Phison's Diversified Engineering Capabilities Delivers Value to Embedded NAND Customers

EXECUTIVE SUMMARY

- Many storage device manufacturers who do not partner with Phison only offer their customers a brand and after sales service for consumer market applications
- For embedded markets, customization of the storage device to the application is critical
- Due to its unique business model and strength in engineering, Phison creates more value for embedded customers, and this contributes to increased earnings per share

Embedded NAND memory is being used in more and more applications today like automotive navigation and entertainment systems, factory automation, video surveillance, medical, and many more. There are a limited number of companies with the capability to serve the embedded NAND memory markets, and Phison's unique business model and strength in vertical engineering positions Phison as superior in this class of suppliers.

Values That NAND Storage Module Manufactures Provide

The advantage of manufacturers who only make NAND flash storage modules lies in the establishment of a name brand and after-sales service. Customers believe in the long-term reputation and quality established by the name brand NAND module manufacturers, so they purchase NAND storage products from that brand. For example, in the consumer market, Brand A sells NAND storage products such as SSD or SD Cards through electronic stores or physical stores, and customers understand the characteristics of the product through the explanation of the customer service staff, and then purchase the product. If there are any problems after the sale, consumers can seek assistance or even replace the goods through the original sales channel.

For embedded application markets, on the other hand, the sales model is to an intermediate system integrator, not the end consumer. Brand name NAND module manufactures sell embedded NAND storage modules to system integrators through agents or distributors worldwide. Through the design-in process, system integrators feedback the test results to local agents or distributors, and brand name NAND module manufacturers also achieve timely technical support through local partners.

Customization Limits Apply to Most Embedded NAND Memory Suppliers, but not to Phison

Embedded NAND memory suppliers sell into point of sale (POS) machines, industrial computers, digital signage, in-vehicle systems, factory automation, or even aerospace technology, and the NAND storage devices, also called NAND modules, required for these applications are not standard products. The functions and specifications of the NAND storage products required for each different embedded application involves special tuning, and often necessitate customized services to meet the environmental and operational conditions of the different embedded applications. It is these specially tuned

functions and customization services that are not within the capability of most embedded NAND memory module manufacturers.

As shown in Exhibit 1, embedded system applications cover a wide range, and each embedded application system has different requirements for storage devices. For example, in-vehicle systems focus on product certification, while factory automation systems emphasis on operation 24 hours a day, and monitoring systems focus on data protection during sudden-power-loss events.

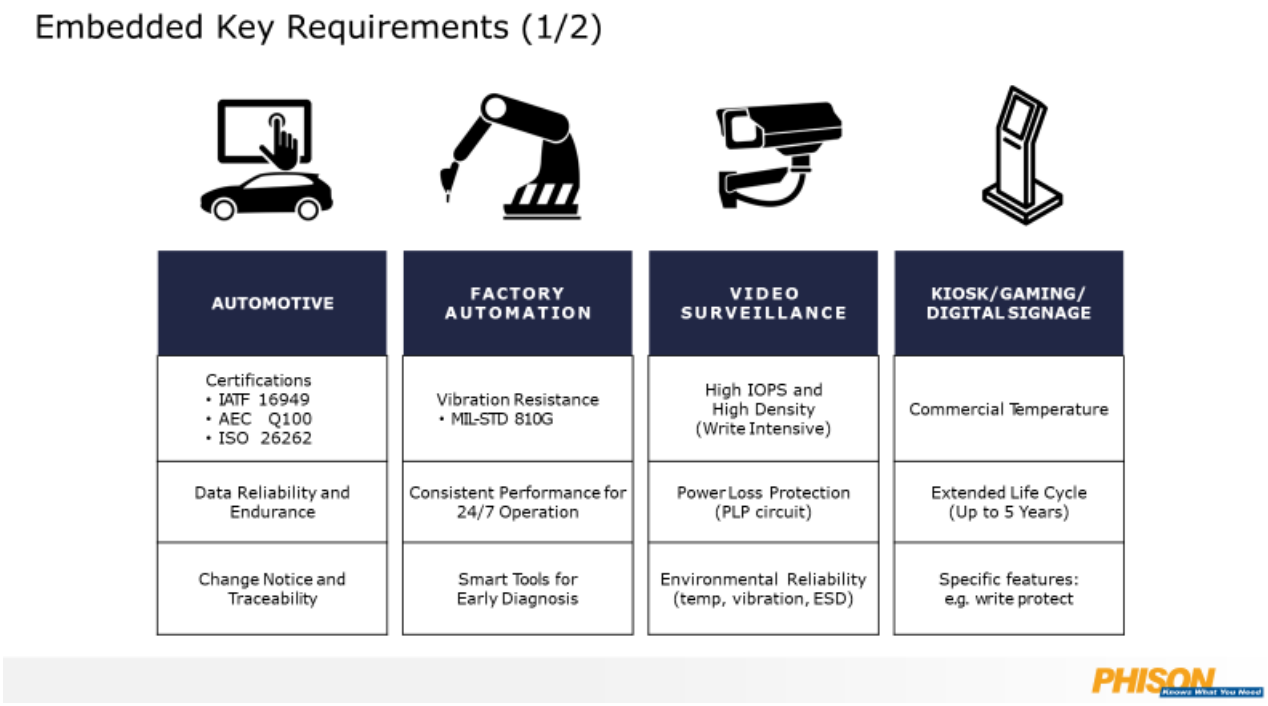

Exhibit 1: Key Requirements for Embedded Applications – Part 1

Examples of differing requirements are shown in Exhibit 2, where medical equipment device manufacturers require a long-term stable supply of products, mass transportation systems require anti-seismic storage devices, aviation flight equipment requires data security protection, and data centers require high-performance storage devices. The storage devices in these systems require customized and optimized NAND storage products. Embedded NAND storage suppliers that only offer standard products are highly limited in the value it can offer customers. By having its own controller IP development, firmware, and manufacturing all within its customization control capability, Phison offers the most suitable storage solution to each of its customers.

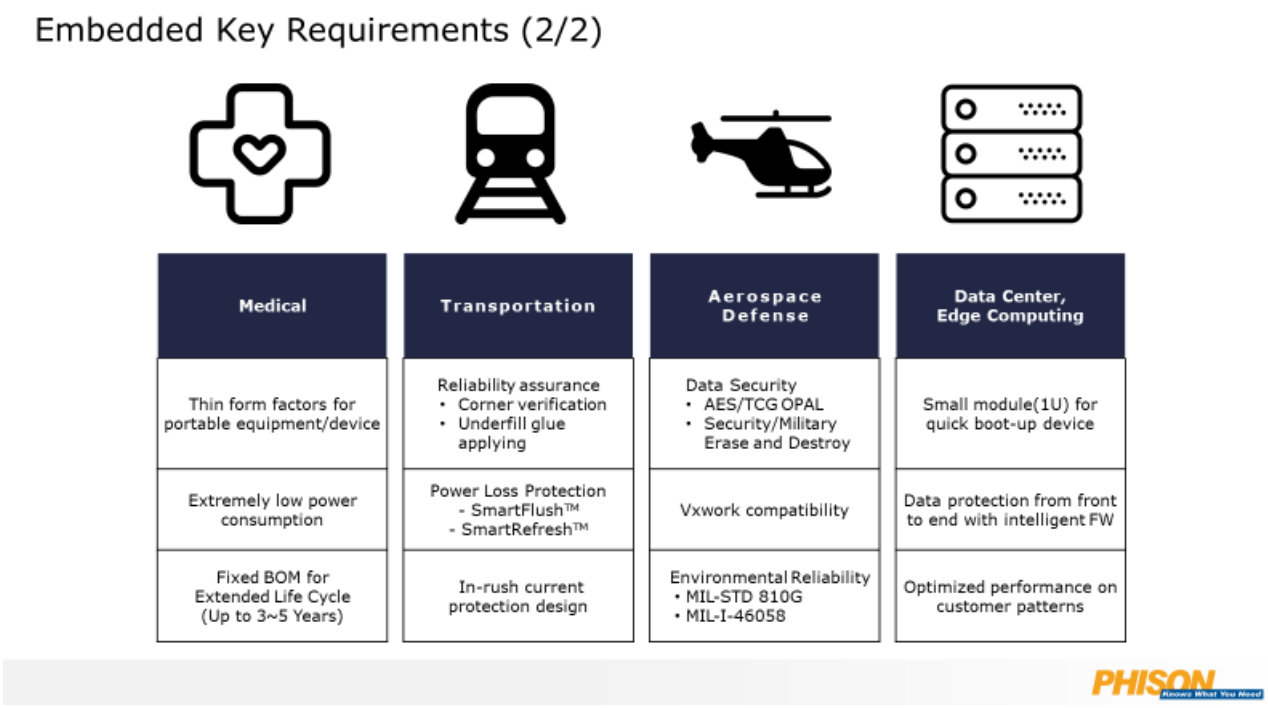

Exhibit 2: Key Requirement for Embedded Applications – Part 2

Values Phison Provides for Embedded NAND Customers

Phison's embedded NAND storage solutions draw strength from its unique business model. Because Phison has owned the research and development of its NAND controller IC designs and integration of NAND storage modules for more than 20 years, Phison provides more value than embedded NAND storage module manufacturers that source a controller and or firmware from yet another supplier. Exhibit 3 below illustrates how Phison's highly integrated R&D model, coupled with its own engineering expertise, customizes, and validates each link to be optimal to each customer's application.

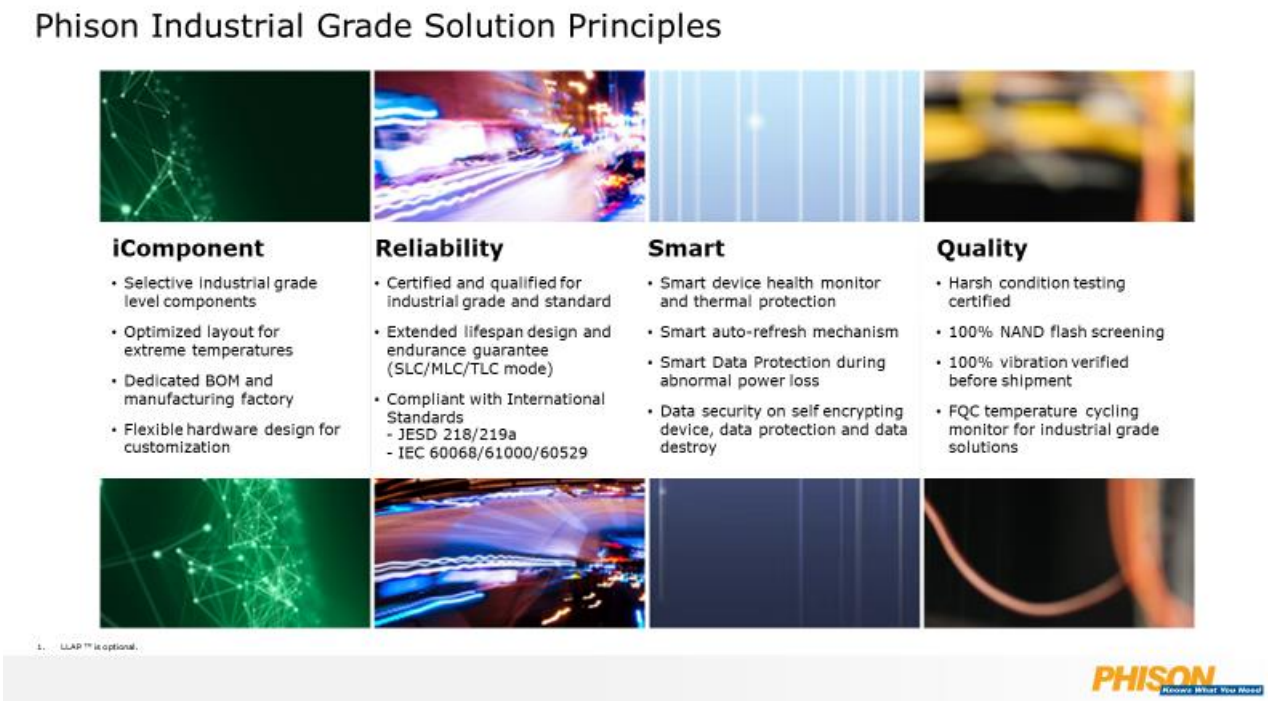

Exhibit 3: Phison's Industrial Grade Solution Principles

Because Phison provides a complete one-stop service, including the integration of NAND controller IC design and NAND storage solutions, Phison is capable of quick problem resolution, offering alternative solutions, and performing product maintenance if there are any issues. This is especially important, because embedded system customers often need timely and professional services, and Phison's long-term experience provide more value to these customers.

Problems that Embedded NAND Customers Might Encounter

For embedded system customers, the best NAND storage solution is no problems after installation and provides long-term stable operation. This may not always be the case because embedded application operating environments are commonly more severe than consumer applications. In addition to the tougher operating temperature environments, embedded NAND storage systems may be installed in the wilderness or other hard to service locations. In these installations if there is a system failure, then huge losses can occur.

When failures happen, it is often necessary to seek assistance from all the sources of engineering intellectual property in the NAND storage device. This is not an issue for Phison because both the controller and firmware are made within the same company. However, for an embedded NAND storage supplier who sources controllers or firmware from outside vendors, it may be a disaster. This not only causes a delay in time in terms of problem solving, but also causes an issue of unclear ownership of the problem: is the problem with the NAND Controller IC manufacturer, the firmware developer, or in the embedded NAND storage module manufacturers processes? Exhibit 4 below shows an example of how Phison provides one-stop problem identification and resolution for customers experiencing technical issues.

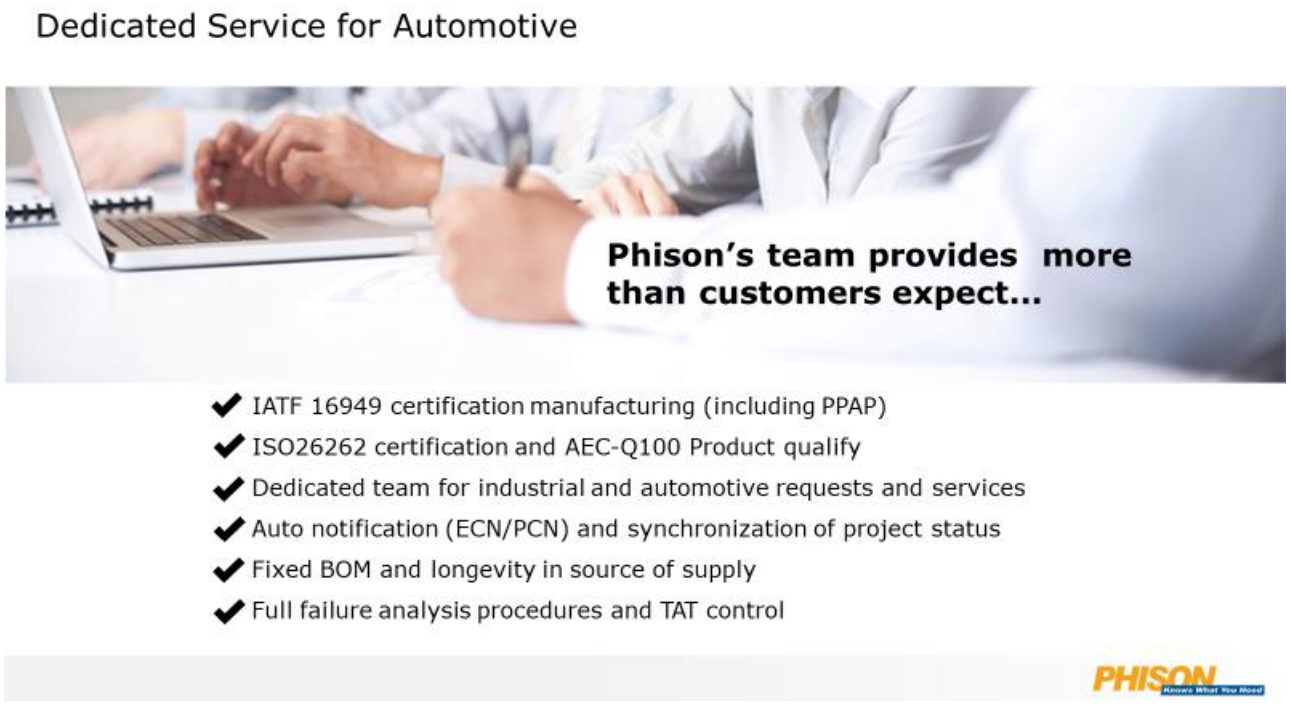

Exhibit 4: Phison's Dedicated Service for Embedded Customers

Embedded Customers Prefer to Cooperate with Phison

The values Phison offers to its embedded NAND storage customers includes one-stop service in product customization, after sales support, stable long-term NAND storage solution supply, customized services, flexible cooperation model, and faster maintenance. In addition, because Phison's product line includes enterprise applications, industrial applications, and consumer applications, Phison provides more NAND storage application experience to its customers.

Embedded NAND storage customers have shown their preference by awarding Phison more business. Exhibit 5 below shows the earnings per share (EPS) of Phison vs. another company "I" listed on the Taipei stock exchange. Company "I" is an embedded NAND storage manufacturer who does not make its own controllers. The chart clearly shows that Phison created higher earnings for its shareholders.

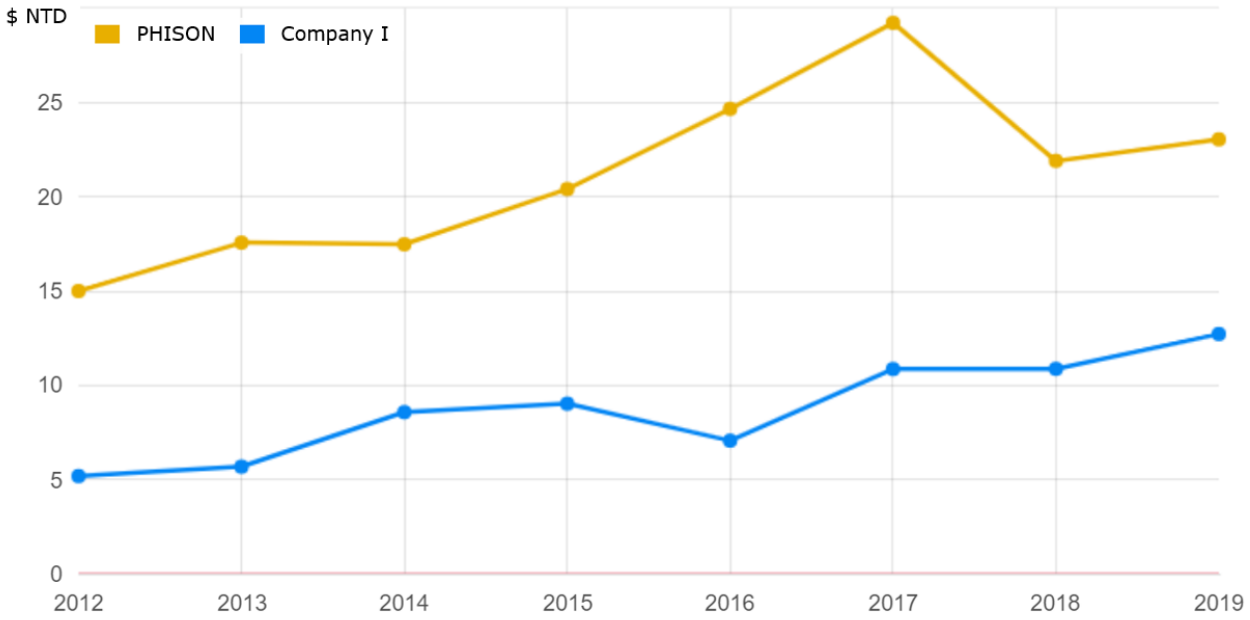

Exhibit 5: EPS Comparison Between Phison and Company I

Customers Who Directly Partner with Phison Also Gain Benefits of Phison's Engineering Capabilities

Phison partners with many manufacturers in the development of NAND storage devices. Phison's direct customers have the benefit of Phison's strength in vertical engineering where the key controller IP, the firmware, and the entire NAND storage device is manufactured to Phison's specifications and testing. Phison's vertical engineering produces a more reliable product with leading features in a competitive time to market. Phison's customers offer a name brand and after sales service and support to their customers which make for an ideal supply chain.

On the contrary, NAND module manufacturers who are not customers of Phison commonly source their storage components and intellectual property from multiple other vendors. A controller may be purchased from one company but inside that controller, the intellectual property may be purchased from several other companies. The supply chain becomes complicated and so does the problem resolution chain if a failure happens in the device.

Phison's capability to customize the controller, firmware, PCBA design, and even ODM turnkey solutions of the device are critical to optimize its performance. Additional features such as enhanced security, waterproofing, dustproofing, robustness to withstand shock and vibration, sustained reads and writes, power-loss protection, etc., under tough environmental conditions are often critical to embedded applications. Only Phison has the capability to address customer needs for customization inside the controller, firmware, and the device itself.

Conclusion

There are many opportunities for NAND storage devices in the growing embedded market applications. These opportunities often come with high gross profit margins and a stable source of revenue. The requirements of the embedded market applications are complex, including a large number of customization needs, long-term stable supply, immediate professional services, and long design-in times. For embedded NAND storage module manufacturers, that do not manufacture their own controller and firmware, their customization and support services are limited. Phison has strength in its complete control over NAND controller IC design and NAND storage solution integration. Embedded customers prefer to partner with Phison, and this enables Phison to create higher and stable profits for its shareholders.

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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 valuesd module customers

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.

To know more about Phison, please visit Phison Website or Phison Q&A for details.

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