PART I

Item 1. *Business*

We provide comprehensive data solutions designed to empower organizations across the semiconductor and electronics ecosystems to improve the yield and quality of their products and operational efficiency for increased profitability. We derive revenues from two sources, Analytics and Integrated Yield Ramp. Our offerings contribute to Analytics revenue through contract fees for on-premise software and hardware system licenses, software-as-a-service ("SaaS"), and other professional services. Certain of our Characterization services engagements contribute to Integrated Yield Ramp revenue through contract fees and a value-based, variable fee or royalty, which we call Gainshare. We are headquartered in Santa Clara, California and also operate worldwide with offices in Canada, China, France, Germany, Italy, Japan, South Korea, and Taiwan.

Business Overview

Our customers include Fortune 500 companies across the semiconductor and electronics ecosystem. These companies use our products and services to achieve various goals depending on whether they are integrated device manufacturers ("IDMs"), fabless semiconductor companies, foundries, equipment manufacturers, electronics manufacturing suppliers ("EMS"), original device manufacturers ("ODMs"), outsourced semiconductor assembly and test ("OSATs"), or system houses. For example, our foundry customers generate and analyze key manufacturing data using our solutions to shorten the time necessary for technology development and to provide their fabless customers with a higher yielding process with improved electrical performance, which are both critical metrics for market success. Higher yields in less time can also mean less total raw materials and process runs, which help lower customers' total cost and minimize environmental impact. Also, equipment manufacturers and factories use our connectivity products to implement evolving industry standards for their equipment or operations, respectively, with required quality and stability. By way of further example, our IDM and fabless customers use our solutions to generate unique, differentiated data that can be analyzed with our machine learning ("ML") and artificial intelligence ("AI") algorithms to predict downstream manufacturing issues, resulting in shorter time for designs to meet performance requirements with fewer iterations and faster time-to-market. For final example, our foundry and OSAT customers use the AI and ML applications of our software to optimize for process control, assembly, and/or test.

Our mission is to provide innovative solutions to create, access, and organize data to enable analysis and control for semiconductor and electronics companies to achieve better time-to-market, yields, quality, and operational efficiencies. Our strategy to achieve this is as follows:

- *Offer a Common, Flexible Platform for a Broad Group of Customers Across the Supply Chain*. As semiconductor and electronics products are made with the efforts of equipment manufacturers, front-end foundries, chip and system designers, design automation, intellectual property ("IP") providers, and OSATs, there is a need to analyze data across this whole chain to optimize yields, operational efficiencies, time to market, quality, and reliability. Our comprehensive platform is designed based on industry standards and integrated with leading solutions providers to enable these different participants to analyze the relevant end-to-end data in near real-time, with cloud or on-premise data stores from 10s to 100s of terabytes ("TBs") and flexible configurations for IDM, foundry, fabless, and OSAT specific needs. Our ML solutions combine professional services with our Exensio software to further enable our customers to push their analytics "to the edge" of their global supply chains and shift the analysis and decision-making processes closer to where their data is being generated. We believe enabling edge analytics will further increase our customers' ability to improve product yield, quality, performance, and profitability, and therefore, should drive the market for our products and services.

- *Drive Tool-Level Software Installations to Create an Infrastructure of Connected Equipment and Enable Smart Factories*. We believe that driving installation of our Exensio and Cimetrix software products at the tool level will help provide an infrastructure of connected equipment and help to enable smart factories. Our Cimetrix products are based on open standards for equipment control and connectivity to equipment manufacturers and factories, which we believe will be more in demand in the smart manufacturing era. Further, we believe that the

benefits from integration between analytics on equipment, the factory, and in the cloud will provide synergies with our existing end-to-end analytics offerings.

- *Create Differentiated Data Sources for Better Analytics*. Historically, companies have only used data that was generated from their manufacturing and test process to drive improvements. We offer unique IP (such as Characterization Vehicle® test chips, also branded CV® test chips) that is not part of an integrated circuit's ("IC") functionality, but significantly improves the manufacturing process by improving yield learning and reducing time to market. Also, our Design-for-Inspection™ system (also branded DFI™ system) identifies blockers that impact product yield and quality up to months earlier than any other hardware- or software-based methodology from proprietary e-beam measurement of product layout or provided on-chip instrumentation. We believe that in the More-than-Moore ("MtM") era, the differentiated data we provide can play an important role in enabling our customers to bring new products to market faster and with higher quality and performance, and, ultimately, more profitability.

- *Collaborate with Other Industry Leaders to Bring Additional Unique Data to Our Platform and Enable New and Differentiated Applications*. We believe that the value we bring to semiconductor manufacturing can be leveraged with additional data and through differentiated applications. For example, in 2023, we started offering an enterprise application integration module called Sapience™ Manufacturing Hub, which is designed to collect and unify data from enterprise applications, such as manufacturing execution systems ("MES"), enterprise resource planning systems ("ERP") like SAP S/4HANA®, and our Exensio software, and make such data available through a central interface. Also in 2023, working with Siemens Digital Industries Software, we started offering two new Exensio modules, Exensio AIM Scan Analytics and Exensio AIM Scan Systematics Diagnostics, which are designed to enable diagnostic accuracy and efficiency of fail mode to help our customers that also use Siemens's Tessent software determine the electrical and physical failing locations for product and process improvements. Building relationships with other industry leaders is intended to provide more ways for mutual customers to leverage their process and product data as part of their Industry 4.0 initiatives. Differentiated applications that make use of this shared data are designed to provide unique insights to help customers achieve sustained profitability in their manufacturing.

Brief History

PDF Solutions was incorporated in Pennsylvania in November 1992, and we reincorporated in California in November 1995. In July 2000, we reincorporated in Delaware, and in July 2001, we completed an initial public offering. Our shares of common stock are currently traded on the Nasdaq Global Market under the symbol "PDFS".

From 2000 through 2009, we expanded our technology footprint and our operations in various countries through acquisitions. From 2009 to 2019, we primarily focused on the pervasive application of our technology to leading edge logic manufacturing and achieving yield targets with our clients that maximized Gainshare royalties. In 2013, we leveraged our extensive experience in yield simulation software and CV® test chip development and started research and development on an e-beam solution for non-contact, inline electrical inspection and process control for wafer inspection.

In a parallel effort, starting in 2014, we re-architected our point-solution software tools into a new generation, highly-integrated data analytics Exensio software, which resulted in accelerated growth in revenues from software through 2019. Starting in 2020, after our acquisition of Cimetrix Incorporated ("Cimetrix"), we began providing software products based on open standards for equipment control and connectivity to equipment manufacturers and factories.

We released our first eProbe tool in 2015, the second generation in 2019, and the third generation in late 2022. The improvements in the third generation included:

- higher resolution and improved beam vector targeting, enabling use for leading-edge, middle-of-line applications;

- higher throughput; and

- better manufacturability and repeatable column performance.

Industry Background

Rapid technological innovation with increasingly shorter product life cycles has fueled the economic growth of the semiconductor industry since the days of the PC revolution. IC companies have historically ramped production slowly, produced at high volume once a product gained market acceptance, and slowly reduced production volume when price and demand started to decrease near the end of the product's life cycle. Today there are many different business models across the semiconductor industry: products that follow the traditional life cycle just described, products targeted towards fast-moving market segments like Internet of Things – which utilize mature process nodes and require a fast ramp to volume with a relatively short life cycle, and products focused on long term market segments like automotive and industrial where product life cycles can last a decade or longer. There is a lot of variation across these business models depending on the level of design complexity and the maturity of the process node used for product implementation. Processors, memory and field-programmable gate arrays ("FPGA") continue to leverage the most advanced process nodes and experience significant challenges to achieve competitive initial yields and optimized performance. Some products and market segments, however, are content to utilize older process nodes. Regardless of the process node used for implementation or how long the product will be sold in the market, success for every semiconductor company is predicated, among other things, on fast product yield ramp and the ability to optimize manufacturing and test metrics, such as yield reclamation, product quality, and test efficiency, throughout a product's life cycle. Thus, technologies or capabilities that can accelerate yield ramp, improve product quality, and optimize production efficiencies are highly sought after because they typically lead to cost reduction and revenue generation concurrently, causing a leveraged effect on profitability.

Technology and Intellectual Property Protection

Our success is largely dependent upon our proprietary software. We believe the creative skills and technological ability of our personnel, product enhancements, and new product development are necessary to maintaining our position as a leading provider. We rely primarily on trade secret rights, copyright laws, and nondisclosure and other contractual agreements to protect our software.

In addition, our success is dependent on various inventions we have made and we seek to protect certain of our IP under patent laws. As of December 31, 2023, we held 115 U.S. patents, with expiration dates on issued patents ranging from 2024 through 2042. We intend to prepare additional patent applications when we feel it is beneficial. Some of the technology we protect by patent includes elements of our CV and DFI systems and inventions related to AI/ML.

We protect our trademarks with registration of marks, including Characterization Vehicle, Cimetrix, CV, eProbe, Exensio, pdFasTest, PDF Solutions, and the PDF Solutions and Cimetrix logos. We have common law rights to additional trademarks, including ALPS, DFI, DirectProbe, DirectScan, Fire, and Sapience.

We enter into confidentiality and inventions assignment agreements with our employees and confidentiality and license agreements with our customers and the various parties we partner with to resell, distribute, and, in some cases, integrate our products. Further, we limit access to and distribution of our software, documentation and other proprietary information.

Third parties could in any case develop competing technologies that include similar functionality or features, or otherwise are substantially equivalent or superior to our technologies. In addition, effective patent, copyright, trademark and trade secret protection may be unavailable or limited in certain foreign countries where we operate. Our business could suffer significantly if we fail to protect our proprietary technology.

In addition, through yield, performance, and reliability improvement services over more than 20 years, we have accumulated a vast library of physical IP in the form of test structures. As part of our DFI and CV systems, our engineers create designs of experiments ("DOEs") and layouts for targeted fail modes. We have also developed electrical measurement hardware tools and proprietary extraction, design, and analysis software. In addition, our technology embodies many production-proven and patented algorithms. Further, our IP includes proven methodologies that our implementation teams use as guidelines to drive our customers' use of our technology. We strive to continually enhance our core technologies through the codification of knowledge that we gain in the use of our products and delivery of services.