JEDEC STANDARD

Universal Flash Storage (UFS)

JESD220

FEBRUARY 2011

JEDEC SOLID STATE TECHNOLOGY ASSOCIATION

NOTICE

JEDEC standards and publications contain material that has been prepared, reviewed, and approved through the JEDEC Board of Directors level and subsequently reviewed and approved by the JEDEC legal counsel.

JEDEC standards and publications are designed to serve the public interest through eliminating misunderstandings between manufacturers and purchasers, facilitating interchangeability and improvement of products, and assisting the purchaser in selecting and obtaining with minimum delay the proper product for use by those other than JEDEC members, whether the standard is to be used either domestically or internationally.

JEDEC standards and publications are adopted without regard to whether or not their adoption may involve patents or articles, materials, or processes. By such action JEDEC does not assume any liability to any patent owner, nor does it assume any obligation whatever to parties adopting the JEDEC standards or publications.

The information included in JEDEC standards and publications represents a sound approach to product specification and application, principally from the solid state device manufacturer viewpoint. Within the JEDEC organization there are procedures whereby a JEDEC standard or publication may be further processed and ultimately become an ANSI standard.

No claims to be in conformance with this standard may be made unless all requirements stated in the standard are met.

Inquiries, comments, and suggestions relative to the content of this JEDEC standard or publication should be addressed to JEDEC at the address below, or refer to www.jedec.org under Standards and Documents for alternative contact information.

Published by
©JEDEC Solid State Technology Association 2011
3103 North 10th Street
Suite 240 South
Arlington, VA 22201-2107

PRICE: Contact JEDEC

Printed in the U.S.A.

PLEASE!

DON'T VIOLATE
THE
LAW!

JEDEC Solid State Technology Association
3103 North 10th Street
Suite 240 South
Arlington, VA 22201-2107

UNIVERSAL FLASH STORAGE (UFS)

Contents

UNIVERSAL FLASH STORAGE (UFS)

Contents (cont'd)

UNIVERSAL FLASH STORAGE (UFS)

Contents (cont'd)

Contents (cont'd)

Contents (cont'd)

Contents (cont'd)

Figures

UNIVERSAL FLASH STORAGE (UFS)

Contents (cont'd)

UNIVERSAL FLASH STORAGE (UFS)

Contents (cont'd)

Tables

Contents (cont'd)

Contents (cont'd)

Contents (cont'd)

Contents (cont'd)

Foreword

This standard has been prepared by JEDEC. The purpose of this standard is definition of an UFS Universal Flash Storage electrical interface and an UFS memory device. This standard defines a unique UFS feature set and includes the feature set of eMMC Specification as a subset. This standard references also several other standard specifications by MIPI (M-PHY and UniPro Specifications) and INCITS T10 (SBC, SPC and SAM Specifications) organizations.

Introduction

The UFS electrical interface is a universal serial communication bus which can be utilized for different type of applications. It’s based on MIPI M-PHY standard as physical layer for optimized performance and power. Architectural model references the INCITS T10 SAM model for ease of adoption.

The UFS device is a universal data storage and communication media. It is designed to cover a wide area of applications as smart phones, cameras, organizers, PDAs, digital recorders, MP3 players, internet tablets, electronic toys, etc.

UNIVERSAL FLASH STORAGE (UFS)

(From JEDEC Board Ballot JCB-11-13, formulated under the cognizance of the JC-64.1 Committee on Electrical Specifications and Command Protocols.)

1 SCOPE

This standard specifies the characteristics of the UFS electrical interface and the memory device. Such characteristics include (among others) low power consumption, high data throughput, low electromagnetic interference and optimization for mass memory subsystem efficiency. The UFS electrical interface is based on an advanced differential interface by MIPI M-PHY standard which together with the MIPI UniPro standard forms the interconnect of the UFS interface. The architectural model is referencing the INCITS T10 SAM standard and the command protocol is based on INCITS T10 (SCSI) SPC and SBC standards.

Universal Flash Storage (UFS) is a simple, high performance, mass storage device with a serial interface. It is primarily for use in mobile systems, between host processing and mass storage memory devices. The following is the summary of the UFS features.

1.1 General Features

- Target Performance
    - UFS version 1.0: 1.25Gbps (Gear1) is mandatory, Support for ~3Gbps (Gear2) is optional ~5.8Gbps max per lane, future UFS revision
- Target Host Applications
    - Mobile phone, UMPC, DSC, PMP, MP3 and any other applications require mass storage , bootable mass storage, and external card
- Target Device Types
    - External Card
        - Micro size for mobile and portable devices
        - Full size or adaptor for DSC and large devices
    - Embedded Packages
        - Mass Storage and Bootable Mass Storage
    - Future expansion of device class types
        - I/O devices, camera, wireless … etc
- Topology: One device per UFS port. A topology to support multiple devices on a single interface is planned to future revision
- UFS Command Set Layer: Simplified SCSI command set based on SBC and SPC. UFS will not modify these SBC and SPC Compliant commands. Option for defining UFS Native command and future extension exist.UFS Transport Protocol Layer: Jedec to define the supported protocol layer, i.e. UTP for SCSI. This does not exclude the support of other protocol in UFS Transport Protocol Layer.
- UFS Interconnect Layer:
    - MIPI M-Phy^{SM} [MIPI M-Phy]
    - MIPI UniPro^{SM} [MIPI UniPro]