Phison's Performance from Diversified Revenue Exceeds NAND Controller IC Only Manufacturers

EXECUTIVE SUMMARY

- The NAND flash and NAND controller IC industry revenue are different markets and size of scale
- The SSD controller IC market size for independent NAND controller manufacturers is estimated at $500M USD, approximately 40% market share of total SSD controller market size in 2020
- Development costs for NAND controller ICs are increasing while the ASP of NAND controllers are decreasing
- NAND controller IC business is profitable, but dependence on revenue only from NAND controller IC business will become more difficult to make a profit or even survive
- Phison's unique business model and value to OEM customers enable growth and profitability

Phison's strength in its business model exceeds its peers by diversifying revenue streams from multiple, massive NAND related product markets. While the NAND wafer industry is estimated to be $46B USD in revenue in 2019[1], and this is a vast market opportunity for companies participating in the NAND storage industry, Phison's total addressable market opportunities for revenue spans from NAND controller IC manufacturing into value added NAND storage solutions. This article provides insight into Phison's total addressable market opportunities, and why Phison is able to maintain continuous growth and profitability.

NAND Controllers and NAND Flash Addressable Markets are Different

USB PenDrives, SD cards, eMMC, UFS, and SSDs are all categorized as NAND storage devices. These storage devices have two main components: a NAND controller and NAND flash. A common misconception is that both the NAND controller and the NAND flash market sizes have revenue in the tens of billions of $USD per year. This is not true.

When industry analysts write about the NAND industry growing to be tens of billions of $USD per year in revenue, this is referring to the NAND Flash market instead of NAND controllers. The fundamental difference is regardless of the NAND storage device and capacity (GB), they all need only one single NAND controller inside. In other words, the "tens of billions of $USD per year" statement is true in terms of NAND Flash, but not NAND controllers (Exhibit 1). For example, SSDs with capacities of 256GB to 8TB or higher, all require only one single NAND controller with one or more packages of NAND flash for each SSD device.

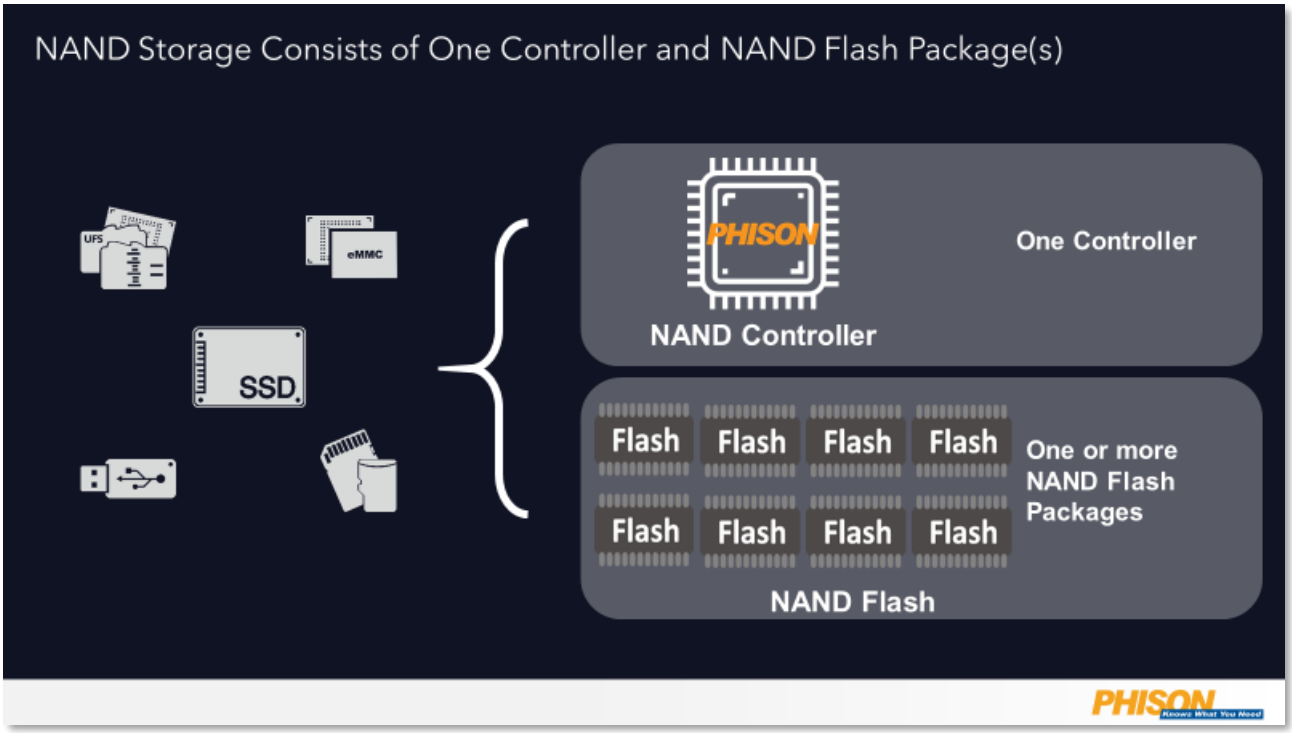

Exhibit 1: Typical internal construction of a NAND storage device

NAND Controller IC Market Size Analysis

Analyzing the SSD controller IC market serves to better understand all NAND flash storage device markets. According to TRENDFORCE, the 2020 world-wide SSD shipments are forested to be 310 million units[2]. It is estimated that the NAND wafer manufacturers who also make their own SSDs will self-develop roughly 60% of their own IC controllers, which equals 186 million units. The remaining 124 million units are the shared available market for the independent NAND controller IC design houses (124 million units is 40% market share of SSD controller out of total 310 million SSD controller ICs). Estimating an average price for a typical SSD controller IC at $4 USD[3], the market size of SSD controller for independent NAND controller IC design houses is estimated at $500M USD (Exhibit 2). From the previous calculation, it is clear that for companies focusing only on NAND controller IC design business, the market size might not be big enough to make a profit or even survive due to the massive R&D investments required.

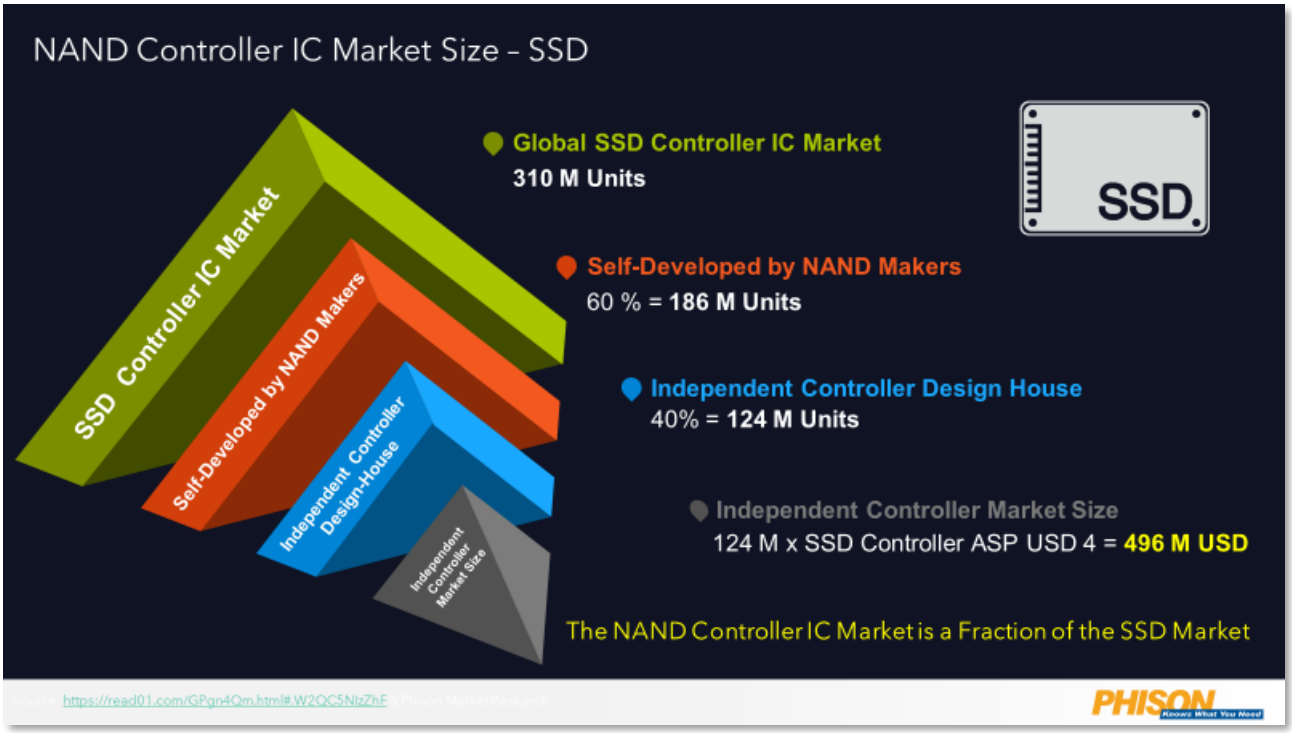

Exhibit 2: SSD controller IC market size

NAND Controller Development Costs

Developing a NAND controller IC is an expensive and time-consuming process. From hardware design, firmware design, mask development, CPU licensing, specialized EDA tools, to validation equipment, etc. (Exhibit 3), all these processes require massive engineering resources to develop a fully functional and validated NAND controller, with a typical development time of 2 years[4].

Exhibit 3: A 28nm SSD controller IC Development Cost

Using a 28nm SSD controller IC development as an example, it will roughly cost $22 million USD before the controller IC begins to sell on the market (Exhibit 3)[4]. When comparing the $22 million USD development cost for one SSD controller, and compare this with the total SSD controller IC market size $500 million USD (40% market share for independent NAND controller IC design houses), it is clear that a pure NAND controller IC business design house will have increasing difficulty making a profit or even surviving in the long term, not to mention while there is pressure to reduce the controller ASP (Exhibit 4).

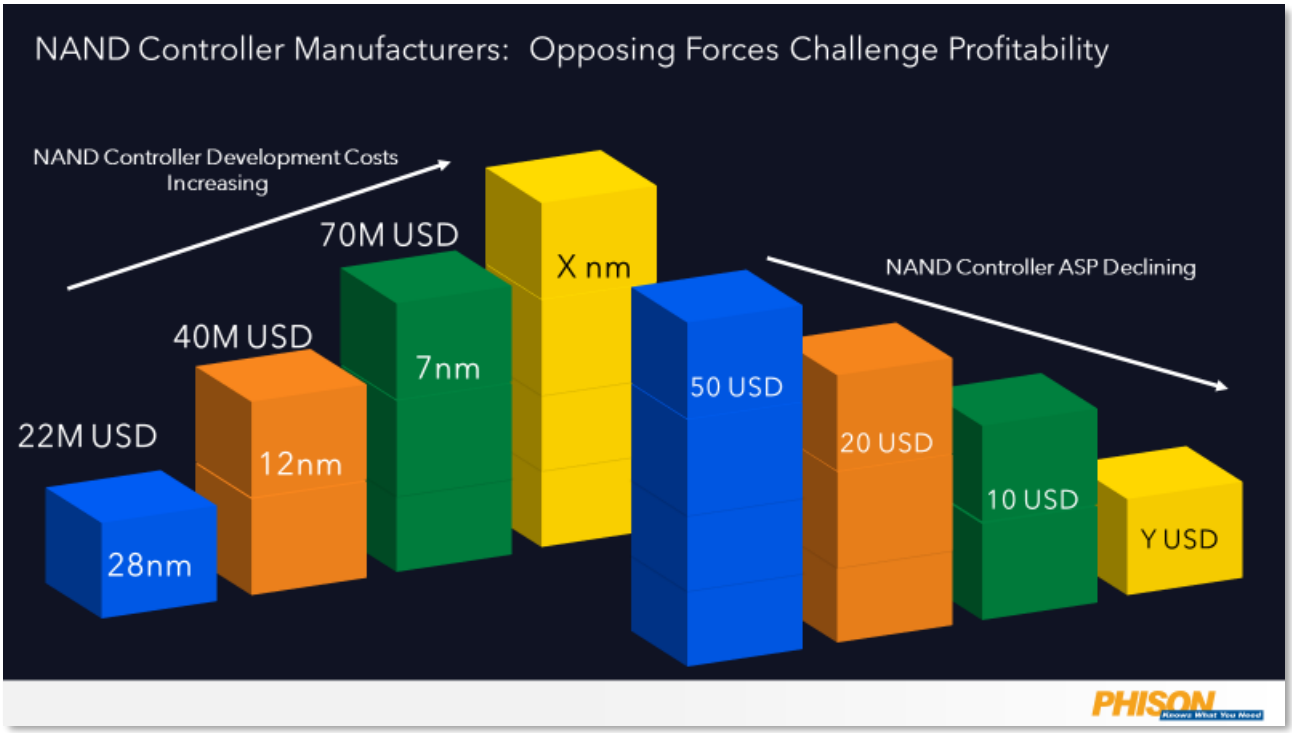

Exhibit 4: Revenue from NAND controller business only challenges profitability[4]

Challenges for Pure NAND Controller Business

Developing a mature and stable NAND controller requires 3 key elements: 1) long development cycles, 2) high capital investment, and 3) long investment of skilled engineering R&D teams (Exhibit 5). However, for a pure NAND controller business IC design house, the challenges are: 1) NAND controller ASPs are driven lower by competitive forces, 2) R&D engineers cost increases, and 3) maintenance costs become higher (Exhibit 6).

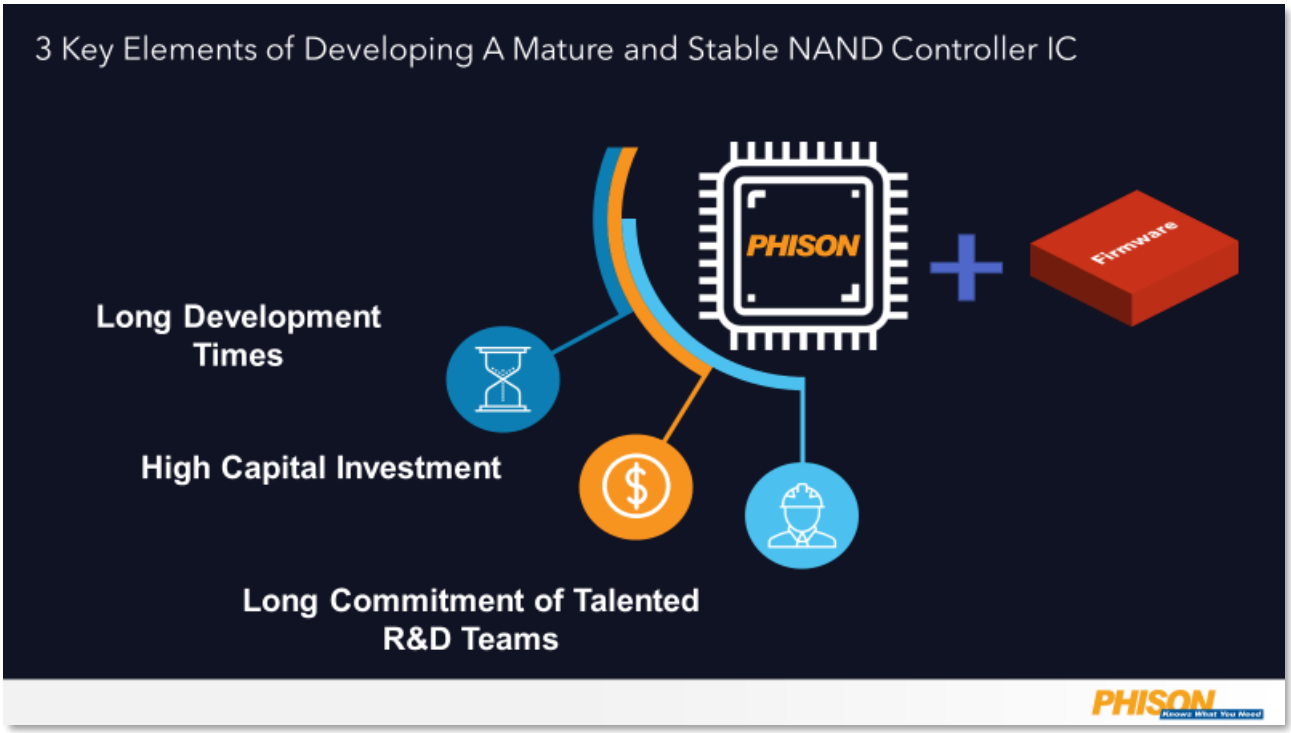

Exhibit 5: 3 Key Elements for Developing a Mature and Stable NAND Controller IC

Exhibit 6: Challenges for Pure NAND Controller IC Business Companies

Questions are raised for a pure NAND controller IC business design house such as 1) will it have enough operational income and resources to fund long-term development? 2) will it have a high enough operational expense budget for R&D development? and 3) will it be able to attract experienced engineers? (Exhibit 7). There are uncertainties that must be addressed while evaluating the financial ability of a pure NAND controller IC design house (e.g. NASDAQ: SxMx).

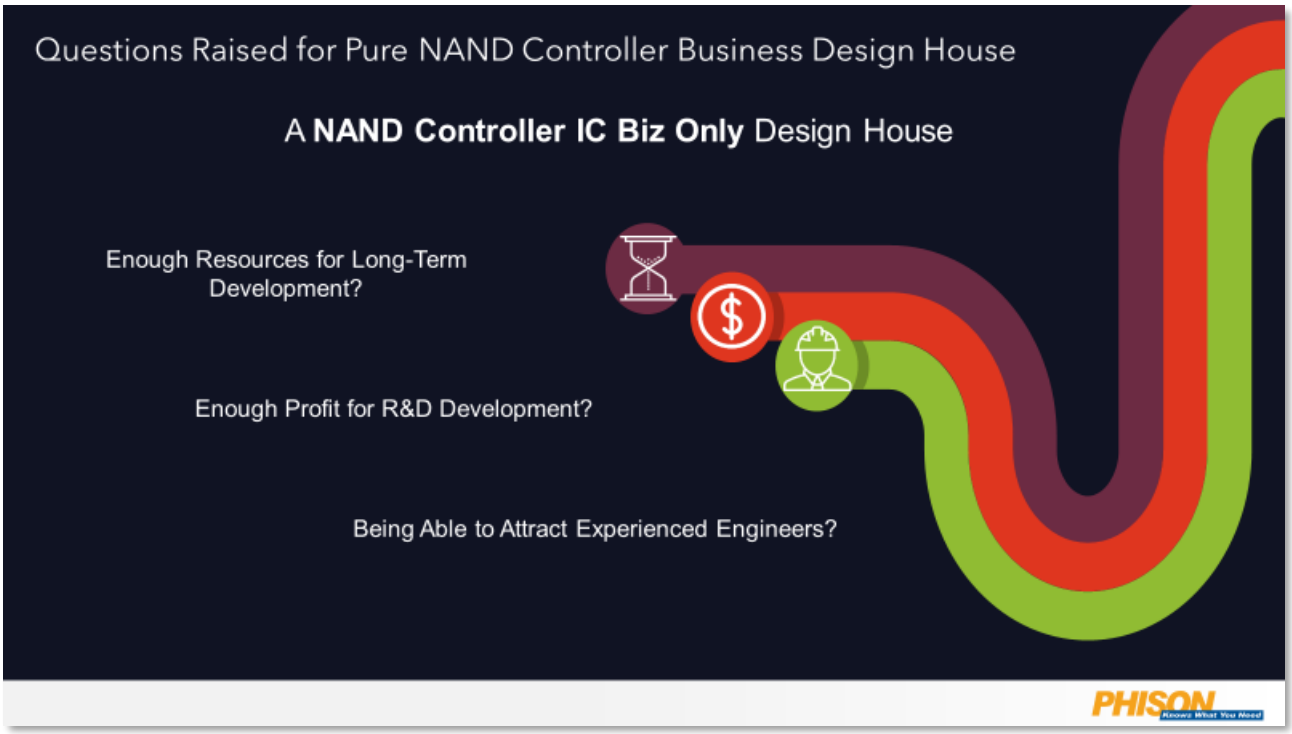

Exhibit 7: Pure NAND controller only businesses have at least 3 main challenges

As detailed in another article "Phison's Resilient Business Model Generates Results through Challenging World Events", pure NAND controller IC companies have less capability to insulate their profits against the cyclicality of the NAND industry (Exhibit 8). All these increase the worries for future development of pure NAND controller business companies.

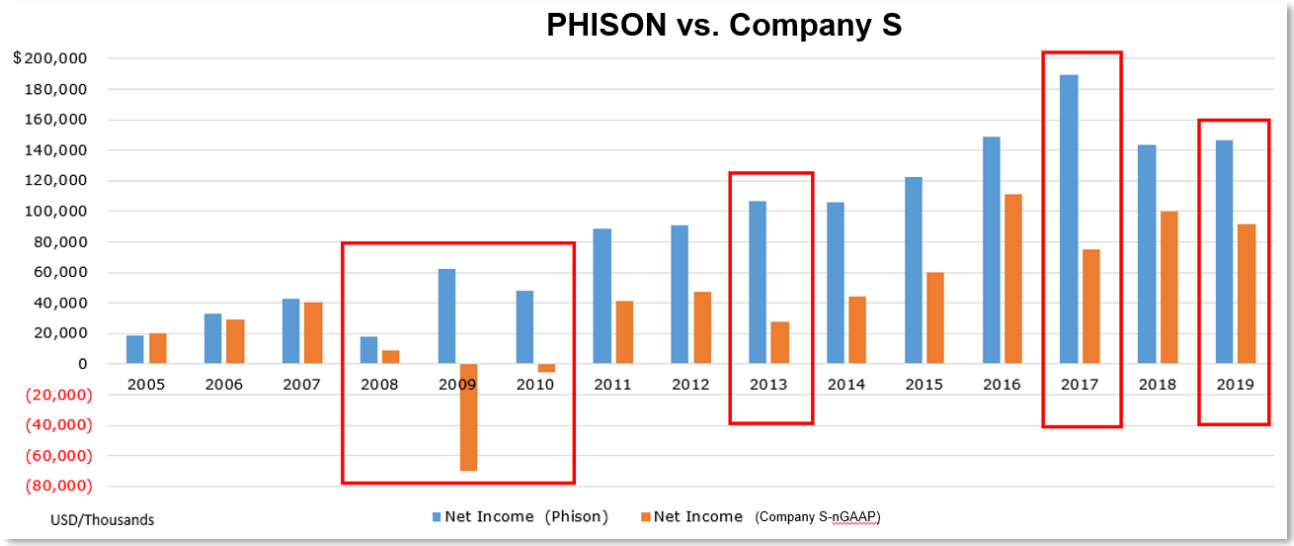

Exhibit 8: Pure NAND Controller Design Companies have Less Capability Against Dynamic NAND Industry

PHISON NOT ONLY SURVIVIES, BUT THRIVES

Phison has a successful NAND controller business, but this is not Phison's only source of revenue. The key is Phison's unique business model (Exhibit 9): consisting both NAND controller IC design and NAND storage integration capabilities, giving Phison the ability to handle the dynamic NAND industry and deliver more value to global customers and partners.

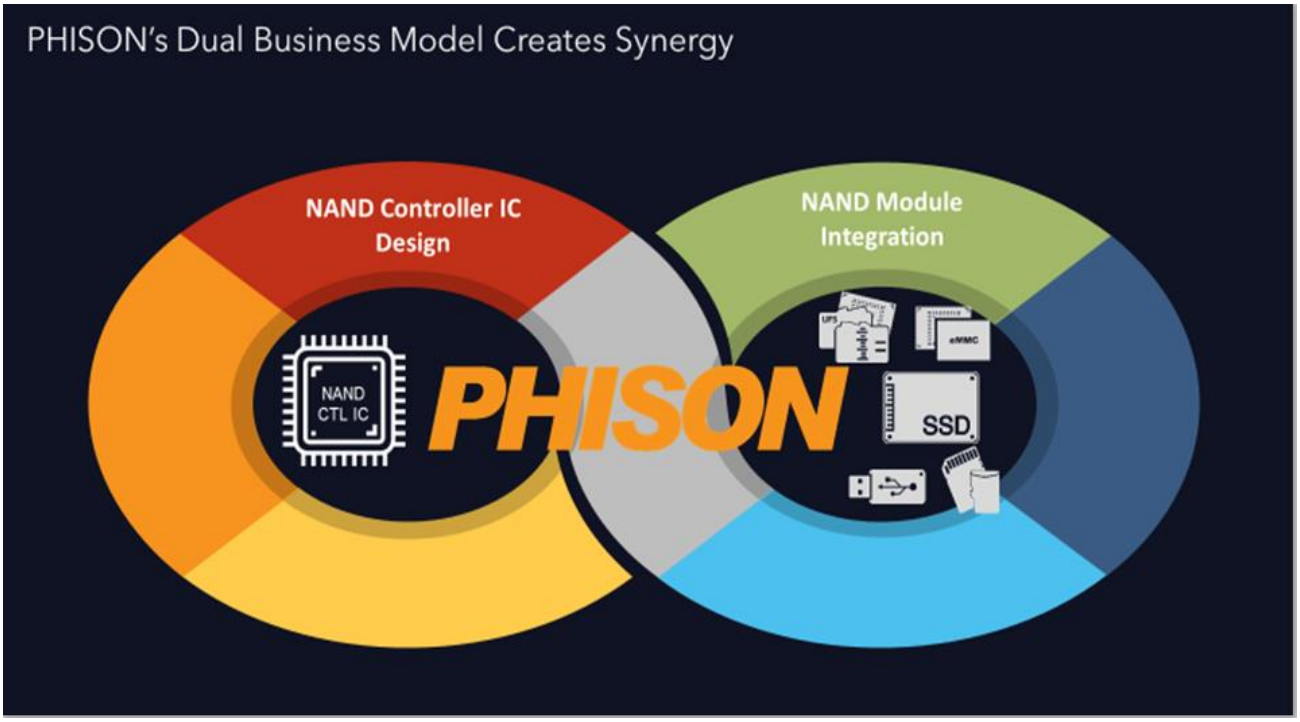

Exhibit 9: Phison's unique business model makes it more flexible than peers

Phison is not only an independent NAND controller IC design house, but also serves a critical role for its NAND wafer fab customers. When NAND wafer fab manufacturers, who also make their own branded storage devices, have a hole in their product roadmaps, Phison bridges the gap by providing storage solutions to connect the NAND wafer manufacturer to profitable NAND end market applications (Exhibit 10). Phison offers these NAND wafer manufacturers a full range of NAND storage solutions for Enterprise, Embedded, to Consumer markets (Exhibit 11).

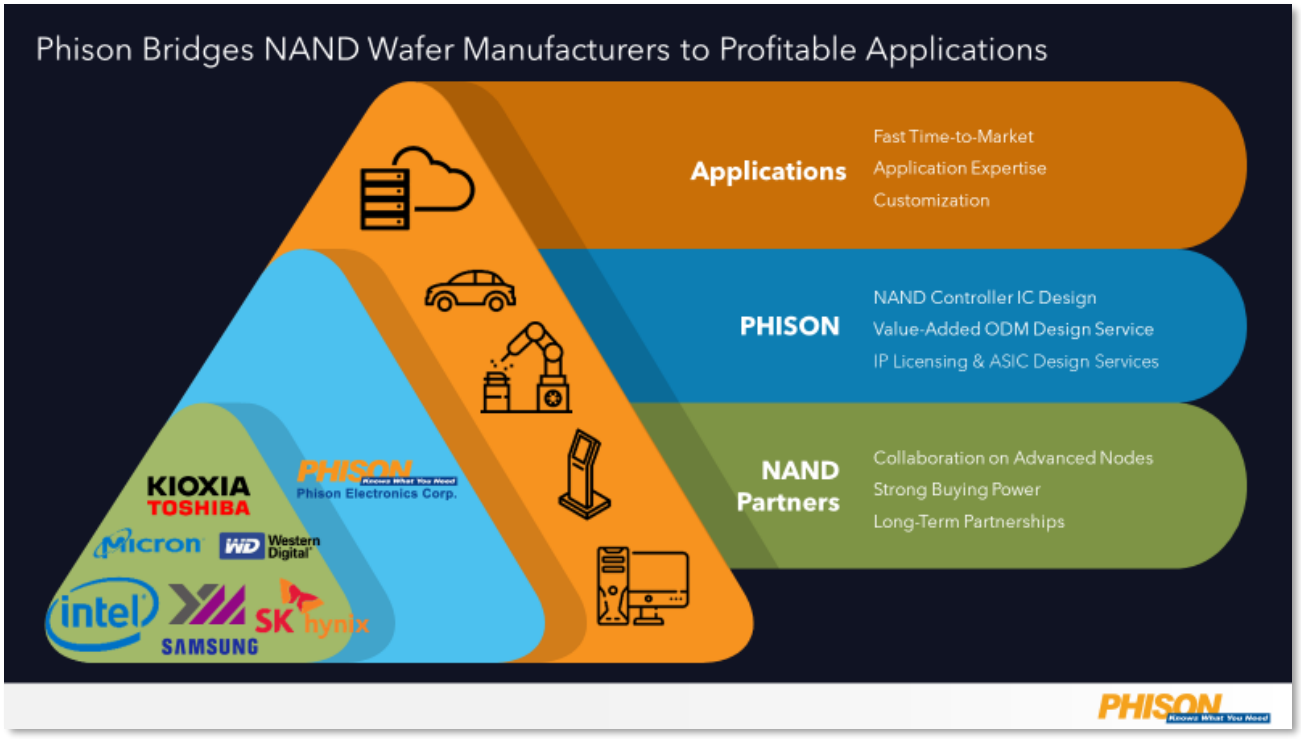

Exhibit 10: Phison not only designs controllers but bridges NAND to applications

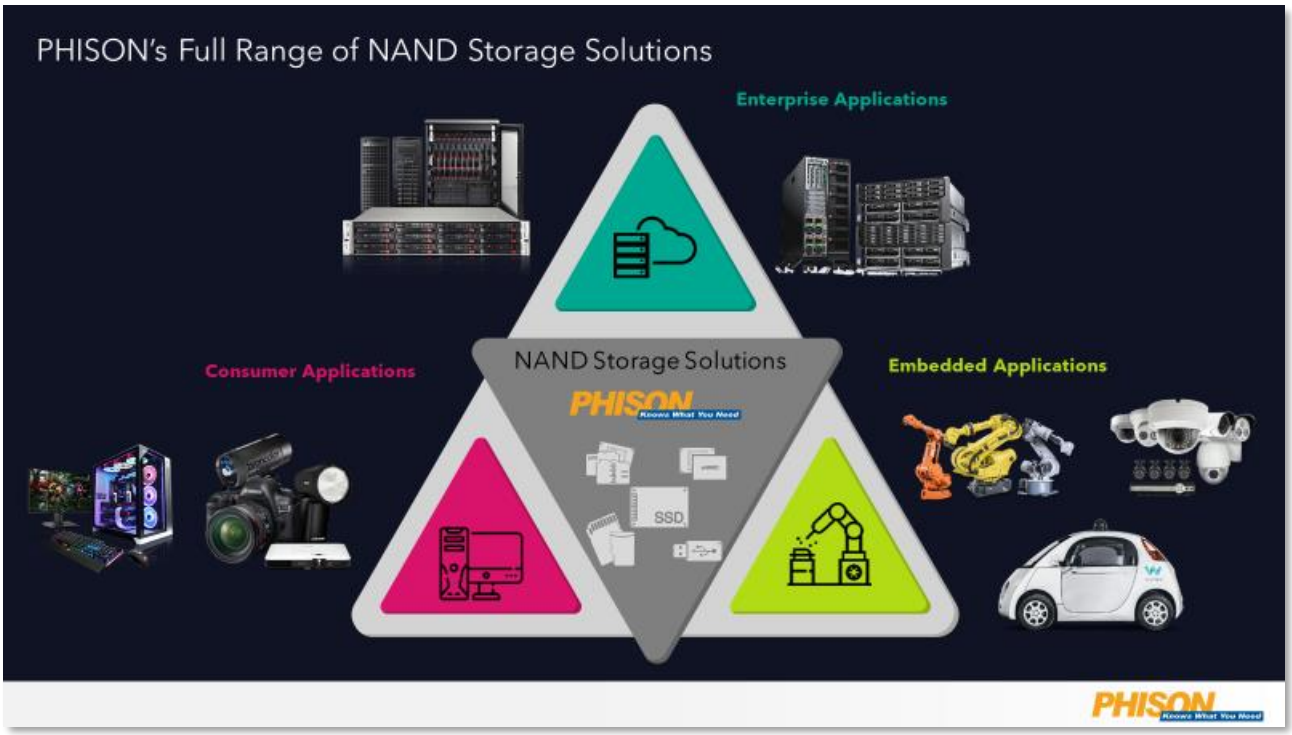

Exhibit 11: Phison offers storage solutions for Consumer, Enterprise, and Embedded applications

Due to Phison's unique business model and engineering capability, Phison delivers more value to global customers and partners than peers (Exhibit 12), enabling Phison to attract various types of OEM customers who benefit from Phison's flexible business models. Unlike pure NAND controller business design houses, Phison can simplify customers' development requirements by providing turnkey NAND storage solutions. For customers who want to invest their own engineering resources in product development, Phison offers controllers with industry leading features that may be paired with Phison's highly acclaimed and reliable firmware.

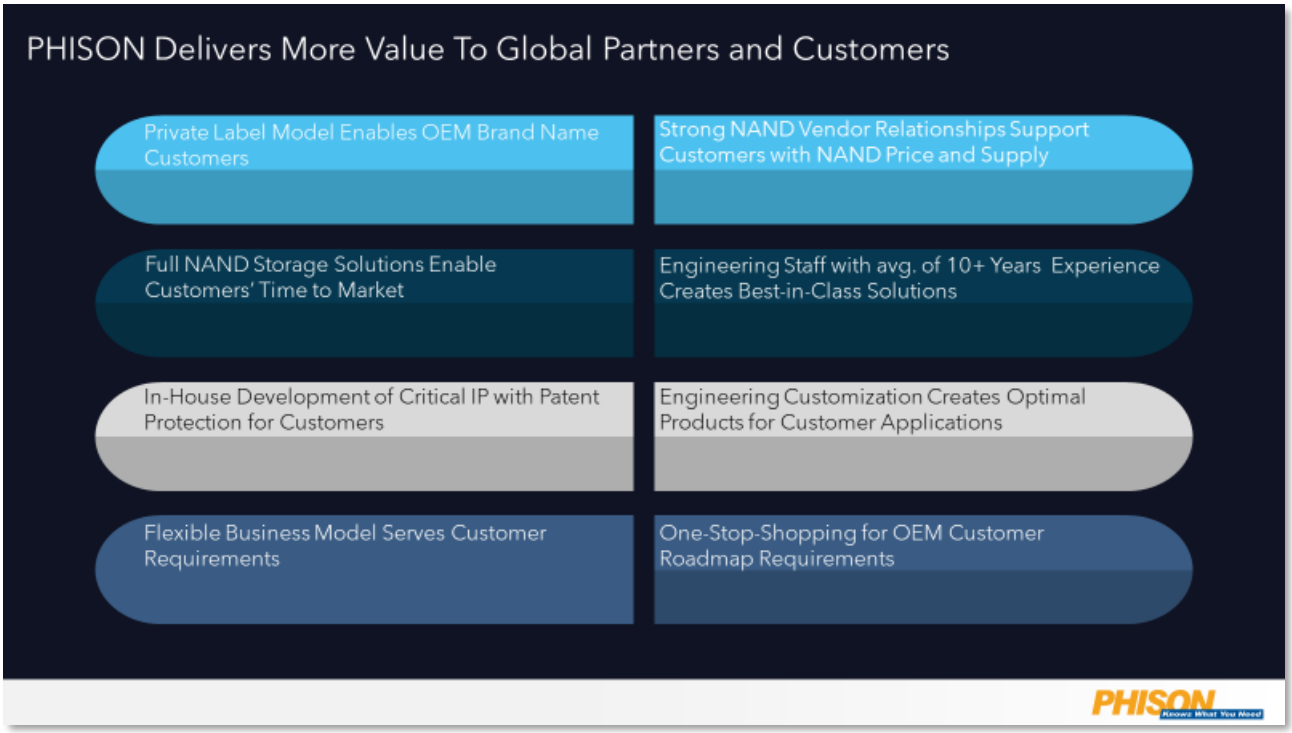

Exhibit 12: Phison delivers critical value to its OEM customers and partners

Conclusion

NAND controller business is profitable, but companies that only rely on revenue from NAND controller IC business have a greater difficulty to survive due to increased development costs and the decreasing pricing pressure on the ASP for NAND controller IC. Combine these factors with a limited addressable market size and it is clear the overall financial challenges NAND controller IC business have in profitability, growth, and sustainability. However, Phison's unique business model and value to its customers enables long term revenue growth and profitability.

PHISON FACTS

- Over 20 years of experience in NAND controller IC design and module integration
- Over 2,000 employees globally, with more than 75% in engineering
- Over 1900 memory-related patents globally
- 3 major priorities: enterprise, embedded, and consumer markets
- 600M average annual controller shipments
- $1.45B USD sales revenue in 2019 (no debt)
- Confidence that our unique business model can produce consistently strong cashflows and profits over the long-term amidst NAND memory market cycles
- Maintain long-term partnerships with our global NAND flash suppliers and with our valued module customers

FOOTNOTES

1) TRENDFORCE, February 2020
2) TRENDFORCE, February 2020
3) Phison Market Research, April 2020
4) Phison Market Research, April 2020

ABOUT PHISON

Phison Electronics Corp. (TPEX:8299) is a global leader in NAND Flash controller IC and storage solutions. We provide a variety of services from controller design, system integration, IP licensing to total turnkey solutions, covering applications across SSD (PCIe/SATA/PATA), eMMC, UFS, SD and USB interfaces, reaching out to consumer, industrial and enterprise markets. As an active member of industry associations, Phison is on the Board of Directors for SDA, ONFI, UFSA and a contributor for JEDEC, PCI-SIG, MIPI, NVMe and IEEE-SA.

Our Website: https://www.phison.com/en/company/about-us

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