Solutions for Implementing SD Express into Your Products

Public Webinar

February 2023
Introduction

Yosi Pinto, Chairman and Technical Committee Chair, SD Association
Senior Technologist at Technology & Strategy Division in Western Digital (formerly SanDisk) and Chairman of the Board and the Technical Committee chair at the SD Association
Disclaimer

During our meeting today SDA members will present some of their products or plans.

Anything presented today, on slides or verbally, by those companies is under the responsibility of the presenting company. SDA do not take any responsibility either on the content presented nor on any consequences of potential implementations of the presented solutions.

Forward-Looking Statements

During our meeting today we may provide forward-looking statements.

Any statement that refers to expectations, projections or other characterizations of future events or circumstances is a forward-looking statement, including those relating to industry trends, standardization plans and any SD Association’s related plans. Actual results may differ materially from those expressed in these forward-looking statements due to various factors. We undertake no obligation to realize these forward-looking statements, which speak only as of the date hereof.
Agenda of the Webinar

- Introduction – Yosi Pinto (*Chairman of SDA*)
- SD Express Bridging Solutions by the Following SDA Member Companies:
  - Bayhub - Toshi Akagi (*Senior Engineering Manager*)
  - Genesys Logic – Sean Chen (*Product Marketing, Deputy Manager*)
  - JMicron - Gordon Chang (*Technical Marketing Manager*)
  - Realtek – Jim Shiau (*System Designer*)
- SD Express and microSD Express Connector Solutions by Amphenol – Robin Aw (*Sr FAE*)
- SD Express **Testing Solution** by Prodigy Technologies – Godfree Coelho (*Founder and CEO*)
- Q&A Session
20+ years creating innovative specifications meeting industry and consumer needs

Strategically maintains the relevance and value of industry-leading SD memory cards for consumer and industrial uses

- Approximately 800 members related to removable cards eco-system (cards, connectors, memory devices and host vendors)

- A unique structure with Technical, Marketing and Compliance capabilities all working together to meet industry needs
SD Express Card – What is it?

- The fastest SD™ and microSD™ memory cards with backward compatibility
- Supporting the following interfaces:
  - NVMe™ + PCIe® interface – up to PCIe 4.0 x2
  - SD interface (UHS-I up to 105MB/s)

Uses the same, well known form-factors

- 32.0 × 24.0 × 2.1 mm
- 15.0 × 11.0 × 1.0 mm
SD Card Specifications Evolution

2000
SD Card Introduced

2004
High Speed mode
of 25MB/s
(SD Ver.1.10)

2005
microSD Introduced
(SD Ver.1.20)

2006
SDHC Introduced
(SD Ver.2.00)

2009/10
UHS-I mode
104MB/s, SDXC
(SD Ver.3.00/3.01)

2011
UHS-II mode
312MB/s
(SD Ver.4.00)

2017
UHS-III mode
624MB/s
Command Queue
Low Voltage
(SD Ver.6.00)

2018/19
SD Express & microSD Express
(PCle®3/NVMe™) 985MB/s, SDUC
(SD Ver.7.00/7.10)

2020
Boot/TCG
/RPMB
(SD Ver.9.00)

2022
SD Express w/PCIe4x2
~4GB/s
(SD Ver.8.00)

>6 Billion SD & microSD cards sold by 2022*
SD is the de-facto worldwide removable memory card standard

Technology and Market Evolution

Evolving technology trends push memory interface requirements to higher sequential and random performance levels

Evolving removable memory devices with higher performance enables new usage models and market opportunities
SD Express: Running Towards New Horizons

PCIe® and NVMe™ Memory Card Interfaces
Delivers performance and advanced protocol required for the next generation of memory-intensive high-performance applications
SD Express - Applications

Multi Channel Video Capturing ➔ requires multi-stream high speed recording and captures large amount of data

Gaming with 3D high-resolution graphics ➔ requires more memory and high-speed capability for real-time usage

VR & AR video increasing in quality ➔ requires a high-speed real-time view of 360°

4K cameras are everywhere
Plus growing 8K, 12K and 8k360o VR cameras with huge data/speed requirements
(8K/24fps uncompressed requires 6GB per minute or 360GB per hour!)
Off-the-shelf bridge solutions allow full support of SD-UHS-II cards as well as SD Express enabling smooth transition

Multi-sensor Data Collection
And/or
Multimedia Apps running from cards

Semi-embedded applications (IoT, Mobile-Compute etc)
☐ Initiate either directly from the PCIe/NVMe or SD
☐ Fully compatible to PCIe/NVMe standards – Identifies itself as a standard NVMe Memory

☐ ESD protection up to 4KV on all pads (Same as legacy SD card requirements)

☐ Hot Plug-In/Removal support

☐ Boot, TCG and RPMB (SD9) may be supported by the SD interface as well

☐ Working on New Speed Classes over NVMe (1)

(1) Forward-looking statement: SDA undertakes no obligation to realize these forward-looking statements, which speak only as of the date hereof.
SD Express Cards Pinout

- **1st row**: conventional SD in SD mode or PCIe side band (PERST#, CLKREQ#, REFCLK+/-) in PCIe mode
- **2nd row**: PCIe 1st lane differential IO’s in PCIe mode – SD 7.X
- **3rd row**: PCIe 2nd lane differential IO’s in PCIe mode – SD8.0
Allowed Power States (Max Power)

☐ Max Current for each power rail depends on the bus mode

☐ Supported power states are defined according to the card type

<table>
<thead>
<tr>
<th>Card Type</th>
<th>G3L1</th>
<th>G3L2 / G4L1</th>
<th>G4L2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.8W</td>
<td>2.8W</td>
<td>4.0W</td>
</tr>
<tr>
<td></td>
<td>1.44W</td>
<td>1.8W</td>
<td>3.2W</td>
</tr>
<tr>
<td></td>
<td>0.72W</td>
<td>1.44W</td>
<td>2.8W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.72W</td>
<td>2.5W</td>
</tr>
</tbody>
</table>

SD7.x ➔ 0.72 through 1.8W (same power levels as legacy SD spec)
SD8.0 ➔ 2.5W through 4.0W

* PCIe interface supports low power sub-states
PCle and NVMe Interfaces – Test Advantages

* Many Bus Analyzers, Protocol Analyzers, Test Suites are in the market* ...

- SD Express Test Fixtures – for SD7.x & SD8.0
- Enables Host and Card vendors to test their SD Express’s PCIe interface using standard test equipment
- The set is available for borrow by our members at our approved labs (GRL and Allion)

In parallel, there are new lower-cost SD Express card dedicated testers available or under development

* May not be a complete list of available solutions
How To Implement SD Express Host

As described in SDA publication: SD Express Host Implementation Guideline
SD Express Host - other possible methods

SD Express Bridge Solution – ready made

PCIe/USB Interface

SD Express Interface

SD Express Card Socket

SD/Express Card Insertion/Card Removal

Interrupts

1.8v
3.3v

PCIe/NVMe_Interface_Enable

VDD1_ON

VDD2_ON

New

New

PCIe/USB Interface

Off-the-shelf components that may serve PCIe or USB to SD Express + UHS-II Interface

Other possible methods
SD Express Host - other possible methods
Summary

☐ SD Express Card – includes PCIe/NVMe interface in addition to the SD UHS-I
☐ The SD Express card introduces itself as NVMe Standard Memory device – standard PCIe/NVMe drivers may be used to access the PCIe interface
☐ The high speed PCIe interface pads are independent while the side band and RefCLK are muxed with DAT lines of the SD interface
☐ SD Express Host may be implemented either as a built-in SD host design update as the example provided by SDA or using an off-the-shelf bridge solution available in the market
SD Express Bridging Solutions

BayHub SD Express Controller Solution

Katsutoshi Akagi, Host-TG Co-Chair, SD Association
Senior Engineering Manager at BayHub Technology
SD Association IO-WG Chair, Host-TG Co-Chair
BayHub Technology

☐ www.bayhubtech.com
☐ Bridge IC and SD host controller leading company
☐ Strong expertise in SD, eMMC, PCIe, USB, SATA, Hi-speed I/O, etc.
☐ Worldwide offices to support customers
☐ Strong partnership in SD eco-system
   ☐ SD card vendors, card controller vendors, testing companies, etc.
☐ Strong partnership with platform companies
   ☐ Intel, AMD, Google, etc.
☐ Strong partnership with SD host products companies
   ☐ PC, High-End Camera, Game, etc.
☐ SD host products have strong motivation for larger and faster removable media
☐ SD Express has the best positioning to support the trend
☐ SD Express eco-system is ready
   ☐ SD Express host controller, SD Express card, SD Express card controller
☐ BayHub offers SD Express host controllers for above all SD host products
Why SD Express? – worldwide IP traffic trend --

☐ Worldwide IP traffic increased from 100EB (2016) to 270EB (2021)
☐ Consumer devices drive IP traffic explosion
☐ More data stream increase the demand for larger and faster storage

Exabyte/month

1 Exabyte = $10^6$ Tera byte
Why SD Express for Camera?

☐ High-End Camera application needs larger/faster memory card more and more
  □ Image sensor technology (Pixel count ~100M -> 500M in 2025)
  □ RAW data recording
  □ High demand for # of continuous shooting frames
  □ Best shot selection among multiple frames
  □ High resolution (~4K/8K)/Long time movie recording

☐ Many intelligent features require larger capacity and faster speed for local storage
☐ Larger and faster storage is a MUST trend and SD Express can fit such demand
BayHub SD7/4/3 Host Controller

- BH770GG7 – PCIe to SD7/SD4/SD3 Bridge IC
- Supports PCIe Gen3 (8Gbps) speed
- Supports SD7.x (SD Express), SD4.x (UHS-II), SD3.x (UHS-I)
- Target Application: High-End Camera (DSLR, Mirror-Less)
  - Perfect solution for high speed/large capacity

System SoC

BH770GG7
PCIe to SD7/4/3 Bridge IC

SD Card Slot

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SD Express Bridging Solutions

GL9767 PCI Express to SD Express Card Reader Controller

Sean Chen, Product Marketing, Genesys Logic Inc.
Product Marketing Manager from Storage Product Team in Genesys Logic.
Overview –
GL9767 PCI Express to SD Express Card Reader Controller

• The major applications of GL9767 are the internal SD Express card reader of laptop, mini PC, Server system, professional camera, game console and drone devices that demand the high speed of SD storage or the second SSD-like storage for the real memory expansion.

• The support of SD Express interface can be up to SD 8.0 SD Express (PCIe Gen.4 x 2).

• GL9767 is the first SD Express card reader controller which can backward support SD 4.0 UHS-II speed mode and SD 3.0 UHS-I speed mode. The existing devices support UHS-II card slot use GL9767 in the next generation product not only upgrade the speed of SD storage also retain the fully support of UHS-II card.

• For power saving, GL9767 support PCI Express ASPM, L1 sub-states (L1.1 and L1.2) and RTD3 (Runtime D3 Hot/Cold), Modern Standby and S0ix.

• The supported OS are Windows, Chrome OS and Linux

• GL9767 is available in QFN32 5mmx5mm
GL9767 is the only SVP for both SD Express and UHS-II

Source: [https://penang.graniteriverlabs.com/svplist](https://penang.graniteriverlabs.com/svplist)
The block in red (not include sideband signal mux and 3.3V/1.2V LDO for SD VDD3) operate as a SD 4.0 card reader.
When the SD Express card inserted, the card will directly connect to PCIe root complex and the in-box NVME driver will be loaded

**System Requirement:**
The PCIe root port need to enable PCIe hot-plug function to support SD7 card plug and un-plug
When the non-SD Express card inserted, the card will be initialized by the internal SD host controller and the vendor driver will be loaded.
Benchmark Test with SD7 & SD4 & SD3 cards

<table>
<thead>
<tr>
<th>SD 7.1</th>
<th>SD 4.0 UHS-II</th>
<th>SD 3.0 UHS-I (SDR104)</th>
</tr>
</thead>
<tbody>
<tr>
<td>890.6</td>
<td>450.2</td>
<td>284.3</td>
</tr>
<tr>
<td>260.5</td>
<td>342.6</td>
<td>16.42</td>
</tr>
<tr>
<td>255.5</td>
<td>213.0</td>
<td>16.67</td>
</tr>
<tr>
<td>40.70</td>
<td>157.8</td>
<td>16.11</td>
</tr>
</tbody>
</table>
Support 2-lane SD8 card by a specific system design

[Diagram showing PCIe root complex connected to SD 8.0 Card via PCIe lane0 and PCIe lane1.]
Benchmark Test use GL9767 2-lane EVB + PCIe G4 SSD

<table>
<thead>
<tr>
<th></th>
<th>Read (MB/s)</th>
<th>Write (MB/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEQ1M Q8T1</td>
<td>3556.88</td>
<td>3458.49</td>
</tr>
<tr>
<td>SEQ1M Q1T1</td>
<td>2833.87</td>
<td>3083.99</td>
</tr>
<tr>
<td>RND4K Q32T1</td>
<td>512.43</td>
<td>368.88</td>
</tr>
<tr>
<td>RND4K Q1T1</td>
<td>84.68</td>
<td>196.15</td>
</tr>
</tbody>
</table>
GL9767 MP schedule

☐ Engineering sample is available now
☐ Customer sample will be available in March
☐ Will release to mass production in May

☐ The design kit is available now for customer to have an early evaluation.
SD Express Bridging Solutions

JMS581SD – USB 3.2 Gen2 to SD7.x

Gordon Chang, Technical Marketing Manager
Technical Marketing Manager at JMicron Technology Corporation
The World’s 1st USB 10Gb/s to SD Express Card Reader Solution

- JMS581SD is a system-on-chip solution which embedded with USB 3.2 Gen 2 to SD7.1/8.0 interfaces
- Its upstream port is USB 10Gbps and its downstream port supports UHS-I and SD8.0 memory cards
- Supports the latest SD Ultra Capacity (SDUC) card specification which enables max capacity of 128TB, plus it is also backward compatible with the legacy SD card specification
- In mass production since July 2020
JMicron JMS581SD – Product Specification

☐ Comply with USB 3.2 Gen 1 and Gen 2 Specification
☐ Comply with USB Mass Storage Class, Bulk-Only Transport Specification (Revision 1.0)
☐ Comply with USB Attached SCSI Protocol (UASP) Specification (Revision 4)
☐ Integrate with USB Type-C multiplexer & configuration channel (CC) logic
☐ Support SD3.01 UHS-I
☐ Support SD8.0 (PCIe Gen3x2 NVMe 1.3)

JMS581SD Block Diagram
JMicron JMS581SD – Product Application

☐ Blazing Performance
  ☐ Maximum speed up to 985MB/s

☐ Broad Compatibility
  ☐ Backward compatible with legacy SD cards

☐ Incredible Capacity
  ☐ Up to 128TB of storage capacity with SDUC cards

JMS581SD SD Express Card Reader
J Micron JMS581SD – Performance

Sample A (128GB)  
Sample B (480GB)

<table>
<thead>
<tr>
<th>Crystal Disk Mark 5.2.0</th>
<th>Crystal Disk Mark 7.0</th>
<th>Crystal Disk Mark 5.2.0</th>
<th>Crystal Disk Mark 7.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>All</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>820.0</td>
<td>659.4</td>
<td>818.4</td>
<td>738.8</td>
</tr>
<tr>
<td>329.7</td>
<td>291.1</td>
<td>209.6</td>
<td>383.2</td>
</tr>
<tr>
<td>521.2</td>
<td>595.8</td>
<td>627.9</td>
<td>584.7</td>
</tr>
<tr>
<td>37.65</td>
<td>79.63</td>
<td>35.34</td>
<td>80.49</td>
</tr>
<tr>
<td>516.15</td>
<td>589.44</td>
<td>618.73</td>
<td>579.92</td>
</tr>
<tr>
<td>330.14</td>
<td>294.32</td>
<td>206.73</td>
<td>378.54</td>
</tr>
</tbody>
</table>

* Performance will vary between different brands and capacities
JMS581LT is an upgraded version of JMS581SD

- Upstream: USB 3.2 Gen 2x1
- Downstream: PCIe Gen3x2 / SATA 6Gbps / SD7.1/8.0
- Support SD Express cards, CFexpress cards, CFast cards, PCIe NVMe SSDs, SATA SSDs, and SATA HDDs
- In mass production since July 2020
J Micron JMS581 LT – Product Applications

- All-In-One Card Reader (SD Express / CFast2.0 / CFexpress)
- Docking Station
- Storage Extension for NAS / Set-top Box / Smart Router
SD Express Bridging Solutions

Realtek Card Reader

Jim Shiau, Manager, Realtek
Manager at Smart Interconnect Business Group, System Design Department in Realtek Semiconductor Corp.
About Realtek Card Reader

- Realtek is a world leading fabless IC design company that provides a variety of IC products
- The Realtek Card Reader product line focuses on high-speed connectivity technology
  - SD card reader, USB3.2 HUB, USB type C/PD
- Realtek SD card reader are widely adopt by ODM/OEM
  - Tight partnership with SD card and host chipset vendor
  - Offer a wide choice of SD card reader

<table>
<thead>
<tr>
<th>SD/Host interface</th>
<th>USB</th>
<th>PCIe</th>
</tr>
</thead>
<tbody>
<tr>
<td>UHS-I</td>
<td>RTS5176E/RTS5306E/RTS5350</td>
<td>RTS5227S/RTS5228</td>
</tr>
<tr>
<td>UHS-II</td>
<td>RTS5329</td>
<td>RTS5250S</td>
</tr>
<tr>
<td>SD Express</td>
<td>RTL9211DS</td>
<td>RTS5261</td>
</tr>
</tbody>
</table>
Implement SD Express Reader

☐ Select SD Express reader according your product type and host interface
  ☐ Reader is build-in host system: We suggest to use PCIe interface RTS5261
    ☐ Ex: Laptop, Tablet, Gaming console
  ☐ Reader is detachable device: We suggest to use USB interface RTL9211DS
    ☐ Ex: Docking station, Dongle

☐ Special notice for PCIe interface implementation
  ☐ Host chipset should support PCIe hot plug
  ☐ Vendor driver needs to install in host system
  ☐ Please use USB interface if you can’t meet above requirement
RTS5261
SD Express Reader Controller

- **Interface**: PCIe
- **Package**: QFN32 4x4
- **Power**: 3.3V
The world’s 1st mass-produced PCIe SD Express reader controller

Widely adopted by laptop makers in gaming, creator, and workstation laptops

Integrates all power sources for SD/SD Express cards, reduces BOM cost and design effort

Co-layout with Realtek UHS-I RTS5227S/RTS5228 and UHS-II RTS5250S solution

Design kit available for SD7.1 or SD8.0 design
## RTL9211DS

SD Express Reader Controller

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface</td>
<td>USB3.2 Gen2</td>
</tr>
<tr>
<td>Package</td>
<td>QFN68 8x8</td>
</tr>
<tr>
<td>Power</td>
<td>5V</td>
</tr>
</tbody>
</table>
RTL9211DS

SD Express Reader Controller

- The world’s 1st mass-produced USB SD Express reader controller
- Support USB3.2 Gen2 10Gbps
- Widely adopted by dongle makers
- Design kit available for SD7.1 or SD8.0 design

<table>
<thead>
<tr>
<th>Super Speed Plus (UASP)</th>
<th>Read</th>
<th>Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seq 1M Q8T1</td>
<td>860</td>
<td>736</td>
</tr>
<tr>
<td>Seq 128K Q32T1</td>
<td>858</td>
<td>699</td>
</tr>
<tr>
<td>RND4K Q32T16</td>
<td>184</td>
<td>199</td>
</tr>
<tr>
<td>RND4K Q1T1</td>
<td>29</td>
<td>74</td>
</tr>
</tbody>
</table>
Customers Implementation FAQ

☐ Could SD Express reader support legacy SD card?
  ☑ Yes!

☐ Could SD Express reader support USB2.0/USB3.2 Gen1 or PCIe Gen1/2 host interface?
  ☑ Yes, reader adjusts to suitable mode automatically, but the SD Express card speed might be limit by host interface
Introduction

Robin Aw, Senior FAE & Design Engineer
Senior FAE & Design Engineer at Amphenol Communications Solutions (Server & Storage IO) and Active member in SD Association Mechanical TG
Amphenol: The Bridge

SD Connector supports multi standards:
- SD 8.0 (PCIe Gen 4)
- SD 7.0 (PCIe Gen 3)
- SD 3.01 (UHS-I)
- SD 4.0 (UHS-II)

microSD Connector supports multi standards:
- SD 7.1 (PCIe Gen 3)
- SD 3.01 (UHS-I)
- SD 4.0 (UHS-II)

Connector SI performance is future proof:
- up to PCIe Gen 4

**Contact Amphenol for more details**
<table>
<thead>
<tr>
<th>WHY AMPHENOL?</th>
<th>Amphenol</th>
<th>Competitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version</td>
<td>Up to v8.0 SD (Gen 4 x 1 lane)</td>
<td>v1.0-v7.0 (SD only)</td>
</tr>
<tr>
<td>SI report/S-Parameter</td>
<td>Y</td>
<td>N**</td>
</tr>
<tr>
<td>Customizable Robustness Requirement</td>
<td>Y</td>
<td>N(TBC)</td>
</tr>
<tr>
<td>Customize Capability</td>
<td>Y</td>
<td>N**</td>
</tr>
<tr>
<td>Effective Shielding Solution (EMI)</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>SD Express type</td>
<td>Push Push/ Push Pull</td>
<td>Push Push/ Push Pull</td>
</tr>
<tr>
<td>Micro SD express type</td>
<td>Push Push/ Push Pull/ Hinge (developing)</td>
<td>N</td>
</tr>
<tr>
<td>Backward compatible version</td>
<td>UHS-I / UHS-II (SD + micro-SD)</td>
<td>UHS-I/UHS-II (SD only)</td>
</tr>
</tbody>
</table>
Connector Evolution with microSD Express

- **Card Detect Pin**
- **1st Row Contacts**
- **2nd Row Contacts**
- **Optional Pins for Other Standards**
- **LVDS TIA/EIA-644**
- **High Speed Pads are OFFSET**

- **Different Foot Print**
- **Standard Off the Shelf**

- **SD3.0**
- **SD3.0**
- **SD4.0**
- **SD3.0**
- **SD7.0**
Connector Evolution with microSD Express

Standard
Off the Shelf

P/N: 101019966912A

Dimension spec
L*W*H=14.65*13.50*1.55mm
Connector Evolution with microSD Express

**Standard**
Off the Shelf

**1st Row Contacts**

**2nd Row Contacts**

**BACKWARD COMPATIBLE OPTION**

**NEW DEVELOPMENT**

**VERY CHALLENGING**
Dual contact apex to handle offset 2nd row high speed signal transmission

**PCI EXPRESS**

**LVDS**
TIA/EIA-644

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Connector Evolution with microSD Express

BACKWARD COMPATIBLE OPTION

NEW DEVELOPMENT

LVDS TIA/EIA-644

PCI EXPRESS NVM EXPRESS

UHS I Micro UHS II microSD Express

Insertion Loss

Return Loss

NEXT TDD11

PASS

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**microSD Express SD7.1 Connector**

*With UHS II Compatibility*

- **1st Row Contacts**
- **2nd Row Contacts**

- **Backward UHS II compatibility** powered by Bayhub controller enabled by Amphenol connector

- **INDUSTRY’S 1ST DEVELOPMENT**

- **NEW DEVELOPMENT**

- **Dimension spec (TBC)**
  - L*W*H=14.65*13.50*2.10mm

- **Mechanical Spec**
  - Durability: 5000 cycles (TBD)
  - Mating force: 40N max (TBD)
  - Un-mating force: 0.5N-40N (TBD)

- **Electronic Spec**
  - Working current: 0.5A
  - Voltage: 100V AC

- **Various Type Solution**
  - Push Pull (MP)
  - Push Push (design stage)
  - Hinge type (design stage)

- **Comprehensive Report Availability**
  - S/ S-Parameter
  - Shielding Effectiveness (base on customer application requirement)
  - Mechanical Robustness Simulation (base on customer requirement)

- **Limited Samples Available**
Full Size SD Express SD7.0 Connector
With UHS II Compatibility

Backward UHS II compatibility powered by Bayhub controller enabled by Amphenol connector

Solder leads arranged in a single row for ease of AOI deployment

1st Row Contacts
2nd Row Contacts

Contacts for reserved area pending for future definition

Host has the option of deploying these contacts for customisation

Dimension spec
L*W*H= 29.40 * 28.35 * 3.15mm

Mechanical Spec
Durability: 5000 cycles (min)
Mating force: 40N max
Un-mating force: 0.5N - 40N

Electronic spec
Working current: 0.5A
Voltage: 100V AC

P/N: GSD21001X7BHR

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WE ARE “THE BRIDGE” FOR SD EXPRESS

Do drop us a mail if you have any enquiries

louis.feng@amphenol.com.tw

Thank You!
SD Express Testing Solution

Introduction

Godfree Coelho, Founder and CEO of Prodigy Technovations

He has 30 years of experience in test and measurement companies Tektronix and HP (Keysight). Godfree as founder in Prodigy Technovations involved developing protocol test solutions different standards such as UHS-I, UHS II and SD Express Interface.
Initialization of SD Express card
SD Express Boot Sequence

☐ SD Express interface has option of booting UHS I interface using CMD0 and CMD8 command.

☐ Set bits 20 and 21 as ‘1’ in CMD8 to request for PCIe data transfer.

☐ If SD card supports PCIe, Card will response with ‘1’ in Response argument to CMD8.

☐ PCIe link initialization starts by sending Line training sequences by TS1 and TS2 packets.

☐ Prodigy make PGY-SSM UHS-I SD Protocol Analyzer can be used analyse the UHS-I boot sequence.
SD Express Protocol Analysis

- To Analyzer SD Express Protocol use PGY-PCIeGen3/4 X4 Protocol Analyzer

- PCIeGen3/4 captures all lines training and data transfer

- PCIeGen3/4-PA provides LTSSM Analysis

- Protocol decode at PCIe and NVME layer

- SD Express interposer for conveniently probe the SD Express interface
PCIe/SD Express Protocol Decode Results

- Main Window displays the transaction between the Root Complex and End Point
  - List the upstream and mainstream packets
  - List Order sets and idle
  - Flexibility view each packets parameters by right click
- Packet level view of selected packet
- LTSSM view
Question and Answer Session
Questions?

☐ Use the GoToWebinar Control panel on your screen and choose the Question or Chat option to submit your question to our panel.
After the Webinar

☐ You will receive an email with a link to download the presentation and access to the on-demand recording of the webinar – feel free to share with your colleagues

☐ More information on SD Express is available at:

☐ Download our white papers on SD Express and other specifications:
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