



# Evaluating Managed Nand Flash Architectures for Consumer Applications

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# Interfaces in Consumer Applications

## ■ Varying interfaces serving different needs

### SD

- Perfect for Removable Storage in Mobility applications
  - DSC
  - Smartphone
  - Tablet
  - PC
- Two form factors options for design flexibility
  - SD
  - uSD

### USB

- High Speed
- Low Cost
- Boot capability
- Plug and Play Interconnectivity
- Portability

### SATA

- Internal Storage Interface
- High speeds
- Boot Caching
- Primary Storage

# SD Comparison

## SD

Interface	<i>SDHC CL4,</i>	<i>SDHC CL6,</i>	<i>SDHC CL10,</i>	<i>SDHC, UHS-1,</i>	<i>SDXC, UHS-1,</i>	<i>SDHC, UHS-2,</i>
Application	Mass Market	Amateur Photo	Hi MP DSC	Entry DSLR	Mid Range DSLR	HE DSLR, HD Video
Write Speed	<b>4MB/s</b>	<b>15MB/s (100X)</b>	<b>20MB/s (133X)</b>	<b>35MB/s (233X)</b>	<b>45MB/s (300X)</b>	<b>80MB/s (533X)</b>
Read Speed	<b>20MB/s</b>	<b>20MB/s (133X)</b>	<b>50MB/s (133X)</b>	<b>50MB/s (333X)</b>	<b>90MB/s (600X)</b>	<b>95MB/s (633X)</b>

## uSD

Interface	<i>uSDHC CL4,</i>	<i>uSDHC CL6,</i>	<i>uSDHC CL10, UHS-1</i>	<i>uSDXC CL10, UHS-1</i>	<i>uSDHC CL10, UHS-2</i>
Application	<i>Mobile Photo/Video</i>	<i>Entry Level Smartphone/Tablet/C ameras</i>	<i>1080p HD mobile video, Hi-End Tablets and DSLRs</i>	<i>1080p HD mobile video, Hi-End Tablets and DSLRs</i>	<i>1080p HD mobile video, Hi-End Tablets and DSLRs</i>
Write Speed	<b>4MB/s</b>	<b>10MB/s (66X)</b>	<b>20MB/s (133X)</b>	<b>15MB/s (100X)</b>	<b>20MB/s (133X)</b>
Read Speed	<b>20MB/s</b>	<b>20MB/s (133X)</b>	<b>45MB/s (133X)</b>	<b>20MB/s (133X)</b>	<b>50MB/s (133X)</b>

# PNY SD & uSD

SDHC CL4



SDHC CL6 15MB/s



SDHC CL10 20MB/s



SDHC CL10 UHS-1  
35MB/s



SDHC CL10 UHS-1  
35MB/s



SDHC CL10 UHS-1  
80MB/s



uSDHC CL4



uSDHC CL6 10MB/s



uSDHC CL10 20MB/s



# USB



Protocol	Bandwidth	Transfer Speed	Power
USB 2.0	480Mbps	60MB/s	500mA
USB 3.0	5Gbps	400MB/s	900mA

- 80MB/s Transfer Rates common today
- Controller technology coupled with 20/19nm Flash for USB 3.0 will make >100MBs
- Large Media File Transfer made easier.
- Limited Flash Channels prohibiting capacity vs. SSD
- Available in 32GB & 64GB Capacities.

# SATA

Protocol	Bandwidth	Transfer Speed
SATA 2.0	3Gbps	300MB/s
SATA 3.0	6Gbps	600MB/s

- Large Supported Flash Array enabling large Capacities
- SSD Speeds today at Transfer Speed thresholds with Compressible Data.

# PNY SSD



- 120GB – 480GB
- Read: up to 500MB/s
- Write: up to 450MB/s
- IOPS : up to 60K



- 120GB – 480GB
- Read: up to 550MB/s
- Write: up to 520MB/s
- IOPS : up to 85K



- 24GB – 240GB
- Read: up to 550MB/s
- Write: up to 520MB/s
- IOPS : up to 85K

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## Conclusion

- SD suited will for portability with DSC, Smartphones, Tablets, PC.
- USB ideally suited for large format media content.
- SATA ideal for OS and primary storage