JEDEC STANDARD

Enclosure Form Factor for SSD Devices, Version 1.0

JESD253.01

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AUGUST 2021

JEDEC SOLID STATE TECHNOLOGY ASSOCIATION

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ENCLOSURE FORM FACTOR FOR SSD DEVICES, VERSION 1.0

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Foreword

This standard has been prepared and approved by JEDEC. The purpose of this standard is to define the enclosure form factor that can be commonly used for various SSD devices. This standard defines the mechanical outline, locking mechanism and position information depending on SSD device.

Introduction

This enclosure is a universal enclosure which can be utilized with different types of SSD devices in harsh environment including automotive applications.

It is designed to increase the efficiency of the heat dissipation, to be strong against EMI/ESD, and to provide high reliability against shock and vibration. As a result, this will make it easier for the SSD device with this enclosure to meet harsh environmental conditions.

ENCLOSURE FORM FACTOR FOR SSD DEVICES, VERSION 1.0

(From JEDEC Board Ballot JCB-21-04, formulated under the cognizance of the JC-64.8 Subcommittee on Solid State Drives, Item 318.06.)

1 Scope

This document specifies the enclosure form factor which can be used with various type of SSD devices: outline of the top and bottom enclosure, three screw holes to mount the enclosure on the system, and two clamping holes in the top enclosure to lock to the connector.

This document works in conjunction with:

- [M.2] PCISIG PCI Express® M.2™ Specification Revision 3.0, Version 1.2
- [E1.S] SNIA SFF-TA-1006, Enterprise and Datacenter 1U Short SSD Form Factor(E1.S), Rev1.4, March 27, 2020

2 Normative Reference

The following normative documents contain provisions that, through reference in this text, constitute provisions of this standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For updated references, the latest edition of the normative document referred to applies.

JEDEC JEP95, MO-348, Enclosure Form Factor, Version 1.0

3 Terms and Definitions

For the purpose of this standard, the terms and definitions given in section 2 "Normative Reference" and the following apply.

3.1 Terms

SSD	Solid State Drive
PCB	Printed Circuit Board
EMI	Electro Magnetic Interference
ESD	Electro Static Discharge

3.2 Keywords

Several keywords are used to differentiate levels of requirements and options, as follow:

Can - A keyword used for statements of possibility and capability, whether material, physical, or causal (*can* equals *is able to*).

Expected - A keyword used to describe the behavior of the hardware or software in the design models assumed by this standard. Other hardware and software design models may also be implemented.

Ignored - A keyword that describes bits, bytes, quadlets, or fields whose values are not checked by the recipient.

Mandatory - A keyword that indicates items required to be implemented as defined by this standard.

May - A keyword that indicates a course of action permissible within the limits of the standard (*may* equals *is permitted*).

Must - The use of the word *must* be deprecated and shall not be used when stating mandatory requirements; *must* is used only to describe unavoidable situations.

Optional - A keyword that describes features which are not required to be implemented by this standard. However, if any optional feature defined by the standard is implemented, it shall be implemented as defined by the standard.

Reserved - A keyword used to describe objects—bits, bytes, and fields—or the code values assigned to these objects in cases where either the object or the code value is set aside for future standardization. Usage and interpretation may be specified by future extensions to this or other standards. A reserved object shall be zeroed or, upon development of a future standard, set to a value specified by such a standard. The recipient of a reserved object shall not check its value. The recipient of a defined object shall check its value and reject reserved code values.

Shall - A keyword that indicates a mandatory requirement strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall* equals *is required to*). Designers are required to implement all such mandatory requirements to assure interoperability with other products conforming to this standard.

3.2 Keywords (cont'd)

Should - A keyword used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain course of action is deprecated but not prohibited (*should* equals *is recommended that*).

Will - The use of the word *will* be deprecated and shall not be used when stating mandatory requirements; *will* is only used in statements of fact.

3.3 Abbreviations

etc. - And so forth (Latin: et cetera)

e.g. - For example (Latin: exempli gratia)

i.e. - That is (Latin: id est)

3.4 Conventions

Temperatures shall be defined as in degrees Celsius.

4 Background

The automotive environment, for example, has many EMI/ESD interferences to the SSD. Due to its higher performance, the operating temperature of the SSD can easily reach its maximum temperature in a very short time, for instance within several seconds. There are also many vibrations that occur in the automotive environment, etc.

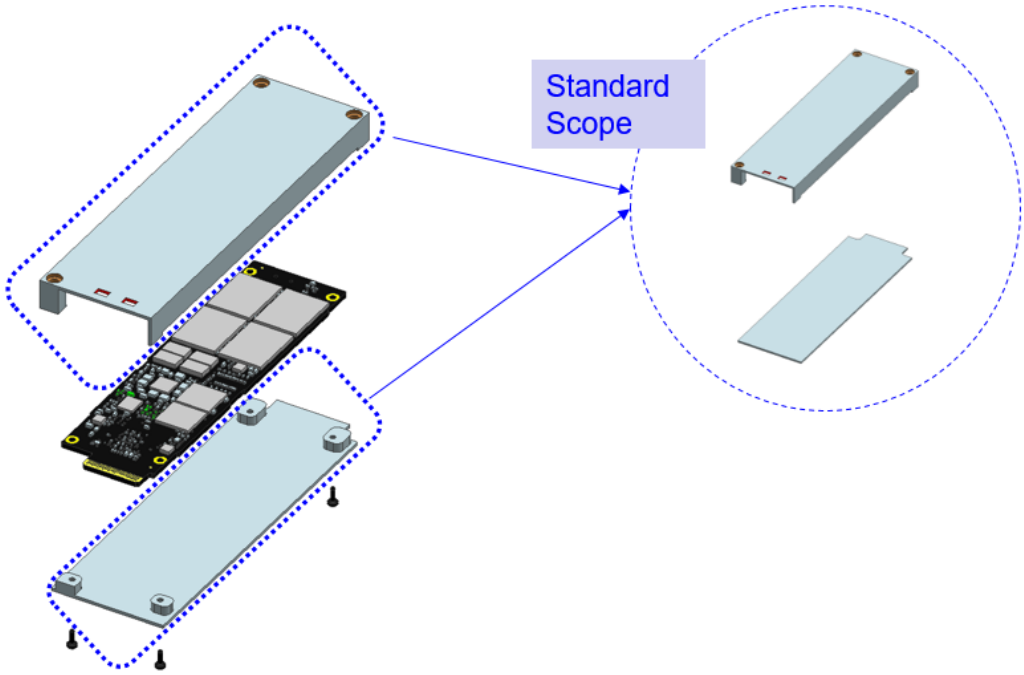
To reduce the EMI/ESD, to improve the heat dissipation, and to lock the SSD to the system more tightly, an enclosure for the SSD may be developed. However, there are many different types of SSD form factors like M.2, E1.S etc., and more are expected in the future. Therefore, from the system vendor point of view, different enclosure dimensions are used depending on the SSD form factor and on the vendor.

This document defines a dimension of SSD enclosure form factor which can dissipate heat efficiently, is strong against EMI/ESD, and provides high reliability against shock and vibration. As a result, this will make it easier for an SSD with this enclosure form factor to meet the harsh conditions like the automotive environment.

5 Scope of this Standard

The scope of this standardization is the SSD enclosure specification as shown in Figure 5.1, which includes mainly:

- An outline of the top and bottom enclosure
- 3 screw holes to mount to the system
- 2 clamping holes to lock to the connector



Note that, in the case of the bottom part of the enclosure, only the outline of the bottom enclosure is the scope of this standard. The mounting holes for locking with the target SSD device is not the scope of this standard, since it depends on the target SSD and it needs to follow the target SSD device specification.

Figure 5.1 — Scope of this standard

6 Mechanical specification of Enclosures

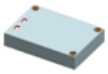
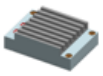
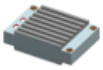
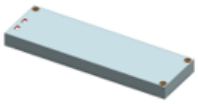
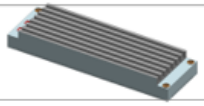
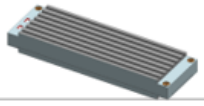
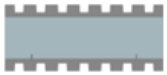
The proposed enclosure will have two different lengths, short or long. See Table 6.1.

The short form factor may support up to 52 mm length SSD (can be applicable for M.2 SSD devices, for example).

The long form factor may support up to 119 mm length SSD (can be applicable for E1. S and M.2 SSD devices, for example).

The short or long form factor has a variation in height depending on which type of optional fin is used. Asymmetric fin (either top or bottom side) or symmetric fin (both top and bottom side) may be considered depending on the system design.

Table 6.1 — Six types of the enclosure form factor

FF (X,Y)	Thickness (Z)	Fin	3D illustrative View	Top view	Side view	(Example) Applicable SSD
Short (52 x 36.5mm)	9.5mm	-				- M.2 22x30 - M.2 22x42
	15mm	Asymmetric				
		Symmetric				
Long (119 x 36.5mm)	9.5mm	-				- M.2 22x80 - M.2 22x110 - E1.S
	15mm	Asymmetric				
		Symmetric				

For the mechanical specification of the enclosure for SSD device, see MO-XXX.

7 Locking mechanism

This enclosure for SSD device has two mechanical locking mechanisms.

7.1 Clamping holes

This enclosure should be locked using the two clamping holes to the system. See Figure 7.1.

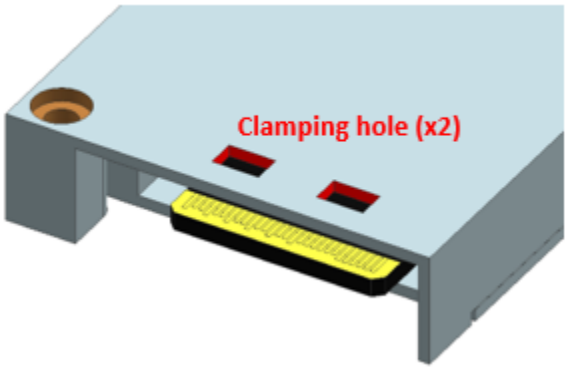


Figure 7.1 — Clamping hole to lock the enclosure with receptacle connector

Figure 7.2 illustrates an example locking the enclosure to the system using two clamping holes.

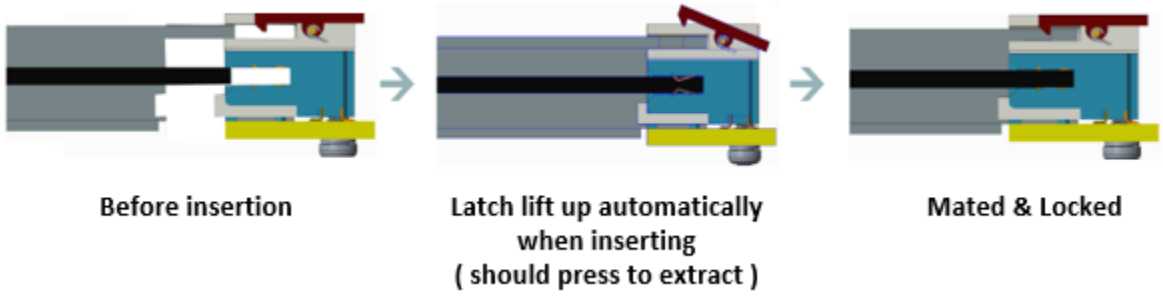


Figure 7.2 — An example locking using clamping holes

7.2 Mounting holes

Enclosure should be mounted using the three screw holes to the system. See Figure 7.3.

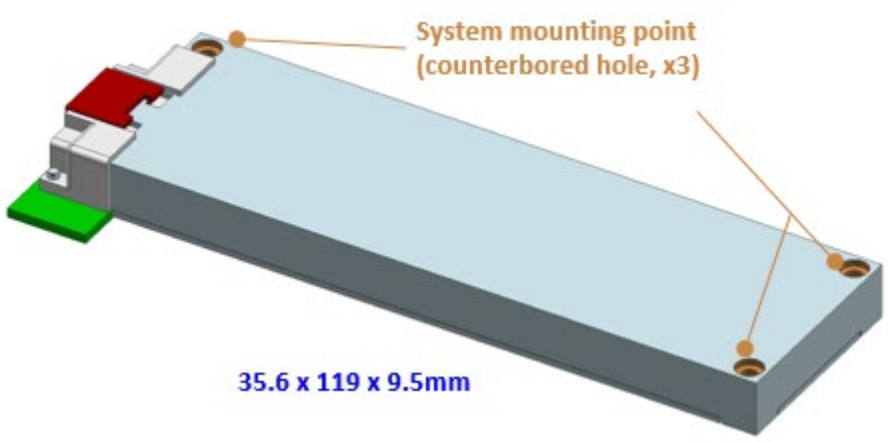


Figure 7.3 — Mounting holes for enclosure assembly on system

Figure 7.4 illustrates example mounting the enclosure on the system PCB or frame.

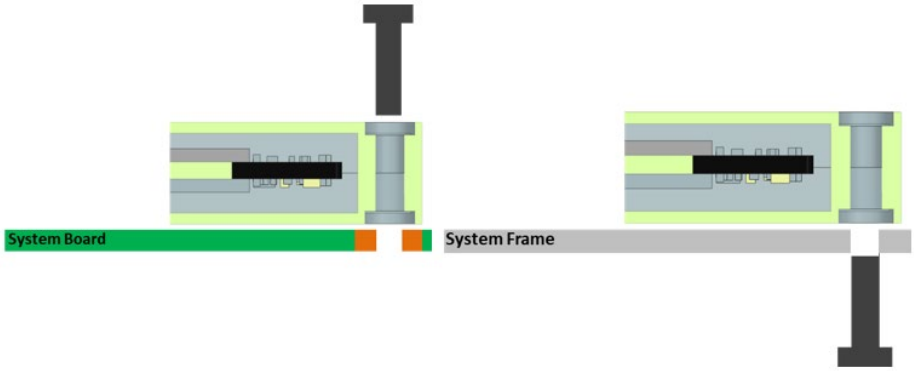


Figure 7.4 — An example mounting enclosure on the system

8 Host Side Connector

This standard enclosure may be applied to any type of host side connector (connector on PCB or with cable, or etc.). The scope of standardization in this document is the enclosure for device side only. See Figure 8.1.

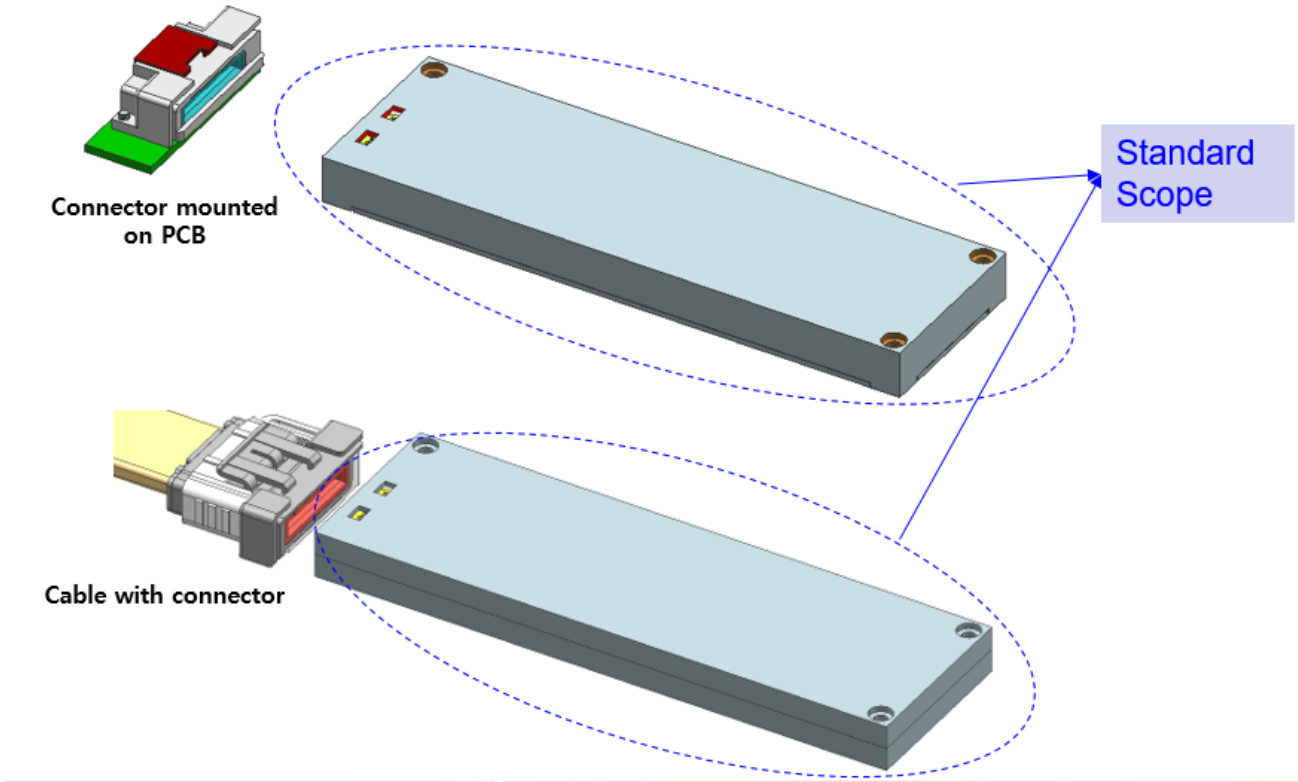


Figure 8.1 — Host side connector

9 Position of SSD device with respect to the Enclosure

9.1 M.2 SSD device

Figure 9.1 illustrates an example overlay view of the enclosure with the M.2 SSD device. The exact position of the M.2 SSD device is defined with respect to the enclosure. For the detailed mechanical specification for the exact overlay position, see MO-XXX.

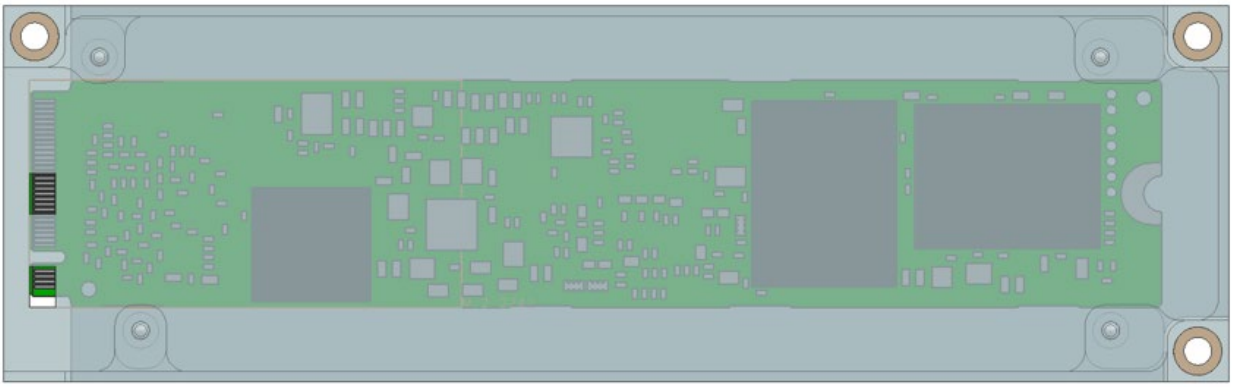


Figure 9.1 — An example overlay view of M.2 device in the enclosure

9.2 E1.S SSD device

Figure 9.2 illustrates an example overlay view of the enclosure with the E1.S SSD device. The exact position of the E1.S SSD device is defined with respect to the location of the enclosure. For the detailed mechanical specification for the exact overlay position, see MO-XXX.

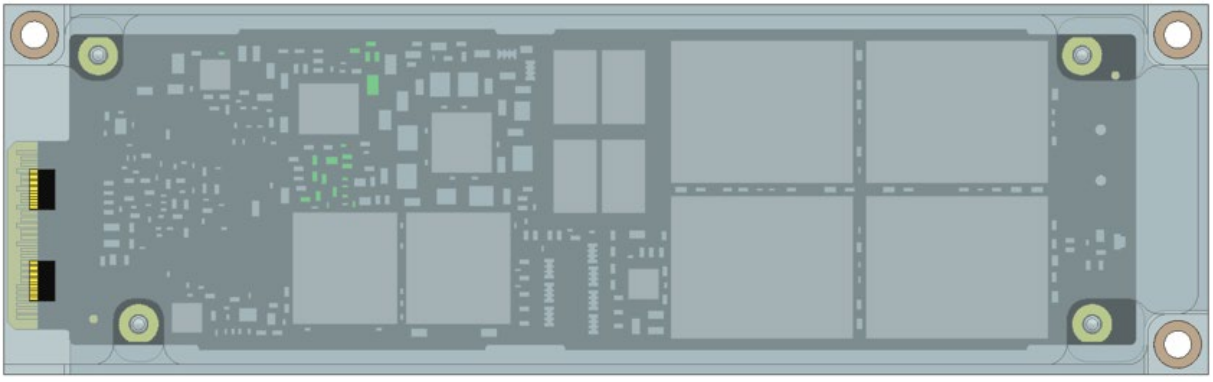


Figure 9.2 — An example overlay view of E1.S device in the enclosure

Annex A (informative) Enclosure Selection Guideline

Table A.1 may be used as a selection guide to choose among the 6 types of enclosures, depending on the sustained power (in Watts), where the very simplified environment is assumed: For example, the airflow is natural convection inside of a system box of 38 cm x 30 cm x 15 cm dimension, ambient temperature is assumed to be 60 degrees Celsius, max NAND case temperature is assumed to be 105 degrees Celsius, and there is no other power source for the SSD.

Therefore, note that the sustained power information shown in Table A.1 should be used reference only relative point of view. The sustained power information does not give any guarantee for the enclosure, since the performance of heat dissipation for the enclosure may be different depending on the material used for the enclosure and heat paths from device to enclosure, different system box dimension which can be different depending on applications etc.

Table A.1 — Enclosure selection guideline depending on relative sustained power

Enclosure type	Fin	Recommended relative sustained power(Watt) (NOTE 1)
Short	None	~3.5 Watt
	Asymmetric fin	~4.0 Watt
	Symmetric fin	~5.5 Watt
Long	None	~10 Watt
	Asymmetric fin	~13 Watt
	Symmetric fin	~18 Watt
NOTE 1 The sustained power is analyzed based on a simplified environment. Therefore, the value of this table should be used reference only relative point of view.		

Annex B (informative) Application for E1.S SSD Device

Long enclosure form factor can be designed for E1.S SSD device as in Figure B.1.

1) Enclosure mechanical dimension and position of SSD device on enclosure is the scope of the standard.

2) E1.S board can be fixed on enclosure by using E1.S board mounting holes according to the [E1.S] standard. (i.e., out of scope of this enclosure form factor standard)

3) Thermal gap filler and cushion can be used to increase heat dissipation and component reliability. (i.e., out of scope of this enclosure form factor standard)

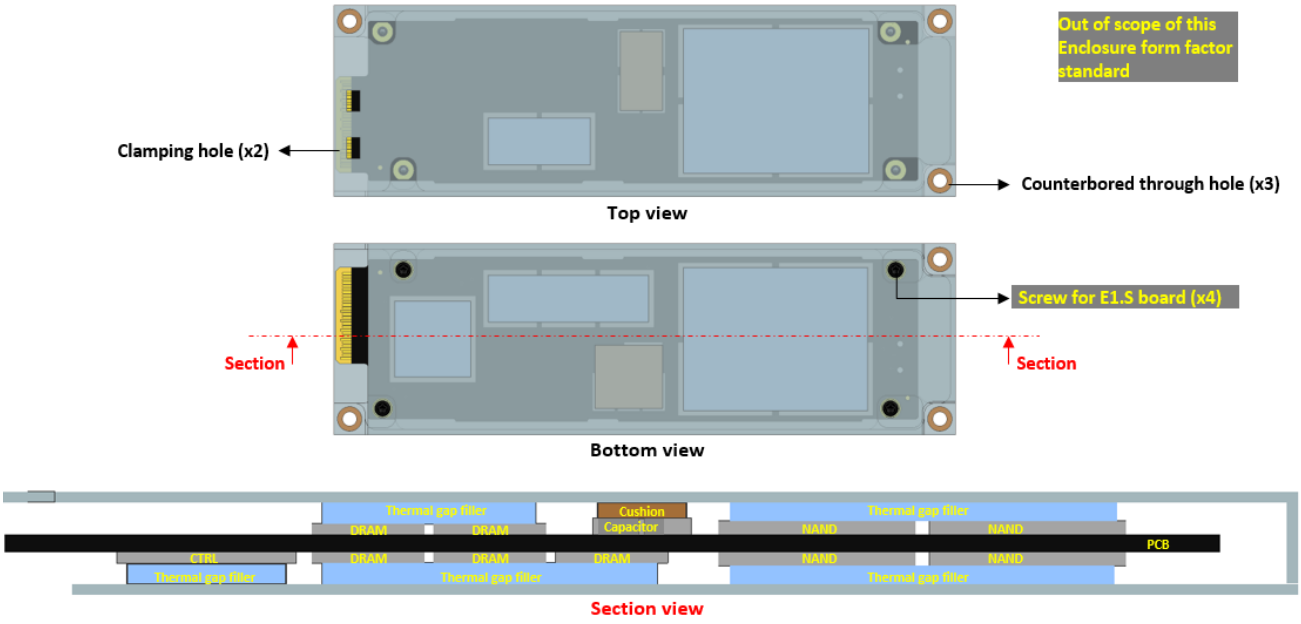


Figure B.1 — An application example of enclosure form factor for E1.S SSD device

Annex C. (informative) Application for M.2 SSD Device

Long enclosure form factor can be designed for M.2 SSD device as in Figure C.1.

1) Enclosure mechanical dimension and position of SSD device on enclosure is the scope of the standard.

2) M.2 board can be fixed on enclosure by using M.2 board mounting holes according to the [M.2] standard. (i.e., out of scope of this enclosure form factor standard)

3) Thermal gap filler and cushion can be used to increase heat dissipation and component reliability. (i.e., out of scope of this enclosure form factor standard)

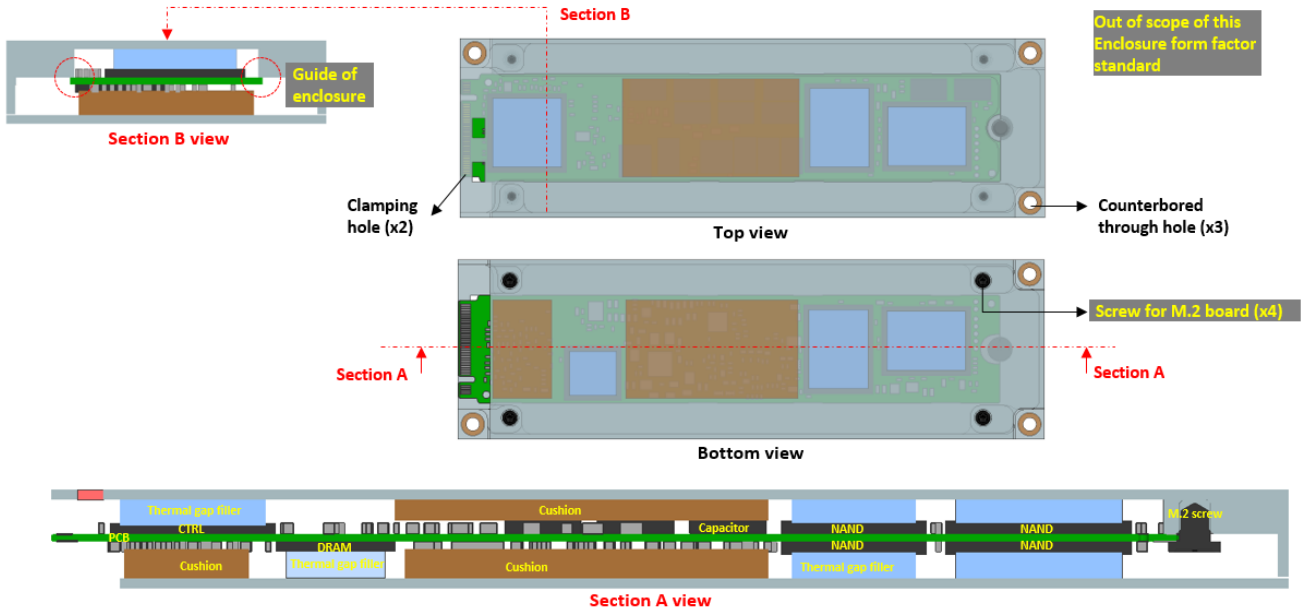


Figure C.1 — An application example of enclosure form factor for M.2 SSD device

Annex D (informative) Differences between JESD253.01 and its predecessors

This tables briefly describe most of the differences between the text of this standard, JESD253.01, and its predecessors JESD253 (February 2021).

Clause	Description of change
2	Changed “MO-XXX” to “MO-348”.

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