JEDEC STANDARD

Automotive Solid State Drive (SSD) Device Standard

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JEDEC SOLD STATE TECHNOLOGY ASSOCIATION

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AUTOMOTIVE SOLID STATE DRIVE (SSD) DEVICE STANDARD

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AUTOMOTIVE SOLID STATE DRIVE (SSD) DEVICE STANDARD

(From JEDEC Board Ballot JCB-22-49, formulated under the cognizance of the JC-64.8 Subcommittee on Solid State Drives, item number 318.02).

1 Scope

This standard defines the specifications of interface parameters, signaling protocols, environmental requirements, packaging, and other features for a solid state drive (SSD) targeted primarily at automotive applications.

The purpose is to provide a standard for automotive SSD devices for uniformity, multiplicity of sources, elimination of confusion, ease of device specification, and ease of use.

Unless otherwise noted in the document, any illegal operation is not allowed and device operation is not guaranteed.

The designation Automotive SSD refers to the part designation of a series of commercial logic parts common in the industry. This number is normally preceded by a series of manufacturer specific characters to make up a complete part designation. The capacity of the device is typically appended, as well as other key characteristics of the device as documented in this standard.

1.1 Common Features Summary

- 28 x 28 mm application landing pattern, socketless solution.
- BGA package options: 16 x 20 mm, 20 x 24 mm, 22 x 28 mm, and 28 x 28 mm.
- PCIe 4.0 x4 electrical interface for 8 GB/s peak transfer rate.
- NVMe command protocol support.
- Single root I/O virtualization (SR-IOV).
- Device authentication and security.
- Firmware resiliency.
- Operating temperature range: A2T (-40 °C to +105 °C).
- Optional system storage area.

1.2 External References

The JEDEC Automotive SSD specification references a number of external specifications developed by other organizations. In many cases, JEDEC applies additional requirements, limitations, or instantiations to these specifications. These will be indicated throughout this standard. Implementors of Automotive SSD devices or controllers should review these external specifications for details and context as well.

1.3 Device Standard

This standard encompasses a variety of requirements, many of which exist in the industry independently. In some cases, these external specifications are referenced directly without modification. In others, this specification will apply usage models, expansions, or restrictions on these standards to define the intended application.

Title	Chapter	Description
Package	2	This clause describes the package and pin assignments for the Automotive SSD.
Electrical	3	This clause defines the electrical interface.
Protocol	4	This clause defines the command interface protocol supported for the Automotive SSD.
Capacity	5	This clause defines the options for device storage capacity.
Security	6	This clause defines the security, device authentication, and key management aspects of the Automotive SSD.
System	7	This clause describes the system requirements for using Automotive SSD devices.
Endurance	8	This clause describes the required Automotive SSD device endurance characteristics.
Environmental	9	This clause defines the environmental characteristics including temperature, humidity, shock, and vibration.

2 Package Specification

2.1 Package

JEDEC Requirement: The Automotive SSD shall use the PCI-SIG 2828 BGA package as the recommended application landing pattern. The pad and ball pitch is 0.80 x 0.80 mm.

JEDEC Requirement: The Automotive SSD devices shall use of one of the following packages, compatible with the entire 2828 landing pattern, or a proper subset of it:

- 1620 (16 x 20 mm)
- 2024 (20 x 24 mm)
- 2228 (22 x 28 mm)
- 2828 (28 x 28 mm)

External, reference only:

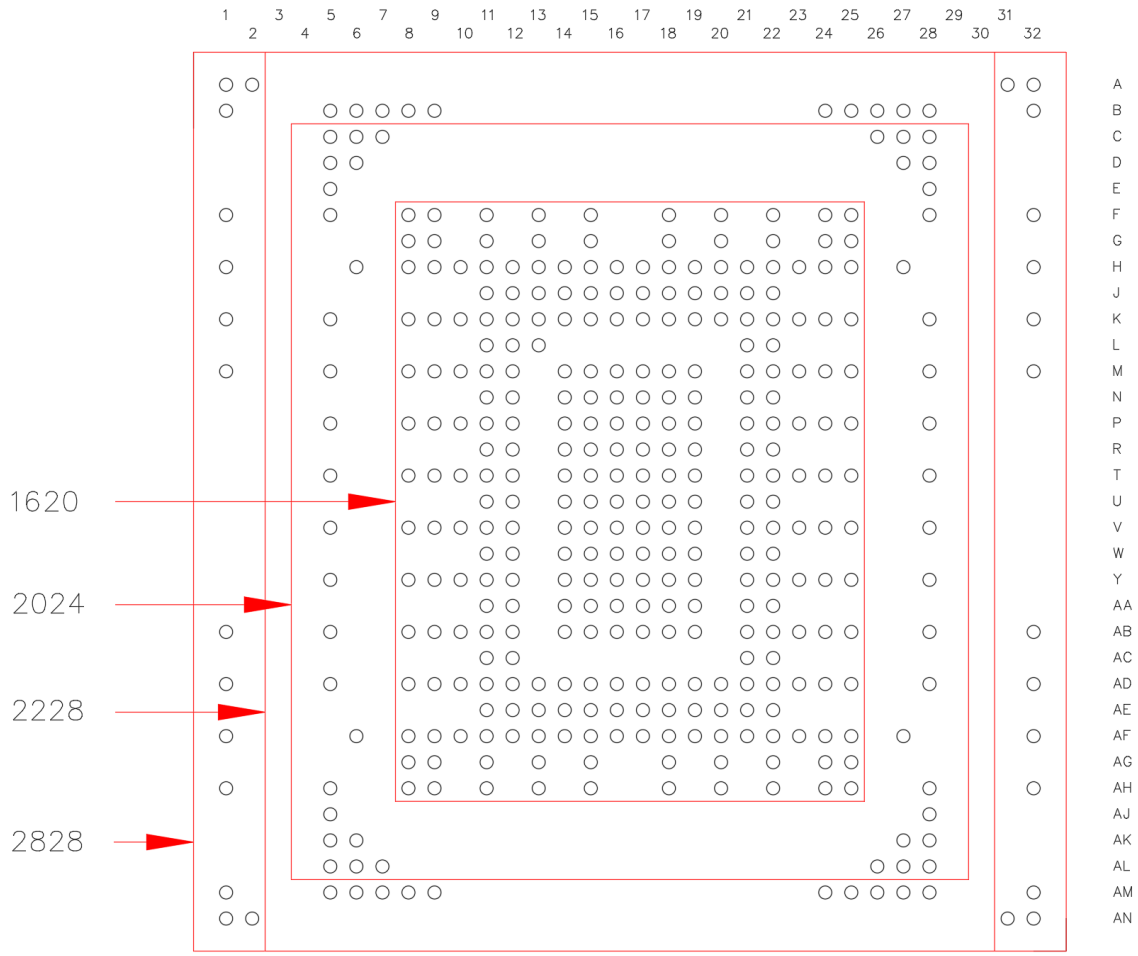

Figure 1 — Automotive SSD Package Types

2.1 Package (cont'd)

Table 1 — JEDEC Requirement, Package Thickness Options

Package Type [1]	Thickness [2]	Units
XXXX-S1	1.20	mm
XXXX-S2	1.35	mm
XXXX-S3	1.50	mm
XXXX-S4	1.75	mm
XXXX-S5	2.00	mm
NOTE 1 XXXX = 1620, 2024, 2228, or 2828 NOTE 2 Thickness applies after solder ball collapse		

2.2 Pin Description

Table 2 — Automotive SSD BGA Ball Assignment

Interface	Signal Name	I/O	Description	Voltage
Power and ground	PWR_ID0 ~ PWR_ID4	I	JEDEC optional; See the Table 3 — Power Identifier (PWR_ID) Pin Definition	
	PWR_1	I	+3.3 V or +2.5 V supply	
	PWR_2	I	+1.8 V or +1.2 V supply	
	PWR_3	I	+1.2 V, +1.1 V, +0.9 V, or +0.8 V supply	
	GND	I	Return current path	
PCIe Signals	PERp0 ~ PERp3 PERn0 ~ PERn3	I/O	PCIe TX/RX differential signals defined by the PCI Express Card Electromechanical Specification	
	REFCLKp/ REFCLKn	I	PCIe reference clock (100MHz)	
	PERST#	I	PCIe Reset is a functional reset to the device as defined by the PCI Express Base Specification	1.8 V
	CLKREQ#	I/O	PCIe clock request is a reference clock request signal as defined by the PCI Express Base Specification	
	PEWAKE#	I/O	PCIe WAKE#. Open drain with pullup on the platform. When the device supports wakeup, this signal is used to request that the system return from a sleep/suspend state to service a function-initiated wake event. When the device supports OBFF mechanism, the PEWAKE# signal is used by the system for OBFF signaling.	
SATA Signals	SATA-A+, SATA-A- / SATA B+, SATA-B-	I/O	Not required by JEDEC Automotive SSD.	
	DEVSLP	I		
	DAS/DSS	I/O		
SSD Specific Signals	SUSCLK	I	Not required by JEDEC Automotive SSD.	
	PEDET	O	Host interface indication. Required to be no connect.	
	RFU		Reserved for future use	
	DNU		Do not use. Manufacturing purpose only.	
	LED_1#	O	Open drain, active low signal. This signal is used to allow the device to provide status indication via LED device that will be provided by the system.	3.3 V
	XTAL_IN	I	Connection to crystal unit.	
	XTAL_OUT	O		
	CAL_P	N/A	PHY calibration resistor.	
	RZQ_1, RZQ_2	N/A	Memory or NAND calibration resistor.	

Table 2 — Automotive SSD BGA Ball Assignment (cont'd)

Interface	Signal Name	I/O	Description	Voltage
JTAG Signals	JTAG_TRST#	I	Refer to JTAG Specification (IEEE 1149.1), Test Access Port and Boundary Scan Architecture for definition of these balls.	3.3 V
	JTAG_TCK	I		
	JTAG_TMS	I		
	JTAG_TDI	I		
	JTAG_TDO	O		
SMBus Signals	SMB_CLK	I/O	SMBus Clock, Open Drain with pull up on Platform.	1.8 V, 3.6 V tolerant
	SMB_DATA	I/O	SMBus Data, Open Drain with pull up on Platform.	
	ALERT#	O	Alert notification to controller; Open Drain with pull up on Platform; Active Low.	
Test signals	DIAG0, DIAG1	I/O	Engineering test mode balls have been specified to allow for special access to DIAG for debug purposes.	Vendor specified

JEDEC Requirement: PWR_ID support is not required. However, if supported, it shall follow the description in Table 3.

Table 3 — Power Identifier (PWR_ID) Pin Definition

Voltage Indication Signal Configuration					Voltage		
PWR_ID0	PWR_ID1	PWR_ID2	PWR_ID3	PWR_ID4	PWR_1	PWR_2	PWR_3
NC	NC	NC	NC	NC	RFU	RFU	RFU
GND	NC	NC	NC	NC	2.5 V	1.2 V	0.9 V
NC	GND	NC	NC	NC	2.5 V	1.2 V	1.1 V
GND	GND	NC	NC	NC	2.5 V	1.2 V	RFU
NC	NC	GND	NC	NC	2.5 V	1.2 V	1.2 V
GND	NC	GND	NC	NC	RFU	RFU	RFU
NC	GND	GND	NC	NC	2.5 V	1.2 V	0.8 V
GND	GND	GND	NC	NC	RFU	RFU	RFU
NC	NC	NC	GND	NC	RFU	RFU	RFU
GND	NC	NC	GND	NC	2.5 V	1.8 V	0.9 V
NC	GND	NC	GND	NC	2.5 V	1.8 V	1.1 V
GND	GND	NC	GND	NC	2.5 V	1.8 V	RFU
NC	NC	GND	GND	NC	2.5 V	1.8 V	1.2 V
GND	NC	GND	GND	NC	RFU	RFU	RFU
NC	GND	GND	GND	NC	2.5 V	1.8 V	0.8 V
GND	GND	GND	GND	NC	RFU	RFU	RFU
NC	NC	NC	NC	GND	RFU	RFU	RFU
GND	NC	NC	NC	GND	3.3 V	1.2 V	0.9 V
NC	GND	NC	NC	GND	3.3 V	1.2 V	1.1 V
GND	GND	NC	NC	GND	3.3 V	1.2 V	RFU
NC	NC	GND	NC	GND	3.3 V	1.2 V	1.2 V
GND	NC	GND	NC	GND	RFU	RFU	RFU
NC	GND	GND	NC	GND	3.3 V	1.8 V	0.8 V
GND	GND	GND	NC	GND	RFU	RFU	RFU
NC	NC	NC	GND	GND	RFU	RFU	RFU
GND	NC	NC	GND	GND	3.3 V	1.8 V	0.9 V
NC	GND	NC	GND	GND	3.3 V	1.8 V	1.1 V
GND	GND	NC	GND	GND	3.3 V	1.8 V	RFU
NC	NC	GND	GND	GND	3.3 V	1.8 V	1.2 V
GND	NC	GND	GND	GND	RFU	RFU	RFU
NC	GND	GND	GND	GND	2.3 V	1.8 V	0.8 V
GND	GND	GND	GND	GND	RFU	RFU	RFU

3 Electrical Specification

3.1 Electrical Specification

JEDEC Requirement: Automotive SSDs shall support PCI Express Base Specification 4.0, Version 1.0.

Limitations and restrictions:

JEDEC Requirement: The Automotive SSD PCIe data bus supports 4 lanes with a peak bandwidth of 16 Gb/s on each lane for a total peak bandwidth of 64 Gb/s or 8 GB/s.

4 Command Protocol Specification

Required command protocols and data throughput specifications are documented in this clause.

4.1 NVM Express Protocol

JEDEC Requirement: Automotive SSDs shall support NVM Express (NVMe) protocol Revision 1.4c.

JEDEC Requirement: Automotive SSDs shall support NVM Express Management Interface Revision 1.1d.

4.2 Single Root I/O Virtualization Protocol

JEDEC Requirement: The Automotive SSD optionally supports Single Root I/O Virtualization (SR-IOV) consistent with the PCI Express Base Specification 4.0, section 9.

Up to 256 virtual functions (VFs) may be supported.

The following features are optional, and documented in control registers such as the SR-IOV Control Register (section 9.3.3.3):

- 10-bit tags
- Virtual function migration

5 Storage Capacity Requirements

5.1 Storage Capacity Requirements

Automotive SSDs may optionally provide a separate system storage region in addition to a bulk storage region where the capacity and endurance characteristics of each storage region may be different. The intent is that the system storage region, when offered, performs as a high reliability region for the storage of essential data such as the bootstrap code, operating system, and critical applications and associated data for the functioning of the vehicle. The bulk storage region is intended to support less critical data such as streaming media.

Automotive SSDs may be available in a variety of total drive capacities, typically ranging from 128 GB to 4 TB. When the storage is split into optional system storage and bulk storage regions, the total capacity offered is the sum of the storage of the two regions. It is expected that the ratio of storage in system and bulk regions will vary based on the device capacity:

Table 4 — Power Identifier (PWR_ID) Pin Definition

Drive Capacity Class	Minimum System Region Capacity	Bulk Region Capacity
128 GB	0	128 GB
256 GB	0	256 GB
512 GB	32 GB	512 GB
1 TB	32 GB	1 TB
2 TB	64 GB	2 TB
4 TB	64 GB	4 TB
NOTE The system storage region is optional. However, it must offer the listed minimum capacity if it is supported. Depending on the Automotive SSD implementation, the optional system region may be in addition to the bulk region, or may be a segment of the storage devices. The total Automotive SSD drive capacity shall express the sum of both regions.		

Automotive SSDs shall support the JESD218B-01 Solid State Drive (SSD) Requirements and Endurance Test Method standard. This shall be applied to both system and bulk storage regions. The test workload is defined in the JESD219 Solid-State Drive (SSD) Endurance Workloads specification; the Enterprise data usage model is applied.

The endurance characteristics of the system and bulk storage regions may be different. Similarly, the available density over the life of the drive may vary by storage region, and also by market category. Refer to the Endurance section for details.

6 Security Requirements

Automotive SSDs shall support the PCI-SIG Component Measurement and Authentication (CMA) protocols Version 1.0 or newer.

6.1 Security Protocol

JEDEC Requirement: Automotive SSDs shall support the Security Protocol and Data Model (SPDM) from the DMTF organization, DSP0274, 2021-05-24, Version 1.1.1, or newer.

6.2 Signature Algorithm

JEDEC Requirement: Automotive SSDs shall support TPM_ALG_ECDSA_ECC_NIST_P384. Other ECC options may also be supported; it is recommended that suppliers consult with customers on specific requirements, including but not limited to:

- TPM_ALG_RSASSA_3072
- TPM_ALG_ECDSA_ECC_NIST_P256
- TPM_ALG_EDDSA

6.3 Hash Algorithm

JEDEC Requirement: Automotive SSDs shall support TPM_ALG_SHA_384. Other hash options may also be supported; it is recommended that suppliers consult with customers on specific requirements, including but not limited to:

- TPM_ALG_SHA_256
- TPM_ALG_SHA_512

7 System Requirements

7.1 System Requirements

7.1.1 System Management Bus

The SMBus interface between controller and target shall provide pull-up resistors on the SMB_CLK , SMB_DATA, and ALERT# signals to the application SMBus supply voltage. Automotive SSDs support up to 1 MHz operation. Point to point or multi-drop configurations are supported consistent with the following derating chart for SMB_CLK and SMB_DATA. ALERT# timing is system dependent.

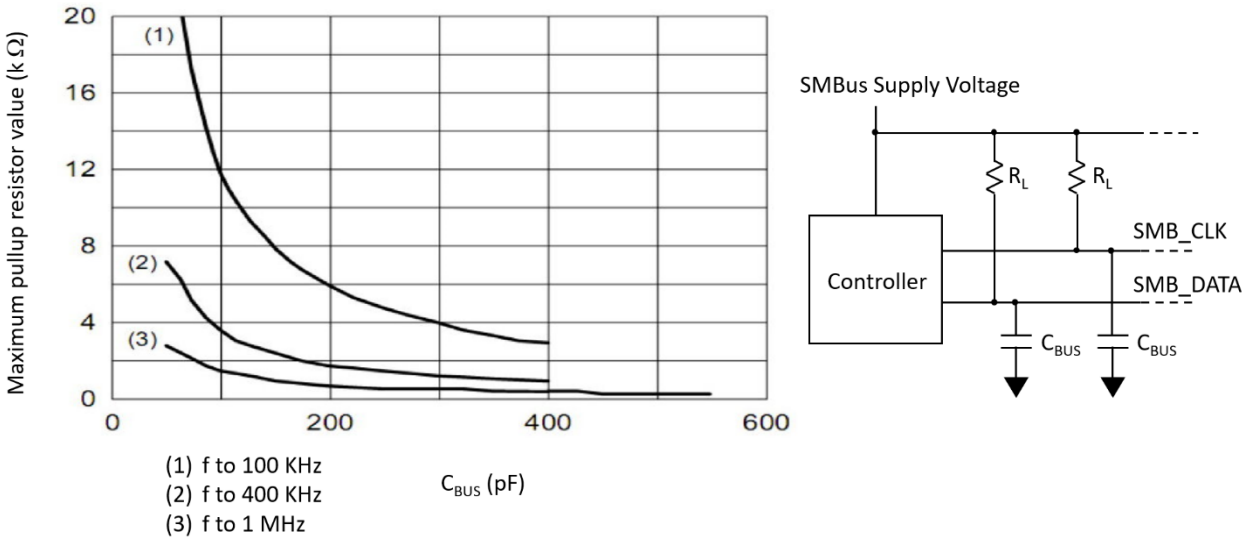

Figure 2 — SMBus Operating Frequency by Bus Loading

7.1.2 Power On Sequence

Supply voltages must follow the power on sequence as defined in the M.2 specification. Voltage margins are consistent with the BGA SSD section of the M.2 specification (reference only).

JEDEC excerpt from the PCI-SIG M.2 “Electrical Requirements for BGA SSDs”. Reference only:

The host should apply the following recommendations for sequencing the voltages on the PWR_1 supply, the PWR_2 supply, and the PWR_3 supply during power-on:

- After the voltage on the PWR_2 supply or the voltage on the PWR_3 supply reaches 300 mV, the voltage on the PWR_2 supply should remain greater than the voltage on the PWR_3 supply by at least 200 mV.
- The voltage on the PWR_1 supply has no timing relationship relative to the voltage on the PWR_3 supply or the voltage on the PWR_2 supply.

If the power-on sequencing recommendations are not followed, there is a risk that the device may not power-on correctly or the device may be damaged.

7.1.3 Power Off Sequence

JEDEC extraction from the PCI-SIG M.2 “Electrical Requirements for BGA SSDs”. Reference only:

The host should apply the following recommendations for sequencing the voltages on the PWR_1 supply, the PWR_2 supply, and the PWR_3 supply during power-off:

- Before the voltage on the PWR_3 supply and the voltage on the PWR_2 supply reach 300 mV, the voltage on the PWR_2 supply should remain greater than voltage on the PWR_3 supply by at least 200 mV.
- After both the voltage on the PWR_2 supply and the voltage on the PWR_3 supply is below 300 mV, there is no specified relationship between them.
- The voltage on the PWR_1 supply has no timing relationship relative to the voltage on the PWR_3 supply or the voltage on the PWR_2 supply.
- The voltage on all supplies must remain below 100 mV for at least 1 ms before the power-on sequence is restarted.

If the power-off sequencing recommendations are not followed, there is a risk that the device may not power-off correctly or the device may be damaged.

7.1.4 Power Ramp Timing

JEDEC extraction from the PCI-SIG M.2 “Electrical Requirements for BGA SSDs”. Reference only:

Table 5 — Power Ramp Timing

Supply Voltage	Maximum	Units
3.3 V	35	ms
2.5 V	30	ms
1.8 V	25	ms
1.2 V	20	ms
1.1 V	20	ms
0.9 V	20	ms
0.8 V	30	ms
NOTE Voltage slew rate 100 kV/s maximum under no-load condition		

7.1.5 Voltage Regulation

JEDEC extraction from the PCI-SIG M.2 “BGA SSD Power Rail Parameters”. Reference only:

Table 6 — Voltage Regulation

Supply Voltage	Minimum	Maximum	Units
3.3	2.8	3.6	V
2.5	2.45	2.75	V
1.8	1.7	1.9	V
1.2	1.14	1.26	V
1.1	1.06	1.17	V
0.9	0.86	0.98	V
0.8	0.76	0.88	V

7.1.6 Firmware Recovery

JEDEC Requirement: Automotive SSD controllers and devices shall support the NIST Platform Firmware Resiliency Guidelines 800-193.

The Root of Trust and Chain of Trust guidelines follow the DMTF security protocols as defined in Clause 6 Security Requirements". Root of Trust for Detection shall be applied to the device firmware and critical operating data prior to the device being enabled for use on power up. If corruption is detected, the JEDEC Automotive SSD should be capable of triggering recovery of firmware and critical data back to an authenticated version.

JEDEC Requirement: The application of firmware policy guidelines is customer specific, with some considerations listed below:

a) Vendors should carefully consider their target customers when designing resilient automotive SSDs to ensure proper management and control of policies and configuration settings can be administered in the way which best serve customer needs. Management of policies and configuration settings can be performed either locally or remotely. Depending on platform type, customers may expect the capability to fully administer a platform securely from a remote location. Some customers may expect to require a physically present user to approve a change in policy. Other customers may expect to be able to remotely extract any log data, or they may wish to prevent the exfiltration of log data except through authorized local mechanisms.
b) Fully automated firmware recovery may be required in the automotive SSD while other customers may rely on the system controller to manage recovery policy.
c) Automotive SSDs should be capable of event logging of errors and attacks. The log format is not defined.
d) Automotive SSDs should be capable of notification to the system controller on detection of errors or attacks.
e) Validation of adherence to NIST guidelines is negotiated between supplier and target customers.

8 Endurance Requirements

8.1 Endurance Requirements

JEDEC Requirement: Automotive SSDs support two primary market segments, referred to in this specification as “Personal Auto” and “Professional Auto”. These reflect the assumed models for use, as well as for external factors such as expected auto maintenance cycles. The assumed market models are defined below, along with endurance requirements by market segment.

Table 7 — Endurance Requirements

Characteristic	Personal Auto	Professional Auto
Years of Operation	15	8
Days per year of use	344	365
Average Hours per Day of Use	3	12
Nominal temperature, power on, active use	55 °C	55 °C
Nominal temperature, power off	30 °C	30 °C

Refer to JESD218 Solid State Drive (SSD) Requirements and Endurance Test Method and JESD219 Solid-State Drive (SSD) Endurance Workloads for detailed descriptions of endurance testing.

Guidelines for market segments are intentionally loosely defined in order to accommodate a variety of implementations in the industry, including mixed media implementations. From JESD218: “To be considered part of the same qualification family, SSD products must use the same nonvolatile memory products, or different nonvolatile memory products that are themselves part of the same component qualification family (defined in JESD47). The SSD products must also use the same controller and the same firmware, except to the extent that the firmware requires different settings to support the different capacities of the drives. The SSD products must also have the same ratio of TBW specification to capacity; for example, a 100 GB drive with a 100 TBW specification could be in the same family as a 50 GB drive with a 50 TBW specification. Due to the complexity of SSD designs, it is beyond the scope of this specification to completely define what constitutes a qualification family. The burden of proof falls upon the SSD manufacturer who chooses to use the qualification family concept.” Alternative requirements may be established by agreement between a supplier and a purchaser, however the formulae and methods in JESD218 apply.

Endurance is affected by the case temperature of the Automotive SSD, and varies based on the storage region. The data usage model for all storage regions as defined in JESD219 is the Enterprise model (67% 4 KB block transfers, 33% block transfers ranging from 512 B to 64 KB excluding 4 KB).

SSD case temperature ranges are broken into a lower range, -40 °C to +95 °C, and a higher range, +95 °C to +105 °C. Read operations are allowed across the widest temperature range, -40 °C to +105 °C, for both bulk and system storage regions. However Program/Erase (P/E) cycles which drive terabyte write (TBW) capabilities are limited by temperature.

8.1 Endurance Requirements (cont'd)

For system storage regions, P/E cycles are supported in the lower temperature range -40 °C to +95 C and in the higher range, +95 °C to +105 °C, however the number of P/E cycles and therefore the TBW rating decreases in the higher temperature range.

Table 8 — Performance in Target Markets for Automotive SSDs

Characteristic	Personal Auto	Professional Auto	Units
Read operations, temperature range -40 °C to +105 °C	unlimited	unlimited	
TBW, Bulk Storage Region, temperature range -40 °C to +95 °C	200 X	200 X	Region capacity
TBW, Bulk Storage Region, temperature range +95 °C to +105 °C	Not supported	Not supported	Region capacity
TBW, System Storage Region, temperature range -40 °C to +95 °C	500 X	500 X	Region capacity
TBW, System Storage Region, temperature range +95 °C to +105 °C	200 X	200 X	Region capacity
NOTE 1 TBW = terabyte write NOTE 2 Minimum requirements shown. Suppliers may exceed these values in specific products.			

Example TBW calculations:

- Bulk storage region capacity 1 TB from -40 °C to +95 °C = minimum 200 TBW.
- System storage region capacity 64 GB from +95 °C to +105 °C = minimum 12.8 TBW.

Drive Writes Per Day (DWPD) may also be calculated from the TBW and target market characteristics.

DWPD = TBW [region-capacity * years-of-operation * days-per-year-of-use * average-hours-per-day-of-use ÷ 24)]

Example DWPD calculations:

- Professional Auto market, bulk storage region capacity 1 TB class from -40 °C to +95 °C = 200 TBW

  DWPD = 200 TBW [1 TB * 8 years * 365 days/year * (12 ÷ 24 hours)] = minimum 0.24 DWPD
- Personal Auto market, system storage region capacity 64 GB from +95 °C to +105 °C = 12.8 TBW

  DWPD = 12.8 TBW [0.064 TB * 15 years * 344 days/year * (3 ÷ 24 hours)] = minimum 0.31 DWPD

9 Environmental Considerations

9.1 Temperature

JEDEC Requirement: Automotive SSDs shall operate under Automotive Temperature Grade 2 (A2T), -40 °C to +105 °C.

Note that JEDEC temperature specifications are for case temperature unlike some industry specifications that define ambient temperature ranges.

Reference: JEDEC JESD402-1.

9.2 Performance Throttling by Temperature Range

JEDEC Requirement: Operating the Automotive SSD at elevated temperatures requires device throttling to ensure media reliability. Performance scaling must follow these guidelines at a minimum.

Table 9 — Performance Scaling by Temperature Range

Case Temperature Range	Minimum Performance Characteristics
≥ -40 °C, ≤ +95 °C	See Chapter 8.1, “Endurance Requirements”
> 95 °C, ≤ 105 °C	See Chapter 8.1, “Endurance Requirements”

10 External References

The following documents are external publications referenced by this specification. Please refer to these external organizations for information regarding these documents.

JEDEC JESD218B-01: Solid State Drive (SSD) Requirements and Endurance Test Method.
http://www.jedec.org

JEDEC JESD219A: Solid-State Drive (SSD) Endurance Workloads.
http://www.jedec.org

JEDEC JESD402-1: Temperature Grade and Measurement Specifications for Components and Modules.
http://www.jedec.org

System Management Bus (SMBus) Specification, Version 3.1, March 19. 2018.
http://smbus.org/

JTAG (IEEE 1149.1) Specification.
https://www.ieee.org

PCI Express Base Specification, Revision 4.0, Version 1.0.
https://pcisig.com/specifications

NVM Express (NVMe) protocol Revision 1.4c.
https://nvmexpress.org/wp-content/uploads/NVM-Express-1_4c-2021.03.09-Ratified.pdf

NVM Express Management Interface Revision 1.1d.
https://nvmexpress.org/wp-content/uploads/NVM-Express-Management-Interface-1.1d-2021.04.19-Ratified.pdf

PCI Express M.2 Specification Revision 4.0, Version 1.0.
https://pcisig.com/specifications

Security Protocol and Data Model (SPDM) from the DMTF organization, DSP0274, 2019-12-22, Version 1.1.1.
https://www.dmtf.org/sites/default/files/standards/documents/DSP0274_1.1.1.pdf

Component Measurement and Authentication (CMA)
https://pcisig.com/

Digital Signature Standard (DSS).
Reference: https://nvlpubs.nist.gov/nistpubs/FIPS/NIST.FIPS.186-4.pdf

Advanced Encryption Standard (AES).
Reference: https://csrc.nist.gov/publications/detail/fips/197/final

NIST Platform Firmware Resiliency Guidelines 800-193.
Reference: https://doi.org/10.6028/NIST.SP.800-193

FIPS PUB 180-4 Secure Hash Standard (SHS)
Reference: https://nvlpubs.nist.gov/nistpubs/FIPS/NIST.FIPS.180-4.pdf

Annex A – (Informative) Differences between Revisions

This annex briefly describes most of the changes made to entries that appear in this standard, JESD312, compared to its predecessors. If the change to a concept involves any words added or deleted (excluding deletion of accidentally repeated words), it is included. Some punctuation changes are not included.

This annex is reserved for future revisions to this specification.

Standard Improvement Form **JEDEC Standard JESD312**

The purpose of this form is to provide the Technical Committees of JEDEC with input from the industry regarding usage of the subject standard. Individuals or companies are invited to submit comments to JEDEC. All comments will be collected and dispersed to the appropriate committee(s).

If you can provide input, please complete this form and return to:

JEDEC
Attn: Publications Department
3103 North 10th Street
Suite 240 South
Arlington, VA 22201-2107

Fax: 703.907.7583

1. I recommend changes to the following:

☐ Requirement, clause number _____

☐ Test method number _____ Clause number _____

The referenced clause number has proven to be:

☐ Unclear ☐ Too Rigid ☐ In Error

☐ Other _____

2. Recommendations for correction:

_____

_____

_____

_____

3. Other suggestions for document improvement:

_____

_____

_____

_____

Submitted by

Name: _____ Phone: _____

Company: _____ E-mail: _____

Address: _____

City/State/Zip: _____ Date: _____


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