

UNIVERSAL DISPLAY CORP \PA\  
Form 10-K  
February 23, 2017

UNITED STATES

SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM 10-K

(Mark One)

ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934  
For the fiscal year ended December 31, 2016

OR

TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF  
1934

For the transition period from \_\_\_\_\_ to \_\_\_\_\_

Commission File Number 1-12031

UNIVERSAL DISPLAY CORPORATION

(Exact name of registrant as specified in its charter)

Pennsylvania

(State or other jurisdiction of

incorporation or organization)

375 Phillips Boulevard, Ewing, New Jersey

23-2372688

(I.R.S.

Employer

Identification

No.)

08618

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(Address of principal executive offices) (Zip Code)

Registrant's telephone number, including area code: (609) 671-0980

Securities registered pursuant to Section 12(b) of the Act:

Title of Each Class	Name of Each Exchange on Which Registered
Common Stock, \$0.01 par value	The NASDAQ Stock Market LLC

Securities registered pursuant to Section 12(g) of the Act: None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes No

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes No

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes No

Indicate by check mark whether the registrant has submitted electronically and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes No

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K.

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, or a smaller reporting company. See the definitions of "large accelerated filer," "accelerated filer" and "smaller reporting company" in Rule 12b-2 of the Exchange Act. (Check one):

Large accelerated filer	Accelerated filer
Non-accelerated filer (Do not check if a smaller reporting company)	Smaller reporting company

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes No

The aggregate market value of the voting and non-voting common equity held by non-affiliates of the registrant computed by reference to the closing sale price of the registrant's common stock on the NASDAQ Global Market as of June 30, 2016, was \$2,364,820,879. Solely for purposes of this calculation, all executive officers and directors of the registrant and all beneficial owners of more than 10% of the registrant's common stock (and their affiliates) were

considered affiliates.

As of February 22, 2017, the registrant had outstanding 46,980,978 shares of common stock.

#### DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's Proxy Statement for the 2017 Annual Meeting of Shareholders, which is to be filed with the Securities and Exchange Commission no later than May 1, 2017, are incorporated by reference into Part III of this report.

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All forward-looking statements speak only as of the date of this report or the documents incorporated by reference, as the case may be. We do not undertake any duty to update, correct, modify, or supplement any of these forward-looking statements to reflect events or circumstances after the date of this report or to reflect the occurrence of unanticipated events.

## PART I

### ITEM 1. BUSINESS

#### Our Company

We are a leader in the research, development and commercialization of organic light emitting diode, or OLED, technologies and materials for use in display and solid-state lighting applications. OLEDs are thin, lightweight and power-efficient solid-state devices that emit light that can be manufactured on both flexible and rigid substrates, making them highly suitable for use in full-color displays and as lighting products. OLED displays are capturing a growing share of the flat panel display market, especially in the mobile phone, television, virtual reality and automotive markets. We believe that this is because OLEDs offer potential advantages over competing display technologies with respect to power efficiency, contrast ratio, viewing angle, video response time, form factor and manufacturing cost. We also believe that OLED lighting products have the potential to replace many existing light sources in the future because of their high power efficiency, excellent color rendering index, low operating temperature and novel form factor. Our technology leadership and intellectual property position should enable us to share in the revenues from OLED displays and lighting products as they continue to be more broadly adopted.

Our primary business strategy is to (1) further develop and license our proprietary OLED technologies to manufacturers of products for display applications, such as mobile phones, wearable electronic devices, tablets, notebook computers and televisions, and specialty and general lighting products; and (2) develop new OLED materials and sell the materials to those product manufacturers. We have established a significant portfolio of proprietary OLED technologies and materials, primarily through our internal research and development efforts and acquisitions of patents and patent applications, as well as maintaining our relationships with world-class partners such as Princeton University (Princeton), the University of Southern California (USC), the University of Michigan (Michigan) and PPG Industries, Inc. (PPG Industries). We currently own, exclusively license or have the sole right to sublicense more than 4,200 patents issued and pending worldwide.

We sell our proprietary OLED materials to customers for evaluation and use in commercial OLED products. We also enter into agreements with manufacturers of OLED display and lighting products under which we grant them licenses to practice under our patents and to use our proprietary know-how. At the same time, we work with these and other companies who are evaluating our OLED technologies and materials for possible use in commercial OLED display and lighting products.

#### Market Overview

##### The Display Panel Market

Thin, energy efficient display panels that can be manufactured on glass or flexible substrates are essential for a wide variety of portable consumer electronics products, such as mobile phones, VR headsets, digital cameras, wearables, tablets and notebook computers. Due to their narrow profile and light weight, flat panel displays have also become the display of choice for larger product applications, such as computer monitors and televisions.

Liquid crystal displays, or LCDs, continue to dominate the flat panel display market. However, we believe that OLED displays are an attractive alternative to LCDs because they offer a number of potential advantages, including:

- higher power efficiencies, thereby reducing energy consumption;
- a thinner profile and lighter weight;
- higher contrast ratios, leading to sharper picture images and graphics;
- wider viewing angles;
- deposition on non-rigid substrates which enables conformable and flexible displays;
- faster response times for video; and



- lower cost manufacturing methods and materials.

Based on these characteristics, product manufacturers have adopted small-area OLED displays for use in a wide variety of electronic devices, such as smartphones, wearables and tablets. Manufacturers have begun commercializing large area OLED displays for use in televisions. We believe that if these efforts are successful, they could result in sizeable markets for OLED displays.

In addition, due to the inherent transparency of organic materials and through the use of transparent electrode technology, OLEDs eventually may enable the production of transparent displays for use in products such as automotive windshields and windows with embedded displays. Organic materials also make technically possible the development of flexible displays for use in an entirely

new set of product applications. Such applications include display devices that can be conformed to certain shapes for wearable, industrial and ruggedized applications.

### The Solid-State Lighting Market

Traditional incandescent light bulbs are inefficient because they convert only about 5% of the energy they consume into visible light, with the rest emerging as heat. Fluorescent lamps use excited gases, or plasmas, to achieve a higher energy conversion efficiency of about 20%. However, the color rendering index, or CRI, of most fluorescent lamps – in other words, the quality of their color compared to an ideal light source – is inferior to that of an incandescent bulb. Fluorescent lamps also pose environmental concerns because they typically contain mercury.

Solid-state lighting relies on the direct conversion of electricity to visible light using semiconductor materials. By avoiding the heat and plasma-producing processes of incandescent bulbs and fluorescent lamps, respectively, solid-state lighting products can have substantially higher energy conversion efficiencies.

There are currently two basic types of solid-state lighting devices: inorganic light emitting diodes, or LEDs, and OLEDs. Current LEDs are very small in size (about one square millimeter) and are extremely bright. Having been developed about 25 years before OLEDs, LEDs are already employed in a variety of lighting products, such as traffic lights, billboards, replacements for incandescent lighting, backlights for smartphones, computer monitors and televisions, and as border or accent lighting. However, the high operating temperatures and intense brightness of LEDs may make them less desirable for many general illumination and diffuse lighting applications.

OLEDs, on the other hand, are larger in size and can be viewed directly, without using diffusers that are required to temper the intense brightness of LEDs. OLEDs can be added to any suitable surface, including glass, plastic or metal foil, and could be cost-effective to manufacture in high volume. Given these characteristics, product manufacturers are working and have introduced limited product applications of OLEDs for diffuse specialty lighting applications and ultimately general illumination. If these efforts are successful, we believe that OLED lighting products could begin to be used for applications currently addressed by incandescent bulbs and fluorescent lamps, as well as for new applications that take advantage of the OLED form factor. In particular, the ability of OLED technology to produce uniform illumination over arbitrary shapes is making OLED lighting very attractive to the automobile industry.

### Our Competitive Strengths

We believe our position as one of the leading technology developers in the OLED industry is the direct result of our technological innovation. We have built an extensive intellectual property portfolio around our OLED technologies and materials, and are working diligently to enable our manufacturing partners to adopt our OLED technologies and materials for expanding commercial usage. Our key competitive strengths include:

#### Technology Leadership

We are a recognized technology leader in the OLED industry. Along with our research partners, we have pioneered the development of our UniversalPHOLED® phosphorescent OLED technologies, which can be used to produce OLEDs that are up to four times more efficient than fluorescent OLEDs and significantly more efficient than current LCDs, which are illuminated using backlights. We believe that our phosphorescent OLED technologies and materials are well-suited for industry usage in the commercial production of OLED displays and lighting products. Through our relationships with companies such as PPG Industries and our academic partners, we have also developed other important OLED technologies, as well as novel OLED materials that we believe will facilitate the adoption of our various OLED technologies by product manufacturers.

#### Broad Portfolio of Intellectual Property

We believe that our extensive portfolio of patents, trade secrets and non-patented know-how provides us with a competitive advantage in the OLED industry. Through our internal development efforts, acquisitions, and our relationships with world-class partners such as Princeton, USC, Michigan and PPG Industries, we own, exclusively license or have the sole right to sublicense more than 4,200 patents issued and pending worldwide. In 2011, we purchased 74 issued U.S. patents from Motorola Solutions, Inc. (f/k/a Motorola, Inc.) (Motorola), together with foreign counterparts in various countries, which patents we had previously licensed from Motorola, and in 2012, we acquired the entire worldwide patent portfolio of more than 1,200 OLED patents and patent applications of Fujifilm Corporation (Fujifilm). In 2016, we acquired more than 500 issued and then pending patents in the area of phosphorescent materials and technologies from BASF SE (BASF). We also continue to accumulate valuable non-patented technical know-how relating to our OLED technologies and materials.

## Focus on Licensing Our OLED Technologies

We are focused on licensing our proprietary OLED technologies to product manufacturers on a non-exclusive basis. Our current business model does not involve the direct manufacture or sale of OLED display or lighting products. Instead, we seek license fees and royalties from OLED product manufacturers based on their sales of licensed products. We believe this business model allows us to concentrate on our core strengths of technology development and innovation, while at the same time providing significant operating leverage. We also believe that this approach may reduce potential competitive conflicts between us and our customers.

## Licenses with Key Product Manufacturers

We have licensed our OLED technologies and patents to manufacturers for use in commercial products. In 2011, we entered into a license agreement with Samsung Mobile Display Co. Ltd. (SMD) for its manufacture of active matrix OLED (AMOLED) display products, which superseded our prior license agreement with Samsung Display Co., Ltd (SDC). In 2012, SMD merged with SDC. Following the merger, all agreements between us and SMD were assigned to SDC, and SDC is obligated to honor all pre-existing agreements made between us and SMD. In 2015, we entered into a license agreement with LG Display Co., Ltd. (LG Display) for its manufacture of AMOLED display products. In 2016, we entered into a license agreement with Tianma Micro-electronics Co., Ltd. (Tianma) for the manufacture of small and medium displays. We also have license agreements with Konica Minolta Holdings Inc. (Konica Minolta), Sumitomo Chemical Company, Ltd. (Sumitomo), Lumiotec, Inc. (Lumiotec), Pioneer Corporation (Pioneer), Kaneka Corporation (Kaneka) and OLEDWorks L.L.C. (OLEDWorks) for the manufacture of OLED lighting products. Additionally, we have a license agreement with DuPont Displays for its manufacture of solution-processed OLED display products using proprietary OLED materials obtained through us.

## Leading Supplier of UniversalPHOLED® Emitter Materials

We are the leading supplier of phosphorescent emitter materials to OLED product manufacturers. The emitter material, which is designed to efficiently convert electrical energy to a desired wavelength of light, is the key component in an OLED device. PPG Industries currently manufactures our proprietary emitter materials for us, which we then qualify and resell to OLED product manufacturers. We record revenues based on our sales of these materials to OLED product manufacturers. This allows us to maintain close technical and business relationships with the OLED product manufacturers purchasing our proprietary materials, which in turn further supports our technology licensing business.

## Complementary UniversalPHOLED® Host Material Business

We supply and offer for sale certain of our proprietary phosphorescent host materials to OLED product manufacturers. In one design, the emitter material is disbursed into a host material, with the resulting mixture consisting of predominantly host material. We believe that host material sales can be complementary to our phosphorescent emitter material sales business; however, our OLED product manufacturing customers are not required to purchase our host materials in order to utilize our phosphorescent emitter materials. In addition, the host material business is more competitive than the phosphorescent emitter material sales business. This means our long-term prospects for host material sales are uncertain.

## Established Material Supply Relationships

We have established relationships with well-known manufacturers that are using, or are evaluating for use, our OLED materials in commercial products. In 2016, SDC, LG Display, AU Optronics Corporation (AU Optronics), BOE Technology Group Co., Ltd. (BOE), Konica Minolta, Tianma, and Tohoku Pioneer Corporation (Tohoku Pioneer), purchased our proprietary OLED materials for use in commercial OLED display and lighting products. We continue to work with many product manufacturers that are evaluating our OLED materials and technologies for use

in commercial OLED displays and lighting products, including Innolux Corporation (Innolux) (formerly Chimei Innolux Corporation (CMI)), and Kaneka.

#### U.S. Government Program Support

We perform work under research and development contracts with U.S. government agencies, such as the U.S. Department of Energy. Under these contracts, the U.S. government funds a portion of our efforts to develop next-generation OLED technologies for applications such as flexible displays and solid-state lighting. This enables us to supplement our internal research and development budget with additional funding. As OLED technology continues to prosper in the marketplace, U.S. government funding will likely continue to decline.

## Experienced Management and Scientific Advisory Team

Our management team has significant experience in developing business models focused on licensing disruptive technologies in high growth industries. In addition, our management team has assembled a Scientific Advisory Board that includes some of the leading researchers in the OLED industry, such as Professor Stephen R. Forrest of Michigan (formerly of Princeton) and Professor Mark E. Thompson of USC.

## Our Business Strategy

Our current business strategy is to promote and continue to expand our portfolio of OLED technologies and materials for widespread use in OLED displays and lighting products. We generate revenues primarily by licensing our OLED technologies and selling our proprietary OLED materials to display and lighting product manufacturers. We are presently focused on the following steps to implement our business strategy:

### Target Leading Product Manufacturers

We are targeting leading manufacturers of displays and lighting products as potential commercial licensees of our OLED technologies and purchasers of our OLED materials. We also supply our proprietary OLED materials to manufacturers of OLED displays and lighting products for evaluation and for use in product development and for pre-commercial activities, and we provide technical assistance and support to these manufacturers. We concentrate on working closely with OLED product manufacturers because we believe that the successful incorporation of our technologies and materials into commercial products is critical to their widespread adoption.

### Enhance Our Existing Portfolio of PHOLED Technologies and Materials

We believe that a strong portfolio of proprietary OLED technologies and materials for both displays and lighting products is critical to our success. Consequently, we are continually seeking to expand this portfolio through our internal development efforts, our collaborative relationships with academic and other research partners, and other strategic opportunities. One of our primary goals is to develop new and improved phosphorescent OLED (PHOLED) technologies and materials with increased efficiencies, enhanced color gamut and extended lifetimes, which are compatible with different manufacturing methods, so that they can be used by various manufacturers in a broad array of OLED display and lighting products.

### Develop Next-Generation Organic Technologies

We continue to conduct research and development activities relating to next-generation OLED technologies for both displays and lighting products. We also are funding research by our academic partners on the use of organic thin-film technology in other applications. Our focus on next-generation technologies is designed to enable us to maintain our position as a leading provider of OLED and other organic electronics technologies and materials as new markets emerge.

### Business and Geographic Markets

We derive revenue from the following:

- sales of OLED materials for evaluation, development and commercial manufacturing;
- intellectual property and technology licensing; and
- technology development and support, including government contract work and support provided to third parties for commercialization of their OLED products.

Most manufacturers of displays and lighting products who are or might potentially be interested in our OLED technologies and materials are currently located outside of the United States, particularly in the Asia-Pacific

region. To provide on-the-ground support to these manufacturers, we have established wholly-owned subsidiaries in Ireland, Korea, Japan, China and Hong Kong, as well as a representative office in Taiwan. Our subsidiary in Ireland is responsible for all material sales world-wide (excluding the United States) and for licensing and managing intellectual property and undertaking certain other business transactions in all non-U.S. territories.

We receive a majority of our revenues from customers that are domiciled outside of the United States, and our business is heavily dependent on our relationships with these customers. In particular, one of our key customers located in the Asia-Pacific region, SDC, accounted for 63% of our consolidated revenues for 2016. Substantially all revenue derived from our customers is denominated in U.S. dollars.

For more information on our revenues, costs and expenses associated with our business, as well as a breakdown of revenues from North America and foreign sources, please see our Consolidated Financial Statements and the notes thereto, as well as “Management’s Discussion and Analysis of Financial Condition and Results of Operations,” included elsewhere in this report.

### Our Technology and its Relation to OLED Technology and Structure

OLED devices are solid-state semiconductor devices made from thin films of organic material that emit light of various wavelengths when electricity is selectively applied to the emissive layer of the device. OLED devices are typically referred to as incorporating an “OLED stack.” OLED stacks vary in specific structure but those commonly used today may include a cathode, an electron injection layer, an electron transport layer, an emissive layer, a hole transport layer, a hole injection layer and an anode, all of which are placed on a substrate which may be made of a number of different materials, including glass, plastic and metal.

Our technology and materials are most commonly utilized in the emissive layer; the materials in the emissive layer are the light-generating component of the OLED stack. Many of our key technologies relate primarily to phosphorescent emitter materials, which we believe are more energy efficient than fluorescent emitter materials that can also be used to generate light within the emissive layer of the OLED device. We began selling emitter materials commercially in 2003. A manufacturer will use a small amount of emitter material for each device through a process called “doping” into a host material. The emitter material(s) and the host material(s) together form an emissive layer system. Depending on the nature of the OLED device, the emissive materials and emissive layer system may be designed to emit different colors. We have commercially produced and sold phosphorescent emitter materials that produce red, yellow, green and light-blue light, which are combined in various ways for the display and lighting markets.

Our current materials business, conducted outside the United States by our Irish subsidiary, is focused primarily on the delivery of such emissive materials. We have also developed host materials for the emissive layer and began selling them commercially in 2011. In addition to our materials, which are protected by patents covering various molecular structures, we also have fundamental and important patents that cover various aspects of the OLED device, including the use of phosphorescent emission in an OLED device, flexible OLEDs, lighting, encapsulation, and methods of manufacturing OLEDs, including through the use of our proprietary materials in OLED devices. These patents are important to our licensing business because they enable us to provide our business partners important OLED related technologies.

### Our Phosphorescent OLED Technologies

Phosphorescent OLEDs utilize specialized materials and device structures that allow OLEDs to emit light through a process known as phosphorescence. Traditional fluorescent OLEDs emit light through an inherently less efficient process. Theory and experiment show that phosphorescent OLEDs exhibit device efficiencies up to four times higher than those exhibited by fluorescent OLEDs. Phosphorescence substantially reduces the power requirements of an OLED and is useful in displays for hand-held devices, such as smartphones, where battery power is often a limiting factor.

Phosphorescence is also important for large-area displays such as televisions, where higher device efficiency and lower heat generation may enable longer product lifetimes and increased energy efficiency.

We have a strong intellectual property portfolio surrounding our existing PHOLED technologies and materials for both displays and lighting products which we market under the UniversalPHOLED® brand. We devote a substantial portion of our efforts to developing new and improved proprietary PHOLED materials and device architectures for red, green, yellow, blue and white OLED devices. In 2016, we continued our commercial supply relationships with companies such as SDC and LG Display to use our UniversalPHOLED® materials for their manufacture of OLED displays. In addition, we continued to work closely with customers evaluating and qualifying our proprietary



PHOLED materials for commercial usage in both displays and lighting products, and with other material suppliers to match our PHOLED emitters with their phosphorescent hosts and other OLED materials.

#### Our Additional Proprietary OLED Technologies

Our research, development and commercialization efforts also encompass a number of other OLED device and manufacturing technologies, including the following:

#### FOLED <sup>TM</sup> Flexible OLEDs

We are working on a number of technologies required for the fabrication of OLEDs on flexible substrates. Most OLED and other flat panel displays are built on rigid substrates such as glass. In contrast, FOLEDs are OLEDs built on non-rigid substrates such as plastic or metal foil. This has the potential to enhance durability and enable conformation to certain shapes or repeated bending or flexing. Eventually, FOLEDs may be capable of being rolled into a cylinder, similar to a window shade. These features create the possibility of new display product applications that do not exist today, such as a portable, roll-up Internet connectivity and

communications device as well as enhance the usefulness of such devices in ruggedized, industrial and wearable computing systems. Manufacturers also may be able to produce FOLEDs using more efficient continuous, or roll-to-roll, processing methods. We currently are conducting research and development on FOLED technologies internally.

#### Thin-Film Encapsulation

We have developed proprietary, patented encapsulation technology for the packaging of flexible OLEDs and other thin-film devices, as well as for use as a barrier film for plastic substrates. Addressing a major roadblock to the successful commercialization of flexible OLEDs, our hybrid, multi-layer approach provides barrier performance useful for OLEDs using a potentially cost-effective process. In addition to accelerating the commercial viability of flexible OLEDs, our thin-film encapsulation technology has the potential to provide benefits for a variety of other flexible thin-film devices, including photovoltaics and thin-film batteries.

#### UniversalP<sup>2</sup> OLED® Printable Phosphorescent OLEDs

The standard approach for manufacturing a small molecule OLED, including a PHOLED, is based on a vacuum thermal evaporation, or VTE, process. With a VTE process, the thin layers of organic material in an OLED are deposited in a high-vacuum environment. An alternate approach for manufacturing a small molecule OLED involves solution processing of the various organic materials in an OLED using techniques such as spin coating or inkjet printing onto the substrate. Solution-processing methods, and inkjet printing in particular, have the potential to be scalable to large area displays.

#### OVJP® Organic Vapor Jet Printing

OLEDs can be manufactured using other processes as well, including OVJP. As a direct printing technique, OVJP technology has the potential to offer high deposition rates for large area OLEDs. In addition, OVJP technology reduces OLED material waste associated with use of a shadow mask (i.e., the waste of material that deposits on the shadow mask itself when fabricating an OLED). By comparison to inkjet printing, an OVJP process does not use liquid solvents and therefore the OLED materials utilized are not limited by their viscosity or solvent solubility. OVJP also avoids generation of solvent wastes and eliminates the additional step of removing residual solvent from the OLED device. We have installed a prototype OVJP tool at our Ewing, New Jersey facility, and we continue to collaborate on OVJP technology development with Professor Forrest of Michigan.

#### OVPD® Organic Vapor Phase Deposition

Another approach for manufacturing a small molecule OLED is based on OVPD. The OVPD process utilizes a carrier gas, such as nitrogen, in a hot walled reactor in a low pressure environment to deposit the layers of organic material in an OLED. The OVPD process may offer advantages over the VTE process or solution processing methods through more efficient materials utilization and enhanced deposition control. We have licensed Aixtron AG, a leading manufacturer of metal-organic chemical vapor deposition equipment, to develop and qualify equipment for the fabrication of OLED displays utilizing the OVPD process.

#### TOLED Transparent OLEDs

We have developed a technology for the fabrication of OLEDs that have transparent cathodes. Conventional OLEDs use a reflective metal cathode and a transparent anode. In contrast, TOLEDs use a transparent cathode and either a transparent, reflective or opaque metal anode. TOLEDs utilizing transparent cathodes and reflective metal anodes are known as “top-emission” OLEDs. In a “top-emission” AMOLED, light is emitted without having to travel through much of the device electronics where a significant portion of the usable light is lost. This results in OLED displays having image qualities and lifetimes superior to those of conventional AMOLEDs. TOLEDs utilizing transparent cathodes

and transparent anodes may also be useful in novel flat panel display applications requiring semi-transparency or transparency, such as graphical displays in automotive windshields and signage.

#### Our Strategic Relationships with Product Manufacturers

We have established early-stage evaluation programs, development and pre-commercial programs, and commercial arrangements with a substantial number of manufacturers or potential manufacturers of OLED display and lighting products. Many of these relationships are directed towards tailoring our proprietary OLED technologies and materials for use by individual manufacturers. Our ultimate objective is to license our OLED technologies and sell our OLED materials to these manufacturers for their commercial production of OLED products. Our publicly announced relationships with product manufacturers include the following:

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## SDC

We have been working with SDC and providing our next generation PHOLED materials to SDC for evaluation since 2001. In 2011, we entered into a patent license agreement with SDC for its manufacture and sale of AMOLED display products which has a term that extends through December 31, 2017. We also supply our proprietary PHOLED materials to SDC for its use in manufacturing licensed products. Under a separate supplemental agreement, SDC has agreed to purchase a minimum amount of phosphorescent emitter material from us for the manufacture of licensed products. This minimum purchase commitment is subject to SDC's requirements for phosphorescent emitter materials and our ability to meet these requirements over the term of the supplemental agreement, which is concurrent with the term of the license agreement.

## LG Display

We have been providing our proprietary PHOLED materials to LG Display for evaluation, and we have been supporting LG Display in its OLED product development activities for several years. In January 2015, we entered into an OLED patent license agreement and an OLED commercial supply agreement with LG Display, which were effective as of January 1, 2015 and superseded a 2007 commercial supply agreement between the parties for the supply of our proprietary PHOLED materials for use in AMOLED display products. The new agreements have a term that is set to expire by the end of 2022. The patent license agreement provides LG Display a non-exclusive, royalty bearing portfolio license to make and sell OLED displays under the Company's patent portfolio. The patent license agreement calls for license fees, prepaid royalties and running royalties on licensed products. The agreements include customary provisions relating to warranties, indemnities, confidentiality, assignability and business terms. The agreements provide for certain other minimum obligations relating to the volume of materials sales anticipated over the life of the agreements as well as minimum royalty revenue to be generated under the patent license agreement. The Company expects to generate revenue under these agreements that are predominantly tied to LG Display sales of OLED licensed products. The OLED commercial supply agreement provides for the sales of materials for use by LG Display, which may include phosphorescent dopants and host materials.

## AU Optronics

We have a longstanding collaborative relationship with AU Optronics dating back to 2001. We are providing our proprietary PHOLED materials to AU Optronics for evaluation, and we have helped AU Optronics accelerate its introduction of commercial OLED products into the market. In 2016, we entered into a revised commercial supply agreement with AU Optronics for the continued evaluation and commercial supply of our proprietary PHOLED materials.

## BOE

In 2013, we entered into an evaluation agreement with BOE for the evaluation of our materials and technology for use in the manufacture of PHOLED display products. The parties extended and expanded the evaluation agreement in 2015 to provide additional OLED materials for purchase by BOE under the evaluation agreement. In 2016, we entered into a new commercial supply agreement with BOE which provides for BOE's continued evaluation and commercial use of our proprietary PHOLED materials.

## Innolux

We have been working with Innolux and its predecessor companies since 2007, when we entered into an agreement to supply our proprietary PHOLED materials and technologies with Chi Mei EL Corporation (CMEL) for use in its manufacture of commercial AMOLED display products. In May 2012, we entered into a Commercial Material Supply Agreement, and in August 2013, we extended our current Evaluation Agreement. We continue to supply our proprietary PHOLED materials to Innolux in support of their OLED development efforts.

Kaneka

In 2013, we entered into a license agreement with Kaneka for the manufacture and sale of OLED lighting products. In April 2014, we entered into a Commercial Material Supply Agreement with Kaneka.

Konica Minolta

We have been supplying our proprietary PHOLED materials to Konica Minolta for evaluation, and we have been supporting Konica Minolta in its efforts to develop OLED lighting products for many years. In 2008, we entered into a technology license agreement with Konica Minolta for its manufacture and sale of OLED lighting products that utilize our phosphorescent and other OLED technologies.

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#### Lumiotec

In January 2012, we entered into a technology license agreement with Lumiotec for its manufacture and sale of OLED lighting products utilizing our phosphorescent and other OLED technologies. The agreement was extended in 2016.

#### LG Chem

We have entered into an evaluation agreement to supply LG Chem, Ltd. (LG Chem) with our proprietary PHOLED materials for use in the development of OLED products. We have also entered into short-term commercial sales agreements with LG Chem, as needed, for their OLED manufacturing needs, which generates commercial chemical sales and license fee revenues from our supply of materials to LG Chem. In late 2015, LG Display announced that it is acquiring the OLED lighting business of LG Chem. We intend to continue our LG Chem OLED lighting relationship with LG Display and cooperate in the transition of the relevant business operations and associated contractual and support services from LG Chem to LG Display.

#### NEC Lighting

We have been supplying our proprietary PHOLED materials to NEC Lighting, Ltd. (NEC Lighting) for the manufacture of sample OLED lighting products. NEC Lighting has publicly exhibited OLED lighting panels that utilize our proprietary PHOLED materials and technology.

#### OLEDWorks

In 2015, we entered into an OLED patent license agreement and an OLED commercial supply agreement with OLEDWorks for use in OLED lighting products. The patent license agreement extends for the term of the applicable patent and patent applications. In 2015, OLEDWorks announced and completed an acquisition of OLED-related lighting assets from Philips, which had been a contracting customer of our proprietary PHOLED materials. The Company has extended rights under the OLEDWorks license agreement and commercial supply agreement to OLEDWorks GmbH, the German company and facility acquired by OLEDWorks from Philips. These rights were granted for as long as OLEDWorks GmbH is a wholly owned affiliate of OLEDWorks.

#### Osram

In 2015, we entered into an evaluation agreement with Osram for the evaluation of our materials and technology for use in manufacturing OLED lighting products, including automotive OLED lighting products.

#### Pioneer

We have been supplying our proprietary PHOLED materials to Tohoku Pioneer, a subsidiary of Pioneer, for the commercial production of passive matrix OLED (PMOLED) display products since 2003. In 2011, we entered into a separate license agreement with Pioneer for its manufacture and sale of OLED lighting products.

#### Sony

We have been supporting Sony in its development of AMOLED display products for many years. We have supplied, and intend to continue supplying, our proprietary PHOLED materials to Sony for evaluation and for potential commercial applications.

#### Sumitomo

In 2015, we entered into an OLED patent portfolio license agreement with Sumitomo in which the Company granted Sumitomo a non-exclusive, world-wide, royalty bearing license to make and sell OLED lighting panels using a solution based manufacturing process. The patent license extends for the term of our current patents and pending applications. The license includes a non-refundable license fee, and running royalties based on Sumitomo's future sales revenues of licensed products.

Tianma

In 2016, we entered into OLED patent license and material purchase agreements with Tianma granting it non-exclusive license rights under various patents owned by us to manufacture and sell OLED display products.

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## Our OLED Materials Supply Business

In support of our OLED licensing business, we supply our proprietary UniversalPHOLED® materials to display manufacturers and others. We qualify our materials in OLED devices before shipment in order to ensure that they meet required specifications. We believe that our inventory-carrying practices, along with the terms under which we sell our OLED materials (including payment terms), are typical for the markets in which we operate. In 2015, our OLED materials business received recertification in accordance with ISO 9001:2008 Quality Management Systems standards and guidelines.

## PPG Industries

We have maintained a close working relationship with PPG Industries since 2000. In 2011, we entered into an agreement with PPG Industries, the term of which continues through December 31, 2017 and shall be automatically renewed for additional one year terms, unless terminated by us with prior notice of one year or terminated by PPG Industries with prior notice of two years. Under that agreement, PPG Industries is responsible, under our direction, for manufacturing scale-up of our proprietary OLED materials, and for supplying us with those materials for research and development, and for resale to our customers, both for their evaluation and for use in commercial OLED products. Through our collaboration with PPG Industries, key raw materials are sourced from multiple suppliers to ensure that we are able to meet the needs of our customers on a timely basis. The raw materials we require for our emitter and host materials are available from multiple sources and historically, we have not had any issues with obtaining access to adequate amounts of any key raw materials.

We intend to invest \$15 million in 2017 in PPG Industries' Barberton, Ohio manufacturing facility, to double commercial production capacity for our UniversalPHOLED® phosphorescent emitter products. The expansion project is scheduled to be completed in the third quarter of 2017.

## Our OLED Material Customers

Throughout 2016, we continued supplying our proprietary UniversalPHOLED materials to SDC for use in its commercial AMOLED display products and for its development efforts. SDC is currently the largest manufacturer of AMOLED displays for handset and other personal electronic devices. SDC's customers for these products have included many well-known consumer electronics companies throughout the world.

In 2016, we also supplied our proprietary UniversalPHOLED materials to LG Display, BOE and Tianma for use in their commercial AMOLED display products, to Tohoku Pioneer for use in its commercial PMOLED display products, and to Konica Minolta for its manufacture of commercial OLED lighting products. During the year, we also supplied our proprietary OLED materials to these and various other product manufacturers for evaluation and for purposes of development, manufacturing qualification and product testing.

## Collaborations with Other OLED Material Manufacturers

We continued our non-exclusive collaborative relationships with other manufacturers of OLED materials during 2016. Most of these relationships are focused on matching our proprietary PHOLED emitters with the host and other OLED materials of these companies. We believe that collaborative relationships such as these are important for ensuring success of the OLED industry and broader adoption of our PHOLED and other OLED technologies.

## Research and Development

Our research and development activities are focused on the advancement of our OLED technologies and materials for displays, lighting and other applications. We conduct this research and development both internally and through various relationships with our commercial business partners and academic institutions. In the years 2016, 2015 and



2014, we incurred expenses of \$42.7 million, \$44.6 million and \$41.2 million, respectively, on both internal and third-party sponsored research and development activities with respect to our various OLED technologies and materials.

#### Internal Development Efforts

We conduct a substantial portion of our OLED development activities at our state-of-the-art development and testing facility in Ewing, New Jersey. At this expanded facility, which now exceeds 50,000 square feet, we perform technology development, including device and process optimization, prototype fabrication, manufacturing scale-up studies, process and product testing, characterization and reliability studies, and technology transfer with our business partners.

Our Ewing facility houses multiple OLED deposition systems, including a full-color flexible OLED system, a system for fabricating solution-processible OLEDs, and an OVJP organic vapor jet printing system. In addition, the facility contains equipment for substrate patterning, organic material deposition, display packaging, module assembly and extensive testing in Class 100 and 100,000 clean rooms and opto-electronic test laboratories. Our facility also includes state-of-the-art synthetic and analytical chemistry laboratories in which we conduct OLED materials research and make small quantities of new materials that we then test in OLED devices.

In 2016, we acquired Adesis, Inc. (Adesis) with operations in New Castle, Delaware. Adesis is a contract research organization (CRO) that provides support services to the OLED, pharma, biotech, catalysis and other industries. Adesis operates in a leased facility of over 25,000 square feet, and as of December 31, 2016, employed a team of 38 chemists. Prior to our acquisition, we utilized more than 50% of Adesis' technology service and production output. Although we expect to continue to utilize the majority of its technology research capacity for the benefit of our OLED technology development, Adesis is expected to continue operating as a CRO in the above mentioned industries.

As of December 31, 2016, we employed a team of 125 research scientists, engineers and laboratory technicians in our Ewing, N.J., New Castle, Del., and Hong Kong facilities. This team includes chemists, physicists, engineers and technicians with physics, electrical engineering, mechanical engineering and organic/inorganic chemistry backgrounds, and highly-trained theoreticians and experimentalists.

#### University Sponsored Research

We have long-standing relationships with Princeton University and USC, dating back to 1994, for the conduct of research relating to our OLED and other organic thin-film technologies and materials for applications such as displays and lighting. This research had been performed at Princeton under the direction of Professor Forrest and at USC under the direction of Professor Thompson. In 2006, Professor Forrest transferred to the University of Michigan, where we continue to fund his research.

We funded research at Princeton under a research agreement executed in 1997 (the 1997 Research Agreement). The 1997 Research Agreement was allowed to expire in 2007, after Professor Forrest transferred to Michigan. We have exclusive license rights to all OLED and other thin-film organic electronic patents (other than for organic photovoltaic solar cells) arising out of research conducted under that agreement.

In connection with Professor Forrest's transfer to Michigan, in 2006 we entered into a new sponsored research agreement with USC under which we are funding organic electronics research being conducted by Drs. Forrest and Thompson (the 2006 Research Agreement). Work by Professor Forrest is being funded through a subcontract between USC and Michigan. As with the 1997 Research Agreement, we have exclusive license rights to all OLED and thin-film organic electronic patents (other than for organic photovoltaic solar cells) arising out of this research.

Effective June 1, 2013, we amended the 2006 Research Agreement again to extend the term of the agreement for an additional four years. As of December 31, 2016, we are obligated to reimburse the universities for up to approximately \$1.6 million in actual costs to be incurred for research conducted under the remaining term of the agreement, which expires April 30, 2017.

In 2005, we entered into a separate sponsored research agreement with Princeton to fund research under the direction of Professor Sigurd Wagner on thin-film encapsulation and fabrication of OLED devices. This research was completed as of December 31, 2013. Like our other relationships with Princeton, we have exclusive license rights to all patents arising out of the research.

We entered into a contract research agreement with the Chitose Institute of Science and Technology of Japan (CIST) in 2004. Under that agreement, we funded a research program headed by Professor Chihaya Adachi relating to high-efficiency OLED materials and devices. We were granted exclusive rights to all intellectual property developed

under this program. Our relationship with CIST ended in 2006 when Professor Adachi transferred to Kyushu University. However, we have continued our relationship with Professor Adachi under a separate consulting arrangement.

In 2006 and 2007, we entered into one-year research agreements with Kyung Hee University to sponsor research programs on flexible, amorphous silicon thin-film transistor (TFT) backplane technology. The programs were directed by Professor Jin Jang. In 2008 and 2009, we entered into contract research agreements with Silicon Display Technology, Ltd. (SDT), a company founded by Professor Jang, and in 2013, we entered into another one-year agreement with SDT. We continue to maintain a good working relationship with Professor Jang.

## Aixtron

In 2000, we entered into a development and license agreement with Aixtron AG of Aachen, Germany to develop and commercialize equipment used in the manufacture of OLEDs using the OVPD process. Under this agreement, we granted Aixtron an exclusive license to produce and sell its equipment for the manufacture of OLEDs and other devices using our proprietary OVPD process. Aixtron is required to pay us royalties on its sales of this equipment. Purchasers of the equipment also must obtain rights to use our proprietary OVPD process to manufacture OLEDs and other devices using the equipment, which they may do through us or Aixtron. If these rights are granted through Aixtron, Aixtron is required to make additional payments to us under our agreement.

Aixtron has reported to us the delivery of nine OVPD systems since 2002. These include two second-generation systems, one of which was sold to the Fraunhofer Institute for Photonic Microsystems in Dresden, Germany in 2007, and the other of which was sold to RiTdisplay Corporation of Taiwan in 2003. We record royalty income from Aixtron's sales of these various systems in the quarters in which Aixtron notifies us of the sale and the related royalties are due.

## U.S. Government-Funded Research

We have entered into several U.S. government contracts and subcontracts to fund a portion of our efforts to develop next-generation OLED technologies. On contracts for which we were the prime contractor, we subcontract portions of the work to various entities and institutions. We also serve as a subcontractor under certain of our government contracts with PPG Industries. All of our government contracts and subcontracts are subject to termination at the election of the contracting governmental agency.

Our government-funded programs are concentrated primarily in two areas: flexible OLEDs and OLEDs for lighting. We have received support for our work on flexible OLED technology through various U.S. Department of Defense (DOD) agencies, including the Army Research Laboratory (ARL), the Air Force Research Laboratory (AFRL), the Army Communications-Electronics Research Development and Engineering Center (CERDEC) and the National Science Foundation (NSF). The U.S. Department of Energy (DOE) supports our work on white OLEDs for lighting, including through its Solid State Lighting (SSL) initiative. Several of our key U.S. government program initiatives in 2016 were as follows:

### Technology Development for OLED Lighting

During 2016, we continued working to develop technical approaches for using our proprietary PHOLED and other OLED technologies for high-efficiency white lighting applications. In 2016, we received funding from the DOE to work with Arizona State University and the University of Michigan.

### OLED Association

We are a charter member of the OLED Association (OLED-A). OLED-A is a trade association whose mission involves serving as an OLED information resource, driving OLED technology development, and promoting interest in OLED products. We are one of 18 members of OLED-A, and we actively participate on its marketing and technology committees. Mike Hack, our Vice President of Business Development, serves as a member of the Board of Directors of OLED-A.

### Next Generation Lighting Industry Alliance

We joined the Next Generation Lighting Industry Alliance (NGLIA) in 2009. NGLIA was formed in 2003 to foster industry-government partnership to accelerate the technical foundation, and ultimate commercialization, of solid state lighting systems. NGLIA was designated in 2005 as the "industry partner" by DOE for its SSL program. The SSL

program is being undertaken to research, develop and conduct demonstration activities on advanced solid state white lighting technologies based on LEDs and OLEDs. We are one of 15 members of NGLIA.

#### OLED Lighting Coalition

We are a founding member of the OLED Lighting Coalition, a subgroup of OLED-A and NGLIA. The OLED Lighting Coalition is a group of U.S. companies and advocates of OLED technology joined together to promote the OLED lighting industry to the government, public and the lighting community. Mr. Hack serves as a member of the Board of Directors of the OLED Lighting Coalition.

## Intellectual Property

Along with our personnel, our primary and most fundamental assets are patents and other intellectual property. This includes numerous U.S. and foreign patents and patent applications that we own, exclusively license or have the sole right to sublicense. It also includes a substantial body of non-patented technical know-how that we have accumulated over time.

### Our Patents

Our research and development activities, conducted both internally and through collaborative programs with our partners, have resulted in the filing of a substantial number of patent applications relating to our OLED technologies and materials. As of December 31, 2016, we owned, through assignment to us alone or jointly with others, 328 pending U.S. applications (active U.S. cases and international applications designated in the U.S.) and 740 U.S. patents, together with counterparts filed in various foreign countries. These owned patents will start expiring in the U.S. in 2020.

### Patents We License from Princeton, USC and Michigan

We exclusively license many of our patent rights, including certain of our key PHOLED technology patents, under the 1997 Amended License Agreement. In 2006, based on Professor Forrest's transfer to Michigan that year, Michigan was added as a party to this agreement. As of December 31, 2016, the patent rights we license from these universities included 220 issued U.S. patents, 41 pending U.S. patent applications, together with counterparts filed in various foreign countries. The earliest of these patents expired in the U.S. in 2014, while our key PHOLED technology patents licensed from these universities will start expiring in the U.S. in 2017.

Under the 1997 Amended License Agreement, Princeton, USC and Michigan granted us worldwide, exclusive license rights to specified patents and patent applications relating to OLED technologies and materials (including our PHOLED technology and materials). Our license rights also extend to any patent rights arising out of the research conducted by Princeton, USC or Michigan under our various research agreements with these entities. We are free to sublicense to third parties all or any portion of our patent rights under the 1997 Amended License Agreement. The term of the 1997 Amended License Agreement continues for the lifetime of the licensed patents, though it is subject to termination for an uncured material breach or default by us, or if we become bankrupt or insolvent.

Princeton is primarily responsible for the filing, prosecution and maintenance of all patent rights licensed to us under the 1997 Amended License Agreement pursuant to an inter-institutional agreement between Princeton, USC and Michigan. However, we manage this process and have the right to instruct patent counsel on specific matters to be covered in any patent applications filed by Princeton. We are required to bear all costs associated with the filing, prosecution and maintenance of these patent rights.

We are required under the 1997 Amended License Agreement to pay Princeton royalties for licensed products sold by us or our sublicensees. These royalties amount to 3% of the net sales price for licensed products sold by us and 3% of the revenues we receive for licensed products sold by our sublicensees. These royalty rates are subject to renegotiation for products not reasonably conceivable as arising out of the research agreements if Princeton reasonably determines that the royalty rates payable with respect to these products are not fair and competitive. Princeton shares portions of these royalties with USC and Michigan under their inter-institutional agreement.

We have a minimum royalty obligation of \$100,000 per year during the term of the 1997 Amended License Agreement. We owed royalties under the 1997 Amended License Agreement with Princeton of \$5.8 million for 2016. We also are required under the 1997 Amended License Agreement to use commercially reasonable efforts to bring the licensed OLED technology to market. However, this requirement is deemed satisfied if we invest a minimum of \$800,000 per year in research, development, commercialization or patenting efforts respecting the patent rights

licensed to us under the 1997 Amended License Agreement.

#### Patents We Acquired from Motorola

In 2000, we entered into a license agreement with Motorola whereby Motorola granted us perpetual license rights to what are now 74 issued U.S. patents relating to Motorola's OLED technologies, together with foreign counterparts in various countries. These patents expire in the U.S. through 2018.

In 2011, we purchased these patents from Motorola, including all existing and future claims and causes of action for any infringement of the patents. This effectively terminated our license agreement with Motorola, including any obligation to make royalty payments to Motorola. In consideration for Motorola assigning and transferring the patents to us, we made a one-time cash payment to Motorola of \$440,000, and we granted Motorola a royalty-free, non-exclusive and non-sublicensable license under the patents for use by Motorola and its affiliates in their respective businesses.

### Patents We Acquired from Fujifilm Corporation

In 2012, we entered into a Patent Sale Agreement (the Fujifilm Agreement) with Fujifilm. Under the Fujifilm Agreement, Fujifilm sold more than 1,200 OLED-related patents and patent applications for a total cost of \$109.5 million. The Fujifilm Agreement contains customary representations and warranties and covenants, including respective covenants not to sue by both parties thereto. The Fujifilm Agreement permitted us to assign all of our rights and obligations under the Fujifilm Agreement to our affiliates, and we assigned, prior to the consummation of the transactions contemplated by the Fujifilm Agreement, our rights and obligations to UDC Ireland Limited (UDC Ireland), a wholly-owned subsidiary formed under the laws of the Republic of Ireland. The transactions contemplated by the Fujifilm Agreement were consummated on July 26, 2012.

### Patents We Acquired from BASF

In 2016, our Irish subsidiary entered into an IP Transfer Agreement (the BASF Agreement) with BASF. Under the BASF Agreement, BASF sold us more than 500 OLED-related patents and patent applications for a total cost of \$96.0 million. The transactions contemplated by the BASF Agreement were consummated on June 28, 2016.

### Intellectual Property Developed under Our Government Contracts

We and our subcontractors have developed, and may continue to develop, patentable OLED technology inventions under our various U.S. government contracts and subcontracts. Under these arrangements, we or our subcontractors generally can elect to take title to any patents on these inventions, and to control the manner in which these patents are licensed to third parties. However, the U.S. government reserves rights to these inventions and associated technical data that could restrict our ability to market them to the government for military and other applications, or to third parties for commercial applications. In addition, if the U.S. government determines that we or our subcontractors have not taken effective steps to achieve practical application of these inventions in any field of use in a reasonable time, the government may require that we or our subcontractors license these inventions to third parties in that field of use.

### Non-patented Technical Know-How

We have accumulated, and continue to accumulate, a substantial amount of non-patented technical know-how relating to OLED technologies and materials. Where practicable, we share portions of this information with display manufacturers and other business partners on a confidential basis. We also employ various methods to protect this information from unauthorized use or disclosure, although no such methods can afford complete protection. Moreover, because we derive some of this information and know-how from academic institutions such as Princeton, USC and Michigan, there is an increased potential for public disclosure. We also cannot prevent the actual independent development of the same or similar information and know-how by third parties.

### Competition

The industry in which we operate is highly competitive. We compete against alternative display technologies, in particular LCDs, as well as other OLED technologies. We also compete in the lighting market against incumbent technologies, such as incandescent bulbs, fluorescent lamps, and inorganic LEDs, and against emerging technologies, such as other OLED technologies.

### Display Panel Industry Competitors

Numerous domestic and foreign companies have developed or are developing and improving LCD and other display technologies that compete with our OLED display technologies. We believe that OLED display technologies can compete with LCDs and other display technologies for many product applications on the basis of lower power consumption, better contrast ratios, faster video rates, form factor and lower manufacturing cost. However, other



companies may succeed in continuing to improve these competing display technologies, or in developing new display technologies, that are superior to OLED display technologies in various respects. We cannot predict the timing or extent to which such improvements or developments may occur.

#### Lighting Industry Competitors

Although there has been a movement to phase out traditional incandescent bulbs throughout many countries, traditional incandescent bulbs and fluorescent lamps remain well-entrenched products in the lighting industry. In addition, compact fluorescent lamps and solid-state LEDs have been introduced into the market and would compete with OLED lighting products. Having attributes different from fluorescent lamps and LEDs, OLEDs may compete directly with these products for certain lighting applications. However, manufacturers of LEDs and compact fluorescent lamps may succeed in more broadly adapting their products to various lighting applications, or others may develop competing solid-state lighting technologies that are superior to OLEDs. Again, we cannot predict whether or when this might occur.

## OLED Technology and Materials Competitors

Eastman Kodak Company (Kodak) developed and patented the original fluorescent OLED technology in 1987. Cambridge Display Technology, Ltd. (CDT), which was acquired by Sumitomo Chemical Company in 2007, developed and patented polymer OLED technology in 1989. Display and lighting manufacturers, including customers of ours, are engaged in their own OLED research, development and commercialization activities, and have developed and may continue to develop proprietary OLED technologies that are necessary or useful for commercial OLED devices. In addition, other material manufacturers, such as Sumitomo, Idemitsu Kosan Co., Ltd. (Idemitsu Kosan), Merck KGaA, Cynora GmbH and Kyulux Inc., are selling or sampling competing OLED materials to customers, including companies to which we sell our proprietary PHOLED materials.

Our licensing business is based on our control of a broad portfolio of OLED-related device patents and technology. We believe this portfolio includes fundamental patents in the field of phosphorescent OLED materials and devices, as well as certain additional complementary OLED technologies. As discussed above, alternative technologies, such as fluorescent OLED emitter materials, exist and could be competitive to our phosphorescent OLED material solutions. However, fluorescent materials have characteristics that we believe many market participants consider less desirable than those of phosphorescent materials. Suppliers of fluorescent emitter materials include Dow Chemical (previously Gracel Display), Doosan Electronics, SFC Co. Ltd. and Idemitsu Kosan. Fluorescent materials may also be viewed as complementary in that they can be used in the same OLED stack as phosphorescent materials, especially for use as emitters for generating deep blue pixels in display modules until such time as the OLED industry improves the properties of currently available deep blue phosphorescent materials.

The competitive landscape with respect to our host materials business is characterized by a larger number of established chemical material suppliers who have long-term relationships with many of our existing customers and licensees. We have elected to partner with certain of these companies to manufacture and deliver host solutions to our customers, as well as selling our host materials directly to device manufacturers. We believe our competitive advantage stems, in part, from our deep knowledge of our phosphorescent emitter materials, which are complementary with the host solutions. We believe that our understanding of the phosphorescent emitter materials enables us to create host material solutions that are especially well suited for use with a certain class of emitter materials that are implemented commercially today. However, we note that many of our technology partners have their own host solutions and the competitive landscape includes many well-established companies such as Dow Chemical, Idemitsu Kosan, NSCC, Doosan Electronics, Merck KGaA, Samsung SDI Co. Ltd. and Duksan, which have significant resources and may aggressively pursue such business in the future.

Our existing business relationships with SDC and other product manufacturers suggest that our OLED technologies and materials, particularly our PHOLED technologies and materials, may achieve a significant level of market penetration in the display and lighting industries. However, others, such as those working to develop thermally activated delayed fluorescence (TADF) and micro-LED alternative technologies, may succeed in developing new OLED technologies, materials and alternative solutions that may supplement or be utilized in place of ours. We cannot be sure of the extent to which product manufacturers will adopt and continue to utilize our OLED technologies and materials for the production of commercial displays and lighting products.

## Employees

As of December 31, 2016, we had 202 active full-time employees and one part-time employee, none of whom are unionized. We believe that relations with our employees are good.

## Our Company History

Our corporation was organized under the laws of the Commonwealth of Pennsylvania in 1985. Our business was commenced in 1994 by a company then known as Universal Display Corporation, which had been incorporated under

the laws of the State of New Jersey. In 1995, a wholly-owned subsidiary of ours merged into this New Jersey corporation. The surviving corporation in this merger became a wholly-owned subsidiary of ours and changed its name to UDC, Inc. Simultaneously with the consummation of this merger, we changed our name to Universal Display Corporation. UDC, Inc. functions as an operating subsidiary of ours and has certain overlapping officers and directors. We have also formed or acquired other wholly-owned subsidiaries, including Universal Display Corporation Hong Kong, Limited (2008), Universal Display Corporation Korea, Y.H. (2010), Universal Display Corporation Japan, GK (2011), UDC Ireland Limited (2012), Universal Display Corporation China, Ltd. (2016) and Adesis, Inc. (2016), and we established a representative office in Taiwan (2011).

#### Our Compliance with Environmental Protection Laws

We are not aware of any material effects that compliance with Federal, State or local environmental protection laws or regulations will have on our business. We have not incurred substantial costs to comply with any environmental protection laws or regulations, and we do not anticipate having to do so in the foreseeable future.

## Our Internet Site

Our Internet address is [www.oled.com](http://www.oled.com). We make available through our Internet website, free of charge, our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Securities Exchange Act of 1934 as soon as reasonably practicable after we file such material with the Securities and Exchange Commission (the SEC). In addition, we have made available on our Internet website under the heading "Corporate Governance" the charter for the Audit Committee of our Board of Directors, the charter for the Compensation Committee of our Board of Directors, the charter for the Nominating & Corporate Governance Committee of our Board of Directors, our Code of Ethics & Business Conduct for Employees, our Code of Conduct for Directors, and our Corporate Governance Guidelines. We intend to make available on our website any future amendments or waivers to our Code of Ethics & Business Conduct for Employees and our Code of Conduct for Directors. The information on our Internet site is not part of this report.

## ITEM 1A. RISK FACTORS

You should carefully consider the following risks and uncertainties when reading this Annual Report on Form 10-K. The following factors, as well as other factors affecting our operating results and financial condition, could cause our actual future results and financial condition to differ materially from those projected.

If we cannot obtain and maintain appropriate patent and other intellectual property protection for our OLED technologies and materials, our business will suffer.

The value of our OLED technologies and materials is dependent on our ability to secure and maintain appropriate patent and other intellectual property rights protection. Although we own or license many patents respecting our OLED technologies and materials that have already been issued, there can be no assurance that additional patents applied for will be obtained, or that any of these patents, once issued, will afford commercially significant protection for our OLED technologies and materials, or will be found valid if challenged. Also, there is no assurance that we will be successful in defending the validity of our current or future patents in pending and future patent oppositions, invalidation trials, interferences, reexaminations, reissues, or other administrative or court proceedings. Moreover, we have not obtained patent protection for some of our OLED technologies and materials in all foreign countries in which OLED products or materials might be manufactured or sold.

We believe that the strength of our current intellectual property position results primarily from the essential nature of our fundamental patents covering phosphorescent OLED devices and certain materials utilized in these devices. Our existing fundamental phosphorescent OLED patents expire in the United States in 2017 and 2019, and in other countries of the world in 2018 and 2020. While we hold a wide range of additional patents and patent applications whose expiration dates extend (and in the case of patent applications, will extend) beyond 2020, many of which are also of importance in the OLED industry, none are of an equally essential nature as our fundamental patents, and therefore our competitive position may be less certain as these patents expire.

We may become engaged in litigation to protect or enforce our patent and other intellectual property rights, or in International Trade Commission proceedings to abate the importation of goods that would compete unfairly with those of our licensees. In addition, we are participating in or have participated in, and in the future will likely have to participate in, interference, reissue, or reexamination proceedings before the U.S. Patent and Trademark Office, and opposition, nullity or other proceedings before foreign patent offices, with respect to some of our patents or patent applications. All of these actions place our patents and other intellectual property rights at risk and may result in substantial costs to us as well as a diversion of management attention from our business and operations. Moreover, if successful, these actions could result in the loss of patent or other intellectual property rights protection for the key OLED technologies and materials on which our business depends.

We rely, in part, on several non-patented proprietary technologies to operate our business. Others may independently develop the same or similar technologies or otherwise obtain access to our unpatented technologies. Furthermore,

these parties may obtain patent protection for such technology, inhibiting or preventing us from practicing the technology. To protect our trade secrets, know-how and other non-patented proprietary information, we require employees, consultants, financial advisors and strategic partners to enter into confidentiality agreements. These agreements may not ultimately provide meaningful protection for our trade secrets, know-how or other non-patented proprietary information. In particular, we may not be able to fully or adequately protect our proprietary information as we conduct discussions with potential strategic partners. Additionally, although we take many measures to prevent theft and misuse of our proprietary information, we may face attempts by others to gain unauthorized access through the Internet to our information technology systems or to our intellectual property, which might be the result of industrial or other espionage or actions by hackers seeking to harm our company or its products. If we are unable to protect the proprietary nature of our technologies, it will harm our business.

We or our licensees may incur substantial costs or lose important rights as a result of litigation or other proceedings relating to our patent and other intellectual property rights or with respect to our OLED materials business.

There are a number of other companies and organizations that have been issued patents and are filing patent applications relating to OLED technologies and materials, including, without limitation, Kodak (substantially all of whose OLED assets were sold to a group of LG companies in 2009), CDT (acquired by Sumitomo in 2007), Canon, Inc., Semiconductor Energy Laboratories Co., Idemitsu Kosan and Mitsubishi Chemical Corporation. As a result, there may be issued patents or pending patent applications of third parties that would be infringed by the use of our OLED technologies or materials, thus subjecting our licensees to possible suits for patent infringement in the future. Such lawsuits could result in our licensees being liable for damages or require our licensees to obtain additional licenses that could increase the cost of their products. This, in turn, could have an adverse effect on our licensees' sales and thus our royalties, or cause our licensees to seek to renegotiate our royalty rates. In addition, we have agreed to indemnify customers purchasing our OLED materials for commercial usage against certain claims of patent infringement by third parties, as a result of which we may incur substantial legal costs in connection with defending these customers from such claims.

Our licensees may also seek to avoid paying future royalties by attempting to have our patents declared invalid and unenforceable by a court. Our licensees may be more likely to file such declaratory actions in light of the U.S. Supreme Court's decision in *MedImmune, Inc. v. Genentech, Inc.* (2007), in which the Court found that a licensee need not refuse to pay royalties and commit material breach of the license agreement before bringing an action to declare a licensed U. S. patent invalid and unenforceable.

In addition, we may be required, from time-to-time, to assert our intellectual property rights by instituting legal proceedings against others. We cannot be assured that we will be successful in enforcing our patents in any lawsuits we may commence. Defendants in any litigation we may commence to enforce our patents may attempt to establish that our patents are invalid or are unenforceable. Thus, any patent litigation we commence could lead to a determination that one or more of our patents are invalid or unenforceable. If a third party succeeds in invalidating one or more of our patents, that party and others could compete more effectively against us. Our ability to derive licensing revenues from products or technologies covered by these patents would also be adversely affected.

Whether our licensees are defending the assertion of third-party intellectual property rights against their businesses arising as a result of the use of our technology, or we are asserting our own intellectual property rights against others, such litigation can be complex, costly, protracted and highly disruptive to our or our licensees' business operations by diverting the attention and energies of management and key technical personnel. As a result, the pendency or adverse outcome of any intellectual property litigation to which we or our licensees are subject could disrupt business operations, require the incurrence of substantial costs and subject us or our licensees to significant liabilities, each of which could severely harm our business. Costs associated with these actions are likely to increase as AMOLED products using our PHOLED and other OLED technologies and materials continue to enter the consumer marketplace.

Plaintiffs in intellectual property cases often seek injunctive relief in addition to money damages. Any intellectual property litigation commenced against our licensees may force them to take actions that could be harmful to their businesses and thus to our royalties, including the halting of sales of products that incorporate or otherwise use our technology or materials.

Furthermore, the measure of damages in intellectual property litigation can be complex, and is often subjective or uncertain. If our licensees were to be found liable for infringement of proprietary rights of a third party, the amount of damages they might have to pay could be substantial and is difficult to predict. Decreased sales of our licensees' products incorporating our technology or materials would have an adverse effect on our royalty revenues under existing licenses and material sales under our existing sales agreements. Were this to occur, it would likely harm our ability to (i) obtain new licensees which would have an adverse effect on the terms of the royalty arrangements we could enter into with any new licensees, and (ii) sell our UniversalPHOLED® materials to existing and new

customers. Moreover, to the extent any third party claims are directed specifically to materials supplied by us to our customers, we may be required to incur significant costs associated with the defense of such claims and potential damages associated with such claims that may be awarded against our customers.

As is commonplace in technology companies, we employ individuals who were previously employed at other technology companies. To the extent our employees are involved in research areas that are similar to those areas in which they were involved at their former employers, we may be subject to claims that such employees or we have, inadvertently or otherwise, used or disclosed the alleged trade secrets or other proprietary information of the former employers. Litigation may be necessary to defend against such claims. The costs associated with these actions or the loss of rights critical to our or our licensees' businesses could negatively impact our revenues or cause our business to fail.

Recent court decisions in various patent cases may make it more difficult for us to obtain future patents, enforce our patents against third parties or obtain favorable judgments in cases where the patents are enforced.

Recent case law may make it more difficult for patent holders to secure future patents and/or enforce existing patents. For example, in *KSR International Co. vs. Teleflex, Inc.* (2007), the U.S. Supreme Court mandated a more expansive and flexible approach to determine whether a patent is obvious and invalid. As a result of the less rigid approach to assessing obviousness, defending the validity of or obtaining patents may be more difficult.

Recent court decisions may also impact the enforcement of our patents. For example, we may not be able to enjoin certain third party uses of products or methods covered by our patents following the initial authorized sale, even where those uses are expressly proscribed in an agreement with the buyer. Also, we may face increased difficulty enjoining infringement of our patents. The U.S. Supreme Court has held that an injunction should not automatically issue based on a finding of patent infringement, but should be determined based on a test balancing considerations of the patentee's interest, the infringer's interest, and the public's interest. Obtaining enhanced damages for willful infringement of our patents may also be more difficult even in those cases where we successfully prove a third party has infringed our patents, as a recent case set a more stringent standard for proving willful infringement.

Therefore, as a result of such rulings, it may be more difficult for us to defend our currently issued patents, obtain additional patents in the future or achieve the desired competitive effect even when our patents are enforced. If we are unable to so defend our currently issued patents, or to obtain new patents for any reason, our business would suffer.

If we cannot form and maintain lasting business relationships with OLED product manufacturers, our business strategy will fail.

Our business strategy ultimately depends upon our development and maintenance of commercial licensing and material supply relationships with high-volume manufacturers of OLED products. We have entered into only a limited number of such relationships from which most of our material sales and licensing revenue are generated. Our other relationships with product manufacturers currently are limited to technology development and the evaluation of our OLED technologies and materials for possible use in commercial products. Some or all of these relationships may not succeed or, even if they are successful, may not result in the product manufacturers entering into commercial licensing and material supply relationships with us.

Many of our agreements with product manufacturers last for only limited periods of time, such that our relationships with these manufacturers will expire unless they are renewed. These product manufacturers may not agree to renew their relationships with us on a continuing basis or may agree to do so on terms that are less favorable to us. In addition, we regularly continue working with product manufacturers after our existing agreements with them have expired while we are attempting to negotiate contract extensions or new agreements with them. Should our relationships with the various product manufacturers not continue or be renewed on less favorable terms, or if we are not able to identify other product manufacturers and enter into contracts with them, our business may materially suffer.

Our ability to enter into additional commercial licensing and material supply relationships, or to maintain our existing relationships, may depend on our ability to make certain financial or other commitments. We might not be able, for financial or other reasons, to enter into or continue these relationships on commercially acceptable terms, or at all. Failure to do so may cause our business strategy to fail.

If we fail to make advances in our OLED research and development activities, we might not succeed in commercializing our OLED technologies and materials.

Further advances in our OLED technologies and materials depend, in part, on the success of the research and development work we conduct, both alone and with our research partners. We cannot be certain that this work will



yield additional advances in the research and development of these technologies and materials.

Our research and development efforts remain subject to all of the risks associated with the development of new products based on emerging and innovative technologies, including, without limitation, unanticipated technical or other problems and the possible insufficiency of funds for completing development of these products. Technical problems may result in delays and cause us to incur additional expenses that would increase our losses. If we cannot complete research and development of our OLED technologies and materials successfully, or if we experience delays in completing research and development of our OLED technologies and materials for use in potential commercial applications, particularly after incurring significant expenditures, our business may fail.

Conflicts or other problems may arise with our licensees or joint development partners, resulting in renegotiation, breach or termination of, or litigation related to, our agreements with them. This would adversely affect our revenues.

Conflicts or other problems could arise between us and our licensees or joint development partners, some of which we have made strategic investments in, as to royalty rates, milestone payments or other commercial terms. Similarly, we may disagree with our licensees or joint development partners as to which party owns or has the right to commercialize intellectual property that is developed during the course of the relationship or as to other non-commercial terms. If such a conflict were to arise, a licensee or joint development partner might attempt to compel renegotiation of certain terms of their agreement or terminate their agreement entirely, and we might lose the royalty revenues and other benefits of the agreement. Either we or the licensee or joint development partner might initiate litigation to determine commercial obligations, establish intellectual property rights or resolve other disputes under the agreement. Such litigation could be costly to us and require substantial attention of management. If we were unsuccessful in such litigation, we could lose the commercial benefits of the agreement, be liable for financial damages and suffer losses of intellectual property or other rights that are the subject of dispute.

If our OLED technologies and materials are not feasible for broad-based product applications, we may not be able to continue to generate revenues sufficient to support ongoing operations.

Our main business strategy is to license our OLED technologies and sell our OLED materials to manufacturers for incorporation into the display and lighting products that they sell. Consequently, our success depends on the ability and willingness of these manufacturers to develop, manufacture and sell commercial products integrating our technologies and materials.

Before product manufacturers will agree to expand the use of our OLED technologies and materials for wider scale commercial production, they will likely require us to demonstrate to their satisfaction that our OLED technologies and materials are feasible for broad-based product applications beyond current commercial application, such as smartphones, wearables and television displays. This, in turn, may require additional advances in our technologies and materials, as well as those of others, for applications in a number of areas, including, without limitation, advances with respect to the development of:

- OLED materials with improved lifetimes, efficiencies and color coordinates for larger area full-color OLED displays and general lighting products;
- more robust OLED materials for use in more demanding large-scale manufacturing environments; and
- scalable and cost-effective methods and technologies for the fabrication of large volume OLED materials and products.

We cannot be certain that these advances will occur, and hence our OLED technologies and materials may not be feasible for additional broad-based product applications and expansion.

Even if our OLED technologies are technically feasible, they may not be adopted by product manufacturers.

The potential size, timing and viability of market opportunities targeted by us are uncertain at this time. Market acceptance of our OLED technologies beyond current product offerings will depend, in part, upon these technologies providing benefits comparable or superior to current display and lighting technologies at an advantageous cost to manufacturers, and the adoption of products incorporating these technologies by consumers. Many current and potential licensees of our OLED technologies utilize and have invested significant resources in competing technologies, and may, therefore, be reluctant to redesign their products or manufacturing processes to incorporate our OLED technologies.

During the entire product development process for a new product, we face the risk that our technology will fail to meet the manufacturer's technical, performance or cost requirements or will be replaced by a competing product or alternative technology. Even if we offer technologies that are satisfactory to a product manufacturer, the manufacturer

may choose to delay or terminate its product development efforts for reasons unrelated to our technologies. In addition, our license agreements do not require our customers to purchase our host materials in order to utilize our phosphorescent emitter materials, and those customers may elect not to purchase our host materials.

Mass production of new mass market OLED products will require the availability of suitable manufacturing equipment, components and materials, many of which are available only from a limited number of suppliers. In addition, there may be a number of other technologies that manufacturers need to utilize in conjunction with our OLED technologies in order to bring these new OLED products to the market. Thus, even if our OLED technologies are a viable alternative to competing approaches, if product manufacturers are unable to obtain access to this equipment and these components, materials and other technologies, they may not utilize our OLED technologies.

There are numerous potential alternatives to OLEDs, which may limit our ability to commercialize our OLED technologies and materials.

The flat panel display market is currently, and will likely continue to be for some time, dominated by displays based on LCD technology. Numerous companies are making substantial investments in, and conducting research to improve characteristics of, LCDs; additionally, other competing flat panel display technologies have been, or are being, developed. A similar situation exists in the solid-state lighting market, which is currently dominated by LED products. Advances in any of these various technologies may overcome their current limitations and permit them to become the leading technologies in their field, either of which could limit the potential market for products utilizing our OLED technologies and materials. This, in turn, would cause product manufacturers to avoid entering into commercial relationships with us, or to terminate or not renew their existing relationships with us.

Other OLED technologies may be more successful or cost-effective than ours, which may limit the commercial adoption of our OLED technologies and materials.

Our competitors have developed and continue to develop OLED technologies that differ from or compete with our OLED technologies. In particular, competing fluorescent and thermally activated delayed fluorescence OLED technology may become a viable alternative to our phosphorescent OLED technology. Moreover, our competitors may succeed in developing new OLED technologies that may become more cost-effective or have fewer limitations than our OLED technologies. If our OLED technologies, and particularly our phosphorescent OLED technology, are unable to capture a substantial portion of the OLED product market, our business strategy may fail.

The consumer electronics industry experiences significant downturns from time to time, any of which may adversely affect the demand for and pricing of our OLED technologies and materials.

Our success depends upon the ability and continuing willingness of our licensees to manufacture and sell products utilizing our technologies and materials, specifically our phosphorescent emitters and host materials, and the widespread acceptance of our licensees' products in the consumer marketplace. Any slowdown in the demand for our licensees' products or a decrease in our licensees' use of or demand for our materials would adversely affect our material sales and royalty revenues and thus our business. Our licensees' decrease in the use of or demand for our materials may depend on several factors, including pricing, availability, continued technical improvements and competitive product offerings. The markets for flat panel displays and lighting products are highly competitive. Success in the market for end-user products that may integrate our OLED technologies and materials also depends on factors beyond the control of our licensees and us, including the cyclical and seasonal nature of the end-user markets that our licensees serve, as well as industry and general economic conditions.

The markets that we hope to penetrate have experienced significant periodic downturns, often in connection with, or in anticipation of, declines in general economic conditions. These downturns have been characterized by lower product demand, production overcapacity and erosion of average selling prices. Our business strategy is dependent on manufacturers building and selling products that incorporate our OLED technologies and materials. Industry-wide fluctuations and downturns in the demand for displays and solid-state lighting products could cause significant harm to our business.

Our customers may develop new or more efficient manufacturing processes, which may adversely affect demand for our OLED materials.

OLED device manufacturing is in its early stages. By developing enhanced material processing methods and more efficient manufacturing techniques, our customers who purchase our phosphorescent emitter and host materials could become more efficient in the utilization of our materials, which could limit or reduce the amount of materials they purchase from us. Thus, demand for our materials may not expand in proportion to the number of OLED related products manufactured by our customers, and may result in reduced demand for our materials and technology relative

to our customers' manufacture and sale of products made with such materials.

Any downturn in U.S. or global economic conditions may have a significant adverse effect on our business.

There have been significant and sustained economic downturns in the U.S. and globally in the past. These downturns have placed pressure on consumer demand, and the resulting impact on consumer spending has had a material adverse effect on the demand for consumer electronic products. Similar downturns in the future may have a significant adverse effect on one or more of our licensees as an enterprise, which could result in those licensees reducing their efforts to commercialize products that incorporate our OLED technologies and materials. Consumer demand and the condition of the display and lighting industries may also be impacted by other external factors such as war, terrorism, geopolitical uncertainties and other business interruptions. The impact of these external factors is difficult to predict, and one or more of these factors could adversely impact the demand for our licensees' products, and thus our business.

Many of our competitors have greater resources, which may make it difficult for us to compete successfully against them.

The flat panel display and solid-state lighting industries are characterized by intense competition. Many of our competitors have better name recognition and greater financial, technical, marketing, personnel and research capabilities than we do. Because of these differences, we may never be able to compete successfully in these markets or maintain any competitive advantages we are able to achieve over time.

If we cannot keep our key employees or hire other talented persons as we grow, our business might not succeed.

Our performance is substantially dependent on the continued services of our executive officers and other key technical and managerial personnel, and on our ability to offer competitive salaries and benefits to these and our other employees. We do not have employment agreements with any of our executive officers or other key technical or managerial personnel. Additionally, competition for highly skilled technical and managerial personnel is intense. We might not be able to attract, hire, train, retain and motivate the highly skilled employees we need to be successful. If we fail to attract and retain the necessary technical and managerial personnel, our business will suffer and might fail.

We rely solely on PPG Industries to manufacture the OLED materials we use and sell to product manufacturers.

Our business prospects depend significantly on our ability to obtain proprietary OLED materials for our own use and for sale to product manufacturers. Our agreement with PPG Industries provides us with a source for these materials for development, evaluation and commercial purposes. Our agreement with PPG Industries currently runs through the end of 2017 and shall be automatically renewed for additional one year terms, unless terminated by us with prior notice of one year or terminated by PPG with prior notice of two years. Our inability to continue obtaining these OLED materials from PPG Industries or another source at cost-competitive prices and to continue obtaining these OLED materials in sufficient quantities to meet our product manufacturers' current and future demands and timetables would have a material adverse effect on our revenues and cost of goods sold relating to sales of these materials to OLED product manufacturers, as well as on our ability to perform future development work.

We strive to maintain sufficient levels of inventory to accommodate our manufacturing customers. Inventory management relating to our material sales is complex, and excess inventory may harm our business and cause it to suffer.

Inventory management remains an area of focus as we balance the need to maintain strategic inventory levels of our OLED materials to ensure competitive lead times against the risk of inventory obsolescence because of rapidly changing technology and customer requirements. As a just-in-time supplier to our customers, we carry sufficient inventory to accommodate their capacity requirements, sometimes without firm purchase commitments. Our dependence on third-party manufacturers to provide our materials to us exposes us to longer lead times than if we were a direct manufacturer, increasing our risk of inventory obsolescence comparatively. Our customers may increase orders during periods of product shortages, cancel orders if their inventory is too high, or delay orders in anticipation of new products. They also may adjust their orders in response to the supply and demand of their products by end-users, or the supply and demand of our products and the products of our competitors that are available to them.

Inventory management risks are heightened when our largest customers launch new products and retire existing products. At such times, these customers tend to change product designs and may introduce some of our new materials into new designs. The production of these materials requires us to purchase essential raw material and commence manufacturing well in advance of receiving firm customer orders for such materials. Accordingly, we are subject to the risk of unanticipated changes in our customers' manufacturing plans and designs. Unanticipated product cessation and product introduction delays or cancellation may cause us to order or produce excess or insufficient inventory. Excess inventory of our OLED materials is subject to the risk of inventory obsolescence. In the event that a substantial portion of our inventory becomes obsolete, it could have a material adverse effect on earnings due to the resulting

costs associated with the inventory impairment charges and inventory write downs.

We are the sole source supplier for certain critical components used in OLED technologies, which subjects customers to risk if we are unable to meet the demand for such components.

Our customers depend on us as the sole source for certain critical components used in manufacturing OLED products, which makes them susceptible to supply shortages if we are unable to meet their demand for such components. A potential customer could be hesitant to adopt OLED technology given the risks inherent in depending on a sole source for critical components and the inability to establish alternate supply relationships. If we are unable to supply the components needed by our existing customers in a timely manner, or if potential customers do not utilize OLED technology because of concerns about our ability to meet supply demands, our business may materially suffer.

We may require additional funding in the future in order to continue our business.

Our capital requirements have been and will continue to be significant. We may require additional funding in the future for the research, development and commercialization of our OLED technologies and materials, to obtain and maintain patents and other intellectual property rights in these technologies and materials, and for working capital and other purposes, the timing and amount of which are difficult to ascertain. Our cash on hand may not be sufficient to meet all of our future needs. When we need additional funds, such funds may not be available on commercially reasonable terms or at all. If we cannot obtain more money when needed, our business might fail. Additionally, if we attempt to raise money in an offering of shares of our common stock, preferred stock, warrants or depositary shares, or if we engage in acquisitions involving the issuance of such securities, the issuance of these shares will dilute our then-existing shareholders.

Because the vast majority of OLED product manufacturers are located in the Asia-Pacific region, we are subject to international operational, financial, legal and political risks which may negatively impact our operations.

Many of our licensees and prospective licensees have a majority of their operations in countries other than the United States, particularly in the Asia-Pacific region. We also have offices in various countries located outside of the United States. Risks associated with our doing business outside of the United States include, without limitation:

- compliance with a wide variety of foreign laws and regulations, including certain registration requirements for the OLED materials we sell;
- legal uncertainties regarding taxes, tariffs, quotas, export controls, export licenses and other trade barriers;
- economic instability in the countries of our licensees, causing delays or reductions in orders for their products and therefore our royalties;
- political instability in the countries in which our licensees operate, particularly in South Korea relating to its disputes with North Korea and in Taiwan relating to its disputes with China;
- difficulties in collecting accounts receivable and longer accounts receivable payment cycles; and
- potentially adverse tax and tariff consequences.

Any of these factors could impair our ability to license our OLED technologies and sell our OLED materials, thereby harming our business. Compliance with changing laws and regulations may involve significant costs or require changes in business practice that could result in reduced profitability.

We rely on information technology systems to operate various elements of our business and a cyber-attack or other breach of our systems, or those of third parties on whom we may rely, could subject us to liability or interrupt the operation of our business.

We are dependent on information technology systems to operate various elements of our business. A breakdown, invasion, corruption, destruction or interruption of critical information technology systems by employees, others with authorized access to our systems or unauthorized persons could negatively impact operations. In the ordinary course of business, we collect, store and transmit important data and it is critical that we do so in a secure manner to maintain the confidentiality and integrity of such information. Additionally, we outsource certain elements of our information technology systems to third parties. As a result of this outsourcing, our third party vendors may or could have access to our confidential information making such systems vulnerable. Data breaches of our information technology systems, or those of our third party vendors, may pose a risk that sensitive data may be exposed to unauthorized persons or to the public. While we believe that we have taken appropriate security measures to protect our data and information technology systems, and have been informed by our third party vendors that they have as well, there can be no assurance that our efforts will prevent breakdowns or breaches in our systems, or those of our third party vendors, that could adversely affect our business.

The U.S. government has rights to intellectual property derived from our government-funded work that might prevent us from realizing the full benefits of our intellectual property portfolio.



The U.S. government, through various government agencies, has provided and continues to provide funding to us, Princeton, USC and Michigan for work related to certain aspects of our OLED technologies. Because we have been provided with this funding, the government has rights to any intellectual property derived from this work that could restrict our ability to market OLED products to the government for military and other applications, or to license this intellectual property to third parties for commercial applications. Moreover, if the government determines that we have not taken effective steps to achieve practical application of this intellectual property in any field of use in a reasonable time, the government could require us to license this intellectual property to other parties in that field of use. Any of these occurrences would limit our ability to obtain maximum value from our intellectual property portfolio.

The market price of our common stock may be highly volatile.

The market price of our common stock may be highly volatile, as has been the case with our common stock in the past as well as the securities of many companies, particularly other emerging-growth companies in the technology industry. We have included in the section of this report entitled “Market for Registrant’s Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities,” a table indicating the high and low closing prices of our common stock as reported on the NASDAQ Global Market for the past two years. Factors such as the following may have a significant impact on the market price of our common stock in the future:

- our revenues, expenses and operating results;
- announcements by us, by our customers, or our competitors of technological developments, new product applications or license arrangements;
- announcements relating to dividends and share repurchases; and
- other factors affecting the flat panel display and solid-state lighting industries in general.

Our operating results may have significant period-to-period fluctuations, which would make it difficult to predict our future performance.

Due to the current stage of commercialization of our OLED technologies and materials, the limited number of commercially successful consumer products utilizing our OLED technologies that licensees have introduced in the marketplace, the relatively short product lifetimes of these consumer products, and the significant development and manufacturing objectives that we and our licensees must achieve for the widespread inclusion of our OLED technologies in consumer products such as tablets, television displays and lighting products, our quarterly operating results are difficult to predict and may vary significantly from quarter to quarter.

We believe that period-to-period comparisons of our operating results are not a reliable indicator of our future performance at this time. Among other factors affecting our period-to-period results, our license and technology development fees often consist of large one-time, annual or semi-annual payments, which may result in significant fluctuations in our revenues. In addition, our reliance on a small number of licensees with large volumes of consumer product sales makes our quarterly operating results subject to our licensee's specific plans and the success of their specific product offerings.

With respect to material sales, our sales are primarily dependent on purchases made by a small number of customers. In addition to the other factors described above relating to our customers’ sales opportunities, our quarter-to-quarter sales may be materially impacted by our customers’ inventory management plans, which may vary substantially based on financial management considerations, changes in their product mix plans, modified material processing techniques and manufacturing line modifications.

If, in some future period, our operating results or business outlook fall below the expectations of securities analysts or investors, our stock price would be likely to decline and investors in our common stock may not be able to resell their shares at or above their purchase price. Broad market, industry and global economic factors may also materially reduce the market price of our common stock, regardless of our operating performance.

The issuance of additional shares of our common stock could drive down the price of our stock.

The price of our common stock could decrease if:

- shares of our common stock that are currently subject to restriction on sale become freely salable, whether through an effective registration statement or based on Rule 144 under the Securities Act of 1933, as amended; or
- we issue additional shares of our common stock that might be or become freely salable, including shares that would be issued upon conversion of our preferred stock or the exercise of outstanding stock options.

We can issue shares of preferred stock that may adversely affect the rights of shareholders of our common stock.

Our Articles of Incorporation authorize us to issue up to 5,000,000 shares of preferred stock with designations, rights and preferences determined from time-to-time by our Board of Directors. Accordingly, our Board of Directors is empowered, without shareholder approval, to issue preferred stock with dividend, liquidation, conversion, voting or other rights superior to those of shareholders of our common stock. For example, an issuance of shares of preferred stock could:

- adversely affect the voting power of the shareholders of our common stock;
- make it more difficult for a third party to gain control of us;

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- discourage bids for our common stock at a premium; or
- otherwise adversely affect the market price of our common stock.

As of February 23, 2017, we have issued and outstanding 200,000 shares of Series A Nonconvertible Preferred Stock, all of which are held by an entity controlled by members of the family of Sherwin I. Seligsohn, our Founder and Chairman of the Board of Directors. Our Board of Directors has authorized and issued other shares of preferred stock in the past, none of which are currently outstanding, and may do so again at any time in the future.

Any decisions to reduce or discontinue paying cash dividends to our shareholders could cause the market price for our common stock to decline.

Our Board of Directors recently declared the first cash dividend on our common stock, and we intend to pay regular quarterly dividends in the future. However, payment of future cash dividends will be at the discretion of our Board of Directors and will depend upon our results of operations, earnings, capital requirements, contractual restrictions and other factors deemed relevant by our Board of Directors. As such, we may modify, suspend or cancel our cash dividend policy in any manner and at any time. Any reduction or discontinuance by us of the payment of quarterly cash dividends could cause the market price of our common stock to decline. Moreover, in the event our payment of quarterly cash dividends are reduced or discontinued, our failure or inability to resume paying cash dividends at historical levels could cause the market price of our common stock to decline. There is no guarantee that our common stock will appreciate in value or even maintain the price at which current shareholders purchased their shares.

Our executive officers and directors own a significant percentage of our common stock and could exert significant influence over matters requiring shareholder approval, including takeover attempts.

Our executive officers and directors and their respective affiliates and the adult children of Sherwin Seligsohn, beneficially own, as of February 23, 2017, approximately 12.3% of the outstanding shares of our common stock. Accordingly, these individuals may, as a practical matter, be able to exert significant influence over matters requiring approval by our shareholders, including the election of directors and the approval of mergers or other business combinations. This concentration also could have the effect of delaying or preventing a change in control of us.

Natural disasters or other unforeseen catastrophic events could unfavorably affect our business.

Natural disasters, such as hurricanes, tsunamis, or earthquakes, particularly in Asia-Pacific region, where many of our licensees are located, or the occurrence of other unforeseen catastrophic events, such a fire or flood, could unfavorably affect our business and financial performance. Such events could unfavorably affect our licensees in many ways, such as causing physical damage to one or more of their properties, the temporary or permanent closure of one or more plants, the disruption or cessation of manufacturing of product lines, and the temporary or long-term disruption in the supply or demand for their products. A resulting by-product of such natural disasters or other unforeseen catastrophic events could be a temporary or long-term disruption in the supply of or demand for our products.

Our effective tax rate may increase or decrease.

We are subject to income taxes in the U.S. and numerous foreign jurisdictions. Significant judgment is required in determining our worldwide provision for income taxes. In the ordinary course of our business, there are many transactions and calculations where the ultimate tax determination is uncertain. We are subject to audit by tax authorities where we do business. Although we believe that our tax estimates and tax positions are reasonable, they could be materially affected by many factors including the final outcome of tax audits and related litigation, the introduction of new tax accounting standards, legislation, regulations, and related interpretations, our global mix of earnings and the realizability of deferred tax assets. An increase or decrease in our effective tax rate could have a material adverse impact on our financial condition and results of operations.

ITEM 1B. UNRESOLVED STAFF COMMENTS

None.

ITEM 2. PROPERTIES

Our corporate offices and research and development laboratories are located at 375 Phillips Boulevard in Ewing, New Jersey. In 2004, we acquired the building and property at which this facility is located. During 2005, we conducted a two-stage expansion of our laboratory and office space in the building, as well as a recent expansion in 2013 and 2015. We currently occupy the entire newly

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expanded facility. In 2016, we acquired Adesis which leases a facility of over 25,000 square feet located at 27 McCullough Drive in New Castle, Delaware.

### ITEM 3. LEGAL PROCEEDINGS

#### Patent Related Challenges and Oppositions

Each major jurisdiction in the world that issues patents provides both third parties and applicants an opportunity to seek a further review of an issued patent. The process for requesting and considering such reviews is specific to the jurisdiction that issued the patent in question, and generally does not provide for claims of monetary damages or a review of specific claims of infringement. The conclusions made by the reviewing administrative bodies tend to be appealable and generally are limited in scope and applicability to the specific claims and jurisdiction in question.

We believe that opposition proceedings are frequently commenced in the ordinary course of business by third parties who may believe that one or more claims in a patent do not comply with the technical or legal requirements of the specific jurisdiction in which the patent was issued. We view these proceedings as reflective of our goal of obtaining the broadest legally permissible patent coverage permitted in each jurisdiction. Once a proceeding is initiated, as a general matter, the issued patent continues to be presumed valid until the jurisdiction's applicable administrative body issues a final non-appealable decision. Depending on the jurisdiction, the outcome of these proceedings could include affirmation, denial or modification of some or all of the originally issued claims. We believe that as OLED technology becomes more established and as our patent portfolio increases in size, so will the number of these proceedings.

Below are summaries of certain active proceedings that have been commenced against issued patents that are either exclusively licensed to us or which are now assigned to us. We do not believe that the confirmation, loss or modification of our rights in any individual claim or set of claims that are the subject of the following legal proceedings would have a material impact on our materials sales or licensing business or on our consolidated financial statements, including our consolidated statements of income, as a whole. However, as noted within the descriptions, some of the following proceedings involve issued patents that relate to our fundamental phosphorescent OLED technologies and we intend to vigorously defend against claims that, in our opinion, seek to restrict or reduce the scope of the originally issued claim, which may require the expenditure of significant amounts of our resources. In certain circumstances, when permitted, we may also utilize the proceedings to request modification of the claims to better distinguish the patented invention from any newly identified prior art and/or improve the claim scope of the patent relative to commercially important categories of the invention. The entries marked with an "\*" relate to our UniversalPHOLED® phosphorescent OLED technology, some of which may be commercialized by us.

#### Opposition to European Patent No. 1394870\*

On April 20, 2010, Merck Patent GmbH; BASF Schweitz AG of Basel, Switzerland; Osram GmbH of Munich, Germany; Siemens Aktiengesellschaft of Munich, Germany; and Koninklijke Philips Electronics N.V., of Eindhoven, The Netherlands filed Notices of Opposition to European Patent No. 1394870 (the EP '870 patent). The EP '870 patent, which was issued on July 22, 2009, is a European counterpart patent, in part, to U.S. patents 6,303,238; 6,579,632; 6,872,477; 7,279,235; 7,279,237; 7,488,542; 7,563,519; and 7,901,795; and to pending U.S. patent application 13/035,051, filed on February 25, 2011 (hereinafter the "U.S. '238 Patent Family"). They are exclusively licensed to us by Princeton, and we are required to pay all legal costs and fees associated with this proceeding.

An Oral Hearing was held before an EPO panel of first instance in Munich, Germany on April 8-9, 2014. After the completion of the hearing, the panel decided that the broad claims originally issued did not satisfy EPO requirements and amended the claims to more narrowly define the scope of the claims. The '870 patent, in its amended form, was held by the panel to comply with the EPO requirements.

We believe the EPO's decision relating to the broad original claims is erroneous and have appealed the ruling to reinstate a broader set of claims. This patent, as originally granted by the EPO, is deemed valid during the pendency of

the appeals process.

At this time, based on our current knowledge, we believe that the patent being challenged should be declared valid and that all or a significant portion of our claims should be upheld. However, we cannot make any assurances of this result.

Invalidation Trial in Japan for Japan Patent No. 4511024\*

On June 16, 2011, we learned that a Request for an Invalidation Trial was filed in Japan by Semiconductor Energy Laboratory, Co., Ltd. for our Japanese Patent No. JP-4511024 (the JP '024 patent), which issued on May 14, 2010. The JP '024 patent is a counterpart patent, in part, to the U.S. '238 Patent Family, which relate to the EP '870 patent, which is subject to one of the above-

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noted European oppositions and which relates to our UniversalPHOLED® phosphorescent OLED technology. They are exclusively licensed to us by Princeton, and we are required to pay all legal costs and fees associated with this proceeding.

On May 10, 2012, we learned that the JPO issued a decision upholding the validity of certain claimed inventions in the JP '024 Patent but invalidating the broadest claims in the patent. We appealed the JPO's decision to the Japanese IP High Court. On October 31, 2013, the Japanese IP High Court ruled that the prior art references relied on by the JPO did not support the JPO's findings, reversed the JPO's decision with respect to the previously invalidated broad claims in the JP '024 patent and remanded the matter back to the JPO for further consideration consistent with its decision. The JPO subsequently issued a decision upholding the validity of certain claimed inventions in the JP '024 Patent but invalidating the broadest claims in the patent. We appealed the decision to reinstate a broader set of claims but the IP High Court declined to reinstate the broader claims. We appealed the IP High Court ruling to the Japanese Supreme Court for reconsideration of the legal basis of the IP High Court's decision. The Japanese Supreme Court maintained the lower court's decision and maintained the patent with respect to the narrower set of claims which were not the subject of the IP High Court's invalidation ruling.

#### Opposition to European Patent No. 1390962

On November 16, 2011, Osram AG and BASF SE each filed a Notice of Opposition to European Patent No. 1390962 (EP '962 patent), which relates to our white phosphorescent OLED technology. The EP '962 patent, which was issued on February 16, 2011, is a European counterpart patent to U.S. patents 7,009,338 and 7,285,907. They are exclusively licensed to us by Princeton, and we are required to pay all legal costs and fees associated with this proceeding.

The EPO combined the oppositions into a single opposition proceeding and a hearing was held in December 2015, wherein the EPO Opposition Division revoked the patent claims for alleged insufficiencies under EPC Article 83. We believe the EPO's decision relating to the original claims is erroneous, and we have appealed the decision. This patent, as originally granted, is deemed valid during the pendency of the appeals process.

At this time, based on our current knowledge, we believe that the patent being challenged should be declared valid, and that all or a significant portion of our claims should be upheld. However, we cannot make any assurances of this result.

#### Opposition to European Patent No. 1933395\*

On February 24 and 27, 2012, Sumitomo, Merck Patent GmbH and BASF SE filed oppositions to our European Patent No. 1933395 (the EP '395 patent). The EP '395 patent is a counterpart patent to the EP '637 patent, and, in part, to the U.S. Patents 7,001,536, 6,902,830 and 6,830,828 and to JP patents 4358168 and 4357781. This patent is exclusively licensed to us by Princeton, and we are required to pay all legal costs and fees associated with this proceeding.

At an Oral Hearing on October 14, 2013, the EPO panel issued a decision that affirmed the basic invention and broad patent coverage in the EP '395 patent, but narrowed the scope of the original claims.

On February 26, 2014, we appealed the ruling to reinstate a broader set of claims. The patent, as originally granted by the EPO, is deemed to be valid during the pendency of the appeals process. Two of the three opponents also filed their own appeals of the ruling. In January 2015, Sumitomo withdrew its opposition of the '395 patent, and the EPO accepted the withdrawal notice.

The appeal proceedings were held in the second quarter of 2016. As a result of the proceedings, the board concluded the oral proceedings and proposed to reinstate a broader set of claims pending the resolution of a remaining question of the applicable law, a question that the board has deferred to the Enlarged Board of Appeals for review. The originally-granted claims remain in force during the pendency of this process.



In addition to the above proceedings and now concluded proceedings which have been referenced in prior filings, from time to time, we may have other proceedings that are pending which relate to patents we acquired as part of the Fujifilm patent or BASF OLED patent acquisitions or which relate to technologies that are not currently widely utilized in the marketplace.

## EXECUTIVE OFFICERS OF THE REGISTRANT

The following table sets forth certain information with respect to our executive officers as of February 23, 2017:

Name	Age	Position
Sherwin I. Seligsohn	81	Founder and Chairman of the Board of Directors
Steven V. Abramson	65	President, Chief Executive Officer and Director
Sidney D. Rosenblatt	69	Executive Vice President, Chief Financial Officer, Treasurer, Secretary and Director
Julia J. Brown	55	Senior Vice President and Chief Technical Officer
Janice M. DuFour	59	Vice President of Technology Commercialization and General Manager, PHOLED Material Sales Business
Mauro Premutico	51	Vice President, Legal and General Manager, Patents and Licensing

Our Board of Directors has appointed these executive officers to hold office until their successors are duly appointed.

Sherwin I. Seligsohn is our Founder and has been the Chairman of our Board of Directors since June 1995. He also served as our Chief Executive Officer from June 1995 through December 2007, and as our President from June 1995 through May 1996. Mr. Seligsohn serves as the sole Director, President and Secretary of American Biomimetics Corporation, International Multi-Media Corporation, and Wireless Unified Network Systems Corporation. He was also previously the Chairman of the Board of Directors, President and Chief Executive Officer of NanoFlex Power Corporation (formally known as Global Photonic Energy Corporation) (NanoFlex) since its inception until April 2012, when he resigned from his positions at NanoFlex. Since that time, the only relationship Mr. Seligsohn has had with NanoFlex is as a shareholder and option holder. From June 1990 to October 1991, Mr. Seligsohn was Chairman Emeritus of InterDigital Communications, Inc. (InterDigital), formerly International Mobile Machines Corporation. He founded InterDigital and from August 1972 to June 1990 served as its Chairman of the Board of Directors. Mr. Seligsohn is a member of the Industrial Advisory Board of the Princeton Institute for the Science and Technology of Materials (PRISM) at Princeton.

Steven V. Abramson is our President and Chief Executive Officer, and has been a member of our Board of Directors since May 1996. Mr. Abramson served as our President and Chief Operating Officer from May 1996 through December 2007. From March 1992 to May 1996, Mr. Abramson was Vice President, General Counsel, Secretary and Treasurer of Roy F. Weston, Inc., a worldwide environmental consulting and engineering firm. From December 1982 to December 1991, Mr. Abramson held various positions at InterDigital, including General Counsel, Executive Vice President and General Manager of the Technology Licensing Division.

Sidney D. Rosenblatt is an Executive Vice President and has been our Chief Financial Officer, Treasurer and Secretary since June 1995. He also has been a member of our Board of Directors since May 1996. Mr. Rosenblatt was the owner of S. Zitner Company from August 1990 through August 2010 and served as its President from August 1990 through December 1998. From May 1982 to August 1990, Mr. Rosenblatt served as the Senior Vice President, Chief Financial Officer and Treasurer of InterDigital. Mr. Rosenblatt is on the Board of Managers of the Overbrook School for the Blind. He is also a member of the Board of the Careers in Culinary Arts Program.

Julia J. Brown, Ph.D. is a Senior Vice President and has been our Chief Technical Officer since June 2002. She joined us in June 1998 as our Vice President of Technology Development. From November 1991 to June 1998, Dr. Brown was a Research Department Manager at Hughes Research Laboratories where she directed the pilot line production of high-speed Indium Phosphide-based integrated circuits for insertion into advanced airborne radar and satellite communication systems. Dr. Brown received an M.S. and Ph.D. in Electrical Engineering/Electrophysics at USC

under the advisement of Professor Stephen R. Forrest. Dr. Brown has served as an Associate Editor of the Journal of Electronic Materials and as an elected member of the Electron Device Society Technical Board. She co-founded an international engineering mentoring program sponsored by the Institute of Electrical and Electronics Engineers (IEEE) and is a Fellow of the IEEE. Dr. Brown has served on numerous technical conference committees and is presently a member of the Society of Information Display.

Janice M. DuFour (formally Janice K. Mahon) has been our Vice President of Technology Commercialization since January 1997, and became the General Manager of our PHOLED Material Sales Business in January 2007. From 1992 to 1996, Ms. DuFour was Vice President of SAGE Electrochromics, Inc., a thin-film electrochromic technology company, where she oversaw a variety of business development, marketing and finance and administrative activities. From 1984 to 1989, Ms. DuFour was a Vice President and General Manager for Chronar Corporation, a leading developer and manufacturer of amorphous silicon photovoltaic (PV) panels. Prior to that, Ms. DuFour worked as Senior Engineer for the Industrial Chemicals Division of FMC Corporation. Ms. DuFour received her B.S. in Chemical Engineering from Rensselaer Polytechnic Institute in 1979, and an M.B.A. from Harvard University in 1984. Ms. DuFour was a member of the Technical Council of the FlexTech Alliance from 1997 through 2010, and a member of its Governing

Board from 2008 through 2010. Ms. DuFour was a member of the Board of Directors and Marketing Committee Chairperson of the OLED Association from 2009-2014.

Mauro Premutico has been our Vice President of Legal and General Manager of Patents and Licensing since April 2012. Prior to joining us, Mr. Premutico was the Managing Vice President and Chief Patent Counsel for The Walt Disney Company from 2009 to 2012, and Vice President of Intellectual Property and Associate General Counsel for Lenovo Group Ltd. from 2005 to 2009. Mr. Premutico was also Special Counsel at the international law firm of Cleary, Gottlieb, Steen & Hamilton from 2002 until 2005 where he served as the co-head of the New York's office Intellectual Property and Technology Law practice. Mr. Premutico received his law degree from Boston University School of Law and a BSEE from Worcester Polytechnic Institute.

ITEM 4. MINE SAFETY DISCLOSURES

Not applicable.

## PART II

## ITEM 5. MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES

## Our Common Stock

Our common stock is quoted on the NASDAQ Global Market under the symbol "OLED." The following table sets forth, for the periods indicated, the high and low closing prices of our common stock as reported on the NASDAQ Global Market.

	High Close	Low Close
2016		
Fourth Quarter	\$62.85	\$49.22
Third Quarter	73.82	55.26
Second Quarter	70.84	52.85
First Quarter	54.76	41.69
2015		
Fourth Quarter	\$56.02	\$33.01
Third Quarter	51.59	33.73
Second Quarter	55.29	44.07
First Quarter	47.23	25.98

As of February 23, 2017, there were approximately 276 holders of record of our common stock.

We recently declared the first cash dividend on our common stock. See Note 21 of the Notes to Consolidated Financial Statements. While we intend to pay regular quarterly dividends in the future, payment of future cash dividends will be at the discretion of our Board of Directors and will depend upon our results of operations, earnings, capital requirements, contractual restrictions and other factors deemed relevant by our Board of Directors. As such, we may modify, suspend or cancel our cash dividend policy in any manner and at any time.

## Share Repurchases

In June 2014, we announced that the Board of Directors had approved a program to repurchase up to \$50 million of the outstanding shares of our common stock from time to time over the next twelve months (the Repurchase Program). During the period, we repurchased 956,362 shares of common stock at a cost of \$29.5 million. The repurchase program ended during the second quarter of 2015.

During the quarter ended December 31, 2016, we acquired 582 shares of common stock through transactions related to the vesting of restricted share awards previously granted to employees of ours. Upon vesting, the employees turned in shares of common stock in amounts sufficient to pay the minimum statutory tax withholding at rates required by the relevant tax authorities.

The following table provides information relating to the shares we acquired during the fourth quarter of 2016 (dollar amounts in thousands, other than per share amounts):

Period	Total Number of Shares Purchased	Weighted Average Price Paid per Share	Purchased as Part of Publicly Announced Program	Approximate Dollar Value of Shares that May Yet Be Purchased Under the Program
October 1 – October 31	504	\$ 53.05	—	\$ —
November 1 – November 30	78	51.95	—	—
December 1 – December 31	—	—	—	—
Total	582	—	—	—

## Performance Graph

The performance graph below compares the change in the cumulative shareholder return of our common stock from December 31, 2011 to December 31, 2016, with the percentage change in the cumulative total return over the same period on (i) the Russell 2000 Index, and (ii) the Nasdaq Electronics Components Index. This performance graph assumes an initial investment of \$100 on December 31, 2011 in each of our common stock, the Russell 2000 Index and the Nasdaq Electronics Components Index.

	Cumulative Total Return					
	12/11	12/12	12/13	12/14	12/15	12/16
Universal Display Corp.	100.00	69.83	93.65	75.63	148.38	153.45
Russell 2000	100.00	116.35	161.52	169.43	161.95	196.45
NASDAQ Electronic Components	100.00	99.13	142.52	186.42	183.01	236.19

## Securities Authorized for Issuance under Equity Compensation Plans

The information required by this item with respect to our equity compensation plans will be set forth in our Proxy Statement, and is incorporated herein by reference.

## ITEM 6. SELECTED FINANCIAL DATA

The following selected consolidated financial data has been derived from, and should be read in conjunction with, our Consolidated Financial Statements and the notes thereto, and with “Management’s Discussion and Analysis of Financial Condition and Results of Operations,” included elsewhere in this report.

(in thousands, except share and per share data)

	Year Ended December 31,				
	2016	2015	2014	2013	2012
<b>Operating Results:</b>					
Total revenue	\$ 198,886	\$ 191,046	\$ 191,031	\$ 146,639	\$ 83,224
Cost of sales (1)	26,288	62,997	41,315	28,889	4,528
Research and development expense	42,744	44,641	41,154	34,215	30,032
Selling, general and administrative expense	32,876	29,046	28,135	24,745	19,550
Amortization of acquired technology and other intangible assets	16,493	10,999	10,997	10,973	4,868
Patent costs	6,249	5,717	6,291	6,300	8,517
Interest income, net	2,113	783	707	764	1,192
Income tax (expense) benefit (2)	(20,528 )	(18,381 )	(17,473 )	35,044	(5,208 )
Net income	48,070	14,678	41,854	74,052	9,660
Net income per common share, basic	\$ 1.02	\$ 0.31	\$ 0.90	\$ 1.61	\$ 0.21
Net income per common share, diluted	\$ 1.02	\$ 0.31	\$ 0.90	\$ 1.59	\$ 0.21
<b>Unaudited non-GAAP Measures:</b>					
Adjusted net income*	48,070	44,842	45,521	32,634	9,660
Adjusted net income per common share, basic*	\$ 1.02	\$ 0.96	\$ 0.98	\$ 0.71	\$ 0.21
Adjusted net income per common share, diluted*	\$ 1.02	\$ 0.94	\$ 0.98	\$ 0.70	\$ 0.21
<b>Balance Sheet Data:</b>					
Total assets	\$ 627,559	\$ 559,412	\$ 489,847	\$ 462,754	\$ 385,524
Current liabilities	40,206	34,510	26,823	23,229	22,299
Shareholders’ equity	528,468	466,765	448,742	427,686	350,235
<b>Other Financial Data:</b>					
Working capital	\$ 345,164	\$ 413,174	\$ 343,682	\$ 303,819	\$ 245,246
Capital expenditures	7,300	5,103	6,153	4,710	2,737
Purchase of intangibles	95,989	—	—	359	109,102
<b>Weighted average shares used in computing basic net</b>					
income per common share	46,408,460	46,816,394	46,252,960	45,898,019	45,951,276
<b>Weighted average shares used in computing diluted</b>					
net income per common share	46,535,980	47,494,188	46,685,145	46,543,605	46,883,602
Shares of common stock outstanding, end of period	48,270,990	48,132,223	47,061,826	46,423,667	46,355,535



- (1) During the second quarter of 2015, the Company experienced a faster-than-anticipated decline in host material sales, which we believe was a result of our customer's selling new products that did not include our host materials. Based on the most recent sales forecast, we determined that there were likely to be significantly lower sales of our existing host material. As such, a write-down in net realizable value of our inventory during the second quarter of 2015 was required.
- (2) During the year ended December 31, 2013, we released income tax valuation allowances of \$59.4 million.

\*The unaudited adjusted presentation is a non-GAAP measure which reflects our operating results excluding the impact of inventory write-downs for the years ended December 31, 2015 and 2014, as well as the release of certain income tax valuation allowances (including the impact of recording a deferred income tax provision subsequent to the release) for the year ended December 31, 2013. The adjusted presentation is intended to present our net income and net income per common share information for the years ended December 31, 2015 and 2014 as if the inventory write-down did not occur. For 2013, the adjusted presentation is intended to present our net income and net income per common share information for the year ended December 31, 2013 as if the income tax valuation allowances were not reversed, consistent with prior years. Refer to the reconciliation of non-GAAP measures below for more detail.

## Reconciliation of non-GAAP measures

The following table details our reconciliation of non-GAAP measures to the most directly comparable GAAP measures:

(in thousands, except per share data)	Year Ended December 31,					
	2016	2015	2014	2013	2012	
	(Unaudited)					
<b>Cost of commercial material sales reconciliation</b>						
Cost of commercial material sales	\$ 18,609	\$ 62,997	\$ 41,315	\$ 28,889	\$ 4,528	
<b>Cost of commercial material sales adjustments:</b>						
Inventory write-down	—	33,000	—	—	—	
Adjusted cost of commercial material sales	\$ 18,609	\$ 29,997	\$ 41,315	\$ 28,889	\$ 4,528	
<b>Cost of commercial material sales as a % of commercial</b>						
material sales	22	% 62	% 35	% 33	% 17	%
<b>Adjusted cost of commercial material sales as a % of</b>						
commercial material sales	22	% 30	% 35	% 33	% 17	%
<b>Operating income reconciliation</b>						
Operating income	\$ 68,413	\$ 32,276	\$ 58,620	\$ 38,244	\$ 13,716	
<b>Operating income adjustments:</b>						
Inventory write-down	—	33,000	3,918	—	—	
Adjusted operating income	\$ 68,413	\$ 65,276	\$ 62,538	\$ 38,244	\$ 13,716	
<b>Operating income as a % of total revenue</b>						
Adjusted operating income as a % of total revenue	34	% 17	% 31	% 26	% 16	%
<b>Net income reconciliation</b>						
Net income	\$ 48,070	\$ 14,678	\$ 41,854	\$ 74,052	\$ 9,660	
<b>Net income per share:</b>						
Basic	\$ 1.02	\$ 0.31	\$ 0.90	\$ 1.61	\$ 0.21	
Diluted	\$ 1.02	\$ 0.31	\$ 0.90	\$ 1.59	\$ 0.21	
<b>Net income adjustments:</b>						
Inventory write-down	—	33,000	3,918	—	—	
Income tax effect of inventory write-down	—	(2,836 )	(251 )	—	—	
Deferred income tax expense	—	—	—	17,934	—	
Release of income tax valuation write-down	—	—	—	(59,352 )	—	
Adjusted net income*	\$ 48,070	\$ 44,842	\$ 45,521	\$ 32,634	\$ 9,660	
<b>Net income as a % of total revenue</b>						
	24	% 8	% 22	% 50	% 12	%

Adjusted net income as a % of total revenue	24	% 23	% 24	% 22	% 12	%
Adjusted net income per share:						
Basic **	\$1.02	\$0.96	\$0.98	\$0.71	\$0.21	
Diluted ***	\$1.02	\$0.94	\$0.98	\$0.70	\$0.21	
Weighted average shares used in computing net income						
per share and adjusted net income per share:						
Basic	46,408,460	46,816,394	46,252,960	45,898,019	45,951,276	
Diluted	46,535,980	47,494,188	46,685,145	46,543,605	46,883,602	

\* Adjusted net income assumes an effective tax rate of 32% and 29% for the years ended December 31, 2015 and 2014, respectively and is based on excluding the impact of the inventory write down.

\*\* Adjusted net income per common share, basic, is derived from dividing adjusted net income by the number of weighted average shares used in computing basic net income per common share.

\*\*\* Adjusted net income per common share, diluted, for the year ended December 31, 2013, is derived from dividing adjusted net income by the weighted average shares of 46,582,347. The exclusion is intended to present our diluted net income per common share for the year ended December 31, 2013 as if our assessment of the future realizability of our deferred tax assets did not change and the income tax valuation allowances were not reversed, consistent with prior periods.

### Non-GAAP Measures

To supplement our selected financial data presented in accordance with U.S. generally accepted accounting principles (GAAP), we use certain non-GAAP measures. These non-GAAP measures include adjusted operating income, adjusted cost of material sales, adjusted net income, adjusted net income per common share, basic and adjusted net income per common share, diluted.

Each of these non-GAAP measures excludes the effect of the write-down of primarily existing host materials that were not included in our customer's new products as well as excluding the effect of the release of income tax valuation allowances. We have provided these non-GAAP measures, which we believe more accurately reflect the operating performance of our ongoing business, to enhance investors' overall understanding of our current financial performance and period-to-period comparisons. The presentation of non-GAAP measures is not intended to be considered in isolation or as a substitute for, or superior to, the financial information prepared and presented in accordance with GAAP.

## ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

The following discussion and analysis of our financial condition and results of operations should be read in conjunction with the section entitled "Selected Financial Data" in this report and our Consolidated Financial Statements and related notes to this report. This discussion and analysis contains forward-looking statements based on our current expectations, assumptions, estimates and projections. These forward-looking statements involve risks and uncertainties. Our actual results could differ materially from those indicated in these forward-looking statements as a result of certain factors, as more fully discussed in Item 1A of this report, entitled "Risk Factors."

### OVERVIEW

We are a leader in the research, development and commercialization of organic light emitting diode, or OLED, technologies and materials for use in displays for wearables, mobile phones, televisions, tablets, portable media devices, laptop computers, personal computers, and automotive interiors, as well as solid-state lighting applications. Since 1994, we have been exclusively engaged, and expect to continue to be primarily engaged, in funding and performing research and development activities relating to OLED technologies and materials, and commercializing these technologies and materials. We derive our revenue from the following:

- sales of OLED materials for evaluation, development and commercial manufacturing;
- intellectual property and technology licensing;
- contract research services; and
- technology development and support, including government contract work and support provided to third parties for commercialization of their OLED products.

Material sales relate to our sale of OLED materials for incorporation into our customers' commercial OLED products or for their OLED development and evaluation activities. Material sales are recognized at the time title passes, which is typically at the time of shipment or at time of delivery, depending upon the contractual agreement between the parties.

We receive license and royalty payments under certain commercial, development and technology evaluation agreements, some of which are non-refundable advances. These payments may include royalty and license fees made pursuant to license agreements and also license fees included as part of certain commercial supply agreements. For arrangements with extended payment terms, where the fee is not fixed or determinable, we recognize revenue when the payment is due and payable. Royalty revenue and license fees included as part of commercial supply agreements are recognized when earned and the amount is fixed and determinable.

Currently, our most significant commercial license agreement, which runs through the end of 2017, is with SDC and covers the manufacture and sale of specified OLED display products. Under this agreement, we are being paid a license fee, payable in semi-annual installments over the agreement term of 6.4 years. The installments, which are due in the second and fourth quarter of each year, increase on an annual basis over the term of the agreement. The agreement conveys to SDC the non-exclusive right to use certain of our intellectual property assets for a limited period of time that is less than the estimated life of the assets. Ratable recognition of revenue is impacted by the agreement's extended increasing payment terms in light of our limited history with similar agreements. As a result, revenue is recognized at the lesser of the proportional performance approach (ratable) and the amount of due and payable fees from SDC. Given the increasing contractual payment schedule, license fees under the agreement are recognized as revenue when they become due and payable, which is currently scheduled to be in the second and fourth quarter of each year.

At the same time we entered into the current patent license agreement with SDC, we also entered into a new supplemental material purchase agreement with SDC. Under the current supplemental material purchase agreement, SDC agrees to purchase from us a minimum dollar amount of phosphorescent emitter materials for use in the manufacture of licensed products. This minimum purchase commitment is subject to SDC's requirements for

phosphorescent emitter materials and our ability to meet these requirements over the term of the supplemental agreement. The minimum purchase amounts increase on an annual basis over the term of the supplemental agreement. These amounts were determined through negotiation based on a number of factors, including, without limitation, estimates of SDC's OLED business growth as a percentage of published OLED market forecasts and SDC's projected minimum usage of red and green phosphorescent emitter materials over the term of the agreement.

In 2015, we entered into an OLED patent license agreement and an OLED commercial supply agreement with LG Display Co., Ltd. (LG Display), which were effective as of January 1, 2015 and superseded the existing 2007 commercial supply agreement between the parties. The new agreements have a term that is set to expire by the end of 2022. The patent license agreement provides LG Display a non-exclusive, royalty bearing portfolio license to make and sell OLED displays under the Company's patent portfolio. The patent license calls for license fees, prepaid royalties and running royalties on licensed products. The agreements include customary provisions relating to warranties, indemnities, confidentiality, assignability and business terms. The agreements provide for

certain other minimum obligations relating to the volume of materials sales anticipated over the life of the agreements as well as minimum royalty revenue to be generated under the patent license agreement. The Company expects to generate revenue under these agreements that are predominantly tied to LG Display's sales of OLED licensed products. The OLED commercial supply agreement provides for the sales of materials for use by LG Display, which may include phosphorescent emitters and host materials.

In 2016, we entered into OLED patent license and material purchase agreements having five year durations with Tianma Micro-electronics Co. Ltd. (Tianma). Under the license agreement, we have granted Tianma non-exclusive license rights under various patents owned or controlled by us to manufacture and sell OLED display products. The license agreement calls for license fees and running royalties on licensed products. Additionally, we expect to supply phosphorescent OLED materials to Tianma for use in its licensed products.

In 2016, we entered into and consummated the transactions contemplated by an IP Transfer Agreement with BASF SE (BASF). Under the IP Transfer Agreement, BASF sold to us certain of its rights, title and interest to its owned and co-owned intellectual property rights relating to the composition, development, manufacture and use of OLED materials, including OLED lighting and display stack technology, as well as certain tangible assets. The intellectual property includes knowhow and more than 500 issued and pending patents in the area of phosphorescent materials and technologies.

In 2016, we entered into an agreement to acquire Adesis, Inc. (Adesis), a privately held contract research organization with 43 employees specializing in organic and organometallic synthetic research, development, and commercialization. Adesis is a technology vendor to companies in the pharmaceutical, fine chemical, biomaterials, and catalyst industries, and has worked with us over the last few years to help advance and accelerate a number of our product offerings. The transaction closed on July 11, 2016. Under the terms of the agreement, our subsidiary, UDC, Inc., acquired all outstanding shares of Adesis in a merger for \$33.7 million in cash, and up to an additional \$2.4 million in cash contingent upon Adesis' achievement of certain milestones within two years of acquisition. The acquisition was funded through use of existing cash and investments.

Contract research services is revenue earned by performing organic and organometallic synthetics research, development and commercialization on a contractual basis for our customers. We also generate technology development and support revenue earned from government contracts, development and technology evaluation agreements and commercialization assistance fees, which include reimbursements by government entities for all or a portion of the research and development costs we incur in relation to our government contracts. Revenues are recognized as services are performed, proportionally as research and development costs are incurred, or as defined milestones are achieved.

While we have made significant progress over the past few years developing and commercializing our family of OLED technologies (including our PHOLED, TOLED, FOLED technologies) and materials, and have generated net income over the past six years, we incurred significant losses prior to this period, resulting in an accumulated deficit of \$25.6 million as of December 31, 2016.

We anticipate fluctuations in our annual and quarterly results of operations due to uncertainty regarding, among other factors:

- the timing, cost and volume of sales of our OLED materials;
- the timing of our receipt of license fees and royalties, as well as fees for future technology development and evaluation;
- the timing and magnitude of expenditures we may incur in connection with our ongoing research and development and patent-related activities; and
- the timing and financial consequences of our formation of new business relationships and alliances.

Critical Accounting Policies and Estimates

The discussion and analysis of our financial condition and results of operations is based on our consolidated financial statements, which have been prepared in accordance with U.S. generally accepted accounting principles. The preparation of these financial statements requires us to make estimates and judgments that affect our reported assets and liabilities, revenues and expenses, and other financial information. Actual results may differ significantly from our estimates under other assumptions and conditions.

We believe that our accounting policies related to revenue recognition and deferred revenue, inventories, the valuation and recoverability of acquired technology, stock-based compensation, income taxes and our Supplemental Executive Retirement Plan, as described below, are our “critical accounting policies” as contemplated by the SEC. These policies, which have been reviewed with our Audit Committee, are discussed in greater detail below.



## Revenue Recognition and Deferred Revenue

Material sales relate to the Company's sale of its OLED materials for incorporation into its customers' commercial OLED products or for their OLED development and evaluation activities. Material sales are recognized at the time title passes, which is typically at time of shipment or at time of delivery, depending upon the contractual agreement between the parties.

We receive license and royalty payments under certain commercial, development and technology evaluation agreements with our customers, some of which payments are nonrefundable. These payments may include royalty and license fees made pursuant to license agreements and certain material supply agreements. Amounts received are deferred and classified as either current or non-current deferred revenue based upon current contractual remaining terms; however, based upon on-going relationships with customers, as well as future agreement extensions and other factors, amounts classified as current may not be recognized as revenue over the next twelve months. For arrangements with extended payment terms where the fee is not fixed and determinable, we recognize revenue when the payment is due and payable. Royalty revenue and license fee revenue included as part of commercial supply agreements are recognized when earned and the amount is fixed and determinable. If we used different estimates for the useful life of the licensed technology, or if fees are fixed and determinable, reported revenue during the relevant period would differ.

Contract research services revenue is revenue earned by performing organic and organometallic synthetics research, development and commercialization on a contractual basis. These services range from intermediates for structure-activity relationship studies, reference agents and building blocks for combinatorial synthesis, re-synthesis of key intermediates, specialty organic chemistry needs, and selective toll manufacturing. These services are provided to third-party pharmaceutical and life sciences firms and other technology firms at fixed costs or on an annual contract basis. Revenue is recognized as services are performed with billing schedules and payment terms negotiated on a contract-by-contract basis. Payments received in excess of revenue recognized are recorded as deferred revenue. In other cases, services may be provided and revenue is recognized before the client is invoiced. In these cases, revenue recognized will exceed amounts billed and the difference, representing amounts which are currently unbillable to the customer pursuant to contractual terms, is recorded as an unbilled receivable.

Technology development and support revenue is revenue earned from technology evaluation and development agreements, commercialization assistance fees, and government contracts which includes reimbursements by the U.S. government for all or a portion of the research and development expenses we incur on those contracts. Revenue is recognized proportionally as research and development expenses are incurred or as defined milestones are achieved. In order to ascertain the revenue associated with these contracts for a period, we estimate the proportion of related research and development expenses incurred and whether defined milestones have been achieved. Different estimates would result in different revenues for the period.

The Company records taxes billed to customers and remitted to various governmental entities on a gross basis in both revenues and cost of material sales in the consolidated statements of income. The amounts of these pass through taxes reflected in revenues and cost of material sales were \$171,000, \$1.3 million and \$4.3 million in the years ended December 31, 2016, 2015 and 2014, respectively.

## Inventories

Inventories consist of raw materials, work-in-process and finished goods, including inventory consigned to our customers, and are stated at the lower of cost, determined on a first-in, first-out basis, or market. Inventory valuation and firm committed purchase order assessments are performed on a quarterly basis and those items that are identified to be obsolete or in excess of forecasted usage are written down to their estimated realizable value. Estimates of realizable value are based upon management's analyses and assumptions, including, but not limited to, forecasted sales levels by product, expected product lifecycle, product development plans and future demand requirements. A

12-month rolling forecast based on factors, including, but not limited to, our production cycles, anticipated product orders, marketing forecasts, backlog, and shipment activities is used in the analysis. If market conditions are less favorable than our forecasts or actual demand from our customers is lower than our estimates, we may require additional inventory write-downs. If demand is higher than expected, inventories that had previously been written down may be sold.

Certain of the Company's customers have assumed the responsibility for maintaining our inventory at their location based on the customers' demand forecast. Notwithstanding the fact that the Company builds and ships the inventory, the customer does not purchase the consigned inventory until the inventory is drawn or pulled by the customer to be used in the manufacture of the customer's product. Though the consigned inventory may be at the customer's physical location, it remains inventory owned by the Company until the inventory is drawn or pulled, which is the time at which the sale takes place.

#### Valuation of Stock-Based Compensation

We recognize in the consolidated statement of income the grant-date fair value of equity-based compensation issued to employees and directors (see Notes 2 and 14 of the Notes to Consolidated Financial Statements). We also record an expense for

equity-based compensation grants to non-employees, in exchange for goods or services based on the fair value of the award, which is remeasured over the vesting period of such awards.

The performance unit awards we grant are subject to either a performance-based or market-based vesting requirement. For performance-based vesting, the grant-date fair value of the award, based on fair value of the Company's common stock, is recognized over the service period, based on an assessment of the likelihood that the applicable performance goals will be achieved, and compensation expense is periodically adjusted based on actual and expected performance. Compensation expense for performance unit awards with market-based vesting is calculated based on the estimated fair value as of the grant date utilizing a Monte Carlo simulation model and is recognized over the service period on a straight-line basis.

#### Accounting for Income Taxes

We are subject to income taxes in both the U.S. and foreign jurisdictions. Significant judgments and estimates are required in evaluating our tax positions for future realization and determining our provision for income taxes. Our income tax expense, deferred tax assets and liabilities, and reserves for unrecognized tax benefits reflect management's best assessment of estimated future taxes to be paid.

Our income tax expense during the year ended December 31, 2016 primarily related to federal taxes on our U.S. income and foreign withholding taxes. The foreign taxes were primarily related to foreign taxes withheld on royalty and license fees paid to the U.S. operating entity. SDC has been required to withhold tax upon payment of royalty and license fees to the U.S. operating entity at a rate of 16.5%. In assessing the realizability of deferred tax assets, we consider whether it is more likely than not that some portion or all of our deferred tax assets will not be realized. The ultimate realization of deferred tax assets is dependent on our ability to generate future taxable income to obtain benefit from the reversal of temporary differences, net operating loss carryforwards and tax credits. As part of our assessment we consider the scheduled reversal of deferred tax liabilities, projected future taxable income, and tax planning strategies. During the year ended December 31, 2016, based on previous earnings history, a current evaluation of expected future taxable income and other evidence, we determined to retain the valuation allowance that relates to UDC Ireland and New Jersey research and development credits and released the valuation allowance that related to U.S. foreign income tax credits.

Actual results could differ from our assessments if adequate taxable income is generated in future periods. To the extent we establish a new valuation allowance or change a previously established valuation allowance in a future period, income tax expense will be impacted. In addition, our ability to use our federal net operating loss carryforwards could be subject to limitation because of certain ownership changes. Net deferred tax assets totaled \$24.5 million, representing 3.9% of total assets, as of December 31, 2016.

#### Retirement Plan

We have recorded a significant retirement plan benefit liability that is developed from actuarial valuations. The determination of our retirement plan benefit liability requires key assumptions regarding discount rates, as well as rates of compensation increases, retirement dates and life expectancies used to determine the present value of future benefit payments. We determine these assumptions in consultation with, and after input from, our actuaries and considering our experience and expectations for the future. Actual results for a given period will often differ from assumed amounts because of economic and other factors.

The discount rate reflects the estimated rate at which the benefit liabilities could be settled at the end of the year. The discount rate is determined by selecting a single rate that produces a result equivalent to discounting expected benefit payments from the plan using the Citigroup Above-Median Pension Discount Curve (the Curve). Based upon this analysis using the Curve, we used a discount rate to measure our retirement plan benefit liability of 3.57% at December 31, 2016. A change of 25 basis points in the discount rate would increase or decrease the expense on an

annual basis by approximately \$62,000.

## RESULTS OF OPERATIONS

Year Ended December 31, 2016 Compared to Year Ended December 31, 2015

We had operating income of \$68.4 million for the year ended December 31, 2016, compared to operating income of \$32.3 million for the year ended December 31, 2015. The increase in operating income was primarily due to the following:

- an increase in revenue of \$7.8 million,
- a decrease in cost of sales of \$36.7 million, due to a \$33.0 million write-down of inventory that was recorded in 2015, as well as a reduction in host material sales which possess less favorable gross margins relative to emitter sales, and
- a decrease in research and development expenses of \$1.9 million, partially offset by

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an increase in selling, general and administrative expenses of \$3.8 million, and  
 an increase in amortization of acquired technology and other intangible assets of \$5.5 million associated with the acquisition of the BASF patents and the Adesis business acquisition.

We had net income of \$48.1 million (or \$1.02 per share, basic and diluted) for the year ended December 31, 2016, compared to net income of \$14.7 million (or \$0.31 per share, basic and diluted) for the year ended December 31, 2015. The \$33.1 million increase in net income was due to:

an increase in operating income of \$36.1 million, associated with the \$33.0 million write-down of inventory recorded in the prior year, partially offset by  
 a decrease in interest and other (expense) income, net of \$0.6 million, and  
 an increase in income tax expense of \$2.1 million.

For the year ended December 31, 2015, absent the inventory write-down and the associated \$2.8 million reduction of income tax expense, we had adjusted net income of \$44.8 million (or \$0.96 per share, basic and \$0.94 per share, diluted). See the discussion of non-GAAP measures in Item 6 (Selected Financial Data) of this report.

## Revenue

The following table details our revenues for the years ended December 31, 2016 and 2015 (amounts in thousands):

	Year Ended		(Decrease)	
	December 31,		Increase	
	2016	2015	\$	%
Material sales	\$99,285	\$113,066	\$(13,781)	(12)%
Royalty and license fees	96,132	77,773	18,359	24%
Contract research services	3,469	207	3,262	1576%
Total revenue	\$198,886	\$191,046	\$7,840	4%

Total revenue for the year ended December 31, 2016 increased by \$7.8 million compared to the year ended December 31, 2015. The increase in revenue was the result of an increase in royalty and license fees and contract research services revenue offset by a decrease in material sales.

## Material sales

The following table details our revenues derived from material sales for the years ended December 31, 2016 and 2015 (amounts in thousands):

	Year Ended		(Decrease)	
	December 31,		Increase	
	2016	2015	\$	%
Commercial material sales	\$85,081	\$101,141	\$(16,060)	(16)%
Developmental material sales	14,204	11,925	2,279	19%
Total material sales	\$99,285	\$113,066	\$(13,781)	(12)%

Commercial material sales for the year ended December 31, 2016 decreased by \$16.1 million compared to the year ended December 31, 2015, primarily due to a decline in host material grams sold and average selling price per gram

sold.

Developmental material sales for the year ended December 31, 2016 increased by \$2.3 million compared to the year ended December 31, 2015. The increase in development material sales was primarily due to an increase in the numbers of grams sold.

Material sales included sales of both phosphorescent emitter and host materials which were comprised of the following for the years ended December 31, 2016 and 2015 (amounts in thousands):

	Year Ended		Decrease	
	December 31, 2016	2015	\$	%
Phosphorescent emitter sales	\$97,894	\$100,571	\$(2,677 )	(3 )%
Host material sales	1,391	12,495	(11,104)	(89)%
Total material sales	\$99,285	\$113,066	\$(13,781)	(12)%

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Phosphorescent emitter sales for the year ended December 31, 2016 decreased by \$2.7 million compared to the year ended December 31, 2015. The decrease in emitter sales was primarily due to a decrease in average selling price per gram sold as customers purchased materials with lower selling prices per gram in 2016 compared to the prior year.

Host material sales for the year ended December 31, 2016 decreased by \$11.1 million compared to the year ended December 31, 2015. The decline in our host material sales was primarily due to a decrease in the number of grams sold due to what we believe was a result of our customer's continuing to sell new products that do not include our host materials. Based on our current sales forecast, we anticipate that sales of existing host material will continue at these reduced levels. Our customers are not required to purchase our host materials in order to utilize our phosphorescent emitter materials, and the host material sales business continues to be more competitive than the phosphorescent emitter material sales business.

#### Royalty and license fees

Royalty and license fees were as follows for the years ended December 31, 2016 and 2015 (amounts in thousands):

	Year Ended		Increase	
	December 31,		\$	%
	2016	2015		
Royalty and license fees	\$96,132	\$77,773	\$18,359	24%

Royalty and license fees for the year ended December 31, 2016 increased by \$18.4 million compared to the year ended December 31, 2015. The increase reflects the receipt and therefore recognition of \$75.0 million of royalty and license fee payments under our patent and license agreement with SDC, compared to \$60.0 million in the prior period.

#### Contract research services

Contract research services revenue was as follows for the years ended December 31, 2016 and 2015 (amounts in thousands):

	Year Ended		Increase	
	December 31,		\$	%
	2016	2015		
Contract research services	\$3,469	\$207	\$3,262	1576%

Contract research services include revenue earned by our subsidiary, Adesis, which performs organic and organometallic synthetics research, development and commercialization on a contractual basis for our customers. Contract research services also include technology development and support revenue earned from government contracts, development and technology evaluation agreements and commercialization assistance fees, which includes reimbursements by the U.S. government for all or a portion of the research and development expenses we incur related to our government contracts.

Contract research services revenue for the year ended December 31, 2016 increased by \$3.3 million compared to the year ended December 31, 2015. The increase in revenue was solely related to activities associated with contract research services of Adesis, which was acquired in July 2016. See Note 3 to the Notes to Consolidated Financial Statements for further discussion.

Cost of sales

Cost of sales, which includes the cost of commercial and development product sales and contract research services, was \$26.3 million for the year ended December 31, 2016, compared to \$63.0 million for the year ended December 31, 2015.

Cost of commercial material sales were as follows for the years ended December 31, 2016 and 2015 (amounts in thousands):

	Year Ended		Decrease	
	2016	2015	\$	%
Commercial material sales	\$85,081	\$101,141	\$(16,060)	(16)%
Cost of commercial material sales	18,609	62,997	(44,388)	(70)%
Inventory write-down	—	33,000		
% of commercial material sales	22	% 62		%

Cost of commercial material sales for the year ended December 31, 2016 decreased by \$44.4 million compared to the year ended December 31, 2015. The decrease was primarily due to an inventory write-down of \$33.0 million, as well as a decrease in commercial material sales. Adjusted cost of commercial material sales, eliminating the impact of the write-down, would have been



\$30.0 million for the year ended December 31, 2015, and the cost of commercial material sales as a percent of commercial material sales would have been 30% for the year ended December 31, 2015. See the discussion of non-GAAP measures in Item 6 (Selected Financial Data) of this report. The increase in commercial sales margin absent the write-down was due to the decrease in host material sales, which have less favorable margins than our emitter materials. Depending on the amounts, timing and state of materials being classified as commercial, we expect cost of materials sales to fluctuate year over year.

Cost of commercial material sales includes the cost of producing materials that have been classified as commercial and shipping costs for such materials, but excludes the cost of producing certain materials, which have already been included in research and development expense.

#### Research and development

We incurred research and development expenses of \$42.7 million for the year ended December 31, 2016, compared to \$44.6 million for the year ended December 31, 2015. The decrease was due to:

- a decrease in consulting and laboratory related costs of \$3.6 million from lower outsourced research and development efforts; partially offset by
- an increase in salaries and benefits, and other operating expenses of \$1.7 million.

#### Selling, general and administrative

Selling, general and administrative expenses were \$32.9 million for the year ended December 31, 2016, compared to \$29.0 million for the year ended December 31, 2015. The increase in selling, general and administrative expenses was primarily due to incremental costs associated with Adesis activity.

#### Amortization of acquired technology and other intangible assets

Amortization of acquired technology and other intangible assets increased to \$16.5 million for the year ended December 31, 2016, compared to \$11.0 million for the year ended December 31, 2015. The increase in amortization relates to a \$4.9 million increase in amortization of acquired technology associated with the acquisition of the BASF patents and \$0.6 million of amortization of other intangible assets associated with the Adesis business acquisition. See Note 8 in Notes to Consolidated Financial Statements for further discussion.

#### Patent costs

Patent costs increased to \$6.2 million for the year ended December 31, 2016, compared to \$5.7 million for the year ended December 31, 2015, primarily due to increased activities associated with the acquisition of the BASF patents.

#### Royalty and license expense

Royalty and license expense increased to \$5.8 million for the year ended December 31, 2016, compared to \$5.4 million for the year ended December 31, 2015. The increase was mainly due to increased royalty expense incurred under our amended license agreement with Princeton, USC, and Michigan, resulting from higher material sales and increased royalty and license fees. See Note 10 in Notes to Consolidated Financial Statements for further discussion.

#### Interest and other (expense) income, net

Interest income, net, increased to \$2.1 million for the year ended December 31, 2016, compared to \$0.8 million for the year ended December 31, 2015. The increase was primarily due to higher interest rates on cash equivalents and investment balances. Other expense was \$1.9 million for the year ended December 31, 2016 and primarily consisted of exchange losses on foreign currency associated with the BASF OLED patent acquisition.

Income tax expense

We recorded income tax expense of \$20.5 million for the year ended December 31, 2016 compared to income tax expense of \$18.4 million for the year ended December 31, 2015.

Our income tax expense for the years ended December 31, 2016 and 2015 primarily related to foreign withholding taxes and federal taxes on our U.S. income.

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The foreign taxes are primarily related to foreign taxes withheld on royalty and license fees paid to the U.S. operating entity. SDC has been required to withhold tax upon payment of royalty and license fees to the U.S. operating entity at a rate of 16.5%. During the years ended December 31, 2016 and 2015, we paid South Korean withholding taxes of \$12.4 million and \$9.9 million, respectively.

#### Year Ended December 31, 2015 Compared to Year Ended December 31, 2014

We had operating income of \$32.3 million for the year ended December 31, 2015, compared to operating income of \$58.6 million for the year ended December 31, 2014. The decrease in operating income was due to the following:

- an increase in cost of sales of \$21.7 million, which includes a \$33.0 million write-down of inventory. Adjusted operating income, eliminating the impact of the write-down, would have been \$65.3 million, an increase of \$2.7 million. See the discussion of non-GAAP measures in Item 6 (Selected Financial Data) of this report.

- selling, general and administrative expenses increased by \$0.9 million and research and development expenses increased by \$3.5 million, all of which are described below.

We had net income of \$14.7 million (or \$0.31 per basic and diluted share) for the year ended December 31, 2015, compared to net income of \$41.9 million (or \$0.90 per basic and diluted share) for the year ended December 31, 2014. The decrease in net income was primarily due to:

- a decrease in operating income of \$26.3 million, primarily due to the \$33.0 million write-down of inventory; and
- an increase in income tax expense of \$0.9 million.

Excluding the inventory write-down in the second quarter of 2015 and its related impact on our effective tax rate, we had non-GAAP net income of \$44.8 million (or \$0.96 per non-GAAP basic and \$0.94 per non-GAAP diluted share) for the year ended December 31, 2015. See the discussion of non-GAAP measures in Item 6 (Selected Financial Data) of this report.

#### Revenue

The following table details our revenues for the years ended December 31, 2015 and 2014 (amounts in thousands):

	Year Ended		(Decrease)	
	2015	2014	Increase	
			\$	%
Material sales	\$113,066	\$126,885	\$(13,819)	(11)%
Royalty and license fees	77,773	63,192	14,581	23 %
Contract research services	207	954	(747 )	(78)%
Total revenue	\$191,046	\$191,031	\$15	0 %

Total revenue for the year ended December 31, 2015 increased by \$15,000 compared to the year ended December 31, 2014. The increase in revenue was primarily the result of an increase in royalty and license fees offset by a decrease in material sales.

#### Material sales

The following table details our revenue derived from material sales for the years ended December 31, 2015 and 2014 (amounts in thousands):

	Year Ended		(Decrease)	
	December 31,		Increase	
	2015	2014	\$	%
Commercial material sales	\$101,141	\$117,499	\$(16,358)	(14)%
Developmental material sales	11,925	9,386	2,539	27%
Total material sales	\$113,066	\$126,885	\$(13,819)	(11)%

Commercial material sales for the year ended December 31, 2015 decreased by \$16.4 million compared to the year ended December 31, 2014, primarily due to lower host sales of \$28.8 million, offset, to some extent, by a \$15.0 million increase in phosphorescent emitter sales, described in more detail below.

Developmental material sales for the year ended December 31, 2015 increased by \$2.5 million compared to the year ended December 31, 2014. The increase in our development material sales was primarily due to an increase in the numbers of grams sold.

Material sales included sales of both phosphorescent emitter and host materials which were comprised of the following for the years ended December 31, 2015 and 2014 (amounts in thousands):

	Year Ended		Increase	
	December 31,		(Decrease)	
	2015	2014	\$	%
Phosphorescent emitter sales	\$100,571	\$85,559	\$15,012	18 %
Host material sales	12,495	41,326	(28,831)	(70)%
Total material sales	\$113,066	\$126,885	\$(13,819)	(11)%

Phosphorescent emitter sales for the year ended December 31, 2015 increased by \$15.0 million compared to the year ended December 31, 2014. The increase in emitter sales was primarily due to an increase in the number of grams sold, offset, to some extent, by a decrease in the average price per gram sold.

Host material sales for the year ended December 31, 2015 decreased by \$28.8 million compared to the year ended December 31, 2014. The decline in our host material sales was primarily due to a decrease in the number of grams sold due to what we believe was a result of our customer's continuing to sell new products that do not include our host materials, as well as a reduction in the average price per gram sold. Our customers are not required to purchase our host materials in order to utilize our phosphorescent emitter materials, and the host material sales business continues to be more competitive than the phosphorescent emitter material sales business.

#### Royalty and license fees

Royalty and license fees were as follows for the years ended December 31, 2015 and 2014 (amounts in thousands):

	Year Ended		Increase	
	December 31,			
	2015	2014	\$	%
Royalty and license fees	\$77,773	\$63,192	\$14,581	23 %

Royalty and license fees for the year ended December 31, 2015 increased by \$14.6 million compared to the year ended December 31, 2014. The increase reflects the receipt and therefore recognition of \$60.0 million of royalty and license fee payments under our patent and license agreement with SDC, compared to \$50.0 million in the prior period.

#### Contract research services

Contract research services revenue was as follows for the years ended December 31, 2015 and 2014 (amounts in thousands):

	Year Ended		Increase	
	December 31,			
	2015	2014	\$	%
Contract research services	\$207	\$954	\$(747)	(78)%

Contract research services for the years ended December 31, 2015 and 2014 consisted of technology development and support revenue earned from government contracts, development and technology evaluation agreements and commercialization assistance fees, which includes reimbursements by the U.S. government for all or a portion of the research and development expenses we incur related to our government contracts. Technology development and support revenue for the year ended December 31, 2015 decreased by \$0.7 million compared to the year ended December 31, 2014 primarily due to a smaller number of government contracts. We do not anticipate technology development and support to be a significant revenue stream in the future.

Cost of material sales

Cost of commercial material sales were as follows for the years ended December 31, 2015 and 2014 (amounts in thousands):

	Year Ended		Decrease	
	December 31, 2015	2014	\$	%
Commercial material sales	\$101,141	\$117,499	\$(16,358)	(14)%
Cost of commercial material sales	62,997	41,315	21,682	52 %
% of commercial material sales	62	% 35	%	

Cost of commercial material sales for the year ended December 31, 2015 increased by \$21.7 million compared to the year ended December 31, 2014. The increase in the cost of our commercial material sales was primarily due to an inventory write-down of \$33.0 million, offset to some extent by a decrease in commercial material sales. During the second quarter of 2015, the Company experienced a faster-than-anticipated decline in host material sales and based on the most recent sales forecasts, we determined that there were likely to be significantly lower sales of our existing host material. As such, a write-down in net realizable value of our inventory was performed in the second quarter. Adjusted cost of commercial material sales, eliminating the impact of the write-down, would have been \$30.0 million for the year ended December 31, 2015, and the cost of commercial material sales as a percent of commercial material sales would have been 30% for the year ended December 31, 2015. See the discussion of non-GAAP measures in Item 6 (Selected Financial Data) of this report. The increase in commercial sales margin absent the write-down was due to the decrease in host material sales, which have less favorable margins than our emitter materials. Depending on the amounts, timing and state of materials being classified as commercial, we expect cost of materials sales to fluctuate year over year.

Cost of commercial material sales includes the cost of producing materials that have been classified as commercial and shipping costs for such materials, but excludes the cost of producing certain materials, which have already been included in research and development expense.

#### Research and development

We incurred research and development expenses of \$44.6 million for the year ended December 31, 2015, compared to \$41.2 million for the year ended December 31, 2014. The increase was primarily due to:

- increased costs of \$1.2 million associated with bonus, retirement benefits, and stock-based compensation for certain employees as well as increased salaries and salary related expenses associated with new and existing employees; and
- increased consulting and lab related costs of \$2.9 million due to increased outsourced research and development efforts.

#### Selling, general and administrative

Selling, general and administrative expenses were \$29.0 million for the year ended December 31, 2015, compared to \$28.1 million for the year ended December 31, 2014. The increase was primarily due to increased costs associated with bonus, retirement benefits, and stock-based compensation for certain executive officers, and increased salaries and salary-related expenses associated with new and existing employees.

#### Amortization of acquired technology and other intangible assets

Amortization of acquired technology and other intangible assets was \$11.0 million for both years ended December 31, 2015 and 2014 and related to amortization of acquired technology associated with the acquisition of the Fujifilm and Motorola patents. See Note 8 in Notes to Consolidated Financial Statements for further discussion.

#### Patent costs

Patent costs decreased to \$5.7 million for the year ended December 31, 2015, compared to \$6.3 million for the year ended December 31, 2014.

#### Royalty and license expense

Royalty and license expense increased to \$5.4 million for the year ended December 31, 2015, compared to \$4.5 million for the year ended December 31, 2014. The increase was mainly due to increased royalties incurred under our amended license agreement with Princeton, USC, and Michigan, resulting from higher material sales and increased royalty and license fees. See Note 10 in Notes to Consolidated Financial Statements for further discussion.

Income taxes

We recorded income tax expense of \$18.4 million for the year ended December 31, 2015 compared to income tax expense of \$17.5 million for the year ended December 31, 2014.

Our income tax expense for the years ended December 31, 2015 and 2014 primarily related to foreign withholding taxes and federal taxes on our U.S. income.

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The foreign taxes are primarily related to foreign taxes withheld on royalty and license fees paid to the U.S. operating entity. SDC has been required to withhold tax upon payment of royalty and license fees to the U.S. operating entity at a rate of 16.5%. During the years ended December 31, 2015 and 2014, we paid South Korean withholding taxes of \$9.9 million and \$8.3 million, respectively.

### Liquidity and Capital Resources

Our principle sources of liquidity are our cash and cash equivalents and our short-term investments. As of December 31, 2016, we had cash and cash equivalents of \$139.4 million and short-term investments of \$188.6 million, for a total of \$328.0 million. This compares to cash and cash equivalents of \$97.5 million and short-term investments of \$298.0 million, for a total of \$395.5 million, as of December 31, 2015 reflecting a reduction in total liquidity of \$67.5 million. The increase in cash and cash equivalents of \$41.9 million was due to cash provided by operating activities, partially offset by cash used in investing activities and financing activities.

Cash provided by operating activities was \$80.3 million for the year ended December 31, 2016, compared to \$113.6 million for the year ended December 31, 2015 or a decrease of \$33.3 million. The decrease in cash provided by operating activities was primarily due to the following:

- the receipt of \$48.8 million from customers for prepaid royalty and license fees recognized as deferred revenue in the prior year as compared to \$3.4 million in the year ended December 31, 2016; partially offset by
- an increase of net income including adjustments to reconcile net income to net cash provided by operating activities of \$2.5 million, and
- an increase in cash due to changes in net working capital balances excluding cash and equivalents and deferred revenue of \$9.7 million.

Cash used in investing activities was \$38.5 million for the year ended December 31, 2016, compared to \$58.6 million for the year ended December 31, 2015. The decrease in cash used in investing activities was due to the timing of maturities and purchases of investments resulting in net sales of \$98.2 million for the year ended December 31, 2016, compared to net purchases of \$53.5 million for the year ended December 31, 2015, partially offset by the addition of intangible assets associated with the BASF OLED patent acquisition of \$96.0 million and the Adesis business acquisition, net of cash acquired, of \$33.4 million, and an increase in purchases of property and equipment of \$2.2 million.

Cash used in financing activities was \$14,000 for the year ended December 31, 2016, compared to cash used of \$2.9 million for the year ended December 31, 2015. The decrease in cash used in financing activities was primarily due to \$4.2 million in excess tax benefits from share-based payment arrangements for the year ended December 31, 2016, partially offset by a reduction of \$1.8 million in proceeds from the exercise of common stock options.

Working capital was \$345.2 million as of December 31, 2016, compared to \$413.2 million as of December 31, 2015. The decrease in working capital was due to the decrease in short-term investments used to fund the BASF patent acquisition and the Adesis business acquisition, and increase in accounts payable and accrued expenses partially offset by the increase in cash and cash equivalents, inventory and accounts receivable.

We anticipate, based on our internal forecasts and assumptions relating to our operations (including, among others, assumptions regarding our working capital requirements, the progress of our research and development efforts, the availability of sources of funding for our research and development work, and the timing and costs associated with the preparation, filing, prosecution, maintenance, defense and enforcement of our patents and patent applications), that we have sufficient cash, cash equivalents and short-term investments to meet our obligations for at least the next twelve months.

We believe that potential additional financing sources for us include long-term and short-term borrowings, public and private sales of our equity and debt securities and the receipt of cash upon the exercise of outstanding stock options. It

should be noted, however, that additional funding may be required in the future for research, development and commercialization of our OLED technologies and materials, to obtain, maintain and enforce patents respecting these technologies and materials, and for working capital and other purposes, the timing and amount of which are difficult to ascertain. There can be no assurance that additional funds will be available to us when needed, on commercially reasonable terms or at all, particularly in the current economic environment.

## Contractual Obligations

As of December 31, 2016, we had the following contractual commitments:

Contractual Obligations	Payments due by period (in thousands)				
	Total	Less			More
		than	1-3	3-5	than 5
		1 year	years	years	years
Estimated retirement plan benefit payments	\$48,544	\$—	\$3,159	\$4,834	\$40,551
Lease obligations	1,020	319	519	182	—
Purchasing obligations	5,003	5,003	—	—	—
Research related obligations	1,872	1,872	—	—	—
Minimum royalty obligation (1)	500	100	200	200	\$100/year
Total (2)	\$56,939	\$7,294	\$3,878	\$5,216	\$40,551

(1) Under the 1997 Amended License Agreement, we are obligated to pay Princeton minimum royalties of \$100,000 per year until the agreement is no longer in effect. The agreement has no scheduled expiration date.

(2) See Note 16 to the Consolidated Financial Statements for discussion of obligations upon termination of employment of executive officers as a result of a change in our control.

## Off-Balance Sheet Arrangements

As of December 31, 2016, we had no off-balance sheet arrangements in the nature of guarantee contracts, retained or contingent interests in assets transferred to unconsolidated entities (or similar arrangements serving as credit, liquidity or market risk support to unconsolidated entities for any such assets), or obligations (including contingent obligations) arising out of variable interests in unconsolidated entities providing financing, liquidity, market risk or credit risk support to us, or that engage in leasing, hedging or research and development services with us.

## Recently Issued Accounting Pronouncements

Recently issued accounting pronouncements are addressed in Note 2 in the Notes to Consolidated Financial Statements.

## ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

We do not utilize financial instruments for trading purposes and hold no derivative financial instruments, other financial instruments or derivative commodity instruments that could expose us to significant market risk other than our investments disclosed in “Fair Value Measurements” in Note 5 to the Consolidated Financial Statements included herein. We generally invest in investment grade financial instruments to reduce our exposure related to investments. Our primary market risk exposure with regard to such financial instruments is to changes in interest rates, which would impact interest income earned on investments. However, based upon the conservative nature of our investment portfolio and current experience, we do not believe a decrease in investment yields would have a material negative effect on our interest income.

Substantially all our revenue is derived from outside of North America. All revenue is primarily denominated in U.S. dollars and therefore we bear no significant foreign exchange risk.

ITEM 8. FINANCIAL STATEMENTS AND  
SUPPLEMENTARY DATA

Our Consolidated Financial Statements and the related notes to those statements are attached to this report beginning on page F-1.

ITEM 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND  
FINANCIAL DISCLOSURE

None.

ITEM 9A. CONTROLS AND PROCEDURES

Evaluation of Disclosure Controls and Procedures

Our management, with the participation of our Chief Executive Officer and Chief Financial Officer, evaluated the effectiveness of our disclosure controls and procedures as of December 31, 2016. Based on that evaluation, the Chief Executive Officer and Chief Financial Officer concluded that our disclosure controls and procedures, as of the end of the period covered by this report, are

effective to provide reasonable assurance that the information required to be disclosed by us in reports filed or submitted under the Securities Exchange Act of 1934, as amended, is (i) recorded, processed, summarized and reported within the time periods specified in the SEC's rules and forms, and (ii) accumulated and communicated to our management, including the Chief Executive Officer and Chief Financial Officer, as appropriate to allow timely decisions regarding disclosure. However, a controls system, no matter how well designed and operated, cannot provide absolute assurance that the objectives of the controls system are met, and no evaluation of controls can provide absolute assurance that all control issues and instances of fraud, if any, within a company have been detected.

Management's Report on Internal Control over Financial Reporting and Report of Independent Registered Public Accounting Firm on Internal Control over Financial Reporting

The report of management on our internal control over financial reporting and the associated attestation report of our independent registered public accounting firm are set forth in Item 8 of this report.

Changes in Internal Control over Financial Reporting

There were no changes in our internal control over financial reporting during the quarter ended December 31, 2016 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

ITEM 9B. OTHER INFORMATION

None.

PART III

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE

Information with respect to this item is set forth in our definitive Proxy Statement for the 2017 Annual Meeting of Shareholders, which is to be filed with the Securities and Exchange Commission no later than May 1, 2017 (our “Proxy Statement”), and which is incorporated herein by reference. Information regarding our executive officers is included at the end of Part I of this report.

ITEM 11. EXECUTIVE  
COMPENSATION

Information with respect to this item will be set forth in our Proxy Statement, and is incorporated herein by reference.

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND  
RELATED STOCKHOLDER MATTERS

Information with respect to this item will be set forth in our Proxy Statement, and is incorporated herein by reference.

ITEM 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE

Information with respect to this item will be set forth in our Proxy Statement, and is incorporated herein by reference.

ITEM 14. PRINCIPAL ACCOUNTANT FEES AND SERVICES

Information with respect to this item will be set forth in our Proxy Statement, and is incorporated herein by reference.

## PART IV

## ITEM 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES

(a) The following documents are filed as part of this report:

(1) Financial Statements:

<u>Management's Report on Internal Control Over Financial Reporting</u>	F-2
<u>Reports of Independent Registered Public Accounting Firm</u>	F-3
<u>Consolidated Balance Sheets</u>	F-5
<u>Consolidated Statements of Income</u>	F-6
<u>Consolidated Statements of Comprehensive Income</u>	F-7
<u>Consolidated Statements of Shareholders' Equity</u>	F-8
<u>Consolidated Statements of Cash Flows</u>	F-9
<u>Notes to Consolidated Financial Statements</u>	F-10

(2) Financial Statement Schedules:

None.

(3) Exhibits:

The following is a list of the exhibits filed as part of this report. Where so indicated by footnote, exhibits that were previously filed are incorporated by reference. For exhibits incorporated by reference, the location of the exhibit in the previous filing is indicated parenthetically, together with a reference to the filing indicated by footnote.

Exhibit Number	Description
3.1	Amended and Restated Articles of Incorporation of the registrant (1)
3.2	Amended and Restated Bylaws of the registrant (2)
10.1#	Amended and Restated Change in Control Agreement between the registrant and Sherwin I. Seligsohn, dated as of November 4, 2008 (3)
10.2#	Amended and Restated Change in Control Agreement between the registrant and Steven V. Abramson, dated as of November 4, 2008 (3)
10.3#	Amended and Restated Change in Control Agreement between the registrant and Sidney D. Rosenblatt, dated as of November 4, 2008 (3)
10.4#	Amended and Restated Change in Control Agreement between the registrant and Julia J. Brown, dated as of November 4, 2008 (3)
10.5#	Amended and Restated Change in Control Agreement between the registrant and Janice M. DuFour, dated as of November 4, 2008 (3)
10.6#	Non-Competition and Non-Solicitation Agreement between the registrant and Sherwin I. Seligsohn, dated as of February 23, 2007 (5)
10.7#	Non-Competition and Non-Solicitation Agreement between the registrant and Steven V. Abramson, dated as of January 26, 2007 (5)
10.8#	Non-Competition and Non-Solicitation Agreement between the registrant and Sidney D. Rosenblatt, dated as of February 7, 2007 (5)

- 10.9# Non-Competition and Non-Solicitation Agreement between the registrant and Julia J. Brown, dated as of February 5, 2007 (5)
- 10.10# Non-Competition and Non-Solicitation Agreement between the registrant and Janice M. DuFour, dated as of February 23, 2007 (3)
- 10.11# Equity Retention Agreement between the registrant and Steven V. Abramson, dated as of March 18, 2010 (6)
- 10.12# Equity Retention Agreement between the registrant and Sidney D. Rosenblatt, dated as of March 18, 2010 (6)
- 10.13# Equity Retention Agreement between the registrant and Julia J. Brown, dated as of January 6, 2011 (7)
- 10.14# Equity Retention Agreement between the registrant and Janice M. DuFour, dated as of January 6, 2011 (7)
- 10.15# Equity Retention Agreement between the registrant and Julia J. Brown, dated as of March 8, 2012 (8)
- 10.16# Equity Retention Agreement between the registrant and Janice M. DuFour, dated as of March 8, 2012 (8)
- 10.17# Amended and Restated Change in Control Agreement between the Registrant and Mauro Premutico, dated April 16, 2012 (9)
- 10.22# Equity Retention Agreement between the Registrant and Mauro Premutico, dated April 16, 2012 (9)
- 10.19# Supplemental Executive Retirement Plan, dated as of April 1, 2010 (6)
- 10.20# Amended and Restated Equity Compensation Plan, effective as of March 7, 2013 (10)

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Exhibit Number	Description
10.21	Sponsored Research Agreement between the registrant and the University of Southern California, dated as of May 1, 2006 (11)
10.22	Amendment No. 1 to the Sponsored Research Agreement between the registrant and the University of Southern California, dated as of May 1, 2006 (3)
10.23	Amendment No. 2 to the Sponsored Research Agreement between the registrant and the University of Southern California, dated as of May 7, 2009 (12)
10.24	1997 Amended License Agreement among the registrant, The Trustees of Princeton University and the University of Southern California, dated as of October 9, 1997 (13)
10.25	Amendment #1 to the Amended License Agreement among the registrant, the Trustees of Princeton University and the University of Southern California, dated as of August 7, 2003 (14)
10.26	Amendment #2 to the Amended License Agreement among the registrant, the Trustees of Princeton University, the University of Southern California and the Regents of the University of Michigan, dated as of January 1, 2006 (14)
10.27	Termination, Amendment and License Agreement by and among the registrant, PD-LD, Inc., Dr. Vladimir S. Ban, and The Trustees of Princeton University, dated as of July 19, 2000 (15)
10.28	Letter of Clarification of UDC/GPEC Research and License Arrangements between the registrant and Global Photonic Energy Corporation, dated as of June 4, 2004 (5)
10.29+	Amended and Restated OLED Materials Supply and Service Agreement between the registrant and PPG Industries, Inc., dated as of October 1, 2011 (16)
10.30+	OLED Patent License Agreement between the registrant and Samsung Mobile Display Co., Ltd., dated as of August 22, 2011 (17)
10.31+	Supplemental OLED Material Purchase Agreement between the registrant and Samsung Mobile Display Co., Ltd., dated as of August 22, 2011 (17)
10.32+	Settlement and License Agreement between the registrant and Seiko Epson Corporation, dated as of July 31, 2006 (18)
10.33+	Amendment No. 1 to the Settlement and License Agreement between the registrant and Seiko Epson Corporation, dated as of March 30, 2009 (19)
10.33+	OLED Technology License Agreement between the registrant and Konica Minolta Holdings, Inc., dated as of August 11, 2008 (20)
10.34+	Limited-Term OLED Technology License Agreement between the registrant and Panasonic Idemitsu OLED Lighting Co., Ltd., dated as of August 23, 2011 (16)
10.35+	OLED Technology License Agreement between the registrant and Pioneer Corporation, dated as of September 27, 2011 (22)
10.36+	OLED Technology License Agreement between the registrant and Lumiotec, Inc., dated as of January 5, 2012 (8)
10.37+	Patent Sale Agreement, dated as of July 23, 2012 by and between FUJIFILM Corporation and the Company. (23)
10.38	Amendment No. 3 to the Sponsored Research Agreement between the registrant and the University of Southern California, dated as of June 1, 2013 (24).
10.39#	Universal Display Corporation Annual Incentive Plan (25)
10.40#	Form Agreement - Restricted Stock Unit Grant Letter (26)
10.41#	Form Agreement - Performance Unit Grant Letter (26)
10.42#	Universal Display Corporation Equity Compensation Plan (27)
10.43#	Amendment 2015-1, dated March 3, 2015, to Universal Display Corporation Supplemental Executive Retirement Plan (28)
10.44#	Equity Retention Agreement between the Registrant and Steven V. Abramson, dated April 7, 2015 (29)
10.45#	Equity Retention Agreement between the Registrant and Sidney D. Rosenblatt, dated April 7, 2015 (29)
10.46#	Equity Retention Agreement between the Registrant and Julia J. Brown, dated September 10, 2015 (30)
10.47#	Equity Retention Agreement between the Registrant and Mauro Premutico, dated September 10, 2015 (30)

- 10.48+ IP Transfer Agreement, dated June 28, 2016 by and between UDC Ireland Limited and BASF SE (31)
- 21\* Subsidiaries of the registrant
- 23.1\* Consent of KPMG LLP
- 31.1\* Certifications of Steven V. Abramson, Chief Executive Officer, as required by Rule 13a-14(a) or Rule 15d-14(a)
- 31.2\* Certifications of Sidney D. Rosenblatt, Chief Financial Officer, as required by Rule 13a-14(a) or Rule 15d-14(a)
- 32.1\*\* Certifications of Steven V. Abramson, Chief Executive Officer, as required by Rule 13a-14(b) or Rule 15d-14(b), and by 18 U.S.C. Section 1350. (This exhibit shall not be deemed “filed” for purposes of Section 18 of the Securities Exchange Act of 1934, as amended, or otherwise subject to the liability of that section. Further, this exhibit shall not be deemed to be incorporated by reference into any filing under the Securities Act of 1933, as amended, or the Securities Exchange Act of 1934, as amended.)
- 32.2\*\* Certifications of Sidney D. Rosenblatt, Chief Financial Officer, as required by Rule 13a-14(b) or Rule 15d-14(b), and by 18 U.S.C. Section 1350. (This exhibit shall not be deemed “filed” for purposes of Section 18 of the Securities Exchange Act of 1934, as amended, or otherwise subject to the liability of that section. Further, this exhibit shall not be deemed to be incorporated by reference into any filing under the Securities Act of 1933, as amended, or the Securities Exchange Act of 1934, as amended.)

Exhibit Number	Description
101.INS*	XBRL Instance Document
101.SCH*	XBRL Taxonomy Extension Schema Document
101.CAL*	XBRL Taxonomy Extension Calculation Linkbase Document
101.DEF*	XBRL Taxonomy Extension Definition Linkbase Document
101.LAB*	XBRL Taxonomy Extension Label Linkbase Document
101.PRE*	XBRL Taxonomy Extension Presentation Linkbase Document

Explanation of footnotes to listing of exhibits:

\*Filed herewith.

\*\*Furnished herewith.

#Management contract or compensatory plan or arrangement.

+Confidential treatment has been accorded to certain portions of this exhibit pursuant to Rule 406 under the Securities Act of 1933, as amended, or Rule 24b-2 under the Securities Exchange Act of 1934, as amended.

- (1) Filed as an Exhibit to the Quarterly Report on Form 10-Q for the quarter ended June 30, 2013, filed with the SEC on August 8, 2013.
- (2) Filed as an Exhibit to the Annual Report on Form 10-K for the year ended December 31, 2003, filed with the SEC on March 1, 2004.
- (3) Filed as an Exhibit to the Annual Report on Form 10-K for the year ended December 31, 2008, filed with the SEC on March 12, 2009.
- (4) Filed as an Exhibit to the Annual Report on Form 10-K for the year ended December 31, 2006, filed with the SEC on March 15, 2007.
- (5) Filed as an Exhibit to the Quarterly Report on Form 10-Q for the quarter ended March 31, 2010, filed with the SEC on May 10, 2010.
- (6) Filed as an Exhibit to a Current Report on Form 8-K, filed with the SEC on March 21, 2011.
- (7) Filed as an Exhibit to the Quarterly Report on Form 10-Q for the quarter ended March 31, 2012, filed with the SEC on May 9, 2012.
- (8) Filed as an Exhibit to the Quarterly Report on Form 10-Q for the quarter ended June 30, 2012, filed with the SEC on August 8, 2012.
- (9) Filed as an Exhibit to the Quarterly Report on Form 10-Q for the quarter ended March 31, 2013, filed with the SEC on May 9, 2013.
- (10) Filed as an Exhibit to the Quarterly Report on Form 10-Q for the quarter ended June 30, 2006, filed with the SEC on August 9, 2006.
- (11) Filed as an Exhibit to the Quarterly Report on Form 10-Q for the quarter ended June 30, 2009, filed with the SEC on August 10, 2009.
- (12) Filed as an Exhibit to the Annual Report on Form 10K-SB for the year ended December 31, 1997, filed with the SEC on March 31, 1998.
- (13) Filed as an Exhibit to the Quarterly Report on Form 10-Q for the quarter ended September 30, 2003, filed with the SEC on November 10, 2003.

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- (14) Filed as an Exhibit to the amended Quarterly Report on Form 10-Q for the quarter ended September 30, 2000, filed with the SEC on November 20, 2001.
- (15) Filed as an Exhibit to the Quarterly Report on Form 10-Q for the quarter ended September 30, 2011, filed with the SEC on November 8, 2011.
- (16) Filed as an Exhibit to an Amended Current Report on Form 8-K, filed with the SEC on December 19, 2011.
- (17) Filed as an Exhibit to the Quarterly Report on Form 10-Q for the quarter ended September 30, 2006, filed with the SEC on November 6, 2006.
- (18) Filed as an Exhibit to the Quarterly Report on Form 10-Q for the quarter ended March 31, 2009, filed with the SEC on May 7, 2009.
- (19) Filed as an Exhibit to the Quarterly Report on Form 10-Q for the quarter ended September 30, 2008, filed with the SEC on November 6, 2008.
- (20) Filed as an Exhibit to Amendment No. 1 to the Quarterly Report on Form 10-Q for the quarter ended September 30, 2011, filed with the SEC on January 27, 2012.
- (21) Filed as an Exhibit to a Current Report on Form 8-K, filed with the SEC on July 27, 2012.
- (22) Filed as an Exhibit to the Quarterly Report on Form 10-Q for the quarter ended September 30, 2013, filed with the SEC on November 7, 2013.
- (23) Filed as an Exhibit to a Current Report on Form 8-K, filed with the SEC on June 24, 2013.
- (24) Filed as an Exhibit to the Annual Report on Form 10-K for the year ended December 31, 2013, filed with the SEC on February 28, 2014.

- (25) Filed as Exhibit A to the Company's Definitive Proxy Statement for the 2014 Annual Meeting filed with the SEC on April 25, 2014.
- (26) Filed as an exhibit to the Current Report on Form 8-K filed with the SEC on March 9, 2015.
- (27) Filed as an Exhibit to the Quarterly Report on Form 10-Q for the quarter ended June 30, 2015, filed with the SEC on August 6, 2015.
- (28) Filed as an Exhibit to the Quarterly Report on Form 10-Q for the quarter ended September 30, 2015, filed with the SEC on November 5, 2015.
- (29) Filed as an Exhibit to the Quarterly Report on Form 10-Q for the quarter ended June 30, 2016, filed with the SEC on August 4, 2016.

Note: Any of the exhibits listed in the foregoing index not included with this report may be obtained, without charge, by writing to Mr. Sidney D. Rosenblatt, Corporate Secretary, Universal Display Corporation, 375 Phillips Boulevard, Ewing, New Jersey 08618.

(b) The exhibits required to be filed by us with this report are listed above.

(c) The consolidated financial statement schedules required to be filed by us with this report are listed above.

#### ITEM 16. FORM 10-K SUMMARY

None.

## SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

## UNIVERSAL DISPLAY CORPORATION

By: /s/ Sidney D. Rosenblatt  
 Sidney D. Rosenblatt  
 Executive Vice President, Chief Financial Officer,  
 Treasurer and Secretary

Date: February 23, 2017

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant and in the capacities and on the dates indicated.

Name	Title	Date
/s/ Sherwin I. Seligsohn Sherwin I. Seligsohn	Founder and Chairman of the Board of Directors	February 23, 2017
/s/ Steven V. Abramson Steven V. Abramson	President, Chief Executive Officer and Director (principal executive officer)	February 23, 2017
/s/ Sidney D. Rosenblatt Sidney D. Rosenblatt	Executive Vice President, Chief Financial Officer, Treasurer, Secretary and Director (principal financial and accounting officer)	February 23, 2017
/s/ Leonard Becker Leonard Becker	Director	February 23, 2017
/s/ Elizabeth H. Gemmill Elizabeth H. Gemmill	Director	February 23, 2017
/s/ C. Keith Hartley C. Keith Hartley	Director	February 23, 2017
/s/ Lawrence Lacerte Lawrence Lacerte	Director	February 23, 2017

/s/ Richard C. Elias  
Richard C. Elias

Director

February 23,  
2017

/s/ Rosemarie B. Greco  
Rosemarie B. Greco

Director

February 23,  
2017

UNIVERSAL DISPLAY CORPORATION AND SUBSIDIARIES

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MANAGEMENT'S REPORT ON INTERNAL CONTROL OVER FINANCIAL REPORTING

Our management is responsible for establishing and maintaining adequate internal control over financial reporting for the Company. Internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of consolidated financial statements for external purposes in accordance with generally accepted accounting principles. Our system of internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the Company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the Company are being made only in accordance with authorizations of management and directors of the Company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of the Company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Management performed an assessment of the effectiveness of our internal control over financial reporting as of December 31, 2016 based upon criteria in Internal Control — Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). Based on this assessment, management determined that the Company's internal control over financial reporting was effective as of December 31, 2016, based on the criteria in Internal Control-Integrated Framework (2013) issued by COSO.

The effectiveness of our internal control over financial reporting as of December 31, 2016, has been attested to by KPMG LLP, an independent registered public accounting firm, as stated in its report which appears on the following page.

Steven V. Abramson

Sidney D. Rosenblatt

President and Chief Executive Officer    Executive Vice President and Chief Financial Officer

February 23, 2017

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REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

The Board of Directors and Shareholders

Universal Display Corporation:

We have audited Universal Display Corporation's internal control over financial reporting as of December 31, 2016, based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). Universal Display Corporation's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management's Report on Internal Control Over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit.

We conducted our audit in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audit also included performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

In our opinion, Universal Display Corporation maintained, in all material respects, effective internal control over financial reporting as of December 31, 2016, based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States), the consolidated balance sheets of Universal Display Corporation and subsidiaries as of December 31, 2016 and 2015, and the related consolidated statements of income, comprehensive income, shareholders' equity, and cash flows for each of the years in the three-year period ended December 31, 2016, and our report dated February 23, 2017 expressed an unqualified opinion on those consolidated financial statements.

/s/ KPMG LLP

Philadelphia, Pennsylvania

February 23, 2017

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REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

The Board of Directors and Shareholders

Universal Display Corporation:

We have audited the accompanying consolidated balance sheets of Universal Display Corporation and subsidiaries as of December 31, 2016 and 2015, and the related consolidated statements of income, comprehensive income, shareholders' equity, and cash flows for each of the years in the three-year period ended December 31, 2016. These consolidated financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on these consolidated financial statements based on our audits.

We conducted our audits in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of Universal Display Corporation and subsidiaries as of December 31, 2016 and 2015, and the results of their operations and their cash flows for each of the years in the three-year period ended December 31, 2016, in conformity with U.S. generally accepted accounting principles.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States), Universal Display Corporation's internal control over financial reporting as of December 31, 2016, based on criteria established in Internal Control — Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO), and our report dated February 23, 2017 expressed an unqualified opinion on the effectiveness of the Company's internal control over financial reporting.

/s/ KPMG LLP

Philadelphia, Pennsylvania

February 23, 2017

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## UNIVERSAL DISPLAY CORPORATION AND SUBSIDIARIES

## CONSOLIDATED BALANCE SHEETS

(in thousands, except share and per share data)

	December 31, 2016	December 31, 2015
<b>ASSETS</b>		
<b>CURRENT ASSETS:</b>		
Cash and cash equivalents	\$ 139,365	\$ 97,513
Short-term investments	188,644	297,981
Accounts receivable	24,994	24,729
Inventory	17,314	12,748
Deferred income taxes	8,661	12,326
Other current assets	6,392	2,387
<b>Total current assets</b>	<b>385,370</b>	<b>447,684</b>
<b>PROPERTY AND EQUIPMENT, net of accumulated depreciation of \$32,167</b>		
and \$27,897	27,203	22,407
<b>ACQUIRED TECHNOLOGY, net of accumulated amortization of \$70,714 and \$54,837</b>		
	152,127	72,015
<b>OTHER INTANGIBLE ASSETS, net of accumulated amortization of \$615 and none</b>		
	16,225	—
<b>GOODWILL</b>		
	15,535	—
<b>INVESTMENTS</b>		
	14,960	2,187
<b>DEFERRED INCOME TAXES</b>		
	15,832	14,945
<b>OTHER ASSETS</b>		
	307	174
<b>TOTAL ASSETS</b>	<b>\$ 627,559</b>	<b>\$ 559,412</b>
<b>LIABILITIES AND SHAREHOLDERS' EQUITY</b>		
<b>CURRENT LIABILITIES:</b>		
Accounts payable	\$ 8,112	\$ 6,849
Accrued expenses	19,845	17,387
Deferred revenue	10,282	10,107
Other current liabilities	1,967	167
<b>Total current liabilities</b>	<b>40,206</b>	<b>34,510</b>
<b>DEFERRED REVENUE</b>		
	31,322	35,543
<b>RETIREMENT PLAN BENEFIT LIABILITY</b>		
<b>Total liabilities</b>	<b>99,091</b>	<b>92,647</b>
<b>COMMITMENTS AND CONTINGENCIES (Note 16)</b>		
<b>SHAREHOLDERS' EQUITY:</b>		
Preferred Stock, par value \$0.01 per share, 5,000,000 shares authorized, 200,000		
shares of Series A Nonconvertible Preferred Stock issued and outstanding		
(liquidation value of \$7.50 per share or \$1,500)	2	2
Common Stock, par value \$0.01 per share, 100,000,000 shares authorized, 48,270,990	483	482
and 48,132,223 shares issued, and 46,913,127 and 46,774,360 shares outstanding at		

December 31, 2016 and December 31, 2015, respectively		
Additional paid-in capital	604,364	589,885
Accumulated deficit	(25,557 )	(73,627 )
Accumulated other comprehensive loss	(10,666 )	(9,819 )
Treasury stock, at cost (1,357,863 shares at December 31, 2016 and December 31, 2015)	(40,158 )	(40,158 )
Total shareholders' equity	528,468	466,765
<b>TOTAL LIABILITIES AND SHAREHOLDERS' EQUITY</b>	<b>\$ 627,559</b>	<b>\$ 559,412</b>

The accompanying notes are an integral part of these consolidated financial statements.

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## UNIVERSAL DISPLAY CORPORATION AND SUBSIDIARIES

## CONSOLIDATED STATEMENTS OF INCOME

(in thousands, except share and per share data)

	Year Ended December 31,		
	2016	2015	2014
<b>REVENUE:</b>			
Material sales	\$99,285	\$113,066	\$126,885
Royalty and license fees	96,132	77,773	63,192
Contract research services	3,469	207	954
Total revenue	198,886	191,046	191,031
<b>COST OF SALES</b>			
Gross margin	172,598	128,049	149,716
<b>OPERATING EXPENSES:</b>			
Research and development	42,744	44,641	41,154
Selling, general and administrative	32,876	29,046	28,135
Amortization of acquired technology and other intangible assets	16,493	10,999	10,997
Patent costs	6,249	5,717	6,291
Royalty and license expenses	5,823	5,370	4,519
Total operating expenses	104,185	95,773	91,096
<b>OPERATING INCOME</b>	<b>68,413</b>	<b>32,276</b>	<b>58,620</b>
Interest income, net	2,113	783	707
Other (expense) income, net	(1,928 )	—	—
Interest and other (expense) income, net	185	783	707
<b>INCOME BEFORE INCOME TAXES</b>	<b>68,598</b>	<b>33,059</b>	<b>59,327</b>
<b>INCOME TAX EXPENSE</b>	<b>(20,528 )</b>	<b>(18,381 )</b>	<b>(17,473 )</b>
<b>NET INCOME</b>	<b>\$48,070</b>	<b>\$14,678</b>	<b>\$41,854</b>
<b>Net income per common share:</b>			
Basic	\$1.02	\$0.31	\$0.90
Diluted	\$1.02	\$0.31	\$0.90
Weighted average shares used in computing net income per common share:			
Basic	46,408,460	46,816,394	46,252,960
Diluted	46,535,980	47,494,188	46,685,145

The accompanying notes are an integral part of these consolidated financial statements.

## UNIVERSAL DISPLAY CORPORATION AND SUBSIDIARIES

## CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME

(in thousands)

	For the Year Ended		
	2016	2015	2014
NET INCOME	\$48,070	\$14,678	\$41,854
OTHER COMPREHENSIVE LOSS, NET OF TAX:			
Unrealized loss on available-for-sale securities, net of tax of \$72, \$46, and \$3, respectively	(135 )	(83 )	(4 )
Employee benefit plan:			
Actuarial loss on retirement plan, net of tax of \$945, \$218, and none, respectively	(1,731 )	(388 )	(385 )
Plan amendment cost, net of tax of none, \$3,305, and none, respectively	—	(5,963 )	—
Amortization of plan amendment cost, prior service cost and actuarial loss for retirement plan included in net periodic pension costs, net of tax of \$591, \$553, and \$209, respectively	1,084	997	375
Net change for employee benefit plan	(647 )	(5,354 )	(10 )
Change in cumulative foreign currency translation adjustment	(65 )	—	—
TOTAL OTHER COMPREHENSIVE LOSS	(847 )	(5,437 )	(14 )
COMPREHENSIVE INCOME	\$47,223	\$9,241	\$41,840

The accompanying notes are an integral part of these consolidated financial statements.



## UNIVERSAL DISPLAY CORPORATION AND SUBSIDIARIES

## CONSOLIDATED STATEMENTS OF SHAREHOLDERS' EQUITY

(in thousands, except for share data)

	Series A		Additional				Accumulated		Treasury Stock Shares Amount	Total Shareholders' Equity
	Nonconvertible Preferred Stock Shares	Common Stock Shares	Common Stock Amount	Paid-in Capital	Accumulated Deficit	Other Comprehensive Loss				
BALANCE, JANUARY 1, 2014	200,000	\$2 46,825,168	\$468	\$572,401	\$(130,159)	\$(4,368 )	401,501	\$(10,658)	\$427,686	
Net income	—	—	—	—	41,854	—	—	—	41,854	
Other comprehensive loss	—	—	—	—	—	(14 )	—	—	(14 )	
Repurchase of Common Stock	—	—	—	—	—	—	956,362	(29,500)	(29,500 )	
Exercise of common stock options	—	— 184,798	3	1,884	—	—	—	—	1,887	
Issuance of common stock to  employees	—	— 83,834	1	8,026	—	—	—	—	8,027	
Shares withheld for employee taxes	—	— (83,831 )	(1 )	(2,843 )	—	—	—	—	(2,844 )	
Issuance of common stock to Board  of Directors and Scientific Advisory Board	—	— 39,484	—	1,318	—	—	—	—	1,318	
Issuance of common stock to  employees under an ESPP	—	— 12,373	—	328	—	—	—	—	328	
BALANCE, DECEMBER 31, 2014	200,000	2 47,061,826	471	581,114	(88,305 )	(4,382 )	1,357,863	(40,158)	448,742	
Net income	—	—	—	—	14,678	—	—	—	14,678	
	—	—	—	—	—	(5,437 )	—	—	(5,437 )	

Other comprehensive loss										
Exercise of common stock options	—	—	340,725	3	2,031	—	—	—	—	2,034
Issuance of common stock to										
employees	—	—	798,036	8	10,039	—	—	—	—	10,047
Shares withheld for employee taxes	—	—	(124,961 )	—	(5,337 )	—	—	—	—	(5,337 )
Issuance of common stock to Board										
of Directors and Scientific										
Advisory Board	—	—	44,351	—	1,591	—	—	—	—	1,591
Issuance of common stock to										
employees under an ESPP	—	—	12,246	—	447	—	—	—	—	447
BALANCE, DECEMBER 31, 2015	200,000	2	48,132,223	482	589,885	(73,627 )	(9,819 )	1,357,863	(40,158)	466,765
Net income	—	—	—	—	—	48,070	—	—	—	48,070
Other comprehensive loss	—	—	—	—	—	—	(847 )	—	—	(847 )
Exercise of common stock options	—	—	12,750	—	185	—	—	—	—	185
Issuance of common stock to										
employees	—	—	165,826	2	12,354	—	—	—	—	12,356
Shares withheld for employee taxes	—	—	(92,241 )	(1 )	(4,870 )	—	—	—	—	(4,871 )
Excess tax benefits from share-based										
payment arrangements	—	—	—	—	4,232	—	—	—	—	4,232
Issuance of common stock to	—	—	43,046	—	2,012	—	—	—	—	2,012

Board										
of Directors and Scientific										
Advisory Board										
Issuance of common stock to										
employees under an ESPP	—	—	9,386	—	566	—	—	—	—	566
BALANCE, DECEMBER 31, 2016	200,000	\$2	48,270,990	\$483	\$604,364	\$(25,557 )	\$(10,666)	1,357,863	\$(40,158)	\$528,468

The accompanying notes are an integral part of these consolidated financial statements.

## UNIVERSAL DISPLAY CORPORATION AND SUBSIDIARIES

## CONSOLIDATED STATEMENTS OF CASH FLOWS

(in thousands)

	Year Ended December 31,		
	2016	2015	2014
<b>CASH FLOWS FROM OPERATING ACTIVITIES:</b>			
Net income	\$48,070	\$14,678	\$41,854
Adjustments to reconcile net income to net cash provided by operating activities:			
Amortization of deferred revenue	(7,406 )	(8,994 )	(4,274 )
Depreciation	4,270	3,086	2,077
Amortization of intangibles	16,492	10,999	10,997
Inventory write-down	—	33,000	3,900
Amortization of premium and discount on investments, net	(1,830 )	(697 )	(531 )
Stock-based compensation to employees	11,374	9,173	7,278
Stock-based compensation to Board of Directors and Scientific Advisory Board	1,715	1,291	995
Deferred income tax benefit	3,094	7,137	9,108
Excess tax benefits from share-based payment arrangements	(4,232 )	—	—
Retirement plan benefit expense	3,965	3,354	1,679
Decrease (increase) in assets, net of effect of acquisition:			
Accounts receivable	1,205	(2,654 )	(6,418 )
Inventory	(4,460 )	(8,639 )	(30,414 )
Other current assets	(3,870 )	1,969	2,267
Other assets	(133 )	251	(183 )
Increase (decrease) in liabilities, net of effect of acquisition:			
Accounts payable and accrued expenses	4,362	790	3,055
Other current liabilities	4,362	56	87
Deferred revenue	3,360	48,812	5,793
Net cash provided by operating activities	80,338	113,612	47,270
<b>CASH FLOWS FROM INVESTING ACTIVITIES:</b>			
Purchases of property and equipment	(7,300 )	(5,103 )	(6,153 )
Purchase of intangibles	(95,989 )	—	—
Purchase of business, net of cash acquired	(33,380 )	—	—
Purchases of investments	(450,277)	(691,876)	(408,974)
Proceeds from sale of investments	548,474	638,411	372,818
Net cash used in investing activities	(38,472 )	(58,568 )	(42,309 )
<b>CASH FLOWS FROM FINANCING ACTIVITIES:</b>			
Proceeds from issuance of common stock	439	354	328
Repurchase of common stock	—	—	(29,500 )
Proceeds from the exercise of common stock options	185	2,034	1,887
Payment of withholding taxes on stock-based compensation to employees	(4,870 )	(5,337 )	(2,844 )
Excess tax benefits from share-based payment arrangements	4,232	—	—
Net cash used in financing activities	(14 )	(2,949 )	(30,129 )
<b>INCREASE (DECREASE) IN CASH AND CASH EQUIVALENTS</b>	<b>41,852</b>	<b>52,095</b>	<b>(25,168 )</b>
<b>CASH AND CASH EQUIVALENTS, BEGINNING OF YEAR</b>	<b>97,513</b>	<b>45,418</b>	<b>70,586</b>
<b>CASH AND CASH EQUIVALENTS, END OF YEAR</b>	<b>\$139,365</b>	<b>\$97,513</b>	<b>\$45,418</b>
The following non-cash activities occurred:			

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Unrealized loss on available-for-sale securities	\$(207 )	\$(129 )	\$(7 )
Common stock issued to the Board of Directors and Scientific Advisory			
Board earned and accrued in a previous period	300	300	323
Common stock issued to employees earned and accrued in a previous period	1,105	967	749
Net change in accruals for purchases of property and equipment	(103 )	467	965
Earnout liability recorded for Adesis acquisition	1,670	—	—
Excess tax benefits accrued in other current liabilities	(4,232 )	—	—
Cash paid for income tax, net	12,870	10,364	8,275

The accompanying notes are an integral part of these consolidated financial statements.

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UNIVERSAL DISPLAY CORPORATION AND SUBSIDIARIES

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. BUSINESS:

Universal Display Corporation (the Company) is a leader in the research, development and commercialization of organic light emitting diode (OLED) technologies and materials for use in display and solid-state lighting applications. OLEDs are thin, lightweight and power-efficient solid-state devices that emit light that can be manufactured on both flexible and rigid substrates, making them highly suitable for use in full-color displays and as lighting products. OLED displays are capturing a growing share of the display market. The Company believes this is because OLEDs offer potential advantages over competing display technologies with respect to power efficiency, contrast ratio, viewing angle, video response time, form factor and manufacturing cost. The Company also believes that OLED lighting products have the potential to replace many existing light sources in the future because of their high power efficiency, excellent color rendering index, low operating temperature and novel form factor. The Company's technology leadership and intellectual property position should enable it to share in the revenues from OLED displays and lighting products as they enter mainstream consumer and other markets.

The Company's primary business strategy is to (1) further develop and license its proprietary OLED technologies to manufacturers of products for display applications, such as mobile phones, televisions, tablets, wearables, portable media devices, notebook computers, personal computers, and automotive interiors, and specialty and general lighting products; and (2) develop new OLED materials and sell existing and any new materials to those product manufacturers. The Company has established a significant portfolio of proprietary OLED technologies and materials, primarily through internal research and development efforts and acquisitions of patents and patent applications, as well as maintaining its relationships with world-class partners such as Princeton University (Princeton), the University of Southern California (USC), the University of Michigan (Michigan) and PPG Industries, Inc. (PPG Industries). The Company currently owns, exclusively licenses or has the sole right to sublicense more than 4,200 patents issued and pending worldwide.

The Company sells its proprietary OLED materials to customers for evaluation and use in commercial OLED products. The Company also enters into agreements with manufacturers of OLED display and lighting products under which it grants them licenses to practice under its patents and to use the Company's proprietary know-how. At the same time, the Company works with these and other companies who are evaluating the Company's OLED technologies and materials for possible use in commercial OLED display and lighting products.

2. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES:

Principles of Consolidation

The consolidated financial statements include the accounts of Universal Display Corporation and its wholly owned subsidiaries, UDC, Inc., UDC Ireland Limited, Universal Display Corporation Hong Kong, Limited, Universal Display Corporation Korea, Y.H., Universal Display Corporation Japan GK, Universal Display Corporation China, Ltd. and Adesis, Inc. (Adesis). All intercompany transactions and accounts have been eliminated.

Business Combinations

Accounting for acquisitions requires the Company to recognize separately from goodwill the assets acquired and the liabilities assumed at the acquisition date fair values. Goodwill as of the acquisition date is measured as the excess of consideration transferred over the net of the acquisition date fair values of the assets acquired and the liabilities assumed. While the Company uses its best estimates and assumptions to accurately value assets acquired and liabilities assumed at the acquisition date as well as contingent consideration, where applicable, the estimates are inherently uncertain and subject to refinement. As a result, during the measurement period, which is when all information necessary is obtained not to exceed one year, adjustments may be recorded to the assets acquired and liabilities assumed with the corresponding offset to goodwill. Upon the conclusion of the measurement period or final determination of the values of assets acquired or liabilities assumed, whichever comes first, any subsequent adjustments are recorded to the consolidated statements of income.

#### Management's Use of Estimates

The preparation of financial statements in conformity with U.S. generally accepted accounting principles (GAAP) requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. The estimates made are principally in the areas of revenue recognition for license agreements, the useful life of acquired intangibles, the use and recoverability of inventories, intangibles and income taxes including realization of deferred tax assets, stock-based compensation and retirement benefit plan liabilities. Actual results could differ from those estimates.

### Cash and Cash Equivalents

The Company considers all highly liquid debt instruments purchased with an original maturity of three months or less to be cash equivalents. The Company classifies its remaining investments as available-for-sale. These securities are carried at fair market value, with unrealized gains and losses reported in shareholders' equity. Gains or losses on securities sold are based on the specific identification method.

### Trade Accounts Receivable

Trade accounts receivable are stated at the amount the Company expects to collect and do not bear interest. The Company considers the following factors when determining the collectability of specific customer accounts: customer credit-worthiness, past transaction history with the customer, current economic industry trends, and changes in customer payment terms. The Company's accounts receivable balance is a result of chemical sales, royalties and license fees. These receivables have historically been paid timely. Due to the nature of the accounts receivable balance, the Company believes there is no significant risk of collection. If the financial condition of the Company's customers were to deteriorate, adversely affecting their ability to make payments, allowances for doubtful accounts would be required. The allowance for doubtful accounts was \$0.1 million at December 31, 2016, and none at December 31 2015 and 2014.

### Inventories

Inventories consist of raw materials, work-in-process and finished goods, including inventory consigned to customers, and are stated at the lower of cost, determined on a first-in, first-out basis, or market. Inventory valuation and firm committed purchase order assessments are performed on a quarterly basis and those items that are identified to be obsolete or in excess of forecasted usage are written down to their estimated realizable value. Estimates of realizable value are based upon management's analyses and assumptions, including, but not limited to, forecasted sales levels by product, expected product lifecycle, product development plans and future demand requirements. A 12-month rolling forecast based on factors, including, but not limited to, production cycles, anticipated product orders, marketing forecasts, backlog, and shipment activities is used in the inventory analysis. If market conditions are less favorable than forecasts or actual demand from customers is lower than estimates, additional inventory write-downs may be required. If demand is higher than expected, inventories that had previously been written down may be sold.

Certain of the Company's customers have assumed the responsibility for maintaining the Company's inventory at their location based on the customers' demand forecast. Notwithstanding the fact that the Company builds and ships the inventory, the customer does not purchase the consigned inventory until the inventory is drawn or pulled by the customer to be used in the manufacture of the customer's product. Though the consigned inventory may be at the customer's physical location, it remains inventory owned by the Company until the inventory is drawn or pulled, which is the time at which the sale takes place.

### Property and Equipment

Property and equipment are stated at cost and depreciated on a straight-line basis over the estimated useful life of thirty years for building, fifteen years for building improvements, and three to seven years for office and lab equipment and furniture and fixtures. Repair and maintenance costs are charged to expense as incurred. Additions and betterments are capitalized.

Major renewals and improvements are capitalized and minor replacements, maintenance, and repairs are charged to current operations as incurred. Upon retirement or disposal of assets, the cost and related accumulated depreciation are removed from the consolidated balance sheet and any gain or loss is reflected in other operating expenses.



Certain costs of computer software obtained for internal use are capitalized and amortized on a straight-line basis over three years. Costs for maintenance and training, as well as the cost of software that does not add functionality to an existing system, are expensed as incurred.

#### Impairment of Long-Lived Assets

Company management continually evaluates whether events or changes in circumstances might indicate that the remaining estimated useful life of long-lived assets may warrant revision, or that the remaining balance may not be recoverable. When factors indicate that long-lived assets should be evaluated for possible impairment, the Company uses an estimate of the related undiscounted cash flows in measuring whether the long-lived asset should be written down to fair value. Measurement of the amount of impairment would be based on generally accepted valuation methodologies, as deemed appropriate. As of December 31, 2016, Company management believed that no revision to the remaining useful lives or write-down of the Company's long-lived assets was required, and similarly, no such revisions were required for the years ended December 31, 2015 or 2014.

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## Goodwill and Purchased Intangible Assets

Goodwill is tested for impairment in the fourth fiscal quarter and, when specific circumstances dictate, between annual tests. If it is determined that goodwill has been impaired, then its carrying value is written down to fair value. The goodwill impairment test involves a two-step process. The first step, identifying a potential impairment, compares the fair value of a reporting unit with its carrying amount, including goodwill. If the carrying value of the reporting unit exceeds its fair value, the second step would need to be conducted; otherwise, no further steps are necessary as no potential impairment exists. If necessary, the second step to measure the impairment loss would be to compare the implied fair value of the reporting unit goodwill with the carrying amount of that goodwill. Any excess of the reporting unit goodwill carrying value over the respective implied fair value is recognized as an impairment loss. The Company performed its annual impairment assessment as of December 31, 2016 utilizing a qualitative evaluation and concluded that it was more likely than not that the fair value of Adesis (see Note 3) is greater than its carrying value. The Company believes it has made reasonable estimates and assumptions to calculate the fair value of the reporting unit. If actual future results are not consistent with management's estimates and assumptions, the Company may have to take an impairment charge in the future related to goodwill. Future impairment tests will continue to be performed annually in the fiscal fourth quarter, or sooner if a triggering event occurs. As of December 31, 2016, no indications of impairment exist.

Purchased intangible assets with finite lives are carried at cost, less accumulated amortization. Amortization is computed over the estimated useful lives of the respective assets.

## Fair Value of Financial Instruments

The carrying values of accounts receivable, other current assets, and accounts payable approximate fair value in the accompanying financial statements due to the short-term nature of those instruments. The Company's other financial instruments, which include cash equivalents and investments, are carried at fair value.

## Fair Value Measurements

Fair value is defined as an exit price, representing the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants based on the highest and best use of the asset or liability. The Company uses valuation techniques to measure fair value that maximize the use of observable inputs and minimize the use of unobservable inputs. Observable inputs are inputs that market participants would use in pricing the asset or liability, and are based on market data obtained from sources independent of the Company. Unobservable inputs reflect assumptions market participants would use in pricing the asset or liability based on the best information available in the circumstances.

## Revenue Recognition and Deferred Revenue

Material sales relate to the Company's sale of its OLED materials for incorporation into its customers' commercial OLED products or for their OLED development and evaluation activities. Material sales are recognized at the time title passes, which is typically at the time of shipment or at the time of delivery, depending upon the contractual agreement between the parties.

The Company receives license and royalty payments under certain commercial, development and technology evaluation agreements, some of which are non-refundable. These payments may include royalty and license fees made pursuant to license agreements and certain commercial supply agreements. Amounts received are deferred and classified as either current or non-current deferred revenue based upon current contractual remaining terms; however, based upon on-going relationships with customers, as well as future agreement extensions and other factors, amounts classified as current as of December 31, 2016 may not be recognized as revenue over the next twelve months. For arrangements with extended payment terms where the fee is not fixed and determinable, the Company recognizes

revenue when the payment is due and payable. Royalty revenue and license fees included as part of commercial supply agreements are recognized when earned and the amount is fixed and determinable. If the Company used different estimates for the useful life of the licensed technology, or if fees are fixed and determinable, reported revenue during the relevant period would differ.

Contract research services revenue is revenue earned by performing organic and organometallic synthetics research, development and commercialization on a contractual basis. These services range from intermediates for structure-activity relationship studies, reference agents and building blocks for combinatorial synthesis, re-synthesis of key intermediates, specialty organic chemistry needs, and selective toll manufacturing. These services are provided to third-party pharmaceutical and life sciences firms and other technology firms at fixed costs or on an annual contract basis. Revenue is recognized as services are performed with billing schedules and payment terms negotiated on a contract-by-contract basis. Payments received in excess of revenue recognized are recorded as deferred revenue. In other cases, services may be provided and revenue is recognized before the client is invoiced. In these cases, revenue recognized will exceed amounts billed and the difference, representing amounts which are currently unbillable to the customer pursuant to contractual terms, is recorded as an unbilled receivable.

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Technology development and support revenue is revenue earned from government contracts, development and technology evaluation agreements and commercialization assistance fees, which includes reimbursements by government entities for all or a portion of the research and development costs the Company incurs in relation to its government contracts. Revenues are recognized proportionally as research and development costs are incurred, or as defined milestones are achieved.

Currently, the Company's most significant commercial license agreement, which runs through the end of 2017, is with Samsung Display Co., Ltd. (SDC) and covers the manufacture and sale of specified OLED display products. Under this agreement, the Company is being paid a license fee, payable in semi-annual installments over the agreement term of 6.4 years. The installments, which are due in the second and fourth quarter of each year, increase on an annual basis over the term of the agreement. The agreement conveys to SDC the non-exclusive right to use certain of the Company's intellectual property assets for a limited period of time that is less than the estimated life of the assets. Ratable recognition of revenue is impacted by the agreement's extended increasing payment terms in light of the Company's limited history with similar agreements. As a result, revenue is recognized at the lesser of the proportional performance approach (ratable) and the amount of due and payable fees from SDC. Given the increasing contractual payment schedule, license fees under the agreement are recognized as revenue when they become due and payable, which is currently scheduled to be in the second and fourth quarter of each year.

At the same time the Company entered into the current patent license agreement with SDC, the Company also entered into a new supplemental material purchase agreement with SDC. Under the current supplemental material purchase agreement, SDC agrees to purchase from the Company a minimum dollar amount of phosphorescent emitter materials for use in the manufacture of licensed products. This minimum purchase commitment is subject to SDC's requirements for phosphorescent emitter materials and the Company's ability to meet these requirements over the term of the supplemental agreement. The minimum purchase amounts increase on an annual basis over the term of the supplemental agreement. These amounts were determined through negotiation based on a number of factors, including, without limitation, estimates of SDC's OLED business growth as a percentage of published OLED market forecasts and SDC's projected minimum usage of red and green phosphorescent emitter materials over the term of the agreement.

In 2015, the Company entered into an OLED patent license agreement and an OLED commercial supply agreement with LG Display Co., Ltd. (LG Display) which were effective as of January 1, 2015 and superseded the 2007 commercial supply agreement between the parties. The new agreements have a term that is set to expire by the end of 2022. The patent license agreement provides LG Display a non-exclusive, royalty bearing portfolio license to make and sell OLED displays under the Company's patent portfolio. The patent license calls for license fees, prepaid royalties and running royalties on licensed products. The prepaid royalty amount is included in deferred revenue and a portion of this amount can be credited against total royalties due over the life of the contract. The agreements include customary provisions relating to warranties, indemnities, confidentiality, assignability and business terms. The agreements provide for certain other minimum obligations relating to the volume of material sales anticipated over the term of the agreements, as well as minimum royalty revenue to be generated under the patent license agreement. The Company expects to generate revenue under these agreements that are predominantly tied to LG Display's sales of OLED licensed products. The OLED commercial supply agreement provides for the sale of materials for use by LG Display, which may include phosphorescent emitters and host materials.

In 2016, the Company entered into an OLED Technology License Agreement and Commercial Material Supply Agreement with Tianma Micro-electronics Co., Ltd. (Tianma) which were both effective July 21, 2016 and run for five years. Under the license agreement, the Company, through its wholly-owned subsidiary UDC Ireland Limited, has granted Tianma non-exclusive license rights under various patents owned or controlled by the Company to manufacture and sell OLED display products. The license agreement calls for license fees and running royalties on licensed products. Additionally, the agreement provides for the sale of phosphorescent OLED materials to Tianma for use in its licensed products.

The Company records taxes billed to customers and remitted to various governmental entities on a gross basis in both revenues and cost of material sales in the consolidated statements of income. The amounts of these pass through taxes reflected in revenues and cost of material sales were \$171,000, \$1.3 million and \$4.3 million for the years ended December 31, 2016, 2015 and 2014, respectively.

All sales transactions are billed and due within 90 days and substantially all are transacted in U.S. dollars.

#### Cost of Sales

Cost of sales consists of labor and material costs associated with the production of materials processed at the Company's manufacturing partners and at the Company's internal manufacturing processing facilities. The Company's portion of cost of sales also includes depreciation of manufacturing equipment, as well as manufacturing overhead costs and inventory adjustments for excess and obsolete inventory.

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## Research and Development

Expenditures for research and development are charged to operations as incurred.

## Patent Costs

Costs associated with patent applications, patent prosecution, patent defense and the maintenance of patents are charged to expense as incurred. Costs to successfully defend a challenge to a patent are capitalized to the extent of an evident increase in the value of the patent. Costs that relate to an unsuccessful outcome are charged to expense.

## Amortization of Acquired Technology

Amortization costs relate to technology acquired from BASF, Fujifilm and Motorola. These acquisitions were completed in the years ended December 31, 2016, 2012 and 2011, respectively. Acquisition costs are being amortized over a period of 10 years for the BASF and Fujifilm patents and 7.5 years for the Motorola patents.

## Amortization of Other Intangible Assets

Other intangible assets from the Adesis acquisition are being amortized over a period of 10 to 15 years. See Note 8 for further discussion.

## Translation of Foreign Currency Financial Statements and Foreign Currency Transactions

The Company's reporting currency is the U.S. dollar. The functional currency for the Company's Ireland subsidiary is also the U.S. dollar and the functional currency for each of the Company's Asia-Pacific foreign subsidiaries is its local currency. The Company translates the amounts included in the consolidated statements of income from its Asia-Pacific foreign subsidiaries into U.S. dollars at weighted-average exchange rates, which the Company believes are representative of the actual exchange rates on the dates of the transactions. The Company's foreign subsidiaries' assets and liabilities are translated into U.S. dollars from the local currency at the actual exchange rates as of the end of each reporting date, and the Company records the resulting foreign exchange translation adjustments in the consolidated balance sheets as a component of accumulated other comprehensive loss. The overall effect of the translation of foreign currency and foreign currency transactions to date has been insignificant.

## Income Taxes

Income taxes are accounted for under the asset and liability method. Deferred tax assets and liabilities are recognized for the future tax consequences attributable to differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax bases and operating loss and tax credit carryforwards. Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. The effect on deferred tax assets and liabilities of a change in tax rates is recognized in income in the period that includes the enactment date. The Company recognizes the effect of income tax positions only if those positions are more likely than not of being sustained. Recognized income tax positions are measured at the largest amount of which the likelihood of realization is greater than 50%. Changes in recognition or measurement are reflected in the period in which the change in judgment occurs. The Company records interest and penalties, if any, related to unrecognized tax benefits as a component of tax expense.

## Share-Based Payment Awards

The Company recognizes in the consolidated statements of income the grant-date fair value of equity based awards such as shares issued under employee stock purchase plans, restricted stock awards, restricted stock units and

performance unit awards issued to employees and directors.

The grant-date fair value of stock awards is based on the closing price of the stock on the date of grant. The fair value of share-based awards is recognized as compensation expense on a straight-line basis over the requisite service period, net of forfeitures. The Company issues new shares upon the respective grant, exercise or vesting of the share-based payment awards, as applicable.

Performance unit awards are subject to either a performance-based or market-based vesting requirement. For performance-based vesting, the grant-date fair value of the award, based on fair value of the Company's common stock, is recognized over the service period, based on an assessment of the likelihood that the applicable performance goals will be achieved and compensation expense is periodically adjusted based on actual and expected performance. Compensation expense for performance unit awards with market-based vesting is calculated based on the estimated fair value as of the grant date utilizing a Monte Carlo simulation model and is recognized over the service period on a straight-line basis.

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## Recent Accounting Pronouncements

In May 2014, the Financial Accounting Standards Board (FASB) issued a new revenue recognition standard entitled Revenue from Contracts with Customers. The objective of the standard is to establish the principles that an entity shall apply to report useful information to users of financial statements about the nature, amount, timing, and uncertainty of revenue and cash flows from a contract with a customer. The standard is effective for annual reporting periods beginning after December 15, 2017. Earlier adoption as of the original date is optional; however, the Company will adopt the standard beginning January 1, 2018. The standard allows for either “full retrospective” adoption, meaning the standard is applied to all periods presented, or “modified retrospective” adoption, meaning the standard is applied only to the most current period presented in the financial statements. The Company is currently analyzing the impact of the new standard on the Company’s revenue contracts, comparing its current accounting policies and practices to the requirements of the new standard, and identifying potential differences that would result from applying the new standard to its contracts. The Company plans to use the “modified retrospective” adoption method. The Company’s most significant license contract expires at the end of 2017 and is anticipated for renewal as of January 1, 2018. As such, the renewed contract will be accounted for in accordance with the new revenue recognition standard. The Company is also identifying and implementing changes to the Company’s business processes, systems and controls to support adoption of the new standard in 2018.

In July 2015, the FASB issued ASU No. 2015-11, Simplifying the Measurement of Inventory, which requires an entity that uses the first-in first-out method for inventory to report inventory cost at the lower of cost or net realizable value versus the current measurement principle of lower of cost or market. The ASU requires prospective adoption for inventory measurements for fiscal years beginning after December 15, 2016. Early adoption is permitted. The Company does not expect the new inventory standard to have a material effect on its financial position, results of operations or cash flows.

In November 2015, the FASB issued ASU No. 2015-17, Balance Sheet Classification of Deferred Taxes, which requires the classification of all deferred tax assets and liabilities as noncurrent rather than separately disclosing deferred taxes as current and noncurrent. The standard is effective for annual reporting periods beginning after December 15, 2016. The Company will adopt ASU 2015-17 in the first quarter of 2017. If the new standard had been effective as of December 31, 2016, \$8,661 of deferred taxes presented as a current asset would have been reclassified and recorded as a non-current asset.

In February 2016, the FASB issued ASU No. 2016-02, Leases, which addresses the classification and recognition of lease assets and liabilities formerly classified as operating leases under generally accepted accounting principles. The guidance will address certain aspects of recognition and measurement, and quantitative and qualitative aspects of presentation and disclosure. The guidance is effective for fiscal years beginning after December 15, 2018, including interim periods within those fiscal years. The Company is evaluating the effect that ASU 2016-02 may have on its consolidated financial statements and related disclosures.

In March 2016, the FASB issued ASU No. 2016-09, Improvements to Employee Share-Based Accounting, which includes provisions intended to simplify various aspects related to how share-based payments are accounted for and presented in the financial statements. Under current guidance, tax effects of deductions for employee share awards in excess of compensation cost (“windfalls”) are recorded in equity in the period in which the deductions actually reduce income taxes payable and any unrecognized tax benefits are tracked separately off the balance sheet. Under the new guidance, excess tax benefits and deficiencies are to be recorded in the income statement in the period in which stock awards vest or are settled, and any excess tax benefits not previously recognized because the related tax deduction had not reduced current taxes payable are to be recorded through a cumulative-effect adjustment to retained earnings at the beginning of the period of adoption. The standard is effective for annual reporting periods beginning after December 15, 2016. The Company will adopt ASU 2016-9 in the first quarter of 2017. The Company expects adoption of this standard to result in an increase of \$26.9 million in deferred tax assets related to excess tax benefits not previously recognized because the related tax deductions had not reduced income taxes payable. The adjustment will be reflected



as an increase to retained earnings as of January 1, 2017.

In August 2016, the FASB issued ASU No. 2016-15, Statement of Cash Flows (Topic 230): Classification of Certain Cash Receipts and Cash Payments. The objective of the standard is to reduce diversity in practice in how certain transactions are classified in the consolidated statements of cash flows. The ASU provides additional clarification guidance on the classification of certain cash receipts and payments in the consolidated statements of cash flows. The new guidance is effective for fiscal years and interim periods within those years beginning after December 15, 2017 with early adoption permitted. The Company is evaluating the effect that ASU 2016-15 may have on its consolidated financial statements and related disclosures.

In October 2016, the FASB issued ASU No. 2016-16, Income Taxes (Topic 740): Intra-Entity Transfers of Assets Other Than Inventory. ASU 2016-16 clarifies the accounting for the current and deferred income taxes for an intra-entity transfer of an asset other than inventory. ASU 2016-16 is effective for fiscal years beginning after December 15, 2017, including interim periods within those fiscal years, with early adoption permitted. The Company is evaluating the effect that ASU 2016-16 may have on its consolidated financial statements and related disclosures.

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## Reclassification

A reclassification was made to operating expenses in the consolidated statements of income for the years ended December 31, 2015 and 2014 to include non-cash amortization charges of \$10,999 and \$10,997, respectively, in amortization of acquired technology and other intangible assets. These amounts were previously included in patents and amortization of acquired technology. This reclassification was made to conform to the current year presentation. The change in classification had no impact on reporting operating income, net income or net income per common share.

## 3. BUSINESS COMBINATIONS:

On June 23, 2016, the Company entered into an agreement to acquire Adesis, Inc., a privately held contract research organization (CRO) with 43 employees specializing in organic and organometallic synthetic research, development, and commercialization. Adesis is a technology vendor to companies in the pharmaceutical, fine chemical, biomaterials, and catalyst industries, and has worked with the Company over the last few years to help advance and accelerate a number of the Company's product offerings. The transaction closed on July 11, 2016. Under the terms of the agreement, the Company's subsidiary, UDC, Inc., acquired all outstanding shares of Adesis in a merger for \$33.9 million in cash, and up to an additional \$2.4 million in cash contingent upon Adesis' achievement of certain milestones within two years of the acquisition. The acquisition was funded through use of existing cash and investments.

### Preliminary Purchase Price Allocation

The Company accounted for Adesis using the acquisition method of accounting in accordance with applicable U.S. GAAP whereby the total purchase price was allocated to tangible and intangible assets acquired and liabilities assumed based on respective fair values. The contingent consideration arrangement requires the Company to pay up to \$1.2 million of additional consideration to the former shareholders of Adesis if revenues exceed certain threshold levels at the end of each twelve-month period ending December 31, 2016 and December 31, 2017. The fair value of the contingent consideration was derived using a Monte Carlo simulation model based on management's projections of future revenue levels. The initial accounting for the business combination is not complete because the evaluation necessary to assess the fair values of certain assets acquired is still in process. The following table summarizes the values of the assets acquired and liabilities assumed at the date of acquisition (in thousands):

Cash consideration	\$33,872
Contingent consideration	1,670
	\$35,542
Allocation of purchase price:	
Current assets, including cash of \$492	\$2,204
Property and equipment	1,869
Accounts payable and accrued liabilities	(906 )
Net tangible assets	3,167
Identifiable intangible assets	16,840
Goodwill	15,535
Total purchase price	\$35,542

The purchase price exceeded the fair value of the net tangible assets and identifiable intangible assets acquired and, as a result, the Company recorded goodwill in connection with this transaction. This difference includes a going concern element that represents the Company's ability to earn a higher rate of return on this group of assets than would be expected on the separate assets as determined during the valuation process.

Transaction costs of \$360,000 for the year ended December 31, 2016 were recorded and charged to selling, general and administrative expense on the accompanying consolidated statements of income.

The fair value of the contingent consideration was remeasured at December 31, 2016 to reflect the achievement of the \$1.2 million earn-out payment for 2016 and updated analysis of achievement for 2017. The liability was \$1.9 million at December 31, 2016, and the \$195,000 increase from the \$1.7 million recorded in purchase accounting was charged to selling, general and administrative expense in the accompanying consolidated statement of income for the year ended December 31, 2016.

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## Intangible Assets Identified

The following table presents the intangible assets identified in the transaction:

Category	Estimated fair value  (in thousands)	Estimated useful life  (in years)
Customer relationships	10,520	11.5
Internally-developed IP, processes and recipes	4,820	15.0
Trade name/Trademarks	1,500	10.0
Total identifiable intangible assets	\$ 16,840	

The preliminary fair value of the customer relationships asset was determined using the income approach through an excess earnings analysis which estimates value based on the present value of future economic benefits. The customer relationships intangible asset represents relationships between Adesis and its customers. The fair value of the internally-developed IP, processes and recipes was determined by utilizing the relief-from-royalty methodology. The preliminary fair value of the Adesis trade name asset was determined using the income approach through a relief-from-royalty analysis. The determination of useful lives was based upon consideration of market participant assumptions and transaction specific factors.

## Impact on Operating Results

The results of Adesis' operations have been included in the Company's consolidated financial statements since the July 11, 2016 date of acquisition. The following unaudited pro forma information assumes the acquisition of Adesis occurred at the beginning of the respective periods presented (in thousands):

Unaudited Pro Forma Information	Year Ended December 31,	
	2016	2015
Revenue	\$202,547	\$197,375
Net income	44,718	12,661

The unaudited pro forma information presented is for illustrative purposes only and does not reflect future events that may occur after December 31, 2016, or any operating efficiencies or inefficiencies that may result from the Adesis acquisition. Additionally, this unaudited pro forma information includes certain one-time costs associated with the Company's integration of the acquired Adesis operations. Therefore, the information is not necessarily indicative of the results that would have been achieved had the business been combined during the periods presented or the results that the Company will experience going forward.

**4. CASH EQUIVALENTS AND INVESTMENTS:**

The Company considers all highly liquid debt instruments purchased with an original maturity of three months or less to be cash equivalents. The Company classifies its remaining investments as available-for-sale. These securities are carried at fair market value, with unrealized gains and losses reported in shareholders' equity. Gains or losses on securities sold are based on the specific identification method. Investments as of December 31, 2016 and December 31, 2015 consisted of the following (in thousands):

Investment Classification	Amortized Cost	Unrealized Gains(Losses)		Aggregate Fair Market Value
<b>December 31, 2016</b>				
Certificates of deposit	\$ 3,362	\$ 3	\$ —	\$ 3,365
Money market instruments	2,998	—	(2 )	2,996
Corporate bonds	209,595	6	(377 )	209,224
U.S. Government bonds	32,996	1	(3 )	32,994
	\$ 248,951	\$ 10	\$ (382 )	\$ 248,579
<b>December 31, 2015</b>				
Certificates of deposit	\$ 11,532	\$ 3	\$ (14 )	\$ 11,521
Corporate bonds	233,848	—	(139 )	233,709
U.S. Government bonds	54,953	1	(16 )	54,938
	\$ 300,333	\$ 4	\$ (169 )	\$ 300,168

At December 31, 2016, corporate bonds of \$14,975, and U.S. Government bonds of \$30,000 are included in cash equivalents in the Consolidated Balance Sheets.

## 5. FAIR VALUE MEASUREMENTS:

The following table provides the assets and liabilities carried at fair value measured on a recurring basis as of December 31, 2016 (in thousands):

	Total carrying value as of December 31, 2016	Fair Value Measurements, Using		
		Quoted prices in active markets (Level 1)	Significant other observable inputs (Level 2)	Significant unobservable inputs (Level 3)
Cash equivalents	\$ 71,773	\$ 71,773	\$ —	\$ —
Short-term investments	188,644	188,644	—	—
Long-term investments	14,960	14,960	—	—

The following table provides the assets and liabilities carried at fair value measured on a recurring basis as of December 31, 2015 (in thousands):

	Total carrying value as of December 31, 2015	Fair Value Measurements, Using		
		Quoted prices in active markets (Level 1)	Significant other observable inputs (Level 2)	Significant unobservable inputs (Level 3)
Cash equivalents	\$ 34,980	\$ 34,980	\$ —	\$ —
Short-term investments	297,981	297,981	—	—
Long-term investments	2,187	2,187	—	—

Level 1 inputs are quoted prices (unadjusted) in active markets for identical assets or liabilities. Level 2 inputs are quoted prices for similar assets and liabilities in active markets or inputs that are observable for the asset or liability, either directly or indirectly through market corroboration, for substantially the full term of the financial instrument. Level 3 inputs are unobservable inputs based on management's own assumptions used to measure assets and liabilities at fair value. A financial asset's or liability's classification is determined based on the lowest level input that is significant to the fair value measurement.

Changes in fair value of the investments are recorded as unrealized gains and losses in other comprehensive income (loss). If a decline in fair value of an investment is deemed to be other than temporary, the cost of the Company's investment will be written down by the amount of the other-than-temporary impairment with a resulting charge to net income. There were no other-than-temporary impairments of investments as of December 31, 2016 or December 31, 2015

## 6. INVENTORY:

Inventory consisted of the following (in thousands):

	December 31, 2016	December 31, 2015
Raw materials	\$ 6,539	\$ 6,539
Work-in-process	3,719	1,064
Finished goods	7,056	5,145
Inventory	\$ 17,314	\$ 12,748

## 7. PROPERTY AND EQUIPMENT:

Property and equipment consist of the following (in thousands):

	December 31,	
	2016	2015
Land	\$820	\$820
Building and improvements	20,384	19,642
Office and lab equipment	30,728	25,086
Furniture, fixtures and computer related assets	3,097	2,457
Construction-in-progress	4,341	2,299
	59,370	50,304
Less: Accumulated depreciation	(32,167)	(27,897)
Property and equipment, net	\$27,203	\$22,407

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Depreciation expense was \$4.3 million, \$3.1 million and \$2.1 million for the years ended December 31, 2016, 2015, and 2014, respectively.

#### 8. GOODWILL AND INTANGIBLE ASSETS:

The Company monitors the recoverability of goodwill annually or whenever events or changes in circumstances indicate the carrying value may not be recoverable. Purchased intangible assets subject to amortization consist primarily of acquired technology and other intangible assets that include trade names, customer relationships and internally developed IP processes.

##### Acquired Technology

Acquired technology consists of acquired license rights for patents and know-how obtained from PD-LD, Inc., Motorola, BASF SE (BASF) and Fujifilm. These intangible assets consist of the following (in thousands):

	December 31,	
	2016	2015
PD-LD, Inc.	\$1,481	\$1,481
Motorola	15,909	15,909
BASF	95,989	—
Fujifilm	109,462	109,462
	222,841	126,852
Less: Accumulated amortization	(70,714)	(54,837)
Acquired technology, net	\$152,127	\$72,015

Amortization expense related to acquired technology was \$15.9 million, \$11.0 million, and \$11.0 million for the years ended December 31, 2016, 2015, and 2014, respectively. Amortization expense is included in amortization of acquired technology and other intangible assets expense line item on the consolidated statements of income and is expected to be \$20.6 million for each of the five subsequent fiscal years.

##### Motorola Patent Acquisition

In 2000, the Company entered into a royalty-bearing license agreement with Motorola whereby Motorola granted the Company perpetual license rights to what are now 74 issued U.S. patents relating to Motorola's OLED technologies, together with foreign counterparts in various countries. These patents will all expire in the U.S. by 2018.

On March 9, 2011, the Company purchased these patents from Motorola, including all existing and future claims and causes of action for any infringement of the patents, pursuant to a Patent Purchase Agreement. The Patent Purchase Agreement effectively terminated the Company's license agreement with Motorola, including any obligation to make royalty payments to Motorola. The technology acquired from Motorola is being amortized over a period of 7.5 years.

##### Fujifilm Patent Acquisition

On July 23, 2012, the Company entered into a Patent Sale Agreement with Fujifilm. Under the agreement, Fujifilm sold more than 1,200 OLED-related patents and patent applications in exchange for a cash payment of \$105.0 million,



plus costs incurred in connection with the purchase. The agreement contains customary representations and warranties and covenants, including respective covenants not to sue by both parties thereto. The agreement permitted the Company to assign all of its rights and obligations under the agreement to its affiliates, and the Company assigned, prior to the consummation of the transactions contemplated by the agreement, its rights and obligations to UDC Ireland Limited (UDC Ireland), a wholly-owned subsidiary of the Company formed under the laws of the Republic of Ireland. The transactions contemplated by the agreement were consummated on July 26, 2012. The Company recorded the \$105.0 million plus \$4.5 million of purchase costs as acquired technology, which is being amortized over a period of 10 years.

#### BASF Patent Acquisition

On June 28, 2016, UDC Ireland entered into and consummated an IP Transfer Agreement with BASF. Under the IP Transfer Agreement, BASF sold to UDC Ireland all of its rights, title and interest to certain of its owned and co-owned intellectual property rights relating to the composition of, development, manufacture and use of OLED materials, including OLED lighting and display stack technology, as well as certain tangible assets. The intellectual property includes knowhow and more than 500 issued and pending patents in the area of phosphorescent materials and technologies. These assets were acquired in exchange for a cash payment of €86.8

million (\$95.8 million). In addition, UDC Ireland also took on certain rights and obligations under three joint research and development agreements to which BASF was a party. The IP Transfer Agreement also contains customary representations, warranties and covenants of the parties. UDC Ireland recorded the payment of €86.8 million (\$95.8 million) and acquisition costs incurred of \$217,000 as acquired technology, which is being amortized over a period of 10 years.

#### Other Intangible Assets

As a result of the Adesis acquisition on July 12, 2016, the Company recorded \$16.8 million of other intangible assets, including \$10.5 million assigned to customer relationships with a weighted average life of 11.5 years, \$4.8 million of internally developed IP, processes and recipes with a weighted average life of 15 years, and \$1.5 million assigned to trade name and trademarks with a weighted average life of 10 years.

	December 31, 2016		
	Gross Carrying	Accumulated Amortization	Net Carrying
	Amount	Amortization	Amount
Customer relationships	\$ 10,520	\$ (401 )	\$ 10,119
Internally-developed IP, processes and recipes	4,820	(146 )	4,674
Trade name/Trademarks	1,500	(68 )	1,432
Total identifiable intangible assets	\$ 16,840	\$ (615 )	\$ 16,225

Amortization expense related to other intangible assets was \$615,000 for the year ended December 31, 2016 and none for both years ended December 31, 2015 and 2014. Amortization expense is included in amortization of acquired technology and other intangible assets expense line item on the consolidated statements of income and is expected to be \$1.4 million for each of the five subsequent fiscal years

#### Goodwill

As a result of the Adesis acquisition, the Company recorded \$15.5 million of goodwill. The Company performs its annual assessment of goodwill during the fourth quarter of the fiscal year unless events suggest an impairment may have been incurred in an interim period. Application of the goodwill impairment test requires the exercise of judgment, including the determination of the fair value of each reporting unit. The Company estimates the fair value of reporting units using an income approach based on the present value of estimated future cash flows. As part of the annual assessment of goodwill completed during the fourth quarter ended December 31, 2016, there were no significant indicators to conclude that an impairment of the goodwill associated with the acquisition of Adesis had occurred.

#### 9. ACCRUED EXPENSES:

Accrued expenses consist of the following (in thousands):

December 31,

	2016	2015
Compensation	\$10,833	\$9,885
Royalties	5,823	5,362
Research and development agreements	757	1,389
Consulting	524	407
Professional fees	238	296
Other	1,670	48
	\$19,845	\$17,387

10. RESEARCH AND LICENSE AGREEMENTS WITH PRINCETON UNIVERSITY, UNIVERSITY OF SOUTHERN CALIFORNIA AND THE UNIVERSITY OF MICHIGAN:

The Company funded OLED technology research at Princeton University and, on a subcontractor basis, at the University of Southern California for 10 years under a Research Agreement executed with Princeton University in August 1997 (the 1997 Research Agreement). The principal investigator conducting work under the 1997 Research Agreement transferred to the University of Michigan in January 2006. Following this transfer, the 1997 Research Agreement was allowed to expire on July 31, 2007.

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As a result of the transfer, the Company entered into a new Sponsored Research Agreement with the University of Southern California to sponsor OLED technology research and, on a subcontractor basis, with the University of Michigan. This new Sponsored Research Agreement (as amended, the 2006 Research Agreement) was effective as of May 1, 2006 and had an original term of three years. On May 1, 2009, the Company amended the 2006 Research Agreement to extend the term of the agreement for an additional four years. The 2006 Research Agreement superseded the 1997 Research Agreement with respect to all work being performed at the University of Southern California and the University of Michigan. Payments under the 2006 Research Agreement were made to the University of Southern California on a quarterly basis as actual expenses were incurred. The Company incurred a total of \$5.0 million in research and development expense for work performed under the 2006 Research Agreement during the extended term, which ended on April 30, 2013.

Effective June 1, 2013, the Company amended the 2006 Research Agreement again to extend the term of the agreement for an additional four years. As of December 31, 2016, the Company was obligated to pay the University of Southern California up to \$1.6 million for work to be actually performed during the remaining extended term, which expires April 30, 2017. From June 1, 2013 through December 31, 2016, the Company incurred \$3.9 million in research and development expense for work performed under the 2006 Research Agreement.

In connection with entering into the 2006 Research Agreement, the Company amended the 1997 Amended License Agreement to include the University of Michigan as a party to that agreement effective as of January 1, 2006. Under this amendment, Princeton University, the University of Southern California and the University of Michigan have granted the Company a worldwide exclusive license, with rights to sublicense, to make, have made, use, lease and/or sell products and to practice processes based on patent applications and issued patents arising out of work performed under the 2006 Research Agreement. The financial terms of the 1997 Amended License Agreement were not impacted by this amendment.

On October 9, 1997, the Company, Princeton University and the University of Southern California entered into an Amended License Agreement (as amended, the 1997 Amended License Agreement) under which Princeton University and the University of Southern California granted the Company worldwide, exclusive license rights, with rights to sublicense, to make, have made, use, lease and/or sell products and to practice processes based on patent applications and issued patents arising out of work performed by Princeton University and the University of Southern California under the 1997 Research Agreement. Under this 1997 Amended License Agreement, the Company is required to pay Princeton University royalties for licensed products sold by the Company or its sublicensees. For licensed products sold by the Company, the Company is required to pay Princeton University 3% of the net sales price of these products. For licensed products sold by the Company's sublicensees, the Company is required to pay Princeton 3% of the revenues received by the Company from these sublicensees. These royalty rates are subject to renegotiation for products not reasonably conceivable as arising out of the 1997 Research Agreement if Princeton University reasonably determines that the royalty rates payable with respect to these products are not fair and competitive.

The Company is obligated, under the 1997 Amended License Agreement, to pay to Princeton University minimum annual royalties. The minimum royalty payment is \$100,000 per year. The Company recorded royalty expense in connection with this agreement of \$5.8 million, \$5.4 million, and \$4.5 million for the years ended December 31, 2016, 2015, and 2014 respectively.

The Company also is required, under the 1997 Amended License Agreement, to use commercially reasonable efforts to bring the licensed OLED technology to market. However, this requirement is deemed satisfied if the Company invests a minimum of \$800,000 per year in research, development, commercialization or patenting efforts respecting the patent rights licensed to the Company.

**11. EQUITY AND CASH COMPENSATION UNDER THE PPG AGREEMENTS:**

On September 22, 2011, the Company entered into an Amended and Restated OLED Materials Supply and Service Agreement with PPG Industries (the New OLED Materials Agreement), which replaced the original OLED Materials Agreement with PPG Industries effective as of October 1, 2011. The term of the New OLED Materials Agreement ran through December 31, 2015 and shall be automatically renewed for additional one year terms, unless terminated by the Company by providing prior notice of one year or terminated by PPG by providing prior notice of two years. The agreement was automatically renewed through December 31, 2017. The New OLED Materials Agreement contains provisions that are substantially similar to those of the original OLED Materials Agreement. Under the New OLED Materials Agreement, PPG Industries continues to assist the Company in developing its proprietary OLED materials and supplying the Company with those materials for evaluation purposes and for resale to its customers.

Under the New OLED Materials Agreement, the Company compensates PPG Industries on a cost-plus basis for the services provided during each calendar quarter. The Company is required to pay for some of these services in all cash. Up to 50% of the remaining services are payable, at the Company's sole discretion, in cash or shares of the Company's common stock, with the balance payable in cash. The actual number of shares of common stock issuable to PPG Industries is determined based on the average closing price for the Company's common stock during a specified number of days prior to the end of each calendar half-year period ending on

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March 31 and September 30. If, however, this average closing price is less than \$20.00, the Company is required to compensate PPG Industries in cash. No shares were issued for services to PPG for the years ended December 31, 2016, 2015, and 2014.

The Company is also to reimburse PPG Industries for raw materials used for research and development. The Company records the purchases of these raw materials as a current asset until such materials are used for research and development efforts.

The Company recorded research and development expense of \$2.3 million, \$7.9 million, and \$9.2 million for the years ended December 31, 2016, 2015 and 2014, respectively, in relation to the cash portion of the reimbursement of expenses and work performed by PPG Industries, excluding amounts paid for commercial chemicals.

## 12. SHAREHOLDERS' EQUITY:

### Preferred Stock

The Company's Articles of Incorporation authorize it to issue up to 5,000,000 shares of preferred stock with designations, rights and preferences determined from time-to-time by the Company's Board of Directors. Accordingly, the Company's Board of Directors is empowered, without shareholder approval, to issue preferred stock with dividend, liquidation, conversion, voting or other rights superior to those of shareholders of the Company's common stock.

In 1995, the Company issued 200,000 shares of Series A Nonconvertible Preferred Stock (Series A) to American Biomimetics Corporation (ABC) pursuant to a certain Technology Transfer Agreement between the Company and ABC. The Series A shares have a liquidation value of \$7.50 per share. Series A shareholders, as a single class, have the right to elect two members of the Company's Board of Directors. This right has never been exercised. Holders of the Series A shares are entitled to one vote per share on matters which shareholders are generally entitled to vote. The Series A shareholders are not entitled to any dividends.

As of December 31, 2016, the Company had issued 200,000 shares of preferred stock, all of which were outstanding.

### Common Stock

The Company is authorized to issue 100,000,000 shares of \$0.01 par value common stock. Each share of the Company's common stock entitles the holder to one vote on all matters to be voted upon by the shareholders. As of December 31, 2016, the Company had issued 48,270,990 shares of common stock of which 46,913,127 were outstanding.

### Scientific Advisory Board and Employee Awards

During the first quarters of 2016 and 2015, the Company granted a total of 27,967 and 35,205 shares, respectively, of fully vested common stock to employees and non-employee members of the Scientific Advisory Board for services performed in 2015 and 2014, respectively. The fair value of the shares issued was \$1.1 million and \$967,000, respectively, for shares issued to employees and \$300,000 for both quarters for shares issued to members of the Scientific Advisory Board, which amounts were accrued at December 31, 2015 and 2014, respectively. In connection

with the issuance of these grants, 8,106 and 9,565 shares, with fair values of \$410,000 and \$346,000, were withheld in satisfaction of employee tax withholding obligations in 2016 and 2015, respectively.

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## 13. ACCUMULATED OTHER COMPREHENSIVE LOSS:

Amounts related to the changes in accumulated other comprehensive loss were as follows (in thousands):

	Unrealized			Total	Affected line items in the
	(loss) on	Net unrealized	Change in cumulative		consolidated statements of
	available-for-gain	(loss) on	foreign currency		operations
	sale-securities	retirement plan <sup>(2)</sup>	translation adjustment		
Balance January 1, 2014, net of tax	\$ (24 )	\$ (4,344 )	\$ —	\$ (4,368 )	
Other comprehensive loss before					
reclassification	(4 )	(385 )	—	(389 )	
Reclassification to net income <sup>(1)</sup>					Selling, general and administrative, research and development
	—	375	—	375	
Change during period	(4 )	(10 )	—	(14 )	
Balance December 31 2014, net of					
tax	\$ (28 )	\$ (4,354 )	\$ —	\$ (4,382 )	
Other comprehensive loss before					
reclassification	(83 )	(388 )	—	(471 )	
Plan amendment cost	—	(5,963 )	—	(5,963 )	
Reclassification to net income <sup>(1)</sup>					Selling, general and administrative, research and development
	—	997	—	997	
Change during period	(83 )	(5,354 )	—	(5,437 )	
Balance December 31, 2015, net of					
tax	\$ (111 )	\$ (9,708 )	\$ —	\$ (9,819 )	
Other comprehensive loss before					
reclassification	(135 )	(1,731 )	(65 )	(1,931 )	
Reclassification to net income <sup>(1)</sup>					Selling, general and administrative, research and development, and cost of material sales
	—	1,084	—	1,084	



Change during period	(135 )	(647 )	(65 )	(847 )
Balance December 31, 2016, net of				
tax	\$ (246 )	\$ (10,355 )	\$ (65 )	\$ (10,666)

- (1) The Company reclassified amortization of plan amendment cost, prior service cost, and actuarial loss for its retirement plan from accumulated other comprehensive loss to net income of \$1.1 million, \$1.0 million, and \$375,000 for the years ended December 31, 2016, 2015, and 2014, respectively.
- (2) Refer to Note 15: Employee Retirement Plans

#### 14. STOCK-BASED COMPENSATION:

##### Equity Compensation Plan

In 1995, the Board of Directors of the Company adopted a stock option plan, which was most recently amended and restated in 2014 and is now called the Equity Compensation Plan. The Equity Compensation Plan provides for the granting of incentive and nonqualified stock options, shares of common stock, stock appreciation rights and performance units to employees, directors and consultants of the Company. Stock options are exercisable over periods determined by the Compensation Committee, but for no longer than 10 years from the grant date. Through December 31, 2016, the Company's shareholders have approved increases in the number of shares reserved for issuance under the Equity Compensation Plan to 10,500,000, and have extended the term of the plan through 2024. As of December 31, 2016, there were 2,588,837 shares that remained available to be granted under the Equity Compensation Plan.

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## Stock Options

The following table summarizes the stock option activity during the year ended December 31, 2016 for all the grants under the Equity Compensation Plan:

	Options	Weighted Average Exercise Price
Outstanding at January 1, 2016	16,500	\$ 14.83
Granted	—	—
Exercised	(12,750)	14.51
Forfeited/ Expired	(250 )	—
Cancelled	—	—
Outstanding at December 31, 2016	3,500	15.99
Vested and expected to vest	3,500	15.99
Exercisable at December 31, 2016	3,500	\$ 15.99

No stock options were granted during the years ended December 31, 2016, 2015 or 2014.

A summary of stock options outstanding and exercisable by price range at December 31, 2016 is as follows (in thousands, except share and per share data):

Exercise Price	Outstanding and Exercisable Number of		Weighted Average Exercise Price	Aggregate Intrinsic Value (A)
	Options	Remaining Contractual Life		
\$10.04-\$12.70	750	1.7	\$ 10.93	\$ 34
\$14.16-\$14.39	250	0.1	\$ 14.16	\$ 11
\$15.22-\$18.34	2,500	0.8	\$ 17.69	\$ 96
Total	3,500	0.93	\$ 15.99	\$ 141

(A) The difference between the stock option's exercise price and the closing price of common stock at December 31, 2016.

The total intrinsic value of stock options exercised during the years ended December 31, 2016, 2015 and 2014 was \$507,000, \$12.0 million and \$3.7 million, respectively. There was no compensation expense recognized for the years ended December 31, 2016, 2015, and 2014.

During the year ended December 31, 2015, 13,959 shares of common stock, with a fair value of \$429,000, were tendered to net share settle the exercise of options. During the years ended December 31, 2016 and 2014, no shares of common stock were tendered to net share settle the exercise of options. In connection with the exercise of options during the year ended December 31, 2015, 30,186 shares with a fair value of \$1.3 million were withheld in satisfaction of employee tax withholding obligations.

#### Stock Awards

The following table summarizes the activity related to restricted stock unit (“RSU”) share based payment awards:

	Number of Shares	Weighted- Average Grant-Date Fair Value
Unvested, January 1, 2016	164,674	\$ 37.49
Granted	73,793	53.85
Vested	(101,739)	38.96
Forfeited	(5,609 )	40.34
Unvested, December 31, 2016	131,119	\$ 45.44

The weighted average grant-date fair value of RSU awards granted was \$53.85, \$41.09 and \$37.95 during the years ended December 31, 2016, 2015 and 2014, respectively. The fair value as of the respective vesting dates of RSUs was \$5.4 million, \$5.6 million and \$3.1 million for 2016, 2015 and 2014, respectively.

The following table summarizes the activity related to restricted stock award (“RSA”) share based payment awards:

	Number of Shares	Weighted- Average Grant-Date Fair Value
Unvested, January 1, 2016	787,324	\$ 43.43
Granted	124,744	65.37
Vested	(162,113)	45.48
Forfeited	—	—
Unvested, December 31, 2016	749,955	\$ 46.64

The weighted average grant-date fair value of RSA awards granted was \$65.37, \$43.49 and \$32.54 during the years ended December 31, 2016, 2015 and 2014, respectively. The fair value as of the respective vesting dates of RSUs was \$8.6 million, \$7.3 million and \$4.6 million for 2016, 2015 and 2014, respectively.

#### Restricted Stock Awards and Units

The Company has issued restricted stock awards and units to employees and non-employee members of the Scientific Advisory Board with vesting terms of one to six years. The fair value is equal to the market price of the Company’s common stock on the date of grant for awards granted to employees and equal to the market price at the end of the reporting period for unvested non-employee awards or upon the date of vesting for vested non-employee awards. Expense for restricted stock awards and units is amortized ratably over the vesting period for the awards issued to employees and using a graded vesting method for the awards issued to non-employee members of the Scientific Advisory Board

For the years ended December 31, 2016, 2015 and 2014, the Company recorded, as compensation charges related to restricted stock awards and units issued to employees and non-employees, selling, general and administrative expense of \$6.6 million, \$5.8 million, and \$3.6 million, manufacturing expense of \$1.1 million, \$178,000 and \$110,000 and research and development expense of \$1.7 million, \$1.9 million and \$1.8 million, respectively.

The majority of the Company’s restricted stock awards and units that vested in 2016, 2015 and 2014 were net-share settled such that the Company withheld shares with value equivalent to the employees’ minimum statutory obligation for the applicable income and other employment taxes, and remitted the cash to the appropriate tax authorities. The total shares withheld were approximately 84,135, 99,345 and 75,760 for 2016, 2015 and 2014, respectively, and were based on the value of the restricted vesting dates as determined by the Company’s closing stock price. Total payments for the employees’ tax obligations to taxing authorities were \$4.5 million, \$4.2 million and \$2.6 million in 2016, 2015 and 2014, respectively, and are reflected as a financing activity within the consolidated statements of cash flows.

For the years ended December 31, 2016, 2015 and 2014, the Company recorded as compensation charges related to all restricted stock units to non-employee members of the Scientific Advisory Board whose unvested shares are marked to market each reporting period, research and development expense of \$242,000, \$426,000 and \$175,000, respectively.

#### Board of Directors Compensation

The Company has granted restricted stock units to non-employee members of the Board of Directors with vesting terms of approximately one year. The fair value is equal to the market price of the Company's common stock on the date of grant. The restricted stock units are issued and expense is recognized ratably over the vesting period. For the years ended December 31, 2016, 2015 and 2014, the Company recorded compensation charges for services performed related to all restricted stock units granted to non-employee members of the Board of Directors, selling and administrative expense of \$1.5 million, \$865,000 and \$797,000, respectively. Restricted stock issued to non-employee members of the Board of Directors during 2016, 2015 and 2014 was 30,000, 29,167 and 23,750 shares, respectively.

As of December 31, 2016, the total unrecognized cost related to RSUs and RSAs was \$32.3 million, which the Company expects to recognize over a weighted average period of 3.44 years.

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## Performance Unit Awards

The following table summarizes the activity related to performance unit awards (“PSU”) share based payment awards:

	Number of Shares	Weighted- Average Grant-Date Fair Value
Unvested, January 1, 2016	68,724	\$ 34.63
Granted	25,045	58.46
Vested	—	—
Forfeited	—	—
Unvested, December 31, 2016	93,769	\$ 46.02

During the years ended December 31, 2016 and 2015, respectively, the Company granted 25,045 and 32,632 performance units, of which 12,520 and 16,315 are subject to performance-based vesting requirements and 12,525 and 16,317 are subject to market-based vesting requirements, and will vest over the terms described below. The weighted average grant date fair value of the performance unit awards granted was \$58.46, \$35.98 and \$38.67 during the years ended December 31, 2016, 2015 and 2014, respectively, as determined by the Company’s common stock on date of grant for the units with performance-based vesting and a Monte-Carlo simulation for the units with market-based vesting.

Each performance unit award is subject to both a performance-vesting requirement (either performance-based or market-based) and a service-vesting requirement. The performance-based vesting requirement is tied to the Company's cumulative revenue growth compared to the cumulative revenue growth of companies comprising the Nasdaq Electronics Components Index, as measured over a specific performance period. The market-based vesting requirement is tied to the Company's total shareholder return relative to the total shareholder return of companies comprising the Nasdaq Electronics Components Index, as measured over a specific performance period. The maximum number of performance units that may vest based on performance is two times the shares granted. Further, if the Company's total shareholder return is negative, the performance units may not vest at all.

For the years ended December 31, 2016, 2015 and 2014, the Company recorded, as compensation charges related to all performance stock units, selling, general and administrative expense of \$1.3 million, \$854,000 and \$1.4 million, manufacturing expense of \$133,000, \$17,000 and \$28,000 and research and development expenses of \$356,000, \$237,000 and \$408,000, respectively. In connection with the vesting of performance units during the year ended December 31, 2016, no shares were withheld in satisfaction of employee tax withholding obligations. During the year ended December 31, 2015, 16,071 shares with an aggregate fair value of \$752,000 were withheld in satisfaction of employee tax withholding obligations.

As of December 31, 2016, the total unrecognized compensation cost related to PSUs was \$1.6 million, which the Company expects to recognize over a weighted average period of 1.50 years.

## Employee Stock Purchase Plan

On April 7, 2009, the Board of Directors of the Company adopted an Employee Stock Purchase Plan (ESPP). The ESPP was approved by the Company’s shareholders and became effective on June 25, 2009. The Company has reserved 1,000,000 shares of common stock for issuance under the ESPP. Unless terminated sooner by the Board of

Directors, the ESPP will expire when all reserved shares have been issued.

Eligible employees may elect to contribute to the ESPP through payroll deductions during consecutive three-month purchase periods, the first of which began on July 1, 2009. Each employee who elects to participate will be deemed to have been granted an option to purchase shares of the Company's common stock on the first day of the purchase period. Unless the employee opts out during the purchase period, the option will automatically be exercised on the last day of the period, which is the purchase date, based on the employee's accumulated contributions to the ESPP. The purchase price will equal 85% of the lesser of the closing price per share of common stock on the first day of the period or the last business day of the period.

Employees may allocate up to 10% of their base compensation to purchase shares of common stock under the ESPP; however, each employee may purchase no more than 12,500 shares on a given purchase date, and no employee may purchase more than \$25,000 of common stock under the ESPP during a given calendar year.

For the years ended December 31, 2016, 2015 and 2014, the Company issued 9,386, 12,246 and 12,373 shares, respectively, of its common stock under the ESPP, resulting in proceeds of \$439,000, \$354,000 and \$328,000, respectively. For the years ended December 31, 2016, 2015 and 2014, the Company recorded charges of \$45,000, \$34,000 and \$36,000, respectively, to selling, general

and administrative expense, \$15,000, \$9,000, \$8,000, respectively, to manufacturing expense and \$67,000, \$50,000 and \$52,000, respectively, to research and development expense, related to ESPP equal to the amount of the discount and the value of the look-back feature.

#### 15. EMPLOYEE RETIREMENT PLANS:

##### Defined Contribution Plan

The Company maintains the Universal Display Corporation 401(k) Plan (the Plan) in accordance with the provisions of Section 401(k) of the Internal Revenue Code (the Code). The Plan covers substantially all full-time employees of the Company. Participants may contribute up to 90% of their total compensation to the Plan, not to exceed the limit as defined in the Code, with the Company matching 50% of the participant's contribution, limited to 6% of the participant's total compensation. For the years ended December 31, 2016, 2015 and 2014, the Company contributed \$459,000, \$348,000, and \$320,000, respectively, to the Plan.

##### Defined Benefit Plan

On March 18, 2010, the Compensation Committee and the Board of Directors of the Company approved and adopted the Universal Display Corporation Supplemental Executive Retirement Plan (SERP), effective as of April 1, 2010. On March 3, 2015, the Compensation Committee and the Board of Directors amended the SERP to include salary and bonus as part of the plan. Prior to this amendment, the SERP benefit did not take into account any bonuses. The purpose of the SERP, which is unfunded, is to provide certain of the Company's executive officers with supplemental pension benefits following a cessation of their employment. As of December 31, 2016 there were six participants in the SERP.

The SERP benefit is based on a percentage of the participant's annual base salary and in certain cases, the participant's average annual bonus for the most recent three fiscal years ending prior to the participant's date of termination of employment with the Company for the life of the participant. For this purpose, annual base salary means 12 times the highest monthly base salary paid or payable to the participant during the 24-month period immediately preceding the participant's date of termination of employment, or, if required, the date of a change in control of the Company.

Under the SERP, if a participant resigns or is terminated without cause at or after age 65 and with at least 20 years of service, he or she will be eligible to receive a SERP benefit. The benefit is based on a percentage of the participant's annual base salary and bonus for the life of the participant. This percentage is 50%, 25% or 15%, depending on the participant's benefit class. All current participants in the SERP are in the 50% benefit class.

If a participant resigns at or after age 65 and with at least 15 years of service, he or she will be eligible to receive a prorated SERP benefit. If a participant is terminated without cause or on account of a disability after at least 15 years of service, he or she will be eligible to receive a prorated SERP benefit regardless of age. The prorated benefit in either case would be based on the participant's number of years of service (up to 20), divided by 20. In the event a participant is terminated for cause, his or her SERP benefit and any future benefit payments are subject to immediate forfeiture.

The SERP benefit is payable in installments over 10 years, beginning at the later of age 65 or the date of the participant's separation from service. Payments are based on a present value calculation of the benefit amount for the actuarial remaining life expectancy of the participant. This calculation is made as of the date benefit payments are to



begin (later of age 65 or separation from service). If the participant dies after reaching age 65, any future or remaining benefit payments are made to the participant's beneficiary or estate. If the participant dies before reaching age 65, the benefit is forfeited.

In the event of a change in control of the Company, each participant will become immediately vested in his or her SERP benefit. Unless the participant's benefit has already fully vested, if the participant has less than 20 years of service at the time of the change in control, he or she will receive a prorated benefit based on his or her number of years of service (up to 20), divided by 20. If the change in control qualifies as a "change in control event" for purposes of Section 409A of the Internal Revenue Code, then each participant (including former employees who are entitled to SERP benefits) will receive a lump sum cash payment equal to the present value of the benefit immediately upon the change in control.

Certain of the Company's executive officers are designated as special participants under the SERP. If these participants resign or are terminated without cause after 20 years of service, or at or after age 65 and with at least 15 years of service, they will be eligible to receive a SERP benefit. If they are terminated without cause or on account of a disability, they will be eligible to receive a prorated SERP benefit regardless of age. The prorated benefit would be based on the participant's number of years of service (up to 20), divided by 20.

The SERP benefit for special participants is based on 50% of their annual base salary and bonus for their life and the life of their surviving spouse, if any. Payments are based on a present value calculation of the benefit amount for the actuarial remaining life expectancies of the participant and their surviving spouse, if any. If they die before reaching age 65, the benefit is not forfeited if the surviving spouse, if any, lives until the participant would have reached age 65. If their spouse also dies before the participant would have reached age 65, the benefit is forfeited.

The Company records amounts relating to the SERP based on calculations that incorporate various actuarial and other assumptions, including discount rates, rate of compensation increases, retirement dates, and life expectancies. The net periodic costs are recognized as employees render the services necessary to earn the SERP benefits.

In connection with the initiation and subsequent amendment of the SERP, the Company recorded cost related to prior service of \$12.7 million as accumulated other comprehensive loss as of December 31, 2016. The prior service cost is being amortized as a component of net periodic pension cost over the average of the remaining service period of the employees expected to receive benefits under the plan. The prior service cost expected to be amortized for the year ending December 31, 2017 is \$1.8 million.

Information relating to the Company's plan is as follows (in thousands):

	Year Ended December 31,	
	2016	2015
Change in benefit obligation:		
Benefit obligation, beginning of year	\$22,594	\$10,916
Service cost	1,415	1,186
Interest cost	875	618
Actuarial loss	2,679	606
Plan amendment	-	9,268
Benefit obligation, end of year	27,563	22,594
Fair value of plan assets	—	—
Unfunded status of the plan, end of year	\$27,563	\$22,594
Current liability	—	—
Noncurrent liability	\$27,563	\$22,594

The accumulated benefit obligation for the plan was approximately \$24.7 million and \$20.0 million as of December 31, 2016 and 2015, respectively.

The components of net periodic pension cost were as follows (in thousands):

	Year Ended December 31,		
	2016	2015	2014
Service cost	\$1,415	\$1,186	\$669
Interest cost	875	618	426
Amortization of prior service cost	1,660	1,550	584

Amortization of loss	15	—	—
Total net periodic benefit cost	\$3,965	\$3,354	\$1,679

The measurement date is the Company's fiscal year end. The net periodic pension cost is based on assumptions determined at the prior year end measurement date.

Assumptions used to determine the year end benefit obligation were as follows:

	Year Ended December 31,	
	2016	2015
Discount rate	3.57%	3.78%
Rate of compensation increases	3.50%	3.50%

Assumptions used to determine the net periodic pension cost were as follows:

	Year Ended		
	December 31,		
	2016	2015	2014
Discount rate	3.57%	3.78%	4.51%
Rate of compensation increases	3.50%	3.50%	3.50%

Actuarial gains and losses are amortized from accumulated other comprehensive loss into net periodic pension cost over future years based upon the average remaining service period of active plan participants, when the accumulation of such gains or losses exceeds 10% of the year end benefit obligation. The cost or benefit of plan changes that increase or decrease benefits for prior employee service (prior service cost or credit) is included in the Company's results of income on a straight-line basis over the average remaining service period of active plan participants.

The estimated amounts to be amortized from accumulated other comprehensive loss into the net periodic pension cost in 2017 are as follows (in thousands):

Amortization of prior service cost	\$1,660
Amortization of loss	188
Total	\$1,848

Benefit payments, which reflect estimated future service, are currently expected to be paid as follows (in thousands):

	Projected
Year	Benefits
2017	\$—
2018	906
2019	2,252
2020	2,375
2021	2,460
2022-2026	16,122
Thereafter	24,429

## 16. COMMITMENTS AND CONTINGENCIES:

### Commitments

Under the 2006 Research Agreement with USC, the Company is obligated to make certain payments to USC based on work performed by USC under that agreement, and by Michigan under its subcontractor agreement with USC. See Note 10 for further explanation.

Under the terms of the 1997 Amended License Agreement, the Company is required to make minimum royalty payments to Princeton. See Note 10 for further explanation.

The Company has agreements with seven executive officers which provide for certain cash and other benefits upon termination of employment of the officer in connection with a change in control of the Company. If the executive's employment is terminated in connection with the change in control, the executive is entitled to a lump-sum cash payment equal to two times the sum of the average annual base salary and bonus of the officer and immediate vesting of all stock options and other equity awards that may be outstanding at the date of the change in control, among other items.

In order to manage manufacturing lead times and help ensure adequate material supply, the Company entered into a New OLED Materials Agreement (see Note 11) that will allow PPG Industries to procure and produce inventory based upon criteria as defined by the Company. These purchase commitments consist of firm, noncancelable and unconditional commitments. In certain instances, this agreement allows the Company the option to reschedule and adjust the Company's requirements based on its business needs prior to firm orders being placed. As of December 31, 2016, 2015, and 2014, the Company had purchase commitments for inventory of \$5.0 million, \$9.0 million, and \$9.1 million, respectively.

## Patent Related Challenges and Oppositions

Each major jurisdiction in the world that issues patents provides both third parties and applicants an opportunity to seek a further review of an issued patent. The process for requesting and considering such reviews is specific to the jurisdiction that issued the patent in question, and generally does not provide for claims of monetary damages or a review of specific claims of infringement. The conclusions made by the reviewing administrative bodies tend to be appealable and generally are limited in scope and applicability to the specific claims and jurisdiction in question.

The Company believes that opposition proceedings are frequently commenced in the ordinary course of business by third parties who may believe that one or more claims in a patent do not comply with the technical or legal requirements of the specific jurisdiction in which the patent was issued. The Company views these proceedings as reflective of its goal of obtaining the broadest legally permissible patent coverage permitted in each jurisdiction. Once a proceeding is initiated, as a general matter, the issued patent continues to be presumed valid until the jurisdiction's applicable administrative body issues a final non-appealable decision. Depending on the jurisdiction, the outcome of these proceedings could include affirmation, denial or modification of some or all of the originally issued claims. The Company believes that as OLED technology becomes more established and its patent portfolio increases in size, so will the number of these proceedings.

Below are summaries of certain active proceedings that have been commenced against issued patents that are either exclusively licensed to the Company or which are now assigned to the Company. The Company does not believe that the confirmation, loss or modification of the Company's rights in any individual claim or set of claims that are the subject of the following legal proceedings would have a material impact on the Company's materials sales or licensing business or on the Company's consolidated financial statements, including its consolidated statements of income, as a whole. However, as noted within the descriptions, some of the following proceedings involve issued patents that relate to the Company's fundamental phosphorescent OLED technologies and the Company intends to vigorously defend against claims that, in the Company's opinion, seek to restrict or reduce the scope of the originally issued claim, which may require the expenditure of significant amounts of the Company's resources. In certain circumstances, when permitted, the Company may also utilize the proceedings to request modification of the claims to better distinguish the patented invention from any newly identified prior art and/or improve the claim scope of the patent relative to commercially important categories of the invention. The entries marked with an "\*" relate to the Company's UniversalPHOLED® phosphorescent OLED technology, some of which may be commercialized by the Company.

### Opposition to European Patent No. 1394870\*

On April 20, 2010, Merck Patent GmbH; BASF Schweitz AG of Basel, Switzerland; Osram GmbH of Munich, Germany; Siemens Aktiengesellschaft of Munich, Germany; and Koninklijke Philips Electronics N.V., of Eindhoven, The Netherlands filed Notices of Opposition to European Patent No.1394870 (the EP '870 patent). The EP '870 patent, which was issued on July 22, 2009, is a European counterpart patent, in part, to U.S. patents 6,303,238; 6,579,632; 6,872,477; 7,279,235; 7,279,237; 7,488,542; 7,563,519; and 7,901,795; and to pending U.S. patent application 13/035,051, filed on February 25, 2011 (hereinafter the "U.S. '238 Patent Family"). They are exclusively licensed to the Company by Princeton, and the Company is required to pay all legal costs and fees associated with this proceeding.

An Oral Hearing was held before an European Patent Office (EPO) panel of first instance in Munich, Germany, on April 8-9, 2014. The panel rejected the original claims and amended the claims to comply with EPO requirements by more narrowly defining the scope of the claims. The '870 patent, in its amended form, was held by the panel to comply with the EPO requirements.

The Company believes the EPO's decision relating to the broad original claims is erroneous and has appealed the ruling to reinstate a broader set of claims. This patent, as originally granted by the EPO, is deemed valid during the pendency of the appeals process.

At this time, based on the Company's current knowledge, the Company believes that the patent being challenged should be declared valid and that all or a significant portion of the Company's claims should be upheld. However, the Company cannot make any assurances of this result.

Invalidation Trial in Japan for Japan Patent No. 4511024\*

On June 16, 2011, the Company learned that a Request for an Invalidation Trial was filed in Japan by Semiconductor Energy Laboratory, Co., Ltd. for its Japanese Patent No. JP-4511024 (the JP '024 patent), which was issued on May 14, 2010. The JP '024 patent is a counterpart patent, in part, to the U.S. '238 Patent Family, which relate to the EP '870 patent, which is subject to one of the above-noted European oppositions and which relates to the Company's UniversalPHOLED® phosphorescent OLED technology. They are exclusively licensed to the Company by Princeton, and the Company is required to pay all legal costs and fees associated with this proceeding.

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On May 10, 2012, the Company learned that the Japanese Patent Office (JPO) issued a decision upholding the validity of certain claimed inventions in the JP '024 Patent but invalidating the broadest claims in the patent. The Company appealed the JPO's decision to the Japanese IP High Court. On October 31, 2013, the Japanese IP High Court ruled that the prior art references relied on by the JPO did not support the JPO's findings, reversed the JPO's decision with respect to the previously invalidated broad claims in the JP '024 patent and remanded the matter back to the JPO for further consideration consistent with its decision. The JPO subsequently issued a decision upholding the validity of certain claimed inventions in the JP '024 Patent but invalidating the broadest claims in the patent. The Company appealed the decision to reinstate a broader set of claims but the IP High Court declined to reinstate the broader claims. The Company appealed the IP High Court's decision to the Japanese Supreme Court for reconsideration of the legal basis of the IP High Court's decision. The Japanese Supreme Court maintained the lower court's decision and maintained the patent with respect to the narrower set of claims which were not the subject of the IP High Court's invalidation ruling.

#### Opposition to European Patent No. 1390962

On November 16, 2011, Osram AG and BASF SE each filed a Notice of Opposition to European Patent No. 1390962 (EP '962 patent), which relates to the Company's white phosphorescent OLED technology. The EP '962 patent, which was issued on February 16, 2011, is a European counterpart patent to U.S. patents 7,009,338 and 7,285,907. They are exclusively licensed to the Company by Princeton, and the Company is required to pay all legal costs and fees associated with this proceeding.

The EPO combined the oppositions into a single opposition proceeding, and a hearing on this matter was held in December 2015, wherein the EPO Opposition Division revoked the patent claims for alleged insufficiencies under EPC Article 83. The Company believes the EPO's decision relating to the original claims is erroneous, and has appealed the decision. The patent, as originally granted, is deemed valid during the pendency of the appeals process.

At this time, based on its current knowledge, the Company believes that the patent being challenged should be declared valid, and that all or a significant portion of the Company's claims should be upheld. However, the Company cannot make any assurances of this result.

#### Opposition to European Patent No. 1933395\*

On February 24 and 27, 2012, Sumitomo, Merck Patent GmbH and BASF SE filed oppositions to the Company's European Patent No. 1933395 (the EP '395 patent). The EP '395 patent is a counterpart to the EP '637 patent, and, in part, to U.S. Patents 7,001,536, 6,902,830, and 6,830,828, and to JP patents 4358168 and 4357781. This patent is exclusively licensed to the Company by Princeton, and the Company is required to pay all legal costs and fees associated with this proceeding.

At an Oral Hearing on October 14, 2013, the EPO panel issued a decision that affirmed the basic invention and broad patent coverage in the EP '395 patent, but narrowed the scope of the original claims.

On February 26, 2014, the Company appealed the ruling to reinstate a broader set of claims. The patent, as originally granted by the EPO, is deemed to be valid during the pendency of an appeals process. Two of the three opponents also filed their own appeals of the ruling. In January 2015, Sumitomo withdrew its opposition of the '395 patent, and the EPO accepted the withdrawal notice. The appeal proceedings were held in the second quarter of 2016. As a result of the proceedings, the board concluded the oral proceedings and proposed to reinstate a broader set of claims pending the resolution of a remaining question of the applicable law, a question that the board has deferred to the Enlarged Board of Appeals for review. The originally-granted claims remain in force during the pendency of this process.

In addition to the above proceedings and now-concluded proceedings which have been referenced in prior filings, from time to time, the Company may have other proceedings that are pending which relate to patents the Company



acquired as part of the Fujifilm patent or BASF OLED patent acquisitions or which relate to technologies that are not currently widely utilized in the marketplace.

17. CONCENTRATION OF RISK:

Included in technology development and support revenue in the accompanying consolidated statements of income is \$156,000, \$185,000, and \$118,000 for the years ended December 31, 2016, 2015, and 2014, respectively, of revenue which was derived from contracts with United States government agencies. Revenues derived from contracts with United States government agencies represented approximately less than 1% of the consolidated revenue for the years ended December 31, 2016, 2015, and 2014, respectively.

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Revenues and accounts receivable from the Company's largest customers for the years ended December 31 were as follows (in thousands):

Customer	2016		2015		2014	
	% of Total Revenue	Accounts Receivable	% of Total Revenue	Accounts Receivable	% of Total Revenue	Accounts Receivable
A	63%	\$ 12,050	62%	\$ 13,355	54%	\$ 8,550
B	28%	9,128	25%	8,477	19%	7,598
C	4%	1,427	1%	1,564	1%	540

Revenues from outside of North America represented approximately 98%, 99%, and 99% of the consolidated revenue for the years ended December 31, 2016, 2015, and 2014, respectively. Revenues by geographic area are as follows (in thousands):

Country	Year Ended December 31,		
	2016	2015	2014
South Korea	\$181,771	\$168,267	\$141,922
China	7,180	2,685	1,260
Japan	4,310	16,542	44,903
Other non-U.S. locations	1,849	2,334	2,240
Total non-U.S. locations	\$195,110	\$189,828	\$190,325
United States	3,776	1,218	706
Total revenue	\$198,886	\$191,046	\$191,031

The Company attributes revenue to different geographic areas on the basis of the location of the customer.

Long-lived assets (net), by geographic area are as follows (in thousands):

	2016	2015
United States	\$26,917	\$22,187
Other	286	220
Total long-lived assets	\$27,203	\$22,407

Substantially all chemical materials were purchased from one supplier. See Note 11.

#### 18. INCOME TAXES:

The components of income before income taxes are as follows (in thousands):

	Year ended December 31,		
	2016	2015	2014
United States	\$69,595	\$54,338	\$60,485
Foreign	(997 )	(21,279 )	(1,158 )
Income before income tax	\$68,598	\$33,059	\$59,327

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The components of the income tax expense are as follows (in thousands):

	Year ended December 31,		
	2016	2015	2014
<b>Current income tax benefit (expense):</b>			
Federal	\$(4,485 )	\$(1,018 )	\$—
State	(47 )	(2 )	(2 )
Foreign	(12,902)	(10,224)	(8,363 )
	(17,434)	(11,244)	(8,365 )
<b>Deferred income tax (expense) benefit:</b>			
Federal	(2,683 )	(7,145 )	(9,652 )
State	(503 )	51	575
Foreign	92	(43 )	(31 )
	(3,094 )	(7,137 )	(9,108 )
<b>Income tax expense</b>	<b>\$(20,528)</b>	<b>\$(18,381)</b>	<b>\$(17,473)</b>

Reconciliation of the statutory U.S. federal tax rate to the Company's effective tax rate is as follows:

	Year ended December 31,		
	2016	2015	2014
Statutory U.S. federal income tax rate	35.0%	35.0%	35.0%
State income taxes, net of federal benefit	0.5 %	(0.1 )%	(0.4 )%
Effect of foreign operations	0.9 %	15.2%	0.7 %
Accruals and reserves	3.2 %	0.0 %	(4.5 )%
Nondeductible employee compensation	1.5 %	2.5 %	0.5 %
Research tax credits	(1.3 )%	(4.4 )%	(2.5 )%
Change in valuation allowance	(9.7 )%	8.4 %	(0.4 )%
Other	(0.2 )%	(1.0 )%	1.0 %
<b>Effective tax rate</b>	<b>29.9%</b>	<b>55.6%</b>	<b>29.4%</b>

As of December 31, 2016, the Company had net operating loss and credit carry forwards. The Company's net operating loss carry forwards below differ from the Company's accumulated deficit principally due to the timing of the recognition of certain revenues and expenses. A portion of the Company's tax credit carry forwards relate to tax deductions from stock-based compensation. Pursuant to Internal Revenue Code (IRC) sections 382 and 383, utilization of the Company's federal and state net operating loss and tax credit carry forwards could be subject to an annual limitation because of certain ownership changes.

The following table summarizes Company tax loss and tax credit carry forwards for tax return purposes at December 31, 2016 (in thousands):

	Related Tax Deduction	Tax Benefit	Expiration Date
Loss carry forwards:			

Federal net operating loss	\$ —	\$ —	
Foreign net operating loss	27,473	3,434	n/a
Total loss carry forwards	\$ 27,473	\$3,434	
Tax credit carry forwards:			
Research tax credits	n/a	\$12,696	2027 to 2036
Foreign tax credits	n/a	13,754	2023 to 2026
State research tax credits	n/a	2,383	2023 to 2030
Total credit carry forwards	n/a	\$28,833	

The table of carryforwards for tax return purposes includes \$75.6 million (tax benefit of \$26.9 million) related to excess tax benefits which are not currently included in deferred tax assets on the consolidated balance sheet and are not recognized until the deduction reduces taxes payable (see below).

The tax loss and tax credit carryforwards for financial reporting purposes at December 31, 2016 were \$3,434 of foreign net operating loss and \$1,846 of state research credits.

In the first quarter of 2017, the Company will adopt ASU No. 2016-09, Improvements to Employee Share-Based Accounting, which includes provisions intended to simplify various aspects related to how share-based payments are accounted for and presented in the financial statements. Under current guidance, tax effects of deductions for employee share awards in excess of compensation cost ("windfalls") are recorded in equity in the period in which the deductions actually reduce income taxes payable and any unrecognized tax benefits are tracked separately off the balance sheet. Under the new guidance, excess tax benefits and deficiencies are to be recorded in the income statement in the period in which stock awards vest or are settled, and any excess tax benefits not previously recognized because the related tax deduction had not reduced current taxes payable, are to be recorded through a cumulative-effect adjustment to retained earnings at the beginning of the period of adoption.

The Company expects adoption of this standard to result in an increase of \$26.9 million in deferred tax assets related to excess tax benefits not previously recognized because the related tax deductions had not reduced income taxes payable. The adjustment will be reflected as an increase to retained earnings as of January 1, 2017.

Significant components of the Company's net deferred tax assets and liabilities are as follows (in thousands):

	December 31,	
	2016	2015
Deferred tax asset:		
Net operating loss carry forwards	\$3,405	\$3,716
Capitalized technology license	4,163	3,922
Capitalized research expenditures	8,100	10,206
Accruals and reserves	1,112	3,275
Retirement plan	9,723	8,062
Deferred revenue	516	731
Tax credit carry forwards	1,846	7,973
Stock-based compensation	2,889	2,012
Other	874	1,857
	32,628	41,754
Valuation allowance	(7,950)	(14,483)
Deferred tax assets	24,678	27,271
Deferred tax liability:		
Acquisition goodwill	(185)	—
Deferred tax liabilities	(185)	—
Net deferred tax assets	\$24,493	\$27,271

During 2016, the Company retained the valuation allowance that relates to UDC Ireland and New Jersey research and development credits, but released the valuation allowance related to U.S. foreign tax credits by \$6.5 million based on reassessment and tax planning.

During the years ended December 31, 2016, 2015 and 2014, the Company paid foreign taxes on South Korean royalty and license fee income of \$12.4 million, \$9.9 million and \$8.3 million, respectively, which were recorded as current income tax expense. SDC has been required to withhold tax at a rate of 16.5% upon payment of royalties and license fees to the Company.

19. NET INCOME PER COMMON  
SHARE:

The Company computes earnings per share in accordance with ASC Topic 260, Earnings per Share ("ASC 260"), which requires earnings per share for each class of stock to be calculated using the two-class method. The two-class method is an allocation of income between the holders of common stock and the Company's participating security holders. Under the two-class method, income for the reporting period is allocated between common shareholders and other security holders based on their respective participation rights in undistributed income. Unvested share-based payment awards that contain non-forfeitable rights to dividends or dividend equivalents are participating securities and, therefore, are included in computing earnings per share pursuant to the two-class method.

Basic net income per common share is computed by dividing net income allocated to common shareholders by the weighted-average number of shares of common stock outstanding for the period excluding unvested restricted stock units and performance units. Net income allocated to the holders of the Company's unvested restricted stock awards is calculated based on the shareholders proportionate share of weighted average shares of common stock outstanding on an if-converted basis.

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For purposes of determining diluted net income per common share, basic net income per share is further adjusted to include the effect of potential dilutive common shares outstanding, including stock options, restricted stock units and performance units, and the impact of shares to be issued under the ESPP.

The following table is a reconciliation of net income and the shares used in calculating basic and diluted net income per common share for the year ended December 31, 2016, 2015, and 2014 (in thousands, except share and per share data):

	Year Ended December 31,		
	2016	2015	2014
<b>Numerator:</b>			
Net income	\$48,070	14,678	41,854
<b>Adjustment for basic EPS:</b>			
Earnings allocated to unvested securities	\$(734 )	(138 )	(57 )
Adjusted net income	\$47,336	14,540	41,797
<b>Denominator:</b>			
Weighted average common shares outstanding – Basic	46,408,460	46,816,394	46,252,960
<b>Effect of dilutive shares:</b>			
<b>Common stock equivalents arising from stock</b>			
options and ESPP	5,398	267,145	265,129
<b>Restricted stock awards and units and performance</b>			
units	122,122	410,649	167,056
<b>Weighted average common shares</b>			
outstanding – Diluted	46,535,980	47,494,188	46,685,145
<b>Net income per common share:</b>			
Basic	\$1.02	\$0.31	\$0.90
Diluted	\$1.02	\$0.31	\$0.90

For the year ended December 31, 2016, 2015, and 2014, the combined effects of unvested restricted stock awards, restricted stock units, performance unit awards and stock options of 2,981, 17,055 and 87,894, respectively, were excluded from the calculation of diluted EPS as their impact would have been antidilutive.

## 20. QUARTERLY SUPPLEMENTAL FINANCIAL DATA (UNAUDITED):

The following tables present certain unaudited consolidated quarterly financial information for each of the eight quarters in the two-year period ended December 31, 2016. In the opinion of Company management, this quarterly information has been prepared on the same basis as the consolidated financial statements and includes all adjustments (consisting of only normal recurring adjustments) necessary to present fairly the information for the periods presented. The results of operations for any quarter are not necessarily indicative of the results for the full year or for any future period.



Presented below is a summary of the unaudited quarterly financial information for the year ended December 31, 2016 (in thousands, except per share data):

	Three Months Ended				Total
	March 31,	June 30,	September 30, 2016	December 31,	
	2016	2016 <sup>(1)</sup>	2016	2016 <sup>(1)</sup>	
Revenue	\$29,703	\$64,392	\$ 30,214	\$ 74,577	\$198,886
Net income (loss)	\$1,949	\$21,802	\$ (1,500 )	\$ 25,819	\$48,070
Net income (loss) per common share:					
Basic	\$0.04	\$0.46	\$ (0.03 )	\$ 0.55	\$1.02
Diluted	\$0.04	\$0.46	\$ (0.03 )	\$ 0.55	\$1.02

(1)The Company receives significant license revenue in the second and fourth quarters; see Note 2 for further details.  
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Presented below is a summary of the unaudited quarterly financial information for the year ended December 31, 2015 (in thousands, except per share data):

	Three Months Ended				Total
	March 31, 2015	June 30, 2015 (1)(2)	September 30, 2015	December 31, 2015 (1)	
Revenue	\$31,223	\$58,092	\$ 39,419	\$ 62,312	\$191,046
Net income (loss)	\$1,314	\$(11,771)(2)	\$ 7,047	\$ 18,088	\$14,678
Basic	\$0.03	\$(0.25 )	\$ 0.15	\$ 0.39	\$0.31
Diluted	\$0.03	\$(0.25 )	\$ 0.15	\$ 0.39	\$0.31

(1) The Company receives significant license revenue in the second and fourth quarters; see Note 2 for further details.

(2) Includes a \$33.0 million write down of inventory.

Per share amounts for each quarter have been calculated separately. Accordingly, quarterly amounts may not add to annual amounts.

#### 21. SUBSEQUENT EVENTS:

In February 2017, the Company's Board of Directors declared a dividend of \$0.03 per share of common stock.

Payment of the dividend will be made on March 31, 2017 to shareholders of record at the close of business on March 15, 2017.