

Realtek SD Express Solution

COMPUTEX TAIPEI 2023

About Realtek Card Readers



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- 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
 - PCIe/USB SD card reader/USB HUB/USB Type-C/Power Delivery
- Realtek SD card readers are widely adopted by ODM/OEM
 - Tight partnership with SD card and host chipset vendors
 - Offer a wide choice of SD card readers

SD/Host Interface	USB	PCIe
UHS-I	RTS5176E/RTS5306E/RTS5350	RTS5227S/RTS5228
UHS-II	RTS5329	RTS5250S
SD Express	RTL9211DS RTL9220DP 	RTS5261 RTS5264 

What is SD Express?



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- Leverage the benefits of SD card and PCIe NVMe SSD

SD Card



- Most widely used removable media
- Supported by most host devices
- Tiny form factor



PCIe NVMe SSD



- High speed & Low latency
- PCIe is a widely used high-speed interface standard



SD Express Card

- Extreme high speed (up to 3938MB/s)
- Backward compatible with old SD hosts
- Tiny form factor

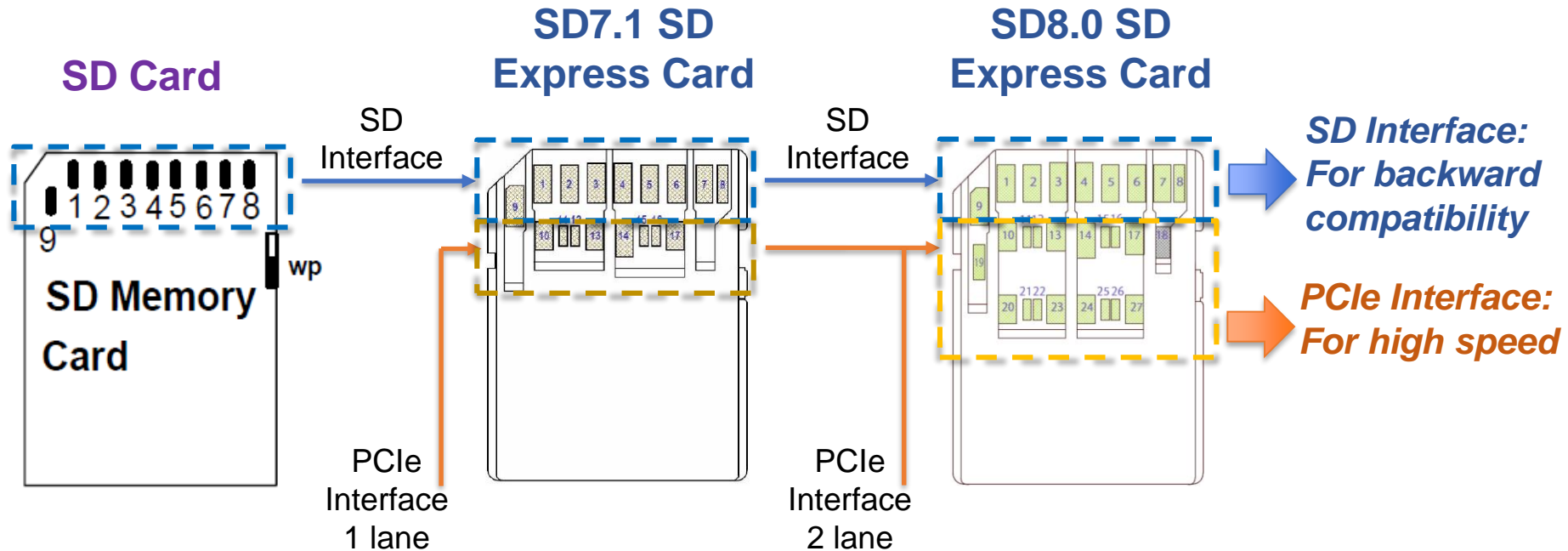
The Secret of SD Express



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- How does SD Express achieve high speed and backward compatibility?



SD Express Reader



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- **Why do I need an SD Express reader?**
 - An SD Express card reader can unlock the true speed of SD Express cards
 - The SD Express card can also run in backward compatible mode, however the speed might be limited to UHS-I SDR104 (104MB/s)



SD Express Family



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- Consider your end-product type and choose the optimal design
- The table below shows combinations of reader and card

Host/Card	SD7.x Card PCIe Gen3x1 (G3L1)	SD8.0 Card PCIe Gen3x2 (G3L2)	SD8.0 Card PCIe Gen4x1 (G4L1)	SD8.0 Card PCIe Gen4x2 (G4L2)
SD7.1 Reader supports up to PCIe Gen3x1 (G3L1)	985MB/s	985MB/s	985MB/s	985MB/s
SD8.0 Reader supports up to PCIe Gen3x2 (G3L2)	985MB/s	1969MB/s	985MB/s	1969MB/s
SD8.0 Reader supports up to PCIe Gen4x1 (G4L1)	985MB/s	985MB/s	1969MB/s	1969MB/s
SD8.0 Reader Supports up to PCIe Gen4x2 (G4L2)	985MB/s	1969MB/s	1969MB/s	3938MB/s

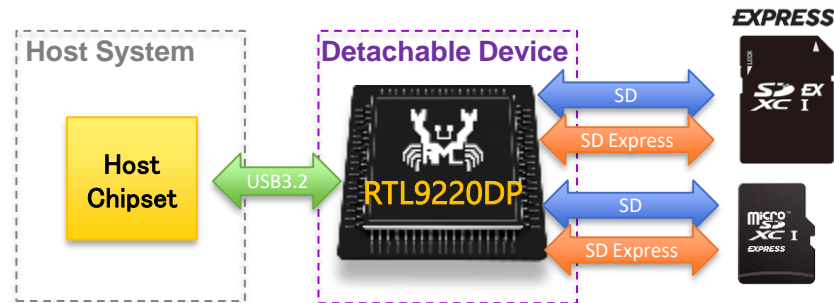
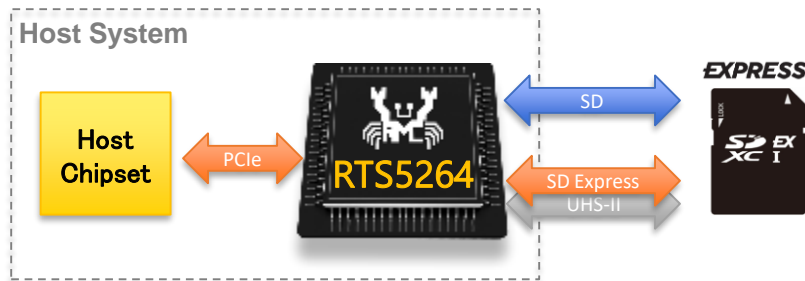
Implement SD Express Reader



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- **Select an SD Express reader according to your product type and host interface**
 - Reader for built-in host system: Suggest using PCIe interface RTS5264/RTS5261
 - Example use: Laptop, Tablet, Gaming console
 - Reader in a detachable device: Suggest using USB interface RTL9220DP/RTL9211DS
 - Example use: Docking station, Dongle, USB card reader



- **Special notes for PCIe interface implementation**
 - Host chipset should support PCIe hot plug
 - Vendor driver needs to be installed in the host system
- => If the above requirements cannot be met, use a USB interface.



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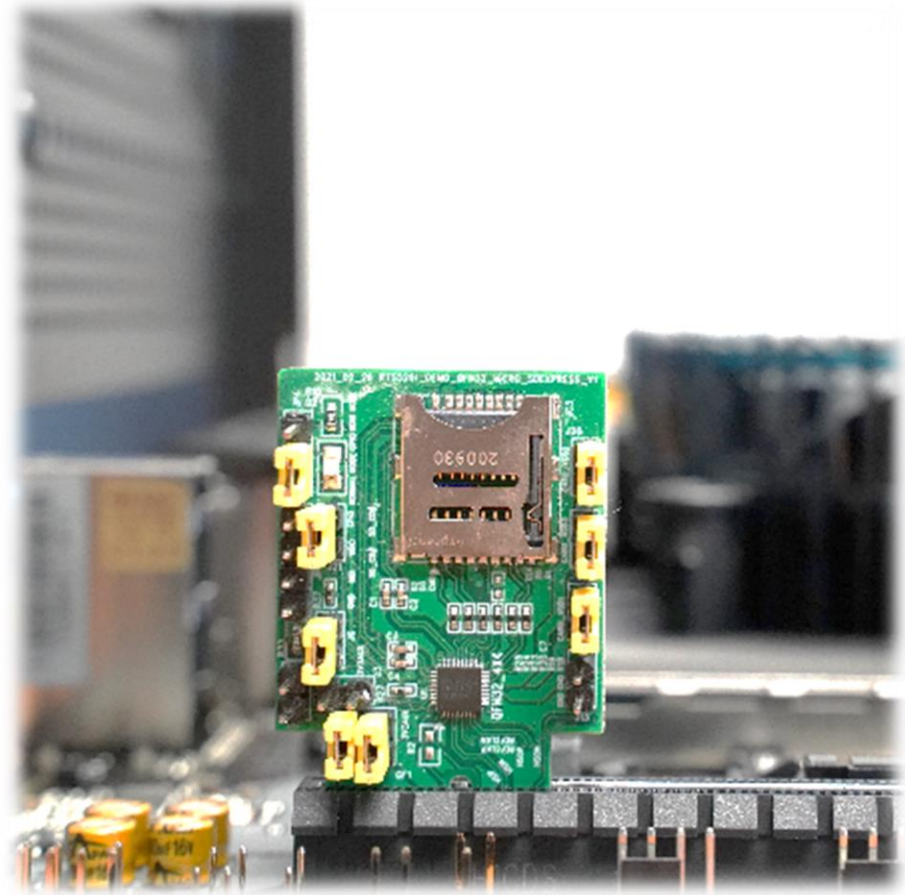


RTS5261

SD Express Reader Controller



Interface	PCIe
Package	QFN32 4x4
Power	3.3V



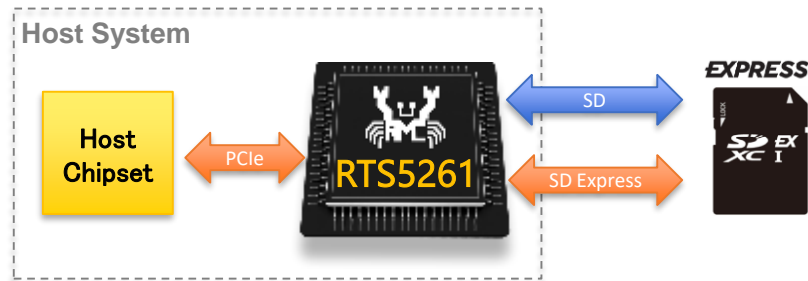
RTS5261

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, UHS-II RTS5250S, SD Ex RTS5264 solution
- Design kit available for SD7.1 or SD8.0 design



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	Read (MB/s)	Write (MB/s)
SEQ1M Q8T1	1776.86	1698.16
SEQ1M Q1T1	1664.35	1578.83
RND4K Q32T1	880.09	791.70
RND4K Q1T1	242.15	255.87

RTS5261 Phison SD Express SD8.0 Gen3x2

SD Express SD8.0 Gen3 x2

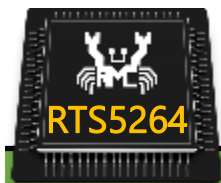


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RTS5264

SD Express Reader Controller



Interface PCIe

Package QFN32 4x4

Power 3.3V



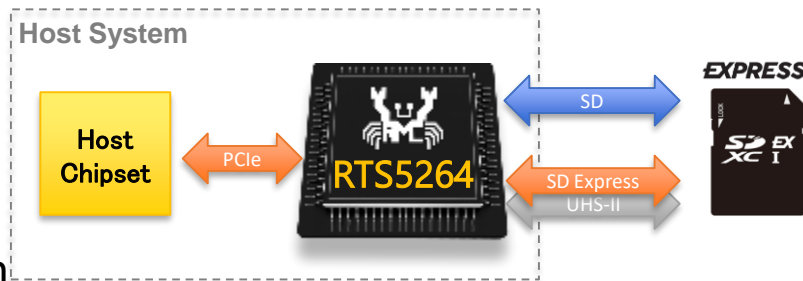
RTS5264

SD Express Reader Controller

- Realtek 2nd Gen SD Express Reader. Evolved from Realtek market proven design RTS5261
- Supports UHS-II and SD8.0 SD Express in the same SD slot
- Integrates all power sources for SD/SD Express cards. Reduces BOM cost and design effort
- Co-layout with Realtek UHS-I RTS5227S/RTS5228, UHS-II RTS5250S, SD Ex RTS5261 solution
- Design kit available for SD7.1 or SD8.0 design



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CrystalDiskMark 8.0.4 x64 [Admin] <0Fill>

File Settings Profile Theme Help Language

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

	Read (MB/s)	Write (MB/s)
SEQ1M Q8T1	1776.74	1700.33
SEQ1M Q1T1	1655.80	1581.52
RND4K Q32T1	881.77	788.04
RND4K Q1T1	235.26	264.93

RTS5264 Phison SD Express SD8.0 Gen3x2

SD Express SD8.0 Gen3 x2



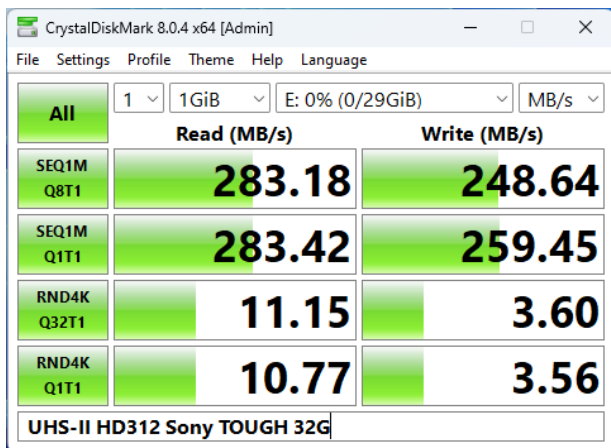
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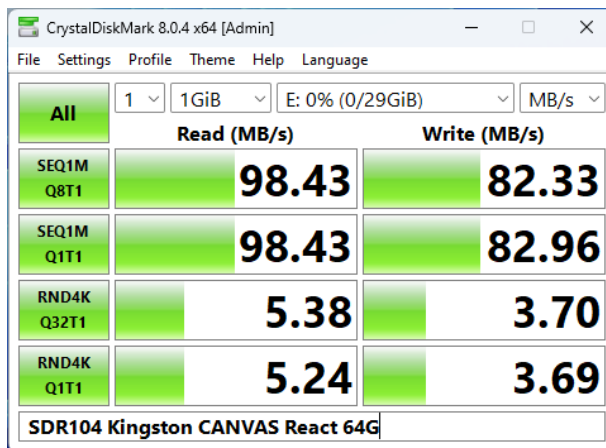
RTS5264

SD Express Reader Controller

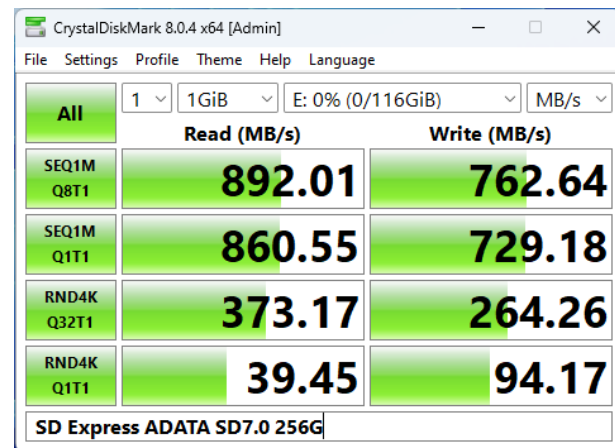
- Performance reference result



UHS-II



UHS-I

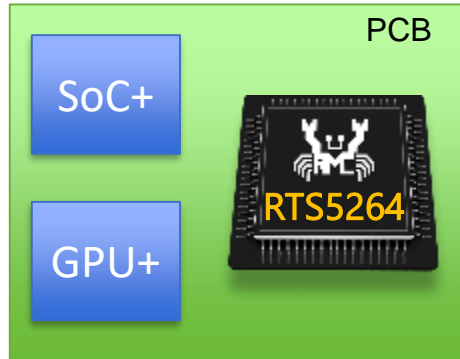


SD Express SD7.1 Gen3 x1

Co-Layout for Faster Product Design REALTEK

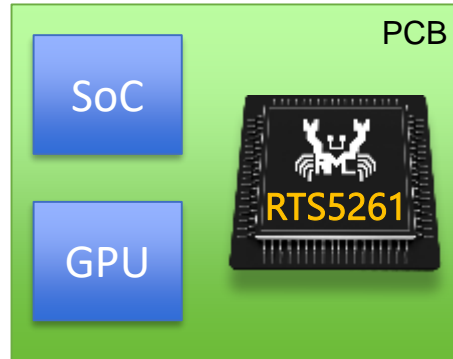
- It is common to use one PCB design for different segments in Notebooks.
 - Realtek's PCIe readers can co-layout and use the same QFN32 4x4 footprint
 - Realtek's PCIe card readers make different segment designs easy

Premium



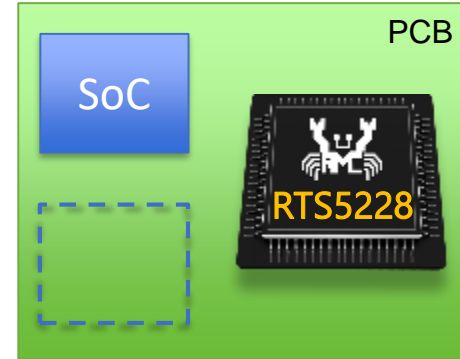
**RTS5264 supports
SD Express & UHS-II**

Mainstream



**RTS5261 supports
SD Express**

Basic



**RTS5228 supports
UHS-I**



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RTL9211DS

SD Express Reader Controller



Interface USB3.2 Gen2

Package QFN68 8x8

Power 5V





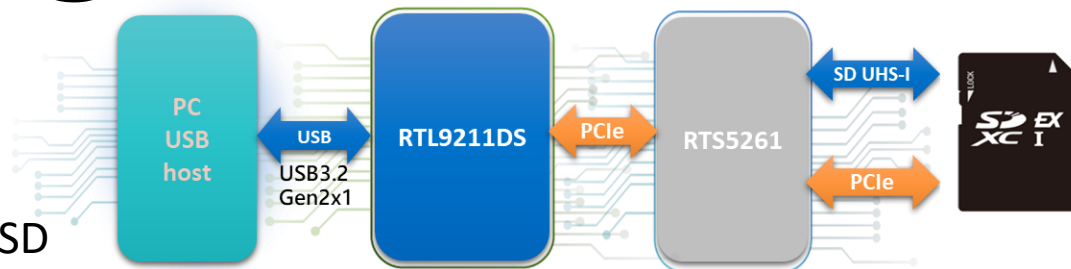
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RTL9211DS

SD Express Reader Controller

- The world's 1st mass-produced USB SD Express reader controller
- Supports 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	971	984
Seq 128K Q32T1	924	987
RND4K Q32T16	252	259
RND4K Q1T1	27	81

SD Express SD8.0 Gen3 x2

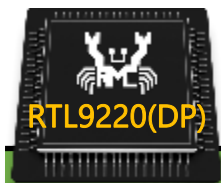


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RTL9220(DP)

SD Express Reader Controller



Interface USB3.2 Gen2x2

Package QFN88 10x10

Power 5V





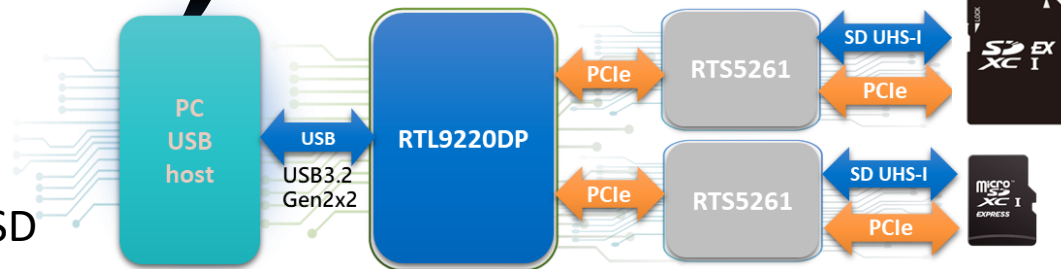
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RTL9220(DP)

SD Express Reader Controller

- The world's 1st mass-produced USB SD Express reader controller is able to support 1 LUN/port and dual LUN/port applications
- Supports USB3.2 Gen2x2 20Gbps
- Widely adopted by dongle makers
- Design kit available for SD7.1 or SD8.0 design



	Read (MB/s)	Write (MB/s)
SEQ1M Q8T1	1803.84	1692.64
SEQ1M Q1T1	1588.99	1526.19
RND4K Q32T1	341.82	310.81
RND4K Q1T1	103.95	107.39

RTL9220 SD8.0(PHISON)

SD Express SD8.0 Gen3 x2

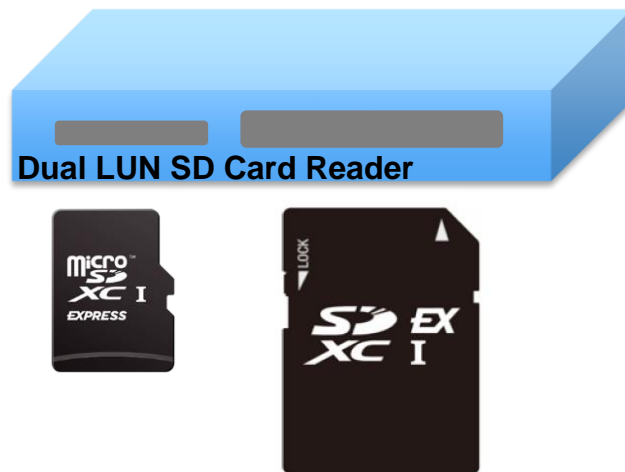
Dual LUN, Double Productivity



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- **Dual LUN means a card reader can support dual SD slots**
 - Two SD slots can operate at the same time
 - A classic design is one standard SD slot and one micro SD slot
 - No requirement for dedicated micro SD adapter



New Applications for SD Express



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- **Beyond Removable Storage**

- SD Express can provide SSD-like speed; it can be a removable bootable device
- Whole PC onto one card becomes a possibility

SD Express

