



Intel[®] 495 Series Chipset Family On- Package Platform Controller Hub (PCH)

Specification Update

November 2020

Revision 012



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Revision History

Revision	Description	Date
001	<ul style="list-style-type: none"> Initial Release 	August 2019
002	<ul style="list-style-type: none"> The following errata are added: <ul style="list-style-type: none"> xHCI CV TD 2.2 Interrupter Handling xHCI Link Protocol Field Value 	October 2019
003	<ul style="list-style-type: none"> The following errata are added: <ul style="list-style-type: none"> xHCI Short Packet Event Using Non-Event Data TRB eSPI SBLCL Register Bit Not Cleared By PLTRST# 	November 2019
004	<ul style="list-style-type: none"> Updated: <ul style="list-style-type: none"> USB DbC Or Device Mode Port When Resuming From S3, S4, S5, or G3 State xHCI Power Management Link Timer The following errata are added: <ul style="list-style-type: none"> Leakage On VCC_VNNEXT_1P05 Power Rail With External Bypass VR xHCI Protocol Speed ID Count Field 	December 2019
005	<ul style="list-style-type: none"> The following erratum is added: <ul style="list-style-type: none"> System May Hang with USB-C* Power Adapter 	January 2020
006	<ul style="list-style-type: none"> The following erratum is added: <ul style="list-style-type: none"> Intel® Serial I/O Controller DMA LLP 4 GB Boundary Alignment 	April 2020
007	<ul style="list-style-type: none"> The following specification clarification is added: <ul style="list-style-type: none"> PCIe Precision Time Measurement (PTM) Byte Order 	May 2020
008	<ul style="list-style-type: none"> The following erratum is added: <ul style="list-style-type: none"> Audio Global Time Synchronization Register Access 	July 2020
009	<ul style="list-style-type: none"> The following erratum is added: <ul style="list-style-type: none"> S0ix Entry When Connecting an USB-C* Power Adapter 	August 2020
010	<ul style="list-style-type: none"> The following errata are added: <ul style="list-style-type: none"> FIVR Clock Frequency Variation Phase Lock Loop (PLL) Feedback Circuit 	September 2020
011	<ul style="list-style-type: none"> The following erratum is added: <ul style="list-style-type: none"> Time Synchronization with xHCI and GbE 	October 2020
012	<ul style="list-style-type: none"> The following errata are added: <ul style="list-style-type: none"> SATA Controller Support for Automatic Partial to Slumber Transition (APST) Feature Internal Clocking Phase Lock Loop (PLL) Locking Increased PCIe* Gen1 RX L0s Exit Latencies The following Specification Clarification is added: <ul style="list-style-type: none"> SX_EXIT_HOLDOFF# Not Functional with eSPI Enabled 	November 2020



Preface

This document is an update to the specifications contained in the Affected Documents table below. This document is a compilation of device and documentation errata, specification changes, and specification clarifications. It is intended for hardware system manufacturers and software developers of applications, operating systems, or tools.

Information types defined in nomenclature are consolidated into the specification update and are no longer published in other documents.

This document may also contain information that was not previously published.

Affected Documents

Title	Document Number
Intel® 495 Series Chipset Family On-Package Platform Controller Hub (PCH), Datasheet Volume 1 of 2	341080
Intel® 495 Series Chipset Family On-Package Platform Controller Hub (PCH), Datasheet Volume 2 of 2	341081

Nomenclature

Errata are design defects or errors. Errata may cause the behavior of the PCH to deviate from published specifications. Hardware and software designed to be used with any given stepping must assume that all errata documented for that stepping are present in all devices.

Specification Changes are modifications to the current published specifications. These changes will be incorporated in any new release of the specification.

Specification Clarifications describe a specification in greater detail or further highlight a specification's impact to a complex design situation. These clarifications will be incorporated in the next release of the specifications.



Summary Tables of Changes

The following tables indicate the errata, specification changes, specification clarifications, or documentation changes which apply to the product. Intel may fix some of the errata in a future stepping of the component and account for the other outstanding issues through documentation or specification changes as noted. These tables use the following notations:

Codes Used in Summary Tables

Stepping

X:	Erratum exists in the stepping indicated. Specification Change that applies to the stepping indicated.
(No mark) or (Blank box):	This erratum is fixed or not applicable in listed stepping or Specification Change does not apply to listed stepping.

Status

Doc:	Document change or update will be implemented.
Plan Fix:	This erratum may be fixed in a future stepping of the product.
Fixed:	This erratum has been previously fixed in Intel® hardware, firmware, or software.
No Fix:	There are no plans to fix this erratum.

Errata (Sheet 1 of 2)

Erratum ID	Stepping	Errata
	D0	
1	No Fix	USB Dbc Or Device Mode Port When Resuming From S3, S4, S5, or G3 State
2	No Fix	xHCI U1 Exit LFPS Duration
3	No Fix	xHCI Power Management Link Timer
4	No Fix	xHCI USB 2.0 ISOCH Device Missed Service Interval
5	No Fix	SPI SFDP Program Suspend And Program Resume Instruction Fields Not Used
6	No Fix	Intel® Trace Hub Pipe Line Empty
7	No Fix	PCIe* Root Port CLKREQ# Asserted Low To Clock Active Timing
8	No Fix	xHCI CV TD 2.2 Interrupter Handling
9	No Fix	xHCI Link Protocol Field Value
10	No Fix	xHCI Short Packet Event Using Non-Event Data TRB
11	No Fix	eSPI SBLCL Register Bit Not Cleared By PLTRST#
12	No Fix	Leakage On VCC_VNNEXT_1P05 Power Rail With External Bypass VR
13	No Fix	xHCI Protocol Speed ID Count Field
14	Fixed	System May Hang with USB-C* Power Adapter
15	No Fix	Intel® Serial I/O Controller DMA LLP 4 GB Boundary Alignment
16	No Fix	Audio Global Time Synchronization Register Access
17	No Fix	S0ix Entry When Connecting an USB-C* Power Adapter
18	No Fix	FIVR Clock Frequency Variation
19	No Fix	Phase Lock Loop (PLL) Feedback Circuit
20	No Fix	Time Synchronization with xHCI and GbE

Errata (Sheet 2 of 2)

Erratum ID	Stepping	Errata
	D0	
21	No Fix	SATA Controller Support for Automatic Partial to Slumber Transition (APST) Feature
22	Fixed	Internal Clocking Phase Lock Loop (PLL) Locking
23	Fixed	Increased PCIe* Gen1 RX L0s Exit Latencies

Specification Changes

Number	Stepping	Specification Changes
	D0	
		No specification changes in this revision of the Specification Update

Specification Clarification

Number	Specification Clarification
1	PCIe Precision Time Measurement (PTM) Byte Order
2	SX_EXIT_HOLDOFF# Not Functional with eSPI Enabled

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Errata

1. **USB DbC Or Device Mode Port When Resuming From S3, S4, S5, or G3 State**

Problem: If a PCH USB 3.2 Type-C port is configured in Device Mode (or in DbC mode) and connected to a external USB 3.2 host controller, it may cause the USB port to go into a non-functional state in the following scenarios:

1. The PCH resumes from S3, S4, or S5 state, the port may remain in U2.
2. The port is connected to a USB 3.2 Gen 1x1 host controller when resuming from S3, S4, S5, or G3, the port may enter into Compliance Mode or an inactive state if Compliance mode is disabled.
3. The port is connected to a USB 3.2 Gen 2x1 host controller when resuming from S3, S4, S5, or G3, the port may enter an inactive state.

Implication: PCH USB Type-C port configured in Device Mode (or in DbC mode) may fail to enumerate or become unavailable.

Workaround: None identified.

Status: For the steppings affected, refer to the ["Summary Tables of Changes"](#).

2. **xHCI U1 Exit LFPS Duration**

Problem: The xHCI U1 Exit LFPS (t13-t11) duration timing is implemented as 0.6 us to 0.9 us. The USB-IF released a ECN updating this timing value to 0.9 us to 1.2 us.

Implication: USB-IF xHCI CV TD 7.18 may report a failure. Intel has obtained a waiver for TD 7.18.

Note: No functional issues are expected.

Workaround: None.

Status: For the steppings affected, refer to the ["Summary Tables of Changes"](#).

3. **xHCI Power Management Link Timer**

Problem: The xHCI implements the Power Management Link Timer (PM LC Timer) Timeout value as 10 us instead of 4 us as defined by the USB 3.2 specification.

Implication: USB-IF xHCI CV TD 7.21 may report a failure. Intel has obtained a waiver for TD 7.21.

Note: No functional issues are expected.

Workaround: None.

Status: For the steppings affected, refer to the ["Summary Tables of Changes"](#).

4. **xHCI USB 2.0 ISOCH Device Missed Service Interval**

Problem: When the xHCI controller is stressed with concurrent traffic across multiple USB ports, the xHCI controller may fail to service USB 2.0 Isochronous IN endpoints within the required service interval.

Implication: USB 2.0 isochronous devices connected to the xHCI controller may experience dropped packets.

Note: This issue has only been observed in a synthetic environment.

Workaround: None.

Status: For the steppings affected, refer to the ["Summary Tables of Changes"](#).

5. SPI SFDP Program Suspend And Program Resume Instruction Fields Not Used

Problem: For flash device suspend/resume opcodes, the SPI controller does not use JEDEC SFDPs 13th DWORD bits [15:0], Program Suspend Instruction and Program Resume Instruction fields. The controller only uses bits [31:16], Suspend Instruction and Resume Instruction fields, to obtain the suspend/resume opcodes.

Implication: If the SPI flash requires bits [15:0] to be different than bits [31:16], then the suspend/resume feature is not functional. In this case, system behavior varies depending on what the suspend/resume instruction is and when it is generated.

Note: Major flash vendors have been using the same value for bits [31:16] and bits [15:0].

Workaround: None.

If a device requires bits [15:0] to be different than bits [31:16], then disable the device suspend / resume via the SPI Suspend / Resume Enable soft strap.

Status: For the steppings affected, refer to the ["Summary Tables of Changes"](#).

6. Intel® Trace Hub Pipe Line Empty

Problem: The Intel® Trace Hub Pipe Line Empty bit (CSR_MTB_BAR, Offset D4h) for a given output port may be set while the Input Buffer Empty for the associated output port is not set. This will only happen when the captureDone signal is de-asserted by clearing the ForceCaptureDone bit (CSR_MTB_BAR, Offset D8h) is cleared or the StoreQual[0] signal is de-asserted by the Trigger Unit before the pipe line is empty, and the destination is either system memory or USB (DCI).

Implication: There may be valid trace data in the trace source input buffer which did not get sent to the destination (output port).

Workaround: None.

CaptureDone should be cleared or de-asserted after the pipe line is empty.

Status: For the steppings affected, refer to the ["Summary Tables of Changes"](#).

7. PCIe* Root Port CLKREQ# Asserted Low To Clock Active Timing

Problem: During L1 exit, the PCH PCIe* Root Ports may exceed the CLKREQ# asserted low to clock active maximum specification due to PCH PCIe* clock un-gate path delays.

Implication: PCIe* end point device L1 exit instabilities may be observed.

Note: PCIe* end point devices that message LTR latency greater than or equal to 1 μ s are not affected by this.

Workaround: None.

- Platforms not supporting S0ix with PCIe* end point devices that do not support LTR may disable the associated PCH SRCCLKREQ# signal to keep the PCIe clock active during L1.
- Platforms supporting S0ix with PCIe* end point devices that have LTR latencies less than 1 μ s may disable the associated PCH SRCCLKREQ# signal to keep the PCIe* clock active during L1.

Status: For the steppings affected, refer to the ["Summary Tables of Changes"](#).

8. xHCI CV TD 2.2 Interrupter Handling

Problem: The xHCI Host Controller will clear the Interrupt Pending (IP) bit when the Interrupt Enable (IE) bit is set, contrary to the expectation of the xHCI CV TD 2.2 Interrupt Handling test.

Implication: USB-IF xHCI CV TD 2.2 may report a failure. Intel has obtained a waiver for TD 2.2.

Note: No functional impact is expected.

Workaround: None.

Status: For the steppings affected, refer to the "Summary Tables of Changes".

9. xHCI Link Protocol Field Value

Problem: The xHCI Host Controller reports the Link Protocol (LP) bits [15:14] as 0hh in the XECP_SUPP_USB3_5 Super Speed Plus register (xHCI MMIO offset 8034h). The xHCI spec rev 1.1 (published in Nov. 2017) defines this bit should be set to 1hh for SuperSpeed USB 10 Gbps port.

Implication: USB-IF xHCI CV TD 1.9 may report a failure. Intel has obtained a waiver for TD 1.9.

Note: No functional impact is expected.

Workaround: None.

Status: For the steppings affected, refer to the "Summary Tables of Changes".

10. xHCI Short Packet Event Using Non-Event Data TRB

Problem: The xHCI may generate an unexpected short packet event for the last transfer's Transfer Request Block (TRB) when using Non-Event Data TRB with multiples TRBs.

Implication: Transfer may fail due to the packet size error.

Note: This issue has only been observed in an synthetic environment. No known implication has been identified with commercial software.

Workaround: None identified.

Intel recommends software to use Data Event TRBs for short packet completion.

Status: For the steppings affected, refer to the "Summary Tables of Changes".

11. eSPI SBLCL Register Bit Not Cleared By PLTRST#

Problem: The IOSF-SB eSPI Link Configuration Lock (SBLCL) bit (offset 4000h, bit 27 in eSPI PCR space) is reset by RSMRST# assertion instead of PLTRST# assertion.

Implication: If the SBLCL bit is set to 1, software will not be able to access the eSPI device Capabilities and Configuration register in the reserved address range (0h - 7FFh) until RSMRST# asserts.

Workaround: None identified.

If software needs to access the eSPI device reserved range 0h - 7FFh while SBLCL bit is set to 1, a RSMRST# assertion should be performed.

Status: For the steppings affected, refer to the "Summary Tables of Changes".

12. Leakage On VCC_VNNEXT_1P05 Power Rail With External Bypass VR

Problem: Leakage on VCC_VNNEXT_1P05 power rail may be observed when external bypass VR is operating with VID value of 0.76 V.

Implication: System may shut down due to the external VR over voltage protection (OVP) limits.

Workaround: Platform designs with an external VR must be designed to operate with Over Voltage Protection (OVP) range of: $1.155\text{ V} \leq \text{OVP} \leq 1.365\text{ V}$ for all VID settings (1.05 V and 0.76 V).

Status: For the steppings affected, refer to the "Summary Tables of Changes".

13. xHCI Protocol Speed ID Count Field

Problem: The xHCI Host Controller reports an incorrect Protocol Speed ID Count value for the USB 3.2 Supported Protocol Capability register - xHCI MMIO offset 8028 bits [31:28].

Implication: USB-IF xHCI CV TD 1.9 may report a failure.

Note: No functional impact is expected.

Workaround: None identified.

Status: For the steppings affected, refer to the "Summary Tables of Changes".

14. System May Hang with USB-C* Power Adapter

Problem: Connecting a USB-C* power adapter to a PCH USB port may cause a race condition that can result in a xHCI controller hang. This issue only occurs on designs where the USB-C Power Delivery (PD) implements OOB messaging to communicate with the PCH for port mapping.

Implication: The system may hang.

Note: This issue does not occur when the system is in Sx state and has only been observed when repeatedly connecting a USB-C power adapter.

Workaround: A fix has been identified for this erratum and may be available in a software update.

Status: For the steppings affected, refer to the "Summary Tables of Changes".

15. Intel® Serial I/O Controller DMA LLP 4 GB Boundary Alignment

Problem: If software assigns a 4 GB-aligned address to the Linked List Pointer (LLP_LOn = 0h) for Intel® Serial I/O Controller DMA engine, then the DMA engine interprets this as an empty link list and will not perform DMA transfers.

Implication: An Intel® Serial IO controller (that is, I²C, GSPI, or UART) may stop operating which may cause the system to hang.

Workaround: Driver software should not assign LLP to a 4 GB aligned address.

Note: This issue has been addressed in the Intel Serial IO drivers in the following versions or later: For Microsoft* Windows* 10, I²C device driver rev 30.100.1724.2, SPI device driver rev 30.100.1725.1, and UART device driver rev 30.100.1725.1.

Status: For the steppings affected, refer to the "Summary Tables of Changes".

16. Audio Global Time Synchronization Register Access

Problem: Disabling the audio DSP through the Intel® High Definition Audio Function Configuration Register Offset 530h in the PCH Private Configuration Space by setting bit 2 to '1' will block accesses to Audio Global Time Synchronization registers in MMIO space (Offset 500h - 55Fh).

Implication: Audio Global Time Synchronization registers may not be accessible and any attempted accesses may result in a system hang.

Workaround: None identified.

Status: No Fix.

17. S0ix Entry When Connecting an USB-C* Power Adapter

Problem: Connecting a USB-C* power adapter to a PCH USB port may cause a race condition that can prevent the system from entering S0ix. This issue only occurs on designs where the USB-C Power Delivery (PD) implements Out Of Band (OOB) messaging to communicate with the PCH for port mapping.

Implication: The system may fail to enter S0ix.

Workaround: A fix has been identified for this erratum and may be available in a software update.

Status: No Fix.

18. FIVR Clock Frequency Variation

Problem: The PCH Fully Integrated Voltage Regulator (FIVR) subsystem clock may have frequency variation when resuming from S0ix or C10.

Implication: The clock frequency variation may result in unexpected functional issues including increased RFI with the Wi-Fi radio and/or system shutdown due to increased current consumption.

Note: None identified. A mitigation has been identified for this erratum and may be available in a software update.

Status: Future product Fix

19. Phase Lock Loop (PLL) Feedback Circuit

Problem: The Main PLL and USBPCIe PLL have independent feedback circuits. A feedback circuit timing marginality may result in a momentary jitter excursion in the corresponding PLL and downstream circuitry.

Implication: If the Main PLL loses lock, then the system may hang. If the USBPCIe PLL loses lock, USB 3.1 / SATA / PCIe / integrated GbE / DMI / CLKOUT_PCIE interfaces may experience errors, including correctable errors, interface downtrains, or hangs.

Workaround: A fix has been identified for this erratum and may be available in a software update.

Status: No Fix

20. Time Synchronization with xHCI and GbE

Problem: The xHCI and GbE do not use the correct time base for time synchronization.

Implication: xHCI Precision Time Measurement and GbE IEEE 802.1AS are not supported.

Note: This issue has only been observed in a synthetic environment. No known implication has been identified with commercial software.

Workaround: None identified.

Status: No Fix.

21. SATA Controller Support for Automatic Partial to Slumber Transition (APST) Feature

Problem: When the Automatic Partial to Slumber Transition (APST) feature is enabled an internal logic issue may occur during the transition from Partial to Slumber causing the SATA controller not to respond properly to additional commands.

Implication: The system may hang.

Workaround: A BIOS code change has been identified and may be implemented as a workaround for this erratum. Alternatively, a fix has been identified for this erratum and may be available in a software update.

Status: No Fix.

22. Internal Clocking Phase Lock Loop (PLL) Locking

Problem: The internal PCH PLL that generates CLKOUT_CPUBCLK_P/N and the On Package DMI (OPDMI) clocks implements incorrect configuration settings which may cause the PLL to unlock.

Implication: Increased clock jitter may occur and could result in system instabilities.

Workaround: A fix has been identified for this erratum and may be available in a software update.

Status: Fixed.

23. Increased PCIe* Gen1 RX L0s Exit Latencies

Problem: When PCIe Link is operating at Gen1 and L0s is enabled with end point devices that have minimum electrical idle timings < 200 ns, the Root Port receiver may fail to train on Fast Training Sequence (FTS) patterns.

Implication: The link may train back to L0 through Recovery instead of directly back to L0 resulting in increased L0s exit latencies.

Workaround: A BIOS code change has been identified and may be implemented as a workaround for this erratum.

Status: Fixed.

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Specification Changes

There are no specification changes in this revision of the Specification Update.

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Specification Clarification

1. **PCIe Precision Time Measurement (PTM) Byte Order**

Added the following note to the Intel® 495 Series Chipset Family On-Package Platform Controller Hub (PCH) Datasheet Volume 1 of 2 (#341080) in the section **Precision Time Measurement (PTM)**:

"PCIe Root Ports transmit the lower byte [7:0] of the Propagation Delay Field first instead of the upper byte [31:24] within their PTM DelayResponseD (Response with Data) messages."

2. **SX_EXIT_HOLDOFF# Not Functional with eSPI Enabled**

Add the following note to the Intel® 495 Series Chipset Family On-Package Platform Controller Hub (PCH) Datasheet Volume 1 of 2 (#341080) in the SX_EXIT_HOLDOFF# Signal Description in section 23.4:

"Note: When eSPI is enabled, SX_EXIT_HOLDOFF# functionality is not available, and assertion of the signal will not impact Sx exit flows."

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