



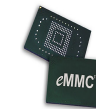
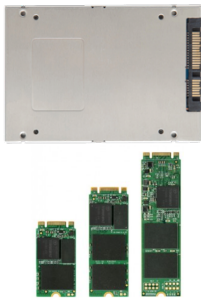
Which PCIe BGASD Architecture is Right for Your Application

Mason Chen
SSD Product Marketing
Silicon Motion, Inc.



Flash Memory Summit

Storage for Consumer Devices



Flash Memory Summit 2017
Santa Clara, CA

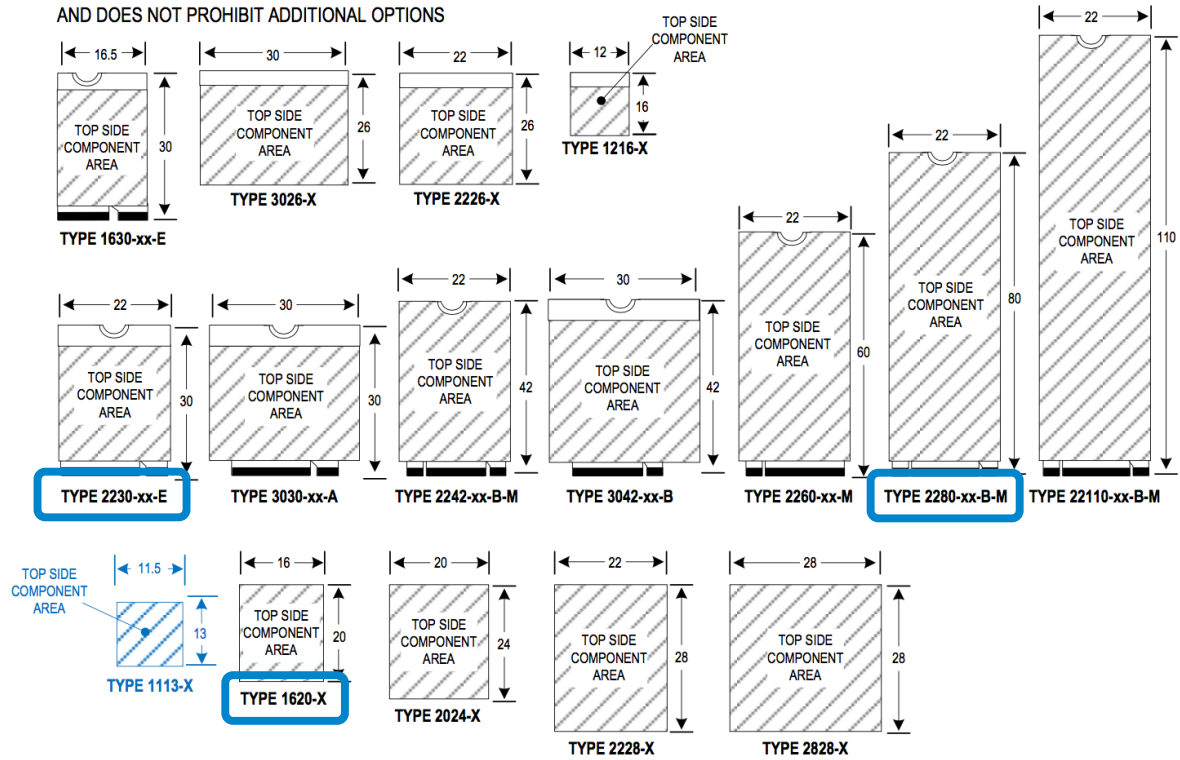


Storage Comparison

	eMMC 5.1	UFS	SATA	PCIe
	HS400	Gear3x2	Gen3	Gen3 x2x4
Form Factor	11.5x13 BGA	11.5x13 BGA	2.5", M.2	M.2
Capacity (GB)	16/32/64/128	16/32/64/128	128/256/512/1TB	128/256/521/1/2TB
Channel	1/2	2	4/8	4/8
DRAM	N	N	Y	Y
Performance (MB/s)	400	800	600	2000/4000

M.2 Family of Form Factors

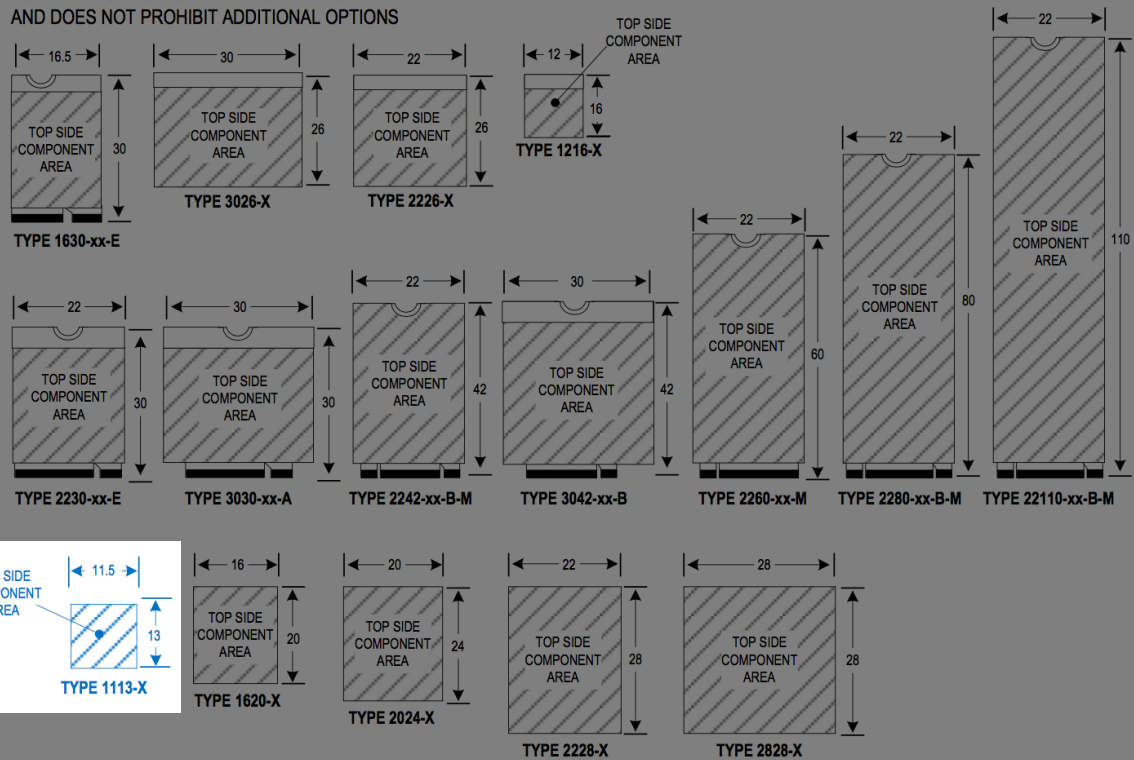
NOTE: KEY OPTION IS A REPRESENTATION ONLY AND DOES NOT PROHIBIT ADDITIONAL OPTIONS





M.2 Family of Form Factors

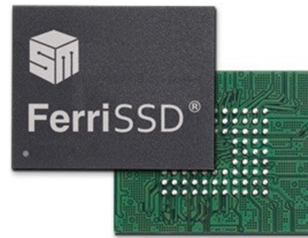
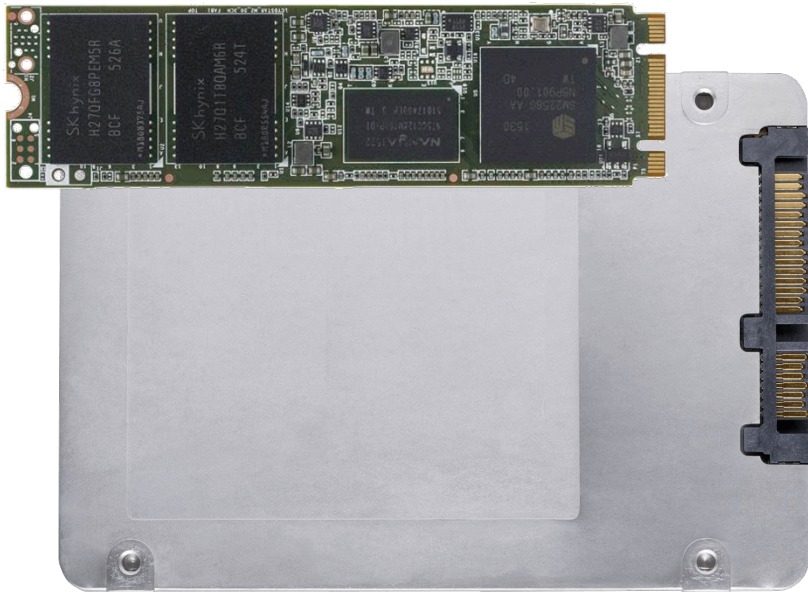
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SSD Form Factors



16mmx20mm



11.5mmx13mm



Key Factors – 11.5x13mm BGASD





Key Factors – 11.5x13mm BGASD





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3D NAND Die Density

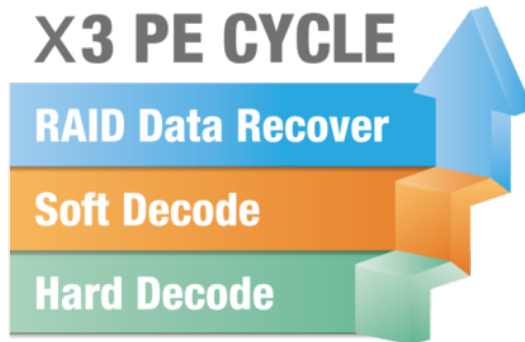
Technology	Generation	Die Density	Die Stack	Capacity
2D TLC	-	16GB	8	128GB
TLC	64-72L	32GB	8	256GB
TLC	64-72L	64GB	8	512GB
TLC	96L	64GB	8	512GB
QLC	-	128GB	8	1TB



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SMI NANDXtend for 3D NAND

NANDXtend™ ECC Technology



3 level Error Correction

>3x PE Cycle

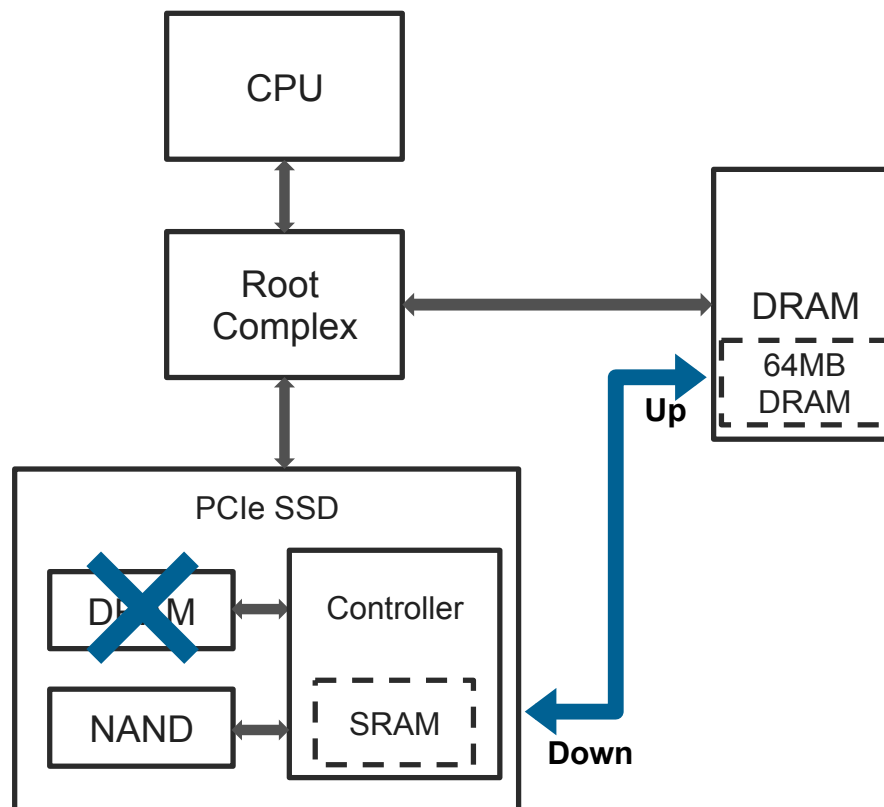
All brands NAND Support

Key Factors – 11.5x13mm BGASSD

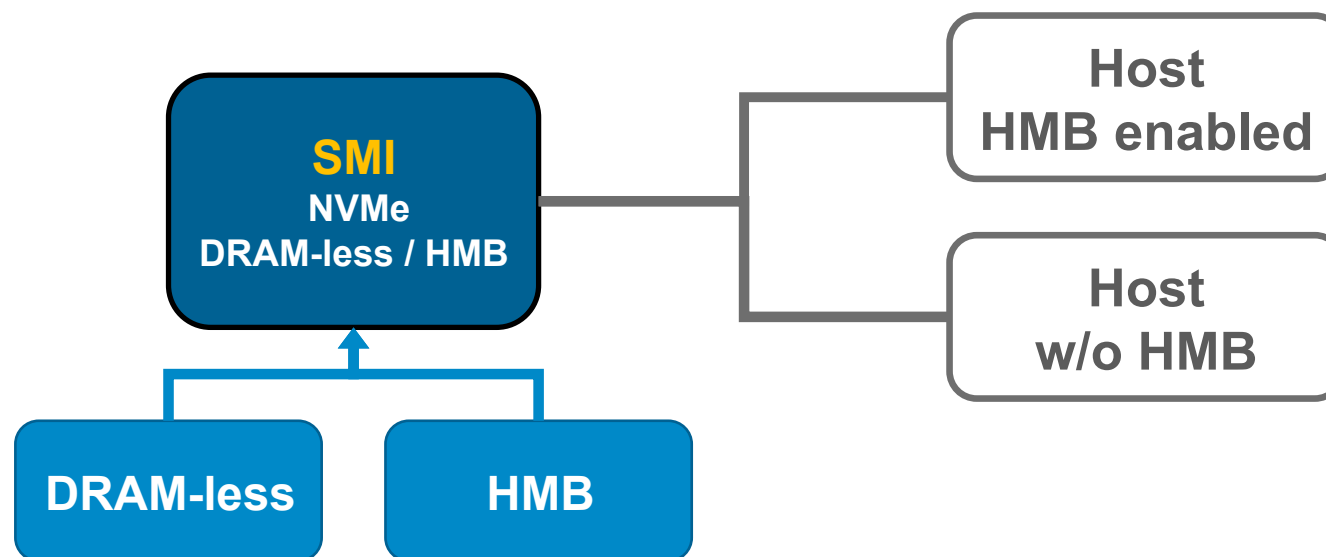


NVMe DRAM-less Performance
Host Memory Buffer (HMB)

Host Memory Buffer (HMB) – NVMe 1.2



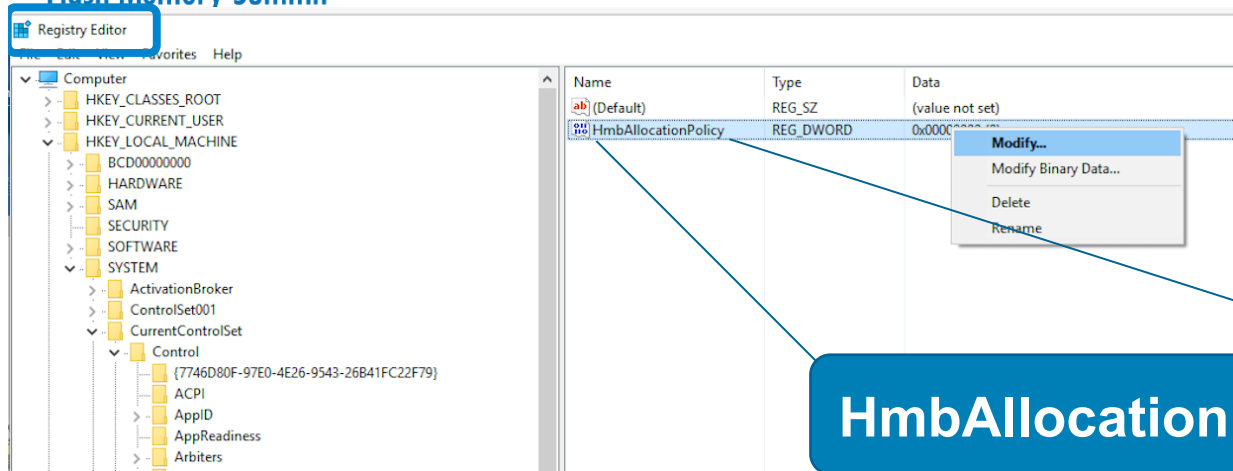
Intelligent HMB Firmware





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Microsoft Inbox Driver Supporting HMB

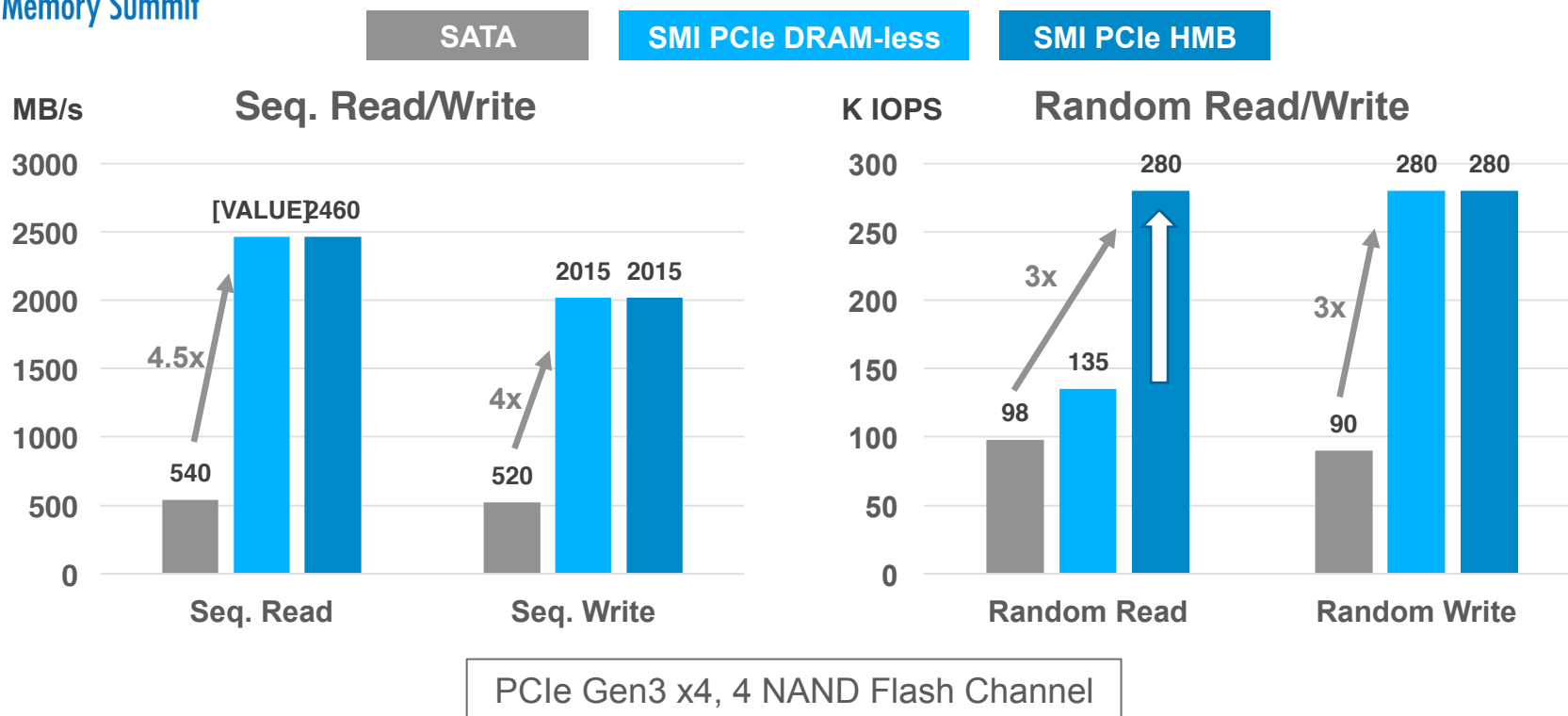


Windows 10 support HMB after version 1607

- Release date: Aug. 2016
- Off by default
- On by adding registry key “HmbAllocationPolicy”



SMI PCIe NVMe DRAM-less Performance



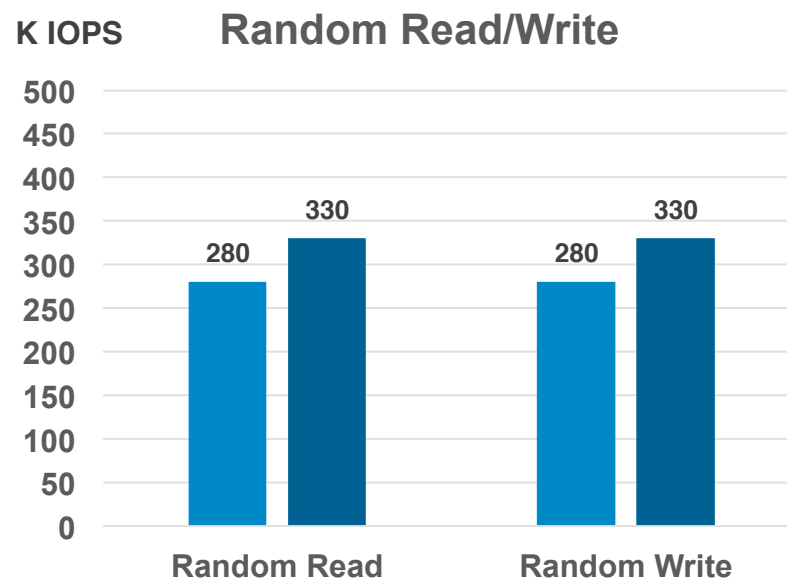
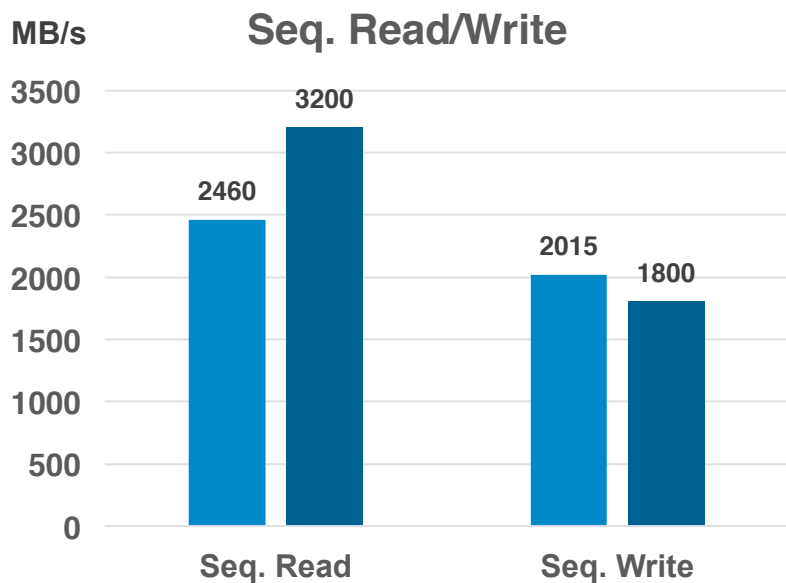


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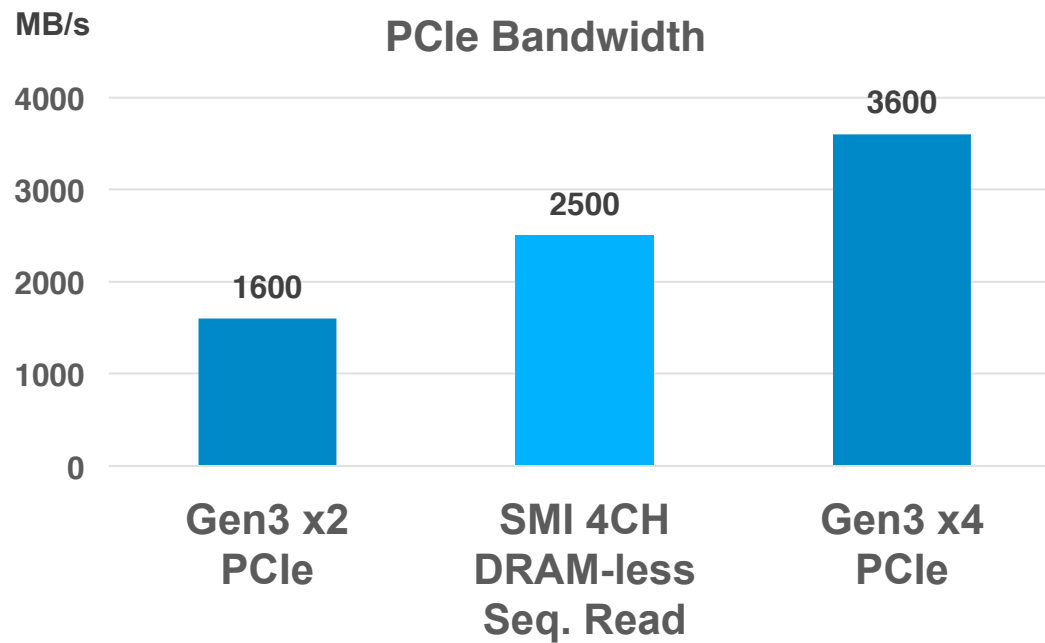
SMI PCIe NVMe DRAM-less Performance

SMI PCIe HMB

8CH PCIe 500GB (DRAM)



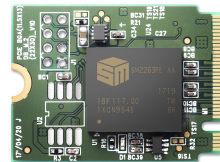
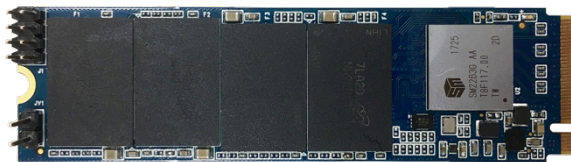
4 NAND Channels vs. PCIe 4 Lanes





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Product Combination



M.2 2280 PCIe Gen3 x4
SR: 2460 MB/s
SW: 2015 MB/s
RR: 280K IOPS
RW: 280K IOPS

11.5x13 mm PCIe Gen3 x2 → x4
SR: 1750 MB/s
SW: 1035 MB/s
RR: 200K IOPS
RW: 220K IOPS

16x20 mm PCIe Gen3 x4
SR: 2460 MB/s
SW: 2015 MB/s
RR: 280K IOPS
RW: 280K IOPS



Key Factors – 11.5x13mm BGASD





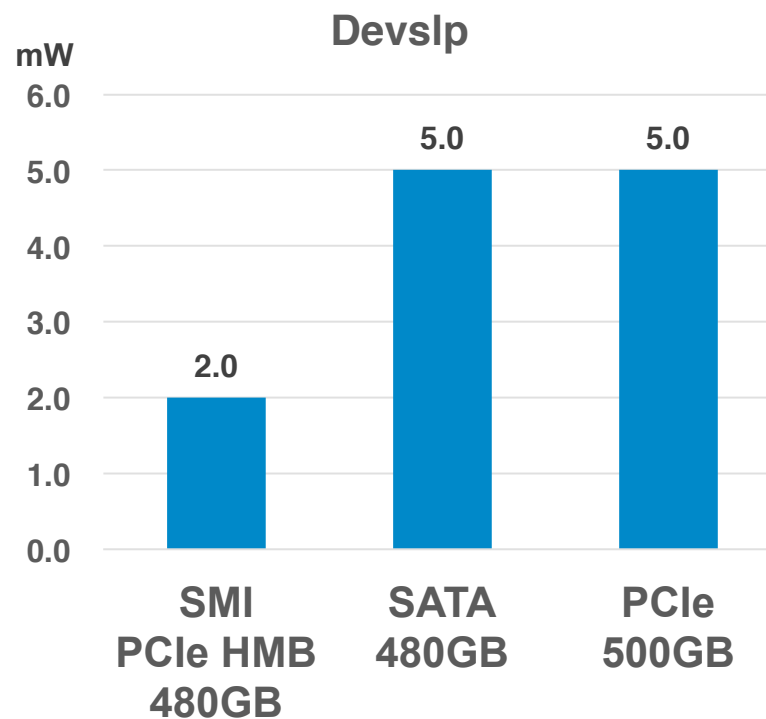
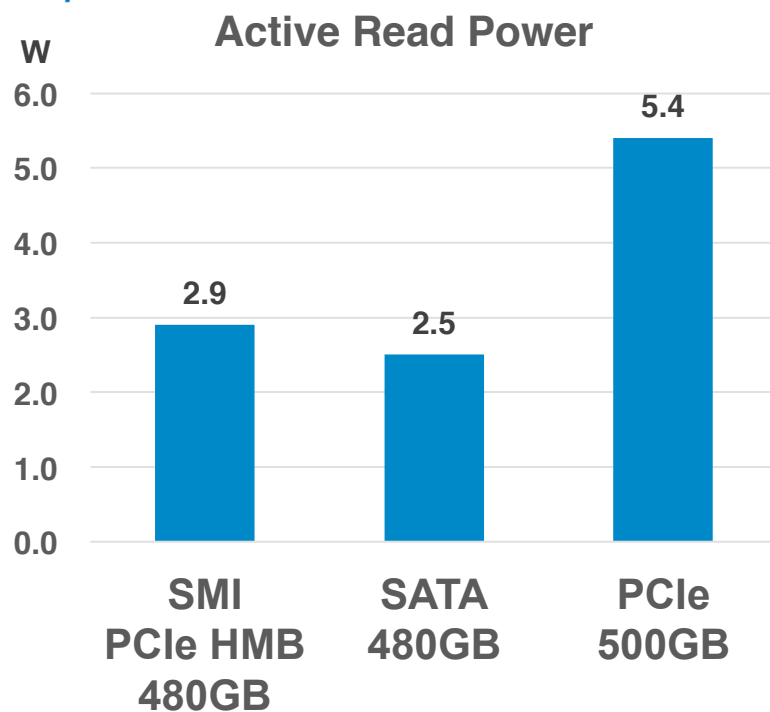
Power Advantages in SMI DRAM-less

- **Remove DRAM power**
- **SMI proprietary power control scheme**
- **HW/FW collaboration**



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Low Power Consumption





Summary

- **Capacity** – NANDXtend for 3D NAND support
- Excellent **DRAM-less Performance**
- **HMB** support in Windows 10 Inbox driver
- **Power consumption = SATA, but in 4X speed**



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Thank you

Visit us at booth #413

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