



GLOBAL WORKSHOP TAIWAN

January 13, 2022

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Introduction and Agenda

Anne Tsou 鄒雅婷

SDA協會行銷委員會台灣區主席 (百佳泰)

SDA MC Taiwan Chair

ALLION[®]
AIoT EXPERT

SD協會臺灣線上研討會

2020, 1/13 , Global Workshop Webinar Agenda - Taiwan



SD Association

#	Topic	Presenter	Company	Remarks
1	開幕致詞與議程簡介 Opening, Introduce event and Agenda	鄒雅婷 Anne Tsou	Allion Labs	SDA協會行銷委員會台灣區主席 (百佳泰) SDA MC Taiwan Chair
2	歡迎致詞 Welcome Message	鄺宗宏 TH Kuang	Phison	SDA協會董事/行銷委員會亞太區主席 SDA BOD & MC APAC Region Chair
3	*SD協會概述 SDA Update/Overview	Kazunori Nakano	KIOXIA	SD協會董事/行銷委員會全球主席 SDA BOD & MC Global Chair
4	*主題演講 SD Express主機導入 SD Express Host Implementation	Yosi Pinto	SanDisk LLC	SD協會董事會主席/技術委員會主席 SDA Chairman and TC Chair
5	SD Express 產品應用:主機控制器 SD Express Host Controller	呂育德 Louis Lu	Bayhub	倍昊資深經理 Senior Manager
6	SD Express 產品應用: 儲存裝置生態系 SD Express-Ecosystem of Storage Devices	蕭俊竑 Jim Shiau	Realtek	瑞昱經理 Manager
7	SD Express 產品應用: 實例分享 SD Express Host Device	陳江村 CT Chen	Acer	宏碁資訊產品事業群資深經理 Senior Manager
8	SVP簡介 SD and UHS-II Verification Program (SVP)	張靜宜 Sandy Chang	GRL	GRL技術總監 Taiwan Technical Director
9	SD Express 卡片介紹與應用範例 SD Express Card and Applications	郭育立 Rex Kuo	Phison	群聯電子產品經理 PM Manager
10	*相容性與測試驗證服務 *Compliance and Testing Services	Hitoshi Hatakeyama	Allion Labs	百佳泰/Allion Japan, Senior SI Expert/ Sales Engineering Supervisor
11	Q&A	All		

* 英文主講 / English language

SD協會台灣線上研討會



Welcome Message

鄺宗宏, 協會董事 / 推廣委員會亞太區主席

T. H. Kuang,

SDA Board of Directors/
Marketing Committee APAC Region Chair (Phison)

PHISON

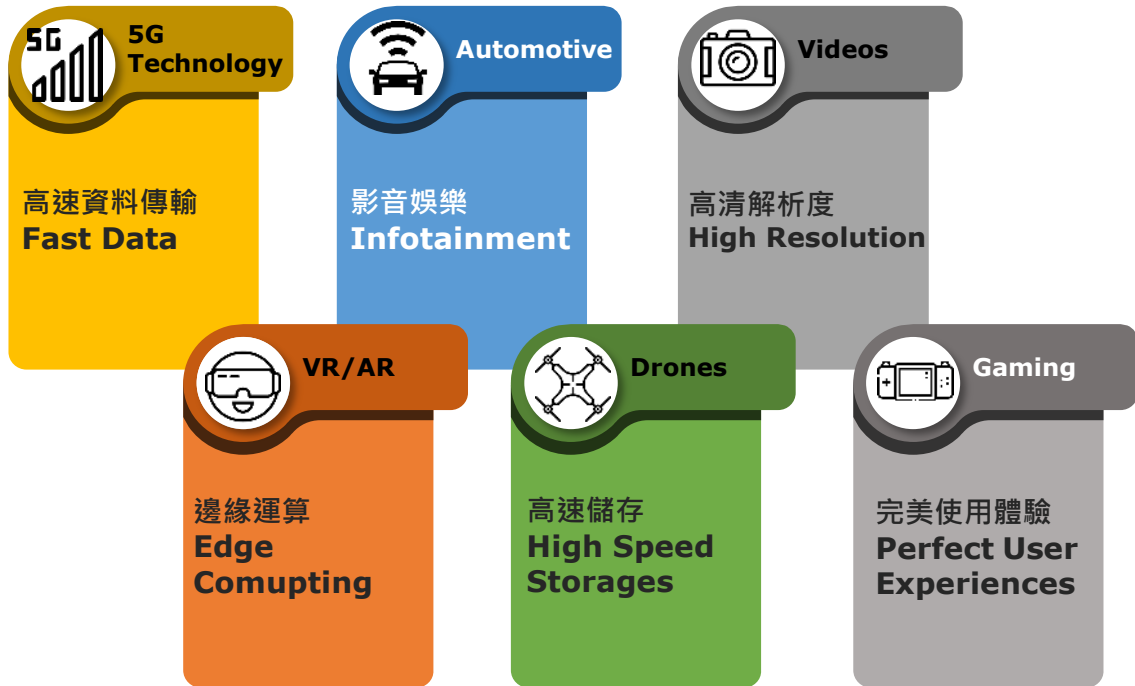
歡迎大家參加SD協會臺灣線上研討會



Welcome to the SDA Global Workshop Taiwan Webinar

巨量資料 正驅動著 SD卡 的技術發展

Big Data is Driving Performance & Capacity of SD Technology Development



更多更新的SD卡技術&規格
More New SD Technology & Specification

- 2012年開始中國的推廣計畫
Strategic Activity in China started in 2012
- 26 New Member Company in China adopted SDA Membership in 2012
- 2012年四月有五十多家公司參與SD協會深圳活動
Welcomed more than 50 company in Shenzhen, April, 2012
- 2012年十一月有五十多家公司參與SD協會上海活動
Welcomed more than 50 company in Shanghai , Nov, 2012
- 2013年五月SD協會全球技術研討會 北京活動
Global Workshop Beijing, May, 2013
- 2013年十月SD協會全球技術研討會 成都活動
Global Workshop Chengdu, Oct, 2013
- 2014年四月SD協會全球技術研討會 上海活動
Global Workshop Shanghai , Apr, 2014
- 2014年十月SD協會全球技術研討會 臺北活動
Global Workshop Taipei , Oct, 1st 2014
- 2015年五月SD協會全球技術研討會 深圳活動
Global Workshop Shenzhen , May, 2015
- 2015年十月SD協會全球技術研討會 臺北活動
Global Workshop Taipei , Oct. 2015
- 2016年四月SD協會全球技術研討會 上海活動
Global Workshop Shanghai , Apr. 2016
- 2016年十一月SD協會全球技術研討會 印度活動
Global Workshop Bangalore, Nov. 2016
- 2017年四月SD協會全球技術研討會 臺北活動
Global Workshop Taipei , Apr. 2017
- 2017年九月SD協會全球技術研討會 印度活動
Global Workshop Bangalore, Sep. 2017
- 2017年十二月SD協會全球技術研討會 日本活動
Global Workshop Tokyo, Dec. 2017
- 2018年三月SD協會全球技術研討會 印度活動
Global Workshop Mumbai, Mar. 2018
- 2018年三月SD協會全球技術研討會 印度活動
Global Workshop New Dehli, Mar. 2018
- 2018年三月SD協會全球技術研討會 杭州活動
Global Workshop Hangzhou, Mar. 2018
- 2018年九月SD協會全球技術研討會 印度活動
Global Workshop Bangalore, Sep/25 2018
- 2018年九月SD協會全球技術研討會 印度活動
Global Workshop Pune, Sep/27,,2018
- 2018年十月SD協會全球技術研討會 臺北活動
Global Workshop Taipei , Oct/26, 2018
- 2019年三月SD協會全球技術研討會 印度活動
Global Workshop Chennai, Mar/12, 2019
- 2019年三月SD協會全球技術研討會 印度活動
Global Workshop Hyderabad, Mar/14, 2019
- 2019年四月SD協會全球技術研討會上海活動
Global Workshop Shanghai, Apr/12. 2019
- 2019年四月SD協會全球技術研討會俄羅斯活動
Global Workshop Moscow, Apr/16. 2019
- 2019年九月SD協會全球技術研討會 印度活動
Global Workshop Bangalore, Sep/24, 2019
- 2019年九月SD協會全球技術研討會 印度活動
Global Workshop New Delhi, Sep/26, 2019
- 2019年十一月SD協會全球技術研討會俄羅斯活動
Global Workshop San Petersburg, Nov/7, 2019
- 2021年三月SD協會全球技術中國線上研討會活動
Global Workshop China Webinar, Mar/25, 2021
- 2021年三月SD協會全球技術研討會俄羅斯活動
Global Workshop Moscow Webinar, Mar/21. 2021
- 2021年四月SD協會全球技術研討會 印度活動
Global Workshop India Webinar , Apr/23, 2021
- 2021年九月SD協會全球技術研討會歐洲活動
Global Workshop Europe Webinar, Sep/22. 2021
- 2021年十月SD協會全球技術研討會美國活動
Global Workshop USA Webinar, Oct/27. 2021
- 2022年一月SD協會臺灣線上研討會活動
Global Workshop Taiwan Webinar, Jan/13, 2022

歡迎加入SD協會, 共創未來

Welcome to join SDA for a better future



YEARS OF INNOVATION

2000-2020





SD Association

Thank You

Email: kuang@phison.com



Global Workshop Taiwan



SD Association Overview

Kazunori Nakano

SDA Board of Directors/Marketing Committee Chair (KIOXIA)

KIOXIA

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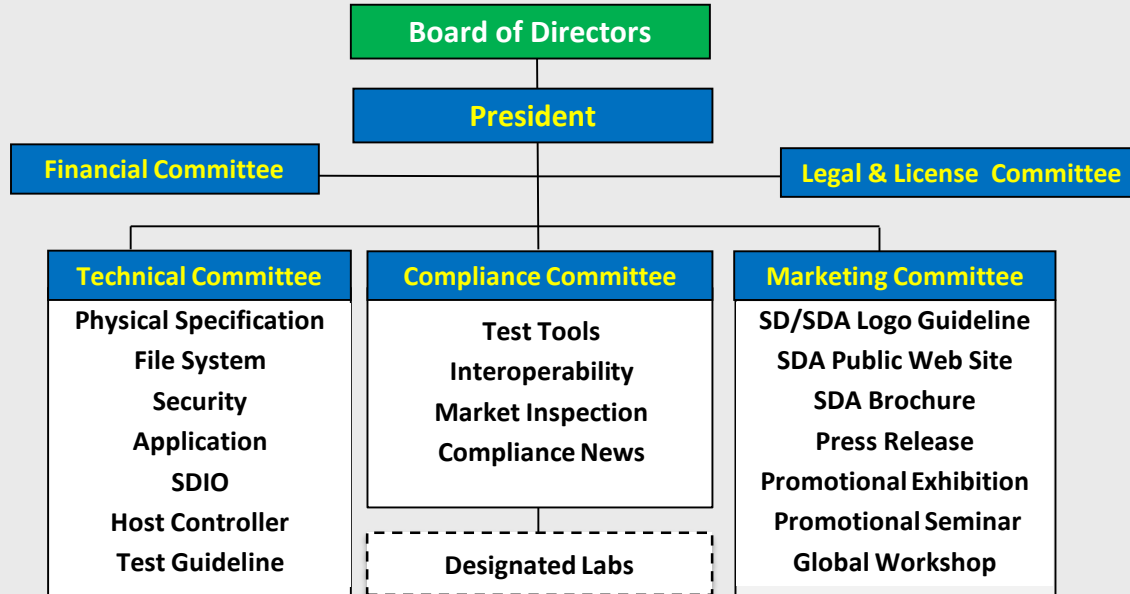
- **SD Association Overview**
 - Organization
 - License Scheme & Compliance
 - Benefit of SDA Membership
- **SD Standard Specification Overview and New Standard Ver.8.00**
 - SD Specification Structure
 - Card Types
 - SD Logos & SDA Pictographs
 - SD Ver.8.00 (SD EXPRESS PCIe Gen.4)
- **Summary of SD Standards**

SD Association Overview



SD Association Organization

SD Association: SDA (www.sdcard.org)

Mission: SD Card Standardization with Promotion and Adaption of SD Standard Worldwide



- Organization Established in 2000
- Member Company :About 800 Companies Worldwide .
- Member Fee: Executive Member \$4,500/year General Member \$2,500/year

Specification	SD Association	SD-3C LLC
	SDA Specification	SD Group Specification
	SDA Pictographs	SD Logos
		Essential Patents
License	Contract with SDA	Contract with SD-3C LLC
Card 	SDA Membership Agreement (SDAMA)	Card License Agreement (CLA)
Host 	SDA License Agreement (SDALA)	Host Ancillary Product License Agreement (HALA)

Licensee should comply with SD/SDA Specifications and SD/SDA Logo Guideline (As Normative Document)

Benefit of SDA Membership

- ❑ **Access to all detailed updated specifications. (Card, Host, Test & Logo Guideline)**
- ❑ **Not only exposed to all on-going standardization activity but up-coming standards well in advance.**
- ❑ **Not only be able to influence on new evolving standards but be able to propose new features for standards.**

❑ **Membership Comparison**



<https://www.sdcard.org/join/membership-benefits-comparison/>

Member Benefits	Executive	General
Can be a candidate to serve on the Board of Directors	✓	
Voting Rights in SDA, including Committees and Workgroups	✓	
Ability to chair Committees and Workgroups	✓	
Participate in Committee and Workgroup all email reflectors, except closed	✓	✓
Obtain pre-release access to documents and deliverables	✓	✓
Ability to make proposals for additions and/or modifications for SD Specifications	✓	✓
Ability to execute the SD Association License Agreement	✓	✓
Access to the SD specification matrix	✓	✓
Participate in and contribute to Committee and Workgroup activities	✓	✓
Attend General and Interim Meetings	✓	✓
Access to the "Members Only" website	✓	✓
Participate in Interoperability Test Events	✓	✓
Participate in marketing events and workshops	✓	✓
Annual Dues	\$4500	\$2500

- **President: Hiroyuki Sakamoto**

Hiroyuki.sakamoto@t-net.ne.jp



- **Chairman: Yosi Pinto**

Yosi.pinto@sandisk.com



- **Treasurer: Bo Li**

Bo.Li@sandisk.com



- **Executive Director*: Stan Moyer**

sdcard_ed@inventures.com



- **Secretary: Open**

* Stan is not an official SDA officer per the bylaws definition. Though he is considered as a team member in the Officers Team as being the Executive Director of the association. A service provided by our SDA Office contractor – Global Inventures

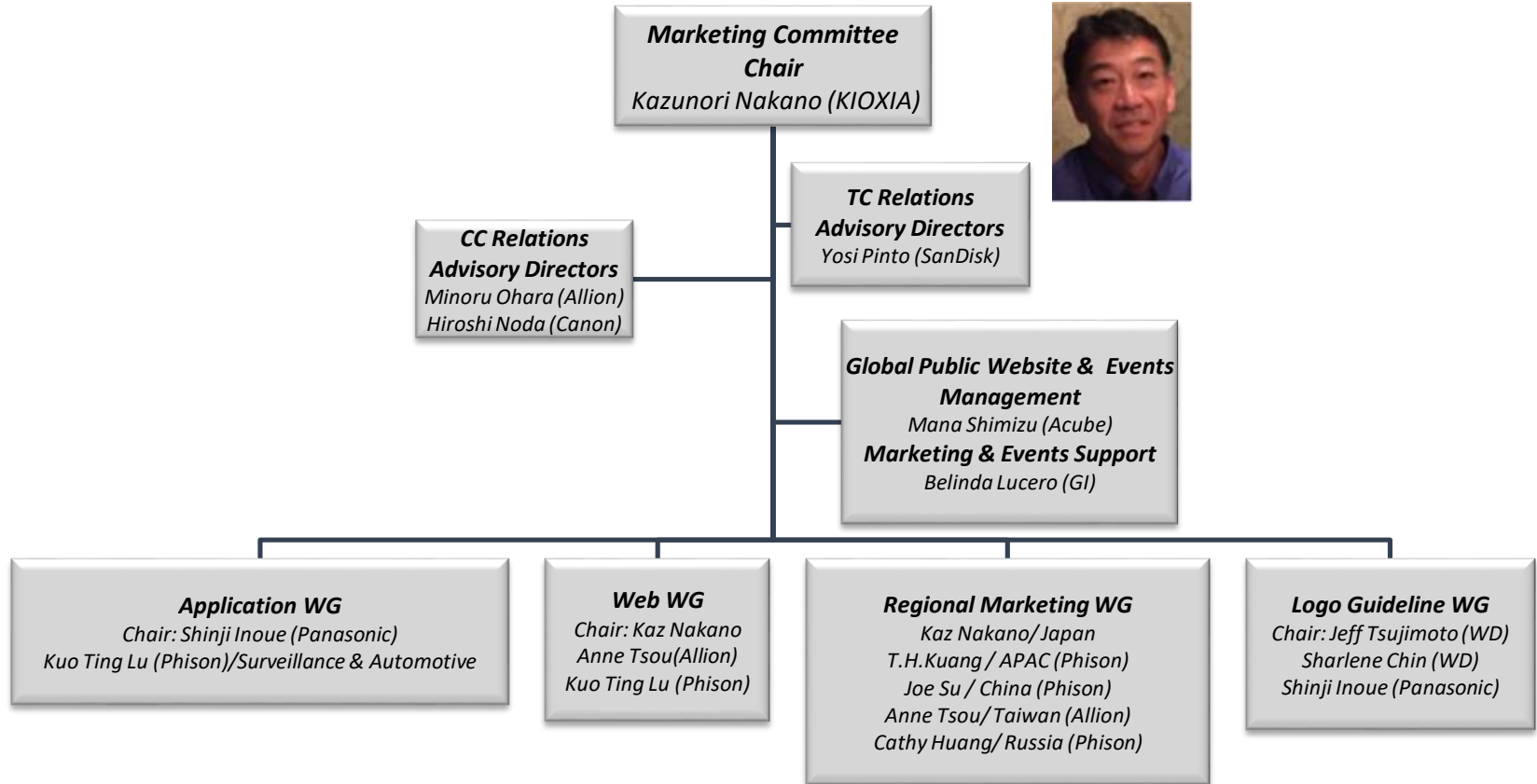
SDA Board of Directors – 12 Companies

(in alphabetical order)

		Danny Lin		Jeff Hsieh
		David Chen		Joel Tang
		Kazunori Nakano		Open
		Joseph Yuan		Jordan Zhong
		Jyh Chau		Open
		Shuichi Ohki		Takuji Maeda

		T.H. Kuang		Andre Chen
		HeeChang Cho		JiCheol Hong
		Yosi Pinto		Jeff Tsujimoto
		Janice Chiu		Josh Chen
		Kenichi Satori		Shingo Aso
		Joel Catala		Thom Denholm

Marketing Committee Organization

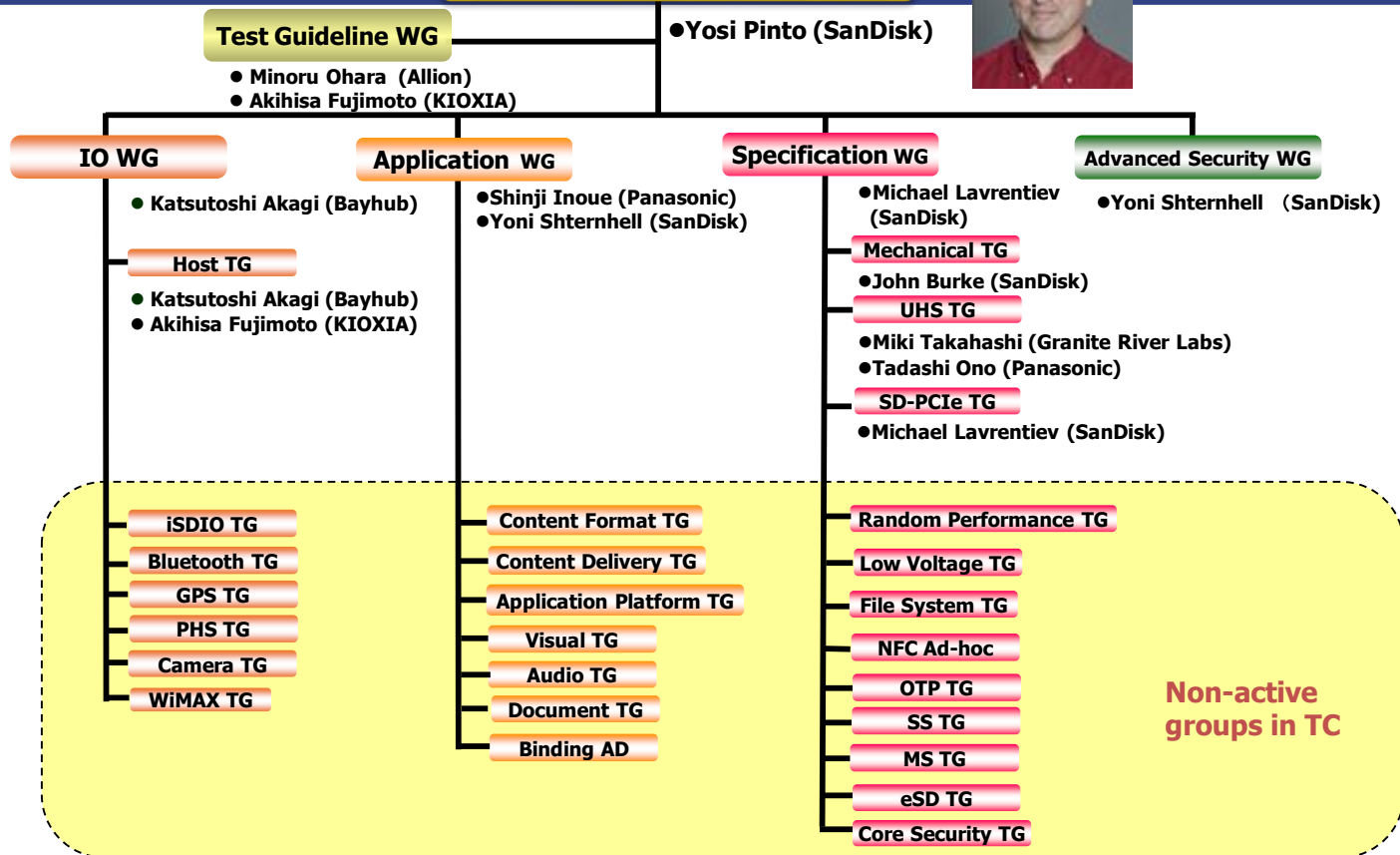


Technical Committee Organization

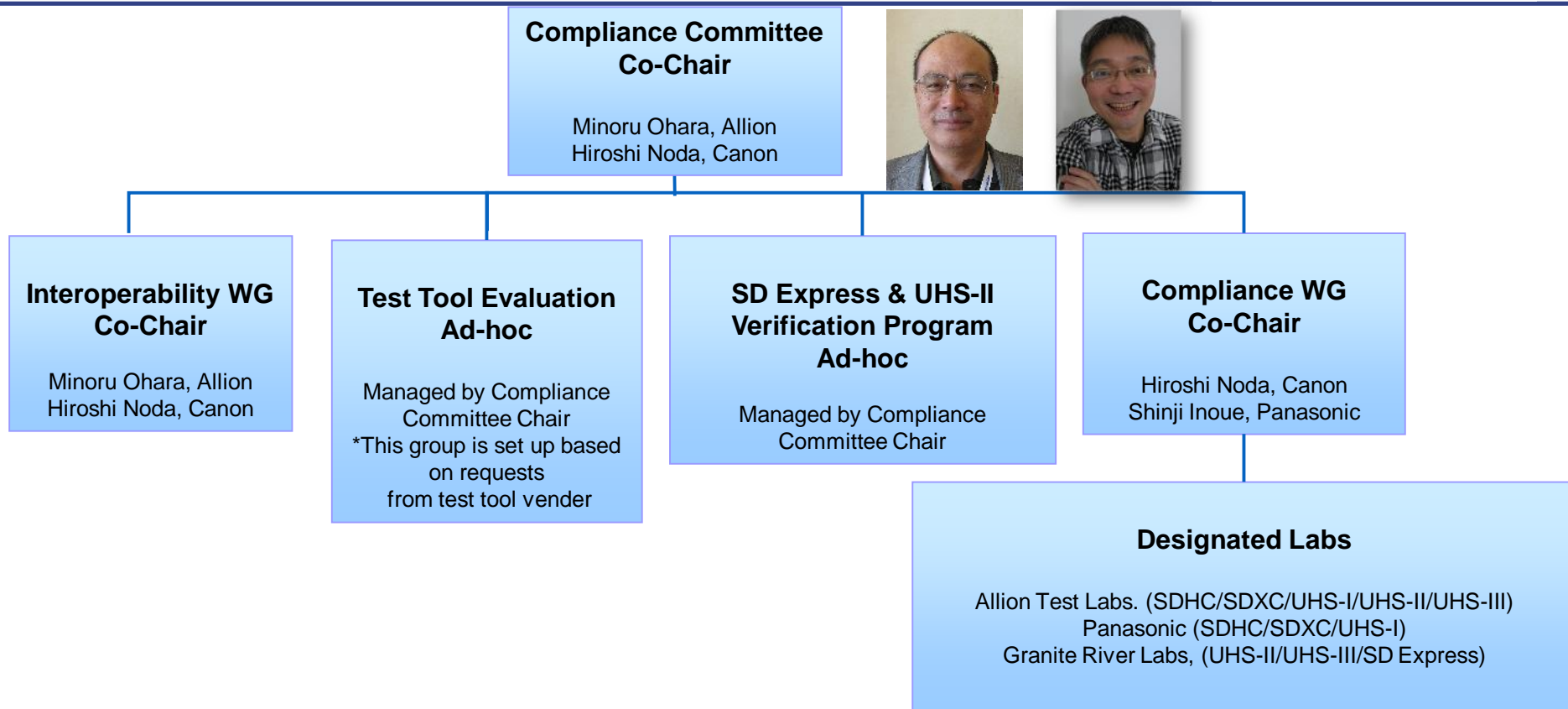


SD Association

Technical Committee

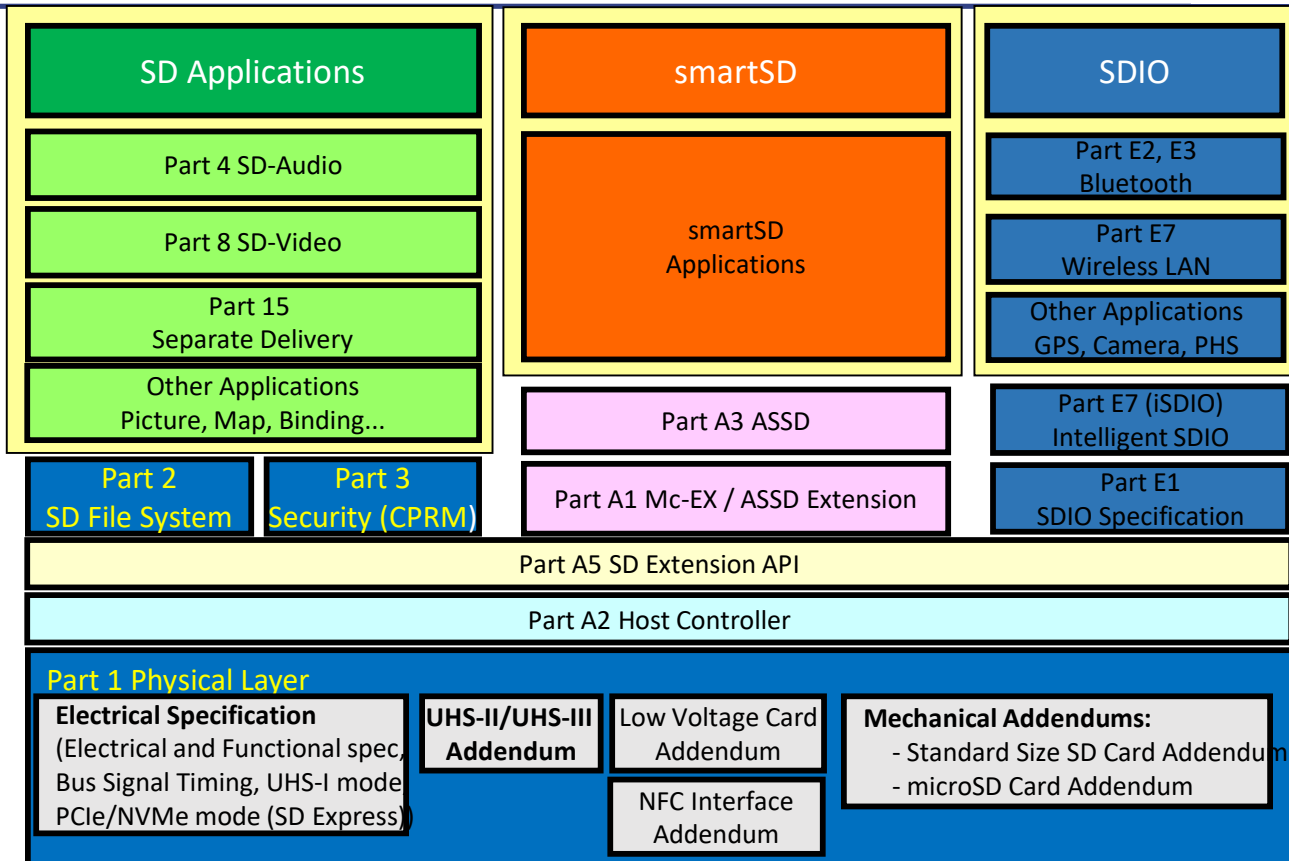


Compliance Committee Organization



SD Standard Specification Overview And New Standard Ver.8.00 SD Express

SD Specifications Structure



SD Card Types

Form Factors

- Standard SD Card



microSD Card



Functions

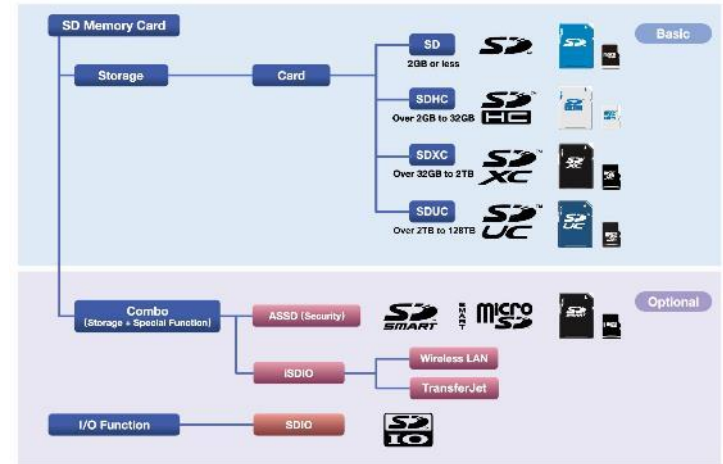
- SD Memory Card
- SDIO Card
- SD Combo Card (SD Memory + SDIO Functions)
 - iSDIO Wireless LAN SD Card
 - iSDIO TransferJet SD Card
- smart microSD
 - microSD with Secure Element or with/without NFC interface

Memory Capacities

- SDSC: Standard Capacity ($\leq 2\text{GB}$) / SDHC: High Capacity ($2\text{GB} < - \leq 32\text{GB}$)
- SDXC: eXtended Capacity ($32\text{GB} < - \leq 2\text{TB}$)
- SDUC: Ultra Capacity ($2\text{TB} < - \leq 128\text{TB}$)**

Bus Interfaces

- Non UHS (Non Ultra High Speed) Card
 - Default Speed : 12.5 MB/sec High Speed : 25 MB/sec
- UHS-I Card
 - UHS 50: SDR50 is mandatory (50MB/sec Max.) UHS104: SDR50 and SDR104 is mandatory (104MB/sec Max.)
- UHS-II Card
 - UHS156: FD156 is mandatory (Full Duplex 156MB/sec Max.) HD312 is optional (Half Duplex 312MB/sec Max.)
- UHS-III Card
 - UHS312: FD312 is mandatory (Full Duplex 312MB/sec Max.) UHS624: FD624 is mandatory (Full Duplex 624MB/sec Max.)
- SD Express Card(New)**
 - PCIe Gen.3 x 1 Lane : (985MB/sec Max.) & NVMe protocol with legacy UHS-I interface
 - PCIe Gen.3 x 2 Lane / Gen.4 x 1 Lane : (1,970MB/sec Max.) & NVMe protocol with legacy UHS-I interface
 - PCIe Gen.4 x 2 Lane : (3,940MB/sec Max.) & NVMe protocol with legacy UHS-I interface



1. SD Logo :Capacity (4 Types)

2000



$\leq 2\text{GB}$
Standard Capacity

2006



$2\text{GB} < - \leq 32\text{GB}$
High Capacity

2009



$32\text{GB} < - \leq 2\text{TB}$
eXtended Capacity

2018



$2\text{TB} < - \leq 128\text{TB}$
Ultra Capacity

2. Bus Mark :Data Transfer Performance

No Mark



High Speed

2004

UHS-I



Ultra High Speed

2010

UHS-II



2011

UHS-III



2017

SD Express



PCIe Gen.3
Gen.4

2018-2020

3. Speed Class Mark: Video Recording

Speed Class



2006



2009

UHS Speed Class



2010



2013

Video Speed Class



2016

SD Ver.8.00 SD Express PCIe Gen.4 x 2 Lane

	SD Memory Card				SD Express Memory Card			
Pin Layout								
PCIe Bus Interface					985MB/sec <i>PCIe Gen.3x1</i> <small>*microSD Express supports only PCIe Gen.3</small>		New 1970MB/sec <i>PCIe Gen.4x1</i> / <i>PCIe Gen.4x1 / Gen.3x2</i>	
SD Bus Interface	25MB/sec		312MB/sec		985MB/sec		3940MB/sec	
	High Speed		High Speed		High Speed		High Speed	
Capacity (file system)	Ultra Capacity		Extended Capacity		High Capacity			
Up to 128TB (exFAT)								
Up to 2TB (exFAT)								
Up to 32GB (FAT32)								

Bus Speed Mode

Bus Mode		Clock Frequency	Interface Method	Bus Maximum Performance	Spec. Version
Default Speed (DS)		25MHz	3.3V single-ended	12.5MB/sec	1.01
High Speed (HS)		50MHz	3.3V single-ended	25 MB/sec	1.10
UHS-I	SDR12	25MHz	1.8V single-ended	12.5MB/sec	3.01
	SDR25	50MHz	1.8V single-ended	25 MB/sec	
	SDR50	100MHz	1.8V single-ended	50 MB/sec	
	SDR104	208MHz	1.8V single-ended	104 MB/sec	
	DDR50	50MHz	1.8V single-ended	50 MB/sec	
UHS-II	FD156	52MHz x 30 (PLL)	UHS-II PHY	156 MB/sec	4.00
	HD312	52MHz x 30 (PLL)	UHS-II PHY	312 MB/sec	4.20
UHS-III	FD312	52MHz x 60 (PLL)	UHS-III PHY	312 MB/sec	6.00
	FD624	52MHz x 120 (PLL)	UHS-III PHY	624 MB/sec	
PCIe	Gen.3	100MHz x 40 (PLL)*	PCIe Gen3 PHY	1-Lane 1GB/sec	7.00
				2-Lane 2GB/sec	8.00
	Gen.4	100MHz x 80 (PLL)*	PCIe Gen4 PHY	1-Lane 2GB/sec 2-Lane 4GB/sec	

* Theoretical Value

Client Computing, Imaging, Automotive – Transition to Higher Speed Interfaces New Markets Demand More Memory with Higher Speed

- Autonomous vehicles and connected cars with multi-sensor data collection & processing



- Multi-channel video capture



- Gaming with 3D high resolution graphics



- New evolving imaging market (360o, VR, AR etc...)



- Imaging market is already heading to PCIe



Tablet

Modem / Gateway

- Edge Computing Gateway : High Speed, Small and Robust



Advantages of PCIe Interface

- **PCIe® standard developed by PCI SIG**
 - • PCIe Gen 3 (up to 8Gb/s) and Gen 4 (up to 16Gb/s) are proven....
 - • PCIe released already Gen 5 and Gen6 is underway...
- **NVMe™ standard developed by NVM Express**
 - The command layer protocol for Non Volatile Memories that teamed up with PCIe...
 - A scalable and sophisticated protocol – ready to handle future system needs
 - Become more and more popular as the de-facto standard for SSDs and other...
 - Supported by all major OSs
 - Proven test environments were defined



Both are world wide recognized as the preferable protocols for future needs → Easy to adopt !

PCIe and NVMe Interfaces – Test Advantages

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



PCIe® is registered trademark of PCI-SIG. NVMe™ is trademark of NVM Express

Summary of New SD Standards

- SDA defined until today performance standards for sequential writes serving the imaging market with focus on growing demands of video capturing

- SDA defined **UHS-III (624MB/s)** to further enhance these market needs



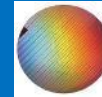
- But its not just storing content ...its App Running demanding enhanced random access...

- SDA defined **Application Perf Class A1(Nov.2016)** and **A2 (Feb.2017)** along with enhanced features; **Command Queuing, Cache and Maintenance**



- Evolving technology trends of mobile SoCs raised a request to operate only with 1.8v Signaling (w/o need for 3.3v initialization)

- SDA defined the **Low Voltage Signaling** card with full backward compatibility



- New evolving technologies of multi-core, high-speed IOs with **SD Express PCIe Gen.3 & Gen.4 NVMe** will raise even higher demands for SD card performance in high end applications



- 1.8W Max. Power Consumption vs (Normal SSD ~ 3W)
- Bus Mastering for inter chip communication between devices to help efficient latency path and longer battery life
- Dedicated CMD Queue in DRAM for every CPU core
- Host Memory Buffer (HMB) to save cost (No SRAM Model)
- Backward Compatibility with SD Interface



Short Version

Long Version

□ **SDA Office – Official Address (Inventures Offices):**

SD Card Association, 5000 Executive Parkway, Suite 302, San Ramon, CA 94583, USA

T: +1.925.275.6698 | E-Fax: +1.925.886.4870 | M: +1.510.427.6976

□ **The team that directly supports the SDA with their titles related to SDA:**

– Stan Moyer – Executive Director



– Kevin Schader – Director of Communication



– Belinda Lucero - Marketing & Events Manager



– Jessica Esparza – Finance



– Jamie Reyes – Membership Services





SD Association

Thank You

Email: kazunori.nakano@kioxia.com



SD Express Host Implementation

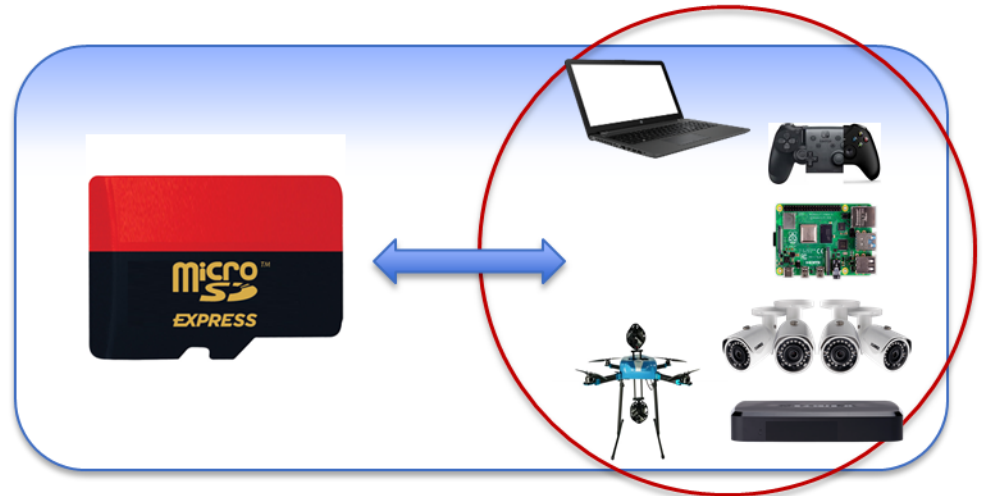
Yosi Pinto

SDA Chairman of the Board/Technical Committee Chair
(SanDisk LLC)



SanDisk®

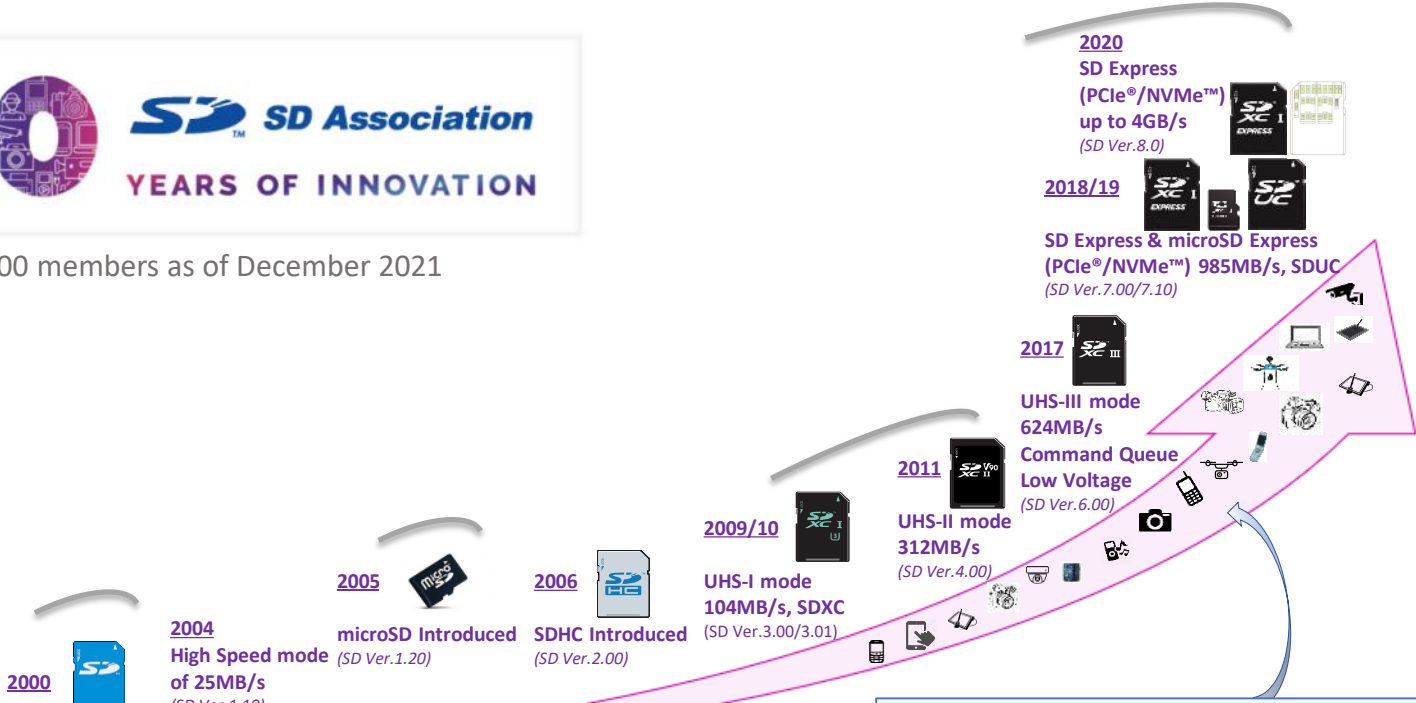
- SD Standard Evolution
- SD Express Host Implementation
 - How to implement hosts with SD Express interface using SDA's Host Controller Spec
 - Other implementation methods



SD Memory Card Standard Evolution



~800 members as of December 2021



>5 Billion SD & microSD cards sold by 2019*. 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") and TrendForce's report from 2019 ("total of ~3 billion cards sold within 2016-2019")

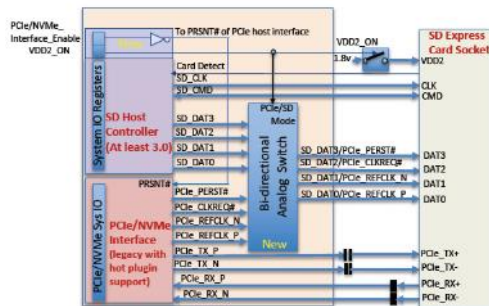
SD Express Benefits and Implementation Method

Material published by SDA that you may use

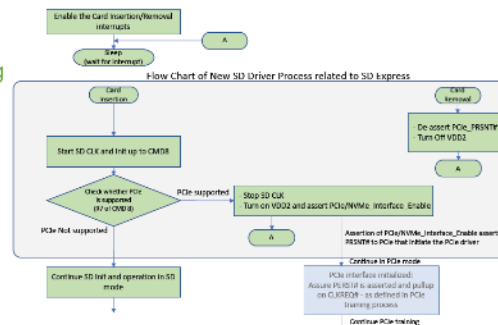


SD Association

SD Express Host Implementation Guideline (for SD7.x cards)



Update to existing SD Driver – As explained in Implementation Guideline



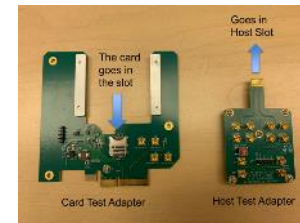
SD Express Test Fixtures –

As explained in the [SD7 Test Guideline](#)

Enables Host and Card vendors to test their PCIe interface using standard test equipment
The set is available for borrow by our members at our approved labs (GRL and Allion)

As explained in the [SD8 Test Guideline](#)

Similar test fixtures for SD8.0 cards are currently under development and expected to be ready in Q2/2022



SDA Brochure – updated for SD8.0




Two SD Express whitepaper (updated with new material about SD8.0):

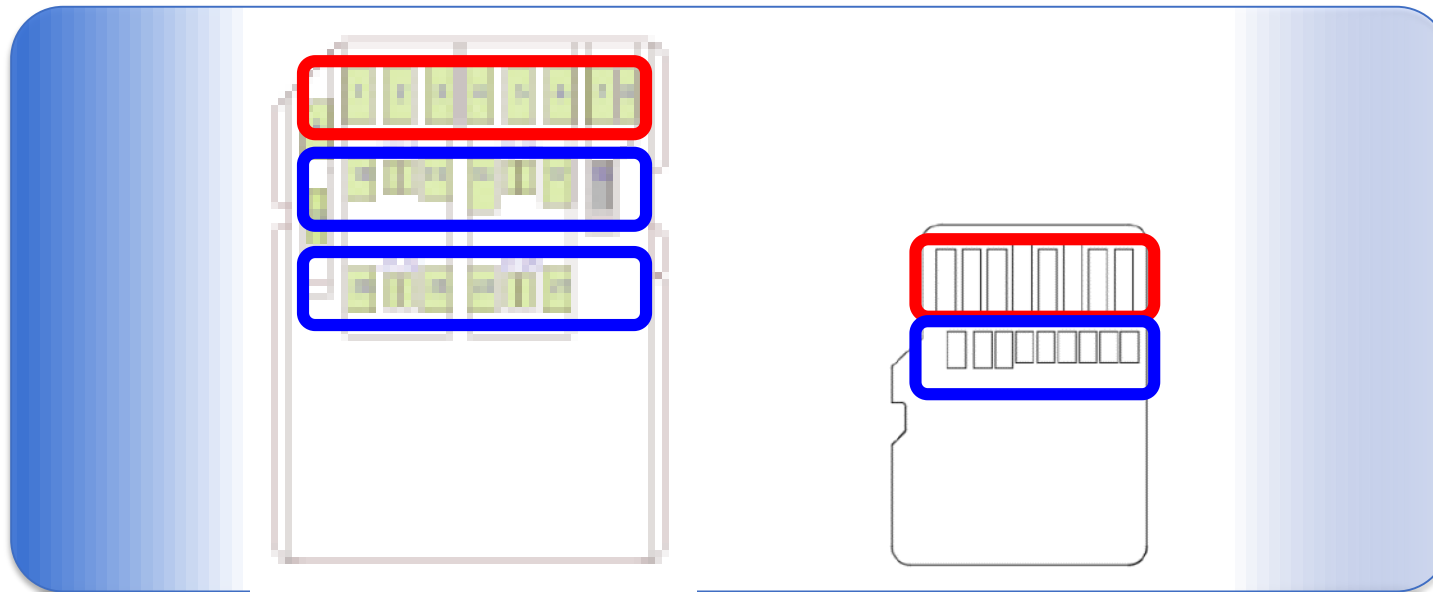
[SD Express Memory Cards with PCIe® and NVMe™ Interfaces](#)

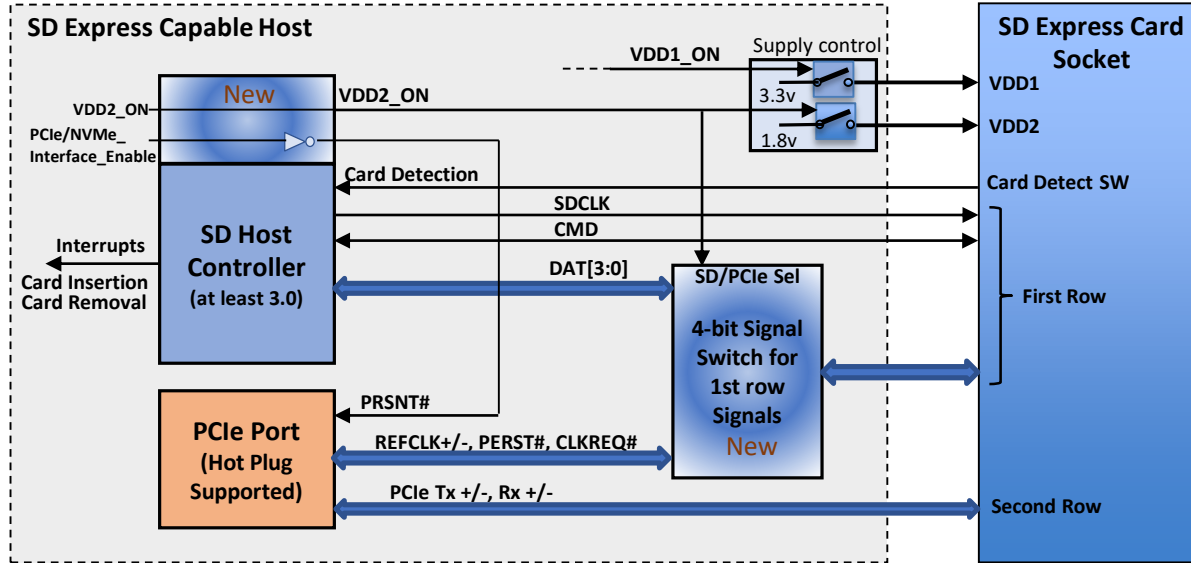
[SD Express and microSD Express Cards: The Best Choice for Your Future Product Designs](#)

SD Express Host Implementation

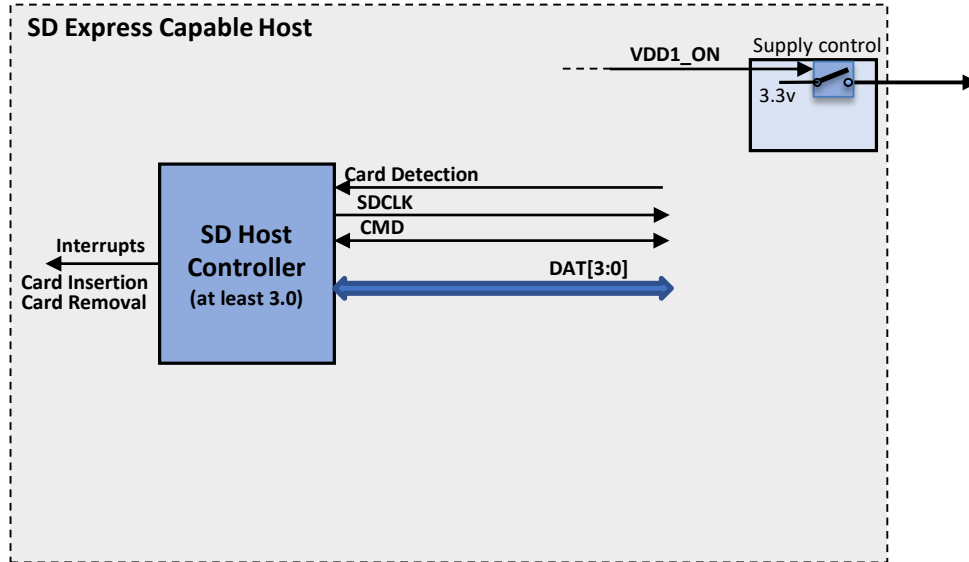
Pinout Functionality in SD Express Cards – General Description

-  =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
-  =3rd row: PCIe 2nd lane differential IO's in PCIe mode

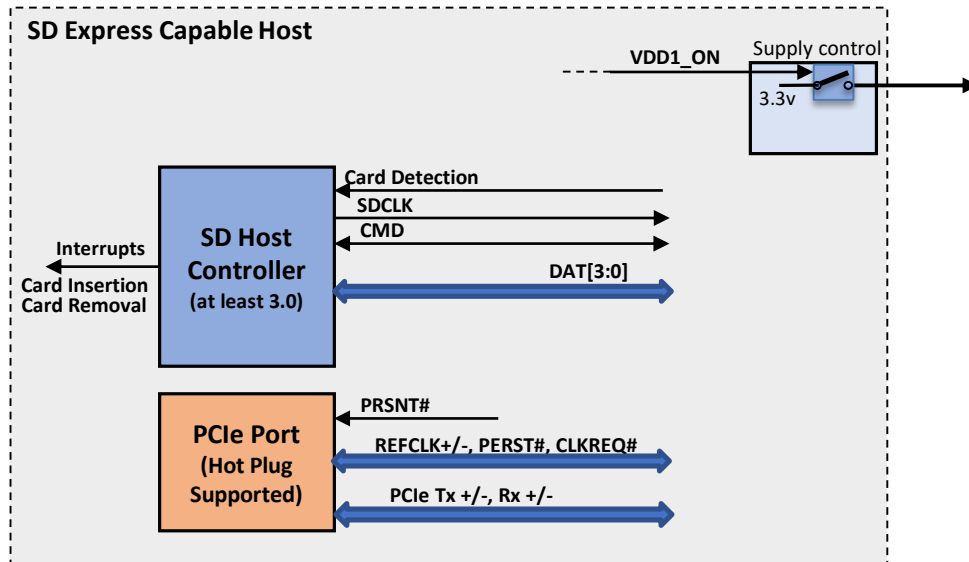




SD Express Host Controller – Full Circuit Example

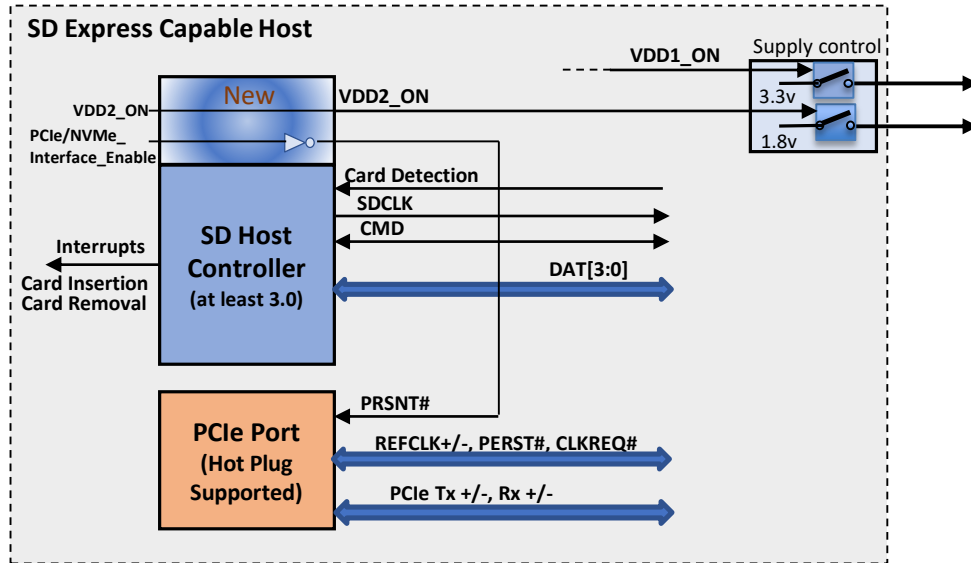


SD Express Host Controller – Building blocks:
➔ SD Host Controller (at least v3.0)



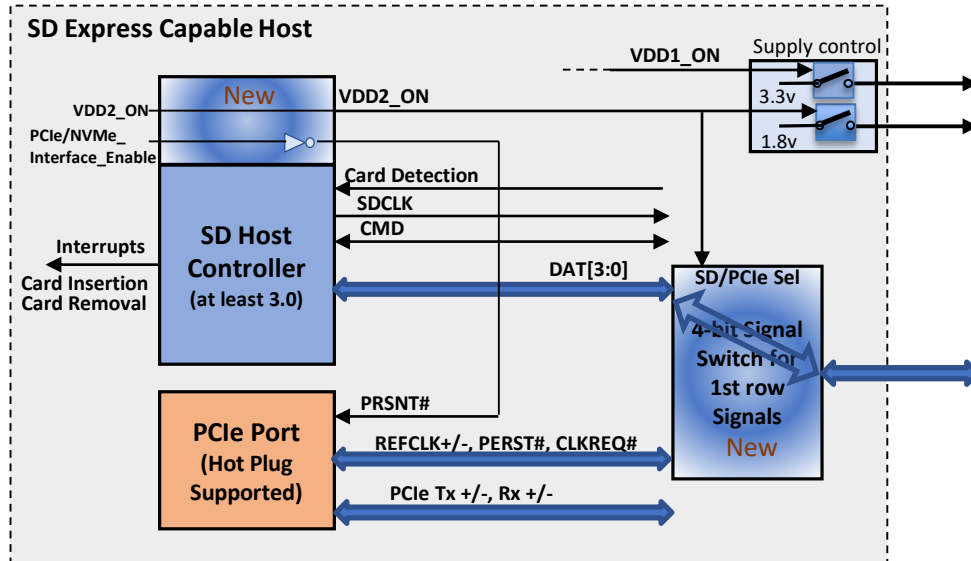
SD Express Host Controller – Building blocks:

- ➔ SD Host Controller (at least v3.0)
- ➔ PCIe Port with hot plugin support



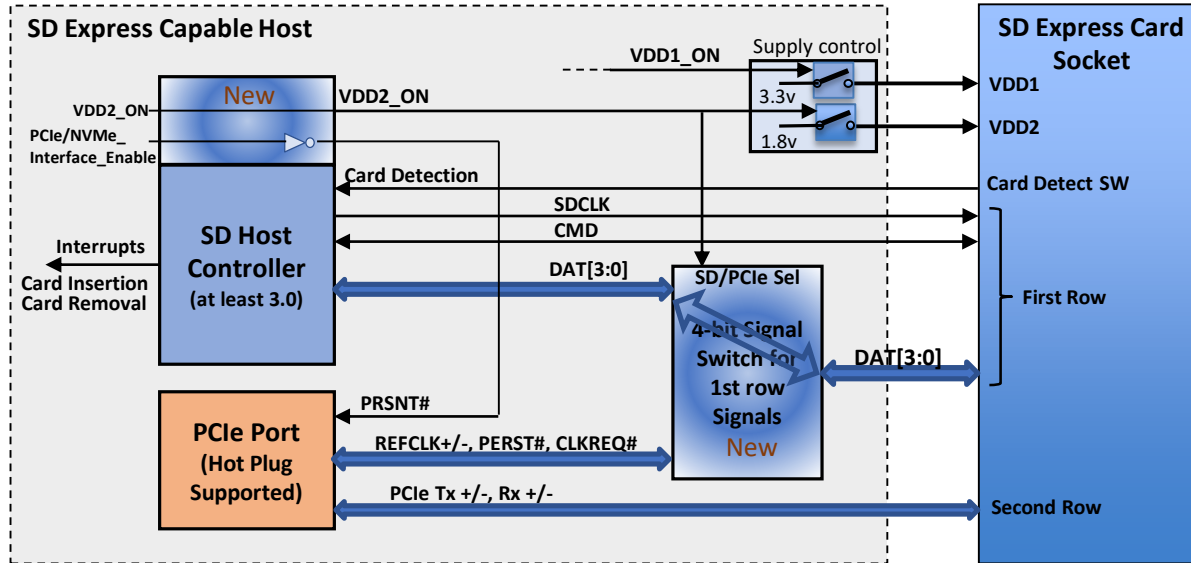
SD Express Host Controller – Building blocks:

- ➔ SD Host Controller (at least v3.0) + VDD2_ON & PCIe/NVMe_Interface_Enable (New)
- ➔ PCIe Port with hot plugin support

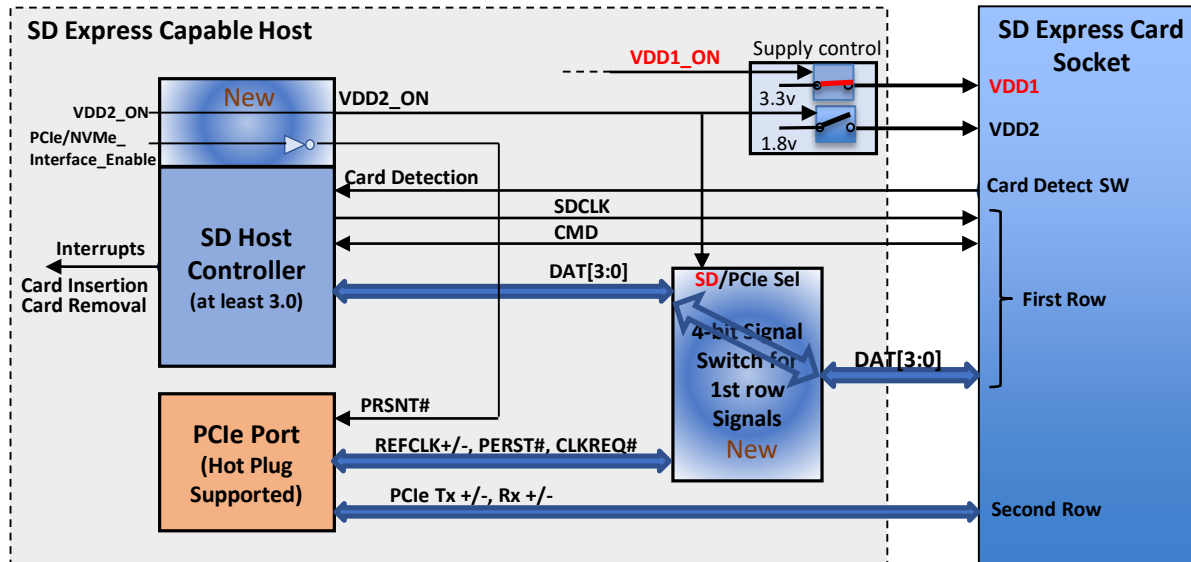


SD Express Host Controller – Building blocks:

- ➔ SD Host Controller (at least v3.0) + VDD2_ON & PCIe/NVMe_Interface_Enable (New)
- ➔ PCIe Port with hot plugin support
- ➔ 4 bit Signal Switch (New)

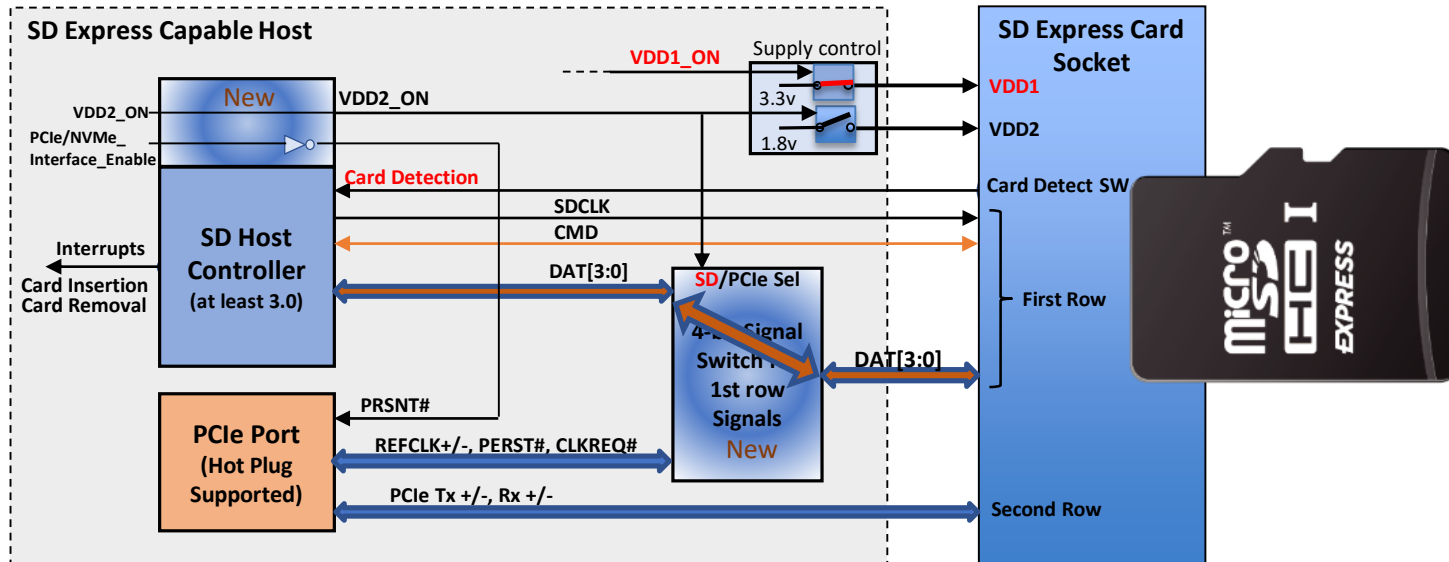


SD Express Host Controller – Full Circuit

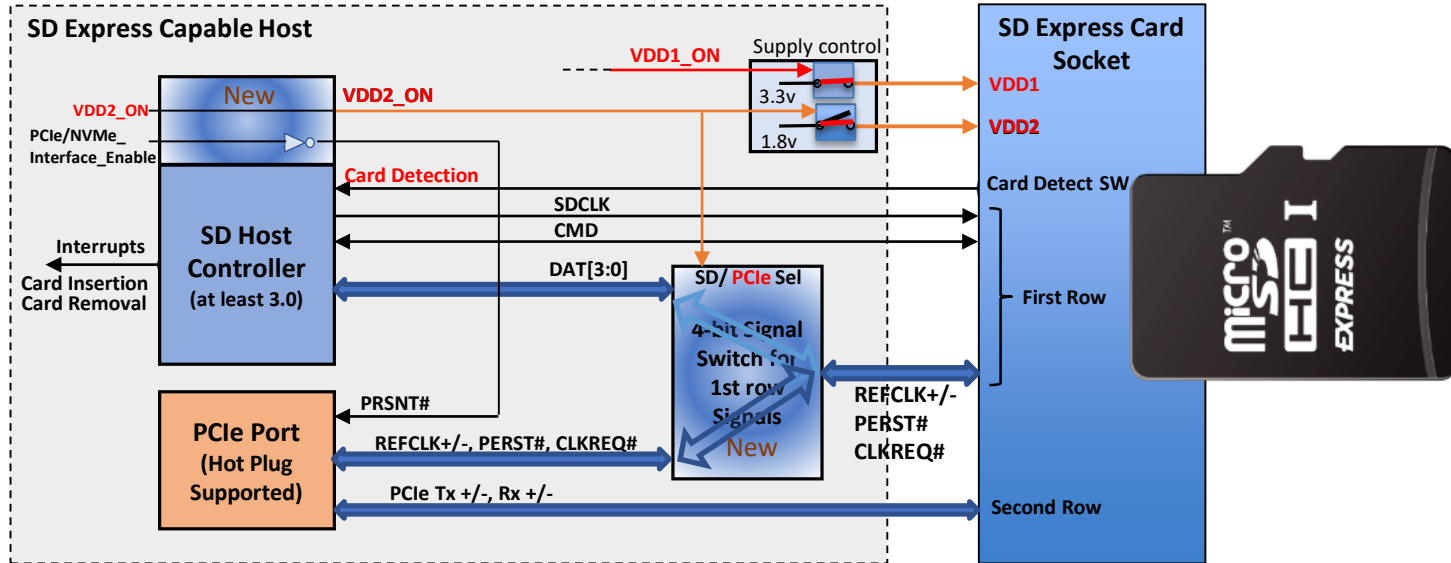


SD Express Host Controller – Operation: Card Insertion-detection

SD driver initiates the SD card & checks PCIe support



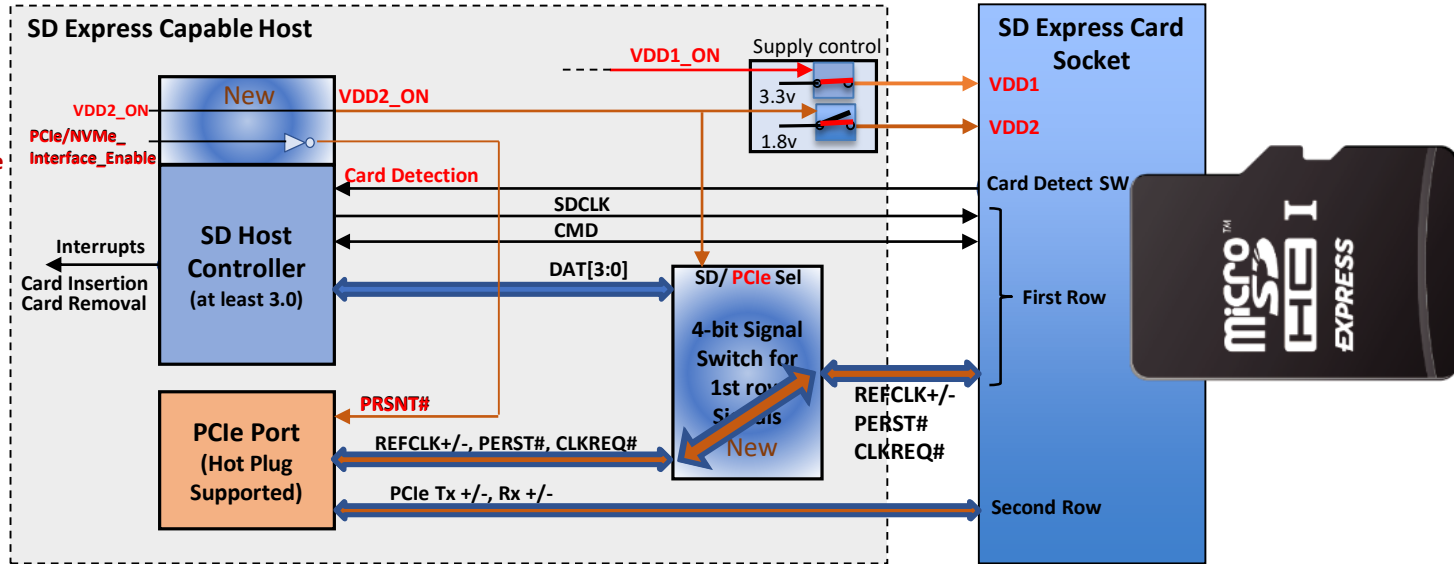
SD Express Host Controller – Operation: PCIe support check



SD Express Host Controller – Operation:

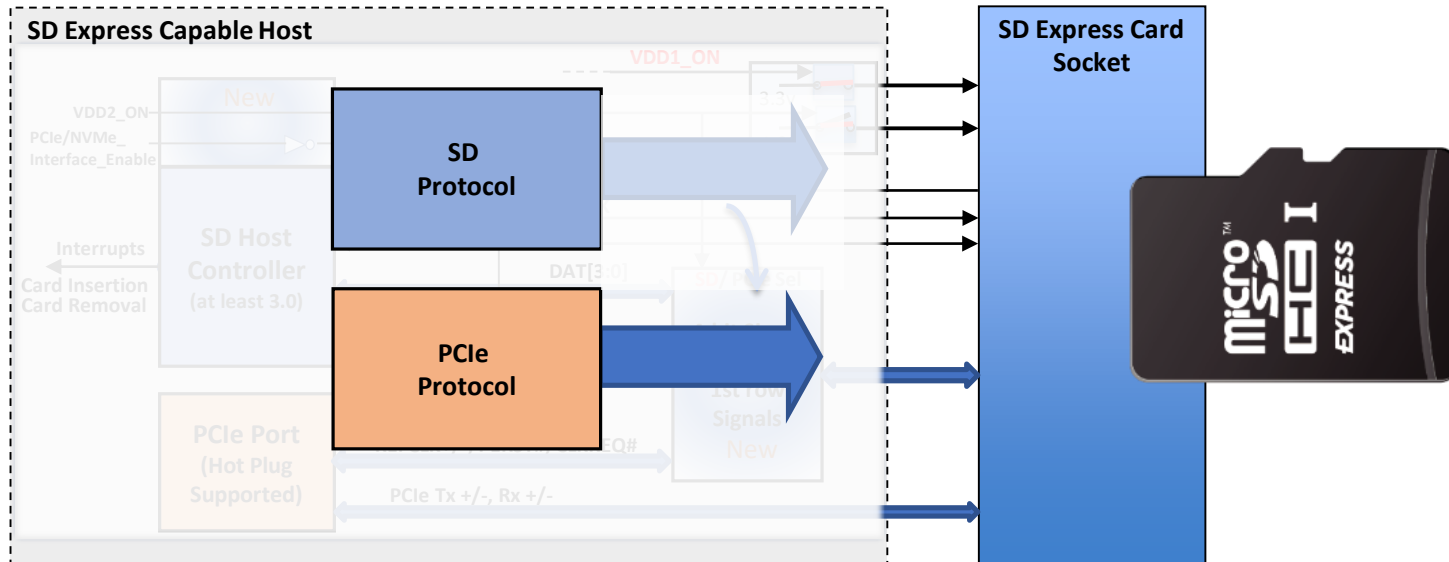
SD Driver indicates to card to move to PCIe mode

and switch its internal host circuits to operate through PCIe interface

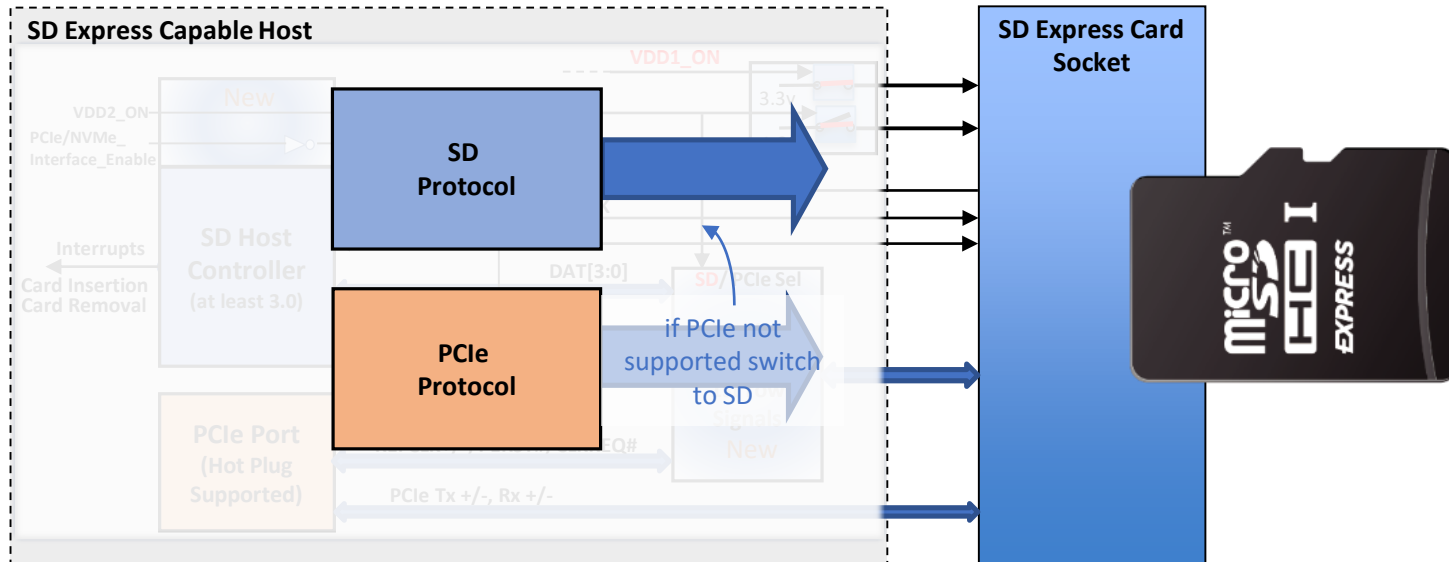


SD Express Host Controller – Operation:

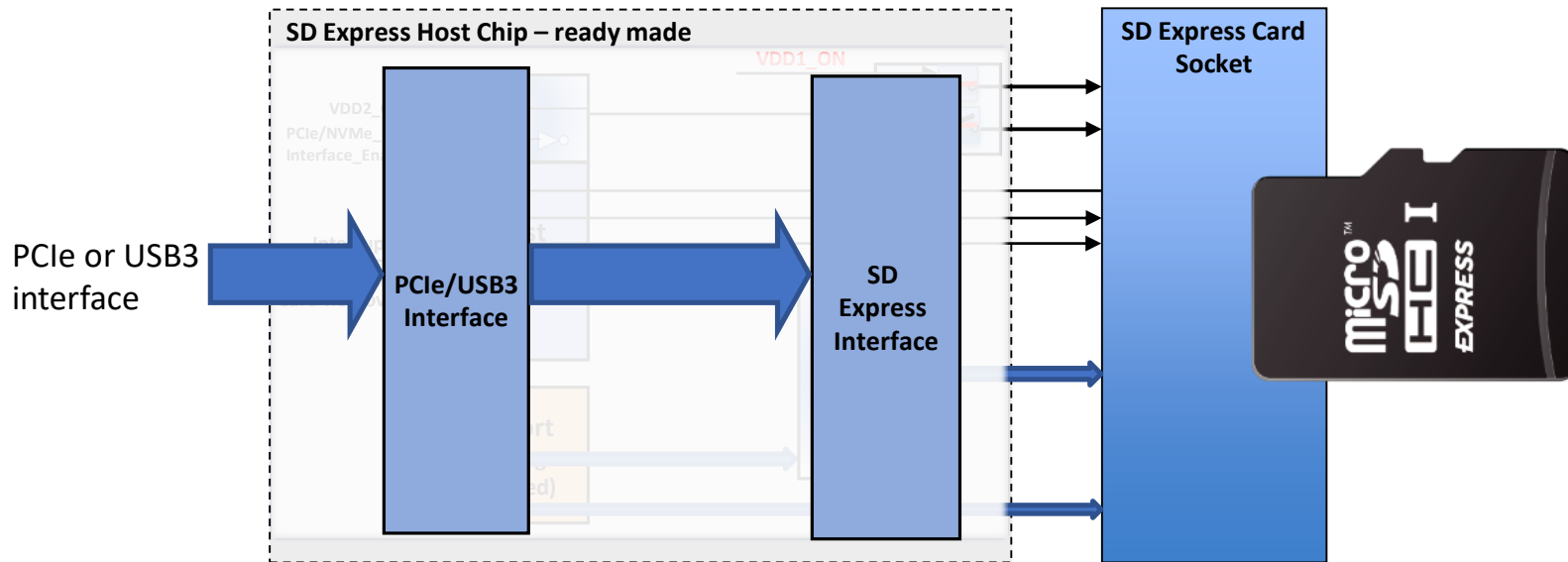
SD Driver Transfer control to the PCIe host and start operation through PCIe channel



The shown example recommends to initiate first through SD interface and then switch to PCIe, if supported



Host may be also implemented with initiation first through PCIe interface (the specification allows it)



Off the shelf components that may serve PCIe or USB3 to SD Express Interface



Thank You

Email: yosi.pinto@wdc.com



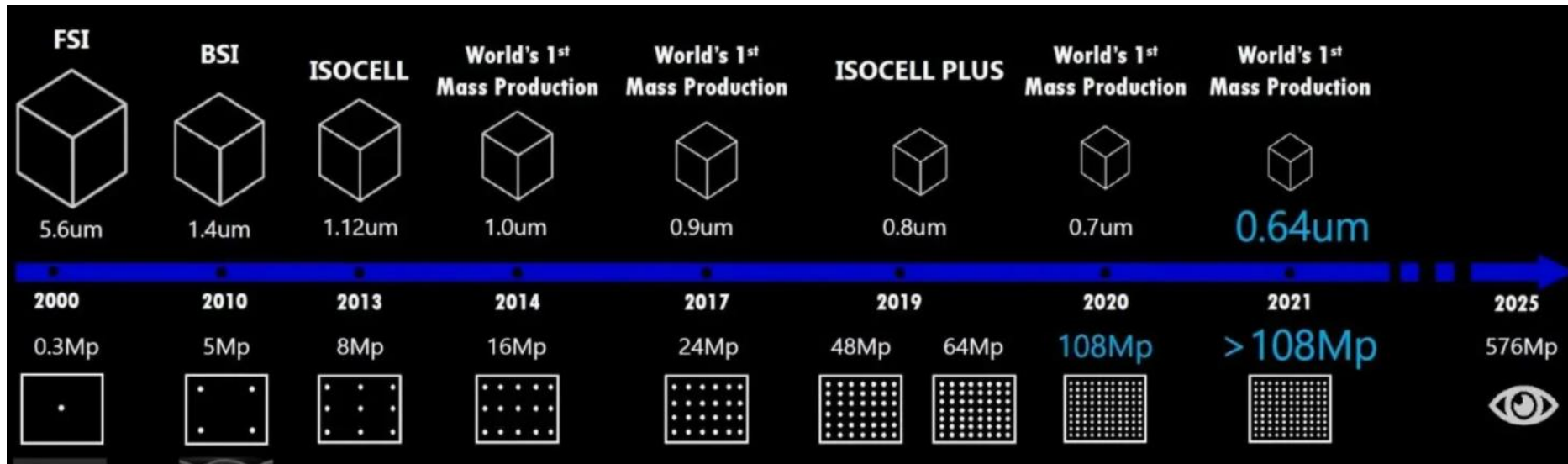
SD Express Host Controller

Louis Lu
Senior Manager (Bayhub)



Why SD Express? - Image sensor trend

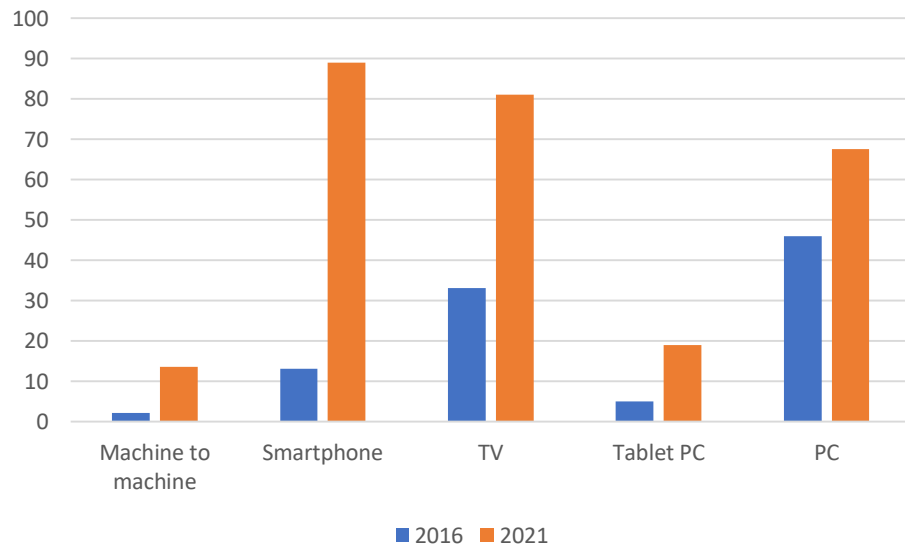
- ❑ Current pixel size is 100Mpixel and it will exceed 500M pixel in 2025
- ❑ Human eyes' resolution is 500M pixel
- ❑ Larger and faster storage is a MUST trend for both removable and embedded



Why SD Express? - Worldwide IP Traffic Trend *SD Association*

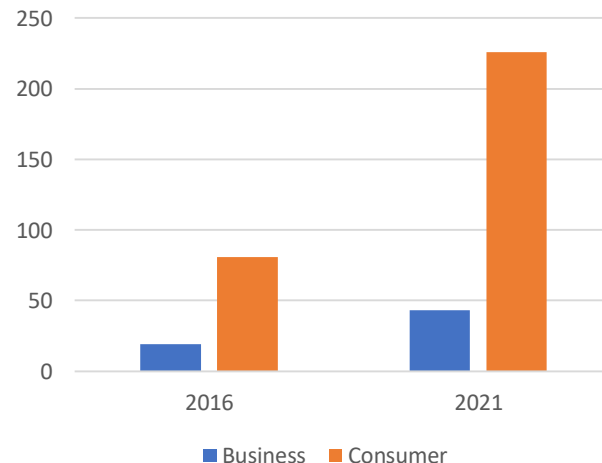
- ❑ Worldwide IP traffic increased from 100EB (2016) to 270EB (2021)
- ❑ Consumer devices drive IP traffic explosion
- ❑ Larger and faster storage is a MUST trend for both removable and embedded

Exabyte/month



Exabyte/month

1 Exabyte = 10⁶ Tera byte



SD Host Devices Now and Future

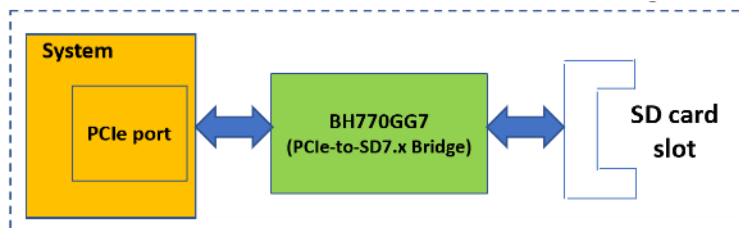


- SD host products have strong motivation for larger and faster removable media
- SD Express has the best positioning to support the trend
- SD Express eco-system is ready
 - SD Express host controller, SD Express card, SD Express card controller
- BayHub offers SD Express host controllers for above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

BayHub SD7.x Host Solutions

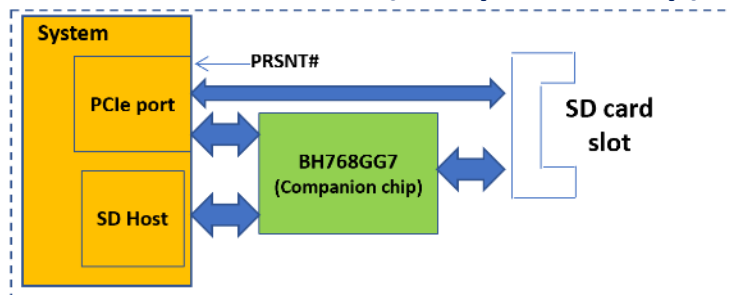
- ❑ For SD7.x Host, below solutions are available;
- ❑ Solution-1: BH770GG7 (PCIe-to-SD7.x Bridge Chip)
- ❑ Solution-2: BH768GG7 (Companion Chip)

Solution-1: BH770GG7 (PCIe to SD7.x Bridge)



BH770GG7 will work system's PCIe-port which supports Hot-plug.

Solution-2: BH768GG7 (Companion Chip)



BH768GG7 will work system's SD Host and PCIe-port which supports Hot-plug.

BayHub Legacy SD Host Solutions

- OZ711LV2 PCIe to SD3 host controller**
 - Host interface; PCIe
 - SD3 (UHS-I) support
 - Package; 32QFN (4 x 4mm)
 - High performance and ultra low power
 - Successful track record in PC and embedded industry

- BH201 Native SD3 companion chip**
 - Bidirectional signal re-driver
 - QFN28 (4x4mm)
 - High performance and ultra low power
 - Successful track record in PC and mobile device industry

BayHub Technology

- ❑ **Bridge IC and SD host controller leading company**
- ❑ **Strong expertise in SD, eMMC, PCIe, USB, SATA, Hi-speed I/O, etc.**
- ❑ **Worldwide office 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, camera, game, etc**





SD Association

Thank You

Email: louis.lu@bayhubtech.com



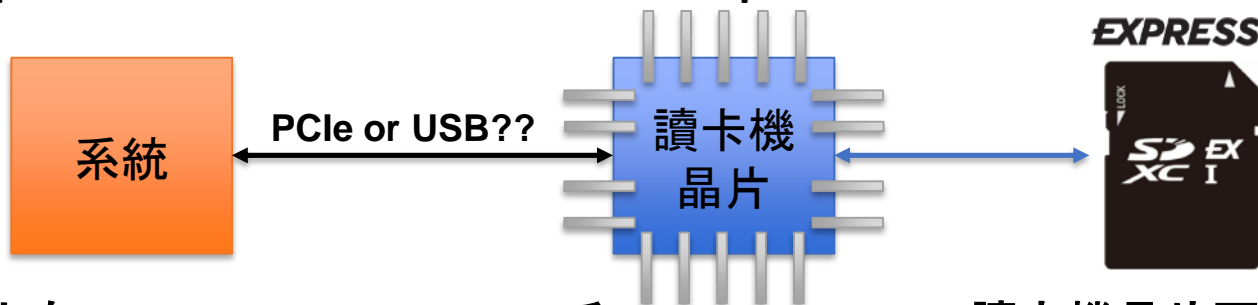
存裝置生態系

2022 SDA SD Express 產品應用工作坊技術研討會

Jim Shiau
Manager (Realtek)

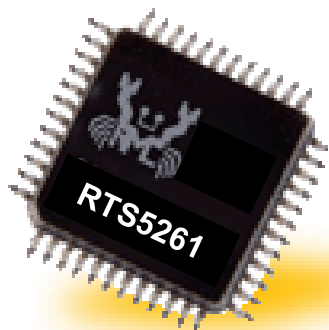


- SD Express讀卡機晶片高度整合存取SD Express卡必要功能, 能加快電子產品開發



- 市場上有Universal Serial Bus(USB)和PCI Express(PCIe)讀卡機晶片要如何挑選??

PCI EXPRESS®



-VS-



PCIe is trademark of of PCI-SIG. USB is trademark of USB-IF.

讀卡機晶片選擇第一關: 產品的系統底層能否客製化?

- 底層客製化舉例: 例如開啟系統的PCIe熱插拔功能, 系統也要支援熱插拔, 產品屬性可額外安裝驅動程式, 需要修改BIOS配置一些東西, 是否搭配固定系統...



是



否



讀卡機晶片選擇第二關:產品的是否當外接式裝置/或走線較長

- 外接式裝置表示不和系統整合(如外接式讀卡機), 或是走線較長需要使用線



是



否



讀卡機晶片選擇第三關:產品是否極端在意BOM cost

- 談錢傷感情...但如您的產品在前兩關兩者都可選的話...



是

PCI EXPRESS®



否

PCI EXPRESS®



SD Express讀卡機晶片適合的產品與介面

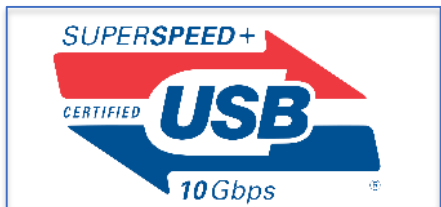


筆記型電腦

平板電腦

相機

手機



桌上型電腦

外接式讀卡機

Docking擴充基座

樹莓派



All-In-One電腦

無人空拍機

自駕車

遊戲機

SD Express的應用範例1:後疫情時代的辦公方式

□ 後疫情時代的辦公方式

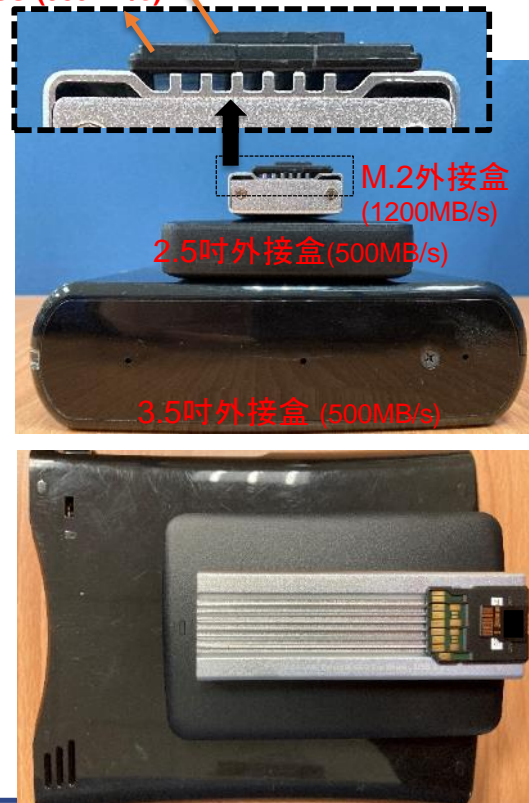
- 居家辦公於疫情間雖不完美但是證明可行
- 混和辦公(hybrid workplace)趨勢
 - 部份員工居家辦公，部份來公司辦公。公司不用租大場地(省錢)，不再是每個員工有座位，公司變成開會/實驗/討論的空間
 - 員工配發筆電，非固定位需預約座位 (Hot Desk的方式)
 - 座位統一，標配docking擴充基座和螢幕方便員工連接筆電
 - 辦公室私人空間受限，下班要清空，家和公司兩邊跑，東西難帶多

□ SD Express卡輕薄短小速度超過SATA SSD，使用直覺不用要拆開筆電即插即用，是擴充空間或備份資料的好幫手

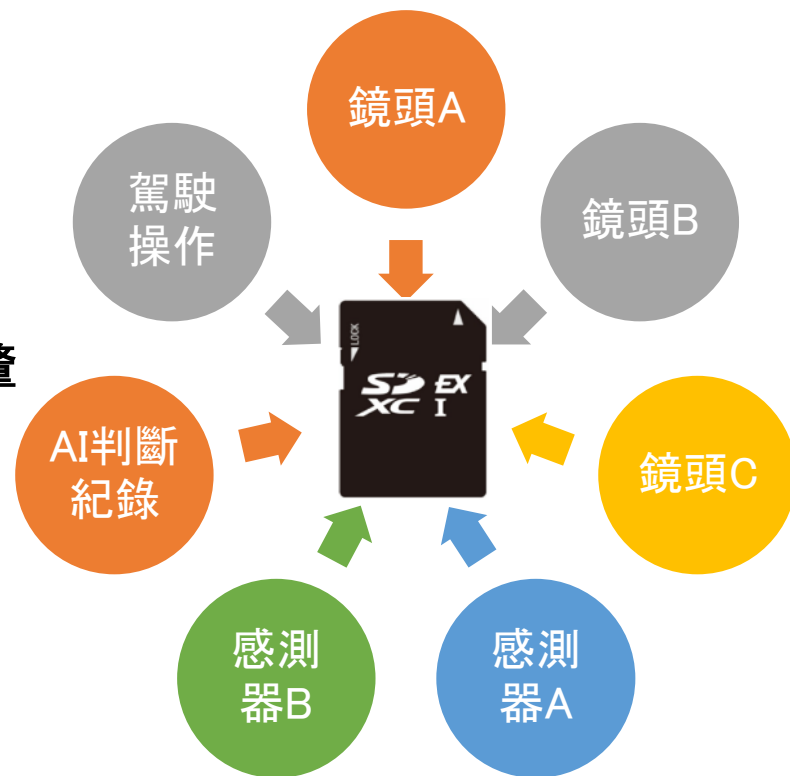
□ SD Express卡用NVMe協議時支援SMART，可簡單了解卡片健康度，能提前示警用戶，確保重要資料的完整性

□ SD Express讀卡機可兼容目前CP值很高的UHS-I卡，亦可滿足對價格敏感但速度要求普通的使用者

microSD Express (985MB/s)
SD Express (985MB/s)



- 自駕車
 - 自駕車撞車，釐清責任
 - 提供真實路況資料供製造商訓練下一代AI模型
- SD Express卡採用NVMe協議，適合多工，且有足夠頻寬，可以同時記錄多鏡頭行車影像，多感測器數據，自駕系統判斷的log作為撞車後釐清責任的依據
- SD Express卡是抽換式的適合數據紀錄這種不斷寫入損耗NAND flash壽命的情境
- SD Express卡向下兼容UHS-I協議，近10年的SD讀卡機產品都可以讀取，方便一般使用者使用，讀取行車紀錄



- **我的系統只支援PCIe Gen2或是USB3.2 Gen1, 使用SD Express讀卡機晶片會有幫助嗎?**
 - 有!
 - 不管是PCIe或是USB協議都可以向下兼容, 這一類系統搭配SD Express讀卡機晶片和SD Express記憶卡可以得到快500MB/s的速度, 接近SATA SSD (600MB/s)速度

- **市場上真的有這一類SD Express的產品嗎?**
 - 有!
 - 在瑞昱於2019推出SD Express讀卡機晶片後, 搭載SD Express讀卡機晶片的系統(筆電)前年2020就開始可以買到, 去年2021有更多家筆電廠商不約而同推出多款SD Express相關產品可供選購, 2022已知會有更多產品, 敬請期待!!~ 另外卡片也可以在去年2021買到了, 所以從讀卡機到卡都有了



SD Association

Thank You

Email: jim_shiau@realtek.com



ConceptD & SD Application

CT Chen

Senior Manager of Product Management (Acer)

The Acer logo, featuring the word "acer" in a stylized, lowercase, green font.

This is how we discovered

We research the target audience for overall laptops over the world.



METHODOLOGY



Homework

Lifestyle collage

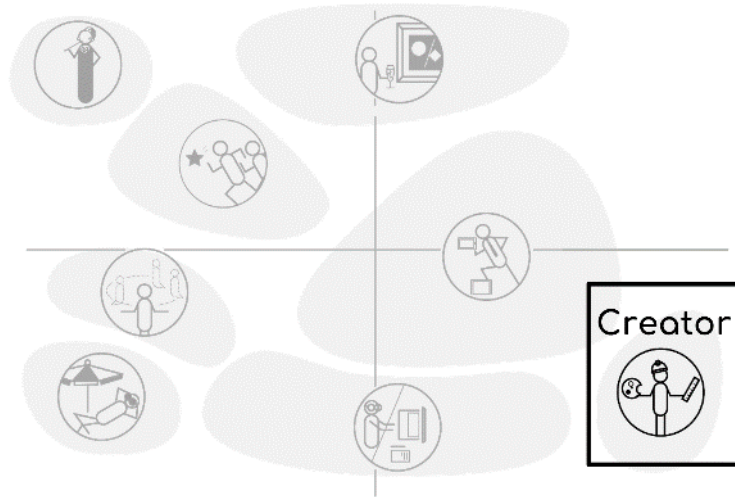
Laptop usage

Other devices / IOT

Retail simulation

Acer Brand

ACER CONFIDENTIAL



We discovered the "Creator" segment since then...



ConceptD Logo Design

Concept D



THE UNMET NEEDS OF
MULTI-TALENTED CREATORS

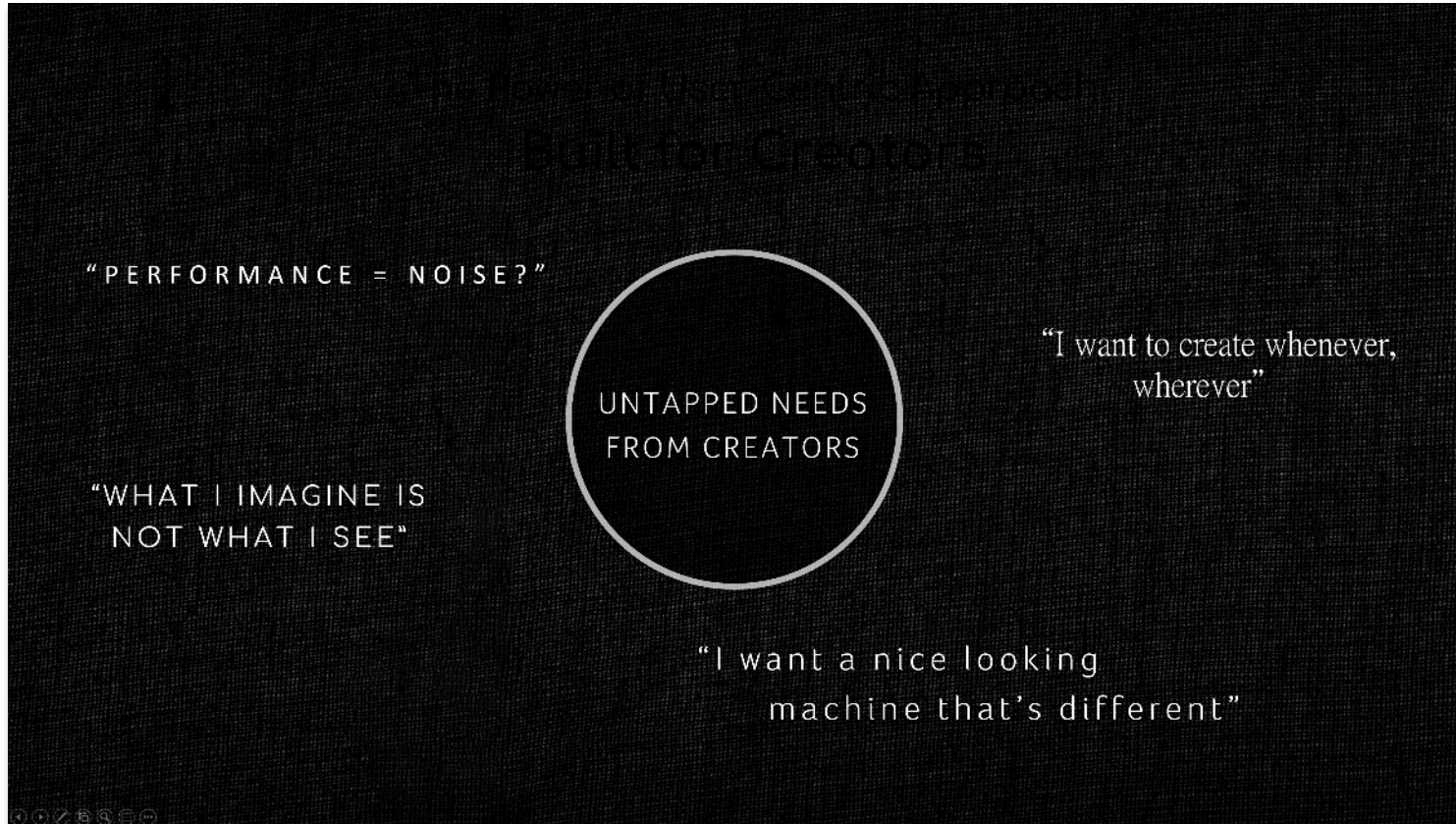
“PERFORMANCE = NOISE?”

“WHAT I IMAGINE IS NOT WHAT I SEE”

UNTAPPED NEEDS FROM CREATORS

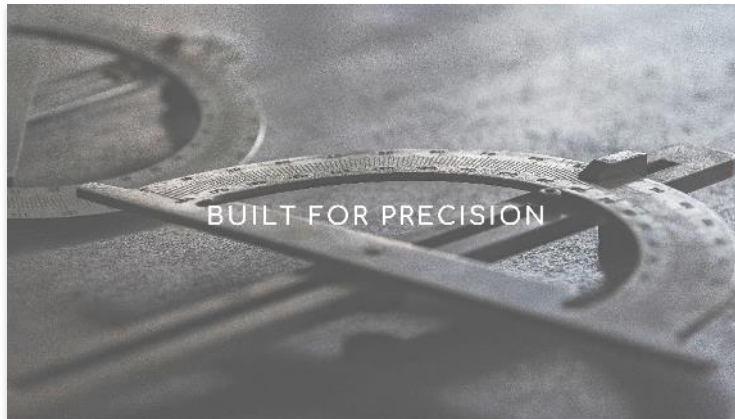
“I want to create whenever, wherever”

“I want a nice looking machine that’s different”





SD Association



BUILT FOR PRECISION



BUILT FOR PERFORMANCE



BUILT FOR SILENCE



BUILT FOR DESIGN



Design Principle



Built for **PRECISION**

- Color Accuracy
- Screen Resolution
- High Refresh Rates



Built for **PERFORMANCE**

- Supreme Processor Performance
- Optimum Graphic Performance
- High Storage & Memory Space



Built for **SILENCE**

- Efficient Thermal Solution
- Enhanced Air Flow
- Silent Operation



Built for **DESIGN**

- Thin-and-Light Design
- Clean and Elegant
- Practical and Ergonomic

Design focus

Sketching is the
fundamental for
the design

ConceptD

"I prefer drawing to talking. Drawing is faster, and leaves less room for lies."
Charles-Édouard Jeanneret-Gris a.k.a. as Le Corbusier (1887-1965) architect

"Drawing is putting a line (a)round an idea. "
Henry Matisse (1869 - 1954) artist

"I have learned that what I have not drawn, I have never really seen"
Frederick Franck (1909 - 2006) sculptor

"You can't do sketches enough. Sketch everything and keep your curiosity fresh."
John Singer Sargent (1856 - 1925) artist



ConceptD 7 Ezel Pro

A NEW TWIST ON CREATION

A one stop high performance laptop for all your creative needs. This convertible laptop with five available display modes, is ideal for professional 3D graphics artists who need the speed and responsiveness of a desktop in a highly portable format to demonstrate and correct their creations in real-time.

Elevate Your Creative Workflow

Acer's patented Ezel Hinge™ gives users five modes to choose from, allowing them to easily collaborate with others in share mode, create efficiently in float mode, work on the move with pad mode, present their work in display mode, and otherwise work in peace in standard mode.

Note-taking and drawing that feels as natural as pen on paper



Jot down ideas whenever you have something in mind



Present anytime, anywhere



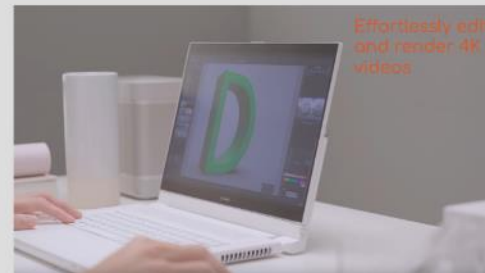
Go through completed work with fellow designers



Experience fluid visuals when using 3D graphics applications.



Effortlessly edit and render 4K videos





ConceptD Signature design - Ezel

ConceptD 3 Ezel (14")



ConceptD 7 Ezel (15.6")

ConceptD 3 Ezel (15.6")

ConceptD™



Usage Behavior

#Major complaints are mostly aligned with our known facts

5. Tell us your top 3 DISLIKES of this ConceptD device based on your creation experiences:

ALL

Audio

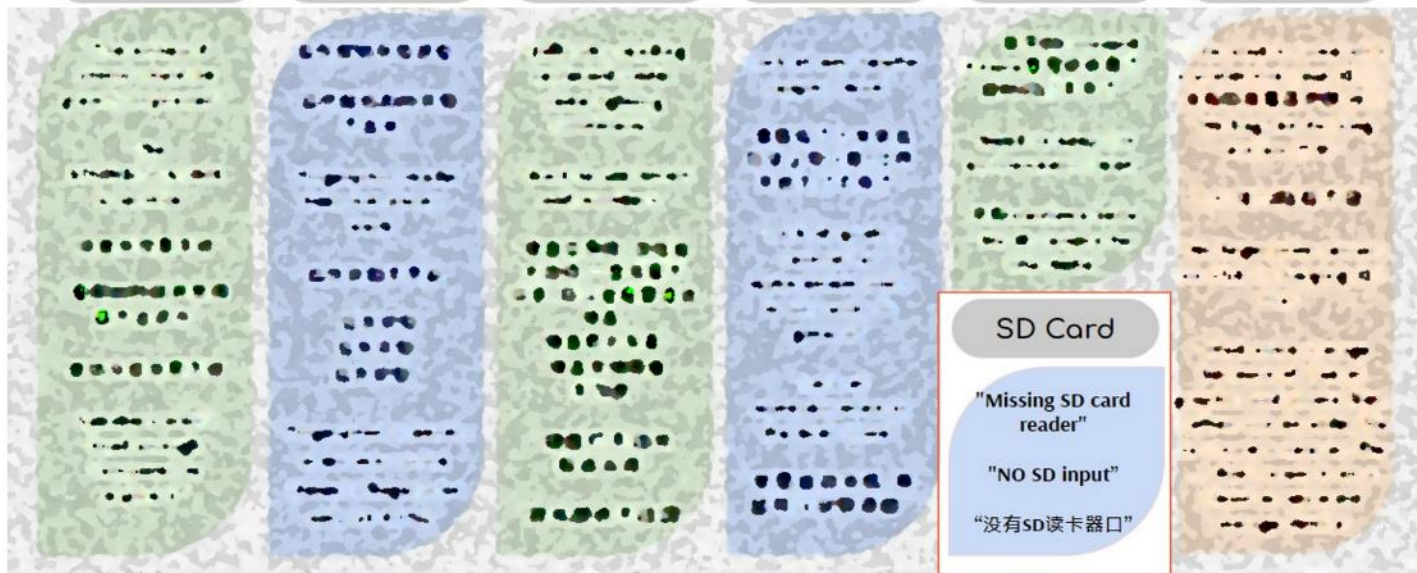
Fingerprint

Keyboard

Service

Software

Others



ConceptD



ConceptD 3 Ezel Pro

Design Performance Features

Packed with Ports

This laptop comes packed with every port you may need such as HDMI, SD 70, and many more. Further, quickly move even the largest of files or work between multiple devices and displays with the Thunderbolt™ 4 USB Type-C port, giving you file transfer speeds of up to 40Gbps.

1x
SD 70 **Card** Reader

2x
USB 3.2 Gen 2 Type-A

1x
USB Type-C w/
Thunderbolt™ 4

1x
Mini DisplayPort



	A Cover (Top)	B Cover (Screen)	C Cover (Keyboard)	D Cover (Bottom)
Color	The White	N/A	The White	The White
Material	Magnesium aluminum alloy	N/A (no bezel)	Magnesium aluminum alloy	Magnesium aluminum alloy
Finish	Painting	N/A	Painting	Painting



SD Association

Concept D™ X



YEARS OF INNOVATION
2000-2020



SD Association

Thank You

Email: CT.Chen@acer.com



SVP 介紹 SD and UHS-II Verification Program

Sandy Chang
Taiwan Technical Director (Granite River Labs)

GRL
GRANITE RIVER LABS

SVP -SD Express/UHS-II Verification Program

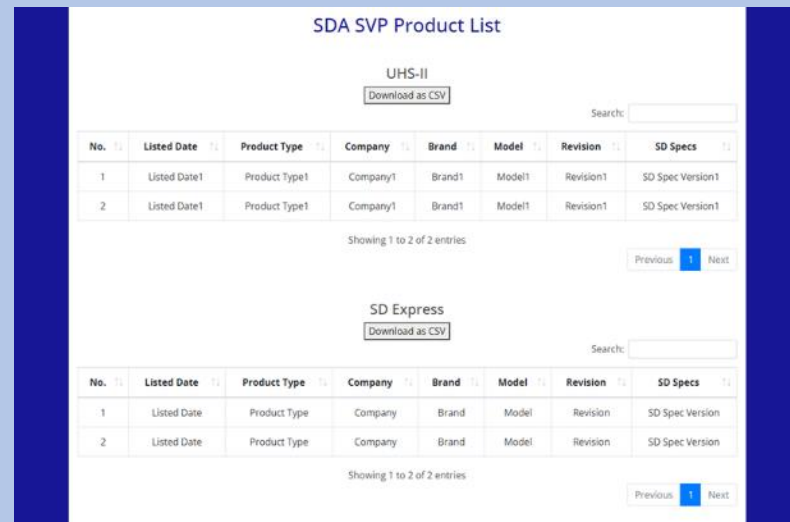
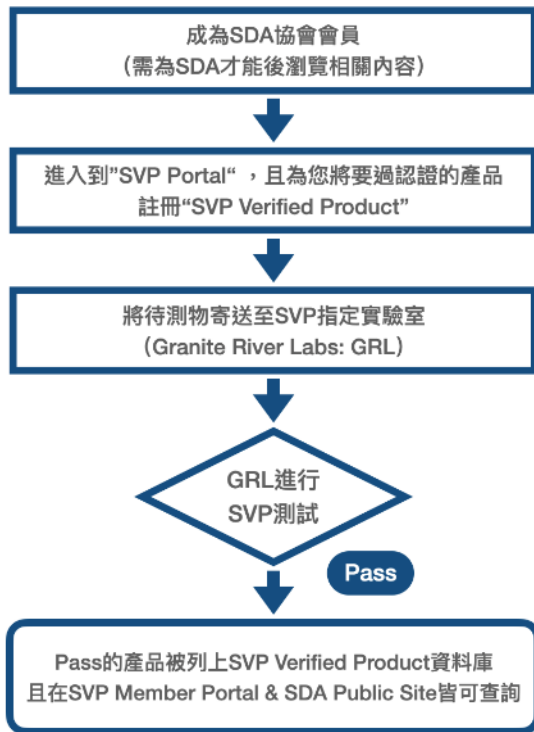
- SDA 協會推出的驗證計畫，讓 SDA 會員能夠進行以下測試：
 - SD Express Electric 測試
 - UHS-II Electric 測試
 - PCI Express Protocol 測試
- SVP 計畫提供 SDA 會員較低成本測試費用與更好的性能測試
- 通過 SVP 測試的產品，SDA 官網會列入“已通過驗證”的產品，供使用者查詢
- SVP 兩種測試時程方案
 - Test Shuttle 共享專車方案：固定送測時間表，好處是能夠與其他SDA會員一同分攤測試費用（下一班車 Shuttle：2022 Q1）
 - On Demand 隨到即測方案：提供立即測試服務

SVP 如何協助 SDA 會員與消費者

- 當產品的傳輸速度不斷提升，協議越來越複雜，同時，所帶來相容性問題的風險也越高。對此高速測試驗證環境所需要投入資源也更昂貴。SVP 提供更符合成本效益的 Signal Integrity 與 Protocol 測試方案
- SDA 在初始階段會對 SVP 測試費用進行補貼，以快速啟用該計劃
- SDA 官網將公布通過 SVP 測試的產品清單，讓終端消費者可以搜尋及確認符合品質要求的產品

SVP 流程說明

□ 首要步驟：成為 SDA 會員，然後進入 SVP 網頁



SDA SVP Product List

UHS-II
Download as CSV

Search:

No.	Listed Date	Product Type	Company	Brand	Model	Revision	SD Specs
1	Listed Date1	Product Type1	Company1	Brand1	Model1	Revision1	SD Spec Version1
2	Listed Date1	Product Type1	Company1	Brand1	Model1	Revision1	SD Spec Version1

Showing 1 to 2 of 2 entries

Previous 1 Next

SD Express
Download as CSV

Search:

No.	Listed Date	Product Type	Company	Brand	Model	Revision	SD Specs
1	Listed Date	Product Type	Company	Brand	Model	Revision	SD Spec Version
2	Listed Date	Product Type	Company	Brand	Model	Revision	SD Spec Version

Showing 1 to 2 of 2 entries

Previous 1 Next

SVP 產品列表

SDA SVP Product List

UHS-II

[Download as CSV](#)

Search:

No. ↑↓	Listed Date ↑↓	Product Type ↑↓	Company ↑↓	Brand ↑↓	Model ↑↓	Revision ↑↓	SD Specs ↑↓
1	Listed Date1	Product Type1	Company1	Brand1	Model1	Revision1	SD Spec Version1
2	Listed Date1	Product Type1	Company1	Brand1	Model1	Revision1	SD Spec Version1

Showing 1 to 2 of 2 entries

Previous **1** Next

SD Express

[Download as CSV](#)

Search:

No. ↑↓	Listed Date ↑↓	Product Type ↑↓	Company ↑↓	Brand ↑↓	Model ↑↓	Revision ↑↓	SD Specs ↑↓
1	Listed Date	Product Type	Company	Brand	Model	Revision	SD Spec Version
2	Listed Date	Product Type	Company	Brand	Model	Revision	SD Spec Version

Showing 1 to 2 of 2 entries

Previous **1** Next

- ✓ 可下載名單
- ✓ 可篩選
- ✓ UHS-II 與 SD Express 分別列表

Who is GRL?

- 自2013年起，擔任SDA的執行委員
- SD 協會指定實驗室
- 提供 SD卡生態系統測試服務 & 解決方案
- GRL的總部位於美國矽谷中心
 - 全球8個據點 以服務全球各地廠商
 - SD Card/Host 測試服務 & 除錯分析
 - SD Card/Host 解決方案 (電性層 & 協議層測試方案)
 - GRL 為 SVP 獨家指定的測試實驗室



<https://graniteriverlabs.com/>



SD Association

Thank You

Email: schang@graniteriverlabs.com



SD Express 卡片介紹與應用範例 SD Express Card and Applications

Rex Kuo
PM Manager (Phison)

PHISON



SD Association

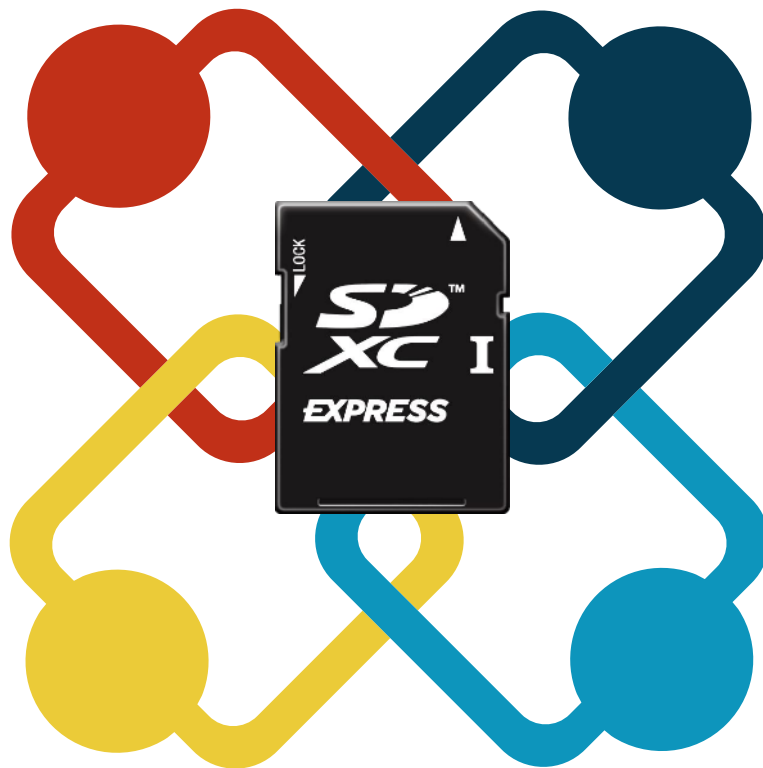
SD Express 卡介紹

SD Express card introduction

SD Express Card 概述

SD Express Card description

SD7.0(SD Express) Spec
在2018年六月導入



沿用目前SD card外觀設計

PCIe Gen3 , Gen4 and
NVMe v1.3 v1.4 介面導入

向下相容Legacy SD 平臺

SD Express 一張像SSD的卡

SD Express Card is a SSD like SD card

集結SSD優點及向下相容現行SD介面的全新世代存儲卡

Good Things from PCIe NVMe SSD

- SSD grade performances and features
- PCIe/NVMe – a continuously innovated market-wide platform
- Scalable SW stack widely supported
- Bus mastering and reduction ram and cost
- Leveraging existing investments for card and products manufacturers



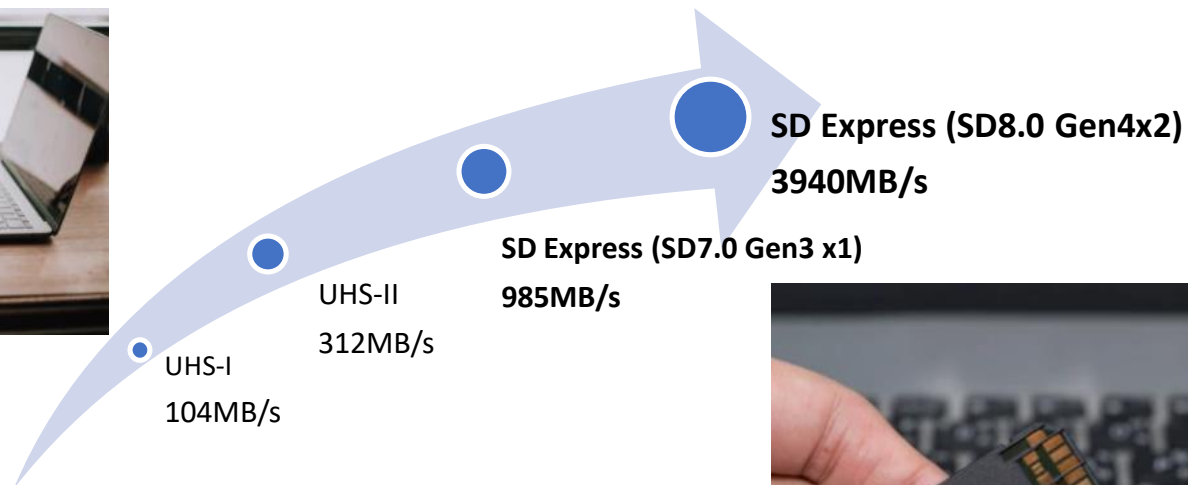
Good Things from SD Card

- Most popular removable card in consumer market
- Enhanced features added: Command Queue, Cache
- SD UHS-I operation mode supported

可攜式SSD等級的存儲裝置

Portable SSD Speed Grade Storage

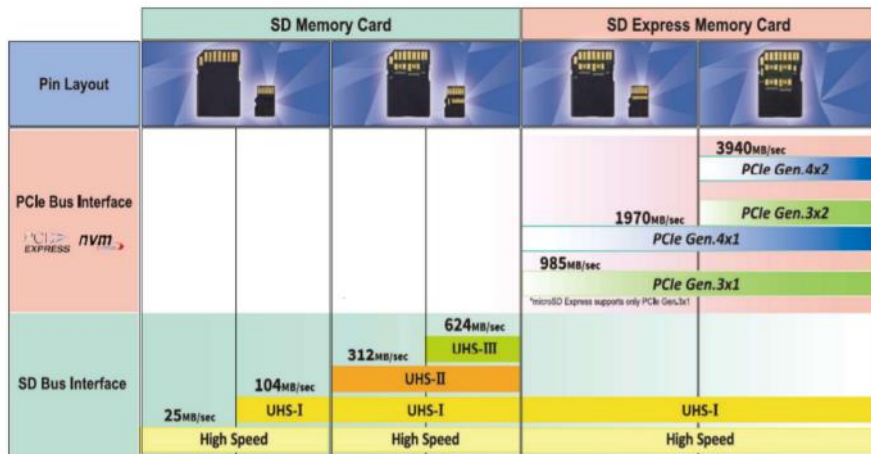
SD Express Card 是目前達到SSD速度等級的可攜式存儲裝置



SD Express 與 Legacy SD card 的區別

Differences between SD Express and legacy SD card

	傳輸介面	傳輸速度	Pad 設計	相容性
SD Express	PCIe	Up to 3940MB/s	2 row/3 row	Support PCIe & UHS-I
Legacy SD	UHS-II	Up to 312MB/s	2 row	Support UHS-II & UHS-I
Legacy SD	UHS-I	Up to 104MB/s	1 row	Support UHS-I





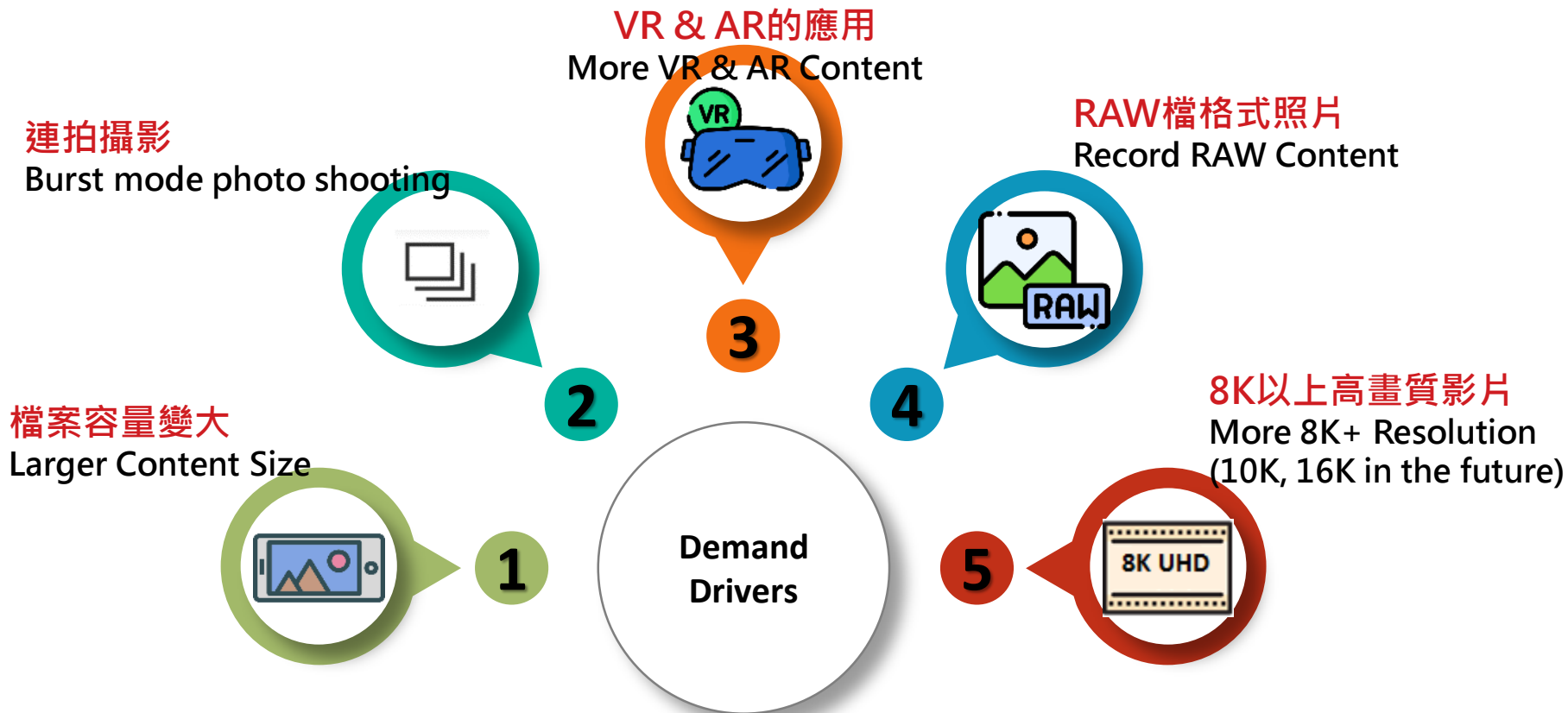
SD Association

SD Express Card 應用

SD Express card applications

等級傳送速率的應用渴望

Applications



未來展望-SD Express Card 一日生活

Future – 1 Day life with SD Express card

未來高速存儲的需求，會充滿你的生活周遭
透過SD Express Card來滿足這類的需求



Morning

Noon



Night

Afternoon



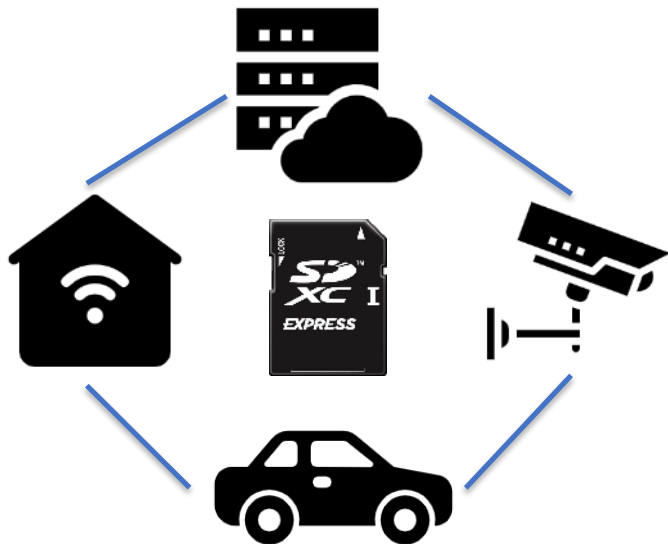
未來展望-智慧都市

Future – Smart City



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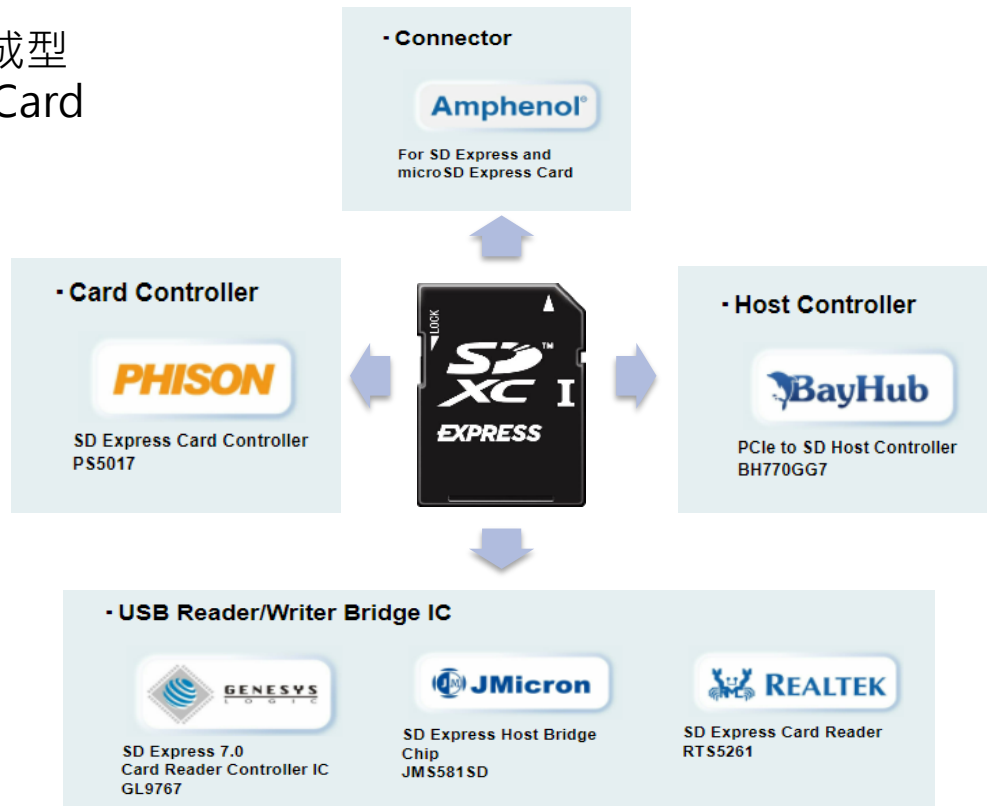
隨著5G時代來臨，各類裝置間的資料傳輸即時性要求會越來越高，未來高速存儲的存在是無可或缺的



SD Express 解決方案的供應鏈

Solution Supply Chain of SD Express

目前SD Express解決方案的供應鏈已成型
從Host, Connector, Reader/Bridge, Card
都有整套的對應方案



Phison SD Express 卡片方案

Phison SD Express Card solution PS5017



<https://www.phison.com/en/company/newsroom/press-releases/general/1963-phison-is-the-first-to-ship-the-new-pcie-sd-express-card-sd-7-0>

FEBRUARY 24, 2021

PHISON



PHISON IS THE FIRST TO SHIP THE NEW PCIe SD EXPRESS CARD (SD 7.0)

San Jose, Calif., February 24th, 2021 | Phison Electronics Corp., a global leader in NAND Flash controllers, integrated circuits, and storage solutions, announced today that it will be the first to ship the new PCIe interface SD card, SD Express 7.0. The card will start shipping in March, 2021 and will come in a 256GB and a 512GB offering.



SD Express (SD 7.0) is the first memory card to apply a PCIe interface in an SD interface compatible with all the existing built-in SD slots. This innovation takes the

https://www.youtube.com/watch?v=RjrbhKD8O48&ab_channel=PhisonElectronicsCorp.

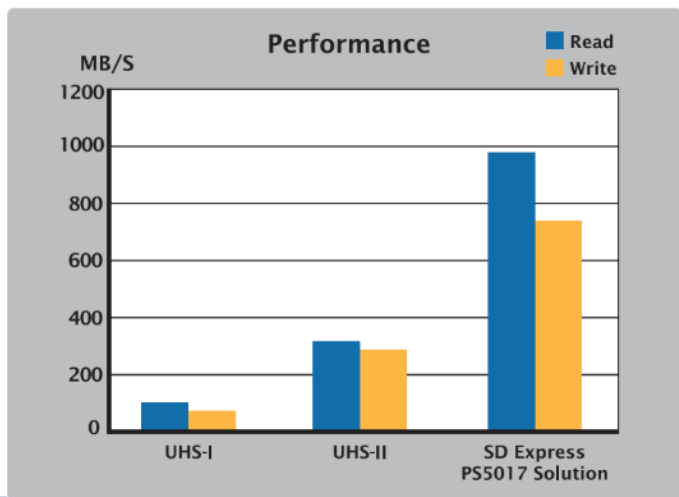


Phison SD Express 卡片方案

Phison SD Express Card solution PS5017



Controller	Sequential Read/Write (up to)	Capacity	NAND Flash	Application Performance Class	Video Speed Class	UHS Speed
PS5017	870/740 MB/s	256GB ~ 1TB	3D QLC	A1	V30 (SD Express)	U3





SD Association

Thank You

Email: rex_kuo@phison.com



SD Card/Host Compliance and Test Services

Hitoshi Hatakeyama

Senior SI Expert/Sales Engineering Supervisor
(Allion Labs)

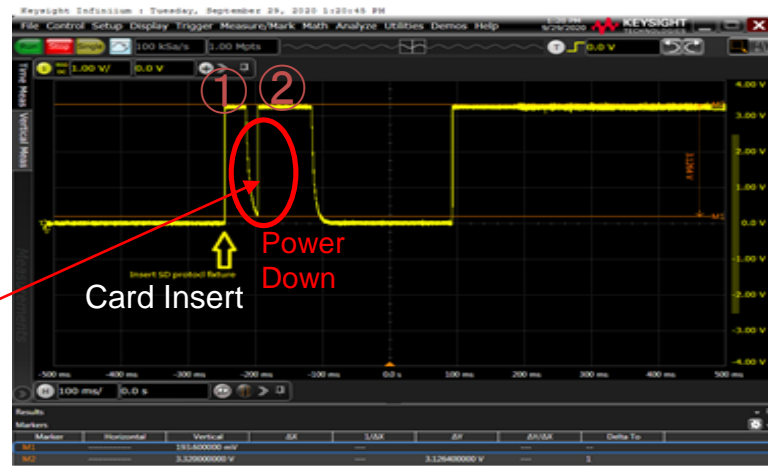
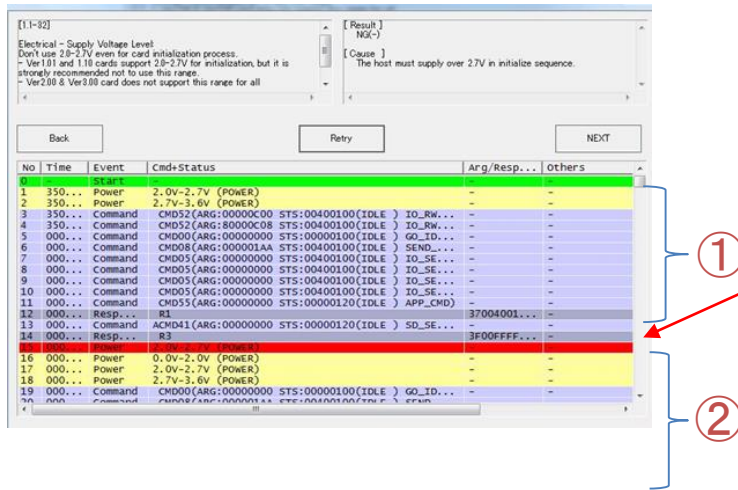
ALLION[®]
AIoT EXPERT

- For Host
 - SQ (Signal Quality) Test and Power Management
 - Protocol Test
 - File System/ Format Function
 - Design Verification: Includes Other Logo: USB/PCIe
- For Card
 - Mechanical Test: 3D-Dimension/Surface Roughness
 - Host Interoperability

SD Host Fail Analysis Example

- Problem Occurred: Card Data Lost on Certain SD Host
- Root Cause Found : Power On Control, Protocol Error

Host Command LOG: Protocol Analyzer



SD Card Interoperability Test

In the questionnaire of the SDA IOP events , there was an opinion from participant company that “it would like to increase the number of host devices”.

Allion can preparing multiple devices as “SD Host Devices” from the following categories. The following categories are topical products that use SD cards. We would like to select host devices based on the market share.

- Music Player
- Game Console
- Drone
- Action CAM
- Professional Camera
- Car Navigation System
- Drive Recorder
- Mobile Phone



SD Card Mechanical Test

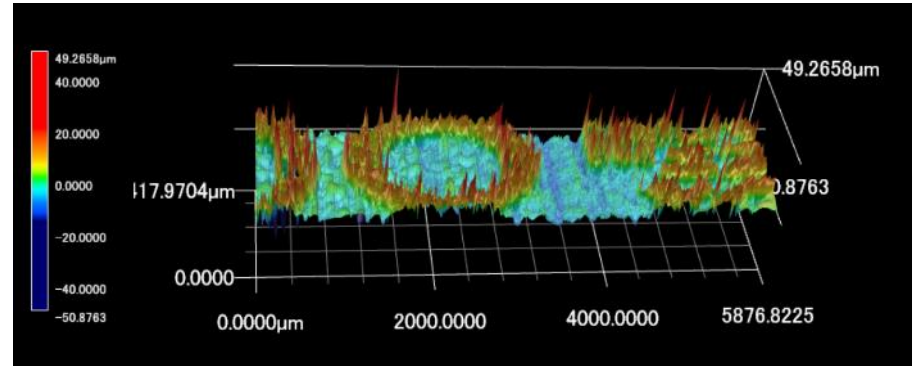
- Environmental Test : Harsh Environments (For Automotive)
- Durability Test with Connectors: Insertion and Removable
- Mechanical Dimensions with 3D
- Any Other Tests for Physical /Mechanical

Card Mechanical Dimension Test Environments

- Surface Roughness Measure
 - Wide-Area 3D Measurement System with 3D Analysis Software

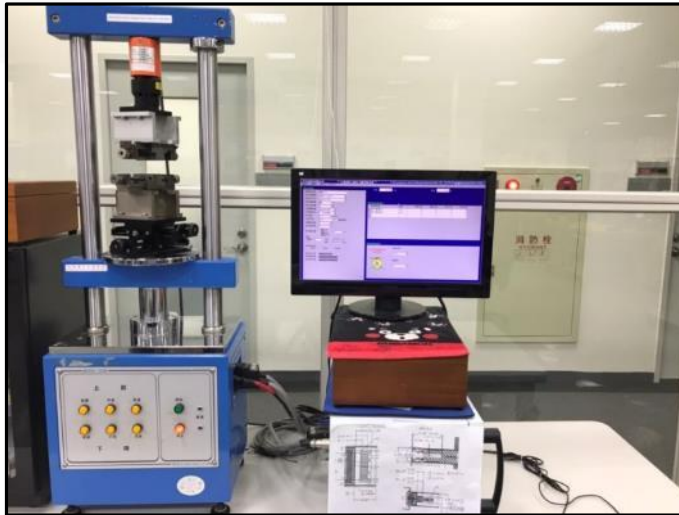


3D Image of the Card Surface



Test Environments : Insertion & Removable

- 4.1.1 Total Insertion Force, Total Pulling Force



Test Equipment



Insertion Force



Removable Force

Allion is the premier resource for all of your third party testing needs. Our services bring products to market more quickly, reliably, and cost effectively to protect your brand quality and that of your suppliers.

Thank you

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QUESTIONS???

