be shown in the **Received Data** field. The status of the CP2112 will be shown at the bottom of the application.

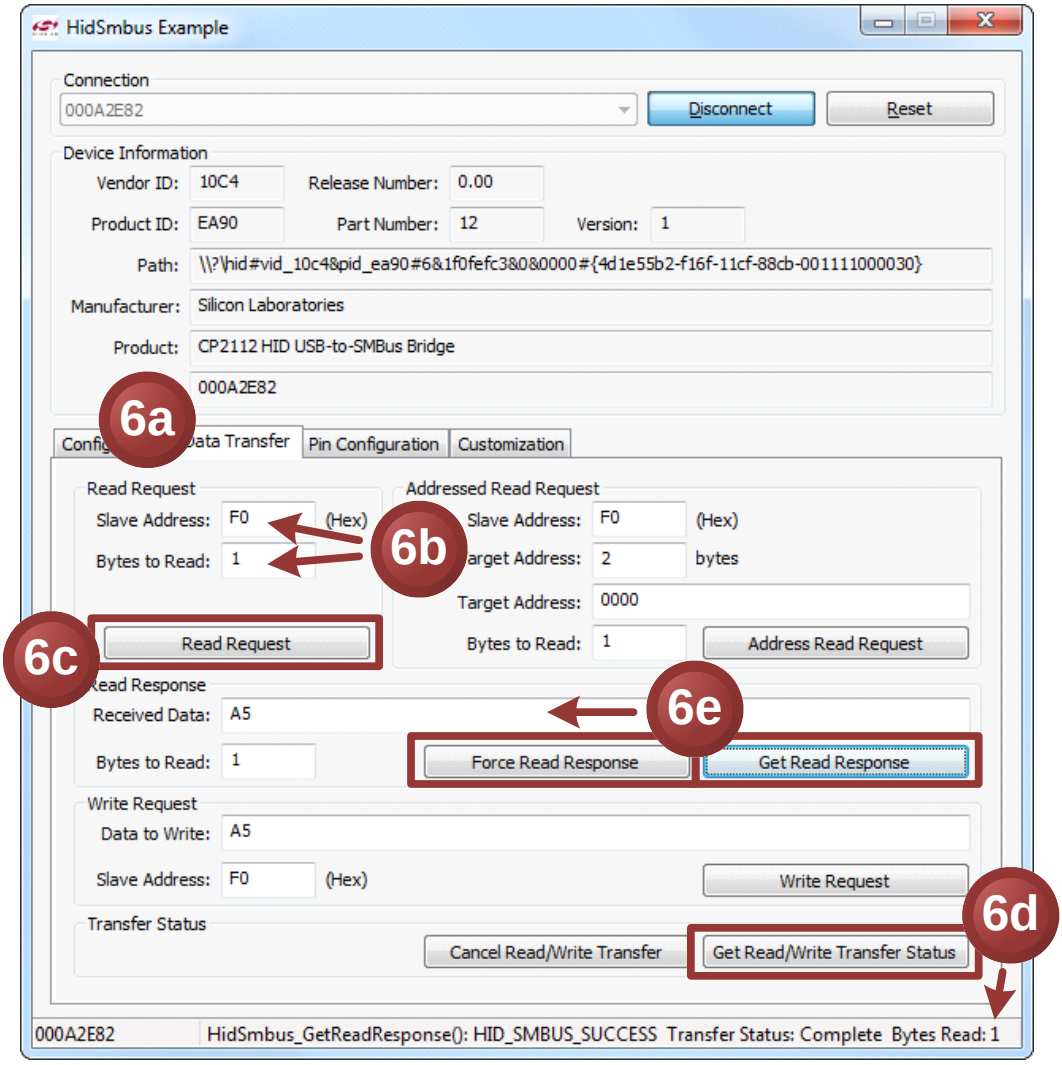


Figure 4. Performing a Non-Addressed Read using the Example Application

7. To read data from an EEPROM or similar device (addressed mode):

   a. Click the **Data Transfer** tab.

   e. Enter the slave address, the number of address bytes in the target address, the target address of the SMBus device being read (in hex), and the number of bytes to read in the **Addressed Read Request** box.

   f. Click the **Address Read Request** button.

   g. To see the number of bytes that were read back, click **Get Read/Write Transfer Status** and verify the number of bytes read at the bottom of the application.

   h. Click **Force Read Response** and then **Get Read Response** until the application reads back the total number of bytes. The bytes will be shown in the **Received Data** field. The status bar of the application displays the current status of the CP2112.

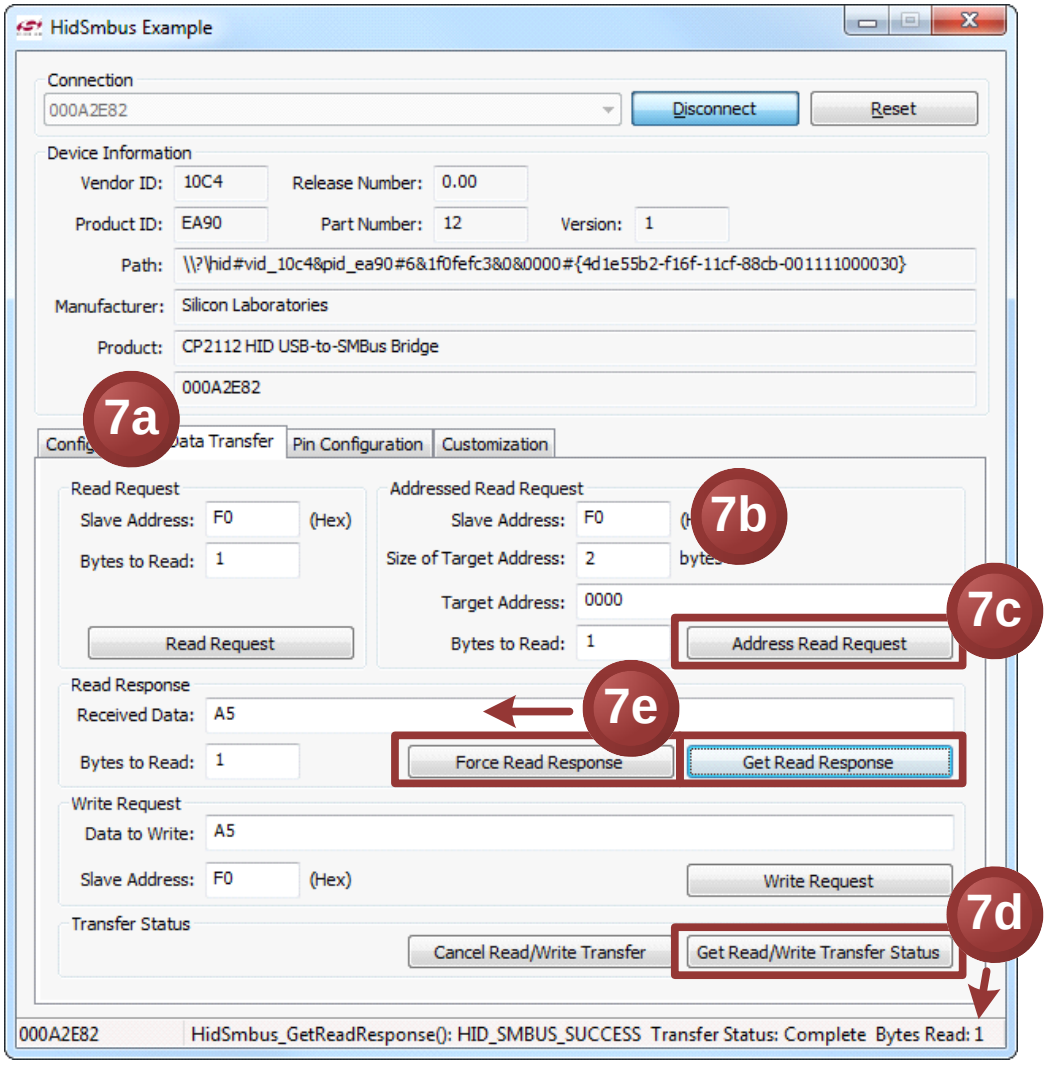


Figure 5. Performing an Addressed Read using the Example Application

8. To write data over the SMBus interface:
   a. Click the **Data Transfer** tab.
   i. Enter the Slave address and data (in hex) in the **Write Request** box.
   j. Click the **Write Request** button.
   k. Click **Get Read/Write Transfer Status** and verify that the transfer completed using the status bar at the bottom of the application.

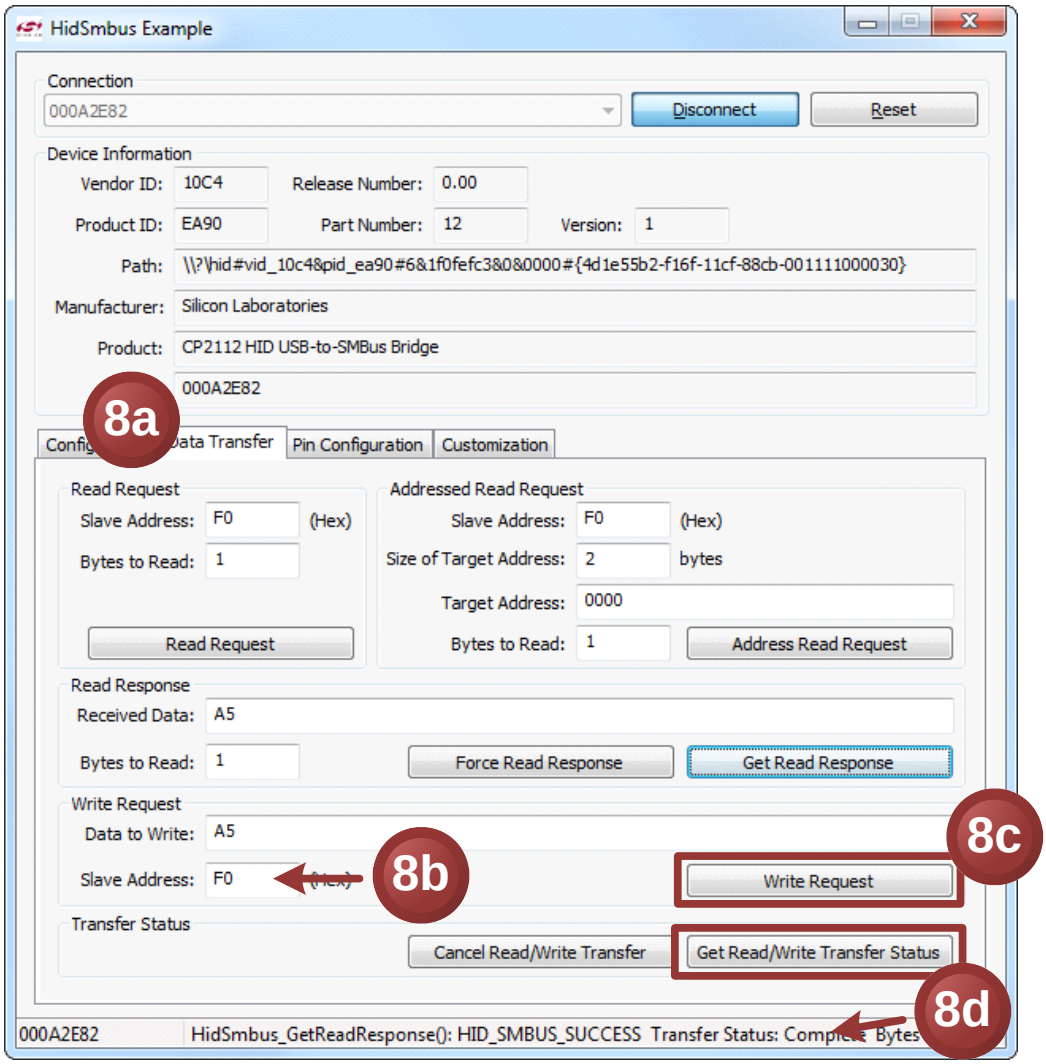


Figure 6. Performing a Write using the Example Application

9. The **Pin Configuration** tab enables configuration of the GPIO and special functions (TX Toggle, RX Toggle, and Clock Output).

   a. Click the Pin Configuration tab.

   l. GPIO pins toggle between Input/Ouput and Open-Drain/Push-Pull by clicking the corresponding GPIO boxes in the **GPIO Configuration** area. Check the boxes for **TX Toggle**, **RX Toggle**, and **Clock Output** to enable the special functionality on these pins. Click the **Set GPIO Config** button to update the device settings.

   m. The **Latch Values** section enables writing or reading the GPIO latches. Clicking the box next the GPIO pins listed will scroll through 1, 0, and X for a don't care. Click the **Write Latch** button to change the state of the GPIO latch.

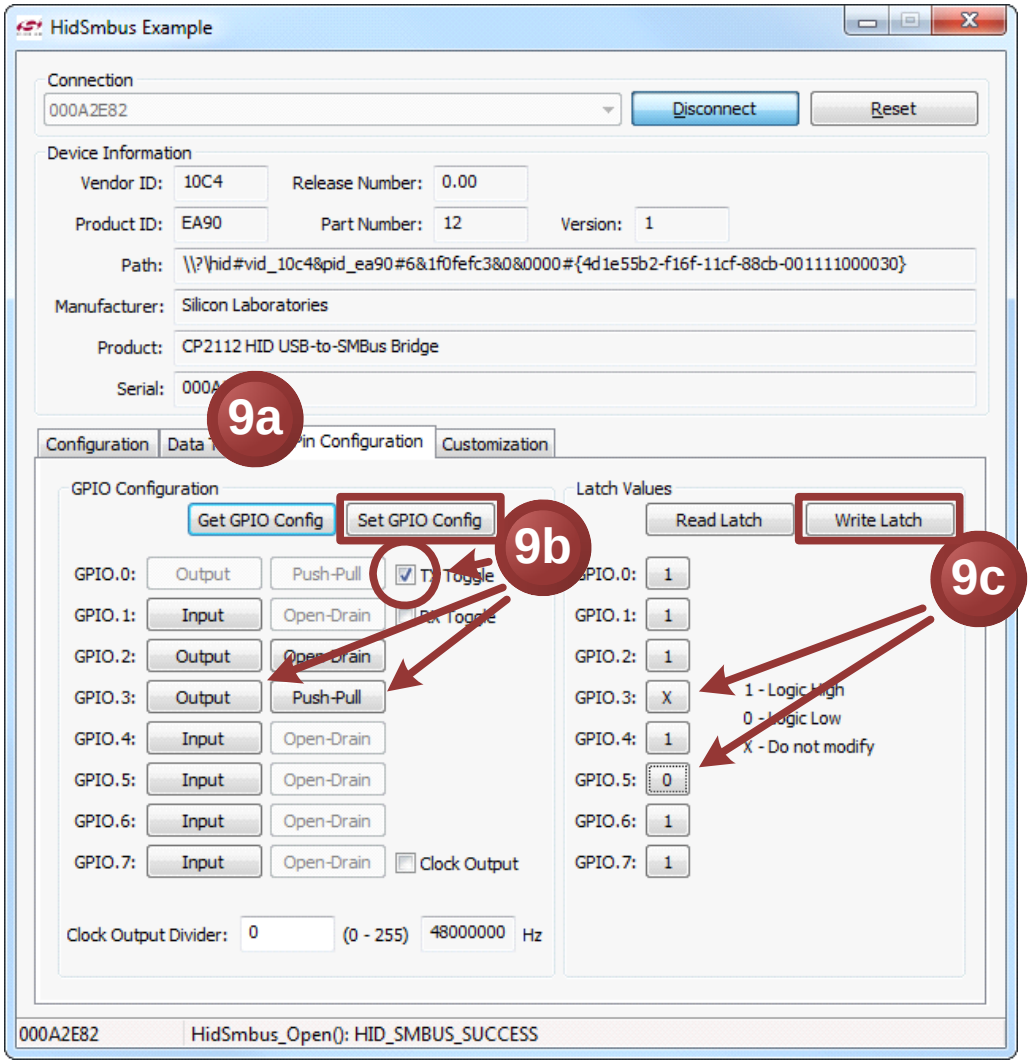


Figure 7. Configuring the CP2112 Pins using the Example Application

10. The **Customization** tab allows for programming the One-Time-Programmable (OTP) parameters of the device. These parameters can only be programmed once and cannot be changed back to their default values after being programmed. This tab has the same functionality as the CP2112SetIDs application provided with the CP2112 software package. In order for these parameters to be sucessfully programmed, a 4.7 µF capacitor must be connected between the VPP pin and ground. This capacitor is populated by default on the CP2112 Evaluation Kit board has this capacitor. See "8. Schematic" on page 12 for more information.
    a. The **USB Customization** section sets the USB parameters. Click **Get** to retrieve the current settings. Change the settings by modifying the text boxes and checking the box next to the parameter being modified. Click the **Set** button to program the device with the modified settings. The parameter will not be changed without checking the corresponding box. Perform a **Get** after changing any parameters to ensure that the settings updated correctly.

n. The **String Descriptors** section enables modification of the serial strings in the CP2112. Type a string into the corresponding text box and click the **Set** button to modify the strings. Perform a **Get** after changing any parameters to ensure that the settings updated correctly.

o. The **Lock Byte** section displays which fields have been programmed and can lock fields to prevent future modification. Any field that has been programmed will not be checked. To prevent a field from being programmed, uncheck the corresponding box and click the **Set** button. Perform a **Get** after changing any parameters to ensure that the settings updated correctly.

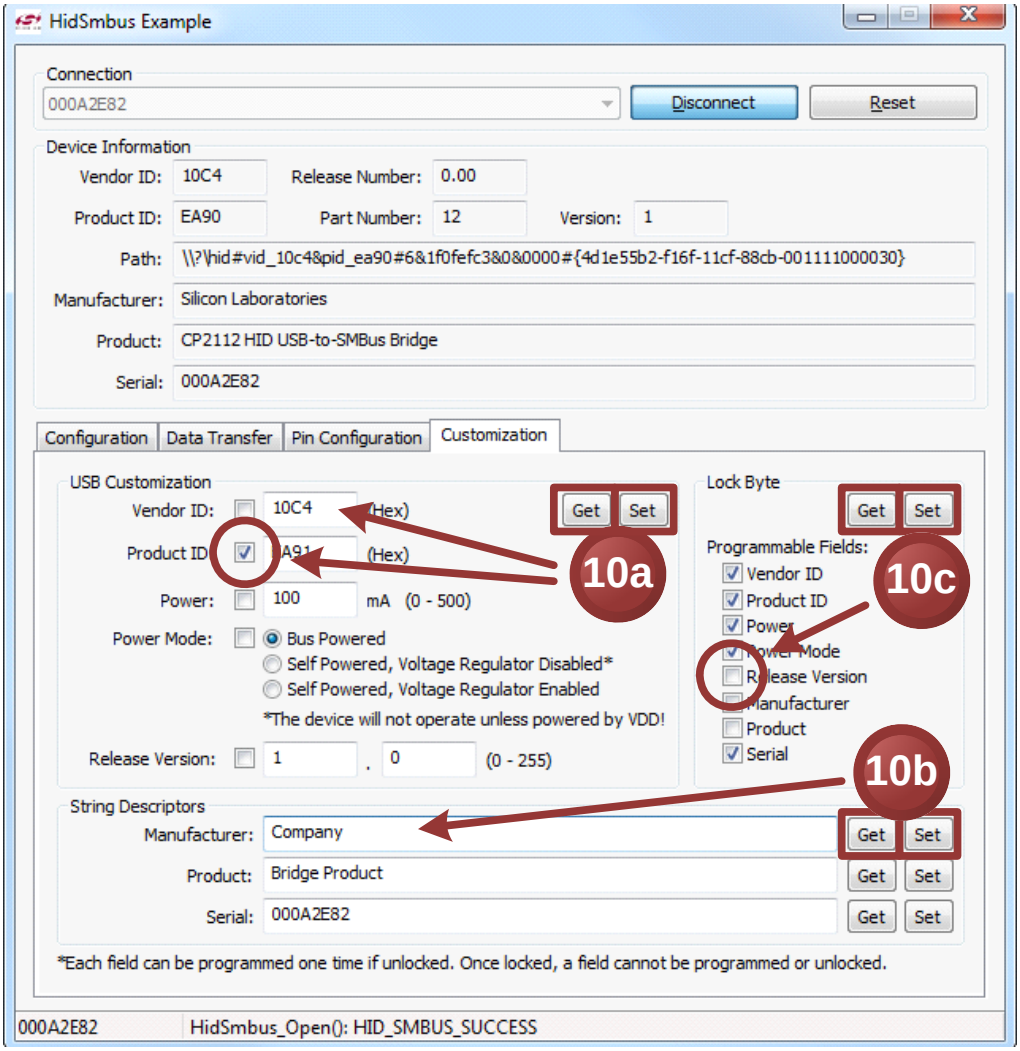


Figure 8. Customizing a CP2112 Device using the Example Application

7. Target Board

The CP2112 Evaluation Kit includes an evaluation board with a CP2112 device pre-installed for evaluation and preliminary software development. Numerous input/output (I/O) connections are provided to facilitate prototyping using the evaluation board. Refer to Figure 9 for the locations of the various I/O connectors. Refer to Figure 10, “CP2112 Evaluation Board Schematic” for information regarding the SMBus pull-up resistors that are located on the target board.

P1	USB connector for USB interface
H1	Access Connector for SMBus interface (SDA, SCL, GND, Pull-Up Voltage)
J1, J2, J3, J4	GPIO access connectors
J6	Power connector
J7	SMBus pull-up voltage connector
J8	Red $\overline{\text{SUSPEND}}$ LED connector
DS0–DS7	Green GPIO LEDs
DS8	Red $\overline{\text{SUSPEND}}$ LED
TB1	SMBus interface terminal block

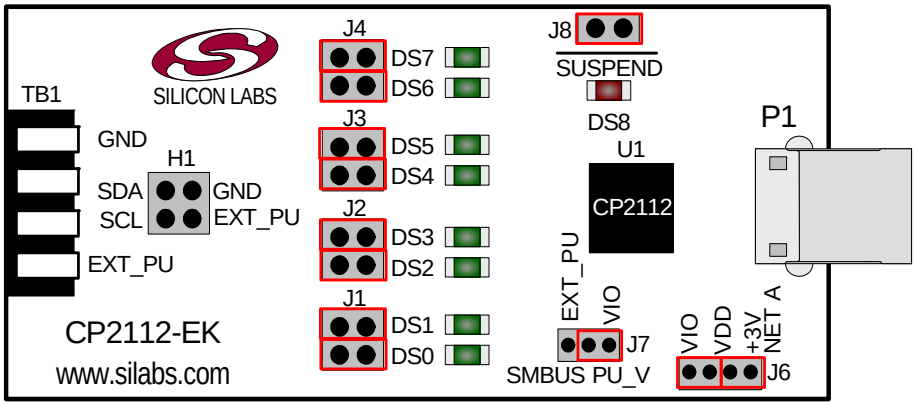


Figure 9. CP2112 Evaluation Board with Default Shorting Blocks Installed

7.1. LED Headers (J1, J2, J3, J4)

Connectors J1, J2, J3, and J4 are provided to allow access to the GPIO pins on the CP2112. Place shorting blocks on J1, J2, J3, and J4 to connect the GPIO pins to the eight green LEDs, DS0–DS7. These LEDs can be used to indicate active communications through the CP2112. Table 1 lists the LED corresponding to each header position.

Table 1. J2 and J3 LED Locations

LED	Pins
DS0	J1[3:4]
DS1	J1[1:2]
DS2	J2[3:4]
DS3	J2[1:2]
DS4	J3[3:4]
DS5	J3[1:2]
DS6	J4[3:4]
DS7	J4[1:2]

7.2. Universal Serial Bus (USB) Interface (P1)

A Universal Serial Bus (USB) connector (P1) is provided to facilitate connections to the USB interface on the CP2112. See Table 2 for the USB pin definitions.

Table 2. USB Connector Pin Descriptions

Pin #	Description
1	VBUS
2	D-
3	D+
4	GND (Ground)

7.3. SMBus Signals (TB1, H1)

The SMBus interface terminal block and access headers are included to easily interace SMBus devices to the evaluation board. The terminal block can be used to connect wires to the board, and the access connectors can be used to connect scope probes to the SMBus interface for debugging. The signals that are accessible through these two connectors are SDA, SCL, GND, and the external pull-up voltage signal.

7.4. VDD and VIO Power Connector (J6)

This header (J6) is included on the evaluation board to provide several power options. The following describes the function of each pin:

- Pins 1–2: Connect CP2112 VIO input (pin 5) to CP2112 VDD (Pin 6). Remove the shorting block to power VIO from an external source.
- Pins 3–4: Connects the main +3 V net to the CP2112 VDD (Pin 6). The main +3 V net powers the other components (eight green LEDs) on the board.

7.5. SMBus Pull-Up Voltage Connector (J7)

This header (J7) is included on the evaluation board to provide power options for SMBus pull-up voltage. The following describes the function of each pin:

- J7[1:2]: Connects CP2112 VIO pin (Pin 5) to the 4.7 kΩ pull-up resistors located on the evaluation board.
- J7[2:3]: Connects the External Pull-Up signal from TB1 (Pin 4) to the 4.7 kΩ pull-up resistors on the evaluation board.

7.6. $\overline{\text{SUSPEND}}$ LED Connector (J8)

The J8 header is used to connect the CP2112 $\overline{\text{SUSPEND}}$ pin (Pin 17) to the DS8 red LED. When the LED is on, the device has enumerated with the PC operating normally. When the LED is off, the device has not yet enumerated or is in the USB Suspend state.

8. Schematic

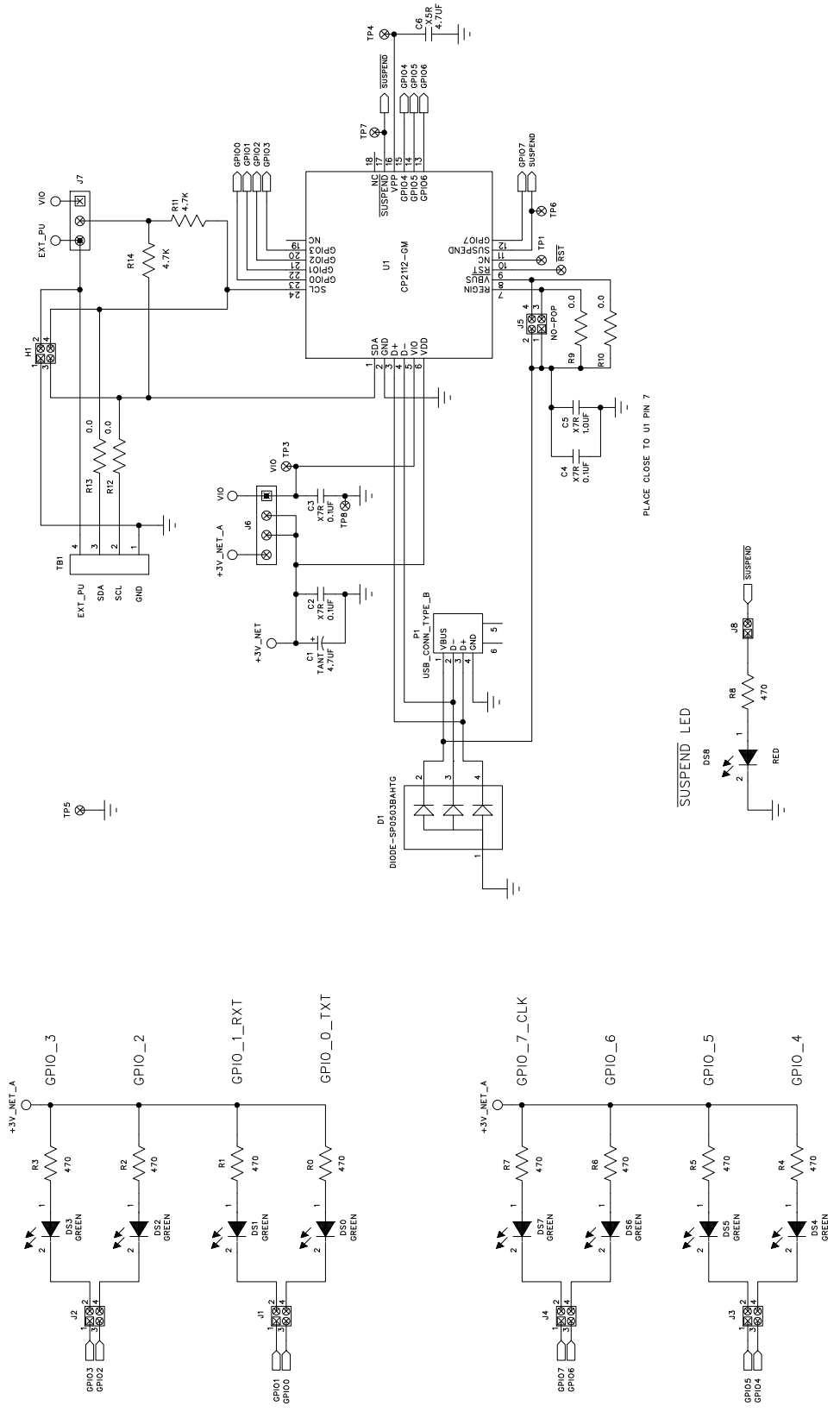


Figure 10. CP2112 Evaluation Board Schematic

DOCUMENT CHANGE LIST

Revision 0.1 to Revision 0.2

- Updated Figure 1.
- Updated "6. CP2112 Windows Application" on page 4.
  - Instructions and figures from updated PC application.
- Updated Figure 10 on page 12.

Revision 0.2 to Revision 0.3

- Updated “1. Kit Contents” to change CD-ROM to DVD.
- Added “2. Relevant Documentation” and “5. CP2112 Software Interface”.
- Updated “3. Software Setup” to point to the drivers on the website.
- Updated Figure 1.
- Updated the instructions and figures in “6. CP2112 Windows Application”.

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