# MICROCHIP

# Product Change Notification - SYST-19TQDD495

**Date:**
20 Nov 2018

**Product Category:**
USB Hubs

**Affected CPNs:**
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**Notification subject:**
ERRATA - USB253x/USB3x13/USB46x4 Silicon Errata and Data Sheet Clarification

**Notification text:**

SYST-19TQDD495
Microchip has released a new DeviceDoc for the USB253x/USB3x13/USB46x4 Silicon Errata and Data Sheet Clarification of devices.
If you are using one of these devices please read the document located at USB253x/USB3x13/USB46x4 Silicon Errata and Data Sheet Clarification.

**Notification Status:** Final

**Description of Change:** Added new erratum 15.

**Impacts to Data Sheet:** None

**Reason for Change:** To Improve Productivity

**Change Implementation Status:** Complete

**Date Document Changes Effective:** 20 Nov 2018

**NOTE:** Please be advised that this is a change to the document only the product has not been changed.

**Markings to Distinguish Revised from Unrevised Devices:** N/A

**Attachment(s):**
USB253x/USB3x13/USB46x4 Silicon Errata and Data Sheet Clarification

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Affected Catalog Part Numbers (CPN)

USB2532-1080AEN
USB2532-1080AEN-TR
USB2532-1081AEN
USB2532-1081AEN-TR
USB2532I-1080AEN
USB2532I-1080AENTR
USB2532I-1081AEN
USB2532I-1081AEN-TR
USB2533-1080AEN
USB2533-1080AEN-TR
USB2533-1081AEN
USB2533-1081AEN-TR
USB2533I-1080AEN
USB2533I-1080AENTR
USB2533I-1081AEN
USB2533I-1081AEN-TR
USB2534-1050AEN
USB2534-1050AEN-TR
USB2534-1051AEN
USB2534-1051AEN-TR
USB2534-1080AEN
USB2534-1080AEN-TR
USB2534-1081AEN
USB2534-1081AEN-TR
USB2534I-1050AEN
USB2534I-1050AENTR
USB2534I-1051AEN
USB2534I-1051AEN-TR
USB2534I-1080AEN
USB2534I-1080AENTR
USB2534I-1081AEN
USB2534I-1081AEN-TR
USB3613-1080XY-TR
USB3613-1081XY-TR
USB3613I-1080XY-TR
USB3613I-1081XY-TR
USB3813-1080XY-TR
USB3813-1081XY-TR
USB3813I-1080XY-TR
USB3813I-1081XY-TR
USB4604-1051HN
USB4604-1051HN-TR
USB4604-1070HN
USB4604-1070HN-TR
USB4604-1080HN
USB4604-1080HN-TR

USB4604-1081HN
USB4604-1081HN-TR
USB4604I-1051HN
USB4604I-1051HN-TR
USB4604I-1070HN
USB4604I-1070HN-TR
USB4604I-1080HN
USB4604I-1080HN-TR
USB4604I-1081HN
USB4604I-1081HN-TR
USB4624-1051HN-TR
USB4624-1070HN
USB4624-1070HN-TR
USB4624-1080HN
USB4624-1080HN-TR
USB4624-1081HN
USB4624-1081HN-TR
USB4624I-1051HN
USB4624I-1051HN-TR
USB4624I-1070HN
USB4624I-1070HN-TR
USB4624I-1080HN
USB4624I-1080HN-TR
USB4624I-1081HN
USB4624I-1081HN-TR

# USB253x/USB3x13/USB46x4

# Silicon Errata and Data Sheet Clarification

This document describes known silicon errata for the USB253x/USB3x13/USB46x4 family of devices, which includes the following:

- USB2532
- USB2533
- USB2534
- USB3613
- USB3813
- USB4604
- USB4624

A summary of USB253x/USB3x13/USB46x4 silicon errata and the affected revisions is provided in Table 1.

**TABLE 1:       SILICON ISSUE SUMMARY**

| Item Number | Silicon Issue Summary | Affected Revisions |
|---|---|---|
| 1. | Minor Current Spike when Hibernating or Entering S3 Suspend | All |
| 2. | Upstream Battery Charger Detection | All |
| 3. | VDD33 Output Voltage | All |
| 4. | SE1 Super High Current Voltage Level Lower than Specification | All |
| 5. | SE1 Super High Current Comparator | All |
| 6. | SE1 Charger Detection | All |
| 7. | High Speed Split Transactions to Full Speed Endpoints | All |
| 8. | Microchip UCS100x Usage | All |
| 9. | LPM Compatibility with Port Remap and Port Disable | All |
| 10. | USB Device Reconnection Error in Windows 8 and Windows Server 2013 | All |
| 11. | Hub fails USBCV Chapter 9 test 9.21 | -1080, -1070, -1050 |
| 12. | Hub fails EL_42 SYNC Truncation | -1080, -1070, -1050 |
| 13. | Hub Startup Timing | All |
| 14. | Repeating byte pattern may cause bit loss | All |
| 15. | FlexConnect via SMBus enumeration issue | USB2532, USB2533, USB2534 |

# USB253x/USB3x13/USB46x4

## Silicon Errata Issues

### Module 1: Minor Current Spike when Hibernating or Entering S3 Suspend

DESCRIPTION

When some hosts enter suspend, the VBUS voltage will slowly decay rather than completely shutting off. This decay can cause the VBUS detection input to oscillate when the VBUS voltage hovers near the digital threshold. The USB253x/USB3x13/USB46x4 will then exit the suspend state and draw typical configured current until the 3ms of inactivity on the DP/DM pins will place the device back into suspend.

END USER IMPLICATIONS

There may be a temporary increase in the current consumption after the end users device has entered suspend mode.

#### Work Around

Since this issue is based on the decay of the host systems' VBUS, the Device can do nothing to prevent this. This is a temporary condition based on the VBUS voltage and the voltage divider resistances used, lower resistances can reduce the time of this occurrence but not remove it completely.

PLAN

This erratum is not planned to be corrected in a future revision.


### Module 2: Upstream Battery Charger Detection

DESCRIPTION

The USB253x/USB3x13/USB46x4 requires a device reset to restart upstream battery charger detection. This can be done by toggling RESET_B.

END USER IMPLICATIONS

If the self powered device detects one type of charger, and then connects to another type of charger without restarting the USB253x/USB3x13/USB46x4, the device will not update the battery charger detection register.

#### Work Around

If using the battery charger detection feature the RESET_N pin must be driven low when VBUS is not present and driven high when VBUS is detected. This will help conserve power by putting the Hub into the STANDBY state and it will ensure that the charger detection will update at every plug-in.

PLAN

This erratum is not planned to be corrected in a future revision.

**Module 3:     VDD33 Output Voltage**

DESCRIPTION

When the USB253x/USB3x13/USB46x4 draws ~150mA of current in single supply VBAT mode, the voltage on VDD33 can drop below 2.8V when VBAT is 2.9V at 85C. This voltage is used as the Full Speed pull up reference and the reference supply for other analog blocks.

END USER IMPLICATIONS

The end user could experience problems with Full Speed communication using 5m cables and long PCB traces. This is an uncommon occurrence and would only happen if the other ports were running full traffic at a rate to consume >150mA of current.

**Work Around**

The USB253x/USB3x13/USB46x4 only draws >150mA of current during high traffic transmission of High Speed data on the downstream ports. Reduce the cable length, or set VBAT to 3V or higher.

PLAN

This erratum is not planned to be corrected in a future revision.


**Module 4:     SE1 Super High Current Voltage Level Lower than Specification**

DESCRIPTION

When a downstream port has battery charging enabled in High Current or Super High Current charging mode, the voltages of the 2.0V and 2.7V outputs can be ~20mV less than the minimum inferred from the *iPod Accessory Protocol Standard Specification r32.* The minimum is calculated from the 5V+/-10% supply combined with a 75k/49.9k+/-1% voltage divider, giving 1.77V and 2.39V. This can occur when VBAT is 2.9V at 85C temperatures.

END USER IMPLICATIONS

An external device may not charge at the maximum current when the system when VBAT is 2.9V.

**Work Around**

VBAT must be greater than 3.0V if this feature is used.

PLAN

This erratum is not planned to be corrected in a future revision.


**Module 5:     SE1 Super High Current Comparator**

DESCRIPTION

The USB253x/USB3x13/USB46x4 comparator was tested to have a minimum detection threshold of 600mV at low voltages and the 85C temperature range. This is greater than the 550mV potential difference between DP and DM in high current chargers.

END USER IMPLICATIONS

The USB253x/USB3x13/USB46x4 could report the wrong type of charger if the charger DP voltage is at the maximum level of the 2V specification and the DM voltage is at the minimum level of the 2.7V specification.

**Work Around**

There is no known workaround.

PLAN

This erratum is not planned to be corrected in a future revision.

**Module 6:      SE1 Charger Detection**

DESCRIPTION

Voltages above 2.23V on both DP and DM can cause the charger detect algorithm to detect the wrong type of charger. This is because the USB4604/USB4624 and USB3813 also use the DP/DM voltage levels at startup to disable the ports.

END USER IMPLICATIONS

A wide variety of SE1 chargers were tested with the USB4604/USB4624 and USB3813 without any issue. At startup weak 15k resistors are used prevent this issue from happening, but if the voltages on DP and DM are driven with stronger drivers that overcome the 15k pull down resistors the upstream port could be disabled at POR, or the upstream battery charger detection state machine could return the wrong data.

#### Work Around

If battery charger detection is enabled on the USB4604/USB4624 or USB3813, Microchip recommends that the hub be powered and out of standby before a charger is connected. If operating in SMBus Slave mode, the charger detection can be restarted any time during the SOC configuration stage.

PLAN

This erratum is not planned to be corrected in a future revision.

**Module 7:      High Speed Split Transactions to Full Speed Endpoints**

DESCRIPTION

If a High Speed split transaction exceeds 288 bytes per microframe to a single downstream port the Transaction Translator of the USB253x/USB3x13/USB46x4 can be corrupted if another HS data packet is sent before the Full Speed packets downstream have completed.

END USER IMPLICATIONS

The corrupted data would be caught by the USB error checks in most applications causing the host to resend the data to the device, so it would not be noticed by the end user. But if the data is not checked by the device, and streamed to a speaker for example, the corrupted data can negatively impact the performance of the device.

#### Work Around

The throughput limits of FS devices is 288 bytes per microframe, a host driver must not schedule more than 288 bytes per microframe going to the same FS device.

PLAN

This erratum is not planned to be corrected in a future revision.

**Module 8:      Microchip UCS100x Usage**

DESCRIPTION

The UCS1002 is an $I^2C$ controlled power switch for the downstream VBUS. The USB4604/USB4624 and USB253x devices are able to communicate and control this switch through $I^2C$ by pulling up on the PRTPWR1 and OCS1_N pins. The Flex Connect feature will not work with the UCS1002 in this mode.

END USER IMPLICATIONS

The Flex Connect feature cannot be used with the UCS $I^2C$ control feature.

#### Work Around

The USC1002 will have to be configured to communicate through digital line control instead of $I^2C$, or use the UCS1001.

PLAN

This erratum is not planned to be corrected in a future revision.

**Module 9:       LPM Compatibility with Port Remap and Port Disable**

DESCRIPTION

Whenever the physical USB port does not match the logical port reported to the Hub, LPM functionality must be disabled. This includes using the Port Remap feature or disabling a port.

END USER IMPLICATIONS

If LPM is enabled while any physical port does not match its logical port, the final device will fail the Chapter 9 LPM tests. All other compliance tests will pass.

> **Work Around**
>
> If the Port Remap feature is used, the user must disable the LPM support. This can be done through ProTouch or by setting bit 1 of configuration register 3104h (HUB_CTL).
>
> When disabling ports, always start at the highest port number. For example, disable port 4 before disabling port 3. This will prevent any remapping of the ports that can create this anomaly.

PLAN

This erratum is not planned to be corrected in a future revision.


**Module 10:      USB Device Reconnection Error in Windows 8 and Windows Server 2013**

DESCRIPTION

There is an issue that affects the USB253x/USB3x13/USB46x4 when used with Windows 8 or Windows Server 2013. This issue occurs when a USB device is connected to a USB downstream port on the hub, the USB device is safely removed from the USB port, and a device (the same device or difference device) is then reconnected to the same downstream port of the hub. In this scenario, Windows does not detect the USB device. This issue occurs because the USB port is disabled after the device was safely removed from the port.

END USER IMPLICATIONS

A Windows 8 or Windows Server 2013 user may not be able to reconnect devices on USB downstream ports without rebooting Windows.

> **Work Around**
>
> To resolve this issue, install the Windows RT, Windows 8, and Windows Server 2012 update rollup 2845533, or install a hotfix that is described at http://support.microsoft.com/kb/2830154.

PLAN

This is a Windows software issue and will not be addressed in a future revision of the device.

# USB253x/USB3x13/USB46x4

**Module 11:     Hub fails USBCV Chapter 9 test 9.21**

DESCRIPTION

This failure is result of the LPM ECN released 9/28/2011. Per this ECN, previously reserved bits in the USB2 Extension Descriptor were allocated to BESL/HIRD support and recommended BESL values. Because the default values of these bits were previously set to 0 in the USB253x/USB3x13/USB46x4 products,  the BESL/HIRD  test will fail.  Note, the part does support the LPM features, the descriptor just needs to be updated.

END USER IMPLICATIONS

The USB-IF Chapter 9 tests will fail compliance, and LPM enabled hosts will not utilize the rapid suspend/resume features when communicating with the Hub.

### Work Around

This errata is fixed in the -1081 and -1051 versions of the device.

To correct this situation in -1080, -1070, and -1050 devices, the following configuration registers need to be changed through OTP or SMBus:

Register 3128h is the register for bits 7:0 in the bmAttributes of the USB 2.0 Extension Descriptor. Bits 1 and 2 must be set to pass the test. Bits 3 and 4 signal if the parts has BESL and Deep BESL recommendations. An example passing value would be 0x0Eh.

Register 3129h is the register for bits 15:8 in the bmAttributes of the USB 2.0 Extension Descriptor. These are recommended values for the host to use when implementing LPM. A recommended value would be 04h.

PLAN

This erratum is corrected in the -1081 and -1051 versions of the device.


**Module 12:     Hub fails EL_42 SYNC Truncation**

DESCRIPTION

The hubs contains a feature that turns off the USB clocks when no traffic is present on the USB lines. This reduces the Idle power consumption but not the maximum power consumption reported in the datasheet. This feature can sometimes cause the hub to truncate 4-6 SYNC pulses when enabled. This feature is enabled by default on -1080, -1070, and -1050 devices.

END USER IMPLICATIONS

With the power saving feature enabled, the host may not communicate with devices in the 5th tier of a USB hub network.

### Work Around

This feature is disabled by default in the -1081 and -1051 versions of the device.

To disable this feature in -1080, -1070, and -1050 devices through SMBus, write 00h to runtime register E9h. To disable this feature through OTP, the following configuration commands need to be added through SMBus or USB: **80 44 2B 01 00 FF.**

PLAN

This erratum is corrected with -1081 part type; contact Microchip for availability.

## Module 13: Hub Startup Timing

DESCRIPTION

The hub software has a startup variable that has no default value. This can cause the startup timing to be random between 10ms and 210ms.

END USER IMPLICATIONS

Systems that attempt to communicate with the hub via SMBus less than 200ms after RESET may randomly receive a failure.

### Work Around

Systems should wait a minimum of 220ms before communicating with the hub via SMBus to guarantee communication.

PLAN

This erratum is not planned to be corrected in a future revision.

## Module 14: Repeating byte pattern may cause bit loss

DESCRIPTION

When a byte pattern with 6 ones and 1 zero is repeated numerous times, consecutively, there is a chance that the repeater may miss one of the bits when receiving the signal.

END USER IMPLICATIONS

Under standard operating protocol, the device or host will ignore the corresponding bad CRC packet and retry the packet, which often results in successful data transfer. The issue is a result of the clock recovery circuit in combination with clock delta's between the USB device and hub. Generally this clock difference is temporary, and the hub will recover and successfully repeat the data packet. This issue has not been observed when the content of the USB data packet is compressed (i.e., H264, MPEG2, MPEG3, JPEG, etc).

### Work Around

Because the issue is temporary, setting the host to increase the number of times it retries a packet before issuing an error and resetting the USB device can reduce the impact to the end user. Because the retries are less than 125us apart, there is minimal impact on the timing.

PLAN

This erratum is planned to be corrected in a future revision.

**Module 15:     FlexConnect via SMBus enumeration issue**

DESCRIPTION

The USB253x requires a particular sequence of commands in order to allow it to flex and enumerate properly when initiating FlexConnect via SMBus.

END USER IMPLICATIONS

If a particular sequence is not followed, the hub may not enumerate properly on a newly flexed host. Also, not following the sequence will prevent the user from swapping between the flexed and unflexed states.

### **Work Around**

To resolve this issue, the following sequence must be followed:

Address: 0x2D   W   00 00 05 00 01 31 8E 83/81 // Enable FlexConnect with/without flex mode

Address: 0x2D   W   99 37 00

Address: 0x2D   W   00 00 05 00 01 30 EE 80 // Ensure the clock stay on during suspend

Address: 0x2D   W   99 37 00

Address: 0x2D   W   AA 55 00 // Attach (At this point, the device on port 1 will enumerate.)

Address: 0x2C   W   FF 40 // Page 2 of runtime register set

Address: 0x2C   W   8E 82/80 // Unflex, thus P0 is upstream

Address: 0x2C   W   8E 83/81 // Flex, thus P1 is upstream

Once this sequence is followed, the user is able to swap the upstream port by performing a write.

PLAN

This erratum is isolated to only the USB253x devices and is not planned to be corrected in a future revision.

## APPENDIX A:   DOCUMENT REVISION HISTORY

| REVISION LEVEL | DESCRIPTION |
|---|---|
| DS80000583E (10-29-18) | Added new erratum 15. |
| DS80000583D (08-22-17) | Added new erratum 14. |
| DS80000583C (06-02-16) | Added new errata 11, 12. and 13. Added errata summary table with links and affected revision information. Updated document formatting for consistency with Microchip standards. |
| DS80000583B (05-16-14) | Updated anomaly 9 to include information on port disable. |
| DS80000583A (09-24-13) replaces the previous SMSC version 1.2 | |
| Revision 1.2 (07-24-13) | Added anomaly 10, fixed misc. typos and grammatical errors |
| Revision 1.1 (05-31-13) | Updated anomalies, added anomalies 8 and 9 |
| Revision 1.0 (04-05-13) | Initial release |

# USB253x/USB3x13/USB46x4

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