

JEDEC STANDARD

**XFM Device
Version 1.0**

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JEDEC SOLID STATE TECHNOLOGY ASSOCIATION



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Foreword

This standard has been prepared by JEDEC. The purpose of this standard is standardization of XFM form factor for embedded removable memory device including package dimensions, pin layout and electrical interface specification. This standard refers several other standard specifications that are provided by PCI-SIG[®] and NVM Express, Inc. organizations.

Introduction

The XFM Embedded Removable Memory Device (XFMD) is based on the PCI Express[®] (PCIe[®]) interface as a physical layer part and the NVM Express[®] (NVMe[®]) interface as a protocol layer part. Conformance to these standard interfaces will maximize connectivity between host and device.

The XFMD is a universal data storage and communication media with small and thin form factor. Its removability makes it suitable for applications that require an easy device exchange. It can be used in a variety of applications such as XR(AR, VR, MR), gaming, video recording (4K/8K movie, surveillance, EDR and drone), IOT, automotive, etc.

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XFM Device

(From JEDEC Board Ballot JCB-21-22, formulated under the cognizance of the JC-64 Committee on Embedded Memory Storage and Removable Memory Cards. Item 140.01.)

1 Scope

This standard specifies the mechanical and electrical characteristics of the XFM Device. Such characteristics include, among others, package dimensions, pin layout, signal assignment, power supply voltages, currents, and electrical characteristics of the PCIe interface.

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. For undated references, the latest edition of the normative document referred to applies.

Reference:

- (1) PCI Express Base Specification Revision 4.0, Version 1.0 (September 27, 2017)
- (2) NVM Express Base Specification Revision 1.4b (September 21, 2020)
- (3) PCI Express M.2 Specification Revision 4.0, Version 1.0 (November 5, 2020)

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3 Terms and Definitions

3.1 Terms and Definition

For the purposes of this standard, the terms and definitions given in the document included in clause 2, Normative Reference, and the following apply.

- **“AC Coupling Capacitor”** as defined by the PCIe Base Specification to isolate the differential data lanes between host and device.
- **“Device PCB”** is inside the device’s package and used for forming pins and routing traces between pins, controller and memory chips.
- **“Host PCB”** is a part of XFM System model that mounts the Host LSI (including PCIe Root Complex), AC Coupling Capacitors and the XFM socket. Differential data lanes are connected by traces on the Host PCB having a specific characteristic impedance (Z_0).
- **“Thermal Interface Material”** is any material that has a high heat conductivity (small thermal resistance) and couples a heat-producing device with a heat-dissipating object (e.g., Host PCB) to improve heat dissipation.
- **“PHY”** in this document is physical layer of PCIe interface for serialization and deserialization of data.

3.2 Acronyms

AC	Alternating Current
ASPM	Active State Power Management (PCIe Base Specification)
AR	Augmented Reality
BER	Bit Error Rate
EDR	Event Data Recorder
ESD	Electro Static Discharge
GND	Ground
HBM	Human Body Model
IOT	Internet of Things
LSI	Large Scale Integrated Circuit
MR	Mixed Reality
NA	Not applicable
NU	Not used
PCB	Printed Circuit Board
PM	Power Management
PWR_1	Power Rail 1
PWR_2	Power Rail 2
RFU	Reserved for future use
SI	Signal Integrity
TIM	Thermal Interface Material
VR	Virtual Reality

3.3 Conventions

A binary number is represented in this standard by any sequence of digits consisting of only the Western-Arabic numerals 0 and 1 immediately followed by a lower-case b (e.g., 0101b). Spaces may be included in binary number representations to increase readability or delineate field boundaries (e.g., 0 0101 1010b).

A hexadecimal number is represented in this standard by any sequence of digits consisting of only the Western-Arabic numerals 0 through 9 and/or the upper-case English letters A through F immediately followed by a lower-case h (e.g., FA23h). Spaces may be included in hexadecimal number representations to increase readability or delineate field boundaries (e.g., B FD8C FA23h).

A decimal number is represented in this standard by any sequence of digits consisting of only the Western-Arabic numerals 0 through 9 not immediately followed by a lower-case b or lower-case h (e.g., 25).

A range of numeric values is represented in this standard in the form "a to z", where a is the first value included in the range, all values between a and z are included in the range, and z is the last value included in the range (e.g., the representation "0h to 3h" includes the values 0h, 1h, 2h, and 3h).

When the value of the bit or field is not relevant, x or xx appears in place of a specific value.

3.4 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* is deprecated and shall not be used when stating mandatory requirements; *must* is used only to describe unavoidable situations.

Obsolete - A keyword indicating that an item was defined in prior standards but has been removed from this standard.

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.

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*).