AN495: CP2112 Interface Specification

The Silicon Laboratories CP2112 is a USB device that adheres to the USB-defined Human Interface Device class specification.

HIDs communicate with a USB host through the use of reports. This document is a specification for the reports supported by the CP2112 and describes the configurable parameters.

Silicon Laboratories provides dynamic libraries that adhere to this specification for the following operating systems:

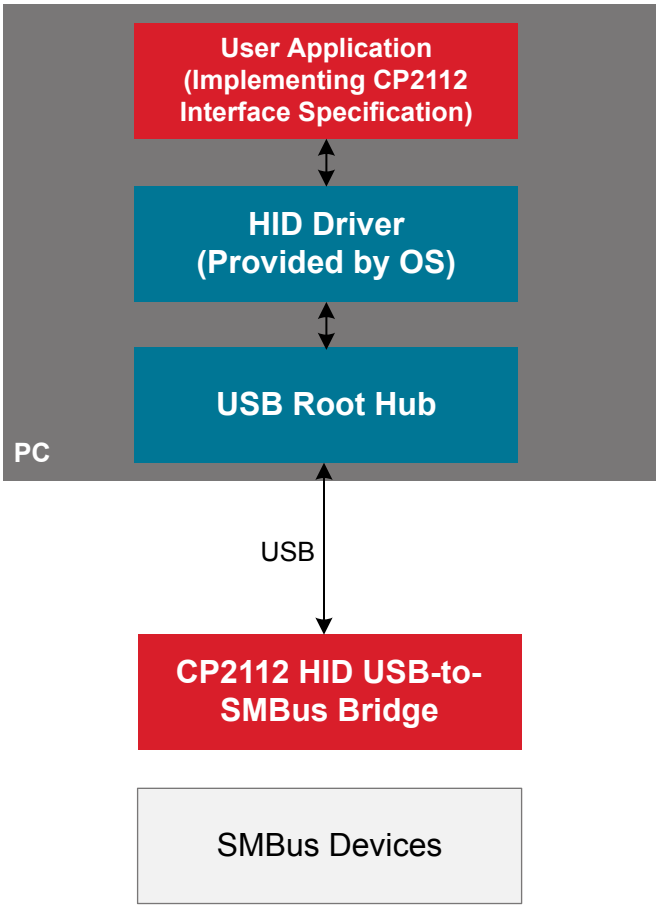
- Windows®
- Mac®

This document is intended for:

- Users who are using an operating system that is not supported by the dynamic libraries and who need to implement their own interface
- Users who want to integrate the device interface into their application

KEY POINTS

- The CP2112 uses an HID interface with custom reports defined.
- Applications can communicate with the CP2112 on any platform or operating system by implementing the reports defined in this document.
- Dynamic libraries implementing these reports are available for some operating systems. See *AN496: CP2112 HID USB-to-SMBus API Specification* for more information.



1. Additional Documentation

- *CP2112 data sheet*, available at http://www.silabs.com/products/interface/hidusbtosmbus.
- Dynamic libraries that adhere to this CP2112 Interface specification are available for various operating systems. See www.silabs.com/interface-software and the CP2112 SDK for more information.
- *AN496: CP2112 HID USB-to-SMBus API Specification* — This document discusses the CP2112 libraries. The document and libraries are available at http://www.silabs.com/products/interface/hidusbtosmbus.
- HID Device Class Definition, available at http://www.usb.org/developers/hidpage/.

2. Defaults

2.1 Default Values for Parameters Stored in PROM and Pin Settings

The following table lists the default values for the one-time configurable parameters stored in the PROM of the CP2112.

Table 2.1. Default PROM Values

Parameter	Default Value
VID	0x10C4
PID	0xEA90
Power	0x32 (100 mA)
Power Mode	Bus Powered
Release Number	0x0100 (Release Version 01.00)
Manufacturing String	Silicon Laboratories
Product String	CP2112 HID USB-to-SMBus Bridge
Serial String	0001
Lock Byte	0xFF[1]

Note:
1. The lock bytes indicate which parameters have already been programmed. See 8.1 Get/Set Lock Byte for more details.

The following table lists the default values for the GPIO, SUSPEND, and SMBus pins. The GPIO pins are configured in RAM and should be reconfigured each time the device is reset. The SUSPEND and SMBus pins are non-configurable.

Table 2.2. Default Pin Settings

Parameter	Default Config Value
GPIO0_TXT	Open-Drain
GPIO1_RXT	Open-Drain
GPIO2	Open-Drain
GPIO3	Open-Drain
GPIO4	Open-Drain
GPIO5	Open-Drain
GPIO6	Open-Drain
GPIO7_CLK	Open-Drain
SDA	Open-Drain
SCL	Open-Drain
SUSPEND	Push-Pull Output
/SUSPEND	Push-Pull Output

2.2 Default SMBus Configuration

The following table lists the default settings for the SMBus. These settings are used at device power-up or reset.

Table 2.3. SMBus Settings

Parameter	Default Value
Clock Speed	0x0186A0 (100 kHz)
Device Address	0x02
Auto Send Read	0x00 (Disabled)
Write Timeout	0x00 (Disabled)
Read Timeout	0x00 (Disabled)
SCL Low Timeout	0x00 (Disabled)
Retry Time	0x00 (No Limit)

3. Report Overview

Communication with the CP2112 is performed using HID Reports as defined in the HID Device Class Definition. The class definition is available for download from http://www.usb.org/developers/hidpage/.

3.1 Reports Response

The CP2112 responds to reports in different ways, depending on whether the report configures a parameter on the device using a Set Report or requests data from the device using a Get Report. A list of all supported reports is available in 4. Report ID List.

3.1.1 Set Reports

In response to a Set Report, the CP2112 will not return any report or acknowledgement of a report. To verify that a report has completed successfully, use the corresponding Get Report to obtain the data. The delay imposed by the HID protocol between reports guarantees that there will be no race condition between the execution of a Set Report and Get Report verification. A Set Report will always complete before the device receives the Get Report.

3.1.2 Get Reports

If a report requests data from the device and the report is valid, the device will return a report with the requested data. If the report is invalid, the device will stall.

3.2 Data Format

In all of the reports, the first byte of the data portion of the payload is the Report ID. In the report definitions in this document, the Report ID is stored in index 0 of the payload and is not explicitly listed in the table. All data content in the report starts at index 1. The reports have a maximum length of 64 bytes, indexed from 0 to 63. For any multi-byte values sent in the reports, the values are sent most-significant byte first.

4. Report ID List

Table 4.1. Report IDs

Report ID	Report Name
Device Configuration (Feature Request)	
0x01	Reset Device
0x02	Get/Set GPIO Configuration
0x03	Get GPIO
0x04	Set GPIO
0x05	Get Version Information
0x06	Get/Set SMBus Configuration
Data Transfer (Interrupt Transfer)	
0x10	Data Read Request
0x11	Data Write Read Request
0x12	Data Read Force Send
0x13	Data Read Response
0x14	Data Write
0x15	Transfer Status Request
0x16	Transfer Status Response
0x17	Cancel Transfer
USB Customization (Feature Requests)	
0x20	Get/Set Lock Byte
0x21	Get/Set USB Configuration
0x22	Get/Set Manufacturing String
0x23	Get/Set Product String
0x24	Get/Set Serial String

5. Device Configuration Reports

5.1 Reset Device

Report ID: 0x01

Direction: Feature Request Out

Name	Offset	Size	Value	Description
Reset Type	1	1	0x01	Reset with re-enumeration

`Reset Device` is used to restart the device from the USB host. The device re-enumerates on the USB bus, and all SMBus configuration settings are reset to their default values. If any value other than 0x01 is sent with the `Reset Type` field of the command, the command will be ignored.

For certain operating systems, such as Windows, initiating a device reset and re-enumerating will make the device's handle stale. The user application is responsible for handling this “surprise disconnect” event. See *AN496: CP2112 HID USB-to-SMBus API Specification* for more information regarding surprise disconnects.

5.2 Get/Set GPIO Configuration

Report ID: 0x02

Direction: Feature Request In/Out

Name	Offset	Size	Value	Description
Direction	1	1	0x00	0 = input 1 = output
Push-Pull	2	1	0x00	0 = open-drain 1 = push-pull
Special	3	1	0x00	Enables special functions of GPIO pins. See Table 5.
Clock Divider	4	1	0x00	0 = 48 MHz Clock Output All other values will output a clock signal determined by Equation 1 below.

`Get/Set GPIO Configuration` is used to configure the eight GPIO pins as input/output and open-drain/push-pull through the `Direction` and `Push-Pull` fields. GPIO0 corresponds to bit zero (the least significant bit), and GPIO7 corresponds to bit seven (the most significant bit). For pins that are configured as an input, push-pull mode is ignored.

`Special` is used to enable special functionality on GPIO0_TXT, GPIO1_RXT, and GPIO7_CLK. By setting a bit in the `Special` byte of this report, the functionality is enabled. The following table has more information regarding the special functionality.

Bit in Special Byte of Get/Set GPIO Configuration	GPIO Pin	Value	Description
Bit 0	GPIO7_CLK	0 1	GPIO Pin Clock Output - Push-Pull Output
Bit 1	GPIO0_TXT	0 1	GPIO Pin TX Toggle - Push-Pull Output
Bit 2	GPIO1_RXT	0 1	GPIO Pin RX Toggle - Push-Pull Output
Bit 3–Bit 7	—	—	Not Used

`Clock Divider` specifies the clock output frequency on GPIO7_CLK when the clock output is enabled. If `Clock Divider` is 0, a 48 MHz clock will be output on GPIO7_CLK. Otherwise, the following equation can be used to determine the clock output.

$$\text{GPIO7\_CLK Clock Frequency} = \frac{48\ \text{MHz}}{2 \times \text{ClockDivider}}$$

5.3 Get GPIO Values

Report ID: 0x03

Direction: Feature Request In

Name	Offset	Size	Value	Description
Latch Value	1	2	*	Current latch values

If a pin is configured as a GPIO input pin, the corresponding `Latch Value` bit represents the input value. If a pin is configured as a GPIO output pin, the corresponding `Latch Value` bit represents the logic level driven on the pin. GPIO0_TXT corresponds to bit zero (the least significant bit), and GPIO7_CLK corresponds to bit seven (the most significant bit).

5.4 Set GPIO Values

Report ID: 0x04

Direction: Feature Request Out

Name	Offset	Size	Value	Description
Latch Value	1	1	*	Latch value
Latch Mask	2	1	*	Pin to set to new latch value

`Set GPIO Values` sets the values for GPIO pins.

The desired value for the pin is configured in `Latch Value`. To drive a “1” on an output pin, the corresponding bit should be set to “1”. To drive a “0” on an output pin, the corresponding bit should be set to “0”.

The Report sets new values only for output pins that have a “1” in the corresponding bit position in `Latch Mask`. If the corresponding bit in `Latch Mask` is set to “0”, a new pin value will not be set, even if the pin is configured as an output pin.

This Report does not affect any pins that are not configured as outputs.

5.5 Get Version Information

Report ID: 0x05

Direction: Feature Request In

Name	Offset	Size	Value	Description
Part Number	1	1	0x0C	Device part number
Device Version	2	1	Varies	

`Part Number` indicates the device part number. The CP2112 returns 0x0C.

`Device Version` is the version of the device. This value is not programmable over the HID interface.

5.6 Get/Set SMBus Configuration

Report ID: 0x06

Direction: Feature Request In/Out

The values in **bold** are the default values.

Name	Offset	Size	Value	Description
Clock Speed	1	4	**0x186A0** *	**100 kHz** SMBus Clock Speed in Hertz
Device Address	5	1	**0x02**	Bits 7–1 make up device address (least significant bit is masked)
Auto Send Read	6	1	**0x00** 0x01	**Disabled** Enabled
Write Timeout	7	2	**0x0000** *	**No Timeout** 0–1000 ms timeout value
Read Timeout	9	2	**0x0000** *	**No Timeout** 0–1000 ms timeout value
SCL Low Timeout	11	1	**0x00** 0x01	**Disabled** Enabled
Retry Time	12	2	**0x0000** *	**No Limit** 0–1000 retries

Values from the Set Report are not stored in PROM. These parameters must be initialized after every power-on or device reset.

`Clock Speed` is the frequency of the SMBus clock in hertz (Hz). It is stored as a big-endian 4-byte unsigned number. For example, to run the SMBus at 400 kHz, the value, 0x61A80, would need to be written to four clock speed bytes in this report. If a value of zero is written, this parameter is ignored.

`Device Address` is the 7-bit slave address of the CP2112. The CP2112 will ACK this address, but the CP2112 will not respond to any read or write requests. If the least significant bit is set in this byte (read/write bit), this parameter is ignored.

`Auto Send Read` controls the read response behavior of the device. If enabled, the device will automatically send read response interrupt reports to the host after a read transfer is initiated. If disabled, the host must issue the `Data Read Force Send` report before read response interrupt reports will be sent to the host.

`Write Timeout` and `Read Timeout` are the time limits in milliseconds before the CP2112 automatically cancels a transfer that has been initiated. If a transfer is canceled by a write or read timeout, the status byte of the `Transfer Status Response` command is set appropriately. If this value is set to 0x0000, the device continues to attempt the transfer until the transfer completes or until the `Cancel Transfer` command is sent. Any value greater than 1000 is ignored.

`SCL Low Timeout` is a timeout that resets the SMBus if the SCL line is held low for more than 25 ms. If enabled and an SCL Low Timeout occurs, the status byte of the `Transfer Status Response` command will be set appropriately. Any value other than 0x00 and 0x01 is ignored.

`Retry Time` is the number of attempts that the CP2112 attempts to complete a transfer before terminating the transfer. Any value greater than 1000 is ignored.

6. Data Transfer Reports

6.1 Data Read Request

Report ID: 0x10

Direction: Interrupt Out

Name	Offset	Size	Value	Description
Slave Address	1	1	*	Must be between 0xF7–0x02. Least significant bit is read/write bit and must be zero.
Length	2	2	*	Number of bytes (1–512 bytes) to read back

`Slave Address` is the 7-bit address of the slave device from which data is being read. The address must be between 0xF7 and 0x02 (the least significant bit is the read/write bit and must be zero). All other values are ignored.

`Length` is the number of bytes being requested from the slave device. The CP2112 can request between 1 and 512 bytes from a slave device. Any value outside that range is ignored.

6.2 Data Write Read Request

Report ID: 0x11

Direction: Interrupt Out

Name	Offset	Size	Value	Description
Slave Address	1	1	*	Must be between 0xF7 and 0x02. Least significant bit is the read/write bit and must be zero.
Length	2	2	*	Number of bytes (1–512 bytes) to read back
Target Address Length	4	1	*	Number of bytes in target address (from 0x01 to 0x10)
Target Address	5	16	*	Address of device to be read. The number of bytes in this field must match the number of bytes specified in the *target length address* above.

`Slave Address` is the 7-bit address of the slave device from which data is being read. The address must be between 0xF7 and 0x02 (the least significant bit is the read/write bit and must be zero). All other values are ignored.

`Length` is the number of bytes that are being requested from the slave device. The CP2112 can request between 1 and 512 bytes from a slave device. Any value outside that range is ignored.

`Target Address Length` is the number of bytes in the target address of the slave device from which data is being read. The target address length must be between 1 and 16. Any value outside that range is ignored.

`Target Address` is the address of the memory location being read on the slave device. The number of bytes in the target address must match the number of bytes in target address length. Target Address Length specifies the number of valid address bytes in `Target Address` starting with the byte at Offset position 5.

This type of report is used when a repeated start condition is used, which is common when accessing an EEPROM or something similar.

6.3 Data Read Force Send

Report ID: 0x12

Direction: Interrupt Out

Name	Offset	Size	Value	Description
Length	1	2	*	Number of valid data bytes

This forces the device to send a `Data Read Response` report when the next Interrupt IN token arrives. This is essentially polled mode reading. The PC should poll using `Transfer Status Request` first to determine whether data is ready. The number of bytes requested can be 1 to 512. If the number of bytes requested is greater than the number of valid bytes in the CP2112's received bytes buffer, only the valid bytes will be returned.

This command should only be used when `Auto Send Read` is set to 0x00. This command is ignored when `Auto Send Read` is set to 0x01. If a transfer is not in progress or if no data is in the buffer, this command performs no action. This command can be used while a read is in progress to retrieve the data received so far.

6.4 Data Read Response

Report ID: 0x13

Direction: Interrupt In

Name	Offset	Size	Value	Description
Status	1	1	0x00	Idle
			0x01	Busy
			0x02	Complete (once read, reverts to 0x00)
			0x03	Complete with error (once read, reverts to 0x00)
Length	2	1	*	Number of valid data bytes
Data	3	61	*	Data being returned from the SMBus slave device

Data for `Data Read Request`, `Data Write Request`, and `Data Read Force Send` will be returned to the host with this report ID.

`Status` shows the current status of the SMBus transmission.

`Length` is the number of valid data bytes being returned to the host.

`Data` is the actual data being returned to the host. Only the number of bytes specified in the `Length` field will be valid.

6.5 Data Write

Report ID: 0x14

Direction: Interrupt Out

Name	Offset	Size	Value	Description
Slave Address	1	1	*	Must be between 0xF7–0x02. Least significant bit is read/write bit and must be zero.
Length	2	1	*	Number of valid data bytes
Data	3	61	*	Data being returned from the SMBus slave device

`Slave Address` is the 7-bit address of the slave device to which data is being sent. The address must be between 0xF7 and 0x02 (the least significant bit is the read/write bit and must be 0). All other values are ignored.

`Length` is the number of bytes that are being sent to the slave device. The host can transmit 1 to 61 bytes to the CP2112. Any value outside that range is ignored.

`Data` is the actual data being sent over the SMBus to the slave device. The number of data bytes being sent in this field should match the number of bytes specified in the `Length` field.

6.6 Transfer Status Request

Report ID: 0x15

Direction: Interrupt Out

Name	Offset	Size	Value	Description
Request	1	1	0x01	Request SMBus transfer status

`Request` is used to request the current SMBus transfer status. If any value other than 0x01 is sent with the transfer status request, the command will be ignored.

6.7 Transfer Status Response

Report ID: 0x16

Direction: Interrupt In

Name	Offset	Size	Value	Description
Status 0	1	1	0x00	Idle
			0x01	Busy
			0x02	Complete (once read, reverts to 0x00)
			0x03	Complete with error (once read, reverts to 0x00)
Status 1	2	1	*	Specific conditions based on *Status 0* (see below)
Status 2	3	2	*	Number of retries before completing, being canceled, or timing out
Status 3	5	2	*	Number of received bytes

`Transfer Status Response` returns information on the SMBus interface.

`Status 0` returns the general status of the CP2112 SMBus interface.

If `Status 0` is 0x00, the rest of the status bytes are not valid. An exception to this rule applies to the first status read from CP2112-F03 devices, as described in 6.7.1 Additional CP2112-F03 Behavior.

`Status 1` returns specific information based off of `Status 0` and is dependent on the value of `Status 0`.

`Status 2` returns the number of retries before completing, being cancelled, or timing out.

`Status 3` returns the bytes successfully read.

Status 0	Status 1	Description
0x01	0x00	Address ACKed
	0x01	Address NACKed
	0x02	Data read in progress
	0x03	Data write in progress
0x02 and 0x03	0x00	Timeout address NACKed
	0x01	Timeout bus not free (SCL Low Timeout)
	0x02	Arbitration lost
	0x03	Read incomplete
	0x04	Write incomplete
	0x05	Succeeded after *Status 2* retries

For example, if this report returned the following data (in hexadecimal):

16 02 05 00 05

This corresponds to:

16: Report ID (Transfer Status Response)

02: Transmission complete without errors

05: Succeeded after the following bytes retry

00: Indicates zero retries

05: Five bytes were received

6.7.1 Additional CP2112-F03 Behavior

Note: This section applies to CP2112-F03 devices only.

To provide the ability for the USB host to detect and correct the situation of SCL or SDA being stuck low, the CP2112 performs the following actions after a reset:

- The CP2112 continuously samples the SCL and SDA signal lines for 112 µs. If SCL remains high and SDA remains low during the sampling period, the CP2112 implements the Bus Clear procedure as recommended in the I2C Bus Specification. Up to nine SCL pulses are generated, during which SDA may go high if a slave device had been holding it low.
- If SDA and/or SCL remain stuck low, the following bits will be set in the `Status 1` byte:
  - b7: Set if SDA is stuck low
  - b6: Set if SCL is stuck low

If either of these bits are set, the host can take appropriate system-level actions to deal with the situation, e.g. toggling a CP2112 GPIO bit that controls slave device RESET or power pins.

Testing for SCL/SDA stuck low occurs only during the CP2112 initialization sequence, and the SCL/SDA error bits will be set (if appropriate) only in the first Transfer Status Response that is read from the CP2112. The SCL/SDA error bits in subsequent Transfer Status Response Reports will be cleared even if SCL and/or SDA remain stuck low.

6.8 Cancel Transfer

Report ID: 0x17

Direction: Interrupt Out

Name	Offset	Size	Value	Description
Cancel	1	1	0x01	Will cancel the current transfer. All other values are ignored.

`Cancel` is used to cancel the current SMBus transfer. If any value other than 0x01 is sent with the reset command, the command is ignored.

7. Programmabe USB Parameters

The following parameters are programmable on the device. Five different reports are provided to program these parameters. Each parameter modified with these five reports can only be modified once.

Table 7.1. Programmable USB Parameters

Name	Description
VID	USB Vendor ID
PID	USB Product ID
Power	Power request in mA/2
Power Mode	Bus Powered (0x00) Self Powered - Regulator Off (0x01) Self Powered - Regulator On (0x02)
Release Version	Major and Minor release version
Manufacturer String	Product Manufacturer
Product String	Product Description
Serial String	Serialization String
Lock Byte	Indicates programmed values

VID

VID is the USB Vendor ID.

PID

PID is the USB Product ID.

Power

Power is the current requested by the device from the USB host in bus-powered mode. The units for this value are milliamps / 2. For example, if the device is configured to request 200 mA, the value for *Power* is 100. The maximum setting for *Power* is 500 mA, or a value of 250. Unpowered USB hubs are limited to providing 100 mA per port.

Power Mode

Power Mode indicates whether the device is operating in Bus-powered (0x00), Self-powered (0x01, voltage regulator disabled) or Self-powered (0x02, voltage regulator enabled) mode. If the device is configured for Self-powered mode, the value programmed for *Power* is not used during USB enumeration.

Release Version

Release Version is a user-programmable value. The most significant byte is the Major revision number. The least significant byte in the report is the Minor revision number. Both bytes can be programmed to any value from 0 to 255.

Manufacturing String

Manufacturing String is a 62-byte string in which the first two bytes must be set according to the USB specification (length, 0x03).

Product String

Product String is a 62-byte string in which the first two bytes must be set according to the USB specification (length, 0x03).

Serial String

Serial String is a 62-byte character array used to provide a unique serial number/string for the device. The first two characters must be set according to the USB specification (length, 0x03).

8. PROM Programming Reports

8.1 Get/Set Lock Byte

Report ID: 0x20

Direction: Feature Request In/Out

Name	Offset	Size	Value	Description
Lock Status	1	1	See Below	Shows which fields have already been programmed.

The device has a 1-byte field that indicates which of the customizable fields have been programmed. The following table shows the values of the bits:

Bit Position	Customizable Field
Bit 0	VID
Bit 1	PID
Bit 2	Max Power
Bit 3	Power Mode
Bit 4	Release Version
Bit 5	Manufacturer String
Bit 6	Product String
Bit 7	Serial String

If the bit value is set to 1, the corresponding field has not been customized. If the bit value is set to 0, the field has been customized or locked and can no longer be changed for this device.

Using the `Set Lock Byte` Report, any bit value set to 0 will lock the corresponding field. Send 0x00 to lock all parameters and prevent future customization.

8.2 Get/Set USB Configuration

Report ID: 0x21

Direction: Feature Request In/Out

Name	Offset	Size	Value	Description
VID Low Byte	1	1	*	VID Low Byte
VID High Byte	2	1	*	VID High Byte
PID Low Byte	3	1	*	PID Low Byte
PID High Byte	4	1	*	PID High Byte
Power	5	1	*	Power requested in mA/2
Power Mode	6	1	0x00 0x01 0x02	Bus Powered Self Powered - Regulator Off Self Powered - Regulator On
Release Major	7	1	*	Release Version Major Value
Release Minor	8	1	*	Release Version Minor Value
Mask	9	1	*	Mask for what fields to program

Get USB Configuration returns the values for the various fields and also the Mask value. The Mask value is equal to the most significant byte value returned in Report Get Lock Byte. If the corresponding Mask bit is set to “0”, the corresponding field has been programmed, and any Set USB Configuration function operating on that field is ignored.

Set USB Configuration is used to customize these fields. The corresponding Mask bit should be set to “1” to program the field. If the field has already been programmed once, an attempt to reprogram it is ignored. If a field is being programmed with the current value, the programmed bit will still be set.

See 8.1 Get/Set Lock Byte for the definition of Mask.

If a parameter is being modified using this report, the corresponding bit in Mask must be set to a 1. For example, if the VID needed to be programmed, bit 0 of Mask would need to be set to a 1, and the values in VID Low Byte and VID High Byte would be written to the CP2112.

8.3 Get/Set Manufacturing String

Report ID: 0x22

Direction: Feature Request In/Out

Name	Offset	Size	Value	Description
String Length	1	1	*	Length of manufacturer string + 2
USB Required	2	1	0x03	Required Value
Manufacturing String	3	60	*	First 60 bytes of string

The `Set Manufacturing String` Report can only be used once to set the Manufacturing String. Any subsequent calls to `Set Manufacturing String` are ignored.

The maximum value for `String Length` is 60. The first two bytes are allocated for `String Length` and the value 0x03, meaning the actual length of the pstring is 62 bytes. The device will ignore the report if `String Length` is too long.

8.4 Get/Set Product String

Report ID: 0x23

Direction: Feature Request In/Out

Name	Offset	Size	Value	Description
String Length	1	1	*	Length of product string + 2
USB Required	2	1	0x03	Required Value
Product String	3	60	*	First 60 bytes of string

The `Set Product String` Report can only be used once to set the Product String. Any subsequent calls to `Set Product String` are ignored.

The maximum value for `String Length` is 60. The first two bytes are allocated for `String Length` and the value 0x03, meaning the actual length of the payload part of the string is 62 bytes. The device will ignore the Report if `String Length` is too long.

8.5 Get/Set Serial String

Report ID: 0x24

Direction: Feature Request In/Out

Name	Offset	Size	Value	Description
String Length	1	1	*	Length of serial string + 2
USB Required	2	1	0x03	
Ser String	3	60	*	60 bytes of string

The `Set Serial String` Report can only be used once to set the Product String. Any subsequent calls to `Set Serial String` are ignored.

The maximum value for `String Length` is 60. The first two bytes are allocated for `String Length` and the value, 0x03, meaning the actual length of the payload part of the string, is 62 bytes. The device will reject the Report if `String Length` is too long.

9. Appendix—Pin Configuration Options

Some of the pins of the CP2112 are configurable as inputs, open-drain outputs, or push-pull outputs. These options are configured when the device has enumerated and is operating in a normal mode. When the CP2112 is in USB suspend, all of the configurable pins are limited to be open-drain or push-pull outputs. The following describes the differences between open-drain and push-pull, and the difference in behavior in Suspend mode. See the CP2112 data sheet for the electrical specifications of the GPIO pins.

- **GPIO Input**—When a pin is configured as a GPIO input, the pin can read a logic high or logic low value. Internally, the GPIO pin is connected to the VIO pin through a resistor. If the pin is not connected externally, it will return a logic high or 1. Any voltages connected to the pin should conform to data sheet specifications.
- **Open-Drain Output**—When a pin is configured as a GPIO open-drain output, the pin can output a logic high or logic low value. The default value is logic high, and a logic high value is created by internally connecting the GPIO pin to the VIO pin through a resistor. In this mode, the pin is unable to source any current when driving a logic high. If the Set GPIO Values Report is used to change the output to a logic low, the pin is internally connected to GND.
- **Push-Pull Output**—When a pin is configured as a GPIO push-pull output, the pin can output a logic high or logic low value. When driving a logic high value, the pin is directly connected to the VIO pin internally and can source current for devices, such as LEDs. When driving a logic low value, the pin is internally connected to GND.
- **Suspend Mode**—When the device is in Suspend mode, all of the GPIO pins are forced to be open-drain or push-pull outputs. The GPIO pins retain their state during suspend mode.

10. Document Change List

10.1 Revision 0.3

March 17th, 2017

Updated formatting.

Updated 5.6 Get/Set SMBus Configuration to include information about `Auto Send Read`.

Added 6.7.1 Additional CP2112-F03 Behavior.

10.2 Revision 0.2

August 2010

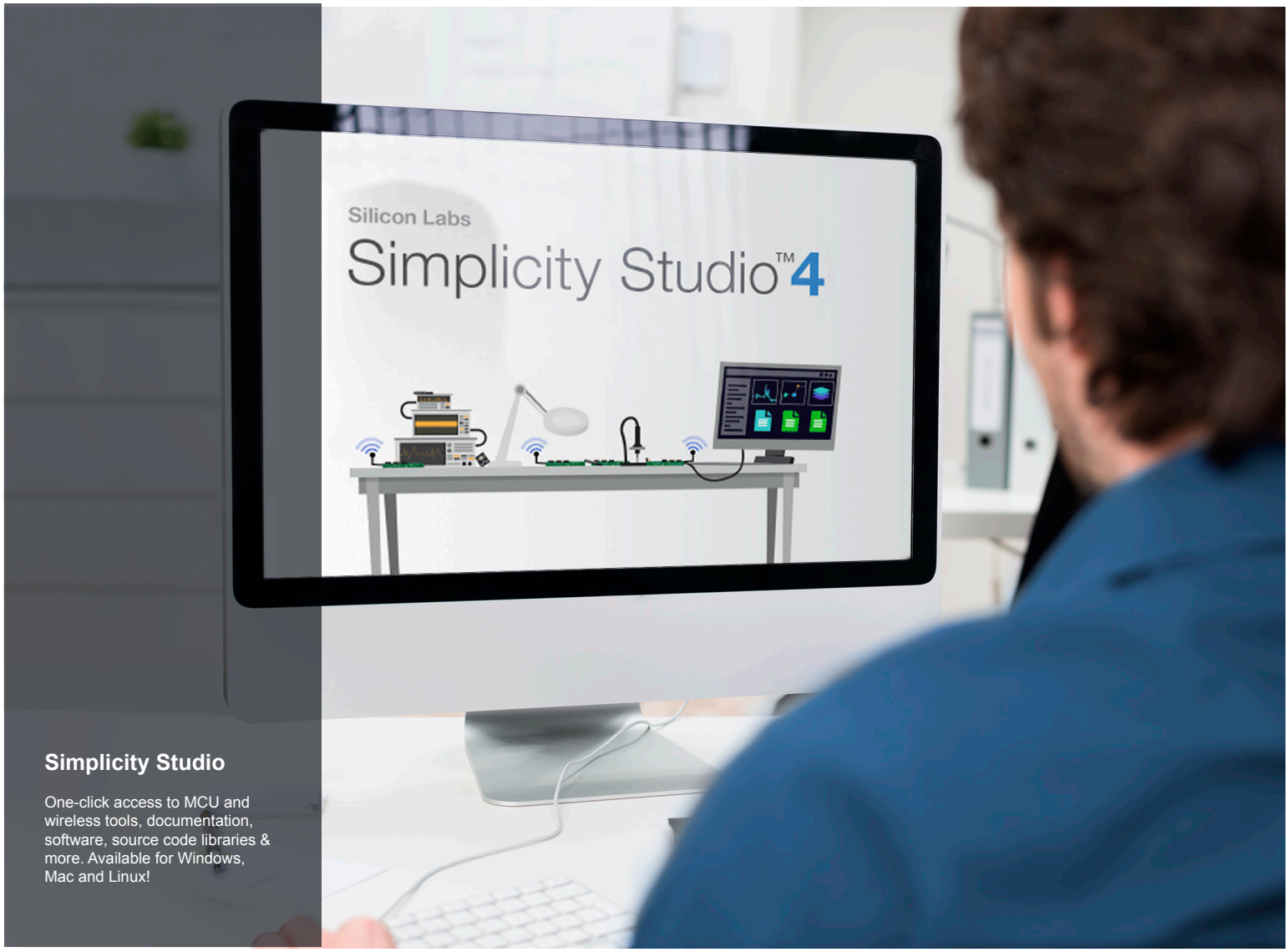
Updated 5.2 Get/Set GPIO Configuration with Special Functions.

Changed names of GPIO0 to GPIO0_TXT, GPIO1 to GPIO1_RXT, and GPIO7 to GPIO7_CLK.

10.3 Revision 0.1

May 2010

Initial release.



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