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Release Notes
DC SN640™ U.2 Generic & AP OEM
Firmware Version: R1110021

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Overview

- This document describes the Ultrastar® DC SN640 U.2 NVMe SSD release with FW version R1110021 for Generic and AP OEM SKUs.

Affected Model/Part Numbers:

Model Number	SKU	Product Description	Firmware Code Name
WUS4BB096D7P3E3	0TS1927	Ultrastar® DC SN640 NVMe SSD, 2.5-inch, 960GB, 0.8 DW/D, ISE	R1110021
WUS4BB019D7P3E3	0TS1928	Ultrastar® DC SN640 NVMe SSD, 2.5-inch, 1.92TB, 0.8 DW/D, ISE	R1110021
WUS4BB038D7P3E3	0TS1929	Ultrastar® DC SN640 NVMe SSD, 2.5-inch, 3.84TB, 0.8 DW/D, ISE	R1110021
WUS4BB076D7P3E3	0TS1930	Ultrastar® DC SN640 NVMe SSD, 2.5-inch, 7.68TB, 0.8 DW/D, ISE	R1110021
WUS4CB080D7P3E3	0TS1952	Ultrastar® DC SN640 NVMe SSD, 2.5-inch, 800GB, 2.0 DW/D, ISE	R1110021
WUS4CB016D7P3E3	0TS1953	Ultrastar® DC SN640 NVMe SSD, 2.5-inch, 1.6TB, 2.0 DW/D,ISE	R1110021
WUS4CB032D7P3E3	0TS1954	Ultrastar® DC SN640 NVMe SSD, 2.5-inch, 3.2TB, 2.0 DW/D, ISE	R1110021
WUS4CB064D7P3E3	0TS1955	Ultrastar® DC SN640 NVMe SSD, 2.5-inch, 6.4TB, 2.0 DW/D, ISE	R1110021
WUS4BB096D7P3E1	0TS1960	Ultrastar® DC SN640 NVMe SSD, 2.5-inch, 960GB, 0.8 DW/D, SE	R1110021
WUS4BB019D7P3E1	0TS1961	Ultrastar® DC SN640 NVMe SSD, 2.5-inch, 1.92TB, 0.8 DW/D, SE	R1110021
WUS4BB038D7P3E1	0TS1962	Ultrastar® DC SN640 NVMe SSD, 2.5-inch, 3.84TB, 0.8 DW/D, SE	R1110021
WUS4BB076D7P3E1	0TS1963	Ultrastar® DC SN640 NVMe SSD, 2.5-inch, 7.68TB, 0.8 DW/D, SE	R1110021
WUS4BB096D7P3E3	0TS2162	Ultrastar® DC SN640 NVMe SSD, 2.5-inch, 960GB, 0.8 DW/D, ISE, AP OEM	R1110021
WUS4CB032D7P3E3	0TS2163	Ultrastar® DC SN640 NVMe SSD, 2.5-inch, 3.2TB, 2.0 DW/D, ISE, AP OEM	R1110021
WUS4BB019D7P3E1	0TS2164	Ultrastar® DC SN640 NVMe SSD, 2.5-inch, 1.92TB, 0.8 DW/D, SE, AP OEM	R1110021
WUS4BB038D7P3E1	0TS2165	Ultrastar® DC SN640 NVMe SSD, 2.5-inch, 3.84TB, 0.8 DW/D, SE, AP OEM	R1110021

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Ultrastar® DC SN640 NVMe SSD with FW version R1110021Qualification Samples are:

- Ultrastar® DC SN640 NVMe SSD Qualification Samples are intended for customer evaluation and performance testing and not authorized for field deployment.
- Ultrastar® DC SN640 NVMe SSD Qualification Samples are delivered as “SAMPLE UNITS” without any express or implied Western Digital warranties.

Changes between R1110012 and R1110021

Category	Severity	Likelihood	Details
Power Cycle Related	Low	Medium	**Where found:** Customer **Host Level Behavior:** • In a rare case, drive reported Format Corrupt **Root Cause:** • PFAIL did not have enough time to save all the required data because of a background task taking too long to complete • In case of back to back PFAILs, in a rare case, if SCRAM did not run again, next boot-up assumed a successful SCRAM. **Change Description:** • PFAIL and background tasks fine-tuned to make sure PFAIL can start as soon as possible. • In case SCRAM did not run, point to the previous SCRAM data. **Drive Recovery:** Power-Cycle the drive

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Category	Severity	Likelihood	Details
Performance	Low	Medium	**Where found:** Internal **Host Level Behavior:** • Performance drop during Random Read test **Root Cause:** • Background Garbage Collection was interfering with Random Reads performance. **Change Description:** • Amount of data Garbage Collected was fine-tuned to remove the performance drops. **Drive Recovery:** No Recovery Needed
New Features	NA	NA	**Where found:** NA **Host Level Behavior:** • Do not update SMBus co-processor's boot code with every code download. • New Log Page CAh implemented **Root Cause:** • NA **Change Description:** • Versioning system put in place. Only update SMBus co-processor's boot-cold if the version number has changed. • Additional SMART counters implemented in the context of Log Page CAh • Additional debug traces and event to catch any field issues faster. **Drive Recovery:** No Recovery Needed

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Category	Severity	Likelihood	Details
BMC (SMBUS)	Low	High	**Where found:** Customer **Host Level Behavior:** • Host read junk/zero temperature via SMBus/BMC at boot-up • Some systems did not boot up with Aspen+ plugged in • BMC commands returning 0's • VendorID in BMC data 0 • Errors seen by host on the SMBUS • VPD data unexpected • Code download through SMBus fails **Root Cause:** • After code download, BMC response could wait for other high priority work to finish. • In rare cases, BMC data is responded before VendorID is set in the PCIe registers. • If Host sends packet greater than max MTU size, drive just ignored it and did not handle it correctly • Transactions between Host processor and SMBus processor were Best effort with no retry mechanism. • In case of 12V loss in the middle of BMC data transaction between Host and SMBus processor, handshaking would fail. • In a rare corner case scenario, VPD/BMC data was not initialized correctly after a reset/power-cycle • Regular temperature updates from Host Processor would sometime overwrite a chunk of firmware image **Change Description:** • 1st BMC response after a code download is handled at higher priority for Atmel to get BMC data quickly. • Read VendorID from APIs and not from registers. • If the packets size is greater than MCTP MTU size, send NACK from drive. • Retry mechanism added between Host processor and SMBus processor in case of any failures. • In case of 12V power-loss and return, any pending BMC transactions are reset/aborted. • Wait till VPD/BMC data is initialized fully after a power-cycle/reset before responding with data to host • Code logic was fixed to make sure that host processor updates do not overwrite code download segments. **Drive Recovery:** Power cycle

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Category	Severity	Likelihood	Details
Miscellaneous fixes	Low	Medium	**Where found:** Customer **Host Level Behavior:** • Double the DDR refresh rate • Command Timeouts or random asserts in high I/O traffic • Percentage Life used SMART counter value can be > 100 • After a Format Command FLBAS field may not have correct value • Command Abort may take longer than expected during high traffic scenario • In a rare scenario, drive may not go RO when available Spares falls below threshold. **Root Cause:** • DDR refresh rate is doubled to help DDR work better at higher temperatures. • Serializer block sometimes loses a command descriptor leading to missing commands. • FW implementation capped the Percentage Life Used SMART counter at 100%. • After Format command some reserved bits were set in FLBAS field • Command Abort handling did not handle submitting abort completion response correctly in CQ, leading to delays. • A specific leg of code was found where the drive would not go RO even though number of spares < threshold **Change Description:** • The sequence has been corrected as per ASIC/DDR specification. • The serializer block was reconfigured to make sure that no commands are missed in high traffic. • The SMART counter Percentage Life Used can have values up to 255 in accordance with NVMe spec. • FLBAS field bits were cleaned up. Only those bits are set that are not marked reserved in the spec. • Command Abort handling corrected to make sure responses are queued correctly. • Spares handling was fixed to make sure drive always goes RO when spares < threshold. **Drive Recovery:** No Recovery Needed

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UEFI Driver related	NA	NA	**Where found:** NA **Host Level Behavior:** • Power-state resets to default after a power-cycle. • Incorrect FW Revision number returned **Root Cause:** • UEFI driver was resetting the power-state of the drive back to default(0). • The UEFI driver was reading FW revision from an incorrect location. **Change Description:** • Modify UEFI driver to not reset the power-state at power-up. • Modify UEFI driver to read FW revision from correct location. • UEFI Driver was modified and recertified by Microsoft. **Drive Recovery:** No Recovery Needed

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Revision History:

FW Revision	Date	Description
R1110021	04/05/2021	Maintenance Release
R1110012	06/24/2020	Maintenance Release
R1110009	02/04/2020	Initial AP OEM SKU FW Release & Generic FW Update
R1110007	11/13/2019	Initial Generic FW Release

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