

# Solutions for Implementing SD Express into Your Products

## Public Webinar

February 2023



# SD Express Public Webinar



## 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*

# Legal Disclaimer



## 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

# SD Association



- 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?



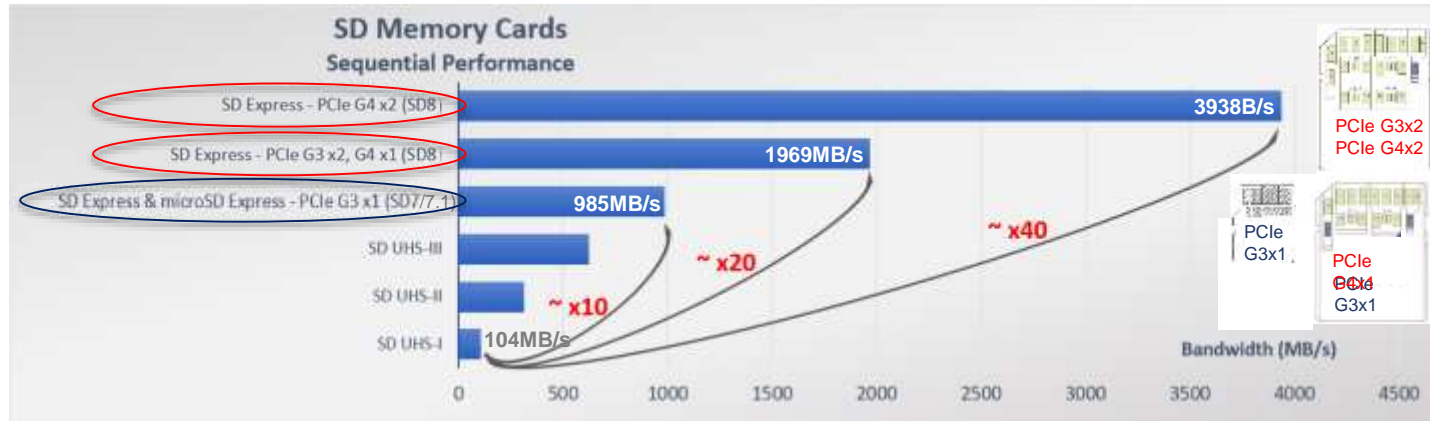
- The fastest SD™ and microSD™ memory cards with backward compatibility
- Supporting the following interfaces:
  - NVMe™ + PCIe® interface – up to PCIe 4.0 x2
  - SD interface (UHS-I up to 105MB/s)



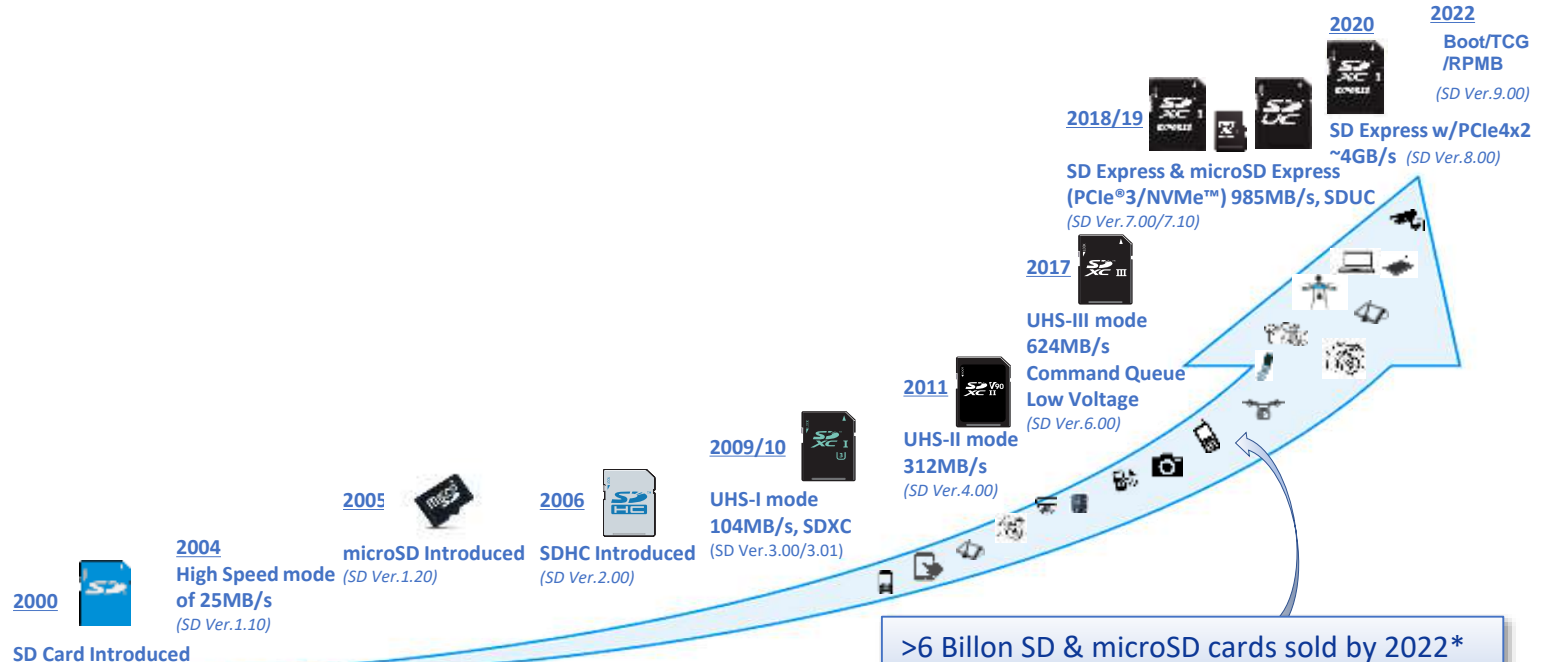
Uses the same, well known form-factors

32.0 × 24.0 × 2.1 mm

15.0 × 11.0 × 1.0 mm



# SD Card Specifications Evolution



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

\* Source: Estimation using news published by SanDisk in 2015 ("2 Billion microSD cards sold by 2015") + TrendForce's report from 2019 ("total of ~3 billion cards sold within 2016-2019") and report from Futuresource of total of ~1.1B sold between 2020-2022

# 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°



Semi-embedded applications (IoT, Mobile-Compute etc)



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



4K cameras are everywhere  
Plus growing 8K, 12K and 8k360 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

# SD Express Card – Features

- ☐ 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)




From PCIe-SiG Spec

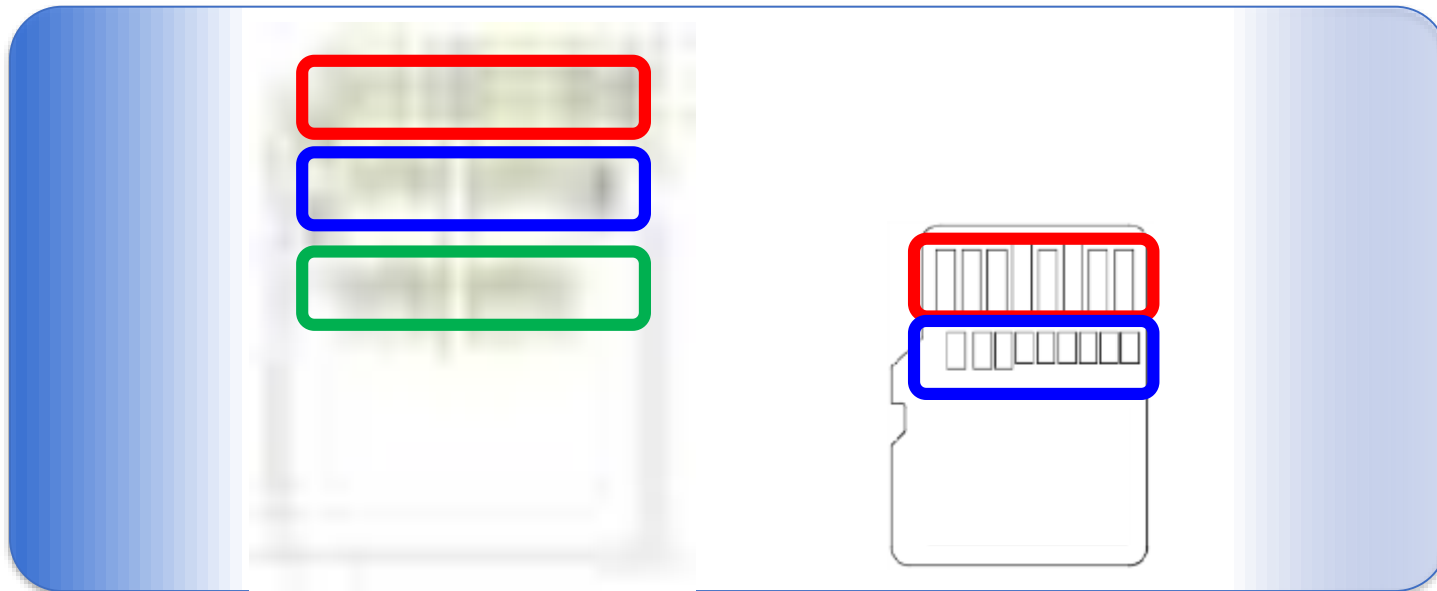
PCI CODES AND IDENTIFICATION SPECIFICATION, REV. 1.0

Base Class	Sub-Class	Programming Interface	Meaning
08h	00h	00h	ATA controller with ACMA interface - single stepping (see Note 2)
		01h	ATA controller with ACMA interface - continuous operation (see Note 2)
	01h	00h	Serial ATA controller - vendor-specific interface
		01h	Serial ATA controller - AHCI interface (see Note 1)
	02h	00h	Serial Storage Bus Interface
		01h	Serial Attached SCSI (SAS) controller - vendor-specific interface
09h	00h	00h	Controller
		01h	Controller
	01h	00h	Non-volatile memory subsystem - vendor-specific interface
		01h	Non-volatile memory subsystem - NVMe interface (see Note 3)
0A	00h	00h	Non-volatile memory subsystem - NVMe Express interface (see Note 3)
		01h	Universal Flash Storage (UFS) controller - vendor-specific interface
0B	00h	00h	Universal Flash Storage (UFS) controller - Universal Flash Storage Host Controller interface (UFS-HCI) (see Note 3)
		01h	Universal Flash Storage (UFS) controller - Universal Flash Storage Host Controller interface (UFS-HCI) (see Note 3)

<sup>(1)</sup>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

-  =1<sup>st</sup> row: conventional SD in SD mode or PCIe side band (PERST#, CLKREQ#, REFCLK+/-) in PCIe mode
-  =2<sup>nd</sup> row: PCIe 1<sup>st</sup> lane differential IO's in PCIe mode – SD 7.X
-  =3<sup>rd</sup> row: PCIe 2<sup>nd</sup> 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

Power State (Max Power)		
Card Type		
G3L1	G3L2 / G4L1	G4L2
		4.0W
		3.2W
	2.8W	2.8W
	2.5W	2.5W
1.8W	1.8W	1.8W
1.44W	1.44W	1.44W
0.72W	0.72W	0.72W

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

# PCIe and NVMe Interfaces – Test Advantages

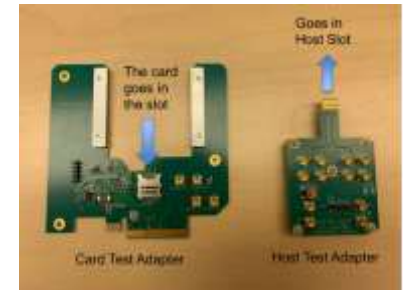
*Many Bus Analyzers, Protocol Analyzers, Test Suites are in the market\*...*



- ☐ 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)



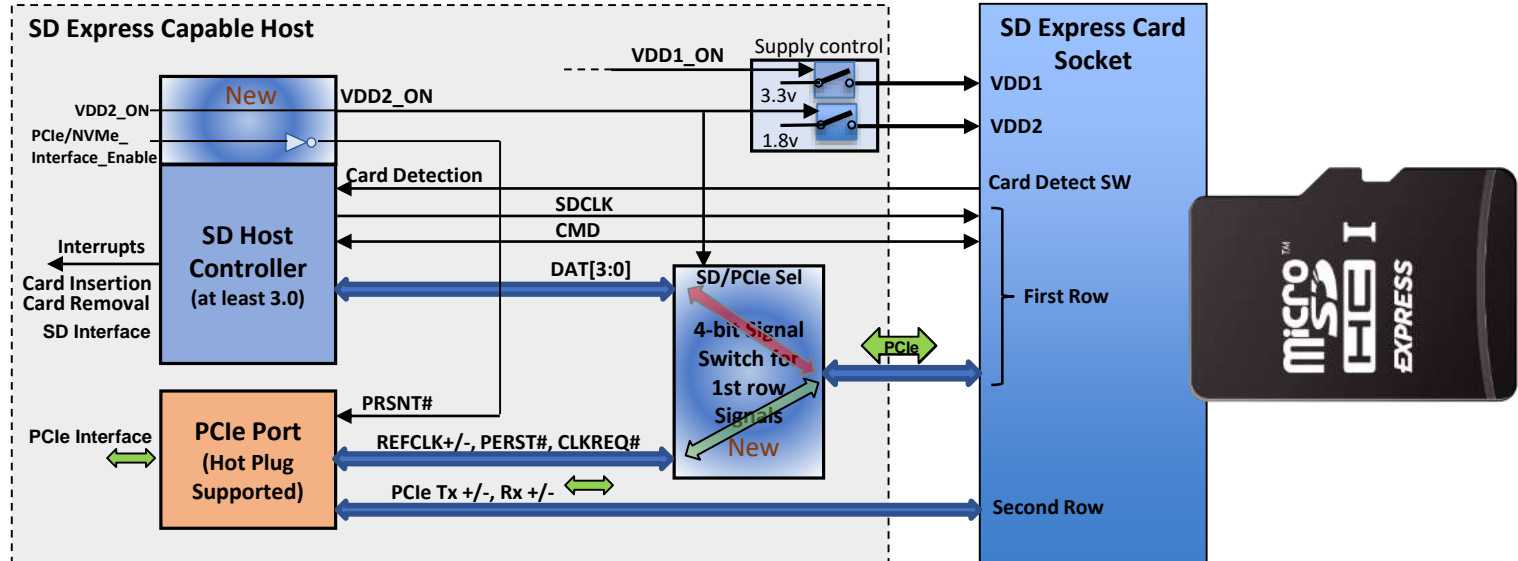
In parallel, there are new lower-cost SD Express card dedicated testers available or under development



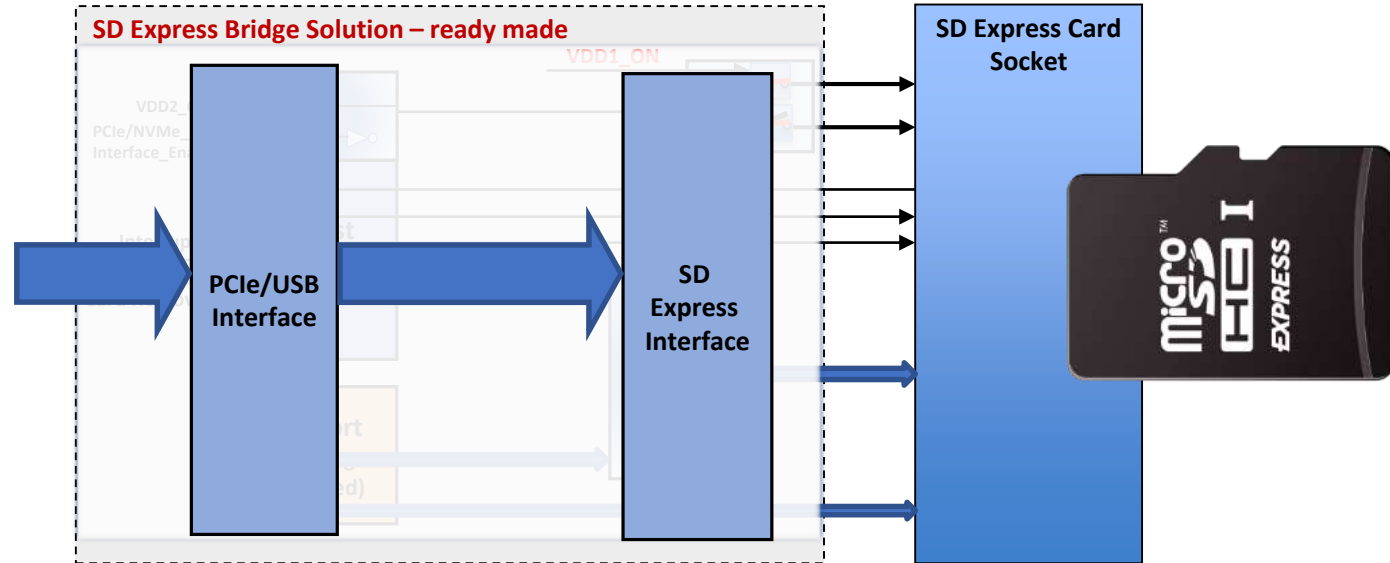
*\* May not be a complete list of available solutions*

# How To Implement SD Express Host

As described in SDA publication: [SD Express Host Implementation Guideline](#)

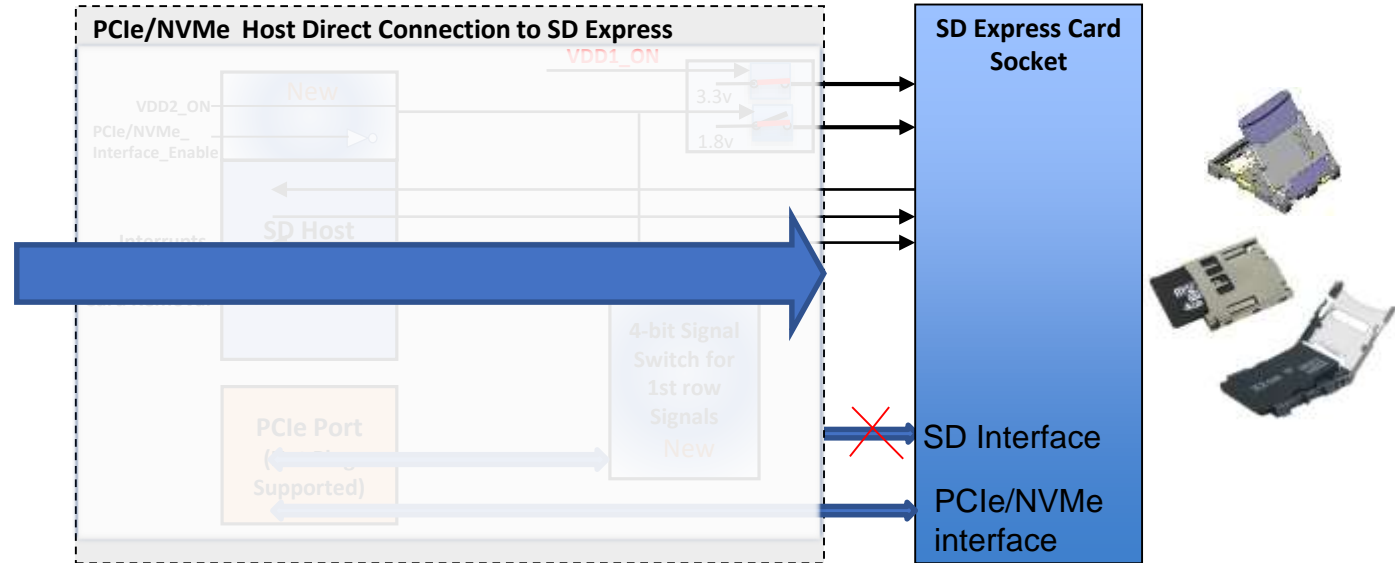


# SD Express Host - other possible methods





# SD Express 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](http://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 Devices Now and Future



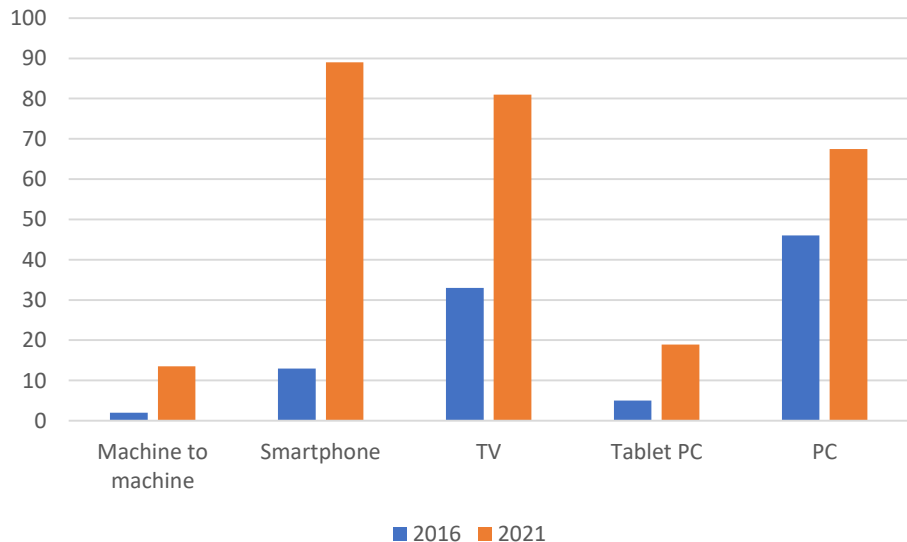
- ☐ SD host products have strong motivation for larger and faster removable media
- ☐ SD Express has the best positioning to support the trend
- ☐ SD Express eco-system is ready
  - ☐ SD Express host controller, SD Express card, SD Express card controller
- ☐ BayHub offers SD Express host controllers for above all SD host products

# Why SD Express? – worldwide IP traffic trend --



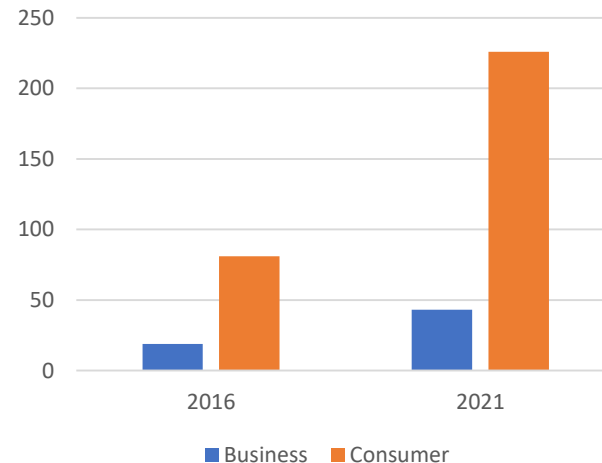
- Worldwide IP traffic increased from 100EB (2016) to 270EB (2021)
- Consumer devices drive IP traffic explosion
- More data stream increase the demand for larger and faster storage

Exabyte/month



Exabyte/month

1 Exabyte = 10<sup>6</sup> 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







# 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.*



- 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



SD Association  
SVP Portal



## SDA SVP Product List

UHS-II

Download as CSV

Search:

No.	Model	Company	Product Type	Listed Date
1	✓ GL9767	Genesys Logic Inc.	Card Reader Controller	2021/12/01

SD Express

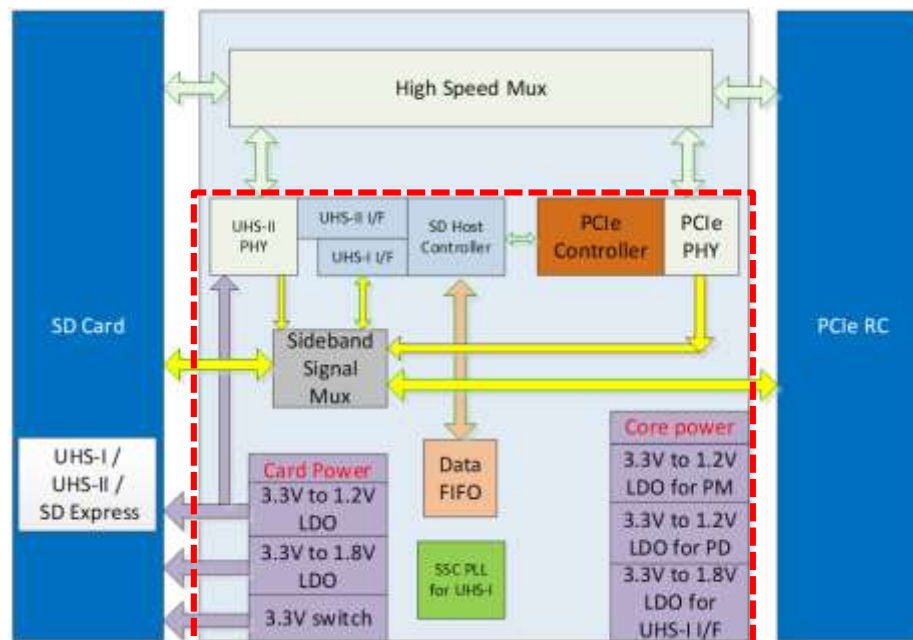
Download as CSV

Search:

No.	Model	Company	Product Type	Listed Date
1	✓ GL9767	Genesys Logic Inc.	Card Reader Controller	2021/12/01

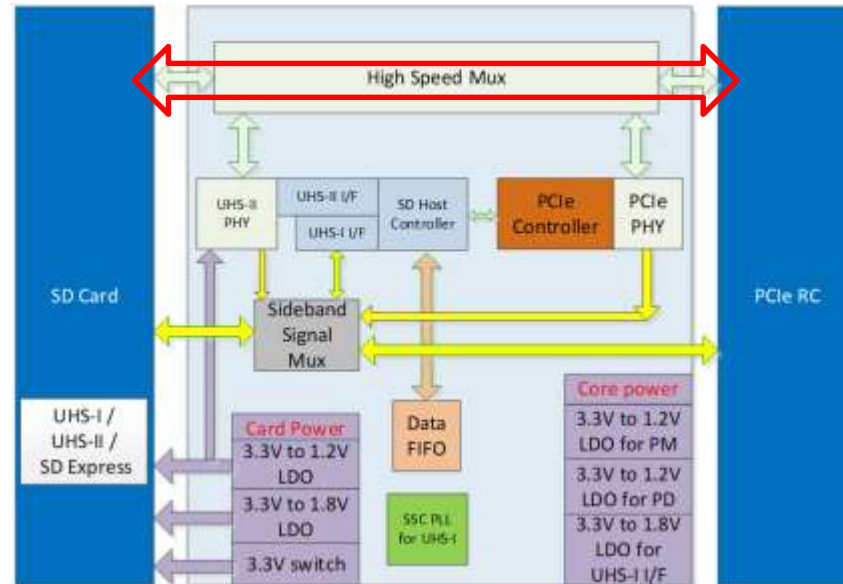
Source: <https://penang.graniteriverlabs.com/svplist>

# Controller Block Diagram – GL9767



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

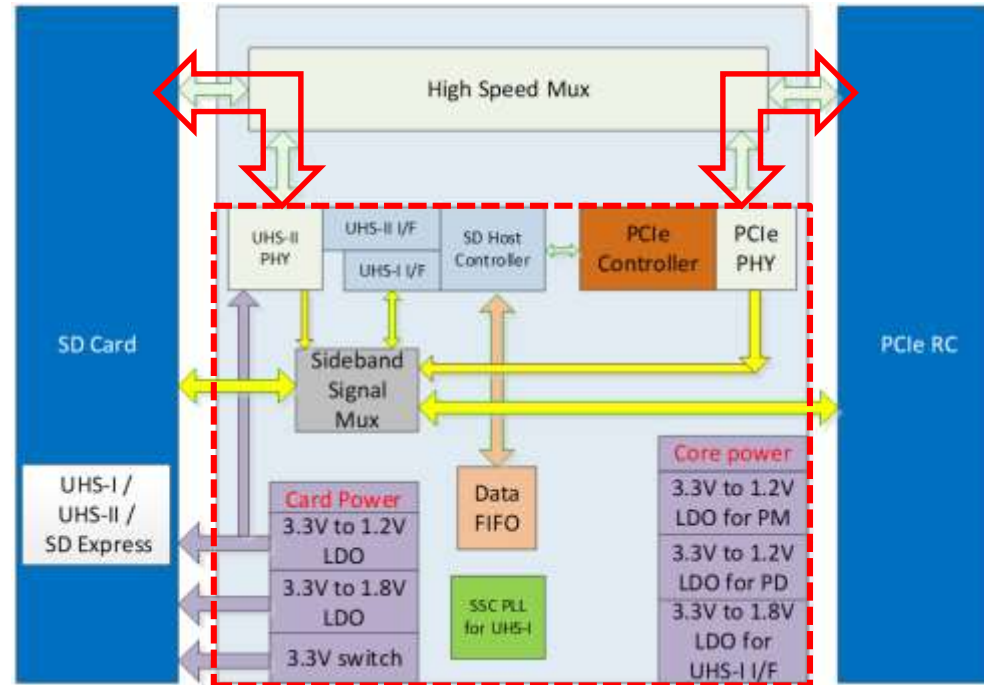
When the SD Express card inserted, the card will directly connect to PCIe root complex and the in-box NVME driver will be loaded



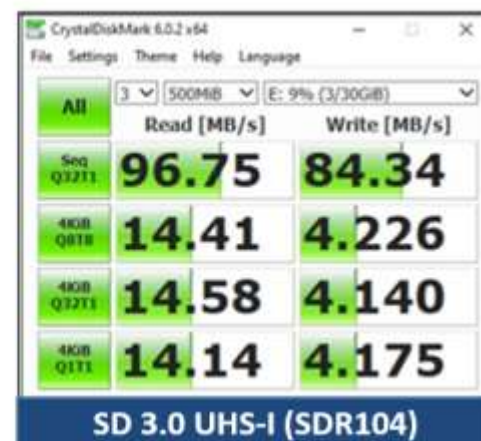
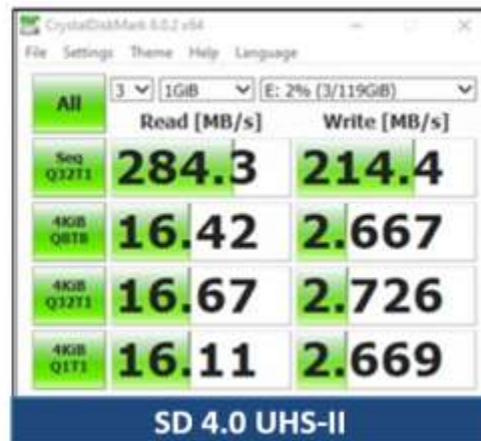
### System Requirement :

*The PCIe root port need to enable PCIe hot-plug function to support SD7 card plug and un-plug*

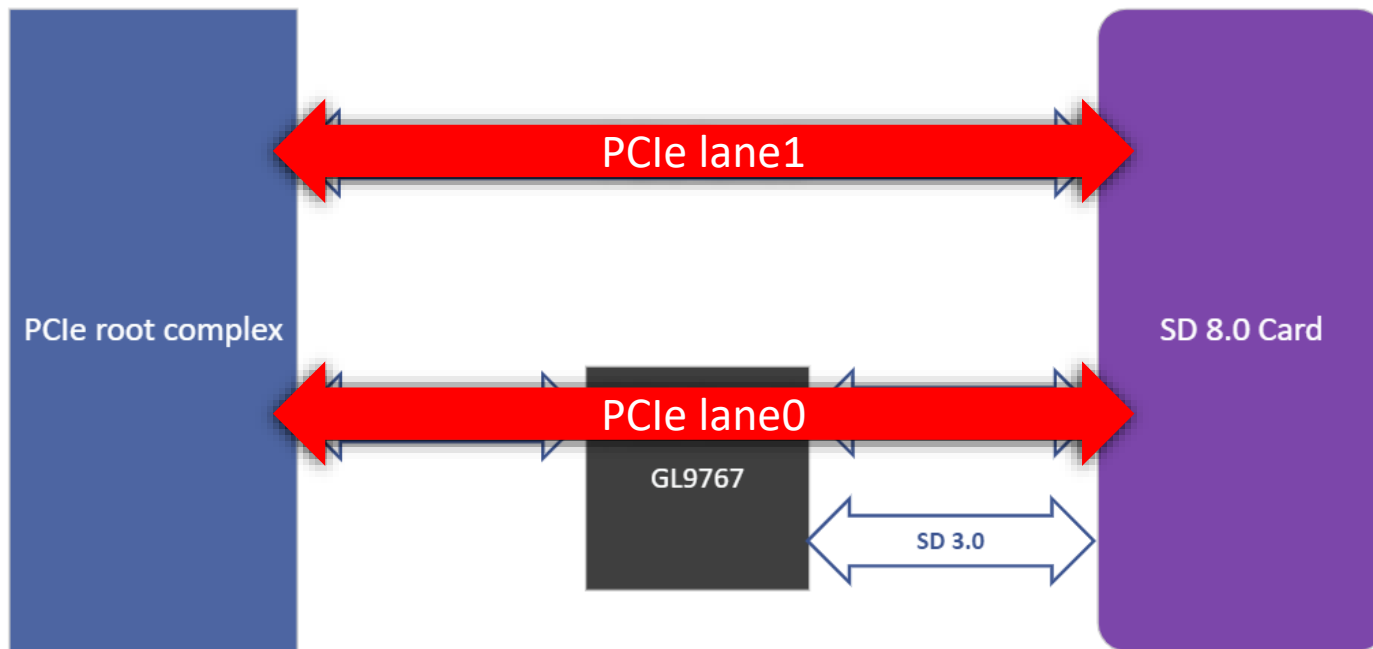
When the non-SD Express card inserted, the card will be initialized by the internal SD host controller and the vendor driver will be loaded



# Benchmark Test with SD7 & SD4 & SD3 cards



# Support 2-lane SD8 card by a specific system design





# Benchmark Test use GL9767 2-lane EVB + PCIe G4 SSD

CrystalDiskMark 8.0.1 x64 [Admin]			
File Settings Profile Theme Help Language			
All	1	8GiB	E: 0% (1/466GiB) MB/s
	Read (MB/s)		Write (MB/s)
SEQ1M Q8T1	3556.88		3458.49
SEQ1M Q1T1	2833.87		3083.99
RND4K Q32T1	512.43		368.88
RND4K Q1T1	84.68		196.15



# 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 1<sup>st</sup> USB 10Gb/s to SD Express Card Reader Solution

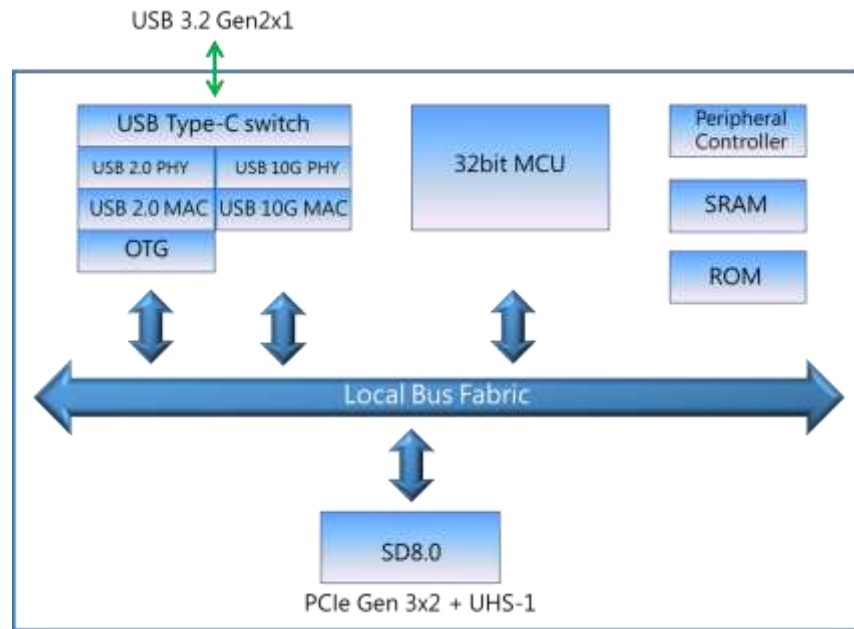


**JMS581SD Demo Board**

- ☐ 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



**JMS581SD SD Express Card Reader**

- ☐ 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



# JMicron JMS581SD – Performance

## Sample A (128GB)

Crystal Disk Mark 5.2.0



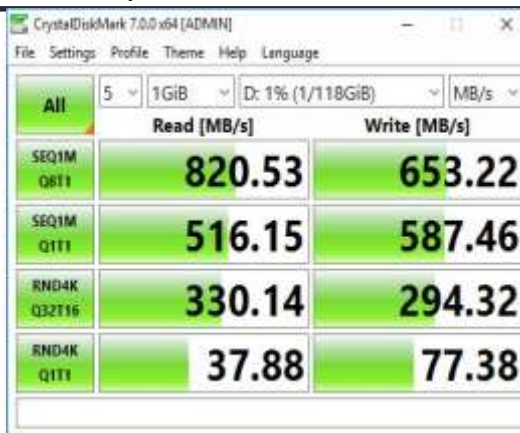
CrystalDiskMark 5.2.0 v04

File Settings Theme Help Language

All 5 1GiB D: 0% (0/118GiB)

	Read [MB/s]	Write [MB/s]
Seq Q32T1	820.0	659.4
4K Q32T1	329.7	291.1
Seq	521.2	595.8
4K	37.65	79.63

Crystal Disk Mark 7.0



CrystalDiskMark 7.0.0 x64 [ADMIN]

File Settings Profile Theme Help Language

All 5 1GiB D: 1% (1/118GiB) MB/s

	Read [MB/s]	Write [MB/s]
SEQ1M QBT1	820.53	653.22
SEQ1M QTT1	516.15	587.46
RND4K Q32T16	330.14	294.32
RND4K QTT1	37.88	77.38

## Sample B (480GB)

Crystal Disk Mark 5.2.0



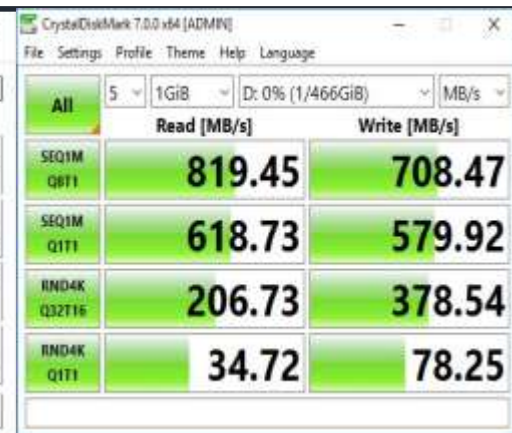
CrystalDiskMark 5.2.0 v04

File Settings Theme Help Language

All 5 1GiB D: 0% (0/466GiB)

	Read [MB/s]	Write [MB/s]
Seq Q32T1	818.4	738.8
4K Q32T1	209.6	383.2
Seq	627.9	584.7
4K	35.34	80.49

Crystal Disk Mark 7.0



CrystalDiskMark 7.0.0 x64 [ADMIN]

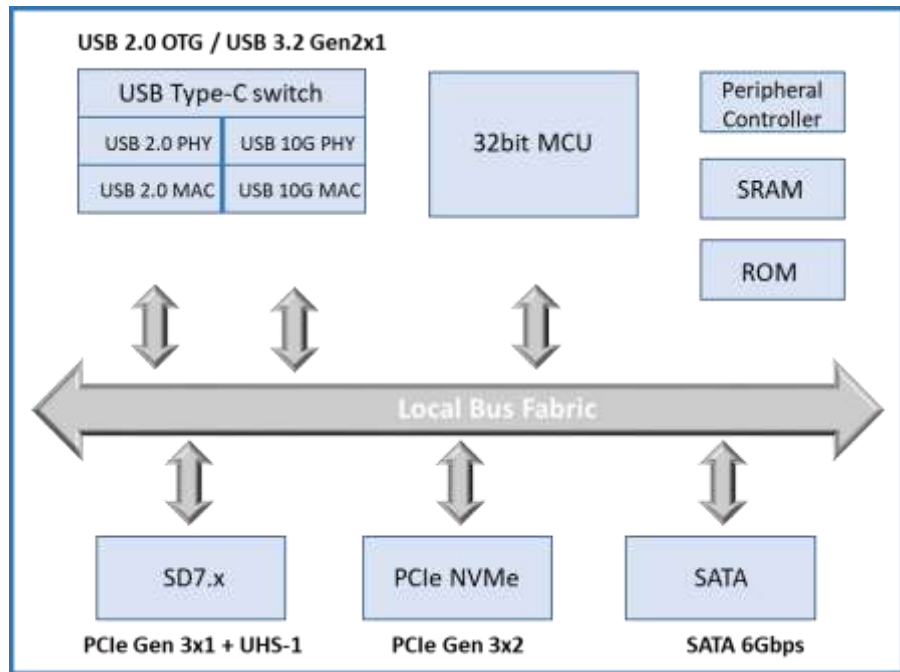
File Settings Profile Theme Help Language

All 5 1GiB D: 0% (1/466GiB) MB/s

	Read [MB/s]	Write [MB/s]
SEQ1M QBT1	819.45	708.47
SEQ1M QTT1	618.73	579.92
RND4K Q32T16	206.73	378.54
RND4K QTT1	34.72	78.25

\* Performance will vary between different brands and capacities

# JMicron JMS581LT – SD Express + PCIe + SATA



**JMS581SD Block Diagram**

- ☐ 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



# JMicron JMS581LT – 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



- ☐ 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

SD/Host interface	USB	PCIe
UHS-I	RTS5176E/RTS5306E/RTS5350	RTS5227S/RTS5228
UHS-II	RTS5329	RTS5250S
SD Express	RTL9211DS	RTS5261

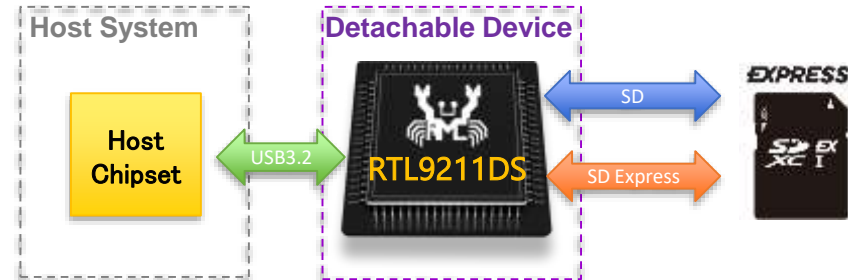
# Implement SD Express Reader



REALTEK



- ☐ 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*



REALTEK



SD Association

# RTS5261

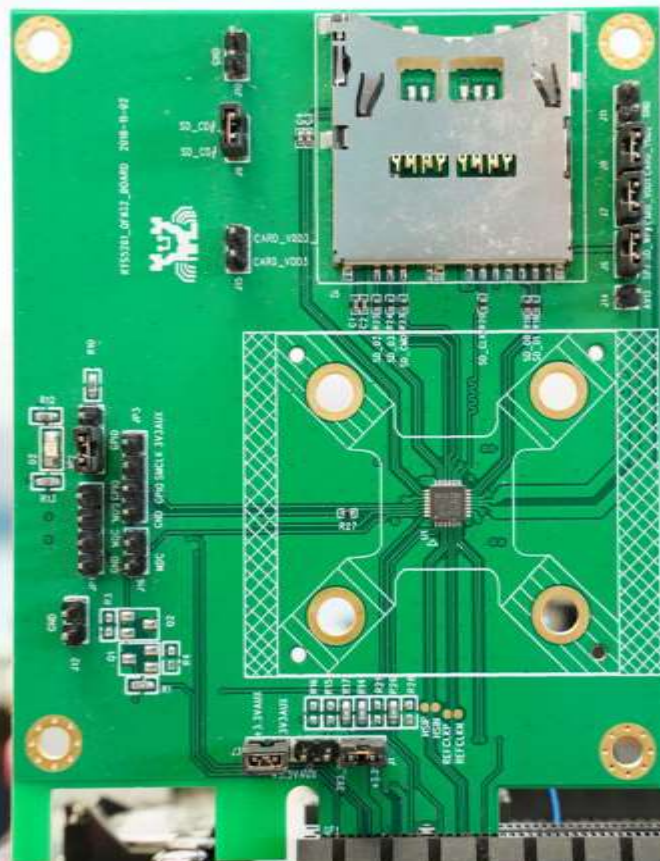
## SD Express Reader Controller



Interface PCIe

Package QFN32 4x4

Power 3.3V







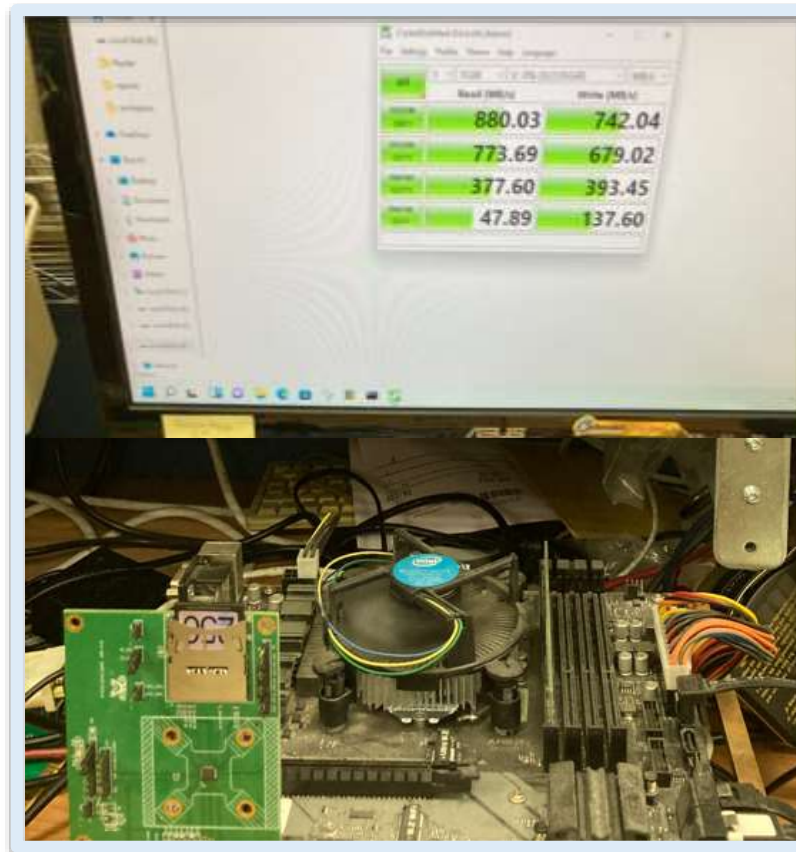
REALTEK



# RTS5261

## SD Express Reader Controller

- 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





REALTEK



SD Association

# RTL9211DS

## SD Express Reader Controller

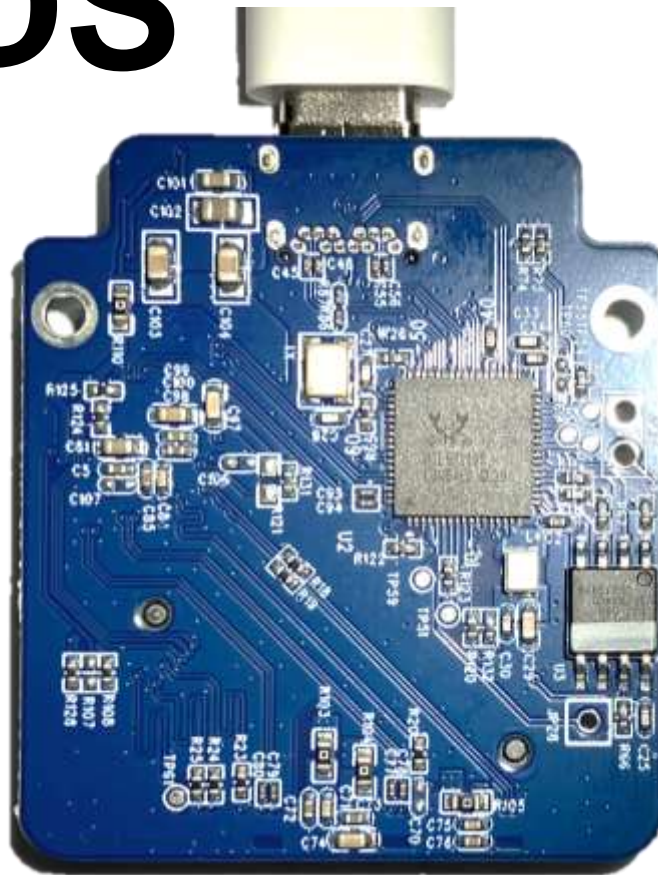


RTL9211DS

Interface	USB3.2 Gen2
-----------	-------------

Package	QFN68 8x8
---------	-----------

Power	5V
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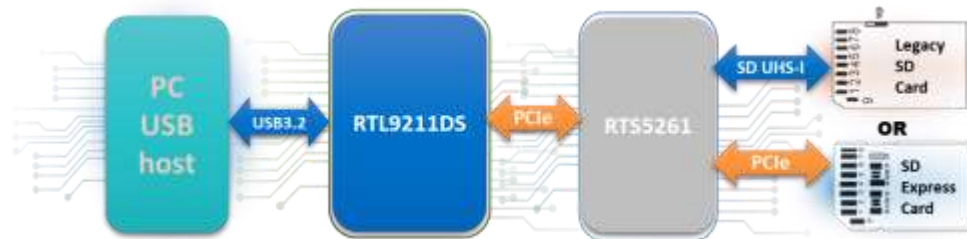
REALTEK



# 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



	Super Speed Plus (UASP)	
	Read	Write
Seq 1M Q8T1	860	736
Seq 128K Q32T1	858	699
RND4K Q32T16	184	199
RND4K Q1T1	29	74



# 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

# SD Express & microSD Express Connector Solutions



**Amphenol**

## 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*

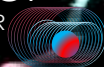
# AMPHENOL: THE BRIDGE

Amphenol



## Amphenol

SD EXPRESS  
INTERCONNECT  
SOLUTION PROVIDER



HOST & DEVICES



NEW  
DEVELOPMENT



microSD Connector supports multi standards.

- **SD 7.1** (PCIe Gen 3)
- SD 3.01 (UHS-I)
- SD4.0 (UHS-II)

Connector SI performance is future proof;  
o up to PCIe Gen 4

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)



MEMORY CARD

\*\*Contact Amphenol for more details

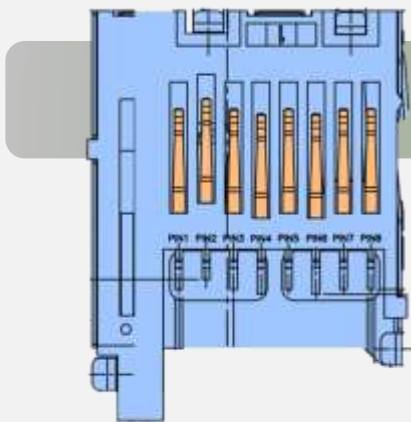
# WHY AMPHENOL?



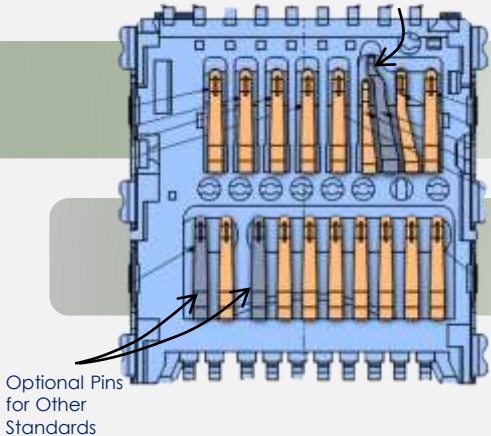
	Amphenol	Competitor
Version	Up to v8.0 <sub>SD</sub> (Gen 4 x 1 lane)	v1.0-v7.0 <sub>(SD only)</sub>
SI report/S-Parameter	Y	N**
Customizable Robustness Requirement	Y	N(TBC)
Customize Capability	Y	N**
Effective Shielding Solution(EMI)	Y	Y
SD Express type	Push Push/ Push Pull	Push Push/ Push Pull
Micro SD express type	Push Push/ Push Pull/ Hinge (developing)	N
Backward compatible version	UHS-I / UHS-II (SD + micro-SD)	UHS-I/UHS-II <sub>(SD only)</sub>

# Connector Evolution with microSD Express

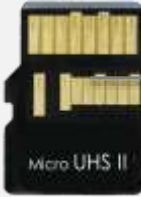
Amphenol



SD3.0



SD3.0



SD4.0

LVDS  
TIA/EIA-644

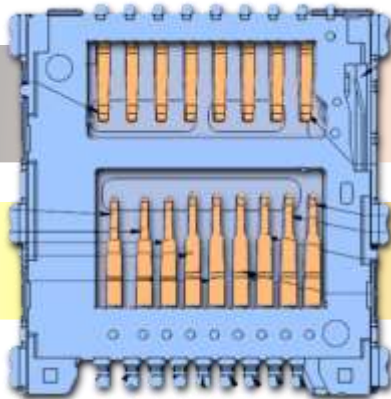
1<sup>st</sup> Row  
Contacts

2<sup>nd</sup> Row  
Contacts

High Speed  
Pads are OFFSET

PCI EXPRESS nvm EXPRESS

Different Foot Print



Connector is rated up to Gen 4



SD3.0



SD7.0

SD EXPRESS  
PCI EXPRESS Gen 3

Standard  
Off the Shelf

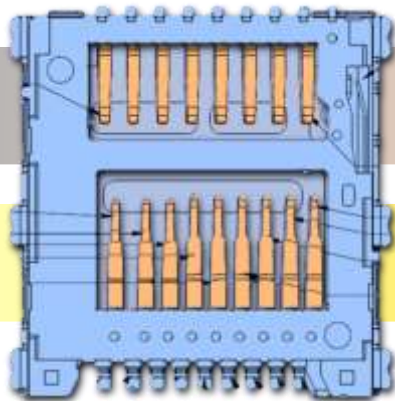


# Connector Evolution with microSD Express

Amphenol

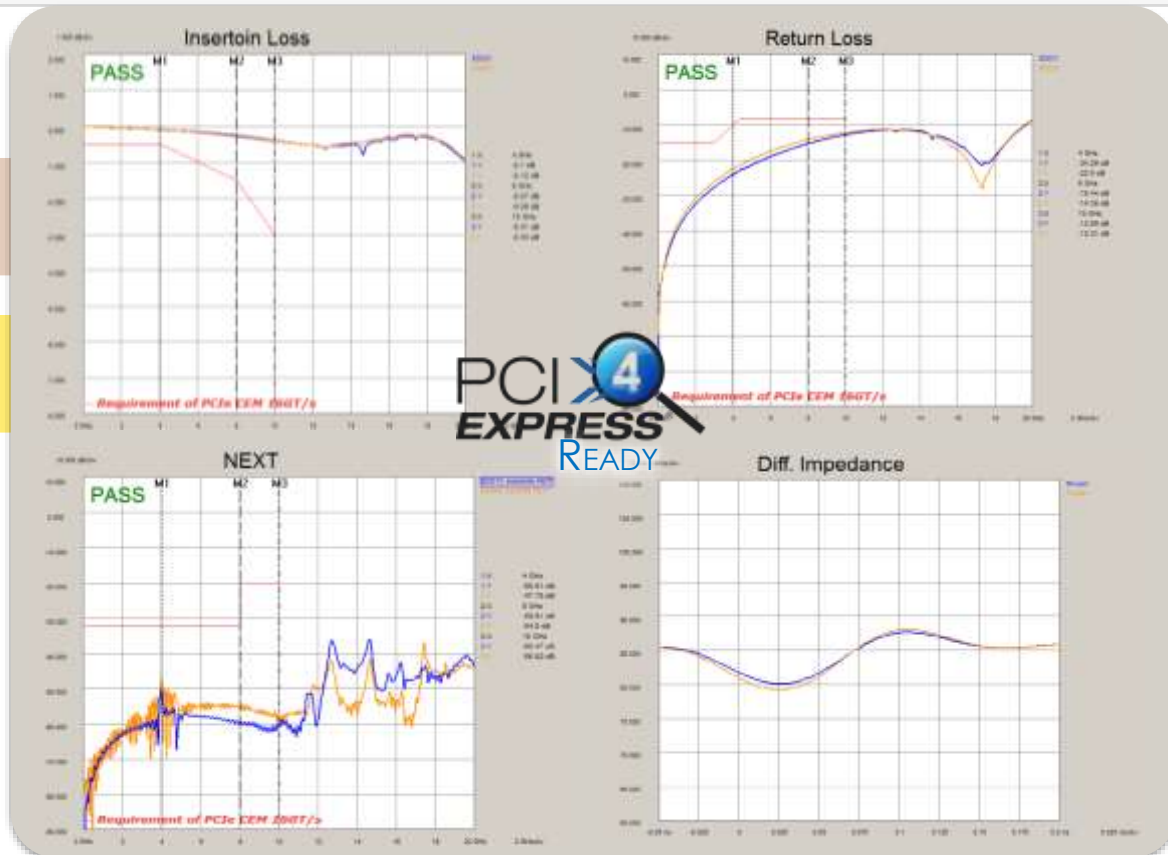


**Standard**  
Off the Shelf



P/N: 101019966912A

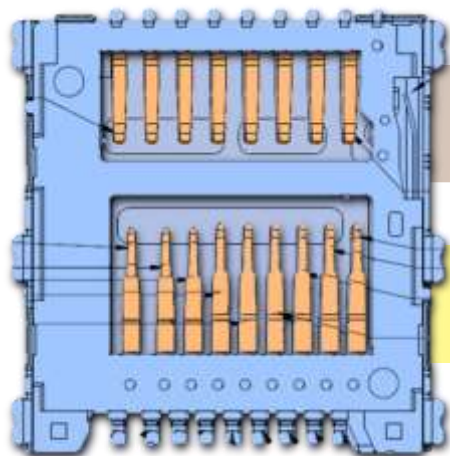
**Dimension spec**  
 $L*W*H=14.65*13.50*1.55\text{mm}$





# Connector Evolution with microSD Express

**Standard**  
Off the Shelf



1<sup>st</sup> Row  
Contacts

2<sup>nd</sup> Row  
Contacts

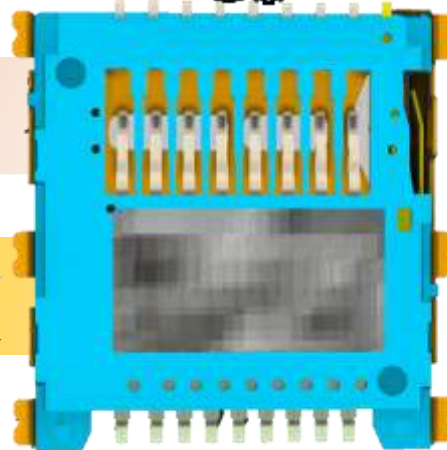


BACKWARD  
COMPATIBLE  
OPTION



**NEW  
DEVELOPEMENT**

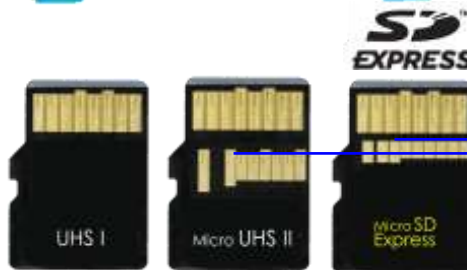
PCI  
EXPRESS  
LVDS  
TIA/EIA-644



**VERY CHALLENGING**

Dual contact apex to handle  
offset 2<sup>nd</sup> row high speed signal  
transmission

PCI  
EXPRESS & LVDS  
TIA/EIA-644

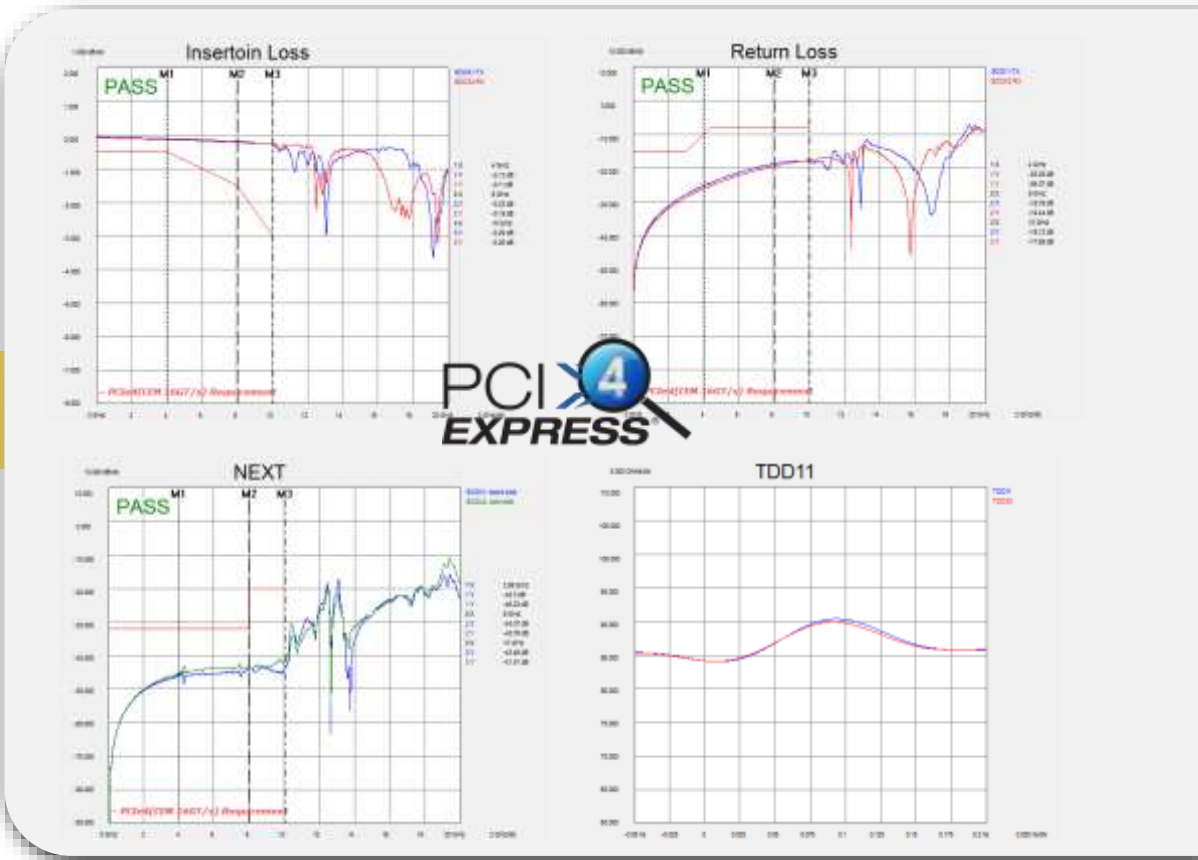
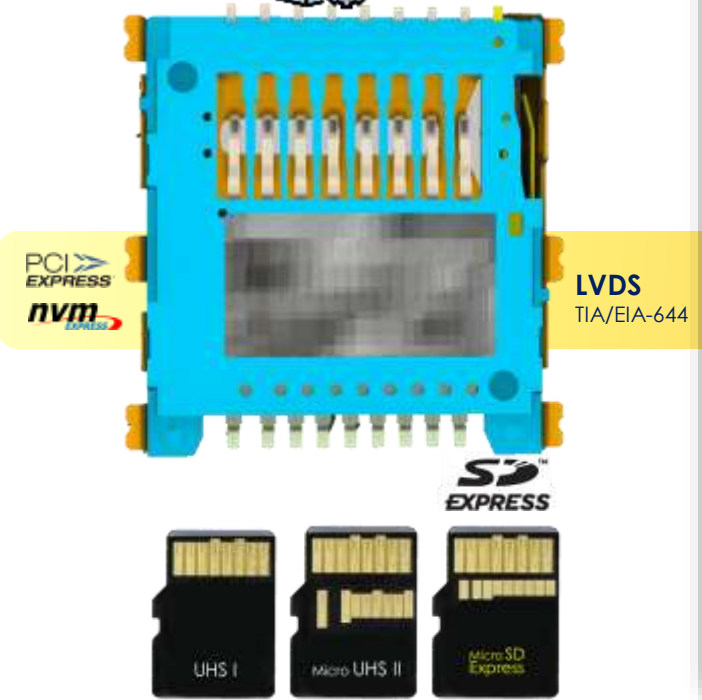


# Connector Evolution with microSD Express

BACKWARD  
COMPATIBLE  
OPTION



NEW  
DEVELOPEMENT



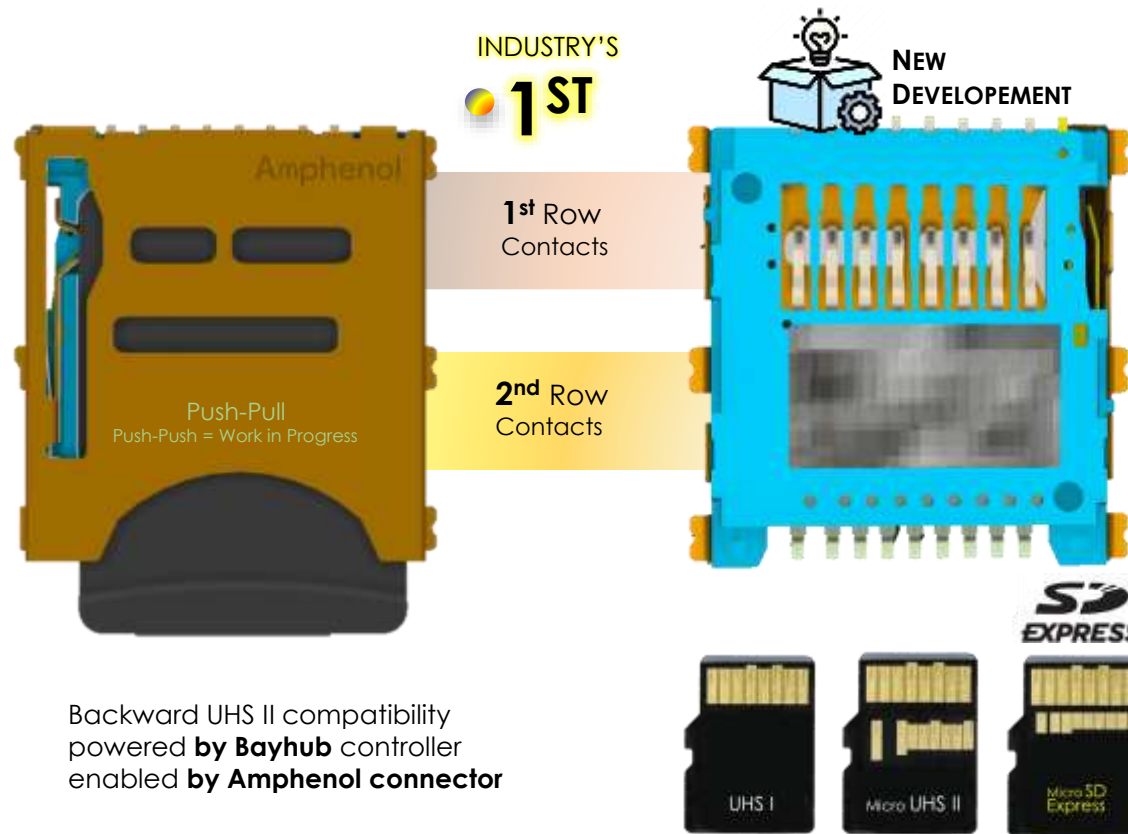


# microSD Express SD7.1 Connector

## With UHS II Compatibility

Amphenol

SD Association



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

### 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)

Limited Samples  
Available

### Comprehensive Report Availability

- ☐ SI/ S-Parameter
- ☐ Shielding Effectiveness (base on customer application requirement)
- ☐ Mechanical Robustness Simulation (base on customer requirement)



# Full Size SD Express SD7.0 Connector

## With UHS II Compatibility

Amphenol

SD Association

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

1<sup>st</sup> Row  
Contacts

2<sup>nd</sup> Row  
Contacts

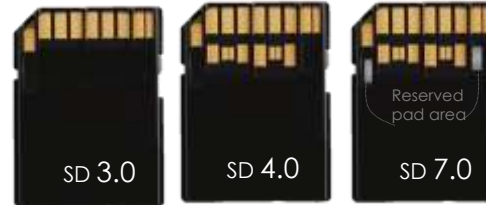
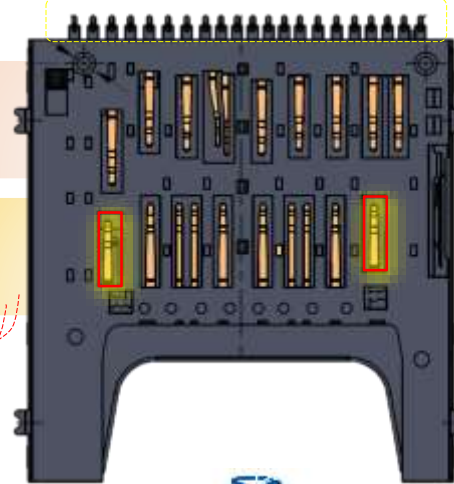
PCI  
EXPRESS  
Gen 3

Push-Push

Contacts for  
reserved area  
pending for  
future definition

Host has the option  
of deploying these  
contacts for  
customisation

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



### 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

CONTACT FINISH:  
GOLD PLATE  
1.6 μ" GOLD  
2.0 μ" GOLD  
3.0 μ" GOLD



The background of the slide is a high-quality image of the Earth as seen from space, showing the curvature of the planet and the blue oceans. Overlaid on this image are several white, glowing orbital lines that represent satellite paths, creating a sense of global connectivity and technology.

WE ARE “**THE BRIDGE**” FOR SD EXPRESS

Do drop us a mail if you have any enquiries

[louis.feng@amphenol.com.tw](mailto:louis.feng@amphenol.com.tw)

*Thank You!*



# SD Express Testing Solution



## Introduction

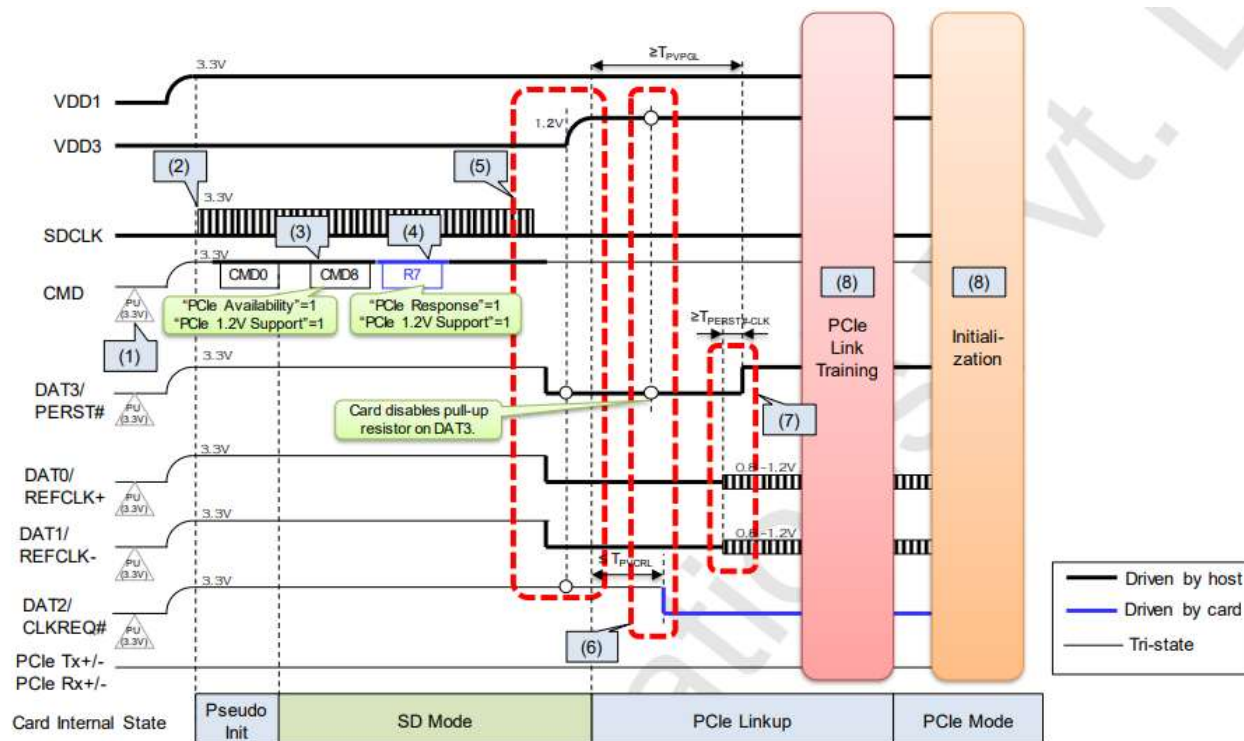
### ***Godfree Coelho, Founder and CEO of Prodigy Technovations***

*He has 30 years of experience in test and measurement companies Tektronix and HP (Keysight). Godfree as founder in Prodigy Technonations 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-PCleGen3/4 X4 Protocol Analyzer
- ☐ PCleGen3/4 captures all lines training and data transfer
- ☐ PCleGen3/4-PA provides LTSSM Analysis
- ☐ Protocol decode at PCIe and NVME layer
- ☐ SD Express interposer for conveniently probe the SD Express interface



PCIeGen3/4 Protocol Analyzer



SD Express interposer

## 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:
  - <https://www.sdcard.org/developers/sd-standard-overview/bus-speed-default-speed-high-speed-uhs-sd-express/>
  
- ☐ Download our white papers on SD Express and other specifications:
  - [https://www.sdcard.org/downloads/pls/latest\\_whitepapers/](https://www.sdcard.org/downloads/pls/latest_whitepapers/)

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- **Website:** <https://www.realtek.com/en/>



# Thank you for attending!

[helpdesk@sdcard.org](mailto:helpdesk@sdcard.org) [www.sdcard.org](http://www.sdcard.org)